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13/523,854 | 5532.01:

SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS

PUBLIC VIEW

|                                             |                                           |                                     |                                                                                                                                                                                                                                                                             |
|---------------------------------------------|-------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Application #</b><br>13/523,854          | <b>Confirmation #</b><br>3097             | <b>Attorney Docket #</b><br>5532.01 | <b>Patent #</b><br><a href="#">8,578,444</a> <br><a href="#">Download PDF</a> <br>Issued - 11/05/2013 |
| <b>Filing or 371 (c) date</b><br>06/14/2012 | <b>Status</b><br>Patented Case 10/16/2013 |                                     |                                                                                                                                                                                                                                                                             |

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Application data

|                                           |                                                                                                                                                                                                                                                                               |                                                 |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| <b>Application type</b><br>Utility        | <b>Earliest publication #</b><br><a href="#">US 2012-0254937 A1</a> <br><a href="#">Download PDF</a>  | <b>Intl. registration # (Hague)</b><br>-        |
| <b>Examiner</b><br>HOSUK SONG             | <b>Earliest publication date</b><br>10/04/2012                                                                                                                                                                                                                                | <b>Intl. registration publication date</b><br>- |
| <b>Group art unit</b><br>2435             | <b>Assignee for publication</b><br>-                                                                                                                                                                                                                                          |                                                 |
| <b>Class/subclass</b><br>726/001.000      | <b>Confirmation #</b><br>3097                                                                                                                                                                                                                                                 |                                                 |
| <b>AIA (first inventor to file)</b><br>No |                                                                                                                                                                                                                                                                               |                                                 |
| <b>Entity status</b><br>Small             |                                                                                                                                                                                                                                                                               |                                                 |

|                                                                                                                   |                                                                                                    |                   |
|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------|
| <b>Correspondence address</b>                                                                                     | <b>Inventors</b>                                                                                   | <b>Applicants</b> |
| 23308 - Steven Colby<br>Rimon Law, P.C.<br>423 Washington Street, Suite 600<br>San Francisco, CA<br>UNITED STATES | Stacey C. Lum<br>Los Altos, CALIFORNIA (US)<br><br>Yuhshiow Alice Lee<br>Saratoga, CALIFORNIA (US) |                   |

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|                        |                  |
|------------------------|------------------|
| Application Number     | Not yet assigned |
| Filing Date            | Herewith         |
| First Named Inventor   | Stacey C. Lum    |
| Art Unit               | Not yet assigned |
| Examiner Name          | Not yet assigned |
| Attorney Docket Number | INFO-002COG      |

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Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).

☒ Attorney or agent of record. Registration Number 50565.

☐ Registered practitioner named in the application transmittal letter in an application without an executed oath or declaration. See 37 CFR 1.33(a)(1). Registration Number \_\_\_\_\_.

Signature /Tam Thanh Pham/

Typed or Printed  
Name Tam Thanh Pham

Date June 14, 2012

Telephone  
650-391-1380

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below\*.

☒ \*Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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**REVOCATION OF ATTORNEY AND POWER OF ATTORNEY**

The undersigned, having authority to act on behalf of InfoExpress, Inc., assignee of all right, title, and interest in the attached schedule of patent applications (Schedule A), hereby revokes all powers of attorney previously given and hereby appoints the attorneys and agents associated with **Customer Number 28661** as its attorney to act on applicant's behalf before the United States Patent and Trademark Office for the attached schedule of patent applications (Schedule A) and to transact all business in the Patent and Trademark Office in connection herewith.

**STATEMENT UNDER 37 CFR 3.73(b)**

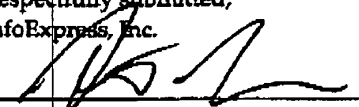
The undersigned certifies that it is the assignee of the entire right, title, and interest in the attached schedule of patent applications (Schedule A). The chain of title from the inventors to the assignee of record for each of the patent applications identified in the attached schedule of patent applications (Schedule A) is attached hereto as Schedule B. The undersigned is empowered and authorized to act on behalf of the assignee.

Kindly address all communications regarding this application to:

**Customer No. 28661**  
**Lewis and Roca LLP**

Respectfully submitted,  
InfoExpress, Inc.

Date: 6/21/11

  
Stacey Lum  
President & CEO

**Schedule A**

| <b><u>Application No.</u></b> | <b><u>Filing Date</u></b> | <b><u>Patent No.</u></b> | <b><u>Issue Date</u></b> |
|-------------------------------|---------------------------|--------------------------|--------------------------|
| 10/949,179                    | September 24, 2004        | 7,523,484                | April 21, 2009           |
| 11/227,679                    | September 14, 2005        | 7,590,733                | September 15, 2009       |
| 12/273,037                    | November 18, 2008         | n/a                      | n/a                      |
| 12/550,321                    | August 28, 2009           | 7,890,658                | February 15, 2011        |
| 13/157,308                    | June 10, 2011             | n/a                      | n/a                      |
| 13/157,309                    | June 10, 2011             | n/a                      | n/a                      |
| 13/157,310                    | June 10, 2011             | n/a                      | n/a                      |

Schedule B

CHAIN OF TITLE INFORMATION  
STATEMENT UNDER 37 CFR 3.73(b)

Application No. 13/157,308

Filed: June 10, 2011

1. From: the Inventors

To: InfoExpress, Inc.

Reel 021851 Frame 0159

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit: Not yet assigned                      Examiner: Not yet assigned

Serial No.: Not yet assigned                      Filed: Herewith

In re Application of: Stacey C. Lum

Confirmation No.: Not yet assigned                      Customer No.: 28661

Title: SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS

---

**STATEMENT REGARDING DECLARATION**

SIR:

The present application is a continuation and claims the priority benefit of U.S. patent application number 13/371,381 filed February 10, 2012, which is a continuation and claims the priority benefit of U.S. patent application number 13/157,309 filed June 10, 2011, now U.S. patent number 8,117,645, which is a continuation and claims the priority benefit of U.S. patent application number 12/273,037 filed November 18, 2008, now U.S. patent number 8,051,460, which is a continuation and claims the priority benefit of U.S. patent application number 10/949,179 filed September 24, 2004, now U.S. patent number 7,523,484, which claims the priority benefit of U.S. provisional application number 60/513,080 filed October 21, 2003 and U.S. provisional application number 60/505,582 filed September 24, 2003.. Enclosed herewith is the declaration for U.S. Patent Application number 10/949,179.

This document is being submitted pursuant to 37 C.F.R. § 1.63(d)(1) whereby a newly executed oath or declaration is not required in a continuation patent application. A power of attorney and 37 C.F.R. 3.73(b) statement from application 13/157,309 is likewise enclosed.

Respectfully submitted,  
LEWIS AND ROCA LLP

Dated: June 14, 2012

/Tam Thanh Pham/  
Tam Thanh Pham  
Reg. No. 50,565

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ATTORNEY'S DOCKET NO.: PA2836US

**SUPPLEMENTAL DECLARATION AND  
POWER OF ATTORNEY FOR PATENT APPLICATION**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled

"Systems and Methods of Controlling Network Access"

which was filed in the United States Patent and Trademark Office on September 24, 2004 and assigned serial number 10/949,179.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under Title 35, United States Code §119(a)-(d) or (f) or §365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s):

| <u>Number</u> | <u>Country</u> | <u>Foreign Filing Date</u> | <u>Priority Claimed?</u>                                 | <u>Certified Copy Attached?</u>                          |
|---------------|----------------|----------------------------|----------------------------------------------------------|----------------------------------------------------------|
| (Number)      | (Country)      | (MM/DD/YYYY)               | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| (Number)      | (Country)      | (MM/DD/YYYY)               | <input type="checkbox"/> Yes <input type="checkbox"/> No | <input type="checkbox"/> Yes <input type="checkbox"/> No |

ATTORNEY'S DOCKET NO.: PA2836US

I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional application(s) listed below.

Prior Provisional Applications:

|                      |                           |
|----------------------|---------------------------|
| <u>60/505,582</u>    | <u>September 24, 2003</u> |
| (Application Number) | (Filing Date)             |
| <u>60/513,080</u>    | <u>October 21, 2003</u>   |
| (Application Number) | (Filing Date)             |

I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s), or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

Prior U.S. or PCT Applications Designating the U.S.:

|                               |                        |                                                   |
|-------------------------------|------------------------|---------------------------------------------------|
| _____<br>(Application Number) | _____<br>(Filing Date) | _____<br>(Status -- patented, pending, abandoned) |
| _____<br>(Application Number) | _____<br>(Filing Date) | _____<br>(Status -- patented, pending, abandoned) |

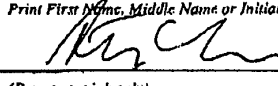
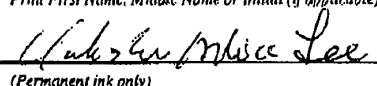
**POWER OF ATTORNEY:** I hereby appoint the attorney(s) and/or agent(s) associated with the customer number **22830** to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

**SEND ALL CORRESPONDENCE TO:**

Customer Number 22830  
CARR & FERRELL LLP  
2200 Geng Road  
Palo Alto, CA 94303  
TEL: (650) 812-3400  
FAX: (650) 812-3444

ATTORNEY'S DOCKET NO.: PA2836US

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of first inventor: Stacey C. Lum Citizenship: U.S.A.*Print First Name, Middle Name or Initial (if applicable), Last Name*Inventor's signature:  Dated: 10/21/08*(Permanent ink only)**(Date of Signature)*Residence Address: Los Altos, California*(if the inventor lives at a location different than his/her mailing address)*Mailing Address: 170 S. Whisman Road, Suite B, Mountain View, California 94041*(Where the inventor customarily receives mail: Number, Street, City, State, Zip Code)*Full name of second inventor: Yuhshiw Alice Lee Citizenship: U.S.A.*Print First Name, Middle Name or Initial (if applicable), Last Name*Inventor's signature:  Dated: 10/21/08*(Permanent ink only)**(Date of Signature)*Residence Address: Saratoga, California*(if the inventor lives at a location different than his/her mailing address)*Mailing Address: 170 S. Whisman Road, Suite B, Mountain View, California 94041*(Where the inventor customarily receives mail: Number, Street, City, State, Zip Code)*

ATTORNEY'S DOCKET NO.: PA2836US**37 CFR §1.56 Duty to disclose information material to patentability.**

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is cancelled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is cancelled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(h)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) Prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) The closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a *prima facie* case of unpatentability of a claim; or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability. A *prima facie* case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application;

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.

(e) In any continuation-in-part application, the duty under this section includes the duty to disclose to the Office all information known to the person to be material to patentability, as defined in paragraph (b) of this section, which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

PA2836US

4

## **SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS**

### **CROSS-REFERENCE TO RELATED APPLICATIONS**

[001] The present application is a continuation and claims the priority benefit of U.S. patent application number 13/371,381 filed February 10, 2012, which is a continuation and claims the priority benefit of U.S. patent application number 13/157,309 filed June 10, 2011, now U.S. patent number 8,117,645, which is a continuation and claims the priority benefit of U.S. patent application number 12/273,037 filed November 18, 2008, now U.S. patent number 8,051,460, which is a continuation and claims the priority benefit of U.S. patent application number 10/949,179 filed September 24, 2004, now U.S. patent number 7,523,484, which claims the priority benefit of U.S. provisional application number 60/513,080 filed October 21, 2003 and U.S. provisional application number 60/505,582 filed September 24, 2003. The disclosures of the aforementioned applications are incorporated herein by reference.

### **BACKGROUND OF THE INVENTION**

#### **Field of the Invention**

[002] The invention is in the field of computing systems and more specifically in the field of network security.

#### **Description of the Related Art**

[003] Several approaches to controlling external access to computing networks have been developed. The goals in developing these approaches include limiting access to authorized users and assuring that computing devices employed by these users do not include malicious computing code such as viruses, worms, or Trojan horses. The need for access control has grown with users' demands for accessing secure networks over the Internet and from personal devices such as laptop computers and personal digital assistants.

[004] A first level of access control is achieved by requiring authentication of a user. This may

be accomplished by requiring the user to enter a username and password or by reading a MAC address or other identifying information from an access device. In some systems, a network switch is programmed to grant access to a secure network only after proper authentication is achieved. Systems capable of using this approach include those using a proprietary VMPS protocol from Cisco Systems, Inc. of San Jose, Calif. or using a IEEE 802.1x standard protocol.

[005] Reliance on mere user authentication includes several disadvantages. For example, there are no provisions to assure that an access device used by the authenticated user meets network security policies. The access device may have out-of-date virus software, may have security vulnerabilities, or may be otherwise compromised. Further, this approach requires that access points (e.g., network switches) support one of a specific set of access protocols. Because many access points do not support VMPS, 802.1x, or a similar protocol, implementation of this approach on a large preexisting network, such as a corporate network, may be prohibitively expensive.

[006] A greater level of access control may be achieved by including a gatekeeper between the secure network and the access device. The gatekeeper is configured to ensure that the access device conforms to a predetermined security policy. FIG. 1 is a block diagram of a Secure Network, generally designated 100, including two instances of a Gatekeeper 110 each associated with a different instance of an Access Point 120. Secure Network 100 further includes, as an illustrative example, a network File Server 130, a Network PC (personal computer) 140 and a Printer 150 included in and connected via, a local area network designated LAN 125.

[007] Each instance of Access Point 120 may include a large number of individual communication ports. These ports are used to connect through GateKeeper 110 to other elements within Secure Network 100 such as File Server 130 or LAN 125. Large corporate networks may include many instances of Access Point 120, each including hundreds of individual communication ports and being associated with an instance of GateKeeper 110.

[008] Some instances of Access Point 120 are capable of supporting virtual local area networks (VLANs). VLANs are generated by associating communication ports within Access Point 120 with separate virtual networks. For example, one Access Device 160 may be placed on a different VLAN than another Access Device 160 by assigning the communication ports of

Access Point 120 to separate VLANs. From the point of view of these devices, the effect of a VLAN is equivalent to having a separate hardwired network.

**[009]** GateKeeper 110 is configured to control access to Secure Network 100. In addition to authenticating users who wish to access Secure Network 100 using an Access Device 160, GateKeeper 110 is configured to ensure that Access Device 160 conforms to a predetermined security policy, before granting access to Secure Network 100. For example, GateKeeper 110 may make certain that Access Device 160 has up-to-date virus software and encryption protocols as proscribed by the security policy. Once GateKeeper 110 has verified that Access Device 160 satisfies the security policy, Access Device 160 is allowed to communicate through GateKeeper 110 to LAN 125.

**[0010]** A disadvantage of the use of GateKeeper 110, as practiced in the prior art, is that all communications between Access Device 160 and LAN 125 pass through GateKeeper 110. For large networks including many instances of Access Point 120, each of which may include many communication ports, this can be a significant burden. The use of one instance of GateKeeper 110 to support numerous instances of Access Device 160 is limited by bandwidth and required sophistication (e.g., cost) of GateKeeper 110. It is undesirable for GateKeeper 110 to become a limiting factor on the bandwidth of communication between instances of Access Device 160 and Secure Network 100. Further, the use of a separate GateKeeper 110 for each instance of Access Device 160 or Access Point 120 is often prohibitively expensive. Even if a separate GateKeeper is used for each Access Point 120, there is no isolation between compliant and non-compliant Access Devices 160 which are attached to the same Access Point 120.

**[0011]** There is, therefore, a need for improved systems and methods of controlling access to secure networks.

## SUMMARY OF THE CLAIMED INVENTION

[0012] Systems and methods of the invention include a protected network physically or logically divided into a restricted subset and one or more less-restricted subsets. Requests from an access device for access to the less-restricted subset are first passed to the restricted subset. Elements (e.g., a gatekeeper) of the restricted subset are then used to apply security policies to the access device and if security policies are satisfied, the access device is granted access to a less-restricted subset of the protected network. The passing of access requests to the restricted subset and granting of access are accomplished by configuring and reconfiguring a communication port of an access point. After access is granted, further communication between the access device and the protected network can include access to the less restricted subset.

[0013] Typically, the less-restricted subset of the protected network and the restricted subset of the protected network are characterized by Virtual Local Area Networks (e.g., VLANs) defined within the access point and optionally by access control lists (ACL) of a router, firewall, or switch situated between the VLAN and the protected network. Different VLANs within the same access point, or within different access points, may be configured to characterize a plurality of restricted subsets and/or a plurality of less-restricted subsets within the protected network. A communication port of the access point is configured such that network traffic directed at the protected network is initially passed through a restricted VLAN rather than through a less-restricted VLAN. The restricted VLAN allows network traffic to pass to the restricted subset of the protected network and is typically restricted in the sense that it only allows access to elements of the protected network that are configured to communicate with an access device whose security characteristics are unknown or questionable. In contrast, the less-restricted VLAN allows access to the less-restricted subset of the protected network and, in typical embodiments, to elements of both the less-restricted subset and the restricted subset. For example, the restricted VLAN allows traffic to pass to a gatekeeper configured to receive requests for access to the less-restricted VLAN, and to determine if, and to what extent, access may be allowed. To grant access, the gatekeeper sends commands to the access point in order to reconfigure a communication port to which the access device is connected. The reconfiguration typically includes reassigning the communication port from the restricted VLAN to the less-

restricted VLAN.

[0014] Subsequent to reconfiguration of the communication port, network traffic can pass from the access device through the less-restricted VLAN to elements of both the less-restricted subset and (optionally) the restricted subset. This network traffic need not pass through the gatekeeper. Thus, in various embodiments of the invention a gatekeeper is used to grant access to the less-restricted subset, and after access has been granted, most network traffic does not need to pass through the gatekeeper. For example, in some embodiments, the gatekeeper only receives requests to access the less-restricted network and data regarding access to and security of the protected network. This data may be received from administrators, access devices, access points, routers, and/or other devices on the network. These limited communications with gatekeeper occur both before and after reconfiguration of the communication port, and eliminate a significant disadvantage associated with the use of prior art gatekeepers.

[0015] Various embodiments of the invention include a computing network comprising a less-restricted subset of the computing network, access to the less-restricted subset being responsive to a first VLAN, a restricted subset of the computing network including a gatekeeper, the gatekeeper configured to receive requests for access to the less-restricted subset from an access device and to issue commands configured to allow access to the less-restricted subset, access to the restricted subset of the computing network being responsive to a second VLAN, and at least one access point including a communication port configurable for communication with the less-restricted subset or alternatively for communication with only the restricted subset, configuration of the communication port including association of the communication port alternatively with the first VLAN or the second VLAN, configuration of the communication port being responsive to the commands issued by the gatekeeper. Other elements are optional.

[0016] Various embodiments of the invention include a network gatekeeper comprising at least one security policy including requirements that must be satisfied before an access device is granted access to a less-restricted subset of a protected network, a policy auditor configured to audit an access device using the at least one security policy, in response to a request to access the less-restricted subset of the protected network, the request being sent from the access device to the gatekeeper via a communication device, and an access control configured to reconfigure

the communication device such that data sent from the access device can be received by the less-restricted subset of the protected network rather than merely a restricted subset of the protected network, if the audit results in a determination that the access device meets the requirements of the at least one security policy, the restricted subset of the protected network including the gatekeeper. Other elements are optional.

[0017] Various embodiments of the invention include a method of granting access to a protected network, the method comprising receiving a request for access to a less-restricted subset of the protected network from an access device external to the protected network, the request being received through a communication port of an access point, the communication port configured for communicating between the access device and a restricted subset of the protected network, the restricted subset including a gatekeeper, applying a security policy to the access device, responsive to the request, and reconfiguring the communication port for communicating between the access device and the less-restricted subset of the protected network, if requirements of the security policy are satisfied. Other steps are optional.

[0018] Various embodiments of the invention include a method of granting access to a protected network, the method comprising receiving a first communication from an access device at a communication port, the communication port being configured to pass the first communication to a restricted subset of the protected network, the restricted subset including a gatekeeper configured to enforce security policy for access to a less-restricted subset of the protected network, receiving a command from the gatekeeper, the command being responsive to the received first communication and being configured to reconfigure the communication port to communicate data to the less-restricted subset of the protected network, configuring the communication port to communicate data to the less-restricted subset of the protected network rather than merely the restricted subset of the protected network, responsive to the received command, and receiving a second communication from the access device at the communication port, the communication port now being configured to pass the second communication to the less-restricted subset of the protected network. Other steps are optional.

[0019] Various embodiments of the invention include a computing network comprising means for dividing the computing network into a restricted subset and a less-restricted subset, means

for receiving a request at the restricted subset, the request being to access the less-restricted subset, means for enforcing a security policy in response to the request, and means for allowing communication to the less-restricted subset, responsive to the enforcement of the security policy, the communication to the less-restricted subset not necessarily passing through the restricted subset. Other elements are optional.

**[0020]** In various embodiments of the invention the restricted subset of a computing network includes elements configured to communicate with access devices having an unknown or questionable security status, and the less-restricted subset of the computing network includes those elements of the computing network not included in the restricted subset.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0021] FIG. 1 is a block diagram of a prior art computing network;

[0022] FIG. 2 is a block diagram of a protected network, according to various embodiments of the invention;

[0023] FIG. 3A is a block diagram showing further details of an access point, router and gatekeeper of FIG. 2, according to various embodiments of the invention;

[0024] FIG. 3B is a block diagram showing further details of the access point, router and gatekeeper of FIG. 2, after access has been granted to a less-restricted subset of a protected network, according to various embodiments of the invention; and

[0025] FIG. 4 is a flowchart illustrating a method of granting access to a protected network, according to various embodiments of the invention.

[0026] FIG. 5 is a block diagram showing EAP over 802.1x/Radius.

[0027] FIG. 6A is a block diagram showing a client in authentication state.

[0028] FIG. 6B is a block diagram showing a server in authentication state.

[0029] FIG. 7 is a block diagram showing a server changing to audit state.

[0030] FIG. 8A is a block diagram showing a server in audit state.

[0031] FIG. 8B is a block diagram showing a client responding to audit requests.

[0032] FIG. 9 is a block diagram showing a system in 802.1x mode where normal traffic does not traverse CGS.

## DETAILED DESCRIPTION

[0033] Access to a protected computing network is controlled by manipulating a communication port within an access point. When an access request is first received, the communication port is configured to pass the request to a restricted subset of a protected computing network. This restricted subset includes a gatekeeper configured to administer a security policy governing access to those parts of the protected computing network that are not part of the restricted subset. Those parts of the protected computing network that are not part of the restricted network are considered to be in a less-restricted subset. The less-restricted subset being less restricted relative to the restricted subset in terms of what elements may be included in each subset. If the device requesting access satisfies requirements of the security policy, then the gatekeeper sends commands to the access point in order to reconfigure the communication port through which the access request was received. The communication port is reconfigured such that further communication from the access device is passed to the less-restricted subset as well as, optionally, the restricted subset. In some embodiments, the less-restricted subset and the restricted subset are characterized by VLANs defined within the protected network.

[0034] FIG. 2 is a block diagram of a Protected Network 200, according to various embodiments of the invention. Protected Network 200 is either physically or logically divided into a Restricted Subset 205 and a Less-Restricted Subset 210. Access to Protected Network 200 is possible through an Access Point 215 (a communication device) and an optional Router 220. As is described further herein this access is under the control of a GateKeeper 225. GateKeeper 225 is configured to enforce a security policy against one or more Access Device 230 requesting access to Less-Restricted Subset 210. Typically, Less-Restricted Subset 210 and Restricted Subset 205 are characterized by VLAN settings within Access Point 215. Access Device 230 and Access Point 215 are connected by a communication channel such as a cable, the Internet, a telephone network, other computing network, and/or the like. In some embodiments, a network access server (not shown) is included between Access Device 230 and Access Point 215.

[0035] In various embodiments, Protected Network 200 includes a corporate network, telephone network, private network, local area network, wide area network, wireless network,

communication network, government network, university network, and/or the like. Restricted Subset 205 is a subset of Protected Network 200 including at least GateKeeper 225. In some embodiments, Restricted Subset 205 further includes a DHCP (dynamic host configuration protocol service) 260 configured to assign and manage network addresses, and/or an Update Module 255 configured for providing security updates to Access Device 230. For example, in one embodiment, Restricted Subset 205 includes a server configured to function as DHCP 260 and a server configured to function as GateKeeper 225. In one embodiment, Restricted Subset 205 includes a single computing device configured to function as both Update Module 255 and GateKeeper 225.

**[0036]** Less-Restricted Subset 210 includes those elements of Protected Network 200 not included in Restricted Subset 205. Less-Restricted Subset 210 optionally includes devices such as a File Server 235, a Network PC 240, a Printer 245, or the like. In some embodiments, Protected Network 200 includes elements having a hierarchy of access restrictions. For example, access to Network PC 240 may require a higher level of authority than access to File Server 235. In this case, as described further herein, access control lists within Router 220 are optionally used to independently control access to specific devices within Less-Restricted Subset 210. Protected Network 200 may be large, including tens, hundreds, or thousands of devices. The hierarchy of access restrictions may be enforced by a hierarchical set of security policies defined using Policy Manager 250. In various embodiments, Router 220 and Access Point 215 may be considered part of Restricted Subset 205 or Less-Restricted Subset 210.

**[0037]** GateKeeper 225 is configured to enforce one or more security policies against an instance of Access Device 230 attempting to access Protected Network 200. The security policies may include requirements for user identification such as user names and passwords, configuration requirements relating to the configuration of Access Device 230, application requirements relating to applications running on Access Device 230, or the like. For example, in one embodiment GateKeeper 225 is configured to enforce a security policy that requires a user of Access Device 230 to provide a username and password, requires Access Device 230 to be running an operating system with specific security patches installed, requires that Access Device 230 not be connected to any insecure devices, and requires that Access Device 230 have

current antivirus software installed.

[0038] In some embodiments, GateKeeper 225 is configured to enforce several alternative security policies having different levels of requirements, and to determine which security policy to enforce based on the identity of Access Device 230, the identity of a user of Access Device 230, those elements of Less-Restricted Subset 210 to which access is requested, and/or the like. For example, a request to access File Server 235 may have to satisfy a security policy that includes scanning Access Device 230 for malicious code, while a request to access Printer 245 may have to satisfy a security policy that includes establishing a user identity. Security policies may be stored on GateKeeper 225, on Policy Manager 250, or elsewhere accessible to Restricted Subset 205.

[0039] In some embodiments, a single instance of GateKeeper 225 is configured to manage access through more than one Access Point 215 and/or to manage access to more than one Protected Network 200. As is described further herein, management of Access Point 215 is accomplished by configuring and reconfiguring one or more communication ports within Access Point 215, and optionally setting access control lists within Router 220. In some embodiments Protected Network 200 includes a plurality of Access Point 215, a plurality of GateKeeper 225 and/or a plurality of Restricted Subset 205. Further details of GateKeeper 225 and Access Point 215 are discussed below.

[0040] Access Device 230 is a computing device configured to operate as an end point (EP) in a communication channel including Access Point 215 and Access Device 230. In various embodiments, Access Device 230 is a personal computer, a personal digital assistant, a telephone, a wireless device, a communication device such as a router, Ethernet card, wireless card, another access point, a network device, or the like. Access Device 230 is optionally identified by a MAC address, by a cookie, by data stored on Access Device 230, by a user name, an IP address, a network address, or the like.

[0041] In some embodiments, Access Device 230 is configured to execute a software and/or hardware agent for communicating with GateKeeper 225. For example, in one embodiment, Access Device 230 includes an agent configured to monitor code running on Access Device 230 and report any suspicious code to GateKeeper 225. In another example, Access Device 230 may

include software and/or hardware configured to monitor other devices connected to Access Device 230 and to report information about these devices (e.g., their security statuses or MAC addresses) to GateKeeper 225.

**[0042]** Policy Manager 250 is configured to centrally create, update, and distribute security policies enforced by one or more GateKeeper 225. For example, in various embodiments, Policy Manager 250 is configured to manage passwords, to specify access privileges, to specify requirements of security policies, or the like. In some embodiments, Policy Manager 250 is configured to establish several security policies and to specify conditions under which each of the security policies should be used. For example, a security policy may be selected for use responsive to a device type of Access Device 230 and/or the elements of Protected Network 200 to which access has been requested.

**[0043]** Update Module 255 is configured for remotely modifying Access Device 230, or a device connected to Access Device 230, in order to improve compliance with a security policy. For example, if it is found that Access Device 230 includes out-of-date antivirus software, then Update Module 255 may facilitate updating of the antivirus software on Access Device 230. In some embodiments, Update Module 255 is configured to update an agent executing on Access Device 230. Update Module 255 is optionally included in Less-Restricted Subset 210 or external to Protected Network 200. Update Module 255 optionally operates responsive to a security policy and/or to GateKeeper 225.

**[0044]** FIG. 3A is a block diagram showing further details of Access Point 215, Router 220 and GateKeeper 225, according to various embodiments of the invention. Access Point 215 is, for example, a network switch, a wireless access point, a remote access virtual private network (VPN), secure socket layer VPN, firewall, or the like. When embodied in a network switch, Access Point 215 includes a series of communication ports, designated Ports 305A-305G and configured for communication with devices such as Access Device 230, Router 220, Less-Restricted Subset 210 and/or Restricted Subset 205.

**[0045]** Communication received at one member of Ports 305A-305G is directed internally to another member of Ports 305A-305G via a member of VLANs 310A-310D. VLANs 310A-310D are logical associations between members of Ports 305A-305G. Typically, any members of Ports

305A-305G that are configured to be associated with the same member of VLANs 310A-310D are in bi-directional communication with each other. These associations are illustrated in FIGS. 3A and 3B by Lines 315. For example, with Ports 305A-305G configured as shown in FIG. 3A, communication from Access Device 230 and received at Port 305A is directed to Port 305F because Port 305A and Port 305F are both associated with VLAN 310C. (In some embodiments of Access Point 215, a member of VLANs 310A-310D may be configured such that some members of Ports 305A-305G, even if associated with the same VLAN, are hidden from each other. For example, in these embodiments, both Ports 305A and 305B may be in communication with Port 305F but not with each other.)

**[0046]** The associations between members of Ports 305A-305G and VLANs 310A-310D are controlled by Switch Logic 317 which is accessible to other devices, for example through Port 305G. Switch Logic 317 is configured for configuring and reconfiguring members of Ports 305A-305G responsive to received commands. For example, by receiving an appropriate command, Switch Logic 317 is configured to reconfigure Port 305A to be associated with VLAN 310A, as illustrated in FIG. 3B below. In this configuration, data received at Port 305A is directed to Port 305D via VLAN 310A, rather than to Port 305F.

**[0047]** As is discussed further below, the commands received by Switch Logic 317 may be generated by GateKeeper 225. This communication between GateKeeper 225 and Switch Logic 317 may be accomplished using SNMP (Simple Network Management Protocol), telnet, SSH (Secure Shell), RADIUS (Remote Authentication User Dial-In Service), EAP (Extensible Authentication Protocol), or the like.

**[0048]** In some embodiments, Switch Logic 317 includes a memory (not shown) configured to store the status of Ports 305A-305G and/or identification data regarding Access Device 230. This identification data may include, for example, MAC addresses, IP (internet protocol) addresses, or other data that may be used to identify Access Device 230 or data sent by Access Device 230.

**[0049]** Data passed through members of Ports 305D-305G are received by Router 220 and may be communicated to other elements of Protected Network 200 responsive to access control lists (ACL 340A-340D) associated with Ports 335A-335D of Router 220. ACL 340A through 340D are each communication filters that deny or allow communication to be passed to specific elements

or sets of elements within Protected Network 200. For example, ACL 340C may be an access control list that specifically allows communication to network addresses used by GateKeeper 225 and DHCP 260, and blocks communication to all other network addresses. In this case, communication through Port 335C of Router 220 would only be allowed to reach these elements of Restricted Subset 205 and would not be allowed to reach elements of Less-Restricted Subset 210.

[0050] ACL 340A-340D of Router 220 may be used to limit communication from Access Device 230 to specific elements of Protected Network 200. For example, in the embodiments illustrated by FIG. 3A, if ACL 340C is configured to restrict communication to Restricted Subset 205, and Ports 305A-305C are associated with VLAN 310C as indicated by Lines 315, then communication via these members of Ports 305A-305G will be restricted to Restricted Subset 205. In typical embodiments, at least one member of ACL 340A-340D is configured to allow communication to Restricted Subset 205 but not to Less-Restricted Subset 210. As is discussed further herein, by reconfiguring a member of Ports 305A-305C to be associated with a different member of VLANs 310A-310D, not subject to the filtering of ACL 340C, communications from Access Device 230 can be directed to elements within Less-Restricted Subset 210, and optionally Restricted Subset 205, rather than merely to Restricted Subset 205.

[0051] When Access Point 215 is embodied in a wireless access point, some or all of Ports 305A-305G may be wireless connections rather than physical ports. In these embodiments, Lines 315 may represent logical associations used to control data flow between wireless connections to Access Point 215 and/or members of Ports 305A-305G that are physical communication ports. For example, in some embodiments, MAC addresses are used to distinguish wireless communications from different instances of Access Device 230 and the logical associations (represented by Lines 315) are used to direct these communications to various output channels. The output channels may be other wireless connections or physical members of Ports 305A-305G. These logical associations may be altered by Switch Logic 317 just as associations with members of VLANs 310A-310D are modified. Therefore, the teachings herein that use a network switch as an example of Access Point 215, apply equally to wireless access points.

[0052] Switch Logic 317 is controlled by an Access Control 320 included in GateKeeper 225.

Access Control 320 is configured to send commands to Switch Logic 317 in order to reconfigure members of Ports 305A-305G. This reconfiguration includes modifying the association of members of Ports 305A-305G with different members of VLANs 310A-310D. In some embodiments, as described further herein, Access Control 320 is also configured to read a status of members of Ports 305A-305G and/or device identification data from Switch Logic 317.

**[0053]** Access Control 320 is responsive to a Policy Auditor 325 included in GateKeeper 225. Policy Auditor 325 is configured to receive a request for access to Less-Restricted Subset 210 from Access Device 230, to determine which of Security Policy 330A or optional Security Policy 330B applies to the current request, to perform a security audit of Access Device 230 based on the appropriate member of Security Policies 330A-330B, and to notify Access Control 320 if the audit is passed. This notice typically causes Access Control 320 to reconfigure a member of Ports 305A-305G using Switch Logic 317. For example, in some embodiments, if Security Policy 330A applies and if Access Device 230 satisfies requirements of Security Policy 330A, then Policy Auditor 325 provides a notice to Access Control 320. In response, Access Control 320 sends appropriate commands to Switch Logic 317. These commands cause changes in Port 305A, such that communication from Access Device 230 is no longer blocked by ACL 340C and can now be received by elements of Less-restricted Subset 310. In alternative embodiments, Security Policies 330A-330B are stored elsewhere in Protected Network 200 accessible to Policy Auditor 325. Restricted Subset 205 optionally includes one, two, or more security policy, such as Security Policies 330A-330B.

**[0054]** FIG. 3B is a block diagram showing further details of Access Point 215, Router 220 and GateKeeper 225 of FIG. 2, after access has been granted to elements of Less-Restricted Subset 210, according to various embodiments of the invention. Port 305A has been reconfigured to be associated with VLAN 310A rather than VLAN 310C. Because VLAN 310A is communicatively coupled to Port 305D and Port 335A (of Router 220) via ACL 340A, any communication received at Port 305A from Access Device 230 is now subject to the filtering effects of ACL 340A rather than ACL 340C. If ACL 340A allows communication to network addresses associated with one or more elements of Less-Restricted Subset 210, the above reconfiguration of Port 305A results in a granting of access to Less-Restricted Subset 210 from Access Device 230. In some

embodiments, if ACL 340A is configured to allow access to members of Less-Restricted Subset 210 it is also configured to allow access to members of Restricted Subset 205. Once Port 305A has been reconfigured to be associated with VLAN 310A, future general network traffic between Access Device 230 and Less-Restricted Subset 210 may pass through Ports 305A, 305D and 335A without passing through GateKeeper 225 or other elements of Restricted Subset 205. Further, communication related to access to security of Protected Network 200 may still be received by GateKeeper 225 via Port 305A. For example, GateKeeper 225 may still receive control traffic such as DNS lookups or DHCP requests, or requests to access additional elements of Protected Network 200, or requests to continue to access the Less-Restricted Subset 210.

[0055] In some embodiments, members of VLAN 310A-310D and ACL 340A-340D are optionally used to grant or bar access to different subsets of Protected Network 200, Less-Restricted Subset 210, or Restricted Subset 205. For example, ACL 340B may be configured to grant access to File Server 235, Policy Manager 250 and GateKeeper 225. In this case, associating a member of Ports 305A-305C with VLAN 310B may provide access to these devices from an instance of Access Device 230. Granting of access to a specific region of Less-Restricted Subset 210 is optionally responsive to which member of Security Policies 330A-330B has been satisfied.

[0056] FIG. 4 is a flowchart illustrating a method of granting access to Less-Restricted Subset 210 (FIG. 2), according to various embodiments of the invention. In these embodiments, an Update Port Log Step 410 and a Restrict Port Step 420 are used to prepare an open (unused) communication port on Access Point 215 for receiving a request for access to Less-Restricted Subset 210. This request is received from Access Device 230 in a Receive Access Request Step 430. In response, GateKeeper 225 authenticates a user, obtains audit data, and applies a security policy in an Authenticate User Step 440, an Obtain Audit Data Step 450 and an Apply Security Policy Step 460, respectively. If the security policy is satisfied, then in a Reconfigure Port Step 470, GateKeeper 225 reconfigures the communication port of Access Point 215 to which Access Device 230 has connected. Finally, the reconfigured communication port is used to pass communication between Access Device 230 and one or more element of Less-Restricted Subset 210 in a Communicate Step 480. Further details of these steps are discussed herein.

[0057] In Update Port Log Step 410, Access Control 320 reads port configuration data from

Access Point 215 to determine the current configuration of Ports 305A-305G. If any of Ports 305A-305G have been configured by an administrator of Access Point 215, then in Update Port Log Step 410 the administrator specified configuration(s) are stored for later use during Reconfigure Port Step 470. Typically, the read configuration data is stored in a port configuration table, for example within GateKeeper 225. Update Port Log Step 410 is optional, as discussed further herein.

[0058] In Restrict Port Step 420, Access Control 320 configures those members of Ports 305A-305G that may be accessed by external devices, such as Access Device 230. These communication ports are configured to be associated with VLAN 310C such that any data (e.g., communications) they receive from external devices are directed to Port 305F and, thus, to subject to ACL 340C. ACL 340C is configured to allow communication to, for example, DHCP 260 and GateKeeper 225. As a result, any requests for access received from external devices are prevented from reaching Less-Restricted Subset 210 and instead are received by elements of Restricted Subset 205. Restrict Port Step 420 results in a configuration such as that illustrated in FIG. 3A. In this configuration, those members of Ports 305A-305G that may be accessed by external devices include Port 305A, Port 305B and Port 305C. As a result of Restrict Port Step 420, these members of Ports 305A-305G are associated with VLAN 310C and communicatively coupled to Protected Network 200 through ACL 340C. Restrict Port Step 420 is optional, for example when members of Ports 305A-305C have been configured to communicate data to elements of Restricted Subset 205 by an administrator of Access Point 215.

[0059] In Receive Access Request Step 430, a request for access to Less-Restricted Subset 210 is received at one of Ports 305A-305C configured to pass data to DHCP 260 and Gatekeeper 225. Typically, this request is received from an external device such as Access Device 230. Because Port 305A, Port 305B and Port 305C are configured to pass data to DHCP 260 and Gatekeeper 225, the received access request passes through Access Point 215 and is received by either DHCP 260 or Gatekeeper 225. In typical embodiments, an initial access request is first acknowledged by DHCP 260 which assigns a dynamic network address (e.g., IP address) to Access Device 230 and returns, to Access Device 230, a network address associated with GateKeeper 225 or more specifically Policy Auditor 325. Using this network address, Access Device 230 may engage in

further communication with GateKeeper 225 or Policy Auditor 325. In some embodiments, DHCP 260 and instances of GateKeeper 225 are associated with a local domain name service configured to provide network addresses associated with a particular instance of GateKeeper 225 configured to manage (reconfigure) the particular Access Point 215 to which Access Device 230 is connected.

**[0060]** In optional Authenticate User Step 440, Policy Auditor 325 authenticates the identity of Access Device 230 and/or a user of Access Device 230. This authentication may be required by a member of Security Policies 330A-330B. In various embodiments, the authentication may include receipt of a user name and password, receipt of a MAC address, reading of data stored on Access Device 230, communication with an agent executing on Access Device 230, or the like.

**[0061]** In optional Obtain Audit Data Step 450, Policy Auditor 325 collects further data to perform a security audit of Access Device 230 responsive to Security Policy 330A or Security Policy 330B. In some embodiments, Obtain Audit Data Step 450 includes sending system data requests to Access Device 230, Router 220, or Access Point 215. The requested system data may include, for example, operating system status (version, updates, etc.), antivirus software status, information concerning devices connected to Access Device 230, Windows registry information, MAC address, IP addresses, cookies, status of applications executing on Access Device 230, or the like.

**[0062]** In some embodiments, Obtain Audit Data Step 450 is facilitated by an agent running on Access Device 230. For example, Access Device 230 may include a software agent configured to monitor local security and to report results of this monitoring to Policy Auditor 325.

**[0063]** In Apply Security Policy Step 460, a security audit of Access Device 230 is performed by Policy Auditor 325 responsive to a member of Security Policy 330A or Security Policy 330B. The particular member of Security Policy 330A or Security Policy 330B used to perform the audit may be responsive to the identity of Access Device 230, an identity of a user of Access Device 230, a part of Less-Restricted Subset 210 to which access is requested, or the like. The security audit typically includes determining if Access Device 230 satisfies requirements of the security policy. The security audit optionally includes active probing, scanning, and/or collection of third party data regarding Access Device 230. In some embodiments, Authenticate User Step 440 is

considered part of the security policy audit.

**[0064]** As is discussed further herein, in some embodiments, satisfaction of all the requirements of a particular security policy results in access to Less-Restricted Subset 210, while satisfaction of a subset of the requirements associated with the particular security policy is considered partial satisfaction of the security policy and may result in a more limited access to Less-Restricted Subset 210.

**[0065]** In some embodiments, Apply Security Policy Step 460 includes using Update Module 255 (FIG. 2) to overcome deficiencies in the security of Access Device 230. For example, in one embodiment, Apply Security Policy Step 460 includes updating antivirus software on Access Device 230 in response to a security audit that determined that the current antivirus software is out-of-date.

**[0066]** In Reconfigure Port Step 470, the communication port of Access Point 215, to which Access Device 230 is communicatively connected, is reconfigured responsive to a successful security audit in Apply Security Policy Step 460. This communication port is reconfigured such that data received by the communication port is passed to one or more elements of Less-Restricted Subset 210 rather than merely elements of Restricted Subset 205 (e.g., GateKeeper 225). For example, FIG. 3A shows Port 305A prior to execution of Reconfigure Port Step 470 and FIG. 3B shows Port 305A following execution of Reconfigure Port Step 470. In FIG. 3B, Port 305A is associated with VLAN 310A and, thus, communicatively coupled through Port 305D to Protected Network 200 subject to the restrictions of ACL 340A. The restrictions of ACL 340A allow access to all or part of Less-Restricted Subset 210, as well as optionally all or part of Restricted Subset 205.

**[0067]** In typical embodiments, reconfiguration of Port 305A is accomplished by sending commands from Access Control 320 to Switch Logic 317. These commands or responses to requests from Switch Logic 317 are optionally sent via SNMP, telnet, SSH, RADIUS, EAP, or the like, and are responsive to data received in Authenticate User Step 440 and Obtain Audit Data Step 450, and/or to the security audit performed in Apply Security Policy Step 460. In response to these commands, Switch Logic 317 configures Port 305A to be associated with VLAN 310A and, thus, communicate through Port 305D.

[0068] While access control lists (ACL 340A-340D) within Router 220 are typically configured prior to Receive Access Request Step 430, in some embodiments, Reconfigure Port Step 470 further includes configuring one or more members of ACL 340A-340D. In alternative embodiments, reconfiguring of members of ACL 340A-340D may be used to grant access to elements of Less-Restricted Subset 210 as an alternative to associating members of Ports 305A-305G to different members of VLANs 310A-310D.

[0069] Access Control 320 may selectively grant access to different parts of Protected Network 200 if ACL 340B is configured to allow access to different elements within Protected Network 200 than ACL 340A is configured. For example, in one embodiment, Access Device 230 will receive access to all of Less-Restricted Subset 210 if Port 305A is associated with VLAN 310A, or alternatively Access Device 230 will receive access to only a part of Less-Restricted Subset 210 if Port 305A is associated with VLAN 310B. When Port 305A is associated with VLAN 310A, as in FIG. 3B, communication from Access Device 230 is directed through Port 335A of Router 220 subject to ACL 340A and, thus, may access only those elements of Protected Network 200 allowed by ACL 340A. When Port 305A is associated with VLAN 310B, communication from Access Device 230 is instead passed through Port 335B subject to ACL 340B and may access only those elements of Protected Network 200 permitted by ACL 340B. A selection between granting access to a first or second part of Protected Network 200 can, therefore, be made using Access Control 320. The selection is optionally responsive to the security policy used in Apply Security Policy Step 460, to whether the security policy was fully or partially satisfied, to data obtained in Authenticate User Step 440 or Obtain Audit Data Step 450, or the like.

[0070] As illustrated in the above example, a member of Ports 305A-305G, through which Access Device 230 is requesting access, may be reconfigured to more than one alternative setting in Reconfigure Port Step 470. For example, in various embodiments a communication port may be reconfigured to a prior administrator specified configuration previously read in Update Port Log Step 410, reconfigured to be linked to a specific port responsive to the request received in Receive Access Request Step 430, reconfigured to grant access to a particular part of Less-Restricted Subset 210, reconfigured to a default setting, and/or the like. By reading administrator specified port configurations in Update Port Log Step 410 and reconfiguring

communication ports back to these read configurations in Reconfigure Port Step 470, an administrator may reconfigure Protected Network 200 without concern that their specifications will be lost or permanently overwritten by methods of the invention. In embodiments wherein a communication port is not reconfigured to a previous administrator specified configuration, Update Port Log Step 410 is optional.

[0071] In Communicate Step 480, communication occurs between Access Device 230 and elements of Less-Restricted Subset 210 via the communication port reconfigured in Reconfigure Port Step 470. However, in some embodiments, ACL 340A is configured to allow access to GateKeeper 225 as well as Less-Restricted Subset 210. Thus, general network traffic does not need to pass through GateKeeper 225, while communication regarding security of Protected Network 200 is optionally received by GateKeeper 225. Further communication between Access Device 230 and GateKeeper 225 may provide a variety of advantages. For example, further communication between GateKeeper 225 and an agent executing on Access Device 230 may allow for continuing audits of security aspects of Access Devices 230. These audits may be similar to those performed in Apply Security Policy Step 460. In one embodiment, ACL 340A is configured to grant access to all of Protected Network 200.

[0072] Further communication between GateKeeper 225 and an agent executing on Access Device 230 may also allow for a user of Access Device 230 to explicitly logoff Protected Network 200. An explicit logoff will result in reconfiguration of Port 305A such that access is again restricted to Restricted Subset 205. A logoff may alternatively be responsive to a timeout of communication with Access Device 230, a SNMP trap message indicating a connection has been broken, or the like.

[0073] According to embodiments like that disclosed in U.S. Provisional Patent Application No. 60/513,080, the disclosure of which has been incorporated herein by reference, an AP (e.g., a switch or wireless access point (WAP) which is used to connect end points to the corporate network) may be programmed to prohibit access by the PC (e.g., notebook, desktop PC, PDA, or similar computing device) to the corporate network until authentication with the authentication server passes AND an audit with the software agent with the GK (e.g., software that acts as a gatekeeper by granting or denying access to the corporate network from end points after

auditing the end point based on certain criteria) passes, while still supporting the existing encryption and authentication functionality. The method used to support auditing functionality over the existing 802.1x protocol implementation is complicated and not an obvious variation of the 802.1x protocol.

**[0074]** According to an embodiment like that disclosed in U.S. Provisional Patent Application No. 60/513,080, the disclosure of which has been incorporated herein by reference, the auditing protocol takes place between the EP (e.g., end point which can either be a PC or network device) agent software and the GK. A client filter redirects calls for audit information to an agent on the EP and sends the responses to the 802.1x compliant AP which relays them to the EAP server. The EAP server then calls a server filter which sends the responses to the GK for evaluation. The GK sends requests for more information on the reverse path and this continues until the audit is completed. If the audit is successful, the server sends a message to the AP which enables the EP's port allowing access for the PC. If the audit fails, the port on the AP is left disabled.

**[0075]** According to an exemplary embodiment, client filters (CF) and server filters (SF) are added along with an agent and GK to perform audits, as highlighted in FIG. 5. There may be one or more instances of the CF and SF, which correspond to the separate EAP Authentication Modules (EAPM) that are supported. Note that the agent and GK are logical components. The functionality of the agent and GK can be embedded into the CF and SF, respectively, or in the case of the GK, may reside on a separate server.

**[0076]** The CF and SF APIs have APIs which correspond to the EAPM APIs. Therefore, the EAP Client Layer (ECL) or EAP Server Layer (ESL) can call the CF and SF instances corresponding to a particular authentication method as shown in FIGS. 6A and 6B. To the ECL and ESL, each instance of the CF and SF appears to be an EAPM which incorporates the functionality of the original EAPM prior to completion of the success response by the server EAPM.

**[0077]** To use the invention as disclosed in U.S. Provisional Patent Application No. 60/513,080, the disclosure of which has been incorporated herein by reference, the ECL and ESL are configured to use the instance of the CF and SF corresponding to the desired authentication method. This authentication method corresponds to an authentication method supported by one of the EAPMs.

[0078] The ECL calls the corresponding CF to perform authentication, which at first calls the appropriate EAPM to obtain the proper authentication response. The authentication response is returned by the CF to the ESL, which sends the response to the server's ESL, SF, and EAPM. This process continues until the authentication either succeeds or fails, at which time the server's authentication EAPM returns a success or failure response to the SF.

[0079] If the SF receives a success response from the server EAPM as shown in FIG. 7, the SF changes to the audit state and calls GK to obtain audit requests to send back to the client. In this state, the SF returns specially formatted audit requests to the ESL which are passed to the ECL, and eventually to the CF which sends back audit responses to the SF requests.

[0080] On the client, audit requests are passed to the agent API instead of to the client EAPM. The agent returns information about the local system, which is converted to audit responses that are sent to the server.

[0081] During the audit state, the SF and CF exchange audit requests and responses about the EP as shown in FIGS. 8A and 8B. The ECL and ESL continue to communicate with the CF and SF, but instead of calling the EAPM, the CF and SF call the agent and GK respectively, to perform this exchange. The audit session continues until the necessary audit information has been passed to the SF.

[0082] If the audit indicates the client EP is in compliance, the SF returns a success response. If the VLAN for the EP is specified in the policy, then the VLAN that should be used for this EP is passed back as well.

[0083] If the GK determines that the EP has failed the audit, GK returns a failure response to SF which causes one of the following: (1) the SF returns a failure to ECL, and the corresponding port on the AP is left disabled, or (2) the SF returns a success response to the ECL but specifies that the EP should be set to a restricted VLAN where the EP has limited network access. In either case, the EP is isolated from the company network until it successfully passes an audit with the GK.

[0084] After the audit has been performed, "keep alives" and updates regarding changes to previous audit information are exchanged. Changes are reevaluated and if inconsistent with the current state, access to the network is modified appropriately by changing the VLAN used for

the EP or by terminating access by the EP by communicating with the AP.

[0085] Several embodiments are specifically illustrated and/or described herein. However, it will be appreciated that modifications and variations are covered by the above teachings and within the scope of the appended claims without departing from the spirit and intended scope thereof. For example, the teachings herein may be applied to embodiments wherein Access Point 215 is a wireless access point and MAC addresses, or the like, are used instead of VLANs to separate traffic from different instances of Access Device 230. It is, thus, anticipated that network management techniques other than VLANs may be used to distinguish Less-Restricted Subset 210 from Restricted Subset 205. In some embodiments, various aspects of GateKeeper 225 may be incorporated into Access Point 215 and/or Router 220. GateKeeper 225 and Policy Manager 250 are each optionally implemented on a plurality of computing devices within Restricted Subset 205.

[0086] In some embodiments, GateKeeper 225 uses DHCP 260 to assign IP addresses from a restricted IP address range depending on the compliance of Access Device 230 to security policies 330A-330B. GateKeeper 225 inserts DHCP options and/or modifies the IP source addresses of DHCPDISCOVER and DHCPREQUEST packets, based on the compliance of the Access Device 230 to security policies 330A-330B. DHCP 260 is configured to provide an address from the restricted address range or the less-restricted address range based on the source address and/or options present in the DHCP request or discover packets that have been modified by GateKeeper 225. In some embodiments, the insertion of DHCP options and/or modification of IP source addresses may be used to characterize restricted and less-restricted subnets, rather than configuring port associations with VLANs as discussed herein.

[0087] The embodiments discussed herein are illustrative of the present invention. As these embodiments of the present invention are described with reference to illustrations, various modifications or adaptations of the methods and or specific structures described may become apparent to those skilled in the art. All such modifications, adaptations, or variations that rely upon the teachings of the present invention, and through which these teachings have advanced the art, are considered to be within the spirit and scope of the present invention. Hence, these descriptions and drawings should not be considered in a limiting sense, as it is understood that

the present invention is in no way limited to only the embodiments illustrated.

## CLAIMS

### What is claimed is:

1. A method for auditing a device in the network, the method comprising:
  - performing an authentication using the EAP protocol from a device connected to an access point configured to use the 802.1x protocol;
  - sending a request for audit data to an agent running on the device;
  - receiving an audit data from the agent, the audit data pertaining to the device having been retrieved by the agent;
  - applying the security policy that includes requirements pertaining to the audit data and the authentication, the applying of the security policy taking place at a gatekeeper.
2. The method of claim 1, wherein applying the security policy includes configuring the access point.
3. The method of claim 2, wherein configuring the access point includes assigning an access control list.
4. The method of claim 2, wherein configuring the access point includes assigning a VLAN.
5. The method of claim 1, wherein receiving the audit data includes the use of the EAP protocol.
6. The method of claim 1, wherein sending a request for audit data includes the use of the EAP protocol.
7. The method of claim 6, wherein the request includes audit data pertaining to an application.

8. The method of claim 1, wherein the received audit data includes audit data that concerns an application on the device.
9. The method of claim 1, wherein the received audit data includes information that concerns operating system of the device.
10. The method of claim 1, wherein the received audit data includes information that concerns antivirus software on the device.
11. The method of claim 1, wherein the received audit data includes information that concerns other devices coupled to the device.
12. The method of claim 1, wherein the security policy audit is based at least in part on information obtained from an active probe of the device.
13. The method of claim 1, wherein the security policy audit is based at least in part on information obtained from a third party.
14. The method of claim 1, wherein the security policy audit is based at least in part on the information concerning the identity of a user of the device.
15. The method of claim 2, wherein the agent continues to send audit data pertaining to the device after configuring an access point.
16. The method of claim 2, wherein the agent continues to send updated audit data pertaining to the device while the device has access to the less-restricted subset of the network.
17. The method of claim 16 wherein the gatekeeper reaudits the device in accordance to a security policy using the updated audit data.

18. The method of claim 1, wherein the gatekeeper takes part in bringing a software on the device up to date in response to applying the security policy.

19. The method of claim 1, wherein the gatekeeper takes part in facilitating updates to a software on the device in response to applying the security policy.

20. The method of claim 1, wherein the received audit data pertains to a logoff by a user of the device.

## **ABSTRACT**

A new approach to network security includes manipulating an access point such that an initial communication from an external device is passed to a restricted subset of a computing network including a gatekeeper. The gatekeeper is configured to enforce a security policy against the external device before granting access to a less-restricted subset of the computing network. If requirements of the security policy are satisfied, then the gatekeeper reconfigures the access point such that further communication from the external device may be received by elements of the less-restricted subset. Enforcement of the security policy optionally includes performing a security audit of the external device.

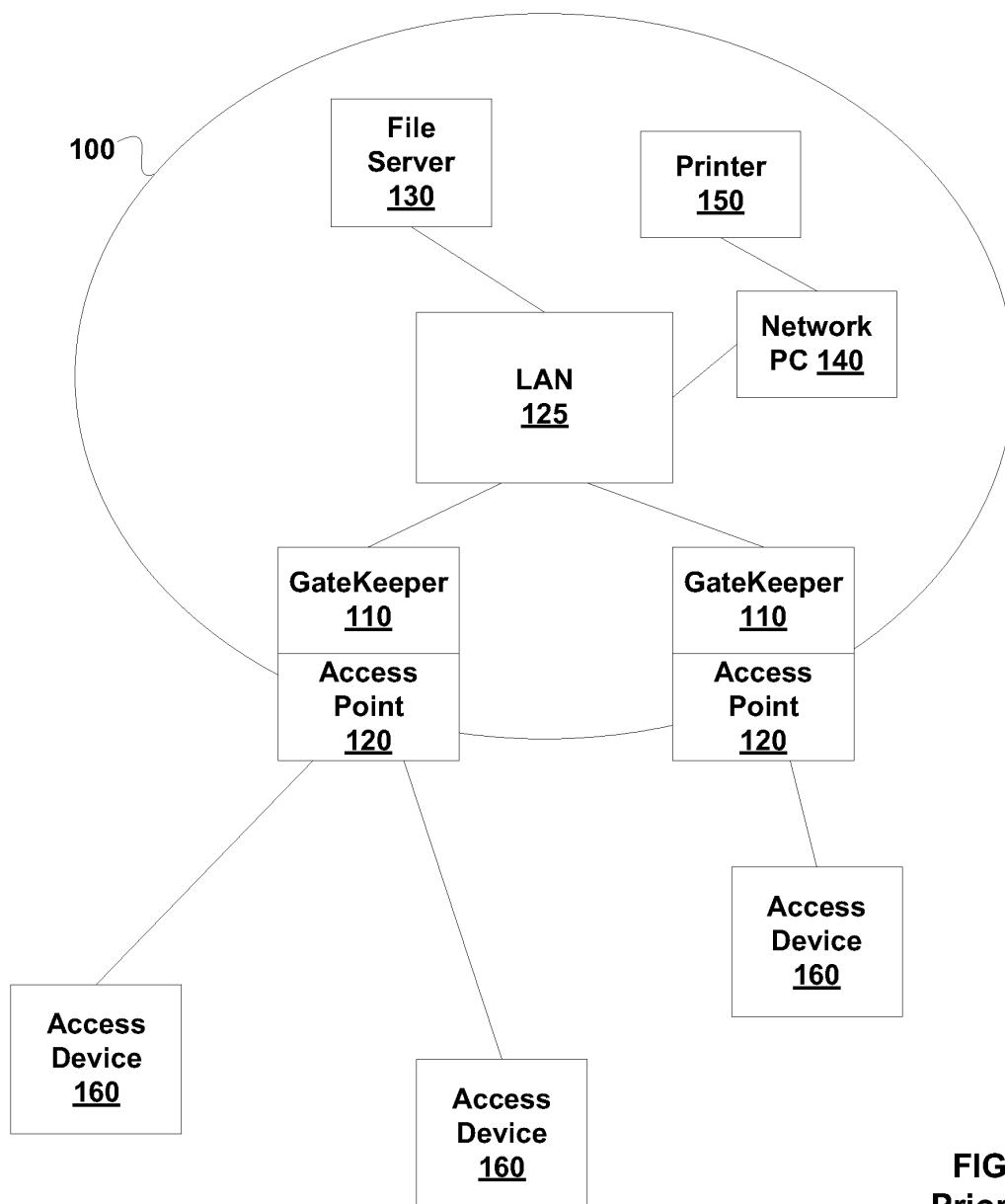


**FIG. 1**  
**Prior Art**

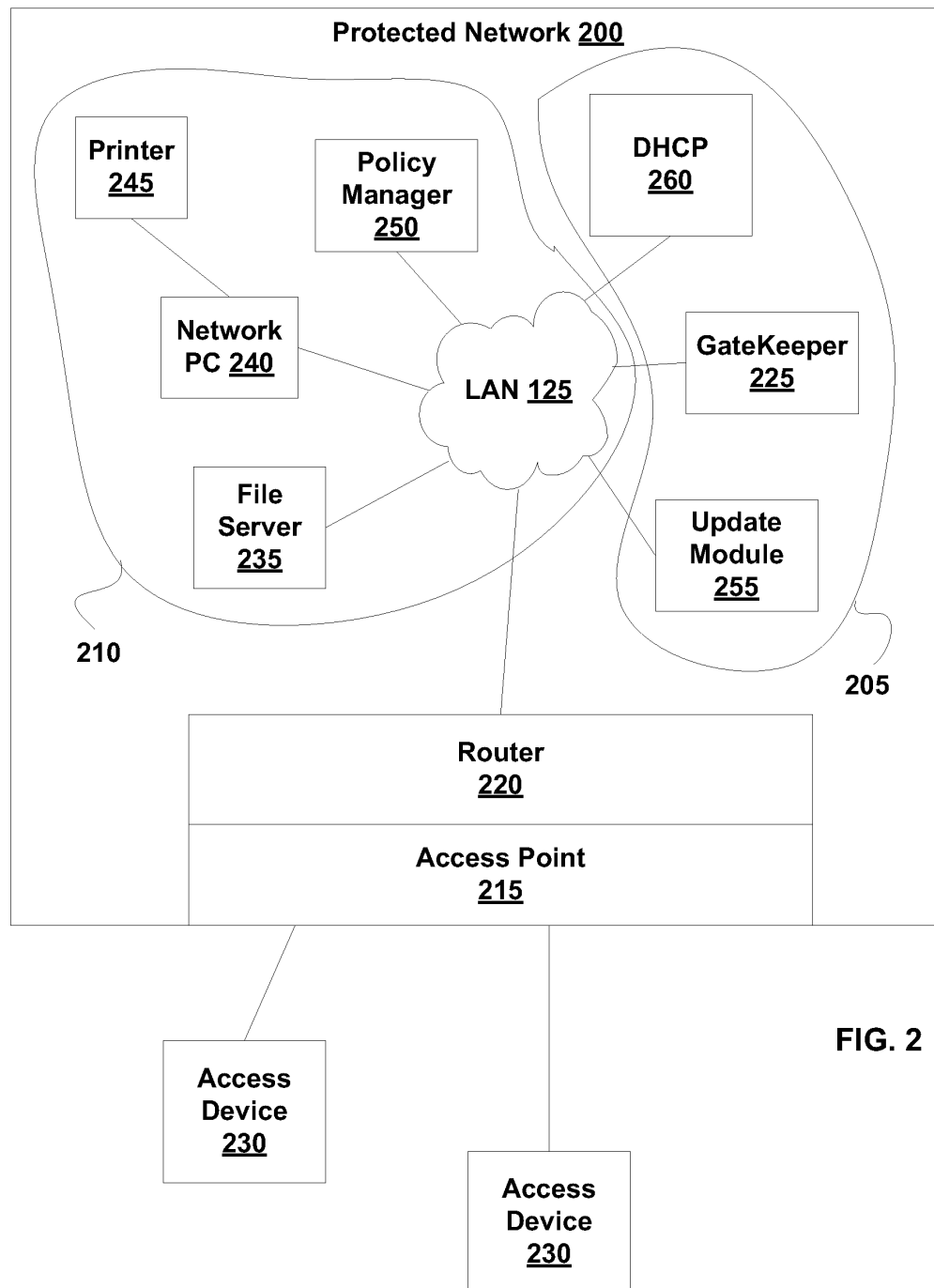
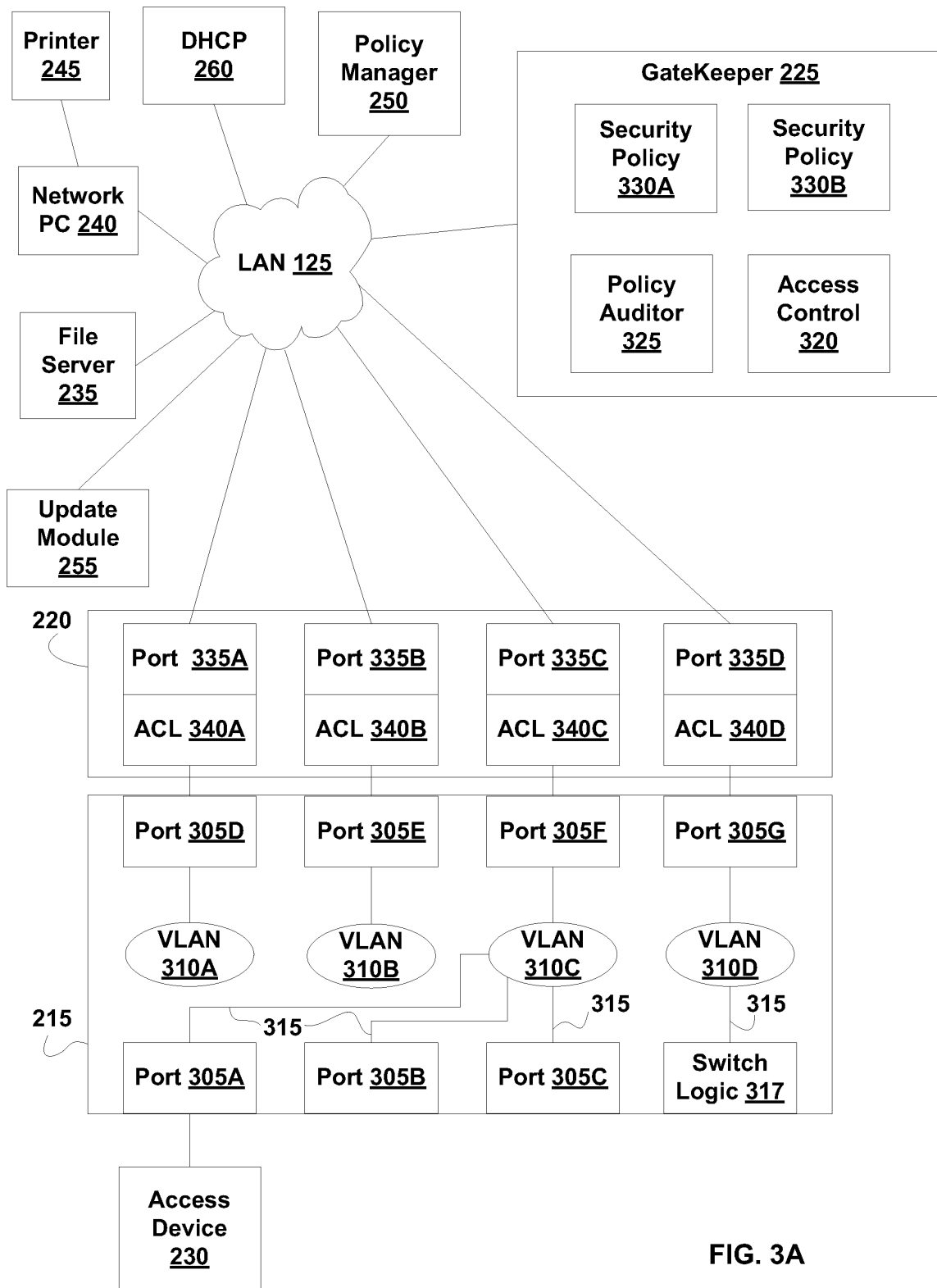


**FIG. 2**



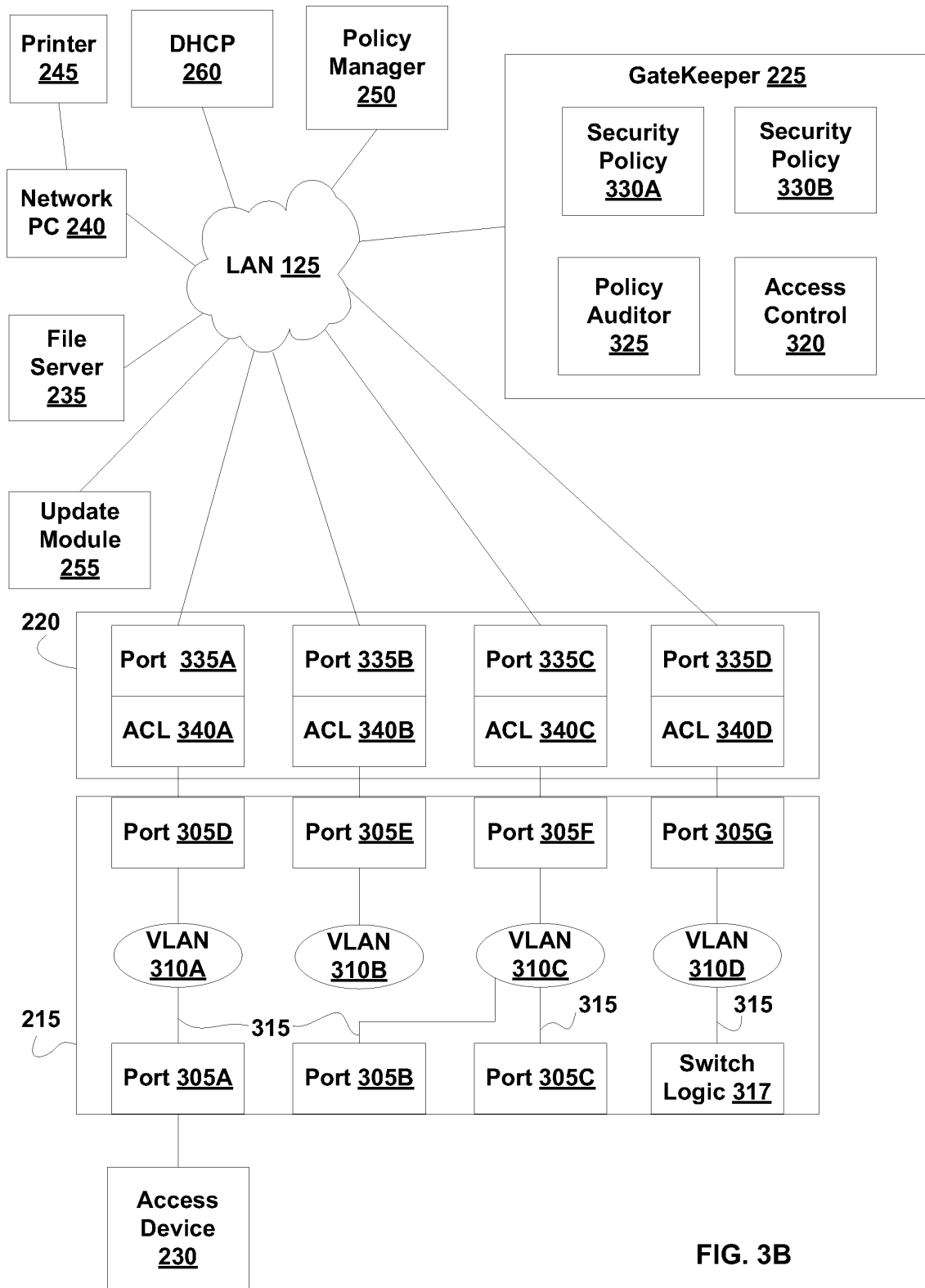


**FIG. 3B**

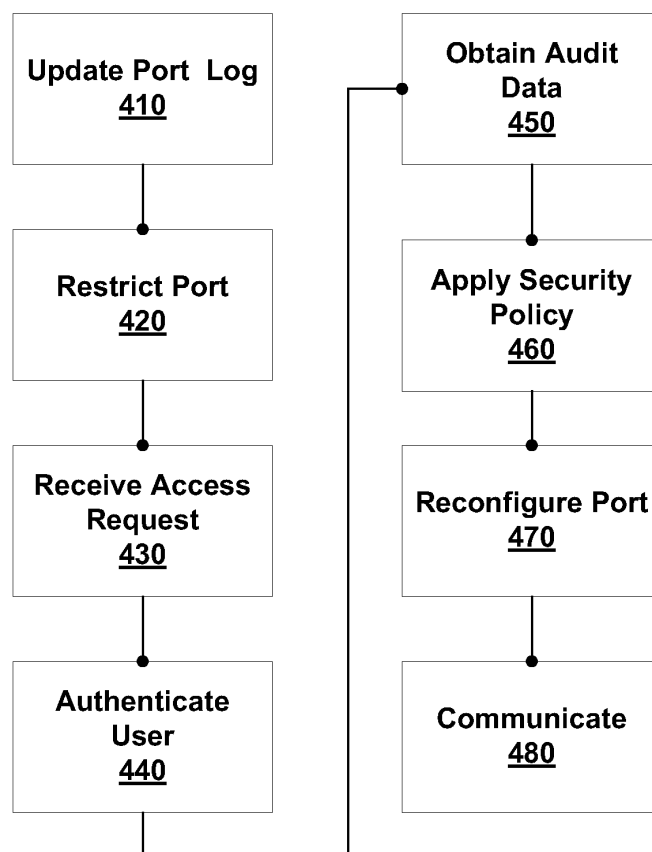


**FIG. 4**

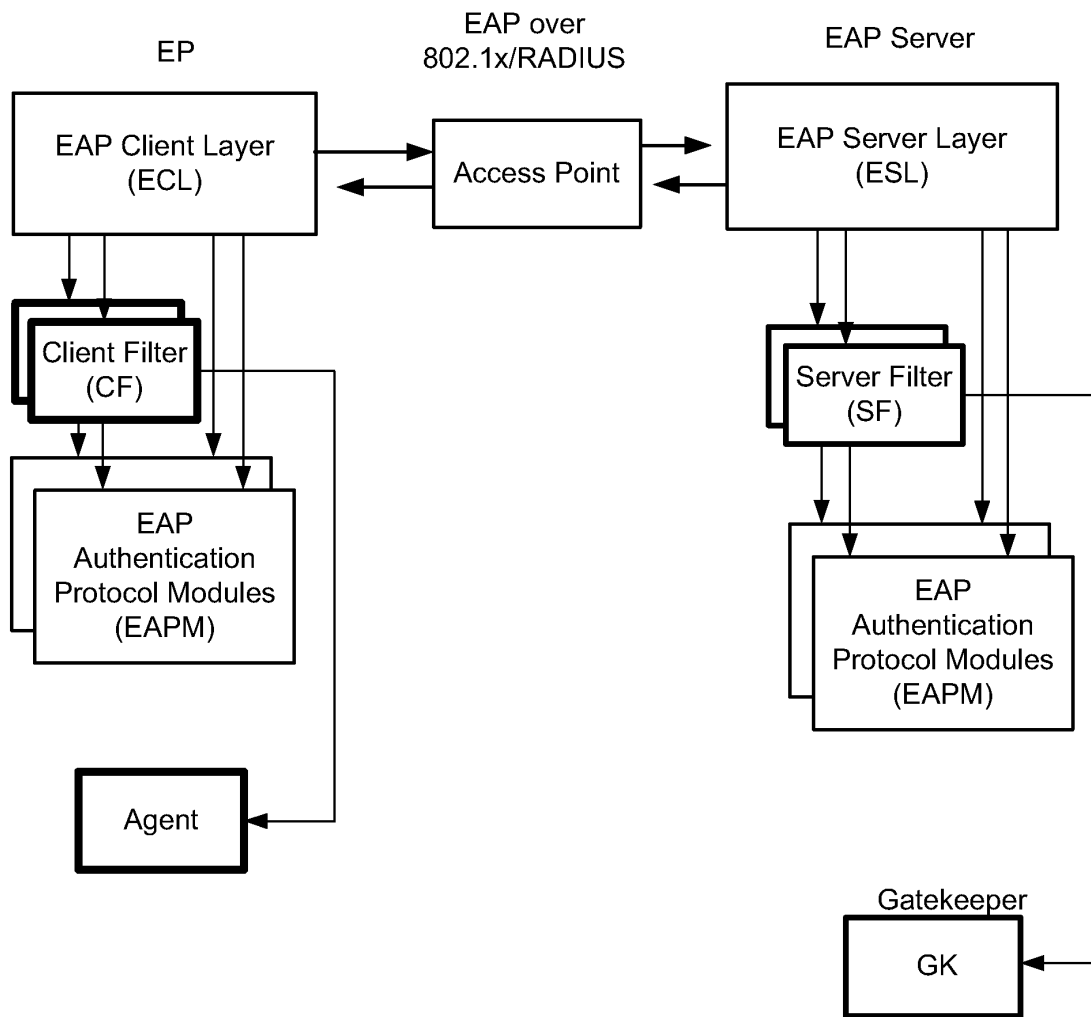


FIG. 5

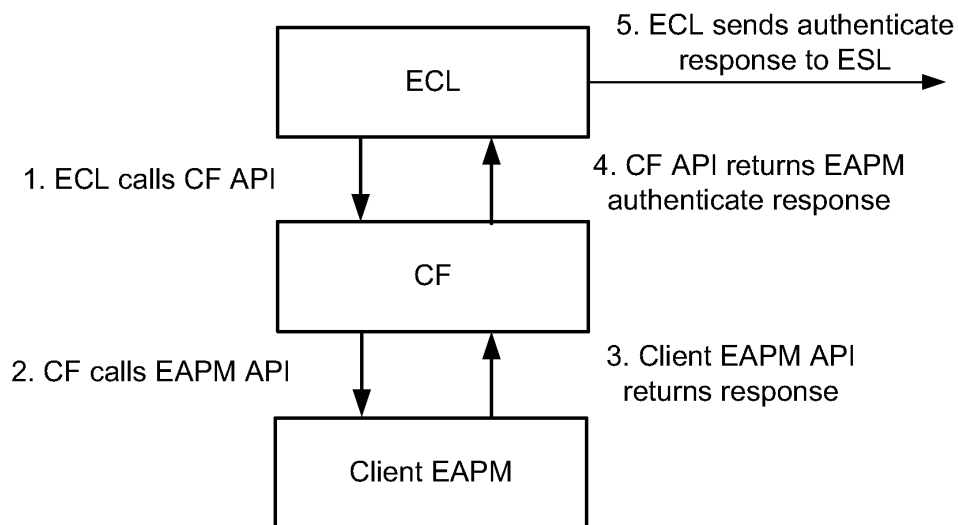


FIG. 6A

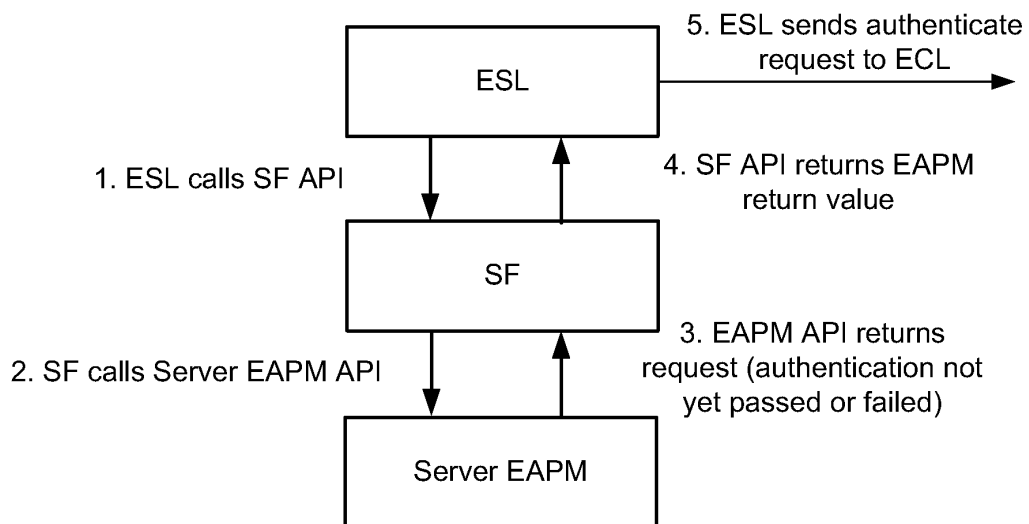


FIG. 6B

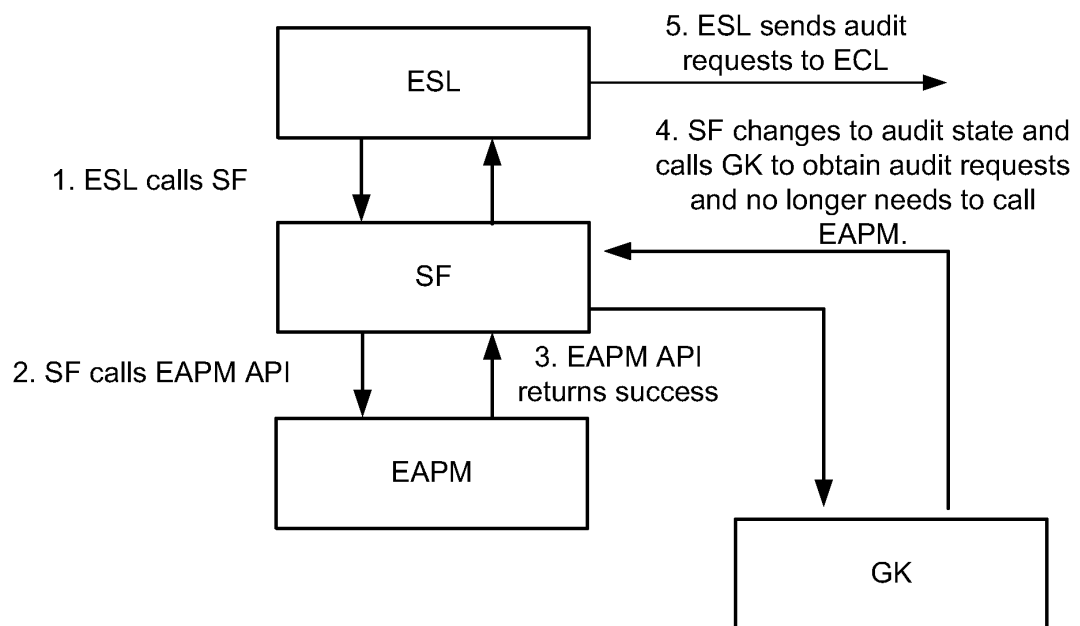


FIG. 7

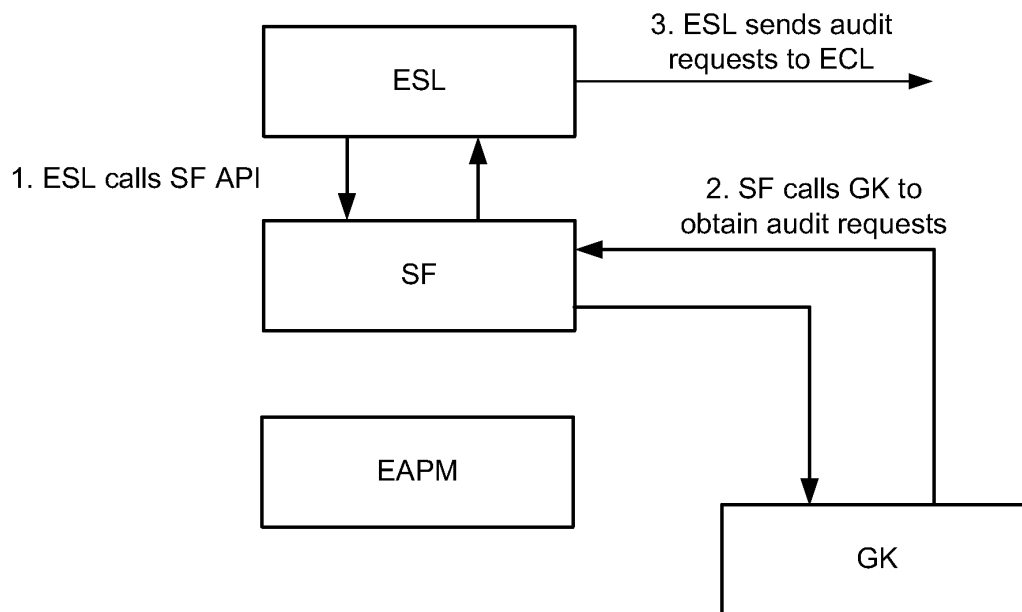


FIG. 8A

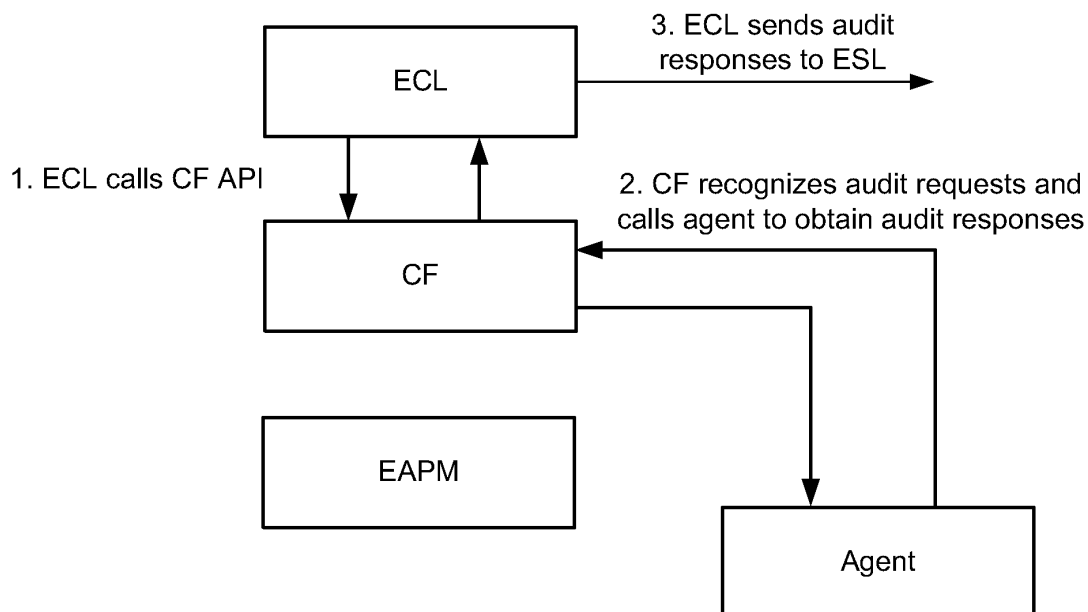


FIG. 8B

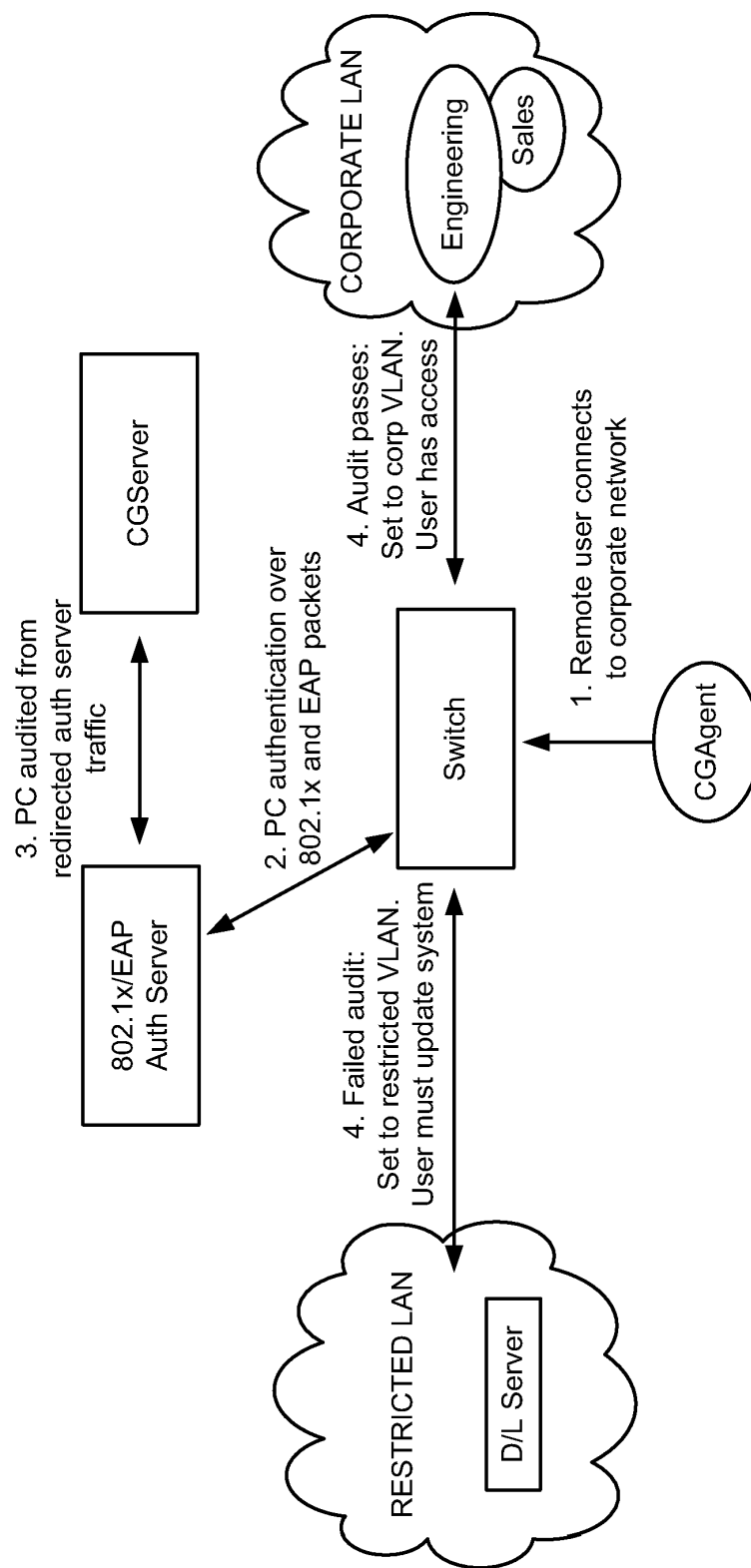


FIG. 9

| Electronic Patent Application Fee Transmittal |          |                                                   |        |                      |
|-----------------------------------------------|----------|---------------------------------------------------|--------|----------------------|
| Application Number:                           |          |                                                   |        |                      |
| Filing Date:                                  |          |                                                   |        |                      |
| Title of Invention:                           |          | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |        |                      |
| First Named Inventor/Applicant Name:          |          | Stacey C. Lum                                     |        |                      |
| Filer:                                        |          | TamThanh Thi Pham/Adriena Garcia                  |        |                      |
| Attorney Docket Number:                       |          | INFO-002COG                                       |        |                      |
| Filed as Small Entity                         |          |                                                   |        |                      |
| Utility under 35 USC 111(a) Filing Fees       |          |                                                   |        |                      |
| Description                                   | Fee Code | Quantity                                          | Amount | Sub-Total in USD(\$) |
| Basic Filing:                                 |          |                                                   |        |                      |
| Utility filing Fee (Electronic filing)        | 4011     | 1                                                 | 95     | 95                   |
| Utility Search Fee                            | 2111     | 1                                                 | 310    | 310                  |
| Utility Examination Fee                       | 2311     | 1                                                 | 125    | 125                  |
| Pages:                                        |          |                                                   |        |                      |
| Claims:                                       |          |                                                   |        |                      |
| Miscellaneous-Filing:                         |          |                                                   |        |                      |
| Petition:                                     |          |                                                   |        |                      |
| Patent-Appeals-and-Interference:              |          |                                                   |        |                      |

| Description                       | Fee Code | Quantity | Amount | Sub-Total in USD(\$) |
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| Post-Allowance-and-Post-Issuance: |          |          |        |                      |
| Extension-of-Time:                |          |          |        |                      |
| Miscellaneous:                    |          |          |        |                      |
| Total in USD (\$)                 |          |          |        | 530                  |

| Electronic Acknowledgement Receipt   |                                                   |
|--------------------------------------|---------------------------------------------------|
| EFS ID:                              | 13020405                                          |
| Application Number:                  | 13523854                                          |
| International Application Number:    |                                                   |
| Confirmation Number:                 | 3097                                              |
| Title of Invention:                  | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |
| First Named Inventor/Applicant Name: | Stacey C. Lum                                     |
| Customer Number:                     | 28661                                             |
| Filer:                               | TamThanh Thi Pham/Adriena Garcia                  |
| Filer Authorized By:                 | TamThanh Thi Pham                                 |
| Attorney Docket Number:              | INFO-002COG                                       |
| Receipt Date:                        | 14-JUN-2012                                       |
| Filing Date:                         |                                                   |
| Time Stamp:                          | 22:29:31                                          |
| Application Type:                    | Utility under 35 USC 111(a)                       |

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| Submitted with Payment                                                                                                                                                                                                                                                                                                                                                                   | yes             |
| Payment Type                                                                                                                                                                                                                                                                                                                                                                             | Deposit Account |
| Payment was successfully received in RAM                                                                                                                                                                                                                                                                                                                                                 | \$ 530          |
| RAM confirmation Number                                                                                                                                                                                                                                                                                                                                                                  | 7200            |
| Deposit Account                                                                                                                                                                                                                                                                                                                                                                          | 500612          |
| Authorized User                                                                                                                                                                                                                                                                                                                                                                          |                 |
| <p>The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:</p> <p>Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)</p> <p>Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)</p> |                 |

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|---------------------------------------------------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------------|------------------------------------------|------------------|------------------|
| Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)           |                                                     |                                                         |                                          |                  |                  |
| Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)             |                                                     |                                                         |                                          |                  |                  |
| Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges) |                                                     |                                                         |                                          |                  |                  |
| File Listing:                                                                                     |                                                     |                                                         |                                          |                  |                  |
| Document Number                                                                                   | Document Description                                | File Name                                               | File Size(Bytes)/ Message Digest         | Multi Part /.zip | Pages (if appl.) |
| 1                                                                                                 | Application Data Sheet                              | INFO-002COG_ADS_6-14-12.pdf                             | 1023824                                  | no               | 5                |
|                                                                                                   |                                                     |                                                         | beacde7ab4720d6a5daea48792f28ceae3719c68 |                  |                  |
| Warnings:                                                                                         |                                                     |                                                         |                                          |                  |                  |
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| 2                                                                                                 | Change of Address                                   | INFO-002COG_Change-of-Address_6-14-12.pdf               | 271493                                   | no               | 2                |
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| Information:                                                                                      |                                                     |                                                         |                                          |                  |                  |
| 3                                                                                                 | Power of Attorney                                   | INFO-002COG_REVPOA_6-14-12.pdf                          | 255027                                   | no               | 3                |
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| 4                                                                                                 | Miscellaneous Incoming Letter                       | INFO-002COG_Statement-Regarding-Declaration_6-14-12.pdf | 45631                                    | no               | 2                |
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| 5                                                                                                 | Oath or Declaration filed                           | INFO-002COG_Declaration_6-14-12.pdf                     | 509636                                   | no               | 4                |
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| 6                                                                                                 |                                                     | INFO-002COG_Specification_6-14-12.pdf                   | 199209                                   | yes              | 29               |
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|                                                                                                   | Multipart Description/PDF files in .zip description |                                                         |                                          |                  |                  |
|                                                                                                   | Document Description                                | Start                                                   | End                                      |                  |                  |
|                                                                                                   | Specification                                       | 1                                                       | 25                                       |                  |                  |
|                                                                                                   | Claims                                              | 26                                                      | 28                                       |                  |                  |
|                                                                                                   | Abstract                                            | 29                                                      | 29                                       |                  |                  |
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| 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Drawings-only black and white line drawings | INFO-002COG_Figures_6-14-12.pdf | 602601<br>ed9a3abd99f3eca3ea3115dd63e2a4fd04e0369f | no | 10 |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                             |                                 |                                                    |    |    |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                             |                                 |                                                    |    |    |
| 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Fee Worksheet (SB06)                        | fee-info.pdf                    | 32865<br>0027a9e28b9f778d1a65dcce357836e48989cfba  | no | 2  |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                             |                                 |                                                    |    |    |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                             |                                 |                                                    |    |    |
| <b>Total Files Size (in bytes):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                             |                                 | 2940286                                            |    |    |
| <p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/>         If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/>         If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/>         If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p> |                                             |                                 |                                                    |    |    |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                   |                        |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------------|-------------|
| <b>Application Data Sheet 37 CFR 1.76</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                   | Attorney Docket Number | INFO-002COG |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                   | Application Number     |             |
| Title of Invention                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |                        |             |
| <p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.</p> <p>This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p> |                                                   |                        |             |

**Secrecy Order 37 CFR 5.2**

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

**Applicant Information:**

|                                                                                                                                                      |                   |                                                                                                                                       |                    |                                                                |    |                                                             |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------------------------------------------------|----|-------------------------------------------------------------|--|
| <b>Applicant 1</b>                                                                                                                                   |                   |                                                                                                                                       |                    |                                                                |    | <a href="#">Remove</a>                                      |  |
| <b>Applicant Authority</b>                                                                                                                           |                   | <input checked="" type="radio"/> Inventor                                                                                             |                    | <input type="radio"/> Legal Representative under 35 U.S.C. 117 |    | <input type="radio"/> Party of Interest under 35 U.S.C. 118 |  |
| <b>Prefix</b>                                                                                                                                        | <b>Given Name</b> | <b>Middle Name</b>                                                                                                                    | <b>Family Name</b> | <b>Suffix</b>                                                  |    |                                                             |  |
|                                                                                                                                                      | Stacey            | C.                                                                                                                                    | Lum                |                                                                |    |                                                             |  |
| <b>Residence Information (Select One)</b>                                                                                                            |                   | <input checked="" type="radio"/> US Residency <input type="radio"/> Non US Residency <input type="radio"/> Active US Military Service |                    |                                                                |    |                                                             |  |
| <b>City</b>                                                                                                                                          | Los Altos         | <b>State/Province</b>                                                                                                                 | CA                 | <b>Country of Residence i</b>                                  | US |                                                             |  |
| <b>Citizenship under 37 CFR 1.41(b) i</b>                                                                                                            |                   | US                                                                                                                                    |                    |                                                                |    |                                                             |  |
| <b>Mailing Address of Applicant:</b>                                                                                                                 |                   |                                                                                                                                       |                    |                                                                |    |                                                             |  |
| <b>Address 1</b>                                                                                                                                     |                   |                                                                                                                                       |                    |                                                                |    |                                                             |  |
| <b>Address 2</b>                                                                                                                                     |                   |                                                                                                                                       |                    |                                                                |    |                                                             |  |
| <b>City</b>                                                                                                                                          |                   |                                                                                                                                       |                    | <b>State/Province</b>                                          |    |                                                             |  |
| <b>Postal Code</b>                                                                                                                                   |                   |                                                                                                                                       |                    | <b>Countryi</b>                                                |    |                                                             |  |
| <b>Applicant 2</b>                                                                                                                                   |                   |                                                                                                                                       |                    |                                                                |    | <a href="#">Remove</a>                                      |  |
| <b>Applicant Authority</b>                                                                                                                           |                   | <input checked="" type="radio"/> Inventor                                                                                             |                    | <input type="radio"/> Legal Representative under 35 U.S.C. 117 |    | <input type="radio"/> Party of Interest under 35 U.S.C. 118 |  |
| <b>Prefix</b>                                                                                                                                        | <b>Given Name</b> | <b>Middle Name</b>                                                                                                                    | <b>Family Name</b> | <b>Suffix</b>                                                  |    |                                                             |  |
|                                                                                                                                                      | Yuhshiow          | Alice                                                                                                                                 | Lee                |                                                                |    |                                                             |  |
| <b>Residence Information (Select One)</b>                                                                                                            |                   | <input checked="" type="radio"/> US Residency <input type="radio"/> Non US Residency <input type="radio"/> Active US Military Service |                    |                                                                |    |                                                             |  |
| <b>City</b>                                                                                                                                          | Saratoga          | <b>State/Province</b>                                                                                                                 | CA                 | <b>Country of Residence i</b>                                  | US |                                                             |  |
| <b>Citizenship under 37 CFR 1.41(b) i</b>                                                                                                            |                   | US                                                                                                                                    |                    |                                                                |    |                                                             |  |
| <b>Mailing Address of Applicant:</b>                                                                                                                 |                   |                                                                                                                                       |                    |                                                                |    |                                                             |  |
| <b>Address 1</b>                                                                                                                                     |                   |                                                                                                                                       |                    |                                                                |    |                                                             |  |
| <b>Address 2</b>                                                                                                                                     |                   |                                                                                                                                       |                    |                                                                |    |                                                             |  |
| <b>City</b>                                                                                                                                          |                   |                                                                                                                                       |                    | <b>State/Province</b>                                          |    |                                                             |  |
| <b>Postal Code</b>                                                                                                                                   |                   |                                                                                                                                       |                    | <b>Countryi</b>                                                |    |                                                             |  |
| All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the <a href="#">Add</a> button. |                   |                                                                                                                                       |                    |                                                                |    |                                                             |  |

**Correspondence Information:**

|                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Enter either Customer Number or complete the Correspondence Information section below.</p> <p>For further information see 37 CFR 1.33(a).</p> |
| <p><input type="checkbox"/> An Address is being provided for the correspondence Information of this application.</p>                             |

|                                           |                                                   |                                          |                                             |
|-------------------------------------------|---------------------------------------------------|------------------------------------------|---------------------------------------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                                   | Attorney Docket Number                   | INFO-002COG                                 |
|                                           |                                                   | Application Number                       |                                             |
| Title of Invention                        | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |                                          |                                             |
| Customer Number                           | 28661                                             |                                          |                                             |
| Email Address                             |                                                   | <input type="button" value="Add Email"/> | <input type="button" value="Remove Email"/> |

**Application Information:**

|                                         |                                                   |                                           |                                     |
|-----------------------------------------|---------------------------------------------------|-------------------------------------------|-------------------------------------|
| Title of the Invention                  | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |                                           |                                     |
| Attorney Docket Number                  | INFO-002COG                                       | Small Entity Status Claimed               | <input checked="" type="checkbox"/> |
| Application Type                        | Nonprovisional                                    |                                           |                                     |
| Subject Matter                          | Utility                                           |                                           |                                     |
| Suggested Class (if any)                |                                                   | Sub Class (if any)                        |                                     |
| Suggested Technology Center (if any)    |                                                   |                                           |                                     |
| Total Number of Drawing Sheets (if any) | 10                                                | Suggested Figure for Publication (if any) |                                     |

**Publication Information:**

|                          |                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> | Request Early Publication (Fee required at time of Request 37 CFR 1.219)                                                                                                                                                                                                                                                                                                                      |
| <input type="checkbox"/> | <b>Request Not to Publish.</b> I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application <b>has not and will not</b> be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing. |

**Representative Information:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                  |                                              |                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------|---------------------------------------------------------|
| Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing. |                                                  |                                              |                                                         |
| Please Select One:                                                                                                                                                                                                                                                                                                                                                                                                                                              | <input checked="" type="radio"/> Customer Number | <input type="radio"/> US Patent Practitioner | <input type="radio"/> Limited Recognition (37 CFR 11.9) |
| Customer Number                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 28661                                            |                                              |                                                         |

**Domestic Benefit/National Stage Information:**

|                                                                                                                                                                                                                                                                                                                                                                                                        |                 |                                       |                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------|--------------------------|
| This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification. |                 |                                       |                          |
| Prior Application Status                                                                                                                                                                                                                                                                                                                                                                               | Pending         | <input type="button" value="Remove"/> |                          |
| Application Number                                                                                                                                                                                                                                                                                                                                                                                     | Continuity Type | Prior Application Number              | Filing Date (YYYY-MM-DD) |
|                                                                                                                                                                                                                                                                                                                                                                                                        | Continuation of | 13371381                              | 2012-02-10               |
| Prior Application Status                                                                                                                                                                                                                                                                                                                                                                               | Patented        | <input type="button" value="Remove"/> |                          |

|                                           |                                                   |                        |             |
|-------------------------------------------|---------------------------------------------------|------------------------|-------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                                   | Attorney Docket Number | INFO-002COG |
|                                           |                                                   | Application Number     |             |
| Title of Invention                        | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |                        |             |

| Application Number                                                                                                                        | Continuity Type    | Prior Application Number | Filing Date (YYYY-MM-DD) | Patent Number          | Issue Date (YYYY-MM-DD) |
|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------|--------------------------|------------------------|-------------------------|
| 13371381                                                                                                                                  | Continuation of    | 13157309                 | 2011-06-10               | 8117645                | 2012-02-14              |
| Prior Application Status                                                                                                                  |                    | Patented                 |                          | <a href="#">Remove</a> |                         |
| Application Number                                                                                                                        | Continuity Type    | Prior Application Number | Filing Date (YYYY-MM-DD) | Patent Number          | Issue Date (YYYY-MM-DD) |
| 13157309                                                                                                                                  | Continuation of    | 12273037                 | 2008-11-18               | 8051460                | 2011-11-01              |
| Prior Application Status                                                                                                                  |                    | Patented                 |                          | <a href="#">Remove</a> |                         |
| Application Number                                                                                                                        | Continuity Type    | Prior Application Number | Filing Date (YYYY-MM-DD) | Patent Number          | Issue Date (YYYY-MM-DD) |
| 12273037                                                                                                                                  | Continuation of    | 10949179                 | 2004-09-24               | 7523484                | 2009-04-21              |
| Prior Application Status                                                                                                                  |                    | Expired                  |                          | <a href="#">Remove</a> |                         |
| Application Number                                                                                                                        | Continuity Type    | Prior Application Number | Filing Date (YYYY-MM-DD) |                        |                         |
| 10949179                                                                                                                                  | non provisional of | 60513080                 | 2003-10-21               |                        |                         |
| Prior Application Status                                                                                                                  |                    | Expired                  |                          | <a href="#">Remove</a> |                         |
| Application Number                                                                                                                        | Continuity Type    | Prior Application Number | Filing Date (YYYY-MM-DD) |                        |                         |
| 10949179                                                                                                                                  | non provisional of | 60505582                 | 2003-09-24               |                        |                         |
| Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the <b>Add</b> button. <a href="#">Add</a> |                    |                          |                          |                        |                         |

## Foreign Priority Information:

| This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a). |                      |                                 |                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------------------------|---------------------------------------------------------------|
| <a href="#">Remove</a>                                                                                                                                                                                                                                                                                      |                      |                                 |                                                               |
| Application Number                                                                                                                                                                                                                                                                                          | Country <sup>i</sup> | Parent Filing Date (YYYY-MM-DD) | Priority Claimed                                              |
|                                                                                                                                                                                                                                                                                                             |                      |                                 | <input type="radio"/> Yes <input checked="" type="radio"/> No |
| Additional Foreign Priority Data may be generated within this form by selecting the <b>Add</b> button. <a href="#">Add</a>                                                                                                                                                                                  |                      |                                 |                                                               |

## Assignee Information:

| Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office. |            |             |             |        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------|-------------|--------|
| <a href="#">Remove</a>                                                                                                                                                                          |            |             |             |        |
| <b>Assignee 1</b>                                                                                                                                                                               |            |             |             |        |
| If the Assignee is an Organization check here. <input type="checkbox"/>                                                                                                                         |            |             |             |        |
| Prefix                                                                                                                                                                                          | Given Name | Middle Name | Family Name | Suffix |
|                                                                                                                                                                                                 |            |             |             |        |

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|                                           |                                                   |                        |             |
|-------------------------------------------|---------------------------------------------------|------------------------|-------------|
| <b>Application Data Sheet 37 CFR 1.76</b> |                                                   | Attorney Docket Number | INFO-002COG |
|                                           |                                                   | Application Number     |             |
| Title of Invention                        | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |                        |             |

|                                                                                         |  |                |                                    |
|-----------------------------------------------------------------------------------------|--|----------------|------------------------------------|
| <b>Mailing Address Information:</b>                                                     |  |                |                                    |
| Address 1                                                                               |  |                |                                    |
| Address 2                                                                               |  |                |                                    |
| City                                                                                    |  | State/Province |                                    |
| Country i                                                                               |  | Postal Code    |                                    |
| Phone Number                                                                            |  | Fax Number     |                                    |
| Email Address                                                                           |  |                |                                    |
| Additional Assignee Data may be generated within this form by selecting the Add button. |  |                |                                    |
|                                                                                         |  |                | <input type="button" value="Add"/> |

**Signature:**

|                                                                                                                                                              |                  |           |      |                     |            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------|------|---------------------|------------|
| A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature. |                  |           |      |                     |            |
| Signature                                                                                                                                                    | /Tam Thanh Pham/ |           |      | Date (YYYY-MM-DD)   | 2012-06-14 |
| First Name                                                                                                                                                   | Tam Thanh        | Last Name | Pham | Registration Number | 50565      |

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

## Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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|                                                                                   |  |  |  |  |                                                   |  |                                  |  |                                       |  |
|-----------------------------------------------------------------------------------|--|--|--|--|---------------------------------------------------|--|----------------------------------|--|---------------------------------------|--|
| <b>PATENT APPLICATION FEE DETERMINATION RECORD</b><br>Substitute for Form PTO-875 |  |  |  |  | Application or Docket Number<br><b>13/523,854</b> |  | Filing Date<br><b>06/14/2012</b> |  | <input type="checkbox"/> To be Mailed |  |
|-----------------------------------------------------------------------------------|--|--|--|--|---------------------------------------------------|--|----------------------------------|--|---------------------------------------|--|

| APPLICATION AS FILED – PART I                                                                                                                                                                                                                                                                   |              |              |           |                                                  | OTHER THAN SMALL ENTITY |          |           |              |           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|-----------|--------------------------------------------------|-------------------------|----------|-----------|--------------|-----------|
| (Column 1)                                                                                                                                                                                                                                                                                      |              | (Column 2)   |           | SMALL ENTITY <input checked="" type="checkbox"/> |                         | OR       |           | SMALL ENTITY |           |
| FOR                                                                                                                                                                                                                                                                                             | NUMBER FILED | NUMBER EXTRA | RATE (\$) | FEE (\$)                                         | RATE (\$)               | FEE (\$) | RATE (\$) | FEE (\$)     | RATE (\$) |
| <input type="checkbox"/> BASIC FEE<br>(37 CFR 1.16(a), (b), or (c))                                                                                                                                                                                                                             | N/A          | N/A          | N/A       |                                                  | N/A                     |          | N/A       |              | N/A       |
| <input type="checkbox"/> SEARCH FEE<br>(37 CFR 1.16(k), (l), or (m))                                                                                                                                                                                                                            | N/A          | N/A          | N/A       |                                                  | N/A                     |          | N/A       |              | N/A       |
| <input type="checkbox"/> EXAMINATION FEE<br>(37 CFR 1.16(o), (p), or (q))                                                                                                                                                                                                                       | N/A          | N/A          | N/A       |                                                  | N/A                     |          | N/A       |              | N/A       |
| TOTAL CLAIMS<br>(37 CFR 1.16(i))                                                                                                                                                                                                                                                                | minus 20 =   | *            | X \$      | =                                                | OR                      | X \$     | =         |              |           |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h))                                                                                                                                                                                                                                                          | minus 3 =    | *            | X \$      | =                                                | OR                      | X \$     | =         |              |           |
| <input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s))<br>If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). |              |              |           |                                                  |                         |          |           |              |           |
| <input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))                                                                                                                                                                                                                      |              |              |           |                                                  |                         |          |           |              |           |
| * If the difference in column 1 is less than zero, enter "0" in column 2.                                                                                                                                                                                                                       |              |              | TOTAL     |                                                  | TOTAL                   |          |           |              |           |

| APPLICATION AS AMENDED – PART II                                                         |            |                                  |                                    |               | OTHER THAN SMALL ENTITY |                     |           |                     |           |                     |  |
|------------------------------------------------------------------------------------------|------------|----------------------------------|------------------------------------|---------------|-------------------------|---------------------|-----------|---------------------|-----------|---------------------|--|
| (Column 1)                                                                               |            | (Column 2)                       |                                    | (Column 3)    |                         | SMALL ENTITY        |           | OR                  |           | SMALL ENTITY        |  |
| AMENDMENT                                                                                | 06/14/2012 | CLAIMS REMAINING AFTER AMENDMENT | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | RATE (\$)               | ADDITIONAL FEE (\$) | RATE (\$) | ADDITIONAL FEE (\$) | RATE (\$) | ADDITIONAL FEE (\$) |  |
| Total (37 CFR 1.16(i))                                                                   | *          | 20                               | Minus                              | ** 20         | =                       | 0                   | OR        | X \$                | =         |                     |  |
| Independent (37 CFR 1.16(h))                                                             | *          | 19                               | Minus                              | ***3          | =                       | 16                  | OR        | X \$                | =         |                     |  |
| <input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))                           |            |                                  |                                    |               |                         |                     |           |                     |           |                     |  |
| <input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) |            |                                  |                                    |               |                         |                     | OR        |                     |           |                     |  |
|                                                                                          |            |                                  |                                    |               | TOTAL ADD'L FEE         | 2000                | OR        | TOTAL ADD'L FEE     |           |                     |  |

| (Column 1)                                                                               |                                  | (Column 2)                         |               | (Column 3) |                     | SMALL ENTITY |                     | OR              |                     | SMALL ENTITY |  |
|------------------------------------------------------------------------------------------|----------------------------------|------------------------------------|---------------|------------|---------------------|--------------|---------------------|-----------------|---------------------|--------------|--|
| AMENDMENT                                                                                | CLAIMS REMAINING AFTER AMENDMENT | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | RATE (\$)  | ADDITIONAL FEE (\$) | RATE (\$)    | ADDITIONAL FEE (\$) | RATE (\$)       | ADDITIONAL FEE (\$) |              |  |
| Total (37 CFR 1.16(i))                                                                   | *                                | Minus                              | **            | =          | X \$                | =            | OR                  | X \$            | =                   |              |  |
| Independent (37 CFR 1.16(h))                                                             | *                                | Minus                              | ***           | =          | X \$                | =            | OR                  | X \$            | =                   |              |  |
| <input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))                           |                                  |                                    |               |            |                     |              |                     |                 |                     |              |  |
| <input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) |                                  |                                    |               |            |                     |              | OR                  |                 |                     |              |  |
|                                                                                          |                                  |                                    |               |            | TOTAL ADD'L FEE     |              | OR                  | TOTAL ADD'L FEE |                     |              |  |

\* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.  
 \*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".  
 \*\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".  
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This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Legal Instrument Examiner:  
/CHRIS A. JONES/



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| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-----------------------|-----------------------|------------------------|
| 13/523,854         | 06/14/2012            | Stacey C. Lum         | INFO-002COG            |

**CONFIRMATION NO. 3097**

**POA ACCEPTANCE LETTER**

28661  
Lewis and Roca LLP  
2440 W. El Camino Real, 6th Floor  
Mountain View, CA 94040



Date Mailed: 06/28/2012

**NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY**

This is in response to the Power of Attorney filed 06/14/2012.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/agoitom/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



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| APPLICATION<br>NUMBER | FILING or<br>371(c) DATE | GRP ART<br>UNIT | FIL FEE REC'D | ATTY. DOCKET NO | TOT CLAIMS | IND CLAIMS |
|-----------------------|--------------------------|-----------------|---------------|-----------------|------------|------------|
| 13/523,854            | 06/14/2012               | 2431            | 530           | INFO-002COG     | 20         | 1          |

CONFIRMATION NO. 3097

## FILING RECEIPT



0000000055043829

28661  
Lewis and Roca LLP  
2440 W. El Camino Real, 6th Floor  
Mountain View, CA 94040

Date Mailed: 06/28/2012

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

### Applicant(s)

Stacey C. Lum, Los Altos, CA;  
Yuhshiow Alice Lee, Saratoga, CA;

**Power of Attorney:** The patent practitioners associated with Customer Number 28661

### Domestic Priority data as claimed by applicant

This application is a CON of 13/371,381 02/10/2012  
which is a CON of 13/157,309 06/10/2011 PAT 8117645  
which is a CON of 12/273,037 11/18/2008 PAT 8051460  
which is a CON of 10/949,179 09/24/2004 PAT 7523484  
which claims benefit of 60/513,080 10/21/2003  
and claims benefit of 60/505,582 09/24/2003

**Foreign Applications** (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)

**If Required, Foreign Filing License Granted:** 06/25/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/523,854**

**Projected Publication Date:** 10/04/2012

**Non-Publication Request:** No

**Early Publication Request:** No

**\*\* SMALL ENTITY \*\***

page 1 of 3

**Title**

SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS

**Preliminary Class**

726

**PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES**

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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| <b>PATENT APPLICATION FEE DETERMINATION RECORD</b><br>Substitute for Form PTO-875                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                               |                                    |                    |              |                    | Application or Docket Number<br>13/523,854 |                    |                               |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------|--------------|--------------------|--------------------------------------------|--------------------|-------------------------------|--|
| <b>APPLICATION AS FILED - PART I</b>                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                               |                                    |                    |              |                    |                                            |                    |                               |  |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                               | (Column 2)                         |                    | SMALL ENTITY |                    | OR<br>OTHER THAN SMALL ENTITY              |                    |                               |  |
| FOR                                                                                                                                                                                                                                                                                                                                                                                                        | NUMBER FILED                                                                                                                                                                                                                  | NUMBER EXTRA                       | RATE(\$)           | FEE(\$)      |                    | RATE(\$)                                   | FEE(\$)            |                               |  |
| BASIC FEE<br>(37 CFR 1.16(a), (b), or (c))                                                                                                                                                                                                                                                                                                                                                                 | N/A                                                                                                                                                                                                                           | N/A                                | N/A                | 95           |                    | N/A                                        |                    |                               |  |
| SEARCH FEE<br>(37 CFR 1.16(k), (i), or (m))                                                                                                                                                                                                                                                                                                                                                                | N/A                                                                                                                                                                                                                           | N/A                                | N/A                | 310          |                    | N/A                                        |                    |                               |  |
| EXAMINATION FEE<br>(37 CFR 1.16(o), (p), or (q))                                                                                                                                                                                                                                                                                                                                                           | N/A                                                                                                                                                                                                                           | N/A                                | N/A                | 125          |                    | N/A                                        |                    |                               |  |
| TOTAL CLAIMS<br>(37 CFR 1.16(i))                                                                                                                                                                                                                                                                                                                                                                           | 20      minus 20 =                                                                                                                                                                                                            | *                                  | x    30    =       | 0.00         | OR                 |                                            |                    |                               |  |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h))                                                                                                                                                                                                                                                                                                                                                                     | 1      minus 3 =                                                                                                                                                                                                              | *                                  | x    125   =       | 0.00         |                    |                                            |                    |                               |  |
| APPLICATION SIZE FEE<br>(37 CFR 1.16(s))                                                                                                                                                                                                                                                                                                                                                                   | If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). |                                    |                    | 0.00         |                    |                                            |                    |                               |  |
| MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                               |                                    |                    | 0.00         |                    |                                            |                    |                               |  |
| * If the difference in column 1 is less than zero, enter "0" in column 2.                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                               |                                    | TOTAL              | 530          |                    | TOTAL                                      |                    |                               |  |
| <b>APPLICATION AS AMENDED - PART II</b>                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                               |                                    |                    |              |                    |                                            |                    |                               |  |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                               | (Column 2)                         |                    | (Column 3)   |                    | SMALL ENTITY                               |                    | OR<br>OTHER THAN SMALL ENTITY |  |
| AMENDMENT A                                                                                                                                                                                                                                                                                                                                                                                                | CLAIMS REMAINING AFTER AMENDMENT                                                                                                                                                                                              | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA      | RATE(\$)     | ADDITIONAL FEE(\$) |                                            | RATE(\$)           | ADDITIONAL FEE(\$)            |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Total<br>(37 CFR 1.16(i))                                                                                                                                                                                                     | *                                  | Minus    **        | =            | x      =           |                                            | OR                 | x      =                      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Independent<br>(37 CFR 1.16(h))                                                                                                                                                                                               | *                                  | Minus    ***       | =            | x      =           |                                            | OR                 | x      =                      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Application Size Fee (37 CFR 1.16(s))                                                                                                                                                                                         |                                    |                    |              |                    |                                            | OR                 |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))                                                                                                                                                               |                                    |                    |              |                    |                                            | OR                 |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                               |                                    | TOTAL<br>ADD'L FEE |              |                    | OR                                         | TOTAL<br>ADD'L FEE |                               |  |
| AMENDMENT B                                                                                                                                                                                                                                                                                                                                                                                                | CLAIMS REMAINING AFTER AMENDMENT                                                                                                                                                                                              | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA      | RATE(\$)     | ADDITIONAL FEE(\$) |                                            | RATE(\$)           | ADDITIONAL FEE(\$)            |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Total<br>(37 CFR 1.16(i))                                                                                                                                                                                                     | *                                  | Minus    **        | =            | x      =           |                                            | OR                 | x      =                      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Independent<br>(37 CFR 1.16(h))                                                                                                                                                                                               | *                                  | Minus    ***       | =            | x      =           |                                            | OR                 | x      =                      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | Application Size Fee (37 CFR 1.16(s))                                                                                                                                                                                         |                                    |                    |              |                    |                                            | OR                 |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))                                                                                                                                                               |                                    |                    |              |                    |                                            | OR                 |                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                               |                                    | TOTAL<br>ADD'L FEE |              |                    | OR                                         | TOTAL<br>ADD'L FEE |                               |  |
| * If the entry in column 1 is less than the entry in column 2, write "0" in column 3.<br>** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".<br>*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".<br>The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1. |                                                                                                                                                                                                                               |                                    |                    |              |                    |                                            |                    |                               |  |



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|--------------------|-----------------------|-----------------------|------------------------|
| 13/523,854         | 06/14/2012            | Stacey C. Lum         | INFO-002COG            |

**CONFIRMATION NO. 3097**

28661

Lewis and Roca LLP

2440 W. El Camino Real, 6th Floor

Mountain View, CA 94040

## PUBLICATION NOTICE



\*OC000000056919549\*

**Title:**SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS

**Publication No.**US-2012-0254937-A1

**Publication Date:**10/04/2012

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The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publicly available Searchable Databases via the Internet at [www.uspto.gov](http://www.uspto.gov). The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

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| <b>Substitute for Form 1449/PTO</b><br><br><b>INFORMATION DISCLOSURE</b><br><b>STATEMENT BY APPLICANT</b><br><i>(use as many sheets as necessary)</i> |                       |                                          |           | <b>Complete if Known</b>    |                                                 |                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------------------------------|-----------|-----------------------------|-------------------------------------------------|---------------------------------------------------------------------------|
|                                                                                                                                                       |                       |                                          |           | Application Number          | 13/523,854                                      |                                                                           |
|                                                                                                                                                       |                       |                                          |           | Filing Date                 | June 14, 2012                                   |                                                                           |
|                                                                                                                                                       |                       |                                          |           | First Named Inventor:       | Stacey C. Lum                                   |                                                                           |
|                                                                                                                                                       |                       |                                          |           | Art Unit                    | 2431                                            |                                                                           |
|                                                                                                                                                       |                       |                                          |           | Examiner Name               | Not Yet Assigned                                |                                                                           |
| Sheet                                                                                                                                                 | 1                     | of                                       | 6         | Attorney Docket Number      | INFO-002COG                                     |                                                                           |
| <b>U.S. PATENT DOCUMENTS</b>                                                                                                                          |                       |                                          |           |                             |                                                 |                                                                           |
| Examiner Initials*                                                                                                                                    | Cite No. <sup>1</sup> | Document Number                          |           | Publication Date MM-DD-YYYY | Name of Patentee or Applicant of Cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|                                                                                                                                                       |                       | Number-Kind Code <sup>2</sup> (if known) |           |                             |                                                 |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 1,830,383 | 11/3/1931                   | Bos                                             |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 1,860,326 | 5/24/1932                   | Jackson                                         |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 2,131,067 | 9/27/1938                   | Paden                                           |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 2,247,592 | 7/1/1941                    | Swift                                           |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 2,519,435 | 8/22/1950                   | Byrd, Jr.                                       |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 2,731,056 | 1/17/1956                   | Anson                                           |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 3,100,664 | 8/13/1963                   | Duval                                           |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 3,701,557 | 10/31/1972                  | Centofante                                      |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 4,181,339 | 1/1/1980                    | Rigsby                                          |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 4,951,984 | 8/28/1990                   | Huang                                           |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 5,010,622 | 4/30/1991                   | Morita                                          |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 5,606,668 | 2/25/1997                   | Shwed                                           |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 5,701,635 | 12/30/1997                  | Hawkes                                          |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 5,835,481 | 11/10/1998                  | Akyol et al.                                    |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 5,842,002 | 11/24/1998                  | Schmurer et al.                                 |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 5,852,722 | 12/22/1998                  | Hamilton                                        |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 5,944,368 | 8/31/1999                   | Hastings                                        |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 5,950,195 | 9/7/1999                    | Stockwell et al.                                |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 5,968,176 | 10/19/1999                  | Nesset et al.                                   |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 6,006,259 | 12/21/1999                  | Adelman et al.                                  |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 6,044,402 | 3/28/2000                   | Jacobson et al.                                 |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 6,119,162 | 9/12/2000                   | Li et al.                                       |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 6,304,973 | 10/16/2001                  | Williams                                        |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 6,363,489 | 3/26/2002                   | Comay et al.                                    |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 6,393,484 | 5/21/2002                   | Massarani                                       |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 6,671,737 | 12/30/2003                  | Snowdon et al.                                  |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 6,678,835 | 1/13/2004                   | Shah et al.                                     |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 6,745,333 | 6/1/2004                    | Thomsen                                         |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 6,769,000 | 7/27/2004                   | Akhtar et al.                                   |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 6,834,414 | 12/28/2004                  | Chiu                                            |                                                                           |
|                                                                                                                                                       |                       | US-                                      | 6,980,660 | 12/27/2005                  | Hind et al.                                     |                                                                           |

|                    |  |                 |  |
|--------------------|--|-----------------|--|
| Examiner Signature |  | Date Considered |  |
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|                                                                                                                                                       |                       |                                          |              | Application Number             | 13/523,854                                         |                                                                                    |
|                                                                                                                                                       |                       |                                          |              | Filing Date                    | June 14, 2012                                      |                                                                                    |
|                                                                                                                                                       |                       |                                          |              | First Named Inventor:          | Stacey C. Lum                                      |                                                                                    |
|                                                                                                                                                       |                       |                                          |              | Art Unit                       | 2431                                               |                                                                                    |
|                                                                                                                                                       |                       |                                          |              | Examiner Name                  | Not Yet Assigned                                   |                                                                                    |
| Sheet                                                                                                                                                 | 2                     | of                                       | 6            | Attorney Docket Number         | INFO-002COG                                        |                                                                                    |
| <b>U.S. PATENT DOCUMENTS</b>                                                                                                                          |                       |                                          |              |                                |                                                    |                                                                                    |
| Examiner Initials*                                                                                                                                    | Cite No. <sup>1</sup> | Document Number                          |              | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Document | Pages, Columns, Lines,<br>Where Relevant<br>Passages or Relevant<br>Figures Appear |
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| <b>U.S. PATENT DOCUMENTS</b>                                                                                                                          |                       |                                          |              |                                |                                                    |                                                                                    |
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| FOREIGN PATENT DOCUMENTS |                          |                                                                                    |                                   |                                                    |                                                                                    |                |
|--------------------------|--------------------------|------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------|----------------|
| Examiner<br>Initials*    | Cite<br>No. <sup>1</sup> | Foreign Patent Document                                                            | Publication<br>Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Document | Pages, Columns,<br>Lines, Where Relevant<br>Passages or Relevant<br>Figures Appear | T <sup>6</sup> |
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| Sheet                                                                                                                                                 | 5                    | of                                                                                                                                                                                                                                                             | 6                        | Attorney Docket Number | INFO-002COG    |
| <b>NON PATENT LITERATURE DOCUMENTS</b>                                                                                                                |                      |                                                                                                                                                                                                                                                                |                          |                        |                |
| Examiner Initials*                                                                                                                                    | Cite No <sup>1</sup> | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published |                          |                        | T <sup>2</sup> |
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| <b>Sheet</b>                                                                                                                                          | 6                    | <b>of</b>                                                                                                                                                                                                                                                      | 6 | Attorney Docket Number   | INFO-002COG      |
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| Examiner Initials*                                                                                                                                    | Cite No <sup>1</sup> | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published |   |                          | T <sup>2</sup>   |
|                                                                                                                                                       |                      | U.S. patent application 12/273,037, Office Action mailed 7/9/10                                                                                                                                                                                                |   |                          |                  |
|                                                                                                                                                       |                      | U.S. patent application 13/157,308, Office Action mailed 8/4/11                                                                                                                                                                                                |   |                          |                  |
|                                                                                                                                                       |                      | U.S. patent application 13/157,309, Office Action mailed 8/4/11                                                                                                                                                                                                |   |                          |                  |
|                                                                                                                                                       |                      | U.S. patent application 13/157,310, Office Action mailed 8/5/11                                                                                                                                                                                                |   |                          |                  |
|                                                                                                                                                       |                      | U.S. patent application 13/371,381, Office Action mailed 7/17/12                                                                                                                                                                                               |   |                          |                  |
|                                                                                                                                                       |                      | U.S. patent application 13/523,849, Office Action mailed 9/28/12                                                                                                                                                                                               |   |                          |                  |
|                                                                                                                                                       |                      |                                                                                                                                                                                                                                                                |   |                          |                  |
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|                    |  |                 |  |
|--------------------|--|-----------------|--|
| Examiner Signature |  | Date Considered |  |
|--------------------|--|-----------------|--|

\*Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>1</sup>Applicant's unique citation designation number (optional). <sup>2</sup>Applicant is to place a check mark here if English Translation is attached.

This collection of information is required by 37 CFR 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SENT FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.**

**If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.**

| Electronic Acknowledgement Receipt   |                                                   |
|--------------------------------------|---------------------------------------------------|
| EFS ID:                              | 14152924                                          |
| Application Number:                  | 13523854                                          |
| International Application Number:    |                                                   |
| Confirmation Number:                 | 3097                                              |
| Title of Invention:                  | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |
| First Named Inventor/Applicant Name: | Stacey C. Lum                                     |
| Customer Number:                     | 28661                                             |
| Filer:                               | TamThanh Thi Pham/Adriena Garcia                  |
| Filer Authorized By:                 | TamThanh Thi Pham                                 |
| Attorney Docket Number:              | INFO-002COG                                       |
| Receipt Date:                        | 06-NOV-2012                                       |
| Filing Date:                         | 14-JUN-2012                                       |
| Time Stamp:                          | 15:58:46                                          |
| Application Type:                    | Utility under 35 USC 111(a)                       |

**Payment information:**

| Submitted with Payment | no                   |                                       |                                                   |                  |                  |
|------------------------|----------------------|---------------------------------------|---------------------------------------------------|------------------|------------------|
| <b>File Listing:</b>   |                      |                                       |                                                   |                  |                  |
| Document Number        | Document Description | File Name                             | File Size(Bytes)/<br>Message Digest               | Multi Part /.zip | Pages (if appl.) |
| 1                      | Transmittal Letter   | INFO-002COG_IDS-Statement_11-5-12.pdf | 19928<br>7a67b653b0d6a880c044dc1f1eeaf4724f9128b1 | no               | 2                |
| <b>Warnings:</b>       |                      |                                       |                                                   |                  |                  |
| <b>Information:</b>    |                      |                                       |                                                   |                  |                  |

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| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                       |                                      |                                                            |    |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                       |                                      |                                                            |    |   |
| This is not an USPTO supplied IDS fillable form                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                       |                                      |                                                            |    |   |
| <b>Total Files Size (in bytes):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                       |                                      | 131462                                                     |    |   |
| <p><b>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/> <b>If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</b></p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/> <b>If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</b></p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/> <b>If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</b></p> |                                                       |                                      |                                                            |    |   |

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit: 2431

Examiner: Not Yet Assigned

Serial No.: 13/523,854

Filed: June 14, 2012

In re Application of: Stacey C. Lum

Confirmation No.: 3097

Customer No.: 28661

Title: Systems and Methods of Controlling Network Access

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**SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT**

**Under 37 C.F.R. § 1.56, and 1.97-1.98**

SIR:

Pursuant to the provisions of 37 C.F.R. §§ 1.56 and 1.97-98 of the Rules of Practice in Patent Cases, enclosed herewith is form PTO-SB-08, listing several references. The Examiner is requested to make these references of official record in the application.

The references cited may be material to examination of the application and are submitted in compliance with the Applicants' duty of disclosure as defined by 37 C.F.R. § 1.56.

Copies of all foreign and non-patent references were previously submitted in U.S. patent application number 12/273,037 filed November 18, 2008, and U.S. patent application number 13/157,308 filed June 10, 2011 to which the present application makes a claim of priority under 35 U.S.C. §120. As such, no copies are provided herewith.

No representation is made or intended as to the completeness of this list, nor is the inclusion of any reference on this list an admission that it is prior art or pertinent to this application.

The Commissioner is hereby authorized to charge any necessary fee to Account Number 50-0612.

Respectfully submitted,  
LEWIS AND ROCA LLP

Dated: November 5, 2012

/Tam Thanh Pham/  
Tam Thanh Pham (50,565)  
**LEWIS AND ROCA LLP**  
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| APPLICATION NO.                                                                    | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.     | CONFIRMATION NO.       |
|------------------------------------------------------------------------------------|-------------|----------------------|-------------------------|------------------------|
| 13/523,854                                                                         | 06/14/2012  | Stacey C. Lum        | INFO-002COG             | 3097                   |
| 28661                                                                              | 7590        | 04/17/2013           |                         |                        |
| Lewis and Roca LLP<br>2440 W. El Camino Real, 6th Floor<br>Mountain View, CA 94040 |             |                      | EXAMINER<br>SONG, HOSUK |                        |
|                                                                                    |             |                      | ART UNIT<br>2435        | PAPER NUMBER           |
|                                                                                    |             |                      | MAIL DATE<br>04/17/2013 | DELIVERY MODE<br>PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                                      |                                   |                                                  |
|------------------------------|--------------------------------------|-----------------------------------|--------------------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>13/523,854 | <b>Applicant(s)</b><br>LUM ET AL. |                                                  |
|                              | <b>Examiner</b><br>Hosuk Song        | <b>Art Unit</b><br>2435           | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) ☒ Responsive to communication(s) filed on 14 June 2012.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.

2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.

3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.

4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

5) ☒ Claim(s) 1-20 is/are pending in the application.  
5a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

6) ☐ Claim(s) \_\_\_\_\_ is/are allowed.

7) ☒ Claim(s) 1-20 is/are rejected.

8) ☐ Claim(s) \_\_\_\_\_ is/are objected to.

9) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

\* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

**Application Papers**

10) ☐ The specification is objected to by the Examiner.

11) ☒ The drawing(s) filed on 14 June 2012 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

**Priority under 35 U.S.C. § 119**

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

**Certified copies:**

a) ☐ All    b) ☐ Some \*    c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Interim copies:**

a) ☐ All    b) ☐ Some    c) ☐ None of the: Interim copies of the priority documents have been received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 11/6/12.

3) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.

4) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Double Patenting*

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-82 of U.S. Patent No. 7,523,484. Although the conflicting claims are not identical, they are not patentably distinct from each other.

Claims 1-20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-31 of U.S. Patent No. 8,051,460. Although the conflicting claims are not identical, they are not patentably distinct from each other.

Claims 1-20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 8,117,645. Although the conflicting claims are not identical, they are not patentably distinct from each other.

Claims 1-20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6 of U.S. Patent No. 8,108,909. Although the conflicting claims are not identical, they are not patentably distinct from each other.

Claims 1-20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-5 of U.S. Patent No. 8,112,788. Although the conflicting claims are not identical, they are not patentably distinct from each other.

Claims 1-20 are provisionally rejected on the ground of nonstatutory double patenting over claims 1-20 of copending Application No. 13/523,858. This is a provisional double patenting rejection since the conflicting claims have not yet been patented.

The subject matter claimed in the instant application is fully disclosed in the referenced copending application and would be covered by any patent granted on that copending application since the referenced copending application and the instant application are claiming common subject matter, as follows: Although the conflicting claims are not identical, they are not patentably distinct from each other because both are directed to applying a security policy to network devices; and only differing in that the claims of '858 application explicitly recite applying a security policy that includes requirements pertaining to the authentication and the active probe. Thus the claims of the '858 application are rendered as obvious variants of the instant claims.

Claims 1-20 are provisionally rejected on the ground of nonstatutory double patenting over claims 1-20 of copending Application No. 13/523,856. This is a provisional double patenting rejection since the conflicting claims have not yet been patented.

The subject matter claimed in the instant application is fully disclosed in the referenced copending application and would be covered by any patent granted on that copending application since the referenced copending application and the instant application are claiming common subject matter, as follows: Although the conflicting claims are not identical, they are not patentably distinct from each other because both are directed to applying a security policy to network devices; and only differing in that the claims of '856 application explicitly recite collecting third party audit data pertaining to the device. Thus the claims of the '856 application are rendered as obvious variants of the instant claims.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-16,18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mann et al(US . 2006/0147043) in view of Meier et al(US 7,373,508).

Claims 1,5,6: Mann disclose sending a request for audit data to an agent running on the device and receiving an audit data from the agent, the audit data pertaining to the device having been retrieved by the agent in (page 2[0033];page 7[0066-0068]). Mann disclose applying the security policy that includes requirements pertaining to the audit data and the authentication, the applying of the security policy taking place at a gatekeeper in (page 3[0035]). Mann does not specifically disclose performing an authentication using the EAP protocol from a device connected to an access point configured to use the

Art Unit: 2435

802.1x protocol. Meier patent teaches EAP protocol authentication from a device connected to an access point configured to use the 802.1x protocol in (col.1,lines 57-66;col.6,lines 42-52). It would have been obvious to person of ordinary skill in the art at the time invention was made to include EAP protocol as taught in Meier with system of Mann in order to support multiple authentication methods thus allowing broad range of authentication methods can be met and enhancing overall system security.

Claim 2: Mann discloses applying the security policy includes configuring the access point in (fig.6).

Claim 3: Mann disclose configuring the access point includes assigning an access control list in (fig.2).

Claim 4: Mann discloses configuring the access point includes assigning a VLAN in (fig.6).

Claim 7: Mann discloses request includes audit data pertaining to an application in (page 7[0071]).

Claim 8: Mann discloses received audit data includes audit data that concerns an application on the device in (fig.5).

Claim 9: Mann discloses received audit data includes information that concerns operating system of the device in (page 3[0036]).

Claim 10: Mann discloses received audit data includes information that concerns antivirus software on the device in (page 1[0016]).

Claim 11: Mann discloses received audit data includes information that concerns other devices coupled to the device in (page 3[0039]).

Claim 12: Mann discloses the security policy audit is based at least in part on information obtained from an active probe of the device in (page 2[0033]).

Claim 13: Mann discloses security policy audit is based at least in part on information obtained from a third party in (page 2[0033]).

Claim 14: Mann discloses security policy audit based at least in part on the information concerning the identity of a user of the device in (page 2[0033]).

Claim 15: Mann discloses agent continues to send audit data pertaining to the device after configuring an access point in (fig.5).

Claim 16: Mann disclose agent continues to send updated audit data pertaining to the device while the device has access to the less-restricted subset of the network in (fig.5,6).

Claim 18: Mann disclose gatekeeper takes part in bringing a software on the device up to date in response to applying the security policy in (page 3[0035]).

Claim 19: Mann discloses gatekeeper takes part in facilitating updates to a software on the device in response to applying the security policy in (page 2[0029],[0032]).

Claim 20: Mann discloses received audit data pertains to logoff by a user of the device in (page 6[0059],[0061]).

***Allowable Subject Matter***

Claim 17 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form **including all of the limitations of the base claim and any intervening claims.**

***USPTO Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hosuk Song whose telephone number is (571)272-3857. The examiner can normally be reached on mon-fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Hirl can be reached on 5712723685. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2435

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Hosuk Song/  
Primary Examiner, Art Unit 2435

|                                   |                                       |                                                          |             |
|-----------------------------------|---------------------------------------|----------------------------------------------------------|-------------|
| <b>Notice of References Cited</b> | Application/Control No.<br>13/523,854 | Applicant(s)/Patent Under<br>Reexamination<br>LUM ET AL. |             |
|                                   | Examiner<br>Hosuk Song                | Art Unit<br>2435                                         | Page 1 of 1 |

**U.S. PATENT DOCUMENTS**

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Name          | Classification |
|---|---|--------------------------------------------------|-----------------|---------------|----------------|
| * | A | US-7,302,256                                     | 11-2007         | O'Hara et al. | 455/418        |
| * | B | US-7,350,077                                     | 03-2008         | Meier et al.  | 713/171        |
| * | C | US-7,373,508                                     | 05-2008         | Meier et al.  | 713/168        |
|   | D | US-                                              |                 |               |                |
|   | E | US-                                              |                 |               |                |
|   | F | US-                                              |                 |               |                |
|   | G | US-                                              |                 |               |                |
|   | H | US-                                              |                 |               |                |
|   | I | US-                                              |                 |               |                |
|   | J | US-                                              |                 |               |                |
|   | K | US-                                              |                 |               |                |
|   | L | US-                                              |                 |               |                |
|   | M | US-                                              |                 |               |                |

**FOREIGN PATENT DOCUMENTS**

| * |   | Document Number<br>Country Code-Number-Kind Code | Date<br>MM-YYYY | Country | Name | Classification |
|---|---|--------------------------------------------------|-----------------|---------|------|----------------|
|   | N |                                                  |                 |         |      |                |
|   | O |                                                  |                 |         |      |                |
|   | P |                                                  |                 |         |      |                |
|   | Q |                                                  |                 |         |      |                |
|   | R |                                                  |                 |         |      |                |
|   | S |                                                  |                 |         |      |                |
|   | T |                                                  |                 |         |      |                |

**NON-PATENT DOCUMENTS**

| * |   | Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages) |
|---|---|-------------------------------------------------------------------------------------------|
|   | U |                                                                                           |
|   | V |                                                                                           |
|   | W |                                                                                           |
|   | X |                                                                                           |

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

## EAST Search History

## EAST Search History (Prior Art)

| Ref # | Hits | Search Query                                                                                                                                                                                                                             | DBs                                         | Default Operator | Plurals | Time Stamp       |
|-------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------|---------|------------------|
| S58   | 14   | (edit\$4 or config\$8 or reconfig\$7 or chang\$7 or modif\$7) near6 (access adj3 point or AP) same (authenticat\$4 or validat\$4) near5 (device or computer) and gatekeeper and (kerberos or "X.509" or "802.1x")                        | US-PGPUB; USPAT                             | OR               | ON      | 2013/04/11 10:35 |
| S59   | 412  | (edit\$4 or config\$8 or reconfig\$7 or chang\$7 or modif\$7) near6 (access adj3 point or AP) same (authenticat\$4 or validat\$4) and EAP                                                                                                | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/04/11 10:40 |
| S60   | 2    | "20060147043"                                                                                                                                                                                                                            | US-PGPUB; USPAT                             | OR               | ON      | 2013/04/11 10:42 |
| S61   | 152  | (edit\$4 or config\$8 or reconfig\$7 or chang\$7 or modif\$7) near6 (access adj3 point or AP) same (authenticat\$4 or validat\$4) and EAP                                                                                                | USPAT; EPO; JPO; DERWENT; IBM_TDB           | OR               | ON      | 2013/04/11 11:17 |
| S62   | 1847 | (access adj3 point or AP) same (authenticat\$4 or validat\$4) and EAP                                                                                                                                                                    | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/04/11 11:18 |
| S63   | 236  | (access adj3 point or AP) same (authenticat\$4 or validat\$4) same EAP and ("802.1x")                                                                                                                                                    | USPAT                                       | OR               | ON      | 2013/04/11 11:24 |
| S64   | 6    | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and ("801.1x")                                                     | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/04/11 11:26 |
| S65   | 112  | (access adj3 point or AP) near5 (audit\$4 or edit or chang\$4 or modif\$8) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule)                   | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/04/11 11:27 |
| S66   | 218  | (access adj3 point or AP) near6 (reconfig\$9 or chang\$4 or modif\$7 or updat\$5 or edit\$4) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/04/11 11:31 |
| S67   | 211  | (access adj3 point or AP) near6 (reconfig\$9 or chang\$4 or modif\$7 or updat\$5 or edit\$4) same (authenticat\$4 or validat\$4 or verif\$9) and (policy or parameter or rule or                                                         | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/04/11 14:32 |

|     |      |                                                                                                                                                                                           |                                             |    |    |                  |
|-----|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|----|----|------------------|
|     |      | access adj3 control\$4) and (firewall or gatekeep\$4)                                                                                                                                     |                                             |    |    |                  |
| S68 | 90   | (access adj3 point or AP) near6 (reconfig\$9 or chang\$4 or modif\$7 or updat\$5 or edit\$4) same (authenticat\$4 or validat\$4 or verif\$9) and (policy or parameter or rule) and (VLAN) | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:33 |
| S69 | 3721 | 726/1.ccls.                                                                                                                                                                               | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:33 |
| S70 | 3640 | 726/2.ccls.                                                                                                                                                                               | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:33 |
| S71 | 3910 | 726/3.ccls.                                                                                                                                                                               | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:33 |
| S72 | 5171 | 726/4.ccls.                                                                                                                                                                               | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:33 |
| S73 | 1559 | 726/11.ccls.                                                                                                                                                                              | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:33 |
| S74 | 1391 | 726/12.ccls.                                                                                                                                                                              | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:34 |
| S75 | 957  | 726/15.ccls.                                                                                                                                                                              | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:35 |
| S76 | 2357 | 713/150.ccls.                                                                                                                                                                             | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:36 |
| S77 | 2161 | 713/153.ccls.                                                                                                                                                                             | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:36 |
| S78 | 2212 | 713/155.ccls.                                                                                                                                                                             | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:37 |
| S79 | 5674 | 713/168.ccls.                                                                                                                                                                             | US-PGPUB; USPAT;                            | OR | ON | 2013/04/11 14:37 |

|     |       |                                                                                                                                                                                                                             |                                                         |    |    |                     |
|-----|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----|----|---------------------|
|     |       |                                                                                                                                                                                                                             | EPO; JPO;<br>DERWENT;<br>IBM_TDB                        |    |    |                     |
| S80 | 2138  | 380/270.ccls.                                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/04/11<br>14:37 |
| S81 | 7013  | 709/220.ccls.                                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/04/11<br>14:37 |
| S82 | 3309  | 709/221.ccls.                                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/04/11<br>14:37 |
| S83 | 16384 | 709/223.ccls.                                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/04/11<br>14:38 |
| S84 | 18795 | 709/224.ccls.                                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/04/11<br>14:38 |
| S85 | 7269  | 709/225.ccls.                                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/04/11<br>14:38 |
| S87 | 10283 | 709/227.ccls.                                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/04/11<br>14:39 |
| S88 | 5717  | 709/228.ccls.                                                                                                                                                                                                               | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/04/11<br>14:39 |
| S89 | 204   | (access adj3 point or AP) near6<br>(reconfig\$9 or chang\$4 or modif\$7 or<br>updat\$5 or edit\$4) same<br>(authenticat\$4 or validat\$4 or verif\$9)<br>and (policy or parameter or rule) and<br>(firewall or gatekeep\$4) | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/04/11<br>14:39 |
| S90 | 53    | (access adj3 point or AP) same<br>(authenticat\$4 or validat\$4 or verif\$9)<br>and (EAP or extensible adj4<br>authentication adj6 protocol) and<br>(policy or parameter or rule) and<br>726/1.ccls.                        | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/04/11<br>14:41 |
| S91 | 55    | (access adj3 point or AP) same<br>(authenticat\$4 or validat\$4 or verif\$9)<br>and (EAP or extensible adj4<br>authentication adj6 protocol) and<br>(policy or parameter or rule) and                                       | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/04/11<br>14:41 |

|      |     |                                                                                                                                                                                         |                                             |    |    |                  |
|------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|----|----|------------------|
|      |     | 726/2.ccls.                                                                                                                                                                             |                                             |    |    |                  |
| S92  | 106 | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 726/3.ccls.   | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:41 |
| S93  | 97  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 726/4.ccls.   | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:54 |
| S94  | 11  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 726/11.ccls.  | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:54 |
| S95  | 19  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 726/12.ccls.  | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:55 |
| S96  | 18  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 726/15.ccls.  | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:55 |
| S97  | 15  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 713/150.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:56 |
| S98  | 30  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 713/153.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:56 |
| S100 | 49  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 713/155.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:56 |
| S101 | 115 | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 713/168.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:57 |
| S102 | 77  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and               | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:57 |

|      |     |                                                                                                                                                                                                                                        |                                             |    |    |                  |
|------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|----|----|------------------|
|      |     | 380/270.ccls.                                                                                                                                                                                                                          |                                             |    |    |                  |
| S103 | 19  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 709/220.ccls.                                                | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:57 |
| S104 | 6   | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 709/221.ccls.                                                | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:57 |
| S105 | 27  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 709/223.ccls.                                                | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:57 |
| S106 | 27  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 709/224.ccls.                                                | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:57 |
| S107 | 44  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 709/225.ccls.                                                | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:57 |
| S108 | 30  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 709/227.ccls.                                                | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:58 |
| S109 | 28  | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 709/228.ccls.                                                | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 14:58 |
| S110 | 6   | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and ("801.1x")                                                   | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 15:06 |
| S111 | 211 | (access adj3 point or AP) near6 (reconfig\$9 or chang\$4 or modif\$7 or updat\$5 or edit\$4) same (authenticat\$4 or validat\$4 or verif\$9) and (policy or parameter or rule or access adj3 control\$4) and (firewall or gatekeep\$4) | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/04/11 17:02 |

4/ 12/ 2013 7:44:18 AM

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| Substitute for Form 1449/PTO                                                                         |                       |                                          |                                | <b>Complete if Known</b>                           |                                                                                    |
|------------------------------------------------------------------------------------------------------|-----------------------|------------------------------------------|--------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------|
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><i>(use as many sheets as necessary)</i> |                       |                                          |                                | Application Number                                 | 13/523,854                                                                         |
|                                                                                                      |                       |                                          |                                | Filing Date                                        | June 14, 2012                                                                      |
|                                                                                                      |                       |                                          |                                | First Named Inventor:                              | Stacey C. Lum                                                                      |
|                                                                                                      |                       |                                          |                                | Art Unit                                           | 2431                                                                               |
|                                                                                                      |                       |                                          |                                | Examiner Name                                      | Not Yet Assigned                                                                   |
| Sheet                                                                                                | 1                     | of                                       | 6                              | Attorney Docket Number                             | INFO-002/COG                                                                       |
| <b>U.S. PATENT DOCUMENTS</b>                                                                         |                       |                                          |                                |                                                    |                                                                                    |
| Examiner Initials*                                                                                   | Cite No. <sup>1</sup> | Document Number                          | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Document | Pages, Columns, Lines,<br>Where Relevant<br>Passages or Relevant<br>Figures Appear |
|                                                                                                      |                       | Number-Kind Code <sup>2</sup> (if known) |                                |                                                    |                                                                                    |
| /H.S./                                                                                               |                       | US- 1,830,383                            | 11/3/1931                      | Bos                                                |                                                                                    |
|                                                                                                      |                       | US- 1,860,326                            | 5/24/1932                      | Jackson                                            |                                                                                    |
|                                                                                                      |                       | US- 2,131,067                            | 9/27/1938                      | Paden                                              |                                                                                    |
|                                                                                                      |                       | US- 2,247,592                            | 7/1/1941                       | Swift                                              |                                                                                    |
|                                                                                                      |                       | US- 2,519,435                            | 8/22/1950                      | Byrd, Jr.                                          |                                                                                    |
|                                                                                                      |                       | US- 2,731,056                            | 1/17/1956                      | Anson                                              |                                                                                    |
|                                                                                                      |                       | US- 3,100,664                            | 8/13/1963                      | Duval                                              |                                                                                    |
|                                                                                                      |                       | US- 3,701,557                            | 10/31/1972                     | Centofante                                         |                                                                                    |
|                                                                                                      |                       | US- 4,181,339                            | 1/1/1980                       | Rigsby                                             |                                                                                    |
|                                                                                                      |                       | US- 4,951,984                            | 8/28/1990                      | Huang                                              |                                                                                    |
|                                                                                                      |                       | US- 5,010,622                            | 4/30/1991                      | Morita                                             |                                                                                    |
|                                                                                                      |                       | US- 5,606,668                            | 2/25/1997                      | Shwed                                              |                                                                                    |
|                                                                                                      |                       | US- 5,701,635                            | 12/30/1997                     | Hawkes                                             |                                                                                    |
|                                                                                                      |                       | US- 5,835,481                            | 11/10/1998                     | Akyol et al.                                       |                                                                                    |
|                                                                                                      |                       | US- 5,842,002                            | 11/24/1998                     | Schmurer et al.                                    |                                                                                    |
|                                                                                                      |                       | US- 5,852,722                            | 12/22/1998                     | Hamilton                                           |                                                                                    |
|                                                                                                      |                       | US- 5,944,368                            | 8/31/1999                      | Hastings                                           |                                                                                    |
|                                                                                                      |                       | US- 5,950,195                            | 9/7/1999                       | Stockwell et al.                                   |                                                                                    |
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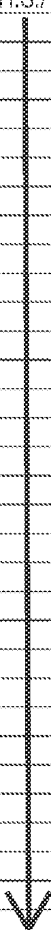
|                    |              |                 |            |
|--------------------|--------------|-----------------|------------|
| Examiner Signature | /Hosuk Song/ | Date Considered | 04/11/2013 |
|--------------------|--------------|-----------------|------------|

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. <sup>1</sup>Applicant's unique citation designation number (optional). <sup>2</sup>See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup>Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup>For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. <sup>5</sup>Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. <sup>6</sup>Applicant is to place a check mark here if English language translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SENT FEES OR COMPLETED FORMS TO THIS ADDRESS.

Based on Form PTO/SB/05A (05/03)

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.S./

| Substitute for Form 1449/PTO<br><br><b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><i>(use as many sheets as necessary)</i> |                       |                                                                 |                                | <b>Complete if Known</b><br>Application Number: 13/523,854<br>Filing Date: June 14, 2012<br>First Named Inventor: Stacey C. Lum<br>Art Unit: 2431<br>Examiner Name: Not Yet Assigned<br>Attorney Docket Number: INFO-002/COG |                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Sheet                                                                                                                                    | 2                     | of                                                              | 6                              |                                                                                                                                                                                                                              |                                                                                    |
| <b>U.S. PATENT DOCUMENTS</b>                                                                                                             |                       |                                                                 |                                |                                                                                                                                                                                                                              |                                                                                    |
| Examiner<br>Initials*                                                                                                                    | Cite No. <sup>1</sup> | Document Number<br><br>Number-Kind Code <sup>2</sup> (if known) | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Document                                                                                                                                                                           | Pages, Columns, Lines,<br>Where Relevant<br>Passages or Relevant<br>Figures Appear |
| /H.S./<br>                                             |                       | US- 6,988,133                                                   | 1/17/2006                      | Zavalovsky et al.                                                                                                                                                                                                            |                                                                                    |
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| Examiner<br>Signature | /Hosuk Song/ | Date Considered | 04/11/2013 |
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| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><i>(use as many sheets as necessary)</i> |                       |                  |                                | Application Number                                 | 13/523,854                                                                         |
|                                                                                                      |                       |                  |                                | Filing Date                                        | June 14, 2012                                                                      |
|                                                                                                      |                       |                  |                                | First Named Inventor:                              | Stacey C. Lum                                                                      |
|                                                                                                      |                       |                  |                                | Art Unit                                           | 2431                                                                               |
|                                                                                                      |                       |                  |                                | Examiner Name                                      | Not Yet Assigned                                                                   |
| Sheet                                                                                                | 3                     | of               | 6                              | Attorney Docket Number                             | INFO-002/COG                                                                       |
| <b>U.S. PATENT DOCUMENTS</b>                                                                         |                       |                  |                                |                                                    |                                                                                    |
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|                                                                                                      | US-                   |                  |                                |                                                    |                                                                                    |
|                                                                                                      | US-                   |                  |                                |                                                    |                                                                                    |
|                                                                                                      | US-                   |                  |                                |                                                    |                                                                                    |

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|-----------------------------------|--------------------------|------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------|----------------|
| Examiner<br>Initials <sup>a</sup> | Cite<br>No. <sup>1</sup> | Foreign Patent Document                                                            | Publication<br>Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Document | Pages, Columns,<br>Lines, Where Relevant<br>Passages or Relevant<br>Figures Appear | T <sup>2</sup> |
|                                   |                          | Country Code <sup>3</sup> Number <sup>4</sup> Kind Code <sup>5</sup><br>(if known) |                                   |                                                    |                                                                                    |                |
| /H.S./                            |                          | JP 2005-079706                                                                     | 3/24/2005                         | NEC Corp                                           |                                                                                    |                |
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|                                   |                          |                                                                                    |                                   |                                                    |                                                                                    |                |
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IPR2024-00677

Ex. 1202, p. 96 of 260

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| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><i>(use as many sheets as necessary)</i> |   |    | Application Number       | 13/523,854             |             |
|                                                                                                      |   |    | Filing Date              | June 14, 2012          |             |
|                                                                                                      |   |    | First Named inventor:    | Stacey C. Lum          |             |
|                                                                                                      |   |    | Art Unit                 | 2431                   |             |
|                                                                                                      |   |    | Examiner Name            | Not Yet Assigned       |             |
| Sheet                                                                                                | 5 | of | 6                        | Attorney Docket Number | INFO-002COG |

| NON PATENT LITERATURE DOCUMENTS |                       |                                                                                                                                                                                                                                                                |  |                |
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| /H.S./                          |                       | "Network Access Control from Mirage Networks," Mirage Networks, 2006                                                                                                                                                                                           |  |                |
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|                                                                                                                                          |                       |                                                                                                                                                                                                                                                                |   | Application Number       | 13/523,854       |
|                                                                                                                                          |                       |                                                                                                                                                                                                                                                                |   | Filing Date              | June 14, 2012    |
|                                                                                                                                          |                       |                                                                                                                                                                                                                                                                |   | First Named inventor:    | Stacey C. Lum    |
|                                                                                                                                          |                       |                                                                                                                                                                                                                                                                |   | Art Unit                 | 2431             |
|                                                                                                                                          |                       |                                                                                                                                                                                                                                                                |   | Examiner Name            | Not Yet Assigned |
| Sheet                                                                                                                                    | 6                     | of                                                                                                                                                                                                                                                             | 6 | Attorney Docket Number   | INFO-002COG      |
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| /H.S./                                                                                                                                   |                       | U.S. patent application 12/273,037, Office Action mailed 7/9/10                                                                                                                                                                                                |   |                          |                  |
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| /H.S./                                                                                                                                   |                       | U.S. patent application 13/157,309, Office Action mailed 8/4/11                                                                                                                                                                                                |   |                          |                  |
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☒ in expanded formResult page: [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [next](#)**1** [PPP EAP TLS Authentication Protocol](#)[B. Ababa, D. Simon](#)

October 1999

PPP EAP TLS Authentication Protocol

**Publisher:** RFC EditorFull text available: [Full Text](#) (50.11 KB)**Bibliometrics:** Downloads (6 Weeks): 0, Downloads (12 Months): 1, Downloads (Overall): 70, Citation Count: 54

The Point-to-Point Protocol (PPP) provides a standard method for transporting multi-protocol datagrams over point-to-point links. PPP also defines an extensible Link Control Protocol (LCP), which can be used to negotiate authentication methods, as well ...

**2** [Secure three-party key distribution protocol for fast network access in EAP-based wireless networks](#)[R. Marin-Lopez, F. Pereniguez, F. Bernal, A. F. Gomez](#)

October 2010

**Computer Networks: The International Journal of Computer and Telecommunications Networking**, Volume 54 Issue 15**Publisher:** Elsevier North-Holland, Inc.**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

In this paper, we present a solution that reduces the time spent on providing network access in multi-domain mobile networks where the authentication process is based on the Extensible Authentication Protocol (EAP). The goal is to achieve fast and smooth ...

**Keywords:** EAP, Fast handoff, Fast re-authentication, Key distribution, Network security**3** [USIM-based EAP-TLS authentication protocol for wireless local area networks](#)[Yuh-Min Tseng](#)

January 2009

**Computer Standards & Interfaces**, Volume 31 Issue 1**Publisher:** Elsevier Science Publishers B. V.**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

Due to the rapid growth in popularity of Wireless Local Area Network (WLAN), wireless security has become one of many important research issues. For the WLAN security, the IEEE 802.1X standard provides an authentication framework that is based on the ...

**Keywords:** Authentication, Cellular network, EAP, USIM, Wireless LAN**4** [PPP Extensible Authentication Protocol \(EAP\)](#)[L. Blunk, J. Vollbrecht](#)

March 1998

PPP Extensible Authentication Protocol (EAP)

**Publisher:** RFC EditorFull text available: [Full Text](#) (29.45 KB)**Bibliometrics:** Downloads (6 Weeks): 1, Downloads (12 Months): 1, Downloads (Overall): 73, Citation Count: 36

The Point-to-Point Protocol (PPP) [1] provides a standard method for transporting multi-protocol datagrams over point-to-point links.

**5** [Extensible Authentication Protocol: Authentication, Wireless LAN, Point-to-Point Protocol, Wi-Fi Protected Access, Internet Engineering Task Force, EAP-SIM, ... Protected Extensible Authentication Protocol](#)[Frederic P. Miller, Agnes F. Vandome, John McBreuwater](#)

November 2009

Extensible Authentication Protocol: Authentication, Wireless LAN, Point-to-Point Protocol, Wi-Fi Protected Access, Internet Engineering Task Force, EAP-SIM, ... Protected Extensible Authentication Protocol

**Publisher:** Alpha Press**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

Extensible Authentication Protocol, or EAP, is a universal authentication framework frequently used in wireless networks and Point-to-Point connections. It is defined in RFC 3748, which has been updated by RFC 5247. Although the EAP protocol is not limited ...

**6** [RADIUS \(Remote Authentication Dial In User Service\) Support For Extensible Authentication Protocol \(EAP\)](#)

[B. Abebe, F. Cainoun](#)

September 2003 RADIUS (Remote Authentication Dial In User Service) Support For Extensible Authentication Protocol (EAP)

**Publisher:** RFC Editor

Full text available: [Full Text](#) (104.47 KB)

**Bibliometrics:** Downloads (6 Weeks): 1, Downloads (12 Months): 2, Downloads (Overall): 61, Citation Count: 6

This document defines Remote Authentication Dial In User Service (RADIUS) support for the Extensible Authentication Protocol (EAP), an authentication framework which supports multiple authentication mechanism. In the proposed scheme, the Network Access ...

**7** [Computationally sound symbolic analysis of EAP-TNC protocol](#)

Zijian Zhang, Liehuang Zhu, Feng Wang, Lejian Liao, Cong Guo, Hongyuan Wang

November 2011

**INTRUST'11:** Proceedings of the Third international conference on Trusted Systems

**Publisher:** Springer-Verlag

Full text available: [Full Text](#) (104.47 KB)

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count: n/a

The Trusted Computing Group has proposed Trusted Network Connection (TNC) Architecture and a series of interface specifications, such as IF-T and IF-TNCCS, to solve the interoperability of network access control. In particular, IF-T describes the mapping ...

**Keywords:** EAP-TNC, computationally sound, trusted computing, trusted network connection

**8** [Design and Implementation of WLAN Authentication and Security: Building Secure Wireless LAN by EAP-MD5, EAP-TLS and EAP-TTLS protocols](#)

[Keshava Munegowda](#)

June 2010 Design and Implementation of WLAN Authentication and Security: Building Secure Wireless LAN by EAP-MD5, EAP-TLS and EAP-TTLS protocols

**Publisher:** LAP Lambert Academic Publishing

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count: n/a

This Book provides basics of Wireless LAN, 802.1x system and 802.11i Security Model. In this book, the flow of messages of the protocols EAP, EAP-MD5, EAP-TLS and EAP-TTLS are covered in detail. The Design, implementation issues and validation of the ...

**9** [Secure protocol for fast authentication in EAP-based wireless networks](#)

[Bafu Marin, Santiago Zapata, Antonio F. Gomez](#)

August 2007 **ICCSA'07: Proceedings of the 2007 international conference on Computational science and Its applications - Volume Part II**, Volume Part II

**Publisher:** Springer-Verlag

**Bibliometrics:** Downloads (6 Weeks): 0, Downloads (12 Months): 0, Downloads (Overall): 3, Citation Count: 1

In this paper we present a solution for providing a fast transition in heterogeneous mobile networks which involve network access control based on the Extensible Authentication Protocol. The goal is to reduce the time spent on providing access and smooth ...

**Keywords:** authentication, fast handover, network access control, security

**10** [Analysis of EAP-GPSK authentication protocol](#)

[John C. Mitchell, Arnab Roy, Paul Rowe, Andre Seedorf](#)

June 2008 **ACNS'08: Proceedings of the 6th international conference on Applied cryptography and network security**

**Publisher:** Springer-Verlag

**Bibliometrics:** Downloads (6 Weeks): 0, Downloads (12 Months): 0, Downloads (Overall): 1, Citation Count: 0

The EAP-GPSK protocol is a lightweight, flexible authentication protocol relying on symmetric key cryptography. It is part of an ongoing IETF process to develop authentication methods for the EAP framework. We analyze the protocol and find three weaknesses: ...

**11** [The Performance Analysis of Fast EAP Re-authentication Protocol](#)

[Qing Xu, Changsheng Wan, Aiqun Hu](#)

December 2008 **ISCSCT '08: Proceedings of the 2008 International Symposium on Computer Science and Computational Technology - Volume 01**, Volume 01

**Publisher:** IEEE Computer Society

Full text available:  [Publisher Site](#)

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

With extensions to current EAP key hierarchy, the EAP re-authentication Protocol provides a consistent, method-independent and low-latency re-authentication mechanism to support intra-domain handoff authentication. This paper analyzed the efficiency ...

**Keywords:** extended EAP re-authentication, EAP-TLS, inter-provider roaming, micropayment

12 [Extensible authentication protocol \(EAP\) and IEEE 802.1x: tutorial and empirical experience](#)  
[Jyh-Cheng Chen, Yu-Ping Wang](#)

December 2005 **IEEE Communications Magazine**, Volume 43 Issue 12

**Publisher:** IEEE Press

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

This article presents the technical details of the Extensible Authentication Protocol (EAP) and IEEE 802.1x by using WIRE1x, an open-source implementation of IEEE 802.1x client (supplicant) and various EAP-based authentication mechanisms. By using a ...

13 [WLAN Authentication System Based on the Improved EAP-TLS Protocol](#)  
[Weili Huang, Renjie Li](#)

June 2009 **WMWA '09: Proceedings of the 2009 Second Pacific-Asia Conference on Web Mining and Web-based Application**

**Publisher:** IEEE Computer Society

Full text available:  [Publisher Site](#)

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

This paper introduces the working principle of IEEE 802.1x protocol and Extensible Authentication Protocol EAP-TLS in the wireless local area network. There are some safety defects by analysis of the EAP-TLS protocol. On this basis, make an improvement ...

**Keywords:** WLAN, Client, Authenticator, Authentication Server, EAP-TLS, RADIUS

14 [Formal Verification of PAP and EAP-MD5 Protocols in Wireless Networks: FDR Model Checking](#)  
[Il-Gon Kim, Jin-Young Choi](#)

March 2004 **AINA '04: Proceedings of the 18th International Conference on Advanced Information Networking and Applications - Volume 2**, Volume 2

**Publisher:** IEEE Computer Society

Full text available:  [Publisher Site](#)

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

IEEE 802.1x and authentication server based security protocols are mainly used for enhancing security of wireless networks. In this paper, we specify PAP and EAP-MD5 based security protocols formally with Casper and CSP, and then verify their security properties ...

15 [Multicast receiver access control by IGMP-AC](#)

[Saieku Islam, J. William Atwood](#)

May 2009 **Computer Networks: The International Journal of Computer and Telecommunications Networking**, Volume 53 Issue 7

**Publisher:** Elsevier North-Holland, Inc.

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

IP multicast is best-known for its bandwidth conservation and lower resource utilization. The present service model of multicast makes it difficult to restrict access to authorized End Users (EUs) or paying customers. Without an effective receiver access ...

**Keywords:** AAA, AAAS, AH, AR, ASM, Authentication Authorization and Accounting (AAA), BGP, BR, CR, DDT, DoS, EAP, ESP, EU, Extensible Authentication Protocol (EAP), GKM, HAAAS, IETF, IGMP, IGMP-AC, IKE, IPsec, Internet Group Management Protocol (IGMP), LAAAS, MitM, NAI, NAS, NSP, PANA, PIM, Receiver access control, SA, SSM, Secure multicasting

16 [A study of performance improvement in EAP](#)

Eun-Chul Cha, Hyung-Kee Choi

May 2007 **NETWORKING'07: Proceedings of the 6th international IFIP-TC6 conference on Ad Hoc and sensor networks, wireless networks, next generation internet**

**Publisher:** Springer-Verlag

**Bibliometrics:** Downloads (6 Weeks): 0, Downloads (12 Months): 0, Downloads (Overall): 1, Citation Count:

Followed by the popularity of the Internet, a number of access technologies to the Internet have been developed. EAP is an authentication framework. It is designed to provide the authentication functionality in the access network. Because of its flexibility ...

**Keywords:** extensible authentication protocol (EAP), network access authentication, network security

17 A self-adaptive K selection mechanism for re-authentication load balancing in large-scale systems

Fanyang, Naixue Xiong, Jong-Hyuk Park

July 2012

**The Journal of Supercomputing**, Volume 61 Issue 1

**Publisher:** Kluwer Academic Publishers

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

Since the 802.16e standard has been released, there are few authentication pattern schemes and Extensible Authentication Protocol (EAP) selection proposals for manufacturers to choose from in large-scale network systems. This paper focuses on the re-authentication ...

**Keywords:** EAP-AKA, Extensible Authentication Protocol (EAP), Re-authentication

18 Untraceable Identity Management Framework for Mobile Access

Min-Chih Kuo, Yi-Shiang Yeh, Chuan-Chi Wang

November 2008 **ISDA '08: Proceedings of the 2008 Eighth International Conference on Intelligent Systems Design and Applications - Volume 02**, Volume 02

**Publisher:** IEEE Computer Society

Full text available:  [Publisher Site](#)

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

Although some Extensible Authentication Protocol (EAP) methods such as EAP-TTLS (Tunneled Transport Layer Security) can hide true identity to protect the privacy of the mobile user, they cannot identify the mobile user for accounting and authorization ...

**Keywords:** Extensible authentication protocol (EAP), Short- lived certificate, Privacy

19 Research on the Access Control Protocol of WiMAX

Leo Gullian

May 2009

**ISECS '09: Proceedings of the 2009 Second International Symposium on Electronic Commerce and Security - Volume 01**, Volume 01

**Publisher:** IEEE Computer Society

Full text available:  [Publisher Site](#)

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

WiMAX security has two goals, one is to provide privacy across the wireless network and the other is to provide access control to the network. Privacy is accomplished by encrypting connections between the subscriber static and the base station. The ...

**Keywords:** Access Control, DIAMETER, Extensible Authentication Protocol (EAP), Remote Access Dial-In User Service (RADIUS), WiMAX

20 Security and privacy for the next wireless generation

Fascioli, Guy, Puolle

March 2008

**International Journal of Network Management**, Volume 18 Issue 2

**Publisher:** John Wiley & Sons, Inc.

Full text available:  (736.37 KB)

**Bibliometrics:** Downloads (6 Weeks): 0, Downloads (12 Months): 1, Downloads (Overall): 408, Citation Count: 1

This paper presents research performed during the last 4 years (2003-2007), in order to design applications (usually referred as EAP smart cards) which enhance security and privacy in emerging WLAN infrastructures. It introduces smart cards ensuring ...

Result page: [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [next](#)

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|                                                                                                                    |                                            |                                                              |
|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------|
| <b><i>Index of Claims</i></b><br> | <b>Application/Control No.</b><br>13523854 | <b>Applicant(s)/Patent Under Reexamination</b><br>LUM ET AL. |
|                                                                                                                    | <b>Examiner</b><br>HOSUK SONG              | <b>Art Unit</b><br>2435                                      |

|   |          |   |            |   |              |   |          |
|---|----------|---|------------|---|--------------|---|----------|
| ✓ | Rejected | - | Cancelled  | N | Non-Elected  | A | Appeal   |
| = | Allowed  | ÷ | Restricted | I | Interference | O | Objected |

| <input type="checkbox"/> Claims renumbered in the same order as presented by applicant |          |            |  |  |  |  |  |  |  |  | <input type="checkbox"/> CPA |  | <input type="checkbox"/> T.D. |  | <input type="checkbox"/> R.1.47 |  |
|----------------------------------------------------------------------------------------|----------|------------|--|--|--|--|--|--|--|--|------------------------------|--|-------------------------------|--|---------------------------------|--|
| CLAIM                                                                                  |          | DATE       |  |  |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| Final                                                                                  | Original | 04/11/2013 |  |  |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
|                                                                                        | 1        | ✓          |  |  |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
|                                                                                        | 2        | ✓          |  |  |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
|                                                                                        | 3        | ✓          |  |  |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
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|                                                                                        | 5        | ✓          |  |  |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
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|                                                                                        | 20       | ✓          |  |  |  |  |  |  |  |  |                              |  |                               |  |                                 |  |

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|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------------------------|
| <b><i>Search Notes</i></b><br><br> | <b>Application/Control No.</b><br><br>13523854 | <b>Applicant(s)/Patent Under Reexamination</b><br><br>LUM ET AL. |
|                                                                                                                     | <b>Examiner</b><br><br>HOSUK SONG              | <b>Art Unit</b><br><br>2435                                      |

| CPC- SEARCHED |      |          |
|---------------|------|----------|
| Symbol        | Date | Examiner |
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| CPC COMBINATION SETS - SEARCHED |      |          |
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| US CLASSIFICATION SEARCHED |                         |         |          |
|----------------------------|-------------------------|---------|----------|
| Class                      | Subclass                | Date    | Examiner |
| 726                        | 1-4,11-12,15            | 4/11/13 | HS       |
| 713                        | 150,153,155,168         | 4/11/13 | HS       |
| 380                        | 270                     | 4/11/13 | HS       |
| 709                        | 220-221,223-225,227-228 | 4/11/13 | HS       |

| SEARCH NOTES                                    |         |          |
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| Search Notes                                    | Date    | Examiner |
| EAST, foreign patent database, IBM TDB, USPGPUB | 4/11/13 | HS       |
| NPL                                             | 4/11/13 | HS       |

| INTERFERENCE SEARCH     |                         |      |          |
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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------------|
| <b>SERIAL NUMBER</b><br>13/523,854                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>FILING or 371(c)<br/>DATE</b><br>06/14/2012<br><b>RULE</b>                                                     | <b>CLASS</b><br>726                                      | <b>GROUP ART UNIT</b><br>2435 | <b>ATTORNEY DOCKET NO.</b><br>INFO-002COG                                                                                                                                                                                                                                 |                           |                                |
| <b>APPLICANTS</b><br>Stacey C. Lum, Los Altos, CA;<br>Yuhshio Alice Lee, Saratoga, CA;<br><b>** CONTINUING DATA *****</b><br>This application is a CON of 13/371,381 02/10/2012 PAT 8347350<br>which is a CON of 13/157,309 06/10/2011 PAT 8117645<br>which is a CON of 12/273,037 11/18/2008 PAT 8051460<br>which is a CON of 10/949,179 09/24/2004 PAT 7523484<br>which claims benefit of 60/513,080 10/21/2003<br>and claims benefit of 60/505,582 09/24/2003<br><b>** FOREIGN APPLICATIONS *****</b><br><b>** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** ** SMALL ENTITY **</b><br>06/25/2012 |                                                                                                                   |                                                          |                               |                                                                                                                                                                                                                                                                           |                           |                                |
| Foreign Priority claimed <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>35 USC 119(a-d) conditions met <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br>Verified and Acknowledged <u>/Hosuk Song/</u><br>Examiner's Signature                                                                                                                                                                                                                                                                                                                           |                                                                                                                   | <input type="checkbox"/> Met after Allowance<br>Initials | <b>STATE OR COUNTRY</b><br>CA | <b>SHEETS DRAWINGS</b><br>10                                                                                                                                                                                                                                              | <b>TOTAL CLAIMS</b><br>20 | <b>INDEPENDENT CLAIMS</b><br>1 |
| <b>ADDRESS</b><br>Lewis and Roca LLP<br>2440 W. El Camino Real, 6th Floor<br>Mountain View, CA 94040<br>UNITED STATES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                   |                                                          |                               |                                                                                                                                                                                                                                                                           |                           |                                |
| <b>TITLE</b><br>SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                   |                                                          |                               |                                                                                                                                                                                                                                                                           |                           |                                |
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|                                                                                                                                                   | <b>Filing Date</b>            | 06-14-2012                                 |
|                                                                                                                                                   | <b>First Named Inventor</b>   | Lum, Stacey C.                             |
|                                                                                                                                                   | <b>Title</b>                  | Systems and Methods of Controlling Network |
|                                                                                                                                                   | <b>Art Unit</b>               | 2435                                       |
|                                                                                                                                                   | <b>Examiner Name</b>          | Hosuk, Song                                |
|                                                                                                                                                   | <b>Attorney Docket Number</b> | 5393.01                                    |

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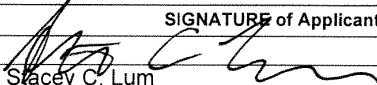
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**OR**  
☐ Assignee of record of the entire interest. See 37 CFR 3.71.  
Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on \_\_\_\_\_.

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| <b>SIGNATURE of Applicant or Assignee of Record</b> |                                                                                     |           |           |
| Signature                                           |  | Date      | 5/15/2013 |
| Name                                                | Stacey C. Lum                                                                       | Telephone |           |
| Title and Company                                   |                                                                                     |           |           |

**NOTE:** Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below\*.

☒ \*Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

| Electronic Acknowledgement Receipt   |                                                   |
|--------------------------------------|---------------------------------------------------|
| EFS ID:                              | 15798017                                          |
| Application Number:                  | 13523854                                          |
| International Application Number:    |                                                   |
| Confirmation Number:                 | 3097                                              |
| Title of Invention:                  | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |
| First Named Inventor/Applicant Name: | Stacey C. Lum                                     |
| Customer Number:                     | 28661                                             |
| Filer:                               | Steven M. Colby/melinda tompkins                  |
| Filer Authorized By:                 | Steven M. Colby                                   |
| Attorney Docket Number:              | INFO-002COG                                       |
| Receipt Date:                        | 16-MAY-2013                                       |
| Filing Date:                         | 14-JUN-2012                                       |
| Time Stamp:                          | 16:31:36                                          |
| Application Type:                    | Utility under 35 USC 111(a)                       |

**Payment information:**

| Submitted with Payment | no                   |                 |                                                   |                  |                  |
|------------------------|----------------------|-----------------|---------------------------------------------------|------------------|------------------|
| <b>File Listing:</b>   |                      |                 |                                                   |                  |                  |
| Document Number        | Document Description | File Name       | File Size(Bytes)/<br>Message Digest               | Multi Part /.zip | Pages (if appl.) |
| 1                      | Power of Attorney    | 5393-01_POA.pdf | 84577<br>00f436e2901df64dcc98c44598471a68ae0b86eb | no               | 2                |
| <b>Warnings:</b>       |                      |                 |                                                   |                  |                  |
| <b>Information:</b>    |                      |                 |                                                   |                  |                  |

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-----------------------|-----------------------|------------------------|
| 13/523,854         | 06/14/2012            | Stacey C. Lum         | INFO-002COG            |

**CONFIRMATION NO. 3097**

**MISCELLANEOUS NOTICE**

28661  
Lewis and Roca LLP  
2440 W. El Camino Real, 6th Floor  
Mountain View, CA 94040



Date Mailed: 05/20/2013

A communication which cannot be delivered in electronic form has been mailed to the applicant.



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| APPLICATION NUMBER | FILING DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-------------|-----------------------|------------------------|
| 13/523,854         | 06/14/2012  | Stacey C. Lum         | INFO-002COG            |

CONFIRMATION NO. 3097

28661  
 Lewis and Roca LLP  
 2440 W. El Camino Real, 6th Floor  
 Mountain View, CA 94040



\*OC000000061357291\*

Cc:  
 PETERS VERNY, L.L.P.  
 425 SHERMAN AVENUE  
 SUITE 230  
 PALO ALTO, CA 94306

Date Mailed: 05/20/2013

## DENIAL OF REQUEST FOR POWER OF ATTORNEY

The request for Power of Attorney filed 05/16/2013 is acknowledged. However, the request cannot be granted at this time for the reason stated below.

- ☐ The Power of Attorney you provided did not comply with the new Power of Attorney rules that became effective on June 25, 2004. See 37 CFR 1.32.
- ☐ The revocation is not signed by the applicant, the assignee of the entire interest, or one particular principal attorney having the authority to revoke.
- ☐ The Power of Attorney is from an assignee and the Certificate required by 37 CFR 3.73(c) has not been received.
- ☐ The person signing for the assignee has omitted their empowerment to sign on behalf of the assignee.
- ☒ The inventor(s) is without authority to appoint attorneys since the assignee has intervened as provided by 37 CFR 3.71.
- ☐ The signature(s) of \_\_\_\_\_, a co-inventor in this application, has been omitted. The Power of Attorney will be entered upon receipt of confirmation signed by said co-inventor(s).
- ☐ The person(s) appointed in the Power of Attorney is not registered to practice before the U.S. Patent and Trademark Office.
- ☐ Only one Customer Number can be designated for the Power of Attorney in an application. The Customer Number that was captured is the first Customer Number provided on the Power of Attorney document.
- ☐ A request under 37 CFR 1.48 to add an inventor was granted in this application, however, no power of attorney consistent with the power of attorney granted by the originally named inventive entity has been



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received. Thus, the addition of the inventor has resulted in the loss of power of attorney in the application. See 37 CFR 1.32(e).

- ☐ The power of attorney has not been accepted because the party who is giving power of attorney has not been identified. Power of attorney may only be signed by the applicant for patent (37 CFR 1.42) or the patent owner. A patent owner who was not the applicant must appoint any power of attorney in compliance with 37 CFR 3.71 and 3.73. See 37 CFR 1.32(b)(4).
- ☐ The power of attorney from the inventors has not been accepted because it is a copy from a prior national application for which benefit is claimed and the continuing application names an inventor who was not named as an inventor in the prior application.
- ☐ The power of attorney from the inventors has not been accepted because the power of attorney must be signed by the applicant for patent. See 37 CFR 1.32(b)(4).
- ☐ Any request to correct or update the name of the applicant must include an application data sheet (ADS) in compliance with 37 CFR 1.76 specifying the correct or updated name of the applicant in the applicant information section. Any request to change the applicant after an original applicant has been specified under 37 CFR 1.46(b) must include a new ADS in compliance with 37 CFR 1.76 specifying the applicant in the applicant information section and comply with 37 CFR 3.71 and 3.73. See 37 CFR 1.46(c).

Any inquiries regarding this notice should be directed to the Application Assistance Unit at 571-272-4200.

  
\_\_\_\_\_  
Application Assistance Unit  
571-272-4200

|                                                                                                                                                   |                               |                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------------------------|
| <b>POWER OF ATTORNEY<br/>OR<br/>REVOCATION OF POWER OF ATTORNEY<br/>WITH A NEW POWER OF ATTORNEY<br/>AND<br/>CHANGE OF CORRESPONDENCE ADDRESS</b> | <b>Application Number</b>     | 13/523,854                                 |
|                                                                                                                                                   | <b>Filing Date</b>            | 06/14/2012                                 |
|                                                                                                                                                   | <b>First Named Inventor</b>   | Stacey C. Lum                              |
|                                                                                                                                                   | <b>Title</b>                  | Systems and Methods of Controlling Network |
|                                                                                                                                                   | <b>Art Unit</b>               | 2435                                       |
|                                                                                                                                                   | <b>Examiner Name</b>          | SONG, Hosuk                                |
|                                                                                                                                                   | <b>Attorney Docket Number</b> | 5532.01                                    |

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

**OR**

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

23308

**OR**

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

| Practitioner(s) Name | Registration Number |
|----------------------|---------------------|
|                      |                     |
|                      |                     |
|                      |                     |
|                      |                     |

Please recognize or change the correspondence address for the above-identified application to:

☒ The address associated with the above-mentioned Customer Number.

**OR**

☐ The address associated with Customer Number:

**OR**

|                                                  |       |     |  |
|--------------------------------------------------|-------|-----|--|
| <input type="checkbox"/> Firm or Individual Name |       |     |  |
| Address                                          |       |     |  |
| City                                             | State | Zip |  |
| Country                                          |       |     |  |
| Telephone                                        | Email |     |  |

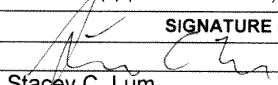
I am the:

☐ Applicant/Inventor.

**OR**

☒ Assignee of record of the entire interest. See 37 CFR 3.71.  
Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on \_\_\_\_\_.

**SIGNATURE of Applicant or Assignee of Record**

|                   |                                                                                     |           |                   |
|-------------------|-------------------------------------------------------------------------------------|-----------|-------------------|
| Signature         |  | Date      | 6/13/13           |
| Name              | Stacey C. Lum                                                                       | Telephone | 650 623 0260 x258 |
| Title and Company | CEO, InfoExpress, Inc.                                                              |           |                   |

**NOTE:** Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below\*.

☒ \*Total of 1 forms are submitted.

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

**STATEMENT UNDER 37 CFR 3.73(b)**

Applicant/Patent Owner: InfoExpress, Inc.

Application No./Patent No.: 13/523,854

Filed/Issue Date: 06/14/2012

Titled: Systems and Methods of Controlling Network Access

InfoExpress, Inc., a Corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;
2. ☐ an assignee of less than the entire right, title, and interest in  
(The extent (by percentage) of its ownership interest is \_\_\_\_\_ %); or
3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

- A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel \_\_\_\_\_, Frame \_\_\_\_\_, or for which a copy therefore is attached.

OR

- B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Stacey C. Lum

To: InfoExpress, Inc.

The document was recorded in the United States Patent and Trademark Office at

Reel 030579, Frame 0107, or for which a copy thereof is attached.

2. From: Yuhshio Alice Lee

To: InfoExpress, Inc.

The document was recorded in the United States Patent and Trademark Office at

Reel 030579, Frame 0309, or for which a copy thereof is attached.

3. From: \_\_\_\_\_

To: \_\_\_\_\_

The document was recorded in the United States Patent and Trademark Office at

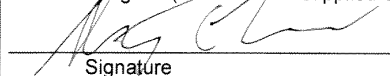
Reel \_\_\_\_\_, Frame \_\_\_\_\_, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

- ☒ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

  
Signature

6/13/13  
Date

Stacey C. Lum

CEO

Printed or Typed Name

Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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| Electronic Acknowledgement Receipt          |                                                   |
|---------------------------------------------|---------------------------------------------------|
| <b>EFS ID:</b>                              | 16138452                                          |
| <b>Application Number:</b>                  | 13523854                                          |
| <b>International Application Number:</b>    |                                                   |
| <b>Confirmation Number:</b>                 | 3097                                              |
| <b>Title of Invention:</b>                  | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |
| <b>First Named Inventor/Applicant Name:</b> | Stacey C. Lum                                     |
| <b>Customer Number:</b>                     | 28661                                             |
| <b>Filer:</b>                               | Steven M. Colby/Melinda Tompkins                  |
| <b>Filer Authorized By:</b>                 | Steven M. Colby                                   |
| <b>Attorney Docket Number:</b>              | INFO-002COG                                       |
| <b>Receipt Date:</b>                        | 24-JUN-2013                                       |
| <b>Filing Date:</b>                         | 14-JUN-2012                                       |
| <b>Time Stamp:</b>                          | 18:03:12                                          |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)                       |

**Payment information:**

| Submitted with Payment |                      | no              |                                              |                  |                  |
|------------------------|----------------------|-----------------|----------------------------------------------|------------------|------------------|
| <b>File Listing:</b>   |                      |                 |                                              |                  |                  |
| Document Number        | Document Description | File Name       | File Size(Bytes)/<br>Message Digest          | Multi Part /.zip | Pages (if appl.) |
| 1                      | Power of Attorney    | 5532-01_POA.pdf | 99613                                        | no               | 2                |
|                        |                      |                 | a0933e516d87433ae94b53c705df366e5db<br>a02bf |                  |                  |
| <b>Warnings:</b>       |                      |                 |                                              |                  |                  |
| <b>Information:</b>    |                      |                 |                                              |                  |                  |

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| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Assignee showing of ownership per 37 CFR 3.73. | 5532-01_Statement-3_73b.pdf | 80686<br>eb9fc98271fa70d1695d6cd60d9f17f50215a6a1 | no | 2 |
| <b>Warnings:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                |                             |                                                   |    |   |
| <b>Information:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                |                             |                                                   |    |   |
| <b>Total Files Size (in bytes):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                |                             | 180299                                            |    |   |
| <p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p> |                                                |                             |                                                   |    |   |



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| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-----------------------|-----------------------|------------------------|
| 13/523,854         | 06/14/2012            | Stacey C. Lum         | 5532.01                |

23308  
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**CONFIRMATION NO. 3097**  
**POA ACCEPTANCE LETTER**



Date Mailed: 07/05/2013

**NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY**

This is in response to the Power of Attorney filed 06/24/2013.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/ddinh/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101



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| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|--------------------|-----------------------|-----------------------|------------------------|
| 13/523,854         | 06/14/2012            | Stacey C. Lum         | INFO-002COG            |

**CONFIRMATION NO. 3097**

**POWER OF ATTORNEY NOTICE**

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\*OC000000062267698\*

Date Mailed: 07/05/2013

**NOTICE REGARDING CHANGE OF POWER OF ATTORNEY**

This is in response to the Power of Attorney filed 06/24/2013.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/ddinh/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

IN THE

UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Stacey Lum  
SERIAL NO.: 13/523,854  
CONF. NO.: 3097  
FILING DATE: 06/14/2012  
TITLE: Systems and Methods of Controlling Network Access  
EXAMINER: Hosuk Song  
ART UNIT: 2435  
ATTY.DKT.NO.: 5532.01

RESPONSE TO OFFICE ACTION

In response to the Office Action mailed April 17, 2013 in the above identified application, please enter the following amendment and consider the following remarks.

Amendments to the **Claims** begin on page 2 of this response.

**Remarks** begin on page 5 of this response.

Listing of Claims:

1. (Currently Amended) A method for auditing a device ~~in the network~~, the method comprising:
  - performing an authentication using ~~the an~~ EAP protocol from ~~a the~~ device, ~~the device being~~  
~~connected via a computer network~~ to an access point configured to use ~~the an~~ 802.1x  
protocol;
  - sending a request for audit data to an agent running on the device;
  - receiving ~~an the~~ audit data ~~at a gatekeeper configured to control access to a network~~, from the  
agent, the audit data pertaining to the device ~~and having been retrieved~~ obtained by the  
agent;
  - applying ~~the a~~ security policy that includes ~~at least one~~ requirements pertaining to the audit  
data and ~~at least one requirement pertaining to~~ the authentication, the applying of the  
security policy taking place ~~at under control of a the~~ gatekeeper.
2. (Original) The method of claim 1, wherein applying the security policy includes configuring the access  
point.
3. (Original) The method of claim 2, wherein configuring the access point includes assigning an access  
control list.
4. (Original) The method of claim 2, wherein configuring the access point includes assigning a VLAN.
5. (Original) The method of claim 1, wherein receiving the audit data includes the use of the EAP  
protocol.
6. (Currently Amended) The method of claim 1, wherein sending ~~a the~~ authentication includes obtaining  
~~a password from a user of the device~~ request for audit data includes the use of the EAP protocol.
7. (Currently Amended) The method of claim ~~6~~ 1, wherein the request includes a request for audit data  
pertaining to an application.

8. (Currently Amended) The method of claim 1, wherein the received audit data includes audit data that ~~pertains to~~concerns an application on the device.
9. (Original) The method of claim 1, wherein the received audit data includes information that concerns operating system of the device.
10. (Original) The method of claim 1, wherein the received audit data includes information that concerns antivirus software on the device.
11. (Original) The method of claim 1, wherein the received audit data includes information that concerns other devices coupled to the device.
12. (Cancelled) ~~The method of claim 1, wherein the security policy audit is based at least in part on information obtained from an active probe of the device.~~
13. (Currently Amended) The method of claim 1, wherein the security policy audit ~~includes at least one requirement[s] based at least in part on information about the device obtained from a third party.~~
14. (Currently Amended) The method of claim 1, wherein the security policy audit ~~is based at least in part on the information concerning the identity of a user of the device.~~
15. (Currently Amended) The method of claim 2, ~~further comprising receiving, wherein from the agent, continues to send updated~~ audit data pertaining to the device after configuring ~~an~~ the access point.
16. (Currently Amended) The method of claim 2, ~~further comprising receiving, from wherein the agent, continues to send updated~~ audit data pertaining to the device while the device has access to the a less-restricted subset of the network.
17. (Currently Amended) A method for auditing a device, the method comprising:  
~~performing an authentication using an EAP protocol from the device, the device being connected to an access point configured to use an 802.1x protocol;~~

sending a request for audit data to an agent running on the device;  
receiving the audit data at a gatekeeper configured to control access to a network, from the  
agent, the audit data pertaining to the device and having been obtained by the agent;  
applying a security policy that includes at least one requirements pertaining to the audit data  
and at least one requirement pertaining to the authentication, the applying of the  
security policy taking place under control of the gatekeeper, wherein applying the  
security policy includes configuring the access point; The method of claim 16  
receiving, from the agent, updated audit data pertaining to the device while the device has  
access to a less-restricted subset of the network; and  
re-auditing wherein the gatekeeper re-audits the device in accordance to a the security policy  
using the received updated audit data.

18. (Currently Amended) The method of claim 1, wherein the gatekeeper is configured to take[s] part in bringing a software on the device up to date in response to applying the security policy.

19. (Currently Amended) The method of claim 1, wherein the gatekeeper is configured to take[s] part in facilitating updates to a software the agent on to the device in response to applying the security policy.

20. (Original) The method of claim 1, wherein the received audit data pertains to a logoff by a user of the device.

21. (New) The method of claim 2, further comprising continuing to receive at the gatekeeper, from the agent, audit data pertaining to the device after the configuring of the access point.

22. (New) The method of claim 1, wherein the audit data characterizes a current state of the device.

23. (New) The method of claim 1, wherein the authentication is of a user of the device.

## REMARKS

Claims 1-11 and 13-23 are currently pending herein. Claim 12 is cancelled. Claims 1, 6, 7, 8 and 12-19 are currently amended, primarily for clarity. Claims 21, 22 and 23 are new.

Claim 17 is amended to include the limitations of those claims from which it depends.

The Examiner has indicated that this would make Claim 17 allowable.

## Double Patenting

The Examiner makes serious procedural and legal error in suggesting Double Patenting rejections. The Examiner first cites the standard a “nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claims(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claims(s).” The Examiner then, incorrectly, states “[t]he subject matter claimed in the instant application is fully disclosed in the referenced copending application and would be **covered by any patent granted** on that copending application since the referenced copending application and the instant application are claiming common subject matter...,” (emphasis added). The Examiner appears to be making double patenting rejections based on the fact that the issued patents and the current application have a common specification. Of course, this is wrong. The proper standard, as cited above, is whether the current claims are “either anticipated by, or would have been obvious over, the reference claims(s).”

In making a double patenting rejection over copending Application No. 13/523,858, the Examiner makes an assertion that claims are “patentably distinct from each other because both are directed to applying a security policy to network devices; and only differing in that claims of

'858 application explicitly recite applying a security policy that includes requirements pertaining to the authentication and the active probe.” This is factually incorrect. For example, Claim 1 includes a combination of elements *“using an EAP protocol,” “sending a request for audit data to an agent running on the device”* and *“receiving the audit data at a gatekeeper from the agent”* that are not found in any independent claims of the '858 application. In order to maintain the provisional nonstatutory double patenting rejection the Examiner must show that at least one of the claims pending in this application is anticipated by, or would have been obvious over, a claim of the '858 application. The Examiner has not done so.

The Examiner also makes double patenting rejections over commonly owned U.S. Patents 7,523,484, 8,051,460, 8,117,645, 8,108,909 and 8,112,788. In each of these rejections the Examiner makes the unsupported statement “[a]lthough the conflicting claims are not identical, they are not patentably distinct from each other.” In order for this to be true at least one claim in the pending application would have to be obvious over at least one claim in each of the above patents. The Applicants request that, as required to maintain the double patenting rejection, for each double patenting rejection the Examiner specifically point out which (at least one) claim of the current application is considered to be “either anticipated by, or would have been obvious over” a specific claim in an issued patent, or withdraw the double patenting rejections.

**Claims 1-16 and 18-20 were rejected under 35 U.S.C. 103(a) as being anticipated by Mann et al. (US 2006/0147043) in view of Meier et al (US 7,373,508).**

Regarding **Claim 1**,

Claim 1 recites:

1. (Currently Amended) A method for auditing a device in the network, the method comprising:
- performing an authentication using ~~the an~~ EAP protocol from ~~a the device, the device being connected via a computer network to an access point configured to use the an~~ 802.1x protocol;
  - sending a request for audit data to an agent running on the device;
  - receiving ~~as the~~ audit data ~~at a gatekeeper~~ from the agent, the audit data pertaining to the device ~~and having been retrieved obtained by the agent;~~
  - applying ~~the a~~ security policy that includes ~~at least one requirements~~ pertaining to the audit data and ~~at least one requirement pertaining to the authentication, the applying of the security policy taking place at under control of a the~~ gatekeeper.

In rejection Claims 1-16 and 18-20, the Examiner admits that Mann does not teach using an EAP protocol. However, the Examiner suggests that the teachings of Meier be used to modify the system of Mann. As motivation to combine these teaching the Examiner states it “would have been obvious ... to include EAP protocol as taught in Meier with the system of Mann in order to support multiple authentication methods thus allowing a broad range of authentication methods can be met and enhancing overall system security.”

This motivation is clearly both circular and based on fallacy. First, a broad range of authentication methods could only decrease overall system security as the security will be dependent on the weakest method. Second, the Examiner does not provide support for the suggestion that a broad range of authentication methods would “enhance overall system security” as suggested by the Examiner. Clearly, having just the one most secure authentication method would be most secure. Third, in paragraphs [0042], [0047], and in particular [0050] Mann already teaches alternative authentication methods.

Further, the authentication that occurs in Mann is between a local computer and a mobile device, see FIG. 7 steps 702, 704 and 706. This communication is protected through a combination of secure socket layer (SSL) and data encryption. There would be no reason to add an EAP protocol to this communication as doing so would not significantly improve security any

further. If SSL is already enabled, it is inherent that there is already an underlying communications protocol that can support SSL. There would not be any need for EAP.

For the above reasons, Examiner's motivation to combine the teachings of Mann and Meier is therefore without merit and the Examiner has failed to make a *prima facie* case for the rejection of Claim 1-16 and 18-20 under 103(a).

In rejecting Claim 1 the Examiner suggest that paragraphs [0033] and [0066]-[0068] teach "*sending a request for audit data to an agent running on the device.*" The Applicants traverse this suggestion.

The cited art teaches a gatekeeper that operates in two different modes. In one mode the gatekeeper supports "local synchronization" and in the other mode, the gatekeeper supports "network synchronization." In the local mode the gatekeeper runs on the local computing device and forms a security layer for personal synchronization – e.g., to local devices. In the network mode the gatekeeper controls communication to a server. At paragraph [0066] it is taught that "system event data, such as successful or unsuccessful authentication attempts, ... [are] transferred to the gatekeeper 104 by the communications module 602."

However, these teachings do not explicitly include "*sending a request for audit data to an agent running on the device.*" Specifically, there is no teaching that a request is sent to the agent. Such a request is also not inherent to the teaching cited by the Examiner.

**Regarding Claim 2,**

Claim 2 recites:

2. (Original) *The method of claim 1, wherein applying the security policy includes configuring the access point.*

In rejecting Claim 2 the Examiner suggests that FIG. 6 of Mann teaches the limitations of Claim 2. However, there does not appear to be any teaching of an access point, much less configuration of said access point. The Applicants request that the Examiner specifically point out which specific teachings in FIG. 6 are believed to teach the limitations of Claim 2, or allow Claim 2 and those claims that depend therefrom.

**Regarding Claim 3,**

Claim 3 recites:

*3. (Original) The method of claim 2, wherein configuring the access point includes assigning an access control list.*

In rejecting Claim 3 the Examiner suggests that FIG. 2 of Mann teaches these limitations. However, there does not appear to be any teaching of an access control list, much less assignment of said access control list in this figure. The Applicants request that the Examiner specifically point out which specific teachings in FIG. 2 are believed to teach the limitations of Claim 3, or allow Claim 3 and those claims that depend therefrom.

**Regarding Claim 4,**

Claim 4 recites:

*4. (Original) The method of claim 2, wherein configuring the access point includes assigning a VLAN.*

In rejecting Claim 4 the Examiner suggests that FIG. 6 of Mann teaches the limitations of Claim 4. However, there does not appear to be any teaching of VLAN in FIG. 6, much less assignment of said VLAN. The Applicants request that the Examiner specifically point out which specific teachings in FIG. 6 are believed to teach the limitations of Claim 4, or allow Claim 4 and those claims that depend therefrom.

**Regarding Claims 5 and 6,** Claims 5 and 6 are believed to be allowable for at least the same reasons as Claim 1.

**Regarding Claim 7,**

Claim 7 recites:

- | 7. (Currently Amended) The method of claim ~~6~~1, wherein the request includes a request for audit data pertaining to an application.

In rejecting Claim 7 the Examiner suggests that paragraph [0071] of Mann teaches the limitations of Claim 7. However, there does not appear to be any teaching of a request for audit data in this paragraph, much less audit data pertaining to an application. The Applicants request that the Examiner specifically point out which specific teachings in paragraph [0071] are believed to teach the limitations of Claim 7, or allow Claim 7.

**Regarding Claim 8,**

Claim 8 recites:

- | 8. (Currently Amended) The method of claim 1, wherein the received audit data includes audit data that ~~concerns~~pertains to an application on the device.

In rejecting Claim 8 the Examiner suggests that FIG. 5 of Mann teaches the limitations of Claim 8. However, there does not appear to be any teaching of “audit data that characterize a state of an application on the device” in FIG. 5. FIG. 5 teaches an Audit log but nothing that log is taught regarding how the audit data relates to “an application on the device.” The Applicants request that the Examiner specifically point out which specific teachings in FIG. 5 are believed to teach the limitations of Claim 8, or allow Claim 8 and those claims that depend therefrom.

**Regarding Claim 9,**

Claim 9 recites:

9. (Original) The method of claim 1, wherein the received audit data includes information that concerns operating system of the device.

In rejecting Claim 9 the Examiner suggests that paragraph [0036] of Mann teaches the limitations of Claim 9. However, there does not appear to be any teaching of audit data in this paragraph, much less audit data concerning *“an operating system of the device.”* The Applicants request that the Examiner specifically point out which specific teachings in paragraph [0036] are believed to teach the limitations of Claim 9, or allow Claim 9.

**Regarding Claim 10,** Claim 10 is believed to be allowable for at least the same reasons as Claim 1, from which it depends.

**Regarding Claim 11,**

Claim 11 recites:

11. (Original) *The method of claim 1, wherein the received audit data includes information that concerns other devices coupled to the device.*

In rejecting Claim 11 the Examiner suggests that paragraph [0039] of Mann teaches the limitations of Claim 11. However, there does not appear to be any teaching of audit data that *“includes information that concerns other devices coupled to the device”* in this paragraph. The Applicants request that the Examiner specifically point out which specific teachings in paragraph [0039] are believed to teach the limitations of Claim 11, or allow Claim 11.

**Regarding Claim 13,**

Claim 13 recites:

13. (Currently Amended) *The method of claim 1, wherein the security policy ~~audit~~ includes at least one requirement[s] based at least in part on information about the device obtained from a third party.*

In rejecting Claim 13 the Examiner suggests that paragraph [0033] of Mann teaches the limitations of Claim 13. This paragraph does teach *“a third party data synchronization tool.”* However, there does not appear to be any teaching of a security policy that *“includes ... information ... obtained from a third party”* in this paragraph. The Applicants request that the Examiner specifically point out

which specific teachings in paragraph [0033] are believed to teach the limitations of Claim 13, or allow Claim 13.

**Regarding Claim 14,**

Claim 14 recites:

14. (Currently Amended) The method of claim 1, wherein the security policy ~~audit~~ is based at least in part on ~~the~~ information concerning the identity of a user of the device.

In rejecting Claim 14 the Examiner suggests that paragraph [0033] of Mann teaches the limitations of Claim 14. This paragraph does teach “a personal synchronization tools.” However, there does not appear to be any teaching of a security policy that “*is based at least in part information concerning the identity of a user of the device*” in this paragraph. The Applicants request that the Examiner specifically point out which specific teachings in paragraph [0033] are believed to teach the limitations of Claim 14, or allow Claim 14.

**Regarding Claim 15,**

Claim 15 recites:

15. (Currently Amended) The method of claim 2, further comprising receiving, wherein from the agent, continues to send updated audit data pertaining to the device after configuring on the access point.

In rejecting Claim 15 the Examiner suggests that FIG. 5 of Mann teaches the limitations of Claim 15. This figure does not teach anything of the kind. There is no “agent,” “updated audit data,” or “configuring on the access point” taught. The Applicants request that the Examiner specifically point out which specific teachings in FIG. 5 are believed to teach the limitations of Claim 15, or allow Claim 15.

**Regarding Claim 15,**

Claim 15 recites:

16. (Currently Amended) The method of claim 2, further comprising receiving, from wherein the agent, continues to send updated audit data pertaining to the device while the device has access to the a less-restricted subset of the a network.

In rejecting Claim 16 the Examiner suggests that FIGs. 5 & 6 of Mann teaches the limitations of Claim 16. These figure does not teach anything of the kind. There is no “agent,” “updated audit data,” or “the device has access to ~~the~~ less-restricted subset of the network” taught. The Applicants request that the Examiner specifically point out which specific teachings in FIG. 5 & 6 are believed to teach the limitations of Claim 16, or allow Claim 16.

**Regarding Claims 18 and 19**, Claims 18 and 19 are believed to be allowable for at least the same reasons as Claim 1, from which they depend.

**Regarding Claim 20,**

Claim 20 recites:

*20. (Original) The method of claim 1, wherein the received audit data pertains to a logoff by a user of the device.*

In rejecting Claim 20 the Examiner suggests that paragraphs [0059] and [0060] of Mann teach the limitations of Claim 20. These paragraphs teach a “logging service” not “a logoff” as recited in Claim 20. A logging service is a recorder of events. In contrast, “a logoff” refers to, for example, logging off a connection or account after logging on. These are two completely different things.. The Applicants request that the Examiner specifically point out which specific teachings in the cited paragraphs are believed to teach the limitations of Claim 20, or allow Claim 20.

### Conclusion

In view of the above remarks and amendments, the pending claims in this application are believed to be in condition for allowance, and the Examiner is respectfully requested to allow the pending claims in this application. The Examiner is invited to call Applicants' representative at the number below if he has any questions or if there are remaining outstanding issues.

Respectfully submitted,

Stacey Lum, et al.

Date: July 17, 2013

By: /Steven M. Colby 50,250/

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| Electronic Patent Application Fee Transmittal |          |                                                   |        |                      |
|-----------------------------------------------|----------|---------------------------------------------------|--------|----------------------|
| Application Number:                           |          | 13523854                                          |        |                      |
| Filing Date:                                  |          | 14-Jun-2012                                       |        |                      |
| Title of Invention:                           |          | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |        |                      |
| First Named Inventor/Applicant Name:          |          | Stacey C. Lum                                     |        |                      |
| Filer:                                        |          | Steven M. Colby                                   |        |                      |
| Attorney Docket Number:                       |          | 5532.01                                           |        |                      |
| Filed as Small Entity                         |          |                                                   |        |                      |
| Utility under 35 USC 111(a) Filing Fees       |          |                                                   |        |                      |
| Description                                   | Fee Code | Quantity                                          | Amount | Sub-Total in USD(\$) |
| Basic Filing:                                 |          |                                                   |        |                      |
| Pages:                                        |          |                                                   |        |                      |
| Claims:                                       |          |                                                   |        |                      |
| Claims in excess of 20                        | 2202     | 2                                                 | 40     | 80                   |
| Miscellaneous-Filing:                         |          |                                                   |        |                      |
| Petition:                                     |          |                                                   |        |                      |
| Patent-Appeals-and-Interference:              |          |                                                   |        |                      |
| Post-Allowance-and-Post-Issuance:             |          |                                                   |        |                      |
| Extension-of-Time:                            |          |                                                   |        |                      |

| Description              | Fee Code | Quantity | Amount | Sub-Total in USD(\$) |
|--------------------------|----------|----------|--------|----------------------|
| <b>Miscellaneous:</b>    |          |          |        |                      |
| <b>Total in USD (\$)</b> |          |          |        | <b>80</b>            |

| Electronic Acknowledgement Receipt          |                                                   |
|---------------------------------------------|---------------------------------------------------|
| <b>EFS ID:</b>                              | 16346958                                          |
| <b>Application Number:</b>                  | 13523854                                          |
| <b>International Application Number:</b>    |                                                   |
| <b>Confirmation Number:</b>                 | 3097                                              |
| <b>Title of Invention:</b>                  | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |
| <b>First Named Inventor/Applicant Name:</b> | Stacey C. Lum                                     |
| <b>Customer Number:</b>                     | 23308                                             |
| <b>Filer:</b>                               | Steven M. Colby                                   |
| <b>Filer Authorized By:</b>                 |                                                   |
| <b>Attorney Docket Number:</b>              | 5532.01                                           |
| <b>Receipt Date:</b>                        | 17-JUL-2013                                       |
| <b>Filing Date:</b>                         | 14-JUN-2012                                       |
| <b>Time Stamp:</b>                          | 19:40:08                                          |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)                       |

**Payment information:**

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Submitted with Payment                                                                                                                                                                                                                                                                                                                                                                   | yes             |
| Payment Type                                                                                                                                                                                                                                                                                                                                                                             | Deposit Account |
| Payment was successfully received in RAM                                                                                                                                                                                                                                                                                                                                                 | \$80            |
| RAM confirmation Number                                                                                                                                                                                                                                                                                                                                                                  | 6374            |
| Deposit Account                                                                                                                                                                                                                                                                                                                                                                          | 161331          |
| Authorized User                                                                                                                                                                                                                                                                                                                                                                          |                 |
| <p>The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:</p> <p>Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)</p> <p>Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)</p> |                 |

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

# File Listing:

| Document Number | Document Description | File Name                          | File Size(Bytes)/ Message Digest                 | Multi Part /.zip | Pages (if appl.) |
|-----------------|----------------------|------------------------------------|--------------------------------------------------|------------------|------------------|
| 1               |                      | 5532-01_Response_to_4-17-13_OA.pdf | 170289<br>be1ef8527e7ca95bffb5c121545397f838fca7 | yes              | 14               |

## Multipart Description/PDF files in .zip description

| Document Description                                  | Start | End |
|-------------------------------------------------------|-------|-----|
| Amendment/Req. Reconsideration-After Non-Final Reject | 1     | 1   |
| Claims                                                | 2     | 4   |
| Applicant Arguments/Remarks Made in an Amendment      | 5     | 14  |

# Warnings:

## Information:

|   |                      |              |                                                   |    |   |
|---|----------------------|--------------|---------------------------------------------------|----|---|
| 2 | Fee Worksheet (SB06) | fee-info.pdf | 29952<br>2c1625405879190aea297b24e5a347487e8a70a0 | no | 2 |
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### New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

### National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

### New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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| PATENT APPLICATION FEE DETERMINATION RECORD<br>Substitute for Form PTO-875                                                                                                                                                                                                                                                                                                                                        |                                                                                          |                                                                                                                                                                                                                               |       | Application or Docket Number<br>13/523,854 |               | Filing Date<br>06/14/2012 |  | <input type="checkbox"/> To be Mailed |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------|---------------|---------------------------|--|---------------------------------------|--|
| ENTITY: <input type="checkbox"/> LARGE <input checked="" type="checkbox"/> SMALL <input type="checkbox"/> MICRO                                                                                                                                                                                                                                                                                                   |                                                                                          |                                                                                                                                                                                                                               |       |                                            |               |                           |  |                                       |  |
| APPLICATION AS FILED – PART I                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                          |                                                                                                                                                                                                                               |       |                                            |               |                           |  |                                       |  |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                          | (Column 2)                                                                                                                                                                                                                    |       |                                            |               |                           |  |                                       |  |
| FOR                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                          | NUMBER FILED                                                                                                                                                                                                                  |       | NUMBER EXTRA                               |               | RATE (\$)                 |  | FEE (\$)                              |  |
| <input type="checkbox"/> BASIC FEE<br>(37 CFR 1.16(a), (b), or (c))                                                                                                                                                                                                                                                                                                                                               |                                                                                          | N/A                                                                                                                                                                                                                           |       | N/A                                        |               | N/A                       |  |                                       |  |
| <input type="checkbox"/> SEARCH FEE<br>(37 CFR 1.16(k), (i), or (m))                                                                                                                                                                                                                                                                                                                                              |                                                                                          | N/A                                                                                                                                                                                                                           |       | N/A                                        |               | N/A                       |  |                                       |  |
| <input type="checkbox"/> EXAMINATION FEE<br>(37 CFR 1.16(o), (p), or (q))                                                                                                                                                                                                                                                                                                                                         |                                                                                          | N/A                                                                                                                                                                                                                           |       | N/A                                        |               | N/A                       |  |                                       |  |
| TOTAL CLAIMS<br>(37 CFR 1.16(i))                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                          | minus 20 =                                                                                                                                                                                                                    |       | *                                          |               | X \$ =                    |  |                                       |  |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h))                                                                                                                                                                                                                                                                                                                                                                            |                                                                                          | minus 3 =                                                                                                                                                                                                                     |       | *                                          |               | X \$ =                    |  |                                       |  |
| <input type="checkbox"/> APPLICATION SIZE FEE<br>(37 CFR 1.16(s))                                                                                                                                                                                                                                                                                                                                                 |                                                                                          | If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). |       |                                            |               |                           |  |                                       |  |
| <input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))                                                                                                                                                                                                                                                                                                                                        |                                                                                          |                                                                                                                                                                                                                               |       |                                            |               |                           |  |                                       |  |
| * If the difference in column 1 is less than zero, enter "0" in column 2.                                                                                                                                                                                                                                                                                                                                         |                                                                                          |                                                                                                                                                                                                                               |       |                                            |               | TOTAL                     |  |                                       |  |
| APPLICATION AS AMENDED – PART II                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                          |                                                                                                                                                                                                                               |       |                                            |               |                           |  |                                       |  |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                          | (Column 2)                                                                                                                                                                                                                    |       | (Column 3)                                 |               |                           |  |                                       |  |
| AMENDMENT                                                                                                                                                                                                                                                                                                                                                                                                         | 07/17/2013                                                                               | CLAIMS REMAINING AFTER AMENDMENT                                                                                                                                                                                              |       | HIGHEST NUMBER PREVIOUSLY PAID FOR         | PRESENT EXTRA | RATE (\$)                 |  | ADDITIONAL FEE (\$)                   |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Total (37 CFR 1.16(i))                                                                   | * 23                                                                                                                                                                                                                          | Minus | ** 23                                      | = 0           | X \$40 =                  |  | 0                                     |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Independent (37 CFR 1.16(h))                                                             | * 2                                                                                                                                                                                                                           | Minus | ***2                                       | = 0           | X \$210 =                 |  | 0                                     |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | <input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))                           |                                                                                                                                                                                                                               |       |                                            |               |                           |  |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | <input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) |                                                                                                                                                                                                                               |       |                                            |               |                           |  |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                          |                                                                                                                                                                                                                               |       |                                            |               | TOTAL ADD'L FEE           |  | 0                                     |  |
| (Column 1)                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                          | (Column 2)                                                                                                                                                                                                                    |       | (Column 3)                                 |               |                           |  |                                       |  |
| AMENDMENT                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                          | CLAIMS REMAINING AFTER AMENDMENT                                                                                                                                                                                              |       | HIGHEST NUMBER PREVIOUSLY PAID FOR         | PRESENT EXTRA | RATE (\$)                 |  | ADDITIONAL FEE (\$)                   |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Total (37 CFR 1.16(i))                                                                   | *                                                                                                                                                                                                                             | Minus | **                                         | =             | X \$ =                    |  |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | Independent (37 CFR 1.16(h))                                                             | *                                                                                                                                                                                                                             | Minus | ***                                        | =             | X \$ =                    |  |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | <input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))                           |                                                                                                                                                                                                                               |       |                                            |               |                           |  |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                   | <input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) |                                                                                                                                                                                                                               |       |                                            |               |                           |  |                                       |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                          |                                                                                                                                                                                                                               |       |                                            |               | TOTAL ADD'L FEE           |  |                                       |  |
| * If the entry in column 1 is less than the entry in column 2, write "0" in column 3.<br>** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".<br>*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".<br>The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1. |                                                                                          |                                                                                                                                                                                                                               |       |                                            |               |                           |  |                                       |  |

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|                                                                                                                                               |   |    |   | Application Number       | 13523854       |
|                                                                                                                                               |   |    |   | Filing Date              | June 14, 2012  |
|                                                                                                                                               |   |    |   | First Named Inventor     | LUM, Stacey C. |
|                                                                                                                                               |   |    |   | Art Unit                 | 2435           |
| Examiner Name                                                                                                                                 |   |    |   |                          |                |
| Sheet                                                                                                                                         | 1 | of | 4 | Attorney Docket Number   | 5532.00        |

| U.S. PATENT DOCUMENTS |             |                                            |                                |                                                    |                                                                                 |
|-----------------------|-------------|--------------------------------------------|--------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------|
| Examiner<br>initial * | Cite<br>No. | Document Number                            | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Document | Pages, columns, Lines, Where<br>Relevant Passages or Relevant<br>Figures Appear |
|                       |             | Number - Kind Code <sup>2</sup> (if known) |                                |                                                    |                                                                                 |
|                       | 1           | US-20010014150 - A1                        | 08-16-2001                     | BEEBE, Todd, et al.                                |                                                                                 |
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|                       | 5           | US-20040107345 - A1                        | 06-03-2004                     | BRANDT, David D., et al.                           |                                                                                 |
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|                       | 19          | US-6473407 - B1                            | 10-29-2002                     | DITMER, Christine M., et al.                       |                                                                                 |

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| Examiner<br>Initial *    | Cite<br>No. 1 | Foreign Patent Document      |                                                       | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited<br>Document | Pages, columns, Lines, Where<br>Relevant Passages or Relevant<br>Figures Appear |
|                          |               | Country <sup>3</sup><br>Code | Number <sup>4</sup> Kind Code (if known) <sup>5</sup> |                                |                                                       |                                                                                 |
|                          | 20            | WO                           | 2000056027 - A1                                       | 09-21-2000                     | BACIC, Eugen                                          |                                                                                 |
|                          |               |                              |                                                       |                                |                                                       |                                                                                 |
|                          |               |                              |                                                       |                                |                                                       |                                                                                 |
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| Examiner<br>Signature |  | Date<br>Considered |  |
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|                                                                                                                                               |   |    |   | Application Number       | 13523854       |
|                                                                                                                                               |   |    |   | Filing Date              |                |
|                                                                                                                                               |   |    |   | First Named Inventor     | LUM, Stacey C. |
|                                                                                                                                               |   |    |   | Art Unit                 | 2435           |
|                                                                                                                                               |   |    |   | Examiner Name            |                |
| Sheet                                                                                                                                         | 2 | of | 4 | Attorney Docket Number   | 5532.00        |

| U.S. PATENT DOCUMENTS |             |                                            |                                |                                                    |                                                                                 |
|-----------------------|-------------|--------------------------------------------|--------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------|
| Examiner<br>initial * | Cite<br>No. | Document Number                            | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Document | Pages, columns, Lines, Where<br>Relevant Passages or Relevant<br>Figures Appear |
|                       |             | Number - Kind Code <sup>2</sup> (if known) |                                |                                                    |                                                                                 |
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|                       | 22          | US-6873988 - B2                            | 03-29-2005                     | HERRMANN, Conrad, et al.                           |                                                                                 |
|                       | 23          | US-7024686 - B2                            | 04-04-2006                     | BRAWN, John Melvin., et al.                        |                                                                                 |
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|                       | 25          | US-7096502 - B1                            | 08-22-2006                     | FOX, Kevin L.                                      |                                                                                 |
|                       | 26          | US-7103915 - B2                            | 09-05-2006                     | REDLICH, Ron M., et al.                            |                                                                                 |
|                       | 27          | US-7134022 - B2                            | 11-07-2006                     | FLYNTZ, Terence T.                                 |                                                                                 |
|                       | 28          | US-7213265 - B2                            | 05-01-2007                     | DAPP, Michael C.                                   |                                                                                 |
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|                       | 31          | US-7249374 - B1                            | 07-24-2007                     |                                                    |                                                                                 |
|                       | 32          | US-7336790 - B1                            | 02-26-2008                     | CARONNI, Germano, et al.                           |                                                                                 |
|                       | 33          | US-7380271 - B2                            | 05-27-2008                     | MORAN, Anthony Scott., et al.                      |                                                                                 |
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|                       | 35          | US-7441043 - B1                            | 10-21-2008                     | HENRY, Paul Shala, et al.                          |                                                                                 |
|                       | 36          | US-7457418 - B2                            | 11-25-2008                     | BUNTE, Bjorn., et al.                              |                                                                                 |
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|                       | 38          | US-7530112 - B2                            | 05-05-2009                     | SMITH, Michael R.                                  |                                                                                 |
|                       | 39          | US-7533407 - B2                            | 05-12-2009                     | LEWIS, Elliot D., et al.                           |                                                                                 |

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|--------------------------|---------------|------------------------------|---------------------|-----------------------------------|--------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------|
| Examiner<br>Initial *    | Cite<br>No. 1 | Foreign Patent Document      |                     |                                   | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited<br>Document | Pages, columns, Lines, Where<br>Relevant Passages or Relevant<br>Figures Appear | T                        |
|                          |               | Country <sup>3</sup><br>Code | Number <sup>4</sup> | Kind Code (if known) <sup>5</sup> |                                |                                                       |                                                                                 |                          |
|                          |               |                              |                     |                                   |                                |                                                       |                                                                                 | <input type="checkbox"/> |
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|                       |  |                    |  |
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| Examiner<br>Signature |  | Date<br>Considered |  |
|-----------------------|--|--------------------|--|

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|                                                                                                                                               |   |    | Application Number       | 13523854               |         |
|                                                                                                                                               |   |    | Filing Date              |                        |         |
|                                                                                                                                               |   |    | First Named Inventor     | LUM, Stacey C.         |         |
|                                                                                                                                               |   |    | Art Unit                 | 2435                   |         |
| Examiner Name                                                                                                                                 |   |    |                          |                        |         |
| Sheet                                                                                                                                         | 3 | of | 4                        | Attorney Docket Number | 5532.00 |

| U.S. PATENT DOCUMENTS |             |                                            |                                |                                                    |                                                                                 |
|-----------------------|-------------|--------------------------------------------|--------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------|
| Examiner<br>initial * | Cite<br>No. | Document Number                            | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Document | Pages, columns, Lines, Where<br>Relevant Passages or Relevant<br>Figures Appear |
|                       |             | Number - Kind Code <sup>2</sup> (if known) |                                |                                                    |                                                                                 |
|                       | 40          | US-7539862 - B2                            | 05-26-2009                     | EDGETT, Jeff Steven, et al.                        |                                                                                 |
|                       | 41          | US-7546629 - B2                            | 06-09-2009                     | ALBERT, Anthony, et al.                            |                                                                                 |
|                       | 42          | US-7568217 - B1                            | 07-28-2009                     | PRASAD, Ranjan, et al.                             |                                                                                 |
|                       | 43          | US-7574737 - B1                            | 08-11-2009                     | LOH, Michael                                       |                                                                                 |
|                       | 44          | US-7606242 - B2                            | 10-20-2009                     | WHELAN, Robert, et al.                             |                                                                                 |
|                       | 45          | US-7743158 - B2                            | 06-22-2010                     | FU, Guangrui, et al.                               |                                                                                 |
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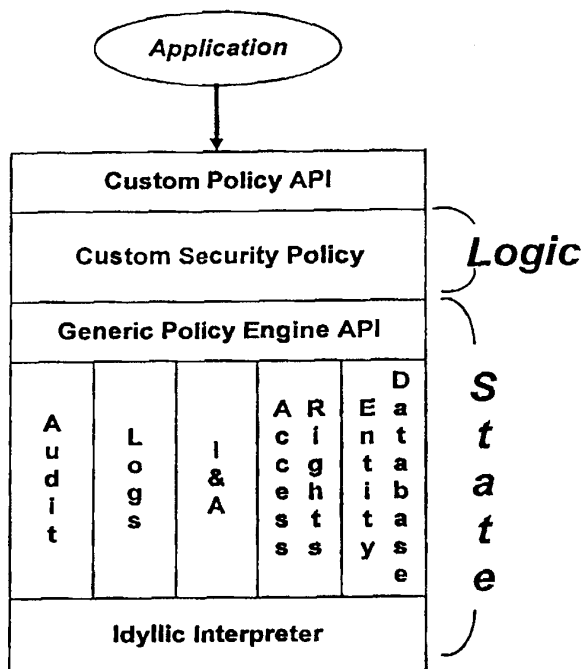
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## (57) Abstract

A generic policy engine (GPE) uses a verifiable, Scheme-like language to generate security policies ranging from the classical, hierarchical models to modern, commercial models. The GPE provides system designers with well-known security entry points, a generic definition of "object", and a means to manipulate these objects in terms of a security policy. The centralized nature of the system allows for experimentation with different security policies rapidly and economically.



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## Computer Security System

## Cross Reference to Related Applications

This invention claims the benefit under 35 USC 199(e) from US provisional application no. 60/124,487 filed on March 15, 1999.

5

## Field of the Invention

This invention relates to the field of computer networks, and in particular to a security server for providing a network with sophisticated access controls.

## Background of the Invention

As computer networks grow, security is becoming more of a concern with each passing day. Organizations view and relate to information differently and have differing requirements for the protection, dissemination, and modification of their information stores. Most organizations are moving towards heavily interconnected systems with links to the Internet. System architectures that were safe, due to limited accessibility, even a few short years ago are now being designed with wide access capabilities to meet the requirements of internal users, shareholders, customers, and clients.

15

For example, suppliers may wish to give third party customers limited access to their networks in order to facilitate design, ordering and accounting functions. Such third parties must not, however, have access to confidential corporate data, although in the case of co-operative design work, for example, there may be specific data files that the customer is authorized to access that would not normally be available to external organizations. This requires the ability to exercise highly sophisticated access control.

20

To meet security concerns, many organizations have opted for firewalls, virtual private networks (VPNs), and virus protection. These are commonly referred to as first generation security solutions. General access to host systems is provided based on the premise that once authenticated, users can be given full freedom to perform their duties.

25

Not only do first generation products protect only the perimeter, but they are islands of security, each performing a single task very well. They operate under their own control and their own rules; they do not play well with others, such as in the case of the third party customer example given above. These products have been defined and refined to control external access to information and ensure that only legitimate users gain access to

30

networks and their resources. Once a user is past these defences, little, if any, security exists to protect valuable corporate information assets.

Windows NT and UNIX systems, for example, offer access controls, but these are often implemented incorrectly, or disabled altogether, due to previous bad experiences on the  
5 part of users or systems administrators. Moreover, they are sufficiently different to offer little help in integrating security.

First generation companies cannot obtain the trust required from their competitors to create integrated solutions. The fear of competitive advantage ensures that players will not engage in an integration effort. While some companies have emerged to provide a  
10 limited form of integration for audit, they do not address the other concerns that security officers have, nor is it clear that they will provide solutions in the foreseeable future.

Reliance on first generation products that protect the periphery of the information rather than the information itself is no longer sufficient. Security requirements are changing, placing new demands on security officers and system administrators. They must now  
15 fulfil six security demands:

Integration among existing security products.

A high water mark for overall network security.

Controlled trust between systems even within an Intranet.

Centralized and uniform controls

20 Compartmentalized and configurable information controls.

Flexible and customer-oriented security rules.

First generation security products can be viewed as offering a wall of protection around information stores. Even though this wall may be sufficiently strong to thwart outside attack, it does not dissuade attack from the most common access point: the inside. These  
25 products are not designed to stop *authorized* users from accessing information. They are meant primarily to authenticate that a user is authorized to access the resources on the network. Once inside, few checks are performed, giving the user free rein.

Because of their distributed nature and the requirement to secure communications between machines, networked architectures are much more difficult to secure than single  
30 machines. This inherent difficulty is exacerbated by the fact that most networks do not

have security systems and policies which were designed for the entire network. In most cases, security has been grown by combining preexisting security systems as individual machines are connected.

With advances in network computing, increased requirements to share information and processing power among physically separate locales, and worries about information sensitivity, existing security can no longer suffice. When two or more computer systems are linked, their security policies often clash and overall security actually diminishes. If policies have evolved over time, rather than being designed for the network, solving these problems becomes more difficult.

To deal with combined legacy architectures, encryption is used to at least guarantee that information gets safely to its destination. Encryption, however, is a coarse technique for protecting information from disclosure. With no standardized method of creating security policies, encryption has become the de facto method of protecting information network-wide, even though its use surrenders the fine-grained control that was available prior to the networking of the computers.

The need for a security infrastructure has been fueled by the desire to provide new solutions in the face of increasing incidents of unauthorized access to and manipulation of computer systems, data, and communications. Malicious misuse of computer systems can be classified into three groups based on the origins of the threat:

1. **Outsider Threat** – This is an external individual or group attempting to breach the security of the system. Outsiders breach communications access controls but operate under the constraints of the communications protocols. This is the standard cracker attack. Outsider attacks are typically defended against by proper system administration and correctly designed and implemented access-control protocols and mechanisms, such as virtual private networks (VPNs) and firewalls.
2. **Malicious Software** – This is a piece of malicious code introduced into the system. The attack takes place within the communications perimeter, but remains bounded by the general access available to the operating system and the executing user. Malicious software may be introduced with or without a user's consent. The most common forms of this attack are the virus and Trojan horse.
3. **Insider Threat** – Here, the perpetrator is an individual with authorized access to the system. An insider may have wide-reaching control of the system or its components. The perpetrator may opt to replace hardware or software, and may observe any communications channel. This attack occurs within the boundaries of the VPNs or

firewalls as the perpetrator is an authenticated user. Insider threats commonly come from disgruntled or compromised employees.

5 A solid defense against insider threats can deter perpetrators by ensuring that they will get only a poor return on their investment. Such a defense can limit the damage done, minimize the information stolen or modified, and ensure that the perpetrator can be caught. In many cases, such a defence can stop most attacks, alerting authorities and ensuring that the threat is limited to system components which the insider generally has access to.

10 There is a need for a second generation security product that provides security across the network, security which is highly trustworthy, which is configurable to the needs of clients, which can be fully integrated with existing technology, and which is centralized for audit and administrative purposes.

*Security policy* refers to the rules governing the flow of information between two entities  
15 via predefined means and channels. A *policy engine* is a program that defines in logic those governing rules for a particular security policy, typically located within a trusted operating system. This patent presents a new method for the generation of policy engines using a high-level, verifiable language and generic security functionality.

Conceptually, security policies are accomplished in two stages, *analysis* followed by  
20 *synthesis*. In the first stage, a natural language description of the security policy model is created so that it can be verified as reflecting the policy for the product being developed. The second stage describes this security policy model as a contrivance of logic within the actual product. Thus security policies rely on the correct modeling of the policies of the target environment and the ability of the designers and implementers to translate these  
25 models into functioning security policies within the product.

Historically the development of security policies has tended towards meeting the perceived needs of the largest market and embedding a static security policy within the product, typically an operating system. The first such system was Multics which implemented the Bell-LaPadula Security Policy Model which closely reflected the  
30 requirements of the military establishment: the implementers. As time progressed and security became a serious concern to commercial interests, the security policies found

within existing operating systems did not adequately reflect their needs. Further aggravation was wrought by the fact that the embedded security policies could not be modified. In fact, the system was meant to handle information security in but one manner and if the methodology did not match that of the purchaser, the client was forced to either  
5 adjust their policies to more closely match that of the system or operate with less security than would be desired. To further aggravate the issue, even when two systems implement identical security policy models, say Bell-LaPadula, the implementations of these models within the products security policies don't match and communication between two machines often leads to security breaches.

10 Summary of the Invention

According to the present invention there is provided a method of controlling access to a network wherein security policies are determined by using a verifiable language consisting of formal definitions of the syntax and semantics.

A generic policy engine (GPE) uses the language to execute a policy in order to mediate  
15 access to an object entity by a subject entity. The invention abstracts the security  
information from the physical data.

Besides eliminating the requirement to custom develop security policies for every product under development, formal descriptions of security policies by means of a *language* allows the development of a semantics-directed security policy generator, one which simplifies formal proofs of the validity of the security policies and ensures valid generation of the security policies for inclusion within a product.

Several methods exist for formally describing the semantics of programming languages, and hence of security policies. Denotational Semantics has gained particularly wide acceptance among semanticists and language designers. This patent bases the verifiability of the language defined on the provability of systems developed using Denotational Semantics, such as VLISP.

In accordance with a further aspect the invention provides a security policy engine known as Generic Policy Engine (GPE) for controlling access to a network in accordance with policies determined with the aid of a verifiable language consisting of formal definitions of the syntax and semantics.

Security policies can be developed more efficiently, in a greater variety, and with comparable or greater trust than with traditional implementations. Security policies developed with the Generic Policy Engine (GPE) using the security language can be customized to reflect end-user security requirements as opposed to single-purpose security policies in common usage today. In order to provide for a generic policy engine a general, information neutral architecture must be used, one that is applicable across all operating systems or applications (henceforth collectively called "products"). Information must be encapsulated by the security measures required. The granularity of the information encapsulated defines the granularity of the security provided. The information thus encapsulated is the entity against which the GPE operates. By removing the restriction of specific products or data storage technologies, the GPE provides a trusted, extensible mechanism by which to implement security not only on a local system but also across heterogeneous networks. Providing custom security policies that provide equivalent trust to those currently in use and with similar efficiency would be a major advancement in the information security field. To attain this level of flexibility with the Generic Policy Engine one must have at one's disposal a high-level, verifiable language. All security relevant architecture must be written using this language which provides both the formalisms required for high security systems as well as the implementation specifics necessary to integrate it into a viable product. Such a language, which is referred to as Idyllic, will be described along with its use as the base language of the Generic Policy Engine.

Idyllic is a Scheme dialect. The Generic Policy Engine comprises a language interpreter plus the associated security extensions and functionality coupled with the ability to generate executable security policies. Thus, Idyllic provides a representation to easily define and implement verifiable security policies.

*Entities* are the unified security object against which all security related functions are performed. Both the base security application and any ancillary security relevant applications utilize entities in order to manage and maintain the security attributes of the applications. By adopting an entity-based approach to the name space being secured, the advantages of encapsulation and, to some extent, inheritance can be leveraged to create a succinct language definition for the creation of security policies. The new approach is to

utilize a language renowned for its small footprint, efficiency, and simplicity and use it to implement security policies. Embedding the GPE as a secure extension with a system provides a trusted, extensible mechanism by which to implement security not only locally but across networks, within operating systems or applications, such as Web servers. The  
5 Generic Policy Engine provides system and application developers a means by which to provide equivalent trust to systems currently in use with smaller footprints and with at least equivalent verifiability, speed, and efficiency.

In accordance with the invention security policies can be developed more efficiently, in a greater variety, and with comparable or greater trust than traditional implementations.  
10 Security policies developed with the Generic Policy Engine can be customized to reflect end-user security requirements as opposed to single-purpose security policies in common usage today utilizing an information neutral architecture applicable across operating systems and applications. As proof of concept, a working Bell-LaPadula Security Policy model has been implemented as has a Message Trusted Guard.

15 Brief Description of the Drawings

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a Stylized Diagram of the Generic Policy Engine;

Figure 2 is an overview of the Generic Policy Engine;

20 Figure 3 shows a Classical Subject/Object Interaction as per TCSEC;

Figure 4 illustrates the Dual Requirement for Object Reuse at the System and GPE Level.

Figure 1 illustrates a system that produces security policies from formal definitions of the security policy model using a higher order, lambda calculus based language. This  
25 provides several advantages. First, it creates a uniform, universal language for developing and proving the correctness of security policies and their models. Instead of the current assortment of policy verification mechanisms developers would have one language, one semantics, and one syntax to implement their security policies. Second, the proofs for the security policies could be automatically generated from the formal semantics of the base  
30 lambda calculus. Third, by providing a uniform language environment, connectivity

between security policies can be improved since they would be based on higher level semantics than is currently available.

The GPE must provide a one-for-one mapping between the entities to be protected in the calling application and the security information maintained by it. In order to accomplish this, the GPE utilizes an entity-based approach defining an encapsulation with all the security relevant components within its boundary. Security relevant application programming interfaces (APIs) are provided so applications can manipulate security attributes and determine proper information flow, call the security policy, examine audit logs, and perform regular maintenance on the entity. The GPE's purpose is to provide sufficient security to an application so that the application requires only minor security specific instructions to meet even the highest security requirements of the various international evaluation criteria.

Figure 2 presents an overview of the Generic Policy Engine. The GPE is written in and controlled by Idyllic. The language is fully extensible and comes with a highly capable library of functions. The GPE's primary data structure is called the entity containing all the security data pertaining to an entity under its control along with the application programming interface (API) to manipulate the entity. Customizable elements, which can differ from application to application, can be provided by application programmers and are referenced via the APIs. The two programmer configurable components are the I&A mechanism and the security policy.

The various components of the GPE, which are discussed in more detail below, are the structure of the entity, its data elements, the facilities provided in the various APIs, the functionality provided by Idyllic, and the security functionality.

Mechanisms are put in place to uniquely identify and authenticate users and to dynamically track their actions within an application or system. Security controls, regardless of type, are not foolproof and to ensure a system of recourse after a security breach a non-circumventable, unalterable, continuous audit mechanism must be in place and operational. A base set of auditable events must exist which can never be disabled. The routines must be non-circumventable ensuring that neither accidental nor intentional modification of the audit system occurs.

The unique identification and authentication of every user or a particular user or system ensures that individuals utilizing the system can be held accountable for their actions. The mechanics behind identification and authentication can vary greatly and as such the core elements should be customizable to suit the threat assessment and the particular  
5 architecture. The guarantee of a minimal auditable event list is vital to maximize the trustworthiness of an application.

Information flow is controlled so that access to and manipulation of information is restricted to a specific set of individuals utilizing specific tools. As such there must be a mechanism provided to store and manipulate access controls for the various entities that  
10 are to be controlled. Each entity contains its own access controls entries to which programmers have access via the Access Controls API. The Access Controls data elements themselves are accessible only to the Access Controls API. The API is the sole method of retrieving pertinent information concerning an entity so that the security policy can operate effectively. The security policy itself is programmable by the developers  
15 though the Security Policy API is fixed. This provides the maximum flexibility: auditable events can be established at the API junction while removing any concern that the developers need remember to insert specific auditable events into the security policy they are writing. The security policy is customizable but is restricted to using the Access Controls API to access the Access Controls.

20 As a general purpose programming language additional security policies can be modeled which enhance, complement, or override the default security policy implemented within each entity. Security policies written in Idyllic can be modified to reflect the requirements of the applications developers thus reflecting the general policies and procedures pertaining to information flow and control for a specific organization. Default security  
25 policies, those applicable to all entities, can be provided to simplify security policy maintenance. Furthermore, compatible and cooperative security policies can be written to represent the nuances particular to a given department or section.

A virtual machine architecture for Idyllic and the Generic Policy Engine has been adopted to maximize portability and simplify the core and primitive elements of the language.  
30 Virtual Machines have been shown to be small and efficient and relatively simple to port.

The following table outlines the base entity within the Generic Policy Engine that represents the actual data stored by the calling application. The entity is subdivided into seven basic components: unique identifier, entity type, authentication information, security policy, audit history, privileges, and access controls.

5

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Unique Identifier</b> | Defined by the developer, usually reflective of the underlying application or operating system.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Entity Type</b>       | The type of entity. There are two distinct types. Those of type <i>group</i> are those which define a group of entities for a particular purpose. Those of type <i>entity</i> are for all other entities. A strict entity can contain multiple groups to which it belongs. A group contains a list of entities forming the particular group. The delineation assists the GPE in quickly traversing associations in order to simplify the security policy's goal of determining whether or not an information flow is to be permitted. |
| <b>Authentication</b>    | String or data required for access (i.e., Password, private key, etc). This can contain more than one authentication attribute, each associated with a mechanism within the security policy.                                                                                                                                                                                                                                                                                                                                          |
| <b>Security Policy</b>   | The security policy for the entity. Each entity can have a different policy or can adopt a general one for the specific machine, domain, network, or institution to which it belongs.                                                                                                                                                                                                                                                                                                                                                 |
| <b>Audit History</b>     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Owner</b>             | A history of who "owns" this entity, most recent 1 <sup>st</sup> , original owner (i.e., creator) last including timestamps.                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Last Modified</b>     | A history of who last modified this entity, most recent 1 <sup>st</sup> , original creator of file last including timestamps.                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Last Access</b>       | A history of who last accessed this entity and by what means, most recent 1 <sup>st</sup> , original creator of file last including timestamps.                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Purge Rate</b>        | When events should be purged from the audit log.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Privileges</b>        | Historically these have been hierarchical in nature, but more modern security policies require a more flexible alternative.                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Groups</b>            | To which groups or roles does this entity belong?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Associations</b>      | To which associations does this entity belong? Typically these are roles and the like.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Level</b>             | What "security level" does this entity have? This is security policy specific in that some require an individual level, others a range, and other none at all. In the cases where it can be within a range, the first element of the list can indicate the currently valid level and subsequent elements can either list the valid range values or provide a minimum and maximum level as per the security policy.                                                                                                                    |

|                        |                                                                                                                   |
|------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Categories</b>      | To which "categories" does this entity belong? This is security policy specific.                                  |
| <b>Caveats</b>         | What "caveats" does this entity have as restrictions? This is security policy specific.                           |
| <b>Access Controls</b> | What are the controls associated with this entity? The two most common are Access Control Lists (ACLs) and Roles. |
| <b>Read</b>            | What other entities can request disclosure of information from this entity?                                       |
| <b>Write</b>           | What other entities can request to update the information in this entity?                                         |
| <b>Execute</b>         | What other entities can activate this entity?                                                                     |
| <b>Delete</b>          | What other entities can request that this entity destroy itself?                                                  |
| <b>Copy</b>            | What other entities can request this entity create a copy itself?                                                 |
| <b>Grant</b>           | What other entities have been granted temporary owner-based rights?                                               |

In order to map the entities managed by the Generic Policy Engine back to the entities under control of the calling application there must be some unique mechanism in place which can determine absolutely which entity corresponds to which application controlled data item. The calling application will always utilize the unique name when requesting or adjusting information stored and managed by the Generic Policy Engine.

To access some entities it may be necessary to provide appropriate authentication, i.e., entities that hold user authentication information or protect data items that have been password protected by the system or owner. To meet expanding authentication needs and retain compatibility with existing identification and authentication schemes the entity allows for a series of zero or more authentication strings to be stored by the entity and access by the Identification and Authentication API (I&A API).

As changes are applied to the item being protected the entity must track the changes, when and by whom they were performed, and the status of the attempt. This information is maintained by the Generic Policy Engine's audit facility. It allows each entity to maintain their own audit information.

Access controls are, in reality, split into two distinct portions: *privileges* and *access controls*. The former is maintenance information used to track groups, associations, levels, etc. to which this particular entity is a member; included in the list of maintenance information are all those entities which reference this entity. Access controls can be broken out into five standard "controls": read, write, execute, delete, and copy. Any

number of these can be utilized, in any fashion required to assist the security policy in performing its duties. It is irrelevant whether the security policy is access control based, capabilities based, role based, or otherwise based. The information required to properly execute such policies is provided within the entity, and especially within the *Privileges* component.

Groups, associations, levels, categories, and caveats provide a mechanism by which like entities can be grouped together. For example, all entities classified *Secret* would have the same Level. Definition of a group, say *Engineering*, could further subdivide the entities classified as *Secret* to those that are *Secret* and available only to someone in *Engineering*.

Each definition of a privilege for an entity further restricts access. Similarly, when an entity becomes active, its privileges define the domain to which it belongs and is utilized by the GPE to determine which passive entities can be accessed.

The other privileges provide a further refinement along traditional lines, namely categories and caveats.

The security policy, dependent and written for a particular application, utilizes the access controls and privileges to determine what is considered appropriate information access. A pointer to the security policy is provided within each entity allowing for individual policies per entity *or* for policies to follow the information as it is copied from one host or application to another. In this manner the information understands its policy and the validity of requests made by entities outside its original domain. Thus, applications protected by Generic Policy Engine built security components could move information securely between themselves knowing that not only the base data is transmitted during the flow of information between the applications but that the security information is passed along as well. This can be utilized to ensure that information to which one individual has access remains with that individual, even though the information was moved to a secondary system for whatever reason. Historically, once information left one trusted system with a given security policy to another, the new security policy determined access controls. In this scenario, if the new security policy was not disclosure driven, for example, it might permit accesses to the information that would be forbidden under the original security policy. By having the security policy move with the entity it requires a

conscious effort by the owner of the item to modify the security policy to the policy of the new host application along with all that it entails.

The flexibility the entity provides, regardless of overhead, to handle any security policy, individually or in tandem, is unique and revolutionary but does not come without cost.

5 The base language, known as *Idyllic*, of the Generic Policy Engine is based on two simple premises:

1. Manipulation of user information must be done efficiently and with minimal overhead.
2. The language must be *provably correct* in order for the GPE to attain the  
10 highest levels of trust within the various criteria.

Premise 1 removes most languages from contention, most notably Smalltalk and the other object oriented languages. The class library overhead of OOP languages is unnecessary baggage that in turn impacts on Premise 2.

Premise 2 requires a simple language that is easily understandable. In computer security,  
15 the development language for secure components must be *well defined*. To be *well defined* a language must have a formally defined grammar, a stable history (few, well defined and delineated changes over time), and supporting documentation available to the computer industry. Most computer languages (i.e., C/C++, Smalltalk) meet these requirements. However, for a *language* to be provably correct requires that all *aspects* of  
20 a language be properly defined and mathematically (or otherwise) provable to function as advertised. This would include all class libraries, control mechanisms, etc. Classical languages such as C/C++ and Smalltalk have large class libraries that preclude them from easily being proven correct.

The major differences between Scheme and Idyllic are that Idyllic has no provisions for:

- 25
1. lazy evaluation;
  2. use of rational or floating point numbers; or
  3. for calls with current continuations.

Strings are provided but at a drastically reduced functionality than found in Scheme. As programs written in Idyllic have no need for I/O, no method of I/O is provided in the

production environment, though one is provided via special debugging routines in the debugging environment.

Idyllic's control structures resemble Scheme.

- The standard Boolean values for true and false are written as #t and #f, case is unimportant. The empty list, (), can be used as false, unlike some implementations of Scheme. In Idyllic, only #f or () are considered to represent false in a conditional expression. #t and all non-empty lists are considered to denote true. Note that the symbol nil is undefined in Idyllic.

|                                |                                                                                                                                                                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (boolean? obj)                 | <i>boolean? returns #t if obj is #t, #f, or () and #f otherwise,</i>                                                                                                                                                                       |
| (not obj)                      | <i>Not returns #t if obj is false, and #f otherwise</i>                                                                                                                                                                                    |
| (or <test <sub>1</sub> > ...)  | <i>The test expressions are evaluated from left to right, and the value of the first expression that evaluates to a non-false (not #f) value is returned. If all expressions evaluate to a false value, #f is returned</i>                 |
| (and <test <sub>1</sub> > ...) | <i>The test expressions are evaluated from left to right, and the value of the first expression that evaluates to a false (#f) value is returned. If all values evaluate to non-false values, the last expression's result is returned</i> |

- 10 A *predicate* is a procedure that always returns a boolean value (#t or #f). An *equivalence predicate* is the computational analogue of a mathematical equivalence relation (it is symmetric, reflexive, and transitive). Of the equivalence predicates found in Scheme only equal? is implemented in Idyllic. This is primarily for reasons of clarity rather than efficiency since equal? is usually the least efficient equivalence predicates available.

|                                             |                                                                              |
|---------------------------------------------|------------------------------------------------------------------------------|
| (equal? obj <sub>1</sub> obj <sub>2</sub> ) | <i>Equal? returns #t if obj<sub>1</sub> is equivalent to obj<sub>2</sub></i> |
|---------------------------------------------|------------------------------------------------------------------------------|

- Note that the advantage of using equal? as the only equivalence predicate is that it allows the policy designer to focus on the task at hand rather than on whether or not particular entities are equivalent. Equal?'s greatest advantage is that, generally, if two

expressions print the same they are equivalent. This is not true of most equivalence predicates available in Scheme.

Idyllic has but one type of number: integers. The reason for not implementing any other form of number is that, historically, operating systems and their components have never  
 5 required floating point nor rational numbers, let alone complex numbers. To that end, Idyllic contains only integers.

An implementation of Idyllic must support integers throughout the range of numbers that may be used for indices of lists, vectors, and strings or that may result from computing the length of a list, vector, or string. The length, vector-length, and string-  
 10 length procedures must return an integer. Mathematical functions always return an integer result.

Idyllic includes but a fraction of Scheme's control structures. Scheme allow for numerous looping constructs as well as numerous conditional expressions. Idyllic, on the other hand, has opted for simplicity. Programs executing under Idyllic need to be trusted and to  
 15 be trusted they must be simple. Additional layers of complexity simply cloud the issues of security, complicate formal proofs, and obfuscate correctness.

To that end, Idyllic contains only eight control structures: apply, cond, define, lambda, let, map, quote, and set!.

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (apply fn largs)        | <i>Calls the function fn with the elements of the list largs. Returns the value fn typically returns after evaluation. For functions that accept no parameters, largs is the empty list.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| (cond <clause><br>...)  | <i>Each &lt;clause&gt; should be of the form</i><br><div style="text-align: center;">(&lt;test&gt; &lt;expression&gt; ...)</div> <i>where &lt;test&gt; is any expression. The last &lt;clause&gt; may be an "else clause", which has the form:</i><br><div style="text-align: center;">(else &lt;expression&gt; ...)</div> <i>A cond expression is evaluated by evaluating each the &lt;test&gt; of each &lt;clause&gt; until one evaluates to true. The associated list of &lt;expression&gt;s is then evaluated. The final &lt;expression&gt;'s value is returned by the cond. If no &lt;test&gt; expression evaluates to true, then the else clause is evaluated. If no else exists, #f is returned.</i> |
| (define <var><br><exp>) | <i>Binds the expression &lt;exp&gt; to the variable &lt;var&gt; at the current level of scope. This is the only method by which a variable can be created into the current environment. Further, definition of a function is performed by having &lt;exp&gt; be a</i>                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              | <i>valid <math>\lambda</math> (lambda) expression. Once bound, a function can be called by simply placing parenthesis around the variable along with any required parameters.</i>                                                                                                                                                                                                                                                                                                                          |
| (lambda<br><args><br><body>) | <i>&lt;args&gt; is a formal parameter list and &lt;body&gt; is a sequence of one or more expressions. The lambda expression evaluates to a function. This lambda is the only method by which programmable information can be stored within Idyllic. Evaluating the lambda expression along with the appropriate number of parameters is the method of calling functions in Idyllic. By using define one can store the definitions of the various functions within the current scope.</i>                   |
| (let<br><bind><br><body>)    | <i>The let expression is, in fact, syntactic sugar for a lambda. However, to aid in readability of Idyllic code, the let has been allowed to be the one exception that defines the rule of Idyllic's simplicity. &lt;Bind&gt; is a list of variable/expression pairs evaluated in turn with each expression being evaluated and bound to the provided variable. Once the binding is complete, the &lt;body&gt; is evaluated and the evaluation of the final expression found within the body returned.</i> |
| (map fn list)                | <i>List must be a list and fn must be a function taking as many arguments as there are lists. If more than one list is provided, then all must be the same length. Map applies fn element-wise to all elements of the provided lists and returns a list of the results, in order.</i>                                                                                                                                                                                                                      |
| (quote atom)                 | <i>Evaluates the provided atom to create a literal constant defined as atom. Quote can be abbreviated as the single quote character '"".</i>                                                                                                                                                                                                                                                                                                                                                               |
| (set! <var><br><expr>)       | <i>The expression &lt;expr&gt; is evaluated and the resulting value is stored in the location to which the variable &lt;var&gt; is bound. The variable &lt;var&gt; must have been defined within the current scope or within the global scope. A variable is defined within a scope by means of the define structure, above.</i>                                                                                                                                                                           |

Security is concerned with limiting access between entities to only those authorized by the security policy. Security is usually defined in terms of an entity-based model which defines all entities controlled by the security policy as entities in one of two states:

- 5 subject, the active state or object, the passive state, as shown in Figure 3. This definition has been shown to be limiting and causes problems when attempting to define security policies across an object-oriented system. The primary issue remains one of state and how the transitions from one state to another are accomplished.

- 10 In the present invention all subjects and objects are transformed into entities. By removing the distinctiveness of subjects and objects the definition of security policies becomes one of restricting flow between peers, rather than between "active" and

“passive” entities. An entity's passiveness or activeness is then directly related to whether the entity is actually being acted *upon* or performing the action.

An external application, such as an operating system, can utilize a policy written in the GPE. There are two customizable portions to the security policy: the I&A mechanisms  
5 and the Security Policy, both indicated in white. Login requests are handled via the standardized GPE API but the login mechanism can be any the developers feel would be most appropriate. This allows for rudimentary login facilities as found on most operating systems today or complex login facilities, such as those based on certificate authorities and X.500 directory services.

10 In Figure 2, a stylized structural of the Generic Policy Engine is presented. Each application wishing to utilize the Generic Policy Engine's security features would instantiate their own copy. Each GPE would be protected by the underlying hardware and memory management, ensuring information can't cross application boundaries. It is assumed that the GPE will be utilized in those environment which properly adopt memory  
15 management, object reuse, and 32 bit (or greater) architectures.

Without the adoption of these elements, the running application cannot be deemed trusted in the evaluation criteria sense of the word. Hence, the Generic Policy Engine would allow for multiple environments by providing for instantiations capable of creating their own secure environments and namespaces governed by the GPE for a particular domain  
20 such as an operating system or a database.

The utility of multiple environments is that various applications can use the Generic Policy Engine to create and manage their security policies and their particular authorization rules. This provides, in the case of an operating system, the ability to provide a *fully* functional security API for applications to use courtesy of the operating  
25 system and one that is as powerful as the native operating system's security system. Since all security is handled by the GPE, it can resist tampering and ensure logs are properly maintained.

Once authentication to the security policy has been achieved, all information access requests made to the Policy API are either boolean or string in value. Boolean values are  
30 returned when a request is made for specific access to a given controlled data item, such

as a file. Strings are returned when the request must return other than true or false, such as a cryptographic key, the true location of a file, current access controls for a particular controlled entity, etc.

- It is impossible to have a security system without a mechanism of identification and authentication. Historically, identification and authentication (I&A) referred to the login/password pair which greeted users prior to the system allowing the user to begin processing. As time progressed, so have the I&A mechanisms until today we have numerous technologies ranging from login/password pairs to one-time passwords to crypto-tokens.
- 10 For the Generic Policy Engine to be generic from an I&A point of view it is sufficiently flexible to allow one or more varied identification and authentication mechanisms. To ensure that programming for the I&A mechanisms chosen remains as simple as possible, a fixed API is required guaranteeing programmers are met with a uniform interface regardless of underlying mechanism. To that end, the Generic Policy Engine must provide
- 15 a standardized I&A API which interfaces to application specific identification and authentication mechanisms.

- Further security is added by providing full audit trails that are customizable by the systems programmers. Since the security policy is available for perusal by the designers, the audit requirements of a particular application can be customized as required. As little
- 20 or as much audit data can be written to various logs as required. The particular information written to the logs is also under the full control of the designers and no limits are placed on the complexities of the source defining how the audit records are created. This provides further flexibility in granting the security policy the option of calling helper functions to create detailed audit records in some instances while in others the records
- 25 could be less detailed prior to pushing them out through the standardized audit mechanisms provided by Idyllic and the Generic Policy Engine. There exists, at all times, a lowest common denominator of auditable events that cannot be turned off. These are hard coded into the actual APIs ensuring that the system programmers cannot accidentally circumvent the audit system.
- 30 There are many forms of access controls. The primary form is known as confidentiality access controls, controls that define to whom information can be released. Conversely, the

control of who can manipulate information stored by an application is known as integrity access controls and operate along similar lines.

Access controls are further divided into the mechanism employed. The classic method is the use of access control lists that place the control information on each entity with  
5 explicit user names as to who can and cannot access the information. A modification of this form is role-based access controls whereby users are associated with roles and it is the role by which each entity determines whether or not an individual can have access. Other access control mechanisms operate similarly.

The Generic Policy Engine must be flexible enough to handle any form of access control,  
10 regardless of whether the controlling action is performed by the active entity, passive entity, or some combination thereof. The entity defines the information pertinent to the decision making of the security policy and contains sufficient information to model any known security policy. Since each entity controlled by the Generic Policy Engine is actually defined *by* an entity, the security policy defined is not restricted to a single form  
15 of access control. Thus, the application developer can define security policies that utilize information stored in an entity, regardless of state (active or passive) and determine via appropriate combination the access permissions.

For example, if the access control model is role-based then passive entities only indicate the type of access associated with a given role. The user entities actually define the roles  
20 to which they belong. Thus, if *User1*'s only role is *clerk* and *Entity1* only allows a *clerk* to read its contents, then *User1* will be granted read permission. If *User1* is removed from the system, *Entity1* does not need to be modified since it has no direct reference to *User1*. The same cannot be said for access control lists that reference the actual users in each entity's access list.

25 The entities under the control of the Generic Policy Engine encapsulators defining the security attributes of the data. The Generic Policy Engine ensures that information between entities is not accidentally shared. The Generic Policy Engine does provide object reuse so that entities no longer in use can be reclaimed. This call is part of the Generic Policy Engine's API.

The Generic Policy Engine has no mechanism to ensure that a trusted path has been set up between the application and the end user. This physical mechanism must be provided by the application whenever the user issues a predefined key sequence to the application. The security policy for the application can be coded such that it requires specific information prior to performing specific actions, such as information downgrades. This then becomes an issue addressed by the programmable security policy.

The actual code for the various parts of the GPE described above will now be presented, describing the entity data structure, its associated functions, and the resulting class-like structure.

In most cases, data structures are passive entities against which a system or application applies procedures or functions. In the Generic Policy Engine a single, state-aware data structure represents all the actual items within a system or application being secured, be they passive, such as files or active, such as processes. The entity can be in one of two states: active or passive. The first state is associated with information processing and typically operates against passive entities. To any active entity all other entities in a system appear passive. This allows for the manipulation and access of entities by entities to be generalized.

```

Entity      = STRUCTURE
20           UniqueIdentifier: string
              EntityType:      Atom
              References:      LIST of Entity
              Authentication:   string
              SecurityPolicy:   Lambda, Default = NOACCESS
25           /* Audit Logs
              Owner:            LIST of Entity
              LastModified:     LIST of (Entity, Timestamp)
              LastAccess:       LIST of (Entity, Timestamp)
              PurgeRate:        Lambda, Default = NEVER
30           /* Privileges
              Groups:           LIST of Entity
              Associations:      LIST of Entity
              Level:            LIST of Entity

```

```

Categories:      LIST of Entity
Caveat:          LIST of Entity
/** Access Controls
Read:            PAIR (Allow: LIST of Entity,
5                Deny: LIST of Entity)
Write:          PAIR (Allow: LIST of Entity,
                Deny: LIST of Entity)
Execute:        PAIR (Allow: LIST of Entity,
                Deny: LIST of Entity)
10 Delete:      PAIR (Allow: LIST of Entity,
                Deny: LIST of Entity)
Copy:           PAIR (Allow: LIST of Entity,
                Deny: LIST of Entity)

ENDSTRUCTURE
15

Pseudo-code Data Structure for GPE Entity

```

Further, it is the entity, defined using pseudo-code above, itself that understands how it is to be manipulated or accessed and can control the type of access via the security policy embedded within it. This is accomplished by storing the security policy for each entity within the entity. This allows the security policy to travel with the entity, regardless of environment. Thus a user requesting access to a passive entity would have to be allowed access by the security policy of the entity itself, even though this policy may be a general one applicable to and shared by all entities in the system. By providing each entity with the ability to carry its own security policy the Generic Policy Engine provides a mechanism by which the information can be transmitted to another GPE controlled system, retaining the original access controls and security policy.

Idyllic implicitly manages all its data structures as symbolic expressions. The entity is by definition a symbolic expression and therefore properly handled by Idyllic. In order to differentiate between entities, each entity is uniquely identified so as to be accessible locally, internally to Idyllic, and externally to the calling application. Each entity has a current state, which indicates whether it refers to a user, process, or data. The data remains private with access permitted only via an exported API.

In a manner of speaking, an entity can be viewed as a database entry where the database management system is Idyllic and the database language is the GPE's APIs. The entity is managed as are all symbolic expressions within Idyllic. Accessing and manipulating entities via the APIs provides the security functionality associated with audit,  
 5 identification and authentication (I&A), access controls, privileges, and security policy. The APIs can be subdivided into:

- General Entity API
- I&A API
- Audit API
- 10 • Access Controls API
- Privileges API
- Security Policy API

The API is used in order that the entity be useful outside the bounds of Idyllic. The entity  
 15 is stored as a series of symbolic expressions and each is uniquely identified and mapable to an external calling application. This one-to-one relationship between the external representation of the entity and the GPE representation of the entity is vital to the security and integrity of the system. As each entity is manipulated it is fetched and stored in the access controls database. Each entity is *identical* in look and can be utilized for any  
 20 purpose. This lack of typing is crucial to ensure that the GPE be sufficiently flexible in implementing any form of security policy utilizing its framework.

The "defaultSecurityPolicy" defined below is an explicit denial security policy. In other words, any action taken while this security policy was in force would be summarily denied. It must be changed, a conscious decision to override the default with a custom  
 25 built security policy. It is in the interest of the application developer to utilize an appropriate and secure security policy.

```
(define (defaultSecurityPolicy . parameters)
  ; *
  30 ; * The default security policy declines every request for
    ; * information. This follows the standard edict of computer
```

```

; * security: if not explicitly allowed, it is denied. This
; * forces the developer to create a security policy. If the
; * developer opts to replace the "#f" with a "#t", it is a
; * conscience effort to forego creating a valid security
5 ; * policy.
; *
#f)

```

*Default Security Policy for the GPE*

10 The choice of a monolithic entity encumbers the software by making it less modular. According to the current object-oriented programming style, a structurally cleaner and aesthetically more pleasing solution would be to have the various audit logs refer to an audit log, which in turn would contain the methods used to manipulate the logs. High-end security (e.g., the CTCPEC's T-5 and T-6 or the Orange Book's B3 and A1) require a

15 tight coupling of all security relevant data within the GPE. In order to provide the tightest coupling, the GPE couples all the elements of the entity – the audit logs, the I&A, the access controls, privileges, and the security policy – directly to the data being controlled. This, in turn, results in all the security data elements being controlled and stored within a well-defined, controlled area, easily placed under the auspices of a memory manager or

20 other well-defined hardware device.

In order to utilize a true object-oriented approach, the linkages between entities and the notion of what constitutes an entity would have to be written into the underpinnings of *Idyllic*. Tracking and understanding the couplings for a given entity would require extensive syntactic extensions at the primitive level removing much of the simplicity and

25 elegance found in *Idyllic*. This increase in complexity would not provide any additional security or trustworthiness to the GPE. Understanding the relevance of the links while utilizing memory management techniques to track and isolate the various memory elements that constitute an entity would be creating an artifice of memory management for the sole purpose of adhering to an object-oriented paradigm when one is not required.

30 The use of a monolithic entity has been chosen to simplify and address the issues at hand, namely the creation of a security solution capable of generically describing and implementing security policies for any situation.

One question that does arise is whether a programmer has the flexibility to create additional audit logs or I&A mechanisms. Should the need arise, additional security logs or I&A mechanisms can be provided by utilizing existing mechanisms within the entity while ignoring other present capabilities. Capabilities not utilized can be viewed as being dormant, but available should the programmer wish to utilize them at a later time.

For each application requiring the functionality of the GPE a copy of the GPE is instantiated with its own memory area and entities. This adheres to the data separation requirements of many security criteria while simplifying the implementation. This also provides a clean and elegant solution to providing unique security policies to any application within a system requiring security functionality.

The entity with the elements expanded to include stylized contents within their association lists is shown below. Each entity is uniquely identified to the calling application by its *<uid>* (*unique identifier*) allowing for full cross-referencing. The cross-referencing is used to quickly remove all references to the entity should it ever be required. Hence, each time one entity refers to another, for whatever reason, the referenced entity is updated. Some fields contain lists that refer to various data instances such as time or entity identifiers (uid). For example, *owner* is a list of all the individuals who have ever owned a particular entity, with the first owner listed being the current owner and the last owner being the original owner, or creator. Similarly, *LastModified* lists in order, from most recent to least recent, which entities performed modifications to the entity.

Although it would be efficient in design terms to define the various audit logs as separate definitions pointing towards an *AuditLog*, it is more beneficial to define the logs within each entity so that the audit information can be properly protected. Access to the audit logs, elemental to the sanity of the entity and as a mechanism to provide additional warranties that the security has not been breached, requires access to the entity. Replication of I&A information and the possibility for error is removed, albeit at the expense of some processing overhead during audit log review.

Of particular interest in the above table is the use and reuse of the unique identifiers *<uid>*. Entities are utilized and referenced by the security policy, which places specific information within each. Thus, *Level* would contain pointers to such entities as *Secret*,

*Unclassified*, and *Top Secret*. The security policy would be able to request which the *Level* for a particular entity, compare it to other entities, and determine the validity of information access requests. Similarly, a group of entities can be placed into a particular role via the *Associations* tag. The *<uid>* for the entity could be *Programmer* and reference the entities which are programmers. And again, *Categories* can be used to define category subsets for use by the security policy. Thus a banking security policy could define valid categories as *Teller*, *Bank Manager*, *Branch Manager*, *Loan Manager*, *Clerk*, and *Financial Analyst* and compartmentalize information appropriately. This cross-referencing could be graphically illustrated to visually create representations of how information, one way or another, is related. This could greatly assist the security officer in determining whether there are any information flows that should not exist, such as data path from a higher hierarchical level to a lower one.

By providing a unified interpretation for *Entity* the GPE is generic. It is the interpretation of the information stored within the various elements of the *Entity* by the security policy that determines the form of the security policy, be it role based or access control based, or otherwise. Generic use of the entity generalizes security to its constituent components.

In any secure system it is vital that the security information remain protected at all times and that the mechanisms utilized to access the information remain immutable. Object oriented technologies provide a partial solution by formalizing the notion of data hiding with both the data and the procedures to manipulate the data stored within an object defined by a class. This notion can be extended to assist us in creating a viable storage mechanism for the Generic Policy Engine. Each entity corresponds to an item on the application side that the application programmer wishes to secure. The entity is the manifestation of the security attributes of the data in the application.

The combination of the data found within the entity and the procedures to manipulate the entity constitute the entity-based form of the GPE. This works well for static procedures which remain constant. The GPE must allow the flexibility to insert custom portions that reflect the unique identification and authentication mechanisms and the unique security policies of various organizations. At the same time, it must be able to put forward a well defined interface and functionality that would meet international security criteria. The solution is to utilize a standard API for each of the procedures while allowing specific

procedures, such as the Security Policy and Identification and Authentication routines, to have replaceable internals.

The following sections present the various procedures and their respective APIs. The final section presents the entire entity-based “class” for GPE-Entity that contains the data described above and all of the APIs and associated functions for manipulating the data within the confines of good security practice.

Creating a new entity requires no more than a call to *define-entity*. This special form accepts only a single parameter: the entity’s name. It must be unique. *Define-entity* will ensure that the identifier provided is unique and if not, will issue an error. It is these structures that are maintained and manipulated by the GPE. They encapsulate the security of the items referred to by the calling application. Idyllic and the GPE maintain all the created entities in a persistent state. Each entity is a self-contained security module capable of determining whether or not another entity is granted access and the type of access allowed. Access to the entity is available only through the defined APIs.

```

15      (define-entity <uniqueID>)
      creates
      <uniqueID> <=
        (variables (<var> <value>)
20              :
              (<var> <value>))
        (private-methods (message . args)
          ((message) <body>)
          :
25          ((message) <body>))
        (public-methods (message . args)
          ((message) <body>)
          :
          ((message) <body>)))
30

```

#### *General Structure of an Entity*

The above code provides a completed entity structure for a generic entity, slightly stylized

for readability. As will be noted, many portions of the object-oriented paradigm are utilized in the design and implementation of the entity. However, it cannot truly be called object oriented as the only elements of object oriented computing utilized in the GPE are garbage collection (inherent in *Idyllic*), polymorphism, and encapsulation. Inheritance is

5 notably absent. This is the primary reason why the GPE is referred to as entity-based.

```

        (define-entity GenericEntity)
    creates
        GenericEntity <=
5          ((variables (UniqueIdentifier GenericEntity)
                        (EntityType Entity)
                        (References ())
                        (Authentication (Active <Expiry> NoPassword))
                        (SecurityPolicy defaultSecurityPolicy)
10          ;* Audit Logs
                        (Owner (<creator>))
                        (LastModified ((<timestamp> <uid>)))
                        (LastAccess ((<timestamp> <uid>)))
                        (PurgeRate (lambda () #f))
15          ;* Privileges
                        (Groups ())
                        (Associations ())
                        (Level (<currentLevel> <min> <max>))
                        (Categories (<currentCategory> <fullSet>))
20          (Caveats (<currentCaveat> <fullSet>))
          ;* Access Controls
          (Read ((allow (GenericEntity
                        <creator>))
                  (deny ())))
25          (Write ((allow (GenericEntity
                        <creator>))
                    (deny ())))
          (Execute ((allow ())
                    (deny ())))
30          (Delete ((allow (GenericEntity
                        <creator>))
                      (deny ())))
          (Copy ((allow (GenericEntity
                        <creator>))
                 (deny ())))
35          ) ;* end variables
    ;*
    ;* Typical housekeeping functions (BetterHomes&Gardens)

```

```

; *

(private-methods (message . args)
  ((getReferences)
5    <code>))
; *
; * The APIs, though their "C-like" form, look nothing
; * like what we have here. The APIs in reality are
; * syntactic sugar but use these calls. Pure GPE coding
10 ; * would be too cumbersome otherwise.
; *
(public-methods (message . args)
  ((get)
15    <code>
    )
  ((put)
    <code>
    )
  ((remove)
20    <code>
    ) ) ; * end public-methods
) ; * end entity definition

```

*Generic Definition of an Entity*

25    *UniqueIdentifiers* refer to the <uid>s found within the GPE entity. This provides closure between the various classes, linking them together explicitly in a large lattice. Code fragments have been removed for clarity and brevity. <creator> is the creator of the new entity. Each entity is created by another entity, which is its creator. All entities can trace their heritage back to the original entity, the system entity, similar to the class Object in

30    Smalltalk. The other parenthesized elements (< ... >) are self-explanatory.

A Trusted Computing Base (TCB) is the term that defines a boundary within which all controlled entities reside. In trusted systems, developers typically define which entities are under the control of the reference monitor and which are not. The defined subset of entities are considered to be *inside* the TCB boundary while the remainder are considered

35    to reside *outside* the TCB boundary. The application using the GPE must provide the

additional security features of memory management and non-circumventability of the security policy.

- By default the GPE provides a security policy. This security policy must be invoked by the calling application in order to properly function. There is no mechanism by which the GPE can guarantee the proper invocation, but by simplifying the mechanics behind the actual call, we can ensure that overhead and complexity are removed as viable answers to not utilizing the security procedures of the GPE.

- Assuming the security policy is always invoked by the application, the application must be able to ensure the information being protected, say files within an operating system, cannot be accessed by standard operating system calls, such as low level disk reads. Although this latter form of access can be viewed as circumventing the security policy, many times this form of access is ignored especially when considering direct memory accesses. Modern memory management assists in preventing cross boundary access and alleviating many attempts at direct manipulation of memory.

- In order for the GPE to be considered "trusted" it must meet the requirements which define a *reference monitor*:

- tamperproof;
- always be invoked; and
- small enough to be subjected to analysis and tests to ensure its correctness.

- To be tamperproof the GPE must reside within a protected memory space. Modern computer hardware provides such mechanisms which are difficult to circumvent and meet the requirement of non-circumventability. Invocation requires that the application being protected *always* invoke the GPE for every transaction. This is something that falls to the application developer to address and if security is paramount, then invocation will occur.
- The final requirement is met by ensuring that both the GPE, Idyllic, and any security policies written in Idyllic are simple enough to be subjected to analysis and proven correct. As defined in the next section, policies that typically took thousands of lines in classical security policies can be defined in less than a hundred lines using the GPE.

One of the most difficult areas in computer security is ensuring that the system being developed is trustworthy. By using reference monitors and trusted computing bases, it is possible to increase the amount of trust that can be placed in a specific trusted product.

However, for each secure product developed, all aspects must be examined by an approved evaluation authority. This is a time consuming process. One of the main goals of the GPE is to reduce the amount of time required to evaluate a trusted product.

The controlled entities must be readily available between invocations. Idyllic can store all of the entities in its address space, readily available to the GPE. On large scale applications a caching scheme is used that is capable of ensuring entities are fetched and stored on disk depending on usage and when modified. Modifications to an entity must be written to disk immediately to minimize the likelihood that security information would be lost for whatever reason. The caching scheme would ensure that the most used entities remain in RAM, those less often used would be removed from memory after Idyllic guarantees that the information has been saved properly.

The simplest method of providing persistence is for the operating system to always keep the GPE and its associated entities in active memory. This would also provide for the quickest reaction time but may not be expedient when the number of entities controlled becomes large, as inevitably will be the case. Regardless of the system used to keep the entities readily available, it must ensure the isolation, availability, and correctness of all GPE data. Caching schemes are sufficiently well understood that one could be adopted for use by Idyllic to guarantee the integrity of its dynamic namespace.

Upon system shutdown, the GPE would have to be called to ensure orderly shut down of the security policy and proper storage of all databases. In a production version of the GPE a shutdown function would be used to initiate security shutdown. Similarly, when an application shuts down, it must properly terminate any copies of the GPE it instantiated.

Two versions of the Application Programming Interface exist: the internal, LISP-like API and the external, C-like API. The C-like API provides standard procedural prototypes for using the capabilities of the GPE. These C-like calls are converted into the internal LISP-like API. Provided in subsequent sections are the C-like APIs. The full LISP-like API is provided as part of the full definition of the Entity found discussed above.

Of note is that all LISP-like API calls are found within the entity as the exported public functions available to manipulate the data contained within. This gives the entity an object-based feel, retains strong encapsulation, and provides a single, cohesive unit to refer to the protected item in the calling application.

- 5 The GPE's purpose is to provide security to a calling application. Each application requests its own instantiation of the GPE. Each instantiation provides a fully functional copy of Idyllic and the GPE APIs. There are four function calls divided into two calls for opening a namespace of GPE entities for manipulation and a third to close the namespace. In order for the GPE to operate, a namespace must be opened and available to the calling  
10 application.

|                              |                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>gpeID = gpeCreate ( )</b> | <i>Returns a reference to a new namespace. The application is expected to use gpeID whenever it requires access to the security functionality. If gpeCreate ( ) could not create a new namespace, 0 is returned. gpeID is a long unsigned integer.</i>                                                                                                 |
| <b>gpeOpen (gpeID)</b>       | <i>Once opened, all initialization to the global status of the GPE must be performed.</i><br><i>The application requests a previously opened GPE namespace to be opened by calling the function with gpeID. If the namespace exists, #T otherwise #F.</i><br><i>Once opened, all initialization to the global status of the GPE must be performed.</i> |
| <b>gpeStart ( )</b>          | <i>All initialization and global sets must occur prior to the gpeStart ( ) command being issued. This ensures that certain attributes are frozen for the running duration of the GPE, such as audit level.</i>                                                                                                                                         |
| <b>gpeClose (gpeID)</b>      | <i>Close the namespace associated with gpeID. #T on success, #F on failure.</i>                                                                                                                                                                                                                                                                        |

*Instantiating a copy of the GPE*

- Every entity has a unique identifier provided by the calling application. This unique  
15 identifier (*uid*) uniquely identifies each entity managed by the GPE and provides a consistent mapping from the GPE entities back to the controlled items of the calling application. This simple, one-to-one mapping enhances the reliability and security of the GPE and ensures that identifier translation routines are not required thereby removing a source of possible error.

### 1.1.1 The Entity API

The GPE Entity API refers to what is normally called *class methods* in object-oriented programming. The functions defined in this API, see below, allow the programmer to manipulate the entity namespace in a coarse manner; strictly at the entity level.

5

|                                                 |                                                                                                                                                                                                    |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>gpeEntity</i></b> (uid create)            | <i>Creates a new entity within the namespace with the unique identifier provided. All information for the entity must be filled in piecemeal. Returns #T on successful creation, #F otherwise.</i> |
| <b><i>gpeEntity</i></b> (uid remove)            | <i>Removes the entity referred to as uid. Returns #T on success, #F otherwise.</i>                                                                                                                 |
| <b><i>gpeEntity</i></b> (uid SP securityPolicy) | <i>Sets the security policy for the entity referred to as uid to securityPolicy. SecurityPolicy must be a valid lambda expression. Returns #T on success, #F otherwise.</i>                        |
| <b><i>gpeEntity</i></b> (uid SP DEFAULT)        | <i>Sets the security policy back to the GPE default. Returns #T on success, #F otherwise.</i>                                                                                                      |

#### *The Entity API*

The GPE Identification and Authentication (I&A) API provides access to the I&A data of an entity. These calls allow for the creation of entities and the definition of unique  
 10 identification and authentication of entities, regardless of whether they refer to a user or data object externally. The calling application need not track which users are valid nor which privileges they have. The GPE API provides system calls that can authenticate individuals. The GPE API provides additional system calls to add, remove, and update information concerning users of the application. The I&A database is maintained and  
 15 protected by the GPE within each unique entity. The following table provides a summary of the Identification and Authentication API.

|                                            |                                                                                                                                  |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b><i>gpeAuth</i></b> (uid Add authStr)    | <i>Adds uid, plus its authentication string (authStr) to the entity referred to by uid. Returns #T on success, #F otherwise.</i> |
| <b><i>gpeAuth</i></b> (uid Remove)         | <i>Removes uid (i.e., the entity it refers to). Returns #T on success, #F otherwise.</i>                                         |
| <b><i>gpeAuth</i></b> (uid equal? authStr) | <i>Is the uid and authentication string (authStr) correct? #T if correct, #F otherwise.</i>                                      |
| <b><i>gpeAuth</i></b> (uid Expires date)   | <i>Sets the expiry date for uid. #T on success, #F on failure</i>                                                                |

|                                                  |                                                                                                                                                              |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>gpeAuth</i></b> (uid Expires?)             | Returns #F if the uid's password never expires, the date of expiry otherwise.                                                                                |
| <b><i>gpeAuth</i></b> (uid SetPaswd old new)     | Sets the password to the new one provided the old password matches the existing one. Returns #T on success, #F on failure.                                   |
| <b><i>gpeAuth</i></b> (uid SetPassLen<br>newlen) | Sets the password length to the new one provided so long as it is between the predefined min and max password lengths. Returns #T on success, #F on failure. |
| <b><i>gpeAuth</i></b> (uid deactivate)           | Deactivate the uid. #T on success, #F otherwise.                                                                                                             |
| <b><i>gpeAuth</i></b> (uid activate)             | (Re)activates the uid. Returns #T on success, otherwise #F.                                                                                                  |

*Identification and Authentication API*

The Generic Policy Engine provides a built in audit capability capable of auditing every request by the calling application for mediation between a requesting entity and the targeted entity. Each entity, when accessed, logs all requests, the time of each request, and the status of the request to their internal logs. Each entity has a default audit level. These audit levels can be adjusted so more or less information is gathered. Therefore, to collect less information the audit level is lowered; to gather more, the audit level is raised. Entity level auditing cannot be completely shut off since a base number of auditable events *must* be tracked for security reasons, such as entity create, access, delete, etc. These typically correspond to system level actions such as file open, file close, file delete, add user, remove user, etc. Logs are lists with each entry stored as a sublist. Each entry contains the following information: requesting entity, time of request, action requested, and return status of request. This information is available, typically to the security officer and the audit tools, via the Audit API.

There exist four logs associated with each entity: *default log*, *owner log*, *last modified log*, and *last accessed log*. The *default log* is provided to allow calling application to insert specific information on events the application feels are security relevant. The *default log* can be used to create general logs by creating an entity whose entire purpose is restricted to logging information on behalf of the application. The *owner log* tracks who the owner of the entity is from the entity's inception through to its final destruction. The *last modified log* tracks all attempts at modification to a particular entity. And, the *last accessed log* tracks all accesses made to a particular entity.

|                          |                                                                                                                                                              |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>MinimalAuditLevel</b> | <i>The only auditing done is the bare minimum, namely recording entity creates and destroys.</i>                                                             |
| <b>AuditLevel1</b>       | <i>Same as MinimalAudit but with the inclusion of open entity and close entity requests.</i>                                                                 |
| <b>AuditLevel2</b>       | <i>Same as Level1 but with the inclusion of modifications (write) to an entity.</i>                                                                          |
| <b>AuditLevel3</b>       | <i>Same as Level2 but with the inclusion of access (read) to an entity.</i>                                                                                  |
| <b>AuditLevel4</b>       | <i>Same as Level3 but with the inclusion of copies so as to track if information is being moved from user to user via copies rather than standard reads.</i> |
| <b>MaximumAuditLevel</b> | <i>Same as Level4.</i>                                                                                                                                       |
| <b>DefaultAuditLevel</b> | <i>Set to one of the above audit levels.</i>                                                                                                                 |

*Defined Audit levels In the GPE*

For different applications, different levels of audit are required. Some require no more  
 5 than the rudimentary audit granularity of when an entity was created and when it is  
 modified. Others require a finer granularity capable of indicating whenever an entity has  
 been accessed, or attempted to be accessed, by another entity. As the granularity becomes  
 finer, the amount of information stored increases. This finer granularity provides a fuller  
 picture of what is occurring from a security perspective, but requires a much larger  
 10 storage allocation or more frequent examination of the logs. The GPE defines a specific  
 set of audit levels, as defined above. These are adjustable prior to the issuance of the  
*gpeStart ( )* command. Once the GPE starts, these global audit values are immutable.

|                                        |                                                                                                                                                                                |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>gpeLog (GetLevel)</b>               | <i>Return the currently set level of audit.</i>                                                                                                                                |
| <b>gpeLog (SetLevel &lt;level&gt;)</b> | <i>The GPE provides predefined levels of granularity for audit. &lt;level&gt; must correspond to one of the predefined audit levels. Returns #T on success, #F on failure.</i> |
| <b>gpeLog (setOptions ...)</b>         | <i>Sets the option list to the list provided (future).</i>                                                                                                                     |
| <b>gpeLog (SetGMT)</b>                 | <i>Sets the time to GMT, default for Time is local time.</i>                                                                                                                   |
| <b>gpeLog (SetLocal)</b>               | <i>Sets the time to local time, this is the default.</i>                                                                                                                       |
| <b>gpeLog (Time)</b>                   | <i>Returns the current setting, either Local or GMT.</i>                                                                                                                       |

*Audit Log API (Global)*

Manipulating the fixed elements is provided by a set of global audit functions, defined above. These are the functions which must be called prior to *gpeStart* ( ).

- 5 As time progresses in any security system, logs grow increasingly larger until they occupy all available space. There must be some mechanism to limit their size. In the GPE each entity has a lambda expression which defines the purge rate. This function determines when the log is to be purged, be it by age or by size. If by size, the log is truncated by removing the older data and retaining the newer information. If logs are never to be removed, then the purge date must be set as *never*. This ensures that the GPE never removes the logs but will, if the logs become full, halt the GPE.

- 15 Manipulating the logs requires an entirely different set of functions. Typically logs can be accessed in one of two ways: read and append. Many modern logs do not require the selective editing of the logs but rather only the wholesale purge, which is logged in the new log created after the existing log is closed for purging. This ensures a trace exists of all actions throughout the life of the system. The destructive functions are typically restricted to the *Security Officer* user.

- The following API defines the common log access functions. The two system calls provided allow access to the four types of log, *defaultLog*, *Owner*, *LastModified*, and *LastAccessed*; *<log>* refers to one of these.

|                                                        |                                                                                                                       |
|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b><i>gpeLog</i></b> (uid put <i>&lt;log&gt;</i> data) | <i>Appends data to &lt;log&gt; for the entity defined by uid.</i>                                                     |
| <b><i>gpeLog</i></b> (uid get <i>&lt;log&gt;</i> expr) | <i>Returns all entries for the entity uid which match expr. expr can be a wildcard, which returns the entire log.</i> |

*Audit Log API (Entity Specific)*

- 25 Privileges in the GPE retain grouping information. There are two distinct types of group: hierarchical and non-hierarchical. Both are defined and accessible to security policies within the GPE framework and both are accessed using the calls defined in the API below.

All relevant grouping information is stored within the entity. Groups, associations, categories, and caveats are all non-hierarchical grouping mechanisms. They follow the common mechanisms found in many security policies which provide for the ability to group users or information in specific ways. For example, UNIX allows users to be  
 5 grouped so as to provide specific groups with certain functionality. The military groups information via categories and caveats in order to limit who within a specific organization, regardless of clearance, can actually see the information. For example, information labeled *Secret NATO* would be visible only to those individuals holding a Secret clearance with the NATO category. Categories and caveats are often called  
 10 *compartments*.

Hierarchical groupings are typically found in the military where the hierarchy is directly related to the classification system used to store information. The most common classifications are *Unclassified*, *Confidential*, *Secret*, and *Top Secret*. As a hierarchy, each is more restrictive than the former. Thus, Secret information is extremely sensitive but  
 15 less so than Top Secret information. Typically, individuals with access to a higher level in the hierarchy also have access to information at lower levels in the hierarchy. Manipulation of the hierarchical mechanisms is performed in exactly the same manner as for non-hierarchical information.

|                                                |                                                                            |
|------------------------------------------------|----------------------------------------------------------------------------|
| <b><i>gpePriv</i></b> (uid put <priv> uid2)    | Adds uid2 to the <priv> list for uid. Returns #T on success, #F otherwise. |
| <b><i>gpePriv</i></b> (uid remove <priv> uid2) | Removes uid2 from uid's <priv> list. Returns #T on success, #F otherwise.  |
| <b><i>gpePriv</i></b> (uid get <priv>)         | Returns the complete <priv> list for the given uid.                        |

20 *Privileges API*

Privileges usually form the most secure mechanism of a secure system. As such, they must be easy to access. Although the entity's Privileges API provides sufficient mechanisms to extract the required information, there must be additional functionality  
 25 provided in order to extract individual fields from within a record.

The granularity provided by the above functions is rather coarse. However, *Idyllic* provides a rich environment in which to extend the syntax by means of macros or user-defined functions. These extensions will be highlighted later when the GPE is illustrated by implementing a few well-understood security problems.

- 5 The access controls subsystem is actually divided into two distinct pieces: the data storing the information and the API providing the access routines. Since the entity stores all relevant information so as to be applicable to *any* security policy, the authors of a particular security policy must create appropriate helper functions that retrieve and manipulate the entity information. In the case of Bell-LaPadula, the helper functions
- 10 would focus on retrieving classification levels for the mandatory controls. In conjunction with these, it is highly probable that the authors would provide functions to perform appropriate evaluations for set inclusion and dominance to further enhance readability. The GPE, however, provides sufficient syntactic enhancements to lessen the difficulty of programming in the GPE's base state.

15

|                                                        |                                                                                                                       |
|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b><i>gpeAC</i></b> (uid put <right> allow uid2)       | <i>Modifies uid's access controls to allow uid2 the specified &lt;right&gt;. Returns #T on success, #F otherwise.</i> |
| <b><i>gpeAC</i></b> (uid put <right> deny uid2)        | <i>Modifies uid's access controls to deny uid2 the specified &lt;right&gt;. Returns #T on success, #F otherwise.</i>  |
| <b><i>gpeAC</i></b> (uid remove <right><br>allow uid2) | <i>Removes uid2 privilege to access uid via &lt;right&gt;. Returns #T on success, #F otherwise.</i>                   |
| <b><i>gpeAC</i></b> (uid remove <right><br>deny uid2)  | <i>Removes uid2 explicit denial of access to uid via &lt;right&gt;. Returns #T on success, #F otherwise.</i>          |
| <b><i>gpeAC</i></b> (uid get <right> allow)            | <i>Returns the allow list for the given &lt;right&gt; for the given uid.</i>                                          |
| <b><i>gpeAC</i></b> (uid get <right> deny)             | <i>Returns the deny list for the given &lt;right&gt; for the given uid</i>                                            |

*Access Controls API*

- Access controls have a number of elements that must be easy to access. Although the entity's Access Controls API provides sufficient mechanisms to extract the required
- 20 information, there must be additional functionality provided in order to extract individual fields from within a record. The above table defines the API for accessing and

manipulating the various aspects of the Access Controls data elements of the entity data structure.

The GPE provides for a generic API to access the security policy. This interface consists of a single call *gpe ( )* defined in below. Valid actions are summarized in the subsequent table.

*gpe* (entity1 action entity2)

*Returns #T if entity1 can perform the indicated action against entity2, #F otherwise.*

*GPE Security Policy API*

**Action**

read

*On access, read the information protected by the entity. On examine, view the list of entities allowed to read the information.*

write

*On access, write into the information protected by the entity. On examine, view the list of entities allowed to write information to the entity.*

execute

*On access, execute the information protected by the entity. On examine, view the list of entities allowed to execute the entity's information.*

copy

*On access, copy the information protected by the entity. On examine, view the list of entities allowed to copy the entity's information.*

delete

*On access, delete information protected by the entity. On examine, view the list of entities allowed to delete the entity's information.*

grant

*To which entities can this entity be "given", i.e., granted ownership.*

*GPE API Commands*

10

There must be two delineated access types: to the entity and to the data protected by the entity. In the former, access controls manipulation and examination is performed without accessing the data protected; examples from typical security includes changing the read and write permissions to a file or device. The latter represents actual access requests to the information protected by the entity. Although the Generic Policy Engine does not store the actual information, it acts as arbitrator on behalf of the calling application.

15

This delineation is vital since the Generic Policy Engine does not store the actual information being protected but merely the encapsulator and mediates information requests from the calling application.

5 The following table enumerates the valid calls to the GPE for invocation of the security policy. As can be seen, the invocation is a simple *entity x action x entity* triple which can map elegantly to any security policy. The simple invocation also allows for easy integration into procedural languages, such as C/C++ or Pascal.

|                                      |                                                                                  |
|--------------------------------------|----------------------------------------------------------------------------------|
| <i>gpe (entity1 read entity2)</i>    | <i>According to the security policy, can entity1 read entity2?</i>               |
| <i>gpe (entity1 write entity2)</i>   | <i>According to the security policy, can entity1 write entity2?</i>              |
| <i>gpe (entity1 execute entity2)</i> | <i>According to the security policy, can entity1 execute entity2?</i>            |
| <i>gpe (entity1 delete entity2)</i>  | <i>According to the security policy, can entity1 delete entity2?</i>             |
| <i>gpe (entity1 copy entity2)</i>    | <i>According to the security policy, can entity1 copy entity2?</i>               |
| <i>gpe (entity1 grant entity2)</i>   | <i>According to the security policy, can entity1 grant ownership to entity2?</i> |

*Enumerated GPE Security Policy Function Calls*

10

These calls work for any security policy that can be broken down into one entity requesting access to another through the provided actions (read, write, execute, delete, and copy). These requests for access to information can then be arbitrated by the Generic Policy Engine.

15 The security policy in the GPE is not integral to the interface but rather interprets incoming requests in a particular manner and passes these requests down to the meta Generic Policy Engine's Security Policy. The meta GPE Security Policy is the default security policy applied when an entity does not have a policy of its own. The customized portion, that dealing with *access*, is defined to handle the nuances of the particular

20 security policy. Thus a GPE written Bell-LaPadula Security Policy handles mandatory access controls and discretionary access controls internally, accessing entity control information via the access controls API. Other security policies can also be defined to control access to the information by utilizing the generic nature of the GPE. The subsequent chapter illustrates the generality of the Generic Policy Engine by

25 implementing a few security policies in common use today.

There are two distinct forms of security policy: the administrative security policy, discussed in this subsection, and the explicit security policy, discussed above.

The administrative security policy implicitly defines the behaviour of the explicit security policy by outlining exactly who, what, and how the various fields of an entity can be examined and updated. For example, Bell-LaPadula strictly restricts the motion of information. An entity at a given hierarchical level cannot be downgraded. A mechanism must exist to downgrade information for the system to be useful in the real world. This special case must be handled by defining individuals, known as security officers, with the special ability to circumvent the security policy. This power, obviously, must be controlled. In order to ensure the use is minimized, or at best properly controlled, *gpeManage ( )* contains special code which may circumvent the overall security policy. Any code that must circumvent the explicit security policy must be placed within *gpeManage ( )*.

***gpeManage*** (entity1 field entity2)      Returns #T if entity1 can update the indicated field of entity2, #F otherwise.

*GPE Security Policy Management Private API*

The fields which are passed to *gpeManage ( )* are provided below.

|                   |                |              |
|-------------------|----------------|--------------|
| UniquelIdentifier | Owner          | Groups       |
| EntityType        | LastModified   | Associations |
| References        | LastAccess     | Level        |
| Authentication    | PurgeRate      | Categories   |
| SecurityPolicy    | AccessControls | Caveat       |

*GPE Field List*

Security operates under a simple assumption: every action must be approved. Once the action has been approved, the specific action can occur. Sometimes the action requires modifying one of the elements of an entity. In these cases, a subsequent call is made via

one of the previously defined APIs which perform the manipulation. All of the APIs, except for the Security Policy API, require only the targeted entity's *uid*. The GPE remembers the last access request, the requesting *uid*, the target *uid*, and the status of the request. For a subsequent call to one of the APIs the requester is therefore known. The action can proceed if and only if the status is #T and the API provided *uid* is identical to the one remembered by the security policy for the target. If not, the request is refused.

The following pseudo-code shows how the GPE is used in-line to check on the validity of one entity, in this case a user, attempting to access another entity, a file.

```
if gpe (user read file)
then
    readLine (file)
else
    warn 'access denied'
endif
```

The example illustrates a general use of the GPE to control access to a file by a user for a specific access method. If the security policy determines that the access should be allowed, the *readLine* is invoked; otherwise, a warning is issued. This general form is all that is required to invoke the security policy implemented in the GPE.

Although the security policy could be called for each invocation of the other API calls used in a program, calls are instead handled implicitly by a call to *gpeManager()* by the API function.

As with any program that must maintain what is, in effect, a database, a number of housekeeping elements and routines are provided to keep the GPE operating smoothly and efficiently. Of particular note is the *References* list which provides pointers back to every entity which refers to a particular entity. This provides the GPE with the ability to rapidly remove references to a particular entity when it is destroyed and no longer required. Although the GPE could operate correctly without a *References* list, it would be inefficient to examine an entire namespace to determine which entities refer to a particular entity.

Object reuse comes in two parts: the reuse of the physical data storage used by a given entity protected by Idyllic; and, the actual security parameters stored for a particular

destroyed entity. The former case must be handled by the underlying application, the latter is part of the garbage collection regimen of Idyllic. It must be guaranteed that the underlying application, prior to reallocation, clears any information stored within the entity. Similarly, the garbage collection routines for Idyllic must clear any security  
5 information from the entity prior to reallocation.

In some cases, such as UNIX, information at the memory level is cleared prior to reallocation. Disk files, however, must be cleared using an additional set of software either at file destruction time or just prior to reallocation. In the cases of other products, it may be necessary to create custom destruction routines to ensure the information is  
10 cleared prior to handoff to an underlying operating system or network. Encryption can be used to perform the object reuse either by the calling application or by Idyllic. It is logically infeasible to define interfaces to every possible kind of program to which the GPE may provide security.

In the Generic Policy Engine, the request to delete an entity automatically forces the  
15 system to delete the information associated with that particular entity. Prior to reallocation, Idyllic ensures any information within the entity is purged.

No trusted path mechanisms are provided by the Generic Policy Engine. A trusted path mechanism, if required for the evaluation of the application utilizing the GPE, must be provided for by the application itself since it is a direct user-system interaction.  
20 Additional logic in the security policy can be utilized to ensure the appropriateness of the trusted path command request.

Security requires that the security mechanism always be invoked. For any application wherein the flow of information from any point to any other point is well known and defined the GPE will work perfectly. Those applications where there is little clear  
25 definition as to where the information is supposed to flow and the paths taken, the GPE will be difficult to incorporate. That said, the latter will also be the least likely applications to be secured and even less likely to be evaluated at anything other than the lowest level of trust within any of the evaluation criteria currently available.

Thus, the GPE is based on the premise that it will be embedded within a properly modular  
30 system with clearly defined and controlled flows of information against which policies

implemented in the GPE can operate. Idyllic and its associated Generic Policy Engines do not rely on any specific operating system or application type. The only requirement is that the underlying operating system or application provide information to the implemented security policy in a format compatible with the GPE API.

- 5 The Generic Policy Engine provides core functionality for implementing security policies. It is not concerned with the details of each and every security policy but rather provides the basic elements required for any security policy. To that end, the functionality provided is simple, and elegant. Since Idyllic is a lambda-based language, extending the syntax is a straightforward exercise; syntactic extensions are used to address the readability
- 10 limitations of the Generic Policy Engine's base functionality. The following paragraphs present a number of security policies which, in order to make the security policies more readable, are provided with their own system calls.

- Bell and LaPadula defined their security policy in terms of subjects (active entities) and objects (passive entities). In the original definition, subjects were processes and objects
- 15 were files associated with an operating system. For our purposes we shall define the Bell-LaPadula Security Policy in terms of their classical use where subjects define active users and objects define passive files and peripherals, such as tape drives and printers.

- The Bell-LaPadula Security Policy is described in terms of a simple triple containing the user (or *subject*), the data (*object*), and the action. The two governing rules of the Bell-
- 20 LaPadula Security Policy below.

***Simple Security Property:***

Also known as the no read up (NRU) rule, states that a subject with security label  $L_S$  can only read information of an object with security label  $L_O$  if and only if  $L_S$  dominates (is greater than)  $L_O$ .

***\*-Property:***

Also known as the no write down (NWD) rule, states that a subject with security label  $L_S$  can only write information to an object with security label  $L_O$  if and only if  $L_O$  dominates  $L_S$ .

*Bell-LaPadula Security Properties*

Each entity controlled by the Bell-LaPadula Security Policy retains state.

Implementing Bell-LaPadula in the Generic Policy Engine is straightforward. Subjects become active entities while objects become passive entities. In actuality, subjects would be defined strictly as processes in the calling application though with this implementation of Bell-LaPadula it does not necessarily have to be so.

- 5 There are many aspects of the policy that presuppose specific attributes existing prior to the security policy coming into force. Three of the most crucial are identification and authentication (I&A), trusted path, and audit mechanisms. These are typically deemed outside the realm of the security policy. The Generic Policy Engine, however, provides a unified approach to security and hence an integrated solution to I&A and audit. These will  
10 be utilized in the implementation to provide necessary identification and accountability information necessary for a properly defined security solution. Trusted path is attainable only by the calling application and cannot be completely addressed by the Generic Policy Engine, it is not implemented below. Object reuse requires corresponding code in both the calling application and the GPE. Within the GPE, object reuse is implicitly handled by  
15 housekeeping functions such as garbage collection.

The Bell-LaPadula Security Policy is known as an hierarchical model. This means that the information is segregated into distinct, hierarchical levels each separate and distinguishable from all others and each defined via a dominance relationship with the others. Typically the hierarchy consists of the military classifications *Top Secret*, *Secret*,  
20 *Confidential*, and *Unclassified*. They are related in that each in turn dominates the next in a simple mathematical relationship:

*Top Secret > Secret > Confidential > Unclassified.*

This allows for simple arithmetic rules to be utilized to determine whether an active entity can view an entity by what Bell and LaPadula called *dominance relationships*. For  
25 example, an entity at Top Secret would be invisible and unavailable to an active entity at Secret; conversely, an entity at Confidential would be visible and available to the same active entity.

But the Bell-LaPadula Security Policy has other aspects, namely categories and caveats that are *not* hierarchical in nature. A given entity is not bound to a single category or  
30 caveat as they are to a single level of a hierarchy. Categories and Caveats are viewed as sets with any entity within the Bell-LaPadula Security Policy belonging to a predefined

set. These categories and caveats are, typically, available to each level and to all entities though not all categories or caveats may be utilized for all entities. Namely, each entity is allowed a specific, predefined subset of the category and caveat sets. Each entity is then restricted to any and all subsets of that predefined subset, including the null set.

- 5 Bell-LaPadula models an active set of processes, one where information is moved from one secure or trusted state to another. In order for information to be moved between states it must first be created. If it is to be created, there may come a time when it needs to be destroyed. The Generic Policy Engine provides mechanisms to create and destroy entities and their associated linkages and information. For this implementation of the Bell-
- 10 LaPadula Security Policy we require two functions as defined below.

|                                                                  |                                                                                                                                                                                                                                             |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>createEntity</i></b> ( <i>type entity classification</i> ) | <i>Creates one of the two types of entity required by the Bell-LaPadula Security Policy (subject or object). The classification level for the new entity is passed as a parameter. On successful creation #T is returned, #F otherwise.</i> |
| <b><i>destroyEntity</i></b> ( <i>entity</i> )                    | <i>Destroys the entity and removes all references within the GPE namespace to it. Returns #T on successful destruction, #F otherwise.</i>                                                                                                   |

- These two functions simply call the existing internal entity creation and destruction routines. All housekeeping functions are handled implicitly by the Generic Policy Engine
- 15 leaving the security policy uncluttered by such matters.

- The least privilege requires that the person performing a duty must be granted only those system privileges necessary to properly perform a particular duty. This is contrary to many systems, such as UNIX, that provide all or nothing privileges under the guise of a super user or administrator. The typical solution is to create privileges that ensure a
- 20 particular task requires a particular privilege. Therefore, the tasks associated with an operator – mounting tapes, starting and stopping the printer queues, routine non-security related maintenance – would require *operator privilege*; the creation or modification of user accounts, upgrade or removal of applications, etc. would require *system privilege*. The privileges are typically associated with *roles* such as *operator* or *system*
  - 25 *administrator*. Applying this solution to UNIX would result in at least three distinct user

types: unprivileged user, operator, and system administrator. Security officer is typically added and is responsible for the system logs, maintenance of the security policy, security policy enforcement, and information flow, typically in the form of document downgrades.

Each entity must be assigned a privilege set at creation time. The privilege set is used to  
5 determine which functionality the entity can utilize during its operation as an active entity. Least privilege further stipulates that the entity activate only those privileges required to perform its duties.

The Bell-LaPadula policy does not require the inclusion of privileges, relying instead on the division of "subjects" and "objects" according to the defined hierarchy. By defining  
10 system applications as "System Low", i.e., below all other levels of the hierarchy, sensitive files can be protected from inadvertent modification. By defining unique categories specific to the various system administrative duties, specific tasks can be delegated to specific individuals. In this way we can subdivide all users into one of two types: privileged users and unprivileged users. We can further subdivide each of these  
15 groupings as required by allocating specific categories to differentiate specific privileged sets. For example, categories could be defined to represent the system administrator, operator, and security officer.

Mandatory access controls (MAC) provides system administrators the ability to control access to entities by active entities in a mandatory (system defined) way. These controls  
20 are regarded by some as system administrator discretionary controls over the entire system. MAC controls typically compartmentalize information. The most common use is to impose hierarchies upon the information such as unclassified, confidential, secret, and top secret. The rules governing MAC define groupings of information to which a active entity *must* belong *prior* to access. The GPE provides for *Levels* which are used to  
25 compartmentalize entities to better control information flow through the system. The compartmented entities are usually further subdivided by means of categories and caveats. The definition of valid sensitivity levels, categories, and caveats must be defined prior to the first utilization of the GPE. This is accomplished by defining each valid level, the explicit hierarchy they represent, and the valid category and caveat sets.

30 Using syntactic extensions that create and populates appropriate entities for us, we first create each hierarchical level.

```

        (createLevel 'SystemHigh)
        (createLevel 'TopSecret)
        (createLevel 'Secret)
        (createLevel 'Confidential)
5      (createLevel 'Unclassified)
        (createLevel 'SystemLow)      ;* where the system files live

```

Once all the levels have been created we create the explicit hierarchy. Idyllic allows us to create the hierarchy simply as a list. This list explicitly defines the hierarchy and allows  
 10 for simple arithmetic operations to be utilized to determine which security level dominates another relative to position in the list; the higher the position, the higher the level.

```

        (define BLPHierarchy (LIST SystemHigh
                                   TopSecret
15      Secret
                                   Confidential
                                   Unclassified
                                   SystemLow))

```

20 Categories and caveats are unordered sets and are similarly created. Instead of creating a hierarchy, they represent valid sets.

```

        (createCategories 'NATO)
        (createCategories 'NUCLEAR)
        (define BLPCategories (LIST NUCLEAR NATO))
25      (createCaveats 'CanadianEyesOnly)
        (createCaveats 'PrivyCouncilOnly)
        (define BLPCaveats (LIST CanadianEyesOnly PrivyCouncilOnly))

```

Every entity begins with the following set as the default when created:

```

30      ((SystemLow SystemLow SystemLow) ([] [])) // Categories
                                   ([] [])) // Caveats
        Current      Min      Max      Current Fullset
        Levels

```

35 This triple defines the entity at *SystemLow*, and has empty sets for both the category and

caveat lists. One of the first actions performed is to upgrade the entity to its appropriate current, minimum, and maximum levels, which in our example would be anything from *Unclassified* through *TopSecret*; the GPE would also insert the appropriate caveats and categories for the current active set and the full set.

- 5 Therefore, an entity with a security level of:

((Confidential Confidential Secret) ([ ] [ ] ) ([ ] [ ] ))

is said to dominate one with the following level:

((Unclassified Unclassified Confidential) ([ ] [ ] ) ([ ] [ ] ))

10

since the current hierarchical level of the former is *Confidential* and that of the latter *Unclassified*, regardless of how high or low any given entity may reside.

Two system calls are typically required to utilize MAC: *setMAC ( )* and *getMAC ( )*. The MAC settings are usually defined as ranges:

15

SecurityLevel = [min, max]

Categories = [ct<sub>1</sub>, ct<sub>2</sub>, ..., ct<sub>N</sub>]

Caveats = [cv<sub>1</sub>, cv<sub>2</sub>, ..., cv<sub>N</sub>]

***setMAC (entity classification)***

*Sets the security level, categories, and caveats for entity to the classification information provided.*

***getMAC (entity)***

*Returns the classification information for entity as a triple. If entity doesn't exist, the request is refused.*

- 20 Discretionary Access Controls (DAC) correspond to Axiom 3 of the Bell-LaPadula model. DAC allows system users to restrict access of the entities that they own to specific active entities, in a discretionary way. The TCSEC requires at C2 and above that "access controls ... be capable of including or excluding access to the granularity of a single user" Some operating systems, most notably UNIX, do not support such permissions via
- 25 self/group/public permission bits. True access controls follow those outlined in Multics and implemented by the Generic Policy Engine.

Permissions come in two primary flavours: role based and access control based. Both are very similar with role based access control defining what specific roles can or cannot access particular information and having all users within the system defined by specific roles. Strict access controls define specific users or groups of users as having access to particular information. Both are equally valid. For our purposes, we will use access controls since they more closely correspond to a majority of the Bell-LaPadula interpretations currently in use throughout computer security. Permissions are typically defined by read, write, and execute controls.

For our purposes we will define access controls as lists of the following form:

```
10      (deny  ( . . . ))
      (allow ( . . . ))
```

for each of read, write, and execute controls. The full access control list (ACL) for any given entity controlled via the Bell-LaPadula Security Policy would have the following general format:

```
15      (read      (deny  ( . . . ))
              (allow ( . . . )))
      (write      (deny  ( . . . ))
              (allow ( . . . )))
20      (execute   (deny  ( . . . ))
              (allow ( . . . )))
```

Therefore, an ACL for a given entity of the form:

```
      (read      (deny  ( ))
              (allow (engineering eugen)))
25      (write      (deny  (engineering))
              (allow (eugen)))
      (execute   (deny  ( ))
              (allow ( )))
```

30 would permit engineering and *eugen* to read the contents of the entity while denying all others. Similarly, although engineering is explicitly denied write access, eugen is explicitly allowed access. If *eugen* was also a member of engineering the specific granting of a privilege *always* supercedes the general denial, and vice versa. In Windows NT this is

not the case. In Windows NT a specific grant of access can be superceded by a more general denial of access; this contradicts the intent of security policies based on Bell-LaPadula wherein the most specific grant of access always supercedes the more general denial of access.

- 5 This general ACL structure allows us to create any variation of permissions desired for any application, be it an operating system or otherwise. This differs from the mechanisms typically employed by trusted UNIX implementations, such as Trusted Xenix and HP-UX in that they employ a fixed size ACL (1 kilobyte per file) and utilize a triple (user, group, access permissions).
- 10 In order to manipulate the access control lists a number of system calls are required. The following table summarizes the three functions which provide the Bell-LaPadula Security Policy with the functionality required to manage the ACLs. Although not explicitly mentioned, the Bell-LaPadula Security Policy model requires mechanisms by which the ACLs can be updated, removed, and fetched.

15

|                                                                        |                                                                                                            |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <b><i>removeACL</i></b> ( <i>entity access<br/>privilege entity2</i> ) | <i>Access can be one of deny or allow. Entity2 is removed from the provided privilege in the ACL.</i>      |
| <b><i>modifyACL</i></b> ( <i>entity ACL</i> )                          | <i>Modify an existing ACL by replacing the ACL with the one provided.</i>                                  |
| <b><i>getACL</i></b> ( <i>entity</i> )                                 | <i>Retrieve the access control lists for entity. If entity doesn't exist, return #F otherwise the ACL.</i> |

- As entities are dynamically created and destroyed, the issue of object reuse must be addressed. Object reuse provides for the return of information to the system's free pool allowing the space occupied to be reused by other applications. Any system that uses Idyllic to implement and maintain its security policy divides the issue of object reuse into
- 20 two distinct types: Idyllic object reuse and system object reuse. Figure 4 illustrates what happens when there is a request for the deletion or creation of a particular data file within the system. When a request is received by the system for the destruction of a particular data file, the system must ensure that the requesting entity has appropriate access. If all controls are correct, then the entity in question can be destroyed. This destruction is
  - 25 twofold: First, the instance representing the entity within the security policy under Idyllic must remove the entity and all references to it. Once that process has successfully

completed, the system itself can remove the physical storage for the entity and, if need be, sanitize it.

All security criteria require some form of object reuse that ensures that any reallocated entity's contents are independent from its previous instance. Some operating systems, such as UNIX, clear all memory prior to reallocation; others, such as DOS, do not. Therefore, depending on the operating system or application using Idyllic, it may be necessary to create an object reuse function to properly sanitize entities returned to the free memory pool.

In order for the Bell-LaPadula policy to operate a mechanism of identification and authentication must be in place. The GPE provides identification and authentication functionality fully capable of delivering sufficient uniqueness to describe all operational active entities within the model. For the purposes of this example a simple login ID and password suffices to properly and uniquely identify each active entity to the security policy. In order to facilitate the usage, the following routines are provided which provide I&A mechanisms for the Bell-LaPadula Security Policy.

**Login** (*user password  
level category caveat*)

*Attempts to log in the user with the provided password, level, category, and caveat. On success, #T is returned, otherwise #F.*

**Logout** (*user*)

*Logs the user out.*

Many high security systems provide a trusted path mechanism whereby a secured line of communication is set up between the user and the system. As the trusted path attention mechanism is typically hardware oriented, it is outside the Generic Policy Engine. However, the Generic Policy Engine does provide a system call that can be utilized to invoke specific system commands securely by the user.

The Generic Policy Engine implicitly handles the most common forms of audit found in many trusted systems. Auditable events such as entity creation, entity destruction, modification of an entity's security parameters, etc. are all logged by the Generic Policy Engine. Bell-LaPadula does not explicitly require audit since in a perfectly functioning Bell-LaPadula Security Policy, no breaches would be possible. It is only when the

implementation moves from the realm of mathematics to one of computer logic that errors can occur that cannot be easily verified. These errors could result in breaches of security with a resulting improper disclosure or manipulation of protected information. Audit facilities are therefore utilized in an attempt to catch breaches as they occur for various reasons including possible prosecution. However, for our purposes and since the Bell-LaPadula Security Policy does not explicitly require audit, it is sufficient to rely on what the Generic Policy Engine provides as default – namely, all major entity modifications are logged by the GPE for future perusal by appropriate security personnel.

Now that the entire infrastructure is in place, we need to define the actual Bell-LaPadula Security Policy. The implementation of the Bell-LaPadula Security Policy is defined below. Utilizing the extensions defined, we have avoided using raw GPE calls. This allows for a shorter and more readable Bell-LaPadula Security Policy implementation without diminishing the verifiability provided by the GPE security framework. When writing code with the GPE framework, it is important to remember the primary goals of the GPE, and, in fact, all security policy implementations: small, readable code that is verifiable and efficient. The following definition epitomizes this goal.

```

(define (Bell-LaPadula subject access object)
  (let* (
    (Subject-Level (getLevel      subject))      ;;* MAC info
    (Subject-Cats  (getCategories subject))
    (Subject-Cavs  (getCaveats   subject))
    (Object-Level  (getLevel      object))
    (Object-Cats   (getCategories object))
    (Object-Cavs   (getCaveats   object))
    (Allowed       (getRight object access 'allow)) ;;* DAC info
    (Denied        (getRight object access 'deny)))
    ; in
    (and (or (= Subject-Level Object-Level)      ;;* MAC
             ;;* no read up
             (and (> Subject-Level Object-Level)
                  (eq? access 'Read)
                  (subset? Object-Cavs Subject-Cavs))
             ;;* no write down
             (and (< Subject-Level Object-Level)

```

```

        (eq? access 'Write)
        (subset? Object-Cavs Subject-Cavs)))

    (and (member subject Allowed)                ;; * DAC
          (not (member subject Denied)))

  ) ) )

```

The simplicity of the above is a direct outgrowth of:

- 10     • the ease with which one can manipulate symbols in a symbolic language; and,
- the underlying functionality provided by the GPE which provides additional security relevant facilities. These additional facilities provide for the needed security functionality typically lacking in operating systems.

Standard access control lists are not typically defined within the two properties associated  
 15     with the Bell-LaPadula policy even though they are always included within operational implementations of the security policy. For completeness, the above policy definition includes access control lists as defined on many systems.

Now, in the implemented prototype the Bell-LaPadula Security Policy uses readable names to differentiate various entities. If the GPE were connected to a working operating  
 20     system, however, unique identifiers understood by the operating system would be used instead. The GPE requires only that the identifiers be unique, regardless of syntax. Most operating systems use numeric representations to ensure uniqueness. This is sufficient for the GPE.

With the Generic Policy Engine, the entire Bell-LaPadula Security Policy, typically  
 25     thousands of lines of system code, has been implemented in less than 10 lines of code. This security policy would be embedded as the default security policy for all entities that were to be governed by the Bell-LaPadula Security Policy.

Even though there exists within the GPE and the earlier syntactic sugar routines for accessing the various security aspects of an entity, the security policy proper requires  
 30     specific routines which return numeric values for the security information to be able to properly execute the security policy.

The Bell-LaPadula Security Policy definition utilizes five functions, as defined below, to assist in manipulating the security information properly and efficiently for the Bell-LaPadula Security Policy.

|                                           |                                                                                 |
|-------------------------------------------|---------------------------------------------------------------------------------|
| <b><i>getLevel</i></b> (entity)           | <i>Returns the current security level for the entity as a numeric quantity.</i> |
| <b><i>getRight</i></b> (entity privilege) | <i>Returns the requested privilege as a list for the entity.</i>                |
| <b><i>getCategories</i></b> (entity)      | <i>Returns the current category set for the entity.</i>                         |
| <b><i>getCaveat</i></b> (entity)          | <i>Returns the current caveat set for the entity.</i>                           |
| <b><i>subset?</i></b> (set1 set2)         | <i>Returns #T if the set1 is a true subset of set2, #F otherwise.</i>           |

5

The Bell-LaPadula Security Policy controls the disclosure of information. To perform this task in a dynamic environment requires that the access controls be constantly updated with current and relevant information pertaining to valid subject-object (active entity-passive entity) interactions. The following figures illustrate how the access controls can be updated and how the Bell-LaPadula Security Policy is invoked to mediate subject-object interaction.

10

|                                           |                                                          |
|-------------------------------------------|----------------------------------------------------------|
| gpeAC (ebacic put write<br>allow GPE.doc) | Request that ebacic be allowed to write to GPE.doc       |
| gpeAC (jagoda put read<br>allow GPE.doc)  | Request that jagoda be allowed to read GPE.doc           |
| gpeAC (ariana put write<br>deny GPE.doc)  | Request that ariana be denied write access to GPE.doc    |
| gpeAC (goran put delete<br>deny GPE.doc)  | Request that goran be denied delete privilege to GPE.doc |

*Updating the Access Controls via the GPE*

|                                |                                                       |
|--------------------------------|-------------------------------------------------------|
| gpeAC (GPE.doc get read allow) | Returns all entities that are allowed to read GPE.doc |
|--------------------------------|-------------------------------------------------------|

`gpe (DOR get execute deny)` Returns all entities that are allowed to execute DOR

*Examining Access Controls via the GPE*

`gpe (ed read GPE.doc)` returns whether ed can read the file GPE.doc

`gpe (john write bp.doc)` returns whether john can write to the file bp.doc

`gpe (dan delete john)` returns whether dan has the right to delete john

*Access Control Mediation by the GPE*

- 5 Message Trusted Guards (MTGs) are defined in terms of users and electronic mail addresses. Controls are placed upon the destinations to which specific users can transmit electronic mail messages. No restrictions are placed on incoming e-mail, even though a Message Trusted Guard is capable of controlling both incoming and outgoing connections.
- 10 Modern implementations of Message Trusted Guards are embedded within Firewalls, however, earlier this decade stand-alone MTGs were quite common and typically were thousands of lines of C code, much of which handled housekeeping functions for the security controls. The GPE implementation, described below, is less than 50 lines and offers the same functionality.
- 15 Implementing a MTG Security Policy in the GPE is straightforward with the active entity being the actual e-mail message/sender pair and the passive entity being the recipient/e-mail address pair. The action is always "send". Therefore the calling sequence to the GPE coded security policy is: *gpe (sender send recipient)*.

There are two types of entities that are maintained by the Message Trusted Guard: senders  
 20 and recipients. The most common implementation places restrictions on who can transmit to a given recipient. If a given sender is not explicitly permitted, transmission is denied. In order for the e-mail messages to be transmitted from the current site to a desired destination both the sender and recipient must exist. To exist the entities must be created. There may come a time when an entity needs to be destroyed. We'll utilize the Generic

Policy Engine's mechanisms to create and destroy entities and their associated linkages and information. For the Message Trusted Guard we will define two functions.

|                                       |                                                                                                                                                        |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i><b>createEntity</b></i> (type uid) | <i>Creates one of the two types of entity (site or user) with the provided unique identifier. On successful creation #T is returned, #F otherwise.</i> |
| <i><b>destroyEntity</b></i> (uid)     | <i>Destroys the entity and removes all references. Returns #T on successful destruction, #F otherwise.</i>                                             |

- 5    These two functions simply call the existing internal entity creation and destruction routines. All housekeeping functions are handled implicitly by the Generic Policy Engine leaving the security policy uncluttered by such matters.

All users of a network capable of transmitting e-mail would be registered with the Message Trusted Guard when their accounts and e-mail are initially set up. Recipient  
 10   restrictions are created by the security officer on an address by address basis. If a given address is not in the Message Trusted Guard's list of restricted addresses, then all traffic can flow to that address. This eliminates the need to have a constantly updated table of Internet sites in the Message Trusted Guard.

Whether or not a user can transmit to an address follows a simple rule:

```

15        if exists (recipientAddress)
          then
              return (user not in recipientAddress.deny) and
                      (user in recipientAddress.allow)
          else
20        return True        ;* address is not explicitly indicated - allow
          endif

```

- By default, the e-mail must go through. Therefore, it is up to the security officer to modify the transmission rights for particular sites. Although this is opposite to the typical  
 25   "deny unless explicitly allowed" rule of computer security, it makes more sense for e-mail. For particularly sensitive destinations, the security officer should preconfigure the MTG to ensure some semblance of protection is provided.

In order to define those sites which are to be restricted and for which users, the following functions are defined:

|                                               |                                                                                                                   |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b><i>removeSite</i></b> ( <i>site</i> )      | <i>Remove site from the list of sites to which access is restricted.</i>                                          |
| <b><i>addSite</i></b> ( <i>site</i> )         | <i>Add site to the list of sites to which access is restricted. Initially the allow and deny lists are empty.</i> |
| <b><i>denySite</i></b> ( <i>user site</i> )   | <i>Disallow user from transmitting to site.</i>                                                                   |
| <b><i>allowSite</i></b> ( <i>user site</i> )  | <i>Allow user to transmit to site.</i>                                                                            |
| <b><i>removeUser</i></b> ( <i>user site</i> ) | <i>Remove user from the allow or deny lists (the user can only reside on a single list).</i>                      |

- 5 A Message Trusted Guard requires user identification and authentication. All users must be registered with the Message Trusted Guard prior to being allowed to transmit. If they are not in the Message Trusted Guard's list of users, all e-mail by the user is rejected and the action audited for future actioning by the security officer.

No trusted path is required by the Message Trusted Guard.

- 10 The Generic Policy Engine implicitly handles audit for the Message Trusted Guard. All mail messages are audited as the flow through the system by explicitly calling the GPE audit routines. Information stored includes sender, recipient, message ID, and status of the transmission.

- Historically, the most difficult aspect of the Message Trusted Guard is all the supporting security software. Utilizing the GPE reduces the surrounding code to a mere fraction of C implementations. The implementation of the Message Trusted Guard Security Policy is defined below.
- 15

```

20      ;* define "send" as "write" to make the security policy
      ;* that much more readable.
      (define send 'write)
      ;*
      ;* The security policy proper
      ;*
      (define (Message-Trusted-Guard sender messageID recipient)
25      (cond
        ((not (entityExists? sender))

```

```

      (define status #F))                                ;;* deny send
      ((not (entityExists? recipient))
      (define status #T))                                ;;* allow send
      (else
5      (let* (
      (Allowed (gpeAC recipient 'get send 'allow))
      (Denied (gpeAC recipient 'get send 'deny)))
      ;      in
      ;* allow only if not explicitly denied,
10      ;* but explicitly allowed!
      (define status (and (not (member sender Denied))
      (member sender Allowed)))))
      (gpeLog sender put (list sender messageID recipient status))
      ;* return the status of the send
15      status
    )

```

*Message Trusted Guard Security Policy Model in the GPE*

The Message Trusted Guard Policy Model controls the transmission of electronic mail  
 20 between a host site and select destinations. The following illustrates how a calling  
 application can quickly deduce whether or not a message can be transmitted to the  
 destination:

*gpe (user@secret.org send dictator@banana.republic)*

The function *gpe ( )* invokes the security policy *Message-Trusted-Guard ( )* and either a  
 25 true is received granting transmission rights to the electronic mail message or a false is  
 received, denying transmission rights.

The GPE offers a unique and flexible approach to creating security policies. The policies  
 are defined solely as security policies performing a singular task: that of mediating  
 information flow. The security policies implemented utilizing the GPE are short and easy  
 30 to read guaranteeing fewer errors and omissions. Two example security policies have  
 been provided illustrating the elegance of GPE implemented security policies. These  
 security policies illustrate two popular security policies currently in use.

To illustrate the flexibility of the GPE, the following provides the code for the Biba Integrity Security Policy utilizing the existing code of the Bell-LaPadula Security Policy. As Biba is the complement of the Bell-LaPadula Security Policy it should be a simple matter to modify Bell-LaPadula into Biba. As can be seen, the only changes required (as  
 5 noted) are trivial. Furthermore, the support routines for Bell-LaPadula remain unchanged.

```

      (define (Biba subject access object)
        (let* (
          (Subject-Level (getLevel      subject))          ;;* MAC info
          (Subject-Cats  (getCategories subject))          10
          (Subject-Cavs  (getCaveats   subject))
          (Object-Level  (getLevel      object))
          (Object-Cats   (getCategories object))
          (Object-Cavs   (getCaveats   object))
          (Allowed       (getRight object access 'allow)) ;;* DAC info
          (Denied       (getRight object access 'deny)))
          ; in
          (and (or (= Subject-Level Object-Level)          ;;* MAC
                  ;;* no write up
                  (and (> Subject-Level Object-Level)
                      (eq? access 'Write)                ;;* CHANGE
                      (subset? Object-Cavs Subject-Cavs)))
                ;;* no read down
                (and (< Subject-Level Object-Level)
                    (eq? access 'Read)                   ;;* CHANGE
                    (subset? Object-Cavs Subject-Cavs))))

          (and (member subject Allowed)                  ;;* DAC
               (not (member subject Denied))))
        ) ) )
  
```

*Biba Security Policy Model in the GPE*

By abstracting out the security to a GPE Server performance would be foremost on any  
 35 implementor's mind. However, in terms of performance the GPE excels. The performance

of the *interpreted* GPE embedded within an HTTP Server on an Intel Pentium 166 running FreeBSD performance was clocked at 100,000 lines of HTML processed per minute through a simplified Bell-LaPadula Security Policy. There was no noticeable impact observed in the throughput of the server, even though each line had to be  
5 processed and approved by the security policy.

Currently the slowest aspect of the GPE is the entity space, which is managed akin to a simple database. Although this could be viewed as a possible trouble spot, there is no reason why a commercial-grade database couldn't be used to manage and maintain the entities on behalf of the GPE. The performance issue would disappear as would other, less  
10 obvious concerns regarding persistence and robustness of the current entity space implementation.

The current implementation of Idyllic is small and interpreted. It offers adequate performance in its interpreted state. However, being small allows it to be easily optimized and the use of a simple language based on Scheme allows for faster, compiled  
15 implementations.

As networks become more prevalent, distributed computing will become commonplace. Networks introduce a plethora of concerns not evident with stand-alone systems. Foremost among these is the need to ensure traffic is guaranteed to arrive at its destination without *any* modifications. The Generic Security Services API (GSSAPI) presented  
20 provides a baseline upon which to build. As users become more sophisticated and their security requirements increase in complexity, the GPE will provide system administrators with the ability to modify the security underpinnings to meet user demands.

We claim:

1. A method of controlling access to a network wherein security policies are defined by using a verifiable language consisting of formal definitions of the syntax and semantics, whereby security policy is abstracted from physical data.
- 5 2. A method as claimed in claim 1, which is controlled by a generic policy engine (GPE) , which executes the policies defined by said language.
3. A method as claimed in claim 1, wherein said GPE mediates access to an object entity by a subject entity, there being a series of defined actions that can be performed on each entity.
- 10 4. A method as claimed in claim 2, wherein said GPE encapsulates security information in entities describing attributes, policy and relationships with items to be protected.
5. A method as claimed in claim 4, wherein said entities are mapped on a one-for-one basis with items to be protected.
- 15 6. A method as claimed in claim 5, wherein each said entity has a unique identifier.
7. A method as claimed in claim 6, wherein said GPE provides Application Programming Interfaces (APIs) to permit third party applications to manipulate security attributes and thereby determine information flow.
8. A method as claimed in claim 7, wherein said APIs comprise an entity API, a  
20 Security Policy API, an identification and authentication API, an audit API, and Access Rights API, and a Privileges API.
9. A method as claimed in claim 7, wherein each calling application obtains its own instantiation of the GPE.
10. A security policy engine for controlling access to a network in accordance with  
25 policies defined with the aid of a verifiable language consisting of formal definitions of the syntax and semantics.
11. A security policy engine as claimed in claim 10, comprising a plurality of Application Programming Interfaces to receive requests for access controls from third party applications.

12. A security policy engine as claimed in claim 10, comprising entities containing security information for external items.
13. A security policy engine as claimed in claim 10, further comprising language support libraries for said verifiable language.

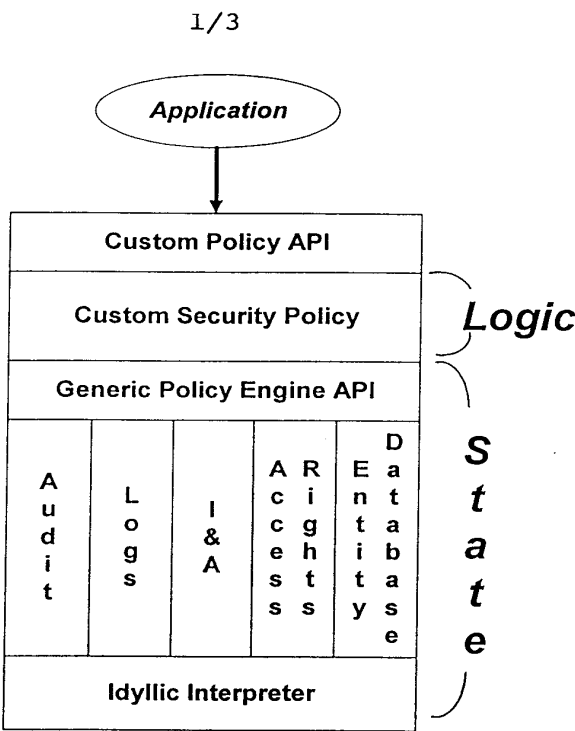


Fig. 1

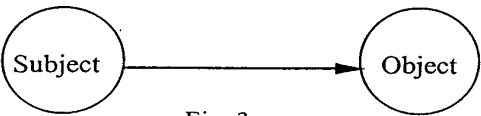


Fig. 3

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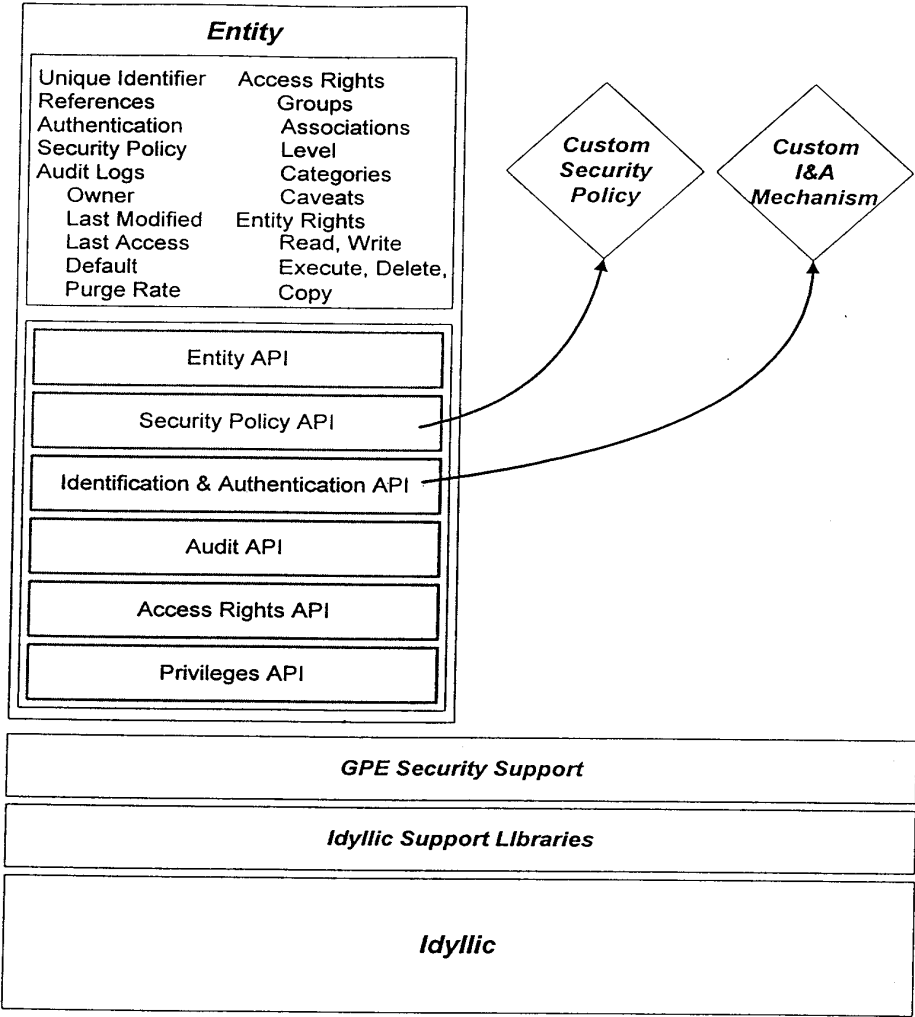


Fig. 2

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3/3

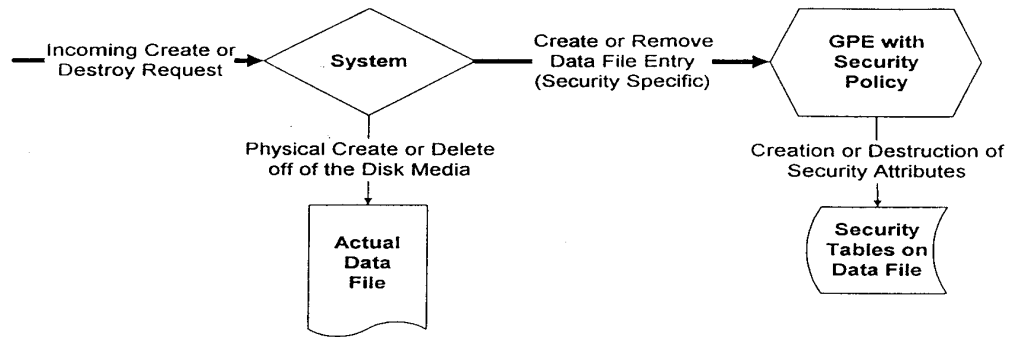


Fig. 4

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/CA 00/00276

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04L29/06

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, IBM-TDB

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Relevant to claim No. |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A          | <p>VARADHARAJAN, V.; CRALL, C; PATO, J.:<br/>"Issues in the design of secure authorization service for distributed applications"<br/>GLOBAL TELECOMMUNICATIONS CONFERENCE, 1998. GLOBECOM 1998. THE BRIDGE TO GLOBAL INTEGRATION. IEEE, 'Online!<br/>vol. 2, 8 - 12 November 1998, pages 874-879, XP002142413<br/>ISBN: 0-7803-4984-9<br/>Retrieved from the Internet:<br/>&lt;URL:www.iel.ihs&gt;<br/>'retrieved on 2000-07-12!<br/>abstract<br/>page 874, right-hand column, line 39 -page 875, left-hand column, line 11<br/>page 875, right-hand column, line 1 -page 876, left-hand column, line 19<br/>page 877, left-hand column, line 25 - line --/--</p> | 1-13                  |



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

### \* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

12 July 2000

Date of mailing of the international search report

26/07/2000

Name and mailing address of the ISA

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Fax: (+31-70) 340-3016

Authorized officer

Adkhis, F

# INTERNATIONAL SEARCH REPORT

Int. l. Application No  
PCT/CA 00/00276

| C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Category *                                           | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Relevant to claim No. |
| A                                                    | <p>44<br/>page 878, right-hand column, line 6 -page<br/>879, left-hand column, line 32<br/>---</p> <p>CHANG, S.K.; POLESE, G.; THOMAS, R.; DAS,<br/>S.: "A Visual language for authorization<br/>modeling"<br/>VISUAL LANGUAGES, 1997. PROCEEDINGS. 1997<br/>IEEE SYMPOSIUM ON, 'Online!<br/>23 - 26 September 1997, pages 110-118,<br/>XP002142414<br/>ISBN: 0-8186-8144-6<br/>Retrieved from the Internet:<br/>&lt;URL:www.iel.ihs&gt;<br/>'retrieved on 2000-07-12!<br/>abstract<br/>page 110, right-hand column, line 28 -page<br/>111, left-hand column, line 24<br/>page 115, left-hand column, line 27<br/>-right-hand column, line 51<br/>-----</p> | 1-13                  |

1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

page 2 of 2

| Electronic Patent Application Fee Transmittal |          |                                                   |        |                      |
|-----------------------------------------------|----------|---------------------------------------------------|--------|----------------------|
| Application Number:                           |          | 13523854                                          |        |                      |
| Filing Date:                                  |          | 14-Jun-2012                                       |        |                      |
| Title of Invention:                           |          | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |        |                      |
| First Named Inventor/Applicant Name:          |          | Stacey C. Lum                                     |        |                      |
| Filer:                                        |          | Steven M. Colby/Melinda Tompkins                  |        |                      |
| Attorney Docket Number:                       |          | 5532.01                                           |        |                      |
| Filed as Small Entity                         |          |                                                   |        |                      |
| Utility under 35 USC 111(a) Filing Fees       |          |                                                   |        |                      |
| Description                                   | Fee Code | Quantity                                          | Amount | Sub-Total in USD(\$) |
| Basic Filing:                                 |          |                                                   |        |                      |
| Pages:                                        |          |                                                   |        |                      |
| Claims:                                       |          |                                                   |        |                      |
| Miscellaneous-Filing:                         |          |                                                   |        |                      |
| Petition:                                     |          |                                                   |        |                      |
| Patent-Appeals-and-Interference:              |          |                                                   |        |                      |
| Post-Allowance-and-Post-Issuance:             |          |                                                   |        |                      |
| Extension-of-Time:                            |          |                                                   |        |                      |

| Description                             | Fee Code | Quantity | Amount | Sub-Total in USD(\$) |
|-----------------------------------------|----------|----------|--------|----------------------|
| <b>Miscellaneous:</b>                   |          |          |        |                      |
| Submission- Information Disclosure Stmt | 2806     | 1        | 90     | 90                   |
| <b>Total in USD (\$)</b>                |          |          |        | <b>90</b>            |

| Electronic Acknowledgement Receipt          |                                                   |
|---------------------------------------------|---------------------------------------------------|
| <b>EFS ID:</b>                              | 16787298                                          |
| <b>Application Number:</b>                  | 13523854                                          |
| <b>International Application Number:</b>    |                                                   |
| <b>Confirmation Number:</b>                 | 3097                                              |
| <b>Title of Invention:</b>                  | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |
| <b>First Named Inventor/Applicant Name:</b> | Stacey C. Lum                                     |
| <b>Customer Number:</b>                     | 23308                                             |
| <b>Filer:</b>                               | Steven M. Colby/Melinda Tompkins                  |
| <b>Filer Authorized By:</b>                 | Steven M. Colby                                   |
| <b>Attorney Docket Number:</b>              | 5532.01                                           |
| <b>Receipt Date:</b>                        | 06-SEP-2013                                       |
| <b>Filing Date:</b>                         | 14-JUN-2012                                       |
| <b>Time Stamp:</b>                          | 16:14:16                                          |
| <b>Application Type:</b>                    | Utility under 35 USC 111(a)                       |

### Payment information:

|                                                                                                                                                                                                                     |                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Submitted with Payment                                                                                                                                                                                              | yes             |
| Payment Type                                                                                                                                                                                                        | Deposit Account |
| Payment was successfully received in RAM                                                                                                                                                                            | \$ 90           |
| RAM confirmation Number                                                                                                                                                                                             | 3359            |
| Deposit Account                                                                                                                                                                                                     | 161331          |
| Authorized User                                                                                                                                                                                                     |                 |
| The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:<br>Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges) |                 |

| File Listing:                                   |                                                    |                                                 |                                          |                  |                  |
|-------------------------------------------------|----------------------------------------------------|-------------------------------------------------|------------------------------------------|------------------|------------------|
| Document Number                                 | Document Description                               | File Name                                       | File Size(Bytes)/ Message Digest         | Multi Part /.zip | Pages (if appl.) |
| 1                                               | Transmittal Letter                                 | 5532-01_IDS-Transmittal_9-5-2013.pdf            | 44908                                    | no               | 2                |
|                                                 |                                                    |                                                 | 10c2b5d6294a6ace828a2e839960f9955a4e70ca |                  |                  |
| Warnings:                                       |                                                    |                                                 |                                          |                  |                  |
| Information:                                    |                                                    |                                                 |                                          |                  |                  |
| 2                                               | Information Disclosure Statement (IDS) Form (SB08) | 5532-01_IDS-Sb08a_9-5-2013.pdf                  | 278865                                   | no               | 4                |
|                                                 |                                                    |                                                 | c21587e39109cc97e505d499136d5ef49e994b00 |                  |                  |
| Warnings:                                       |                                                    |                                                 |                                          |                  |                  |
| Information:                                    |                                                    |                                                 |                                          |                  |                  |
| This is not an USPTO supplied IDS fillable form |                                                    |                                                 |                                          |                  |                  |
| 3                                               | Foreign Reference                                  | WO2000056027.pdf                                | 3009249                                  | no               | 70               |
|                                                 |                                                    |                                                 | 60d14f8af886cd8a9df9aff9faa378d9b66395ee |                  |                  |
| Warnings:                                       |                                                    |                                                 |                                          |                  |                  |
| Information:                                    |                                                    |                                                 |                                          |                  |                  |
| 4                                               | Non Patent Literature                              | Cardinal-IP-Search-Results_8-12-2013_6pages.pdf | 104451                                   | no               | 6                |
|                                                 |                                                    |                                                 | 2f523b278dacfd9d9ed2dea62a80bf9adbcaeef2 |                  |                  |
| Warnings:                                       |                                                    |                                                 |                                          |                  |                  |
| Information:                                    |                                                    |                                                 |                                          |                  |                  |
| 5                                               | Non Patent Literature                              | Fratto_5-29-2003.pdf                            | 1074791                                  | no               | 9                |
|                                                 |                                                    |                                                 | f0b46b3492a5873a98313d8661dae1011f2c810f |                  |                  |
| Warnings:                                       |                                                    |                                                 |                                          |                  |                  |
| Information:                                    |                                                    |                                                 |                                          |                  |                  |
| 6                                               | Non Patent Literature                              | Hunt_4-1998.pdf                                 | 574835                                   | no               | 11               |
|                                                 |                                                    |                                                 | 63b382265397bc963b67e76e68312110f2632bfb |                  |                  |
| Warnings:                                       |                                                    |                                                 |                                          |                  |                  |
| Information:                                    |                                                    |                                                 |                                          |                  |                  |
| 7                                               | Non Patent Literature                              | MCI_4-6-2004.pdf                                | 177564                                   | no               | 3                |
|                                                 |                                                    |                                                 | 2826049fa34405b64f726982e64a2fb306e4177e |                  |                  |
| Warnings:                                       |                                                    |                                                 |                                          |                  |                  |
| Information:                                    |                                                    |                                                 |                                          |                  |                  |
| 8                                               | Non Patent Literature                              | Moffett-etal_1990.pdf                           | 60101                                    | no               | 17               |
|                                                 |                                                    |                                                 | 31462942471927e28a62f7301d82ac0059ee87   |                  |                  |
| Warnings:                                       |                                                    |                                                 |                                          |                  |                  |
| Information:                                    |                                                    |                                                 |                                          |                  |                  |

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| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Non Patent Literature | Sygate-Technologies_2-24-2004.pdf | 111466<br>b40cbb3d0137c87c1843a9b607aadba3695337ac | no | 2 |
| Warnings:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |                                   |                                                    |    |   |
| Information:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |                                   |                                                    |    |   |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Non Patent Literature | Wolthusen_2001.pdf                | 150904<br>1ba62d4d94acb3d59136c683b2f39fabba5391b  | no | 8 |
| Warnings:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |                                   |                                                    |    |   |
| Information:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |                                   |                                                    |    |   |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Non Patent Literature | Yu_1989.pdf                       | 535874<br>73e9232ff1102bdaa7eae673d7752f0518e6aa91 | no | 8 |
| Warnings:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |                                   |                                                    |    |   |
| Information:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |                                   |                                                    |    |   |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Fee Worksheet (SB06)  | fee-info.pdf                      | 30361<br>d2ab8bf9e72e7aa6e1e287e90362735296e1bd76  | no | 2 |
| Warnings:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                       |                                   |                                                    |    |   |
| Information:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |                                   |                                                    |    |   |
| Total Files Size (in bytes):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |                                   | 6153369                                            |    |   |
| <p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b><br/>If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b><br/>If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b><br/>If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p> |                       |                                   |                                                    |    |   |

**IN THE  
UNITED STATES PATENT AND TRADEMARK OFFICE**

APPLICANT: LUM, Stacey  
APPLICATION NO.: 13/523,854  
FILED: June 14, 2012  
TITLE: SYSTEMS AND METHODS FOR CONTROLLING  
NETWORK ACCESS  
CONFIRMATION NO.: 3097  
EXAMINER: HOSUK, Song  
GROUP ART UNIT: 2435  
ATTY.DKT.NO.: 5532.01C1

---

**TRANSMITTAL OF INFORMATION DISCLOSURE STATEMENT  
Under 37 C.F.R. §§ 1.56, and 1.97-1.98**

SIR:

Pursuant to the provisions of 37 C.F.R. §§ 1.56 and 1.97-98 of the Rules of Practice in Patent Cases, enclosed herewith is form PTO-SB-08 listing several references. The Examiner is requested to make these references of official record in the application. The references cited may be material to examination of the application and are submitted in compliance with Applicant's duty of disclosure as defined by 37 C.F.R. § 1.56. Copies of foreign patents and non-patent literature are submitted with this filing.

No representation is made or intended as to the completeness of this list, nor is the inclusion of any reference on this list an admission that it is prior art or pertinent to this application. The documents included in this IDS are the result of a recently performed professional search by Cardinal IP. The document "Cardinal IP Search

Results for IDS" includes representations made by the searcher as to sections of the cited art that may be most relevant. The Applicants make no representation as to the accuracy or completeness of the searcher's representations.

Pursuant to 37 C.F.R. § 1.97(c), the Applicant submits herewith the fee set forth in § 1.17(p). If additional fees are determined to be due, Commissioner is hereby authorized to charge such additional fees, or credit any overpayment to Account Number 16-1331.

Respectfully submitted,  
Stacey Lum

Dated: September 6, 2013

By: /Steven M. Colby, 50,250/  
Steven M. Colby, Reg. No. 50,250  
Peters Verny, LLP  
425 Sherman Ave. Suite 230  
Palo Alto, CA 94306  
650-324-1677  
650-324-1678 FAX



# UNITED STATES PATENT AND TRADEMARK OFFICE

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## NOTICE OF ALLOWANCE AND FEE(S) DUE

23308 7590 09/18/2013  
PETERS VERNY, L.L.P.  
425 SHERMAN AVENUE  
SUITE 230  
PALO ALTO, CA 94306

|             |              |
|-------------|--------------|
| EXAMINER    |              |
| SONG, HOSUK |              |
| ART UNIT    | PAPER NUMBER |
| 2435        |              |

DATE MAILED: 09/18/2013

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 13/523,854      | 06/14/2012  | Stacey C. Lum        | 5532.01             | 3097             |

TITLE OF INVENTION: SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS

| APPLN. TYPE    | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE   |
|----------------|---------------|---------------|---------------------|----------------------|------------------|------------|
| nonprovisional | SMALL         | \$890         | \$300               | \$0                  | \$1190           | 12/18/2013 |

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

### HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

# PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail Stop ISSUE FEE**  
**Commissioner for Patents**  
**P.O. Box 1450**  
**Alexandria, Virginia 22313-1450**  
**or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23308 7590 09/18/2013  
**PETERS VERNY, L.L.P.**  
**425 SHERMAN AVENUE**  
**SUITE 230**  
**PALO ALTO, CA 94306**

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

## Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

|                    |
|--------------------|
| (Depositor's name) |
| (Signature)        |
| (Date)             |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 13/523,854      | 06/14/2012  | Stacey C. Lum        | 5532.01             | 3097             |

TITLE OF INVENTION: SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS

| APPLN. TYPE    | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE   |
|----------------|---------------|---------------|---------------------|----------------------|------------------|------------|
| nonprovisional | SMALL         | \$890         | \$300               | \$0                  | \$1190           | 12/18/2013 |

| EXAMINER    | ART UNIT | CLASS-SUBCLASS |
|-------------|----------|----------------|
| SONG, HOSUK | 2435     | 726-001000     |

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev. 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 \_\_\_\_\_
- (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 \_\_\_\_\_
- 3 \_\_\_\_\_

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies \_\_\_\_\_

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number \_\_\_\_\_ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

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NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

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Authorized Signature \_\_\_\_\_

Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_

Registration No. \_\_\_\_\_

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This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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|                                                                                                         |             |                      |                         |                  |
|---------------------------------------------------------------------------------------------------------|-------------|----------------------|-------------------------|------------------|
| APPLICATION NO.                                                                                         | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.     | CONFIRMATION NO. |
| 13/523,854                                                                                              | 06/14/2012  | Stacey C. Lum        | 5532.01                 | 3097             |
| 23308 7590 09/18/2013<br>PETERS VERNY, L.L.P.<br>425 SHERMAN AVENUE<br>SUITE 230<br>PALO ALTO, CA 94306 |             |                      | EXAMINER<br>SONG, HOSUK |                  |
|                                                                                                         |             |                      | ART UNIT<br>2435        | PAPER NUMBER     |

DATE MAILED: 09/18/2013

## Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

## Privacy Act Statement

**The Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

|                               |                                      |                                   |                                                  |
|-------------------------------|--------------------------------------|-----------------------------------|--------------------------------------------------|
| <b>Notice of Allowability</b> | <b>Application No.</b><br>13/523,854 | <b>Applicant(s)</b><br>LUM ET AL. |                                                  |
|                               | <b>Examiner</b><br>Hosuk Song        | <b>Art Unit</b><br>2435           | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment filed on 7/17/13.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-23. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
**Certified copies:**  
a) ☐ All    b) ☐ Some    \*c) ☐ None of the:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).  
\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.  
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.  
**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

|                                                                                                                            |                                                                           |
|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)                                                           | 5. <input type="checkbox"/> Examiner's Amendment/Comment                  |
| 2. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date <u>9/6/13</u> | 6. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| 3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material                    | 7. <input type="checkbox"/> Other _____                                   |
| 4. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____                                      |                                                                           |

|                                                 |  |
|-------------------------------------------------|--|
| /Hosuk Song/<br>Primary Examiner, Art Unit 2435 |  |
|-------------------------------------------------|--|

## EAST Search History

## EAST Search History (Prior Art)

| Ref # | Hits | Search Query                                                                                                                                                                                                                                        | DBs                                         | Default Operator | Plurals | Time Stamp       |
|-------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------|---------|------------------|
| S112  | 13   | (edit\$4 or config\$8 or reconfig\$7 or chang\$7 or modif\$7) near6 (access adj3 point or AP) same (authenticat\$4 or validat\$4) near5 (device or computer) same gatekeeper                                                                        | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/09/06 10:51 |
| S113  | 446  | (edit\$4 or config\$8 or reconfig\$7 or chang\$7 or modif\$7) near6 (access adj3 point or AP) same (authenticat\$4 or validat\$4) and EAP                                                                                                           | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/09/06 10:53 |
| S114  | 1976 | (access adj3 point or AP) same (authenticat\$4 or validat\$4) and EAP                                                                                                                                                                               | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/09/06 10:55 |
| S115  | 1259 | (access adj3 point or AP) same (authenticat\$4 or validat\$4) same EAP                                                                                                                                                                              | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/09/06 11:16 |
| S116  | 226  | (access adj3 point or AP) near6 (reconfig\$9 or chang\$4 or modif\$7 or updat\$5 or edit\$4) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule)            | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/09/06 11:17 |
| S117  | 1559 | (access adj3 point or AP) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule)                                                                               | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/09/06 11:17 |
| S118  | 54   | (access adj3 point or AP) near6 (reconfig\$9 or chang\$4 or modif\$7 or updat\$5 or edit\$4) same (authenticat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and (VLAN) | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/09/06 11:18 |
| S119  | 221  | (access adj3 point or AP) near6 (reconfig\$9 or chang\$4 or modif\$7 or updat\$5 or edit\$4) same (authenticat\$4 or validat\$4 or verif\$9) and (policy or parameter or rule or access adj3 control\$4) and (firewall or gatekeep\$4)              | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/09/06 11:19 |
| S120  | 4572 | 726/1.ccls.                                                                                                                                                                                                                                         | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR               | ON      | 2013/09/06 11:20 |

|      |      |               |                                                         |    |    |                     |
|------|------|---------------|---------------------------------------------------------|----|----|---------------------|
| S121 | 4330 | 726/2.ccls.   | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:20 |
| S122 | 4774 | 726/3.ccls.   | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:21 |
| S123 | 6320 | 726/4.ccls.   | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:23 |
| S124 | 1817 | 726/11.ccls.  | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:23 |
| S125 | 1617 | 726/12.ccls.  | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:24 |
| S126 | 1119 | 726/15.ccls.  | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:24 |
| S127 | 2821 | 713/150.ccls. | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:24 |
| S128 | 2549 | 713/153.ccls. | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:25 |
| S129 | 2607 | 713/155.ccls. | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:25 |
| S130 | 6801 | 713/168.ccls. | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:25 |
| S131 | 2555 | 380/270.ccls. | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:25 |
| S132 | 7949 | 709/220.ccls. | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:25 |

|      |       |                                                                                                                                                                                                         |                                                         |    |    |                     |
|------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----|----|---------------------|
| S133 | 3791  | 709/221.ccls.                                                                                                                                                                                           | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:27 |
| S134 | 18735 | 709/223.ccls.                                                                                                                                                                                           | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:27 |
| S135 | 21698 | 709/224.ccls.                                                                                                                                                                                           | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:28 |
| S136 | 8366  | 709/225.ccls.                                                                                                                                                                                           | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:29 |
| S137 | 11811 | 709/227.ccls.                                                                                                                                                                                           | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:29 |
| S138 | 6663  | 709/228.ccls.                                                                                                                                                                                           | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:29 |
| S139 | 169   | (edit\$4 or config\$8 or reconfig\$7 or<br>chang\$7 or modif\$7) near6 (access<br>adj3 point or AP) same (authenticat\$4<br>or validat\$4) and EAP                                                      | USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB              | OR | ON | 2013/09/06<br>11:30 |
| S140 | 473   | (edit\$4 or config\$8 or reconfig\$7 or<br>chang\$7 or modif\$7) near6 (access<br>adj3 point or AP) same (authenticat\$4<br>or validat\$4) and (EAP or extensible<br>adj5 authentication adj4 protocol) | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:31 |
| S141 | 53    | (access adj3 point or AP) same<br>(authenticat\$4 or validat\$4 or verif\$9)<br>and (EAP or extensible adj4<br>authentication adj6 protocol) and<br>(policy or parameter or rule) and<br>726/1.ccls.    | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:31 |
| S142 | 56    | (access adj3 point or AP) same<br>(authenticat\$4 or validat\$4 or verif\$9)<br>and (EAP or extensible adj4<br>authentication adj6 protocol) and<br>(policy or parameter or rule) and<br>726/2.ccls.    | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:34 |
| S143 | 114   | (access adj3 point or AP) same<br>(authenticat\$4 or validat\$4 or verif\$9)<br>and (EAP or extensible adj4<br>authentication adj6 protocol) and<br>(policy or parameter or rule) and<br>726/3.ccls.    | US-PGPUB;<br>USPAT;<br>EPO; JPO;<br>DERWENT;<br>IBM_TDB | OR | ON | 2013/09/06<br>11:35 |
| S144 | 107   | (access adj3 point or AP) same<br>(authenticat\$4 or validat\$4 or verif\$9)<br>and (EAP or extensible adj4                                                                                             | US-PGPUB;<br>USPAT;<br>EPO; JPO;                        | OR | ON | 2013/09/06<br>11:37 |

|      |     |                                                                                                                                                                                         |                                             |    |    |                  |
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|      |     | authentication adj6 protocol) and (policy or parameter or rule) and 726/4.ccls.                                                                                                         | DERWENT; IBM_TDB                            |    |    |                  |
| S145 | 11  | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 726/11.ccls.  | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 11:38 |
| S146 | 19  | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 726/12.ccls.  | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 11:39 |
| S147 | 18  | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 726/15.ccls.  | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 11:40 |
| S148 | 17  | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 713/150.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 12:07 |
| S149 | 31  | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 713/153.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 12:49 |
| S150 | 53  | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 713/155.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 14:09 |
| S151 | 126 | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 713/168.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 14:10 |
| S152 | 84  | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 380/270.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 14:17 |
| S153 | 21  | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 709/220.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 14:17 |
| S154 | 7   | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4                                                                                   | US-PGPUB; USPAT; EPO; JPO;                  | OR | ON | 2013/09/06 14:18 |

|      |    |                                                                                                                                                                                         |                                             |    |    |                  |
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|      |    | authentication adj6 protocol) and (policy or parameter or rule) and 709/221.ccls.                                                                                                       | DERWENT; IBM_TDB                            |    |    |                  |
| S155 | 29 | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 709/223.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 14:31 |
| S156 | 28 | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 709/224.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 14:33 |
| S157 | 45 | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 709/225.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 14:33 |
| S158 | 32 | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 709/227.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 14:33 |
| S159 | 31 | (access adj3 point or AP) same (authentikat\$4 or validat\$4 or verif\$9) and (EAP or extensible adj4 authentication adj6 protocol) and (policy or parameter or rule) and 709/228.ccls. | US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB | OR | ON | 2013/09/06 14:34 |
| S160 | 3  | (EAP and audit and agent and security and policy and (authentikat\$4 or verif\$9 or validat\$4) and request\$4).CLM.                                                                    | US-PGPUB; USPAT                             | OR | ON | 2013/09/06 14:36 |
| S161 | 3  | (EAP and audit and agent and security and policy and (authentikat\$4 or verif\$9 or validat\$4) and subset).CLM.                                                                        | US-PGPUB; USPAT                             | OR | ON | 2013/09/06 14:37 |

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☐ in expanded formResult page: [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [next](#)**1** [A security architecture for protecting LAN interactions](#)[Andre Zugusta, Hugo Marques](#)

August 2006

**ISC'06:** Proceedings of the 9th international conference on Information Security**Publisher:** Springer-VerlagFull text available: [Publisher Site](#)**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

This paper describes a security architecture for a LAN. The architecture uses the 802.1X access control mechanisms and is supported by a Key Distribution Centre built upon an 802.1X Authentication Server. The K is used, together with a new host identification ...

**2** [Cisco Network Admission Control, Volume I: NAC Framework Architecture and Design \(Networking Technology\)](#)[Denise Helfrich, Lou Renna, Jason Frazier, Paul Forbes](#)

December 2006 Cisco Network Admission Control, Volume I: NAC Framework Architecture and Design (Networking Technology)

**Publisher:** Cisco PressFull text available: [Safari Online Book](#)**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

Cisco Network Admission Control Volume I: NAC Framework Architecture and Design A guide to endpoint compliance enforcement Today, a variety of security challenges affect all businesses regardless of size and location. Companies face ongoing challenges with ...

**3** [Using secure coprocessors to enforce network access policies in enterprise and ad hoc networks](#)[Haifeng Xia](#)

January 2008

Using secure coprocessors to enforce network access policies in enterprise and ad hoc networks

**Publisher:** University of Pittsburgh**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

Nowadays, network security is critically important. Enterprises rely on networks to improve their business. However, network security breaches may cause them loss of millions of dollars. Ad hoc networks, which enable computers to communicate wirelessly ...

**4** [Research trend on secure SCADA network technology and methods](#)[Farkhod Alisherov, Taihoon Kim](#)

August 2010

**WSEAS Transactions on Systems and Control**, Volume 5 Issue 8**Publisher:** World Scientific and Engineering Academy and Society (WSEAS)**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

The overall security concern facing the designers and operators of SCADA and, more generally, of industrial control systems typically originates either from malicious threat agents attempting to disrupt the control system operation, e.g. to create a ...

**Keywords:** SCADA security, SCADA systems, secure SCADA networks**5** [Protection of LAN-wide, P2P interactions: a holistic approach](#)[Andre Zugusta](#)

August 2009

**International Journal of Communication Networks and Distributed Systems**, Volume Issue 4**Publisher:** Inderscience Publishers**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

This article advocates the need of a holistic approach to protect LAN interactions and presents a solution for implementing it based on secure LAN (SLAN), a novel security architecture. SLAN uses the 802.1X access control mechanisms and is supported ...

**Keywords:** 8021X framework, P2P security associations, SLAN architecture, holistic LAN security, host identification, local area networks, message authentication, network security, peer, peer-to-, resource allocation, secure LANs, secure communication networks

6 [EAP using the split password-based authenticated key agreement](#)

[Jongho Ryu](#)

August 2006 **WISA'06:** Proceedings of the 7th international conference on Information security applications: Part 1

**Publisher:** Springer-Verlag

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count: 0

EAP (Extensible Authentication Protocol) provides authentication for each entity based on IEEE Std 802.1X wireless Local Area Networks and RADIUS/DIAMETER protocol and uses authentication certificates, passwords and dual schemes (e.g., password and ...)

7 [Security and trust in virtual healthcare communities](#)

 [Anargyros Chrysanthou, Iraklis Varlamis, Charikieia Latsiou](#)

June 2009 **PETRA '09:** Proceedings of the 2nd International Conference on Pervasive Technologies Related to Assistive Environments

**Publisher:** ACM [Request Permissions](#)

Full text available:  PDF (602.49 KB)

**Bibliometrics:** Downloads (6 Weeks): 11, Downloads (12 Months): 85, Downloads (Overall): 604, Citation Count: 5

The main purpose of a virtual healthcare community is to enforce members' collaboration and allow them collectively conduct health care activities. Patient monitoring and medical consultation and support are the most popular activities inside health ...

**Keywords:** health care, security, teleconsultation, trust, virtual communities

8 [Network selection and discovery of service information in public WLAN hotspots](#)

 [Yui-Wah Lee](#)

October 2004 **WMASH '04:** Proceedings of the 2nd ACM international workshop on Wireless mobile applications and services on WLAN hotspots

**Publisher:** ACM [Request Permissions](#)

Full text available:  PDF (276.09 KB)

**Bibliometrics:** Downloads (6 Weeks): 6, Downloads (12 Months): 44, Downloads (Overall): 715, Citation Count: 5

In a public WLAN hotspot, a roaming mobile terminal (MT) may be within radio range of more than one access point (AP), each of which may or may not have roaming agreements with the service provider of the user of the MT. In this case, the MT may need ...

**Keywords:** Wi-Fi, discovery of service information, network selection, public WLAN hotspots, roaming

9 [Implementation of a Secure Wireless Communication Technology in a Highly Mobile Organisation: Challenges and Issues](#)

[Keyurkumar J. Patel, Steve McCubben](#)

November 2005 **Wireless Personal Communications: An International Journal**, Volume 35 Issue 3

**Publisher:** Kluwer Academic Publishers

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count: 0

Wireless Technology is growing at an alarming rate with increased security being the main challenge for developers and end users. This study presents after tackling initial challenges and issues faced during the implementation of wireless technology, ...

**Keywords:** and wireless applications, wireless networks, wireless security, wlan, wvoip

10 [Authentication: Authentication across the airwaves](#)

Adrian Davis  
February 2007

**Network Security**, Volume 2007 Issue 2

**Publisher:** Elsevier Science Publishers B. V.

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

Authentication of users and devices lies at the heart of network security. Organizations have spent a lot of time and money trying to prove that people are who they claim to be, which is the basis of authentication. It is one of the most challenging ...

**11** Wireless handoff optimization: a comparison of IEEE 802.11r and HOKEY

Kashif Nizam Khan, Anai Benana

June 2010 **EUNICE'10: Proceedings of the 16th EUNICE/IFIP WG 6.6 conference on Networked services and applications: engineering, control and management**

**Publisher:** Springer-Verlag

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

IEEE 802.11 or Wi-Fi has long been the most widely deployed technology for wireless broadband Internet access yet it is increasingly facing competition from other technologies such as packet-switched cellular data. End user expectations and demands ...

**12** Data diodes in support of trustworthy cyber infrastructure

Hamed Okhravi, Fredrick L. Sheldon



April 2010 **CSII RW '10: Proceedings of the Sixth Annual Workshop on Cyber Security and Information Intelligence Research**

**Publisher:** ACM [Request Permissions](#)

Full text available: [PDF](#) (235.28 KB)

**Bibliometrics:** Downloads (6 Weeks): 3, Downloads (12 Months): 28, Downloads (Overall): 109, Citation Count:

Interconnections between process control networks and enterprise networks has resulted in the proliferation of standard communication protocols in industrial control systems which exposes instrumentation, control system and the critical infrastructure ...

**Keywords:** data diodes, industrial control systems, trusted process control networks

**13** VoIP: A comprehensive survey on a promising technology

Stylianos Karapantazis, Fotini-Niovi Pavlidou

August 2009 **Computer Networks: The International Journal of Computer and Telecommunications Networking**, Volume 53 Issue 12

**Publisher:** Elsevier North-Holland, Inc.

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

The Internet has burgeoned into a worldwide information superhighway during the past few years, giving rise to a host of new applications and services. Among them, Voice over IP (VoIP) is the most prominent one. Beginning more as a frolic among computer ...

**Keywords:** Call admission control, IP Telephony, Security, Signaling protocols, VoIP, Voice codecs, Voice quality

**14** Wireless mesh network security: A traffic engineering management approach

Okechukwu E. Muegillim, Kok-Keong Lee, Richard Comley

March 2011 **Journal of Network and Computer Applications**, Volume 34 Issue 2

**Publisher:** Academic Press Ltd.

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

The wireless mesh network (WMN) is an emerging multihop, heterogeneous, easily scalable and low cost network. The architecture of the WMN is a connectionless-oriented, mobile and dynamic traffic of routed packets. The mesh infrastructure environment ...

**Keywords:** IPSec, MPLS, Security, Traffic engineering, VPN, Wireless mesh networks

**15** Data center evolution

Krishna Kani

December 2009 **Computer Networks: The International Journal of Computer and Telecommunications Networking**, Volume 53 Issue 17

**Publisher:** Elsevier North-Holland, Inc.

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

Data centers form a key part of the infrastructure upon which a variety of information technology services are built. As data centers continue to grow in size and complexity, it is desirable to understand aspects of their design that are worthy of carrying ...

**Keywords:** Data center, Ethernet, InfiniBand, Power management, Solid state storage, Virtualization

16 Multicast receiver access control by IGMP-AC

Salekul Islam, J. William Atwood

May 2009 **Computer Networks: The International Journal of Computer and Telecommunications Networking**, Volume 53 Issue 7

**Publisher:** Elsevier North-Holland, Inc.

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

IP multicast is best-known for its bandwidth conservation and lower resource utilization. The present service model of multicast makes it difficult to restrict access to authorized End Users (EUs) or paying customers. Without an effective receiver access ...

**Keywords:** AAA, AAAS, AH, AR, ASM, Authentication Authorization and Accounting (AAA), BGP, BR, CR, DDT, DoS, EAP, ESP, EU, Extensible Authentication Protocol (EAP), GKM, HAAAS, IETF, IGMP, IGMP-AC, IKE, IPsec, Internet Group Management Protocol (IGMP), LAAAS, MitM, NAI, NAS, NSP, PANA, PIM, Receiver access control, SA, SSM, Secure multicasting

17 An orchestration approach for unwanted Internet traffic identification

Eduardo Fattosa, Eduardo Souto, Djamel H. Sadok

August 2012 **Computer Networks: The International Journal of Computer and Telecommunications Networking**, Volume 56 Issue 12

**Publisher:** Elsevier North-Holland, Inc.

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

A simple examination of Internet traffic shows a wide mix of relevant and unwanted traffic. The latter is becoming increasingly harmful to network performance and service availability, while often consuming precious network and processing resources. ...

**Keywords:** Alert correlation, Dempster-Shafer Theory, Frequent episodes discovery, Orchestration, Unwanted Internet traffic

18 On the impact of quality of protection in wireless local area networks with IP mobility

Avesh K. Agarwal, Wanyu Wang

January 2007 **Mobile Networks and Applications**, Volume 12 Issue 1

**Publisher:** Kluwer Academic Publishers

Full text available: PDF (570.49 KB)

**Bibliometrics:** Downloads (6 Weeks): 2, Downloads (12 Months): 41, Downloads (Overall): 1206, Citation Count:

Wireless local area networks (LANs) are vulnerable to malicious attacks due to their shared medium in unlicensed frequency spectrum, thus requiring security features for a variety of applications even at the cost of quality of service (QoS). However, ...

**Keywords:** mobile IP, performance analysis, quality of protection, quality of service, security protocols, wireless local area networks

19 Review: Cognitive radio network security: A survey

Sazia Parvin, Farooq Khadeer Hussain, Omar Khadeer Hussain, Song Han, Binming Tian, Elizabeth Chang

November 2012 **Journal of Network and Computer Applications**, Volume 35 Issue 6

**Publisher:** Academic Press Ltd.

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

Recent advancements in wireless communication are creating a spectrum shortage problem on a daily basis. Recently, Cognitive Radio (CR), a novel technology, has attempted to minimize this problem by dynamically utilizing the free spectrum in wireless communications ...

**Keywords:** Attacks, Primary users, Radio, Secondary users, Security, Trust

20 Security versus convenience? An experimental study of user misperceptions of wireless internet service quality

Eyung Cho Kim, Yong Wan Park

April 2012 **Decision Support Systems**, Volume 53 Issue 1

**Publisher:** Elsevier Science Publishers B. V.

**Bibliometrics:** Downloads (6 Weeks): n/a, Downloads (12 Months): n/a, Downloads (Overall): n/a, Citation Count

This paper demonstrates that consumers make incorrect inferences about security/convenience tradeoff. We find the evidence that consumers tend to infer unobservable security quality from observable convenience and that their inferences are not always ...

**Keywords:** Inference making, Information security, Security engineering, Security/convenience tradeoff

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| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><br>(Use as many sheets as necessary) |   | Application Number       | 13523854       |
|                                                                                                   |   | Filing Date              | June 14, 2012  |
|                                                                                                   |   | First Named Inventor     | LUM, Stacey C. |
|                                                                                                   |   | Art Unit                 | 2435           |
|                                                                                                   |   | Examiner Name            |                |
| Sheet                                                                                             | 1 | of                       | 4              |
|                                                                                                   |   | Attorney Docket Number   | 5532.00        |

| U.S. PATENT DOCUMENTS |          |                                            |      |                                |                                                    |                                                                                 |
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| /H.S./                   | 20       | WO                           | 2000056027 - A1                                       | 09-21-2000                     | BACIC, Eugen                                       |                                                                                 |
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| Examiner Signature | /Hosuk Song/ | Date Considered | 09/07/2013 |
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|                                                                                                                                               |   |    |   | Application Number       | 13523854       |
|                                                                                                                                               |   |    |   | Filing Date              |                |
|                                                                                                                                               |   |    |   | First Named Inventor     | LUM, Stacey C. |
|                                                                                                                                               |   |    |   | Art Unit                 | 2435           |
|                                                                                                                                               |   |    |   | Examiner Name            |                |
|                                                                                                                                               |   |    |   | Attorney Docket Number   | 5532.00        |
| Sheet                                                                                                                                         | 2 | of | 4 |                          |                |

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|                       |          | Number - Kind Code <sup>2</sup> (if known) |                                |                                                    |                                                                                 |
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Sheet 3 of 4

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|------------------------|----------------|
| Application Number     | 13523854       |
| Filing Date            |                |
| First Named Inventor   | LIJ, Stacey C. |
| Art Unit               | 2435           |
| Examiner Name          |                |
| Attorney Docket Number | 5532.00        |

**U.S. PATENT DOCUMENTS**

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|                                                                                                                                               |   |    |   | Filing Date              |                |
|                                                                                                                                               |   |    |   | First Named Inventor     | LUM, Stacey C. |
|                                                                                                                                               |   |    |   | Art Unit                 | 2435           |
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| Sheet                                                                                                                                         | 4 | of | 4 | Attorney Docket Number   | 5532.00        |

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|------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------|
| <b>Issue Classification</b><br> | <b>Application/Control No.</b><br>13523854 | <b>Applicant(s)/Patent Under Reexamination</b><br>LUM ET AL. |
|                                                                                                                  | <b>Examiner</b><br>HOSUK SONG              | <b>Art Unit</b><br>2435                                      |

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| NONE                                            | <b>Total Claims Allowed:</b><br>23 |                          |
| (Assistant Examiner)                            | (Date)                             |                          |
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| (Primary Examiner)                              | (Date)                             | O.G. Print Figure<br>2   |



|                                                                                                                  |                                            |                                                              |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------|
| <b>Issue Classification</b><br> | <b>Application/Control No.</b><br>13523854 | <b>Applicant(s)/Patent Under Reexamination</b><br>LUM ET AL. |
|                                                                                                                  | <b>Examiner</b><br>HOSUK SONG              | <b>Art Unit</b><br>2435                                      |

| <input type="checkbox"/> Claims renumbered in the same order as presented by applicant <input type="checkbox"/> CPA <input type="checkbox"/> T.D. <input type="checkbox"/> R.1.47 |          |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|----------|-------|----------|
| Final                                                                                                                                                                             | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original |
| 1                                                                                                                                                                                 | 1        | 17    | 17       |       |          |       |          |       |          |       |          |       |          |       |          |
| 2                                                                                                                                                                                 | 2        | 18    | 18       |       |          |       |          |       |          |       |          |       |          |       |          |
| 3                                                                                                                                                                                 | 3        | 19    | 19       |       |          |       |          |       |          |       |          |       |          |       |          |
| 4                                                                                                                                                                                 | 4        | 20    | 20       |       |          |       |          |       |          |       |          |       |          |       |          |
| 5                                                                                                                                                                                 | 5        | 21    | 21       |       |          |       |          |       |          |       |          |       |          |       |          |
| 6                                                                                                                                                                                 | 6        | 22    | 22       |       |          |       |          |       |          |       |          |       |          |       |          |
| 7                                                                                                                                                                                 | 7        | 23    | 23       |       |          |       |          |       |          |       |          |       |          |       |          |
| 8                                                                                                                                                                                 | 8        |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 9                                                                                                                                                                                 | 9        |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 10                                                                                                                                                                                | 10       |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 11                                                                                                                                                                                | 11       |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 12                                                                                                                                                                                | 12       |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 13                                                                                                                                                                                | 13       |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 14                                                                                                                                                                                | 14       |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 15                                                                                                                                                                                | 15       |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 16                                                                                                                                                                                | 16       |       |          |       |          |       |          |       |          |       |          |       |          |       |          |

|                                                 |                                    |                          |
|-------------------------------------------------|------------------------------------|--------------------------|
| NONE                                            | <b>Total Claims Allowed:</b><br>23 |                          |
| (Assistant Examiner)                            | (Date)                             |                          |
| /HOSUK SONG/<br>Primary Examiner. Art Unit 2435 | 9/6/13                             | O.G. Print Claim(s)<br>1 |
| (Primary Examiner)                              | (Date)                             | O.G. Print Figure<br>2   |

|                                                                                                                    |                                            |                                                              |
|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------|
| <b><i>Index of Claims</i></b><br> | <b>Application/Control No.</b><br>13523854 | <b>Applicant(s)/Patent Under Reexamination</b><br>LUM ET AL. |
|                                                                                                                    | <b>Examiner</b><br>HOSUK SONG              | <b>Art Unit</b><br>2435                                      |

|   |          |   |            |   |              |   |          |
|---|----------|---|------------|---|--------------|---|----------|
| ✓ | Rejected | - | Cancelled  | N | Non-Elected  | A | Appeal   |
| = | Allowed  | ÷ | Restricted | I | Interference | O | Objected |

| <input type="checkbox"/> Claims renumbered in the same order as presented by applicant |          |            |            |  |  |  |  |  |  | <input type="checkbox"/> CPA |  | <input type="checkbox"/> T.D. |  | <input type="checkbox"/> R.1.47 |  |
|----------------------------------------------------------------------------------------|----------|------------|------------|--|--|--|--|--|--|------------------------------|--|-------------------------------|--|---------------------------------|--|
| CLAIM                                                                                  |          | DATE       |            |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| Final                                                                                  | Original | 04/11/2013 | 09/06/2013 |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 1                                                                                      | 1        | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 2                                                                                      | 2        | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 3                                                                                      | 3        | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 4                                                                                      | 4        | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 5                                                                                      | 5        | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 6                                                                                      | 6        | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 7                                                                                      | 7        | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 8                                                                                      | 8        | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 9                                                                                      | 9        | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 10                                                                                     | 10       | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 11                                                                                     | 11       | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 12                                                                                     | 12       | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 13                                                                                     | 13       | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 14                                                                                     | 14       | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 15                                                                                     | 15       | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 16                                                                                     | 16       | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 17                                                                                     | 17       | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 18                                                                                     | 18       | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 19                                                                                     | 19       | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 20                                                                                     | 20       | ✓          | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 21                                                                                     | 21       |            | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 22                                                                                     | 22       |            | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |
| 23                                                                                     | 23       |            | =          |  |  |  |  |  |  |                              |  |                               |  |                                 |  |

|                                                                                                              |                                                |                                                                  |
|--------------------------------------------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------------------------|
| <b>Search Notes</b><br><br> | <b>Application/Control No.</b><br><br>13523854 | <b>Applicant(s)/Patent Under Reexamination</b><br><br>LUM ET AL. |
|                                                                                                              | <b>Examiner</b><br><br>HOSUK SONG              | <b>Art Unit</b><br><br>2435                                      |

| CPC- SEARCHED |      |          |
|---------------|------|----------|
| Symbol        | Date | Examiner |
|               |      |          |

| CPC COMBINATION SETS - SEARCHED |      |          |
|---------------------------------|------|----------|
| Symbol                          | Date | Examiner |
|                                 |      |          |

| US CLASSIFICATION SEARCHED |                         |        |          |
|----------------------------|-------------------------|--------|----------|
| Class                      | Subclass                | Date   | Examiner |
| 726                        | 1-4,11-12,15            | 9/6/13 | HS       |
| 713                        | 150,153,155,168         | 9/6/13 | HS       |
| 380                        | 270                     | 9/6/13 | HS       |
| 709                        | 220-221,223-225,227-228 | 9/6/13 | HS       |

| SEARCH NOTES                                    |        |          |
|-------------------------------------------------|--------|----------|
| Search Notes                                    | Date   | Examiner |
| EAST, foreign patent database, IBM TDB, USPGPUB | 9/6/13 | HS       |
| NPL                                             | 9/6/13 | HS       |

| INTERFERENCE SEARCH     |                         |        |          |
|-------------------------|-------------------------|--------|----------|
| US Class/<br>CPC Symbol | US Subclass / CPC Group | Date   | Examiner |
| 726                     | 1-4,11-12,15            | 9/6/13 | HS       |
| 713                     | 150,153,155,168         | 9/6/13 | HS       |
| 380                     | 270                     | 9/6/13 | HS       |
| 709                     | 220-221,223-225,227-228 | 9/6/13 | HS       |

|  |  |
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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
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INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23308 7590 09/18/2013  
PETERS VERNY, L.L.P.  
425 SHERMAN AVENUE  
SUITE 230  
PALO ALTO, CA 94306

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

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I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

|                    |
|--------------------|
| (Depositor's name) |
| (Signature)        |
| (Date)             |

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 13/523,854      | 06/14/2012  | Stacey C. Lum        | 5532.01             | 3097             |

TITLE OF INVENTION: SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS

| APPLN. TYPE    | ENTITY STATUS | ISSUE FEE DUE | PUBLICATION FEE DUE | PREV. PAID ISSUE FEE | TOTAL FEE(S) DUE | DATE DUE   |
|----------------|---------------|---------------|---------------------|----------------------|------------------|------------|
| nonprovisional | SMALL         | \$890         | \$300               | \$0                  | \$1190           | 12/18/2013 |

| EXAMINER    | ART UNIT | CLASS-SUBCLASS |
|-------------|----------|----------------|
| SONG, HOSUK | 2435     | 726-001000     |

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.  
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively,  
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Peters Verny, LLP  
2 \_\_\_\_\_  
3 \_\_\_\_\_

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

InfoExpress, Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Mountain View, Calif.

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

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☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 161331 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☒ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

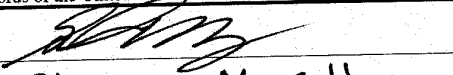
**NOTE:** Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

**NOTE:** If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

**NOTE:** Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

**NOTE:** The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature



Date

9/19/13

Typed or printed name

Steven M. Colby

Registration No.

50,250

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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| Electronic Patent Application Fee Transmittal |          |                                                   |        |                      |
|-----------------------------------------------|----------|---------------------------------------------------|--------|----------------------|
| Application Number:                           |          | 13523854                                          |        |                      |
| Filing Date:                                  |          | 14-Jun-2012                                       |        |                      |
| Title of Invention:                           |          | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |        |                      |
| First Named Inventor/Applicant Name:          |          | Stacey C. Lum                                     |        |                      |
| Filer:                                        |          | Steven M. Colby                                   |        |                      |
| Attorney Docket Number:                       |          | 5532.01                                           |        |                      |
| Filed as Small Entity                         |          |                                                   |        |                      |
| Utility under 35 USC 111(a) Filing Fees       |          |                                                   |        |                      |
| Description                                   | Fee Code | Quantity                                          | Amount | Sub-Total in USD(\$) |
| Basic Filing:                                 |          |                                                   |        |                      |
| Pages:                                        |          |                                                   |        |                      |
| Claims:                                       |          |                                                   |        |                      |
| Miscellaneous-Filing:                         |          |                                                   |        |                      |
| Petition:                                     |          |                                                   |        |                      |
| Patent-Appeals-and-Interference:              |          |                                                   |        |                      |
| Post-Allowance-and-Post-Issuance:             |          |                                                   |        |                      |
| Utility Appl Issue Fee                        | 2501     | 1                                                 | 890    | 890                  |
| Publ. Fee- Early, Voluntary, or Normal        | 1504     | 1                                                 | 300    | 300                  |

| Description        | Fee Code | Quantity | Amount | Sub-Total in USD(\$) |
|--------------------|----------|----------|--------|----------------------|
| Extension-of-Time: |          |          |        |                      |
| Miscellaneous:     |          |          |        |                      |
| Total in USD (\$)  |          |          |        | 1190                 |

| Electronic Acknowledgement Receipt   |                                                   |
|--------------------------------------|---------------------------------------------------|
| EFS ID:                              | 16907745                                          |
| Application Number:                  | 13523854                                          |
| International Application Number:    |                                                   |
| Confirmation Number:                 | 3097                                              |
| Title of Invention:                  | SYSTEMS AND METHODS OF CONTROLLING NETWORK ACCESS |
| First Named Inventor/Applicant Name: | Stacey C. Lum                                     |
| Customer Number:                     | 23308                                             |
| Filer:                               | Steven M. Colby                                   |
| Filer Authorized By:                 |                                                   |
| Attorney Docket Number:              | 5532.01                                           |
| Receipt Date:                        | 20-SEP-2013                                       |
| Filing Date:                         | 14-JUN-2012                                       |
| Time Stamp:                          | 02:05:19                                          |
| Application Type:                    | Utility under 35 USC 111(a)                       |

**Payment information:**

|                                                                                                                                                                                                                                                                                                                                                                                          |                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Submitted with Payment                                                                                                                                                                                                                                                                                                                                                                   | yes             |
| Payment Type                                                                                                                                                                                                                                                                                                                                                                             | Deposit Account |
| Payment was successfully received in RAM                                                                                                                                                                                                                                                                                                                                                 | \$1190          |
| RAM confirmation Number                                                                                                                                                                                                                                                                                                                                                                  | 7695            |
| Deposit Account                                                                                                                                                                                                                                                                                                                                                                          | 161331          |
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| <p>The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:</p> <p>Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)</p> <p>Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)</p> |                 |

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

# File Listing:

| Document Number | Document Description        | File Name                                 | File Size(Bytes)/ Message Digest                   | Multi Part /.zip | Pages (if appl.) |
|-----------------|-----------------------------|-------------------------------------------|----------------------------------------------------|------------------|------------------|
| 1               | Issue Fee Payment (PTO-85B) | InfoExpress-IssuePayment09192013_0000.pdf | 601943<br>314934579e846671cf9088c6d8bac57c79de6f48 | no               | 2                |

# Warnings:

# Information:

|   |                      |              |                                                   |    |   |
|---|----------------------|--------------|---------------------------------------------------|----|---|
| 2 | Fee Worksheet (SB06) | fee-info.pdf | 31766<br>ddba7cc6e13a5876cd3c5fafd01cb89e1eb48827 | no | 2 |
|---|----------------------|--------------|---------------------------------------------------|----|---|

# Warnings:

# Information:

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## New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

## National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

## New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

|                                                                                                                  |                                            |                                                              |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------|
| <b>Issue Classification</b><br> | <b>Application/Control No.</b><br>13523854 | <b>Applicant(s)/Patent Under Reexamination</b><br>LUM ET AL. |
|                                                                                                                  | <b>Examiner</b><br>HOSUK SONG              | <b>Art Unit</b><br>2435                                      |

| CPC    |      |         |
|--------|------|---------|
| Symbol | Type | Version |
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| CPC Combination Sets |      |     |         |         |
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| Symbol               | Type | Set | Ranking | Version |
|                      |      |     |         |         |
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|                                                 |                                    |                          |
|-------------------------------------------------|------------------------------------|--------------------------|
| NONE                                            | <b>Total Claims Allowed:</b><br>22 |                          |
| (Assistant Examiner)                            | (Date)                             |                          |
| /HOSUK SONG/<br>Primary Examiner. Art Unit 2435 | 9/6/13                             | O.G. Print Claim(s)<br>1 |
| (Primary Examiner)                              | (Date)                             | O.G. Print Figure<br>2   |

|                                                                                                                  |                                            |                                                              |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------|
| <b>Issue Classification</b><br> | <b>Application/Control No.</b><br>13523854 | <b>Applicant(s)/Patent Under Reexamination</b><br>LUM ET AL. |
|                                                                                                                  | <b>Examiner</b><br>HOSUK SONG              | <b>Art Unit</b><br>2435                                      |

| US ORIGINAL CLASSIFICATION |                                   |   |          |  |  | INTERNATIONAL CLASSIFICATION |   |   |   |                     |             |  |  |  |    |  |
|----------------------------|-----------------------------------|---|----------|--|--|------------------------------|---|---|---|---------------------|-------------|--|--|--|----|--|
| CLASS                      |                                   |   | SUBCLASS |  |  | CLAIMED                      |   |   |   |                     | NON-CLAIMED |  |  |  |    |  |
| 726                        |                                   |   | 1        |  |  | H                            | 0 | 4 | L | 9 / 00 (2006.01.01) |             |  |  |  |    |  |
| CROSS REFERENCE(S)         |                                   |   |          |  |  | H                            | 0 | 4 | L | 9 / 32 (2006.01.01) |             |  |  |  |    |  |
|                            |                                   |   |          |  |  |                              |   |   |   |                     |             |  |  |  |    |  |
| CLASS                      | SUBCLASS (ONE SUBCLASS PER BLOCK) |   |          |  |  |                              |   |   |   |                     |             |  |  |  |    |  |
| 726                        | 2                                 | 3 |          |  |  |                              |   |   |   |                     |             |  |  |  |    |  |
|                            |                                   |   |          |  |  |                              |   |   |   |                     |             |  |  |  |    |  |
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|------------------------------------------------|--------|------------------------------|-------------------|
| NONE                                           |        | <b>Total Claims Allowed:</b> |                   |
| (Assistant Examiner)                           | (Date) | 22                           |                   |
| /HOSUK SONG/<br>Primary Examiner.Art Unit 2435 | 9/6/13 | O.G. Print Claim(s)          | O.G. Print Figure |
| (Primary Examiner)                             | (Date) | 1                            | 2                 |

|                                                                                                                  |                                            |                                                              |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------|
| <b>Issue Classification</b><br> | <b>Application/Control No.</b><br>13523854 | <b>Applicant(s)/Patent Under Reexamination</b><br>LUM ET AL. |
|                                                                                                                  | <b>Examiner</b><br>HOSUK SONG              | <b>Art Unit</b><br>2435                                      |

| <input type="checkbox"/> <b>Claims renumbered in the same order as presented by applicant</b> <input type="checkbox"/> <b>CPA</b> <input type="checkbox"/> <b>T.D.</b> <input type="checkbox"/> <b>R.1.47</b> |          |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
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| Final                                                                                                                                                                                                         | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original | Final | Original |
| 1                                                                                                                                                                                                             | 1        | 22    | 17       |       |          |       |          |       |          |       |          |       |          |       |          |
| 2                                                                                                                                                                                                             | 2        | 17    | 18       |       |          |       |          |       |          |       |          |       |          |       |          |
| 3                                                                                                                                                                                                             | 3        | 18    | 19       |       |          |       |          |       |          |       |          |       |          |       |          |
| 4                                                                                                                                                                                                             | 4        | 19    | 20       |       |          |       |          |       |          |       |          |       |          |       |          |
| 8                                                                                                                                                                                                             | 5        | 7     | 21       |       |          |       |          |       |          |       |          |       |          |       |          |
| 9                                                                                                                                                                                                             | 6        | 20    | 22       |       |          |       |          |       |          |       |          |       |          |       |          |
| 10                                                                                                                                                                                                            | 7        | 21    | 23       |       |          |       |          |       |          |       |          |       |          |       |          |
| 11                                                                                                                                                                                                            | 8        |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 12                                                                                                                                                                                                            | 9        |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 13                                                                                                                                                                                                            | 10       |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 14                                                                                                                                                                                                            | 11       |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
|                                                                                                                                                                                                               | 12       |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 15                                                                                                                                                                                                            | 13       |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 16                                                                                                                                                                                                            | 14       |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
| 5                                                                                                                                                                                                             | 15       |       |          |       |          |       |          |       |          |       |          |       |          |       |          |
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| (Assistant Examiner)                            | (Date)                             |                          |
| /HOSUK SONG/<br>Primary Examiner. Art Unit 2435 | 9/6/13                             | O.G. Print Claim(s)<br>1 |
| (Primary Examiner)                              | (Date)                             | O.G. Print Figure<br>2   |

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| <b><i>Index of Claims</i></b><br> | <b>Application/Control No.</b><br>13523854 | <b>Applicant(s)/Patent Under Reexamination</b><br>LUM ET AL. |
|                                                                                                                    | <b>Examiner</b><br>HOSUK SONG              | <b>Art Unit</b><br>2435                                      |

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| CLAIM |          | DATE       |            |  |  |  |  |  |  |  |  |
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| Final | Original | 04/11/2013 | 09/06/2013 |  |  |  |  |  |  |  |  |
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| 4     | 4        | ✓          | =          |  |  |  |  |  |  |  |  |
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| APPLICATION NO.                                                                | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.             | CONFIRMATION NO.            |
|--------------------------------------------------------------------------------|-------------|----------------------|---------------------------------|-----------------------------|
| 13/523,854                                                                     | 06/14/2012  | Stacey C. Lum        | 5532.01                         | 3097                        |
| 23308                                                                          | 7590        | 09/27/2013           |                                 |                             |
| PETERS VERNY, L.L.P.<br>425 SHERMAN AVENUE<br>SUITE 230<br>PALO ALTO, CA 94306 |             |                      | EXAMINER<br>SONG, HOSUK         |                             |
|                                                                                |             |                      | ART UNIT<br>2435                | PAPER NUMBER                |
|                                                                                |             |                      | NOTIFICATION DATE<br>09/27/2013 | DELIVERY MODE<br>ELECTRONIC |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PVDoc@petersverny.com  
smcarchive@yahoo.com  
biopatents@gmail.com

|                                             |                                      |                                   |                                                  |
|---------------------------------------------|--------------------------------------|-----------------------------------|--------------------------------------------------|
| <b>Corrected<br/>Notice of Allowability</b> | <b>Application No.</b><br>13/523,854 | <b>Applicant(s)</b><br>LUM ET AL. |                                                  |
|                                             | <b>Examiner</b><br>Hosuk Song        | <b>Art Unit</b><br>2435           | <b>AIA (First Inventor to File) Status</b><br>No |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment filed on 7/17/13.  
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on \_\_\_\_\_.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_\_; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-11 and 13-23. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see [http://www.uspto.gov/patents/init\\_events/pph/index.jsp](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
**Certified copies:**  
 a) ☐ All    b) ☐ Some    \*c) ☐ None of the:  
     1. ☐ Certified copies of the priority documents have been received.  
     2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
     3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).  
 \* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.  
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

|                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)<br>2. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date _____<br>3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material<br>4. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____ | 5. <input type="checkbox"/> Examiner's Amendment/Comment<br>6. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance<br>7. <input type="checkbox"/> Other _____ |
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|                                                 |  |
|-------------------------------------------------|--|
| /Hosuk Song/<br>Primary Examiner, Art Unit 2435 |  |
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Under the Paperwork reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

|                                                                                                   |   |    |   |                          |                |
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| Substitute for form 1449A/PTO                                                                     |   |    |   | <b>Complete if Known</b> |                |
| <b>INFORMATION DISCLOSURE<br/>STATEMENT BY APPLICANT</b><br><br>(Use as many sheets as necessary) |   |    |   | Application Number       | 13523854       |
|                                                                                                   |   |    |   | Filing Date              |                |
|                                                                                                   |   |    |   | First Named Inventor     | LUM, Stacey C. |
|                                                                                                   |   |    |   | An Unit                  | 2435           |
|                                                                                                   |   |    |   | Examiner Name            |                |
| Sheet                                                                                             | 2 | of | 4 | Attorney Docket Number   | 5532.00        |

| U.S. PATENT DOCUMENTS |          |                                                               |                                |                                                    |                                                                                 |  |
|-----------------------|----------|---------------------------------------------------------------|--------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------|--|
| Examiner Initial *    | Cite No. | Document Number<br>Number - Kind Code <sup>2</sup> (if known) | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Document | Pages, columns, Lines, Where<br>Relevant Passages or Relevant<br>Figures Appear |  |
| /H.S./                | 21       | US-6736908 - B1                                               | 06-16-2004                     | BONN, David Wayne, et al.                          |                                                                                 |  |
|                       | 22       | US-6873988 - B2                                               | 03-29-2005                     | HERRMANN, Conrad, et al.                           |                                                                                 |  |
|                       | 23       | US-7024686 - B2                                               | 04-04-2006                     | BRAWN, John Melvin, et al.                         |                                                                                 |  |
|                       | 24       | US-7042688 - B2                                               | 05-09-2006                     | JUETT, David, et al.                               |                                                                                 |  |
|                       | 25       | US-7096502 - B1                                               | 06-22-2006                     | FOX, Kevin L.                                      |                                                                                 |  |
|                       | 26       | US-7103915 - B2                                               | 09-05-2006                     | REDLICH, Ron M., et al.                            |                                                                                 |  |
|                       | 27       | US-7134032 - B2                                               | 11-07-2006                     | FLYNTZ, Terence T.                                 |                                                                                 |  |
|                       | 28       | US-7219265 - B2                                               | 05-01-2007                     | DAPP, Michael C.                                   |                                                                                 |  |
|                       | 29       | US-7222359 - B2                                               | 06-22-2007                     | FREUND, Gregor, et al.                             |                                                                                 |  |
|                       | 30       | US-7249187 - B2                                               | 07-24-2007                     | SOBEL, William E, et al.                           |                                                                                 |  |
|                       | 31       | US-7249374 - B1                                               | 07-24-2007                     | Lear, et al.                                       |                                                                                 |  |
|                       | 32       | US-7336790 - B1                                               | 02-26-2008                     | CARONNI, Germano, et al.                           |                                                                                 |  |
|                       | 33       | US-7380271 - B2                                               | 05-27-2008                     | MORAN, Anthony Scott, et al.                       |                                                                                 |  |
|                       | 34       | US-7388859 - B2                                               | 06-10-2008                     | SHAY, A. David                                     |                                                                                 |  |
|                       | 35       | US-7441043 - B1                                               | 10-21-2008                     | HENRY, Paul Shela, et al.                          |                                                                                 |  |
|                       | 36       | US-7487418 - B2                                               | 11-25-2008                     | BLUNTE, Bjorn, et al.                              |                                                                                 |  |
|                       | 37       | US-7458098 - B2                                               | 11-25-2008                     | JUDGE, Paul, et al.                                |                                                                                 |  |
|                       | 38       | US-7550112 - B2                                               | 05-05-2009                     | SMITH, Michael R.                                  |                                                                                 |  |
|                       | 39       | US-7633407 - B2                                               | 05-12-2009                     | LEWIS, Elliot D., et al.                           |                                                                                 |  |

Change(s) applied  
to document,  
/S.J.W./  
9/23/2013

| FOREIGN PATENT DOCUMENTS |            |                                                                                                       |                                |                                                    |                                                                                 |   |
|--------------------------|------------|-------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------|---|
| Examiner Initial *       | Cite No. * | Foreign Patent Document<br>Country <sup>2</sup> Number <sup>3</sup> Kind Code (if known) <sup>5</sup> | Publication Date<br>MM-DD-YYYY | Name of Patentee or<br>Applicant of Cited Document | Pages, columns, Lines, Where<br>Relevant Passages or Relevant<br>Figures Appear | T |
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|--------------------|--------------|-----------------|------------|
| Examiner Signature | /Hosuk Song/ | Date Considered | 09/07/2013 |
|--------------------|--------------|-----------------|------------|

\* EXAMINER Initial if reference considered, whether or not citation is in performance with MPEP 609. Draw line through citation if not in conformance and not Considered. Include copy of this form with next communication to applicant. 1. Applicant's unique citation design number (optional). 2. See Kind Codes of USPTO patent Documents, at [www.uspto.gov](http://www.uspto.gov) or MPEP 601.04. 3. Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4. For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5. Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. 6. Applicant is to place a check mark here if English language Translation is attached.

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| APPLICATION NO. | ISSUE DATE | PATENT NO. | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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23308 7590 10/16/2013  
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### ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

#### **Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)** (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

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