US007212113B2

(12) **United States Patent**
Zanovitch

(10) **Patent No.: US 7,212,113 B2**
(45) **Date of Patent: May 1, 2007**

(54) **PASSENGER AND ITEM TRACKING WITH SYSTEM ALERTS**

(75) Inventor: **Joseph P. Zanovitch**, Barton, NY (US)

(73) Assignee: **Lockheed Martin Corporation**, Bethesda, MD (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 155 days.

(21) Appl. No.: **10/837,645**

(22) Filed: **May 4, 2004**

(65) **Prior Publication Data**

US 2005/0248450 A1 Nov. 10, 2005

(51) **Int. Cl.**
G08B 21/12 (2006.01)

(52) **U.S. Cl.** **340/540**; 340/518; 340/5.1; 340/5.2; 340/10.1

(58) **Field of Classification Search** 340/540, 340/568.1, 5.1, 555, 10.1, 545.2, 518, 541, 340/521, 5.3, 5.2; 378/8, 57, 63, 86, 88; 382/131

See application file for complete search history.

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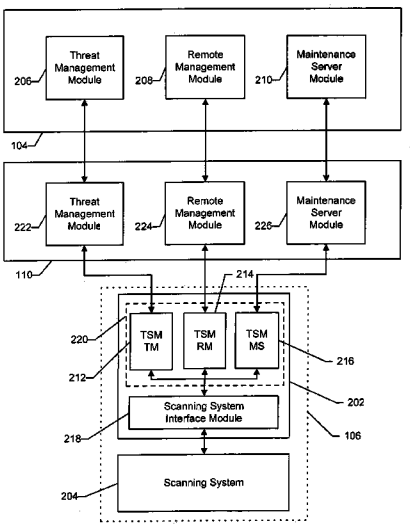
Primary Examiner—Davetta W. Goins
(74) *Attorney, Agent, or Firm*—Miles & Stockbridge; James T. Carmichael

(57) **ABSTRACT**

A dynamically configurable threat scanning machine management system is capable of tracking information associated with one ore more items and/or passengers. The central control computer network can transmit, among other things, operational software and threat profiles to the threat scanning machines, while the threat scanning machines can transmit, among other things, images, alarms, and performance data to the central computer that can be distributed to one or more operator stations and/or other command and control centers for review and analysis. The threat scanning machine management system can be arranged in a hierarchical manner which enables threat scanning machines at various locations to be connected into regional, national or international control centers. The tracked information and alarm generation and distribution allow, for example, comparison to other information to determine if an alarm or change in thresholds or sensitivity is warranted.

20 Claims, 42 Drawing Sheets



GOOGLE EXHIBIT 1006

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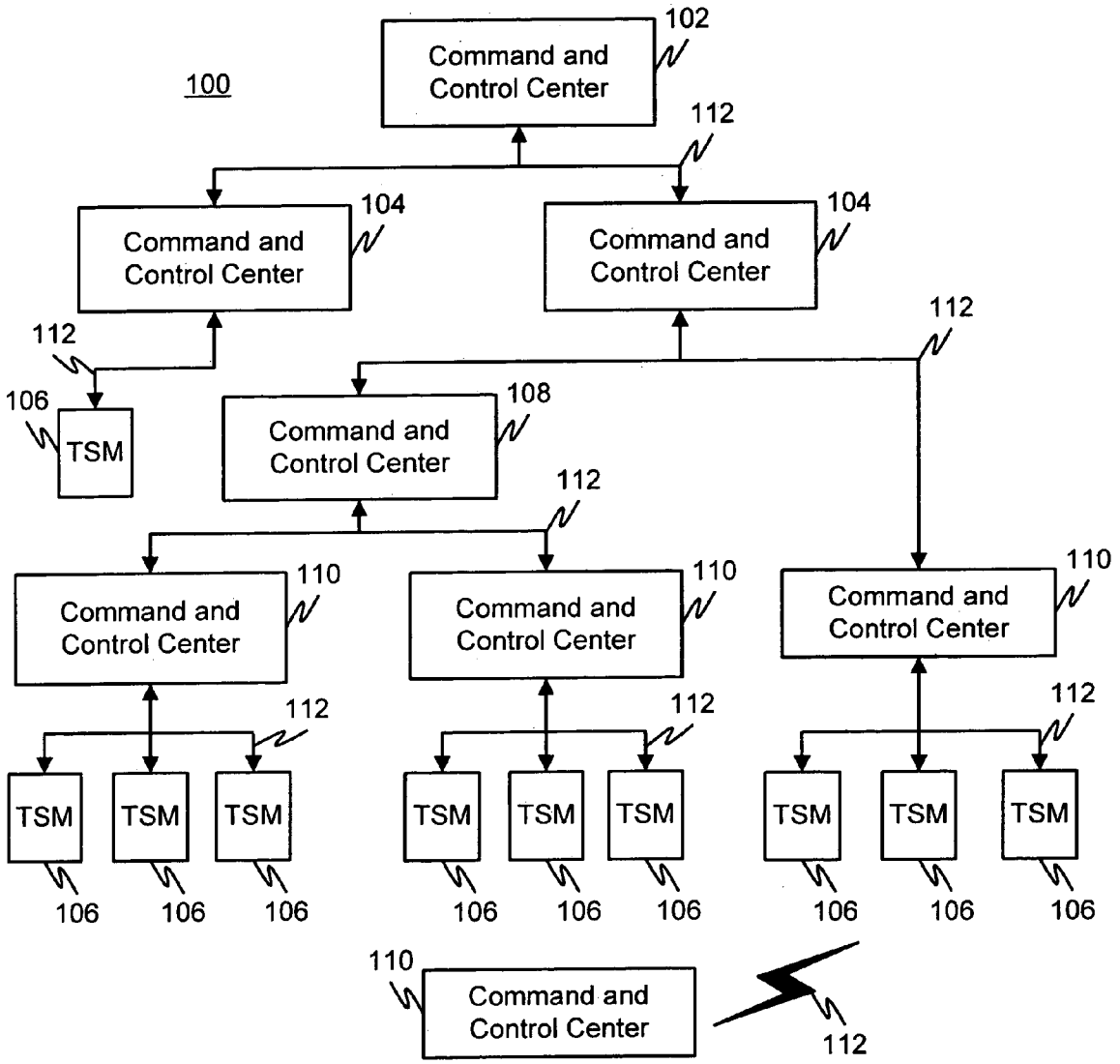
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Command and Control Center
102
112
Command and Control Center
104
Command and Control Center
104
112
112
106
TSM
Command and Control Center
108
112
Command and Control Center
110
Command and Control Center
110
Command and Control Center
110
112
112
112
TSM
TSM
TSM
TSM
TSM
TSM
TSM
TSM
TSM
106
106
106
106
106
106
106
106
106
110
Command and Control Center
112

FIG. 1

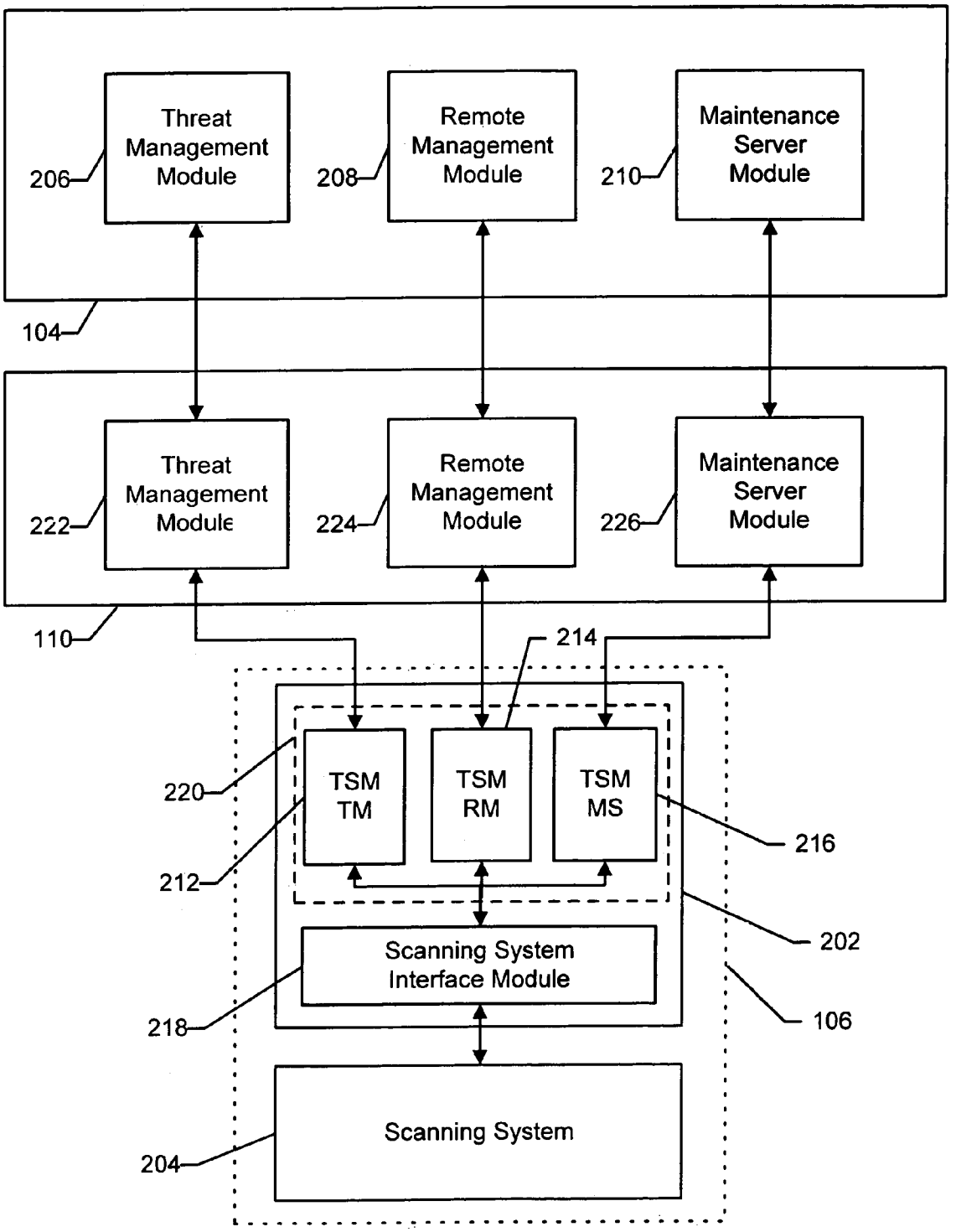
Threat Management Module
206
Remote Management Module
208
Maintenance Server Module
210
104
Threat Management Module
222
Remote Management Module
224
Maintenance Server Module
226
110
214
TSM TM
TSM RM
TSM MS
220
212
216
202
Scanning System Interface Module
218
106
Scanning System
204

FIG. 2

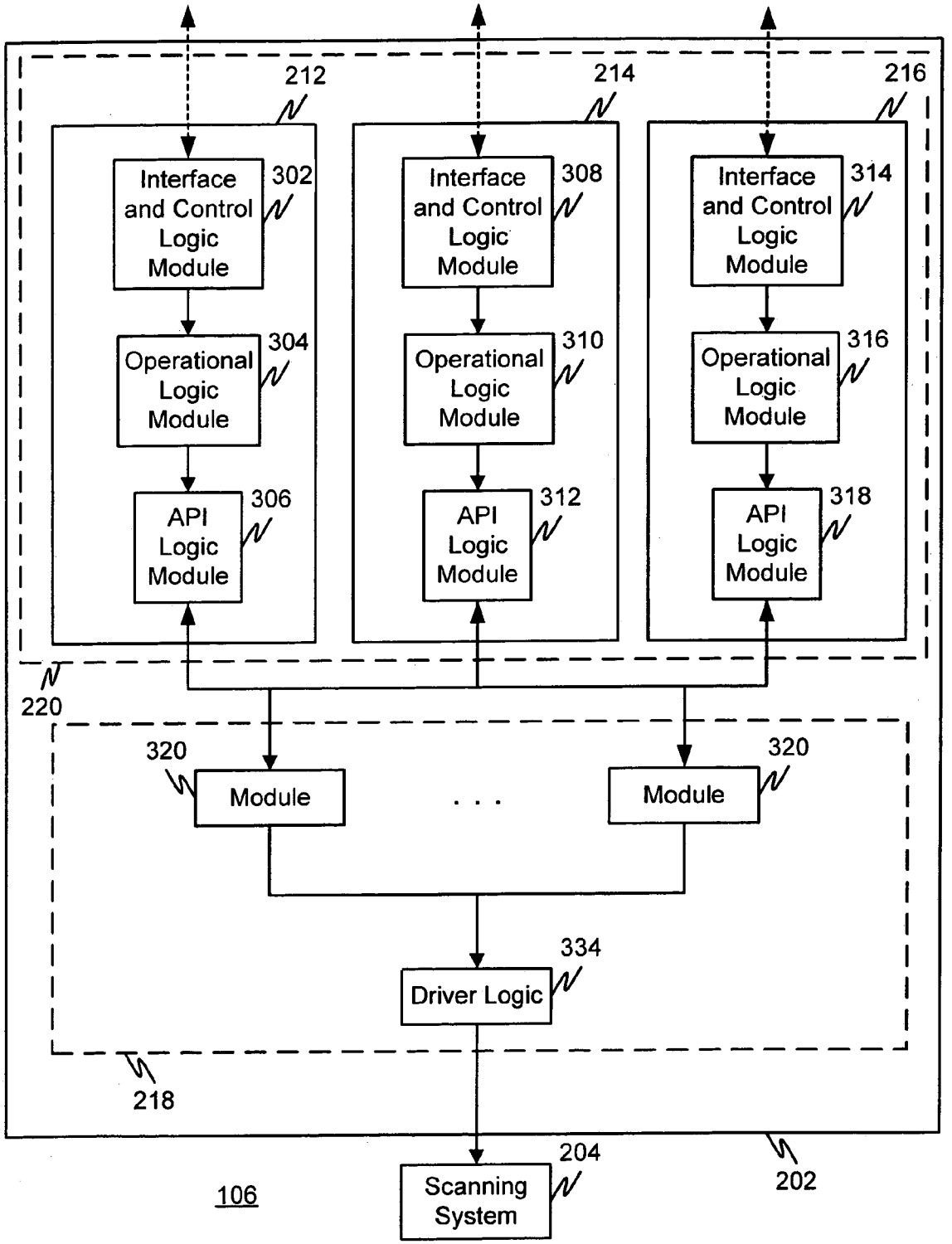
212
214
216
Interface and Control Logic Module
302
Interface and Control Logic Module
308
Interface and Control Logic Module
314
Operational Logic Module
304
Operational Logic Module
310
Operational Logic Module
316
API Logic Module
306
API Logic Module
312
API Logic Module
318
220
320
Module
. . .
Module
320
334
Driver Logic
218
204
Scanning System
106
202

FIG. 3

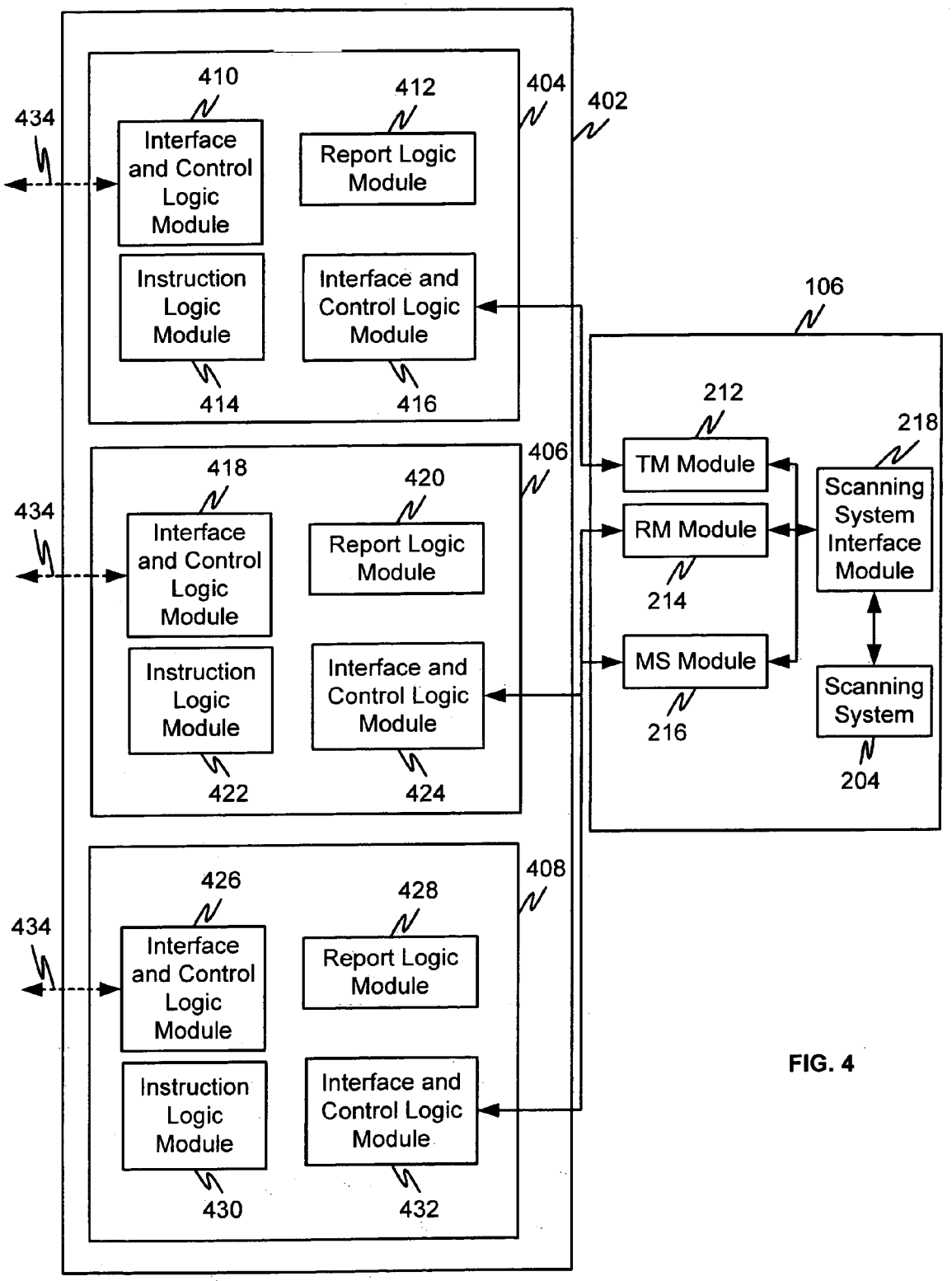
402
404
406
408
410
412
414
416
418
420
422
424
426
428
430
432
434
434
434
Interface and Control Logic Module
Report Logic Module
Instruction Logic Module
Interface and Control Logic Module
Interface and Control Logic Module
Report Logic Module
Instruction Logic Module
Interface and Control Logic Module
Interface and Control Logic Module
Report Logic Module
Instruction Logic Module
Interface and Control Logic Module
106
212
214
216
218
204
TM Module
RM Module
MS Module
Scanning System Interface Module
Scanning System

FIG. 4

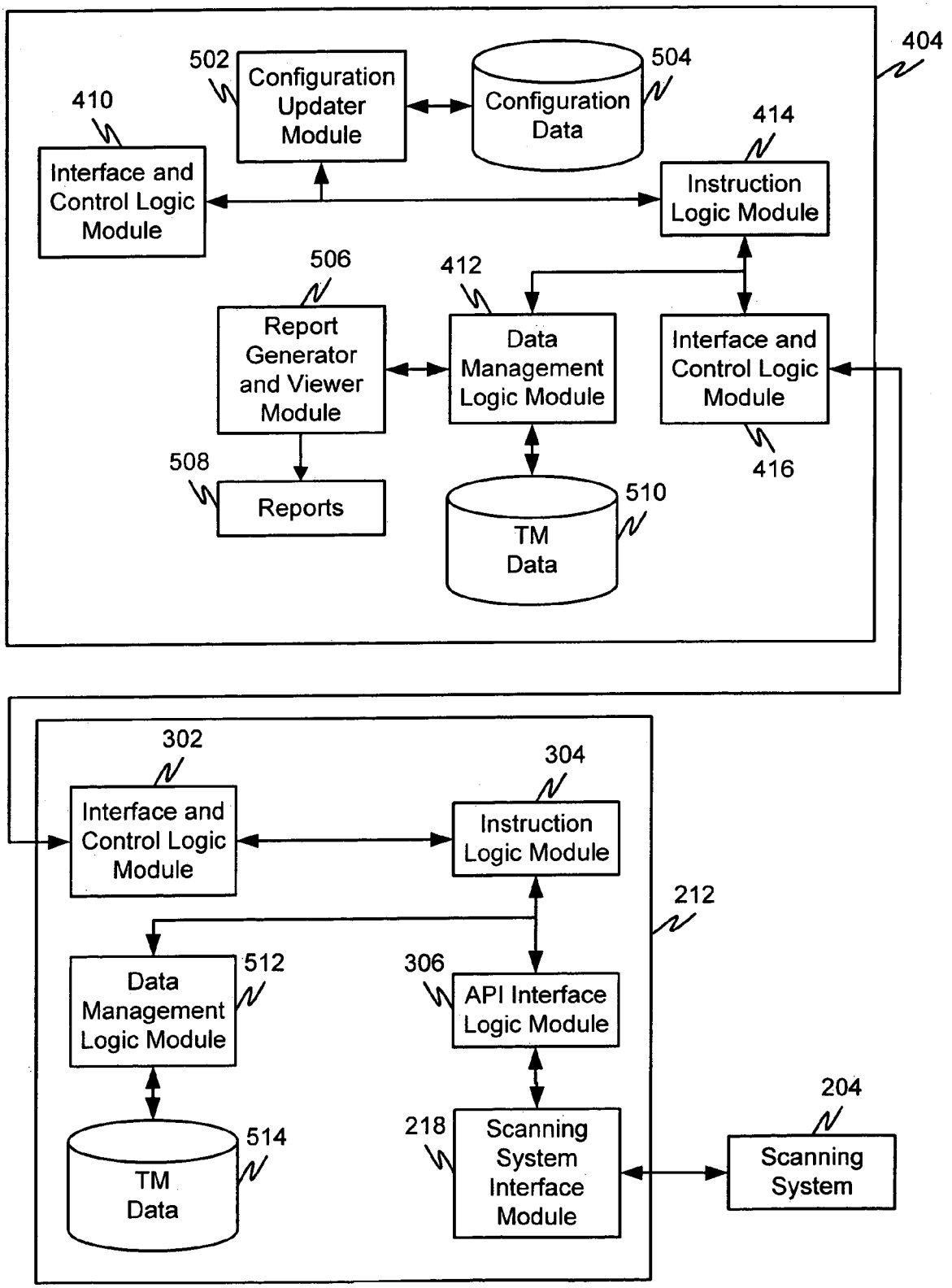
404
502
Configuration Updater Module
504
Configuration Data
410
Interface and Control Logic Module
414
Instruction Logic Module
506
412
Report Generator and Viewer Module
Data Management Logic Module
Interface and Control Logic Module
508
Reports
510
TM Data
416
302
Interface and Control Logic Module
304
Instruction Logic Module
212
512
Data Management Logic Module
306
API Interface Logic Module
204
514
TM Data
218
Scanning System Interface Module
Scanning System

FIG. 5

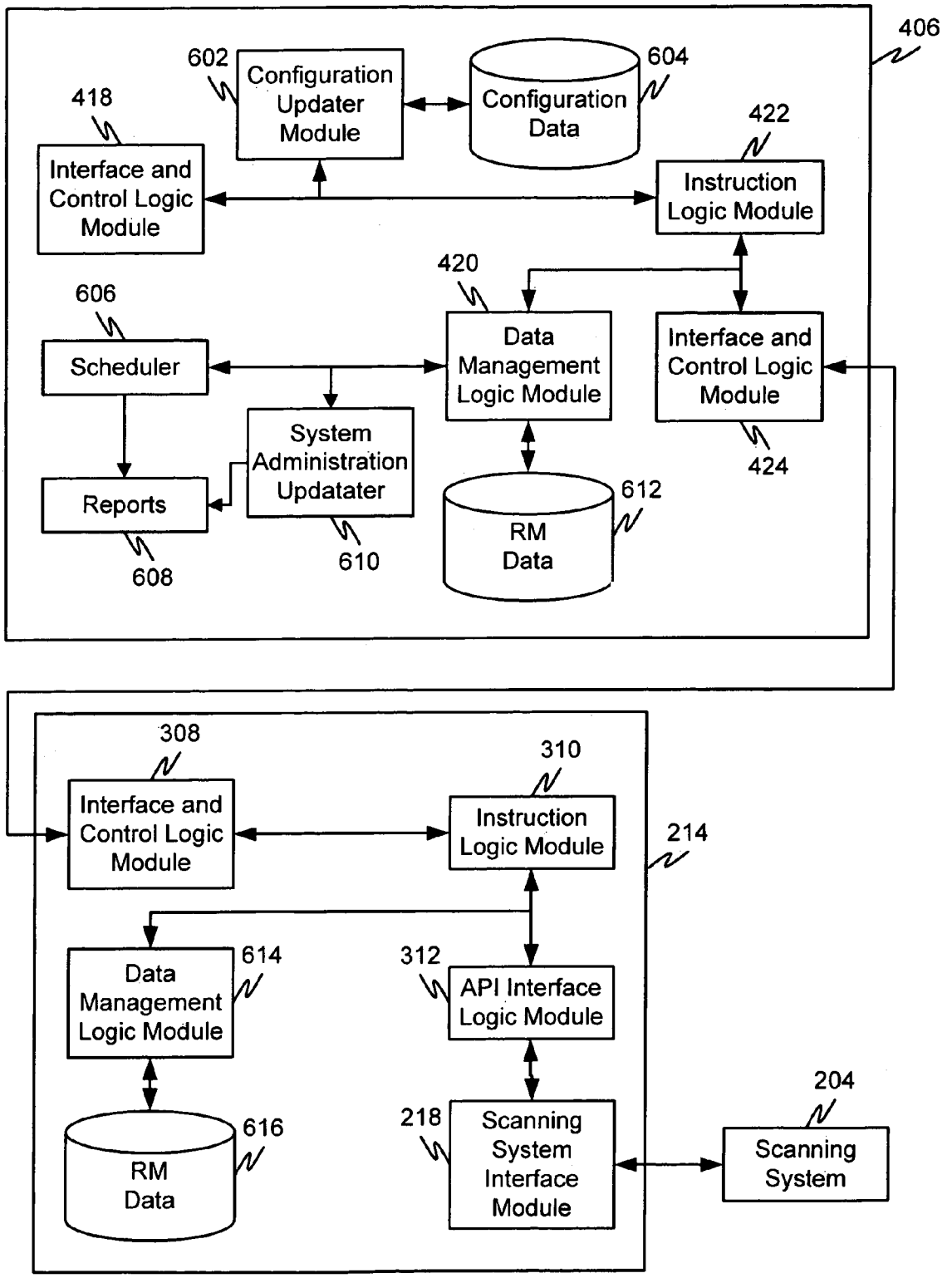
406
602
Configuration Updater Module
604
Configuration Data
418
Interface and Control Logic Module
422
Instruction Logic Module
420
606
Scheduler
Data Management Logic Module
Interface and Control Logic Module
System Administration Updatater
424
Reports
612
RM Data
608
610
308
310
Interface and Control Logic Module
Instruction Logic Module
214
614
312
Data Management Logic Module
API Interface Logic Module
204
616
218
RM Data
Scanning System Interface Module
Scanning System

FIG. 6

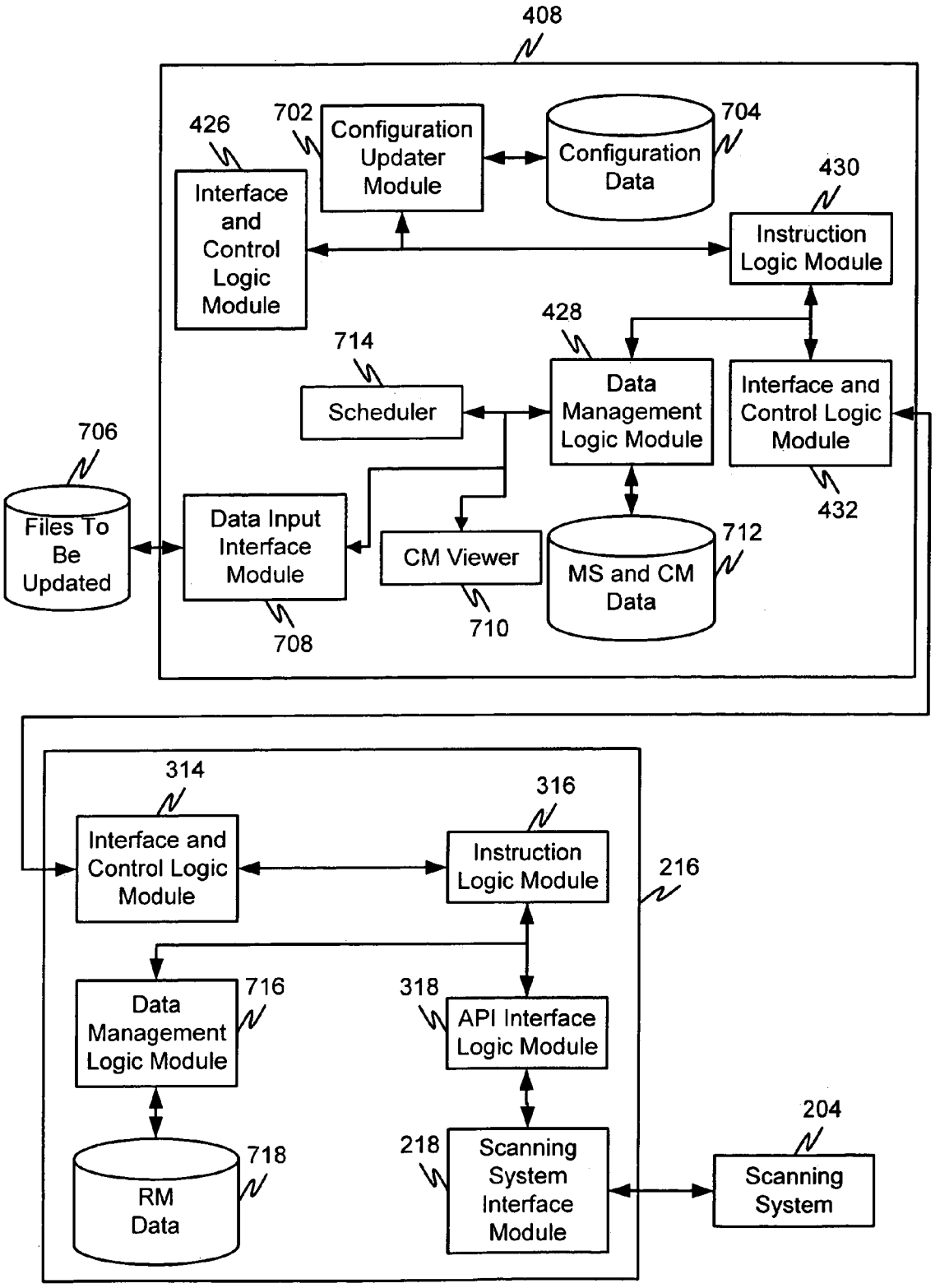
408
426
Interface and Control Logic Module
702
Configuration Updater Module
Configuration Data
704
430
Instruction Logic Module
428
714
Scheduler
Data Management Logic Module
Interface and Control Logic Module
432
706
Files To Be Updated
Data Input Interface Module
708
CM Viewer
710
MS and CM Data
712
314
Interface and Control Logic Module
316
Instruction Logic Module
216
Data Management Logic Module
716
318
API Interface Logic Module
RM Data
718
218
Scanning System Interface Module
204
Scanning System

FIG. 7

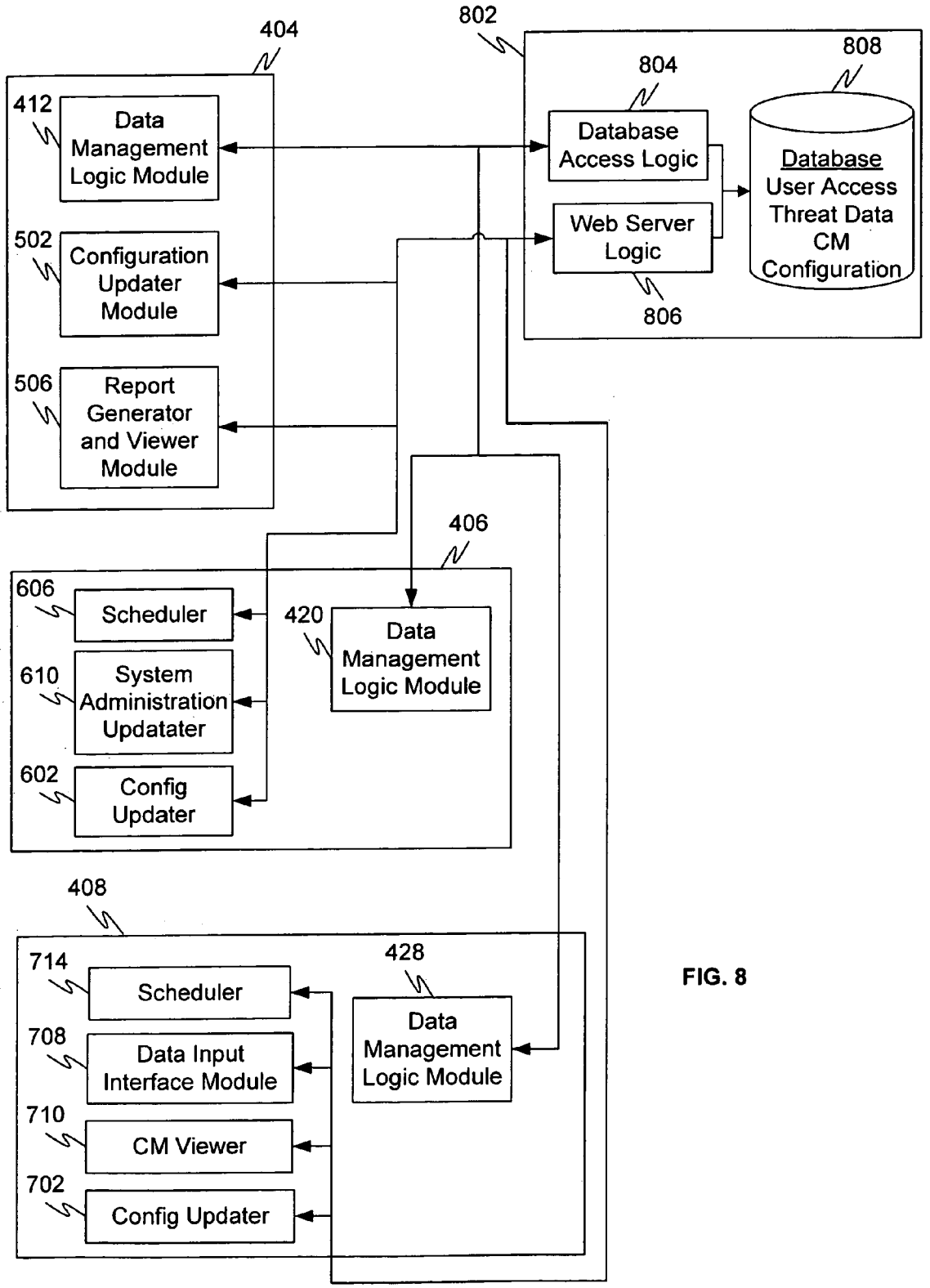
404
412
Data Management Logic Module
502
Configuration Updater Module
506
Report Generator and Viewer Module
802
804
Database Access Logic
Web Server Logic
806
808
Database
User Access
Threat Data
CM
Configuration
406
606
Scheduler
610
System Administration Updatater
602
Config Updater
420
Data Management Logic Module
408
714
Scheduler
708
Data Input Interface Module
710
CM Viewer
702
Config Updater
428
Data Management Logic Module

FIG. 8

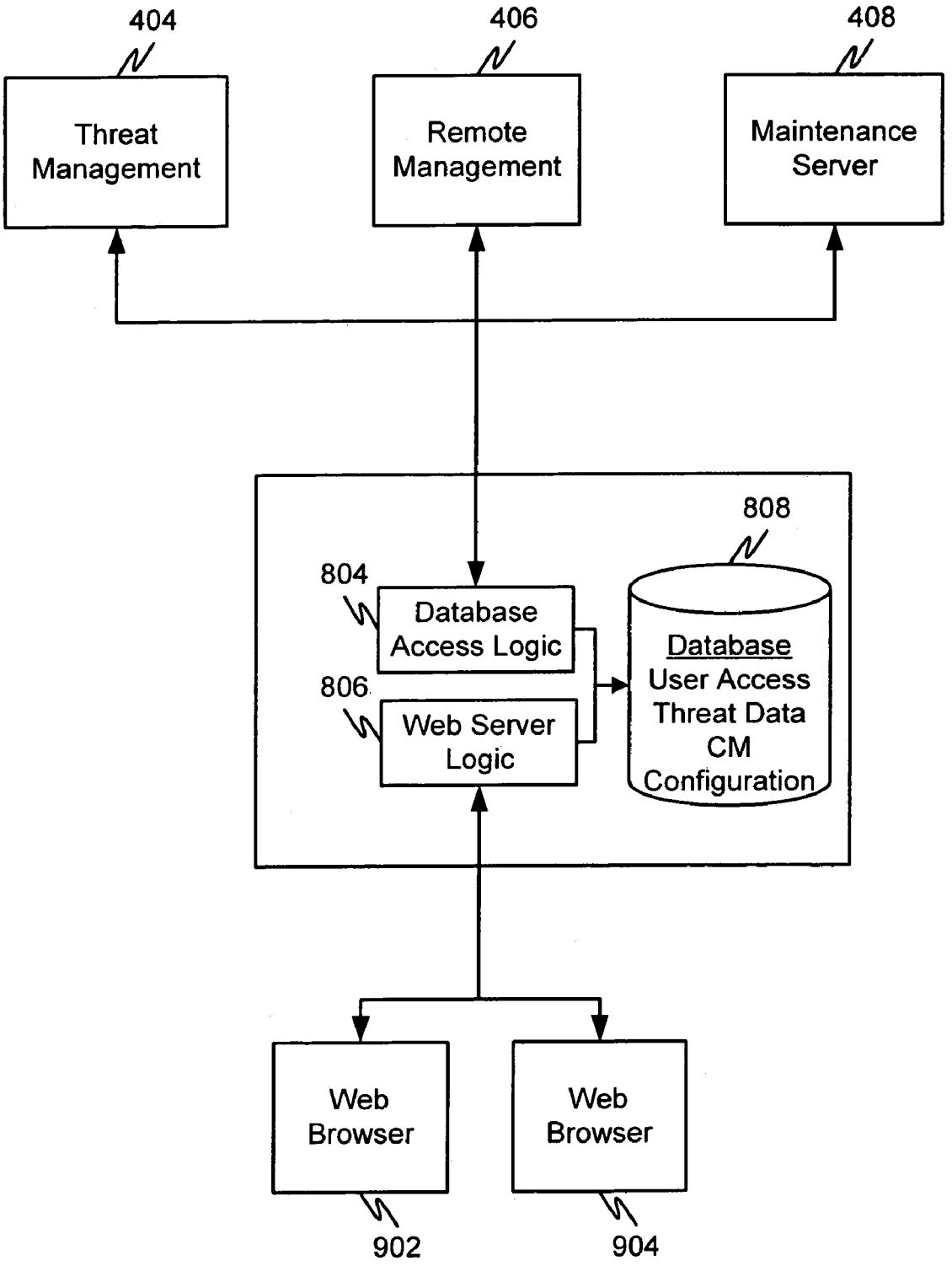
404
Threat Management
406
Remote Management
408
Maintenance Server
808
804
Database Access Logic
806
Web Server Logic
Database
User Access
Threat Data
CM
Configuration
Web Browser
Web Browser
902
904

FIG. 9

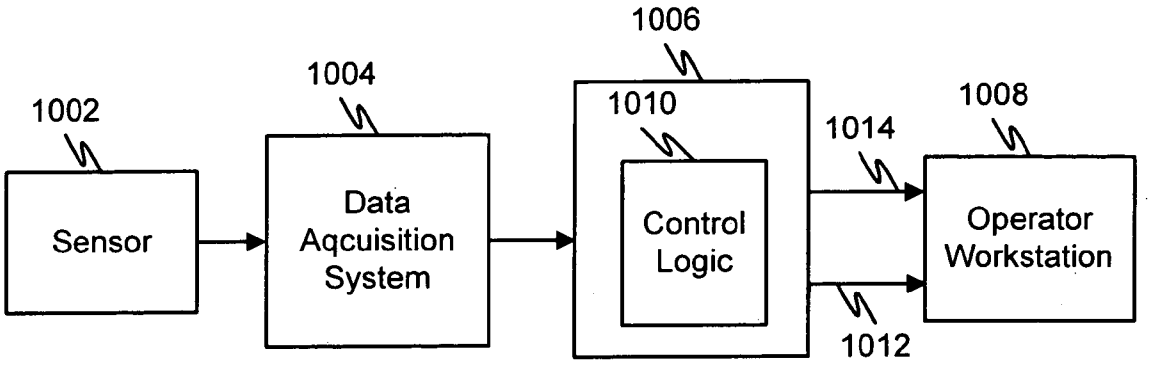
1002
Sensor
1004
Data
Aqcuisition
System
1006
1010
Control
Logic
1014
1012
1008
Operator
Workstation

FIG. 10

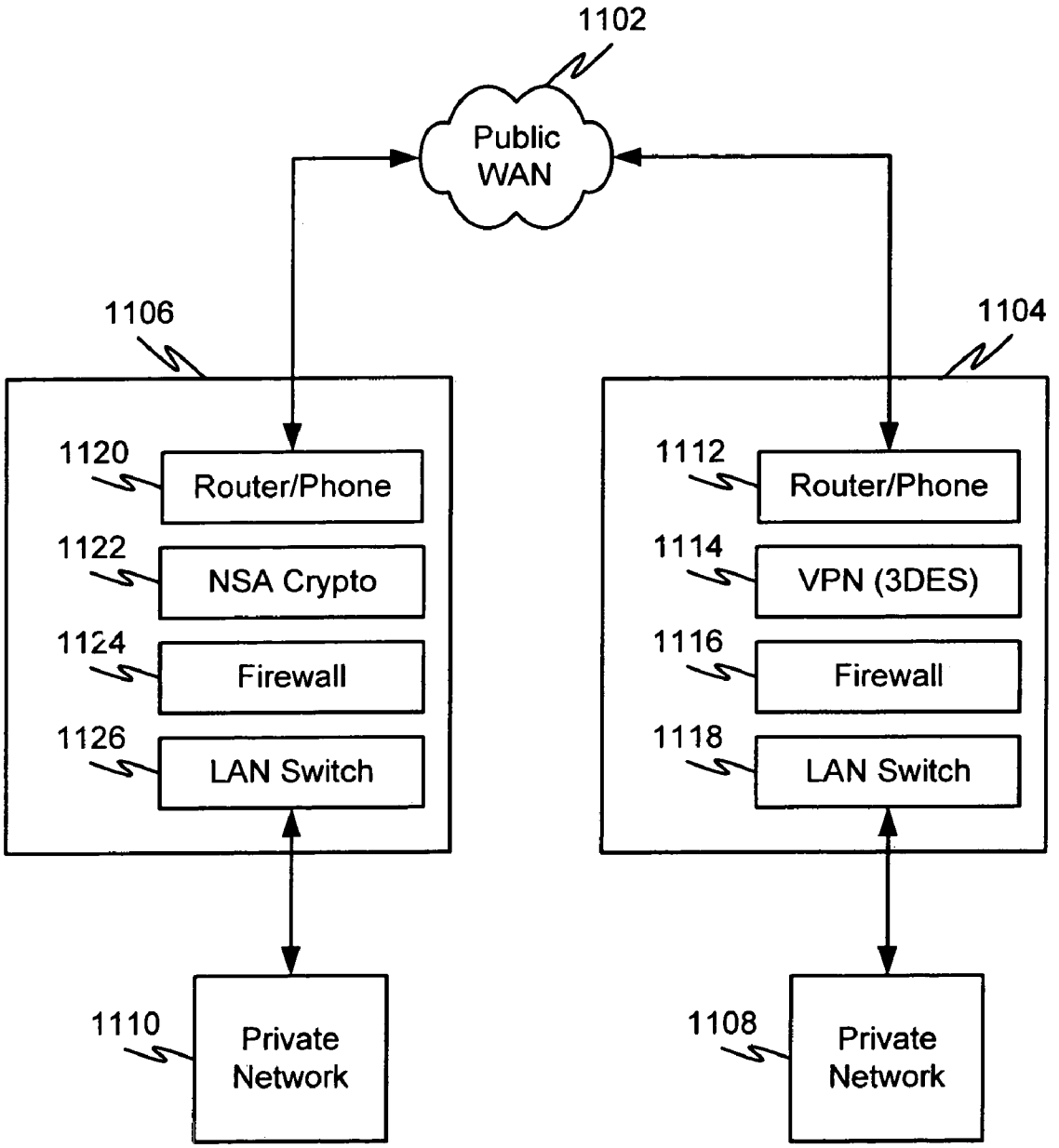
1102
Public WAN
1106
1104
1120
Router/Phone
1122
NSA Crypto
1124
Firewall
1126
LAN Switch
1112
Router/Phone
1114
VPN (3DES)
1116
Firewall
1118
LAN Switch
1110
Private Network
1108
Private Network

FIG. 11

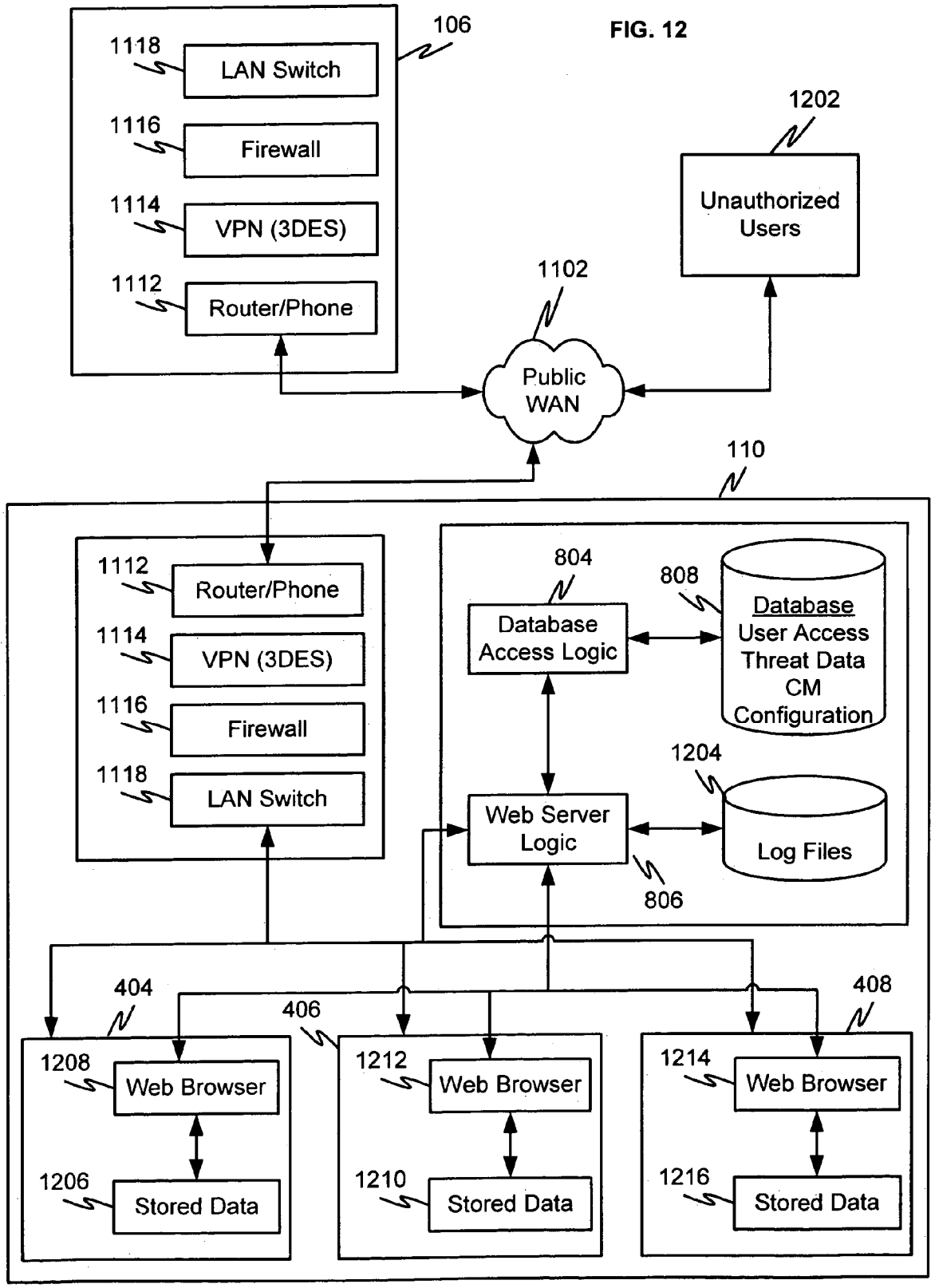
106
1118
LAN Switch
1116
Firewall
1114
VPN (3DES)
1112
Router/Phone
1202
Unauthorized Users
1102
Public WAN
110
1112
Router/Phone
1114
VPN (3DES)
1116
Firewall
1118
LAN Switch
804
Database Access Logic
808
Database
User Access
Threat Data
CM
Configuration
1204
Log Files
Web Server Logic
806
404
406
408
1208
Web Browser
1206
Stored Data
1212
Web Browser
1210
Stored Data
1214
Web Browser
1216
Stored Data

FIG. 12

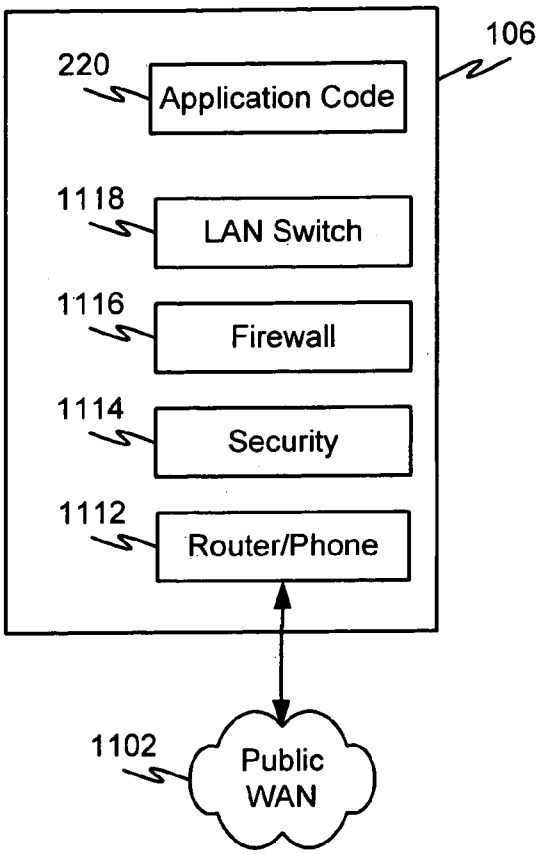

FIG. 13A

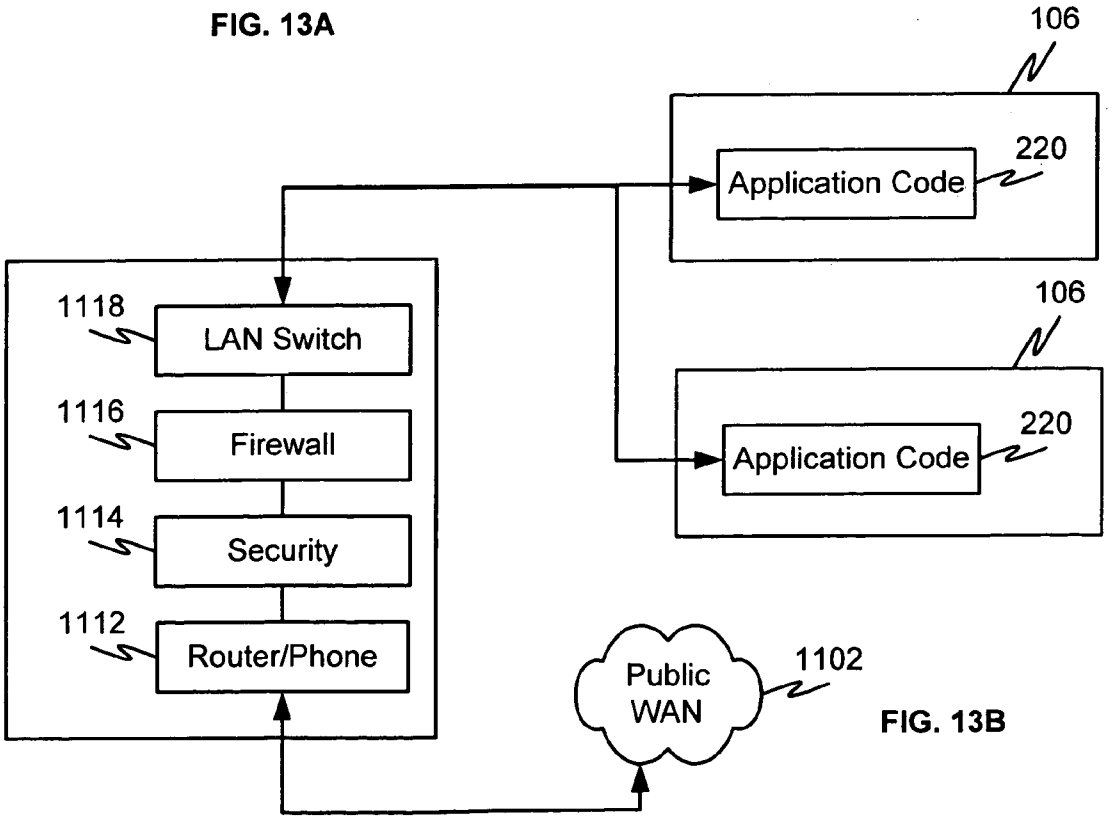

FIG. 13B

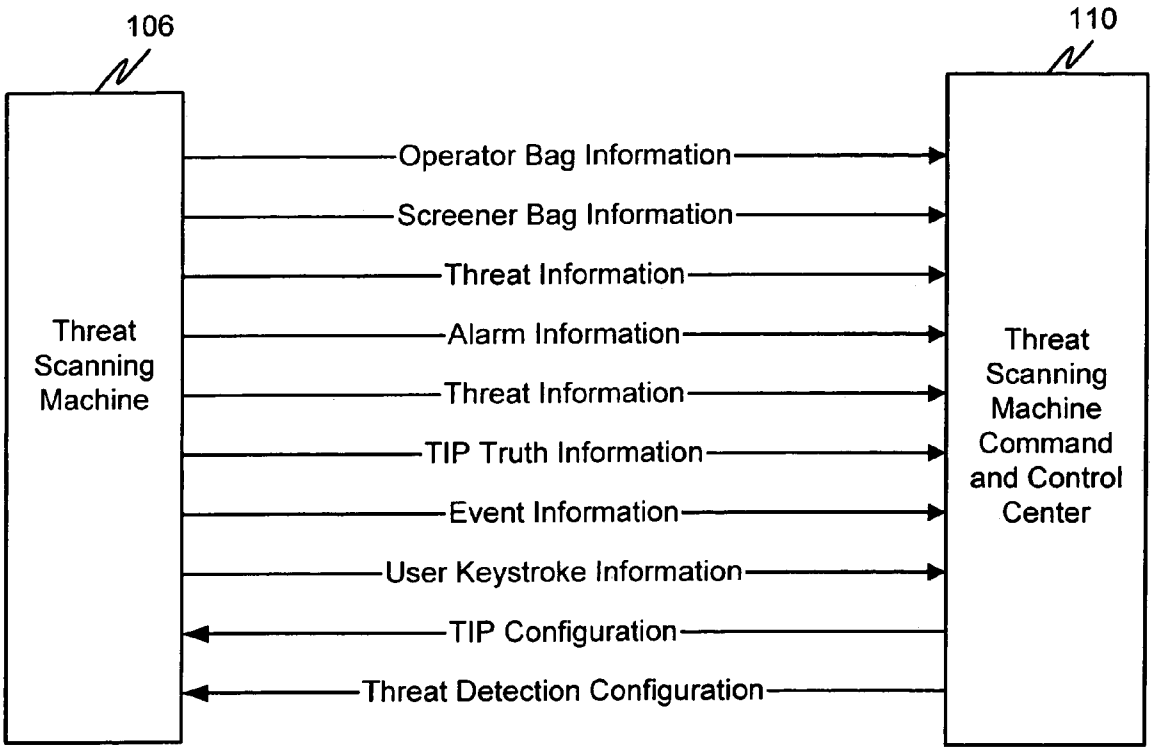
106
110
Threat Scanning Machine
Operator Bag Information
Screener Bag Information
Threat Information
Alarm Information
Threat Information
TIP Truth Information
Event Information
User Keystroke Information
TIP Configuration
Threat Detection Configuration
Threat Scanning Machine Command and Control Center

FIG. 14

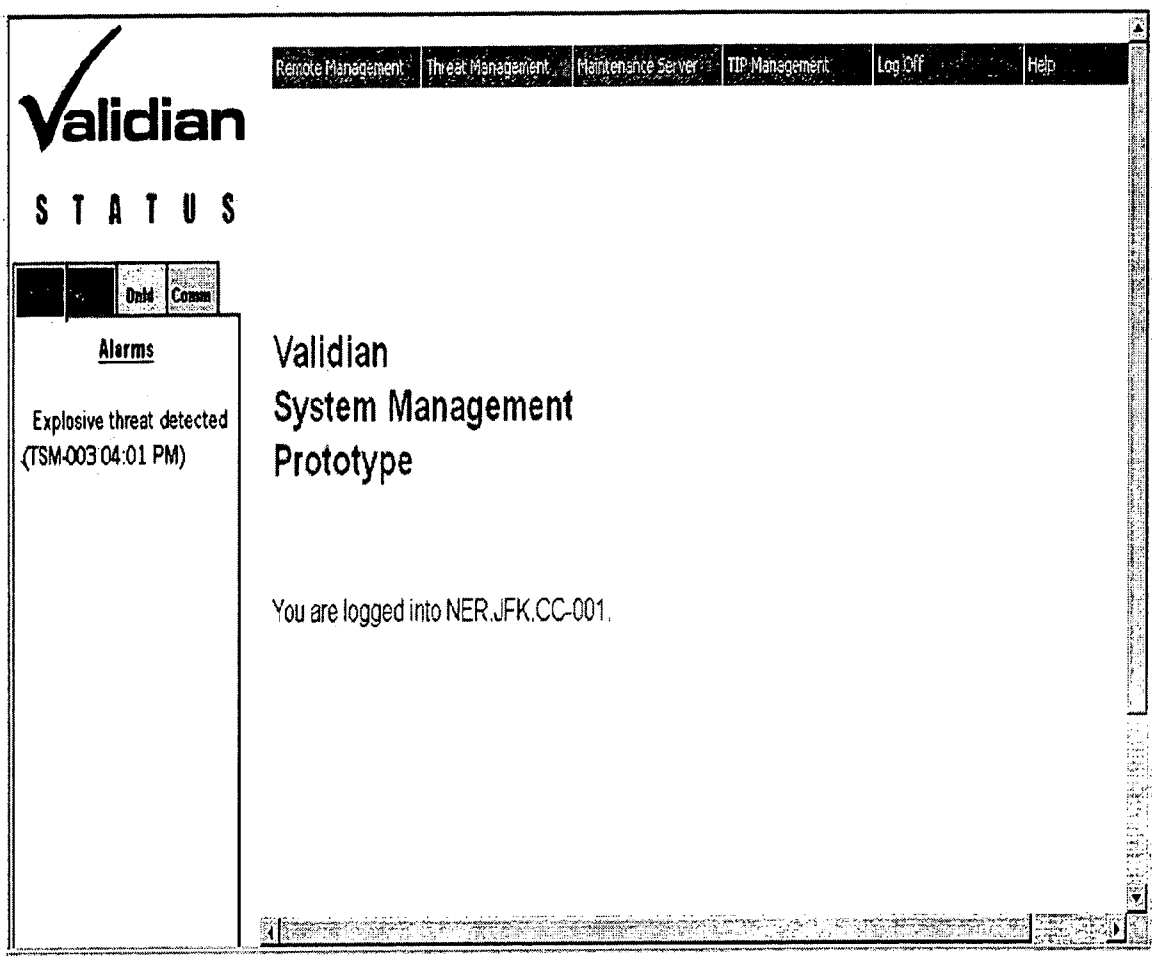
Remote Management
Threat Management
Maintenance Server
TIP Management
Log Off
Help
Validian
STATUS
Unld
Comm
Alarms
Explosive threat detected
(TSM-003 04:01 PM)
Validian
System Management
Prototype
You are logged into NER.JFK.CC-001.

FIG. 15

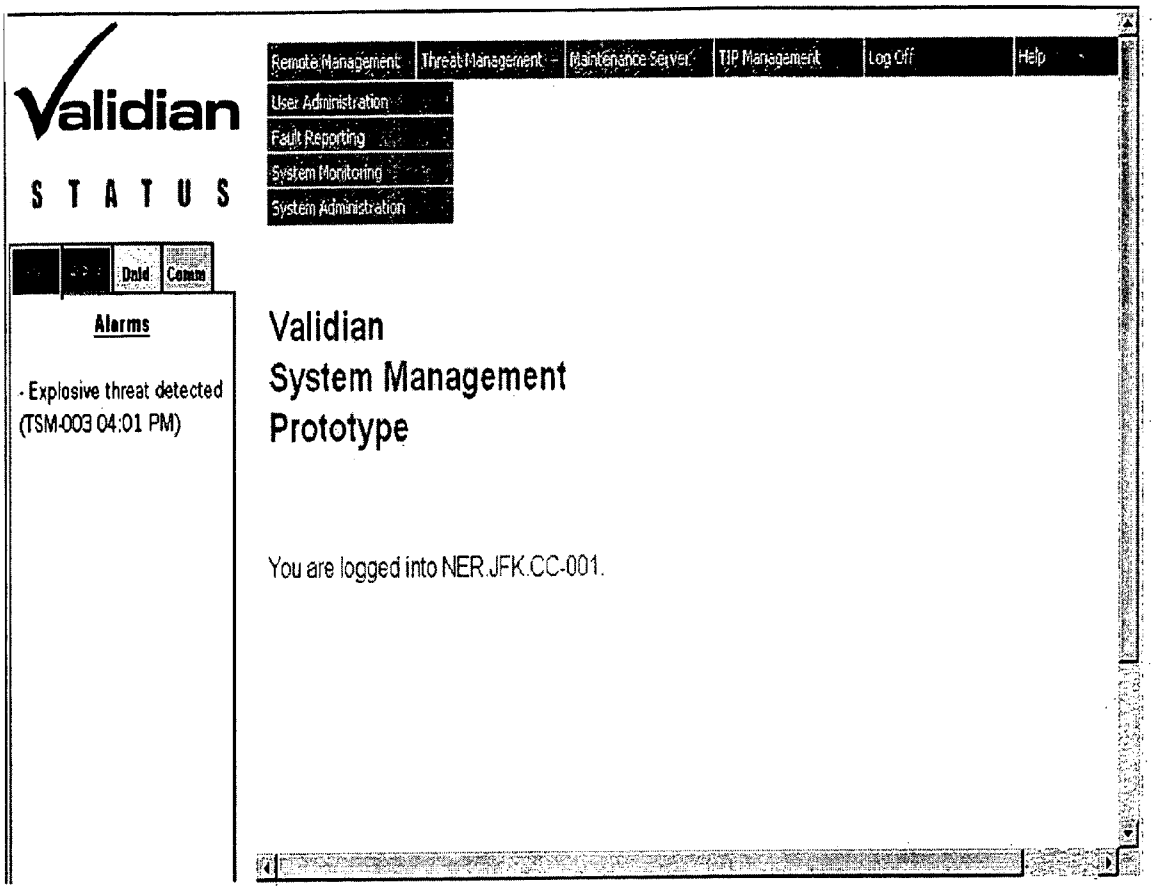
Validian
STATUS
Remote Management
Threat Management
Maintenance Server
TIP Management
Log Off
Help
User Administration
Fault Reporting
System Monitoring
System Administration
Dnld
Comm
Alarms
- Explosive threat detected (TSM-003 04:01 PM)
Validian
System Management
Prototype
You are logged into NER.JFK.CC-001.

FIG. 16

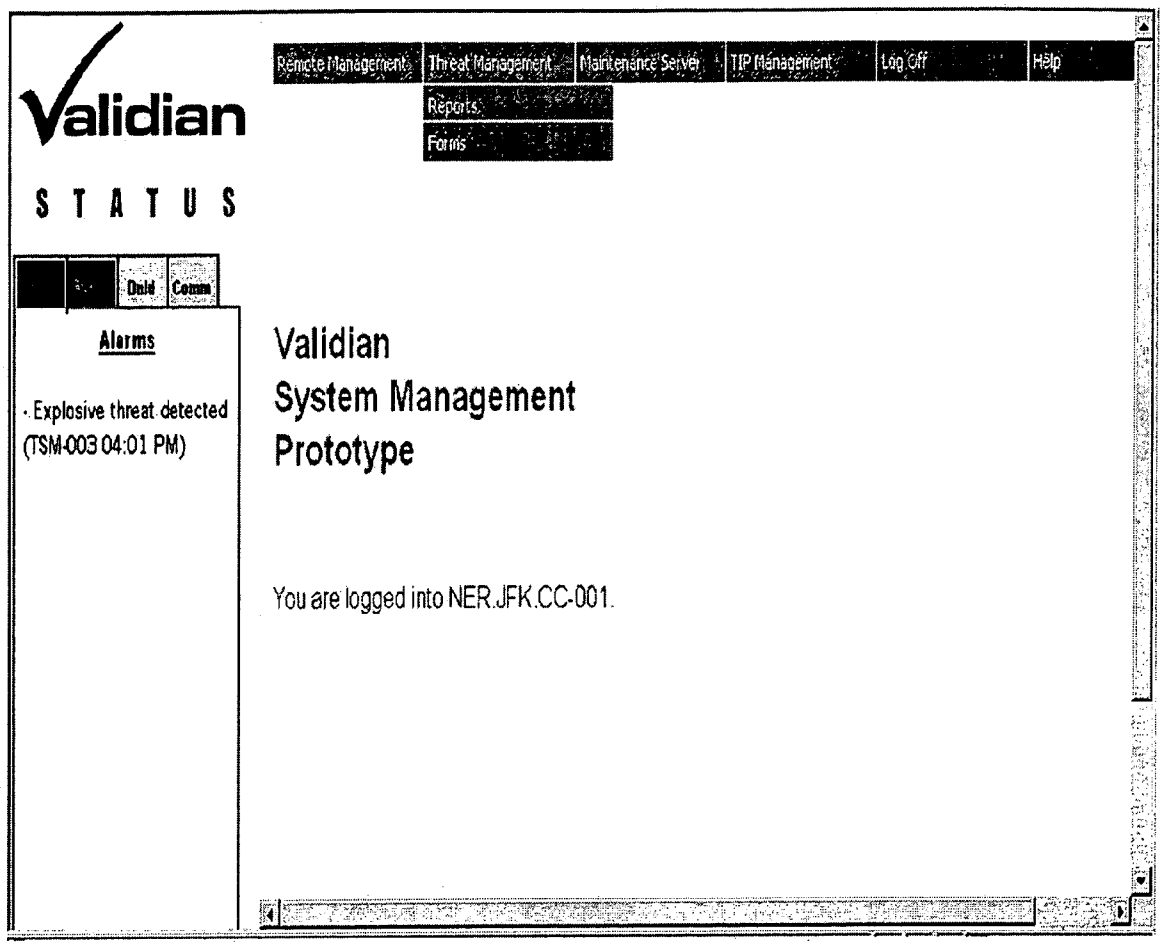
Validian
STATUS
Remote Management
Threat Management
Maintenance Server
TIP Management
Log Off
Help
Reports
Forms
Alarms
Explosive threat detected
(TSM-003 04:01 PM)
Validian
System Management
Prototype
You are logged into NER.JFK.CC-001.

FIG. 17

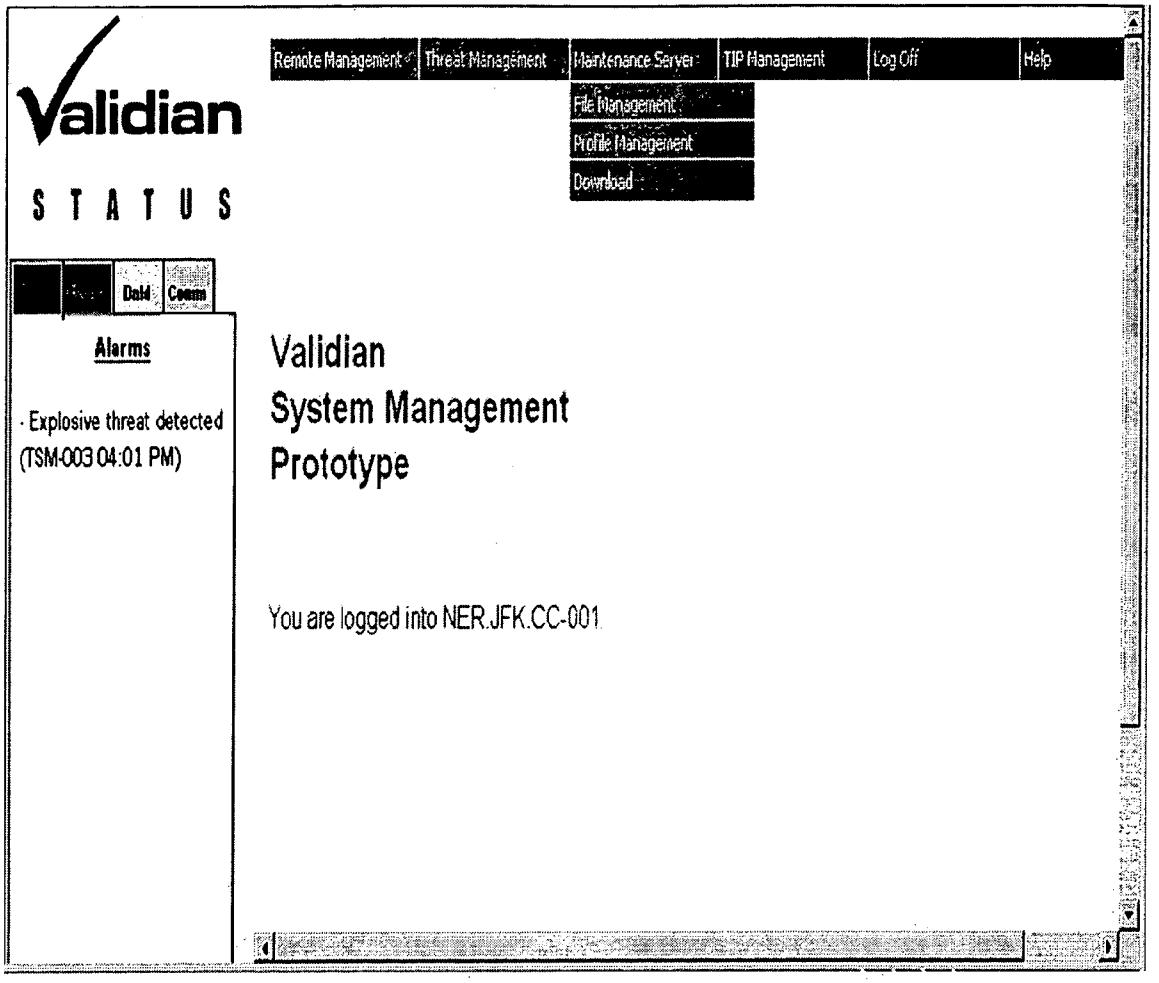
Validian
STATUS
Remote Management
Threat Management
Maintenance Server
TIP Management
Log Off
Help
File Management
Profile Management
Download
Alarms
Explosive threat detected
(TSM-003 04:01 PM)
Validian
System Management
Prototype
You are logged into NER.JFK.CC-001

FIG. 18

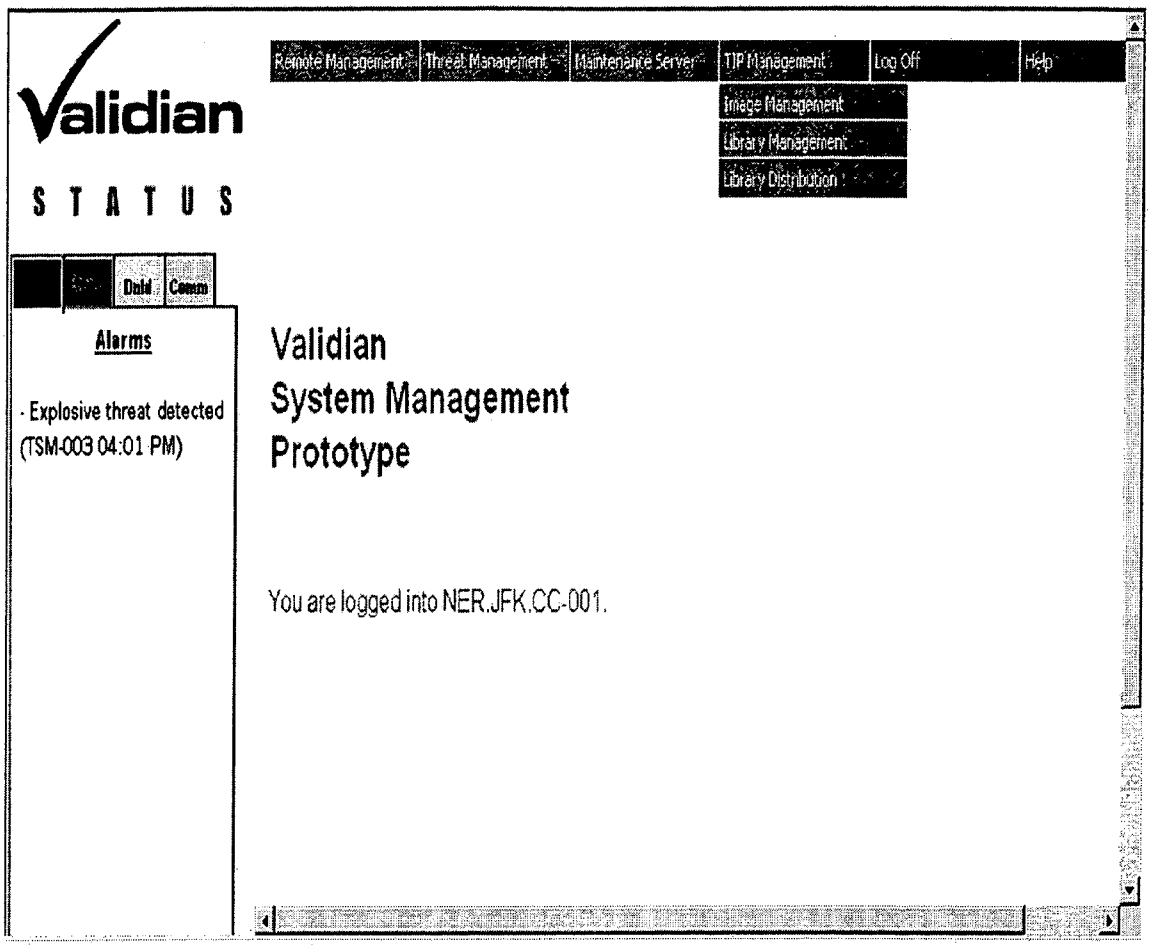
Validian
STATUS
Remote Management
Threat Management
Maintenance Server
TIP Management
Log Off
Help
Image Management
Library Management
Library Distribution
Alarms
- Explosive threat detected (TSM-003 04:01 PM)
Validian
System Management
Prototype
You are logged into NER.JFK.CC-001.

FIG. 19

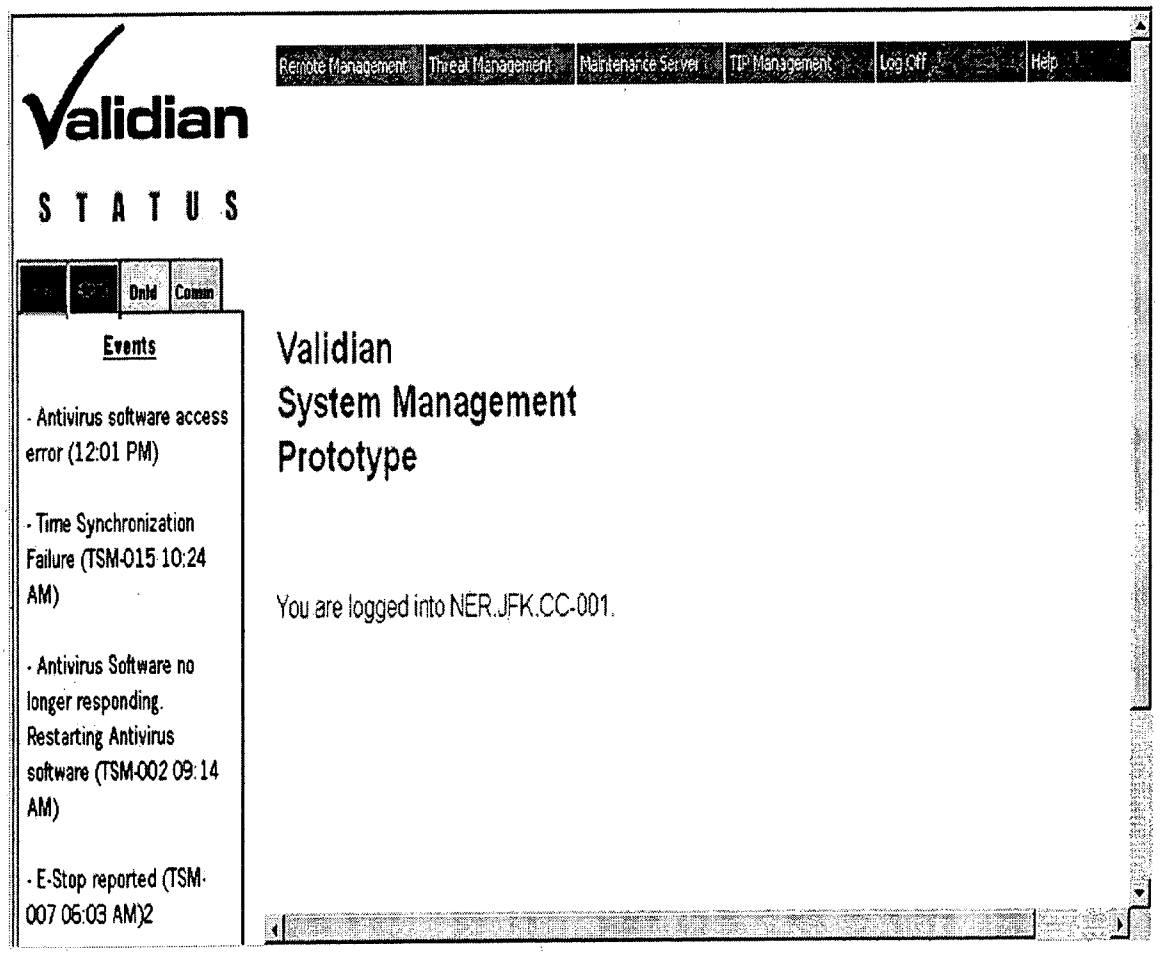
Validian
STATUS
Remote Management
Threat Management
Maintenance Server
TIP Management
Log Off
Help
Events
- Antivirus software access error (12:01 PM)
- Time Synchronization Failure (TSM-015 10:24 AM)
- Antivirus Software no longer responding. Restarting Antivirus software (TSM-002 09:14 AM)
- E-Stop reported (TSM-007 06:03 AM)2
Validian
System Management
Prototype
You are logged into NER.JFK.CC-001.

FIG. 20

Validian

Remote Management | Threat Management | Maintenance Server | TIP Management | Log Off | Help

STATUS

User Administration

Dnld | Comm

Communications

· No Response to Ping (TSA-023 07:23 AM)

Employee ID	First Name	Last Name	Status	Access Level	Last Access
E130153	Jane	Smith	Logged on HH-001	4	05/01/2003 12:03pm
E130154	Edward	Chin	Logged on TSM-002	1	05/01/2003 09:04pm
E130155	Joe	Zanovitch	Logged on CC-002	4	05/01/2003 09:04pm
E130156	Bill	Bates	Suspended	2	05/01/2003 09:04pm
E130157	Joe	Porter	Logged off	4	05/01/2003 09:04pm
E130158	Mark	Gaug	Logged on TSM-003	1	05/01/2003 09:04pm
E130159	Sheila	Curry	Logged on TSM-004	1	05/01/2003 09:04pm
E130160	Dave	Matthews	Logged off	3	05/01/2003 09:04pm
E130161	Eunice	Kim	Logged off	1	05/01/2003 12:03pm
E130162	Jim	Bean	Logged on HH-003	3	05/01/2003 09:04pm
E130163	Jane	Smith	Logged on HH-001	4	05/01/2003 12:03pm
E130164	Edward	Chin	Logged on TSM-002	1	05/01/2003 09:04pm

Unselect All

Create New User | View Selected User | Modify Selected User | Delete Selected User(s)

FIG. 21

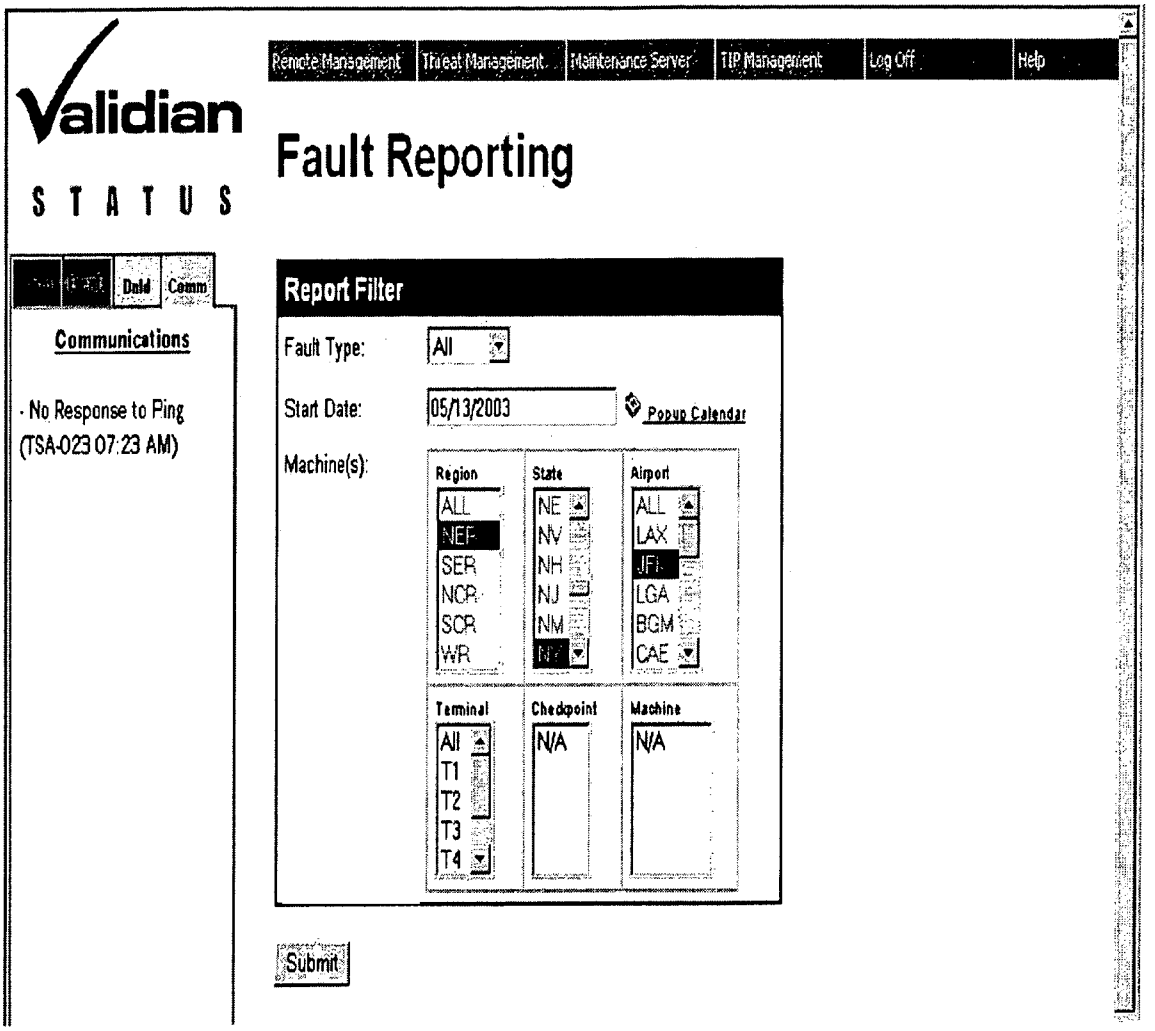
Remote Management
Threat Management
Maintenance Server
TIP Management
Log Off
Help
Validian
STATUS
Fault Reporting
Comm
Communications
· No Response to Ping
(TSA-023 07:23 AM)
Report Filter
Fault Type:
All
Start Date:
05/13/2003
Popup Calendar
Machine(s):
Region
ALL
NEF
SER
NCR
SCR
WR
State
NE
NV
NH
NJ
NM
Airport
ALL
LAX
JFK
LGA
BGM
CAE
Terminal
All
T1
T2
T3
T4
Checkpoint
N/A
Machine
N/A
Submit

FIG. 22

Validian

STATUS

Dnld Comm

Communications

- No Response to Ping (TSA-023 07:23 AM)

Performance Information

Report Format: Throughput

Report Filter

Time Period/ Interval: One year broken down by month

Start Date: 05/13/2003 Popup Calendar

Machine(s):

Region	State	Airport
ALL	NE	ALL
NER	NV	LAX
SER	NH	JFK
NCR	NJ	LGA
SCR	NM	BGM
WR	NY	CAE

Terminal	Checkpoint	Machine
All	N/A	N/A
T1		
T2		
T3		
T4		

Operator: All

Type: Normal

Submit

FIG. 23

Validian

STATUS

Dnld | Comm

Communications

- No Response to Ping (TSA-023 07:23 AM)

Remote Management | Threat Management | Maintenance Server | TIP Management | Log Off | Help

System Administration

Hostname	Type	IP Address	Connection Type	Commands
CC-001	Parent	24.12.225.44	LAN	
CC-029	CC	128.226.29.33	LAN	Sync Time | Reboot | Modify | Delete
TSM-001	TSM	24.29.61.12	Dialup	Get Software Versions | Sync Time | Reboot | Modify | Delete
TSM-002	TSM	66.129.0.128	LAN	Get Software Versions | Sync Time | Reboot | Modify | Delete
TSM-003	TSM	128.109.1.99	LAN	Get Software Versions | Sync Time | Reboot | Modify | Delete

Add New Host

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FIG. 24

Validian

STATUS

Dnld Comm

Communications

- No Response to Ping (TSA-023 07:23 AM)

Remote Management | Threat Management | Maintenance Server | TIP Management | Log Off | Help

Download Schedule

Download	File	Date	Time	Locations
Dnld-001	All	05/20/2003	12:00pm	TSM-003
Dnld-002	Profile 2	05/21/2003	01:00pm	TSM-001, TSM-005, ...
Dnld-003	Profile 4	05/23/2003	03:00am	CC-003, CC-001,
Dnld-004	Profile 2	05/25/2003	05:00am	TSM-002
Dnld-005	Profile 3	05/26/2003	06:00am	All

Schedule New Download

FIG. 25

Validian

STATUS

Remote Management | Threat Management | Maintenance Server | TIR Management | Log Off | Help

System Administration

Build | Comm

Communications

- No Response to Ping (TSA-023 07:23 AM)

Parent:

Hostname	Type	IP Address	Status	Connection	Local Time
NER.CC-001	CC	24.28.114.9	Online	LAN	05/01/2003 12:03pm

Children:

Hostname	Type	IP Address	Status	Connection	Local Time
NER.JFK.HH-001	HH	24.26.165.15	Online	LAN	05/01/2003 12:03pm
NER.JFK.T6.CP2.CC-001	CC	24.26.165.15	Online	LAN	05/01/2003 09:04pm
NER.JFK.T6.CP2.TSM-002	TSM	24.26.165.15	Online	Dialup	05/01/2003 09:04pm
NER.JFK.T6.CP2.TSM-003	TSM	24.26.165.15	Offline	Dialup	05/01/2003 09:04pm
NER.JFK.T6.CP2.TSM-004	TSM	24.26.165.15	Rebooting	LAN	05/01/2003 09:04pm
NER.JFK.T6.CP2.TSM-005	TSM	24.26.165.15	Repair	LAN	05/01/2003 09:04pm
NER.JFK.T6.CP2.TSM-006	TSM	24.26.165.15	Online	LAN	05/01/2003 09:04pm
NER.JFK.T6.CP2.TSM-007	TSM	24.26.165.15	Online	LAN	05/01/2003 09:04pm
NER.JFK.T6.CP2.TSM-008	TSM	24.26.165.15	Online	LAN	05/01/2003 12:03pm

Unselect All

Synchronize All Times | Reboot Selected Host(s)

Add New Host | View Selected Host | Modify Selected Host | Delete Selected Host(s)

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FIG. 26

Validian

STATUS

Unid Comm

Communications

- No Response to Ping (TSA-023 07:23 AM)

Remote Management | Threat Management | Maintenance Server | TIP Management | Log Off | Help

Throughput Report

Report Filter

Time Period/ Interval:	One day broken down by hour
Start Date:	05/12/2003
Location:	NER.JFK.T6.CP2.TSM-002
Operator:	E130189
Type:	Normal

Period	Processed Items	Manually Inspected	Alarms	False Alarms	Threats
12:00am	26	2	0	0	0
01:00am	25	5	0	0	0
02:00am	23	4	0	0	0
03:00am	8	1	0	0	0
04:00am	19	1	0	0	0
05:00am	55	2	0	0	0
06:00am	100	23	0	0	0
07:00am	123	18	2	2	0
08:00am	160	10	4	4	0
09:00am	189	22	3	3	0

FIG. 27

Validian

STATUS

Dnld Comm

Communications

- No Response to Ping (TSA-023 07:23 AM)

Remote Management | Threat Management | Maintenance Server | TIP Management | Log Off | Help

Personnel Report

Report Filter	
Location:	All
Operator	All

Location	Operator	Screener #1	Screener #2	Screener #3
TSM-001	jzanovitch	jmichael	echin	N/A
TSM-002	mgaug	edavid	blu	N/A
TSM-003	scurry	jcarter	dbailey	jnicholson
TSM-004	jporter	poakenfield	rstone	bstrathmore

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FIG. 28

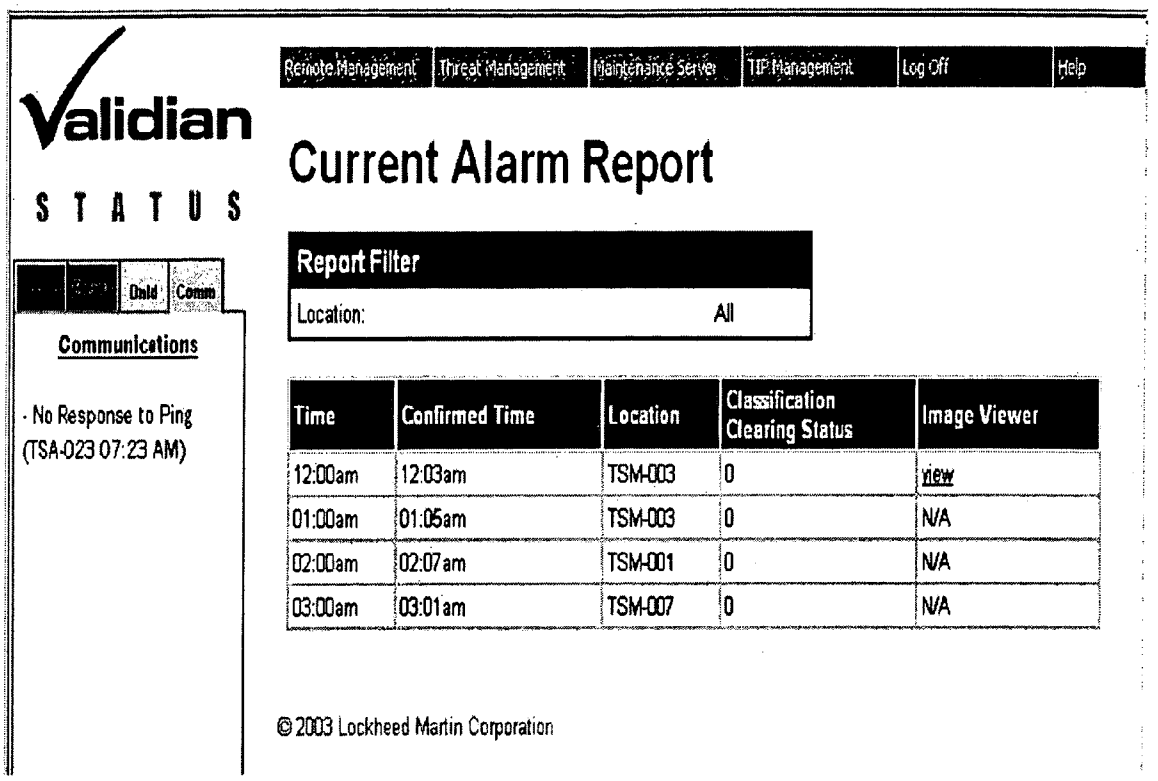
Validian
STATUS
Remote Management
Threat Management
Maintenance Server
TIP Management
Log Off
Help
Current Alarm Report
Dnld
Comm
Communications
- No Response to Ping (TSA-023 07:23 AM)
Report Filter
Location: All
Time
Confirmed Time
Location
Classification Clearing Status
Image Viewer
12:00am 12:03am TSM-003 0 view
01:00am 01:05am TSM-003 0 N/A
02:00am 02:07am TSM-001 0 N/A
03:00am 03:01am TSM-007 0 N/A
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FIG. 29

Validian

STATUS

Remote Management | Threat Management | Maintenance Server | TIP Management | Log Off | Help

Historical Bag/Threat Information

General Overview Report

Unid | Comm

Communications

- No Response to Ping (TSA-023 07:23 AM)

Report Filter	
Time Period:	One month
Machine ID:	All
Operator:	All

Bag ID	Machine ID	Date/Time	Threat Type	Supervisor Resolution
B000101	NER.JFK.T6.CP2.TSM-002	05/26/2003 05:43pm	Weapon	Threat successfully cleared.
B000102	NER.JFK.T6.CP2.TSM-004	05/29/2003 05:43pm	Explosive	Threat successfully cleared.
B012433	NER.JFK.T6.CP2.TSM-001	05/30/2003 05:43pm	Weapon	Threat successfully cleared.
B064321	NER.JFK.T6.CP2.TSM-006	06/14/2003 05:43pm	Explosive	Threat successfully cleared.

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FIG. 30

Validian

STATUS

Remote Management | Threat Management | Maintenance Server | TIP Management | Log Off | Help

Threat Type Information

General Overview Report

Dnld | Comm

Communications

- No Response to Ping (TSA-023 07:23 AM)

Report Filter

Threat Category: All

Threat ID	Threat Category	Threat First Detected
D873SDGP02	Explosive	Bag ID: RJ90S3D
T1038472	Weapon	Bag ID: B029387
T1238374	Weapon	Bag ID: B282038
T3904842	Weapon	Bag ID: B212822

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FIG. 31

Validian

STATUS

Remote Management | Threat Management | Maintenance Server | TJP Management | Log Off | Help

Dnld | Comm

Communications

- No Response to Ping (TSA-023 07:23 AM)

All Actions Taken Information

General Overview Report

Report Filter	
Time Period:	Month
Machine ID:	All
Operator:	All

Location	Operator	Date/Time	Action
TSM-002	E103189	05/02/2003 08:03pm	Cleared Threat 1 of 3
TSM-001	E135468	05/04/2003 08:03pm	Cleared Threat 1 of 1
TSM-004	E198465	05/05/2003 08:03pm	Cleared Threat 1 of 2
TSM-021	E130111	05/08/2003 08:03pm	Cleared Threat 3 of 3

Back

FIG. 32

Validian

Remote Management | Threat Management | Maintenance Server | TIP Management | Log Off | Help

STATUS

File Management

Dnld | Comm

Communications

· No Response to Ping (TSA-023 07:23 AM)

Filename	Description	Owner	Version	Type	Build Date
F000374	Maintenance Server Software	E130189	1.2	Config	05/01/2003
F000375	TSM firmware	E130190	3.1	SM	05/01/2003
F000376	Control Center Software	E130165	5.0	Control	05/01/2003
F000377	CC Antivirus Software	E130166	1.1	Exe	05/01/2003
F000378	Control Center Software	E130198	1.1	Config	05/01/2003
F000379	CT Software	E154123	1.6	CT	05/01/2003
F000380	SM Software	E130189	1.01	SM	05/01/2003
F000381	SM firmware	E130190	6.6	SM	05/01/2003
F000382	Threat Management Software	E130165	1.02	Config	05/01/2003
F000383	Remote Management Software	E130166	1.41	Control	05/01/2003
F000384	Threat Library - Hand Guns	E130198	1.11	SM	05/01/2003
F000385	Threat Library - Small Bombs	E154123	1.0	Exe	05/01/2003
F000386	Threat Library - Rifles	E130189	3.0	Config	05/01/2003
F000387	Threat Library - Kitchen Knives	E130190	2.2	SM	05/01/2003

Unselect All

Add New File | Update Selected File | View Selected File Details | Delete Selected File(s)

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FIG. 33

Validian

STATUS

Remote Management | Threat Management | Maintenance Server | TIP Management | Log Off | Help

Profile Management

Unld | Comm

Communications

- No Response to Ping (TSA-023 07:23 AM)

Profile ID	Description	Creator	Files	Type	Creation Date
P000374	Updated Control Center Software	E130189	10	Control	05/01/2003
P000375	Updated TSM firmware	E130159	25	SM	05/01/2003
P000376	Updated Control Center Software	E130186	1	Control	05/01/2003
P000377	Updated Control Center Software	E130120	15	Control	05/01/2003
P000378	Updated Control Center Software	E130121	12	Control	05/01/2003
P000379	Updated Control Center Software	E130122	13	Control	05/01/2003
P000380	Updated TSM firmware	E130160	4	SM	05/01/2003
P000381	Updated TSM firmware	E130178	6	SM	05/01/2003
P000382	Updated Control Center Software	E195189	15	Control	05/01/2003
	Updated Control				

Unselect All

Create New Profile | View Selected Profile Details | Delete Selected Profile(s)

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FIG. 34

Validian

Remote Management | Threat Management | Maintenance Server | TIP Management | Log Off | Help

STATUS

Download Management

Dnld | Comm

Communications

- No Response to Ping (TSA-023 07:23 AM)

Download ID	Profile ID	Date	Time
D000383	P000374	05/20/2003	10:00am
D000408	P000375	05/20/2003	10:00am
D000409	P000376	05/20/2003	10:00am
D000410	P000377	05/20/2003	10:00am
D000411	P000378	05/20/2003	10:00am
D000412	P000379	05/20/2003	10:00am
D000413	P000400	05/20/2003	10:00am

Unselect All

Schedule New Download | View/Modify Selected Download | Delete Selected Download(s)

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FIG. 35

Validian

Remote Management | Threat Management | Maintenance Server | TIP Management | Log Off | Help

STATUS

TIP Image Management

Dald | Comm

Communications

· No Response to Ping (TSA-023 07:23 AM)

Image	Truth description	Threat Type	Date
I000374	Rifle	Weapon	05/01/2003
I000375	BB gun	Weapon	05/01/2003
I000376	Missile	Weapon	05/01/2003
I000377	Bomb	Explosive	05/01/2003
I000378	Handgun	Weapon	05/01/2003
I000379	Semi-automatic handgun	Weapon	05/01/2003
I000380	Corkscrew	Weapon	05/01/2003
I000381	Bomb	Explosive	05/01/2003
I000382	Pocket knife	Weapon	05/01/2003
I000383	Bomb	Explosive	05/01/2003
I000384	Large knife	Weapon	05/01/2003
I000385	Large knife	Weapon	05/01/2003
I000386	Bomb	Explosive	05/01/2003
I000387	Scissors	Weapon	05/01/2003
I000388	Bomb	Explosive	05/01/2003
I000389	Small knife	Weapon	05/01/2003
I000390	Bomb	Explosive	05/01/2003
I000391	Letter opener	Weapon	05/01/2003
I000392	Bat	Weapon	05/01/2003

Unselect All

Add New Image | View Selected Image | Delete Selected File(s)

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FIG. 36

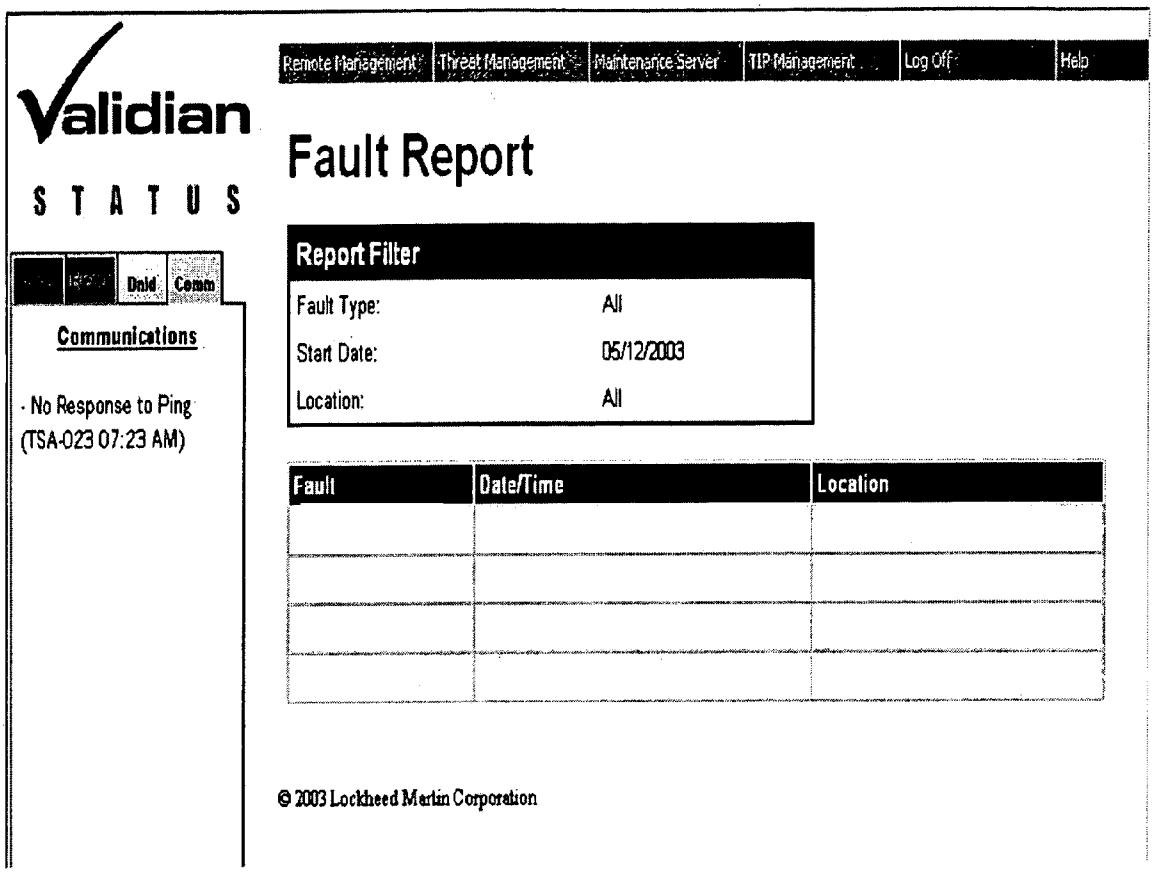
Remote Management
Threat Management
Maintenance Server
TIP Management
Log Off
Help
Validian
STATUS
Dnid
Comm
Communications
- No Response to Ping
(TSA-023 07:23 AM)
Fault Report
Report Filter
Fault Type: All
Start Date: 05/12/2003
Location: All
Fault
Date/Time
Location
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FIG. 37

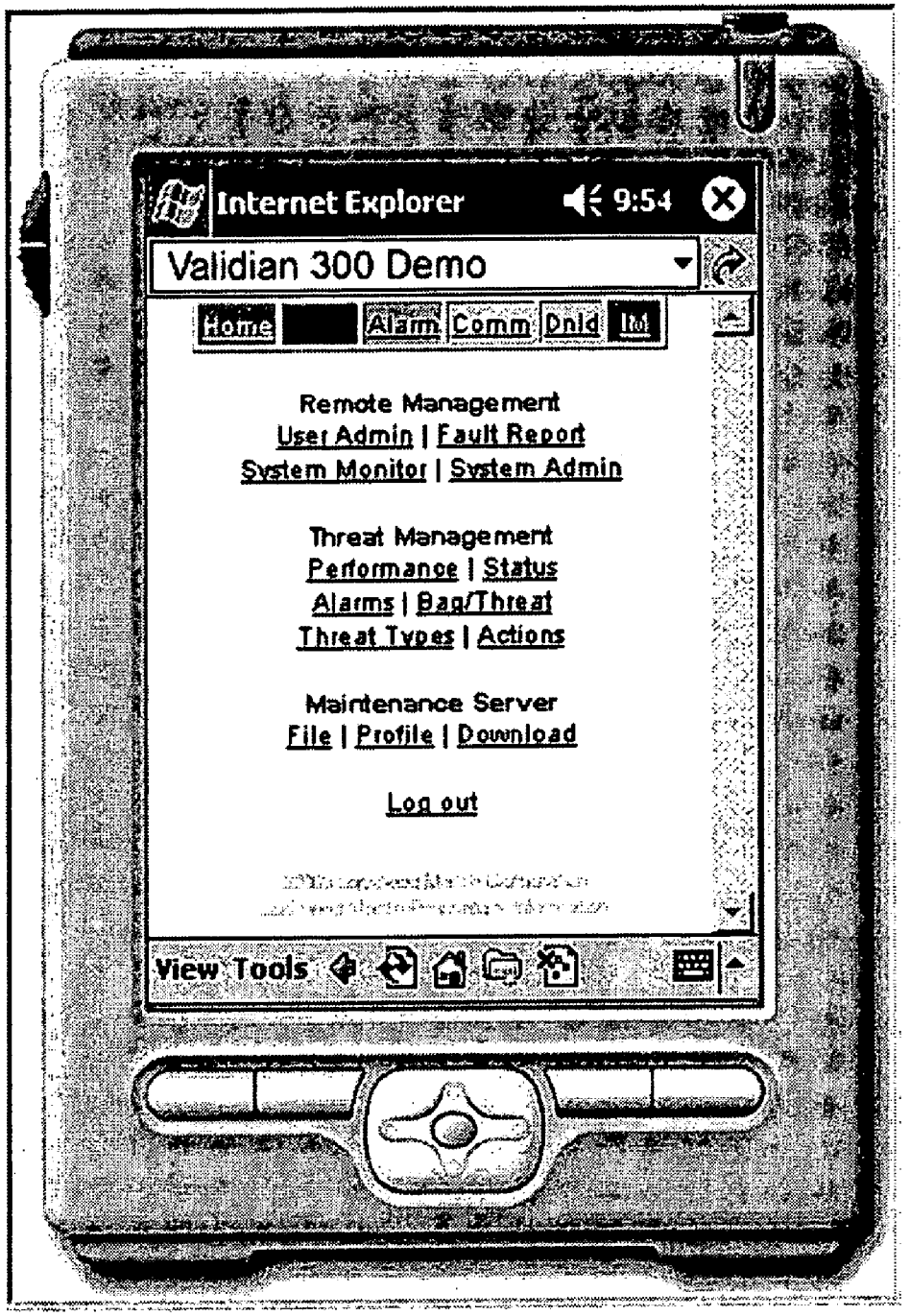
Internet Explorer
9:54
Validian 300 Demo
Home
Alarm
Comm
Dnld
Remote Management
User Admin | Fault Report
System Monitor | System Admin
Threat Management
Performance | Status
Alarms | Bag/Threat
Threat Types | Actions
Maintenance Server
File | Profile | Download
Log out
View Tools

FIG. 38

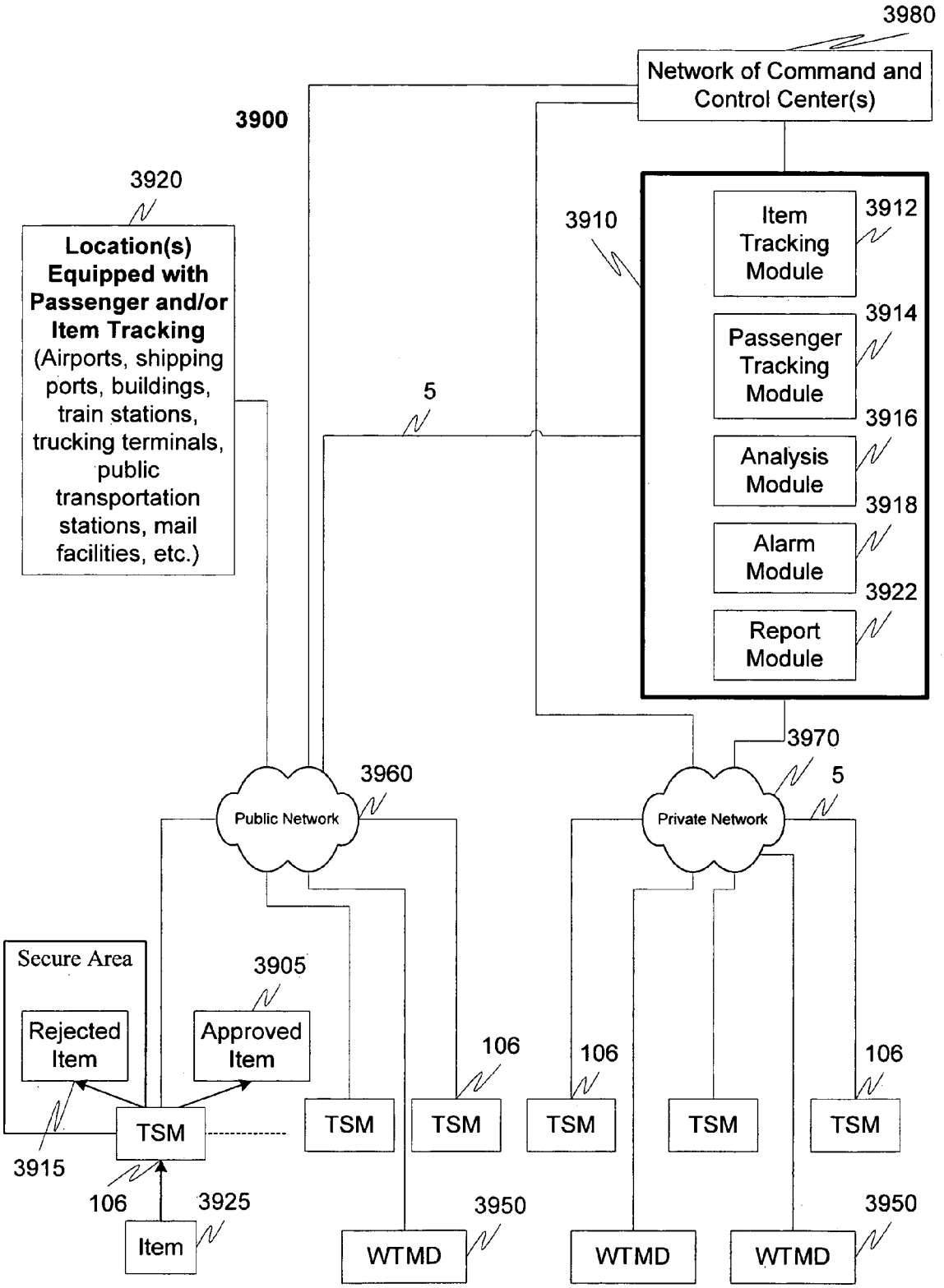
3980
Network of Command and Control Center(s)
3900
3920
Location(s) Equipped with Passenger and/or Item Tracking (Airports, shipping ports, buildings, train stations, trucking terminals, public transportation stations, mail facilities, etc.)
3910
Item Tracking Module
3912
Passenger Tracking Module
3914
Analysis Module
3916
Alarm Module
3918
Report Module
3922
5
3970
5
3960
Public Network
Private Network
Secure Area
Rejected Item
Approved Item
3905
3915
TSM
106
3925
Item
TSM
TSM
TSM
TSM
TSM
106
106
106
WTMD
WTMD
WTMD
3950
3950

Fig. 39

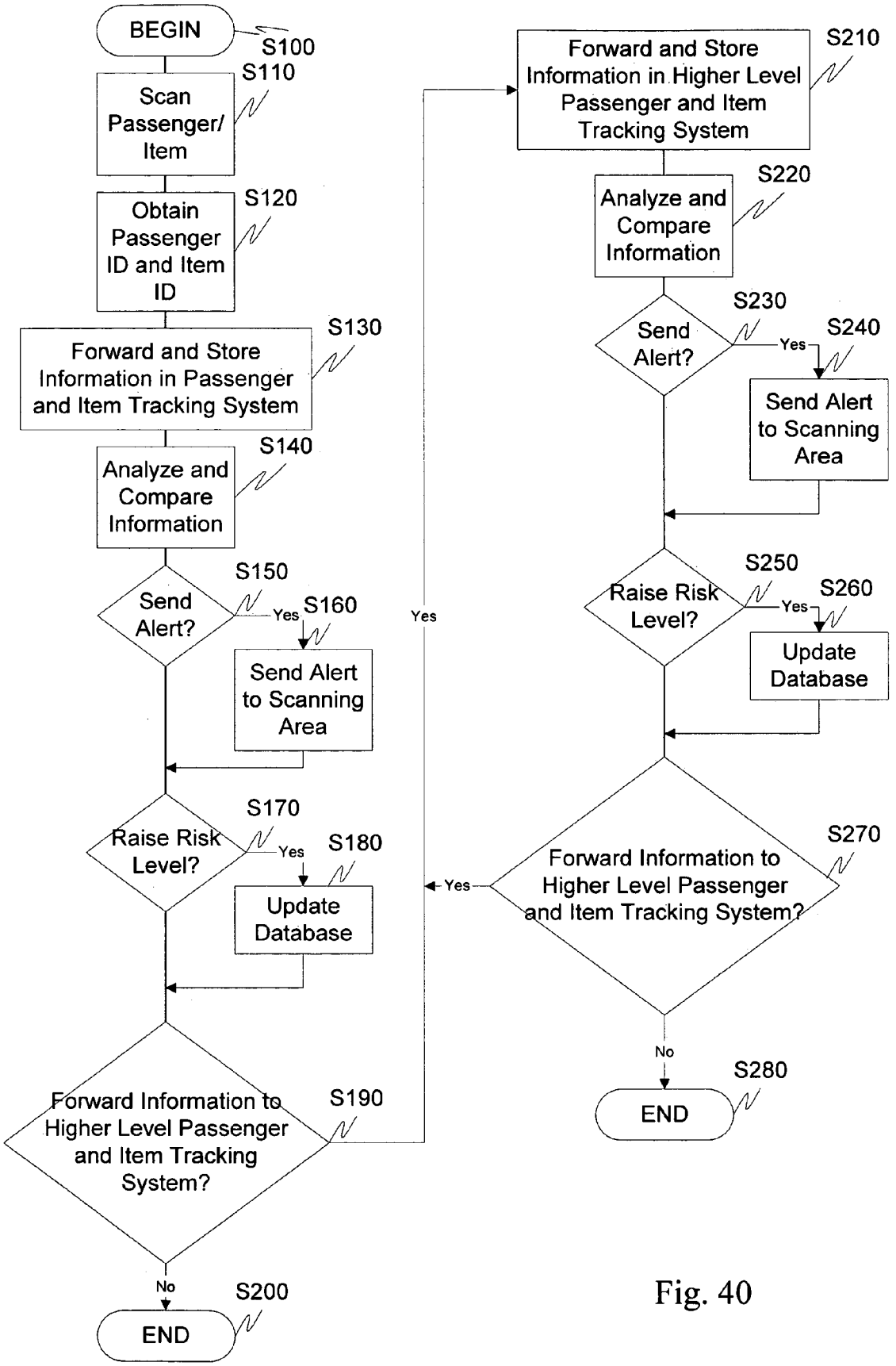
BEGIN
S100
Scan Passenger/ Item
S110
Obtain Passenger ID and Item ID
S120
Forward and Store Information in Passenger and Item Tracking System
S130
Analyze and Compare Information
S140
Send Alert?
S150
Yes
S160
Send Alert to Scanning Area
Raise Risk Level?
S170
Yes
S180
Update Database
Forward Information to Higher Level Passenger and Item Tracking System?
S190
No
S200
END
Yes
Forward and Store Information in Higher Level Passenger and Item Tracking System
S210
Analyze and Compare Information
S220
Send Alert?
S230
Yes
S240
Send Alert to Scanning Area
Raise Risk Level?
S250
Yes
S260
Update Database
Forward Information to Higher Level Passenger and Item Tracking System?
S270
Yes
No
S280
END

Fig. 40

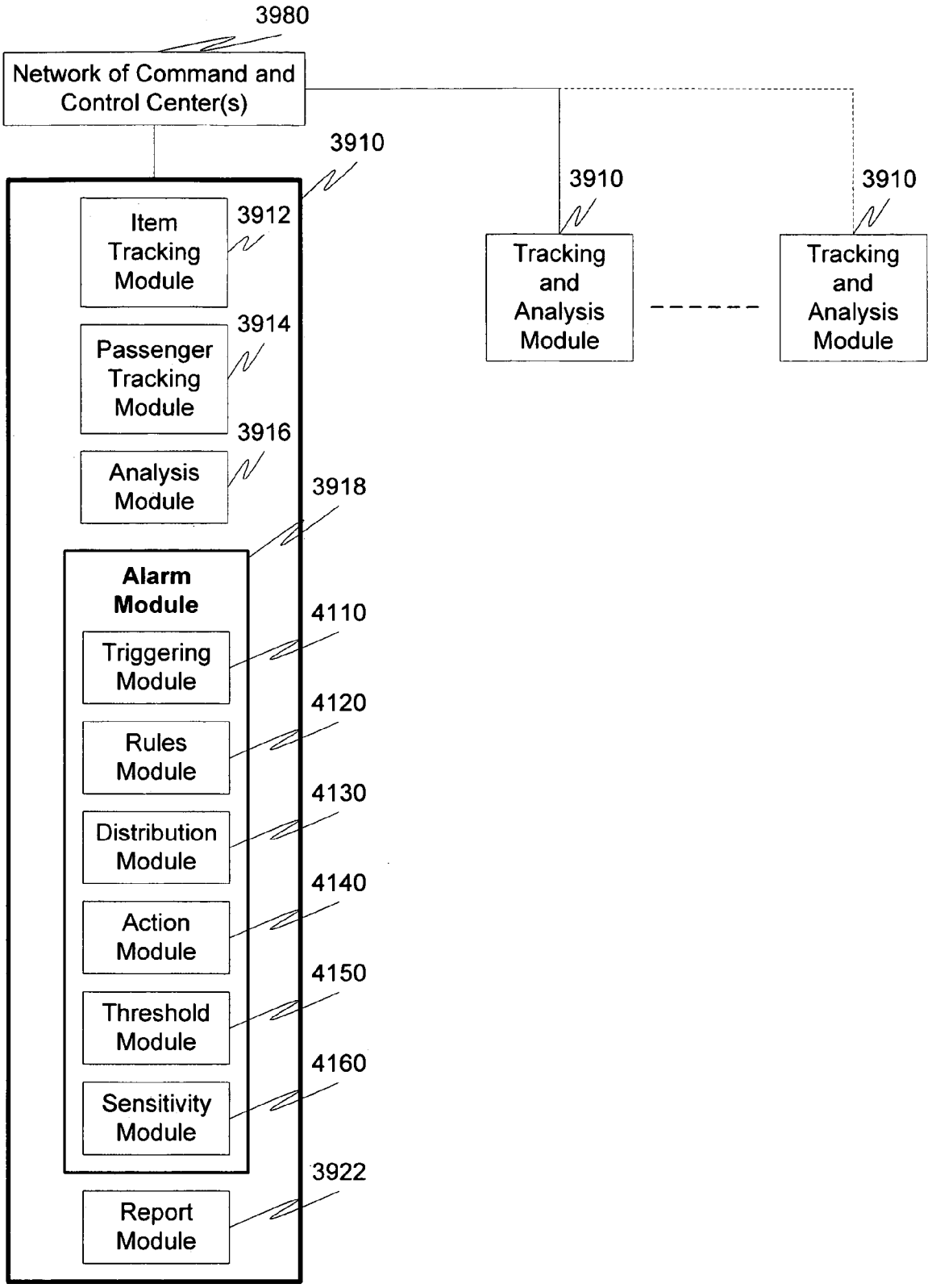
3980
Network of Command and Control Center(s)
3910
Item Tracking Module
3912
Passenger Tracking Module
3914
Analysis Module
3916
3918
Alarm Module
Triggering Module
4110
Rules Module
4120
Distribution Module
4130
Action Module
4140
Threshold Module
4150
Sensitivity Module
4160
Report Module
3922
3910
Tracking and Analysis Module
3910
Tracking and Analysis Module

Fig. 41

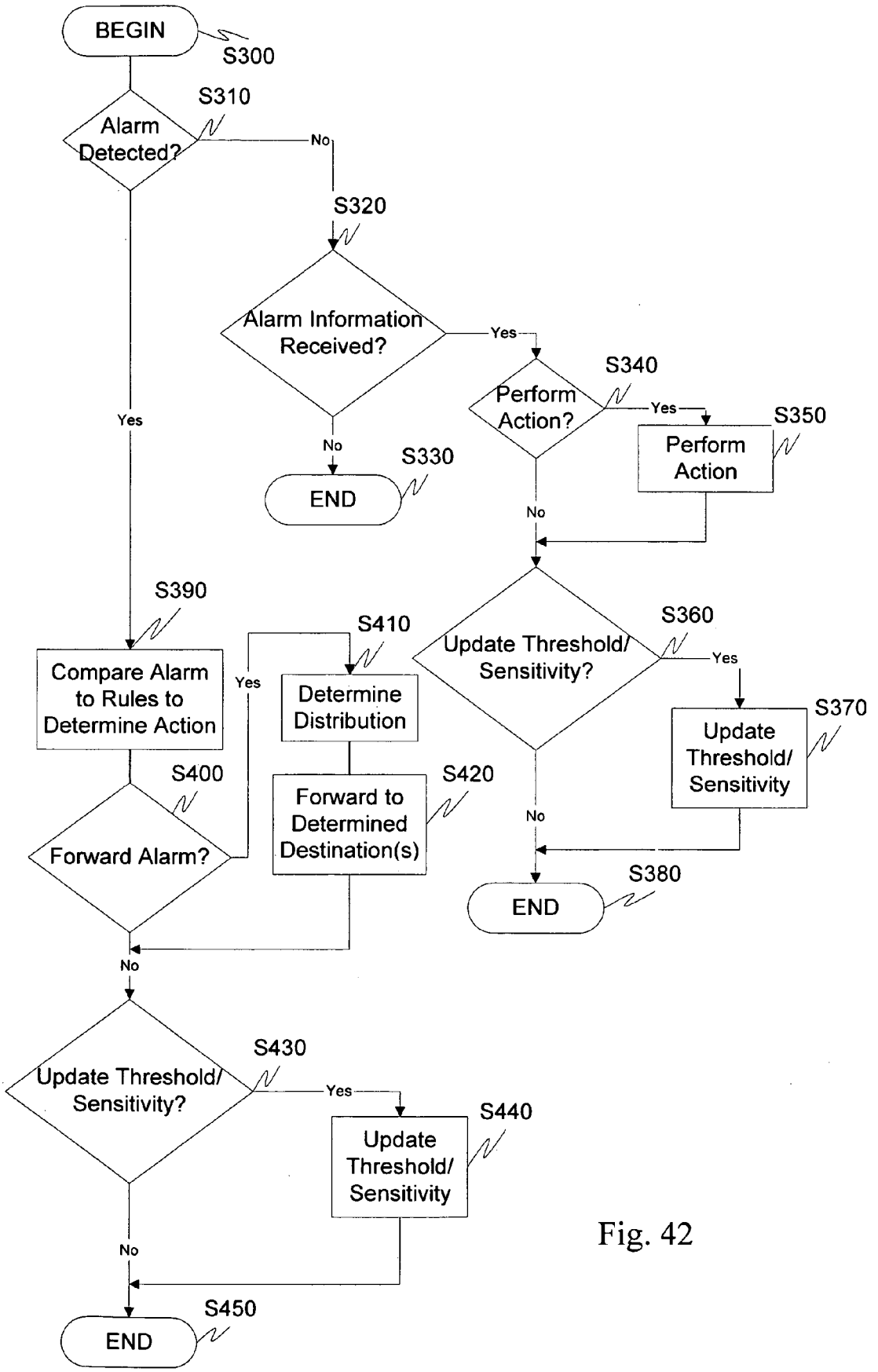
BEGIN
S300
S310
Alarm Detected?
No
Yes
S320
Alarm Information Received?
Yes
No
S330
END
S340
Perform Action?
Yes
No
S350
Perform Action
S390
Compare Alarm to Rules to Determine Action
S400
Forward Alarm?
Yes
No
S410
Determine Distribution
S420
Forward to Determined Destination(s)
S360
Update Threshold/ Sensitivity?
Yes
No
S370
Update Threshold/ Sensitivity
S380
END
S430
Update Threshold/ Sensitivity?
Yes
No
S440
Update Threshold/ Sensitivity
S450
END

Fig. 42

PASSENGER AND ITEM TRACKING WITH SYSTEM ALERTS

Threat scanning machines are often employed in locations where safety and security are at issue. Transportation facilities, for example, airports, train stations, seaports, and the like, may employ threat scanning machines to detect security threats within passenger or freight baggage. Other facilities, such as office buildings, government buildings, court houses, museums, and the like, may also employ threat scanning machines to detect, for example, restricted items being carried by a person seeking entry to the facility. A threat scanning machine, as used herein, refers to any device capable of scanning an item to detect an object defined as a threat, or any object that combined with one or more other objects is or is capable of being a threat. A threat, as used herein, can be anything that is restricted from being brought aboard a vehicle, into a building or into an area.

Threat scanning machines may be of different make and model, including carry-on bag scanning machines, checked-bag scanning machines, walk-through metal detectors, x-ray scanners, computerized tomography devices, magnetic resonance imaging devices, cargo and freight scanners, package scanners, and the like, thus requiring individualized maintenance and control of each machine's software and data components. The task of individually maintaining and controlling each machine may be time consuming, prone to error and expensive. For example, when supervisor attention is required at a particular machine, the supervisor must physically go to the machine, assess the situation and provide guidance to the threat scanning machine operator. As another example, when the software in an existing threat scanning machine needs to be upgraded, the media containing the upgrade may be required to be carried from machine to machine in order to perform the upgrade. The diversity of threat scanning machine types and the varied locations of threat scanning machines pose obstacles to the efficient management of the threat scanning machines.

In an exemplary embodiment of the threat scanning machine management system, the threat scanning machines are connected to a communication network. One or more command and control center computers are connected to the communication network. The threat scanning machines, possibly of different make and model, are adapted with hardware and software to allow them to communicate over the network with the command and control center computer. The command and control center computer is adapted with software and/or hardware to control and manage threat scanning machines. In another exemplary embodiment of the present invention, the command and control computer can transmit data, such as, for example, operational software and threat profiles to the threat scanning machine; and the threat scanning machines may transmit data, such as, for example, images and performance data to the command and control computer.

In yet another exemplary embodiment of the present invention, a supervisor may view the images or performance data of a threat scanning machine remotely on the control center computer, assess the situation and assist the threat scanning machine operator remotely, thereby permitting the supervisor to manage multiple threat scanning machines in an efficient manner. In still another exemplary embodiment of the present invention, the threat scanning machine management system may be dynamically configurable, the network may be a wireless network, and the command and control center computer may be a portable device, thus permitting a superior to manage the threat scanning machines while remaining mobile. In still another exemplary embodiment, a group of operators within an operator pool are used to scan images associated with scanned items to check for threats, and alarms are sent based on, for example, detected threats, automatically, manually or some combination thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a functional block diagram of an exemplary embodiment of a threat scanning machine management system;

FIG. **2** is a functional block diagram of an exemplary embodiment of a threat scanning machine management system showing the control centers connected to a threat scanning machine in accordance with the present invention;

FIG. **3** is a functional block diagram of an exemplary embodiment of a threat scanning machine management system showing the details of an exemplary threat scanning machine in accordance with the present invention;

FIG. **4** is a functional block diagram of an exemplary embodiment of a threat scanning machine management system showing the details of an exemplary control center in accordance with the present invention;

FIG. **5** is a functional block diagram of an exemplary embodiment of the logical functions of an exemplary threat management module in accordance with the present invention;

FIG. **6** is a functional block diagram of an exemplary embodiment of a remote management module in accordance with the present invention;

FIG. **7** is a functional block diagram of an exemplary embodiment of a maintenance server module in accordance with the present invention;

FIG. **8** is a functional block diagram of an exemplary embodiment of a control center database and web service connections in accordance with the present invention;

FIG. **9** is a functional block diagram of an exemplary control and maintenance system showing a web browser connection in accordance with the present invention;

FIG. **10** is a functional block diagram of an exemplary threat scanning machine architecture in accordance with the present invention;

FIG. **11** is a functional block diagram of an exemplary embodiment of the threat scanning machine management system showing an exemplary approach to network security in accordance with the present invention;

FIG. **12** is a functional block diagram of an exemplary embodiment of the threat scanning machine management system showing exemplary security components in accordance with the present invention;

FIGS. **13**A and **13**B are functional block diagrams of exemplary embodiments of the threat scanning machine management system showing exemplary alternative approaches to the network connection of security equipment in accordance with the present invention;

FIG. **14** is a functional block diagram of an exemplary message interface between a threat scanning machine and the threat scanning machine management system in accordance with the present invention;

FIG. **15** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing the main menu screen;

FIG. **16** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing the items of the Remote Management menu;

FIG. **17** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing the items of the Threat Management menu;

FIG. **18** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing the items of the Maintenance Server menu;

FIG. **19** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing the items of the Threat Image Projection (TIP) Management menu;

FIG. **20** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing Event information;

FIG. **21** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing User Administration data;

FIG. **22** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing a Fault Reporting selection dialog;

FIG. **23** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing a Report Filter selection dialog;

FIG. **24** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing System Administration data;

FIG. **25** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing a download schedule;

FIG. **26** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing the System Administration screen;

FIG. **27** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing a Throughput Report;

FIG. **28** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing a Personnel Report;

FIG. **29** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing a Current Alarm Report;

FIG. **30** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing an Historical Bag/Threat Information Report;

FIG. **31** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing a Threat Type Information Report;

FIG. **32** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing an All Actions Taken Information Report;

FIG. **33** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing a File Management Report;

FIG. **34** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing a Profile Management Report;

FIG. **35** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing a Download Management Report;

FIG. **36** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing a TIP Image Management Report;

FIG. **37** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface showing a Fault Report;

FIG. **38** is an illustration of an exemplary embodiment of the threat scanning machine management system user interface adapted for use on a handheld or portable computer showing the main menu screen;

FIG. **39** is a functional block diagram illustrating an exemplary embodiment of the passenger and item tracking according to this invention;

FIG. **40** is a flowchart illustrating an exemplary operation of the passenger and item tracking according to this invention;

FIG. **41** is a functional block diagram illustrating in greater detail the alarm module according to this invention; and

FIG. **42** is a flowchart illustrating an exemplary operation of sending alarms according to this invention.

DETAILED DESCRIPTION

While the exemplary embodiments illustrated herein may show the various components of the threat scanning machine, and corresponding command and control center, collocated, it is to be appreciated that the various components of the system can be located at distant portions of a distributed network, such as a telecommunications network and/or the Internet or within a dedicated communications network. Thus, it should be appreciated that the components of the threat scanning machine, the command and control center, and tracking and analysis module, respectively, can be combined into one or more devices or collocated on a particular node of a distributed network, such as a telecommunications network. As will be appreciated from the following description, and for reasons of computational efficiency, the components can be arranged at any location within the distributed network without affecting the operation of the system. Also, the exemplary embodiments shown provide a layout of the system in which the subsystems (i.e. Threat Management, Remote Management, and Maintenance Server) are shown separately for conceptual clarity and for illustrative purposes in both the threat scanning machines and the command and control center. However, it should be appreciated, that other layouts, groupings, and/or arrangements of the subsystems within the system may be used. Furthermore, while the exemplary embodiment will be discussed in relation to one or more command and control centers, it should be appreciated that the systems and methods of this invention can work equally well without a command and control center architecture. For example, the logic and accompanying hardware/software functionality of the command and control center(s) can be distributed throughout one or more of the remaining components of the architecture, such as in the threat scanning machine(s), for example, in a distributed peer-to-peer network, or the like.

Furthermore, it should be appreciated that the various links connecting the elements can be wired or wireless links, or a combination thereof, or any known or later developed element(s) that is capable of supplying and/or communicating data to and from the connected elements. Additionally, the term module as used herein can be any hardware, software of combination thereof that is capable of performing the functionality associated therewith.

FIG. **1** shows a functional block diagram of an exemplary embodiment of a threat scanning machine management system **100**. In particular, a command and control center **102** forms a top level of a system hierarchy and is interconnected by a network **112** to a next level comprising command and control centers **104**. A command and control center **104** is interconnected with a threat scanning machine **106** by the network **112**. A command and control center **104** is interconnected to command and control center **108** and to

command and control center **110** via the network **112**. A command and control center **110** is interconnected to one or more threat scanning machines **106** via the network **112**.

The threat scanning machine management system **100** shown in FIG. **1** represents, for purposes of illustration, an exemplary configuration of command and control centers connected to each other and to threat scanning machines. However, it should be appreciated that the system **100** can be configured in order to be adaptable to various contemplated uses of the present invention. The configuration of the system **100** may be static or dynamic depending on contemplated uses of the invention. In an exemplary embodiment, a transportation facility may have an existing network (not shown), and in such a case, the threat scanning machine management system **100** may be adapted to the existing network. Alternatively, in another exemplary embodiment, if an existing network within a transportation facility is insufficient to be able to be adapted to meet the communications requirements of the threat scanning machine management system **100** for any reason, such as low bandwidth or poor security, for example, then a new network can be installed for the threat scanning machine management system **100** to communicate over. However, it should be appreciated that any communications medium that allows the threat scanning machines and the control centers to communicate may be used with equal success. In an exemplary embodiment of the invention, the command and control centers and the threat scanning machines communicate over the network **112** using standard protocols common in the industry. Examples of standard protocols include, for example, hypertext transfer protocol. (HTTP), Internet Inter-ORB Protocol (IIOP), Remote Method Invocation (RMI), Simple Mail Transfer Protocol (SMTP), Secured Sockets Layer (SSL), Secure Hypertext Transfer Protocol (SHTTP) and the like. Examples of a network **112** include wired or wireless solutions such as Ethernet, fiber optic, or the like. However, it should be appreciated that any present or future developed networks and/or network protocols which perform the tasks required for a command and control center to communicate with a threat scanning machine may be used with equal success according to the present invention.

In operation, the exemplary command and control center **110** communicates with one or more threat scanning machines **106** via the network **112**. The command and control center **110** may transmit data to the threat scanning machine, for example, operational software, authorized users and credentials, threat profiles, etc. The operational software may comprise any combination of software for the operation of the scanning system and/or software for the operation of the management system **100**. The authorized users and credentials may include, for example, a list of user login names and passwords. Threat profiles may include data that the threat scanning machine uses to aid in identification of threats, for example the shape of potential threat items, and/or the physical properties of an item that may indicate a potential threat. However, it should be appreciated that the data transmitted from the command and control center **110** to the threat scanning machine **106** may be any data required for the management and operation of the threat scanning machine **106** and could be used with equal effectiveness according to the present invention.

The exemplary threat scanning machine **106** communicates with the command and control center **110**. The threat scanning machine **106** may receive data from the command and control center **110** and/or may transmit data to the command and control center **110**. The data that the threat scanning machine may transmit to the command and control center **110** may include, for example, performance data, requests for operator assistance, threat detection data, and/or the like.

The exemplary command and control center **110** may communicate with one or more command and control centers **104** and/or **102**. In the exemplary embodiment shown in FIG. **1**, the command and control centers **110** are interconnected to command and control centers **104**. The command and control centers **104** are interconnected to command and control center **102**. In this exemplary embodiment and configuration of the present invention control centers are arranged in a hierarchical manner to provide for the centralized management of many threat scanning machines **106** from a central command and control center **102**, thus providing more efficient management of the threat scanning machines **106**.

FIG. **2** is a functional block diagram of an exemplary embodiment of a threat scanning machine management system. In particular, a command and control center **104** at one level is interconnected with a command and control center **110** of another level. The command and control center **104** comprises, in addition to standard control center components, a threat management module **206**, a remote management module **208** and a maintenance server module **210**. The exemplary command and control center **110** comprises, in addition to standard control center components, a threat management module **222**, a remote management module **224** and a maintenance server module **226**. The exemplary command and control center **110** is interconnected to one or more exemplary threat scanning machines **106**. The exemplary threat scanning machines **106** comprise, in addition to standard threat scanning machine components, a threat scanning machine computer **202** and a scanning system **204**.

The exemplary threat scanning machine computer **202** comprises, in addition to standard computer hardware and software components, a management system interface module **220** and a scanning system interface module **218**. The management system interface module **220** comprises a threat management module **212**, a remote management module **214**, and a maintenance server module **216**. The exemplary threat management module **212**, remote management module **214**, and maintenance server module **216** are adapted to provide the interface and logic necessary for the threat scanning machine **106** to be connected to the threat scanning machine management system **100**; these modules also communicate with the scanning system interface module **218**. In an exemplary embodiment, the threat scanning machine computer **202** may be a standard PC. In another exemplary embodiment, the threat scanning machine computer **202** may be a specialized computer adapted specifically to control the threat scanning machine **106**.

In yet another exemplary embodiment of the present invention, the threat scanning machine management system **100** may be designed to adapt to any existing threat scanning machine computer **202** in order to allow the threat scanning machine **106** to connect and communicate within the threat scanning machine management system.

In still another exemplary embodiment of the present invention, the management system interface module **220** can be housed in a computer separate from the threat scanning machine computer **202**; this construction may be useful in situations where the execution of the management system interface module **220** may present too great a processing and/or communications burden for the threat scanning machine computer **202**.

In operation, the exemplary threat management module **206** of the command and control center **104** communicates

with the threat management module **222** of the command and control center **110**. The threat management module **222** of the command and control center **110** communicates with the threat management module **212** of the threat scanning machine **106**. The threat management information comprises any information related to the management of threats. Examples of such information include Threat Image Projections (TIPs), which are non-threat images with threats inserted into them for testing purposes, threats detected within a particular piece of baggage, or messages alerting the threat scanning machine operators to specific or general types of security risks that may be present or that may be attempted.

The exemplary remote management module **208** of the command and control center **104** communicates with the remote management module **224** of the command and control center **110**. The remote management module **224** of the command and control center **110** communicates with the remote management module **214** of the threat scanning machine **106**.

The exemplary maintenance server module **210** of the command and control center **104** communicates with the maintenance server module **226** of the command and control center **110**. The maintenance server module **226** of the command and control center **110** communicates with the maintenance server module **216** of the threat scanning machine **106**.

The command and control center **110** and the threat scanning machine **106** may communicate with each other using a predefined interface format. A predefined format allows for the command and control center **110** to be connected to any threat scanning machine **106** that has been adapted to work in accordance with the present invention. The tables below provide an example of a predefined interface between the command and control center **110** and the threat scanning machine **106**. However, it should be appreciated that these tables merely represent an exemplary interface for illustration purposes. An actual interface may vary in both content and design, while still being used with equal success, depending on contemplated uses of the invention.

TABLE 1

Interface Message
Operator Bag Information
Screener Bag Information
Threat Information
Alarm Information
TIP Truth Information
Event Information
User Keystroke Information
TIP Configuration
Threat Detection Configuration

Table 1 shows the messages of an exemplary interface between the command and control center **110** and the threat scanning machine **106**. In this exemplary interface the threat scanning machine **106** transmits messages to the command and control center **110**, including, for example, Operator Bag Information, Screener Bag Information, Threat Information, Alarm Information, Threat Image Projection (TIP) Truth Information, Event Information, and/or User Keystroke Information. While the command and control center **110** transmits the TIP Configuration and Threat Detection Configuration messages to the threat scanning machine **106**.

TABLE 2

Operator Bag Information	
Field Name	Description
Machine ID	Unique Identifier of Threat Scanning Machine
Bag ID	Identification of the bag
TIP ID	Identification of the TIP image
Logon ID	Operator ID
Bag Start Date CT	Date bag entered CT (Computerized Tomography)
Bag Start Time CT	Time bag entered CT
Bag Start Date QR	Date bag entered QR (Quadrupole Resonance)
Bag Start Time QR	Time bag entered QR
Operator Start Date CT	Date operator received the image
Operator Start Time CT	Time operator received the image
Operator End Date CT	Date operator completed the transaction
Operator End Time CT	Time operator completed the transaction
Bag Size	Length and/or weight of bag
Number of Threats	Number of threats detected in this bag
Number of Keystrokes	Number of keystrokes used by operator
Machine Decision	Machine indication of possible threat present within bag
Operator Decision	Operator indication of possible threat present within bag
Image ID	File name if cannot be derived from Bag ID

Table 2 shows the contents of an exemplary Operator Bag Information message. The Operator Bag Information message provides the command and control center **110** with information relating to a particular piece of baggage that has been scanned by the threat scanning machine **106**.

In operation, the Operator Bag Information message is used to transmit information gathered by an operator on a particular bag. A supervisor or screener can review the Operator Bag Information message in assisting the operator in assessing a potential threat. Another use of the Operator Bag Information message may be to monitor the performance of an operator by placing a test bag containing a known threat or threat-like object in order to evaluate the operator's performance in identifying and assessing the potential threat. A further use of the Operator Bag Information message is to collect the messages over time in order to form statistical models of the operator bag information. These statistical models may then be used to further enhance the operation of the threat scanning machine management system.

TABLE 3

Screener Bag Information	
Field Name	Description
Machine ID	Unique Identifier of Threat Scanning Machine
Bag ID	Identification of the bag
Logon ID	Screener ID
Screener Start Date CT	Date screener received the image
Screener Start Time CT	Time screener received the image
Screener End Date CT	Date screener completed the transaction
Screener End Time CT	Time screener completed the transaction
Number of Keystrokes	Number of keystrokes used by screener
Screener Decision	Determination of possible threat within bag
Screener Annotation	Screener's notes

Table 3 shows the contents of an exemplary Screener Bag Information message. The Screener Bag Information message provides the command and control center **110** with information from a particular screener about a particular piece of baggage.

In operation, when a threat scanning machine and/or operator detect a potential threat, a screener may be called

upon to search the bag physically. The Screener Bag Information message is used to transmit information gathered by a Screener on a particular bag, such as the results of the physical search, threats found or not found, and any action taken by security with regard to the passenger or the baggage. A supervisor can review the Screener Bag Information in assisting the screener and operator in assessing and dealing with a potential threat. Another use of the Screener Bag Information message may be to monitor the performance of a screener by placing a test bag containing a known threat or threat-like object in order to evaluate the screener's performance in identifying and assessing the potential threat. A further use of the Screener Bag Information message is to collect the messages over time and correlate them with other system data, such as operator bag messages, in order to form statistical models of the screener bag information. These statistical models may then be used to further enhance the operation of the threat scanning machine management system.

An important aspect of the present invention, achieved through the operator and screener bag information messages, is that baggage may be tracked and associated with a particular person as that person moves about from place to place, as discussed in more detail hereinafter. For example, the information about a particular person's bag may be gathered as the person travels from location to location. The threat scanning can then be augmented with historical bag information data in order to further inform the operator, screener, or supervisor of the need for further inspection of the bag. Additionally, the baggage may be associated with an owner or carrier and vice versa, thereby permitting the threat scanning machine management system to enhance the threat scanning with auxiliary information about the owner or carrier to further enhance the security.

TABLE 4

Threat Information

Field Name	Description
Machine ID	Unique Identifier of Threat Scanning Machine
Bag ID	Identification of the bag
CT Compound Type	Detected compound type
CT Mass	Measured mass/density
CT Confidence	Algorithm confidence factor
QR Compound Type	Detected compound type
QR Mass	Detected mass
Viewed by operator	Identifies if operator viewed this particular threat
Operator Action	Identifies what action the operator took on a given threat
Machine Decision	Machine decision of threat/non-threat
Threat Category	Identifies category of threat (e.g. weapon, explosive, etc.)
Picture File Name	The name of the file containing the picture

Table 4 above shows the contents of an exemplary Threat Information message. The Threat Information message provides the command and control center **110** with information about a particular threat detected by the threat scanning machine **106**.

In operation, Threat Information messages may be transferred to the command and control center for assistance in assessment by a supervisor. Additionally, the supervisor in the command and control center may pass the message along to a more senior supervisor at a regional or national level command and control center. Further still, the system can be configured to automatically forward messages to higher levels in the hierarchy based on a pre-selected or dynamic criteria, such as threat type or threat category. In this manner a threat that once could only be viewed and assessed on site, may now be able to be assessed by numerous people with possibly increasing levels of expertise, thereby by making efficient use of the supervisor's time through a hierarchical system of review and assessment of potential threats. This process can be carried out in a very expeditious manner through the interconnection of the threat scanning machine and the command and control centers on a distributed network. A further use of the Threat Information message is for the threat management system as a whole to scan for incidents of like or similar threats and alert supervisors and threat scanning machine operators to patterns in the data which may indicate a security breach is being attempted. Still another use of the Threat Information message is to gather information on things that have been identified as threats, but in actuality are only items of interest for purposes other than security. For example, the threat scanning machine could possibly be configured to monitor for aerosol cans within baggage and record statistics related to their occurrence in the baggage. This type of statistical information on "threats" could be used to guide policies regarding acceptable items, for general research into items in baggage, or for other such purposes. In yet another use of the Threat Information messages, the data may be collected over time and used to build statistical models of potential threats and their rates of occurrence. These statistical models could be fed back into the threat management system in order to improve the accuracy, security, and management efficiency of the threat scanning machine management system.

TABLE 5

Alarm Information

Field Name	Description
Machine ID	Unique Identifier of the Threat Scanning Machine
Bag ID	Identification of the bag
Alarm Severity	Identifies the severity of the alarm (e.g. nail clippers may be low, scissors may be medium, and gun/knife may be high)
Threat Category	Identifies category of threat (e.g. weapon, explosive, etc.)
Threat Confirmed	Annotation indicating if a threat was actually found

Table 5 shows the contents of an exemplary Alarm Information message. The Alarm Information message provides the command and control center **110** with information about a particular alarm from the threat scanning machine **106**.

In operation, the Alarm Information messages provide information useful to achieving management goals. As a current situational awareness indication, the Alarm Information may be transferred both vertically (i.e. from threat scanning, machine to command and control center and on up the chain of command and control centers) and horizontally (i.e. threat scanning machine to threat scanning machine) in order to inform management and other operators of threat events in a real time manner. This real-time reporting of threat event information makes an added dimension in security response possible, namely one of recognizing a looming security risk that may be geographically disbursed. By utilizing threat scanning machine management systems in multiple countries it would even be possible for nations to collectively detect and recognize a global security threat event that was in the early stages of being carried out. By collecting Alarm Information messages over time, statistical trends may be analyzed to aid management in improving the efficiency and security of the threat scanning machines.

TABLE 6

Event Information	
Field Name	Description
Machine ID	Unique Identifier of the Threat Scanning Machine
Logon ID	User ID
Event Date CT	Date event happened
Event Time CT	Time event happened
Event Code	Code responding to event
Event Detail	Text message about event

Table 6 shows the contents of an exemplary Event Information message. The Event Information message provides the command and control center **110** with information about a particular event that occurred at a threat scanning machine **106**.

In operation the Event Information messages provide information useful to achieving management goals. As a current situational awareness indication, the Event Information message may be transferred both vertically (i.e. from threat scanning machine to command and control center and on up the chain of command and control centers) and horizontally (i.e. threat scanning machine to threat scanning machine) in order to inform management and other operators of threat events in a real-time manner. This real-time nature of the reporting of threat event information brings a new dimension in security response, namely one of recognizing a looming security risk that may be geographically distributed. By collecting Event Information messages over time, statistical trends may be analyzed to aid management in improving the efficiency and security of the threat scanning machines.

TABLE 7

User Keystroke Information	
Field Name	Description
Machine ID	Unique Identifier of the Threat Scanning Machine
Logon ID	User ID
Bag ID	Identification of the bag
Keystroke Count	Number of keystrokes
Keystroke 1	Keystroke code
Timestamp 1	Time keystroke occurred
Keystroke 2	Keystroke code
Timestamp 2	Time keystroke occurred
.	.
.	.
.	.
Keystroke n	Keystroke code
Timestamp n	Time keystroke occurred

Table 7 shows the contents of an exemplary User Keystroke Information message. The User Keystroke Information message provides the command and control center **110** with details from the threat scanning machine **106** regarding the keystrokes of a user in the processing of a particular piece of baggage.

In operation, the User Keystroke Information message can be used for several management and supervisory purposes. The keystroke information may be used as a training aid by permitting supervisor to oversee the keystrokes used by a scanning machine operator and determine if the operator has used the scanning effectively, or if further training is needed in a particular area. Further, the keystroke information may be collected over time to study the efficiency of the threat scanning machine operators. Further still, the keystroke information may provide additional details to a supervisor who is assisting a scanning machine operator with a possible threat presence. Yet another use of the keystroke information may be to correlate the keystroke information with the image data and recreate, or playback, what took place at a particular machine to look for suspicious activity by the operator or as an aid in analyzing machine performance and debugging the threat scanning machine software.

An important aspect of the threat scanning machine management system is that it is capable of managing both the threat scanning machine equipment and the personnel operating the threat scanning machines.

FIG. **3** is a functional block diagram of an exemplary threat scanning machine **106**. In particular, the threat scanning machine **106** comprises, in addition to the standard threat scanning machine components, a computer **202** and a scanning system **204**. The computer **202** comprises, in addition to standard computer components, a management system interface module **220** and a scanning system interface module **218**. The management system interface module **220** comprises a threat management module **212**, a remote management module **214**, and a maintenance server module **216**. The scanning system interface module **218** comprises one or more interface modules **320**, and, optionally, a low level driver module **334**. The threat management module **212** comprises an interface and control logic module **302**, an action logic module **304**, and an Application Programming Interface (API) logic module **306**. The remote management module **214** comprises an interface and control logic module **308**, an action logic module **310** and an API logic module **312**. The maintenance server module **216** comprises an interface and control logic module **314**, an operational logic module **316**, and an API logic module **318**.

In operation, the threat scanning machine computer **202** executes the management system interface module **220** and the threat scanning machine physical machine interface software **218**.

The exemplary interface and control logic module **302** contains the logic necessary for the connection and communication with the threat management module within the control computer. The Operation Logic module **304** contains operational logic. The application programming interface (API) module **306** contains the logic necessary for interfacing with the scanning system interface module **218**.

The remote management module **214** contains an interface and control logic module **308** that contains the logic necessary for the connection and communication with the remote management module in a command and control center. The operational logic module **310** contains operational logic and an application programming interface (API) component **312** that contains the logic necessary for interfacing with the scanning system interface module **218**.

The interface and control logic module **314** contains the logic necessary for the connection and communication with the maintenance server module in the command and control center. Also within the threat scanning machine maintenance server module **216** is an operational logic module **316** that contains operational action logic and an application programming interface (API) component **318** that contains the logic necessary for interfacing with the scanning system interface module **218**.

An exemplary embodiment of the scanning system interface module **218** is shown in FIG. **3**. In particular, the scanning system interface module **218** may contain one or more modules **320**. These modules **320** may provide interface logic necessary for the management system interface

module **220** to be interconnected with and/or to control the scanning system **204**. The modules **320** may, for example, provide user interface functionality to the threat scanning machine **106** operator. In another exemplary embodiment of the invention, the operator interface module **320** may reside within the management system interface module **220**. Examples of interface modules **320** include weapons processing, explosive processing, data archiving, diagnostics, image capture, material movement system, and/or the like. In addition, the scanning system interface module **218** also may contain a low-level driver module **334** adapted to directly control the circuitry, software, and/or mechanics of the scanning system **204**. It should be appreciated that the threat scanning machine **106** shown in FIG. **3** is an exemplary embodiment shown for illustration purposes, and any threat scanning machine can be utilized within the threat scanning machine management system **100** with equal success. The exact software component configuration of a particular threat scanning machine **106** will depend on its contemplated use and the capabilities of its subsystems, in accordance with the present invention.

FIG. **4** is a functional block diagram of an exemplary embodiment of the control center computer side of an exemplary threat scanning machine management system **100**. In particular, the command and control center software **402** comprises, in addition to standard control center software components, a threat management module **404**, a remote management module **406**, and a maintenance server module **408**.

The threat management module **404** comprises a interface and control logic module **410**, a report logic module **412**, an instruction logic module **414**, and a threat scanning machine receive and control logic module **416**.

The remote management module **406** comprises an interface and control logic module **418**, a report logic module **420**, an instruction logic module **422**, and a threat scanning machine receive and control logic module **424**.

The maintenance server module **408** comprises an interface and control logic module **426**, a report logic module **428**, an instruction logic module **430**, and a threat scanning machine receive and control logic module **432**. In an exemplary embodiment, the interface and control logic modules (**302**, **308**, and **314**) of the threat scanning machine **106** may be similar to the interface and control logic modules (**410**, **418**, and **426**) of the command and control center **110**.

FIG. **5** is a functional block diagram of an exemplary embodiment of a threat management module in accordance with the present invention. In particular, a command and control center threat management module **404** is shown connected to a threat scanning machine threat management module **212**. The command and control center threat management module **404** comprises an interface and control logic module **410**, a configuration updater **502**, a configuration database **504**, a report generator and viewer module **506**, one or more reports **508**, an instruction logic module **414**, a data management logic module **412**, threat management database **510** and interface and control logic module **416**. The threat scanning machine threat management module **212** comprises an interface and control logic module **302**, an instruction logic module **304**, a data management logic module **512**, a threat management database **514**, an API interface logic module **306**, and a scanning system interface module **218**.

FIG. **6** is a functional block diagram of an exemplary embodiment of a remote management module in accordance with the present invention. In particular, a command and control center remote management module **406** is shown connected to a threat scanning machine remote management module **214**. The command and control center remote management module **406** comprises an interface and control logic module **418**, a configuration updater **602**, a configuration database **604**, a scheduler **606**, a system administration updater **61 0**, one or more reports **608**, an instruction logic module **422**, a data management logic module **420**, remote management database **612** and interface and control logic module **424**. The threat scanning machine remote management module **214** comprises an interface and control logic module **308**, an instruction logic module **310**, a data management logic module **614**, a remote management database **616**, an API interface logic module **312**, and a scanning system interface module **218**.

FIG. **7** is a functional block diagram of an exemplary embodiment of a maintenance server module in accordance with the present invention. In particular, a command and control center maintenance server module **408** is shown connected to a threat scanning machine maintenance server module **216**. The command and control center maintenance server module **408** comprises an interface and control logic module **426**, a configuration updater **702**, a configuration database **704**, a configuration management viewer **710**, a data input interface **708**, one or more data files **706**, an instruction logic module **430**, a data management logic module **428**, maintenance server and configuration database **712**, a scheduler module **714** and an interface and control logic module **432**. The threat scanning machine threat management module **216** comprises an interface and control logic module **314**, an instruction logic module **316**, a data management logic module **716**, a maintenance server database **718**, an API interface logic module **318** and a scanning system interface module **218**.

FIG. **8** is a functional block diagram of an exemplary embodiment of a control center database and web service connections in accordance with the present invention. In particular, the threat scanning machine management system **100** data store **802** comprises a database access logic module **804**, a web server logic module **806** and a database **808**. The data management logic modules **412**, **420**, and **428** of the threat management, remote management, and maintenance server modules, respectively, are connected to the database access logic module **804**. The report generator and viewer **506** and the configuration updater **502** of the threat management module **404** are connected to the web server logic module **806**. The system administration updater **610**, the scheduler **606** and the configuration updater **602** of the remote management module **406** are connected to the web server logic module **806**. The configuration management viewer **710**, the scheduler **714**, the data input interface **708** and the configuration updater **702** of the maintenance server **408** are connected to web server logic module **806**. The web server logic module **806** is connected to the database **808**.

In operation, the data management logic modules **412**, **420**, and **428** of the threat management, remote management, and maintenance server modules respectively communicate with the database access logic module **804**. The database access logic module provides the interface connectivity to the database **808**. The web server logic module **806** provides the command and control center with web service access to the database **808**.

FIG. **9** is a functional block diagram of an exemplary control and maintenance system showing a web browser connection in accordance with the present invention. In particular, web browsers **902** and **904** are shown connected to the web server logic module **806**. While two web brows-

ers are shown, it should be appreciated that multiple web browsers may connect to the web server logic module **806**.

FIG. **10** is a functional block diagram of an exemplary threat scanning machine architecture. In particular, the threat scanning machine comprises a sensor **1002**, a data acquisition system **1004**, a reconstruction computer **1006**, and an operator workstation **1008**. The reconstruction computer **1006** comprises a control logic module **1010**. The operator workstation **1008** presents a graphical user interface to the operator of the threat scanning machine.

In operation, raw data from the sensor **1002** is collected by the data acquisition system **1004**. The raw data is then transmitted to the reconstruction computer **1006**. The reconstruction computer **1006** processes the raw data and may provide a three-dimensional image **1014** or a two-dimensional image **1012** to the operator workstation **1008**. In a threat scanning machine adapted for use with the threat scanning machine management system **100**, the software for the threat scanning machine management system **100** resides on the operator workstation **1008**. The threat scanning machine management system **100** can download software or data to the reconstruction computer **1006**, operator workstation **1008**, and/or other components of the threat scanning machine that may require software or data to operate.

FIG. **11** is a functional block diagram of an exemplary embodiment of the threat scanning machine management system showing an exemplary approach to network security for two different levels of security, confidential and secret. In particular, the public network **1102**, for example a wide area network (WAN), is connected to both a confidential communications system **1104** and a secret communications system **1106**. The confidential communications system comprises a router **1112**, a triple data encryption standard (3DES) virtual private network connection **1114**, a firewall **1116** and a local area network (LAN) switch **1118**. An exemplary private network **1108** is connected to the LAN switch **1118**. The secret communications system **1106** comprises a router **1120**, a National Security Agency (NSA) cryptographic processor **1122**, a firewall **1124**, and a LAN switch **1126**. A private network **1110** is connected to the LAN switch **1126**.

FIG. **12** is a functional block diagram of an exemplary embodiment of the threat scanning machine management system showing exemplary security components in accordance with the present invention. In particular, a threat scanning machine **106** is connected to the public wide area network (WAN) **1102**. A command and control center **110** is also connected to the public WAN **1102**. Unauthorized users **1202** may be connected to the public wide area network. The threat scanning machine communications system comprises a router/phone **1112**, an encryption module **1114** or **1120** depending on the level of security, a firewall **1116**, and a local area network (LAN) switch **1118**. The command and control center **110** comprises a threat management module **404**, a remote management module **406**, a maintenance server module **408**, a web server logic module **806**, log files **1204**, a database **808**, a router/phone **1112**, an encryption device **1114** or **1120** depending on the level of security required, a firewall **1116** and a LAN switch **1118**.

In operation, the unauthorized users **1202** are restricted from accessing the threat scanning machine **106** or the command and control center **110**. While the encryption devices **1114** or **1120**, permit the threat scanning machine **106** and the command and control center **110** to communicate in a secure manner.

FIG. **13** is a functional block diagram of an exemplary embodiment of the threat scanning machine management system showing exemplary alternative approaches to the network connection of security equipment in accordance with the present invention. In particular, FIG. **13** shows two approaches to network security within a transportation facility. In FIG. **13**A, the threat scanning machine **106** requires the security hardware and software to be present within the threat scanning machine. In FIG. **13**B, there is one set of security hardware and software for an entire facility and the threat scanning machines **106** are all interconnected to the one set of communications security hardware and software.

In FIG. **13**A, the threat scanning machine comprises application code **220**, a local area network switch **1118**, a firewall **1116**, an encryption device **1114** or **1120** depending on the level of security required, and a router/phone **1112**. In operation the threat scanning machine **106** containing its own set of communications security hardware and software is able to be directly connected to the public wide area network **1102**.

In FIG. **13**B, the communications security hardware and software may be placed in a central location and accessed by one or more threat scanning machines **106**. The communications equipment comprises a local area network switch **1118**, a firewall **1116**, an encryption device **1114** or **1120** depending on the level of security required, and a router/phone **111 2**. The threat scanning machines **106** each contain their own application code **220**. The threat scanning machines **106** are interconnected to the communications security equipment via the LAN switch **1118**.

In operation, each threat scanning machine **106** communicates through the LAN switch **1118** to the communications security hardware and software in order to access the public wide area network **1102**.

FIG. **14** shows a functional block diagram of a threat scanning machine **106** interconnected with a command and control center **110**. In particular, FIG. **14** shows an exemplary message interface between the threat scanning machine **106** and the command and control center **110** in accordance with the messages described in Tables 1 through 7 above.

In operation, the threat scanning machine **106** provides the following message to the command and control center **110**: operator bag information, the screener bag information, the threat information, alarm information, TIP truth information, event information, and user keystroke information. The command and control center **110** provides the following messages to the threat scanning machine **106**, TIP configuration and threat detection configuration.

One way that the personnel using a threat scanning machine management system can interact with the system is through computer adapted to provide a graphical user interface. The following is a description of an exemplary graphical user interface in accordance with the present invention. However, it should be appreciated that the graphical user interface shown in the figures is provided for illustrative purposes. A particular embodiment of the invention may have a graphical user interface that is implemented, configured, or adapted differently depending on the contemplated uses of the invention.

FIG. **15** is an illustration of an exemplary user interface for the threat scanning machine management system showing the main menu screen. In particular, the main menu comprises Remote Management, Threat Management, Maintenance Server, TIP Management, Log Off, and Help choices. There is also shown in FIG. **15** a tab style user interface element comprises the tabs choices of Alarms, Events, DnId (an abbreviation for download), and Comm (an abbreviation for communications).

If the user selects the Remote Management menu choice, the Remote. Management menu will be displayed. FIG. **16** is an illustration of an exemplary user interface for the threat scanning machine management system showing the items available under the Remote Management menu choice. In particular, the Remote Management menu comprises User Administration, Fault Reporting, System Monitoring, and System Administration choices.

If the user selects, from the main menu, the Threat Management menu choice, the Threat. Management Menu will be displayed. FIG. **17** is an illustration of an exemplary user interface for the threat scanning machine management system showing the items available under the Threat Management menu choice. In particular, the Threat Management menu comprises Reports and Forms menu choices.

If the user selects, from the main menu, the Maintenance Server menu choice, the Maintenance Server menu will be displayed. FIG. **18** is an illustration of an exemplary user interface for the threat scanning machine management system showing the items available under the Maintenance Server menu choice. In particular, the Maintenance Server menu comprises File Management, Profile Management, and Download menu choices.

If the user selects, from the main menu, the TIP Management menu choice, the TIP Management menu will be displayed. FIG. **19** is an illustration of an exemplary user interface for the threat scanning machine management system showing the items available under the TIP Management menu choice. In particular, the TIP management menu comprises Image Management, Library Management, and Library Distribution menu choices.

If the user sects, from the main menu, the Log Off menu choice, the user will be logged of the system.

If the user selects, from the main menu, the Help menu choice, the user will be presented with information on how to operate the threat scanning machine management system.

FIG. **20** shows an exemplary Events tab screen. FIG. **26** shows an exemplary Comm (short for communications) tab screen. The tab screens allow the operator to quickly ascertain the status of important system functions.

Returning to the Remote Management menu of FIG. **16**, if the user selects the User Administration menu choice, the User Administration screen will be displayed. FIG. **21** is an illustration of an exemplary user interface for the threat scanning machine management system showing the User Administration screen.

If the users selects, from the Remote Management menu, the Fault Reporting menu choice, the Fault Reporting dialog will appear. FIG. **22** is an illustration of an exemplary user interface for the threat scanning machine management system showing the Fault Reporting selection dialog interface.

If the user selects, from the Remote Management menu, the System Monitoring menu choice, the Performance Information dialog will be displayed. FIG. **23** is an illustration of an exemplary user interface for the threat scanning machine management system showing the Performance Information dialog.

If the user selects, from the Remote Management menu, the System Administration menu choice, the System Administration menu will be displayed. FIG. **24** is an illustration of an exemplary user interface for the threat scanning machine management system showing the System Administration screen.

Turning now to the Threat Management menu shown in FIG. **17**, if the user selects, from the Threat Management menu, the Reports menu choice, the reports selection will be displayed. Examples of the types of reports available include the Download Schedule shown in FIG. **25**, the Throughput Report shown in FIG. **27**, the Personnel Report shown in FIG. **28**, the Current Alarm Report shown in FIG. **29**, the Historical Bag/Threat Information Report shown in FIG. **30**, the Threat Type Information Report shown in FIG. **31**, the Fault Report shown in FIG. **37** and the All Actions Taken Information Report shown in FIG. **32**.

Turning now to the Maintenance Server menu shown in FIG. **18**, if the user selects from the Maintenance Server menu, the File Management menu choice, the File Management screen will be displayed. FIG. **33** is an illustration of an exemplary user interface for the threat scanning machine management system File Management screen. From the File management screen, the user can add files.

If the user selects, from the Maintenance Server menu, the Profile Management menu choice, the Profile Management screen will be displayed. FIG. **34** is an illustration of an exemplary user interface for the threat scanning machine management system showing the Profile Management screen. From the Profile Management screen, the user can define a profile comprising one or more files that require downloading. The profile is a way of bundling the files that require downloading together.

If the user selects, from the Maintenance Server menu, the Download menu choice, the Download Management screen will be displayed. FIG. **35** is an illustration of an exemplary user interface for the threat scanning machine management system showing the Download Management screen. Using the Download Management screen, the user can schedule a download of a previously defined profile.

Turning now to the TIP Management menu shown in FIG. **19**, if the user selects the Image Management option, the TIP Image Management screen will be displayed. FIG. **36** is an illustration of an exemplary user interface for the threat scanning machine management system showing the TIP Image Management screen.

FIG. **37** shows an exemplary Fault Report screen. There are no faults shown in this example. However, if faults were present for the report criteria specified, such faults would be displayed in the table along with the pertinent fault details.

FIG. **38** shows an exemplary threat scanning machine management system user interface that has been adapted to be displayed on a handheld computer, laptop computer, or the like. In particular, FIG. **38** is presented to show the main menu screen on a simulated handheld device. While the other screens are not shown on a handheld device is should be appreciated that the entire threat management system user interface may be adapted to use on handheld computer, laptop computer, portable computer, network enabled communications device, or any type of portable computing device.

The unique architecture of the threat scanning management system **100** allows the expansion of its capability beyond that already discussed. In particular, the horizontal and vertical architecture of the threat scanning machine management system **100** lends itself to easy management and the cross-integration of information from a plurality of sources. While the embodiments discussed hereinafter will be described as integrated with the threat scanning machine management system **100**, it is to be appreciated that the passenger and item tracking with predictive analysis can be used as an independent architecture and methodology.

Passenger and item tracking with predictive analysis is illustrated in FIG. **39**. The system includes a tracking and analysis module **3910**, which includes an item tracking module **3912**, a passenger tracking module **3914**, an analysis module **3916**, an alarm module **3918**, and a report module

3922. The tracking and analysis module **3910** is connected to one or more command and control centers within the network of command and control centers **3980** (illustrated in FIG. **1**). Both of the tracking and analysis module **3910** and the command and control centers can be directly or indirectly connected to one or more of a public network **3960** and private network **3970**, which are in turn connected to one or more threat scanning machines **106**, walk through metal detectors (WTMD) **3950**, or, in general, any equipment, information acquisition and/or data entry system that can be used to receive information that can be utilized to track one or more of items and passengers.

As with the threat scanning machine management system **100**, the tracking and analysis module **3910** can be replicated in a hierarchical manner with, for example, a first level tracking and analysis module **3910** that cooperates with a next higher level tracking and analysis module **3910** that may, for example, be associated with another command and control center within the network of command and control centers **3980**. For example, as illustrated by the one or more locations equipped with passenger and/or item tracking **3920**, a tracking and analysis module **3910** can be associated with a plurality of different locations, with the tracking and analysis module **3910** capable of being collocated or non-collocated with those locations. Through this type of architecture, it is possible to create a network of tracking and analysis modules that have the capability of monitoring items and/or passengers at a plurality of different locations, nationally or internationally to provide more comprehensive protection and safety.

It may also be desirable to restrict the tracking and analysis module **3910** to only communicate with a plurality of equipment, information acquisition and/or data entry system(s) that can be used to receive information that can be utilized to track one or more of items and passengers. As such, the tracking and analysis module **3910**, and associated equipment can be used as a stand-alone system.

As discussed above, each of the locations equipped with passenger and/or item tracking **3920** can have their own tracking and analysis module **3910**. Alternatively, a plurality of locations can communicate with a shared tracking and analysis module **3910**. Each tracking and analysis module **3910** optionally includes the further capability of being able to communicate with a next higher-level tracking and analysis module **3910**. With each higher-level tracking and analysis module **3910**, the system becomes more comprehensive and is capable of basing the analysis on more information relating to items and passengers.

In general, airports, shipping ports, train stations, and the like, are often configured to have multiple concourses or terminals. Each concourse or terminal may have a plurality of different screening areas with each screening area having multiple threat scanning machines as illustrated in FIG. **39**.

To achieve item and passenger tracking, an identification of each item and passenger needs to be present. For passengers, this identification is usually present and can be, for example, a boarding pass, a passport, a drivers license, a fingerprint, bioinformatics, or the like. In general, any identification that can be used to identify an individual will work equally well with the systems and methods of this invention.

Each item also needs to be identifiable. This identification can come in numerous formats including, but not limited to, a Radio Frequency Identification (RFID) tag or bar code associated with the item, shipment tracking information, shipment container information, or the like. While the exemplary embodiment will be discussed in relation to airline passengers and items, such as baggage, it is to be appreciated that the general concepts disclosed herein can be extended to any type of item in any type of environment. For example, the system can be extended to include vehicle tracking, cargo tracking, shipment tracking, or in general, tracking of any item or person. In general, provided there is a scanning and identification reading capability, such as a threat scanning machine, walkthrough metal detector, or the like, that is capable of reading an identifier associated with one more of an item and a passenger, that item and/or passenger can be tracked and a analysis of the contents performed. This analysis can include a comparison to historical information as well as a prediction about the future threat capabilities of an item, individual or group of individuals.

Up to this point, the threat scanning machines **106** have been discussed as having the capability of being able to detect objects readily identifiable as threats. However, the threat scanning machines **106** can also be configured to detect additional characteristics about an item, such as object(s) associated with the item, weight, color, dimensions, or in general any other information that could be useful to assist with the tracking and analysis of that particular item.

In operation, an item is-associated with a passenger. However, if the item is not passenger related, the item can be associated with, for example, the shipper, owner, sender, or in general any entity that is associated with the item. For example, in an airport type environment, the item, such as one or more pieces of baggage, can be associated with a passenger when the passenger checks-in their baggage at the ticket counter. This process could be implemented manually where, for example, the ticket agent enters information about the passenger and number of items. The check-in counter could also be equipped with suitable scanning equipment that is capable of associating one or more of an item identifier and passenger identifier with the item(s) and passenger(s), respectively.

Upon check-in, the item tracking module **3912** and passenger tracking module **3914** are updated with the item and passenger identification(s), respectively. For example, the item tracking module **3912** and passenger tracking module **3914** can store information indicating that "Passenger X" has 2 checked bags and one carry on. Upon arrival at the security checkpoint, a passenger generally places their carry-on baggage on a conveyor for scanning by a threat scanning machine **106** and passes through a walk through metal detector (WTMD) **3950**. In conjunction with performing the threat analysis, the threat scanning machine **106** also obtains the item tracking identification associated with the scanned baggage and forwards the results of the threat scanning to the item tracking module **3912**. These results can include, as discussed above, an identification of any threat, as well as any supplemental information regarding the baggage such as, for example, weight, contents, dimensions, or the like.

Similarly, the walk through metal detector **3950** can be equipped with a passenger identification scanning device, such as a bar code reader that may read a bar code associated with a boarding pass, passport, drivers license, or the like. Upon obtaining this passenger identification, the walk through metal detector **3950** forwards information to the passenger tracking module **3914** regarding, for example, the time, date, passenger destination information, passenger origination information (if the passenger was from a connecting flight or another area), or in general any other information that may be relevant to passenger tracking.

The passenger and item information, upon receipt at the tracking and analysis module **3910** can be stored and indexed as well as forwarded to additional tracking and analysis module(s) (not shown) as appropriate. For example, certain profiles can specify that, for example, all information obtained from the major airports and shipping terminals throughout the world be automatically forwarded to one or more higher-level tracking and analysis module(s) for storage and indexing. Similarly, all information relating to passengers traveling to a certain destination could be forwarded to a tracking and analysis module that analyses passenger and item traffic for a particular geographic region. In general, the handling of the passenger and item information can be configured in any manner as appropriate.

Advantageously, in addition to threat detection as previously discussed, the threat scanning machines **106** are configured with the capability of identifying contents within an item. For example, through the use of backscatter techniques, bills of ladings, the manual entry of contents within items, or the like, the threat scanning machines **106** are able to compile and forward to the item tracking module **3912** a list of contents within each item. As will be discussed in more detail hereinafter, it will become apparent that threats may not be one readily identifiable object but rather could be various pieces-and parts that could be assembled to create a threat. Thus the determination of all or a portion of the contents could be important and could also be accomplished automatically where, for example, the system detects content based on one or more of size, shape and density. By tracking contents within each item, and in conjunction with the analysis module **3916**, the systems and methods of this invention are able to perform predictive analysis regarding whether a threat is present, or could be present, based on various contents that may or may not be associated with the same item, at the same location, or even it the same country.

Once the item tracking module **3912** and passenger tracking module **3914** receive the item and/or the passenger identification, as well as information associated with that item and/or passenger, the analysis module **3916** analyzes information associated with the item, such as contents, and information associated with the passenger, such as historical traveling patterns, or the like in an attempt to predict whether that item and/or passenger poses a threat.

For example, as previously discussed, a gun or a knife is a readily identifiable threat. However, it becomes more challenging when items which are not themselves considered as threats, are combined with other objects to become a threat. For example, a hammer, barrel and grip of a pistol taken by themselves are not a threat, but when combined obviously raise the status of the items to a threat. Less obvious items could be an aerosol can, a lighter and rubber band or tape. Again, while each of these devices alone may not present a threat, the rubber band or tape could be used to hold open the nozzle on the aerosol can thus creating a frame thrower. Similarly, BB's and glue are not in and of themselves threats, though if the glue was used to secure BB's to an explosive device, this would obviously cause the potential for concern due to the BB's being used as shrapnel. Similarly, numerous chemical materials by themselves do not pose a threat. However, when combined, could be a serious threat.

With the information obtained by the item tracking module **3912**, the analysis module **3916** is capable of performing an analysis of all or a portion of the contents associated with the item, and compares the obtained information to, for example, information associated with one or more other items and/or passengers to determine if contents identified as non-threats could become threats if combined with other items.

For example, assume a Passenger A boards at London Heathrow Airport with chemical A in a carry-on bag. Passenger B boards an airplane in Atlanta with chemical B in a carry-on bag. Both passengers are destined for JFK and upon arriving at JFK, board a plane destined for LAX. As in the previous example, chemical A and chemical B taken alone do not pose a threat. However, chemical A and chemical B when combined produce an explosive and now, since both passengers are on the same flight, could present a threat. Similarly, through the tracking of items and passengers, the system can be used to determine if, for example, one of the passengers no longer has all or a portion of the chemicals in their possession. For example, it a coordinated attack where Passenger A is scheduled to pick-up chemical B at JFK, the threat scanning machines at JFK could determine when Passenger B passes through a threat scanning machine **106** that passenger B no longer has chemical B. The appropriate alerts could then be raised by the alarm module **3918** in relation to Passenger A and the appropriate security officials at the JFK airport notified. Similarly, a determination could be made about whether the weight of Passenger B's bag has changed and thus Passenger B may have only dropped off a portion of chemical B in the airport, thus raising two alarms, one for the passenger and one for airport security indicating the chemical could be present somewhere in the airport facility.

As another example, it may be desirable to keep Passenger A and Passenger B from traveling aboard the same aircraft. Similar to the above example, the threat scanning machine could be used to track whether Passenger A and Passenger B attempt to board the same aircraft. If they do, an appropriate alarm could be generated by the alarm module **3918**.

The analysis module **3616** can take into consideration any relevant factor in determining whether a possible threat could exist. As with the previous examples, this information is not limited to content associated with an item, but can also include historical and future itineraries of the passenger, historical and future information about the item(s), origin and destination information about the items, and the like.

As discussed above, the network of threat scanning machines **106** could provide the information about items that allows the evaluation and analysis of contents to determine if there could be a group of related items that, when combined, could pose a threat. The analysis includes evaluation and analysis of the various items, and possibly a comparison to other items, for example through the use of an expert system, artificial intelligence, fuzzy logic, neural networks, or the like, to determine if a threat is present based on the various individual items and/or passengers. For example, the analysis of the items can account for historical information, origin information, destination information, and the like, as well as a comparison to other individuals' items and contents to determine if a threat exists.

In addition to the scanning by the one or more of the threat scanning machines **106**, walk through metal detectors **3950**, or any other scanning device or system that identify and forward information regarding items or passengers to one or more of the item tracking module **3912** and passenger tracking module **3914**, manually entered information regarding items and passengers can also be forwarded to the item tracking module **3912** and passenger tracking module **3914**.

For example, personnel manning a security checkpoint can forward information to one or more of the item tracking

and passenger tracking modules that could be useful in determining whether a threat exists. For example, through the use of one or more of a passenger or item identifier, information regarding suspicious behavior of a passenger, a passenger leaving before boarding a plane, or the like, can also be taken into consideration by the analysis module **3916**. Thus, it is to be appreciated, that not only can information be forwarded to the item tracking module **3912** and passenger tracking module **3914** prior to, for example, a passenger boarding in an aircraft, but information regarding that passenger and associated items be collected upon departure from the aircraft and/or airport. Therefore, the analysis module **3916** could do a comparison between passenger(s) and/or item(s) before and after the traveling.

The analysis module **3916** is accessing a hierarchy of information to assist with the analysis of items and passengers starting with, for example, other items and passengers that meet specific criteria. For example, the analysis module **3916** could first analyze items associated with a passenger at a particular threat scanning machine **106**. If an alert is warranted based on this first tier of analysis, an alert can be sent to the appropriate destination with the cooperation of the alarm module **3918**. Similarly, if the analysis warrants the raising of a risk level associated with one or more of the item and passenger, the network of command and control centers **3980** can be notified to indicate this change in risk level. Likewise, a determination can be made whether a broader analysis should be made and information regarding the item(s) and/or passenger(s) forwarded to a next higher-level tracking and analysis module. For example, if the passenger is flying on a local hop from Oklahoma City to Dallas-Fort Worth, and the passenger has been making the identical trip for the past seven months, with the same number, of items, it may not be necessary to forward information regarding that passenger and associated item(s) to the next higher-level tracking an analysis module. However, if, for example, the passenger is a first time flyer with the destination of Washington, D.C., and the passenger has no checked bags, and only one small carry-on bag, it may be advantageous to forward that passenger's information to a next higher level analysis module for comparison to, for example, other passengers and items on the same flight. This escalating analysis and forwarding can continue until a determination is made that an alert need not be sent, the risk level need not be raised, and further analysis need not be performed.

In an exemplary implementation, the analysis within an analysis module **3916** can be based on a comparison between item and passenger information and information stored in, for example a look-up table. This could be a simple one to one correlation and if certain conditions are satisfied, one or more of an alert, risk level and elevation to a next higher-level analysis module could be performed. Alternatively, or in addition, the analysis can be based on an expert system, an artificial intelligence system and/or in conjunction with human review of the information relating to items and passengers. With the hierarchical nature and capabilities of the analysis module to forward information to a next higher-level analysis module, cross-integration and comparison of information can be performed on a local basis all the way up to a global level that could include, air traffic, shipping traffic, public transportation traffic, cargo traffic, and the like. Similarly, different agencies, governments, other entities and the like can coordinate scanning and screening efforts.

The alarm module **3918** works in cooperation with the analysis module **3916** to send an appropriate alarm upon the analysis module **3916** determining that an alert is required. The alarm module **3918** is capable of sending an alert to a particular destination associated with a local threat scanning machine **106** or walk through metal detector **3950**, as well a security group assigned to that geographic location, or, for example, where there is evidence of collaboration, to any other destination as may be appropriate. For example, and in accordance with the previous example where Passenger A with chemical A and Passenger B with chemical B are both preparing to travel to JFK, and then share a flight to LAX, the airports at London Heathrow, JFK, Atlanta, and the airlines on which they are traveling can all be notified by the alarm module **3918** that a threat may exist. The alarm module **3918** can also be used to send alerts and to raise a threat status based on the outcome of the analysis by the analysis module **3916**.

As also alluded to earlier, if the passenger tracking module **3914** is tracking the whereabouts of passengers and their associated items, the frequency with which a passenger enters and reenters a screening area can be tracked and, for example, if the passenger(s) reenters too many times, it can trigger the sending of an alert or raising of the risk level by the alarm module **3918**. Similarly, if the passenger enters numerous different screening areas, and they appear to be on the same flight, this could also trigger an alert or raising of the risk level by the alarm module **3918**.

Taken a step further, flying habits can also be monitored and the hierarchy of the present invention is uniquely configured to monitor this type of information since the item tracking module **3912** and passenger tracking module **3914** are capable of forwarding their information to one or more centralized databases that can be accessed by one or more other analysis modules for performing threat assessment.

Even further, the passenger tracking module **3914** and item tracking module **3912** can cooperate with, for example, threat scanning machines **106** that are placed at the entrance of the airplane and can collect information related to one or more of items and passengers immediately prior to boarding. The analysis module could then perform an analysis between when the baggage went through a previous security checkpoint and the passenger/item bag as it is loaded onto the airplane. For example, a comparison can be made between the weight of a carry-on bag at the security checkpoint and the weight of the carry-on bag at the airplane. If a difference exists, there may be sufficient cause to send an alert and or alter a risk level. Similarly, equipment can be installed that allows the monitoring of the actual passenger(s) who board an aircraft. This information can be forwarded to an analysis module **3916** that can compare that information to information the tracking and analysis module **3910** already has regarding who should be on the airplane. If there is a discrepancy, one or more of the alert and/or entering of the risk level can be initiated.

The analysis by the analysis module **3916** can be based on one or more of any of the following: contents, number of items, weights, frequency of travel, duration of stay, origin information, destination information, connection information, owner information, a comparison to other items or passengers "in the system," a comparison to "common" content, trip patterns, historical travel information, port origination information, destination port information, number of passenger traveling together, relationship between the passengers, or the like.

For example, if the passenger is departing from Florida and heading to Alaska in the middle of the winter, and the passenger does not have any items such as extra winter clothing, an alert and/or risk level can be altered. Similarly,

if a passenger's trip includes driving to a train station, taking a train from a first destination to a second destination, catching a plane to a third destination, and a ship to a fourth destination, the passenger and the items with that passenger can at least be checked every time the passenger changes their mode of transportation to verify continuity between the items that passenger has with them. If, for example, the content within an item has changed, during the course of the trip, one or more of an alert and/or altering of the risk level can be performed.

The report module **3922** can be used in conjunction with any component of the passenger and item tracking system to compile and produce reports related to any one or more of alarms, threat levels, items, passengers, status of the system, historical information, prediction information, or the like, and can be forwarded to any destination, such as a threat scanning machine adapted to receive communications from the passenger and item tracking system and/or one or more command and control centers, either electronically, such as in an e-mail or on a web page, or in a more traditional paper based manner.

FIG. **40** illustrates an exemplary method of operation of the passenger and item tracking system. In particular, control begins in step S**100** and continues to step S**110**. In step S**110** one or more of passengers and/or items are scanned. Next, in step S**120**, identifications corresponding to the scanned passengers and or items are obtained. Then, in step S**130**, the obtained scanning and identifications are forwarded to the passenger and item tracking system. Control then continues to step S**140**.

In step S**140**, an analysis is performed on the obtained information and compared to other information, such as, but not limited to historical information, base-line information, and the like. Control then continues to step S**150** where a determination is made whether an alert should be sent based on the analysis. If an alert is to be sent, control continues to step S**160** where an alert can be sent to one or more destinations and/or entities. For example, alert information can be forwarded to one or more "officials" and/or screeners. For example, if there is something suspicious about a person a screening position X, the alert information can be displayed the next time the person's identifier is displayed, e.g., at screening position Y. In this manner, both the operator and/or screening point Y can be alerted to the suspicion. Similarly, if there is a suspicious item, information about the item can be retrieved and displayed each time the item identifier is detected. For example, the alert information, or a derivative thereof can be displayed to a supervisory location, on a portion of an operators screen, on dedicated alarm information displaying equipment, on a wireless device(s), anywhere in the network of command and control centers, to an adjacent or governing agency, such as railways, police, FBI, etc., DHS, or the like. In a similar fashion, while alarm information can be forwarded vertically up the "chain of command" alert information can be distributed down the chain. For example, if an agency, such as the FBI, has a specific individual targeted, the system could be notified that upon presentation of that individual's identifier to the system, an alert could be sent, for example, back to the agency that specified the watch, can notify the location where the individual is to take appropriate action by, for example, manual screening, or the like.

Otherwise, control jumps to step S**170** where a determination is made whether a risk level should altered. If a risk level is to be altered, control continues to step S **180** where a database is updated with the new risk information. This database can be collocated with a local passenger and item tracking system, and/or associated with the network of command and control centers. Control then jumps to step S**190**.

In step S**190**, a determination is made whether to forward the obtained information to a higher-level passenger and item tracking system. If the information is to be forwarded to a higher-level passenger and item tracking system, control continues to step S**210**. Otherwise, control jumps to step S**200** where the control sequence ends.

In step S**210**, the obtained information is forwarded and stored at a higher-level passenger and item tracking system. In step S**220**, an analysis is performed on the obtained information and compared to other information, the scope of which can be specified in accordance with, for example, a set of rules. Control then continues to step S**230** where a determination is made whether an alert should be sent based on the analysis. If an alert is to be sent, control continues to step S**240** where an alert can be sent to one or more destinations and/or entities.

Otherwise, control jumps to step S**250** where a determination is made whether a risk level should altered. If a risk level is to be altered, control continues to step S**260** where a database is updated with the new risk information. This database can be collocated with a local passenger and item tracking system, and/or associated with the network of command and control centers. Control then jumps to step S**270**.

In step S**270**, a determination is made whether to forward the obtained information to a higher-level passenger and item tracking system. If the information is to be forwarded to a higher-level passenger and item tracking system, control jumps back to step S**210**, otherwise control jumps to step S**280** where the control sequence ends.

FIG. **41** illustrates in greater detail the tracking and analysis module **3910**, and in particular, the alarm module **3918**. Specifically, the alarm module comprises a triggering module **4110**, a rules module **4120**, a distribution module **4130**, an action module **4140**, a threshold module **4150** and a sensitivity module **4160**. As previously discussed, the tracking and analysis module **3910** can be associated with, for example, a threat scanning machine, a plurality of threat scanning machines, and/or one or more command and control centers within the network of command and control centers **3980**. For example, the tracking and analysis module **3910** can be strategically positioned at any location and can cooperate with any number of threat scanning machines and/or command and control centers. In particular, in a basic exemplary embodiment, the tracking and analysis module **3910** can be associated with, or even installed in, a threat scanning machine **106** as a stand-alone unit.

As an illustrative operational example, assume a first threat scanning machine detects a threat. The threat scanning machine cooperating with the tracking and analysis module **3910**, and in particular the alarm module **3918**, determines an action to take based on the threat. This can include, for example, notifying other threat scanning machines and/or operators within a predefined area, communicating alarm information to a plurality of threat scanning machines within a geographic area, forwarding alarm information corresponding to the threat to a command and control center, or the like. As will be discussed in more detail hereinafter, rules can define the action of the alarm module **3918**, with the rules capable of being static or dynamic.

In general, and in accordance with an exemplary embodiment, the actions associated with the alarms can be broken into three categories. The first category of action specifies when an alarm should be triggered. The second category of

action specifies which actions are to be performed based on the triggering of an alarm. The third category of action specifies what reaction an alarm receiver, such as a threat scanning machine, command and control center(s), or the like, performs based on the receipt of alarm information.

In operation, and as previously discussed, the alarm could be generated automatically, for example upon the detection of a threat. The alarm could also be generated through an automatic and manual combination where, for example, a threat scanning machine forwards notification to a human operator who then makes the determination as to whether an alarm should be raised, or totally manually, where an operator is entirely responsible for raising an alarm. For example, in an automated or semi-automated mode of operation, the analysis module **3916**, could forward to the alarm module **3918** an instruction indicating that an alarm is warranted. Upon receipt of an alarm notification, the triggering module **4110** cooperates with the rules module **4120** to determine an appropriate course of action.

The semi-automatic mode could also be configured so that some items would be forwarded automatically and others would require a human to "hit the OK button" before sending. Furthermore, the totally manual mode could require a human to "hit the OK button" every time before sending. In general, the system could do the determination of a situation that would require the notification, although there might be human effort in determining such. Once the system determines that something needs to be sent based on the rules, the system could automatically send all alarms, automatically send some, require manual approval for others, or require manual OK for all alarms.

Specifically, the triggering module **4110** cooperates with the rules module **4120** to determine if alarm information need be generated, and if so, how to handle the alarm information. For example, the rules module could specify that the alarm information be sent out to one or more destinations. Utilizing logic based on rules in the rules module **4120**, the triggering module **4110** cooperates with the distribution module **4130** to initiate various types of action.

Table 8 outlines exemplary responses and actions that can be activated by the triggering module **4110** based on rules within the rules module **4120**.

TABLE 8

Responses and Actions

Alarm	Response
At TSM	Forward to Adjacent TSM's
At TSM with certain Characteristics	Forward to all TSM's within Predetermined Area
At TSM and an Explosive Device	Automatically Forward to Predetermined Command and Control Center(s)
Activated by Operator	Analyze Nature of Alert and Forward to Appropriate Destination(s)
At Local TSM	Analyze Threats At Other Locations To Dynamically Determine Subsequent Action, Update Rules based on Determination

Alarms can be based on, for example, the type of threat discovered, e.g., an explosive verses a weapon, and weapons can, for example, can be broken into different types such as "sharp" weapons, e.g., knives, and blunt objects such as baseball bats. For some instances, for example, such as a carry on item for a plane, a baseball bat could be considered a threat and trigger an alarm. However, if the same baseball bat was placed in checked baggage it would not be considered a threat. The rules within the rules module **4120** can account for these types of variances and can be configured and updated, as discussed hereinafter in relation to, for example, the modifying of thresholds and sensitivities, to account for these types of variations.

In addition to rules that specify one or more actions to take based on a received alarm, the rules module **4120** can include rules that specify thresholds and/or sensitivities. For example, if a trace amount of a particular chemical is found, the trace amount might not warrant raising an alarm. However, if a substantial amount of that same chemical is found, or an amount above a predetermined amount, an alarm can be raised. It is therefore possible to adjust the sensitivities of both the analysis module **3916** that determines if there is an alarm, and the alarm module **3918** that determines what action to take upon receipt of the alarm. Similarly, with sensitivity, one or more of a threat scanning machine's sensitivity, the analysis module's sensitivity and the alarm module's sensitivity to one or more items, can be adjusted based on, for example, a higher likelihood that someone may be trying to introduce a particular item into a secure area, such as on an airplane. For example, if a barrel of a gun is detected at a threat scanning machine, other threat scanning machines can have the sensitivity toward other gun components elevated.

Once a determination is made that a response need be generated in response to an alarm, the distribution module **4130** is activated. In particular, and as previously discussed, the distribution module **4130** can operate in a completely automatic manner, a semi-automatic manner and/or a manual manner. For example, in accordance with an exemplary fully automatic mode of operation, the distribution module **4130** can distribute alarm information based on, for example, rules in the rules module **4120**. Furthermore, the distribution module **4130** can distribute alarm information in a semi-automatic manner where, for example, the distribution module **4130** may determine, in accordance with the rules in the rules module **4120**, that alarm information should be sent to a particular group of destinations. This compiled group of projected recipients could then be forwarded to, for example, an operator or a command and control center for approval prior to distribution. Upon confirmation that the alarm information and intended recipients are appropriate, or after editing, the distribution module **4130** can forward the alarm information in the usual manner. Furthermore, alarm information can be manually entered and distributed with the aid of distribution module **4130**. For example, an operator or, for example, a supervisor at one or more command and control centers can specify that alarm information is to be sent to one or more tracking and analysis modules. The distribution module **4130** could then distribute the alarm information in accordance with the operator's and/or supervisor's instructions.

Take, for example, a situation where an operator identifies a passenger carrying a particular threat. Upon the operator notifying the passenger tracking module **3914**, through the use of a special flag, of the attempted security breech by that passenger, the analysis module **3916**, in conjunction with the triggering module **4110** and rules module **4120**, recognizing the special flag, could forward, with the cooperation of the distribution module **4130**, alarm information to any one or more of a tracking and analysis module **3910** and a command and control center.

As with the tracking and analysis module **3910**, the alarm module **3918** can be distributed and configured in a hierarchal manner. Thus, for example, if a particular "local"

distribution module **4130** determines that alarm information should be distributed, and subsequently forwards that alarm information to a number of destinations, one or more command and control centers can act as an overseer confirming that the action is appropriate and maintaining the ability to recall, edit and supplement destinations for the alarm information. Furthermore, if a particular tracking and analysis module **3910** is unable to determine whether alarm information should be distributed, the tracking and analysis module **3910** can cooperate with a next higher-level tracking and analysis module such that a collaborative effort could be used to determine whether alarm information need be distributed. Furthermore, and in accordance with another exemplary embodiment, the distribution module **4130** can cooperate with one or more command and control centers and reconcile the rules in the rules module **4120** with the rules stored at one or more of the command and control centers. Thus, the distribution module **4130** could, for example, in response to a particular threat, forward alarm information to a command and control center for performing a supplemental analysis based on, for example, a rule set at the command and control center. It should be appreciated that this could allow a "master" rule set would have the capability of supplementing or overriding one or more rules in the rules module **4120**.

The distribution module **4130** could also be configured to contact one or more specific command and control centers to determine, for example, distribution information. The command and control centers, in cooperation with the triggering module **4110**, the rules module **4120** and the distribution module **4130** could collaborate and determine if, and where, to send the alarm information. Given the hierarchal arrangement of the system, a command and control center has the capability of overseeing and forwarding, for example, alarm information to a scanning area where the threat was found, to the concourse or geographic area where the threat was found, to all threat scanning machines within the airport, to one or more other command and control centers and/or threat scanning machines outside the airport, nationally or internationally, to another transportation and/or secured facility, or the like. In general, the system can be configured in any manner to allow collaboration, hierarchical verification of distribution information, or the like.

Upon the distribution of alarm information by the distribution module **4130**, an action module **4140** located at one or more of a command and control center and another tracking and analysis module receives the alarm information. The action module **4140**, in cooperation with, for example, rules stored therein, or information associated with the alarm information, performs an action based on the received alarm information. For example, the action module **4140** can alter, in cooperation with the threshold module **4150**, threshold levels in, for example, an automatic or semi-automatic manner. For example, if a particular chemical has gone through another threat scanning machine on the same concourse, other threat scanning machines on the same concourse could be instructed to adjust their threshold levels in attempt to regulate the amount of that chemical allowed through security.

Similarly, the action module **4140** can specify a change in sensitivity for one or more particular items. Again, this can occur in an automatic or semi-automatic manner where, for example, if a portion of a gun is detected at a particular threat scanning machine, the sensitivity at the sensitivity module **4160** can be adjusted in an effort to more accurately detect an attempt to smuggle other gun parts into a secure area.

Furthermore, the action module **4140** can notify one or more of operators, security personnel, or personnel at one or more command and control centers. For example, notification such as a text or icon can be displayed on a threat scanning machine indicating, for example, a threat has been detected. This notification could be a text or an icon representing the threat that was found on another threat scanning machine, or could be, for example, an instruction to the operator(s).

If one or more of the threshold module **4150**, sensitivity module **4160** and rules module **4120** were updated, a notification of the update and optionally specifics related thereto could also be forwarded to the operator indicating, for example, a change in threshold or sensitivity levels. Furthermore, pictures or diagrams could be displayed on one or more threat scanning machines to highlight, for example, what items have been found, and what items are to be specifically looked for. If, for example, a handgun handle is found by one threat scanning machine, the other threat scanning machines could display the handgun handle graphically and could highlight the remaining components, such as the barrel, hammer, bullets, and the like, indicating that there may be an attempt to bring these other components through their threat scanning machine.

In that the tracking and analysis module **3910** can be configured in the hierarchal configuration as previously discussed, additional exemplary advantages and benefits based on this configuration can be achieved. For example, the distribution module **4130** can be configured to manage one or more geographically defined regions, such as, regions within an airport, county, country, geographical locations based on, for example, political boundaries, local resources, target areas, or the like. For example, it may be advantageous to notify a specific threat scanning machine at a particular location along one or more particular commuters' paths that a particular individual is a threat, and to carefully screen that person. For example, in conjunction with the passenger tracking module **3914**, the image of one or more "high-risk" passengers could be distributed and displayed at one or more threat scanning machines to advise the operators of those machines that extra attention may be warranted when scanning this individual.

The distribution module **4130** could also forward the alarm information based on, for example, the intended use of the threat. For example, if the threat is something that could be used on a ship, the threat scanning machines at seaports and/or near seaports could be notified. In general, the distribution module **4130**, in cooperation with the one or more sets of rules, can adapted to any configuration based on, for example, one or more of threats, passengers, items, location(s), or the like.

Furthermore, while the above-described embodiment discusses the cross-integration and sharing of information through a hierarchy of tracking and analysis modules and network of command and control centers, is to be appreciated that the flow of information could also be from a higher-level to a lower-level. For example, if a threat is found in an airport in a particular city, a local command and control center could communicate alert information directly to, for example, that cities railway command and control center. This could eliminate the need for the alert information to flow up the hierarchy of command and control centers then back down to a specific command and control center.

These basic principles can be expanded to include intercommunication with various government agencies such as the Department of Homeland Security, NSA, FBI, CIA, and the like. The system could also be configured such that

access to one or more command and control centers is provided to one or more of these various agencies, thus providing them with the capability of initiating an alarm, modifying threshold or sensitivity values, updating the rules, and the like. For example, if the Department of Homeland Security indicates that the national threat level needs to be modified, a change to one or more of the rules, thresholds and sensitivities can be initiated and promulgated down through the various command and control centers to each alarm module **3918** and/or analysis module **3916**. This can be further expanded to include, for example, government agencies from other nations by allowing them the ability to both forward and receive alarm information, as well as distribute and receive rules, threshold values and sensitivity values around the world, to any location where a threat scanning machine is in operation.

For example, the Department of Homeland Security may initiate a program where all passengers destined for the United States on an airline must past through a Department of Homeland Security (DHS) approved threat scanning machine. Thus, various DHS approved threat scanning machines could be distributed around the world at all locations and airports where passengers depart for the United States. Thus, a command and control center managed by the United States could be configured to monitor rules, thresholds, and or sensitivities to aid in, for example, assuring uniform scanning of all inbound passengers.

FIG. **42** outlines an exemplary method of operation of the alarm module **3918**. In particular, control begins at step S**300** and continues to step S**310**. In step S**310**, a determination is made whether an alarm has been detected. If an alarm has not been detected, control continues to step S**320**. Otherwise, control jumps to step S**390**.

In step S**320**, a determination is made whether alarm information has been received. If alarm information has been received, control continues to step S**340**. Otherwise, control continues to step S**330** where the control sequence ends.

In step S**340**, a determination is made whether an action should be performed based on the received alarm information. If an action is to be performed, control continues to step S**350**. Otherwise, control jumps to step S**360**.

In step S**350**, an action is performed. For example, a message can be sent to one or more of an operator at a threat scanning machine, various official(s), such as airport security, or the like, rules can be updated, passenger and/or item status updated, and the like. Control then continues to step S**360**.

In step S**360**, a determination is made whether one or more of threshold and sensitivity values should be updated. If the values are to be updated, control continues to step S**370**. Otherwise, control jumps to step S**380** where the control sequence ends.

In step S**370**, the threshold and/or sensitivity values are updated. Control then continues to step S**380** where the control sequence ends.

In step S**390**, information associated with the alarm is compared to one or more rules to determine an action. Next, in step S**400**, a determination is made whether to forward information about the alarm to one or more destinations. If information about the alarm is to be forwarded, control continues to step S**410**. Otherwise, control jumps to step S**430**.

In step S**410**, a determination is made as to which location(s) the alarm information is to be distributed. Next, in step S**420**, the alarm information is forwarded to the determined destinations. Control then continues to step S**430**.

In step S**430**, a determination is made whether the threshold and/or sensitivity values should be updated based on the alarm. If one or more of the threshold and/or sensitivity values are to be updated, control continues to step S**440**. Otherwise, control jumps to step S**450** where the control sequence ends.

In step S**440**, one or more of the threshold and/or sensitivity values are updated. Control then continues to step S**450** where the control sequence ends.

As shown in the above figures, the threat scanning machine management system with system alerts can be implemented on a general-purpose computer, a special-purpose computer, a programmed microprocessor or microcontroller and peripheral integrated circuit element, an ASIC or other integrated circuit, a digital signal processor, a hardwired electronic or logic circuit such as a discrete element circuit, a programmed logic device such as a PLD, PLA, FPGA, PAL, or the like. In general, any process capable of implementing the functions described herein can be used to implement the system and methodology according to this invention.

Furthermore, the disclosed system may be readily implemented in software using object or object-oriented software development environments that provide portable source code that can be used on a variety of computer platforms. Alternatively, the disclosed system may be implemented partially or fully in hardware using standard logic circuits or a very large-scale integration (VLSI) design. Other hardware or software can be used to implement and supplement the systems in accordance with this invention depending on the speed and/or efficiency requirements of the system, the particular function, and/or a particular software or hardware system, microprocessor, networking, or microcomputer system being utilized. The system illustrated herein can readily be implemented in hardware and/or software using any known or later developed systems or structures, devices and/or software by those of ordinary skill in the applicable art from the functional description provided herein and with a general basic knowledge of the computer and network communication arts.

Moreover, the disclosed methods may be readily implemented in software executed on programmed general-purpose computer, a special purpose computer, a microprocessor, or the like. In these instances, the systems and methods of this invention can be implemented as a program embedded on personal computer such as JAVA® or Common Gateway Interface (CGI) script, as a resource residing on a server or graphics workstation, as a routine embedded in a dedicated security system, or the like. The system can also be implemented by physically incorporating the system and method into a software and/or hardware system, such as the hardware and software systems of a security network.

It is, therefore, apparent that there is provided in accordance with the present invention, systems and methods for managing threat scanning machines with passenger and item tracking and system alerting. While this invention has been described in conjunction with a number of embodiments, it is evident that many alternatives, modifications and variations would be or are apparent to those of ordinary skill in the applicable arts. Accordingly, applicants intend to embrace all such alternatives, modifications, equivalents and variations that are within the spirit and scope of this invention.

What is claimed:

1. An alarm handling system comprising:

an item tracking module configured to read an item identifier associated with an item;

a passenger tracking module configured to read a passenger identifier associated with a passenger;

a triggering module utilizing rules to determine an action in response to a threat detected for the item at a first threat scanning machine, the rules including associating a read item identifier with a read passenger identifier;

a distribution module capable of performing the action, the action capable of including forwarding alarm information to a second threat scanning machine geographically remote from the first threat scanning machine.

2. The system of claim 1, further comprising an action module adapted to receive one or more of an instruction from a command and control center and incoming alarm information and performing an operation based thereon.

3. The system of claim 1, wherein the first threat scanning machine is in a first transportation concourse and the second threat scanning machine is in a second transportation concourse.

4. The system of claim 1, further comprising a sensitivity module adapted to cooperate with a rules module and the triggering module to determine the action.

5. The system of claim 1, wherein the analysis module is adapted to detect the threat at the threat scanning machine.

6. The system of claim 1, wherein a plurality of alarm handling systems are interconnected.

7. The system of claim 6, wherein the plurality of alarm handling systems are adapted to cooperate to perform threat detection and the action determination.

8. The system of claim 1, wherein the rules specify an automatic action to be taken in response to the detected threat.

9. The system of claim 1, wherein the distribution module is adapted to distribute one or more of the alarm information, the sensitivity information, the threshold information and the information for the analysis module based on distribution information associated with the action.

10. An alarm handling method comprising:

utilizing rules to determine an action in response to a threat detected at a first threat scanning machine; and

performing the action, the action capable of including forwarding alarm information, updating sensitivity information at a second threat scanning machine, updating threshold information and updating information in an analysis module,

wherein the first threat scanning machine is geographically remote from the second threat scanning machine.

11. The method of claim 10, further comprising receiving one or more of an instruction from a command and control center and incoming alarm information and performing an operation based thereon.

12. The method of claim 10, wherein the first threat scanning machine is located at a first transportation facility and the second threat scanning machine is located at a second transportation facility remote from the first transportation facility.

13. The method of claim 10, further comprising utilizing sensitivities to determine the action.

14. The method of claim 10, wherein the threat detected at the first threat scanning machine relates to a first screened person and wherein updating threshold information includes modifying an alarm threshold of the second threat scanning machine for a second person to be screened.

15. The method of claim 10, wherein the alarm handling method is performed by a hierarchy of alarm handling systems.

16. The method of claim 10, wherein the first threat scanning machine is in a first concourse of an airport and the second threat scanning machine is in a second concourse of the airport.

17. The method of claim 10, further comprising distributing one or more of the alarm information, the sensitivity information, the threshold information and the information for the analysis module based on distribution information associated with the action.

18. An alarm handling system comprising:

means for tracking an identity of a passenger;

means for tracking an item associated with the passenger;

means for utilizing rules to determine an action in response to a threat detected at a threat scanning machine responsive to the means for tracking the identity of a passenger and the means for tracking an item associated with a passenger; and

means for performing the action, the action capable of including forwarding alarm information, updating sensitivity information, updating threshold information and updating information in an analysis module.

19. The system of claim 18, further comprising means for distributing one or more of the alarm information, the sensitivity information, the threshold information and the information for the analysis module based on distribution information associated with the action.

20. The system of claim 18, wherein the action is capable of including forwarding alarm information to a facility remote from the threat scanning machine.

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