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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
61/435,564	01/24/2011		220	RALEP046+		

CONFIRMATION NO. 6704

21912
VAN PELT, YI & JAMES LLP
10050 N. FOOTHILL BLVD #200
CUPERTINO, CA 95014

FILING RECEIPT



OC000000046074262

Date Mailed: 02/22/2011

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Applicant(s)

Gregory G. Raleigh, Woodside, CA;

Power of Attorney:

Michael Schallop--44319

If Required, Foreign Filing License Granted: 02/17/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 61/435,564**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title

FRAMEWORK FOR DEVICE ASSISTED SERVICES

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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Doc Code: **TR.PROV**

Document Description: Provisional Cover Sheet (SB16)

PTO/SB/16 (04-07)

Approved for use through 06/30/2010 OMB 0851-0032

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Provisional Application for Patent Cover Sheet

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Inventor(s)

Inventor 1

Remove

Given Name	Middle Name	Family Name	City	State	Country i
Gregory	G.	Raleigh	Woodside	CA	US

All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

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Title of Invention

FRAMEWORK FOR DEVICE ASSISTED SERVICES

Attorney Docket Number (if applicable)

RALEP046+

Correspondence Address

Direct all correspondence to (select one):

☒ The address corresponding to Customer Number ☐ Firm or Individual Name

Customer Number

21912

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are:

Entity Status

Applicant claims small entity status under 37 CFR 1.27

☐ Yes, applicant qualifies for small entity status under 37 CFR 1.27☒ No**Warning**

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Signature

Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/Michael J. Schallop/			Date (YYYY-MM-DD)	2011-01-24
First Name	Michael	Last Name	Schallop	Registration Number (If appropriate)	44319

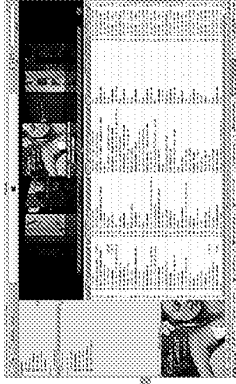
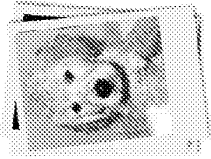
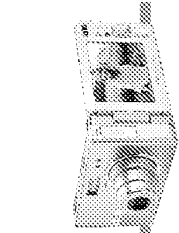
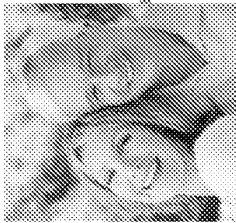
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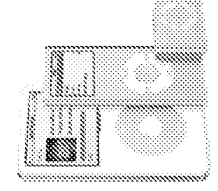
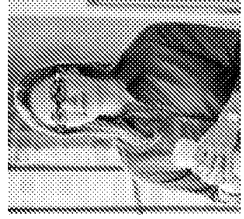
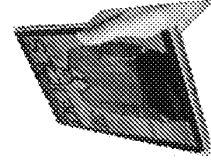
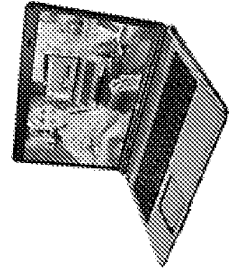
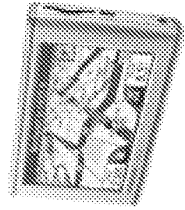
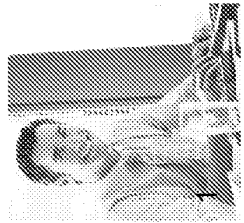
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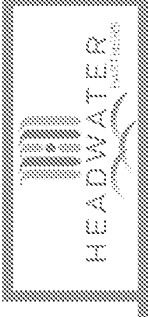
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Framework for Device Assisted Services (DAS) Provisional Patent Application



Proxy Service Function Service Usage Classification



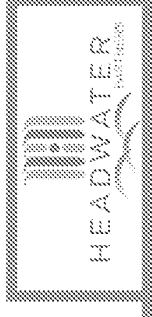
- It is becoming increasingly important to associate device access network services usage (e.g. network data services usage, voice services usage, etc.) to the applications (e.g. application, widget, service, process, embedded object, or any combination of these, etc.) that are using the services. This information is used in a variety of ways, including but not limited to:
 - Classifying service usage to assist a user to understand one or more aspects of service usage
 - e.g. Notifying a user about which applications are consuming service usage, or how much service usage one or more applications are consuming (e.g. amount of usage)
 - Classifying service usage for the purpose of service control policy enforcement
 - e.g. traffic control, QoS control, QoS channel setup, application based service classification or usage controls, etc.
 - Classifying service usage for the purpose of service charging accounting
- Various embodiments disclosed herein provide a way for device software agents, integrated into the device in addition to an operating system or as an integral set of functions in an operating system, to track network service usage through a proxy service function back to an originating application that utilizes the proxy service function to assist in transferring data between a network and the application (e.g. application, widget, service, process, embedded object, or any combination of these, etc.).

Proxy Service Function Service Usage Classification Cont'd



- In some existing device OS, a proxy service function is used to manage the network service flows between the network and an application (e.g. application, widget, service, process, embedded object, or any combination of these, etc.) and the proxy service is stored in the OS as the application responsible for using services rather than the application actually using the network service.
 - For example, in the Android OS, there exists a “media service” OS library software program function that manages the network stack interface for download of network data (typically, but not limited to multi-media data). The device makes a request to the media service which then performs various network stack interface functions to transfer the network data between the device application and the networks. The media service can also process media files to determine how best to decode the multi-media and play the multi-media on the device UI (e.g. determine the media filing coding standard [MP3, MP4, OGG, H.264, VP8, etc.] decode the media, select a player for the media [e.g. libstagefright (an Android streaming service library function), a 3rd party or OEM media player, etc.] and send the decoded media to the media player for UI playback). In the case of the media service, the data flows to the network can be classified by various device service usage monitoring agents (e.g. a kernel agent in the network stack) as belonging to the media service, not the originating application, and the OS provides no mechanism for tracking the usage back to the originating application.
 - Another example in the Android OS is the “media” OS library software program that is used by applications such as the Android browser, Android store app downloader, the Gmail client, OS updater, etc. The media function manages network data transfers for such applications, allowing an application to launch a data transfer request and then continue other operations while the media service is managing the network data transfer. In the case of the media function, the data flows to the network can be classified as belonging to the media function, not the originating application, and the OS provides no Techniques/Mechanisms of tracking the usage back to the originating application
 - As another example, some higher level library software functions or framework software functions provide proxy server client functions that encapsulate native application traffic to send application flows to a network proxy server for further network traffic processing, and this proxy client function sits above the network stack. Examples of this include the Android.net library function, the Apache library function, and the Java.net library function, 3rd party proxy server client functions or tunneling protocol functions, and other proxy server client functions or tunneling protocol functions.
 - As another example, there are system services (e.g. DNS, certificate management, etc.) for many OS (e.g. Windows 7 and other Windows versions). Similar to the above, these OS functions manage data transfer with the OS network stack interface for an originating application and the device network stack service flows can be classified back to these OS functions, but not to the originating applications.

Android Media Service Data Flow Classification Embodiments



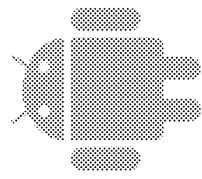
- A. Techniques/Mechanisms to identify an application name, i.d., process, etc. for an application (e.g. application, widget, service, process, embedded object, or any combination of these, etc.) that requests from a media service manager a data transfer (data transfer request) that includes a network resource identifier (e.g. IP address, url, remote file name/address, stream name, object name, or any combination of these identifiers) that identifies a source (or a proxy to the source) of the data to be transferred or a data object to be transferred,
 - 1. Where the Techniques/Mechanisms to identify the originating application is provided by a software agent (the Service Classification and Accounting Agent) that monitors and stores the application name, i.d., process, etc. for each application that requests a data transfer from the media service manager or that conducts a data transfer with the media service manager,
 - i. Where the Service Classification and Accounting Agent is implemented by including a requesting application storing function in the media services manager
 - a. Where the Service Classification and Accounting Agent further identifies and stores information about the network resource identifier along with the entry specifying the requesting application name, i.d. process, etc.,
- B. Techniques/Mechanisms within the media service manager to transfer the requested data from the network resource identifier by mapping the transfer request and network resource identifier into one or more data flow connections communicated through a device networking stack (and, in some embodiments, managing the resulting flow of data between the network and device stack and/or between the network stack and the application),
 - Techniques/Mechanisms to identify the resulting network data flows,
- C. Techniques/Mechanisms to identify the resulting network data flows is provided
 - 1. Where the Techniques/Mechanisms to identify the resulting network data flows is provided by a Service Classification and Accounting Agent that monitors and records the resulting network data flow identifiers (e.g. data flow tag, IP address, TCPIP identifier, layer 7 identifier, socket tuple, etc.),

Android Media Service Data Flow Classification Embodiments Cont'd

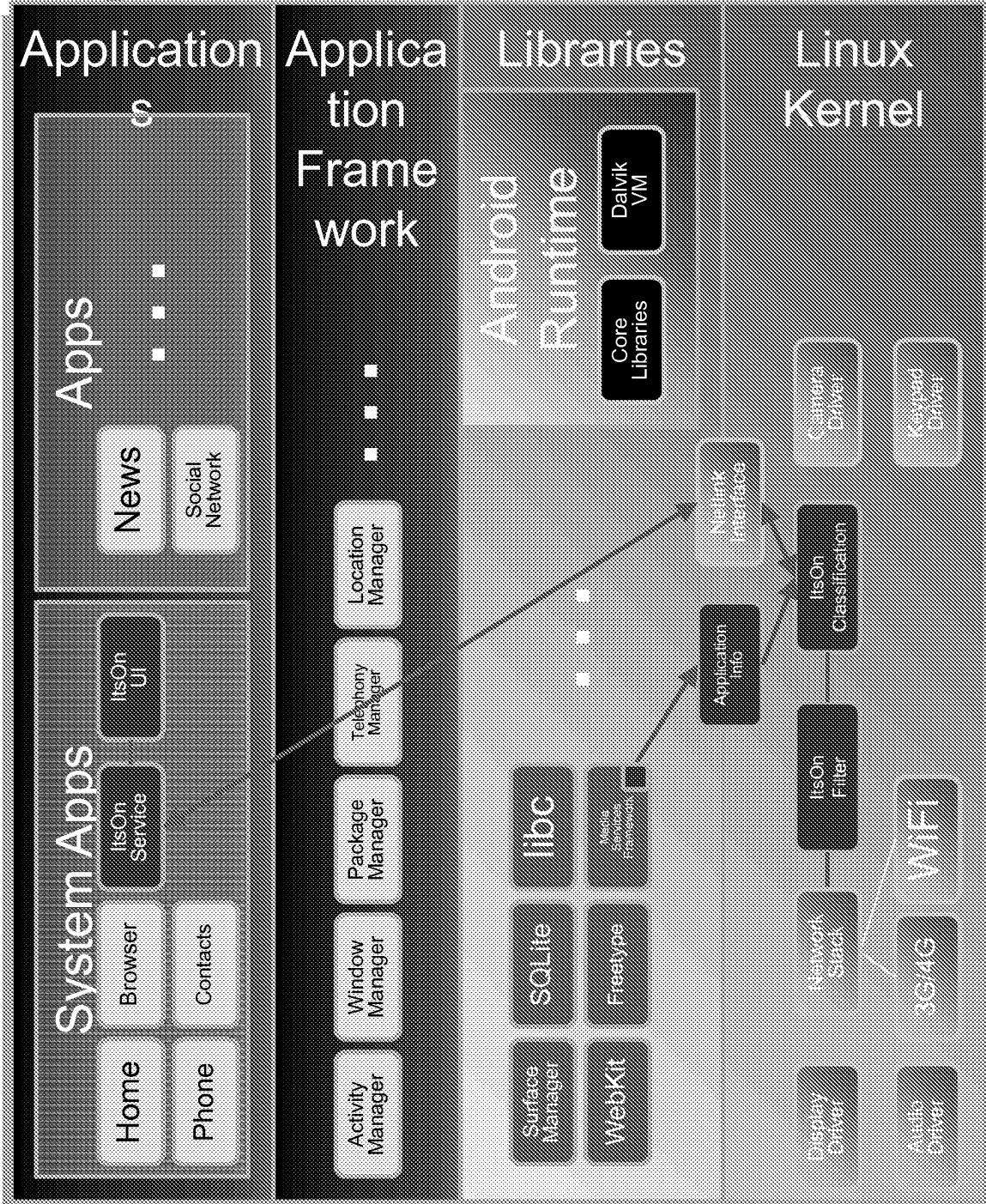


- D. Techniques/Mechanisms to associate the resulting network data flows back to the application name, i.d., process, etc. (e.g. UID in Android).
1. Where the Techniques/Mechanisms to associate the resulting network data flows back to the application name, i.d., process, etc. are provided by a Service Classification and Accounting Agent that inspects the resulting network data flows to determine a match between with one or more aspects of the network resource identifier stored in association with the requesting application name, i.d., process, etc.,
 2. Where the Techniques/Mechanisms to associate the resulting network data flows back to the application name, i.d., process, etc. are provided by a Service Classification and Accounting Agent that tracks the data flow from the interface between the media service manager and the application, through each stage of media service manager data flow processing to the resulting network data flow between the media service manager and the network stack,
 - I. (Virtual Tagging) Where the tracking is accomplished by identifying and recording, at each traffic processing step within the media services manager, an association between the traffic flows at once side of the traffic processing step and the traffic flows at the other side of the traffic processing step.
 - a. And if there are more than one traffic processing step, following the associations made for each step to create an association for all steps.
 - II. (Literal Tagging) Where the tracking is accomplished by tagging the data flows at one side of the media service manager traffic processing and identifying the tag at the other side of the media service manager traffic processing.
- E. Techniques/Mechanisms to create an accounting record for the resulting network data flow usage, or Techniques/Mechanisms to enforce a network traffic control policy on the resulting network data flows, or Techniques/Mechanisms to create a service usage notification for the resulting network data flow usage.
- F. The results of the service usage classification and/or accounting can be stored in a local device (or OS) data base. The results of the service usage classification and/or accounting can be provided to a device (or OS) UI function for the purpose of displaying usage classifications to a user. The results of the service usage classification and/or accounting can be provided to other applications, OS service functions, other device software functions, or network based service classification and/or accounting functions.

Media Service Classification in ANDROID



android

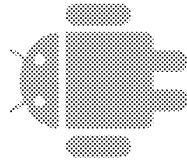
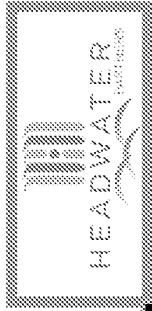


LEGEND:

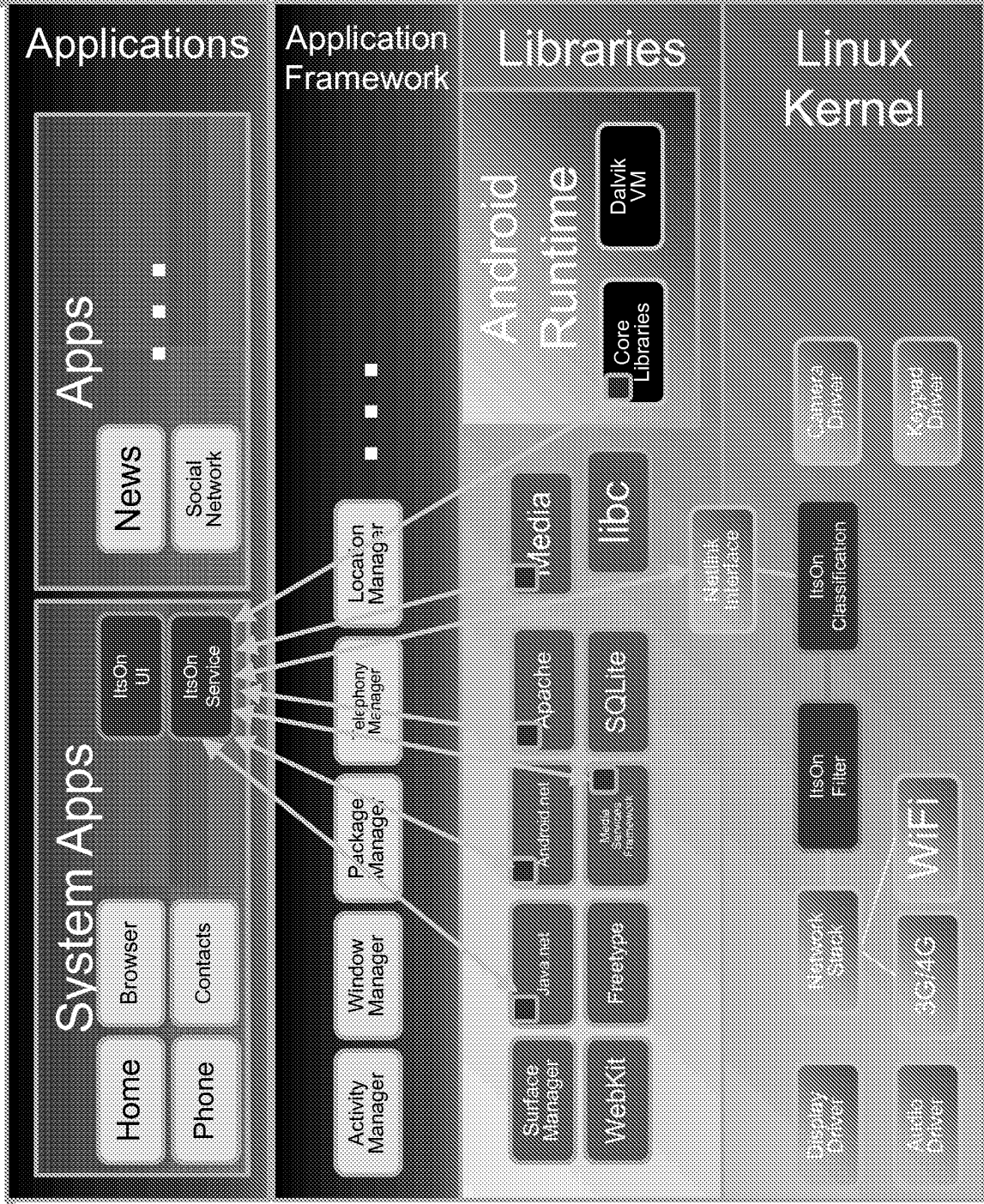
■ = Service Classification and Accounting Agent (shown inside of Media Services framework library function)

Note: In this embodiment, items 400 and 500 are inside the App Info and Classification functions.

Proxy Service Classification in Android



android



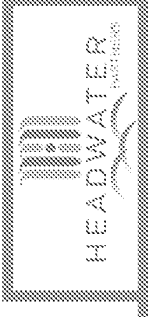
LEGEND:

- = Service Classification and Accounting Agent (shown inside of various Proxy Service framework library functions)

Note: In this embodiment, items 400 and 500 are inside the ItsOn Service.

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Proxy Service Manager



- In some embodiments, a proxy network service manager refers to an intermediary data flow function in a device operating system that sits on a data path between a device application and a device networking stack interface to provide a level of network service abstraction from the network stack interface, a higher level service function above the network stack interface, enhanced or special traffic processing functions, media service transfer management, file download service, HTTP proxy service functions, QoS differentiation, or other similar or related higher level traffic processing.
- Example Proxy Service Managers include the following: media service manager (e.g. android media service library function), email service manager, DNS function, software download service manager, media download manager, data download service manager, Android "media" library function, Android.net library function, Java.net library function, Apache library function, other similar software/library functions or services in other device operating systems, SMTP/IMAP/POP proxy, HTTP proxy, IM proxy, VPN service manager, SSL proxy, etc.

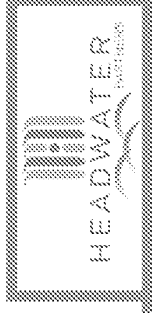
Generalized OS Proxy Service Data Flow Classification Embodiment



- A. Techniques/Mechanisms to identify an application name, i.d., process, etc. for an application (e.g. application, widget, service, process, embedded object, or any combination of these, etc.) that requests from a proxy service manager a data transfer (data transfer request) that includes a network resource identifier (e.g. IP address, url, remote file name/address, stream name, object name, or any combination of these identifiers) that identifies a source (or a proxy to the source) of the data to be transferred or a data object to be transferred,
 - 1. Where the Techniques/Mechanisms to identify the originating application is provided by a Service Classification and Accounting Agent that monitors and stores the application name, i.d., process, etc. for each application that requests a data transfer from the proxy service manager or that conducts a data transfer with the proxy service manager,
 - i. Where the Service Classification and Accounting Agent is implemented by including a requesting application storing function in the proxy services manager
 - a. Where the Service Classification and Accounting Agent further identifies and stores information about the network resource identifier along with the entry specifying the requesting application name, i.d. process, etc.,
- B. Techniques/Mechanisms within the proxy service manager to transfer the requested data from the network resource identifier by mapping the transfer request and network resource identifier into one or more data flow connections communicated through a device networking stack (and possibly managing the resulting flow of data between the network and device stack and/or between the network stack and the application),
 - C. Techniques/Mechanisms to identify the resulting network data flows,
 - 1. Where the Techniques/Mechanisms to identify the resulting network data flows is provided by a Service Classification and Accounting Agent that monitors and records the resulting network data flow identifiers (e.g. data flow tag, IP address, TCP/IP identifier, layer 7 identifier, socket tuple, etc.),

- D. Techniques/Mechanisms to associate the resulting network data flows back to the application name, i.d., process, etc. (e.g. UID in Android).
1. Where the Techniques/Mechanisms to associate the resulting network data flows back to the application name, i.d., process, etc. are provided by a Service Classification and Accounting Agent that inspects the resulting network data flows to determine a match between with one or more aspects of the network resource identifier stored in association with the requesting application name, i.d., process, etc.,
 2. Where the Techniques/Mechanisms to associate the resulting network data flows back to the application name, i.d., process, etc. are provided by a Service Classification and Accounting Agent that tracks the data flow from the interface between the media service manager and the application, through each stage of media service manager data flow processing to the resulting network data flow between the media service manager and the network stack,
 - I. (Virtual Tagging) Where the tracking is accomplished by identifying and recording, at each traffic processing step within the media services manager, an association between the traffic flows at once side of the traffic processing step and the traffic flows at the other side of the traffic processing step.
 - a. And if there are more than one traffic processing step, following the associations made for each step to create an association for all steps.
 - II. (Literal Tagging) Where the tracking is accomplished by tagging the data flows at one side of the media service manager traffic processing and identifying the tag at the other side of the media service manager traffic processing.
- E. Techniques/Mechanisms to create an accounting record for the resulting network data flow usage, or Techniques/Mechanisms to enforce a network traffic control policy on the resulting network data flows, or Techniques/Mechanisms to create a service usage notification for the resulting network data flow usage
- F. The results of the service usage classification and/or accounting can be stored in a local device (or OS) data base. The results of the service usage classification and/or accounting can be provided to a device (or OS) UI function for the purpose of displaying usage classifications to a user. The results of the service usage classification and/or accounting can be provided to other applications, OS service functions, other device software functions, or network based service classification and/or accounting functions.

OS Proxy Service Data Flow Classification Detailed Example Embodiment

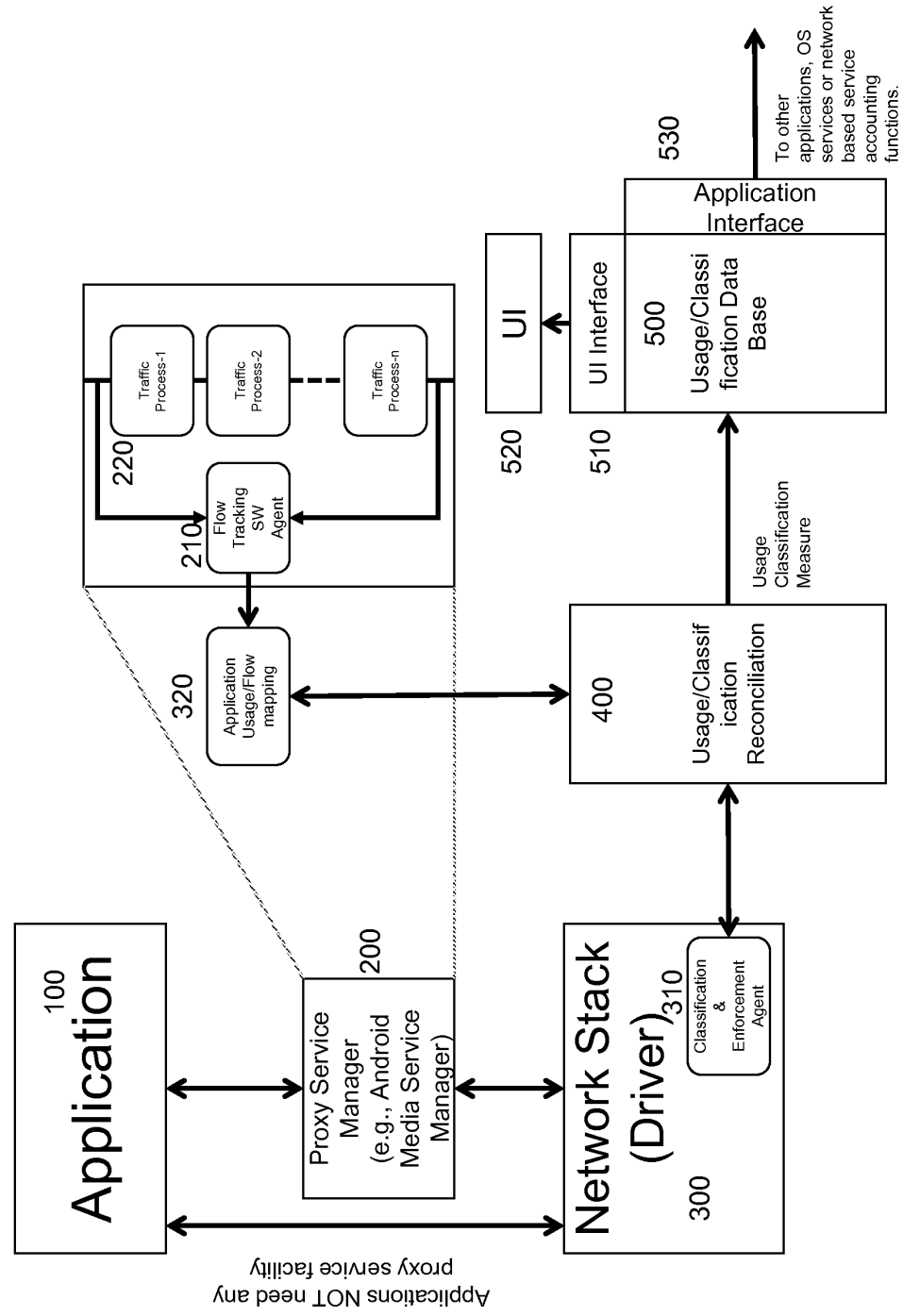


Virtual Tagging Detailed Embodiment Description

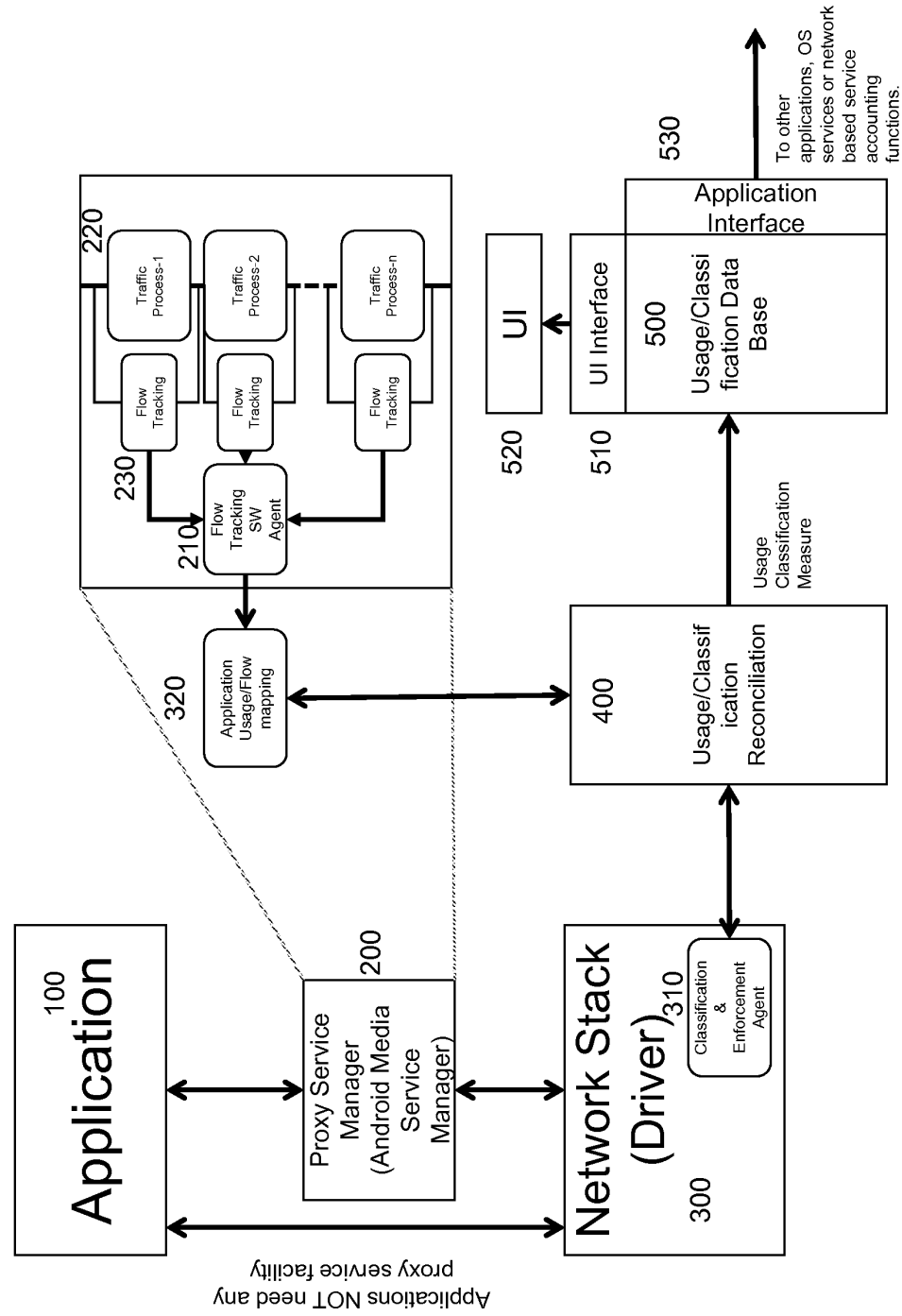
Note that the number of detailed embodiments are numerous and this detailed description is provided for instructive purposes and not to indicate any limitation to the general embodiments described herein.

- A. Pandora application calls the Media Service Function with a Network Resource Indicator (NRI) that includes a Pandora url with song identifier included in the url descriptor. Pandora receives back from Media Service Function a media object handle descriptor so that the Pandora app can control playback etc by sending commands back to Media Service for that handle descriptor (e.g. pause on xyz song handle, play xyz song handle, etc).
- B. Media Service Function initiates HTTP download by calling libstagefright which conducts the HTTP song download process. At some point in the download process the Media Service Function begins playback with a media player under the control of the media service function and in accordance with the Pandora app playback commands for the media object handle for the song being played back.
- C. A Classification and Accounting Agent Function 210 included in the Media Service Function writes the NRI descriptor into a table located in Application Usage/Flow Mapping 320 and also associates the NRI with the Pandora app by writing a Pandora app identifier descriptor into the same table entry within 320. This table entry is then communicated to Usage/Classification Reconciliation 400.
- D. The Classification and Enforcement Agent 310 identifies the network data flows (e.g. socket [IP address, destination port, source port, protocol] indexed packet flows) originating from the Media Service Function (and/or possibly the libstagefright function originating the flows), identifies the NRI via packet flow layer 7 inspection, logs the service usage accounting for these packet flows.
- E. The Classification and Enforcement Agent 310 writes into a table entry the following associations: (i) identifier for the Media Service Function originating the flows (and/or possibly the identifier for libstagefright function originating the flows), (ii) the NRI, the (iii) service usage classification for these flows and accounting for these flows, and (iv) possibly the service usage accounting for these flows. This table entry is then communicated to Usage/Classification Reconciliation 400.
- F. Usage/Classification Reconciliation 400 then uses these two table entries, which both have common entries for the NRI and the Media Service Function (and/or possibly the libstagefright function) to make the association between the Pandora app and the service usage classification and possibly the service usage accounting. These parameters may then be written into Usage/Classification Data Base 500.

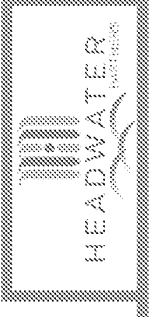
Proxy Service Manager (e.g., Media Service Library in Android) Classification Mapping using virtual tagging



Proxy Service Manager (e.g. Media Service Library in Android) Classification Mapping using in-band/literal tagging

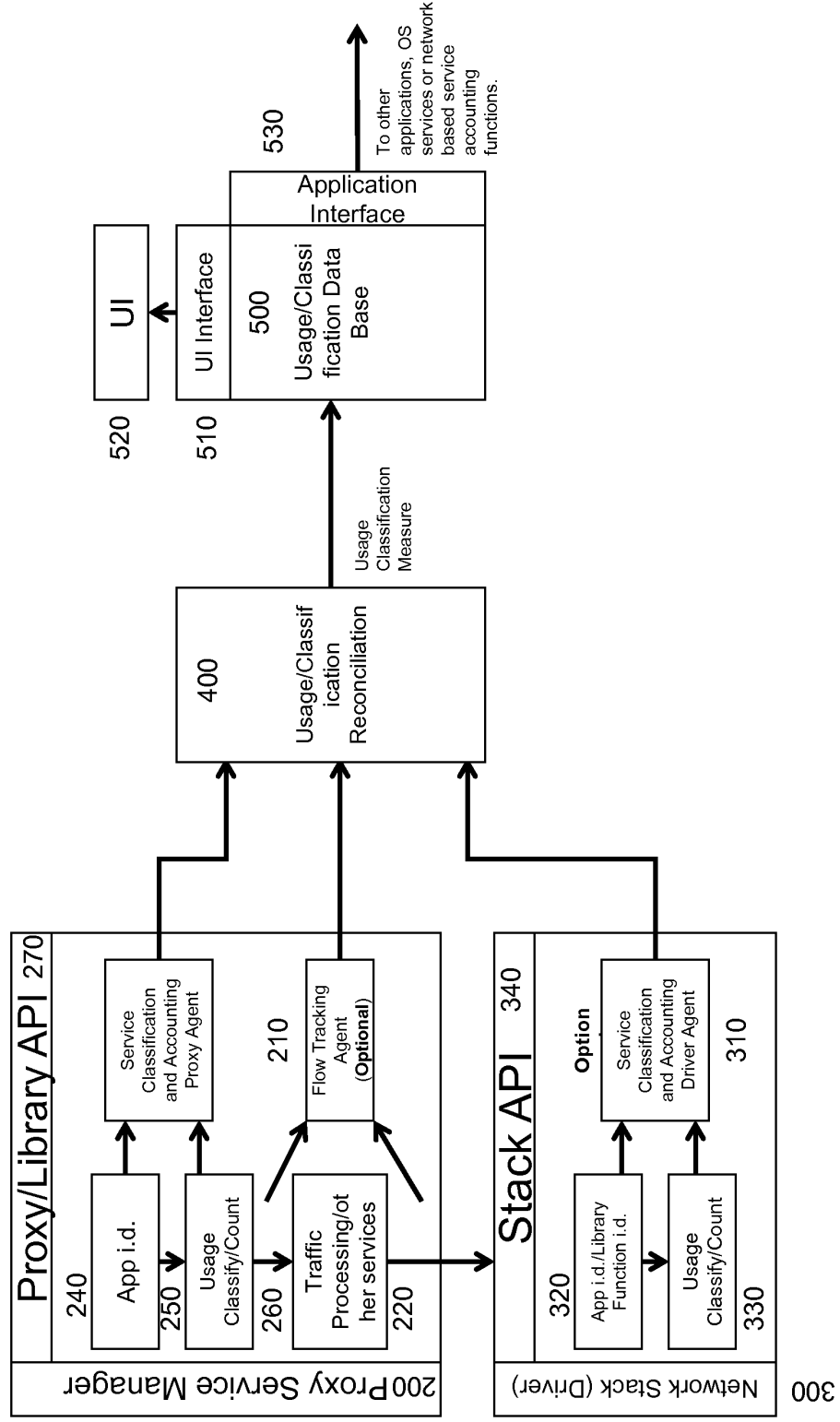
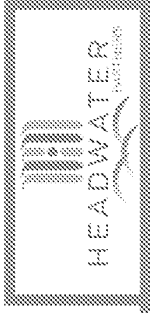


Proxy Client Counter Embodiments

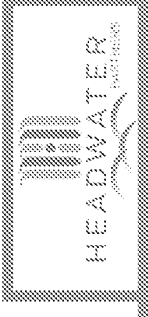


- In some embodiments, the Proxy Service Manager can perform application identification & classification, usage monitor and counting. This allows service usage to be classified and associated with an application prior to proxy processing. Classification can be accomplished with a software agent (the Service Classification and Accounting Agent) added to the Proxy Service Manager software program (or library function). The Service Classification and Accounting Proxy Agent can identify which application requested or is processing the data transfer with the network and include this as part of the data flow classification for the data transfer. The Service Classification and Accounting Proxy Agent can inspect the traffic to determine other parameters such as network destination (e.g. domain, url, network address, IP address, traffic flow identifier, port address, etc.) or type of traffic (e.g. data or voice, network protocol [e.g. TCP/IP, UDP, native IP, HTTP, SSL, etc.]). The Service Classification and Accounting Proxy Agent can also classify the traffic with other parameters such as active network, network state (network busy state, time of day, type of network [3G/4G/WiFi/etc.]). The Service Classification and Accounting Proxy Agent may also monitor service usage and account for traffic.
- In some embodiments, the Proxy Service Manager includes a Service Classification and Accounting Proxy Agent that uses a flow tracking function as discussed in a previous embodiment to associate the requesting application network service flows between the requesting application and the Proxy Service Manager and tracks these flows through the traffic processing or other service processing that takes place in the Proxy Service Manager and the tracks the network service flows into the OS network stack interface. The Service Classification and Accounting Proxy Agent can then provide the classification and/or usage accounting results to the Usage Classification and Reconciliation Agent which can then reconcile the service classification and usage that is reported by the Proxy Service Manager Service Classification and Accounting Proxy Agent against classification and/or usage accounting results that are reported by other agents on other parts of the data path between the requesting application and the network (e.g. a Service Classification and Accounting Driver Agent located in the network stack driver that is discussed in various embodiments in other patents filed by these inventors).
 - The results of the service usage classification and/or accounting can be stored in a local device (or OS) data base. The results of the service usage classification and/or accounting can be provided to a device (or OS) UI function for the purpose of displaying usage classifications to a user. The results of the service usage classification and/or accounting can be provided to other applications, OS service functions, other device software functions, or network based service classification and/or accounting functions.

Proxy Client Counter Figure

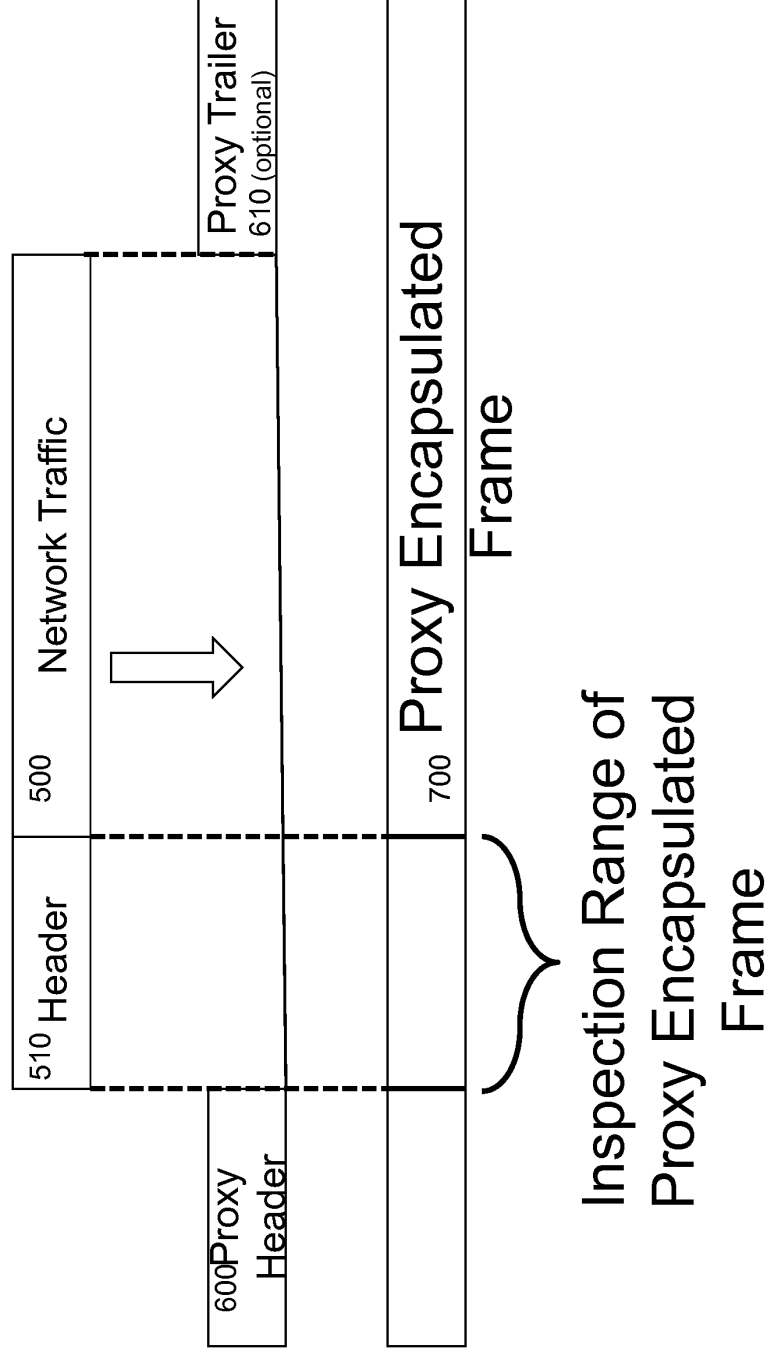


Proxy Encapsulation DPI Embodiments



- In some embodiments, the Proxy Service Manager encapsulates the received frames (or packets) by adding its own header and trailer fields. The encapsulated frames (or packets) traffic is then forwarded with a header (possibly trailer) to a network proxy server or proxy gateway. The encapsulated frames are then forwarded to the Network stack where the Service Classification and Accounting Driver Agent inspects the traffic to classify and possibly account for it.
- In some embodiments, the classification includes the Service Classification and Accounting Driver Agent steps of first determining that the frame (or packet) is a packet with a proxy forwarding destination specification, determine the Inspection Range of Proxy Encapsulated Frame within the encapsulated frame traffic (this is the encapsulated packet byte offset where the destination information and/or other classification information from the original requesting application packet is located), then inspecting this byte offset range to determine the classification of the original requesting application traffic, and then associating the classification or usage accounting with the original packet information and/or the requesting application.
- The results of the service usage classification and/or accounting can be stored in a local device (or OS) data base. The results of the service usage classification and/or accounting can be provided to a device (or OS) UI function for the purpose of displaying usage classifications to a user. The results of the service usage classification and/or accounting can be provided to other applications, OS service functions, other device software functions, or network based service classification and/or accounting functions.

Proxy Encapsulation DPI Figure



Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		FRAMEWORK FOR DEVICE ASSISTED SERVICES		
First Named Inventor/Applicant Name:		Gregory G. Raleigh		
Filer:		Michael J. Schallop		
Attorney Docket Number:		RALEP046+		
Filed as Large Entity				
Provisional Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Provisional application filing	1005	1	220	220
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				220

Electronic Acknowledgement Receipt	
EFS ID:	9290419
Application Number:	61435564
International Application Number:	
Confirmation Number:	6704
Title of Invention:	FRAMEWORK FOR DEVICE ASSISTED SERVICES
First Named Inventor/Applicant Name:	Gregory G. Raleigh
Customer Number:	21912
Filer:	Michael J. Schallop/Veronica Pula
Filer Authorized By:	Michael J. Schallop
Attorney Docket Number:	RALEP046+
Receipt Date:	24-JAN-2011
Filing Date:	
Time Stamp:	16:27:51
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$220
RAM confirmation Number	3250
Deposit Account	500685
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees) Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Provisional Cover Sheet (SB16)	RALEP046plus_Application_Data_Sheet.pdf	999985	no	3
			fd9ea700ec570bf2e27f9eb62639027f413267f5		
Warnings:					
Information:					
2	Specification	RALEP046plus_App.pdf	806032	no	17
			3a9d2e1f18384eb16057ba0b7c666eaa392f5459		
Warnings:					
Information:					
3	Fee Worksheet (PTO-875)	fee-info.pdf	29289	no	2
			a3d2cbde7a4920e6a15c8e832bf4443c337dcbab		
Warnings:					
Information:					
Total Files Size (in bytes):			1835306		
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