

ixDPI Information eXtraction through Deep Packet Inspection



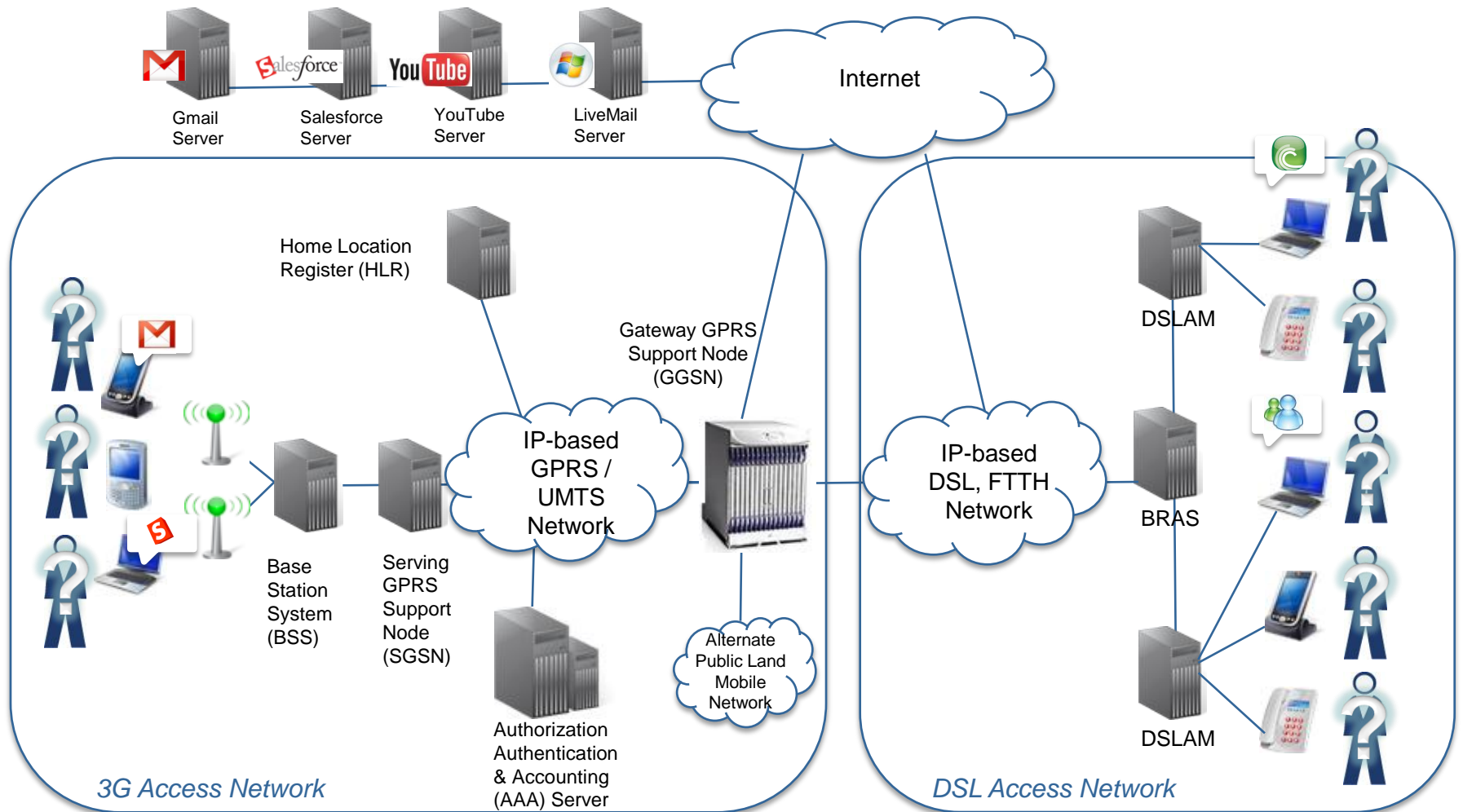
Layer 7 Identity Management for Lawful Interception

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A New Complex Situation Creates a Number of Challenges to Correctly Identify Targets...



How do you accurately identify targets across multiple applications, multiple physical locations, multiple terminals and multiple identities?

Challenge #1: Identify Users across all Types of Communications

■ New challenges for LEAs

- People are no longer linked to physical subscriber lines
- The same person can communicate in several ways
- Example: VoIP, Instant Messaging, Webmail, FTP, etc
- How to launch interception across all communication with a single trigger?

■ Answer

- Identify users and intercept all type of communication initiated by the same user when a trigger such as “user login” is detected
- Identify Internet access point and physical device of targeted user
- Link trigger to IP address, MAC address, IMSI, IMEI, etc.
- Show all communication on the same screen, in real-time: Webmail, Instant Messaging, FTP, P2P, Financial Transactions



1. Trigger = VoIP activity on monitored user login



2. Link user login to:
-User MAC
-or IP address
-or IMSI



3. Intercept VoIP + Webmail + Chat from a particular user on a certain PC or mobile to a specific person in real-time!

Challenge #2: Need to Understand Different Applications Behind The Same Protocol

- HTTP is not only used by Web browsing
 - HTTP is also used by: LiveMail, Gmail, YahooMail, GoogleEarth, GoogleMap, Salesforce, iGoogle, mashups, and hundreds of other applications...
- A user typically has different IDs in different applications
- Answer
 - Understand all the applications using a particular protocol (such as HTTP)
 - Deep and stateful analysis of IP packets
 - Connection context and session management
 - Connection expiration management
 - IP fragmentation management
 - Session inheritance management



Challenge #3: Ability to Recognize Regional Protocols

- Targets may use regional services for Webmail, Instant Messaging, Social Networking, etc.
 - Used by large a number of people in local country and local language
 - Targets can also use services from outside their country of origin, in local language or other languages
- Answer
 - Extend protocol expertise to local Webmail, Instant Messaging, Social Networking, etc.



Poland



China



QQ2007
Chinese
Version



QQ2005
English
Version

Examples of Regional Protocols

Americas

Hushmail
Lavabit
FuseMail
LuxSci
Trusty Box
Webmail.us
ATT webmail

Meebo
VZOchat
BeeNut
Xfire

fotolog
Bebo
Sonico
MiGente

EMEA

Jubii
Mail.ru
O2 Webmail
Orange Webmail
Pochta.ru
Runbox
GMX Mail

Mxit
Maktoob
Paltalk
Gadu-Gadu

Lunarstorm
PSYC
vkontakte.ru
Cloob
Grono.net

APAC

QQ webmail + Chat
263 webmail

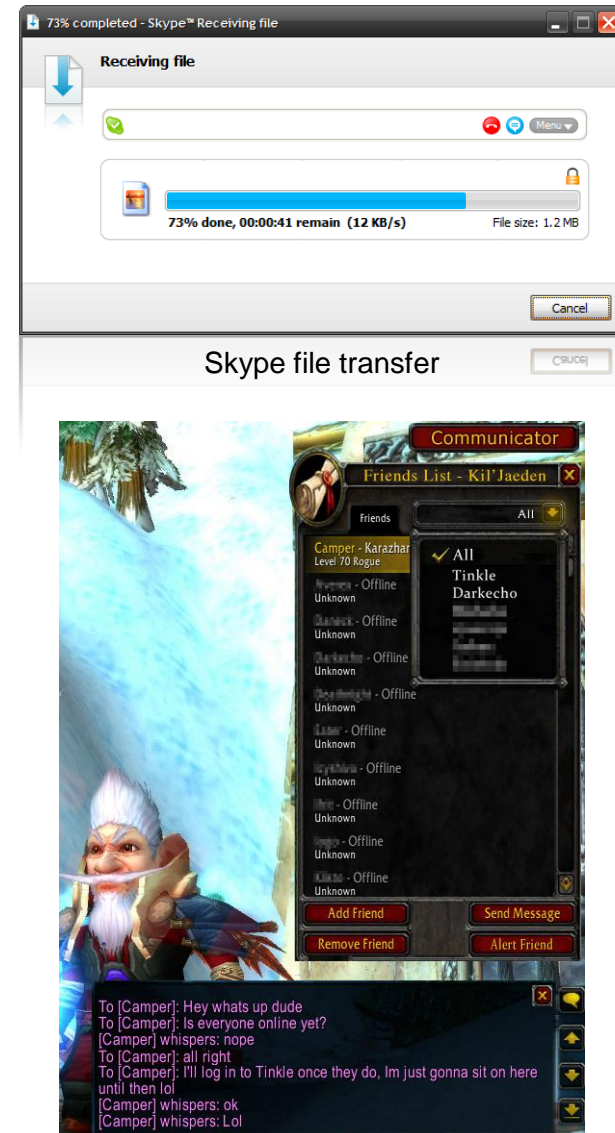
SOQ (Sohu) IM
POPO, IM
UC (Sina)
Fetion
NateOn
India Times webmail

Rediff.com
ZAPAK

Mixi
Taobao
naver.com
youku

Challenge #4: Many Applications have Evolved from their Initial Use

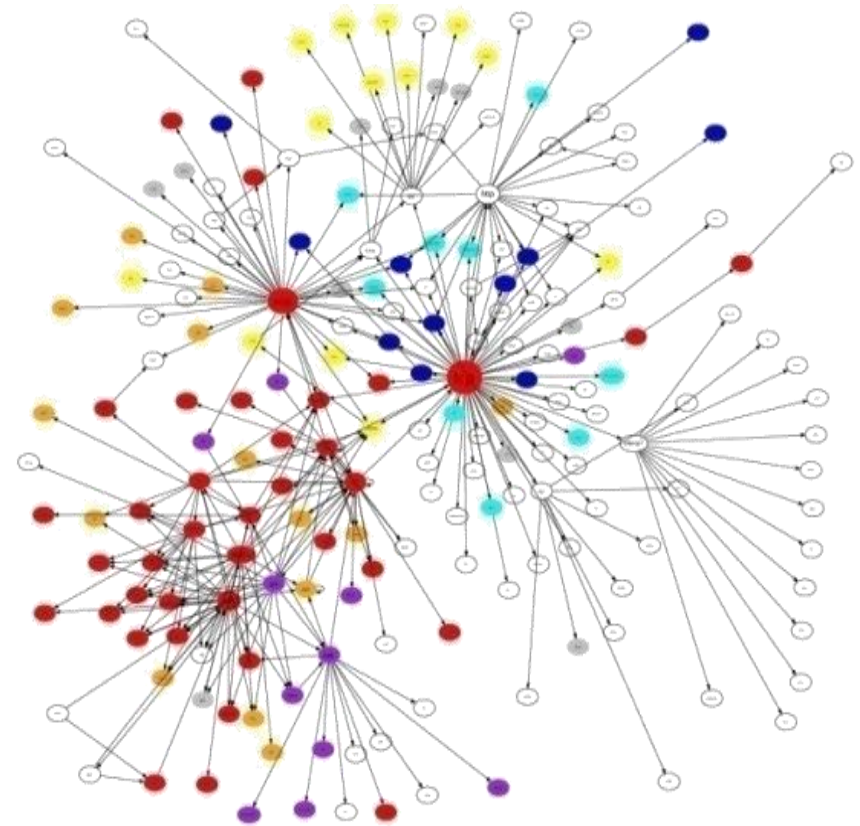
- Applications are used differently than their originally intended purpose
 - File transfer in Skype
 - Instant Messaging in WOW
 - Financial transactions in Second Life
 - Use of “Dead Mailboxes” within Webmail => shared storage space and folders (same login/password for different users)
- Answer
 - Understand real application usage by correlating multiple sessions and packets
 - Ensure a full view of application / service / user, independently of protocol



World Of Warcraft Instant Messaging

Challenge #5: Recognizing Correct Identity Means Going BEYOND OSI Reference Model

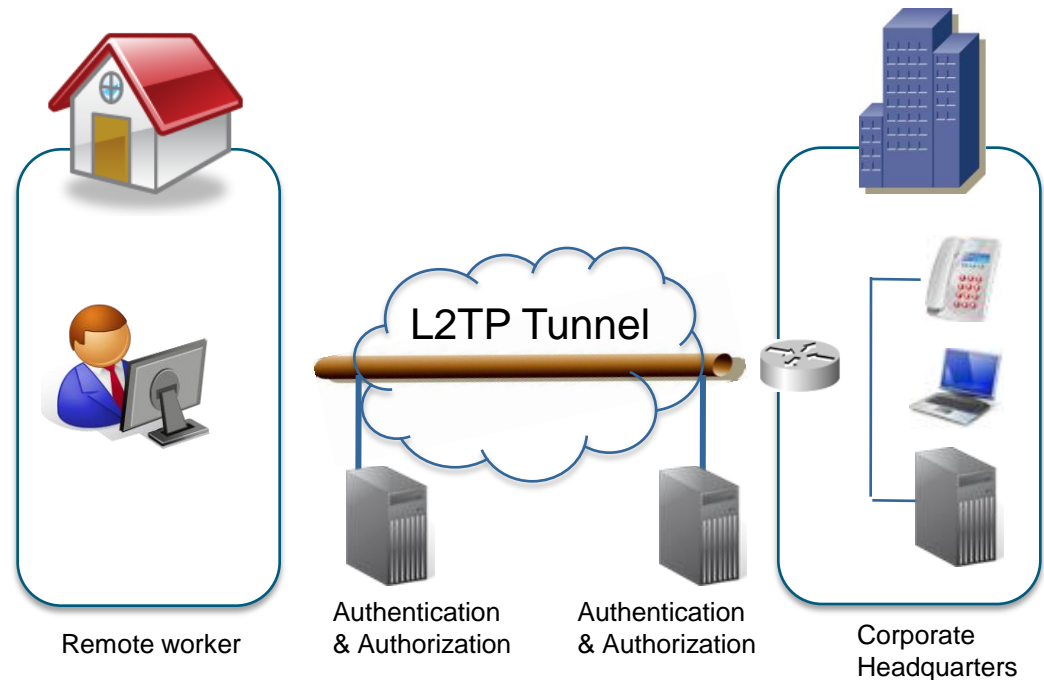
- ❑ Users can easily hide their identity
- ❑ New, complex communication protocols do not follow OSI model
 - Examples: P2P, Instant Messaging, 2.5G/3G (GTP), DSL Unbundling, (L2TP), VPN (GRE), etc.
- ❑ Protocols are frequently encapsulated
 - Example: multiple encapsulations in an operator DSL network (ATM / AAL5 / IP / UDP / L2TP / PPP / IP / TCP / HTTP)
- ❑ Answer
 - Extract user identity information in real-time, independently of OSI model and dig into encapsulation within several complex IP layers



Qosmos protocol graph

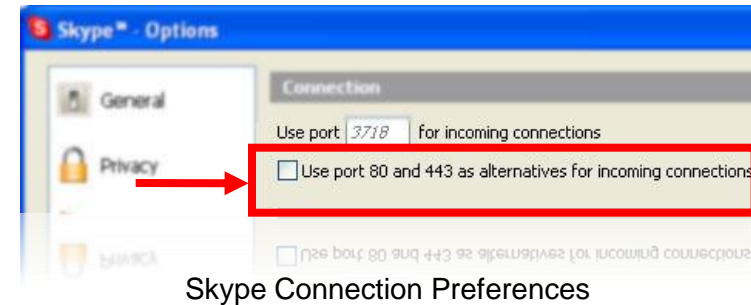
Example of User Identification within a Tunnel Protocol: L2TP

- It is important to accurately identify encapsulated protocols such as L2TP (Layer 2 Tunnel Protocol)
- This enables the tracking of VPN connections between remote employees and enterprise networks

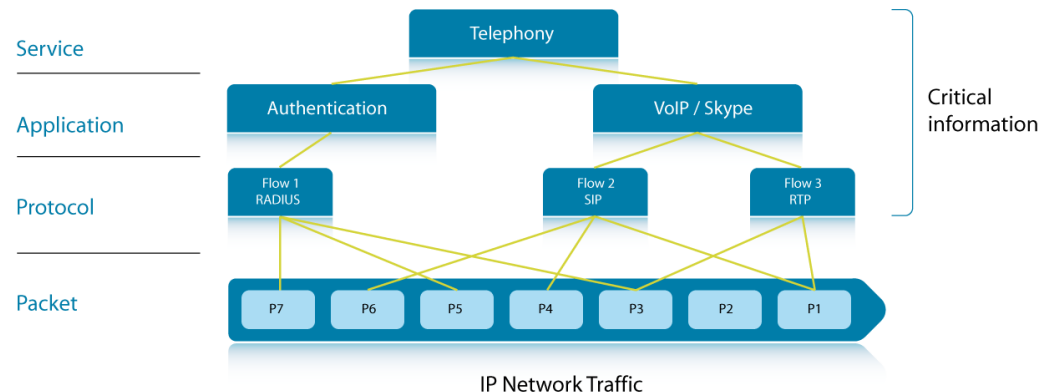


Challenge #6: Not Possible to Rely on IANA Ports to Track Applications and Users

- Applications can no longer be linked to specific ports
 - Port 80 = “The crime boulevard”
 - Skype runs on port 80, port 443, or on random ports
 - RTP does not use predefined ports
 - SIP negotiates and defines the ports used for data communication (RTP)

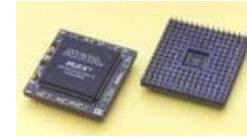


- Answer
 - Inspect complete IP flows rather than “packet by packet”
 - Track control connections: e.g. FTP data, SIP/RTP or P2P traffic
 - Ensure a full view of application / service / user independently of protocol

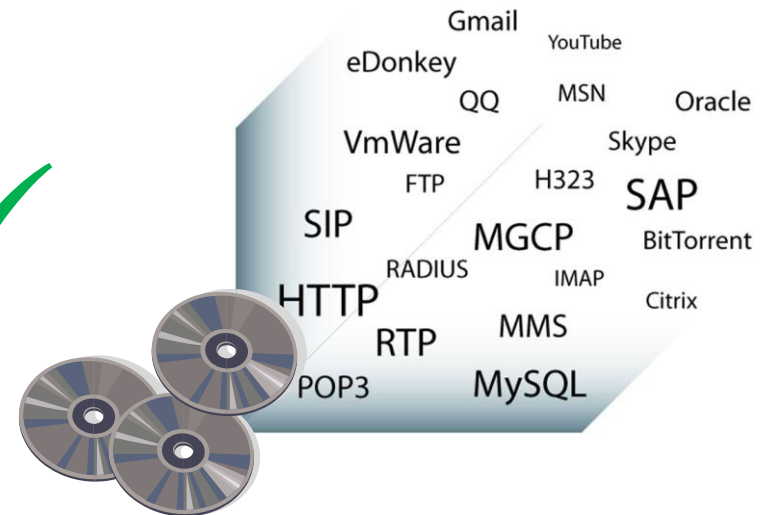


Challenge #7: Adapt Rapidly to New Protocols

- ❑ Difficult to handle an increasing numbers of protocols with dedicated ASICs
 - Long development times (MONTHS)
 - Limited flexibility



- ❑ Answer
 - Use a **software-based approach**, ensuring greater flexibility, easy updates and short development time (DAYS)
 - Shorten lead times to answer quickly to mounting threat patterns
 - Ensure high packet processing performance by using the latest standards-based, multi-core architecture
 - Make the software portable across different hardware platforms
 - Appliances, routers, IP DSLAMs, GGSNs, Set-Top-Boxes, PCs, etc.



A Short Illustrative Demo

Organization

Mon_entrep...
Edit

Options

Refresh period (s): 2

Action

Access attributes
Find

Display

Tree Global view

Properties

Properties <<

Modules

- Live Flow
- Configuration
- Player
- Users
- Report-Center

Tree	Incomin...	Outgoin...	Incomin...	Outgoin...
DEFAULT				
player0				
Application Service		3.91k		0.00
Audio/Video	871.27k	27.46k	301.75k	5.06k
Instant Messaging	35.72k	40.68k	11.97k	21.06k
Mail	35.35k	42.70k	12.54k	12.43k
Middleware	3.69k	3.37k	0.00	0.00
Network Service	83.87k	880.43k	11.78k	249.92k
NonClassified	1.18M	909.61k	168.00k	192.00k
Routing	7.18k	618.00	2.45k	0.00
Tunneling	104.69k	277.56k	32.00k	88.00k
Wap	2.07M	454.20k	566.77k	152.89k
Web	2.24M	769.22k	920.00k	296.00k
Webmail	48.95k	75.13k	8.00k	8.51k

Properties

Auto-display properties

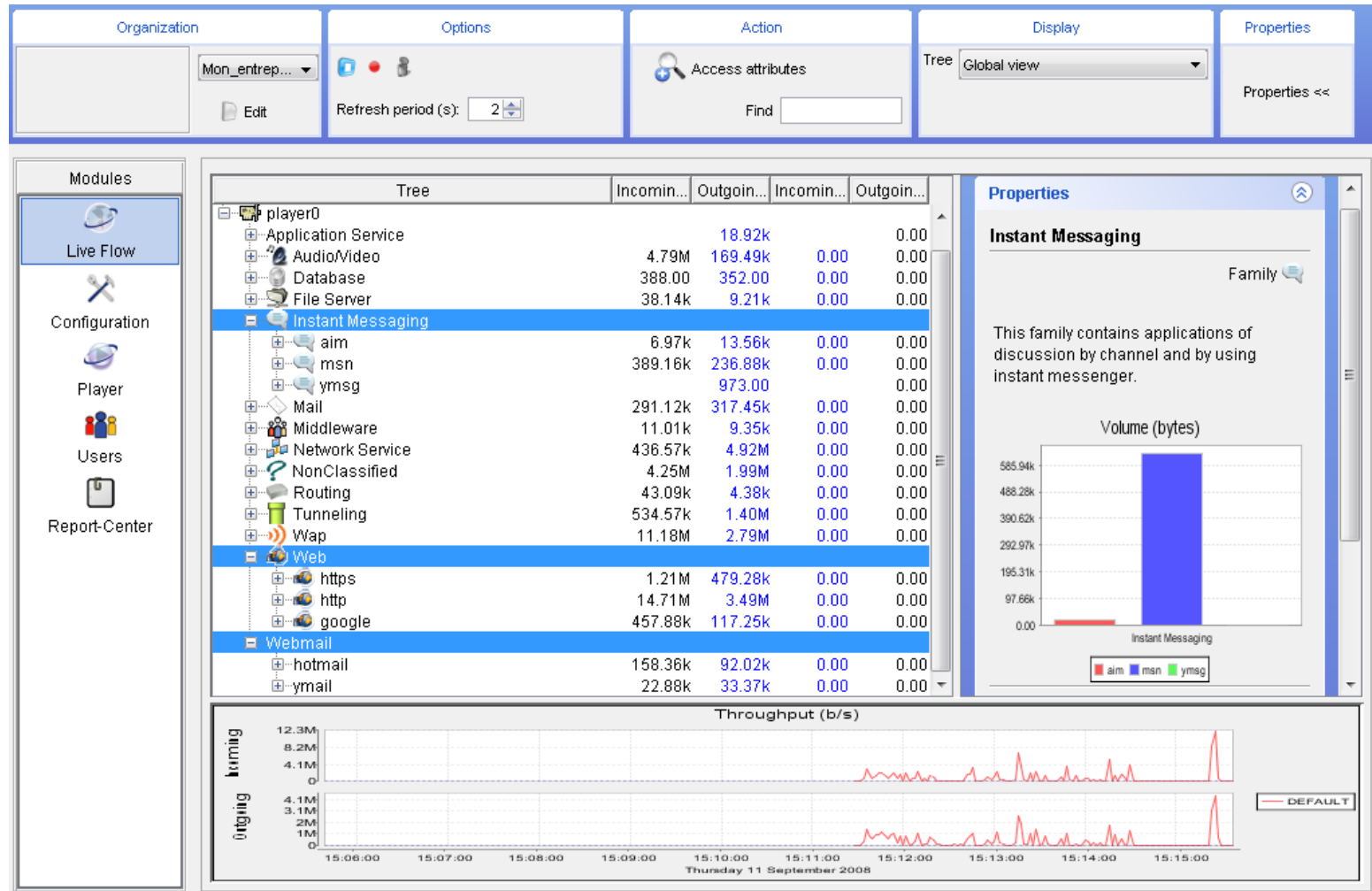
Selection

Columns

Charts

Throughput (b/s)

A Short Illustrative Demo



A Short Illustrative Demo

Organization

Mon_entrep... ▼

Edit

Options

Refresh period (s):

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Tree Protocol Tree view ▼

Properties

Properties <<

Modules

- Live Flow
- Configuration
- Player
- Users
- Report-Center

Tree	Incomin...	Outgoin...	Incomin...	Outgoin...
eth				
ip				
udp	399.29k	1.04M	0.00	0.00
gtp				
ip				
udp				
wtp	2.13k	16.26k	0.00	0.00
wsp	2.34M	257.34k	0.00	0.00
bxml	5.10M	992.29k	0.00	0.00
mmse	520.92k	774.39k	0.00	0.00
wtls	286.95k	91.45k	0.00	0.00
ripng1	3.81k	3.00k	0.00	0.00
dns	255.19k	148.51k	0.00	0.00
wsp	14.01k	8.88k	0.00	0.00
bxml	13.09k	6.32k	0.00	0.00
rtcp	71.55k	31.09k	0.00	0.00
rtsp	1.94M		0.00	0.00
rtt	1.35M	31.19k	0.00	0.00
dhcp	987.00	11.57k	0.00	0.00
rip2		114.00	0.00	0.00
ntp	138.00	1.07k	0.00	0.00
ssdp		15.23k	0.00	0.00
nbns		51.45k	0.00	0.00

Properties

Auto-display properties

Selection

Columns

Charts

Throughput (b/s)

A Short Illustrative Demo

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Edit

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Refresh period (s): 2

Action

Access attributes

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Tree Protocol Tree view

Properties

Properties <<

Modules

- Live Flow
- Configuration
- Player
- Users
- Report-Center

Tree	Incomin...	Outgain...	Incomin...	Outgain...
nbns		67.15k		0.00
unknown		91.00		0.00
ttf		993.00		0.00
tcp				
aim	6.97k	13.56k	0.00	0.00
ssl				
https	1.21M	479.28k	0.00	0.00
http	14.71M	3.49M	0.00	0.00
hotmail	158.36k	92.02k	0.00	0.00
soap	8.45k	8.89k	0.00	0.00
google	457.88k	117.25k	0.00	0.00
ymail	22.88k	33.37k	0.00	0.00
mmse	78.36k	121.68k	0.00	0.00
msn	7.20k	3.52k	0.00	0.00
dns				
pop3				
rtsp				
established				
msn				
smtp				
unknown				
ymsg				
mms				

- Access attributes
- Filter and Expand
- Cancel "Filter and Expand"
- Add/Remove in throughput charts
- Expand tree
- Expand whole tree
- Collapse tree
- Collapse whole tree

Properties

msn

Protocol

The MSN protocol allows the exchange of instant messages. The MSN protocol is used by the Microsoft software...

Volume (bytes)

A Short Illustrative Demo

The screenshot shows a software window titled "Access attributes". At the top, it displays "REFERER" with a description: "Source address from which the client obtained the requested URI." Below this is a "Filter" section with "Protocol path : msn". A dropdown menu for "Protocol path" is set to "base.eth.ip.udp.gtp.ip.tcp.http.msn". There are two radio buttons: "Attributes per protocol" (selected) and "Multiprotocol attributes". Below these are five columns of attribute lists, each with a scroll bar and a menu icon. The columns are labeled "gtp", "ip", "tcp", "http", and "msn".

gtp	ip	tcp	http	msn
<input type="checkbox"/> access_point	<input type="checkbox"/> client_addr	<input type="checkbox"/> client_os	<input type="checkbox"/> charset	<input type="checkbox"/> callee
<input type="checkbox"/> create_cbt_delay	<input type="checkbox"/> client_addr32	<input type="checkbox"/> client_port	<input type="checkbox"/> code	<input type="checkbox"/> caller
<input type="checkbox"/> flow_label	<input type="checkbox"/> client_net	<input type="checkbox"/> cnx_duration	<input type="checkbox"/> content_len	<input type="checkbox"/> client_status
<input type="checkbox"/> gsn_address	<input type="checkbox"/> defrag_len	<input type="checkbox"/> dst_port	<input type="checkbox"/> cookie	<input type="checkbox"/> contact
<input type="checkbox"/> imei	<input type="checkbox"/> dst_addr	<input type="checkbox"/> flag_fin	<input type="checkbox"/> directory	<input type="checkbox"/> contact_id
<input type="checkbox"/> imeisvn	<input type="checkbox"/> dst_addr32	<input type="checkbox"/> flag_reset	<input type="checkbox"/> filename	<input type="checkbox"/> contact_login
<input type="checkbox"/> imsi	<input type="checkbox"/> dst_as	<input type="checkbox"/> flags	<input type="checkbox"/> forward_addr	<input type="checkbox"/> contact_nickname
<input type="checkbox"/> imsi_cc	<input type="checkbox"/> dst_class	<input type="checkbox"/> loss_count	<input type="checkbox"/> location	<input type="checkbox"/> contact_status
<input type="checkbox"/> imsi_nc	<input type="checkbox"/> dst_mask	<input type="checkbox"/> mss	<input type="checkbox"/> method	<input type="checkbox"/> encoding
<input type="checkbox"/> location	<input type="checkbox"/> dst_net	<input type="checkbox"/> previous_lost	<input type="checkbox"/> mime_type	<input type="checkbox"/> group
<input type="checkbox"/> location_type	<input type="checkbox"/> frag_id	<input type="checkbox"/> rtt	<input type="checkbox"/> proxy_auth	<input type="checkbox"/> login
<input type="checkbox"/> message_code	<input type="checkbox"/> nexthop	<input type="checkbox"/> rtt_app	<input type="checkbox"/> proxy_login	<input type="checkbox"/> message_len
<input type="checkbox"/> message_type	<input type="checkbox"/> pkt_len	<input type="checkbox"/> sack	<input type="checkbox"/> proxy_realm	<input type="checkbox"/> method
<input type="checkbox"/> ms_addr_org	<input type="checkbox"/> prot	<input type="checkbox"/> server_port	<input type="checkbox"/> referer	<input type="checkbox"/> online_principal

A Short Illustrative Demo

Monitor: Display values in real time

msn

Refresh DNS Resolution

Incoming

base[time]	base[application]	msn[login]	ip[src_addr]	ip[dst_addr]
1084358579	msn	msn_mike@hotmail.com	207.46.108.6	10.95.10.1
1084358580	msn	msn_wat@hotmail.com	207.46.108.7	10.95.10.123
1084358580	msn	msn_mike@hotmail.com	207.46.108.7	10.95.10.1
1084358580	msn	msn_mike@hotmail.com	207.46.108.6	10.95.10.1
1084358581	msn	msn_d@hotmail.com	207.46.108.103	10.95.10.42
1084358582	msn	msn_mike@hotmail.com	207.46.108.7	10.95.10.1
1084358583	msn	msn_wat@hotmail.com	207.46.108.7	10.95.10.123
1084358583	msn	msn_wat@hotmail.com	207.46.108.111	10.95.10.123
1084358583	msn	msn_ttapoom@hotmail.com	207.46.108.6	10.95.17.117
1084358584	msn	msn_mike@hotmail.com	207.46.108.6	10.95.10.1
1084358585	msn	msn_ala@hotmail.com	207.46.108.6	10.95.10.98
1084358585	msn	msn_wat@hotmail.com	207.46.108.7	10.95.10.123
1084358585	msn	msn_mike@hotmail.com	207.46.108.6	10.95.10.1
1084358585	msn	msn_@hotmail.com	by1msg-108.118.108.108	gateway.edge.mess...
1084358585	msn	msn_ttapoom@hotmail.com	207.46.108.6	10.95.17.117
1084358586	msn	msn_ala@hotmail.com	207.46.108.6	10.95.10.98
1084358586	msn	msn_wat@hotmail.com	207.46.108.111	10.95.10.123
1084358587	msn	msn_wat@hotmail.com	207.46.108.111	10.95.10.123

Outgoing

base[time]	base[application]	msn[login]	ip[src_addr]	ip[dst_addr]
1084358430	msn	msn_28@hotmail.com	10.95.10.98	207.46.108.6
1084358430	msn	msn_kt@hotmail.com	10.95.10.42	207.46.108.6
1084358430	msn	msn_awat@hotmail.com	10.95.5.123	207.46.108.7
1084358432	msn	msn_ttapoom@hotmail.com	10.95.17.117	207.46.108.6
1084358432	msn	msn_28@hotmail.com	10.95.10.98	207.46.108.6
1084358432	msn	msn_l_mike@hotmail.com	10.95.10.1	207.46.108.7
1084358435	msn	msn_awat@hotmail.com	10.95.5.123	207.46.108.7
1084358435	msn	msn_ala@hotmail.com	10.95.4.98	207.46.108.6
1084358435	msn	msn_kt@hotmail.com	10.95.10.42	207.46.108.6
1084358437	msn	msn_d@hotmail.com	10.95.10.42	by1msg-108.118.108.108 gateway.edge.mess...
1084358437	msn	msn_kt@hotmail.com	10.95.10.42	207.46.108.6
1084358439	msn	msn_ala@hotmail.com	10.95.4.98	207.46.108.6
1084358439	msn	msn_28@hotmail.com	10.95.10.98	207.46.108.6
1084358440	msn	msn_awat@hotmail.com	10.95.5.123	207.46.108.7
1084358441	msn	msn_28@hotmail.com	10.95.10.98	207.46.108.6
1084358445	msn	msn_awat@hotmail.com	10.95.5.123	207.46.108.7
1084358445	msn	msn_ala@hotmail.com	10.95.4.98	207.46.108.6
1084358447	msn	msn_ala@hotmail.com	10.95.4.98	207.46.108.6

A Short Illustrative Demo

Application_Per_IP

Actualiser Résolution DNS

Entrant

base[application]	ip[client_addr]	sum(eth[tot_len])
bxm1	10.113.10.100	82
http	172.17.14.200	6526
bxm1	10.113.10.100	126
http	10.95.5.120	7980
gtp	203.170.228.100	288
wsp	10.113.10.100	263
http	10.95.6.107	1484
wsp	10.113.10.113	252
gtp	203.170.228.100	63
http	10.95.1.1200	572
rtp	10.15.1.10.40	10497
bxm1	10.113.10.100	2142
hotmail	10.95.3.100	3938
bxm1	10.113.10.95	187

Sortant

base[application]	ip[client_addr]	sum(eth[tot_len])
icmp	203.170.228.100	8050
http	10.112.100.40	578
bxm1	10.113.10.100	85
http	10.95.1.100	1296
bxm1	10.113.10.120	226
gtp	mail.m... ..	888
http	10.95.6.107	645
tcp	10.95.5.11	990
bxm1	10.113.10.100	290
bxm1	10.113.10.100	87
dns	10.95.1.101	125
tcp	10.95.1.100	2750
http	10.95.4.100	1081
wsp	10.113.10.113	131

A Short Illustrative Demo

Prévisualisation

index	^base.*applicatio...	^hotmail.*login not null	^hotmail.*sender not null	^hotmail.*receiv...	^hotmail.*subject not null	^base/...
1	hotmail	...@hotmail.com	...stress <est37z@...	...iU51@shi...	Refresh..memory,mood and Mental..energy	27/06/...
2	hotmail	...@hotmail.com	...stress <est37z@...	...iU51@shi...	Refresh..memory,mood and Mental..energy	27/06/...
3	hotmail	...@hotmail.com	...ster@hostmaung...	...krit@hotm...	á'D'Ó Host 'Ó»ÇÓÁÁÇÇÉU\$ µNé\$ÍÁUè jÉ...	27/06/...
4	hotmail	...@hotmail.com	...ster@hostmaung...	...krit@hotm...	á'D'Ó Host 'Ó»ÇÓÁÁÇÇÉU\$ µNé\$ÍÁUè jÉ...	27/06/...
5	hotmail	...@hotmail.com	...ster@hostmaung...	...krit@hotm...	á'D'Ó Host 'Ó»ÇÓÁÁÇÇÉU\$ µNé\$ÍÁUè jÉ...	27/06/...
6	hotmail	...@hotmail.com	...ster@hostmaung...	...krit@hotm...	á'D'Ó Host 'Ó»ÇÓÁÁÇÇÉU\$ µNé\$ÍÁUè jÉ...	27/06/...
7	hotmail	...@hotmail.com	...ster@hostmaung...	...krit@hotm...	á'D'Ó Host 'Ó»ÇÓÁÁÇÇÉU\$ µNé\$ÍÁUè jÉ...	27/06/...
8	hotmail	...@hotmail.com	...ster@hostmaung...	...krit@hotm...	á'D'Ó Host 'Ó»ÇÓÁÁÇÇÉU\$ µNé\$ÍÁUè jÉ...	27/06/...
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11	hotmail	...@hotmail.com	...ster@hostmaung...	...krit@hotm...	á'D'Ó Host 'Ó»ÇÓÁÁÇÇÉU\$ µNé\$ÍÁUè jÉ...	27/06/...
12	hotmail	...@hotmail.com	...ster@hostmaung...	...krit@hotm...	á'D'Ó Host 'Ó»ÇÓÁÁÇÇÉU\$ µNé\$ÍÁUè jÉ...	27/06/...
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14	hotmail	...@hotmail.com	...ster@hostmaung...	...krit@hotm...	á'D'Ó Host 'Ó»ÇÓÁÁÇÇÉU\$ µNé\$ÍÁUè jÉ...	27/06/...
15	hotmail	...@hotmail.com	...ster@hostmaung...	...krit@hotm...	á'D'Ó Host 'Ó»ÇÓÁÁÇÇÉU\$ µNé\$ÍÁUè jÉ...	27/06/...
16	hotmail	...@hotmail.com	...ster@hostmaung...	...krit@hotm...	á'D'Ó Host 'Ó»ÇÓÁÁÇÇÉU\$ µNé\$ÍÁUè jÉ...	27/06/...
17	hotmail	...@hotmail.com	...@airasia.com>	...@hotmail...	Travel Itinerary	27/06/...
18	hotmail	...@hotmail.com	...@airasia.com>	...@hotmail...	Travel Itinerary	27/06/...
19	hotmail	...n@hotmail.com	...ailand <micronth...	...i Thailand"...	Splice Product	27/06/...
20	hotmail	...n@hotmail.com	...NUCHSALA <wic...	...n@hotmail...	price list	27/06/...
21	hotmail	...@hotmail.com	...stress <est37z@...	...iU51@shi...	Refresh..memory,mood and Mental..energy	27/06/...
22	hotmail	...@hotmail.com	...stress <est37z@...	...iU51@shi...	Refresh..memory,mood and Mental..energy	27/06/...
23	hotmail	...lenclos@hotmail.com	...ister via Travelpric...	...delenclos...	5 euros offerts sur PriceMinister !	27/06/...
24	hotmail	...lenclos@hotmail.com	...ter@mistergoodd...	...delenclos...	GRAND DESTOCKAGE	27/06/...
25	hotmail	..._elias@hotmail.com	...@elyo.fr	...ne Elias"...	Réf. : besoin de conseils	27/06/...
26	hotmail	..._elias@hotmail.com	...@elyo.fr	...ne Elias"...	Réf. : besoin de conseils	27/06/...

Configurer OK

A Short Illustrative Demo

The screenshot shows a window titled "Monitor : Display values in real time" with a sub-window "Web_sites_accessed". The sub-window has checkboxes for "Refresh" and "DNS Resolution", both of which are checked. The data is presented in two sections: "Incoming" and "Outgoing". Each section contains a table with three columns: "base[time]", "ip[client_addr]", and "http[server]".

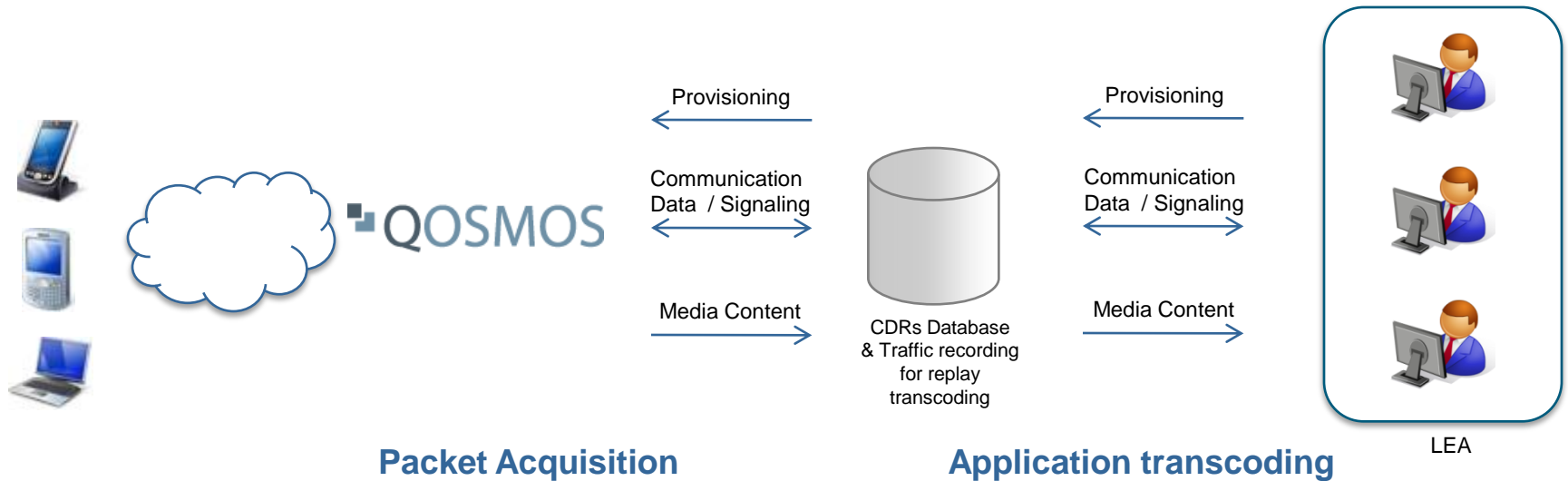
Incoming

base[time]	ip[client_addr]	http[server]
1214554618	10.95.10.140	www.thaimate.com
1214554618	10.95.10.140	us.f401.mail.yahoo.com
1214554618	10.95.10.140	www.guild.fortress.in.th
1214554618	10.95.10.140	rtradeinfo.bualuang.co.th
1214554618	10.113.100.10	www.mobilelife.co.th
1214554618	10.95.10.140	www.siamsport.co.th
1214554618	10.95.10.140	stocknet.seamico.co.th
1214554618	10.95.10.140	www.bbznet.com
1214554618	10.95.10.140	www.settrade.com
1214554618	10.95.10.140	c.msn.com
1214554618	10.95.10.140	www.mond24.com

Outgoing

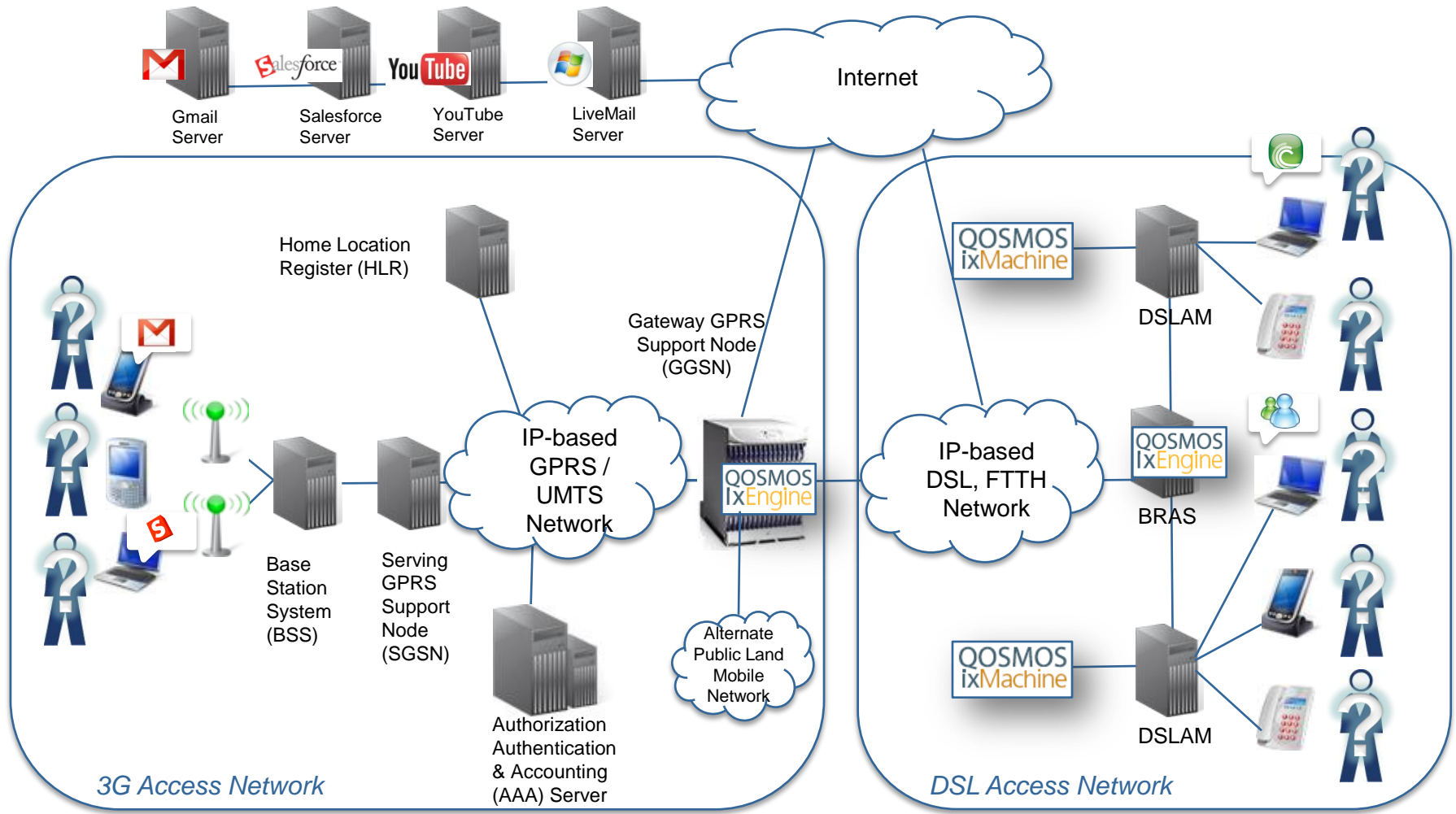
base[time]	ip[client_addr]	http[server]
1214554618	10.95.10.140	www.ruamkatanyu.or.th
1214554618	10.95.10.140	www.komchadluek.com
1214554618	10.95.10.140	www.ubctv.com
1214554618	10.113.100.100	hotsweets.com
1214554618	10.95.10.140	www.thaimate.com
1214554618	10.113.100.100	www.mobilelife.co.th
1214554618	10.95.10.140	www.free-applets.com
1214554618	10.95.10.140	rtradeinfo.bualuang.co.th
1214554618	10.113.100.100	wap.mobclub.net
1214554618	10.95.10.140	download.windowsupdate...
1214554618	10.95.10.140	www.bbznet.com

Qosmos Legal Intercept Solutions

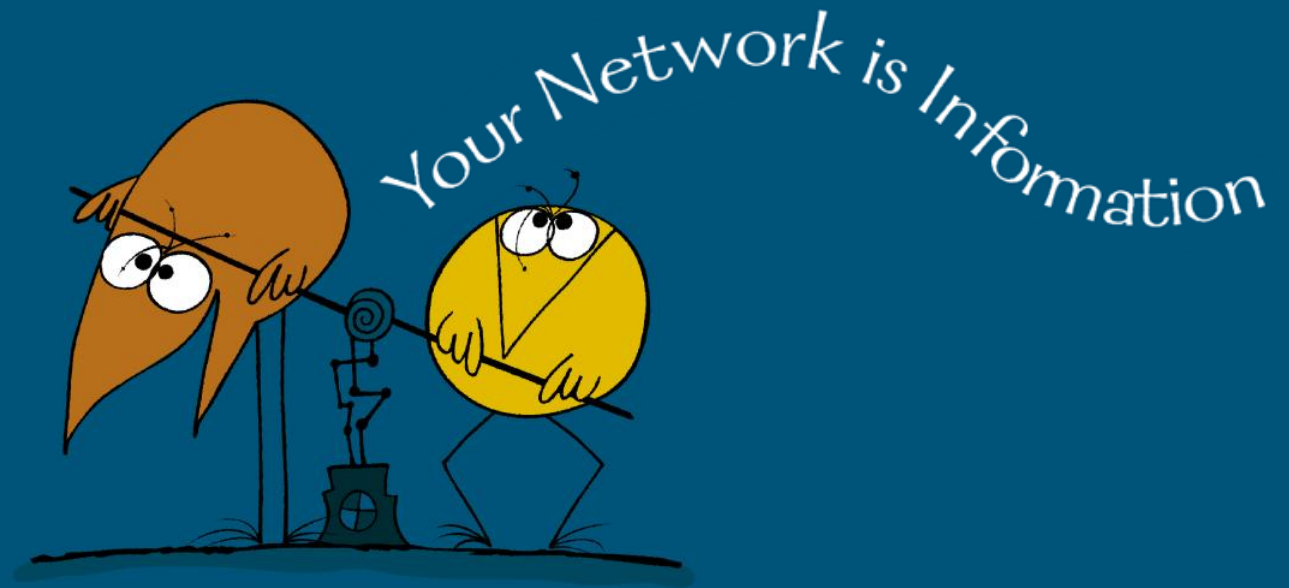


- Qosmos and its integrator partners offer a complete interception solution including:
 - Flow classification
 - Applicative classification
 - Information extraction
 - Selective recording
 - Application transcoding (mail, etc.)
 - Visualization

Summary: It Is Possible To Accurately Identify Users!



SPECIAL OFFER: Get your free evaluation of ixEngine at the Qosmos booth!



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