

Philippine Open Internet eXchange

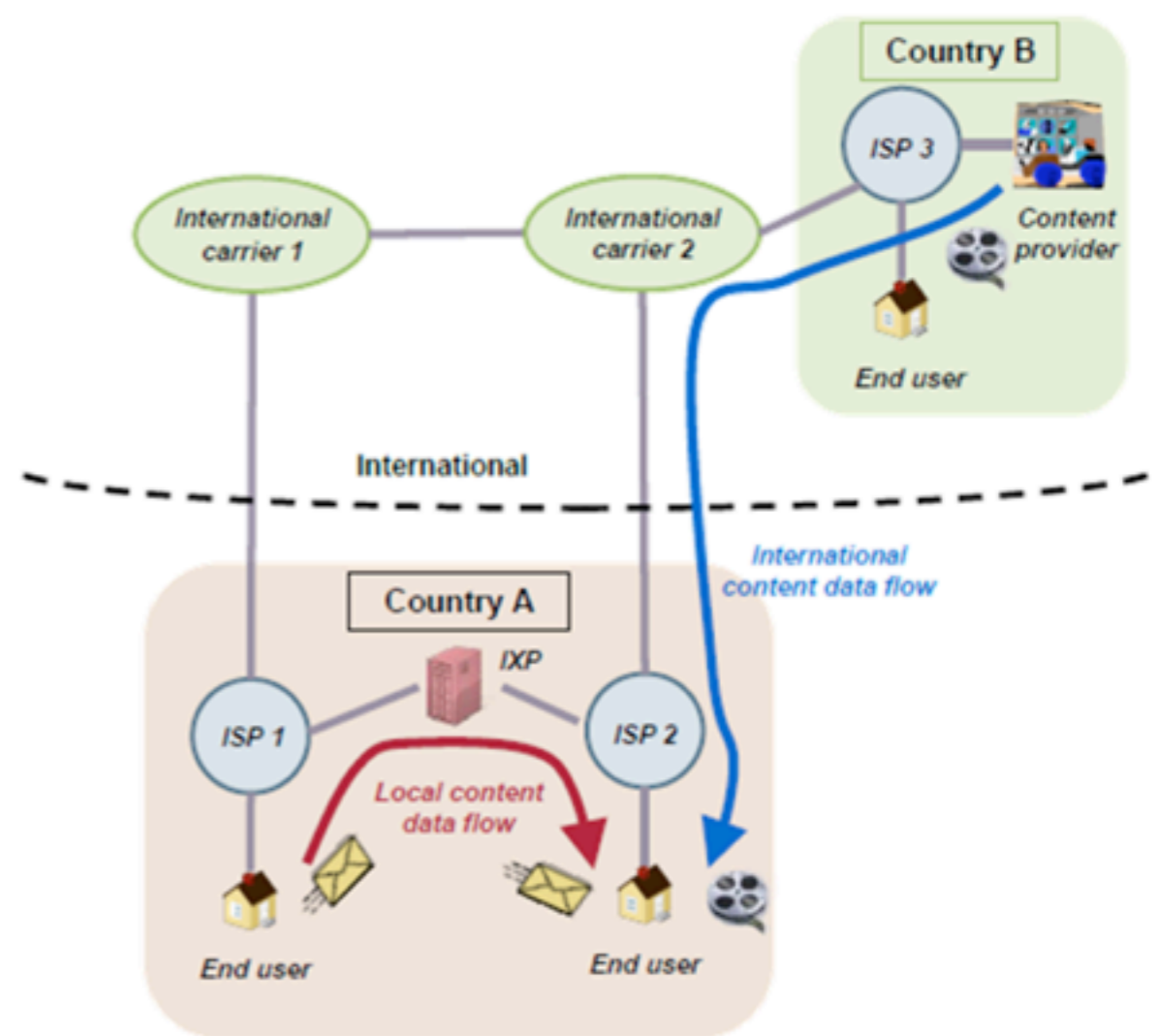
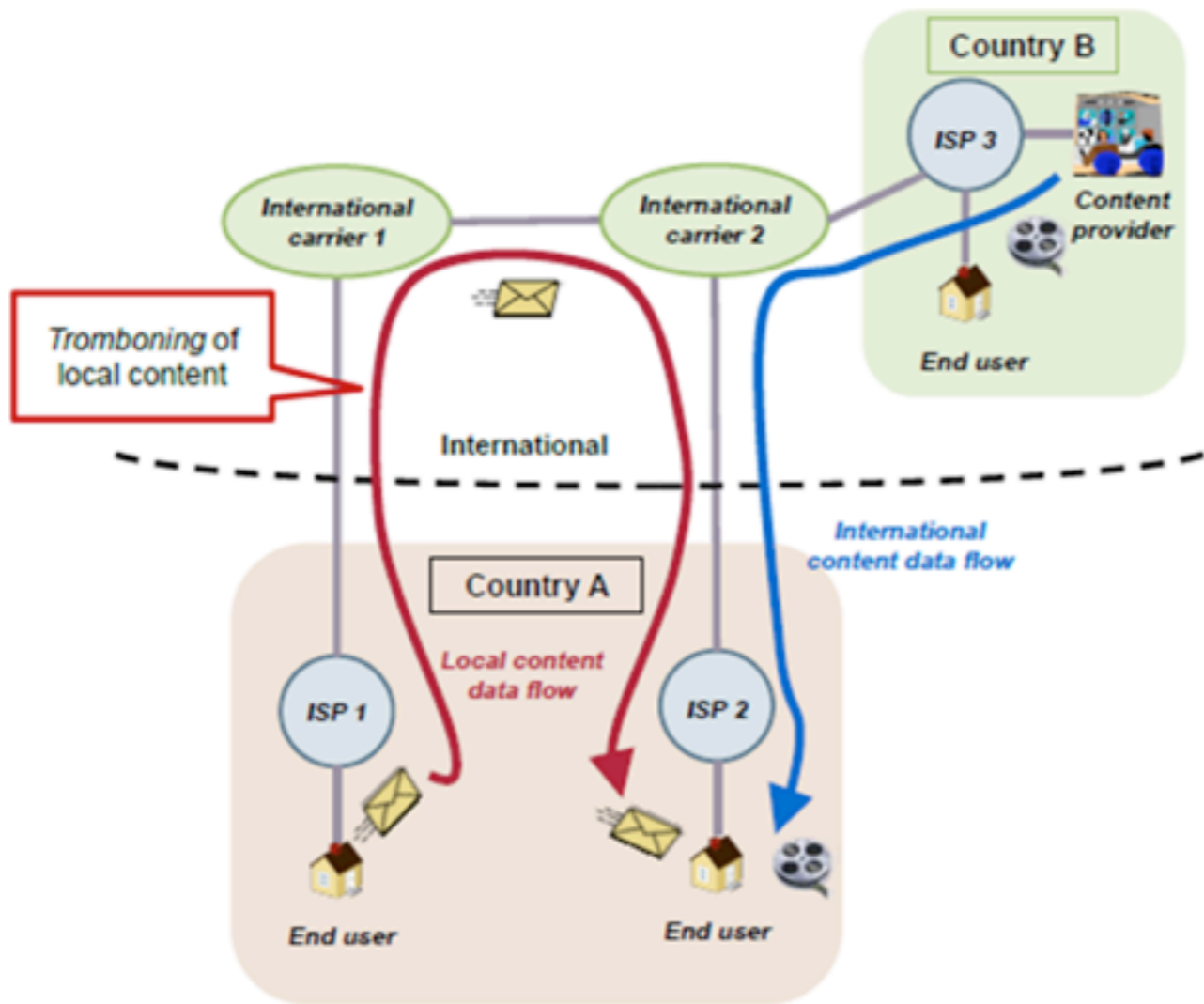
PhOpenIX

Bani Lara
Network Janitor

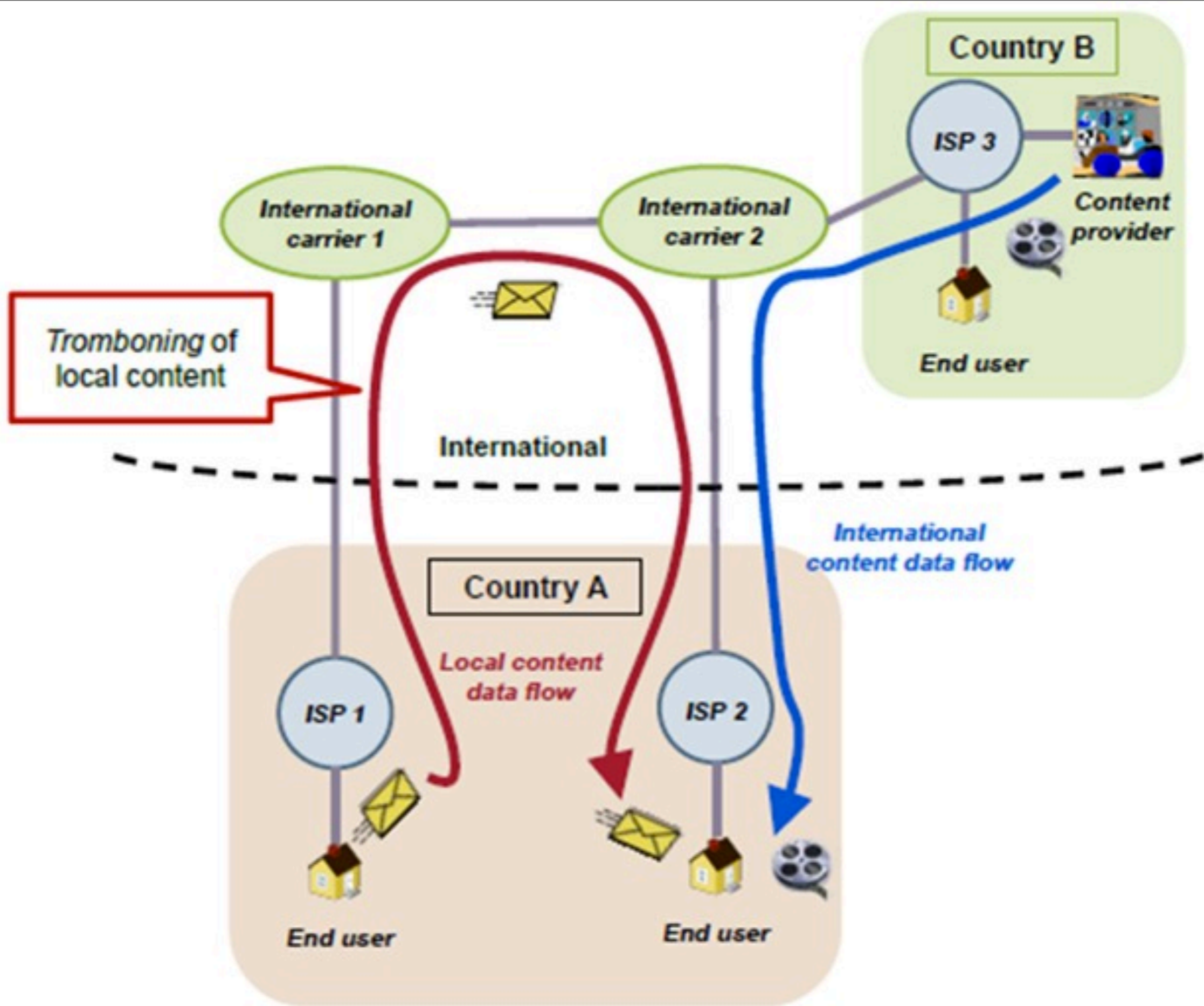
Advanced Science and Technology Institute (ASTI)
Department of Science and Technology (DOST)

[http://
www.phopenix.net/
rootcon2014](http://www.phopenix.net/rootcon2014)

[http://
www.phopenix.net/
articles](http://www.phopenix.net/articles)



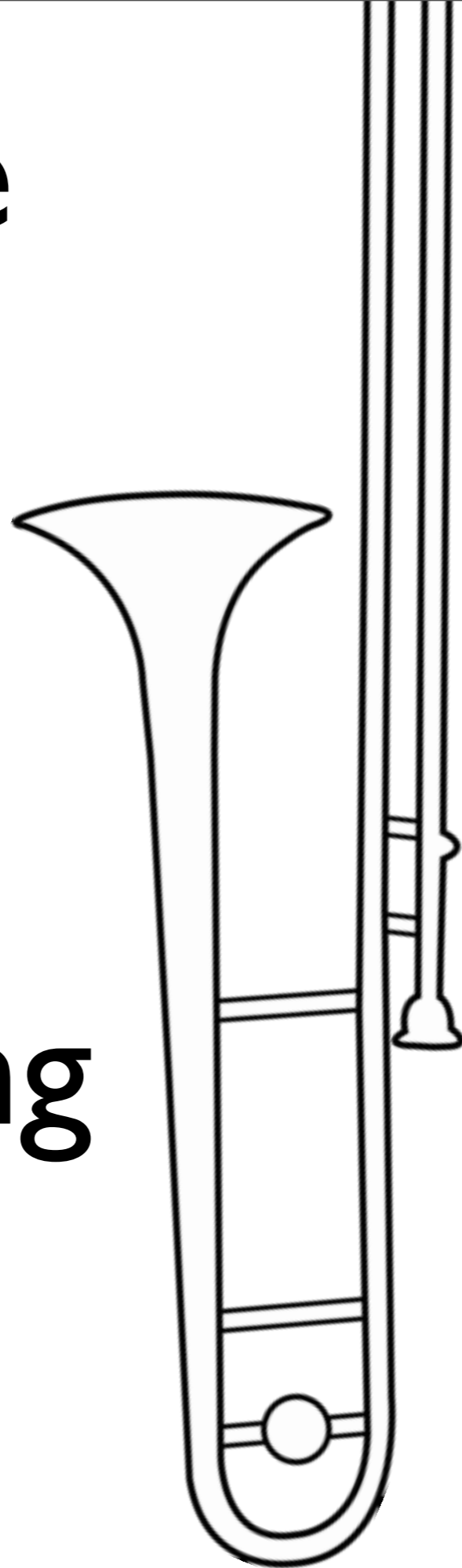
<http://www.divinetworks.com/is-there-a-case-for-internet-exchange-points-in-internet-edges/>

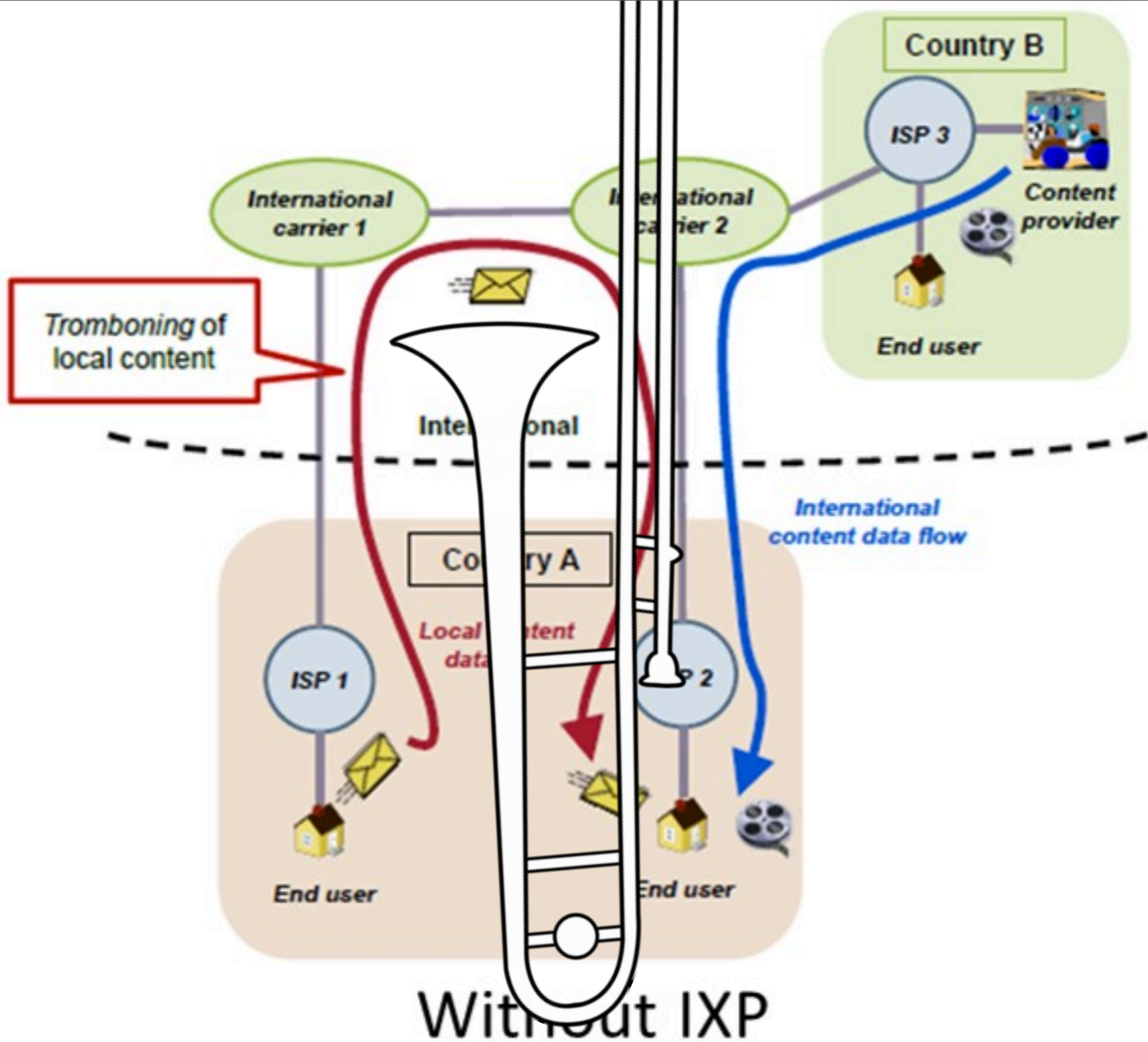


Without IXP

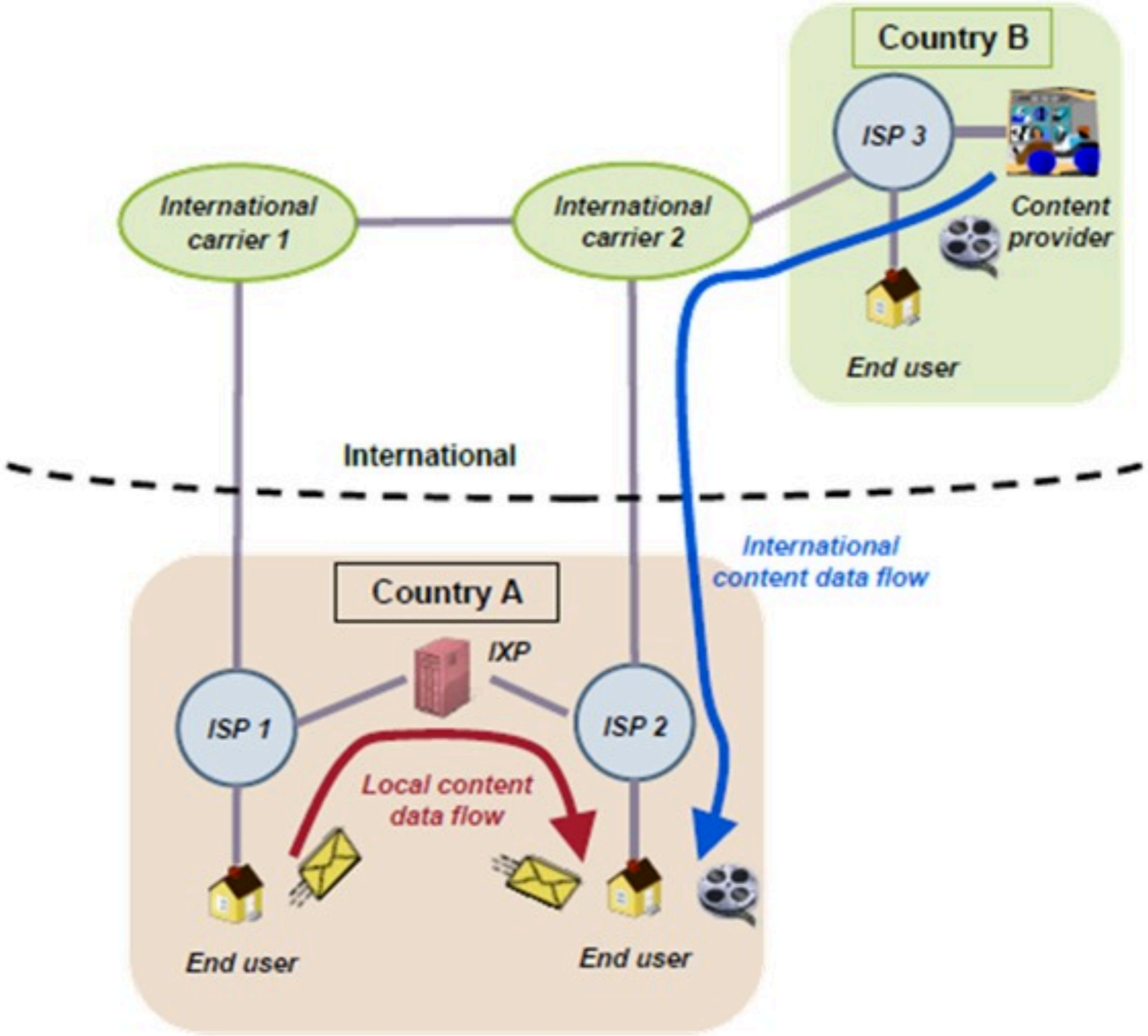
Trombone

Tromboning
of local
content

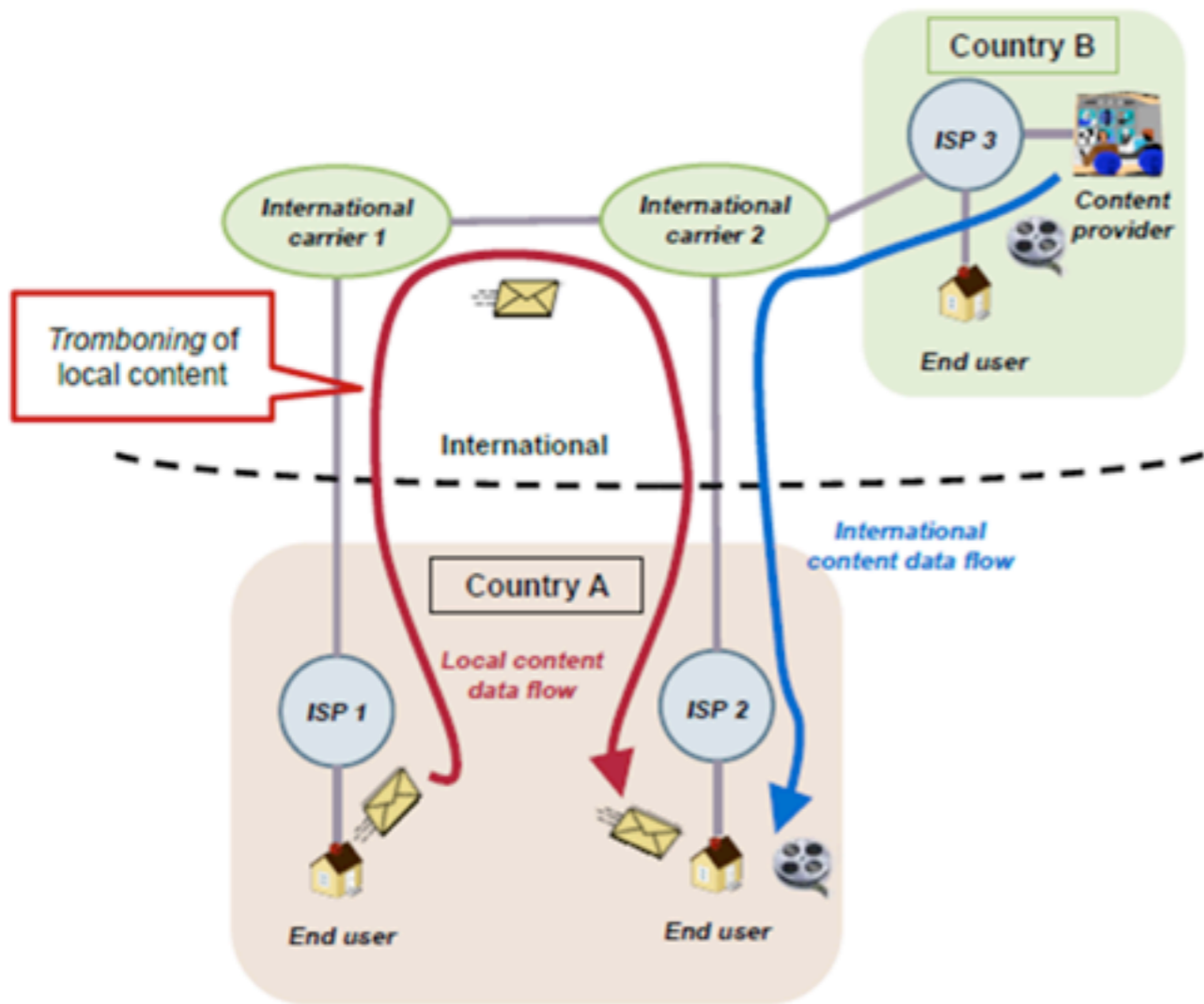




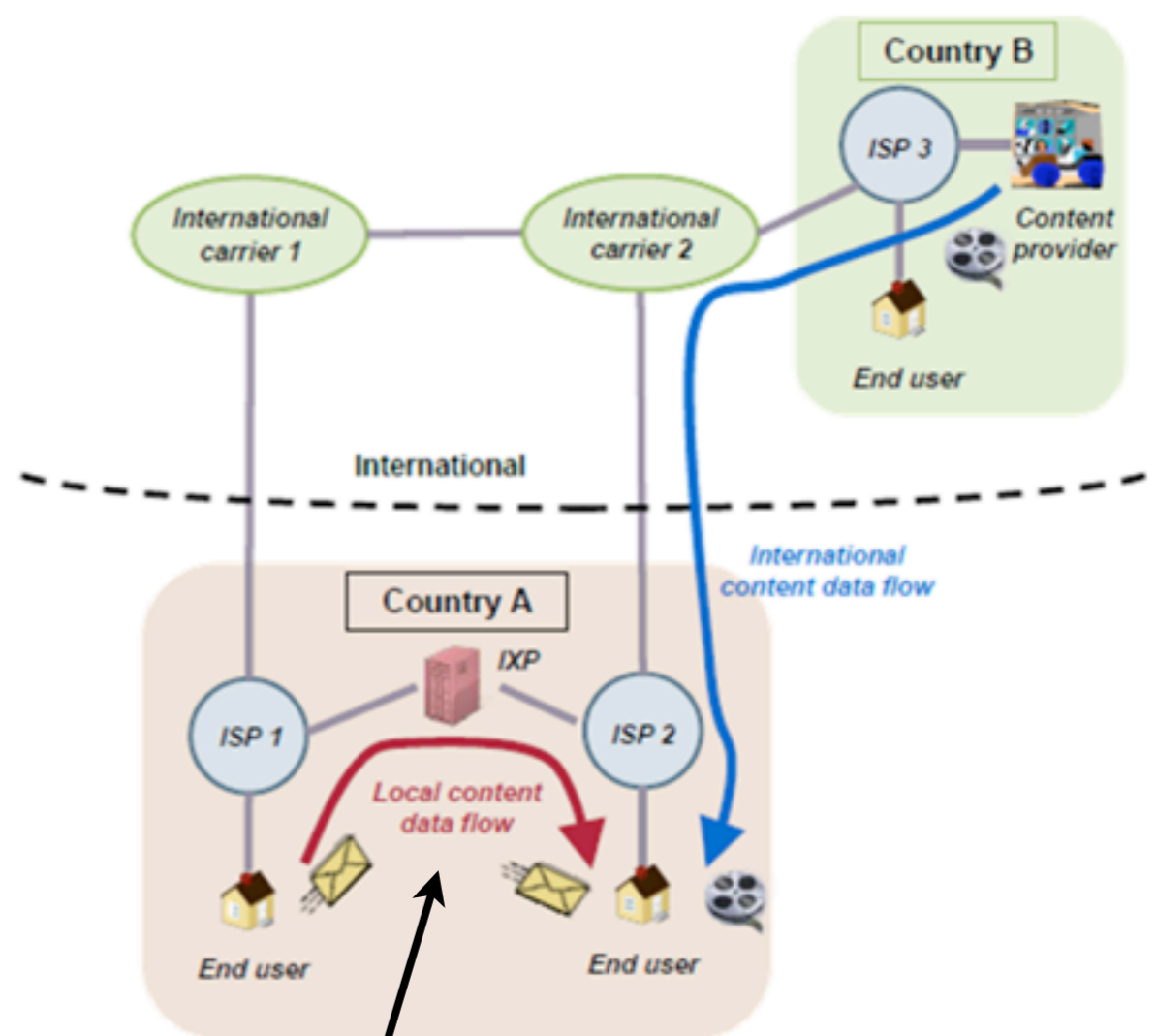
Without IXP



With IXP



Without IXP



With IXP



**Locally sourced content
should be delivered to a local
destination without crossing
our national borders**

- Bill Woodcock, PCH

Why???

**Contribute to the
overall security of
domestic networks**



Edward Snowden reveals tapping of major Australia-New Zealand undersea telecommunications cable

September 15, 2014

Comments 17

Philip Dorling

Submarine internet cables are a gift for spooks

› 16:54 25 June 2013 by [Paul Marks](#)

Snowden: NSA hacked China telcos, submarine cable network firm

Summary: Former NSA contractor reportedly provided documents pointing to the U.S. government hacking of major Chinese telcos, Internet submarine cable giant Pacnet, and China University.

How The NSA Taps Undersea Fiber Optic Cables

MIKE WHEATLEY | JULY 19TH

Phneah | June 25, 2013 -- 05:38 GMT (13:38 SGT)

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**Attract content to
host locally**

Preference for English language websites to blame for PH's slow Internet speed, says PLDT

By: Darwin G. Amojelar, InterAksyon.com

July 15, 2014 7:30 PM



Recommend Share 265

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InterAksyon.com means BUSINESS

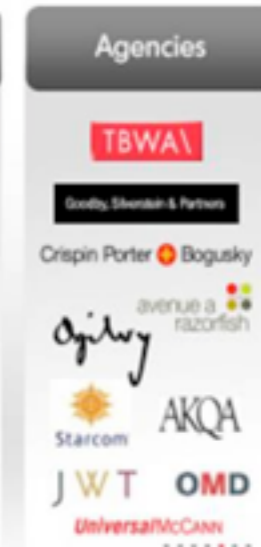
Local Content

- Any web content, in any language, that is hosted within the Philippines' national borders
- Convince content providers to locate in the country

Content providers



Delivering and Monetizing Brilliant Experiences for 1800 Online Businesses





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To speed up Internet, media owners must bring content to PH exchanges: PLDT

Posted on September 24, 2014

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 **Pin it**

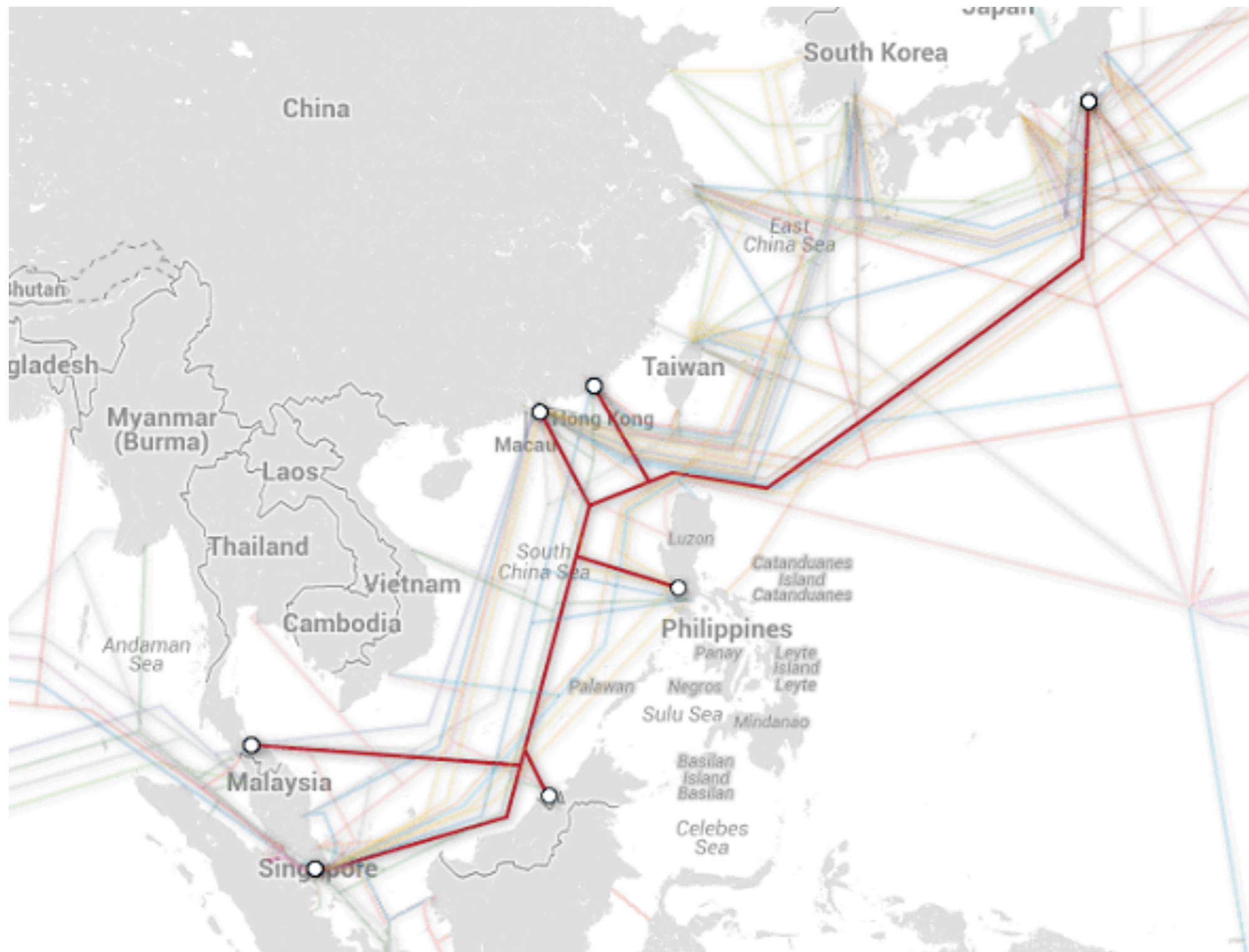
 **Like** 62

By Tom Noda

One of the solutions to speed up Internet access in the Philippines is to convince media owners to bring their content to local Internet exchanges, according to telco giant PLDT.

**Attract so called 'tier-
one' carriers to go to
the Philippines**

Connectivity providers



Oh hell no... Slow internet misery caused by broken undersea cable to last 20 more days

 **TECHINASIA** By Anh-Minh Do | Tech in Asia – Mon, Sep 22, 2014

If you're in Southeast Asia, specifically Malaysia, Singapore, Thailand, Brunei, Vietnam, Hong Kong, Guam, or Philippines, then you're likely getting dismal internet speeds right now. That's because one major [undersea internet cable, called the AAG, was cut on September 15.](#)

The worst part is, you'll be experiencing these depressing dial-up web speeds for another twenty days while cable operators from various nations scramble to repair it.


www.submarinecablemap.com

← → ↻ www.submarinecablemap.com ☆ 🔄 ☰

TeleGeography
Submarine Cable Map

The **Submarine Cable Map** is a free resource from TeleGeography. Data contained in this map is drawn from the **Global Bandwidth Research Service** and is updated on a regular basis.

To learn more about TeleGeography or this map please click [here](#).

 **HUAWEI MARINE NETWORKS**
Sponsored in part by Huawei Marine Feedback [t](#) [f](#) [github](#)

Submarine Cables

- ACS Alaska-Oregon Network (AKORN)
- Aden-Djibouti
- Adria-1
- Africa Coast to Europe (ACE)
- ALASIA
- Alaska United East
- Alaska United Southeast
- Alaska United Turnagain Arm (AUTA)
- Alaska United West
- ALBA-1
- Aletar
- Alonso de Ojeda
- ALPAL-2
- America Movil Submarine Cable System-1 (AMX-1)
- American Samoa-Hawaii (ASH)
- American 1 North

Last updated on September 15, 2014
Map data ©2014 AutoNavi, GBRMPA, Google, SKplanet, ZENRIN Terms of Use

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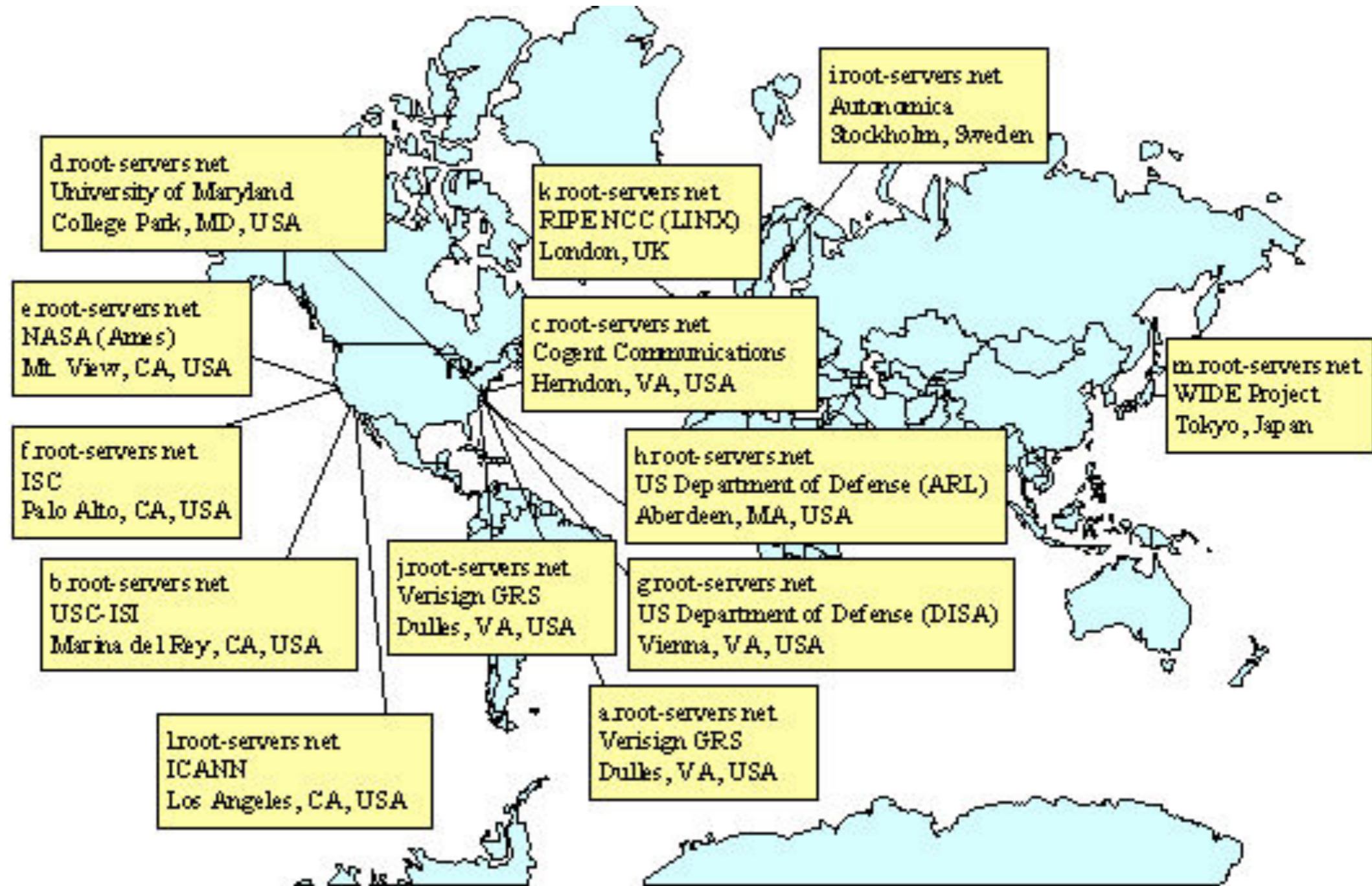
APG Submarine Cable to Connect Malaysia to Korea and Japan

Posted on Jul 4th, 2012 with tags [APG](#), [asia](#), [Cable](#), [construction](#), [Japan](#), [Korea](#), [Malaysia](#), [News by topic](#), [submari](#)



**An IX is a good location
for so called “critical
internet resources”**

Internet Yellow Pages



PhOpenIX is mirroring 3 of the 13 root servers (E, I and L)

List of Root Servers

Hostname	IP Addresses	Manager
a.root-servers.net	198.41.0.4, 2001:503:ba3e::2:30	VeriSign, Inc.
b.root-servers.net	192.228.79.201	University of Southern California (ISI)
c.root-servers.net	192.33.4.12, 2001:500:2::c	Cogent Communications
d.root-servers.net	199.7.91.13, 2001:500:2d::d	University of Maryland
e.root-servers.net	192.203.230.10	NASA (Ames Research Center)
f.root-servers.net	192.5.5.241, 2001:500:2f::f	Internet Systems Consortium, Inc.
g.root-servers.net	192.112.36.4	US Department of Defence (NIC)
h.root-servers.net	128.63.2.53, 2001:500:1::803f:235	US Army (Research Lab)
i.root-servers.net	192.36.148.17, 2001:7fe::53	Netnod
j.root-servers.net	192.58.128.30, 2001:503:c27::2:30	VeriSign, Inc.
k.root-servers.net	193.0.14.129, 2001:7fd::1	RIPE NCC
l.root-servers.net	199.7.83.42, 2001:500:3::42	ICANN
m.root-servers.net	202.12.27.33, 2001:dc3::35	WIDE Project

10 in North America
2 in Europe
1 in Asia

First RP 'root server' now live, improves local Net traffic

By Erwin Oliva
INQUIRER.net

Last updated 04:58pm (Mla time) 06/17/2007



MANILA, Philippines -- The first Philippine root server or "i-root" server run by various non-profit organizations went live just after the May 14 elections, the project coordinator and technical adviser of this project told INQUIRER.net.

Hoping to improve local Internet traffic in the Philippines, the Philippine "i-root" is now part of the Philippine Internet Open Exchange or PHOpenIX network which was launched in January 2007.

The i-root is currently operated by Autonomica from Stockholm, Sweden.

The PHOpenIX is a joint project managed by Advance Science Technology Institute of the Department of Science and Technology, the Philippine Network Operators Group, and the Asia Pacific Network Information Center, which awarded the hosting of the root server.

Root Servers











A B C D **E** F G H I J K L M

Operator:

NASA Ames Research Center

Locations:

Sites: 12

 Atlanta, US  Brussels, BE  Cape Town, ZA  Chicago, US  London, UK  Los Angeles, US
 Mountain View, US  New York, US  San Paulo, BR  Seattle, US  Sydney, AU  Tokyo, JP

IPs:

IPv4: 192.203.230.10

ASN:

297


```
[ ~ ]$ ping e.root-servers.net
PING e.root-servers.net (192.203.230.10) 56(84) bytes of data.
64 bytes from e.root-servers.net (192.203.230.10): icmp_seq=1 ttl=61 time=1.30 ms
64 bytes from e.root-servers.net (192.203.230.10): icmp_seq=2 ttl=61 time=1.37 ms
64 bytes from e.root-servers.net (192.203.230.10): icmp_seq=3 ttl=61 time=1.40 ms
64 bytes from e.root-servers.net (192.203.230.10): icmp_seq=4 ttl=61 time=1.46 ms
64 bytes from e.root-servers.net (192.203.230.10): icmp_seq=5 ttl=61 time=1.43 ms
^C
--- e.root-servers.net ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4434ms
rtt min/avg/max/mdev = 1.308/1.398/1.469/0.054 ms
[ ~ ]$ traceroute e.root-servers.net
traceroute to e.root-servers.net (192.203.230.10), 30 hops max, 60 byte packets
 1          0.252 ms  0.292 ms  0.344 ms
 2          0.240 ms  0.287 ms  0.330 ms
 3  as42-woodynet.phopenix.net (198.32.172.253)  2.024 ms  2.382 ms  2.683 ms
 4  e.root-servers.net (192.203.230.10)  1.628 ms  1.666 ms  1.661 ms
```

Root Servers

A B C D E F G H **I** J K L M

Operator: Netnod (formerly Autonomica)

[Homepage](#)

[Peering Policy](#)

Locations: Sites: 41

- Amsterdam, NL
- Ankara, TR
- Bangkok, TH
- Beijing, CN
- Brussels, BE
- Bucharest, RO
- Chicago, US
- Colombo, LK
- Doha, QA
- Frankfurt, DE
- Geneva, CH
- Helsinki, FI
- Hong Kong, HK
- Jakarta, ID
- Johannesburg, ZA
- Karachi, PK
- Kiev, UA
- Kuala Lumpur, MY
- London, UK
- Lulea, SE
- Manama, BH
- Manilla, PH
- Miami, US
- Milan, IT
- Mumbal, IN
- Oslo, NO
- Palo Alto, US
- Paris, FR
- Perth, AU
- Porto Alegre, BR
- Singapore, SG
- Stockholm, SE
- Taipei, TW
- Tallinn, EE
- Thimphu, BT
- Tokyo, JP
- Ulaanbaatar, MN
- Vienna, AT
- Washington, US
- Wellington, NZ
- Yerevan, AM

IPs: IPv4: 192.36.148.17
IPv6: 2001:7fe::53

ASN: 29216


```
~]$ ping i.root-servers.net
PING i.root-servers.net (192.36.148.17) 56(84) bytes of data.
64 bytes from i.root-servers.net (192.36.148.17): icmp_seq=1 ttl=61 time=1.22 ms
64 bytes from i.root-servers.net (192.36.148.17): icmp_seq=2 ttl=61 time=1.19 ms
64 bytes from i.root-servers.net (192.36.148.17): icmp_seq=3 ttl=61 time=1.32 ms
64 bytes from i.root-servers.net (192.36.148.17): icmp_seq=4 ttl=61 time=1.27 ms
64 bytes from i.root-servers.net (192.36.148.17): icmp_seq=5 ttl=61 time=1.24 ms
^C
--- i.root-servers.net ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4432ms
rtt min/avg/max/mdev = 1.199/1.254/1.326/0.049 ms
[ ]$ traceroute i.root-servers.net
traceroute to i.root-servers.net (192.36.148.17), 30 hops max, 60 byte packets
 1          0.319 ms  0.355 ms  0.408 ms
 2          1.323 ms  1.427 ms  1.464 ms
 3  peering.r1.phi.dnsnode.net (198.32.172.251)  1.115 ms  1.112 ms  1.105 ms
 4  i.root-servers.net (192.36.148.17)  1.276 ms  1.319 ms  1.315 ms
```

Root Servers

A B C D E F G H I J K **L** M

Operator: ICANN

[Homepage](#)

[Statistics](#)

[Peering Policy](#)

Locations: Sites: 142

- Abidjan, Cote d'Ivoire
- Al Muharraq, Bahrain
- Anchorage, United States
- Ankara, Turkey
- Atlanta, United States
- Baku, Azerbaijan
- Belrut, Lebanon
- Belem, Brazil
- Belgrade, Serbia
- Belo Horizonte, Brazil
- Berlin, Germany
- Bogota, Colombia
- Boston, United States
- Bouake, Cote d'Ivoire
- Brasilia, Brazil
- Brisbane, Australia
- Leeds / Bradford, England
- Londrina, Brazil
- Los Angeles, United States
- Lyon, France
- Malmo, Sweden
- Mangere, New Zealand
- Marseille, France
- Mascot, Australia
- Melbourne, Australia
- Metro Manila, Philippines
- Miami, United States
- Mississauga, Canada
- Monterrey, Mexico
- Montevideo, Uruguay
- Moscow, Russia
- Munich, Germany
- Muscat, Oman
- Nadi, Fiji
- Narita, Japan
- Natal, Brazil
- Washington, United States
- Wellington, New Zealand
- Yerevan, Armenia
- Zurich, Switzerland

IPs: IPv4: 199.7.83.42

IPv6: 2001:500:3::42

ASN: 20144


```
~]$ ping l.root-servers.net
```

```
PING l.root-servers.net (199.7.83.42) 56(84) bytes of data.
```

```
64 bytes from l.root-servers.net (199.7.83.42): icmp_seq=1 ttl=61 time=1.47 ms
```

```
64 bytes from l.root-servers.net (199.7.83.42): icmp_seq=2 ttl=61 time=1.61 ms
```

```
64 bytes from l.root-servers.net (199.7.83.42): icmp_seq=3 ttl=61 time=1.64 ms
```

```
64 bytes from l.root-servers.net (199.7.83.42): icmp_seq=4 ttl=61 time=1.48 ms
```

```
64 bytes from l.root-servers.net (199.7.83.42): icmp_seq=5 ttl=61 time=1.46 ms
```

```
^C
```

```
--- l.root-servers.net ping statistics ---
```

```
5 packets transmitted, 5 received, 0% packet loss, time 4360ms
```

```
rtt min/avg/max/mdev = 1.460/1.536/1.641/0.075 ms
```

```
~]$ traceroute l.root-servers.net
```

```
traceroute to l.root-servers.net (199.7.83.42), 30 hops max, 60 byte packets
```

```
1 0.403 ms 0.376 ms 0.412 ms
```

```
2 0.248 ms 0.334 ms 0.374 ms
```

```
3 as42-woodynet.phopenix.net (198.32.172.253) 1.831 ms 1.978 ms 2.353 ms
```

```
4 l.root-servers.net (199.7.83.42) 2.706 ms 2.744 ms 2.739 ms
```

Benefits of peering

- If networks agree to cooperate with each other, and develop a healthy internet exchange, then the benefit would be lower costs of operation by:
 - contributing to the overall security of our domestic network
 - attracting content providers (foreign and local) to set up shop locally
 - attracting connectivity providers to haul their bandwidth to go inside the country; and
 - attract critical internet resources to mirror their services in our country

About PhOpenIX

- *AS4779*
- Carrier-neutral IPv4 and IPv6 Multilateral Peering Exchange
- Non-profit membership based exchange
- Layer 2 exchange (supports 10/100/1000BaseT interconnect)
- BGP Peering (member needs own AS number)

About PhOpenIX

- Switches located at MK2 in Makati and at DOST in Quezon City
- Rack space and equipment power at Makati donated by Globe
- Rack space and equipment power at QC donated by ASTI-DOST
- Network operation “man-hours” donated by ASTI
- Equipment donated by Packet Clearing House (PCH/Cisco/APNIC/I-Root)

About PhOpenIX

- Managed and operated by DOST-ASTI until a consortium can be formed from its members
- First come, first connect policy
- No financial model as of now
- Open to all networks with BGP resources (AS number and a minimum /24 IPv4 block)
- Mandated bilateral peering with the route server
- Optional bilateral peering with peers

History

- 1/2007 - Launching of the IX
- 4/2007 - PREGINET
- 5/2007 - Bitstop
- 5/2007 - PCH
- 8/2007 - I-Root
- 8/2007 - Globe
- 12/2007 - IRRI
- 12/2007 - BellTel



History

- 2/2008 - PhilCom
- 8/2009 - ETPI/Manila IX
- 10/15/2009 - ADMU
- 2/2010 - Comclark
- 10/27/2013 - CableLink
- 3/19/2014 - DataOne
- 3/21/2014 - WifiCity



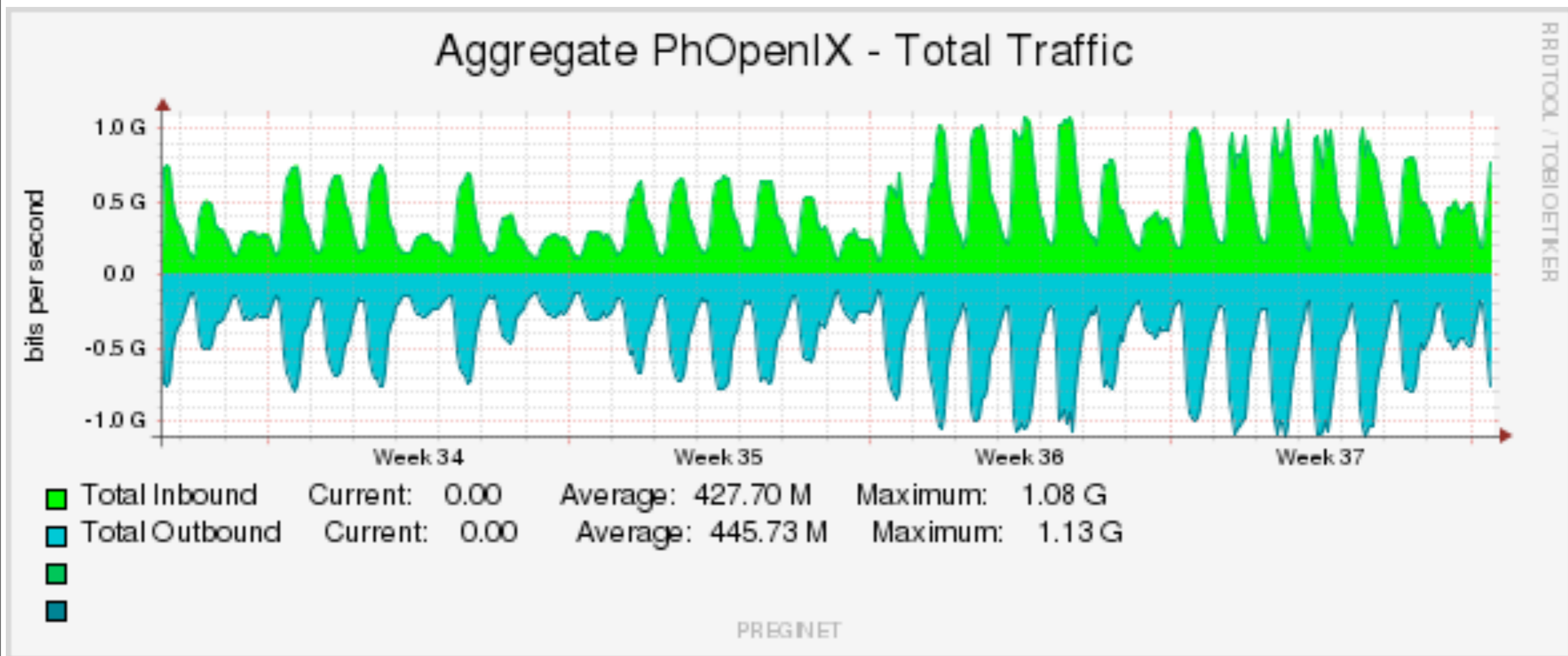
History

- 3/24/2014 - RADIUS
- 6/3/2014 - DCTV
- 6/14/2014 - St Lukes MC
- 6/19/2014 - PTT
- 6/24/2014 - iXSforall



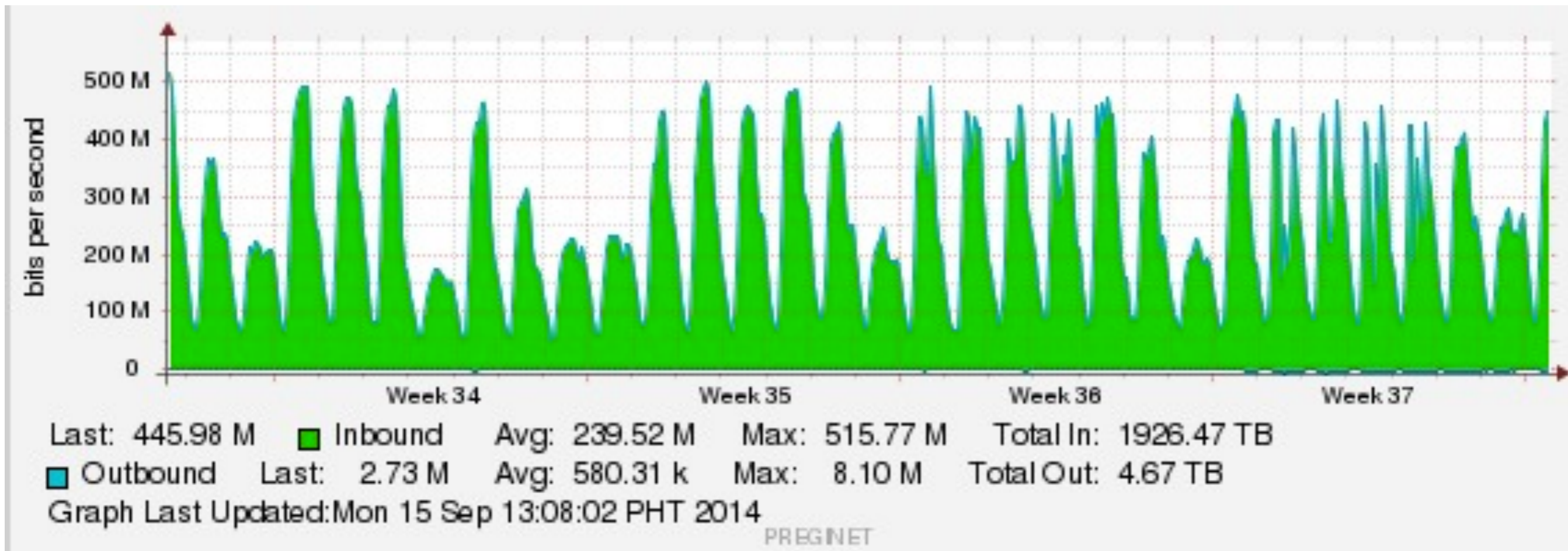
<http://www.phopenix.net/members>

Reached 1 Gb of traffic last August 5, 2014



<http://www.phopenix.net/traffic>

DOST Traffic at PhOpenIX



DOST is offloading around ~400Mbps of traffic to the IX daily. If we are paying around USD30 per Mbps to our ISP, that means we are saving around USD12000 per month (on the average) by routing some of our traffic to the IX.

Successful IX's

HKIX

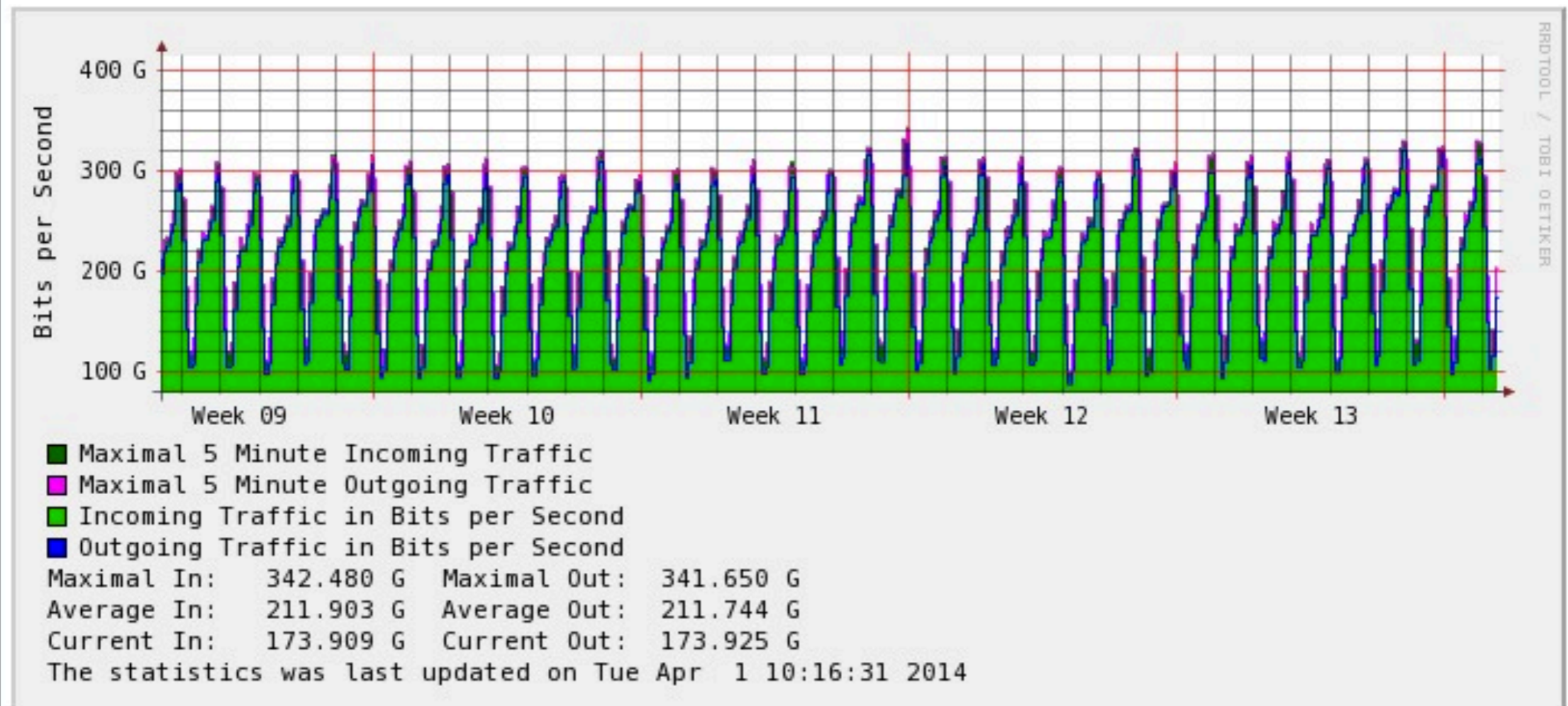
www.hkix.net/hkix/stat/aggt/hkix-aggregate.html



Google



'Monthly' Graph (2 Hour Average)

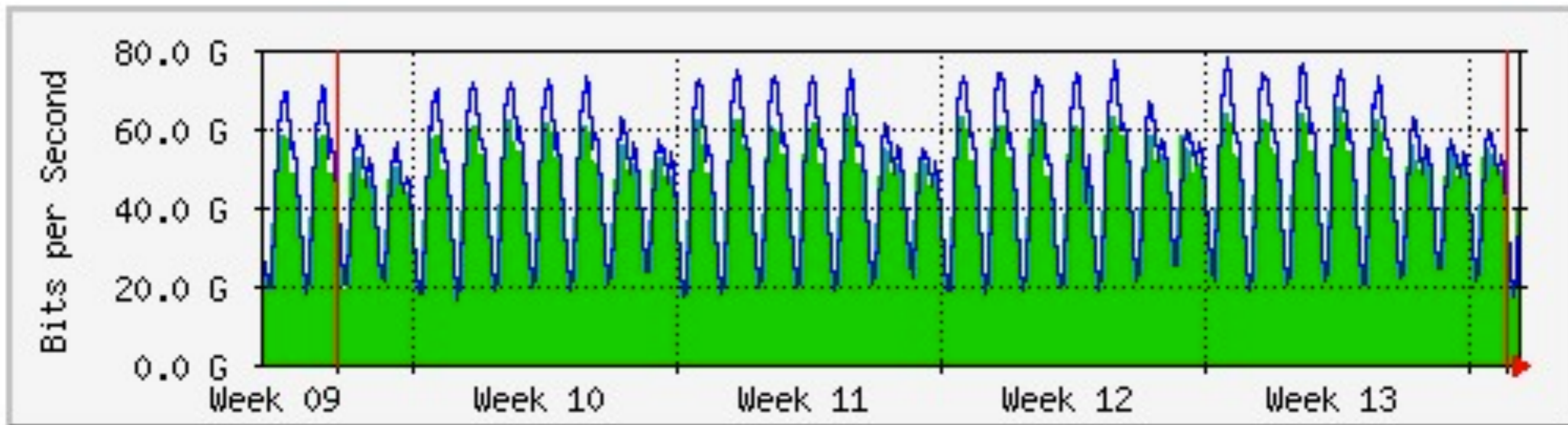


<http://www.hkix.net/hkix/participant.htm>

- Among the participants of HKIX are Globe, Bayantel, Eastern Telecoms and IP Converge

Indonesia (OpenIXP)

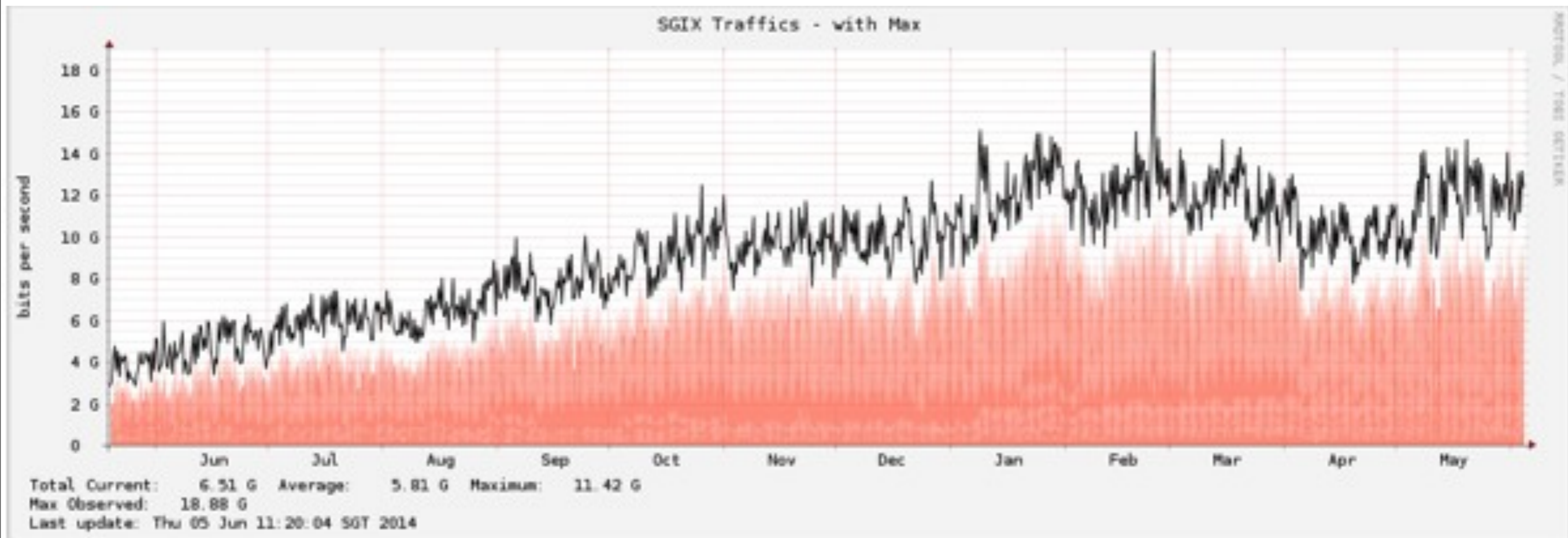
'Monthly' Graph (2 Hour Average)



	Max	Average	Current
In	65.2 Gb/s (0.0%)	42.5 Gb/s (0.0%)	39.6 Gb/s (0.0%)
Out	77.1 Gb/s (0.0%)	46.9 Gb/s (0.0%)	42.7 Gb/s (0.0%)

100% of Indonesia's networks are connected to their IX

Singapore IX



An internet exchange is simply a tool. The impact that it creates depends on how its peers/members use the available resources within it.

[http://
www.phopenix.net/
rootcon2014](http://www.phopenix.net/rootcon2014)

[http://
www.phopenix.net/
articles](http://www.phopenix.net/articles)