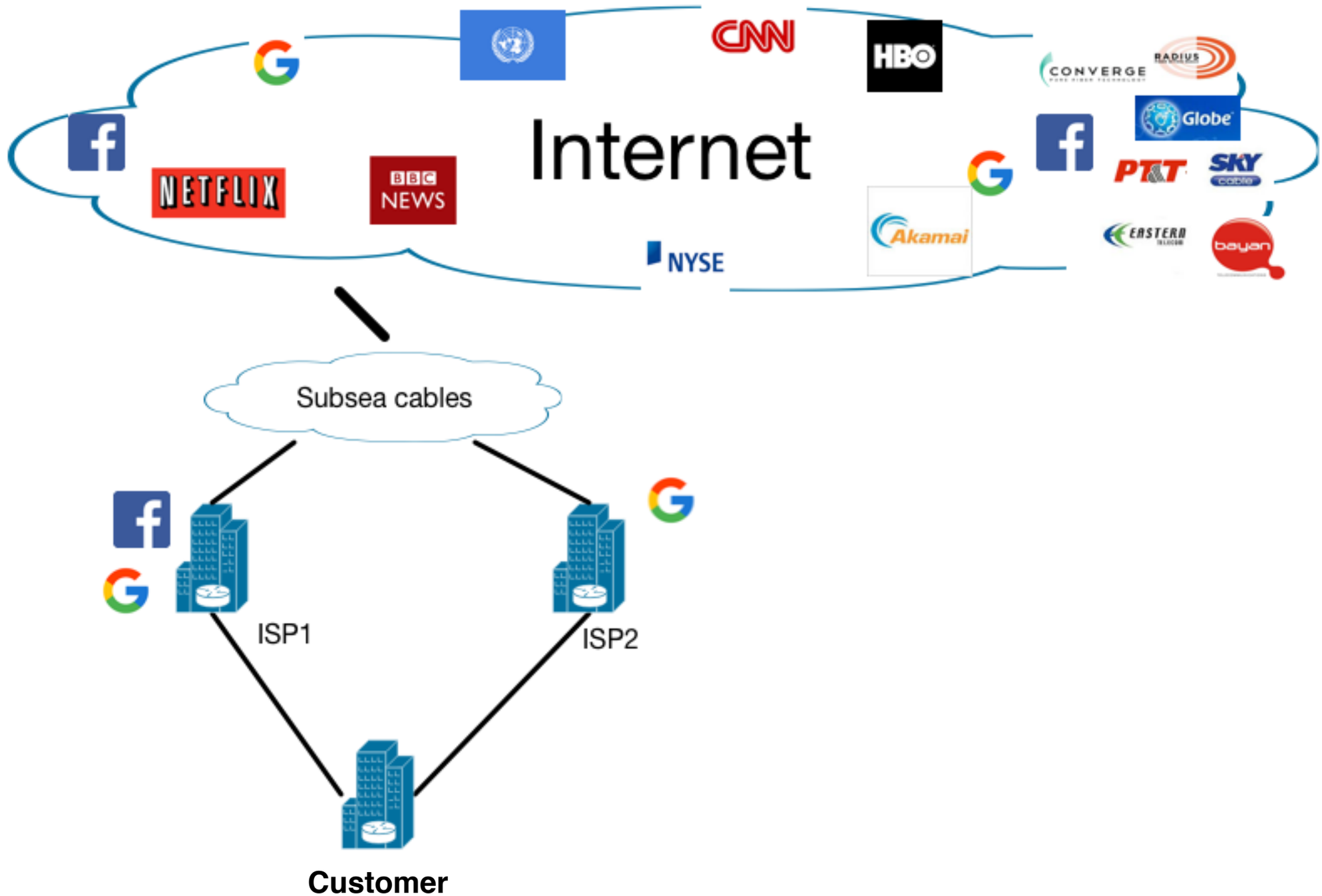
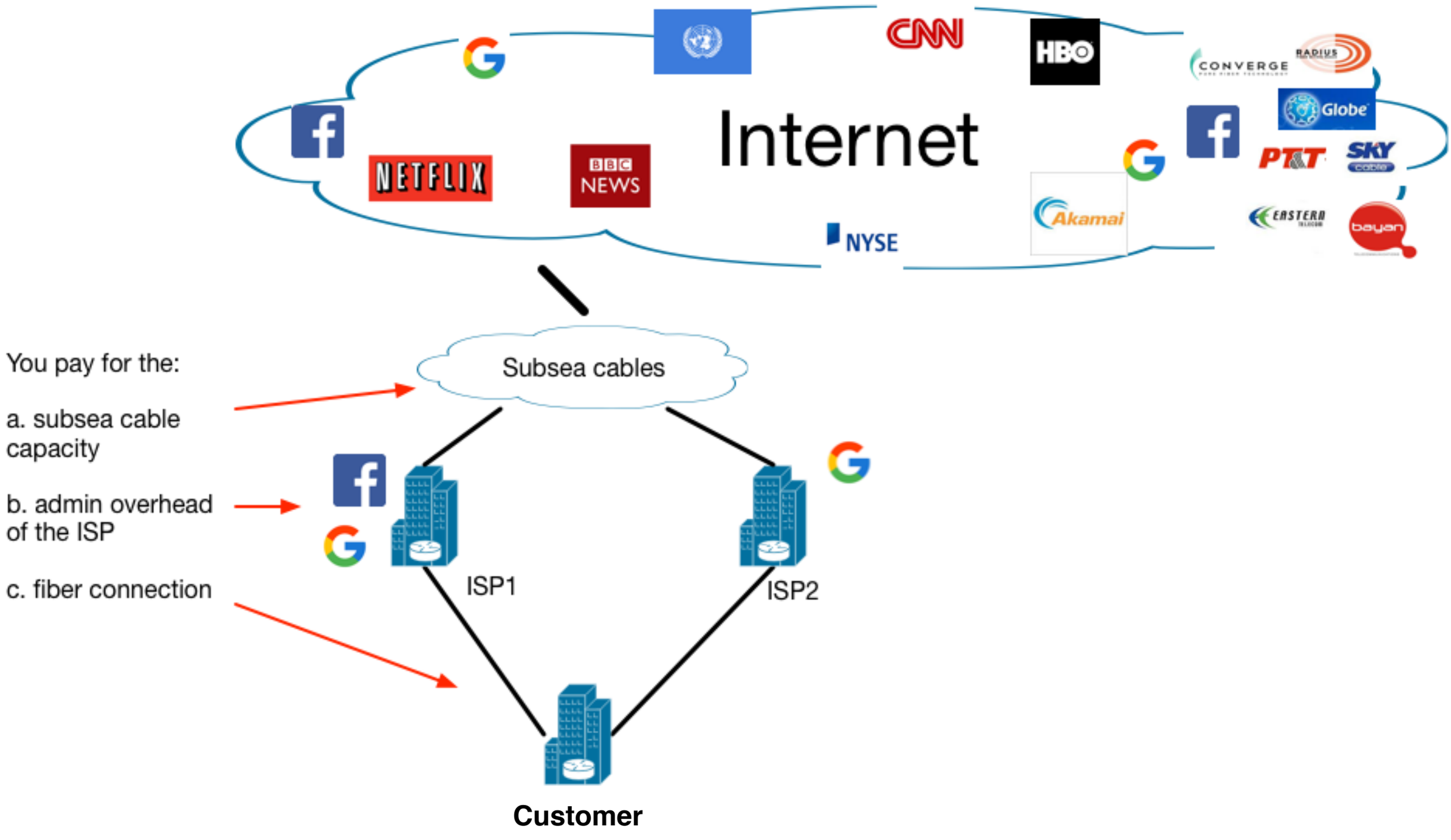
Philippine Open Internet eXchange (www.phopenix.net)

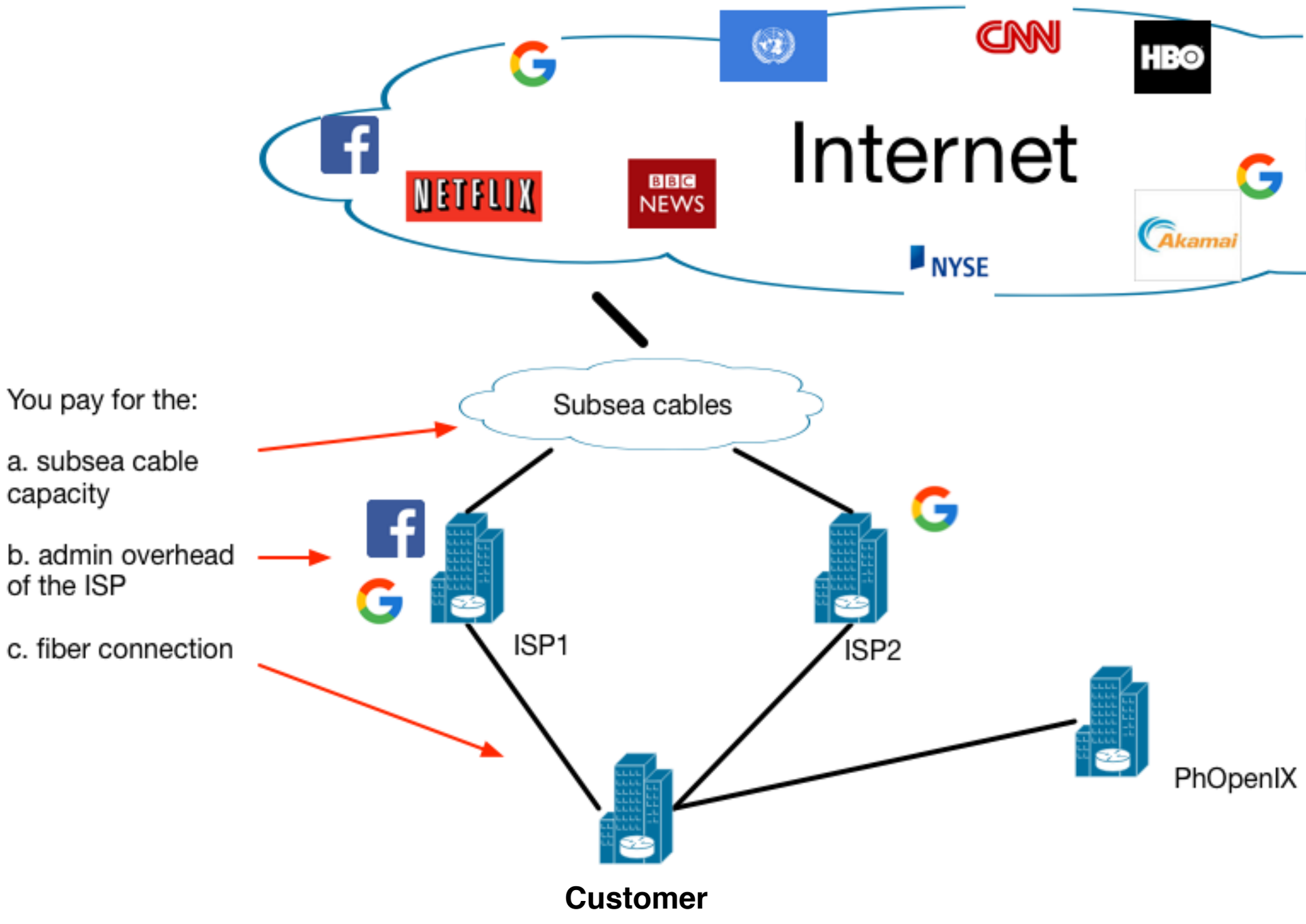
Basic BGP Workshop
November 27, 2017
Harold's Hotel, Cebu City

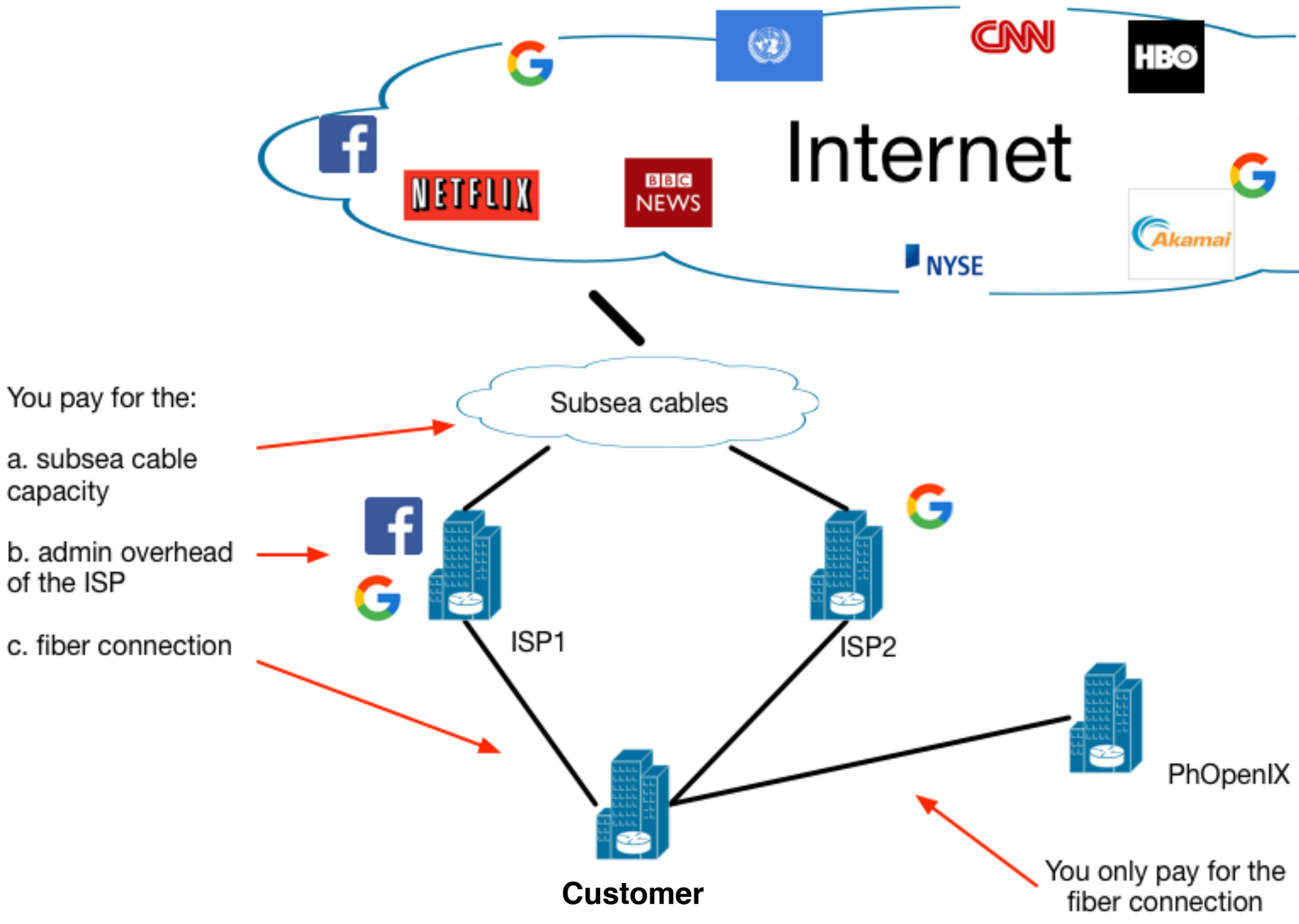
Bani Lara

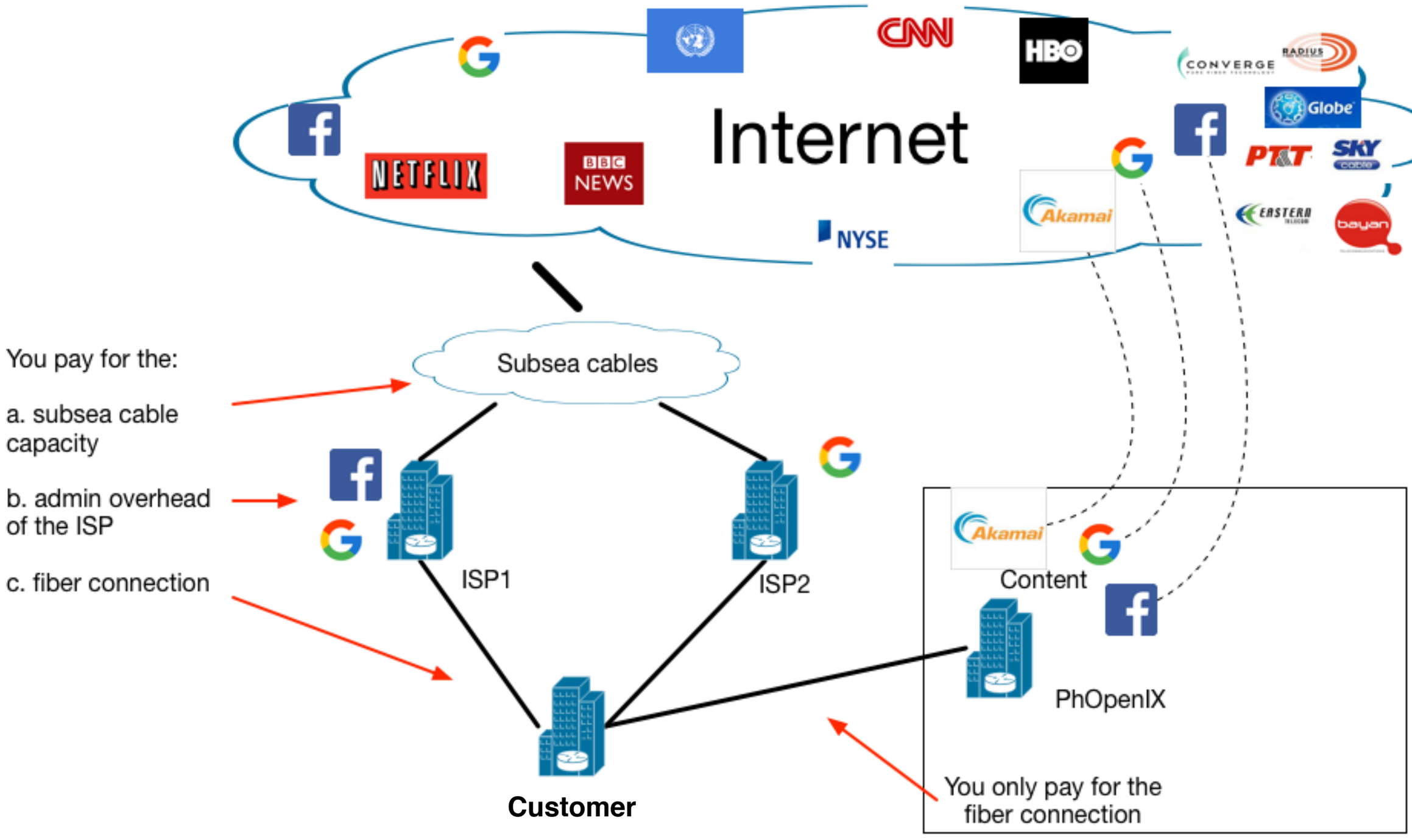
Advanced Science and Technology Institute
Department of Science and Technology

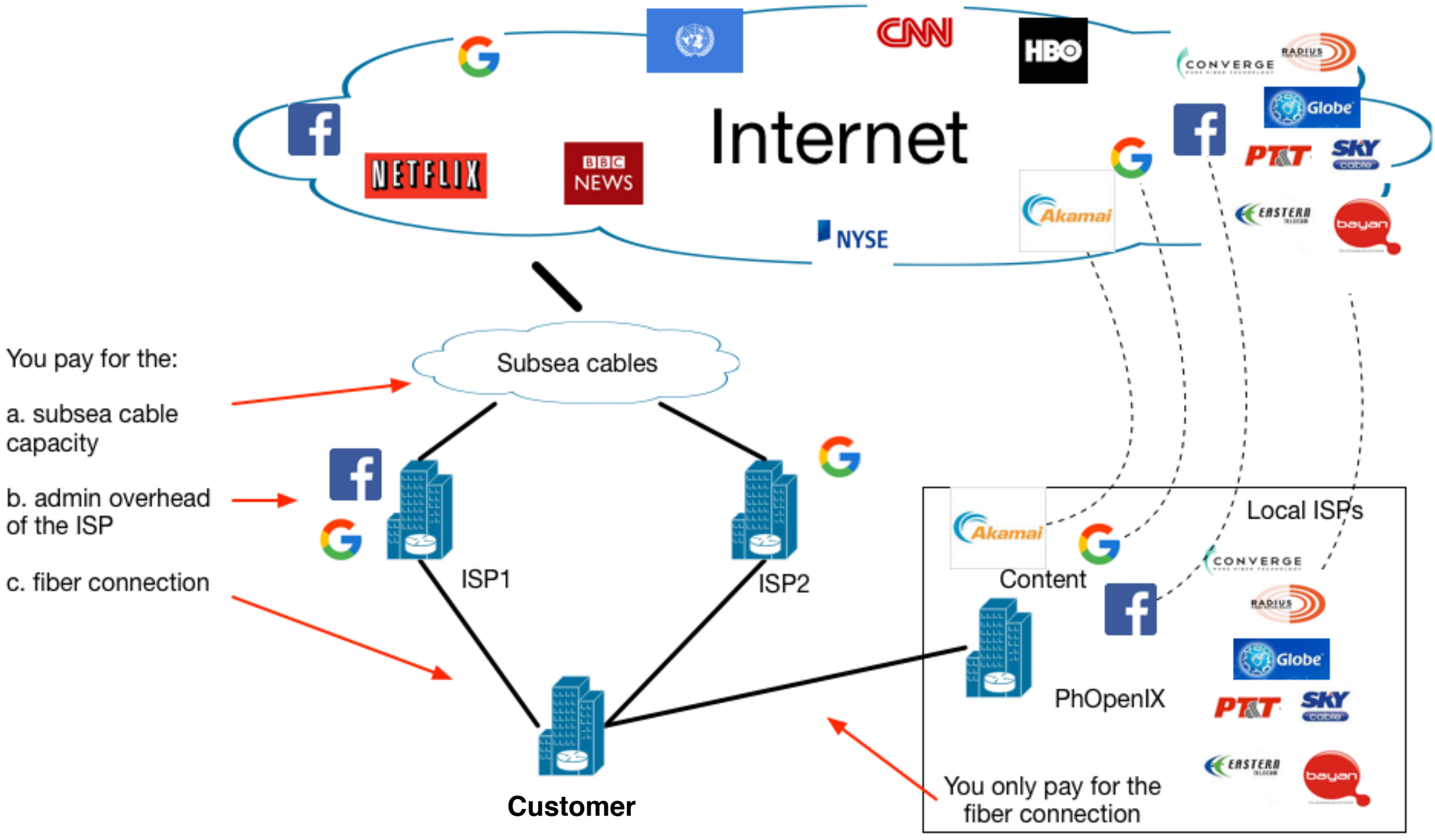

Internet
NETFLIX
BBC NEWS
CNN
HBO
CONVERGE
RADIUS
Globe
PLDT
SKY cable
Akamai
EASTERN
bayan
NYSE
Subsea cables
ISP1
ISP2
Customer


Internet
NETFLIX
BBC NEWS
NYSE
CNN
HBO
CONVERGE
RADIUS
Globe
PLDT
SKY cable
Akamai
EASTERN
bayan
Subsea cables
You pay for the:
a. subsea cable capacity
b. admin overhead of the ISP
c. fiber connection
ISP1
ISP2
Customer


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Content
PhOpenIX
You only pay for the fiber connection


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NYSE
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Akamai
EASTERN
bayan
Subsea cables
You pay for the:
a. subsea cable capacity
b. admin overhead of the ISP
c. fiber connection
ISP1
ISP2
Customer
Local ISPs
Content
PhOpenIX
You only pay for the fiber connection

About PhOpenIX

- AS4779
- Carrier-neutral IPv4 and IPv6 Multilateral Peering Exchange
- Non-profit membership based exchange
- Layer 2 exchange (supports ~~10Mb~~/100Mb/1Gb/10Gb ports)
- BGP Peering (member needs own AS number)

About PhOpenIX

- Switches located at
  - MK2 Data Center in Makati (% Globe)
  - ASTI-DOST in Quezon City (% ASTI)
  - Vitro Data Center in Pasig (% PLDT)
  - DICT in Cebu (% DICT)

About PhOpenIX

- Network operation "man-hours" donated by ASTI
- Rack space, power and remote hands donated by Globe/ASTI/PLDT/DICT
- Equipment donated by
  - Packet Clearing House (router and switch)
  - APNIC (i-root server)
  - NSRC (10Gbps switch)

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

About ASTI

- ICT and Electronics research arm of the Department of Science and Technology
- Manages and operates the Philippine Research, Education and Government Information Network (PREGINET)
- Operates and maintains the gov.ph domain name registry

History

- January 2007 - the launch of the IX during the Manila hosting of the Asia Pacific Advanced Network (APAN) meeting at Shangrila-EDSA

- April 2007 - PREGINET (IPv4/IPv6 at 100Mbps) and Bistop (IPv4 at 1Mbps) are the first networks to commit to join the IX

History

- May 2007 - installation of the
  - core switch (Catalyst 3560)
  - route server (Cisco 2600)
  - monitoring servers
  - PCH ccTLD
  - looking glass





- with the help of Gaurab Raj Upadhaya (PCH) and Amante Alvaran (APNIC)

History

- August 2007 - I-Root DNS anycast instance is operational
- August 2007 - Globe (IPv4 at100Mbps) joins the IX - the first local carrier to do so



- December 2007 - International Rice Research Institute (IPv4 at 100Mbps) and Bell Telecommunications joins the IX (IPv4 at 2Mbps)





From: Amante Alvaran
Reply-To: amante@apnic.net
Date: 9/20/07 1:36 PM
To: Gaurab Raj Upadhaya
Cc: Steve Gibbard <scg@pch.net>, Denis F. Villorente, bani, Ceejay Dideles <ceejay@asti.dost.gov.ph>

```
-----BEGIN PGP SIGNED MESSAGE-----
Hash: SHA1

Hi Mants,

can u get bani, ceejay and dennis in the loop here. Steve Gibbard, my
colleague at PCH does this analysis every month.

It may even be interesting to show that what number of DNS queries they
can send locally by coming to PhOpenIX. which otherwise they seem to be
sending to Hongkong.

this is the query pattern to our own anycast server with 18 ccTLDs,
hosted in Manila.

- ----

Here are DNS query distribution maps from Tuesday, September 11.

<snip>
We're getting no significant amount of traffic into the node in Manila.
The big Philippine query sources.  The big Philippine networks that it
would be useful to have connect to the exchange and peer with us are:

17866   AS9299   IPG-AS-AP Philippine Long Distance Telephone Company
8752    AS6648   ASN-SKYINTERNET Bayan Telecommunications Inc.
2888    AS7629   INFOCOM-AS-AP INFOCOM Technologies, Inc.
1845    AS10139  SMARTBRO-PH-AP Smart Broadband, Inc.
1729    AS9497   DIGITELONE Digital Telecommunications Philippines Inc.
1479    AS18233  PTT-AS-AP Philippine Telegraph and Telephone Corporation,
1390    AS7491   PI-PH-AS-AP PI-PHILIPINES
1116    AS6163   ERX-MOZCOM-NETWRK Mosaic Communications Inc.

(the first column is the number of queries from the AS.  Currently, we're
getting 200 queries per day there).
```

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(the first column is the number of queries from the AS. Currently, we're getting 200 queries per day there).

History

- February 2008 - PhilCom Inc. (IPv4 at 2Mbps) joins the IX
- August 2009 - Eastern Telecoms (IPv4 at100Mbps) joins the IX
- August 2009 - I-Root DNS anycast instance had a hard disk crash. Netnod decides to upgrade the whole server setup
- October 15, 2009 - Ateneo de Manila connects

History

- February 2010 - Comclark (IPv4 at 100Mbps) joins the IX



- April 6, 2011 - Globe/Innove announces its IPv6 prefixes to PhOpenIX. One the same day, PREGINET announces Globe's IPv6 prefixes to APAN and TEIN3 for testing purposes



History

- July 8, 2011 - First public hearing of the draft Memorandum Circular of the regulator (NTC), mandating all telcos with IPL's to peer at PhOpenIX
- August 26, 2011 - Philcom bursts to 160Mbps :-)
- August 29, 2011 - Regulator drops the Memorandum Circular for telcos to peer with PhOpenIX. Instead, it orders the telcos to just negotiate peering with each other.

History

- Nov 28, 2011 - Philcom bursts to 80Mbps
- Dec 12, 2011 - Bitstop upgrades from 1Mbps to 2Mbps

IX Support

- PH Network Operators Group (PhNOG)
  - PhNOG was instrumental in establishing PhOpenIX thru Amante Alvaran of APNIC
- EP.net (Bill Manning)
  - Provided the IPv4 and IPv6 blocks that we are using
- Packet Clearing (PCH)
  - org, info, asia, aero, mobi, biz, us, iq, cat, etc.....

IX Support

- Asia Pacific Network Information Center (APNIC)
  - Funded servers to host an I-root instance
- Netnod/Autonomica
  - Deployed an I-root on those servers
- Cisco (Philip Smith)
  - Donated the first Cisco 2600 and Catalyst 3560 used in the IX
- Google
  - Google Global Cache

IX Support

- Akamai
  - Installed their CDN inside ASTI, to be shared to the rest of the peers
- Facebook
  - Also installed their CDN in ASTI, to also be shared

Membership thru the years

- 2007 - 8
- 2008 - 1
- 2009 - 3
- 2010 - 2
- 2011 - 0
- 2012 - 0
- 2013 - 1
- 2014 - 11
- 2015 - 8
- 2016 - 19
- 2017 - 7

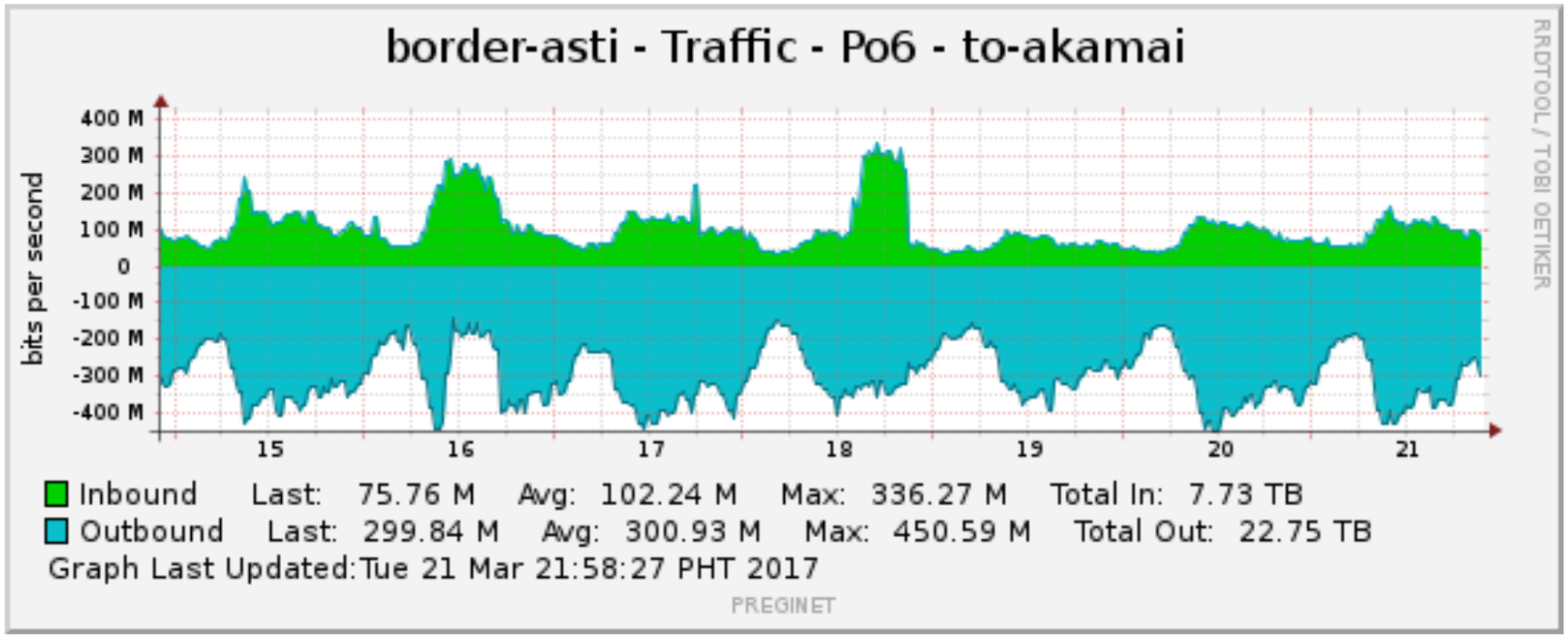
60 "directly peered" ASNs

http://www.phopenix.net/members

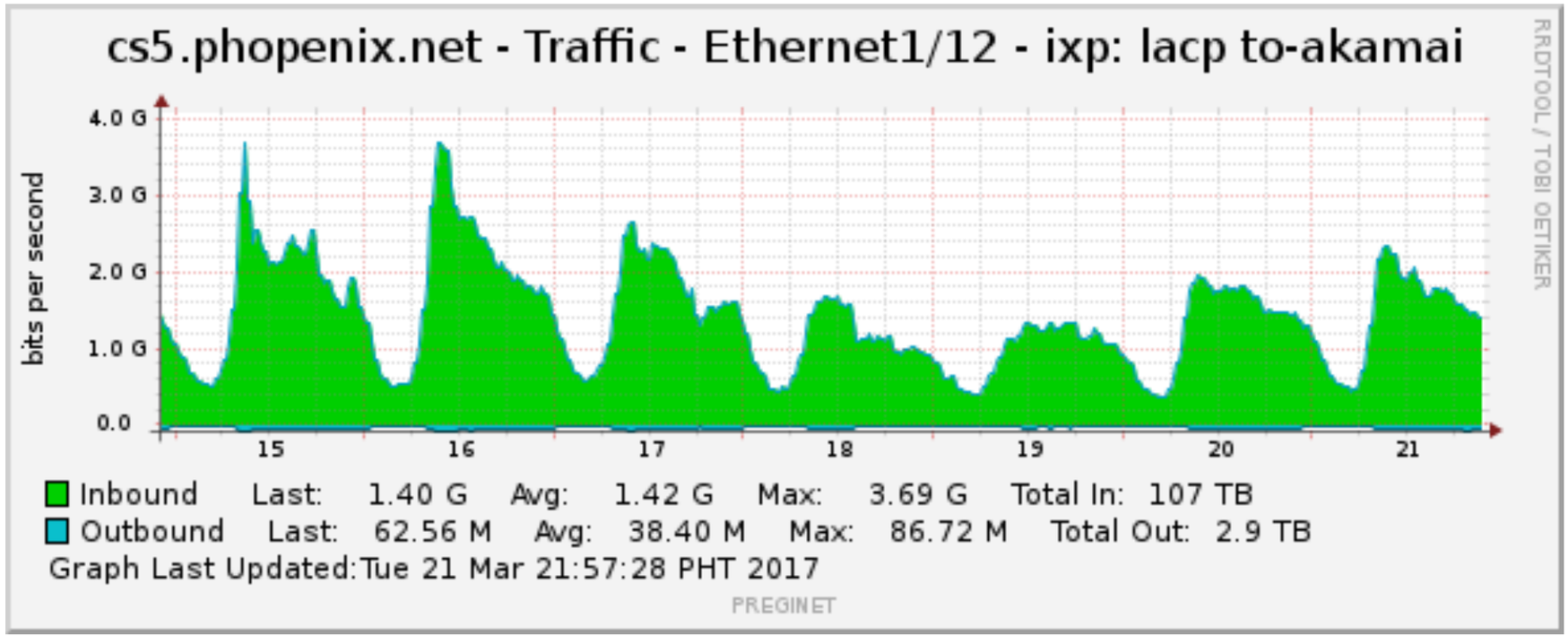
Updates!

Akamai CDN

Traffic IN from ASTI (ASN9821)



Traffic OUT into PhOpenIX (AS4779)



Updates!





global cache

https://g.co/doodle/xbvfwe

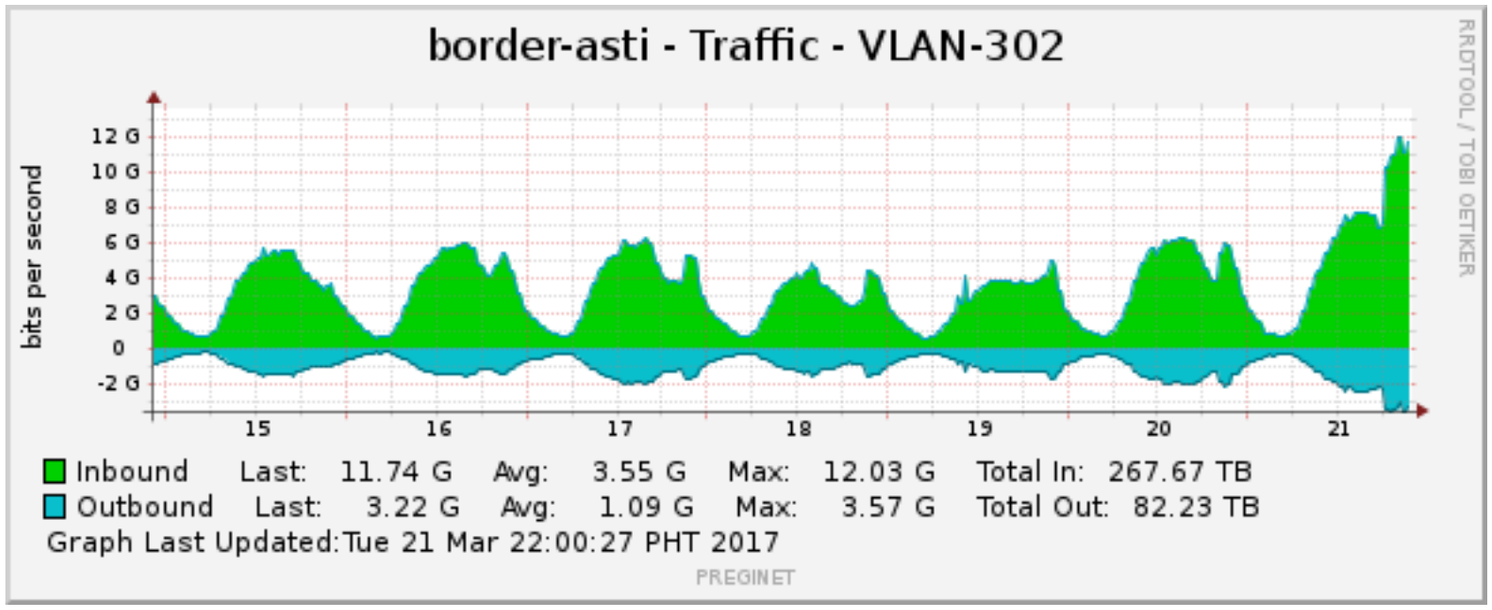
5Gb

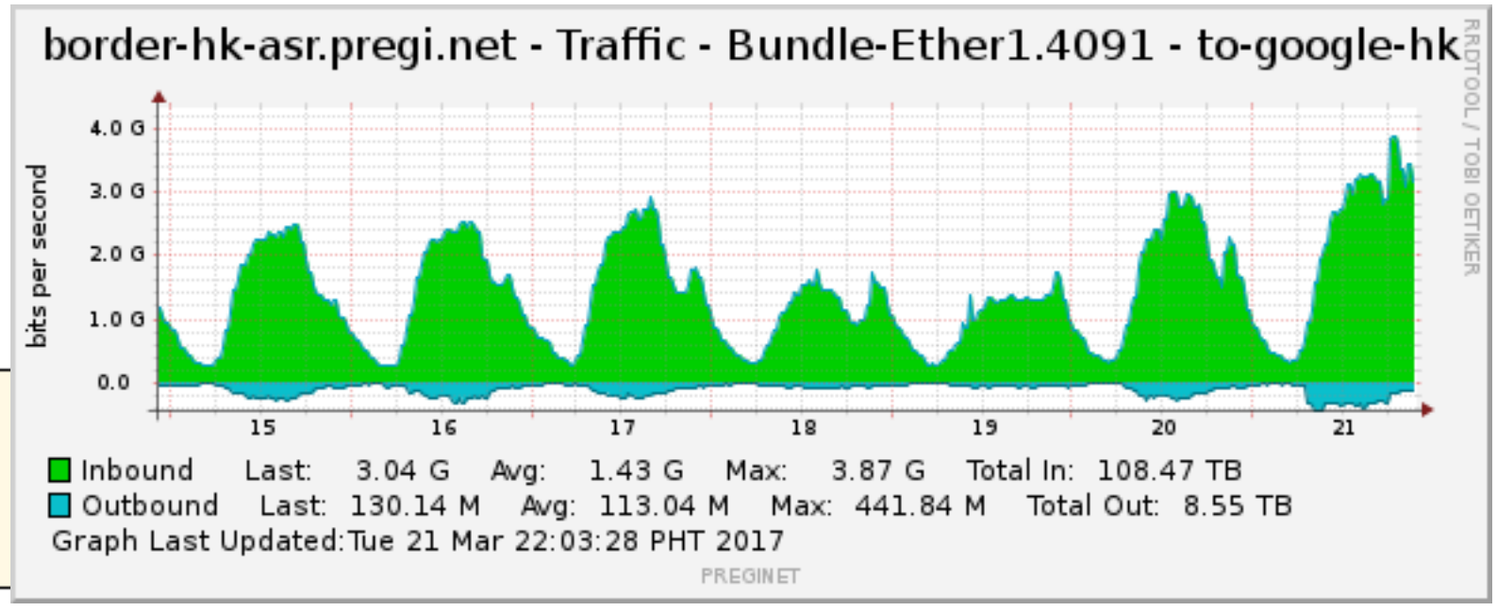
1Gb

GGC is part of
ASTI (ASN9821)
NOT part of
PhOpenIX (AS4779)

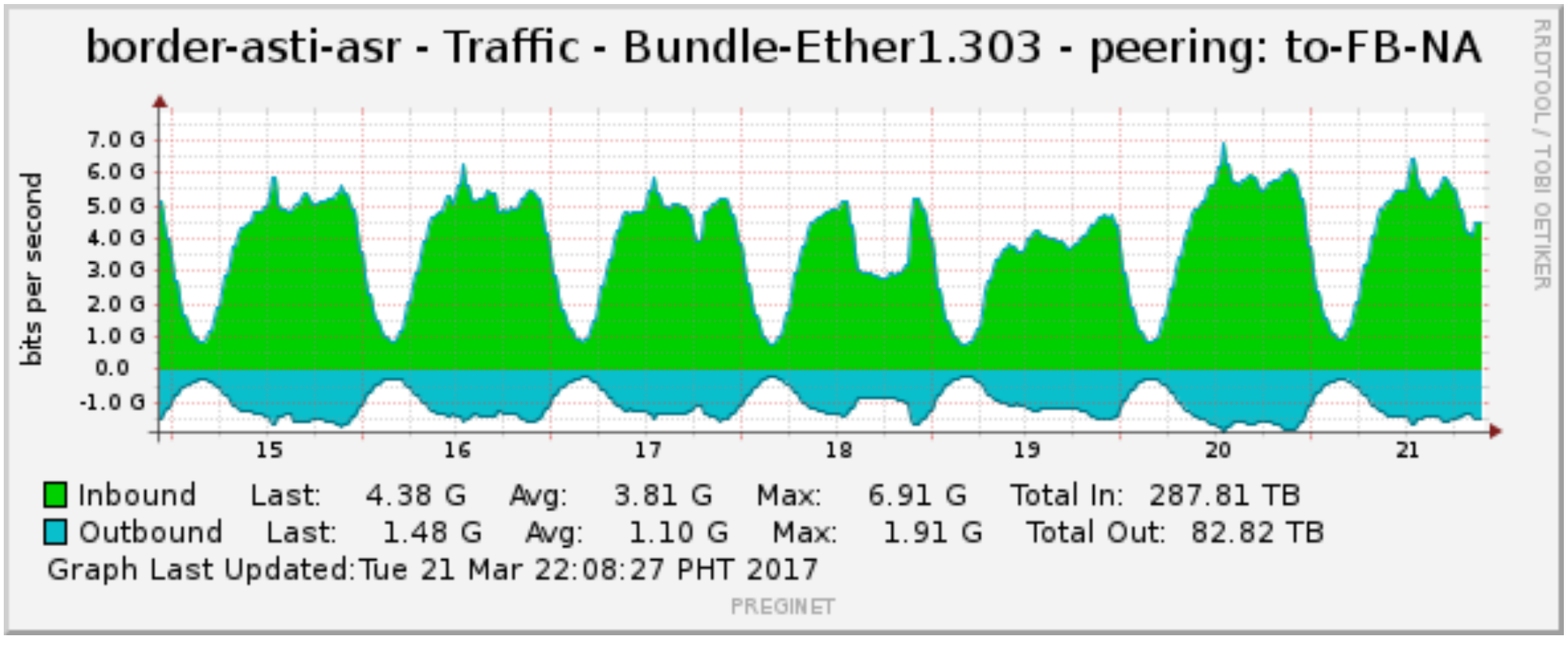
Your traffic levels qualify for Google Peering

Your network traffic could be better served through Google Peering

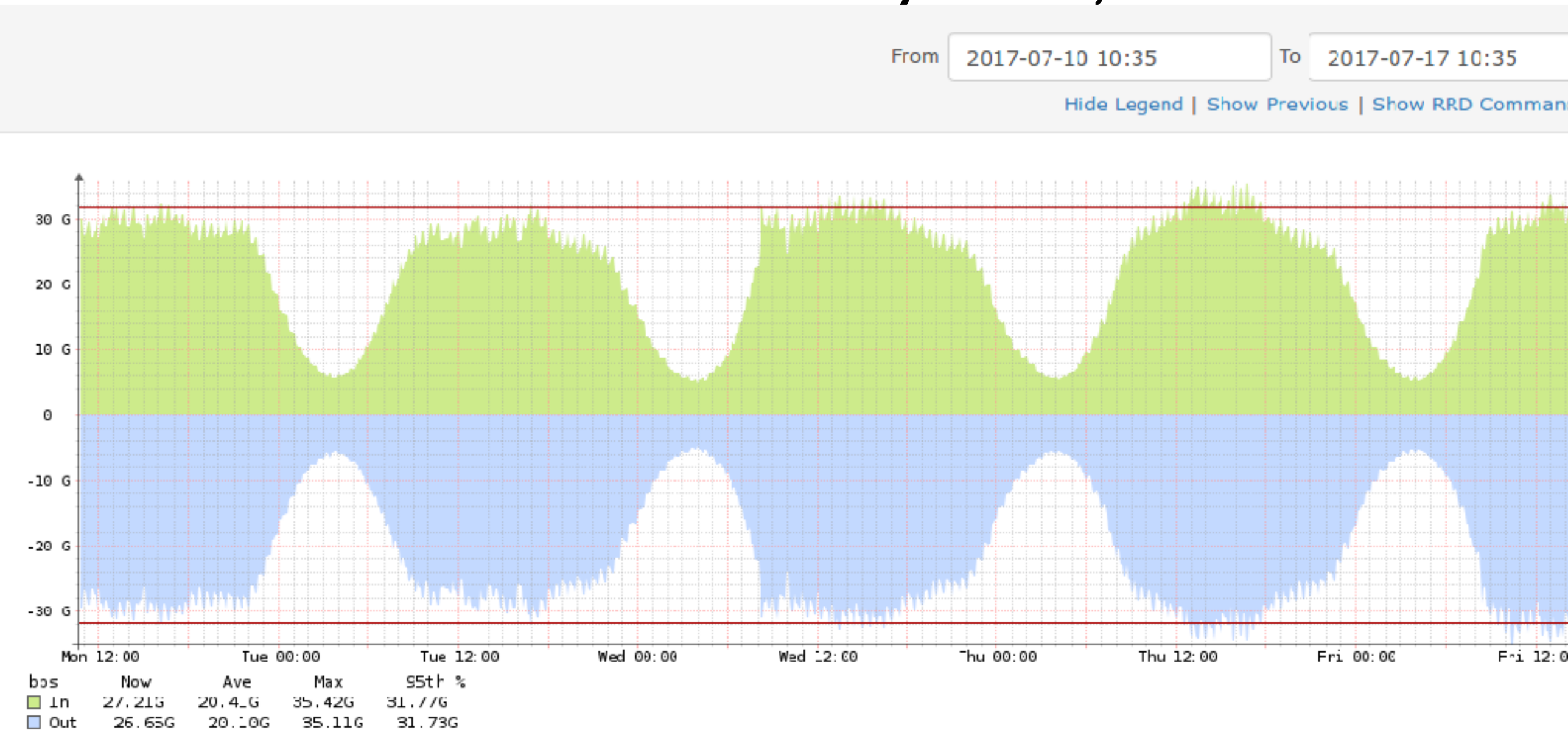




Updates!


border-asti-asr - Traffic - Bundle-Ether1.303 - peering: to-FB-NA
RRDTOOL / TOBI OETIKER
bits per second
7.0 G
6.0 G
5.0 G
4.0 G
3.0 G
2.0 G
1.0 G
0.0
-1.0 G
15
16
17
18
19
20
21
Inbound Last: 4.38 G Avg: 3.81 G Max: 6.91 G Total In: 287.81 TB
Outbound Last: 1.48 G Avg: 1.10 G Max: 1.91 G Total Out: 82.82 TB
Graph Last Updated:Tue 21 Mar 22:08:27 PHT 2017
PREGINET

Current PhOpenIX aggregate traffic as of July 17, 2017



http://phopenix.net/traffic/

Network Time Protocol

- ntp.phopenix.net
- ntp.pagasa.dost.gov.ph



PAGASA's newly installed atomic clock

Republic of the Philippines
PHILIPPINE ATMOSPHERIC, GEOPHYSICAL AND ASTRONOMICAL SERVICES ADMINISTRATION
"tracking the sky...helping the country"

PHILIPPINE STANDARD TIME

mirror.pregi.net



- pub
- archlinux
- centos
- debian
- debian-cd
- linuxmint-iso | linuxmint-packages
- linux deepin
- linux deepin-cd
- manjaro
- pfsense
- raspbian
- slackware
- ubuntu
- ubuntu-iso
- libreoffice

email: info@mirror.pregi.net

mirror.rise.ph

rise mirror

SPEEDTEST FILES:

- 16MB
- 32MB
- 64MB
- 128MB
- 256MB
- 512MB
- 1024MB
- 2048MB
- 4096MB

RISE

The fastest internet in the Philippines

WELCOME TO THE RISE MIRROR

Files can be downloaded using http://mirror.rise.ph and ftp://mirror.rise.ph

Directory: /

Name	Last modified	Size
apache/	03-Feb-2017 00:10	-
archlinux/	15-Jun-2016 06:01	-
centos/	02-Jan-2017 23:47	-
cpan/	05-Mar-2017 23:00	-
cran/	20-Dec-2015 01:05	-
ctan/	29-Oct-2016 16:46	-
cygwin/	22-Dec-2016 05:52	-

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” Domain Name Services (DNS), the yellow pages of the internet

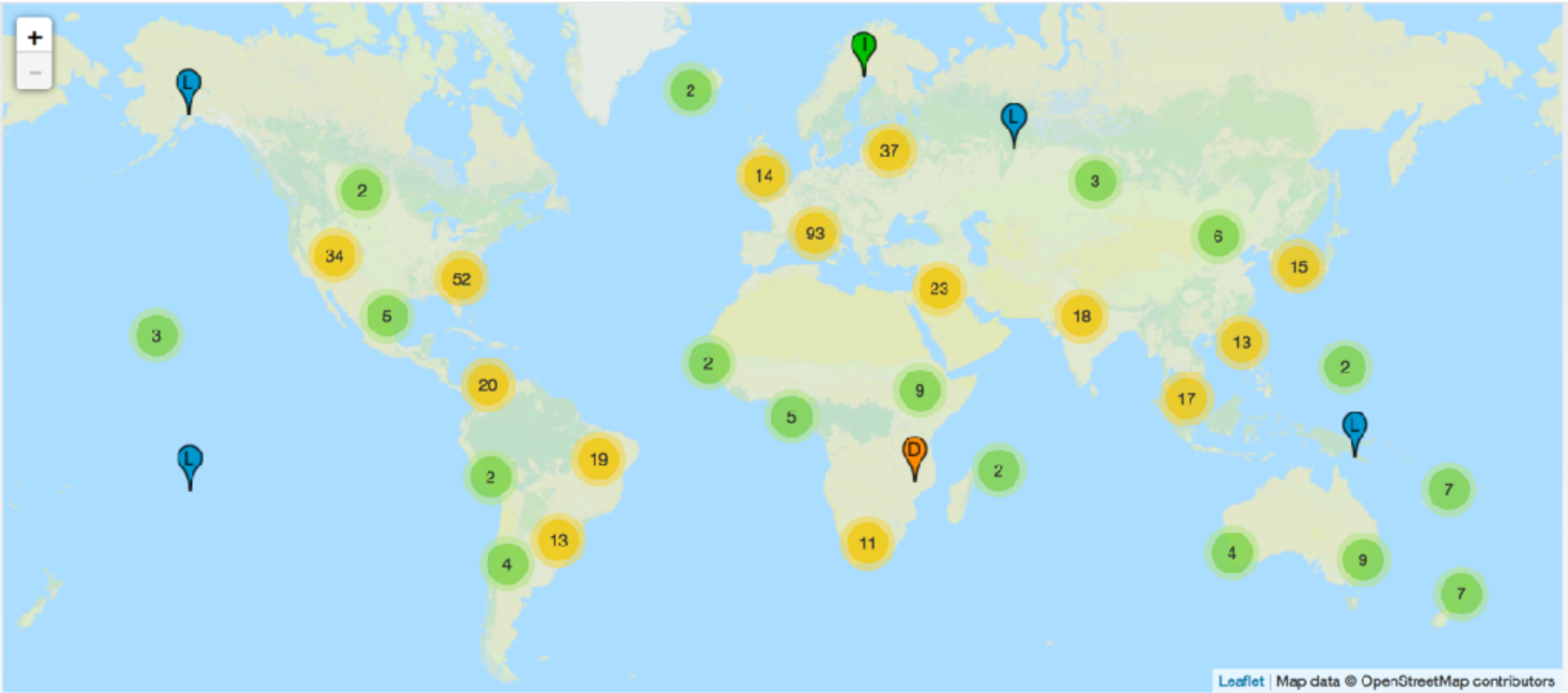


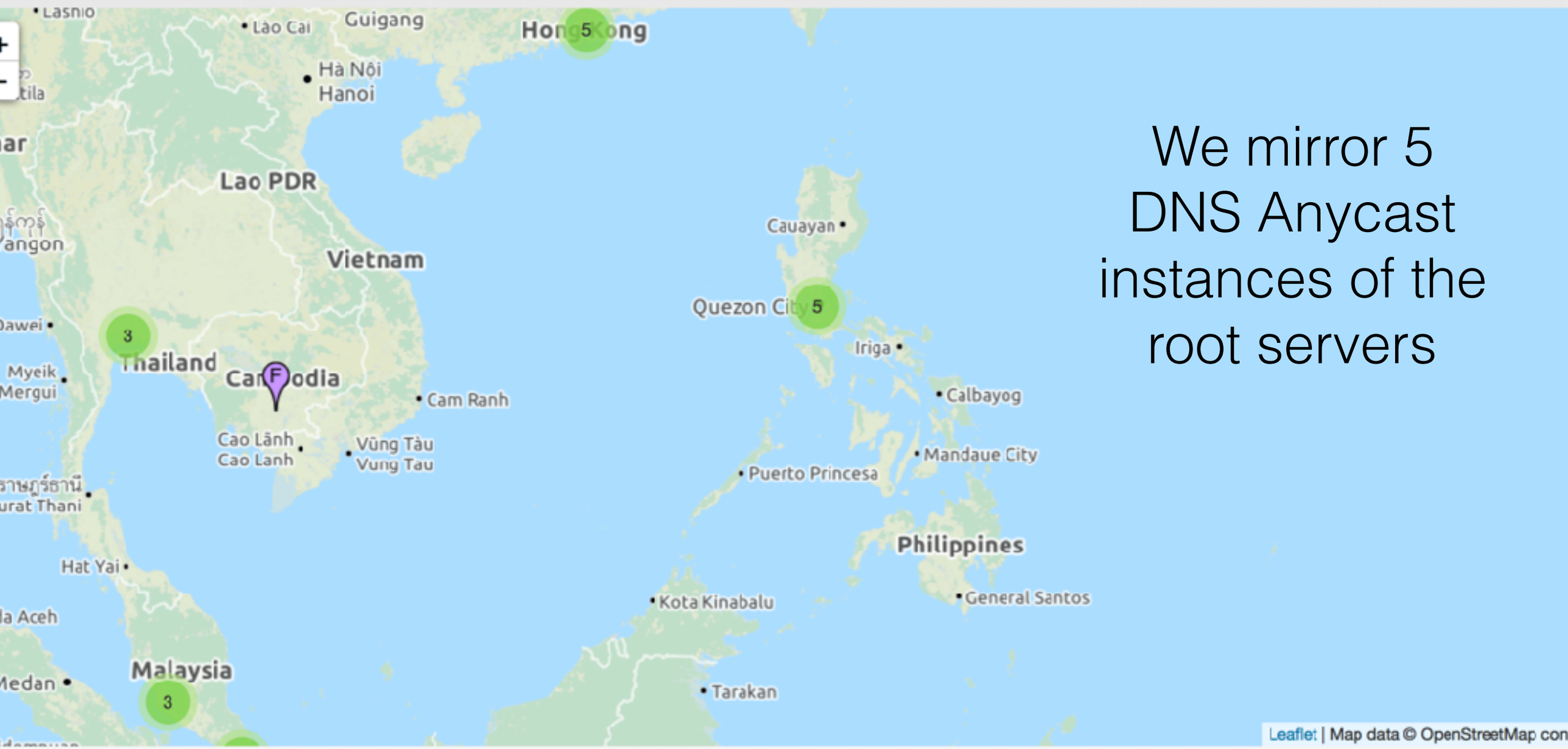


List of Root Servers

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


+
−
L
L
L
L
D
2
37
14
3
93
6
15
34
52
23
18
5
3
13
2
2
9
17
20
5
2
19
2
7
13
4
11
4
9
7
Leaflet | Map data © OpenStreetMap contributors



We mirror 5 DNS Anycast instances of the root servers

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 | Manila, PH | Miami, US | Milan, IT | Mumbai, 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 | Beirut, 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
```

MANILA BULLETIN
The Nation's Leading Newspaper

Big Data Analytics: PHOpenIX and PH Bandwidth

332
SHARES

Share it!

By: Wilson Chua

Published March 3, 2017, 12:30 AM

Wow! The Philippines just overtook Vietnam, Indonesia and Cambodia in Internet speeds. 22 million records formed the basis of the analysis. Chris Ritzo, MLabs supplied the data. And Ms Grace Mirandilla Santos helped with our analysis. Thanks!

http://technology.mb.com.ph/2017/03/03/big-data-analytics-phopenix-and-ph-bandwidth-2/

MANILA BULLETIN
The Nation's Leading Newspaper

PHOpenIX drops bombshell at PhNOG's 1st IP Peering forum

370
SHARES

Share it!

By Wilson Chua

Updated March 17, 2017, 11:57 AM

The PHNOG (Philippine Network Operators Group) concluded the 1st Philippine IP Peering Forum. This

http://technology.mb.com.ph/2017/03/17/364393/

This graph shows the bandwidth that does not need to go 'overseas'. It is bandwidth that is 'saved' because it travels locally. Local traffic is cheaper than international traffic. This is like making a local call and making an international call. The toll charges will kill you.

Note the bandwidth saved goes beyond 20 gigabit per second. How fast is 20gbps? You can download an entire Blu-ray movie in about 11 seconds. If we put a monetary value to this bandwidth savings, it would be over PHP 240 million a year. The 240 million savings is equal to what the DSWD needs to support 48,000 school children yearly for its 4P Pantawid Pamilyang Pilipino Program!

http://technology.mb.com.ph/2017/03/17/364393/

Thank you



Amante Alvaran
APNIC



Paul Wilson
APNIC



Bill Woodcock
PCH



Gaurab Raj Upadhaya
PCH



Philip Smith
Cisco



Kurt Lindqvist
Netnod



Bill Manning
USC ISI



Ceejay Dideles
ASTI-DOST

NSRC

Network Startup Resource Center













Thank you



Marco van den Berg (IRRI)



Equipment shipment

Thank you



Raj



Jane



Noelle

“An IX is 10% technical, 90% political” - Anonymous

Gov't urged to remedy slow PHL Internet; PLDT put to task

By BEA MONTENEGRO September 16, 2014 9:13pm

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The Philippine government has been called upon to intervene in the sorry state of Philippine Internet infrastructure, with calls for public regulation of local Internet service providers (ISPs)—particularly local telco giant PLDT.



Why Internet is slow in PH

By Atom Araullo, ABS-CBN News
Posted at 09/16/2014 3:23 PM

Pressure on PLDT to solve PH's slow Internet

At a Senate hearing on the cause of slow Internet connection in the Philippines, discussions focus on mandatory IP peering, a policy that government can't implement because of protests from the telco player



Gov't mulls making broadband Internet as basic service

Posted on September 17, 2014

Tweet 10 +1 +2 Pin it Like 37

In order to exercise its power to regulate the telecommunications industry and consequently speed up the "slow and expensive" Internet connection in the country, the government is proposing to reclassify Internet broadband as a basic service rather than a mere value-added service.




PLDT
ATTY. RAY ESPINOSA
PLDT
PAOLO BENIGNO AQUINO IV
Senator of the Philippines

Moving forward

- More networks at the Manila/Cebu switches
- More content (CDNs)
- ~~Setup internet exchanges outside of Manila (i.e. Cebu)~~
- IP blocks for expansion
- Lobby for donation of more equipment
- More network training
- ~~Become a member of APIX Assoc.~~
- BGP communities soon


2017-11-15 12:56

Philippine gov't, Facebook partner for 'ultra high-speed' broadband

The government says the planned Luzon Bypass Infrastructure will have 'spectrum equivalent to at least two million Mbps,' nearly equal to the combined capacity of Globe and PLDT

SCITECH

Filtered By: Scitech

FASTER CONNECTION BY 2019

PHL gov't teams up with Facebook to build infra to improve internet

Published November 15, 2017 4:21pm

By JON VIKTOR D. CABUENAS, GMA News

The Philippine government has teamed up with Facebook for the creation of a cable landing system set to improve internet speeds to as fast as 2 terabits per second by connecting the country to the rest of Asia and the United States starting 2019.

Filipinos to enjoy faster Internet soon due to agreement with FB

Updated November 15, 2017, 9:29 PM

By Martin Sadongdong

Filipinos will soon enjoy a faster Internet speed connection after the natior agreement with Facebook Wednesday to build a high-speed Internet infras

Gov't challenges telcos

November 16, 2017



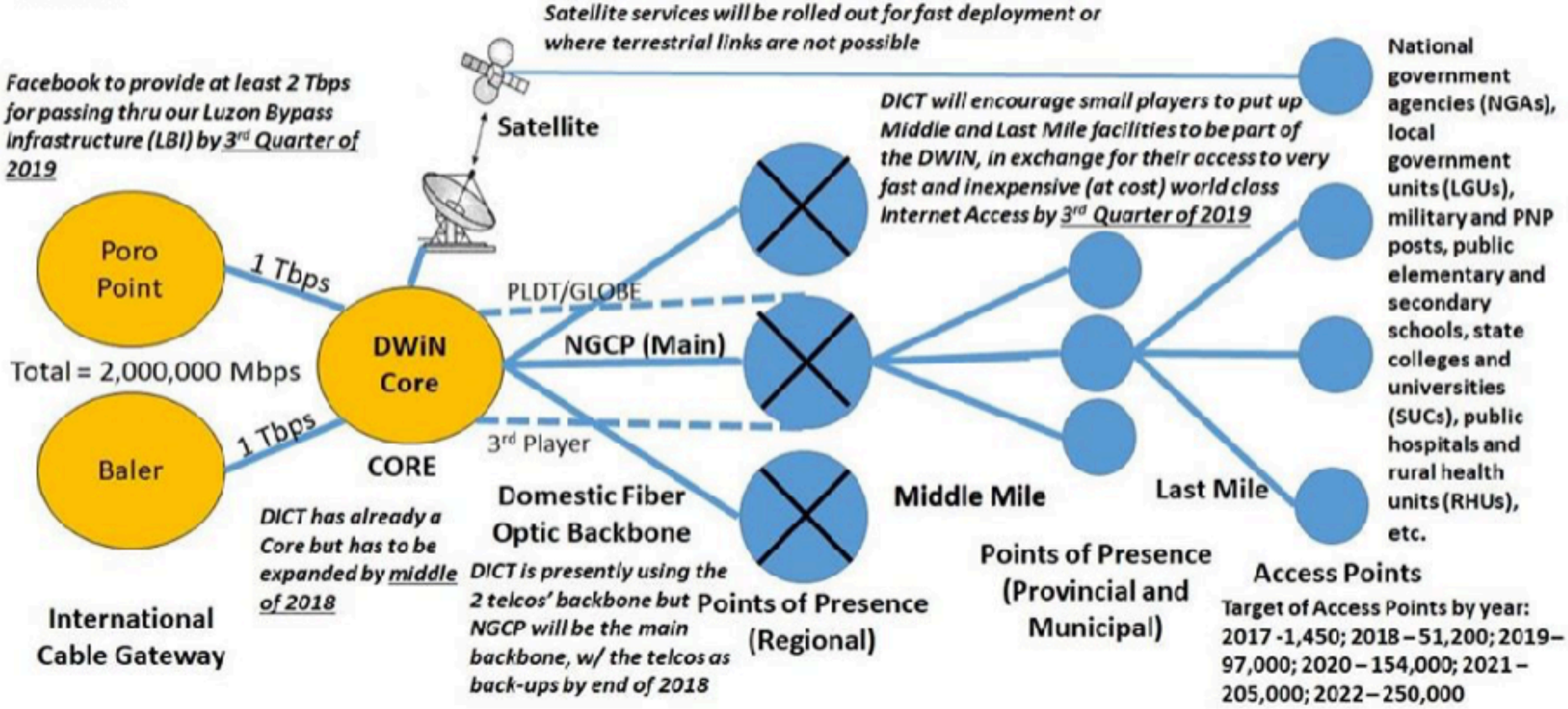
Philippine telecommunication companies are poised to lose a third of their business with a planned government-led telecom infrastructure that would provide fast internet, a project done in partnership with

Eliseo Rio Jr is with Zynelle Corpin and 3 others.
November 22 at 10:46pm ·

A schematic diagram and timeline to explain how the Facebook capacity of 2Tbps will greatly improve speed and cost of internet access in DWIN, for the win!

The Domestic Wideband Information Network (DWIN), Improving Philippine Internet Speed and Access Cost

The Domestic Wideband Information Network (DWIN) with timelines of completion are schematically shown below:



bani@asti.dost.gov.ph

https://www.facebook.com/groups/phopenix/