How to build an Internet Exchange in Asia

Raphael Ho
Network Engineering and Operations

March 3, 2010

How to build an Internet Exchange in Asia

Step 1: Buy a big switch

Step 2: ???

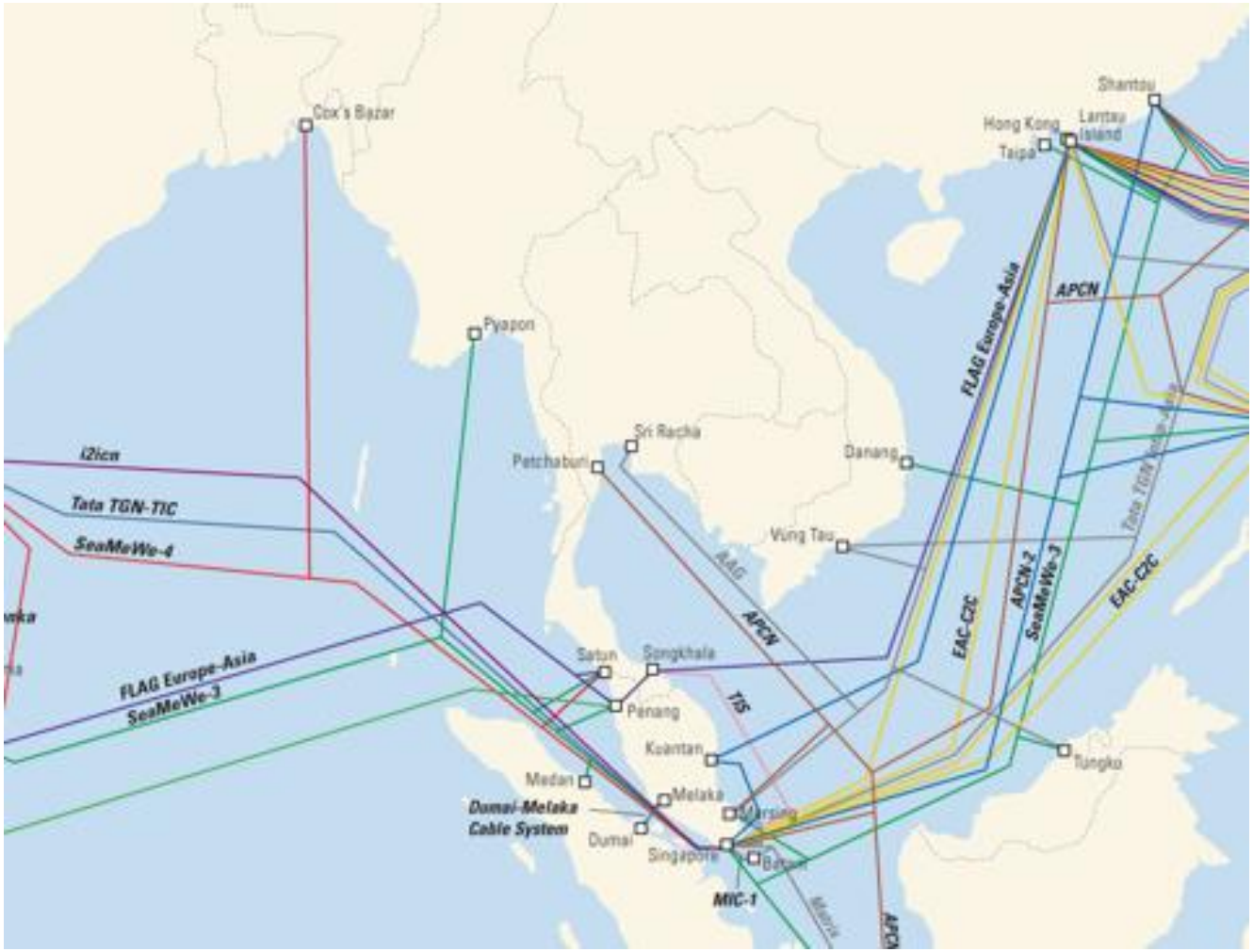
Step 3: Profit!

The secret to success

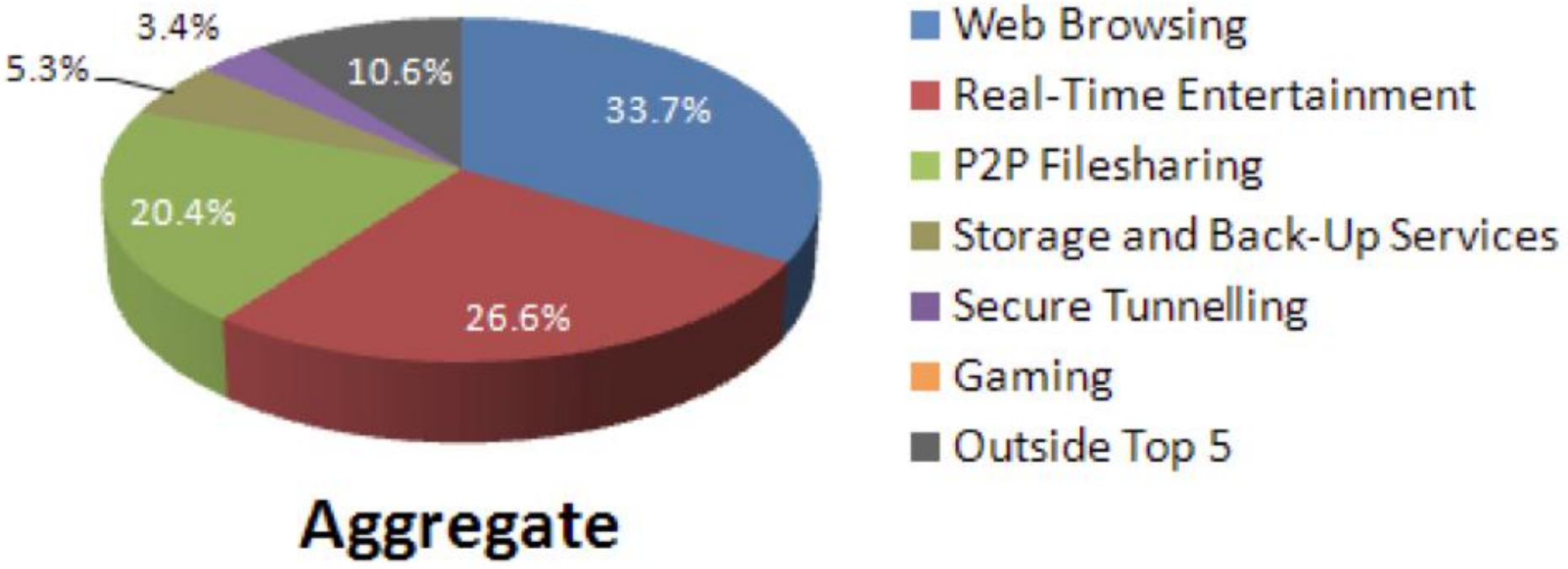
Location….

Timing…

People…



Where's the traffic coming from?



60% Content to Eyeball traffic

Source: Sandvine Traffic Report 2009

Internet Traffic Volume (South Asia)

EQUINIX

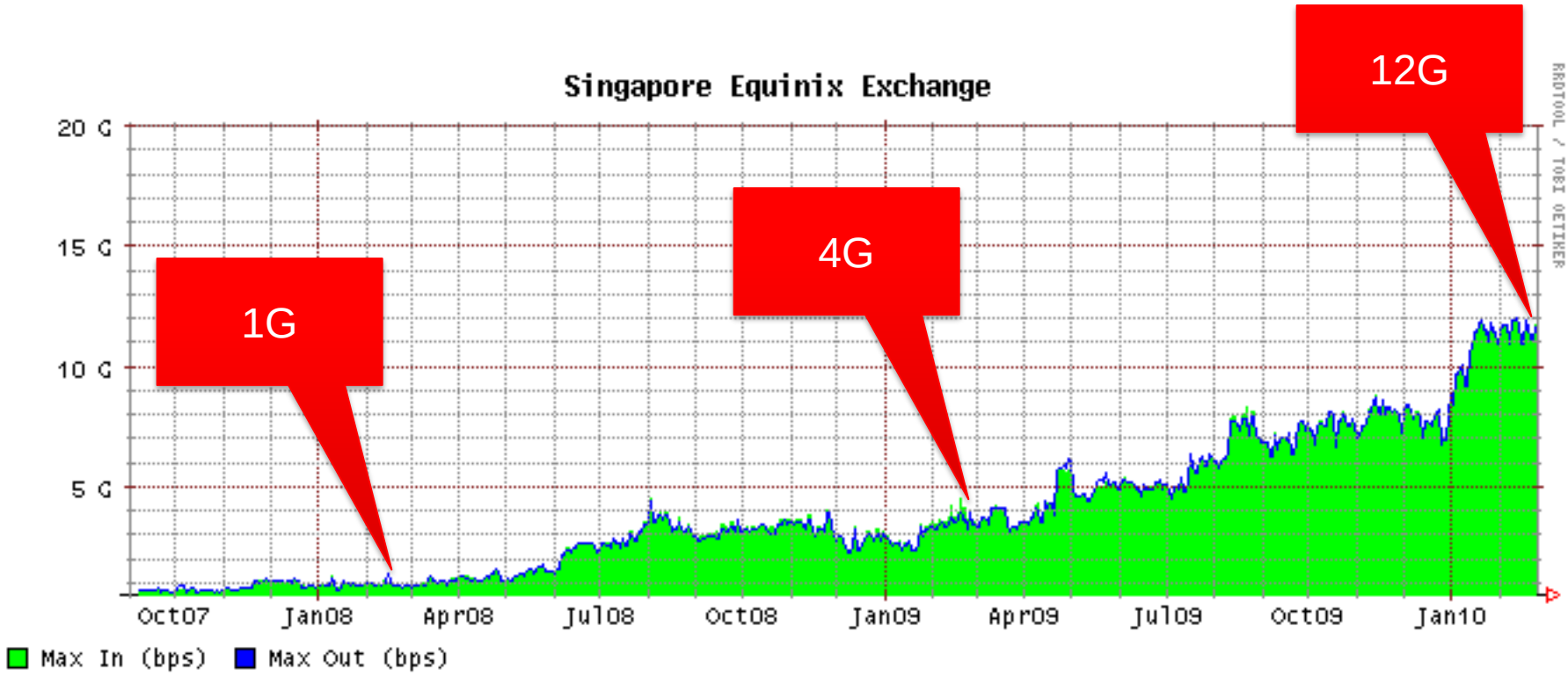
Country	Internet Users	Broadband Users	Traffic Volume
Singapore	3.4M (72%)	1.0M	415G
Malaysia	17M (66%)	1.4M	172G
India	81M (7%)	5.3M	160G
Philippines	24M (25%)	1.0M	95G
Thailand	16M (24%)	0.9M	67G
Vietnam	21M (25%)	2.5M	45G
Indonesia	30M (12%)	0.3M	31G
Pakistan	18M (11%)	0.2M	18G
Total	**210M**	**12.6M**	**1.0T**

≈300Gbps of potential peering traffic

Source: http://www.internetworldstats.com/asia.htm

Source: Telegeography International Internet Bandwidth by Country 2009

Equinix Exchange Singapore



4% of potential peering traffic

Where is all the traffic?

Transmitted over other exchanges out of region?

Transmitted over PNI?

Transmitted over Transit links?

- Via the US?

Challenges in Peering

International Inbound …

- Can't find the right peering coordinators
- Lack of carrier concentration in data centers

In Region…

- What is Peering?
- Peering is too complicated
- Peering is too expensive
- It's easier to justify an upgrade existing transit capacity vs. new connectivity to peering platforms
- Peering doesn't give me the SLA that I need
- My IRU capacity is all structured to the USA

Any other reasons? How can we help?

Promoting Peering…

Meet your peers

- Facebook Group: Equinix AP Beer and Peer
- BeerAndPeer.com: http://www.beerandpeer.com

Join the community

- Peering DB: http://www.peeringdb.com/
- Mailing Lists: http://lists.ap.equinix.com/mailman/listinfo

Visit our website

- Equinix IX Portal: http://ix.equinix.com

Join Our Internet Exchanges

- Get your IPv6 Addresses
- For Open peering policy members, consider MLPE

Join us at the Equinix Peering Cocktail!

Asia Peering Forum 2010

30 Aug – 1 Sept
Hong Kong

Mark your calendars!

Equinix Updates
Carrier Ethernet Exchange

Carrier Ethernet Interconnection

1. Motivation for E-NNI fabric
2. Equinix Carrier Ethernet Exchange (EECE) Architecture
    1. Service Connectivity Mapping
    2. Service CoS and Bandwidth Mapping
    3. Ethernet OAM
3. ECEE Portal
4. Equinix Metro Ethernet Lab
5. ECEE Trials
6. ECEE Locations

Why Do We Need E-NNI Aggregation?

EQUINIX

1 NNI's traditionally have been set up as Bilateral agreements
- Few in number
- Complex business relationships
- Each one may be different, both in business and technical terms
- Difficult if you need an NNI just for one or a few customers

2 What has changed?
- Carrier Ethernet standards
- More carriers and Ethernet growth in Metro and WAN
- Customer requirements: global and high bandwidth applications
- Acknowledgement of scaling benefits of Internet model

Benefits of E-NNI Aggregation and Standards

EQUINIX

1 Setup many E-NNI's with more speed and less complexity
- Easy to do a new E-NNI for a single customer or deal
- Consider more options when looking for low cost of access
- Reduce cost by aggregating inter-carrier relationships onto a single GigE or 10GigE port
- Can still groom large E-NNI relationships to Bilateral
  - — Just like Internet peering

2 Standardized Carrier Ethernet Interconnection
- Service/Product level standardization of E-NNI in Metro Ethernet Forum (currently in draft)
- Better operational consistency
- Troubleshooting and SLA Verification using OAM
- Still allows carriers to differentiate their offering and SLAs

NNI Marketplace Service Components

1 Recognize Carrier roles and bring them together
- Buy side
- Sell side
- Wholesale
- NNI's are usually one-way but can be bilateral buy/sell

2 Lit Building Lists
- Standardized access drives the discovery of inventory
- Building lists drive value: do you have the footprint I need?

3 SLAs
- Carriers differentiate based on monitoring and guarantees

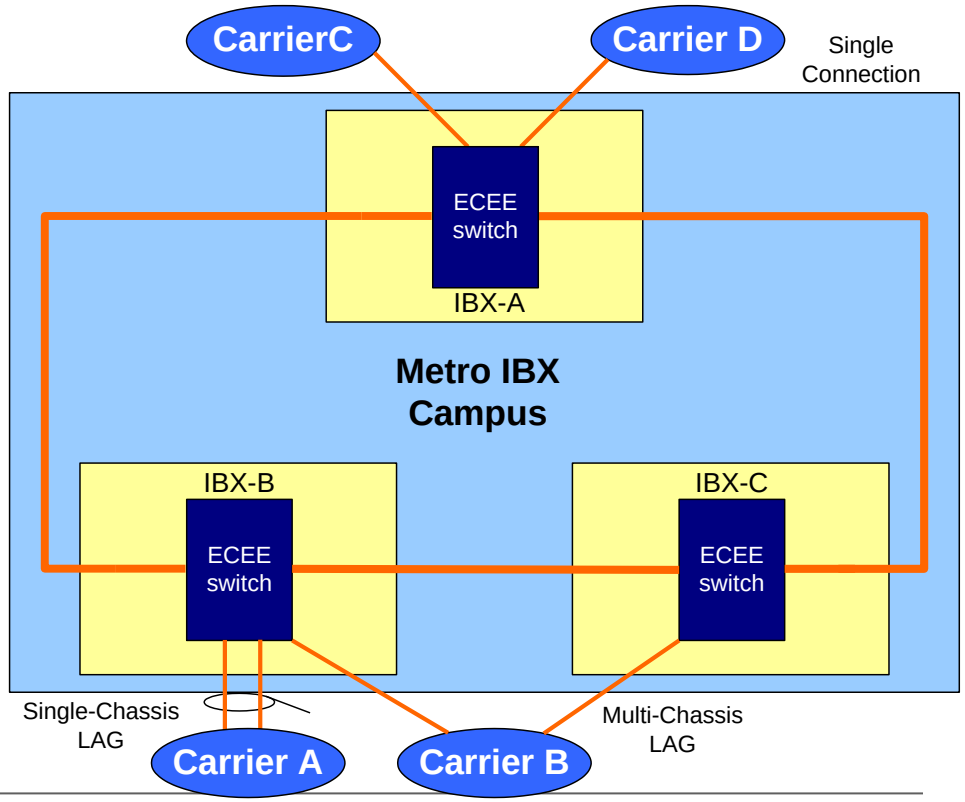
ECEE Architecture

1. Service Interoperability Mapping
   - S-Tag, C-Tag, TPID, MTU, etc.
2. QoS and Bandwidth Control Mapping
   - 802.1p bits, Traffic Classes, Port and Service limits
3. OAM
   - Test continuity and service performance at NNI boundary
4. Self-serve Portal Automates E-NNI tasks such as
   - Interact with other carriers, search lit building lists
   - Req/Ack Virtual Service Connections
   - Conduct OAM testing
   - View port and logical connections and statistics

ECEE Physical Connection Scenarios

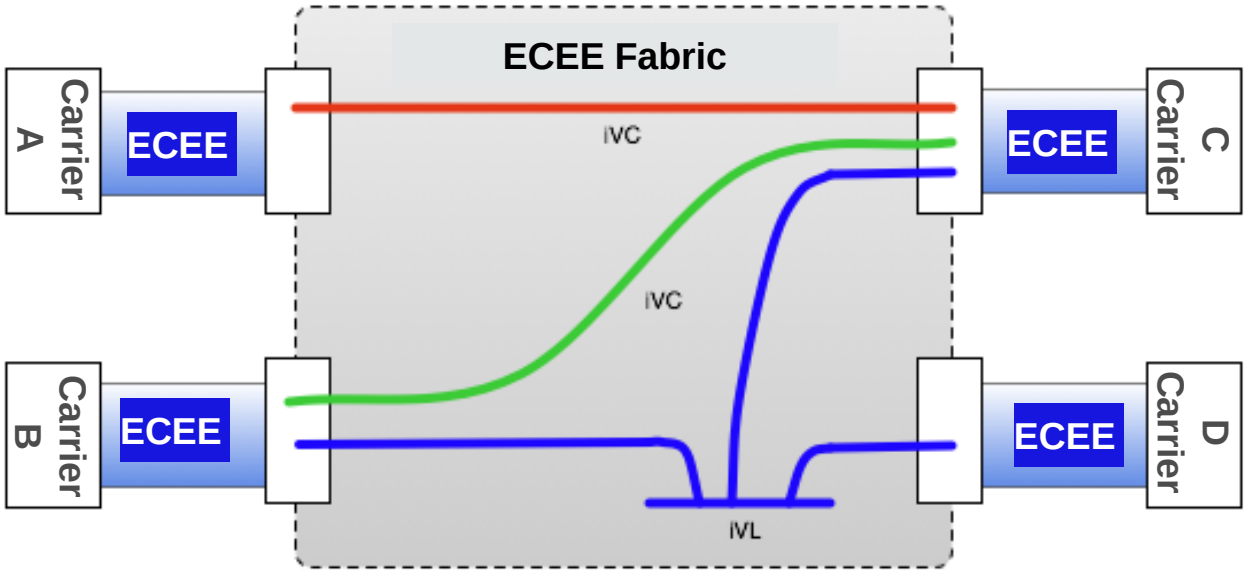
- Available Port Type
  - Gig-E port
  - 10Gig-E port

- Physical Connection Type
  - Single connection
  - Redundant Connections
    - Single Chassis LAG
      - Single chassis for redundant link connections (hot and stand-by)
    - Multi Chassis LAG
      - Multi chassis and multi link connections



Service Logical Connection Scenarios

- Point-to-Point Topology
- Multi-Point Topology
  - VPLS Protocol (LAN Environment)



S-Tag	C-Tag	Identifier	Type
2042		DC1_Port2	EPL

S-Tag	C-Tag	Identifier	Type
1001		WDC-P10-1001	EPL
2300	1209	WDC-P10-2300	EVPL
4110	409	WCD-P10-4110	ELAN

S-Tag	C-Tag	Identifier	Type
1032	1032	DC01_1032	EVPL
400	400	DC01_400	EVPL

S-Tag	C-Tag	Identifier	Type
235	476	DC_P2_230	ELAN

ECEE CoS Traverse Scenarios

*Recommend CoS traverse table for two different CoS networks (**Right-→ Left**)*

Classification Example	6 CoS	5 CoS	4 CoS	3 CoS	2 CoS	1 CoS
Class 6 (Voice, EF)	6	5	4	3	2	1
Class 5 (multimedia, AF4x)	5	4	3			
Class 4 (Critical Data, AF3x)	4	3		2	1	
Class 3 (Preferred Data, AF2x)	3	2	2			
Class 2 (Business Data, AF1x)	2			1		
Class 1 (Best Effort, BE)	1	1	1			

Traffic Direction →

*Recommend CoS traverse table for two different CoS networks (**Right-→ Left**)*

1 CoS	2 CoS	3 CoS	4 CoS	5 CoS	6 CoS	Classification Example
1	2	3	4	5	6	**Class 6 (Voice, EF)**
	1	2	3	4	5	**Class 5 (multimedia, AF4x)**
		1		3	4	**Class 4 (Critical Data, AF3x)**
			2	2	3	**Class 3 (Preferred Data, AF2x)**
					2	**Class 2 (Business Data, AF1x)**
			1	1	1	**Class 1 (Best Effort, BE)**

Traffic Direction →

Service Bandwidth Control Scenarios

EQUINIX

Principle of Service Bandwidth Control Method

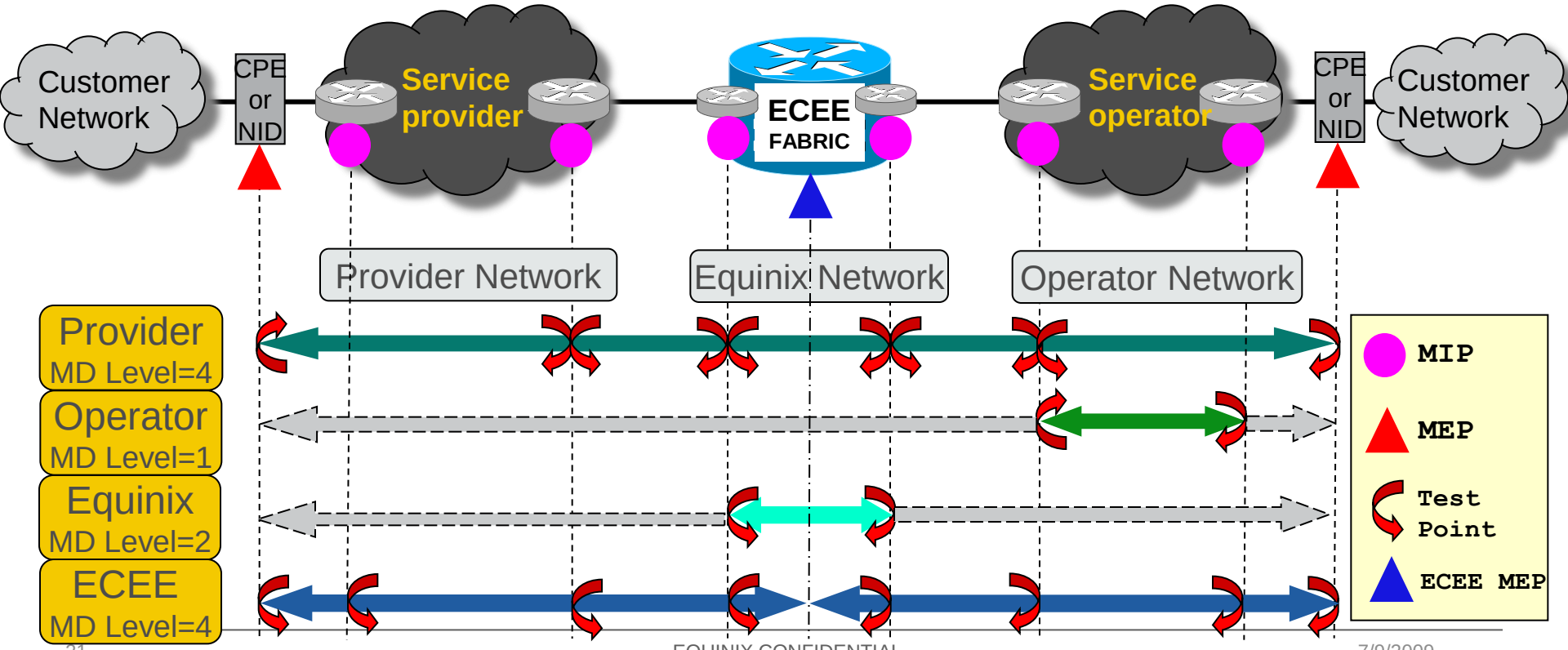
- Operator should match or adapt to service provider's method to guarantee the service bandwidth

Service Operator (partial service owner)	Service Provider (end-to-end service owner) Bandwidth Control Method					
		CIR	**Aggregate (CIR+PIR)**	**Fixed (CIR+PIR)**	**Aggregate, Per Q CIR**	**Fixed, Per Q CIR**
	CIR	CIR to CIR	Aggregate (CIR+PIR) to CIR	Aggregate (CIR+PIR) to CIR	Aggregate bandwidth to CIR	Aggregate bandwidth to CIR
	Aggregate (CIR+PIR)	CIR to CIR	CIR to CIR, PIR to PIR	CIR to CIR, PIR to PIR	Aggregate bandwidth to CIR	Aggregate bandwidth to CIR
	Fixed (CIR+PIR)	CIR to CIR	CIR to CIR, PIR to PIR	CIR to CIR, PIR to PIR	Aggregate bandwidth to CIR	Aggregate bandwidth to CIR
	Aggregate, Per Queue CIR	CIR to Highest Queue or one of Queues	CIR to highest Q, PIR to lowest Q	CIR to highest Q, PIR to lowest Q	Queue on Queue (s) map	Queue on Queue (s) map
	Fixed, Per Queue CIR	CIR to Highest Queue or one of Queues	CIR to highest Q, PIR to lowest Q	CIR to highest Q, PIR to lowest Q	Queue on Queue (s) map	Queue on Queue (s) map

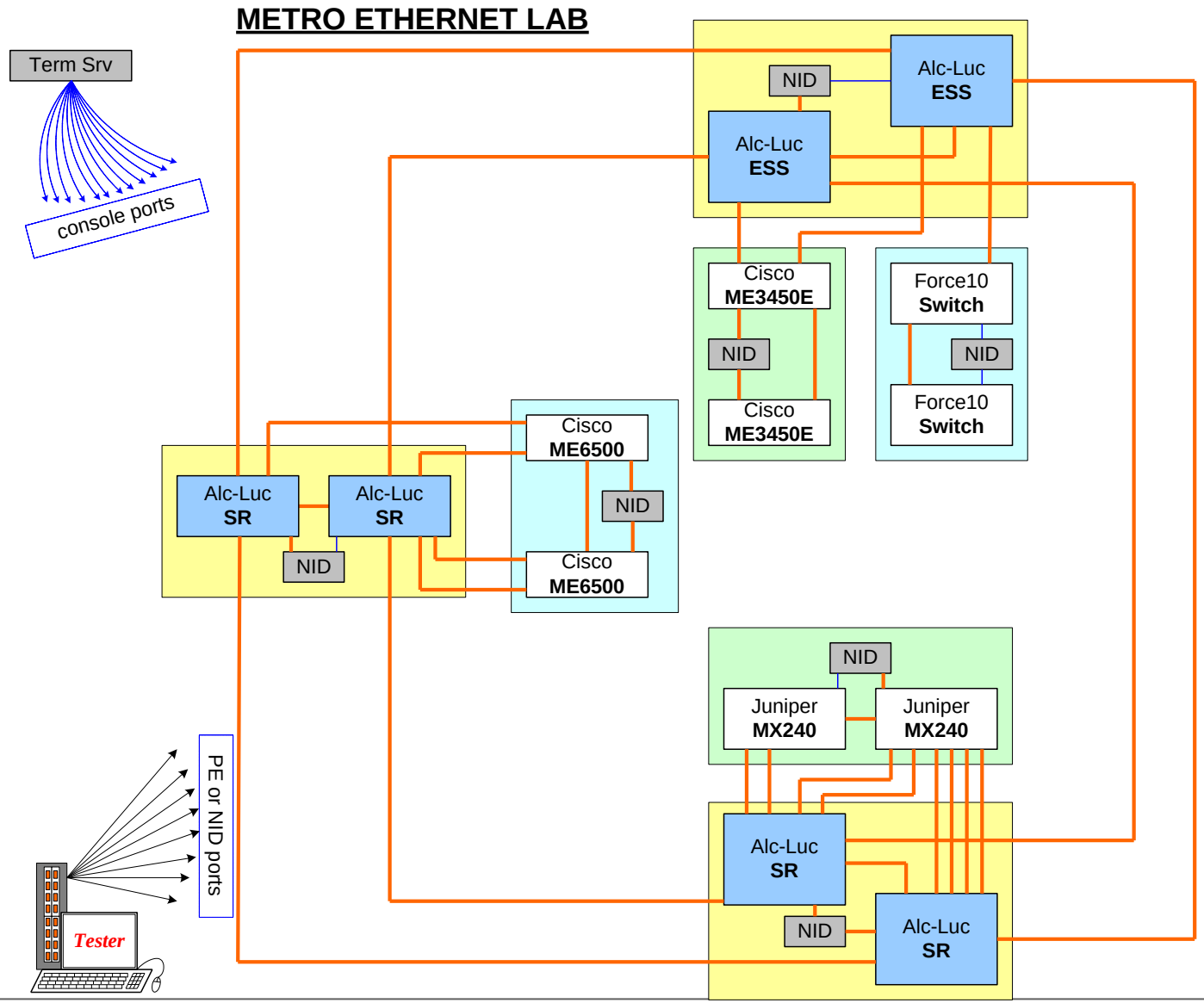
Ethernet OAM (CFM)

Service OAM (CFM)

- 802.1ag Configuration parameters
  - MD = service, MA = Service ID, MEP Level = 4, CCM with 10s interval
- CFM Features
  - Service connectivity check message (CCM)
  - Service loopback (LBM) test – and send test traffic through loop to see loss, latency, jitter
  - Service link trace (LTM) test
- ECEE MEP
  - ECEE MEP will be available from ECEE portal for assisting activation and troubleshooting



Equinix Metro Ethernet Lab Layout



ECEE Locations

Current Metros for Trial Program:

- Silicon Valley
- Chicago
- New York

Planned in 1H2010

- London
- Los Angeles

Planned in 2H2010

- Ashburn (Washington DC)
- Singapore/Tokyo/Hong Kong
- Paris/Frankfurt/Amsterdam
- 4 more “Phase 3” metros

Planned in 1H2011

- 5 more “Phase 4” metros

Contacts

Trial qualification:

1.ECEE Carrier Trial Requirements
2.ECEE Service Information Form

If you are interested in joining Trial program or learning more,

- Lane Patterson <lane@equinix.com>
- Raphael Ho <rho@equinix.com>

EQUINIX

Q & A

Lane Patterson
Chief Technologist

March 3, 2010