HKIX Updates at HKNOG 3.0

鄭志豪

Che-Hoo CHENG

www.hkix.net

09 Sep 2016

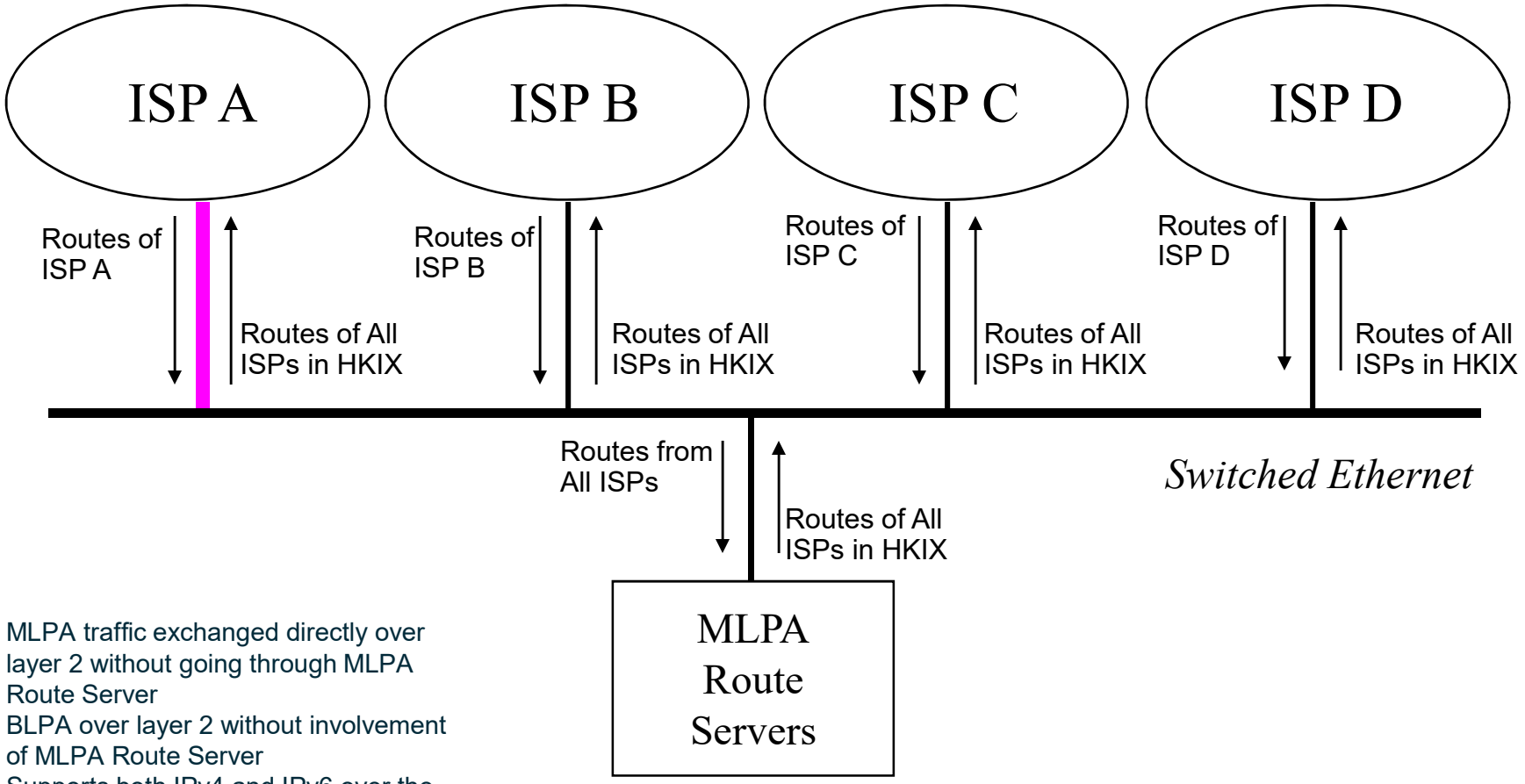
What is HKIX?

- Hong Kong Internet eXchange (HKIX) is the main layer-2 Internet eXchange Point (IXP) in HK where various autonomous systems can interconnect with one another and exchange traffic
- HKIX was a project initiated by ITSC (Information Technology Services Centre) of CUHK (The Chinese University of Hong Kong) and supported by CUHK in Apr 1995 as a community service
- **HKIX serves both commercial networks and R&E networks**
- The original goal is to keep intra-HongKong traffic within Hong Kong

Requirements to Connect

- Have AS (Autonomous System) number and IP address block(s) allocated/assigned by RIR (Regional Internet Registry)
- Be able to run BGP4 routing protocol
- Have global Internet connectivity independent of HKIX Access Switches
- Provide its own circuit(s) to HKIX Access Switch(es)

HKIX Model — MLPA over Layer 2 + BLPA



- MLPA traffic exchanged directly over layer 2 without going through MLPA Route Server
- BLPA over layer 2 without involvement of MLPA Route Server
- Supports both IPv4 and IPv6 over the same layer 2 infrastructure

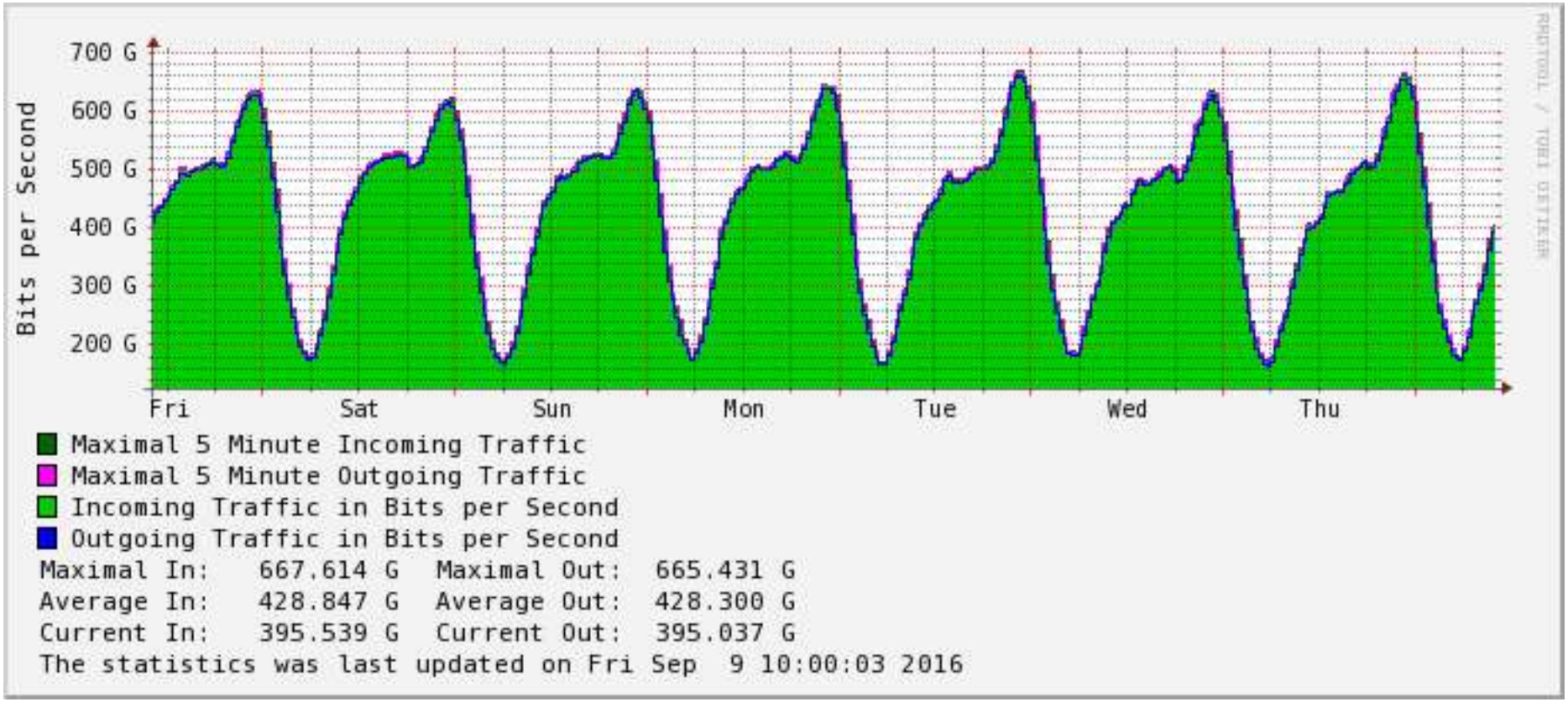
Help Keep Intra-Asia Traffic within Asia

- We have almost all the Hong Kong networks
- So, we can attract participants from Mainland China, Taiwan, Korea, Japan, Singapore, Malaysia, Thailand, Indonesia, Philippines, Vietnam, Cambodia, India and other Asian countries
- We now have more non-HK routes than HK routes
- We do help keep intra-Asia traffic within Asia
- In terms of network latency, Hong Kong is a good central location in Asia
- **HKIX does help HK maintain as one of the Internet hubs in Asia**
- **HKIX supports both domestic and international traffic**

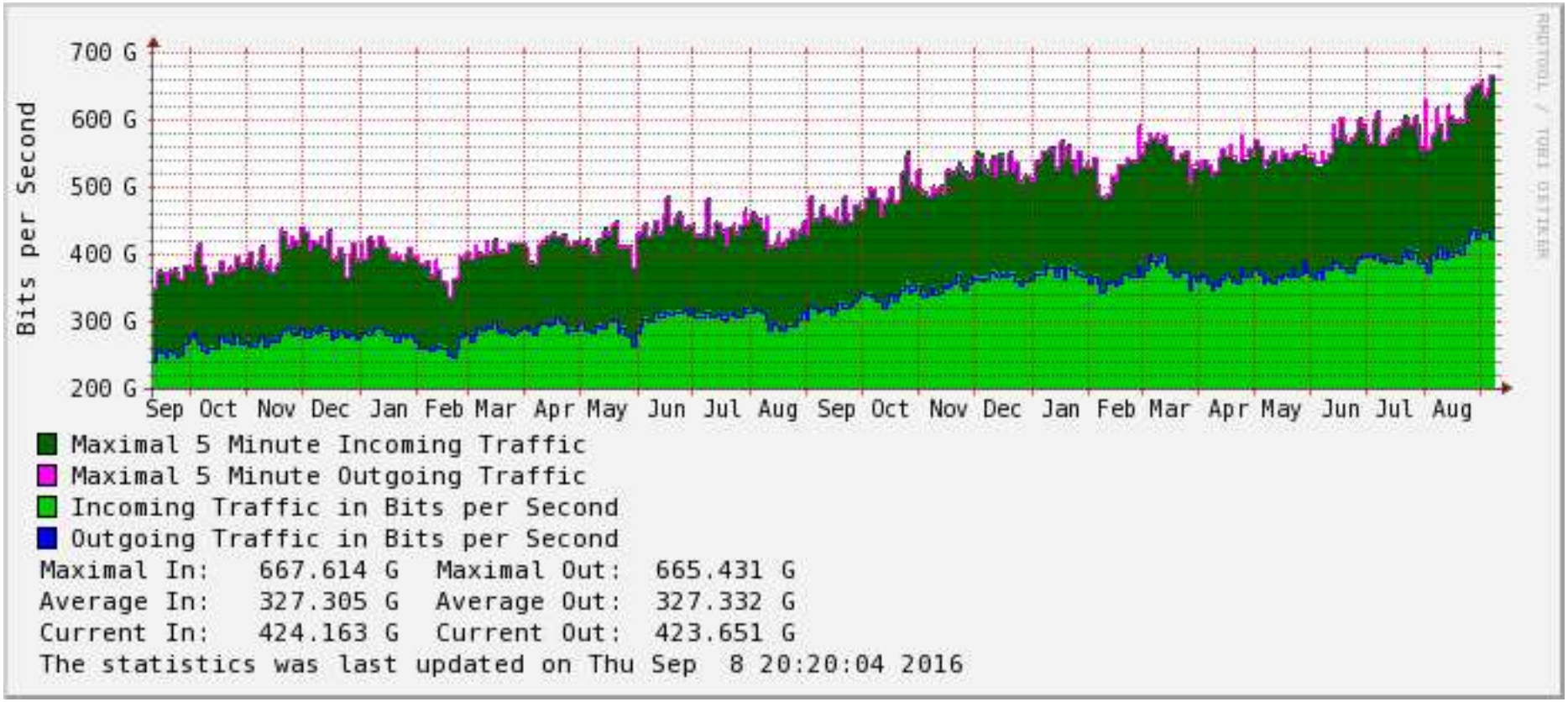
HKIX Today

- Supports both MLPA (Multilateral Peering) and BLPA (Bilateral Peering) over layer 2
- Supports IPv4/IPv6 dual-stack
- More and more non-HK participants
- 240+ autonomous systems connected
- 470+ connections in total
  - **~267 10GE** & ~205 GE
  - A few 100GE connections are coming
- 660+Gbps (5-min) total traffic at peak
- Annual Traffic Growth = 30+%

Weekly Traffic Statistics



Yearly Traffic Statistics



Charging Model

- An **evolution** from free-of-charge model adopted at the very beginning, to penalty-based charging model based on traffic volume for curbing abuse, to now simple port charge model for fairness and sustainability
- **Have started simple port charge model since 01 Jan 2013**
- Not target for profit
  - the Hong Kong Internet eXchange Ltd (100% owned by CUHK) to sign agreement with participants
  - Target for long-term sustainability

HKIX Charge Table (v1.3)

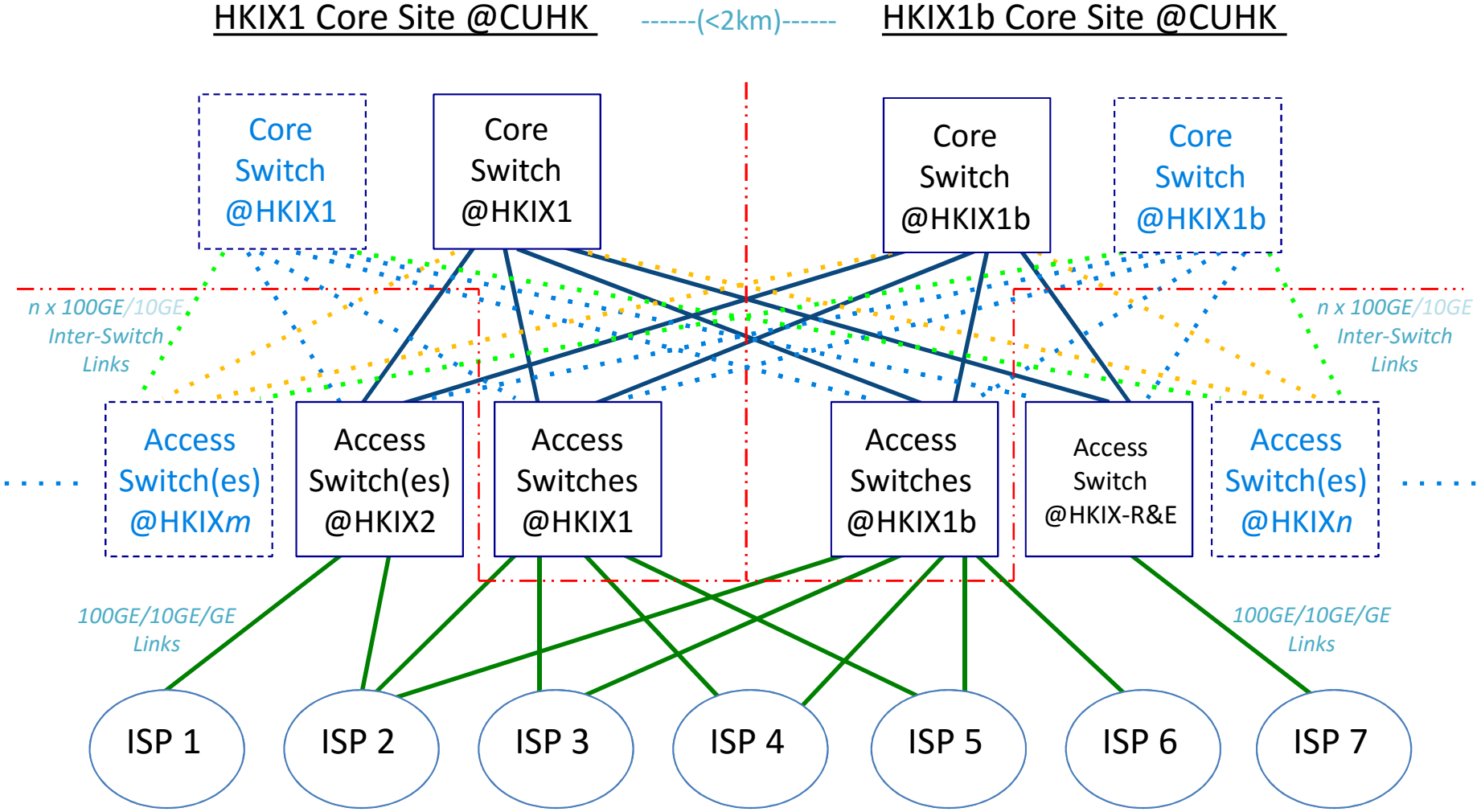
Standard Port Charges						NRC		MRC	
Port	Interface	Standard Interface	Availability			HKD	*USD*	HKD	*USD*
			HKIX1	HKIX1b	Satellite Sites				
GE	T	Yes	Yes			Waived		**936**	*120*
	SX	Yes			Yes				
	LX/LH	Yes		Yes	Yes				
	EX	No		Yes		**9,360**	*1,200*		
	ZX	No		Yes		**15,600**	*2,000*		
10GE	SR	Yes			Yes	**10,140**	*1,300*	**7,800**	*1,000*
	LR	Yes	Yes	Yes	Yes	**17,940**	*2,300*		
	ER	No	Yes	Yes		**39,000**	*5,000*		
	ZR	No	Yes	Yes		**62,400**	*8,000*		
100GE	LR4	Yes	Yes	Yes	Some	**78,000**	*10,000*	**31,200**	*4,000*
	ER4-Lite	No	Yes	Yes		**312,000**	*40,000*		

http://www.hkix.net/hkix/Charge/ChargeTable.htm

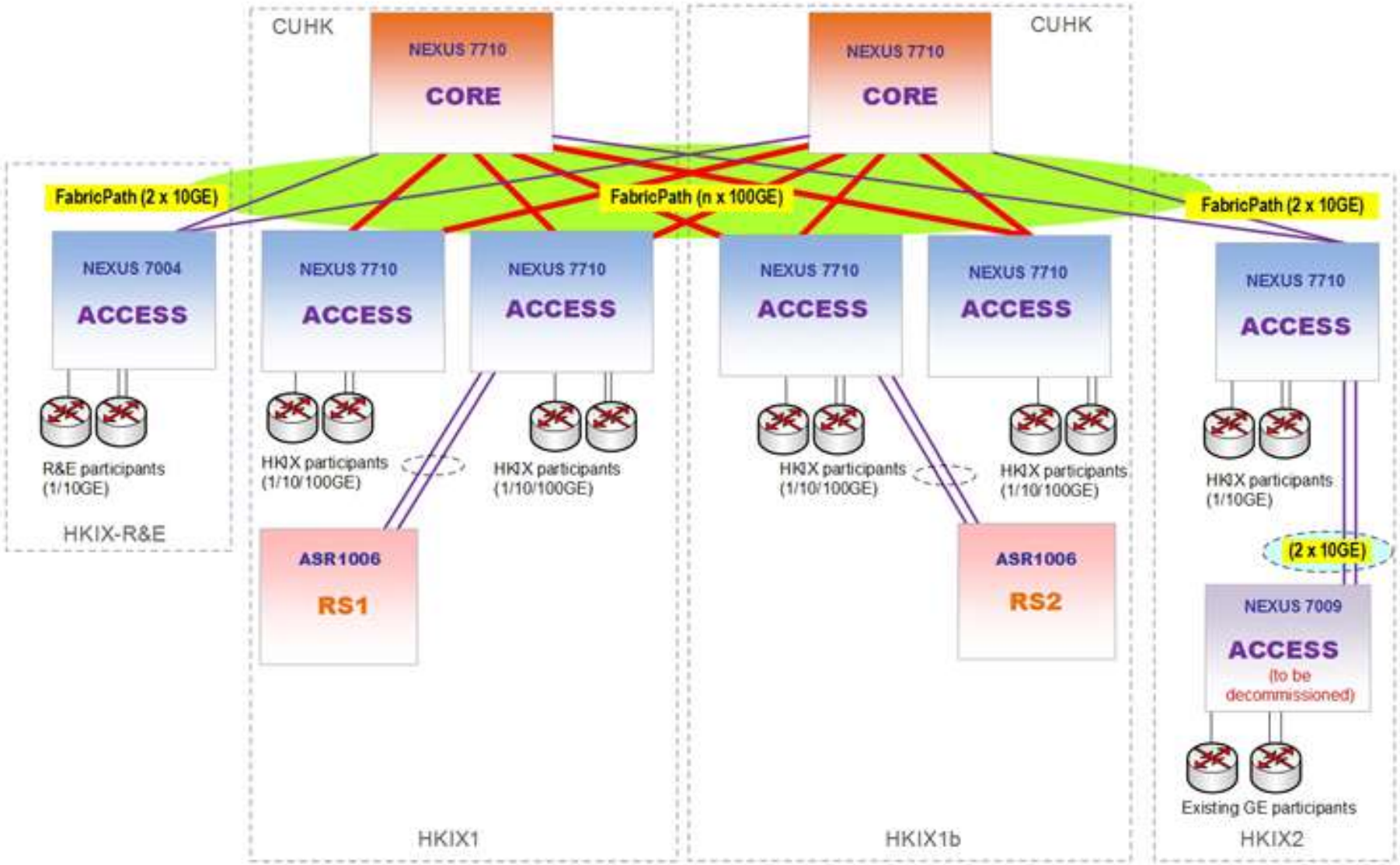
Setting up
Multiple HKIX Satellite Sites

- Allow participants to **connect to HKIX more easily at lower cost** from those satellite sites in Hong Kong
- Open to commercial data centres in HK which fulfil minimum requirements so as to maintain neutrality which is the key success factor of HKIX
- Intend to create win-win situation with satellite site collaborators
- To be named HKIX2/3/4/5/6/etc
  - HKIX2 already confirmed - being migrated from old architecture to new architecture
- *HKIX1 and HKIX1b (the two HKIX core sites **located within CUHK Campus**) will continue to serve participants directly*

New HKIX Dual-Core Two-Tier Spine-and-Leaf Architecture For 2014 and Beyond



HKIX Network Diagram (AUG 2016)



1. HKIX1 and HKIX1b are the two core sites of HKIX while the others are satellite sites.
2. HKIX participants are encouraged to connect to multiple sites for site resilience.

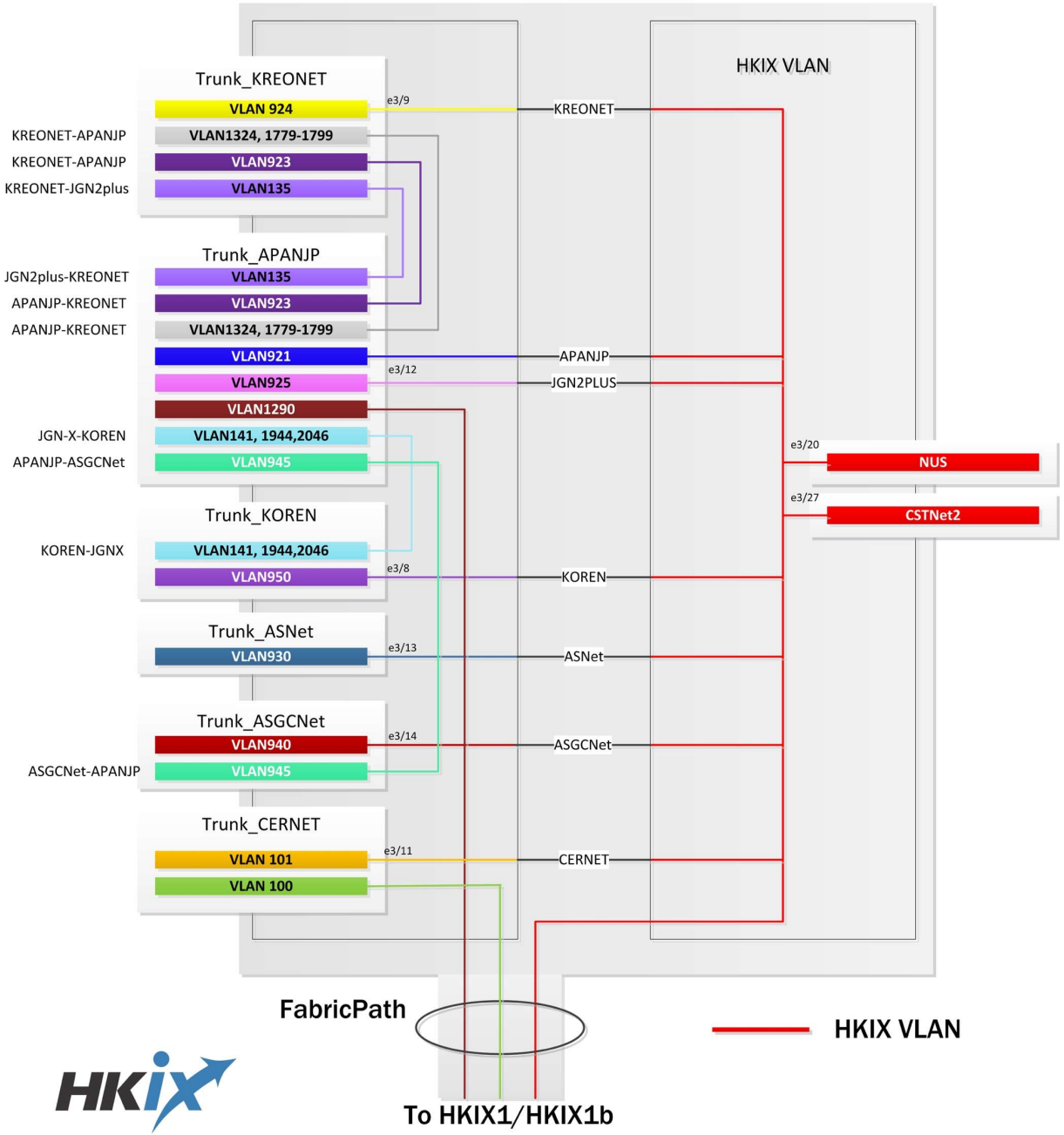
Near-Term Plan

- 4Q2016 – Production of Blackholing function (via Route Servers)
- 4Q2016 – More Route Server functions such as hiding AS4635 in AS Path
- 1Q2017 – True 24x7 NOC

Research & Education Networks Having Presence in HK

- APAN-JP/JGN-X
- ASCC-ASNET
- ASGC
- ASTI-PREGINET
- CERNET/CERNET2
- CSTNET
- KISTI-KREONET2
- NIA-KOREN
- NUS
- TEIN4
- **Most of these R&E networks have their IPLs terminated at MEGA-i Building with network presence (but on different floors)**
- **Most are connected to HKIX-R&E at MEGA-i**
  - **HKIX-R&E is a special node of HKIX (www.hkix.net) which serves R&E networks only and connects to HKIX core switches with 2 x 10GE circuits**

HKIX-R&E Network Diagram



Updated on 01-SEP-2016

HKIX-R&E – Special Support for R&E Networks Having Presence in HK

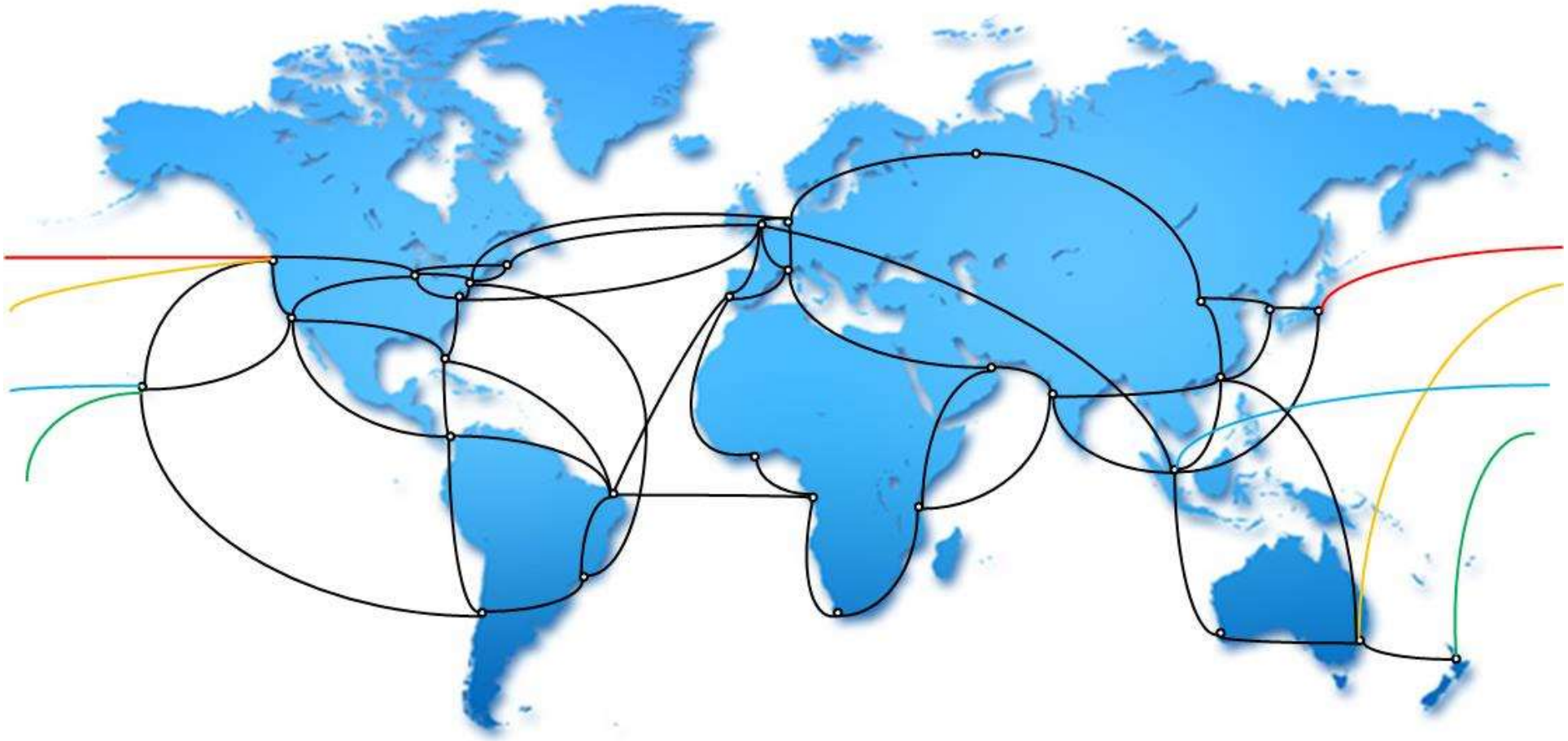
- **HKIX helps those R&E Networks to interconnect with commercial networks without restrictions via HKIX-R&E switch at MEGA-i**

- Support GE/10GE Trunk Ports for R&E Networks only
- Support special point-to-point VLANs for R&E Networks only
  - For private interconnections among any 2 R&E networks
  - Jumbo Frame support

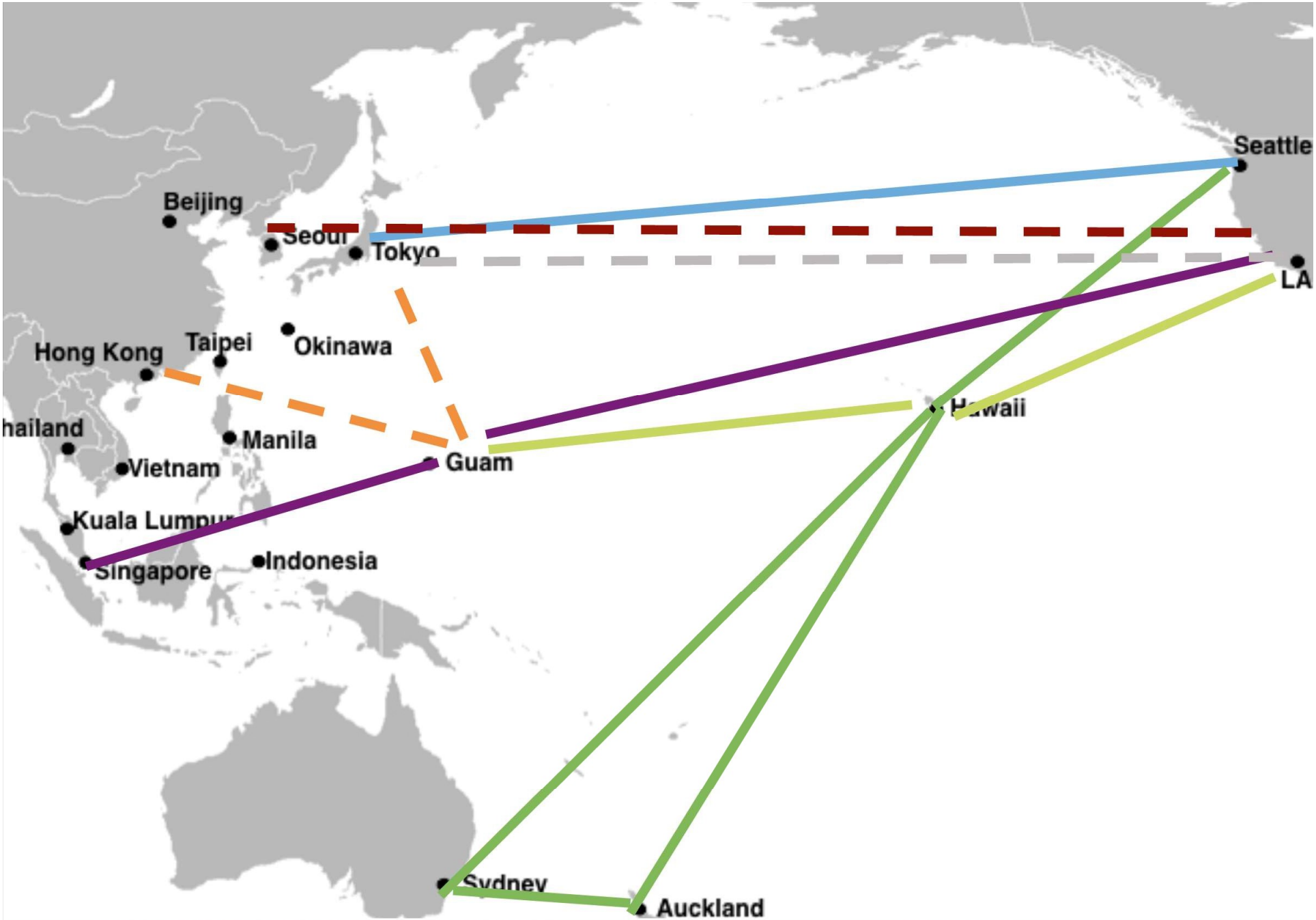
- *Offer colo at new HKIX1b site inside CUHK Campus*
  - *Up to 2 racks per R&E network*
    - *Discounted MRC*
  - *No MRC for fiber cross-connects*
  - *Basic Remote Hands & Eyes included*
  - *This offer always stands*

GNA – artist's impression

Credit – Mian Usman (DANTE)



Reference: http://gna-re.net


Seattle
Beijing
Seoul
Tokyo
LA
Hong Kong
Taipei
Okinawa
Hawaii
Thailand
Manila
Guam
Vietnam
Kuala Lumpur
Singapore
Indonesia
Sydney
Auckland

Possible Guam-HK 10G/100G Circuit Termination Point

- To be funded by NSF of US: Confirmed? Timeline?
- If go ahead, where is the best termination point in HK?
  - Best to terminate it at the possible HKOXP
  - *See http://gna-re.net for information of Global Network Architecture program for R&E networks which covers the concept of Open eXchange Point (OXP)*
- Best to have all R&E networks co-located in the same room with long-term contract for easiest interconnections and sustainable development
  - Currently, individual R&E networks at MEGA-i need to relocate from one floor to another within MEGA-i once every 2 to 3 years due to change of IPL supplier
  - Laying fiber cross-connects across floors within MEGA-i can be difficult sometimes

Things to Determine

- **Do we need Open eXchange Point in Hong Kong (HKOXP)? Who to set up and operate it?**
  - If HK has an OXP, it can benefit significant part of R&E community
    - Note that a lot of R&E networks have already chosen to have network presence in Hong Kong
  - **JUCC/HARNET expressed interest to contribute by providing the switch needed for HKOXP**
    - **<u>May</u> gradually take over the existing role of HKIX-R&E node (the left part)**
- **Where should be the location of the shared colo space in Hong Kong for all R&E networks having presence in HK?**
  - MEGA-i?
  - CUHK/HKIX1b?
  - Other commercial data center options?
    - Better be HKIX Satellite Sites
  - NOT very critical though
- **The decision process is complicated so it will take quite a while to materialize but hopefully HKIX will play a key role in HKOXP**
  - **The prerequisite is Guam-HK circuit is confirmed**

Thank You!