

Hong Kong peering scene and network infrastructure

TWNOG 3.0 – 21st Jun, 2019 – Taipei, Taiwan

Agenda

- Hong Kong Overview
- Hong Kong Telecommunications
- Internet Exchanges
- Data Centers
- Sub Sea Cables & Cable Landing Stations
- Transit Carriers & Cloud Providers

Hong Kong Overview

Demography (as of 31st Mar 2018)

- Population: 7.413 millions
- Households: 2.535 millions

Area

- 1,106 square km

Official Languages

- Chinese (Cantonese)
- English



Hong Kong Telecommunications Licenses

- Issued by The Office of the Telecommunications Authority (OFTA)
- Carrier Licenses
 - Unified Carrier License (“UCL”)
 - Fixed Carrier License (“FCL”) / Fixed Carrier (Restricted) License (“FC(R)L”) / Fixed Telecommunications Network Services (“FTNS”) License
 - Mobile Carrier License (“MCL”) / Mobile Carrier (Restricted) License (“MC(R)L”)
- Mobile Virtual Network Operator (MVNO) License
- Services-Based Operator (SBO) License
- Space Station Carrier License (Telemetry, Tracking, Control & Monitoring License)
- Class Licenses
- Other Licenses

248 Licensed Internet Service Providers (as of 5 Jun, 2019)

- Major home broadband providers
 - PCCW Netvigator
 - Hong Kong Broadband (HKBN)
 - Hutchison Global Communications (HGC)
 - i-Cable
- Major corporate broadband providers
 - PCCW Business Netvigator
 - Hutchison Global Communications (HGC)
 - Hong Kong Broadband (HKBN) [merged with WTT HK in April 2019]

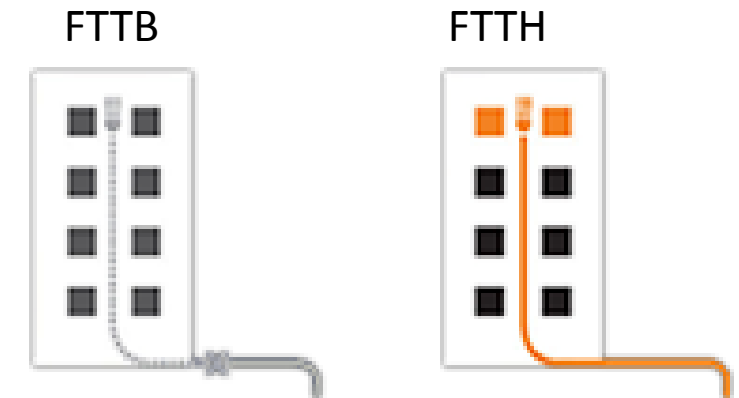
Internet access

Fixed broadband services (as of Dec 2018)

- 2.7 millions registered customer accounts
- 93.2% - households penetration rate
- 74.3% FTTH/B household penetration rate
 - 47.8% Fibre-to-the-home
 - 26.5% Fiber-to-the-building
- Up to 10G for fixed broadband services
 - (1G – USD 18 per month)
 - (10G – USD370 per month)

Wi-Fi (as of Mar 2019)

- 56,993 public Wi-Fi hotspots
- free Wi-Fi in 603 government premises
- Wi-Fi.HK Hotspot Locations: 3,690



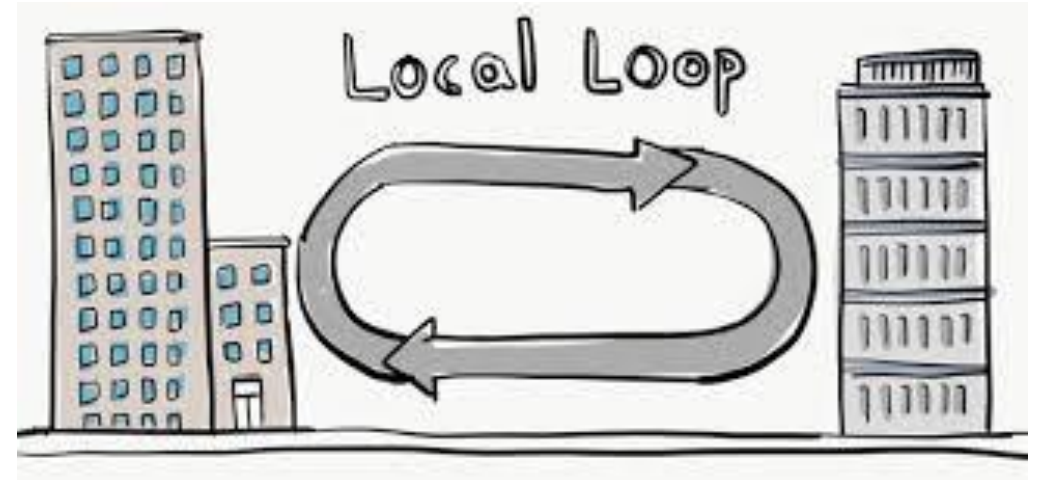
Mobile Services

- 4 mobile network operators:
 - HKT (csl./1010)
 - Hutchison (3HK)
 - SmartTone
 - China Mobile Hong Kong (CMHK)25 MVNOs: HKBN, Sun Mobile, CT, CU etc
- Mobile users (as of October 2018)
 - 19.37 million mobile subscribers
 - 259.9% penetration rate
 - 18.57 million mobile broadband customers



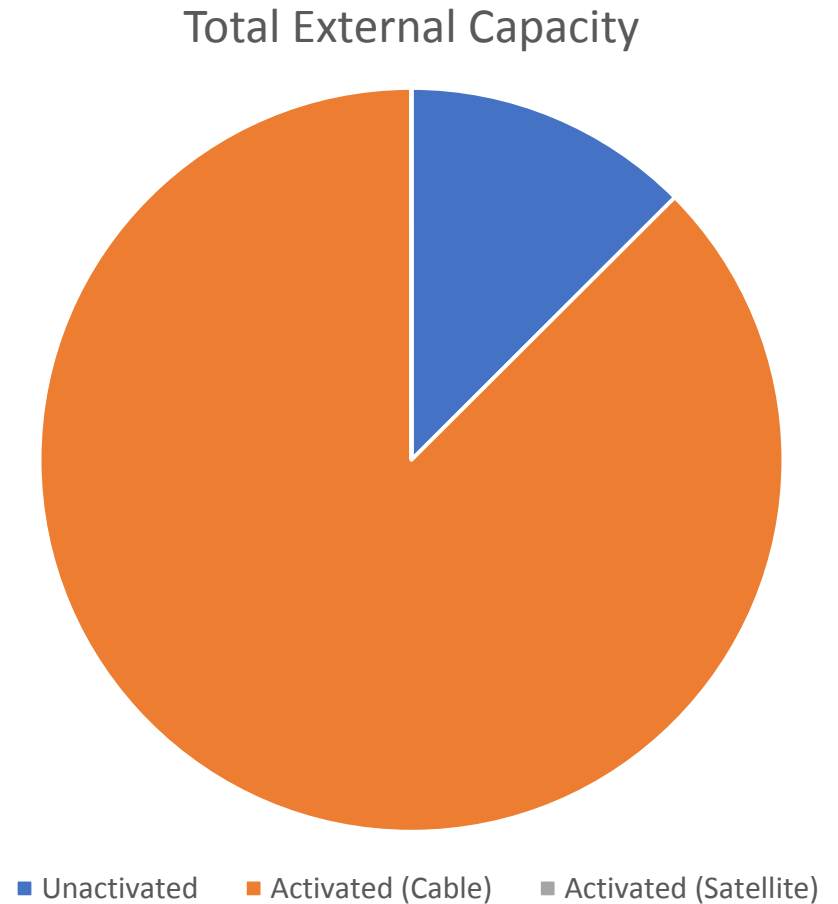
29 Local fixed network operators (as of Jun 2019)

- Major operators
 - PCCW-HKT
 - HGC
 - HKBN [merged with WTT in Apr 2019]
 - Traxcomm
 - Towngas Telecom (TGT)
 - Superloop



External Telecommunications (as of 12/2018)

- 230 satellite earth station antennas
- 8 submarine cable landing stations
- 11 submarine cable systems
- 73,842Gbps equipped capacity
 - 73,838Gbps by Cable*
 - 4.09Gbps by Satellite
- 64,592Gbps activated capacity
 - 64,590Gbps by Cable*
 - 2.05Gbps by Satellite

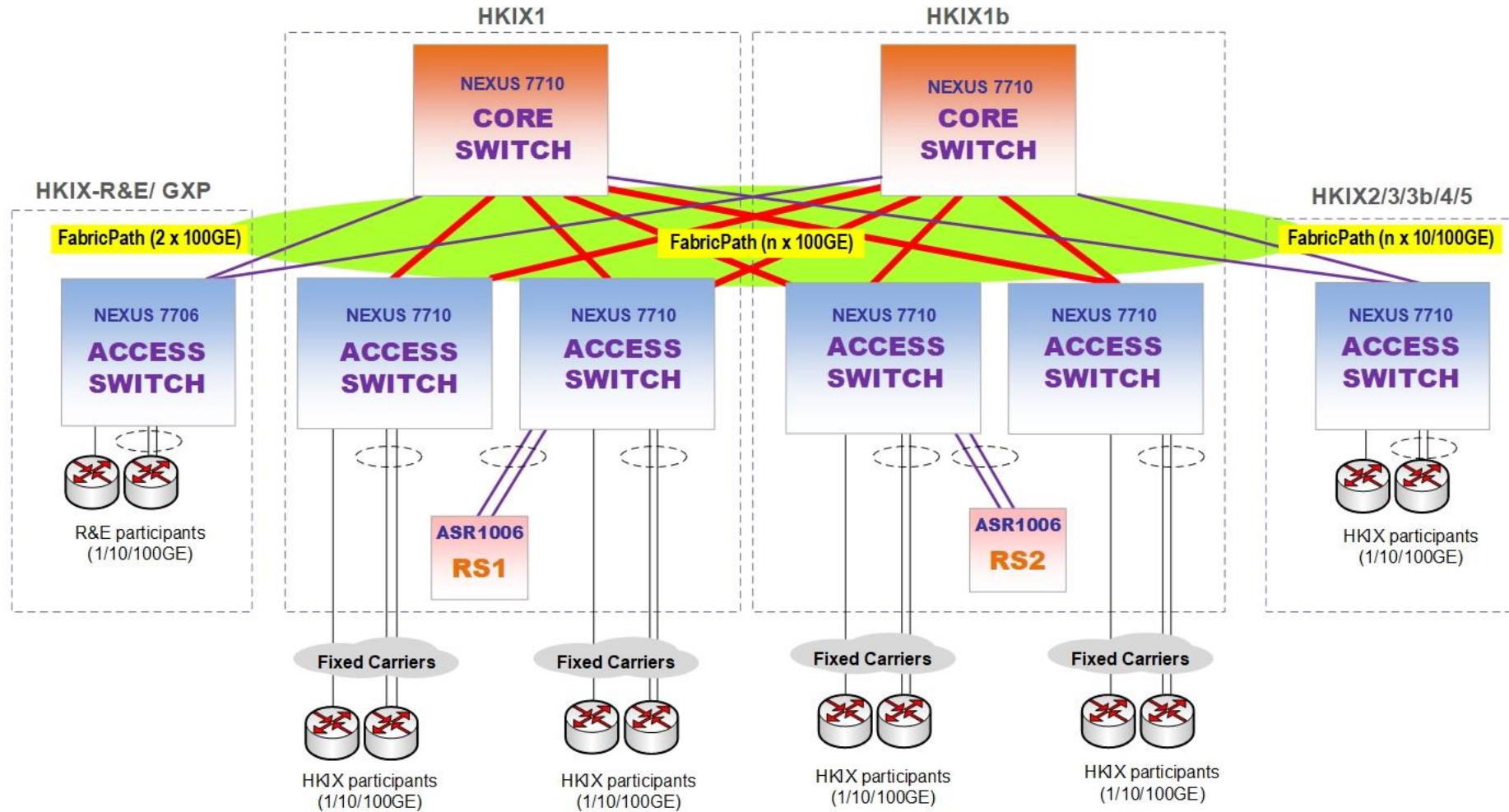


*Cable includes submarine cable systems and overland cable systems

Internet Exchanges in Hong Kong



HKIX Network Diagram (May 2019)



1. **HKIX1** and **HKIX1b** are the two core sites of HKIX at CUHK while **HKIX2/3/3b/4/5** are HKIX satellite sites outside of CUHK.
2. HKIX participants are encouraged to connect to multiple sites for site resilience.



HKIX Satellite Sites and Reseller Program

5 new satellite sites were established in collaboration with 4 commercial data centres which provide colocation services as well as easy connections to HKIX.

Satellite Site	Satellite Site Collaborator	District	Ports Supported
HKIX2	CITIC Telecom International Limited	Kwai Chung	GE/10GE
HKIX3 / HKIX3b	SUNeVision Holdings Limited	Fo Tan / Chai Wan	GE/10GE/100GE
HKIX4	NTT Com Asia Limited	Tseung Kwan O	GE/10GE/100GE
HKIX5	KDDI Hong Kong Limited	Tseung Kwan O	GE/10GE/100GE

- For connections to HKIX at Satellite Sites, [special connection charges](#) will be charged by relevant operators, in addition to the [port charges](#) charged by HKIX.
- For HKIX participants not co-located at HKIX satellite sites, they can still connect to any of the two HKIX core sites, i.e. HKIX1 and HKIX1b sites by local loops via local loop providers.

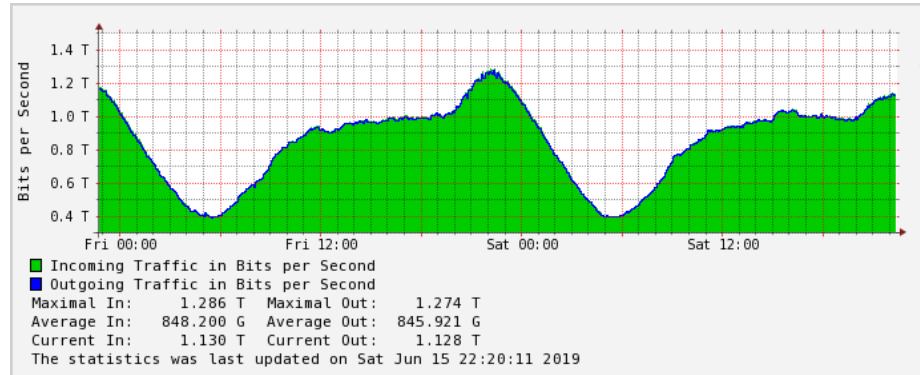
Reseller Program: <http://www.hkix.net/hkix/ResellerPPT.PDF>



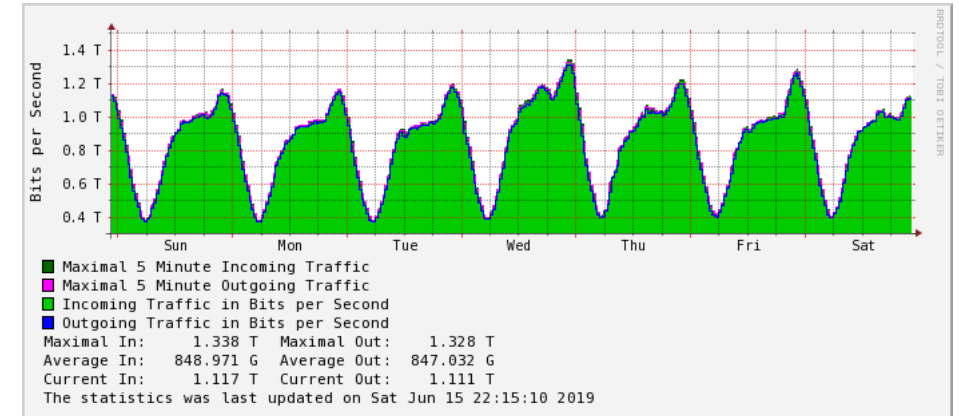
HKIX traffic and route prefixes (as of 15th Jun 2019)

Aggregate
Switching
Statistics
Peak: 1.34T
on 12th Jun

Daily Graph (5 Minute Average)

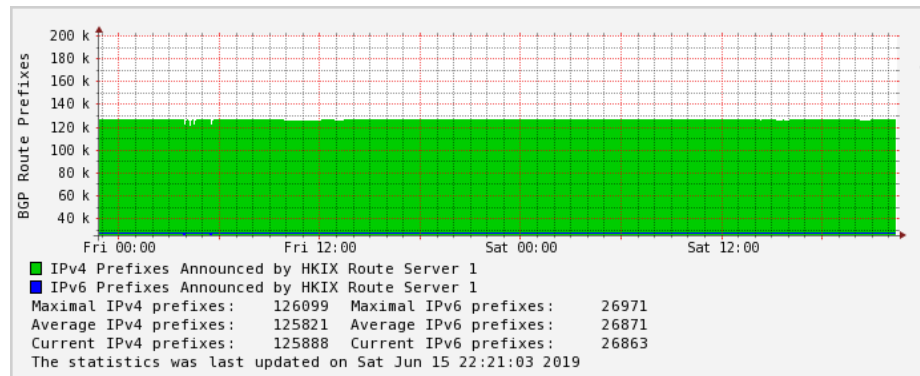


Weekly Graph (5 Minute Average)

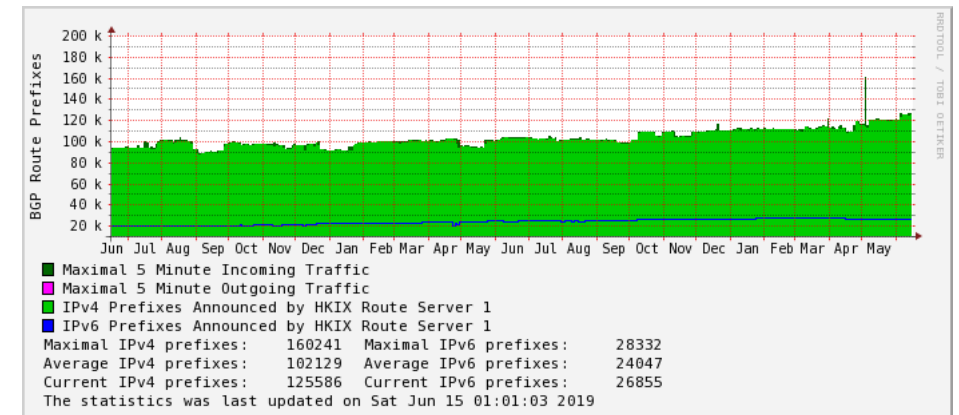


Number of
Route Prefixes
announced by
RS1
~126k IPv4
~27k IPv6

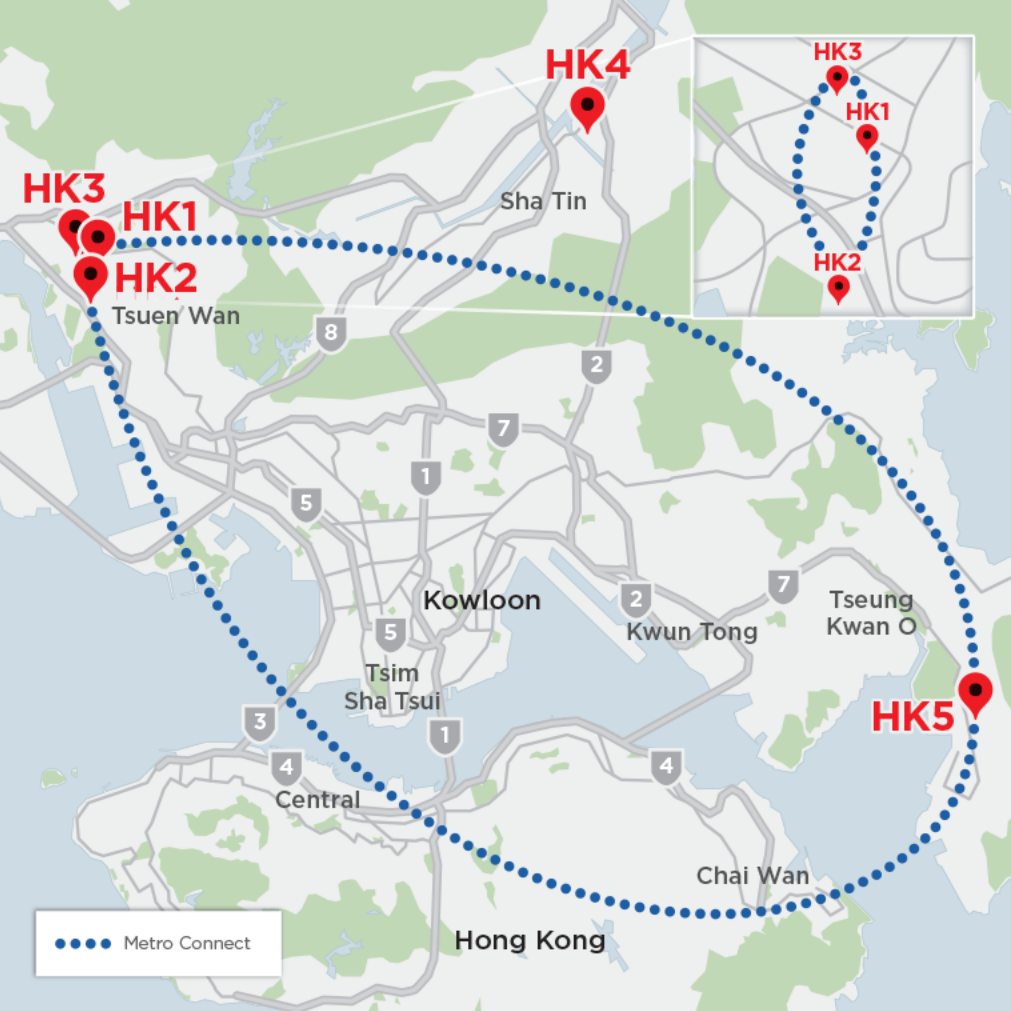
Daily Graph (5 Minute Average)



Yearly Graph (1 Day Average)

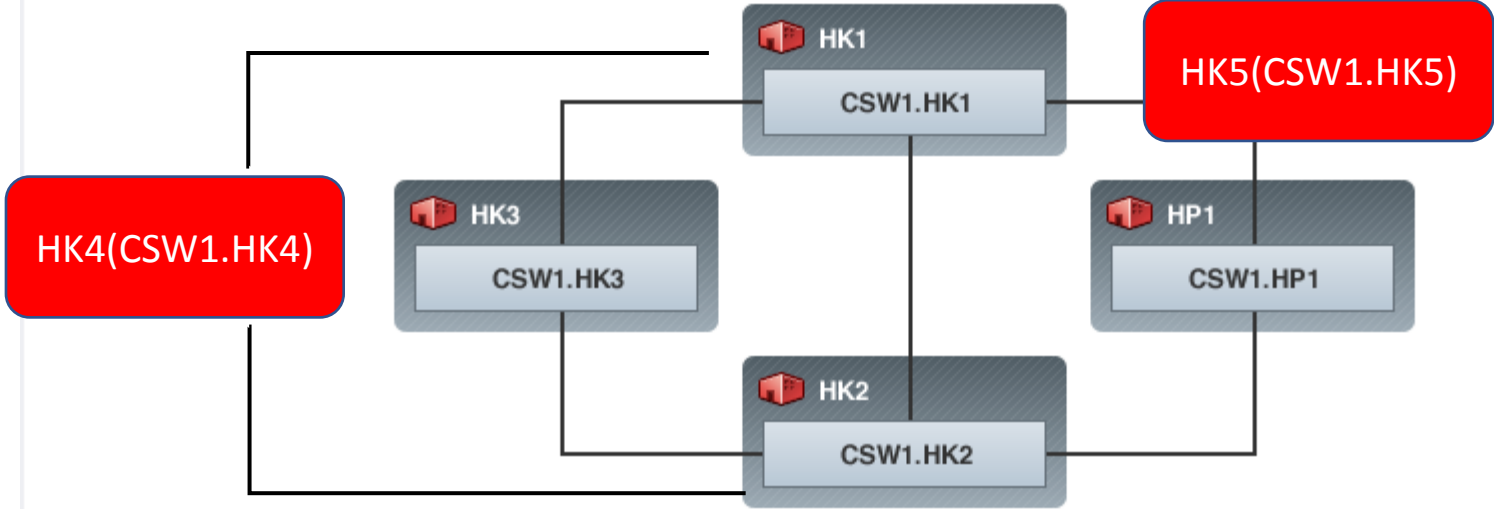


Equinix IX Hong Kong



Hong Kong IX Topology

Save



AMS-IX Hong Kong

AMS-IX HK stats (as per Jun, 2019).

Colocations

- 1 AMS-IX PoP: Sino Favour Centre
- 7 other colocations from where to connect (via partners HGC or and/or Megaport): MEGA-I, Equinix HK1, Equinix HK2, Big Data Exchange, Watson Data Centre, Cavendish Data Centre, HKCOLO TKO

Connected networks

- 52 connected ASNs
- 4 Inter-IPX members: BICS, Deutsche Telekom, HGC ad Tata Communications
- 52 active ports

Traffic

- 404 Gbps total capacity
- Peak traffic: 53 Gbps

Other feature

- AMS-IX HK customers can connect directly to AMS-IX Amsterdam

Sources: https://ams-ix.hk/connected_parties



BBIX Hong Kong



A Softbank Group company

- Web site: <http://www.bbix.net/en>
- Peering DB
 - Exchange Points
 - BBIX Tokyo
 - NTT Data Otemachi
 - Comspace
 - TY2
 - TY4
 - @Tokyo
 - SoftBank's Maruyama Cable Landing Station
 - NTT Communications Nexcenter
 - BBIX Osaka
 - NTT Data Dojima 4
 - Equinix OS1
 - **BBIX Hong Kong**
 - **Mega-i Advantage 13F**
 - **Equinix HK1**
 - BBIX Singapore
 - Equinix SG1
 - BBIX Thailand
 - TIDC North Muang Thong Data Center

Quick Facts (as of April 2019)

- 37 connected member ASNs
- Tokyo nodes are connected by BBIX's nx100G backbone

Service

- Internet Exchange
- Roaming Peering eXchange
 - L2 peering for mobile data roaming
 - Introducing “Peering Culture” to the mobile roaming environment.

A distributed Internet Exchange



Smart IX Node Location



- Hong Kong:

1. Mega-i 13th Floor
2. HK1 Equinix

- Singapore: SG1 Equinix 4th Floor

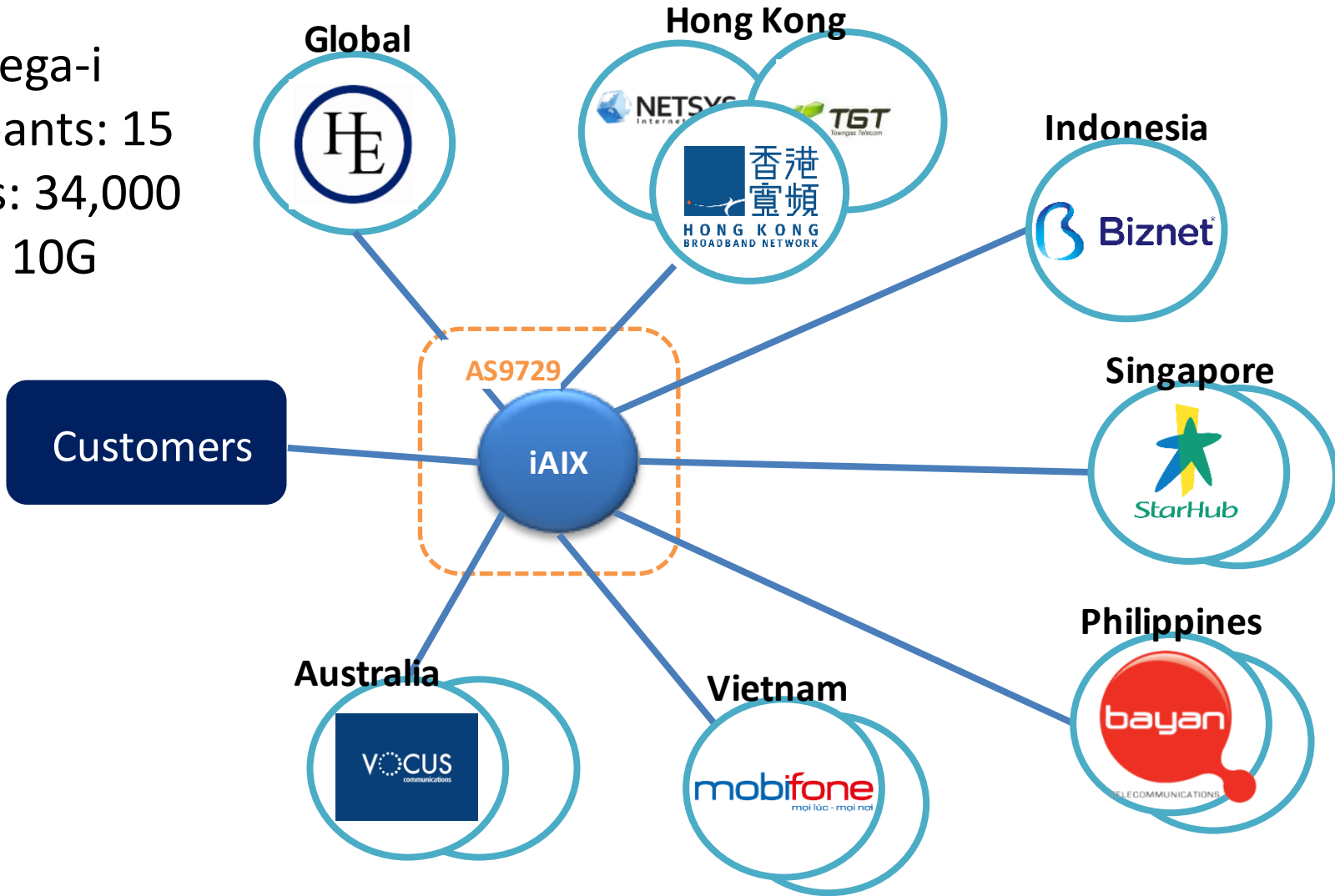
- Tokyo:

1. NTT Data Otemachi
2. Comspace
3. TY2 Equinix
4. TY4 Equinix
5. @Tokyo
6. SoftBank's Maruyama Cable Landing Station
7. NTT Communications Nexcenter

iAIX Platform



Location: Mega-i
of participants: 15
of prefixes: 34,000
Peak traffic: 10G



KINX IX in Hong Kong



➤ **KINX IX Remote Peering PoP**

- ✓ HK Mega Plus
- ✓ KINX has backbone between Korea and HK

➤ **Networks**

- ✓ 60 connected ASNs
- ✓ Members consist of Tier II carriers / MSO in South Korea (about 15% of KR eyeball network)
- ✓ Major cloud service providers, CDN, and Chinese content providers.

➤ **Traffic**

- ✓ Peak Traffic : 450Gbps+

➤ **Others**

- KINX also operates remote peering PoP in Japan @Tokyo CC1 and Equinix TY2
- <https://www.peeringdb.com/ix/52>

Data Centers in Hong Kong

50+ unique colocation data centers

- SUNeVision:
 - **Mega-i**, Mega Two, Mega Plus, ONE, JUMBO
- Equinix:
 - **HK1**, HK2, HK3, HK4, HK5
- NTT FDC, HKColo, DRT, Cyxtera, CMI GNC, China Unicom, Telstra Global, PCCW SkyExchange, Towngas IAC, TM Billion Center, HGC GlobalCenter, IXTech, iTech, CITIC, OneAsia and Global Switch, etc
- Upcoming: HGC BDX, AirTrunk, GDS, etc

Driving factors: Hyperscale and Land scarcity

Tseung Kwan O DC Layout

Sources: <https://www.hkstp.org/media/1803/tkoie.pdf>

HKColo / Telehouse

CMI GNC

Global Switch

Towngas IAC

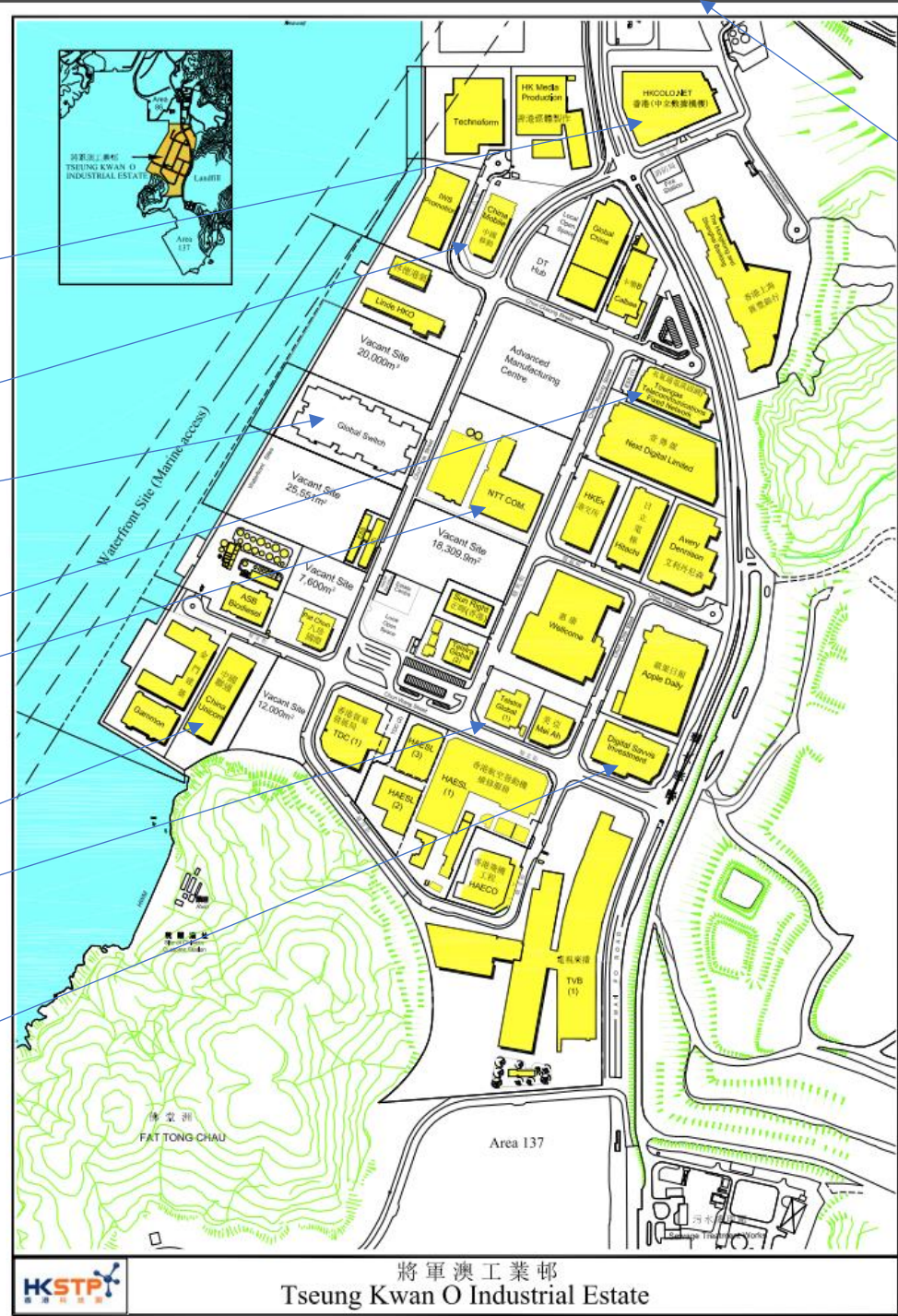
NTT FDC

China Unicom

Telstra Global

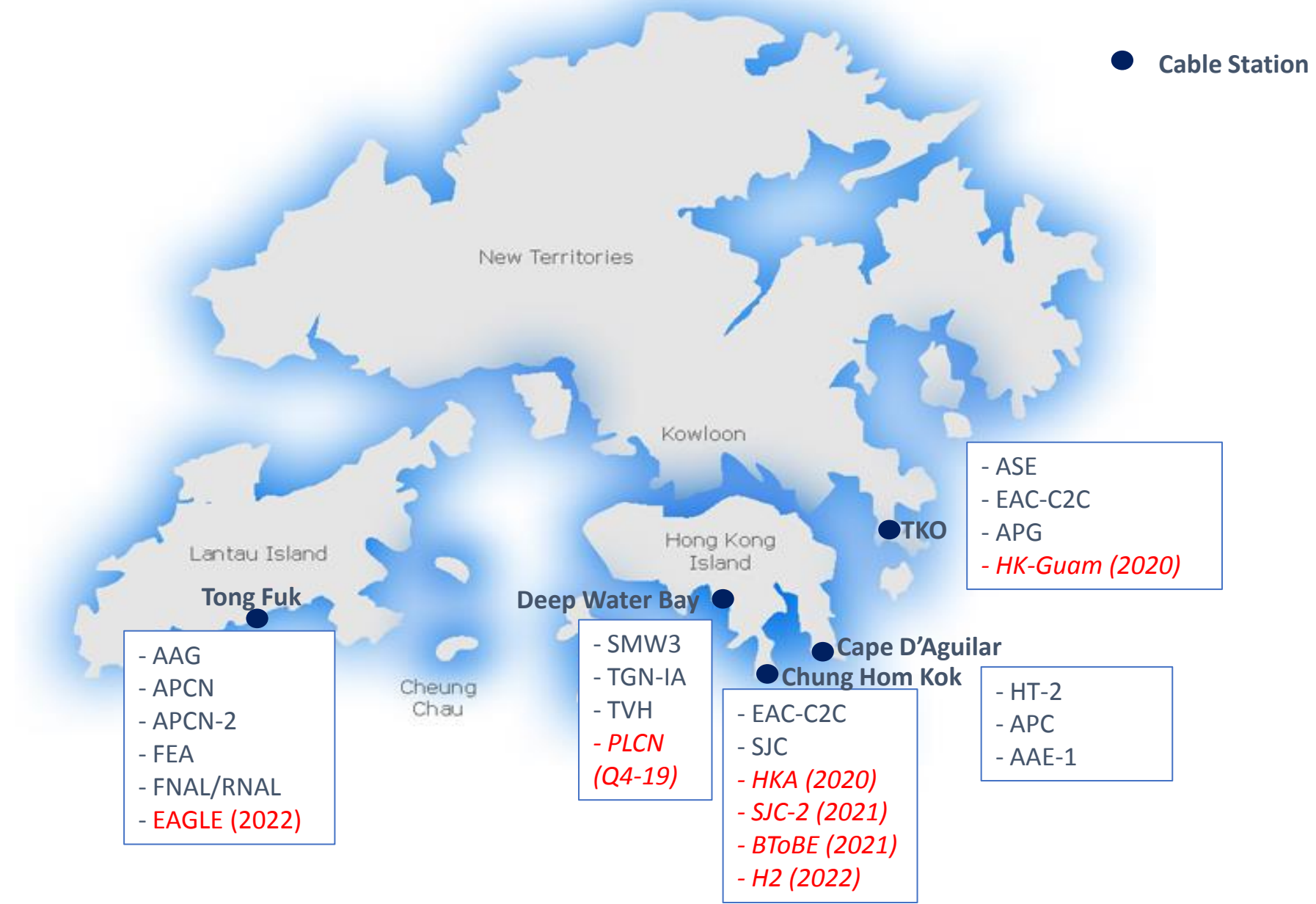
DRT / Cyxtera

Mega+ / Equinix HK5



Sub Sea Cables & Cable Landing Stations

Cable stations in Hong Kong



Major Consortium cables at Hong Kong

Cable System	Key Investors	Coverage	Cable Stations	Design Capacity
A-A-G	Traditional incumbent Operators in the Region	Singapore, Malaysia, Thailand, Vietnam, Brunei, Philippines, Guam, Hawaii, US	Tong Fuk	5.2Tbps
APCN		Japan, Korea, Taiwan, Philippines, Malaysia, Singapore, Thailand, Indonesia, Australia		5Gbps
APCN-2		Japan, Korea, Taiwan, Philippines, Malaysia, Singapore, Mainland China		2.56Tbps
SMW-3		Asia – Middle East – Western Europe	Deep Water Bay	4.6Tbps
A-P-G	CT, CU, CMI, CHT-I, NTT, KT, LG, PLDT, StarHub, TT, Viettel, VNPT, Facebook	Japan, Korea, Taiwan, Mainland China, Malaysia, Thailand, Vietnam, Singapore	TKO	54Tbps
S-J-C	CT, CU, CMI, CHT-I, KDDI, Globe, SingTel, ToT, Telin, Google	Japan, Guam, Philippines, Thailand, Singapore	Chung Hom Kok	28Tbps
AAE-1	BT, CU, Chuan Wei, Djibouti Telecom, Etisalat, PCCW, Mobily, Omantel, Ooredoo, PTCL, Telecom Egypt, Telecom Yemen, Vittel, OTEG, Reliance Jio , TT, TOT.	Hong Kong, Vietnam, Cambodia, Malaysia, Singapore, Thailand, India, Pakistan, Oman, UAE, Qatar, Yemen, Djibouti, Saudi Arabia, Egypt, Greece, Italy and France.	Cape D'Aguilar	40 Tbps

Major Private cables at Hong Kong

Cable System	Key Investors	Coverage	Cable Stations	Design Capacity
ASE	NTT / TM / PLDT / StarHub	Japan, Philippines, Malaysia, Singapore	TKO	15Tbps
EAC-C2C	Pacnet	All Asian destinations	TKO, Chung Hom Kok	30Tbps
FEA	FLAG Telecom	Asia – Middle East – Western Europe	Tong Fuk	5Gbps
FNAL / RNAL	FLAG Telecom / REACH	Taiwan, Japan, Korea	Tong Fuk	1.92Tbps
TGN-IA	TATA / PCCW Global	Japan, Guam, Philippines, Vietnam, Singapore	Deep Water Bay	3.84Tbps

New/Planned cables at Hong Kong

Cable System	Key Investors	Coverage	Cable Stations	Design Capacity
PLCN <i>(Q4-2019)</i>	Pacific Light Data Communication Co. Limited, a subsidiary of China Soft Power Technology Holding Limited (CSPT), and TE SubCom <i>(Google, Facebook also join)</i>	Hong Kong and Los Angeles in the shortest path, with branch out to Philippines and Taiwan	Deep Water Bay	120Tbps
HK-Guam <i>(Q4-2019)</i>	RTI Connectivity Pte. Ltd. (RTI-C) and NEC Corporation and Google	Hong Kong and Piti, Guam (subsequently connected to US, Philippines and Indonesia via SEA-US)	TKO	48 Tbps
HKA <i>(Q2 2020)</i>	CTG, CU, RTI-C, TATA, Telstra, ASN and Facebook	Hong Kong and Los Angeles in the shortest path	Chung Hom Kok	120Tbps
SJC-2 <i>(Q4-2021)</i>	CMI, CHT-I, Chuan Wei, KDDI, SingTel, SK Broadband, VNPT and Facebook	Japan, Korea, Taiwan, Mainland China, Hong Kong, Cambodia, Thailand, Vietnam, Singapore	Chung Hom Kok	144Tbps
BtoBE <i>(Q4-2021)</i>	CMI, AWS and Facebook	Guangdong-Hong Kong-Macao Bay Area, San Francisco Bay Area and Singapore.	Chung Hom Kok	108Tbps
EAGLE <i>(2022)</i>	Global Cloud Exchange	Hong Kong - India (Mumbai)	Tong Fuk	96Tbps
H2 <i>(2022)</i>	H2 Cable Pte. Ltd	Hong Kong – Australia (Sydney) (Branch to Taiwan, Papua New Guinea, Solomon Island, Guam, Queensland, Hawaii and Los Angeles under planning)	Chung Hom Kok or DWB	>51Tbps

Intra-Asia

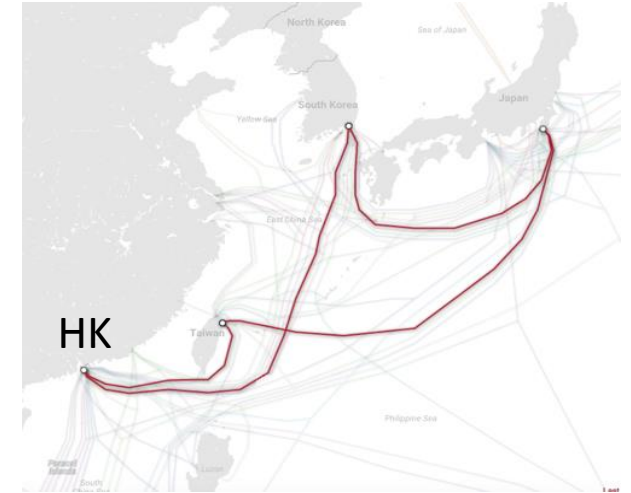
EAC-C2C



APCN-2



FNAL/RNAL



SJC



ASE



APG



Trans-Pacific

TGN-IA



AAG

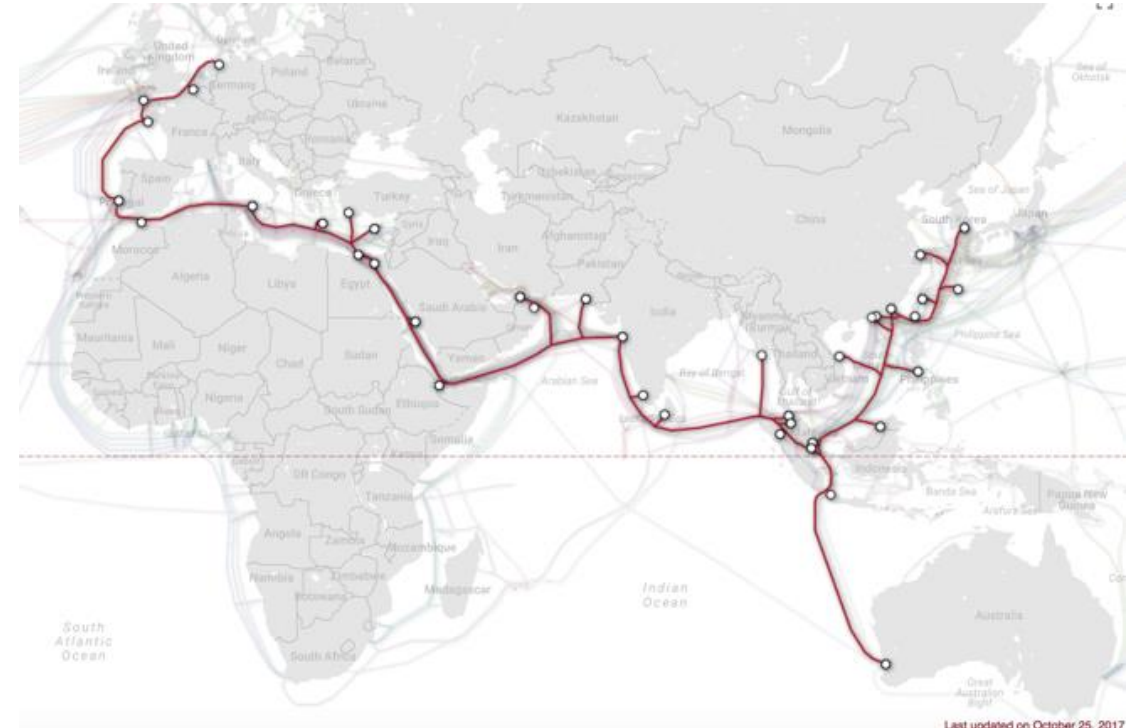


West bound to Europe

FEA



SMW3



Transit carriers and Cloud providers

Transits carriers

- Major players: PCCW Global, Telstra, NTT, Tata
 - Gateway to China: China Telecom (CTG), China Unicom (CUG), China Mobile (CMI)

Cloud providers

- Microsoft Azure, Alibaba Cloud, Tencent Cloud, Huawei Cloud, Google Cloud Platform, AWS, IBM Cloud



Summary

- High penetration of high-speed Internet access
- Central location in Asia, one of major Internet hubs
- Neutral and open markets
- Well-connected Internet Exchanges
- Plenty of choices for data centers
- Major subsea cable hub in APAC
- Multiple transit carriers and cloud providers

Special Thanks

- Kenneth Chan / HKIX
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- Petra Wensing / AMS-IX
- Mike Ng / SUNeVision
- Se Young Chung / KINX
- Robin Kong / Facebook

One more thing...

Internet Events in Hong Kong

HKNOG 8.0

- 6th September 2019
- <https://hknog.net/hknog-8-0/>

Capacity Asia 2019

- 3rd – 4th December 2019
- <https://www.capacitymedia.com/events/capacity-asia>



Q & A

謝謝