

CNS SG/13 Meeting

CRV introduction and promotion
program for MID region



PCCW Global

- Established the PCCW Global brand in 2005

- Best in class connections across the globe linking Asia, Europe, the Americas, the Middle East and Africa

- Acquired Gateway Communications, Crypteia Networks, Syntelligence and Voxclever, Console Connect's advanced software platform and proprietary technology

62
Offices Worldwide

35
Languages spoken

- Leading provider of global telecommunications, offering the latest voice and data solutions to multinational enterprises and communication service providers

HKT

- Headquartered in Hong Kong
- Founded in 1925


- 2022 Revenue: US\$4.401 billion

- Separately listed on the Hong Kong Stock Exchange in 2011

- Employees: 13,600


- Leading provider of Telecommunication Services in Hong Kong

Our Global Reach



685,000
Kilometers of Diverse
Cable Capacity Globally

69 Tb/s
of Global Fiber Capacity




Tier 1
Transit Free Network

MPLS Network
Connectivity to over
3,000 Cities
and **160** Countries



 **consoleconnect**
World's **1st**
Software-Defined
Interconnection® Platform

Connected to all
Hyper-scale
public Cloud Providers



Serving **>1,000**
Mobile Networks
worldwide





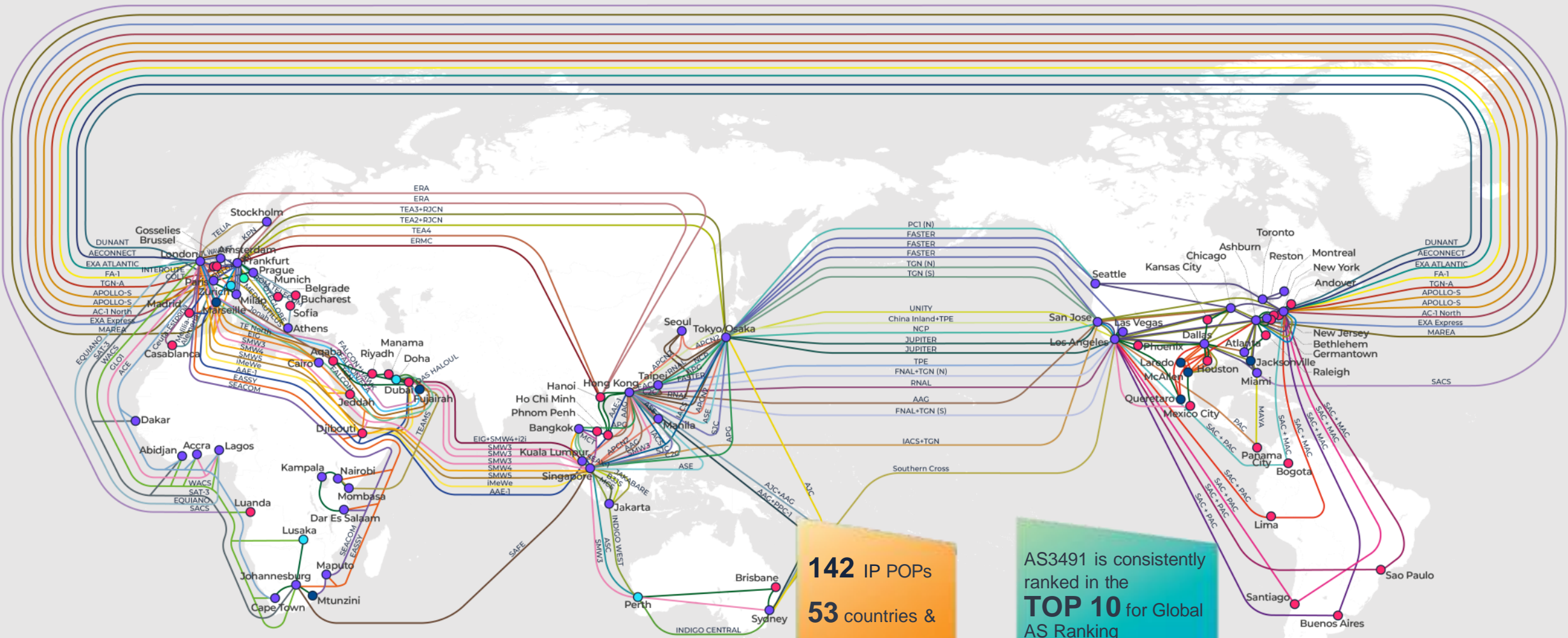
140 transmission
PoPs

34 countries and

56 cities

HKT Here To Serve a **PCCW** Group member

Global Connectivity – IP Network



- Legend**
- PoP supporting MPLS & IP
 - PoP supporting MPLS, IP & VSAT
 - PoP supporting MPLS & VSAT
 - PoP supporting IP
 - PoP supporting MPLS

142 IP POPs
53 countries &
89 cities

AS3491 is consistently ranked in the **TOP 10** for Global AS Ranking
Total IP Capacity → **29** Tbps

Global Connectivity - Satellite



- Fully Managed Services
- Extensive global satellite coverage, 5 major Teleports
- “Feet on the Ground” Field Engineering
- Innovative satellite based broadcast applications

PCCW Global chosen for CRV aviation network deployment

06 JUNE 2019



📌 Recruiting ANSPs joining CRV ; developing valued added services **(SWIM, Console Connect for Aviation)**

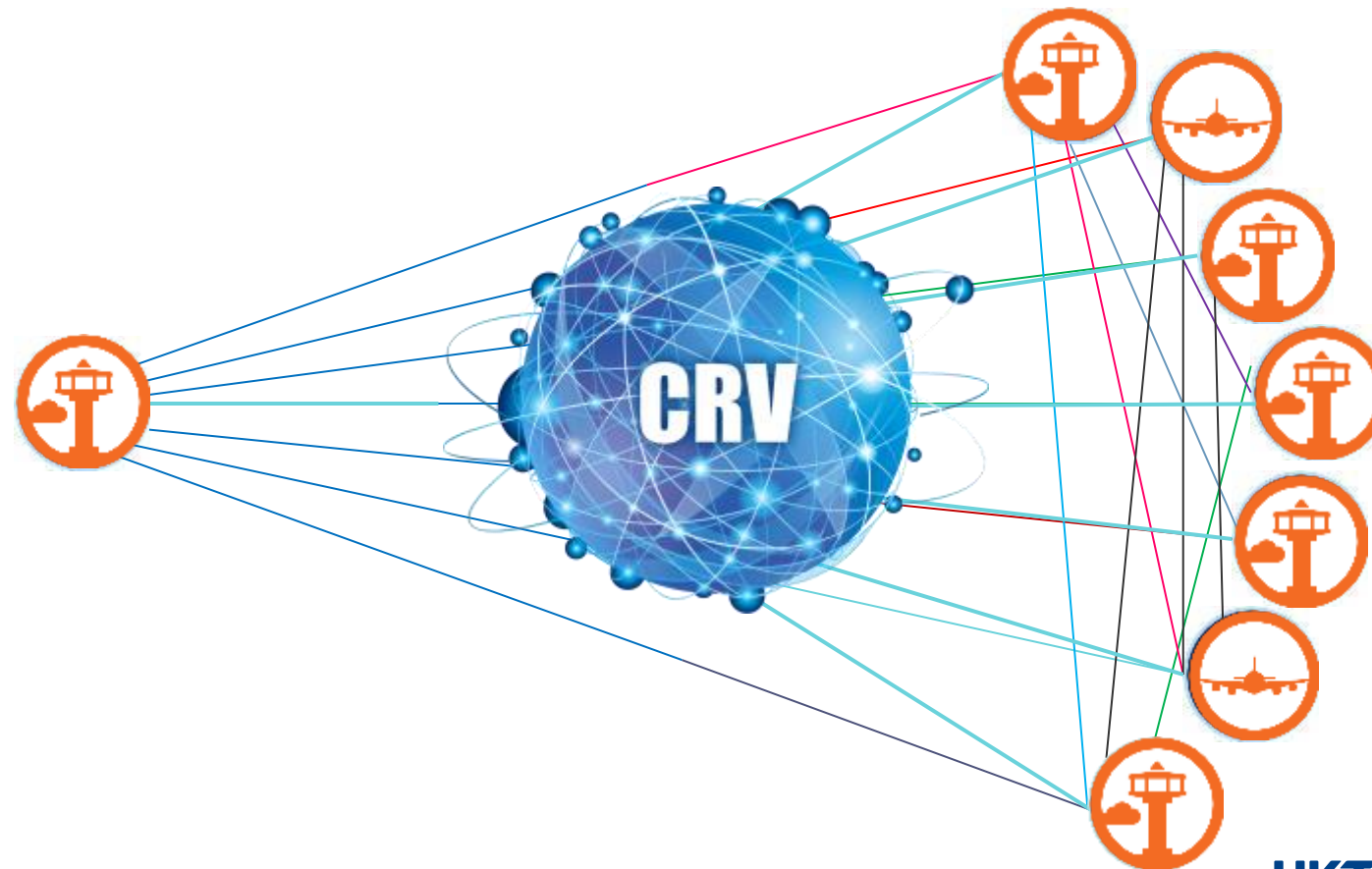
PCCWG Role and Target Audience





Simple

- IP based network - single network carries multiple aviation operation traffic
- One Stop Shop - ordering, provisioning, troubleshooting



Secure

- Closed private network – unreachable & invisible from Internet
- ISO 27001: Information Security Management



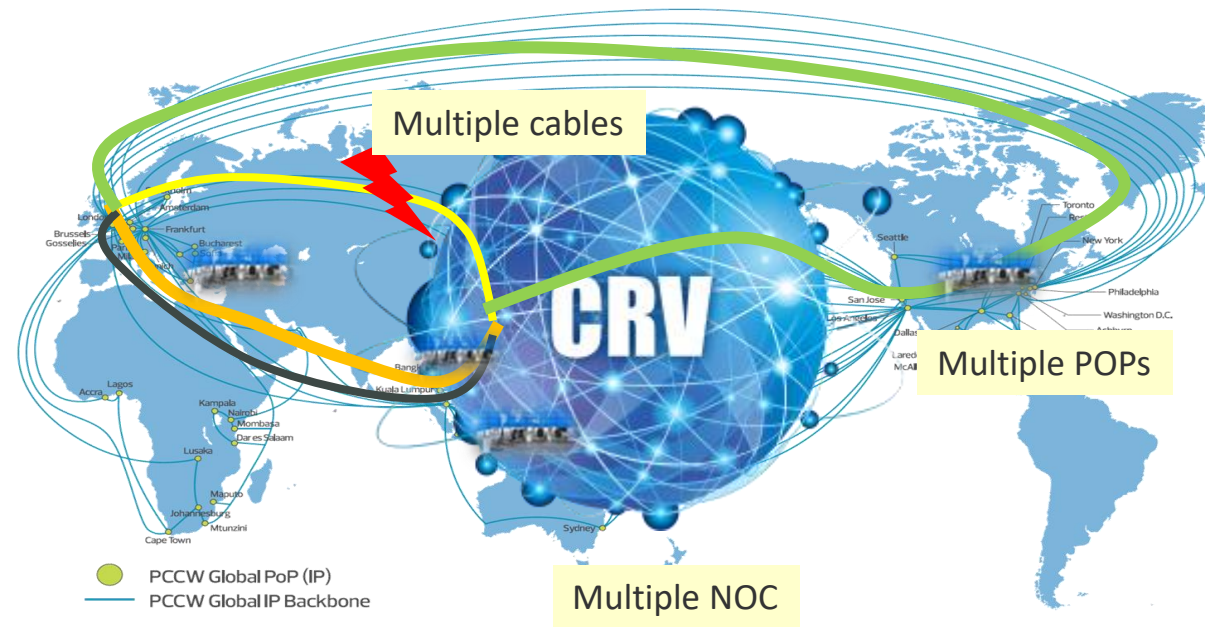
Private



Public

Safe

- Resilient network consists of multiple nodes and trunks riding on diverse cable systems
- Contingency plan to maintain high availability



Fully managed

- Central administration of CRV network performance.
- State users have full Visibility and measurable of it's network health.





SIMPLER

SAFER

FASTER

CRV, the network of
tomorrow

CRV Powered by PCCW Global

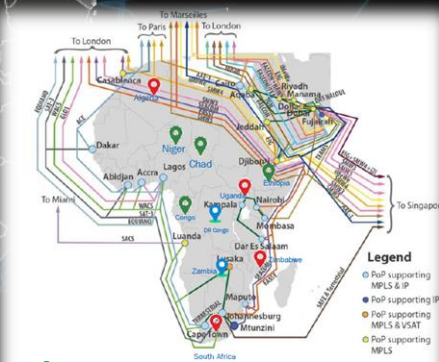
■ Operating 18 ■ Provisioning 7 ■ Hot Prospects 2 ■ Prospects 28

Bangladesh
Brunei

Samoa
Cook Islands
Kiribati
Laos
Maldives
Marshall Islands
Federated States of Micronesia
Nauru
Niue
Palau
Solomon Islands
East Timor
Tonga
Tuvalu
Vanuatu
Wallis and Futuna

Interconnect with PEN2 (Europe)

Interconnect with REDDIG (Latin America)

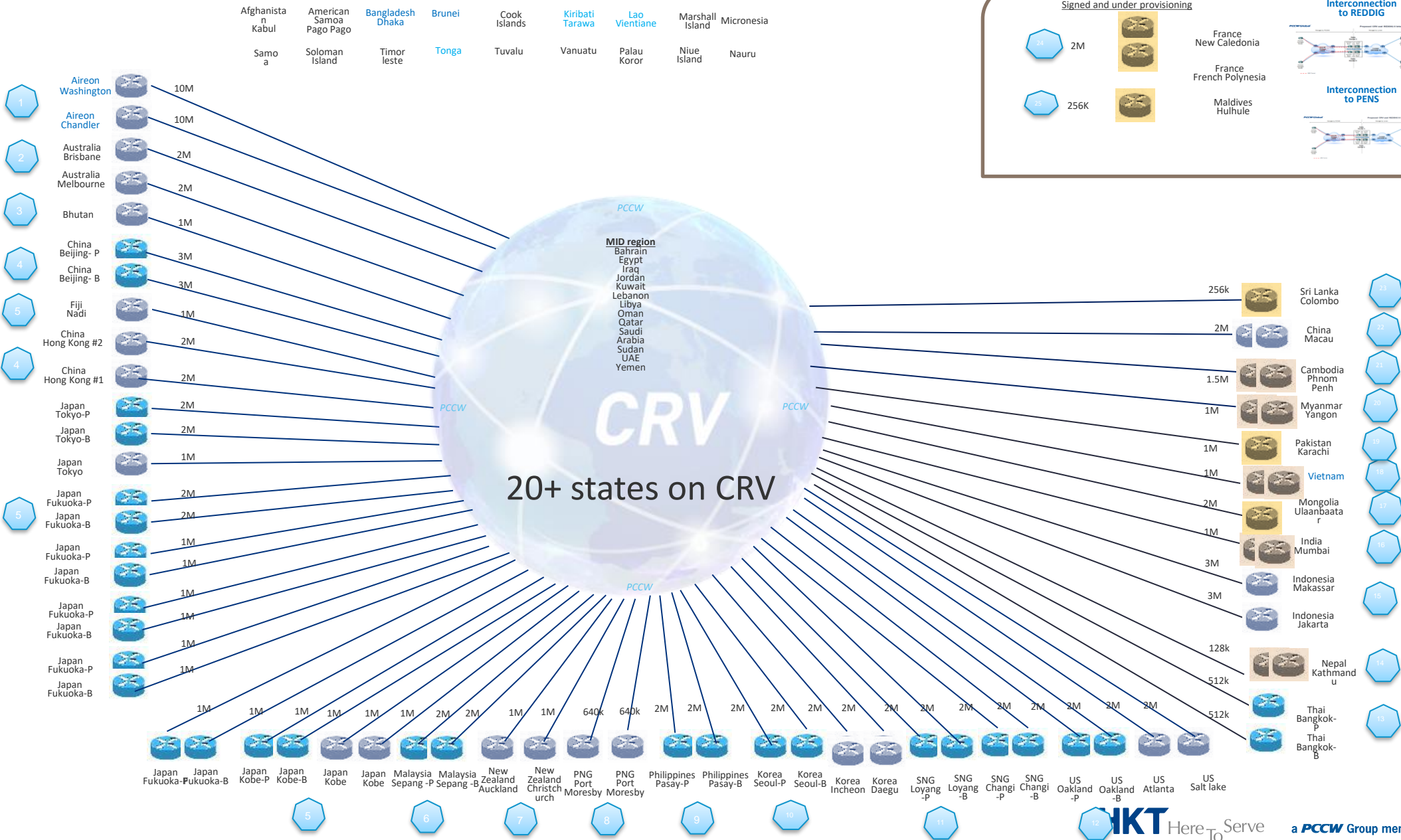


Africa : 54 locations/ states

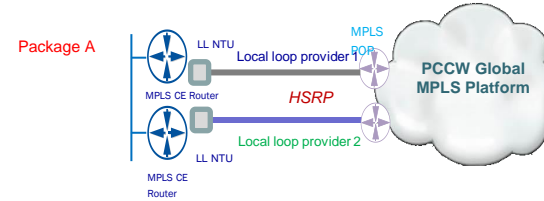
The budgetary price is based on the below list:

PCCW Global

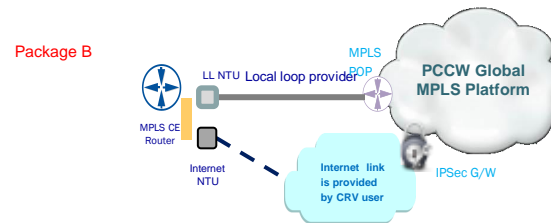
2024



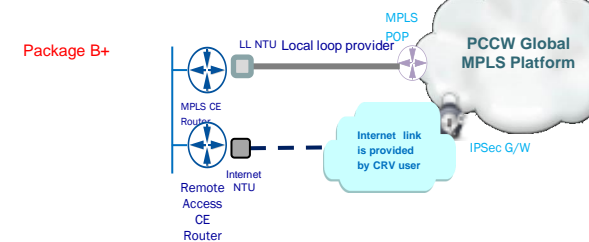
4 major packages plus 3 variations are proposed as below:



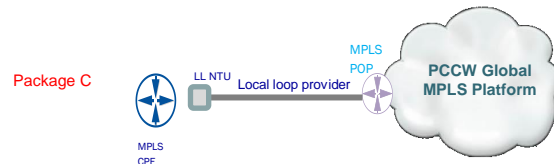
Package A – dual links and dual CE routers (NIDs) in active / standby operation mode will be installed at the CRV user site.



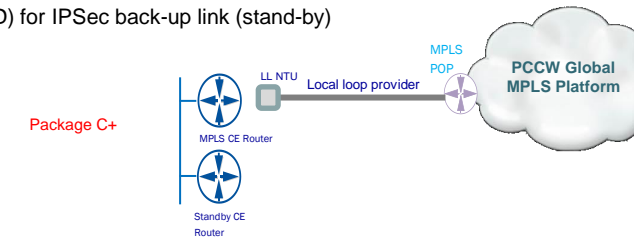
Package B – single link and single CE router (NID) will be installed at the CRV user site. In addition, PCCW Global will provide an IPsec port at MPLS IPsec gateway for back-up and CRV user will provide a dedicated Internet link for connection.



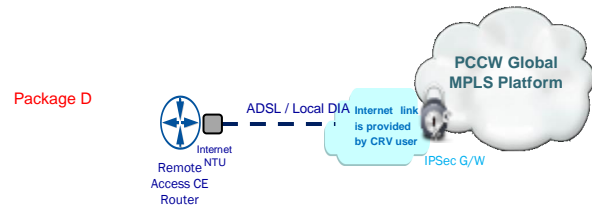
Package B+ – same as Package B but with one extra CE router (NID) for IPsec back-up link (stand-by)



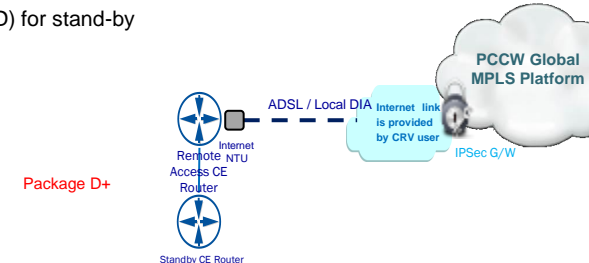
Package C – single link and single CE router (NID) will be installed at the CRV user site.



Package C+ – same as Package C but with one extra CE router (NID) for stand-by



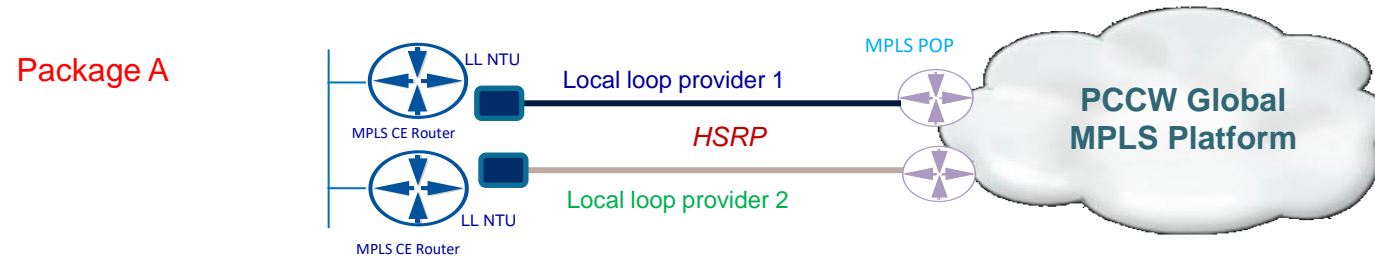
Package D – PCCW Global will provide an IPsec port at MPLS IPsec gateway and CRV user will provide a dedicated Internet link for connection.



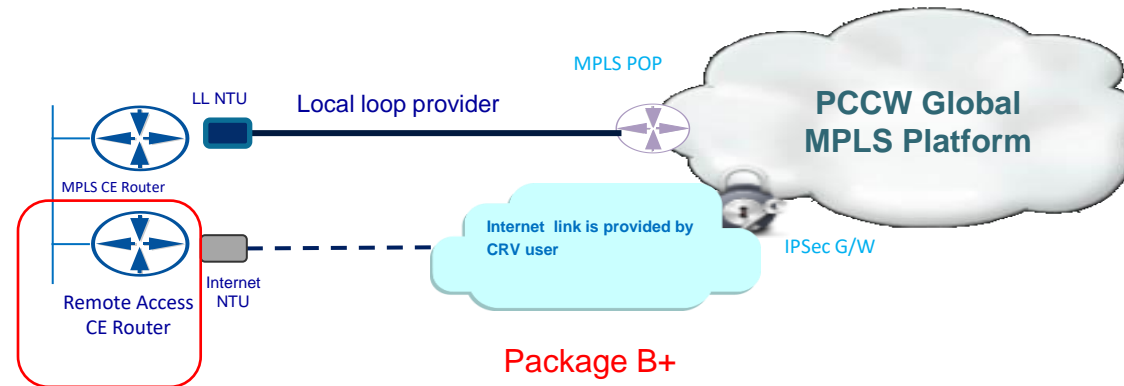
Package D+ – same as Package D but with one cold standby CE router (NID)

- 4 major packages plus 3 variations are proposed as below:

- **Package A** – dual links and dual CE routers (NIDs) in active / standby operation mode will be installed at the CRV user site. The local accesses are from different providers or from the same provider but with different paths if feasible. Each local access is a dedicated single unprotected terrestrial or VSAT access and will be terminated at different PCCWG PoPs/ICIs/PEs where applicable to achieve access resilience

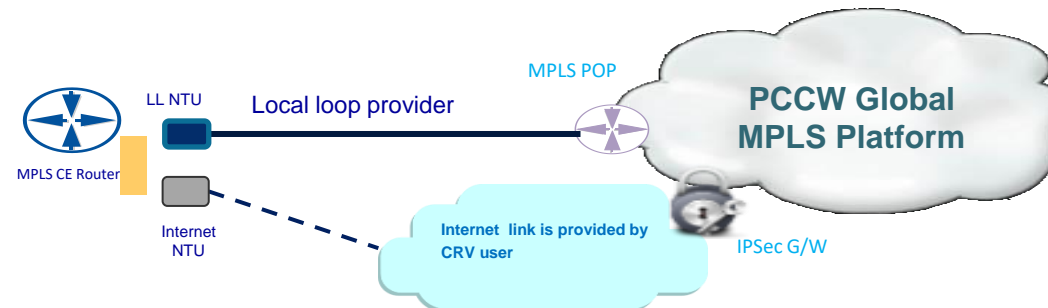


- **Package B+** – it is same as Package B but with one extra CE router (NID) to connect the Internet link for IPsec remote access. Both MPLS CE router and Remote Access CE router will work in active / standby mode

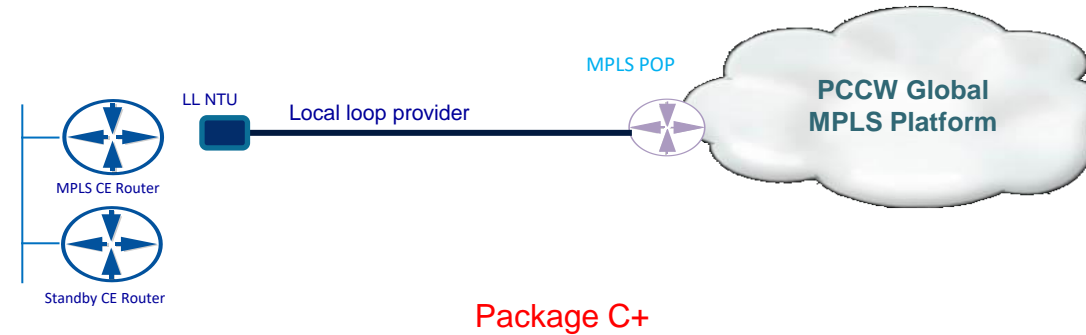


- **Package B** – Single link and single CE router (NID) will be installed at the CRV user site. The local access is a dedicated single unprotected terrestrial or VSAT access and will be terminated at PCCWG PoP/ICI where applicable. In addition, PCCW Global will provide an IPsec port (2M port speed and 100% Bronze) at MPLS IPsec gateway and an Ethernet port at the CE router (NID) for connecting customer owned Internet link. The CE router will automatic switch over to this IPsec link in case the primary MPLS link is failure. The Internet link provided by the customer has to fulfill the requirements below:
 - Ethernet hands-off with at least one fixed public IP address assigns to the CE router
 - only use for connecting PCCW Global MPLS Layer3 VPN service

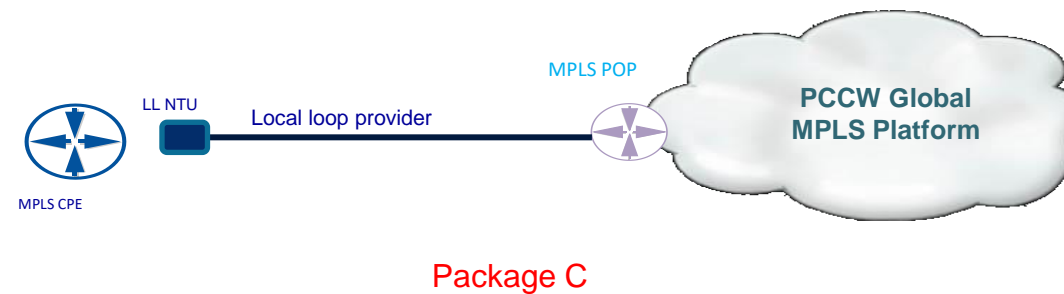
Package B



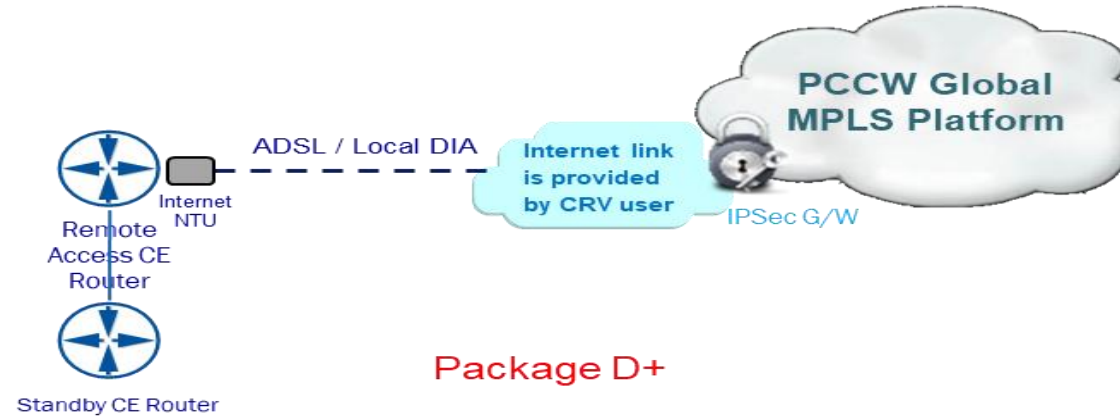
- **Package C+** - It is same as Package C but with one standby CE router (NID). The standby CE router is same configuration as the primary MPLS CE router. Assistance from the customer is required to switch over LAN/WAN cables under the instructions from PCCW Global NOC in case of the primary router failure



- **Package C** – Single link and single CE router (NID) will be installed at the CRV user site. The local access is a dedicated single unprotected terrestrial or VSAT access and will be terminated at PCCWG PoP/ICI where applicable



- **Package D+** - It is same as Package D but with one cold standby CE router (NID). The cold standby CE router is the same configuration as the primary MPLS CE router. Assistance from the customer is required to switch over LAN/WAN cables under the instructions from PCCW Global NOC in case of the primary router failure if quick restoration of the service is required

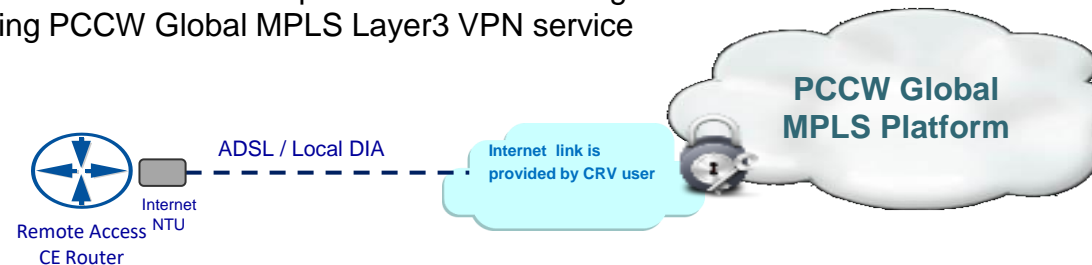


Package D+

- **Package D** - PCCW Global will configure IPsec port at MPLS IPsec gateway and install a CE router (NID) for connecting customer owned Internet link on site. User will connect to the CRV network via a point-to-point encrypted IPsec tunnel which supports 100% Bronze QoS only.

The Internet link provided by the customer has to fulfill the requirements below:

- Ethernet hands-off with at least one fixed public IP address assigns to the CE router
- only use for connecting PCCW Global MPLS Layer3 VPN service



Package D

Highest Availability

SLA Package	Package A		Package B+		Package B		Package C+		Package C		Package D+		Package D	
Local loop connection	2		1		1		1		1		NIL (customer self provided internet)		NIL (customer self provided internet)	
NID	2		2		1		2		1		1		1	
IP Sec Gateway (backup)	NIL		Yes (customer provides internet)		Yes(customer provides internet)		No		No		Yes (customer provide internet)		Yes (customer provide internet)	
Availability	99.97% (connectivity + router)		99.95% (connectivity+ router)		99.5% (connectivity+ router)		99.7% (connectivity+ router)		99.5% (connectivity+ router)		99.5% (IPSec gateway port only)		99.5% (IPSec gateway port only)	
Site to Site Round Trip Delay by zone	200ms	600ms	200ms	600ms	200ms	600ms	200ms	600ms	200ms	600ms	PoP to PoP 200ms	PoP to PoP 600ms	PoP to PoP 200ms	PoP to PoP 600ms
Site to Site Packet Drop rate	<0.1% for Voice; <0.5% for Data		<0.1% for Voice; <0.5% for Data				<0.5% for Data				PoP to PoP <0.5% for Data		PoP to PoP <0.5% for Data	
Site to Site Jitter	15ms for Voice; 250ms for Data		15ms for Voice; 250ms for Data				250ms for Data				250ms for Data (PoP to PoP)		250ms for Data (PoP to PoP)	
Rebate	Yes		Yes				Yes				No		No	



How to proceed to join CRV



Proposed process to contract

- 1. State notifies CRV OG Chair(s) and ICAO Regional Office the intention to join – update CRV implementation plan
- 2. State contact Mr. Benny Cheng (PCCW) who sends the High level survey
- 3. State downloads the Common Package from CRV portal
- 4. State submits the High level survey to PCCW
- 5. PCCW recommends a package (design) and submits a Project Plan
- 6. State cross checks with its peers and starts coordination of implementation (CRV OG can facilitate)
- 7. State and PCCW discuss Price, Schedule and Terms and Conditions:
 - Local optimizations and additional requirements may be required
- 8. State and PCCW agree and record any variation from the common provisions in the Order Form
 - State and PCCW sign the Order Form which is governed by:
 - (a) Terms and Conditions between PCCW Global and CRV Authority ;
 - (b) The CRV Terms of Reference (including all annexes);
 - (c) Specific Terms for MPLS VPN Service, Specific Terms for Managed Router Service and Specific Terms for Satellite VSAT Services (the "Specific Terms");
 - (d) Addendum to the Specific Terms;
 - (e) The price schedule in their latest applicable version;
 - (f) The Project Management Plan in its latest applicable version; and
 - (g) The CRV implementation plan in its latest applicable version.
- 9. Installation occurs
- 10. Testing is carried out
- 11. Service Commencement Notice provided from PCCW to the State, includes all drawings and documentation
- 12. State notifies CRV OG about the service commencement
- 13. State carries out service migrations in coordination with peers



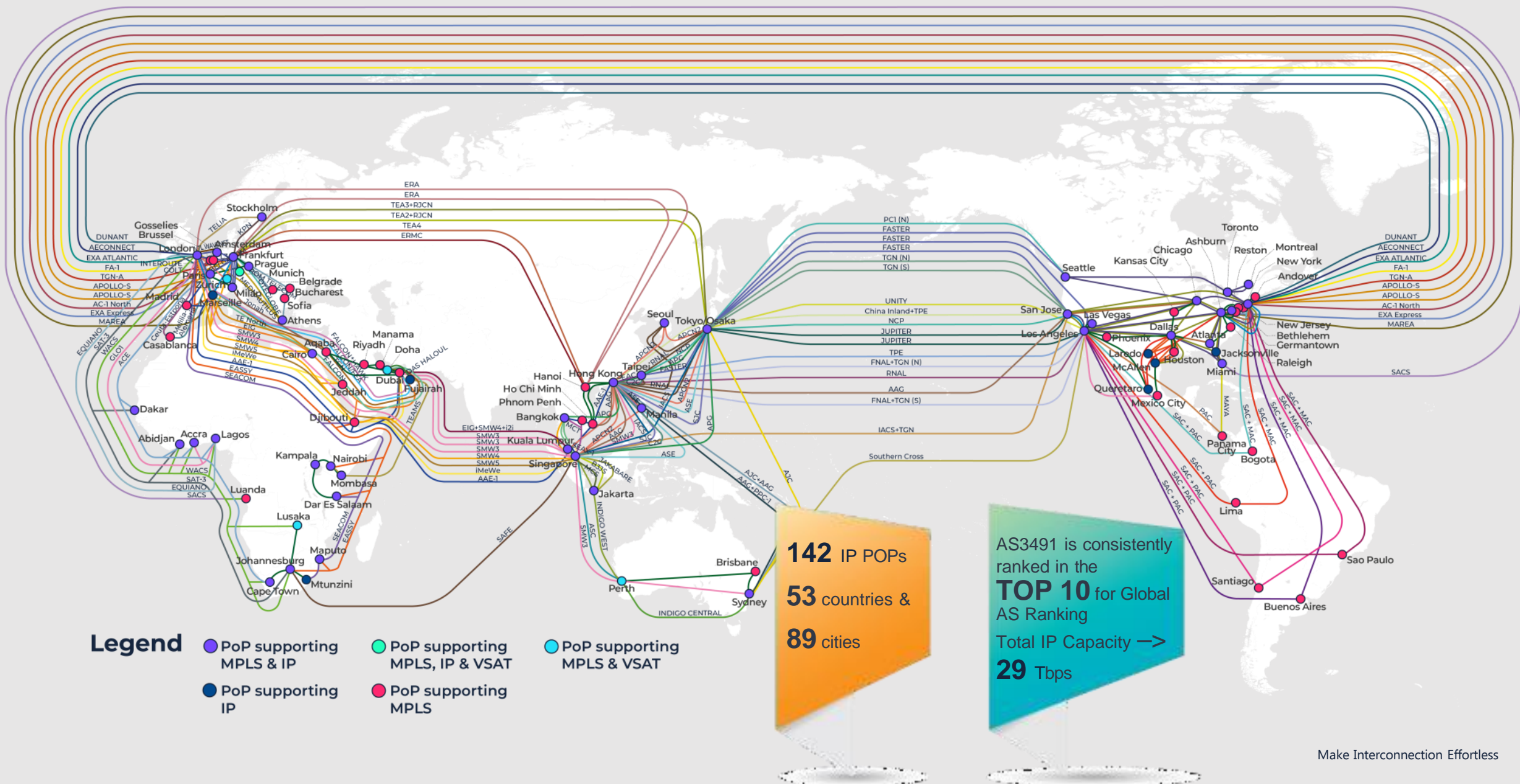
High Level
dual Site Question

Note: the engineering package is made applicable through the PMP

An aerial photograph of the London skyline, featuring prominent skyscrapers like The Shard, the Gherkin, and the Walkie-Talkie. The image is overlaid with large, semi-transparent geometric shapes in shades of blue and pink, creating a modern, architectural aesthetic. The text 'Proposed Solution for CRV MID (2024)' is centered in the upper left area.

Proposed Solution for CRV MID (2024)

Global Connectivity – IP Network



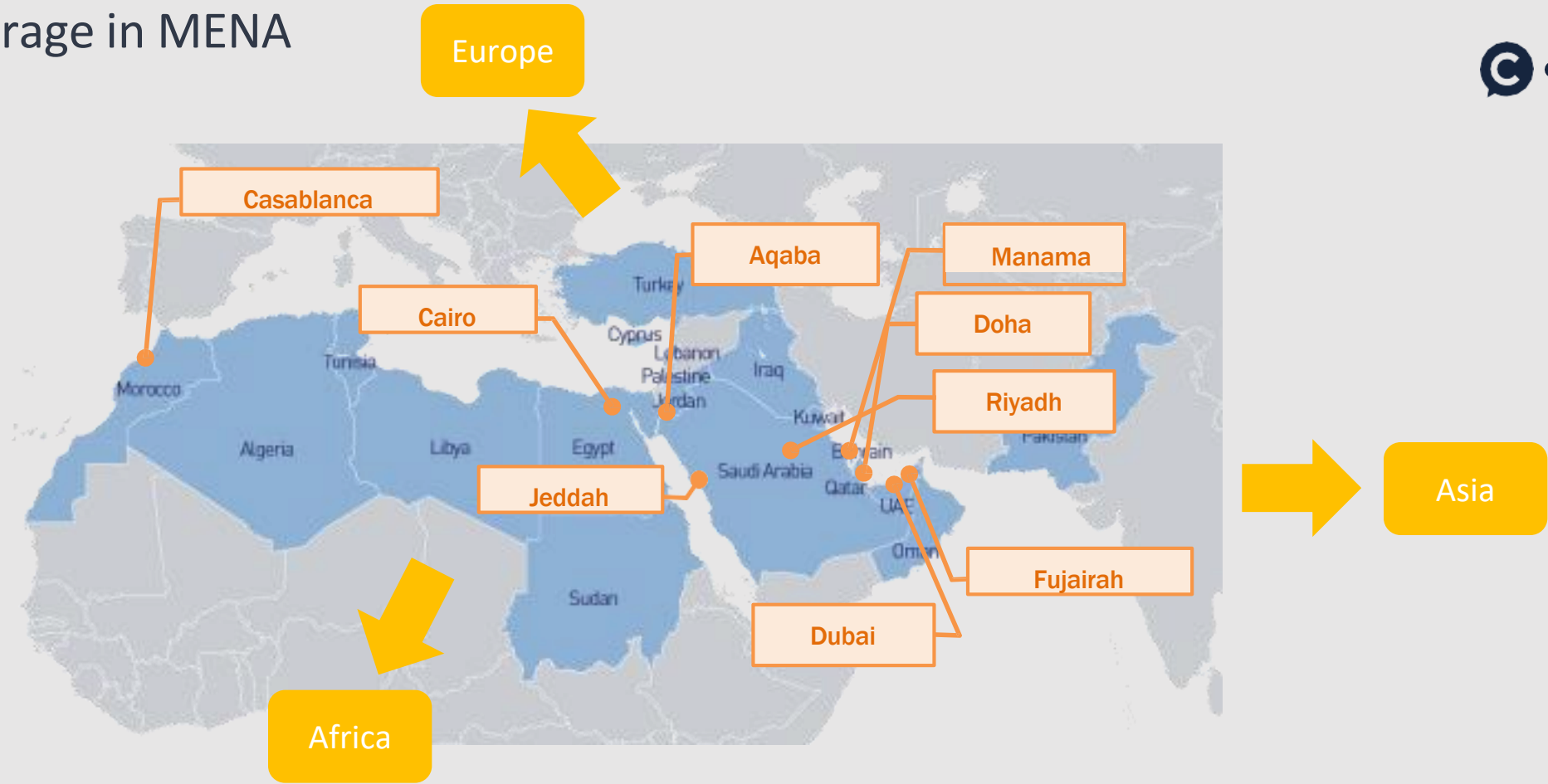


NNI Alliance with over 180 MPLS partners around the globe

160
countries
and 3,000
cities

Strength
and depth in
emerging
growth
markets

Service Coverage in MENA



Presence in
22 Middle East and North African countries

7 On-Net countries with
9 PoPs

34 Partnerships for inter-region connections

On-net Infrastructure in MENA



Unique Features

Casablanca / Morocco PoP

- ① Key PoP for enterprise in Morocco

Aqaba/Jordan PoP

- ① Gateway between Europe and Middle East

Cairo/Egypt PoP

- ① Regional Hub for N Africa

Jeddah/KSA PoP

- ① Regional sub-sea cables hub
- ② Strategic PoP to connect Gulf, East Africa and Europe

Riyadh/KSA PoP

- ① Gateway between Asia and Africa
- ② Key PoP for enterprise in KSA

Doha/Qatar PoP

- ① Transit gateway for UAE traffic

Manama/Bahrain PoP

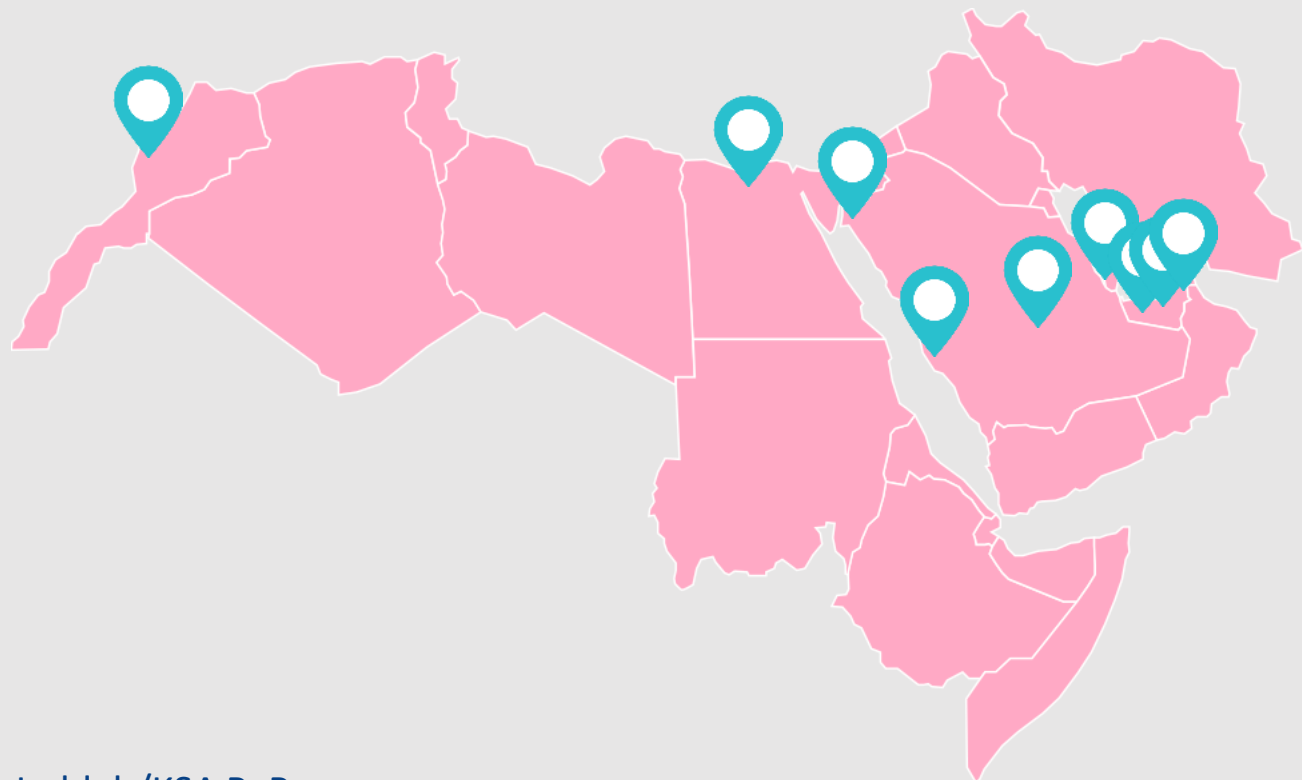
- ① Transit gateway for Bahrain traffic

Dubai/UAE PoP

- ① Regional Hub for GCC

Fujairah/UAE PoP

- ① Gateway between Asia and Africa
- ② Key PoP for enterprise in UAE

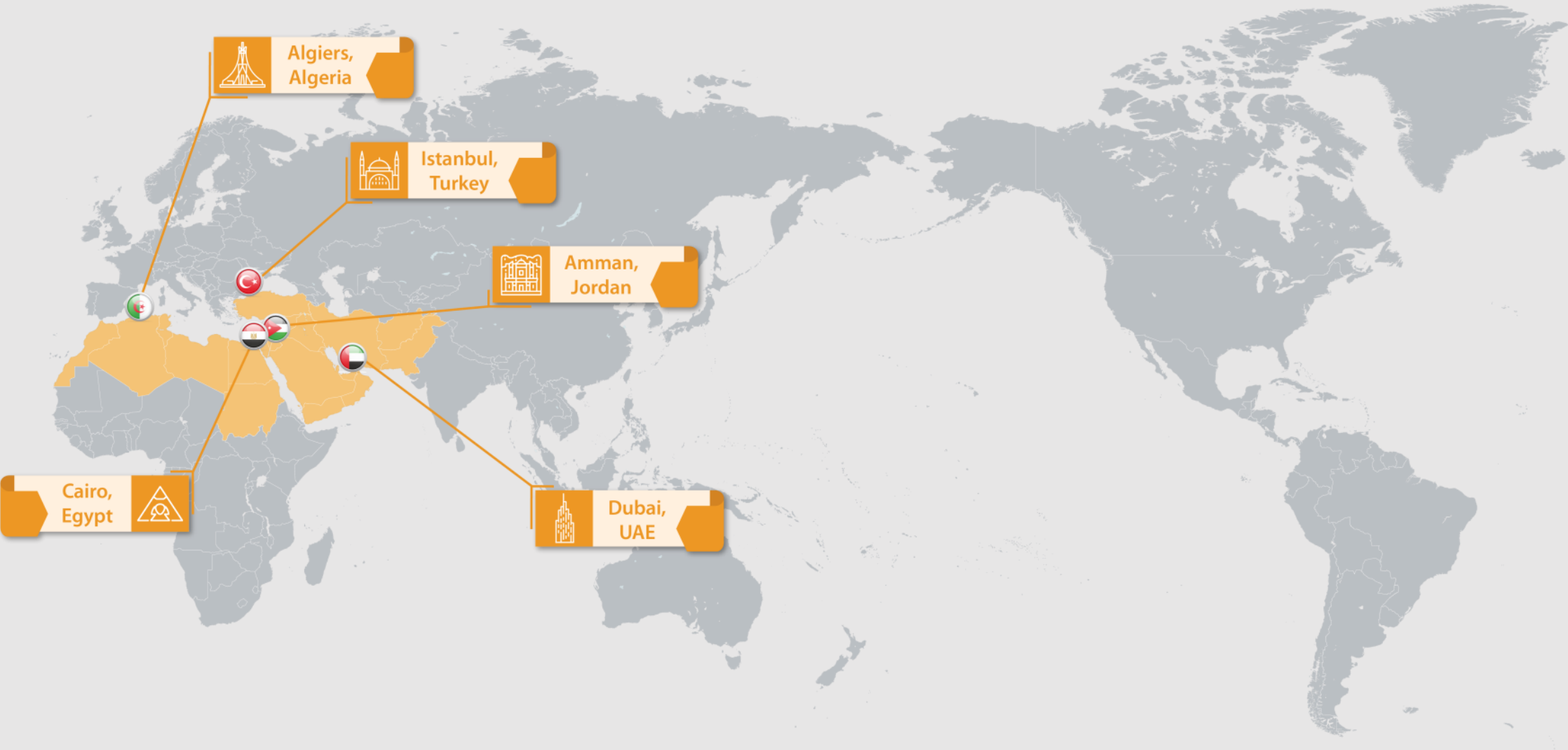


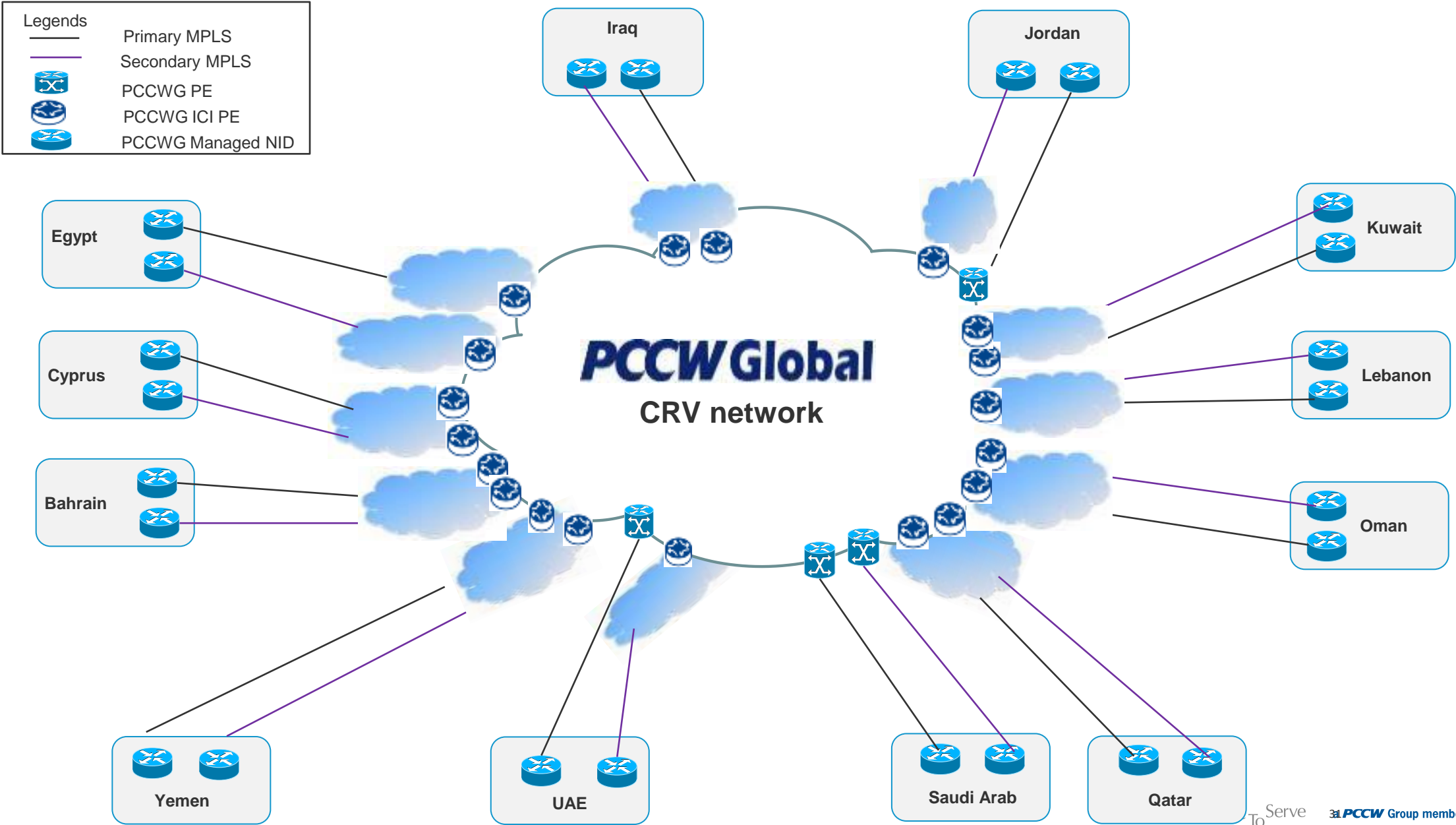
Key Value



Regional Traffic (data + video) within MENA region + High availability + *Africa connection*

Staff Presence in MENA





***Remarks: Subject to site survey