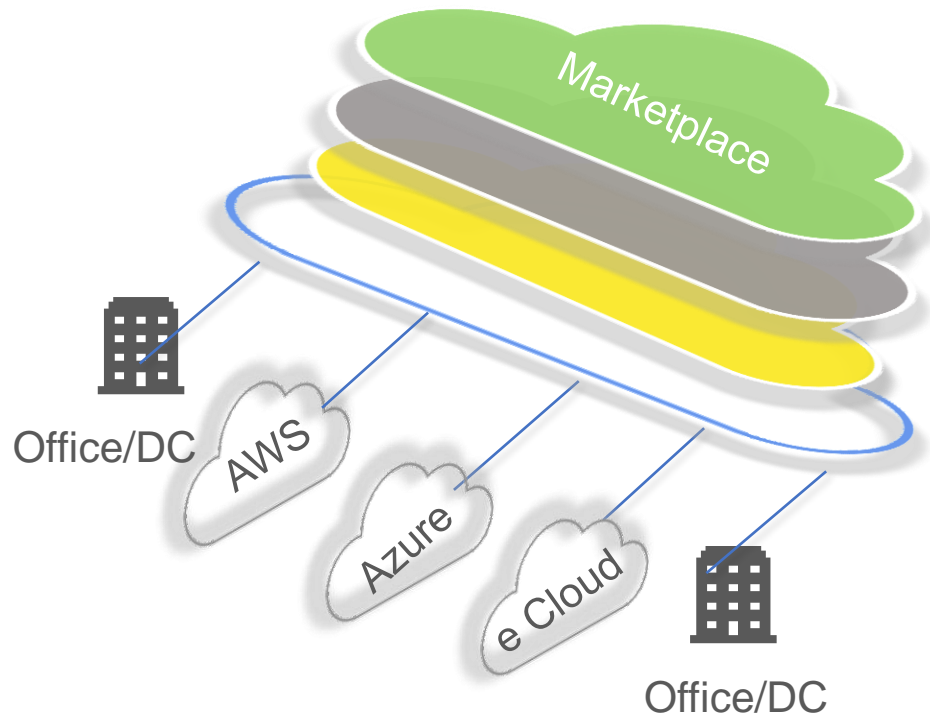# Cloud Exchange Briefing

China Telecom Global

Version: January 11, 2022

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- 02 Supply: What is CTG Cloud Exchange

- 03 Customer use cases

China Telecom Global | Exploring Success Together

Marketplace
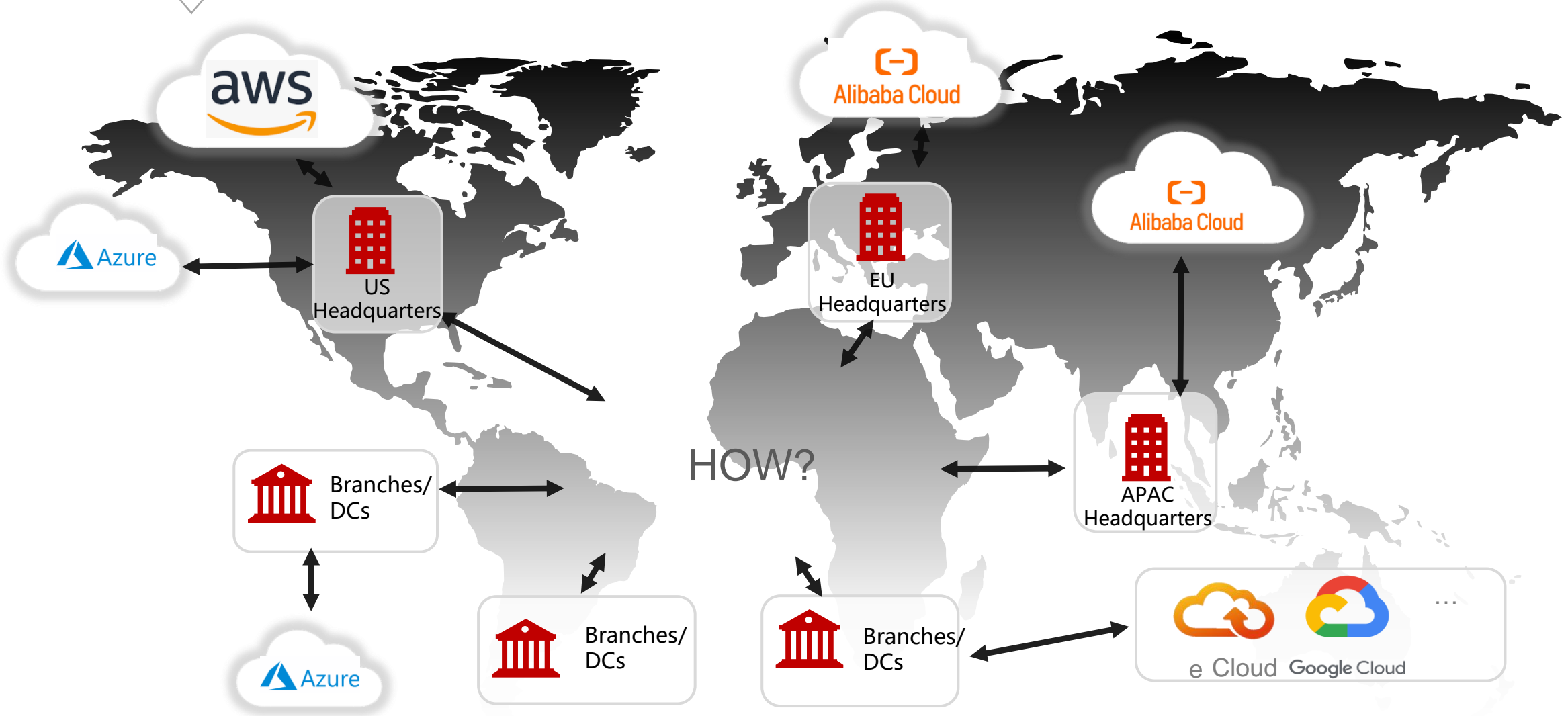
Office/DC

AWS

Azure

e Cloud

Office/DC

Ecology: Applications in the Public Cloud Marketplace

Elasticity: On demand and scale as you like

Resource sharing: Storage, Computing, Professionals

Enterprise Cloud Connect | Not Yes/No, But How

Enterprise Cloud Connect | Challenges

Cost
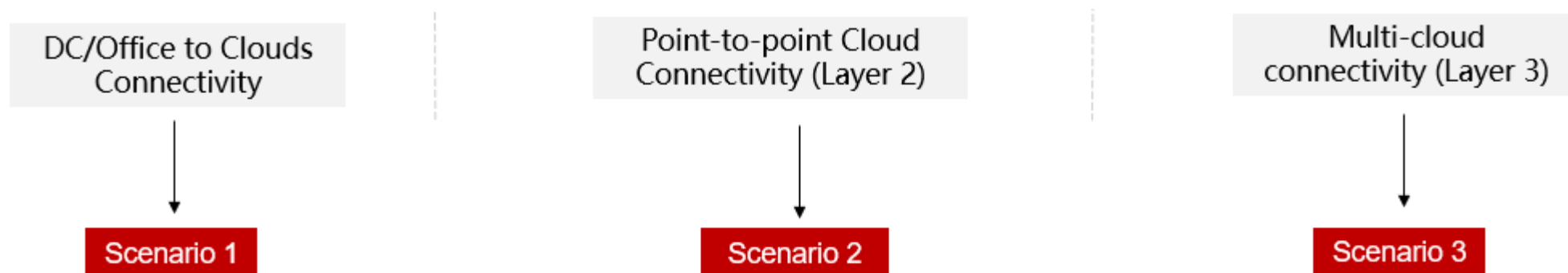
Security

High
Availability

Agility

Worldwide
Resources

Skills
Shortage

02 Supply: What is CTG Cloud Exchange

What is CTG Cloud Exchange

- Cloud Exchange helps customers achieve multipoint connectivity between offices, data centers, and public cloud platforms.

- 3 Typical scenarios including:

DC/Office to Clouds Connectivity	Point-to-point Cloud Connectivity (Layer 2)	Multi-cloud connectivity (Layer 3)
Scenario 1	Scenario 2	Scenario 3

Cloud Exchange=Worldwide Resources+1 Platform

Cloud Exchange | Scenarios Overview

CTG already has scenarios such as Hybrid Cloud Connectivity, Multi-cloud connectivity, Cloud to Cloud connectivity, Multi-cloud and Multi-Region Connectivity, Global branch interconnection, and IDC interconnection. Compared with benchmark manufacturers, there are still gaps in scenarios such as In-region SaaS/Internet access, End-to-End Segmentation, and Virtual edge connectivity .

Hybrid Cloud Connectivity

Enables hybrid connectivity between a private data Centre environment and cloud environment

Multi-cloud connectivity

One interconnection point to connect multiple public clouds

Cloud to Cloud connectivity

private multi-cloud connectivity between two chosen Cloud Service Providers, , but do not own any physical infrastructure.

Multi-cloud and Multi-Region Connectivity

Enables cross-region private multi-cloud connectivity between multiple public clouds

In-region SaaS/Internet access

Realize intra-regional, optimal access to internet and SaaS applications

End-to-End Segmentation

Segment the network so that the infrastructure connected on different network segments can be globally interconnected and the networks are isolated from each other

Global Branch Interconnection

Enables interconnection between headquarters (data center) and global branches

IDC interconnection
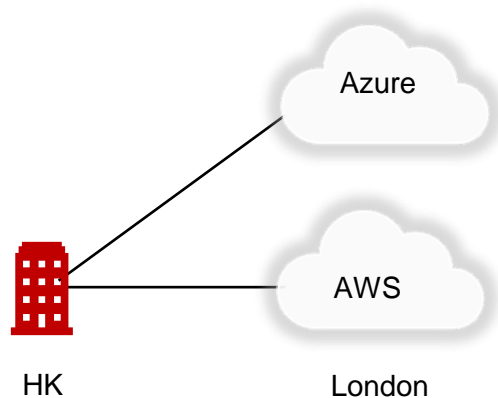
Interconnection between data centers
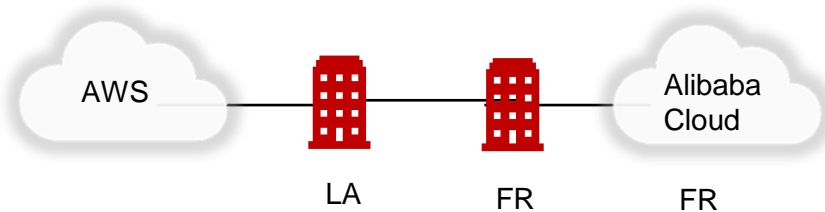
Virtual edge connectivity

Integrate with SD-WAN solution to enable users to connect various resources around the world through the Internet

Cloud Exchange | 3 typical scenarios

DC/Office to Clouds Connectivity

Scenario 1

Point-to-point Cloud Connectivity (Layer 2)

Scenario 2
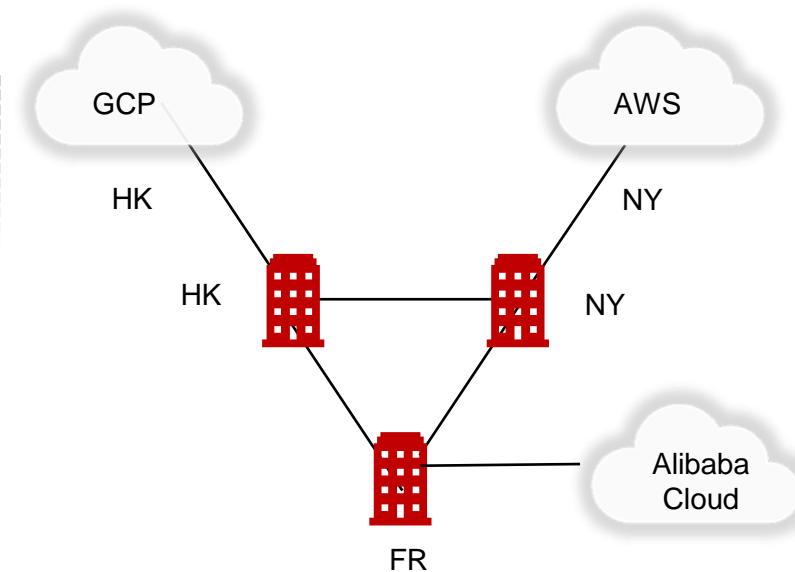
Multi-cloud Connectivity (Layer 3)

Scenario 3

Cloud Exchange = Worldwide Resources + 1 Platform

Northbound API

Cloud Exchange Platforms

function

Southbound API

function

Middle East and Africa POP

Europe POP

Americas POP

Asia pacific POP

Partners NNI

Direct Connect

Direct Connect

Partners NNI

Public cloud

Public cloud

Public cloud
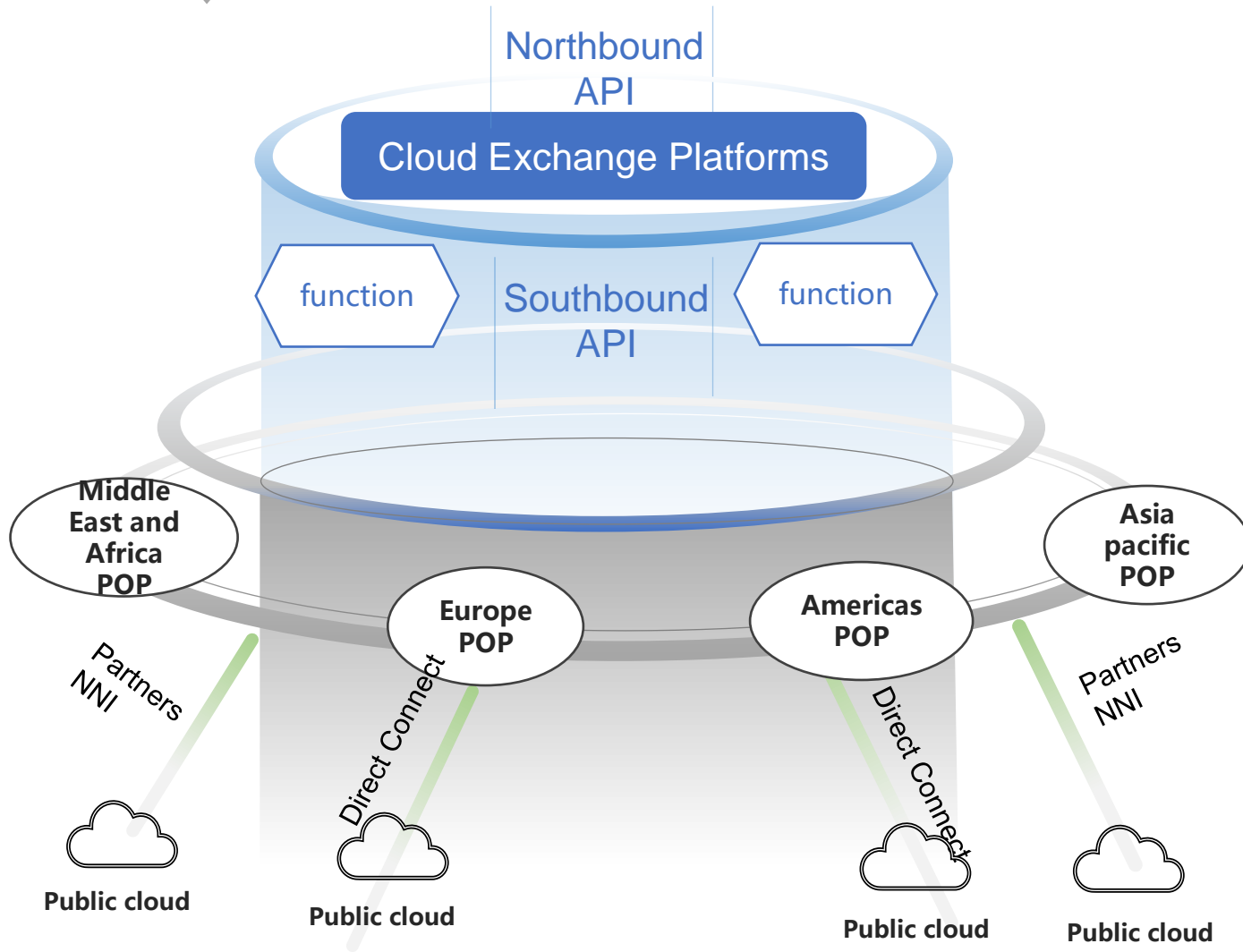
Public cloud

Platform

External embodiment of product capabilities

Resources

The inner core of the product's capabilities

Cloud Exchange = Resources + Platform

Cloud Exchange Resources | Cloud & Network

Cloud Resources

- Nodes that can connect to public clouds and currently pre-connected to public cloud through direct connection and/or partner NNI

Network Resources

Nodes that have been connected to CTG's own network resources and can provide users with cross-region multi-cloud interconnection services

Q1 What is the difference between cloud and networking resource?

Q2 Cloud & Network resources overview?

Q3 Which public clouds can be connected to?

Resources| Cloud & Network

Q1

What is the difference between cloud and networking resource?

New York

Cloud

CTG Devices

Frankfurt

Cloud + networking

Cloud + networking

Hong Kong

CTG Devices

CTG Devices
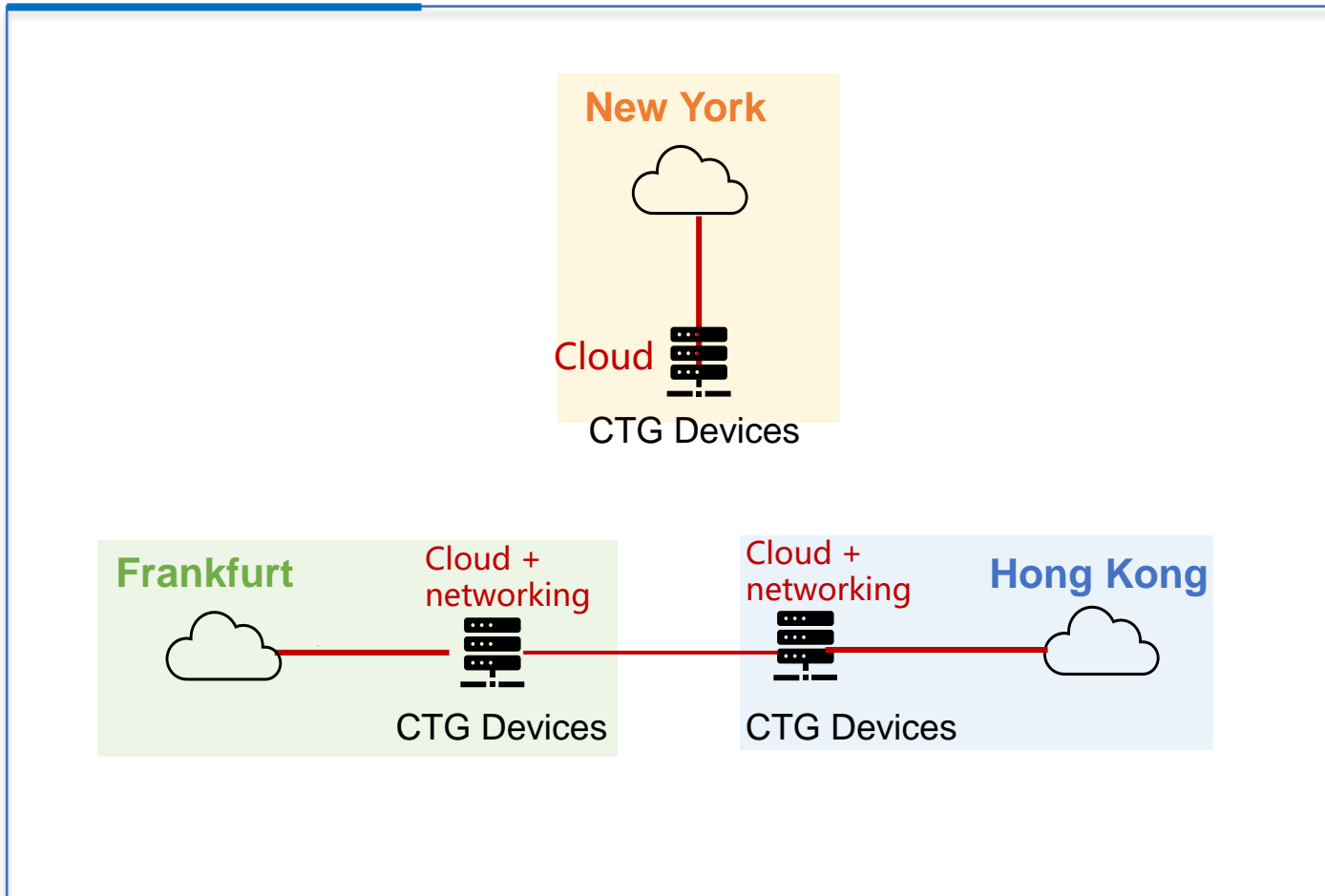
Cloud Resources

- Scattered
- Pre-connected to a public cloud (2 methods: direct connection and partner NNI)

✔ Clients in New York connect to AWS in New York

Network Resources

- Both connected

✔ Clients in Hong Kong connect to AWS in Frankfurt
✘ Clients in Hong Kong connect to AWS in New York

Resources| Cloud & Network

Worldwide Cloud&Network resources

- 26 PoPs

- Covering 22 cities

Area	City	Cloud Resources	Network Resources
AMER	Chicago	Cloud	
AMER	Dallas	Cloud	
AMER	New York	Cloud	
AMER	San Jose	Cloud	
AMER	Washington	Cloud	
APAC	Hong Kong	Cloud	Network
APAC	Singapore	Cloud	Network
APAC	Tokyo	Cloud	Network
EU	Amsterdam	Cloud	Network
EU	Dublin	Cloud	
EU	Frankkurt		Network
EU	Frankkurt	Cloud	Network
EU	London	Cloud	Network
EU	Paris	Cloud	Network
EU	Prague		Network
EU	Stockholm		Network
Mainland China	Beijing		Network
Mainland China	Beijing	Cloud	
Mainland China	Chongqing		Network
Mainland China	Foshan		Network
Mainland China	Shanghai		Network
Mainland China	Shenzhen		Network
MEA	Fujairah		Network
MEA	Johannesburg		Network

Area	City	Alibaba Cloud	AWS	Azure	GCP	IBM Cloud	Oracle Cloud	Salesforce Cloud
AMER	Chicago		√	√	√	√		√
AMER	Dallas		√	√	√	√		√
AMER	Los Angeles		√	√	√		√	
AMER	New York		√	√	√	√		
AMER	San Jose	√	√	√	√	√	√	√
AMER	Sao Paulo		√	√	√	√	√	
AMER	Toronto		√	√	√	√	√	
AMER	Washington	√	√	√	√	√	√	√
APAC	Hong Kong	√	√	√	√	√		
APAC	Hong Kong	√	√	√	√	√		
APAC	Singapore	√	√	√	√	√		
APAC	Singapore	√	√	√	√	√		
APAC	Tokyo		√	√	√	√	√	
EU	Amsterdam		√	√	√	√	√	
EU	Dublin		√	√				
EU	Frankkurt	√	√	√	√	√	√	√
EU	London	√	√	√	√	√	√	√
EU	Paris		√	√		√		√
Mainland China	Beijing		√					

Cloud resources

- 19 PoPs
- Covering 17 cities

Public clouds

- Including AWS, Azure, Alibaba Cloud and GCP

Cloud Exchange Platform | Features

Basic functions

Feature one	Cloud Channel

Feature two	End-to-end high-speed connection

Feature three	SD Matrix connector

Advanced features

In progress

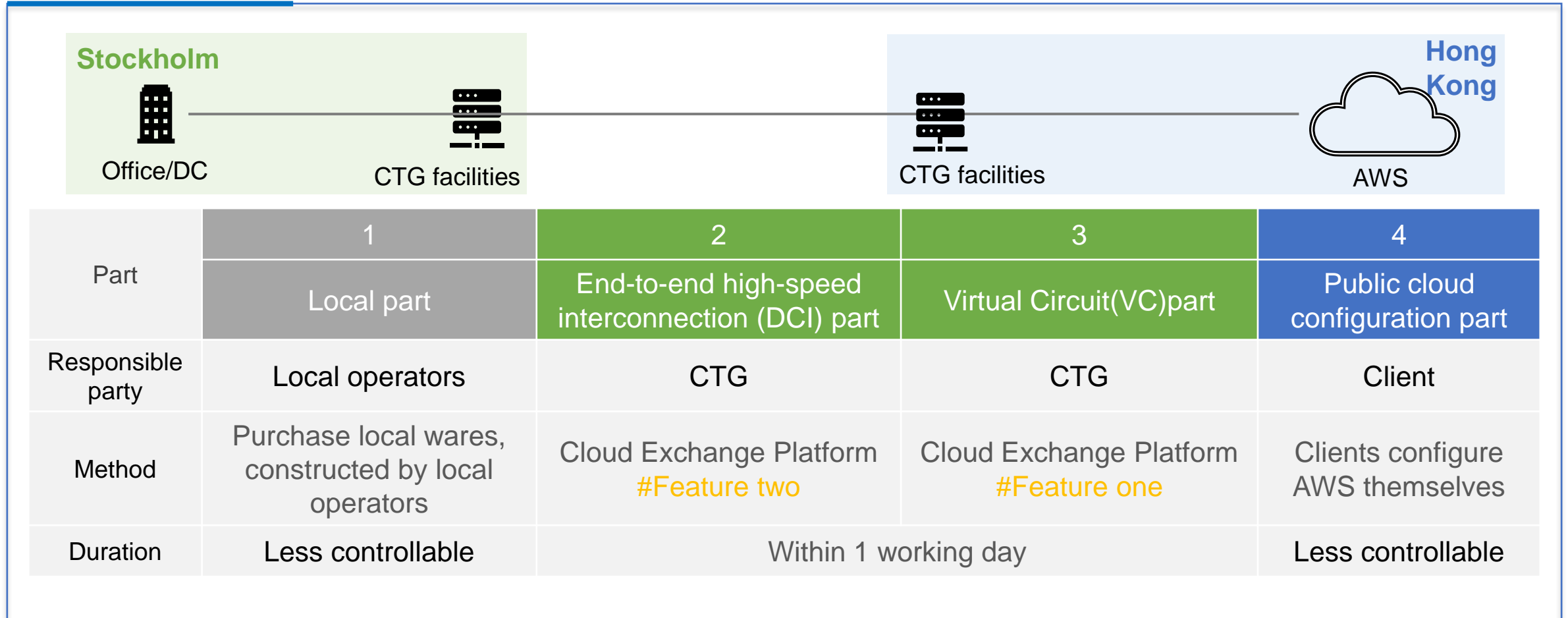| Feature four	Elastic bandwidth

Feature five	Bandwidth monitoring

Feature six	Capability Dashboard

Cloud Exchange Platform | Enterprise use cases

Scenario 1: DC/Office to Clouds Connectivity

Stockholm

Office/DC

CTG facilities

CTG facilities

Hong Kong

AWS

Part	1	2	3	4
	Local part	End-to-end high-speed interconnection (DCI) part	Virtual Circuit(VC)part	Public cloud configuration part
Responsible party	Local operators	CTG	CTG	Client
Method	Purchase local wares, constructed by local operators	Cloud Exchange Platform #Feature two	Cloud Exchange Platform #Feature one	Clients configure AWS themselves
Duration	Less controllable	Within 1 working day		Less controllable

Cloud Exchange Platform | Enterprise use cases

Scenario 2: Point-to-point Cloud Connectivity (Layer 2)

Singapore — AWS — CTG facilities — CTG — CTG facilities — Alibaba Cloud — Hong Kong

Part Name	1 Public cloud configuration part	2 Cloud channel part	3 End-to-end high-speed connection(DCI) part	4 Virtual Circuit (VC) part	5 Public cloud configuration part
Responsible party	Client	CTG	CTG	CTG	Client
Method	Clients configure AWS themselves	Cloud Exchange Platform #Feature one	Cloud Exchange Platform #Feature two	Cloud Exchange Platform #Feature one	Clients configure Alibaba Cloud themselves
Duration	Less controllable	Within 1 working day			Less controllable

Scenario 3: Multi-cloud Connectivity (Layer 3)

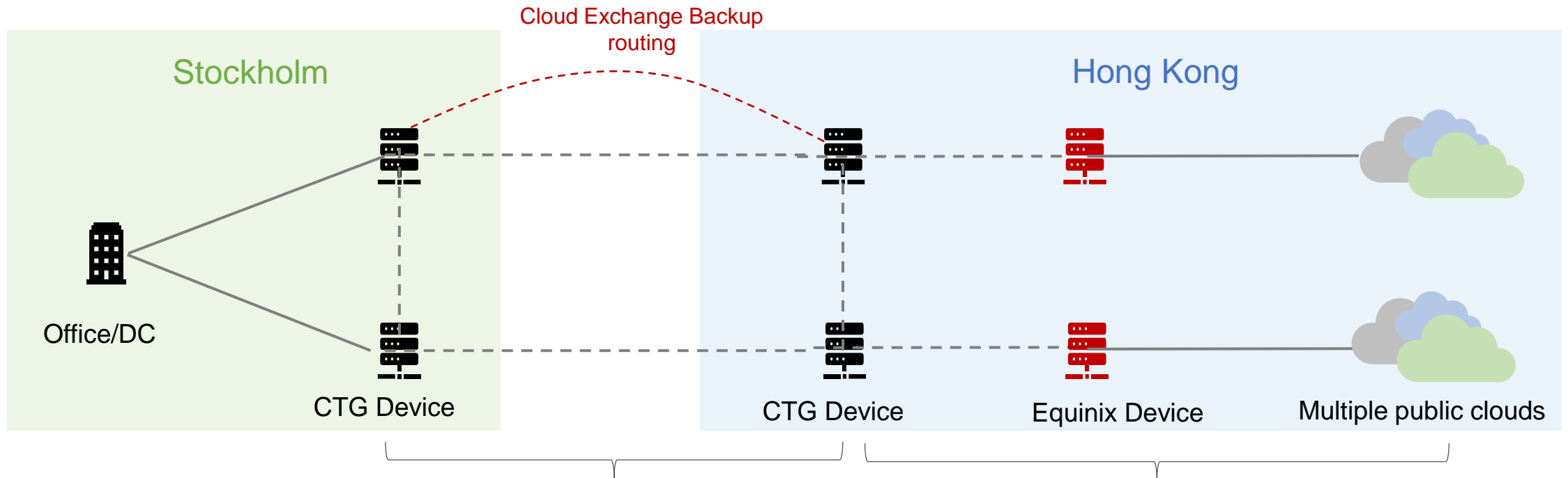| Part Name	1	2	3	4	5
	Public cloud configuration part	Virtual Circuit (VC) part	Matrix interconnection (L3) part	Virtual Circuit (VC) part	Public cloud configuration part
Responsible party	Client	CTG	CTG	CTG	Client
Method	Clients configure Alibaba Cloud themselves	Cloud Exchange Platform #Feature one	Cloud Exchange Platform #Feature three	Cloud Exchange Platform #Feature one	Clients configure AWS themselves
Duration	Less controllable	Within 1 working day			Less controllable

Connect Office/DC to CTG PoPs: 3 ways
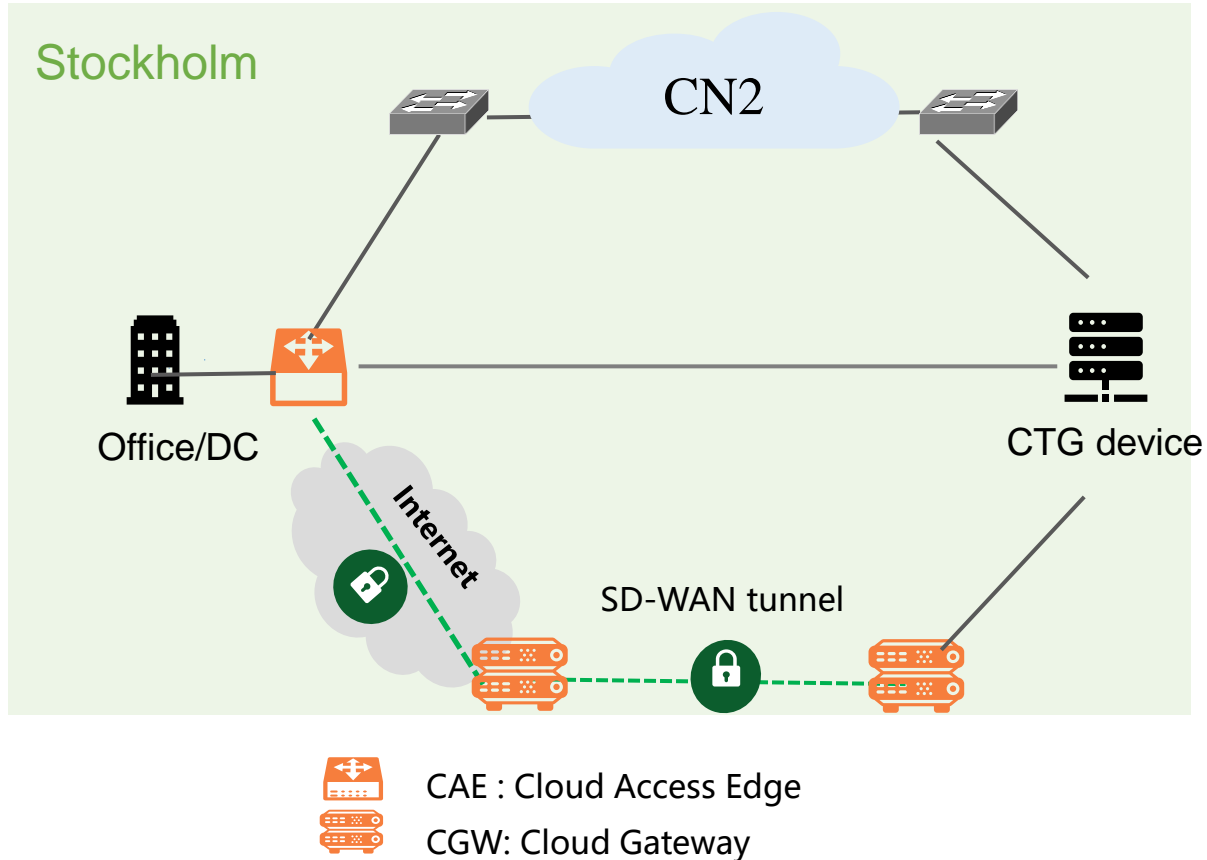
Method 1: MPLS VPN access. This access method includes local or in-house links at both ends

Method 2: Private link product (IEPL) access

Method 3: SD-WAN access. This access method is a hybrid networking scenario for SD-WAN and cloud connections

CAE : Cloud Access Edge
CGW: Cloud Gateway

HA: Dual redundancy of devices and lines and backup routing

Cloud Exchange Backup routing

Stockholm

Hong Kong

Office/DC

CTG Device

CTG Device

Equinix Device

Multiple public clouds

Data Center Interconnection (DCI)	Virtual Circuit (VC) part
Customers can achieve high availability by turning on dual wires (physical lines accessing devices with different nodes). In addition, backup routes are available in six cities (Beijing, Shanghai, Hong Kong, Frankfurt, Singapore, London).	By opening two VCs (Virtual Circuit) to enable hight availability

Security: VXLAN & VLAN Enable Logical Isolation of Circuits

Stockholm

Hong Kong

Client B

Office/DC

CTG Device

CTG Device

Equinix Device

Multiple public clouds
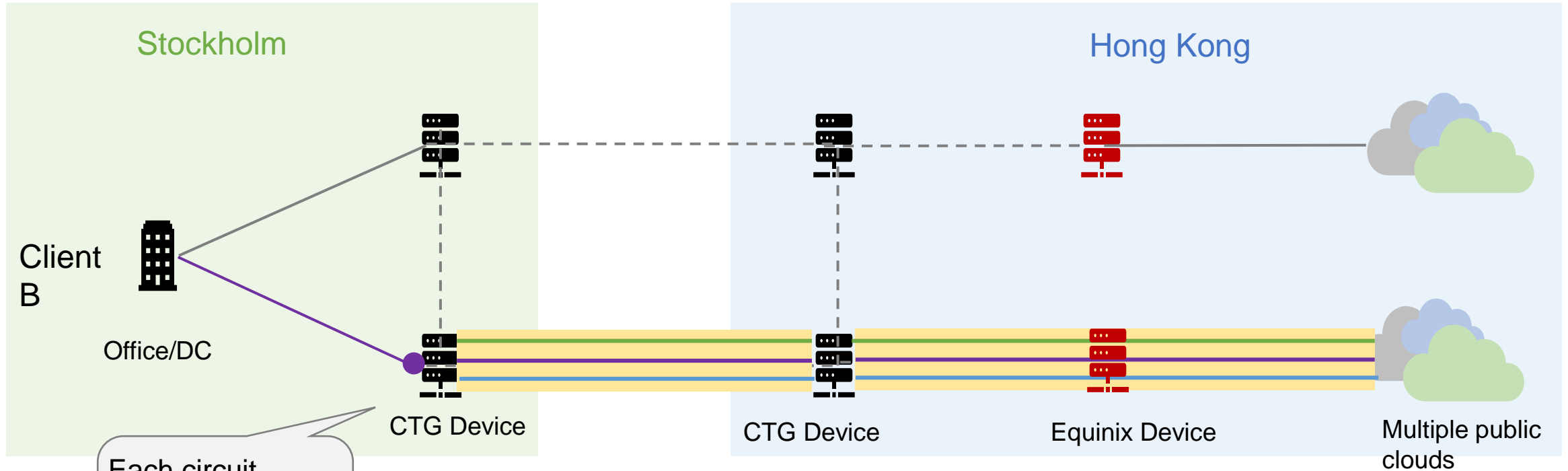
Each circuit occupies 1 physical port on the CTG device

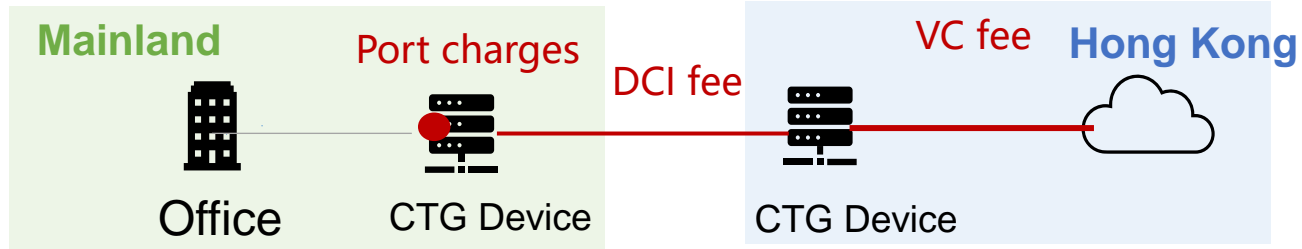| Data Center Interconnection (DCI)	Virtual Circuit (VC)
Use VXLAN technology to separate different customers on the same physical line, with each logical line assigned a different VNI (VXLAN Network Identifier)	VLAN technology separates different customers on the same physical line, with each VC (Virtual Circuit) assigning a different VLAN ID

Pricing Model | 3 elements

Quotation = DCI fee + Port charges + VC fee

- *DCI：Data Center Interconnection*
- *VC: Virtual Circuit*

Location A

Port charges

DCI fee

Location B

VC fee

Office

CTG Device

CTG Device
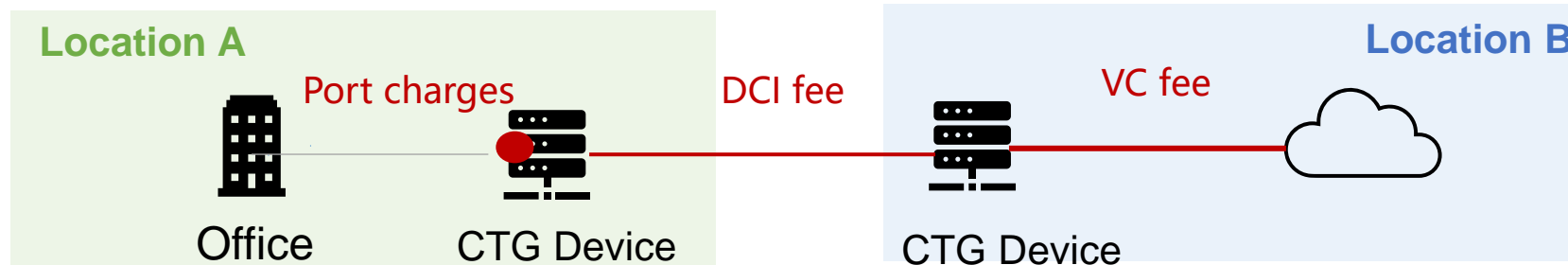
Pricing Model | 3 elements apply to different scenarios

Scenario 1: DC/Office to Clouds Connectivity

Mainland

Port charges

Office

CTG Device

DCI fee

VC fee **Hong Kong**

CTG Device

In this scenario, local line, VPN or SD-WAN will be needed to connect customer office to CTG Device

Price= DCI fee + Port charges + VC fee

- *DCI：Data Center Interconnection*
- *VC: Virtual Circuit，虚拟链路*

Pricing Model | 3 elements apply to different scenarios

Scenario 2：Point-to-point Cloud Connectivity (Layer 2)

Mainland

VC fee   DCI fee

CTG Device

Hong Kong

VC fee

CTG Device

Price= DCI fee + VC fee

- *DCI：Data Center Interconnection*
- *VC: Virtual Circuit*

Scenario 3：Multi-cloud Connectivity (Layer 3)
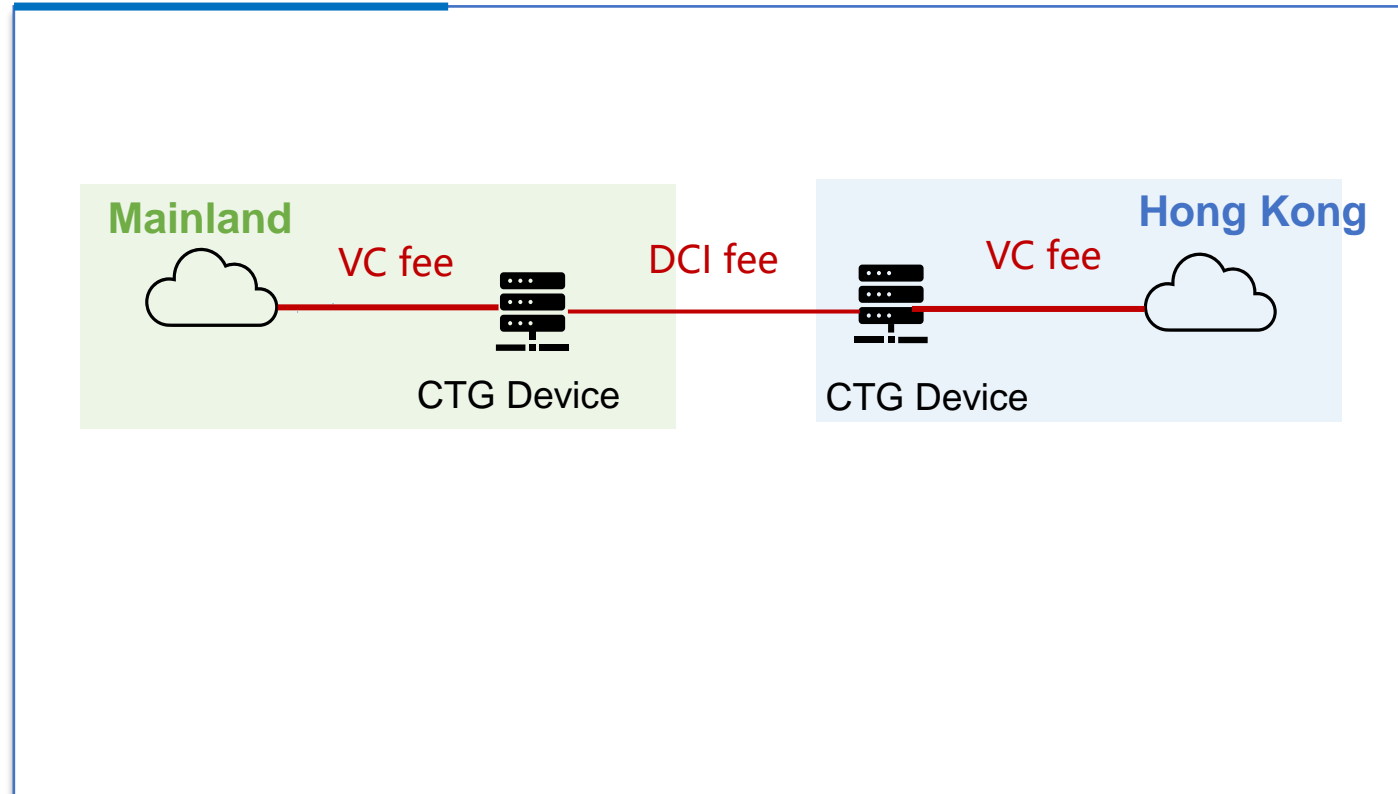
Quotation = DCI fee + VC fee

- *DCI：Data Center Interconnection*
- *VC: Virtual Circuit*

Pricing list

Gradient quotation		
DCI Fee		
Area	Bandwidth	MRC(USD/M)
Mainland China	0M~100M（included)	19
Mainland China	100M~1000M（included)	12
APAC	0M~100M（included)	12
APAC	100M~1000M（included)	8
AMER	0M~100M（included)	21
AMER	100M~1000M（included)	12
EU	0M~100M（included)	17
EU	100M~1000M（included)	10
MEA	0M~100M（included)	61
MEA	100M~1000M（included)	36

Gradient quotation	
Virtual Circuit Fee	
Bandwidth	MRC(USD/Mbps)
0-100M（含）	1.5
100-1000M（含）	1

Port Fee	
Port	MRC(USD/Port)
1G	32.5
10G	40

Product Benefits | Summary

Compliant cross-border lines

"In terms of strict compliance, only China Telecom, China Mobile and China Unicom are currently qualified to operate cross-border data communications services"

Source:https://www.submarinenetworks.com/zh/operators/20180831

Platform with automated opening capability

Cloud Exchange platform can be agile to open three typical enterprise cloud scenarios, customer self-service opening capacity will be realized in the second phase

Cloud resources cover mainstream public clouds

It now has 7+ mainstream public clouds, including AWS, Azure, GCP, and more

Network resources covers the world's core cities

Cloud Exchange has backbone network resources around the world to meet users' cross-regional business access needs

The private network link has a lower latency

Cloud Exchange uses high-quality dedicated line resources for security and stability, lower latency, and optimized QoE foundation for critical enterprise applications
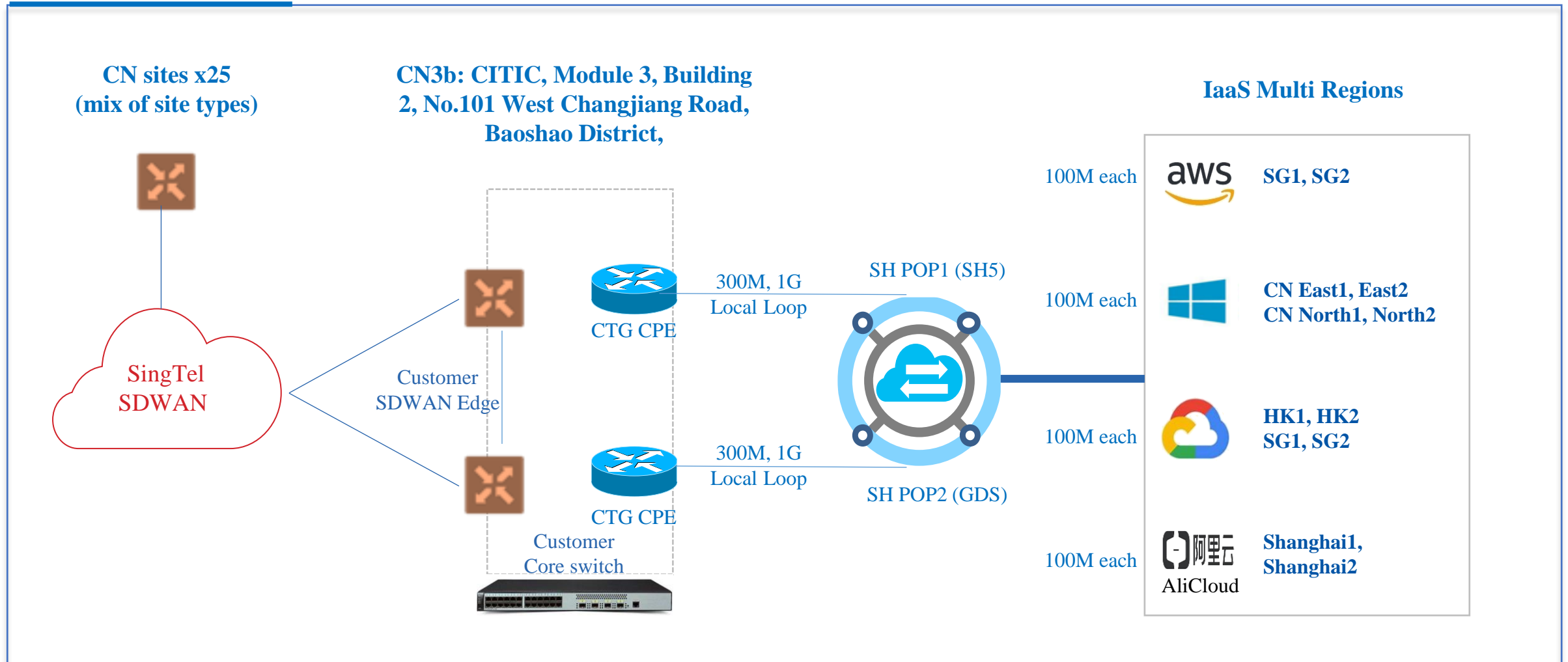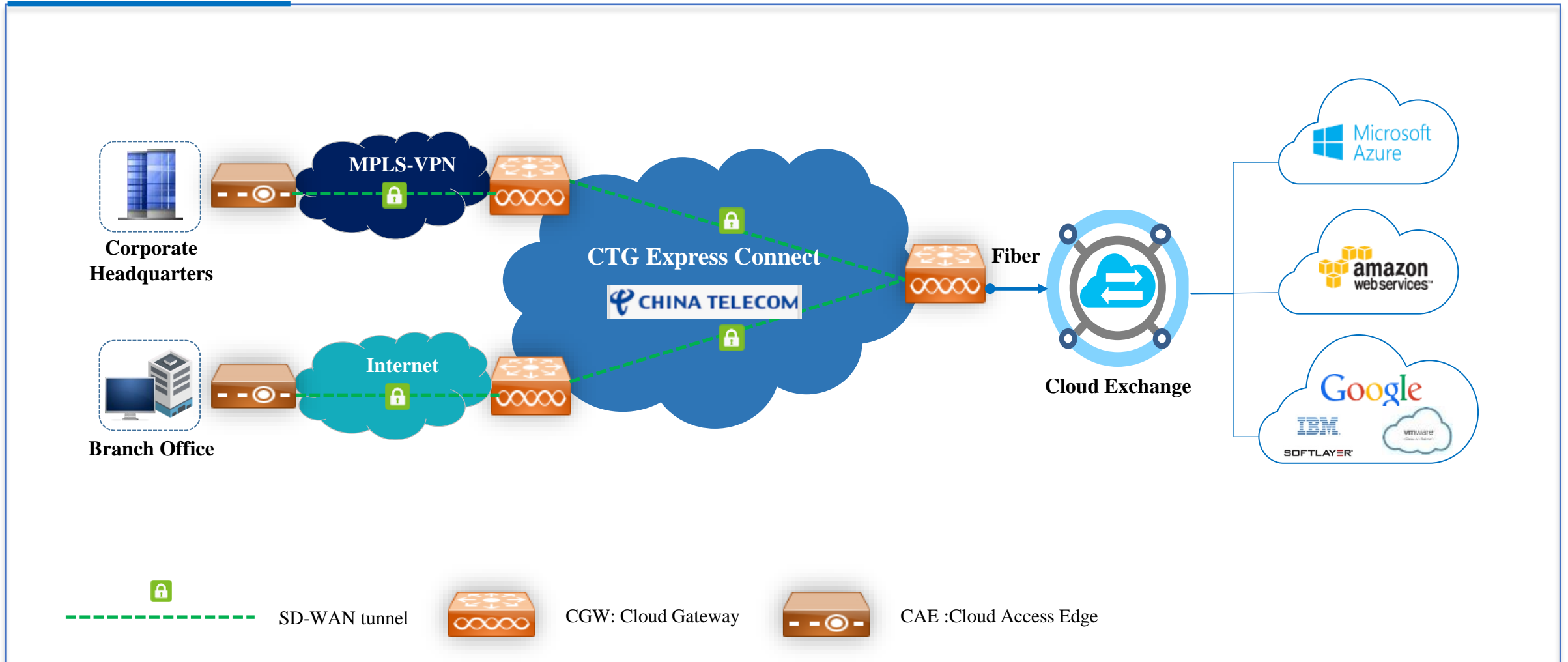
Professional and technical support

Networking scenario advice
Public cloud configuration assistance
7x24 Professional operations support

03 Customer Use Cases

Use Case 1 | Hybrid Cloud for a cosmetic company

CN sites x25 (mix of site types)

CN3b: CITIC, Module 3, Building 2, No.101 West Changjiang Road, Baoshao District,

IaaS Multi Regions

SingTel SDWAN

Customer SDWAN Edge

CTG CPE

300M, 1G Local Loop

SH POP1 (SH5)

CTG CPE

300M, 1G Local Loop

SH POP2 (GDS)

Customer Core switch

100M each — aws — **SG1, SG2**

100M each — **CN East1, East2 CN North1, North2**

100M each — **HK1, HK2 SG1, SG2**

100M each — AliCloud — **Shanghai1, Shanghai2**

Use Case 2 | SD-WAN to the Cloud

EXPLORING
SUCCESS
TOGETHER

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