Huawei OTN P2MP Private Line Solution Overview

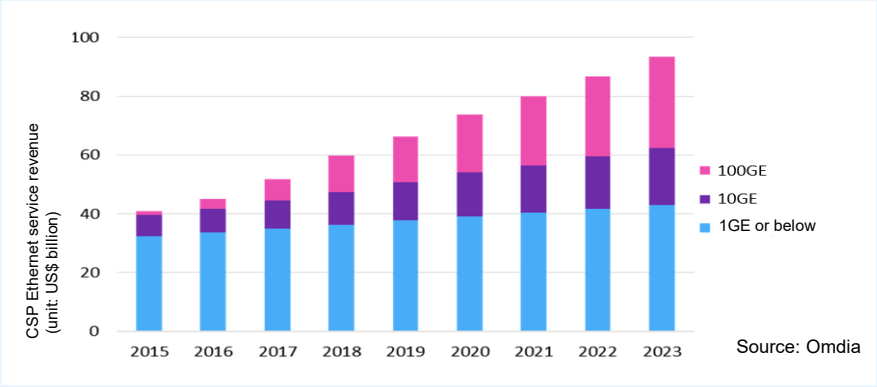
2022-07-15

01 Current Situation and Challenges

01-1 Tremendous Private Line Market Potential

Enterprises and industries are going digital faster with data and cloud, requiring higher network quality. As such, the demand for private lines is growing rapidly, creating a tremendous market space.

In 2023, the global private line market will exceed US$90 billion, with a CAGR of about 10%



Premium private line

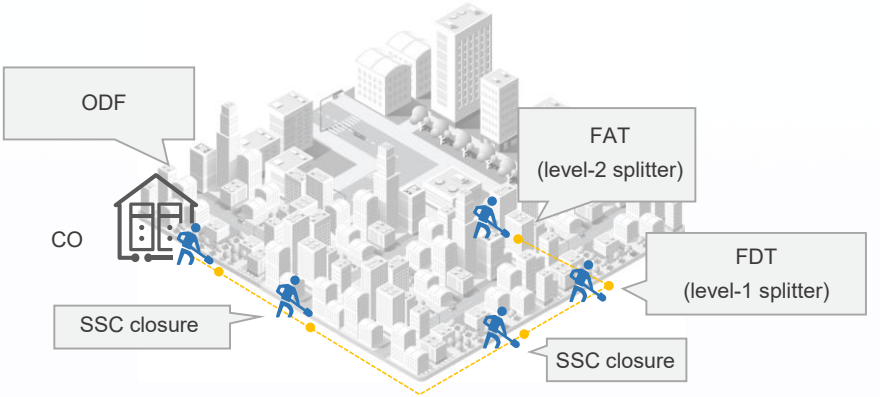
Top enterprises

Industries

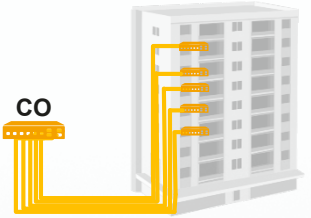
- Bank network flattening/digitalization High security
- Securities and finance Ultra-low latency
- e-Government extranet High reliability
- Medical imaging Ultra-high bandwidth
- Commercial building Branch networking

01-2 Challenges Faced by Private Lines

- **Slow service provisioning:** Deploying fiber patch cords for 4 to 5 times takes one week at the earliest.



- **High fiber consumption:** More optical cables are needed to enter the building, the rental of the equipment room in the building is high, and optical fibers are difficult to be deployed.



- **Limited equipment room conditions:** 80% buildings do not have equipment rooms and the installation space is limited, resulting in high risks of fault occurrence.

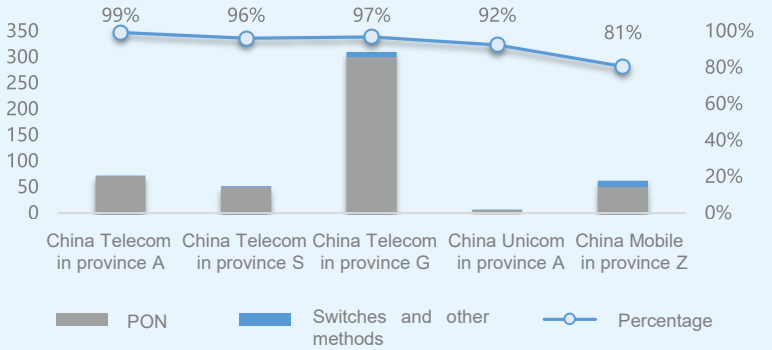
- **High cost:** E2E OTN premium private lines cost too much for SMEs.

- **Experience bottleneck:** The experience of key services deteriorates (video conference disconnection and frame freezing) significantly during peak hours.

01-3 Wide Coverage of Massive Mid-Range Networking Private Lines, Increasing Enterprise Requirements

PON private lines are the go-to in the building market. However, they do not fully meet customers' needs.

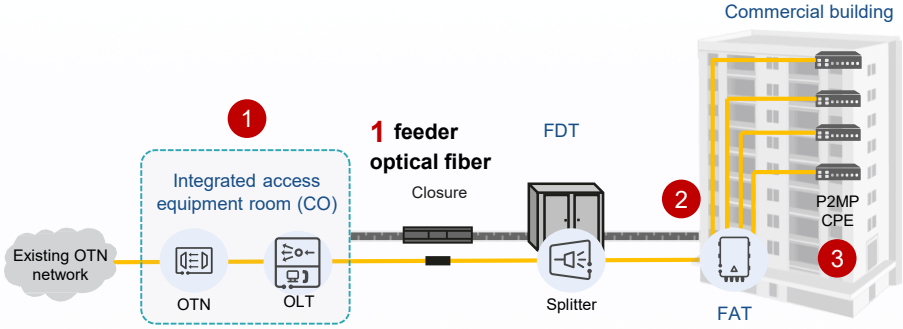
500,000 commercial buildings nationwide, with a market space of CNY50 billion
Widespread use of PON private lines (80%+) in the commercial building market



Services	Service Indicator	PON (Upstream Transmission)	OTN P2MP Private Line
Basic	Bandwidth	20M to 1G	< 1G
	Hard pipe isolation	Unsatisfied	Satisfied
	Latency (access section)	ms (not guaranteed)	Hundreds of microseconds
	Latency jitter	300 μs	< 150 μs
	Reliability	Uncommitted	Committed
Value-added	Hitless bandwidth adjustment	Not supported	Supported
	Service visualization, automatic service management, and visualization of key indicators such as latency	Not supported	Supported
	E2E service provisioning	Not supported	Supported

02 Huawei OTN P2MP Private Line

Huawei's OTN P2MP private line solution uses a passive optical fiber multiplexing architecture at the end of the ODN, and combines advantages of premium OTN enterprise private lines with wide-coverage ODN. It offers customizable service quality, assuring SLAs, such as high bandwidth, low latency, and fast provisioning for commercial buildings and video surveillance.



1. OTN P2MP boards (supported by OLT)
   Connection between the transmission network and the access network
2. Predeployed passive optical splitter
   Fewer backbone optical fibers and fast service provisioning
3. New P2MP CPE
   Hard pipe and low latency

Fast provisioning and fiber saving

- Reuse of ODNs, fast end coverage, and 80% reduction in fiber usage
- CPE plug-and-play, shortening the TTM to days

High quality, secure and reliable

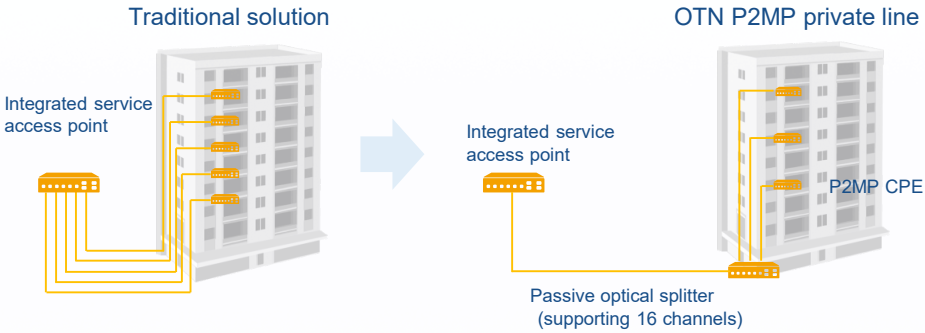
- Service+management isolation
- Single-site latency < 200 μs
- Multi-layer protection, ensuring high quality

Intelligent management & control and visualized SLAs

- Unified PON OTN management and control
- On-demand bandwidth adjustment and SLA visualization

02-1 Fast Service Provisioning and Fiber Saving

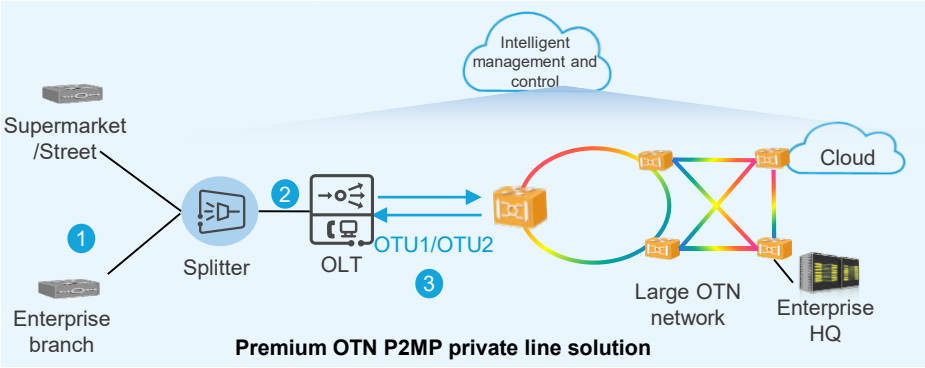
Traditionally, optical fibers are directly connected to the CO, which consumes a large number of backbone optical cables. To address this problem, the Huawei OTN P2MP private line reuses the wide-coverage ODN at the tail access section of the enterprise network, uses one optical fiber to connect to the CO, and adopts 1:16 optical splitting at the tail, saving the number of backbone optical cables by about 80%. At the same time, operators' manpower and resource costs are greatly reduced.



02-2 High Quality, Secure, and Reliable

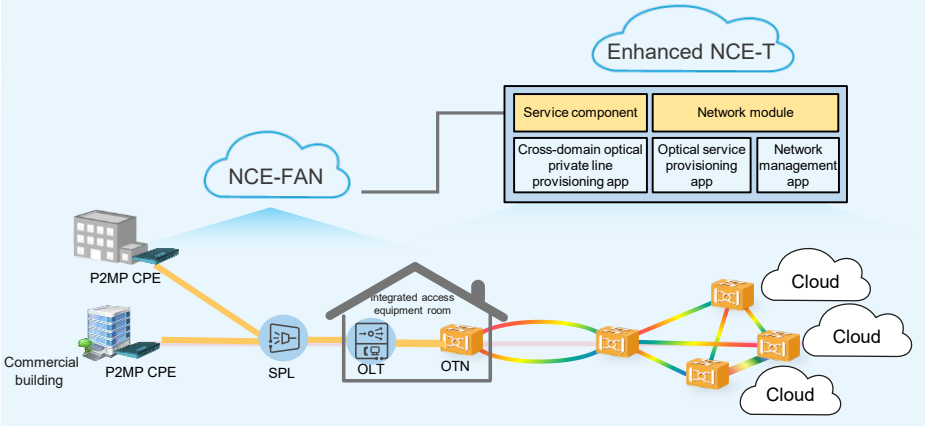
The OTN P2MP private line solution adopts technological innovation to quickly build high-performance private lines at low costs.

1. **Lower latency:** The dual-wavelength CPEs and SDH-like timeslot allocation technology achieve low latency and jitter for private line services.
2. **Higher security:** Independent ODN resources, OLT slicing, and exclusive tributary and line port resources improve security.
3. **Higher availability:** The dual-upstream OTN ports of OLTs and multi-layer protection implement protection switching within 50 ms.

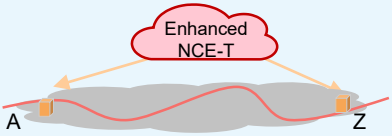


02 – 3 Intelligent Management & Control and Visualized SLAs

The OTN P2MP private line solution supports E2E centralized management and control. The enhanced service components and network components of NCE-T work with NCE-FAN to implement E2E provisioning and cross-domain management of OTN P2MP private lines. In addition, on-demand bandwidth adjustment and SLA visibility are met.



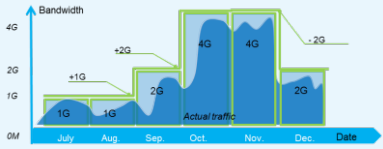
◆ Fast E2E service provisioning



Service configuration: A to Z

E2E service provisioning in seconds

◆ Bandwidth on demand (BoD)

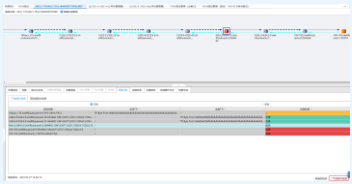


Instant bandwidth expansion during traffic bursts

◆ Private line SLA visualization

Real-time private line traffic, latency, SLA visualization, and historical playback

◆ Enhanced O&M capability

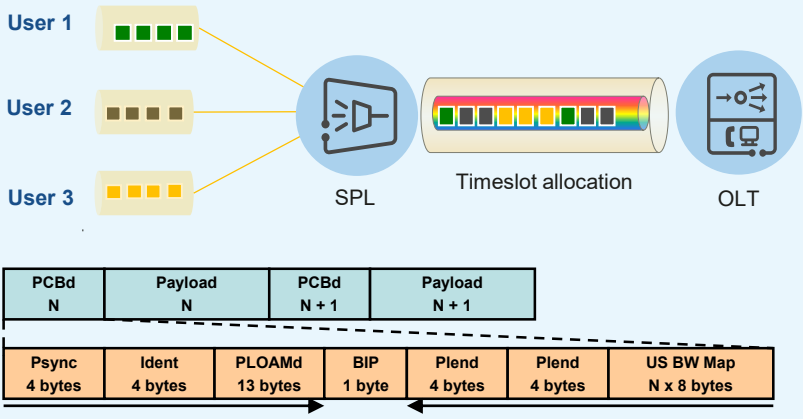


- Visualized service running status and service path alarms
- Service connectivity check and service fault point detection

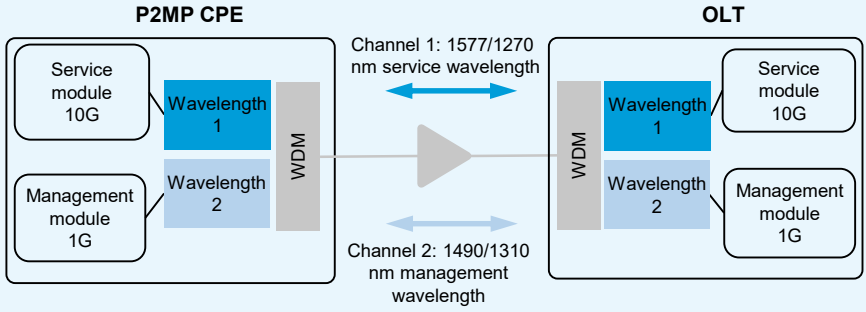
03 Key OTN P2MP Technologies

03-1 Dual Wavelength Mode and Timeslot Allocation, Ensuring Stable and Low Latency

SDH-like fixed timeslot allocation technology is used in the upstream direction to isolate timeslots between users and reduces the upstream latency in the access section to less than 200 μs.

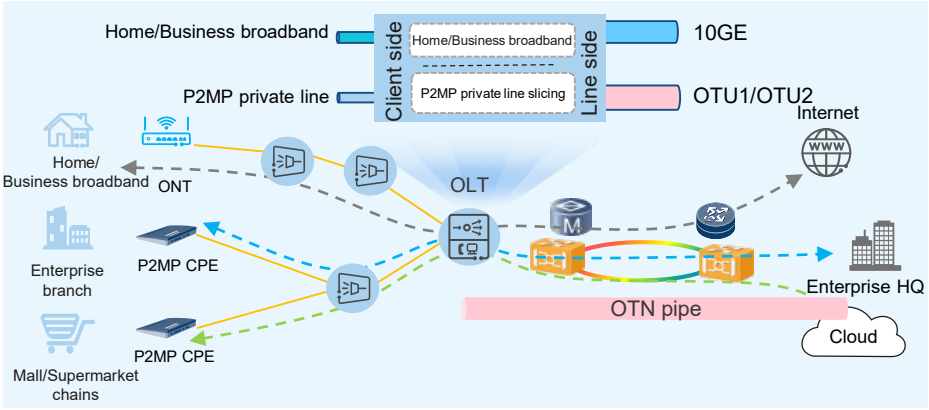


CPE dual-wavelength technology isolates service wavelengths from management wavelengths. Management wavelengths independently detect CPE online status, ensuring that the upstream latency in the access section is less than 150 μs.

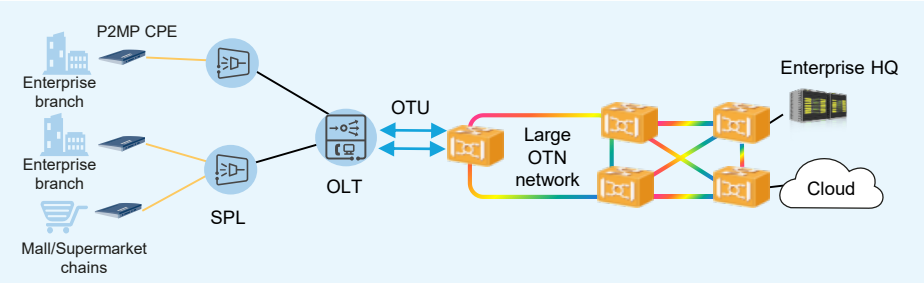


03-2 OLT Slicing, Providing E2E Hard Pipes

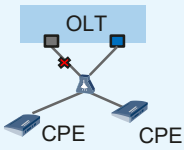
- Physical isolation of the ODN network
- OLT client side: services isolated from home broadband services
- Independent OLT resource slicing
- OLT line side: OTN hard isolation



03-3 Multi-layer Protection, Ensuring Availability

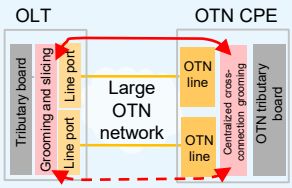


Type B protection



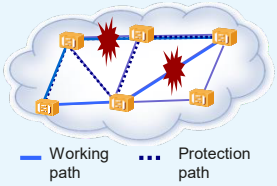
- When the working link is faulty, the system automatically switches services from the working port to the protection port.

SNCP



- Dual OLT ports for upstream transmission
- 1+1 line protection, switching within 50 ms

ASON protection



- OTN ASON protection against multiple fiber cuts
- High availability of the large network

04 Huawei OTN P2MP Product Portfolio

P2MP CPE

OptiXstar C610 E

Network-Side Port		Dual-wavelength, supporting 2.5G/10G upstream transmission
User-Side Port		2 x GE (optical) + 2 x FE/GE (electrical)
Dimensions (H x W x D)		43.6 mm x 250 mm x 180 mm
Weight		About 1.8 kg
Operating Environment	Temperature	–20°C to +55°C
	Humidity	5%–95% RH, non-condensing
Installation Mode		Desktop, wall, 19-inch cabinet, or network box

OptiXstar C610 L

Network-Side Port		Dual-wavelength, supporting 10G upstream transmission
User-Side Port		2 x GE (optical) + 2 x FE/GE (electrical)
Dimensions (H x W x D)		43.6 mm x 250 mm x 180 mm
Weight		About 1.8 kg
Operating Environment	Temperature	–20°C to +55°C
	Humidity	5%–95% RH, non-condensing
Installation Mode		Desktop, wall, 19-inch cabinet, or network box

* This data is provided based on V100R022C00.
The OptiXstar C610 E is the preferred P2MP CPE.

P2MP Tributary Board

H901CSPD

External Port	8 x 10G
Forwarding Performance	100 Gbit/s
Optical Module	Class B+/C+/D
Maximum Split Ratio	1:16
Max. Transmission Distance	20 km
Protection	Type B protection
Operating Temperature	–40°C to +65°C

H901CGPD

External Port	8 x 2.5G
Forwarding Performance	100 Gbit/s
Optical Module	Class B+/C+/D
Maximum Split Ratio	1:16
Max. Transmission Distance	60 km
Protection	Type B protection
Operating Temperature	–40°C to +65°C

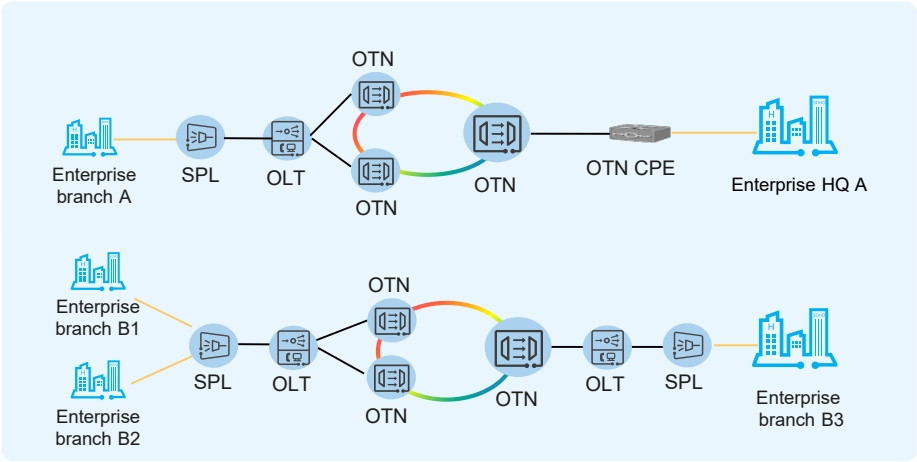
P2MP Line Board

H901TNSC

External Port	4 x OTU2(e)/OTU1
Number of Services	120 x OSUflex
Transmission Distance	10 km
Optical Module	SFP+, gray optical modules
Operating Temperature	–25°C to +55°C

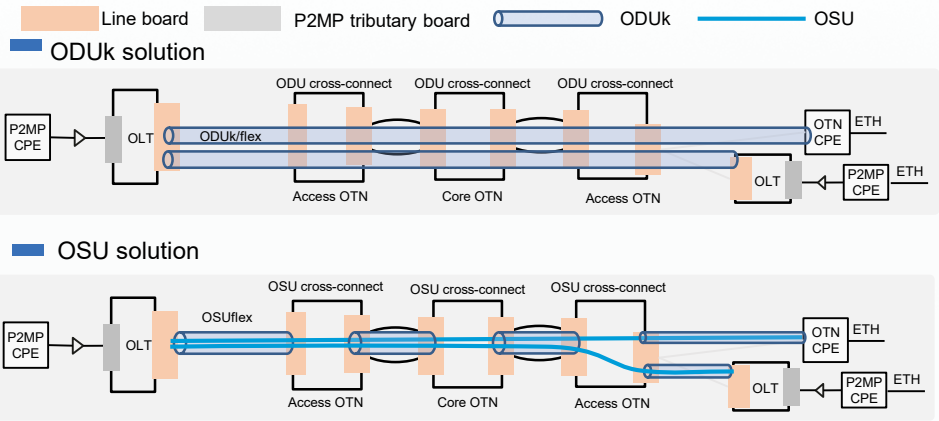
*The data is provided based on V100R022C00.
For details about board specifications, see the product documentation.

05 Typical Service Scenarios



- **Symmetric networking:** Both ends of a private line use P2MP CPEs to access the OTN network through OLTs. This applies to interconnection between small and medium-sized enterprise (SME) branches.
- **Asymmetric networking:** On one end of a private line, a P2MP CPE is deployed and connected to the OTN network through an OLT. An OTN CPE is deployed on the other end. This applies to interconnection between enterprise branches and HQs, or site-to-cloud private lines.

Service Interconnection Model



*More detailed service interconnection model, contact Huawei engineers.

06 Application Cases

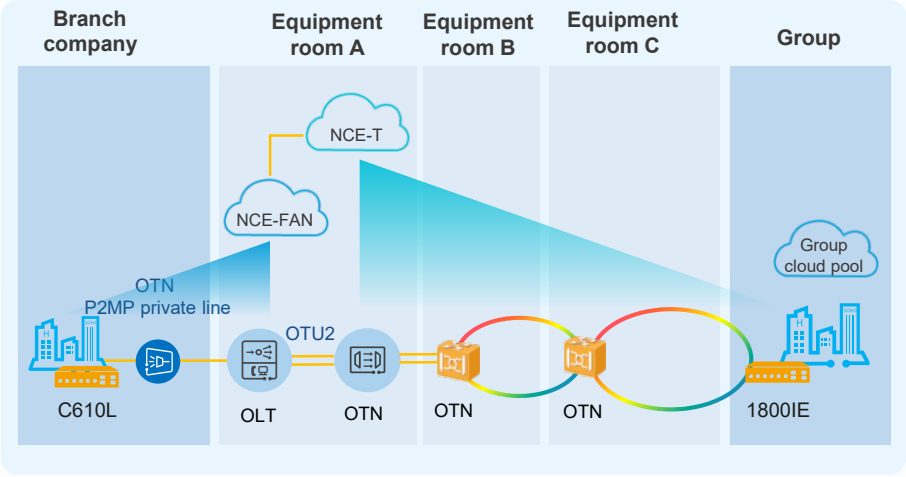
06-1 Data Migrated to the Cloud and Intelligent Management and Control

Customer Requirements

Company D is an all-in-one card carrier under Group S. Company D has issued more than 4.5 million all-in-one cards and has more than 1.2 million registered users of the all-in-one card app. The app covers more than 5,600 buses and one subway line in the city, and has more than 2,000 service outlets. A P2MP private line service needs to be provisioned from the branch to the group for accessing the group's cloud pool services. The requirements on the network are as follows:

- The network is secure and reliable for data migration.
- The bandwidth is 50 Mbit/s.
- The network is stable, the latency is low enough, and the access experience of cloud services is no worse than that of local access.

Solution



Customer Benefits

- Precise positioning: This solution is aimed at commercial buildings and industrial parks, enabling enterprises to obtain OTN-like private lines at a moderate price.
- Excellent performance: The average round-trip latency is only 1.4 ms and the average jitter is only 0.0185 ms.
- Flexible bandwidth adjustment: The bandwidth can be flexibly adjusted from 10 Mbit/s to 1000 Mbit/s, and the performance can be visualized in real time.
- Reduced deployment costs: Only one fiber is required to the building, and no extra equipment room needs to be leased.

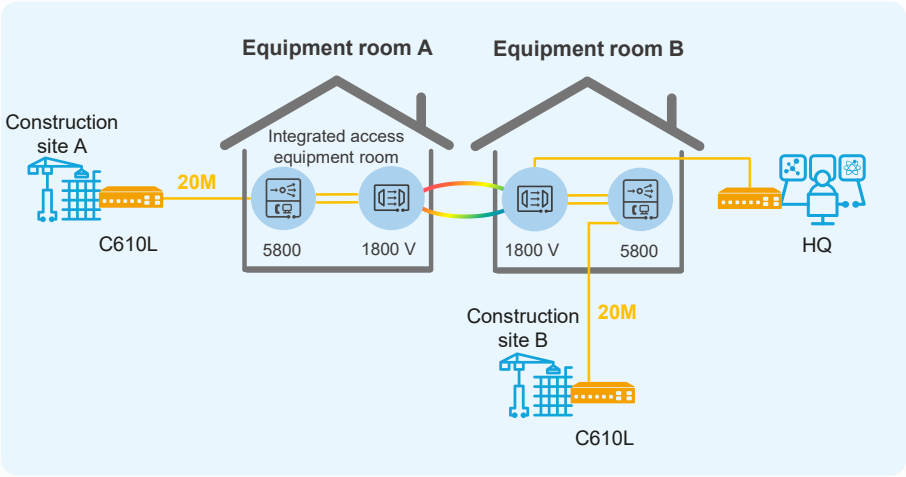
06-2 Video Backhaul at Ultra-Low Latency

Customer Requirements

Enterprise A in city C mainly undertakes video surveillance services of the public security bureau, traffic patrol police system, and construction sites. The video surveillance service for construction site security is a typical P2MP service. However, traditional service provisioning is complex, no NMS is available for management, and the private network quality is not as expected. A P2MP private line is provisioned for HD video transmission from the construction site to the HQ. The requirements on the network are as follows:

- Video surveillance requires zero frame freezing and zero interruption.
- The bandwidth is stable and no packets is lost.
- The network is secure enough for data transmission and private line services are isolated from public services.

Solution



Customer Benefits

- **Intelligent management and control**: Services can be managed in E2E manner and SLAs are visualized.
- **Performance optimization**: Enterprises can obtain OTN-like performance, with the round-trip latency 1.6 ms and jitter only 0.053 ms.
- **Flexible deployment**: Easy device deployment and removal, one-click configuration delivery, CPE plug-and-play, and day-level TTM help the operator quickly deliver the solution.

07 Acronyms or Abbreviations

Acronym/Abbreviation	Full Name
ASON	Automatically Switched Optical Network
BoD	Bandwidth on Demand
CO	Central Office
CPE	Customer-Premises Equipment
EoO	Ethernet over OTN
IM	Instant Messaging
OCh	Optical Channel with Full Functionality
ODN	Optical Distribution Network
ODUk	Optical Channel Data Unit-k
OLT	Optical Line Termination
OSU	Optical Service Unit
OTN	Optical Transport Network
OTUk	Optical Channel Transport Unit-k
PON	Passive Optical Network
P2MP	Point-to-Multipoint
P2P	Point-to-Point
SDH	Synchronous Digital Hierarchy
SLA	Service Level Agreement
SNCP	Subnetwork Connection Protection
SPL	Splitter
TTM	Time to Market
VC	Virtual Container
VLAN	Virtual Local Area Network
WDM	Wavelength Division Multiplexing