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## WDM/OTN Solution

# Full Series of 400G/800G WDM Solution



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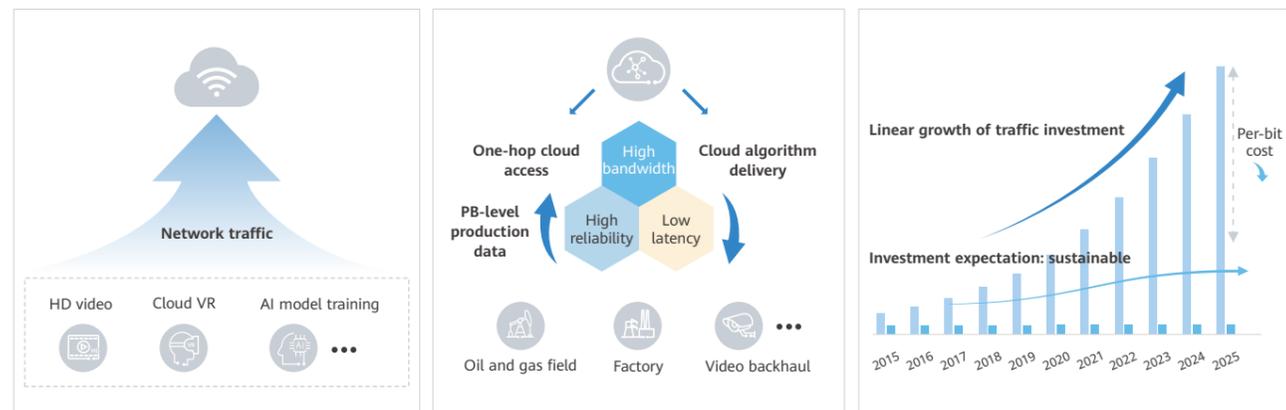
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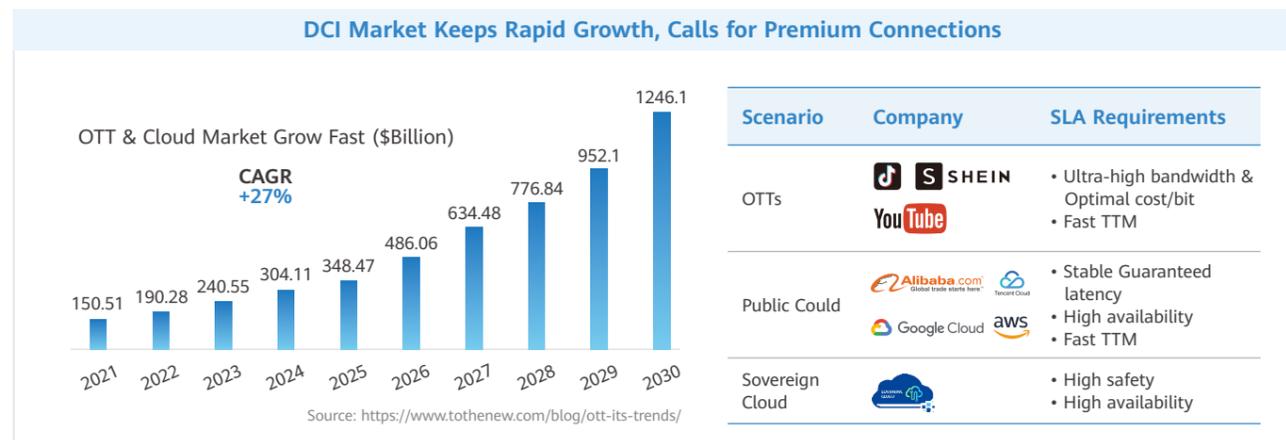
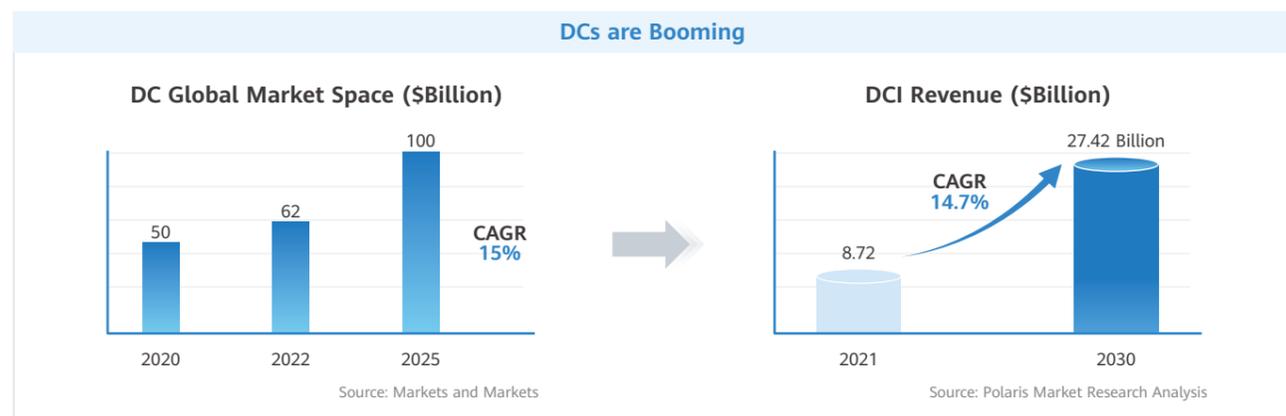
# 01 Trends and Challenges

## 1.1 Services Drive Traffic Growth and Upgrade of Transmission Network Bandwidth

Services such as HD video, cloud VR, and AI model training are driving the rapid growth of network traffic. Petabytes of data needs to be transmitted with high bandwidth, high reliability, and low latency.



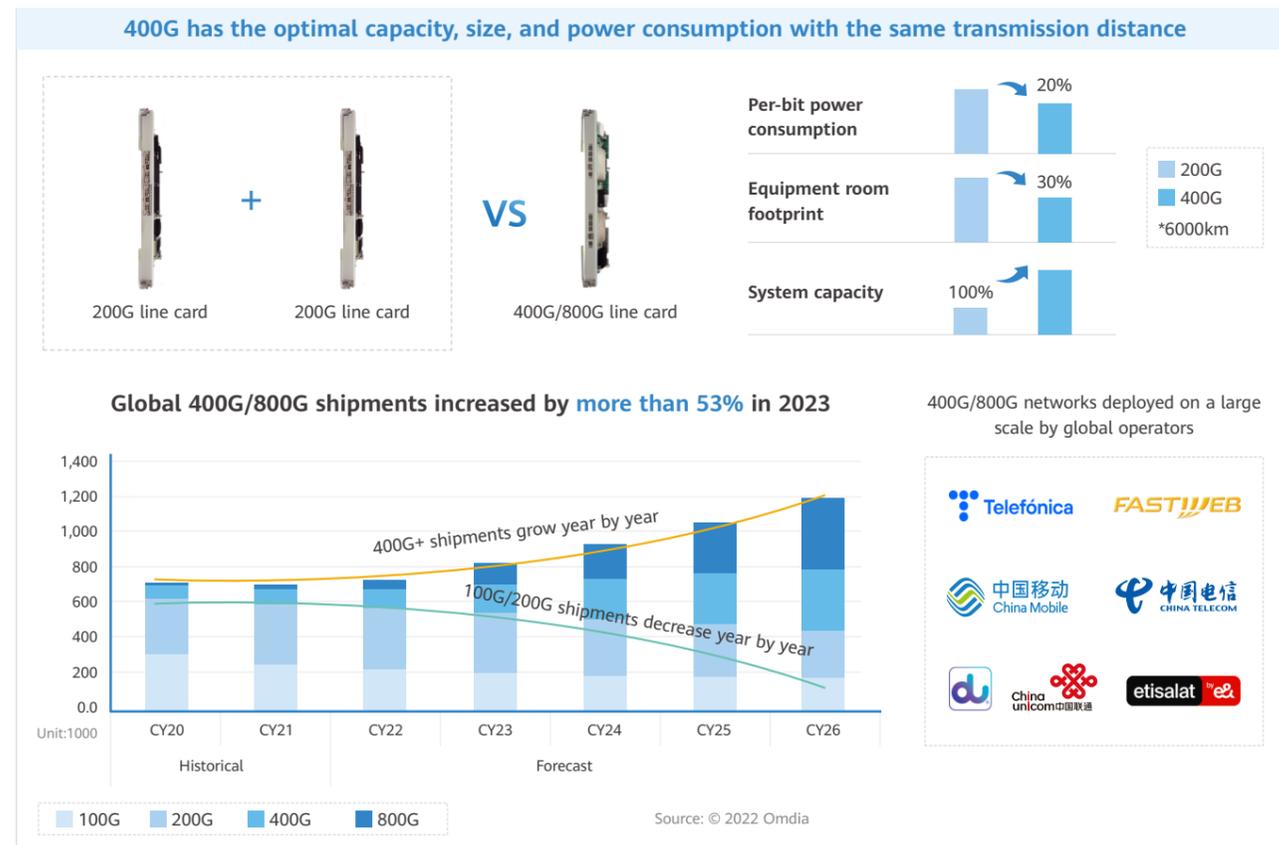
## 1.2 DC-centric Network Needs High Reliability and High Bandwidth



# 02 Overview of 400G/800G Solution

## 2.1 400G/800G Ushers in a New WDM Era

Compared with 200G, 400G has the same transmission capability, double system capacity, and less per-bit power consumption. This makes 400G the mainstream choice for operators.



## 2.2 Key Capabilities of Huawei 400G/800G Solution

- Ultra-long haul/Large capacity**
  - 400G, 6000+ km transmission distance, single-fiber 32T/48T
  - 800G, 2500 km transmission distance, single-fiber 64T
  - 1.2T, 320 km transmission distance, single-fiber 96T
- High reliability/ASON**
  - 100 ms-level fast recovery, no sense of service interruption
  - Predictable and detectable risks, achieving 99.999% reliability
- Ultra-wide spectrum/Optical system**
  - C120/L120 OA, expanding available spectrums to 12 THz
  - Super C+L integrated WSS, flexible wavelength grooming in any direction
- Green/Efficient**
  - Energy-efficient OTN platform, 0.1 W per Gbit, 65% ↓
  - E2E OXC all-optical switching, simplified sites, one-hop connection

# 03 Key Capabilities

## 3.1 Ultra-Long Haul and Large Capacity

Huawei full series of 400G/800G WDM solution supports QPSK and s16QAM modulation formats and is applicable to ultra-long-haul, regional, and metro networks.

**400G: Ultra-long-haul**

>6000km

**400G: Region**

>3000km

**800G: Metro**

2500km

**1.2T: DCI**

320km

**Algorithms upgraded for leading performance and capacity**

**PBC non-linear compensation algorithm**

Computational complexity 90% ↓

Transmission performance 1 dB ↑

**5-in-1 optoelectronic packaging, high integration, low loss**

**Coherent optical sub-assembly (COSA)**

Component size 70% ↓

Component connection loss 90% ↓

## 3.2 Wide-Spectrum Optical Switching

The 400G/800G WDM solution supports smooth evolution from C120 to C120+L120, and provides 25% wider spectrum than the industry average.

**New L-band OA module, breaking the amplification boundary, doubling the capacity over the same distance**

Huawei: 12THz

C120 (6 THz) | L120 (6 THz)

**New elements, new formula, vapor deposition process**

**10,000+ verifications**

Effective L-band amplification by X-doped and Y-doped fibers

OA performance 0.5 dB ↑

**Super C+L integrated WSS, 2-in-1, C6T+L6T for flexible wavelength grooming**

**Meta lens**

1 billion microlenses in 1 cm<sup>2</sup> surface

Lens quantity 75% ↓

**High refractive index 2.9K LCOS**

2x wavelength diffraction range

2x response speed ↑

## 3.3 Highly Reliable ASON

An ASON with the new architecture supports more than 3000 NEs and deterministic trail recovery within 100 ms.

**Elastic large-scale network**

Electrical layer: 600 NEs → 3000 NEs

Optical layer: 150 ROADMs + 800 OLA → 1000 ROADMs sites + unlimited OLA sites

Larger-scale network, supporting elastic capacity expansion

**Fast rerouting**

Electrical layer

Seconds

ASON1.0

Optical layer

Minutes

ASON1.0

ASON2.0

Upper-layer services do not flap and are not affected during rerouting caused by a fiber cut

**Deterministic recovery**

Stable No fiber cut → Rerouting commissioning Available trails refreshed in real time

Predictable rerouting trails and guaranteed resources

**Fewer resources**

Electrical-layer ASON

Multiple copies of line resources, high costs

Optical-layer ASON

Restoration in seconds

Optical- and electrical-layer ASON

Two copies of line resources, recovering services within ms

Protection against multiple faults with fewer electrical-layer recovery resources

## 3.4 Green and Efficient

By using E2E OXC & OTN devices and efficient, green, and innovative technologies, operators can continuously build green all-optical networks.

**Innovative application of green technologies: Continuously improves energy efficiency**

**Power supply pooling, on-dem and configuration**

Conventional partitioned power supply → AC/HVDC power supply pooling

Initial stage: power consumption 60%+ ↓

Full-load stage: power consumption 20%+ ↓

**Intelligent fans + airflow**

Conventional fans → Hato fans Bionic winglet Suppressing the vortex at the blade tips

Conventional cascading air duct → Front-to-rear airflow

1.5x air volume, power consumption 35% ↓

**Thermal-conductive material**

Conventional thermal-conductive material → Copper diamond composite material

3x heat dissipation capability, temperature 10°C ↓

**OXC: Simplifies ROADM sites and enables green all-optical switching networks**

**Backbone network: OXC for mesh networks**

Conventional solution: 1 subrack for 1 direction → Innovative solution: 1 board for 32 directions

Space 80% ↓, power consumption 50% ↓, fiber connections 95% ↓

**Metro site: ultra-highly-integrated Blade OXC**

Conventional solution: 1 subrack for 1 direction → Innovative solution: 1 board for 1 direction

Space 90% ↓, power consumption 80% ↓

**Alps architecture: 9-in-1 Blade OXC**

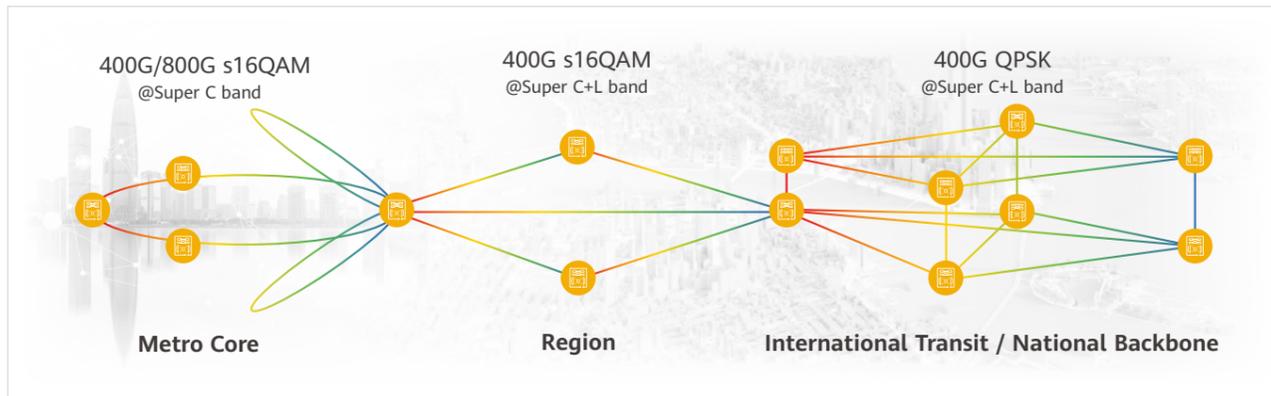
Conventional solution: 1 subrack for 1 direction → Innovative solution: 1 subrack for 9 directions

Space 80% ↓, power consumption 60% ↓

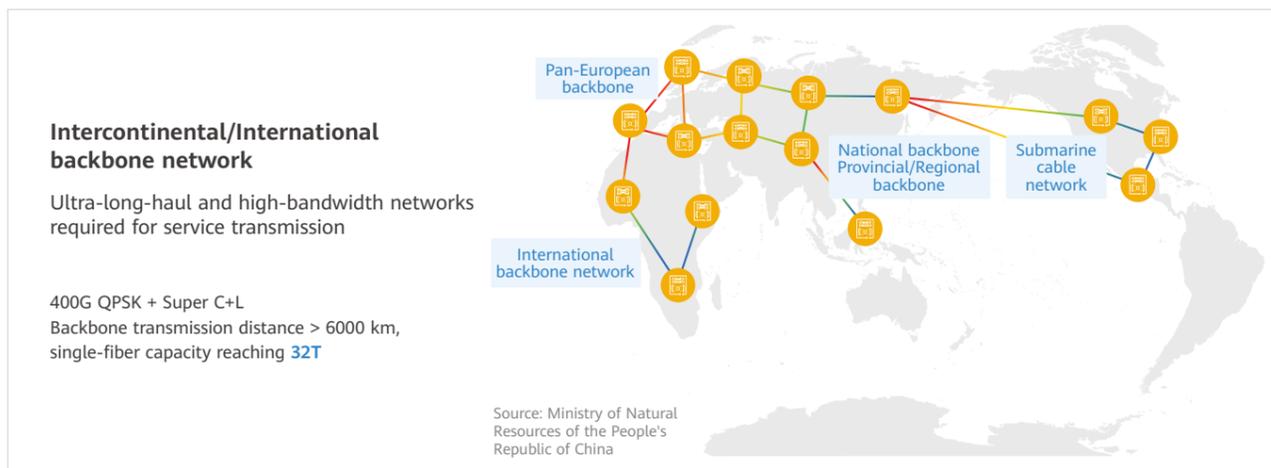


# 04 Application Scenarios

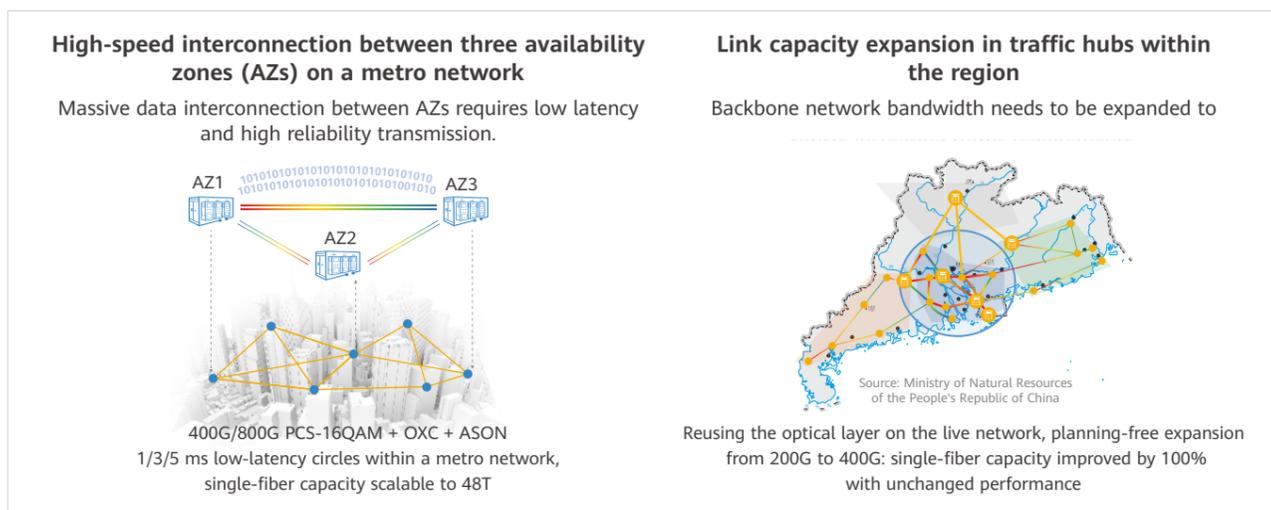
The 400G/800G solution is applicable to ultra-long-haul, regional backbone, and metro networks



## Ultra-long-haul networks

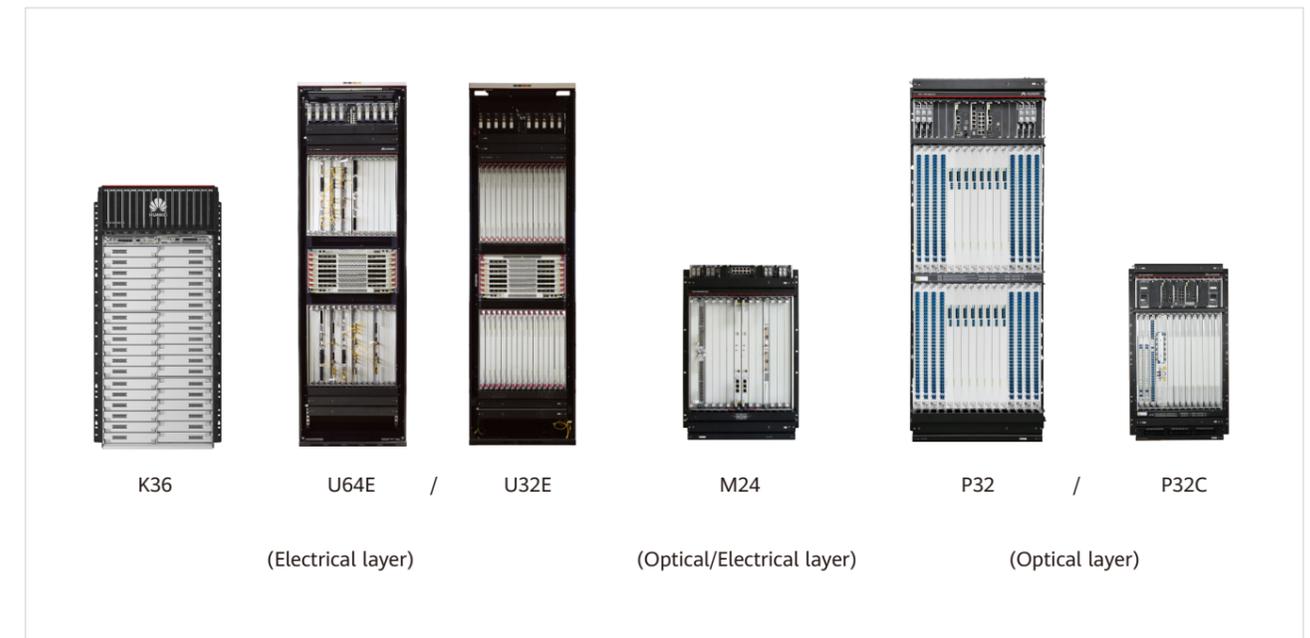


## Regional/Metro networks



# 05 Products

## 5.1 Supported Devices



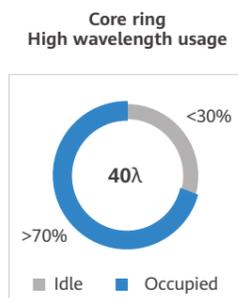
## 5.2 Boards

 <p><b>TKE1T604</b></p> <p>4 x 400GE/4 x 200GE → 4 x ODUflex tributary service processing board Subrack: OSN 9800 K36</p>	 <p><b>TNS3N801/TNS3N801L</b></p> <p>1 x 400G/800G OTN/VC line board Supporting Super C/Super L band Subrack: OSN 9800 U64E/U32E/M24</p>	 <p><b>TNG1M608D</b></p> <p>8 x 100GE/2 x 400GE → 2 x 400G Supporting Super C band Subrack: OSN 9800 M24/M12/M05</p>
 <p><b>TKE1N602P</b></p> <p>2 x 400G/800G OTN line board Supporting Super C Subrack: OSN 9800 K36</p>	 <p><b>TNS3N602/TNS3N602L</b></p> <p>2 x 400G OTN/VC line board Supporting Super C/Super L band Subrack: OSN 9800 U64E/U32E/M24</p>	 <p><b>TNG2M808S/TNG2M808SL</b></p> <p>8 x 100GE/8 x OTU4/2 x 400GE → 1 x 400G/800G Supporting Super C/Super L band Subrack: OSN 9800 M24/M12/M05</p>

## 06 Success Stories

### Challenges

- Backbone networks cannot provide sufficient bandwidth to satisfy increasing traffic requirements.
- The overall usage is low. The core ring is congested with high wavelength usage, while the edge ring is lightly loaded.
- High-value services and low-value services are not distinguished, thereby affecting each other.
- As the O&M manpower is limited, products need to support easy O&M, for example, quick fault locating and easy service expansion and commissioning.



### Solution

1

#### Large capacity

Only the core sites are upgraded to 200G/400G, reducing network construction costs and difficulties in the initial phase.

2

#### Simplified sites

OXC is deployed in core areas to build a 3D mesh backbone network, simplifying ROADM sites and improving system scheduling capabilities.

3

#### Easy O&M

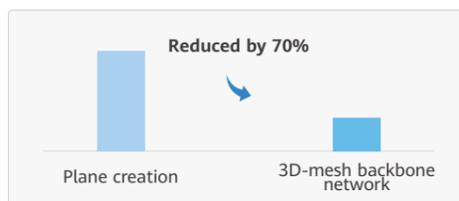
NCE-T is used for unified management and O&M, and line-side 1+1 protection achieves 99.999% service reliability.



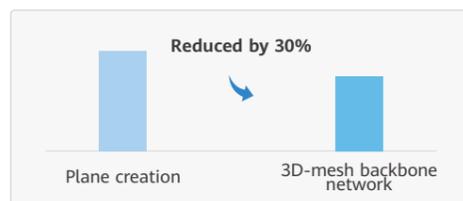
### Solution benefits



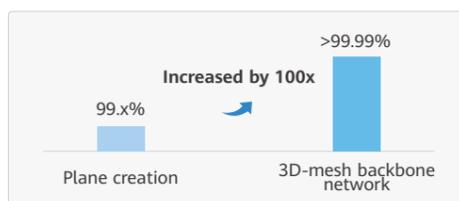
Construction cost



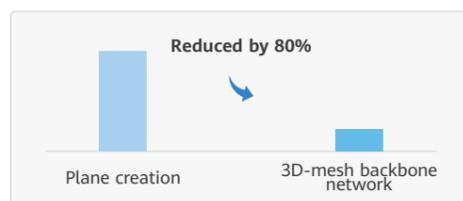
Maintenance cost



Network reliability



Delivery period



## 07 Acronyms and Abbreviations

Abbreviation	Full Name
ASON	automatically switched optical network
AZ	availability zone
COSA	Coherent Optical Sub-Assembly
DC	data center
OTN	optical transmission network
OXC	optical cross-connect
PBC	Perturbation-based compensation
PCS	probabilistic constellation shaping
QAM	quadrature amplitude modulation
QPSK	quadrature phase shift keying
ROADM	reconfigurable optical add/drop multiplexer
WDM	wavelength division multiplexer
WSON	wavelength switched optical network(WSON)
WSS	wavelength selective switch