



# Gigaband City Enhances Digital Transformation

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# Breakdown the Components



## Gigaband Solution

- Giga Network
  - Giga Copper / Coax / Fiber
- Giga Home and Smart Home
- 10G / 40G / 100G PON
- Seamless Wifi
- Network Slicing



## Smart City

- Smart Transportation
- Smart Energy and Water
- E – Healthcare
- Smart Logistics
- Smart Garbage Disposal
- Smart Agriculture



## Digital Transformation

- Broadband
- Data Centers
- Cloud Network
- Big Data
- Internet of things (IOT)
- 4K / VR / Game online

# Challenges of Fast Developing Cities

- Rapid growth of Urbanization
- About **180,000** people move into a city everyday
- **60% of world population** will be living in cities by 2030
- **70% of global GDP** is generated by cities

Source: WorldBank.org



Public Safety



Traffic



Governance



Health

# Severe Challenges Facing Fast-Growing Cities



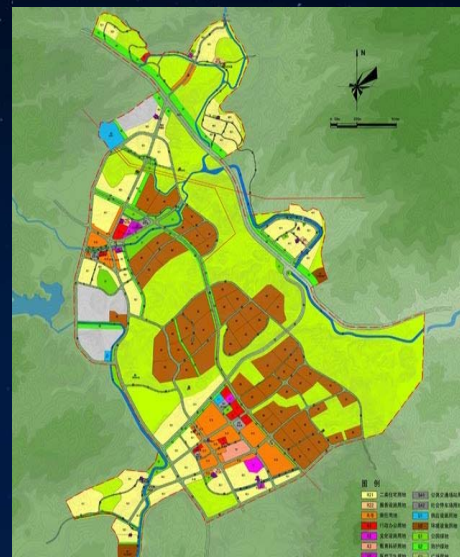
## City governance

Terrorist attacks, natural disasters, passive emergency command, and difficult cross-agency collaboration



## People's livelihood

Regional education unbalance and poor healthcare conditions



## Industry development

Insufficient decision-making support and difficulties in enterprise innovation, upgrading, and transformation



## Environmental ecology

Insufficient pollution monitoring and poor green energy development

# Smart City is the Future



## Innovation

Big data will drive Safe and Smart City innovations

## Efficiency

Improved Government efficiency and enhanced public safety

## Public Safety

Lower crime rates, Social living environment and prevention of loss of lives

## Pro-business climate

Attract investments leading to GDP growth

# Smart City Brings All-Round Changes to Cities

## Efficient Municipal Governance



- Social security
- Emergency response
- Utilities management
- Urban planning
- ...

## High-quality Public Services



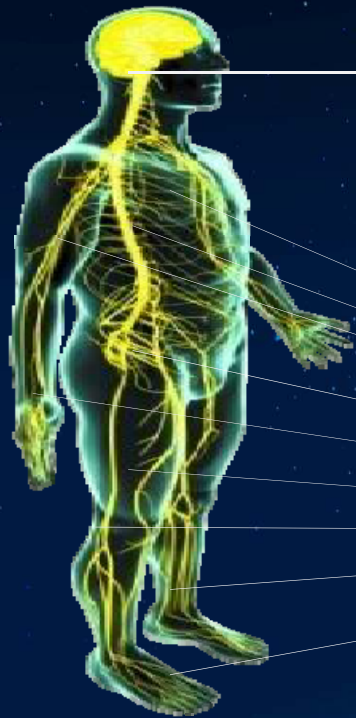
- Public transportation
- Education
- Healthcare
- Government services
- ...

## Sustainable Economic Development



- Environmental ecology
- Industrial parks
- Tourism
- Intelligent manufacturing
- ...

# Huawei: Builds Smart City 'Nervous System'



Central Nervous System – 'Brain'

'Peripheral Nervous System'

City Operations Center



Cloud Data Center



+



Internet of Things



Communications Network

+

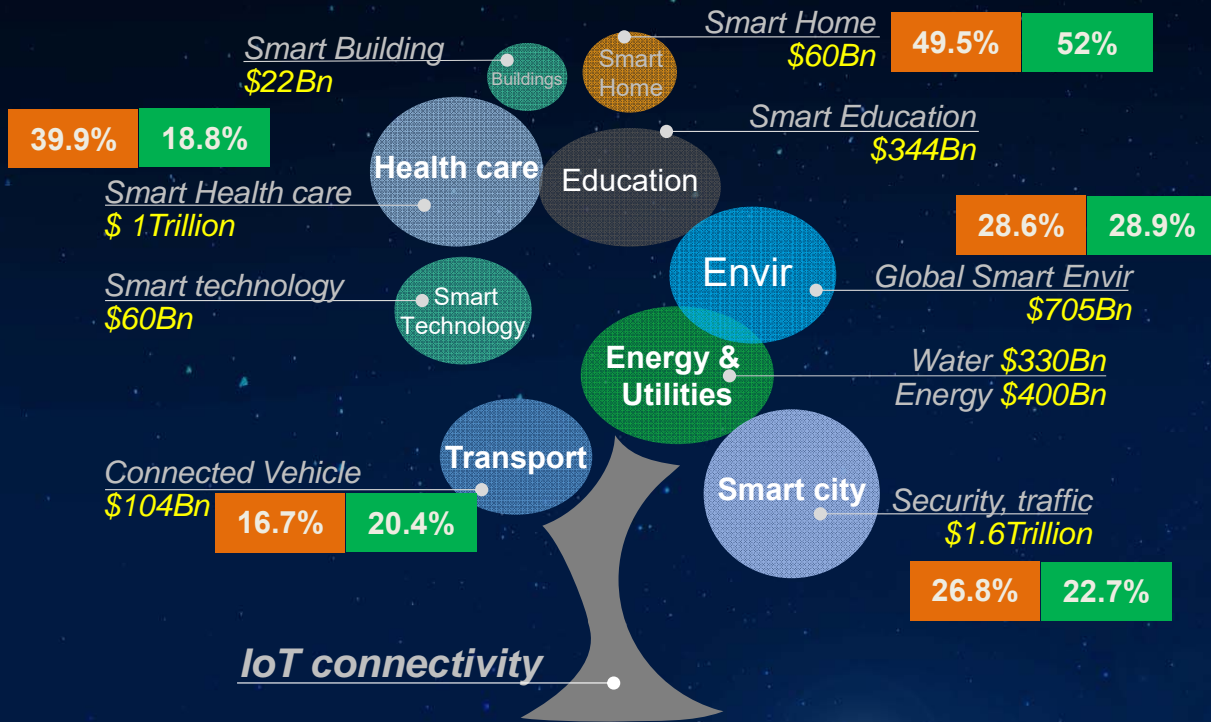


# IoT + Communications Network, 'Peripheral Nerve System' of Cities





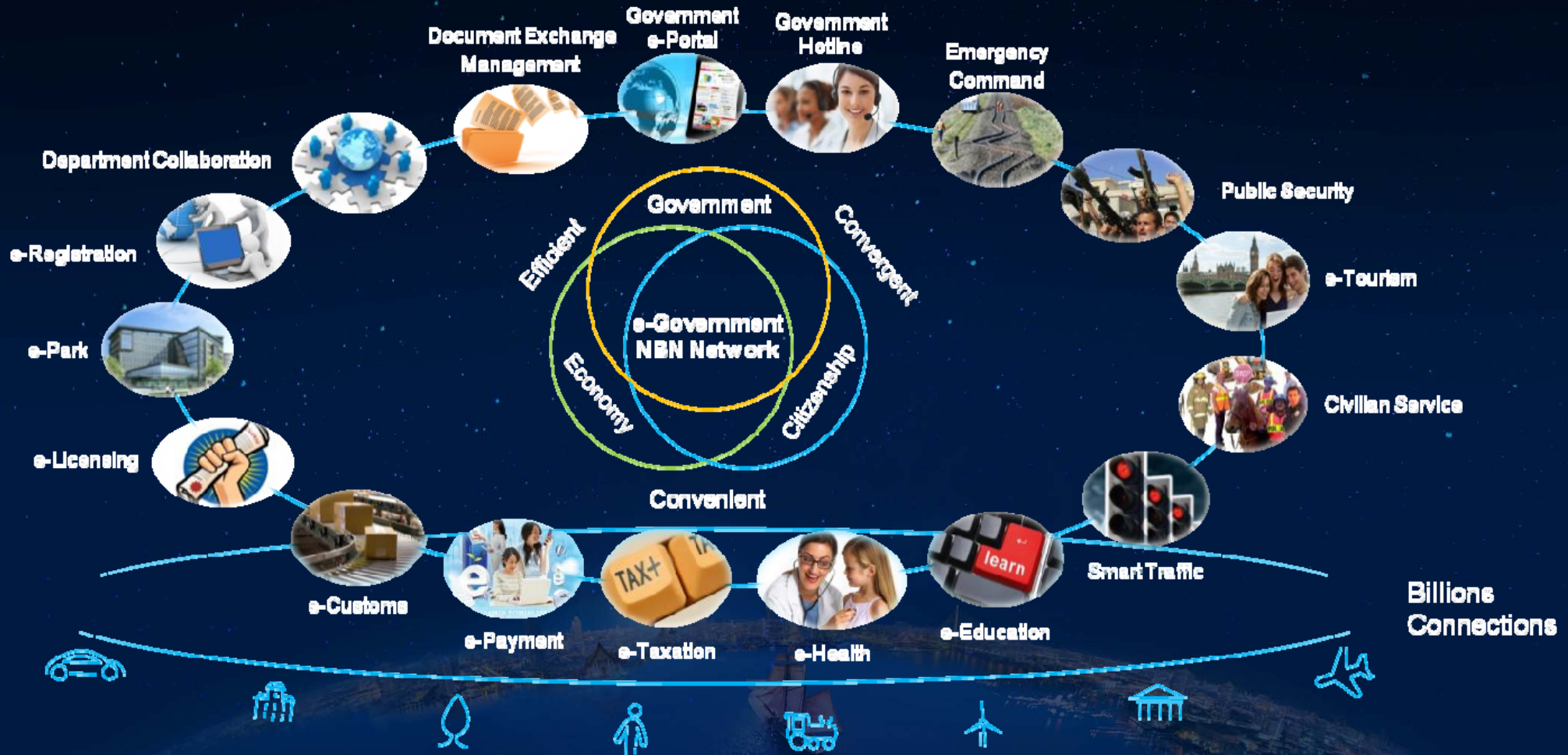
# IoT connectivity : a new entrance for Telco to verticals



(Global estimations from 9 analytics agencies, eg. Ovum, GSMA, Gartner)

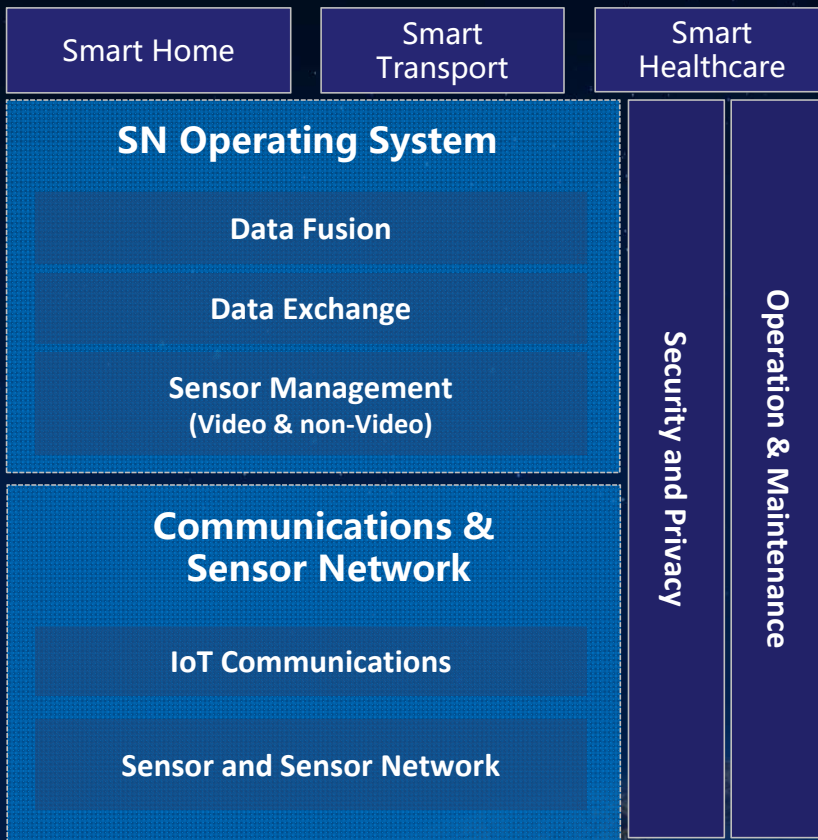
\* Mc Kinsey Global Research 2015

# Every Service on Cloud



# Case of Singapore: 3 Pillars for the Smart Nation

## Cloud



## National Datacenter

**Smart Nation Platform – Collect & Comprehend**

Platform to Manage Data Collection and Access

Unified Technology Platform to integrate and operate various components of the Smart Nation Platform e.g. allows data to be stored and shared securely, robust access control

## National Broadband

**Nationwide Broadband Network**

Singapore's **Download** speed  
**840% increase** since Sep 2010

Download Speed Mbps		Singapore's Global Ranking
9	Sep 2010	35
18	Sep 2011	13
33	Sep 2012	7
51	Sep 2013	2
<b>80</b>	<b>Sep 2014</b>	<b>2</b>

Singapore's **Upload** speed  
**3200% increase** since Sep 2010

Upload Speed Mbps		Singapore's Global Ranking
2	Sep 2010	36
8	Sep 2011	16
18	Sep 2012	6
35	Sep 2013	3
<b>63</b>	<b>Sep 2014</b>	<b>2</b>

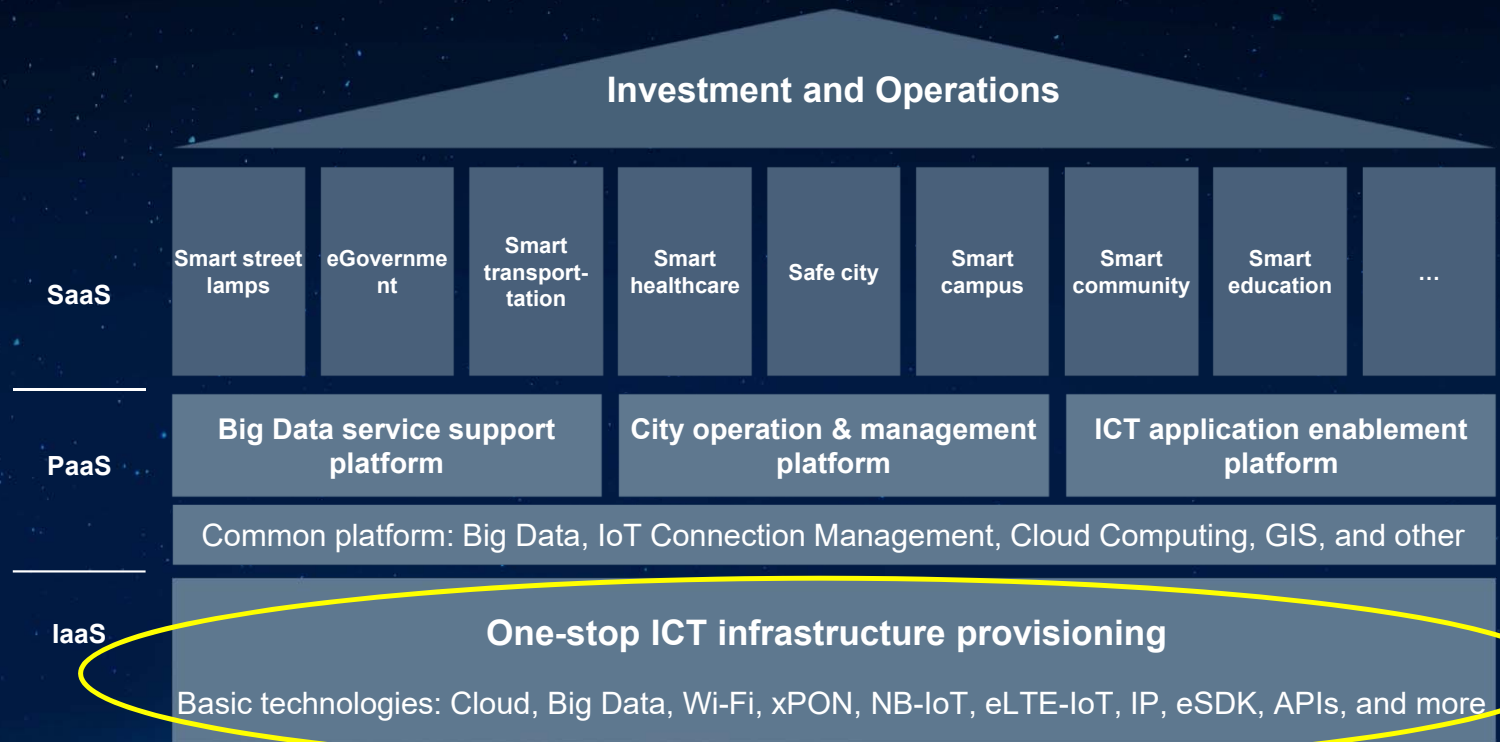
# Huawei in Smart City Solution



Integrate SaaS

Enable PaaS

Focus on IaaS



# Huawei Access Network Strategy

**Business Success**



**Gigaband**



**Gigaband**

- Any Media Giga Access
- Giga Home, Giga City,

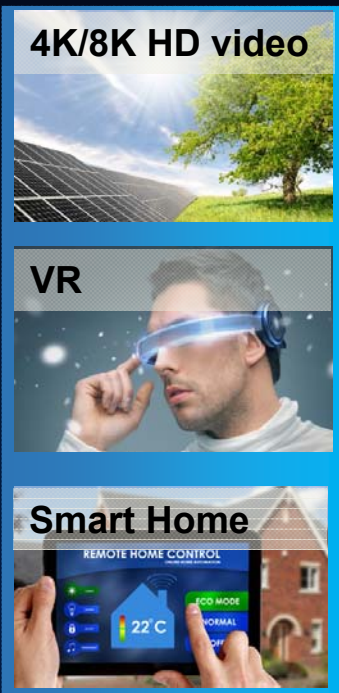
**More connections**

- Multi-service @FTTx
- Home , Enterprise , MBH

**CloudFAN**

- Network Architecture Evolution

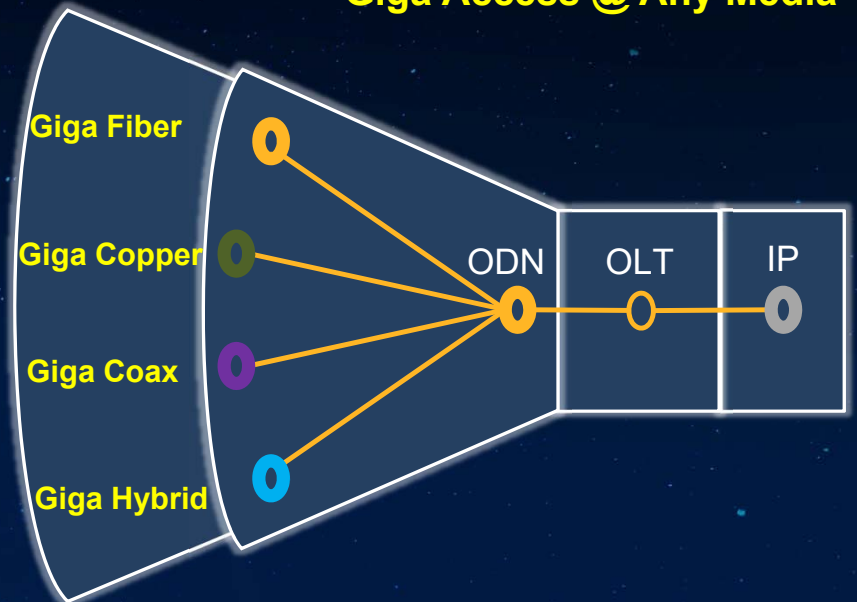
# SingleFAN3.0: Any Media Gigaband Access Solution



Bandwidth:  
**500M~1G**



**Giga Access @ Any Media**



**DAE 2020:**  
100M 50%, Big Cities: 500M~1G

**BB China 2020:**  
50M 100%, Big Cities: ~1G

**Giga Fiber**



10G@10G PON

**Giga Copper**



500M@G.fast

**Giga Coax**



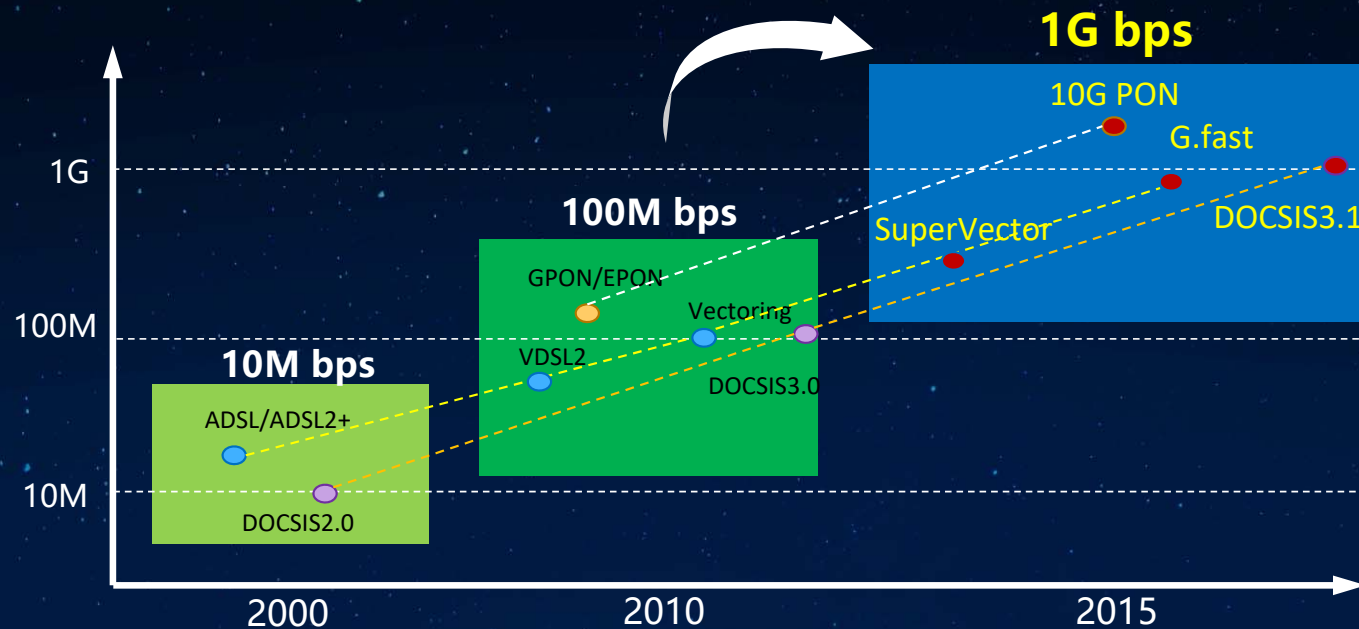
800M@DOCSIS 3.1

**Giga Hybrid**



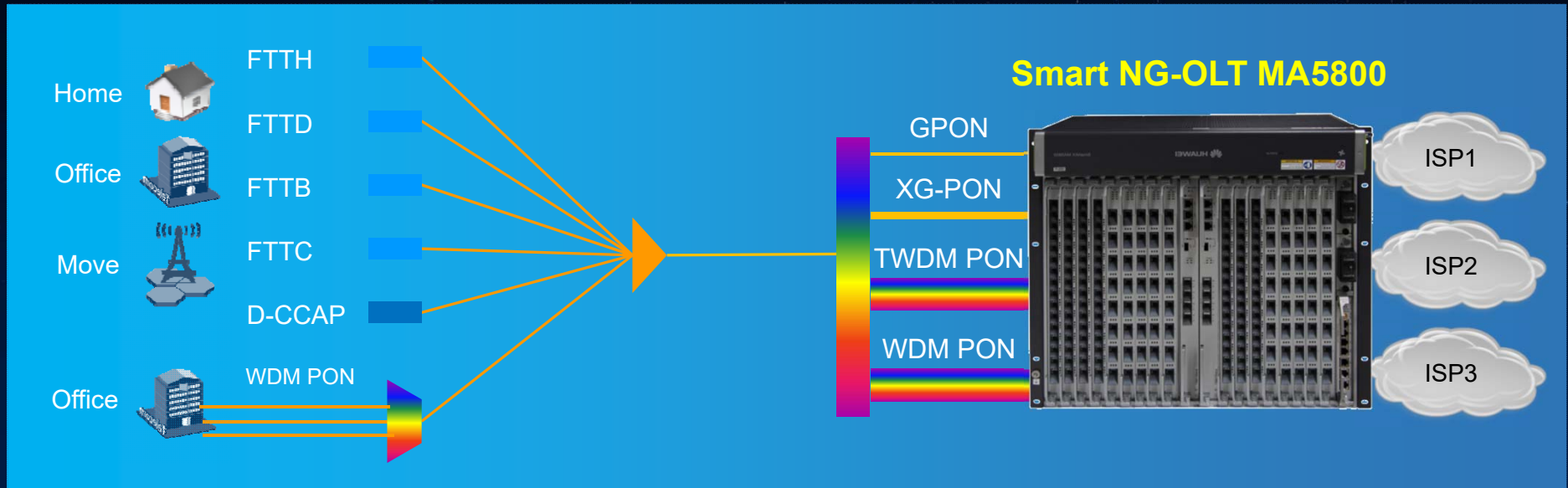
LTE+GPON

# Innovations Drive Access towards Gigabit



- Giga Fiber: GPON => 10G PON => 40G TWDM PON
- Giga Copper: Vectoring => SuperVector => G.fast
- Giga Coax: DOCSIS3.0 => DOCSIS3.1
- Giga Wifi: 802.11n => 802.11ac

# Gigaband Access Engine: Smart NG-OLT



## Best Experience of 4K/8K

- Non-blocking all 4K/8K users online
- High capacity and distributed structure
- VMOS to monitor video QOS

## Future Proof Giga Evolution

- 10G PON, 40G PON, WDM PON
- GE/10GE, and 100GE in future
- Any media access aggregator

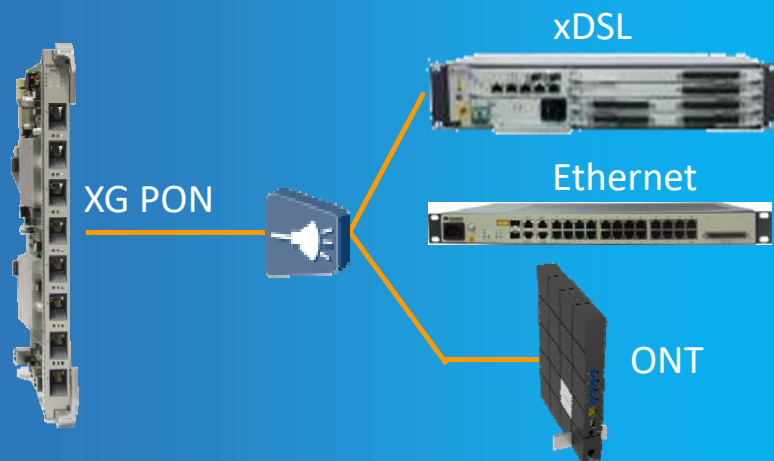
## Efficient management

- vAN for different ISP
- Centralized management
- Line card Hitless upgrade



# Giga Fiber: From XG PON To Flexible NG PON

## XG PON is Mature Now



XG PON chipset



## Flexible NG PON: 3 in 1



### Flexible NG PON:

- XG PON: 10G/2.5G
- XGS PON: 10G/10G
- TWDM PON: 4λ\*10G/10G

# E2E 10G-PON Seamless Evolution

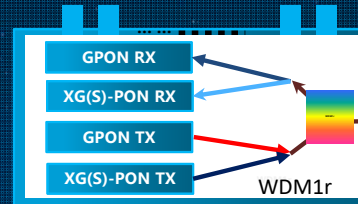
## PON COMBO: GPON to XG(S)-PON , Share ODN

Card

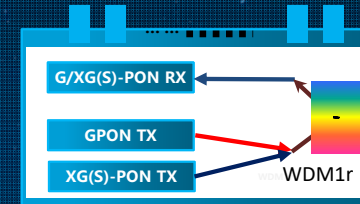


Standalone WDM1r

Frame



PON Combo SFP



TDM PON Combo

## Flex-PON: XG-PON to XGS/TWDM-PON Evolution



Flex-PON

=



XG-PON



Home

+



XGS-PON



SME

+



TWDM-PON



Government

## The first XGS PON Smart ONT in the industry



- 1\*10GE+4\*GE+2POTS,10GE L3 wire-speed forward
- 11n&11ac Dual-band WiFi, 2.4G 3\*3 MIMO & 5G 4\*4 MU-MIMO
- The maximum air interface rate up to 2180Mbps, IOT extension

# Giga Copper: Leading G.fast Commercial Use

## Leading in Lab Test and Commercial Trials



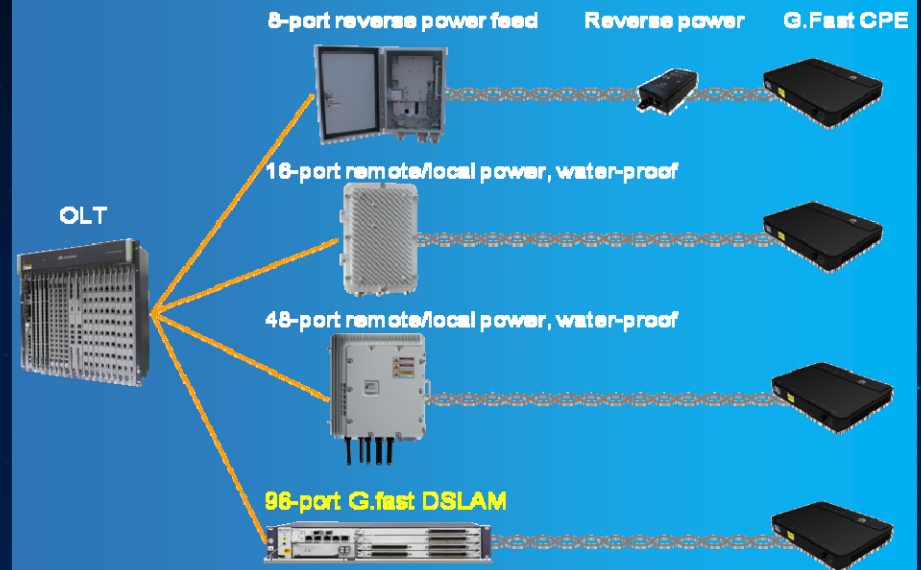
In Switzerland



In UK

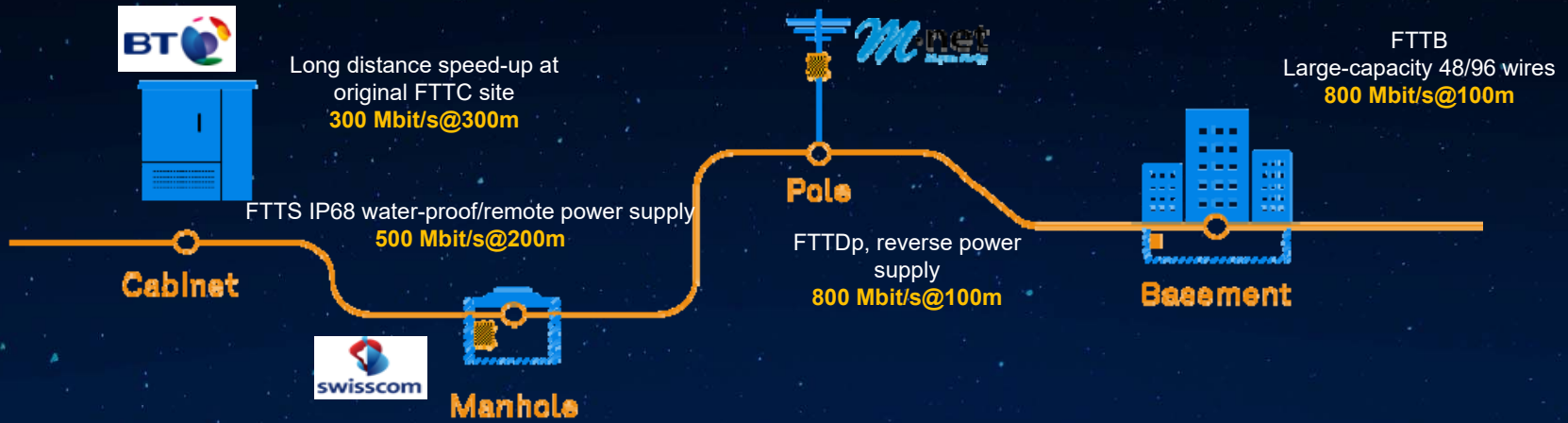


## Large capacity G.fast to drive cost down



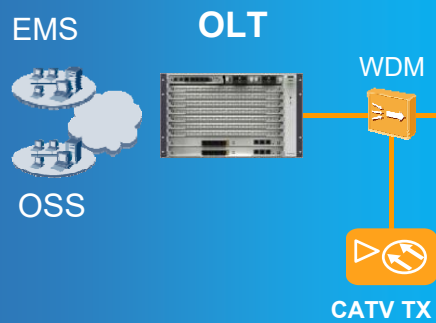
Scheme	Now	Future	Note
TX power	4 dBm	8 dBm	Power budget
S/N: Bit cap	12 bit	15 bit	Coding efficiency
Frequency	17M-106MHz	2.2M-106MHz	Full frequency band

# Various G.fast Commercial Cases

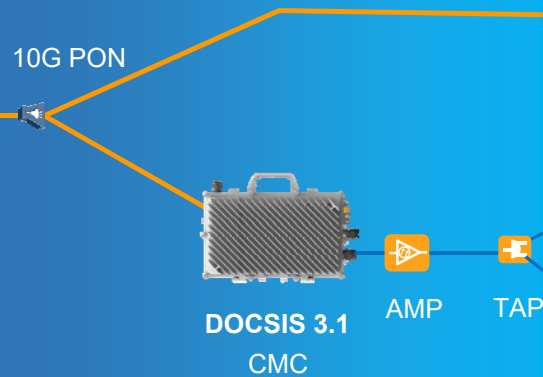


# Giga Coax: Best DOCSIS 3.1 Network with D-CCAP

## 10G PON OLT Ready



## DOCSIS 3.1 CMC Ready



## DOCSIS 3.1 CM Ready



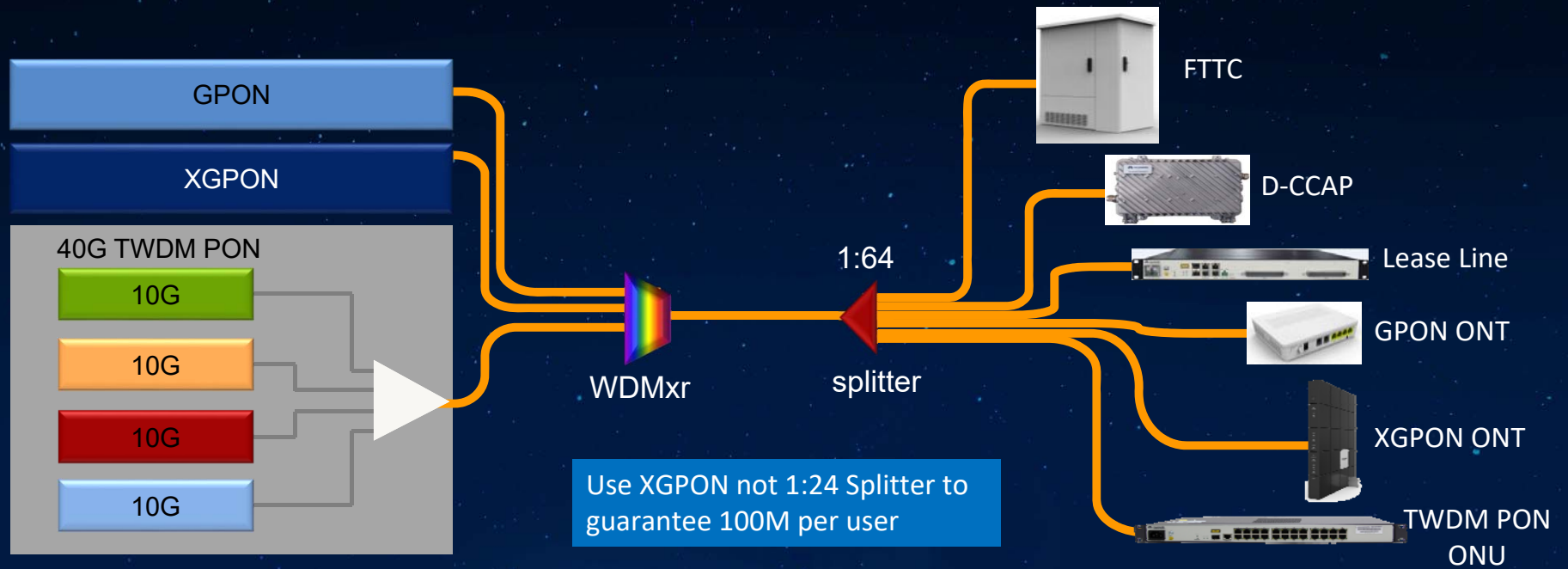
## Best DOCSIS 3.1

- Best Performance **4K/16KQAM**
- **Best CableLabs IOP test result**
- E2E solution and migration service

## Future-oriented Architecture

## Intelligent O&M

# Share ODN to Drive Fiber Cost Down



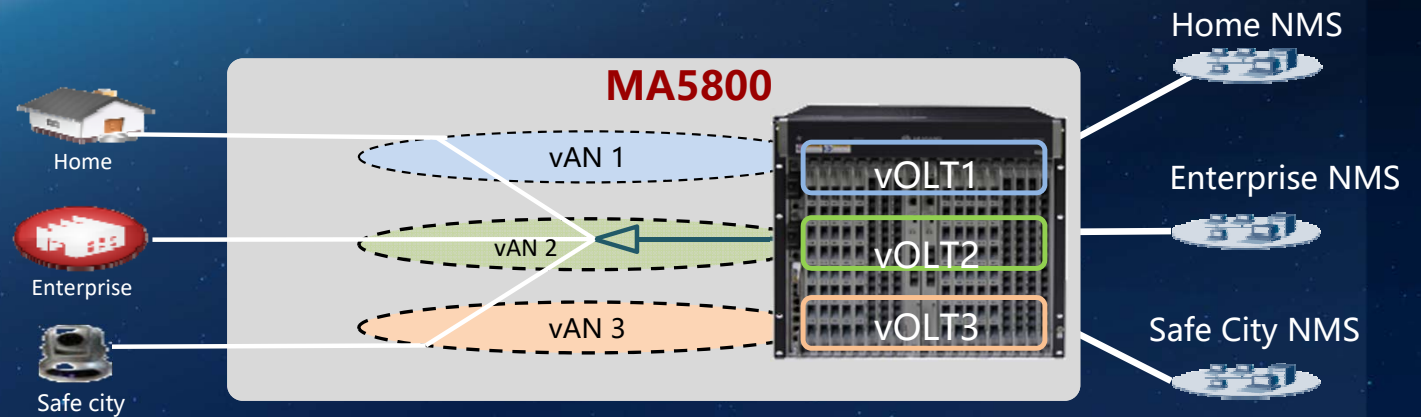
- Universal ODN for FTTH, FTTC, FTTB, D-CCAP, etc. to save infrastructure cost
- New technologies to compensate bandwidth: GPON -> NG PON; 2.5G -> 10G -> 40G
- Different optical module for long distance: Class B+, Class C+, C++: -28dB, -32dB, -35dB

# Network Slicing for Multi-services

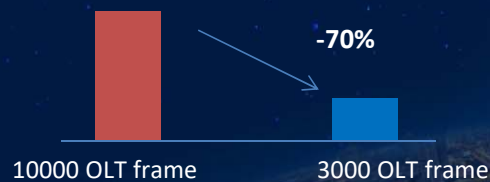
## Typical scenarios

- Safe City
- Leased line for LSN
- FTTH
- Satellite Communication
- Campus / School
- Hotel
- LTE backhaul

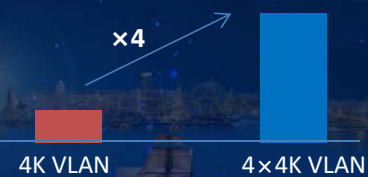
## CTC-Shanghai: Multi-Service @ One-Fiber



### 70% space saving in Shanghai



### 4 times resource expansion

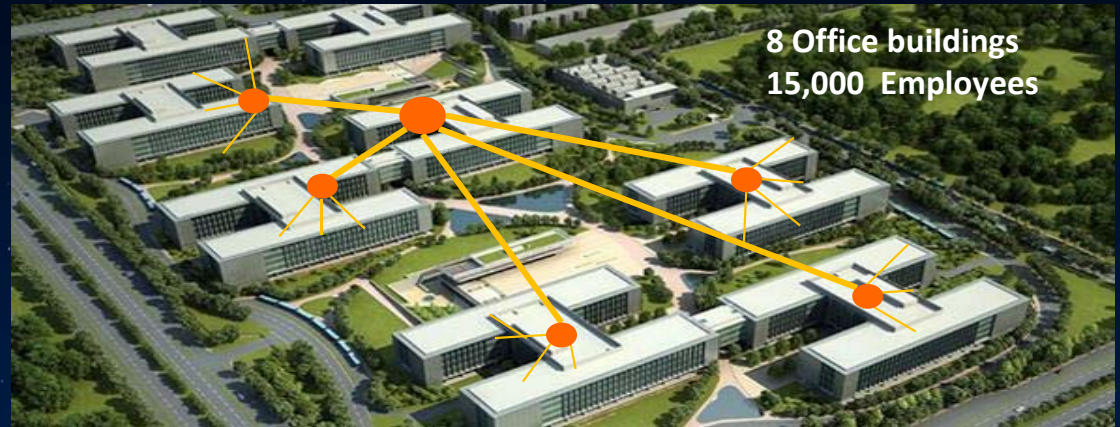
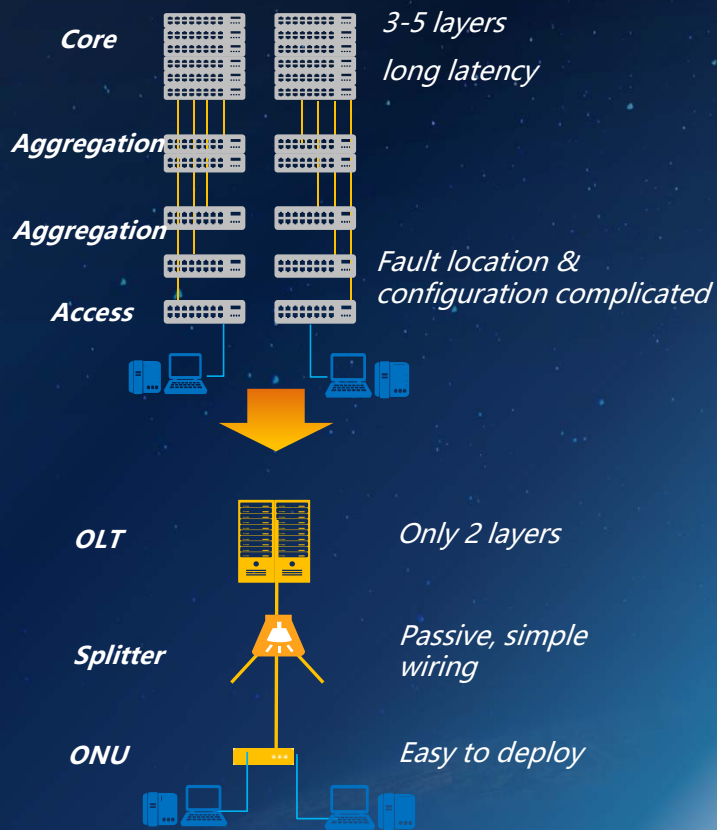


### 0 service interruption



# Cloud Era require POL for Campus

## Traditional LAN VS POL



Air Conditional + Active Equipment → Passive ODN

Power consumption ↓ 60%

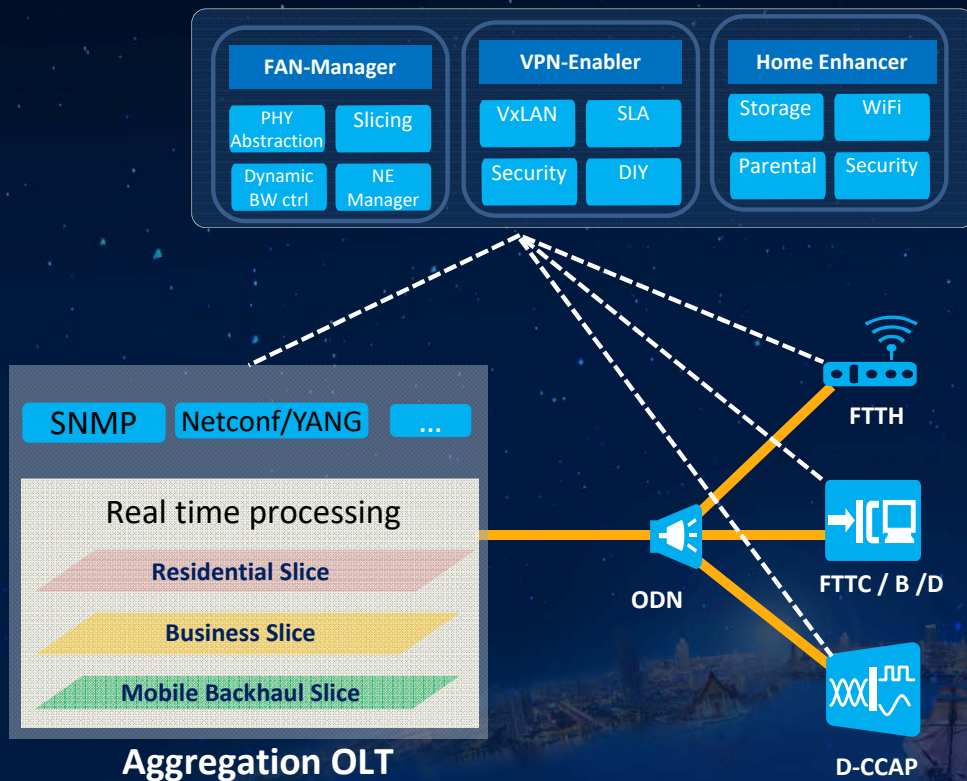


384 P\*D → 192 P\*D

Engineer Efficiency ↑ 50%



# CloudFAN: Maximize the Value of Access Infrastructure



## Multi-service @SLA Network

- One network multi-service (Home, Enterprise, Mobile)
- One network multi-tenant (Open access, FAN sharing)
- Virtual access network with differentiated SLA

## One stop to Cloud @CloudVPN

- Flexible & high efficient FTTx business lease line
- OLT as virtual tunnel end point

## Agile service @Smart home

- Cloud services (parental control, security, etc.)
- User DIY home services
- Cloud management of home network (visible, operational, optimizable)

# Agile Services for Home Network and Smart Home



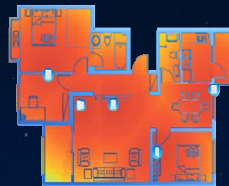
User-DIY



Surveillance



Photo sharing

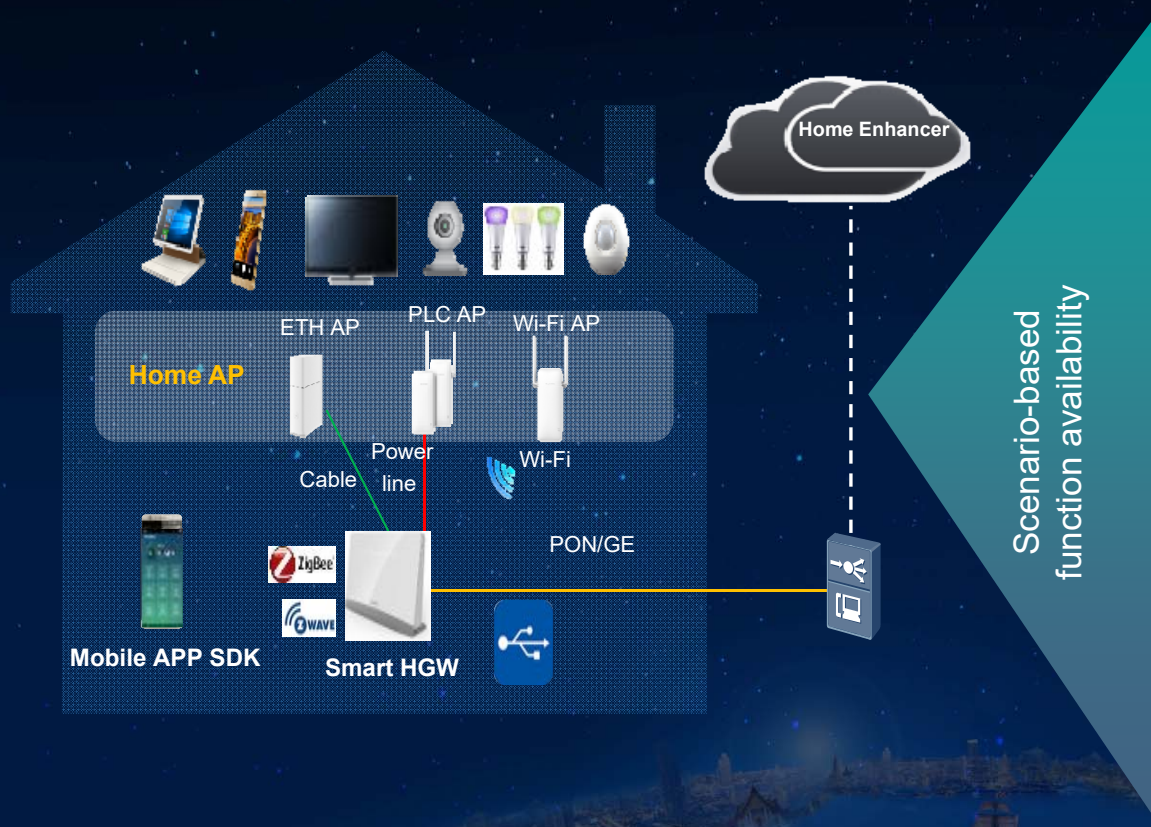


Wi-Fi Map

- Cloud-based services (parental control, security, etc.)
- User DIY home services
- Cloud management of home network (visible, operational, optimizable)



# Cloud Based Services, Meet Different Demands



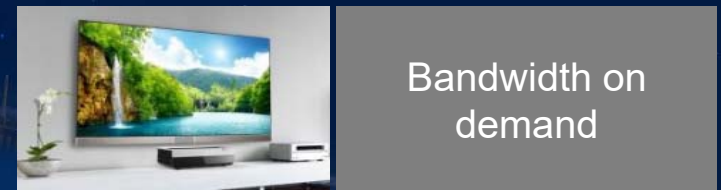
## ➤ Parental control



## ➤ Guest SSIDs, ensuring home network security.



## ➤ Guarantee bandwidth for specific terminals (TVs), ensuring user experience.



# 100M~500M @Anywhere

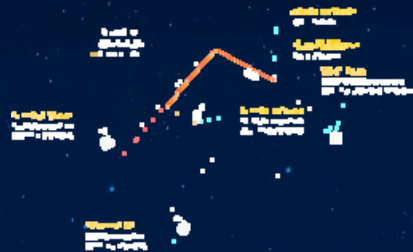
## Accurate Design Wi-Fi

- Self-planning App



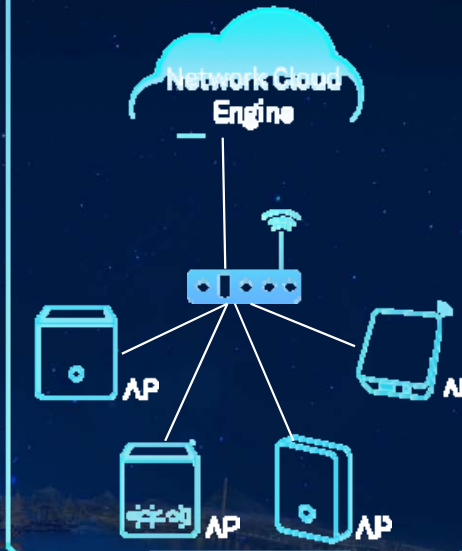
## 100M/500M Coverage

- Power Line/ Coax Line
- Ethernet/Wi-Fi Relay



## Centralized Management

- Plug & Play



## Performance Optimize

- Prevent Crosstalk
- Load Balancing

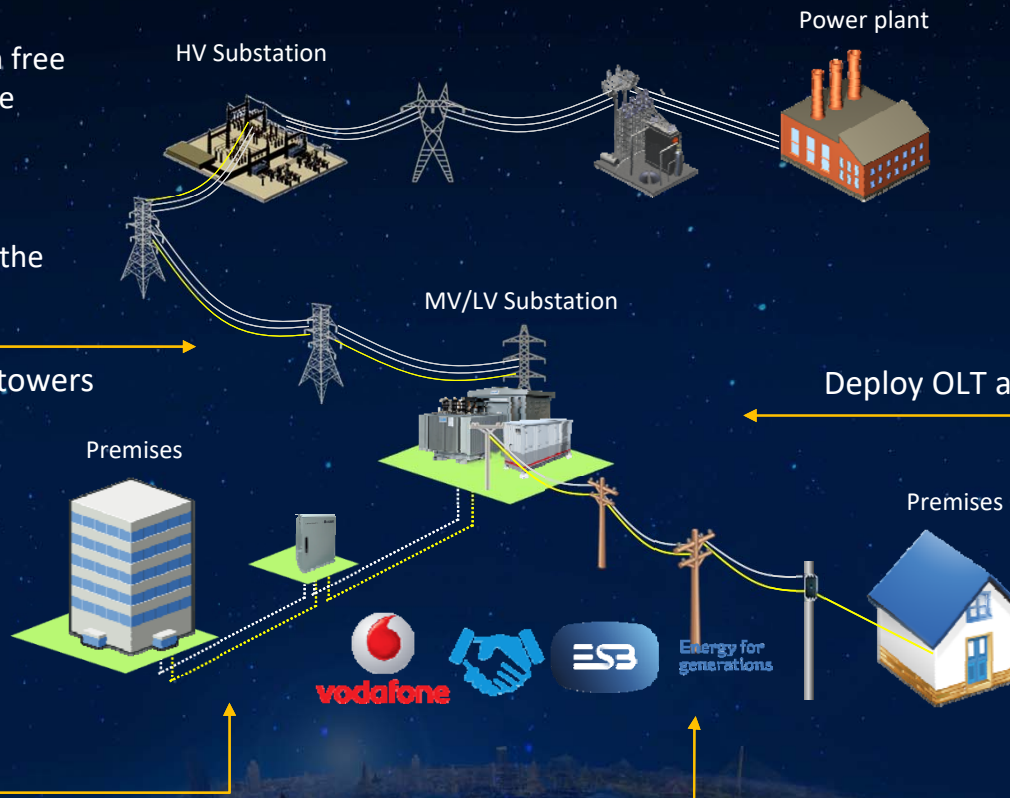
APs RF Power Control



APs Traffic Distribution Control

# Infrastructure Synergy: FTTH Cost Reduce 39%

- Apply WDM technology can free dark fibre from existing fibre transmission network
- New build fibre can either enlarge bandwidth or pave the way to do Smart Grid



- CO cabinet is isolated at substation for safety and security control
- Cabinet can be deployed and reallocated easily

Transmission line along HV towers

Deploy OLT at Substation Container

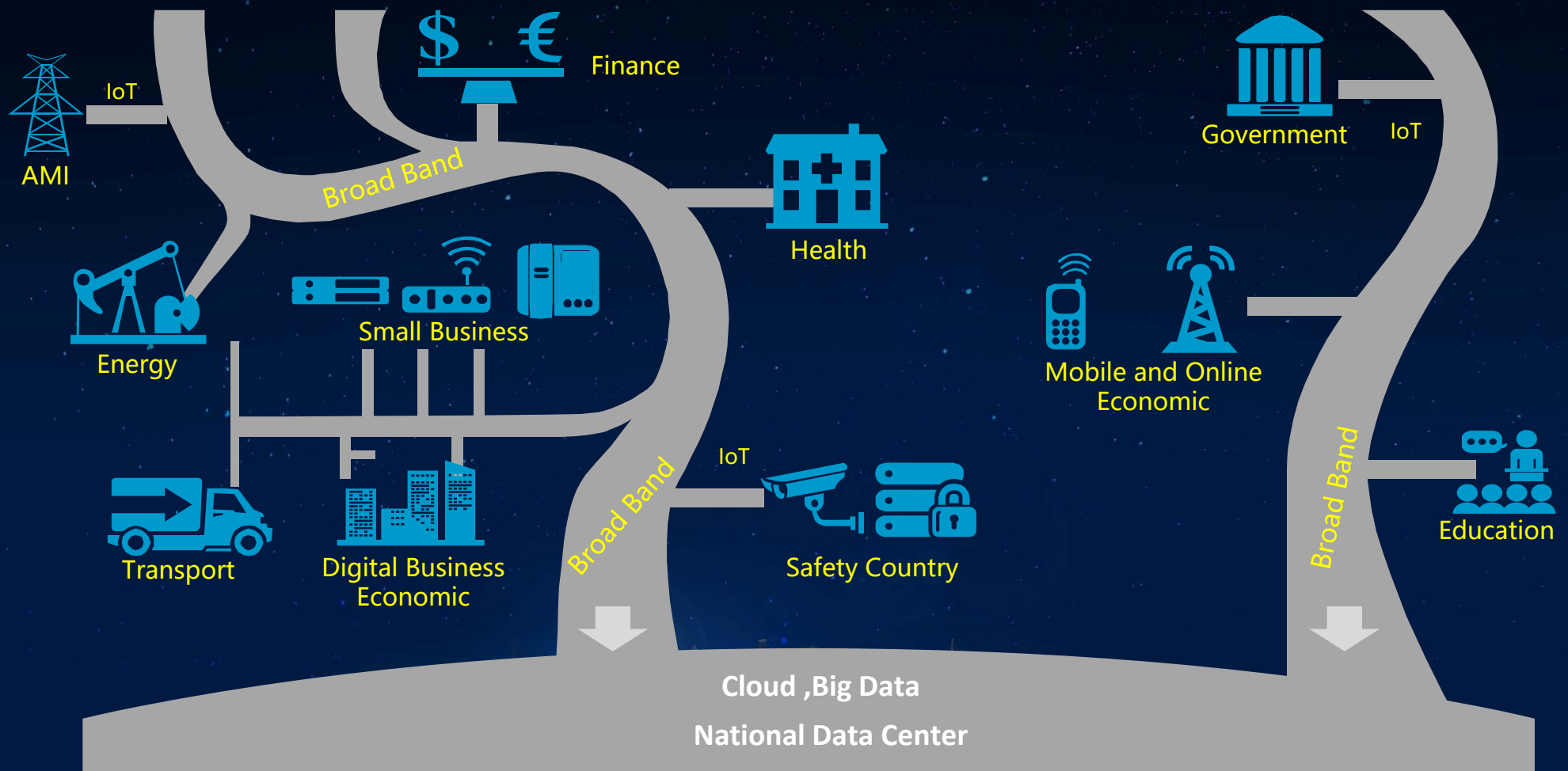
- Using existing utility ducts can either save up deploy costs, shorten work time, or minimize the disruption.

- Using existing utility poles is the most efficient way to lay the fibre and very easy to maintain in the future.

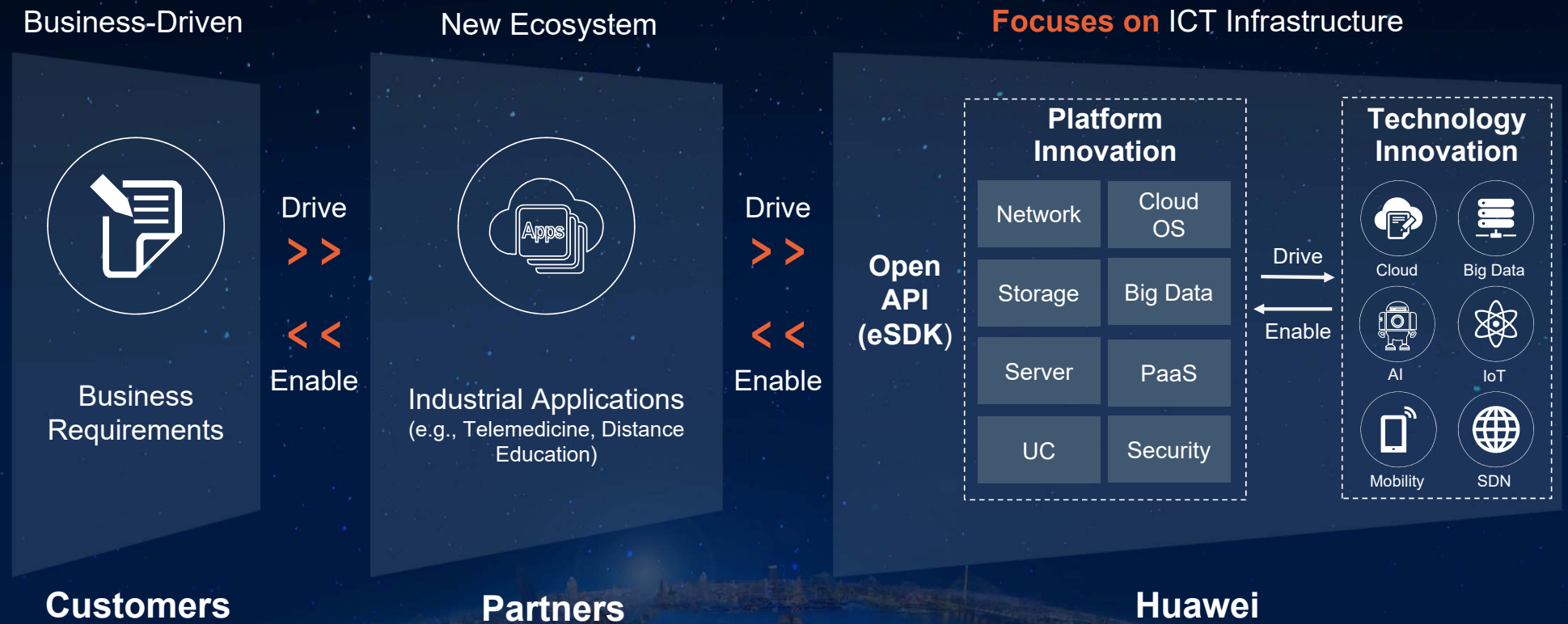
Underground cabling along utility ducts

Aerial cabling along utility poles

# National ICT Plan, Setup the Blue Print of Digital Economy



# Guiding Principle: Business-Driven ICT Infrastructure (BDII)



# To be your Trusted Partner for Gigaband Network & Smart City



CWTSI: City Wide Technical Solutions Integration



- Leading innovative end-to-end Gigaband and Smart City solution provider
- Customized service, sustainable partnership ecosystem



Thank You

