Huawei GPON Solution for ISP

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1 Challenges and Choices for ISPs

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3 Huawei GPON Products

4 Success Stories
Challenges for ISPs

- Which technology can best meet users' requirements?
- Which technology has the most potential and will become the mainstream access network?
- Increasing demand for high network quality creates enormous cost pressures.
- Small networks result in high costs per user.
- How to use the existing network to reduce waste of current resources?
- How do you design a network with comprehensive functions plus the ability to evolve easily?
- Timely, expert network deployment.
- Convenient, visual network management.
- Fast and accurate fault location and correction.

How Do You Choose a Partner to Confront These Challenges Together?
A Leading Global ISP Partner

- Huawei — 30 years’ experience in ICT
- World’s most diversified E2E communications provider
- Serves 45 of the top 50 global telecom operators and 1/3 more global broadband users than competitors
GPON is Becoming International Mainstream — Features

- Large bandwidth and a variety of services
- Easy broadband access
- Passive network — safer and more reliable

- Open standard (ITU-T/IEEE)
- Established industrial chain
- Flexible network
- Multiple scenarios

PAST

ITU-T/FSAN

NarrowBandPON → A/BPON → GPON → NG-PON

IEEE 802.3

EPON → 10 G EPON

FUTURE
How GPON Helps ISPs — Benefits

**Low Cost**
- Each optical fiber provides wide 2.5 G bandwidth, saves fiber resources
- Simple network structure is more suitable for middle- and small-sized networks

**Plug and Play**
- ONU auto-configuration on-site
- Highly efficient ONU installation on-site

**Benefits**
- Flexible expansion
- Easy evolution
- Unified network management
- Efficient operation

**OLT**

**ONU**
**GPON vs. EPON — Advantages**

- Larger bandwidth
- Better bandwidth efficiency
- Larger optical power budget
- High splitting ratio
- Better TDM service support
- More comprehensive QoS guarantee and OAM
1. Challenges and Choices for ISPs

2. Huawei GPON Solutions

3. Huawei GPON Products

4. Success Stories
Small Business Office Solution

- Provide broadband and POTS voice service to small-scale enterprises (< 50 people) by direct connection with voice function ONU.
- Recommended equipment: MA5612.
Normal Enterprise Solution

- For average enterprises (< 300 people), use a PBX for voice service. Internet services go through the GE port on ONU, connecting an enterprise’s internal router or switch.
- Recommended equipment: MA5620, MA5626.
Large Enterprise Solution

- For large enterprises (> 300 people), suggest using dedicated lines.
- GE ports on OLT connect directly to enterprise egress routers.
- Recommended equipment: MA5620, MA5626.
FTTH Solution for Homes

- For homes, the FTTH solution provides services such as HSI, IPTV, and VoIP
- Recommended equipment: HG8247, HG8245.
FTTB Solution for Apartments

- For apartments, suggest the FTTB solution using xDSL to access computer, IPTV, and telephone.
- Recommended equipment: MA5603T, MA5616.
Huawei EoC Solution

- PON+EoC solution provides broadband and video service over cable.
- No special requirement for existing cable network, thus protecting investment.

- Adopt PON technology to provide large coverage and bandwidth.
- Recommended equipment: MA5631, MA5632.
Huawei RF Overlay Solution

- RF video signals and PON signals combined by WDM and transmitted by ODN.
- ONT optical module can support 3 wavelengths: 1310/1490/1550 nm.

- ONT separates data and video signals.
- Recommended equipment: HG8245, HG8247.

![Diagram of Huawei RF Overlay Solution]
### Video Surveillance Scenario – IP Camera (IPC)

<table>
<thead>
<tr>
<th>Indoor</th>
<th>Outdoor</th>
<th>Intelligent monitoring/Automatic vehicle detection and recording system</th>
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</table>
| ▪ PON+EoC solution provides broadband and video service over cable.  
▪ No special requirement for existing cable network; protects investment.  
MA5626 PoE/Non-PoE | ▪ Widely distributed  
▪ Difficult environment  
▪ Industrial park, safe-city plan  
MA5669/ (MA5621/MA5621A+cabinet) | ▪ High quality round-the-clock  
▪ Flash lamp or LED lamp  
▪ Difficult environment  
▪ Police system (security & traffic)  
MA5626/MA5621A/MA5621+cabinet |

- Outdoor cabinet includes air-break switch, regulated power supply, fan, SPD, temperature controller, grounding device, ODF, power extension strips, and heating module (optional)

![Diagram of Video Surveillance Scenario](image)

- Video management system
- IP Network
- OLT
- Splitter
- MDU MA5669
- MDU MA5621/MA5621A/MA5626
- Outdoor MDU MA5626 PoE
- Indoor Cabinet (option)
- Outdoor cabinet

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Video Surveillance Scenario – Analog Camera

Analog camera (pure analog camera coexists with IPC)

- Analog camera option will be available for a long time because of low price
- Digital Video Encoder is easily damaged, not suitable for high-quality use
- The distance between ONU and camera is longer than 100 m
- IPC is future trend

Video management system

### Indoor
- Digital video encoder
- Widely distributed
- Large quantity
- Power supply is difficult
- Kindergarten, shopping mall, office

**MA5626 PoE/Non-PoE**

### Outdoor
- Digital video encoder
- Widely distributed
- Difficult environment
- Industrial park, safe-city plan

**MA5669 / (MA5621/MA5621A+cabinet)**

- Outdoor cabinet includes air-break switch, regulated power supply, fan, SPD, temperature controller, grounding device, ODF, power extension strips, and heating module (optional).
Video Surveillance Solution Based on GPON

1: MA5669
- GE
- Outdoor
- 2 GE, supports PoE
- Install on pole, wall, wire
- Scenario: 1-2 IPC
- 2 GE, outdoor integrated, PoE, pole-, wall-, and wire-mounted

2: MA5621A
- FE
- IPC/Analog camera
- Outdoor/indoor
- 4 FE+2*RS485
- Install in outdoor/indoor cabinet
- Scenario: <4 IPC/Analog camera
- 4FE+2*RS485

3: MA5621
- FE
- IPC/Analog camera
- Outdoor/indoor
- 4 GE+4*RS485
- Install in outdoor/indoor cabinet
- -40°C to 85°C, lighting protection 6 kV
- Scenario: <4 IPC/Analog camera
- 4 GE+4*RS485

4: MA5626
- FE
- IPC/Analog camera
- Outdoor/indoor
- 4 GE+4 FE/8 FE/16 FE/24 FE, supports PoE
- Install in outdoor/indoor cabinet
- Scenario: >4 IPC/Analog camera
- 4 (GE+FE), 8 FE, 16 FE, 2 4FE

OLT
PON
FTTW Application Scenarios

- Schools
- Hotels
- Government
- Enterprises
- Apartments
- Small Businesses
- Public Spaces
- Government
FTTW Backhaul

- Fully utilizes existing PON resources
- Supports PoE and PoE+ power supplies
- Supports indoor or outdoor MDUs

Network Management System (NMS)

Core Network Layer

Aggregation Layer

OLT

1:N Optical splitter

Upstream: 2.5 Gbits/s
Downstream: 1.25 Gbits/s

BRAS

MDU (PoE)

Universities Hotels Families

Public Area

Government or Enterprise Customers

Outdoor AP

Outdoor MDU (PoE)
iODN: Visible and Manageable

- Identified passive connector
- Identified optical links
- Identified network resources

ID Tag, Identified passive resources

ID tag

Network Management, E2E Visible Network

- E2E optical network management
- Automatic topology collection
- Accurate geographic information

Topologies

GIS Information

Automatic Record, 100% Accurate

- Auto. Checkout with planned data
- Auto. Return to U2000 by wireless or cable in real time

Automatic Record, 100% Accurate

Utilization of optical cable

Before

Now

5%-35% Utilization of optical cable

90%-100% One-Time Provision

Before

Now

Before

Now

20%-50% Manpower Saved

Before

Now

Wrong Dispatch Rate

Utilization of optical cable

One-Time Provision

Manpower Saved

Wrong Dispatch Rate
GPON Device Location Map

Local Site

OLT: MA5600T
OLT: MA5603T

Curb

Building

User Terminal

FE
GE
FE
GE
POTS
PRI
FE
E1
GE
PON
P2P

Surveillance

FTTW

FTTB

PC
IP PBX
ROUTER

WLAN
POTS
FE
GE

FTTH
Advantages of Huawei GPON Solution

- **All Services for All Scenarios**
  - Product specifications meet a variety of application scenarios for all kinds of ISPs
  - All services are supplied on one unified optical-and-copper access platform

- **Safe and Reliable Network**
  - Variety of hardware protection to ensure network stability
  - Variety of software security measures used to ensure network security

- **Easy Deployment and Operation**
  - ONU batch deployment with one site visit
  - NM U2000 and Line Manager N2510 fulfill operation and visual and remote monitoring
Ring Protection

- **STP/RSTP/MSTP**: By supporting the Spanning Tree Protocol, a ring network can include other manufacturers’ products.

- **Rapid Ring Protection Protocol (RRPP)**: Huawei proprietary protocols only dock with Huawei equipment. Failure recovery within 50 ms.
Multiple Router Protection

**Link Aggregation (most used)**
1. Maximum 8 links aggregation
2. Supports cross-board aggregation

**Pair-Link Protection**
1. Supports cross-board or in-board pair-link protection

**Smart Link**
1. Dual uplink to different devices
2. Switch time within 200 ms

**Dual-Homed Upstream**
1. Uses the main standby mode aggregation group (LACP)
2. Also uses in-board pair-link protection
STM-1 Protection

- MA5680T could be used with SDH/MSTP, with 2 STM-1 link to SDH device to supply 1+1 protection.
- Supports 2 stm-1 in 1 board or in different boards.
- STM-1 supports pluggable optical modules.
- Protection switch time < 50 ms.
PON Line Protection

Type B Protection
- Trunk fiber protection
- For PON ports/PON boards

Dual ONU protection (for VIP clients)
- Branch and trunk optical fiber
- For PON ports/PON boards
- ONT/OLT
HQoS Bandwidth Guarantee

- Under one OLT, different segments of the enterprise can be configured with the same SVLAN and different CVLAN.
- The bandwidth of the entire enterprise can be configured by SPUA board.
- Each segment’s bandwidth can be controlled by the GPON board.

An additional layer of SVLAN on GPON boards for enterprise segments.

Configuration of SVLAN on a SPUA board provides bandwidth control of all segments under the same OLT.
Comprehensive Security Solutions

User Security
- User authentication SN+PW
- PITP, DHCP option 82
- 802.1x

GPON Line Security
- AES-128 encryption
- Rogue ONU detection

Security Services
- Isolation in Layer 2
- ACL access control
- MAC address filtering
- MAC address binding
- IP address binding

Network Security
- Anti–MAC deception
- Anti–IP deception
- Anti–DOS attack
- Anti–ICMP/IP attack
Intelligent O&M Solution

Challenge of O&M

- Complex, massive terminal deployment is slow and inefficient for businesses
- Optical detection success rate is low due to lack of professional diagnostic tools
- Accuracy and low fiber resources, ODN low utilization of network fiber

Solution

- N2510 Optical Line Supervision
- U2000
- iODN

Design & Planning

- Professional tools and experienced support team will ensure the network is efficiently designed and deployed.

Services Deployment

- Rapidly deploy E2E and use OSS integration specialists to ensure business is quickly listed.

iODN Solution

- Use e-label to replace the paper label and make the ODN network visible and manageable. Makes deployment 100% automatic and accurate.

Optical Line Supervision

- N2510 can locate a fiber cut within 5 meters.
Plug and Play — No On-site Configuration required

- Makes on-site operation as easy as possible, even if site conditions are bad and the worker is unskilled.

Traditional Requirements for Site Installation

- Each worker needs a laptop.
- The worker should be capable of configuring ONU.
- ONU installation can take a long time under difficult conditions.

The Plug & Play Solution

- No laptop needed.
- No on-site configuration needed.
- Highly efficient on-site ONU installation.
OLT Products

MA5600T

- Large-size aggregation OLT
- Single-frame 128-PON port
- Dual master, dual power, dual uplink
- Supports GPON/10 GPON
- 3.2 Tbits/s backplane capacity, 40 G slot bandwidth, 960 Gbits/s switching capacity
- High-density 8-port PON board
- Uplink 4*10 GE/4*GE interface

MA56003T

- Middle size, industry's only fully redundant OLT
- Dual master, dual power, dual uplink
- Supports GPON/10 GE GPON
- 1.5T bits/s backplane capacity, 40 G slot bandwidth, 960 Gbits/s switching capacity
- 6 U high, 6 service slots
- LPU MA5600T-compatible, reducing the number of spare parts
## MDU Products

### FTTB
- **MA5612**: 48POTS/24FE (2 GE) /16E1/1RF
- **MA5620/6**: 8/16/24FE+8/16/24POTS
- **MA5616**: 256POTS/128AD/192VD/64G.SHDSL/32ISDN

### P2P
- **MA5612**: 32POTS/24FE/8E1
- **MA5628 Integrated**: 4 GE/FE + 8E1
- **MA5628PoE**: 4 GE/FE + 4E1

### Cable
- **MA5632**: 64-128 users
- **MA5631**: 64-256 users

### Monitor
- **MA5669 Integrated**: 2 GE/FE PoE+
- **MA5621**: 4*GE/FE + 4RS485
- **MA5621A**: 4*FE+2 Serial port
## ONT Products

### Bridging Type
- **HG8010**
  - 1 GE
- **HG8040**
  - 4 GE
- **HG861**
  - 1 GE
  - 1 RF

### Bridging and Voice Type
- **HG8110**
  - 1 GE
  - 1 POTS
- **HG8240**
  - 4 GE
  - 2 POTS
- **HG8242**
  - 4 GE
  - 2 POTS
  - 1 RF
- **HG8247**
  - 4 GE
  - 2 POTS
  - 1 RF
  - 1 Wi-Fi
  - USB
- **HG8247T**
  - 4 GE
  - 2 POTS
  - 1 RF
  - 1 Wi-Fi
  - USB

### Gateway Type
- **HG8245**
  - 4 GE
  - 2 POTS
  - 1 RF
  - 1 Wi-Fi
  - USB
- **HG8247**
  - 4 GE
  - 2 POTS
  - 1 RF
  - 1 Wi-Fi
  - USB
- **HG8245T**
  - 4 GE
  - 2 POTS
  - 1 RF
- **HG8247T**
  - 4 GE
  - 2 POTS
  - 1 RF
  - 1 Wi-Fi
  - USB
- **HG8447**
  - 4 GE
  - 4 POTS
  - 1 RF
  - 1 Wi-Fi
  - USB
Intelligent End-to-End ODN Products

Boxes
- iODF
- iFDT
- iFAT
- Joint Box
- Fiber Panel

Splitter
- Inserted Type Splitter
- Box Type Splitter

Jump or Pigtail Fiber, Connector
- Pigtail Fiber
- eID Jump Fiber
- Butterfly Fiber
- Fast Connector

Intelligent Accessories
- eID Tag
- Transformer
- Control Board
- Management Unit
- eID Reader
Agenda

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Beijing: Outdoor WLAN Coverage

Goals
- Achieve the “wireless city” plan to deploy WLAN in hot spots such as several traffic hubs, Jinrong Street, and Chang’an Avenue
- Share data load on the current CDMA network
- Occupy site space for future LTE BTSs

Difficulties
- Outdoor APs require indoor devices to provide power for them in PoE mode
- Outdoor sites are difficult to install (such as on the top of a building), and devices must support installation against poles
- Outdoor devices must be small and aesthetically pleasing in appearance and must have carrier-class protection capabilities
- Devices must be plug and play and do not need to be configured so as not to affect traffic and safety.

Scale
- More than 1000 MA5669 outdoor PoE MDUs have been deployed in Beijing
World’s Largest GPON Deployment

Challenges
- Inefficient service provisioning
- Low pick up rate caused by slow ODN deployment

Solution
- Customized OMCI for OSS system. Plug & Play ONT service provisioning.
- Huawei iODN solution, deployed for 5000+ users in 3 months; efficiency is 50% higher than other solutions.

Benefit
- 1.3 M FTTH ports are under construction
- 300 k subscribers
Thank You

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