General Solution Overview

Sept 2014
1. The Trend

Vision

Trend of Smart Home & FTTH Evolution

2. The Solution

3. The Portfolio
Smart Home is coming, enabled by 2 key elements: Home Networking & Smart Service

1. **Home Networking**
   - Efficient home network required for QoE guarantee
   - The end-user not skilled enough to build and manage the home network by themselves

2. **Smart Service**
   - Four types of Smart home service defined by ITUT

**Challenge:**
- Smart home Era, an **efficient home network** required for QoE guarantee
- The end-user **not skilled** enough to build and manage the home network by themselves
- Smart Home Era, not only **big pipe** required, **flexible & smart pipe** needed
**Challenge**: Poor experience now, Big Gap to U2BB@home

100M Access ≠ 100M Experience, WIFI experience is Best-Effort coverage at home.

View Point of Telcos: Home Networking is the key of releasing the business potential

**Voice of customer:****
- **TEF CTO**: Without stable HN, I am worry about FTTH service;
- **Mobily**: It’s no way to release the FTTH business potential without a good home connection solution;
- **Shanghai Telecom**: 30% subscriber cancel IPTV service cause of home connection issue;
Challenge ② How to catch opportunity of Smart Service?

Traditional Service will be saturated, Telcos is looking for new opportunities.

Big potential of Smart Service, But Challenges and opportunities coexist.

**Challenge:**
- No close cooperation between Telco and OTT provider to guarantee user’s experience;
- Creating a new business model requires a hardware and software solution.

**Global fixed broadband revenue forecast ($billion):**
- 2013: 218.77
- 2017: 218.12
- ~4 times growth

**Global Home Security Market forecast ($ billion):**
- 2013: 22.5
- 2017: 34.46
- 9% CAGR

Source: Ovum

**Sources:**
- MarketsandMarkets
- Roland Berger Strategy Consultants
- CHETAN SHARMA
**Vision: Smart FTTH help Telco boost Smart home**

- **Smart Connection**
  - Smart ONT as the home connection center; 7*24 on-line and guarantee service experience

- **Smart Service**
  - Smart ONT as **Service Enabler**, synergy with the smart pipe to open network capability for OTT like Smart Phone; Service virtualized to Cloud like AppStore

- **Smart O&M**
  - Efficient **O&M**, increase experience from local mobile APP and remote system

---

End-user pay for better experience

Growing revenue for Telco & OTT

Provide better experience

Telco & OTT Cooperation

Positive Loop
The Essence of smart: Experience & Open-platform

Smart phone:
Excellent experience (Easy Operation)
Open platform (Service Extension)

Smart ONT:
Excellent experience (Easy Connection)
Open platform (Service Extension)
Every emergence of Entrance bring big opportunity

**Entrance of Personal life**: Mobile Phone
- Always on (Carry-on) + Service Extension
- Mobile phone, the Mobile APP, Entrance for personal digital life

**Entrance of Information**: Browser/Search Engine
- The browser, Search Engine, News Site, Entrance for internet

**Entrance of Smart Home**: Smart Home Gateway
- Always on (7*24 Hours) + Service Extension
- More intelligent devices/More M2M connections driven Smart home gateway with open-platform becoming the new entrance.
Why should carries seize this HGW entrance?

Lose the entrance: Dump Pipe position

HGW is the key of home network, but it has been 10 years without big change.

Many Startup company launched innovative HGW, Try to seize the new entrance.

Once the OTT company succeed, Telco will be located in the dump pipe position.

Win the entrance: Increase ARPU

Extend Home Networking Service and package to the end-user

Pipeline monetization, releasing the network potential

Provide new services With Open-platform to the end-user
Case of CTC#: From OTT to VTT and put it as a core strategy

Using Smart platform, Fujian Telecom and OTT Providers create a new business model

Benefits: Revenue increase about 20 million RMB half a year, the number of users will still grow rapidly in 2014.
Case of PCCW#: Provide Access, Home Networking and Smart Home Service, Monetizing the Value of FTTH network

Defining Smart Living

“Smart Living” makes use of technologies to enhance your quality of living by bringing you extra comfort, convenience, and efficiency at home.

Mid-Grade:
Including 1 Controller 250, 1 ZigBee gateway, 3 ZigBee panel, 4 infrared head, air conditioning and curtain controller for each of 1 group, two groups of 4 light control, 1 indoor remote control etc.

High-Grade:
Provide 1 sets of audio and video management system additionally

Home Networking (2~3K users)

Charge Fee: 8800 HKD

Using high quality equipment and cables for our Star Network design, we offer you a fast, stable and secured internet network within your home.

NowTV PLC Adapter:
15HKD/Month

More than 90% WiFi coverage guarantee*

Individual WiFi packages (50%+ penetration)

Charge Fee: 19900 HKD

Charge Fee: 39800 HKD

http://smartliving.hkt.com/chi/showroom.html
Vision of smart home in the future

1. Home Connection Experience
   - 100M ~ 1G Access
   - Seamless WiFi
   - Visible HN
   - Green Life
   - ...

2. Service Experience
   - HD Video
   - Home Storage Cloud
   - Home Security
   - Smart Open-platform
   - Mobile Phone MNG
   - ...

U2BB@home experience: Any-device@ Any-where enjoy life

- Wi-Fi Coverage Anywhere
- High Bandwidth Performance
- Enjoy any Smart Service
- Easy for Operation, Maintenance & Extension
The Solution

Smart FTTH Boost Your Business
Overview of Huawei FTTH Solution

Networking Topologies

7 Components in FTTH solution, this roadmap will focus on U2000/OLT/ONT.

Valued-Added Components
- N2510
- U-Traffic

Core Components
- U2000
- OLT
- ONT

Supplemental Components
- TMS
- ODN

Cooperated OTT
- Data
- Voice
- Video

Home Connection
# Overview of Smart FTTH Solution

## Smart Connection

<table>
<thead>
<tr>
<th>U2BB Connection</th>
<th>Ultra BB Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra BB Connection</td>
<td></td>
</tr>
<tr>
<td>Ubiquitous BB Coverage</td>
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</tbody>
</table>

## Smart Service

<table>
<thead>
<tr>
<th>WiFi Sharing/upstream DAA/iOS-Like Open Platform</th>
</tr>
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<tbody>
<tr>
<td>OTT as a Service</td>
</tr>
<tr>
<td>Open Platform for Digital Service Platform Provider</td>
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## Smart O&M

<table>
<thead>
<tr>
<th>Fast Integration to OSS</th>
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<tbody>
<tr>
<td>Effective Provision</td>
</tr>
<tr>
<td>Easy Assurance</td>
</tr>
<tr>
<td>Video Quality Remote Diagnosis</td>
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</tbody>
</table>
## Smart Connection is the Basis of Smart FTTH

<table>
<thead>
<tr>
<th>Sub-solution</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ultra BB Access</strong></td>
<td>2Gbps Connection</td>
</tr>
<tr>
<td></td>
<td>10G PON Connection</td>
</tr>
<tr>
<td><strong>Ultra BB Connection</strong></td>
<td>WiFi High Throughput</td>
</tr>
<tr>
<td></td>
<td>11n Dual band</td>
</tr>
<tr>
<td></td>
<td>11ac Dual band</td>
</tr>
<tr>
<td><strong>Ubiquitous BB Coverage</strong></td>
<td>WiFi 200mw</td>
</tr>
<tr>
<td></td>
<td>Smart WiFi Coverage</td>
</tr>
<tr>
<td><strong>Green Life</strong></td>
<td>Smart power save</td>
</tr>
<tr>
<td></td>
<td>Smart Management of WiFi Power On/Off</td>
</tr>
</tbody>
</table>
2Gbps Access help Telco lead competition

Industry mainstream maximum rate: 1Gbps

Inside of Smart ONT: No bottleneck

Lead the competition, increase ARPU and strengthen brand image

More Telcos are considering to provide 2Gbps service package

Current offering:
- FTTH 300Mbps
- FTTH 200Mbps
- FTTH 100Mbps

So-net

2Gbps ★ 1Gbps ★ 4,980円～
# 10G PON ONT Samples are Available

Samples are used to validate the compatibility of GPON & 10G PON network

<table>
<thead>
<tr>
<th>Data SFU</th>
<th></th>
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<tbody>
<tr>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Voice SFU</th>
<th></th>
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<tbody>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>HGU</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RG8000</strong></td>
<td><strong>RG8000 V2</strong></td>
</tr>
<tr>
<td>10G GPON</td>
<td>10G GPON</td>
</tr>
<tr>
<td>2 × POTS</td>
<td>2 × POTS</td>
</tr>
<tr>
<td>4 × GE</td>
<td>4 × GE</td>
</tr>
<tr>
<td>FPGA Based</td>
<td>ASIC Based</td>
</tr>
<tr>
<td>2012-04 available</td>
<td>2013-12 Available <em>(TR4A only. Should not be used for commercial application)</em></td>
</tr>
</tbody>
</table>

Notes-1: Appearance of actual products may be different to diagrams in this page

- Commercial roadmap for 10G GPON ONT is under evaluation, since the cost is still not adequate for residential application up to now.
WiFi Experiences are doubled and even more

**11n 2*2 throughput doubled**

- **100Mbps UBB experience is possible**

- Notes: Real throughput depends on actual application scenario

**WiFi emission power up to 200mW**

- Default configuration is 100mW
- 200mW need different hardware and customization fee will be charged

**11n 3*3+3*3 dual band dual cast**

**11n 3*3 + 11ac 3*3 dual band dual cast**

**Air Interface**
- 3*3@2.4GHz: 450Mbps
- 3*3@5GHz: 450Mbps

**Air Interface**
- 3*3@2.4GHz: 450Mbps
- 3*3@5GHz: 1300Mbps
Smart WiFi Coverage provide Ubiquitous BB connection

Any room with power socket can realize WiFi coverage

WiFi Repeater can be auto-configured / auto-managed by Smart ONT. WiFi device can roam smoothly between ONT / repeaters.

PLC Adapter used at HGU side; WiFi Repeater used at requirement site

PLC Adapter sold by Huawei Device
- PT210
  - 200M
  - 1 FE
- PT500
  - 500M
  - FE

WiFi Repeater sold by Huawei Device
- WS322
  - 1FE
  - 11n 300Mbps
- WS323
  - 1GE
  - 11n 300Mbps
  - 2.4G/5G dual band
Smart Power Save Support ...

Dynamic Power-Saving

- **Smart Mode**: ONT dynamically reduces the power consumption according to service status
- **Dynamic power saving**: Shut down the unnecessary chips according to the service status, solve the heat dissipation issue and extend the service life

High standard compliance

- Strictly comply with European COCv4 standard
- **IEEE Std 802.3az** for Energy - Efficient Ethernet
- Total power saving up to 20% less than the industry level
WiFi Power On/Off support Smart Management

End user can set rules of WiFi off according to user own customs

WiFi OFF Timing Configuration Illustration

<table>
<thead>
<tr>
<th>Timing</th>
<th>Period-1</th>
<th>Start</th>
<th>End</th>
<th>Day of Week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>:</td>
<td>:</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Period-2</th>
<th>Start</th>
<th>End</th>
<th>Day of Week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>:</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Period-3</th>
<th>Start</th>
<th>End</th>
<th>Day of Week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>:</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Period-4</th>
<th>Start</th>
<th>End</th>
<th>Day of Week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>:</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

It is beneficial for end user to reduce WiFi radiation and wireless interference

Wireless enrich people's life and communication, but for some period, e.g. sleeping, staying out, WiFi is not necessary to work
Case of PCCW#: monetization WiFi with Service extension

NETVIGATOR Home Wireless Service

Basic Plan:
- Monthly fixed term rate: $18
- Provision of equipment during contract term:
  (a) One FE router with 802.11g Wi-Fi (applicable to 3M/5M/8M/18M users).

Fiber-to-the-Home Plan:
- Monthly fixed term rate: $28
- Provision of equipment during contract term:
  (a) One GE router with 802.11n Wi-Fi

Additional WiFi Service Package

ARPU Increase

$18 HKD
$28 HKD
$38 HKD

WiFi Connection Experience

Smart Living

$8800 HKD Per house

Smart Service define a road of Via The Telecom

Phase 1.0
OTT as a Service (OaaS) (Destination IP Based)

Phase 1.1
OTT as a Service (OaaS) (Domain Name Based)

Phase 2
Open Platform for Digital Service Platform Provider

- OaaS is initial stage of VTT
- Digital Service Platform Provider is the target of VTT
OTT as a Service (OaaS) help to raise ARPU

Principle: Best Effort for OTT, Differential Service for OaaS

ONT is **Ingress** of pipe, ensuring QoS for **upstream**
(Note: BRAS/SR for downstream)

- OTT HD-Video upstream (TCP ACK)
- Video Communication/ Supervision
- Cloud Storage
- etc.

Create the Positive Loop of Value Chain

**Positive Loop**

- **Differential service**
- **Smart FTTH Telco**
- **Smart FTTH Subscribers**
- **OaaS w/ Competitive Edge - QoE Ensurance**

**Differential OaaS**
- 7
- 6
- 5
- 4
- 3
- 2
- 1
- 0

**Best Effort for OTT**

**Mapping**
- 8 codes of IP ToS
- 8 codes of 802.1p
- 8 queues
- 8 T-CONT

**Smart Service**
OaaS Require E2E Networking

- Multiple network planes (HSI, IPTV, etc) co-exist. Smart ONT is convergence point.
- OaaS can use same WAN as OTT or use dedicated WAN that depends on network strategies.
DIP based OaaS has 3 service process at Ingress

1. OaaS Provisioning
   - EMS configure rules to ONT/OLT

2. OaaS Flow Identification (OFI)
   - Destination IP (Recommended)
     - Source/Destination TCP/UDP Port
     - Source IP, Protocol
     - Ingress Port, Ingress VLAN
   - Service Transport Mode-1: One Pipe for One Service
   - Service Transport Mode-2: One Pipe for Multi Service
   - Service Transport Mode-3: Hybrid of Mode-1/2
   - Select pipe according to OFI
   - Ensure QoS according to OFI

3. OaaS Flow Scheduling
   - Ingress of Smart Pipe
     - EMS
     - OLT
     - BRAS
     - CR
     - CDN
     - Smart ONT
     - Smart Pipe
     - Upstream QoS/Bandwidth assured by ONT/OLT
     - Downstream QoS/Bandwidth assured by BRAS

EMS configure rules to ONT/OLT

Select pipe according to OFI

Ensure QoS according to OFI

Service Transport Mode-1: One Pipe for One Service

Service Transport Mode-2: One Pipe for Multi Service

Service Transport Mode-3: Hybrid of Mode-1/2
Domain Name Identification: natural way for OaaS awareness

Simple and Easy for deployment and provisioning

It is Domain Name instead of DIP that represent the OaaS to be guaranteed.

Domain Name Oriented Forwarding and QoS Ensurance
In Management Plane

<table>
<thead>
<tr>
<th>Domain Name</th>
<th>WAN</th>
<th>QoS</th>
<th>DIP</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.ott-1.com">www.ott-1.com</a></td>
<td>#2</td>
<td>1</td>
<td>A.B.C.D</td>
</tr>
<tr>
<td><a href="http://www.ott-2.com">www.ott-2.com</a></td>
<td>#2</td>
<td>2</td>
<td>E.F.G.H</td>
</tr>
<tr>
<td><a href="http://www.ott-3.com">www.ott-3.com</a></td>
<td>#1</td>
<td>1</td>
<td>I.J.K.L</td>
</tr>
<tr>
<td><a href="http://www.others.com">www.others.com</a></td>
<td>#1</td>
<td>2</td>
<td>M.N.O.P</td>
</tr>
</tbody>
</table>

DIP Oriented Forwarding and QoS Ensurance
In Data Forwarding Plane

ONT is ingress of uplink stream:
- select pipe (WAN interface) according to DIP
- Remark QoS and select queue according to DIP
Upstream DAA support Telco / OTT Cooperation

DAA: Destination Application Accelerate

Before Acceleration:
- Downlink 100Mbps
- Uplink 2Mbps

After Acceleration:
- Downlink 100Mbps
- Uplink 100Mbps

• For 600MB file, duration of upload is reduced to 48sec from 40min.
• User experience is enhanced dramatically.

Benefits for Telco
- Telco cooperated OTT (Cloud Storage, video supervision...) can get more subscriber with enhanced user experience
- Telco can share revenue with OTT

Main Specification
- Subscriber apply acceleration when using specific OTT
- OSS configuration to OLT/ONT take effect in real time
- Multiple services in same VLAN of ONT Internet WAN are mapped to different GEM Port/T-CONT according to 802.1p/ToS. T-CONT bandwidth are pre-assign on OLT
- ONT classify different services according to destination-IP, domain name ..., and forward cooperated OTT traffic to specific pre-assigned channel of GEM-Port/T-CONT
WiFi Sharing Service provide ARPU increment

Benefits for Telco
- Converged "Fixed + Wi-Fi" service can enhance user experience
- There is no additional hardware cost on FTTH network
- Telco may lease Public SSID to other Telcos.

Main Specification
- Four SSID: 1 for private and 3 for public
- Support portal authentication and EAP-SIM/AKA, PEAP

FTTH V1R15C10
EMS or TMS
AAA Server
Portal Server
AC
BNG/WiFi GW
Other Telcos

Public WiFi Flow of Services/Signaling
HGU Management Flow
iOS-like Open-platform for service extension

Digital home network

- Surveillance Camera
- Security Sensor
- Home automation
- Healthcare
- USB Dongle
- 2.4G/ ZigBee
- Phone/PAD
- Wifi

Services Platform

- E-Learning
- eSmartHealth
- Home Monitoring
- Home Entertainment
- Home Automation

Mobile phone for service bundles installation

Benefits: Easy to control smart home service with ONT for Carries, one terminal for Easy O&M and Cost-effective
Case of China Unicom#: Increase ARPU with OTT Engagement

Benefits for end-user:
- Achieve IPTV HD Video and OTT HD Video from single STB, abundant contents;
- Achieve media sharing with multi-screen;
- Any Ethernet port can access service, no limitation only “iTV” port can access IPTV as before, more flexible;

Benefits for Telco & OTT:

<table>
<thead>
<tr>
<th>Service package</th>
<th>Old ARPU (/per month)</th>
<th>New ARPU (/per month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSI 4M BB</td>
<td>¥80</td>
<td>¥110</td>
</tr>
<tr>
<td>IPTV SD</td>
<td>¥20</td>
<td>HD ¥40</td>
</tr>
<tr>
<td>OTT HD</td>
<td>¥40</td>
<td>HD ¥20/ per month (¥8/per month for QIY)</td>
</tr>
</tbody>
</table>
Smart O&M support OPEX saving for Smart Connection and Smart Service

- Fast Integration
  - Pre-integration with leading OSS vendors
  - HGU support both EMS and ACS integration with OSS

- Efficient Provisioning
  - GUI based E2E configuration of FTTH
  - Automatic provisioning w/ efficiency and reliability
  - Flexible and fast upgrade before provisioning

- Easy Assurance
  - Rich Tools for FTTH Remote Diagnosis
  - GUI based E2E FTTH Remote Diagnosis
  - Rogue ONT Self-Detection, Self-Isolation
  - Graded management for VIP subscriber
  - Y.1731 based E2E performance measurement
  - Video Quality Remote Diagnosis
Pre-integration with leading OSS vendors help to reduce integration time

High performance, multiple NBI support

Rich and Replicable integration experience

Exclusive OSS pre-integration laboratory

Close co-operation with industry-leading OSS vendor

OSS partners
HGU can be managed flexibly by EMS or EMS+ACS

**EMS can manage HGU/SFU**

- Low cost and fast integration solution

**HGU support managed by EMS + ACS**

- Could share ACS with DSL CPE

**Services Network**

- OSS

**Metro Network**

- U2000

**OLT**

- XML+

**HGU**

- TR-069 for:
  - Non TR-069 WAN
  - USB/WIFI
  - IP-based services
  - Gateway services

**XML for**

- Voice Services
- Common Configuration mgmt. Items as TR-069

**OMCI for**

- PON Layer
- ETH-based services
- RF Interface
- TR-069 WAN

**Notes:** ACS could be Huawei or 3rd party system

**Services Network**

- TL1/ XML

**U2000**

- XML+

**ACS**

- TR-069

**OMCI + XML:** mandatory for PON layer And Common Config
GUI based E2E Configuration of FTTH

Efficiency come from GUI and E2E, esp. for ONT

Feature Description:
- OLT and ONT configuration integrate in one view, multi-play service fast provision.
- FTTH service configuration from OLT to ONT (HSI, multi-cast, voice) can be finished E2E on one view.

Benefits:
- Easy to configure FTTH, no need to switch windows from OLT and ONT.
- Efficiency of deploy service with GUI upgrade 50%.
### Automatic provisioning w/ efficiency & reliability

<table>
<thead>
<tr>
<th>Steps</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A user applies for services</td>
</tr>
<tr>
<td>2</td>
<td>CRM receives the order and confirm the available resource and transfer the order to the service provisioning system.</td>
</tr>
<tr>
<td>3</td>
<td>Service provisioning system pre-provision services via the EMS NBI.</td>
</tr>
<tr>
<td>4</td>
<td>ONT installation; power on the ONT and input the password via the ONT WEB console.</td>
</tr>
<tr>
<td>5</td>
<td>OLT verifies the ONT password. If it is correct, the ONT will download the pre-provisioned data. And services are automatically activated.</td>
</tr>
</tbody>
</table>

- **U2000 provides** TL1, XML NBI to integrate with service provisioning system
- **High provisioning efficiency:** 4000 FTTH order /per day (Real network application data)
- **99% success rate** of provisioning
- Fully automatic provisioning, service activation immediately
Flexible and fast upgrade before provisioning

Provide flexibility to software version management and time to market

3 steps of ONT service provisioning process:

1. U2000 → OSS → ONT Installment
2. U2000 → OSS → Upgrade (Automatic upgrade before provisioning)
3. U2000 → OSS → Provisioning

Compared with the industry:
- **Doubled ONT upgrade efficiency:** 1K ONTs connected to an OLT need 20 minutes only for an upgrade.
- **Half service interruption duration:** Upgraded ONT has 100s only service interruption time when there were 3.5K ONTs connected to an OLT

Feature Description:
- When this feature is enabled, designated source ONT software release can be upgraded to designated target release
- The designated source ONT software version can be a range from version xx to version zz

Benefits:
- Sync the software version to the same as new shipped ONT
- Provide an independent solution when ONT hardware and software delivery is in separated mode.
Rich Tools for FTTH Remote Diagnosis

Loopback of ETH/POTS/GEM Port

- ETH Port Loopback
- POTS Port Loopback
- GEM Port Loopback

Simulation of Caller/Callee, PPPoE, DHCP

Connectivity Test w/o participation of subscriber

- BRAS: Simulated PPPoE Client
- Caller: Simulated Caller
- Callee: Simulated Callee
- IPTV System: Simulated DHCP Client

Remote Phone Line Test

Line Test Function

- ONT: SoC

Voice Packet Analysis Function

Simulation of Broadband Speed Test

Speed Test w/o participation of subscriber

- Speed Tester Server @XXX
- Speed Tester Client @ONT

To be planned in future version

【Open Discussion】
Huawei suggest that speed tester server should run on standalone server to ensure accessible by client.
The Video Quality Remote Diagnosis

Base on VMOS/MDI, Help Telcos to locate remote video(IPTV&Signed OTT) fault

Classification of Video Fault

Benefits:
- Distinguish responsibility, the Video fault of Access network is less than 30%.
- Reduce OPEX, Normal fault do not need visit user’s home, only use remote tools.
- Construct SLA baseline, visual experience
GUI based E2E FTTH Remote Diagnosis

E2E View

Remote Diagnosis & Test

Display OLT, ONT info.

U2000 V1R6
Smart Detection and Isolation of Rogue ONT

Service was assured by 2 levels Smart Isolation of OLT+ONT

Rogue ONT damage the FTTH security

- Uplink service of all the ONT under the same PON port will fail
- Since maintenance personnel has to unplug ONT fiber one by one, it will take long time to locate Rogue ONT.

Comparison:

<table>
<thead>
<tr>
<th>Detection/Isolation</th>
<th>Detection duration</th>
<th>Isolation</th>
<th>Fault Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Detection/Isolation</td>
<td>15 min</td>
<td>1 min. Passively</td>
<td>Continuous optical TX</td>
</tr>
<tr>
<td>Smart Detection/Isolation</td>
<td>1 sec</td>
<td>20us. Actively</td>
<td>Continuous/random optical TX</td>
</tr>
</tbody>
</table>

Contact Detection and Isolation by Smart OLT

Smart Detection and Isolation by Smart ONT

ONT hardware real-time detected rogue ONT and shut down power of optical module, giving LED indication.
Graded ONT Management for High Value Service

Graded ONTs have different service grade (alarm, topology, traffic ...)

Feature Description:
- Support 8 ONT-grade priorities
- Set default alarm filtering condition based on the ONT priority
- Filter and display alarm, topology, traffic etc. based on the ONT priority

Value:
- Identify and deal with failure of VIP customers with priority to improve maintenance efficiency and customer satisfaction

Example of diff service:
- **Bronze**
  - Monitor power on or power off alarm of ONT
- **Silver**
  - Monitor power on or off alarm of ONT
  - Monitor upstream and downstream traffic of ONT
- **Gold**
  - Monitor power on or off alarm of ONT
  - Monitor upstream and downstream traffic of ONT
  - VIP ONT on topology
Y.1731 is useful for Open Access SLA measurement

E2E Y.1731 was provided by ONT/OLT/U2000/uTraffic

Network traffic quality statements report

<table>
<thead>
<tr>
<th>Link Name</th>
<th>Link S...</th>
<th>Source D...</th>
<th>Source Port</th>
<th>Sink D...</th>
<th>Sink Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Link 1</td>
<td>10.78.221.12</td>
<td>10.78.221</td>
<td>9911</td>
<td>9911</td>
<td>9911</td>
</tr>
<tr>
<td>Delay (ms)</td>
<td>0</td>
<td>5.37</td>
<td>9.9</td>
<td>48.16</td>
<td>99</td>
</tr>
<tr>
<td>Packet Loss Ratio (%)</td>
<td>49</td>
<td>99</td>
<td>18</td>
<td>49.33</td>
<td>99</td>
</tr>
<tr>
<td>Delay Jitter (ms)</td>
<td>4.66</td>
<td>9.9</td>
<td>5.37</td>
<td>9.9</td>
<td></td>
</tr>
</tbody>
</table>

Network traffic quality history data of delay

U2000 for config and connectivity mgmt; uTraffic for performance mgmt

- OLT & ONT real-time report packet loss, delay, jitter statistics, calculated to uTraffic
- uTraffic analyses data and state report

Specification:
- Frame Loss Measurement (Single-ended ETH-LM);
- Delay Measurement (ETH-DM, two-way delay);
- Two-way delay accuracy: 100us;
- Support uplink MEP & downlink MEP @SPUF, uplink MEP @OPGD

Benefits:
- OLT & ONT real-time report packet loss, delay, jitter statistics, calculated to uTraffic;
- uTraffic analyses data and state report
Case of Ooredoo#: Double the efficiency with smart O&M

The largest SP in Qatar has 60,000 FTTH users by 13Q3, 200,000 users by 2015

Customer Benefits:

- Trouble-shoot rate in 72hrs increased from 37% to 94%;
- Field visit rate has fallen from 88% to 35%.
- Repeat visit rate has fallen from 87% to 0%.

Fault Solve Duration reduced (D<=72hr increased from 37% to 94%)

Visit Rate reduced from 88% to 35%

Fault Report Before April 2012
Fault Report March 2013
## Smart FTTH Roadmap 1/2

Notes: Roadmap is not commitment and vulnerable to change.

<table>
<thead>
<tr>
<th>FTTx V1R12</th>
<th>FTTx V1R13</th>
<th>FTTx V1R13C10</th>
</tr>
</thead>
</table>

### Smart Service
- OTT as a Services
- Home based hot spot service

### Smart Connection
- UBB Access of 2Gbps
- Doubled WiFi Throughput
- Smart power save

### Smart O&M
- Rogue ONT Self-Detection, Self-Isolation

### OLT Product
- New Line Card
  - H806GPBH (8 ports)
  - H802GPFD (16 ports)

### ONT Product
- New Generation SFU
  - HG8010H (GE)
  - HG8240A (FE)
- New Generation HGU
  - HG8245A (FE)
  - HG8045A (FE)

### FTTx V1R12
- ONT V3R12

### FTTx V1R13
- ONT V3R13

### FTTx V1R13C10
- ONT V3R13C10

- Storage sharing
- Media sharing
- Printer sharing

- Y.1731 based E2E performance measurement

- HGU: HG8045H (GE)
- 802.11n dual band HGU
  - HG8245D (GE) TR5 only
  - HG8045D (GE)

- Y.1731 based E2E performance measurement

- HGU: HG8045H (GE)
- 802.11n dual band HGU
  - HG8245D (GE) TR5 only
  - HG8045D (GE)
## Smart FTTH Roadmap 2/2

### FTTx V1R15C00
- **CA:** 2014-Q2 / **GA:** 2014-Q3
  - Domain name based smart pipe
  - Broadband Full Coverage
  - Parental Control

### FTTx V1R15C10
- **CA:** 2014-Q4 / **GA:** 2015-Q1
  - Public WiFi Sharing
  - upstream DAA
  - iOS-Like Open Platform

### FTTx V3R16C00
- **CA:** 2015-Q2 / **GA:** 2015-Q3
  - Video Quality Remote Diagnosis
  - New Generation Product for China Market
  - 10G GPON ONT*

### Notes
- Roadmap is not commitment and vulnerable to change.

### (*) RISK: Feature is on planning. The respective release time schedule is vulnerable to change.
Smart FTTH Boost Your Business

3. The Portfolio

1. The Trend
2. The Solution
3. The Portfolio
Recommended Portfolio of OLT & GPON Line Card

GPON Series line card is compatible with various types of OLT

- **OLT**
  - **MA5600T**: Large capacity (10U)
  - **MA5603T**: Medium size (6U)
  - **MA5608T**: MiniOLT (2U)

**8 Port line card: H806GPBH**

- **Specification**
  - A maximum of 1:128 split ratio
  - SFP, Class B+/C+ module
  - Support RSSI
  - ONU-based queue shaping

- **Highlight & Value**
  - Design for Smart FTTH

**16 Port line card: H802GPFD**

- **Specification**
  - Power consumption: 73w
  - SFP, Class B+/C+ module
  - Support RSSI
  - Maximum ONTs: 1K
  - Inherit previous features

- **Highlight & Value**
  - High Density & Power Save
## Recommended Portfolio of GE Series ONT

### Supported by V3 software

<table>
<thead>
<tr>
<th>Data SFU</th>
<th>Voice SFU</th>
<th>HGU</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HG8010H</strong></td>
<td>1 × GE</td>
<td><strong>HG8040H</strong></td>
</tr>
<tr>
<td>2012-09 CA</td>
<td></td>
<td>2013-05 CA</td>
</tr>
<tr>
<td>2012-12 GA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **HG8240H** | 2 × POTS | **HG8240S** | 2 × POTS | **HG8245H** | 2 × POTS | **HG8247H** | 2 × POTS | **HG8045H** | 4 × GE | **HG8045D** | 2 × POTS | **HG8245D** | 2 × POTS | **HG8245Q** | 2 × POTS |
| 4 × GE | | 4 × GE | | 4 × GE | | 4 × GE | | 4 × GE | | 1 × USB | | 4 × GE | | 4 × GE | | 1 × USB |
| 2013-09 GA | | | | | | | | | | | | | | | |

**Notes-2**: Customer should purchase AC/DC & UPS from 3rd party.

Outdoor ONT for Residential Scenario Only

---

**Notes-1**: Appearance of actual products may be different to diagrams in this page
# Recommended Portfolio of FE Series ONT

## Supported by V3 software

<table>
<thead>
<tr>
<th></th>
<th>Data SFU</th>
<th>Voice SFU</th>
<th>HGU</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HG8240F</strong></td>
<td>2 × POTS</td>
<td>4 × FE</td>
<td>2 × POTS</td>
</tr>
<tr>
<td><strong>HG8245A</strong></td>
<td>4 × FE</td>
<td>1 × USB</td>
<td>4 × FE</td>
</tr>
<tr>
<td><strong>HG8045A</strong></td>
<td>1 × USB</td>
<td>WIFI(11n 2*2)</td>
<td>1 × USB</td>
</tr>
<tr>
<td></td>
<td>2012-09 CA</td>
<td>2012-09 CA</td>
<td>WIFI(11n 2*2)</td>
</tr>
<tr>
<td></td>
<td>2013-01 GA</td>
<td>2013-01 GA</td>
<td>2013-01 GA</td>
</tr>
</tbody>
</table>

Notes-1: Appearance of actual products may be different to diagrams in this page
Small Size ONT

**Dimension Reduced**

HG8240/HG8245  
195*155

HG8240H/HG8245H  
176*138  
-19%

**Height Reduced**

HG8240/HG8245  
32mm  
-13%

HG8240H/HG8245H  
28mm
Fiber Protection and Optional fiber tray design

Two Design: Reduce fiber interface damage. Need customization period and expense.

1. Optical protection, Easy for focus and operation.
2. Enough Space for circle angle of patch cord.
3. Fiber Cover, to prevent the fiber break off.

1. Fiber protection

1. Optical pin location on one side, not in the middle, to meet fiber minimum bend radius requirements.
2. Enough space supports patch cord circle for 2 meters at 3mm diameter.
3. Twining box and Stable clasp to make sure no fiber break off.

2. Optional fiber tray

Suitable for HG8240H, HG8245H, HG8247H
HG8010H is simplest ONT for pure pipe operator

Application scenario-1: pure HSI service

- RGW is provided by subscriber instead of Telco
- Suitable for Telco positioned as pure pipe operator
- Voice is provided by other Telco or non-FTTH

Application scenario-2: ONT + RGW

- Disadvantage:
  - total CAPEX and OPEX are higher than HGU
  - It is hard to support Smart Service

Brief Specification

- 1 SC/APC, 1 GE port
- Dimension: 117 × 95 × 27 mm
- OMCI management

Power consumption comparison

- HG8010
- HG8010H

Both ONT and RGW are provided by Telco
HG8245H : Enhanced HG8245

**Optimized Outlook**

- Smaller size and fashionable design
- Easy to use from fiber connect protection
  - (1) prevent from bumped out
  - (2) prevent from pulled out

**Highlights**

<table>
<thead>
<tr>
<th>Features</th>
<th>HG8245</th>
<th>HG8245H</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPv4/IPv6</td>
<td>supported</td>
<td>dual stack and DS-Lite, 900M L3 for IPV4; 500M for IPV6</td>
</tr>
<tr>
<td>WIFI Enhance</td>
<td>802.11b/g/n</td>
<td>up to 140Mbps; Transmit power up to 200mW (*)</td>
</tr>
<tr>
<td>Power consumption</td>
<td>16W</td>
<td>15W, EEE supported</td>
</tr>
</tbody>
</table>

**Brief Specification**

- 1 SC/APC, 2 VoIP Port, 4 GE port, WIFI 11n, 1USB
- Dimension: 176 × 138.5 × 28 mm
- Same Accessories for wall-mounted and desktop
- DHCP server /IPv4 NAT
- OMCI/TR069 management

*Note: WIFI signal power is limited by country regulation. Factory default is 100mW. High power mode needs hardware customization*
**HG8240H — Enhanced HG8240**

### Optimized Outlook

![HG8240H Enhanced ONT](image)

### Highlights

<table>
<thead>
<tr>
<th>Features</th>
<th>HG8240</th>
<th>HG8240H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy O&amp;M</td>
<td>supported</td>
<td>Enhance O&amp;M</td>
</tr>
<tr>
<td>OPM</td>
<td>supported</td>
<td>supported</td>
</tr>
<tr>
<td>Fibre protection</td>
<td>customization</td>
<td>customization</td>
</tr>
<tr>
<td>Power consumption</td>
<td>12W</td>
<td>10W, EEE supported</td>
</tr>
</tbody>
</table>

### Brief Specification

- 1 SC/APC, 2 VoIP Port, 4 GE port
- Dimension: 176 × 138.5 × 28 mm
- OMCI+XML management
HG8247H = HG8245H + RF Overlay

**Highlights**

- **IPV6 supported**, dual stack and Ds-Lite
- Forwarding speed increased: 900M L3 for IPV4; 500M for IPV6
- WIFI performance increased: throughput up to **140Mbps**;
- Power consumption **decreased**
- Fiber protection supported

**Brief Specification**

- 1 SC/APC, 1 CATV, 2 VoIP Port, 4 GE port, 1 USB port
- Same Accessories for wall-mounted and desktop
- **RF Overlay** with wavelength 1550nm
- OMCI/TR069 management
- Internal antenna

**Optimized Outlook**
HG8040H — Enhanced HG8040

**Optimized Outlook**

**Highlights**

<table>
<thead>
<tr>
<th>Features</th>
<th>HG8040</th>
<th>HG8040H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Speed</td>
<td>1G/1G</td>
<td>2.5G/1G</td>
</tr>
<tr>
<td>Easy O&amp;M</td>
<td>supported</td>
<td>Enhance O&amp;M</td>
</tr>
<tr>
<td>Size</td>
<td>Medium</td>
<td>Small</td>
</tr>
<tr>
<td>Power consumption</td>
<td>7W</td>
<td>3.5W, EEE supported</td>
</tr>
</tbody>
</table>

**Brief Specification**

- 1 SC/APC, 4 GE port
- Dimension: 176 × 138.5 × 28 mm
- OMCI+XML management
HG8045H — Enhanced HG8045

**Optimized Outlook**

**Highlights**

<table>
<thead>
<tr>
<th>Features</th>
<th>HG8045</th>
<th>HG8045H</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPv4/IPv6</td>
<td>supported</td>
<td>dual stack and DS-Lite, 900M L3 for IPV4;500M for IPV6</td>
</tr>
<tr>
<td>Easy O&amp;M</td>
<td>supported</td>
<td>Enhance O&amp;M</td>
</tr>
<tr>
<td>Power consumption</td>
<td>16W</td>
<td>14W, EEE supported</td>
</tr>
</tbody>
</table>

**Brief Specification**

- 1 SC/APC, 4 GE port, WiFi 11n, 2.4G
- Dimension: 176 × 138.5 × 28 mm
- OMCI/TR069 management
HG8245D — Dual-band WIFI HGW

**Optimized Outlook**

**Highlights**

- Support Single Device access to Multiple Network Planes
- Support Any Port Any Service
- High forwarding rate: Linear L2, 900M L3, **900M IPv6 dual-stack/DS-lite**
- Optical-Power-Meter function for NNI
- Remote trouble-shooting by PPPOE/DHCP/VoIP simulation
- Hardware fault indication
- Less Power consumption, EEE supported
- Fibre protection supported

**Brief Specification**

- 1 SC/APC, 4 GE port, 2POTS, WiFi 11n, 11n Dual-band **2.4G 3*3 MIMO & 5G 3*3 MIMO**
- Dimension: **235 × 200 × 75 mm** (include stand)
- OMCI/TR069 management
HG8045D — Dual-band WIFI HGW

Optimized Outlook

Highlights

- Support Single Device access to Multiple Network Planes
- Support Any Port Any Service
- High forwarding rate: Linear L2, 900M L3, 900M IPv6 dual-stack/DS-lite
- Optical-Power-Meter function for NNI
- Remote trouble-shooting by PPPOE/DHCP/VoIP simulation
- Hardware fault indication
- Less Power consumption, EEE supported
- Fibre protection supported

Brief Specification

- 1 SC/APC, 4 GE port, WiFi 11n, 11n Dual-band 2.4G 3*3 MIMO & 5G 3*3 MIMO
- Dimension: 235 × 200 × 75 mm (include stand)
- OMCI/TR069 management
HG8245Q — 11ac WIFI HGW

Optimized Outlook

Highlights

• Support Single Device access to Multiple Network Planes
• Support Any Port Any Service
• High forwarding rate: Linear L2, 900M L3, 900M IPv6 dual-stack/DS-lite
• Optical-Power-Meter function for NNI
• Remote trouble-shooting by PPPOE/DHCP/VoIP simulation
• Hardware fault indication
• Less Power consumption, EEE supported
• Fibre protection supported

Brief Specification

• 1 SC/APC, 4 GE port, 2POTS, WiFi 11n, 11ac Dual-band 2.4G 3*3 MIMO & 5G 3*3 MIMO
• Dimension: 285x174x67mm
• OMCI/TR069 management
Heterogeneous Access Network
Realize Your U2BB Business Potential

Thank you!