

2008-5-16

Security Level:

# Taking Backhaul to ALL IP Era

Mobile Backhaul workshop for PT  
6th of May 2008

[www.huawei.com](http://www.huawei.com)



# Agenda

## **1. Challenge of Backhaul Network**

## 2. How to Build IP-based Backhaul Network

## 3. Test result of Huawei Solution

## 4. Case Study

## 5. Trial Proposal

# The Legacy Network transition

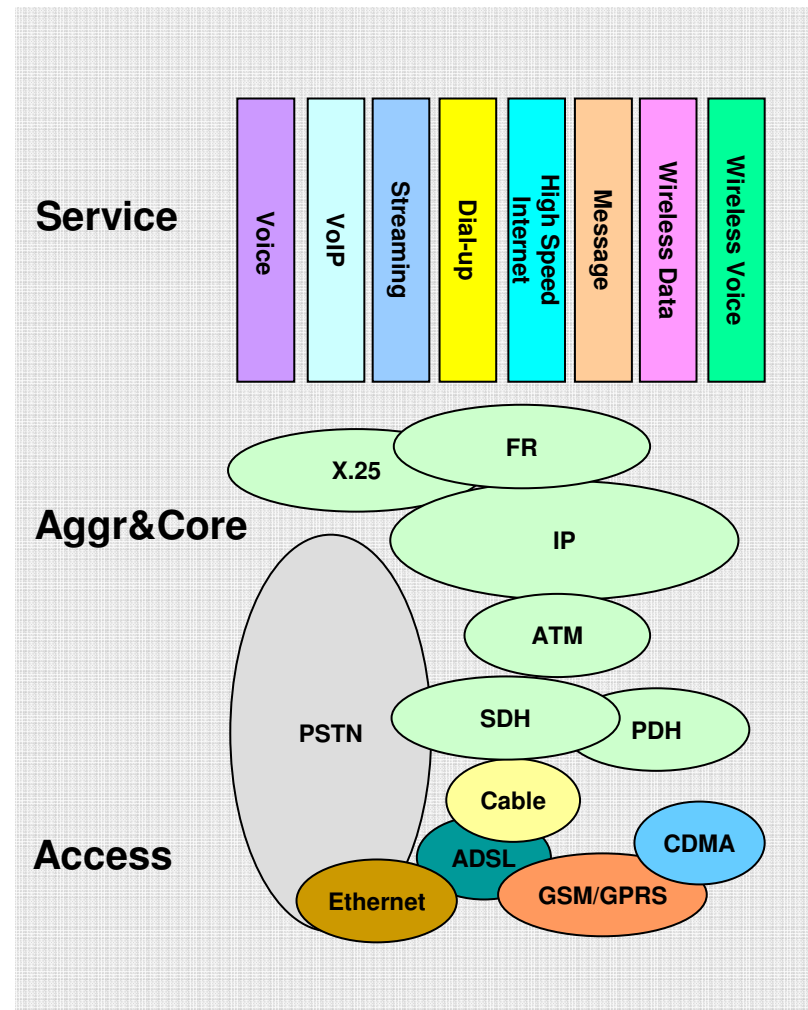
- **The legacy network will remain for a long period**
  - Existing investment on the legacy networks
  - Some customers are reluctant to switch over to new technology
- **However, the trend towards ALL-IP will not stop**
  - Higher bandwidth with lower cost
  - Rich applications
  - Improved efficiency & productivity
  - Lower CAPEX
  - Lower OPEX
  - Improved Time-to-Market
  - Enhanced Competitiveness



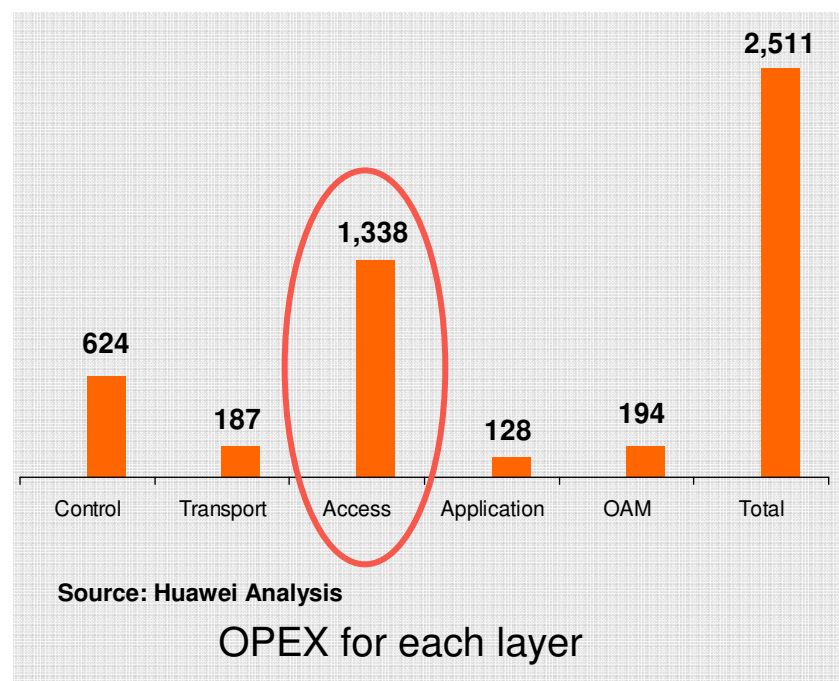
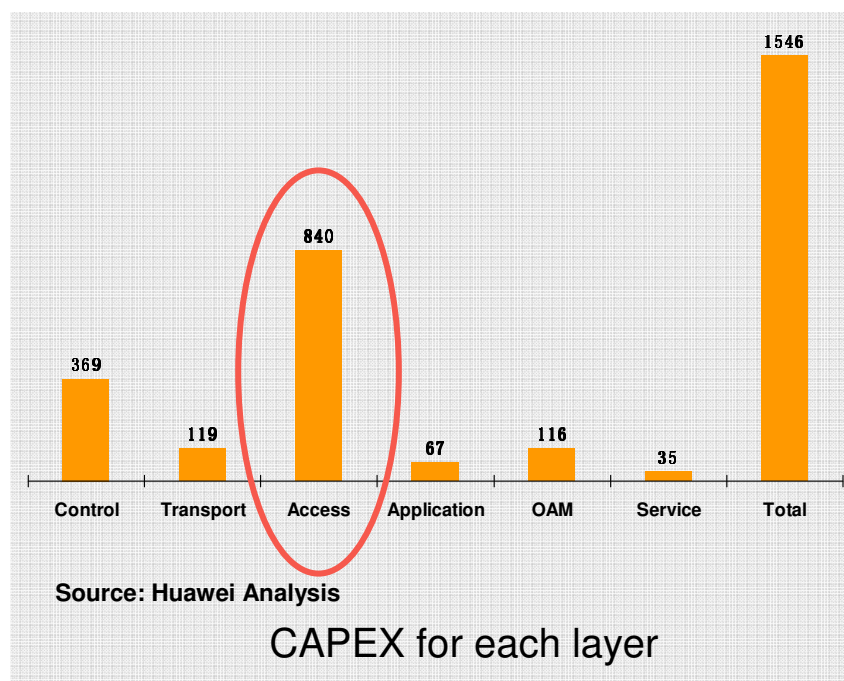
# Challenges for Service Providers

- **Reduce OPEX of their existing networks**
  - Reduce number of overlay networks
  - Network reuse to maximize profitability
- **Invest in new network without reducing their existing revenue streams**
  - Support for legacy services over new network
  - Guarantee similar customer experience after migrating to new network
- **Reduce risk for network upgrade to meet future service demands**
  - Minimal CAPEX for network upgrade
  - Reuse equipment installed at customer sides

# Existing Network can't ...



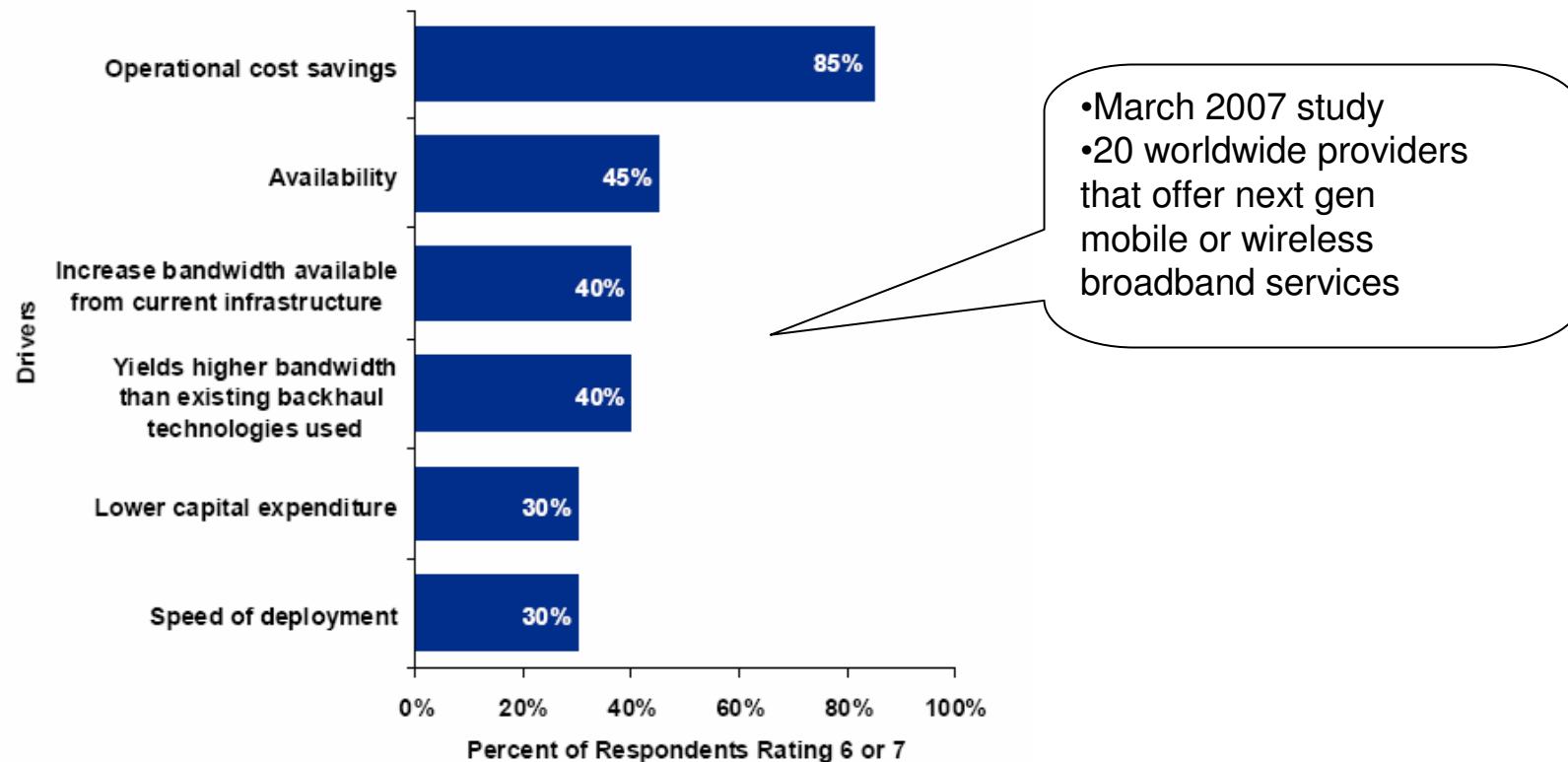
# Access Network Transformation is the Most Important Step



## Access Network Transformation is the most important step for

- Realizing TCO savings
- Realizing ALL-IP Converged platform
- Generating new revenue opportunities with multi-play offerings

# Drivers: For Operators to Use New Backhaul Technologies



Source: Infonetics Service Provider Plans for Next Gen Mobile and Wireless Broadband: North America, Europe, and Asia Pacific 2007

- The NO.1 driver is reducing operations costs in the face of rising bandwidth

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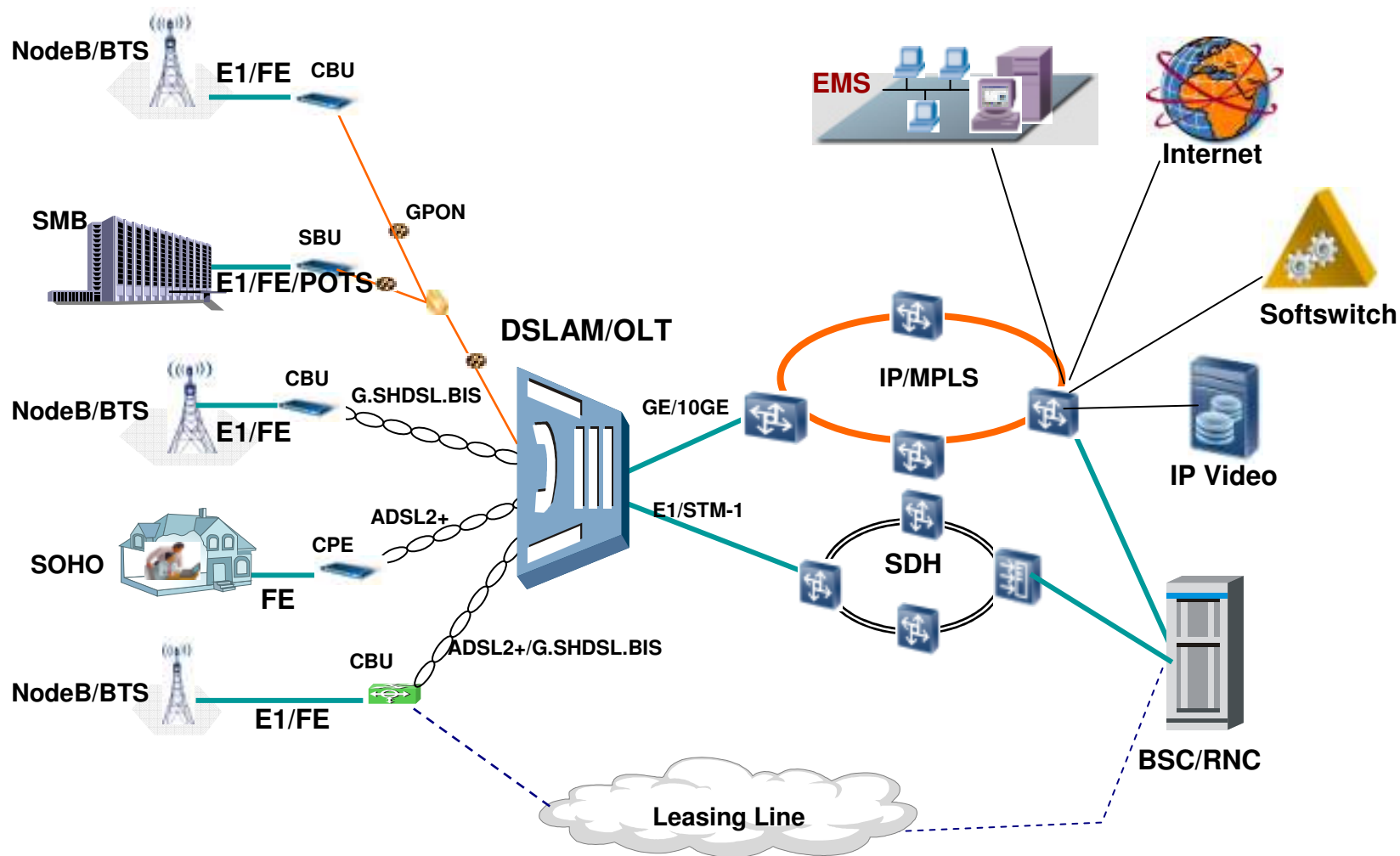
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# DSL/PON Legacy Service Access Solution



# Legacy Service Backhaul Series Products

## OLT/DSLAM

MA5600T



MA5603T



MA5606T



- GE/10GE uplink/cascading
- G.shdsl/G.shdsl.bis/ADSL 2+/VDSL2/GPON/P2P fiber access
- ATM PWE3
- BITS input/Sync Ethernet/1588V2
- GPON Native TDM
- G.SHDSL NTR
- GPON TYPE B Protection

## CBU/SBU

OT925



- 4 E1/4FE/GE interface
- GPON uplink
- Native TDM

OT928



- 8 E1/4FE/GE interface
- GPON uplink
- Native TDM

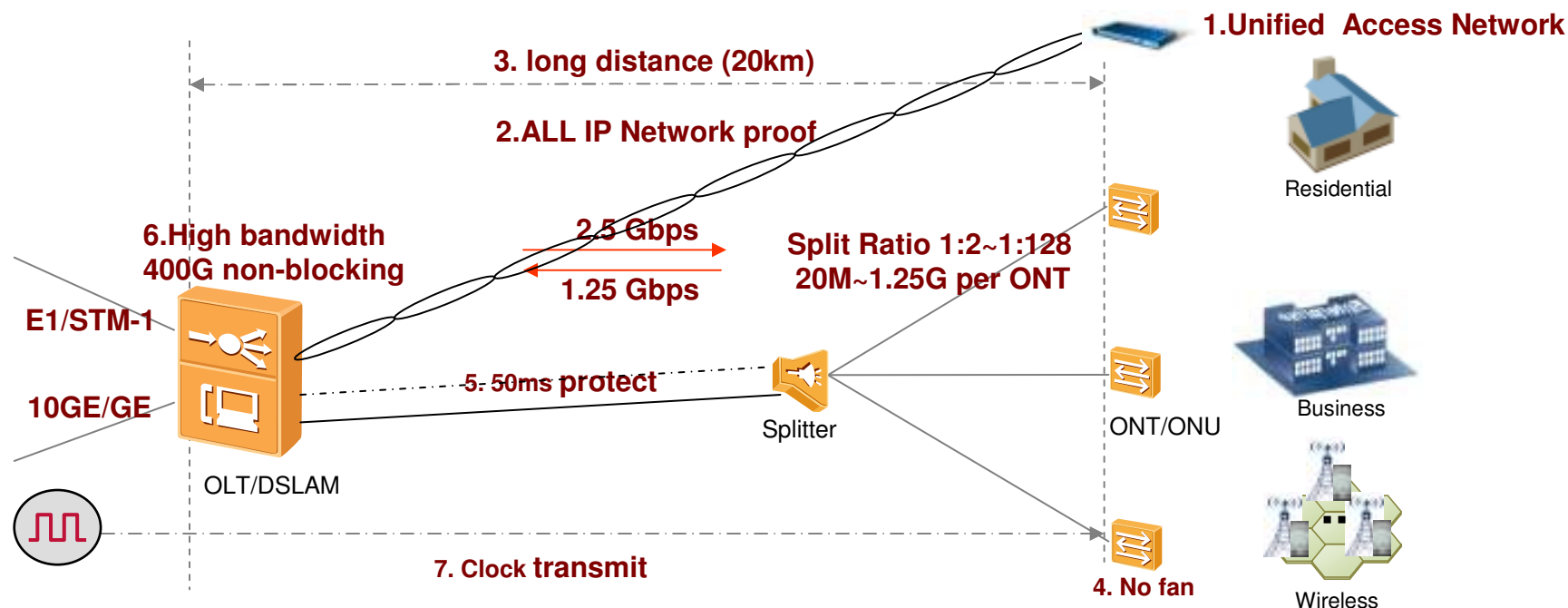
OT910



- 16E1/4FE/GE interface
- Dual GPON uplink
- TDM/ATM/IMA PWE3
- 1588V2
- sync ethernet/bits output
- ADSL2+/G.SHDSL.bis uplink

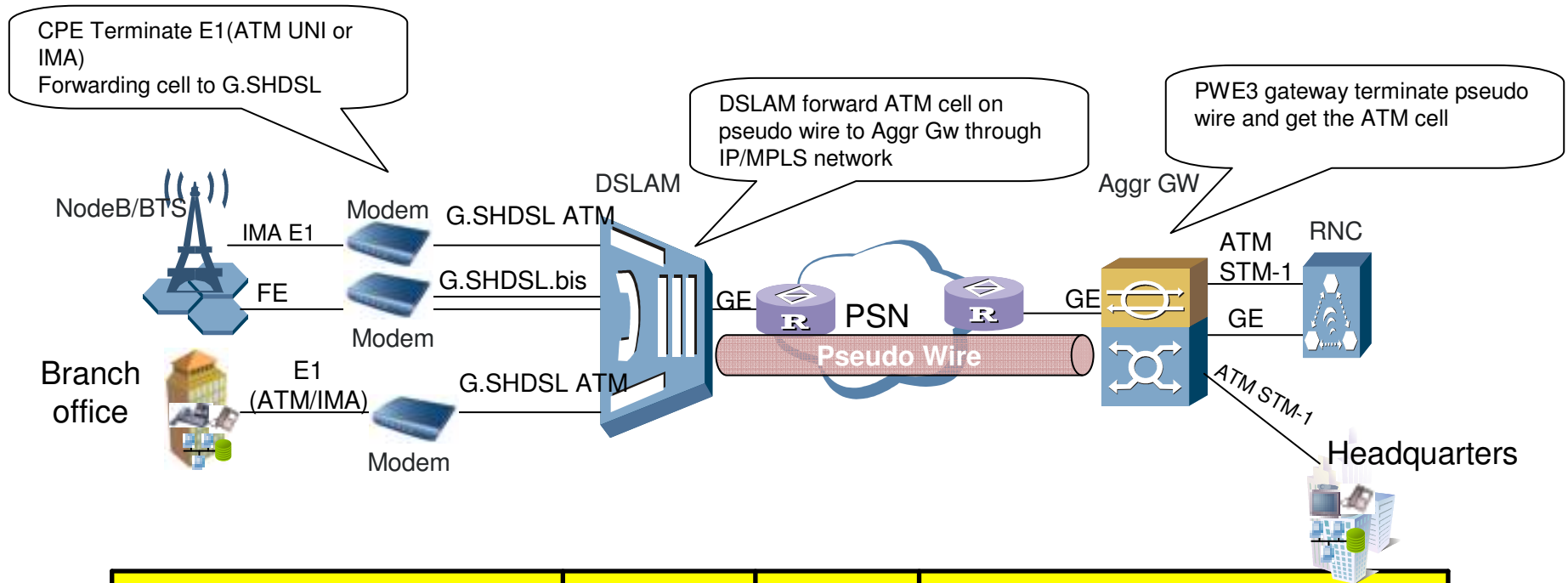
Under planning

# Highlight overview



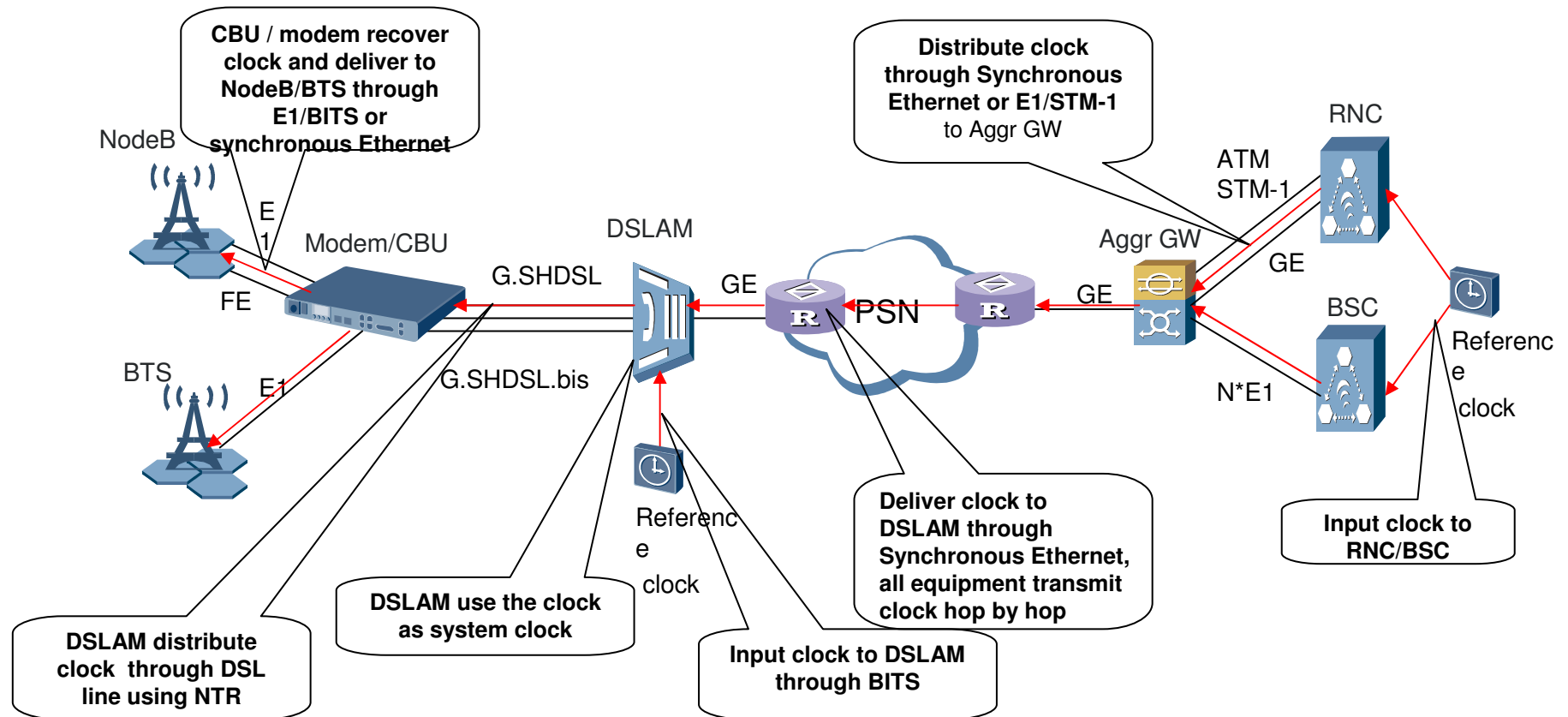
1	UAN: Residential Business Wireless on a <b>Unified Access Network</b> , reduce TCO
2	ALL IP: all IP network proof TDM-> PWE3 -> IP, save CAPEX on Access Network
3	Distance: GPON long distance up to 20km, and to 50km via split ratio 1:4, for suburb area
4	Natural Cooling: CBU natural cooling, no fan, more quiet and save power
5	High reliability: GPON typeB protect method, performance like SDH to 50ms, carrier class
6	High bandwidth: for more and more bandwidth requirement of wireless base station
7	Clock transmit: multi-mode for clock synchronization.

# DSL Backhaul Solution



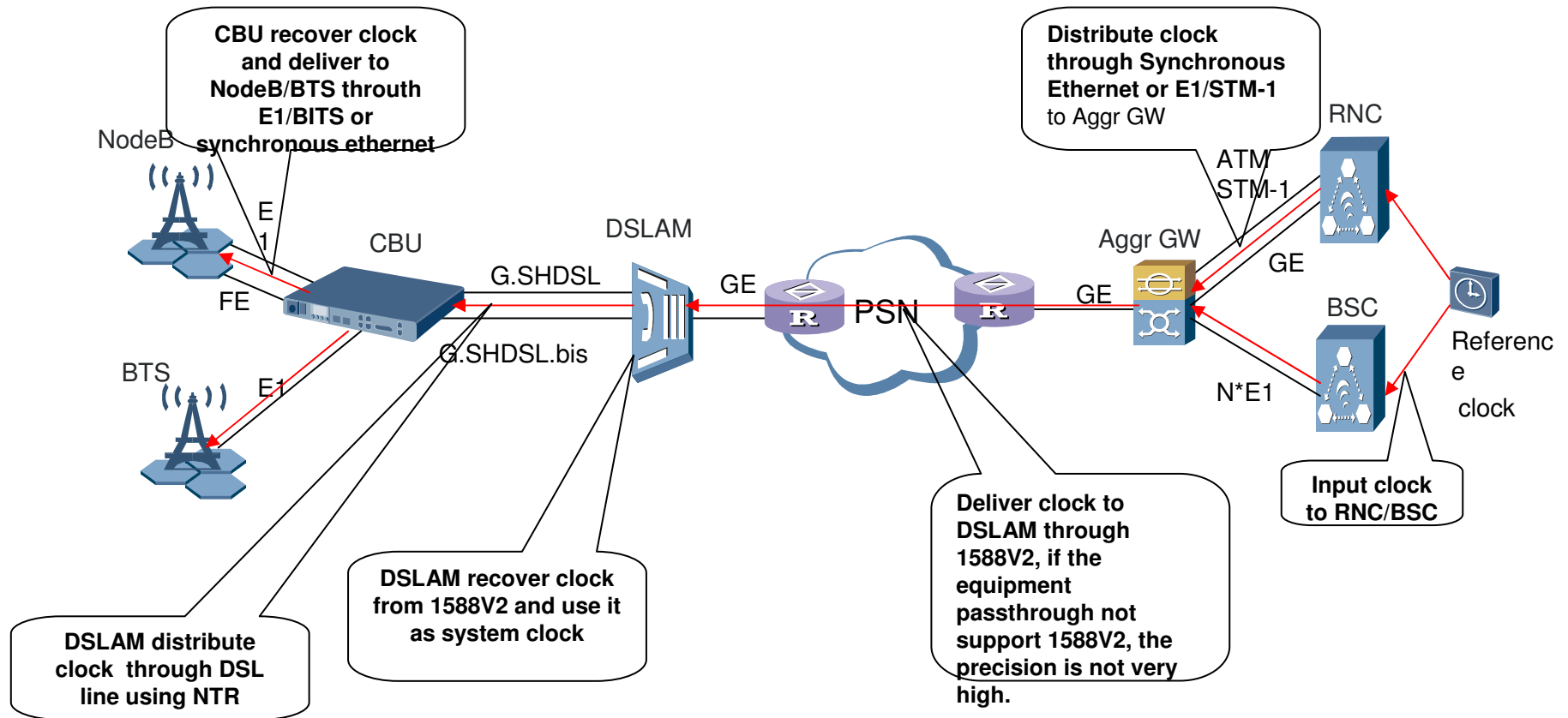
Equipment		Type	Vendor	Main Feature
Modem	G. SHDSL ATM	LA-110	RAD	E1/FE/G. SHDSL ATM/NTR
		LA-130	RAD	4*E1/FE/4*G. SHDSL ATM/NTR
	G. SHDSL.bis	PAMSPAN 5014	C-COM	4*E1/FE/4*G. SHDSL.bis
		ST620S	Thomson	4*E1/FE/4*G. SHDSL.bis
DSLAM		MA5600T	Huawei	ATM PWE3, BITS, Sync ethernet, 1588V2, NTR
Aggr GW		PTN 3900	Huawei	ATM PWE3, BITS, Sync ethernet, 1588V2

# Synchronization for DSL backhaul



- 1. DSLAM Synchronous Ethernet input.
- 2. DSLAM BITS input.

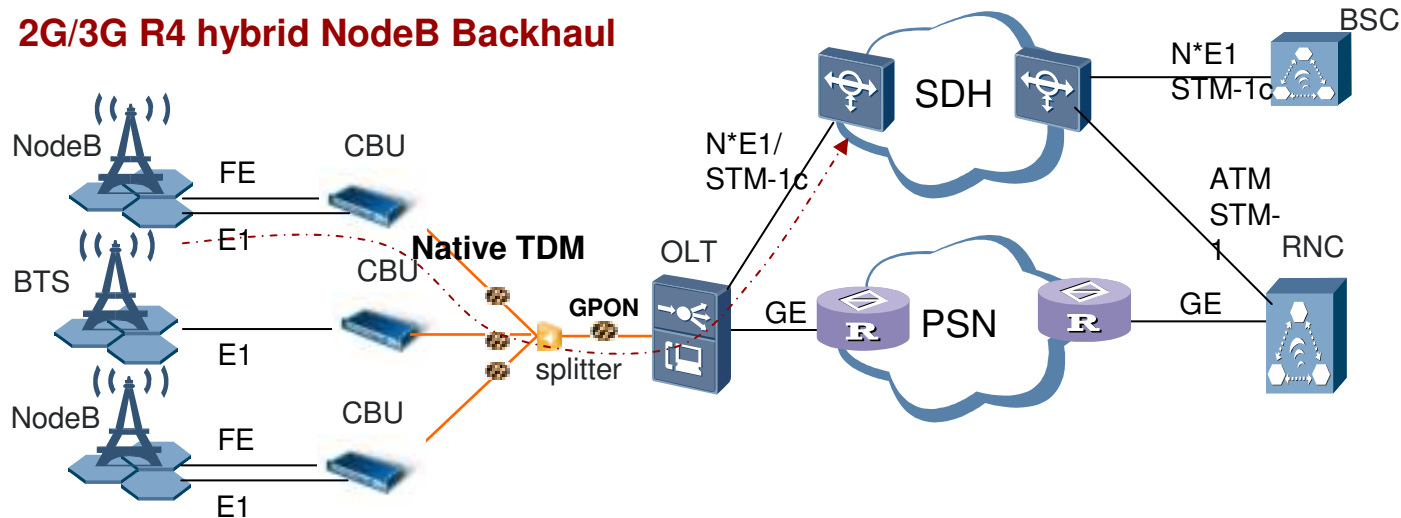
## Synchronization for DSL backhaul(cont.)



- **3. DSLAM 1588V2 input.**

# GPON Backhaul Solution - Scenario 1

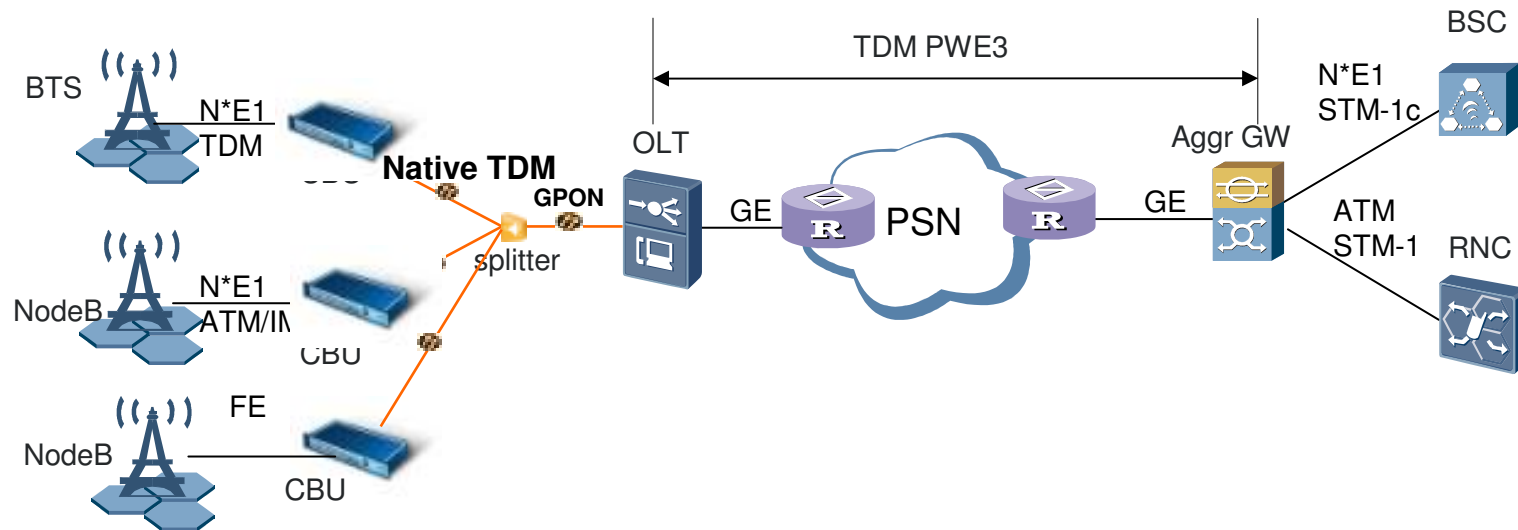
## 2G/3G R4 hybrid NodeB Backhaul



Equipment	Type	Vendor	Main Feature
CBU	OT925/928	Huawei	4*E1/8*E1, 4*FE, GE, GPON uplink, GPON line clock recover, Native TDM
OLT	MA5600T	Huawei	BITS, Sync ethernet, 1588V2, 16*E1/2*STM-1 uplink per board, GE/10GE uplink, Native TDM

- 3G R4 hybrid NodeB, voice and data flow offload from NodeB.
- OLT forward voice flow to SDH network and data to IP network.
- Clock delivered from SDH network through GPON line to NodeB/BTS.
- Suitable for operators to reuse SDH network and develop IP network to carry increasing data traffic.

# GPON Backhaul Solution - Scenario 2

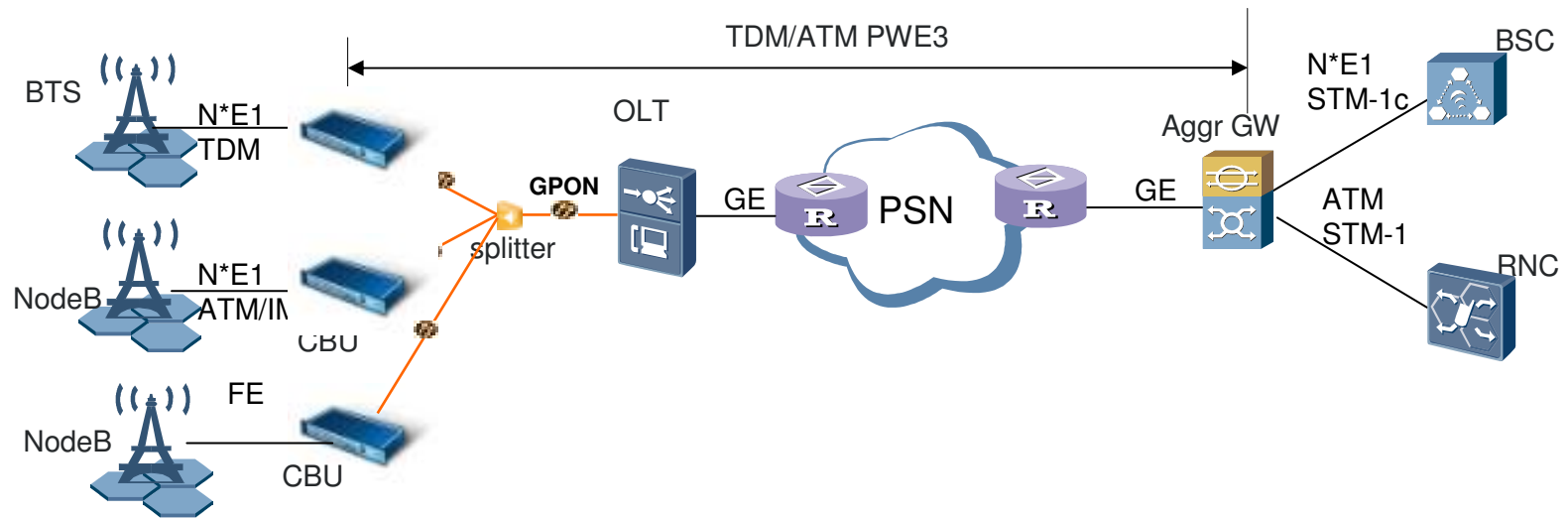


Equipment	Type	Vendor	Main Feature
CBU	OT925/928	Huawei	4/8*E1, 4*FE, GPON uplink, Native TDM, GPON line clock recover
OLT	MA5600T	Huawei	TDM PWE3, BITS, Sync ethernet, 1588V2, Type B Protection
Aggr GW	PTN 3900	Huawei	ATM/TDM PWE3, BITS, Sync ethernet, 1588V2

- 5600T TDM PWE3, Core and aggregation network is IP, GPON Native TDM mode to carry legacy service.
- Suitable for operators to deploy all ip backhaul network, and access residential / enterprise subscribers together.
- Smoothly upgrade from scenario 1 (SDH) without replacing CBU/SBU



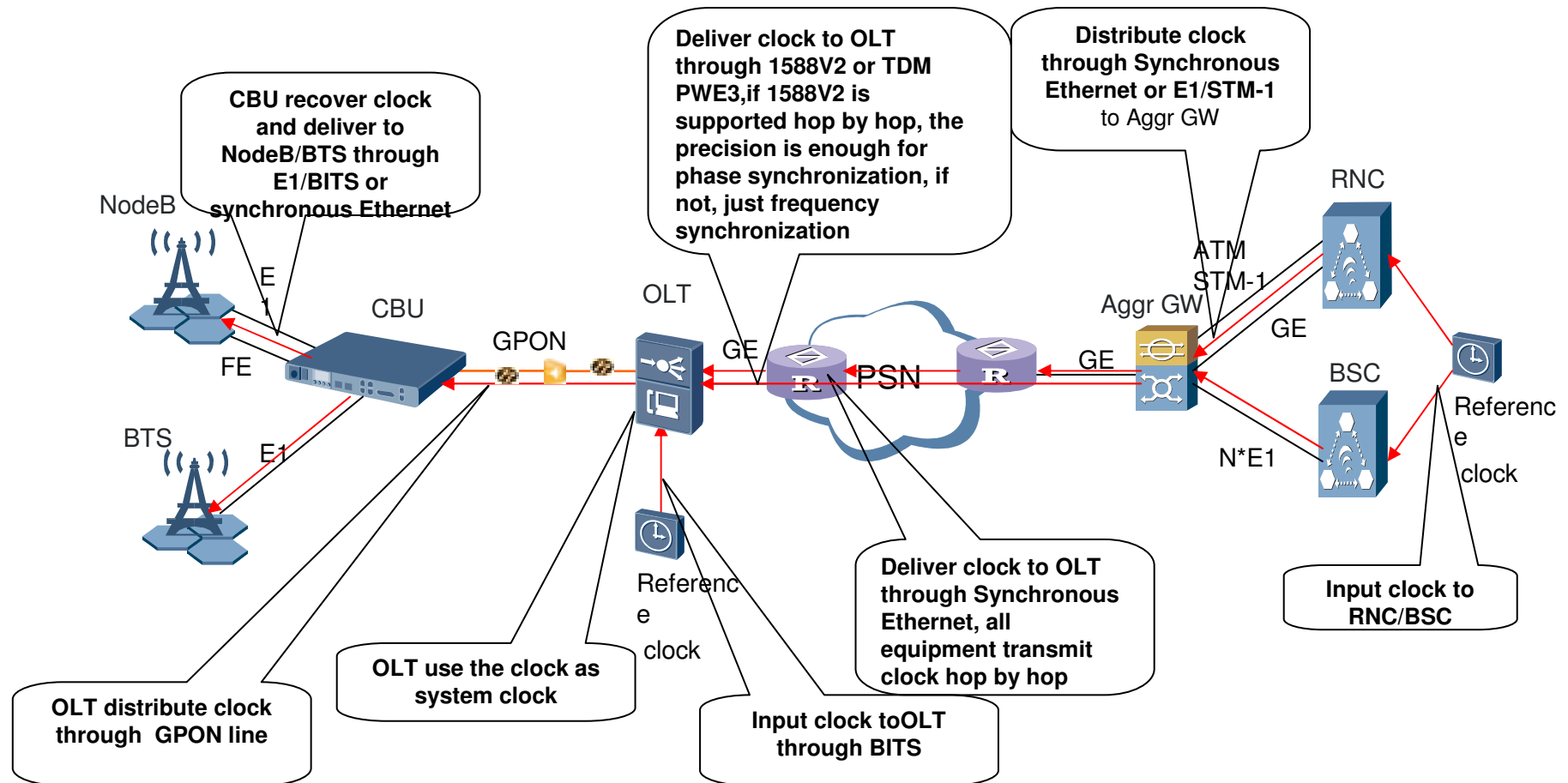
# GPON Backhaul Solution-Scenario 3



Equipment	Type	Vendor	Main Feature
CBU	OT910	Huawei	16*E1, 4*FE, GE, dual GPON uplink, TDM/ATM/IMA PWE3, GPON line clock recover, BITS output, Sync ethernet, 1588V2
OLT	MA5600T	Huawei	BITS, Sync ethernet, 1588V2, Type C Protection
Aggr GW	PTN 3900	Huawei	ATM/TDM PWE3, BITS, Sync ethernet, 1588V2

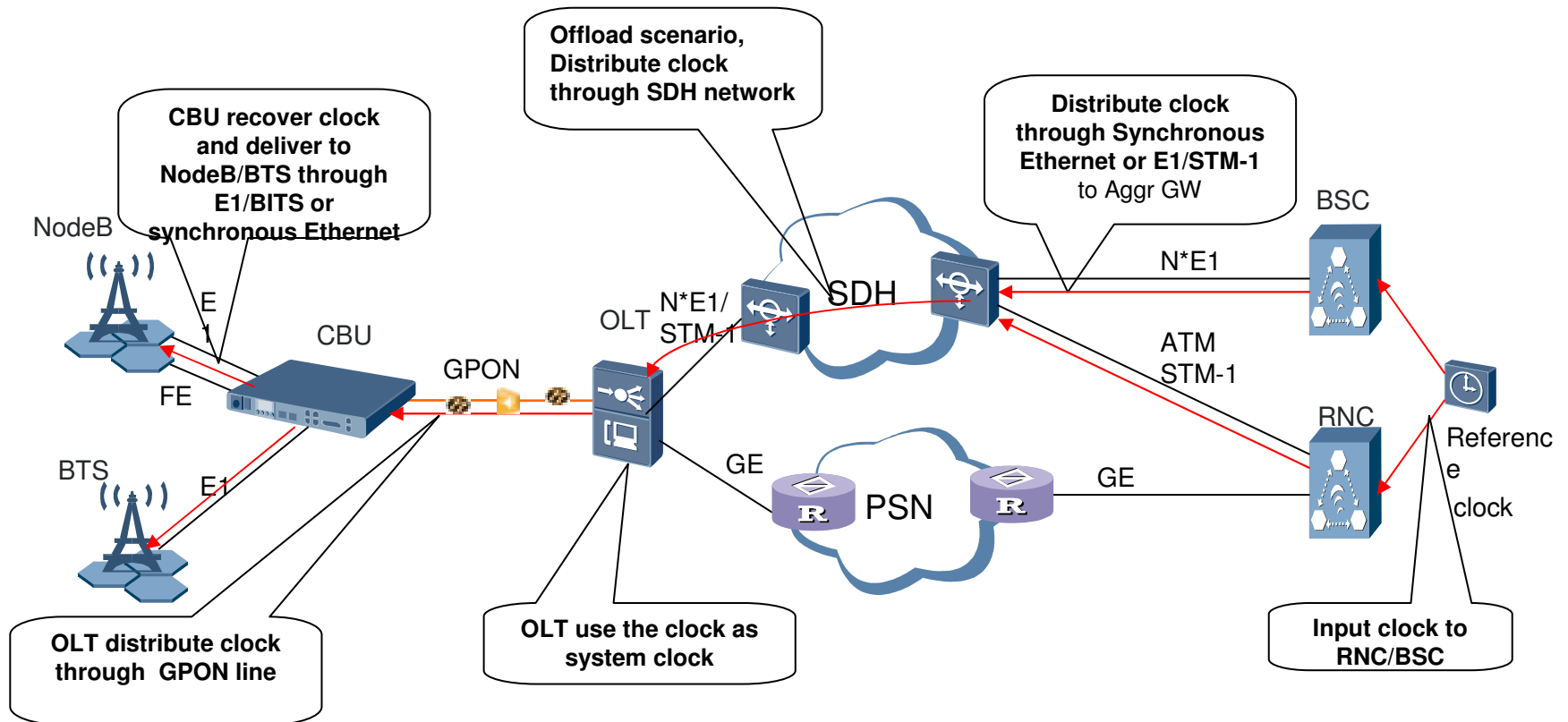
- CBU PWE3, Core and aggregation network is IP, GPON line is Ethernet mode.
- Suitable for operators to deploy all ip backhaul network, and access residential / enterprise subscribers together.

# Synchronization for GPON backhaul



- 1. OLT Synchronous Ethernet input.
- 2. OLT BITS input.
- 3. OLT 1588v2/TDM PWE3 input.

# Synchronization for GPON backhaul(cont.)

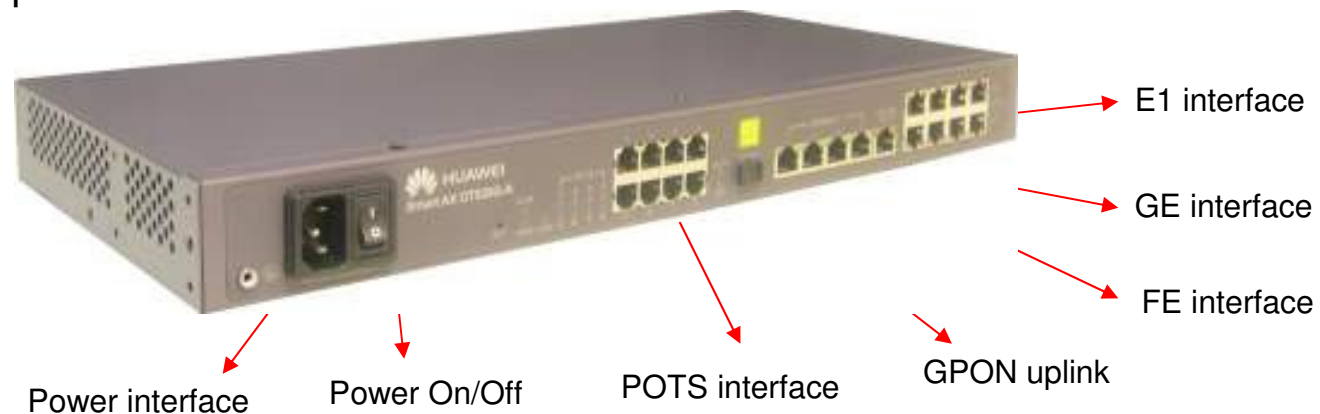


- 4. OLT SDH clock input.

# Huawei SBU/CBU: OT928G

OT928G is a FTTx multi-service access ONT product

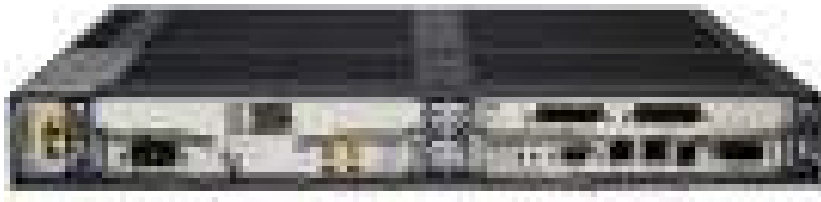
- One PON interface, providing high-speed fiber access
- Eight E1 ports, providing TDM leased line and base station access
- One GE port, connecting with the LAN switches, routers and other devices
- Four FE ports, connecting with PCs or switches and providing Web configuration
- Eight VoIP FXS ports, providing the VoIP telephone line access
- Power consumption: 32 W max



# Huawei CBU: OT910

OT910 is a cell-site backhaul product

- One or two PON/ ADSL2+/G.SHDSL.bis uplink , providing high-speed fiber access, and uplink protection
- Sixteen E1 ports, providing TDM or ATM base station access.
- One GE port, Four FE ports, connecting with NodeB provide higher bandwidth
- TDM/ATM PWE3 to support legacy service
- Multi-mode for clock synchronization, support synchronous Ethernet, BITS output, 1588v2



Sample product (Under design)

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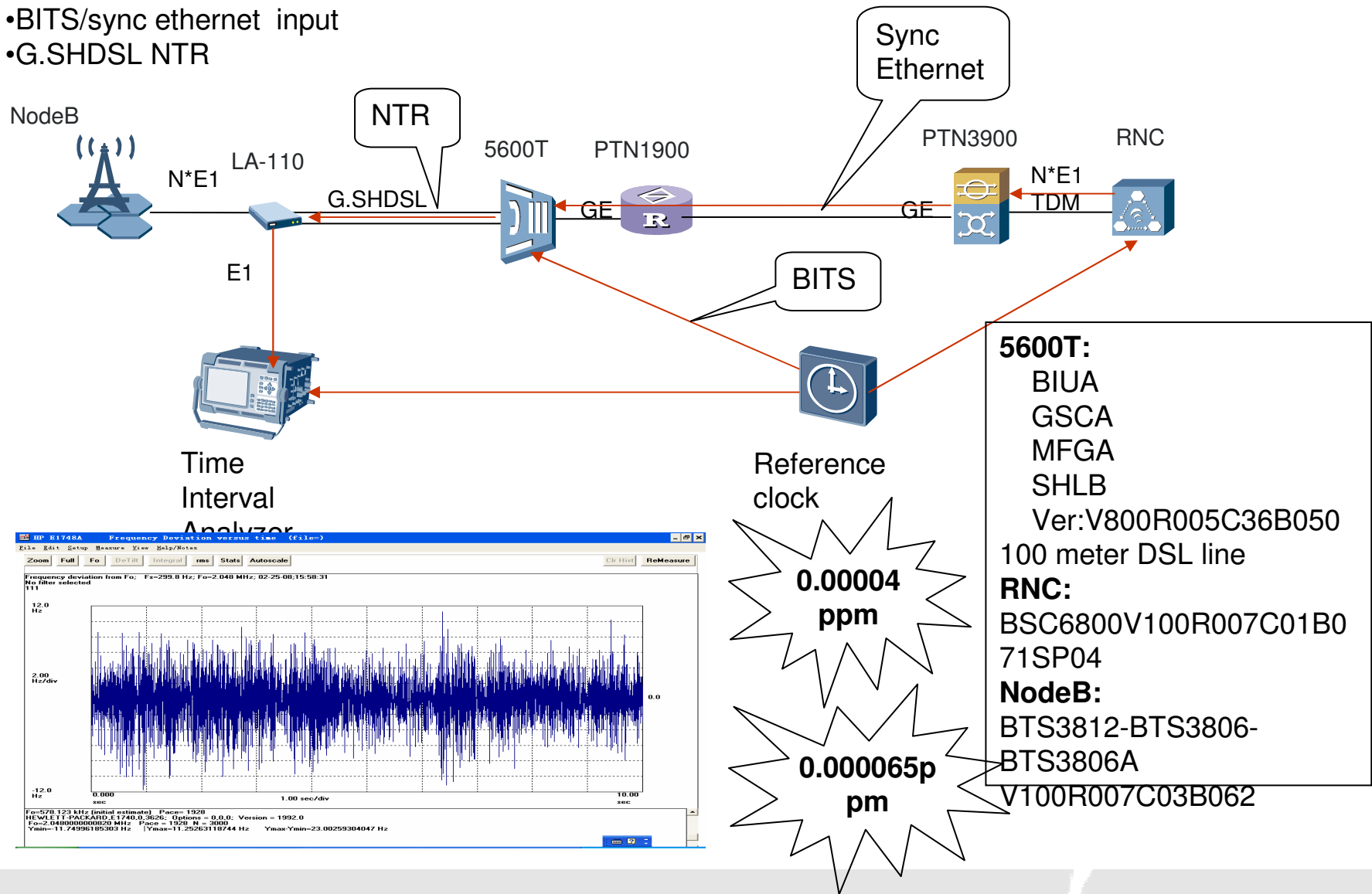
3. Test result of Huawei Solution

4. Case Study

5. Trial Proposal

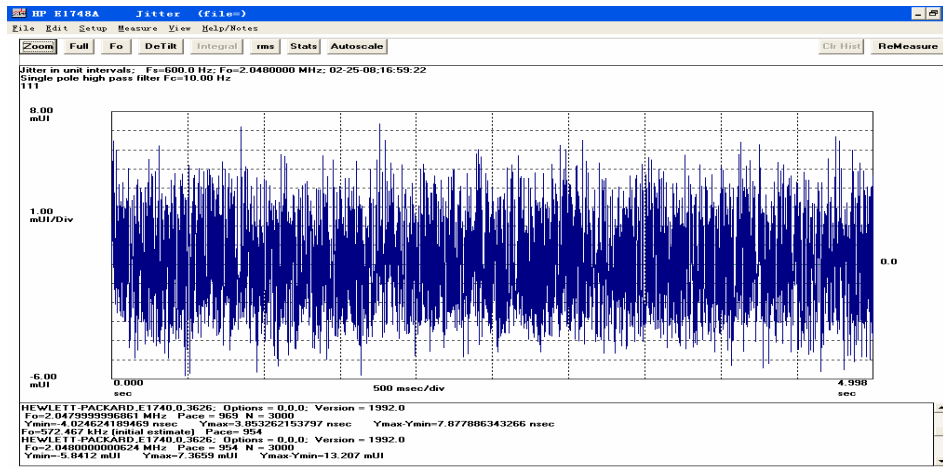
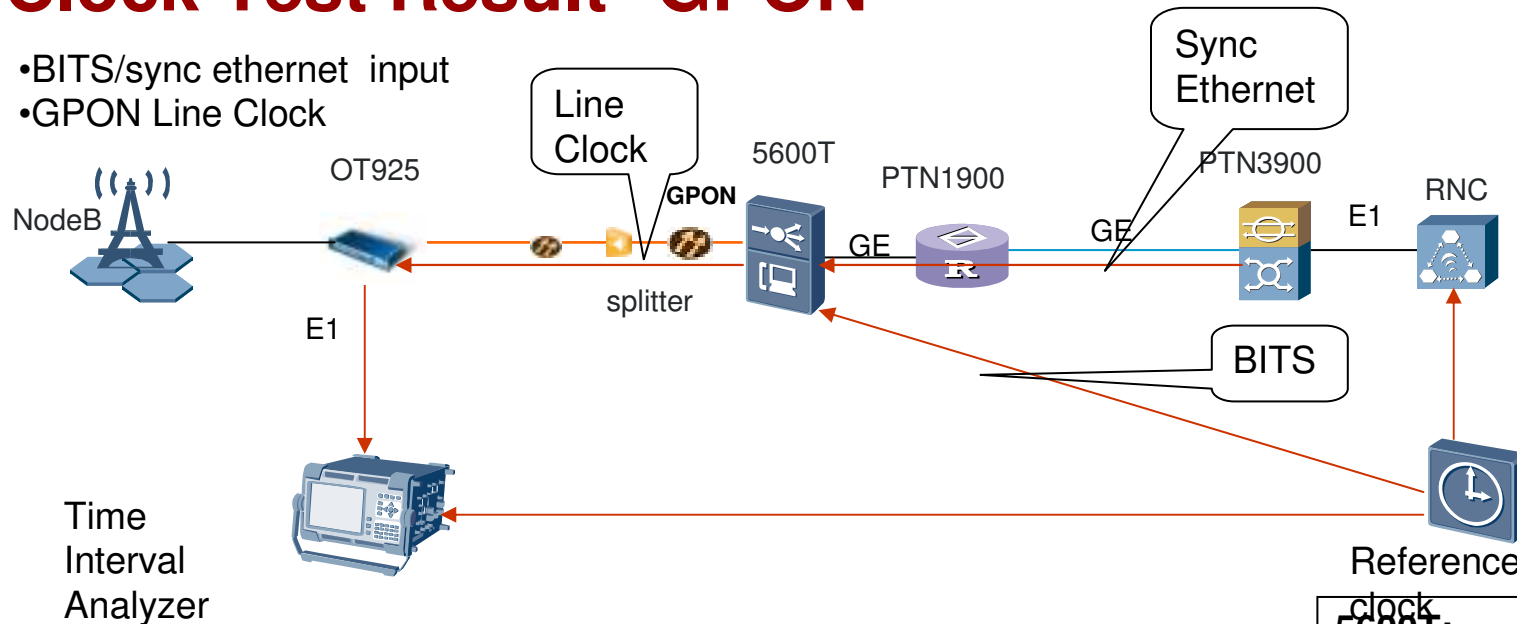
# Clock Test Result in Huawei Laboratory--DSL

- BITS/sync ethernet input
- G.SHDSL NTR



# Clock Test Result--GPON

- BITS/sync ethernet input
- GPON Line Clock



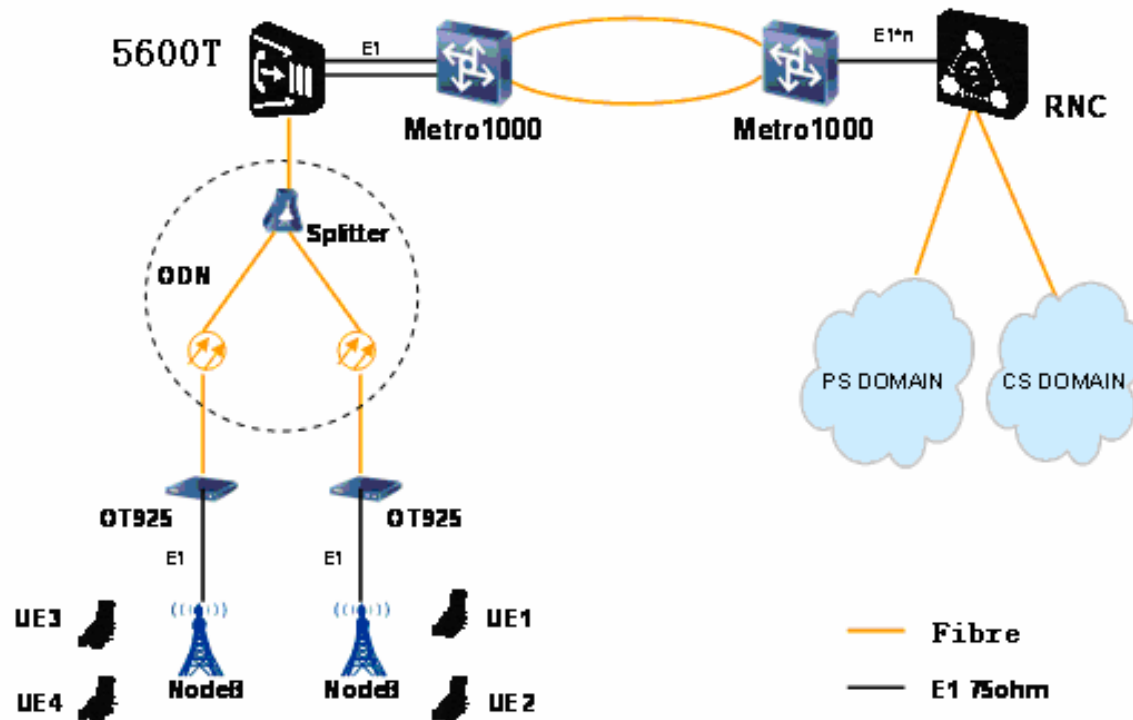
0.000012  
ppm

0.00006  
ppm

clock  
**5600T:**  
BIUA  
GSCA  
MFGA  
TOPA  
Ver:V800R005C36B050  
2Km fiber  
**RNC:**  
BSC6800V100R007C01B0  
71SP04  
**NodeB:**  
BTS3812-BTS3806-  
BTS3806A  
V100R007C03B062



# GPON Mobile backhaul Service test



- BITS input
- GPON Line Clock
- 3G voice/data/video test, experience is good
- FTP: downlink:640~744kbps, uplink:7.68~10.88kbps

## 5600T:

BIUA

GSCA

MFGA

TOPA

Ver:V800R005C36B050

2Km fiber

## RNC:

BSC6800V100R007C01B0

71SP04

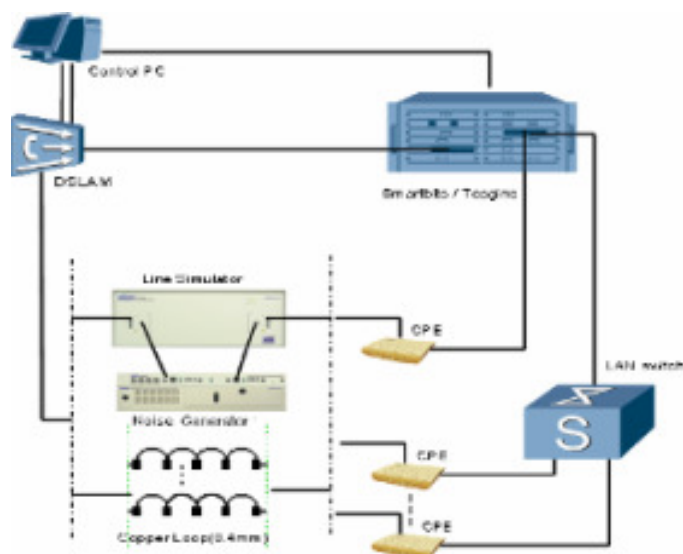
## NodeB:

BTS3812-BTS3806-

BTS3806A

V100R007C03B062

# G.SHDSL.bis test result (0km)



## EFM multi pairs bonding throughput (0km)

### EFM single pair throughput:

pkt length (bytes)	up/down stream pkt rate(pks/sec)	net data rate(Mb/s)
64	6929	3.650932312
128	5101	5.217384338
256	2634	5.306556702
512	1344	5.373687744
1024	679	5.408622742
1280	544	5.412368774
1518	459	5.413162231

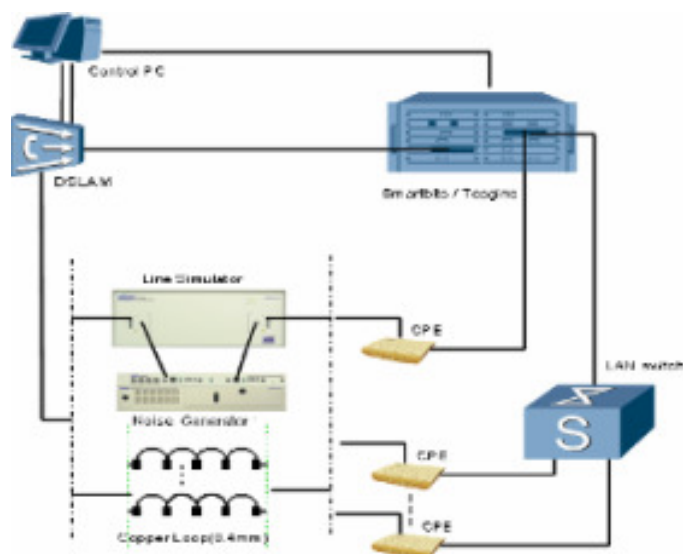
### EFM two pair bonding throughput:

pkt length (bytes)	up/down stream pkt rate(pks/sec)	net data rate(Mb/s)
64	18939	9.79057312
128	10117	10.34783173
256	5250	10.57685089
512	2635	10.53546906
1024	1319	10.50658417
1280	1051	10.45661926
1518	888	10.47251892

### EFM four pair bonding throughput:

pkt length (bytes)	up/down stream pkt rate(pks/sec)	net data rate(Mb/s)
64	20627	10.86847687
128	19936	20.39085388
256	9980	20.1060791
512	5271	21.07493591
1024	2636	20.99723053
1280	2110	20.99282837
1518	1777	20.95683289

# G.SHDSL.bis test result (1.5km)



## EFM multi pairs bonding throughput (1.5km)

### 1.5km EFM single pair throughput

Packet length(bytes)	Packet rate US/DS (pps)	Net rate(Mbps/s)
64	9059	4.638208
128	4944	5.062656
256	2604	5.332992
512	1336	5.472256
1024	676	5.539.792
1280	541	5.539840
1518	458	5.561952

### 1.5km EFM two pair bonding throughput

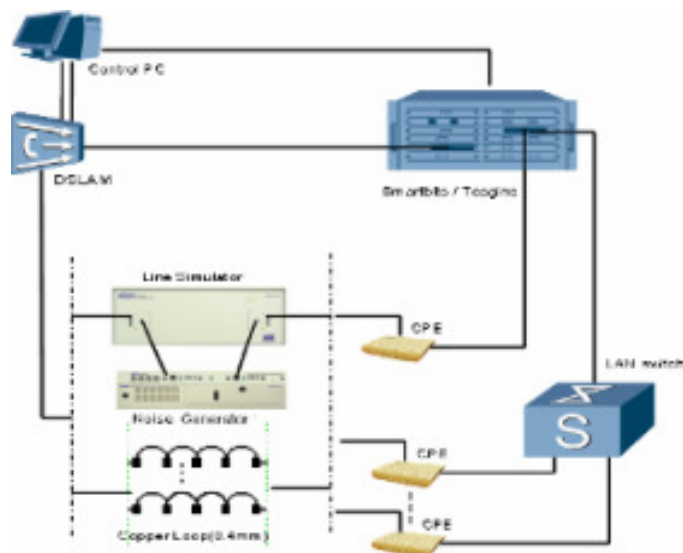
Packet length(bytes)	Packet rate US/DS (pps)	Net rate(Mbps/s)
64	18012	9.222144
128	9888	10.125312
256	5009	10.258432
512	2569	10.522624
1024	1301	10.657792
1280	1043	10.680320
1518	888	10.783872

### 1.5km EFM four pair bonding throughput

Packet length(bytes)	Packet rate US/DS (pps)	Net rate(Mbps/s)
64	30000	15.360
128	15000	15.360
256	10000	20.480
512	5000	20.480
1024	2593	21.241856
1280	2083	21.329920
1518	1776	21.567744

# G.SHDSL.bis test result (2km)

## EFM multi pairs bonding throughput (2km)



2km EFM single pair throughput

Packet length(bytes)	Packet rate US/DS (pps)	Net rate(Mbps/s)
64	9059	4.721738
128	4944	5.062656
256	2604	5.332992
512	1336	5.472256
1024	676	5.539.792
1280	541	5.539840
1518	458	5.561952

2km EFM two pair bonding throughput

Packet length(bytes)	Packet rate US/DS (pps)	Net rate(Mbps/s)
64	18012	9.222144
128	9888	10.125312
256	5009	10.258432
512	2569	10.522624
1024	1301	10.657792
1280	1043	10.680320
1518	888	10.783872

2km EFM four pair bonding throughput

Packet length(bytes)	Packet rate US/DS (pps)	Net rate(Mbps/s)
64	21235	10.872320
128	10617	10.871808
256	7078	14.495744
512	3539	14.195744
1024	1835	15.032320
1280	1474	15.093760
1518	1257	15.265008

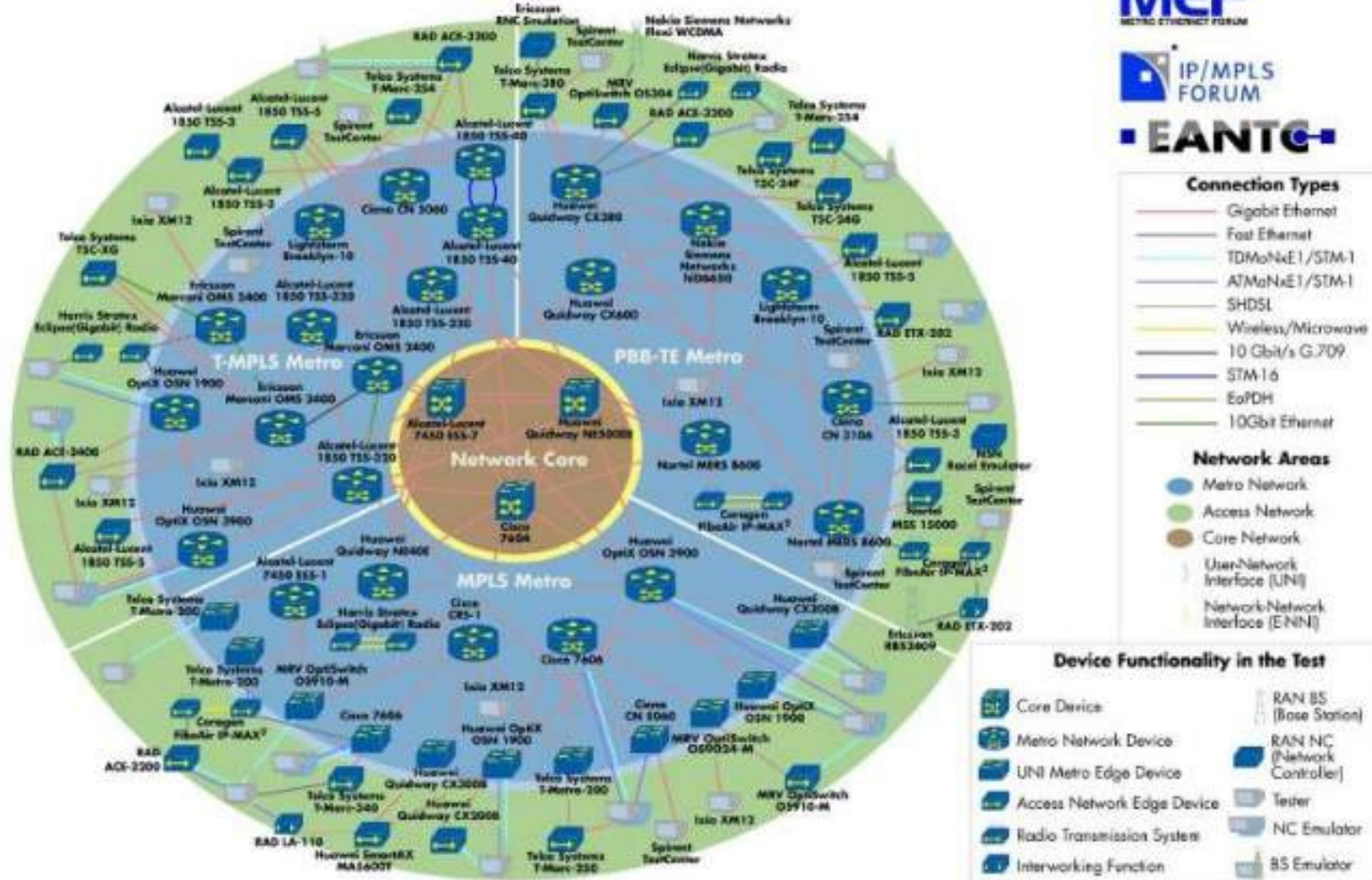
# MULTI-VENDOR MOBILE BACKHAUL INTEROPERABILITY EVENT 2008

## Physical Network Topology

**MEF**  
METRIC EFFICIENCY FORUM

**IP/MPLS**  
FORUM

**EANTC**



“Huawei's ALL IP Mobile Transport Solution, including packet transport network equipment and multi-service access modules(MA5600T), successfully interoperated with equipment from multiple vendors in the three domains of MPLS, PBB-TE and T-MPLS and demonstrated high-precision clock synchronization technology “ -- by light reading

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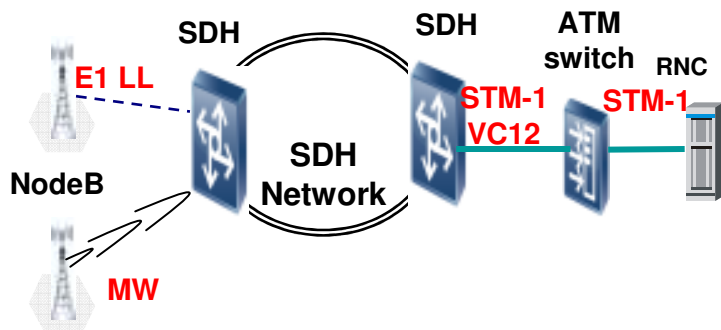
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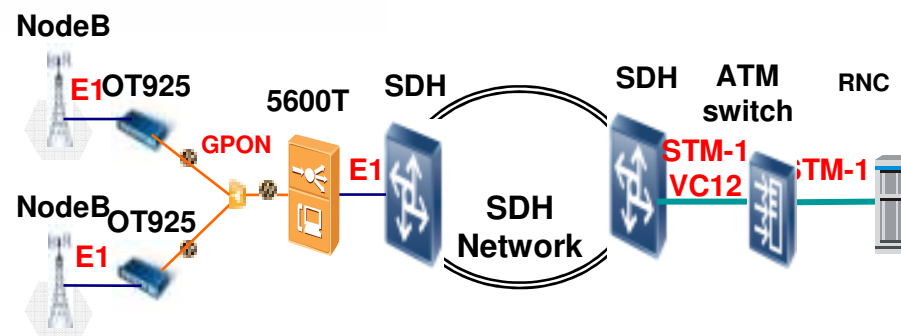
5. Trial Proposal



# Case Study— Bouygues Telecom Mobile backhauling trial



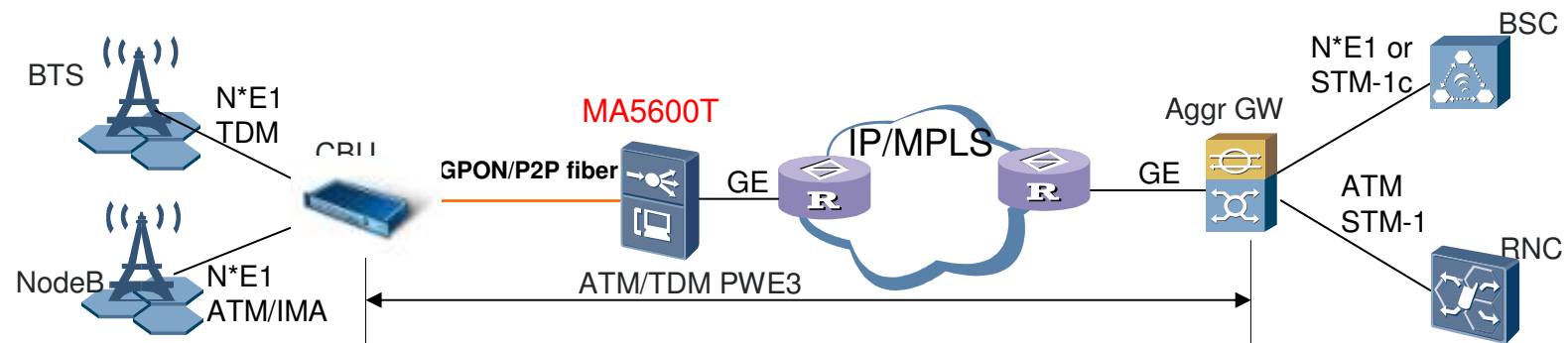
NodeB and BTS are connected to E1 LL or MW



NodeB and BTS are connected to POP with GPON ONT

- **Microwave** frequency and **E1** link are **full**: no margin for increasing 3G services
- **Easier Fiber**: Price decreased; Infrastructure with FTTX
- **Incremental bandwidth**: big pressure to SDH expansion, Not enough copper resource.
- Backhauling with GPON access technology
  - **Native TDM service**: no touch to IP/SDH network
  - **ETH/IP NodeB supported**: support increasing 3G data service
  - **Cheaper CPE**: GPON CPE cheaper than SDH CPE
- Same access platform for NodeB backhauling and Broadband access: CAPEX saved

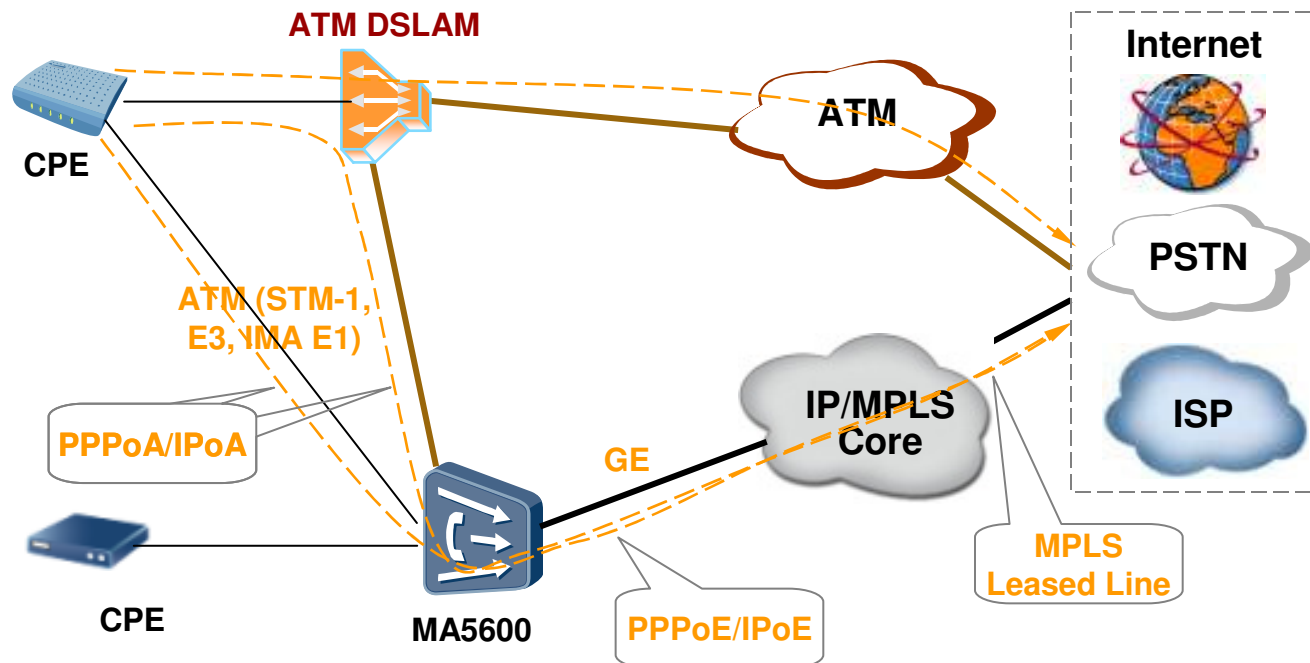
# Case Study—FT Mobile backhaul solution



- All IP/MPLS aggregation and core network, End to End pseudo-wire from CBU to Aggregation GW.
- Synchronization solution is Synchronous Ethernet and BITS input to MSAN, DSL/GPON line use NTR or GPON 8kHz line clock



# Case Study—QSC Seamless Migration with IP DSLAM



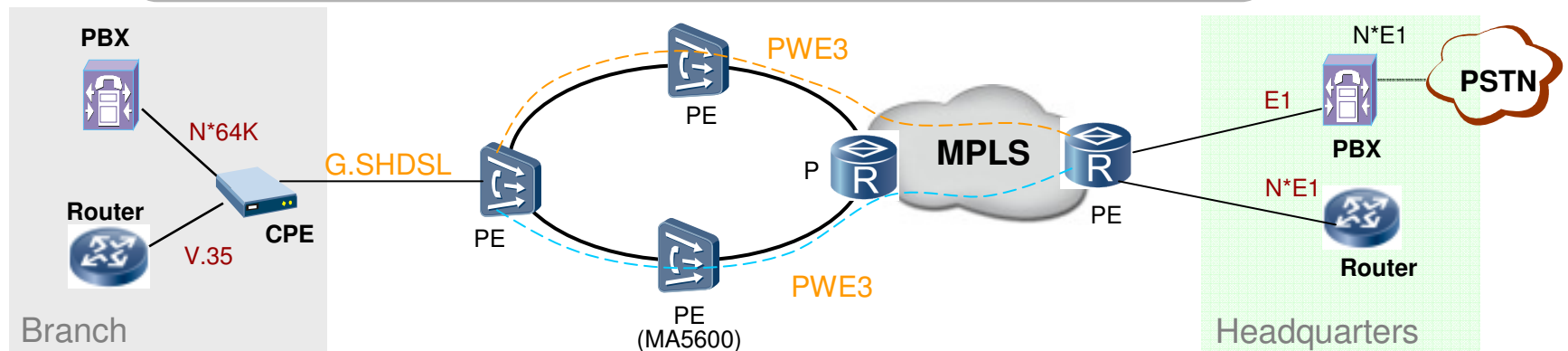
- Cascade existing ATM DSLAMs and CPEs
- Leased line migration with MPLS
- PPPoA to PPPoE and IPoA to IPoE conversions

- Reuse ATM DSLAMs and CPEs, Protect the investment
- Services migrating with the same experience

# Case Study—QSC Full Services VPN for Legacy Services



**Increase Revenue & Customer Loyalty**



- Uses **G.SHDSL** and **Clock Synchronization Boards** to inherit PBXs and leased lines
- Adopts MPLS PWE3 technology, transports not only ETH but ATM and TDM
- Supports MPLS OAM to ensure carrier-grade service recovery (sub-50ms)

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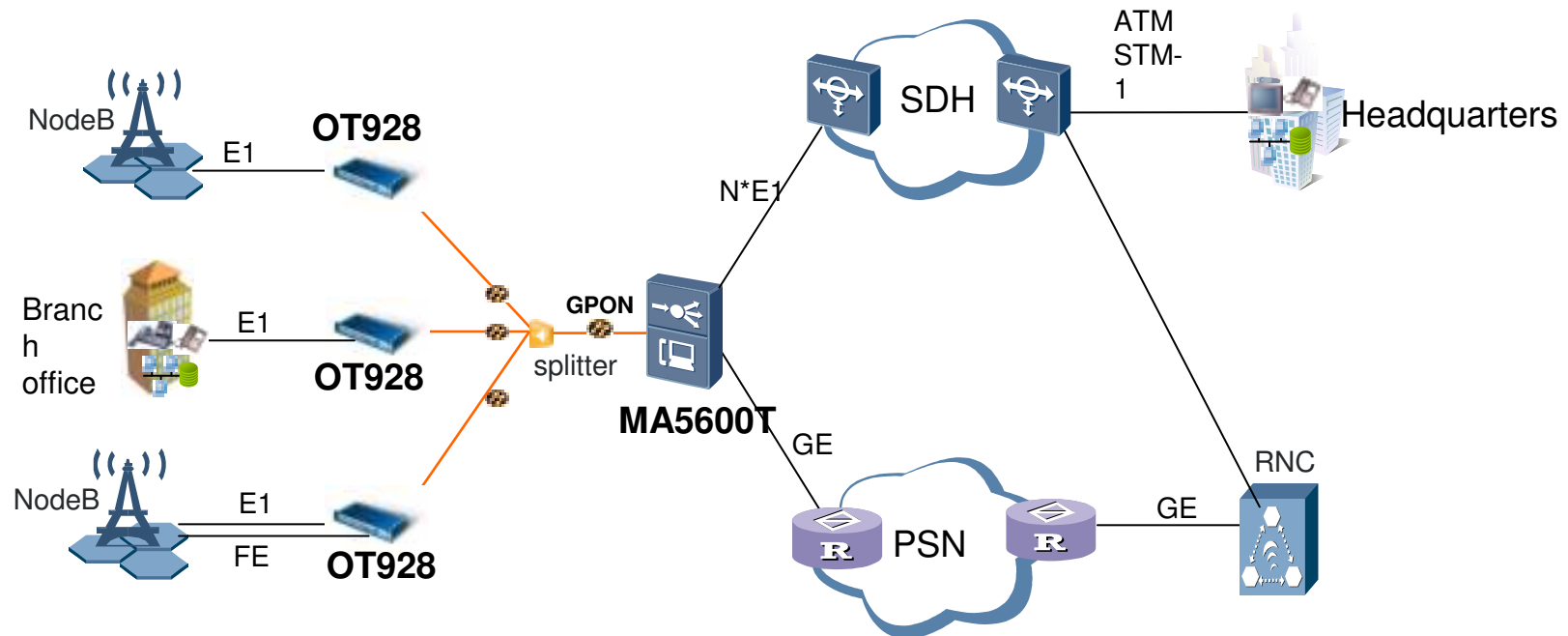
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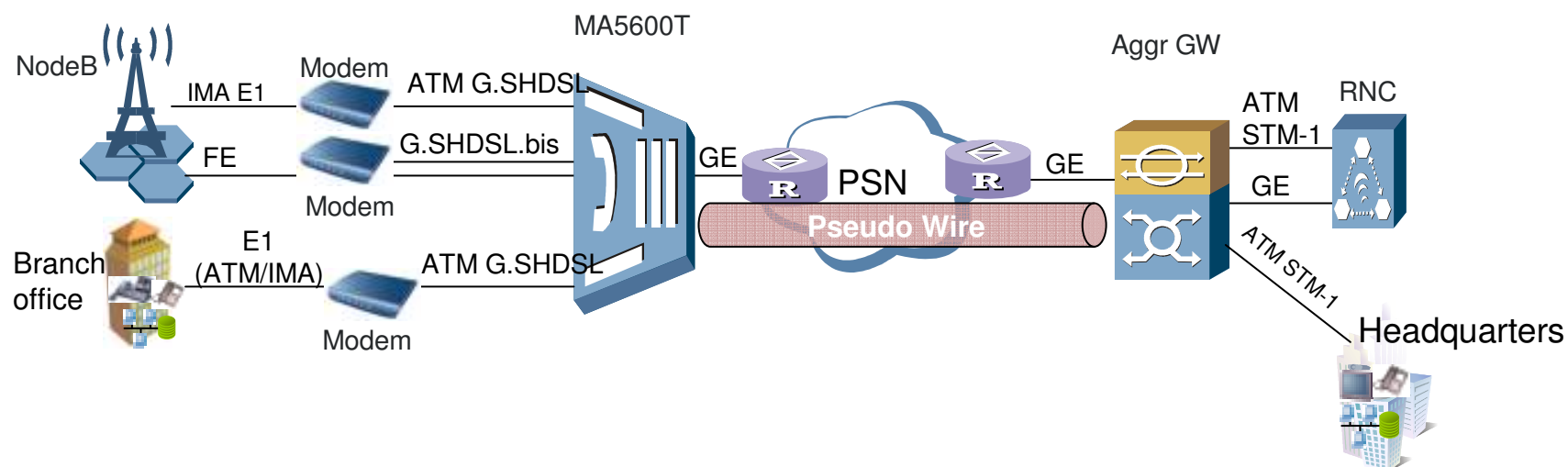
**5. Trial Proposal**

# Huawei access backhaul solution trial proposal- GPON



Equipment Name	Quantity	Configuration
MA5600T	1	2 x SCUL; 2 x GPBC; 2TOPA;1
OT928	3	8 x E1; 4 x FE

# Huawei access backhaul solution trial proposal-DSL



Equipment Name	Quantity	Configuration
MA5600T	1	2 x SCUL; 2 x GPBC; 2TOPA; BIUA; 2 x SHLB
LA 130	2	4*E1; 1E1; 4*G.SHDSL ATM/NTR
PAMSPAN 5000	1	4 x FE

# Thank You

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