

**FTTH** China  
2008

LIGHTWAVE CHINA  
光波通信

A Top Level Executive Meeting Place in China

第四届中国光纤到户研讨会

中国·深圳会展中心·六楼桂花厅 8 - 9 September 2008  
Sweet Osmanthus Hall · Shenzhen Convention & Exhibition Center · China

# The Path Forward with GPON

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# Outline

- Global GPON Activity
- Towards NG PON
- Latest in Technology



# Global Standard for Fiber Access

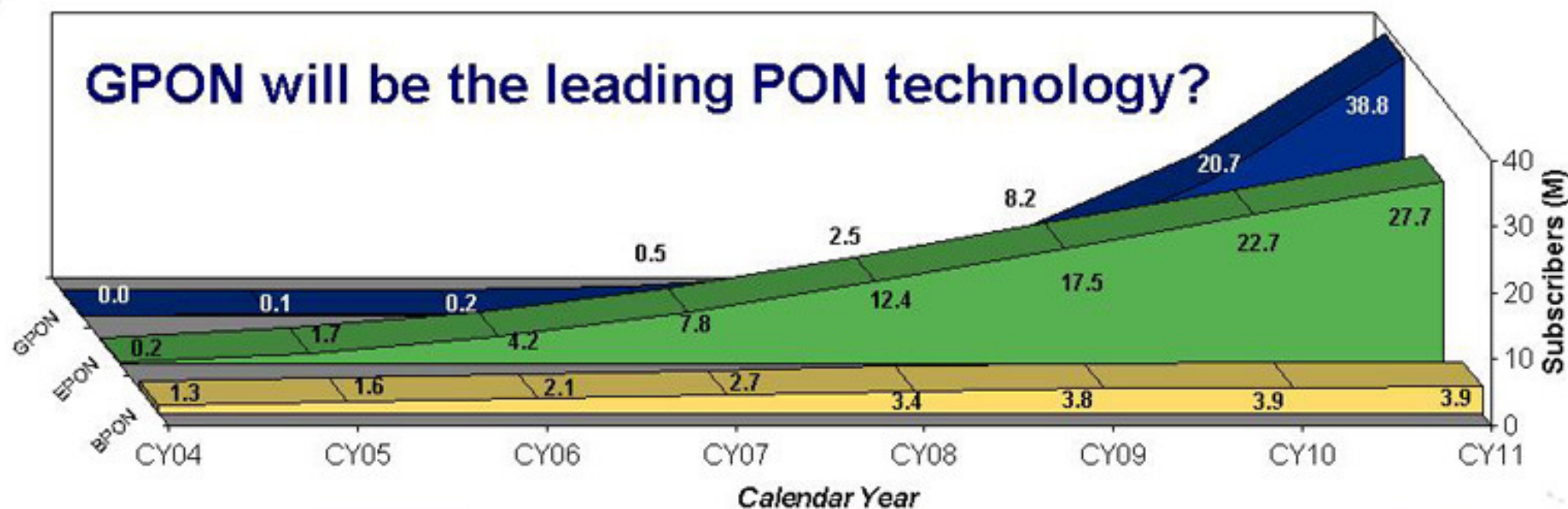


# Worldwide Industry Investment



GPON equipment alone expected to reach \$4.7B by 2011\*

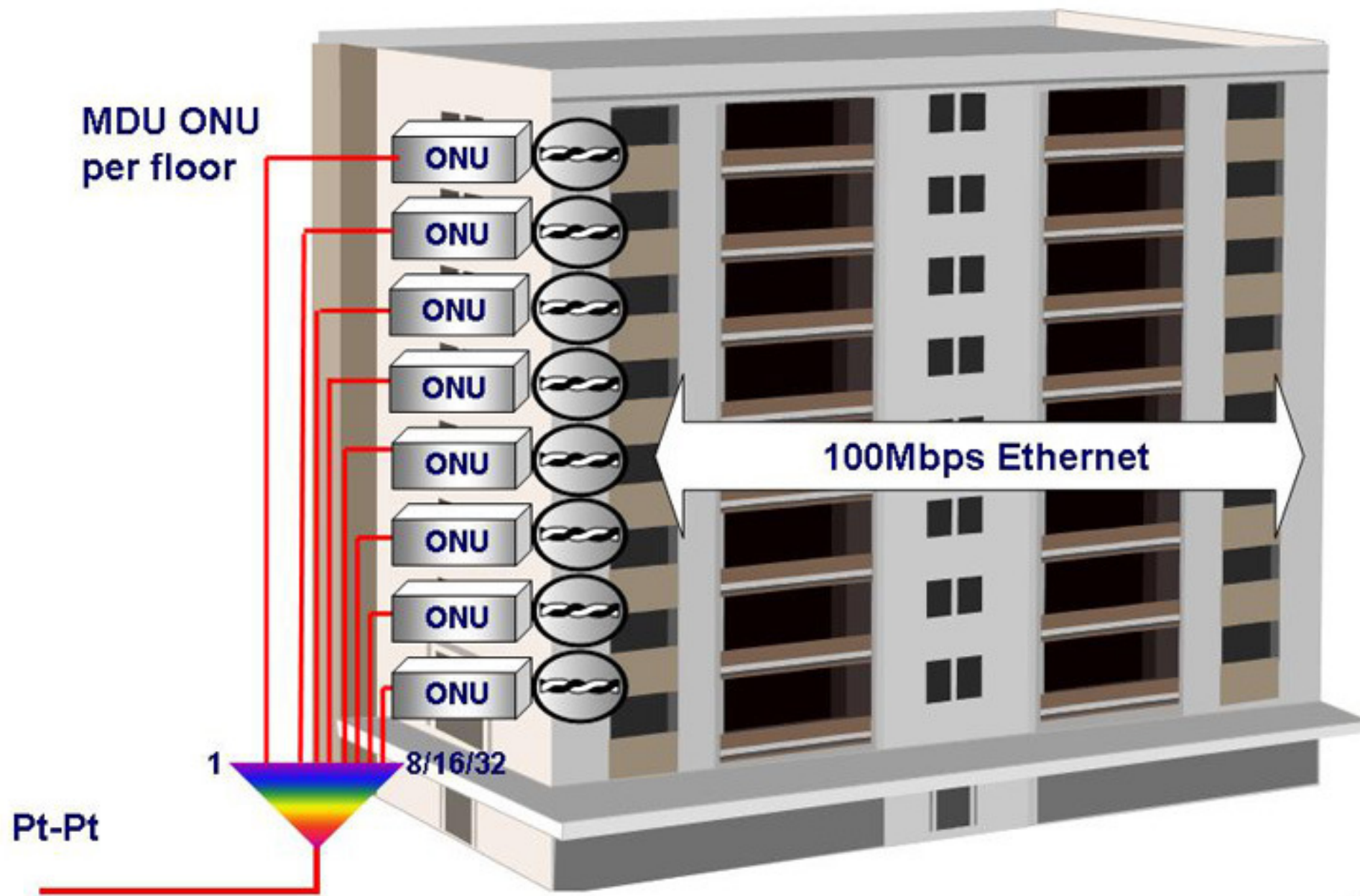
# PON Subscribers by Technology



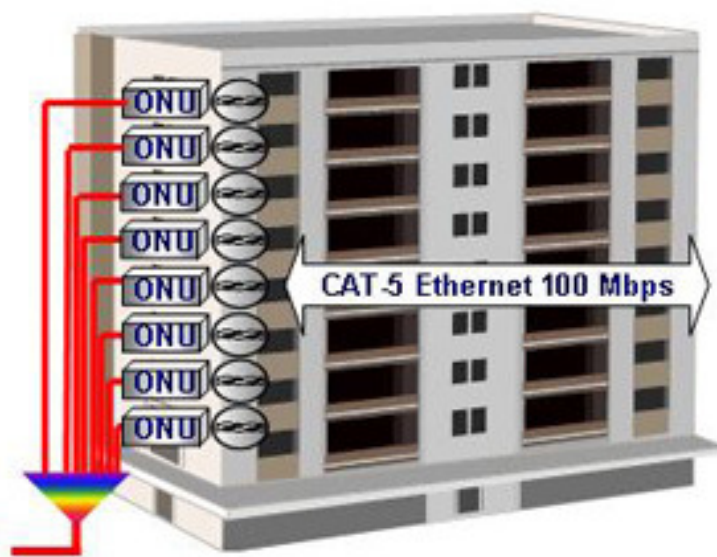
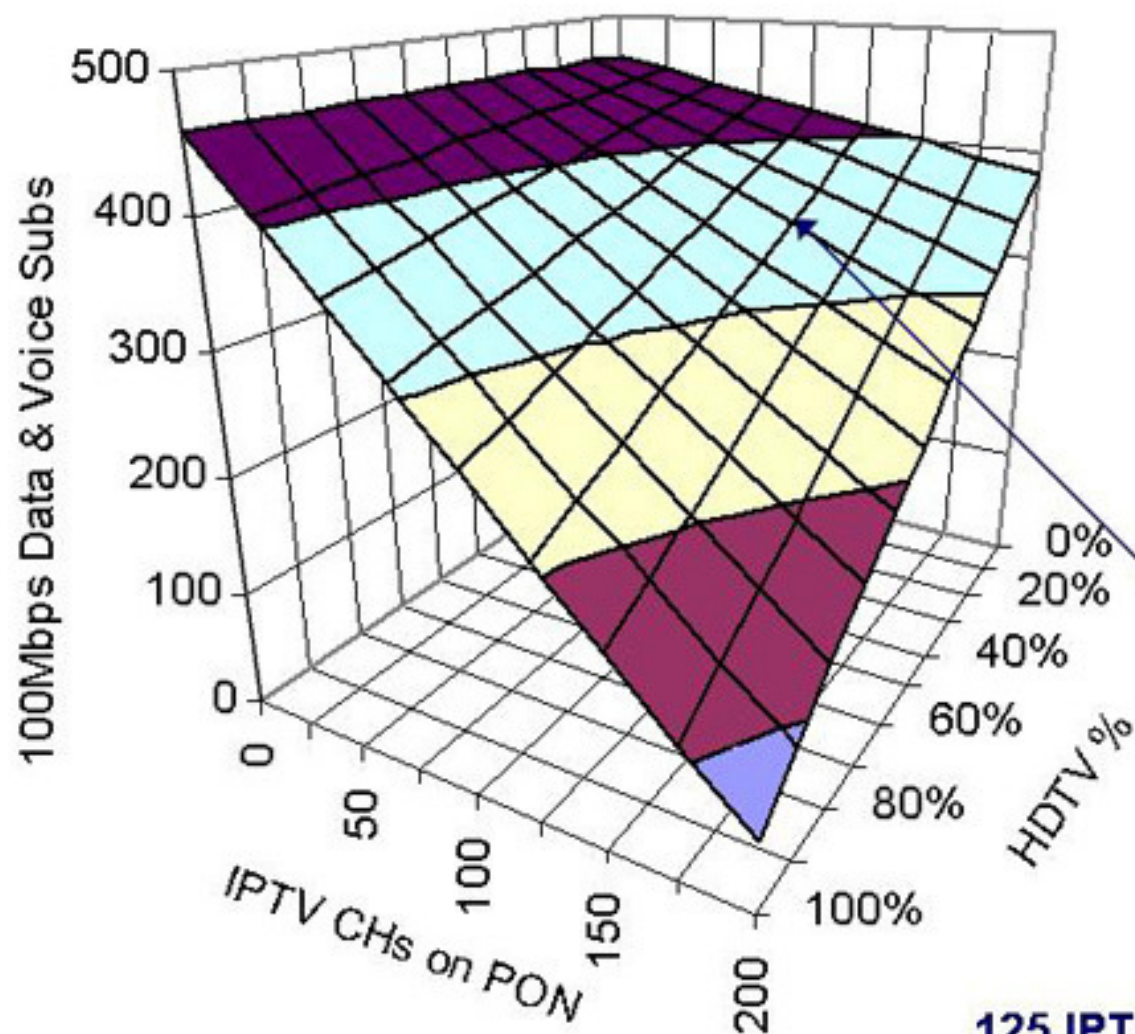
## Why?

International adoption  
International investment  
and the following key reasons....

# Performance for the Target Application



# Plenty of Capacity for IPTV



**125 IPTV Channels 30%  
HDTV with 350 100Mbps  
internet and VoIP subscribers**

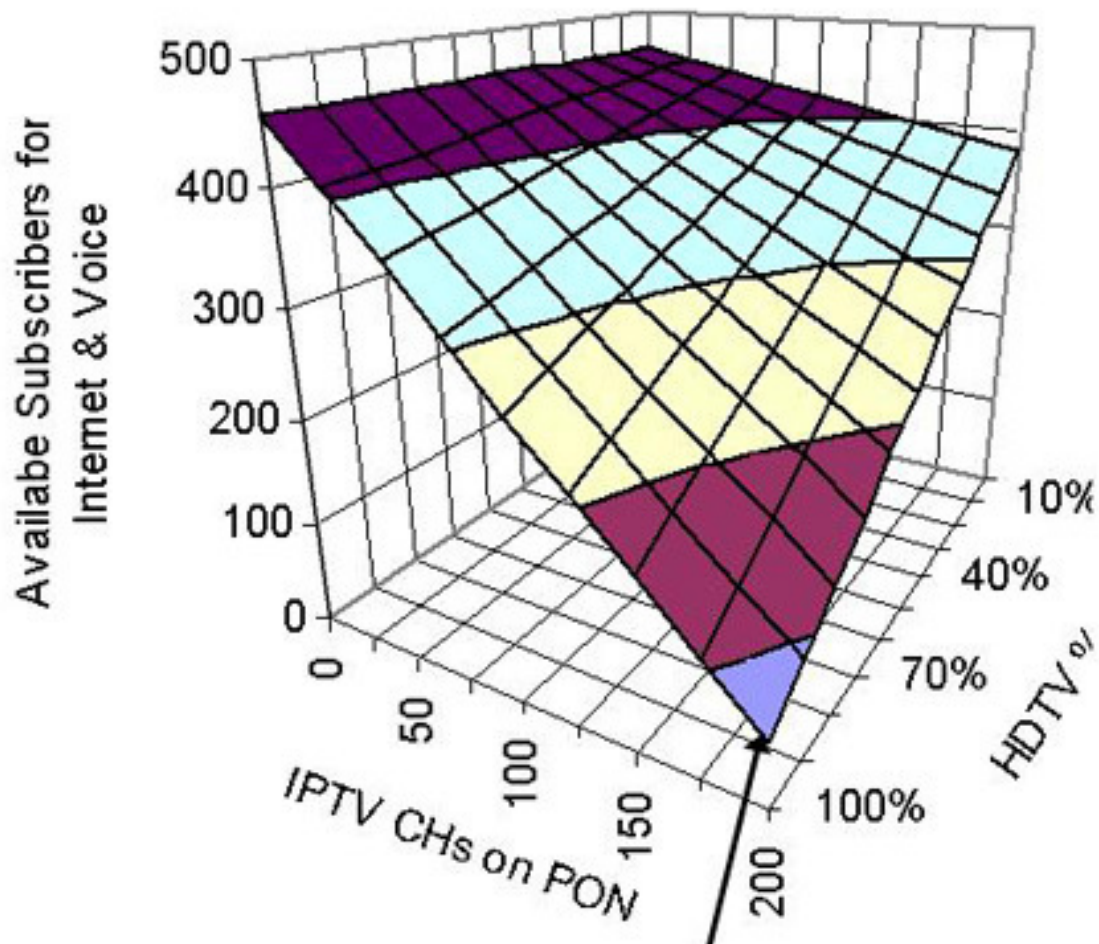
**125 IPTV Channels 100% HDTV with 200  
100Mbps internet and VoIP subscribers**

HDTV = 10 Mbps  
SDTV = 2 Mbps  
HS Internet = 100 Mbps with 20:1 oversubscription  
VoIP = 100 Kbps



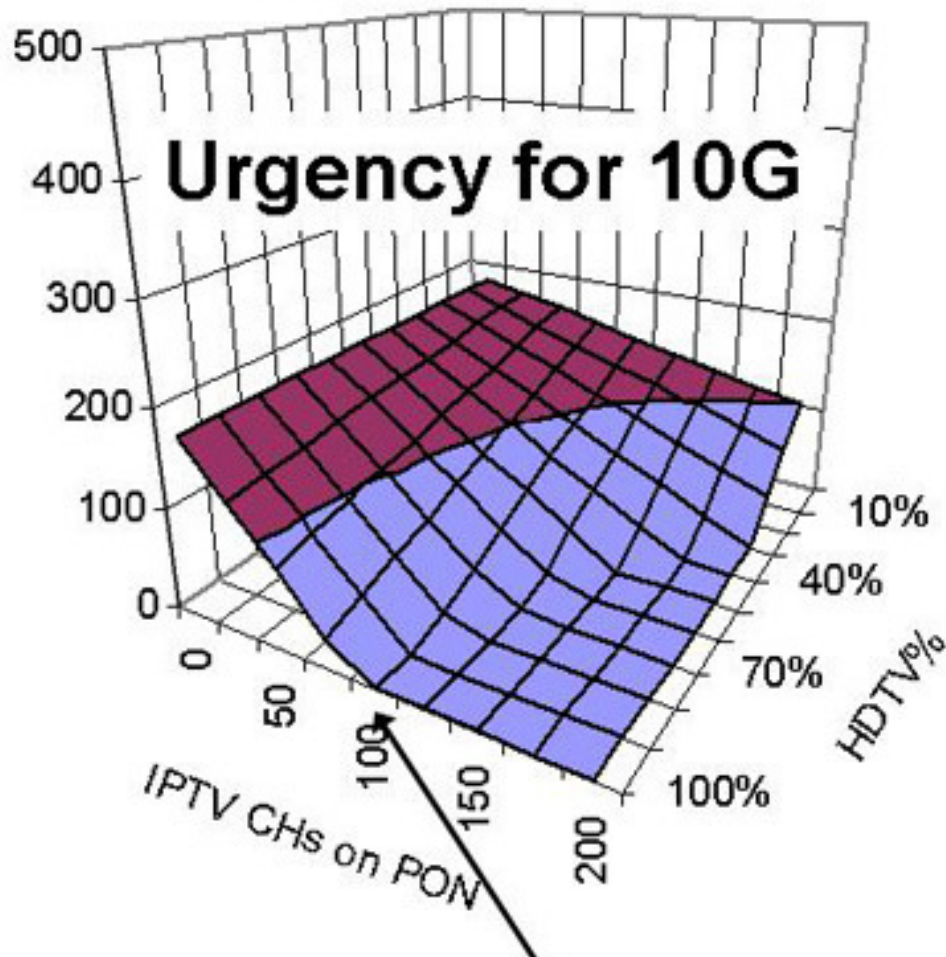
# PON Comparisons for IPTV

## GPON



200 HDTV channels and  
>300Mbps for internet and voice

## GE-PON/EPON



90 HDTV channels on PON  
– out of capacity.

### GPON can accommodate ~1200 IPTV channels

# E2E GPON Interoperability



Resulting in a strong GPON CPE ODM Market – like DSL



**FSAN**  
Full Service  
Access Network

**figroup**

**ETSI**

**Lannion France May 11, 2007**  
**3-play Services and OMCI**

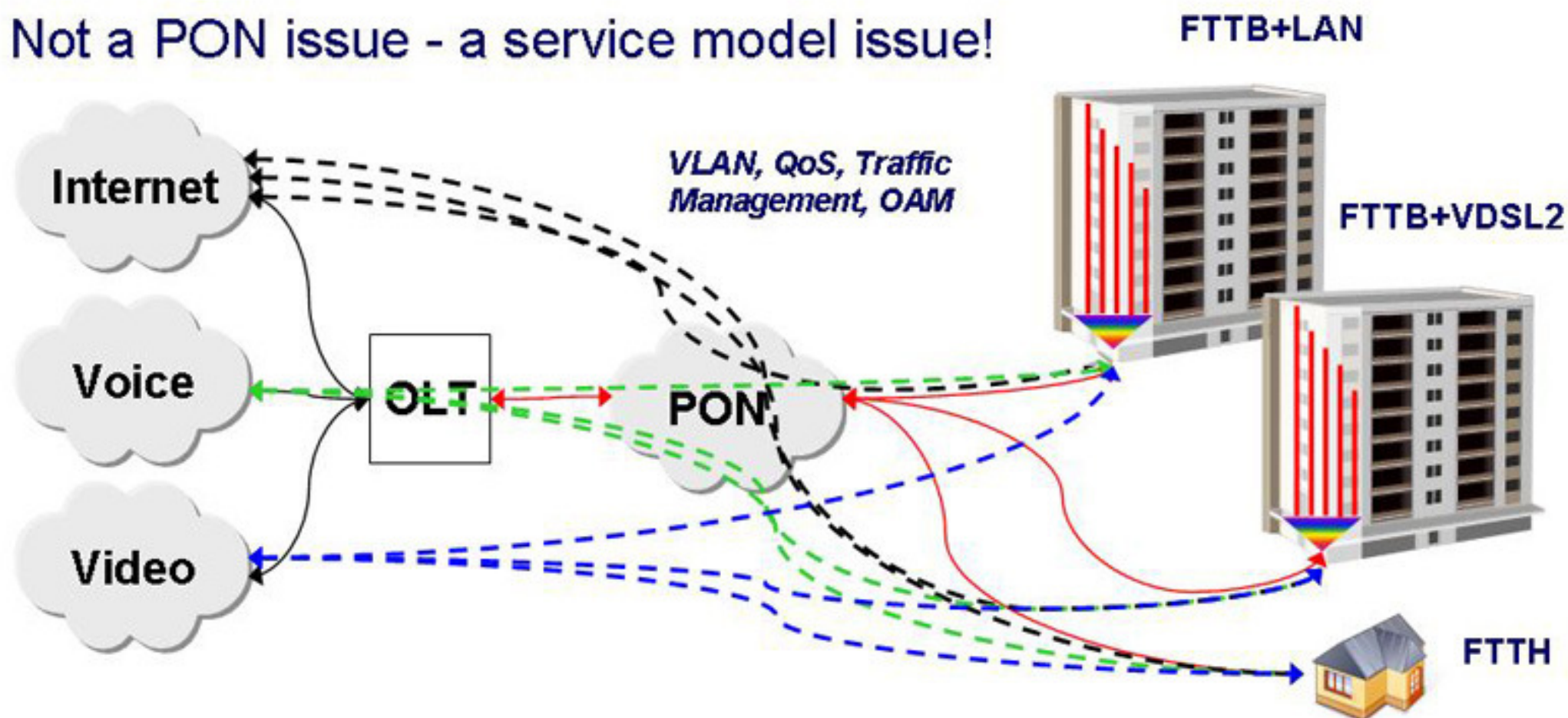
**HSI** **HDTV** **VoIP**  
**Phone**



# GPON IOP - Towards Plug-N-Play?

Different equipment and applications - how to provision?

Not a PON issue - a service model issue!



Next GPON IOP test event Oct 27-30 at Telcordia - Service Flow IOP

- ✓ 7 OLT vendors & 17 ONT vendors
- ✓ OLT publishes service model and provision sequence – ONT implements
- ✓ Service flow IOP not a result of standard deficiencies but implementation

# Common Service Models with DSL



is now the



- WT-156 "Using GPON in context of TR-101"
  - Applies TR-101 VLAN configurations to GPON
    - N:1 VLAN
    - 1:1 VLAN
    - Transparent VLAN
  - QoS architecture for US and DS traffic management
  - Multicast
  - OAM
  - Network Management

**Common service architecture for DSL & GPON operators**

# GPON Update Summary

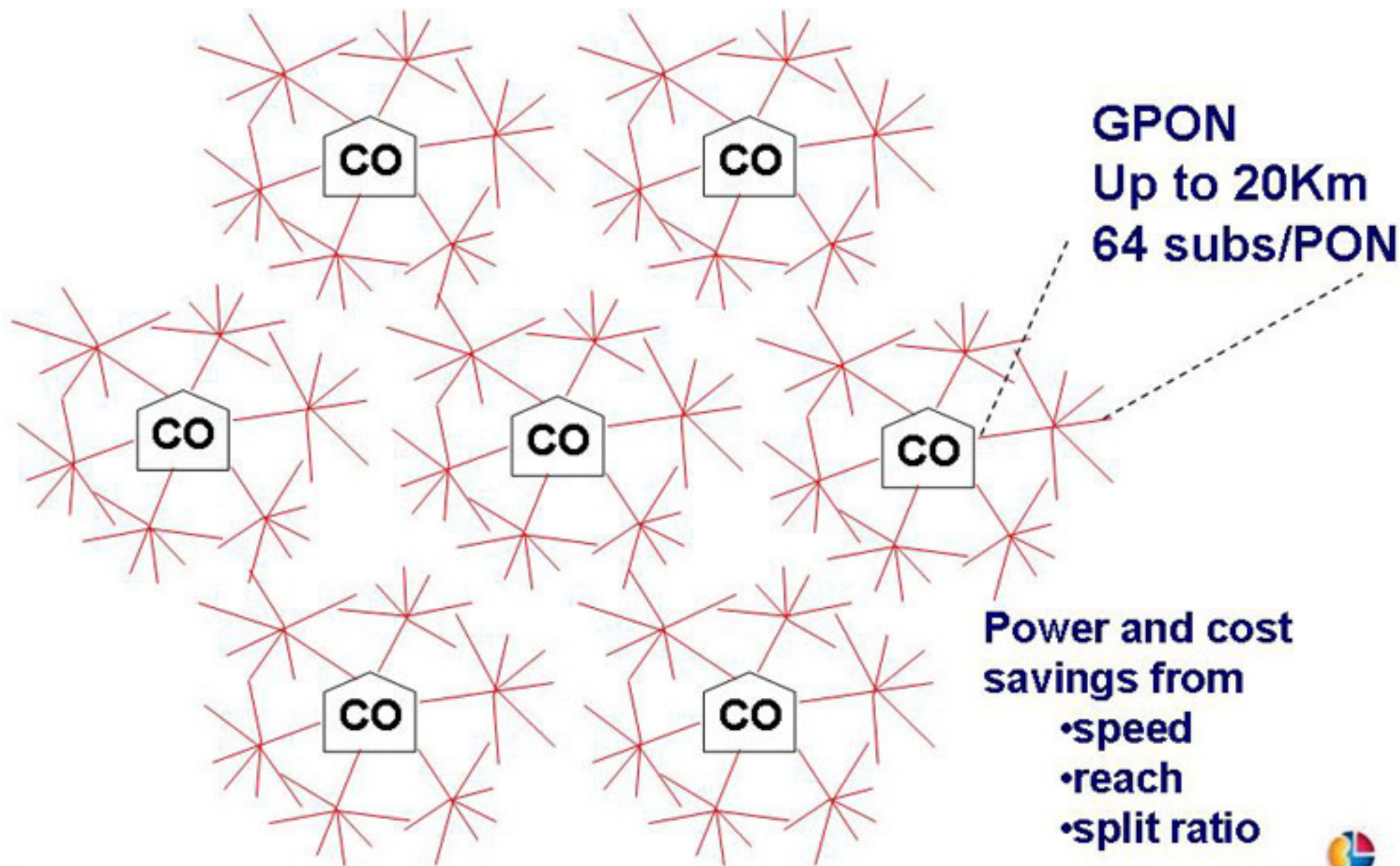
- GPON is beginning ramp to mass deployment
  - Worldwide acceptance, investment and IOP
- GPON meets the MDU application
  - Speed for IPTV with rich HDTV content
- Moving along the same path as DSL
  - Service flow IOP
  - Common DSL and GPON service architecture

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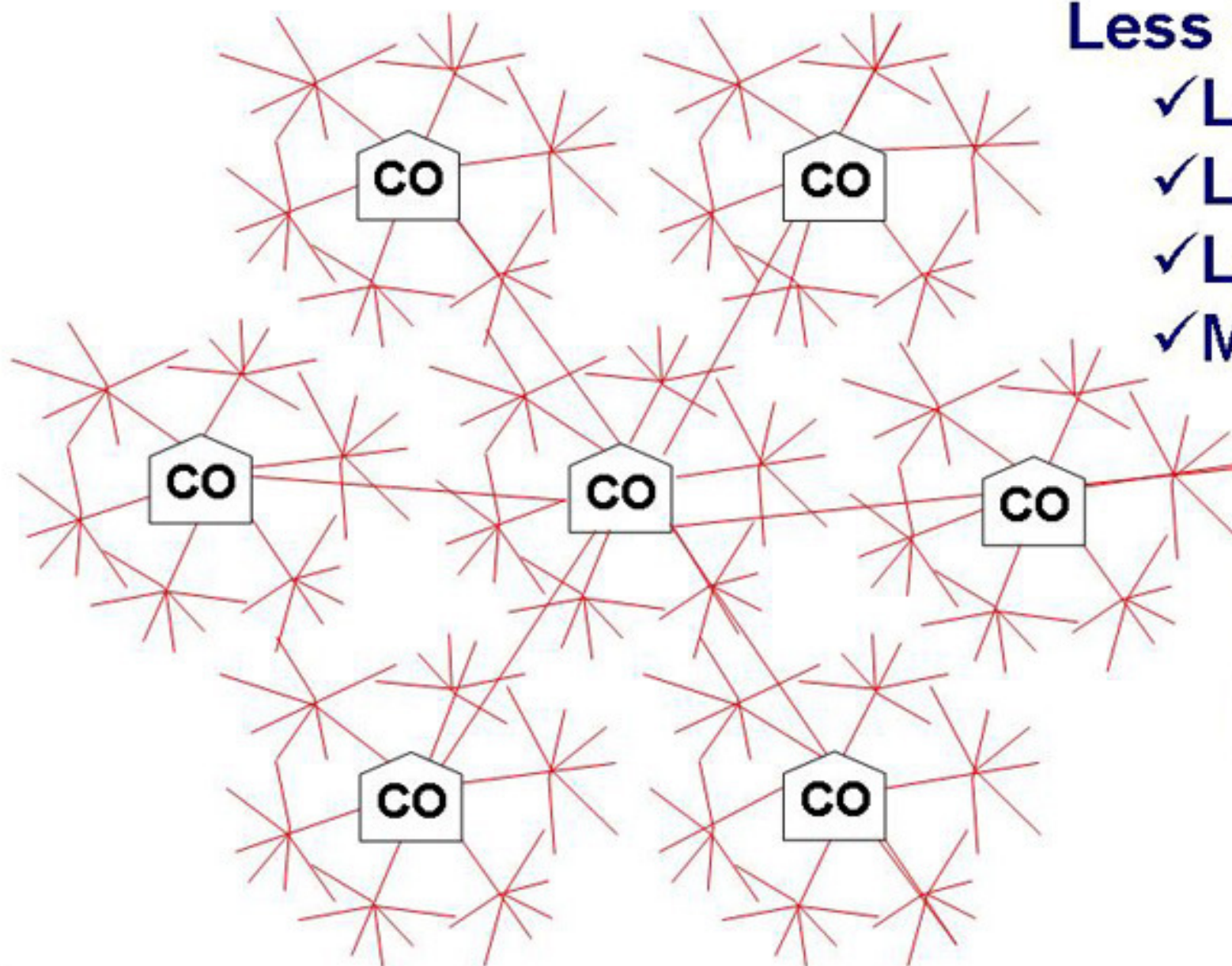


# Current Generation PON





# NG PON - More than Just Speed

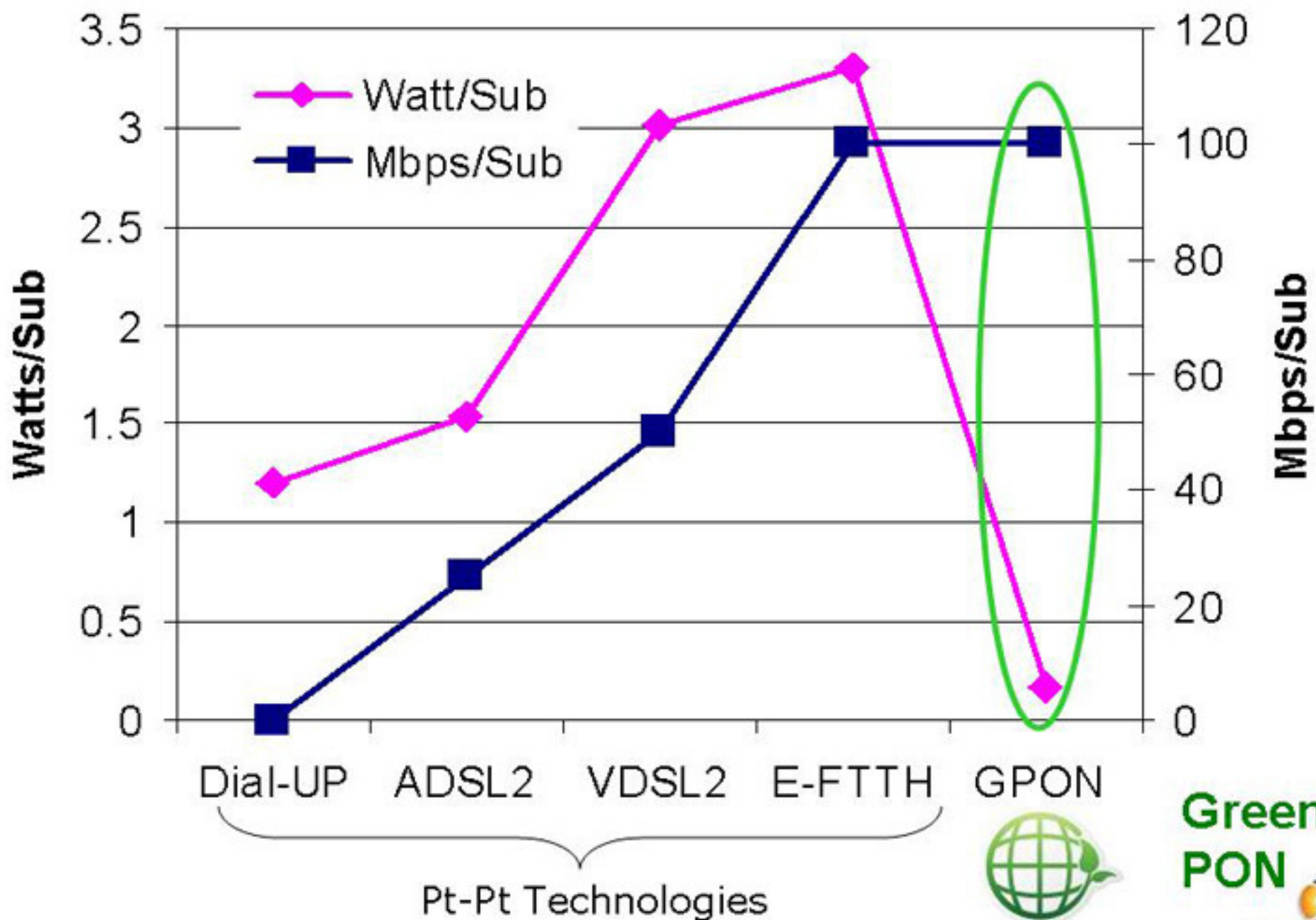


**Less COs =**

- ✓ **Less Power**
- ✓ **Less Space**
- ✓ **Less Cost**
- ✓ **More Green**



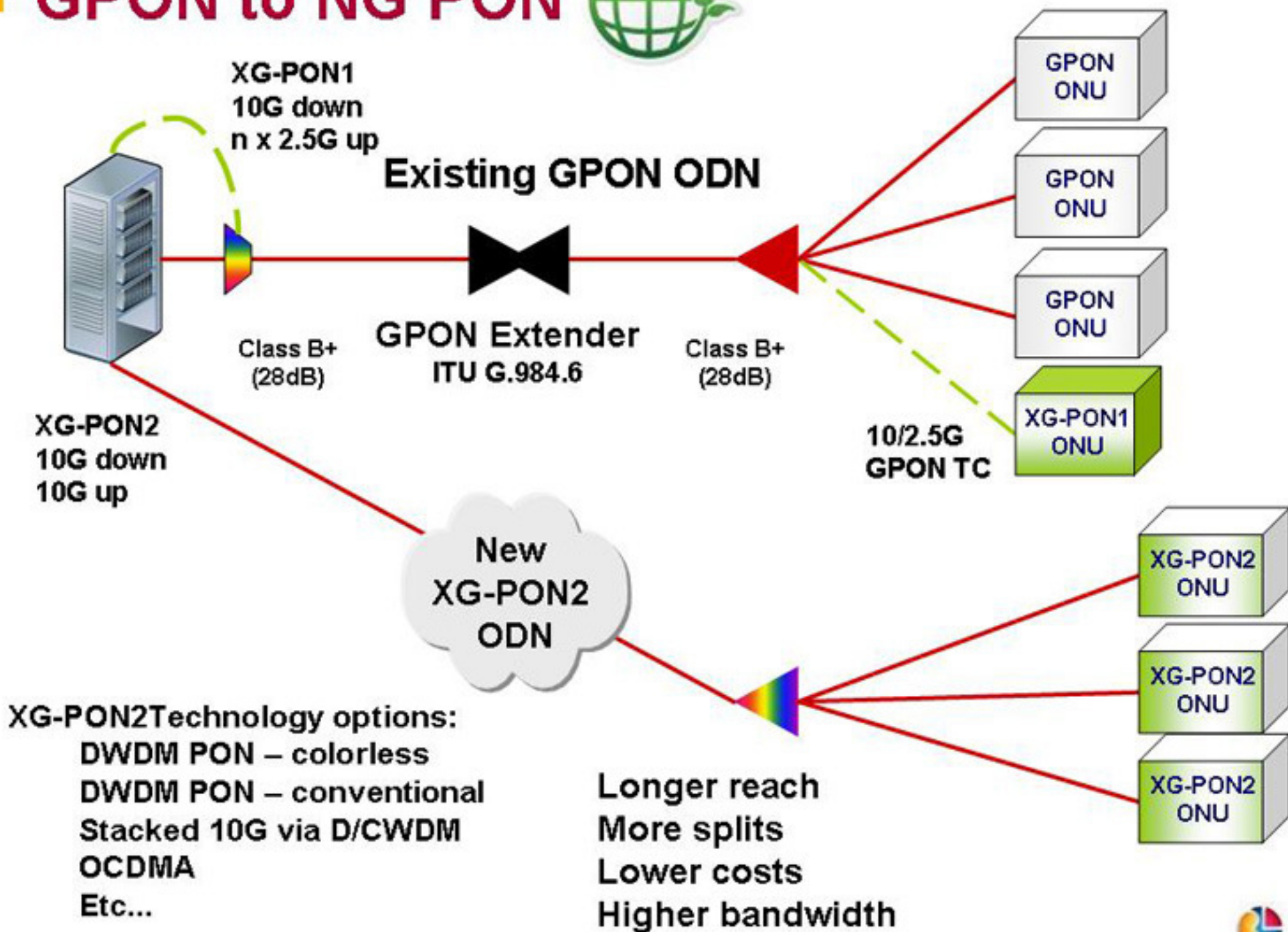
# PON Reserves the CO Power-BW Trend



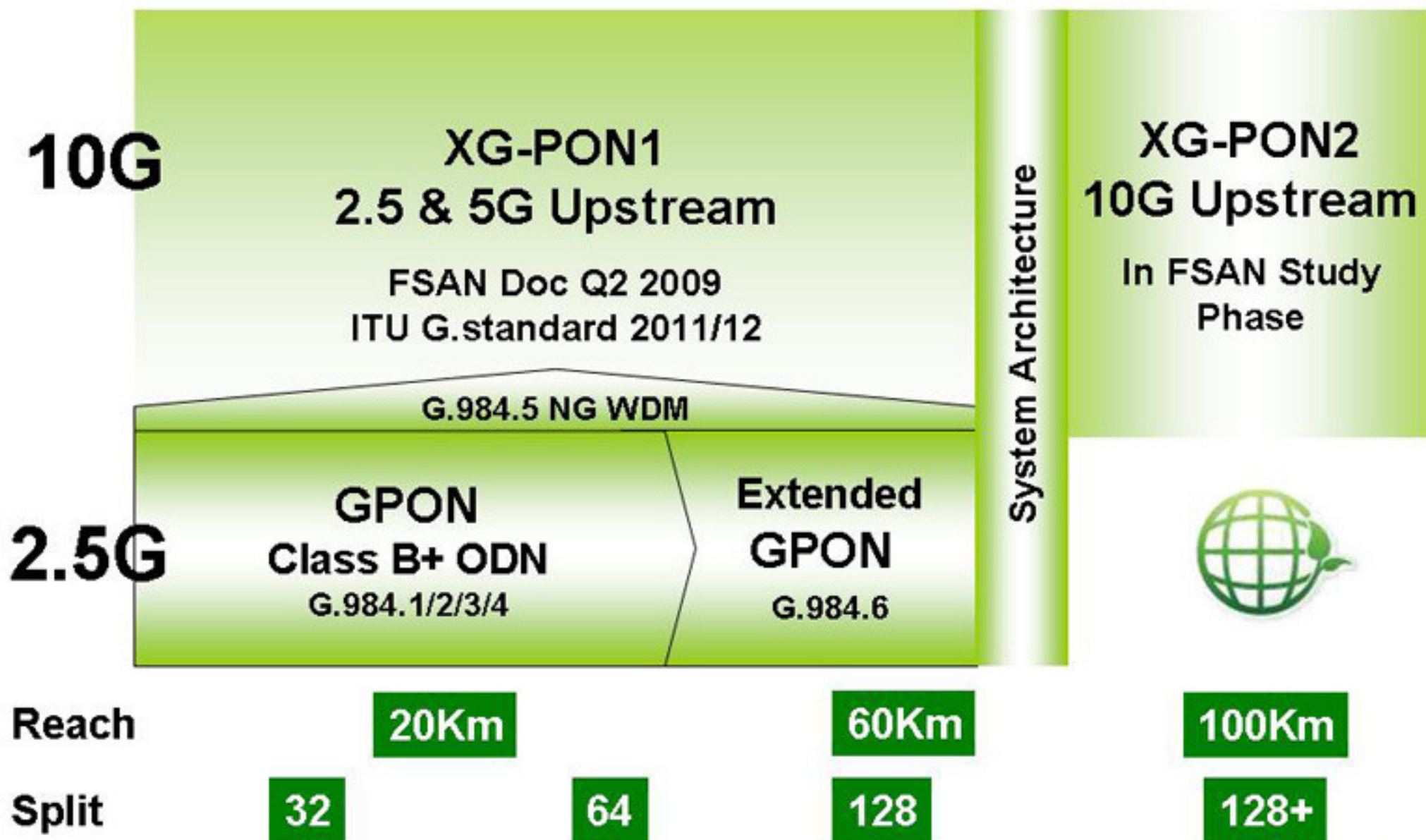
Green  
PON



# GPON to NG PON



# NG PON Activity Roadmap



# Why Two 10G PON Initiatives?



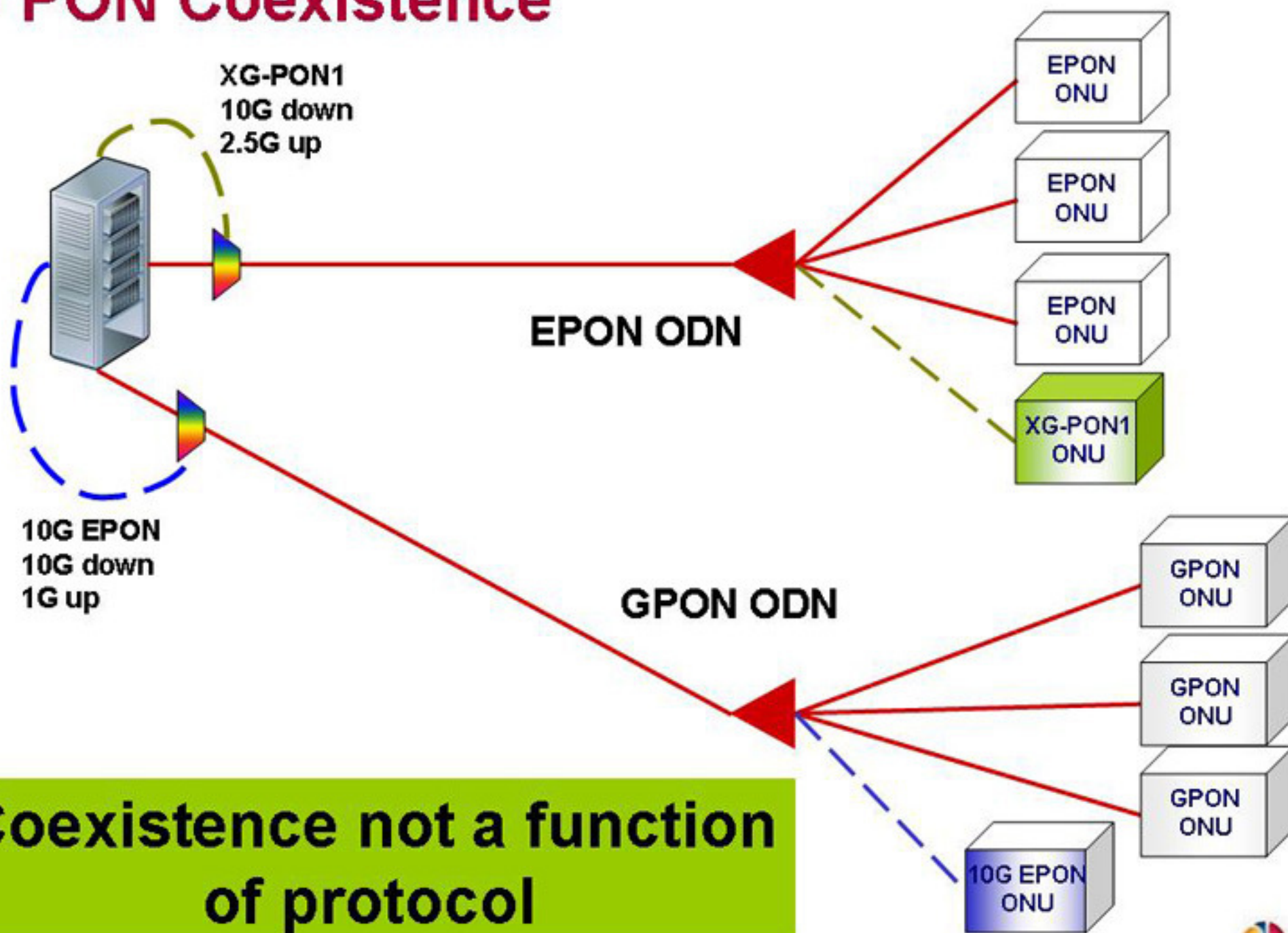
**FSAN**  
Full Service  
Access Network

**10G-EPON**

- Driven by carrier needs and evolution of the entire network
  - Less COs – long reach PON
- Fully specified TC to OAM&P
  - WW IOP and BBF activity
- Higher upstream rate initially
  - 2.5G & 5G going to 10G
- A 10G GPON concept was demonstrated at NXTcomm 2008
  - 10G DS, 1.25G US
- Driven by sense of urgency for immediate speed increase
  - Address MDU and IPTV
- Lack of specification - still
  - Carrier specific IOP again?
- Same 1Gbps upstream initially
  - 10G technology? LLID?
- 10G EPON FPGAs demonstrated at IPTV China 2008
  - 10G DS, 1G US

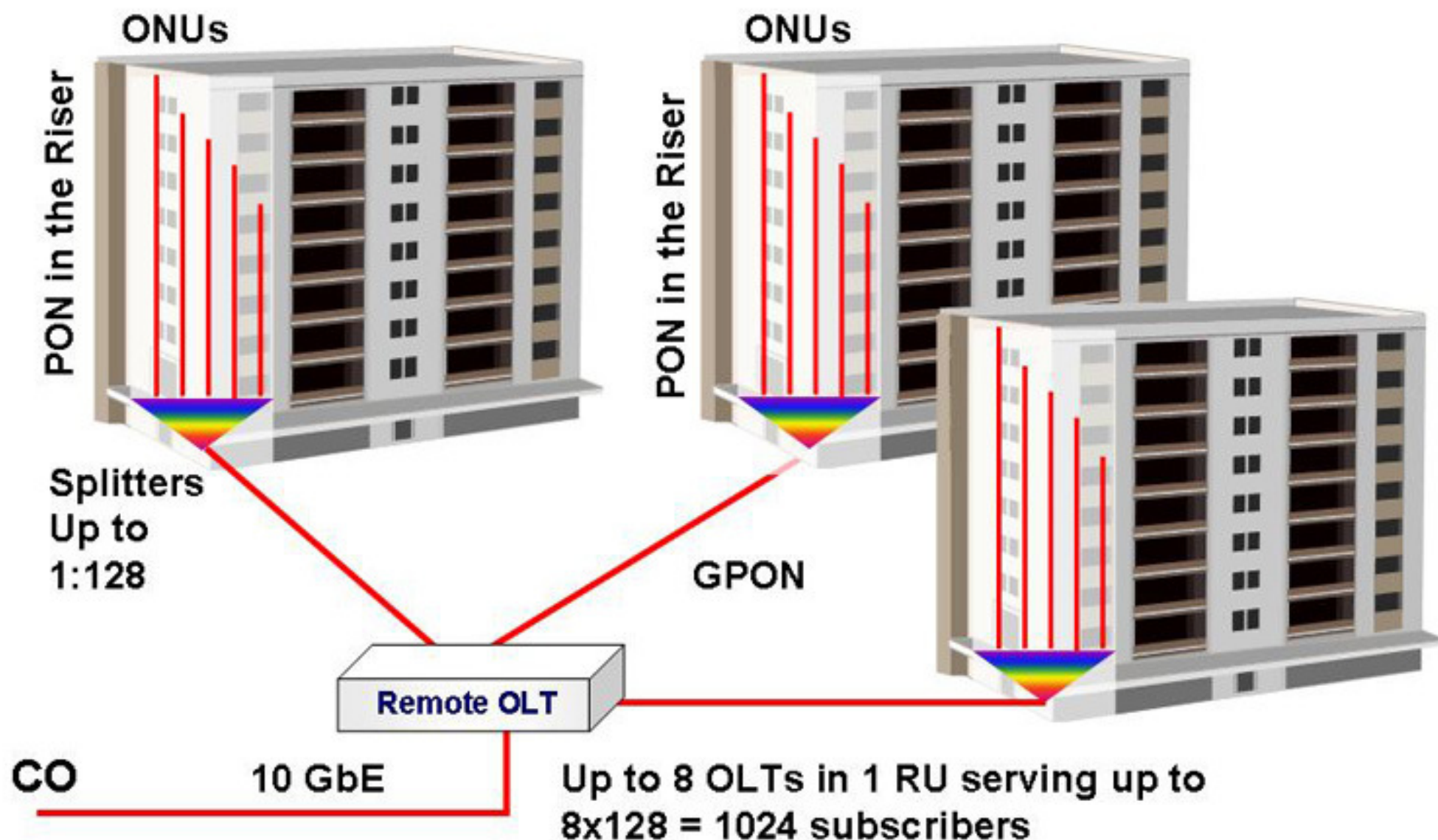
## Synergies for the industry?

# PON Coexistence





# FTTB+PON = 10Gbps Access (non-FSAN)







# Towards NG PON Summary

- 10G-EPON IEEE 802.3av standard EOY 2009
  - Coexist with current ODN
  - Same issues as IEEE 802.3ah
    - Incomplete system standard – IOP issues – carrier investment
    - Limited upstream at 1G now going 10Gbps ....when?
- XG-PON1 standard mid 2011
  - Coexist with current ODN
  - Leverages existing ITU-T system work for IOP – industry investment
  - 2.5Gbps upstream with 5Gbps capabilities
  - Common use of 10G transceivers – XG-PON1 and 10G EPON
- XG-PON2 under study
  - Disruptive new optical access for dramatic cost and power savings
  - Leverage work existing system work of FSAN/ITU
- 10G fiber access solutions available now
  - 10GbE Remote GPON OLT
  - C/DWM+GPON

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# GPON in Next Phase: 1-Box Digital Home

*Happening now - RFP's from leading LECs*

**Single Chip GPON RG**  
Layer 1/2/3/4 @ 1 Gbps Home  
Networking I/Fs w/ VoIP



>100 Mbps

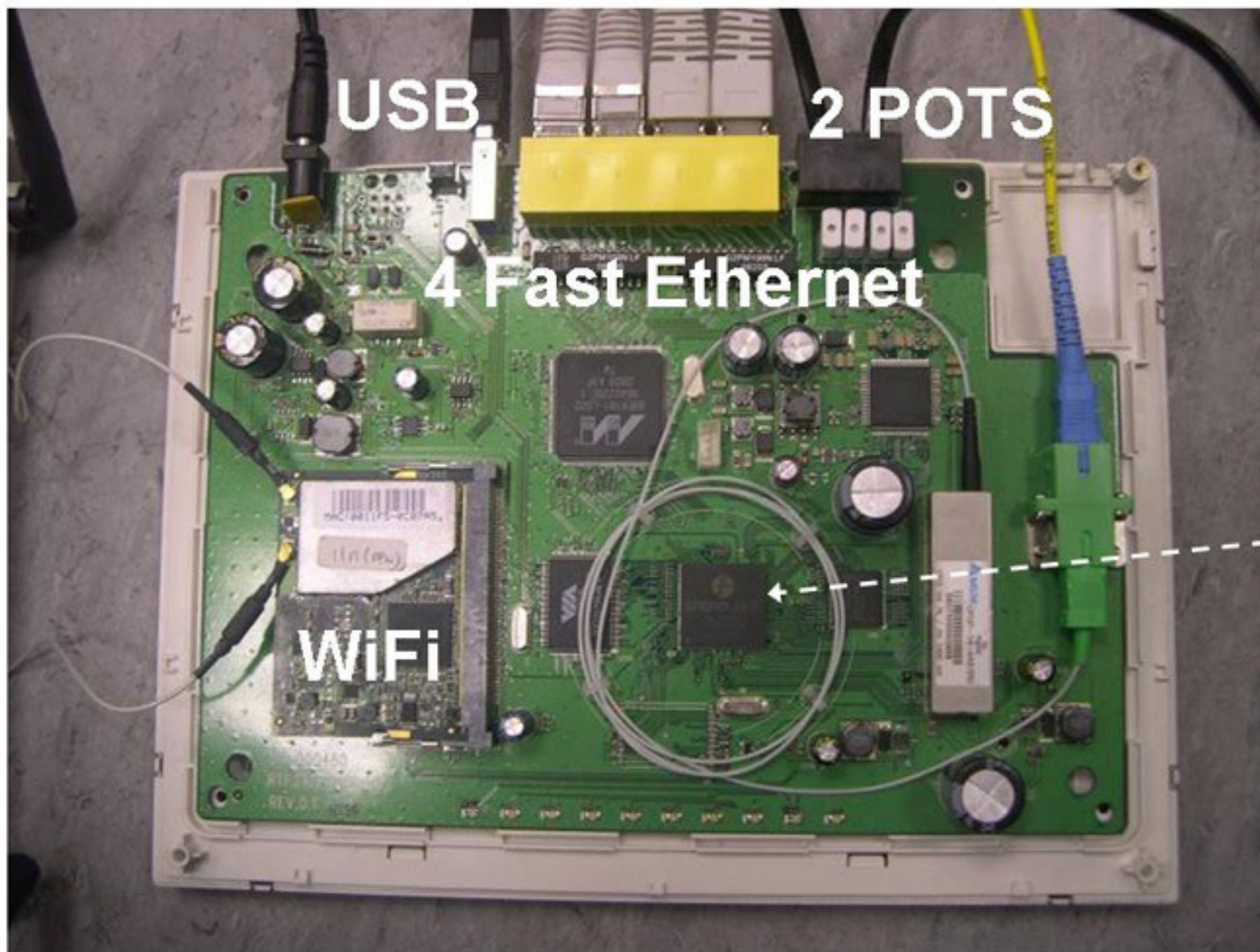


Ethernet

1.2W (0.6W LP mode)  
19x19mm



# GPON Residential Gateway – ODM#1

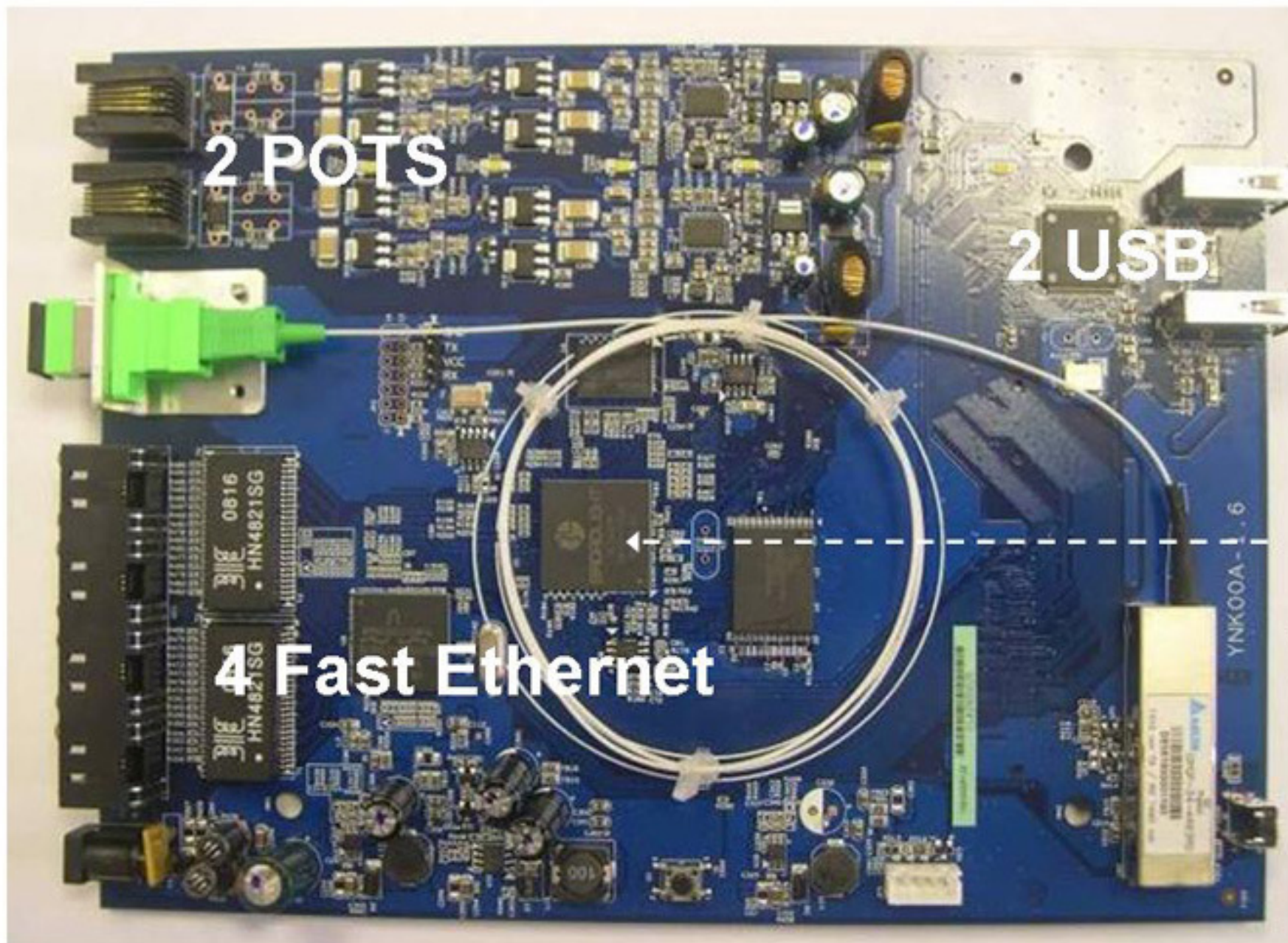


BL2348  
ONT/RG  
SoC



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# GPON Residential Gateway – ODM#2

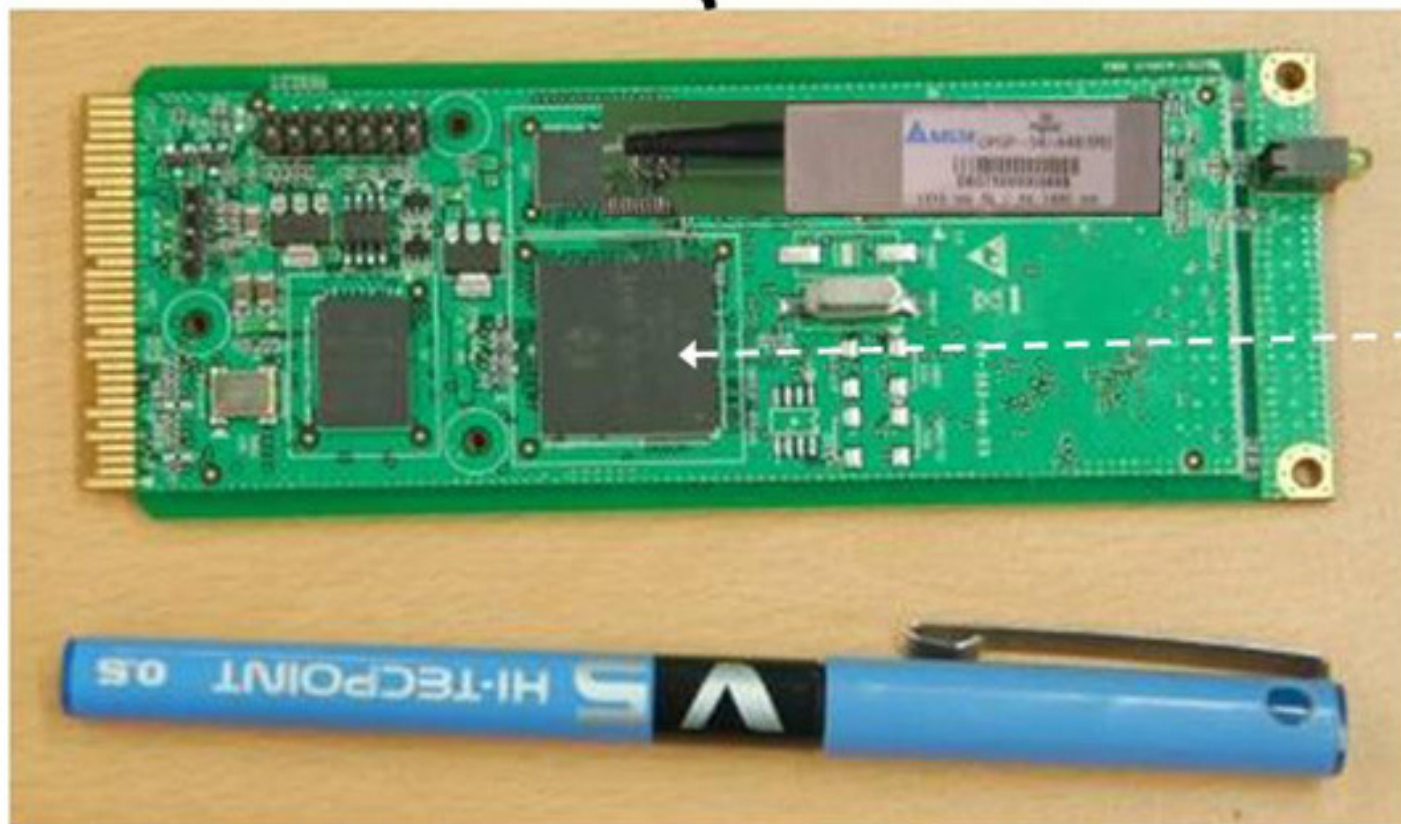


  
BL2348  
ONT/RG  
SoC

# MDU ONT – FTTB+LAN or VDSL2



GPON interface card



BL2345  
ONT/RG  
SoC



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## Summary

- GPON is poised to be the dominant PON technology
  - ITU standard
  - Worldwide IOP and service management – like DSL
  - Global industry investment
- GPON has the capacity for rich HDTV services
  - Migration to NG PON for reasons other than just BW
- BroadLight leads E2E GPON technology
  - High density, low-power OLT devices
  - High performance, low-power ONT and RG devices
  - XG-PON investment

# Thank You

# 谢谢

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# Possible 10G PON Synergies - Optics

