

Passive Optical Networks

'Beyond Triple Play'

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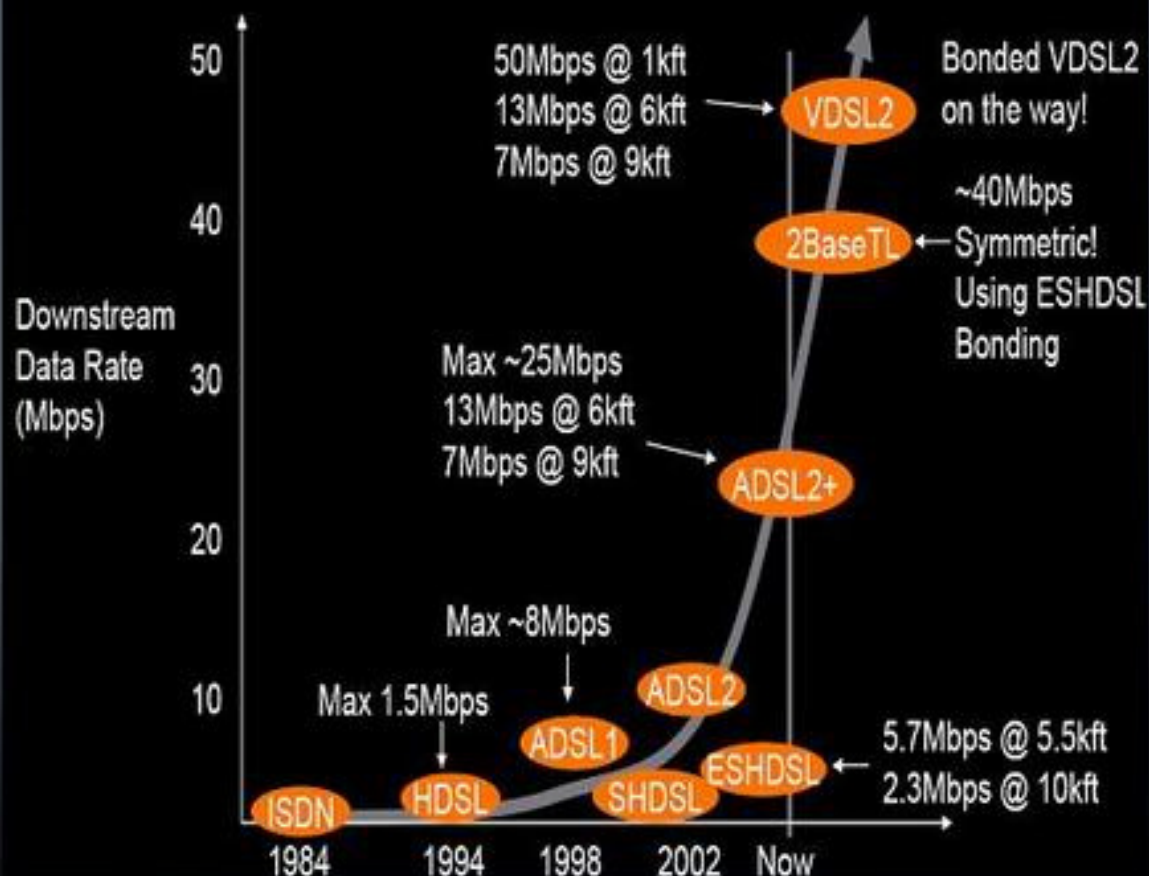
TO THE HOME

Time for a 'Technology Paradigm Shift'?



Street in Manhattan, circa 1890

A history of bandwidth



Raymond Kurzweil: "The Law of Accelerating Returns"

Passive Optical Networks – The Promise

'Unlimited' Bandwidth

- Copper to Fiber transition
- Longer Distance
(without amplification)
- Longer Lifetime
- Fiber is cheaper
- ...

Cost-effective OSP

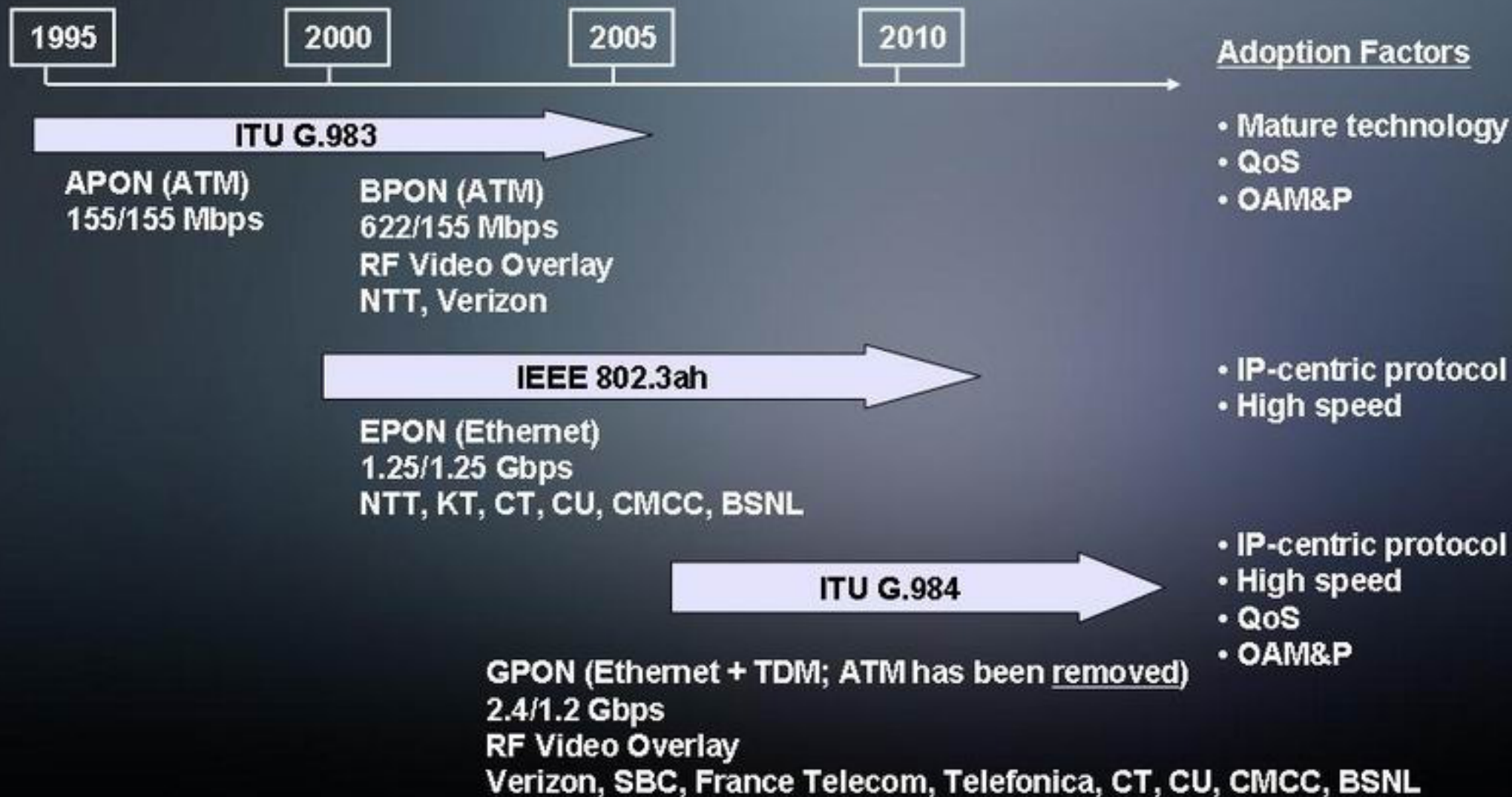
- Passive Split vs. P2P
- Less Fiber
- Less Equipment (P2MP)
- Less Power (Remote & CO)
- Less Cooling (CO)
- ...



'Unlimited' BW
+
Cost-effective
OSP

Enable High Value Services at Low Cost

PON – Evolution and Adoption



PON – Delivering on The Promise



Technology Foundation

- Increased Bandwidth
- Video Delivery
- ATM to Ethernet



Enable High Value Services at Low Cost

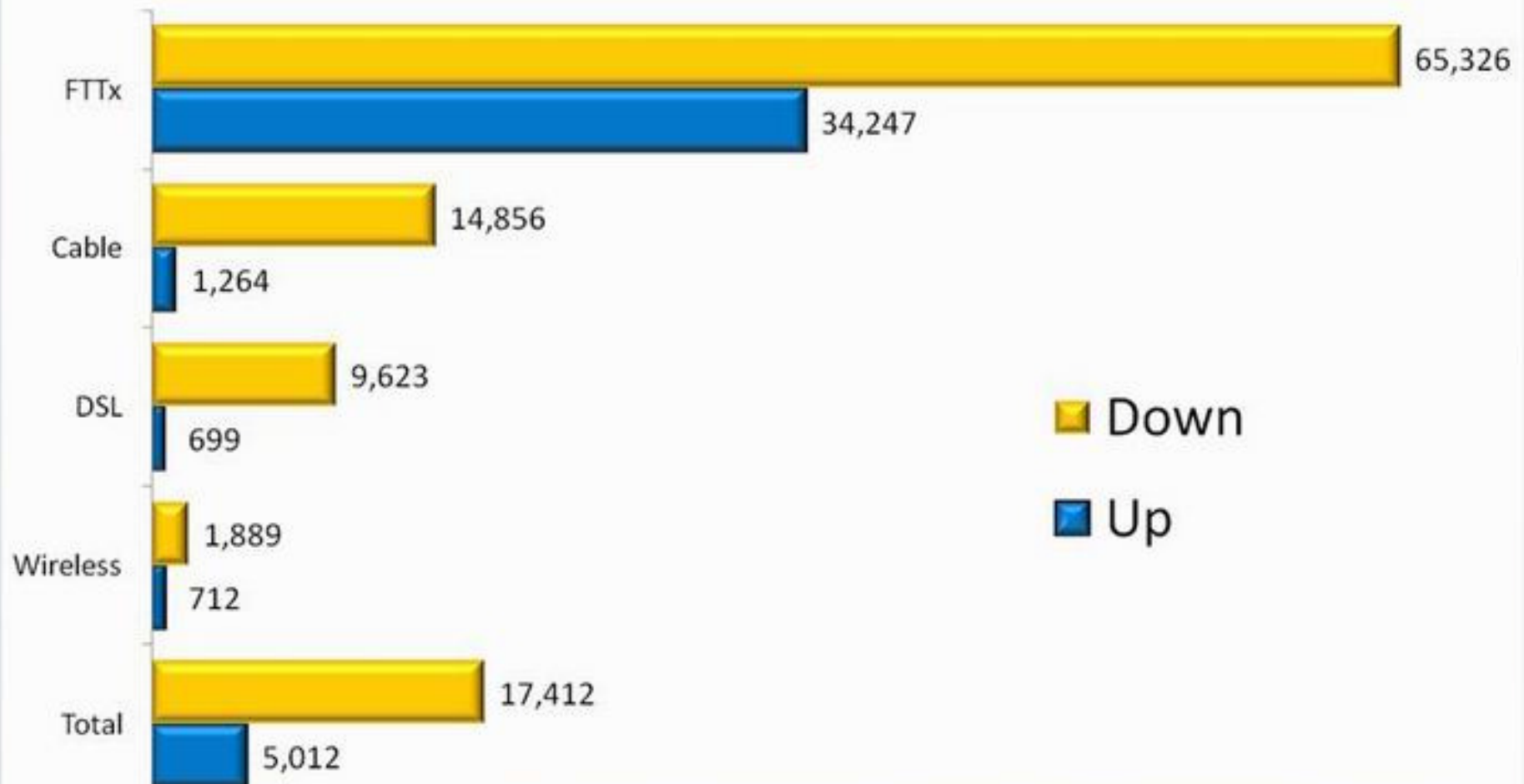


Enable High Value Services at Low Cost

Broadband Speed by Technology



OECD average advertised broadband speeds, kbit/s, by technology





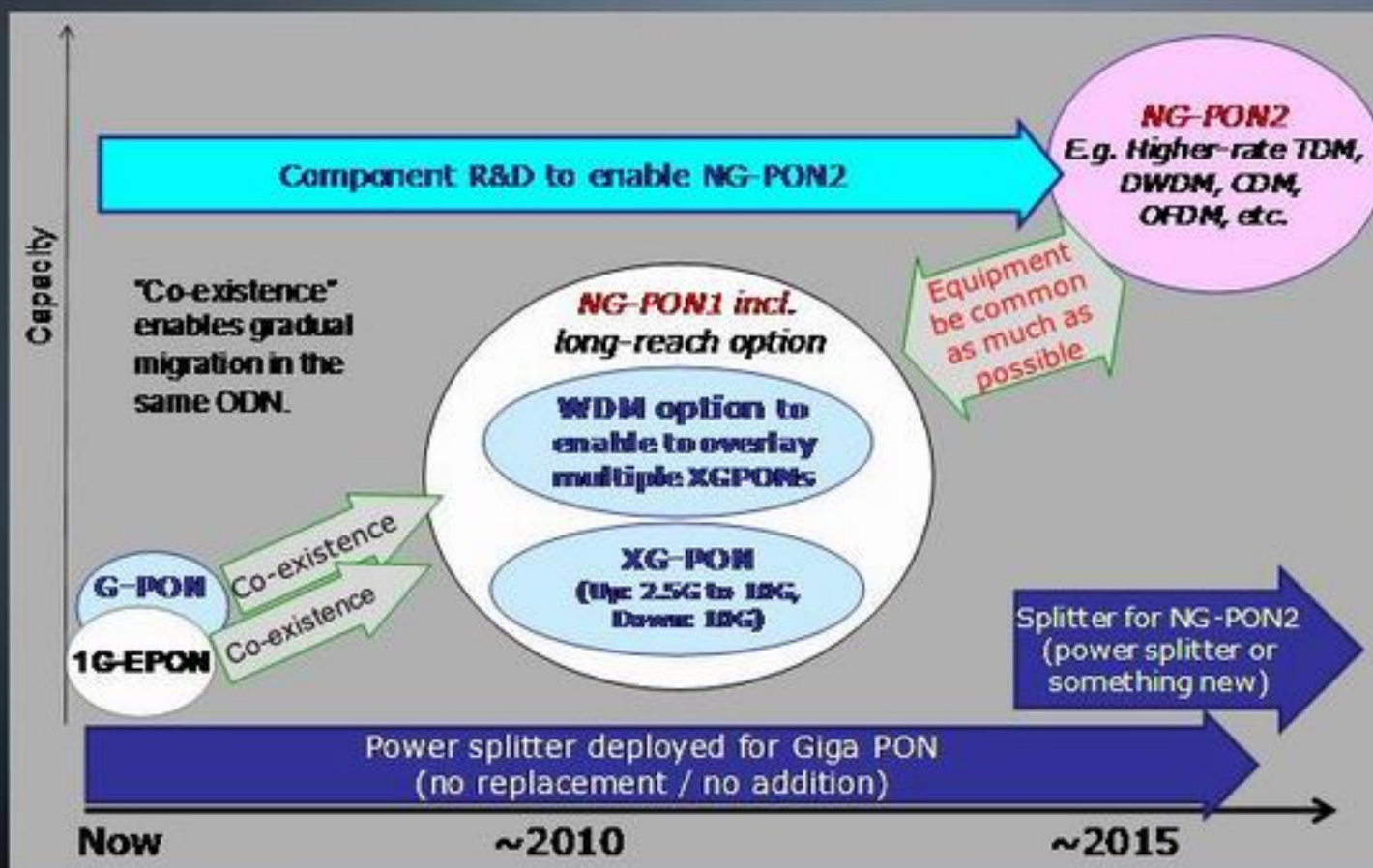
Standardization Initiatives

Passive
Optical
Networks



- Increased Bandwidth
 - *IEEE802.3av*
 - *G.987*
- Extended Reach
 - *G.984.6*
- Lower Power
 - *G.Sup45*

PON – Next Generation 10G



Source: FSAN NG-PON White Paper Draft 3.0

- NG-PON1 – coexistence with G.984 GPON on the same ODN based on G.984.5
- NG-PON2 – disruptive technology implying a new ODN



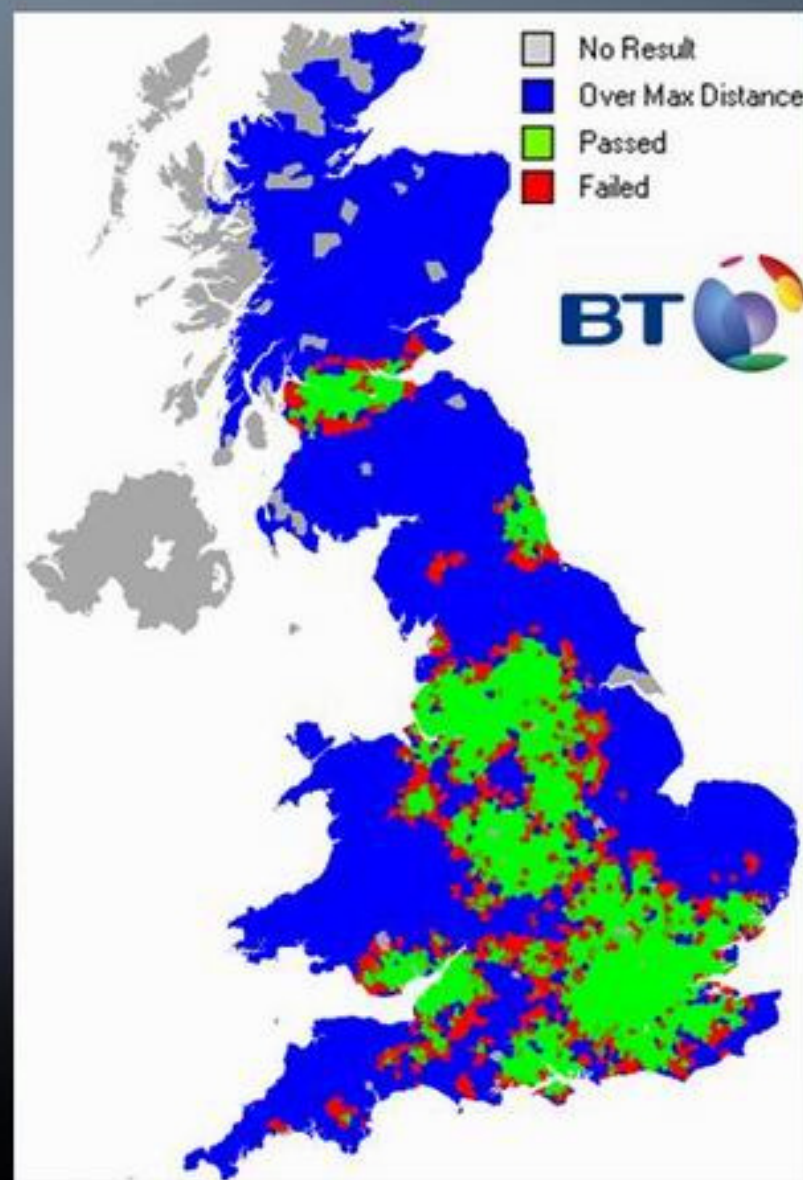
United Kingdom

Standard GPON Reach

- *Still quite many central office exchanges*
- *Utilize existing “road network” of fiber*
- *Analysis based on 1:32 split*
- *Could reach 65% of potential customers*

Extended Reach G.984.6

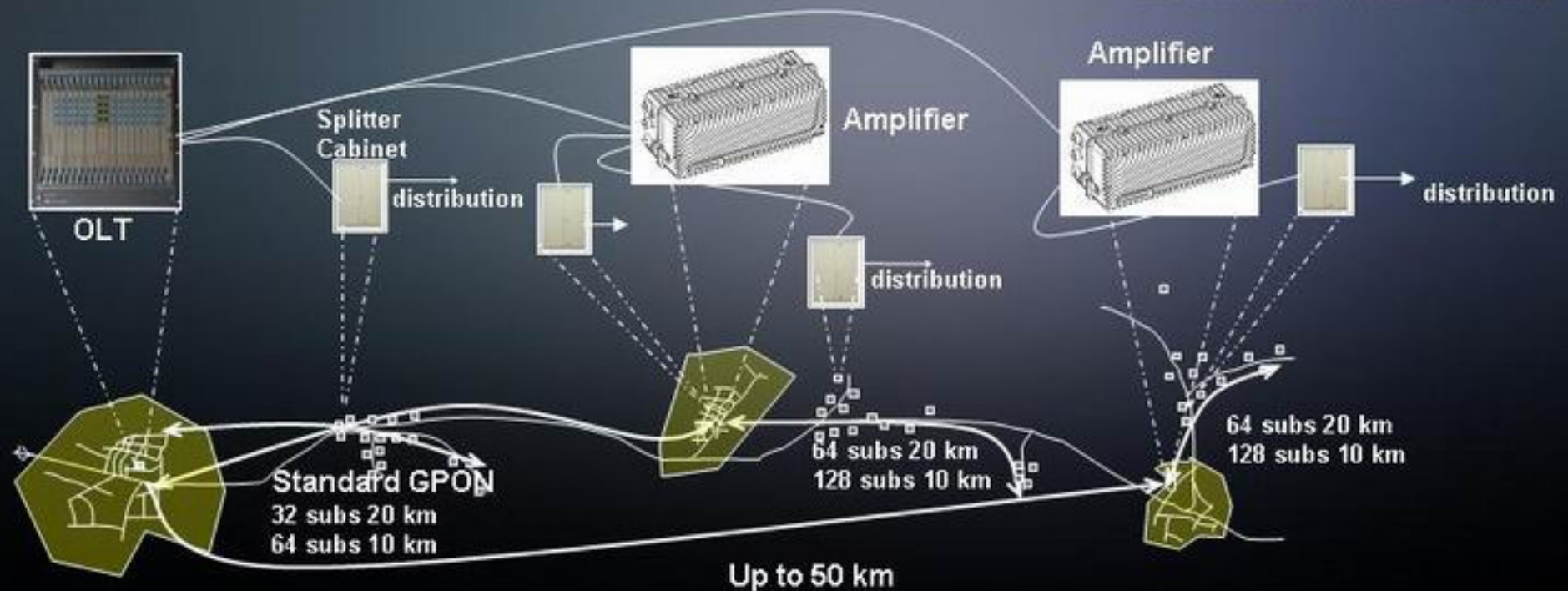
- *Could reach 91% of potential customers*
- *Allows to collapse number of Central Offices saving real estate and operational expenses*



Extended PON – Implementation Example



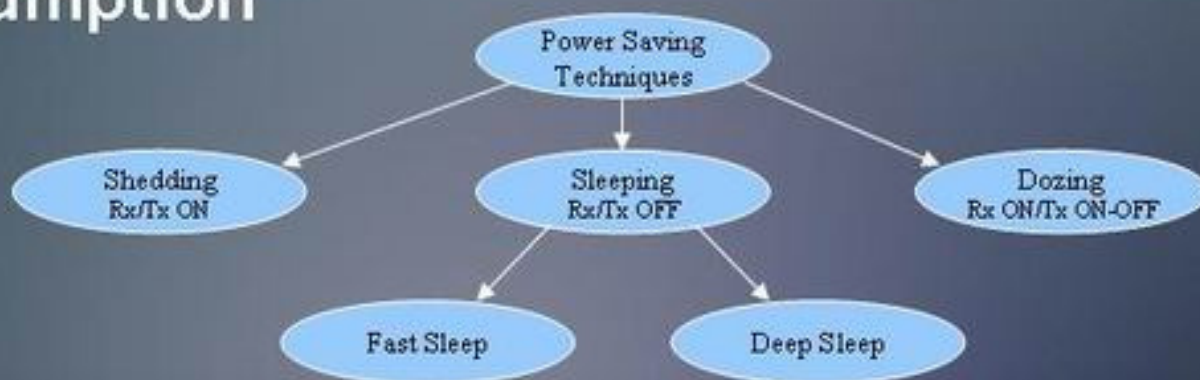
- **Standard GPON Class B+ loss budget is 28.5 dB**
 - Equates to 20 km/1:32 split or 10 km/1:64 split
- **Extended Reach: >50km**
 - Increased split ratio to 1:128 improves RoI



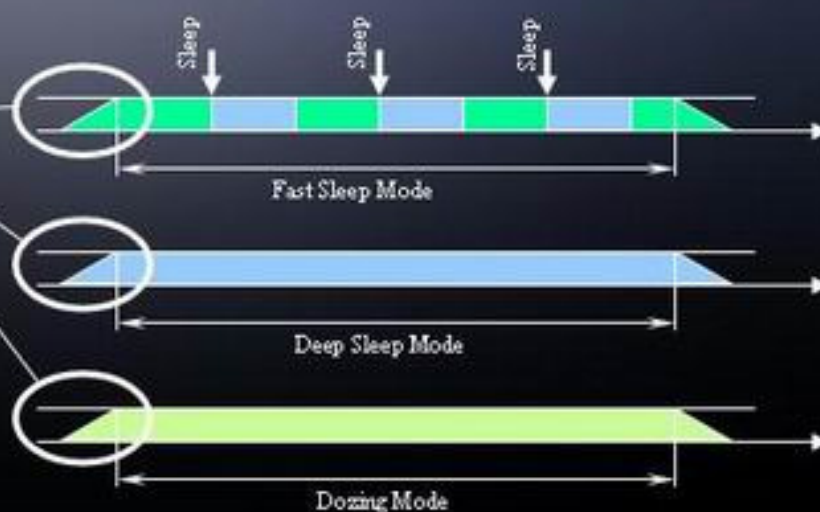


Reduced Power Consumption

- *Emergency service during power failure*
- *Reduced carbon dioxide emissions*
- *ITU G.Sup45 summarizes power savings proposals*
- *EU BBCoC for Power Consumption*
 - *Target power levels for ONT and OLT*



- Slow, asynchronous transition
- Same signaling methods apply



PON – Changing the Engineering Rules



Unlimited' BW
+
Cost-effective
Fiber
Infrastructure



Changing the Engineering Rules
for
Access Networks

PON – Changing the Engineering Rules



Unlimited' BW
+
Cost-effective
Fiber
Infrastructure

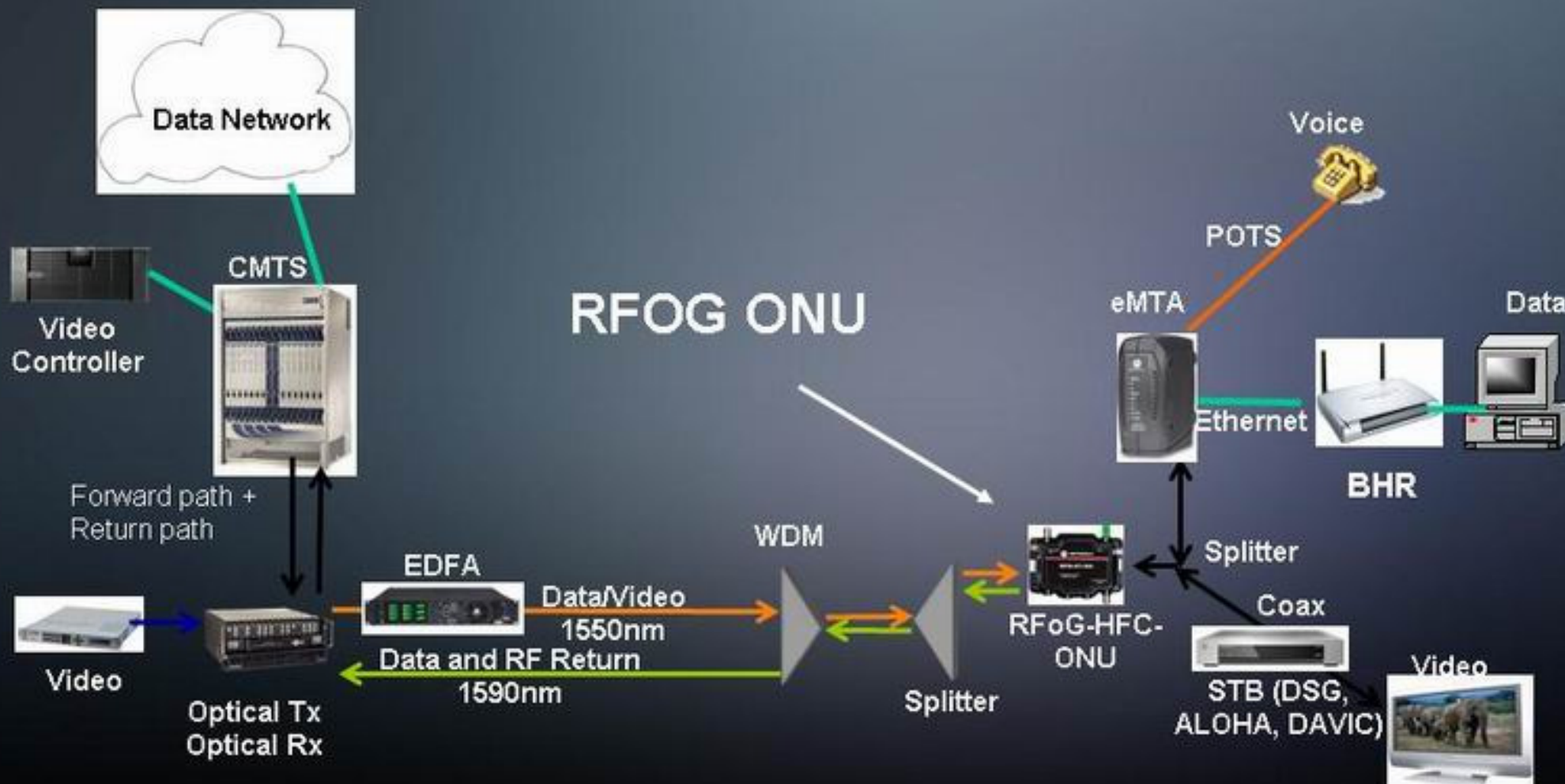


Changing the Engineering Rules
for
HFC Networks

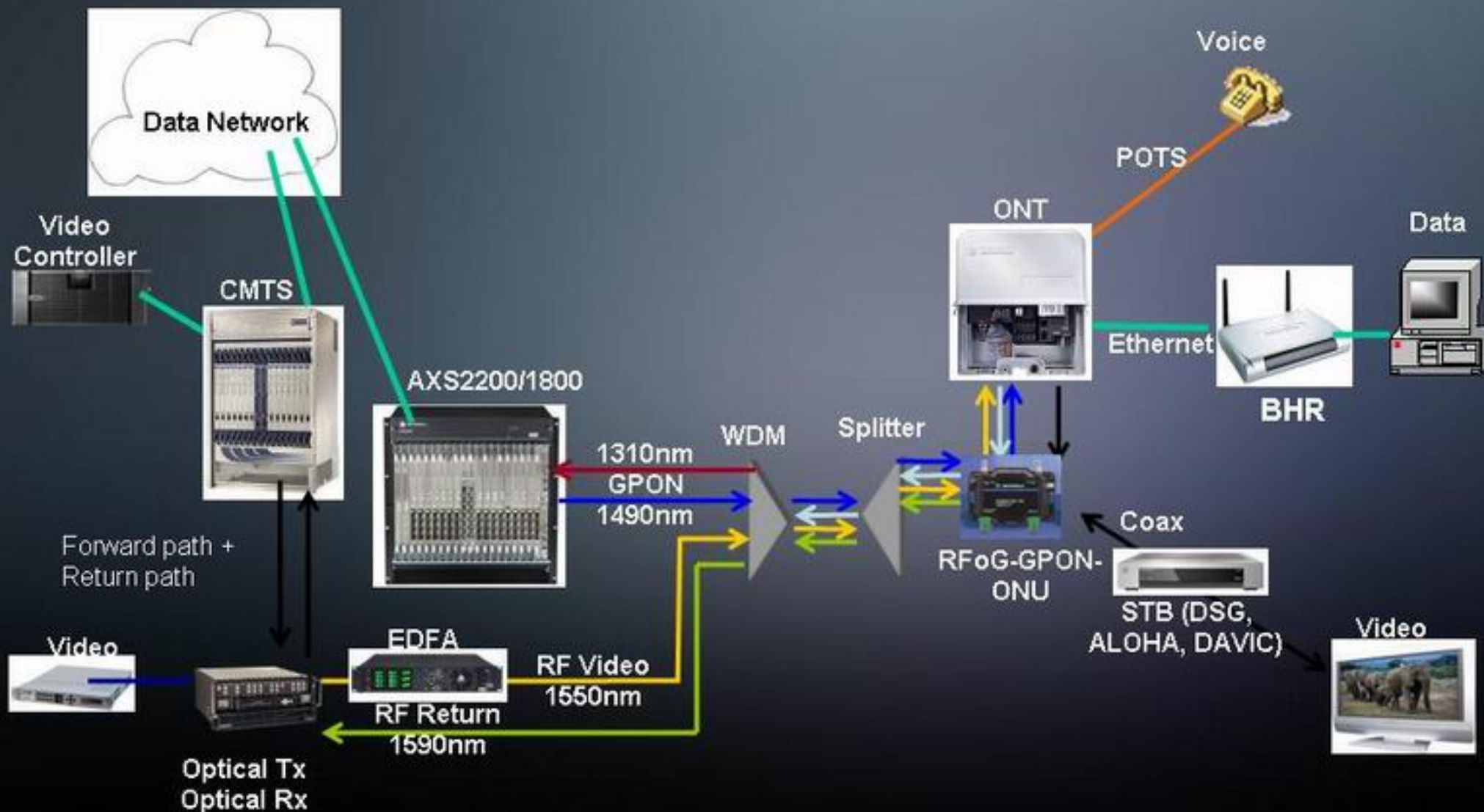


RFoG

HFC – Fiber Deep with RFoG



RFoG – Transitioning to PON



PON – Changing the Engineering Rules



Unlimited' BW
+
Cost-effective
Fiber
Infrastructure



Changing the Engineering Rules
for
Enterprise Networks

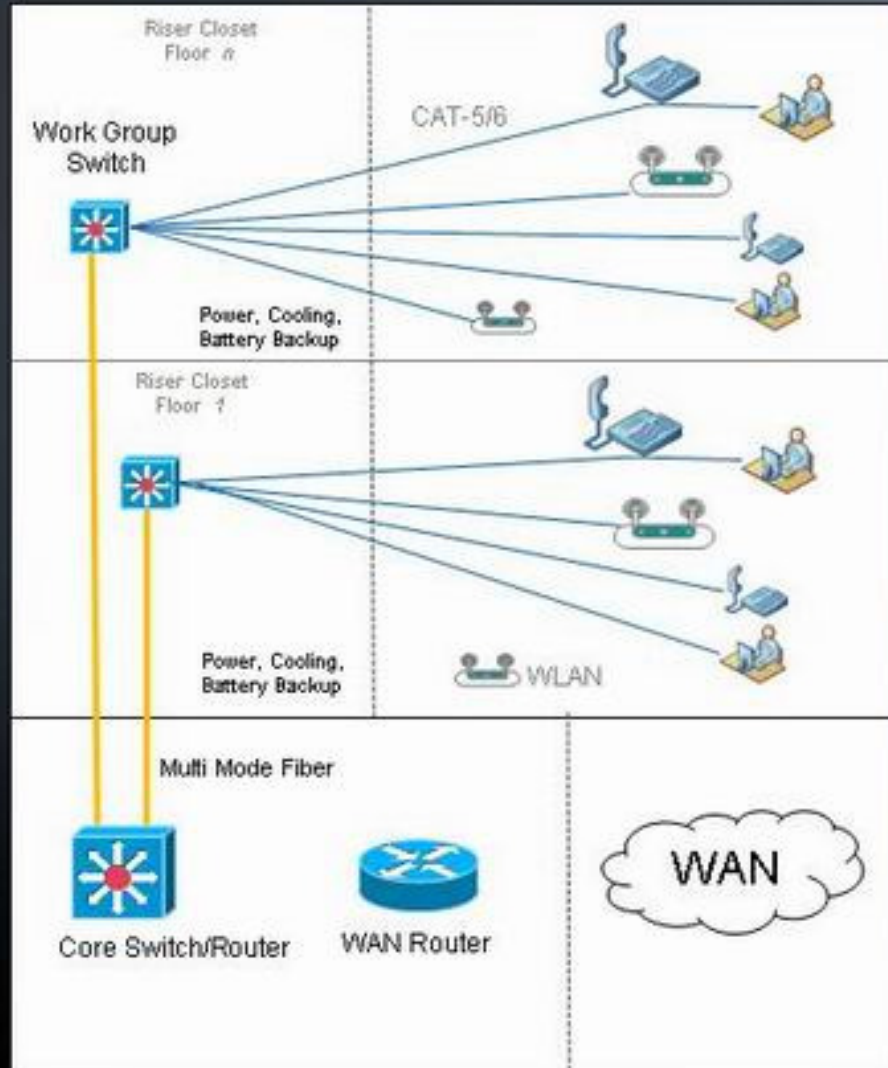


Passive Optical LAN

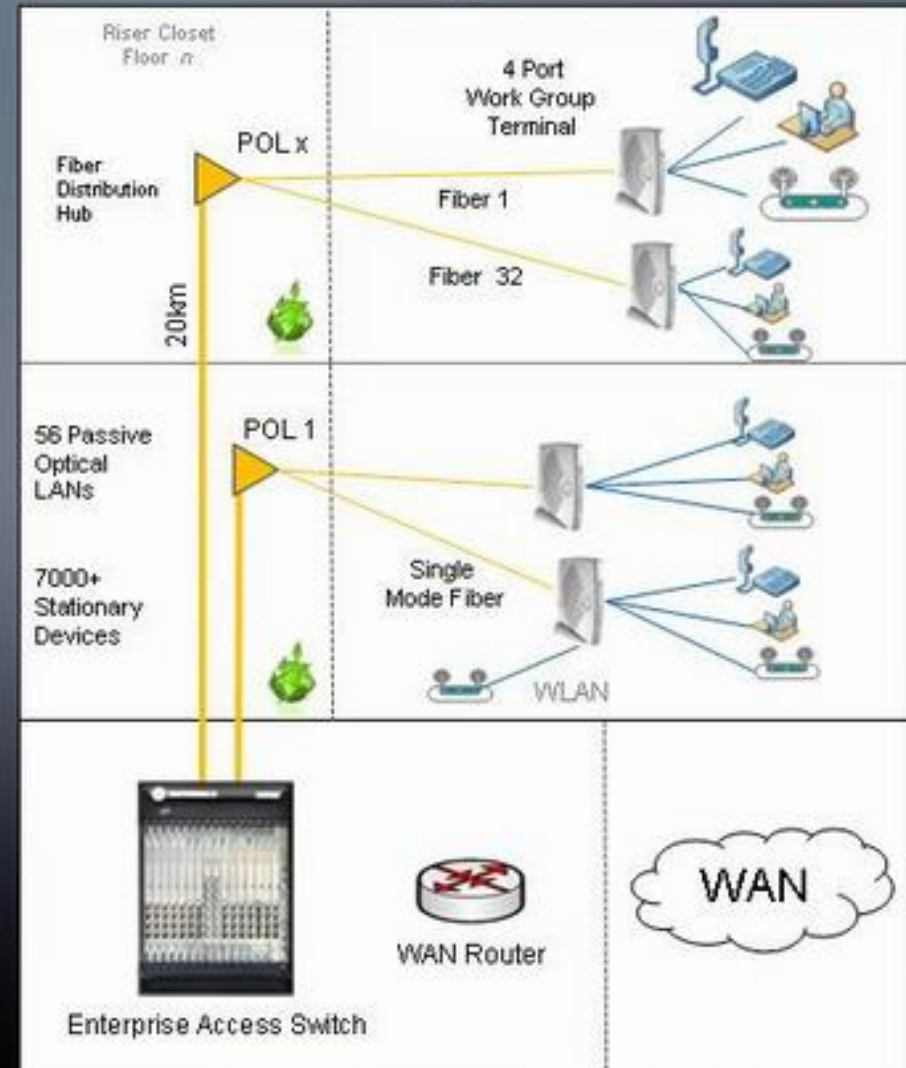
Passive Optical LAN - Architecture



Traditional LAN



Passive Optical LAN



Passive Optical LAN – Disruptive TCO



TCO Assumptions

- 1000 Person Enterprise
- 4 floors, 20k sq. ft. per floor
- 70% Cubes, 15% Offices, 15% open Space
- 1 PoE and 1 non-PoE device in every stationary user location
- Serving WLAN

| Expense | Savings over PMO |
|------------|------------------|
| CapEx | -48% |
| OpEx | -65% |
| 5 Year TCO | -57% |



“The Law of Accelerating Returns”

All Fiber Access Networks

- *PON is changing the Engineering Rules for Access Networks*

PON Technology Adoption in Enterprise Networks

- *Passive Optical LAN*

New ways of Social Networking and Human Interaction

- *Skype, YouTube, and Facebook are just the beginning ...*

Motorola

Thank You!

谢谢



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