FTTX TECH. SOLUTIONS & BUSINESS MODELS

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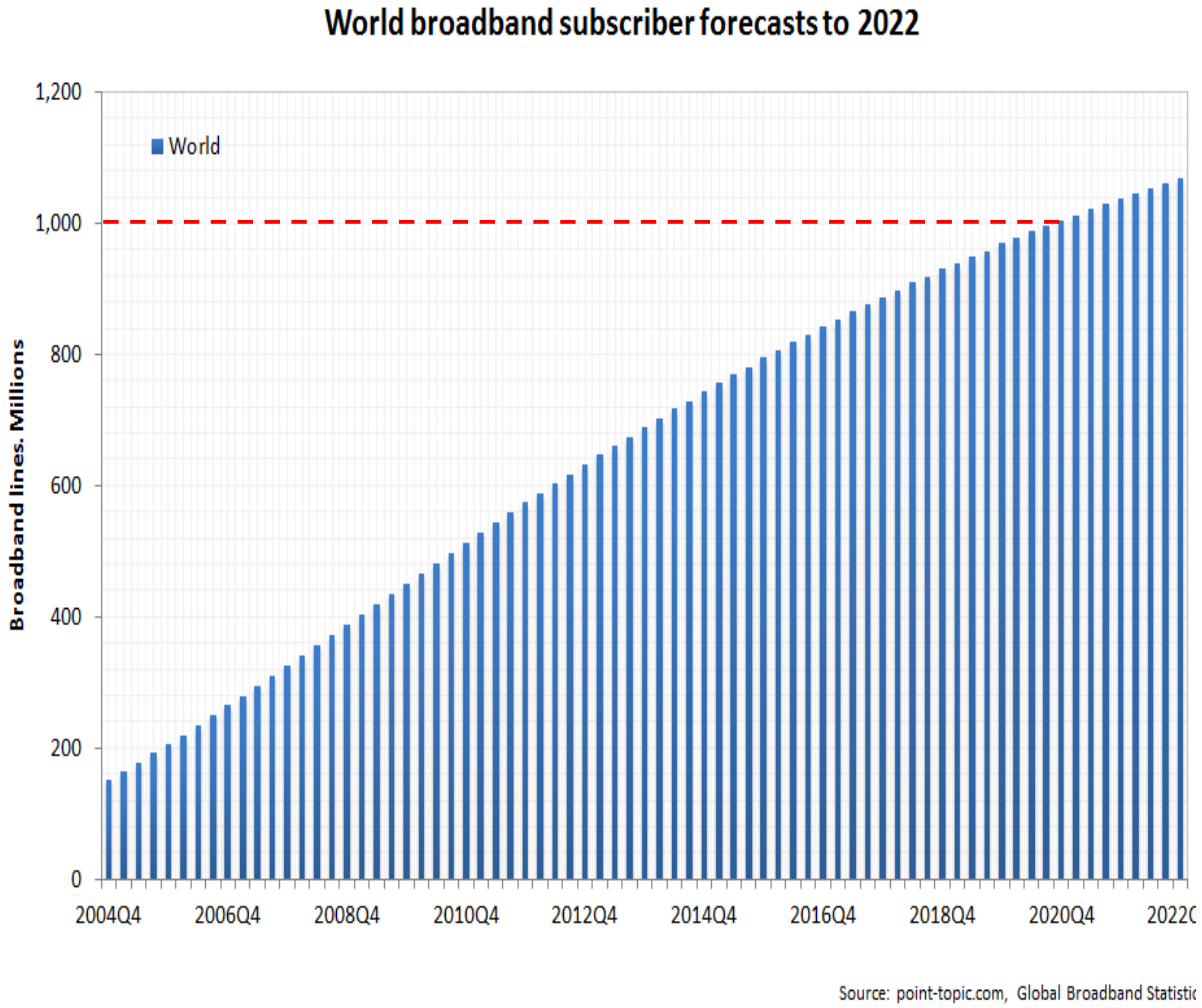
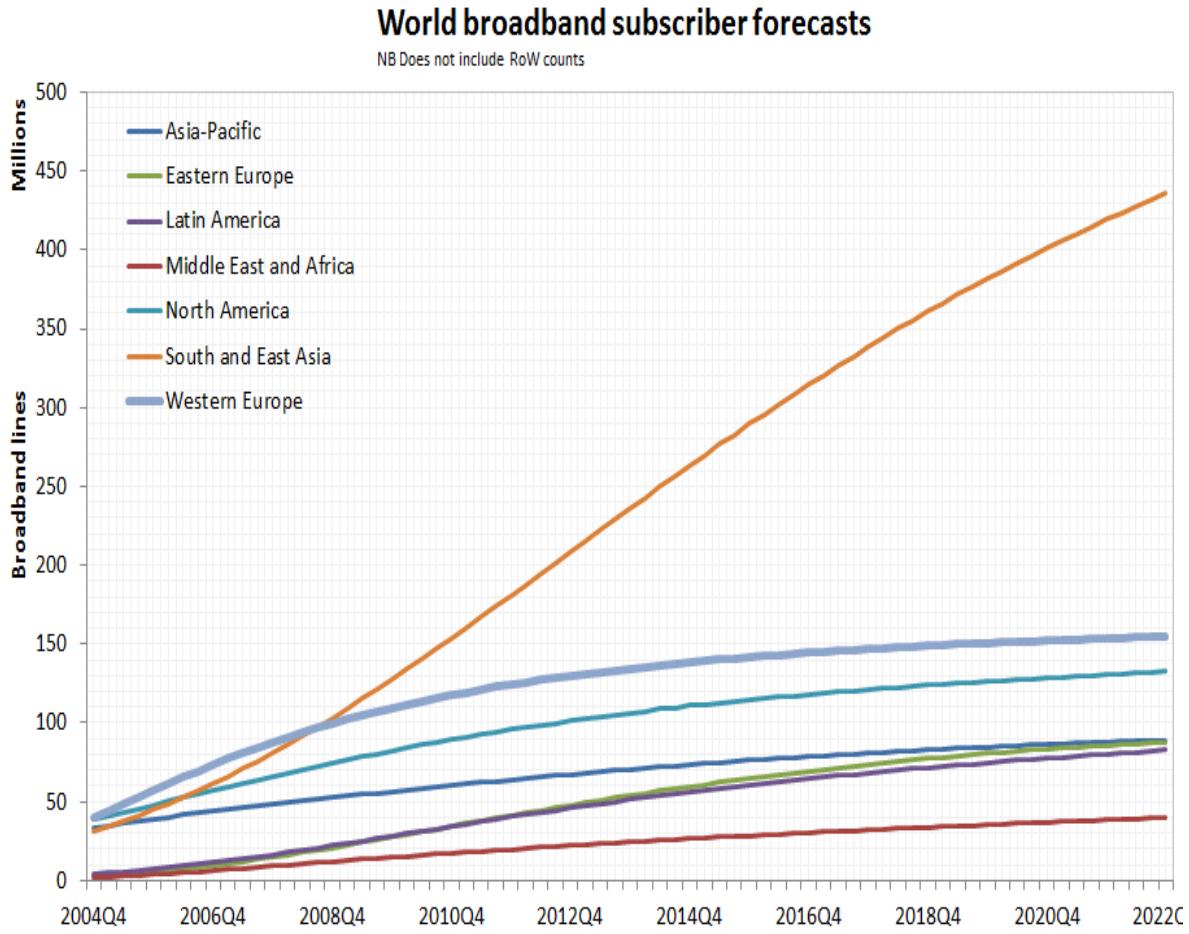
www.utstar.com

BROADBAND MARKET

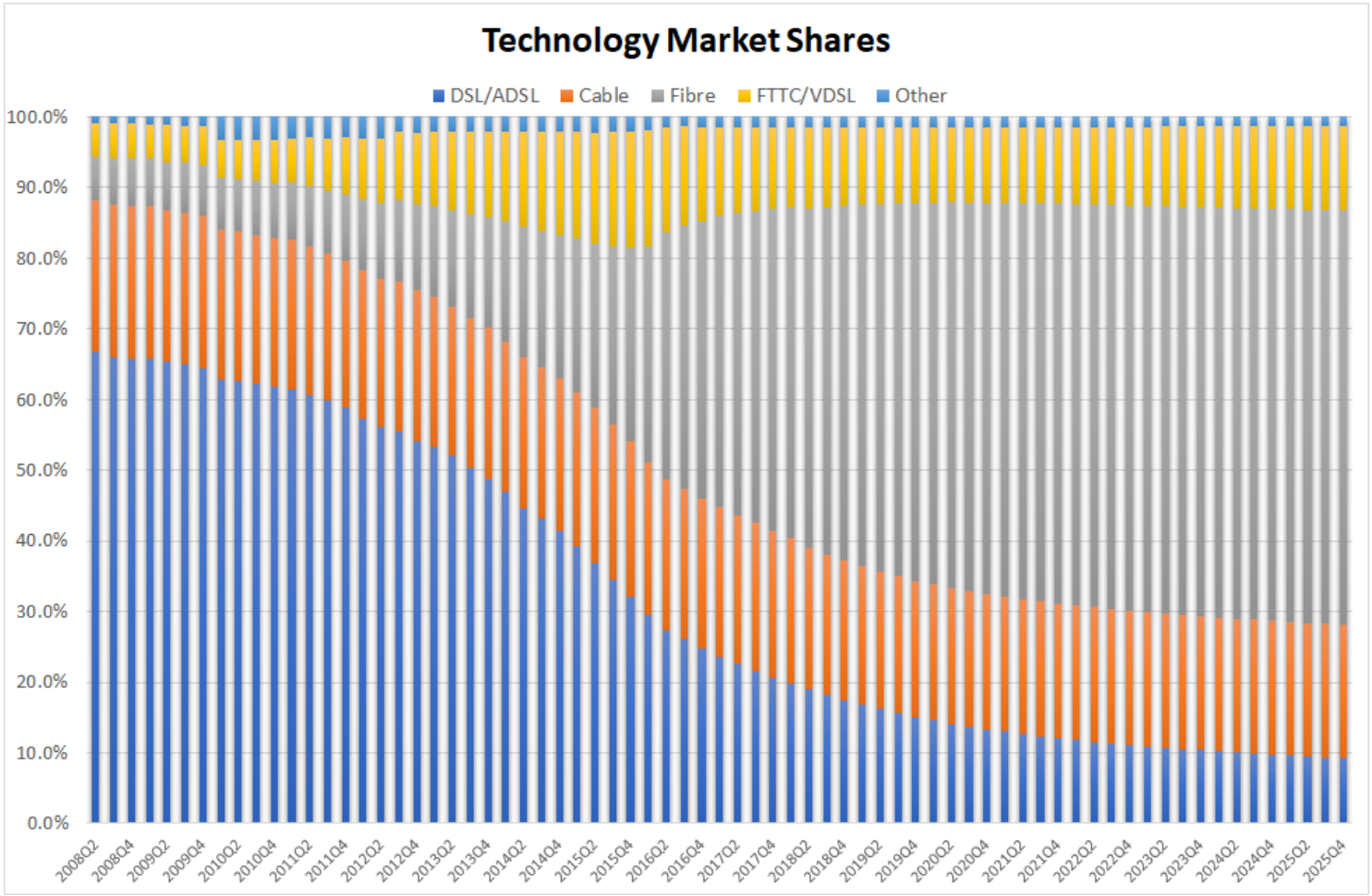




http://point-topic.com/free-analysis/global-fixed-broadband-subscriber-forecasts-2022/

BROADBAND MARKET

Wireline/fixed broadband



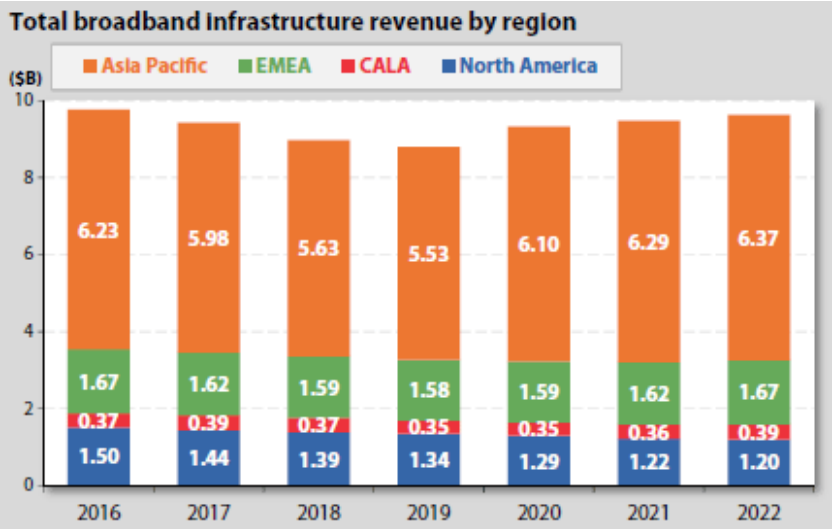
…by end-2025 some variants of fibre (FTTH/P/B) will be used by 59% of fixed broadband subscribers globally

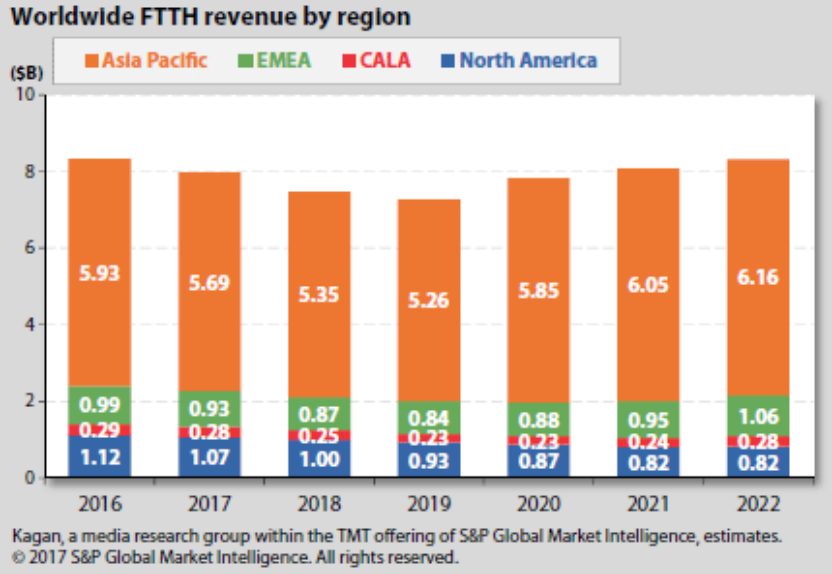
http://point-topic.com/free-analysis/the-first-billion-broadband-subscribers/

FTTX MARKET

- Beginning in 2020, overall spending on FTTX equipment is expected to pick up, based on increased shipments of XGS-PON and NGPON-2 equipment to support upgrades to first-generation FTTH networks, business services and backhaul of 5G wireless network traffic.

http://techblog.comsoc.org/tag/market-forecast/

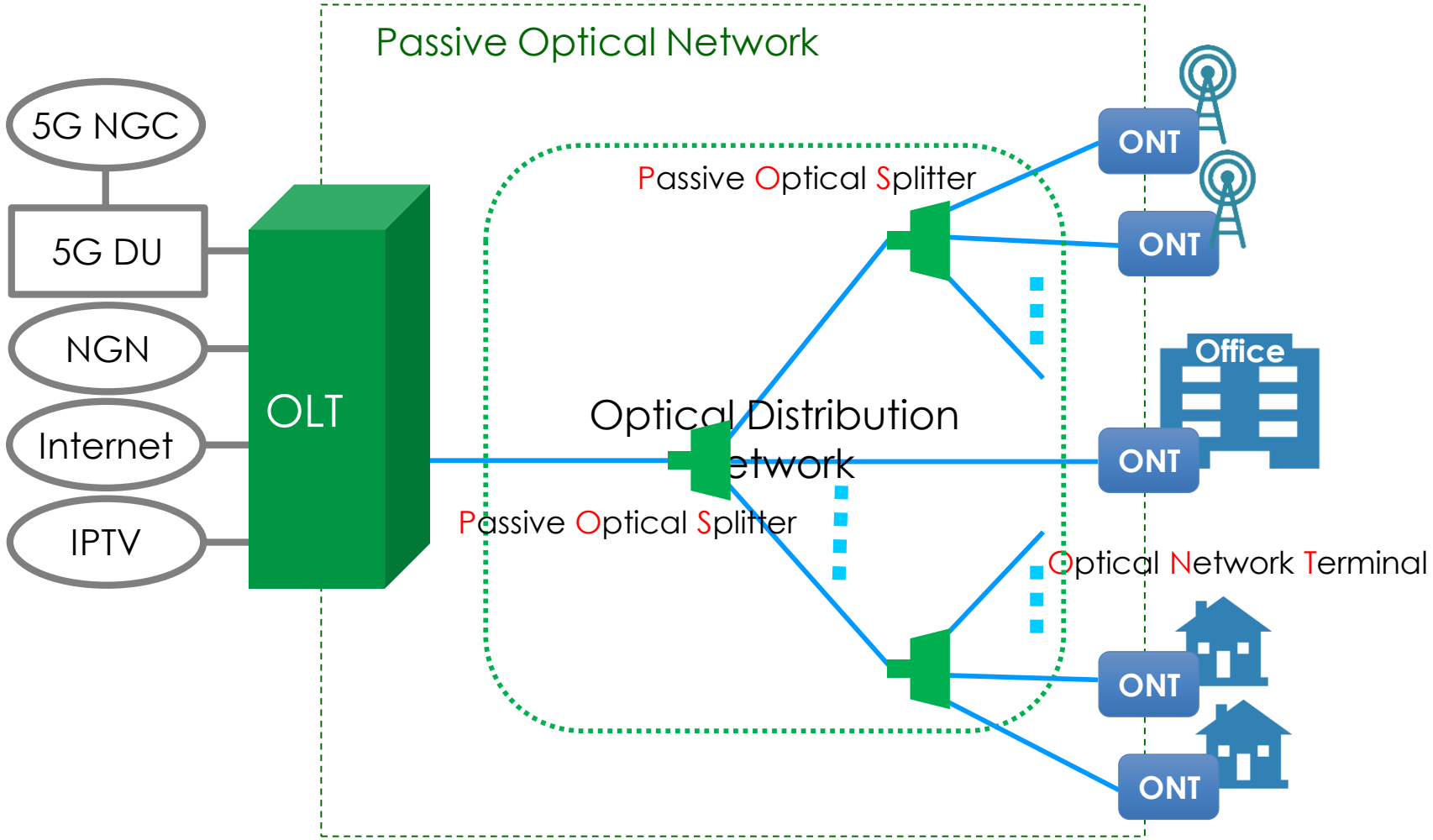




Technology Trends

TECHNOLOGY TRENDS

- ❑ **NG-PON2**
- ❑ **XGS-PON**
- ❑ **XG-PON**



TECHNOLOGY TRENDS

TECHNOLOGY TRENDS

- **XG-PON**
  - First standardized generation of NG-PON
  - Asymmetrical (2.5Gbps up and 10Gbps down)
  - Est. transmission distance <100km
  - Est. split ratio 1:256

TECHNOLOGY TRENDS

- **XGS-PON**
  - Symmetrical (10Gbps up and 10Gbps down)
  - Asymmetrical (2.5Gbps up and 10Gbps down)
  - Uses fixed optics and wavelengths, like current GPON technologies
  - Also provides an upgrade path to tunable optics to move to NGPON-2
  - Est. transmission distance <100km
  - Est. split ratio 1:256
  - Compatible with XG-PON ONTs

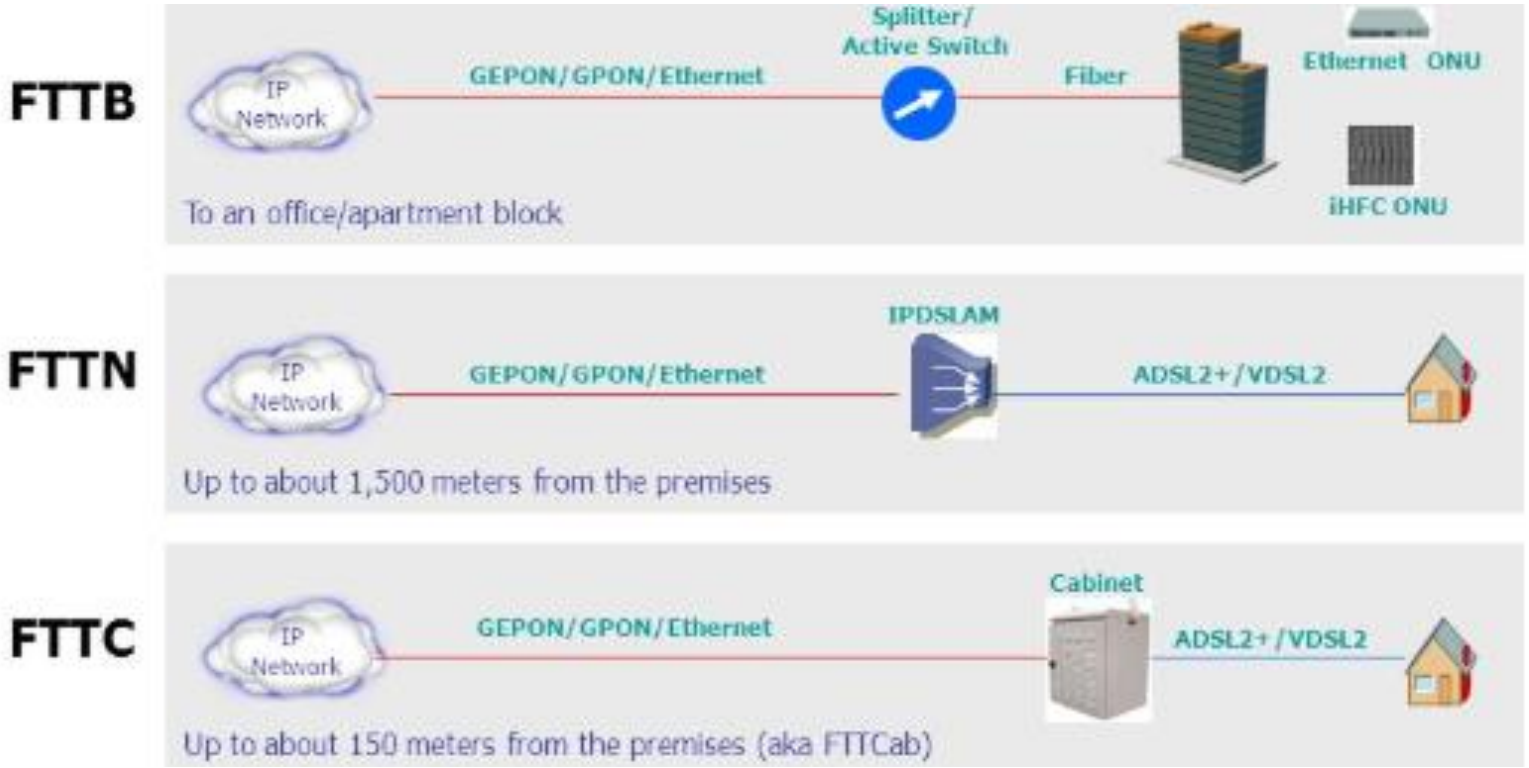
TECHNOLOGY TRENDS

- **NG-PON2**
  - Symmetrical (10Gbps up and 10Gbps down)
  - Asymmetrical (2.5Gbps up and 10Gbps down)
  - TWDM-PON
  - Multi-channel wavelengths
  - Tunable wavelengths
  - Four or eight symmetrical 10Gbps PONs on the same fiber

FTTX Networking Applications

FTTB/FTTP/FTTC/FTTN

The OLT is connected to ONUs in corridors (FTTB) or by the curb (FTTC) using an optical distribution network (ODN). The ONUs are then connected to user terminals. FTTB/FTTC is applicable to densely-populated residential communities or office buildings.



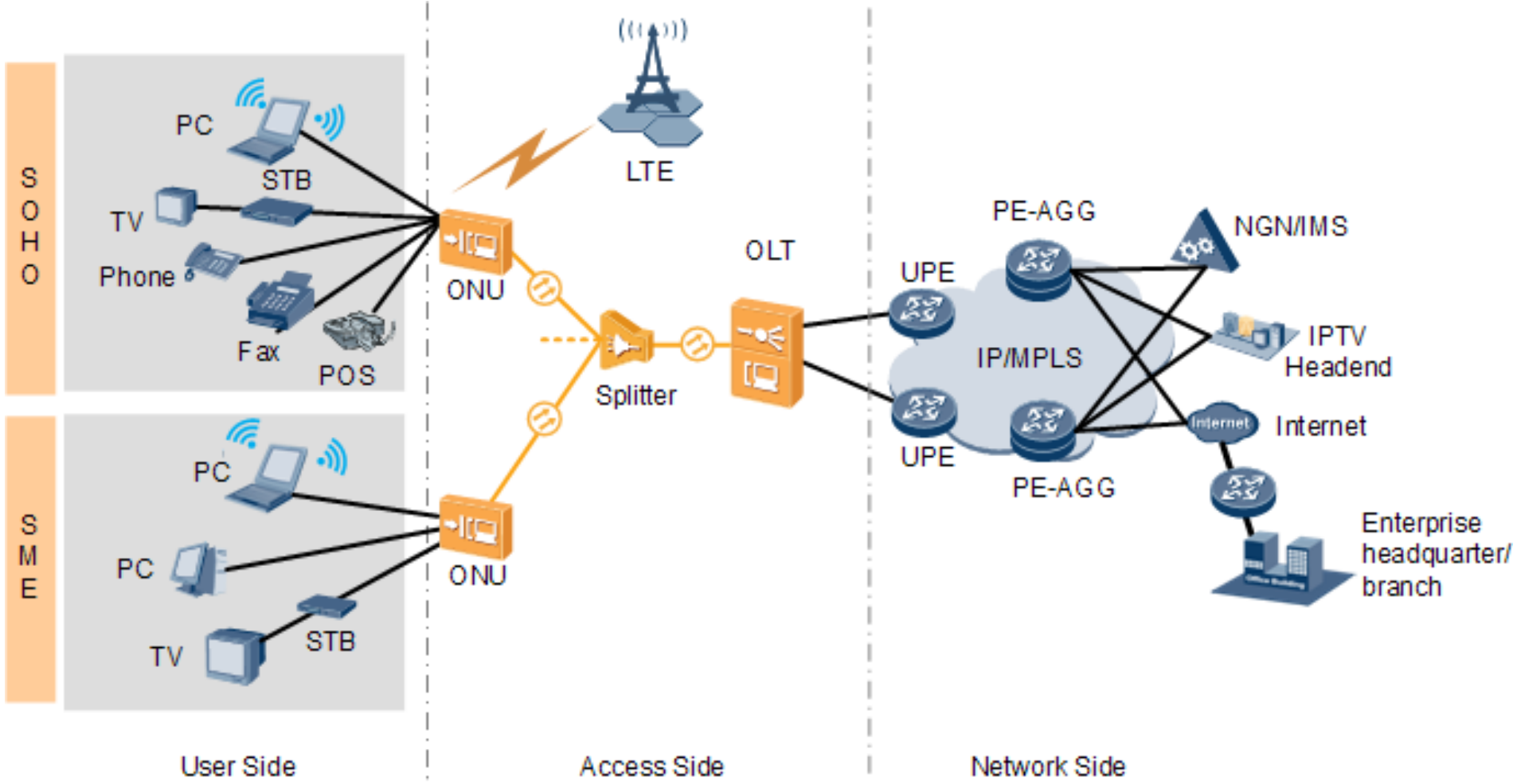
FTTD/FTTH

FTTD: uses existing access media at user homes to resolve drop fiber issues in FTTH scenarios.

FTTH: The OLT connects to ONTs at user homes using an ODN network. In this scenario, FTTH provides services of higher bandwidth for high-end users.

FTTO

The OLT is connected to enterprise ONUs using an ODN network. The ONUs are connected to user terminals. FTTO is applicable to enterprise networks.



WIRELESS BACKHAULING

Deliver Wireless Backhaul with Flexible Last Mile Access Options

Benefits:

- Opportunity to leverage Fiber for Wireless backhaul
- High capacity backhaul at lower cost than traditional services
- Superior QoS to ensure delay and jitter requirements
- Solution to provide the clock reference to base stations for its synchronization

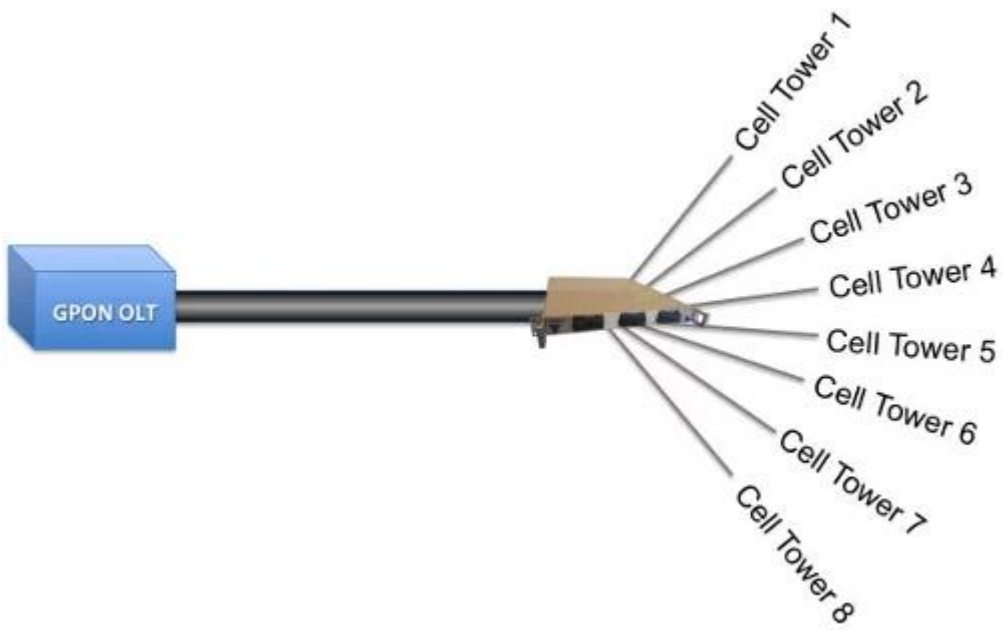
FTTW-A PERFECT BACKBONE FOR WI-FI

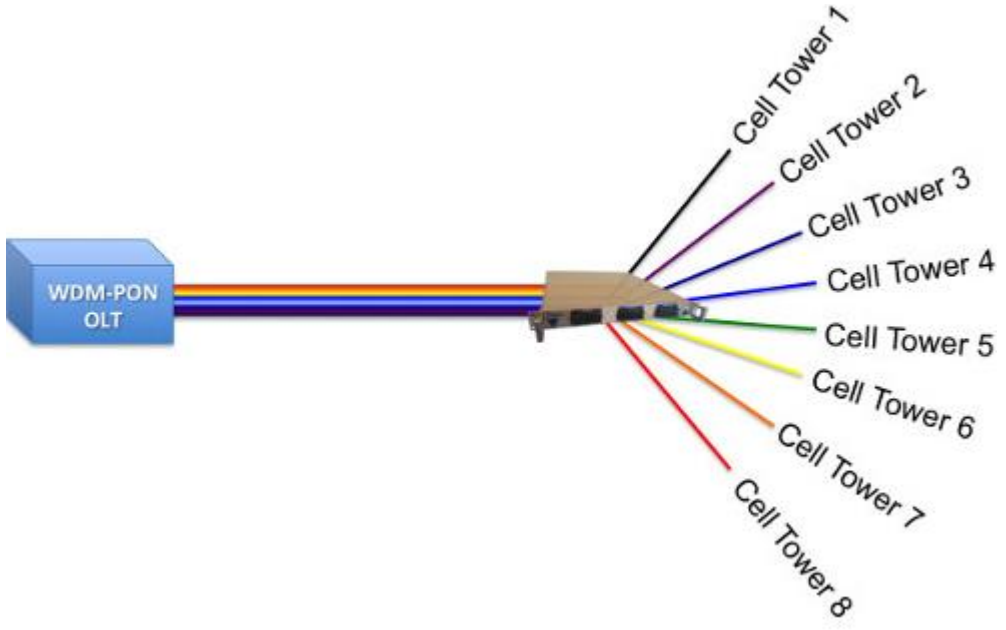
The OLT connects to ONUs using an ODN network, the ONUs connect to access points (APs). FTTW is the trend in Wi-Fi construction.

4G BACKHAUL

With the ability to deliver up to 10Gbps per port, GPON can also be a cost-effective technology for delivering higher bandwidth to cell towers.

WDM-PON uses an Arrayed Waveguide Grating (AWG) to multiplex and de-multiplex wavelengths between the feeder fibers and distribution fibers. The result is dedicated bandwidth and a more secure network for each cell tower. Another advantage of WDM-PON is the ability to add/drop wavelengths at intermediate cell towers that lie between mobile switching centers.





5G BACKHAUL-5G AND GPON A PERFECT BLEND

While wireless links may not be a viable option, Gigabit Passive Optical Network (GPON) deployments are currently being deployed to support 5G speeds over long distances. In late 2017, AT&T completed 10-gigabit-capable symmetric passive optical network (XGS-PON) trials in order to merge all services onto a single network, including the 5G wireless infrastructure. Verizon is adopting Next Generation PONs (NG-PON)—a gigabit-capable PON with more wavelength added to the fiber installation—for last milerouting.

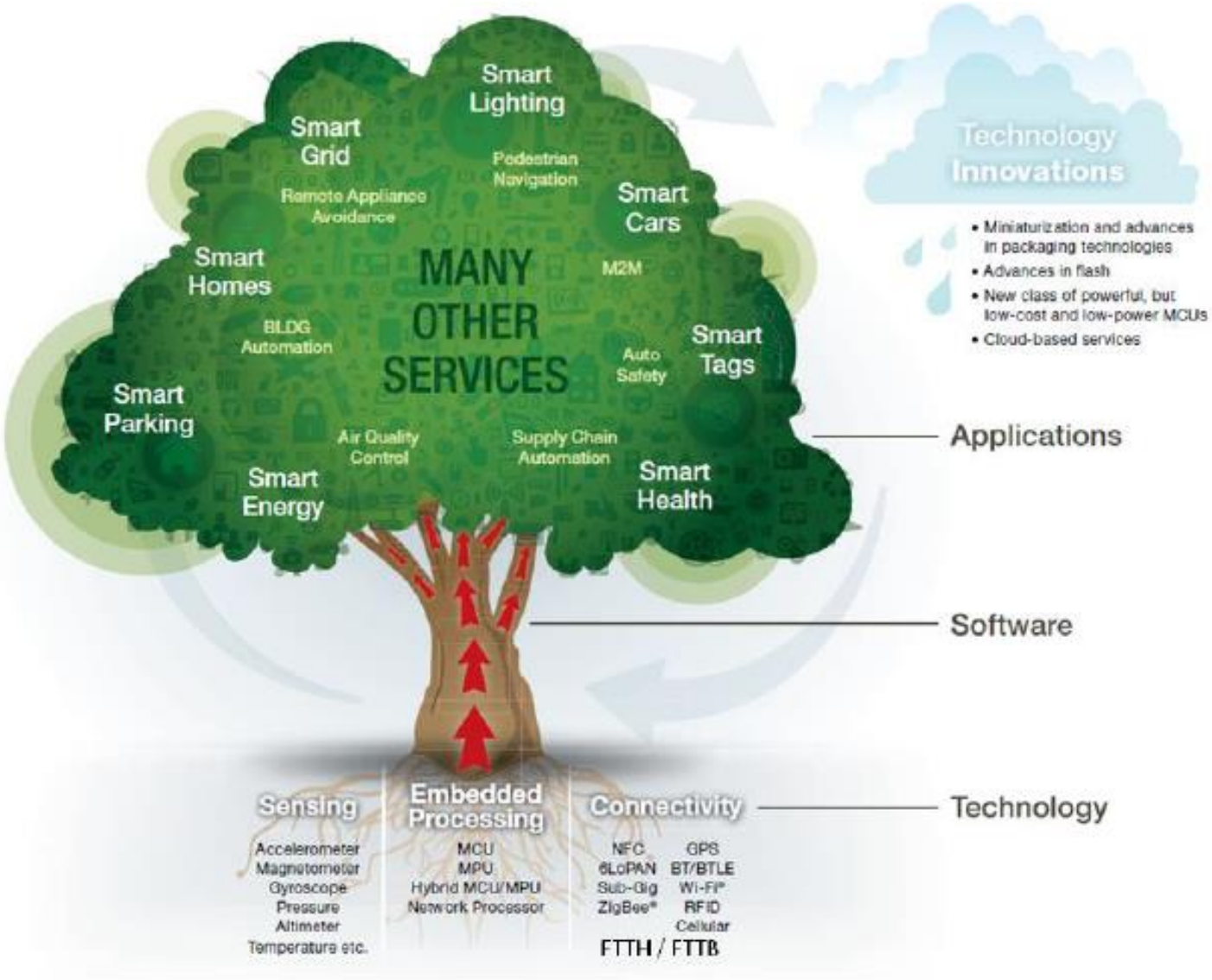
https://www.cablinginstall.com/home/article/16468526/the-role-of-fiber-in-5g-networks

SMART FTTX- BELIEVE IN SMART

FTTX technology is proven and best fit for smart applications. It is considered as default technology to provide connectivity for services envisaged in IOT .

It can enable connectivity for .....

1) Smart Homes
2) Smart offices
3) Smart Cities



[Source: Freescale /ARM 2014]

FTTX HARDWARE INTEROPERABILITY

1. Despite promising growth, the interoperability issues between various vendors' of optical line terminals (OLT) and optical network unit (ONU) equipment has caused an array of problems for many service providers.

2. We observed that FTTH industry is becoming more open and vendors are more enthusiastic for interoperability .

FTTX Deployment Models

FTTX DEPLOYMENT APPROACHES

- The two approaches of supply-driven deployment and demand-driven deployment Strategies.

Supply Driven Strategy

- The supply-driven strategy starts the deployment independently of any guaranteed demand. The large national broadband networks can follow this strategy.
- This strategy is inevitably higher risk as there is no guaranteed revenue.
- Same time this strategy can benefit the service providers to capture the market share quickly

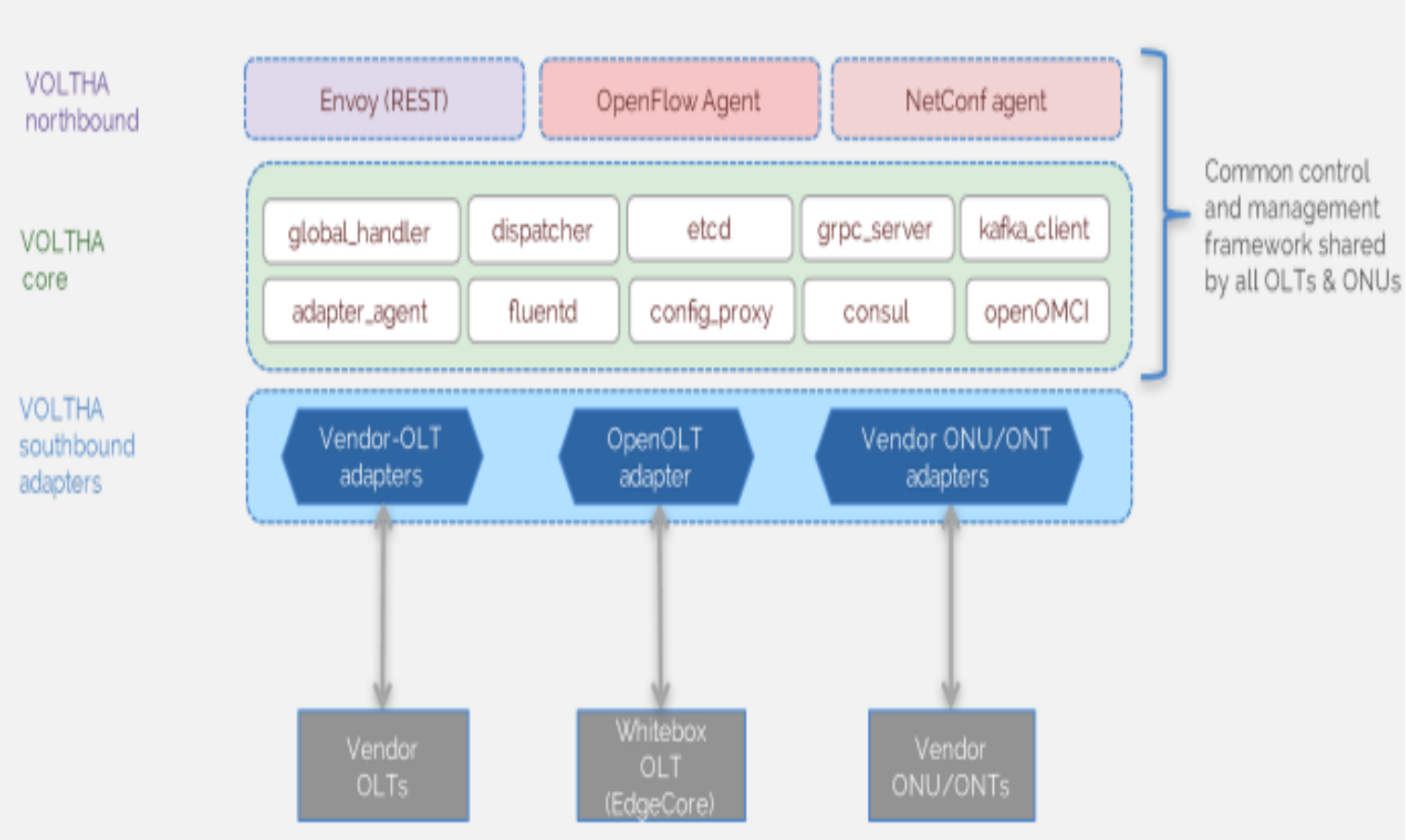
FTTX DEPLOYMENT APPROACHES

Demand-driven Strategy

- This type of deployment only starts if a certain number of pre-contracts are already signed.
- This strategy requires a minimum which is believed necessary to achieve a positive return on investment according to numerous techno-economic investigations.
- Because this strategy links investment directly to revenues so has much lower financial risk and secure revenues.
- But suffer from the problem of potentially long delays before deployment can commence and maybe losing out to neighboring areas that deploy earlier.

VIRTUAL OLT HARDWARE ABSTRACTION (VOLTHA)™

Software Defined Access: Powering a 10 Gbps XGS-PON Network for 5G and More



Access as a Switch: Makes an access network look like an abstract programmable switch

Evolution to virtualization: Works with legacy as well as virtualized devices. Can run on the device, on general purpose servers, or in a virtualized cloud.

Unified OAM abstraction: Provides unified, vendor/technology agnostic management interface

DevOps bridge to modernization: Brings the latest development techniques to telecommunications

VIRTUALIZATION OF FTTX-SDN AND NFV

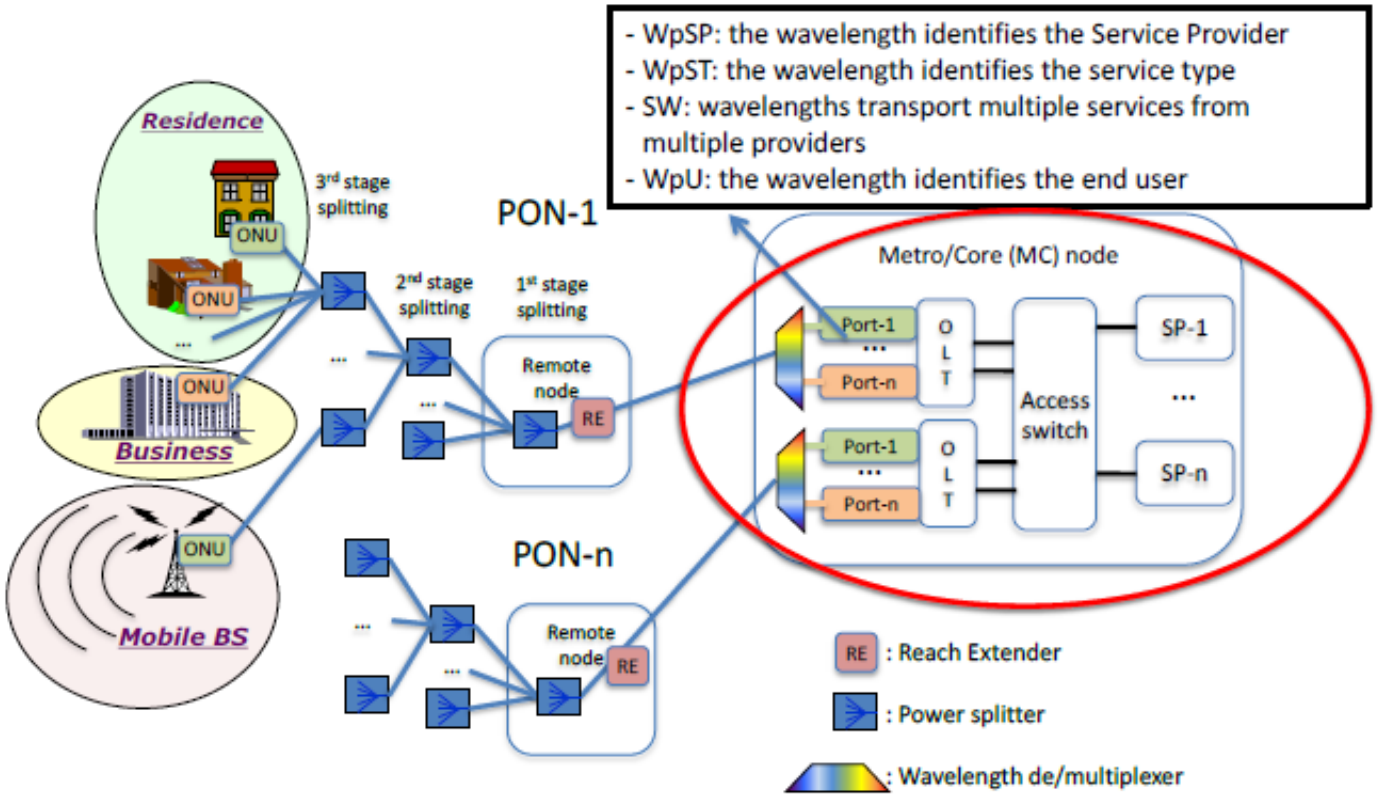
- Telecom and IT industry is experiencing a shift towards the virtualization .
- SDN and NFV are becoming more popular choices for core network deployment.
- SDN and NFV starts rejuvenating GPON.
- Separating control plane and data plane in the access infrastructure.
- Software in commodity servers through NFV could produce a new virtual OLT.
- Fully programmable and will allow different operators to take control of virtual slices of PON.
- Some of the European and American vendors started testing Virtualized FTTX.

https://www.lightreading.com/nfv/nfv-tests-and-trials/atandt-testing-virtualized-gpon/d/d-id/715748

https://about.att.com/innovationblog/voltha

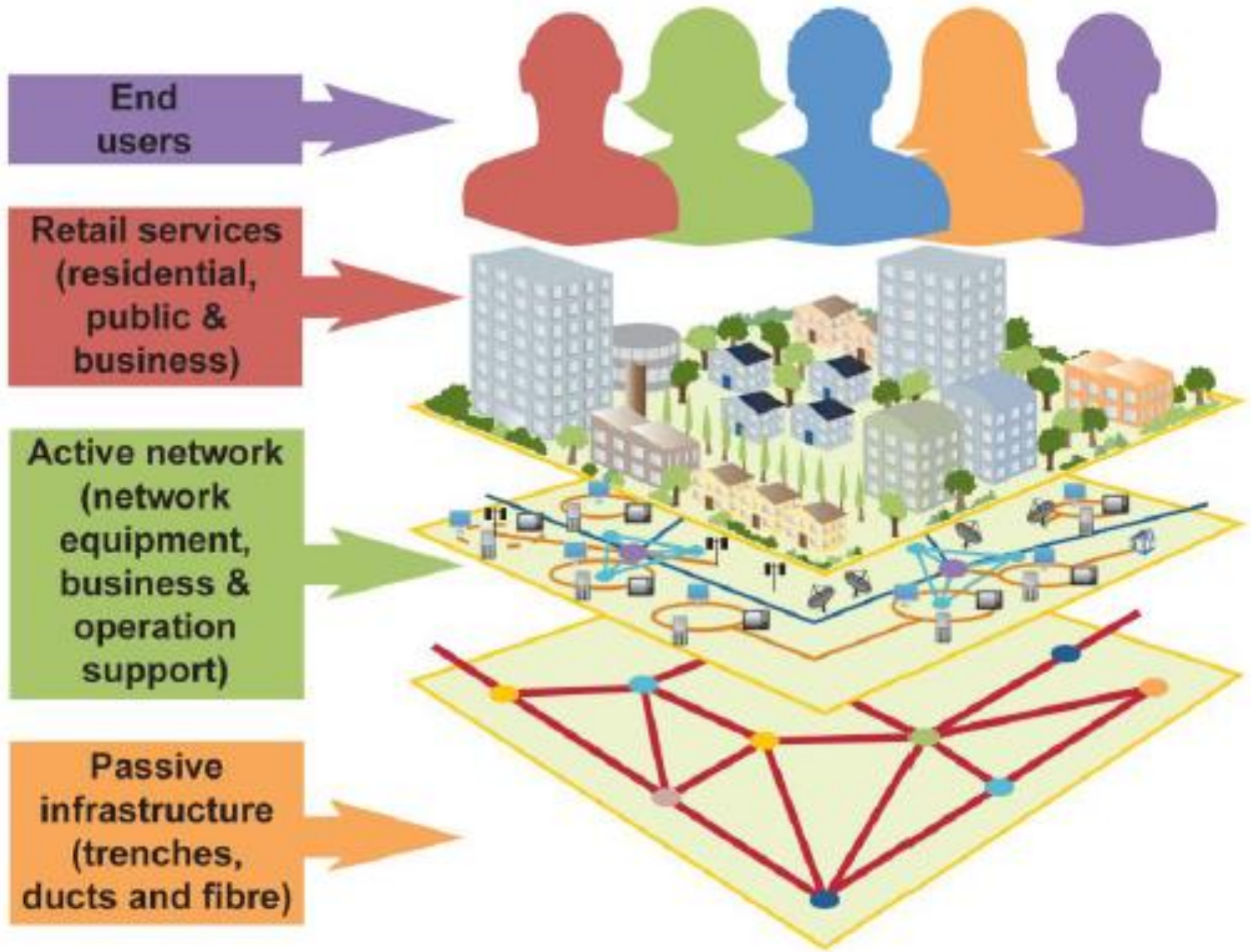
WAVELENGTH USAGE MODELS

A. Wavelength assigned to service providers
B. Wavelength assigned to service types
C. Wavelength used flexibly for bandwidth management
D. Wavelength assigned to users



FTTX Ownership Models

OWNERSHIP MODELS



OWNERSHIP MODELS

An FTTX network can comprise of a number of different layers:

The passive infrastructure involving ducts, fiber, enclosures and other outside plants

Who OWN the passive hardware & Fiber infrastructure ?

We understand that there are many RoW issues in India which creates unjustifiable delays in project execution . Due to RoW issues the project goes into cost overrun and time overrun state.

We strongly believe that OSP (***passive hardware & Fiber infrastructure)*** *should be owned by following entities…*

- municipalities or local governments
- utility companies
- Incumbent telecoms operators
- real-estate developers
- residential associations
- community project teams

OWNERSHIP MODELS

The active network using electrical equipment which include OLT and ONTs

Who OWN the Active hardware (OLT & ONT) infrastructure?

We strongly believe that active electronic network equipment (OLTs and ONTs) *should be owned by following entities…*

- Incumbent telecom operators
- New Telecom operators
- Virtual Network operators (VNOs)
- Retail Service Providers

OWNERSHIP MODELS

Retail services, which provide internet connectivity and managed services, such as IPTV and internet

An additional layer can also be included:

Content(OTT), located above the retail services layer and the end users. This can be exploited commercially by "over the top" content providers.

Who OWN the Services?

We strongly believe that services *should be owned by following entities…*

- Incumbent telecom operators
- New Telecom operators
- Virtual Network operators (VNOs)
- Internet service provider (ISP)
- OTT (over the top)content providers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Thank you !