

# Creating a brighter future

Deployment & Operations Committee

## FTTH Basics – Architecture, Topology and Technology

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Moderator:

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Chair

Deployment & Operations  
Committee

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Vice Chair

Deployment & Operations  
Committee

# FTTH Council Europe

**Our Vision: A sustainable future enabled by Fibre to the Home**

## **Our Mission**

- To accelerate FTTH adoption through information and promotion in order to enhance the quality of life, contribute to a better environment and increased competitiveness

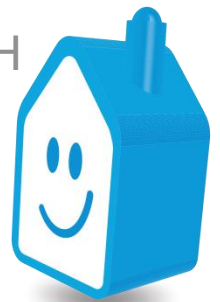
## **Organisation**

- Founded in 2004, non-profit industry organisation
- More than 150 member companies



# Webinar

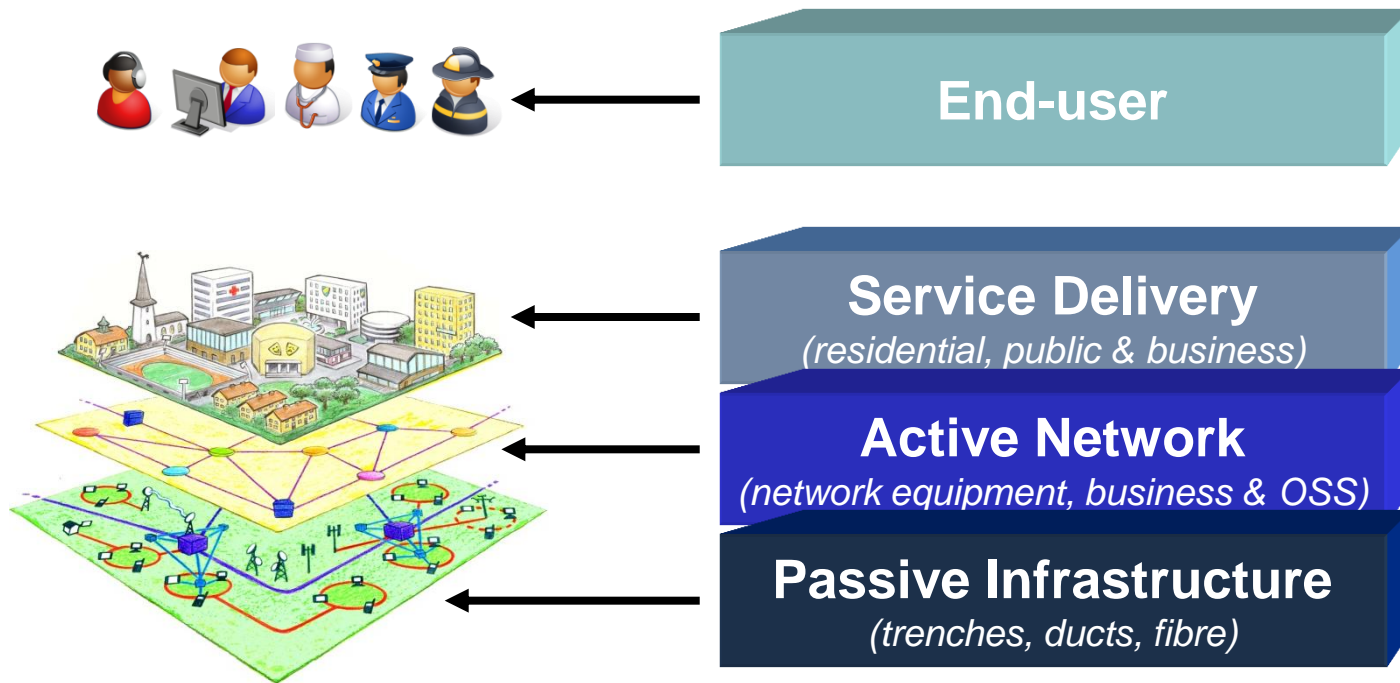
- 20-25 minutes presentation
- 15-20 minutes Q&A
- Please write your questions in the questions box of the webinar system
- Relevant questions that are not answered during the webinar will be answered by email
- The slides will be available for download after the webinar
- The webinar is recorded and can be viewed as video-stream afterwards. The video will be available on the website of the FTTH Council Europe within one week
- Slides and information about the availability will be sent to registered attendees by email



The following presentation does not necessarily reflect the opinion of the FTTH Council Europe

# FTTH

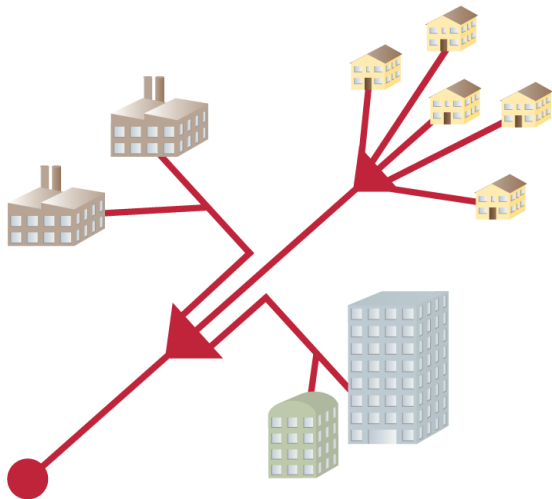
## The Layered Model



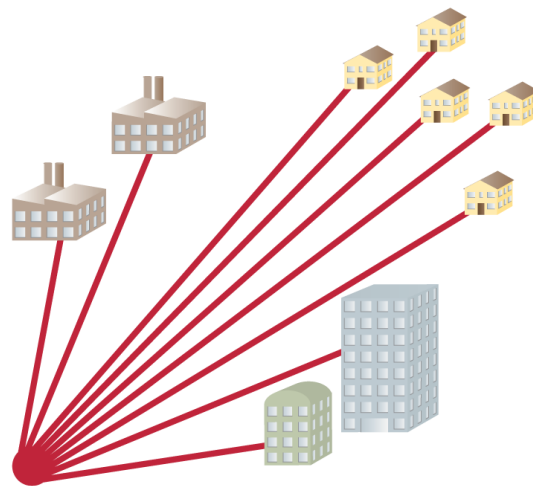
# Passive Infrastructure FTTH Topologies

## Topology

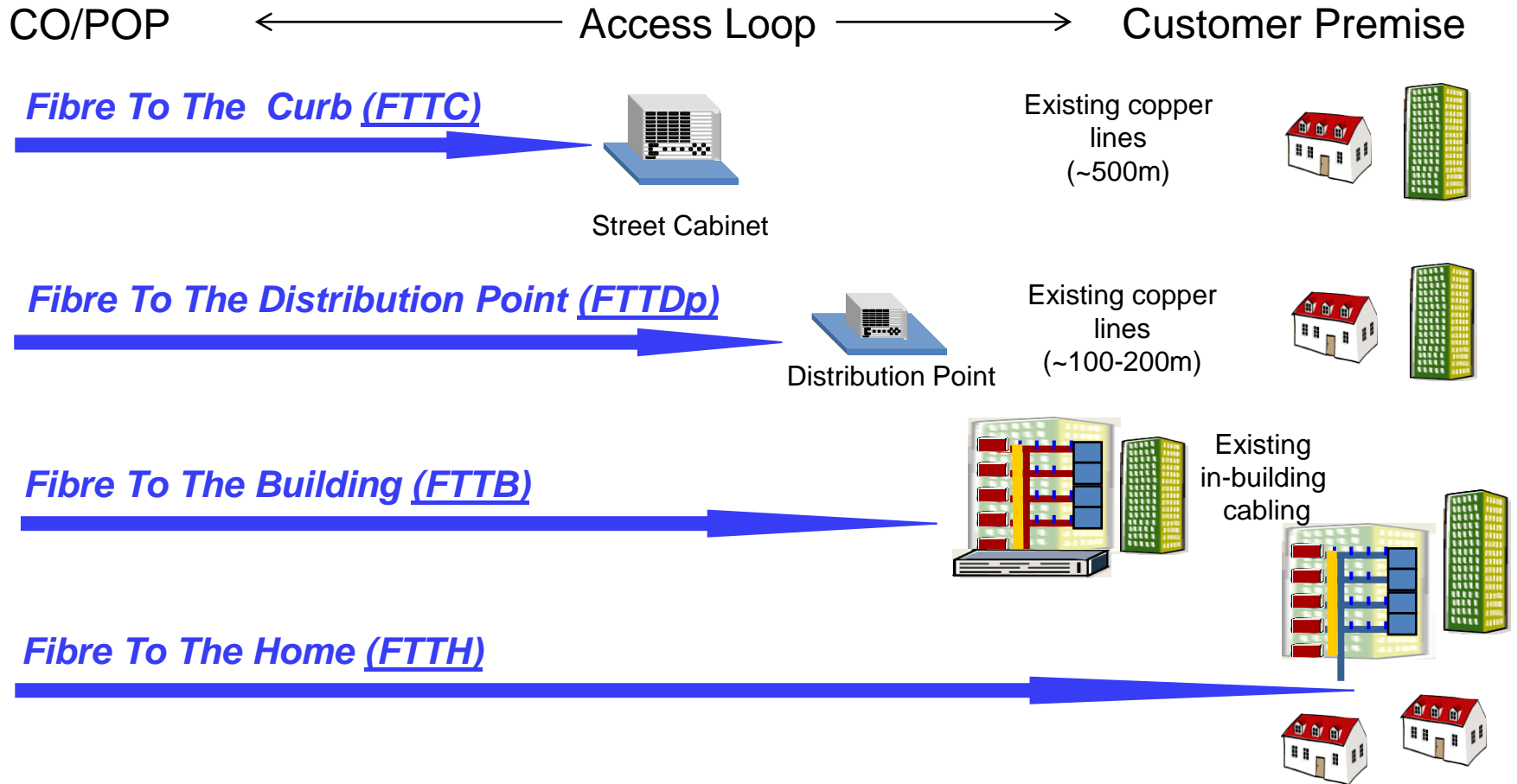
- Point to Multi-Point (P2MP)



- Point to Point (P2P)



# FTTx Architectures



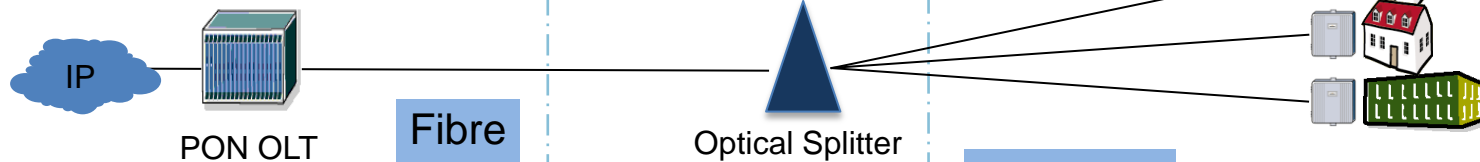
# Active Infrastructure FTTH Technology

Point of Presence

Access loop

Customer Premise

PON  
(P2MP)

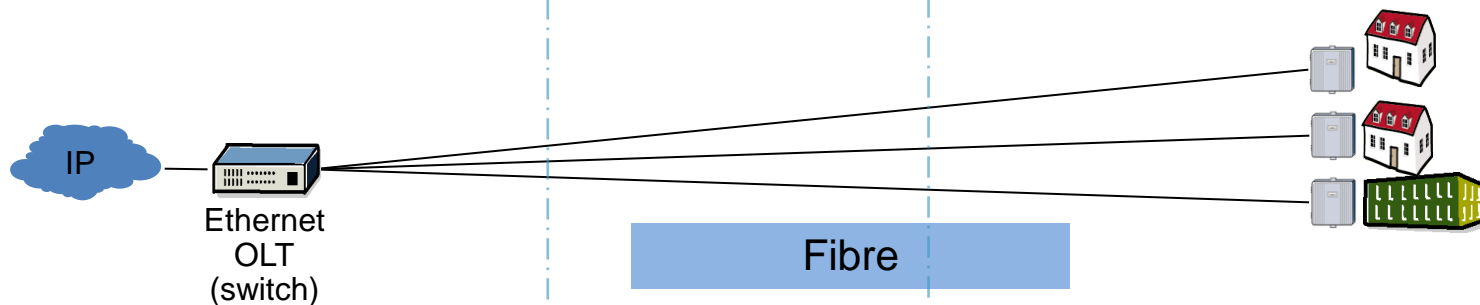


Fibre

Optical Splitter

Fibre

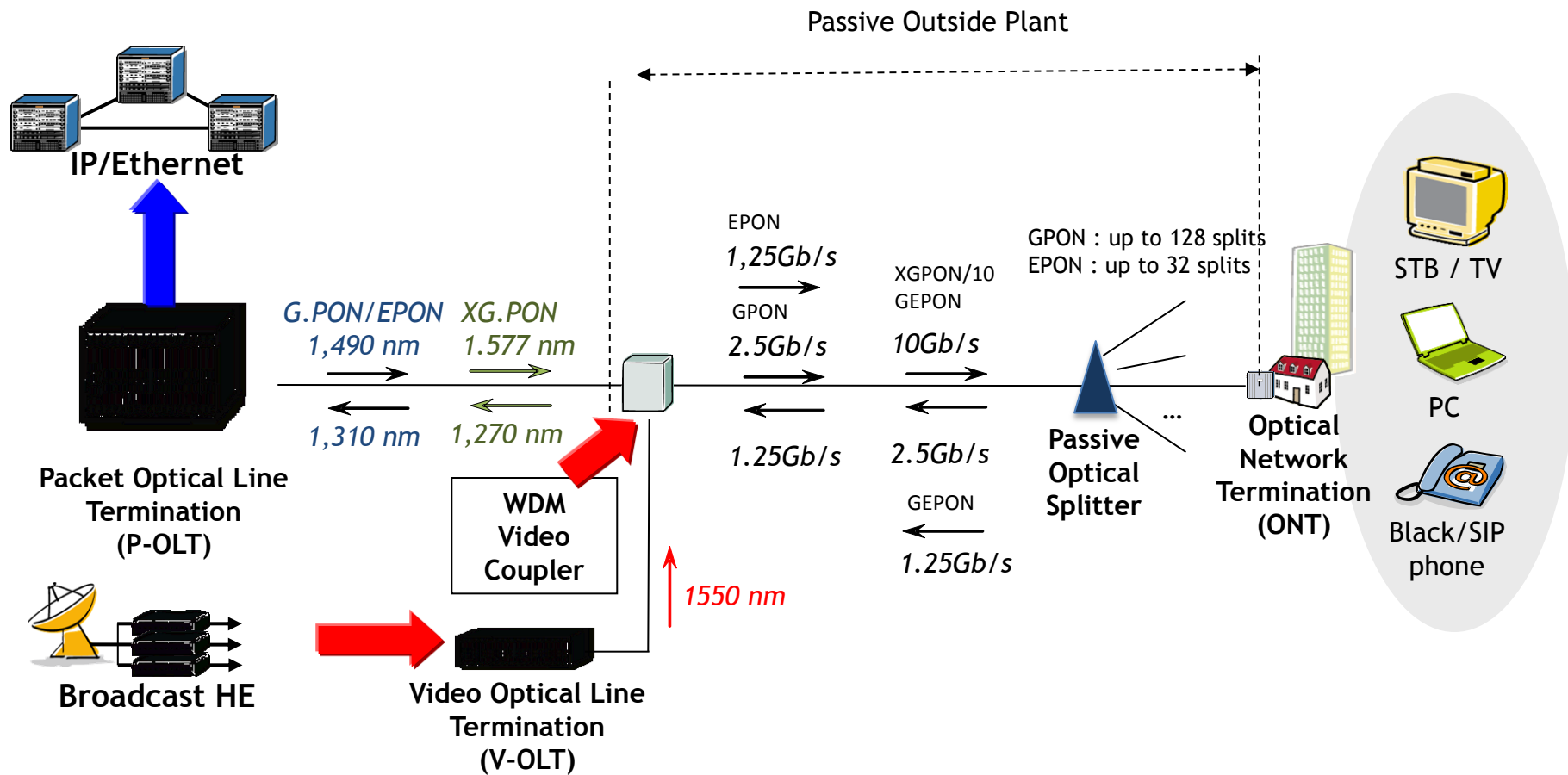
Ethernet  
(P2P)



Fibre

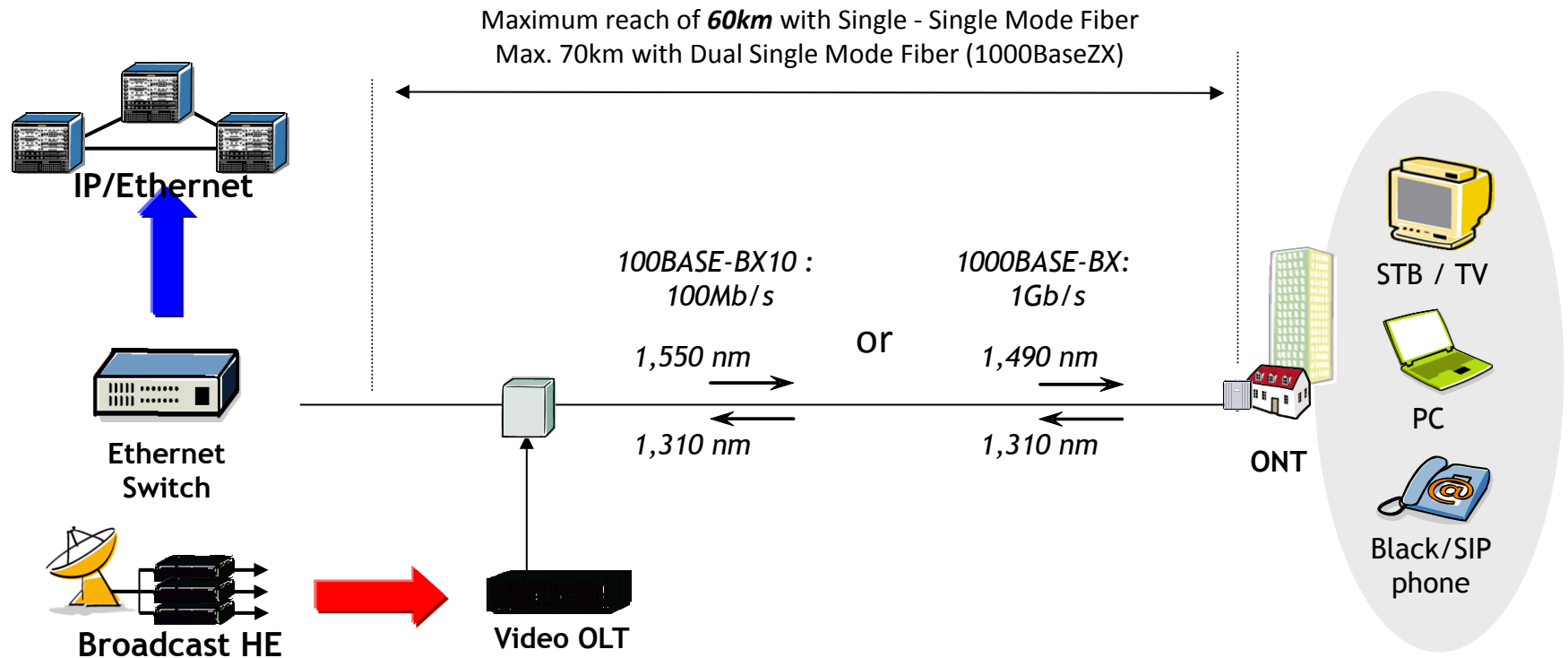
# Active Infrastructure

## The FTTH Solution Based On PON



# Active Infrastructure

## The FTTH Solution Based On Ethernet P2P



Two options for RF Video Overlay (1,550 nm)

- Additional fibre from Video OLT and fed into coax
- Signal inserted into each fibre (triplexers)

# Active Infrastructure General Standardization

It started in the 90's...

The standard of the 90's		The standard of 2004		The standard of 2010	
<b>FSAN – ITU</b>	<b>APON</b>	<b>BPON</b> G.983	<b>GPON</b> G.984	<b>XG-PON1</b> G.987	<b>NG-PON2?</b>
<b>IEEE</b>			<b>EPON</b> IEEE 802.3ah	<b>10G-EPON</b> IEEE 802.3av	



**PON**  
(P2MP)

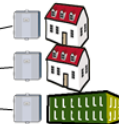


PON OLT

Fibre

Optical Splitter

Fibre

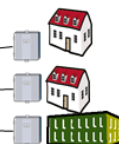


**Ethernet**  
(P2P)



Ethernet OLT (switch)

Fibre



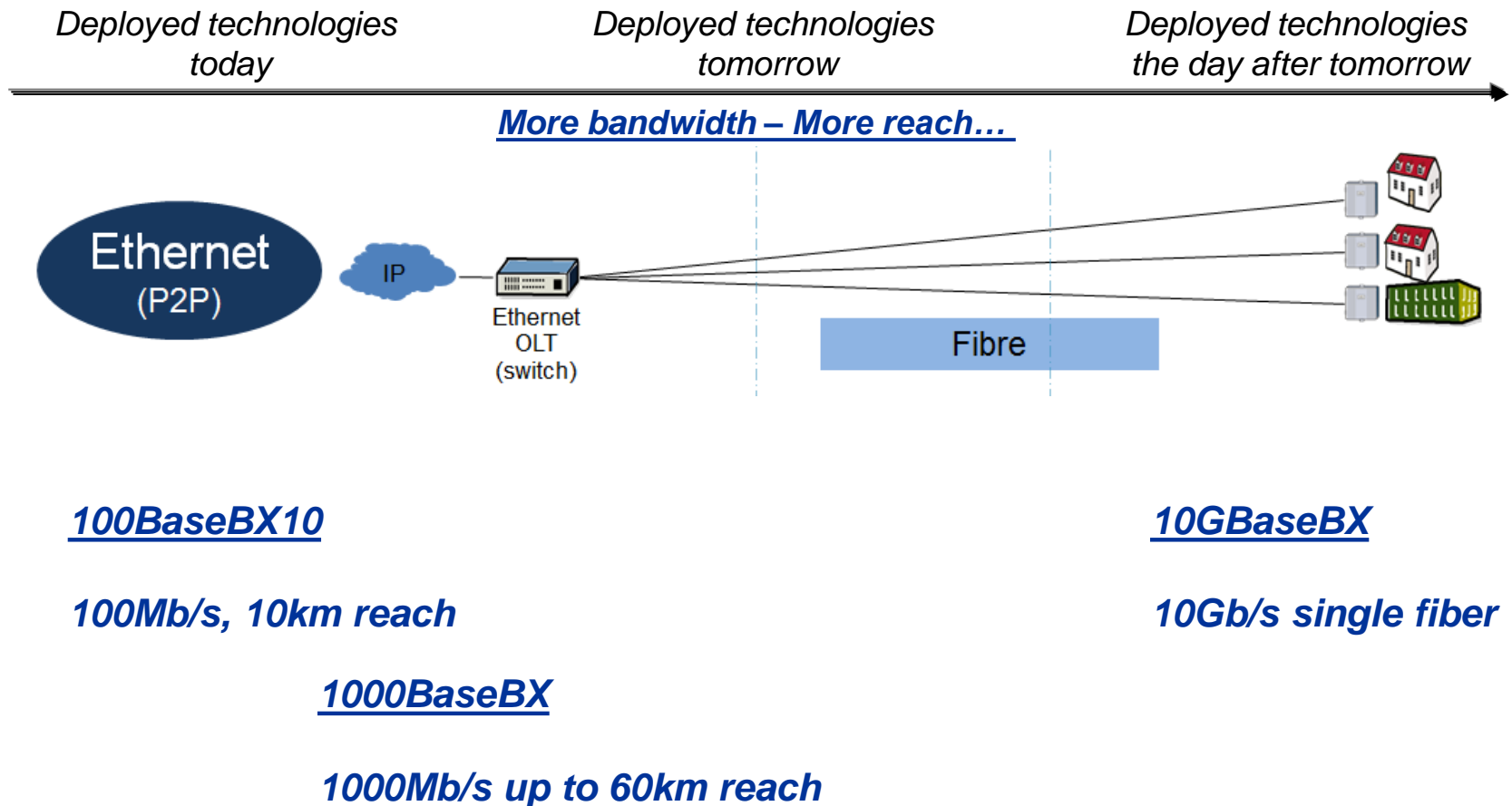
It started in the 70's...

The standard of 2005	
<b>IEEE</b>	<b>EFM</b> (Ethernet in the First Mile) → <b>100BASE-BX</b> (FE) <b>1000BASE-BX</b> (GE) <b>10GBASE-BX</b> (10GE)



# Active Infrastructure

## FTTH Technology Evolution - Ethernet



# Active infrastructure

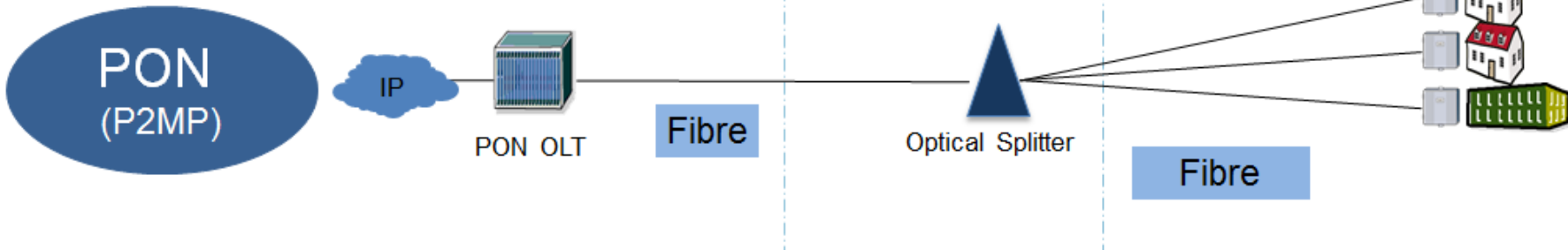
## FTTH Technology Evolution - PON

Deployed technologies  
today

Deployed technologies  
tomorrow

Deployed technologies  
the day after tomorrow

More bandwidth – More splitting – More reach...  
(10G...) (128...) (60km...)



### Class B optics

1:64 Split ratio  
20km reach

### Class C Optics

1:128 Split ratio  
60km reach

### NG-PON1 technologies

XG-PON1 : 10Gb/s DS – 2.5Gb/s US

XG-PON2 : 10Gb/s DS - 10Gb/s US

### The evolutionary approach of NG-PON1

Reuse Optical Distribution Network

Coexistence of G.PON/NG-PON customers

### NG-PON2 technologies

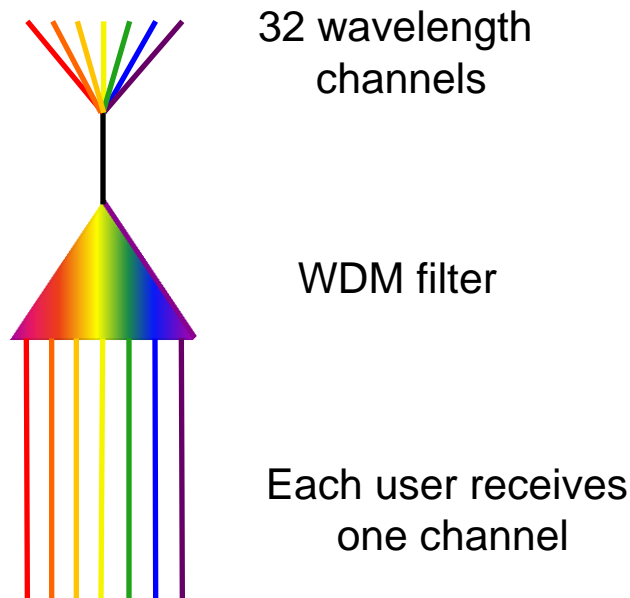
“the revolutionary approach”



# Active Infrastructure

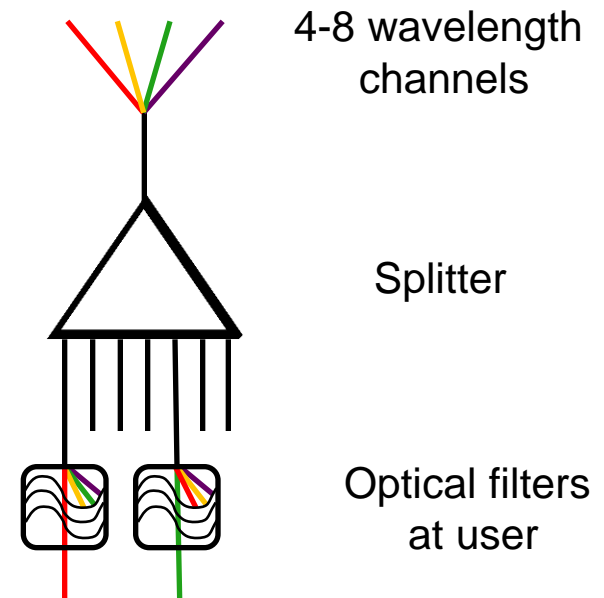
## PON Evolution & standardization

### “Real” WDM PON



- Dedicated wavelength per user
- Typically 32 users
- Requires 32/64 colours
- No real standards, some talks in ITU

### Using WDM in PON (NG-PON2, TWDMPON)



- 4-8 channels, each carrying a “normal” PON
- Users subscribed to one of the channels
- Requires extra filters, add complexity
- FSAN/ITU driven: (part of GPON roadmap)
- Wavelength per operator

# Active Infrastructure

## PON Evolution NG-PON2

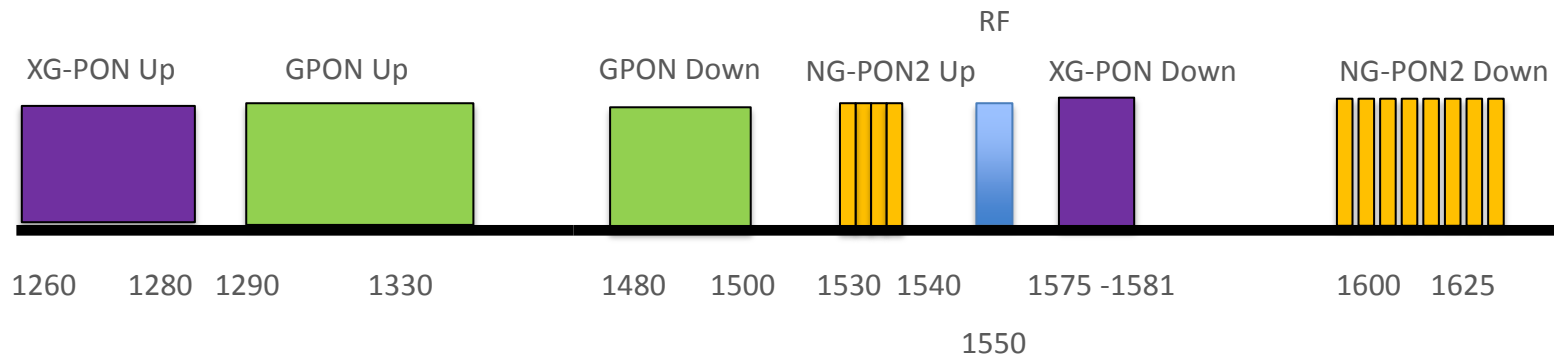
### NG-PON2 will support multiple 10G (G.987) wavelengths

ONU has tunable upstream laser as well as a tunable receiver

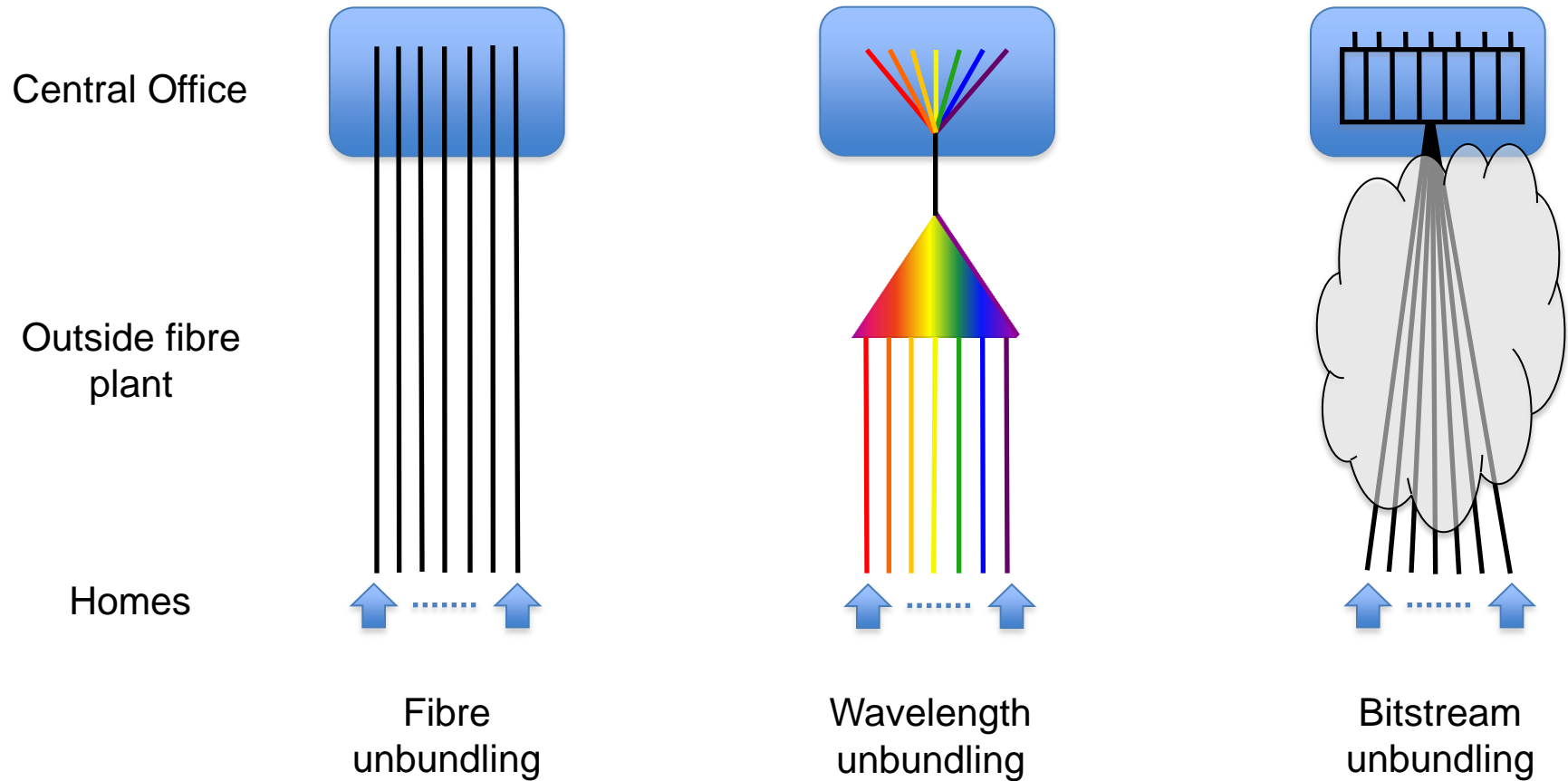
4 wavelengths in the downstream, with an option of up to 8

Up to 4 wavelengths in the upstream

RF overlay at 1550nm is not impacted by NG-PON2 and is continued to be supported



# Unbundling Options Compared

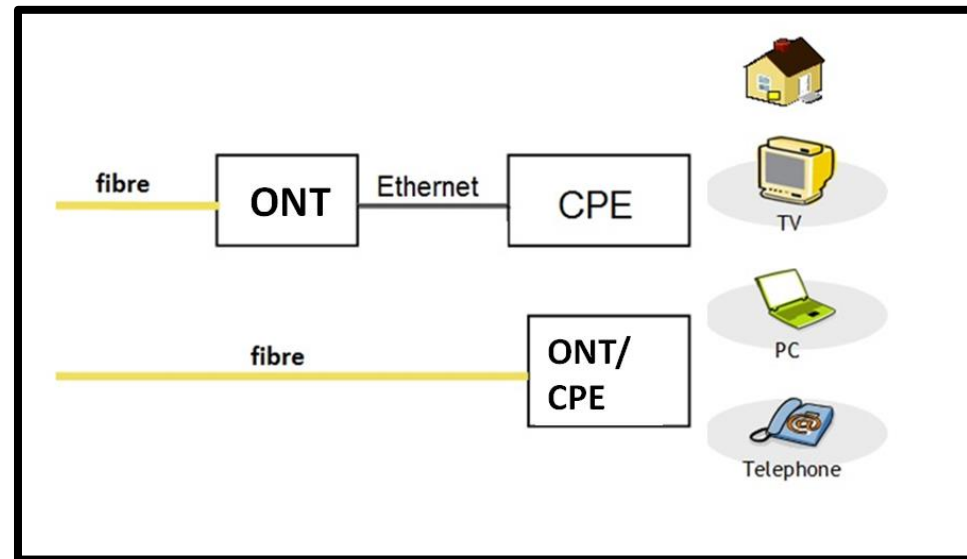


# Active FTTH Infrastructure

## Customer Premises Equipment (CPE)

Service Provider's regard the CPE as demarcation point for their services and termination of the FTTH line

- 2 major types of CPE approaches, depending on the service offering
- **ONT (Optical Network Termination)**  
Terminates incoming fiber and provides Ethernet Interface(s) towards the subscriber
- **Residential Services Gateway**  
Combined ONT and Service termination  
Mostly Voice/Data combinations  
routing, wireless LAN (Wi-Fi), security and firewall, integrated VoIP and quality of service capabilities



# FTTH Standardization

## Service Delivery And Interoperability

### Standardization enables wide adoption of FTTH

- Transmission, Components
  - PON
  - Ethernet
- Services, Provisioning, Interoperability
  - Broadband Forum
    - Service delivery TR-101/TR-177
    - Automatic CPE provisioning TR-69
    - OLT ⇔ ONT/ONU interoperability TR-247
  - Metro Ethernet Forum
    - Ethernet Services, Transport Services



# The FTTH Handbook

## Written by the D&O Committee of the FTTH Council Europe

- What is it's purpose?
- Explaining all elements associated with FTTH deployments
- Listing details of deployment options when planning and building FTTH
- Two main parts
  - Active Infrastructure
    - Active Network Components & Technologies
  - Passive infrastructure
    - Infrastructure Components, Cabling, OSP,
- Current version, released in Feb 2012 has been downloaded more than 1500 times
- New release will be available in Feb 2014
  - to be released at the Stockholm Conference



# Download the FTTH Handbook

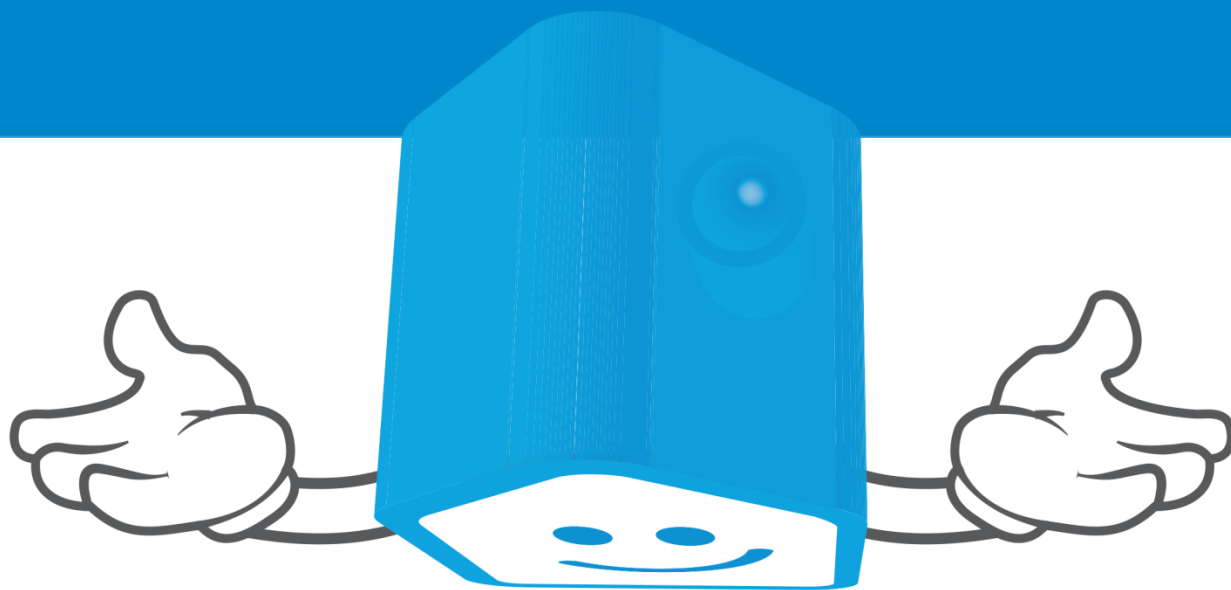


# FTTH Conference 2014

## Join us Next Year in Stockholm!

### 18-20 February 2014





[www.ftthcouncil.eu](http://www.ftthcouncil.eu)

