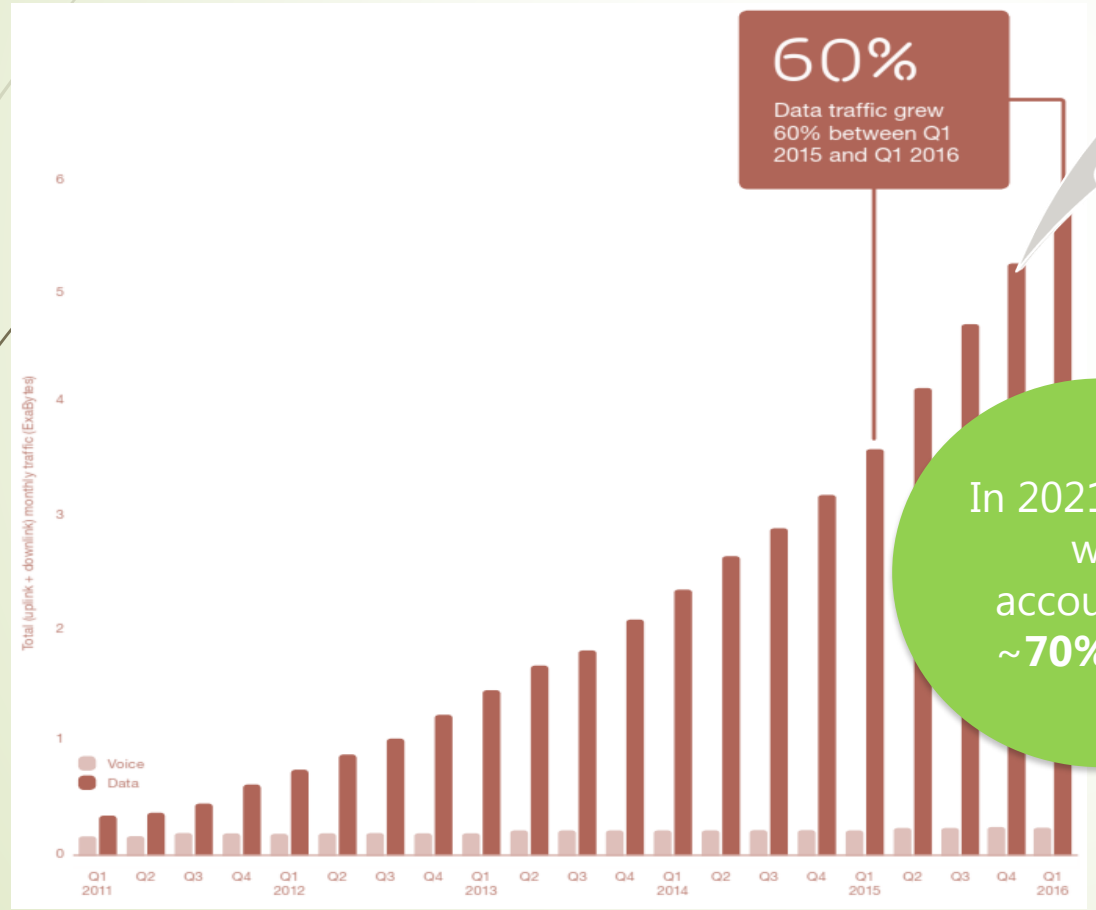
Ασύρματα Δίκτυα νέας γενιάς και η διασύνδεσή τους με οπτικές ίνες

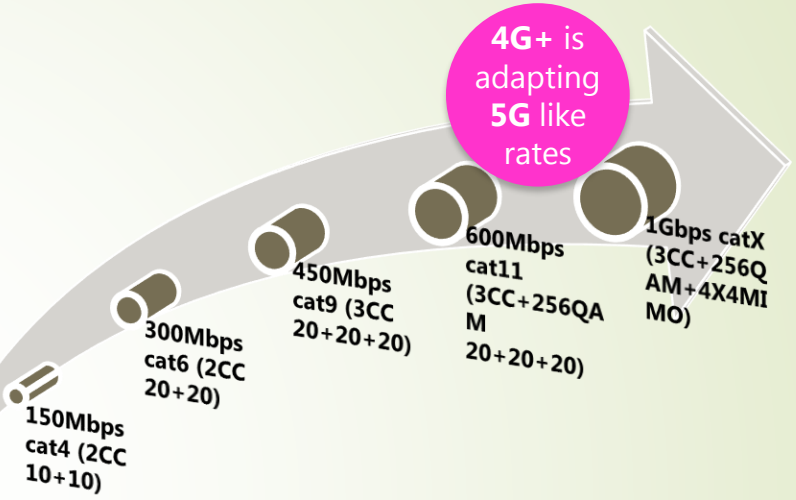
Γιώργος Αγαπίου, OTE Group

Ρόλος ενοποίησης ασύρματης και οπτικής Μετάδοσης

Global Mobile Broadband Facts

Mobile Traffic Outlook & Data Rates Evolution





In 2021, video will account for ~**70%** MBB

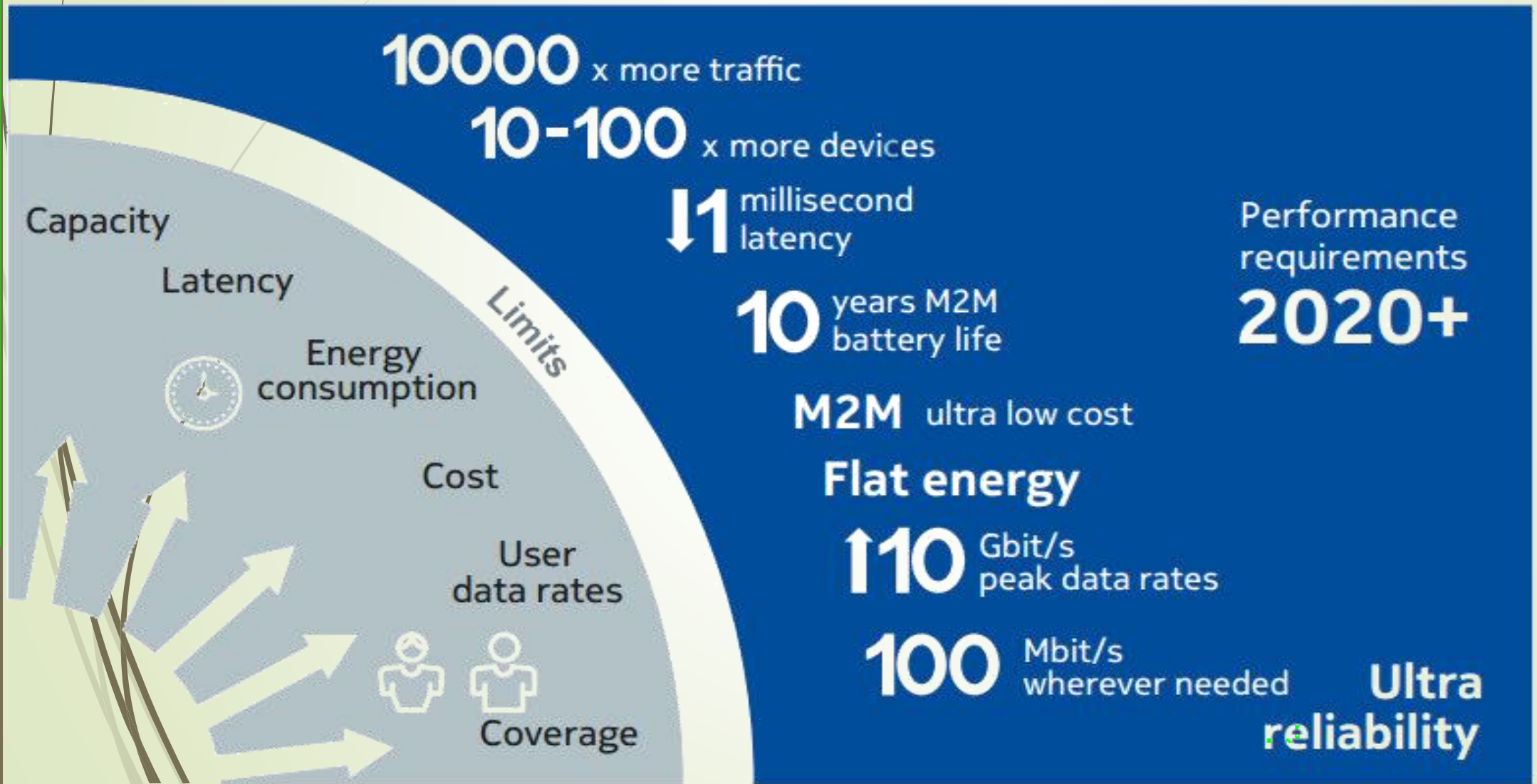
FYE2021 ~**90%** of MBB traffic will be from **smartphones**

from 2015-2021, a **12X** growth is expected in smartphone traffic

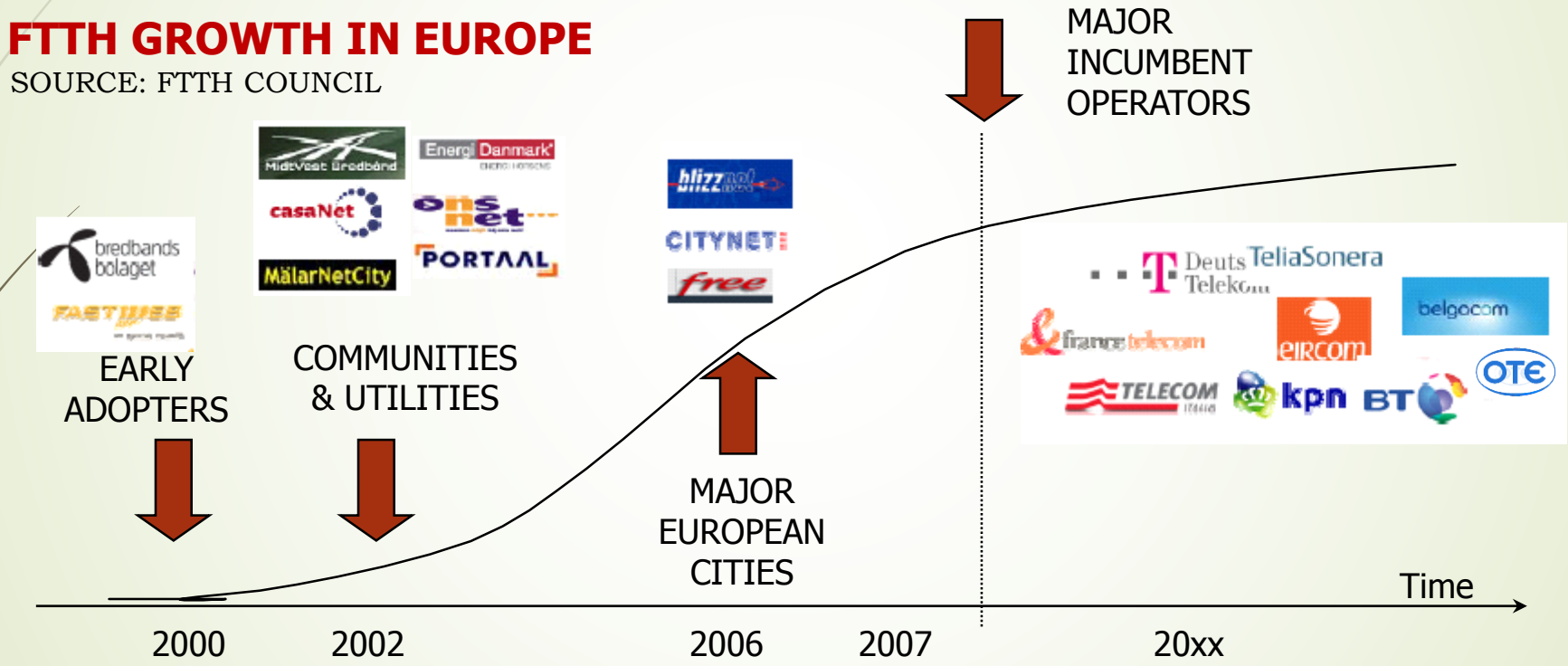
Ρόλος ενοποίησης ασύρματης και οπτικής Μετάδοσης

5G Basic Requirements

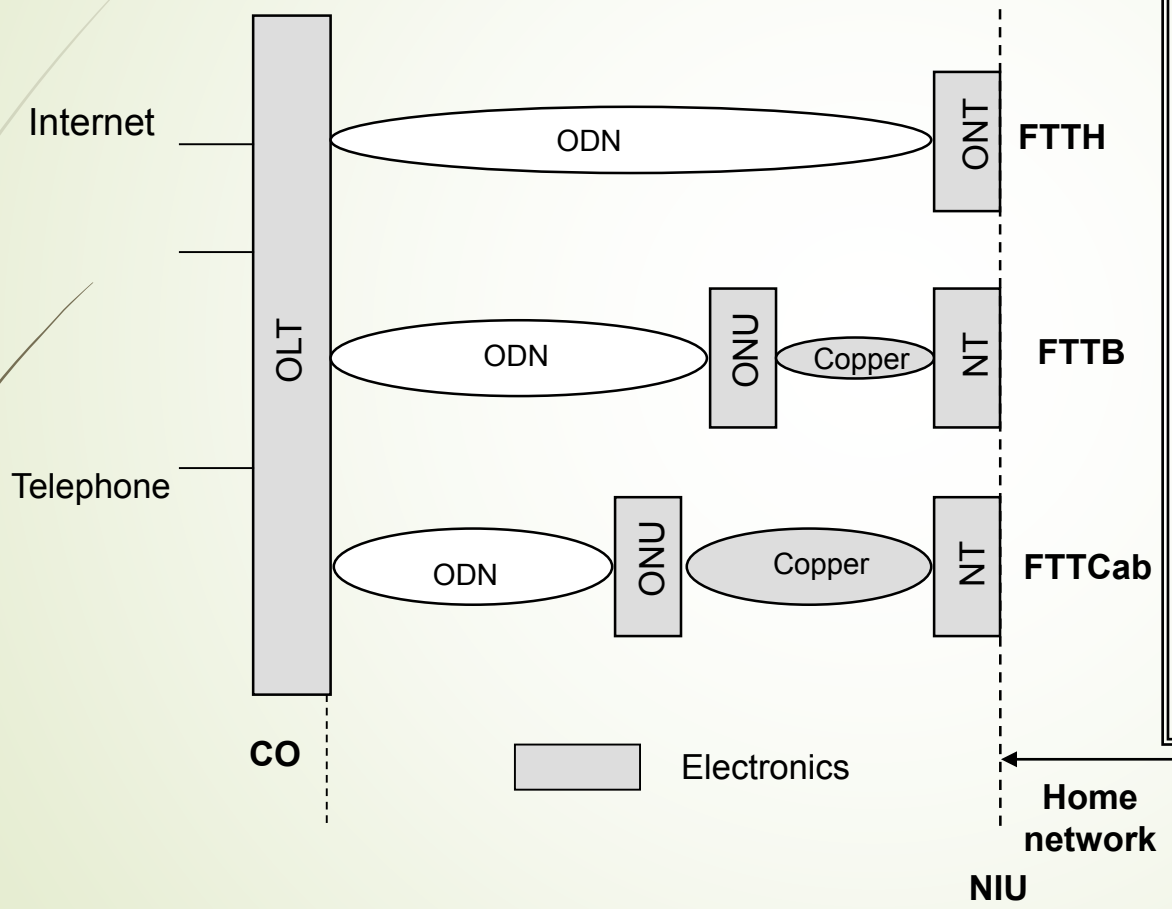
evolving by revolving



Οπτική Μετάδοση



Οπτική Μετάδοση



Why fiber access?

- Fiber is a ”future proof” infrastructure
- Low attenuation → long distances
- High capacity → many broadband users

But

- Too expensive to roll out overnight
- Other access technologies will complement (especially wireless)
- In some areas FTTH is not economically viable

FTTx σχέδια απέτυχαν τη δεκαετία του 1990's τώρα όμως μπορεί να επιτύχουν:

- **Ethernet** based technologies have been standardized

- **Demand** for high speed is growing due to VDSL addiction, particularly for younger people.

- **Services** high broadband and bundled

- **Construction** cost is coming down due to the use of more cost effective techniques (mini-trenching, fibre blowing etc)

FTTx (Τάσεις εγκατάστασης– Εμπόδια)

Trends

History shows that ambitious, highly expensive and long term plans in telecommunications usually fail if not supported by all players (governments, regulators, operators, competition authorities, investors etc.).

Obstacles for FTTH development by incumbent operators:

- Very high cost of investment (more than 2.000 €/customer).
- Privatization limits incumbent "national-strategic" investment plans.
- Regulation uncertainty.

Γιατί χρειάζεται η παροχή υψηλού ρυθμού μετάδοσης?

- VoIP
  - VoIP will diminish the use of circuit switched POTS/ISDN
- IP-TV –HDTV
  - People start to watch IPTV-HDTV than traditional broadcast networks
- Music on Demand
  - Demand of music over telecom networks than on CDs
- Video on Demand
  - Demand of video over telecom networks than on video stores
- Games on Demand
  - Online gaming over the Internet

Radio over Fiber (RoF) techs

- Remarkable advancement in wireless communication services
  - Larger bandwidths are provided per end-user (**1-2GHz**)
  - At 60 GHz can offer above 1 Gbps

Challenges

- **Higher radio carrier frequencies**
- **High propagation losses**
- **Increase power consumption for user terminals**

↓

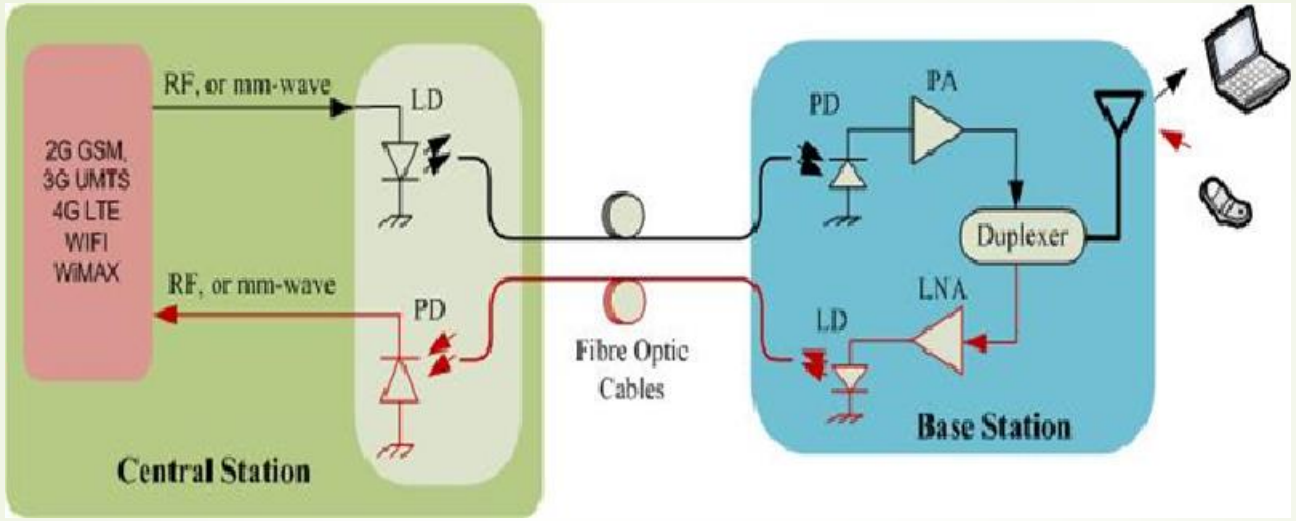
Smaller cell sizes and centralization of base stations to ensure seamless connection and to share resources

Large number of remote antennas (RAU) to reduce complexity

↓

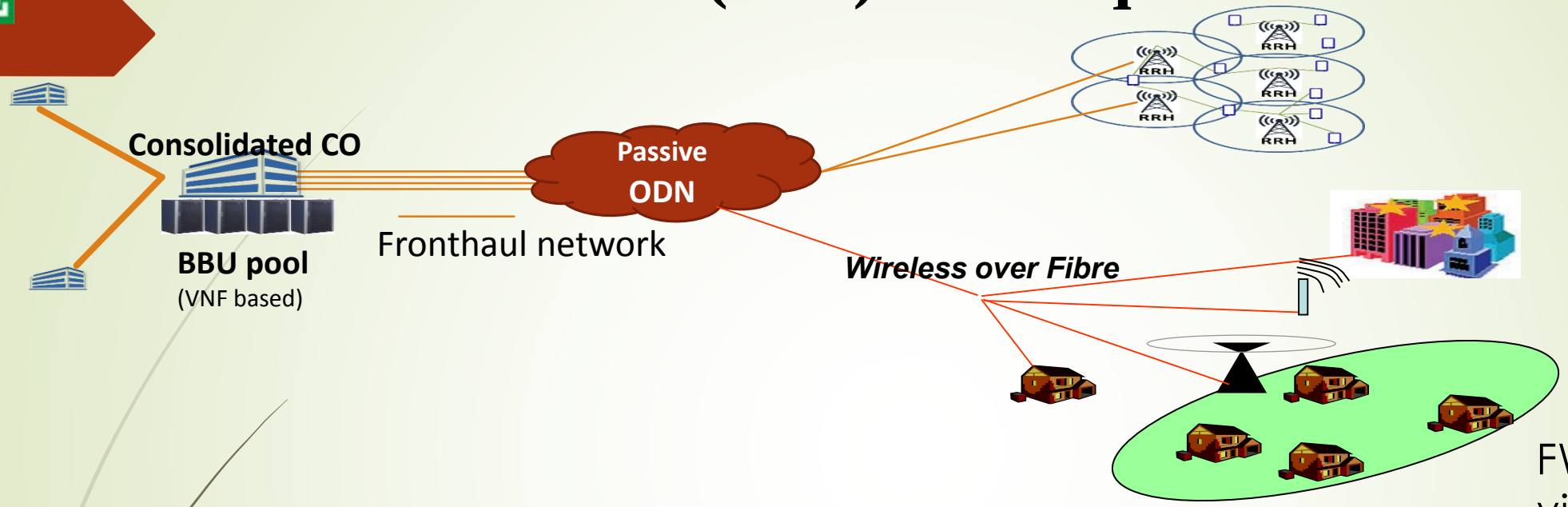
Optical fiber with ultra-wide BW is suitable for transfer the radio signals to/from the RAUs to central units

Radio over Fibre (RoF) Technique



Integration of wireless and fibre optic communication technologies, and modulating wireless signals over optical carrier for transporting over fibre optic cable.

Radio over Fibre (RoF) Technique

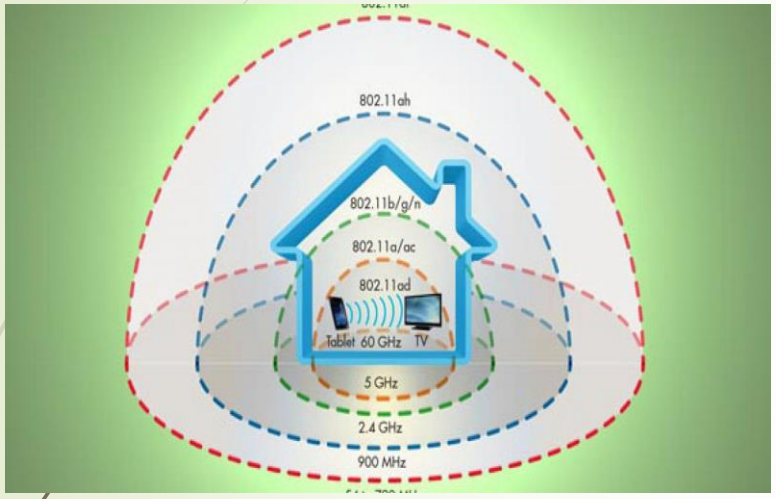


FWA, FiWi, virtual fiber

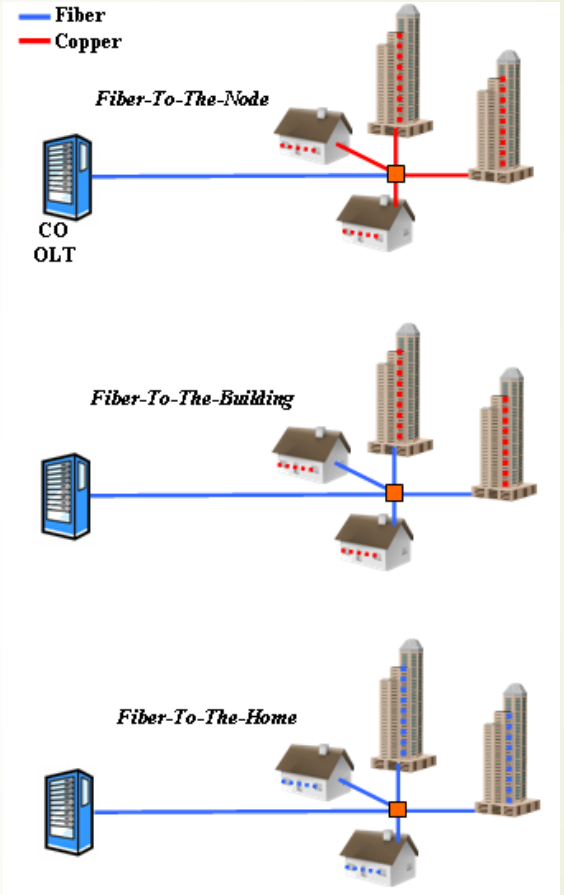
RoF benefits

- Centralizing signal processing, share resources, and control and management.
- Cheaper, smaller size & simpler base stations.
- Smaller cells: allocates higher bandwidth to end-users.
- Could be accommodated with passive optical network (PON) Infrastructures.
- Can use wavelength division multiplexing (WDM) technique for improving the network throughput.
- Physical BBUs located at the CO.
- Actual BBUs can be replaced by virtual BBUs.
- Some HW functions are still needed (encryption, HARQ, FEC, Beam forming)

Σύγκλιση ασύρματης και οπτικής τεχνολογίας



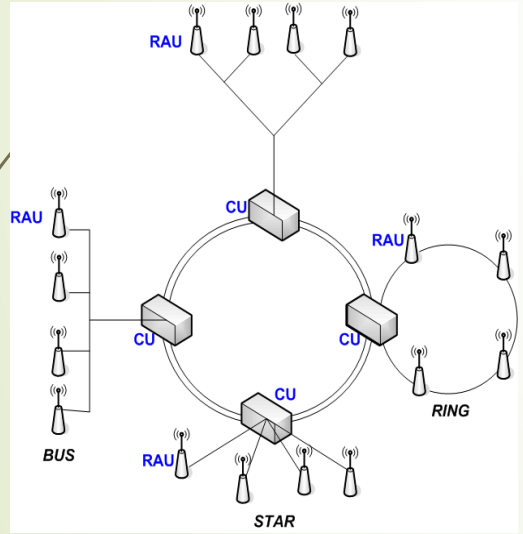
At 60 GHz ⟶ >1Gbps



Χρήστης ~ 1Gbps

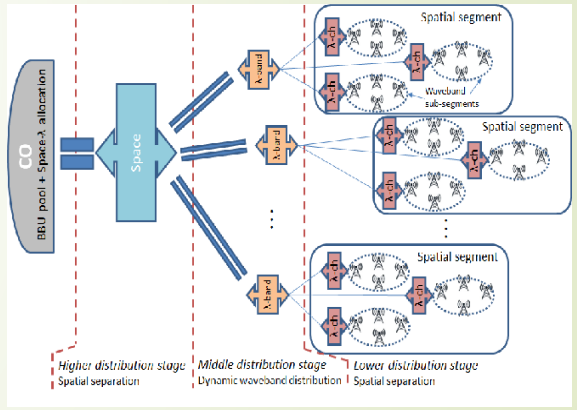
Integration of wireless and fibre optic communication technologies, and modulating wireless signals over optical carrier for transporting over fibre optic cable.

FUTON architecture

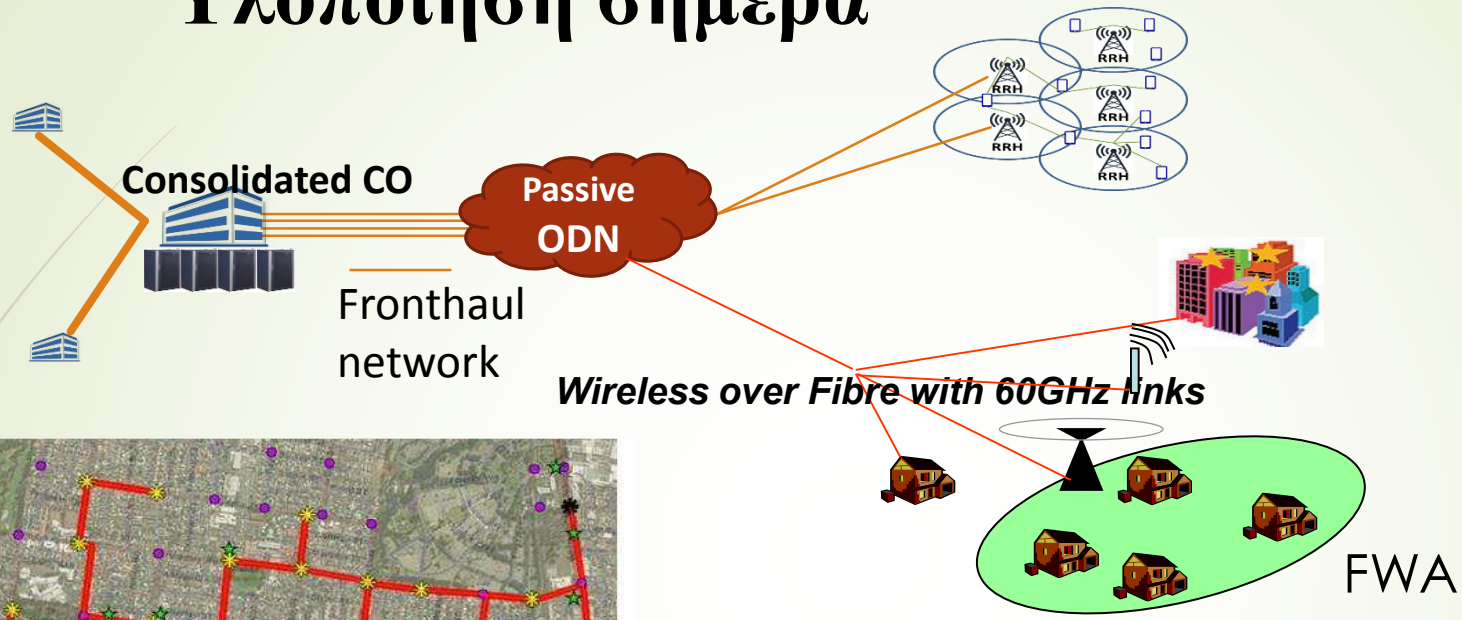


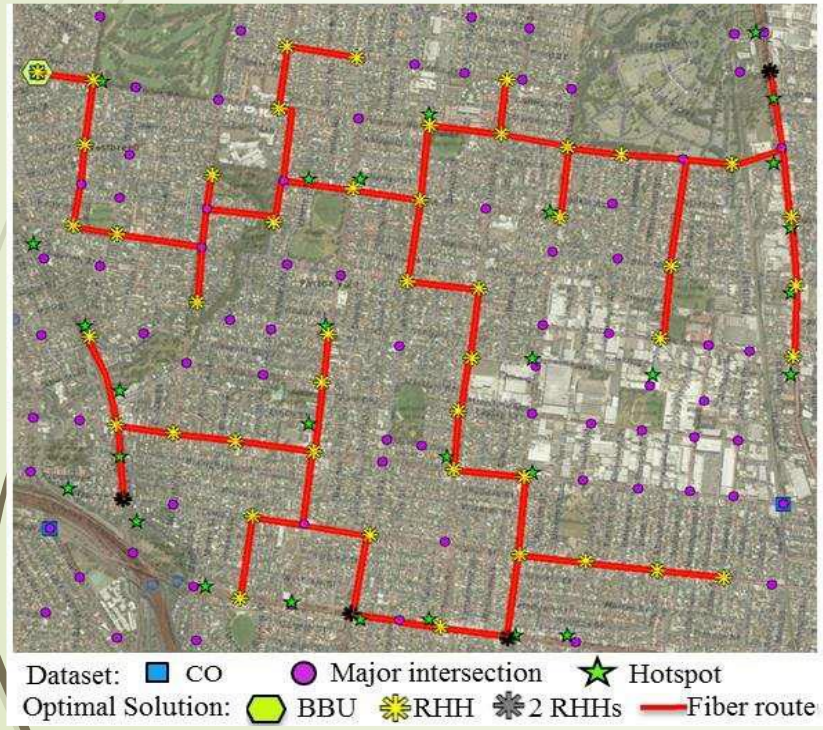
60 GHz mmWave prototype (ΕΣΠΑ)

blueSPACE



Υλοποίηση σήμερα





Fixed wireless access in high frequency 60 GHz to create hot spots and also give access inside houses

Ευχαριστώ

Ερωτήσεις?