SKYLANE
OPTICS®

EVOLUTION OF THE TRANSPORT OF DATA FROM FTTH TO 5G AND INSIDE THE BUILDING FOR IOT

Philippe Bolle April 2019

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ABOUT US

Company Presentation

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ABOUT US

Company Presentation – Skylane Optics

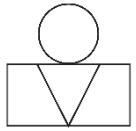
SKYLANE OPTICS®

/ Creation

Skylane Optics® exists since 2008

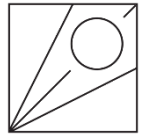
/ Support & services

Expertise, quality & unique solutions



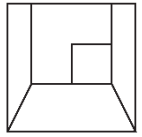
/ Team

Team of 40+ persons, strong expertise in telecom



/ Field deployment

More than 3M transceivers in the field



/ Offer

Optical transceivers for FTTx, Access/Metro , Mobile Fronthaul/backhaul , Core , datacenter, entreprise/campus

/ Achievement

Support major Tier’s operators in Europe

More than 30% of the FTTH market in Sweden

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ABOUT US

Company Presentation – Skylane Optics

1. Fraire **/ Belgium (HQ)**

- Sales office for Europe
- Laboratory for qualification
- Production centre for Europe and US
- Customer service for Europe
- Technical support for Europe
- Sourcing

2. Stockholm **/ Sweden**

- Sales office for Nordics and Baltics
- Technical support for Nordics and Baltics

3. Vinkeveen **/ Netherlands**

- Sales office for Netherlands

4. Miami **/ USA**

- Sales office for United States

5. Campinas **/ Brazil**

- Sales office for CALA
- Logistics centre for Brazil
- Production centre for Brasil

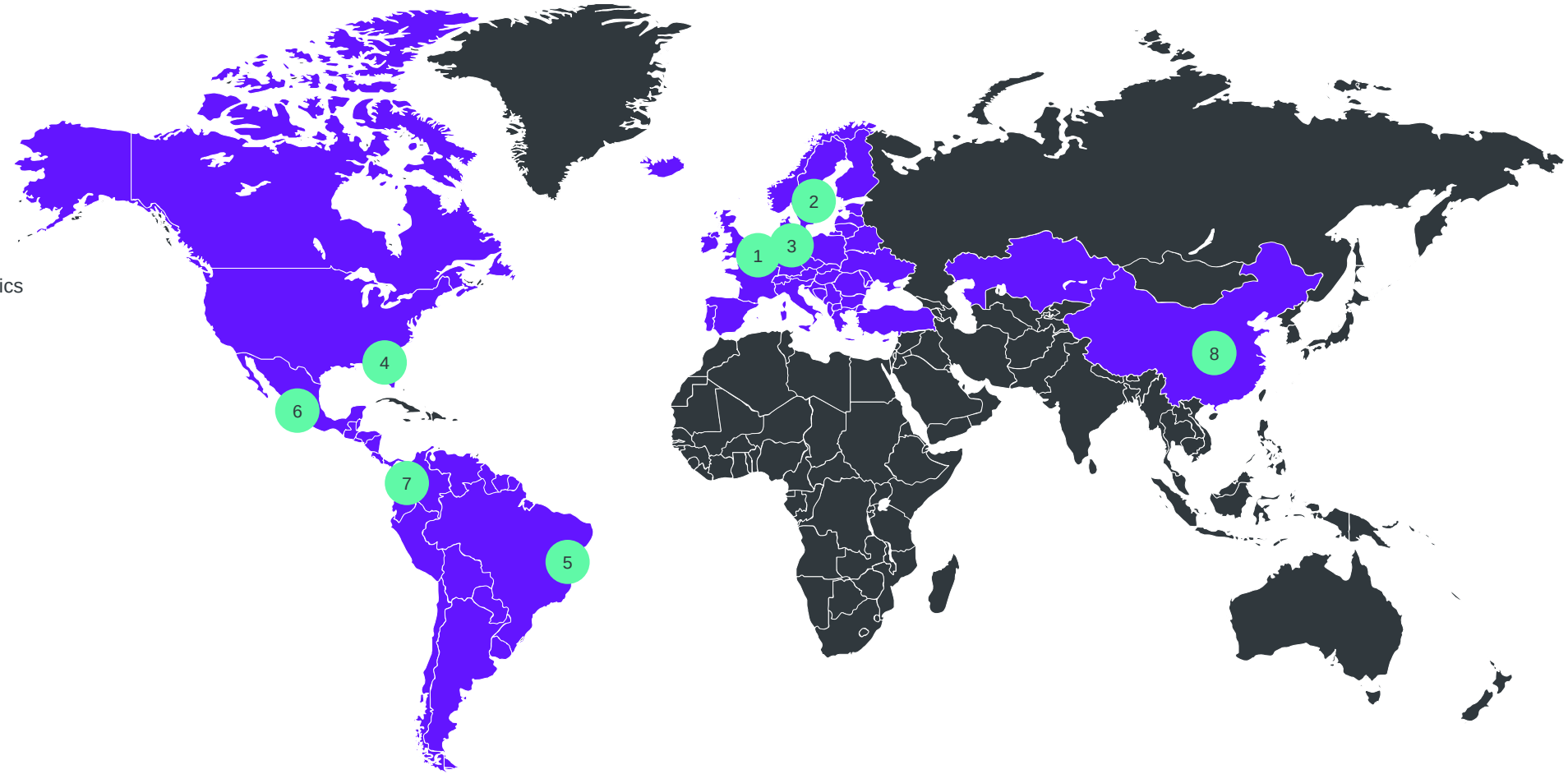
6. Ciudad de Mexico **/ Mexico**

- Sales office for Mexico

7. Bogota **/ Colombia**

- Sales office for Colombia

8. Production with CM in China



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MEMBERSHIP

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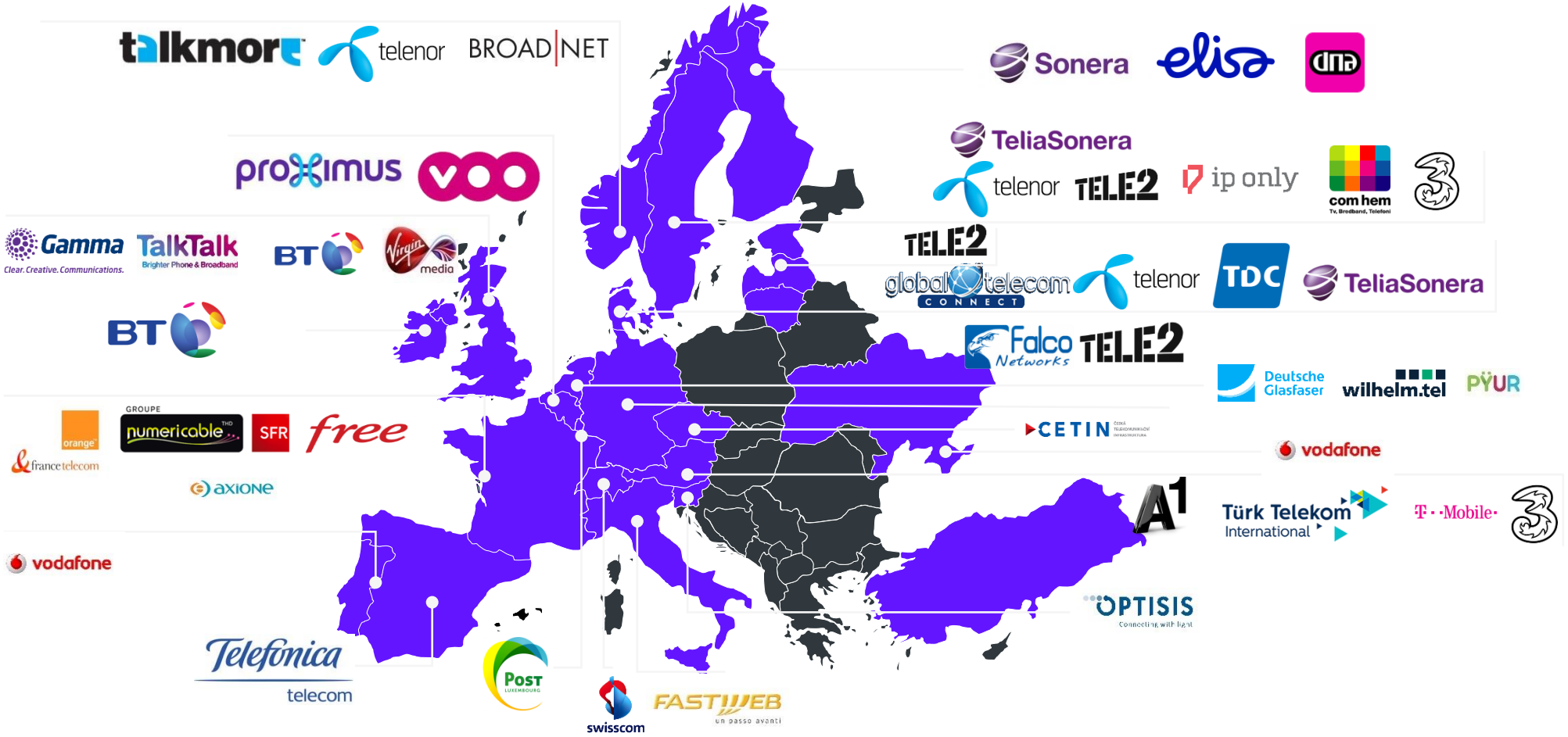

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R&D PROGRAMS

- Actphast 2015-2016 : RCLED to PoF coupling device
- Eurostar 2015-2018 : S1-PoF
- DGO6 2014-2018 : Senzor
- EFL 2017-2018 : autosensing
- RPR 2017-2018 : Unified Home backbone network
- BEWARE 2017-2018 : Skygate Secure Coding
- H2020 : Next Generation Free Form optics (proposition March 19)

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FTTX : EVOLUTION OVER THE LAST 30 YEARS

Optical network deployment

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2025 EU OBJECTIVES : SEPTEMBER 14TH 2016

- **1 Gbps for** schools, universities, research centres, transport hubs, all providers of public services such as hospitals and administrations, and enterprises replying on digital technologies,
- **All European households**, rural or urban, should have access to connectivity offering a **download speed of at least 100 Mbps**, which can be upgraded to 1 Gbps,
- All urban areas as well as major roads and railways should have **uninterrupted 5G coverage**. As an interim target, 5G should be commercially available in **at least one major city in each EU Member State by 2020**

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FTTH TECHNOLOGY : STANDARDISATION

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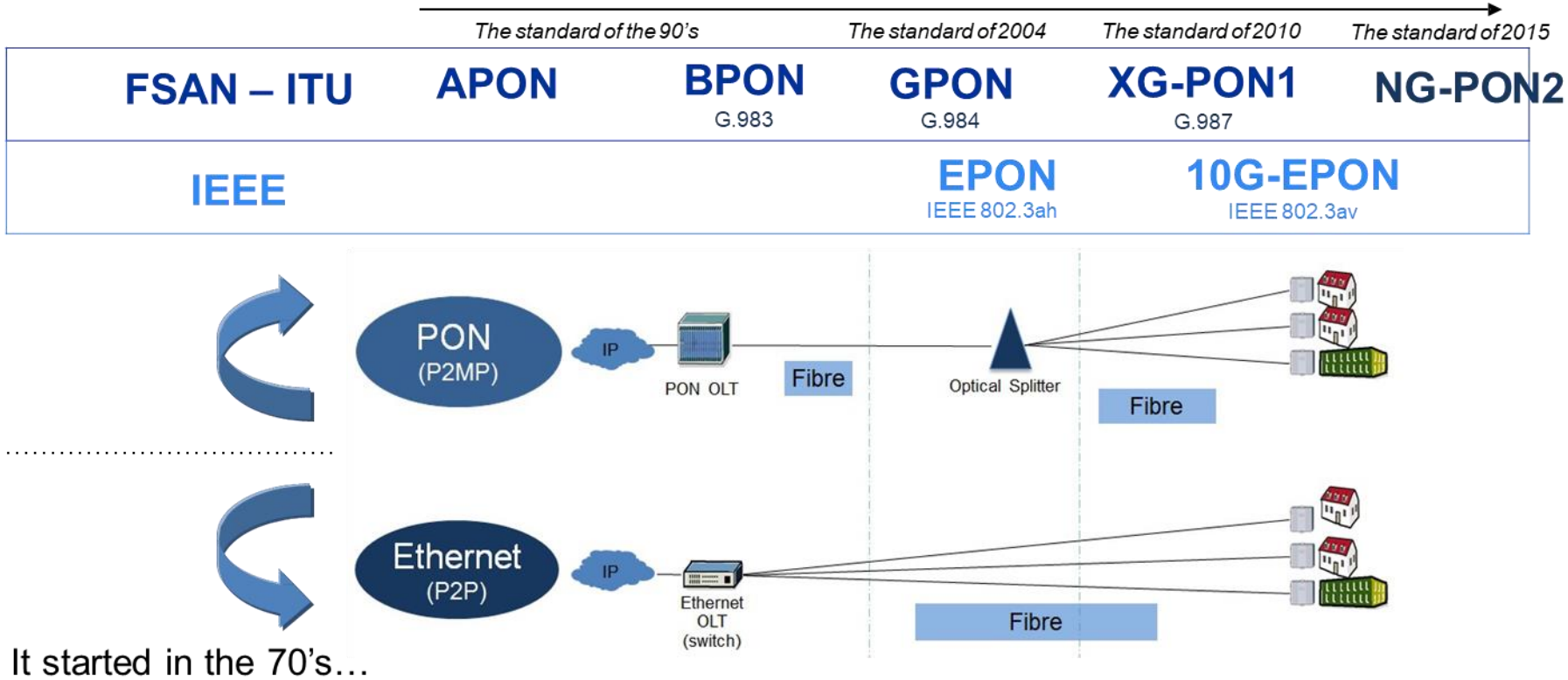

Source: FTTH Handbook, Edition 8, Feb 2018

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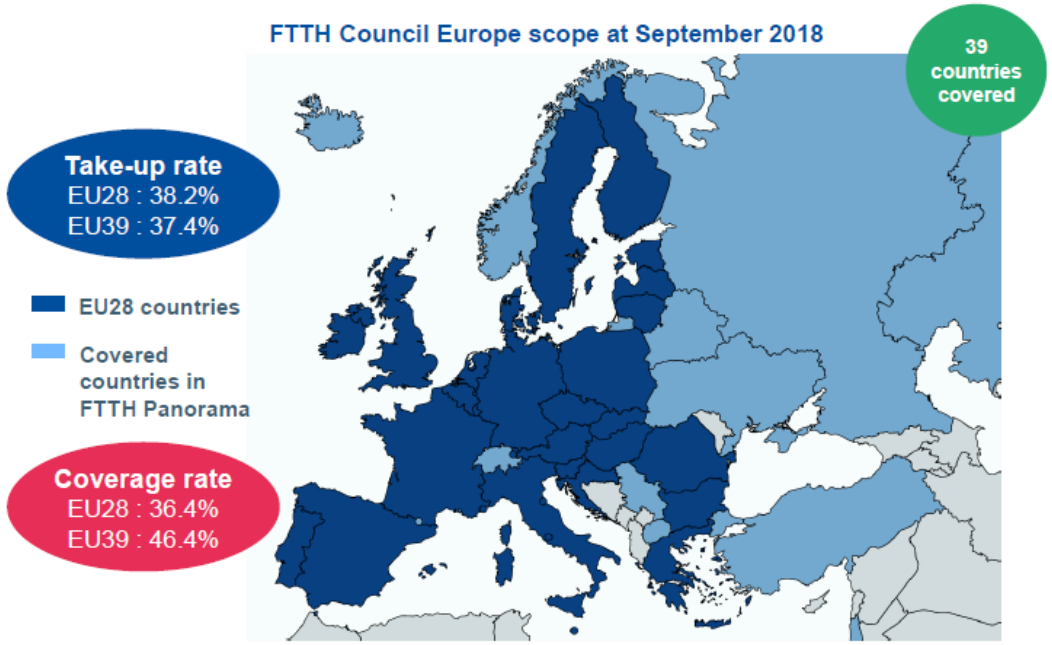
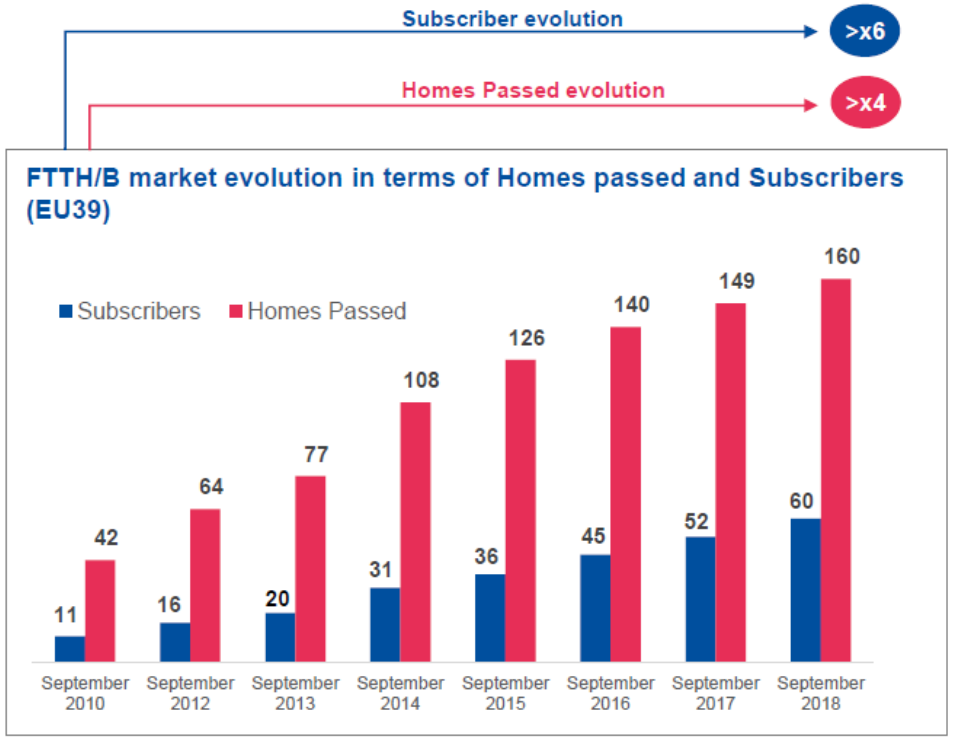
FTTH/B FIGURES AS AT SEPTEMBER 2018

Since 2010 penetration of fibre has grown more than six fold

As at September 2018 in EU39*:

- **59.6 million FTTH/B subscribers**
- **Almost 160 million FTTH/B Homes Passed**





Source: IDATE for FTTH Council EUROPE

(1) EU39 = EU28 (excl. Cyprus) + 4 CIS countries + Andorra, Iceland, Israel, Macedonia, Norway, Serbia, Switzerland, Turkey

(2) Cyprus was replaced by Macedonia at end-2012 because the FTTH/B market is much more developed in this country.

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TOP 15 COUNTRIES BY FTTH/B SUBSCRIBERS IN 2020 & 2025

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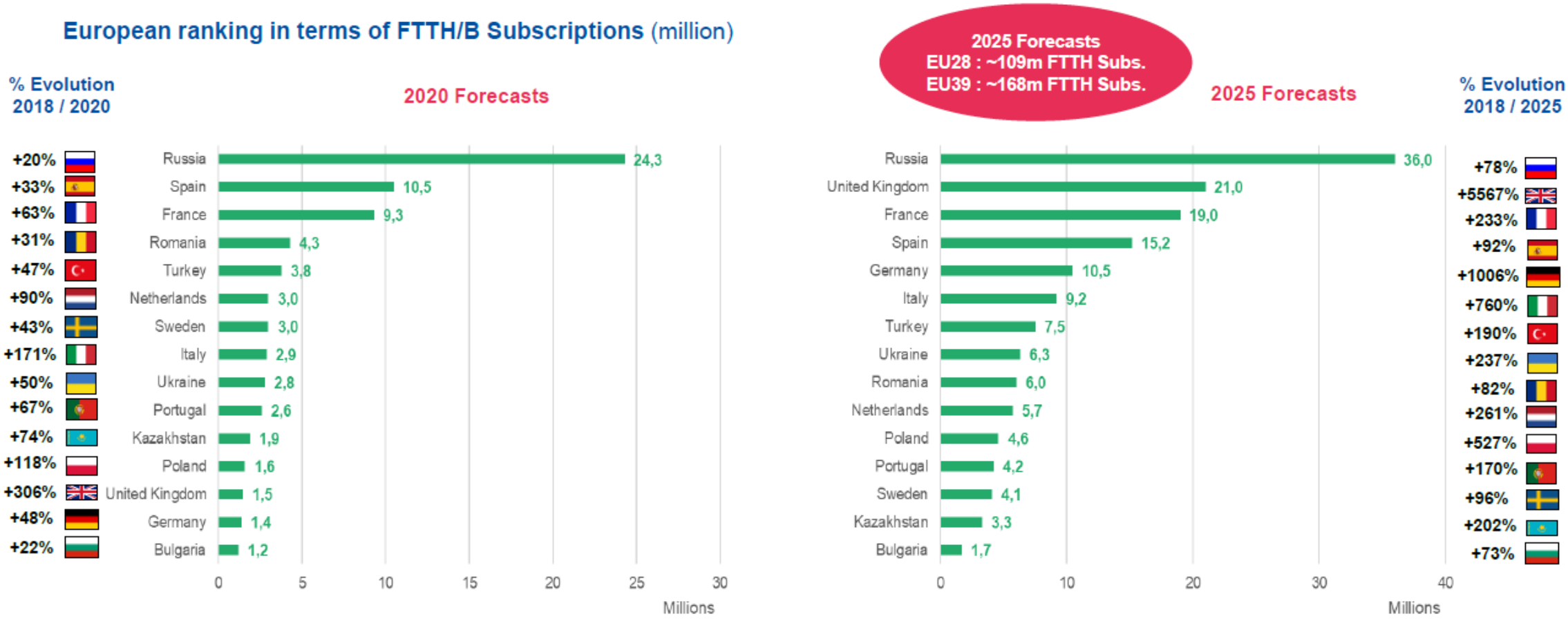
European ranking in terms of FTTH/B Subscriptions (million)



Source: IDATE for FTTH Council EUROPE

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FTTH GLOBAL PANORAMA – SEPT 2018

FUTURE-PROOF
1Gbps today, 10Gbps and more tomorrow using the same fibre network

ENABLER
Digital society – Smart Cities 5G backhaul

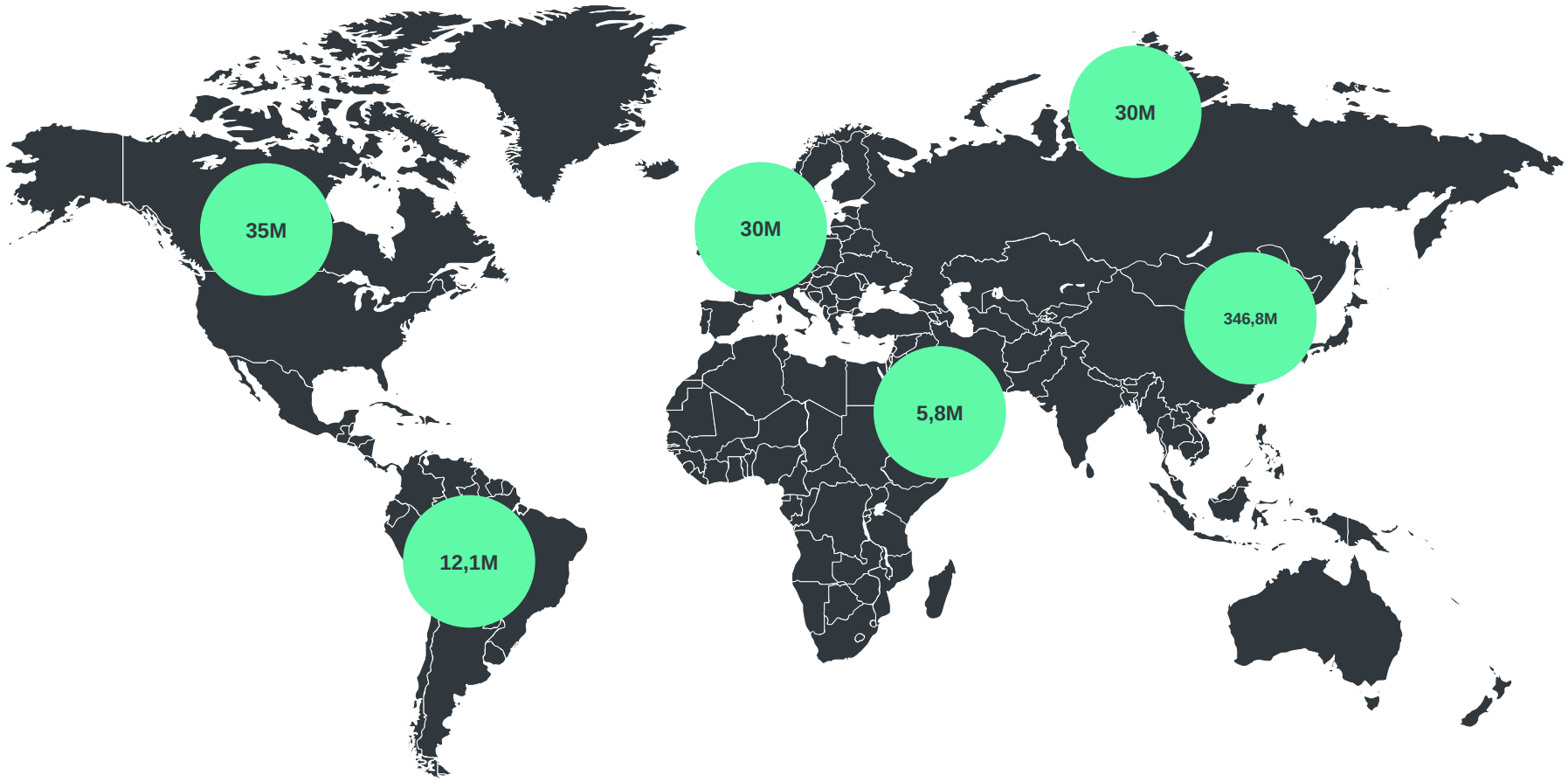
Legacy evolution

COMPETITIVE
Unbeatable 1G service offer

Premium customer experience, marketing & branding Low OPEX (less maintenance cost)

ECO-FRIENDLY
Lowest power consumption per megabit per second

Number of FTTH subscribers worldwide



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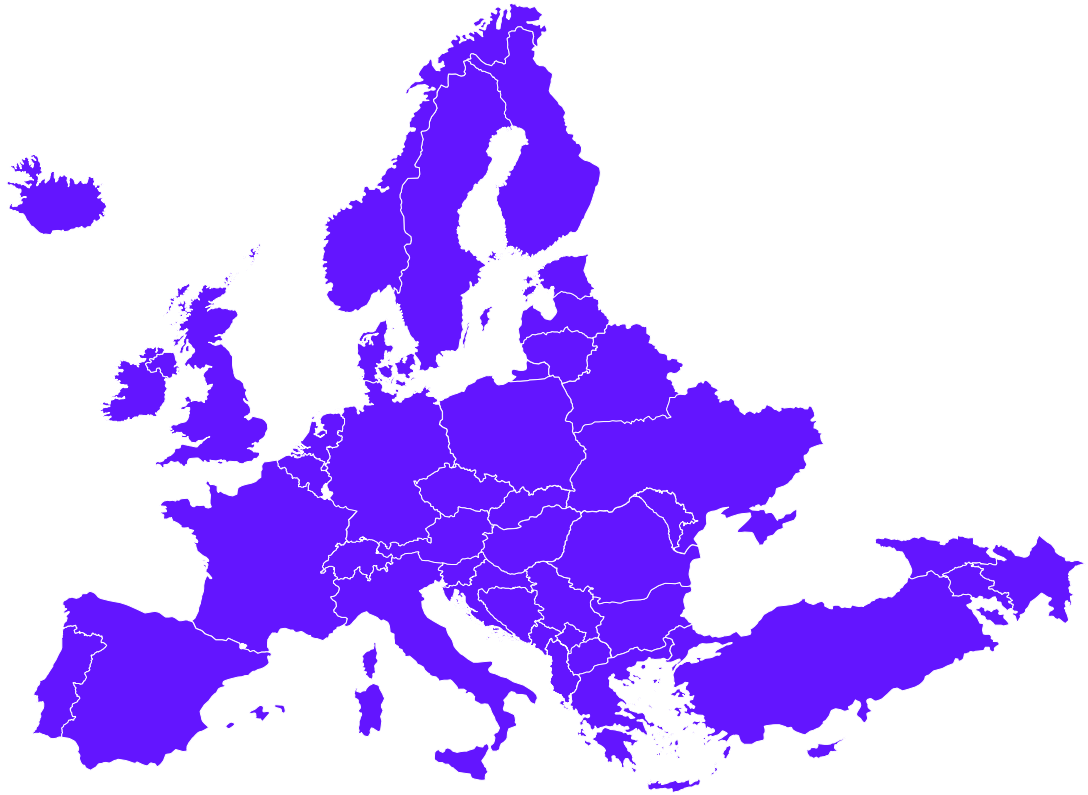
SOCIO-ECONOMIC BENEFITS

Consumers and companies benefit from FTTH across the world

88% less

greenhouse gas emissions per gigabit with FTTH/B infrastructure compared to other access technologies.

// Europe



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SOCIO-ECONOMIC BENEFITS

Consumers and companies benefit from FTTH across the world

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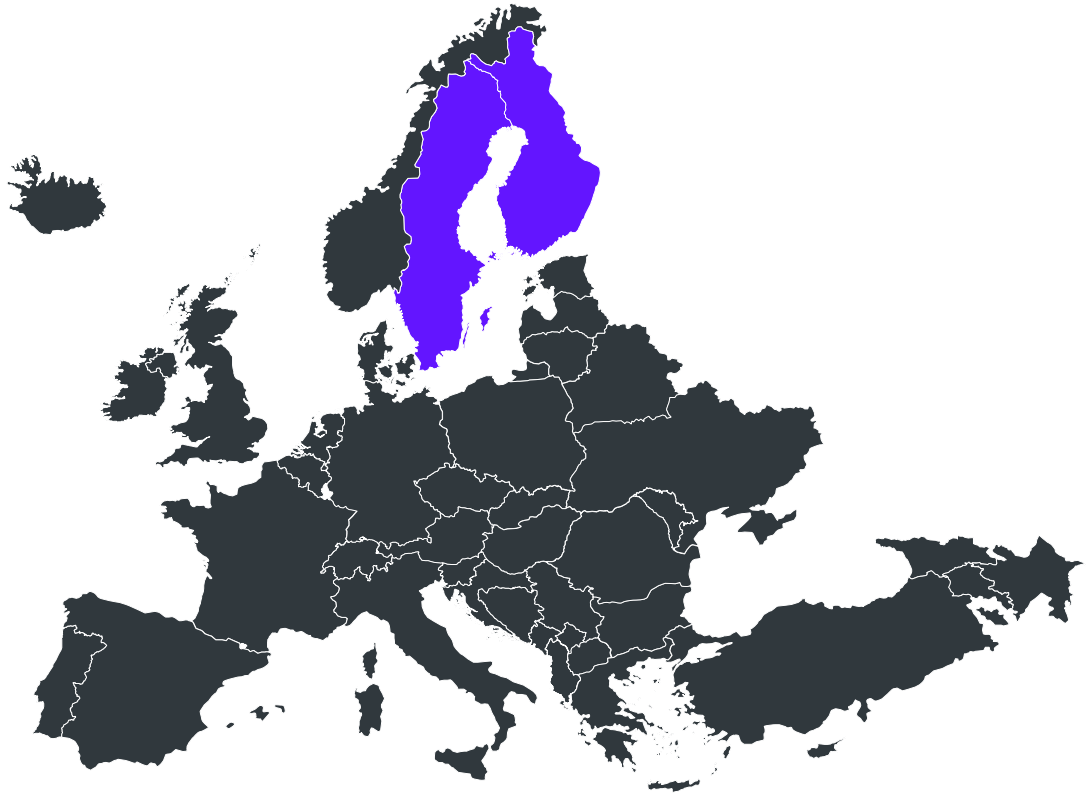
75€ to 425€

per capita can be saved annualy in small municipalities depending on the take-up rate of digital home services enabled by FTTH broadband.

// Sweden and Finland



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SOCIO-ECONOMIC BENEFITS

Consumers and companies benefit from FTTH across the world

4.8% more

Start-ups
In french
municipalities
have ultrafast
broadband than
have slower access.

// France

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SOCIO-ECONOMIC BENEFITS

Consumers and companies benefit from FTTH across the world

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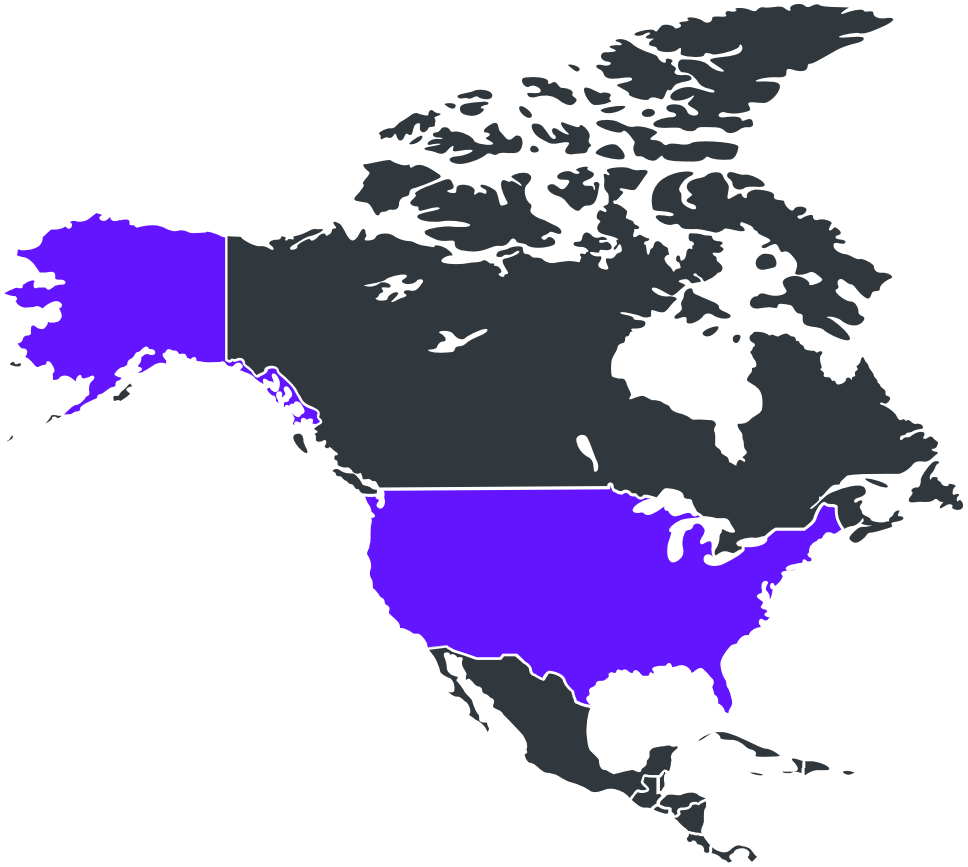
12. 8 days

Working from home per Month for FTTH users Compared of 10.8 days for DSL and Cable users.

1.1%

Higher GDP per capita in communities with Gigabit broadband Access than in those With slower access.



//USA

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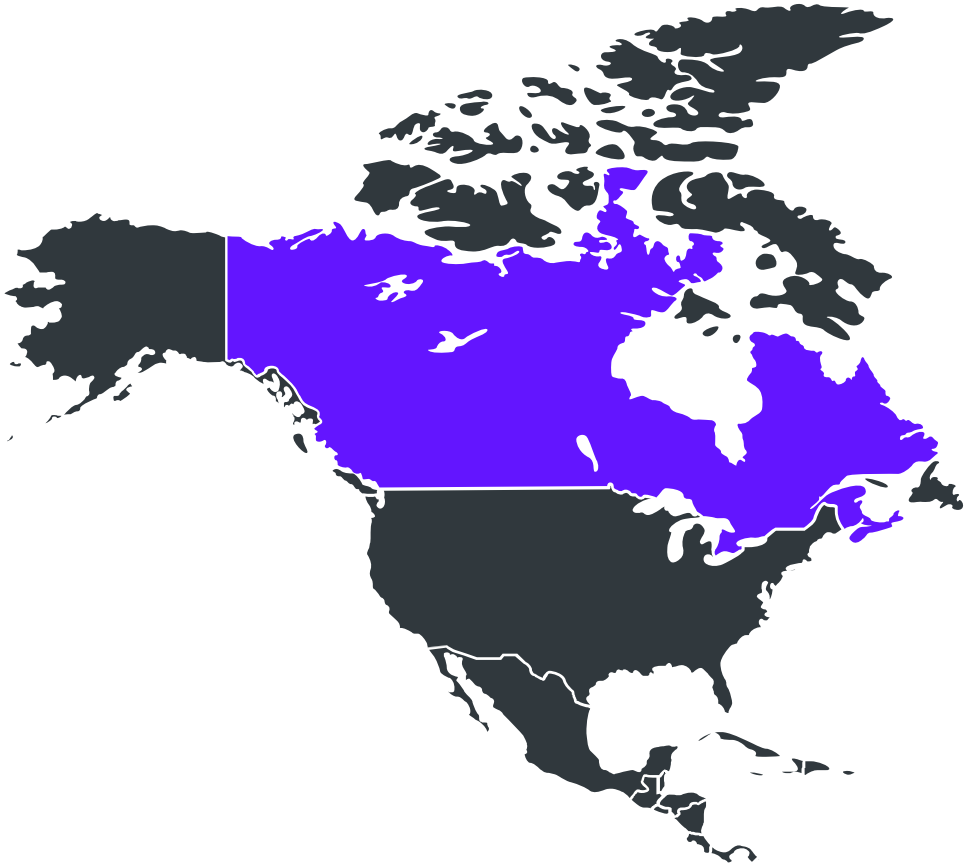
SOCIO-ECONOMIC BENEFITS

Consumers and companies benefit from FTTH across the world

2.9%

Expected increase in employment from full FTTP roll-out.

// Canada



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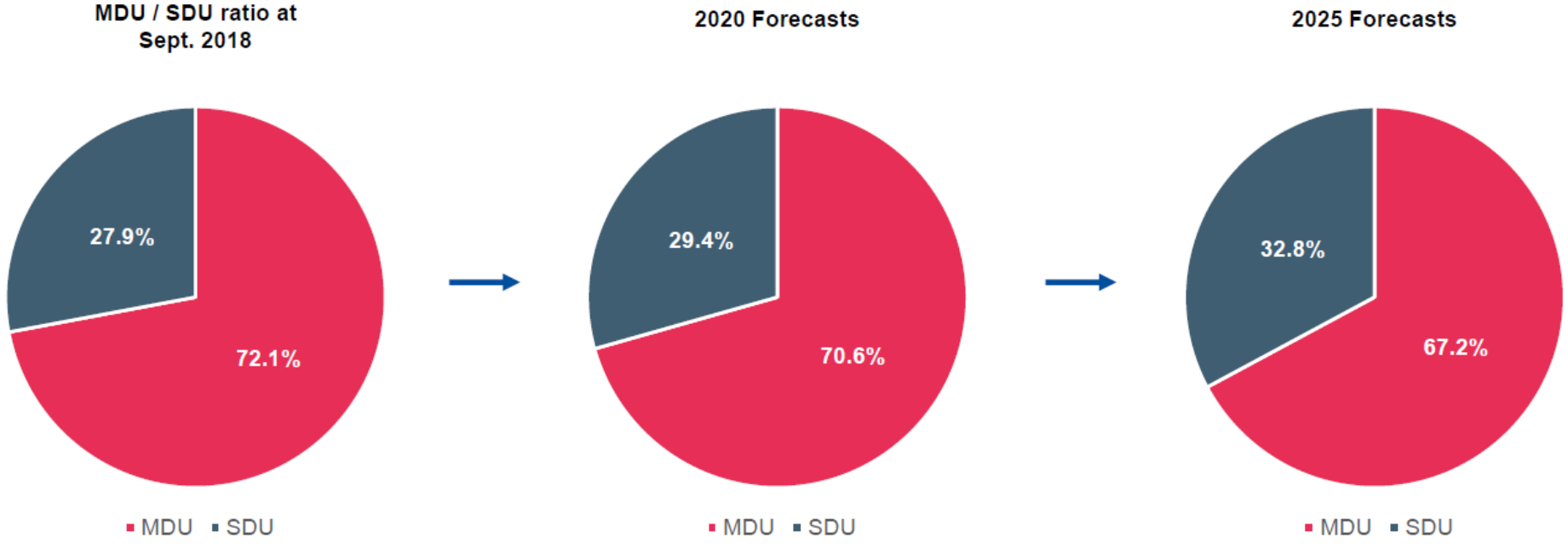
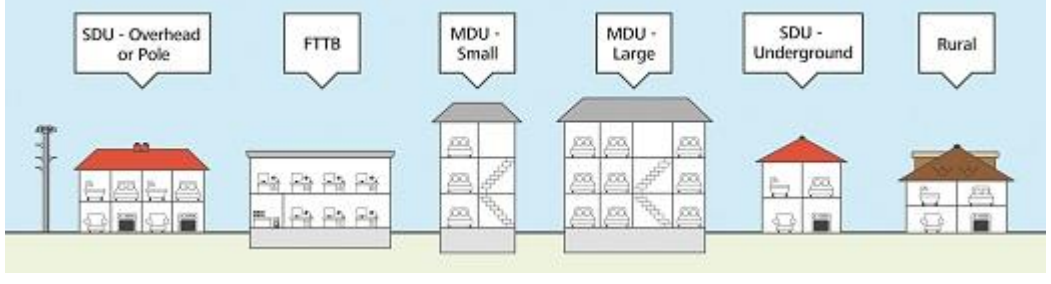
FTTH ARCHITECTURE & TECHNOLOGY TRENDS

MDU / SDU ratio
Evolution towards the delivery of individualized fibre services by 2025



Source: IDATE for FTTH Council EUROPE



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FTTH ARCHITECTURE & TECHNOLOGY TRENDS

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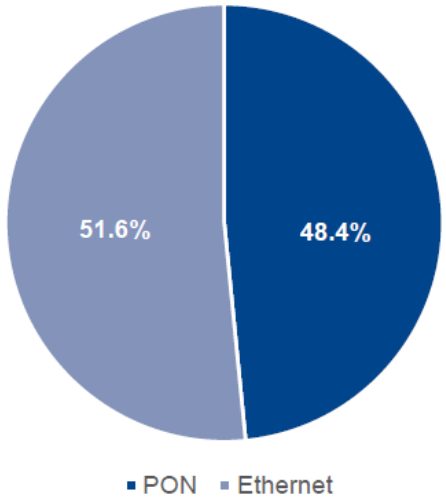
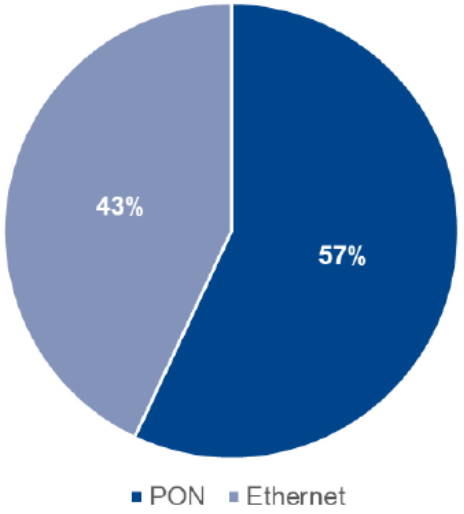
PON / Ethernet

PON solutions will tend to be predominant in the coming years

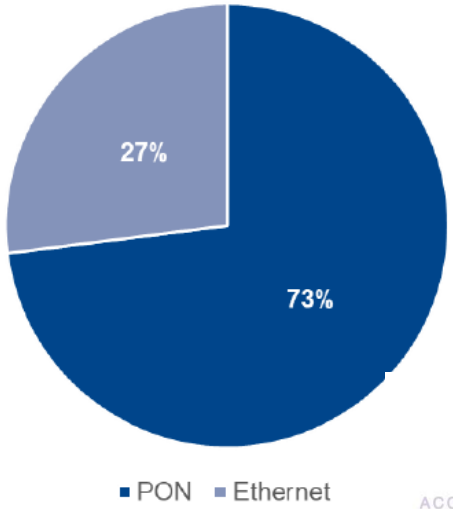
PON/Ethernet ratio at Sept. 2018



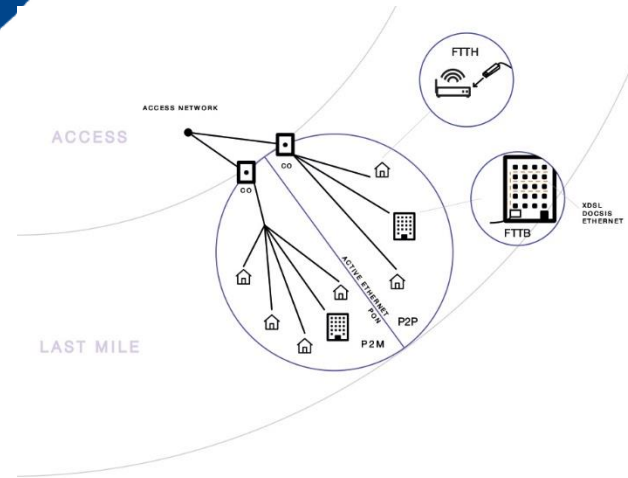
2020 Forecasts



2025 Forecasts



Source: IDATE for FTTH Council EUROPE



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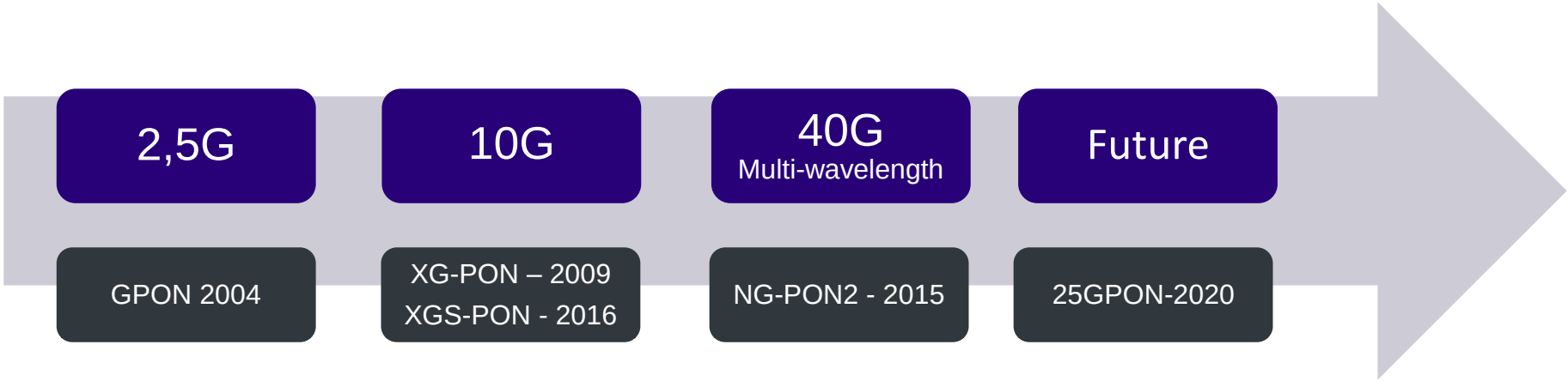
SOLVING THE BANDWITH PROBLEM



XGS-PON and NG-PON2 approved

- Both being deployed to some level in 2017
- XGS-PON provides 10G/10G services
- NG-PON2 provides 4 wavelengths x10G / 10G services

But its not just about bandwidth

broadband forum

ITU

FSAN
Full Service Access Network

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THE 10GPON DEPLOYMENT IN THE WORLD

Today

Operators worldwide are testing or deploying 10G PON

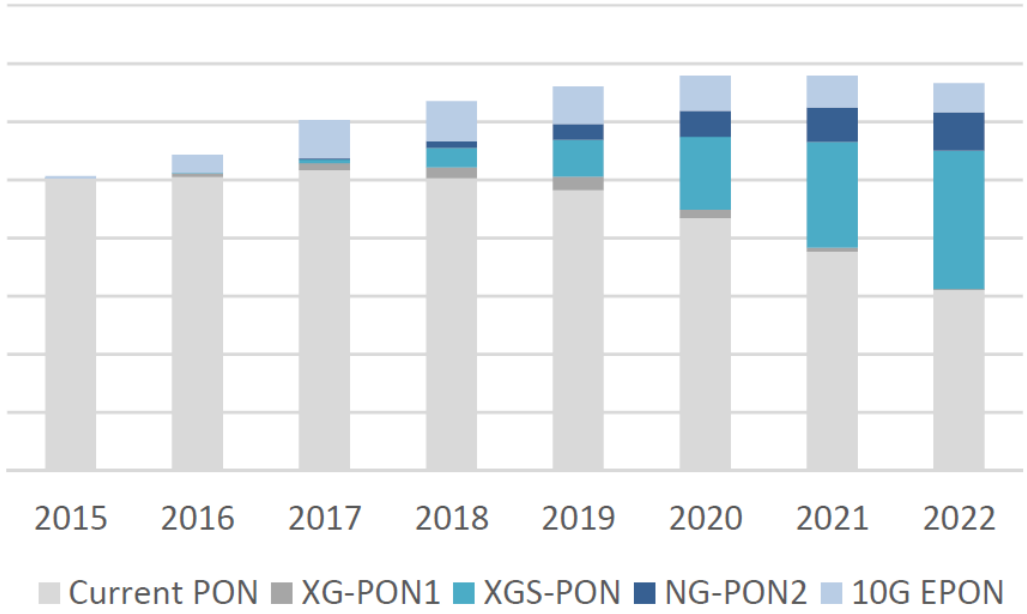
Drivers:

- 5G readiness
- Market leading speeds
- Service convergence
- Technology proof of concept

Future

By 2022: 10G PON may overtake current PON

(Source: Ovum 2017)



Common analysts' view:

- 10G PON is growing
- XG-PON1 and 10G EPON flattering out

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EVOLUTION OF WIRELESS NETWORKS

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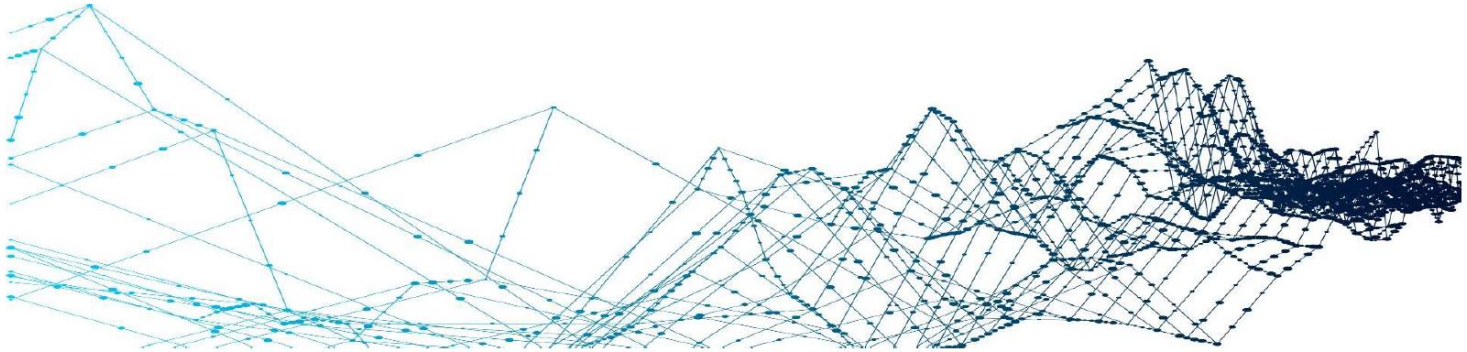
Addressing the needs of mobile evolution

Trend 1: Network densification



High capacity PON network can easily meet the need to backhaul increasing number of small cells

Source : Nokia

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COMBINE FIBER, COPPER, COAX AND WIRELESS FOR UBIQITOUS ULTRA-BROADBAND

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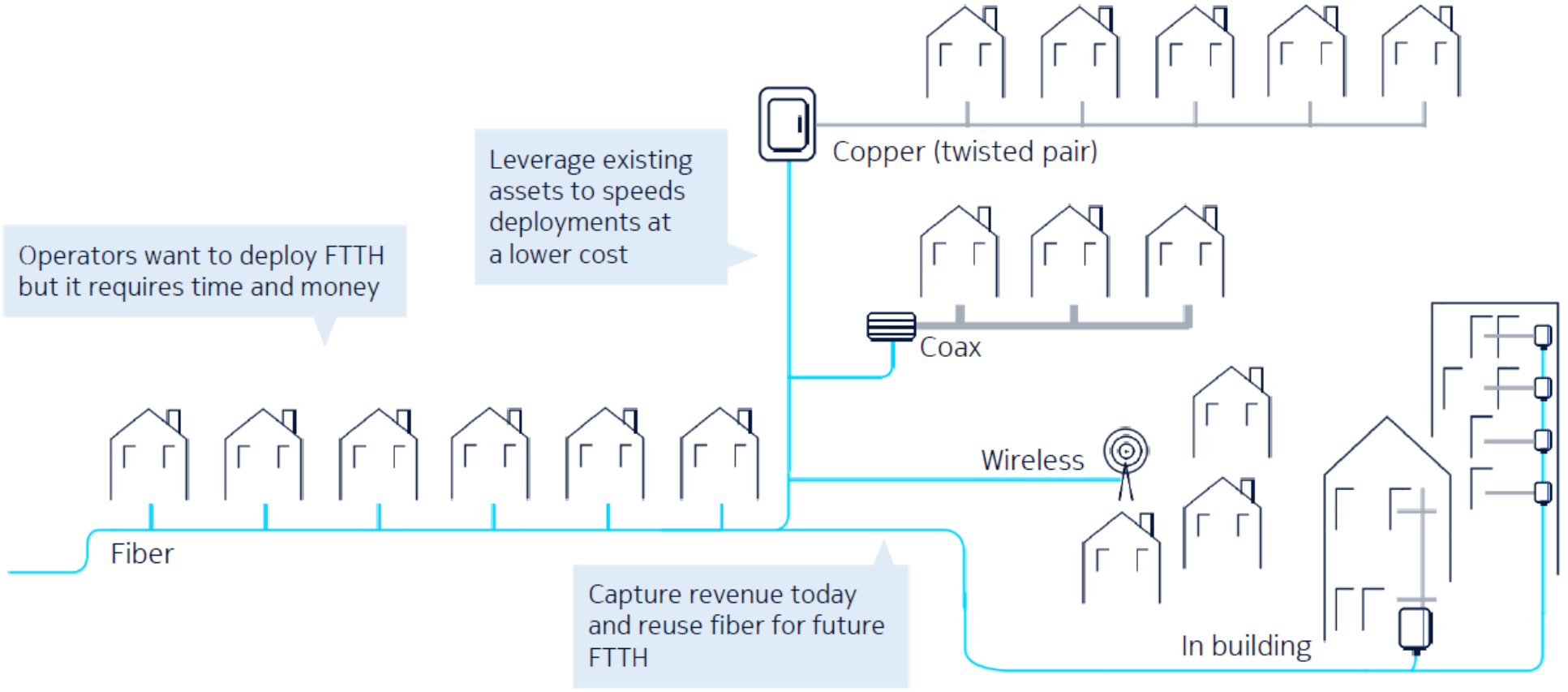

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POF A DIY FIBER FOR UBIQUITOUS INHOME'S GIGABIT CABLING

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DEMAND EVOLUTION

B2C Services

- Smart home
- TV 4K/8K
- Video on-demand
- Catchup TV
- Gaming

B2B Services

- Video conferenc
- VPN Network
- Cloud application

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WORLDWIDE REVENUE IN THE SMART HOME MARKET

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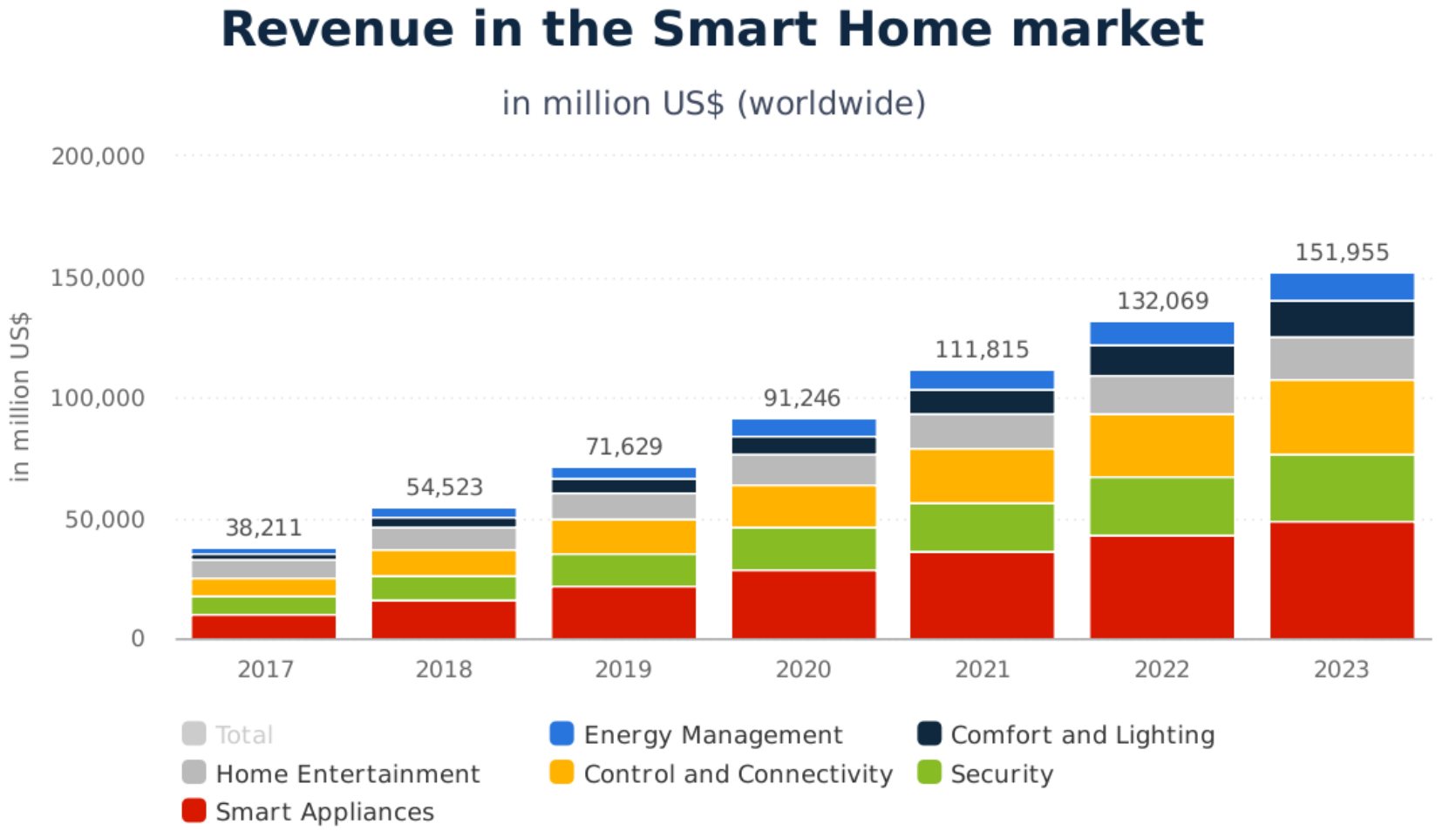

Source: Statista, March 2019; Selected region only includes countries listed in the Digital Market Outlook

statista

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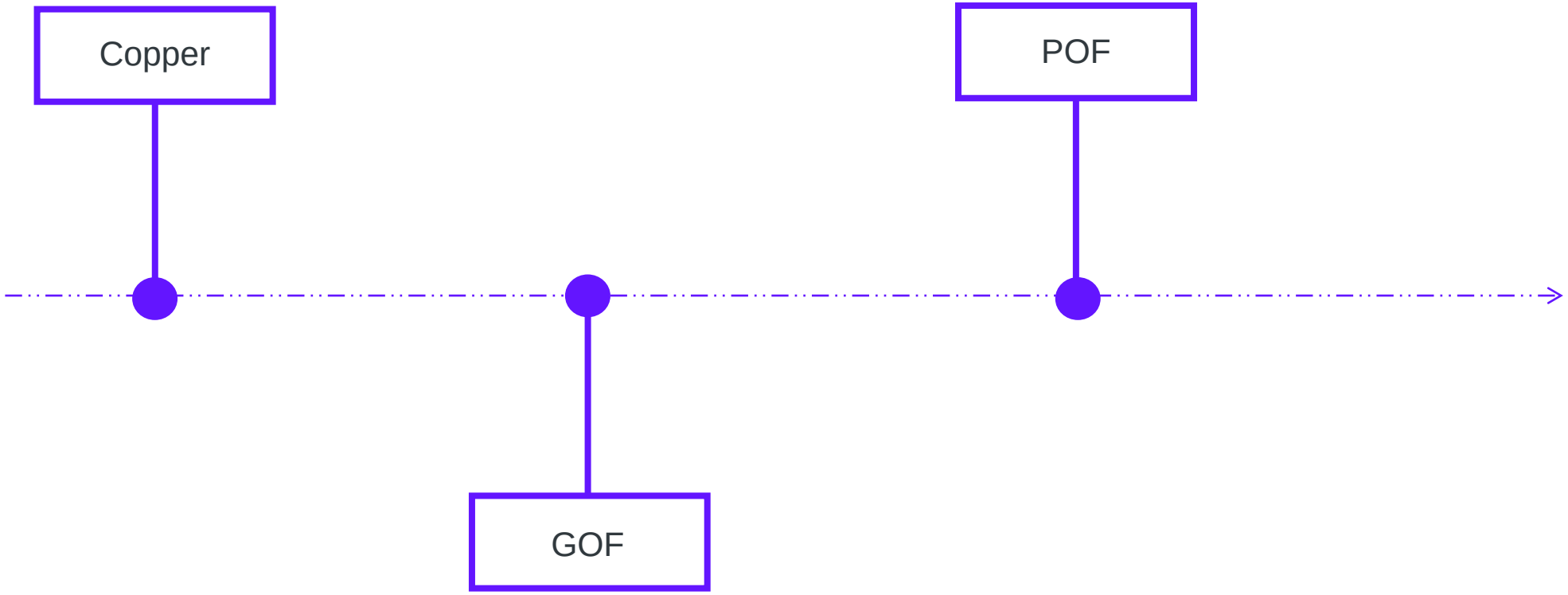
TIME EVOLUTION

Making Smart Cities Sustainable from large scale pilots to real-life deployment



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COMPARISON

Making Smart Cities Sustainable from large scale pilots to real-life deployment

Cable Type		
	Cuivre Cat.6	**POF**
Copper Capacity	17 Kg	0 Kg
Energy consumption (12kW/Km)	204 kWh/km	0 kWh/km
Plastic Capacity	13 Kg	3,5Kg
Energy consumption (24kWh/Km)	312 kWh/Km	86,4 kWh/Km
Total consumption	516 kWh/km	86,4 kWh/km
CO2 Equivalence	310 KgCO2/km	52 KgCO2/km

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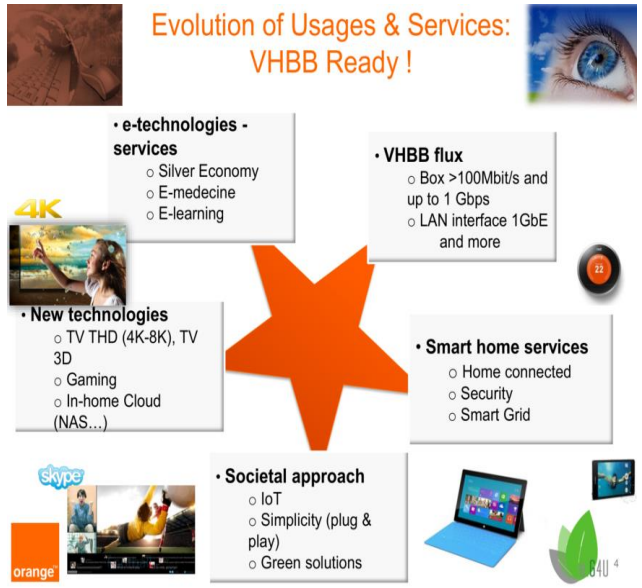
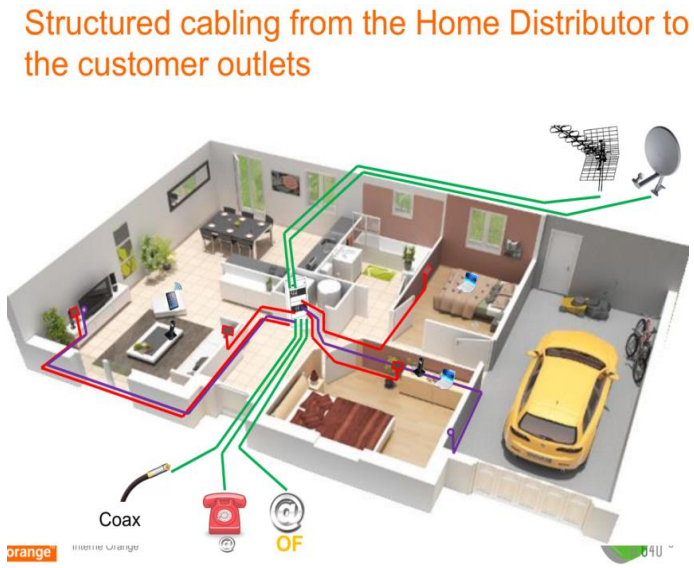
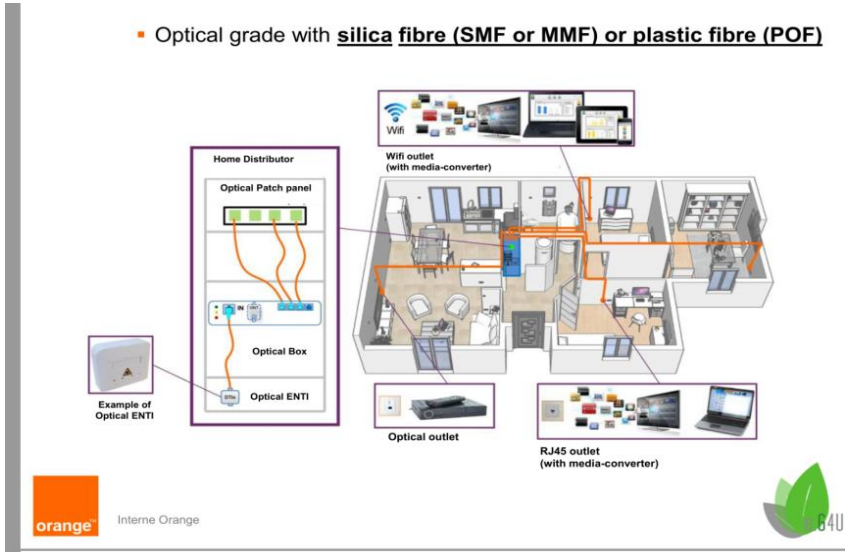
EXAMPLE ON THE FRENCH MARKET

Minimal Digital Home Connectivity of a home

Since 2010, french regulation on residential cabling mandate a minimal network infrastructure for the digital home.
NFC 15-100 mention a minimum of 4 digital outlet in the house amongst which 2 must be active.







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IN HOME DATA WIRING

- The POF technology enables transmission UP to 1Gbps (1000 Mbps) for link length UP to 50m (can reach 100m at half speed)
- The standards that governs such bitrate digital transmission are:
  - ETSI TS 105 175-1: Plastic Optical Fibre System Specifications for 100 Mbit/s and 1 Gbit/s.
  - IEEE 802.3bv: IEEE P802.3bv IEEE Standard for Ethernet Amendment 9: Physical Layer Specifications and Management Parameters for 1000 Mb/s Operation Over Plastic Optical Fiber

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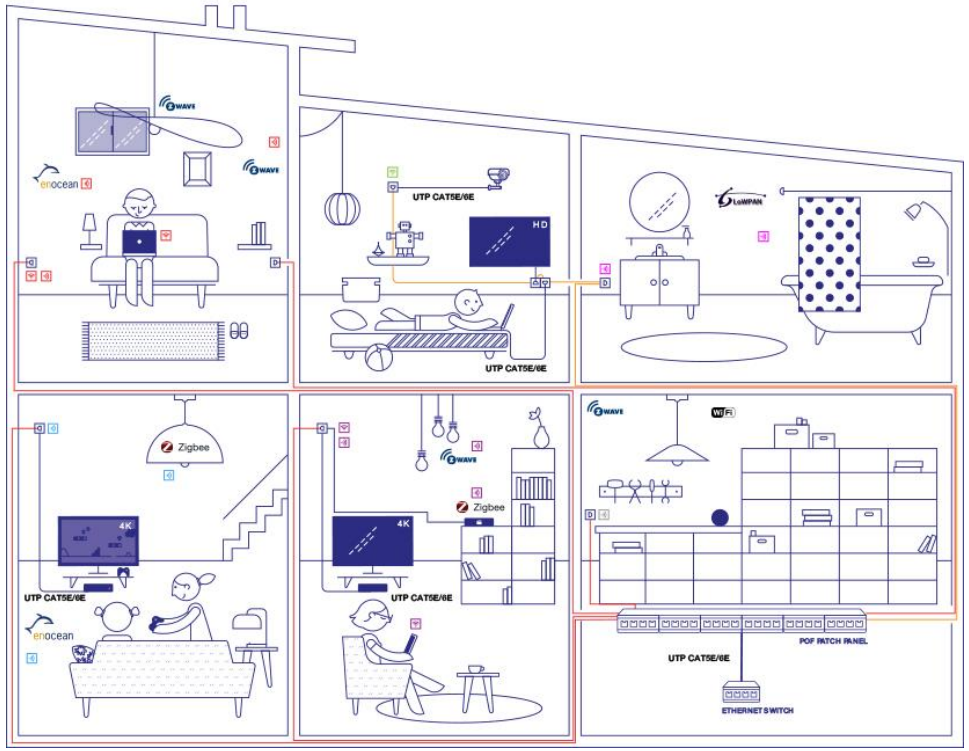
GIGABIT PLASTIC OPTICAL FIBER BY SKYLANE OPTICS:

A "Do It Yourself" optical fiber solution for ubiquitous inhome's **Gigabit Cabling**

Simple, Fast, Unbreakable & Performant



#01 POF Patch Panel:

> Gigabit Media Converter 1U Factor:
  - 8/16/24/48 Ports
> Optional Power Injection:
  - IEEE 802.3af(PoE)
  - IEEE 802.3at(PoE+)

#02 POF Wall Plug:

> Gigabit In Wall Media Converter
> Compatible 48/110/220v
> Optional Wifi Acces Point
> Optional USB Power Supply
>... (Form Factor)

#03 POF IOT Extensions:

> Wi Fi IEEE 802.11nac
> Z-WAVE ITU-T G.9959/
> IEEE 802.4.15:
  - 6LoWPAN
  - Zigbee
  - THREAD
> BLE Bluetooth

*The Skylane Optics POF Product catalogue is compatible with POF Cables, POF Hybrid Cables and **IEEE 803.3bv** and **itu-t G.9960 (G.hn)**.

***Star Cabling Topology** (IEEE 802.3bv) and **Daisy Chain Cabling Topology** (itu-t G.9960) **(G.hn)** are supported by all Skylane Optics POF Products.

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ADVOCACY FOR A DISTRIBUTED IOT LPAN RF

Room level Multi-radio Access Point

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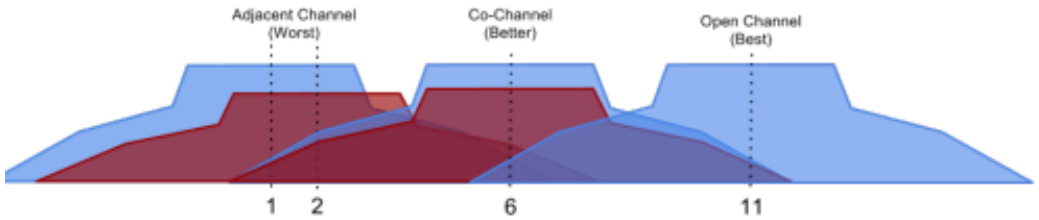
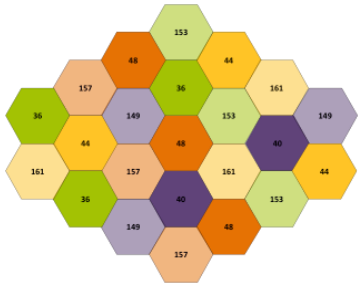
FIGHTING FOR RADIO FREQUENCY AIRTIME

Local Area Network aka Wireless Ethernet : WiFi APs race to spectrum

- 2.4Ghz & 5Gh (& soon 60Ghz) in a license free space
- According to ISM Band Type B RF: spectrum is shared amongst technologies
  « *Radiocommunication services operating within these bands must accept harmful interference which may be caused by these applications.”*
- Various type of Signal strength





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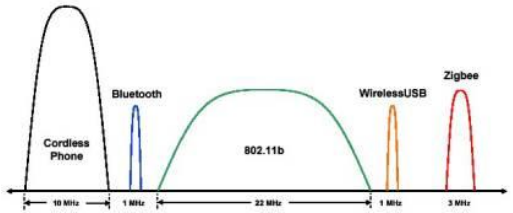
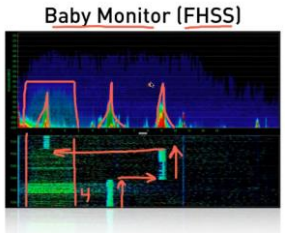
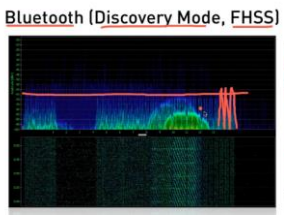
EVEN MORE FIGTHERS

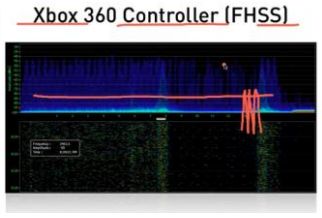
Local Area Network aka Wireless Ethernet : WiFi

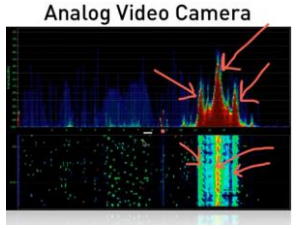
- Industrial, Scientific and Medical radio spectrum band
  - Non-ISM uses:
    - WLAN, LWPAN, Hiperlan, BLE
    - Sensors,
    - DECT phone
    - Baby Monitor
    - Camera
    - RADAR
    - …
  - Various type of RSSI strength (RF power emissions)

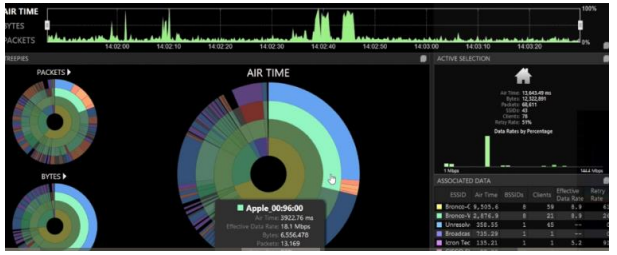












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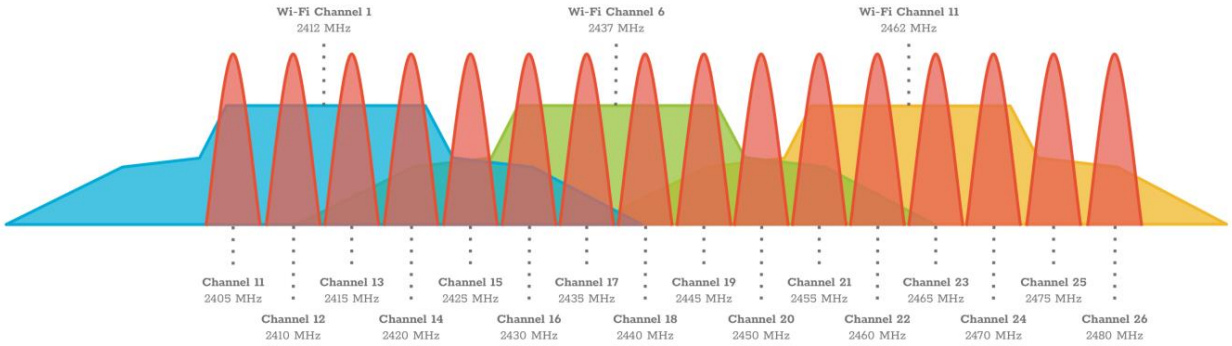
IOT IS IN THE ARENA TOO

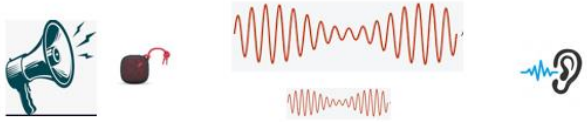
Low Power Area Network aka Smartbuilding IoT

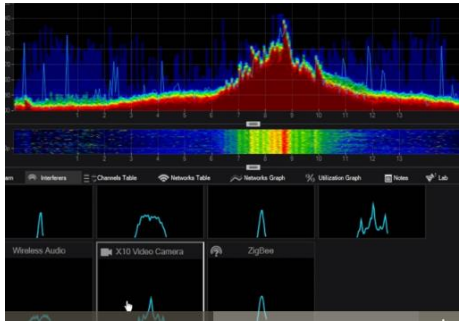
SKYLANE OPTICS®

- LPAN means LOW POWER
- WiFi interferes with ZigBee channels (2,4Ghz)
  - WiFi's three non-overlapping channels (1, 6 & 11) exact same frequencies as ZigBee channels 11-22
  - ZigBee channels 25-26 aren't immune either because of channel 11's sideband lobe



- Stronger signal is not the solution 4 all
  - (IoT) LPAN radio
    - Low power RF signal
    - Powered by a battery
    - Small form factor (and antenna)
  - e.g. WiFi transmit Energy which crushes the IoT device
    as numerous other RF devices do





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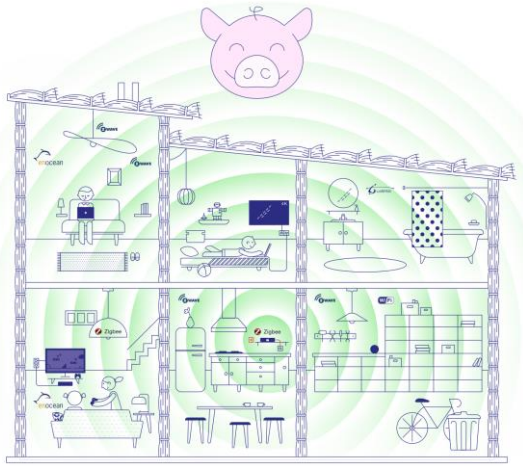
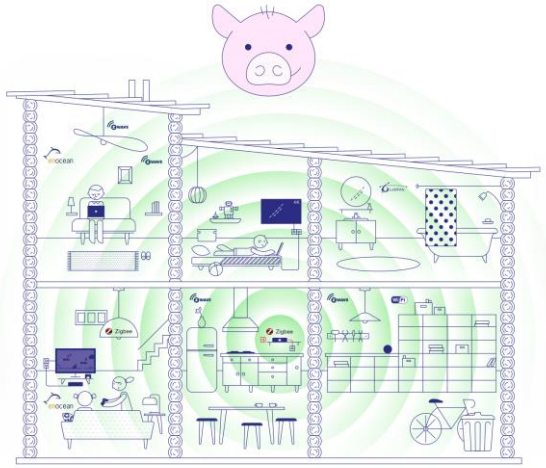
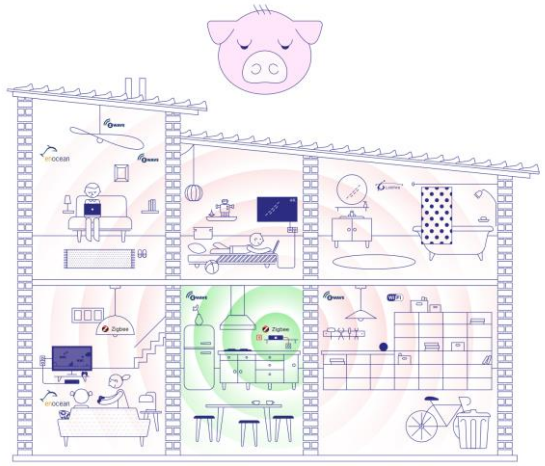
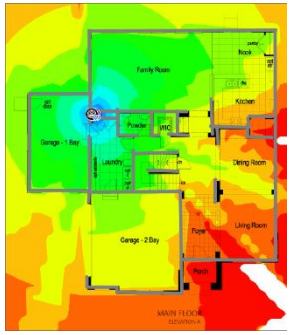
MANY MATERIALS ARE NOT (ISM) RF FRIENDLY

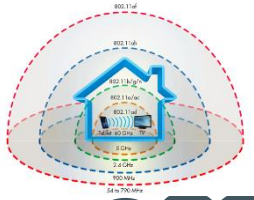
Once upon a time, three little pigs…







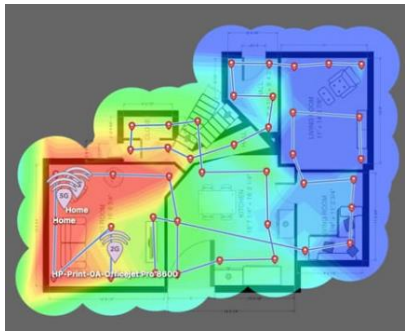


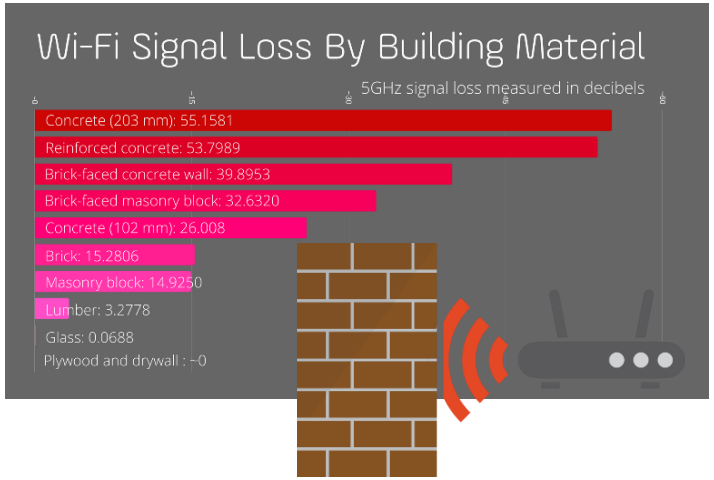


Placing the AP in the 'Kitchen' which is in the center of the house

Works well IF and only IF: **Construction is made of Straw or Wood**

What about house made of **bricks?**





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TODAY TRENDS ON LWPAN

Dowscaling the IoT Gateway Controller Radio(s) coverage + Add local IoT Bridged Radio(s) coverage

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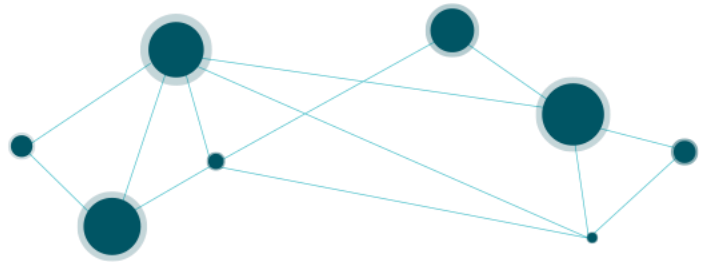
From the Kitchen Hub to the local in-room's distribution



- Mesh networking
  - IoT message relay by multiple Hop by Hop to the SmartHome Controller
  - Requires many 'non battery powered' sensors accross the house
  - **Highly depends on the house rooms architecture and wall materials**

- IoT radio bridges with wired Ethernet backhall
  - IoT message relay single Hop to the SmartHome Controller

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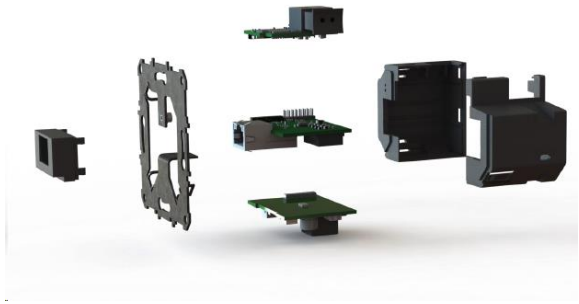
LOCAL, LOW POWER, MULTI-RADIO RF BRIDGE WITH ETHERNET BACKHALL

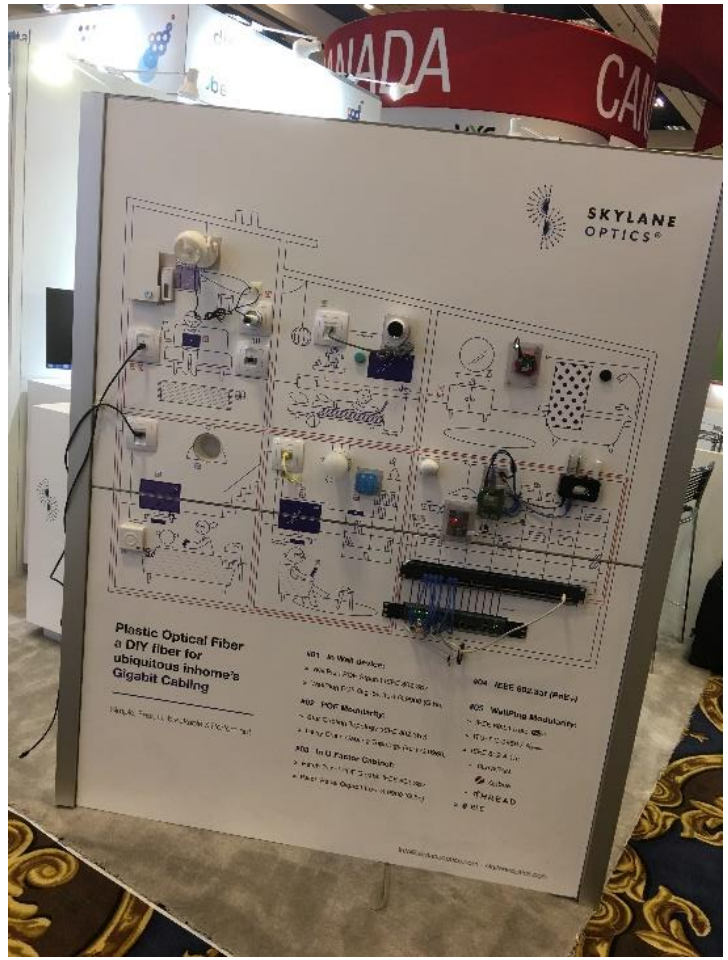
Wired uplink WallPlug RF bridge

- Uplink room connectivity (wired Ethernet Backhall)
  - TV Coax
  - Phone Twister Pair
  - Electricity Wires
  - Fiber
    - Plastic : POF (tube retrofit)
    - Glass : GOF
- Room digital services connectivity (with Quality of Service)
  - WiFi (>=Gigabit aka nac)
  - Z-Wave
  - Zigbee
  - 6LBR (6lowPAN over X / Thread)
  - BLE
  - ENOCEAN

ITU-T G.hn

IEEE 802.3





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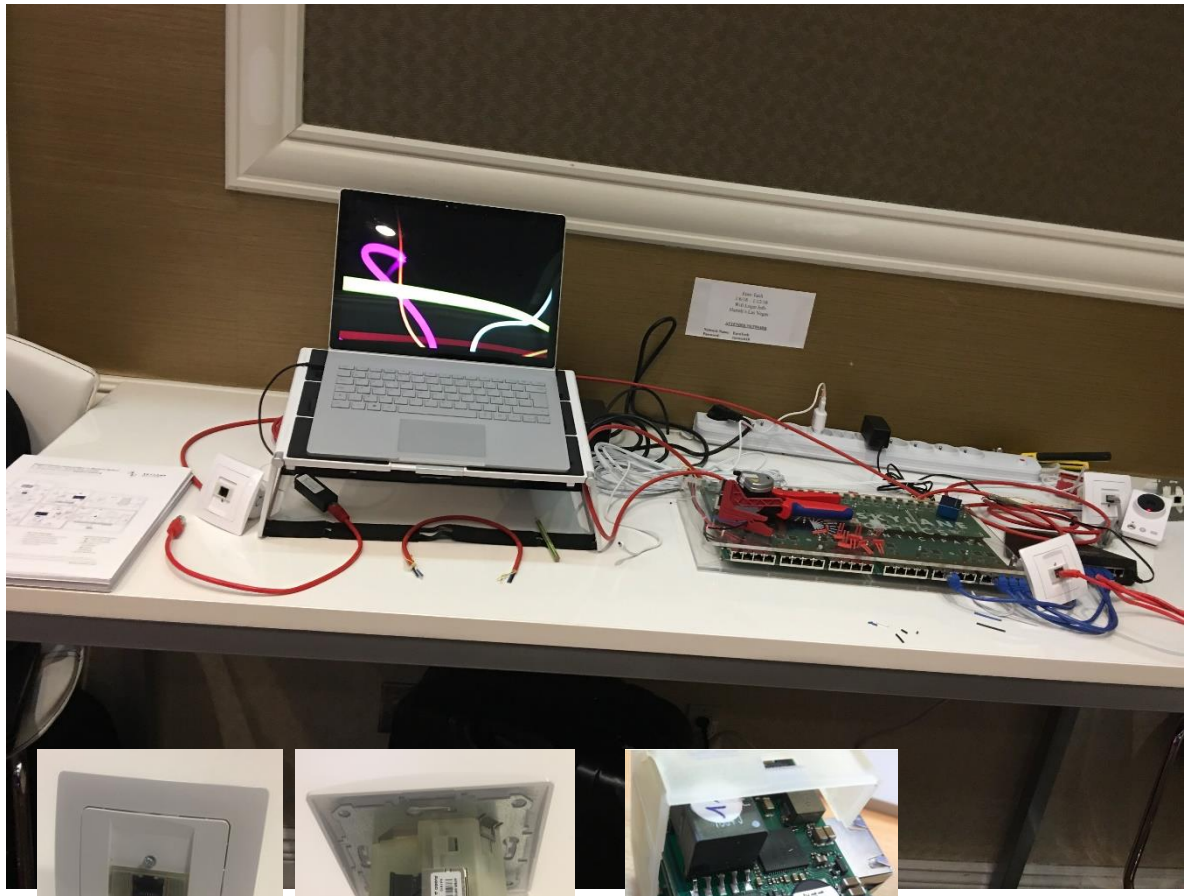
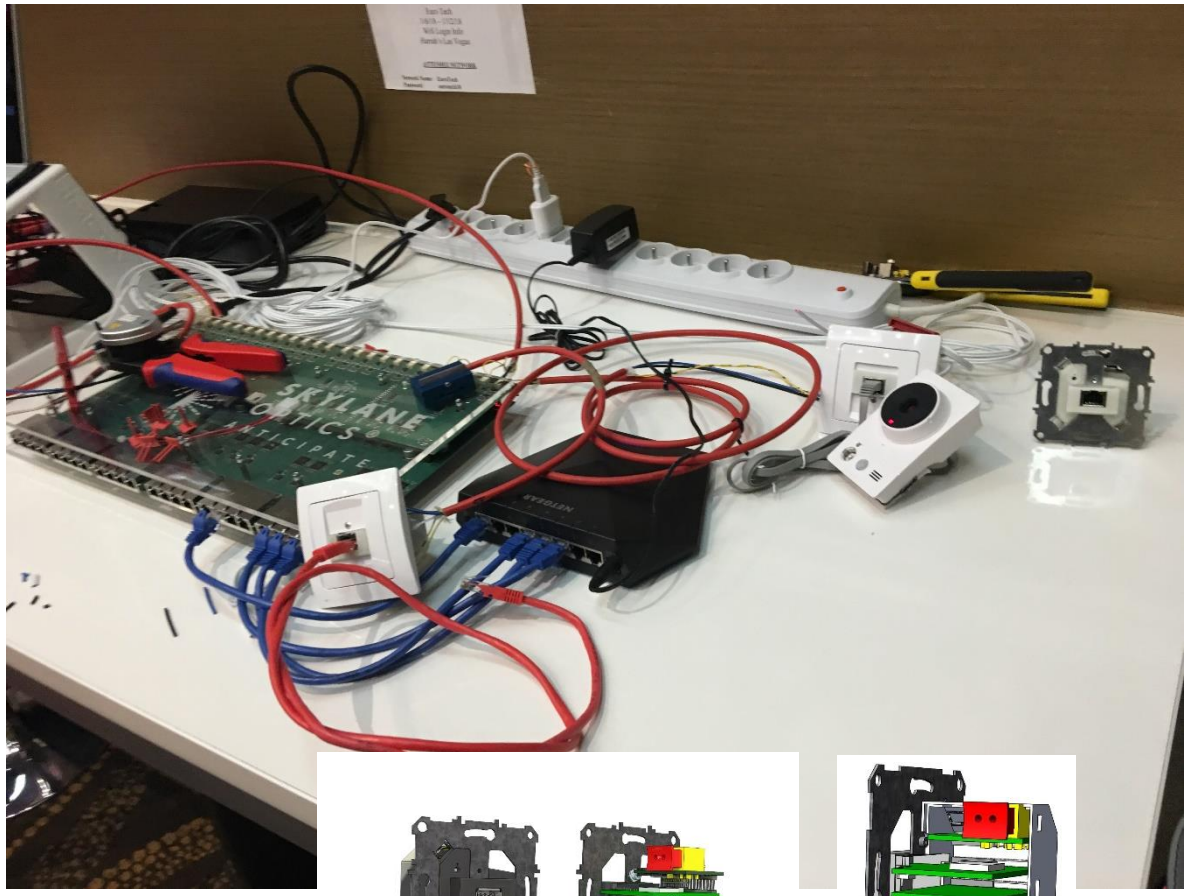
INDUSTRIALIZATION OF A 2 YEARS R&D

(multi) Gigabit WallPlug IoT RF bridge operational prototypes





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R&D PROGRAMS

- Actphast 2015-2016 : RCLED to PoF coupling device
- Eurostar 2015-2018 : S1-PoF
- DGO6 2014-2018 : Senzor
- EFL 2017-2018 : autosensing
- RPR 2017-2018 : Unified Home backbone network
- BEWARE 2017-2018 : Skygate Secure Coding
- H2020 : Next Generation Free Form optics (proposition March 19)

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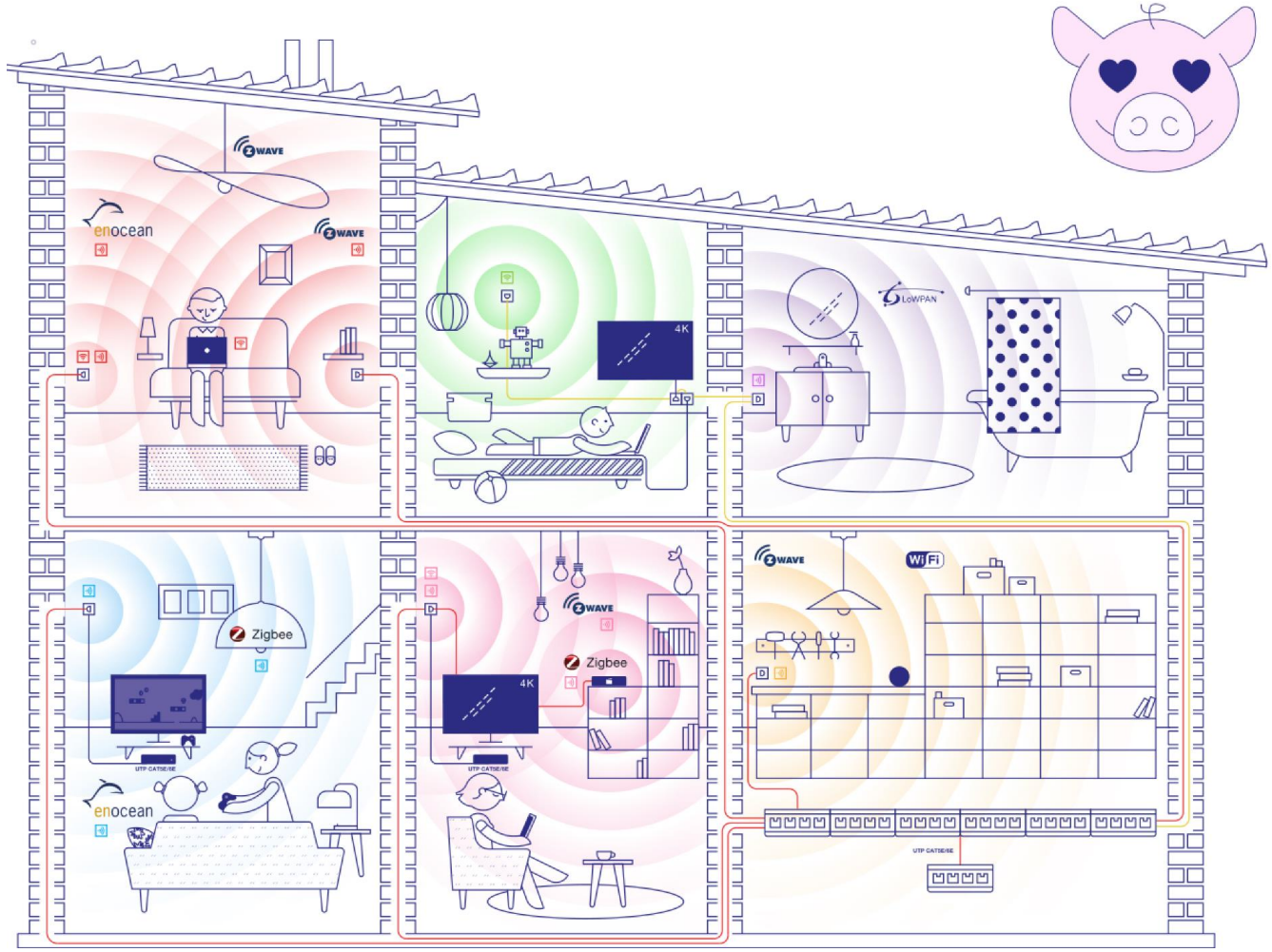
PER ROOM LOW POWER RADIO BRIDGE(S)

Skylane Optics flexible in-WallPlug is a small form factor Multi-Radio bridge which fits within traditional wall environment.



This new kind of in-wall flush-mounted outlet offer in room relay services for **high speed ubiquitous Internet** (WiFi) and **narrow band speeds IoT sensors or actuators** (Zigbee, Thread, Z-Wave, BLE, Enocean) located **across the various living place of the smarthome**”

«

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WE HAVE A LOT OF INNOVATIONS IN EUROPE AND IT IS NOT TOO LATE TO POSITION OURSELF IN THE WORLWIDE MARKET.

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