Are data network inside buildings ready for the near future?

The evolution of LANs inside buildings
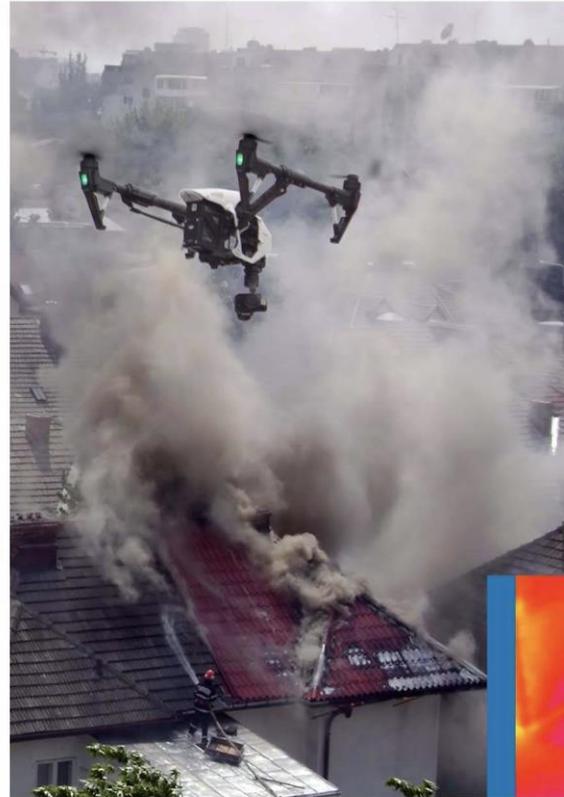

ETHERNET SPEEDS
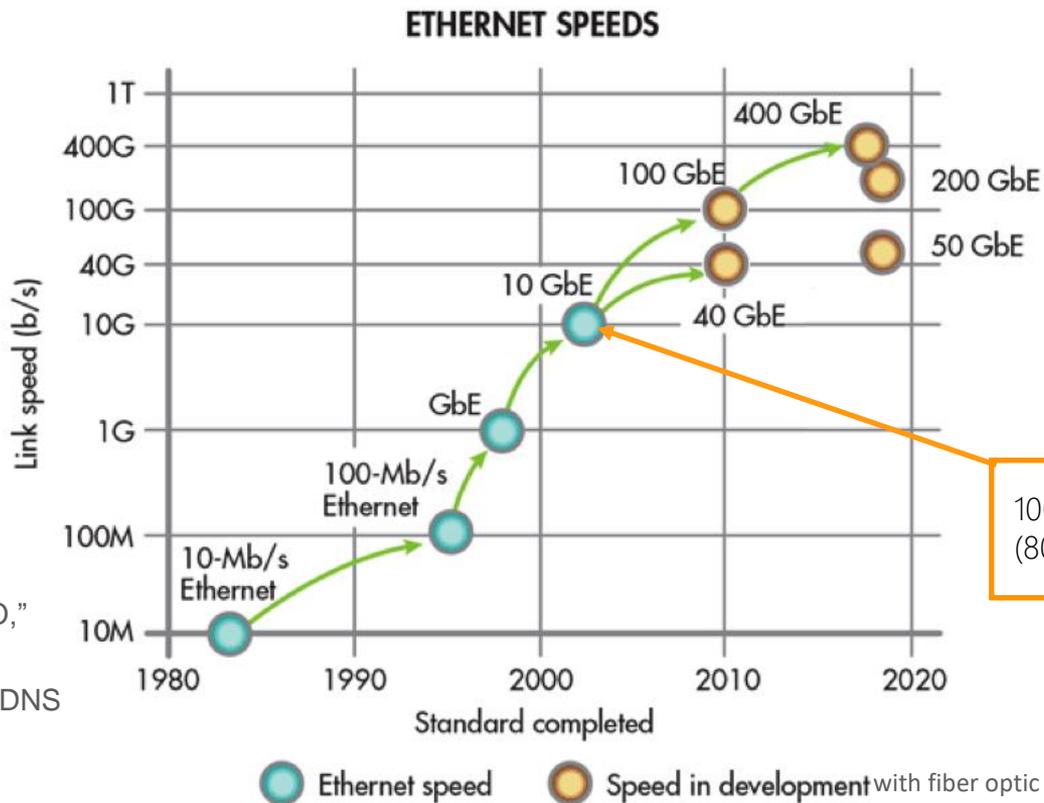
1969 The first message is "LO,"

1982-1983 TCP/IP & DNS

10Gbit standardized in 2006
(802.3an on copper)

Are we aware of the increase in transfer speed requirements?

Scene Monitoring

- Deploy aerial assets for overwatch within minutes of arrival on scene
- Rapid 360 degree assessment of burning structures
- See through smoke with thermal imaging cameras to monitor hotspots and crew from above
- Illuminate nighttime scene operations with floodlights

Transfer speed requirements today…

9,6Gbps

30Gbps

- A single minute of UHD (3840 x 2160) file is about 5.3 GB. A single hour of 4K footage is 318GB. 25 hours of 4K filming is equivalent to approximately 7.76 TB, data volume that needs 2 hours for transfer at 10Gbit/s and 50 minutes at 25Gbit/s.

MediaTek releases Wi-Fi 7 chips for wireless access points, clients

The Filogic 880 and Filogic 380 chips are among the first Wi-Fi 7 chip platforms to hit the market, allowing wireless connectivity device makers to deliver the next generation of products.

Cabling Installation & Maintenance Staff

May 23, 2022

🖨 f in 𝕏 📌

MediaTek Filōgic 380

Single-chip **Wi-Fi 7** and **Bluetooth 5.3** Client Combo Solution

MediaTek Filogic 380 is an ultra-efficient Wi-Fi 7 and Bluetooth combo chip that provides peak connectivity performance and features for smartphone, tablet, laptop, PC, wearable or other client devices to deliver incredible new experiences in your connected life.

Media Tek Filogic 380 F0522

The Filogic 880 platform includes a 6nm Wi-Fi 7 access point solution with:
- Support for key Wi-Fi 7 technologies such as 4096-QAM, 320MHz, MRU and MLO
- Flexibility to scale to penta-band **36Gbps speeds**
- Support up to 10Gbps in one channel

https://www.cablinginstall.com/wireless-5g/article/14277040/wifi-7-chips-for-wireless-access-points-clients-emerge

Deloitte.   Services ∨   Industries ∨   Insights ∨   Careers ∨   Sea

Perspectives

The digital hospital of the future

In 10 years, technology may change the face of global health care delivery

As the cost of care continues to rise, many hospitals are looking for long-term solutions to minimize inpatient services. Learn how technology and health care delivery will merge to influence the future of hospital design and the patient experience across the globe in this report developed by Deloitte US.

University of Glasgow has established a 5G testbed in partnership with Nokia

6 December 2021

The University of Glasgow has successfully tested 3D holographic calls. Basically, they used Nokia's 25G PON XGS-PON technology and 5G phone network transmission.
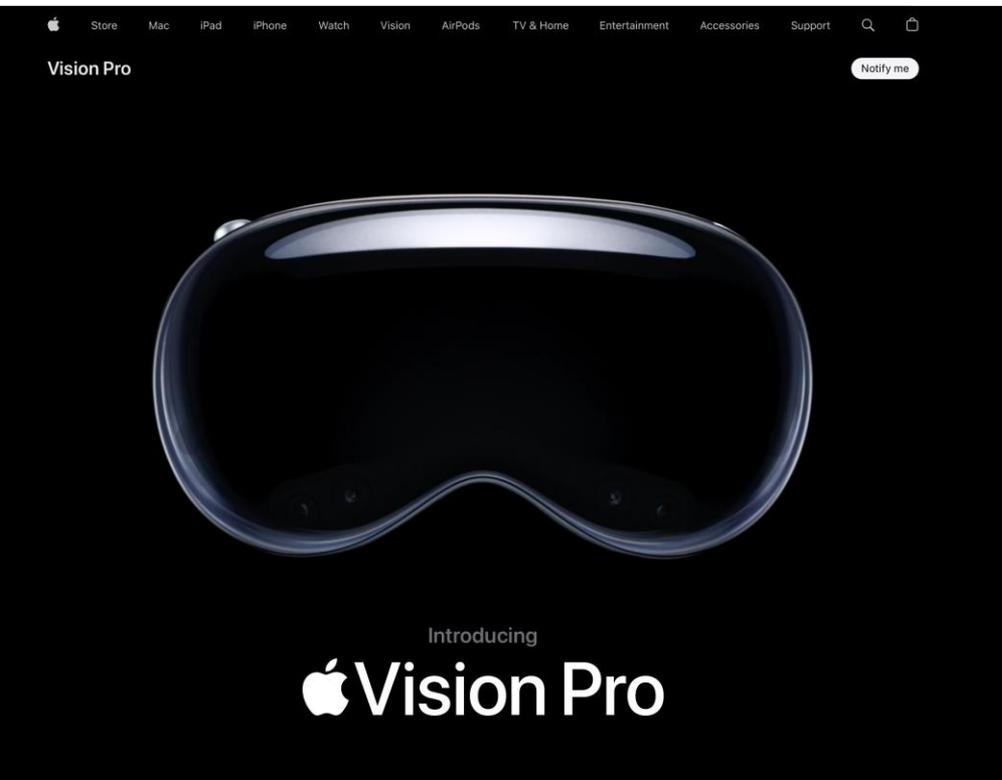A single call requires a minimum of **100Mbps, 300Mbps recommended**

The Apple Vision Pro will primarily be used in static locations, and as a result is most likely to be connected via Wi-Fi to a fixed broadband connection rather than 5G. **Local playback on the device impacts network traffic**.

However, as the transitions to on-premises/cloud play out in the future, network traffic from XR devices will increase rapidly. Additionally, despite local rendering, Vision Pro will still impact network traffic, increasing the demand for 4K+-per-eye video content. The device's ability to record "3D space videos" will also prove popular **and will inevitably generate large amounts of traffic.** Additionally, as more social and gaming applications are launched, the demand for **lower latency connectivity technologies will increase**.

Here, we get to the weak point of people's overall experience with Apple Vision Pro, and one that is in the control of operators: not only will broadband in people's premises limit how the XR is used, but how broadband is distributed the home. **Consumers will demand improved Wi-Fi connectivity to support these devices**, and operators must ensure they provide full, reliable, fast and low-latency connectivity to support them.

Passive Optical LAN - Today Gigabit, tomorrow 100Gbps without rebuild the network

Standard GPON on typical solution for enterprises

Main server room

- VoIP/PBX
- WiFi ctrl
- Surveillance
- Internet
- RF/cable TV video
- Access Control
- Building mgt & control
- IT & Data Center

POL Command Center management platform

7750/7450 IP/MPLS

7360 FX (OLT)

2.5 Gb/s →
← 1.25 Gb/s

FIBER DISTRIBUTION

Offices
- WI-FI AP
- Access Control
- RF / IPTV
- IP/Analog phone

Conference & meeting rooms
- PA
- IP phones
- Signage

R&D/test center
- virtual desktop
- Security/ access ctrl
- Surveillance
- Bldg mgmt IP sensors

Upstream data ← 1310nm
Downstream data → 1490nm   3 λs
Downstream RF video → 1550nm

Traditional LAN (copper) vs Passive Optical LAN (fiber)

Traditional LAN

Passive Optical LAN

CAT6 FTP

Fiber Optic

Racks and Switches

Switch Fiber Optic

Router Server Firewall

Fiber Optic

Fiber Optic

Fiber Optic

Passive Splitters

Optical OLT Acces Node

Router Server Firewall
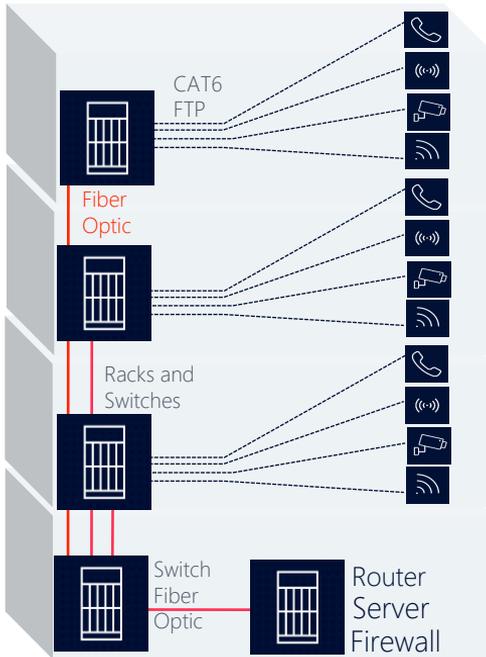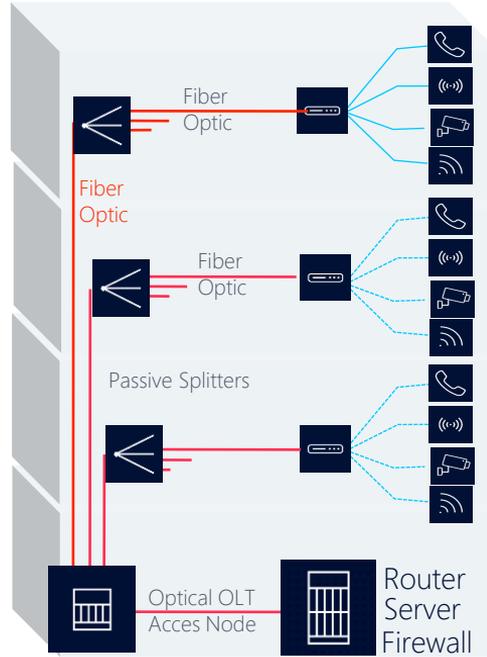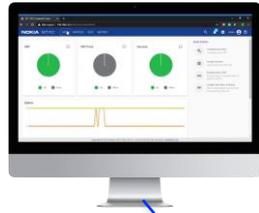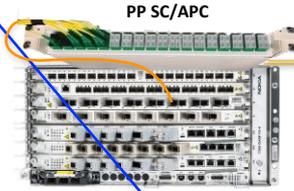
- Speed 2.5Gbps and 10Gbps today. In the future 25G, 40G or 100G, without replacing the network

- Distance up to 20km

- Less equipments

- Less occupied space

- Less energy consumption

- Less cables and metalic structures

- Easy to maintain (OPEX)

- EMI immunity

- Military grade AES 128bit security

- Easy software management

Passive Optical LAN Network Distribution Plan

SOFT USER FRIENDLY
ONT status in real time
Automatic detection and allocation
View on the map of ONTs
Alarms, Upgrade, Allocation /port
Replacement, quick reallocation
Web interface for management

SPLITTER BOX / PATCH PANEL
1:32

Optic Network Terminal
Voice-Data 1, 2 sau 4 ports

Outlet FO

FO DROP
1FO G657

ONT PoE
1, 4, 8 ports

PP SC/APC

1 FIBER OPTIC
up to 20km

OPTICAL LINE TERMINAL
OPTICAL ACCESS NODE
480GBps up to 1.28 TBps
8 to 256 PON ports
19 inch - 4U rack
-48V with backup batteries (24h)

Outlet FO

ONT WiFi
2 Tel + 4 Gbit

ONT
SFP Type

POL DESIGN ///Next Generation LAN Passive Optical LAN

5571 POL Command Center (PCC)

... Because your network is only as good as your ability to use it

Management made easy

Intuitive Web
User Interface

Powerful solution
with minimal
overhead

Simplified
provisioning

Logical alarm
display and
management

ONT auto
activation

Intuitive trouble
shooting Tools

Pre-define service
definitions for each
user type
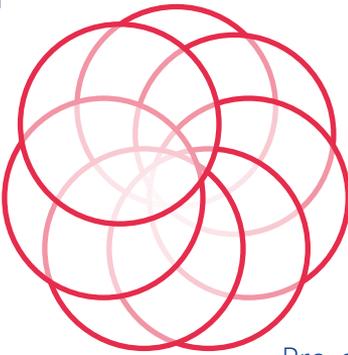
5571 PCC - Realistic network view

Easily customize for your environment

- Upload your floor plans
- Display ONTs in their actual location

Multiple ways to navigate to ONTs

- By floor plan: displays aggregated stats
- By Tile view
- Filtered from a list

ONT detail view

- Services
- OLT shelf, Line Termination (LT) Card and the port it is connected to
- Alarms

The floor plan gives a real time network status view, which in-turn helps in network planning & augmentation. It assists with quick reactivity to network issues.
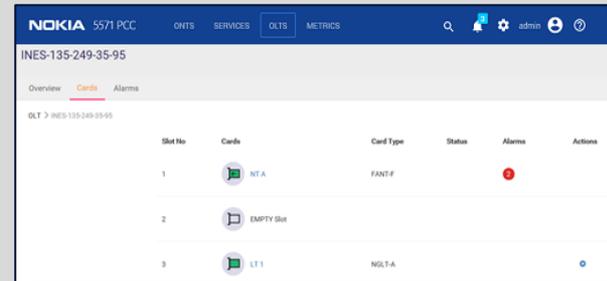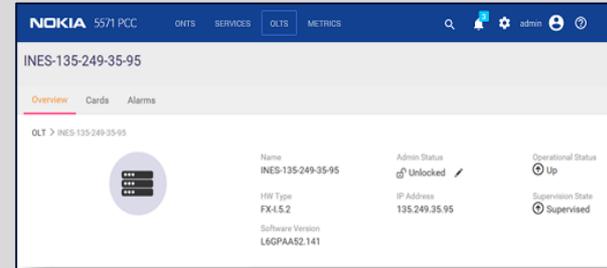
Optical Line Terminal (OLT) Configuration

Add an OLT with one easy step

OLT automatically discovered based on specified IP address or address range

OLT is automatically supervised by PCC

PCC pushes pre-defined POL configuration to the OLT based on cards installed

Single touch OLT provisioning

Service Creation

Service ↑	Service Type	Mode Of Operation	Service Tagging	Uplink Ports	ONT Ports	Update Status	Description
CUST_HSI	HSI_CUSTOM	Switch Emulation	UNTAGGED	0	1	SUCCESSFUL	
Default-Data	FTTD_DATA	Forced Forwarding	UNTAGGED	0	0	SUCCESSFUL	
Default-Voice	FTTD_VOICE	Restricted User User	TAGGED	0	0	SUCCESSFUL	
Default-Wifi	WIFIACCESSPOINT	Secure Force Forwarding	UNTAGGED	0	0	SUCCESSFUL	

Define your own service types
- Create your own service definitions
- Assign one service definition as your default

How to create new service?
- Service name, choose type, set configurable parameter and add a description

Define individual service parameters
- OLT & ONT ports and settings

Copy services defined on one ONT to others

Wi-Fi
Wi-Fi access point connected over POE to ONT

Fiber To The Desktop
Office VoIP phone, PC configuration

IPTV
IPTV Multicast service for TV or Video

VoIP-SIP
Enable VoIP-SIP over ONT POTs port

High Speed Internet
Pure Internet access

Digital Signage
Electronic information boards at airports, etc...

Public Announcement
Public Announcement systems

Surveillance
Connecting IP cameras to a coordination center

Security Control
Badge readers, biometric devices, etc...

Future
Future service definitions as needed

Supported Service Types

A service configuration infrastructure with pre-defined Service definitions highly simplifies the task of network provisioning with little or no need to know the intricacies of a POL network

Troubleshooting & Alarms

PCC specific troubleshooting tasks are provided

- Fully compatible with touch and mobile devices for people on the move

Common types of faults:

- ONT down
- Cable fault
- LT card unplugged
- OLT fault

Relevant alarms shown in each view

Active alarms views at:

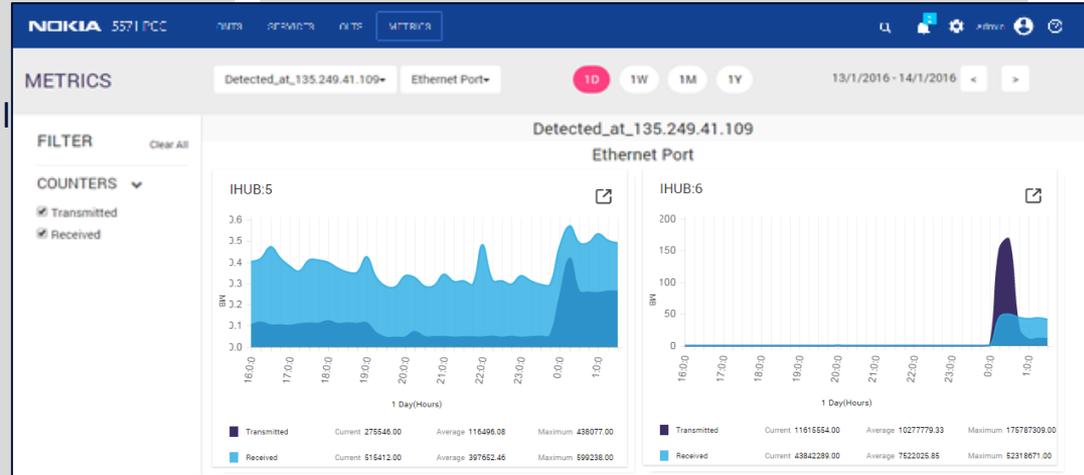- OLT
- OLT card
- ONT
- service levels

Metrics on PCC

Continuously monitor and visualize performance using its metric data

Metrics provide an overview of the overall network health at different intervals
Metrics based on:

- Alarms
- Ethernet Uplink Ports
- L2 Services
- IP System Parameters

Passive Optical LAN: Reliability
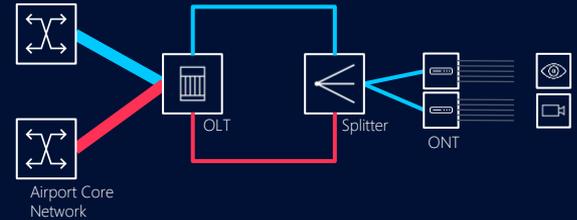
Carrier Class reliability: 5 x 9 (99.999%)

- GPON is rooted in the telecommunications industry
  - Carrier Grade performance
  - Architectural resilience options to achieve 5 x 9 service availability (5.26 minutes of downtime per year)

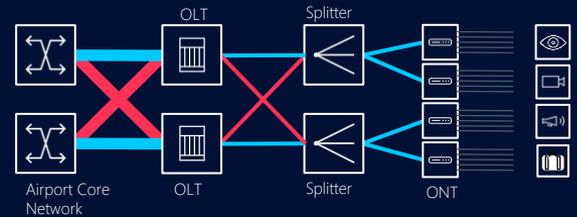- Redundancy options to critical network (aero, hospitals, etc)
  - Redundant Network / Controller cards
  - Redundant Line cards
  - Redundant Optical paths
 - Redundant Nodes
  - Redundant Power feeds

DESIGN IS ALL – ENSURING THE RIGHT RESILIENCE IS IMPLEMENTED

INTRA CHASSIS REDUNDANCY

GEO REDUNDANCY

Main – Fiber or copper
Backup – Fiber or copper
Main – Fiber
Backup – Fiber
Copper

NOKIA

PCC Orchestrated Nokia POL Inter-Shelf Type-B
Sequence

a Operator configures Inter-shelf PON protection in PCC pairing one/more PON port from working OLT with correspond PON port in protecting OLT

b PCC automatically replicates following config from working to protecting OLT with respect to protected PONs
1. Services
2. ONTs

c PCC identifies failure in Working PON port
1. Failures (PON port, LT card, backplane) are reported by OLT to PCC as trap notifications
2. PCC identifies OLT reachability via its heart beat mechanism

d PCC initiates failover by unlocking the corresponding PON port(s) in protecting OLT

e Traffic rerouting is done via the protecting OLT
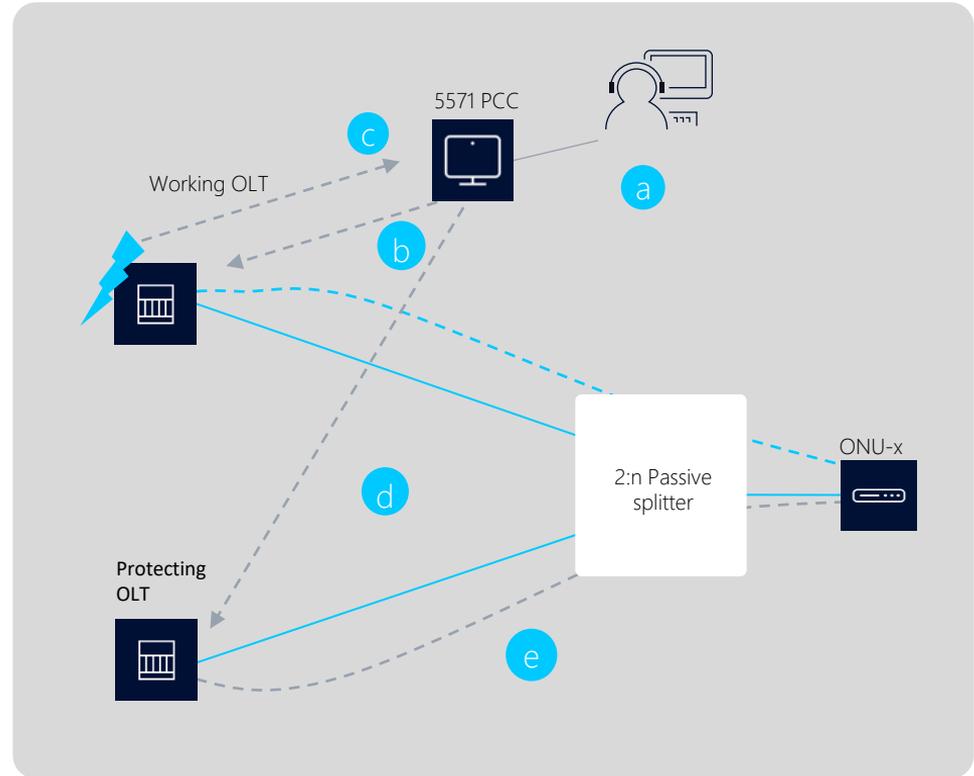
Passive Optical LAN: Security

> All Nokia products are based on DFSEC (Design For SECurity)

> Nokia POL comes with intrinsic build in security features for both access and data. Examples:

- Military-grade security with AES-128 data encryption

- Fine grain controls on management: Role & resource based access control

- Fiber optic is inherently a more secure medium & difficult to tap-in Fiber isn´t subject to EMI nor does it introduce EMI

- ONTs are thin-client devices: can´t be managed and accessed locally (unlike switches)

Specific Compliance

- US Government Security standard: FIPS PUB 140-2

- US Department of Defense Joint Interoperability Test Command (JITC)

Design for Security (DFSEC)

Feature screening
- Security threat & risk analysis
- Privacy Impact Assessment

Systems engineering
- Security & privacy requirements
- Security architecture specification

Development
- Secure coding
- Source Code security testing
- Product hardening

Integration & verification
- Security testing

NOKIA

Passive Optical LAN: QoS

Quality of Service is the ability to provide different priority to different applications, users or data flows
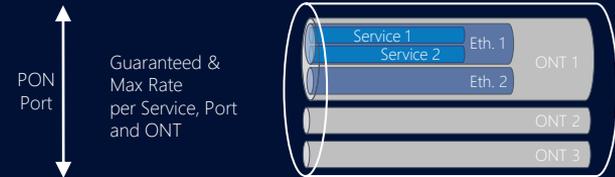
> Nokia Optical LAN QoS

- GPON Standard implementation
- Per ONT, Ethernet Port, VLAN

> Allow to define various types of services with different priority
- CCTV
- Alarm system
- Access Control systems
- Voice call
- Etc.

QoS SETTING IN NOKIA OPTICAL LAN ELIMINATES THE COMPLEXITY OF COPPER BASED NETWORKS

UPLINK TRAFFIC

Additional Bandwidth

Best Effort
Low-priority additional BW, Prio3

Non-Assured
High prio additional BW, Prio 2

Guaranteed Bandwidth

Assured
Fixed average BW, Prio 1

Fixed

Traffic Shaping

Statically Reserved

DOWNLINK TRAFFIC

PON Port

Guaranteed & Max Rate per Service, Port and ONT

Service 1
Service 2
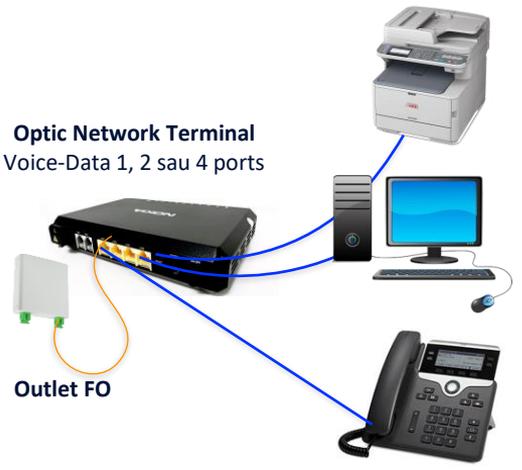Eth. 1
Eth. 2
ONT 1
ONT 2
ONT 3

- Traffic priority set in core network (p-bits)
- OLT features queues per ONT, Ethernet Port and service each with priority handling and bandwidth control
- OLT performs hierarchical scheduling to cope with various traffic types & priorities

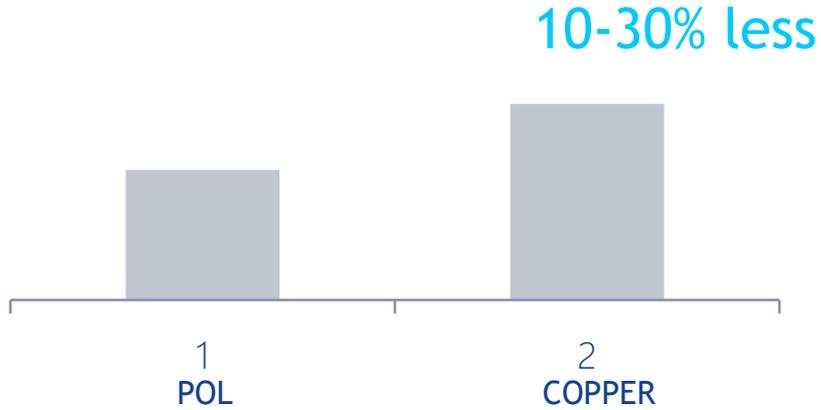# NOKIA POL USER-TO-USER Communications
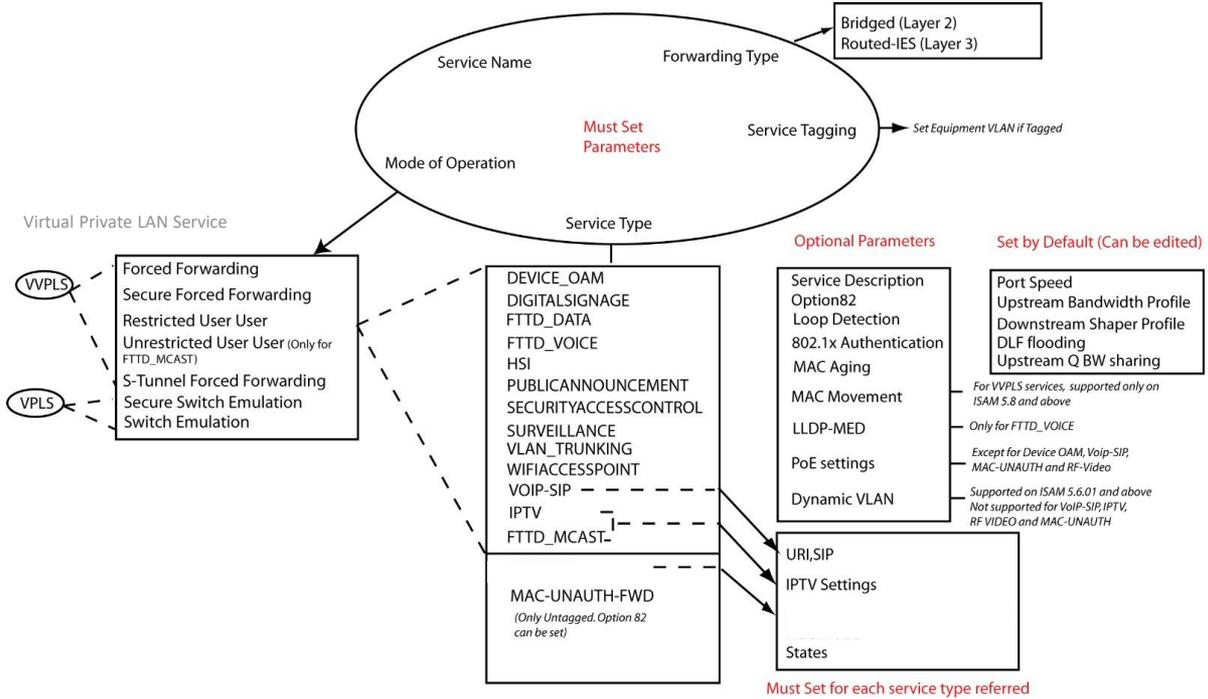
Optic Network Terminal
Voice-Data 1, 2 sau 4 ports

Outlet FO

LAN Network in bulding with 200 to 5000 ports, 2 - 10 floors

Investment Expenditures (CAPEX)

10-30% less

1
POL

2
COPPER

Source: Analysis of Nokia projects in Romania

Operating Expenses (OPEX)

54% less

2

1

■ Maintenance   ■ Space   ■ Electricity
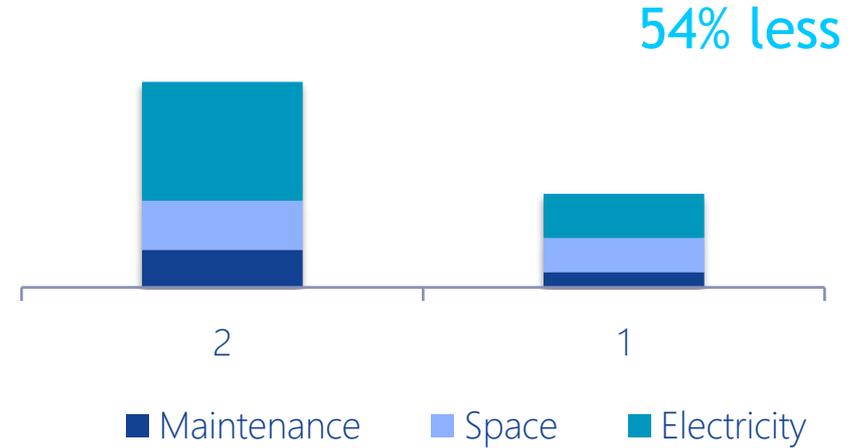
Source: Bell Labs 2015

Melbourne University study on Passive Optical LAN energy efficiency

Study of the energy consumption of two different network architectures and technologies using real measurements

- Traditional copper-based network vs Passive Optical LAN
- Small size (200 LAN ports) and large (2000 LAN ports)

	Power consumption per port	
	200 LAN ports	2000 LAN ports
Copper based LAN	14 Watt/port	6 Watt/port
POL	2.5 Watt/port	1.6 Watt/port

Energy-Efficient Passive Optical Local Area Network

The University of Melbourne's POL deployment analysis comparing Passive Optical LAN to Traditional Ethernet LAN

82% Power Saving

Lower Equipment Power Consumption

Higher Passive Technology Utilisation

Requires Less Cooling

Nokia: a recognized broadband leader

Airport Terminal 3 - Indonesia
3 x OLT | ONT classified

Beijing Railway - China
84 x OLT | 16160 ONT's

Clemton University - USA
1 x OLT | 86 ONT's

Guizhou Zunyi Traditional Hospital - China
2 x OLT | 1170 ONT's

Defence Science & Technology Agency - Singapore
Classified

....and more then 300 Global Reference (2021)

VoIP telephony | High Speed Internet | Wi-fi Access | Access Door Security | IPTV | Alarm system | CCTV | Digital Signage

Office LAN | VoIP telephony | High Speed Internet

Office LAN | VoIP telephony | Wi-fi Access

Intranet | Wi-fi Acces | VoIP Telefonie | High Speed Internet | IPTV

Intranet | High Speed Internet

Current Analysis

One of the most competitive and comprehensive portfolios on the market

Nokia & Kronect projects in Romania

Stadion Sibiu

1 x OLT | 235 ONT's 30km Fiber replace 58km CAT6 Cable and 10km Coaxial

Stadion Steaua

1 x OLT | 556 ONT's

Stadion Rapid

1 x OLT | 287 ONT's

Hotel Avram Iancu - Cluj Napoca

1 x OLT | ONT's

ASE Bucuresti

1 x OLT | ONT's | 16km Fiber replace 61km of CAT6a Cable

.... from 2020 more then 50 completed projects

KRONECT
since 1998

Authorized Distributor in Romania

NOKIA

COMMSCOPE®

excel
without compromise.

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