

THE

INTERCONNECTED

NETWORK



The Interconnected Network

The number of applications / Services on a network increases from year to year. New applications are permanently in preparation.

- Server and Server Virtualization
- Cloud Computing
- IP-telephony
- Video conferencing
- Digital TV Services
- Wireless Access Points

A scalable infrastructure forms the basis to guarantee the network performance, for today's and tomorrow's applications. Due to on demand scalability, fibre is the best medium. The Fibre To The Office (FTTO) combines the advantages of fibre with the requirements for a flexibility, cost-efficiency and interoperability enterprise network



DISCUSSION AGENDA

- Modern Data Networks
- Cabling Technologies
- Fibre To The Office (FTTO)
- Why FTTO
- Questions & Answers



Modern Data Networks



- High performance infrastructure Protection
- Flexibility
- Fault tolerance
- Security
- Investment Protection
- Economic Efficiency
- Green and Sustainable



Network Media Options

- Copper Cables CAT 6 / 6A / 7 / 7A / 8.1 / 8.2.
- fibre optic cables OM 3 / 4 / 5 | OS 1 / 2
- Coaxial cables (Twinax)
- Wireless

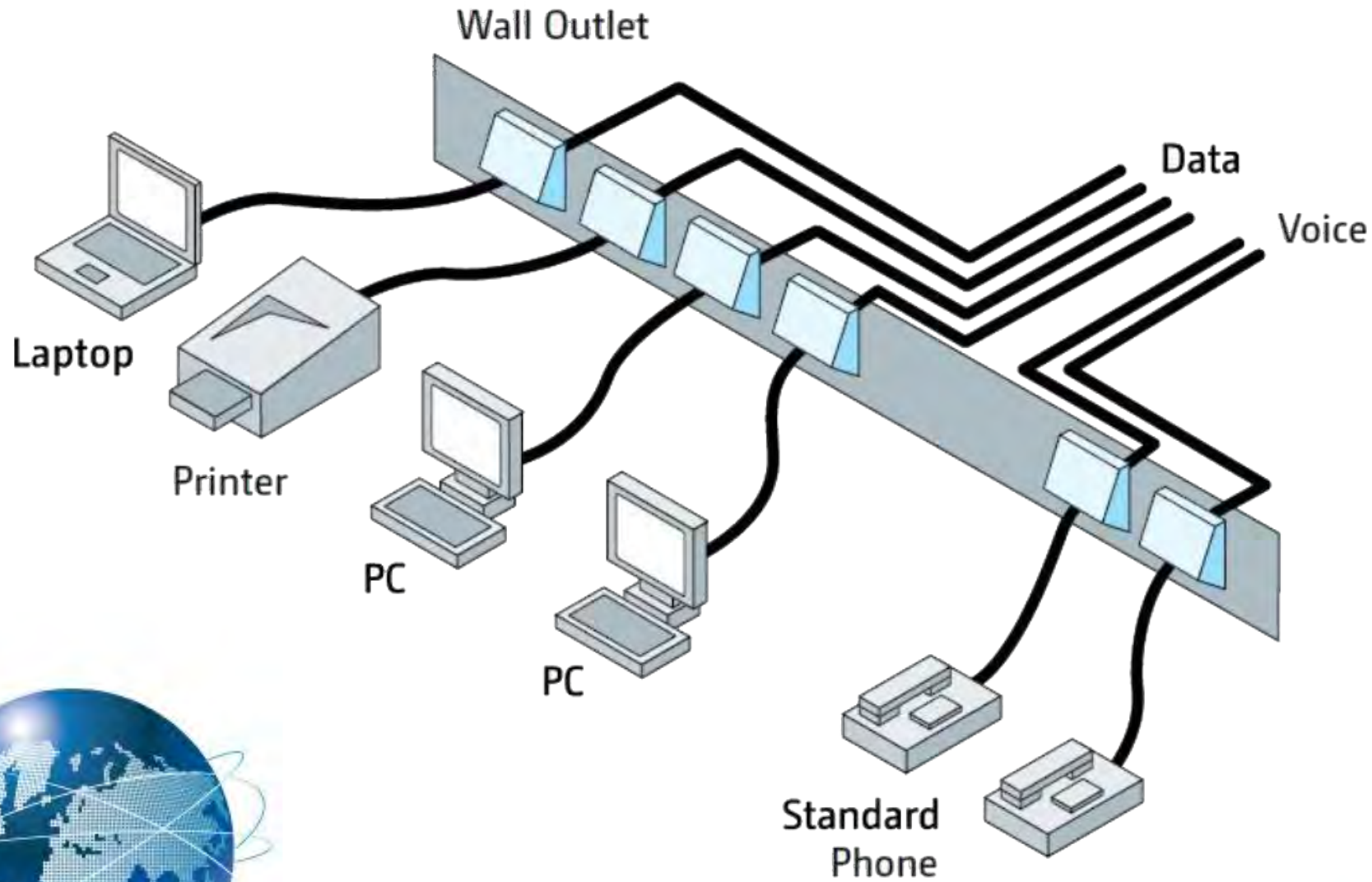


Cabling Technologies

- Structured Cabling Network
 - Copper
- Structured Cabling Network
 - Fibre
 - ✓ Passive Optical Network (PON)
 - ✓ fibre to the Office (FTTO)



Copper Based Cabling

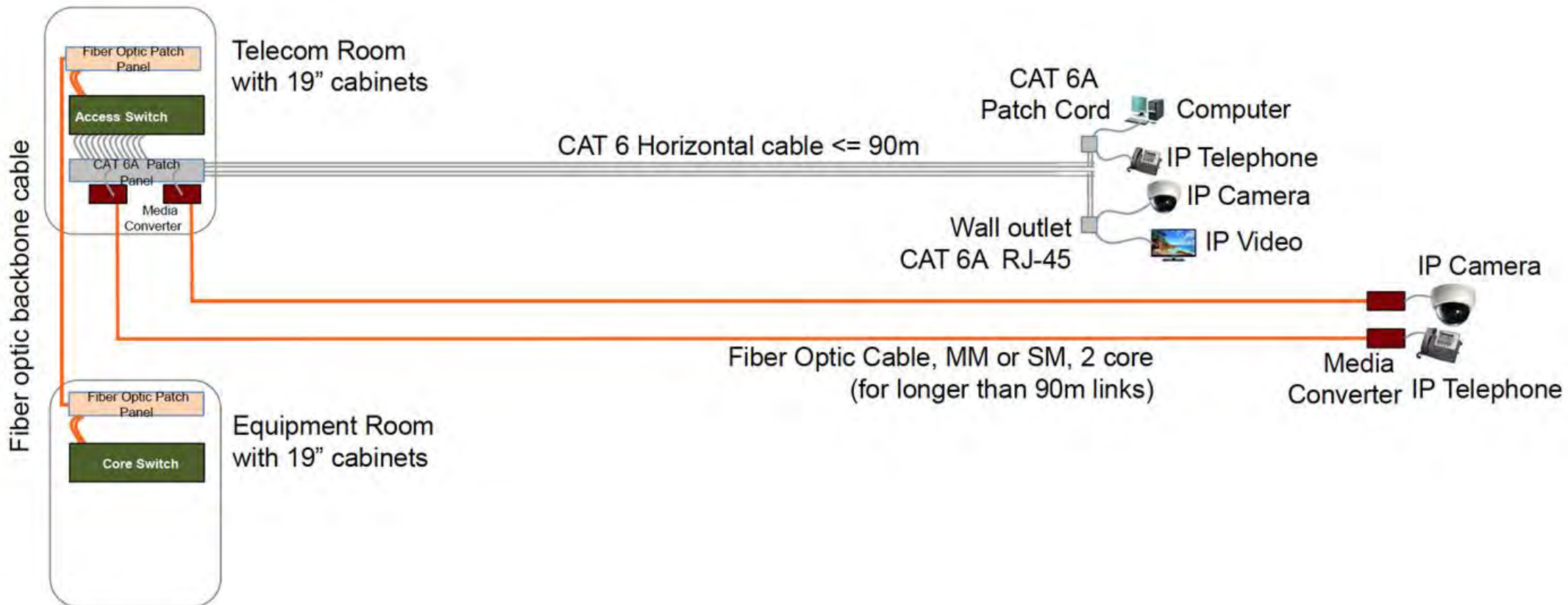


Copper Based Cabling

- Strict length limitations (90m)
- Many wiring cabinets for termination
- High fire and weight loading
- Susceptibility to EMI / RFI
- Electromagnetic and radio frequency interferences
- Average bandwidth per user is limited
 - ❑ One central switch port is shared by typically by 24 or 48 users



Copper Based Cabling



Future Proof LAN Solutions

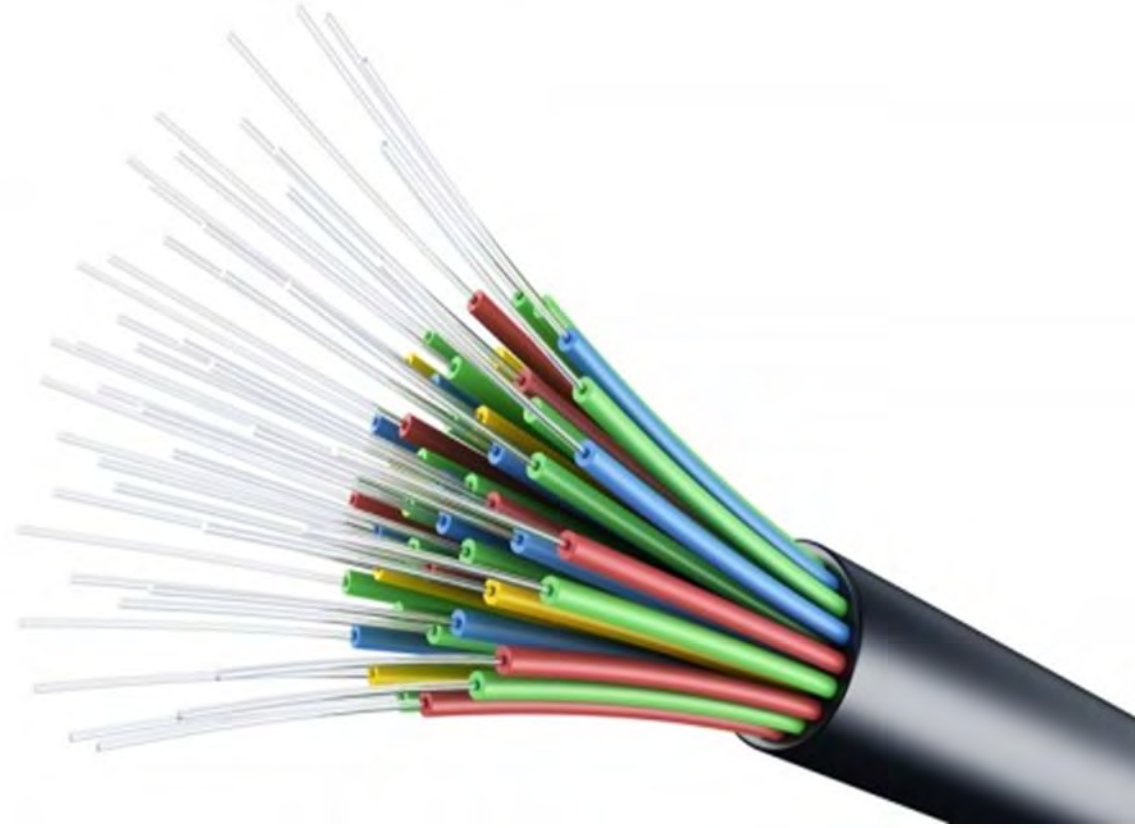


- Number of Applications on LANs keep increasing
- Scalable infrastructure for future-proof solution
- Optical fibre is the best medium
- Fibre based LAN concept combines the advantages of fibre with the requirements of modern enterprise networks



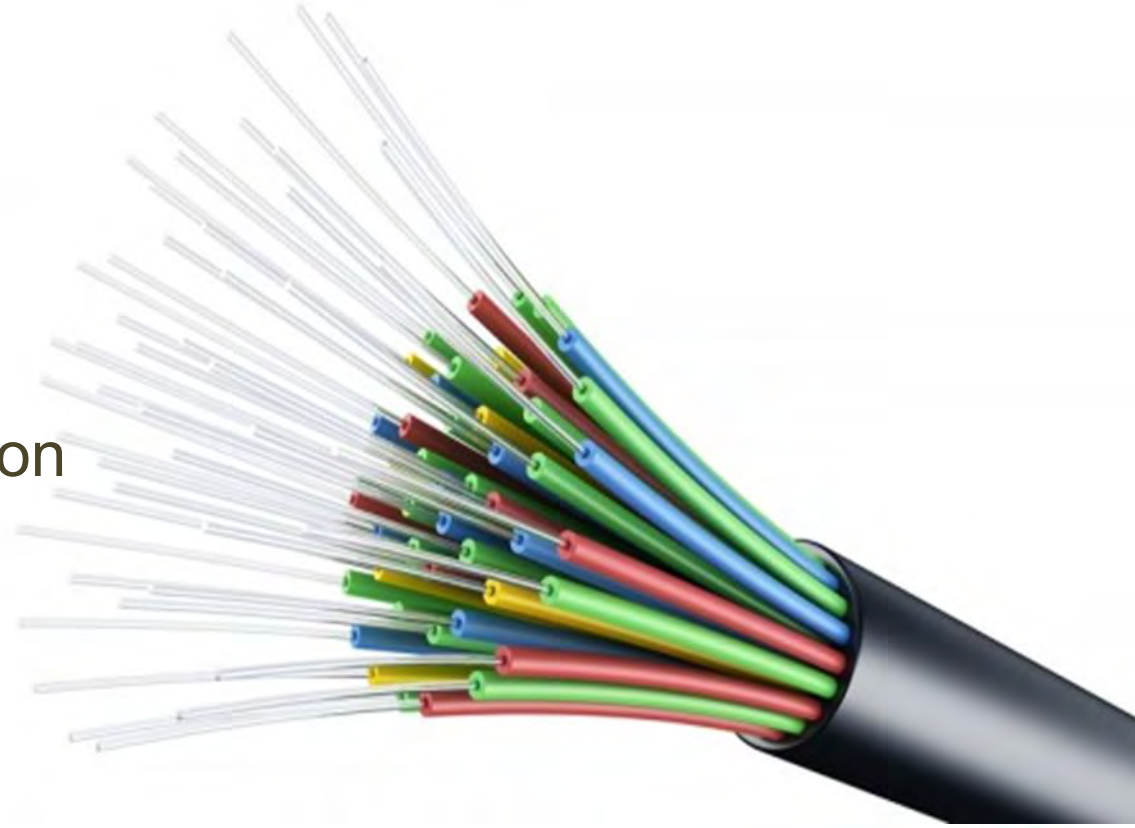
Advantages of Optical Fibre

- High data rates
- Larger link lengths
- Safe from EMI/RFI
- Smaller Pathways
- High Security



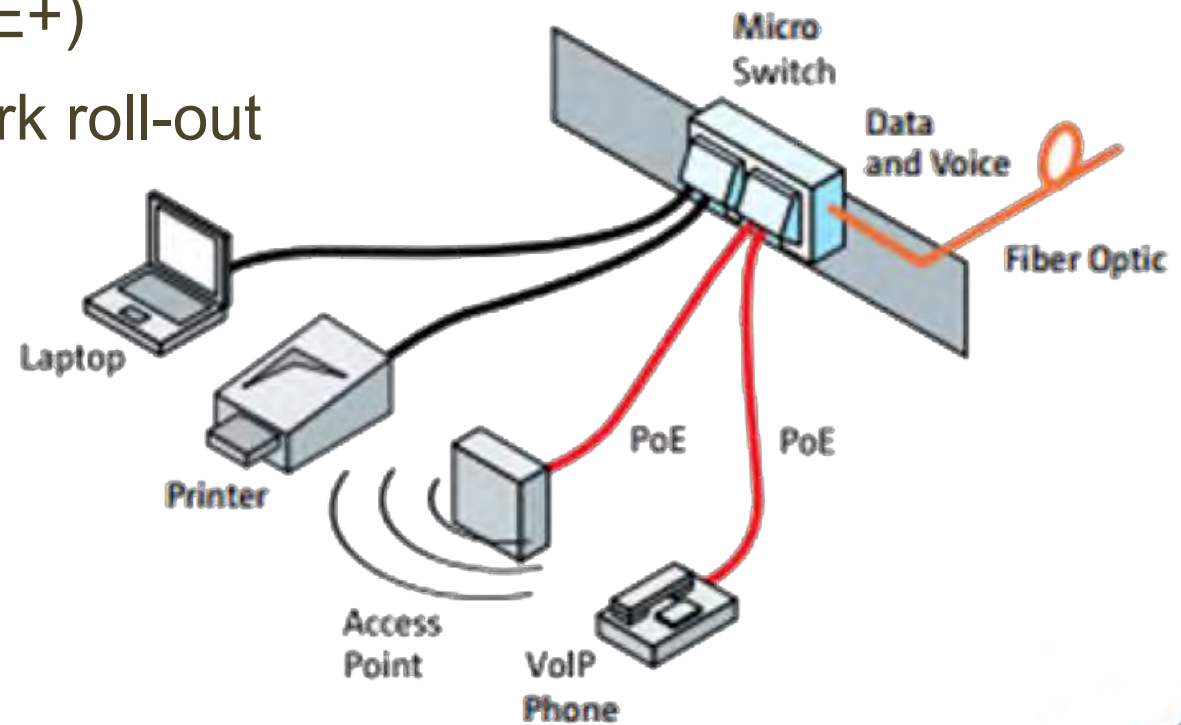
Advantages of Optical Fibre

- Future-proof (scalable, flexible, sustainable)
- Investment Protection
- Secure network
- Low investment cost
- Low maintenance cost
- Simple administration
- Quick and simple realisation
- Up to 70% less energy consumption

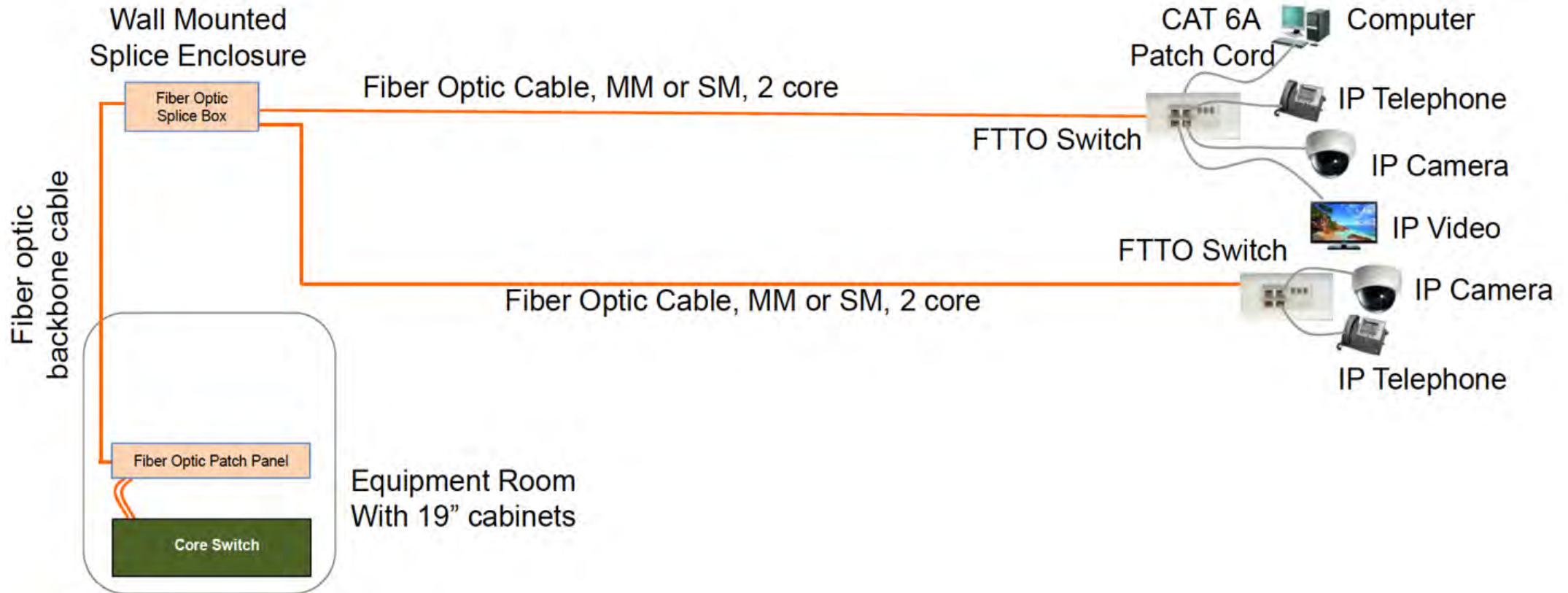


Fiber Based Structured Cabling

- Fibre is distributed to the workplace (connection point)
- Fibre to copper conversion via intelligent FTTO switches
- Four / Five twisted pair (TP) devices can be connected via Micro Switch to one fibre port
- Power over Ethernet (POE+)
- Simple and flexible network roll-out



Fiber Based Structured Cabling



Fiber Based Structured Cabling



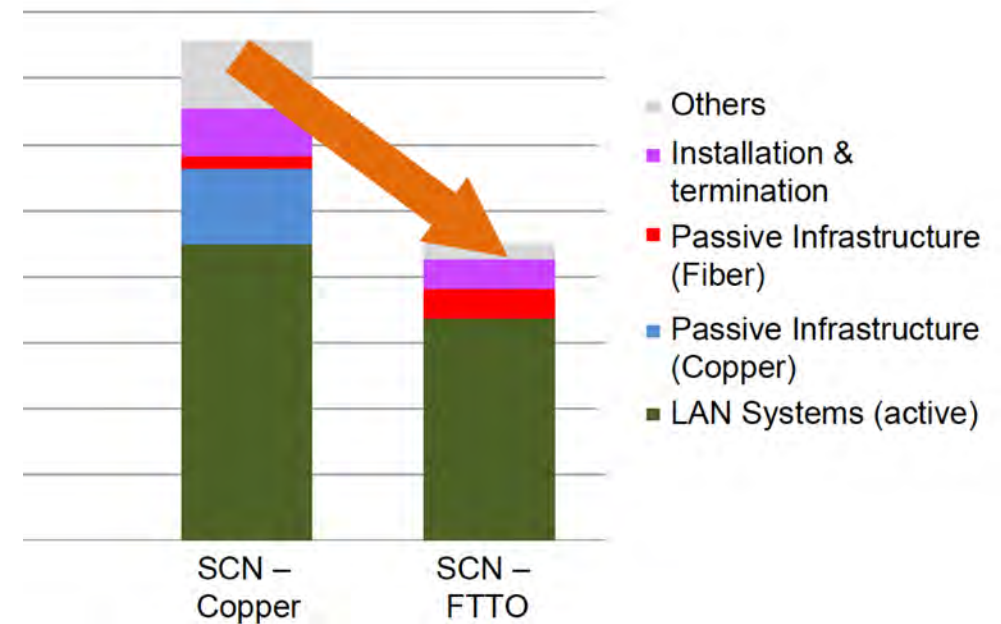
- No need for floor distribution rooms (more office Space)
- 60-70% less installation time
- Low cable volume (one fiber cable instead of 4 copper cables)
- High bandwidth reserves thanks to fiber
- No grounding or Earthing problems
- No problems with electromagnetic interference
- Simple redundancy up to the network outlet (optional)
- Up to 40% less TCO (Total Cost of Ownership)



FTTO Reduces Costs

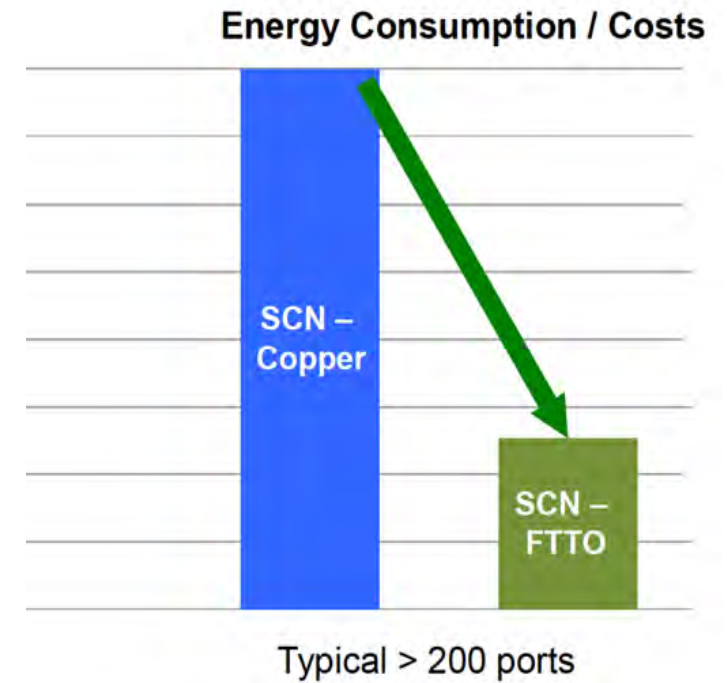
FTTO Makes Gigabit Ethernet Cost-Effective for medium to large IT Infrastructures

- ✓ CAPEX (Capital expenditure)
- ✓ OPEX (Operational expenditure)
- ✓ Flexibility



FTTO Green and Sustainable

- FTTO saves up to 70% in energy costs
- FTTO is the greenest network solution
- No energy hungry floor distribution rooms
 - ✓ Less power consumed
 - ✓ Less active equipment also means less CO₂ Footprint and less impact on the environment
 - ✓ Less tech rooms means more useable area



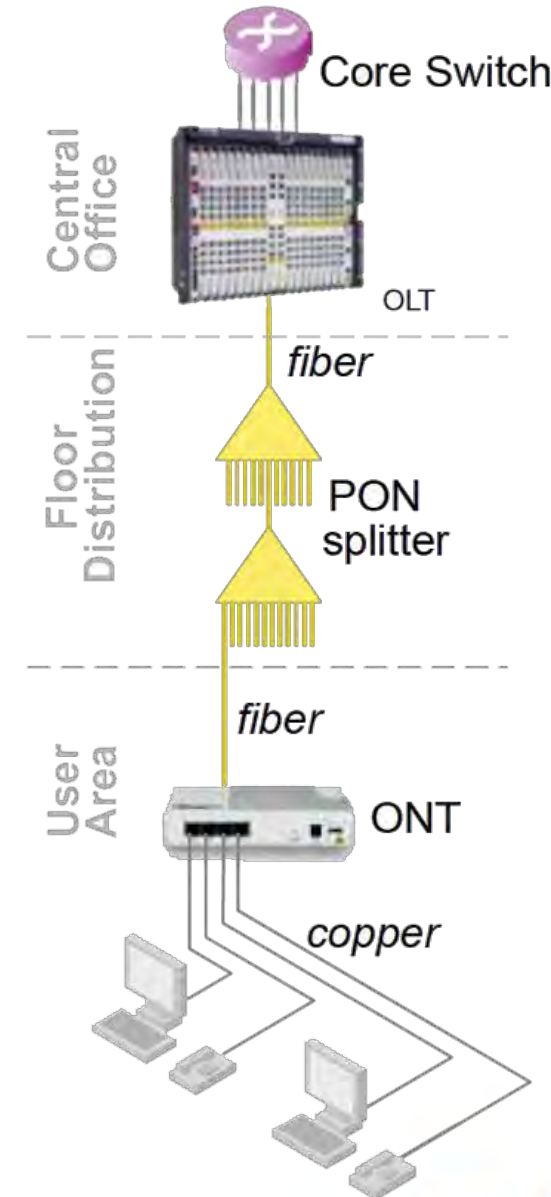
Fiber uses Less Energy

- Less energy is required to transport data over fibre.
 - ✓ Fibre transmission can halve energy requirements in comparison with traditional copper cabling solutions.
 - ✓ Fibre optic cables can carry signals with much **less energy loss** than copper cable as copper wires lose signal energy as heat ($P=I^2R$) due to their resistance.



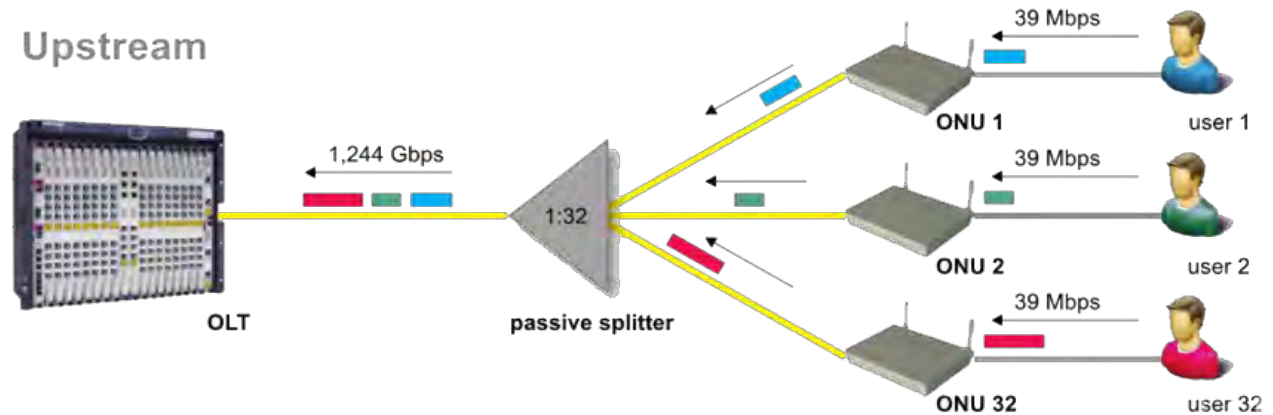
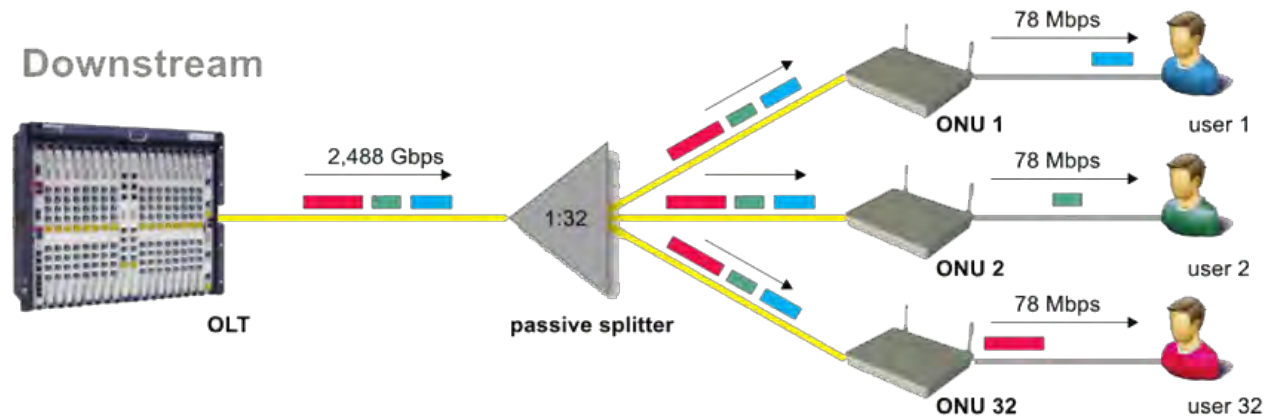
Passive Optical Network (PON)

- Passive Optical Network
- Originated from WAN
- Similar to FTTH
- Uses PON components in an indoor environment
- Optical fiber (single mode) is deployed almost all the way to the end user
- Point-to-multi-point



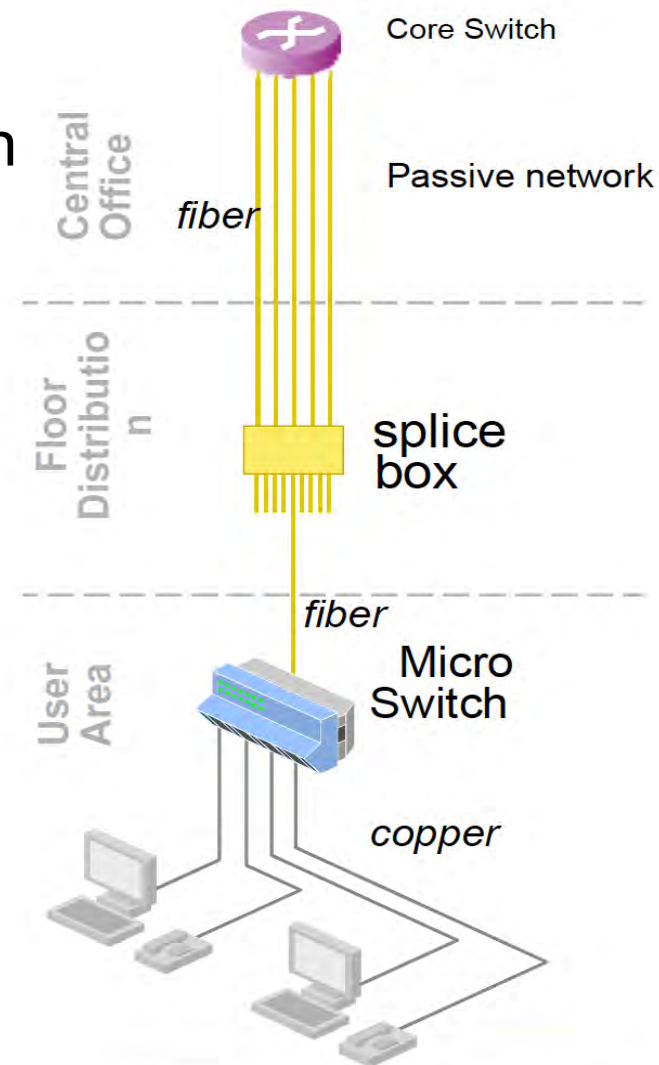
PON Disadvantages

- Shared bandwidth
- Time Division Multiplexing
- OLT/ONT from single vendor
- Link upgrades
- Building automation services

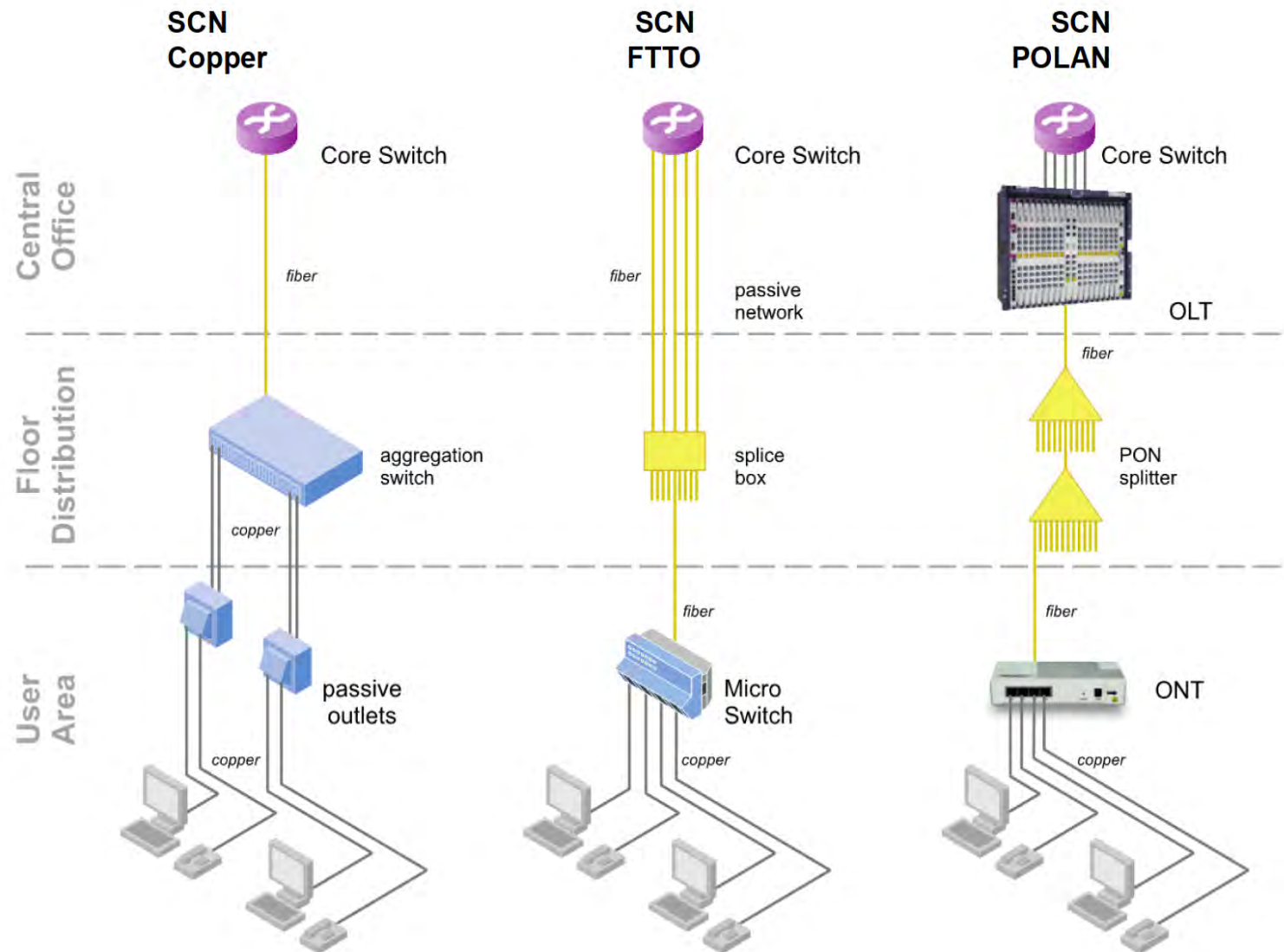


Fiber to the Office (FTTO)

- Developed for LAN sector
- Ethernet Switches at central position
- Future proof
- Gigabit performance

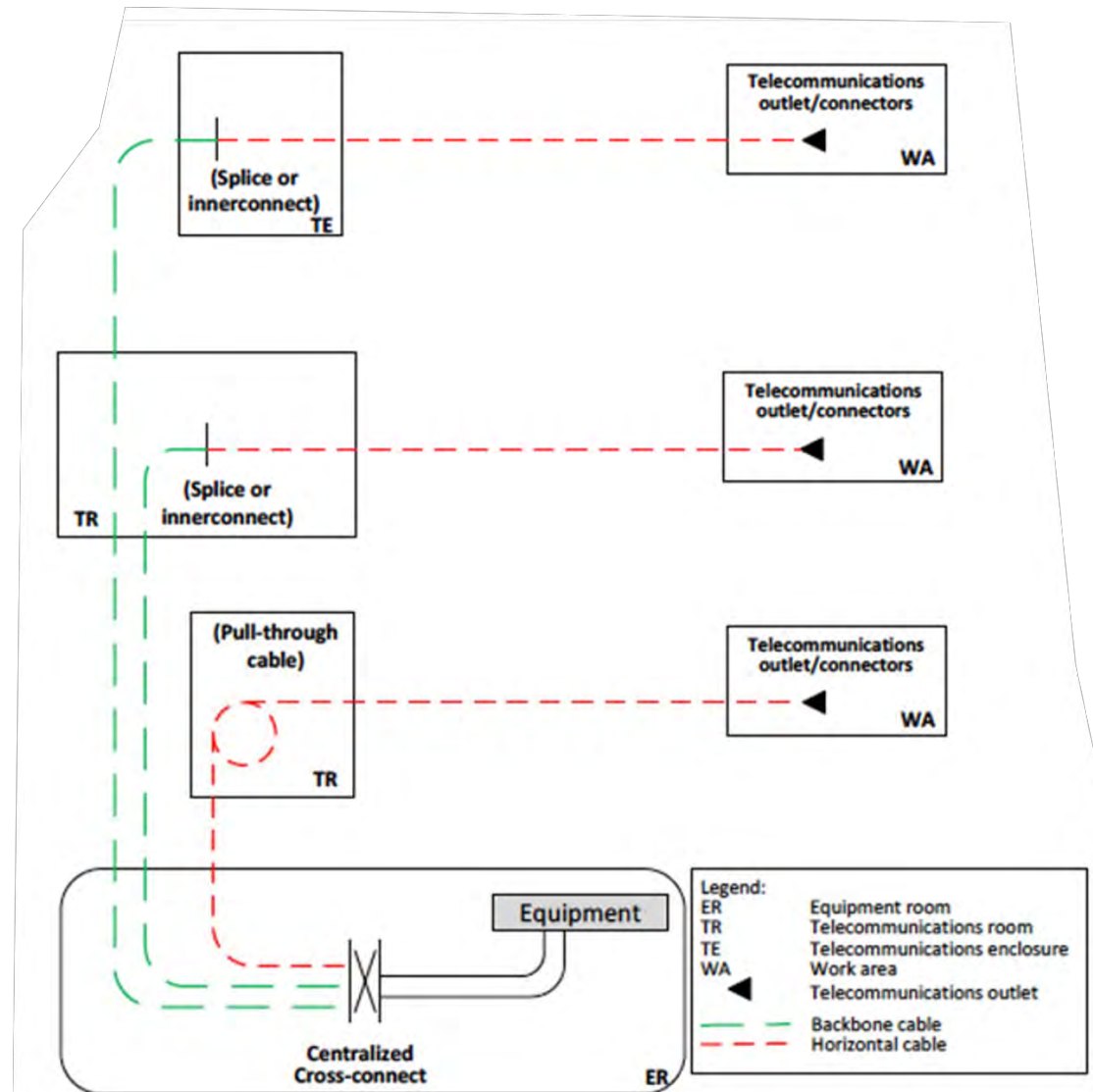


Technology Comparison



Centralized Fiber Cabling

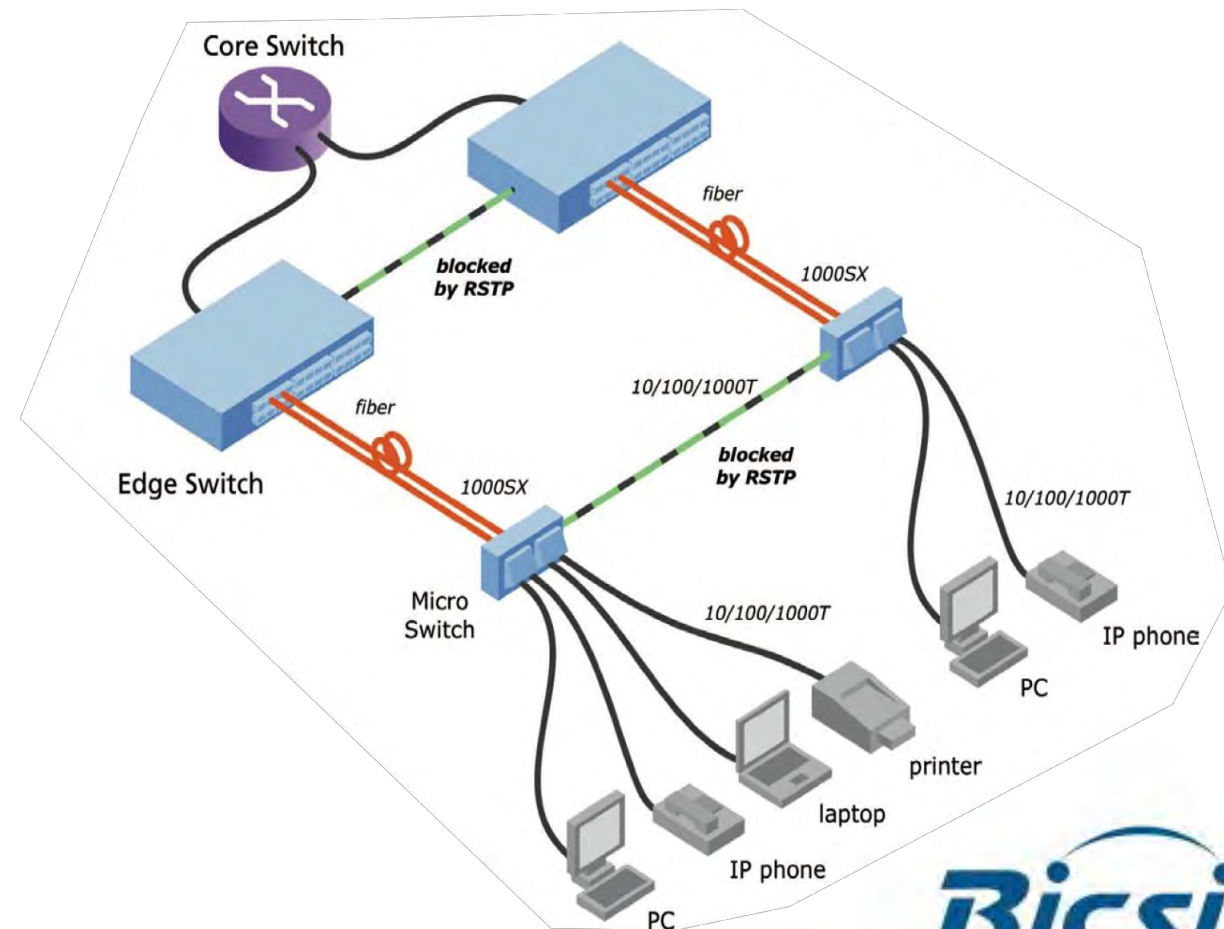
ANSI/TIA-568.1-D Commercial Building Telecommunications Cabling Standard



FTTO Redundancy Option 1

Classical FTTO with Cascading via Copper

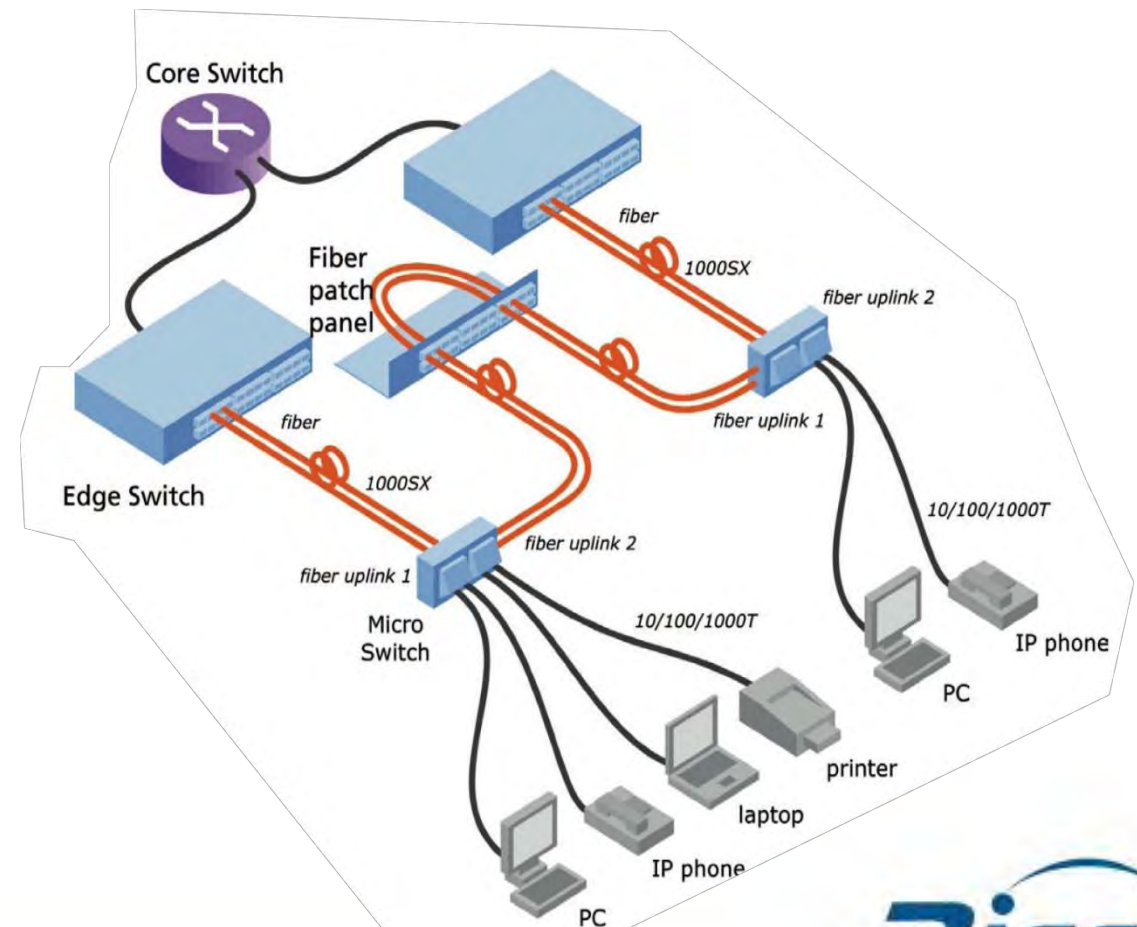
- ✓ The simplest form of redundancy: Two micro switches are connected via a copper patch cable.



FTTO Redundancy Option 2

Classical FTTO with Cascading via Fiber Optics

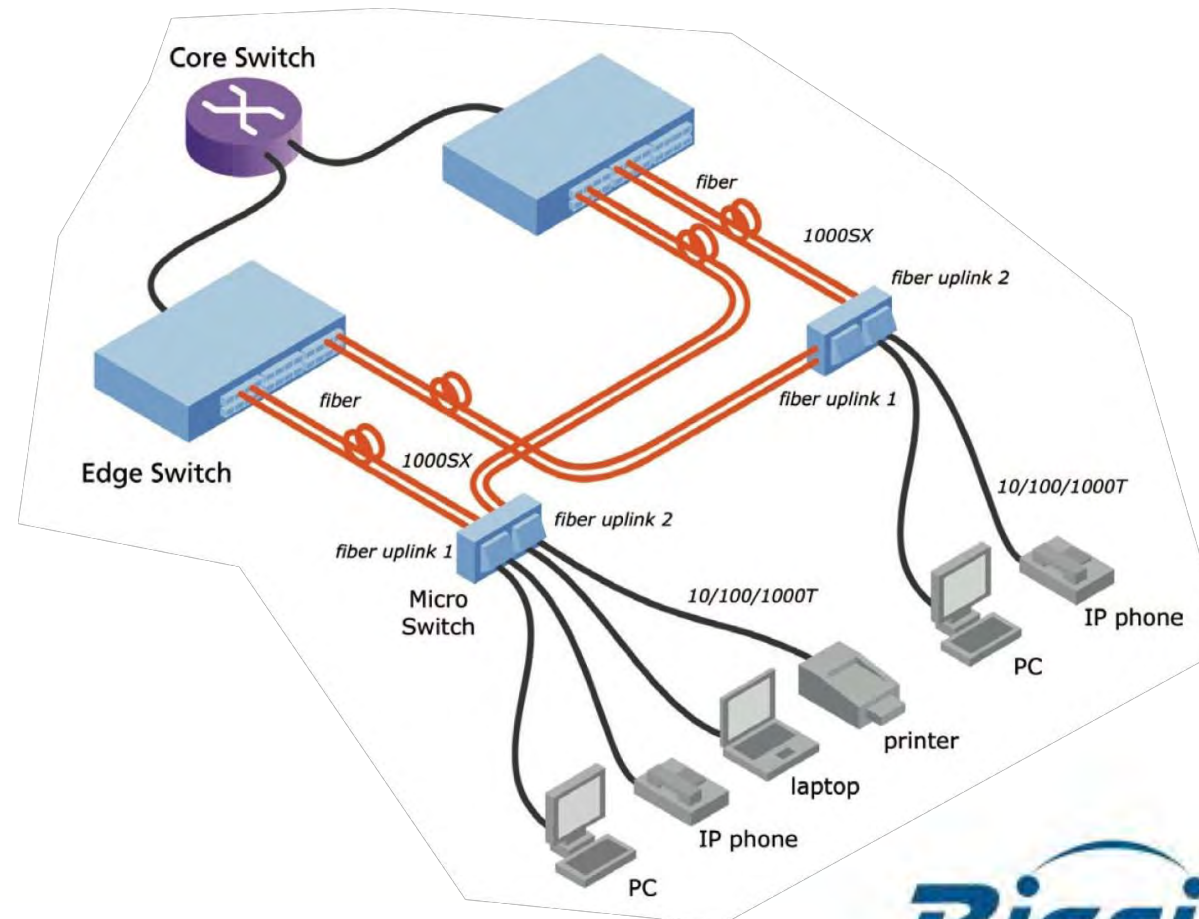
- ✓ Cascading via fiber optics: One port of a micro switch is connected with a core switch, the second with another micro switch



FTTO Redundancy Option 3

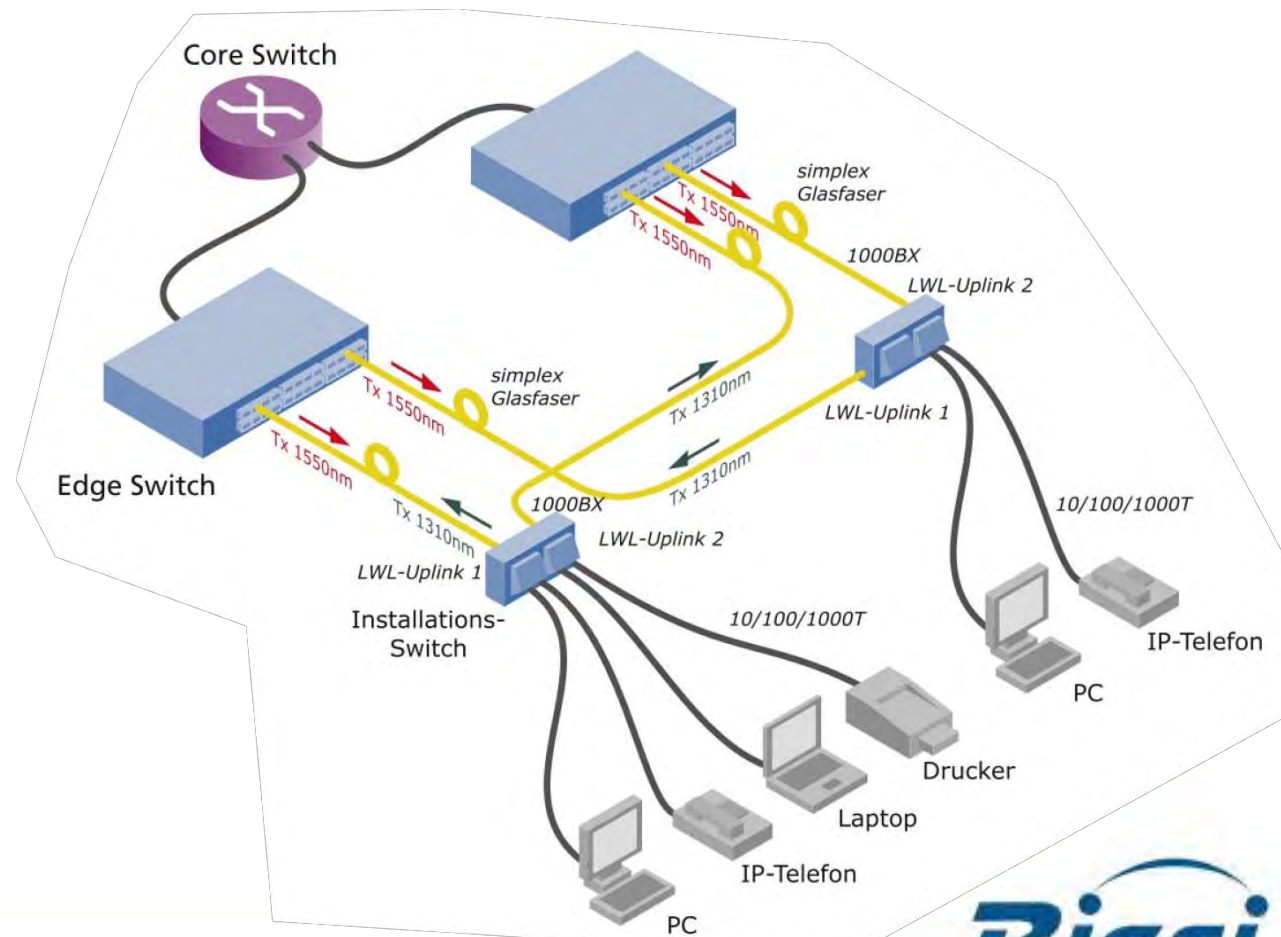
Dual Homing Dual Fibre Connections

- ✓ Dual homing: micro switch with two mutually independent fiber optic connections, connected with two separate switches



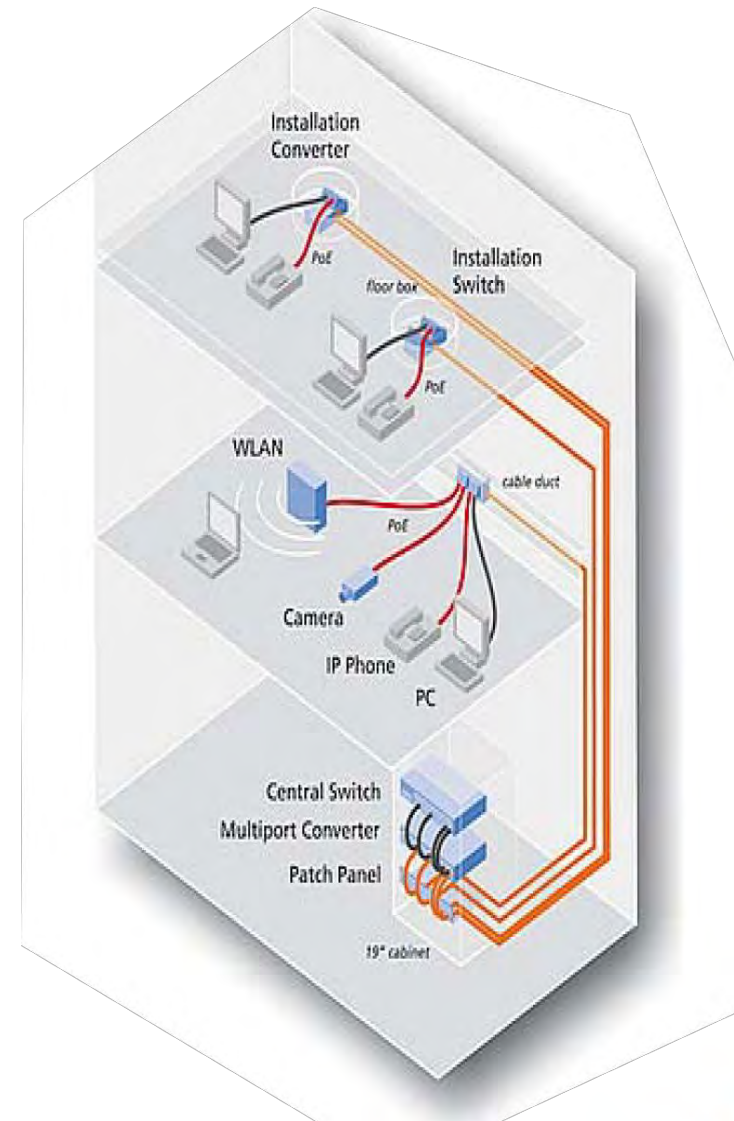
FTTO Redundancy Option 4

- Dual Homing with Single Fibre
- ✓ Dual homing with single fiber: switches with BiDi-SFPs



FTTO for Commercial Buildings

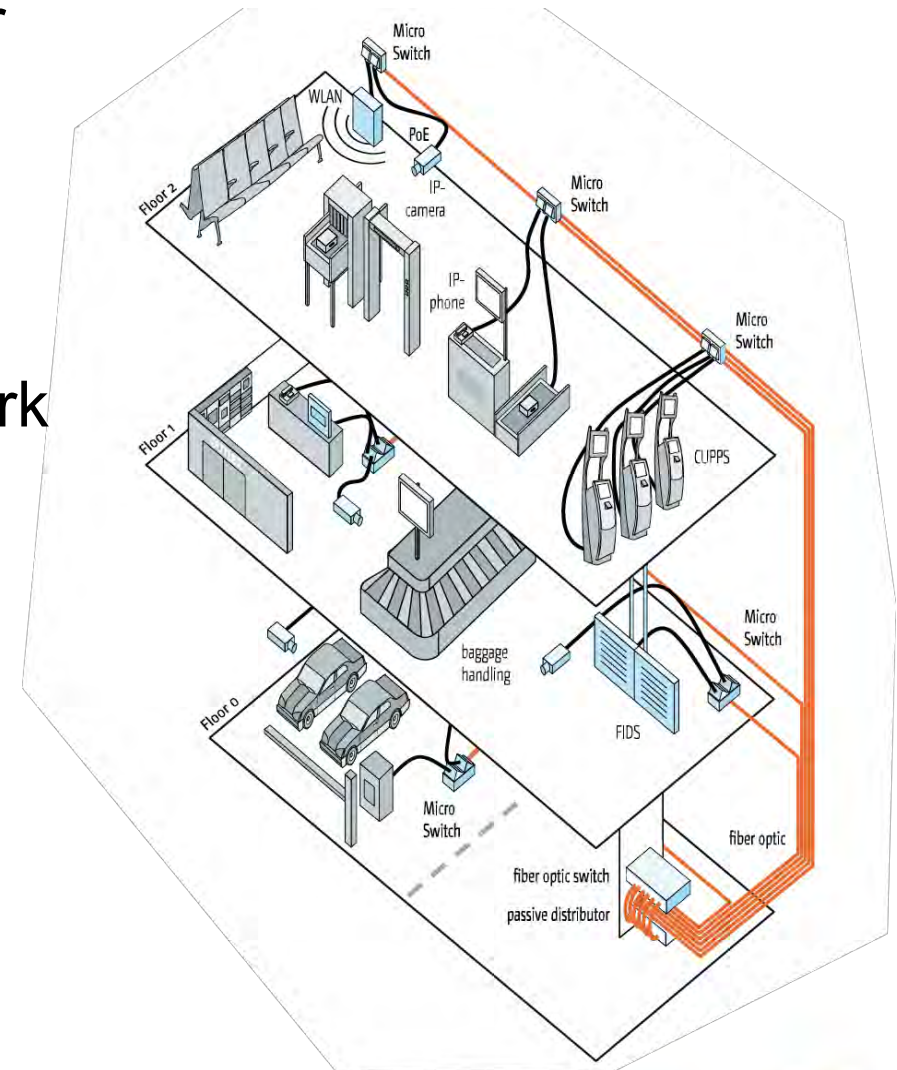
- Future proof hardware
- Reduced energy consumption
- Flexible configuration management
- Tamper proof housing
- Innovative installation concept



FTTO for Airports

Reliable in-house networking architecture for airports

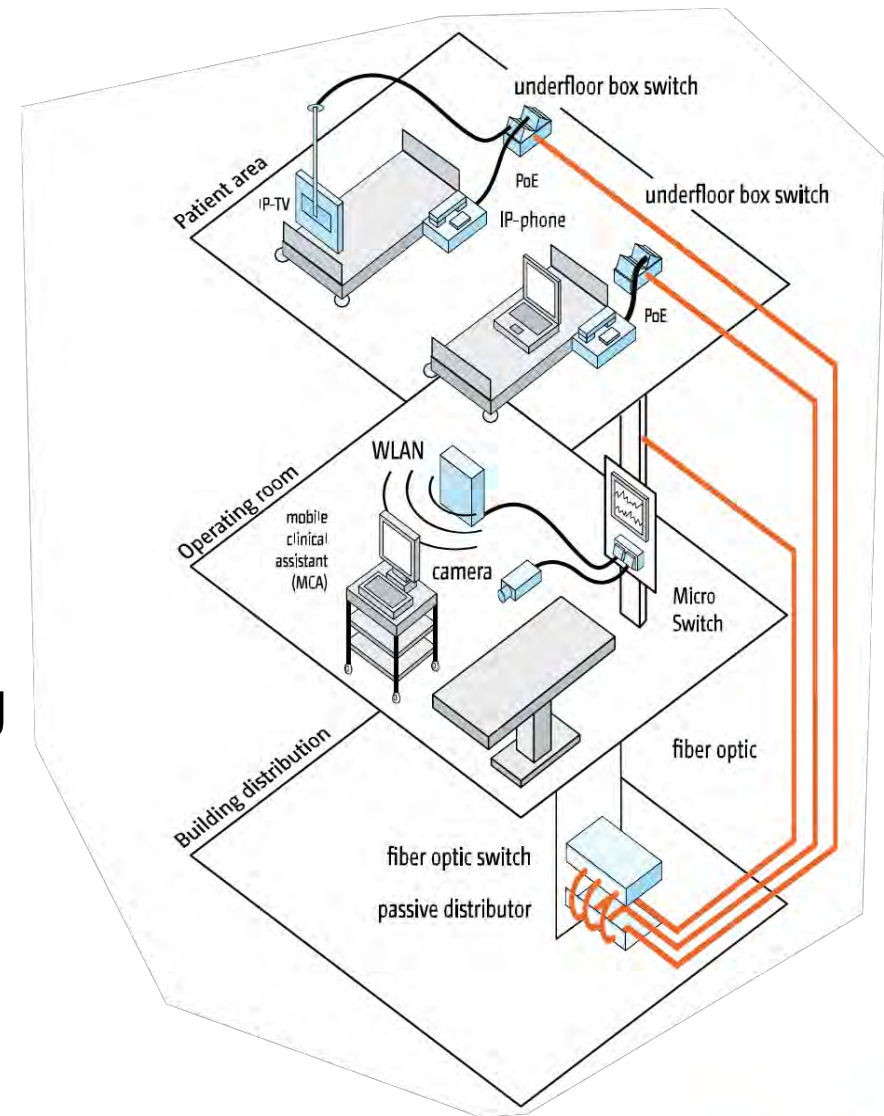
- Almost no length limitations
- Minimal wiring cabinets needed
- No EMI susceptibility and very high network reliability
- Easily expandable by using downlink port
- High bandwidth per user



FTTO for Healthcare

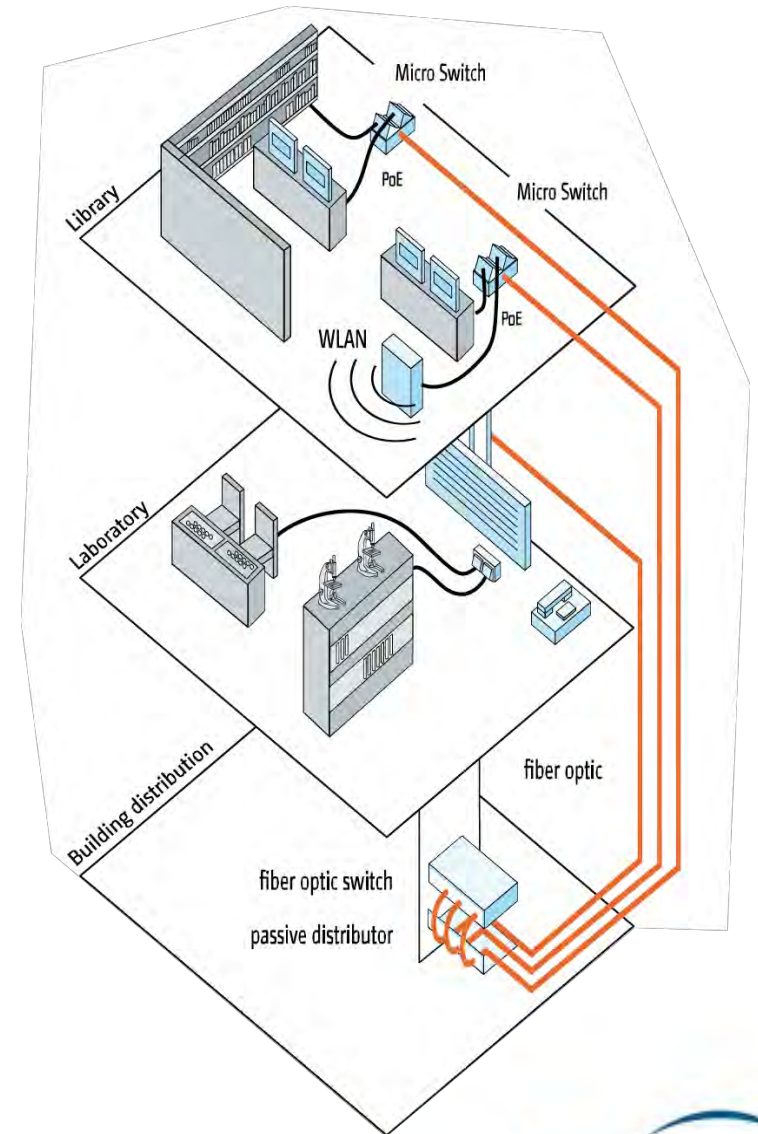
Flexible applications for triple play throughout the entire clinical environment

- Applications in patient care, operating theatre and administrative areas
- Direct integration into ceiling-mounted units
- Integration of IP-based call systems
- Suitable for IP-based patient monitoring systems



FTTO for University / Campus

- Flexible wireless network access to educational content and information systems
- Integrated powering of wireless equipment and VoIP telephones via Power-over-Ethernet
- Usable with all important security protocols (authentication in accordance with IEEE 802.1X, RADIUS)
- Future-proof thanks to IPv6 support



Summary

- Fiber based structured cabling is more beneficial
- FTTO is a future proofed and profitable network concept
- CAPEX and OPEX are lower than conventional copper based structured cabling
- Fiber based SCN is green and sustainable

