

# CUMBRE PARA LA INDUSTRIA **TOTALMENTE** **ÓPTICA 2023**

Iluminando la **GIGA-Industria**

Ciudad de México | San Hipólito | 24 de Agosto 10:00 - 20:00 hrs

#CITO2023

# ITU-T STUDY GROUP 15

NETWORKS, TECHNOLOGIES AND INFRASTRUCTURES  
FOR TRANSPORT, ACCESS AND HOME

SUPPORT FOR FIFTH GENERATION FIXED NETWORK (F5G)

Presenter: Hiroshi Ota on behalf of Bilel Jamoussi (ITU)

All Optical Industry Summit 2023

24 August 2023, Mexico City

# Key dimensions of F5G

- Full-Fiber connections (FFC)
- Enhanced Fixed Broadband (eFBB)
- Guaranteed Reliable Experience (GRE)

Many standards from ITU-T Study Group 15 (SG15) support these key dimensions.

# Questions in ITU-T SG15

	Question Number	Question title
WP1	1/15	Coordination of Access and Home Network Transport Standards
	2/15	Optical systems for fibre access networks
	3/15	Technologies for in-premises networking and related access applications
	4/15	Broadband access over metallic conductors
WP2	5/15	Characteristics and test methods of optical fibres and cables, and installation guidance
	6/15	Characteristics of optical components, subsystems and systems for optical transport networks
	7/15	Connectivity, Operation and Maintenance of optical physical infrastructures
	8/15	Characteristics of optical fibre submarine cable systems
WP3	10/15	Interfaces, interworking, OAM, protection and equipment specifications for packet-based transport networks
	11/15	Signal structures, interfaces, equipment functions, protection and interworking for optical transport networks
	12/15	Transport network architectures
	13/15	Network synchronization and time distribution performance
	14/15	Management and control of transport systems and equipment

# Collaboration with other organizations

SDO	Related SG15 Questions	Topics
BBF	Q2, Q3, Q4, Q14	G.fast, MGfast, xDSL and PON, YANG
CENELEC TC86A & TC86BXA	Q5, Q7	Optical fibers and cables, optical connectors & passive components
<b>ETSI ISG F5G</b>	<b>Q2, Q3, Q11</b>	<b>PON, Fiber to the Room (FTTR), Optical Transport Network (OTN)</b>
IEC TC86 - SC86A	Q5	Optical Fibers and cables
IEC TC86 - SC86B	Q7, Q5	Optical connectors & passive components
IEEE 802.1	Q10, Q12, Q13, Q14	VLAN Bridging, OAM/CFM, Synchronization, Time Sensitive Network (TSN), Information modeling Issues, YANG
IEEE 802.3	Q2, Q6, Q11, Q12, Q14	OTN mappings for Ethernet, Optical characteristics of Ethernet modules used for OTN, PON, Information modeling Issues, YANG
IEEE 1588	Q13, Q14	Time Synchronization, Synchronization Management
FSAN	Q2	PON
MEF	Q10, Q11, Q14	Ethernet Services, OTN & Wavelength services, LSO
OIF Networking, IETF (CCAMP, TEAS, PCE), ONF	Q12, Q14	Optical Control Plane, SDN, Information modeling Issues, YANG
OIF PLL	Q6, Q11	Flex Ethernet, 400ZR, 800ZR

# Joint workshop on FTTR (Fibre to the Room)

ITU Webinars

## Third Joint ETSI ISG F5G, BBF, CCSA TC6 and ITU-T SG15 Workshop on "FTTR" Fibre-to-The-Room (FTTR)

23 June 2023

14:00 – 18:00 CEST

<https://itu.int/go/FTTR-3>

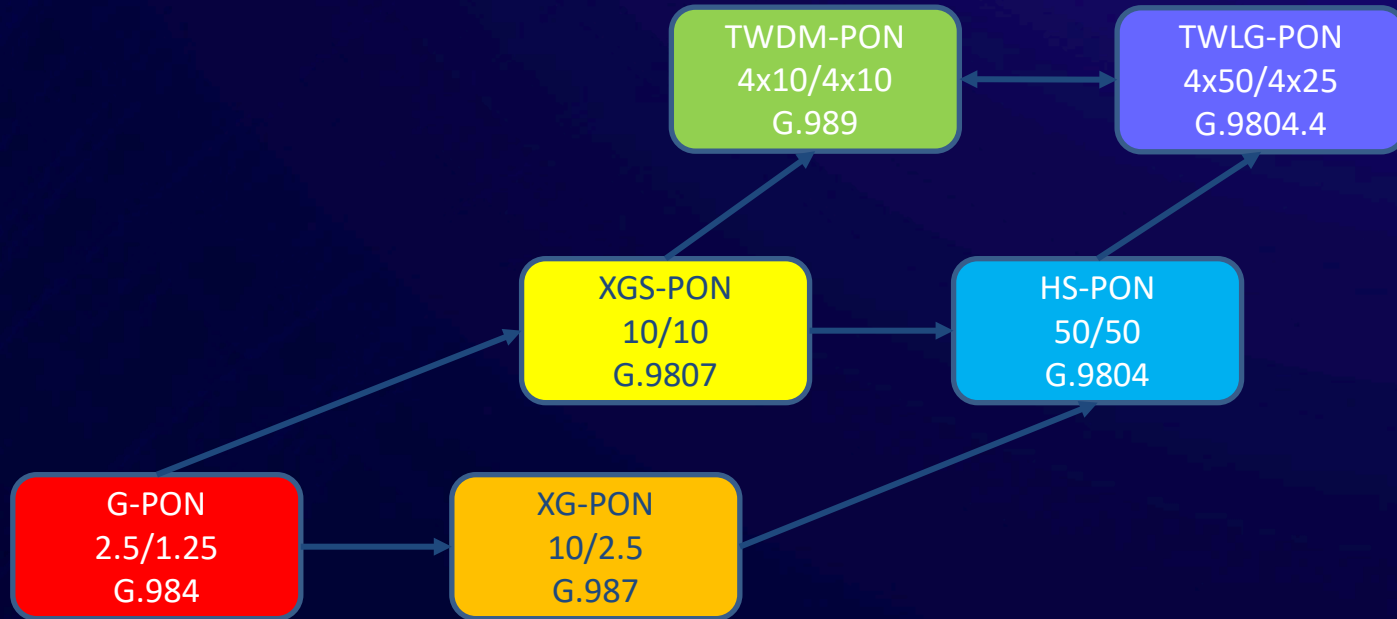
Co-organized by:



# Joint workshop on FTTR (Fibre to the Room)

- Jointly organized by BBF, CCSA TC6, ETSI ISG F5G and ITU-T SG15
- Held annually – June 2021, June 2022 and June 2023
- Offered the opportunity to continue the discussion on FTTR for all involved stakeholders.
- ITU-T SG15 started the approval process of the new Recommendation ITU-T G.9940 (ex. G.fin-SA) "High speed fibre-based in-premises transceivers - system architecture" at the last meeting in April 2023.
- More information, including presentations and recordings, is at <https://www.itu.int/en/ITU-T/Workshops-and-Seminars/2023/0623/Pages/default.aspx>

# Q2/15 - Optical broadband access





# Q3/15 - Optical In-home applications

Use of visible light  
communications  
TP.vlc

High-speed indoor  
visible light  
communication  
G.9991

Indoor optical  
camera  
communication  
G.9992

FTTR Use Cases  
GSTR-FTTR

High Speed Fiber-  
based In-home  
networks  
G.fin

# WP3/15 - Transport network characteristics

## Q11/15 - OTN beyond 400G

- 800G FlexO interfaces, including Ethernet-optimized interfaces
- 800GE client mappings

## Q11/15 - Fine-Grained OTN (fgOTN) and Fine-Grained MTN (fgMTN)

- Sub-1G
- Service-awareness

## Q13/15 - Synchronization

- PTP telecom profile evolution
- Timestamping accuracy of optical modules
- Network resilience and monitoring

## Q12 and Q14/15 - Management and control

- Management of optical media and synchronization

# Conclusion

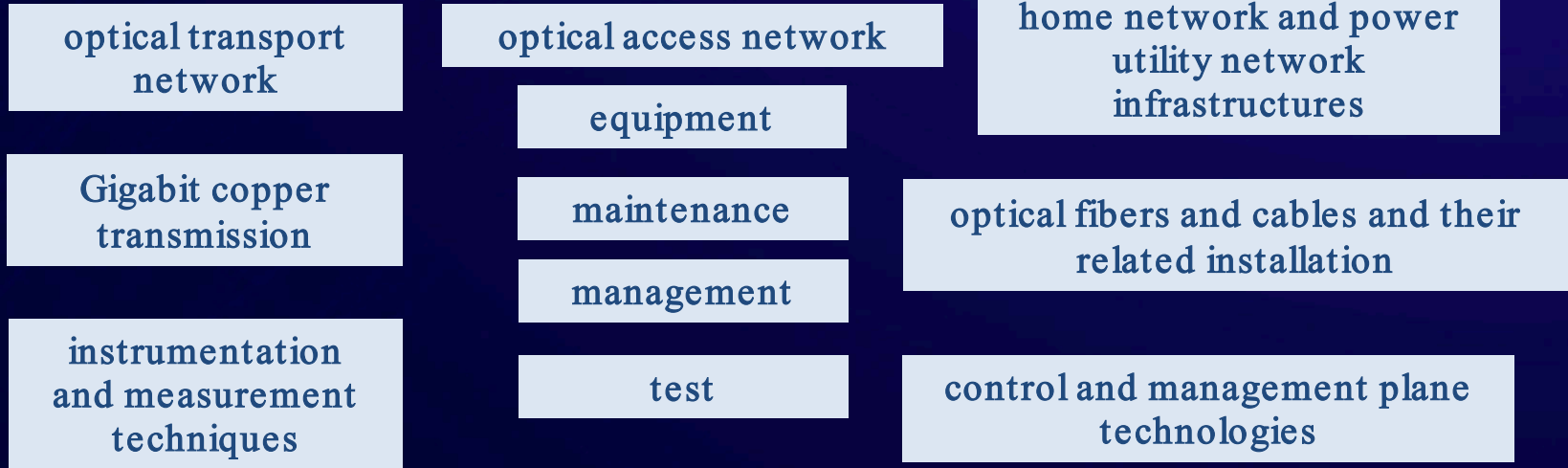
- ITU-T Study Group 15 (SG15) develops standards on Networks, Technologies and Infrastructures for Transport, Access and Home.
- Many standards from SG15 support F5G key dimensions.
- SG15 is collaborating with ETSI ISG F5G and other organizations to develop consistent standards.



# BACKUP

# SG15 mandate

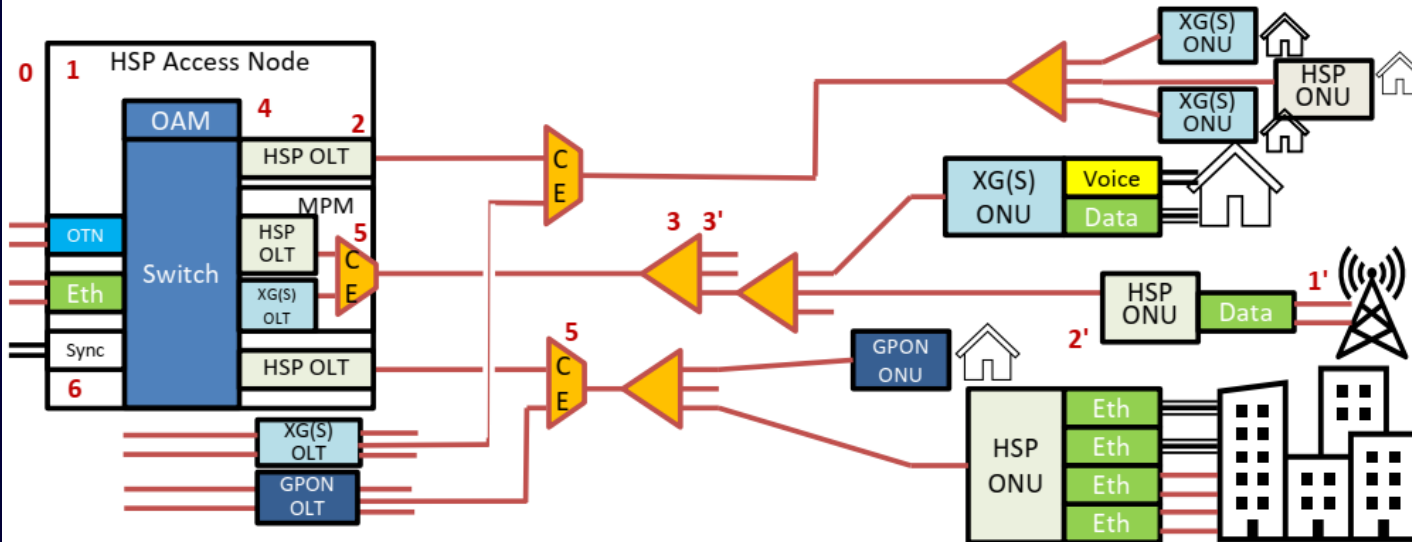
SG15 is responsible for the development of standards on:



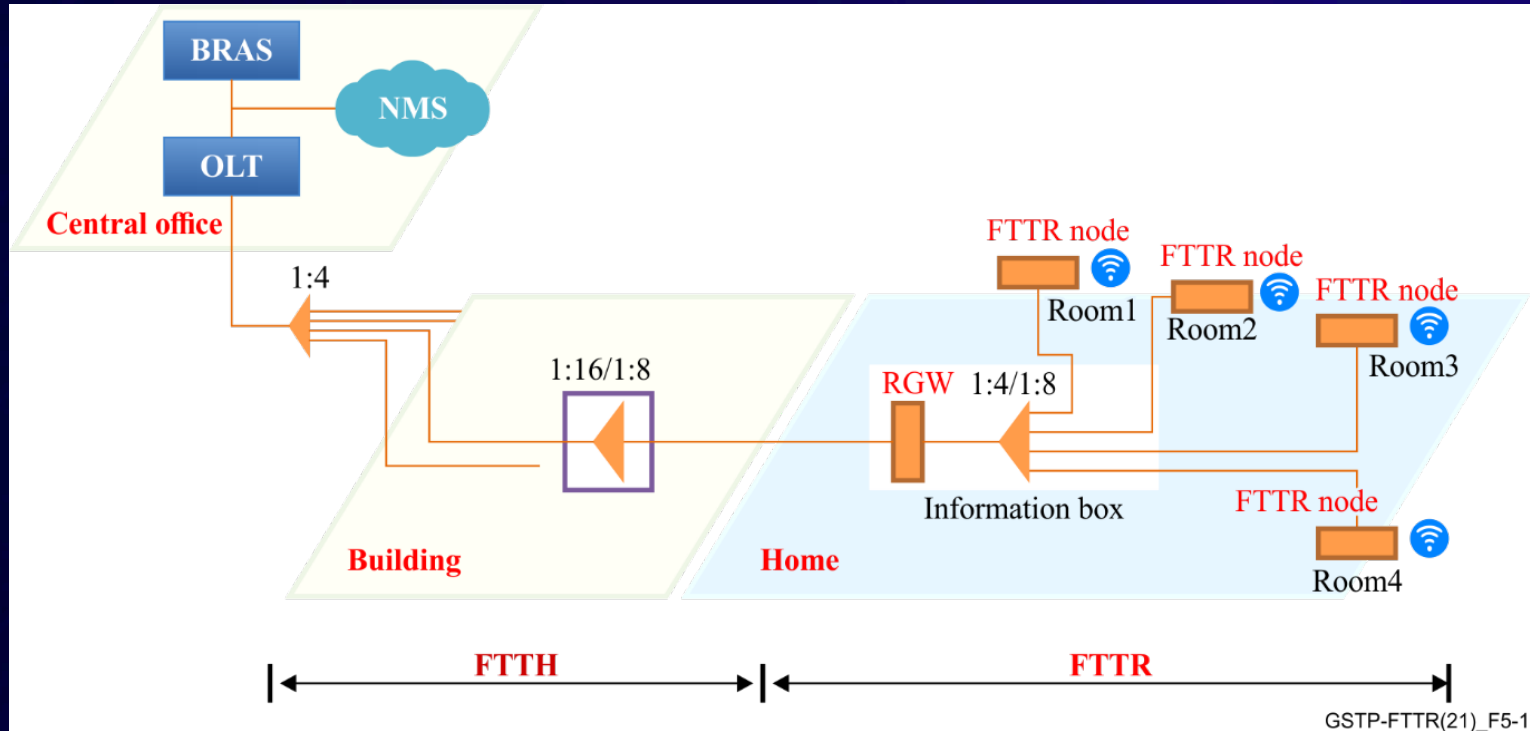
to enable the evolution toward intelligent e2e optical networks.

# G.9804 HSP: Higher Speed Passive Optical Networks

- Full-service support – including voice, TDM, Ethernet (10/100/1000/10G/25G BASE), xDSL, wireless xhaul
  - Basic physical reach is 20 km. Logical reach of up to 60 km. System is wavelength coexistent with G-PON, XG(S)-PON, 10G-EPON
  - Support for bit-rate options, 50 Gbit/s downstream and 12.5 or 25 or 50 Gbit/s upstream
  - Powerful OAM&P and system protection capabilities
- providing a feature rich and reliable service management system
  - Advanced security features including authentication, rogue detection, and information privacy
  - Power saving features on top of the already considerable low power nature of fibre access



# Q3/15 - Fibre-to-the-Room (FTTR)

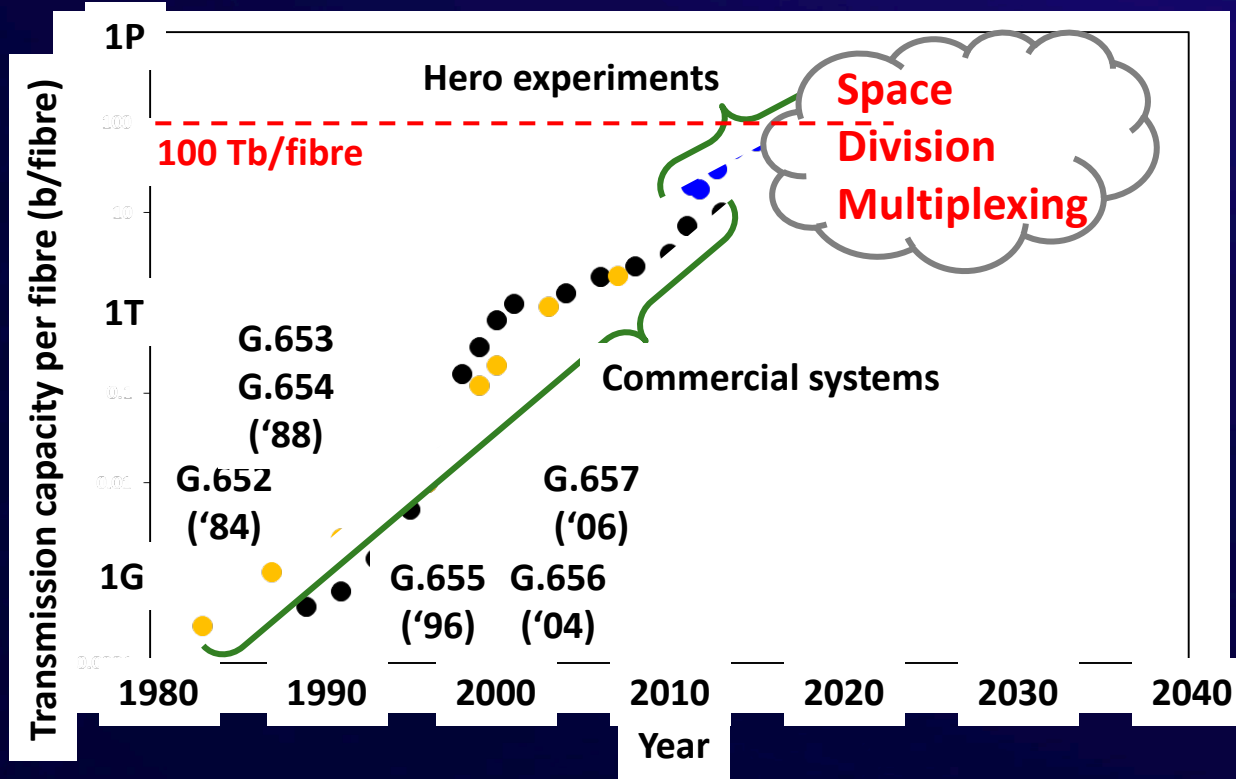




## Q5/15 - Characteristics and test methods of optical fibres and cables, and installation guidance

- Single-mode fibre Recommendations (G.652 and G.654)
- **Optical fibre, cable and components for space division multiplexing transmission (TR.sdm)**
- Characteristics of a bending-loss insensitive single-mode optical fibre and cable (G.657)
- Optical/electrical hybrid cables for access points (L.oehc)
- Optical fibre cables for duct and tunnel application (L.100)
- Optical fibre cables for in-home applications (L.111)
- Criteria for optical fibre cable installation with minimal existing infrastructure (L.163)

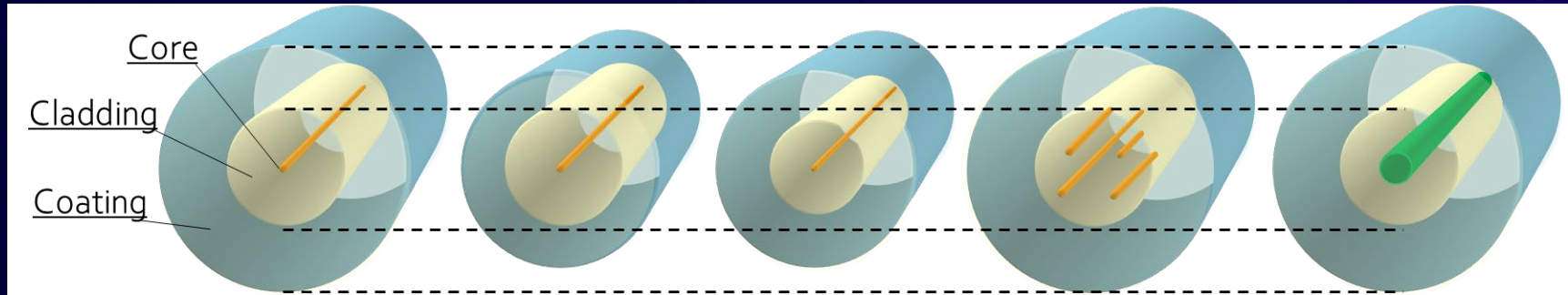
# History of Optical Fibre Standards



# What is space division multiplexing (SDM)?

SDM Optical Fibre Cable can:

- improve a spatial density of optical fibre in a unit cross section,
- increase the number of spatial transmission channels in a common cladding



**Traditional**

**Reduced  
Coating  
Diameter  
Fibre**

**Reduced  
Cladding  
Fibre**

**Multi  
Core  
Fibre**

**Few  
Mode  
Fibre**

## Q6/15 - Characteristics of optical components, subsystems and systems for optical transport networks

- Its scope encompasses all technologies needed to transmit, amplify and switch (at the physical layer) optical signals in communications networks that use optical fiber as propagation medium
- Q6/15 defines specifications for physical layer components and interfaces of single and multi-wavelength transmission systems

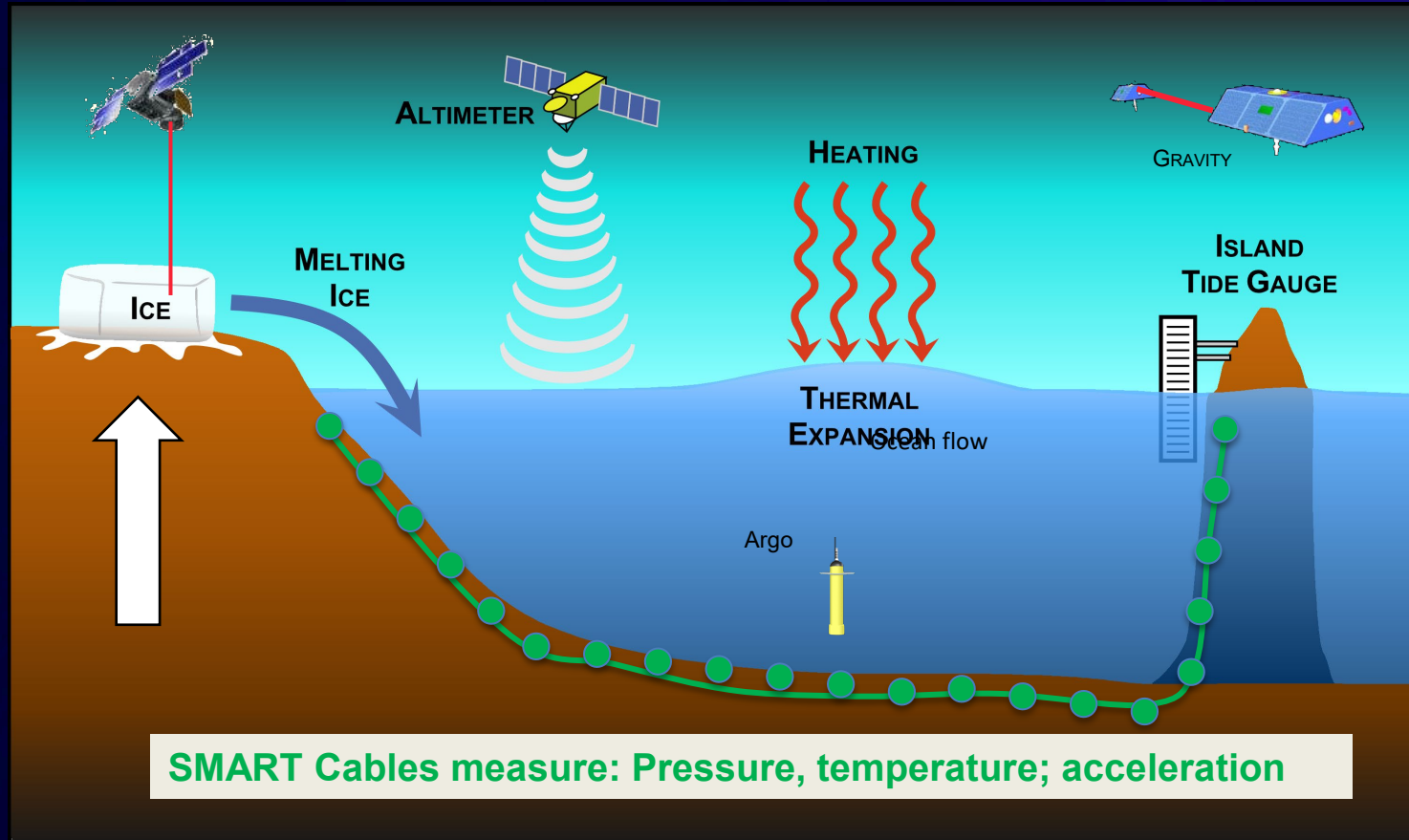
## Q7/15 - Connectivity, Operation and Maintenance of optical physical infrastructures

- Telecommunication infrastructure facility management (L.330)
- Cable identification for the construction and maintenance of optical fibre cable networks with optical sensing technique(L.316)
- Maintenance of telecommunication underground facilities (L.340/L.74)
- Requirements for Passive Optical Nodes: nodes for customer indoor premises (L.ncip)
- Topologies for optical access network (L.250/L.90)

## Q8/15 - Characteristics of optical fibre submarine cable systems

- Transverse compatible DWDM applications for repeatered optical fibre submarine cable systems (G.977.1)
- Dedicated Scientific Sensing Submarine cable system (G.dsssc)
- **Scientific Monitoring and Telecommunication Submarine Systems (G.smart)**

# G.smart - SMART cable system



# Societal Benefits

**Climate change – humanity's greatest existential threat**

## Societal and environmental issues

### UN Decade of Ocean Science

Climate  
SDG 13



– **Climate change** – ocean temperature, circulation, direct impact on societies, short and long term

Ocean  
SDG 14



– **Sea level rise** – hazard for coasts, islands, cities

UN  
DRR



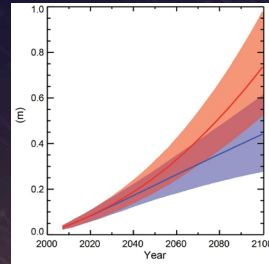
– **Disaster Risk Reduction** – tsunami and earthquake monitoring throughout ocean basins and coastal margins

Infrastructure  
SDG 9, 11



– **Societal Connectivity** – Enable progress with resilient and sustainable telecom infrastructure

Sea level rise



Tsunami





## Q10/15 - Interfaces, interworking, OAM, protection and equipment specifications for packet-based transport networks

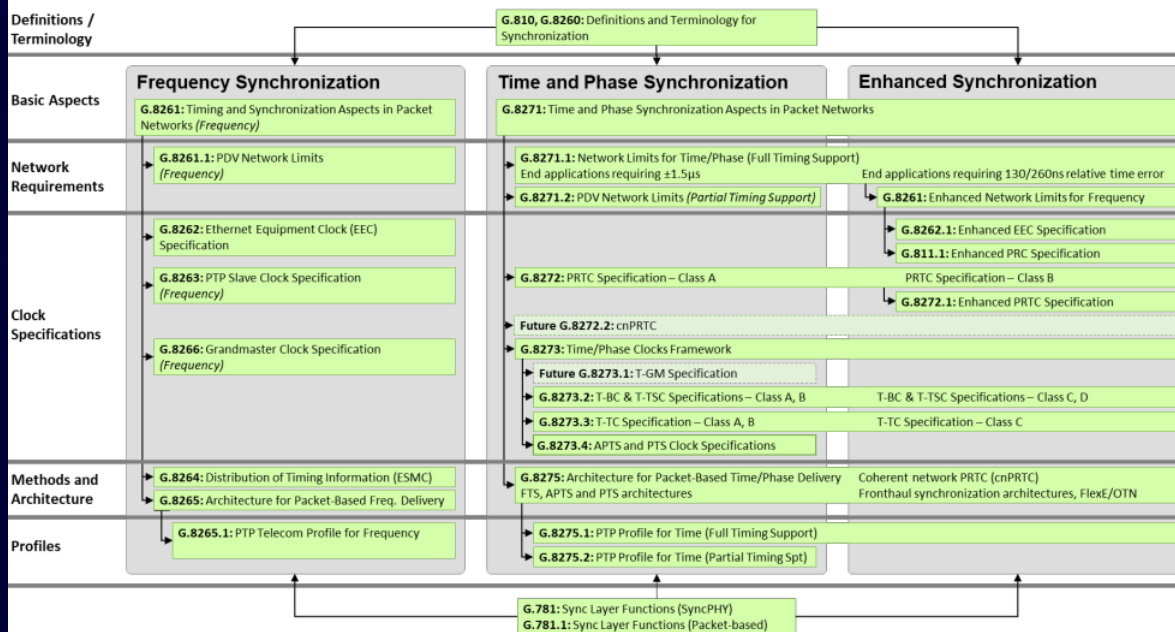
- Network protection for Ethernet and MPLS-TP
- OAM functions for Ethernet and MPLS-TP
- Ethernet UNI and Ethernet NNI
- Interfaces for the MPLS-TP layer network
- Characteristics of Ethernet transport network and MPLS-TP equipment functional blocks
- Ethernet service characteristics

# Q13/15 – Synchronization

- Evolution of the Precision Time Protocol (PTP) Telecom profiles (e.g., management, security, robustness)
- Synchronization network performance monitoring
- Synchronization network resiliency (e.g., against loss of GNSS)
- ePRTC holdover enhancements (1 month)
- “cnPRTC” (network of PRTCs)
- Timestamping accuracy of optical modules
- Addresses fronthaul network needs

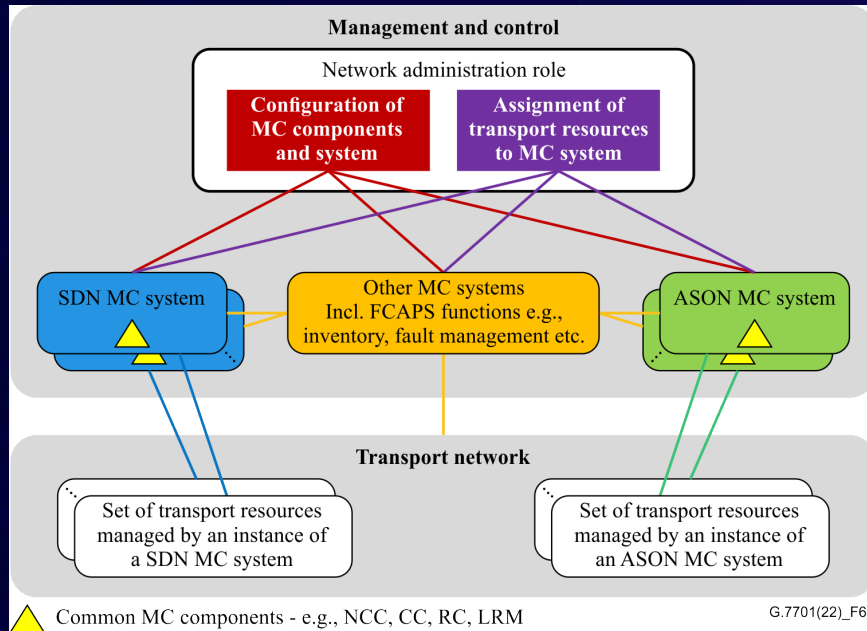
# Q13/15 - Network synchronization and time distribution performance

- Network timing performance standards are necessary to define the feasibility and most effective means of implementing a time reference distribution service. This includes the distribution of both precision time and frequency.



Note: Q13/15 Recommendations specifically developed for SDH and OTN are not shown in this diagram

# Q12/15, Q14/15 – Management and control



- Development of generic management/control architecture
- Specification of management requirements and information models for the optical media layer
  - Includes management of amplifiers, ROADMs, etc.
- The management information models are specified through pruning/refactoring the common core information model and extended with technology-specific properties
- Specification of management requirements and information models for synchronization

# WP3/15 Recommendations related to optical transport networks

Topic	Common	OTN	Media	Transport Ethernet	Sync
Transport Architecture	G.800, G.805	G.872	G.807	G.8010	G.826x G.827x
Interfaces	-	G.709 G.709.x	G.698.x	G.8012 G.8013	G.703 G.8271
Protection	G.808.x	G.873.x	-	G.803x	-
Equipment	G.806	G.798	-	G.8021 G.8023	G.781 G.781.1
DCN	G.7712	G.7712	-	G.7712	-
Management and Control Architecture	G.770x	-	-	-	-
Management Requirements	G.7710, G.7716, G.7718	G.874	G.876	G.8051	G.7721
Management Info Model	G.7711 G.7719	G.875	G.876	G.8052 G.8052.x	G.7721 G.7721.1