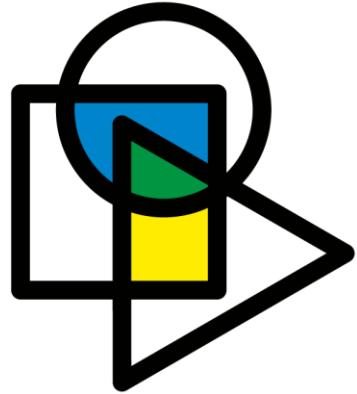


WORLD TELECOMMUNICATION  
STANDARDIZATION ASSEMBLY



# ITU WTSA-20

GENEVA2022

1- 9 March 2022  
Geneva, Switzerland

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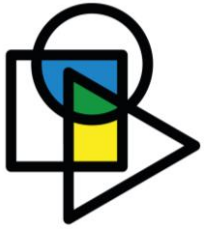
## ITU-T STUDY GROUP 15

Networks, Technologies and Infrastructures for  
Transport, Access and Home

Summary of Results - Study Period 2017-2021

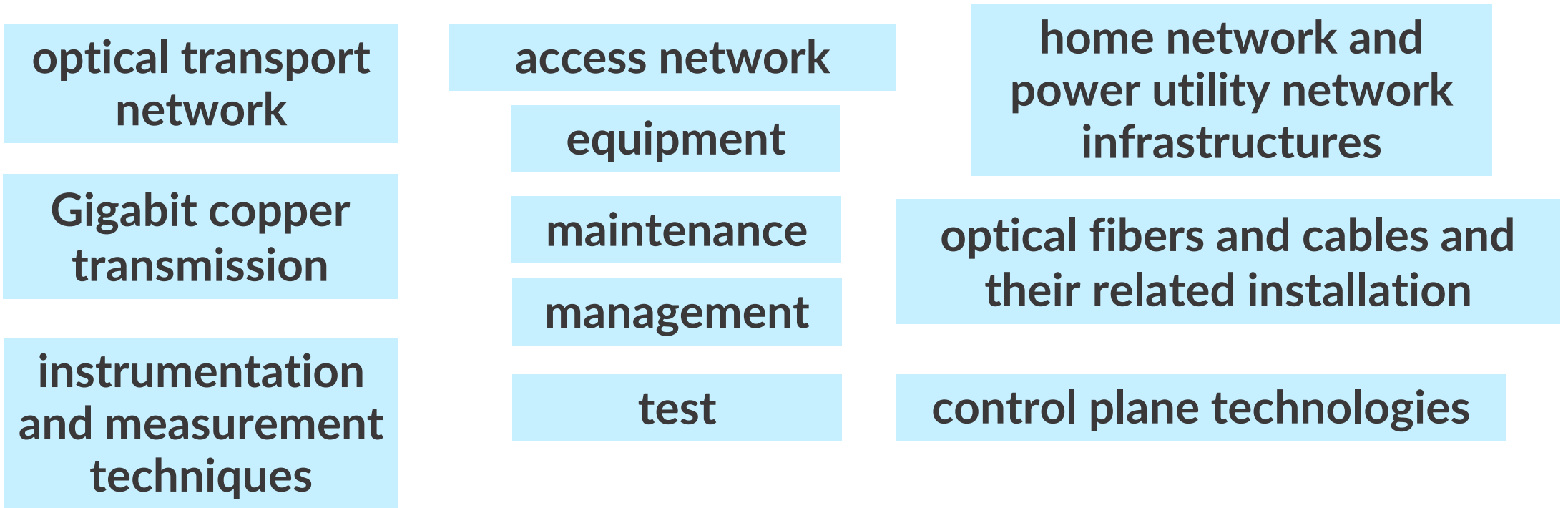
Dr. Stephen J. Trowbridge



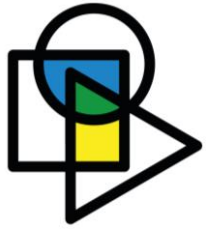


# SG15 mandate

SG15 is responsible for the development of **standards** on:

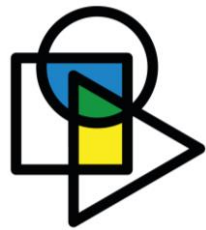


to enable the evolution toward intelligent transport networks, including the support of smart-grid applications.



# Lead Study Group

- [Access network transport](#)
- [Home networking](#)
- [Optical technology](#)
- [Smart grid](#)



# SG15 Working Parties

- **WP1/15**: Transport aspects of access, home and smart grid networks
- **WP2/15**: Optical technologies and physical infrastructures
- **WP3/15**: Transport network characteristics



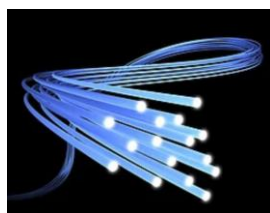
# WP1 – Broadband Access

**G.fastback**

Multi-Gigabit copper backhaul

**MGfast**

Next generation  
copper access 5-10 Gbps



50 Gbps fiber PON



Continue collaboration with



**G.RoF**

PON support for mobile  
front/backhaul, Radio over fiber



Fiber networking inside  
the premises



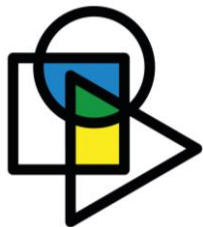
Free space optical  
home networking



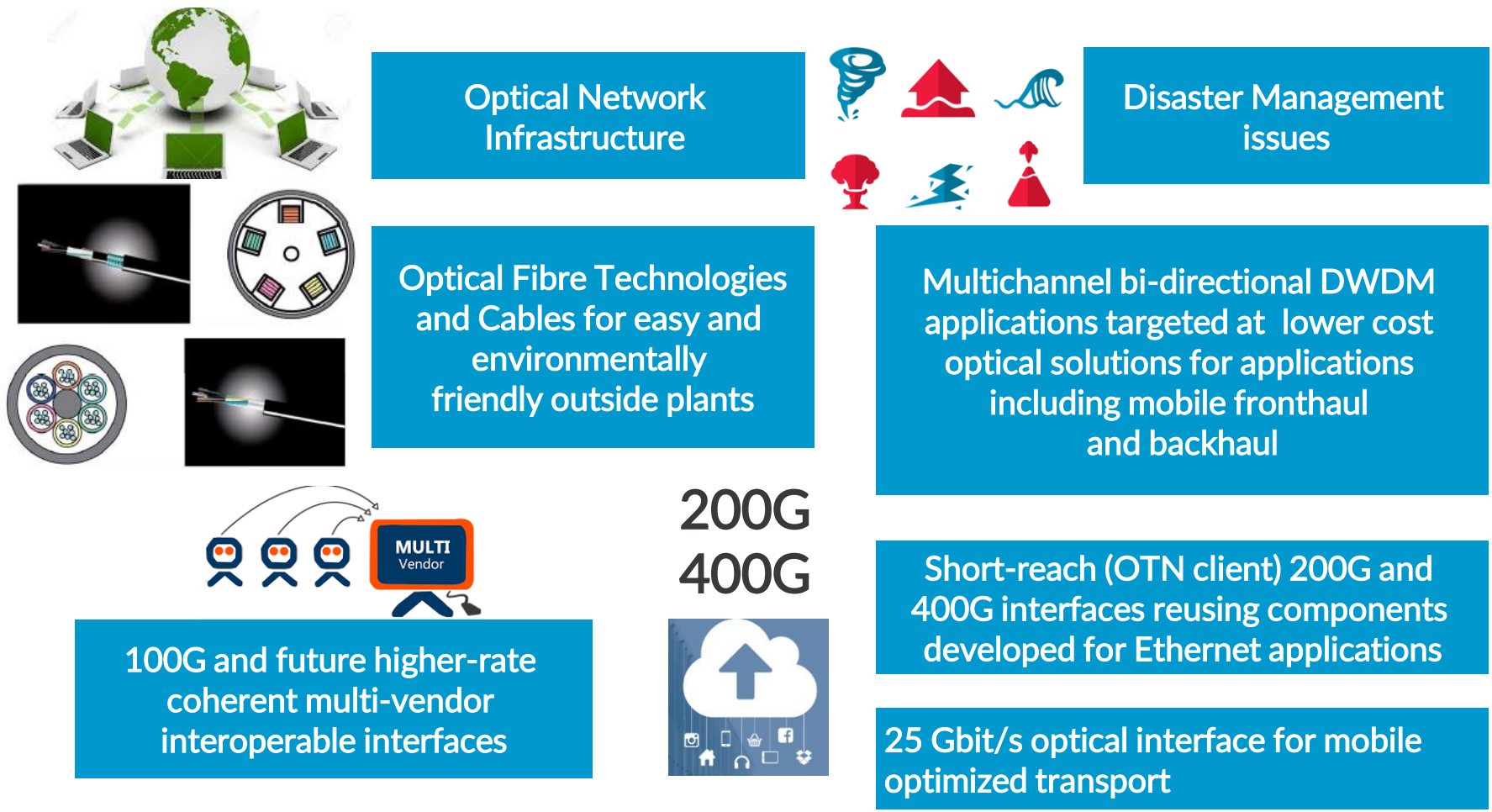
Powerline  
communication  
(PLC)

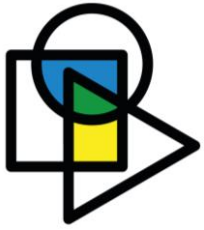
**G.Hn**

G.hn and G.hn2 home  
networking over indoor  
phone, power, and coax  
wires >2 Gbps



# WP2 – Optical Technologies





# WP3 – Optical Transport Networks

5G

Transport and synchronization supporting 5G mobile fronthaul and backhaul

MTN

G.mtn (metro transport network) for 5G optimized transport



Architecture and other Transport SDN Aspects

BEYOND 400G

New “B400G” OTN interfaces, including the use of coherent G.698.2 interfaces



Equipment & management specifications for OTN, Ethernet, MTN and MPLS-TP

Optical Transport Networks

Synchronization of packet networks and future OTN networks, e.g., beyond 400G



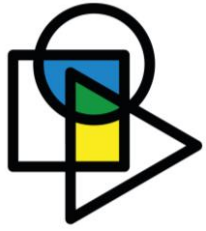
Network survivability (protection and restoration)



Management aspects of control and transport planes

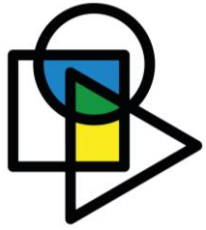


Core Information model enhancement for management of synchronization and optical media



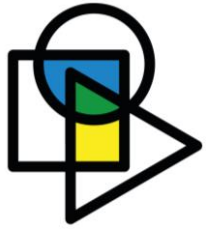
# Achievements





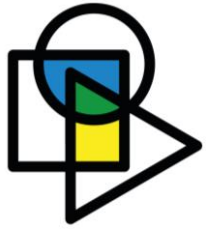
# WP1/15 highlights

- 50 Gigabit-capable Passive Optical Networks (GPON) (G.9804.x series)
- 10 Gbit/s-capable symmetric PON systems; XGS-PON (G.9807.x series)
- Higher speed bidirectional, single fiber, point-to-point optical access (G.9806)
- Radio over Fiber systems (G.9803)
- G.fast for up to 2 Gb/s for short copper access lines (G.970x series)
- MGfast for up to 10 Gb/s for short copper access lines (G.971x series)
- G.hn2 home networking up to 10 Gbps
- Visible light communications in the premises (G.999x series)



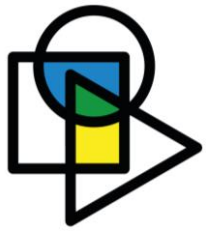
# WP2/15 highlights

- Single-mode fibre Recommendations (G.652 and G.654)
- Amplified multichannel dense wavelength division multiplexing applications with single channel optical interfaces (G.698.2)
- Multichannel bi-directional DWDM applications with port agnostic single-channel optical interfaces (G.698.4)
- Transverse compatible DWDM applications for repeatered optical fibre submarine cable systems (G.977.1)
- 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)
- Telecommunication infrastructure facility management (L.300)
- Cable identification for the construction and maintenance of optical fibre cable networks with optical sensing technique(L.316)

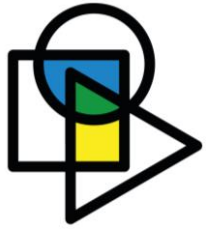


# WP3/15 highlights

- Metro Transport Network (MTN) (G.8300-series)
- Network restoration and protection for MTN, OTN, Ethernet and MPLS-TP
- OAM functions for Ethernet and MPLS-TP
- OTN hierarchy and Interfaces (G.709- and G.709.x-series) for beyond 100G bit/s signals ( $n \times 100$  Gbit/s)
- Architecture of transport networks and architecture of transport SDN
- Network synchronization and time distribution (G.82xx series)
- Management and control of transport systems and equipment

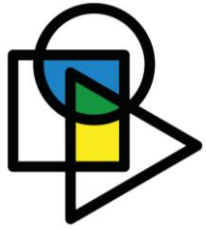


# Future work



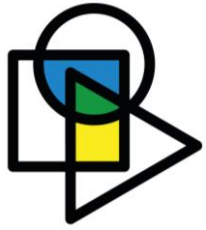
# WP1/15 future work

- Higher Speed Passive Optical Networks
- Wavelength multiplexed point-to-multipoint 10-Gigabit-capable passive optical network
- PON support for slicing
- MGfast – optical class broadband access using existing metallic cables
- Multi-Gigabit bonded copper backhaul (G.fastback)
- Evolution of unified high-speed wire-line based home networking transceivers (G.hn2)
- Support UHD video service over G.hn (G.uvs)
- High speed fiber-based in-premises transceivers (G.fin)
- High speed indoor free space optical networking (G.vlc)



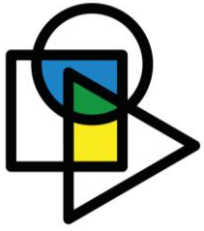
## WP2/15 future work

- Optical fibre and cable for space division multiplexing transmission
- Optical/Electrical Hybrid Cables for access point and other terminal equipment (L.oehc)
- Multi-vendor interoperable optical interface specifications for:
  - mobile optimized applications at 25 Gbit/s. (G.698.1, G.698.2 and G.698.4)
- Multichannel WDM applications with single-channel optical interfaces in the O-band (G.owdm and G.owdm2)
- Dedicated Scientific Sensing Submarine cable system (G.dsssc)
- Scientific Monitoring and Telecommunication Submarine Systems (G.smart)
- 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)



# WP3/15 future work

- Architecture, interfaces, protection/restoration, network element management for the OTN beyond 400Gb/s
- Ethernet UNI and Ethernet NNI
- Characteristics of Ethernet transport network equipment functional blocks
- Path layer network for sub 1G services
- Architecture, interfaces, protection/restoration, network element management for MTN (G.83xx series)
- Interfaces for various transport network technologies
- Architecture for various transport network technologies
- Network synchronization and time distribution
- Synchronization of packet networks and future MTN, OTN and other interfaces e.g. beyond 100Gbit/s
- Management information model
- SDN control of transport networks including the use of AI/ML



# Conclusions

✓ Leading development of

Optical  
Transport  
Networks

ACCESS  
NETWORK

Home Networking

✓ The **LARGEST** and **MOST PRODUCTIVE** group in ITU-T with broad, global industry participation

✓ Highlights include:

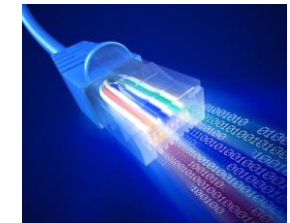


Home Networking



Smart Grid

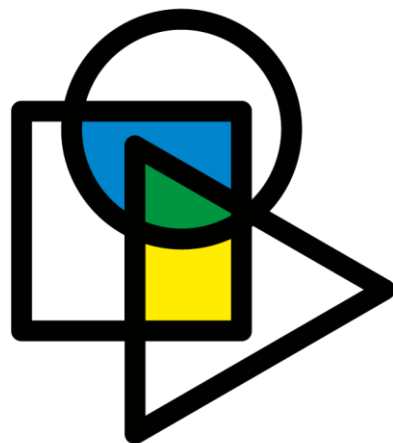
High Speed Access



Transport  
Technologies

The Optical Transport Network



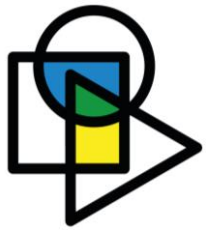


# ITU WTS-20

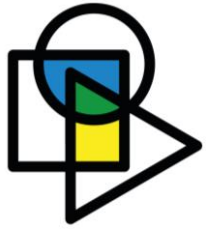
GENEVA2022

*Setting the standard*

1- 9 March 2022  
Geneva, Switzerland

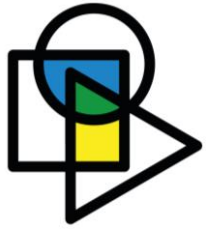


# **Additional slides**



# Terms of Reference

- ITU T Study Group 15 is responsible in ITU T for the development of standards for the optical transport network, access network, home network and power utility network infrastructures, systems, equipment, optical fibres and cables. This includes related installation, maintenance, management, test, instrumentation and measurement techniques, and control plane technologies to enable the evolution toward intelligent transport networks, including the support of smart-grid applications.



# Conclusion

- Leading development of optical transport network, access network, home networking, and smart grid standards in ITU.
- The largest study and most productive group in ITU-T, with broad, global industry participation
- Highlights include home networking, smart grid, high speed access, optical transport network infrastructure and transport technologies.