

Standardization in ITU-T Study Group 15 and Q13/15

Networks, Technologies and Infrastructures for Transport,
Access and Home:
Network synchronization and time distribution performance

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SG15 mandate

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

**optical transport
network**

systems

**instrumentation
and
measurement
techniques**

access network

equipment

maintenance

management

test

**home network and
power utility network
infrastructures**

**optical fibres and cables and
their related installation**

control plane technologies

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

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.FAST

Broadband access
up to 2 Gbps

G.mgfast

Next generation
G.fast targeting 5-10 Gbps

DTA

G.fast dynamic time assignment
(DTA) – downstream/upstream
bit-rates responsive to
customer traffic



Continue collaboration with



G.RoF

Radio over fiber
for mobile fronthaul



NG-PON2

Next generation of
converged fiber access
going to higher speeds



Visible Light
Communication
for home networking

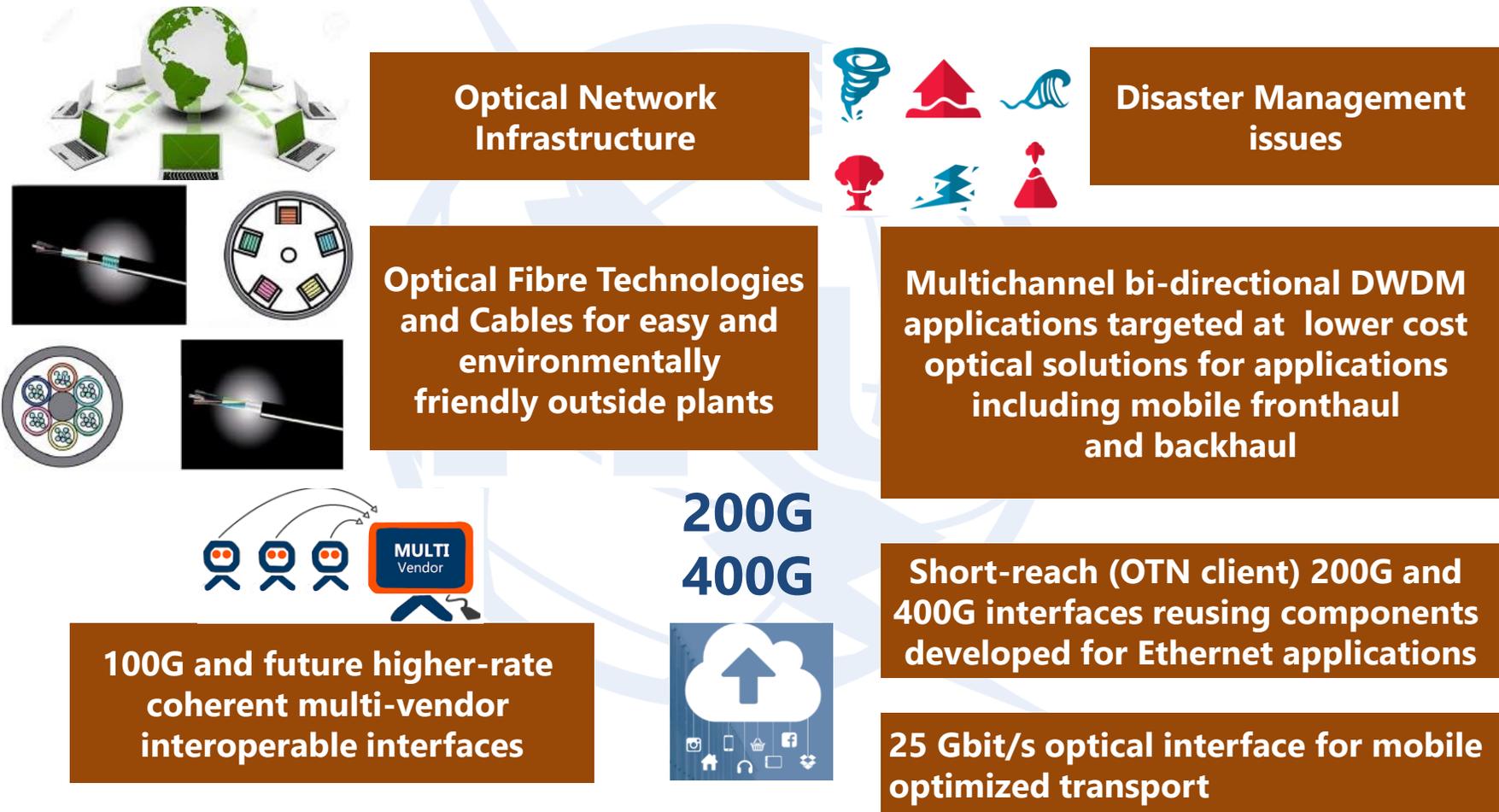


Powerline
communication
(PLC)

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

Optical Transport Networks

Synchronization of packet networks and future OTN networks, e.g., beyond 100G

MTN

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



Network survivability (protection and restoration)



Architecture and other Transport SDN Aspects



Management aspects of control and transport planes

BEYOND 100G

New "B100G" OTN interfaces, including the use of coherent G.698.2 interfaces



Core Information model enhancement for management of synchronization and optical media



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

List of Questions

- Telecommunication Standardization Advisory Group (TSAG*), endorsed the revised Questions in SG15 at the January 2021 meeting

WP 3

| New number | Question title | Status |
|------------|--|---|
| 1/15 | Coordination of Access and Home Network Transport Standards | Continued |
| 2/15 | Optical systems for fibre access networks | Continued |
| 4/15 | Broadband access over metallic conductors | Continued |
| 5/15 | Characteristics and test methods of optical fibres and cables, and installation guidance | Continuation of Question 5/15 and part of Question 16/15 |
| 6/15 | Characteristics of optical components, subsystems and systems for optical transport networks | Continued |
| 8/15 | Characteristics of optical fibre submarine cable systems | Continued |
| 10/15 | Interfaces, interworking, OAM, protection and equipment specifications for packet-based transport networks | Continued |
| 11/15 | Signal structures, interfaces, equipment functions, protection and interworking for optical transport networks | Continued |
| 12/15 | Transport network architectures | Continued |
| 13/15 | Network synchronization and time distribution performance | Continued |
| 14/15 | Management and control of transport systems and equipment | Continued |
| 16/15 | Connectivity, Operation and Maintenance of optical physical infrastructures | Continuation of part of Question 16/15 and Question 17/15 |
| 18/15 | Technologies for in-premises networking and related access applications | Continued |

*TSAG acts as an advisory body to the study groups, membership and staff of ITU-T. It is responsible for working procedures and the organization of the ITU-T work programme.



Meetings

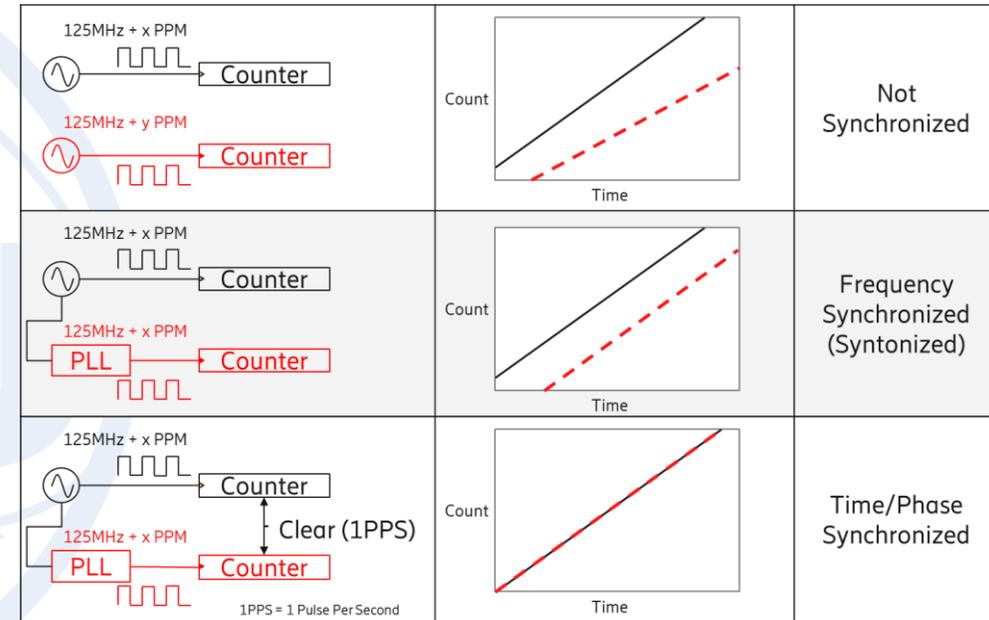
- Past meetings since 2017
 - Geneva, 19 – 30 June 2017
 - Geneva, 29 January – 9 February 2018
 - Geneva, 8-19 October 2018
 - Geneva, 1 – 12 July 2019
 - Geneva, 27 January – 7 February 2020
 - “Virtual”, 7-18 September 2020
- Future Meetings
 - “Virtual”, 12-23 April 2021
 - Geneva/”Virtual” (to be confirmed), 6-17 December 2021

2017-~~2020~~ 2022
Study Period

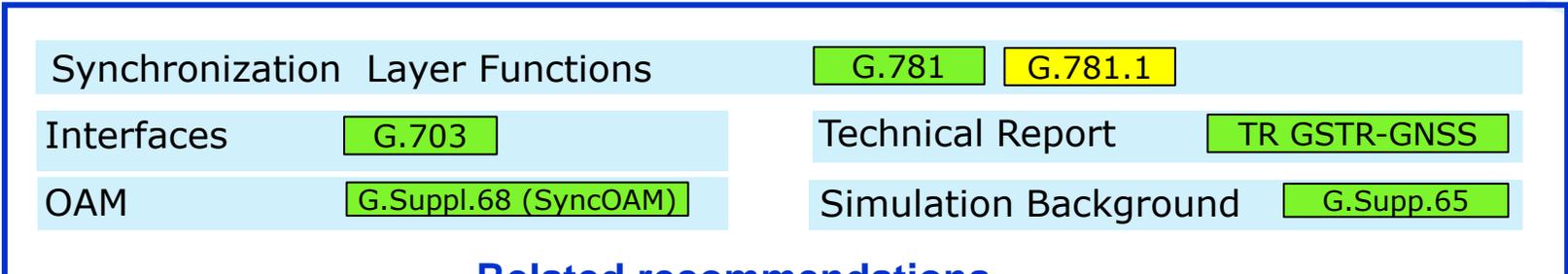
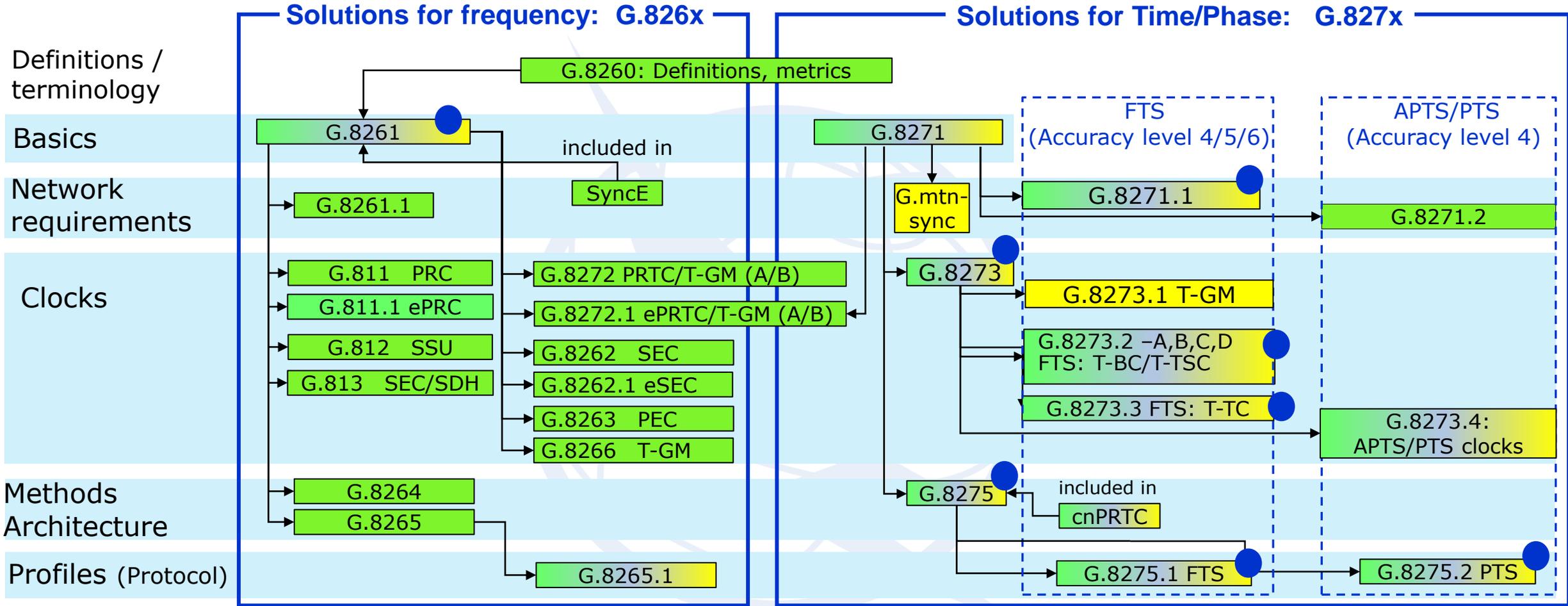


Q13: Introduction

- Network synchronization and time distribution performance
 - Networks Timing Needs (e.g., OTN)
 - End Applications Timing Needs (e.g. 5G Base Stations)
- Distribution of Time-Phase and Frequency
 - Methods (e.g., over physical layer, via packets, GNSS)
 - Architectures
 - Clocks
 - IEEE 1588 profiles
 - Performance, Redundancy, Reliability, etc.
- Networks
 - From SDH to Ethernet, IP-MPLS, OTN, xPON, ... -> MTN
- Recommendations
 - G.826x series (distribution of frequency synchronization)
 - G.827x series (distribution of time synchronization)
 - G.781, G.781.1 (Sync Layer Functions)
 - «Historical» (G.803, G.810, G.811, G.812, G.813, G.823, G.824, G.825...)
 - Supplements (G.Suppl65, G.Suppl68)



Q13 Recommendations



● New Rec/Rev/Amd/Corr 09-2020

Legend:

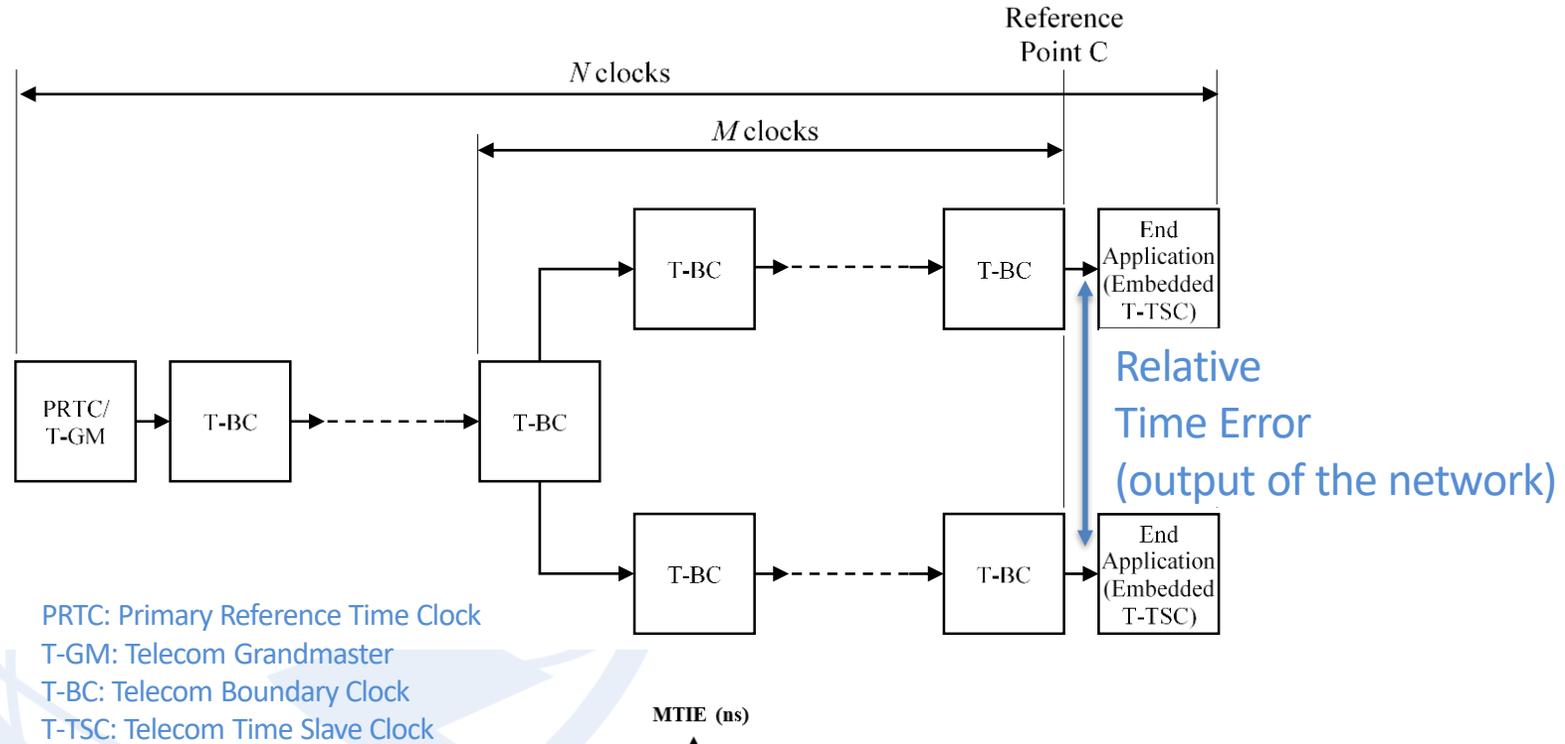
- Agreed Progress based on contributions
- Work item: New rec. New work item
- Work item: Upgrade Planned updates



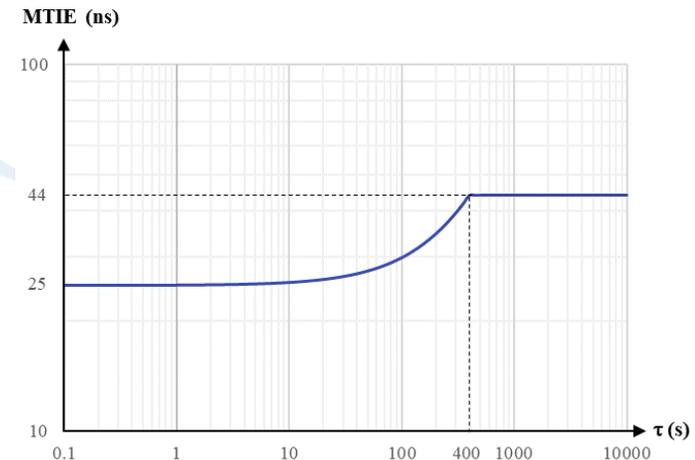
From, Helmut Imlau, Deutsche Telekom

Latest Studies: Fronthaul (G.8271.1)

- Guidelines for network dimensioning
- Use of G.8273.2 Clock Class C (or B) are assumed
- Use of enhanced Synchronous Ethernet
- Short clock chain ($M \leq 4$ with *class C* and $M = 1$ for *class B*)



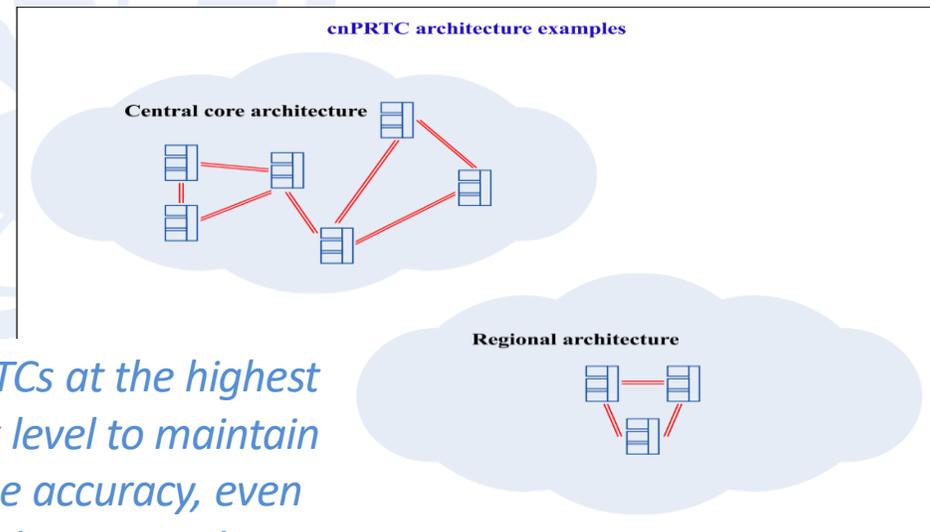
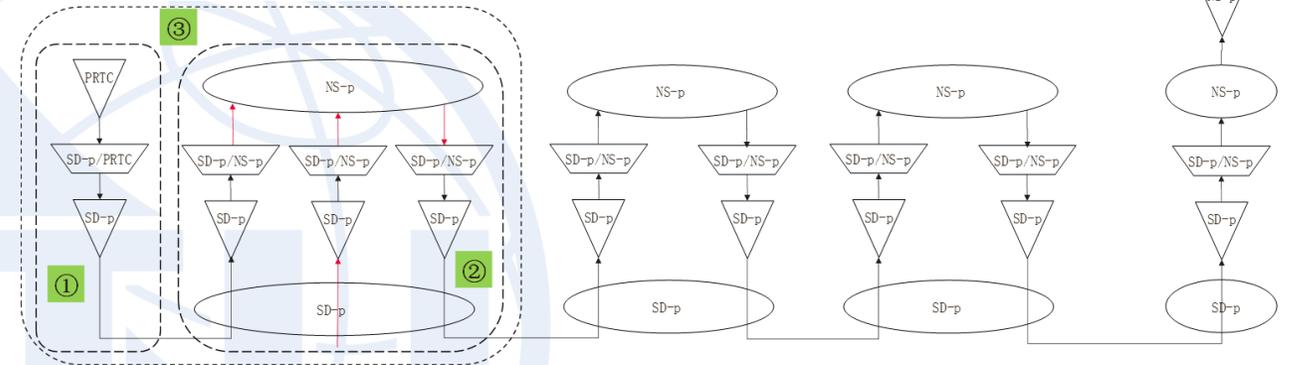
Network Performance measurement with respect to a PRTC deployed in the access (enhanced SyncE)



What is Next ?

- MTN, Metro Transport Network (G.mtn-sync)
 - Sync Requirements
 - Sync Architecture
 - PTP and syncE distribution
 - Clocks
- Complete work on Profile Interworking
- Complete work on packet-based sync layer functions
- Complete work on cnPRTC (Coherent PRTC)
 - Requirements, Methods (high accuracy profile?)
- Address New Sync Requirements
 - Emerging needs in mobile networks (positioning or use cases with less stringent requirements)
 - Future needs ? (e.g., sync for Quantum Key Distribution ?)

Packet-based synchronization distribution network connections transporting PRTC-quality timing reference information (G.781.1)



The cnPRTC connects PRTCs at the highest core or regional network level to maintain network-wide ePRTC time accuracy, even during periods of regional or network-wide GNSS loss (G.8275)

G.8275-Y.1369(17)-Amd.1(18)_FV1.1

