Gap analysis between Y.det-qos-intwk-wan and IETF DetNet/IEEE802.1 TSN

1. Summary

The two LS responses have been received from IETF DetNet and IEEE 802.1 TSN respectively. But it is not clear about the particular differences between Y.det-qos-intwk-wan from SG13 and the work from IETF DetNet/IEEE802.1 TSN.

This document addresses the gaps between Y.det-qos-intwk-wan and IETF DetNet/IEEE802.1 TSN based on the LS responses. It includes the following subjects:

- Gap analysis of technical scope between SG13 Q6 and IETF/IEEE;

- Gap analysis between Y.det-qos-intwk-wan and related active work in IETF DetNet/IEEE 802.1 TSN.

2. Reference

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T Y.3101] Recommendation ITU-T Y.3101, *Requirements of the IMT-2020 network.*

[ITU-T Y.3102] Recommendation ITU-T Y.3102, *Framework of the IMT-2020 network.*

[ITU-T Y.3106] Recommendation ITU-T Y.3106, *QoS functional requirements for the IMT-2020 network.*

[ITU-T Y.3107] Recommendation ITU-T Y.3107, *Functional architecture for QoS assurance management in the IMT-2020 network.*

[ITU-T Y.3113] Recommendation ITU-T Y.3113, *Requirements and framework for latency guarantee in large scale networks including IMT-2020 and beyond.*

[ITU-T Y.3118] Recommendation ITU-T Y.3118, *Requirements and framework for jitter guarantee in large scale networks including IMT-2020 and beyond.*

[ITU-T Y.3120] Recommendation ITU-T Y.3120, *Functional Architecture for latency guarantee in large scale networks including IMT-2020 and beyond.*

[ITU-T Y.3121] Recommendation ITU-T Y.3121, *QoS requirements and framework for supporting deterministic communication services in local area network for IMT-2020.*

[ITU-T Y.3126] Recommendation ITU-T Y.3126, *QoS requirements and framework of interworking capability for supporting deterministic communication services in local area network for IMT-2020 and beyond.*

[ITU-T Y.3129] Recommendation ITU-T Y.3129, *Requirements and framework for stateless fair queuing in large scale networks including IMT-2020 and beyond.*

3. The gaps analysis between SG13 and IETF/IEEE

3.1 The gaps of technical scope between SG13 and IETF/IEEE 802.1

IETF is designated as the lead working group for internet standardization, particularly focuses on internet protocols and infrastructure, emphasizing technical efficiency, scalability, and innovation for open internet ecosystems.

IEEE 802.1 is designated to address high-level networking protocols, focusing on interconnection, management, and security in local and metropolitan area networks (LANs/MANs).

ITU-T SG13 is designated as the lead study group for future network standardization, particularly focuses on telecommunication infrastructure, emphasizing network architectures, interoperability, and service quality.

ITU-T SG13 has always been responsible for the standardization of architecture and interconnection, while IETF and IEEE focus on the engineering implementation technologies. They have clear boundaries of technical scope.

3.2 The gaps of technical scope between SG13 Q6 and IETF DetNet /IEEE TSN

IETF DetNet focuses on deterministic data paths that operate over Layer 2 bridged and Layer 3 routed segments, where such paths can provide bounds on reordering, latency, loss, and packet delay variation (jitter), and high reliability. DetNet solutions apply to both wireless and wired networks. The typical applications for deterministic networks include professional and home audio/video, multimedia in transportation, engine control systems, and other general industrial and vehicular applications being considered by the IEEE 802.1 TSN Task Group.

IEEE802.1 TSN TG is to provide deterministic connectivity through IEEE 802 networks, i.e., guaranteed packet transport with bounded latency, low packet delay variation, and low packet loss. The TSN TG has been evolved from the former IEEE 802.1 Audio Video Bridging (AVB) TG.

ITU-T SG13 Q6 mainly focus on QoS mechanisms for IMT networks and quantum communications. As described in [ITU-T Y.3101], the services expected to be supported by the IMT-2020 network include enhanced mobile broadband services, ultra-reliable and low-latency communication based services, and massive machine type communication (MTC) based services. As described in [ITU-T Y.3106], the IMT-2020 network is recommended for high level QoS capabilities to support finer granularity of QoS control mechanisms than those supported by legacy networks. Particularly, the ultra-reliable and low-latency communication based services in IMT-2020 has stringent requirements for capabilities such as throughput, latency and availability. So the ITU-T SG13 Q6 is also responsible for the standardization to support the deterministic QoS for various applications within the scope of IMT-2020 network.

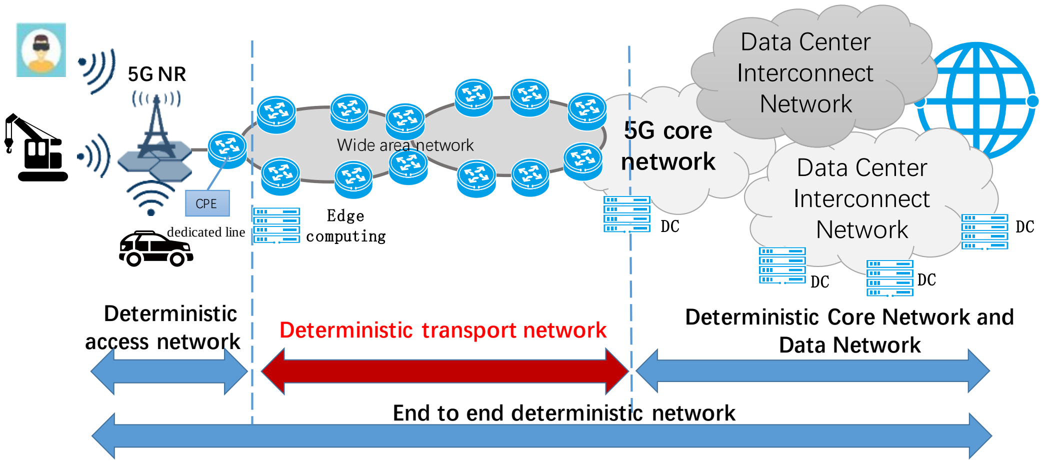
From the scope of Q6, it mainly focuses on the high level QoS capabilities of deterministic QoS for the network beyond IMT-2020 while IETF DetNet and IEEE802.1 TSN mainly focus on the underlay deterministic network technologies in Layer 2 and Layer 3 respectively. The Q6 may be viewed as the overlay architecture to achieve the end-to-end QoS/QoE assurance for deterministic services within the scope of IMT-2020 network.

4. The gaps analysis between Y.det-qos-intwk-wan and related active work in IETF DetNet/IEEE 802.1 TSN

4.1 The Clarification of the scope of Y.det-qos-intwk-wan

Figure 1 shows that the end-to-end deterministic QoS may be provisioned in IMT-2020 network and the deterministic Transport Network may interconnect between the deterministic Access

Network and deterministic Core Network/Data Network. The networks and nodes in local area networks may be interconnected with heterogeneous wide area networks such as dedicated line or private network, tunnels and so on. Y.det-qos-intwk-wan focused on the interworking QoS mechanism across multiple technology domains should be provided to achieve the end-to-end deterministic QoS guarantee.



（*Source: The revised draft of Y.det-qos-intwk-wan-R1*）

Figure 1. End-to-end deterministic QoS in IMT-2020

As the Figure 2 shown, Y.det-qos-intwk-wan is in the scope of the Q6 which focus on the network beyond IMT-2020 and it filled the gap of interworking capability between Q6 existing deterministic QoS mechanisms and other technologies which may be defined in IETF DetNet/IEEE 802.1 TSN.

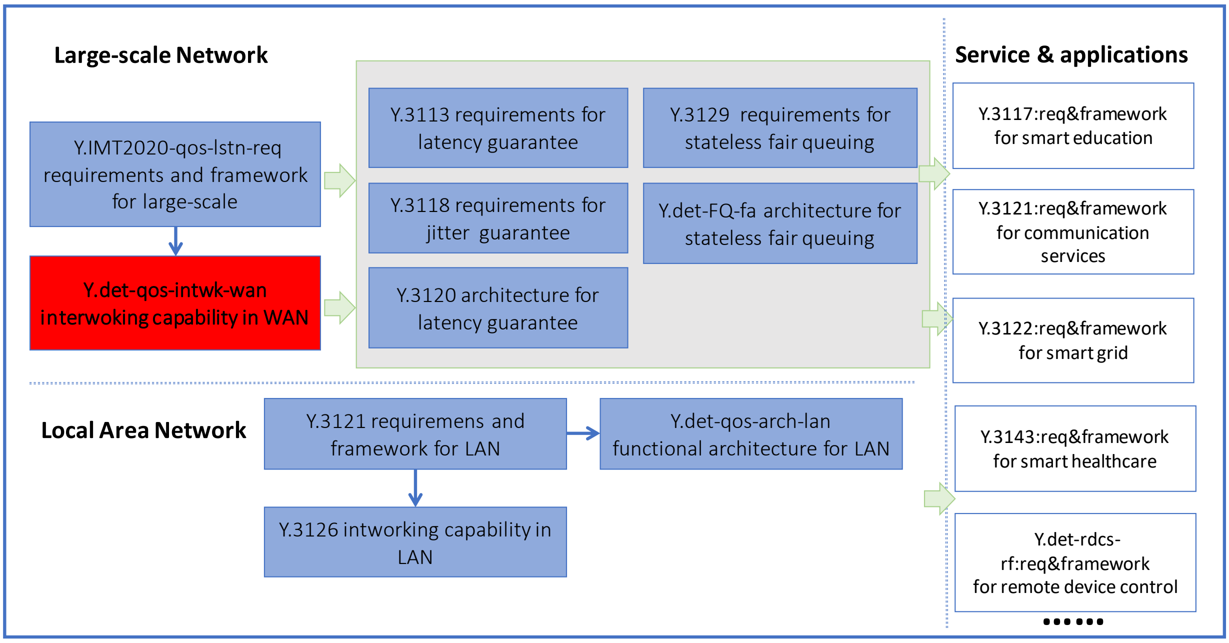


Figure 2. The items related to deterministic QoS in Q6

Y.det-qos-intwk-wan is closely related to Q6 existing standards to meet Q6 deterministic services and technologies for smart education, smart grid, smart healthcare and so on. The existing IETF standards can not be directly fulfill the requirements and scenarios of Q6 deterministic interworking.

4.2 The gaps analysis between Y.det-qos-intwk-wan and IETF DetNet active working group documents

Y.det-qos-intwk-wan mainly focus on deterministic QoS interworking mechanisms across multiple heterogeneous domains regarding to Q6 existing deterministic QoS mechanisms. And IETF DetNet mainly focus on the internet protocols in Layer 3 to provide deterministic connection. The gaps between Y.det-qos-intwk-wan and IETF DetNet active working group documents listed in LS are analyzed as following shown:

- draft-ietf-detnet-controller-plane-framework: "Deterministic Networking (DetNet) Controller Plane Framework"

This draft in IETF DetNet provides a framework for DetNet controller plane and discusses concepts and requirements. The section 6 mentioned the multi domain aspects, but it just proposes the requirement for multiple PCEs Coordination, not involving the requirement for interworking capability. Y.det-qos-intwk-wan mainly focus on the interworking capability for the end-to-end deterministic QoS guarantee.

- draft-ietf-raw-technologies: "Reliable and Available Wireless Technologies"

This draft in IETF DetNet discussed the radio technologies that are suitable to provide a DetNet/RAW service. As mentioned in the scope of the new work item, Y.det-qos-intwk-wan mainly focus on the interworking capability in fixed network, not involving wireless technology.

- draft-ietf-raw-architecture: "Reliable and Available Wireless Architecture"

This draft in IETF DetNet discussed the Reliable and Available Wireless (RAW) architecture.Y.det-qos-intwk-wan mainly focus on the interworking capability in fixed network, not involving wireless technology.

- draft-ietf-detnet-scaling-requirements: "Requirements for Scaling Deterministic Networks"

This draft in IETF DetNet describes the technical and operational requirements for scaling network especially the data plane enhancement requirements related to queuing solutions. Section 3.8 mentioned the support of multi-mechanisms, but it mainly focuses on different queuing mechanisms which belong to the same L3 technology. Y.det-qos-intwk-wan mainly focus on heterogeneous technology domains and the interworking capability between Q6 existing deterministic QoS mechanisms and other technologies.

- draft-ietf-detnet-dataplane-taxonomy: "Dataplane Enhancement Taxonomy"

This draft in IETF DetNet provides criteria for classifying data plane solutions such as queuing mechanisms. Y.det-qos-intwk-wan dose not involve queuing mechanisms.

4.3 The gaps analysis between Y.det-qos-intwk-wan and IEEE 802.1 TSN published specifications

Y.det-qos-intwk-wan does not involve the LAN technologies especially the IEEE TSN technologies. It mainly focuses on the interworking between different large-scale technology domains. The gaps between Y.det-qos-intwk-wan and IEEE 802.1 TSN documents listed in LS are analyzed as following shown:

- IEEE Std 802.1BA-2021 “Audio Video Bridging (AVB) Systems”

This specification in IEEE Std 802.1 TSN mainly focus on the AVB use case but Y.det-qos-intwk-wan dose not involve the application regarding to AVB.

- IEEE Std 802.1CM-2018 “Time-Sensitive Networking for Fronthaul”

This specification in IEEE Std 802.1 TSN mainly focus on the fronthaul Profiles but Y.det-qos-intwk-wan dose not involve the LAN scenario such as fronthaul.

5. Conclusion

The gap analysis highlights that Y.det-qos-intwk-wan addresses different objectives to IETF DetNet and IEEE 802.1 TSN, focusing on the interwoking QoS mechanisms within the scope of IMT-2020. This document aims to clarify potential ambiguities and prevent the duplication and overlapping, fostering collaboration between these SDOs efforts.