ITU-T Focus Groups

FG-QIT4N: Focus Group on Quantum Information Technology for Networks

Info session on FG-QIT4N deliverables

06 December 2021

Impacting the Information Society

- Quantum 2.0[1] is an emerging nascent technology area that is likely to have a significant global impact on ICT network architectures of the future
  - **Conventional Information Technology:** Quantum mechanics plays a "*supporting role*" (e.g., materials, devices, etc.)
  - **Quantum Information Technology (QIT):** Fundamental quantum phenomena play "*center stage*" to applications in Quantum Information Processing and Communication (QIPC)[2] as well as security
- QIT includes
  - Quantum computing
  - Quantum Key Distribution (QKD)
  - Quantum sensing, random number generation (QRNG), and direct communications (i.e., teleportation)
- While still in its infancy, QIT standardization activities are taking root (ITU-T, ETSI, ISO/IEC, IEEE)
- Significant investments are being made by the international community
- It is important now to consider and *carefully* prepare for the rapidly changing landscape of ICT networks to ensure seamless interoperability and ubiquitous access to information, as well as to promote a competitive and proliferated marketplace

[1]J P Dowling and G J Milburn, "Quantum technology: the second quantum revolution," *Philos. T. Roy. Soc. A* **361** (2003)

[2]T P Spiller and W J Munro, "Towards a quantum information technology industry," *J. Phys.: Condens. Matter* **18** (2006)

Terms of Reference - Objectives

- **Considering evolution and applications of QIT for networks,**
- The topics of study include:
  - **Telecom/network aspects of QKD networks** that are identified in close coordination with ITU-T SG13 and SG17 as not within the scope of SG13 (QKD network architecture aspects) and SG17 (security aspects of QKD networks and applications of QRNG for security)
  - **QIN technology and network evolution**
- **The FG outputs will focus on terminology and use cases.** The FG will reference relevant terminology defined in the pertinent ITU-T SGs. When necessary, the FG will liaise with the relevant SGs if terminology needs to evolve to take into account technology evolution.
- **To provide necessary technical background information and collaborative conditions** in order to effectively support QIN-related standardization work in ITU-T study groups.
- **To provide an open cooperation platform with ITU-T study groups and other SDOs,** including collaborative standardization work, co-located meetings, and workshops on quantum topics.

https://www.itu.int/en/ITU-T/focusgroups/qit4n/Pages/ToR.aspx

FG-QIT4N Working Structure

Co-Chairmen

- Mr. Alexey Borodin, Rostelecom, Russian Federation
- Mr. James Nagel, L3Harris Technologies, USA
- Mr. Qiang Zhang, University of Science and Technology of China (USTC), China

Working Group Chairs

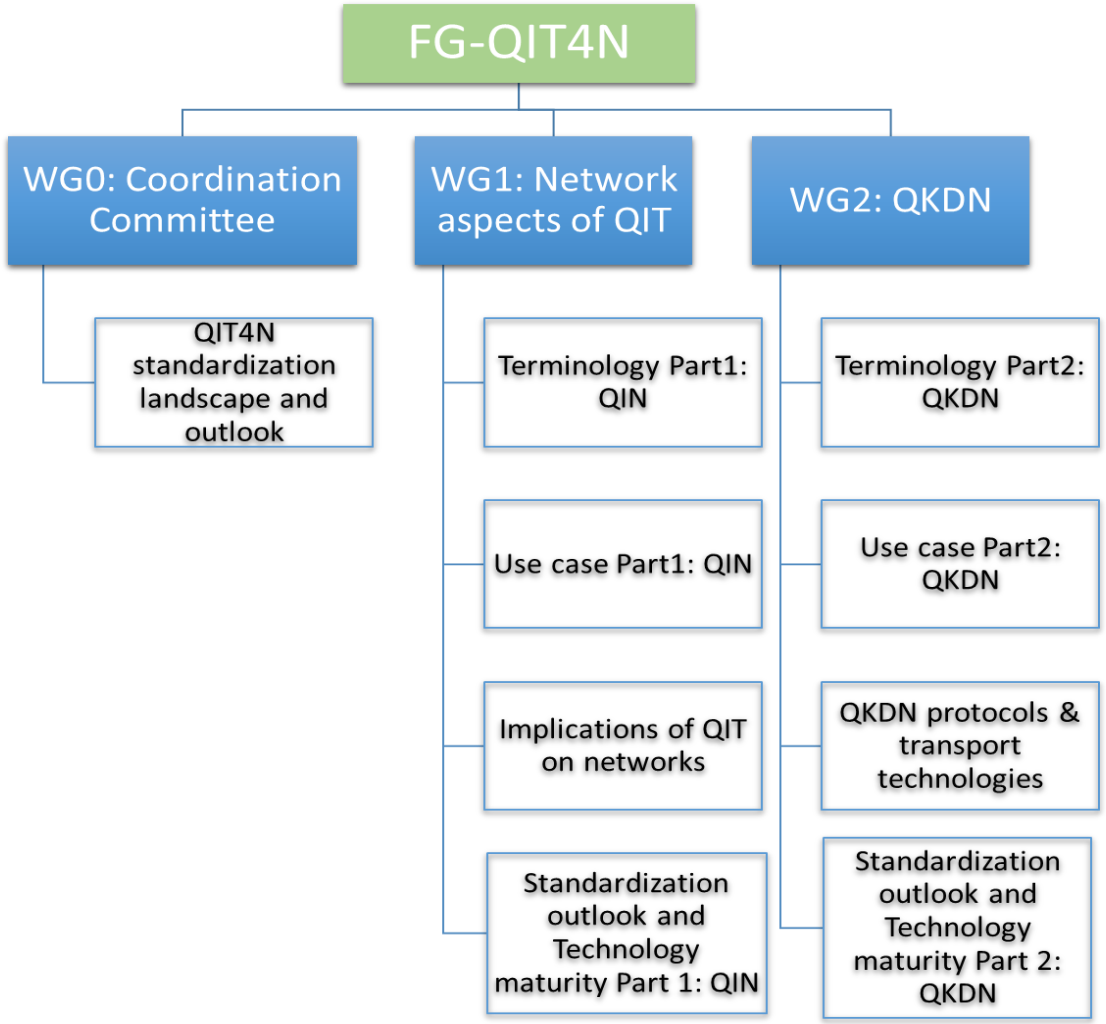
- WG0: Co-Chairmen
- WG1: Mr. Helmut Griesser, Adva Optical Networking, Germany
- WG2: Mr. Zhangchao Ma, CAS Quantum Network, China

WG1: Network aspects of QIT

To provide technical context in relation to the study topics and deliverables related to network aspects of quantum information technology

WG2: QKDN

To provide technical context in relation to the study topics and deliverables related to quantum key distribution networks and those aspects not covered in SG 13 and SG 17



FG-QIT4N Activities

Activities throughout the lifetime of the Focus Group have included…

- **Collaboration and cooperation with ITU-T study groups and other SDOs and sub-groups**
  - Formal liaisons
  - Joint meetings with ETSI (ISG QKD) and ISO/IEC (JTC 1 SC27/WG3)
  - Informational presentations by industry and academia groups at plenary meetings
- **Development and writing of technical reports**
  - Evolution and applications of QIT for networks
  - Evolution of Quantum Information Networks (QIN), focused on terminologies and use cases
  - Telecom/network aspects of QKD networks that are not currently within the scope of SG13 and SG17, focused on terminologies, new use cases, protocols and transport technologies
- **Organizing and hosting of the FG-QIT4N QIT Webinar series***
  - *Cybersecurity in the Quantum Era* (WSIS Forum 2021 – w/ ETSI ISG QKD)
  - *Joint Symposium on Quantum Transport Technology* (w/ IEEE and IEC)
  - *Quantum Information Technologies (QIT) for Networks – Use Cases*
  - *Harmonisation of Terminology in Standards for Quantum Technology* (participation of ITU, ISO, IEC, and ETSI)
  - *Joint Symposium on Quantum Photonic Integrated Circuits* (w/ IEEE and IEC)

*All webinars recorded and available for viewing at https://www.itu.int/en/ITU-T/webinars/qit/Pages/default.aspx

Presentation of Deliverables

- **Standardization outlook and technology maturity:**
  - *Quantum key distribution networks,* **Junsen Lai**, China Academy of Information and Communications Technology (CAICT), China
  - *Network aspects of quantum information technologies*, **Barbara Goldstein**, National Institute of Standards and Technology (NIST), United States [Deliverable]
- **Terminology:**
  - *Quantum key distribution networks,* **Zhangchao Ma**, CAS Quantum Network, China [Deliverable]
  - *Network aspects of quantum information technologies*, **Ming-Han Li**, CAS Quantum Network, China [Deliverable]
- **Use cases:**
  - *Quantum key distribution networks,* **Zhangchao Ma**, CAS Quantum Network, China [Deliverable]
  - *Network aspects of quantum information technologies*, **Helmut Griesser**, Adva Optical Networking, Germany [Deliverable]
- **Quantum key distribution network protocols and transport technologies:**
  - *QKDN protocols: Quantum layer,* **Hao Qin**, National University of Singapore (NUS), Singapore [Deliverable]
  - *QKDN protocols: Key management layer, QKDN control layer and QKDN management layer*, **Hongyu Wu**, QuantumCTek Co., Ltd. China [Deliverable]
  - *QKDN transport technologies*, **Yalin Li**, QuantumCTek Co., Ltd. China [Deliverable]