



Applications and Use Cases for the Quantum Internet

<https://www.ietf.org/id/draft-irtf-qirg-quantum-internet-use-cases-01.txt>

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Background of Present I-D v01

- v00 was uploaded on May 24 as RG document with a few pending comments
 - Need to clarify “control vs data plane classification”
 - Need to map the described use cases to Wehner’s quantum internet roadmap
- The present v01 aims to address these pending comments on v00 with two major updates
 - Clarifications on “Control vs Data Plane Classification” (Section 4.3)
 - Map Use Cases to Wehner’s Quantum Internet Roadmap (Section 6)

Clarifications on “Control vs Data Plane Classification”

Planes	Classical Internet	Quantum Network	Quantum Internet
Control Plane	ICMP, DNS	Signalling for controlling entanglement distribution	QKD-based secure communication setup; Quantum ping
Data Plane	Web Browsing	Entanglement distribution	Video conference using QKD-based secure communication setup

Figure 1: Examples of Control vs Data Plane Classification

Map Use Cases to Wehner's Quantum Internet Roadmap

Six Stages of Quantum Internet Development from Wehner	Quantum Internet Stages	Quantum Internet Use Cases	Requirements
1 Trusted repeater networks (Stage-1)	Stage-1	Secure Comm Setup with Basic QKD	Trusted Nodes
2 Prepare and measure networks (Stage-2)	Stage-2	Secure Comm Setup with E2E QKD	Long-distance qubit transmission
3 Entanglement distribution networks (Stage-3)	Stage-3	Secure Comm Setup with Advanced E2E QKD	Entanglement distribution
4 Quantum memory networks (Stage-4)	Stage-4	Secure/Blind Quantum Computing	Quantum memory
5 Fault-tolerant few qubit networks (Stage-5)	Stage-5	Higher-accuracy clock synchronization	Fault tolerance
6 Quantum computing networks (Stage-6)	Stage-6	Distributed quantum computing	More qubits

Figure 5: Use Cases in Different Quantum Internet Stages

Next Steps

- Address a few pending comments
 - “General Requirements – Performance Indicator” (Mathias Van Den Bossche)
 - Welcome inputs from QIRG on “Performance Indicators”
- Continue to collect feedback from QIRG and improve the present I-D
- A Question for QIRG
 - Should QIRG consider whether this use case draft and *draft-irtf-qirg-principles* be synchronized in time for RG last call (as this is sometimes done in other WG/RGs for related drafts)?