Quantum Technologies Courses for Industry

Technische Universität Braunschweig
TUBS

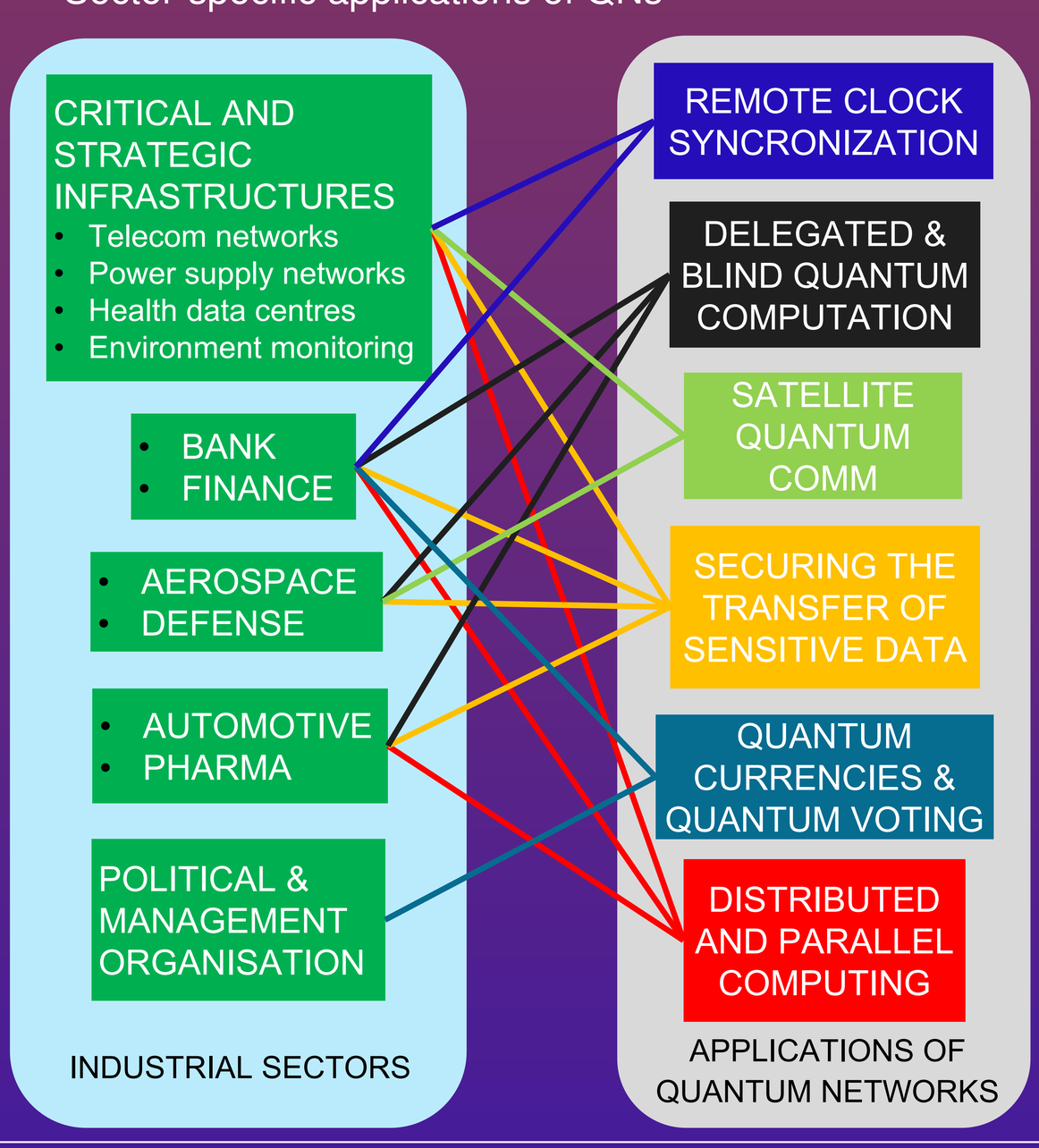
QUANTUM COMMUNICATION AND QUANTUM NETWORKS

Quantum communication (QC) is one of the most advanced quantum technologies that is acquiring increasing interest into market adoptions. The main QC applications, like quantum key distribution (QKD), do not need a fully-quantum computer to be practically implemented and some QKD systems, allowing two distant (~150Km) parties to share secret correlations, have already reached comercialization. The long-term goal of QC is the establishment of a global-scale fully quantum network (quantum internet), but before that, intermediate stage-development of quantum networks can already be exploited to provide solutions to real-world use cases. This course is a qualitative journey through the protocols of quantum communications and their technological realization. It will also guide the learner through the progressive stages for the realization of quantum networks and their respective sector-specific applications.

DESCRIPTION

CONTENT OF THE COURSE:

- Quantum Key Distribution: BB84 protocol, E91 protocol, decoy state, quantum random number generation
- Trusted node quantum networks
- Measurement device independent QKD
- Device independent QKD
- Fully trusted node quantum network
- Quantum teleportation
- Quantum repeaters: working principles and technological challenges
- Quantum memories
- Sector-specific applications of QNs



AUDIENCE

The course will have two different learning-degrees, based on different proficiency levels. From A1-A2 (awereness-exploration) to B1 (adaptation)

	1) A1 (Awareness) – A2 (Exploration)	2) B1 (Adaptation)
Audience	Decision makers, CxOs, SME leaders, business strategists	Engineers, Computer Scientists, Data Analysts
Format	Video, Audio, Texts with interactive activities at the end of each session (inspired by language learning platform)	+ links to already existing material on the physics of Qcomms + hands-on tools, like the Quantum Network Explorer (TUD)

LEARNING OUTCOMES

By the end of the course the learner will:

- Be QC fluent. They will develop a general knowledge of quantum communication and the applications of quantum networks and their advantages over classical
- Understand the fundamental role played by quantum networks in providing new real-life solutions
- Be able to engage in discussion with QC experts to understand and identify which quantum network technologies have near-term realization in order to accordingly orientate investments
- Be familiar with the main technological challenges faced by a realistic implementation of a global-scale fully-quantum network

INSTRUCTOR

Dr. Riccardo Laurenza has a PhD in quantum information theory with a focus on quantum communications at the University of York (UK). Before joining the TUBS, he worked as a postdoctoral researcher in Quantum Networks at CNR (Florence - IT) and the Freie Universität Berlin.

DURATION

Course: ~7 hours
Interactive learning activities: ~2 hours

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