

ITUWebinars

# Quantum information technology (QIT)

*Episode #2: Joint symposium on quantum transport technology*

28 April 2021

15:00 - 18:00 CEST

<http://itu.int/go/QIT-03>

Co Organized by



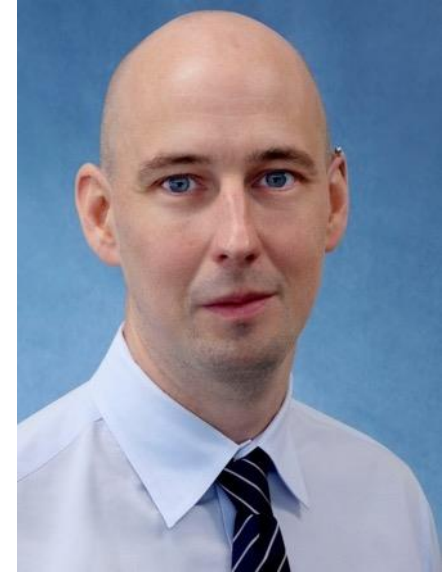
# Moderators of the Webinar



**Dr. Bernard Lee**  
Director of Technology & Innovation  
SENKO Advanced Components



**Dr. Richard Pitwon**  
CEO  
Resolute Photonics



**Dr. James Nagel**  
Lead Photonic & Laser Systems Engineer  
L3Harris Technologies Space and Airborne  
Systems

# Housekeeping slide



Webinar will comprise of 2 sessions



Each session will have a series of presentations and a 15min Q&A slot at the end of the session



Each presentation will be approximately 20min



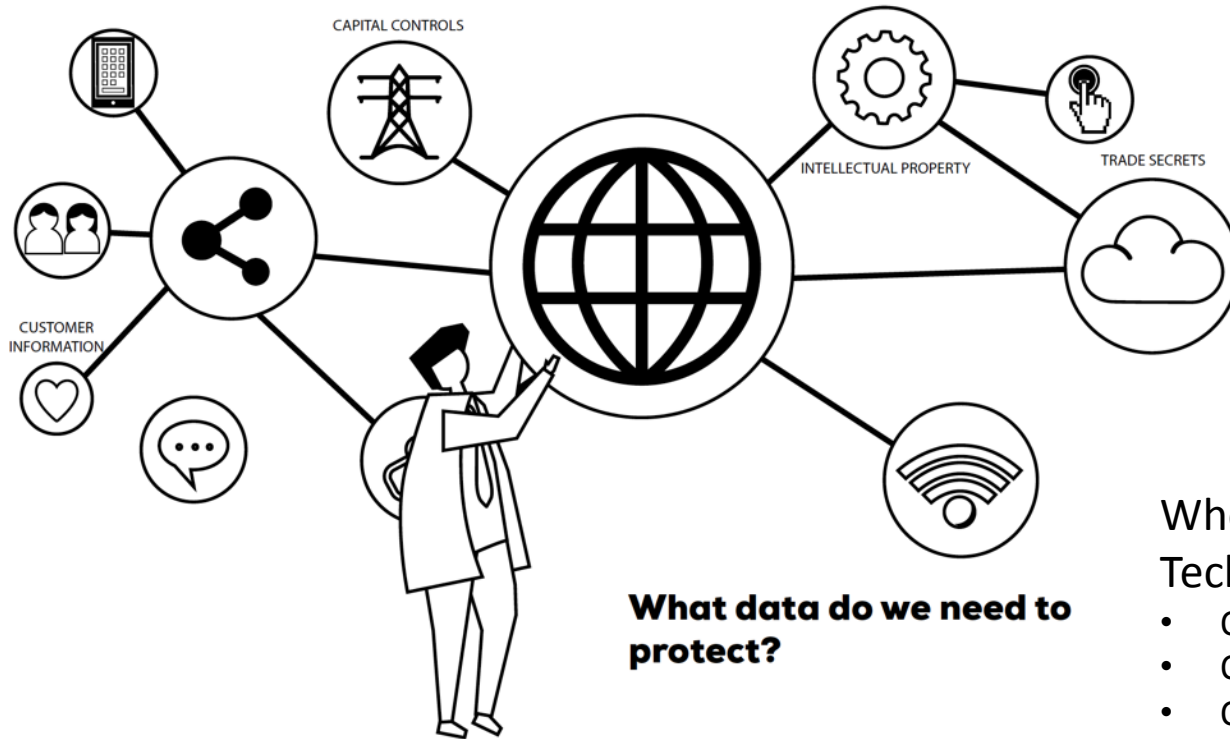
Please type your questions in the Q&A dialog box

# The importance of Quantum Transport Technology



The world turns on information.  
It is by far the most important and valuable global resource in the modern world

# The importance of Quantum Transport Technology



## Where is Quantum Transport Technology required?

- Quantum sensor network
- Quantum computing network
- Quantum communication network
  - QKD most common

# The need for a Secure Communications Networks

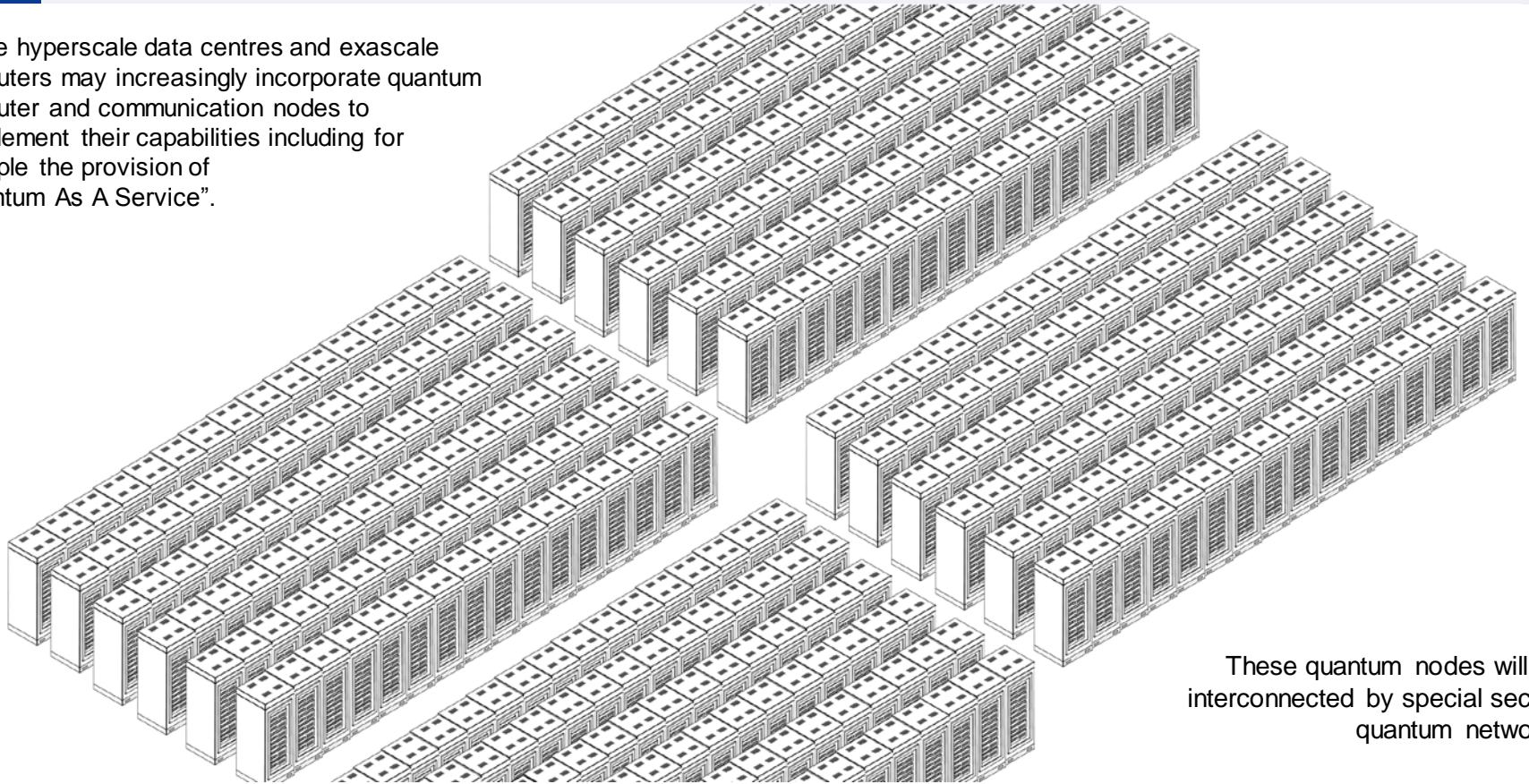


Information Technology security is increasing with more organizations looking to the Cloud to manage everyday operations



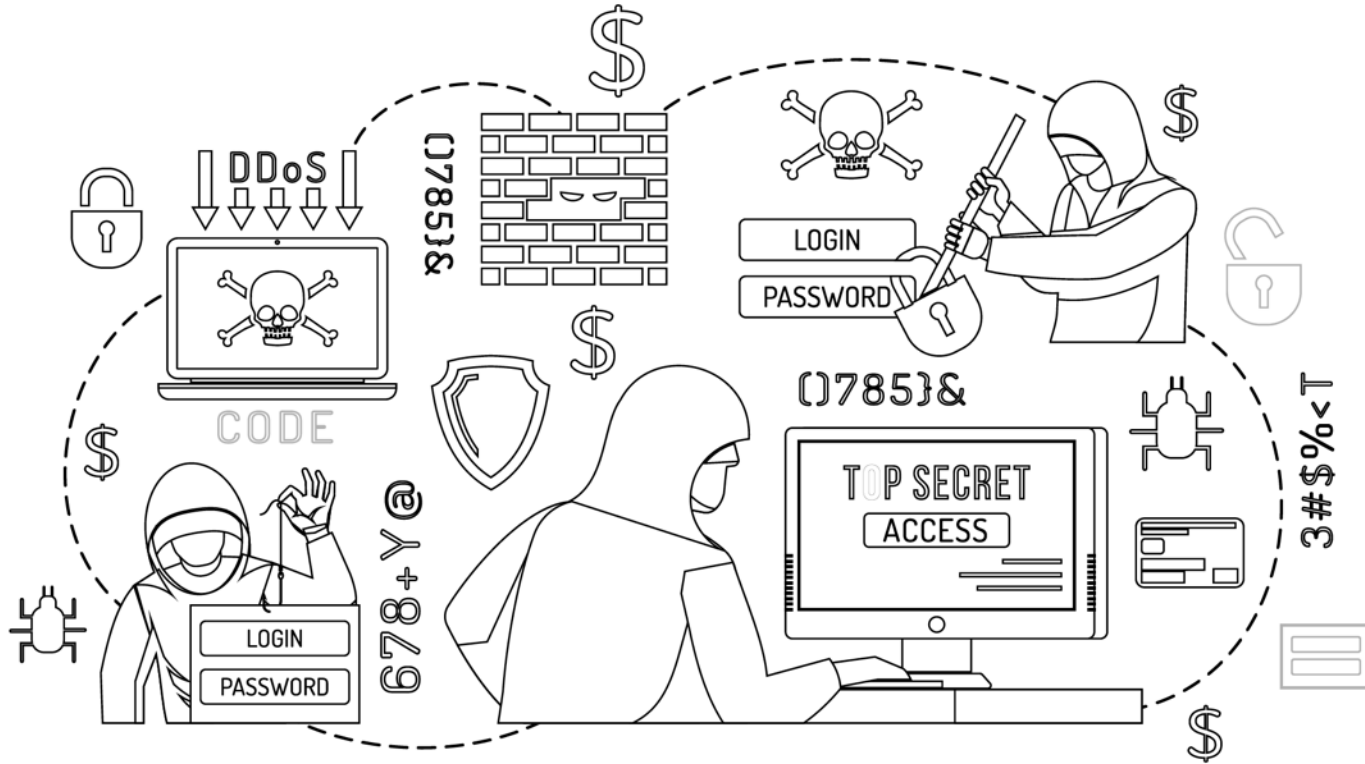
# The need for a Secure Communications Networks

Future hyperscale data centres and exascale computers may increasingly incorporate quantum computer and communication nodes to complement their capabilities including for example the provision of “Quantum As A Service”.



These quantum nodes will be interconnected by special secure quantum networks

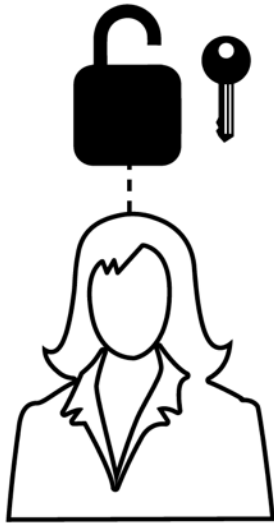
# The need for a Secure Communications Networks



However cyber-attacks and data breaches are becoming ever more common



# The need for a Secure Communications Networks



**'Alice'**  
Commonly used  
to name the  
Sender

## Normal Optical Channel



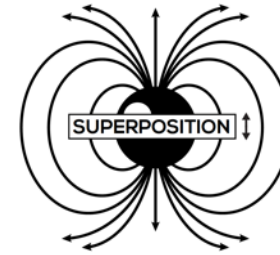
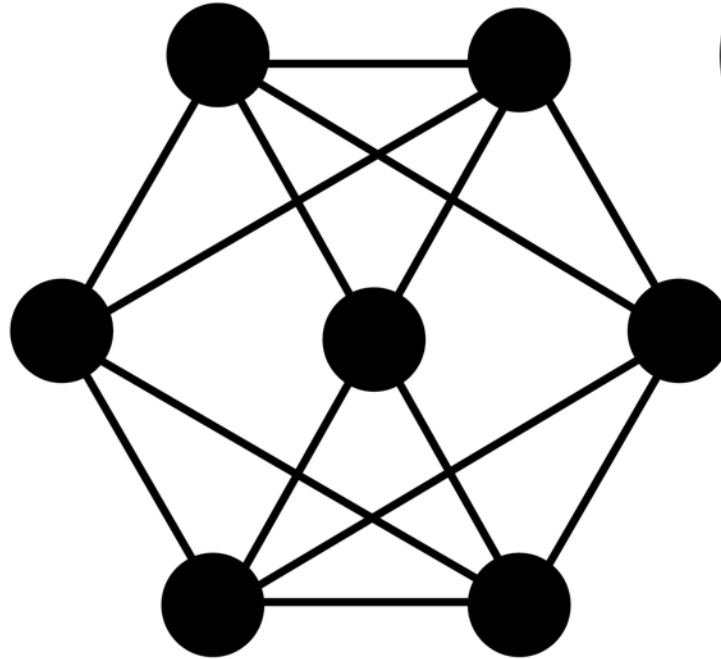
**'Eve'**  
Commonly used to name the  
Eavesdropper/Hacker



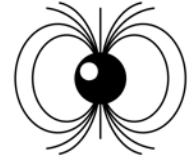
**'Bob'**  
Commonly  
used to name the  
Receiver

# QKD based Quantum Communications Network

## Quantum Key Distribution



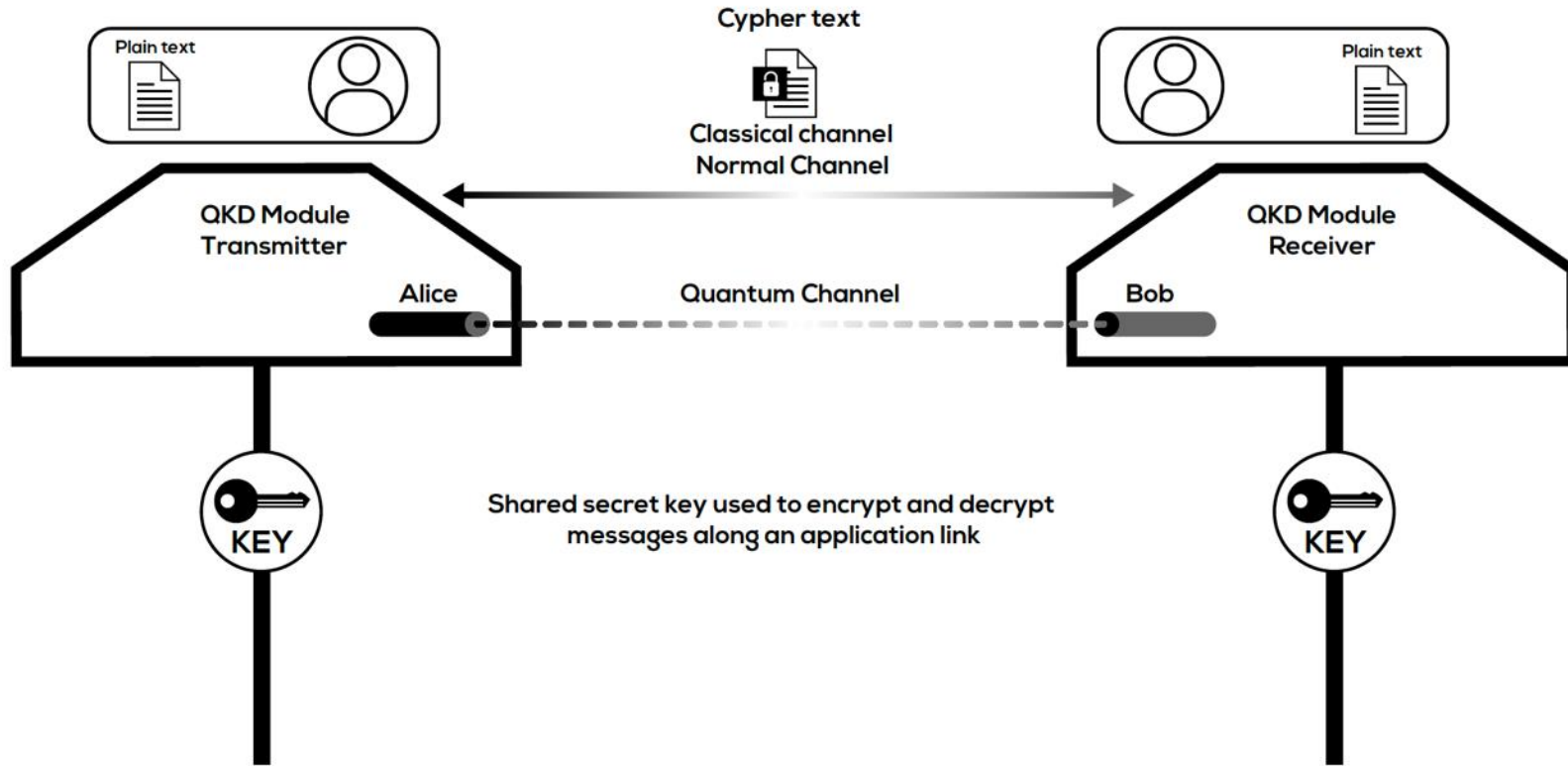
Quantum Key Distribution uses quantum effects



- take advantage of quantum effects, such as superposition or entanglement
- a particle, such as a single photon, can be many things at once, until it is measured or observed for the first time

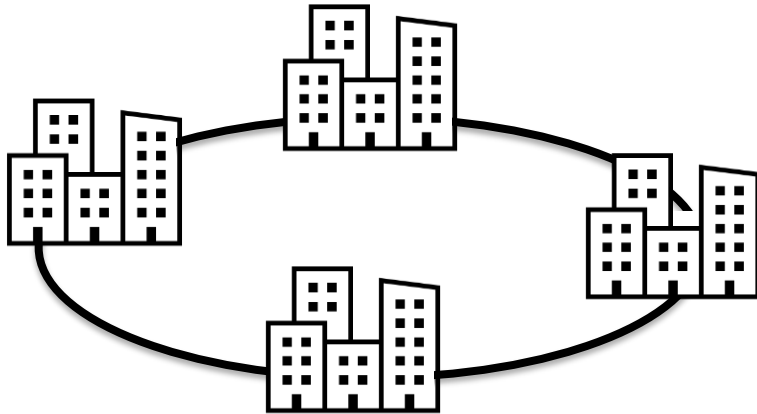
This technique of sending cryptographic keys safely is called Quantum Key Distribution

# QKD based Quantum Communications Network



# Today's Webinar Focus

## Quantum Transport Technology

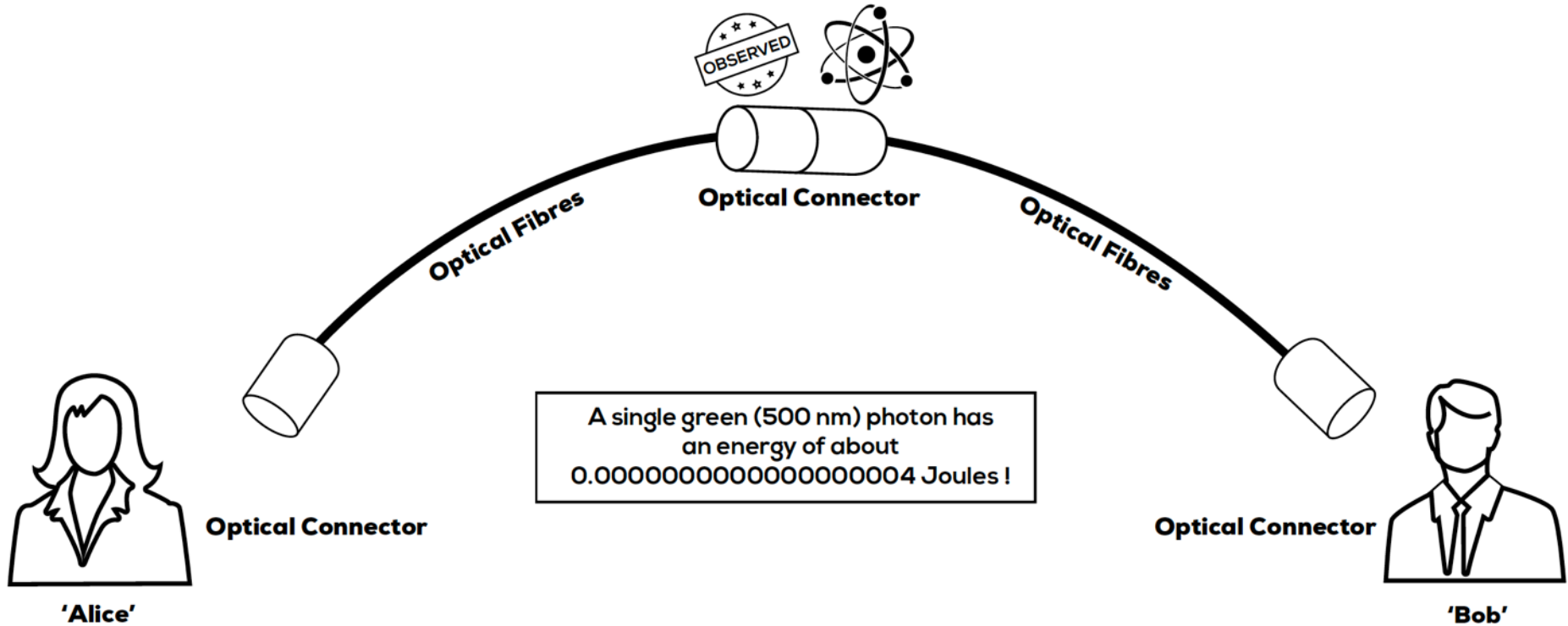


*Session 1:*  
Metro & Trunk Networks



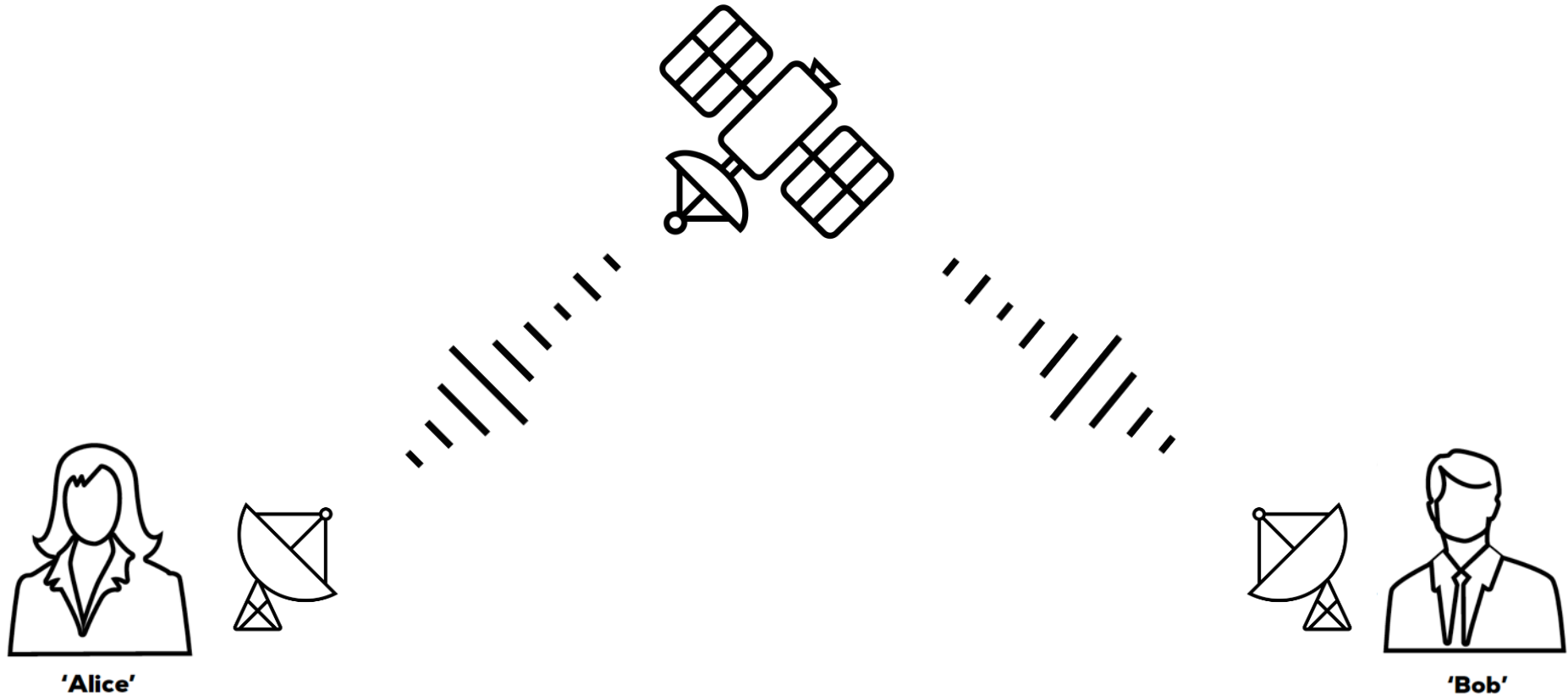
*Session 2:*  
Long Haul Network

# Quantum Transport Technology - Wired





# Quantum Transport Technology - Wireless



# Overview on quantum standards activities



## ISO/IEC JTC1

**SC7** formed SG1 to investigate quantum standards

**SC27** focusses on security and privacy in ICT systems



## ITU -T

**SG 17** – Quantum security

**SG 13** – QKD

**FG-QIT4N** – Quantum information technology for networks



## IEEE

**P7130** Standards for QC Definitions

**P1913** for Software Quantum Communications

**P7131** for QC performance metrics & Performance Benchmarking



## IEC SMB/SWG 10

**WP** on Quantum Information Technologies



## ETSI

**ISG QKD** – Quantum key distribution

**TC Cyber WG QSC** – Quantum Safe Cryptography



## CEN / CENELEC

**FGQT** – Focus Group on Quantum Technologies

# Introduction to ITU-T FG-QIT4N

## An ITU-T Focus Group is...

- an instrument that provides an additional working environment for quick development of standards in specific areas.
- used to address industry needs as they emerge, and when they are not covered within an existing ITU-T Study Group.

## Who/What?

- The ITU-T Focus Group on Quantum Information Technology for Networks – FG-QIT4N
- Created by the ITU-T Telecommunications Standardization Advisory Group (TSAG) *to provide a collaborative platform for pre-standardization aspects of Quantum Information Technology (QIT) for networks*
- Participation is open to all interested parties and stakeholders

## When/Where?

- Established September 2019
- First official meeting held December 2019 in Jinan, China
- Lifetime to two years from date of first meeting (till December 2021)

## Why?

- *QIT has promoted the booming of the second quantum revolution and will have a profound impact on ICT networks*

## Interested?

- Join the next meeting taking place from 10-21 May 2021
- Find out more at: <http://www.itu.int/go/fgqit4n>

# QKDN Protocols and Transport Technologies

D2.3 studies protocols of QKDN based on the architecture and reference points being specified in SG13 and may include other SDOs to ensure network interoperability and facilitate certification

## D2.3 QKDN PROTOCOLS – PART 1

### Part 1 – The Quantum Layer

- i. Study and review of protocols in the quantum layer of a QKDN
- ii. Focus on QKD protocols as an essential part of a QKDN
  - overview of different types of QKD protocols
  - protocol workflows
  - protocol features
  - Parameters
  - commercialization status
  - security proofs
  - future network integrations
- iii. Discussion and suggestions for future directions



## D2.3 QKDN PROTOCOLS – PART 2

### Part 2 – Key Management and QKDN Control & Management Layers

- i. Study and review of classical communication protocols in a QKDN
- ii. Focus on traditional network strata, based according to their functionality
  - key management layer
  - QKDN control layer
  - QKDN management layer
- iii. Includes discussion of necessary workflows and parameters

### D2.3 QKDN Protocols

- Mr. Kaoru Kenyoshi, NICT, Japan

### D2.4 QKDN Transport Technologies

- Mr. Yalin Li, QuantumC Tek Co. Ltd., China

## D2.4 QKDN TRANSPORT TECHNOLOGIES

- i. Review of QKDN transport technologies
  - transport system components
  - technical solutions
  - requirements for co-fibre transmission of quantum and classical signals
- ii. DV-QKD
  - Systems and transport requirements
  - Co-fibre transmission with classic optical communications systems
- iii. CV-QKD
  - Systems and transport requirements
  - Co-fibre transmission with DWDM

# Opening Speaker

## Yalin Li - Chief Editor of the D2.4 QKDN Transport Technologies Technical Report, FGQIT4N

Application Product Director, QuantumCTek Co., Ltd, Rep. of China

Yalin Li is the application product director at QuantumCTek Co., Ltd in China. He studied at the University of Science and Technology of China (USTC) from September 1999 to July 2008 and graduated with a PhD. After his studies, he worked at Alcatel-Lucent Shanghai Bell from July 2008 to December 2012 as a post-doctorate fellow and an advisor engineer, where he gained research experience on communication systems.

Following this, he worked at BJRZ Tech. Co from December 2012 to January 2015 as vice general manager and chief engineer where he gained experience and expertise on system design and management. Since January 2015, he has been working at QuantumCTek Co. Ltd as the director of the application product line. In recent years, he has led the testing of co-fiber systems for quantum and classical signals and contributed to the research report : “Research on the co-fiber transmission of quantum key distribution and classic optical communication systems” in CCSA ST7.





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