



Quantum Key Distribution in real Telecommunication Networks

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Outcome

- Who we are
- What we do
- Testbed and concrete use-cases
- Future development and research directions

Who we are



We are a CNR spin-off (Italian National Research Council), incorporated in late 2020.

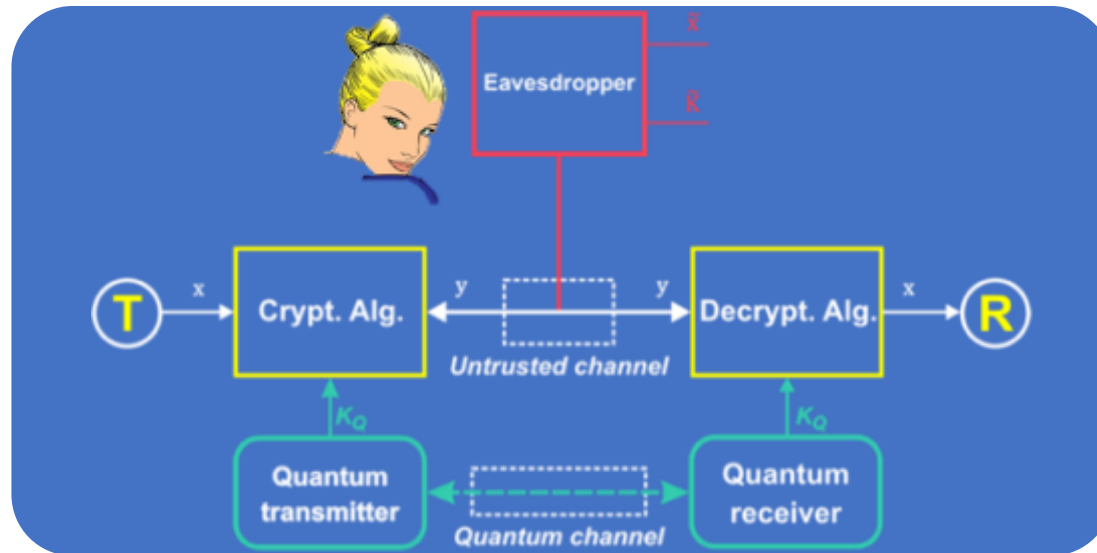
We are a team of quantum experts and entrepreneurs working in the field of quantum technologies.

From fundamental atomic and quantum optics to solid state lasers and optical telecommunications, spatial and terrestrial.

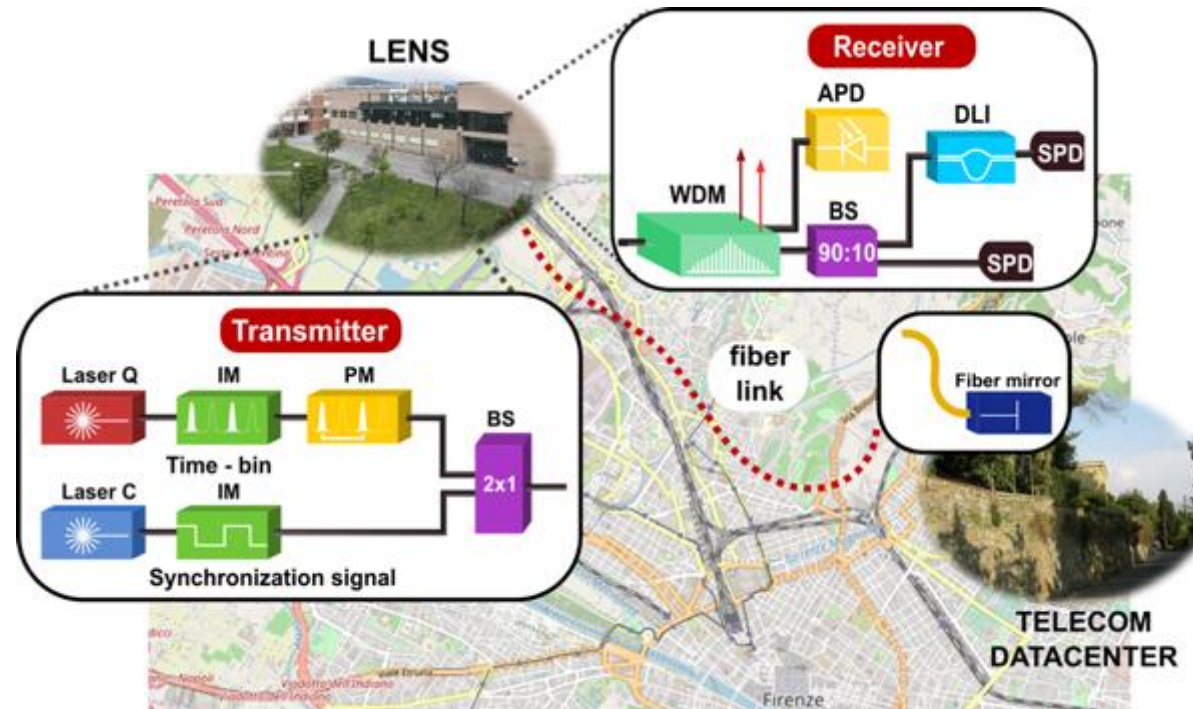


Quantum key distribution

- a novel approach towards information theoretic secure communications
- exploit quantum mechanics laws for establishing secure keys
- single photons transmission for create quantum keys and classical channel for send encrypted messages
- using One time Pad (OTP) encryption (or others) Alice and Bob can share secret messages



Italian Quantum Backbone in Florence



RESEARCH

Open Access

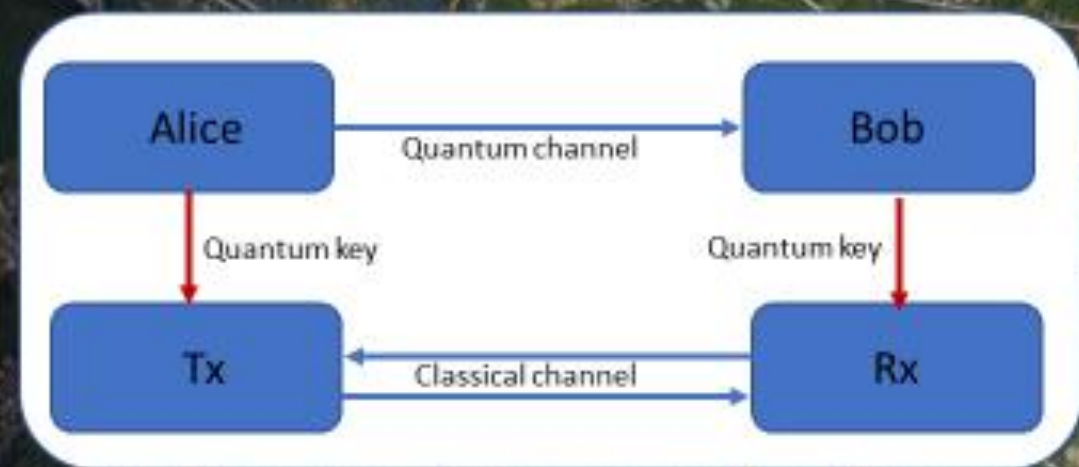
Field trial of a three-state quantum key distribution scheme in the Florence metropolitan area



Bacco et al. *EPJ Quantum Technology*
<https://doi.org/10.1140/epjqt/s40507-019-0075>



Quantum encrypted videocall



Alice

Porto Vecchio Trieste

SS14

Via Udine

Porto Franco
Nord di Trieste

Via Udine

Via Commerciale

Università
degli Studi
di Trieste

Bob

Via Giulia

SS14

BARRIERA
NUOVA

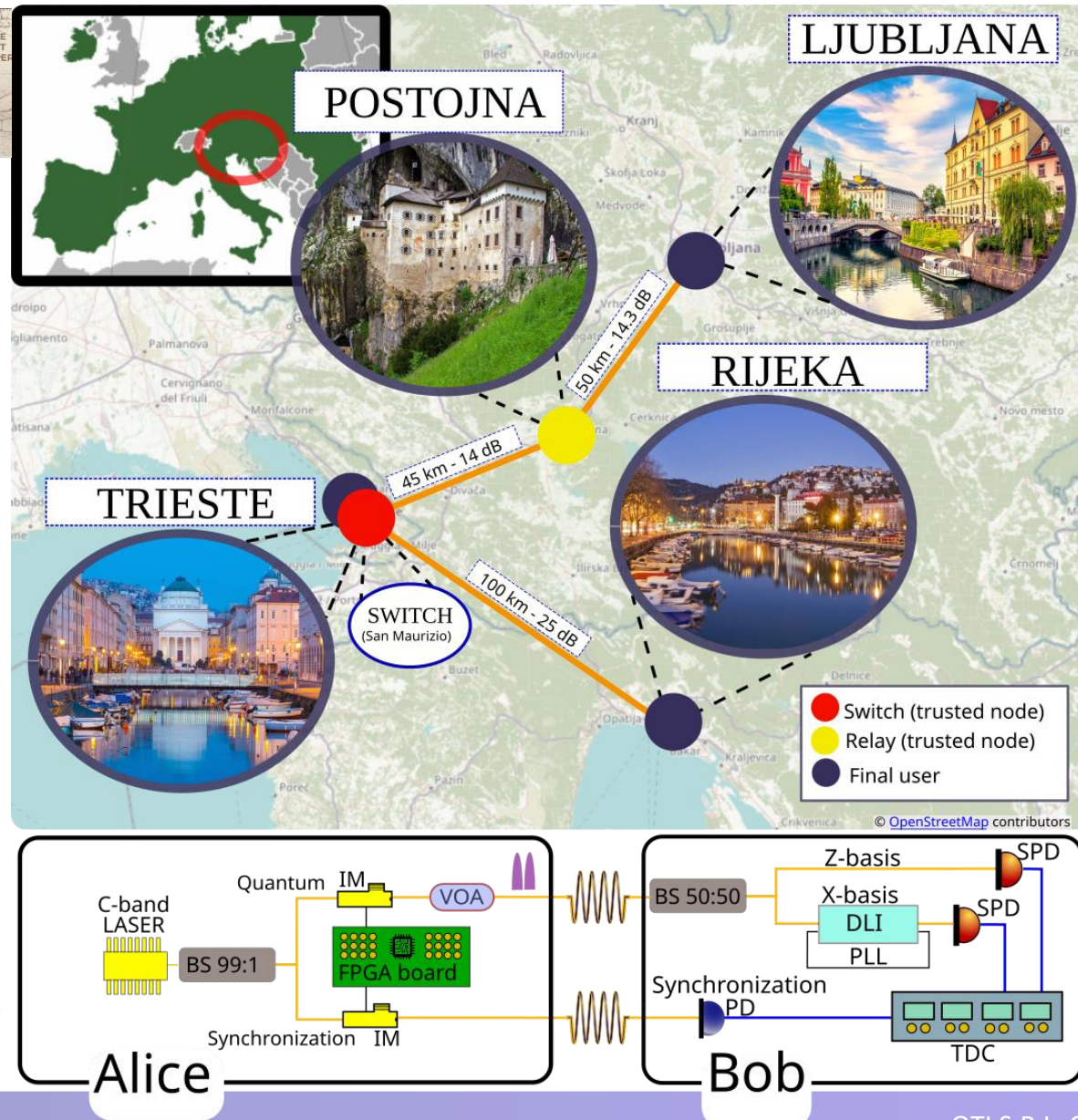
BORG
TERESIANO

CNR-QTI: ESOF2020



September 2020 – QKD enabled video-call between
the Italian Prime Minister and the Magnifico Rettore
of the Trieste University

QKD public demonstration at G20 event



Quantum communication between three Countries – Italy, Slovenia and Croatia.

Trieste – Postojna – Ljubljana (50 km + 50 km with trusted node, 14 + 14.3 dB)

Trieste – Rijeka (100 km, 25dB)

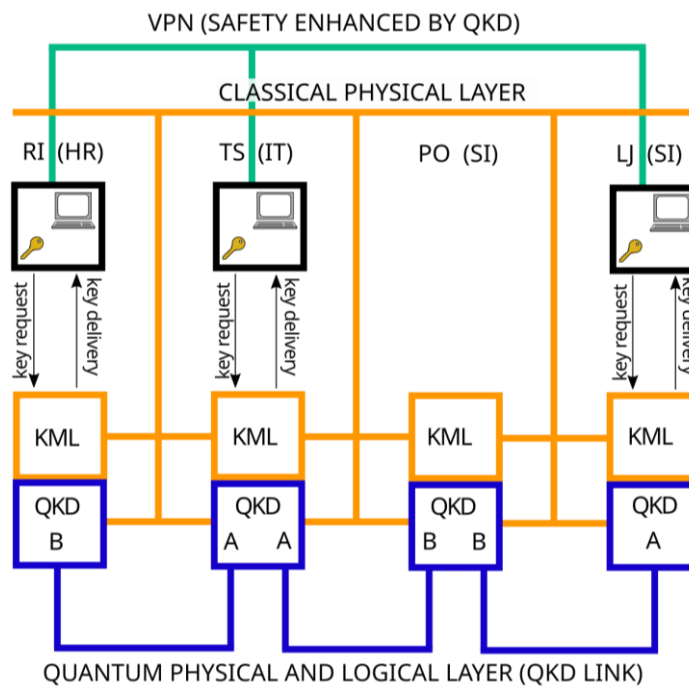


D. Ribezzo et al., arXiv 2203.11359

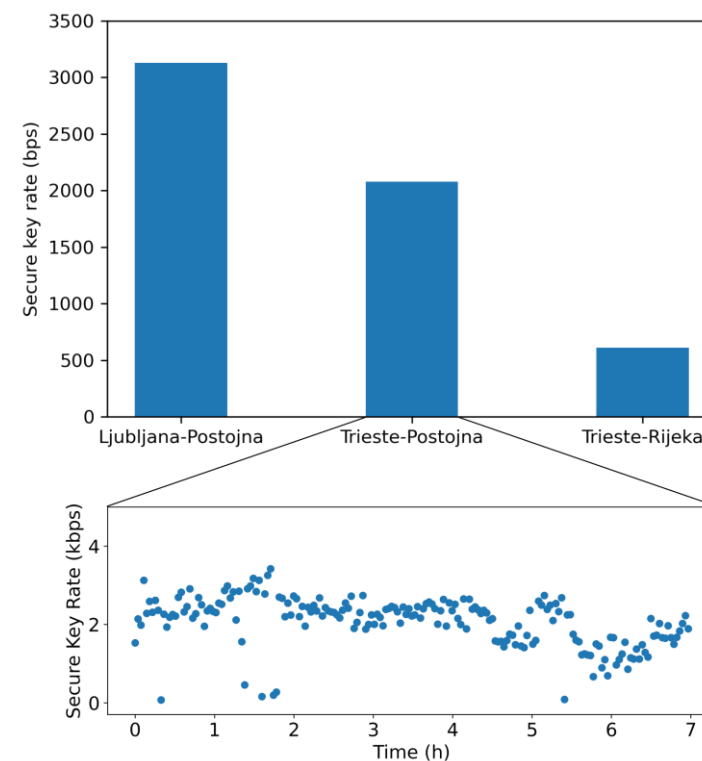
Results



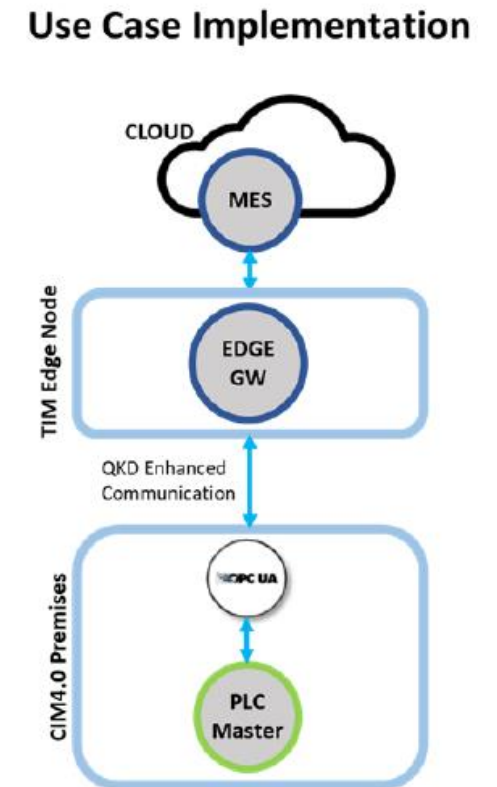
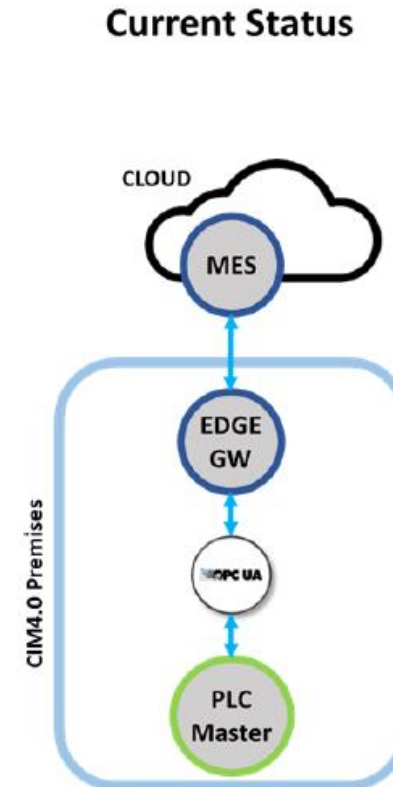
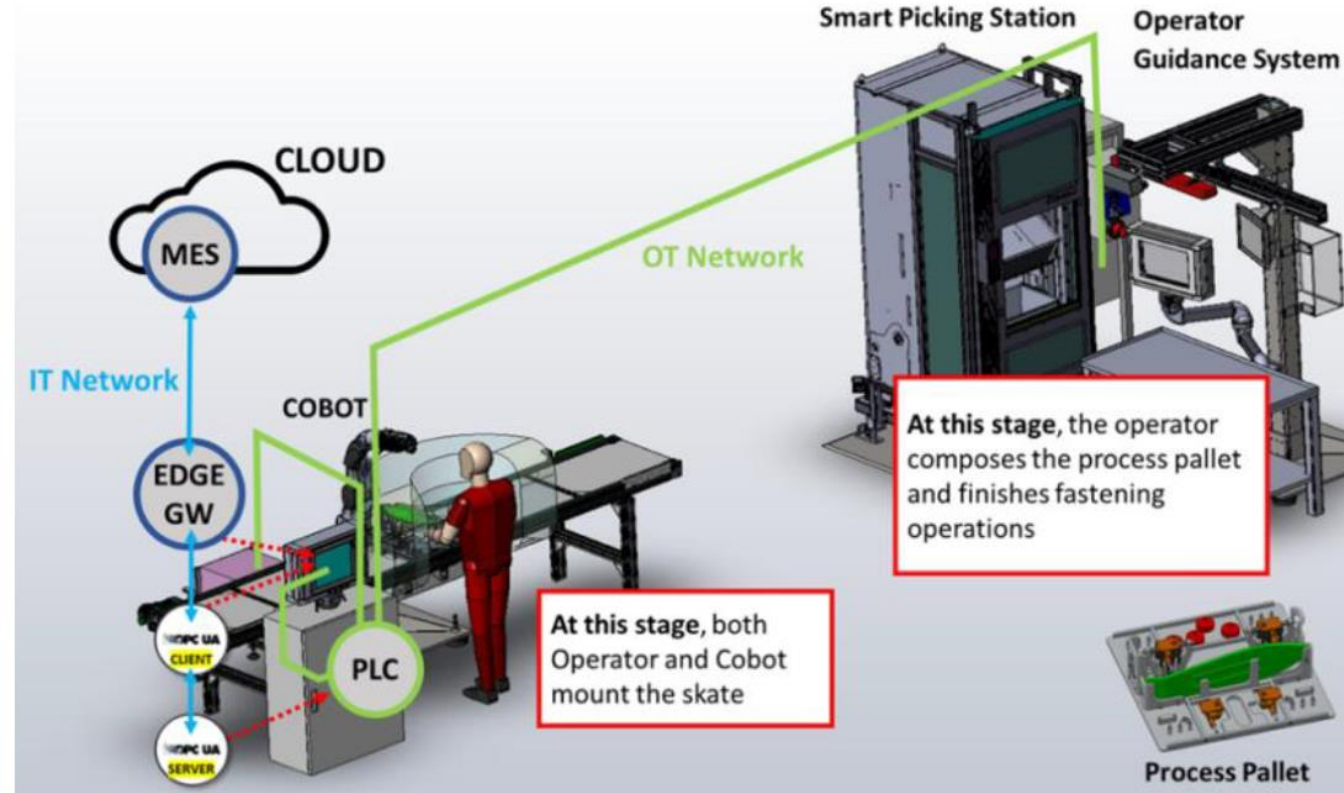
(a) QKD module.



(b) Network architecture.



II4QuTe project (Italian Industry 4.0 Quantum Testbed)



Brochure products

Quantum features	Quell-X	Quell-XC	Quell-XR
Quantum state preparation	600 MHz		
Quantum protocol	Discrete variable BB84 time-bin encoding BB84 with decoy state method		
Key security parameter	$4 \cdot 10^{-9}$		raw key data output*
Link budget	up to 16 dB (standard)		
	up to 20 dB (premium)		
Secret key rate	2 Kb/s (@ 14 dB)		raw key data output*

*: optional SW to be installed on a control PC for the extraction of the cryptographic key

Specifications	Quell-X	Quell-XC	Quell-XR
Dimensions (for Alice or Bob)	2U - 19" rack mount	3U - 19" rack mount	2U - 19" rack mount**
Interfaces	1x Simplex Fiber (Quantum Channel C/O-band), 4x 1Gb Ethernet ports Operating LEDs outputs		
Operating temperature	10°C to 35°C (50°F to 95°F) with no direct sunlight on the equipment		
Operating humidity	0% to 80% relative humidity with 29°C (84.2°F) maximum dew point		

** optional external detectors



Booth 101, Hall A4, World of QUANTUM

THANKS



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