

Applications of Quantum Technologies

IQCC
New Delhi

March 28
2023

Quantum Technology (QT)

- > Quantum Computing
- > **Quantum Cryptography/**
Communication
- > Quantum Metrology
- > Quantum Memory

Uses properties of quantum physics like superposition, uncertainty, entanglement, etc

*Among the 4, **Quantum Cryptography** is the most mature*

ABOUT US

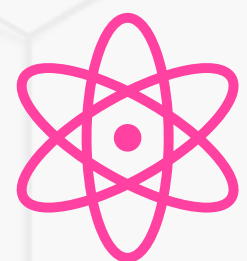
18 Scientists (PhDs, MS, BE)

4 Tech Advisors

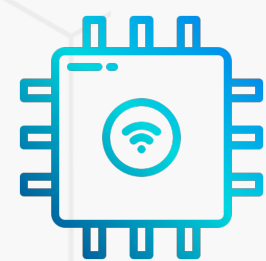
100+ years of collective research experience

30+ collective research papers

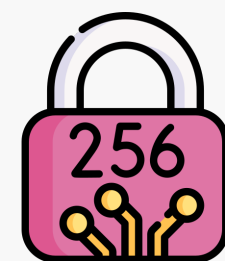
Strong team with diverse skillsets



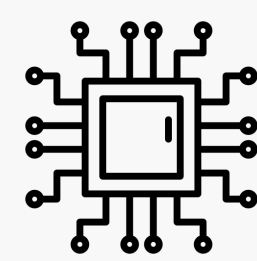
Quantum Physics



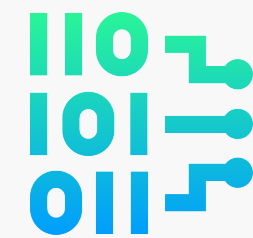
Computer Science



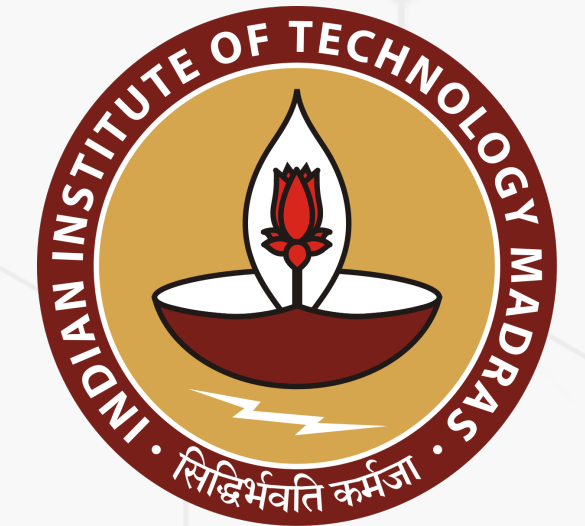
Cryptography



Electronics



Signal Processing



WHAT WE DO

We use quantum technologies to build 'Quantum Enhanced Solutions'

TAQBIT's offerings are in

Products



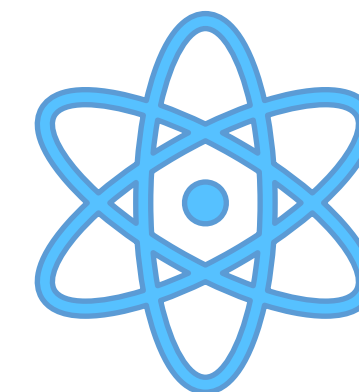
Quantum Secure
Communication



Quantum Internet



Quantum Imaging



Quantum Sensing



Quantum Algorithms



Solutions

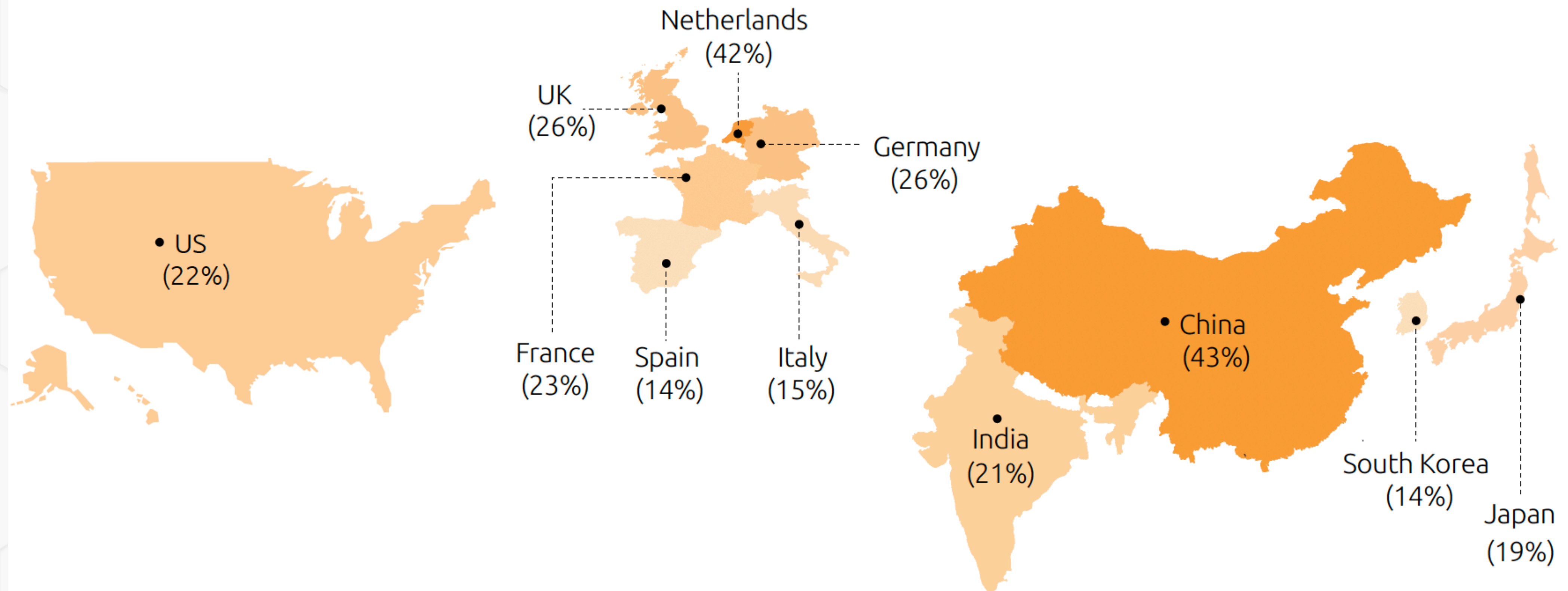
Tech Verticals - Our Capabilities

Quantum Secure Communication (QSC)		Quantum Imaging / Sensing (QI/QS)	Quantum Algorithm (QA)	Quantum Devices (QD)
QKD	QRNG	Q Imaging	Q Cryptoanalysis	Entangled Photon Source
Fiber/Free space QKD	VF/ToA	Lab level PoC demonstration	Efficient algorithms to run on Quantum Computers	Compact source for space applications

QT Adoption

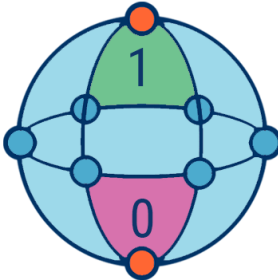
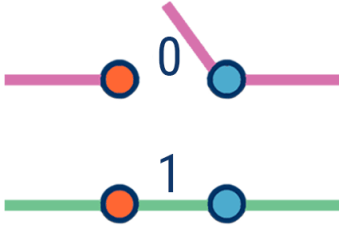
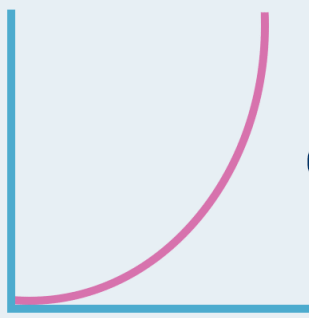
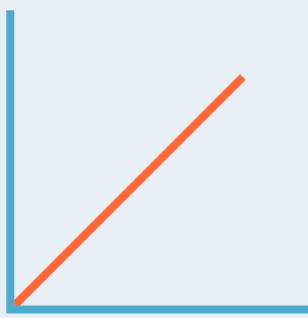
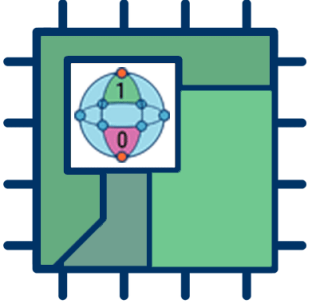
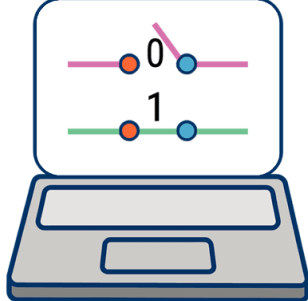
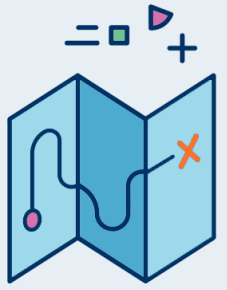

Quantum technology adoption by country

(% indicate share of organizations working or planning to work with quantum technologies)



Source: Capgemini Research Institute Quantum Technologies Survey, N=857 organizations, November–December 2021.

Quantum vs Classical Computing ?

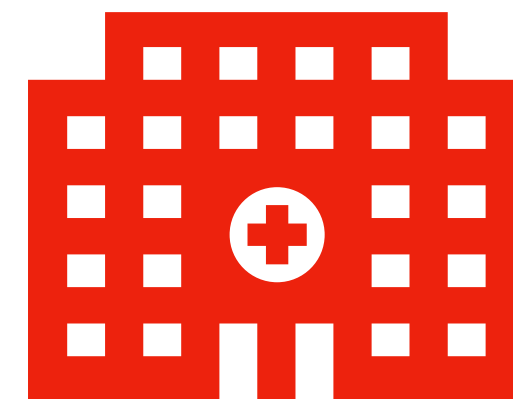
Quantum Computing	Vs.	Classical Computing
 <p>Calculates with qubits, which can represent 0 and 1 at the same time</p>		 <p>Calculates with transistors, which can represent either 0 or 1</p>
 <p>Power increases exponentially in proportion to the number of qubits</p>		 <p>Power increases in a 1:1 relationship with the number of transistors</p>
 <p>Quantum computers have high error rates and need to be kept ultracold</p>		 <p>Classical computers have low error rates and can operate at room temp</p>
 <p>Well suited for tasks like optimization problems, data analysis, and simulations</p>		 <p>Most everyday processing is best handled by classical computers</p>

1. It is not QC vs CC, rather QC + CC
2. QCs better at certain tasks like optimisation problems, data analysis simulations, etc
3. QCs will mostly be accessible via cloud

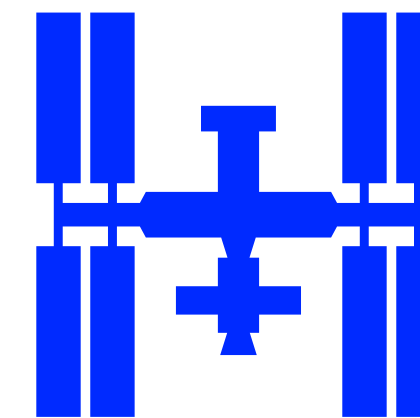
Applications of QT



Govt & Defence



Healthcare



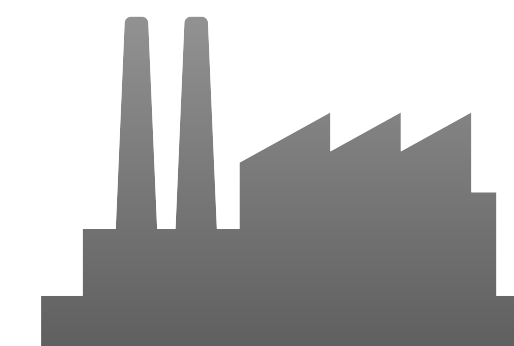
Space



Finance



Telecomm



Critical Infra &
Industry 4.0

Applications of Q Computing

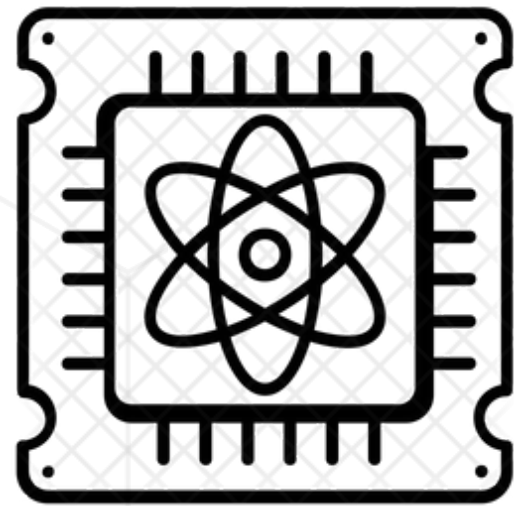
1. QCs will be immensely helpful in health care
(drug discovery, simulations)
2. QC could reduce the impact of transport on the climate.
3. Solve optimisations problems, data analysis in finance, logistics, manufacturing etc



THE Y2Q PROBLEM!

Our digital world is on the verge of a global data security crisis

Quantum computers are rapidly becoming more powerful



- > Threat of Quantum hacking is real
- > Quantum algorithms will render today's encryption invalid

Classified data with 5+ years of confidentiality already at risk



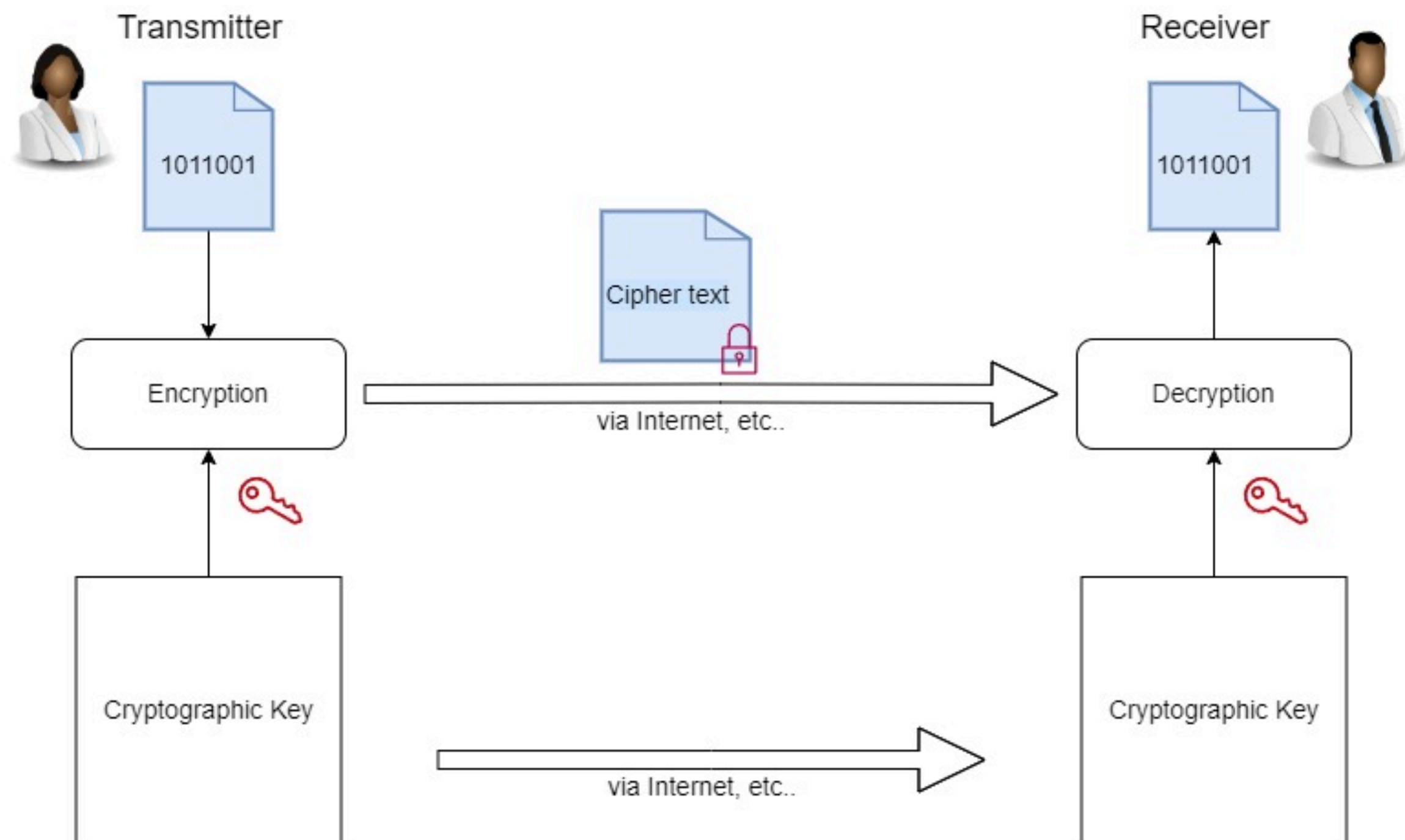
- > First victims are governments, banks, telecom operators, data centres, MNCs
- > Harvesting Attack - Recording encrypted data today to decode later

Collapse without quantum encryption inevitable

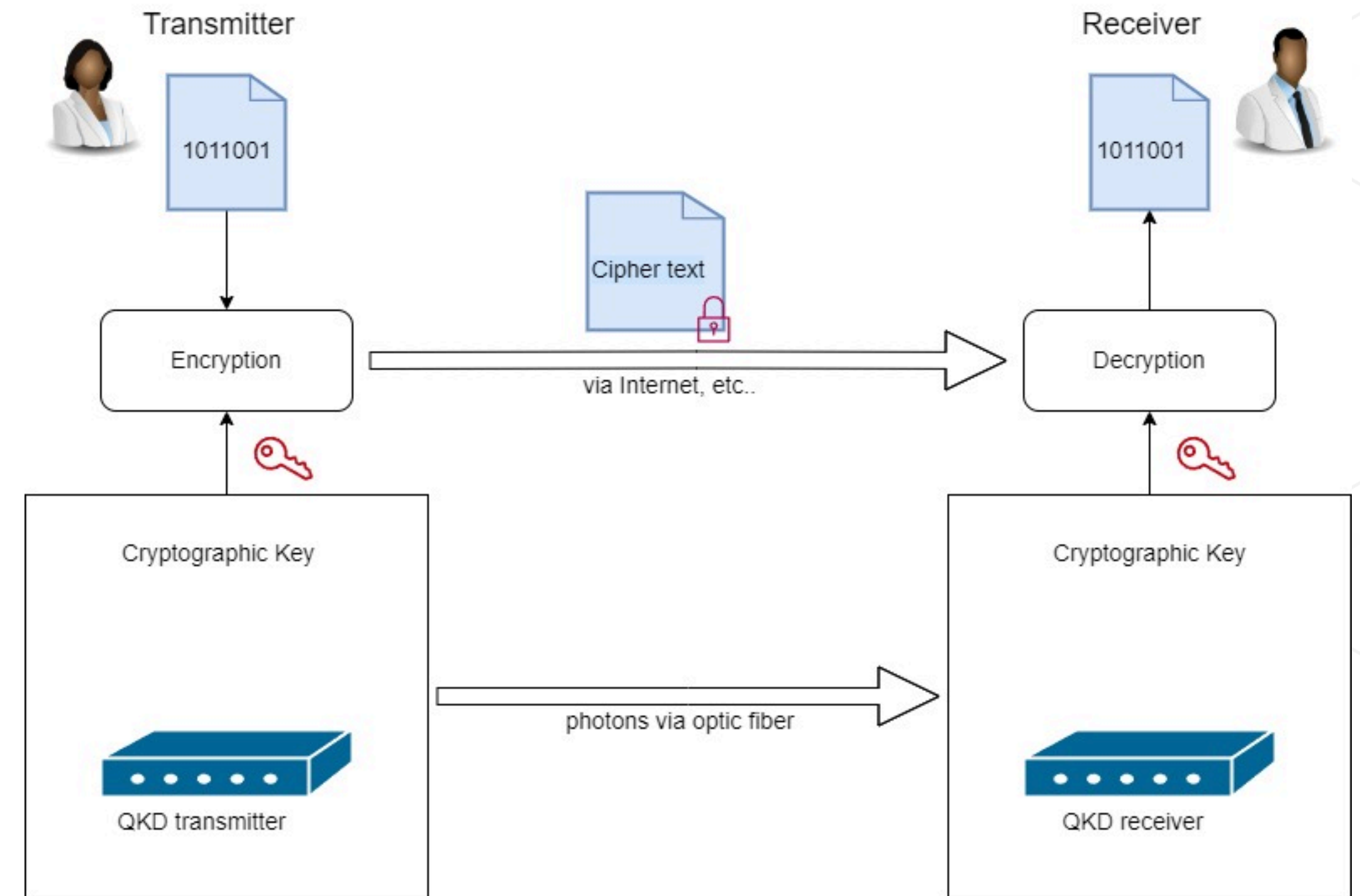


- > 'The quantum apocalypse' - complete collapse of all digital infrastructure and cryptography of today

CONVENTIONAL vs QUANTUM



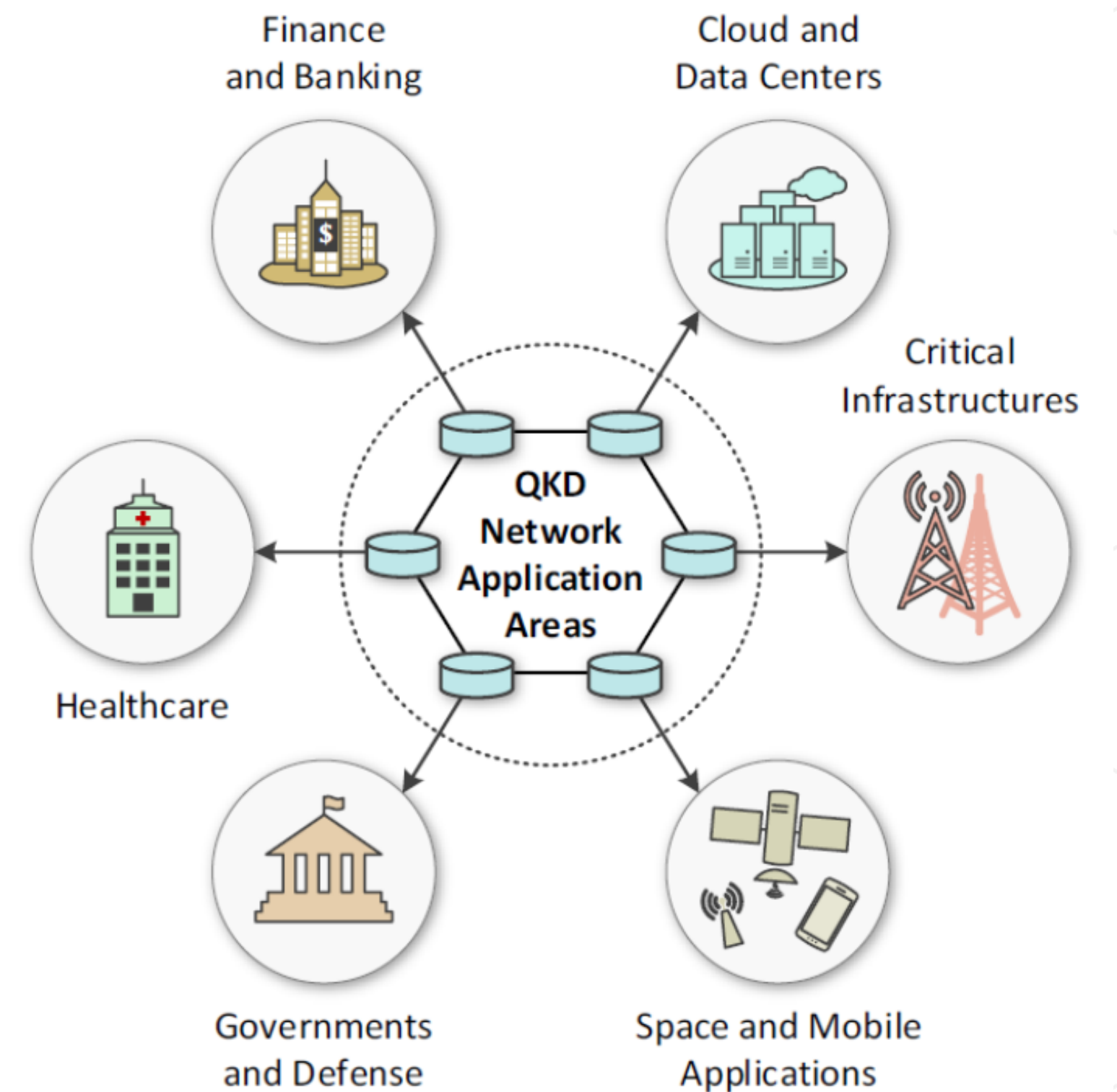
Conventional Cryptography
(Not Quantum Safe!)



Quantum Cryptography (QKD)

Applications of QSC

1. Defense strategic applications.
2. Securing highly confidential military intelligence for future purposes.
3. Securing confidential projects in top level enterprises.
4. Secure Live data recording in remote and adverse situations.
5. Transmitting data securely using couriers and packages.
6. Quantum proofing cyber security for the healthcare



USE CASES

List of use cases

> **Use Case 1: Quantum Fortress**

> Objective: Secure digital tokens/assets

> **Use Case 2: Offsite Backup / Business Continuity**

> Objective: The protection of backup and other business continuity processes and transactions

> **Use Case 3: Enterprise Metropolitan Area Network**

> Objective: Protection of infrastructures and services in Enterprise MAN networks.

> Protection of communication in a critical infrastructure supervisory control and data acquisition (SCADA) system.

> **Use Case 4: Backbone Protection**

> Objective: Use QKD for security services between the nodes of a backbone network.

> **Use Case 5: High Security Access Network**

> Objective: Provide communication security in a passive optical network.

> **Use Case 6: Long-Haul Service**

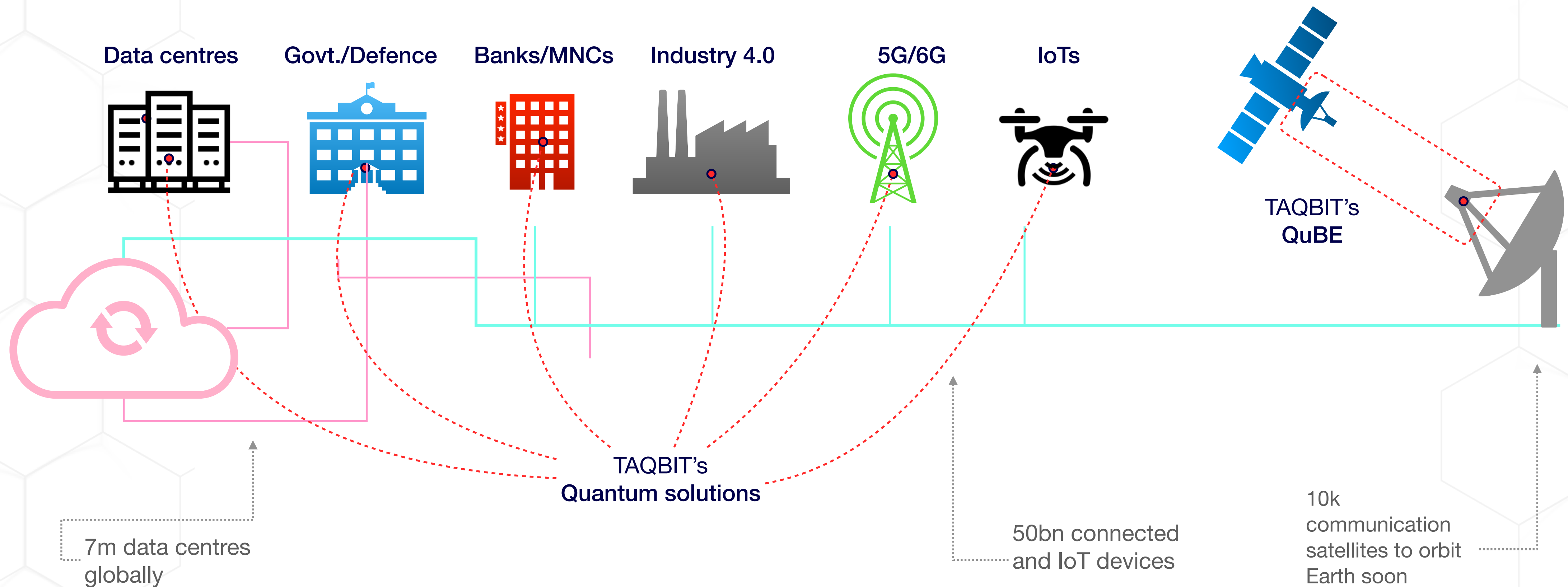
> Objective: Facilitate highly secure key distribution between far remote sites without trust assumptions on intermediary nodes.

TARGET MARKET for QSC

TAQBIT systems will be at the heart of emerging global quantum networks

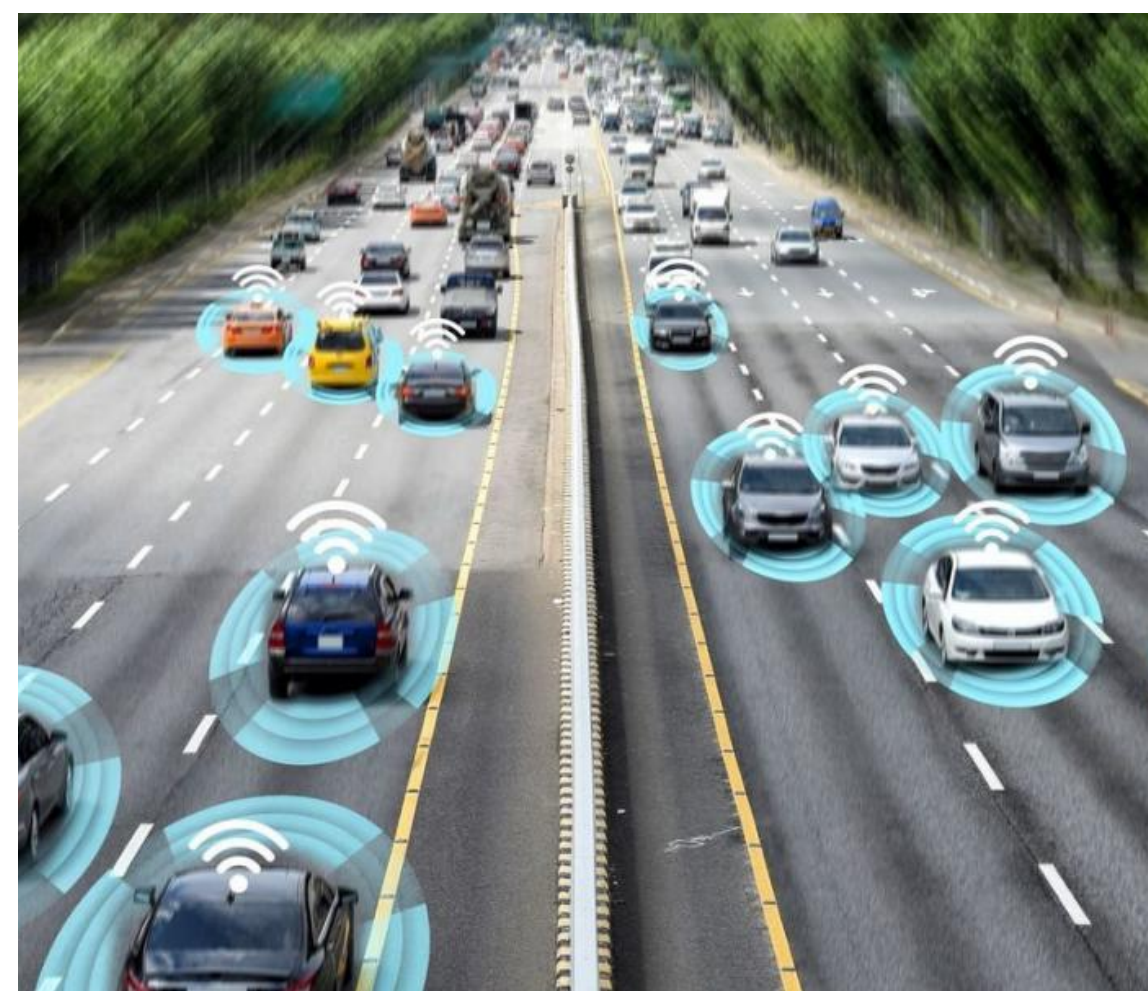
Immediate focus

Long-term opportunity

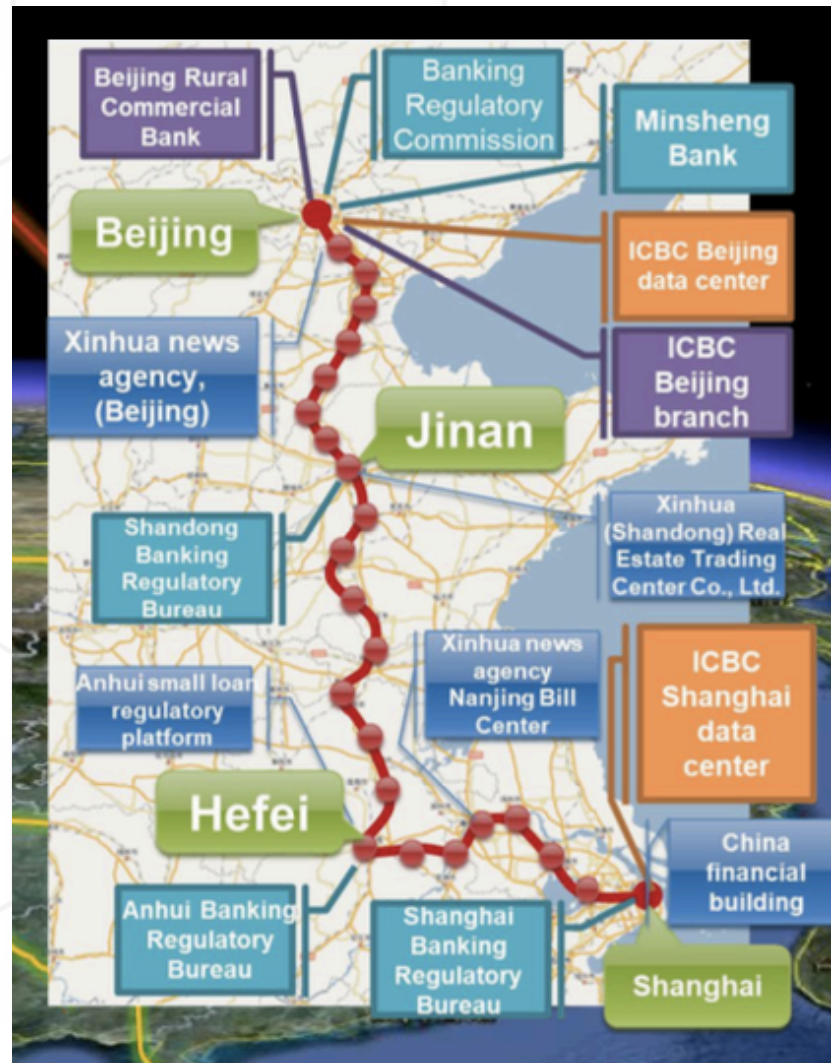


Applications of QI/QS

1. Revolutionising Medical Imaging
2. Imaging through fog, snow & heavy rain
3. Quantum sensors to diagnose heart diseases

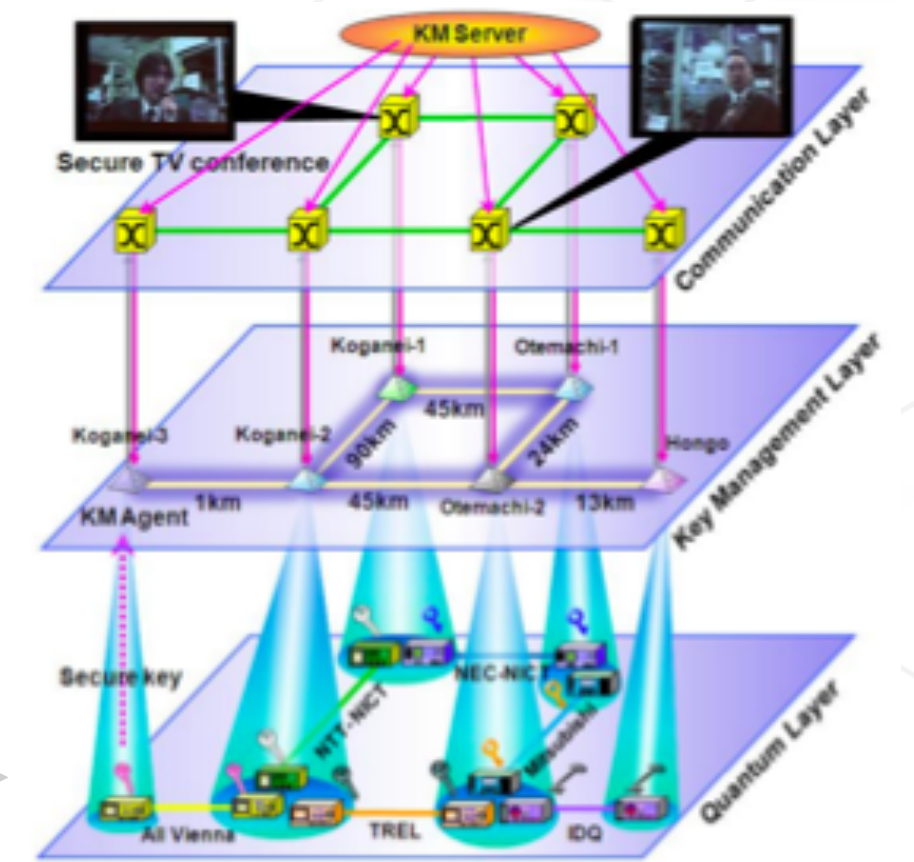


GLOBAL LANDSCAPE



- > China has already demonstrated its quantum supremacy
- > 4,600 kms of territorial quantum network for all defense, banking & financial organisations (2021)
- > Free space quantum communication using quantum satellite (2016)
- > Target to achieve ~36,000 kms of quantum network (by 2025)

- > Japan's QKD Network
- > Video-conferencing through quantum networks



- > DARPA Quantum Network, USA
- > SwissQuantum QKD Network
- > EU SECOQC Network

GLOBAL LANDSCAPE

JPMorgan Chase, Toshiba and Ciena Build Quantum Key Distribution Network Used to Secure Blockchains

By Matt Swayne February 19, 2022

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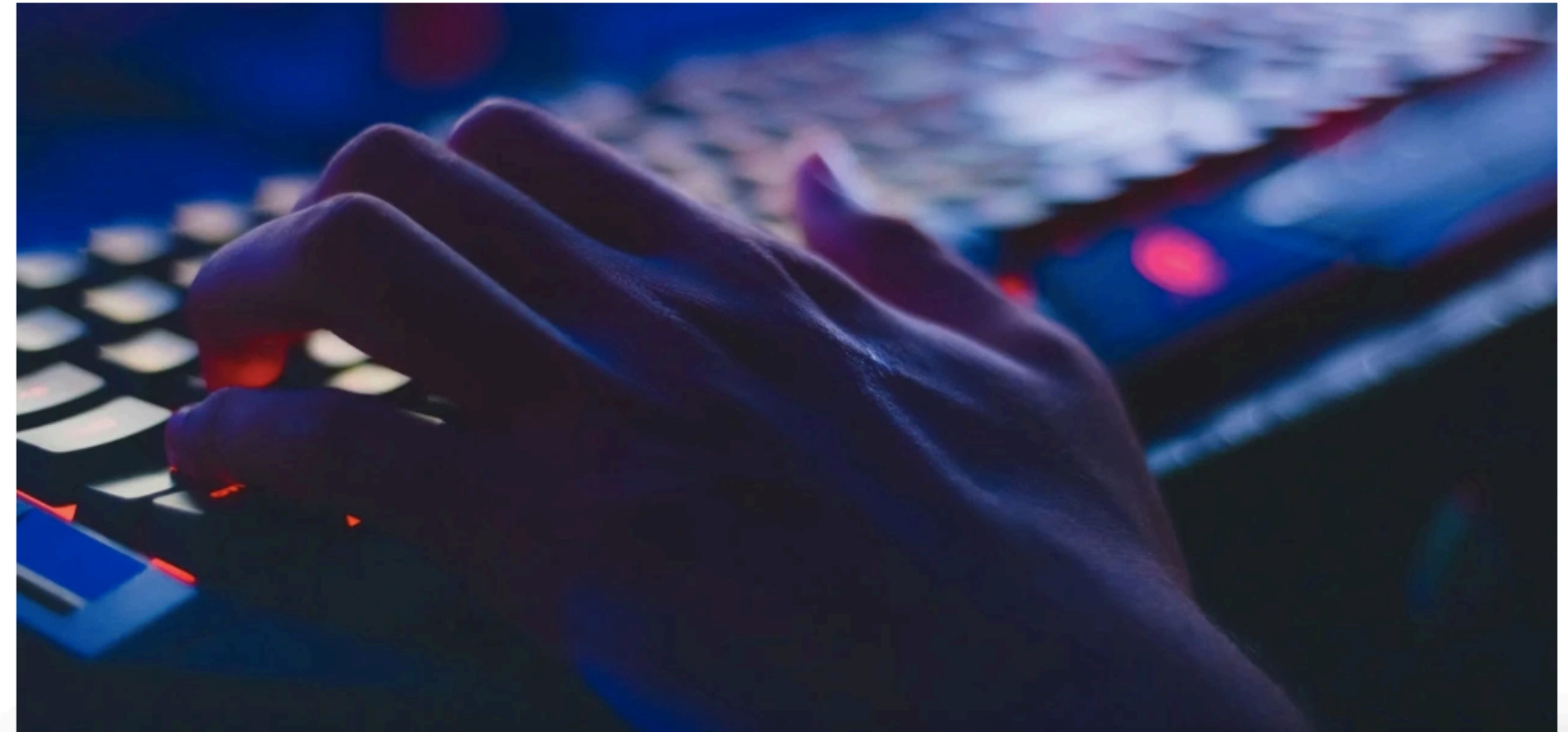
[Telegram](#)



JPMorgan Chase, Toshiba and Ciena have demonstrated the full viability of a first-of-its-kind Quantum Key Distribution (QKD) network for metropolitan areas, resistant to quantum computing attacks. (Image: Pixabay/geralt)

India Successfully Tests Quantum Key Distribution Tech

Samaya Dharmaraj February 26, 2022



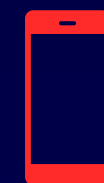


THANK YOU

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