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Use Cases for QKD networks in China

ITU Webinars, May 26, 2021

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QuantumCTek Co., Ltd.

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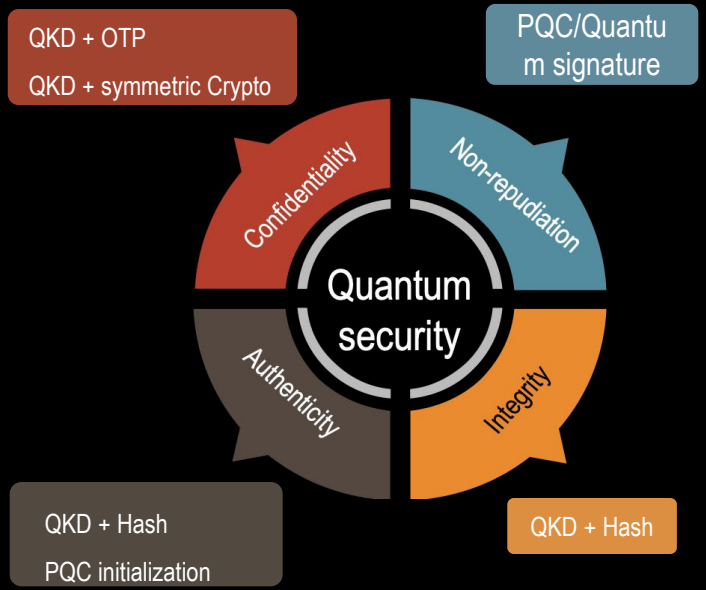
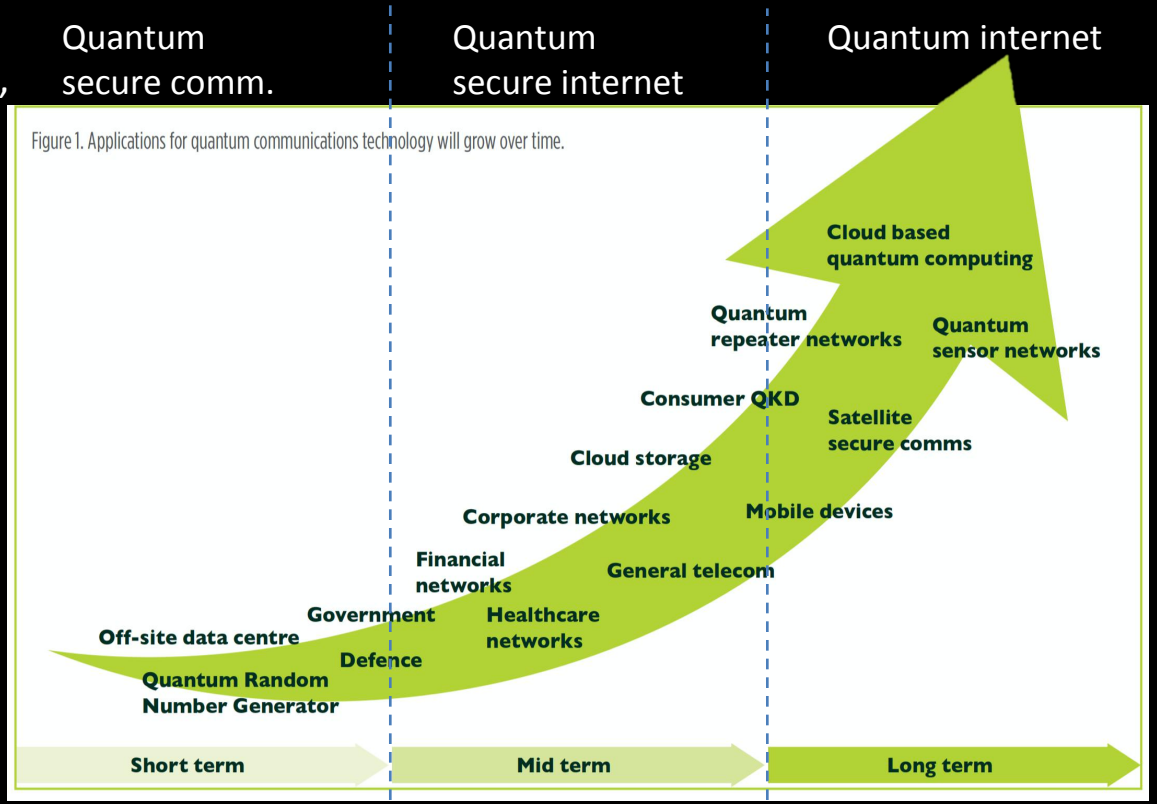
QKD:

generate and distribute symmetric keys, which are combined with Cryptography to realize Quantum Security





From: The Quantum Age: technological opportunities, UK Government Office for Science, 2016

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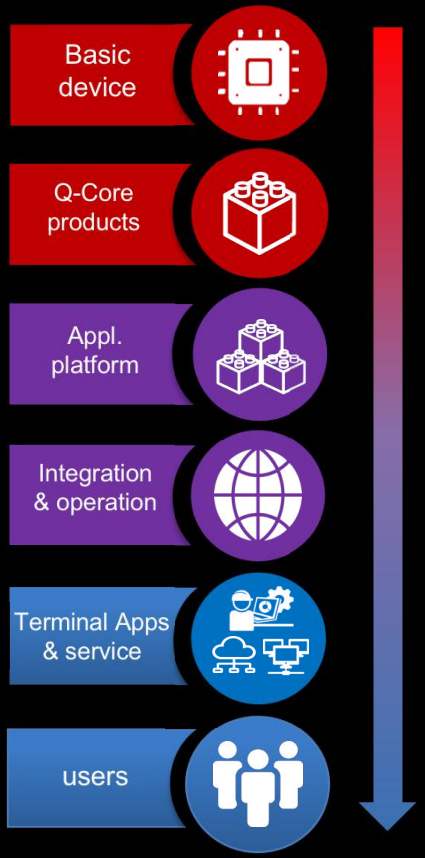
QKDN Industrial Chain



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Global Wide-area QKDN Infrastructure

Fiber-based Metropolitan QKD Network

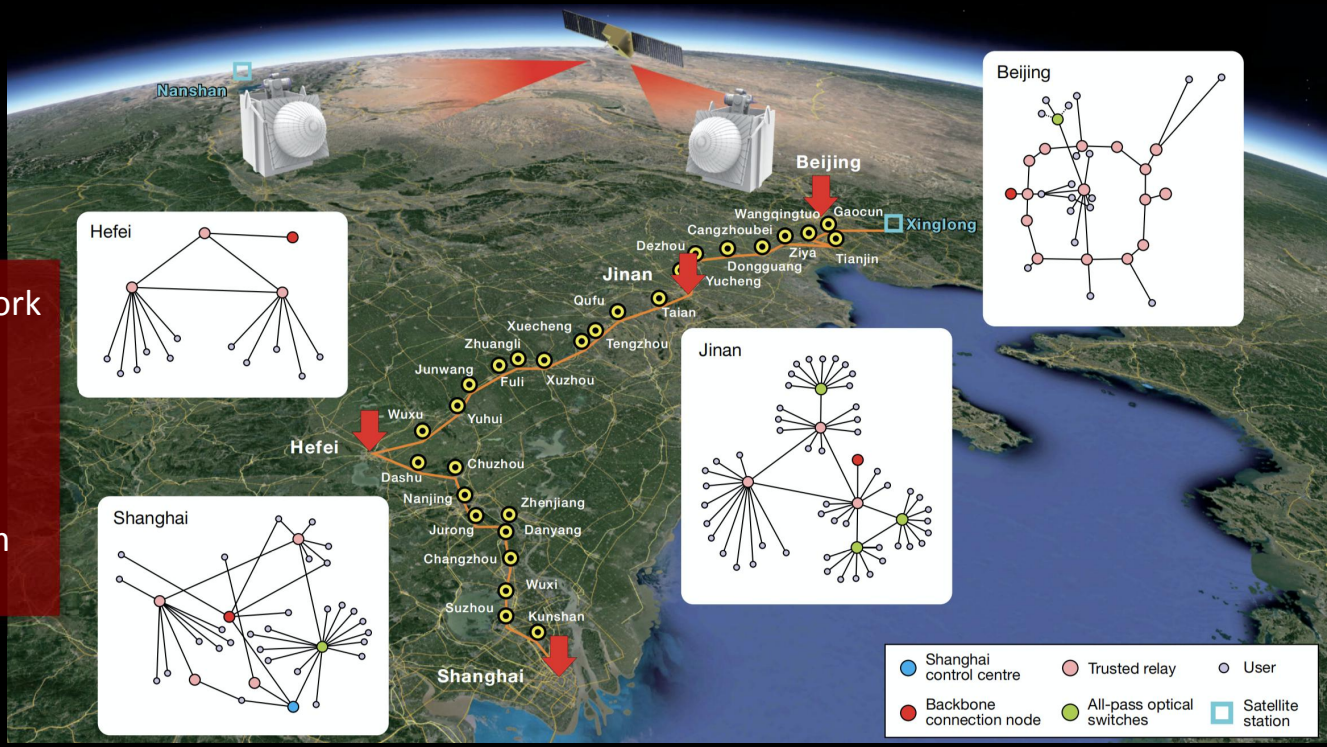
+

Intercity QKD Network via Relay

+

Satellite-ground Long-haul Quantum Communication

Global Wide-area QKDN



An integrated space-to-ground quantum communication network over 4,600 kilometres. *Nature* (2021).

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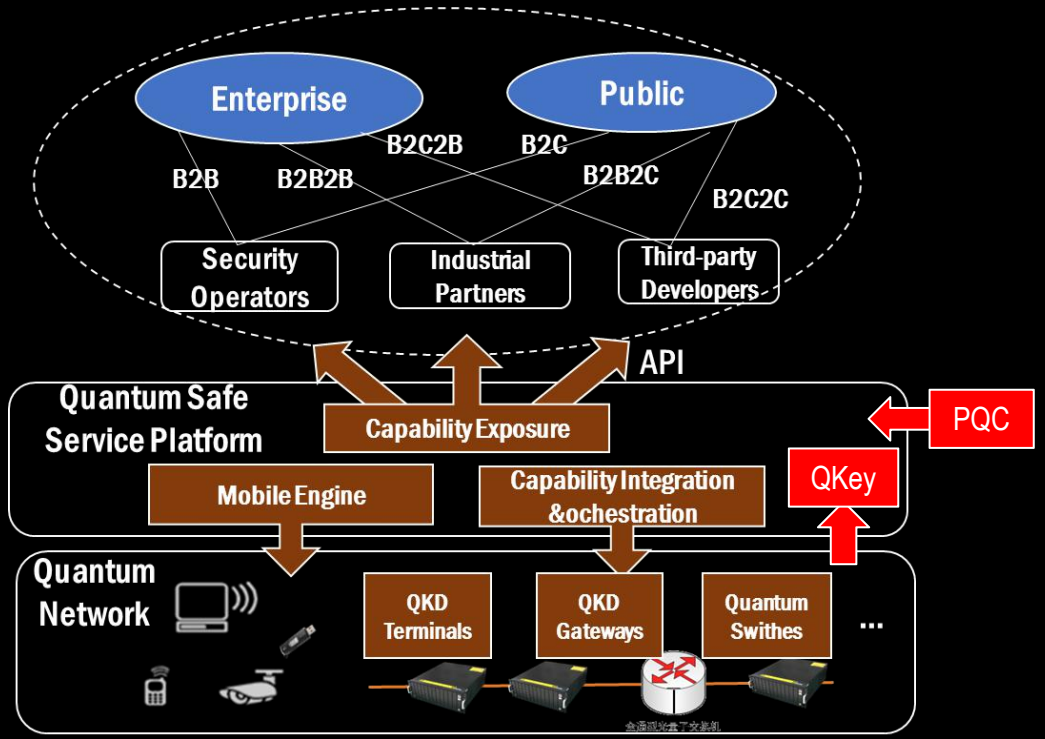
Quantum Security as a service (QSaas)

SaaS

+

PaaS



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Key Resource ➡ Quantum Safe Service Platform

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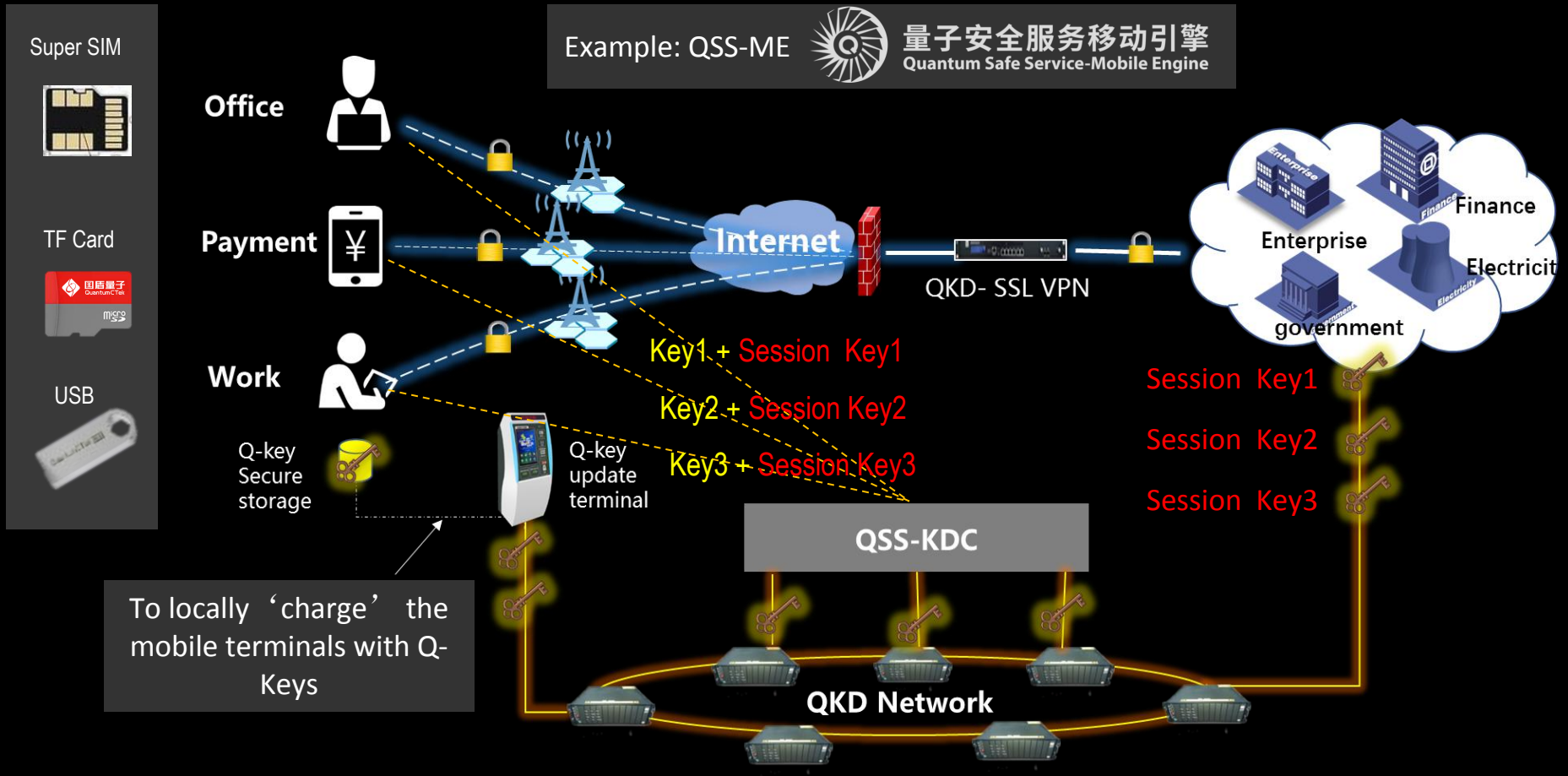

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- ✓ Fiber trunk line applications
- ✓ Fiber and wireless hybrid metropolitan network applications
- ✓ IOT applications
- ✓ Telecom carriers' general communication service
- ✓ Satellite – ground network applications
- ✓ QKD+PQC applications

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State Grid and Banks:

Quantum Secure Communication (QSC) through trunk line

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CFCA-Local Bank CA Data transmission

(from CAS Quantumnet Co., Ltd.)

CFCA (Beijing)

QKD

Data

Q-keys

Q-VPN

CA sensitive data

Huishang Bank (Hefei)

Q-VPN

Data

Q-keys

QKD

ICBC Remote Data Disaster Recovery

(from QuantumCTek)

Quantum Channel

SDH

电信2.5G

联通2.5G

联通2.5G

QKDA2

Q-Keys

QKDA1

310M

Q-VPN

Q-Keys

Fiber Switch

VF1

SAN

Q-VPN

310M

NBU

Data Storage

Data Center (Beijing)

SDH

Q-VPN

310M

Fiber Switch

Q-Keys

Q-VPN

VF1

SAN

QKDB1

310M

Q-Keys

QKDB2

Data Storage

Data Center (Shanghai)

Quantum Channel

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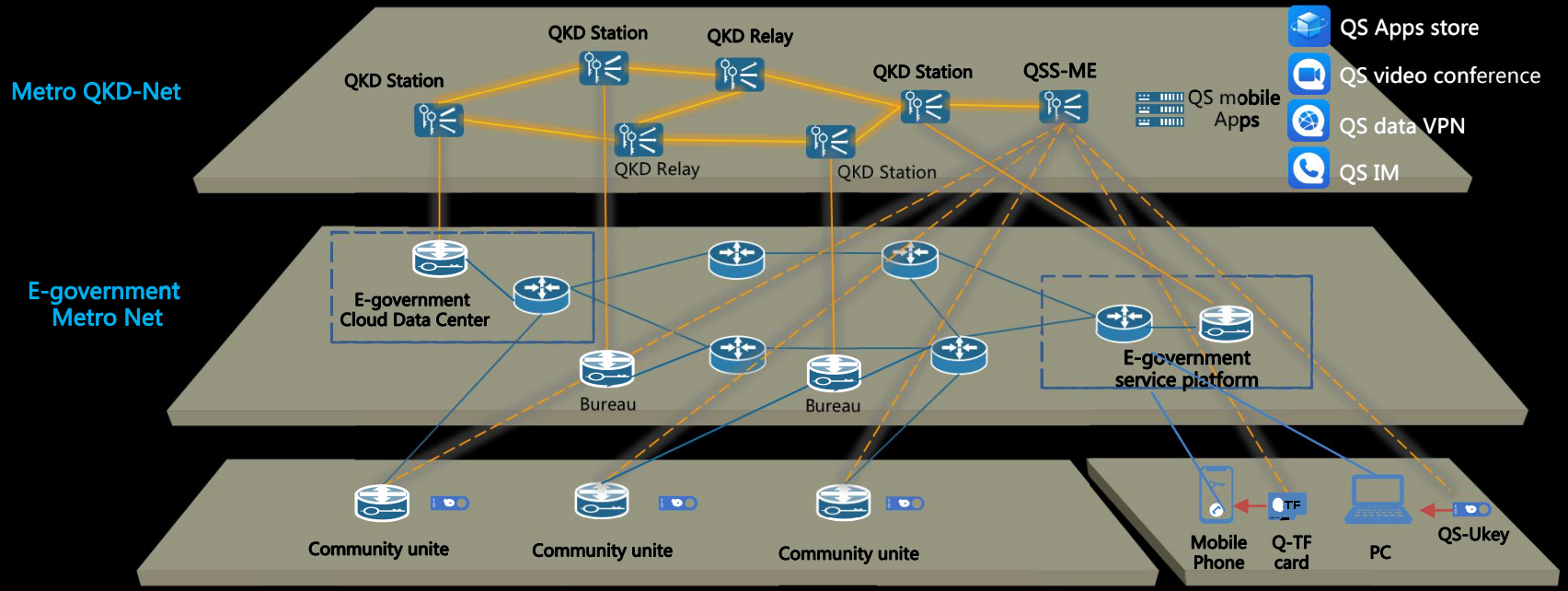
E-government & Public Service: (from EQTINFO Co., Ltd.)

Office Automation, mobile office, healthcare, traffic and transportation, other resource management …



01

QS Private Net

Data transmission

02

QS VPN

OA and daily communication

03

QS Mobile Apps

OA and daily communication

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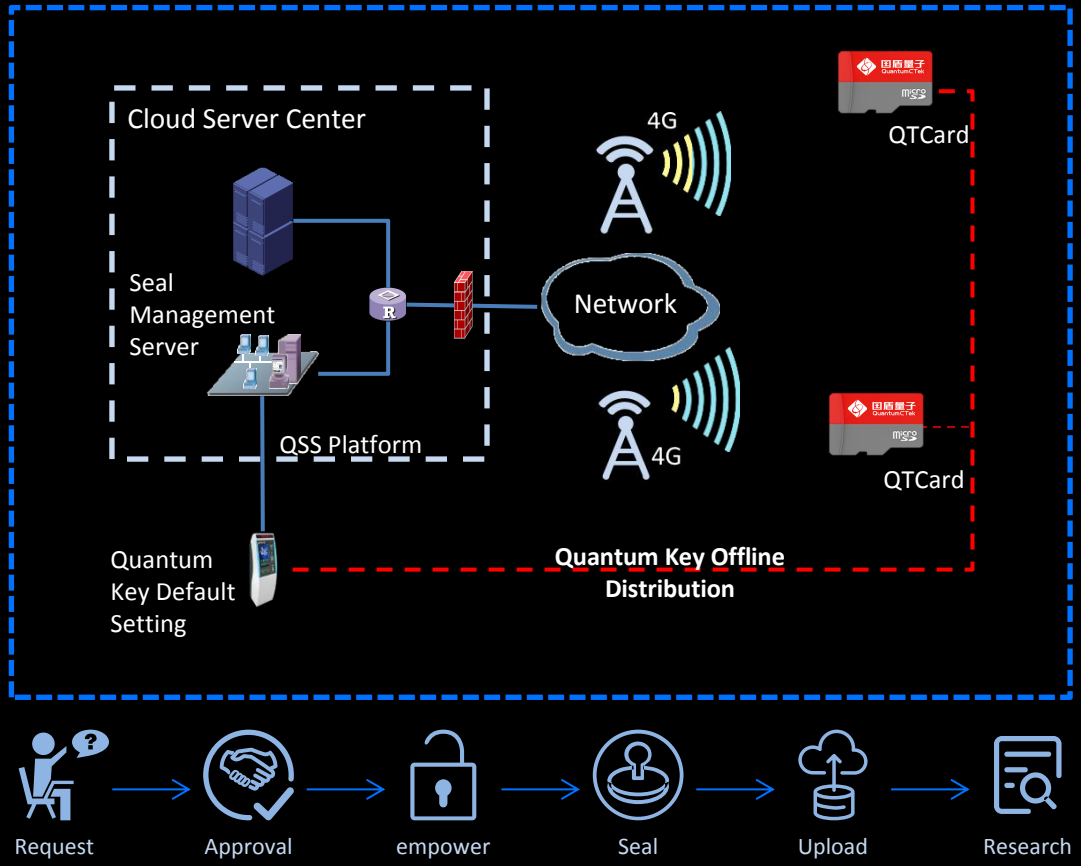
IOT: Intelligent Seal (from Yunxi tech Co.,Ltd.)



- Fingerprint detection
- location recording
- cloud service
- image storage
- quantum security

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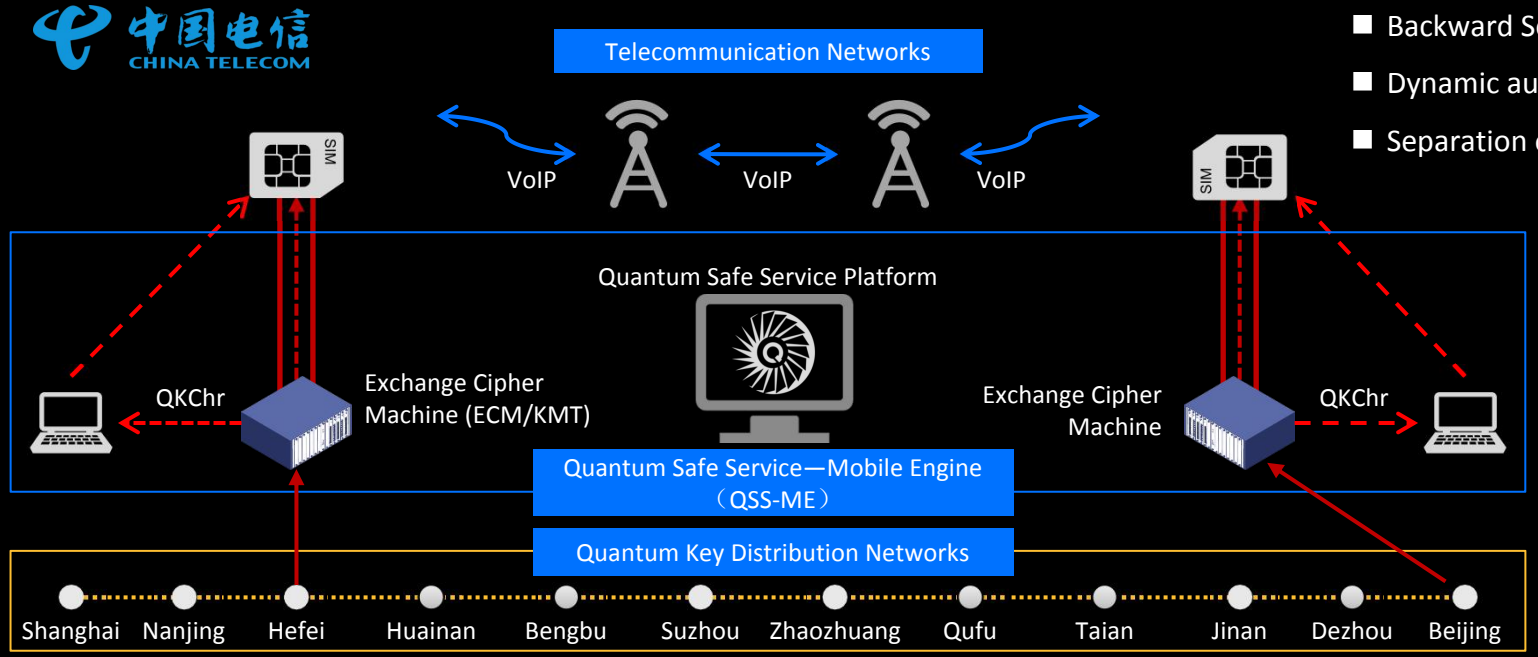
Telecom carrier: General telecom service (from China Telecom)

- End-to-end Security
- Forward Security
- Backward Security
- Dynamic authorization
- Separation of key and service



Beijing – Shanghai backbone

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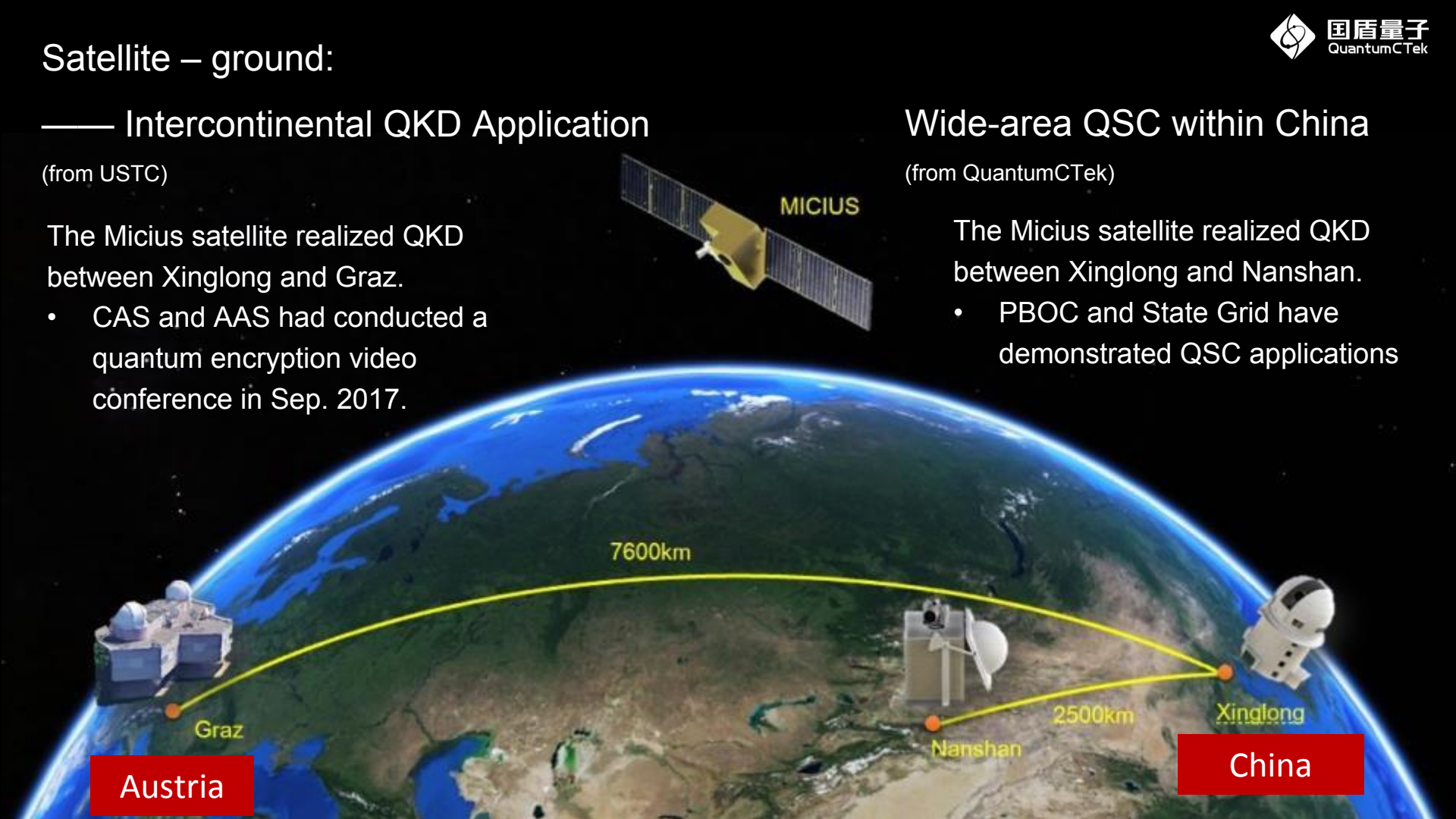
Satellite – ground:

—— Intercontinental QKD Application

(from USTC)

The Micius satellite realized QKD between Xinglong and Graz.

- CAS and AAS had conducted a quantum encryption video conference in Sep. 2017.



Wide-area QSC within China

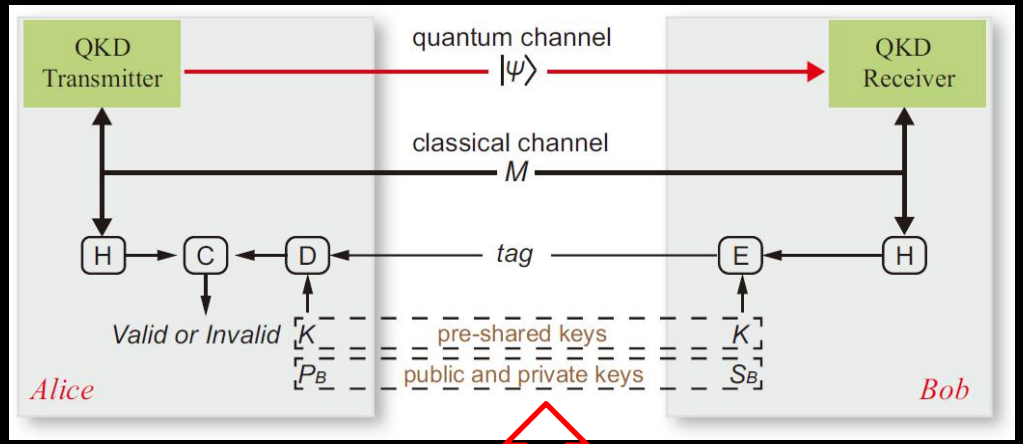
(from QuantumCTek)

The Micius satellite realized QKD between Xinglong and Nanshan.

- PBOC and State Grid have demonstrated QSC applications

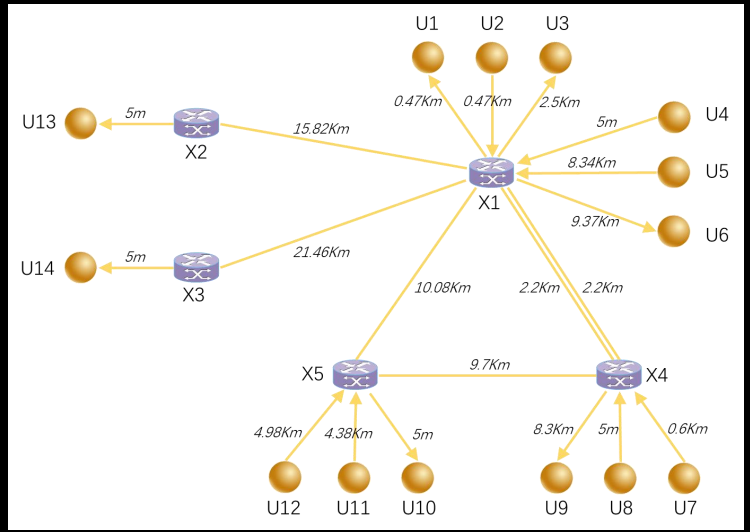
QKD + PQC: PQC Authentication of QKD (led by USTC)

- Post-quantum cryptography (PQC) can provide quantum resistant security of authentication
- USTC led the experiment in a 14-user QKD network within Jinan metro-QKD networks.
- Lattice-based PQC algorithm Aigis-sig



Lattice-based PQC algorithm Aigis-sig

H hash
E encrypt
D decrypt
C compare



[Wang et al., NPJ Quantum Inf. 7, 67 (2021)]

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Key Resource ⟶ Quantum Safe Service Platform

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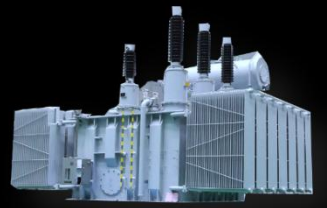
	Resource	Transp / Dist Network	Transp / Dist Power
STATE GRID CORPORATION OF CHINA 国家电网公司			
CHINA WATER			
国盾量子 QuantumCTek	QKD		Appl. Enablement platform QSS-ME

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More Secure

More Intelligent

Quantum+

Quantum+

Quantum Technology Ecosystem

Intelligent Manufacturing

IoT

AI

5G

BLOCK CHAIN

Cloud

Smart City

BIG DATA

Cryptography

Quantum cloud computation……

Quantum-safe service enablement platform

Quantum internet

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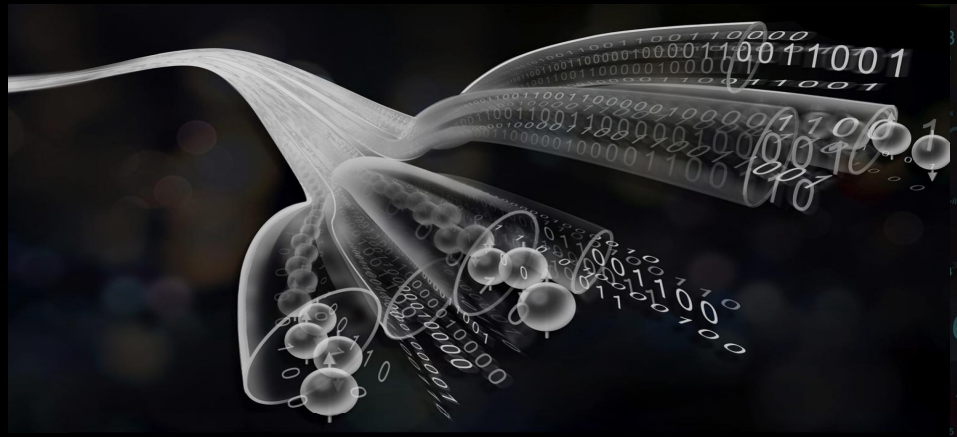

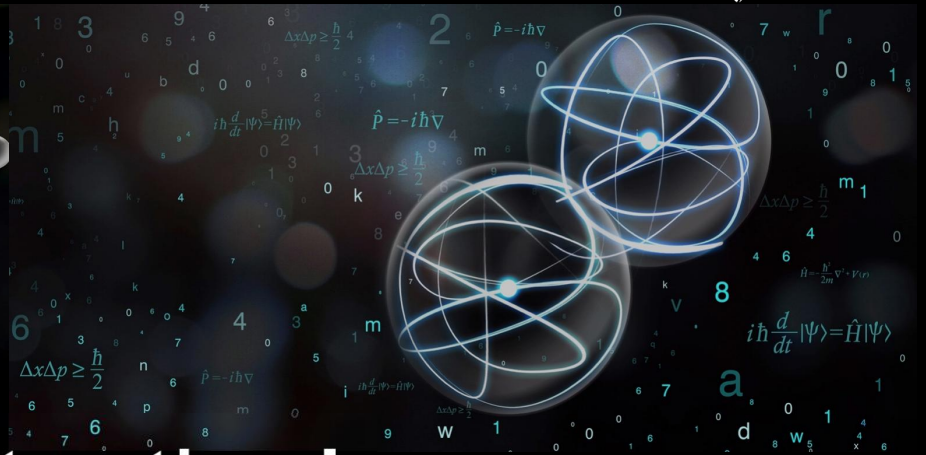

Thanks for your attention!

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