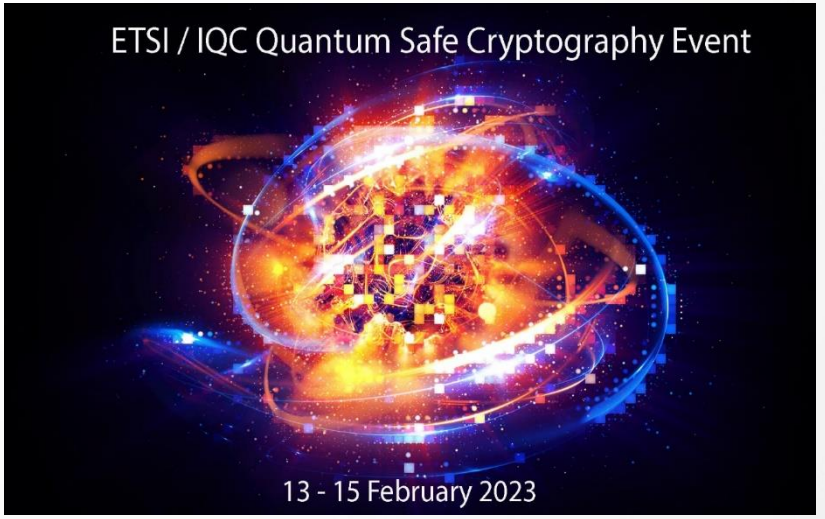
South Korea's Quantum Leadership for Global Reach

Status and Plan of Quantum-Safe Communications Infra in South Korea

Dong-Hi SIM

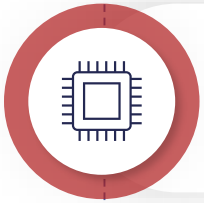
Team Lead, Innovation Business Office

SK telecom



South Korea's Quantum Leadership

Quantum Leadership



Korean National Quantum Project

3 yr Quantum-safe Communication Infra Project

SK Telecom's Quantum Experience

Constant innovation and investment since 2011

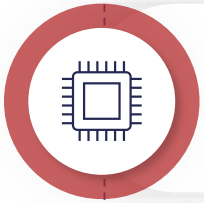
Hands-on Experience on QKD Network, QRNG chipset & Quantum Sensing

Quantum Partnership

Worldwide Collaboration & Standardization

South Korea's Quantum Leadership

Quantum Leadership



Korean National
Quantum Project

3 yrs Quantum-safe Communication Infra
Project

Stimulus Package for Korean Quantum-safe Infra

Quantum Cryptography Communication Infra Pilot Project

Testbed Build-ups

Project
Quantum-safe Communication Infra Pilot Project

Duration
'20~ '22

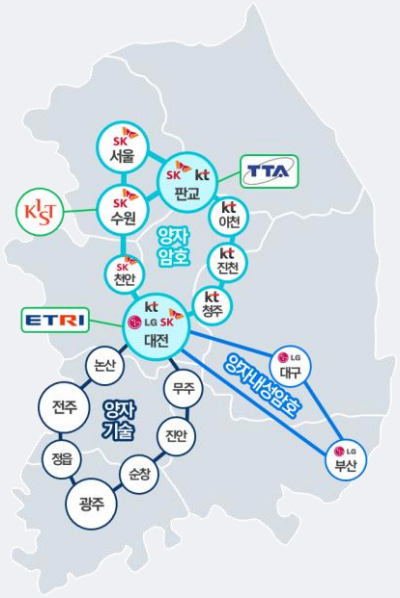
Budget
≈ 29M €

Objective
Highest level security system in public and Private sector
Initial reference pilot security system & Policy development

Quantum Cryptography Testbed

Use cases

QKD Testbeds (SKT etc)	Total 490km QKD Testbeds - Development & Demonstration
PQC Testbed	Total 820Km PQC Testbeds- Development & Demonstration
Quantum Cryptography Testbed	Total 445 km Testbeds with fiber/encryptor to test new protocols, etc



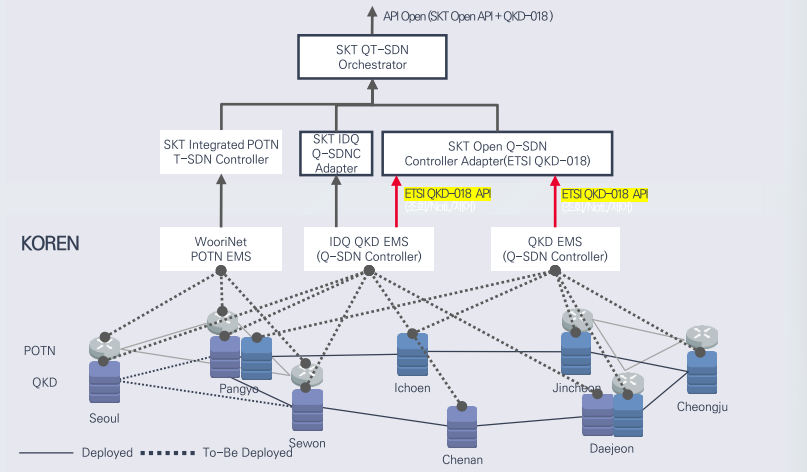
SDN Orchestration in ETSI QKD-018

Centralized Control for QKD

Achieve-ment

- Interoperability between different QKD Systems
- Q-SDN Controller based on ETSI QKD-018 standards

Centralized Control for different vendors of QKD



Plan

- Interoperability for different KMS vendors with Q-SDN
- SDN Orchestration Upgrade to control/manage different KMS vendors and different QKD vendors

SDN-QKD

SKT SDN Orchestration for QKD and OTN

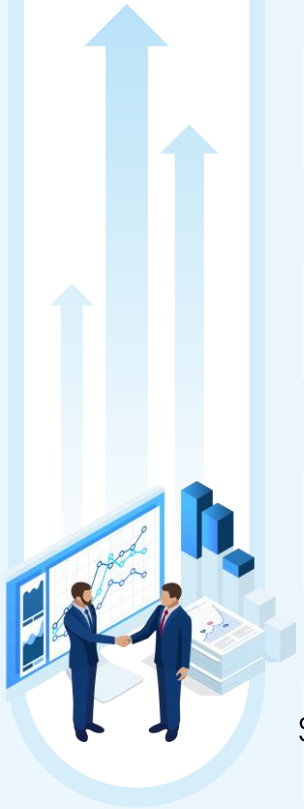
ETSI Standards GS QKD 018

- Separate QKD Network with OTN
- SDN is already adopted for the existing OTN & QKD is overlayed
- Adopt design principle of Software-Defined Network Architecture to control both networks
- Each network has each SDN-Controller
- SDN Orchestrator is adopted to control both QKD and OTN networks through SDN-Controller & to orchestrate the operations between them

South Korea's efforts to create the future growth engines

Public sector

Gwangju health office	Personalized health data protection (ex: COVID19, Avian Flu)
Daejeon water service	Purification plant monitoring data (CCTV) Access authentication using QRNG adopted FIDO[1] card
KHNP	Secure power plant-related operation data



Private sector

KUMC	Build total hospital information system/process
Pyunghwa motors	Hydrogen vehicle component design files protection Double encrypted with QRNG
Dongsan hospital	Biometric information management
SK shieldus Physical security service	Protecting surveillance data (CCTV, intrusion detection) Access authentication using QRNG adopted FIDO card

KHNP: Korea Hydro & Nuclear Power, Fido: Fast Identity Online, KUMC: Korea University Medical Center

Policy setting for Quantum-safe Communication Infra

Policy Perspective

Legal Basis

Revision of Special Act, June 21

- Information and Communication Promotion & Convergence Vitalization
- Dedicated agencies, Infra Build-ups, Commercialization, Manpower

Security System

Security Compliance for Public Sector

- For Public Sector Quantum Cryptography
- Security Compliance Verification Criteria
- Dec., 22 → Implementation from '23

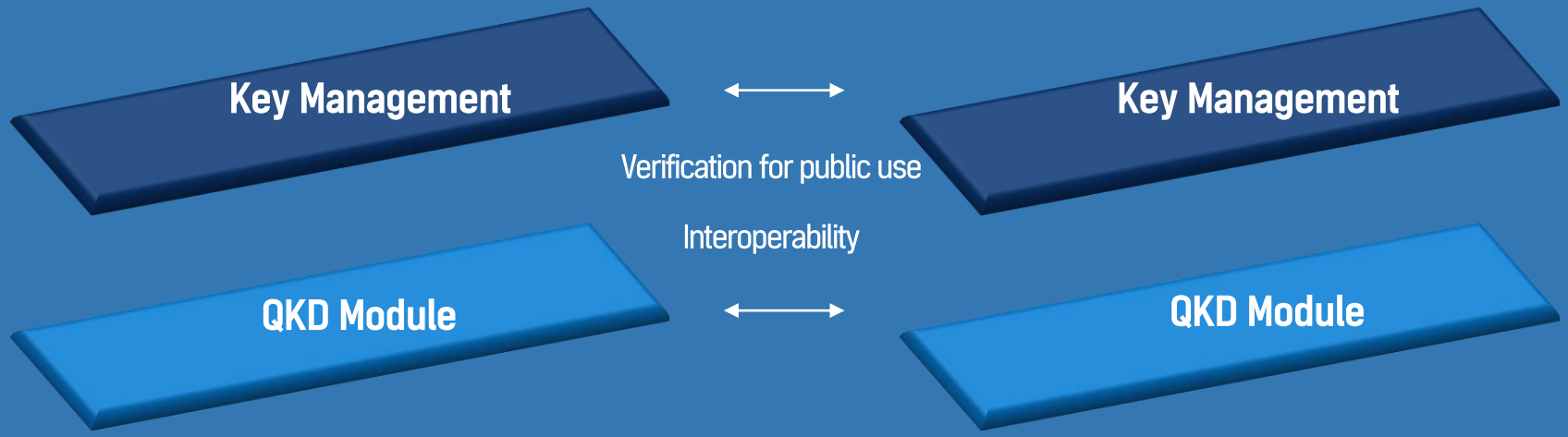
Dedicated Quantum Channel Plan + Leased Line Plan ➡ Quantum-safe Communication Dedicated Plan

(SK Broadband) Leased Line service launch (Dec. 21)

QKD Security Compliance Verification in Korea

QKD & Key Management Security Requirements

QKD and Key Management Security Requirements with interested parties for QKD Security Compliance Verification



South Korea's Quantum Leadership

Constant Innovation in Quantum Technology & Business

Quantum Leadership

SK Telecom's
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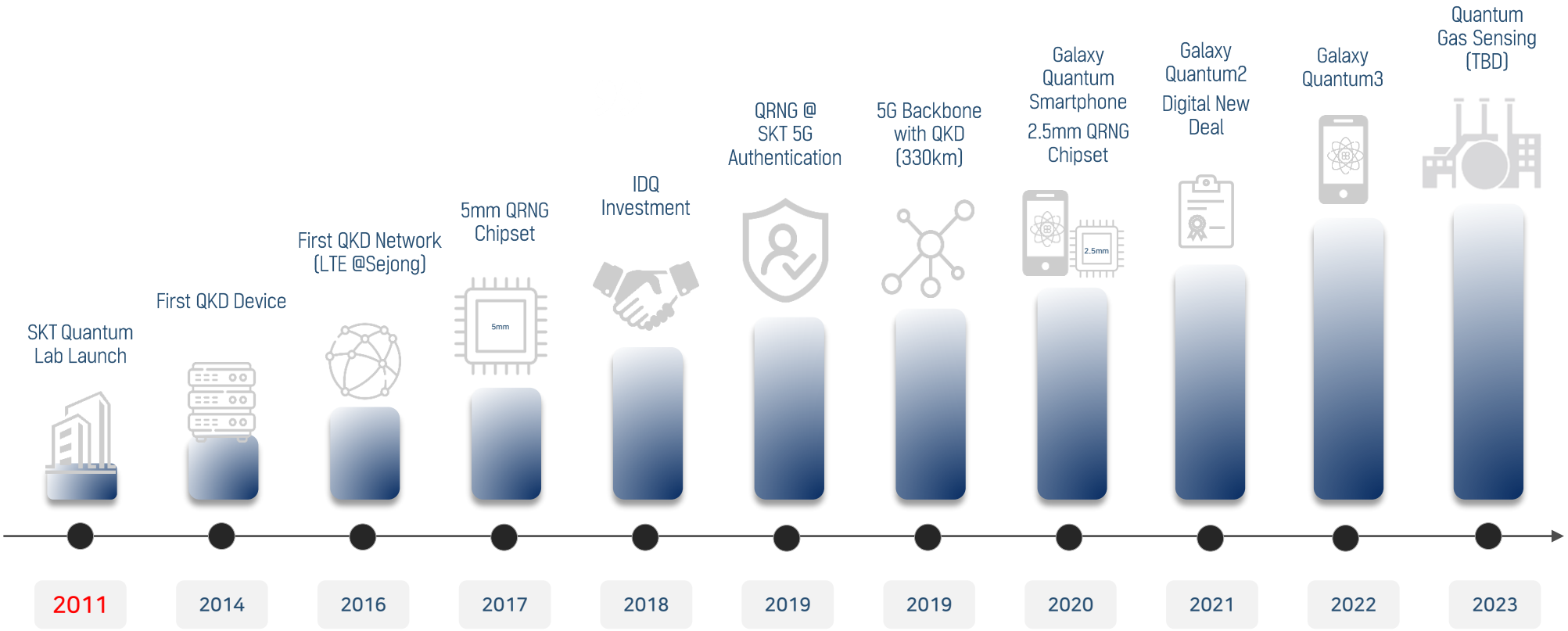
SKT's Quantum Expertise

Constant Innovation in Quantum Technology & Business *since 2011*

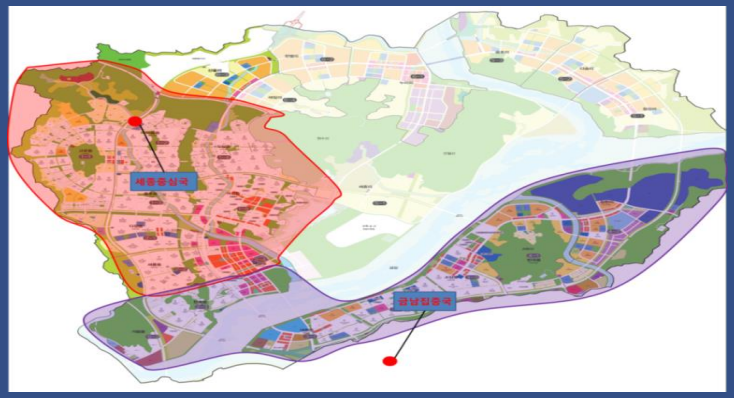


QKD: Quantum Key Distribution, QRNG: Quantum Random Number Generator

SKT' World first LTE Backhaul Protection with QKD

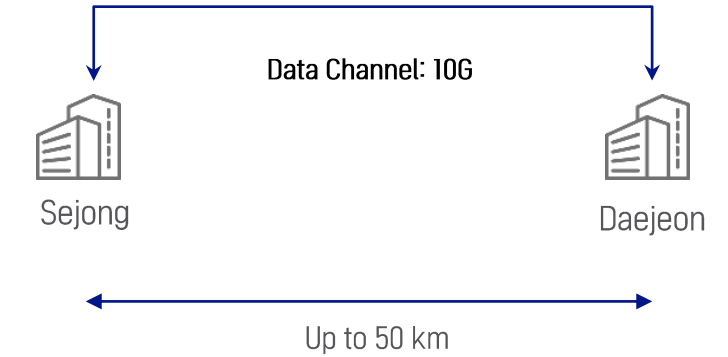
World-First (June '16)

LTE backhaul Protection with QKD



Configuration of
QKD Network in Sejong

QKD-implemented



QKD System (Sejong)

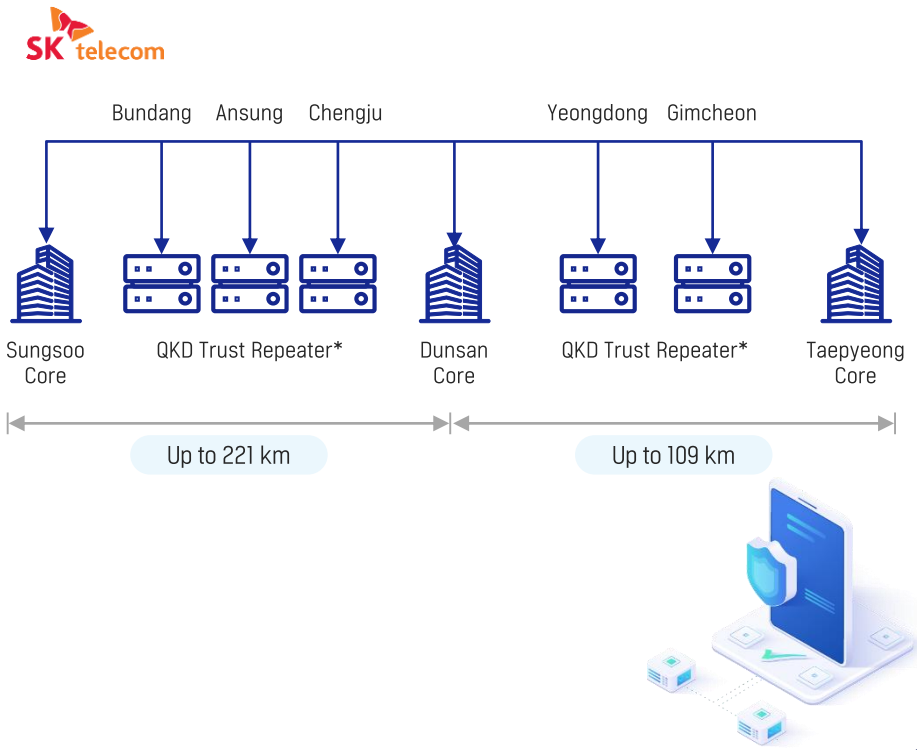
QKD System (Daejeon)

QKD Commercial use case for SKT's Customers

SKT's 5G Backbone protection with QKD

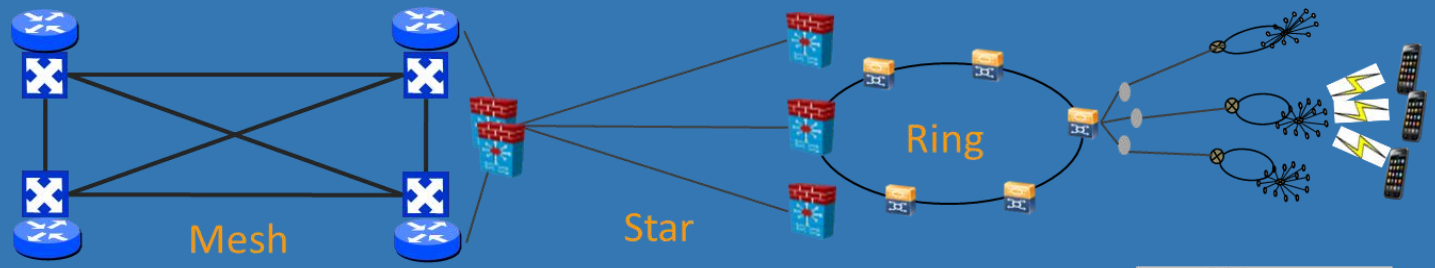
5G Backbone protection with QKD since 2019

Quantum-safe Network with QKD



Different QKD Network Topologies

Backbone	Core	Access



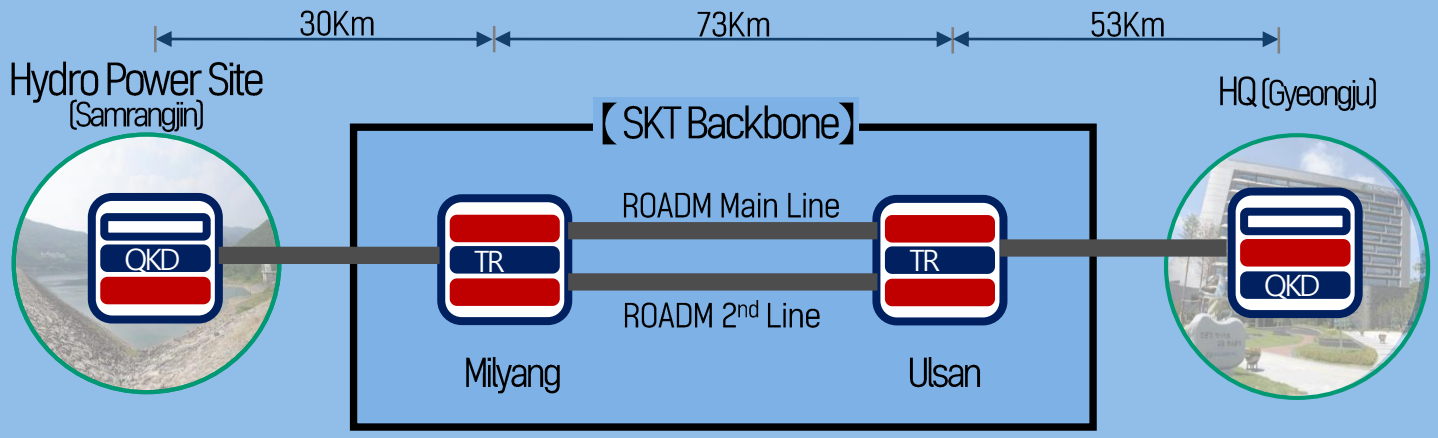
Quantum Key Distribution

5G standard security & QRNG

QKD Commercial case: Various Vertical Sectors

Power & Finance Sector

KHNP
Korea Hydro & Nuclear Power



NICE Information Service Co.

National Convergence Network for e-Government

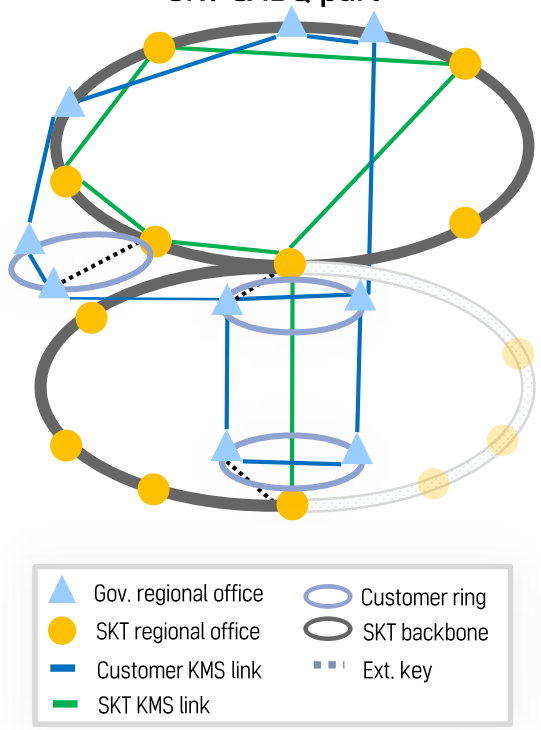
Government Convergence Network with highest level of Security

Construction of the first nation-wide Government QKD network in Korea

A national backbone network interconnect individual networks run by 48 government organizations

- 800 kilometers
- 48 government organizations
- Security, stability & efficiency

[QKD & KMS Network]
SKT & IDQ part



QKD: Quantum Key Distribution, KMS: Key Management System

QKD Commercial Case: Integration with Encryption

Integrating QKD with existing Encryption Solutions

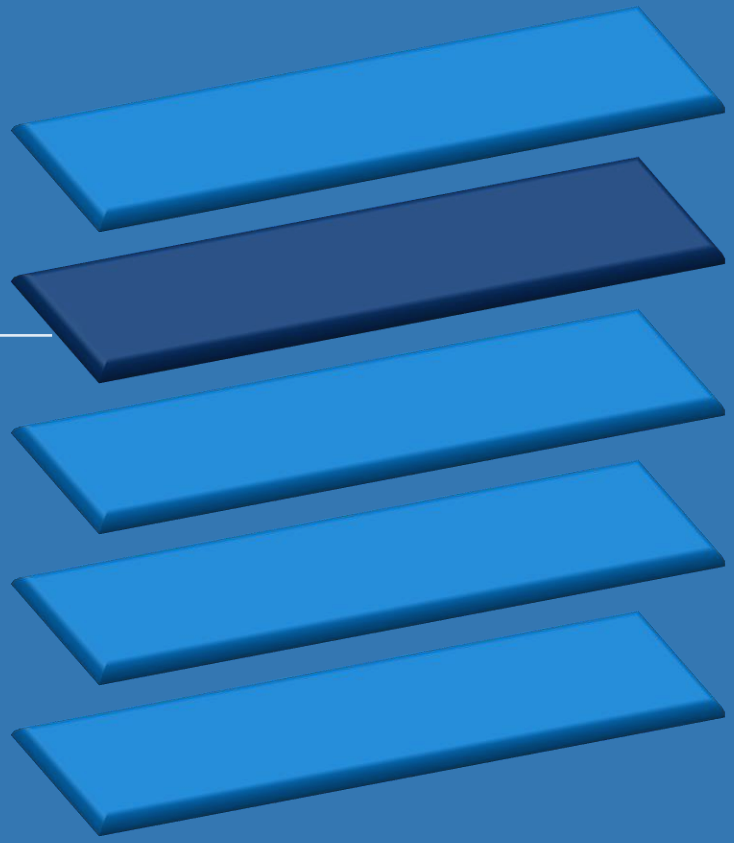
Network Encryption Upgrade with QKD

- QKD key can be supplied to different layers for long-term confidentiality

Fortinet-IDQ-SKT Integration

IPSec with QKD keys

REST-based API



Transport Layer
SSL/TLS

Network Layer
IPSec

MPLS Layer
MPLS VPN

Data Link Layer
MACSec

Physical Layer
OTN Encryption

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Quantum Leadership

Quantum Partnership

Worldwide Collaboration & Standardization

Integrating QKD with Encryption Solutions and Operators' Networks *to provide End to End Network Encryption*

What's better

End to End Network Encryption

+ Integration with Operators' Network

Centralized Control for different vendors of QKD

- Interoperability between different QKD Systems
- Control and Management based on International Standards to make sure the global reach and interoperability

+ Integration with Encryption Solutions

End to End Encryption

- Network Encryption Upgrade with QKD
- Hybrid solutions with QKD and PQC

ETSI World Class Standards · ITU · GSMA · TIM · T · Telefónica · IMDA Infocomm Media Development Authority · Singtel

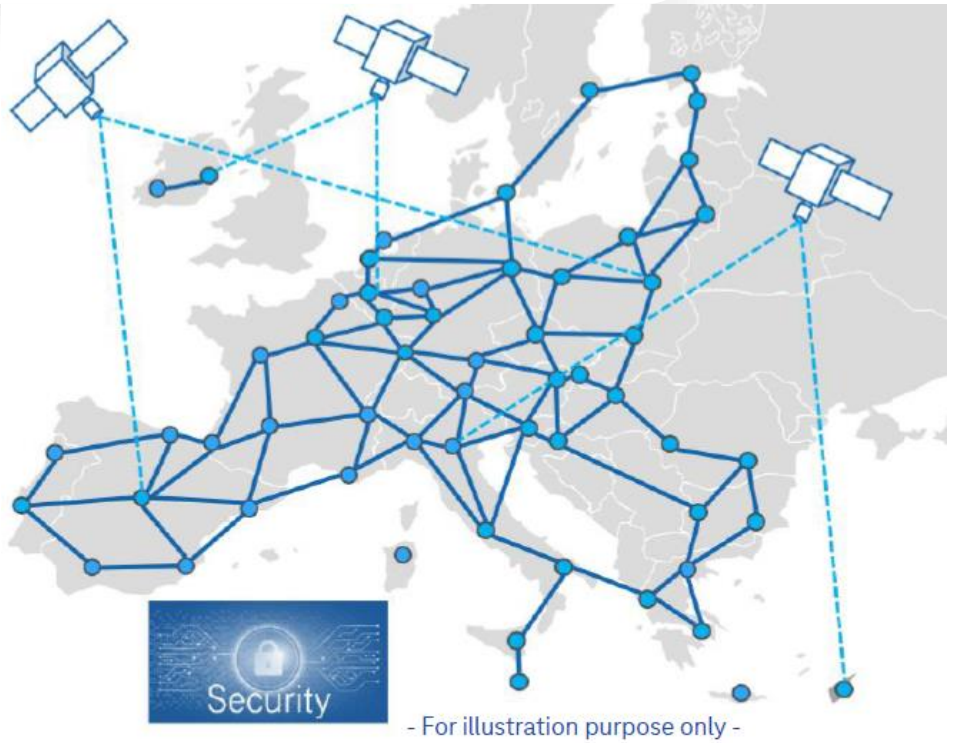
The EuroQCI Initiative

Cybersecurity Strategy for the coming decades.

Aiming at safeguarding sensitive data and critical infrastructures by integrating quantum–based systems into existing communication infrastructures.

- First phase 2022–2023 National Phases
- Second phase 2024 any beyond – roll out
- Fully operational by 2027

EU Quantum Communication Infrastructure



- For illustration purpose only -

EuroQCI: European Quantum Communication Infrastructure

Thank you 감사합니다

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