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Proactively
Quantum™

Satellite-QKD project

QNu's mission for a quantum secure Indian subcontinent

13 December 2022

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Company	QNu Labs Private Limited, Bangalore
Tech Innovation	Deep Tech, Quantum Secure Communication, Incubated in IITM Research Park
Nurtured by	Cisco LaunchPad; Intel Sine, NetApp Excellerator programs
Platform, Products and Solutions	Quantum secure communication platform "Sure SeQure " – Key Generation and Mgmt. Products – Quantum RNG, Quantum Key Distribution and Quantum Key Vault -On-Prem and Cloud Solutions: Quantum Secure Vault, Messenger and VPN
Capability	QKD – 150Kms single hop; Trusted Relay Node, Hub and Spoke topology QRNG – Optical source-based high entropy and high throughput Compliant with latest NIST finalized PQC algorithms
Product Stage	Production Ready and Commercially deployed
Indigenization	100% indigenized design, development and production
IP Stage	3 granted; 3 patents pending; 10+ trade secrets
Customers	Customers in India and a few other countries; Enterprises, Defence and government
Team	Leadership team with proven expertise to scale tech companies 45 (35 in Product and Solutions Dev.); 7 in S&M

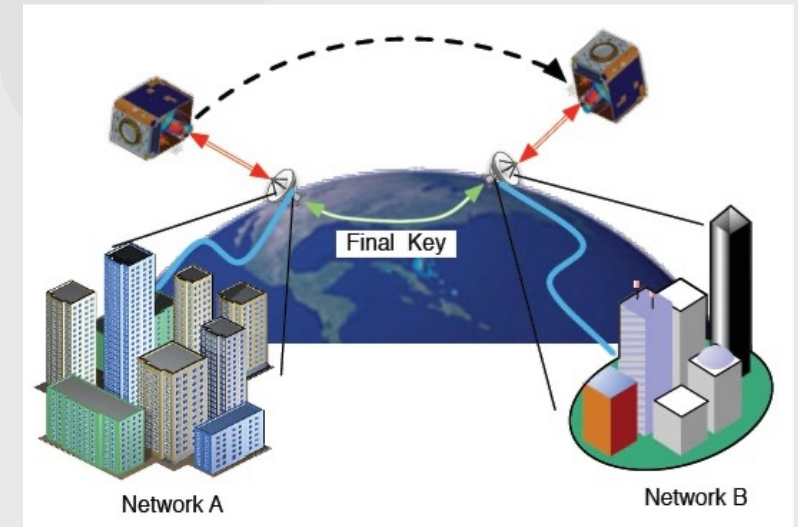


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Quantum Key Distribution

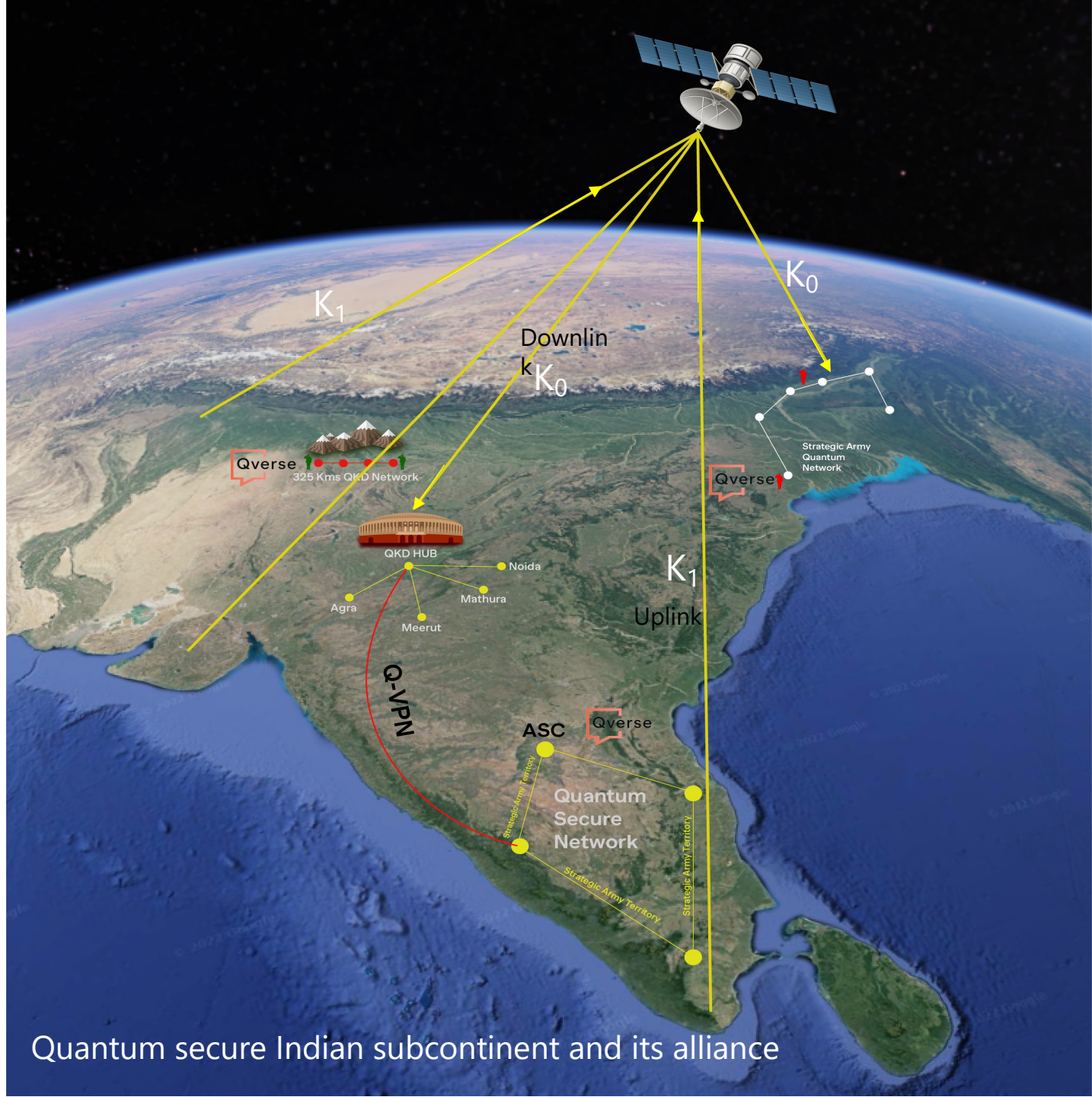
Why Quantum Key Distribution via satellite?

- **Quantum Key Distribution uses symmetric cryptography to distribute the same pre-shared key to communicating partners** - this technique is considered to be resistant against known quantum computing algorithms and is Information Theoretically Secure (ITS)
- **Terrestrial QKD implementations have significant limitations** in terms of bridging larger geographical distances
- **Space-based QKD will keep information and communications secure in an era of quantum computing** – the service will distribute symmetric cryptographic keys to pairs of users located anywhere on Earth, thereby delivering a global QKD service



Prime objective of satellite – QKD project

“Securing the information exchange between various government entities not just within India but worldwide as well using satellite-based Quantum key distribution”



Quantum secure Indian subcontinent and its alliance

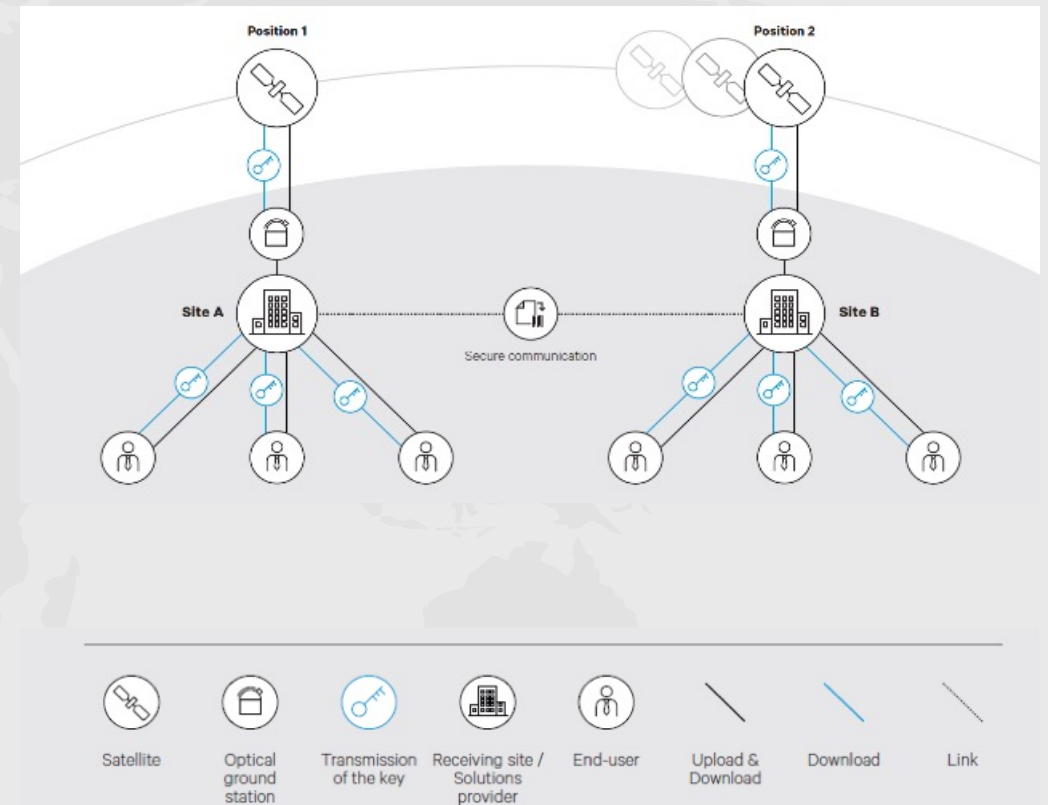
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Space-based Quantum Key Distribution

Insight into the program

In a nutshell

- Design and implementation of an LEO satellite-based QKD system
- In collaboration with INSPACe / ISRO
- QKD payload as trusted node - QKD protocol based on DPS and Decoy (Prepare & Measure)
- Driven by user requirements/business case – India is the prime focus
- Full end-to-end system development and implementation including QKD Payload, Ground Terminals and Operations Centre
- Full end-to-end system and service validation



60 metres free
space QKD
demonstration at
the terrace of
Centenary
building,
Bengaluru

Alice

60 metres

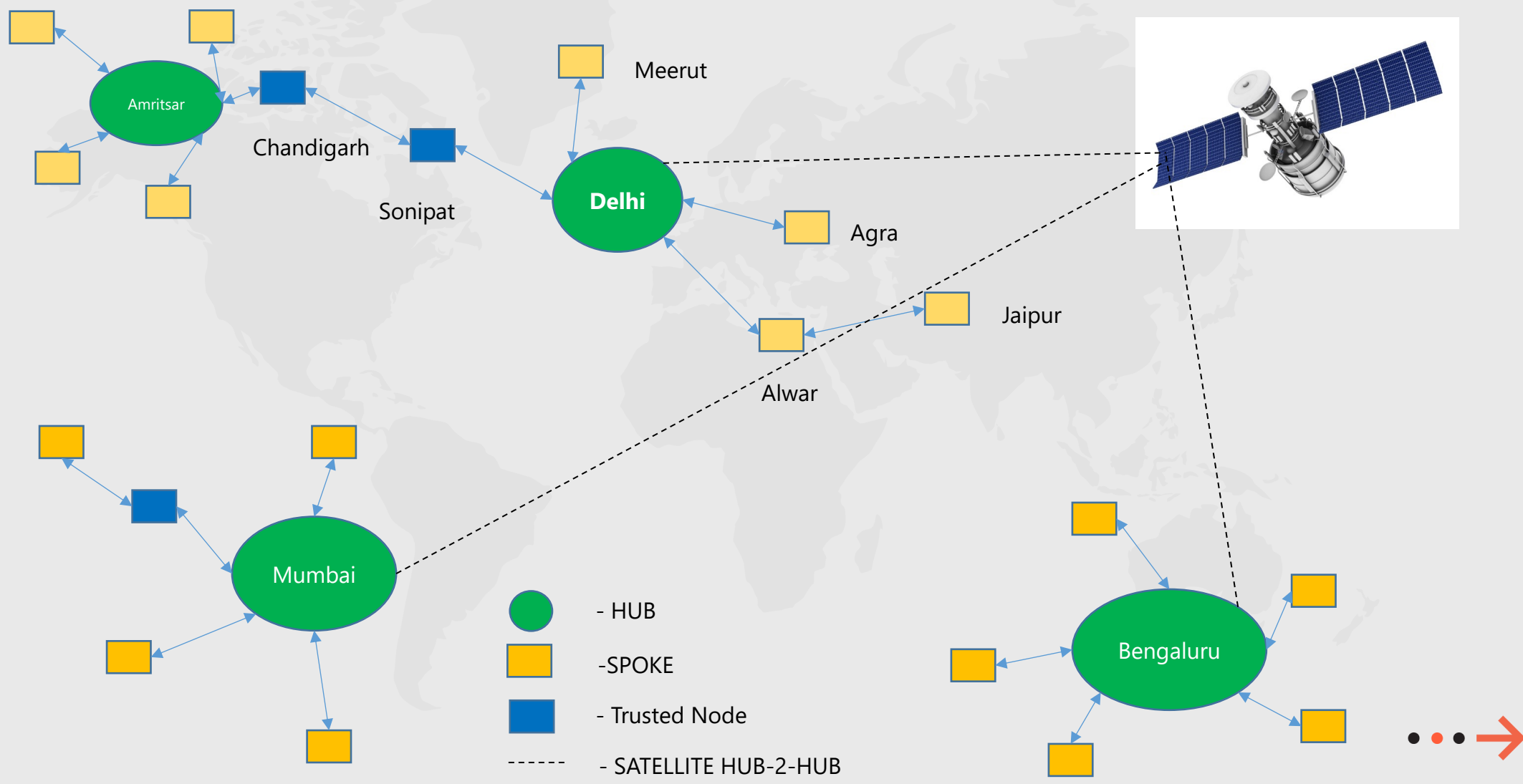
Bob

gree
Service

251...

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Quantum Secure Dome – Big Picture



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Quantum Secure Communications

QKD System 150KM P2P (World's Best)

Available

Trusted Node

Available

Hub & Spoke topology

Available

Satellite QKD (Proposed)

Jun'24

- ❖ India is self-reliant in Quantum Secure Communication over the entire Fiber Network thru available Technology by QNu Labs
- ❖ With Satellite QKD, India would be able to seamlessly deploy Quantum secure communication over much larger distances
- ❖ QNu Labs proposes to leverage ISRO's capability of space-grade design, satellite communication expertise and the overall testing infrastructure in its mission of giving India a Quantum Secure Dome



Implementation Phases & Timelines

Phase	Key Focus
Phase 1	<ul style="list-style-type: none"> QKD System over 1 KM Free Space Distance QKD System at 1KM height using Aerostat. Alice at Aerostat acting as trusted Node with 2 Ground stations within same City
Phase 2	<ul style="list-style-type: none"> QKD system Demonstration using a moving Drone at a vertical distance of approx. 5KM with 2 Ground Stations in the same city Operational Acquisition, Pointing & Tracking system
Phase 3	<ul style="list-style-type: none"> QKD System Demonstration using LEO Satellite (500-1000KM) with 2 Ground Stations in different city





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Thank You

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Project	Country	Remark
Micius	China	Chinese Academy of Sciences
Tiangong-2	China	14 missions, earth to space QKD
QUESS	China, Austria	Intercontinental quantum secure video conferencing, quantum teleportation
Cubesat	Singapore	National University of Singapore
Alphasat	Germany	Geostationary laser communication
Quiness	US	Macroscopic quantum communications project to catalyze development of quantum internet
Eagle-1	Europe	Development and deployment of the European Quantum Communication Infrastructure (EuroQCI)