**VTT Technical Research Center of Finland**

**Secure Connectivity**

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Connectivity Lead

**VTT – beyond the obvious**

# VTT – *beyond the obvious*

VTT is a Finnish visionary research, development and innovation partner for companies and society and one of the leading research organisations in Europe.

Our role is to promote the utilisation and commercialisation of research and technology in business and society. Through science and technology, we turn global challenges into sustainable solutions for business and society in a responsible way.

**261 M€**
turnover and other operating income

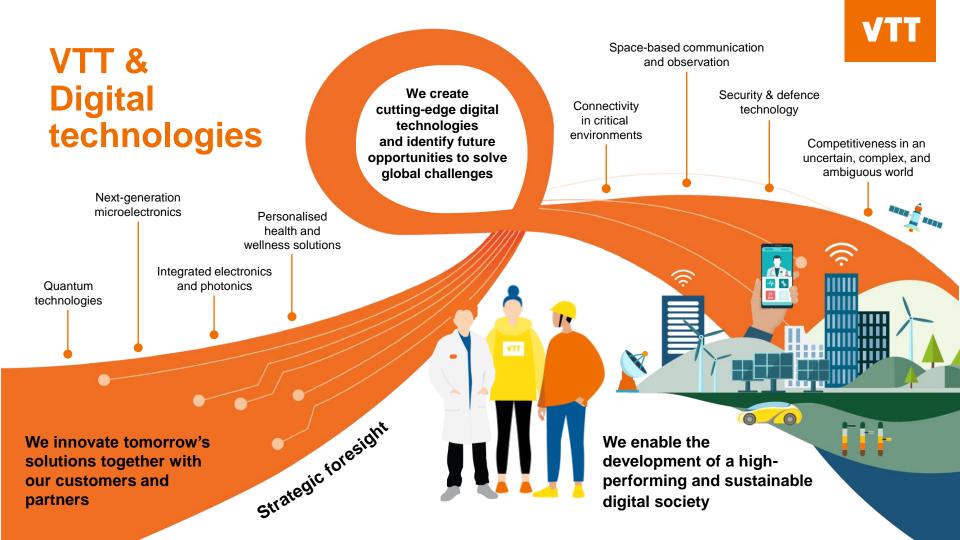**2,213**
employees

**43%**
of the net turnover from abroad

**32%**
a doctorate or a licentiate's degree

Establishment year
**1942**

Steered by Ministry of Economic Affairs and Employment

**VTT & Digital technologies**

We create cutting-edge digital technologies and identify future opportunities to solve global challenges

Space-based communication and observation

Connectivity in critical environments

Security & defence technology

Competitiveness in an uncertain, complex, and ambiguous world

Next-generation microelectronics

Personalised health and wellness solutions

Integrated electronics and photonics

Quantum technologies

We innovate tomorrow's solutions together with our customers and partners

Strategic foresight

We enable the development of a high-performing and sustainable digital society

# • Cyber Security

- • Applied Cryptography
- • Cybersecurity for mission critical networks
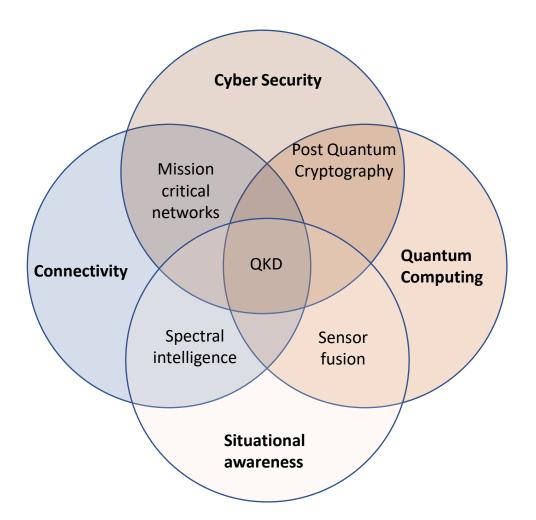- • Cyber security testing & security exercises

# • Quantum Computing

- • Quantum algorithms
- • Quantum hw components
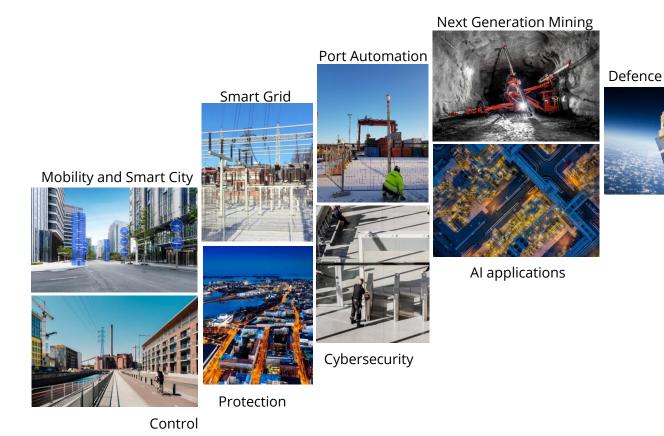- • Quantum foresight

# • Connectivity

- • 5G-Advanced, 6G and NTN networks
- • 5G test and experimentation network for development of new network technologies and services.
- • 5G and NTN network integration

# • Situational Awareness

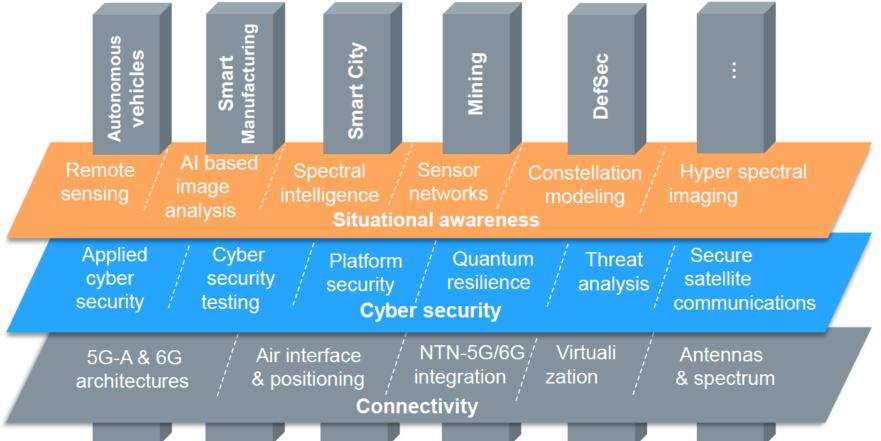- • AI based Earth Observation analysis
- • Sensor fusion
- • Data correlation

# VTT B5G/6G research domains



Next Generation Mining

Port Automation

Defence

Smart Grid

Mobility and Smart City

AI applications

Cybersecurity

Protection

Control

# Safe and Connected Society expertise areas supports digitalisation in different verticals

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Verticals:
- Autonomous vehicles
- Smart Manufacturing
- Smart City
- Mining
- DefSec
- ...

**Situational awareness**
- Remote sensing
- AI based image analysis
- Spectral intelligence
- Sensor networks
- Constellation modeling
- Hyper spectral imaging

**Cyber security**
- Applied cyber security
- Cyber security testing
- Platform security
- Quantum resilience
- Threat analysis
- Secure satellite communications

**Connectivity**
- 5G-A & 6G architectures
- Air interface & positioning
- NTN-5G/6G integration
- Virtualization
- Antennas & spectrum

# Connectivity R&D

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Connectivity R&D
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## Network technologies

## Test and experimentation network
- 5G/6G test network development, capabilities and services
- Demonstrations, measurements (QoS), testing,

## Networks in verticals
- Smart energy, city, logistics, vehicles (V2X), etc.
- Mobile net vs. electricity net
- Resilience of critical networks

## Radio and antennas
- Hardware and technology development for RF applications from 6 GHz to sub THz frequencies

### Architectures
- 5G-A, 6G
- Backhaul, fronthaul
- O-RAN, V-RAN
- Private networks
- MEC

### Radio/air interface
- Modulation, numerology
- Baseband processing
- Radio channel
- RadCom
- Positioning
- Network as a sensor

### Management and orchestration
- Virtualization
- Slicing
- SDN, SDR
- Resource management

### Network security
- Intrusion detection and prevention, etc. methods
- Authentication, micro segmentation
- AI/ML in trust, network anomaly detection

### Non-Terrestrial-Networks
- 5G-satellite integration
- Satellite communications
- System simulations
- Ground segment
- Tactical network bubble

### AI/ML for telecoms
- Learning based methods and solutions in support of device, connection and security management, e.g. beam forming, anomaly detection and performance optimization

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# Examples of testing facilities

- ## 5G/6G test network several locations
  - Testing of radio access and services for different verticals

- ## Antennas and RF components testing
  - Anechoic rooms , Millimetre Wave Laboratory of Finland, Clean rooms

- ## Cyber security testing facilities
  - War room for cyber security testing

- ## Data link Lab as a Service Facility
  - Facility to support R&DI work on data links and critical communication for defsec as well as critical infrastructure industry
  - Enabling security classified research and testing



VTT

# VTT and SNS

- Active member in 6G-IA and Networld Europe
- Active participant in SNS projects
  - Hexa-X-II – the European 6G Flagship
  - Confidential-6G – Secure 6G
  - 6G-XR – Sustainable 6G infrastructure development, validation of 6G use cases
  - 6G-Cloud – AI-native cloud-friendly system infrastructure for 6G
- Looking forward for fruitful collaboration in SNS, and future secure connectivity solutions RDI work

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