

5G TNF ecosystem overview

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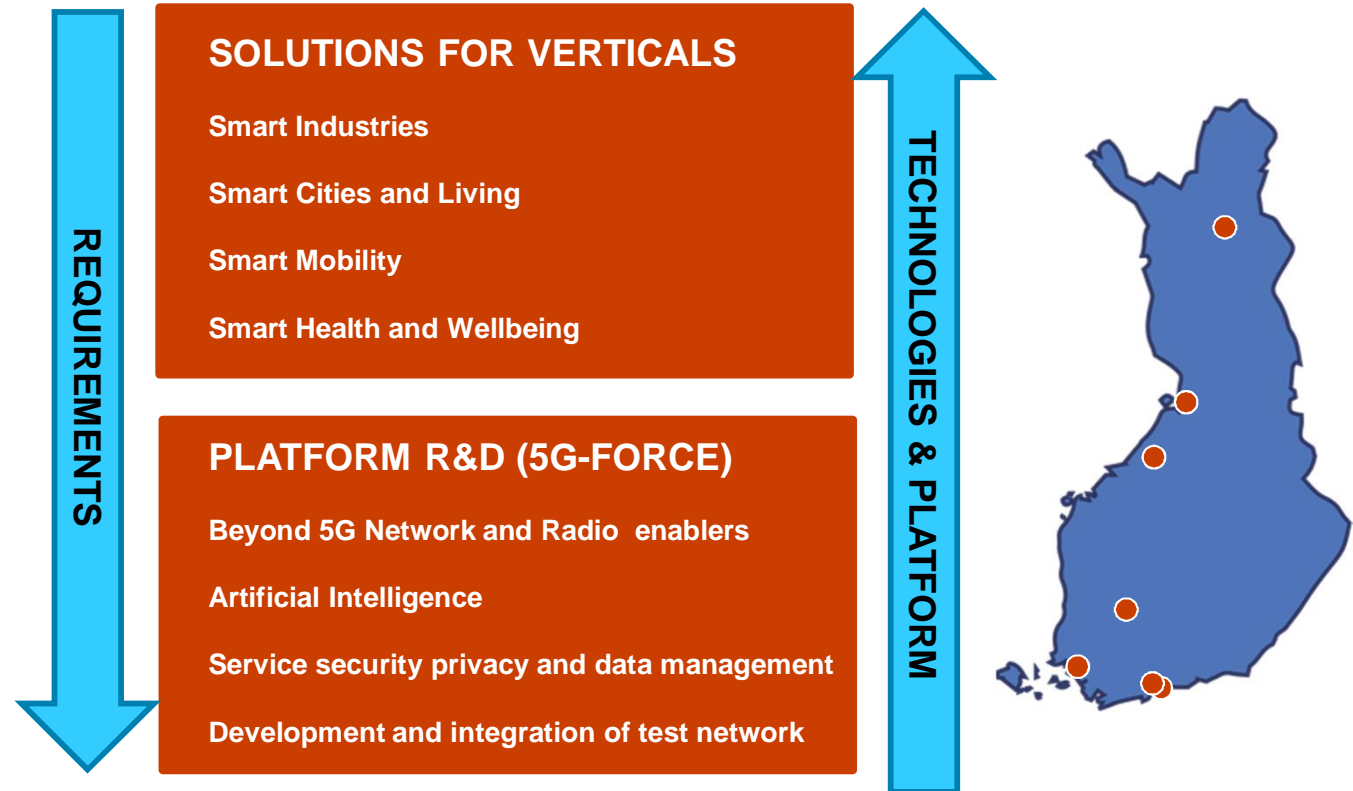
5G Test Network Finland Targets

MISSION

5G Test Network Finland is open and evolving innovation ecosystem supporting **5G evolution and Beyond 5G technology research and validation, vertical industry product development** and pioneer company experiments.

VISION

5G evolution and B5G R&D and utilization of AI and novel cyber security concepts are ramping up and offer excellent business opportunities to both telecom and vertical industries



General Targets

§ regeneration

§ 3GPP Rel16->, **5G and beyond** communication concepts, towards 6G

§ **utilization of AI** in radio resource and network management and vertical use case implementation, novel **cyber security** concepts

§ **vertical use cases** utilizing 5G and beyond, AI and cyber security concepts

§ interdisciplinary approach

§ co-operation between **telecom and vertical** (automation, energy, health, safety, media, automotive, buildings, ...) area technology and **business model** experts

§ differences compared to existing research;

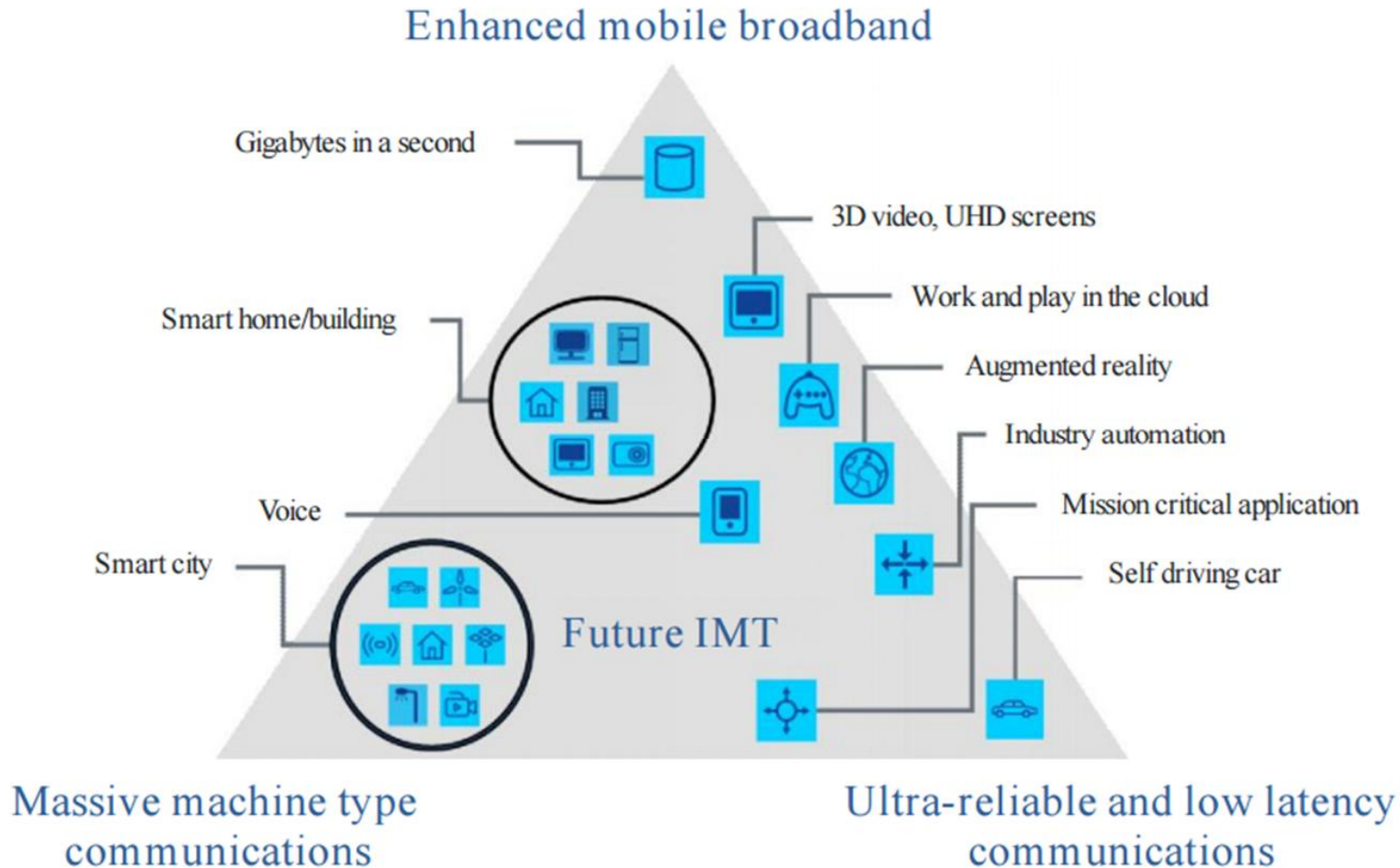
§ Strong support to **verticals**

§ **Integration** of Beyond 5G research, vertical use case design, utilization of AI, cyber security concepts and large area research infrastructure integration

§ differences compared to pre-commercial test environments;

§ more **future looking**, non-commercial (still under standardization and research, utilization of AI, novel cyber security) technologies, flexibility, wide set of tools and co-operation possibilities with wide eco-system

Needs for 5G Test Network



5G features:

- Unlimited Broadband experience
- Instant Action
- Things Connected
- Ultra Reliability
- Slicing
- Virtualization
- Energy saving

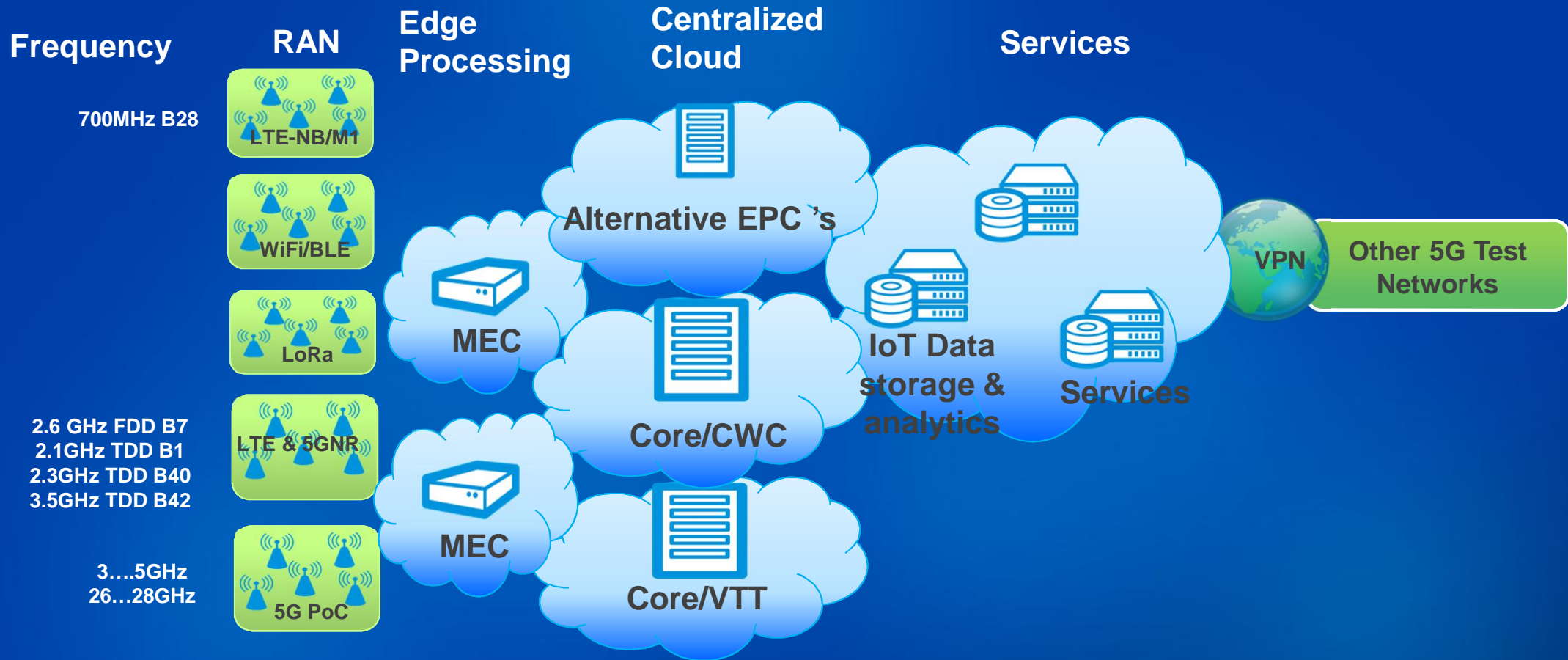
Source: 5GPPP

Current core test platform with state-of-the-art technologies

- From LTE evolution to 5G radio access
- Provides access for the IoT network (NB-IoT, LTE-M, LoRa) to test your devices and applications
- New frequencies and spectrum sharing
- MEC's to bring services close to users access
- Network slicing
- C-RAN, SDN and NFV technologies
- eMBMS enables efficient broadcasting to mobile users
- Core network in a cloud environment
- Cloud systems for applications
- Connection between test sites in Finland and worldwide
- Monitoring of selected KPIs from network elements and interfaces for your use case



Architecture in Oulu



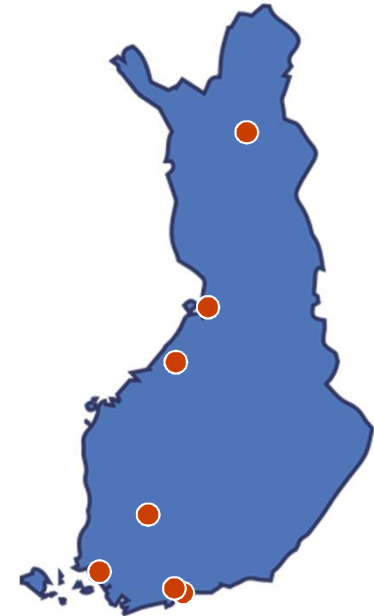
Platform R&D (5G-FORCE)

§ Scope:

- § B5G, cyber security and AI research
- § Development of common network modules/parts
- § Development and integration of test network
- § Platform experiments manager and cross platform orchestrator

§ Technology focus:

- § **Network Technology enablers:** Edge computing, Network slicing, Industrial Internet, Massive scale autonomous IoT network
- § **Radio Technology enablers:** positioning and tracking, RAN support fo UAV's, multi-RAT mobility and connectivity, mmw massive MIMO, uRLLC platform, radio enablers for dense 5G networks
- § **Artificial Intelligence:** network management and self healing, mobility and radio beam management, uRLLC and E2E reliability, Media & Entertainment, AI integration to verticals
- § **Service security privacy and data management:** AI applications in Security, Trust and blockchain, DoS vulnerabilities and defencies, Roaming security, Cyber-Security interface for verticals



Trial domains

	Smart Industry	Smart Cities and Living	Smart Mobility	Smart Health and Wellbeing
5GVIIMA	harbors, factories, smart grids			
SMART OTANIEMI	remote monitoring and control of a self-sustained pico-eNodeB, remote inspection of facilities targeted to local production, energy consumption, and storage with drones	multi-point metering system to monitor of energy consumption of buildings' cooling and air conditioning systems, smart electric vehicle charging		
DECENT	cross-commodity sharing and management of energy in smart neighborhoods			
FUSE	solutions for demand response and predictive maintenance of the electric grid			
5G-ENHANCE				AR/VR streaming from operation room to students and remote doctors
5G-DRIVE		Utilization of indoor positioning in eMBB	Green light optimal speed advisory, Intellig. Intersection	
5G-HEART			autonomous/assisted driving	the use of rich media communications in the context of remote monitoring, education and robotics in patient treatment

Trial domains

	Smart Industry	Smart Cities and Living	Smart Mobility	Smart Health and Wellbeing
5G DRONES		UAV traffic management and related 3D mapping and visualisation, location of UE in non-GPS environments		
PRIMO		use of drones to enable immersive video services for firefighting scenarios		
PRIORITY		search and capture, support for rural use		emergency response
5GLuxTurrim+		5G light pole based network infrastructure with pole integrated 5G mmW radios, sensors, cameras, information displays and other connected devices. Navigation, information sharing & advertisement, public safety use cases	environmental monitoring and smart lighting for self-driving and automated vehicles,	
5G-MOBIX		5G for cooperative & connected automated MOBility on X-border corridors		
MEGASENSE		air pollution status		
5G SAFE			Road safety services	

Demos & posters on 1.11.2019 at 13.30->

5G TECHNOLOGIES

- Mobile Communications at Beyond 50 GHz Bands
- 5G Networks and Mesh
- Realm Gateway for remote access to private networks
- Cooperative security for 5G and the Internet
- Slicing (demo)
- 5G Networks and UAVs
- Visual content analysis in multiple streams of different quality over 5G network (demo)
- NLP demo for Finnish language (demo)

... Demos & posters on 1.11.2019 at 13.30->

SMART CITIES AND LIVING

- Building blocks towards energy autonomous 5G (demo)
- 5G TNF enabling connectivity for Smart Otaniemi pilots (demo)
- Enabling cross-commodity energy sharing for a more sustainable future
- 5G enhanced mobile broadband access in crowded environments
- Sensing and analytics of air quality (demo)
- Unmanned Aerial Vehicle Vertical Applications Trials Leveraging Advanced 5G Facilities
- Multimedia Public Warning message transmission (demo)
- Real Time eMBMS for emergency (demo)
- Hybrid positioning system for exploration of new location based services in 5G (demo)
- 5G solutions for search and capture, emergency response, support for rural use

SMART HEALTH AND WELLBEING

- AR/VR Hospital use case (demo)
- Advanced 5G validation trials across multiple vertical industries

... Demos & posters on 1.11.2019 at 13.30 ->

SMART MOBILITY

- 5G for cooperative & connected automated mobility on x-border corridors (demo)
- A Crowd-Sensing Platform for Cooperative Driving
- LEVIS (Live Vehicle Streaming) platform
- Road Safety Enhancements enabled by 5G
- 5G-DRIVE: Harmonised Research and Trials for Service Evolution between EU and China

SMART INDUSTRIES

- Harbour automation solution (demo)
- 360° mobile robot surveillance over 5G (demo)
- Network as a Firewall for Smart Grid Security
- Virtual Sensing with Digital Twin (demo)
- AI Foreman (demo)
- Employee introduction with Virtual Reality (demo)
- Standard Robot Interface (demo)

Ecosystem founding members

Network manufacturers

Operators

Technology and R&D service providers

Testing systems and tools manufactures

Verticals/ applications developers

Public organizations

Research organisations



- **Ecosystem Services:**

- Access to state-of-art 5G infrastructure with expert support to:
 - test network operation/configuration and management
 - technology validations and application trials
- Expert services for 5G evolution R&D and different type application and system design with 5G infrastructure
- Participation to wide R&D ecosystem focusing on
 - technologies and innovations related to 5G evolution and beyond network and radio enablers, cyber security, utilization of AI and business models
 - 5G and AI enabled solutions for vertical industries; smart industry, smart cities and living, smart mobility and smart health and wellbeing

- **More information:**

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