inGenious

Next-GENeration IoT sOlutions for the Universal Supply chain

iNGENIOUS aims to design and evaluate the Next-Generation IoT (NG-IoT) solution, with emphasis on 5G and the development of Edge and Cloud computing extensions for IoT, as well as providing smart networking and data management solutions with Artificial Intelligence and Machine Learning. The project embraces the 5G Infrastructure Association (5G IA) and Alliance for Internet of Things Innovation (AIOTI) vision for empowering smart manufacturing and smart mobility verticals.

Use Cases

Automated robots with heterogeneous networks use case foresees the use of 5G-enabled multi-task automated robots in future smart factory production lines or warehouses, targeting the interoperability of wireless and wired environments and the tactile internet where sensors and actuators synchronously work with latencies of few milliseconds.

Transportation platforms health monitoring use case pursues the asset health tracking in order to decrease operational costs and increase asset availability with new data-based service provided by low-power edge distributed network and intelligent sensor modules installed in the transportation platforms.

Situational understanding and predictive models in smart logistics scenarios use case aims to integrate artificial intelligence to improve the access of vehicles to ports and reduce the waiting times, leading to corresponding savings on direct costs for carriers.

Improved driver's safety with Mixed Reality (MR) and haptic solutions is a safety-centric use case that foresees to remotely control transportation of goods with Automated Guided Vehicles using tactile internet, edge computing and immersive enablers (MR engines, haptic gloves). Employees will be safe, away from hazardous working locations such as fuel port terminals.
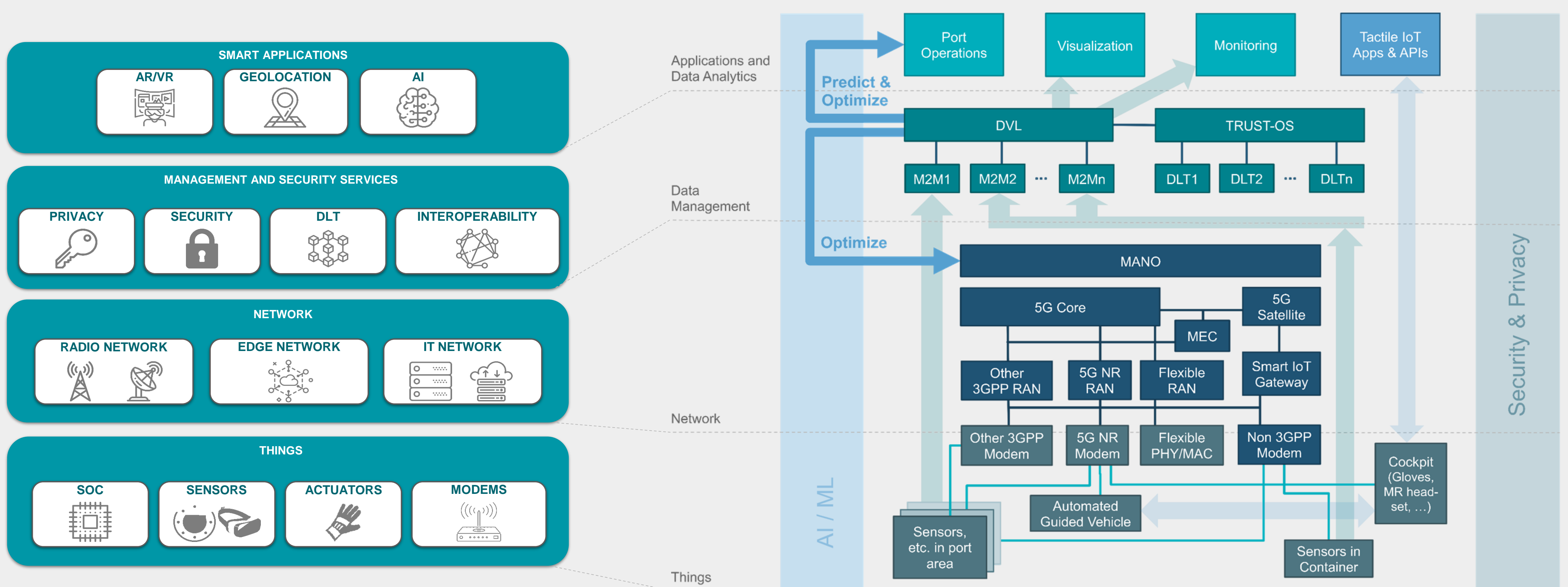
Inter-modal visibility in the supply chain with containers use case aims to provide End-to-End (E2E)intermodal asset tracking with satellite connectivity for enabling enhanced real-time monitoring of shipping containers when they are sailing through oceans without connectivity to terrestrial IoT networks.

Supply chain ecosystem integration use case overcomes the absence of a virtual interoperability IoT and DLT layer that will be capable of securely and semantically exchange the information flows between the different actors that can take part along the supply chain ecosystem.

Architecture

SMART APPLICATIONS
- AR/VR
- GEOLOCATION
- AI

MANAGEMENT AND SECURITY SERVICES
- PRIVACY
- SECURITY
- DLT
- INTEROPERABILITY

NETWORK
- RADIO NETWORK
- EDGE NETWORK
- IT NETWORK

THINGS
- SOC
- SENSORS
- ACTUATORS
- MODEMS

Applications and Data Analytics — Port Operations, Visualization, Monitoring, Tactile IoT Apps & APIs
Predict & Optimize

Data Management — DVL (M2M1, M2M2, ... M2Mn), TRUST-OS (DLT1, DLT2, ... DLTn)
Optimize

Network — MANO; 5G Core; 5G Satellite; MEC; Other 3GPP RAN; 5G NR RAN; Flexible RAN; Smart IoT Gateway; Other 3GPP Modem; 5G NR Modem; Flexible PHY/MAC; Non 3GPP Modem; Cockpit (Gloves, MR headset, …)

Things — Sensors, etc. in port area; Automated Guided Vehicle; Sensors in Container

AI / ML

Security & Privacy

Cross-layer Innovations in the iNGENIOUS Architecture

Artificial Intelligence and Machine Learning (AI/ML)
- At the Smart Application level: accurate prediction of arrival times for vessels at maritime ports optimisation of truck turn-around times in ports
- At the Network level: adapting the assignment of network resources to IoT devices
- At the Things level: data processing at the edge within energy-constrained IoT sensors

Security and privacy
- At the Management and Security level: data interoperability with pseudonymization for handling personal data according to European General Data Protection Regulation (GDPR); data integrity using Distributed Ledger Technology
- At the Network level: security enhancements over previous 3GPP standards
- At the Things level: policy analysis and definition for Identity & Access management for 5G-connected IoT devices