

Secure 5G Non-Public-Networks

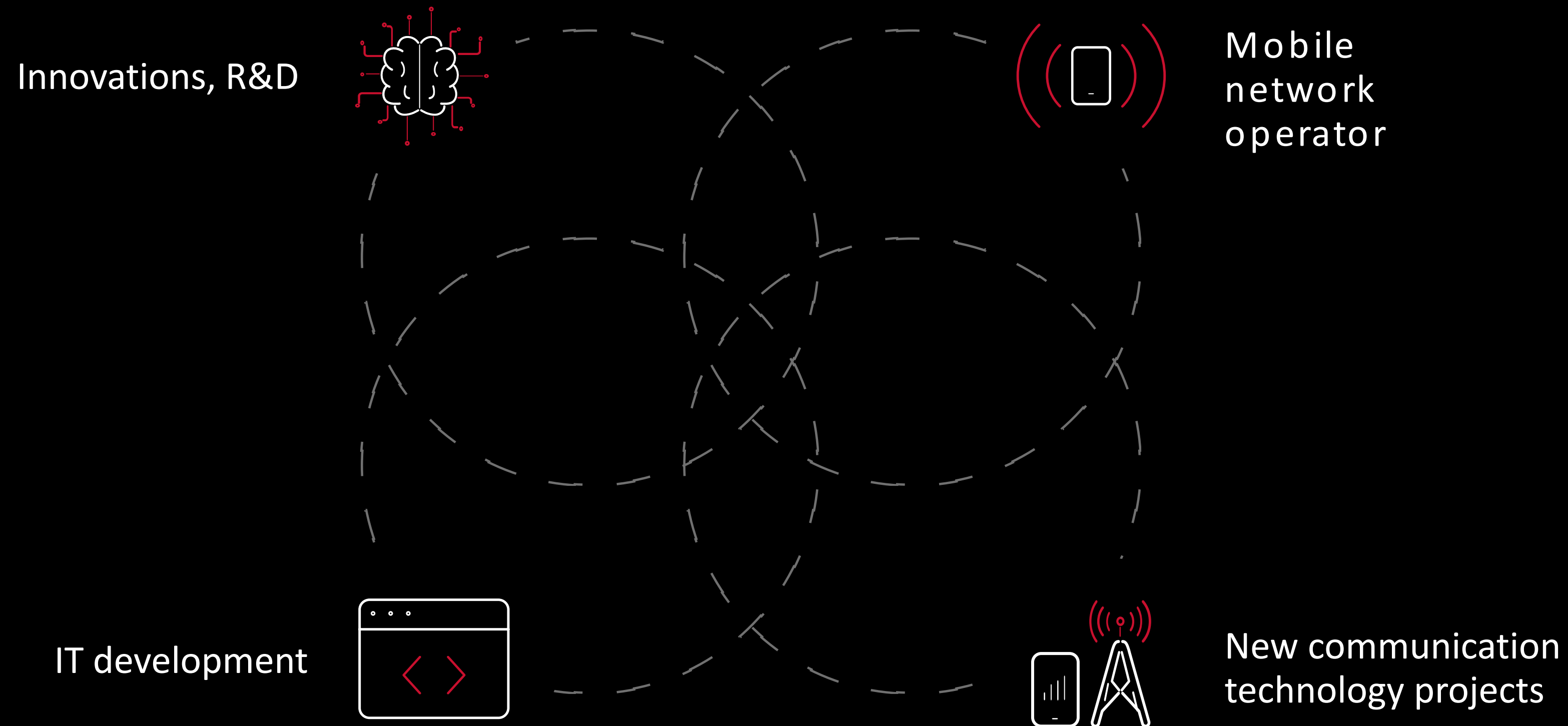
Baltic Container Terminal case

Kārlis Vilciņš, Head of System Integration Business

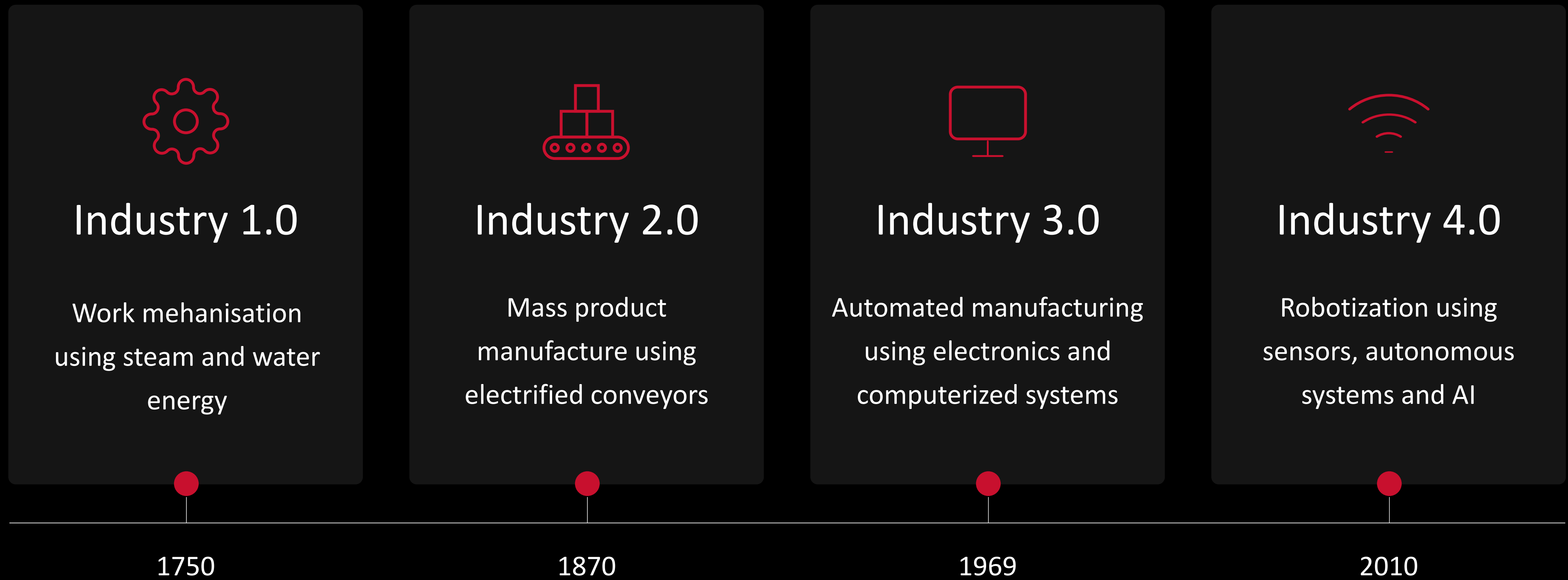
20.10.2024



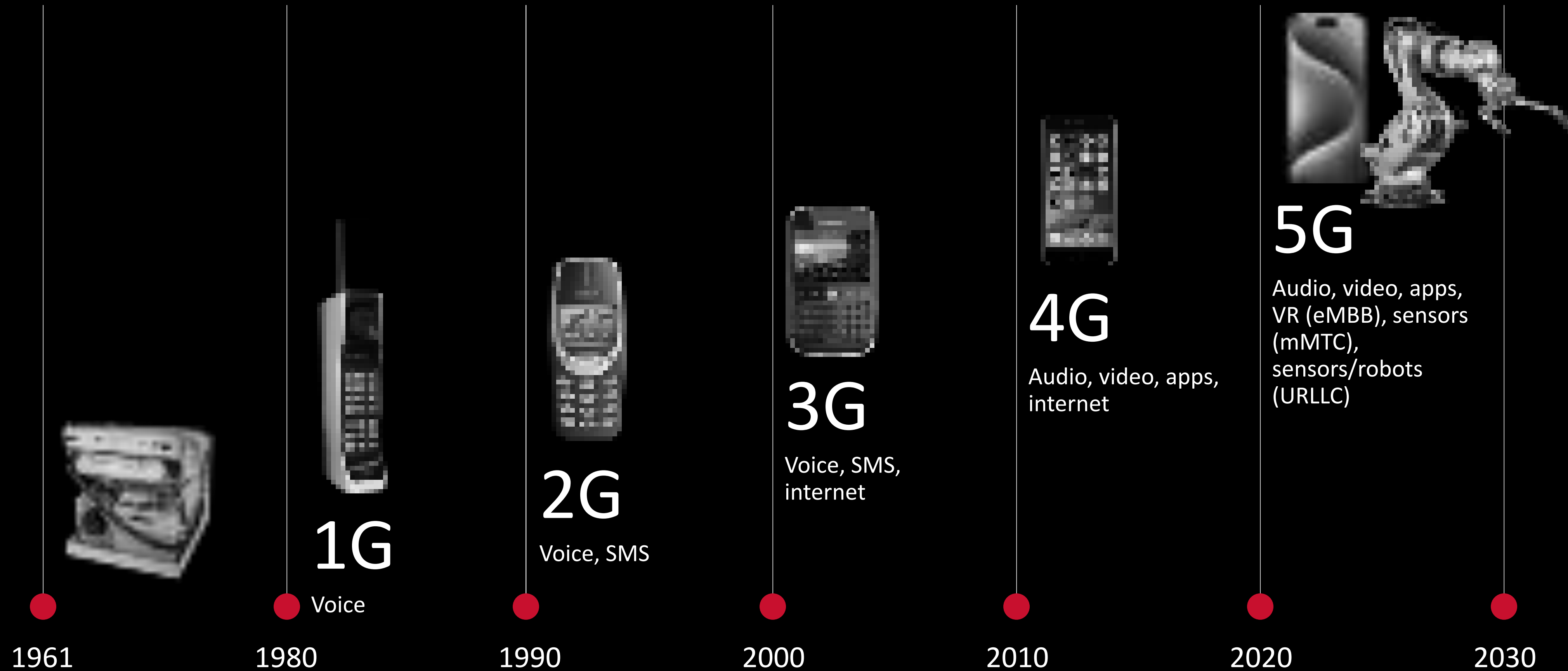
LMT – more than mobile network operator



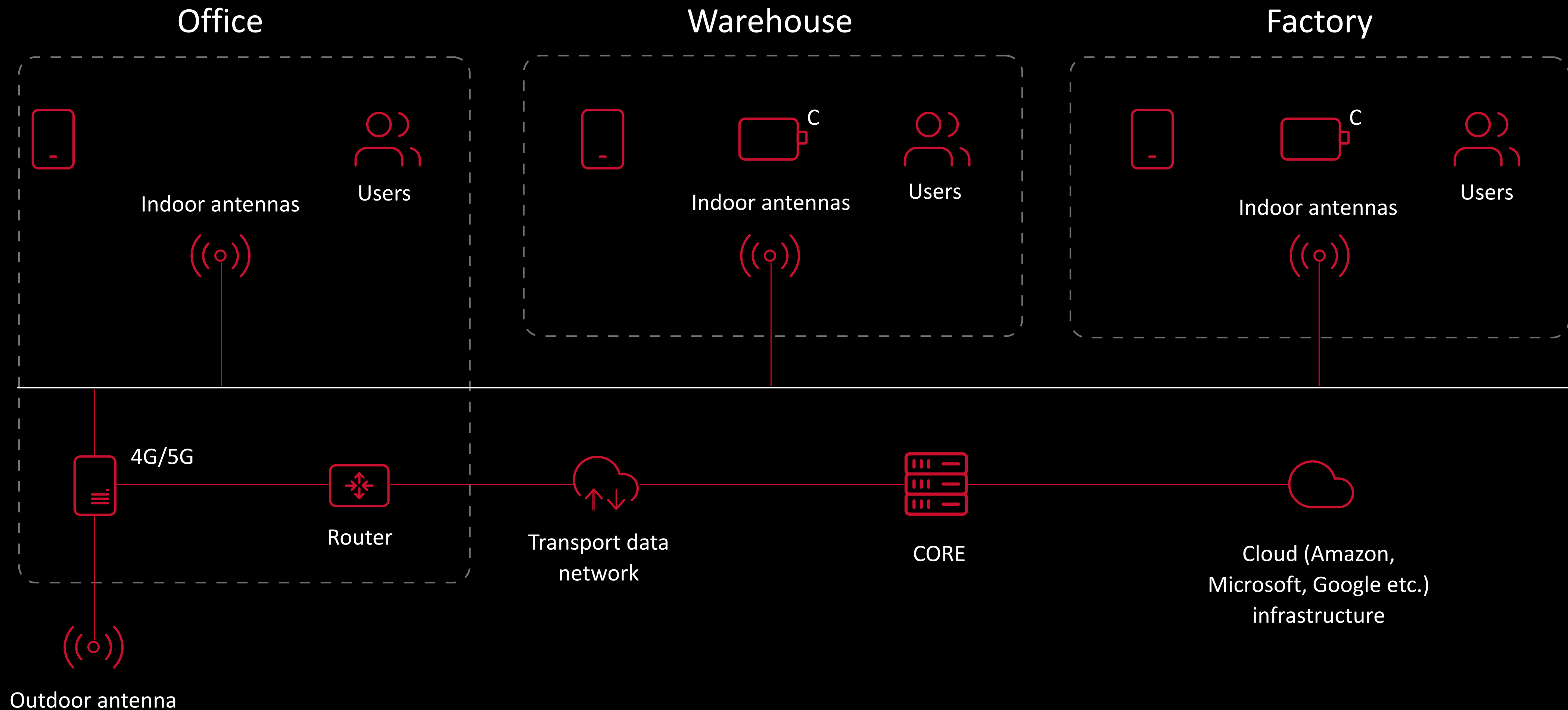
On the way to the 5th industrial revolution



Mobile Technology Evolution



How the 5G NPN is designed?



Main benefits of 5G NPNs

Security

Isolated network, access control, data encryption, security monitoring and incident response, Physical security.

Performance

Improved radio coverage. Local CP and/or UP. Connected technologies –LTE & 5G. Low latency. Faster real-time communication. Configurable QoS. Data flow prioritization.

Control

Complete control over your private network. Network management and orchestration. Scalability and ability to adapt.

When it is worth to build a 5G NPN?

 Security

High security requirements, information must remain in the company's IT infrastructure

 Mobility

A stable and uninterrupted connection is required for moving objects

 Performance

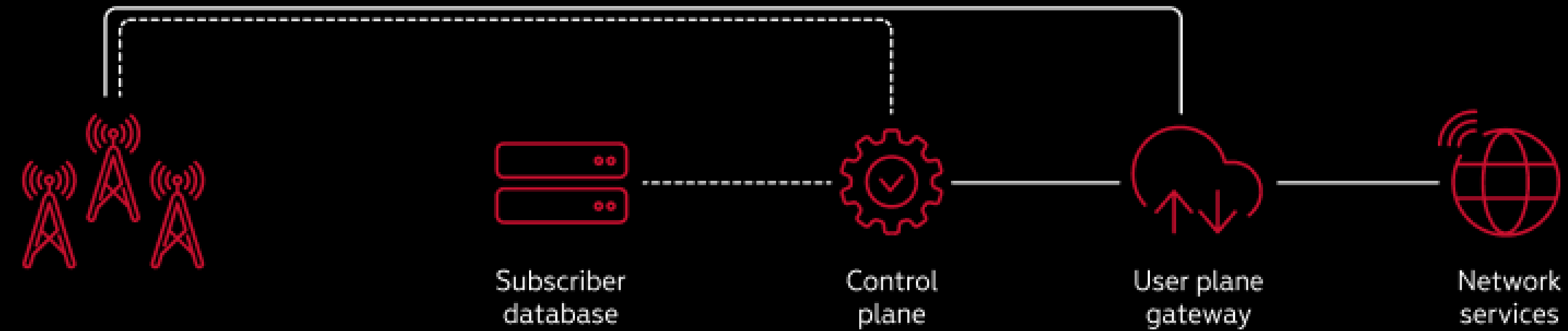
High commercial network load, that affects the company performance

 Coverage

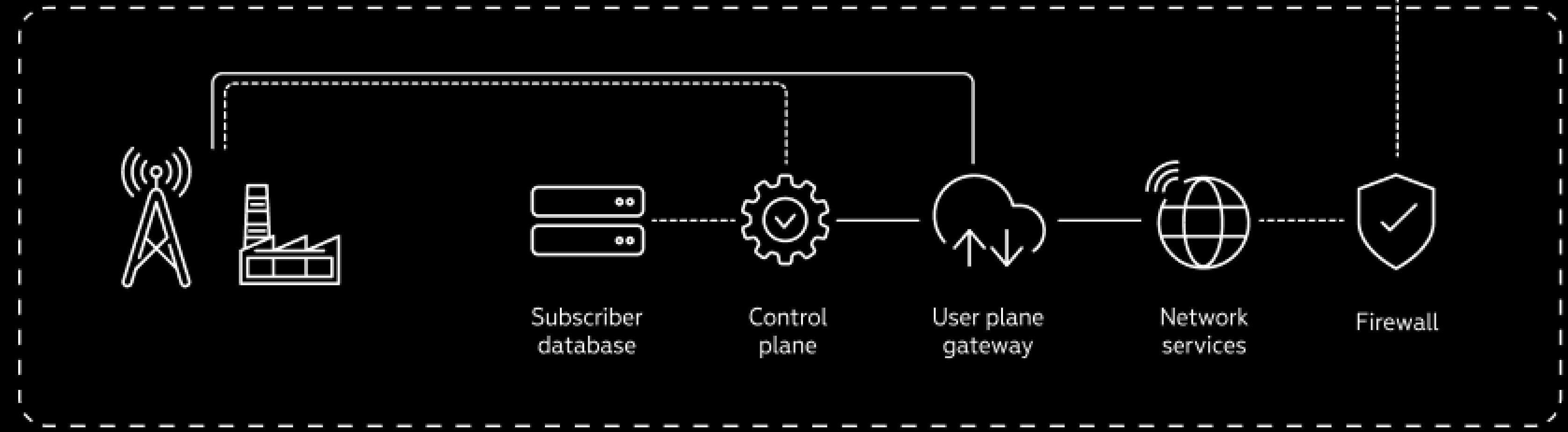
Large indoor areas, high ceilings or significant outdoor area

SNPN: Stand-alone

Public network



Private network

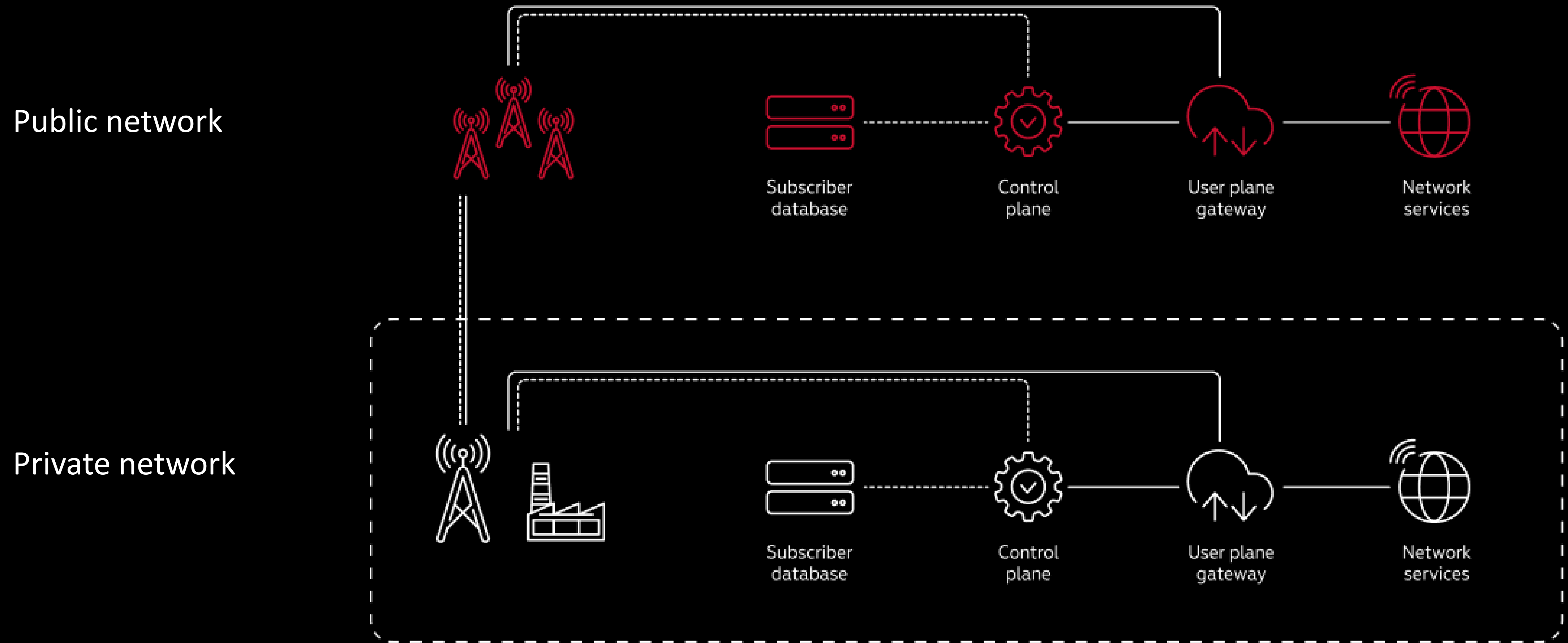


SNPN: Stand-alone

- Fully isolated network
- Licenced radio spectrum – low probability of interference
- Higher QoS – independent from the MNO network
- Data security, local data storage
- Lowest latency
- Reduced cable installation
- No monthly fee for users

- A separate radio frequency required
- Required technical competence – in-house or outsourced

PNI-NPN: Shared RAN

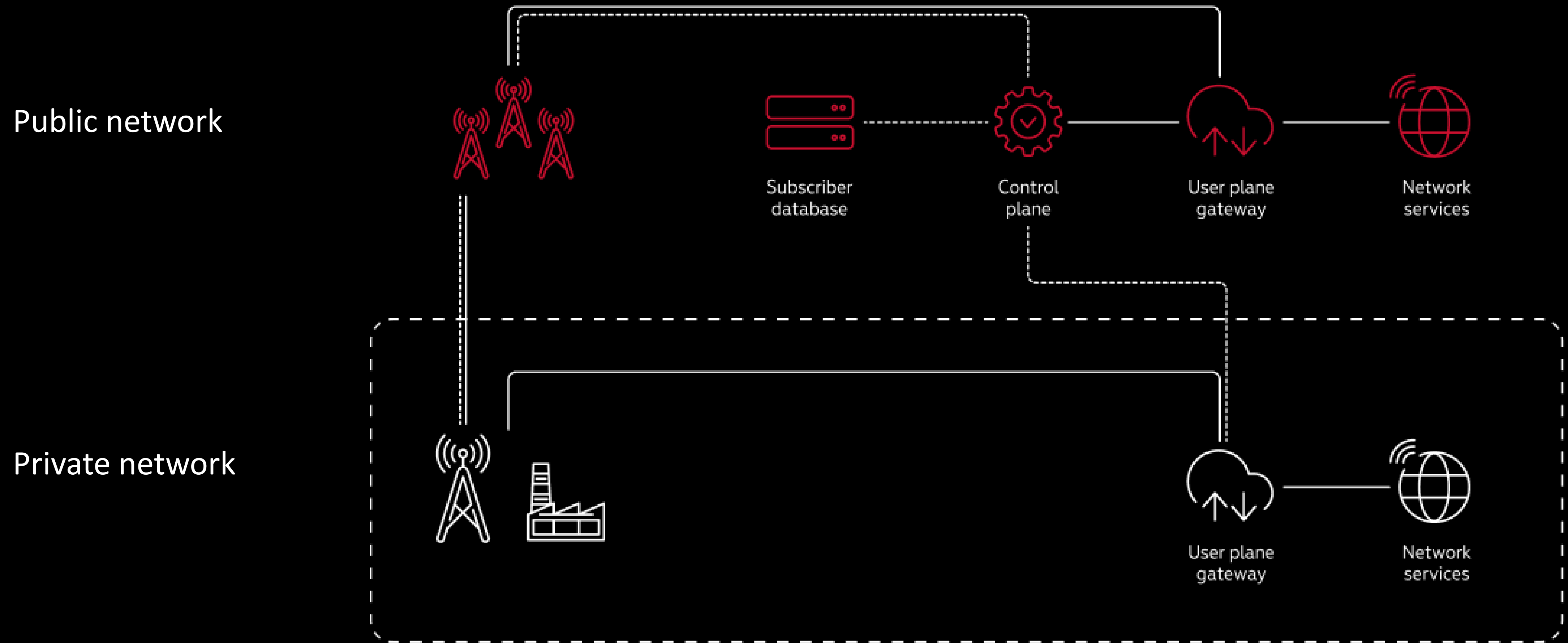


PNI-NPN: Shared RAN

- Licenced radio spectrum – low probability of interference
- Data security, local data storage
- Low latency
- Reduced cable installation
- No monthly fee for users

- Dependence of MNO RAN HW – not fully isolated
- A separate radio frequency required
- Required technical competence – in-house or outsourced

PNI-NPN: Shared RAN & Core CP

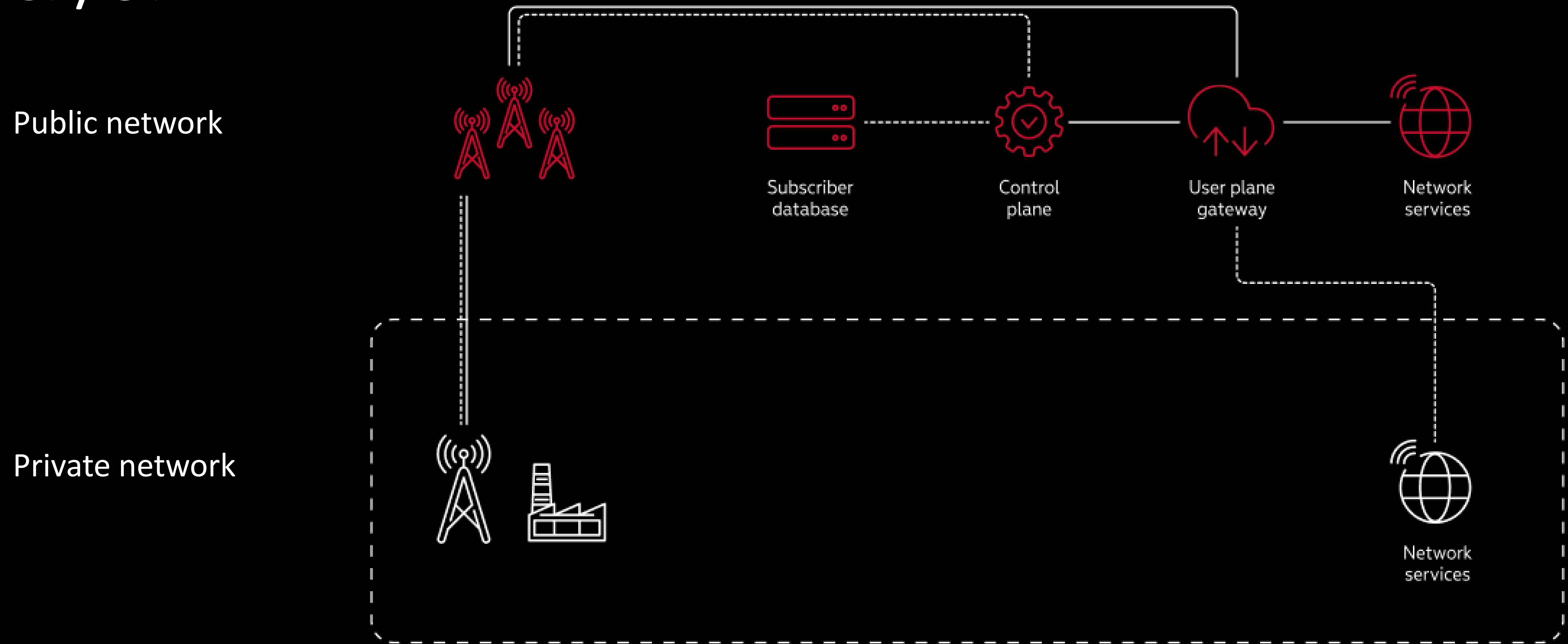


PNI-NPN: Shared RAN & Core CP

- User Plane (UP) separated from the Control Plan (CP) – main data stays in the company infrastructure
- Licenced radio spectrum – low probability of interference
- Reduced cable installation
- Lower CAPEX requirements

- Dependence of MNO RAN & CP HW – not fully isolated
- NPN user base in the MNO network
- Latency depends on MNO commercial network
- Required technical competence – in-house or outsourced
- Monthly fee per user

PNI-NPN: Shared RAN & Core CP/UP





PNI-NPN: Shared RAN & Core CP/UP

- + Priority of the private network comparing to MNO commercial network
- + Use of licensed MNO spectrum with smaller probability of interference
- + Reduced cable installation
- + Lower CAPEX requirements

- Integrated in the MNO commercial network – not isolated
- NPN user base in the MNO network
- Latency depends on MNO commercial network
- Monthly fee per user
- Security level of the network depends on MNO

5G Stand-Alone integration with LAN

-  5G SA is integrated with LAN – ensuring uninterrupted connectivity and data flow
-  Security:
 - Firewall integration to protect the 5G NPN from cyber threats;
 - VPN: to ensure secure access for 5G NPN remote management.

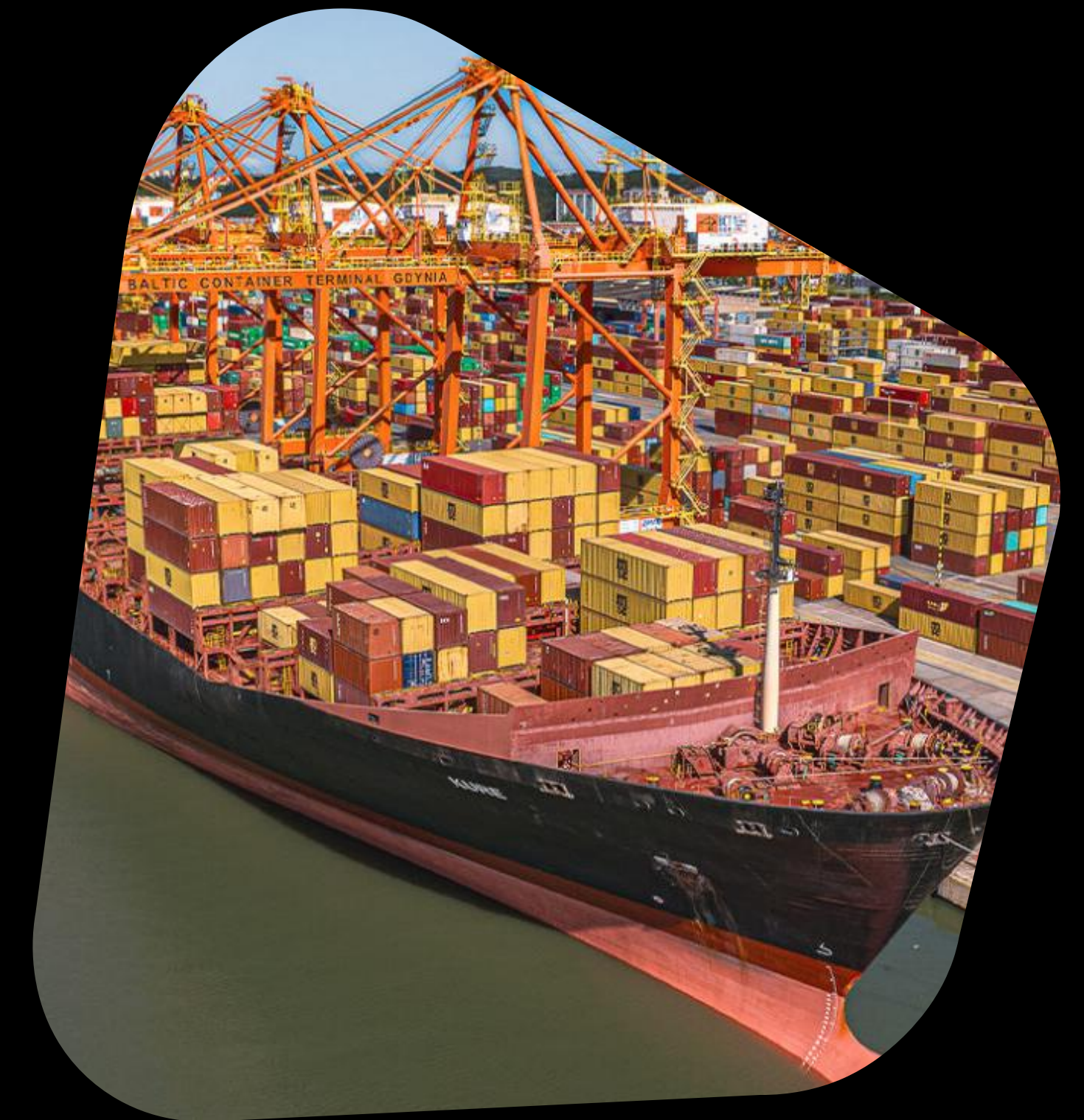
Baltic Container Terminal

Location: On the banks of the Daugava River within the Freeport of Riga.

Annual Throughput: Over 325,000 TEU containers transhipped each year.

Main Operations:

- Berthing: Managing the berthing of ships at terminal berths.
- Container Handling: Loading and unloading of containers.
- Cargo Storage: Storage solutions and various warehouse services.



Existing challenges

- Unstable WiFi Coverage
- Outdated WiFi Equipment
- Limited Data Transfer Speeds
- Analog Motorola Radios



Tested Use Cases

- 5G NPN Coverage
- PTT Functionality
- Data Transmission from Cranes
- Seamless Connectivity for Mobile Objects
- A network integrated with the LAN

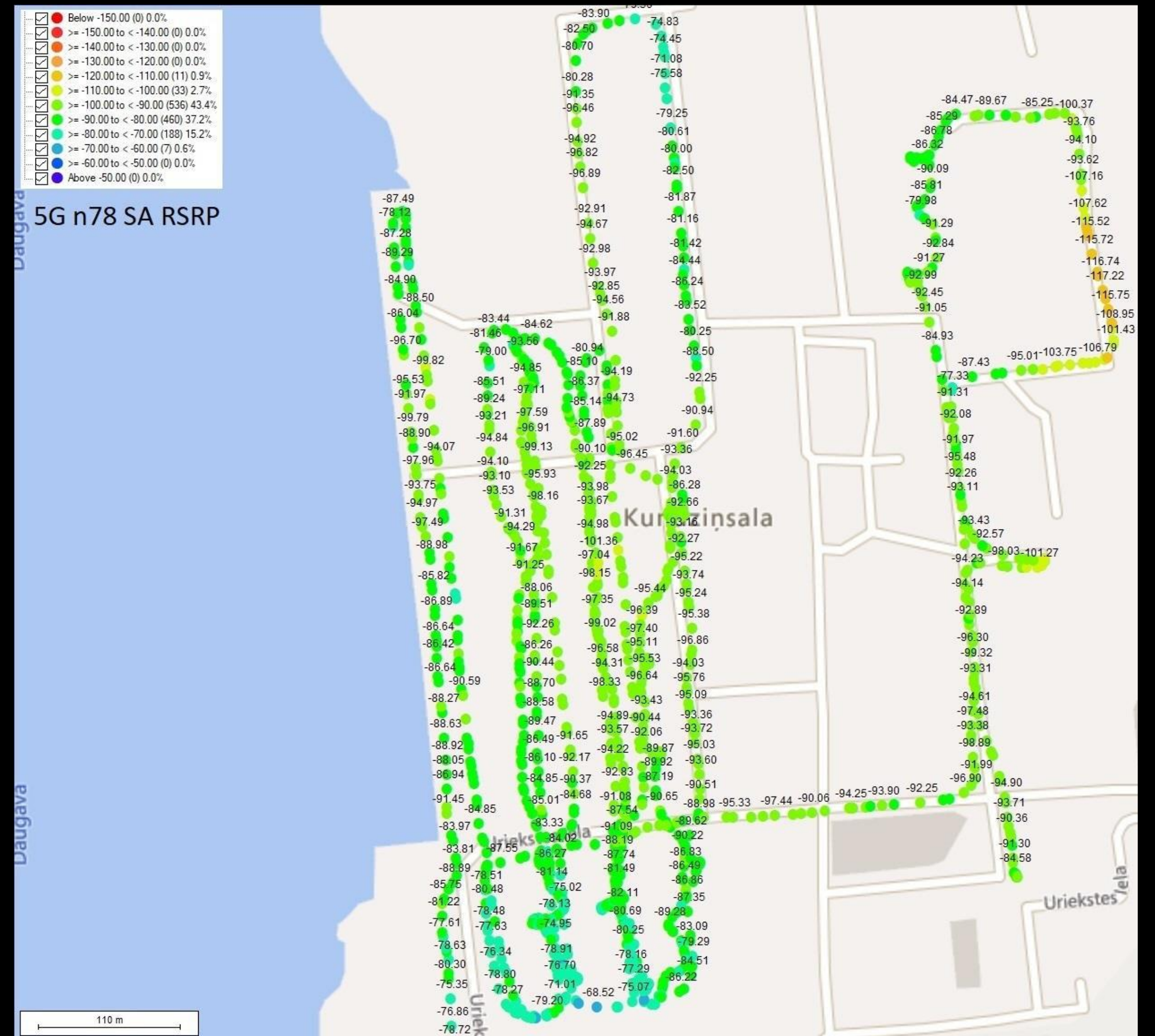
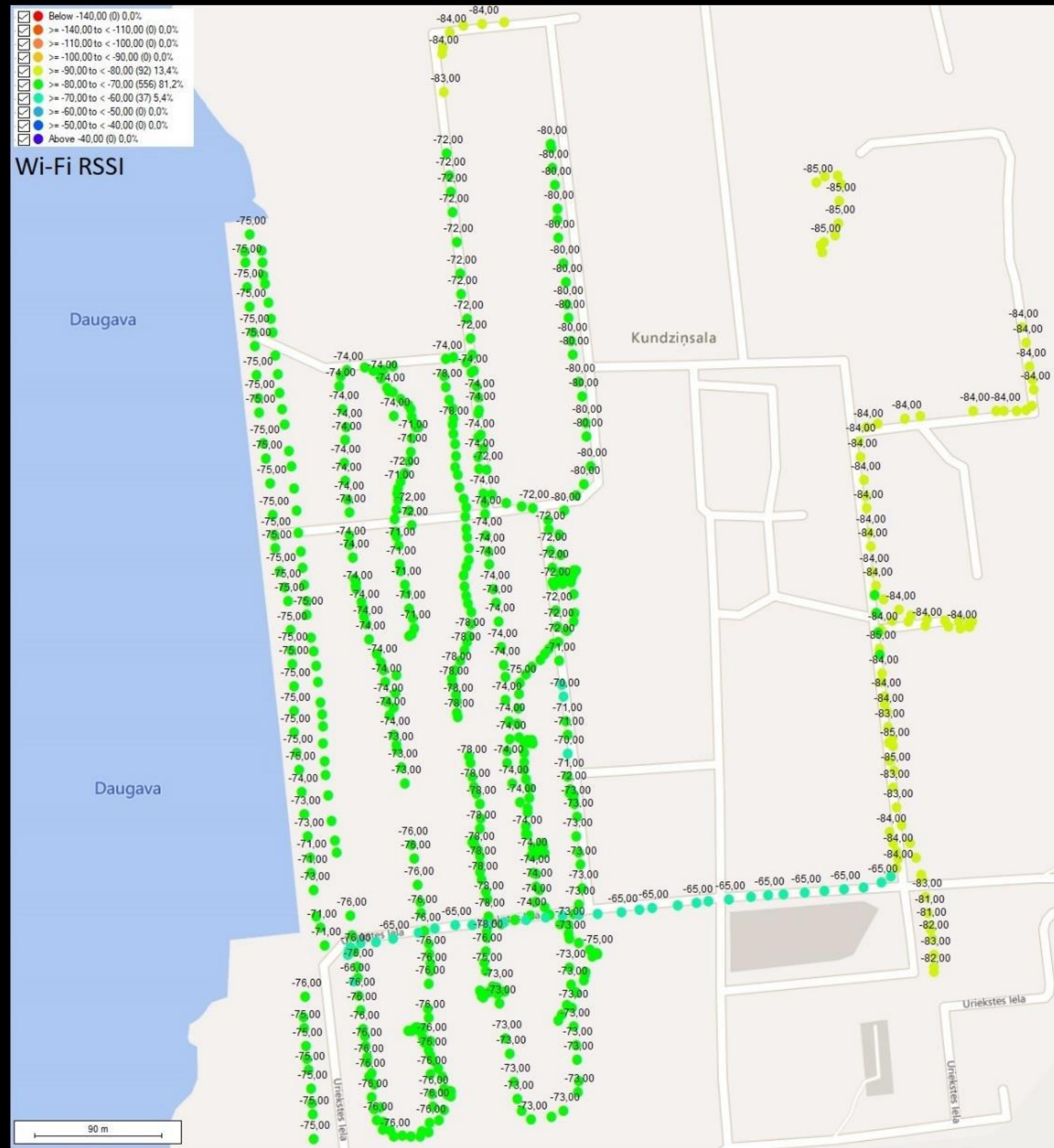


Test Results

- Excellent Coverage: Achieved with 2 or even just 1 antenna (50W power per antenna).
- PTT Functionality: Worked as requested.
- Data Transmission from Cranes: demonstrated good performance.
- Seamless Operation: Equipment operated without data session interruptions, with speeds up to 100Mbps.
- Integrated Network: Network integrated with the local LAN, on-site devices worked flawlessly.

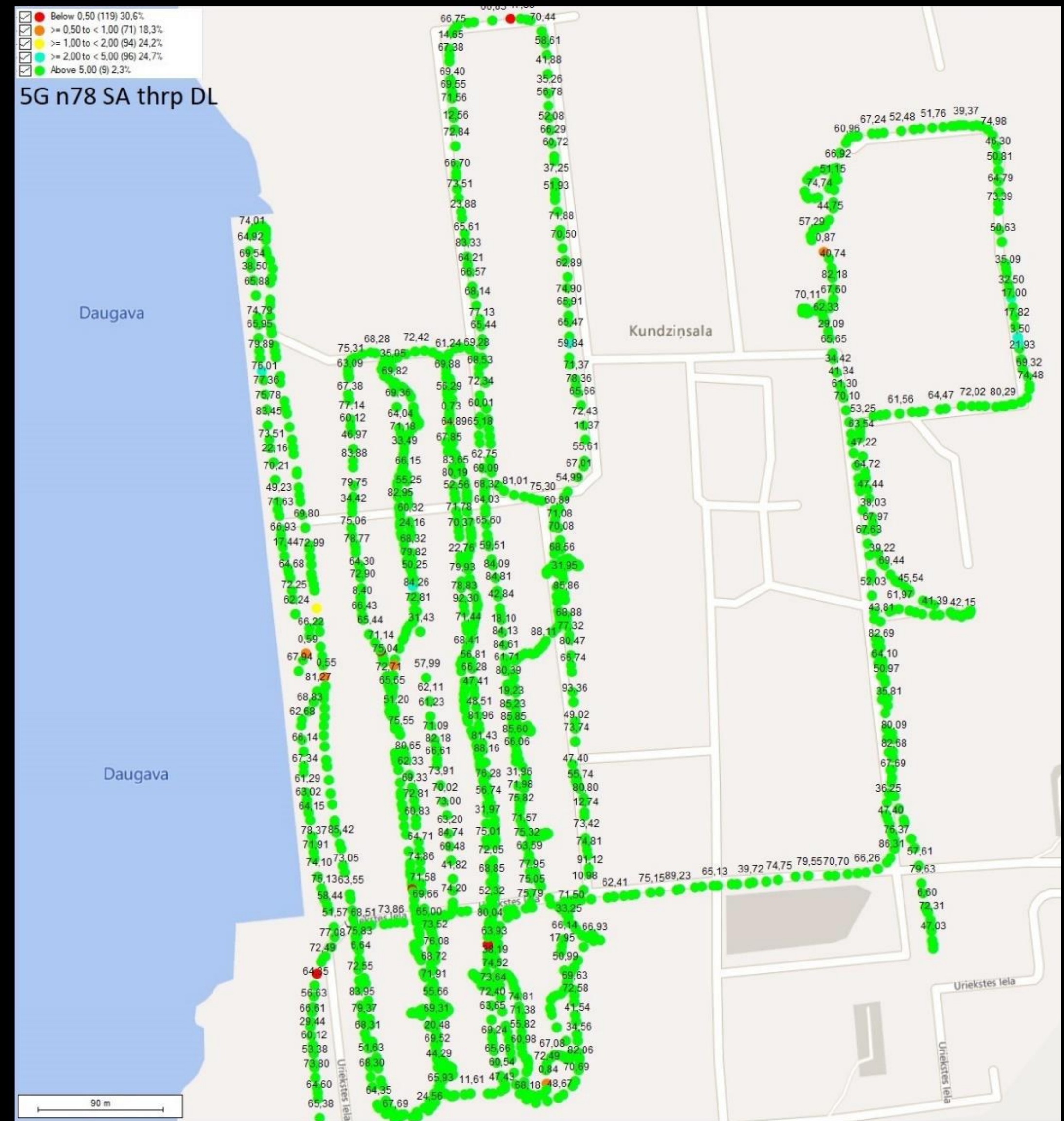
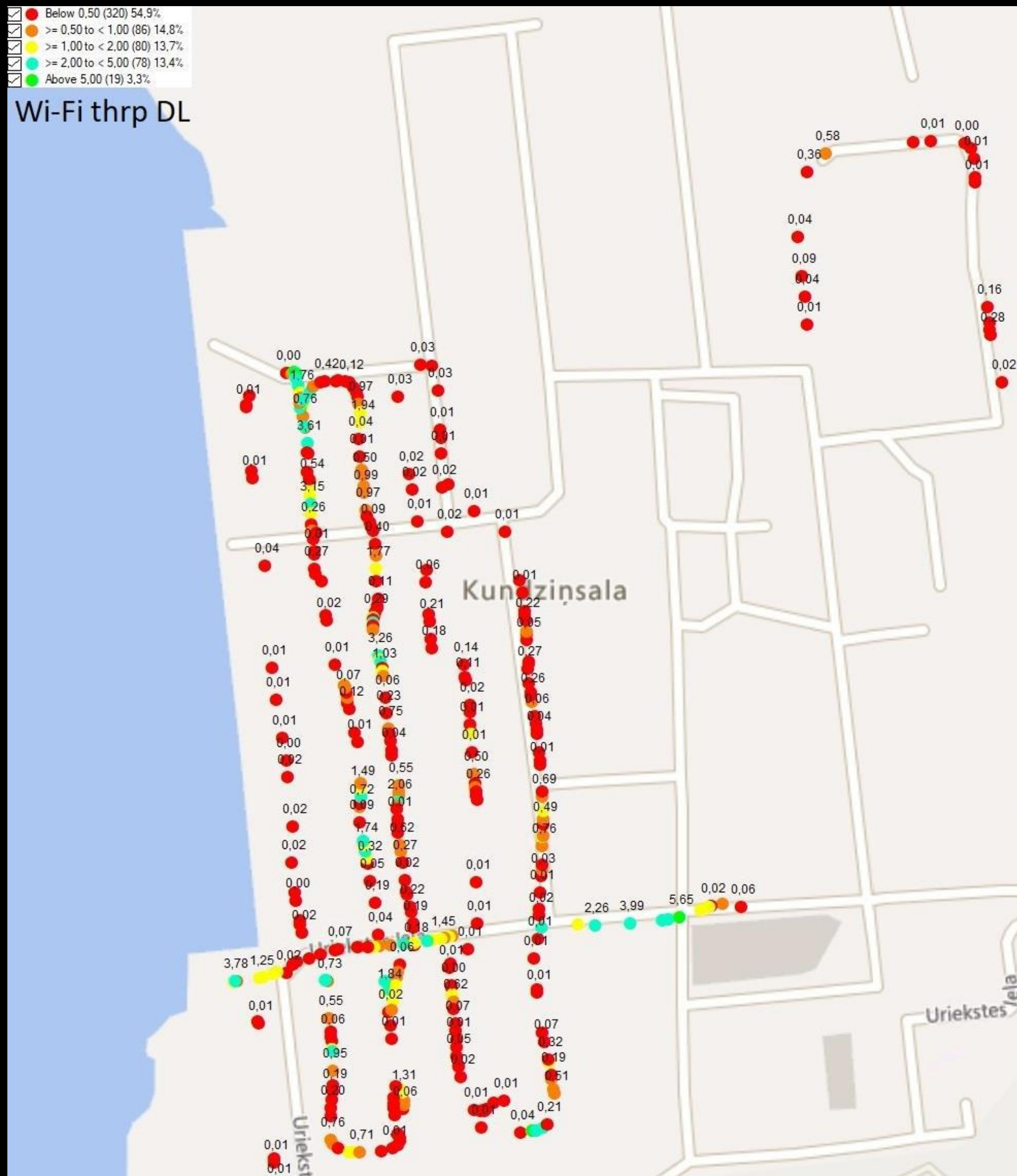


WiFi vs. 5G Coverage

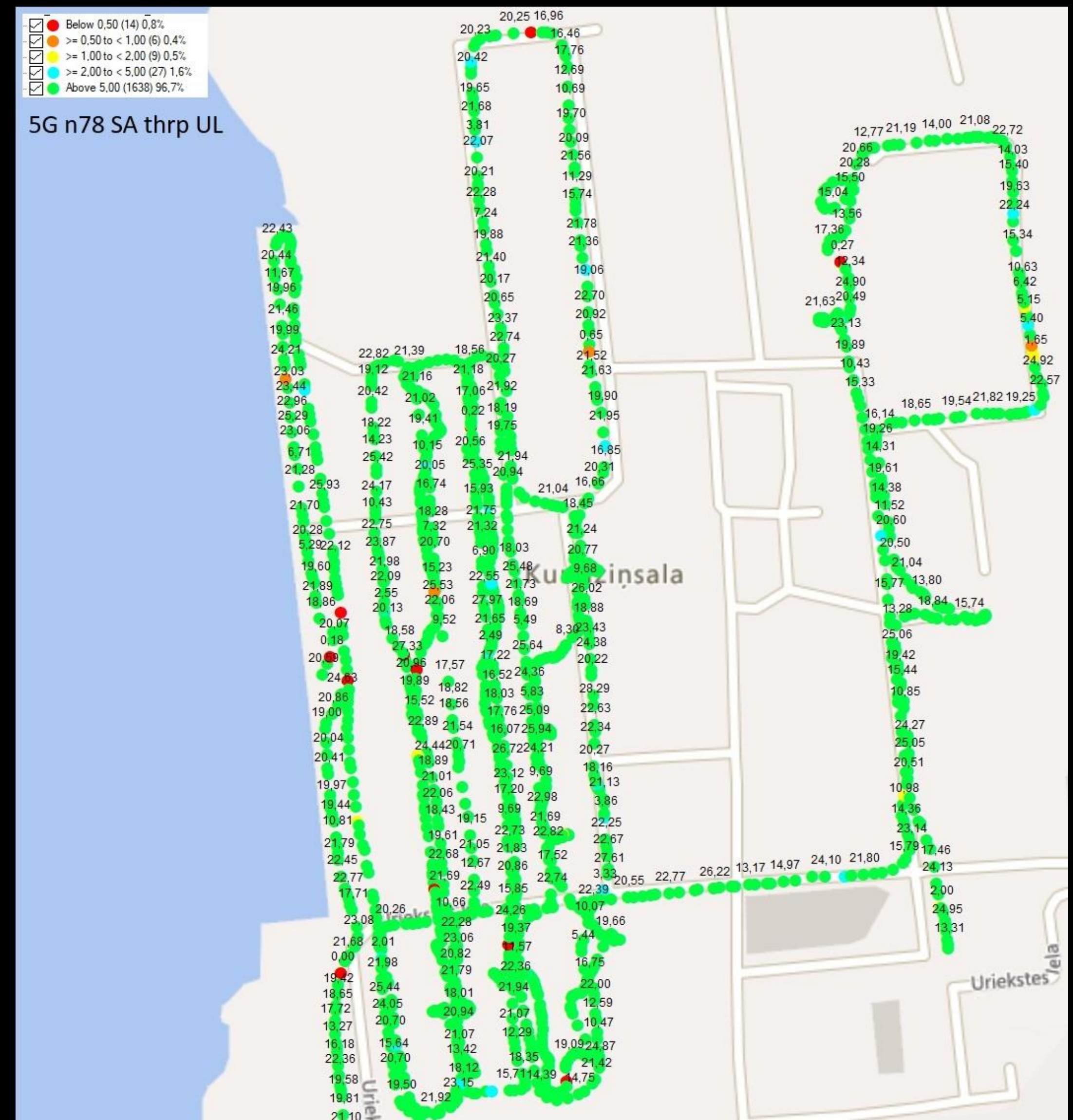
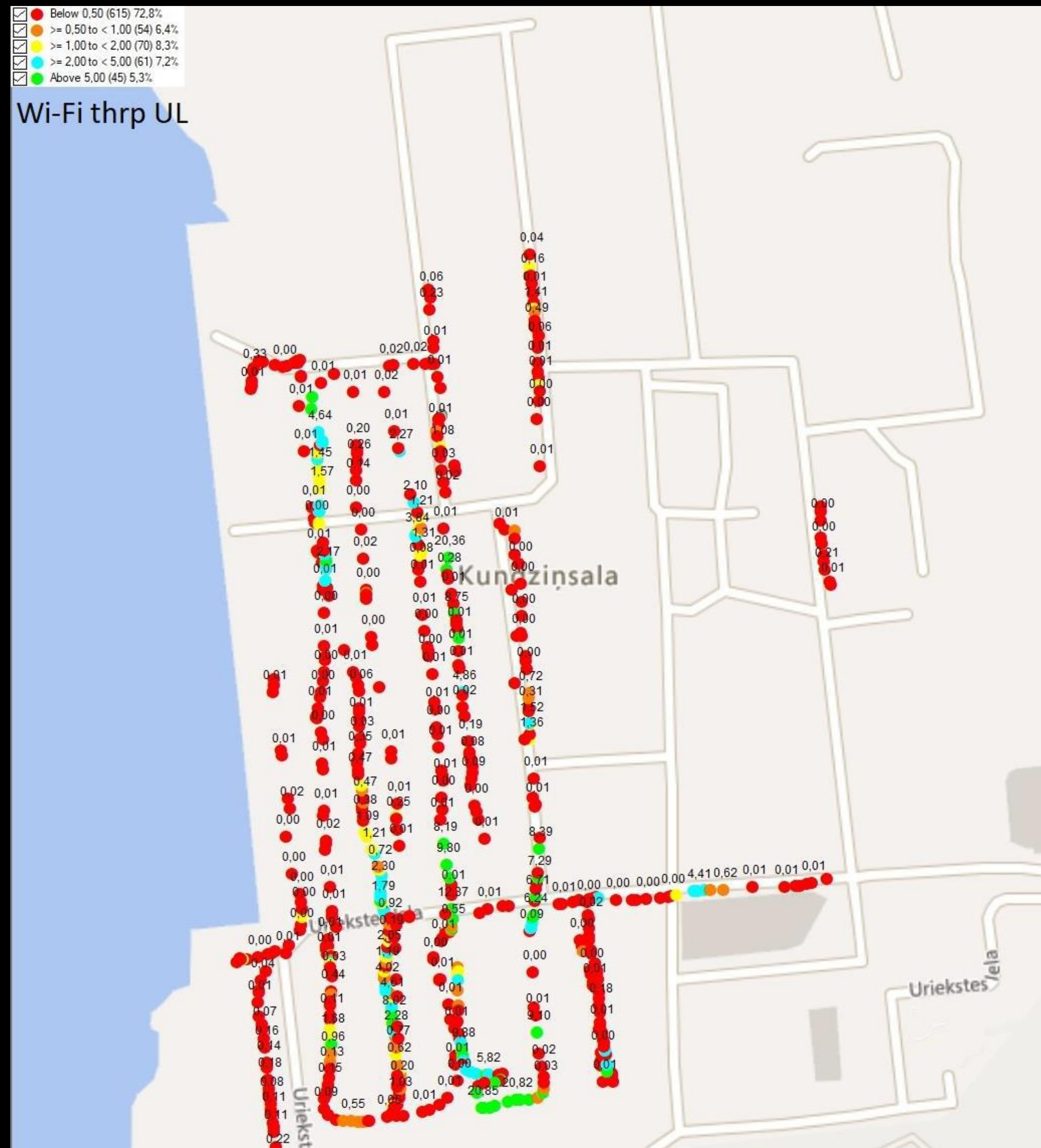


WiFi vs. 5G

Download



WiFi vs. 5G Upload



5G & WiFi use cases



WiFi projects:

- For indoor areas with large amount of access points to reduce overall investment.
- Good solution with lower security requirements.

5G Stand-alone projects:

- High security and mobility, higher transmission speed, wide coverage.
- The best choice for industrial solutions with high security and performance requirements.

Hybrid projects (5G Stand-alone + WiFi):

- Larger territories with various levels of requirements – WiFi for public spaces indoors, 5G for large outdoor areas and industrial indoor sites as well as business critical systems.

NPN implementation steps

- 👁️
Network planning:
 - Frequency spectrum: in Latvia n78 - 3750-3775 MHz, 25MHz wide dedicated spectrum from LMT.
 - Network design and customer requirements.
- 📶
Infrastructure development:
 - Antenna, base station, core installation.
 - Core integration with LAN.
- ⚙️
Testing and adaptation:
 - Connectivity and performance testing.
- ✅
Maintenance and optimization:
 - Technical support and improvements.



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