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NETWORK ARCHITECTURE AND SLICING FOR VERTICAL TRIALS IN THE 5GTN TEST FACILITY

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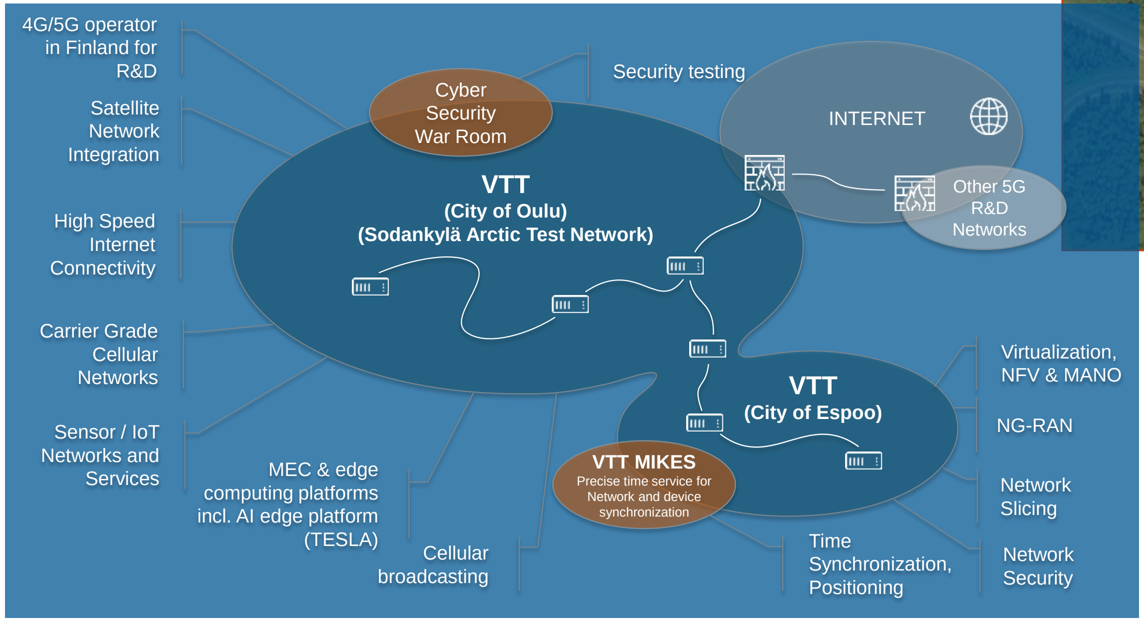
5G HEALTH AQUACULTURE AND TRANSPORT VALIDATION TRIALS

5G Test Network (5GTN) Oulu, Finland

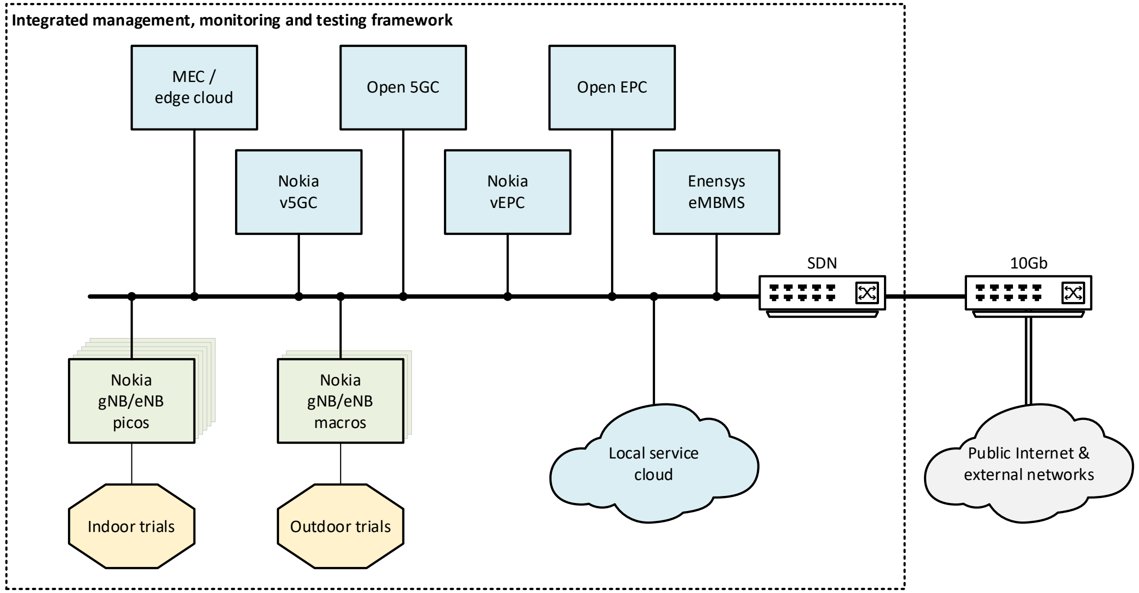
- Support for 5G NR and LTE-A access
- Variety of core network options available for different use cases
- Support for edge cloud/MEC deployments and cellular multicast/broadcast



- Indoor and outdoor coverage at VTT Oulu premises
- Full control and visibility into the infrastructure

Key capabilities

- Core & transport
  - 5GC: carrier grade and open source
  - EPC: carrier grade and open source with eMBMS support
  - Transport: 10 Gb with SDN support
- Radio & edge
  - 5G NR: 1 outdoor + 2 indoor cells (4x2 MIMO)
    - 3.5 GHz – Band n78 TDD with 60 MHz BW
  - LTE-A: 3 outdoor + 9 indoor cells (2x2 MIMO)
    - 700 MHz – Band 28 FDD with 10 MHz bandwidth for NB-IoT
    - 2.1 GHz – Band 1 FDD with 10 MHz bandwidth for LTE-A and NB-IoT
    - 2.6 GHz – Band 7 FDD with 10+5 MHz bandwidth for LTE-A
- Management & orchestration
  - Combination of proprietary and open source tools for network management and monitoring

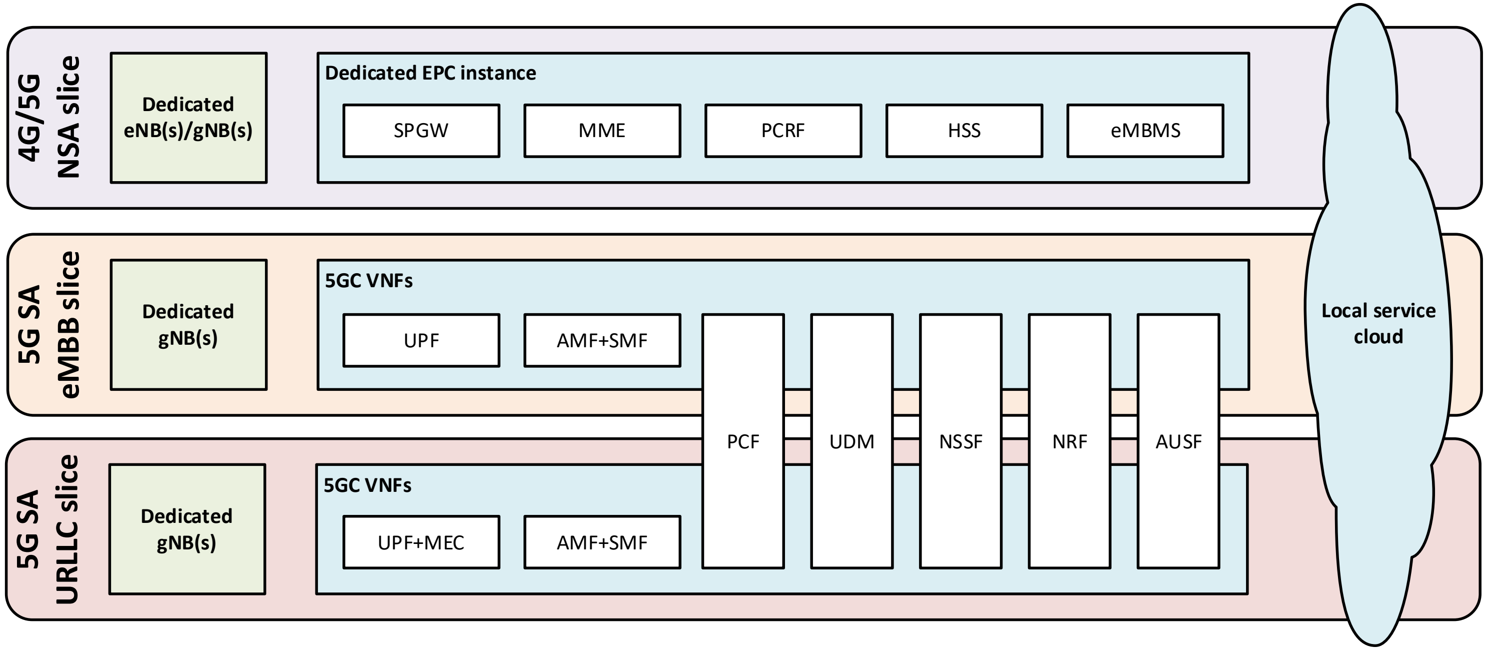


Vertical trials in 5GTN

Vertical	Sub use cases / scenarios	Description	Service Type	Notes
Healthcare	H1A	Educational Surgery	eMBB	Requires MEC and eMBMS with 5G NSA and SA.
Transport	T2S4	Human Tachograph	uRLLC	Emphasis on low latency over ultra-reliability. Requires MEC.
	T4S1	Vehicle Prognostics	mMTC	-
	T4S2	Over-the-air (OTA) Updates	mMTC	Requires eMBMS with 5G NSA and SA.

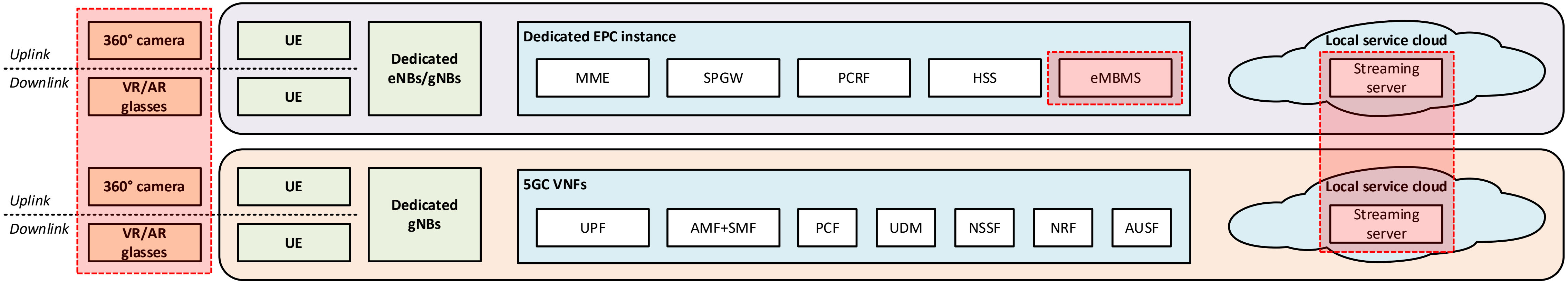
Deployment of vertical trials

- Three types of slices
  - 4G / 5G NSA
  - 5G eMBB
  - 5G URLLC
- Edge cloud enables low latency for 5G URLLC deployments
- Rudimentary RAN slicing with dedicated eNBs/gNBs



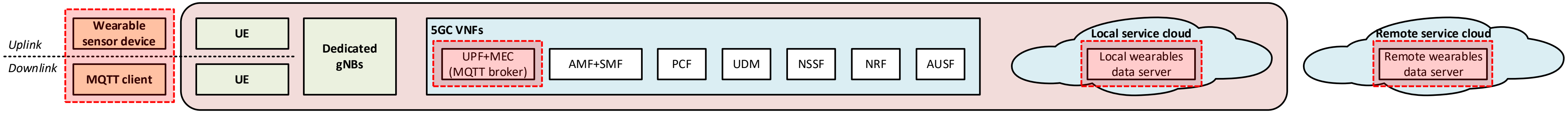
Deployment of Healthcare trials

- **Remote Interventional Support: H1A – Educational Surgery**
- eMBB and 4G / 5G NSA slice configurations
- Service components and user devices
  - 360° video camera transmitting live feed over 5G uplink
  - Video streaming server in the local cloud distributing 360° video content
  - Smartphones and VR/AR classes receiving the content over 5G downlink



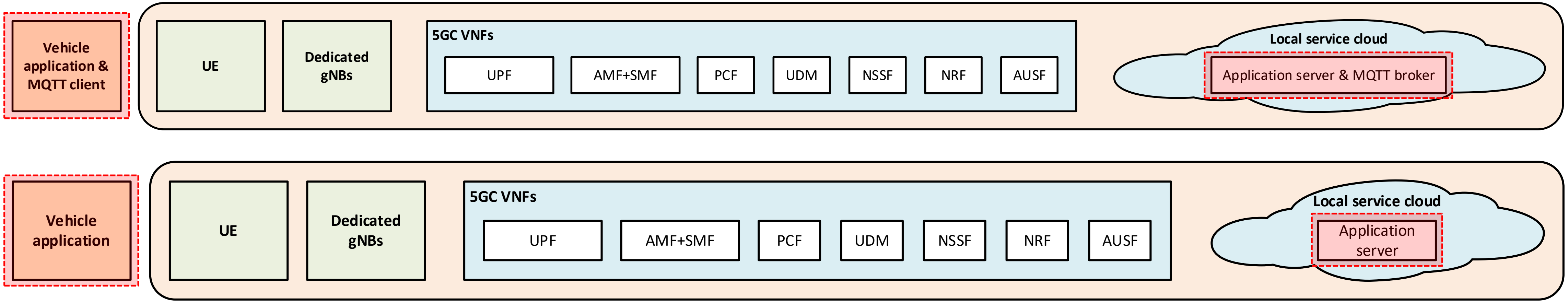
Deployment of Transport trials (1/2)

- **Autonomous/Assisted Driving: T2S4 – Human Tachograph**
- URLLC slice configuration
- Service components and user devices
  - Wearable sensor devices streaming data over 5G uplink
  - Wearables data server in the local cloud processing live sensor data
  - Wearables data server in the remote cloud processing historical sensor data
  - MQTT broker in the edge cloud triggering warning messages
  - MQTT clients in smartphones receiving the warning messages over 5G downlink



Deployment of Transport trials (2/2)

- **Vehicle Data Services: T4S1 – Vehicle Prognostics & T4S2 – Over-the-Air Updates**
- eMBB slice configuration
- Emulated service components providing use case specific test traffic
  - Measurements of the best case performance for single user
- mMTC aspects of the use cases assessed and validated using traffic emulators
  - Measurements of the scalability for large amount of emulated users



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FOR YOUR ATTENTION

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