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Military use of 5G

Kennet Nomeland

Radio Systems Architect

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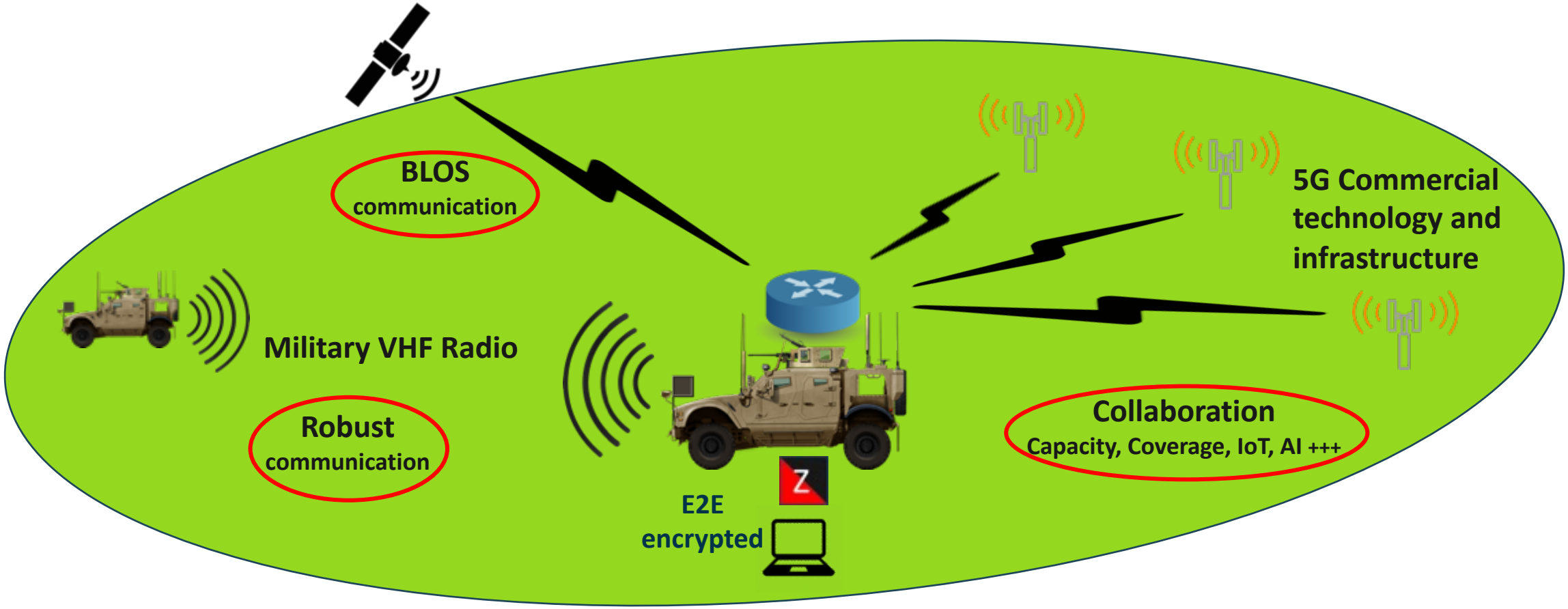
Communication for different scenarios



3GPP ecosystem gives many new possibilities

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Broad collaboration & Iterative Development

4G Prototyping

5G Pilots

BUILD / TEST / DESIGN

Selection of partner(s)

Commercial agreement
Defence NW Slice

Strategic Cooperation

Fixed network- Fiber -Pilots -Coverage -Spectrum - Edge

Strategic 5G — 5G-VINNI Vertical Innovation Infrastructure **Telenor Research**

Tactical 5G — FUDGE-5G Fully Disintegrated private networks for 5G verticals **Telenor Research**

FFI (Norwegian Defence Research Establishment) **CD&E, Research, Analysis**

NSM (Norwegian National Security Authority) **Research, Analysis**

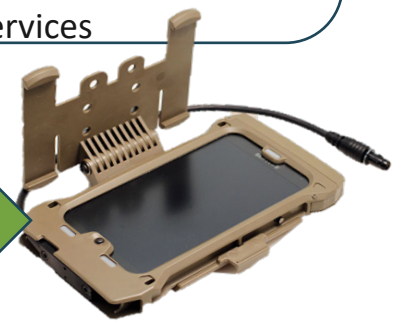
Defence renewal program MIME (funding + operational requirements)

FMA (Norwegian Defence Materiel Agency) **Project management, procurement**

2019 | 2020 | 2021 | 2022 | 2023

Mobile communication for Military use

- Robust
- High availability
- Secure
- Necessary functionality and services



Adapting 5G to military use

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Rygge military airbase

Strategic 5G

5G-VINNI

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5G-VINNI

5G New Radio testing at Rygge military airbase

Range, Capacity and Robustness in different frequency bands

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FUDGE 5G pilot

5G Private Network

FUDGE-5G

Cell on Wheels

Tactical 5G

Fully Disintegrated private networks for 5G verticals (FUDGE)

- EU funded 5G pilot - Running until March 2023
- Fully autonomous 5G SA Private Network
- Equipped with Edge for PPDR / Defence Use Cases

Goal:

- Utilize both **Public** and **Private** 5G network
- Utilize centralized Clouds, 5G and Edge to create **Better** and more **Robust** services
- Leverage 5G SUCI security concept (Subscription Concealed Identifier) to **mitigate IMSI catcher problems**

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FUDGE-5G

Cell on Wheels

Tactical 5G

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FUDGE-5G

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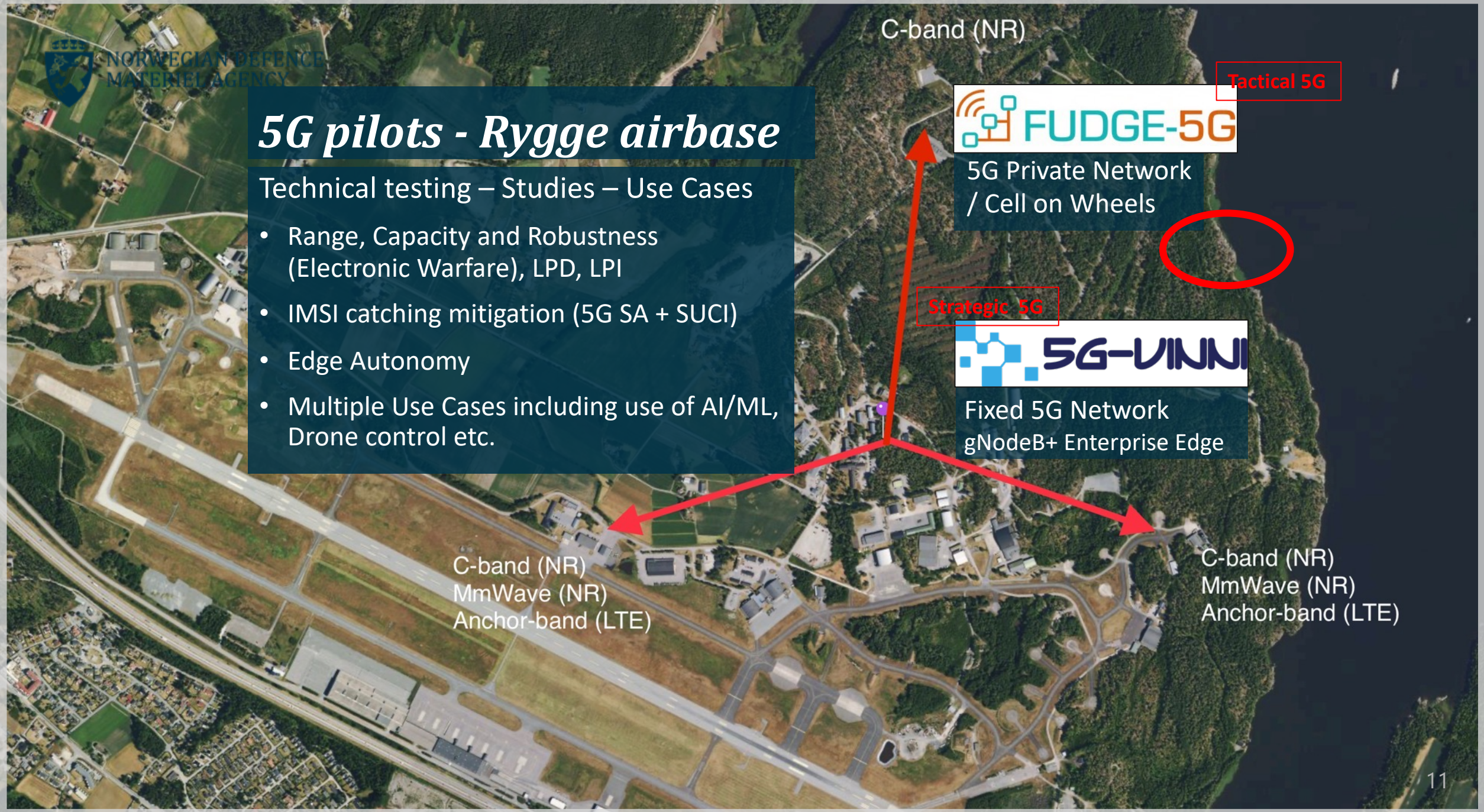
Tactical 5G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5G pilots - Rygge airbase
Technical testing – Studies – Use Cases
• Range, Capacity and Robustness (Electronic Warfare), LPD, LPI
• IMSI catching mitigation (5G SA + SUCI)
• Edge Autonomy
• Multiple Use Cases including use of AI/ML, Drone control etc.
C-band (NR)
Tactical 5G
FUDGE-5G
5G Private Network / Cell on Wheels
Strategic 5G
5G-VINNI
Fixed 5G Network
gNodeB+ Enterprise Edge
C-band (NR)
MmWave (NR)
Anchor-band (LTE)
C-band (NR)
MmWave (NR)
Anchor-band (LTE)

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Network Slicing *to separate Public and Military traffic*

eMBB NW Slice

Public use
- Roaming abroad
- Social media
- Access to Internet

2G, 3G, 4G, 5G

Separation

IoT SAFE

Military use
- Only Data / SUCI / IoT SAFE
- Removal of attack vectors (No Roaming /No Internet)
- Shielding of metadata
- Disable legacy technology
- Autonomy
- Coverage «on-demand»

Public nationwide 5G SA networks

Edge Computing

Necessary Services

Improved Security

Better Availability

IoT

Defence NW Slice

Strategic 5G

Private 5G Network

Tactical 5G

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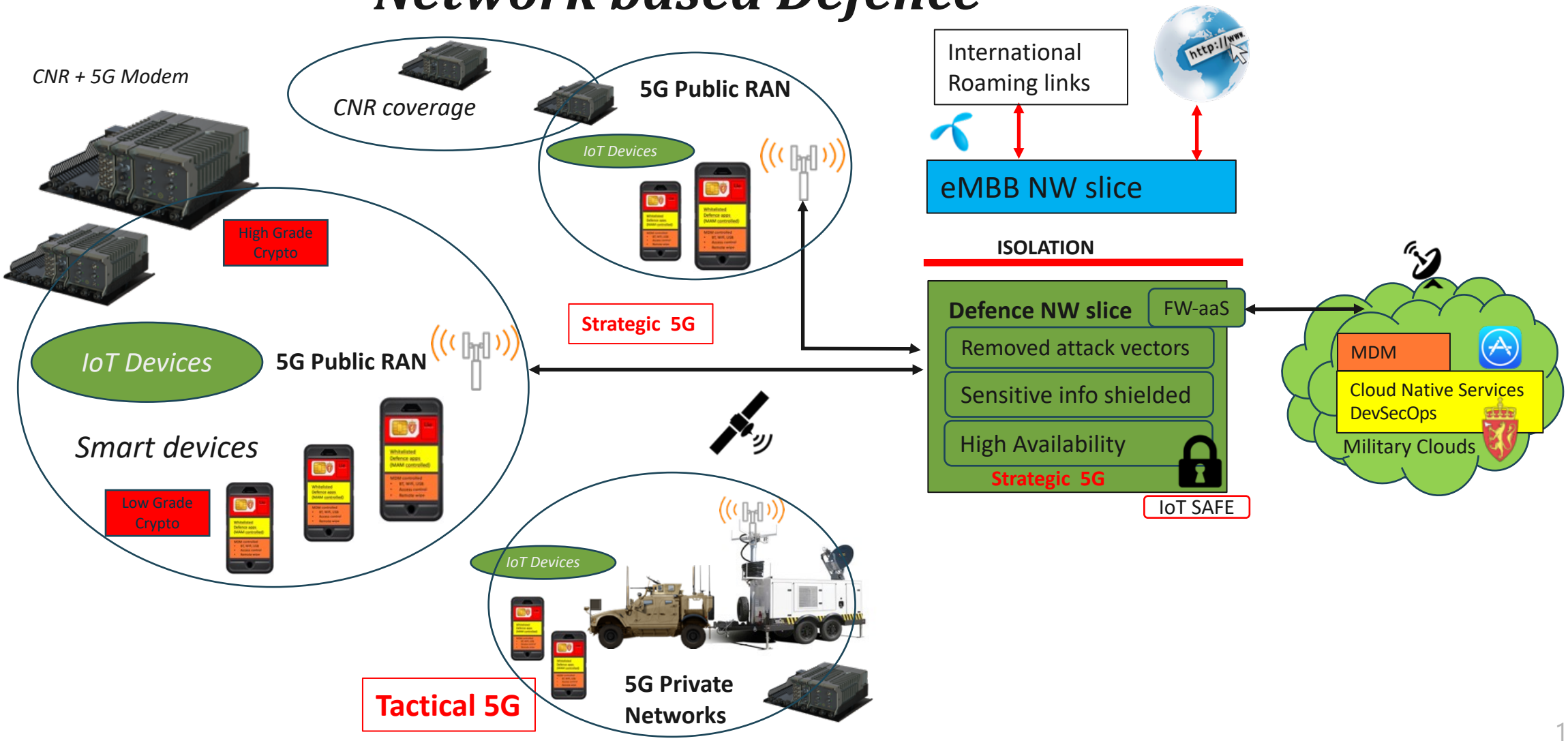
Network based Defence



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Autonomy

Enabled by **Edge Computing** and **5G Private Networks**

Foto: Lars Rørås/ Forsvaret

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Strategic 5G

5G-VINNI

Autonomous Edge in strategic important areas

Defence Slice with full 5GC functionality + Services running in the Edge is providing services in important areas (airport, hospital, naval base) even when the central 5GC DC is not available

5G Core

Central Data Center Oslo

Fiber Cut

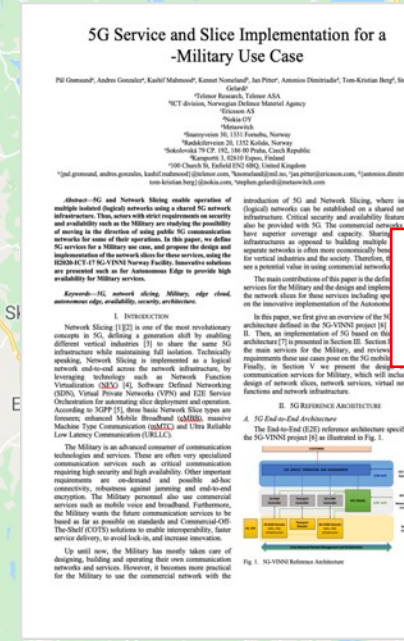
Defence Slice has dedicated 5G Core also in Edge

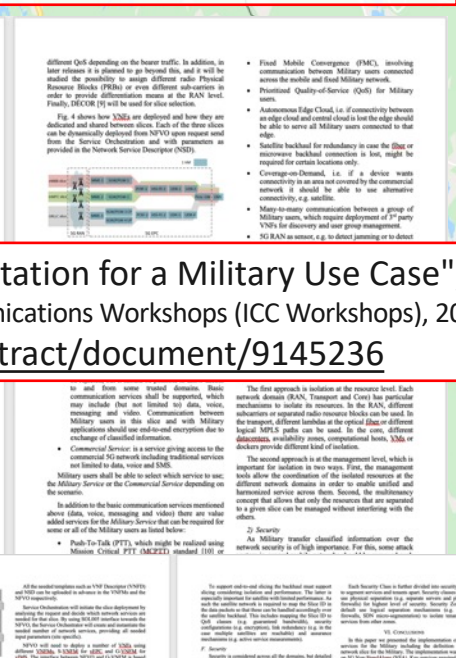
Important Services available in our Defence NW Slice e.g. PTT

(Application Function)

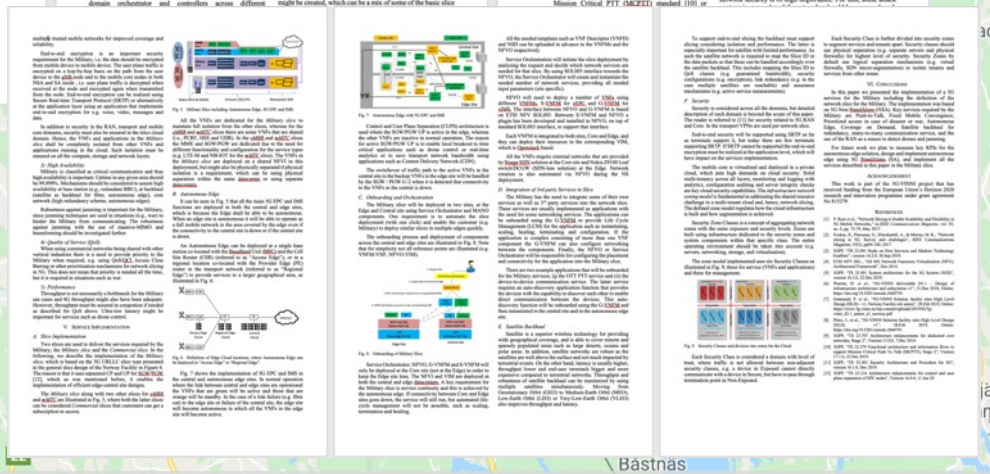
Autonomous Edge

(MEC) connected to gNB (basestations) Rygge Airbase


5G Service and Slice Implementation for a -Military Use Case



"5G Service and Slice Implementation for a Military Use Case",
IEEE International Conference on Communications Workshops (ICC Workshops), 2020
https://ieeexplore.ieee.org/abstract/document/9145236



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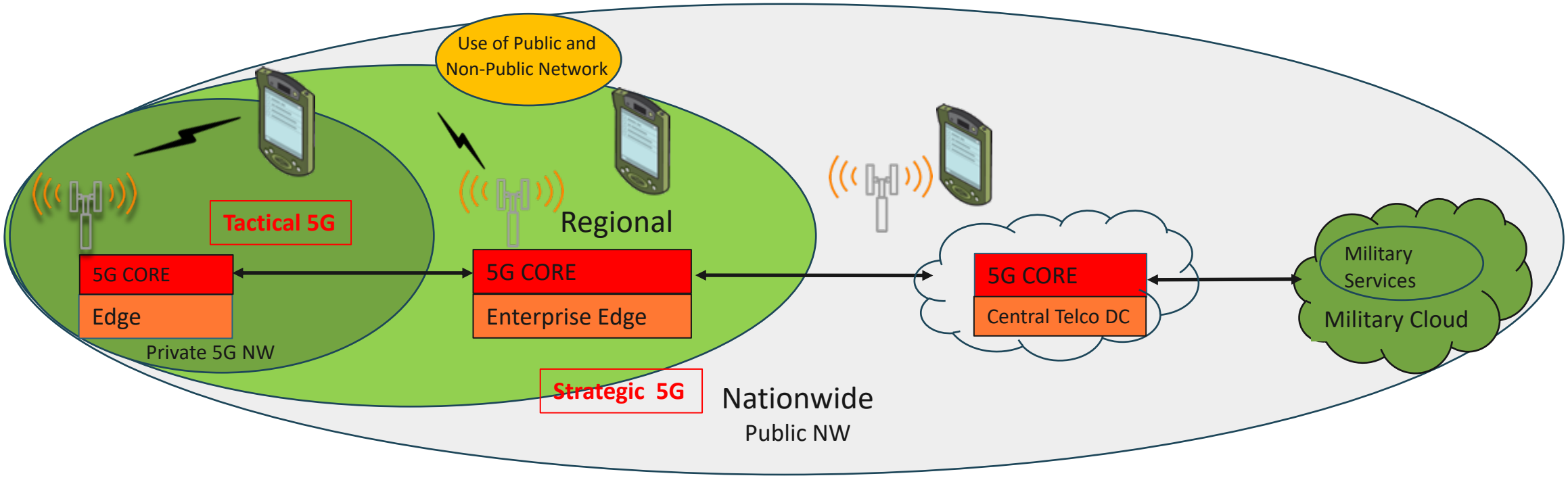
5G Private Networks (S-NPN)

FUDGE-5G



From a **Telco** perspective

How to utilize both **Private** and **Public** 5G networks

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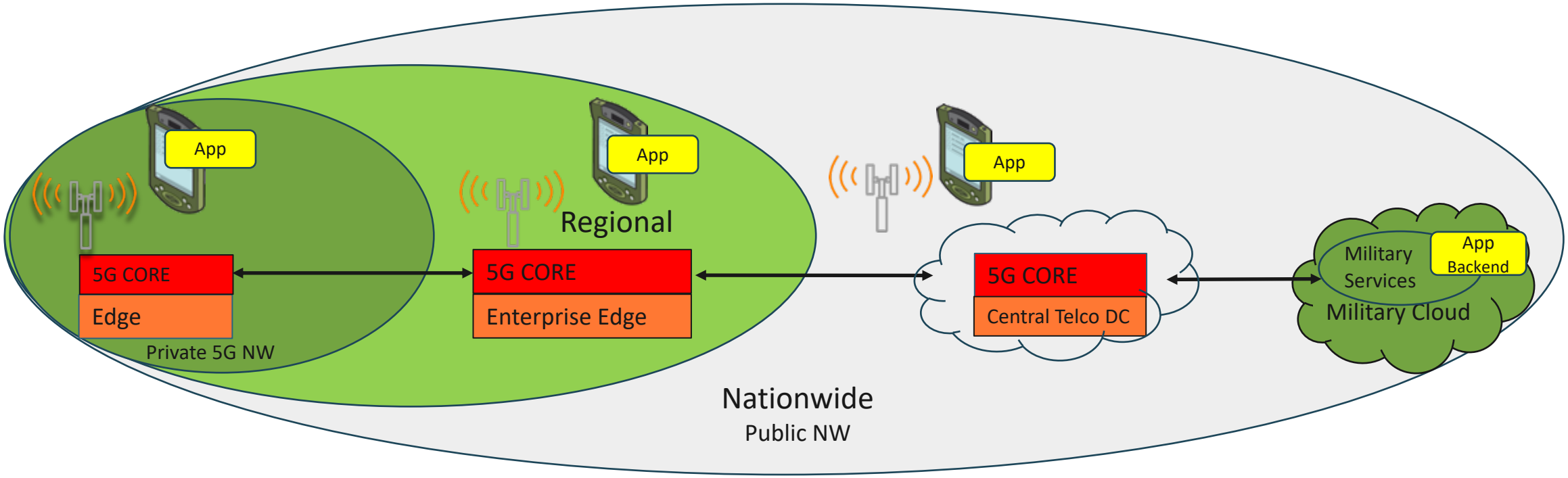
Edge Computing – The extended cloud



From a **Service** perspective

How to utilize centralized clouds, 5G and Edge to create **Better** and more **Robust** services

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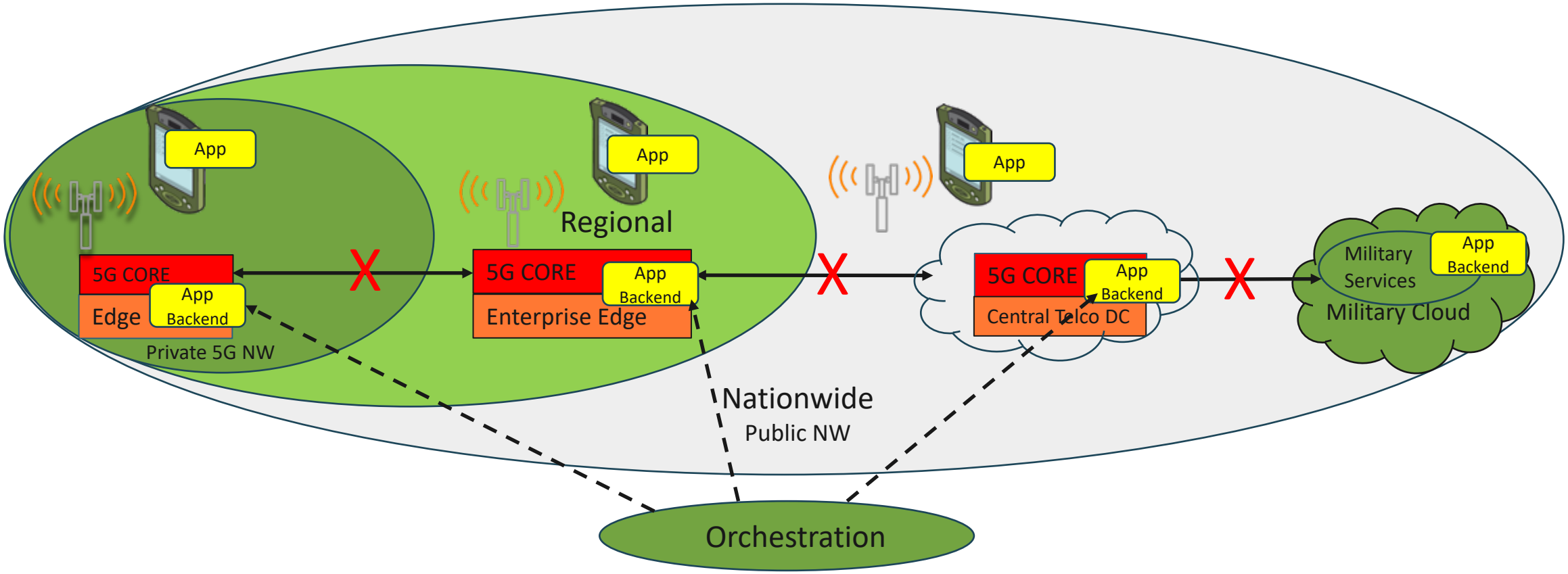
Edge Computing – The extended cloud



How to utilize centralized clouds, 5G and Edge to create **Better** and more **Robust** services
(Cloud Native principles)

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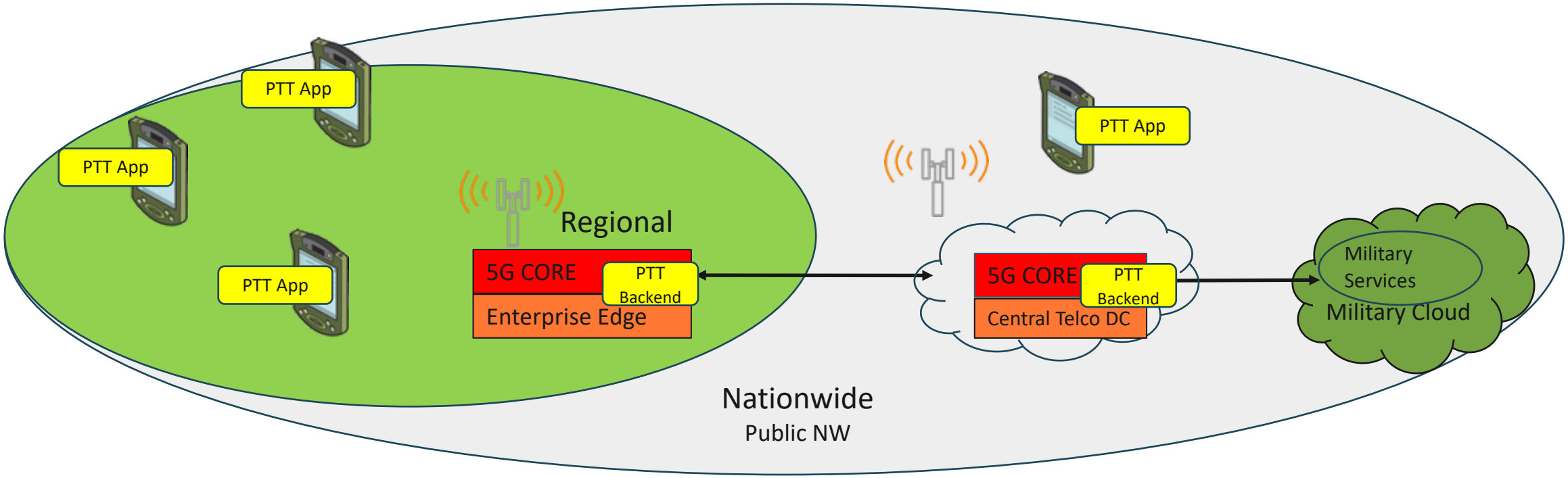
Edge Computing – The extended cloud



Services offered in close cooperation with a strategic MNO partner

Application Function in Defence Network Slice + Enterprise Edge

(PTT=Push-To-Talk)

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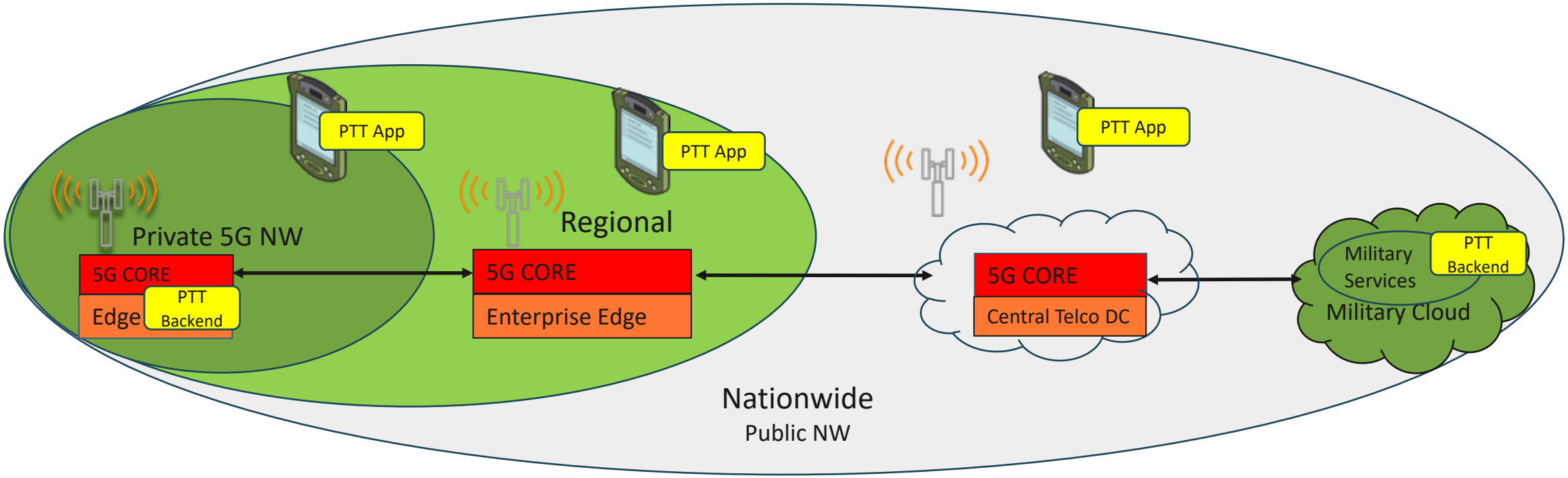
Edge Computing – The extended cloud

FUDGE-5G



Services offered from 5G Private Networks (NPN) and Military Clouds

(PTT=Push-To-Talk)

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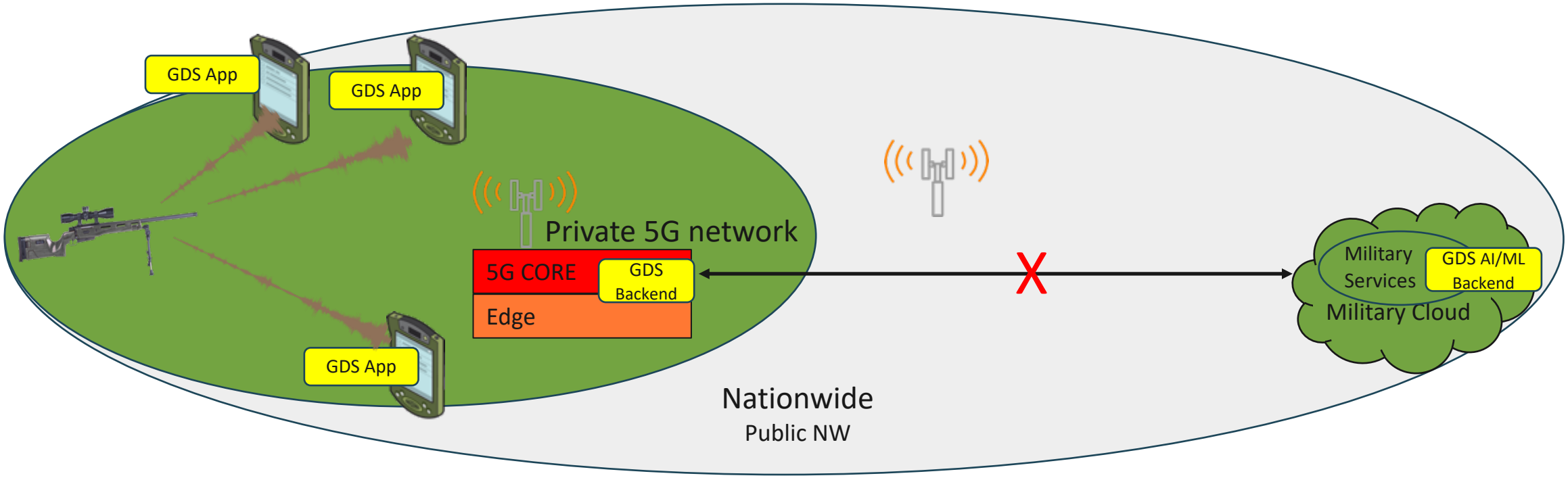
Edge Computing – The extended cloud

FUDGE-5G



From a **Service** perspective

How to utilize centralized clouds, 5G and Edge to create **Better** and more **Robust** services

(GDS=Gunshot Detection System)

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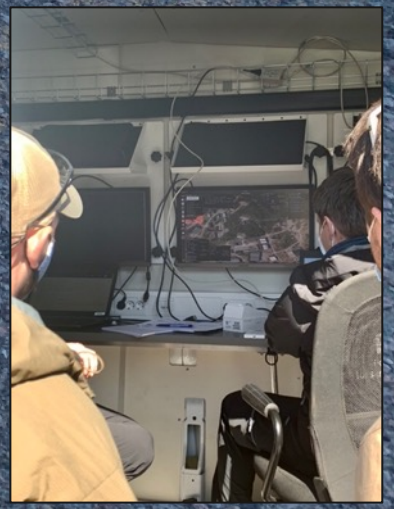
5G Drone control

5G-VINNI

- BLOS Drone control via 5G network
- Distribution of live video from the drone to relevant personnel
- GNSS independent
- AI to improve Situational Awareness



5G Drone control

- BLOS Drone control via 5G network
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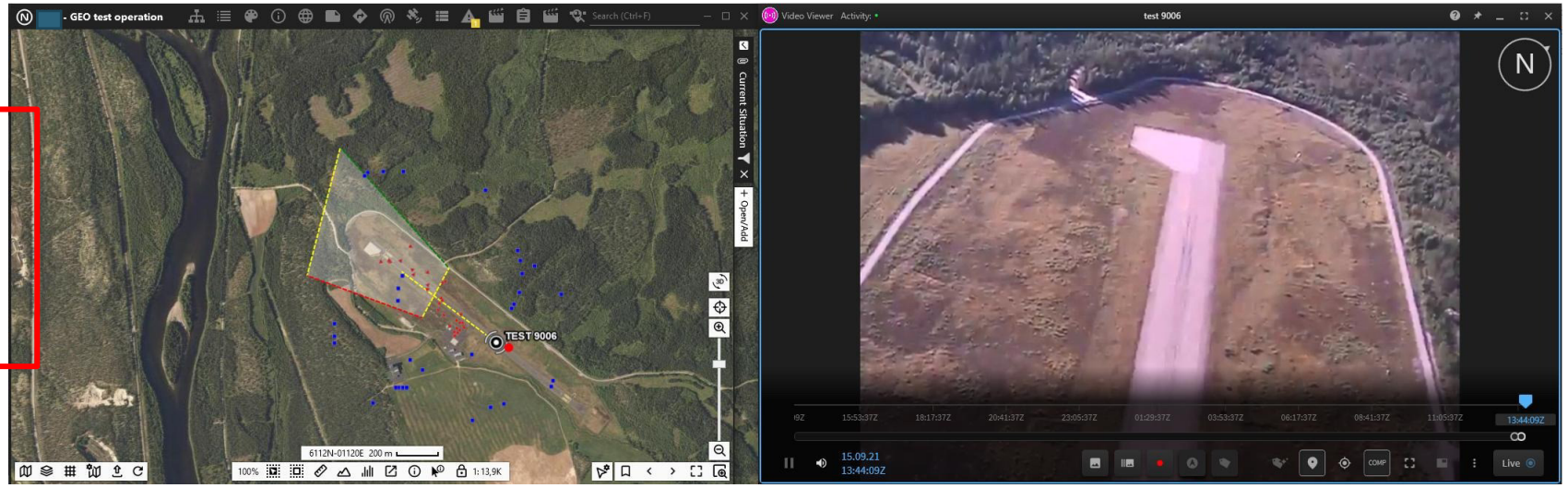
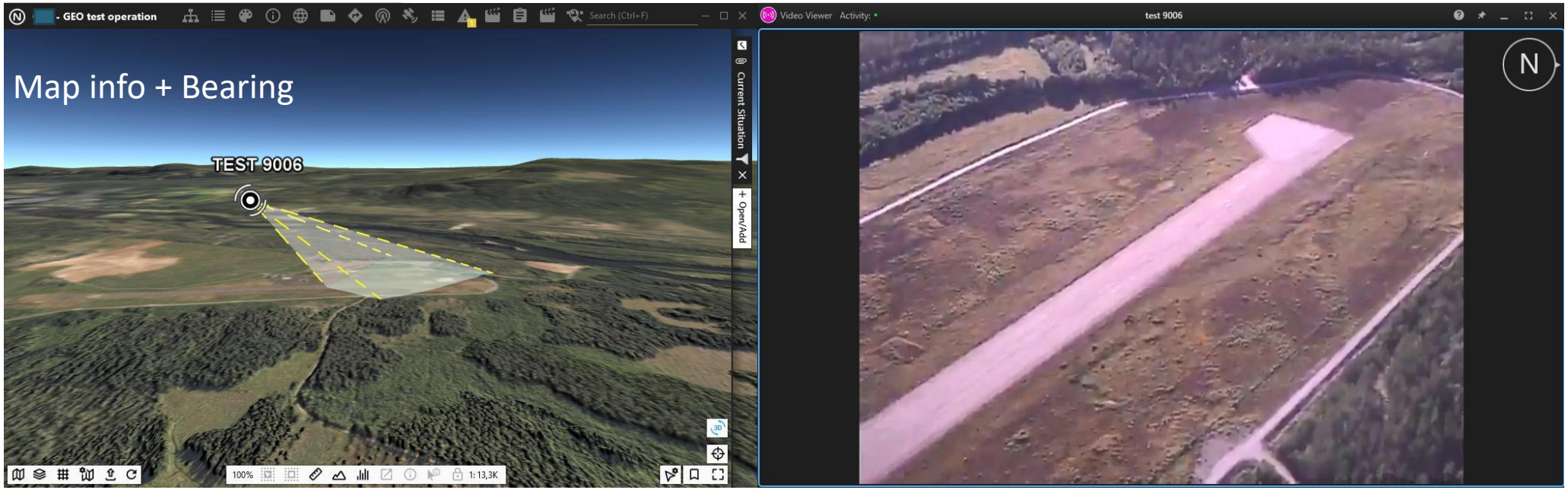
5G Drone control

5G-VINNI

Goal:

GNSS independent by use of LMF (5G) + Onboard camera/maps navigation.





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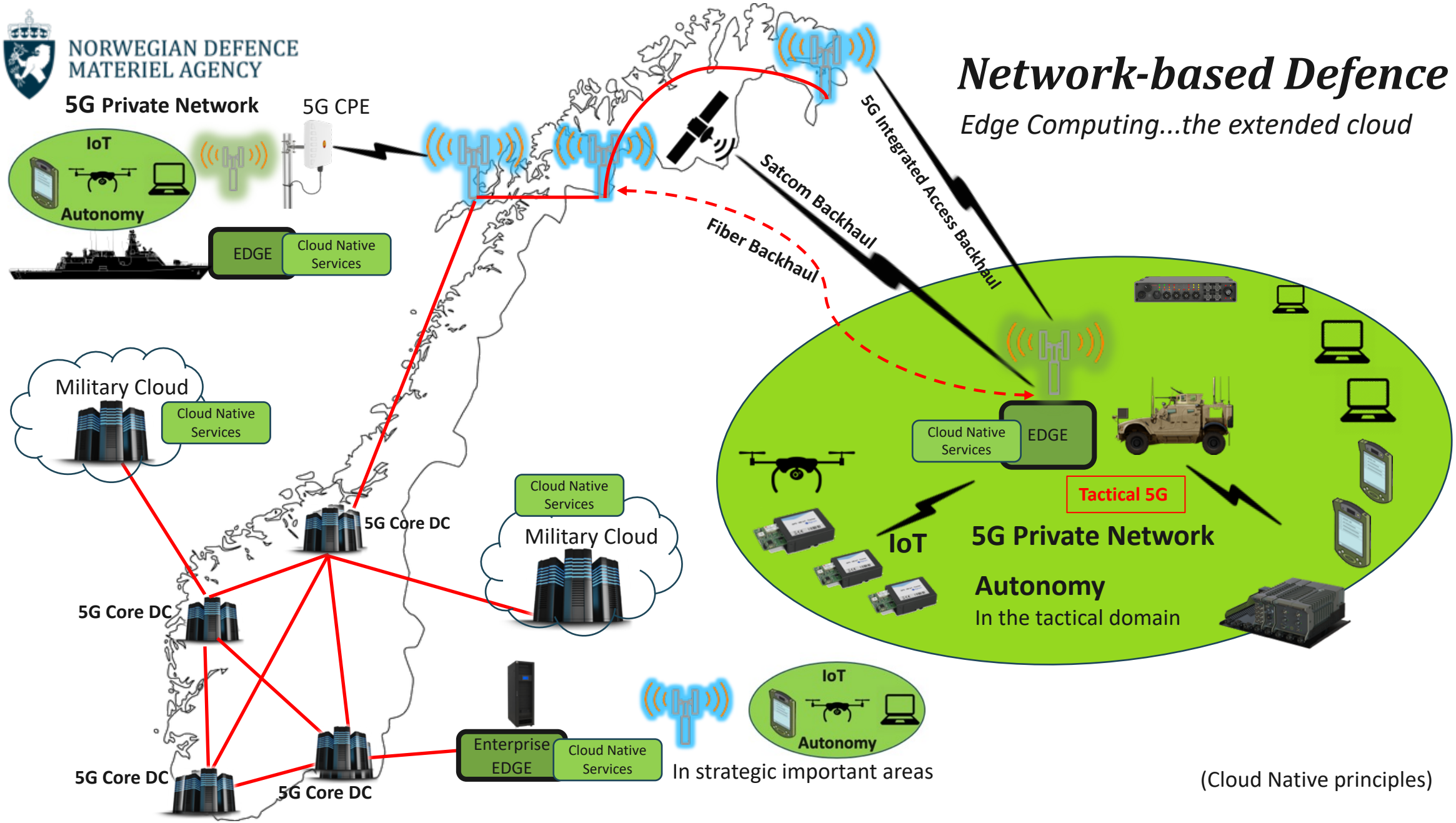
Network-based Defence

Edge Computing...the extended cloud



(Cloud Native principles)

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5th Generation Changes Everything

Kennet Nomeland
Radio System Architect
Norwegian Defence Materiel Agency

Foto: Morten Hanche/ Forsvaret