

# Project idea: 5G field testing for vertical applications

## Contacts

### Research team leadership

- hosting the field testing site for 5G with commercial class and industrial scale core network:

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### Project management:

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# Why the project is needed

- Need of experimental research:
  - Telecom operators, vendors, test system providers and system integrators do not have enough knowledge yet of the behaviour in the real environments in different verticals
- The new paradigm causes jamming problems:
  - New type of devices in the network, no persons using those, nobody anymore checking the strenght of signal and moving to better place or postponing the session > access must be quaranteed e.g. in a factory
  - M2M communications
  - Amount of devices explodes
  - Vertical specific approach is needed: different conditions for
- New antenna types will be used in 5G > needs field testing
- Vertical specific applications need taylored field testing
- With field testing the simulation models and funtionalities can be verified
- It is wise to utilise the results of the existing strong efforts, from other continents also: some teams will be asked to "knowledge exchange"

# Content

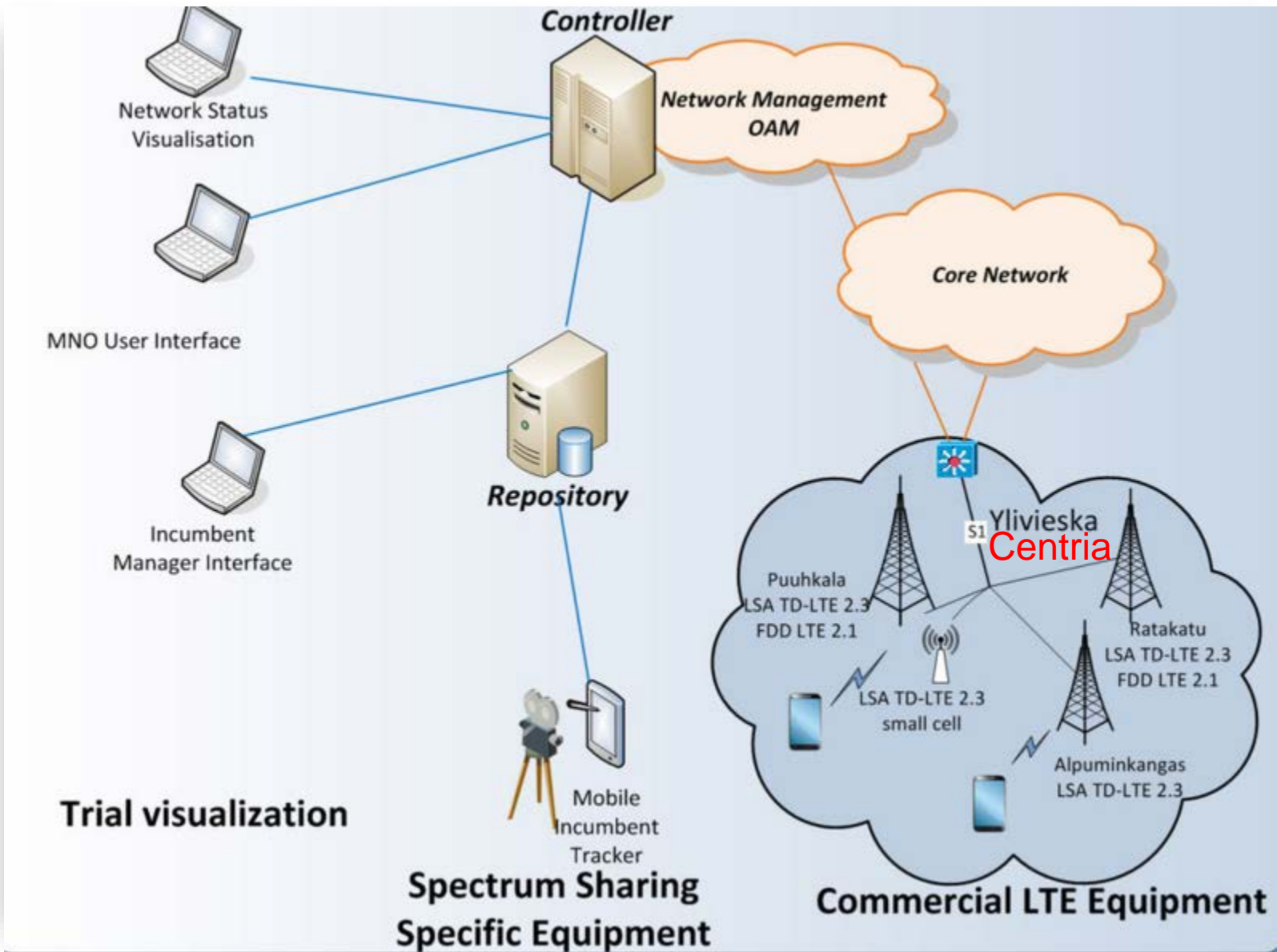
- Field testing in real environments to verify simulation models and functionalities
- Studying the different conditions of use cases: different capacity and reliability needs of the verticals
  - For example when jamming may appear in each vertical
- Studying the performance limits and optimum parameters, and providing use case advices
  - In co-operation with device vendors, telecom operators and systems integrators
- Testing new 5G antenna types which suit best to verticals
- Providing use case advisory booklets for verticals
- Sub-consortiums will be created for solving issues per each vertical

# Vertical teams for field testing according to the white papers

- FoF, continuation of the successful field testings, especially in the following Use Cases
  - UC1: time-critical, reliable process optimization inside digital factory
  - UC2: non time-critical communication inside the digital factory
  - UC3: Remotely controlling digital factories
- Health
  - Massive machine-type communication (MTC) is a vital part of the overall 5G vision. Research efforts are required to further improve the MTC capacity in terms of density of connected objects per area and in terms of coverage. This capacity to extend coverage especially indoor and in rural areas is key for e-health applications.
- Energy
  - Exchanging knowledge: the technologies this far haven't been good enough for energy vertical
    - Within the home area we are already beyond experimentation with large scale trials or even up and running services in different countries in the world (see e.g. Google Nest in the USA or Issy Grid in France, <http://issygrid.com/en/>). However, experimentations should be conducted beyond these domains regarding the real time command, control, protection and monitoring system of the energy distribution and transport grid at the regional level.
- Automotive
  - Exchanging knowledge with latest achievements of the strong on-going research, especially with the following activity:
    - V2I/N (Vehicle-to-Infrastructure/Network): covering LTE-based communication between a vehicle and a roadside unit/network. A Roadside Unit (RSU) is a transportation infrastructure entity (e.g., an entity transmitting speed notifications) implemented in an eNB or a stationary UE.

# Background

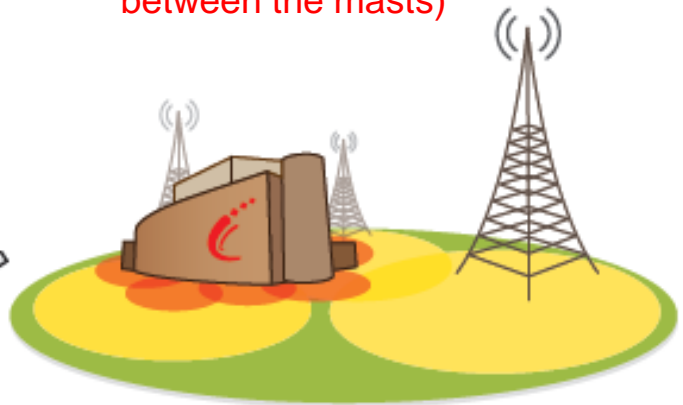
- Field trial environment to test 5G features
- Long experience of field trial mobile network management with commercial devices
  - Network covers one town in Northern Finland (Ylivieska)
- Good location: ability to get frequencies into use
  - Good co-operation with communication regulatory authority
    - Ability to use technologies and frequencies used now in USA, Asia and Australia
- Trial and environment evolution, agile approach:
  - Environment building
  - Partner in the following projects:
    - Core project: macro cells with simulated core network
    - Core+ project: macro cells with real core network
    - Core++ project: heterogeneous network with macro and small cells <http://core.willab.fi/>
- Strong knowledge and experience of field testing
  - Mobile field measuring systems with visualisations
- Effective co-operation with key players of mobile network business





## CORE++ Centria trial environment

Macro sites covering the center of the town (2-5 km distance between the masts)



Centria Trial environment has been started to build in the preceding CORE/CORE+ projects in 2011-2014. The trial environment will be further developed during the project.

CORE++ trial environment allows researchers and to carry out experiments with large scale tests in the field trial environments.

Live LTE networks at Centria University of Applied Sciences in Ylivieska, Finland. The environment consists of following elements:

- FDD LTE 2.1 GHz macro cells
- TDD LTE 2.3 GHz macro cells
- TDD LTE 2.3 GHz small cells
- TDD LTE 3.5 GHz small cells
- WiFi Network

### CORE++ partners

- Industrial partners: Nokia, Pehutec, Anite, EB
- Research partners: Centria, VTT, CWC, TUAS
- Public sector partners: TEKES, Finnish Defense Forces, Finnish Communications Regulatory Authority

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Picture of the top of a macro site