

An aerial, high-angle photograph of a dense urban area, likely a city center. The image shows a complex network of buildings with various colored roofs, including shades of blue, green, orange, and brown. The perspective is looking down, creating a sense of depth and scale. The text is overlaid on the center of the image.

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# LoRa, LoraWan, 5G/NB-IoT

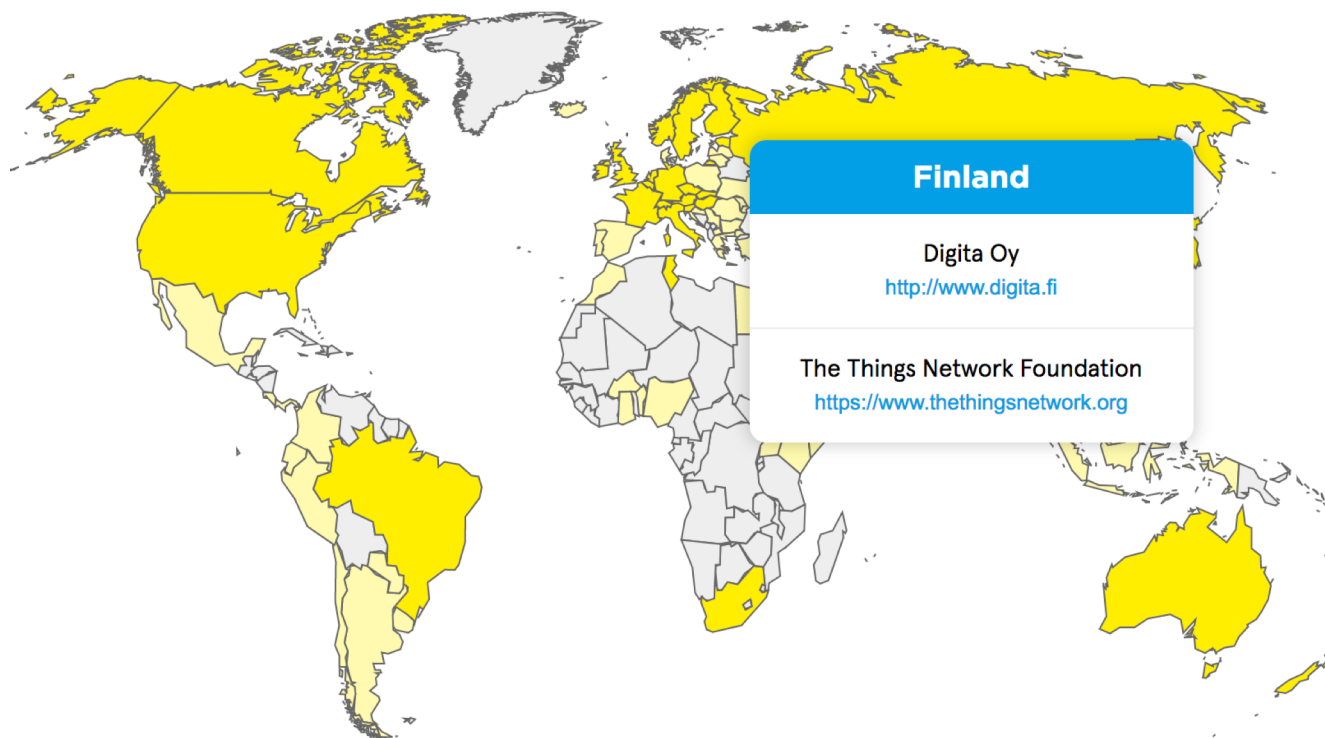
**Connecting: new networks available for demos.  
LoRa, LoraWan, 5G/NB-IoT**

**Date: 7.3**

**Place: Kalasatama (REDI) Urban Lab**

**PM Eero Jalo**

# Lora Alliance

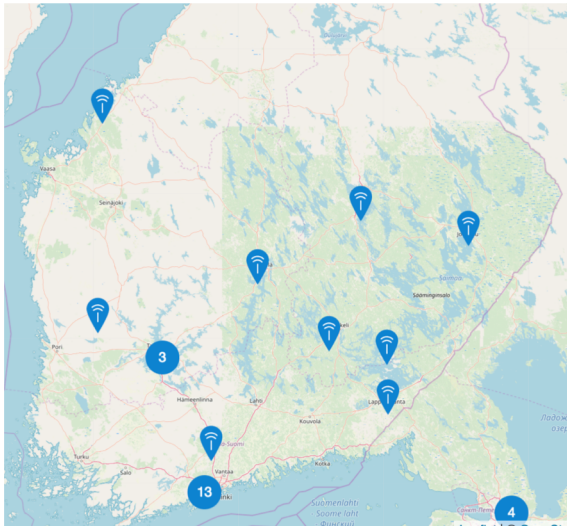


<https://lora-alliance.org/>  
<https://www.digita.fi/en/services>  
<https://www.thethingsnetwork.org/>

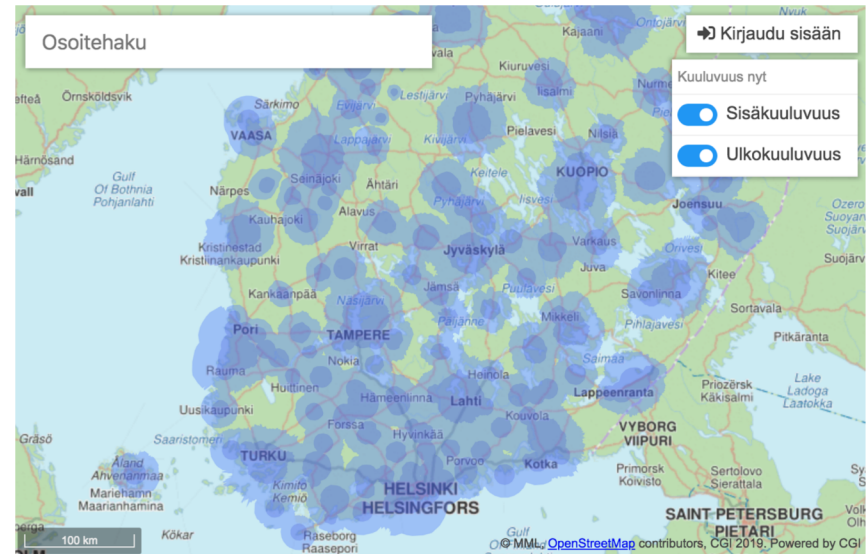
# LORAWAN

<https://youtu.be/m6lvwcjcxQc>

The Things Network, Gateways.



Digita coverag



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# Mobile IoT in the 5G Future

## NB-IoT and LTE-M in the context of 5G

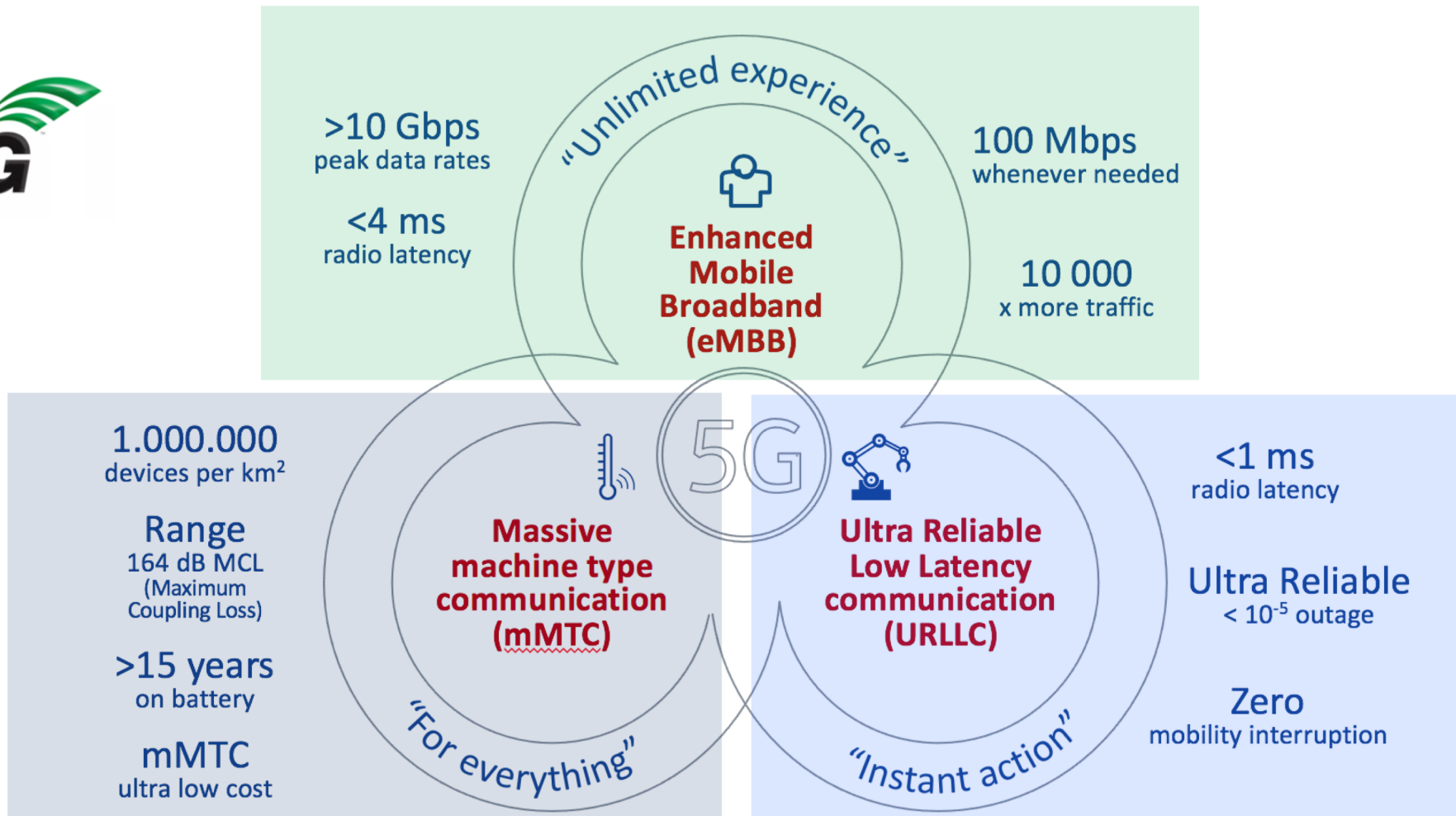
- NB-IoT and LTE-M are 3GPP standards that coexist with other 3GPP 5G technologies, so fulfilling the long term 5G LPWA requirements.



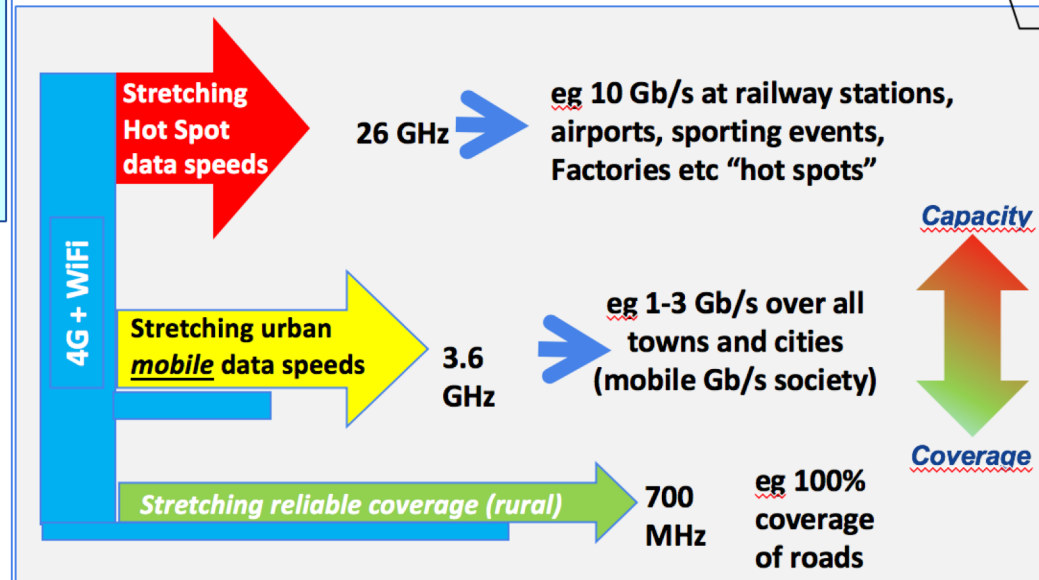
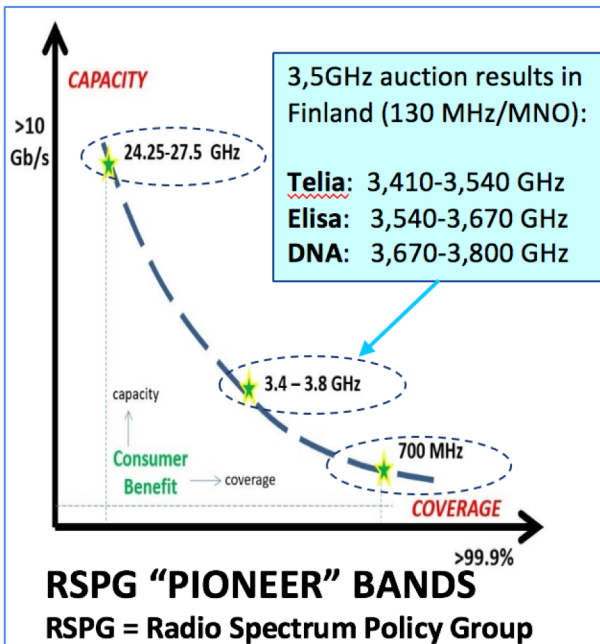
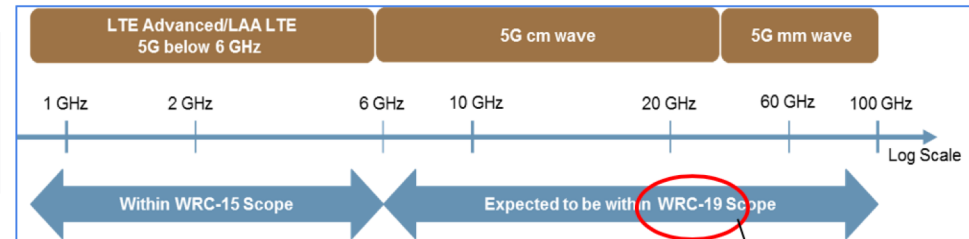
# Characteristics of The Mobile LPWA

- Low power consumption that enables devices to operate for many years on a single charge
- Low device unit cost
- Improved outdoor and indoor coverage
- Secure connectivity and strong authentication
- Optimised data transfer for small, intermittent blocks of data
- Simplified network topology and deployment
- Network scalability for capacity upgrade

# 5G – Three Main Segments



High data rates up to 20 Gbps require bandwidth up to 1 GHz which is available at higher frequency bands.  
5G is the first radio technology that is designed to operate on any frequency bands between 450 MHz and 90 GHz.



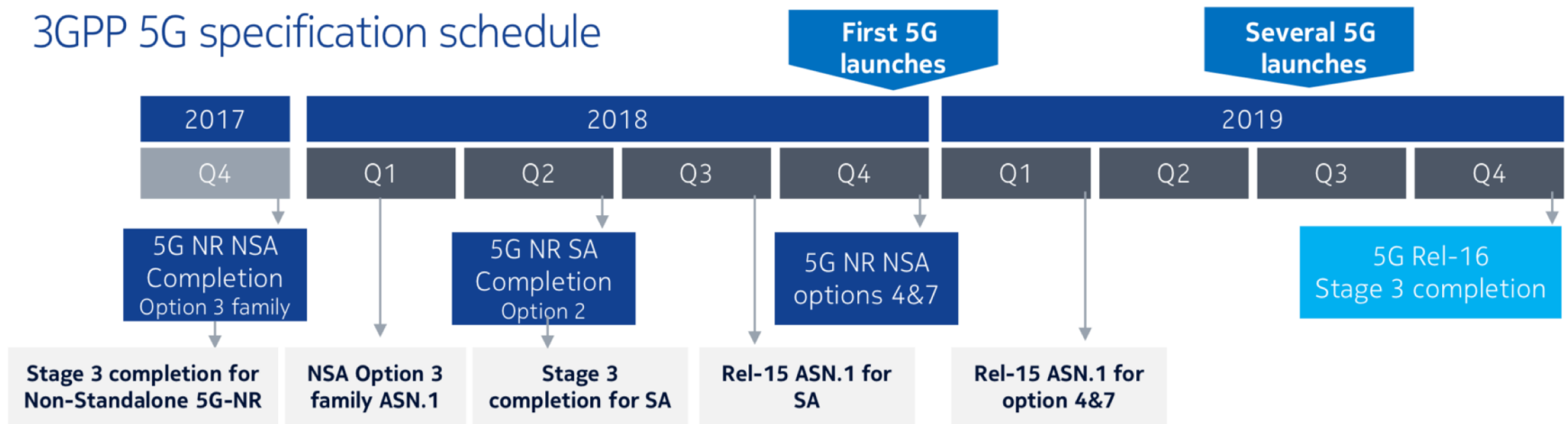
World Radio Conference 2019

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# 3GPP 5G

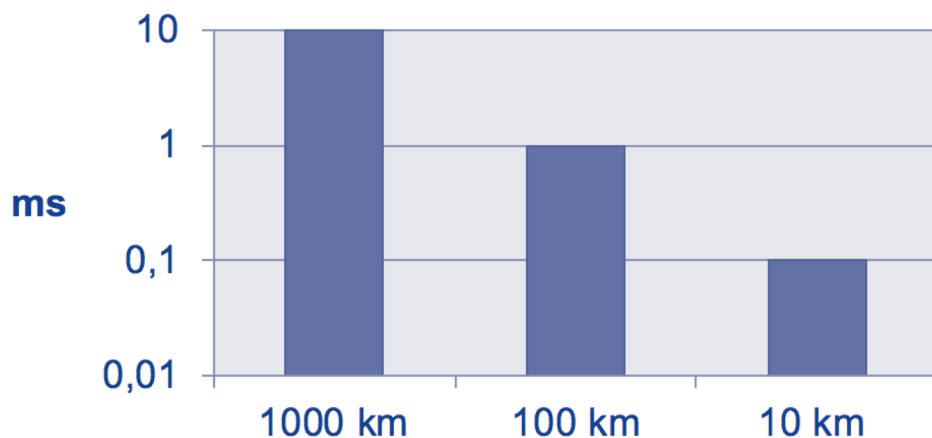
## 3GPP 5G specification schedule



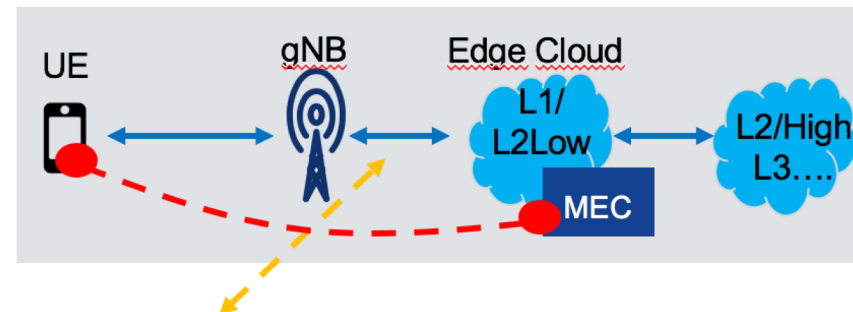
# MEC

## Speed of Light is the Limit – Content Must be Close to the Radio

Round trip time in fiber



- 5G target is 1 ms round trip time
- 100 km two-way propagation delay in optical fiber is to 1 ms
- 10 km propagation delay to 0.1 ms



Content must be close to the radio (within a few 10 km) to get full benefit from the 1-ms round trip time in the radio  $\Rightarrow$  **Multi access Edge Computing (MEC/vMEC)** and Local break out will be needed

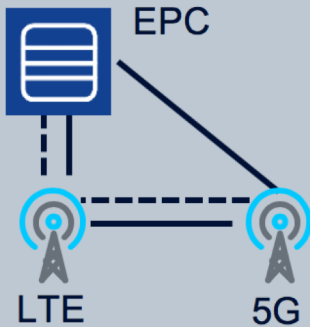
# 5G Architecture in Release 15

## 5G Architecture Options in Release 15

NSA = Non-Standalone  
SA = Standalone

### Why Dual Connectivity with NSA?

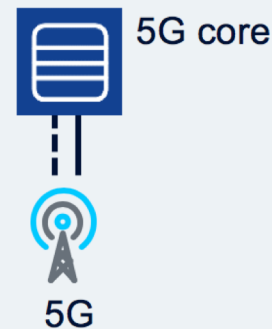
#### Option 3x | **LTE+5G under EPC**



- Available 6 months earlier than SA
- Existing EPC core used
- Existing LTE idle mode used
- Data rate aggregation LTE + 5G
- VoLTE in LTE

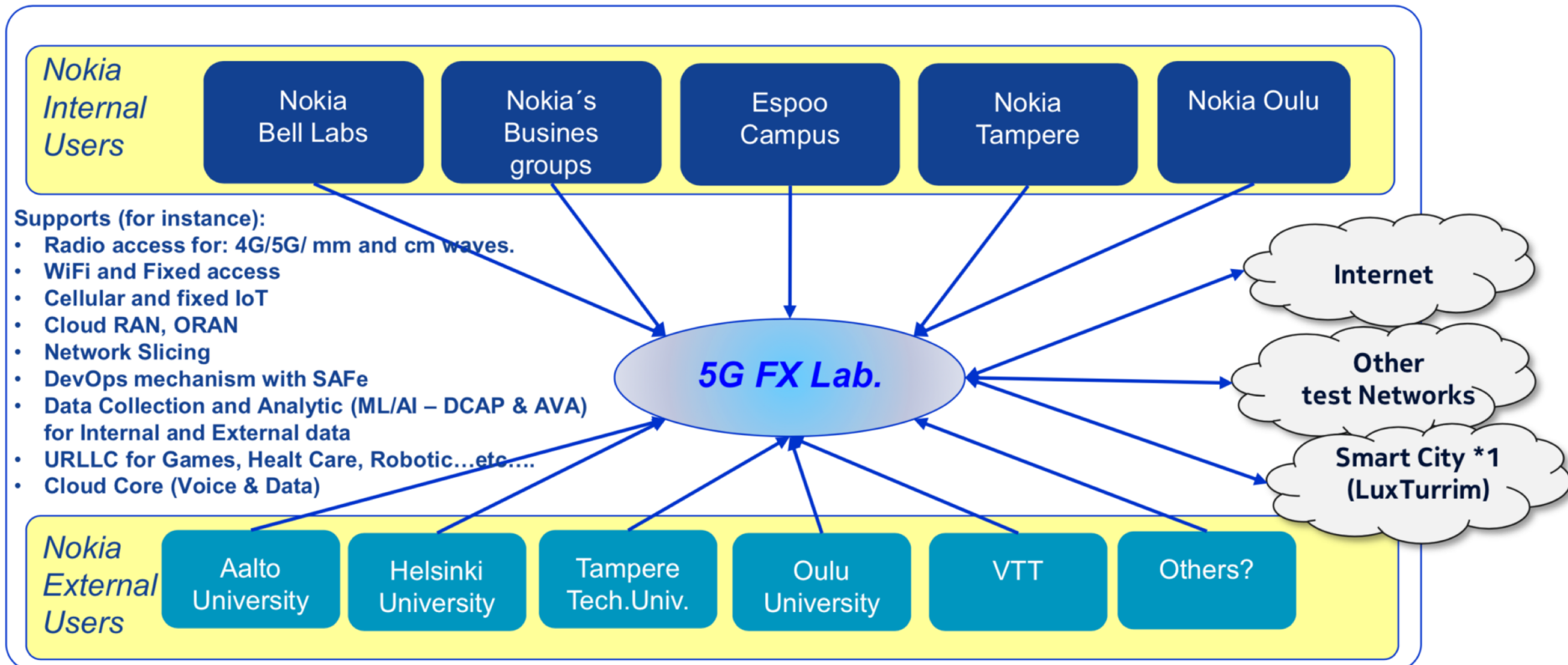
### Why Standalone SA?

#### Option 2 | **SA 5G under 5GC**



- 5G end-to-end for new services
- Lower latency without LTE leg
- Lower setup time in 5G
- No need for LTE network upgrades

# 5G Future X Lab. for testing - users



# 5G Mobile terminal, Qualcomm

- 5G Mobile Terminal in live





# Forum Virium Helsinki UrbanSense: AR/VR Challenge

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# UrbanSense

UrbanSense: Open 5G Innovation Platform

06.2018 – 06.2020

Collaboration with:

- The University of Helsinki, The Department of Computer Science.
- The City of Helsinki, the Economic Development Division
- Forum Virium Helsinki

# Three thematic experimental rounds

**Massive  
IOT**



**Open Call closed  
experimentation phase**

**AR / VR**



**Open Call until 19.4**

**Edge  
Computing**



**Open later Q2-Q3**

# Open AR/VR Challenge

Develop and test the market with a new AR/VR product through innovative experimentation.

Demonstrate how AR/VR benefit of 5G technology to transmit large amounts of data in real time.

Gain valuable information and learnings

The pilot may also be a part of a greater entity or concept.

Accelerate the adoption and raise awareness of new technology

Challenge Open until 19.4

# Examples of possible AR and VR applications.

Utilising the 3D model of Helsinki

Virtual guides for tourists

Multimedia experiences

City planning and construction

Teaching, training and simulations

Maintenance and servicing

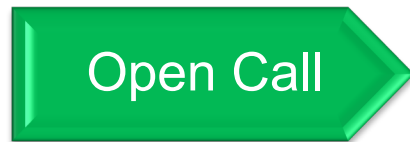
Assembly and automation

360-degree videos.

# Piloting program

## Piloting program start with OPEN CALL

Open call lasts 1–2 months, during which communication channels are used actively.

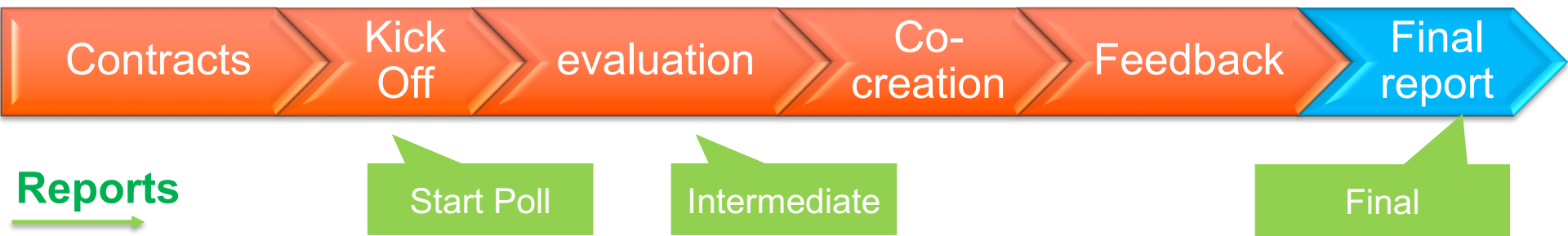


1 – 2 months



3 – (max) 6 months

# Experimentation phase



After Contract for procurement. The experimentation phase starts with a common kick-off is followed by Evaluation, Co-creation, Feedback and Final report. The process takes from three months up to (max) six months to complete.

# Contacts

Home page <https://forumvirium.fi/en/>

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