LuxTurrim 5G: Building key enablers for a Digital Smart City

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Agenda: LuxTurrim 5G Building key enablers for a Digital Smart City

- Introduction
- LuxTurrim 5G for Smart Cities
- Solution Overview and Use Case
- Neutral Host Scenario















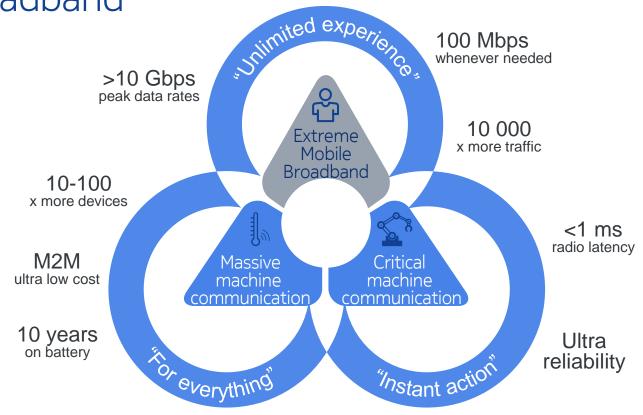








5G Enables New Capabilities Beyond Mobile Broadband

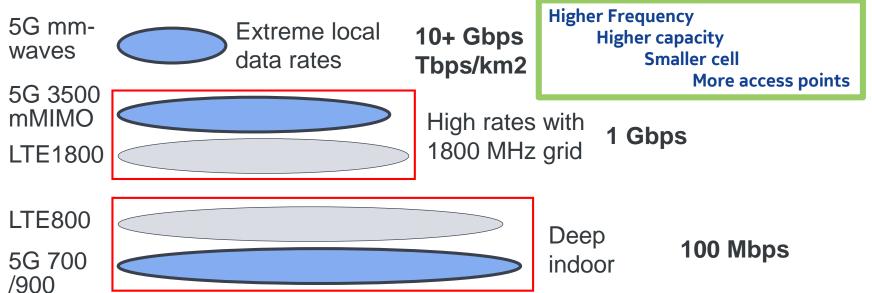




## 5G Coverage Footprint



- Extreme local capacity with mm waves
- Match LTE 2 GHz with 5G 3.5 GHz massive MIMO
- Full coverage with 700 MHz or 900 MHz



## Smart cities require fast communication networks

## Smart cities requires a new service infrastructure and a truly digital ecosystem enabling:

- Development of relevant smart city services
- High data capacity for citizens
- New service and business opportunities for companies
- One common flexible total cost optimized high capacity 5G network
- Opportunities for new micro-operators in the systems

#### Need

Our modern society and growing cities face great **challenges** nowadays, e.g. to improve :

- safety
- energy efficiency
- air quality
- effectivity of transportation
- general quality of living



#### Capacity of mobile networks is a bottleneck now

- Capacity of mobile networks far too insufficient due to the increased number of users and new data demanding digital services built and planned
- The problem can be solved by using small cell 5G radio frequency technology & higher frequencies
- This requires dense networks of antennas setting new requirements for the network infrastructure
- **New sites** in dense urban areas are scarce

#### How

#### LuxTurrim5G:

- Joint R&D project started 2017
- **5G** network based on **smart light poles** with :
- Integrated antennas, small cells, cameras, sensors, screens, drones and other devices
- Ecosystem for piloting new technical solutions, digital services & business models

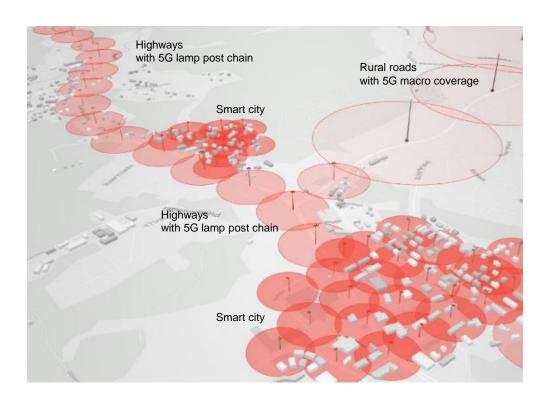




## LuxTurrim 5G Project Goals and Results



- Develop & pilot key technical solutions and concept for smart light pole based
   5G infrastructure, and business & service innovations
- Create an open access ecosystem for digital services which could be extended to sub-urban, rural areas and highways
- Pilot services on navigation, information sharing & advertisement, weather monitoring and smart lighting





## LuxTurrim 5G Key Project Characteristics

## **WLuxTurrim** 5G

- Highly multi-disciplinary joint R&D project developing composite and antenna materials, smart light pole design, miniaturized 5G base stations and integrated sensors
- The project creates novel digital services, business models and ecosystem
- 2½ year project started 2017 including 9 companies and 3 research institutes, with project volume of 15 M€ (1st phase) from Tekes and the companies

Public



Total budget 15Me/28moths, started 2/2017



#### LuxTurrim5G



### Joint Research Project combining business and technology

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LuxTurrim5G consortium

#### **Development of New Technologies**

- 5G RF communications
- Sensors, displays, signal windows, antenna materials

Network

- 3D modelling

## Identification of Business Opportunities

- 5G ecosystem opportunities: key players, roles, and sharing costs
- Smart City service needs

#### **WP1 Services** WP3 Ecosystem build up for and business WP2 Small cell service platform service opportunities Infrastructure. Interface for providers Positionine. deployment Traffic monitoring Service enablers Tracking and nevigation Commercial Energy platforms Surveillance Service nfrastructure provisioning Weather forecasting Testine & validation platform Environment WP8 Testbeds and PoCs monitoring

Smart light poles

## Creating New Digital Ecosystem Business Cases

- Operators business case
- Smart city business case
- Service providers business case
- Business cases for different service providers

#### **Partners**

Outdoor to indoor

penetration

SG Small-cell

mmW AP + BH

Smart city services.



#### **Proof of Concepts**

External sensor

- 5G smart light pole
- City infra planning
- New digital services (4 pilot cases)



#### LuxTurrim5G – Solution Overview



We develop and pilot concrete technology enablers and service concepts for open Smart City Digital Ecosystem

## Indoor/Outdoor connections

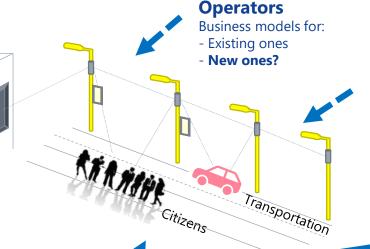
Signal propagation through construction materials

- RF permeable windows:

#### **Lammin Windows**

#### **5G** network

High capacity, low latency Small cells -> many sites 5G network: **Nokia Bell Labs** Light pole: **Exel Composites** Radom materials: **Premix** 



#### **City Infrastructure**

Light pole infra, power, data transport Infra planning: **Sitowise** Infra owner: **Espoo,...** 

#### **Smart city services**

#### Examples:

- Video surveillance, screens: Teleste
- Air quality, weather: Vaisala
- Location, navigation: Indagon
- Lighting: **Ensto**
- Drones: Rumble Tools
- ....

#### **Public Partners**

contributing in each research area:

VTT, Aalto, TUT

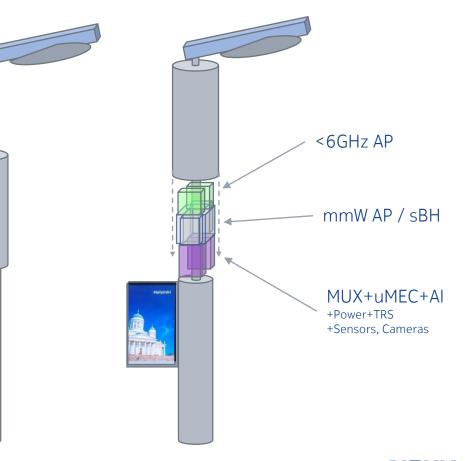


LuxTurrim5G - Solution Overview - Digital Smart City Use Case/WLuxTurrim 5G

5G module radome maintenance cover



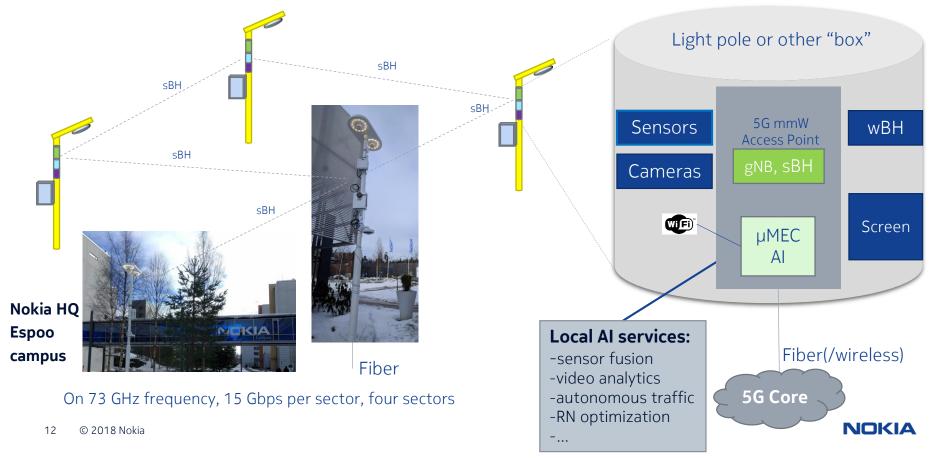
One possible construction



LuxTurrim5G – Solution Overview - Digital Smart City Use Case/WLuxTurrim 5G

5G mmW access points in every light pole

5G Base station with sensors, cameras, sBH,...



### Recent International Recognitions

LuxTurrim5G - Building key enablers for a Digital Smart City



City of Espoo awarded as Intelligent Community of the Year 2018, 6.6.2018 London



Exel Composites & LuxTurrim5G **Innovation Competition Finalist** at JEC World 2018, 8.3.2018 Paris



**√₩LuxTurrim 5G** 

Read more: www.luxturrim5g.com





















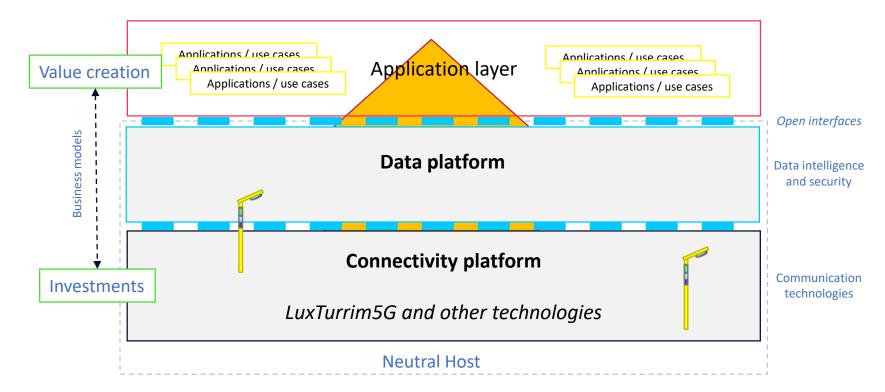








## Possible Model: Smart City Digital Platform for Local Use Enabled by 5G light poles and Data platforms





## City of Espoo, new Kera District, new Innovation Ecosystem Digital connectivity platform planned to be LuxTurrim5G light poles

## Smartest city and community of the year 2018 (ICF):

- to continue the excellence: Kera is planned to be a new innovation area for smart city applications

## Selected by UN as an example of future digital smart city (OiER, UNGII):

- to meet UN sustainable goals already in year 2025
- To be a forerunner and example for all cites globally

ICF International Community Forum
OiER, Organization for International Economic Relations
UNGSII, Global Sustainability Index Institute



Kera District, smart city innovation: digitalization, sustainability



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## LuxTurrim5G

"Smart 5G small cell street pole infrastructure for digital service ecosystem in future urban city environments"

www.luxturrim5g.com





















Nokia Bell Labs Disclaimer: This is a research project, possible products are not yet in the Nokia product roadmap