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

- **Unlimited experience**: >10 Gbps peak data rates
- **100 Mbps** whenever needed
- **10 000** x more traffic
- **<1 ms** radio latency
- **Ultra reliability**
- **Massive machine communication**: 10-100 x more devices
- **Critical machine communication**: M2M ultra low cost
- **For everything**: 10 years on battery

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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

5G mm-waves
5G 3500 mMIMO
LTE1800

Extreme local data rates
10+ Gbps Tbps/km²
High rates with 1800 MHz grid

LTE800
5G 700 /900

Deep indoor
100 Mbps

Higher Frequency
Higher capacity
Smaller cell
More access points
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

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**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.

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

- **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

Total budget 15Me/28moths, started 2/2017
LuxTurrim5G
Joint Research Project combining business and technology

Development of New Technologies
- 5G RF communications
- Sensors, displays, signal windows, antenna materials
- 3D modelling

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

LuxTurrim5G consortium

Creating New Digital Ecosystem Business Cases
- Operators business case
- Smart city business case
- Service providers business case
- Business cases for different service providers

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

Partners
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

**Operators**
Business models for:
- Existing ones
- New ones?

**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

**City Infrastructure**
Light pole infra, power, data transport
Infra planning: Sitowise
Infra owner: Espoo,...
LuxTurrim5G – Solution Overview - Digital Smart City Use Case

One possible construction

<6GHz AP

mmW AP / sBH

MUX+uMEC+AI
+Power+TRS
+Sensors, Cameras
LuxTurrim5G – Solution Overview - Digital Smart City Use Case

5G mmW access points in every light pole

On 73 GHz frequency, 15 Gbps per sector, four sectors

Local AI services:
- sensor fusion
- video analytics
- autonomous traffic
- RN optimization
- ...

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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

Read more: www.luxturrim5g.com
Possible Model: Smart City Digital Platform for Local Use
Enabled by 5G light poles and Data platforms

Value creation

Investments

Data platform

Connectivity platform

LuxTurrim5G and other technologies

Application layer

Open interfaces

Data intelligence and security

Communication technologies

Neutral Host

Applications / use cases

Applications / use cases

Applications / use cases

Applications / use cases

Applications / use cases
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
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 roadmaps.