“Smart 5G small cell street pole infrastructure for digital service ecosystem in future urban city environments”
LuxTurrim5G - Building key enablers for a Digital Smart City

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

LuxTurrim5G is a Nokia Bell Labs driven Finnish public funded Smart City Ecosystem research project innovating and piloting novel digital services and business opportunities for a real smart city.

Partner companies:
Smart cities require fast communication networks

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

- Development of 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
LuxTurrim5G - Solution
LuxTurrim5G develops and pilots 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, ....

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

Smart city services on top of a common platform
Examples:
- Video surveillance, public safety, infotainment screens: Teleste
- Air quality, weather: Vaisala
- Location, navigation: Indagon
- Lighting/charging: Ensto
- Drones: Rumble Tools
- ....

Public partners contributing in each research area:
VTT, Aalto, TUT

Citizens
Transportation

City Infrastructure

Light pole infra, power, data transport
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LuxTurrim5G Approach and Targets

• Develop and demonstrate key technical solutions and concepts based on **smart 5G light pole infrastructure with integrated / camouflaged 5G mmW radios, sensors, cameras, information displays and other devices.**

• Create **open access ecosystem, business model and technology platform** for digital services which could be extended to sub-urban, rural areas and highways

• Build a real life real time **outdoor test and demo network** in Nokia Espoo campus to demonstrate new innovations on top of and enabled by 5G small cell infrastructure

• **Pilot business & service innovations** on e.g. navigation, information sharing & advertisement, public safety, weather monitoring, building automation and smart lighting
LuxTurrim5G smart light pole concept

- Luminaires (Ensto)
- Camouflage Radome Unit for connected devices (Nokia, Premix)
- Connector boxes for pole external devices (Nokia)
- Composite pole (Exel Composites)
- Utility box (device space) (Nokia, Exel Composites)
- Energy harvesting & cooling network under ground
- Drone docking station (Rumble Tools) or Weather sensor (Vaisala)
- 5G radios (Nokia)
- 180° / 360° panorama camera (Teleste)
- Air quality sensor (Vaisala)
- Pole display (Teleste)
- Electric Vehicle charger (Ensto)

2nd prototype at Nokia campus
LuxTurrim5G is the connectivity platform of future projects

- **LuxTurrim5G outdoor test network** in Nokia HQ Espoo Karaportti campus area in Espoo is *open for innovations for all consortium partners*

- Close *co-operation with city of Espoo*, e.g. Kera area building

- During 2019 – 2020 LuxTurrim5G provides the connectivity platform for **Neutral Host pilot project** and start-up company NeutralHost Oy.

- Part of Finland wide 5G Test Network Finland (5GTNF) *co-operation and 5G research* funded by Business Finland
Recent International Recognitions

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

Flagship ecosystem project

Business Finland Director General Pekka Soini: “Case LuxTurrim5G –co-operation is the key”, 100 Lasissal Smart city and environment 12.12.2017 Helsinki

Nokia: “Best Project in Interaction with Local Ecosystem” award winner Nov/2018
LuxTurrim5G 5GTFN seminar demo pods

Pod 1: Project Info
Pod 2: Video analytics + SCSP
Pod 3: Signal propagation
Pod 4: Light Pole
Pod 5: Radio protos
Pod 6: Positioning
Pod 7: Business & services
Pod 8: Smart city planning demo
Pod 9: City drone

The “hipster lecture room”

The entrance
LuxTurrim5G demo pods at 5GTNF demo seminar 15.11 (1)

• Pod1: General Project Introduction
• Pod2: Video analytics & Small Cell Service Platform
  • Privacy protection via video anonymization & a gesture/pose controlled information display
  • Service awareness video
  • SCSP: a virtualized runtime environment for applications at the edge of the mobile network
    – enables localized service delivery for verticals
• Pod3: Signal propagation through materials
  • Outdoor-To-Indoor signal propagation Quality-of-Experience HW demo: visualize effects of
    the signal loss in network performance and service quality from user perspective
  • Signal propagation measurements: Indoor and outdoor attenuation in 5G
• Pod4: Smart Light Pole
  • Pole concept including connected devices, 3D printed scale models
  • design aspects: effect of aging on mechanical and signal propagation properties of
    polymeric materials
LuxTurrim5G demo pods at 5GTNF demo seminar 15.11 (2)

• Pod5: Radio prototypes
  • 28 GHz radio, 64 element phased array
  • 73 GHz backhaul radio, beamsteerable lens antenna

• Pod6: Positioning services & applications
  • Outdoor-Indoor positioning demo
  • Protos: RTK station, drone & robot

• Pod7: Business cases and smart city services

• Pod8: Smart City Infrastructure and Service Planning
  • Smart city service planning: radio layer, infrastructure, sensors, cameras
  • use case visualization: autonomous bus scenario

• Pod9: City Drone
Building key enablers for a Digital Smart City - already today