

LuxTurrim5G builds the key enablers for Digital Smart City – Single 5G network based on smart light poles opens new services and business

Nokia Bell Labs driven industry group builds concrete enablers for future smart city with an ambitious three-year joint project called LuxTurrim5G. This will bring big data capacity available for companies and users through a network of smart light poles which include antennas and base stations for the novel fast 5G networks. The project includes technical development of the smart light poles with integrated 5G radio technology, different sensors and other devices as well as modern city planning and new digital services and business concepts related e.g. to security, navigation, smart lighting, weather monitoring, information sharing and advertisement. Concrete piloting will start already this year in Espoo, Finland.

Our society and cities face great challenges to improve safety, energy efficiency, air quality, effectivity of transportation and quality of living. There is a growing need for a new generation digital service infrastructure for smart cities which enables improved data capacity for citizens and new service and business opportunities for companies. However, the capacity of mobile networks will be far too insufficient already in a few years due to the increased number of users and new digital services built and planned. This creates a serious bottleneck and threatens realization of the important smart city digital services which will be vital only if they are connected and distributed through an effective and reliable telecommunications network. This problem can be solved only by taking into use small cell radio frequency (RF) technologies and higher frequencies. This needs dense networks of antennas setting new requirements for the network infrastructure.

*“We need 5G networks for video surveillance as the current wireless networks do not provide enough capacity”, says **Ilkka Ritakallio**, Director, New Applications, R&D at Teleste”.*

LuxTurrim5G will solve these critical challenges by developing and demonstrating concrete technical solutions for smart light pole based 5G infrastructure, and business and service innovations based on that. The smart light poles being developed and piloted in the project including integrated miniaturized 5G antennas and base stations, different sensors, screens and other devices enable the realization of a novel smart city infrastructure bringing not only energy-efficient smart LED lighting but especially big data capacity and a variety of new smart city services available for all users. The project will also analyze what are the best practices to build the network, what cost items there are in planning, building and managing the network and how to share the cost of the network.

*“This ambitious multi-disciplinary joint R&D project gathers together ten innovative companies and three research institutes to develop and pilot the critical technical solutions regarding composite and antenna materials, smart light pole designs, miniaturized 5G base stations, integrated sensors as well as novel services and business models” says Coordinator of the project **Markku Heino** from Spinverse.*

The partners include **Nokia Bell Labs, Sitowise, Exel Composites, Premix, Lammin Windows and Doors, Vaisala, Teleste, Indagon, C2 Smart Light, VTT, Tampere University of Technology (TUT), Aalto University** and **Spinverse**. The project, set in first phase for three years, is funded by the companies and **Tekes**. LuxTurrim5G aims to proceed fast from R&D to piloting as the first parts of the novel 5G smart light pole based test network will be built in Nokia Campus Espoo already by the end of 2017. **Espoo city** is involved in the project supporting the implementation and learning the practical design aspects of smart city infrastructure.

*“The LuxTurrim pilot is a marvelous example of the ways Nokia and Espoo are building a smart city of the future and its requisite infrastructure in collaboration. Smart light pole networks will provide lucrative business opportunities for companies both large and small in the future”, says **Tuula Antola**, Director for Economic Development at City of Espoo.*

Nokia Bell Labs will develop high capacity low latency 5G mobile access and backhaul system to be deployed for small cells located in the street level e.g. in light poles and provide a full 5G test bed network (including connectivity to the TAKE-5 core test network of the 5G Test Network Finland) at Nokia HQ campus in Espoo for the use of all the consortium partners. **Sitowise** (earlier Sito) will act as a bridgebuilder between technological 5G solutions and the urban context and practical workflows through its expertise in planning and construction processes in urban environments. They will develop 3D design tools for smart city planning. *"Open, real-time data transfer is a key issue in a modern smart city merging the virtual and physical environments into one entity", says project manager **Anssi Savisalo** from Sitowise.*

The materials and components expertise is brought by **Exel Composites** developing the light pole mechanics and needed composites, **Premix Oy** focusing on materials for integrated 5G access points, especially on antenna radomes and **Lammin Windows and Doors** studying radio wave propagation through building materials to establish sufficient outdoor-indoor connections. **C2 SmartLight** is dedicated to smart lighting control systems and service on top of the 5G network. **Teleste** will develop low maintenance displays and solutions for CCTV, information and advertisement. **Vaisala** will explore the opportunity to build cost-efficient and dense networks of compact air quality sensors and weather stations using the shared 5G infrastructure. **Indagon** will create location business cases and develop the location platform for centimeter and decimeter accuracies for 5G network for automotive and intelligent mobility applications. **Spinverse** acts as professional coordinator for this ambitious cross-technological open innovation project.

The research partners, **TUT, VTT and Aalto university**, bring versatile technical and scientific knowledge focusing the R&D both on materials and 5G RF technology and networks. The dedicated business development groups from the two latter ones lead the studies on novel business models and service concepts studying e.g. how and who can exploit the novel high data capacity networks business-wise, who are the potential key players, and what are the roles of cities, mobile operators and users.

To make the transformation to the new generation smart city infrastructure possible, we need proof of concepts to test the technological opportunities and economic feasibility of this digital ecosystem. The digital ecosystem requires open interfaces and data access for different stakeholders and service providers.

*"The goal of the project is to enable feasible digital service business opportunities for smart city environment, both on street level and in buildings. Big data capacity and a platform for novel services will improve the life and security of citizens enabling also autonomous traffic in near future", emphasizes Director of the project **Juha Salmelin** from Nokia Bell Labs.*

LuxTurrim5G will be the breakthrough enabler for a digital smart city ecosystem in street level deployments, building versatile technology and service platform utilizing a single flexible 5G network. As an outcome, the project brings big data capacity available and provides an open access platform for new digital services – both technology and business-wise. The solutions related to smart 5G light poles, small cell 5G base stations, smart 5G light pole infra and related services will be demonstrated and business base for these products created - from pioneering proof-of-concept solutions to building new potential export business for Finnish companies.

*"LuxTurrim5G is a good example of an ecosystem project with which one can take the 5G technologies being developed in Finland to new actors and environments as well as to form a basis for new business", says Program Manager **Mika Klemettinen** from Tekes.*

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