

LuxTurrim5G – Building the Digital Backbone for a Smart City

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NOKIA Bell Labs

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Rumble Tools
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 **LuxTurrim 5G**

LuxTurrim5G - Building the Digital Backbone for a Smart City

LuxTurrim5G ecosystem creates the digital backbone for a smart city. Our network of smart poles combines fast 5G connectivity, relevant data from a variety of sensors and a secure platform to build new data-driven services. This will help cities to tackle the grand challenges regarding urbanization and climate change, boost sustainable development and enable their digital transformation to smart or even hyperconnected cities.

CHALLENGES

Today cities are facing several major challenges which they need to be able to solve quickly to be sustainable in the future. In particular, the effects of climate change and the continuously growing trend of urbanization sets a lot of pressure on them.

Cities count for...

- 75% of global energy consumption and carbon emissions
- 70% of global population by 2050

Already now more than 75% of global energy consumption and carbon emissions originate from cities. According to United Nations (UN) estimate, about 70% of global population will live in urban areas by 2050.

This requires the cities to make systematic sustainable development actions and actually reinvent the ways they arrange and run many of their basic functions related to e.g. public safety, energy production & efficiency, effective and fluent transportation, air quality & health issues and thus guarantee safe, sustainable and smooth living for the people.

Digitalization is seen as an important tool to overcome these challenges and help cities to meet the sustainable development goals (SDG) set by the UN. However, many of the digital solutions ideated or planned require such high data capacity that they cannot be realized yet. Luckily the novel

5G networks based on so called mmWave technology make it possible by providing superfast and reliable, high-capacity mobile connectivity. As higher frequencies are used a dense network of base stations is needed, due to shorter signal propagation length. That's why we have created the LuxTurrim5G smart pole concept which turns light poles to 5G small cell base stations equipped also with a variety of sensors providing the novel infrastructure needed for digital smart city services.

SOLUTION

LuxTurrim5G

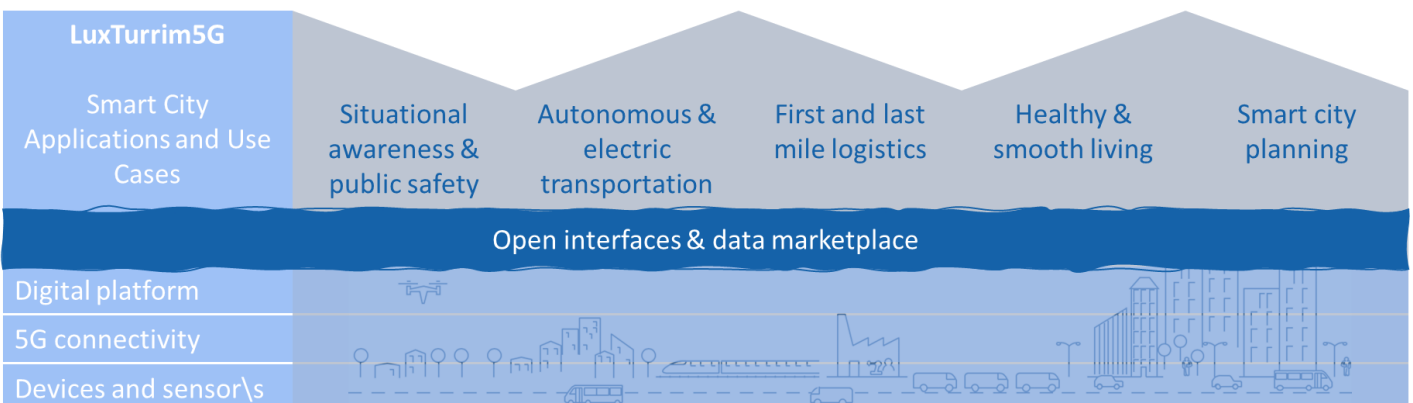
Digital backbone for a smart city

- 5G connectivity and sensor network via smart poles
- Secured data driven services

LuxTurrim5G ecosystem answers the above-mentioned needs of cities holistically by building a digital backbone for a smart city. This forms the basis for a multitude of local digital services enabling sustainable development for the city in all its operations in practice.

The local digital backbone includes

1. novel infrastructure of smart urban furniture providing 5G connectivity and an IoT platform based on a network of smart 5G poles with integrated 5G radio transmitters, video cameras, a variety of different sensors and other



connected devices in the urban city infrastructure

2. Secured local data platform enabling holistic use of data and utilizing artificial intelligence and machine learning to build new digital smart city services

This results as one common flexible and total cost optimized high capacity 5G network bringing high data capacity for citizens and enabling development of needed smart city services with new service and business opportunities for companies and local data as service operators.

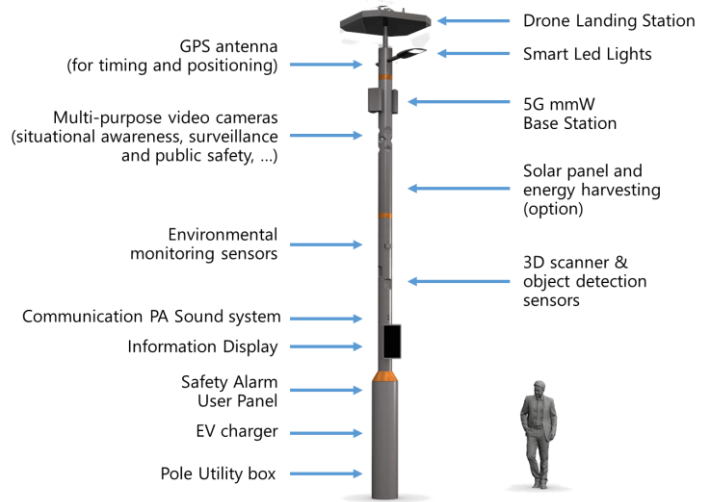
SMART POLE

Luxturrim5G smart pole, one example depicted in the attached figure, is a smart urban utility pole equipped with various IoT and connectivity devices enabling multitude of variable smart city services.

In addition to smart led based lighting the list of connected IoT devices includes a set of multi-purpose video cameras, environmental sensors (weather, air quality), public safety and infotainment devices like alarm panel, sound sensors, communication PA system and infotainment display screens, 3D environment sensing and tracking devices like laser scanners and radars.

The high capacity broadband connectivity in LuxTurrim5G Smart Pole is provided via millimeter wave 5G network. Also Wi-Fi hot spot can be supported. Special integrated devices include Electric Vehicle charger, solar panel module, power back-up battery and energy harvesting system, drone landing station and support for autonomous vehicles and smart logistics like C-V2X roadside unit and accurate positioning and location systems.

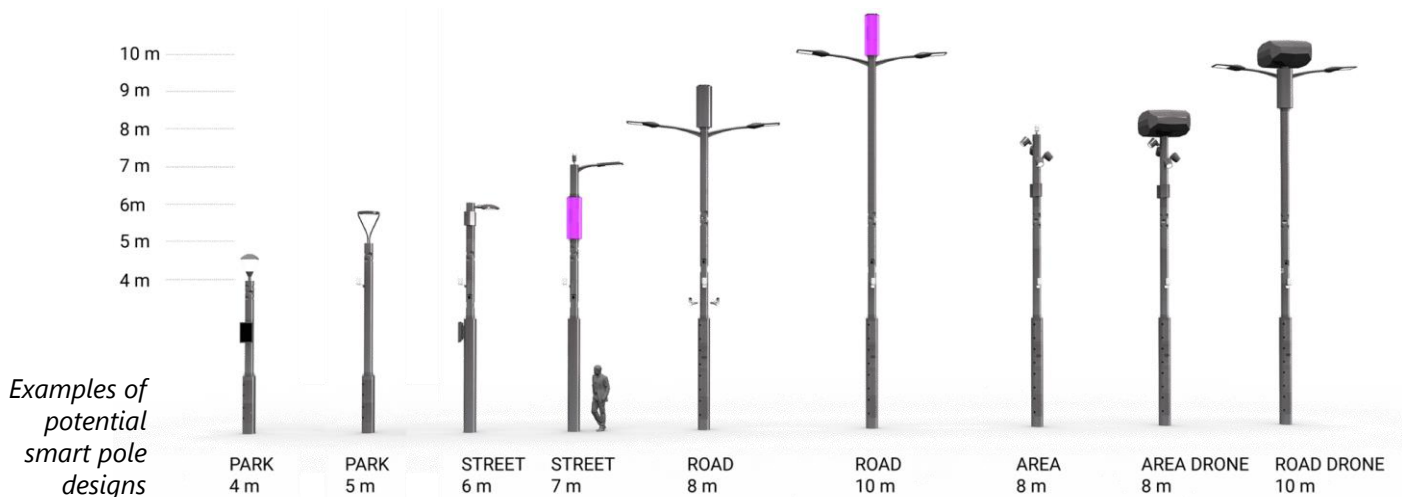
LuxTurrim5G Smart Pole



LuxTurrim5G smart pole product family includes different types of smart poles for various use cases and environments from city streets, parks and other urban and rural areas to highways. The modular design with innovative cabling concept enables plug-in type of construction of a pole configuration on need basis including use case and environment specific decorative parts.

MOBILIZING DATA

LuxTurrim5G smart pole network provides a high-speed communications platform and creates an extensive sensor network that can collect a wide range of different data, for example, on environment, traffic, weather and energy usage. This is important to be able to build comprehensive real-time situational awareness for the city. In addition, cities have already a large amount of own data available that could be used to develop a variety of new useful services. The LuxTurrim5G data platform is capable of managing, collecting, storing, handling and enriching these large masses of data from various local sources in a reliable and efficient manner for different use cases in the local



city environment. Through the data platform all data is secured and shared with the rules of local regulations. LuxTurrim5G Data Platform has open interfaces and aims to form a common data marketplace (Data Bazaar) to share data and solutions for city, city community and local businesses. The open interfaces of the data platform support connections to other data sources and to the open data of the city. This means that new digital services can use data from many different sources. Via the marketplace external application developers can make new digital services and provide their services back to the local smart city ecosystem thus monetizing the locally shared 5G and IoT connectivity.

One area of our research is the Neutral host operating model, where a "neutral" local operator would take care of building and operating the urban 5G network and providing a data platform for service providers. The rules of the data market are a key issue that will be addressed also in our joint research. The aim is not only to investigate different scenarios and business models, but also to pilot the Neutral host operating model in practice in the Kera neighbourhood in Espoo. The Neutral Host operator will share the connectivity network (sensors, smart pole, 5G) with city and mobile operators to share both costs of building the infra and benefits utilizing the data.

SERVICES

Smooth mobility, transport and logistics are examples of the major everyday challenges that will make the smart city breathe in the right pace.

LuxTurrim5G ecosystem - partners



Self-driving vehicles utilize the high-speed 5G network and contribute to the expansion of the sensor platform. New data-driven solutions for the last mile logistics ensure efficient supply chains in a city.

Urban planning and new operating models and services related to construction phase of urban areas is a key development area capable of bringing a lot of efficiency. Holistic energy solutions and new services related to e.g. local distributed energy production and demand response are key part of sustainability. Combining sensor data from different sources, such as utilizing the weather and air quality data for identified needs, enable development of specific services for traffic management, energy management and preventive health.

From a city perspective, a comprehensive, up-to-date on-line situational awareness on e.g. public safety, environmental, traffic and energy issues is a major new opportunity provided by the smart pole network with its high-speed 5G connections and extensive data base gathered by the wide sensor network and video management solutions. One part of this development is the Connected zone smart and safe bus stop concept (by Teleste).

ECOSYSTEM & PILOTING

LuxTurrim5G is an intensive joint development activity involving key experts from high-tech companies and top-notch research groups in various fields working together with each other and with cities, regulation authorities, operators and other key stakeholders. Together this group makes pioneering research and development combining








5G, sensors and data in a holistic way, integrated to urban planning, to build services needed in a smart city.

First key service areas

- Situational awareness & public safety
- Autonomous & electric transportation
- First and last mile logistics
- Healthy & smooth living
- Smart city planning

Active piloting has been made throughout the joint development work since early 2017. Key pilot environment has been built around Nokia Campus, in Espoo Finland. The pilot infrastructure includes a network of LuxTurrim5G smart poles (with different configurations), two smart and safe bus stops (Connected Zone by Teleste), autonomous vehicles such as the GACHA self-driving shuttle bus (by Sensible4), city drones (by Rumble Tools) and individual equipment like information screens, weather stations and radios. The pilot network covers areas at Nokia Campus and the route from the campus to the near-by Kera railway station.

LuxTurrim5G Kera Route pilot services

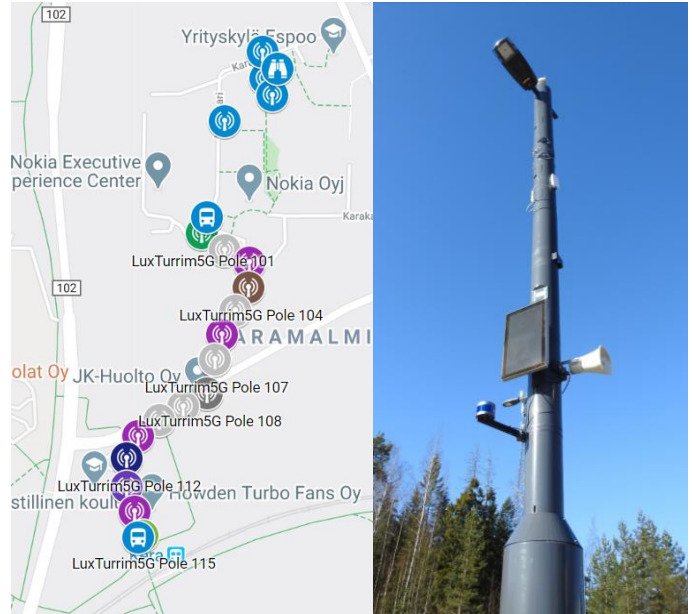
Ultra high Broadband	Surveillance & Safety	Environmental monitoring	Traffic & road optimization	Autonomous remote driving
				

FROM ESPOO TO GLOBAL MARKETS

Espoo aims to be Europe's most sustainable city and carbon-neutral already in the 2020s. Together with its partners, the city is at the forefront of smart urban development, climate work and the circular economy. A key action in the Espoo agenda is to transform the Kera area to a smart and green urban district with at least 14,000 residents and 10,000 jobs.

LuxTurrim5G ecosystem plays an important role in this development. The first pilot phase, completed spring 2020, provides a network of 19 smart poles covering the route from Nokia Campus to Kera railway station. The modern Kera, which will be built in the coming years, will provide a significant pilot

ground for new smart city solutions, which will also pave the way for larger international projects. Espoo's role as a UN model city for sustainable development contributes to this.



LuxTurrim5G ecosystem – Building key Enablers for a Digital Smart City

**We are building the future now.
Want to know more?**

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