

# *Development and Implementation of a Smart City Use Case in a 5G Mobile Network's Operator*

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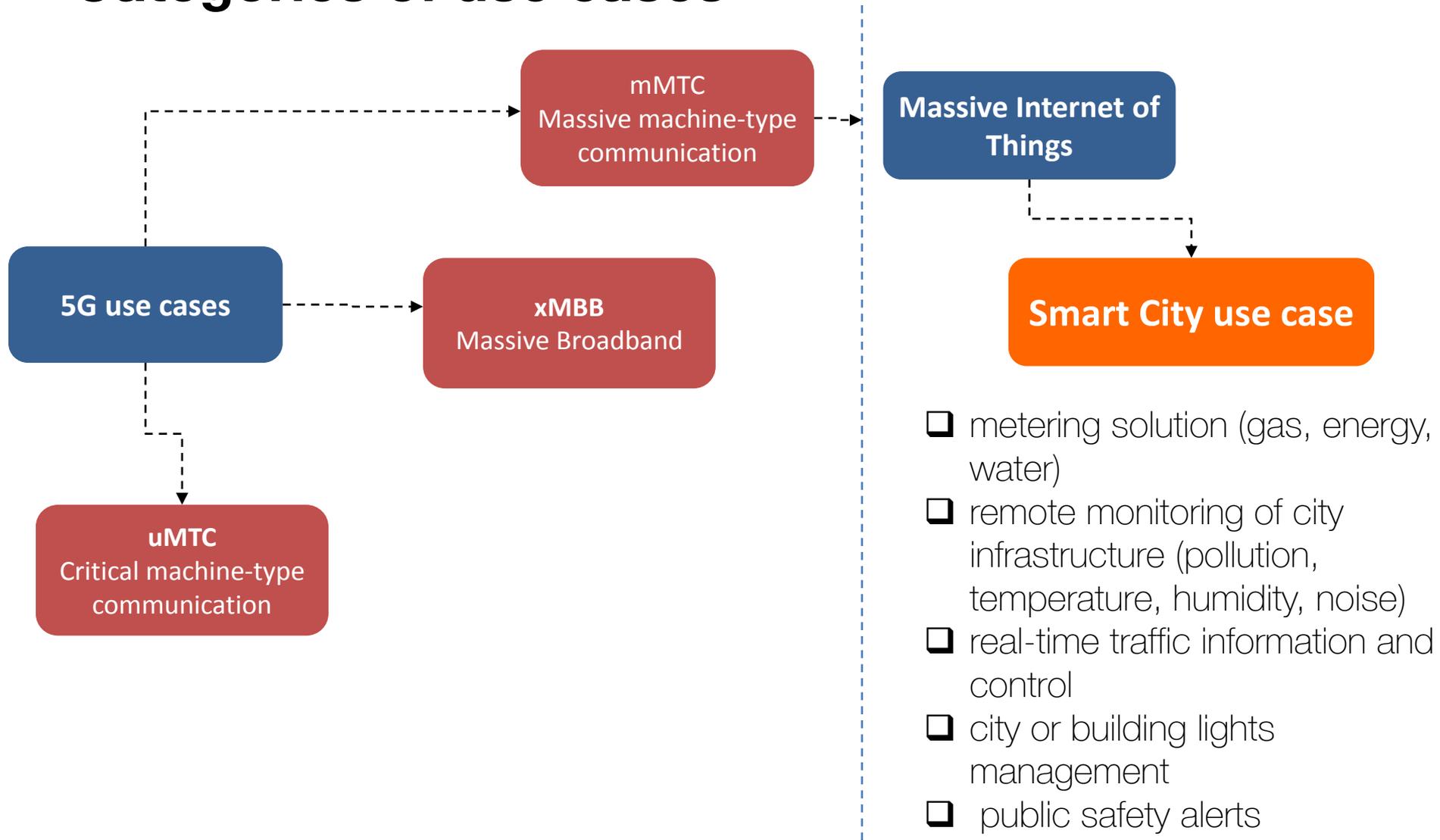
- Introduction

- Generalities about Smart City use cases and verticals

- Smart City Intelligent Lighting use case

- Conclusions

# Categories of use cases



# Alba Iulia Smart City

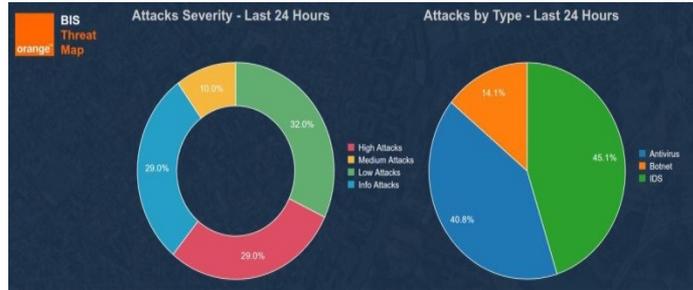
- ❑ **Alba Iulia** was the first Smart City from Romania, developed by Orange, and is a small to middle size city in Romania with about 70k inhabitants. It is moving forwards as a smart city by adopting the latest ICT technologies including LoRaWAN, LTE-M and finally 5G enablers.
- ❑ **Alba Iulia** has been selected by Orange to demonstrate the capabilities of the targeted Smart City high level architecture under Intelligent Lighting use case.

# Alba Iulia is the first smart city under implementation in RO

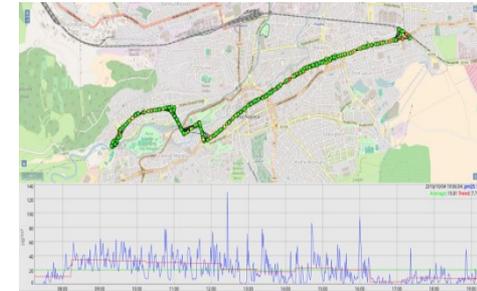
## Public Wi-Fi



## Cyber security



## Env. monitoring

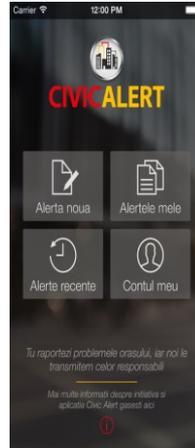
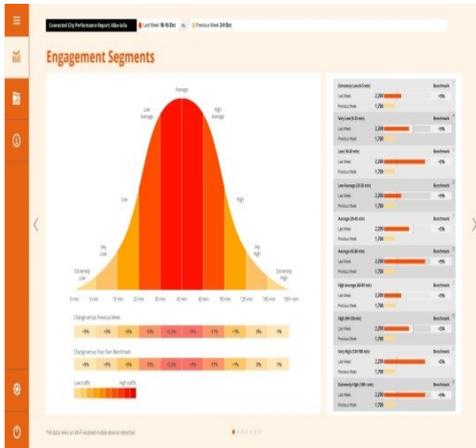


## Mobility management

## City incident app

## Proximity engagement

## IoT based on LoRa (LPWAN)



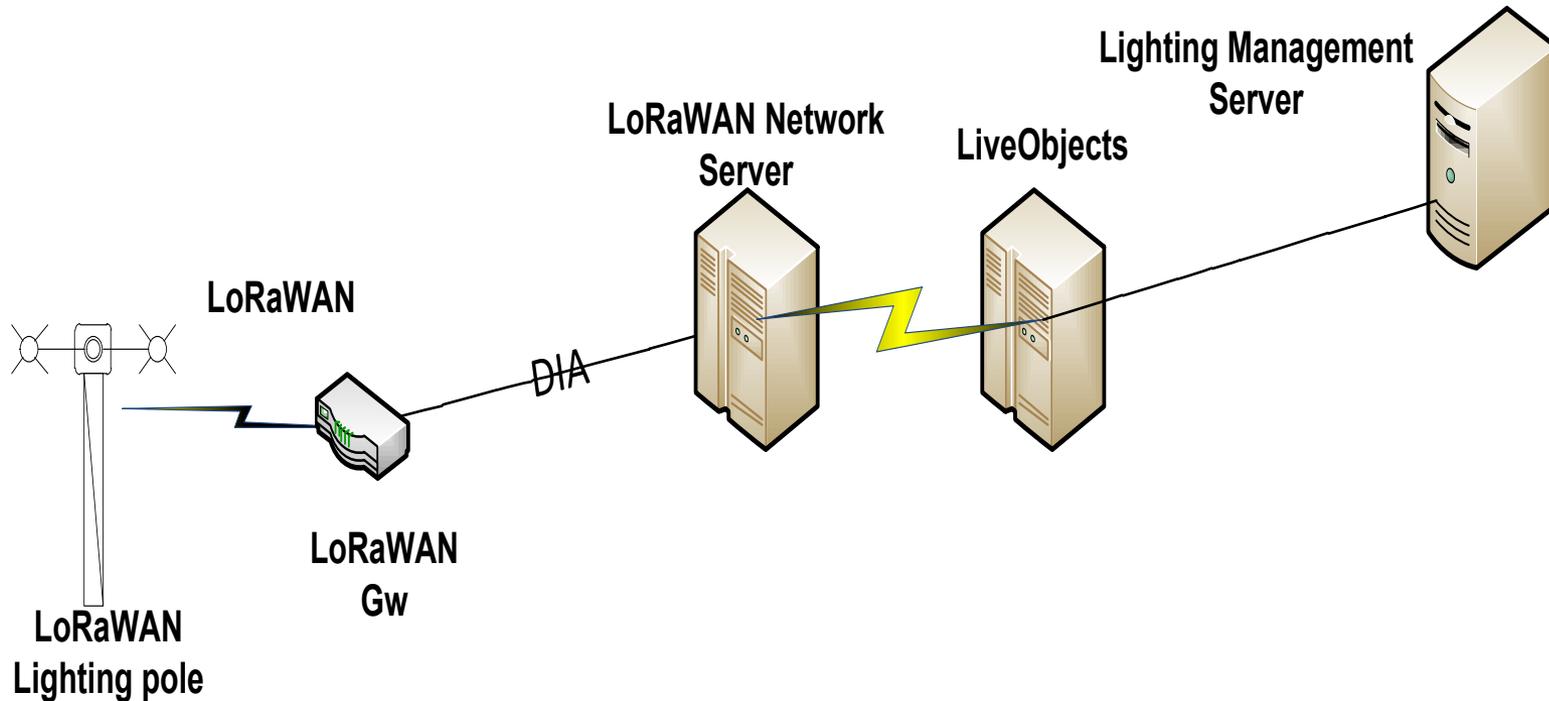
# Alba Iulia Smart City- Intelligent Lighting

- ❑ **Intelligent Lighting** use case will be considered in the scope of the **5G mMTC** category where the challenge is to accommodate the massive number of connected actuators/controllers without impacting QoS and QoE.
- ❑ **Intelligent Lighting** use case will assure ultra-high network reliability and availability, while low-power, context awareness and location awareness requirements for managing the connected actuators/ controllers over the access and transport layers can further improve the solution cost efficiency.

# Main Objectives of the Intelligent Lighting System Implementation at Alba Iulia

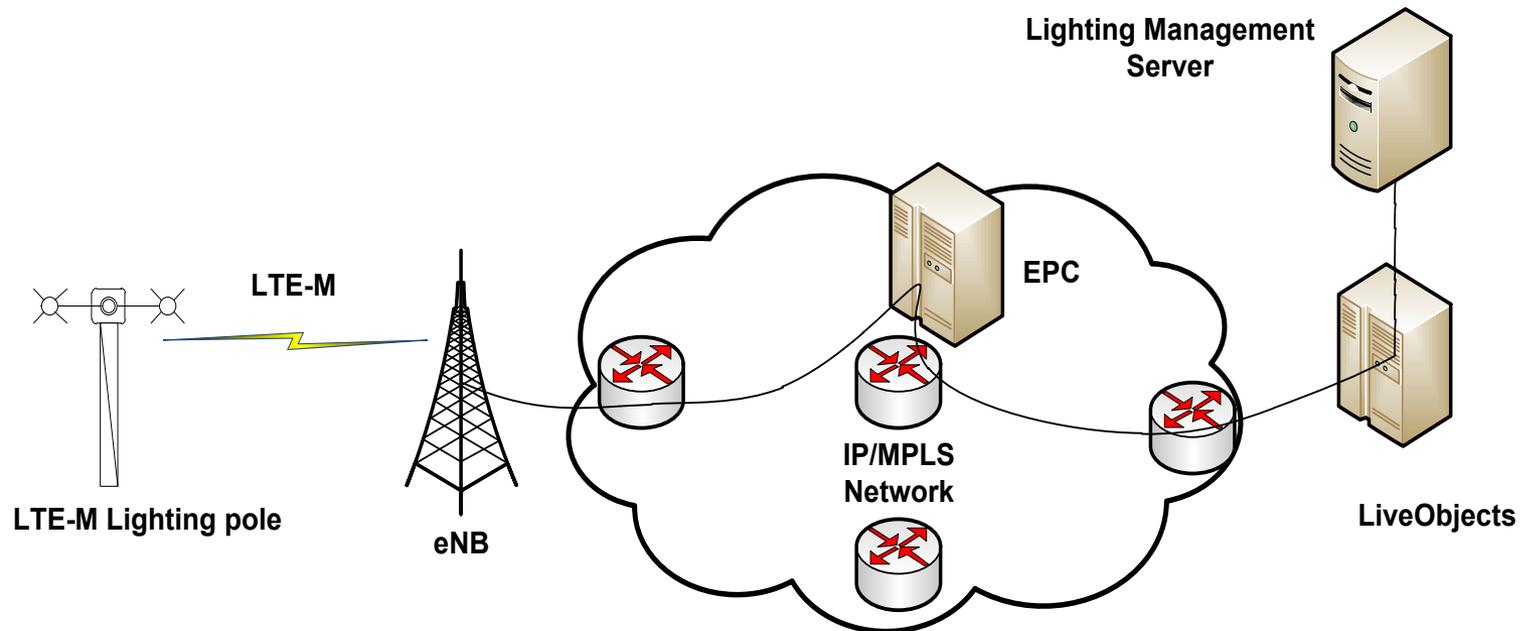
- Prototype demonstration of the use case over 5G
- Demonstration of the coexistence of selected Smart City IoT applications in the shared 5G infrastructure
- Integration and testing of this vertical use case within the project's 5G communication framework
- Demonstration of the openness of 5G to different radio access technologies
- Usage of different types of Radio Access Network (RAN) terminals
- Timing service creation from weeks or days to hours
- Extended network coverage, new service capabilities and new business models
- Enhanced network management and network control

**Presently, Orange Romania, has at Alba Iulia implemented this solution:**



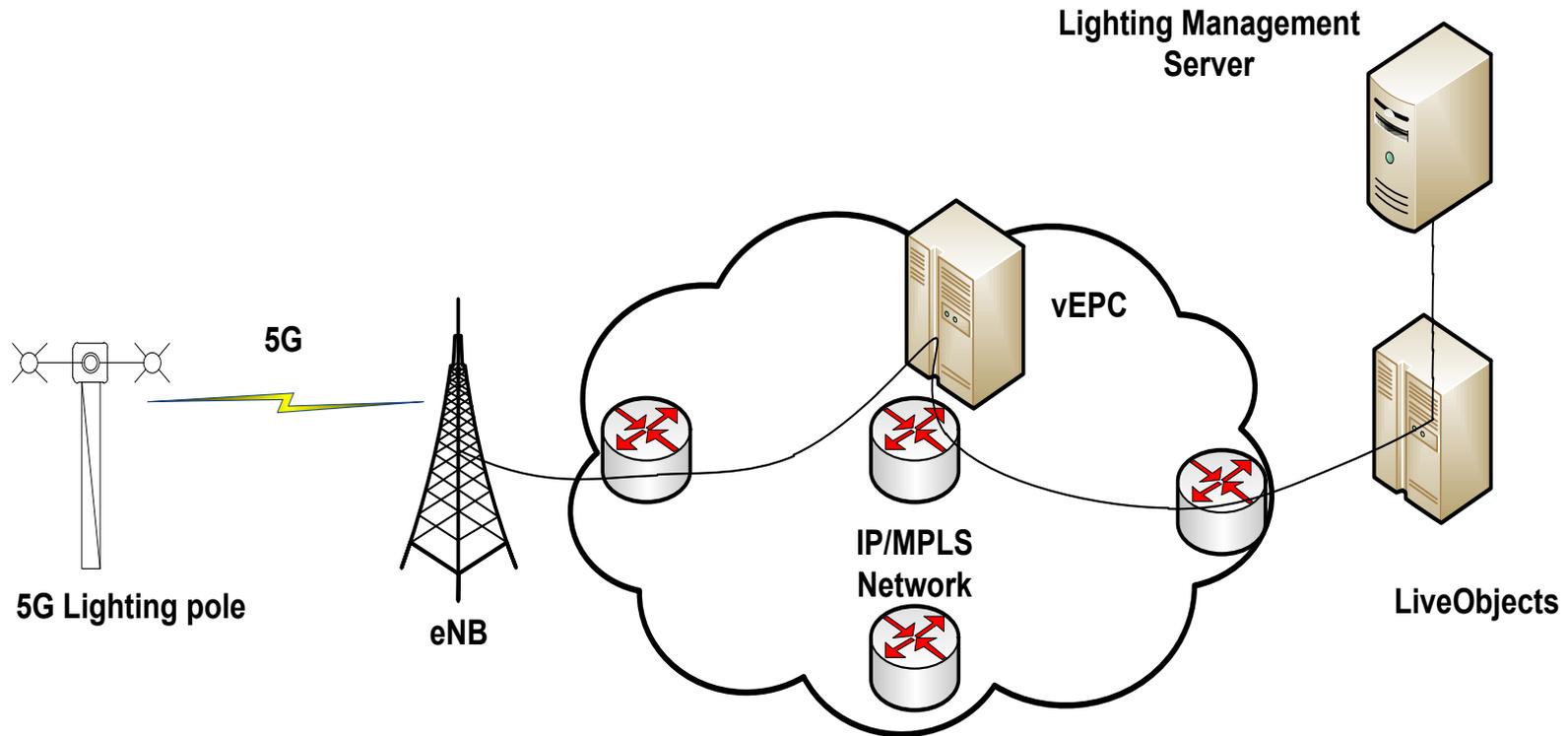
## **Intelligent Lighting System using LoRaWAN**

**In the near future, Orange Romania will implement at Alba Iulia this solution:**



## **Intelligent Lighting System using LTE-M**

# The final implementation for Intelligent Lighting System at Alba Iulia is:



## Intelligent Lighting System using 5G network

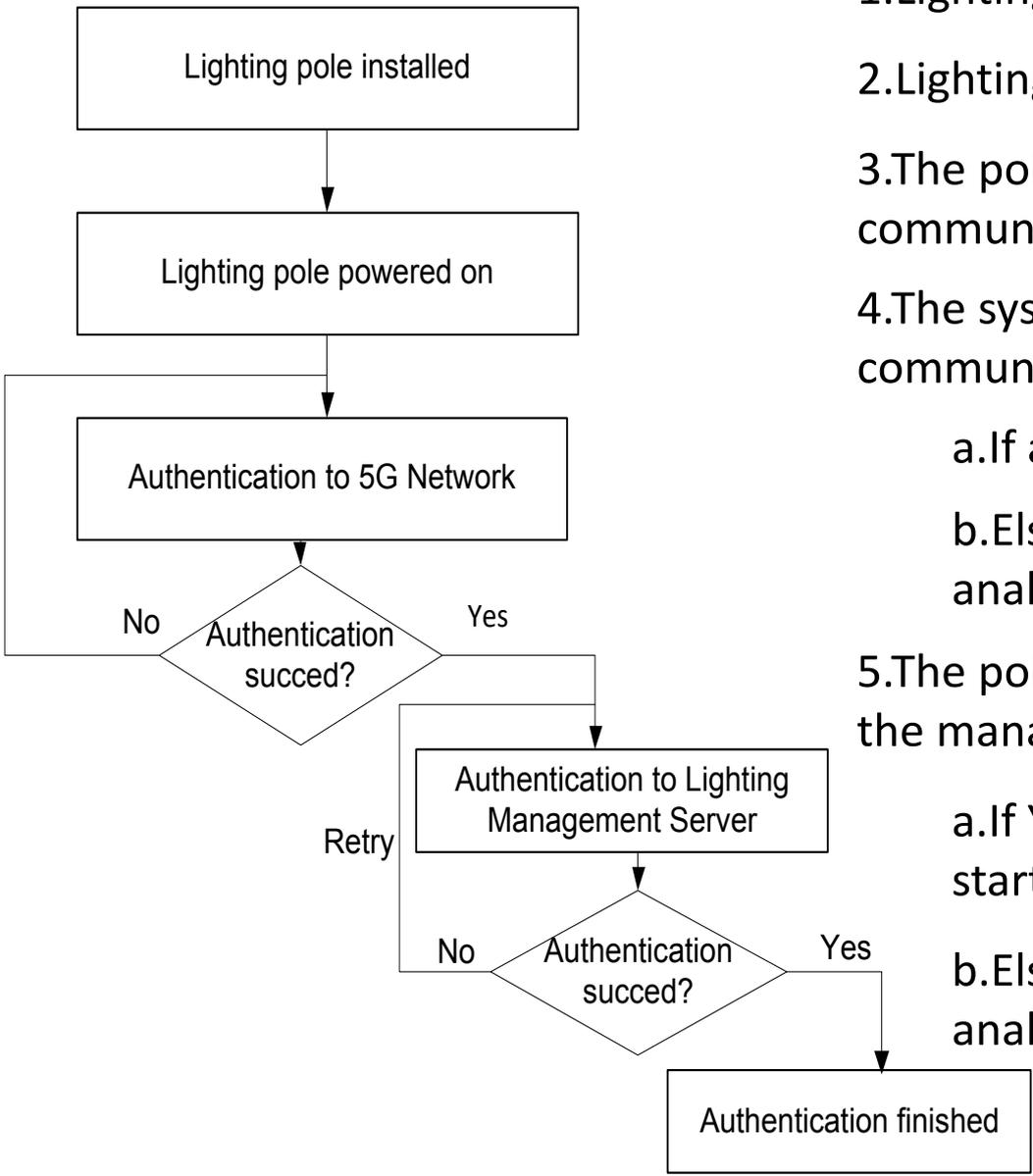
# Functionality of the Intelligent Lighting Solution:



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1. Lighting pole system is installed.
2. Lighting pole is powered on.
3. The pole system is trying to connect to the communication network.
4. The system is authenticated with the communication network.
  - a. If authentication succeeds, go to step 5.
  - b. Else go to step 4, the failed cause to be analyzed at network level.
5. The pole lighting system is authenticated to the management server.
  - a. If Yes, authentication succeeds, system starts working.
  - b. Else, go to step 5, the cause to be analyzed at management server level.





# Specific Requirements for Intelligent Lighting System

## RAN requirements:

- high reliability
- dense coverage
- accommodation of small bursts of data
- accommodate large density of devices/ km<sup>2</sup>

## Core requirements:

- VNFs provisioning (vMME, vPGW and vSGW)
- service chaining
- IP/MPLS transport network
- end-to-end authentication for devices

- Low bandwidth needs
- Low delay
- Fast deployment of core system on demand

**Specific Sliced system with dedicated resources for the communication capabilities within the Intelligent Lighting Solution**

- Massive communication type devices
- Large number of devices and sensors
- High requirements for signaling capabilities

- Sensitive response to the system triggers
- Easy to accommodate new devices
- Economic aspects, for business cases sustainability, accommodating of slicing principles over the dedicated hardware infrastructure

# Conclusions



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- ❑ **Intelligent Lighting** use case will be implemented and tested by Orange, in Alba Iulia city and also in the lab environment, and the results will be compared with existing functionality network infrastructure based on LoRaWAN to highlight the benefits of 5G.
  
- ❑ **Intelligent Lighting** use case under 5G network will bring these new capabilities:
  - ❑ it provides higher wireless area capacity and more varied service capabilities compared to 2010
  - ❑ can save up to 80% of energy per service provided
  - ❑ reduces the average service creation time cycle
  - ❑ can create a secure, reliable and dependable Internet with a “zero perceived” downtime for services provision
  - ❑ facilitates very dense deployments of wireless communication and enable advanced user controlled privacy

# Acknowledgments

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- ❑ It has been done as a result of dissemination work on these two projects, by the Development and Innovation team from Orange Romania.

# Questions?

thank you!

благодарение!

хвала!

multumesc!

grazie!

merci!

danke!

go raibh maith agat!

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