Urban Mobility in the City of Things

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Introduction

Predictions of the number of IoT devices – multiple tens of billions connected devices by 2020

This generates new challenges, including:

- Scalability
- Creation of a new, converged access architecture
- Security
- Maintainability

Problem Statement

Suboptimal administration of public resources and services in the majority of cities today:

- Lack of transparency – between different urban administrations
- Data from various sources, such as sensors, cameras or vehicles

Smart cities IoT concepts improve the quality of public administration by:

- Continuous measurements of city data
- Adapting behaviour of people and things accordingly

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Open IoT Architecture

Precondition for a smart city enabling all public services to use a common infrastructure exchanging data for cross-optimization

We propose a smart city IoT architecture with four layers:

- Street layer
- City layer
- Data center layer
- Applications layer

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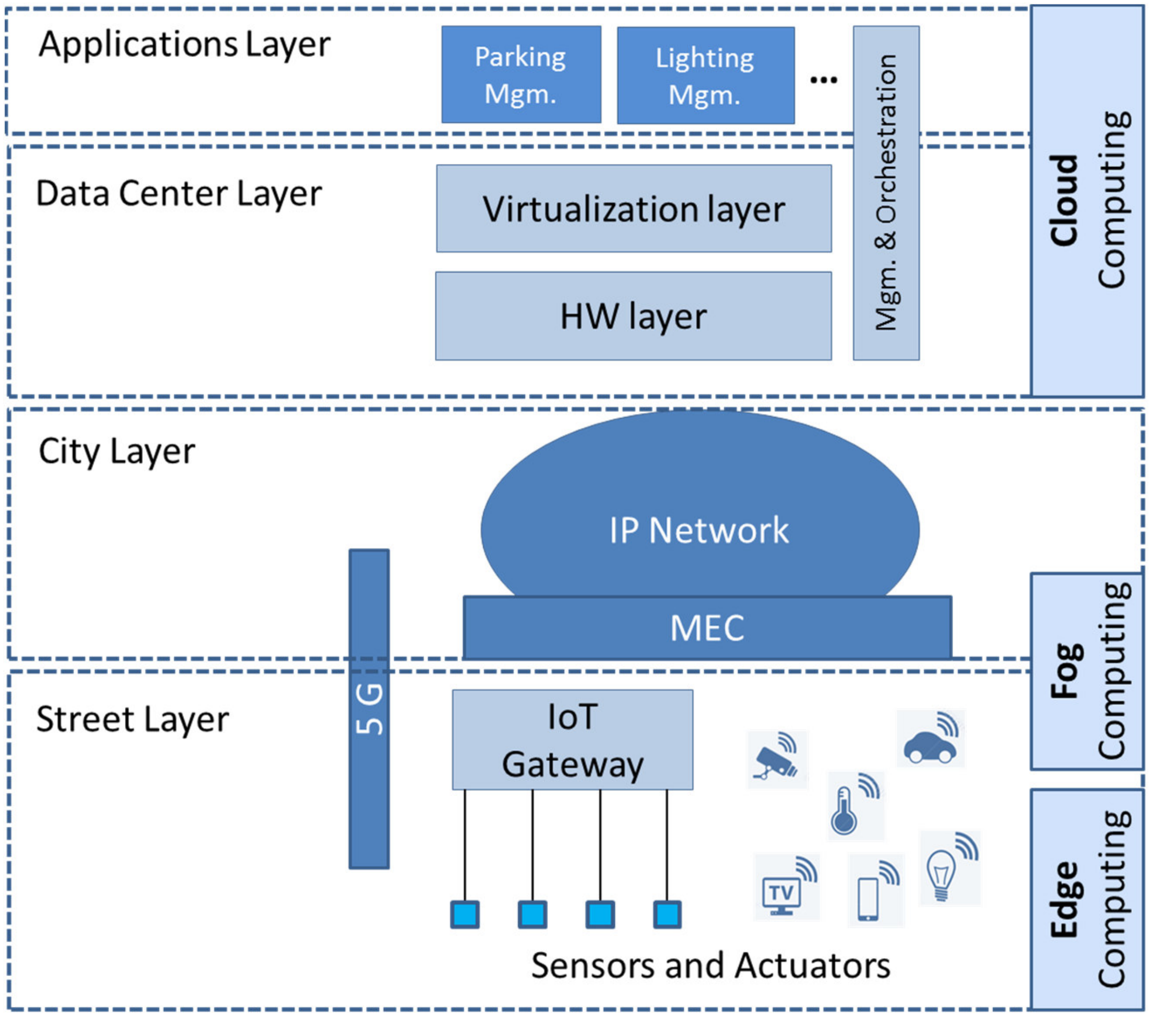
Proposed IoT Architecture



Smart City Applications Allocation

Cloud

- Centralized
- High scalability and capacity
- Higher latency and network traffic

Fog

- Near the IoT devices
- Lower scalability and capacity
- Low latency and network traffic

Edge

- More complex IoT devices with some computation power
- Lowest latency

The Role of 5G Networks

5G focusses on several major requirements, highly relevant for IoT

Our architecture supports 5G and benefits from Mobile-Edge Computing (MEC)

MEC emerging technology for 5G networks – cloud computing within the Radio Access Network (RAN), comparable with fog computing

We focus on a smart city IoT architecture with 5G and discuss the differences between cloud computing and MEC

Dynamic Applications Allocation

Selected application parameters permanently measured

- Priority
- Storage requirements
- Network traffic between sensors/actors and the application

Optimal application allocation based on the measured data

- Applications with high priority are allocated in MEC to meet time critical requirements
- Applications with medium and low priority can be dynamically moved between the cloud and MEC

Example Use Cases

Smart parking and smart lighting have both priority medium
Smart parking is used more frequently in the day time
Smart lighting is used more frequently in the night time

Application	Prio.	Strg.	Lat.	Allocation
Day time				
Smart Parking	M	L-M	M-H	MEC
Smart Lighting	M	L	L	Cloud
Night time				
Smart Parking	M	L-M	L	Cloud
Smart Lighting	M	L	M	MEC

L-Low, M-Medium, H-High

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Conclusions

Expected explosion of the number of IoT devices in the next years

Public resources and services in the majority of cities today on a suboptimal level

Introduction of an innovative IoT layered architecture for optimal management of applications allocation

Two use cases demonstrate the anticipated benefits of the proposed architecture