FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Security Challenges in the Internet of Things

Dr. Sigrid Schefer-Wenzl

FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Agenda

- Introduction
- Problem statement
- Open Internet of Things (IoT) Architecture
- Use Cases for Smart Cities
- Security Challenges
- Conclusions

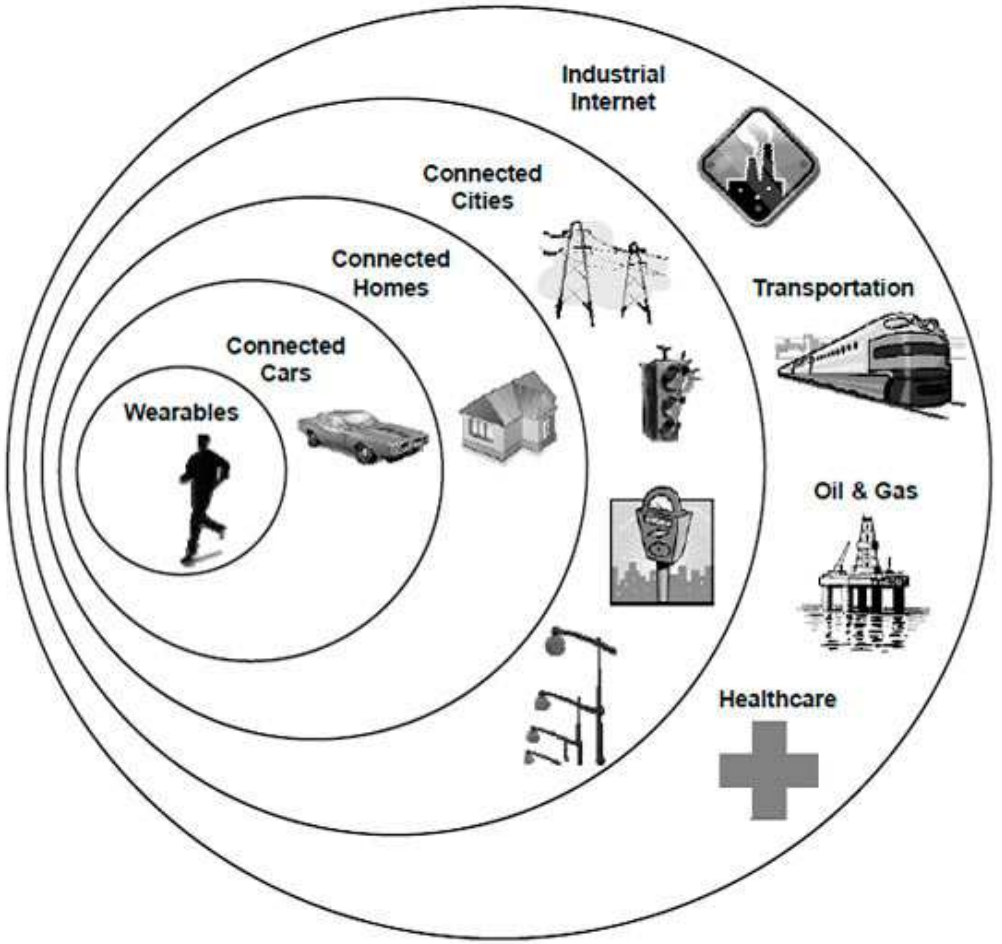
FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Introduction

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

This generates new challenges, including:

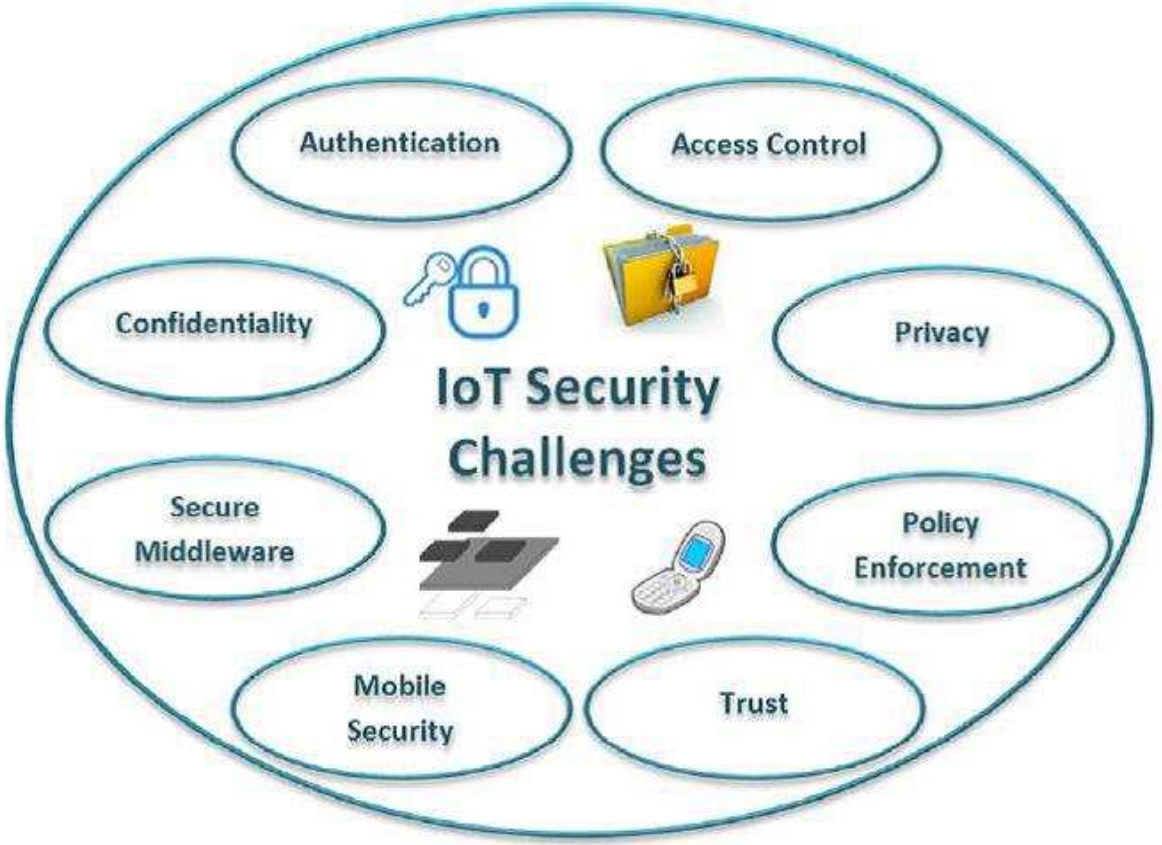
- Scalability
- Creation of a new, converged access architecture
- Security
- Maintainability



FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Problem Statement (1/2)

- Majority of IoT devices and applications not designed to handle the security and privacy attacks
- Increase in security and privacy issues in the IoT network



FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Problem Statement (2/2)

- Appraisals disclose that 70% of IoT devices are very easy to attack
- Common attacks
  - Stealing of sensitive information by hacking IoT devices
  - Compromise IoT components to launch attacks against a thirdparty (e.g. security breaches of baby monitors, connected cars, smart watches, smart televisions)

FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Smart City Use Case

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

FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Open IoT Architecture

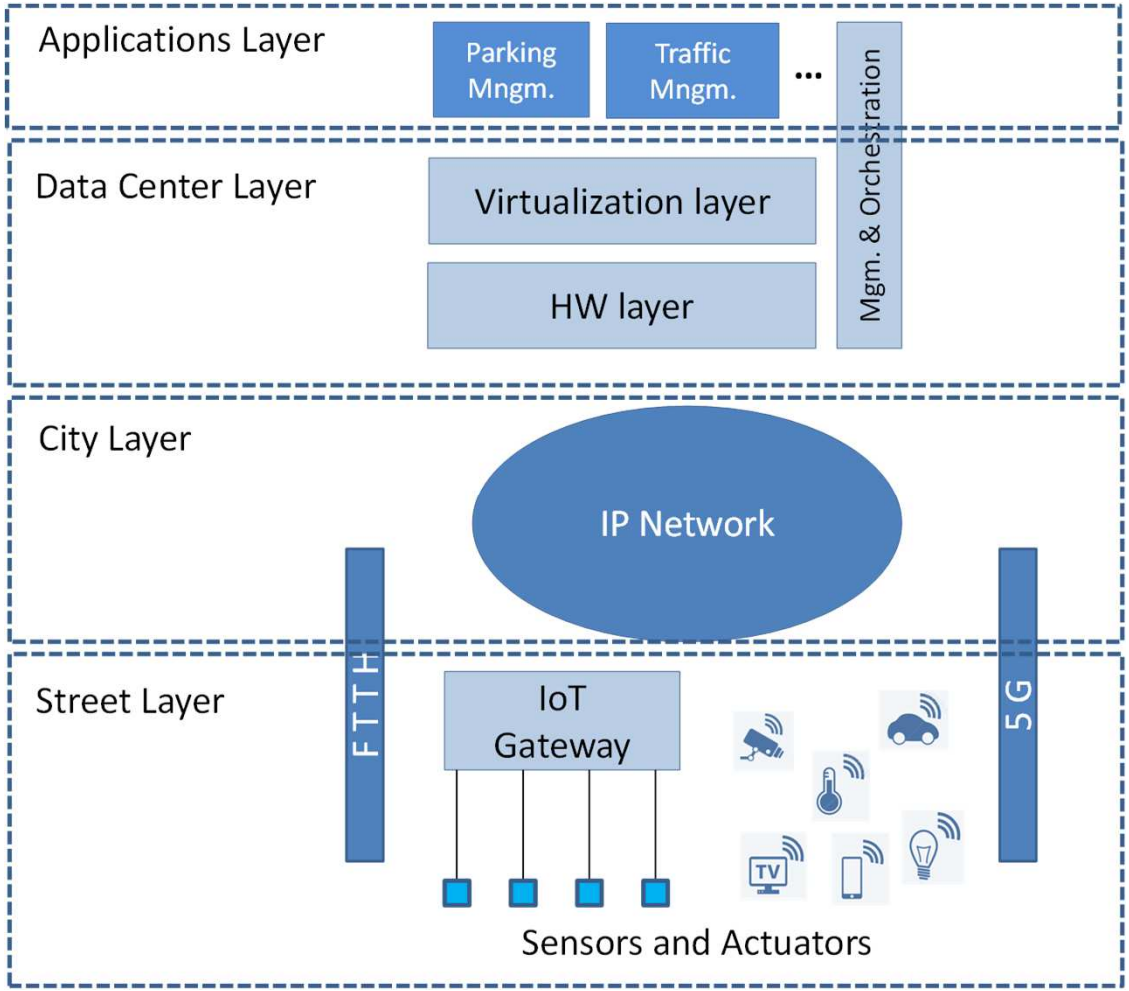
Precondition for a smart city enabling all public services to use a common infrastructure exchanging data for cross-optimization

Smart city IoT architecture with four layers:

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

FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Proposed IoT Architecture



FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

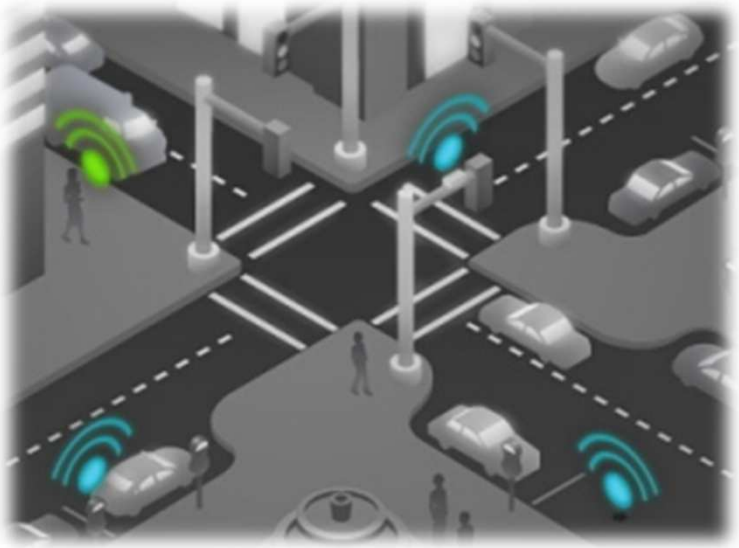
Use Cases for Smart Cities

Smart parking
Smart city bikes
Traffic jam avoidance
Public transport optimization
Traffic noise reduction
Street lights optimization

FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Smart Parking

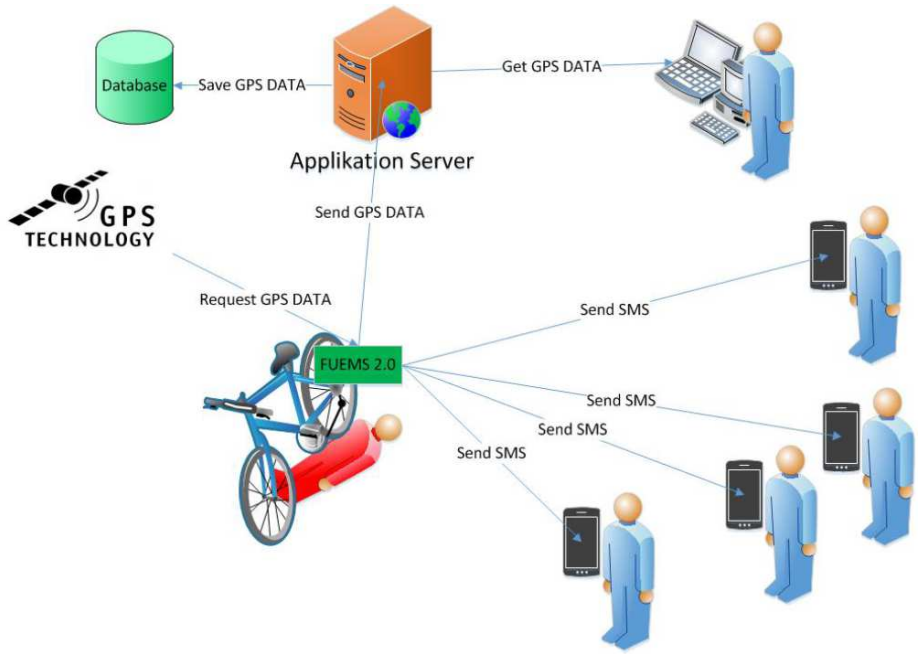
- Ineffective parking management causes pollution, frustration and traffic incidents.
- Parking sensors as in-ground magnetic sensors, video-based sensors and radar sensors connected over IoT.
- Parking availability shown on smart phones, also supporting drivers with disabilities to locate suitable parking spots.



FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Smart City Bikes

- An environment friendly kind of public transportation
- Traditional city bikes extended with low cost equipment (GPS, motion and acceleration sensors)
- This enables:
  - finding of a stolen bike
  - accidence detection
  - real-time positions
  - automatic maintenance alerts
  - damage detections



FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Further Use Cases 1/2

Traffic Jam Avoidance

- Show real-time jam information
- Provide alternative mobility suggestions like car sharing, cabs, subways, trains, rental bikes

Public Transport Optimization

- Planning new routes
- Optimization of routes
- Alternative routes in the case of damage
- Fast damage detection and response

FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Further Use Cases 2/2

Traffic Noise Reduction

- 31-36% of population in Vienna suffers from traffic noise
- Sensors measure the noise level and alerts the traffic system to reduce the speed limit if needed

Street Lights Optimization

- Responsive street lights react to motion and to level of darkness
- 70% energy cost reduction

FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Security in IoT

- Security as foundational enabler for IoT
- Currently no consensus on how to implement security on IoT-devices
- Main challenge is to compress 25 years of security evolution into novel IoT devices
- No silver bullet that can effectively mitigate the threats
- Available knowledge needs to be adapted to fit the unique constraints of IoT devices

FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Basic IoT Security Guidelines

- Emphasise security from day one
- Lifecycle, future-proofing, updates
- Access control and device authentication
- Know your enemy
- Prepare for security breaches

FH CAMPUS WIEN
UNIVERSITY OF APPLIED SCIENCES

Conclusions

- Expected explosion of the number of IoT devices in the next years
- Introduction of an innovative IoT layered architecture showcased via use cases for optimal management in some areas of urban mobility
- Security must be the foundational enabler for IoT