

Multiprocessor Platform for a Smart City Infrastructure

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Background (1)

- It is expected that the Internet of Things / Internet of Everything (IoT / IoE) will comprise billions of connected devices
- MPSoc enable intelligent connected devices at reasonable cost

Background (2)

- **Most efficient lighting is LED-based**
- **All LED lights require LED-drivers (to drive a predefined DC current through the LED's)**
- **In outdoor lighting the power level (typically $\geq 50W$) requires driver electronics separate from LED-'bulb'**

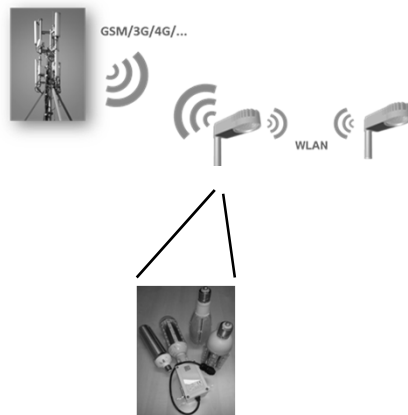
- I am in a strategic position
- I save energy at night but sleep all day
- Isn't this stupid???

Energy saving:
Save up to 80 %
with smart LED
street lights.



Making the Street Light Smart

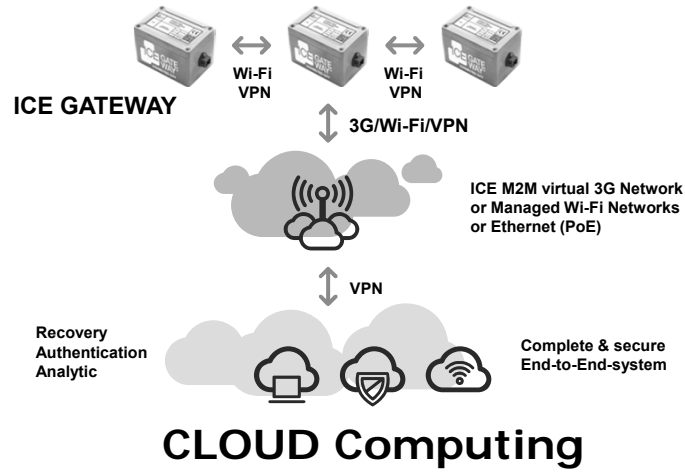
- **This is less expensive than an LED-light:**
- **So, *connect* the light and add *processing power***



ICE CELL (Group of 1-5 nodes)

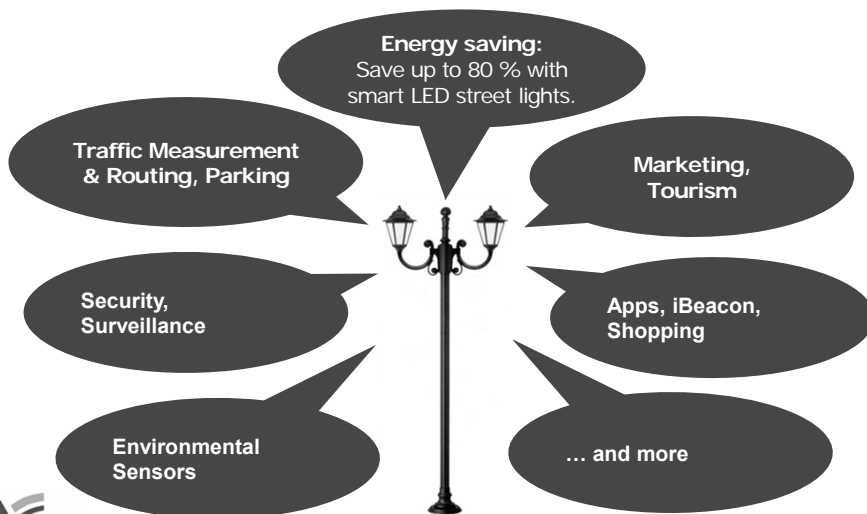


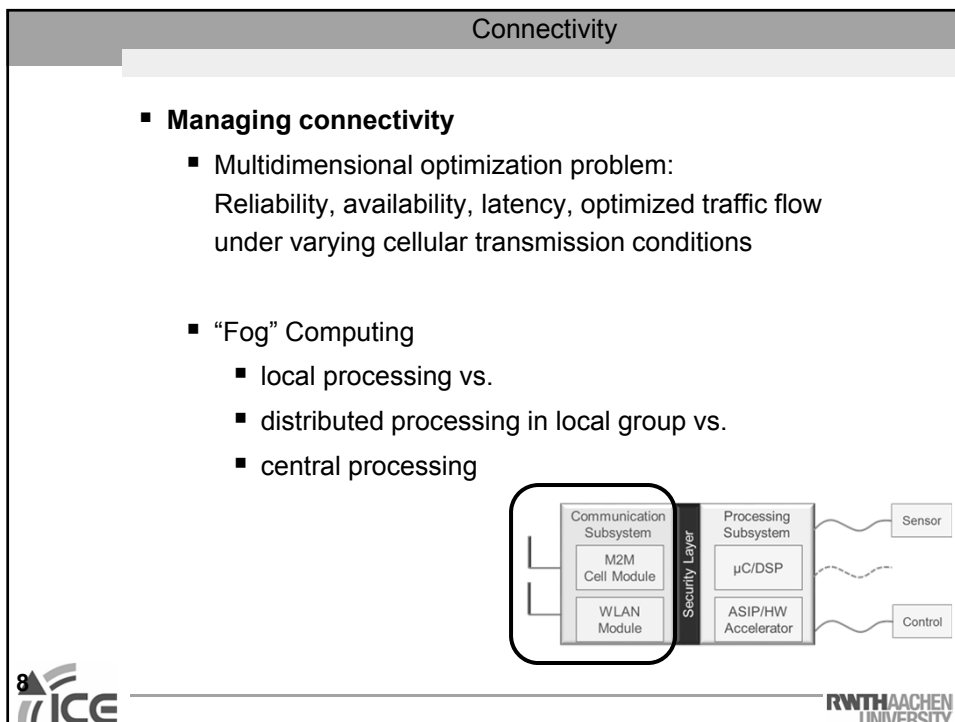
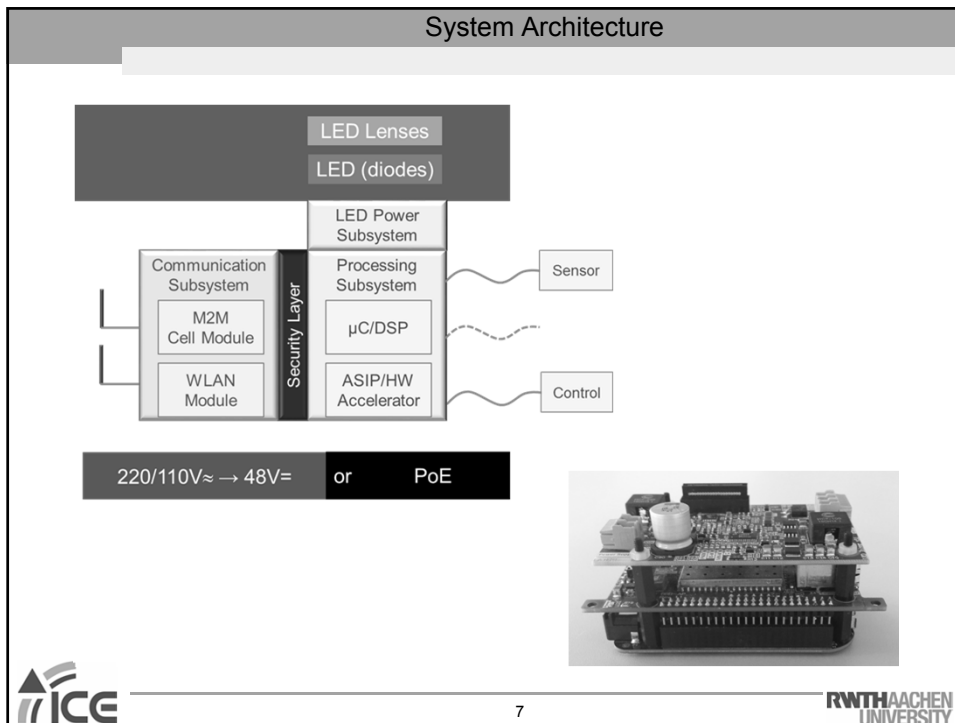
„FOG“ Computing



Background (3)

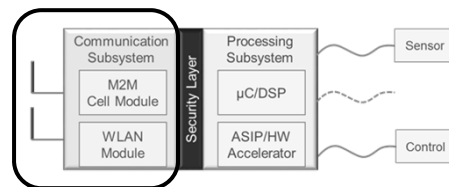
- A smart M2M-communication platforms enables a lot of daytime activities





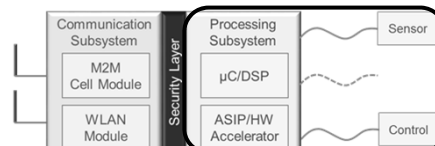
Why Multiprocessor System?

- **Managing connectivity**
- **Connecting external devices via WLAN**



Why Multiprocessor System?

- **Managing connectivity**
- **Connecting external devices via WLAN**
- **Processor with (real-time) operating system**
 - for device management, control and
 - wire-connected devices (e.g. USB)
- **DSP/Accelerator**
 - for high rate signal processing



Intelligence

▪ Example

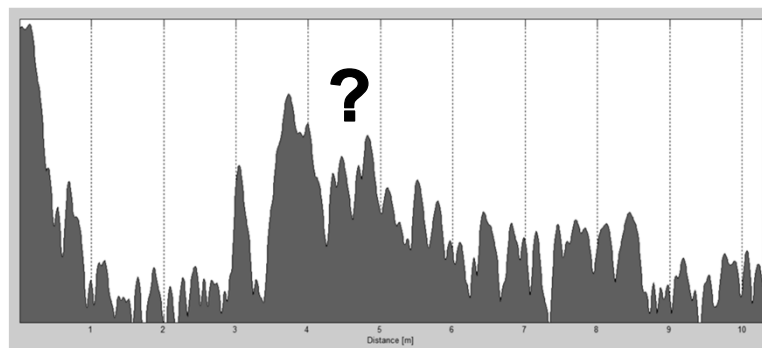
- Extraction of traffic information from video requires camera
- Privacy preserving alternatives, e.g. ultrasound or sound-based



Intelligence

▪ Example

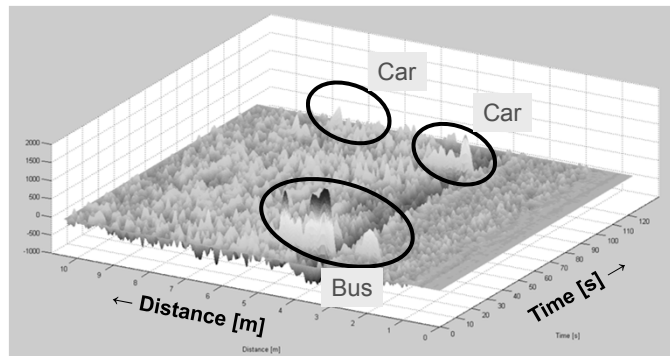
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Intelligence

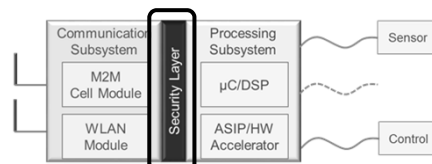
▪ Example

- Preprocessing at sampling rate on DSP-unit
- Classification at frame rate on real-time OS-unit



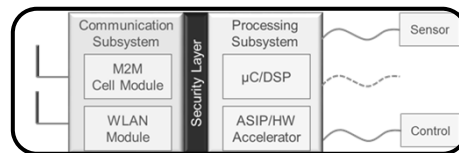
Security – Often taken too easy

- Issue: devices are out there for many years
 - They may face threats we do not know today!
- ⇒ Security considerations must be integral part of system concept
- Strict separation between (vulnerable) communication subsystem and “secure” data subsystem
 - OS/SW-separation of connected cores or separated cores?
- Fallback communication-reboot from secure side in case of service interruption (single wire)



More System Issues

- **There is nobody who can press Alt-Ctrl-Delete or power-button in case of dead-lock/hang-up and loss of communication**
 - Needs sophisticated checks of
 - Communication status
 - Processor status
- **Recovery starting from processing subsystem**
 - E.g. watchdog based



Finally, ...

- **A combination of research questions**
 - RWTH Aachen 
- and technology development by a start-up company

