Karlsruhe Institute of Technology

Technology for Pervasive Computing

A Platform-as-a-Service for in-situ Development of Wireless Sensor Network Applications

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Motivation

- Facilitating development of WSN applications
  - On-demand *development*
  - On-demand *deployment*
  - On-demand *integration*

- Dinam PaaS for WSN application hosting
  - *Service delivery* architecture for WSNs
  - *QoS, Reliability* & *Scalability*
  - Enabler for *business integration*

Overview

1. Dinam Cloud Architecture
2. Dinam PaaS Approach
3. Application Example
4. System Integration Example
5. Discussion
6. Summary and Outlook

Overview

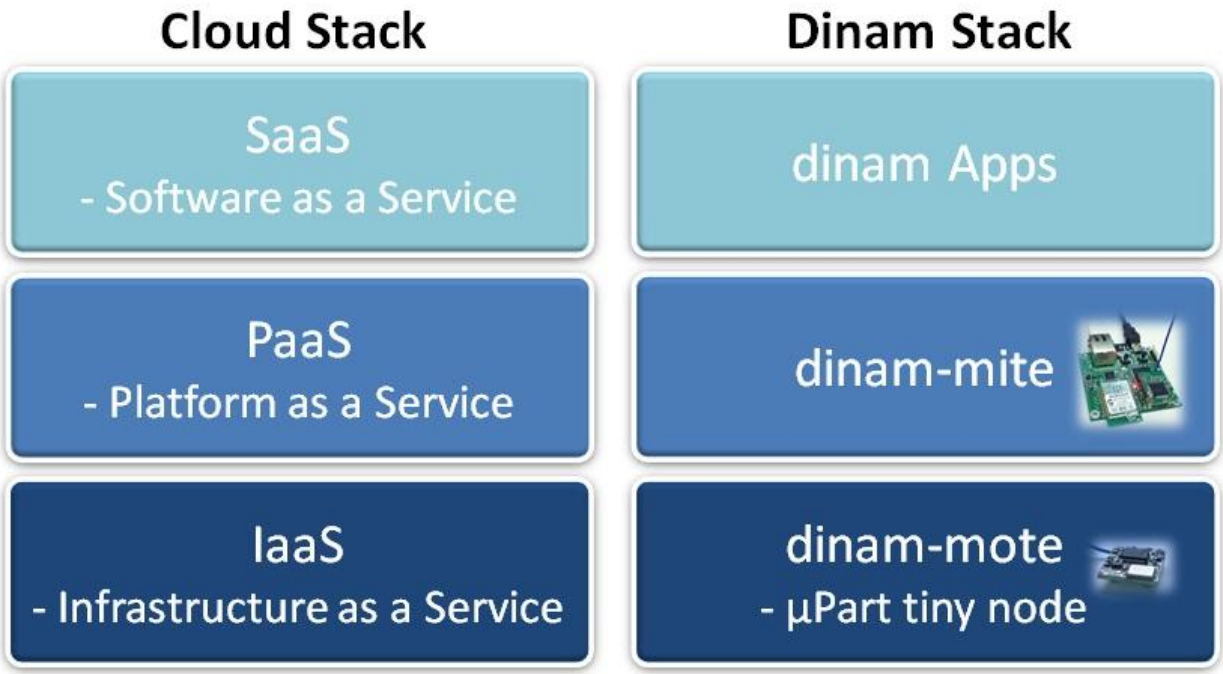
Dinam Cloud Architecture – I

- Dinam Cloud Stack:
  - Dinam *IaaS:*

    infrastructure services
  - Dinam *PaaS:*

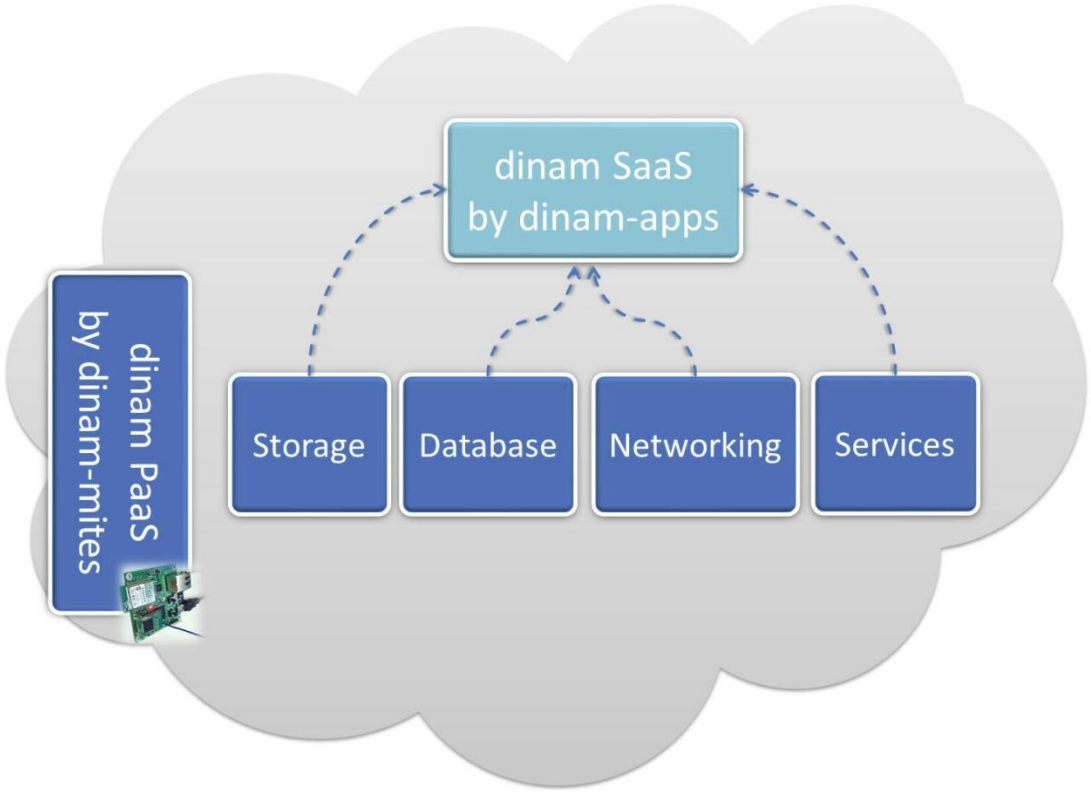
    platform services
  - Dinam *SaaS*

    software services



Dinam Cloud Architecture – II

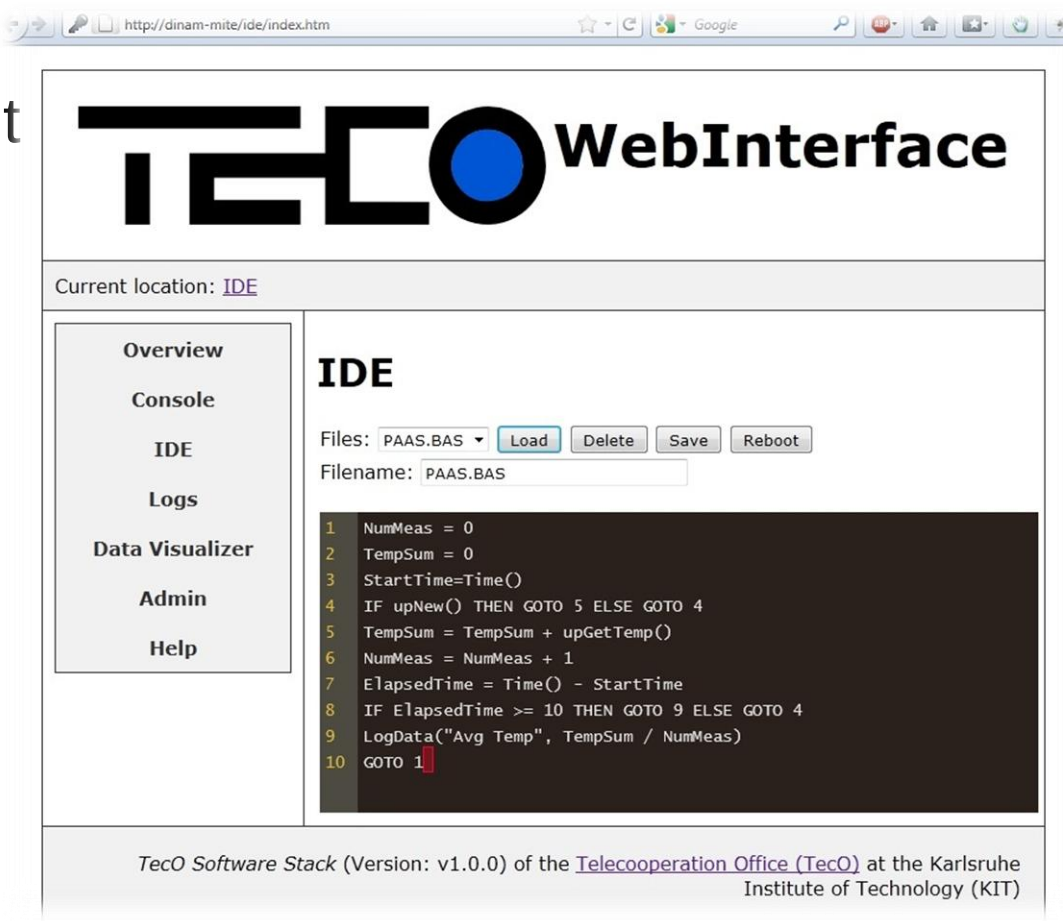
- Dinam *PaaS* Layer
  - ⇨ computing platform services for WSN apps



Overview

Dinam PaaS Approach – I

- A programming and run-time environment
  - Web-based IDE
  - Services development
  - Services deployment
  - Sensing systems
  - Business systems

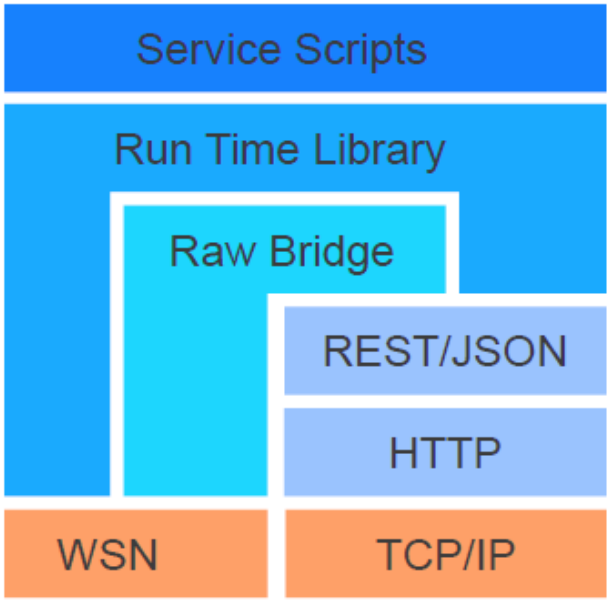


Dinam PaaS Approach – II

Dinam PaaS Reference Implementation

- Physical networking interfaces
- Services for integration of WSNs and business systems
- Services in BASIC using bridging framework

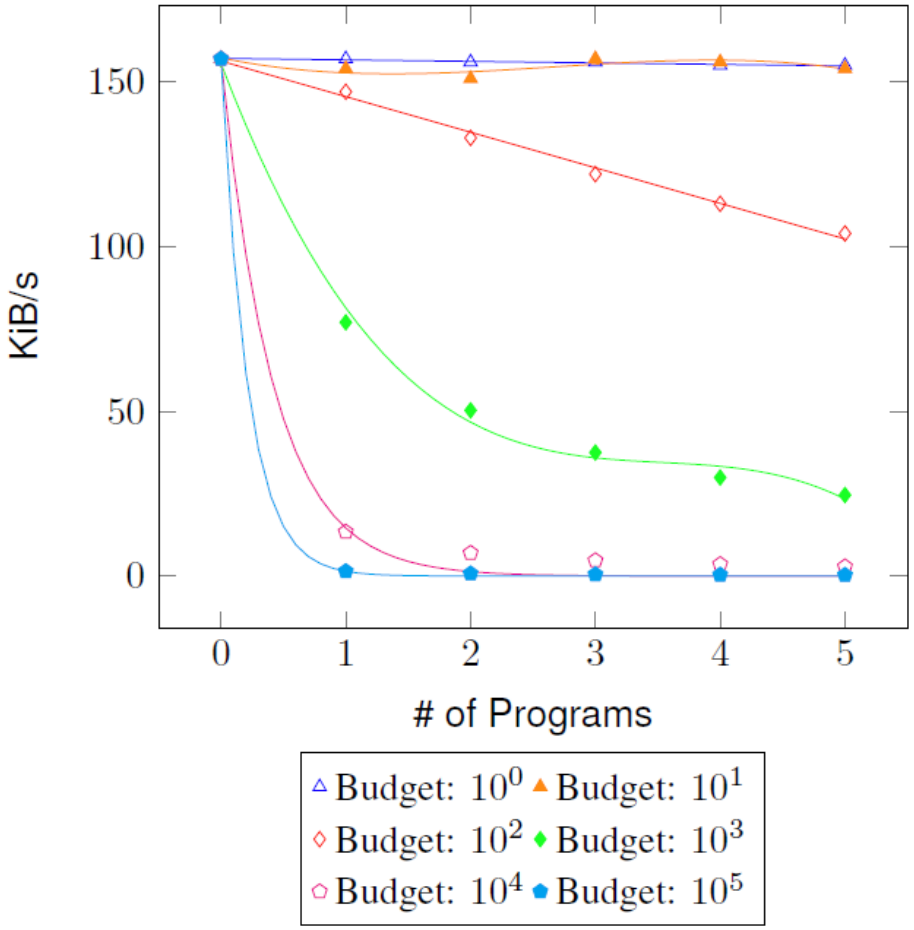
HW platform



SW platform

Dinam PaaS Approach – III

Performance Evaluation



- Test routine in 6 iterations
- Trade-off between BASIC program performance (budget) and the number of scripts

✓ Towards Monitoring

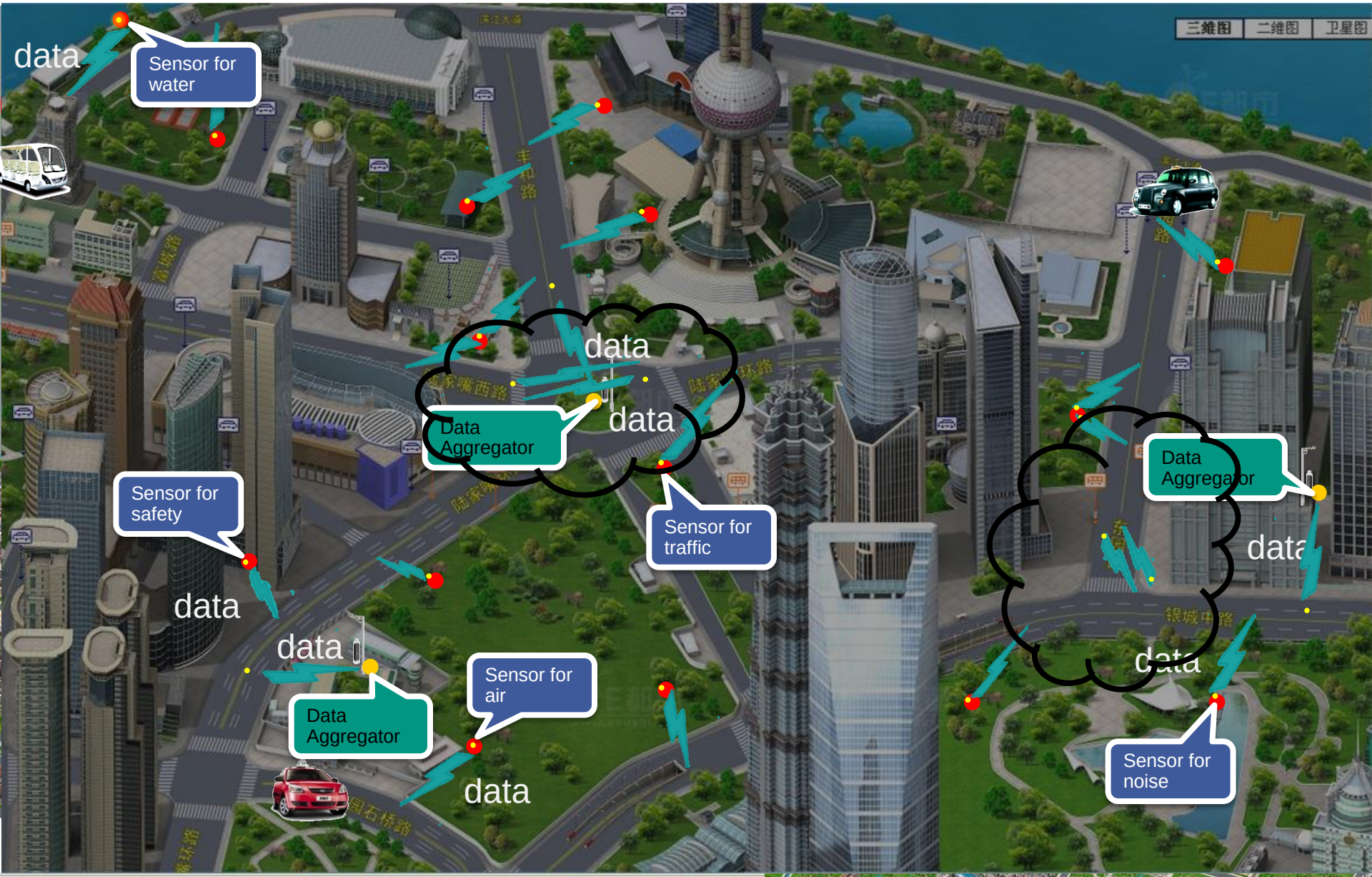
- ✓ … for QoS
- ✓ … for rapid elasticity

Overview

Application Example – I

- Sensing System – *MASON*
  - Fine-grained environmental data within the city of Beijing
  - A mobile vehicular network of Tsinghua University
  - GPS, temperature, humidity, carbon-monoxide, and 3-axis accelerometer.
- Business Process – *Energy Demand Prediction*
  - The majority is based on long-term statistics
  - Urban information is an effective support for accurate prediction
  - New approach takes environmental factors into account

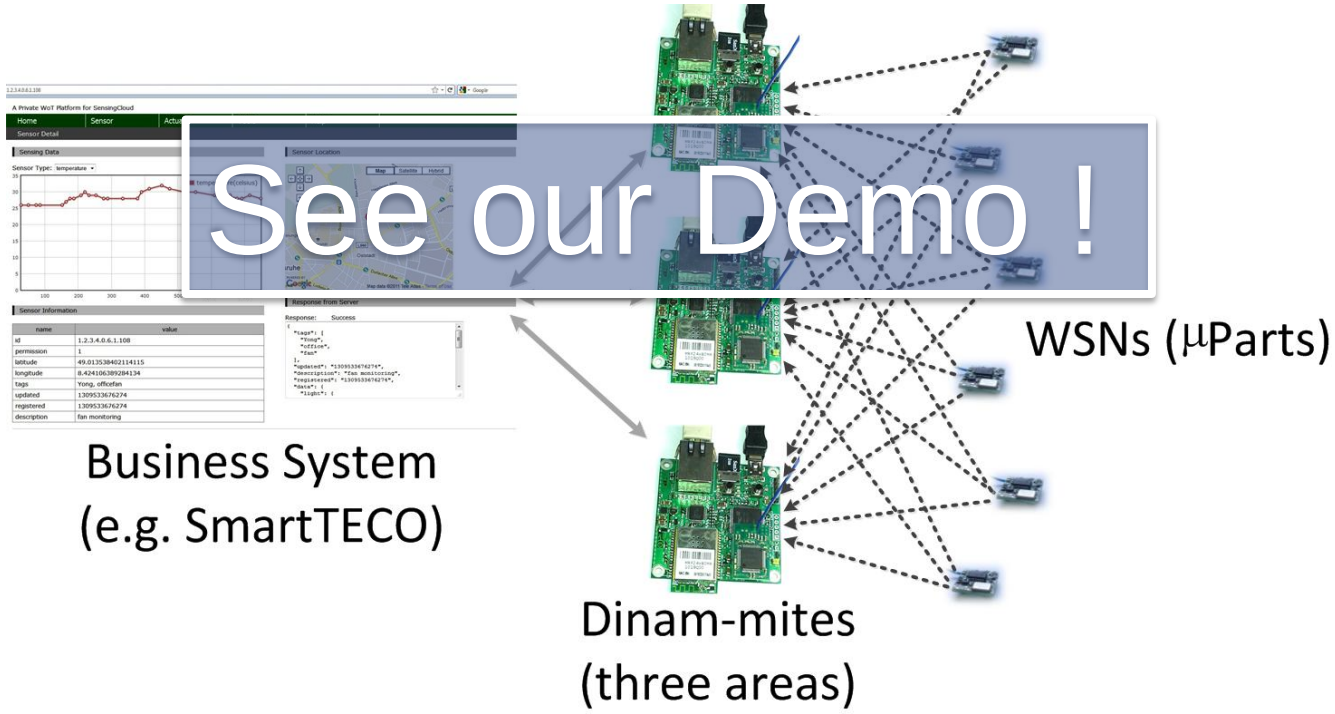
Application Example – II



Overview

System Integration Example

- *PaaS development interface*
- *PaaS platform* for hosting services
- *Business integration* using web services



Overview

Five Essential Characteristics

- On-demand self-service
  - *Automatically provisioning of computing resources*
- Broad network access
  - *Networking interfaces (for WSNs and IP-based)*
- Resource pooling
  - *N BASIC scripts to 1 dinam-mite node*
- Rapid elasticity
  - *N dinam-mites to 1 computing platform*
- Measured service
  - *Monitoring of running apps on a dinam-mite node*

Overview

Conclusions

- Concept of an embedded PaaS
  - for in-situ development of WSN apps
  - for WSN integration into business system
- Dinam-mite concept and implementation …
- A real world scenario for WSN system integration
- The dinam PaaS provides …
  - *QoS*
  - *Reliability*
  - *Scalability*

That's All

- *Thank You!*
- *Questions?*