

VITAL



A Platform to be used for Smart City Applications

Sema F. Oktuğ, Prof.Dr.
Department of Computer Eng.
Istanbul Technical University
oktug@itu.edu.tr





“Virtualized Programmable Interfaces for innovative cost-effective IoT deployments in Smart Cities”

A novel Approach for Integrating Application silos in Modern Smart Cities



Project Facts

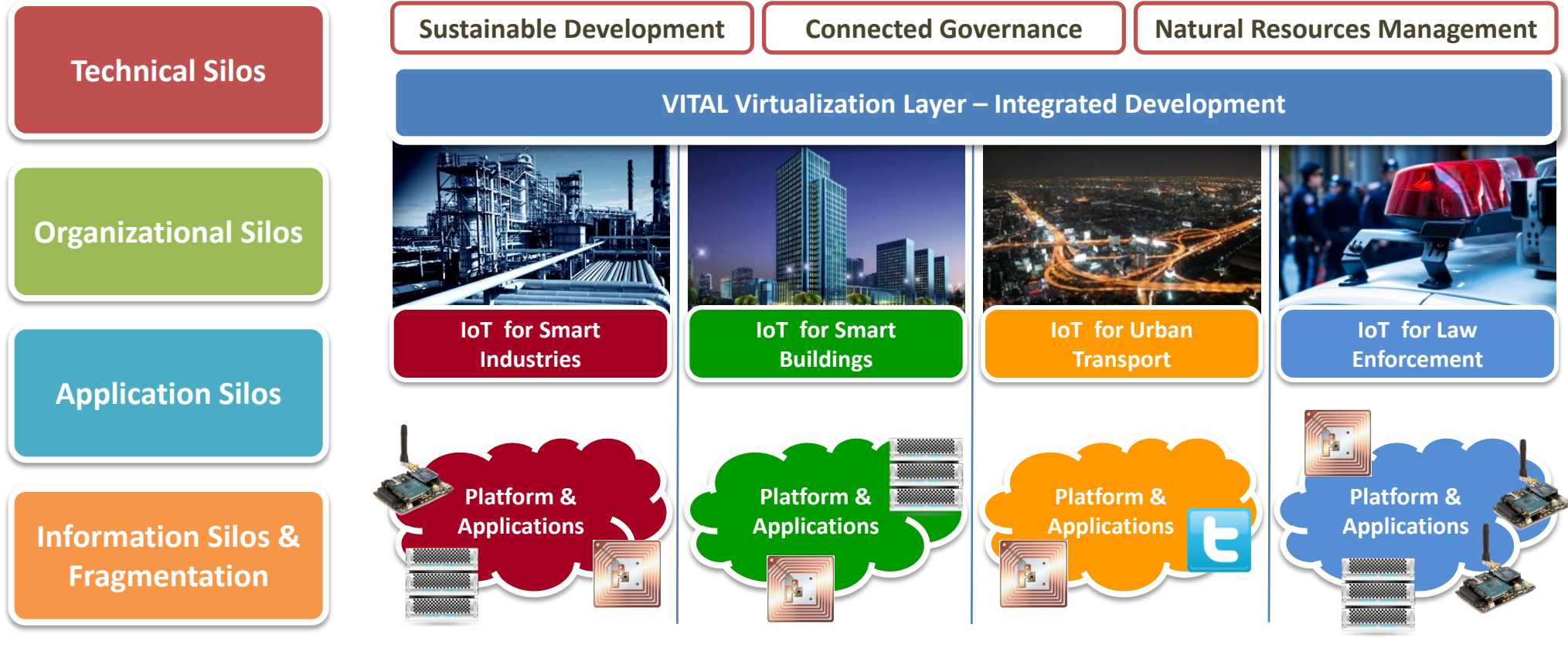
The **VITAL** project (EU FP7 - 608682) is financially supported by the European Union Seventh Framework Programme (FP7 2007-2013).

<input type="checkbox"/> Project Number:	608682
<input type="checkbox"/> Project Acronym/Title:	VITAL
<input type="checkbox"/> Call (part) Identifier:	FP7-SMARTCITIES-2013
<input type="checkbox"/> Duration in months:	36
<input type="checkbox"/> Starting date:	01.09.2013
<input type="checkbox"/> Total Project Costs:	4,190,359.00 €
<input type="checkbox"/> Requested EU contribution:	2,695,000.00 €
<input type="checkbox"/> Project website:	http://vital-iot.eu



VITAL Motivation: Integrating Smart City Silos

Process Integration, Integrated Security, Enhanced Intelligence, City Operations Optimization



Fragmented ICOs Access, Fragmented Intelligence, Fragmented Security, Limited Data Sharing, Limited Integration



Project Goals



Provide the means for **repurposing** and **reusing IoT** data & services in **Smart Cities**



Enable application development **across** diverse IoT systems and **domains**



Facilitate **Unified** Management & Governance of IoT Systems in the Smart City



VITAL Major Work Areas

Alleviate Technical Silos – Enable Cross-Context Apps

- Virtualized Platform
- Business Context Filtering

Federation of IoT Platforms & Architectures

- Federating / Integrating Different IoT Systems
- Integrated Architectures or silo architectures?

Virtualized Unified Access Interfaces (VUAIs)

- Learn-once use across platforms interfaces
- Ensure compatibility across diverse systems

Integrated Development & Management Tools

- Unified Access to ICOs
- Applications Development & Deployment across IoT architectures / domains

Study of Business Models & SLAs

- For Cross-Context Applications
- Spanning multiple IoT systems & domains



VITAL Platform Overview



Integrated IoT Applications
(Cross-Platform & Cross-Context)



VITAL Virtualization, Interoperability and Integration Framework

VITAL Development Environment & Tools

Governance Toolkit (Legal, Ethical, Policy)

Information & Business
Context Filtering

Event Processing (CEP) &
Event Management

Sensor-Driven Business
Process Management (BPM)



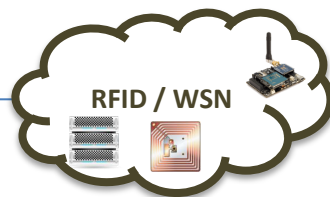
Smart Cities Info DB

Virtualized Unified Access Interfaces (VUAIs)

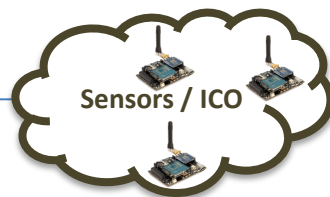


VITAL Semantic
Directory Service

Meta-Architecture & Migration Layer
(Connectors & Drivers to IoT Platforms)



Domain #1



Domain #K



Domain #N

Building



Hospital



Smart City
Urban
Environment



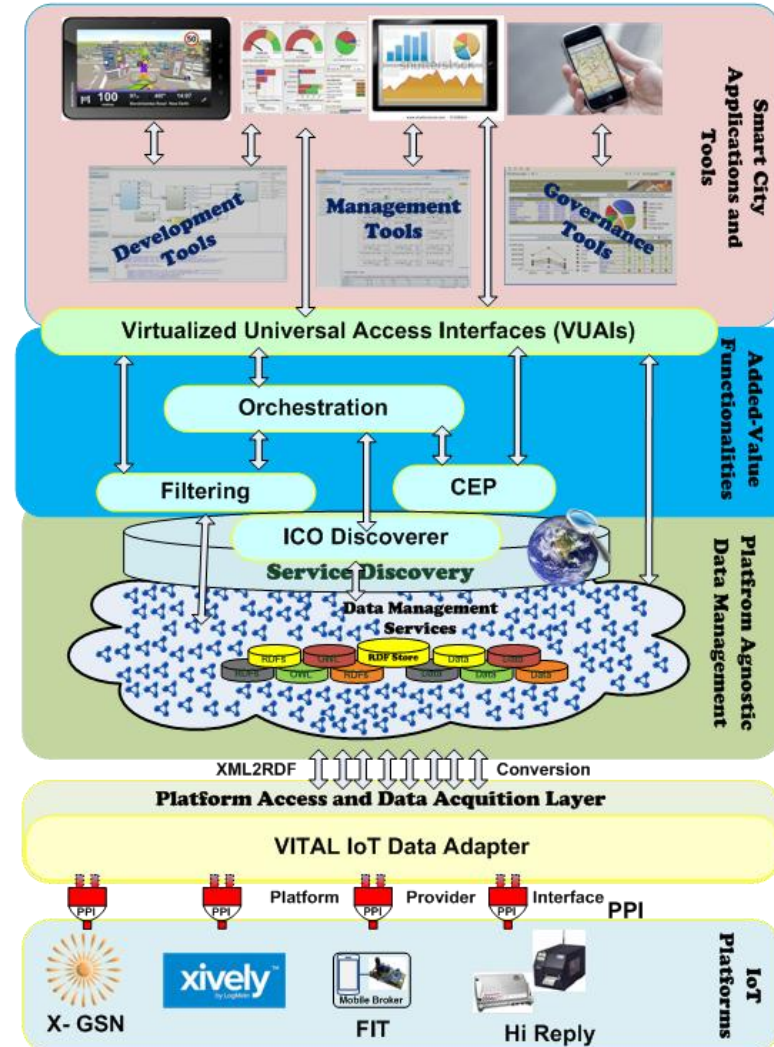
VITAL Architecture (High Level Functional View)

IoT Systems are accessed via a **Virtualized Abstract PPI (Platform Provider Interface)**

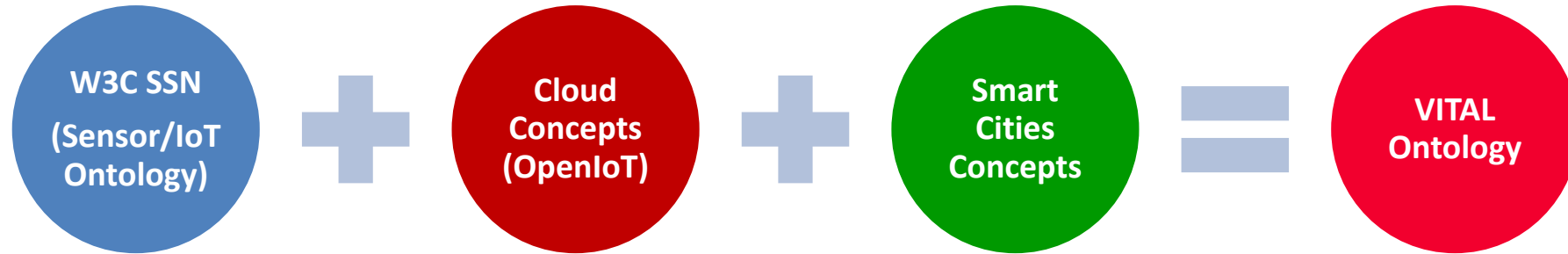
IoT data are modelled according to a common (VITAL) **ontology** (extending **W3C SSN**)

Added Value Functionalities (**CEP, Discovery, Filtering**) are provided via Virtualized Interfaces (**VUAIs**), but through PPIs

VITAL Provides a range of development & management **tools**



VITAL Ontology: Modeling for Semantic Interoperability



Smart Cities Concepts - Apps
<ul style="list-style-type: none">• Smart Energy• Smart Transport• Smart Security• City KPIs• ...

Smart Cities Concepts – City Information
<ul style="list-style-type: none">• Demographics• City structures & Taxonomies (Homes, Buildings, Neighborhoods, Regions)• ...

Smart Cities Concepts – Stakeholders and Apps
<ul style="list-style-type: none">• Citizens• Authorities• Businesses

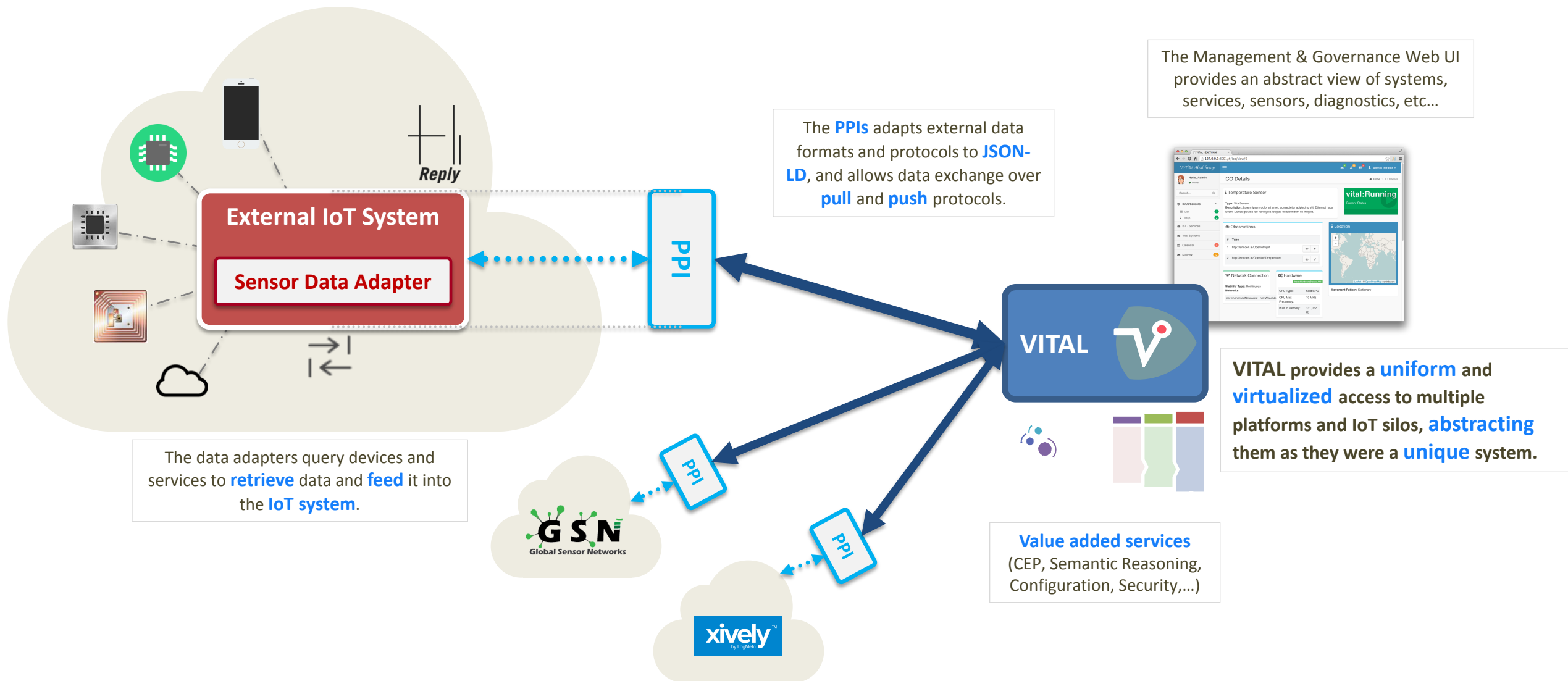


Supported IoT Systems & Platforms

- ❑ Four different IoT Platform selected
- ❑ PPI Enabled – Augmented to support the Platform Provider Interface
- ❑ OpenIoT is used as a basis for ensuring the semantic interoperability of the various data streams



Integration of external IoT Platforms



IoT System Agnostic Management & Governance (1/2)

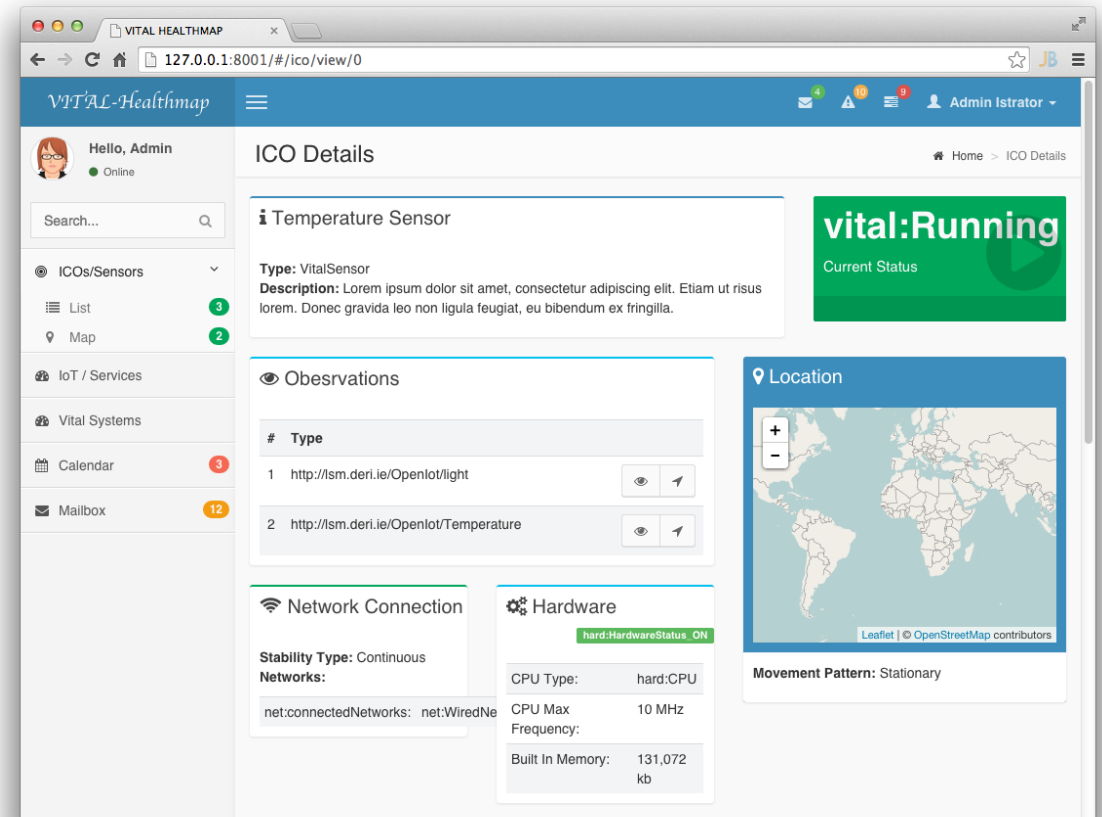
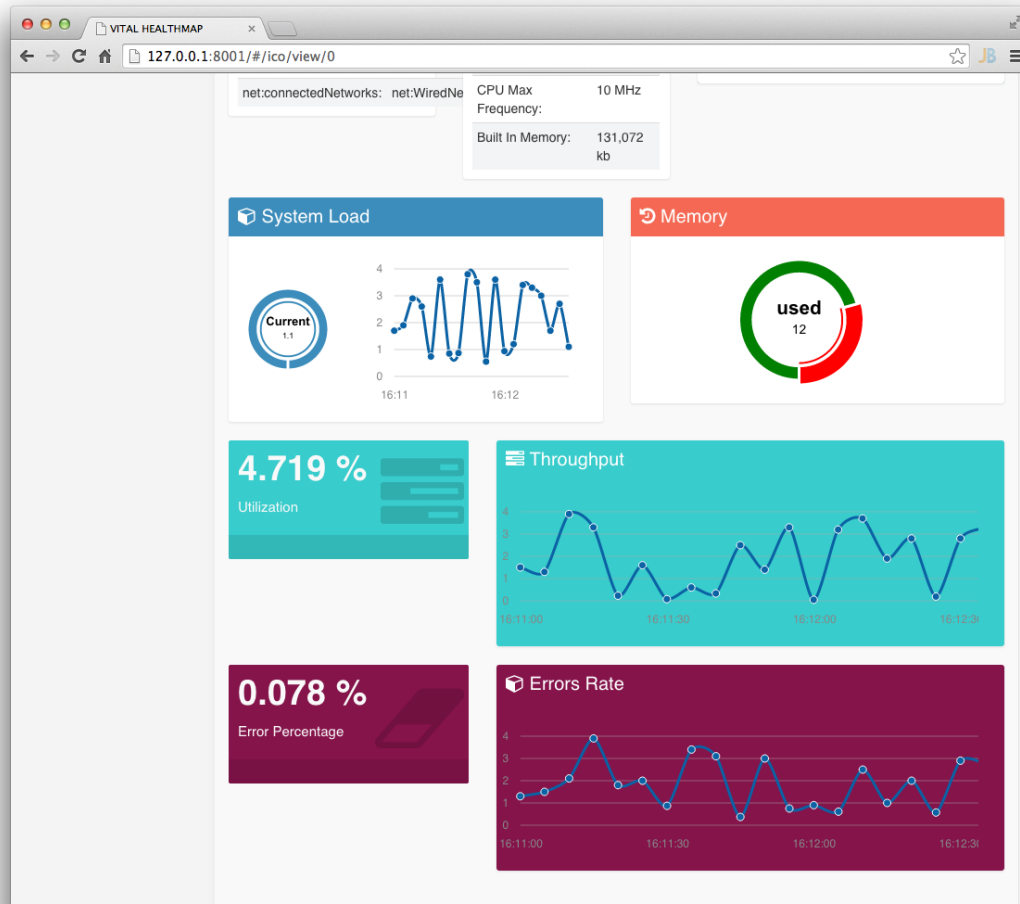
The screenshot shows the VITAL Healthmap interface with the URL `127.0.0.1:8001/#/ico/map`. The page title is "Map of ICOs/Sensors". A search bar is present with the text "Q Search Managed Entity". The map displays several locations across Europe, with green eye icons indicating active sensors and orange warning icons indicating unavailable sensors. The left sidebar contains navigation options: "ICOs/Sensors", "IoT / Services", "Vital Systems", "Calendar" (with 3 items), and "Mailbox" (with 12 items). The user is logged in as "Admin" and is online.

The screenshot shows the VITAL Healthmap interface with the URL `127.0.0.1:8001/#/ico/list`. The page title is "List of ICOs/Sensors". A search bar is present. The left sidebar shows the "ICOs/Sensors" menu expanded with "List" (3 items) and "Map" (2 items) selected. The main content area displays a table of sensor data.

Name	Status	Type	Description	
Temperature Sensor0	vital:Unavailable	VitalSensor	Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam ut risus lorem. Donec gravida leo non ligula feugiat, eu bibendum ex fringilla.	More
Temperature Sensor1	vital:Running	VitalSensor	Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam ut risus lorem. Donec gravida leo non ligula feugiat, eu bibendum ex fringilla.	More
Temperature Sensor2	vital:Unavailable	VitalSensor	Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam ut risus lorem. Donec gravida leo non ligula feugiat, eu bibendum ex fringilla.	More
Temperature Sensor3	vital:Unavailable	VitalSensor	Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam ut risus lorem. Donec gravida leo non ligula feugiat, eu bibendum ex fringilla.	More
Temperature Sensor4	vital:Running	VitalSensor	Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam ut risus lorem. Donec gravida leo non ligula feugiat, eu bibendum ex fringilla.	More
Temperature Sensor5	vital:Running	VitalSensor	Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam ut risus lorem. Donec gravida leo non ligula feugiat, eu bibendum ex fringilla.	More
Temperature Sensor6	vital:Running	VitalSensor	Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam ut risus lorem. Donec gravida leo non ligula feugiat, eu bibendum ex fringilla.	More
Temperature Sensor7	vital:Running	VitalSensor	Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam ut risus lorem. Donec gravida leo non ligula feugiat, eu bibendum ex fringilla.	More



IoT System Agnostic Management & Governance (2/2)



Current Status



Achieved goals:

- Requirements & Specification (WP2)
- First definition of Virtual Models, Data and Metadata (WP3)
- **Demo** implementation of CEP with Istanbul Traffic data (WP4)
- Management and Governance Platform: first prototype (WP5)
- **Demo** PPI implementation for HiReply integration with VITAL (WP5)
- **Demo** PPI implementation of OpenIoT integration with Camden data (WP5)

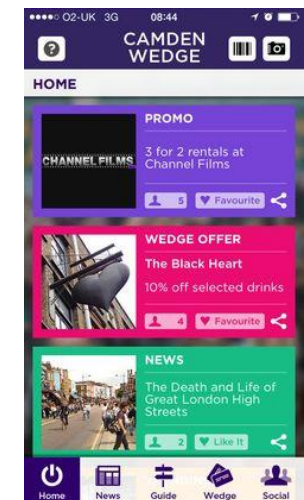


VITAL Applications: Activity Monitoring and Security Management at London's Camden Borough



Facilitate Camden Market Stakeholders in Managing & Tracking **Activity and Security Incidents**

Integrate (live) data currently fragmented in IoT-based systems (CCTV system, Footfall system, Transport For London (TFL) systems)



VITAL Applications: Traffic Management at Istanbul Metropolitan Municipality



Holistic Approach to **Traffic Management** –
Harnessing Multiple Traffic Systems and Delivering
Functionalities at various scales & granularities (e.g.,
Long Term Planning, Day-to-Days Operations)

Traffic Systems & Sensors e.g., Remote Traffic
Microwave Sensor (RTMS), Bluetooth Sensor, Smart
Sensors, Wireless Magnetic Sensors, Loop Detectors,
Traffic Cameras, Electronic Violation Detection
System (EVDS), Lane Control System (LCS) etc.



Wrap-up

- ❑ **VITAL** introduces a new integrated **cross-platform** and **cross-context** approach to the development & deployment of **IoT** applications in Smart Cities
- ❑ The VITAL approach builds on **proven blueprint** solutions for the semantic **interoperability** of IoT applications (FP7-OpenIoT, W3C SSN)
- ❑ VITAL is a first (sound) step towards the **wider vision** of **integrated development**, management and governance of smart city services across areas such as energy, transport, urban mobility, security and ICT



More Information

 VITAL Web Site: <http://www.vital-iot.com>

All our (public) deliverables and publications are accessible there!

Subscribe our newsletter!

Stay tuned for VITAL “Smart Cities” Hackathon, Summer 2015



Follow us on Twitter: [@VITALfp7](https://twitter.com/VITALfp7)



Join our “[VITAL](#)” discussion group on LinkedIn!



Like our “[VITAL Project](#)” Page on Facebook!



THANKS!

Sema F. Oktuğ, Prof.Dr.
Department of Computer Eng.
Istanbul Technical University
oktug@itu.edu.tr

