

IoT not only as smart city enabler but as research enabler for other disciplines...

Session: Smart city/smart home in the aspect of R&D/
Demonstrations/Standardisation

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Independent if out in town, or at home:
It's always about people, citizens, users!!!

R&D and Demonstration

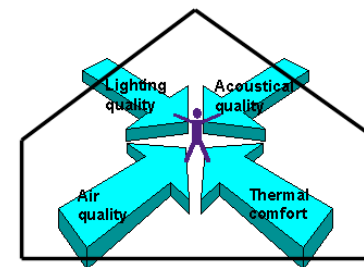
Or rather experimentation in the wild

- The main stakeholder in a smart house is the user.
- Incidentally, they are also the main information source and the main beneficiary.
- Experimentation in this area is about understanding 3 things:

Environment



<http://www.calcitegroup.com>



<http://www.rehva.eu>

User in the environment



<http://www.qualicon.in>

Objective

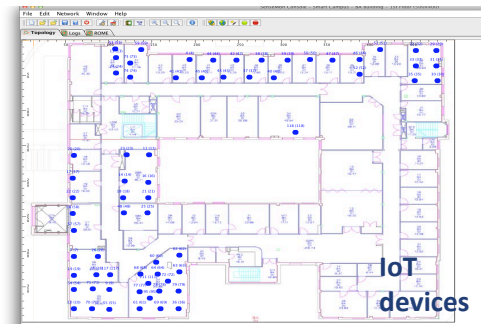
The Surrey IoT Testbed

a real world playground

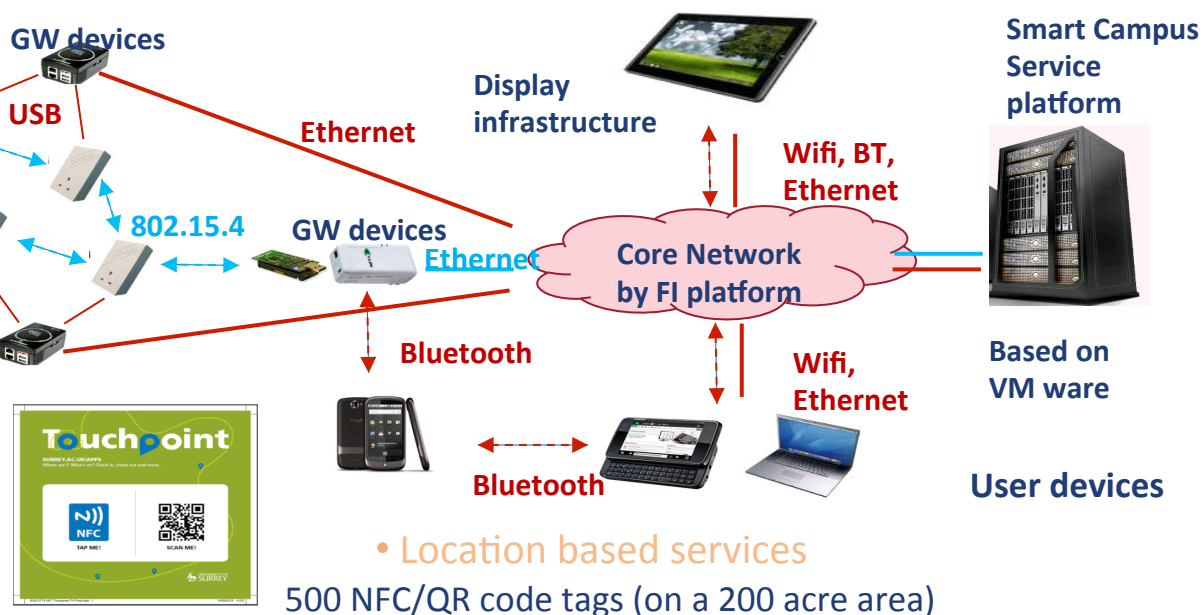
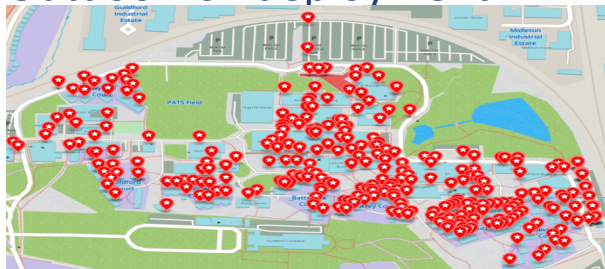
SmartCampus IoT Testbed

Originally set up to investigate energy usage at workplaces

200 fixed IoT units: SmartPlogg (1000+ sensors)
100 embedded GWs, 100 mobile IoT units, 10 smart displays, 30 smartphones

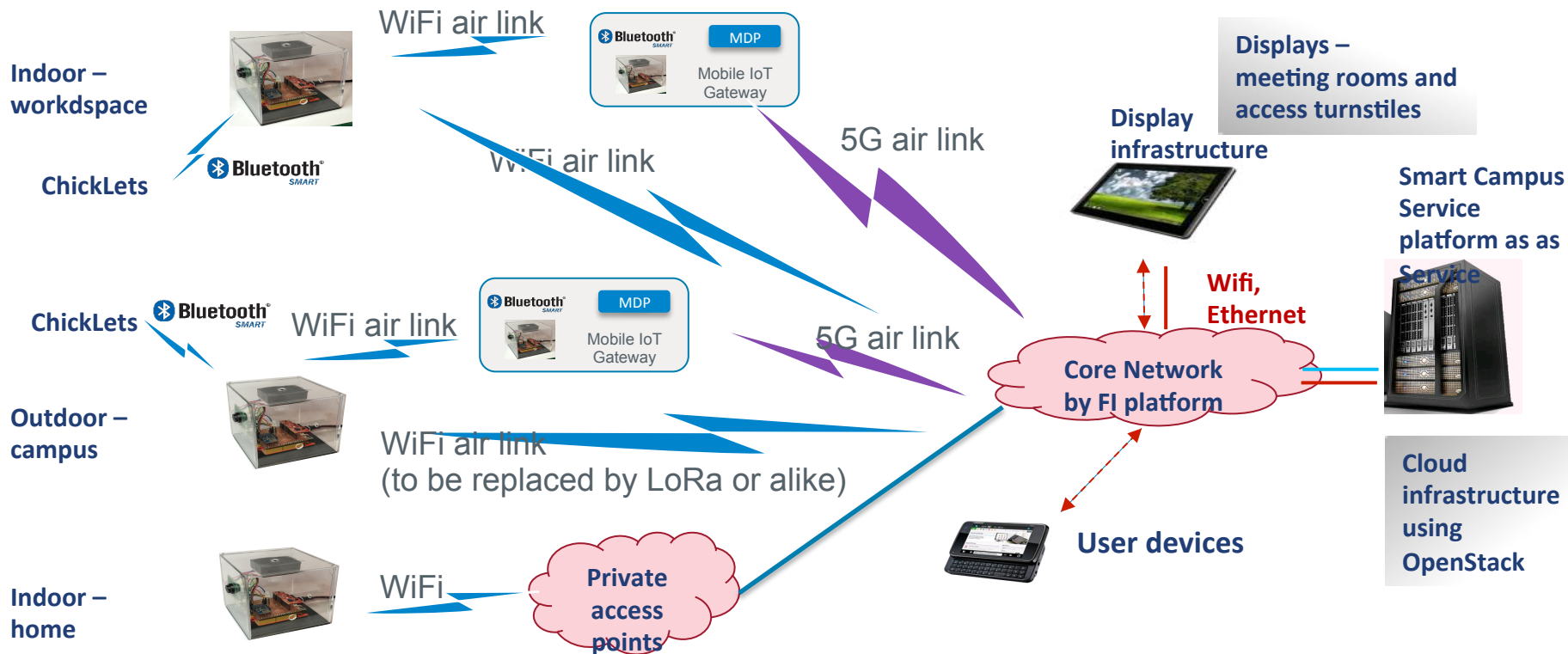


Outdoor IoT deployment



The IoT Testbed

Currently being deployed in the JC Maxwell Building, on Campus and in (some) homes

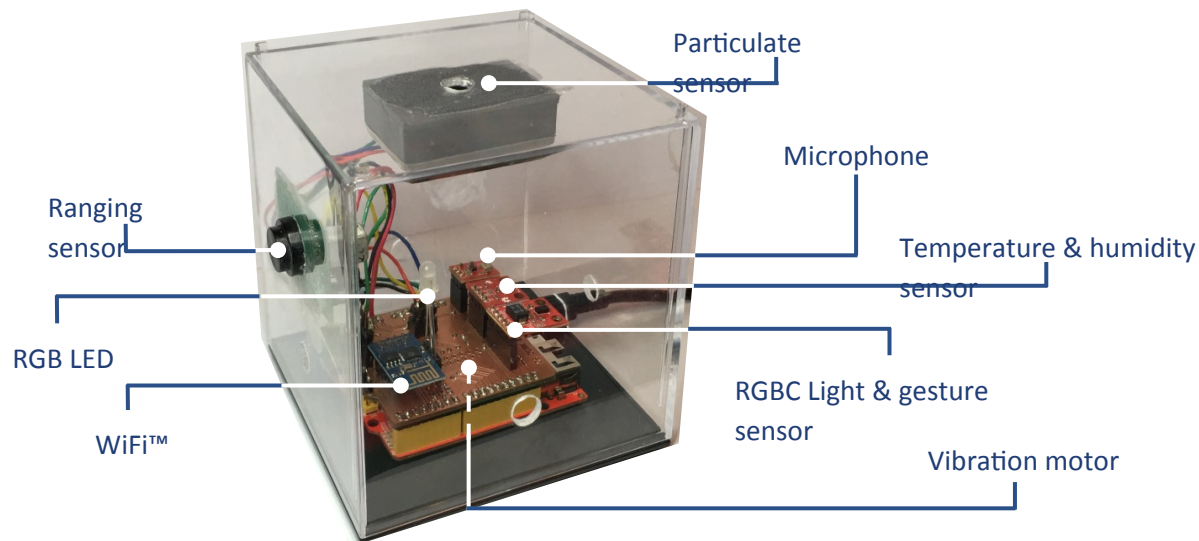


The IoT Egg

an IoT node for research into many disciplines
(HomeSense, SmartCampus, DisCC,...)

The IoT Egg

First design was rather geeky...



Coming Soon

- BLE
- 64Mbit ext. mem.
- Chicklets
- Professional enclosure

Under Investigation

- HW encryption
- CO₂ sensing
- Optical ranging
- LoRa comms.

The IoT Egg

An open-source, multimodal sensor suite designed for:

- IoT testbeds
- (social) science data collection tool
- electronic engineering student projects
- Smart City conceptual demonstrations
- educational support for data handling/analysis/aggregation techniques
- home/office sensing projects
- environmental contextualisation

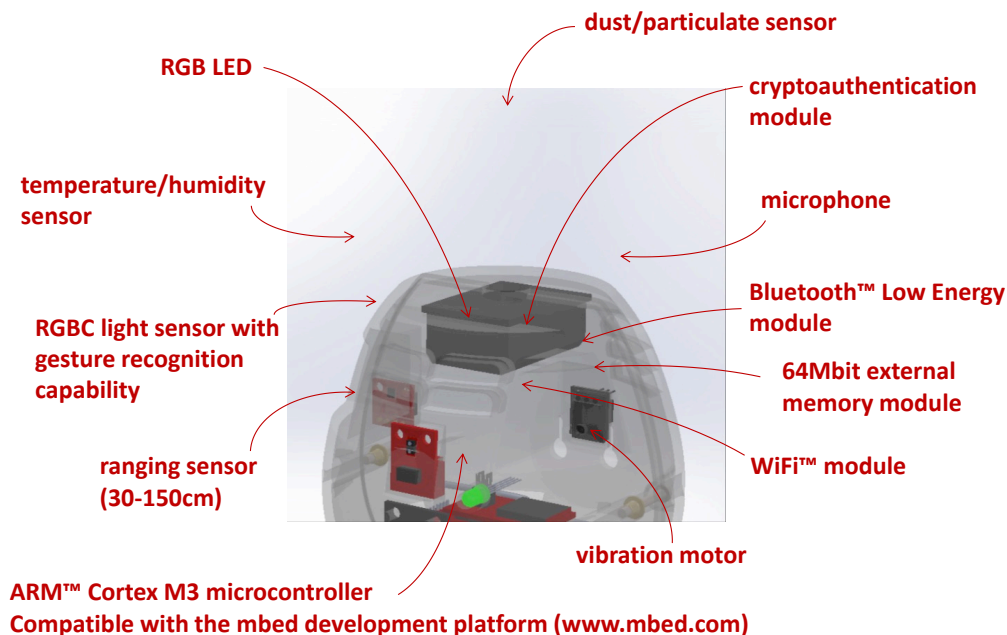


*Design in progress. Final product may differ slightly in appearance from that pictured above

Egg Status

Long road from dirty board to more professional looking (still geeky) device...

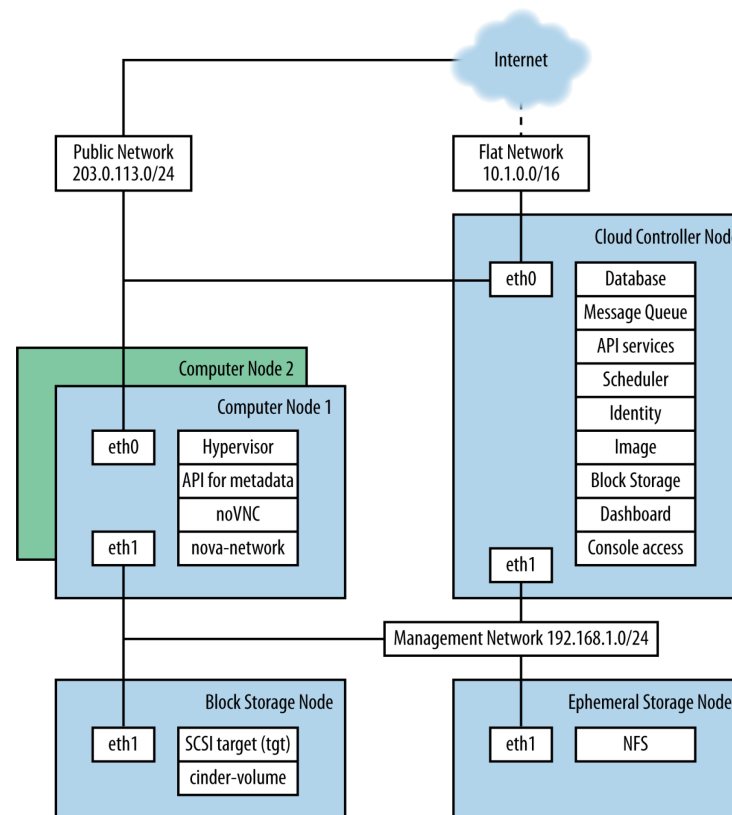
- First manufacturer's prototypes expected in 3rd week of October 2016
- Full order received (500 units) by mid-November
- 200 complete units by end of November
 - 75-150 units for HomeSense project
 - 50-100 units for ICS-5GIC IoT testbed (replacing the old nodes)



IoT Server

The backend for the IoT Egg

- High end cloud server installation (96 cores, 13TB data storage)
- Openstack implementation
- Implementing LWM2M communications protocol between testbed Eggs and server with IPSO object definitions to define sensors and their descriptions.
- Several other VMs up and running supporting different projects (e.g. one for HomeSense)





facebook.com/sensoresearch/



[@CRESS_HomeSense](https://twitter.com/CRESS_HomeSense)

HomeSense

digital sensors in social research

The HomeSense project

Demonstrate the use of sensors via household trial

Catalogue technical, methodological and ethical issues

Create guidelines for using sensors



Three research strands:

Adapt and develop devices

Develop data collection methods

Create tools for analysing data streams in
reference to other data sources

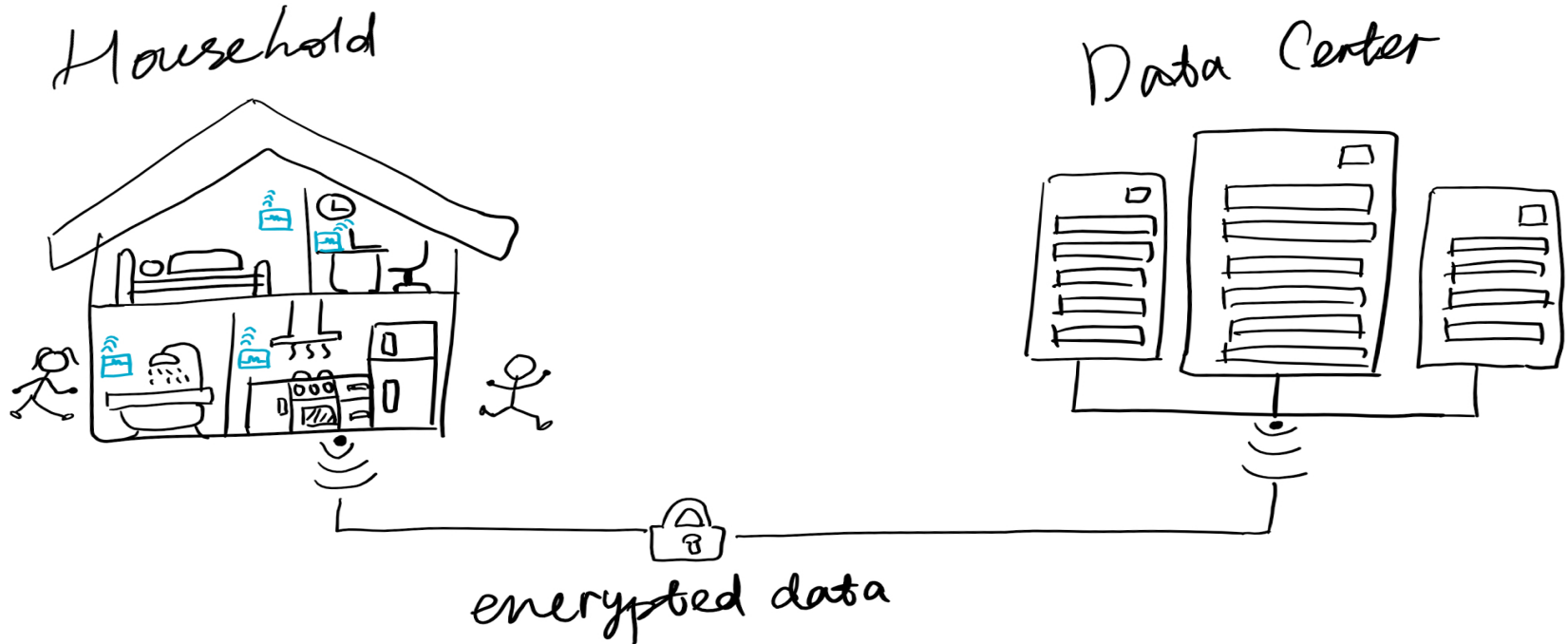
Development and adaptation

Issues of technical reliability and data security



Development and adaptation

Issues of technical reliability and data security



Using sensors in households

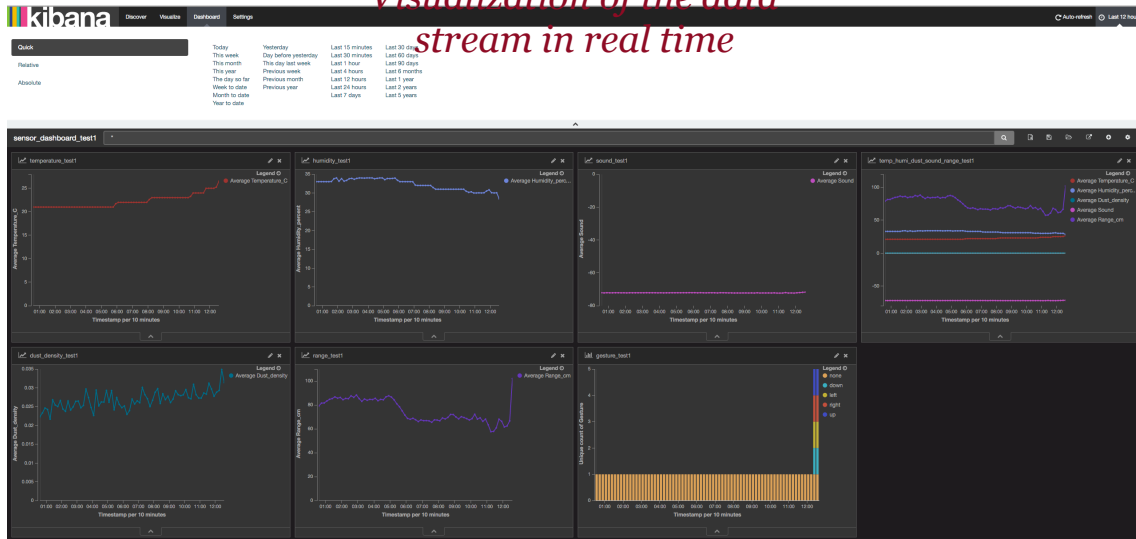
Persons and practices

Location: identify location of persons in households

(In)activity: detect activities and idleness

(Non)-interactions: detect communications and silences

Visualization of the data stream in real time



Using sensors in social research

Beyond the house and the household



Observe activities in neighbourhoods?

Observe energy waste in neighbourhoods?

Study shopping activities or commuter habits?

Observe activities around major operations?

Using sensors in social research

Beyond the house and the household



Study group problem-solving activities?

Observe management/administration activities?

Observe communication and networking trends?

Lessons learnt and issues identified

Research needs

- tools to better understand the user as an individual as well as in a group or social relation.
- data analytics (much at the edge but some still at the core).
- models for data from the user and data about the user.
- models for the operational environment.



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@klamoe



Chicklets

DeskEgg Extension

- Battery-operated, single sensor modules that communicate directly with the Egg via wireless comms (likely BLE).
- Spoke and hub connectivity model
- Extends the reach and functionality of the Egg
- Sensor types and applications under consideration:
 - Integrated temperature/humidity sensor
 - Attached to oven/kettle/water pipes for usage information and routine outlier detection (elderly monitoring, energy efficiency)
 - Accelerometer
 - Attached to windows/doors/floors for movement detection (security, presence, elderly fall monitoring)
 - Microphone
 - Acoustic Event Detection
 - Directional movement (a.k.a. Gesture) sensor
 - Presence with counting

