

Internet of Things Engineering Group

in the Integrative Systems, Platforms and Technologies
Competence Area, CSIR Meraka Institute, CSIR, South Africa

by Dr. Louis Coetzee (louis.coetzee@csir.co.za)

Research Group Leader

Internet of Things Engineering Group

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Internet of Things

- What is IoT – Enables communication & exchanges useful information between and with everyday objects (things) to improve people's quality of life
 - Things sense, actuate, interact, communicate with other things & services to create intelligence, knowledge & smartness to benefit society
 - Machine to Machine, Machine to Person
 - Cloud & IPv6 are key enablers.
- Where is IoT used – Applies to Smart Environments & Spaces
 - Energy, Health, Buildings, Logistics, Transport...
- IoT – Challenges:
 - Number & heterogeneity of devices
 - Mobility
 - Information explosion
 - Trust, security & privacy
 - Importance of meta-data
 - Standards, interoperability, open architectures
 - Building blocks & platforms
 - Business models

Why IoT in South Africa?

- Internet is expanding into physical realm with potential for impact in:
 - Society, Economy, Environment
- Interesting differentiating South African context:
 - Digital divide
 - Poor connectivity
 - Low ICT literacy
 - But **high mobile penetration**
- South Africa rich in possible IoT application domains with potential for impact
- Recognition of importance of IoT in South Africa
- Strategic decision in CSIR Meraka Institute to create IoT research group

IoT will impact South Africa and is fast becoming a reality. IoT creates new opportunities for innovative solutions.

Internet of Things Engineering Group – Activities:

- Conducting aligned HCD
- Developing core competence and skills
- Developing reusable **technology building blocks & platforms:**
 - BeachComber – protocol agnostic combiner (People & Things)
 - ThingMemory – cyber representation of the Thing
 - Visualization – view into IoT
- Demonstrating IoT application for **impact** in different domains:
 - **Energy** conversation & load optimization (kitchen load equalization) (M2M)
 - Build environmental control and inclusion (**smart** enabling environment) (P2M)
 - Information **dissemination** to society (Vaaldam on social media) (M2P)
 - Natural environment and societal impact (**Carbon** Observation Network – COP17) (M2P)

Thank you!

Dr. Louis Coetzee

louis.coetzee@csir.co.za

<http://ioteg.meraka.csir.co.za>

<http://things.meraka.csir.co.za>

The logo for the Council for Scientific and Industrial Research (CSIR) of South Africa. It features the letters 'CSIR' in a bold, blue, sans-serif font. The 'C' is a large, rounded shape, and the 'S' is a vertical bar with a small horizontal bar at the top. The 'I' is a vertical bar with a small horizontal bar at the top, and the 'R' is a vertical bar with a small horizontal bar at the top and a curved bottom.

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Outline

- South African IoT Intervention
 - Internet of Things Engineering Group
- Focus
- Activities
- Applications
- Research Framework & Building Blocks
- Challenges
- Opportunities

Enabling IoT in South Africa (IoTEG)

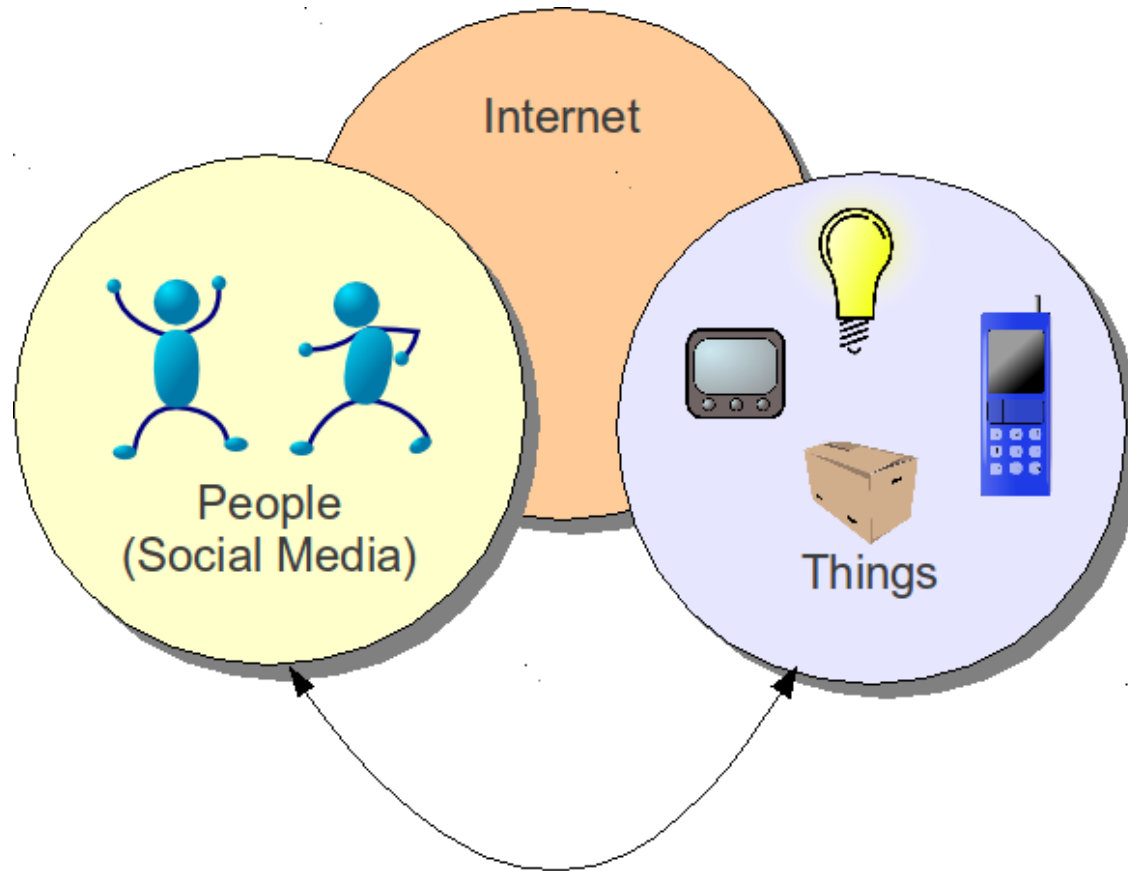
- Recognition of **importance of IoT** in South Africa
- Strategic decision in CSIR Meraka Institute to **create IoT research group**:
 - Council for Scientific & Industrial Research (CSIR):
 - Biggest research & development organization in Africa
 - CSIR Meraka Institute
 - Large-scale Government intervention in the information and communications technology (ICT) space
 - Track record of **successful FP7 collaboration**
- **Internet of Things Engineering Group**:
 - Established 2010
 - Aims to:
 - Research, develop & innovate in IoT in South African context
 - Establish international research collaboration
 - Become national Human Capital Development (HCD) hub

Internet of Things Engineering Group (IoTEG)

- Research group in the Integrative Systems, Platforms and Technologies Competence Area
- Diverse composition & interest:
 - Skills include:
 - Enterprise, mobile and commercial class software development capabilities
 - Embedded and hardware development capabilities
 - Academic orientation and partnerships for HCD
 - 8 people:
 - Qualifications: 2 x PhD, 3 x MSc
 - Studying: 2 x PhD, 1 x PhD studentship, 3 x MSc studentships
- High level strategy:
 - **Link Things & People** through Internet
 - Incorporate ability to **Sense**
 - Create ability to **Act**
 - Intelligently **Process** data
 - Repeat...



IoTEG Focus



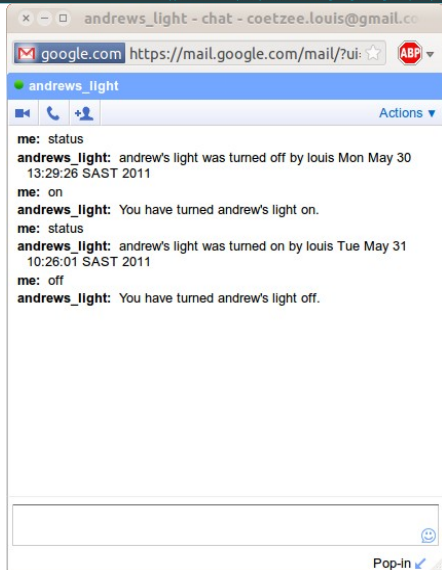
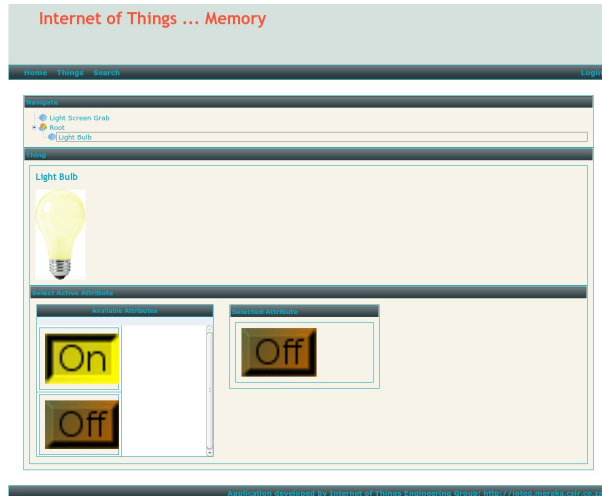
Internet of Things Engineering Group

- Focus on sweet spot between “Internet”, “Things” and “People”

IoTEG Activities

- Conducting aligned HCD
- Developing core competence and skills
- Developing reusable technology building blocks:
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 - Visualization – view into IoT
- Demonstrating IoT application in different domains:
 - Energy conversation & load optimization (M2M)
 - Environmental control and inclusion (P2M)
 - Information dissemination to society (M2P)

• Applications: Energy conversation & load optimization



- South African energy challenge (opportunity)
- Implementing multi protocol interface to electrical devices:
 - HTTP
 - XMPP
- [Http://things.meraka.csiir.co.za](http://things.meraka.csiir.co.za)
- andrews_light@jabber.org

• Applications: Energy conversation & load optimization

Internet of Things ... Memory

Home Things Search

Navigate

Light Screen Grab
Root

Thing

Light Screen Grab

Image of the light being controlled.



Internet of Things ... Memory

Home Things Search

Navigate

Light Screen Grab
Root

Thing

Light Screen Grab

Image of the light being controlled.



• Applications: Information dissemination to society through social media

- Twitter & Facebook used as output channel for important South African elements:
 - Vaal Dam (and others)
 - Electricity consumption

the vaal dam
@vaal_dam South Africa
Google Street View <http://tinyurl.com/vaaldam> Google Earth <http://tinyurl.com/vaaldge> Data from the Department of Water Affairs. <http://www.dwaf.gov.za/hydrology/RTMain.aspx>

Following

Tweets Favorites Following Followers Lists

vaal_dam the vaal dam
I am 96.14% full. You can also email me for the latest levels the.vaal.dam (at) gmail.com #fb
1 hour ago

vaal_dam the vaal dam
I am 96.14% full. You can find my page on facebook <http://tinyurl.com/5wr24sz> #fb
3 hours ago

vaal_dam the vaal dam
I am 96.14% full. If you have Google Earth configured on your computer, you can find me here <http://tinyurl.com/4t3te49> #fb
5 hours ago

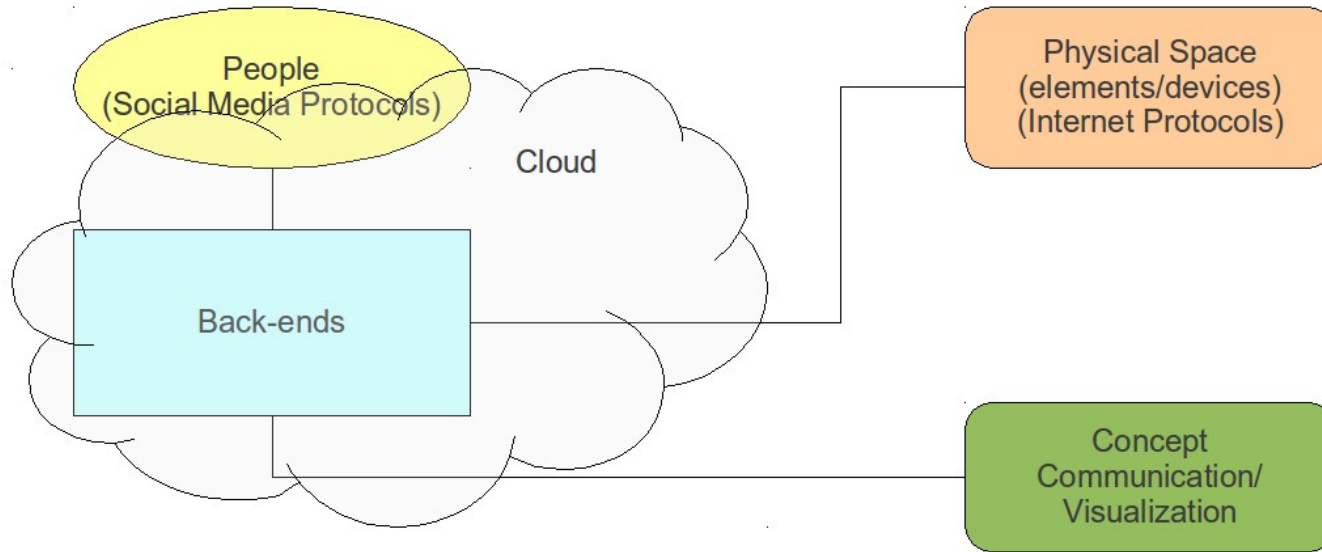
vaal_dam the vaal dam
At 2011-05-31 00:00 My water level is 22.213 m above outlet. I am 96.14% full. #fb
7 hours ago

vaal_dam the vaal dam
I am 96.21% full. I am also on jabber vaal_dam (at) jabber.org Come chat to me. #fb
7 hours ago

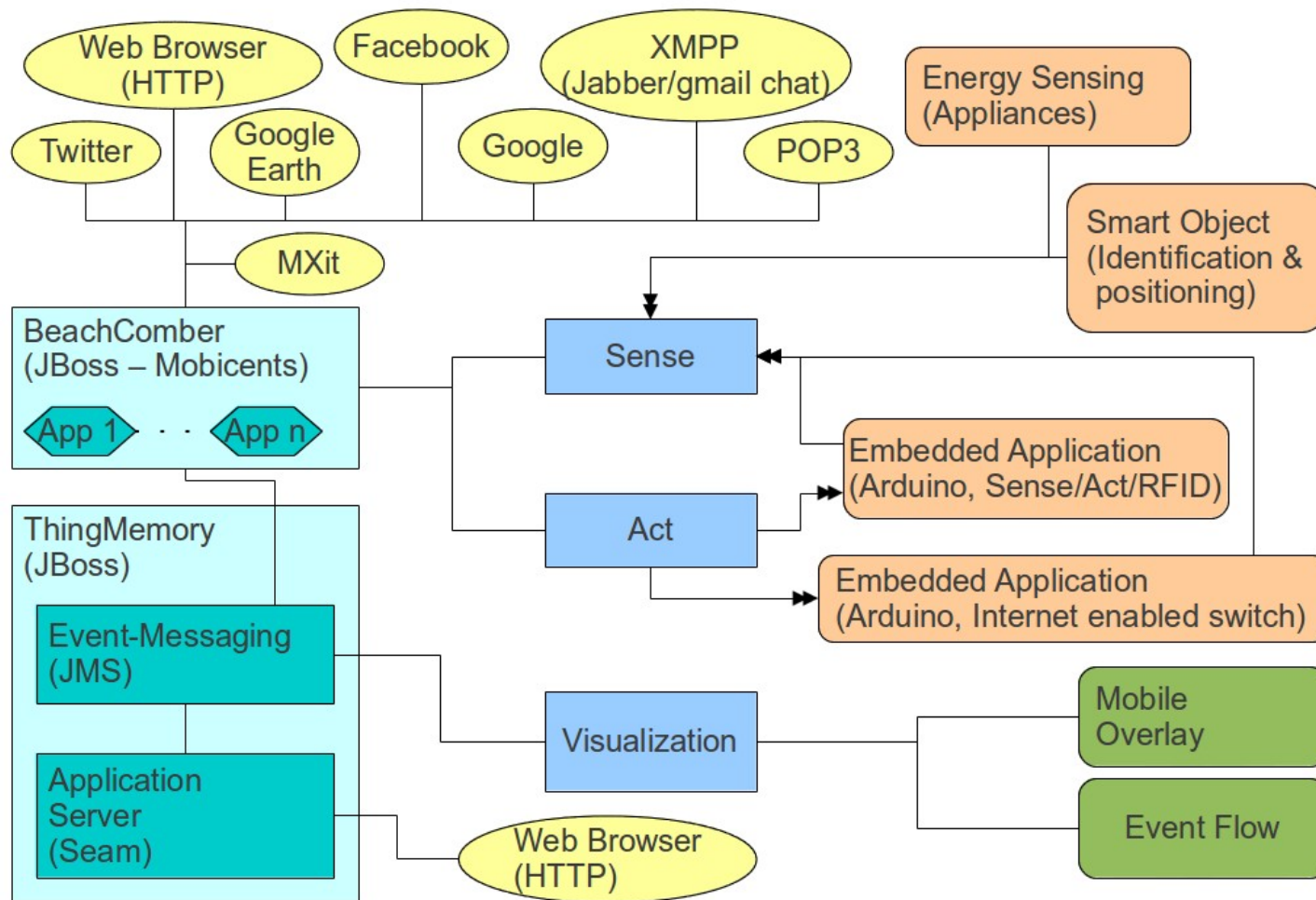
vaal_dam the vaal dam
I am 96.21% full. I'm a movie star! SLUICE GATES AT THE PARAKRAMA TANK IN POLONNARUWA OPENED... <http://tinyurl.com/3bgg6su> #fb
9 hours ago

vaal_dam the vaal dam
I am 96.21% full. Here are some nice photos of me <http://tinyurl.com/4fta3c5> #fb
11 hours ago

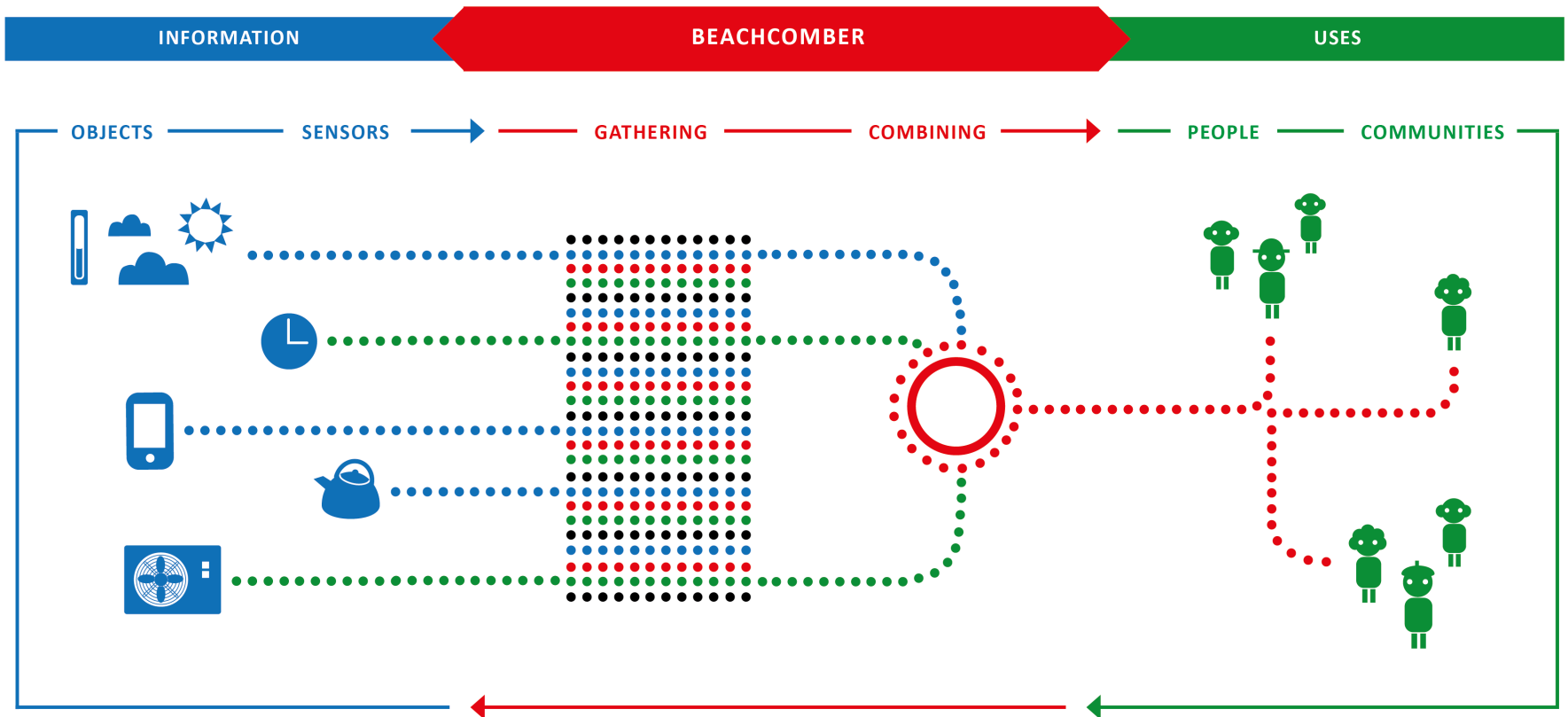
IoTEG Framework



Framework Building Blocks



Visualization



Objects in our everyday environment contain invisible information that is not used and combined to the extent that it could be. What if we could harvest this information, narrowing the gap between the physical and digital worlds?

The Beachcomber is a system that is capable of gathering information from various sources, such as objects, devices and sensors. It not only stores the information, but enables the creation of intelligent applications that combine the data in novel ways.

Individuals, communities and businesses can use, interact with and build upon the intelligent information available via the Beachcomber. The range of possible applications is vast, as the system is interoperable with most current protocols and media formats.

IoT Challenges

- IoT applications are not widespread & business models are not known
- HCD pipeline challenge:
 - Support, further development & extension of skills
- Communication costs (bandwidth)
- Communication latency to international solutions
- South Africa has very progressive constitution... rights of the individual (e.g. privacy) very important
- Governance
- Lack of maturity and digital literacy of end-users

IoT Opportunities

- Opportunity for local research & differentiation:
 - Create HCD focal point
 - Create core competence that provides world class research, development & implementation which leverage a range of technologies relevant to IoT
- South Africa rich in possible application domains. Opportunity for pilot & demonstrator projects that demonstrate potential for real impact in our socio-economic context:
 - Energy
 - Water
 - Natural disaster management
 - Climate change
 - Smart cities: Tshwane, Johannesburg, Cape town
 - Road Safety & Enforcement
 - Logistics
- Opportunity for international research collaboration:
 - FP7
 - International research organizations (e.g. SINTEF ICT, Norway)
 - Other R&D organizations
 -

Conclusion

- IoT is an important international developing technological trend:
 - South Africa is developing local expertise
 - Creating opportunities for international collaboration
 - Strategic intervention through IoTEG
- IoTEG is a new group, but:
 - Has lots of scope & potential
 - Is conducting HCD
 - Is building profile & networks
 - Is creating usable technology (small scale demonstrators)
 - Multiple possibilities for collaboration

**Well positioned to learn and
to collaborate!!!**

