

# **Designing for an Internet of Humans**

## **The Route to Adoption of IoT**

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# IT Innovation Centre

- The IT Innovation Centre is an applied research centre advancing a wide range of information technologies and their deployment in industry and commerce.
  - Part of Electronics and Computer Science at the University of Southampton, we are located on the Science Park, 3 miles from the main University Campus.
  - collaborative research (supported by EC and UK programmes)
  - client-funded research, development and consulting
- Currently ~30 staff, ~20 projects with ~100 commercial clients/partners

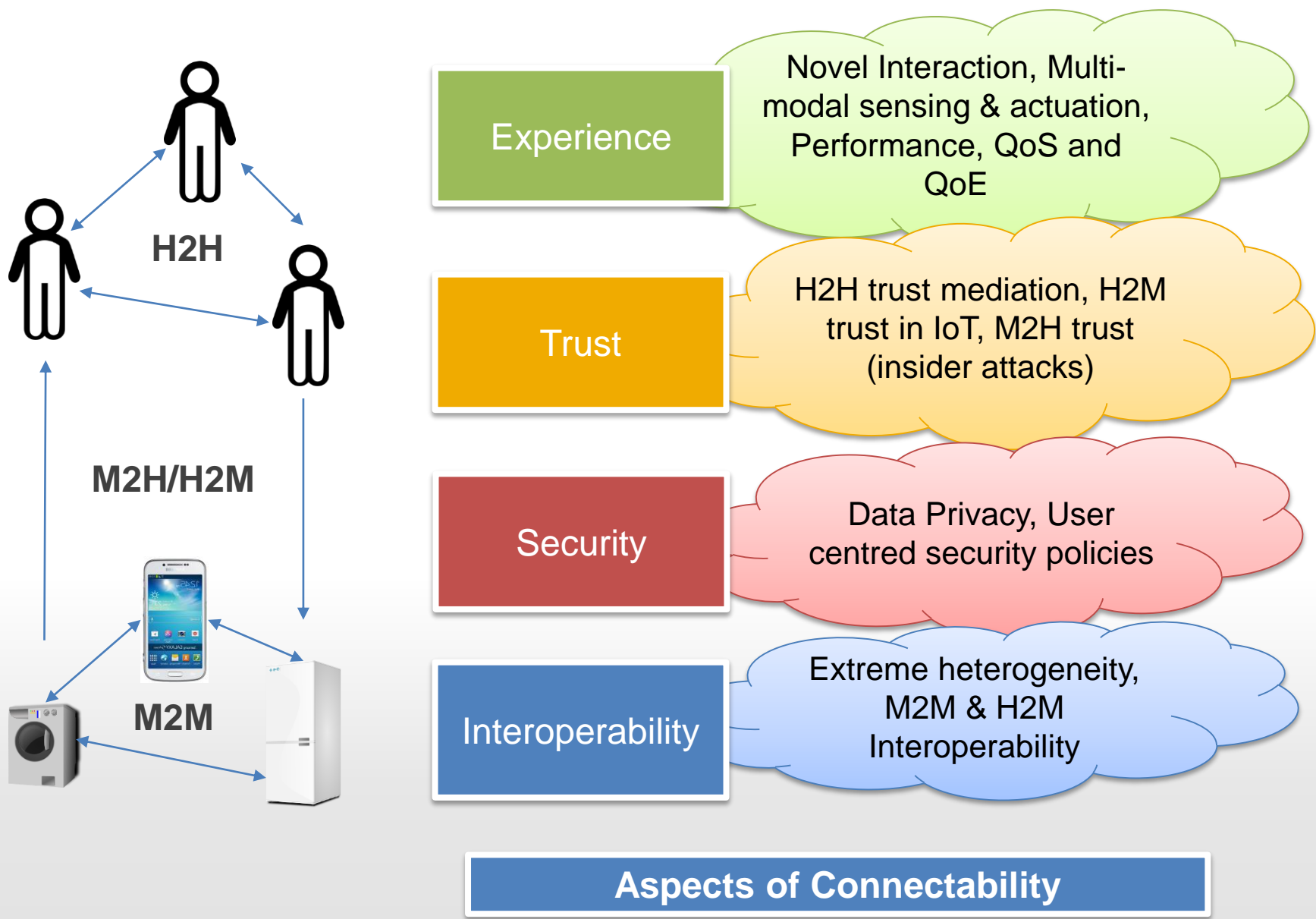
We deliver proofs-of-concept demonstrators and novel operational systems

We work in a spirit of partnership, aiming to provide effective transfer of knowledge to our clients and collaborators

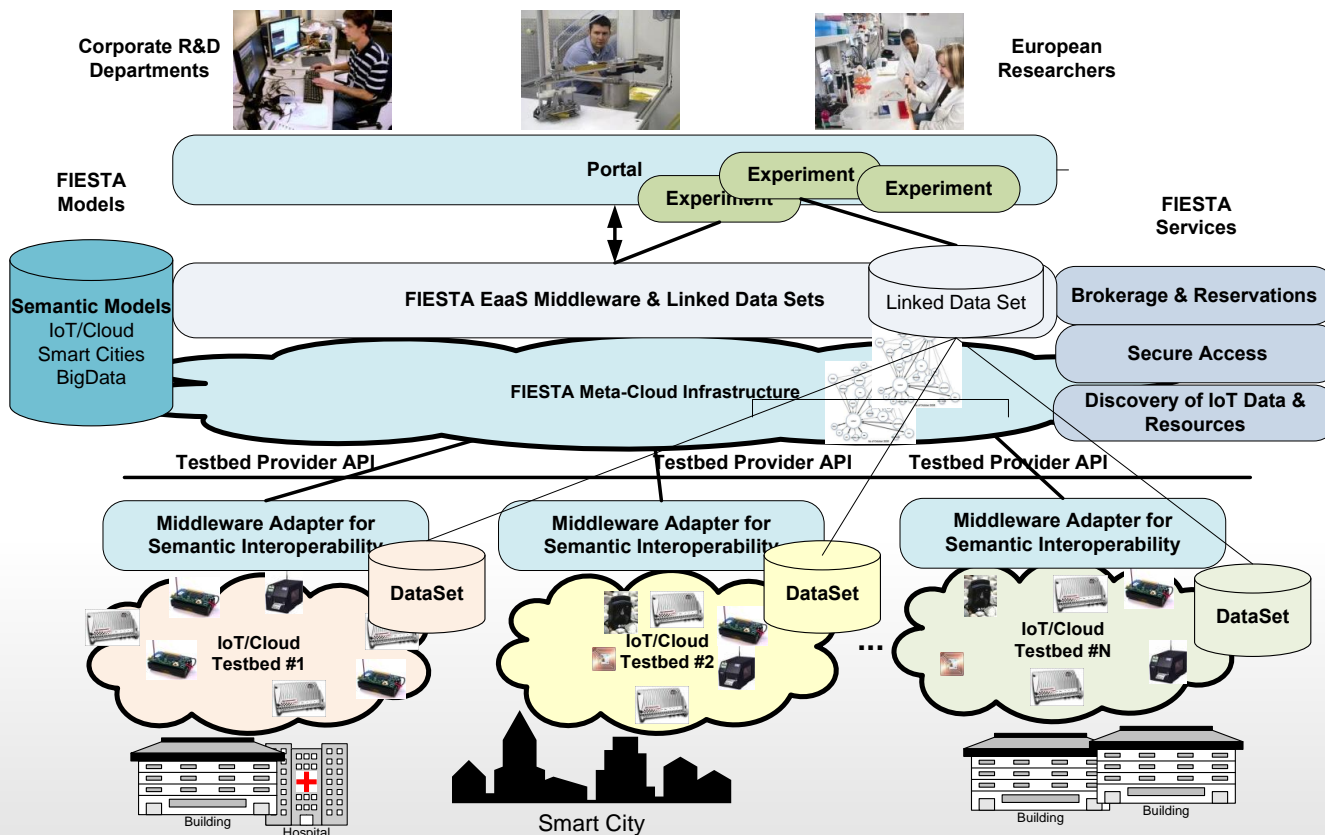
# Motivation

- The **Internet of Things** must consider and benefit **People**
  - Smarter interactions between *humans* and *things*
    - *E.g. Novel and Beneficial Smart Home Applications*
  - Smarter interactions between *humans*
    - *E.g. Novel and Beneficial Smart Healthcare, or Ambient Assisted Living*
- IoT is not just M2M
  - H2H: Human to Human
  - H2M: Human to Machine
  - M2M: Machine to Machine
- Challenges for **adoption** of real-world IoT solutions
  - Extreme heterogeneity
  - Easy to use Multi-modal Interfaces
  - Trustworthy IoT solutions
  - Observable benefits & value

# Human/Machine Interactions in IoT



## Global IoT testbed

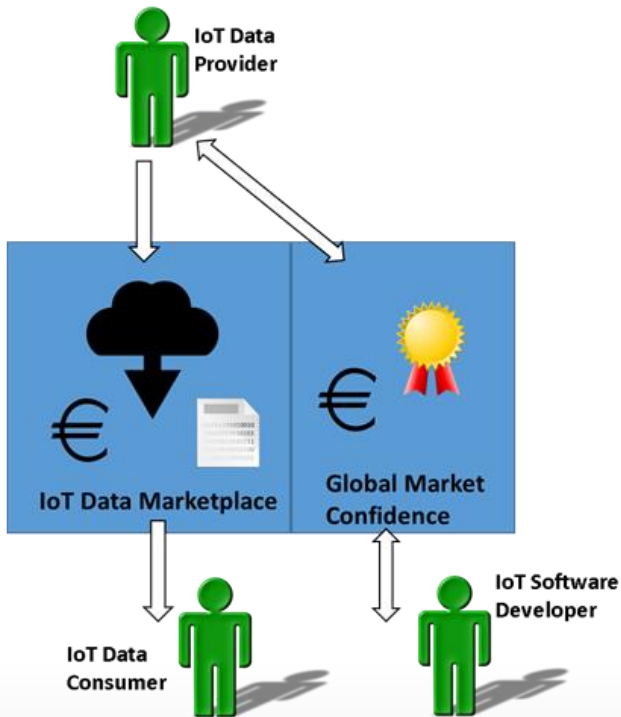


Semantically Interoperable data

IoT Experimentation & Technology testing

Large Scale

# What is the FIESTA-IoT Facility Offering?



## IoT Data Marketplace:

- Access to highly heterogeneous data sources that are semantically aligned and can be easily leveraged and integrated using the FIESTA-IoT tools.

## Certification:

- A *Global Market Confidence Certification Programme*, that will help developers certify that their software and products conform with and interoperate with the latest IoT market specifications & standards.

# FIESTA-IoT Open Calls



- **Funding to use FIESTA-IoT**
- **50K Euros** for a 6 month FIESTA-IoT experiment
- Yet to be published – follow:
  - <http://fiesta-iot.eu/opencall>
- SMEs and Scientific research

## 3<sup>rd</sup> Open Call

Published: April '17

Submission deadline: June'17

## 4th Open Call

Published: June'17

Submission deadline: Sep'17

Europe's citizen privacy laws are world-leading

However, **escalating loss of user privacy**



The evolving data protection and privacy frameworks are yet to be implemented in a **transparent and friendly way**



Users need to **understand** and **control** how their personal data are **used**



Users should be able to **take part** of the **monetization** of the economic value of their data



# OPERANDO: Privacy as a Service

## Innovative privacy enforcement framework

O{P}ERANDO  
online privacy enforcement, rights assurance & optimization

Online Service Providers  
(OSP)

\* Including PPAA

Privacy Authority (PA)(\*)

(\*) operated by Privacy Service Provider  
Machine readable privacy guarantees of OSP

Input / update privacy regulations

Privacy Regulator



Provides (paid) OSP-side services

Consume (paid) OSP-side services  
Provide Privacy Guarantees:  
- on use of personal data  
- on handling of personal data

If Privacy guarantees match UPP  
access is granted

Provides (free) user-side services

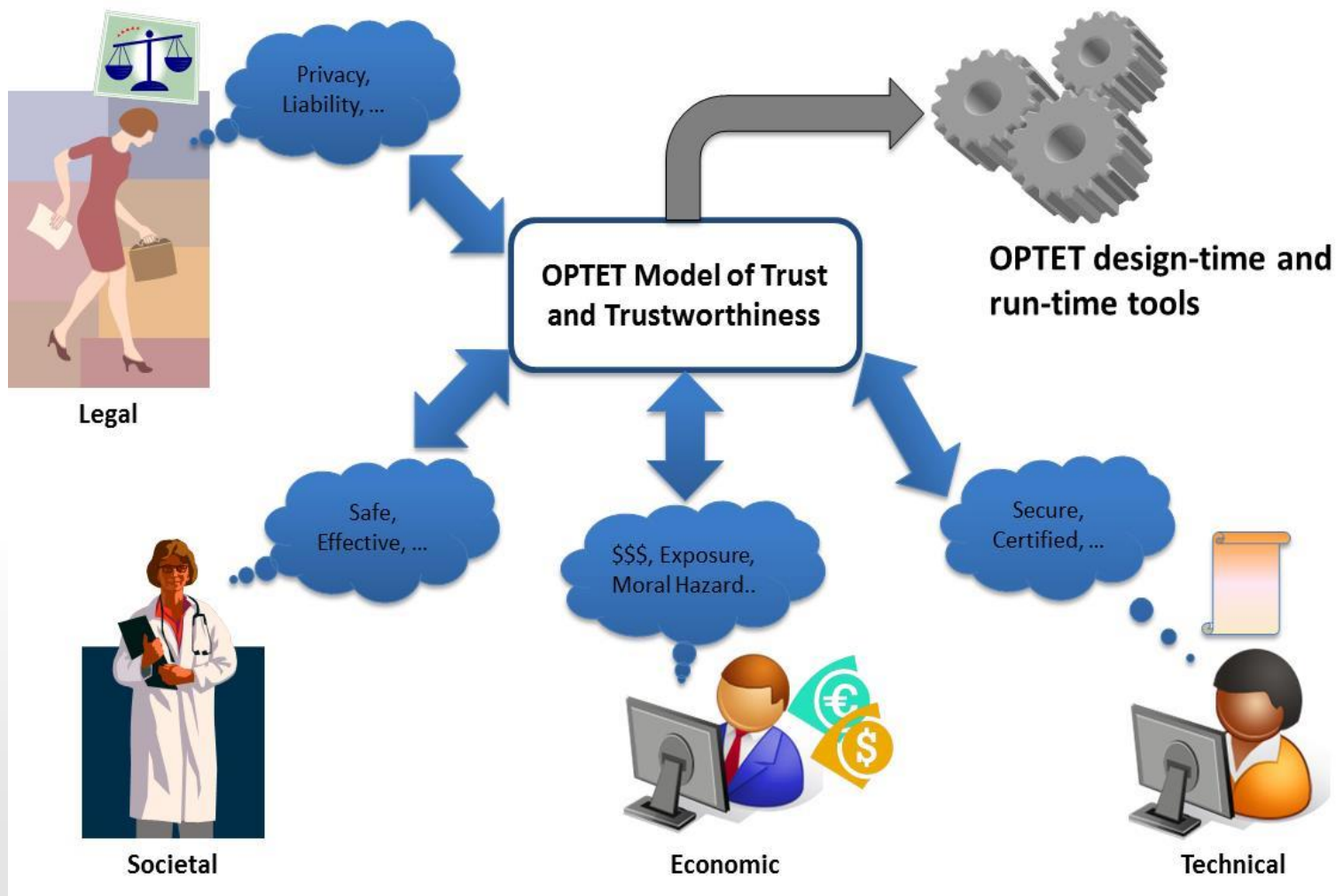
User

**User Privacy Policy** =  
User sensitivity profile +  
Explicit user input + Privacy  
laws + Best practices

**Trusted Privacy Protection Relationship**  
(OSP-Users – Privacy Regulators)

# FP7 OPTET

2012-2015



# FP7 3D Live

2012-2015

- Experience and interact across distant locations using real-time mixed reality, sensing and immersion
  - compete in live sports competitions from anywhere!
  - World's 1st Mixed Reality Ski Race Feb 2015 as seen on BBC Click
- Reconstruct scenes of moving humans in real-time 3D
  - Real env: biomechanics from inertia sensors, weather from environment sensors, location from GPS, etc.
  - Immersive env: simulators, game interaction tech (Wii fit, Kinect sensors)
- Experience design concerns focus on creating meaningful activity interaction with Internet of Humans technologies
  - dealing with experience perspectives caused by diverse interaction environments
  - activity characterisation drives needs for spatial and temporal consistency (e.g. skiing vs walking)
  - power and influence of participants constrained by HCI capabilities
  - minimising cost to real participant needed to support distant participation



# FP7 3D Live

2012-2015

## Outside gear

Controller



Smartphone



### Inputs

- Real GPS Location
- Biomechanics
- Environment conditions
- Game control
- Voice and Background Sound

Smart Data Goggles



### Outputs

- Player voices and Game Sounds
- Augmented slope scenes
- Virtual player location
- Online competitor locations
- Online player's movements

Inertial Sensor



Environment Sensor



Headphones



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# FP7 3D Live

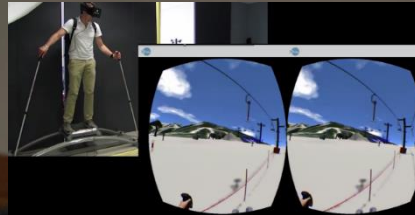
2012-2015

## Inside gear

Ski Simulator  
or Wii Fit



Oculus Rift, CAVE



## Inputs

- RT 3D reconstruction of players
- Activity recognition
- Voice

## Outputs

- Player voices, Game Sounds, Real Sound
- Immersive 3D environment
- Virtual player location
- Real and Online competitor locations
- Reconstructed 3D online players

1 to 4 Kinect Sensors



Laptop



# H2020 ProsocialLearn

2015-2017

- Teach children (7-10) social skills using digital games in schools
- Measure human prosociality through multi-modal sensing of interaction, emotion and engagement
  - game interaction classification (prosocial skills) and analytics
  - emotion/engagement from voice, facial expression and body language
- Pedagogical and interaction design considers enhanced learning opportunities
  - Role distribution: teachers vs machines
  - Learning space: tablets vs desktops
  - Learning generalisation: real vs online interaction

## Learning Possibilities for Everyone's Inclusion



# Conclusions

