



# Internet of Things

## The EU research agenda – Information Day

**Thibaut KLEINER**  
**European Commission - DG CONNECT**  
**Head of Unit E1: Network Technologies**

# Outline

*Internet of Things: enormous potential + a real market*

*FP7 has delivered a series of achievements*

*But key challenges remain*

*Initiatives are on-going: ICT30, AIOTI*

*The next work programme will offer the opportunity to take IoT technology closer to the market*



# Part I

## Approche de la Commission pour l'Internet des Objets

*The Internet of Things is the next digital revolution*

- **Everything will be connected= convergence of physical and digital**
- **IoT + Cloud Computing + Big Data (+cyberphysical systems and robotics) = new smart products and services**
- **We may be approaching another 'iphone moment'**

*The Internet of Things is not another technology hype*

- **Research cycle is maturing**
- **Demand is consolidating**
- **Leading to innovation and tremendous economic opportunities**

*Europe has the capacity to lead*

- **We have all the ingredients (research, players, eco-system...)**
- **But there is a big risk of fragmentation and delay in front of international competition**

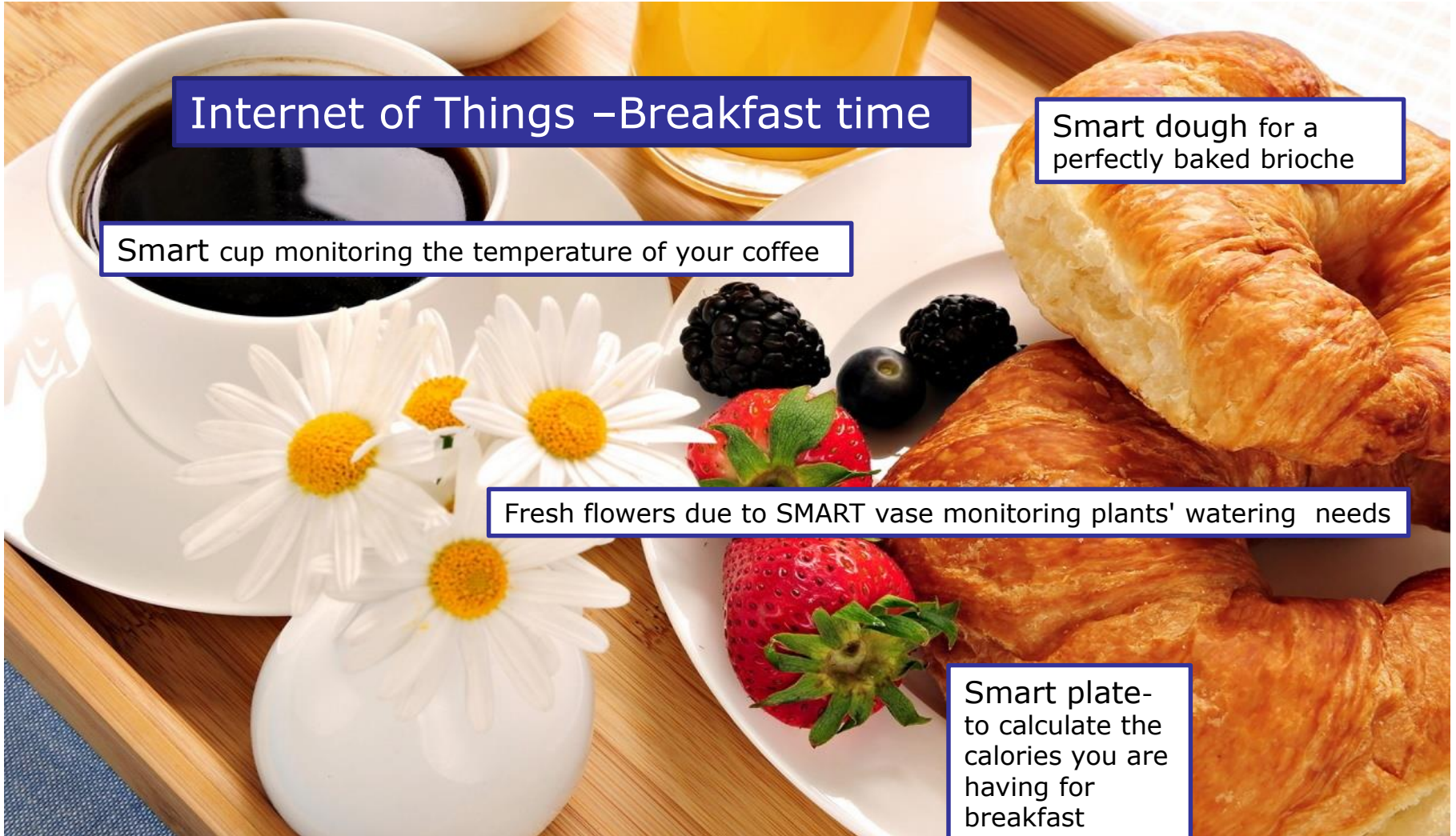
## Internet of Things – Breakfast time

Smart cup monitoring the temperature of your coffee

Smart dough for a perfectly baked brioche

Fresh flowers due to SMART vase monitoring plants' watering needs

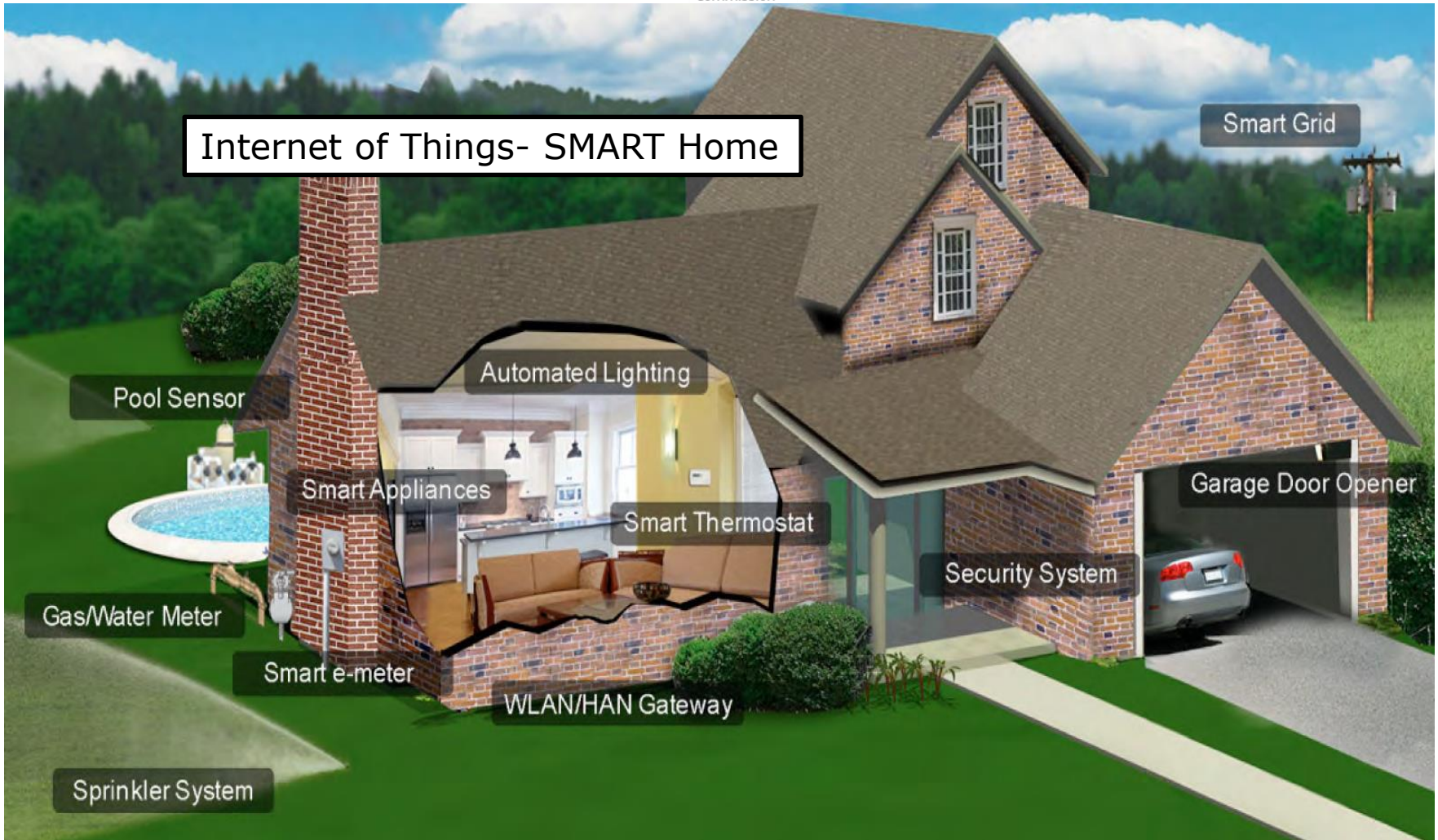
Smart plate-  
to calculate the  
calories you are  
having for  
breakfast



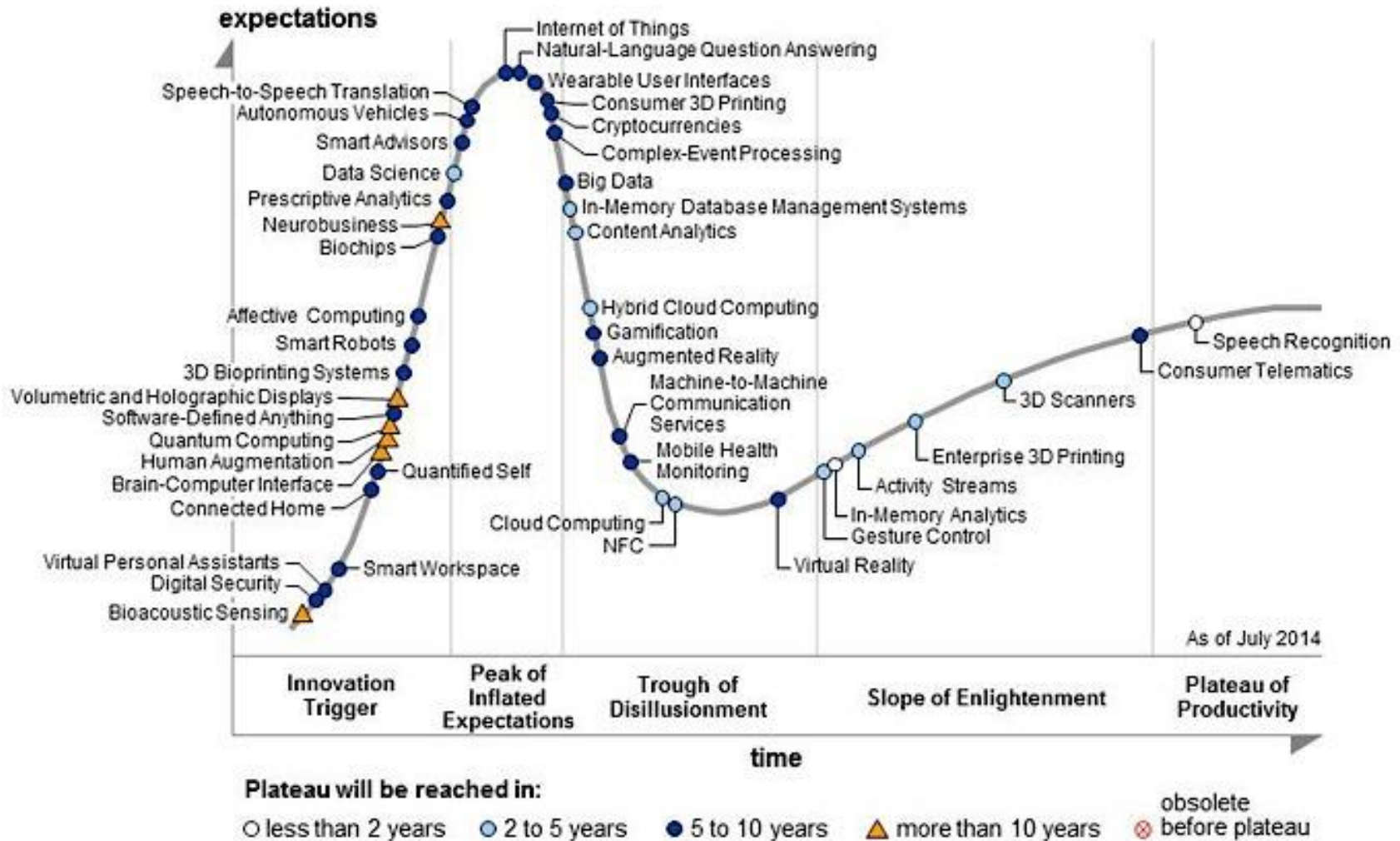


European  
Commission

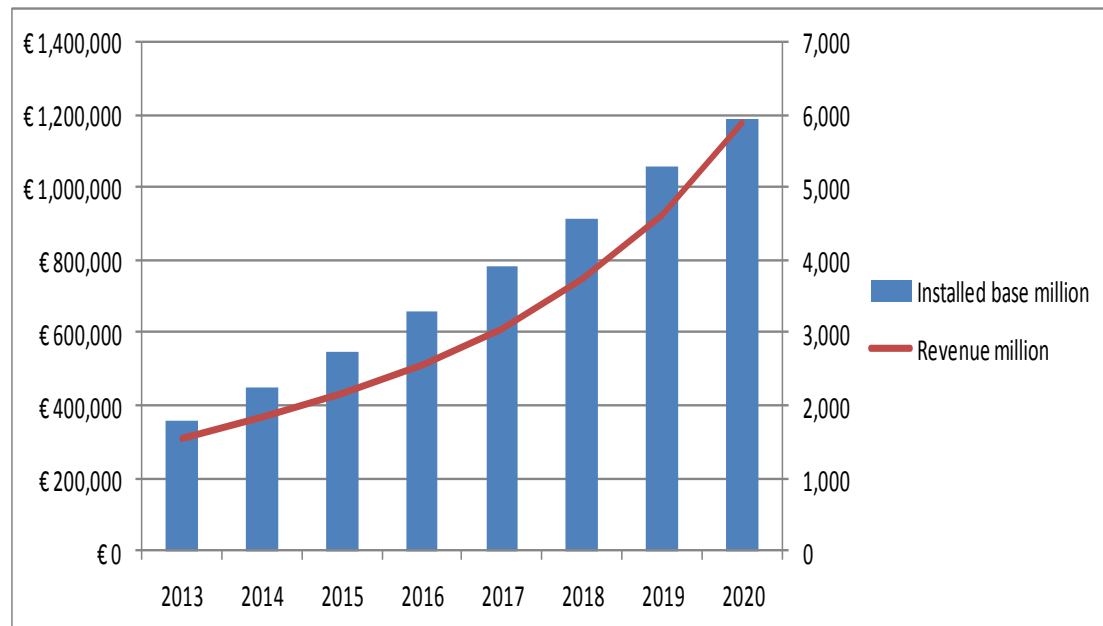
## Internet of Things- SMART Home



# High expectations for the IoT (Gartner, 2014)



- **Globally**, Gartner forecasts 26 bn devices online by 2020; ABI Research puts that number at 30 bn; Cisco estimates about 50 bn
- McKinsey forecasts global IoT market in 2025 worth 2.5T€ – 6T€
- **In EU28**, IDC/TXT (2015) estimates IoT connections at 1.8 bn in 2013 and almost 6 bn in 2020
- In EU28, IDC/TXT estimates IoT revenues at €307 bn in 2013 and more than 1.1 T€ in 2020, including HW, SW and services.



Source: IDC, 2014



# IoT Vision in 2020



IoT connections within EU28

6B Units

€ 1,181B Revenues

All EU countries will gain from the IoT revolution (Top 3 UK, FR, DE)

IoT will impact all sectors (Top 3 Manufacturing, Finance and Utilities)

## EU IoT Industry Ecosystem

An industry ecosystem (components vendors, suppliers creating solutions, service providers, and enterprise users in all sectors of the economy) will have emerged and will measure € billions in Europe alone



Cloud Computing

IoT Technologies

Big Data

Cloud computing and Big Data/analytics will be central elements of, and key contributors to, enabling the growth of the European and worldwide IoT ecosystems.

Towards hyperconnected society and economy

**Security**

**Trust**

**Open Standards**



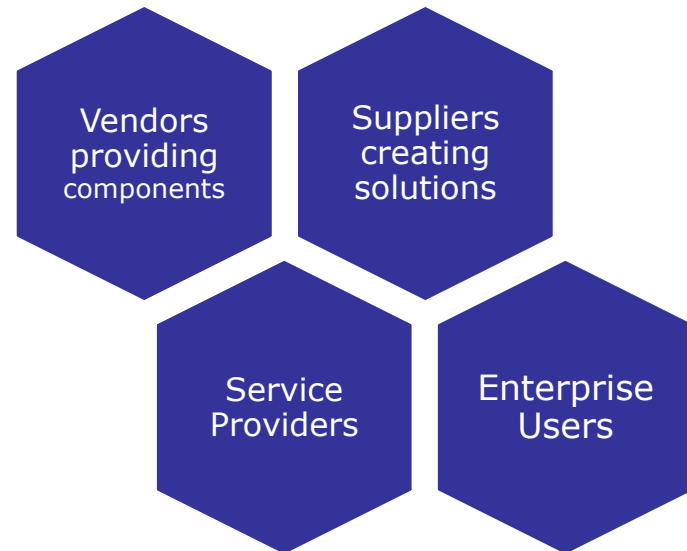
**SMEs participation**

**Time and cost savings**

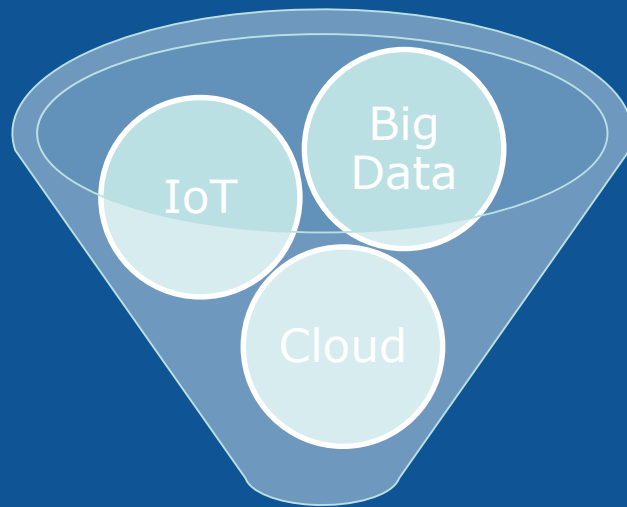
**Privacy**

**Interoperability** **Digital Single Market** **Innovation**

*Needed = a sophisticated industry ecosystem across vertical silos and consisting of:*



# New business opportunities combining IoT, cloud and big data



## Identified Smart Environments

**Smart  
Energy/  
Utilities**

**Smart  
Transport**

**Smart  
Manufacturin  
g**

**Smart Health**

**Smart  
Government/  
Environment**

**Smart Homes**

**Smart  
Customer  
Experience**

**Smart  
Finance**

# EU R&I agenda for the IoT

## FP7- Ignition phase

**FP7** research results  
(platforms,  
architectures,  
demonstrators)

### 2014-15 Building the eco-system

**ICT30:** *Building the eco-system, breaking silos CPS-IoT, Using platforms integrating devices, embedded systems and network technologies for a multiplicity of novel applications*  
+ ODI, FI-ware accelerators, IERC, standardisation etc.

### 2016-17 Going to market

**WP16-17:** Focus Area on Internet of Things will focus on experimentation with real-life solutions being tested at large scale with users

**Deployment**



# FP7: results and achievements

## IOT ARCHITECTURES

- IoT Reference Architecture and Open IoT platform
- Clouds of internet-connected objects, Open source middleware framework
- Adaptive middleware for small solutions
- Virtual objects and composite VO semantics
- City infrastructure as a cloud service (CIaaS)
- Future Internet PPP Generic Enablers and platform approaches (FI-WARE, FI-CORE)
- Open platforms ReAAL and Universaal for home environment (smart home)
- Cyber-physical systems (I4MS) for manufacturing



## IOT SOLUTIONS

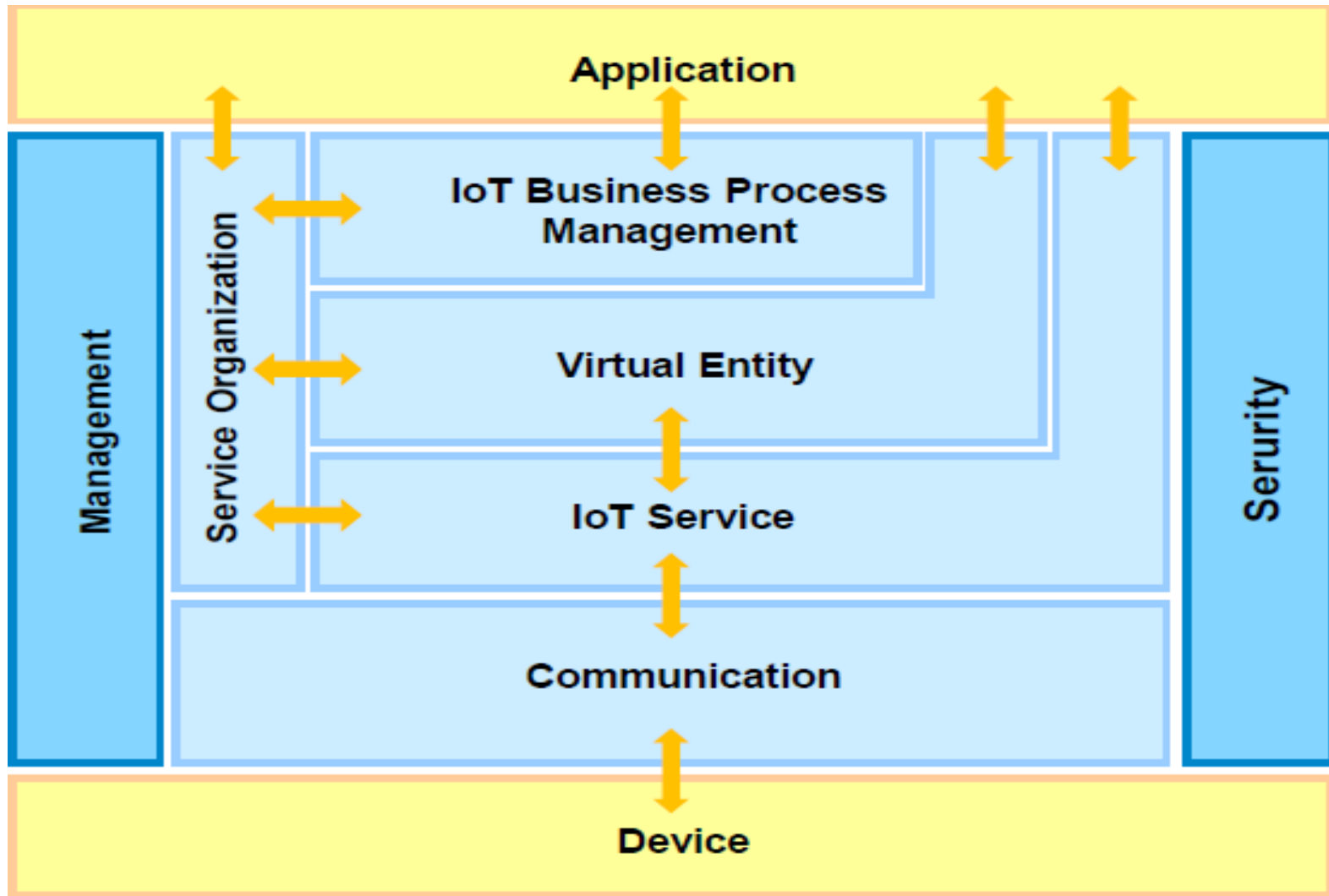
- IP-based smart objects connectivity with low power consumption
- Naming and identification systems
- Test-driven service creation environment for business services
- Reliable communication and self-configuration mechanisms in industry
- Context-awareness, cognitive framework object networking
- Knowledge-Social-Business Experience Models
- Ubiquitous, secure location-based IoT
- Semantic interoperability approaches
- Embedded smart objects / Cyber-physical systems
- real-time measuring and decision making solutions

# Internet of Things Architecture (finished 2013)

- Holistic view to overcome *Intranet* of things
- Architectural reference model for the interoperability of IoT systems,
  - **Principles and guidelines for the technical design of its protocols, interfaces, and algorithms;**
  - **Efficient integration into the service layer of the Future Internet**
- Novel resolution infrastructure, allowing scalable look up and discovery of IoT resources and their associations;



# IoT-A Functional model





# FP7: results and achievements

## IOT DEMONSTRATORS

- City-scale smart city experimental research facility in Santander
- Use-cases in e-Health, Smart Mobility, Smart Office, Smart Shopping, Smart Home, Tourism, Smart Toys, Smart Agriculture
- IoT Use Cases in European Smart Cities (energy, environment, open data, transport, security, water mgt., social communities, urban regeneration)
- Health & Safety monitoring & control system including semantic sensing information processing
- Smart Campus platform for monitoring of municipality services, smart traffic and public transportation management
- Social Connected TV combined with device management
- Eco-conscious cruise control for public transport
- Urban environment monitoring for lighting, noise, pollution, waste generation, energy consumption
- Logistics Product Life-cycle Management
- Smart Manufacturing for textiles
- Smart Shopping pilot
- Smart Toys
- Smart Care / advancing active and healthy ageing

- 20,000+ IoT devices; experimentation & services
- Environmental monitoring; traffic management; irrigation optimization; participatory sensing; public street lighting; waste management





# Policy actions

*Trust and Security*

*Privacy*

*Developing demand side (societal challenges)*

- Smart cities, e-health, Intelligent Transport Systems

*Link with infrastructures (5G PPP, Future-Internet PPP)*

*International co-operation on IoT*

- China, Japan, Korea, Taiwan, India, US and Brazil
- Promoting convergence on standards and platforms

# Digital Single Market: IoT *inside*





## DSM: IoT inside



*Telecom regulatory framework: roaming, net neutrality, spectrum*

*Platforms*

*Trust and security and data protection*

*Data economy: free flow of data, allocation of liability, ownership, interoperability, usability and access*

*Interoperability and standardisation*

# Key challenges for H2020

## *Remaining technological challenges*

**Security and privacy, connectivity and reliability of data transmission at large scale, semantic interoperability**

## *Risk of fragmentation*

**Between siloes, between standards, between MS**

## *User acceptability*

**Privacy, user-friendliness**

## *Insufficient investment in Europe*

**Uncertainty about business models**

## *International competition*

**Google, Apple, Samsung, GE**



# Breaking silos



# ICT-30: IoT and Platforms for Connected Smart Objects (51 MEUR funding)

*Objective= create **ecosystems** of platforms that can be used by developers*

*Fi-Ware mentioned in most proposals*

***Sub-granting mechanisms*** will be used for around 20% of total funding (#10 M€ in batches of 50-150k)

*Time-frame: results announced end of August 2015; projects starting end 2015*  
*Application areas: smart cities, mobility, smart homes, industrial internet, etc.*



# Interoperability through standards

*Mapping/Gap analysis conducted by ETSI*

- **Mapping global standardisation activities**  
<http://www.etsi.org/news-events/events/771-2014-etsi-ec-dg-connect-iot>
- **Identification of business scenarios and applicable (or missing) standards**
- **ETSI's expertise "Making Better Standards"**  
<http://portal.etsi.org/mbs>

*Testing of standards*

- **Demonstrate standards/interoperability in operational conditions.**
- **Test reference implementations and open source approaches**



# Part II

## Alliance for Internet of Things Innovation (AIOTI)



# The AIOTI Momentum Declaration

Europe will have the most dynamic, agile IoT ecosystem and industry in the world which transforms people's lives, drives growth, creates employment and addresses societal challenges.

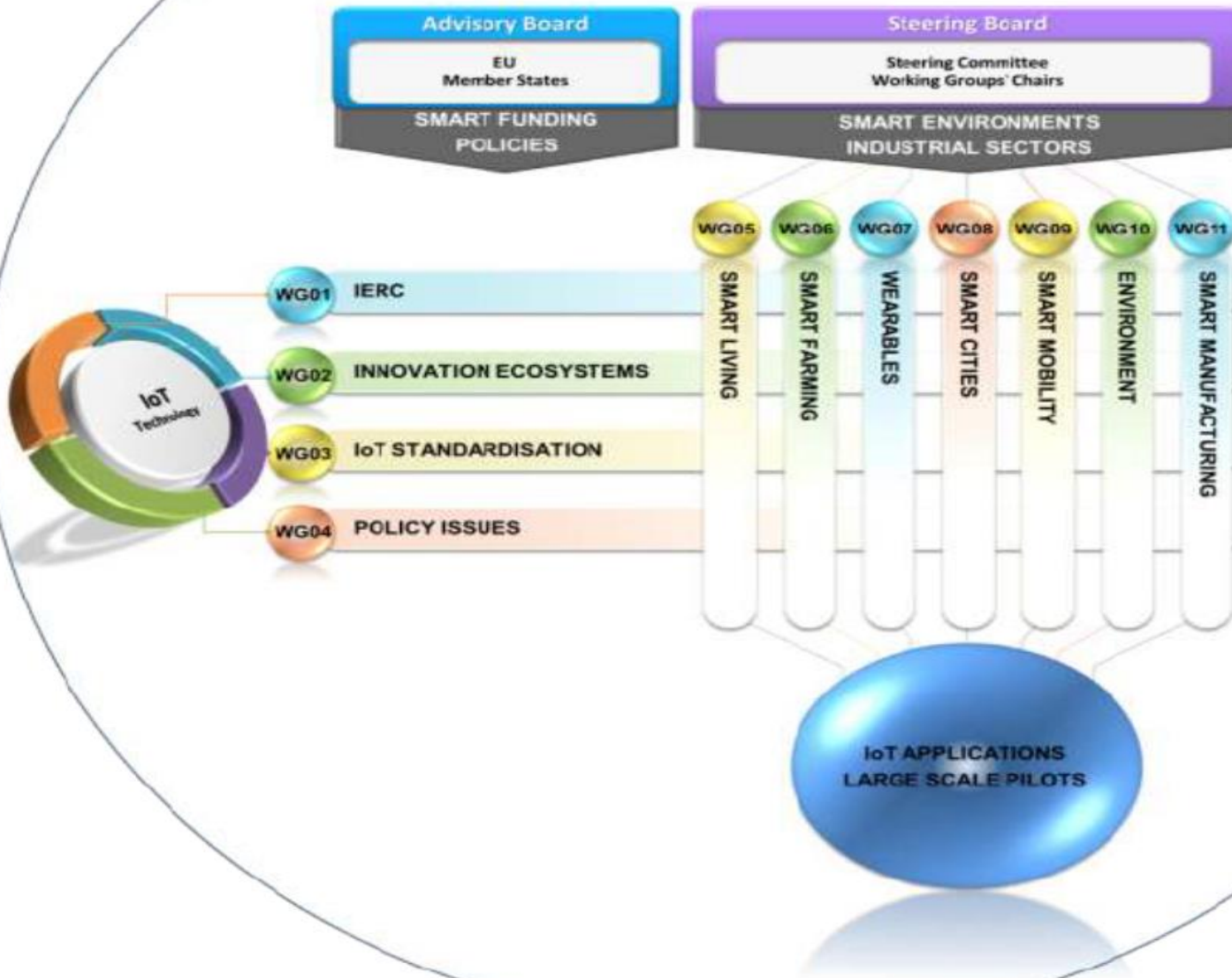
Today we agree, in partnership with the European Commission, that collaborative and innovation driven activities are necessary in order to drive a successful take-up of the Internet of Things.

By understanding the potential of connected things, their intelligence and smart data, we all support the creation of an IoT ecosystem, which supports openness, value creation, scalability, sustainability and co-existence.

Core principles are to cooperate and share knowledge with existing and new partners of all sizes along value chains, to adopt agile approaches and to search flexible agreements for convergence, interoperability and standardisation.

Through common reference models and IoT Large Scale Pilot activities we aim to bring IoT forward and to stimulate service creation, acceptance and take-up from the user and creator perspectives.

# ALLIANCE FOR INTERNET OF THINGS INNOVATION - AIOTI



# AIOTI not the only available forum



Open Automotive Alliance



IoT•Forum

**UNIQUE**

## HOWEVER AIOTI is UNIQUE!

- ★ *Focused on the Internet of Things from a cross-cutting perspective*
- ★ *Special link with the EU institutions, and soon MS*
- ★ *Clear deliverables around IoT large scale pilots, standardisation, ecosystems, IoT platforms*
- ★ *Neutral ground, open to all (already 95 new members)*
- ★ *Builds on the IERC and results from years of research*



# AIOTI Members up Today!



# To become a member, you only need to join one AIOTI Working group:

*WG 1: IoT European research cluster*

*WG 2: Innovation Ecosystems*

*WG 3: IoT Standardisation*

*WG 4: Policy issues (trust, security, liability, privacy)*

*WG 5: Smart living environments for ageing well (e.g. smart house)*

*WG 6: Smart farming and food security*

*WG 7: Wearables*

*WG 8: Smart cities*

*WG 9: Smart mobility (smart transport/smart vehicles/connected cars)*

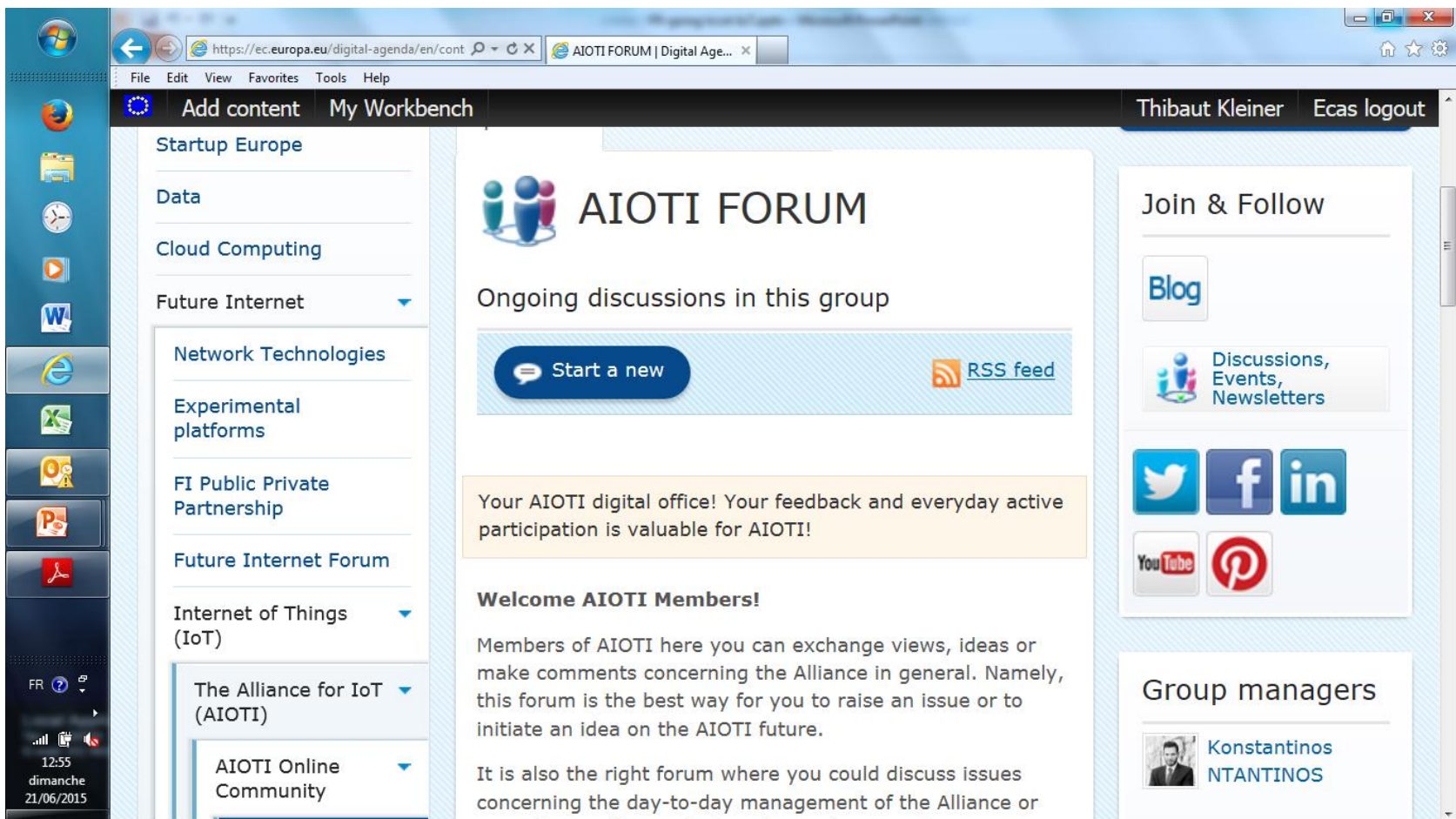
*WG 10: Smart environment (smart water management)*

*WG 11: Smart manufacturing*

- **You can apply on-line:**

**<https://ec.europa.eu/digital-agenda/en/content/aioti-membership-application>**

# AIOTI – online community



The screenshot shows a web browser window displaying the AIOTI FORUM website. The browser's address bar shows the URL <https://ec.europa.eu/digital-agenda/en/cont>. The website has a dark blue header with navigation links: "Add content" and "My Workbench". On the right side of the header, the user "Thibaut Kleiner" is logged in as "Ecas".

The main content area features the "AIOTI FORUM" logo and the heading "Ongoing discussions in this group". Below this is a blue button labeled "Start a new" and an "RSS feed" link. A yellow callout box contains the text: "Your AIOTI digital office! Your feedback and everyday active participation is valuable for AIOTI!".

A "Welcome AIOTI Members!" section follows, stating: "Members of AIOTI here you can exchange views, ideas or make comments concerning the Alliance in general. Namely, this forum is the best way for you to raise an issue or to initiate an idea on the AIOTI future." Below this, it says: "It is also the right forum where you could discuss issues concerning the day-to-day management of the Alliance or".

The left sidebar contains a menu with categories: "Startup Europe", "Data", "Cloud Computing", "Future Internet", "Network Technologies", "Experimental platforms", "FI Public Private Partnership", "Future Internet Forum", "Internet of Things (IoT)", "The Alliance for IoT (AIOTI)", and "AIOTI Online Community".

The right sidebar includes a "Join & Follow" section with links for "Blog", "Discussions, Events, Newsletters", and social media icons for Twitter, Facebook, LinkedIn, YouTube, and Pinterest. At the bottom of the sidebar is a "Group managers" section featuring a profile for "Konstantinos NTANTINOS".

The Windows taskbar at the bottom shows the system tray with the date "21/06/2015" and time "12:55".



# Part III

**Work Programme 2016-2017**



# WP16-17: Internet of Things as a Focus Area

*Opportunity to design IoT as a programme combining research, innovation/experimentation and horizontal actions, including policy issues*

*Building bridges between SCs and LEIT*

*Trying to re-inforce community-building across vertical silos and with industry*



- **Conference** sessions on EC policy and initiatives on R&I in ICT
- **Networking** sessions
- **Exhibition** showcasing results of most recent EU projects
- **Presentation of WP2016-17**

info & registration: [ec.europa.eu/digital-agenda/ict2015](http://ec.europa.eu/digital-agenda/ict2015)



European  
Commission

# Thank You



# Useful links

Follow us on Twitter

[@NetTechEU](#)

IoT

<http://ec.europa.eu/digital-agenda/en/internet-things>

Network Technologies

<http://ec.europa.eu/digital-agenda/en/network-technologies>

<http://www.aioti.eu>