

"Towards the Internet of Things"

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What is the IoT?

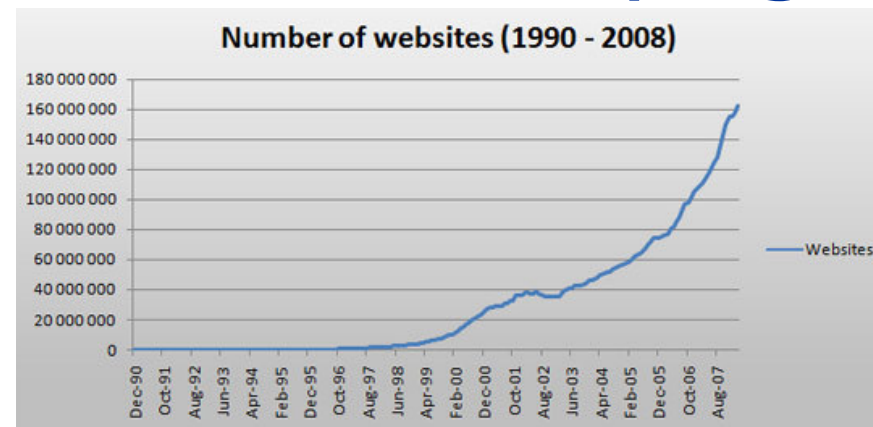
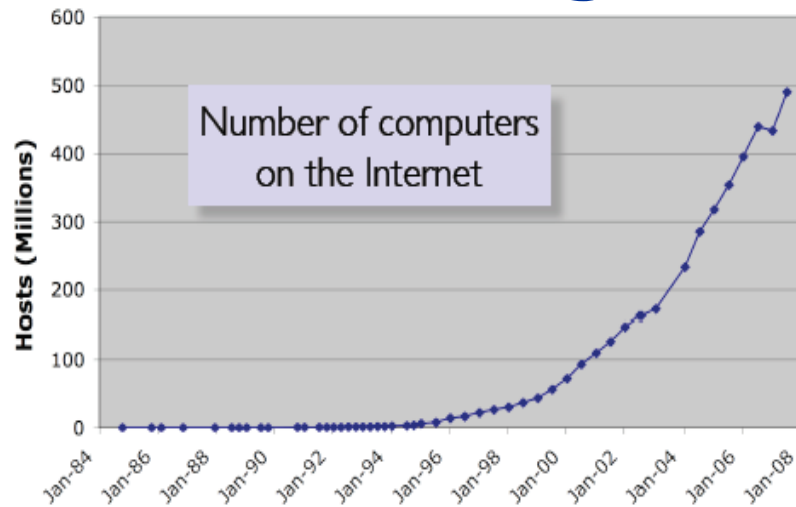
➔ **A world where physical objects (dumb or smart) are seamlessly integrated into the Internet, and where the physical objects can become active participants in business processes.**

“The Internet of Things is a description of a not-too-distant future time, where everyday objects, rooms and machines have sensors and can “communicate” about themselves and with each other.”

(Prof. Elgar Fleisch)



Internet is evolving beyond connecting hosts and web pages



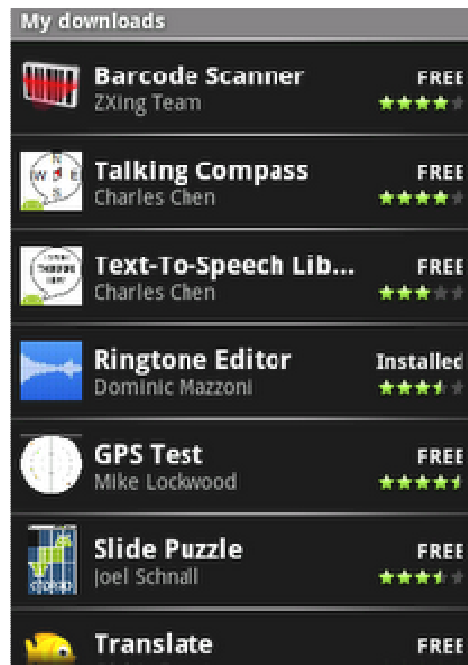
- Towards trillions of connected devices, M2M, Internet of objects
- Merging the physical and the virtual worlds;
- The network becomes a data base
- From information to knowledge, to reasoning and problem solving (Internet of services)
- Geo-location as embedded capability
- Multi service network, multi network services, cloud computing



IoT Key Components

ID technologies

- ➔ Barcodes
- ➔ RFID tags
- ➔ 2D codes
- ➔ GPS chips
- ➔ Geo-tagging



Terminals

- **Devices**
 - Fixed readers
 - POS readers
 - Boarding gates
 - Subway gates
 - Mobile readers
 - Barcode
 - NFC
 - Bluetooth
 - GSM, 3G ...
 - PDAs, Cameras
 - WiFi
 - UWB
 - Sensors
 - Stand ~~alone~~
 - Internetworked
 - Open source OS?

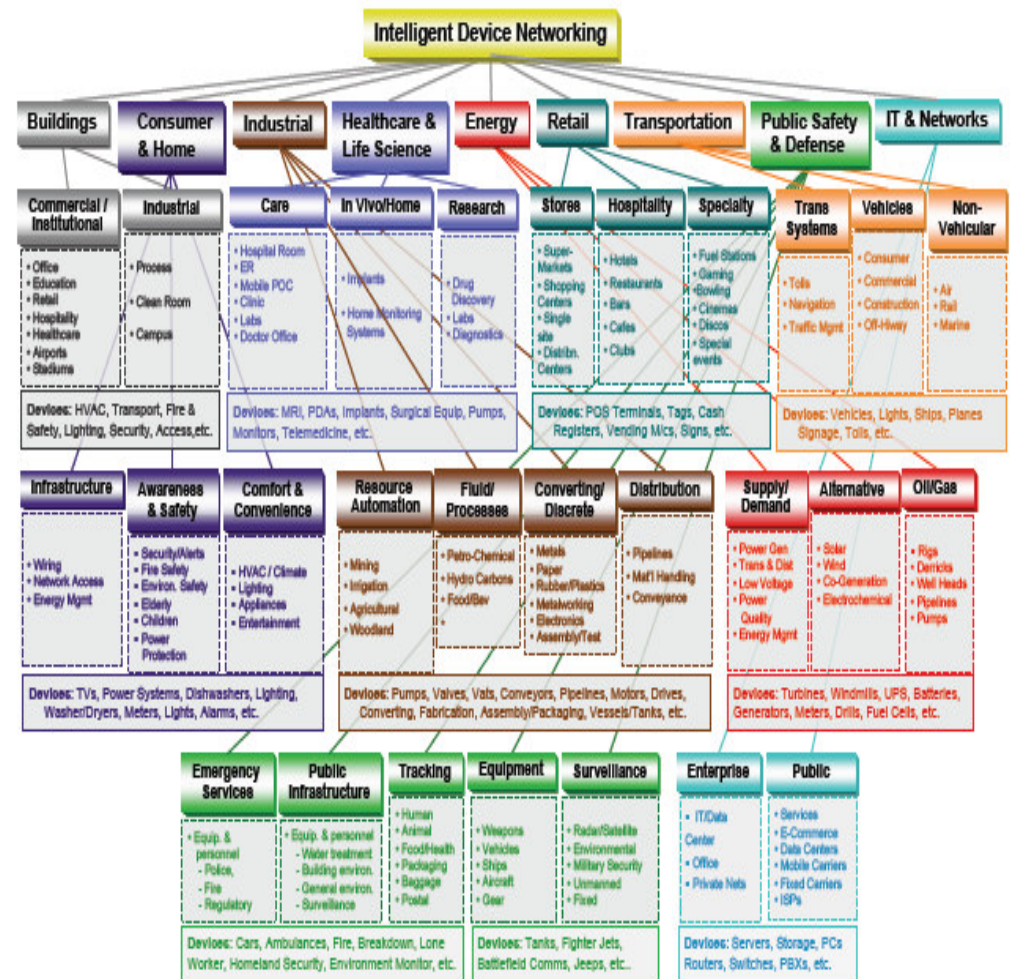
Networks

- ❖ Back-end Systems
- ❖ Local area networks
- ❖ Private/public networks
- ❖ Internet
 - ❖ Data bases
 - ❖ Routers
 - ❖ ONS servers
 - ❖ Discovery services

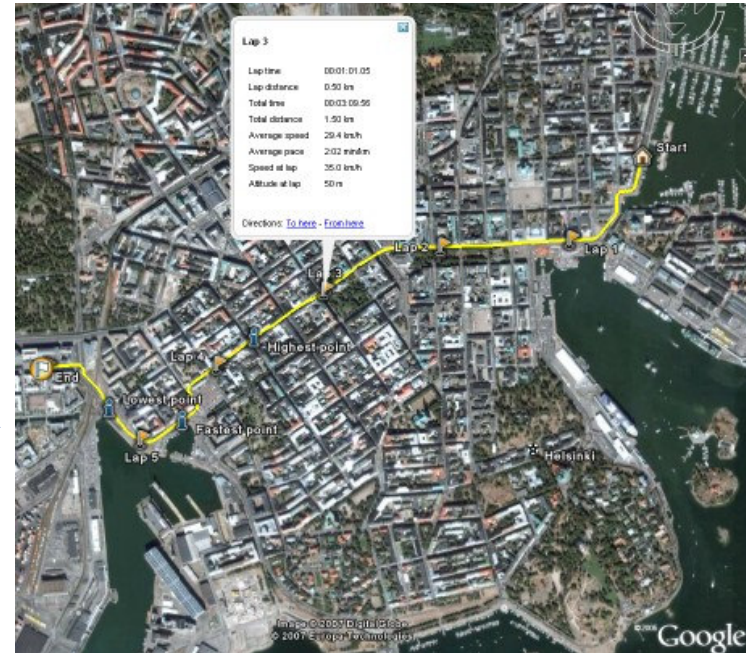


Networking opportunities for smart devices

- Today's smart devices have limited communication capabilities (e.g. RFID tags),
- Smart devices are characterised by:
 - A CPU (8-, 16- or 32-bit micro-controller),
 - Memory (a few tens of kilobytes) and
 - Low-power wireless communication device (from a few kilobits/s to a few hundreds of kilobits/s).
- Sensors built in to smart devices will gather real-time data (e.g. temperature, pressure, vibrations etc) and will have bidirectional communications capabilities
- Will they support an IP stack?



Examples



Workout Summary
13/03/2007 6:22 am

User	Joe Average
Activity	Driving
Route	

- Send
- Save: As route
- View: Export as XML
- Repla: **Export to Google Earth**
- Properties
- Switch orientation

Select Cancel



Examples (2D Barcodes)



DVD Release promotion for "28 weeks later" in London



Internet of Things
<http://qrcode.kaywa.com/>



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Examples (Geo-Location)



Technological progress is making IoT an economic reality

➔ Inexpensive sensor technology

- ➔ Recognition of context information
- ➔ Capable to cope with limited resources (e.g., energy, CPU, memory)

➔ Ongoing miniaturisation and integration

- ➔ Devices (tags, sensors) embedded in everyday objects, appliances, products
- ➔ Integration in the physical world

➔ Pervasive wireless communication

- ➔ Cooperating mobile devices
- ➔ Capable to adapt to rapidly changing environments



Resulting in

- ➔ *Increasing interaction / cooperation between physical items*
- ➔ *Increasing interaction / cooperation with the physical environment*
- ➔ *Increasing interaction / cooperation with information systems*

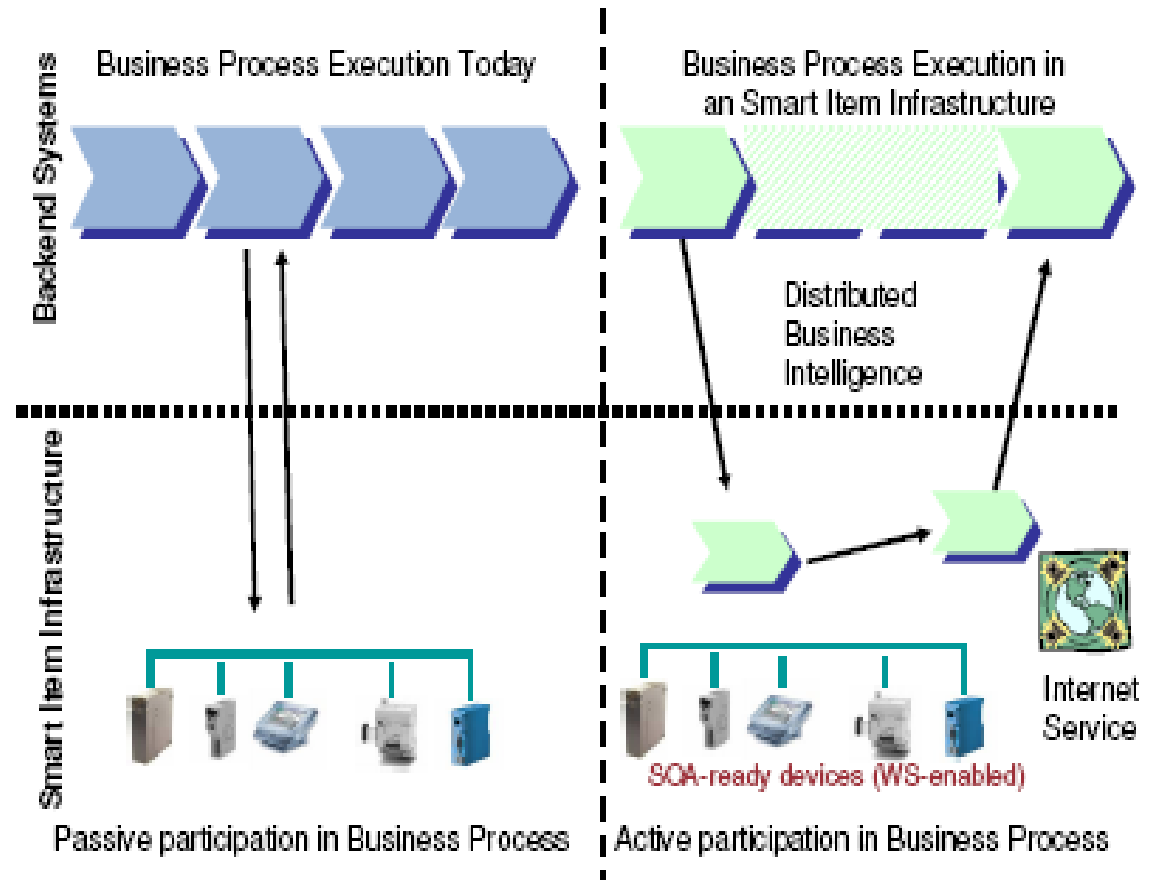
A Range of Applications

- ➔ **Manufacturing, logistics, retail**
- ➔ **Health monitoring**
- ➔ **Intelligent transportation systems**
- ➔ **Environment monitoring**
- ➔ **Remote sensing in disaster management**
- ➔ **Forest fire response**
- ➔ **Home management**
- ➔ **Internet of “My Things”**



From 'Internet of Things' to 'Internet of Services'

- Networked Smart systems will host business logic extending business processes to the point of action
- They will offer directly their functionality as a service (and/or act as gateways for dependant devices)
- Cross-enterprise / cross-layer (enterprise, network, device) service mash-ups will be possible
- Complex collaboration at service level → local decisions and actions → global visibility
- Real-time info for re-/pro-active monitoring, management and control → optimization of resources & actions

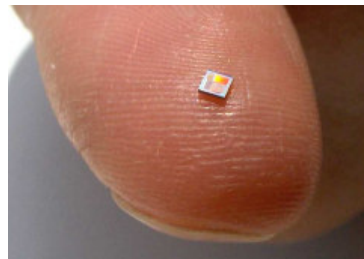


European Commission Intentions

- ➔ **Trigger a debate on IoT with all concerned stakeholders (including public authorities and data protection authorities)**
- ➔ **Staff Working Paper on IoT produced**
- ➔ **SWP available on “Your Voice”**
 - <http://ec.europa.eu/yourvoice/>
- ➔ **Suggestions on possible actions and initiatives are welcome**
- ➔ **Commission Communication planned for 2009**

Open Issues

- ➔ Architecture (edge devices, servers, discovery services, security, privacy etc)
- ➔ Governance, naming, identity, interfaces
- ➔ Service openness, interoperability
- ➔ Spectrum
- ➔ Standards



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Conclusion

➔ Opportunities in IoT should not be missed

- Competitiveness, business efficiencies, quality of life are at stake.
- IoT developments must be compliant with:
 - Public policy principles (WSIS),
 - Openness, interoperability, neutrality, competition, equal access, diversity, inclusion

➔ Debate has been launched

➔ Up to you to shape the future of Europe