



# **The IoT as key enabler to low-carbon smarter homes and cities**

ICT for Sustainable Homes – 24th October 2011, Nice

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# EU Vision

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- The EU has committed itself to expanding the use of renewable energies and reducing greenhouse gas emissions by 2020, both in its energy and climate package announced on 2007.
- The EU is also aiming for a 20% increase in energy efficiency by 2020. The European Commission has acknowledged that, by enabling substantial gains in energy efficiency, ICT-based innovations may provide one of the potentially most cost-effective means to help Member States achieve the 2020 targets.

# The Internet of Things (IoT)

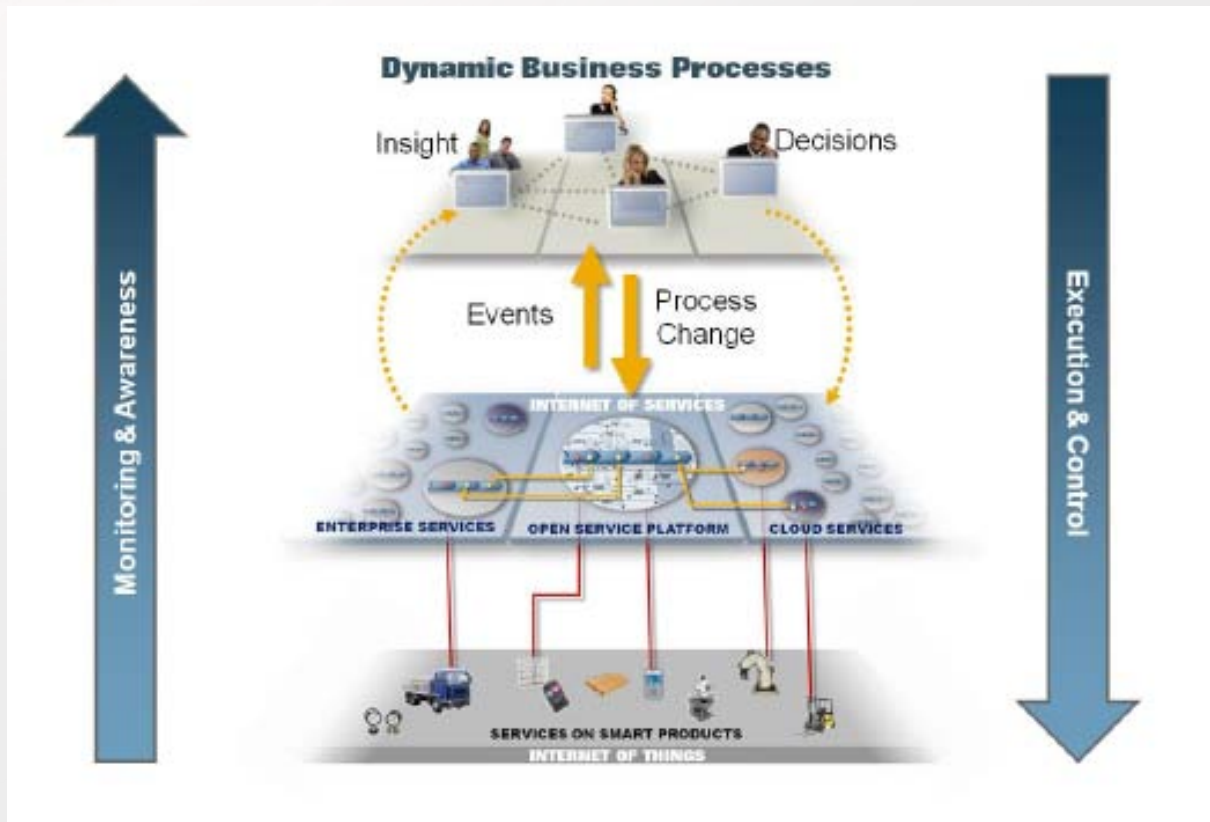
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- It has been predicted (see: [www.telegraph.co.uk/technology/internet/8097488/16bn-devices-online-by-2020-says-report.html](http://www.telegraph.co.uk/technology/internet/8097488/16bn-devices-online-by-2020-says-report.html)) that by 2020 there will be a rise from today's 6 billion to potentially 44 billion digitally identifiable electronic devices on this planet. This proliferation of potentially connected devices, and the concurrent dramatic increase in available data, has been termed the “**Internet of Things**” and can present an enormous opportunity for those poised to take advantage of the new technologies.
- The challenge lies in defining those areas that provide clear business cases; and it is those business problems/opportunities that can be resolved by the technology that are the main interest, rather than the technologies themselves.

# IoT as key enabler to CO2e reduction

- The EU targets on energy efficiency can only be achieved with the contribution from many different sources, coming from all the energy system stakeholders, mainly: customers, utilities, manufacturers, industries, governmental actors and regulators
- One of the most important contributions comes from the ICT sector. In fact, the road towards a society without energy waste can be made easier thanks to the availability and the management of large amount of information on energy consumption for all the actors. **IoT has a major role to play.**

# IoT enabling the establishment of Service Platforms



Source: SAP, Haller, 2009

# IoT Challenges

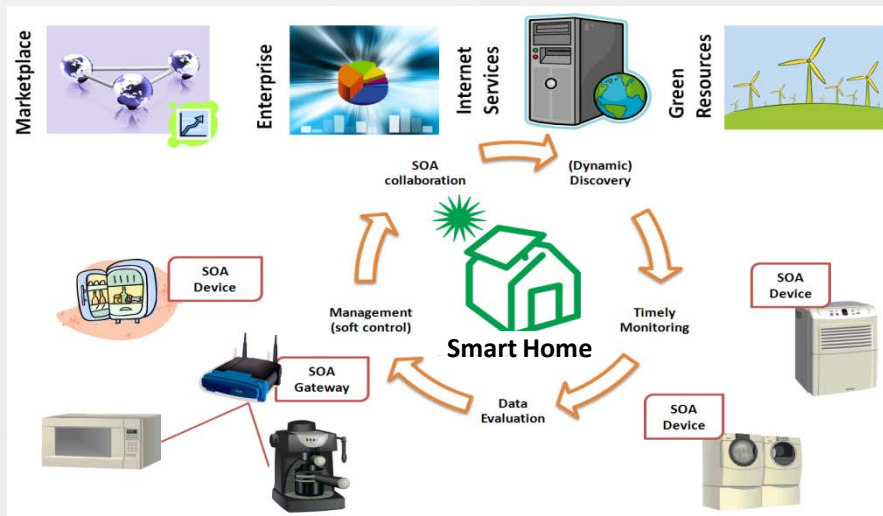
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The principal challenges, representative of the wide ranging practicalities include:

- **Interfacing with the physical world:** accommodating the capacity and transfer needs (of an estimated 50,000 billion objects) – also data, information and knowledge management
- **Communications and connectivity:** wireless (radio platforms integration), spectrum usage – software and cognitive radio
- **Exploiting developments in ubiquitous computing and networks:** embedded platform needs sensor platforms
- **Global identification:** connection and integration with the evolving Internet – IPv6, accommodating legacy systems
- **Security of data and systems and against attack:** particularly issues with respect to autonomous networks and protection
- **Reliability:** self-diagnosis and repair
- **Standards and needs for interoperability**
- **Governance**

# Smart Home

- The Smart Home of the future will be able to collaborate with numerous external entities, let it be alternative energy resources, marketplaces, enterprises, energy providers, etc. The “de facto” standard for high-level communication today is via (web)services, which allows for flexible functionality integration without revealing details for the implementation. Therefore the heterogeneity is hidden, while a common service-based interaction is empowering the creation of sophisticated applications. As such the smart home will be part of a complex system of systems.



Source: SAP Research, 2010

# Smart Cities

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- It is becoming increasingly challenging to design infrastructures that efficiently support the many changing needs of its inhabitants. New modalities will need to be developed to deliver services such as energy, transportation, healthcare or public safety in a timely manner for more people in urban areas that are growing both in size and complexity.
- Cities are now being blanketed by systems and networks driven by digital data in real-time. In this way, while keeping infrastructures operational, large amounts of data are being generated, this data represents digital traces of human activity and their context in urban space: Environmental sensors measure parameters such as air quality, temperature or noise levels; telecommunication networks reflect connectivity and the location of its users; transportation networks digitally manage the mobility of people and vehicles as well as products in the city

# Smart Cities

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- It is estimated that IoT has the potential to cut global carbon emissions by as much as 15% by 2020. There are in particular some major opportunity areas where IoT can act as a key enabler:
  - Energy and utilities sector: smart electricity and water transmission grids, real-time monitoring of sewage systems, efficient energy and water consumption at homes enabled by connected devices to the grid, accelerating the uptake of renewable energy.
  - Smart buildings: By using ICTs in buildings for managing light and heat systems, resources consumption can be adapted to match demand in real time.
  - Intelligent logistics: support for vehicular ecosystems, use of in-vehicle sensor and , telematics, GPS and wireless networks for developing smart vehicles, vehicle-to-vehicle and vehicle to roadside communication for collaborative road safety and efficiency, vehicle tracking, traffic data collection for traffic management
  - Environment monitoring systems: wireless sensor nodes to monitor weather, environment, civil structures, soil conditions etc.

# Conclusion

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- There are many opportunities to the emerging Internet of Things within Health, Transport, Energy, and Built Environment sector, from smart homes to smart cities.