"Towards the Internet of Things"

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GLOBAL FORUM Shaping the Future 2008

European Commission Information Society and Media

Context

Part of the renewed Lisbon strategy for growth and jobs, the Commission proposed in June 2005 a new strategy —

the i2010 Initiative:

A European Information Society for growth and employment — laying down broad policy orientations to promote an open and competitive digital economy.

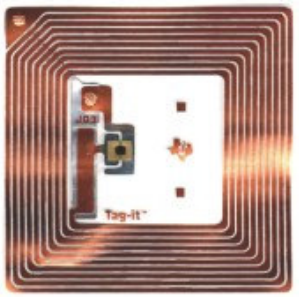
The creation of a Single European Information Space, which is one of the three pillars of the i2010 Initiative, includes as one of its key challenges **actions to address RFID challenges**, especially the concerns and threats to privacy revealed by the public consultation launched in 2006.

European Commission Past Actions

March 2006	Commissioner Reding announces the launch of a Europe wide public consultation on RFID
Summer 2006	Series of five workshops with various stakeholders
Autumn 2006	Public consultation on 'Your Voice in Europe' , analysis of the more than 1000 replies and concluding conference.
March 2007	Adoption of a Commission communication on "RFID in Europe: steps towards a policy framework" (COM(2007)96)
Spring 2007	EU RFID Forum, CeBit announcement by Commissioner Reding (recommendation), Berlin conference (25-26 June)
June 2007	Launch of the RFID Expert Group (2007-2009)
November 2007	Lisbon conference (15-16 November)
Spring 2008	Public consultation on the draft recommendation
June 2008	OECD Seoul conference
Autumn 2008	Adoption of the RFID recommendation
Winter 2008/09	Staff working paper and communication on the Internet of Things

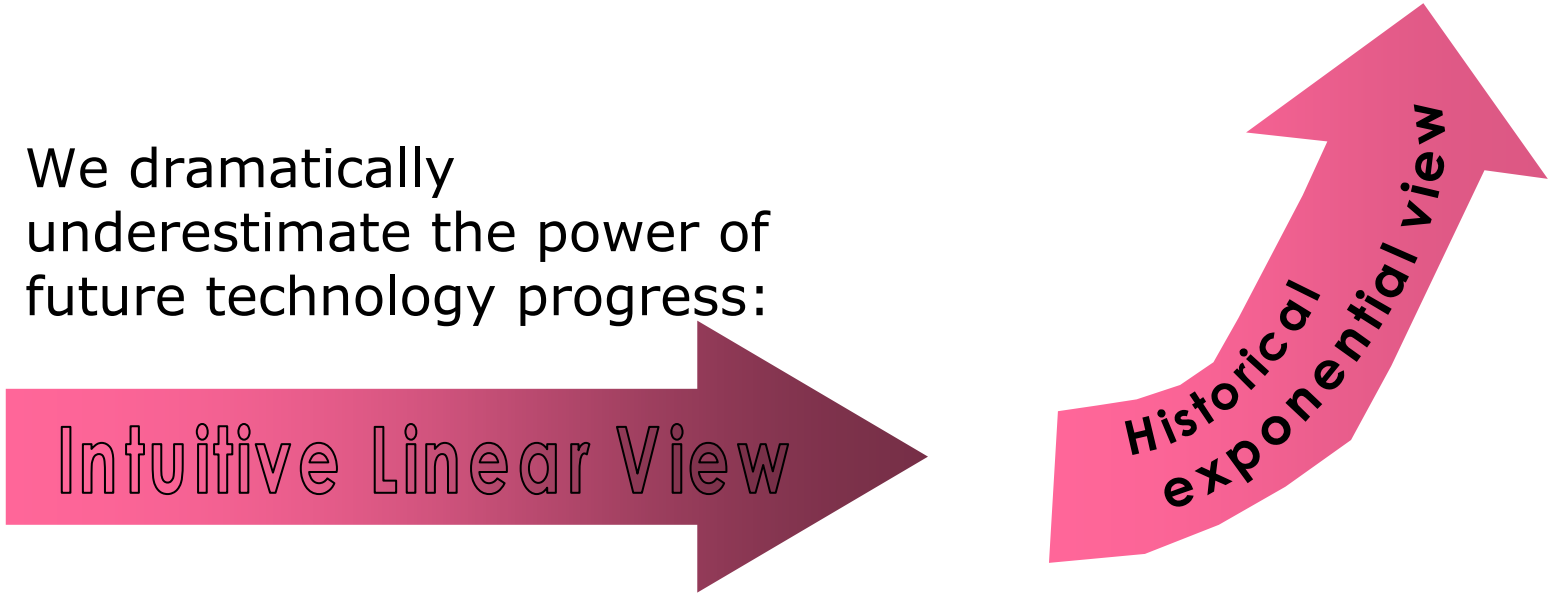
Grounds for and Objectives of the RFID Recommendation

- Moving towards a **secure and privacy-friendly RFID** use across the relevant economic sectors in Europe;
- Ensuring a **more efficient and simpler application of existing regulations** both by stakeholders and by competent national authorities;
- Making a decisive step towards more consistency in the **harmonised application of EU rules in** order to complete the internal market for RFID
- Encouraging **responsible design** of and decisions regarding consumer-oriented RFID applications.



Power of Technology Progress – the Digital Universe is Expanding … *rapidly*

We dramatically underestimate the power of future technology progress:

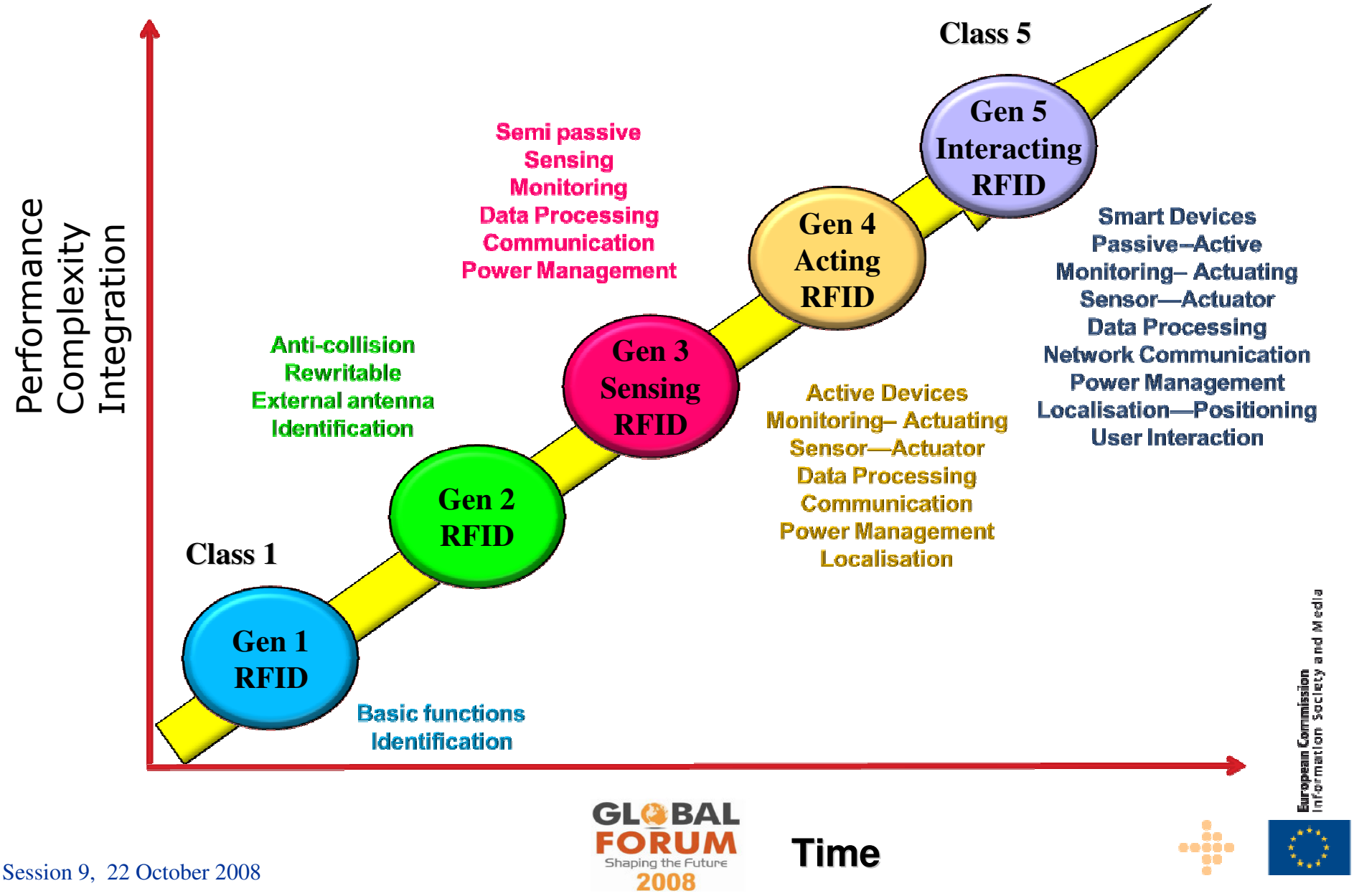


We tend think of a future period at today's rate of progress…
our memories are dominated by our recent experience.

But we are doubling our rate of progress every ten years…

So in this century we will experience 20,000 years of progress at today's rate.

Linking the WEB and the Real World…



Next Step - "Internet of Things"

Seamless integration of physical things into information Networks, i.e. connecting objects and information about them - real world to information – to the Internet.

- Considering active participation and **creation of information/content** and services by citizens - Citizens not just as end-consumers but as creators/publishers
- **Improve quality of life** for all members of society including the disadvantaged
- Make the world a safer place (combat counterfeits, reduce waste, etc.)
- Contribute to building an interactive and educational **'global archive'** of our rapidly-changing world for future generations and for citizens with mobility difficulties

Technological Progress is Making IoT an Economic Reality

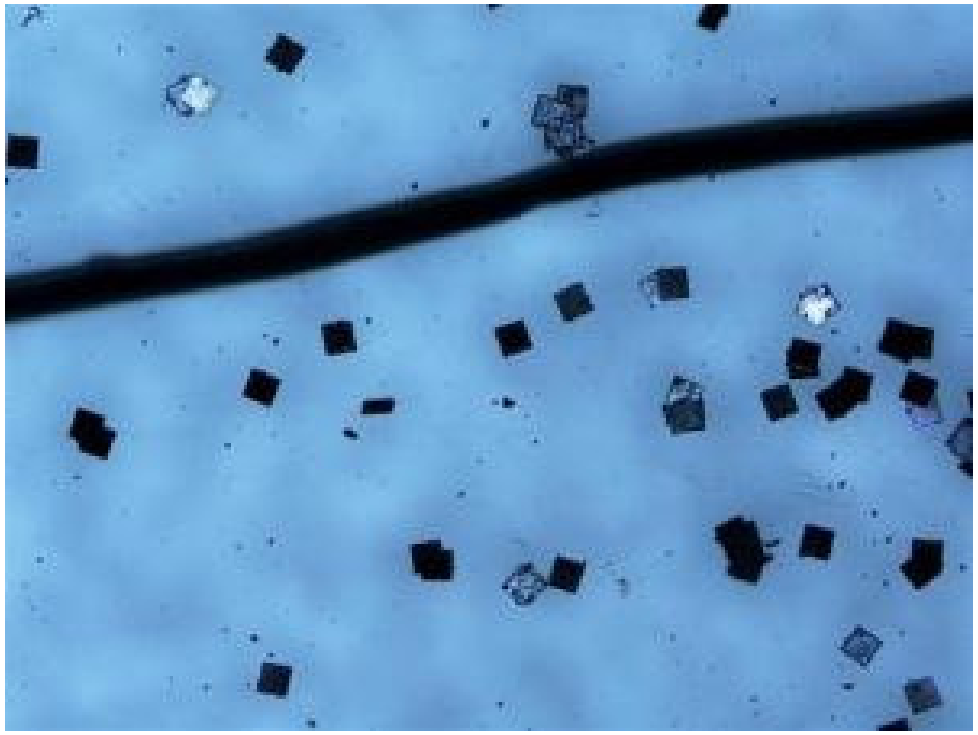
- ***Inexpensive sensor technology***
  - *Recognition of context information*
  - *Capable to cope with limited resources (e.g., energy, CPU, memory)*
- ***Ongoing miniaturisation and integration***
  - *Devices (tags, sensors) embedded in everyday objects, appliances, products*
  - *Integration in 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*

RFID 'powder type' Chip From 0.4 mm to 0.05mm (2007)

- Newly developed 'RFID Powder', as invisible as a speck of dust: 0.05 mm x 0.05 x 0.005mm
- Chips (90nm CMOS) are packed with 128 bits of static memory, enough to store a unique 38-digit ID number, 2.45 GHz, 1mW
- For embedding directly into pieces of paper
- Main application: anti-counterfeiting



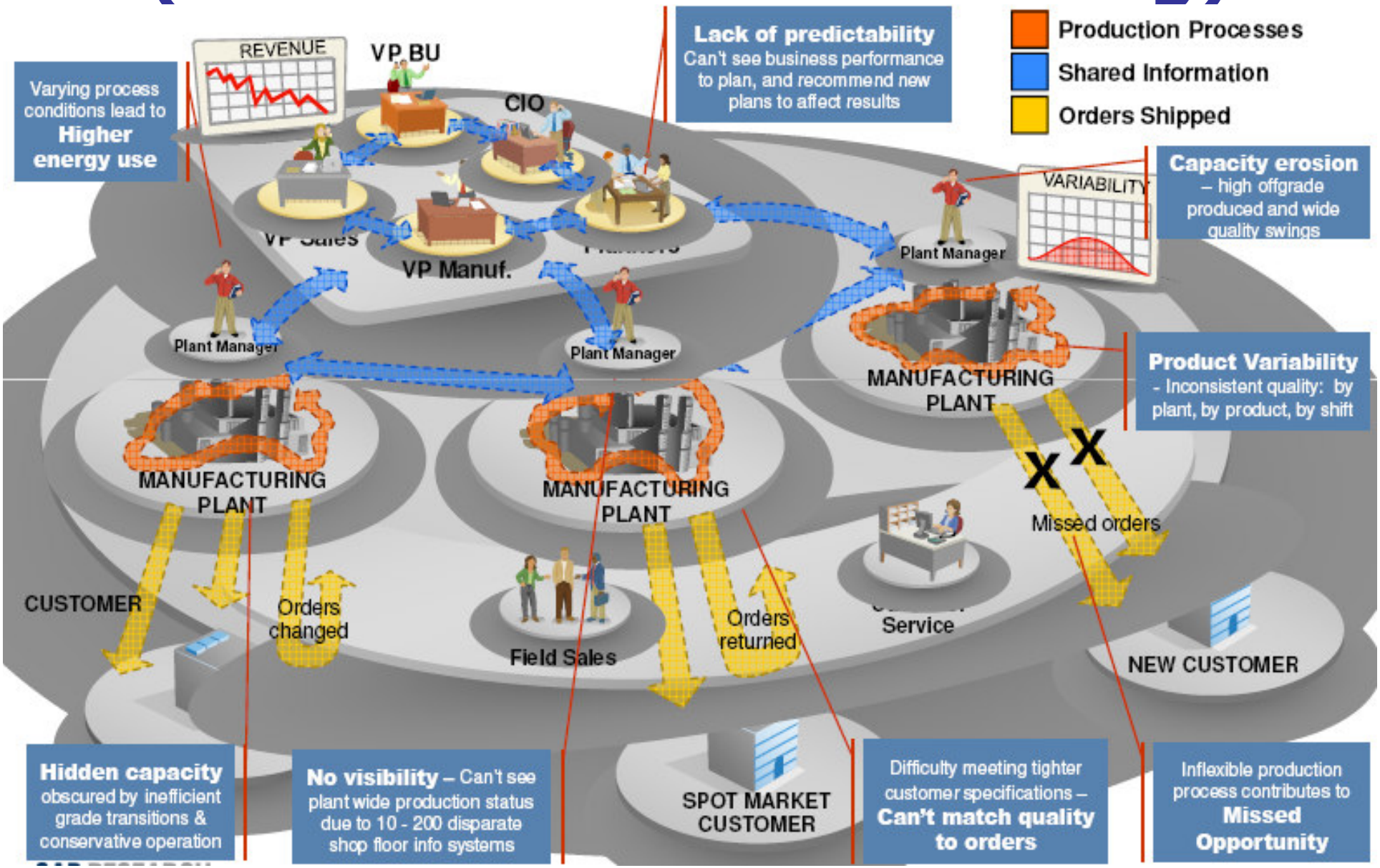
Key Internet of Things Challenges

Public Consultation – 29 September/28 November 2008

http://ec.europa.eu/yourvoice/ipm/forms/dispatch?form=IOTconsultation

- **Security**
- **Privacy and data protection**
- **Control of critical global resources**
- **Governance of resources**
  - Who controls the unique identifiers?
  - More commercial value at stake than DNS
- **Standards-setting and interoperability**
  - Harmonisation is needed to ensure smooth development and widespread adoption
  - Spectrum, communication protocols and tag formats
- **Social and human impacts**
  - Better personal safety, more efficient care of human health
  - Better environmental protection
  - Internet of Things should support individuality and self-expression, not create a (perceived) societal/individual surveillance
  - Impact of technology on human relationships **and intimacy**

Sample Applications (Distributed Manufacturing)



Sample Applications
(Health Monitoring)

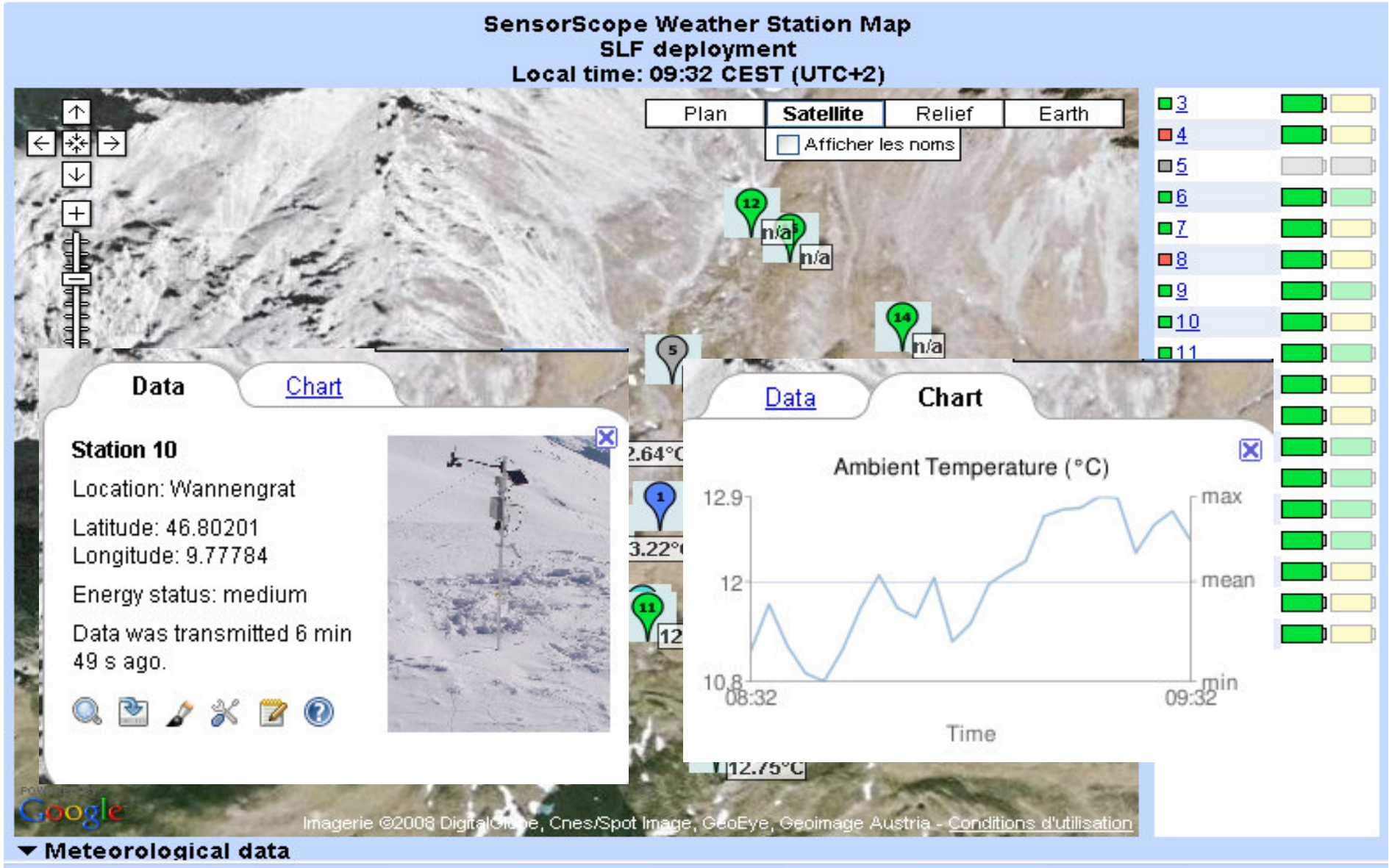
- A network of advanced bio-sensors can be developed to conduct point-of-care testing and diagnosis for a broad variety of conditions. This technology will reduce delays in obtaining test results, thus having a direct bearing on patient recovery rates or even survival rates.

- On the basis of the sensed data, physicians can make a more rapid and accurate diagnosis and recommend the appropriate treatment.

Sample Applications
(Intelligent Transportation Systems)

- A network of sensors set up throughout a vehicle can interact with its surroundings to provide valuable feedback on local roads, weather and traffic conditions to the car driver, enabling adaptive drive systems to respond accordingly.
- This may involve automatic activation of braking systems or speed control via fuel management systems. Condition and event detection sensors can activate systems to maintain driver and passenger comfort and safety through the use of airbags and seatbelt pre-tensioning.
- Sensors for fatigue and mood monitoring based on driving conditions, driver behaviour and facial indicators can interact to ensure safe driving by activating warning systems or directly controlling the vehicle.
- A broad city-wide distributed sensor network could be accessed to indicate traffic flows, administer tolls or provide continually updated destination routing feedback to individual vehicles. The feedback may be based on global and local information, combining GPS information with cellular networks.

Sample Applications
(Monitoring the Environment)



Sample Applications (Remote Sensing in Disaster Management)

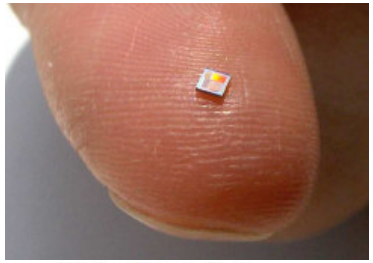
- Remote sensing systems enable the disaster management community to make critical decisions based on information obtained from combined satellite imagery and on-the-ground data. Better emergency preparedness and better assessments of the nature and magnitude of damage and destruction are possible.
- High resolution remote sensing data is especially useful for documenting certain hazards, for determining where to locate response facilities and supplies, and for planning related facilities for reconstruction and relocation activities.
- Data availability and its timely delivery are crucial to saving lives and property during disasters. Some of the most significant progress in disaster reduction is being made using historical and contemporary remote sensing data in combination with other geospatial data sets as input to compute predictive models and early warning systems.

Sample Applications
(Forest Fires Response)

- A low-cost distributed sensor network for environmental monitoring and disaster response could assist in responding to forest fires by using an integrated network of sensors combining on-the-ground sensors – monitoring local moisture levels, humidity, wind speed and direction – with satellite imagery to determine fire-risk levels in targeted regions and offering valuable information on the probable direction in which fires may spread.
- In this type of applications, valuable understanding of forest fire developments can be obtained. Assistance to authorities in organizing a coordinated disaster response by providing early warning for high risk areas, is possible.

Key Open Issues of the IOT

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



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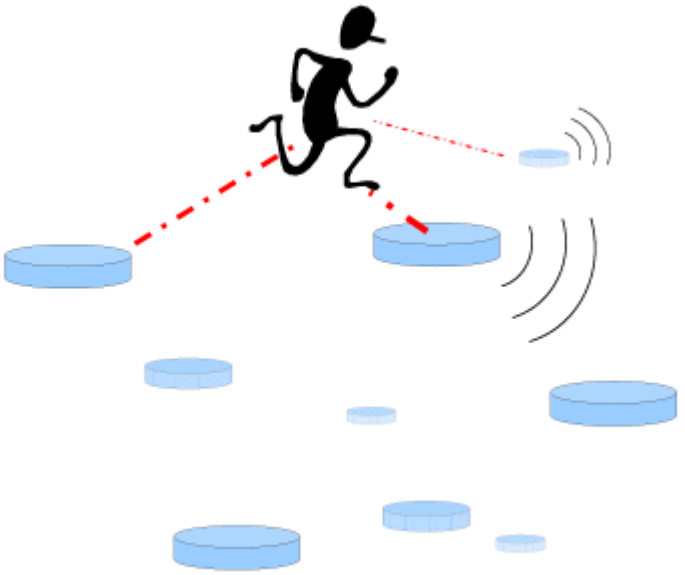
Initial Set of Questions

- How to define the role of public actors and of private actors?
- How to reconcile the public interests with those of commercial entities?
- How to capture the key requirements of public actors that will be involved in IoT value chains, notably where commercial aspects are not directly relevant?
- Are the principles of openness, security, access, diversity and adequate management as defined by the Internet Governance Forum are equally applicable to the IoT?
- Should the concept of subsidiarity - responsibility placed at national or regional level -apply for what concerns overall control and management of IoT?
- Which particular actions should be initiated to provide for an IoT ensuring a level playing field catering for multiple business models?
- Is there a strong requirement for public policy intervention in IoT governance debates?
- Is the approach of a multi-stakeholder public-private debate, the right approach for IoT?

Further Information & Recent/Upcoming Events

- **RFID / Internet of Things** … activities of the European Commission
  - Policy → ec.europa.eu/information_society/policy/rfid
  - Research → cordis.europa.eu/fp7/ict/enet
- **Future of the Internet** … activities of the European Commission
  - Policy → ec.europa.eu/foi
  - Research → cordis.europa.eu/ict/ch1
- **Internet of Things – Internet of the Future** … French EU Presidency conference, Nice, 6-7 October '08 → www.internet2008.eu
- **ICT 2008 Event** … the biggest European ICT Research jamboree, Lyon, 25-27 November '08 → ec.europa.eu/information_society/events/ict
- **FP7 ICT Research Information Day** … upcoming calls, how to participate, Budapest, 22 January '09 → cordis.europa.eu/fp7/ict
- **Future of the Internet** … one year after the Bled Declaration, Prague, 11-13 May '09 → www.fi-prague.eu

Thank You!



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