



Internet of Things and “Smart” Cities

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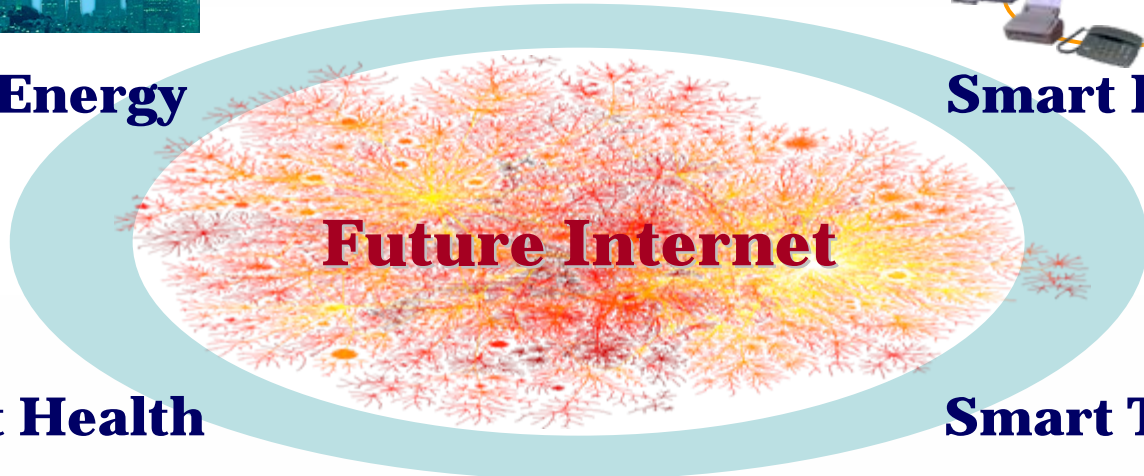
Internet-enabled Services: Making the World "Smarter"



Smart Energy

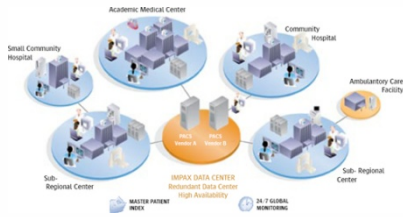


Smart Living



Future Internet

Smart Health



Smart Transport



"Smart Cities" in EU Research Framework Programmes

- **Telematics for Urban and Rural Areas (FP4)**
 - 1995-1998
 - 222 Proposals; 35 Projects [incl. 33 shared-cost]
 - 78 M€
- **Integrated Applications for Digital Sites (FP4)**
 - 1997-1998
 - 55 Proposals; 22 Projects [incl. 12 shared-cost]
 - 55 M€



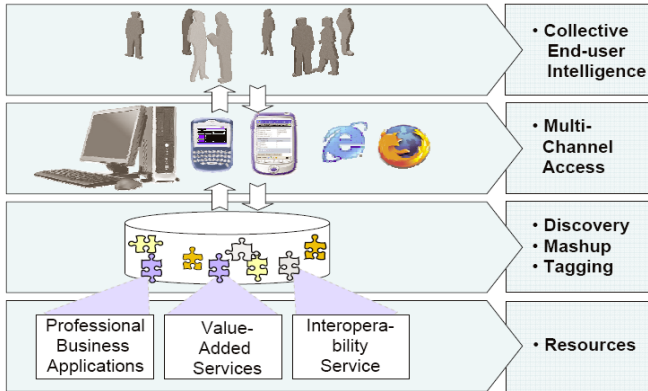
Some IADS Success Stories

- CALYPSO
 - A unique card for payment, identification and ticketing (“Citizen Pass”)
- CITIES
 - A global cooperative digital platform supporting a host of telematics services
- DISTINCT
 - Smart card based services and multimedia information services for Transport, Elderly Persons and Disabled People
- IMAGINE
 - A European model for a “Digital Town” (building urban intranets)
- INFOVILLE
 - Increasing access of people to electronic services (Municipal/Regional services, Education & Training, Transport, Electronic Commerce)



Future Internet: Multiple Aspects

Internet of Services, Service Web



3D Internet



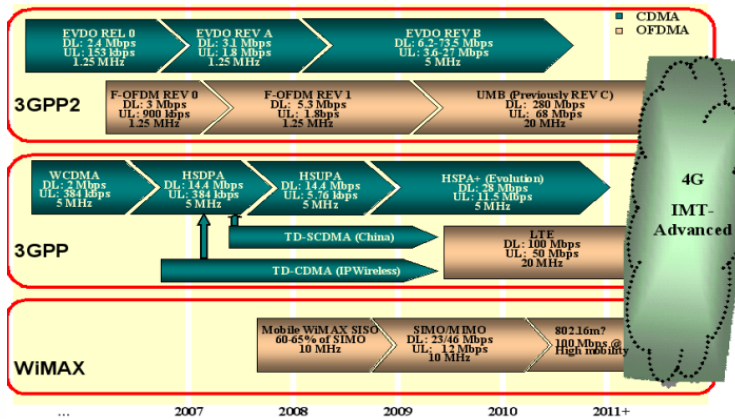
Trust



Security



Internet of Things



Networks of the Future

The World is getting smarter: Cities are at the core of this trend



Smarter
Transportation



Smarter
Education



Smarter
Food Systems



Smarter
Healthcare



Smarter
Energy



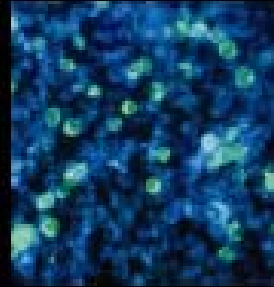
Smarter
Retail



Smarter
Countries



Smarter
Government
Services



Smarter
Water



Smarter
Public Safety



Smarter
Regions



Smarter
Cities

Why Smart Cities Now?

- **Technological factors**
 - Pervasive digital networks, cheap sensors,...
 - Over 4 bn mobile cellular subscribers in the world (60% penetration)
 - Location-based services and social networking
 - Global Networked Enterprises
- **Economic factors**
 - The top 100 urban agglomerations account for 25% of worldwide GDP
 - Developed world has underinvested in its cities; developing world needs new urban infrastructure
 - Rise of “new” cities: Masdar City, Songdo, GIFT, KAEC, etc.
 - Financial and economic crisis is spurring government stimulus
- **Social / Demographic factors**
 - 50% of the world population lives in a city
 - 2010-2050: Urban population will almost double
 - 18 countries in the world with contracting populations (in 2050: 44)
 - Rapid urbanisation creates high stresses in Asia
- **Environmental factors**
 - Cities occupy 2% of the world’s geography but account for 75% of the world’s greenhouse gas emissions → drive for cities to cut carbon emissions and increase the energy received from renewable sources
 - 1.2 billion cars on the road by 2015 (1 car / 6 people)



Smart cities: Sustainable and Connected Cities



Smart City Building Blocks

- Connectivity : DSL, fibre, mobile, WiFi
- M2M : remote monitoring & tele-action
- Geo-localisation
- Video services (video monitoring; video-presence)
- Information services
- Web 2.0



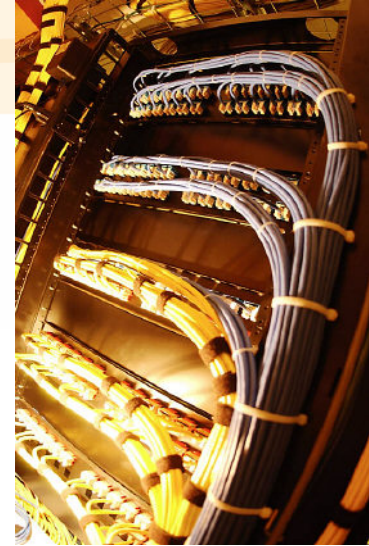
Computing Challenges

- The Cloud vs. Local Autonomy
- Quantity of Information
- Security of Information
- Latency and (Intelligent) Routing
- Mapping and Displaying Information
- Ontology and Discovery
- Fusion and adding value
- Power (always on - to mostly off)



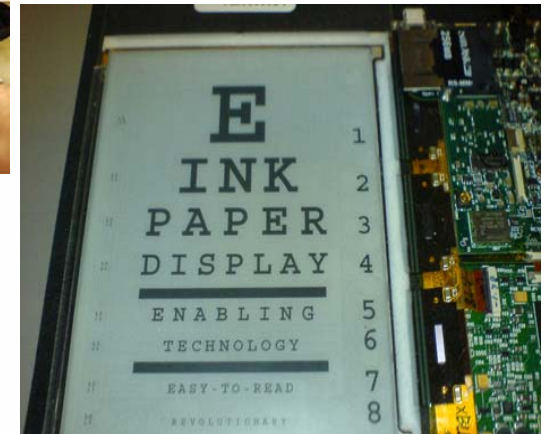
Smart Networks

- **Sensing from Communications**
 - Connectivity
 - WiFi Positioning
 - Fibre Sensors
- **Info Networks (Web2.0 etc.)**
 - Social Location and Geo-Networking
- **Telepresence**
 - More Cameras
 - Less Wheels and Wings!
- **Smart Highways & Railways**
 - Cameras, Inductive Loops
- **Smart Oceans and Rivers**
 - Tsunamis, Flash Flood Detector
- **Pitt Report**
 - Anticipate, Assess, Prevent, Prepare, Respond, Recover



Smart Objects & People

- Easy Recycling
- Lower Energy
- Flexible working
- Better Security
 - Something you are
 - Something you have
 - Something you know
 - Somewhere you are



Smart Buildings

- New Materials
- Smart Energy
- Smart Lighting
- Smart Water
- Alternative Technology



A Few Examples in the World

- *Portland: Use of ITS to improve traffic light synchronisation*
- *Wuxi: From a manufacturing hub to a high-tech city*
- *Amsterdam: The world leader in energy-saving*



EU RTD & Innovation Programmes Related to the Internet

- FP7 - Challenge 1 (technology driven)
- FP7 - Applications Challenges (application pull)
- Future Internet PPP: Short-to-medium term R&D combining application pull and technology push
- **CIP: Accelerating take-up of technologies which come out of the labs and are mature for innovation**

Smart cities are ecosystems important for both the Future Internet PPP and CIP

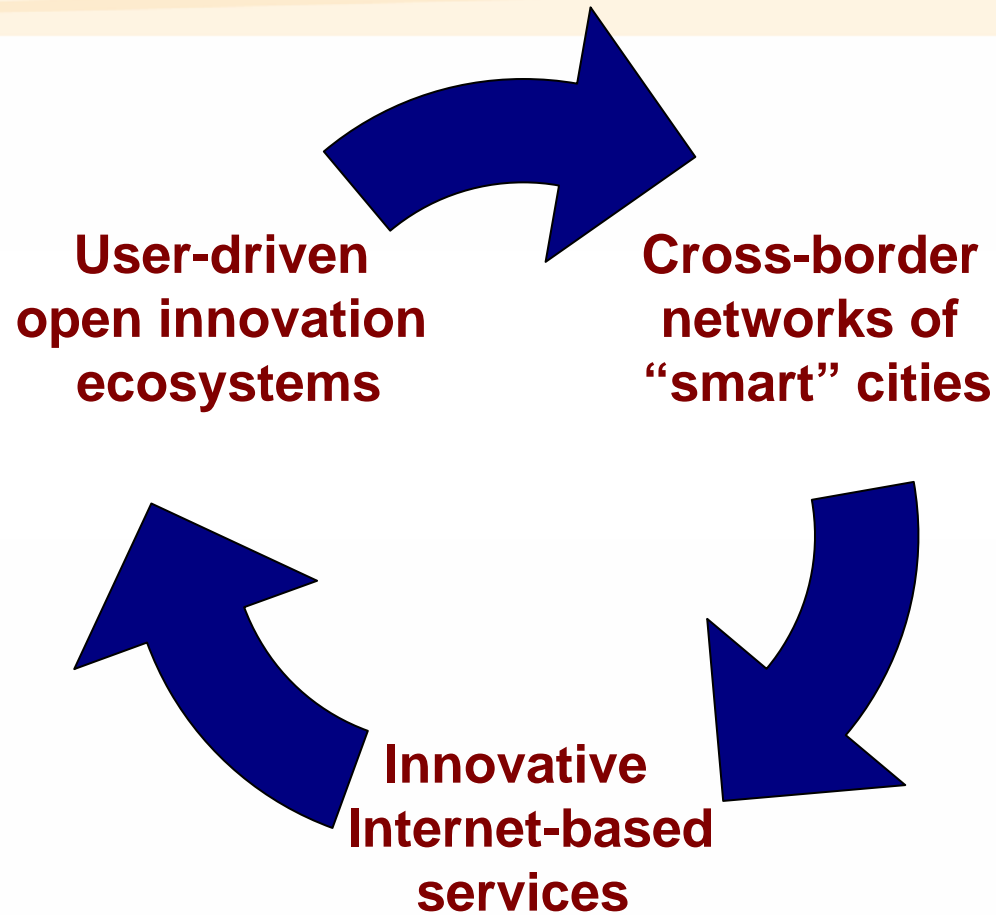


Rationale for CIP-PSP

- **New and often “revolutionary” Internet technologies are maturing**
 - Ready for a new wave of internet-based services
 - Transforming our way of life
- **Fragmented market of island solutions – a barrier for broad take-up**
 - Single solutions in individual cities
 - Pilots of limited scope
 - Fragmented groups of stakeholders
 - Need for open platforms for internet-based services
- **Innovation ecosystems can bridge**
 - Work well locally in cities or regions
 - High potential for exploiting synergies across borders



Three Major Elements



User-driven Open Innovation Ecosystems

Bridging the gap between Internet-based technologies and their take-up in new services

- Integral part of local ecosystems while being networked across borders
- Early user engagement in the innovation process
- Enabling PPPPs
(Public Private Partnerships including People)



Cross-border Networks of Smart Cities

Sharing best practices towards open platforms for new Internet-based services

- Smart living
- Green digital agenda
- Improved citizen involvement
- Open smart city platforms



Innovative Internet-based Services

Based on an appropriate combination of advanced Internet technologies

- Mobile and location-based services
- Broadband and high-speed networks
- Internet of Things including sensor networks and RFID
- Advanced protocols and standards (e.g. IPv6)
- Security and privacy management systems
- Multimodal interfaces and 3D technologies
- Modelling and simulation
- . . .



Expected Impact

- Stimulating a new wave of Internet-based services using innovative Internet technologies
- Wider uptake of innovation ecosystems in cities through sharing of experiences in “smart” city concepts
- Reinforcing the role of the user/citizen
- Improving capacities for SMEs



References

- Future of the Internet: ec.europa.eu/foi
- Living Labs:
ec.europa.eu/livinglabs
- Competitiveness and Innovation Programme: ec.europa.eu/ict_psp
- ICT Programme
<http://cordis.europa.eu/fp7/ict>

