# The eMobility Technology Platform – Staying Ahead with Simplicity, Efficiency and Trust

## "The European Industrial Perspective on Future Internet"

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# Future Internet

- The eMobility Technology Platform
  - What is it and what are its activities?
- Future Internet WG in eMobility
  - Results and plans of the group
- The FP 7 Future Internet projects
  - Many new projects are starting up
- The 4WARD IP in FP 7
  - The largest FP 7 project on Future Internet
- Perspectives on future activities
  - Plans for 2008

# Rationale for investment in *e*Mobility

- Mobile & wireless products and services have an **economic impact** greater than the INTERNET
- Europe should ride the **next wave** of wireless innovation
  - Growth in the wireless/mobile sector
  - Growth in the applications sectors
- Public investments around the globe continues to grow rapidly
- Mobile services account for about **3% of European GDP at present in Europe**
- Job creation – from 4 Million jobs in 2005 to **10 Million** in 2010 (Deutsche Bank)

# Global developments

- WRC meeting provides for new spectrum
- Future Internet initiatives coming up to speed on all continents
- Fixed-mobile convergence is happening
- Broadband in focus in developed markets
- 3 billion mobile users worldwide reached (50% of world population)
- Continued growth in emerging markets
- Connection to the internet will first be through a mobile device for most users

# *e*Mobility Objectives

- ***Drive future technology developments*** ***in mobile and wireless communications*** that serve Europe's citizens and the European economy
- Enhance ***cooperation*** between industry players, the research community and public authorities
- ***Mid- to long-term vision (2015+ )*** to maximise the benefit of mobile and wireless communications, thus enabling economic and social advances in the EU
- Formulation of an ***action plan and time-table*** for the key developments
- Support the renewed ***Lisbon Strategy for a competitive, knowledge-based society***

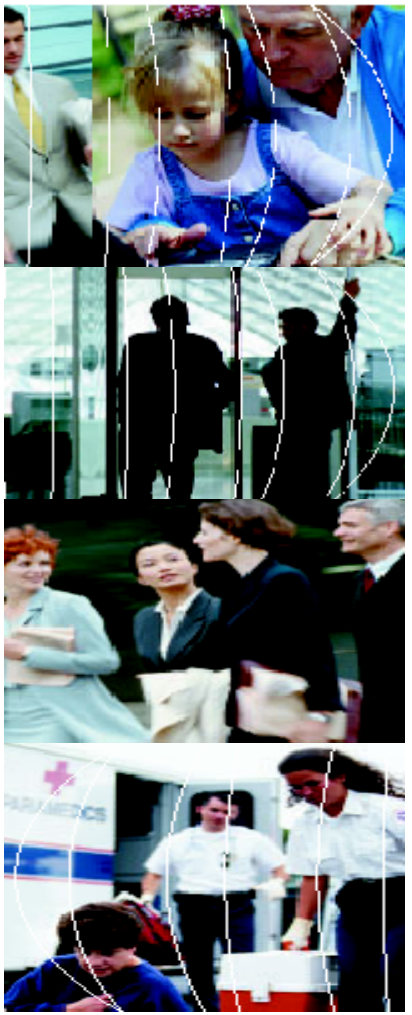
# SRA Version 6

Available from our web site:
www.*e*Mobility.eu.org

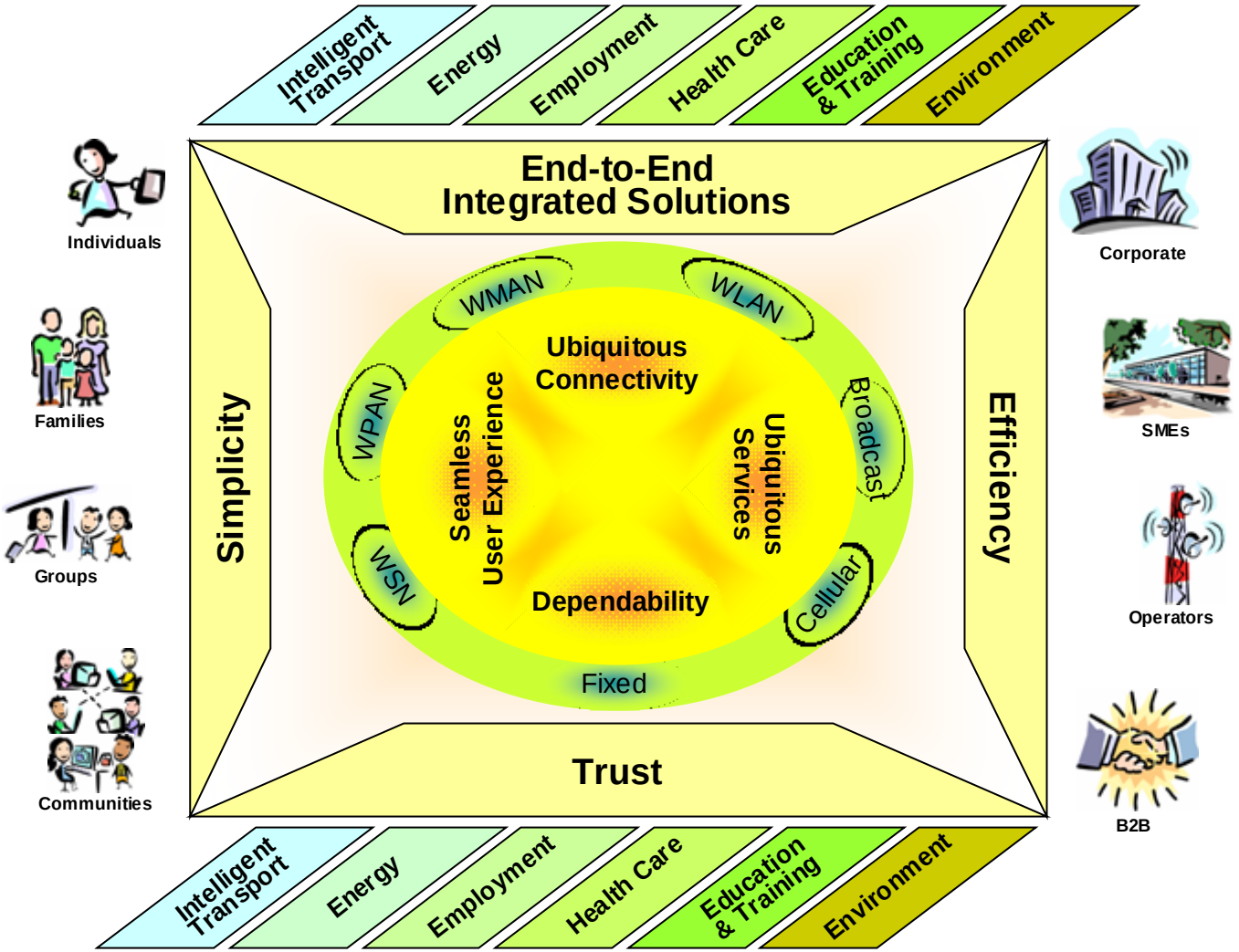
# The Shared Vision

"Improving the individual's quality of life, achieved through the availability of an environment for the instant provision of and access to meaningful, multi-sensory information and content"

***Simplicity, Efficiency & Trust***



# SRA V 6 - SET


Intelligent Transport
Energy
Employment
Health Care
Education & Training
Environment
End-to-End Integrated Solutions
Simplicity
Efficiency
Trust
Ubiquitous Connectivity
Seamless User Experience
Ubiquitous Services
Dependability
WMAN
WLAN
WPAN
Broadcast
WSN
Cellular
Fixed
Individuals
Families
Groups
Communities
Corporate
SMEs
Operators
B2B

# Membership – 518 members

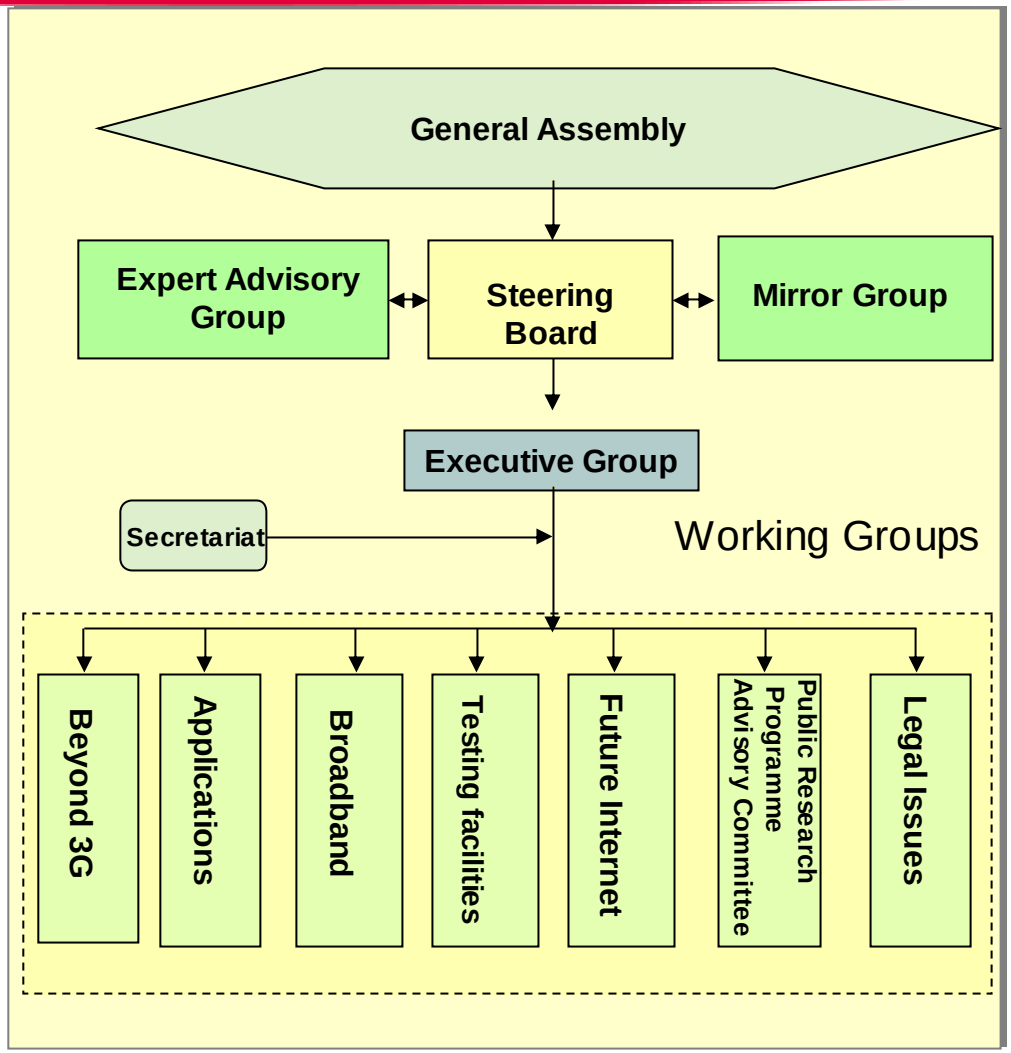

Total number of members **518**

Industry **114**
Research **192**
SME 212
Other **27**

Steering Board of 23 members (all elected)
+
Expert Group
Mirror Group
Executive Group

# *e*Mobility organisation

- **Public launch**
  - March 18, 2005 in Brussels
- **General Assemblies**
  - November 23, 2005,
  - November 14, 2006 Heidelberg,
  - November 14, 2007, Brussels, with election of new Steering Board
- **Strategic Research Agenda**
  - Version 5 published October 06
  - Version 6 in preparation for November 07
- **Mirror Group Meetings**
  - April 27, 2005 in Brussels
  - October 11, 2005 in Brussels
  - May 19, 2006 in Brussels
  - February 13, 2007 (Joint) in Brussels
- **Cross Technology Platforms Meeting**
  - September 7, 2005 in Brussels
  - February 16, 2006 in Brussels
  - Joint mirror group meeting, June 29, 2006
  - 2 joint press releases
  - December 12, 2006 in Geneva



# External Relationships

- X-Forum meeting (WWRF organised)
- Meeting with NICT (Japan) in July, Brussels
- Joint activities with NEM on test beds
- Regular contact with Celtic Initiative
- Supporting National Platforms
  - Hungary,
  - Slovenia,
  - Spain,
  - Poland
- Joint activities with WWRF planned for ’08
- Cluster activities on Future Internet
- Investigations of synergies with NEM, NESSI and Celtic planned for 2008

# Working Groups

- Technical
  - Future Internet Technology (R. Tafazolli)
  - Broadband for Europe (W. Mohr)
  - Applications in eMobility (L. Correia)
  - Roadmapping for B3G (D. Bourse)
  - Test-beds requirements (B. Cardinael)
- Non-technical
  - Public Research Programme Advisory Committee (just starting up now)
  - Legal working group (lawyers group)

# Future Internet

- The eMobility Technology Platform
- Future Internet WG in eMobility
- The FP 7 Future Internet projects
- The 4WARD IP in FP 7
- Perspectives on future activities

# Future Internet WG

- Objective - To provide a discussion forum for the following issues:
  - Future Usage of Services
  - Technical Challenges
  - Possible regulatory/standardisation impacts
  - Mechanisms to ensure maximum impact in Europe
  - Pan-European Test-bed(s) requirements.
- Past activities
  - Three Post-IP Working Group meetings held since October 2006
  - **Post-IP White paper** was presented in EU organized workshop on Future Internet on 15th December 2006
  - White Paper available for Download on http://www.eMobility.eu.org
  - Two meetings of the group held in Brussels during the summer
- Ongoing Activities
  - October 2007 –2nd White Paper, which is now in draft status
- Group Chair: Prof. Rahim Tafazolli, University of Surrey

# Post-IP Internet Working Group

**Chairman: Professor Rahim Tafazolli**

e.Mobility TP Expert Advisory Group Chair

CCSR, University of Surrey

UK

e.mail: R.Tafazolli@surrey.ac.uk

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# Next Generation Internet

# In

# Post-IP era

# From

# Mobile/Wireless Requirements points of View

# Current and Future

# Post-IP WG

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- Current Activities
  - Pan-European Test-bed(s) requirements

# Definition

Post-IP ≠IPv7 or IPv8 or IPvxx

**Post-IP = Next Generation Internet protocols and architecture**

# Post-IP Definition
# Revolutionary Approach

Sources of Current Internet limitations:

- **Architecture**
- **End-to-end paradigm**
- **Internet Protocols**

## Post-IP approach:

- New Architecture with management capability supporting multi-domain
- New Wireless-friendly (Energy and spectral efficiency) Protocols capable of supporting variety of wireless networks, from very low power sensor networks to wide area mobile networks

# Experimental Research on Next Generation Internet

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- Experimental research topics and research approach
- Test-bed requirements, capabilities, and phased approach to a wide scale European testbed
- Test-bed Framework

# Main research topics and approach

- Testing and optimisation of integrated solutions leading to:
  - innovative protocols and architectures for Service and Network
- Research Topics:
  - Impact of different business models and interfaces on service & network architectures and Interfaces
  - Networking framework, protocols and intermittent connectivity management for wide area transportation and Wireless Sensors, actuators, RFIDs, (objects)
  - Full Delay tolerant networking
  - Autonomous communications, dynamic networking compositions, its stability versus degree of autonomous operation
  - Dynamic peering and **coopetition**
  - Operating system independency
  - Dynamic service/content blocks integration and composition
  - Manageability (e.g., traffic engineering)

# Main research topics

- Self-healing
- Virtualisation
- Integrated security, privacy, mobility, QoS
- Intelligent resource management
- Testing process and protocols for integrating new models/applications/protocols for small businesses
- Minimum protocol stack on radio and role of radio over fibre in realising this
- New and flat protocol framework (collapsed stack structure)
- Semantic networking
- Cognitive networking, stability, degree of decision making on robustness and stability
- Community services networking support, interfaces and protocols for easier and faster development of new services by the community members

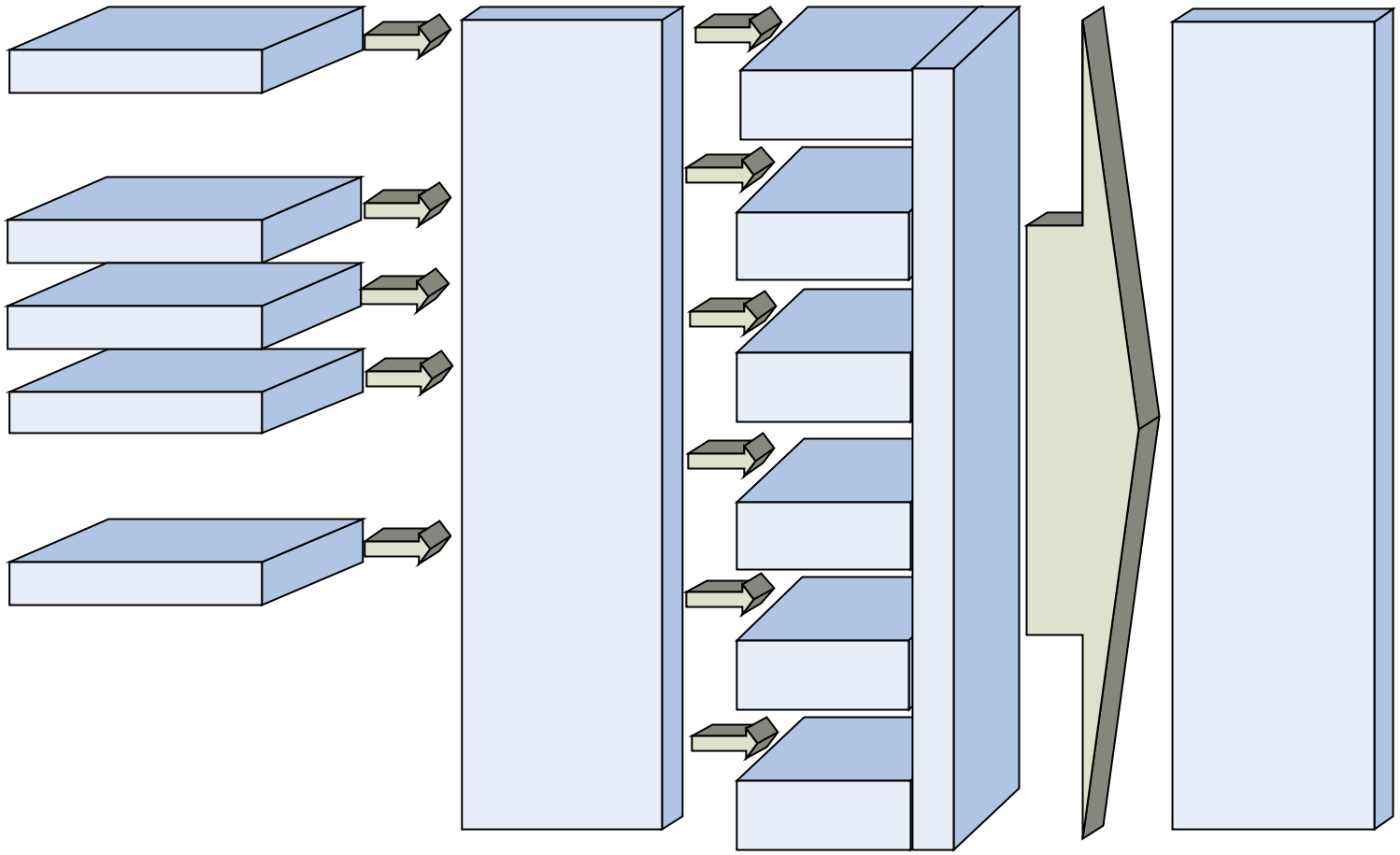
# Recommendations for Experimental Facilities

- Provide unconstrained connectivity to experimental facility to address challenges in Future Internet design: overall architecture, manageability and governance;
- Provide dependable Post-IP research and technology development facilities that enable the set up of experiments at the right scale under realistic operational conditions;
- Provide a framework for investigation, prototyping and evaluation that is neither limited by current **technologies** nor by the current Internet **architecture** and that encompasses any device, content and system present in the world that is not directly and naturally part of the Internet today;
- Provide effective and efficient test-bed control/management architecture that guarantees isolation, protection and correct behaviour under different and extreme conditions

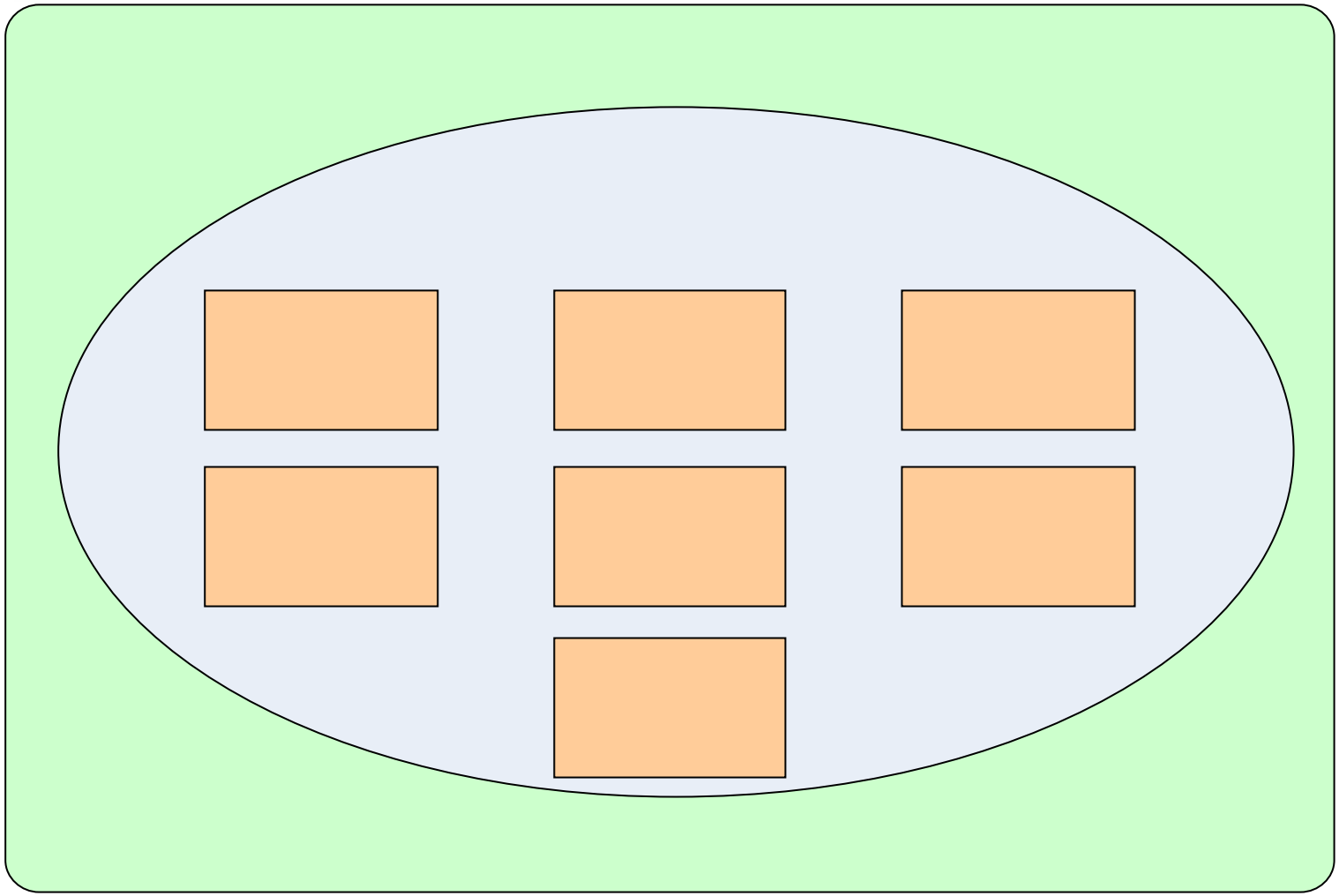
# Testbed Features


- Toolbox (new protocols) and interfaces for variety of experiments
- Information passing mechanisms between Network protocols and application
- Flexibility to accommodate a variety of different business models and interfaces
- Facilitate protection of IPR to encourage full involvement of all stake holders.
- Flexibility to experiment new protocols, applications, new or minimum protocol stacks operation and test
- Ability to model and test interaction between network and services
- Tools for analytical/practical models extractions from tests
- Management layer
- Building blocks to enable bootstrapping
- Suitability of existing infrastructures such as Geant
- Disruptive networking, and means to test protocols for spontaneous networking and intermittent connectivity
- Ability to test integrated and end to end solutions (e.g., mobility and security, and application and their adaptability, etc..)
- Traffic and load generation

# Reference Model Methodology



# Reference Model Essential Components



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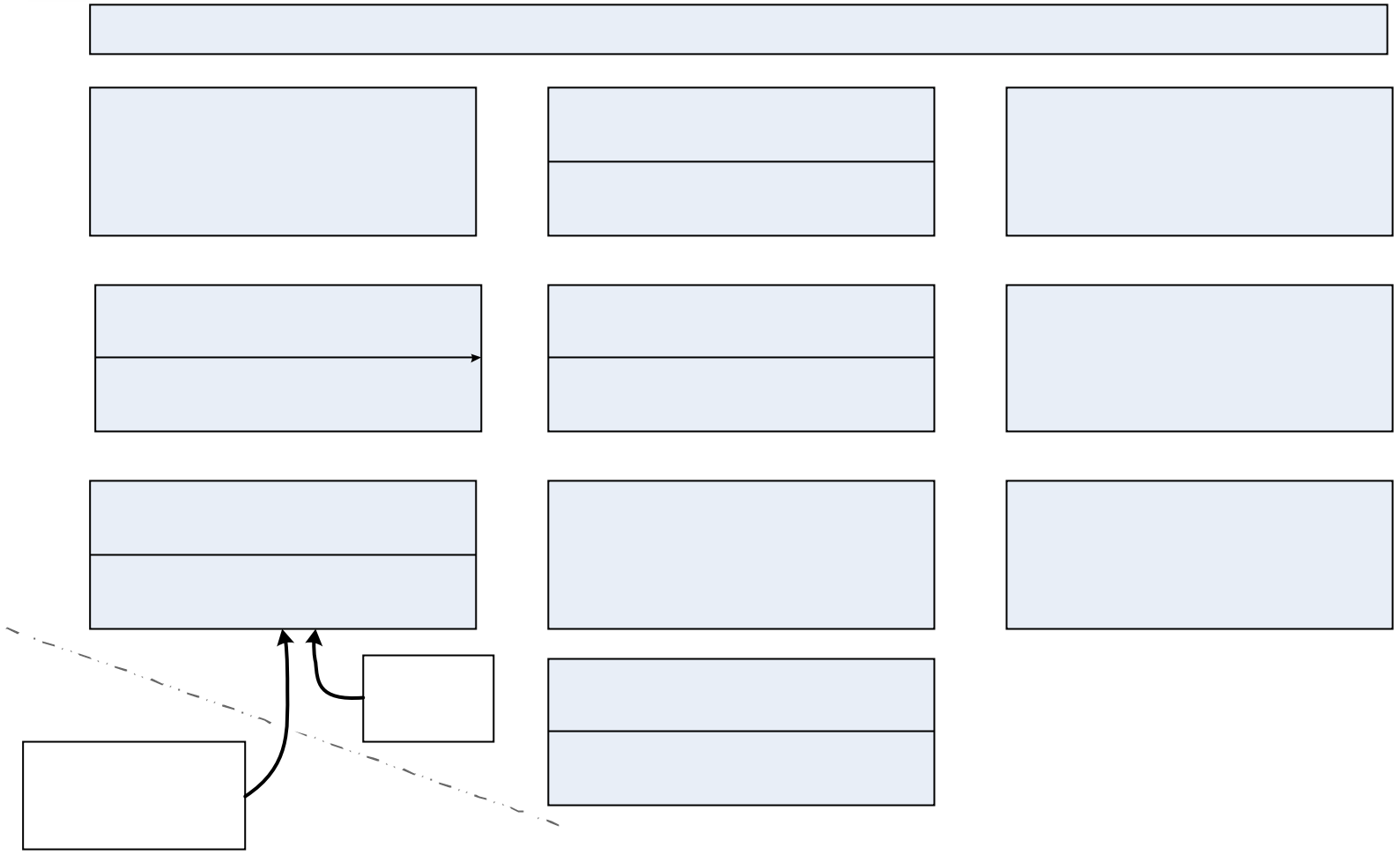

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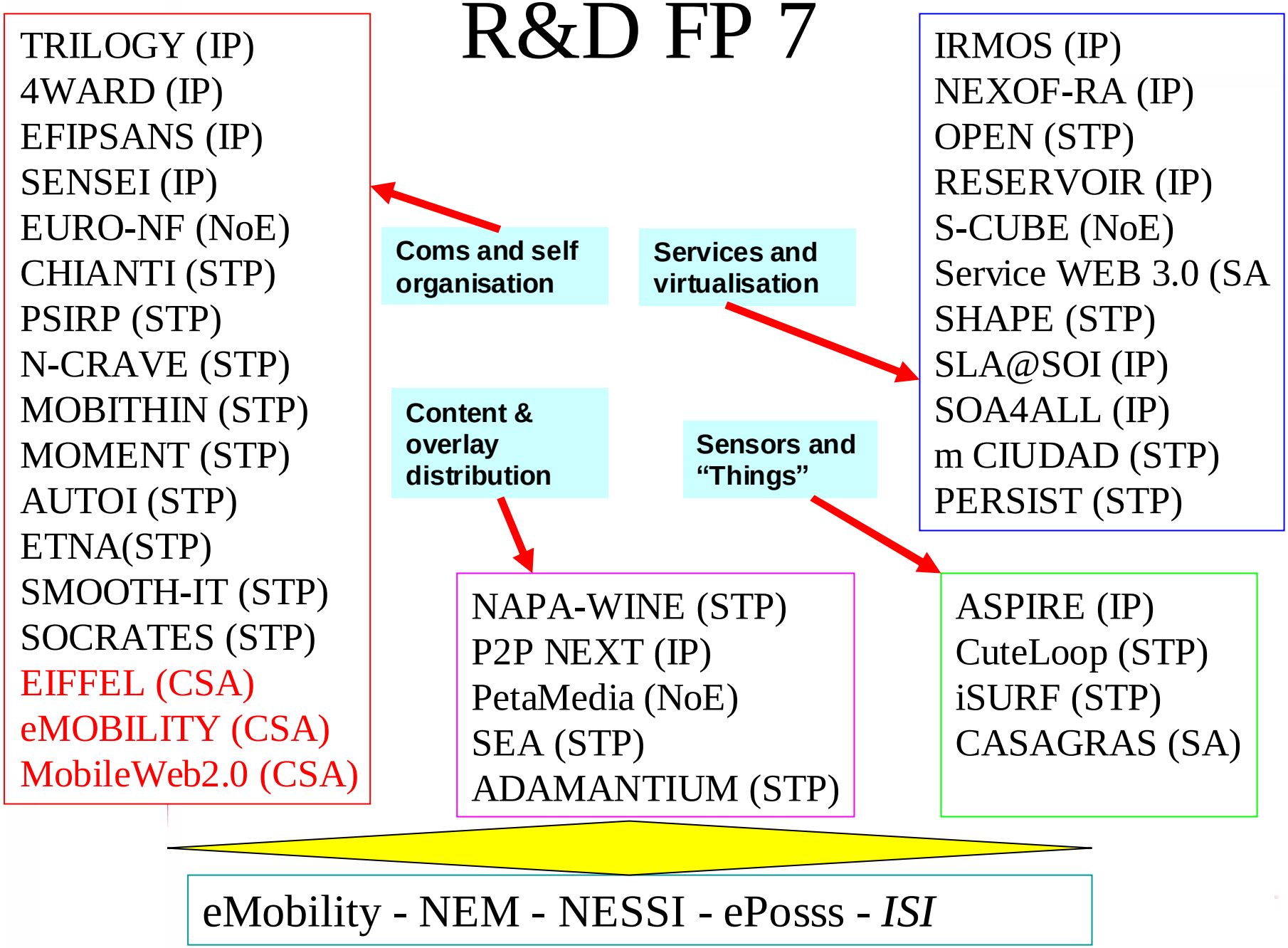
# Future Internet Europe 2007

- **eMobility** working group active
  - White papers available
- Other technology platforms active in the area:
  - NEM cluster on Future Internet
  - NESSI activities on Future Internet
- **EIFFEL** working group established by European Commission
  - White paper available
- **FIRE** working group on test-beds established by European Commission (focus on Call 2)
  - Report published, two meetings of the group held

# Future Internet in Europe in 2008

- Projects start on 1 January 2008
  - 4WARD IP
  - eMobility CA
  - Trilogy IP
  - EIFEL SSA project – Think Tank
  - Sensei IP
- EU Preparation for joint activities to be presented at conference in Bled, March 31st
- Testbeds – Fireworks and OneLab2 in negotiations from Call 2

# R&D FP 7


TRILOGY (IP)
4WARD (IP)
EFIPSANS (IP)
SENSEI (IP)
EURO-NF (NoE)
CHIANTI (STP)
PSIRP (STP)
N-CRAVE (STP)
MOBITHIN (STP)
MOMENT (STP)
AUTOI (STP)
ETNA(STP)
SMOOTH-IT (STP)
SOCRATES (STP)
EIFFEL (CSA)
eMOBILITY (CSA)
MobileWeb2.0 (CSA)
Coms and self organisation
Services and virtualisation
Content & overlay distribution
Sensors and "Things"
IRMOS (IP)
NEXOF-RA (IP)
OPEN (STP)
RESERVOIR (IP)
S-CUBE (NoE)
Service WEB 3.0 (SA
SHAPE (STP)
SLA@SOI (IP)
SOA4ALL (IP)
m CIUDAD (STP)
PERSIST (STP)
NAPA-WINE (STP)
P2P NEXT (IP)
PetaMedia (NoE)
SEA (STP)
ADAMANTIUM (STP)
ASPIRE (IP)
CuteLoop (STP)
iSURF (STP)
CASAGRAS (SA)
eMobility - NEM - NESSI - ePosss - *ISI*

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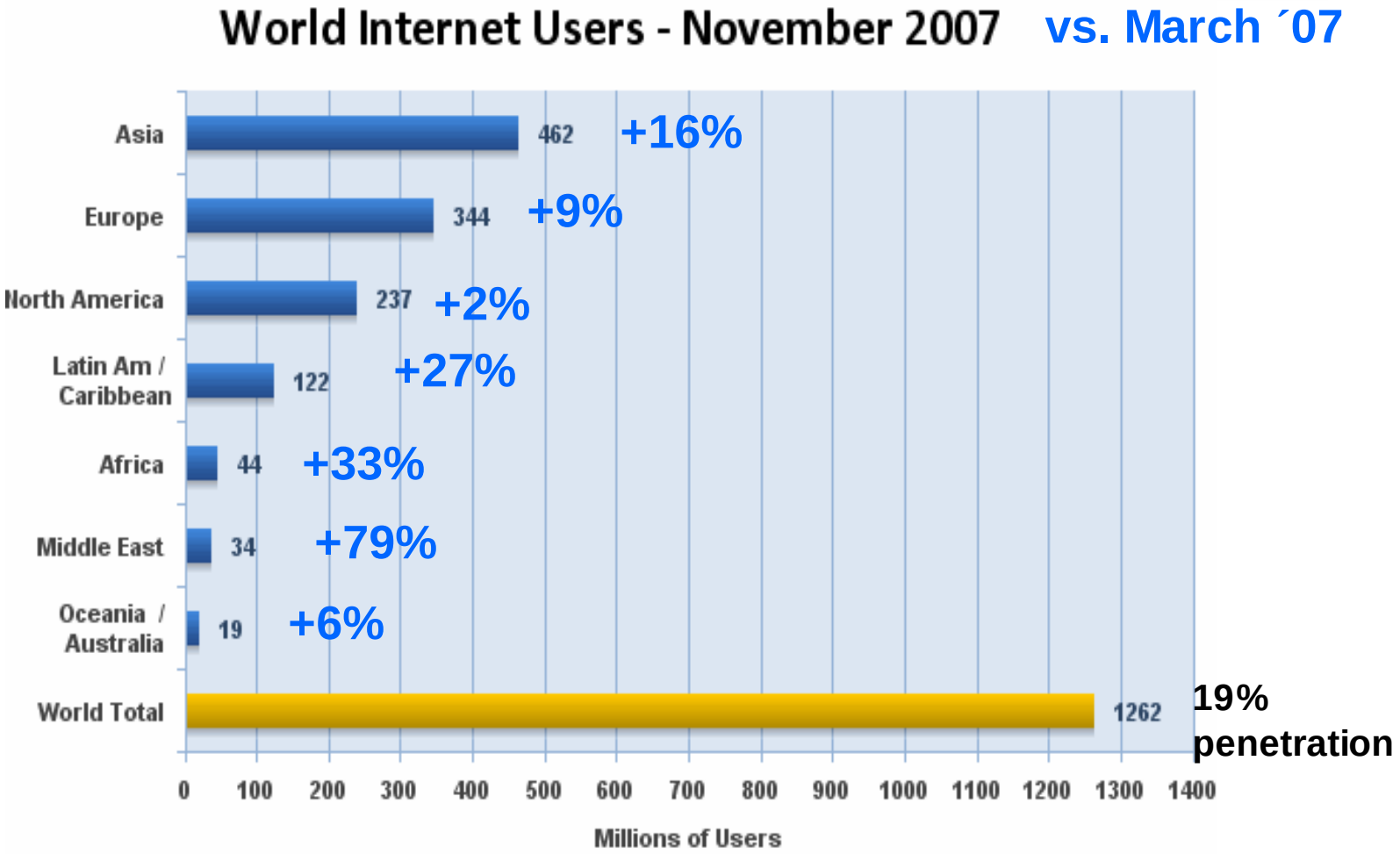
# The 4WARD Approach

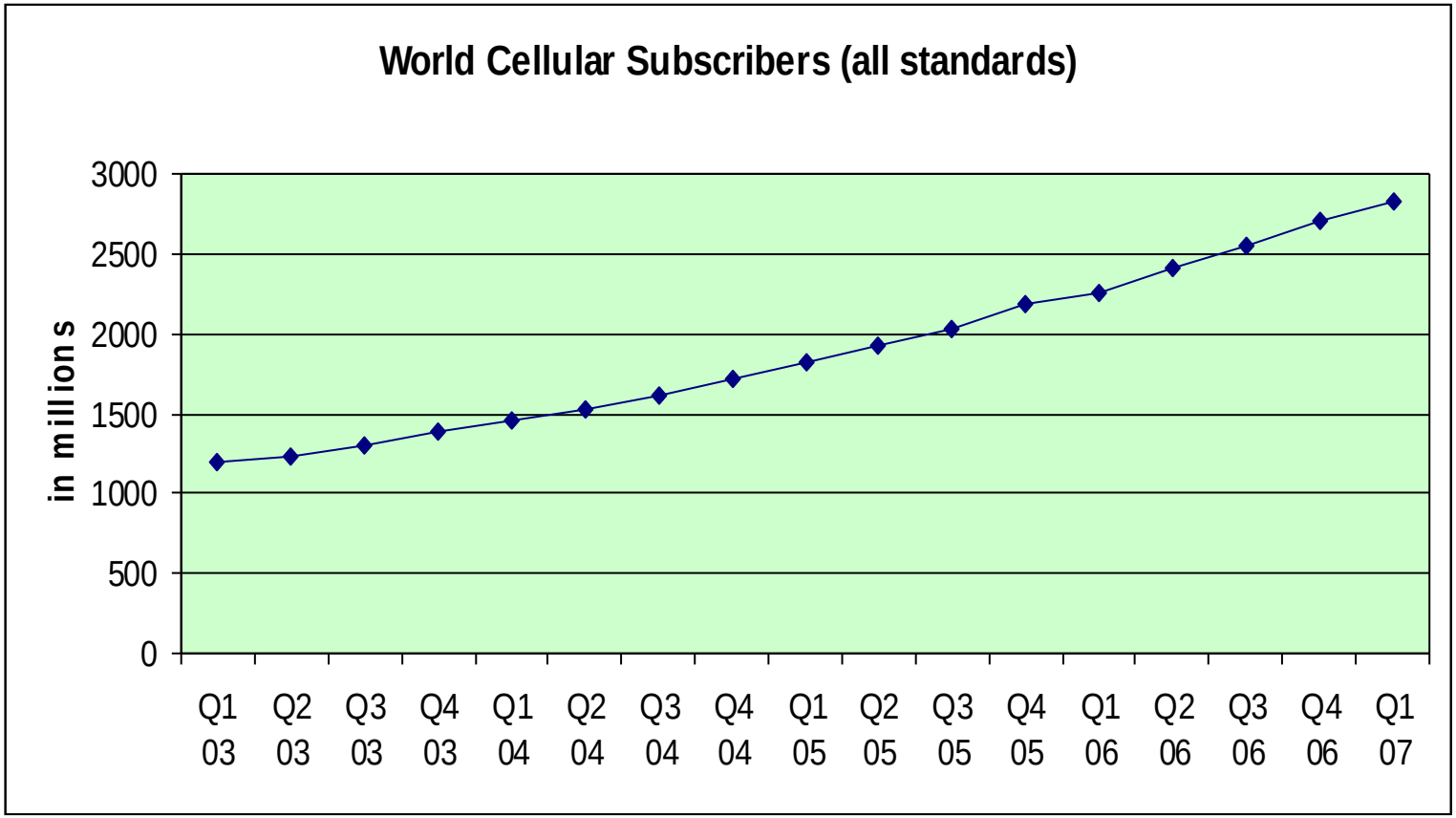
# INTERNET USAGE STATISTICS – The Big Picture

## World Internet Users and Population Stats.




Source: www.internetworldstats.com

# Mobile growth




Source GSMA

All cellular 2.8 bill 1Q 07

# Upcoming new drivers: Mobile control communication areas – M2M

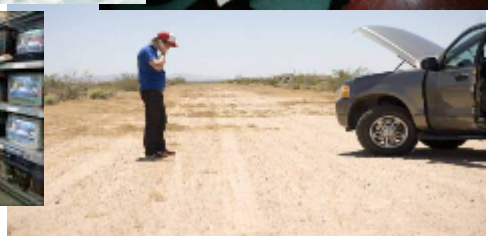
**Home and office**
- Remote control of consumer electronics and appliances
- Monitoring
- Security, door access

**Convenience**
- Lost and found items
- Home control
- Shopping
- Location services

**Fun and leisure**
- Pervasive gaming
- Tourism guidance

**Logistics**
- Cargo tracking
- Route planning
- Stock management

**Sales and payment**
- Vending machines
- POS terminals
- Advertisements



**Industrial**
- Service & maintenance
- Process automation
- Agricultural & forestry
- Environmental

**Health, Safety&Security**
- Health monitoring
- Property monitoring
- Environmental and weather monitoring

**Telematics/in-vehicle**
- Navigation
- Safety
- Vehicle diagnostics
- Traffic information

# So what are the problems ?

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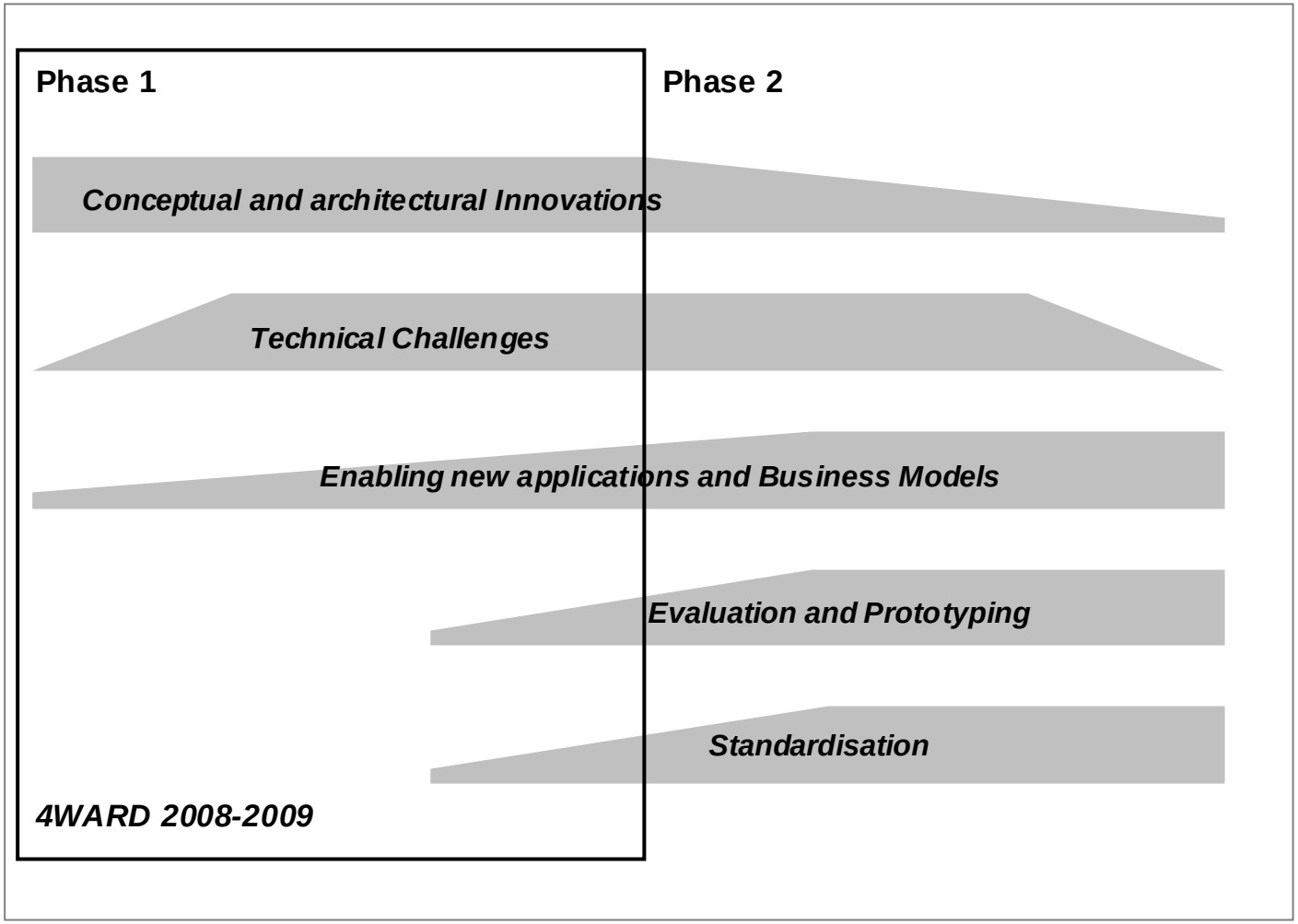
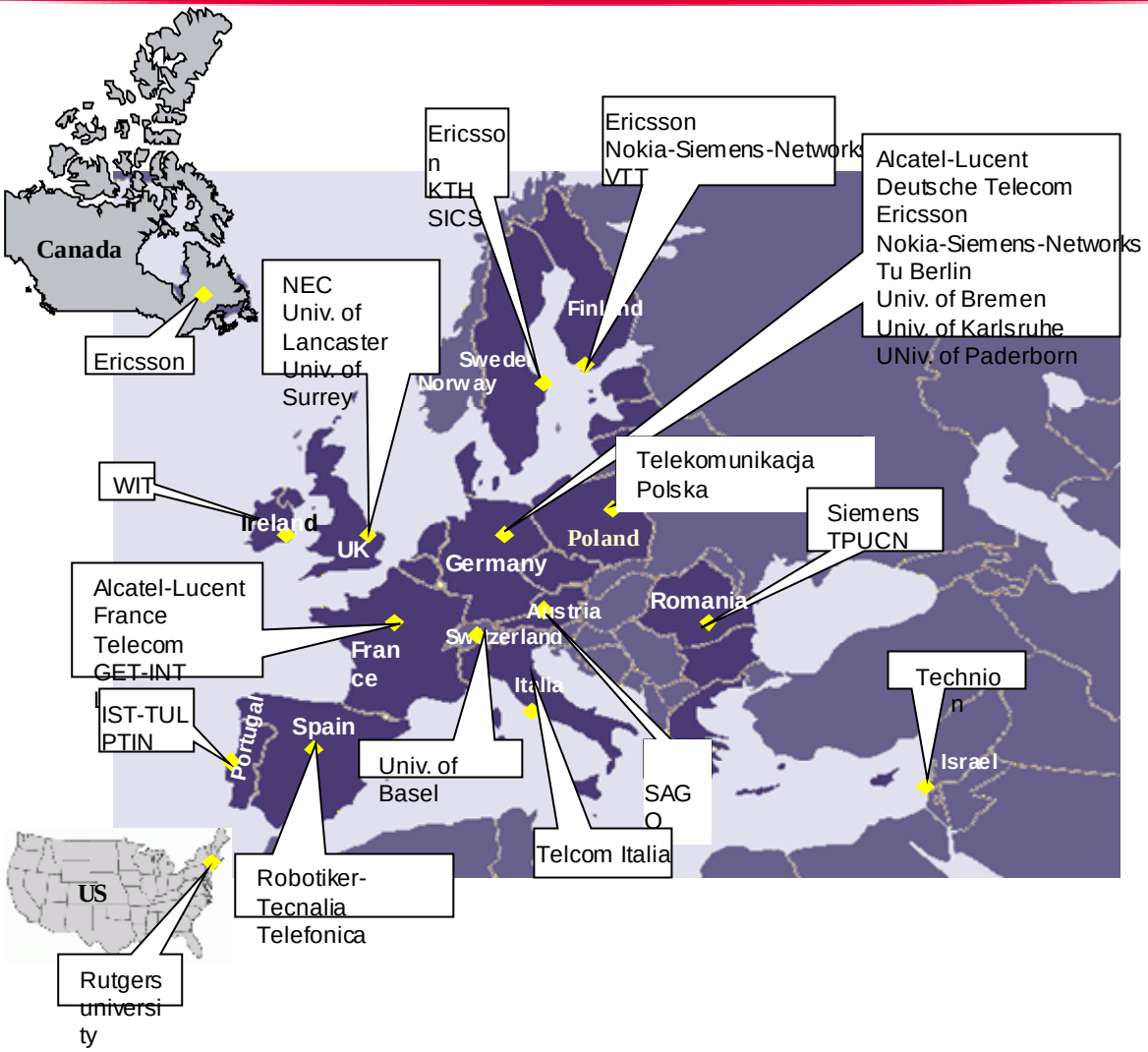
- **Both the architecture and the engineering processes of**
  **the Internet no longer suitable**
- **We want to bring innovation back into the network**
- **Some technical issues to deal with:**
  - **Can we cope with the massive number of communicating things?**
  - **Separation of nami[illegible]nd addressing**
  - **Integrated support [illegible]Mobility, QoS, Security**
  - **A generic multi-li[illegible]abstraction**
  - **Self-* mgmt**
- **Policy and[illegible]**
- **…**

**A new holistic global approach is needed**

# Work phases


Phase 1
Phase 2
Conceptual and architectural Innovations
Technical Challenges
Enabling new applications and Business Models
Evaluation and Prototyping
Standardisation
4WARD 2008-2009

# Some project data



# 4WARD Summary

- Inherent integration of self-management
- Increasing the amount of network features reliably available to end-user applications
  - Like mobility, QoS, security but also scalability, deployability
- Driving innovation and new business opportunities into the network layer
- Defining a systems approach to the Future Internet
- Drive the work from the mobile and wireless perspective

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# Future Activities

- European approach will be consolidated through eMobility and European Commission organised meetings
- A wide range of projects and players are participating in research
- Research projects address evolutionary and clean slate approaches
- Some commercial organisations are favour evolutionary approaches while others see the most benefit in investigating clean slate revolutionary approaches at this stage of the research
- Meetings in Bled (31 March) and Stockholm (ICT-Mobile Summit, (10-12 June) will provide overview

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Thank you for listening!

**http://www.emobility.eu.org/**