

Net!Works

IEEE ICC 2013, Budapest

June 12, 2013

P8: Horizon 2020: Europe's Major New Collaborative
Research Programme

Werner Mohr

Nokia Siemens Networks

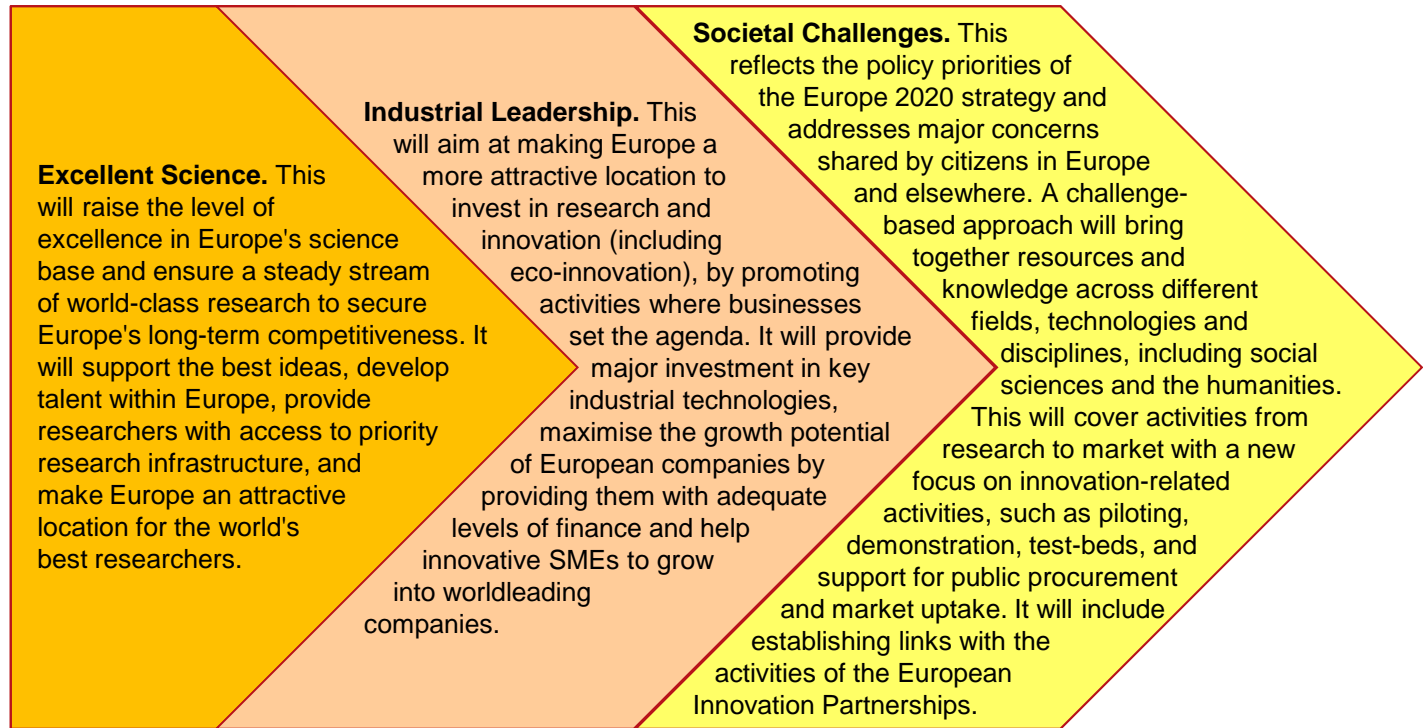
Chairman of Net!Works ETP

the **Heartbeat** of a smarter Society



Horizon 2020 – The new Framework Research Program of the EU 2014 - 2020

- Horizon 2020 will address three priorities in one program
 - Excellent Science
 - **Industrial Leadership**
 - Societal Challenges



Source: Horizon 2020 Regulation.



Industrial Leadership

- Build leadership in enabling and industrial technologies, with dedicated support for
 - **Information and communication technologies**
 - Nanotechnologies
 - Advanced materials
 - Biotechnology
 - Advanced manufacturing and processing
 - Space
- while also providing support for cross-cutting actions to capture the accumulated benefits from combining several Key Enabling Technologies

Source: Horizon 2020 Regulation.

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Industrial Leadership

- An integrated approach to Key Enabling Technologies
 - ICT plays an important role as it embraces some of the KETs and provides the key basic infrastructures, technologies and systems for vital economic and social processes and new private and public products and services. European industry needs to remain at the cutting edge of technological developments in ICT, where many technologies are entering a new disruptive phase, opening up new opportunities.
- **Information and Communication Technologies (ICT)**
 - *A new generation of components and systems:* engineering of advanced and smart embedded components and systems
 - *Next generation computing:* Advanced computing systems and technologies
 - **Future Internet: Infrastructures, technologies and services**
 - *Content technologies and information management:* ICT for digital content and creativity
 - *Advanced interfaces and robots:* Robotics and smart spaces
 - *Micro- and nanoelectronics and photonics:* Key enabling technologies related to micro- and nanoelectronics and to photonics

Source: Horizon 2020 Regulation.

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Industrial Leadership Information and communication

- *Future Internet*: infrastructures, technologies and services
 - The objective is to reinforce the competitiveness of European industry in developing, mastering and shaping
 - next generation Internet that will gradually replace the current Web
 - fixed and mobile networks and service infrastructures
 - enable the interconnection of trillions of devices (IoT) across multiple operators and domains that will change the way we communicate, access and use knowledge
 - This includes R&I on networks, software and services, cyber security, privacy and trust, wireless communication and all optical networks, immersive interactive multimedia and on the connected enterprise of the future

Source: Horizon 2020 Regulation.

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EU Commissioner Kroes called industry to join EU Commission in a PPP on 5G

- Commissioner Kroes called industry at Mobile World Congress 2013 in Barcelona, Spain

“... And today I call on EU industry and other partners to join us in a Public-Private partnership in this area. An open platform that helps us reach our common goal more coherently, directly, and quickly. European 5G is an unmissable opportunity to recapture the global technological lead. And I hope you will be able to support and join us. ...”

- Group of organisations prepared a PPP proposal

Source: Commissioner Neelie Kroes, Smashing barriers and thinking big. Address at Mobile World Congress, 26 February 2013, Barcelona, Spain.



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5G PPP proposal

- Roots of 5G PPP proposal in Net!Works European Technology Platform
- Public consultation on technical content launched on My 10, 2013 at <http://www.networks-etp.eu/>
- Supporting organisations:

Source: 5G PPP proposal.

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5G PPP vision

- Context
 - Future 5G networks significantly different from today's networks
 - It takes in average 10 years to develop a new generation of network
- Vision
 - In ten years from now, telecom and IT will be integrated towards a common very high capacity ubiquitous infrastructure
 - Converging capabilities for both fixed and mobile accesses
 - Future networks massively based on general purpose, programmable and specific high performance hardware
 - That will offer resources for transport, routing, storage and execution
 - Network elements will become "computing equivalent" equipment that gathers programmable resources, interfaces and functions based on virtualisation technologies

Source: 5G PPP proposal.

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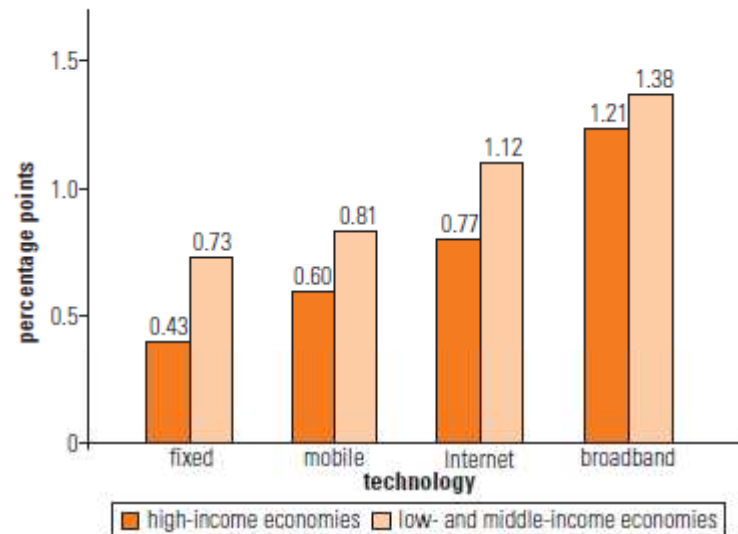
Proposed research program

- Faster, More Powerful and More Energy Efficient Solutions for integrated High Capacity Access and Core Networks for a Wider Range of Services
 - Wireless Networks
 - Optical Networks
 - Automated Network Organisation - Network Management and Automation
 - Implementing Convergence Beyond the Access Last Mile
- Re-Designing the Network
 - Information Centric Networks
 - Network Function Virtualisation
 - Software Defined Networking
 - Networks of Clouds

Source: 5G PPP proposal.



Importance of the ICT and networking sector for society and economy



Source: Qiang 2008.

Note: The y axis represents the percentage-point increase in economic growth per 10-percentage-point increase in telecommunications penetration. All results are statistically significant at the 1 percent level except for that of broadband in developing countries, which is at the 10 percent level.

Source: Worldbank, Information and Communication for Development: Extending Reach and Increasing Impact – Economic impacts of broadband, 2009, http://siteresources.worldbank.org/EXTIC4D/Resources/IC4D_Broadband_35_50.pdf

Major trends in mobile and wireless communications

- 6 billion mobile subscriptions
- 200 million smart phones sold per quarter
- 120 Million apps downloaded every day
- 4 billion YouTube views per day
- 3 billion social media profiles globally
- 1 billion active Facebook users, 600 million mobile
- 200 billion photos in Facebook
- 500 million Twitter accounts
- 200 000 tweets every minute

We cannot predict all the use cases

so **agility** is a key requirement

AND WHAT WILL BE NEXT?

NETWORKS NEED TO BE READY FOR...



CLOUD COMPUTING



'ALWAYS ON' SOCIAL GAMING



VIDEO CALLING EVERYWHERE AND ANYWHERE



3D MOBILE VIDEO



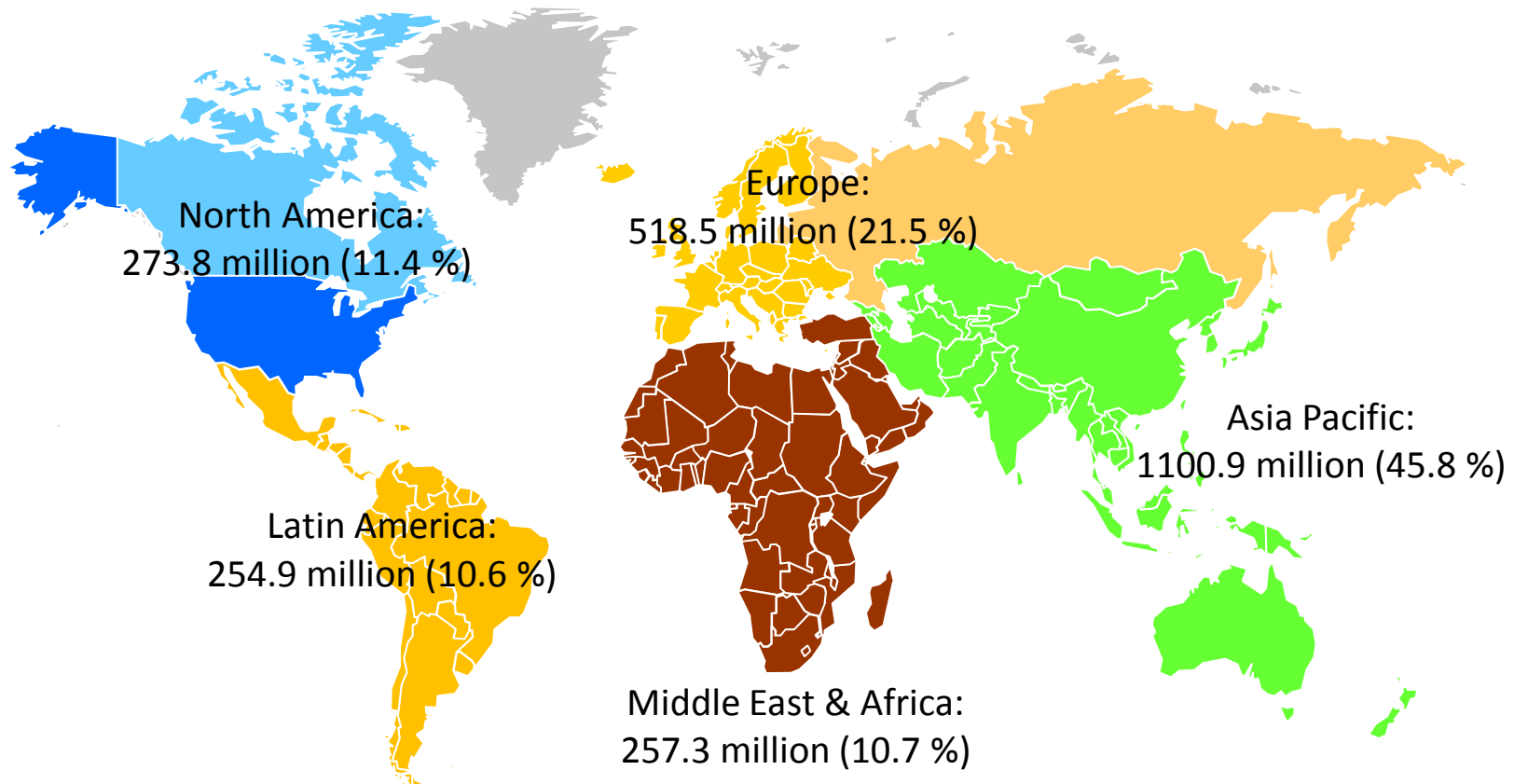
FRIDGES, CARS, FLOWERPOTS, THE INTERNET OF THINGS

Source: Nokia Siemens Networks



Worldwide Internet audience

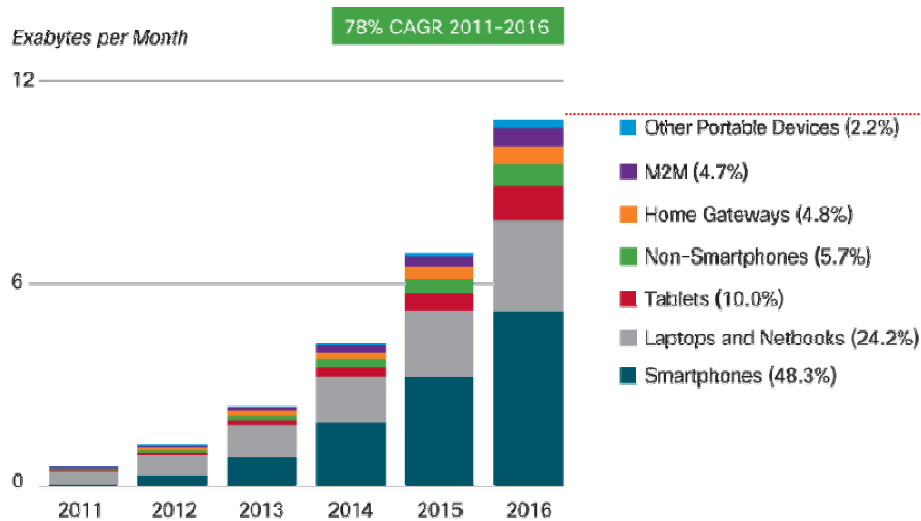
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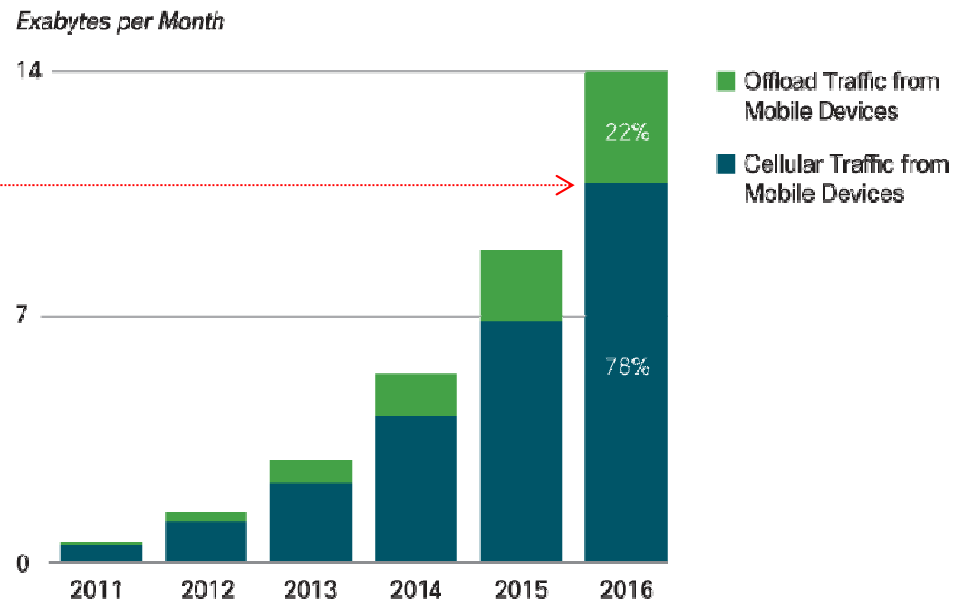
 More than 2.4 billion Internet users worldwide

Source: Internet statistics: <http://www.internetworldstats.com>

Consumer Internet traffic growth forecast



Figures in legend refer to traffic share in 2016.
Source: Cisco VNI Mobile, 2012



Source: Cisco VNI Mobile, 2012

Source: Cisco: Cisco Visual Networking Index: Forecast and Methodology, 2011-2016, February 2012, http://www.cisco.com/en/US/netsol/ns827/networking_solutions_sub_solution.html#~forecast

Key requirements towards 2020

Mobile networks are able to deliver one Gigabyte of personalized data per user per day profitably

Support up to 1000 times more capacity



Reduce latency to milliseconds



Teach networks to be self-aware



Reinvent the Telcos for cloud



Flatten total energy consumption



Networks need to undergo a fundamental transformation

Network Architecture 2020

- Central data centers for efficient network control and XaaS offerings
- Common Network & IT data

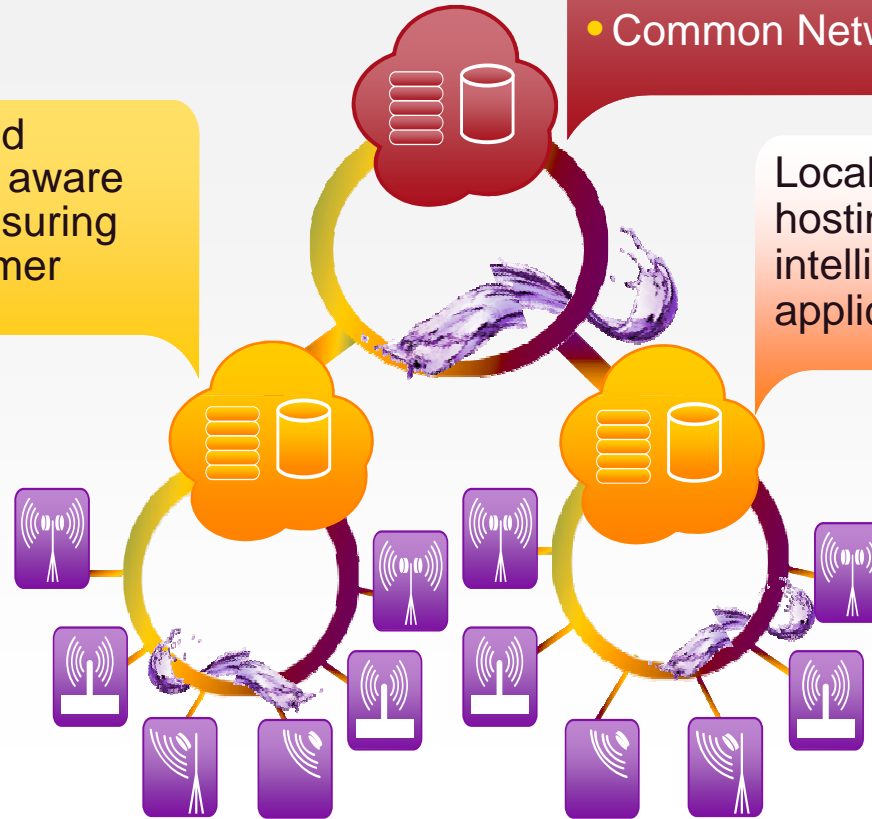
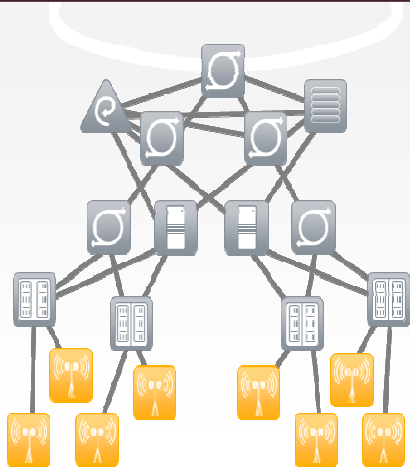
Content and application aware network ensuring best customer experience

Local data centers hosting multiple intelligent network applications

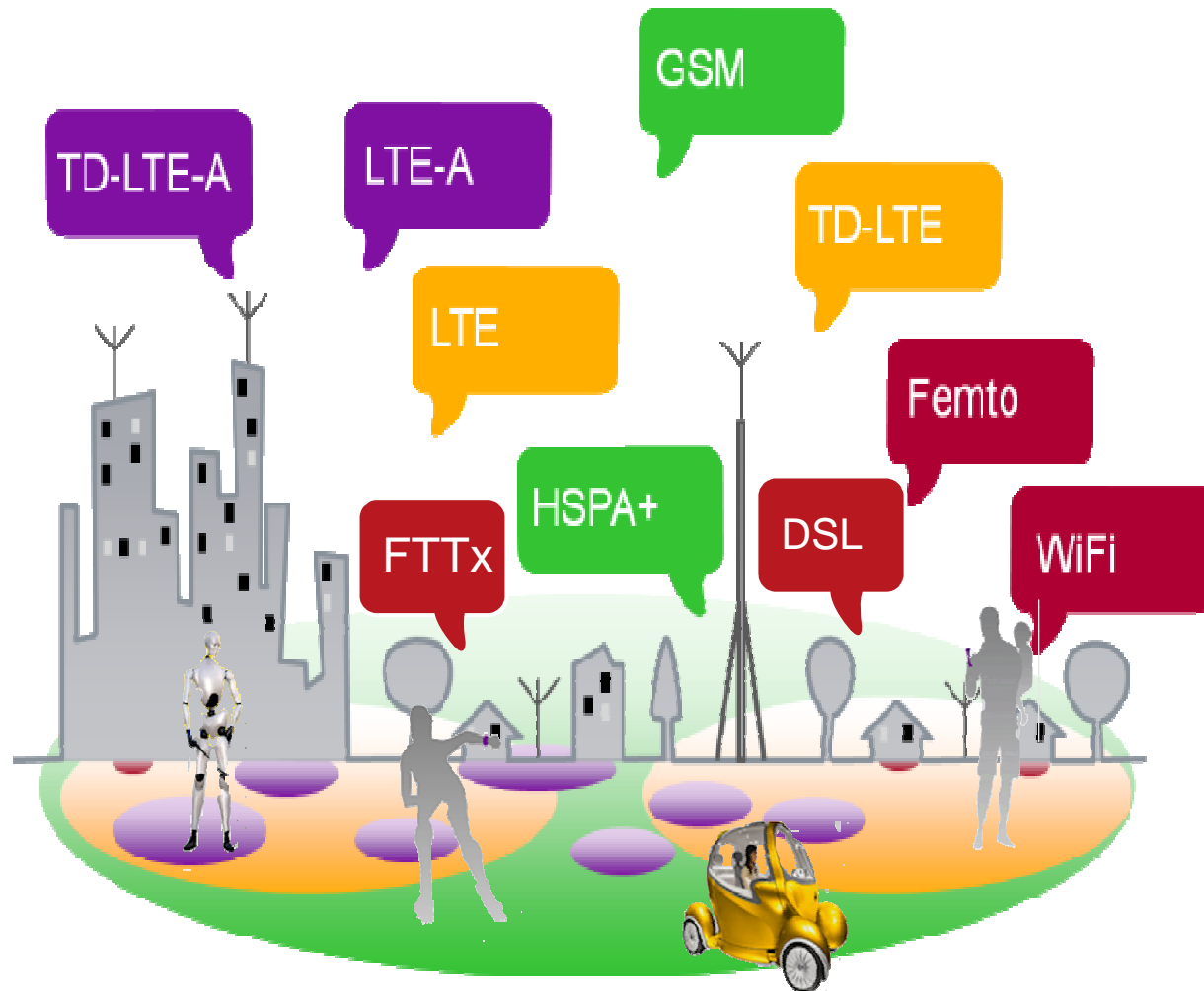
Heterogeneous access combining multiple technologies and cell sizes

Flexibility & efficiency through virtualization and automation

Network Architecture 2011



Heterogeneous access networks will enable ubiquitous broadband coverage



Gigabits on the move with “beyond 4G”

Licensed & unlicensed spectrum

Large & small cells

FTTx for homes, enterprises & backhaul

Conclusions

Net!Works

- New EU Framework Research Program Horizon 2020 opens opportunities
 - for collaborative research and
 - consensus building to prepare future standardization
- A group of organizations based on Net!Works European Technology Platform prepared a 5G infrastructure PPP proposal
 - to work on future networks towards 2020
 - Based on an agreed research program
- ICT and in particular communication networks are key technology for all sectors of society and economy and basis for economic growth
- Traffic in mobile and wireless communication systems is significantly increasing
- But we cannot predict all use cases
- Challenging requirements on future networks
- New network architecture and necessary technologies require continuous research effort

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