Convergence paving a path towards 4G

Prof. Dr. Ramjee Prasad
Center for TeleInFrastruktur (CTIF)
Aalborg University
Denmark
prasad@kom.aau.dk
Convergence

Wireless / Wired Networks

Services:
Speech, Data, Graphics, Video, Multimedia

Computer/
Communications/
Consumer Electronics
Convergence is what 4G is about

4G Mobile Communication Systems

Fixed

Broadcasting/Satellite Communication

Cellular phone systems, such as 2G, 3G, and 3.5G

WPANs, WLANs such as IEEE 802.11a, HIPERLAN/2, and MMAC
What is 4G?

The 4G is defined as a completely new fully IP-based integrated system of systems and network of networks achieved after convergence of wired and wireless networks as well as computers, consumer electronics, and communication technology and several other convergences that will be capable to provide 100 Mbps and 1 Gbps, respectively in outdoor and indoor environments, with end-to-end QoS and high security, offering any kind of services at any time as per user requirements, anywhere with seamless interoperability, always on, affordable cost, one billing and fully personalized.
B3G + Pers = 4G

- **B3G** is defined as the integration of existing systems to interwork with each other and with a new interface.

- **Pers** stands for Personalization and this topic is under research in the EC 6th Framework program within an integrated project:

  "My Personal Global Net (MAGNET)"

  [http://www.ist-magnet.org/]
B3G + MAGNET = 4G

Personal Network

Home network

Corporate network

Interconnecting structure (Internet, UMTS, WLAN, Ad Hoc, etc.)

Vehicular area network

PAN

Remote personal devices

Local foreign devices

Smart building

P-PAN

Remote foreign devices

Private PAN (P-PAN)
PN Applications

- Home/ daily life applications
  - Office environment
  - Smart shopping
  - Family members and friends sharing PN’s
- The Health Sector
  - Doctors, nurses, patients at hospitals in cooperating networks
  - Ambulance and medical staff on the move
  - Surveying of recovering patients
- Distributed work
  - Journalists/ mass media
  - Students work situation
  - Researchers in cooperating projects
Personal Networks

Personal Networks (PNs) will support users’ professional and private activities, without being obtrusive and while self-guarding their privacy and security.

Cellular networks will be one (important) part of the Personal Networks, but people will consider the PNs in the same way they consider today’s mobile phone networks: an indispensable tool that we call 4G.
Moving towards future network

- Architectures
- Cluster interaction
- Self configuration
- Different technologies
- Mobility
- Context awareness
Security is a big issue

Attacks on my private ground

- Phishing
- Virus/worms/Trojans etc.
- Eavesdropping
- More & unknown
- Brute force attacks
Future platforms

- Drivers for adaptivity
- Efficient, advanced & flexible end-user service provision
- Efficient spectrum utilization
- Reduced cost to upgrade fielded systems
- Better support for customized solutions
- Reduced standards risk

Some challenges
- Reconfigurable platforms
  - End to end reconfigurability
- Power efficient
MAGNET in perspective

Divergence

Convergence
Remember the user!

Do you know this?

Users are of all ages and personalities

What the user needs, and not what we can do!
Future perspective and opportunities

New services and applications

And new business and markets!

New types of platforms
The need for 4G

Convergence is really what 4G is about. For example, combined billing or developing handsets which unite the advantages of fixed and mobile services in one device. U-turn as mobile and fixed-line suppliers combine to promote handset development and linked billing.

The key is availability of new technologies. The speed with which telecom operators can roll out converged fixed and mobile services is heavily dependent on the technological revolution taking place at both the network and handset level.
The need for 4G

In a bid to influence the development of these new technologies, several of the world’s leading telecom operators – including NTT DoCoMo of Japan, Korean Telecom, Swisscom and Telestra of Australia – have formed an alliance with the aim of communicating their demands for convergent technologies of handset and equipment makers. The operators hope they can communicate a much stronger voice to the suppliers of technology whose products will determine how consumer use convergence.

These are nevertheless fears that some technologies could disrupt the fragile business models of operators. The new alliance is the strongest in direction yet of the huge interest in convergence. But it is also a sign that operators recognize that they need to harness these new technologies to prevent potential opportunities from business threads to their business.
Challenges

In order to implement 4G, a huge amount of research and standardization work is needed.

Work needs to be done at all OSI layers.

The result will be the first global transparent wireless access communication network, the Global-NET.

To achieve the 4G, technical challenges have to be solved by joint, world-wide research and development forces.
Conclusions

4G, convergence of networks, technologies, applications and services, will offer a personalized and pervasive network to the users.

Convergence is heading towards an advent of a really exciting and disruptive concept of 4th generation mobile networks.
Since 1998 WPMC has become a successful symposium and is now an annual event which has been held in Europe, Asia and USA.

The 8th symposium will address the open challenges to realize ubiquitous wireless networks seen from a human point of view.

More information
www.iws2005.org