

Trends & Challenges for Next Generation Wireless

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If we want wireless broadband, we need wireless capacity

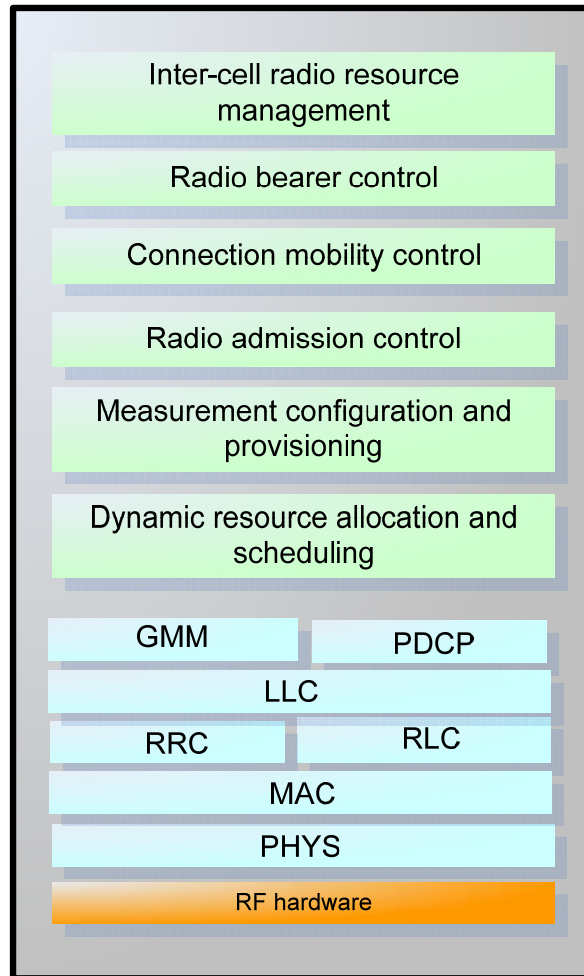
- *Wireless capacity has increased approximately 1,000,000 times since 1957*
- *Breaking down these gains shows*
 - a 5X improvement by efficient information coding techniques,
 - a 5X improvement by designing better modulation schemes,
 - a 25X improvement from wider spectrum, and
 - A 1600X gain by reducing cell sizes and transmit distance

["Femtocell Networks: A Survey", (Vikram Chandrasekhar and Jeffrey G. Andrews, The University of Texas at Austin; Alan Gatherer, Texas Instruments), September 2008]

- *If we want true wireless broadband, we'll need*
 - *lots of base stations*
 - *very small cells*

Next Gen Wireless: Extremely smart wireless nodes!

- Higher data rates & spectral efficiency
- Support for more frequency bands
- Lower latency
- Fallback modes to support legacy cellular systems
- Extreme Intelligence provides tremendous flexibility



More intelligence pushed down closer to the wireless layers:

Extended functions that were formerly performed in the radio network

Radio Link, Resource control – all the things that make wireless work

Applications – huge opportunities for innovation!

Business & Social networking



Telematics & Smart cars



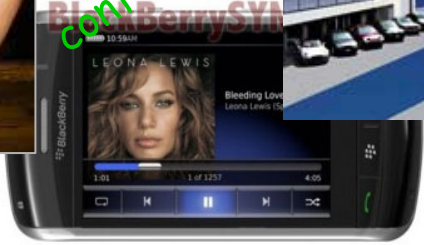
Location based services



eCommerce
Wireless banking



Video conferencing



High-speed outdoor access



In flight connectivity



Healthcare



Navigation



Gaming

Enterprise services, Messaging and email



Serious Practical Challenges for Next Generation Handsets

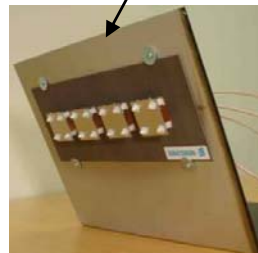
- **Antennas – must be multi-band and support MIMO**
- **Battery life – more processing and demand for larger, brighter screens**
- **Cost & feasibility of roaming services?**

This is ok for the lab

Still ok to put 4 antennas on back of a laptop



Handset Receiver and Array



How do we fit MIMO antennas that really work into a real handheld form-factor?



BlackBerry 8830

Thanks

Mark Pecen

- Mark Pecen serves as Vice President, Advanced Technology for Research in Motion Limited (RIM), makers of the BlackBerry wireless devices, systems and services. He reports to RIM CEO and founder Mike Lazaridis and is responsible for corporate strategy and economic assessment of advanced wireless technology investments, commercialization of applied research, strategic technology partnerships and customer collaboration on future technology deployment.
- Pecen is the founder of the RIM Wireless and Networking Advanced Research Centre and the RIM CTO Board. The Research Centre functions as a wireless technology incubator, and spans the value chain from applied research, analysis, simulation, proof-of-concept development, prototyping and the creation of initial products that use internally developed technology.
- His labs are active in applied information theory, radio channel modeling, cross-layer wireless network design and protocols, mobility management, radio link control, statistical analysis and simulation and end-to-end modeling of wireless systems.
- Since 1988, Pecen has invented a number of technologies adopted in global standards for the Global System for Mobile telecommunication (GSM), General Packet Radio Service (GPRS), Enhanced Data for GSM Evolution (EDGE), Universal Mobile Telecommunication System (UMTS) and various Wireless Local Area Networks (WLAN) standards.
- He serves on the board of directors of Ecole Polytechnique Centre de Recherche En Electronique Radiofrequence (CREER), School of Business and Economics of Wilfred Laurier University, Communitech Ontario, 3G Americas, LLC., QuantumWorks network for quantum information research and others. He also serves as advisory board member to several technology-focused industrial, academic and governmental associations in North America and Europe.
- Pecen holds more than 80 patents in the areas of mobile communication, networking and computing, and is a graduate of the University of Pennsylvania, Wharton School of Business and the School of Engineering and Applied Sciences.

