

Seminar on Internetworking, spring 2007

Topics by Juha Winter (e-mail: firstname.lastname@tkk.fi)

1. The evolution of wireless home networking

Several wireless technologies of varying bandwidth, operating range, and form factor currently exist or are emerging for home networking (e.g., Wi-Fi, Bluetooth, (Certified) Wireless USB (and its proprietary competitors), 3G/HSDPA cellular data, fixed/mobile WiMAX, etc.). Examine and compare their capabilities, applications, and future potential.

The following is a non-exhaustive list of key issues/questions that the student may use as a starting point for his paper:

- What is the role of the different technologies in the context of home networking? Are they complementary or overlapping? Compare the key strengths and weaknesses of each technology.
- What are the current and (likely) future applications of wireless home networking? Present user scenarios using textual descriptions and/or figures.
- Explain the differences between PAN, LAN, and possibly also MAN. What are the typical applications of each and how well do the different wireless technologies fulfill their requirements (considering coverage, data rate, latency, etc.)?
- Wi-Fi and Bluetooth devices have already become a commodity, available at low cost to consumers and commonly integrated into laptop chipsets, but is the same to be expected for, e.g., Wireless USB and mobile WiMAX? Why?
- For a more business-oriented approach, try to evaluate the market potential of emerging wireless technologies (optional)

Student background:

Familiarity with the different wireless technologies is beneficial. For a deeper understanding of their foundations and differences, a background in radio communications or signal processing may be an advantage, though not required.

Starting references:

- /1/ David Fisher and Michael Stich: *Home Wireless Networks Evolve to Include Bluetooth, Wi-Fi, UWB, WiMAX, HSDPA*. <http://www.convergedigest.com/bp-ttp/bp1.asp?ID=326&ctgy=>
- /2/ IEEE standards, available at <http://ieeexplore.ieee.org/> (also a good place to look for related scientific papers)

2. Device convergence and ubiquitous wireless connectivity

Device (or terminal) convergence is an important aspect of the on-going mega trend known as *convergence* in the IT and communications industry. Handheld and portable devices have traditionally been designed for a single main purpose (e.g., telephony, digital photography, video recording, music playback, note keeping, e-mail and/or web browsing, etc.). Furthermore, the devices having (wireless) network connectivity have typically been restricted to a single access

method (such as 2G/3G cellular radio), limiting their usability and efficiency in diverse scenarios. In device convergence, multiple functionalities are provided in a single device. This development is already visible in the current high-end smartphones, or “multimedia computers” as they are perhaps more aptly called, having high-resolution integrated digital cameras, large color displays, high speed data transfer capabilities, high quality music playback, and even digital TV receivers. Many of the newer devices also possess *multiradio* capabilities, i.e., they are able to connect to various radio networks. In particular, Wi-Fi enabled cell phones are becoming increasingly common.

The following is a non-exhaustive list of key issues/questions that the student may use as a starting point for his paper:

- What new possibilities and added value does multiradio bring from the consumer (end user) point of view?
- What is meant by *service-enabled* devices? What new services or applications are enabled by such capabilities? What is their business potential?
- Wireless Protected Set-up (WPS) is a recently released standard by the Wi-Fi Alliance. Describe and evaluate its benefits for Wi-Fi enabled devices, especially in the context of home networking.
- What are the next likely additions to the portfolio of functionality found in convergence devices? Why?

Student background:

Familiarity with multimedia terminals, applications, and services as well as wireless technologies is beneficial. A background in radio communications may also be an advantage, though not required.

Starting references:

- /1/ Dave Fraser: *Making the Most of Ubiquitous Wi-Fi: The Service Enabled Device*. <http://www.convergedigest.com/bp-ttp/bp1.asp?ID=447&ctgy=>
- /2/ Ashok Bindra: *On the Road to Ubiquitous Wireless Connectivity*. RF Design magazine. August 2006. http://rfdesign.com/next_generation_wireless/transmit_receive_technologies/ubiquitous-wireless-connectivity/