

Economic Feasibility of Fixed Wireless Access Networks

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Background

- Demand for broadband is growing
 - 1000.000 subscribers in Finland in 2005
- Many alternative access technologies:
 - xDSL, cable modems, fiber, EFM, PLC, wireless networks
- Broadband FWA networks are hyped a lot
 - New standards, non-line-of-sight operation, smart antennas
 - None / some / all of this is just hype?

Research objectives

- To determine the economic feasibility of fixed wireless access networks in different environments
 - Urban, suburban, rural
- To find out whether or not FWA presents
 - a threat to operators' current (ADSL) business,
 - an opportunity to move to new markets.
- (To learn more about techno-economic modelling of telecom networks)

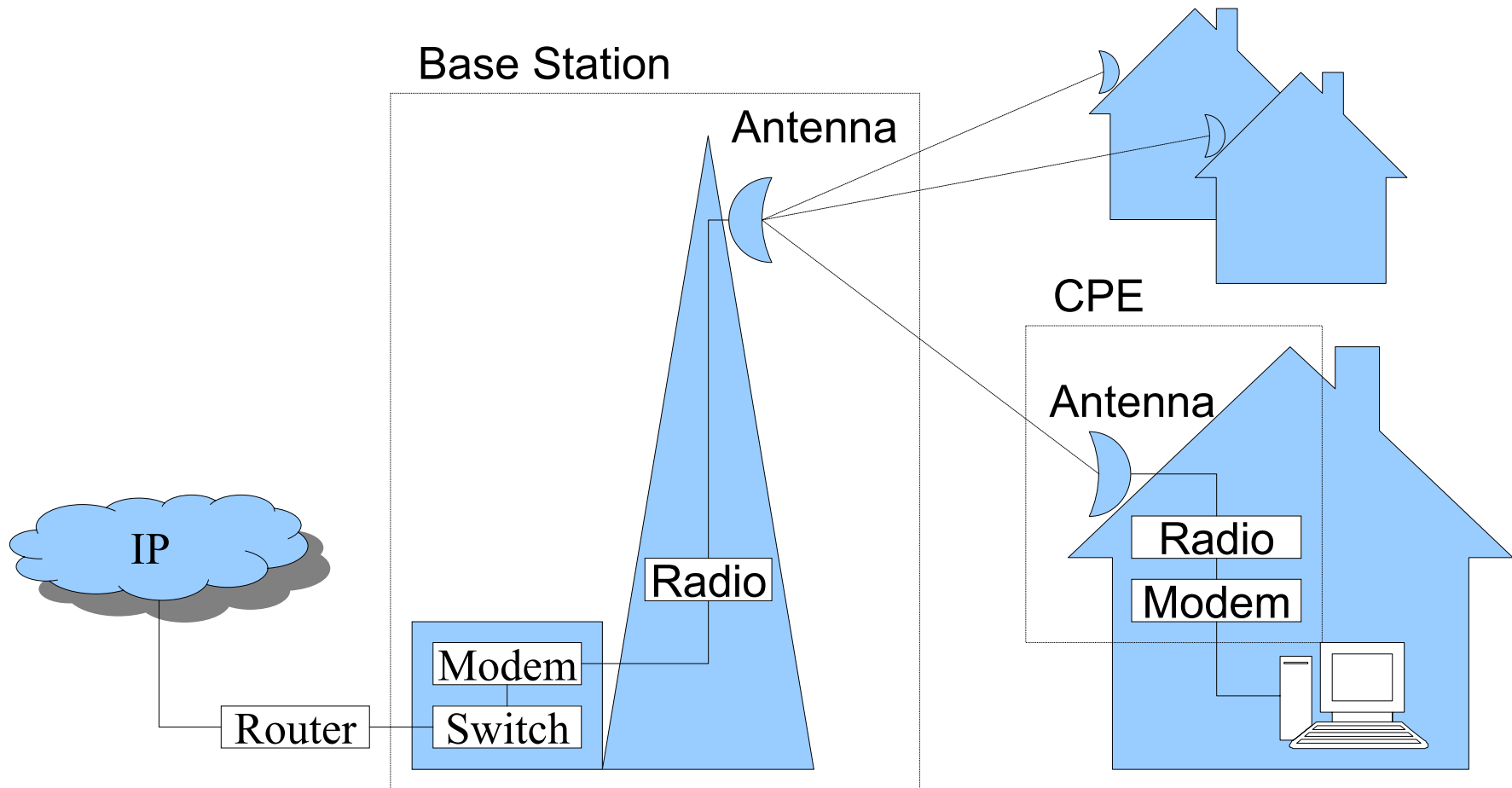
Research methods

- Literature study on FWA networks
 - FWA technologies and standards
 - FWA network planning methods
- Literature study on techno-economics
 - Techno-economic models for telecom network projects
 - Techno-economic tools for carrying out the analyses
- Study on the economic feasibility of FWA networks
 - Using the learnings of the literature studies

Basics of FWA technology (1)

- Fixed
 - Base stations connected to fixed terminals
- Wireless
 - Radio transmission at 2.4, **3.5**, 5.6, 10.5, and 26 GHz
 - Line-of-sight vs. Non-line-of-sight
- Broadband access
 - An alternative to ADSL and cable modems

Basics of FWA technology (2)



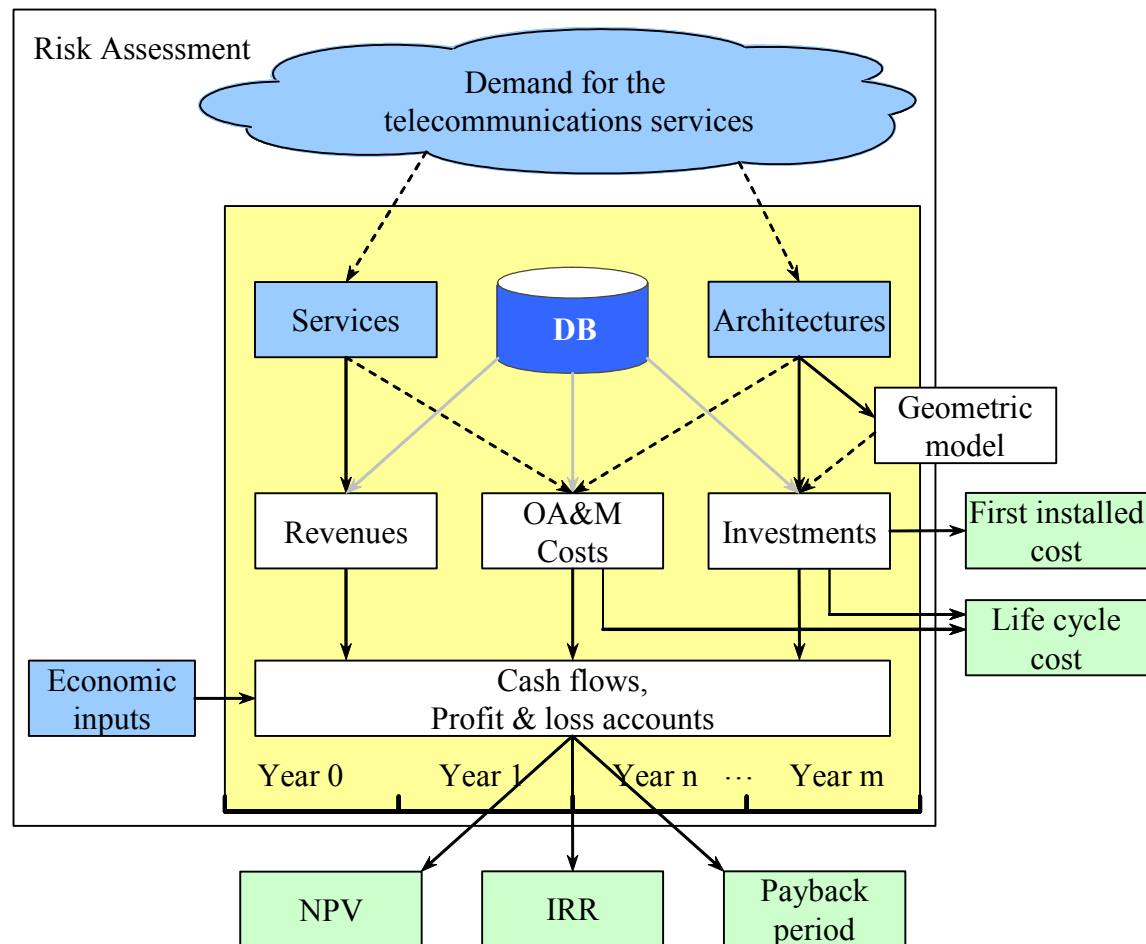
IEEE 802.16 standards

- IEEE Std 802.16-2001™ for 10-66 GHz
 - Single carrier, line-of-sight, point-to-multipoint
- IEEE Std 802.16a-2003™ for 2-11 GHz
 - Single carrier, OFDM, or OFDMA
 - Line-of-sight and non-line-of-sight
 - Point-to-multipoint and Mesh
- Interoperability certified by WiMAX Forum
 - Mass production of chipsets >> Economies of scale >> Lower prices >> Mass demand >>...
 - Less fear of lock-in to a single manufacturer
 - Repeat the success of Wi-Fi –certified 802.11 WLANs?

Techno-economics of telecom networks

- Active research area during '90s and '00s
 - EU-funded projects: TITAN, OPTIMUM, TERA, TONIC
 - Means to evaluate emerging broadband network technologies required
- Includes modelling of
 - Demand for telecom services = Revenues
 - Network architectures = Costs
- Comparisons between technologies
- Optimal network upgrade paths

OPTIMUM / TERA / TONIC tool



First results and findings

- Licensed frequencies for FWA are scarce
 - 3.5 GHz band: 6 – 8 independent 7 MHz (~15 Mbps) channels per operator
 - Solutions: Unlicensed bands, 26 GHz line-of-sight systems, lobbying for new allocations
- Sparsely populated areas have potential
 - Urban / Suburban areas heavily competed
- FWA might be wireless ADSL, but not VDSL
 - Demand for >10 Mbps services still low, but...
- OPEX is uncertain and hard to forecast

Suggestions for future research

- NLOS channel models for FWA
 - 3.5 GHz frequency band
 - Urban, suburban, rural areas
 - Empirical studies with real 802.16a systems
- Mesh architecture and ad-hoc networks
- Studies and modelling on network OPEX
 - Great effect on outcomes of analyses
 - Hard to get reliable information
- More developed business models
 - Complement to 3G and WLAN, Enterprise / SME customers, ...

Thank You! Questions?

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