Communication Systems

**Professors**: Carl-Gustaf Jansson (coordinator), Rassul Ayani, Mats Brorsson, Love Ekenberg, Seif Haridi, Gerald Maguire, Mihiail Matskin, Sead Muftic, Björn Pehrson, Mark T. Smith, and Jens Zander

Research in the field involves the technical and economic aspects of wireless and wired systems, as well as communication-related services and their application. These systems and services are being based, to an ever greater extent, on Internet technology. The technological focus in this research is on medium-access (MAC) and ‘upwards’ and on all levels of implementation aspects in the systems. Special key areas include: mobile and wireless communication systems, heterogeneous networks and systems for open access, mobile services, design of terminals/artefacts, user interfaces, context-sensitive functionality in both services and artefacts, backbone networks and Internet junctions, including optical networks and IP optical integration, plus electronics and implementation methods for advanced wireless systems.

Radio Communication Systems, RST

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Affordable Wireless Broadband Access (AWBA)

**Authors**: Jan Markendahl, Östen Mäkitalo, Jan Werding, Jens Zander

**Financiers**: VINNOVA, Telia

This tele-economic research project intends to extend the concepts developed in the EU funded Ambient Networks project and the Vinnova project Novel Access Provisioning. We believe that wireless broadband for public Internet access will be widely adopted if it is perceived as ‘affordable’. The amount of data is 100-1000 times larger compared to voice services but customers will not pay 100-1000 times more. In the proposed research project we will identify and analyze solutions where low cost local networks are integrated in traditional cellular network in order to offload traffic in known and.xd locations and hence decrease the need for deployment of more costly types of networks. The proposed project consists of three work packages:

- Design and analysis of technical solutions for radio access and roaming
- Design and analysis of business support solutions for network cooperation
- Feasibility analysis including Cost Capacity Pricing analysis

Multi Operator Dynamic Spectrum access (MODyS)

**Authors**: Jens Zander, Ömer Ileri, Saltanat Khamit, Ali Özyagci, Östen Mäkitalo

**Financiers**: VINNOVA, Ericsson, PTS

The key challenge of the wireless industry is to develop a system concept that can provide affordable, true broadband access for a variety of services under various business and regulatory regimes. It has been shown that making more spectrum available is a key tool to radically lower the cost of access and services. Current regulatory mechanisms for spectrum management have failed to provide significant portions of new spectrum and have not been very well adapted to the rapid pace of the development of technical systems. Today’s and emerging technologies, however, allow for the use of alternative spectrum management regimes involving rapid and more Dynamic Spectrum Access (DSA). The challenge addressed in this project is finding technical and regulatory schemes that can significantly increase the amount of spectrum for use in future mobile/wireless systems through the use of spectrum sharing etiquettes as well as market based approaches for spectrum allocation.

Although there is a considerable literature regarding DSA, most approaches for future systems have severe shortcomings when it comes to practical implementation. Schemes that are feasible in terms of scalability, fast convergence (real-time) and business appropriateness (e.g. from an operator perspective), are still to be developed. In this project, we aim at developing detailed technical mechanisms for DSA considering both the heterogeneous environments described above as well as future business models in cooperative or competitive multi-operator scenarios. The results are disseminated in the form of scientific publications as well as public workshops. Results are expected to (through project partner activities in FP7 and ITU) have direct impact on future spectrum regulation as well as systems standardization.
Network and Infrastructure management in Competitive Environments (NICE)

Authors: Johan Hultell, Ömer Ileri, Jens Zander, Tao Cai, Huawei
Financiers: Wireless@KTH, Huawei

Providing affordable wireless broadband access is one of the key challenges for the telecommunication industry. Since no new single radio technology can solve all wireless access needs in a cost efficient way, sharing and reusing multiple (new and legacy) wireless systems has been identified as the key to achieving low end-user cost. Large cost benefits are at stake when considering wideband wireless systems. In the project cooperative and competitive sharing regimes are compared with the objective to establish if and how ‘win-win’ scenarios can be achieved, where sharing benefits can be equitably shared between users and providers. In particular the project will quantify the effects of novel concepts including Competitive network deployment, Access advertising and Demand responsive pricing. The studies will be based on game-theory and mathematical biology and disseminated in scientific publications and public workshops / conferences.

Wireless sensor and actuator networks for measurement and control (WiSA II)

Authors: Jens Zander, Luca Stabellini
Financiers: VINNOVA, TEKES (Nordite II)

To gain a competitive advantage, industrial companies are demanding greater measurement and control (WiSA II) 

High Performance AD/DA converters

Authors: Yajie Qin, Xiaolong Yuan, Svante Signell
Financier: SSF partially via RamSiS

Next Generation FDM Systems (NGFDM)

Authors: Jinfeng Du, Svante Signell
Financier: Wireless@KTH

In the area of data converters the joint PhD students Yajie Qin and Xiaolong Yuan are working on “Low-voltage, Low-power and High-Performance Pipeline AD-converters” and “High-Performance Continuous-Time Delta-Sigma Converters”, respectively. Both students are now at their respective Chinese University, Fudan in Shanghai and Zhejiang in Hangzhou. According to the time schedule, they will return to KTH spring 2009.

Dynamic Spectrum Access Enabled Radios (DSAER)

Authors: Jinfeng Du, Svante Signell
Financier: Wireless@KTH

This new project addresses technical schemes to implement Dynamic Spectrum Access (DSA) systems and strives to significantly increase the efficiency of spectrum utilisation in future mobile/wireless systems. To enable efficient spectrum sharing, some practical requirements must be put on the signal construction for the spectrum users: efficient physical implementation, capability of covering arbitrary spectrum ranges, extremely low power leakage to neighboring frequency bands, and immunity to asynchronous sub-channel communication.

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