TECHNISCHE UNIVERSITÄT DRESDEN

Department of Electrical Engineering and Information Technology – Communications Laboratory – Chair of Communications Theory

SAPHYRE – Sharing Physical Resources
Mechanisms and Implementations for Wireless Networks

General Project Information

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Project Details

This is our vision: (i) to show how voluntary sharing of physical and infrastructure resources enables a fundamental, order-of-magnitude gain in the efficiency of spectrum utilisation; (ii) to develop the enabling technology that facilitates such voluntary sharing; and (iii) to determine the key features of a regulatory framework that underpins and promotes such voluntary sharing.

Main Objectives

In current wireless communications, radio spectrum and infrastructure are typically used such that interference is avoided by exclusive allocation of frequency bands and employment of base stations. SAPHYRE will demonstrate how equal-priority resource sharing in wireless networks improves spectral efficiency, enhances coverage, increases user satisfaction, leads to increased revenue for operators, and decreases capital and operating expenditures.

SAPHYRE aims at developing new approaches to make better use of the spectrum resources that are available for mobile communication services. Development will be focussed on new principles and enabling technology for resource sharing in wireless networks, specifically for sharing of spectrum and infrastructure.

The main topics emphasised in the SAPHYRE project are: Self-organising infrastructure sharing, new adaptive spectrum sharing models, efficient autonomous co-ordination, and high spectral efficiency.

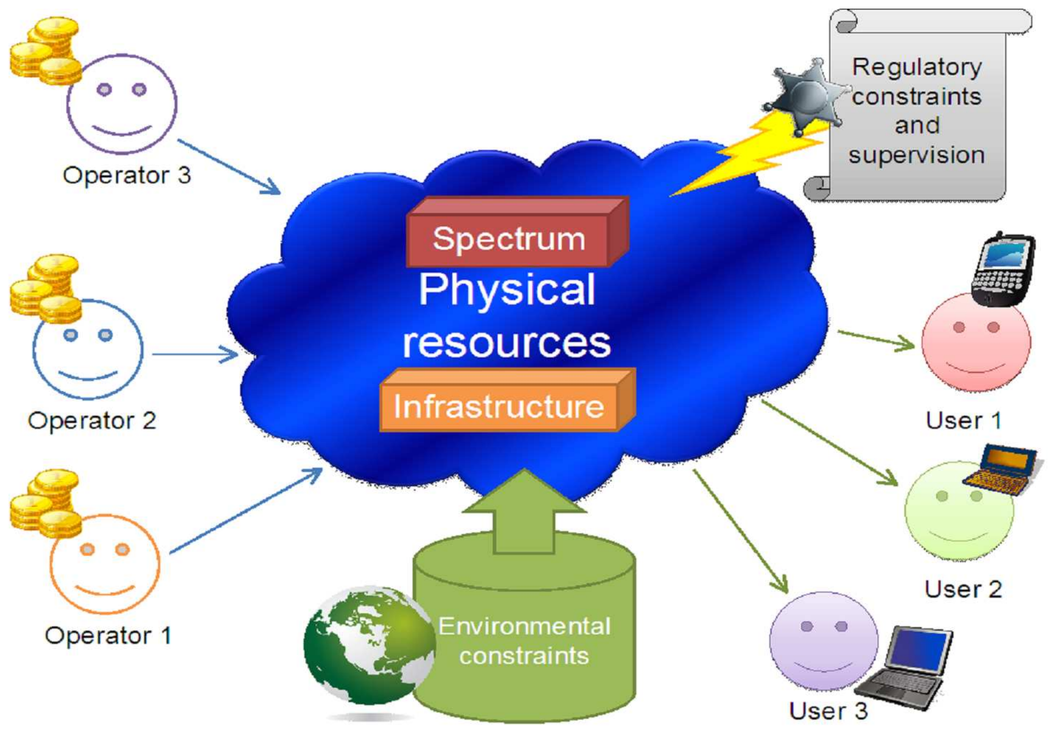
SAPHYRE will develop novel physical layer techniques, including network and interference aware modulation/coding, multi-antenna, spatial scheduling, multi-hop, and relay co-operative transmission, leading to a high spectral efficiency for wireless communications.

The common background is that different users can all gain from a collective approach, if they voluntarily share the spectrum between them. But also operators will earn increased revenue by spectrum and infrastructure sharing due to a higher quality of the services they can offer. Furthermore, the SAPHYRE project will show how the different options for making more efficient use of spectrum resources will fit within the regulatory frameworks as they currently exist and recommendations will be made assisting ongoing regulation processes, which changes in the regulatory framework would be required or beneficial in order to provide optimal opportunities for the identified innovations.

Key Issues

SAPHYRE's main objectives can be summarised as follows and are conceptually illustrated in the figure below:

1. SAPHYRE will analyse and develop new adaptive spectrum sharing models by a generalised cross-layer and cross-disciplinary approach.
2. SAPHYRE will propose and analyse efficient co-ordination mechanisms which require as less regulation as possible (to counteract selfish, malicious users). In particular in sharing scenarios, incentive based design is applied in order to reduce regulatory complexity.
3. SAPHYRE will develop a framework for infrastructure sharing to support a quality of service (QoS) with sufficiently wide carrier bandwidths and competition between different operators.
4. SAPHYRE will develop modern and novel physical layer techniques, including MIMO, SDMA, multi-hop, relay co-operative transmission which lead to high spectral efficiency.



The physical resource sharing problems are interdisciplinary and require input from regulatory and political bodies, business and market experts, and communication and network engineers.