

Tutorial:

ETSI Reconfigurable Radio Systems (RRS)

- Syllabus -

- Instructor:** The tutorial will be held by a member of the ETSI RRS leadership, i.e. Dr. Markus Mueck (Infineon Technologies, Munich, Germany) or Andrea Lorelli (ETSI, Sophia Antipolis, France)
- Contact Details:** MarkusDominik.Mueck@infineon.com; Andrea.Lorelli@etsi.org
- Prerequisites:** The course is suitable to any participant with a Communications Engineering background or relevant working experience in the field of wireless communications.
- Duration:** 2h
- Location:** SDR'10 Wireless Innovation Conference and Product Exposition, 30-Nov / 3-Dec 2010, Washington DC, USA

Context of the Tutorial:

To meet the requirements of the growing number of mobile phone users with limited radio spectrum available, more flexible ways to share radio frequencies amongst multiple services and radio networks are needed – and Reconfigurable Radio Systems (RRS) offer a solution.

RRS are intelligent radio devices which offer significant potential for maximising the use of scarce and expensive spectrum by sensing – and acting upon – their environment. For example, they can adjust for location, time, frequency and other users. They can scan for unused frequency, opening up the opportunity to negotiate the use of unused spectrum.

ETSI's Reconfigurable Radio Systems Technical Committee was set up in 2008 with the initial task of undertaking feasibility studies on the potential for RRS standardisation. The new committee hit the road running. By the end of 2009 TC RRS had produced seven ETSI Technical Reports (TRs) which together summarise potential standardisation activities in Cognitive Radio and Software Defined Radio and provide a baseline for RRS standardisation. These feasibility studies describe the application of SDR to both mobile devices and radio base stations and exploit the concepts of Cognitive Radio and Cognitive Pilot Channel to resolve spectrum congestion and improve spectrum efficiency.

Candidate topics for standardisation at ETSI have now been identified and standardisation of RRS is under way. The TC's terms of reference, which initially focussed only on feasibility studies, were updated accordingly late in 2009 to cover this new work. New work for 2010 will include work on white space frequency bands. The TC will produce an ETSI Technical Specification (TS) defining the system architecture for spectrum sharing and co-existence between multiple (potentially different) Cognitive Radio Networks on UHF white space frequency bands.

Objectives of the Tutorial:

The objective of this tutorial is to enable the participant

- To understand the ETSI framework with a particular focus on the ETSI Reconfigurable Radio Systems (RRS) Technical Committee. Information will be given on the possible deliverables to be produced (Technical Reports (TR), Technical Specifications (TS), European Norm (EN), etc.) and the possibilities for interacting with ETSI RRS;
- To understand the ETSI RRS vision related to Cognitive Radio (CR) and Software Defined Radio (SDR). In particular, the proposed solutions elaborated in the various Working Groups (WGs) are detailed and discussed:
 - **WG1** focuses on “**System Aspects**” and develops proposals from a system aspects point of view for a common framework in TC RRS with the aims to guarantee coherence among the different TC RRS WGs and to avoid overlapping and gaps between related activities. Recently, WG1 also considers TV White Space related activities targeting the operation of cellular systems based on opportunistic spectrum access;
 - **WG2** focuses on SDR technology with a particular interest in “**Radio Equipment Architecture**” and proposes common reference architectures for SDR/CR radio equipments (mobile handset devices, radio base stations, etc.), related interfaces, etc;

- **WG3** focuses on "**Cognitive Management and Control**"; the group collects and defines the system functionalities for Reconfigurable Radio Systems which are related to the Spectrum Management and Joint Radio Resource Management across heterogeneous access technologies. Furthermore, the group has developed a Functional Architecture for the Management and Control for Reconfigurable Radio Systems as well as a report on the Cognitive Pilot Channel as an enabler to support the management of the RRS;
- **WG4** focuses on "**Public Safety**" and has collected and defined the related RRS requirements from relevant stakeholders in the Public Safety domain. The group has defined the system aspects for the applications of RRS in Public Safety.

In the framework of this tutorial, it will be illustrated how ETSI RRS will complement ongoing effort in other bodies (building on the structure outlined above), such as IEEE standardization bodies, by proposing technological solutions beyond the existing scope (related to SDR interfaces, CR specific Management and Control architectures and interfaces, knowledge management via a Cognitive Pilot Channel and Security solutions); furthermore, ETSI RRS fulfills a key role in the framework of European Regulation, with a focus, among other aspects, on the following:

- The R&TTE Directive regime in force in Europe is based on a declaration of conformity and does require neither type approval nor registration of the equipment nor equipment identifier (in the US, type approval is still necessary). This (manufacturer's) self-declaration is preferably a reference to a Harmonised Standard to be developed by ETSI.
- Protection of TV bands: In Europe, DVB-T does not show a residual carrier as it is the case in the US (the possibility for detection of the US ATSC signal below noise (i.e., at -114 dBm) is made possible thanks to the residual carrier which is present in the ATSC signal). A corresponding adaptation of sensing based standards needs to be defined for Europe.
- Broadcasting, wireless microphones and assignment to radio stations are managed in Europe at the national level. Any sharing scheme based on a database will require some level of integration of the national data.

In order to address the above and other European Regulatory aspects, the Electronic Communications Committee (ECC) within the European Conference of Postal and Telecommunications Administrations (CEPT) has set up the SE43 group working on "*Technical and operational requirements for the operation of cognitive radio systems in the 'white spaces' of the frequency band 470-790 MHz*". ETSI RRS is the competence center within ETSI to implement those regulatory requirements.

- To understand ongoing interactions with regulatory bodies and possibilities for impacting related actions via ETSI RRS;
- To understand the most relevant future study axes, related to commercial and military related applications of CR and SDR.