IEEE SCC41Standards for Dynamic Spectrum Access Networks

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Authors:

Name	Company	Address	Phone	email
Hiroshi Harada (SCC41 Acting Chair)	NICT	3-4 Hikarino-oka, Yokosuka, 239-0847, Japan	+81 46 847 5074	harada@nict.go.jp
Paul Houzé (P1900.4 chair)	France Telecom	38-40 rue du general Leclerc 92794 Issy Les Moulineaux, France	+33 1 45 29 44 06	paul.houze@orange-ftgroup.com
Lynn Grande(P1900.5 chair)	General Dynamics C4 systems			
Klaus Moessner (P1900.6 chair)	Univ. of Surrey			

IEEE SCC41Standards for Dynamic Spectrum Access Networks

Hiroshi Harada and Paul Houzé

IEEE Standards Coordinating Committee 41 Dynamic Spectrum Access Networks

Scope

This Standards Coordinating Committee will develop standards related to *dynamic spectrum access networks*. The focus is on improved use of spectrum. New techniques and methods of dynamic spectrum access require managing interference, coordination of wireless technologies and include network management and information sharing.

Role

- Catalyst for stakeholders to come together to address the DSA market
- Driver of consensus on technical approaches
- World-class standards-making venue
- Contributor to DSA regulations and policies

SCC41 Working Groups

- **IEEE 1900.1**: Standard Definitions and Concepts for Spectrum Management and Advanced Radio System Technologies
- **IEEE 1900.2**: Recommended Practice for Interference and Coexistence Analysis
- **IEEE 1900.3**: Standard for Assessing the Spectrum Access Behavior of Radio Systems Employing Dynamic Spectrum Access Methods
- **IEEE 1900.4**: Standard for Architectural building blocks enabling network-device distributed decision making for optimized radio resource usage in heterogeneous wireless access networks
- **IEEE 1900.5**: Standard on Policy Language and Policy Architectures for Managing Cognitive Radio for Dynamic Spectrum Access Applications
- **IEEE 1900.6**: Standard on interfaces and data structures for exchanging spectrum sensing information for dynamic spectrum access systems

Status of SCC41 Working Groups

	1900.1	1900.2	1900.3	1900.4	1900.5	1900.6
PAR Approved	3/04/05	03/20/05	12/05/07	12/06/06	03/28/08	9/26/08
Initial Ballot - Open	9/07/07	07/02/07	Pending Withdrawal	9/08/08		
Initial Ballot – Close	10/07/07	08/03/07		10/08/08		
1st Recirc – Close	4/17/08	10/24/07		10/26/08		
2nd Recirc - Close		01/01/08		11/22/08		
RevCom Approval	4/10/08	1/08/08		1/19/09		
SASB Approval	6/12/08	3/28/08		1/29/09		
Published	9/26/08	7/29/08		2/27/09		

1900.4 Standard

Architectural Building Blocks Enabling Network-Device Distributed Decision Making for Optimized Radio Resource Usage in Heterogeneous Wireless Access Networks

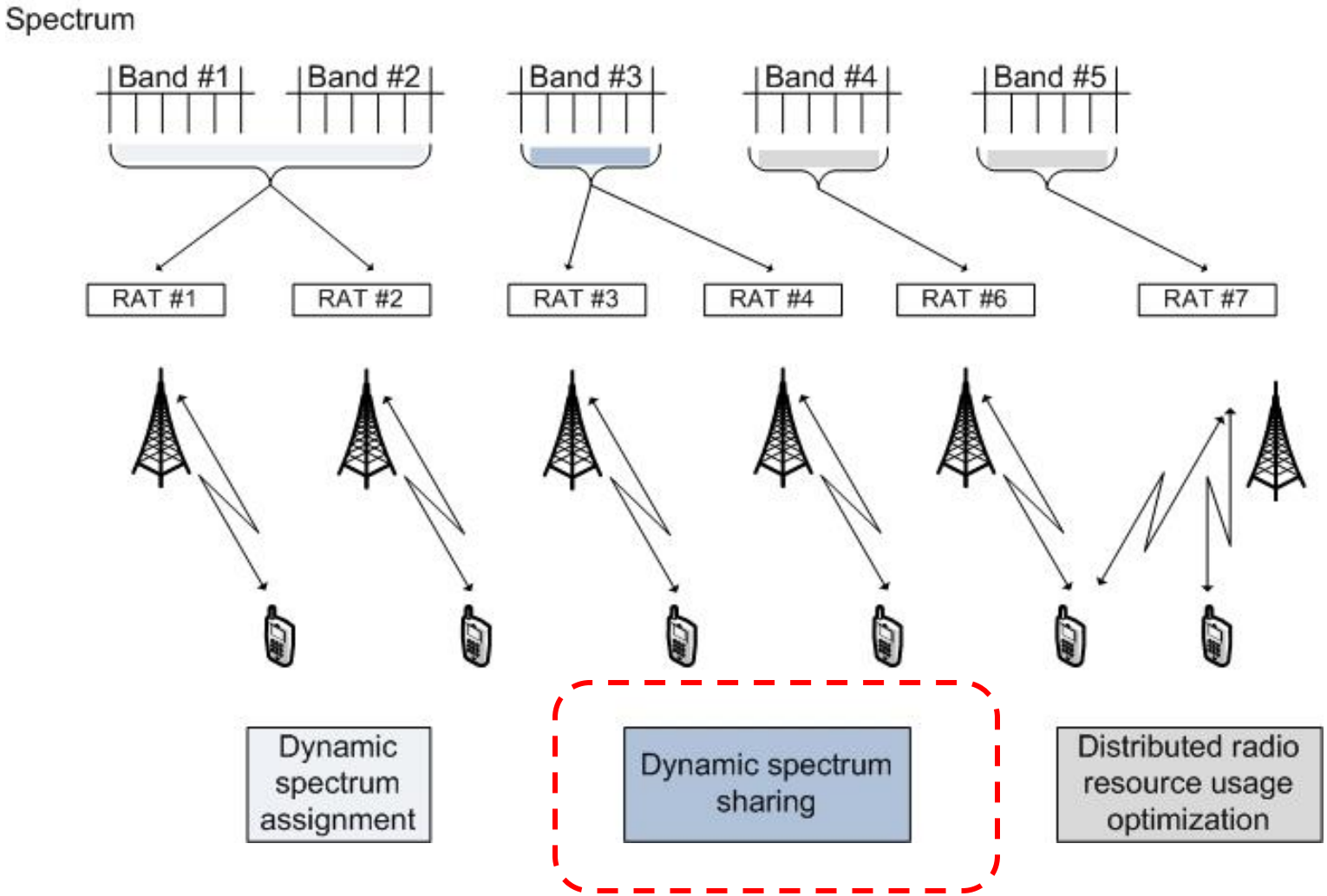
Chair	Paul Houzé	paul.houze@orange-ftgroup.com
Vice Chair	Hiroshi Harada	harada@nict.go.jp
Vice Chair	Ralph Martinez	ralph.martinez@baesystems.com

1900.4 Standard Scope

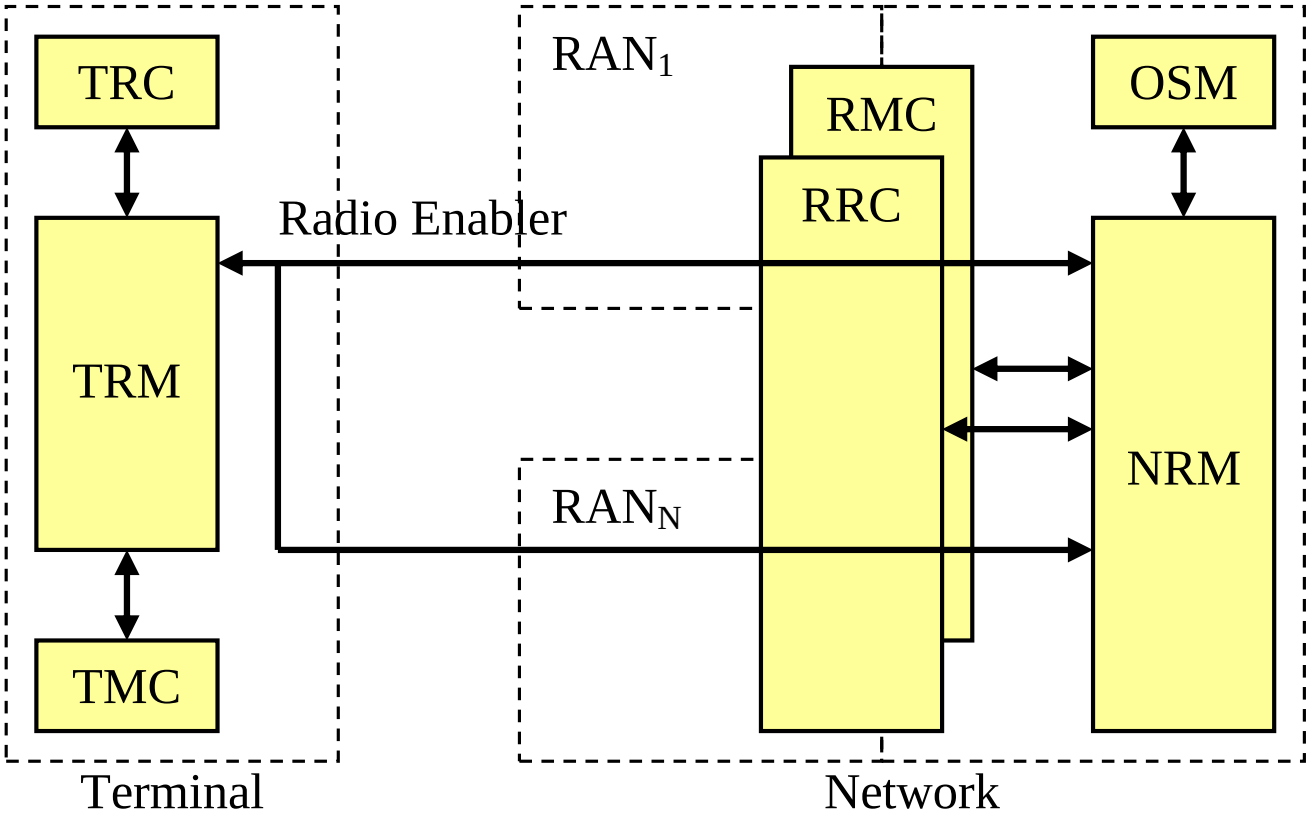
- To address radio resource management, **reconfiguration management** in **composite wireless network**
  - Multiple Radio Access Technologies
  - IEEE 802.xx, Cellular 2nd, 3rd generation
- In **Dynamic Spectrum Access** context
  - also addresses optimization of resources in fixed spectrum allocation
- **Policy-based managemen**t: Network-device distributed decision making
  - Event-Condition-Action Policies
  - Policies are sent by network to terminals via a "radio enabler"
- **1900.4 standard was published** on February 27th 2009.

  http://grouper.ieee.org/groups/scc41/4/documents.htm
- WS Study Group documents:09-0031; 09-0022

1900.4 Use Cases (2/9)



Architecture

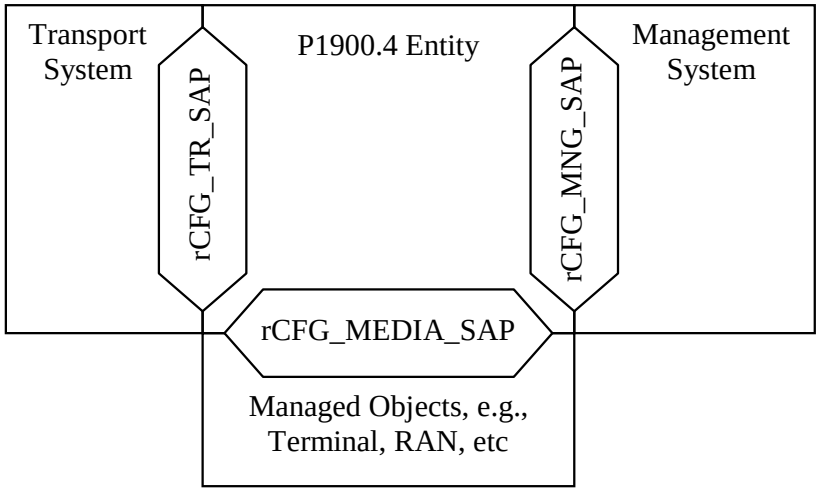


TRM – Terminal Reconfiguration Manager
TRC – Terminal Reconfiguration Controller
TMC – Terminal Measurement Collector
OSM – Operator Spectrum Manager

NRM – Network Reconfiguration Manager
RRC – RAN Reconfiguration Controller
RMC – RAN Measurement Collector
RAN – Radio Access Network configuration

Reference Model – Information Model

- Service Access points
  - **Transport SAP** provides transport service for message exchange between P1900.4 entities.
    - Typically used to exchange radio resource selection policies and context information between NRM and TRM.
  - **Reconfiguration and Measurement SAP** provides reconfiguration and measurement services for managing RANs and Terminals.
  - **Management SAP** provides management service for managing P1900.4 entities
- Information Model
  - Type, nature, structure of the information to be exchanged via the defined interfaces
  - Uses an object-oriented approach to describe policies, terminal classes, network classes.



- Each P1900.4 entity has the same reference model
- P1900.4 entities are modeled as System Management Application Entity (SMAE) (see ITU-T X.701).
- The P1900.4 entity, as SMAE, is located on the application layer and has access to any layer of the OSI model.

Way forward

- SCC41 approved the submission of two Project Authorization Requests:
  - 1900.4.1: "interfaces and protocols enabling distributed decision making for optimized radio resource usage in heterogeneous wireless networks"
  - 1900.4.a: "IEEE Standard for Architectural building blocks enabling network-device distributed decision making for optimized radio resource usage in heterogeneous wireless access networks – Amendment: Architecture and interfaces for dynamic spectrum access networks in white space frequency bands".
- The PARs are currently under review by IEEE-SA. The related work will start at next SCC41 meeting in London 6-9 April 2009.
- 1900.4 ready for starting specifications of interfaces and protocols to address white spaces
  - Protocols towards external entities (database)
  - Transport, reconfiguration, management from higher layers.

1900.5 Standard

Standard on Policy Language and Policy Architectures for Managing Cognitive Radio for Dynamic Spectrum Access Applications

Chair	Lynn Grande	lynngrande@ieee.org
Vice Chair	James Hoffmeyer	jhoffmeyer@ieee.org

Scope and purpose

- Scope: This standard defines a set of policy languages, and their relation to policy architectures, for managing the functionality and behaviour of cognitive radios for dynamic spectrum access applications in a vendor-independent fashion.

- Purpose: The purpose of this standard is to define a policy language (or a set of policy languages or dialects), and their relation to policy architectures, for specifying interoperable, vendor-independent control of Cognitive Radio functionality and behavior for Dynamic Spectrum Access resources and services. This standard will also define policy language, architecture, and their relation with each other with respect to the needs of at least the following constituencies: the regulator, the operator, and the network equipment manufacturer.

From Project Authorization Request (PAR) available at:

https://development.standards.ieee.org/get-file/P1900.5.pdf?t=21212900024

Progress

- A standard outline and workplan are almost finalized.
- There will be an outreach activity conducted to get input from the user community on use cases and policy language input from academia and research institutions.
- Policies and Procedures were updated and voted.
- 2 – 3 F2F meetings a year, 1-2 telecons a month.
- Three ad-hoc subgroups identified to focus work:
  - Policy Architecture
  - Policy Language
  - Use Case Analysis
- Goal is to define requirements by end of May 2009. Requirements in progress. Each ad-hoc group meets regularly to work on their area of the draft specification.

1900.6 Standard

Spectrum Sensing Interfaces and Data Structures for Dynamic Spectrum Access and other Advanced Radio Communication Systems

Chair Klaus Moessner k.moessner@surrey.ac.uk

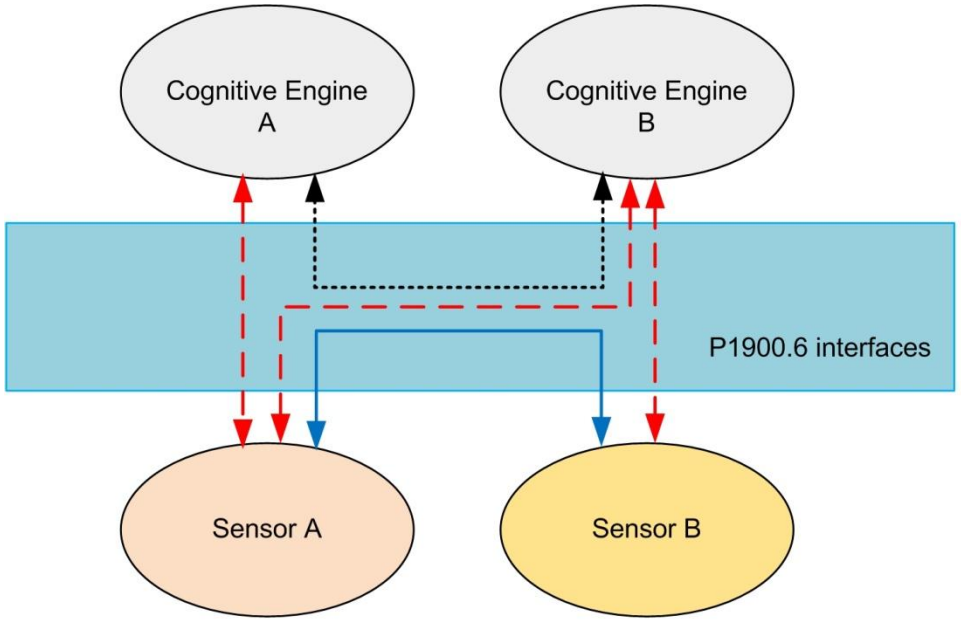
Scope and purpose

- Scope
  - This standard defines the information exchange between spectrum sensors and their clients in radio communication systems.
  - The logical interface and supporting data structures used for information exchange are defined abstractly without constraining the sensing technology, client design, or data link between sensor and client.
- Purpose
  - The purpose of this standard is to make development and evolution of spectrum sensors independent of the development and evolution of other system functions.

Interfaces in P1900.6

- Standardization topics
  The standard will provide a formal definition of data structures and interfaces for exchange of sensing related information between sensors and users of sensing information (client/cognitive engines)

- Current status
  - Three SEDs on Objectives, Use Cases and State of the Art has been edited
  - SEDs set the system boundaries and link to the currently conceivable deployment scenarios
  - To develop the requirements, the use cases will be analysed together with objectives and the current state of the art in sensing technologies.



For more information

- Meeting

  2009 Plenary meeting

  - April 2009, Kings College, UK
  - September 2009, IEEE HQ, Piscataway, NJ

- SCC41 Website

  http://www.scc41.org

Appendix 1: Definitions of Dynamic Spectrum Access and Cognitive Radio

According to the P1900.1 Standard : -

- Dynamic Spectrum Access is the real-time adjustment of Spectrum Utilization in response to changing circumstances and objectives.

- Cognitive Radio is a type of Radio in which communication systems are aware of their environment and internal state and can make decisions about their radio operating behavior based on that information and predefined objectives.