Project	**P1900.7: Radio Interface for White Space Dynamic Spectrum Access Radio Systems Supporting Fixed and Mobile Operation** http://www.dyspan-sc.org/
Title	**System Requirement**
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Abstract	
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Proposed System Requirements for P1900.7 System Design

1. Scope of The Document

This document describes the requirements related to technical system performance for P1900.7: Radio Interface for White Space Dynamic Spectrum Access Radio Systems Supporting Fixed and Mobile Operation [1]. The objective of the contribution is to develop a framework for the evolution of the P1900.7 system design of radio-access technology to realize the use cases in [2].

This document provides guidance and collects requirements which an evolved P1900.7 system shall meet or better to have.

2. References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

[1] 1900.7-11-0005-00 IEEE 1900.7 White Space Radio Introduction from PAR and 5C
[2] Usage cases
[3] scc41-ws-radio-10-0008-02, System Requirements

3. Introduction

The system requirement discussions were initialled in the white space ad hoc group in Dyspan (formerly SCC41) before IEEE 1900.7 WG setup. The merged results from the proposals of different entities were summarised in [3], and was presented again in IEEE 1900.7 WS Radio WG face-to-face meeting, 29-30 September 2011, Berlin Germany. In this contribution, the system requirements were updated due to the update of use cases, comments in the face-to-face meeting and some new contributions related to system requirements. The objective of this contribution is to be approved by the IEEE 1900.7 WG as guidance for P1900.7 system design of radio-access technology.

4. Architecture-Related Requirements

4.1. Unique Architecture

A single P1900.7 architecture shall be agreed. Architecture includes network topology and reference model.

4.2. Cognitive Plane

The P1900.7 architecture shall have the cognitive plane for database access, spectrum sensing management, spectrum access, coexistence mechanism, etc.

4.3. Management/Control plane

The P1900.7 architecture shall have radio interface management/control plane for link control and devices management.

4.4. Data plane

The P1900.7 architecture shall have data plane to provide radio interfaces for data transmission and reception.

4.5. Interfaces

The P1900.7 architecture shall simplify and minimize the introduced number of interfaces.
The P1900.7 architecture shall have means to support IEEE 1900.4a for white space management and IEEE 1900.6 to obtain and exchange sensing related information (spectrum sensing and geolocation information).
The P1900.7 architecture shall have means to access WS database.
The P1900.7 architecture should have means to support P802.19.1 for WS coexitence.

4.6. Network Topology

The P1900.7 architecture shall support network topologies of Point-to-Multipoint.
The P1900.7 architecture should support relay as an amendment to the above network topologies.

4.7. Cost

The P1900.7 architecture should reduce the cost of future network deployment while enabling the defined functionalities.

5. Policy Related Requirements

5.1. Channelization

The P1900.7 shall provide channelization to support operation in different regulatory domains.

5.2. Incumbent protection

The P1900.7 shall provide a means to protect incumbent users and use those means whenever and wherever required by the national and international radio regulations.

6. Technical Requirements

6.1. Spectrum efficiency

The P1900.7 shall achieve a mandatory spectral efficiency of at least 1bit/s/Hz.
The P1900.7 should achieve a maximum spectral efficiency of at least 4bit/s/Hz

6.2. Mobility

The P1900.7 shall support mobility across the network and should be optimized for low mobile speed from 0 to 15 km/h. Higher mobile speed between 15 and 120 km/h should

be supported with high performance. The connection shall be maintained at speeds from 120 km/h to 350 km/h. Voice and other real-time services shall be supported over the whole speed range. The mobile speed above 250 km/h represents special case, such as high speed train environment.

The P1900.7 shall support handover in cellular based deployment scenarios. The P1900.7 should also support techniques and mechanisms to optimize delay and packet loss during handover.

6.3. Coverage

The P1900.7 shall be sufficiently flexible to support a variety of coverage scenarios.

The P1900.7 shall support the following deployment scenarios in terms of maximum transmission range.

In the deployment of high power base station to high/low power user terminal, the P1900.7 spectrum efficiency shall be optimized up to 5km, and shall have more significant degradation in system spectral efficiency in 5 ~ 30km, and should be functional up to 100km. However the mobility requirement shall be met for all range.

In the deployment scenarios of low power only networks, P1900.7 spectrum efficiency shall be optimized up to 100m, and shall have more significant degradation in system spectral efficiency in 100 ~ 500 m, and should be functional up to 10km. However the mobility requirement shall be met for all range.

7. Spectrum Access

The P1900.7 shall provide a means to support spectrum access in an efficient manner, for example, by avoiding spectrum fragmentation, by supporting spectrum aggregation technique.

Spectrum aggregation technique refers to the capability to support (same and different) content delivery over an aggregation of resources in the same and different bands, in both uplink and downlink and in both adjacent and non-adjacent channel arrangements.

The P1900.7 shall enable the flexibility to modify the radio resource allocation according to specific demand or operator’s policy

8. Complexity Related Requirement

8.1. System complexity

P1900.7 shall minimize system complexity from the following prospectives:

a) Minimize the number of options
b) No redundant mandatory features

c) Reduce the number of necessary test cases, e.g. reduce the number of states of protocols, minimize the number of procedures and appropriate parameter range

8.2. Mobile Terminal Complexity

The P1900.7 should enable a variety of hardware platforms with differing performance and complexity requirements. The P1900.7 should minimize the mobile terminal complexity in terms of size, weight, battery life (standby and active) in the following prospectives.

a) The mandatory features shall be kept to the minimum.

b) There shall be no redundant or duplicate specifications of mandatory features, or for accomplishing the same task.

c) The number of options shall be minimized. Sets of options shall be realizable in terms of separate distinct terminal "types/capabilities". Different terminal "types/capabilities" shall be used to capture different complexity vs. performance trade-offs.

d) The number of necessary test cases shall be minimized so it is feasible to complete the development of the test cases in a reasonable timeframe after the Core Specifications are completed. No unnecessary test cases shall be developed.

e) The mechanism to achieve power efficient communications such as transmission power control, power saving mode/sleep mode, etc shall be taken into account.

9. Security Related Requirement

The system shall provide a means to support security mechanisms.

10. Coexistence Related Requirement

10.1. Self-Coexistence

The P1900.7 shall be able to facilitate coexistence among systems of its own type.

10.2. Inter-System Coexistence

The 1900.7 should support mechanisms that enable coexistence with the systems of different types, such as IEEE 802.11af, IEEE 802.22, ECMA 392, etc.