

**Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)**

**Submission Title:** [Components of PAR and 5c Documents]

**Date Submitted:** [March 2011]

**Source:** [Chin-Sean Sum, Hiroshi Harada, Fumihide Kojima, Alina Lu Liru]  
Company [NICT]

Address [3-4, Hikarino-oka, Yokosuka, 239-0847, Japan]

Voice: [+81-46-847-5092], FAX: [+81-46-847-5440], E-Mail: [sum@nict.go.jp]

**Re:** [PAR and 5c]

**Abstract:** [This document provides the components that construct the PAR and 5c documents]

**Purpose:** [This document facilitates discussion in the 802.15 SG for TV White Space.]

**Notice:** This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

**Release:** The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.

# High Level Summary

- This document presents the components that construct the PAR and Five Criteria (5c) documents
- Part 1 presents the components of the PAR document
- Part 2 presents the components of the 5c document
- The objective of this document is to initiate discussions to further improve its quality for the construction of the actual PAR and 5c documents

# Part 1

# Components of PAR Document

# Title of Proposed Standard

- IEEE Standard for Information and Technology – Telecommunications and Information Exchange Between Systems – Local and Metropolitan Area Networks – Specific Requirements – Part 14: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low Rate Wireless Personal Area Networks (WPANs) – Amendment: Smart Utility Networks Operation in TV White Space

# Scope on Proposed Standard

- This standard specifies an amendment to 802.15.4 MAC and PHY layers
- This standard defines the enabling technologies for 802.15.4 low rate WPAN Smart Utility Networks to operate in TV White Space, to meet the regulatory requirements and to support coexistence

# Purpose of Proposed Standard

- The purpose of this standard is to enable the 802.15.4 low rate WPAN for Smart Utility Networks in TV White Space operation

# Need for the Project

- Recent regulations have allowed the operation of unlicensed devices in locally unused TV channels (*i.e.* TV White Space)
- Operation in the TV White Space is beneficial for smart utility networks to deploy large scale industrial applications to connect with large number of nodes distributed in geographically diverse environments with minimal infrastructure
- To achieve this, smart utility networks could take the advantages of the TV spectrum to meet different system demands of targeted application
- This project is needed to make the necessary changes to enable the operation of low rate WPAN for smart utility applications in the TV White Space

# Stakeholders

- Communications device manufacturers and users
- Utility service providers
- Infrastructure operators
- Device component suppliers



# Project with Similar Scopes

- IEEE P802.11af
- IEEE P802.22
- IEEE 802.16h-2010
- ECMA TC 48

# Part 2

## Components of 5c Document

# Broad Market Potential

- Broad sets of applicability
  - There is a large and rapidly growing demand for applications related to smart utility networks targeted in different licensed-exempt bands dependent on regulatory domains
  - With the expansion of bandwidth to the TV White Space, smart utility networks can further extend its potential and applicability
- Multiple vendors and numerous users
  - There are multiple semiconductor manufacturers providing semiconductor solutions for smart utility networks
- Balanced cost (LAN versus attached stations)
  - The proposed amendment can be implemented with connectivity costs which are reasonably small as compared to the cost of devices
  - The proposed amendment to meet the regulatory changes is not expected to impact the cost of clients versus base stations

# Compatibility

- The MAC Layer of the WPAN standard will be compatible with the IEEE 802 requirements for architecture, management, and inter-networking
- The MAC SAP definition will not be modified to ensure compatibility with the upper (sub)layers

# Distinct Identity (1/2)

- Substantially different from other IEEE 802 standards
  - There are no other projects specifically addressing the application of smart utility networks in low rate WPAN operating in unused TV channels (*e.g.* as defined in the US by FCC 10-174)
  - IEEE 802.16-2009 and IEEE 802.16h-2010 (coexistence protocol for license-exempt bands) can be used to access unused TV channels for WMAN applications
  - P802.11af is working to address WLAN personal/portable operation in the unused TV channels
  - P802.22 is working on a WRAN cognitive radio approach for sharing unused TV channels by means of spectrum sensing and location information for protection of licensed services

## Distinct Identity (2/2)

- One unique solution per problem (not two solutions to a problem)
  - This project will specify radio extensions to facilitate fixed devices and personal/portable devices to operate in conformance of TV white space regulations to support smart utility related applications
  - This is the first standardization effort targeting the smart utility network application areas in the TV White Space

# Technical Feasibility

- Demonstrated system feasibility
  - There are many existing solutions already in other license-exempt bands (*e.g.* US 902-928 MHz, Europe 863-870 MHz, Japan 950-950 MHz and *etc.*) in the market with similar PHY and MAC functionality, supported by multiple system vendors and semiconductor manufacturers
- Proven technology, reasonable testing
  - There are many examples of existing technology that allow the design and fabrication of these radio systems
- Confidence in reliability
  - The proposed functionality will be designed to meet the relevant reliability, as proven by the existing products

# Economic Feasibility

- Known cost factors, reliable data
  - Existing products of utility network applications indicate that cost targets are easily met
  - Adding another supported band in a nearby spectrum region is expected to give similar cost-efficiency
- Reasonable cost for performance
  - Test results, prototype, and production solutions produced estimates that meet expected size, cost, and power requirements
- Consideration of installation costs
  - Cost installation can be minimized by excluding operator intervention