IEEE P802.11
Wireless LANs

A CSD Proposal for Wake-up Radio (WUR)

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Abstract

This is the IEEE 802.11 Wake-Up Radio~~ceiver~~ (WUR) SG proposed CSD.

1. IEEE 802 criteria for standards development (CSD)

The CSD documents an agreement between the WG and the Sponsor that provides a description of the project and the Sponsor's requirements more detailed than required in the PAR. The CSD consists of the project process requirements, 1.1, and the 5C requirements, 1.2.

1.1 Project process requirements

1.1.1 Managed objects

Describe the plan for developing a definition of managed objects. The plan shall specify one of the following:

a) The definitions will be part of this project. YES
b) The definitions will be part of a different project and provide the plan for that project or anticipated future project.
c) The definitions will not be developed and explain why such definitions are not needed.

1.1.2 Coexistence

A WG proposing a wireless project shall demonstrate coexistence through the preparation of a Coexistence Assurance (CA) document unless it is not applicable.

a) Will the WG create a CA document as part of the WG balloting process as described in Clause 13? YES
b) If not, explain why the CA document is not applicable.

1.2 5C requirements

1.2.1 Broad Market Potential

Each proposed IEEE 802 LMSC standard shall have broad market potential. At a minimum, address the following areas:

a) Broad sets of applicability.

Many devices rely on ~~Wi-Fi technologies~~802.11 WLAN technologies to connect to the Internet. Among those devices are those that operate using batteries as the main source of power. Examples to these devices include wearables, e.g. watches and fitness trackers, health care monitoring devices, sensors used for industrial applications or measuring some natural phenomenon, etc.

For example worldwide shipments of wearable devices are expected to reach 110 million by the end of 2016 with 38.2% growth over the previous year. According to the International Data Corporation (IDC) Worldwide Quarterly Wearable Device Tracker (https://www.idc.com/getdoc.jsp?containerId=prUS41100116), an expanding lineup of vendors combined with fast-growing consumer awareness and demand will generate double-digit growth throughout the 2015-2020 forecast period, culminating in shipments of 237.1 million wearable devices in 2020.

On the other hand, Global Industry Analysis, Inc.

(http://www.strategyr.com/MarketResearch/Wearable_Medical_Devices_Market_Trends.asp) projects the global market for Wearable Medical devices to reach $4.5 billion by 2020 driven by the growing need for effective management of chronic diseases, rising healthcare awarness and launch of innovative health care management devices.

With the increased popularity of 802.11 WLAN~~Wi-Fi~~ as the preferred technology to connect these devices to the Internet, a mechanism to efficiently utlize the limited available power becomes highly desirable.

b) Multiple vendors and numerous users.

A wide variety of vendors currently build numerous products for various IoT applications including those that are mentioned in this section. Those vendors include chip makers, system integrators, industrial establishments, etc. It is expected that by 2020 there will be over 50 billion devices connected to the internet.

New forecasts are available regarding the IoT opportunity, with GE estimating that the "Industrial Internet" has the potential to add $10 to $15 trillion to global GDP over the next 20 years, and Cisco increasing to $19 trillion its forecast for the economic value created by the "Internet of Everything" in the year 2020. Gartner estimates that IoT product and service suppliers will generate incremental revenue exceeding $300 billion in 2020. IDC forecasts that the worldwide market for IoT solutions will grow from $1.9 trillion in 2013 to $7.1 trillion in 2020.

1.2.2 Compatibility

Each proposed IEEE 802 LMSC standard should be in conformance with IEEE Std 802, IEEE 802.1AC, and IEEE 802.1Q. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with IEEE 802.1 WG prior to submitting a PAR to the Sponsor.

a) Will the proposed standard comply with IEEE Std 802, IEEE Std 802.1AC and IEEE Std 802.1Q? YES
b) If the answer to a) is no, supply the response from the IEEE 802.1 WG.

The review and response is not required if the proposed standard is an amendment or revision to an existing standard for which it has been previously determined that compliance with the above IEEE 802 standards is not possible. In this case, the CSD statement shall state that this is the case.

1.2.3 Distinct Identity

Each proposed IEEE 802 LMSC standard shall provide evidence of a distinct identity. Identify standards and standards projects with similar scopes and for each one describe why the proposed project is substantially different.

This project will have a narrow focus on the definition of the PHY and the MAC layers of an auxiliary wake-up signal.There is no other WLAN standard with similar focus. Wake-up radio ~~receiver~~ (WUR) as applicable to WLAN and IEEE 802.11 standard hasn't been considered before in 802.11.

~~This amendment will differentiate itself from other IEEE 802 wireless standards via the title which stresses the specification of wake-up signal~~.

1.2.4 Technical Feasibility

Each proposed IEEE 802 LMSC standard shall provide evidence that the project is technically feasible within the time frame of the project. At a minimum, address the following items to demonstrate technical feasibility:

a) Demonstrated system feasibility.

There are many publications demonstrating the hardware feasibility of a WUR. Some of the references are listed in the submisson:

https://mentor.ieee.org/802.11/dcn/15/11-15-1307-00-0wng-low-power-wake-up-receiver-for-802-11.pptx

b) Proven similar technology via testing, modeling, simulation, etc.

~~Until the full extent of the user models referenced in the IEEE 802.11 WUR PAR is understood, the study group cannot completely assess the extent of reasonable testing for those technologies. However,~~ IEEE 802.11 is a mature technology which has a wide variety of legacy devices and a proven track record, with several billions of devices shipping each year. The increased capabilities envisioned for the baseband and RF parts necessary to implement the proposed amendment are in line with the current progress in technology and not expected to impinge testability.

The amendment will use modeling and simulation, ~~based on real world deployment~~, as a tool for evaluating performance metrics.

1.2.5 Economic Feasibility

Each proposed IEEE 802 LMSC standard shall provide evidence of economic feasibility. Demonstrate, as far as can reasonably be estimated, the economic feasibility of the proposed project for its intended applications. Among the areas that may be addressed in the cost for performance analysis are the following:

a) Balanced costs (infrastructure versus attached stations).

WLAN equipment is accepted as having balanced costs. The development of WUR to enhance the power efficiency of WLAN network deployments will not disrupt the established balance.

b) Known cost factors.

Support of the proposed standard will likely require a manufacturer to develop a new auxiliary radio, modem and firmware. The WUR circuit is expected to be simple enough so that the cost

factors and risks are kept to their minimum. This is similar in principle to the transition between different WLAN amendments, e.g. IEEE 802.11n and IEEE 802.11ac as well as in previous iterations of IEEE 802.11 enhancements. The cost factors for these transitions are well known and the data for this is well understood.

c) Consideration of installation costs.

The proposed amendment has no known impact on installation costs.

d) Consideration of operational costs (e.g., energy consumption).

There are billions of WLAN systems in operation around the world. WLAN systems are recognized to provide a total cost of ownership (TCO) that provides significant operation cost benefits. This amendment is not expected to change today's operation costs.

This amendment is targeting improved power efficiency per device as specified in the PAR.

e) Other areas, as appropriate.

None.

References: