IEEE P802.15
Wireless Personal Area Networks

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)	
Title	PSC Study Group Draft PAR	
Date Submitted	January 20, 2011	
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Re:		
Abstract	PAR draft for the PSC Study Group.	
Purpose	To develop the PAR for a standard within the 802.15 WG.	
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PAR FORM

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PAR Status: Unapproved PAR, PAR for a New IEEE Standard
Type of Project: New IEEE Standard
PAR Request Date: 20-Jan-2011
PAR Approval Date:
PAR Expiration Date:

1.1 Project Number: P802.15.8
1.2 Type of Document: Standard
1.3 Life Cycle: Full Use

2.1 Title: Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 15.8: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Personal Space Communications (PSC).

3.1 Working Group: Wireless Personal Area Network (WPAN) Working Group (C/LM/WG802.15)

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3.2 Sponsoring Society and Committee: IEEE Computer Society/LAN/MAN Standards Committee (C/LM)

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None

4.1 Type of Ballot: Individual

4.2 Expected Date of submission of draft to the IEEE-SA for Initial Sponsor Ballot: 07/2013

4.3 Projected Completion Date for Submittal to RevCom: 02/2014

5.1 Approximate number of people expected to be actively involved in the development of this project: 60

5.2 Scope: This standard defines the PHY and MAC specifications optimized for personal space communications, providing dynamic scalability of link rates from 100 kbps to 50 Mbps in the globally available unlicensed bands including 2.4 GHz and 60 GHz bands, principally operating in short range. It supports features including group communication, high precision ranging, quality of service (QoS) (reliability and latency), low power consumption, fast association and synchronization, enhanced security, handover for devices, and coverage extension. (More information regarding this project is provided in Section 8.1.)

JPKG: Including 2.4 GHz and 60 GHz? The project should have a focus and specify the bands that will be used, not targeting every unlicensed band, which is what the PAR says. Change to "in the 2.4 GHz and 60 GHz unlicensed bands"

JPKG: 2.4 GHz and 60 GHz are very different bands in the sense of the feasible PHY implementations. Furthermore, these PHY differences create different requirements for the MAC, such that the MAC operation in each band will likely be different. Solving both problems simultaneously will distract the group. I suggest picking one band based on the application requirements.

JPKG: Delete "(More information … Section 8.1)" This text goes verbatim into the standard, which will not have a Section 8.1.

JPKG: The PAR scope does not define a range of operation. We cannot judge if the proposed project is practical unless we have a good understanding of the range. Specify a range in meters that is the target coverage area.

JPKG: The PAR scope refers to "fast association", "low power consumption", and "high precision ranging" but we do not know what is fast enough, low enough or what is sufficient precision. Absent some hard goals in time, power and distance, it is not clear that existing standards do not already solve the problem.

JPKG: Other changes noted in the text.

5.3 Is the completion of this standard dependent upon the completion of another standard: No

5.4 Purpose:

The applications and services used in a personal space become diversified, demanding a wide

variety of service requirements. To accommodate such diverse applications and services, the electrical, electronic, and mechanical devices surrounding a person can be automatically configured according to his or her preference. This standard is provides a wireless communication means to a personal space involving various devices associated with a single individual to be controlled and managed in a personally tailored fashion.

JPKG: This section does not really state the purpose of the standard. Please add a few applications that tell the reader the various areas in which this standard might be applied.

5.5 Need for the Project:
There are many devices in a personal space not interoperable with each other. It is beneficial to have a new solution with one technology, not by combining multiple technologies into a combo chip. There are standards that could serve parts of the PSC, but no single standard supports all features addressed in the scope uniquely optimized for this connectivity adaptable to these personal space services and applications. Hence there is a need for a new standard to serve the PSC applications.

JPKG: The proposed standard uses at least the 2.4 GHz and 60 GHz band. This means that the solution will be a “combo chip”, hence the proposed solution does not remove this requirement. The solution here would be to pick a single band or at least bands that are close together and then it would not require a “combo chip”.

JPKG: I am unaware of any requirement in the industry to get rid of a “combo chip” Modern mobile phones integrate many radios (900 MHz and 1.9 GHz cellular, 1.5 GHz GPS, 87-107 MHz FM, 2.4 GHz WiFi and 2.4 GHz Bluetooth). Yet the cost to the consumer is quite low. What I have heard is that the mobile phone manufacturers want to limit the number of antennas, as that creates a challenge from an aesthetic point of view. I do not see any reason given in this PAR of 5C that shows that the current combo chips are unsuitable.

JPKG: The paragraph states that current standards serve parts of the PAR. If so, then perhaps the best solution is to adopt the portions that work and only create new features where required. However, the 5C does not convincingly show that the current standards are inadequate to satisfy the application requirements.

5.6 Stakeholders for the Standard: The stakeholders include:

- Telecom industry
- Mobile device manufacturers
- Game device manufacturers and content providers
- Consumer electronics industry

6.1.a Is the Sponsor aware of any copyright permissions needed for this project?: No

6.1.b Is the Sponsor aware of possible registration activity related to this project?: No

7.1 Are there other standards or projects with a similar scope?: No.

7.2 Joint Development: No.

8.1 Additional Explanatory Notes (Item Number and Explanation):

8.1.a Definition of Personal Space Communications (PSC): note for Sections 2.1 and 5.2

(JPKG: It doesn't matter what a personal space is "In general", instead, we are concerned with what it means with respect to the proposed standard.) For this standard, the personal space is defined as a physical space where devices are controlled by or for the person. Personal space communication is connectivity between the individual and the devices and among devices associated with this individual without human intervention in the personal space for exchange of information and management of the environment.

8.1.b Example applications and services and related features of PSC: note for Sections 5.2 and 5.5

JPKG: I have added below where I think current standards have satisfied the applications listed.

Applications based on this standard include home automation (802.15.4), sensor applications (802.15.4), local advertisement/information system (802.11, 802.15.3c), group games requiring low latency (802.15.3, 802.15.3c, 802.11), conferencing (not well defined application), multi-lingual simultaneous interpretation systems (802.11), personal broadcasting (not well defined, but probably 802.11 would handle this), stereo wireless karaoke (802.15.1 and Bluetooth 3.0), wireless tour guide (802.15.3, 802.11), multiple peer-to-peer communications (not well defined), drive-in shop operations audio (what is this application?), mobile Voice over Internet Protocol (VoIP) (802.16m. Mobile requires wide range and/or handover. I am already using VOIP on my mobile handset via WiFi. The work in 802.21 should allow handover of the connection between 802.11 and 802.16m, giving the desired mobility.), internet radio (802.11, 802.15.3, 802.16, products exist today), mobile Internet Protocol TV (IPTV) (802.16m. For most people, mobile means over a wide coverage area, at least a building but more likely a neighborhood. The proposed standard does not attempt to address this application), graphic remote control (802.15.1, 802.11 802.15.4 RF4CE), and convergence of such applications. A PSC device should be able to dynamically adapt to the different needs of various applications and services on the fly. Some applications are critical on low latency while other applications are more critical on energy efficiency. Therefore, dynamic scalability of broad range of link rates is required to better serve the convergence of wide range of applications.

JPKG: Adaptation of link rates is provided for in 802.15.3, 802.16 and 802.11. 802.11 offers a range of 1 Mb/s to 600 Mb/s in the currently approved standard. This is the same range of link rates that are proposed in this standard. Furthermore, in a shared medium, actually using a wide range of link rates can often lead to poor application performance (which is why 802.11 allows the AP to restrict the rates that are used in the BSS). It appears that the authors have confused the need for the applications to have a wide range of data rates with the requirement that the PHY support a wide range of link rates. Often, the best answer is to transmit as fast as possible and then shut down for long periods of time. This will typically provide the best average power usage. In addition, it also provides for more efficient use of the shared spectrum. So I see a wide range of link rates as a disadvantage for this standard, not an advantage.

JPKG: Supporting conflicting set of application requirements often is best solved by using multiple protocols, not necessarily the same protocol. Trying to make single device simultaneously support these is not necessarily efficient. Instead, it can simply switch to the best MAC/PHY combination for that application.

Wireless tour guide is a good example application that requires group communication and localization (i.e., high precision ranging) of devices. If we are standing under an art piece in a museum, we can use our PSC featured devices to listen to the information about the display on any of group communications of our preferred languages. At the same time, the PSC devices allow us to talk to the tour guide with specific questions. As there may be many art pieces in the vicinity of the person, localization of devices can identify each art piece based on the relative location (i.e., upper left or lower right of the person).

JPKG: This does not seem like a high precision ranging application. It may require accuracy to only a few meters. Furthermore, it can be solved at the application layer or with existing wireless standards. If high precision ranging is required, then we need to know the accuracy that is the goal of this standard. For example, refer to 802.15.4a standard.

An important part of the standard is the low latency, and stereo wireless karaoke is a good example requiring the feature. Tight lip synchronization has to be maintained between the video on the TV and the sound from the speakers.

JPKG: The text does not specify the latency that is targeted. Without that number we cannot be sure if the existing standards do not satisfy this reqirement.

Fast association and synchronization of devices around a user is another important aspect of this standard. A PSC user sees what devices are around and can associate in an expeditious manner with any of available devices which are ready to be connected and provide services. This feature instantly enables the user to enjoy numerous services such as point of sale contents, audio and video streaming, and an instant group game through group association as he or she moves.

JPKG: Instant is not possible. The authors need to specify the target association speed and synchronization speed that is required. For example, what is the size of the data that needs to be exchanged in order to synchronize the data? What time is allowed for this exchange? What is the number of simultaneous synchronization that is required? Can the user really react this quickly to changes with their mobile device?

JPKG: Overall, I am very skeptical with the proposition that a single MAC/PHY will solve an extremely wide set of applications. History has shown that the approach that is most likely to succeed is to find a specific problem and to solve that problem. Once the problem is solved, then additional problems can be addressed by extending the solution. As an example, Bluetooth was slowed down because people tried to get the 1.0 version to solve every wireless problem, rather than focusing on solving a few simple problems. In the end, Bluetooth became successful initially with a single application (the original driving application) which was voice. Once they were successful in that area, it was possible to add other applications that made sense, such as remote controls, object exchange, etc.