IEEE P802.15
Wireless Personal Area Networks

Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)
Title	Personal Space Communication (PSC) Study Group 5 Criteria
Date Submitted	[January 20, 2011]
Source	Soo-Young Chang [CSUS], Peter Murray [Self-Employed], Jinkyeong Kim, Yongsun Kim, Hoosung Lee, Kapseok Chang, Wooyong Lee, Hyung Soo Lee, Cheolhyo Lee, Sangsung Choi, Seong-Soon Joo, Hong Soon Nam [ETRI], Gahng-Seop Ahn, Myung J. Lee [CUNY], Seung-Hoon Park [Samsung Electronics], Liang Li [Vinno], Zhen Cao, Haiyun Luo [China Mobile], and Betty Zhao [Huawei Technologies] E-mail: [sychang@ecs.csus.edu, petermurr@mac.com]
Re:	[IEEE P802.15.8 Project Authorization Request (PAR)]
Abstract	[PSC Study Group 5 Criteria.]
Purpose	[Working document for the 5 Criteria to the P802.15 Working Group]
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.

<PSC 5 Criteria>

1. Broad Market Potential

a) Broad sets of applicability.

The integrated personal space environments are more demanding of the customized and intelligent living environment services with the convergence of mobile phones, personal electronic equipment, and servers. The speed of data access on the network is getting higher and the amount of media contents on the web increases. The activities by a user become diversified demanding different requirements.

To accommodate these services, the electrical, electronic, and mechanical devices surrounding the user can be automatically configured according to user preferences. There will be an increasing demand for seamless connectivity with fast association between an individual user and the network and between devices surrounding the user as she or he moves around.

JPKG: What is the requirement in time for an association? What does it mean to be associated?   Is the association process the longest part of the time that is required to connect applications or is the delay from higher layers the dominant portion of the delay?

Due to a variety of technical requirements of PSC, currently available standards do not support the envisioned PSC applications and services.

JPKG: The technical requirements that are stated are vague, hence we cannot determine if the current standards do, in fact, not meet the requirements.

The new standard opens up markets with its unique features such as its multi rate information delivery, concurrent group communication, fast association and synchronization, high precision ranging, low latency, and other differentiating features all of which have not been feasible with single existing standard technology.

JPKG: Again, without specific requirements, it is not clear that existing standards are inadequate. The term concurrent group communications is not defined. Later there is some expansion of this idea, but again, without any specific numerical requirements to back it up. Furthermore, it is not clear that a single standard technology is required to solve these disparate requirements.

b) Multiple vendors and numerous users

The participation of members from various industry sectors and institutions including international wireless industry, academic researchers, system integrators, consumer electronics companies, and potential end users in the IEEE 802.15 PSC study group demonstrate the broad interest in the utilization of PSC technologies. The standard will be optimized to meet the cost and other requirements from these sectors to ensure broadening the markets and increasing the number of target users. Availability of the technology for use at reasonable license fee and a huge potential of new markets will be a base of benefits due to the economy of scale in the long term. The target user base will be large as indicated by the growing demand for ubiquitous connection without human interaction such as remote sensor, remote bio-monitoring and personal environment service.

JPKG: First of all, I am concerned that we are discussing what is a "reasonable license fee" in this group. I suspect that this is not a topic appropriate for discussion in IEEE standards development. But even more important is that the authors cannot possible guarantee "reasonable license fee" ~~for~~ a standard that has not yet been written. We have no idea what potential patents might apply to this unwritten standard and that the parties that may or may not have these patents are indeed willing to license under reasonable and non-discriminatory terms. Delete "Availability of the … in the long term."

c) Balanced costs (LAN versus attached stations)

The proposed project will be developed with the aim that the connectivity costs will be a reasonably small fraction of the cost of the target devices such as sensors, tags, human-interface devices, etc.

JPKG: The question is about balanced cost, not low cost. Please answer the question.

2. Compatibility

IEEE 802 defines a family of standards. All standards shall be in conformance with the IEEE 802.1 Architecture, Management, and Interworking documents as follows: 802 Overview and Architecture, 802.1D, 802.1Q, and parts of 802.1f. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with 802.1.

Each standard in the IEEE 802 family of standards shall include a definition of managed objects which are compatible with systems management standards.

This standard will be compatible with the IEEE 802 requirements of Architecture, Management, and Inter-networking documents as required. There is no specific technology feature anticipated in the standard that could preclude this compliance.

3. Distinct Identity

a) **Substantially different from other IEEE 802 standards**

Existing standards can provide parts of the envisioned PSC services, but no single standard provides all of dynamic scalability of link rates, group communication, high precision ranging, low latency, and fast association and synchronization adaptable to new services required to address the variety of personal space applications.

JPKG: We cannot evaluate the claim that the current standards are inadequate without specific numerical requirements for the areas listed.

i) **Dynamic scalability of broad range of link rates**
Diversified devices associated to a user in a personal space have their unique services and features demanding a variety of link rates. This fact requires link rates dynamically scalable to be adapted to abrupt service requests for personal environment control without human interruption. For this feature, dynamic link rate change will be inevitable with a new frame structure to assign radio resources temporally and spectrally adaptive to changing services.

JPKG: The requirement is for a variety of application data rates, not link rates. Link rates dynamically adjust to maintain application level requirements, i.e., to reduce error rates or extend range. An application can dynamically scale application level data rates by simply sending packets less often. Dynamic change to temporal and spectral radio resources is already supported in 802.11, 802.15.3, 802.15.3c and 802.16.

ii) **Concurrent group communication**
Multiple group communications can be simultaneously supported without interference. PSC provides dynamic grouping for concurrent delivery of information and abrupt changes of services without interruption of other services. Peer PSC devices can dynamically form a group without any central coordinator. A PSC device can quickly associate and synchronize with one or more groups.

JPKG: It is not clear what is meant by dynamic grouping. 802.16 has methods for broadcast and multi-cast. However, the requirement here is very vague. What are the services that need to be delivered? Why do these services need to be grouped? Why is a central coordinator a bad idea?

JPKG: It is physically impossible to have multiple wireless communications without interference. Any protocol that assumed that it can create an interference-free environment is broken.

iii) **Fast association and synchronization**
Not like today's lengthy procedure to get connected to a wireless network and authorized by a router or a server, a PSC device needs to quickly associate with any device or any group of devices which are ready to be

connected and provide services. The PSC standard will provide fast association and synchronization for both peer-to-peer and group communication while maintaining sufficient security.

JPKG: What is meant by "quickly"? 1 second? 15 seconds? Is the MAC/PHY association delay the gating item or is it delay from the upper layers? If it is the upper layers, then "fixing" the MAC/PHY association won't help. In order to define the requirements, the authors need to define the externally observable events that need to happen so that we can evaluate if the proposed standard can meet the specific timing requirements.

b) One unique solution per problem (not two solutions to a problem)

The PSC Standard will consist of one Medium Access Control and Physical Layer per problem. The standard will address a unique solution for PSC in free space.

c) Easy for the document reader to select the relevant specification

The proposed PSC standard will be a distinct document with clearly distinguishable specifications.

4. Technical Feasibility

a) Demonstrated system feasibility

There have been sufficient simulations, test results, and demonstrations verifying that PSC implementations are feasible.

JPKG: The prior statement does not answer the question. The authors need to provide specific, public documentation that shows system feasibility.

b) Proven technology, reasonable testing

There are examples of technology that are well proven both by laboratory testing and market acceptance today, which will allow the design and fabrication of PSC systems.

JPKG: The prior statement does not answer the question. The authors need to provide specific, public documentation that shows proven technology and reasonable testing.

c) Confidence in reliability

Previously demonstrated prototypes provide confidence in the reliability of the proposed project.

JPKG: The prior statement does not answer the question. The authors need to provide specific, public documentation that shows confidence in reliability.

A coexistence assurance document will be submitted to the 802.19 TAG.

5. Economic Feasibility

a) Known cost factors, reliable data

High volume devices and applications like mobile phones will enable a low cost source of PSC components. Development efforts for PSC will ensure a cost that is consistent with reasonable business strategy.

JPKG: Mobile phones are a poor comparison for 2.4 and 60 GHz systems that run up to 50 Mb/s. The range and data rates are dramatically different that the proposed solution. A better comparison would be to WiFi, Bluetooth and ZigBee.

JPKG: We should not be referring to a "business strategy" Delete the entire response and start over by comparing to existing products that are similar to the proposed solution.

b) Reasonable cost for performance

Based on performance and related costs of other systems which utilize the same core components, the estimates of the size, cost, and power requirements will meet the expectations.

JPKG: The authors have not identified the other systems that are comparable. Delete the entire response and replace with text that identifies similar systems that demonstrate reasonable cost for performance.

c) Consideration of installation costs

The PSC Standard objectives will have no impact on installation costs.