IEEE P802.15

**Wireless Personal Area Networks**

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| Project | Dependability Interest Group |
| Title | **Meeting Minutes for March 2021**  |
| Date Submitted | March 17th, 2021 |
| Source | [Ryuji Kohno1,2 Marco Hernandez1][1; YNU(Yokohama National University), Japan, 2; CWC University of Oulu, Finland] | Voice: +81 90 3061 7978E-mail: kohno@ynu.ac.jp Marco.hernandex@ieee.org |
| Re: | Meeting Minutes |
| Abstract | By the discussion in previous meetings, IG-DEP has been focusing on amendment of existing IEEE802.15.6-2012 for WBAN with enhanced dependability and has prepared draft PAR and CSD with detail technical requirement in cases of WBAN for medical use case for human body and for automotive use case for car and robotic bodies with their connected use cases. Necessity and demand for amendment of std.15.6 WBAN with enhanced dependability ; amendment in 15.6 MAC and PHY for contention and interference in case of overlaid same std. BANs, and co-exiting different UWB and narrow band wireless networks and bi-directional traffic of packets between senso, actuator nodes and coordinator for sensing and controlling feedback loop etc. and additional functionality. Corresponding to questions and comments of EC meeting for our draft of PAR and CSD for the amendment of IEEE802.15.6-2012, we have discussed revision of the PAR to prepare for motion to SG in closing session this week. In IG-DEP session, IEEE802.1 Chair and Vice-Chair were invited to study and refer TSN in MAC in the amendment. To avoid confliction with IG NG-UWB, we hold a joint session and have already consensus for harmonization. Preparation for motion to SG and timeline to next step in May and later meetings . |
| Purpose | Minutes of Dependability Electronic Plenary Session on Webex, March 2021 |
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**IG-DEP 1st Session**

**Wednesday, March 10th, 2021, PM, 7:00-9:00 EST**

**Room: Webex Virtual Conference**

* 1. Meeting called to order PM 7:00

By Chair Ryuji Kohno (YNU / CWC UofOulu)

* 1. Roll Call *Ryuji Kohno*

Announcement to attendance by using IEEE Attendance Tool (IEEE IMAT).

* 1. Opening Report doc.# 802. 15-21-0141-01-dep*Ryuji Kohno (YNU / CWC UofOulu)*

Chair showed IEEE Patent policy.

Chair issued Call for Potentially Essential Patents.

⇒ No essential intellectual property in the scope of IG DEP was declared.

Chair presented agenda of this meeting doc.# 802. 15-21-0142-01-0dep

⇒ Approved.

* 1. Approval of previous meeting minutes *Ryuji Kohno, Takumi Kobayashi (YNU)*

⇒ Upon no comments on the previous meeting minutes, doc. #15-21-0055-00-0dep was approved.

[Review of previous meetings and current state]

* 1. IG DEP Activity for Amendment of IEEE802.15.6 Wireless BAN with Enhanced Dependability, doc. #802. 15-21-0023-00-0dep, *Ryuji Kohno*
	2. Latest draft of PAR for amendment of IEEE802.15.6-2012 WBAN with Enhanced Dependability doc. #802. 15-21-0030-01 *Marco Hernandez*
* Which part we should discuss focusing on? Comment and question from EC? *(Ryuji Kohno)*
	+ Move onto 2.0 Review of questions, response, and discussion against doc.#802. 15-21-0154-00 (*Marco Hernandez*)
	1. *(Skipped)* Latest draft of CSD for amendment of IEEE802.15.6-2012 WBAN with Enhanced Dependability, doc. #802. 15-21-0088-00 *Marco Hernandez*
	2. *(Skipped)* Revised technical requirement focused on Amendment of IEEE802.15.6 WBAN, *Ryuji Kohno*
	3. *(Skipped)* Short descriptions of 4 SG formation requests from 802.15 WG, doc. #802. 15-21-0138-00 *Marco Hernandez*

[Discussion]

* 1. IG DEP Activity for Amendment of IEEE802.15.6 Wireless BAN with Enhanced Dependability, doc. #802. 15-21-0023-00-0dep, *Ryuji Kohno*
	2. Responses to EC's Comments in doc.#21-0138-00, doc. #802. 15-21-0154-00 *Marco Hernandez*
* Review of questions, response, and discussion against doc.#15-21-0154-00 *(Marco Hernandez)*
	+ On page 2, d), I am not thinking about peer-to-peer topology. One of 802.15.6 originality is one-plus-one hop. Peer-to-peer structure is difficult to guarantee dependability. BAN-to-BAN – coordinators negotiating each other is better. Let us discuss deeply later. *(Ryuji Kohno)*
	1. IG DEP Activity for Amendment of IEEE802.15.6 Wireless BAN with Enhanced Dependability, doc. #802. 15-21-0023-00-0dep, *Ryuji Kohno*
	2. Harmonization between IG DEP and IG NG-UWB, doc. #802. 15-21-0153-00 *Marco Hernandez*
	3. Recessed.

**Attendees list**

Attendees 41

* Ryuji Kohno (YNU / UofOulu)
* Yoshio Kashiwagi (Nissin Systems)
* Kenich Mori ( )
* Robert Muller
* Benjamin Rolfe Blind Creek Associates
* Chunyu Hu
* Clint Powell
* Jerome Henry (Cisco)
* Tetsushi Ikegami (Meiji Univ.)
* Jeng-Shiann Jiang
* Minsoo Kim (YNU)
* Ayman Naguib
* Carl Murray (Qorvo)
* Ersen Ekrem
* Ghiath Rias Al-Kadi (NXP)
* Henk de Ruijter (Sillicon Labs)
* Huan-Bang Li (NICT)
* Kamran Sayrafian
* Kiran Thimme Gowda (NXP)
* Takashi Kuromachi (LAPIS)
* Marco Hernandez
* Masayuki Hirata (
* Iwao Hosako (NICT)
* Paul Bromely
* Riku Pirhonen (NXP)
* Ryota Okumura (Kyoto Univ)
* Sang-Kyu Lim (ETRI)
* Shinichi Sato (Mobile Techno)
* Seiji Nakanishi
* Seong-Soon JooXiliang Luo (Apple)
* Yong Liu (Apple)
* Shang-Te Yang
* Sirvathsa (NXP)
* Takafumi Suzuki (NICT)
* Taeyoung Ha (Samsung)
* Takamitsu Hafuka
* Takumi Kobayashi (YNU)
* Yasuharu Amezawa (Mobile Techno)
* Oliver Holland
* Tuncer Baykas (Kadir Has Univ)
* Carlos Aldana

**IG-DEP and IG-NG-UWB Joint Session**

**Wednesday, March 11th 2021, PM 5:00-7:00 EST**

**Room: Webex Virtual Conference**

* 1. Meeting called to order PM 5:00

By Co-Chair Ryuji Kohno (YNU / CWC UofOulu)

* 1. Roll Call *Ryuji Kohno*

Announcement to attendance by using IEEE Attendance Tool (IEEE IMAT).

* 1. Opening Report *Ryuji Kohno*

Co-Chair presented agenda of this meeting, doc. #802. 15-21-0153-00-0dep

⇒ Approved.

[Review of Draft PARs of IG-NG-UWB and IG-DEP]

* 1. IG NG-UWB and IG DEP Harmonization, doc. #802. 15-21-0153-01-0dep, *Marco Hernandez*
* Question: activities planning of IG-DEP, given new possible standards of NG, NS? *(Clint Powell)*
	+ Answering to the questions or comments at the EC meeting and moving a motion to the closing plenary. *(Ryuji Kohno)*
	+ One point of view is a common PHY for all 3 possible standards. *(Benjamin Rolfe)*
	+ We already have some consensus throughout us. The reason of this joint session is getting opinions from audiences. (*Ryuji Kohno*)
* Question: the 15.4 MAC and the 15.6 MAC are completely different and cannot be easily mapped to each other. Because their frame formats are different, they would see each other’s frames as interference. *(Tero Kivinen)*
	+ Regarding how to prevent contention/interference, the 15.6 has hybrid MAC consist of contention-free and contention-based access. We can have some agreement of how to co-exist each other in the same field. *(Ryuji Kohno)*
	+ We are going to propose same PHY, compatible to each other. *(Marco Hernandez)*
	+ We are going to change 15.4 frame format and adjust 15.6 superframe format. *(Ryuji Kohno)*
* Question: operating band of IG-DEP? *(Chanyu Hu)*
	+ Operation band depends on regulation. In common sense, UWB band is 2.2 to 10.6 GHz. Low band overlaps ISM band and we need interference mitigation technology like DAA and so on.
* Question: general approach/strategy in mind? *(Chanyu Hu)*
	+ We cannot control every other system because there may be other UWB systems which are not IEEE standards but using contention-based protocol we can at least monitor channel. The 15.4 and 15.6 standards in same 802.15 group may easily collaborate. *(Ryuji Kohno)*
* Question: use cases? *(Chanyu Hu)*
	+ The 15.6 mainly focus on medical applications such as combating COVID-19 which is an urgent issue. Automotive application is also considered in a sense of not only human body but also vehicle body. *(Ryuji Kohno)*
	+ Use case of NG-UWB is diverse. *(Benjamin Rolfe)*
* Question: define of dependability and how to evaluate, in a technical viewpoint? *(Chanyu Hu)*
	+ Technical requirements and 5 criteria are set in PAR and CSD. Dependability is a general term and hard to explain quickly. One important concept is guaranteeing the worst-case performance not only average performance. *(Ryuji Kohno)*
* Question: is DAA actually used in the field and do people test it? *(Carlos Aldana)*
	+ DAA is required by regulation. In case of Japan, authorities such as NICT may be checking DAA functionality and so on, but it depends on regions or countries. *(Ryuji Kohno)*
* Question: are there documented use cases of each IG which can be compared? Use cases might not be similar and channel characteristic might be different. *(Kamran Sayrafian)*
	+ There may be a possibility of common PHY for wide variety of use cases. *(Benjamin Rolfe)*
	+ There are typical overlaid use cases in both medical and automotive. *(Ryuji Kohno)*
	1. Short description of 4 SG formation requests from 802.15 WG, doc. #802 15-21-0138-00 *Marco Hernandez*
* Question: is new PHY expected to backward compatible to 3 other PHYs? *(Carlos Aldana)*
	+ The 2 of 3 PHYs are UWB. Focus is especially placed on the impulse radio UWB. *(Benjamin Rolfe, Ryuji Kohno)*
* Question: The coordinator of BAN should have capability of both UWB and narrowband PHYs. Does new UWB PHY still has to work with narrowband? *(Kamran Sayrafian)*
	+ Yes, the coordinator can coordinate the contention of different narrowband and ultra-wideband packet. *(Ryuji Kohno)*
* Question: so much emphasis is placed on UWB and narrowband. Is HBC also important? *(Kamran Sayrafian)*
	+ Personally I don't think so. HBC is prohibited in medical device regulation except for one country. *(Ryuji Kohno)*
	1. Recessed. (PM 06:20)

**Attendees list**

Attendees >35

* Ryuji Kohno (YNU / UofOulu)
* Benjamin Rolfe (Blind Creek Associates)
* Marco Hernandez
* Ayman Naguib
* Bernhard Großwindhager
* Billy Verso (Qorvo)
* Carl Murray (Qorvo)
* Carlos Aldana
* Chunyu Hu
* Clint Powell
* David Barras
* Dominic Deslandes (Spark Microsystems)
* Ersen Ekrem
* Frank Leong (NXP)
* Fredric Nabki (Spark Microsystems)
* Ghiath Rias al-Kadi (NXP)
* Igor Dotlic (Qorvo)
* James Pace
* Kamran Sayrafian
* Kenichi Mori
* Kiran Thimme Gowda (NXP)
* Larry Zakaib
* Robert Müller
* Takumi Kobayashi (YNU)
* Tero Kivinen
* Tetsushi Ikegami (Meiji University)
* Masayuki Hirata
* Minsoo Kim (YNU)
* Mohammad Rahmani (Spark Microsystems)
* Paul Kettle
* Phil Beecher
* Raphael Guimond (Spark Microsystems)
* Riku Pirhonen (NXP)
* Ryota Okumura (Kyoto University)
* Srivathsa (NXP)

**IG-DEP 2nd Session**

**Wednesday, March 11th 2021, PM 7:00-9:00 EST**

**Room: Webex Virtual Conference**

* 1. Meeting called to order PM 7:00

By Chair Ryuji Kohno (YNU / CWC UofOulu)

* 1. Roll Call *Ryuji Kohno*

Announcement to attendance by using IEEE Attendance Tool (IEEE IMAT).

* 1. Opening Report *Ryuji Kohno*

Chair presented agenda of this meeting, doc. #802. 15-21-0142-01-0dep

⇒ Approved.

[Review of Discussion in Joint Session with IG-NG-UWB]

* 1. Definition of Dependability in IEEE802.15.6: Feasible Technologies for Enhanced Dependability of WBAN, doc. #802. 15-19-0157-03-0dep, *Ryuji Kohno*
* “Dependability in network” means to guarantee lowest performance enough high in a sense of highly reliable, safe, secure, fault tolerant, robust services in any predictable and even unpredictable worse environments.
	1. High QoS for Medical Use Case: Requirement for Wireless Medical BAN to Apply for ECoG-based Brain-Machine Interface, doc. #802. 15-19-0419-01 *Ryuji Kohno*
	2. High QoS for Vehicular Use Case: Overview of IG-DEP Activities on Enhanced Dependability in Wireless Networks for Automotive and Other Use Cases, doc. #802. 15-18-0311-01, *Ryuji Kohno*

[Discussion]

* 1. Responses to EC's Comments in doc. #802. 15-21-0138-00, doc. #802. 15-21-0154-00 *Marco Hernandez*
* Question: does positioning of devices means collaborative positioning by BAN nodes or GPS-like one? Potential use case in mind? (*Kamran Sayrafian*)
	+ In typical usage of 15.4z, positioning can be achieved by measuring distances from 3 anchor nodes to the user node. In 15.6, UWB ranging capability can be used for medical situation. (*Ryuji Kohno*)
	1. Architecture in IEEE 802.1, doc. #802. 15-21-0154-00 *Marco Hernandez*
	2. Update draft of PAR for amendment of IEEE802.15.6-2012 WBAN with Enhanced Dependability, doc.#802. 15-21-0030-01-0dep *Marco Hernandez*
* Question: is Brain Computer Interface the use case here? BCI date rate is over 60 Mbps. Is there other use cases require over 50 Mbps? *(Kamran Sayrafian)*
	+ Yes, Brain Machine Interface is one of the use cases. Yes, over 50 Mbps is ideal for BMI, but is compromised to 47 Mbps considering feasibility of current available devices and so on. If new device appears than the standard can be renewed. There are more than one sensor in a BAN, so the 50 Mbps is aggregated data rate. The 50 Mbps is also a boundary of high/low data rate which became feasible now. (*Ryuji Kohno*)
	1. Update draft of CSD for amendment of IEEE802.15.6-2012 WBAN with Enhanced Dependability, doc.#802. 15-21-0088-00-0dep *Marco Hernandez*
	2. Recessed. (PM 10:32)

**Attendees list**

Attendees 38

* Ryuji Kohno (YNU / UofOulu)
* Marco Hernandez
* Iwao Hosako (NICT)
* Benjamin Rolfe (Blind Creek Associates)
* Carlos Aldana
* Clint Powell
* Chunyu Hu
* Daoud Serang
* Ersen Ekrem
* Frederic Nabki (Spark Microsystems)
* George Taylor (Spark Microsystems)
* Hitoshi Tanaka
* Huan-Bang Li (NICT)
* Jack Zou
* James Pace
* Jeng-Shiann Jiang (Vertexcom)
* Juha Juntunen (Meteorcomm)
* Kamran Sayrafian
* Kiran Thimme Gowda (NXP)
* Kenichi Mori
* Larry Zakaib (Spark Microsystems)
* Masayuki Hirata
* Minsoo Kim (YNU)
* Mohammad Rahmani (Spark Microsystems)
* Nicolas Paillusseau (Spark Microsystems)
* Paul Bromley
* Paul Kettle
* Raphael Guimond (Spark Microsystems)
* Riku Pirhonen (NXP)
* Sang-Kyu Lim (ETRI)
* Shinichi Sato (Mobile Techno)
* Seong-Soon Joo
* Shang-Te Yang
* Suzuki
* Takumi Kobayashi (YNU)
* Tetsushi Ikegami (Meiji University)
* Yasuharu Amezawa (Mobile Techno)
* Yong Liu (Apple)

**IG-DEP 3rd Session**

**Monday, March 15th 2021, PM 7:00-9:00 EDT**

**Room: Webex Virtual Conference**

* 1. Meeting called to order PM 7:00

By Chair Ryuji Kohno (YNU / CWC UofOulu)

* 1. Roll Call *Ryuji Kohno*

Announcement to attendance by using IEEE Attendance Tool (IEEE IMAT).

* 1. Opening Report *Ryuji Kohno*

Chair issued Call for Potentially Essential Patents

⇒ No essential intellectual property in the scope of IG-DEP was declared.

Chair presented agenda of this meeting, doc. #802. 15-21-0142-04-0dep

⇒ Approved.

* 1. Short Overview of IG-DEP Activity for Amendment of IEEE 802.15.6 BAN with Enhanced Dependability, doc. #802. 15-21-0023-00-0.dep *Ryuji Kohno*
* Question: Deployed devices using 15.6 technology? *(Carlos Aldana)*
	+ Feasible devices that are meeting our CSD are already in the market and we are expecting new devices too. Devices using the same UWB PHY but different MAC based on different standards such as 15.4a, f, and z could be applicable and adapt radio resources. (*Ryuji Kohno*)
	1. Short descriptions of 4 SG formation requests from 802.15 WG, doc. #802. 15-21-0138-00-0dep Marco Hernandez
	2. Responses to EC's Comments in doc. #802. 15-21-0138-00, doc. #802. 15-21-0154-00-0dep *Marco Hernandez*
	3. Solution for Harmonization between IG-DEP and IG-NG-UWB, doc. #802. 15-21-0153-00-0dep, *Marco Hernandez*
* Question: Goal differences between NS, NG, and DEP? *(Carlos Aldana)*
	+ DEP is primary focusing on medical and healthcare use-cases mainly, covering MAC protocol to be more dependable. NG-UWB covers 15.4 MAC, which is contention based. DEP is also covering secondary use-case – vehicular, because medical and vehicular market are not independent as in case of elderly drivers. (*Ryuji Kohno*)

[Discussion]

* 1. Introduction of Time-Sensitive Network (TSN) Task Group of IEEE 802.1, <https://1.ieee802.org/tsn/> *Glenn Parsons*
* We wish to use MAC or some other methods of TSN. *(Ryuji Kohno)*
	1. Presentation: Time-Sensitive Network Basic Concepts, *Max Turner*
* Despite of terminology differences, there are lots of similarities in concepts. There would also be lots of technical parts which can be shared too. *(Minsoo Kim)*
* For the deterministic situation, we are proposing more dependable contention-free and contention-based MAC protocols with priority level which should be defined to guarantee the Quality of System. We may follow or harmonize and propose interoperable system with TSN. *(Ryuji Kohno)*
* Our focus in TSN is on reliability within a packet network, how is the dependability retained in the network ecosystem, the requirements and TNS capabilities within the particular ecosystem – such as a car ecosystem. *(Glen Parsons)*
* Your concepts are great. Because we are focusing on quite similar issues, we wish to collaborate on secure, dependable and error probability issues. *(Ryuji Kohno)*

[Update of PAR and CSD]

* 1. New Version of draft of PAR for amendment of IEEE802.15.6-2012 WBAN with Enhanced Dependability, doc. #802. 15-21-0030-01-0dep *Marco Hernandez*
* I think we should add some more description about how to collaborate with 802.1 TSN. *(Ryuji Kohno)*
* We are now planning on clinical test of Brain-Machine Interface devices to realize real-world device. Medical data requires highly reliable and low latency data transmission, so setting highest priority on medical use case is reasonable. *(Masayuki Hirata)*

⇒ Modification approved.

* 1. Recessed. (PM 8:57)

**Attendees list**

Attendees 31

* Ryuji Kohno (YNU / UofOulu)
* Marco Hernandez
* A Rocha
* Carlos Aldana
* Clark Palmer (Meteorcomm)
* Ersen Ekrem
* Fredric Nabki (Spark Microsystems)
* Glenn Parsons (Ericsson)
* Hideyuki Kuribayashi (Rohm)
* Hitoshi Tanaka
* Huan-Bang Li (NICT)
* Jack Zou
* James Pace
* Kamran Sayrafian
* Masayuki Hirata
* Max Turner (Ethernovia)
* Minsoo Kim (YNU)
* Raphael Guimond (Spark Microsystems)
* Robert Müller
* Sang-Kyu Lim (ETRI)
* Shigenobu Sasaki
* Shinichi Sato (Mobile Techno)
* Seong-Soon Joo
* SK
* T. Suzuki (NICT)
* Taeyoung Ha (Samsung)
* Takashi Kuramochi (LAPIS)
* Takumi Kobayashi (YNU)
* Tetsushi Ikegami (Meiji University)
* Yasuharu Amezawa (Mobile Techno)
* Yong Liu (Apple)