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Type of Project: New IEEE Standard

PAR Request Date: 17-Sep-2015

PAR Approval Date:

PAR Expiration Date:

Status: Unapproved PAR, PAR for a New IEEE Standard

1.1 Project Number: P802.15.12

1.2 Type of Document: Standard

1.3 Life Cycle: Full Use

2.1 Title: Upper Layer Interface (ULI) for IEEE 802.15.4 Low-Rate Wireless Networks

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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4.1 Type of Ballot: Individual

4.2 Expected Date of submission of draft to the IEEE-SA for Initial Sponsor Ballot: 12/2017

4.3 Projected Completion Date for Submittal to RevCom: 08/2018

5.1 Approximate number of people expected to be actively involved in the development of this project: 100

5.2 Scope: This standard defines an Upper Layer Interface (ULI) sublayer in Layer 2 (L2), between Layer 3 (L3) and the IEEE 802.15.4 Media Access Control (MAC) sublayer. The ULI provides interfaces for data, control, and management information. The ULI adapts L3 protocols and provides operational configuration including network and regulation requirements of the IEEE 802.15.4 MAC. Furthermore, the ULI integrates upper Layer 2 sub-layer (L2+) functionalities focused on interfacing to IEEE Std 802.15.4 such as Key Management Protocols (KMP), L2 routing (L2R) protocols, and Internet Engineering Task Force (IETF) 6TiSCH Operation Protocol (6TOP) for optional use. Finally, the ULI provides protocol differentiation, using mechanisms such as EtherType, to support multiple, diverse higher layer protocols.

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

5.4 Purpose: This standard integrates sublayer protocols developed to support the IEEE 802.15.4 MAC and harmonize their ancillary functionality, e.g. fragmentation and protocol differentiation, along with providing the IEEE 802.15.4 MAC and physical layer (PHY) configuration that is required by IEEE Std 802.15.4.

5.5 Need for the Project: As IEEE 802.15.4 devices have become widely deployed, deficiencies in IEEE Std 802.15.4 became apparent as an expanding set of applications were addressed. To address these deficiencies numerous L2+ protocols were independently developed to interface to the IEEE 802.15.4 MAC sublayer. These L2+ protocols, such as KMP, L2R, 6TOP, and network layer abstraction, often replicate ancillary functionality, e.g. fragmentation and protocol differentiation, in an inconsistent and often incompatible manner. The ULI is needed to harmonize the L2+ sublayer protocols and provide necessary IEEE 802.15.4 MAC and PHY configuration to:

* Enable IEEE 802.15.4 devices to support multiple diverse higher layer protocols by using mechanisms such as EtherType and also

fragmentation to allow longer datagrams/packets

- * Integrate L2+ protocols that interface to the IEEE 802.15.4 MAC providing services such as KMP, L2R, and 6TOP
- * Enhance L3 internet protocol (IP) connectivity by providing L3 IP abstraction
- * Fulfill IEEE 802.15.4 MAC and PHY configuration needs for operation such as:
 - * network configuration
 - * configuration for regulatory requirements
 - * channel configuration
 - * transmit power control configuration
 - * modulation encoding configuration

5.6 Stakeholders for the Standard: The stakeholders include silicon vendors, manufacturers and users of telecom, medical, environmental, energy, and consumer electronics equipment and manufacturers and users of equipment involving the use of wireless sensor and control networks

Intellectual Property

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?: Yes

If yes please explain: As noted in the scope and need for the project, this standard provides mechanism(s) for multiple diverse higher layer protocols such as EtherTypes for IEEE 802.15.4. However, since IEEE 802.15.4 is stringent on small packet lengths, this standard will also provide mechanisms for compression of higher layer headers.

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

7.2 Joint Development

Is it the intent to develop this document jointly with another organization?: No

8.1 Additional Explanatory Notes (Item Number and Explanation): 5.2 Scope:

1) Examples of network configuration include:

- * Selection of the network to join
- * Choosing either beacon-enabled (superframe structure and the necessary parameters) or nonbeacon-enabled
- * Short address assignment
- * Low energy operation such as battery life extension, coordinated sample listening, receiver initiated transmission
- * Mode of operation such as Deterministic and Synchronous Multi-channel Extension (DSME), Time Scheduled Channel Hopping (TSCH), Low Energy Critical Infrastructure Monitoring (LECIM)

2) Examples of configuration for regulation requirements include:

- * PHY configuration as per country of operation such as channel, transmit power level, and modulation
- * Device classes
- * Duty cycle constraints
- * Clear Channel Assessment (CCA) settings such as duration, threshold level, and CCA mode

5.5 Need for the Project:

- 1) Selection of whether fragmentation is needed and if so what datagram size is needed is dependent upon the IEEE 802.15.4 MAC and PHY configuration. Accordingly, the ULI is the appropriate place to determine fragmentation settings.
- 2) Integrating L2+ protocols prevents conflicts between those protocols that would result in undesired behavior.