
IEEE P802.15
Wireless Personal Area Networks

Project IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Title **SG LECIM 5C draft15-September-2010**

Date 2 October 2010
Submitted

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Re: Low Energy Critical Infrastructure Monitoring Study Group

Abstract SG LECIM5C draft

Purpose Draft document for study group

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FIVE CRITERIA

1. Broad Market Potential

A standards project authorized by IEEE 802 shall have a broad market potential. Specifically, it shall have the potential for:

- a) Broad sets of applicability.*
- b) Multiple vendors and numerous users.*
- c) Balanced costs (LAN versus attached stations).*

a) Broad sets of applicability:

There is significant interest for Low Rate Wireless Personal Area Networks (WPAN-LR) in the low energy critical infrastructure monitoring market. Examples of applications in this market are:

Water leak detection, wastewater monitoring, bridge/structural integrity, streetlight control systems, faulted circuit indicators, soil monitoring, oil & gas pipeline monitoring

b) Multiple vendors and numerous users:

There are a number of vendors that provide variety of proprietary solutions for LECIM applications. Standardization is needed for interoperability.

The breadth of membership of this WPAN Low Rate Study Group, demonstrates the interest in this class of WPANs. Members include international wireless industry leaders, academic researchers, semiconductor manufacturers, system integrators, and end users. Already there are many vendors addressing LECIM wireless networks and are promoting the current study group.

The target user base will be large as indicated by the growing demand for wireless monitoring of almost all devices.

c) Balanced costs (LAN versus attached stations):

The proposed amendment to 802.15.4 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, and other monitoring devices.

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.

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

This amendment will not affect the IEEE 802.15.4 standard's compliance with the IEEE 802. Architecture, Management, and Interworking documents as required. There is no specific technology feature anticipated in the amendment that could preclude this compliance.

3. Distinct Identity

Each IEEE 802 standard shall have a distinct identity. To achieve this, each authorized project shall be:

- a) Substantially different from other IEEE 802 standards.*
- b) One unique solution per problem (not two solutions to a problem).*
- c) Easy for the document reader to select the relevant specification.*

a) Substantially different from other IEEE 802 standards:

802.15.4 uniquely supports wireless sensor and control application. Without this amendment, 802.15.4 will not adequately support the low energy critical infrastructure monitoring application requirements such as:

- Simultaneous operation for at least 8 co-located orthogonal networks
- Propagation path loss of at least 120 dB
- Extreme difference in capabilities and performance between endpoint devices and coordinating devices (collectors)
 - coordinator may support all standardized modulations (MCS) and data rates
 - coordinator may be required to support antenna diversity or antenna beam steering
 - end point must be able to conserve energy
- Reliable operation in dramatically changing environments (no control over environment)
 - e.g. increased interference due to urban build out, placement of interfering transmitter tower near devices, new chain-link fence

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

The proposed amendment to 802.15.4 will provide a unique solution for the low energy critical infrastructure monitoring market.

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

The proposed amendment to 802.15.4 will be a clearly distinguishable specification.

4. Technical Feasibility

For a project to be authorized, it shall be able to show its technical feasibility. At a minimum, the proposed project shall show:

- a) Demonstrated system feasibility.*
- b) Proven technology, reasonable testing.*
- c) Confidence in reliability.*

a) Demonstrated system feasibility.

Many systems are in operation have been built using proprietary Wireless SCADA, cellular technology and other proprietary technologies such as high processing gain DSSS, and narrowband licensed systems.

b) Proven technology, reasonable testing.

The main components of radio technology and signaling are in use today.

c) Confidence in reliability.

There are a variety of proprietary systems in operation today, and their reliability is factored into the services offered.

Coexistence of 802 wireless standards specifying devices for unlicensed operation

The WG will create a coexistence assurance document as a part of the WG balloting process.

5. Economic Feasibility

For a project to be authorized, it shall be able to show economic feasibility (so far as can reasonably be estimated), for its intended applications. At a minimum, the proposed project shall show:

- a) Known cost factors, reliable data.*
- b) Reasonable cost for performance.*
- c) Consideration of installation costs.*

a) Known cost factors, reliable data.

High volume critical infrastructure monitoring applications will drive volume production and provide a low cost source of components. IEEE802.11, 802.15.1, 802.15.4 are examples of the industry's ability to create low cost radios.

b) Reasonable cost for performance.

Based on test results, prototype, and production solutions, the estimates meet expected size, cost, and power requirements. The cost and performance of single chip radios such

as 802.15.4 is well understood, and this amendment is expected to have a similar complexity.

c) Consideration of installation costs.

For LECIM applications, the infrastructure is typically professionally installed. The standard will address the needs of professional installer in addition to providing for non-skilled installation.