

PAR FORM

PAR Status: New PAR (Unapproved PAR)

PAR Approval Date:

PAR Signature Page on File: No

1. Assigned Project Number: P1902

2. Sponsor Date of Request: 2006-02-16

3. Type of Document: Standard for

4. Title of Document:

Draft: RuBee Standard for Long Wavelength Network Protocol

5. Life Cycle: Full-Use

6. Type of Project:

6a. Is this an update to an existing PAR? No

6b. The Project is a: New Standard

7. Working Group Information:

Name of Working Group: RuBee Working Group

Approximate Number of Expected Working Group Members:15

8. Contact information for Working Group Chair:

Name of Working Group Chair: John Stevens

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9. Contact information for Co-Chair/Official Reporter, Project Editor or Document Custodian if different from the Working Group Chair:

Name of Co-Chair/Official Reporter, Project Editor or Document Custodian:

Telephone: **FAX:**

Email:

10. Contact information for Sponsoring Society or Standards Coordinating Committee:

Name of Sponsoring Society and Committee: IEEE-SA Board of Governors Corporate Advisory Group

Name of Sponsoring Committee Chair: Chuck Adams

Telephone: 914-765-4382 **FAX:** 914-765-4420

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Name of Liaison Rep. (if different from the Sponsor Chair):

Telephone: **FAX:**

Email:

Name of Co-Sponsoring Society and Committee:

Name of Co-Sponsoring Committee Chair:

Telephone: **FAX:**

Email:

Name of Liaison Rep. (if different from the Sponsor Chair):

Telephone: **FAX:**

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11. The Type of ballot is: Entity Sponsor Ballot

Expected Date of Submission for Initial Sponsor Ballot: December 2006

12. Projected Completion Date for Submittal to RevCom: October 2007

Target Extension Request Information for a Modified PAR whose completion date is being extended past the original four-year life of the PAR:

13. Scope of Proposed Project:

The project will develop a physical layer and data link layer protocol standard for long wavelength (< 450Khz), low speed (300-9600 Baud), low power, medium range (50' to 100') industrial visibility networks. It will fill a gap between non-network-based RF-ID standards (e.g., ISO/IEC CD 15961-3, ISO 18000-6C or 7) and existing high bandwidth network standards such as IEEE 802.11 a,b,g and IEEE 802.15.4 e.

Is the completion of this document contingent upon the completion of another document? No

14. Purpose of Proposed Project:

The purpose of this project is to produce a protocol standard for use in applications where bandwidth is not an issue; but low cost, high tag (client) count, long battery life and use in harsh environments (near steel and water) are key performance criteria. Example applications include visibility of medical devices in hospitals, patient and physician visibility in OR's, product visibility in retail stores, and livestock visibility. Many cost-sensitive, power "limited" applications exist (e.g., most industrial visibility networks) that may not require high bandwidth, yet do require real-time, peer-to-peer networking with extended battery life. The purpose of the proposed standard will be to provide a definition for full physical interoperability for all components (chips, tags, routers, and handhelds) within a long-wavelength network.

15. Why Needed for the Proposed Project:

This proposed project will enable a standard for low speed, low cost sensor and visibility networks in harsh environments, with battery/power source lives of over 10 years. The standard is necessary so a variety of manufactures can manufacture devices that can reliably work together in the field. Current RF-ID tags use a non-radiating, back-scattered communications mode. This has the advantage of eliminating the battery, crystal and other external components, so tags are low cost, but often require a high cost (> \$1,000) base station and with no tag networking capabilities. In contrast, IEEE 802.11 uses a radiating transceiver mode and lower cost routers (< \$100.00) and base stations. IEEE 802.11 "tags" or clients may have near-unlimited memory with flexible IP addresses and modest cost (\$10-\$30). However, power requirements for high frequencies used by IEEE 802.11, lead to short battery lives (days/months). Additionally, IEEE 802.11 was designed for managing high bandwidth, high volume data from a relatively few clients. The IEEE 802.11 protocol is not optimal for low bandwidth visibility networks. Many visibility networks require 1000's to 10,000's of IP addresses (tags) within a small network (e.g. shelf of products), but have low data volume, low bandwidth requirements, require long battery life (years). IEEE 802.11 performance often becomes unacceptable as tag count increases within a network. 802.15.4 e has an improved battery life but still limited to a few months and similar client/tag count networking issues. Some 802.15.4 e devices may consume less than 8 milliamps, while most IEEE 802.11 systems are in 100's of milliamps. Finally, both IEEE 802.11 and 802.15.4 e make use of frequencies over one gigahertz, which cannot perform near liquids and fail near steel. The use of spread spectrum has improved harsh environment performance, though it remains a serious issue and limitation for use in harsh environment industrial visibility networks. New long-wavelength (LW under 450Khz) power efficient designs have made it possible to create active transceivers that function like 802.15.4 e and IEEE 802.11, with IP addresses and peer-to-peer, on-demand, communications, with an acceptable range to work as a local network. These LW tags are slow compared to other standards (300-9600 baud), but have a field-proven 10-year or longer battery life using a quarter-sized CR2525 Li battery. Current LW systems use a protocol known as RuBee IV, and consume only a few microamps in standby and less than 1 milliamp in active mode. RuBee tags may be fully programmable using low cost 4-bit processors capable of encryption and decryption and complex functions associated with managing IP addresses (DCHP, ARP). LW systems, offer the advantage of low cost tags and low cost base stations (< \$100). Moreover, because LW tags have a power source, they may optionally be equipped with sensors, sRAM, displays, LEDs and may also be low in cost (< \$2 per tag). Some Rubee protocol designs also eliminate the battery and cost about 15 cents with a reduced range. Networks of thousands of peer-to-peer LW tags work reliably as a visibility network.. LW tags are not affected by liquids, can be used underwater or as an implantable device, and are minimally affected by steel. LW industrial visibility networks may be used to provide visibility on or near steel shelves and in harsh environments such as operating theaters (rooms), oil and chemical plants, warehouses and retail stores. Long wavelength, low bandwidth visibility systems and sensor networks are currently in use at industrial installations. Pilot systems are installed in several major retailers as in-store inventory visibility systems, in hospitals to provide medical device visibility, other healthcare applications providing real-time inventory visibility of high valued products throughout distribution, in agriculture applications providing visibility and age verification for cattle, and in other industries providing identity systems and visibility systems for patients, physicians, policemen, firemen, correctional officers and corporate employees. Thus, in summary, long wavelength, radiating transceiver-based networks of radio tags have the disadvantages of low bandwidth. They have the advantage of low cost clients, low cost base stations and routers, a long battery life tags, high client/tag counts within a single network, and work in harsh environments (near steel and water). Long wavelength protocols will not work for network computer applications, but do have a niche use in industrial, agriculture and healthcare, visibility networks. The long-term potential of industrial long wavelength visibility networks using this technology is potentially large, but also new and unexplored. A well thought-out IEEE standard will be essential to facilitate the growth of this commercial market.

16. Intellectual Property:

a. Has the IEEE-SA policy on intellectual property been presented to those responsible for preparing/submitting this PAR? No 0000-

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The policy will be presented formally to the Working Group at their first meeting.

b. Is the sponsor aware of copyright permissions needed for this project? Yes

This document is based on a specification from Visible Assets who will provide required LOA.

c. Is the sponsor aware of trademarks that apply to this project? No

d. Is the sponsor aware of possible registration activity related to this project? No

17. Are there other documents or projects with a similar scope? No

Similar Scope Project Information:

18. Is there potential for this document (in part or in whole) to be adopted by another national , regional or international organization? Do not know at this time

If yes, the following questions must be answered:

Organization Name?

Technical

Committee

International

Contact

Information?

19. Will this project result in any health, safety, or environmental guidance that affects or applies to human health or safety? No

If yes, please explain:

20. Sponsor Information

a. Is the scope of this project within the approved/scope/definition of the Sponsor's Charter? Yes

If no, please explain:

b. The Sponsor's procedures have been accepted by the IEEE-SA Standards Board Audit Committee? Yes

21. Additional Explanatory Notes: (Item Number and Explanation)