**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title | Positive Train Control 5 Criteria |
| Date Submitted | [December 14, 2011] |
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| Re: |  |
| Abstract | [5 Criteria draft for the SG PTC.] |
| Purpose | [Working document for the 5 Criteria to the P802.15 PTC Group] |
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**Five Criteria - 802.15 PTC, Amendment to 802.15.4 current revision**

**1. Broad Market Potential**

 **a) Broad sets of applicability.**

Development of a 802.15 Positive Train Control standard will not only have immediate applicability to the federally mandated PTC that must be in operation by end of 2015, but may also find broad applicability in other transportation industries that interact with the rail system. As well, with the establishment of a 802.15 PTC standard, this may encourage use of other existing or in-process standards for low data rate command and control applications, including Smart Utility Networks 15.4g, Low-Energy Critical Infrastructure Monitoring 15.4k, that address components that might be of use to a future expanded transportation monitoring system.

 **b) Multiple vendors and numerous users**

* Spectrum Holders (FCC, Spectrum Bridge, PTC 220 LLC, AMTS Consortium LLC, Telesaurus VPC LLC, Intelligent Transportation & Monitoring Wireless LLC, Skybridge Spectrum Foundation, Warren Havens)
* Freight and Passenger Railroads (Canadian National, Canadian Pacific, CSX, BNSF, Norfolk Southern, Union Pacific, Kansas City Southern, Alaska Railroad, Amtrak, CRSH, KTC, Long Island Railroad, MARC,MBTAA,MNCW, MNRR, New Jersey Transit, New Mexico Railrunner, San Diego Northern Railroad, NIRC,NICD,PCMZ,PATH,SCR,SEPTA,SCAX, TMEV, TRE, UFRC,VREX)
* Device, component, and systems suppliers (GE Transportation, Invensys, Ansaldo-STS, Thales, Boeing, Lockheed Martin, Tait, Simrex, RF Neulink, GE, Kenwood, Motorola Solutions, Lilee Systems, California Amplifier, ICOM, Yaesu/Vertex, Meteorcomm, and many more)

 **c) Balanced costs (LAN versus attached stations)**

Based upon the known costs of existing or planned IEEE 802.15-compliant devices, the proposed standard can be implemented with connectivity costs that are reasonably small as compared to the cost of devices or the value of the applications served.

**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 802requirements 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**

1. **Substantially different from other IEEE 802 standards**

There are no other IEEE 802 projects specifically addressing narrow channel width, high QoS, low-data-rate operation optimized for use in high-mobility (500km/h vehicle to fixed device, 1000km/h vehicle to vehicle) device command and control applications.

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

An optimized wireless solution specifically designed for command and control applications has not been anticipated by any other wireless standard where the focus has been on delivering robust control communications capability, similar to other IEEE 802.15.4 efforts, but in a high-mobility environment. Consequently, this is the only optimized solution to this particular problem.

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

The proposed standard will produce an amendment to the IEEE 802.15.4 specification.

**4. Technical Feasibility**

 **a) Demonstrated system feasibility**

Existing train communications and control protocols (including ITCS, ACSES, and ETMS) have been implemented and are operational. Use of unlicensed band IEEE 802.11 (WiFi) to provide data transfer in terminal and yard areas from wayside to onboard is successfully operating. Testing in the “220 MHz” band is ongoing at the American Association of Railroads (AAR) Transportation Technology Center (TTC). Operations in 44 MHz spectrum have demonstrated some aspects of the required functionality, at speeds up to 50 mph (80km/h). Higher speed operations are unknown, and as a matter of record, no feasibility studies have been accomplished and made publically available.

 **b) Proven technology, reasonable testing**

The technologies mentioned in a) above

 **c) Confidence in reliability**

To be completed.

 **d) Coexistence of 802 wireless standards specifying devices for unlicensed operation**

As the 216-222 MHz spectrum allocations in the United States allow only licensed operation, there is no expectation that there will be an issue with coexistence of other IEEE 802 wireless standards devices that are not licensed for these allocations.

**5. Economic Feasibility**

 **a) Known cost factors, reliable data**

To be completed.

 **b) Reasonable cost for performance**

To be completed.

 **c) Consideration of installation costs**

Devices compliant to a future IEEE 802.15 PTC specification will have no impact on individual device installation costs, and will likely reduce over time system-level implemention costs based on the reduction in required infrastructure.