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Submittal Email: vivekggupta@ieee.org
Type of Project: Amendment to Standard 802.21
1.1 Project Number: 802.21c
1.2 Type of Document: Standard for
1.3 Life Cycle: Full
1.4 Is this project in ballot now? No
2.1 Title of Standard: Standard for Local and Metropolitan Area Networks: IEEE Media Independent Handover Services – Amendment: Optimized Single Radio Handovers
3.1 Name of Working Group: Media Independent Handoff Working Group(C/LM/WG 802.21)
Contact information for Working Group Chair Vivek Gupta 4945 Bridgeview Lane, San Jose, CA 95138 US vivekggupta@ieee.org
Working Group Vice Chair Subir Das One Telcordia Drive Piscataway, NJ 08854 US subir@research.telcordia.com
3.2 Sponsoring Society and Committee: IEEE Computer Society/Local and Metropolitan Area Networks (C/LM) Contact information for Sponsor Chair: Paul Nikolich 18 Bishops Lane Lynnfield, MA 01940 US p.nikolich@ieee.org Contact information for Standards Representative:
4.1 Type of Ballot: Individual
4.2 Expected Date of Submission for Initial Sponsor Ballot: 2011-03
4.3 Projected Completion Date for Submittal to RevCom: 2012-03
5.1 Approximate number of people expected to work on this project: 25
5.2 Scope of Proposed Standard:

This amendment defines enhancements to enable optimized single radio handovers between heterogeneous IEEE 802 wireless technologies and extend these mechanisms for single radio handovers between IEEE 802 wireless technologies and cellular technologies. These enhancements will be based on media access independent mechanisms.

5.3 Is the completion of this standard dependent upon the completion of another standard: No
If yes, please explain:

5.4 Purpose of Proposed Standard:

The purpose of this amendment is to enhance the user experience by enabling optimized single radio handover solutions between heterogeneous networks. This standard defines mechanisms to reduce latency and enable service continuity during handover.

5.5 Need for the Project:

There is a need to develop optimized single radio handover solutions between heterogeneous wireless networks. Dual radio operation requires multiple radios to be transmitting and receiving at the same time. This leads to platform noise and co-existence issues for radios operating in close proximity frequency bands and generally leads to increased cost of mobile device due to need for RF isolation, sharper filtering or active cancellation, apart from increased design complexity. This amendment will develop protocols that will mitigate these issues by enabling controls for having only a single radio transmitting at any time during the entire handover process. This will simplify design of mobile devices and reduce service interruption time during handovers.

5.6 Stakeholders for the Standard: Semiconductor manufacturers, network equipment manufacturers, mobile and wireless device manufacturers and network operators.

Intellectual Property

6.1.a. Has the IEEE-SA policy on intellectual property been presented to those responsible for preparing/submitting this PAR prior to the PAR submittal to the IEEE-SA Standards Board?

Yes

If yes, state date: 2008-07-14

If no, please explain:

6.1.b. Is the Sponsor aware of any copyright permission needed for this project? No

If yes, please explain:

6.1.c. Is the Sponsor aware of possible registration activity related to this project? No

If yes, please explain:

7.1 Are there other standards or projects with a similar scope? Yes

If yes, please explain: 3GPP Technical Specifications have implemented Single Radio Handovers between 3GPP Radio Access Technologies and between 3GPP and 3GPP2 technologies.

and answer the following: Sponsor Organization: 3GPP

Project/Standard Number: TS 36.300

Project/Standard Date: 3GPP Release-8

Project/Standard Title: E-UTRA and E-UTRAN Overall Description Release-8, March-2009

7.2 International Standards Activities

a. Adoptions

Is there potential for this standard to be adopted by another organization? No

Organization:
Technical Committee Name:
Technical Committee Number:
Contact person Name:
Contact Phone:
Contact Email:

b. Joint Development

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

Organization:
Technical Committee Name:
Technical Committee Number:
Contact person Name:
Contact Phone:
Contact Email:

c. Harmonization

Are you aware of another organization that may be interested in portions of this document in their standardization development efforts? No

Organization:
Technical Committee Name:
Technical Committee Number:
Contact person Name:
Contact Phone:
Contact Email:

8.1 Additional Explanatory Notes: (Item Number and Explanation)

5.2 (Scope): Following definitions are provided for explanatory purposes:

Single Radio Handover: A multi-mode terminal where *only a single radio is* transmitting “on” at any given time during the handover process.

Dual Radio Handover: A multi-mode terminal where *both* the radios can be transmitting and/or receiving simultaneously at any given time.

Five Criteria

17.5.1 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.

Today, mobile phones, netbooks, laptops and other portable communication devices are often equipped with two or more access technologies such as IEEE 802.11, IEEE 802.16, GSM, UMTS, CDMA and other emerging cellular technologies such as LTE. There is a need to maintain session continuity and service continuity when transitioning across these technologies to achieve acceptable level of user experience. Single radio handovers is one of the best mechanisms to achieve this.

Dual radio operation leads to platform noise, interference and co-existence issues for radios operating in close proximity frequency bands. This generally leads to increased cost of mobile device due to need for RF isolation, sharper filtering or active cancellation. Optimized Single radio handover solutions mitigate these issues by having only a single radio transmitting at any time during the entire handover process. This will simplify design of mobile devices and reduce service interruption time during handovers. This is applicable for various wireless technologies and different classes of applications on mobile device.

b) Multiple vendors and numerous users.

A wide variety of vendors are currently involved in building wireless products for the network equipment and mobile device market segments. With the number of combo handset sales alone increasing from 6 million in 2006 to 190 million by 2011, affected market categories include smart phones, netbooks, laptops – essentially anything with multiple radios. Vendors, operators and users are all affected by this multi-network device trend.

c) Balanced costs (LAN versus attached stations).

Multi-radio equipment is accepted as having balanced costs. Optimized single radio handover capabilities will reduce platform complexity and cost of mobile device.

17.5.2 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 that are compatible with systems management standards.

1. The proposed project will be developed in conformance with the IEEE 802 Overview and Architecture.
2. Managed objects will be defined consistent with existing policies and practices for IEEE 802 standards.

Consideration will be made to ensure compatibility with the IEEE 802.21 and IEEE 802 wireless architectural models. Security optimizations as defined in 802.21a should apply to both dual and single radio handovers.

17.5.3 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.

Existing wireless access technologies support dual radio handovers. However, no IEEE 802 standard supports optimized single radio handovers across heterogeneous networks.

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

There is no other proposed solution for optimized single radio handovers. No other IEEE standard covers this topic.

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

The project will produce an amendment to the IEEE 802.21 specification. The enhancements in this amendment will be clearly distinguishable, since they will address single radio handover specific issues.

17.5.4 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.**

Handover is a common mechanism, present in many systems such as IEEE 802.11, IEEE 802.16 and cellular systems. Accordingly it is clear that handovers within the confines of different 802 technologies are feasible. In single radio handovers the device can transmit on only one radio at a time. This is usually the mode of operation when radio frequencies are close to each other (e.g. IMT 2000 bands). Since only one radio can be active at a time in these types of devices, they use the source radio and the back-end connection between the source and target network to prepare the target network for handover. Single Radio handover solution can alleviate issues associated with dual radio handovers. Optimized single radio handovers are already supported across different 3GPP technologies today (such as between GSM and UMTS). This standard will work with other core-network standards to enable service continuity during handovers.

The proven ability to handover within 802 networks and cellular networks has proved a minimum set of capabilities for mobile technologies. The nature of message passing protocols is such that the timing and passage of the messages is subject to observation and testing. Methods of testing single radio handovers are well established in 3GPP systems.

17.5.4.1 Coexistence of 802 wireless standards specifying devices for unlicensed operation

A working group proposing a wireless project is required to demonstrate coexistence through the preparation of a Coexistence Assurance (CA) document unless it is not applicable. The Working Group will create a CA document as part of the WG balloting process. If the Working Group elects not to create a CA document, it will explain to the EC the reason the CA document is not applicable.

A CA document is not necessary for this amendment. It will not change access mechanisms nor physical layer operation of IEEE networks at all, as this is already out of scope for IEEE 802.21.

17.5.5 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.**

Cellular systems, IEEE 802.11, and IEEE 802.16 systems provide real world examples of single-radio handover mechanisms within heterogeneous networks with known cost factors, cost of performance, and installation costs. The functionality described in this amendment will allow for a well known way for managing handovers between these radios in combination.

In dual radio handovers enabling simultaneous transmitter and receiver operation even in non-adjacent frequency bands is very complex and requires expensive RF isolation, filtering or even active cancellation. Single radio handovers will result in reduction of these costs of mobile device due to operation of only a single radio at any time.

Additional costs will be incurred owing to network coordination in preparing target network using the source network. However these are incremental costs and most of this functionality is already present in current core networks of 3GPP systems and WiMAX networks. IEEE 802.21 is uniquely positioned to provide support for optimized single radio handovers by coordinating the access network functionality with those of core networks.