**IEEE P802.15**

**Wireless Personal Area Networks**

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| Project | IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs) |
| Title |  |
| Date Submitted | [Nov 2011] |
| Source | [Betty Zhao][Huawei Technologies Co., Ltd.][address] | Voice: [ ]Fax: [ ]E-mail: [ ] |
| Re: | [Task Group 802.15.4k Plenary Session in Atlanta] |
| Abstract | [Task Group 802.15.4k Minutes] |
| Purpose | [Official Minutes of the Task Group Session] |
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# PM1, Monday, November 7, 2011

13:33 Chair called meeting to order

Chair introduced opening report doc. 770-00.

* Chair displayed slide 6 to 10.
* Chair asked if anyone in the meeting was personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance? There were no responses.

Agenda 737-01 approved unanimously.

Pat presented doc. 484-01 4e tutorial.

* C: 4e uses symbol time, symbol time is good for single rate PHY, but DSSS is multi-rate PHY, which needs chip timing. A: May enhance the timing of 4e for 4k.
* C: Beacon period followed by CFP is more power-saving than beacon period followed by CAP considering timing.
* Q: Does fast association depend on network architecture? A: Explanation on the difference between direct and indirect transmission of association response.
* Q: The size of network addressed by 4e, PAN or LAN? If it’s long distance, how about sensing capability? A: No matter which name it’s called, it’s a wireless network. And suggest focusing on behavior not terminologies.
* Discussion about topologies supported by 4e.

14:30 Recessed

# PM2, Monday, November 7, 2011

16:04 Chair called meeting to order

Doc. 795-01 DSSS merger by Sourav Dey

* Q: Is it sufficient information for beginning to draft. A: Yes and need to reference back to original proposals.
* Q: Could you give the data rate range now? A: No yet now.

Straw poll:

Support the DSSS merger proposal 795-01 to be adopted as baseline: For 12, Against 0, Abstain 3.

16:30 Recessed

# AM1, Tuesday, November 08, 2011

8:07 Chair called meeting to order

Doc. 774-01 FSK merger by Matt Johnson

* Q: For transmission range, what’s the difference between 4g and 4k? A: 4g is on mesh network, 4k provides longer battery life and lower data rate. For transmission range it’s the different issue in different regions
* Q: What’s the topology? Single or multiple downlinks for multiple end-points? A: PHY doesn’t prescript anything, depends on MAC.
* Q: What’s the spreading factor? A: Spreading is time-based, depends on the regulation of the region.
* Q: Why the date rate is optional? A: There is no single rate mandatory, optional data rates are provided to end-device. 4k compliant device needs to choose one of the optional date rates. Pat explained it using PICs. David explained it using 802.11b/g/n.
* Q: Slide 15 network ID means? A: In 4k applications multiple coordinators may listen to one end-point, so Network ID across multiple coordinators.
* Q: Is network ID a FSK related or 4k common issue? A: Not necessary restricted to FSK, but FSK supports it.
* C: Agree to the concept of Network ID, but feel it’s a higher layer issue.
* C: 64-bit address is too large. A: 16-bit is too small considering a large area, 32-bit is appropriate.
* Q: What’s the … of convolution code? A: Same with 4g

Straw poll:

Support the FSK merger proposal 774-01 to be adopted as baseline: For 13, Against 0, Abstain 5.

08:50 Recessed

# AM2, Tuesday, November 08, 2011

10:33 Chair called meeting to order

Doc. 804-00 by Xiang Wang

* Q: Can differential encoding be used for this scheme? Then don’t need code reference. A: Yes.
* Q: Any drawbacks comparing with simple BPSK? A: No.
* Q: Is spreading code used on single channel? A: Spreading code before modulation, then separate chip to I and Q phase.
* Q: Slide 7 system bit rate is same for Offset QPSK and BPSK? The figure looks better than simulation. A: Yes.
* Q: Can you confirm that the data rate and channel throughput in your proposal are also supported by DSSS merger proposal? A: Yes.
* Q: How does this affect DSSS merger proposal? Is it a different system under the DSSS title? A: Its only difference is spreading after modulation.

Doc. 807-00 by Kyung Sup Kwak

* Q: When multiple end-points transmit to a coordinator, do multiple uplinks have different OVSF codes and same scrambling code? A: Yes.
* Q: Does it channelize different user using spreading code and scrambling code? A: Spreading code for overcoming path loss, scrambling code for separating from other systems or PANs
* Q: What’s the advantage of having two spreading? A: Can obtain better spreading factors
* The proposal needs offline discussion and to provide more advantages of it.

11:27 Recessed

# PM1, Tuesday, November 08, 2011

13:42 Chair called meeting to order

Doc. 758-00 Fragmentation merger by Ben Rolfe

* Q: Does 4k employ the whole new MAC or only the enhancements of existing MAC? A: I’m advocate of MAC with enhancements, only visit what needs to be enhanced.
* Suggestion: There is simple address in 4e, 8-bit address. A: Using 16-bit address because of large number of end-points.
* Q: If we reuse CID for the end-points, then we can get more compressed CID, because there is not so many end-points transmitting at the same time. A: Depend on higher layer.
* Q: How to map MPDU to PPDU? A: Depend on the max PPDU (fragment) size
* Q: Fragment dynamic? A: From the view of MAC, there is no dynamic, but upper layer may have.
* Q: How to reflect timing to IP network? A: Need more work on it.
* Q: Slide 13 3-bit LQI is short for enough information and does downlink need LQI? A: Longer bit LQI will make header longer. Two-level acknowledgement will be taken on. Add some flexibility on presenting LQI.
* Q: What’s the ‘fragment data’ mean? A: Part of MPDU.
* Q: If two end-points send fragments to one coordinator at the same time, how to distinguish which fragment from which end-points? A: By CID, pair wise relationship. Q: How to distinguish ACK when there’re multiple end-points and multiple coordinators communication? A: By ID recognized only by end-point and by timing.
* Q: How to prevent fragment error when it’s in an interfered environment (more and more same types of nodes in the same bands)? A: multiple-level protection, MPDU ACK, multiple-level filtering.
* Discussion on the definition of LQI
* Q: Overhead is a little bit too big considering the 100bps date rate, any idea on this? A: Coherent time is 20ms which depends on a few of things, and the header needs to contain the necessary information.
* C: CID is more applicable for FSK, and DSSS can be separated by gold code.
* C: CRC can be 2 octets. A: Yes, but 4 octets are more optimal. Need more simulation and analysis.
* Q: An end-point may accumulate too many packets at the end of the day, how to handle it? A: Application layer will be aware of it.

Straw poll:

Support the Fragmentation merger proposal 758-00 to be adopted as baseline: For 22, Against 0, Abstain 5.

15:00 Recessed

# PM2, Tuesday, November 08, 2011

16:02 Chair called meeting to order

Doc. 806-02 MAC merger by Ben Rolfe

* Q: There are some frequency hopping schemes in 4e/g, any other elements needed to be added? Whether or not the PHY needs frequency hopping? A: There are different regulations on frequency hopping in different regions, also working on the channel hopping scheme on top of MAC.
* C: In the scope of 4k PAR, it says ‘It defines an alternate PHY and only those MAC modifications needed to support its implementation’, so MAC amendments can only address what PHY needs other than introducing a new MAC. A: Need to identify and map the 4k requirements to existing MAC.
* Q: We may not need a new frame format, but we may not need some fields of it. A: we can use multi-purpose frame in 4e. After setting up the fragment frame format, we can investigate the fields.
* C: May need some commands to implement prioritized channel access. And suggest really looking at what 15.4/4e already has and what to be enhanced.
* Q: Suggest not using symbol time for multiple rates PHY. A: 4g had the same struggle, but finally used symbol time in order to keep consistence, so in 4k we may need the same effort to do that.

Sourav Dey talked about the updates of DSSS merger. DSSS proposers agreed to adopt in principle two presentations 804-00 and 807-00 into DSSS merger this morning.

17:00 Recessed

# PM1, Wednesday, November 09, 2011

13:35 Chair called meeting to order

Panel discussions: DSSS led by Sourav Dey, FSK led by Matt Johnson, MAC/Fragmentation led by Ben Rolfe.

Baseline discussion led by Chair

Updates of DSSS PHY by Sourav Dey

* Alternate modulation technique which Wilson proposed will be adopted as baseline in a different diagram other than diagram given in DSSS merger.
* For Inha University’s proposal, adopt gold code spreading as the baseline, continue to explore the double spreading

14:51 Recessed

# AM1, Thursday, November 10, 2011

8:07 Chair called meeting to order

Ben presented the updates in doc. 806-03.

Motion: Move that TG4k adopt the following documents as the baseline for drafting the TG4k document:

* LECIM DSSS PHY Merger (15-11-795-01)
* An additional modulation technique in “O-QPSK Modulation Discussion for TG4K” (15-11-804-00)
* Merged FSK Proposal (15-11-774-01)
* More MPDU Fragmentation Details (15-11-758-00) & MAC Merge Discussion (15-11-806-03)

Moved by Matt Johnson, Seconded by Ben Rolfe

Approved unanimously consensus

Discussion on format of draft: based on 4g.

Straw poll:

* FSK clause followed by DSSS: 0
* DSSS clause followed by FSK: 1

Clause assignments:

* x.1 DSSS PHY

Sub-clauses in order: PPDU format / modulation / coding / RF requirement

* x.2 FSK PHY

Sub-clauses in order: PPDU format / modulation / RF requirement

Assignments:

* FSK drafting is led by Matt
* DSSS drafting is led by Sourav
* MAC drafting is led by Ben and Pat

09:49 Recessed

# PM1, Thursday, November 10, 2011

13:42 Chair called meeting to order

Finalize the closing report

**Assignments:**

**MAC subgroup:**

* Fragmentation: everyone
* Low energy: Jussi, Matt, Ameen and Youcy (coordinated by Ameen)
* Channel Access: Seong song, Youcy and Ameen (coordinated by Youcy)

**FSK subgroup:**

16.1 MR-FSK PHY specification

16.1.1 PPDU format for MR-FSK  Needs discussion – teleconference call

16.1.2 Modulation and coding for MR-FSK

GFSK/FSK - Matt

P-FSK - Mi-Kyung

Reference Modulator Design - Matt

Bit to symbol mapping - Matt

Modulation Quality - Matt and Jean

Frequency Deviation tolerance - Matt and Jean

Zero Crossing Tolerance - Matt and Jean

FEC – copy 4g - Jean

Interleaving – copy 4g- Jean

Spreading – Mi-Kyung

16.1.3 Data whitening for MR-FSK – Mi-Kyung

16.1.5 MR-FSK PHY RF requirements – Matt and Steve

Operating Frequency Range

Regulatory compliance

Radio frequency tolerance

Channel switch time

Transmitter symbol rate

Transmit spectral mask

Receiver sensitivity

Receiver interference rejection

TX-RX turn around time

RX-TX turn around time

Transmit power

Receiver max input desired level

LQI – Needs discussion – teleconference call

CCA – Needs discussion – teleconference call

**DSSS subgroup:**

1. Reference modulator diagram, and text

a. Sourav, Wilson

2. PPDU (PHY frame format)

a. PHY Header

b. Sync Header (Preamble, SFD) - Ameen, Howard, Kato

3. FEC, interleaver - Sourav, Ameen, Kato

4. Modulation - Wilson, Sourav, Kato

5. Spreading, PN generator - Howard, Sourav, Wilson

6. Interference mitigation (CLON) - Professor Kwak, Ameen

7. RF requirements (Regional specifics)

a. Frequency

b. Channelization

c. Spectral mask

d. Data rates

Shimada, and ... (Conference call assignment TBD)

14:01 Recessed