802.3bn Ad-hoc
Multiple Modulation Profile (MPP)

December 7, 2012

Jorge Salinger, Comcast – Chair

Agenda – 04Dec12

- Review IEEE Patent Policy
- Attendance
- Review Objectives and Goals for the Ad-hoc
- Answer questions presentation of field data on SNR variation from Dave Urban
- Next steps

Instructions for the WG Chair

The IEEE-SA strongly recommends that at each WG meeting the chair or a designee:

- **Show slides #1 through #4 of this presentation**
- **Advise the WG attendees that:**
  - The IEEE's patent policy is described in Clause 6 of the *IEEE-SA Standards Board Bylaws*;
  - Early identification of patent claims which may be essential for the use of standards under development is strongly encouraged;
  - There may be Essential Patent Claims of which the IEEE is not aware. Additionally, neither the IEEE, the WG, nor the WG chair can ensure the accuracy or completeness of any assurance or whether any such assurance is, in fact, of a Patent Claim that is essential for the use of the standard under development.
- **Instruct the WG Secretary to record in the minutes of the relevant WG meeting:**
  - That the foregoing information was provided and that slides 1 through 4 (and this slide 0, if applicable) were shown;
  - That the chair or designee provided an opportunity for participants to identify patent claim(s)/patent application claim(s) and/or the holder of patent claim(s)/patent application claim(s) of which the participant is personally aware and that may be essential for the use of that standard
  - Any responses that were given, specifically the patent claim(s)/patent application claim(s) and/or the holder of the patent claim(s)/patent application claim(s) that were identified (if any) and by whom.
- The WG Chair shall ensure that a request is made to any identified holders of potential essential patent claim(s) to complete and submit a Letter of Assurance.
- It is recommended that the WG chair review the guidance in *IEEE-SA Standards Board Operations Manual* 6.3.5 and in FAQs 12 and 12a on inclusion of potential Essential Patent Claims by incorporation or by reference.

Note: **WG** includes Working Groups, Task Groups, and other standards-developing committees with a PAR approved by the IEEE-SA Standards Board.

(Optional to be shown)

Participants, Patents, and Duty to Inform

All participants in this meeting have certain obligations under the IEEE-SA Patent Policy.

- Participants [Note: Quoted text excerpted from IEEE-SA Standards Board Bylaws subclause 6.2]:
  - "Shall inform the IEEE (or cause the IEEE to be informed)" of the identity of each "holder of any potential Essential Patent Claims of which they are personally aware" if the claims are owned or controlled by the participant or the entity the participant is from, employed by, or otherwise represents
    - "Personal awareness" means that the participant "is personally aware that the holder may have a potential Essential Patent Claim," even if the participant is not personally aware of the specific patents or patent claims
  - "Should inform the IEEE (or cause the IEEE to be informed)" of the identity of "any other holders of such potential Essential Patent Claims" (that is, third parties that are not affiliated with the participant, with the participant's employer, or with anyone else that the participant is from or otherwise represents)
- The above does not apply if the patent claim is already the subject of an Accepted Letter of Assurance that applies to the proposed standard(s) under consideration by this group
- Early identification of holders of potential Essential Patent Claims is strongly encouraged
- No duty to perform a patent search

Patent Related Links

All participants should be familiar with their obligations under the IEEE-SA Policies & Procedures for standards development.

Patent Policy is stated in these sources:

IEEE-SA Standards Boards Bylaws

http://standards.ieee.org/develop/policies/bylaws/sect6-7.html#6

IEEE-SA Standards Board Operations Manual

http://standards.ieee.org/develop/policies/opman/sect6.html#6.3

Material about the patent policy is available at

http://standards.ieee.org/about/sasb/patcom/materials.html

If you have questions, contact the IEEE-SA Standards Board Patent Committee Administrator at patcom@ieee.org or visit http://standards.ieee.org/about/sasb/patcom/index.html

This slide set is available at https://development.standards.ieee.org/myproject/Public/mytools/mob/slideset.ppt

Call for Potentially Essential Patents

- If anyone in this meeting is 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:
  - Either speak up now or
  - Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible or
  - Cause an LOA to be submitted

Other Guidelines for IEEE WG Meetings

- **All IEEE-SA standards meetings shall be conducted in compliance with all applicable laws, including antitrust and competition laws.**
  - **Don't discuss the interpretation, validity, or essentiality of patents/patent claims.**
  - **Don't discuss specific license rates, terms, or conditions.**
    - Relative costs, including licensing costs of essential patent claims, of different technical approaches may be discussed in standards development meetings.
      - Technical considerations remain primary focus
  - **Don't discuss or engage in the fixing of product prices, allocation of customers, or division of sales markets.**
  - **Don't discuss the status or substance of ongoing or threatened litigation.**
  - **Don't be silent if inappropriate topics are discussed … do formally object.**

See *IEEE-SA Standards Board Operations Manual*, clause 5.3.10 and "Promoting Competition and Innovation: What You Need to Know about the IEEE Standards Association's Antitrust and Competition Policy" for more details.

Attendance – 04Dec12

- **Jorge Salinger - Comcast**
- **Hal Roberts – Calix**
- **Leo Montreuil – Broadcom**
- **Saif Rahman – Comcast**
- **Bill Powell – ALU**
- **Marek Hajduczenia – ZTE**
- **Ron Wolfe – Aurora Networks**
- **Wim De Ketelaere – Excentis**
- **Tom Williams - CableLabs**
- **Mike Darling – Shaw**
- **Hesham ElBakoury – Huawei**
- **George Hart –Rogers**
- **Mark Laubach – Broadcom**
- **Andrea Garavaglia - Qualcomm**
- **Juan Montojo – Qualcomm**
- **Christian Pietsch - Qualcomm**
- **Patrick Stupar – Qualcomm**
- **Steve Shellhammer – Qualcomm**
- **Satish Mudgere - Intel**
- **Michel Alard**
- **Nicola Varanese - Qualcomm**
- **Charaf Hanna - ST**
- **Alex Garcia - Videotron**

Ad-hoc Logistics

- Conference Call on Tuesdays at 9:00 – 10:00 AM ET
- Timeslot picked with 2 criteria in mind:
  a. the meeting not overlap with existing EPoC or DOCSIS 3.1 activities, and
  b. it be possible for the widest range of participants as possible.
- The chose timeslot meets the a. criteria, but
- It is very difficult to pick a timeslot that meets the b. criteria for everyone (in particular, I know that this timeslot is pretty early in the West coast).

Objective and Goal

- This ad-hoc will be a forum to discuss the merits and draw-backs of MMP for EPoC
- The ad-hoc will to try to arrive to a recommendation on whether MMP should be used or not in EPoC for the next EPoC F2F meeting.
- While we may discuss approaches for implementing MMP for EPoC to facilitate the discussion on its merits or draw-backs, it is not the purpose of this ad-hoc to arrive to a recommendation on how MMP would be implemented even if it is deemed appropriate to use it.

Notes from 12/4/12 meeting

- Ad-hoc will focus on downstream; use of different MCS in the US is already possible given burst mode
- Reviewed slides from Dave Urban
  - Questions regarding node sizes
  - Questions regarding the accuracy of readings from CMs
  - Questions regarding readings showing low and high SNR values
  - Questions regarding one-time snapshot vs. continuous performance
  - Questions regarding network elements contained in HFC plant
  - Questions regarding correlation between US and DS level
- Multiple questions following meeting included in next pages

Questions/Comments from Hal Roberts

1. Impact of Analog Optics: It is often stated that the data we should be analyzing should subtract the impact of the analog optics, since this will not be present in some EPoC scenarios. Observation: The impact of the analog optics is negligible. The optics sets a baseline of about 42dB SNR for digital channels. However the problematic channels have noise that is 10dB worse than the optical baseline. Eliminating the optical noise will only improve the SNR of a 30dB modem by a fraction of a decibel. Therefore elimination of the analog optics will not substantially alter the problem or solution space. The higher SNR channels will, however, improve by elimination of the analog optics.

2. Source of Low SNR Modems: These are generally correlated to modems with low received signal power (RSSI) due to long in-home cable runs or high split ratios. Observation: However this leads to the following mystery when examining the Gateway Data……..

Questions/Comments from Hal Roberts

3. Gateway Data - Impact of Locating Modem at Home Entry Point: Locating the modem here would seem to solve both low signal problems as well as reduce in-home ingress. Surprisingly, locating the modem here has a relatively negligible affect with only a 2dB shift in average SNR and a ½ dB reduced Standard Deviation. Observation: How do we reconcile #2 and #3?

4. General Conclusion: The only potential way of eliminating the low SNR outliers is to reduce those modems experiencing a low signal (eliminating the analog optics will not do it). Therefore, locating the CNU at the entrance to the home where the signal level should be close to 0dBmV (and any in-home ingress at lower levels) would seem to be the way to do this. However, current data shows this is not the case. The only possibilities to explain this seem to be: A) Low signal is not the cause of low SNR or B) the 'gateway' location mysteriously still experiences low signal strength even though it is not behind a long cable run or high loss splitters.

Questions/Comments from Marek Hajduczenia

- First, I think that looking at 50+ million modems and drawing conclusions based on such data is a mistake from the get go. Statistically, we will have much smaller service groups than 50 million modems and we should be observing behavior per node, and variations in such behavior, rather than averaging everything. The law of large numbers is there for a reason – in here, we should be looking at trees, and not at the forest.

- Second, I find it hard to reconcile data presented on the call yesterday with data shown by Ed from BHN at the last meeting. To me, it seems that either both operators have completely different network designs, use different equipment, or perhaps the measurement methodology is different. While one data set supports clearly multiple profiles, the other one puts that observation into question. Do we then follow the larger data set just because it is larger?

Questions/Comments from Marek Hajduczenia

- Third, in the SNR distribution per node shown on the yesterday's call, it seems that two profiles would cut it for a grand majority of the connected modems. The question then becomes: how distant are these modems from the node itself? Is there any correlation between distance to node and observed SNR or it is rather a complex function of cable, passives and any other sources of noise? Furthermore, are all modems connected to the given node exactly the same? We assume all modems are alike, but I think it is only fair to assume they are not, and under the very same conditions may behave slightly different, especially in terms of measured SNR values (seems that some discussions yesterday support this conclusion).

- Fourth, and perhaps last for now. What is the premium (in relative terms, % wise if you like, taking a single profile equipment as a base value of 1.00) acceptable for equipment supporting multiple profiles versus single profile equipment? There is no free lunch as we all know and making devices more complex entails extra cost due to hardware and management complexity. I am trying to understand where the pain threshold is located and when it becomes simpler for the network operator to go and fix the coax problems rather than trying to address them through the use of super-intelligent and highly-adaptable equipment. Recall that Ethernet is first and foremost about simplicity and robustness, while adaptiveness and tons of options (and knobs to fine tune such options) does not sound very Ethernet-like to me.

Questions/Comments from Eugene Dai

First, some general comments on the statistics. 20+ million data is a very large sample space for cable modems; how to map it into a much smaller sample space such as the number of CNUs connect to one OCU which is in the order of two digits? The nice Gaussian sharp distribution will disappear. This may be the explanation of the difference of the two sets of data from tow MSOs.

Second, Many factors affect the SNR distribution; take one for example, the data from 20+ million CMs came from many different HFC plants, and even more, if we break them into cable segments – thousands of them. For a relative "bad" cable segment, all CMs may show lower SNR than a better cable segment. The correlations of the data have to be considered and analyzed.

Third, consider the above, for a much smaller sample space such as the CNUs connected to a given OCU, we may not see that kind of distribution; more true in N+1 or N+0 environment.

Previously presented related materials

Presentations related to data

- mallette_01_1112 from November IEEE F2F
- schmitt_01a_1112 from November IEEE F2F

Presentations containing analysis

- elbakoury_01_0912 from October IEEE F2F
- varanese_01_0912 from October IEEE F2F
- boyd_02_1112 from November IEEE F2F
- dai_01b_1012 from October IEEE F2F and expanded in dai_01a_1112 from November IEEE F2F
- garavaglia_01a_1112 from November IEEE F2F

Next Steps

- Move meeting up by 30 minutes to accommodate schedules
- Schedule a follow-up call on Friday, December 8 to finish review of slides and answer questions