Work Plan and Baseline Checklist Going Forward

- Suggestions for Coordinating Focus and Decisions

IEEE P802.3bn EPoC PHY Task Force

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Introduction

- The intent of this presentation is to suggest an enumeration of issues and decisions for building a “checklist work plan” of past and future items for technical consensus
  - Technical decisions
  - Base line contribution items
  - Requirements
  - Other, etc.
- Living document, updated at each meeting
  - Update work plan items
  - Set prioritization and ordering (if possible)
  - Enumerate sequencing / dependencies
- The example in this presentation are not exhaustive lists

Areas

- Areas in this presentation
  - Technical Decisions
  - Other / Architecture / System work to do
  - “Management”
  - Consensus challenge items
  - Base Line Needs – Building a “bucket list”

- Sub-groups need to maintain their own lists and workplan
  - Coordination still needed across Task Force

Checklists

TECHNICAL DECISIONS

Example Downstream Decisions

Parameter		Comments
Frequency range		FDD / TDD From: RF Spectrum / Channel Model work
Modulation	**OFDM**	[TD #2]
Sampling Frequency	**204.8 MHz (20 * 10.24 MHz)**	192 MHz (usable) OFDM channel [10.24 MHz TD #7]
FFT size	**4096, 8192**	[implied from TD #17 and TD#7]
Subcarrier spacing	**25, 50 KHz**	[TD #17]
OFDM blocks	N blocks of 192 MHz, N=?	[TD #8 for N>1]
CP		
Windowing		
Subcarrier grouping		FDD / TDD, MMP?
Sub-Channel	Phy Link Channel, ?	[TD #11, 12, 13]
Framing / Bursts		FDD Continuous? versus TDD Burst?
Preamble, Sync		
Continuous Pilots		
Scattered Pilots		
Bit loading / Modulation Rate	**16, 64, 128, 256, 512, 1024, 2048, 4096 QAM**	[TD #6]
FEC	**LDPC Downstream Inner Code**	[TD #4]. Need coding, codewords, shortening, et al.
Time interleaver		
Freq. interleaver		
PAPR technique		
Exclusion rules		[based on TD #14]

Example Upstream Decisions

Parameter		Comments
Frequency range		FDD / TDD From: RF Spectrum / Channel Model work
Modulation	**OFDMA**	[TD #2]
Sampling Frequency		
FFT size		
Subcarrier spacing	**25, 50 KHz**	[TD #17]
OFDM blocks	N blocks of 192 MHz, N=?	[TD #8 for N>1]
CP		
Windowing		
Subcarrier group		FDD / TDD, MMP, “burst profiles”, etc?
Sub-Channel		PHY Link channel ?
Framing / Burst		Burst
Preamble, Sync		
Continuous Pilots		
Scattered Pilots		
Bit loading / Modulation Rate	**16, 64, 128, 256, 512, 1024 QAM**	[TD #6]
FEC		
Time interleaver		
Freq. interleaver		
PAPR technique		
Exclusion rules		[based on TD #14]

Example of some PHY Link Decisions

Parameter		Comments
Frequency range / rules		
Modulation	**OFDM downstream / OFDMA upstream**	[TD #2, #x]
Sampling Frequency	**204.8 MHz (20 * 10.24 MHz)**	192 MHz (usable) OFDM channel [10.24 MHz TD #7]
FFT size	**4096, 8192**	[implied from TD #17 and TD#7]
Subcarrier spacing	**25, 50 KHz**	[TD #17]
OFDM sub-carriers / rules		
CP / Symbol Duration	**Auto-detect / Same as data channel**	[TD #12, #13]
Windowing		
Subcarrier group		
Sub-Channel		
Framing		
Preamble, Sync		
Continuous Pilots		
Scattered Pilots		
Bit loading / Modulation Rate	**16 QAM**	[TD #6]
FEC / Error Protection		
Time interleaver		
PAPR technique		
Exclusion rules		

Checklists

OTHER / ARCHITECTURE / SYSTEM

Other / Architecture / System

- PHY delay and delay variation budget
  - Impacts evaluation of FEC and interleaving selections
  - How about a default delay of 1.0 msec until otherwise changed?
- Define Energy Efficient Ethernet Operation [TD #10]
  - Start early, define as “we go”, work in progress
- Any PHY mechanism(s) for supporting downstream burst mode for TDD?
  - Any requirements from TDD Sub-Task Force for PHY Sub-Task Force?
- Asian (e.g., China, Japan, South East Asia) and European: RF Spectrum, requirements, and channel model topologies and use cases

What and How is being “Managed”?

“MANAGEMENT”

“Management”

- Topics in PHY Link – attend the ad hoc
- Howard Frazier presentation this meeting
- Some other items for consideration
  - Channel / sub-channel / sub-carrier numbering / addressing
  - Sub-carrier state
    - E.g., On, Off, Null, Bit loading, pilot use, etc

“Management”

- Sub-carrier operations
  - How to specify operations on individual through all sub-carriers
    - Range, mask?
  - Restrictions on operations?
    - Groups of 8, etc.?
- Any relation of numbering to center frequency f_c?
- Method should permit straight forward correlation of channel and sub-carriers to occupied RF spectrum
  - Algorithmic adjusting for sub-carrier spacing

NOTE: some of this could be facilitated by editors with sufficient enabling technical decisions

How are we doing?

CONSENSUS CHALLENGE ITEMS

List from 2012 Sept, Geneva

- RF Bandwidth (RF Spectrum)
- FDD Downstream is OFDM/OFDMA
- Bonding approach for downstream
- Rate adaptation, which layer and how
- FEC / Interleaving (error performance) (req: channel model)
- MPCP Changes
- Adaptive Bit Rate Loading
- PHY Link
- Complexity of hardware scaling with “bandwidth”
- How we are going to do TDD
- Coding Efficiency gains vs cost
- Synchronization in terms of time / frequency (mobile backhaul)
- OFDM Numerology / FFT Size / Symbol Size / CP size (req: channel model)
- Framing Structure
- MAC layer efficiency
- PHY layer efficiency
- Energy Efficiency
- Subcarrier group

Building a “Bucket List”

BASELINE NEEDS

BASE LINE “BUCKET LIST”

- Mostly can follow Editor’s outlines for clauses
- Devil is in the details on writing for specifications, including but not limited to:
  - Overview, signal processing paths, modulation formats and rates, forward error correction, framing, interleaver, scrambler (if needed), modulation encoding, preamble insertion, CP insertion, symbol mapping, pre-equalization, spectral shaping, processing delays, transmit power, profiles, burst timing, fidelity, input/output, error performance, multiple-channels, probing, etc.
  - Our “starting state” through Ethernet “Linked” status: detailed flow charts, PHY link channel hunt algorithm, course and fine ranging, power adjustment, frequency adjustment, data channel acquisition, periodic maintenance and discovery, etc.
  - Management: registers, MDIO, MIB

When is Base Line Near Complete?

- Some of the key “Tell Tails”:
  - All technical selections mostly completed that deterministically detail the processing of all transmitted MAC/PLS bytes (frames) to “bits on the wire”
    - Sufficient to permit separately developed implementations to produce the same results under the same conditions
    - Sufficient to permit receivers to be constructed that produce the desired results at the receiving peer MAC/PLS interface
    - I.e., interoperability assurance
  - Electrical requirements: CLT and CNU input / output specified
  - Functional assumptions specified
    - The cable “environment and conditions” where operation according to the specification will meet operational goals and performance expectations
  - Management / MIB specified (e.g., input to 802.3.1)
  - The Editor Team tells us they have enough material to almost complete the first draft specification with only a few remaining (if any) additional technical base line selection decisions by the Task Force
    - Reminder Editors do not create technical selection decisions

Example Electrical Input to CNU – Table

Parameter	Value
Center Frequency of Channel(s)	? MHz (FDD?) (TDD?)
Level Range	? dBmV
Modulation Type	OFDM
Modulation Rate	?
Symbol Rate (nominal)	? (or equivalent ?)
Bandwidth	192 MHz (Alpha? – need to specify)
Total Input Power	? dBmV
Maximum average power of carrier input to CNU, within any channel	+/- dB, dBmV, etc.
Input Impedance	75 ohms
return loss	dB
Connector	F connector as per ISO/IEC-61169-24 or ANSI/SCTE 02

Example Electrical Output from CNU – Table

Parameter	Value
Frequency	? MHz (ranges?) (FDD?) (TDD?)
Level	? dBmV (issues of power per OFDM channel ?) (accuracy?)
Modulation Type	OFDMA
Modulation Rate	?
Bandwidth	? kHz / MHz
Inband / Out of Band Spurious Emissions and Noise	? dB / dBc
Phase noise	? kHz / dBc
Output Impedance	75 Ohms
Return Loss	? dB
Connector	F connector as per ISO/IEC-61169-24 or ANSI/SCTE 02

Example Electrical Input to CLT – Table

Parameter	Value
Center Frequency of Channel(s)	? MHz (FDD?) (TDD?)
Level Range	? dBmV
Modulation Type	OFDM
Modulation Rate	?
Symbol Rate (nominal)	? (or equivalent)
Bandwidth	192 MHz (Alpha? – need to specify)
Total Input Power	? dBmV
Maximum average power of carrier input to CLT, within any channel	+/- dB, dBmV, etc.
Input Impedance	75 ohms
Return loss	? dB
Connector	F connector as per ISO/IEC-61169-24 or ANSI/SCTE 02

Example Electrical Output from CLT – Table

Parameter	Value
Center Frequency of Channel(s)	? MHz (FDD?) (TDD?)
Level Range	? dBmV (variances with number of OFDM channels?)
Modulation Type	OFDM
Modulation Rate	?
? Symbol Rate	? (or equivalent)
Bandwidth / Frequency response	192 MHz per channel (Alpha? – need to specify)
Total Input Power	? dBmV
Inband / Out of Band Spurious Emissions and Noise	? dB / dBc
Phase noise	? kHz / dBc
Output Impedance	75 ohms
Return loss	? dB
Connector	F connector as per ISO/IEC-61169-24 or ANSI/SCTE 02

Functional Assumptions

- Functional Assumptions
  - Channel Model base line conditions?
  - Environmental effects: e.g., temperature variation
  - Frequency plan(s)
  - Harmful interference avoidance
  - Transmission Levels
  - Frequency Inversion
  - Other service avoidance

Timeline, Checklists, and Work Plans

HOW LONG TO DRAFT?

Base Line Productivity

- Summary of IEEE 802.3av
  - URL: http://www.ieee802.org/3/av/public/baseline.html
    - How many participants have reviewed this URL?
  - 30(+1) accepted baseline proposals
  - 9 months (3/07 – 11/07, big push last month)
- IEEE P802.3bn to date
  - URL – none at this time
  - 0 accepted baseline proposals, how many?
  - X months?

How do we get baseline submissions created?

SUMMARY

Summary

- Baseline proposals require focused time and work between face-to-face meetings
  - Have heard this echoed from many people
- Suggest we guide focus by checklists, work plans, bucket lists, time lines
  - Chair and Vice-Chair will start coordinating lists
  - Review / update every plenary meeting
  - Drive “Call for Topics” for next meeting(s)
    - Postpone other presentations for later to permit socialization and discussion time on presentation agenda
    - Request volunteer earlier submissions for web page posting for early socialization
- Get any “blocking” technical selection decisions done

Thank You!