IEEE 802.3 Beyond 10k SG Terminology (again)

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Topics

- Terminology recap from last ad hoc
- Proposed updates

From 2/13/18 ad hoc

General agreement

1. Lane - Proposed Updated Definition per http://www.ieee802.org/3/cj/comments/P8023-D3p0-Comments-Final-byID.pdf
   - "A logical subset of the data and control information transmitted from one sublayer (e.g., PCS, PMA) to an adjacent sublayer across the inter-sublayer interface or from one PHY to another across the transmission medium (e.g. optical fiber, optical wavelength, wire pair). Lanes are transmitted in parallel and combine to deliver the full set of data and control information across the interface."
2. Signal - An impulse or fluctuating quantity, as of electrical voltage or light intensity, whose variations represent coded information. (http://www.thefreedictionary.com/signal)
3. Lambda - indicates the wavelength in a wavelength-division multiplexing optical communications system. (https://en.wikipedia.org/wiki/Lambda)

Outcome from 2/13/18 ad hoc

General observation that “Link” carries a lot of historical usages so that it may not enable clarity when used.

4. PHY (1.4.372) - **Physical Layer entity (PHY):** Within IEEE 802.3, the portion of the Physical Layer between the Medium Dependent Interface (MDI) and the Media Independent Interface (MII), Gigabit Media Indepen-dent Interface (GMII) or 10 Gigabit Media Independent Interface (XGMII), consisting of the Physical Cod-ing Sublayer (PCS), the Physical Medium Attachment (PMA), and, if present, the WAN Interface Sublayer (WIS) and Physical Medium Dependent (PMD) sublayers. The PHY contains the functions that transmit, receive, and manage the encoded signals that are impressed on and recovered from the physical medium. (For example, See IEEE Std 802.3, Clauses 23 to 26, Clause 32, Clause 36, Clause 40, Clauses 48 to 54, Clauses 58 to 63, Clause 65, Clause 66, Clauses 82 to 89, and Clause 96.)
5. Link - One PHY transmitting to another PHY through a transmission path between them. All links under consideration by this Study Group will be point-to-point links, and will not include point-to-multipoint.
6. Channel – The transmission path between a PHY transmitting to another PHY
7. Point-to-point link - ~~a communications medium with exactly two endpoints and no data or packet formatting. (https://en.wikipedia.org/wiki/Point-to-point_(telecommunications). Optical Link Types 1, 2, and 3.~~

    a) One PHY transmitting to only one other PHY through the transmission path between them. All links under consideration by this Study Group will be point-to-point links, and will not include point-to-multipoint.

    ~~b) The transmission path between two, and only two, MDIs.~~

    ~~c) ITU Definition – Fixed interconnection between two sub networks. Ref ITU-T G.805~~

From 2/13/18 ad hoc

Not as much time spent on the original strawman due to lack of time.

This presentation is an attempt to refine these definitions.

8. WDM – optical technology that couples many wavelengths in the same fiber, thus effectively increasing the aggregate bandwidth per fiber to the sum of the bit rates of each wavelength. *
   - IEEE 802.3 has defined various optical "WDM" PHYs, e.g. based on multiple optical wavelengths. Sample definition - 1.4.72l 400GBASE-LR8: IEEE 802.3 Physical Layer specification for 400 Gb/s using 400GBASE-R encoding and 4-level pulse amplitude modulation over eight WDM lanes on single-mode fiber, with reach up to at least 10 km. (See IEEE Std 802.3, Clause 122.) (See Optical Link #3)
9. DWDM – In fiber-optic communications, wavelength-division multiplexing (WDM) is a technology which multiplexes a number of optical carrier signals onto a single optical fiber by using different wavelengths (i.e., colors) of laser light. This technique enables bidirectional communications over one strand of fiber, as well as multiplication of capacity. (Source: Wikipedia)
   - IEEE 802.3 Normative Reference: ITU-T Recommendation G.694.1—Spectral grids for WDM applications: DWDM frequency grid.
   - Based on villarruel_b10k_01b_0917, it is assumed each wavelength would correspond to a " DWDM link"
10. DWDM Link - One PHY transmitting to another PHY through [assumed] single optical wavelength on the G.694.1 DWDM frequency grid in the presence of multiple DWDM links on a single fiber. (See Optical Link Types #4, 5, and 6.)
11. DWDM Systems –A basic DWDM system will have an optical mux / demux for the multiplexing of multiple DWDM links onto a fiber (See Optical Link Type #4), and may include amplification (See Optical Link Types #5 and 6), and an optical add-drop multiplexer (See Optical Link Type #6).
12. DWDM Network - same as DWDM System?
13. In-line amplification –Optical amplification resides between the demarcation points, e.g. within the channel. See Optical Link Types #5 and 6.

Source: Kartalaopoulos, Introduction to DWDM Technology.

Proposed updated terminology

- **WDM** – optical technology that couples many wavelengths in the same fiber, thus effectively increasing the aggregate bandwidth per fiber to the sum of the bit rates of each wavelength.
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- **DWDM** – In fiber-optic communications, wavelength-division multiplexing (WDM) is a technology which multiplexes a number of optical carrier signals onto a single optical fiber by using different wavelengths (i.e., colors) of laser light. This technique enables bidirectional communications over one strand of fiber, as well as multiplication of capacity. (Source:Wikipedia)
  - IEEE 802.3 Normative Reference: ITU-T Recommendation G.694.1—Spectral grids for WDM applications: DWDM frequency grid.
- **DWDM PHY**: An Ethernet PHY that operates at a single wavelength on a defined wavelength grid and is intended to run over a DWDM system
- **DWDM Link**: One DWDM PHY transmitting to another DWDM PHY through a transmission path between them
- **DWDM Channel**: The transmission path between a DWDM PHY transmitting to another DWDM PHY
- **DWDM System**: An aggregate of DWDM links. [Alternative: A system which multiplexes a number of optical wavelengths onto a single optical fiber]
- **DWDM Network** - same as DWDM System. (Suggest to not use because of the potential confusion with the common usage of network in an Ethernet sense)

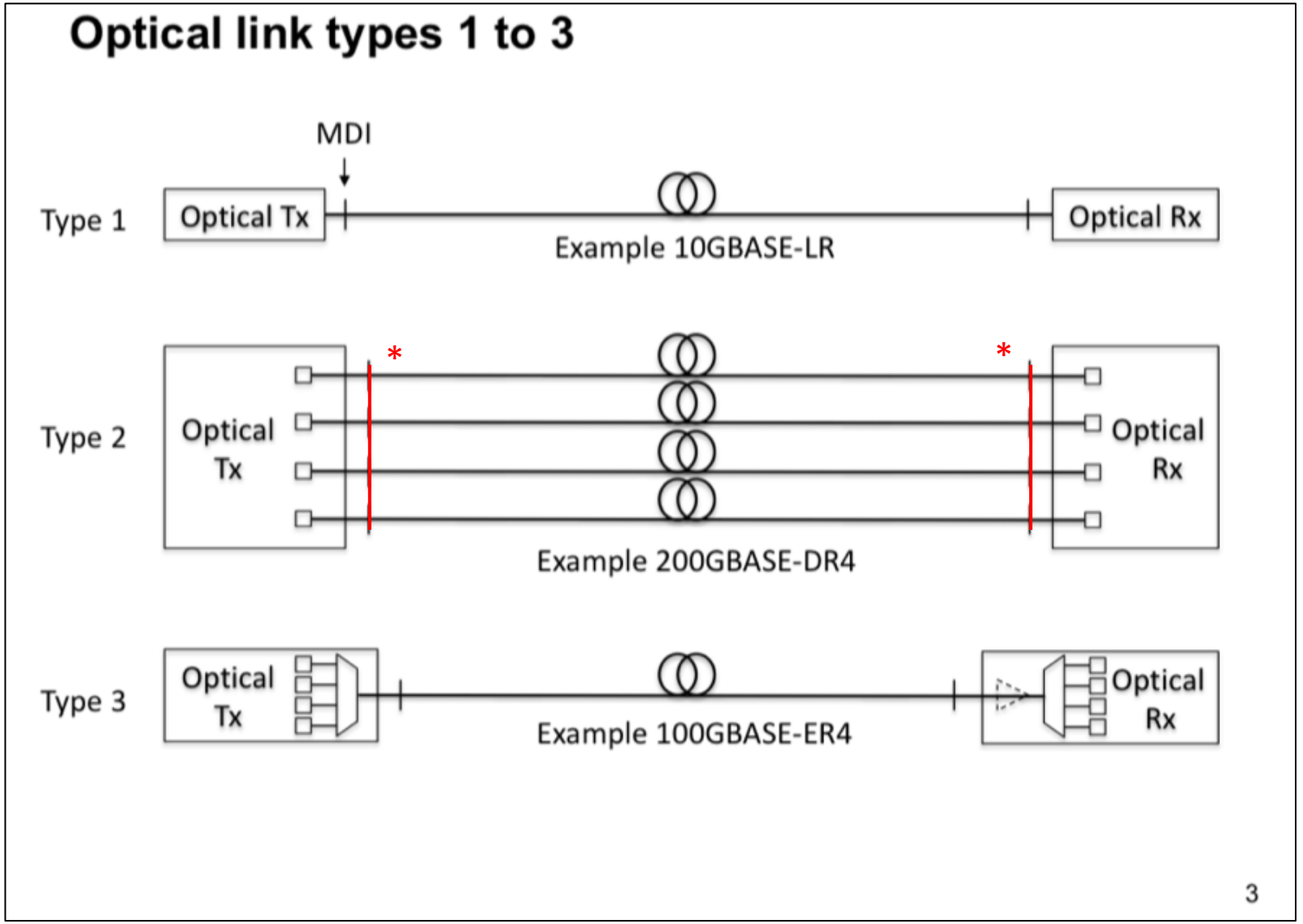
Link Types

Presented by Pete Anslow.

Excellent summary of link type configurations.

Type 1, 2, 3 all represent what would be typical of past IEEE 802.3 PMDs

Common usage would call these “Optical PHYs” as opposed to “Electrical PHYs” and different to the “DWDM PHY” that would be the outcome of the proposed objective in this presentation.



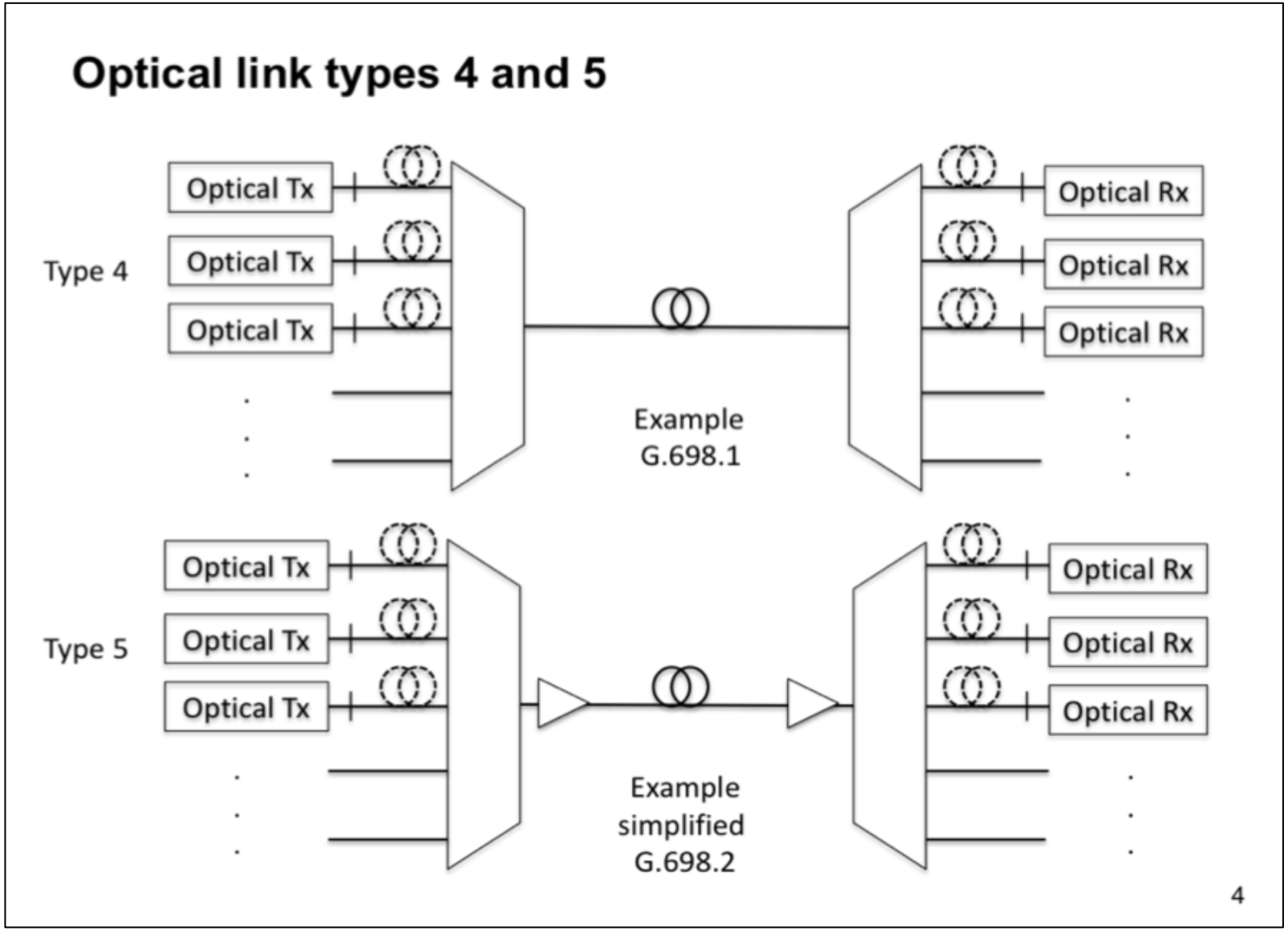
http://www.ieee802.org/3/B10K/public/18_01/anslow_b10k_01_0118.pdf

* Proposed modification to slides

Link Types

Link Types 4 & 5 are representative of network topologies consistent with DWDM systems and technologies.

Difference between Type 4 and Type 5 is the inclusion of the optical amplifiers which would typically be used to extend reaches beyond ~40km.



http://www.ieee802.org/3/B10K/public/18_01/anslow_b10k_01_0118.pdf

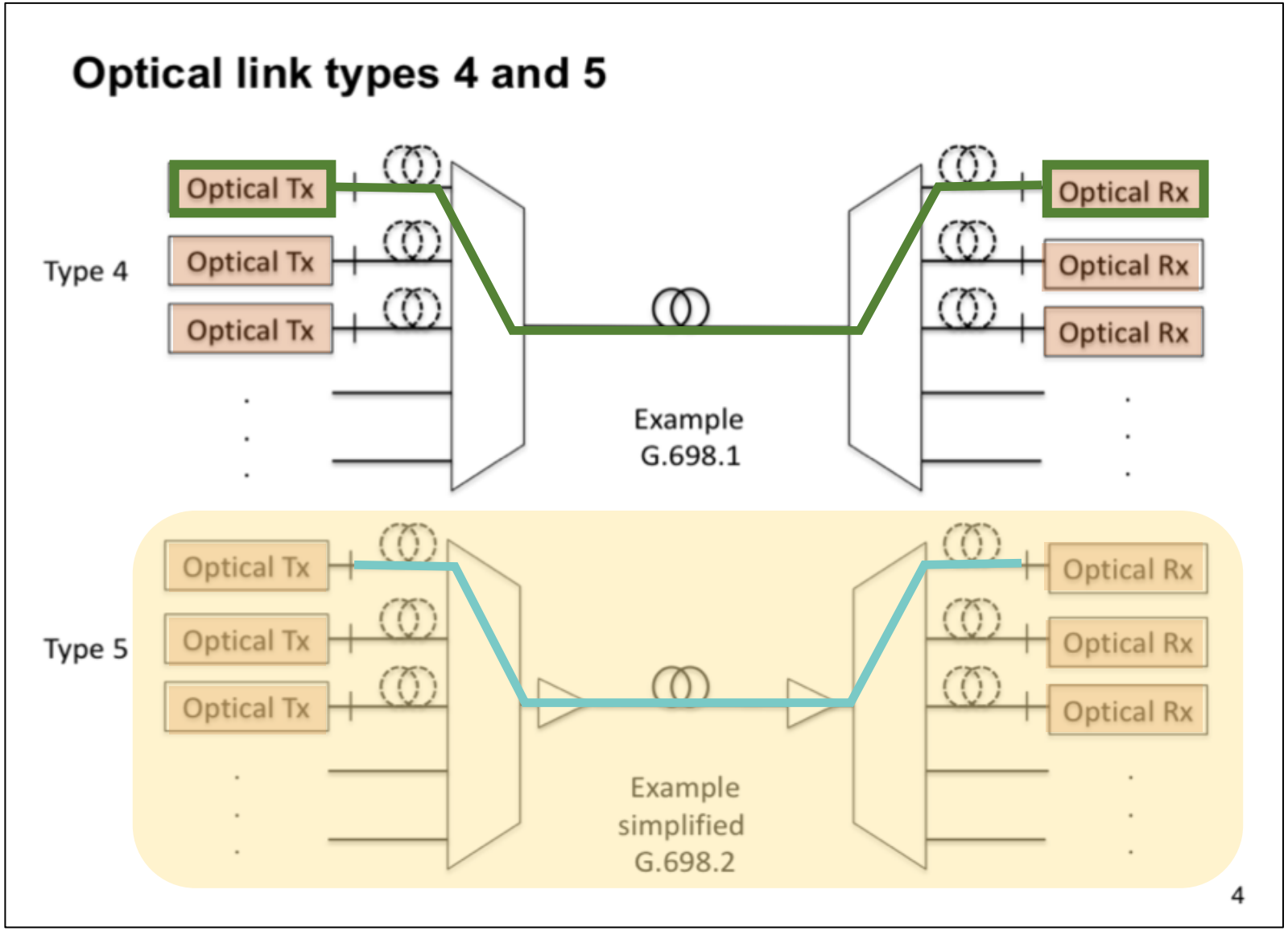
DWDM Link Types and Terminology

DWDM PHY:

DWDM Link:

DWDM Channel:

DWDM System:



http://www.ieee802.org/3/B10K/public/18_01/anslow_b10k_01_0118.pdf

Terminology summary

- The areas of work under consideration overlap between different industry groups.
- Terminology discussion in 802.3 B10k should focus on achieving broadest understanding within B10k participants
  - Formal definitions (or modifications of definitions) into the specification would happen during Task Force this is just a helpful exercise to accelerate consensus and discussion
  - Experts who are intimate with the nuances are probably able to translate depending on audience