Terminology around DWDM systems and relation with ITU-T SG15 Recommendations. Author's understanding of outcome meetings 28 January & 4 February 2021

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IEEE P802.3ct Task Force, Terminology Ad Hoc Call, 12 February 2021

Introduction

During the interim teleconference meetings on 28 January and 4 February 2021 4 presentations were given on terminology around DWDM systems, stassar_3ct_01_210128, dambrosia_3ct_01b_210128, stassar_3ct_01_210204, and dambrosia_3ct_01_210204.

As a result of the discussion on both presentations the understanding of the terms “DWDM system”, “DWDM PHY”, “DWDM channel”, “DWDM link” and “black link” appears to have significantly improved.

This presentation contains the author’s understanding of the outcome with suggestions for further discussions and consensus building.

What do we have so far in D3.1

1.4.160a black link: A multi-channel link specified using a methodology where the input, output, and transfer characteristics of the uni-directional transmission path between TP2 to TP3 for a given DWDM channel are specified, without specifying how the transmission path is implemented. (See, for example, IEEE Std 802.3, Clause 154, Figure 154–3)

1.4.237a DWDM channel: The transmission path between a DWDM PHY transmitting to another DWDM PHY.

1.4.237b DWDM link: One DWDM PHY transmitting to one other DWDM PHY through the transmission path between them.

1.4.237c DWDM PHY: An Ethernet PHY that is capable of running over one DWDM channel in each direction of transmission.

1.4.237d DWDM system: An aggregate of DWDM links optically multiplexed and demultiplexed onto and off either a single optical fiber or a single optical fiber per direction.

DWDM system

Generic term, not needing a specific definition for the purpose of the actual PMD specification in Clause 154.

Depending its “context” (system configuration).

There seems to be no opposition to delete this definition from the draft.

There seems no impact on the usage of the term “DWDM system” in the project name and PAR.

Black link approach

Current definition:

1.4.160a black link: A multi-channel link specified using a methodology where the input, output, and transfer characteristics of the uni-directional transmission path between TP2 to TP3 for a given DWDM channel are specified, without specifying how the transmission path is implemented. (See, for example, IEEE Std 802.3, Clause 154, Figure 154–3)

To be modified along the lines as suggested on slide 9 of dambrosia_3ct_01b_210128:

Black Link Approach - the specification of the input, output, and transfer characteristics of the uni-directional transmission path between TP2 to TP3 for a given DWDM channel within a DWDM Link, without specifying how the transmission path is implemented. (See, for example, IEEE Std 802.3, Clause 154, Figure 154–3)

DWDM PHY

Current definition:

An Ethernet PHY that is capable of running over one DWDM channel in each direction of transmission.

No need for modification

DWDM channel

Current definition:

The transmission path between a DWDM PHY transmitting to another DWDM PHY.

To be modified along the lines as suggested on slide 9 dambrosia_3ct_01b_210128, including some word smiting:

DWDM channel: The transmission path between a transmitting DWDM PHY (TP2) to a receiving DWDM PHY (TP3)

Or equivalent …..

There seems to be no opposition to this proposal.

DWDM link

Current definition:

DWDM Link –an aggregate of DWDM channels over either a single optical fiber or a single optical fiber per direction.

It is the author's view that "DWDM link" is more generic than "black link" used in subclause 154.6 of D3.1.

The links in 100GBASE-LR4, 200GBASE-LR4, 400GBASE-FR8 and 400GBASE-LR8 can be called DWDM links, because the various channels are on an 800 GHz grid, and therefore by definition on a DWDM grid.

There seems to be no opposition to the proposal to delete the definition for DWDM link.

black link

Concerns remain on usage of term “black link” in combination with “black link approach / methodology”.

“DWDM black link” could be an alternative, better than the generic term “DWDM link”

There seems to be no (or limited) opposition to replace instances of black link (and also DWDM link) by DWDM black link, and reuse the proposed definition for DWDM link on slide 9 of dambrosia_3ct_01b_210128:

> *DWDM black link – an aggregate of DWDM channels over either a single optical fiber or a single optical fiber per direction.*

link

During the call on 28 January some concerns were raised on usage of term “black link” compared to the definition of “link” in IEEE Std 802.3™-2018.

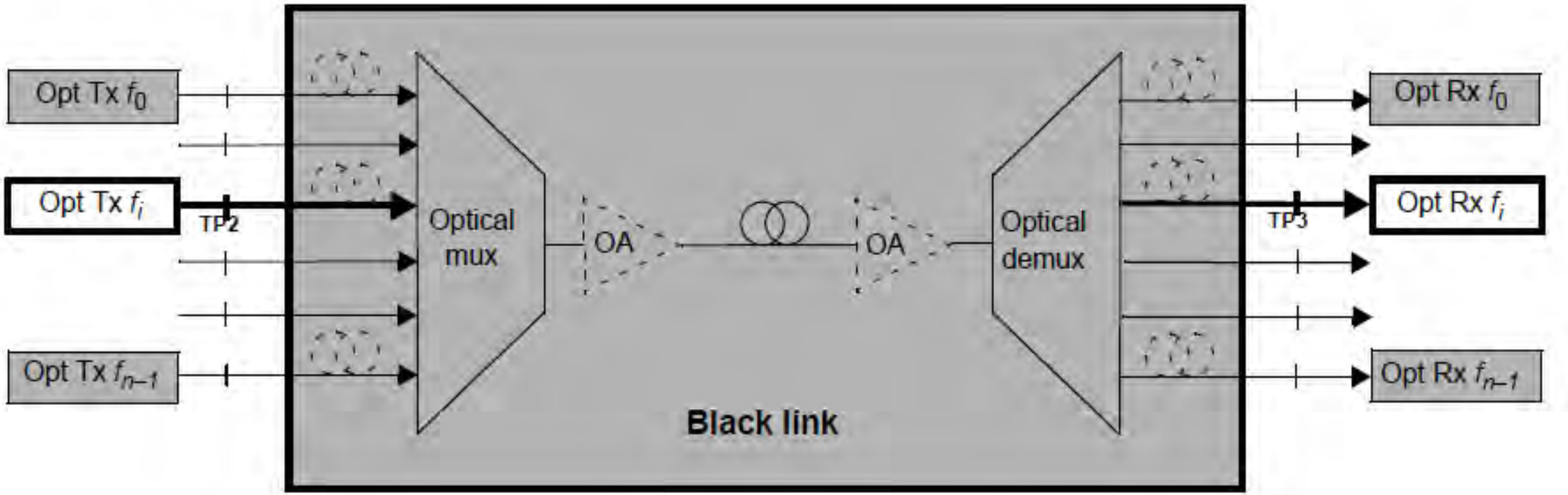
Current definition for “link”:

> *1.4.302 link: The transmission path between any two interfaces of generic cabling. (From ISO/IEC 11801.)*

This could be seen not inconsistent with a definition of DWDM black link between multiple TP2 and multiple TP3.

There seems to be no issue with general usage of link.

Name for the grey box in Figure 154-3



There seems to be no opposition to call the grey box in Figure 154-3 “DWDM black link”.

Concerns raised on Figure 154-3

- The focus of Figure 154-3 is when all signals are propagating on a single fiber in the same direction.
- It should be shown as a black box instead of a grey box and show the figure with the details in an informative annex.

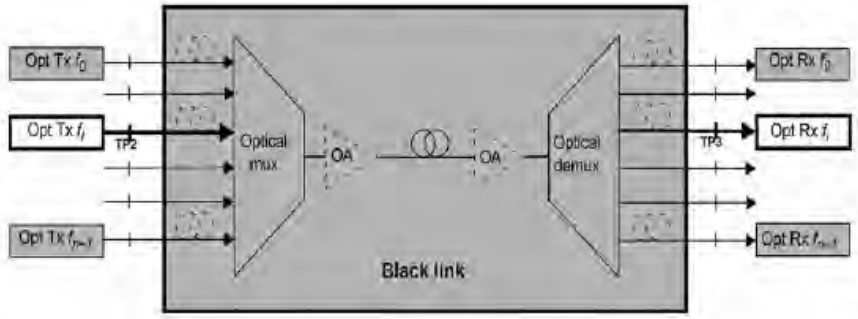


Figure 154–3—Black link example configuration for specifying *n* DWDM channels

Current

For clarity, only one direction of transmission is shown
Figure 154-3 – Black Link Approach for specifying DWDM channels in a DWDM Link

From dambrosia_3ct_01_210204

Concerns raised on Figure 154-3, continued

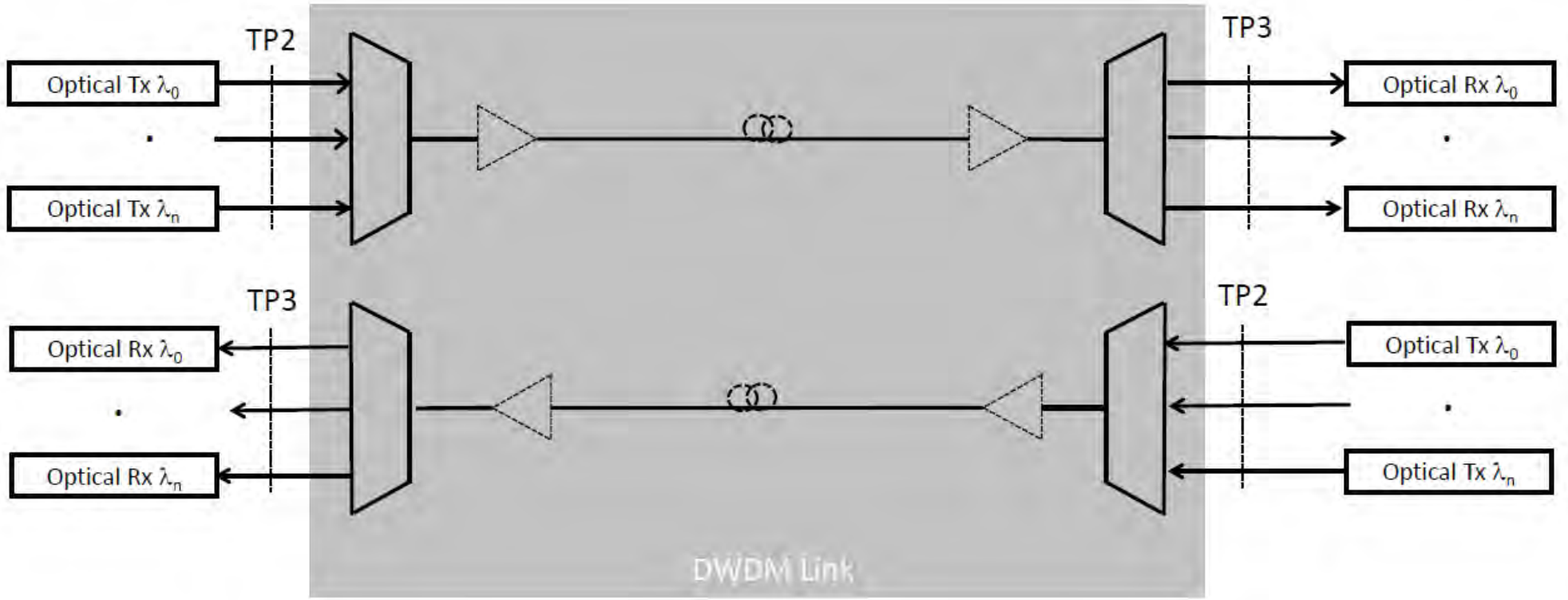
Need another figure illustrating an aggregate of DWDM channels over a single optical fiber (bi-directional transmission), where 50% of the signals go West-East and the other 50% go East-West (opposite direction).

Figure 154-x – Black Link Approach for specifying DWDM channels in a DWDM Link

From dambrosia_3ct_01_210204

Concerns raised on Figure 154-3, continued

Add another Figure showing that to get a complete link both directions are needed.

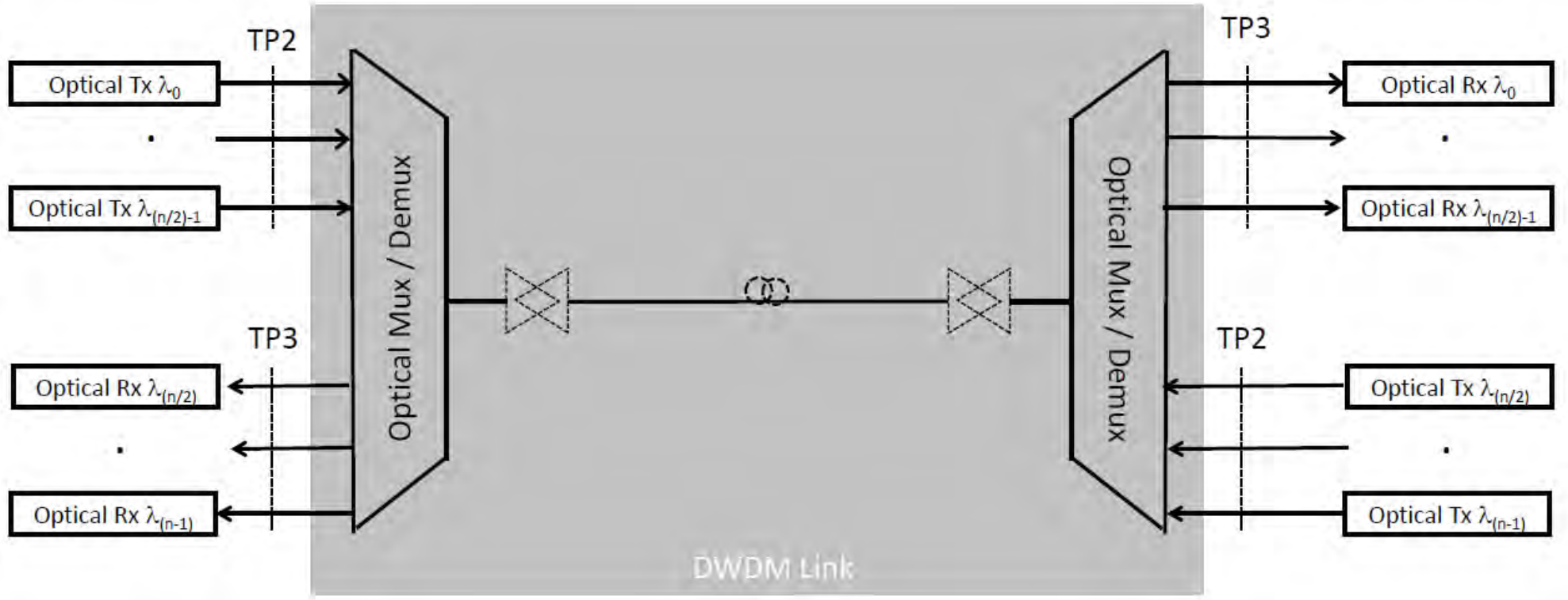


Example - DWDM Link – Single Fiber Per Direction

From dambrosia_3ct_01_210204

Concerns raised on Figure 154-3, continued

Need another Figure showing bi-directional operation of the multi-channel operated fiber inside the DWDM black link.



Example - DWDM Link – Single Fiber

From dambrosia_3ct_01_210204

Thoughts on raised concerns

- During the discussion on 4 February 2021 the concerns raised in dambrosia_3ct_01_210204 and reproduced on the four previous slides were extensively discussed.
- Making the grey box black without details will be removing crucial information to understand what Clause 154 is about.
- Adding the proposed figures are only a small subset of all potential configurations. There are endless variations, especially in the case of bi-directional operation, where the proposed figure in dambrosia_3ct_01_210204 shows a very particular choice of wavelength partitioning which may be adding more confusion than resolving.
- The purpose of Figure 154-3 is to show the location of single-channel reference points and give an insight of the functions inside the grey box.
- We could consider to see how far we get by adding notes to the text in subclause 154.6 and to Figure 154-3.

Further thoughts / proposals on and around Figure 154-3

- In line with comment / proposed remedy R1-2 (from the author):

  Add "Furthermore bi-directional transmission over the multi-channel fiber inside the black link is not precluded." to the Note in 154.6 and additionally add "Bi-directional transmission over the multi-channel fiber inside the black link is not precluded" to Figure 154-3.

- Add further notes to the text in subclause 154.6 and to Figure 154-3 (similar to the note in Figure 154-2:

  "*Only one direction of transmission is shown. For communication between two 100GBASE-ZR PHYs two DWDM channels will be required - one DWDM channel in each direction of transmission. Inside the DWDM black link these two DWDM channels may be transported over a single optical fiber or a single fiber per direction*."

Summary of terms & definitions with no / limited opposition

- Removal of definitions for “DWDM system” and “DWDM link”
- Merging terms “DWDM link” and “black link” into “DWDM black link”.
- Maintain definition for “DWDM PHY”.

- Definition for “DWDM black link”: *DWDM black link – an aggregate of DWDM channels over either a single optical fiber or a single optical fiber per direction*

- Modify definition for “DWDM channel” to: *DWDM channel: The transmission path between a transmitting DWDM PHY (TP2) to a receiving DWDM PHY (TP3)*

- Modify definition for black link to**:** “*Black Link Approach - the specification of the input, output, and transfer characteristics of the uni-directional transmission path between TP2 to TP3 for a given DWDM channel within a DWDM Link, without specifying how the transmission path is implemented. (See, for example, IEEE Std 802.3, Clause 154, Figure 154–3)”*

Thanks!