100GE WDM Grid Observations

IEEE 802.3 Higher Speed Study Group
Fiber Optic Ad Hoc

4 April 2007
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Outline

- Proposed Simplifications to 100GE Alternatives Table Entries

- Existing WDM Grid Alternatives

- Possible New WDM Grid Alternative

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Reach (Technical) Feasibility of 100GE Alternatives

SMF	10km 1310nm	40km 1310nm	10km 1550nm	40km 1550nm
10x10G DML	yes	yes + OA	yes	maybe + OA
10x10G ML	yes	yes + OA	yes	yes + OA
5x20G / 4x25G DML	yes	yes + OA	maybe	maybe + DC
5x20G / 4x25G ML	yes	yes + OA	yes	yes + DC
2x50G DQPSK I/Q ML	yes	yes + OA + DC	yes + DC	yes + DC
1x100G TDM ML	yes + OA	yes + OA + DC	yes + OA + DC	yes + OA + DC

OA = Optical Amplification, DC = Dispersion Compensation

Green shading designates alternatives under detailed study by Fiber Optic Ad Hoc contributors

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Existing WDM Grid Alternatives

- IEEE 802.3 LX-4 grid
  - ~ 1275- 1350nm span (O band) with 4 channels
  - 25nm spacing
  - 13.4nm width

- ITU G.694.2 CWDM grid
  - ~ 1470 – 1610nm span (O, E, S, C, L band) with 18 channels
  - 20nm spacing
  - 13nm width

- ITU G.694.1 DWDM grid
  - ~ 1492 – 1612nm span (S, C, L band) from 193.1THz base
  - 200, 100, 50, 25, 12.5GHz spacing alternatives
  - Application dependent width

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Observations on Existing WDM grids

- CWDM (or LX4)
  - Uses un-cooled lasers
    - For 2.5G applications this was estimated to result in ~40% cost savings versus cooled lasers.
  - 4 or 5 channel applications span 60nm to 80nm
    - Monolithic laser arrays require complex fabrication processing steps.
- DWDM
  - Uses cooled lasers
  - Transport applications have stringent specifications (ex. frequency stability, four wave mixing effect, etc,) which increase cost.

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Possible New WDM grid alternative

- IWDM or iWDM (Intermediate WDM)*
  - 400GHz to 800GHz spacing
    - ~2nm to 4nm spacing in the 1310nm band
    - ~10nm span supported by standard monolithic laser array processing
    - Does not impose stringent frequency stability requirements
    - Avoids most non-linear DWDM effects
  - Requires cooling or semi-cooling
  - Feasible WDM Mux and DeMux structures
- It is recommended that HSSG FOAC contributors study non-standard WDM grid alternatives to recommend an optimum grid for the 100GE application.

* ITU defines a grid as CWDM if it is between 1000GHz to 50nm, and as DWDM if it is under 1000GHz, so strictly speaking the above grid is DWDM. However, a distinct name, such as iWDM, may a better differentiator.

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