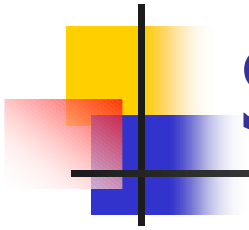
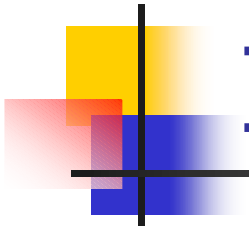
P2MP Optics Baseline

Major Items needed
for a complete specification



Supporters

Brian Ford	BellSouth
Francois Fredricx	Alcatel
Frank Effenberger	Quantum Bridge
Jerry Radcliffe	Hatteras Networks
Kenji Nakanishi	NTT
Kent McCammon	SBC
Meir Bartur	Zonu
Oren Marmur	Flexlight
Paolo Solina	Telecom Italia Lab
Raanan Ivry	Broadlight
Robert Deri	Terawave
Walter Soto	Agere
Zheng-Yang Liu	NEC eLuminant



Issues

Current draft items:

- Dynamic performance
- Budget adjustments

Future draft items:

- Power control
- Isolation requirements

Dynamic performance

- General idea: We want one ONT PMD if at all possible, used in as many systems as possible, achieving high volumes ASAP
- There are diverse opinions on the values of the timing performance

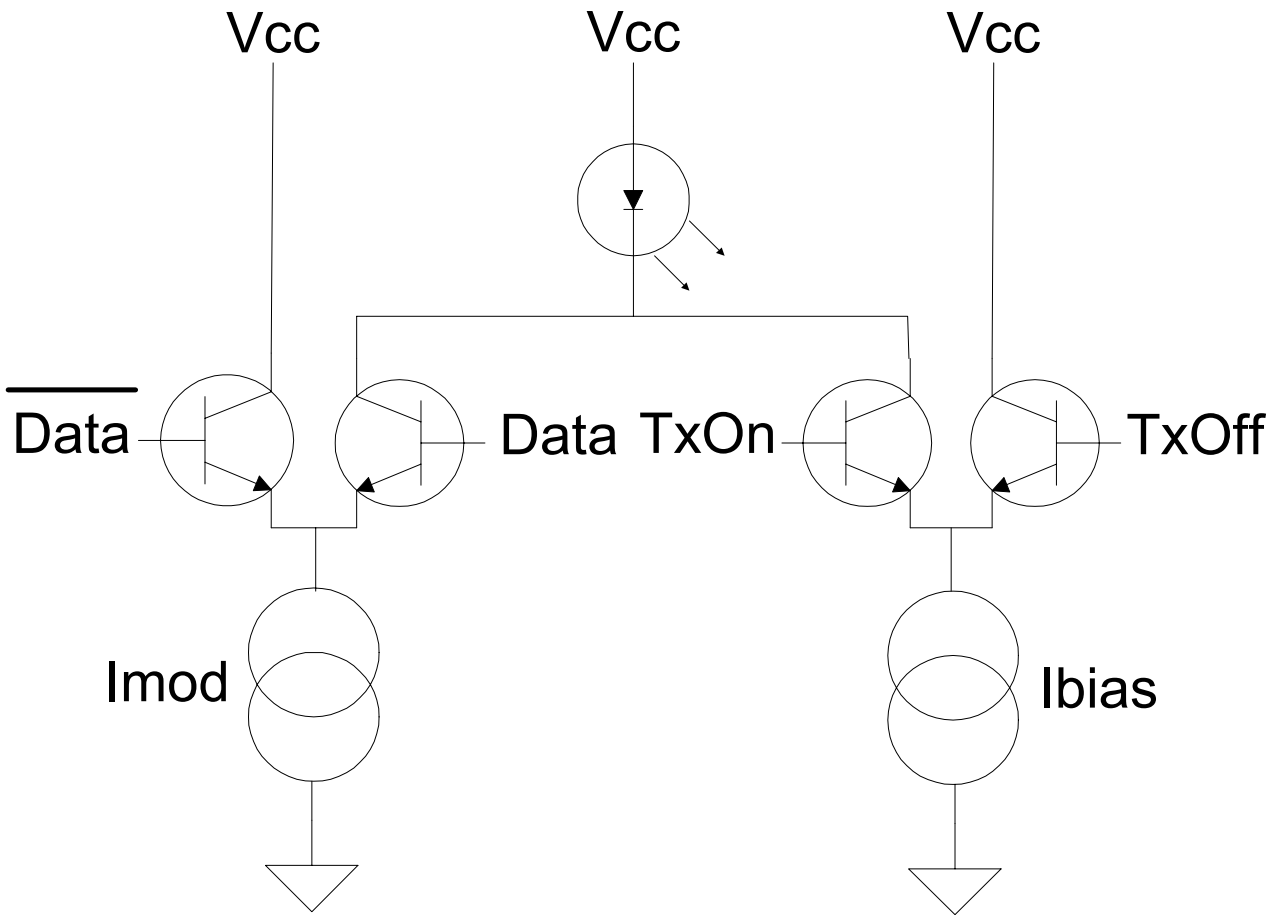
- Compromise: Let's try to reach agreement on the PMD parts of the overhead
- Non-PMD parts of the overhead in the OLT can be variable (or standardized later, if possible)

Technical Details

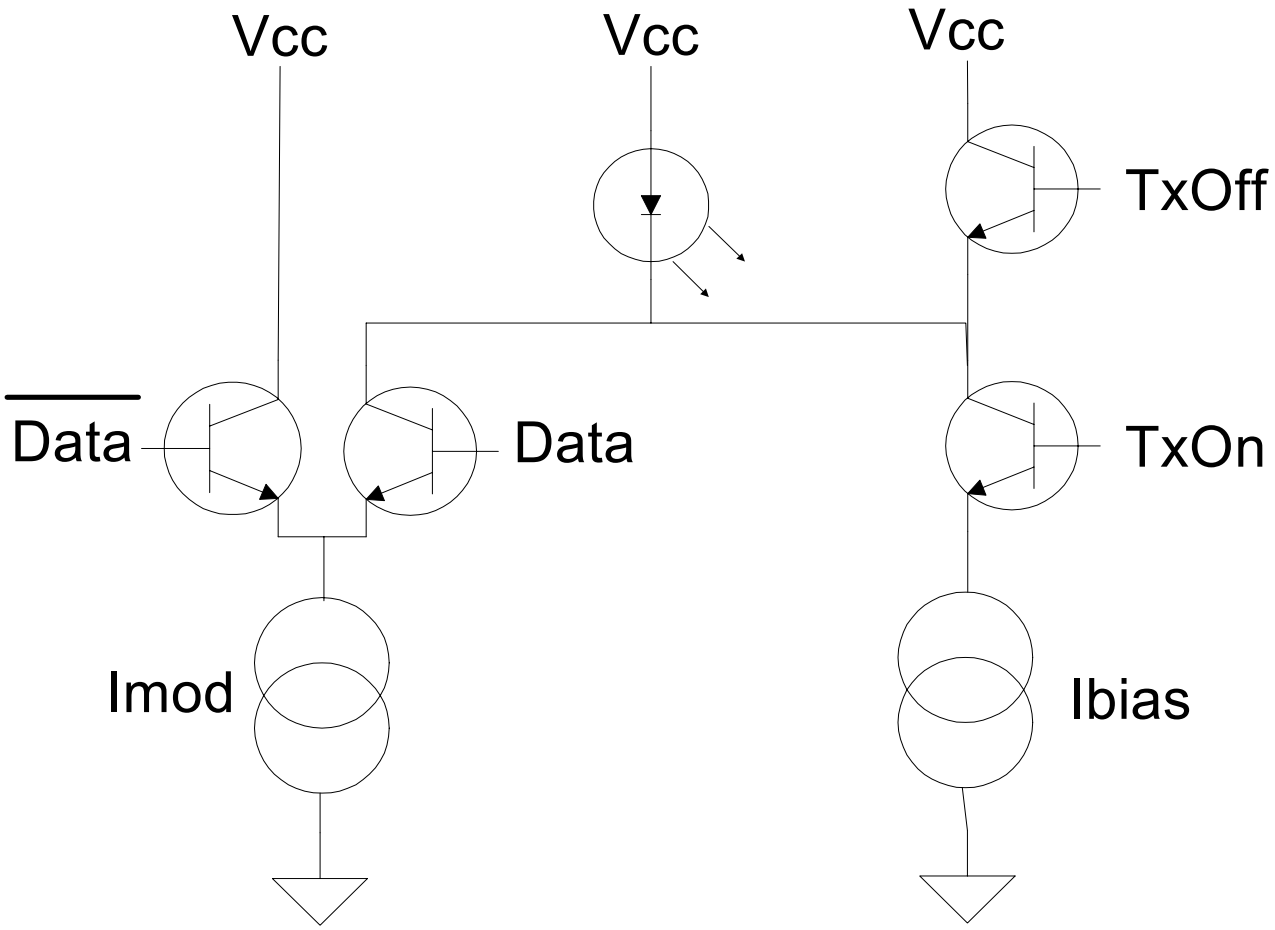
- ONT: Ton < 16 ns. Toff < 16 ns.
  - This matches the clock precision of the MPCP
  - This is very forgiving – anybody can do it
  - There is zero extra cost for achieving this
- OLT: Tdsr+Tlr* < 50 ns.

  *Tdsr+Tlr does not include allowance for timing inaccuracies, clock recovery, or burst delimiter
  - This value has been proven in the literature
  - OLT maker can locally optimize other timing values

Burst Mode Transmitter (1)



Burst Mode Transmitter (2)

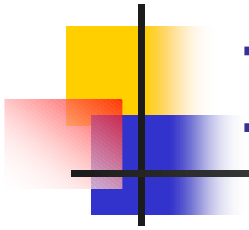


Compromise advantages

- ONT behavior should be standard, not optional
  - A PON contains many ONTs – we don't want to have to manage many different kinds
- This middle-of-the-road timing value will achieve volume sooner and with less risk
  - Values are compatible with ITU-T GPON system, hence there will be one optic for both systems
  - Removes the system-level choice from the PMD manufacturer's decision tree

Budget Adjustments

- Initial budget assumed an output power of +2 to –3 dBm for the ONT transmitter
  - This results in aggressively low OLT sensitivity
- A recent meeting of the Q.2/15 agreed that the ONT transmitter output power be changed to +3 to –2 dBm, with corresponding changes to the OLT Rx
- It is recommended that IEEE follows suit



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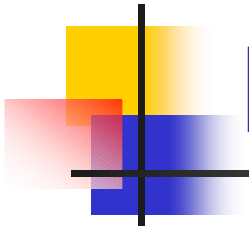
Power Control



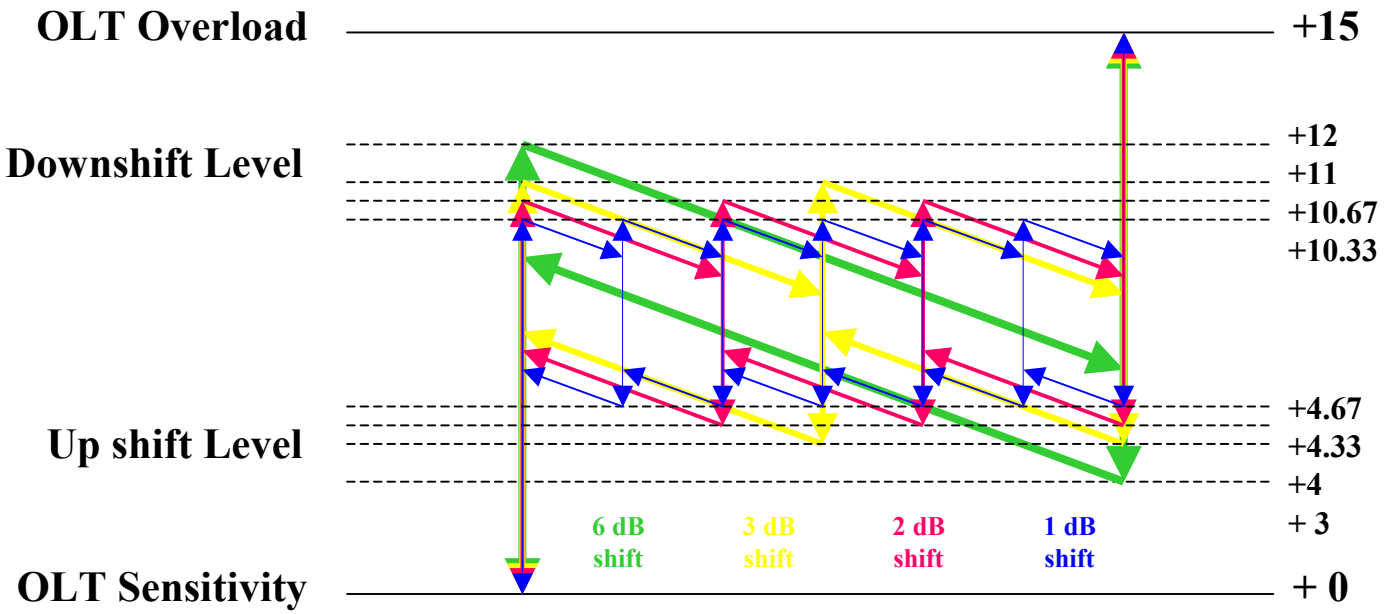
- The dynamic range of 20+dBs can be difficult, especially for APDs
- There are three solutions to this problem
  - Reduce the fiber plant loss range
    - Practical in mass FTTH deployments
    - Early deployments might have trouble
  - Give the ONTs power control
    - Nearby ONTs lower their power output
    - Requires a method of control
  - Overcome the problems of OLT dynamic range
    - Might be difficult to do and increase cost

System Impacts

- Power control as an optional factor?
  - PC may add cost to the ONT
  - PC not required in all settings
- However, optional ONT PC will not allow all combinations of OLT-OSP-ONT
  - At least one part of the network must take up the excess dynamic range: OLT, OSP, or ONT
- Either make PC mandatory, or learn to manage the combinations

Granularity of Power Control

- Minimum power variation needed is 6 dB
- Only a few (2 or 3) levels are necessary



Control Concepts

- ONT defaults to full power
  - Insures initial ranging (or at least detection)
  - If power control is optional, full power is default for ONTs that do not support it
- OLT tells ONT to go up or down a level
  - Finesses the issue of ‘how many levels’
  - Request valid during ranging and operation
    - Ranging: Ensures that bright ONT can join the network
    - Operation: Compensates for ‘seasonal’ variations in optics

PMD interface requirements

- PC will require OLT PMD to have a received signal strength indication (RSSI)
  - (RSSI is also useful from an operator standpoint)
- The accuracy and precision needs to be carefully described
  - In general, RSSI signals are not linear over the whole range of input signals
  - Absolute accuracy is not that good
- Most importantly, the RSSI signal must track the actual Rx sensitivity and overload

Isolation/ORL Requirements

- Using the formalism established in G.983.3 – appendix IV, the following are derived

Output Parameters	Type 1	Type 2	Based on G.983.3, Ap	
Isolation of ONU Rx from 1310nm	6	6	Eqn. IV:1	
Isolation of OLT Rx from 1490nm	16	24	Eqn. IV:4	
Min OLT Return loss at 1310nm	13	11	Eqn. IV:3	
Min ONU Return loss at 1310nm	2	0	Eqn. IV:2 and 5	

- Note that ONT requirements are very easy, OLT requirements are somewhat harder