10 Gigabit/sec

Status and Technology

- Need for Speed (Bandwidth)
- Need for Distance
- Technology Capability
- Technology Choices
- Actions

Need for Bandwidth

Demand from customers to increase data throughput:

- Computer clustering
- Storage networking
- Expansion of Internet-Based Applications
- Convergence of Telecom and Datacom Environments
- Established 1 GbE Product in Backbone and crossconnect
- Higher data rates in FTTO/D applications expected soon

--> Strong demand from both Datacom and Telecom camps for faster physical layer

--> Request from major suppliers for faster products

Need for Distance

Applications for 10 Gigabit Modules

- Short Distance: <100m
  - High Volume Disk Servers
  - Bay to Bay interconnections in CO switches and DCS
  - Interconnection of high speed equipment
- Intermediate Distance: <3km
  - Buildings Interconnection
  - Campus Interconnection
- Long Distance: <10km
  - Long Distance Backbones
  - Cooperate Networks, Metro/City Networks
- Extreme long distance (up to 80km)

Technology Capability

- Components for 10 Gigabit operation are already available
  (Laser, Mux/DeMux, Amplifier, Laser Driver)

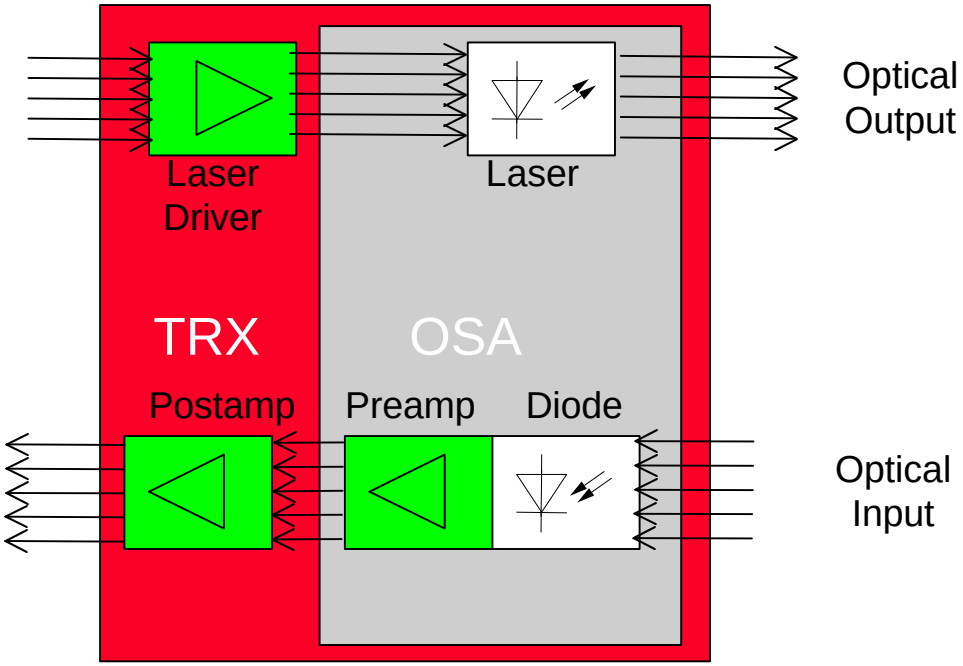
- New ASIC Technologies supporting 10 Gigabit are available today
  - SiGe (f_t 75 GHz)
  - Hybrid Bipolar (f_t 50 GHz)

- New Fibre Optic and Fibre technologies have been introduced

- Cost Reduction due to higher volumes are expected

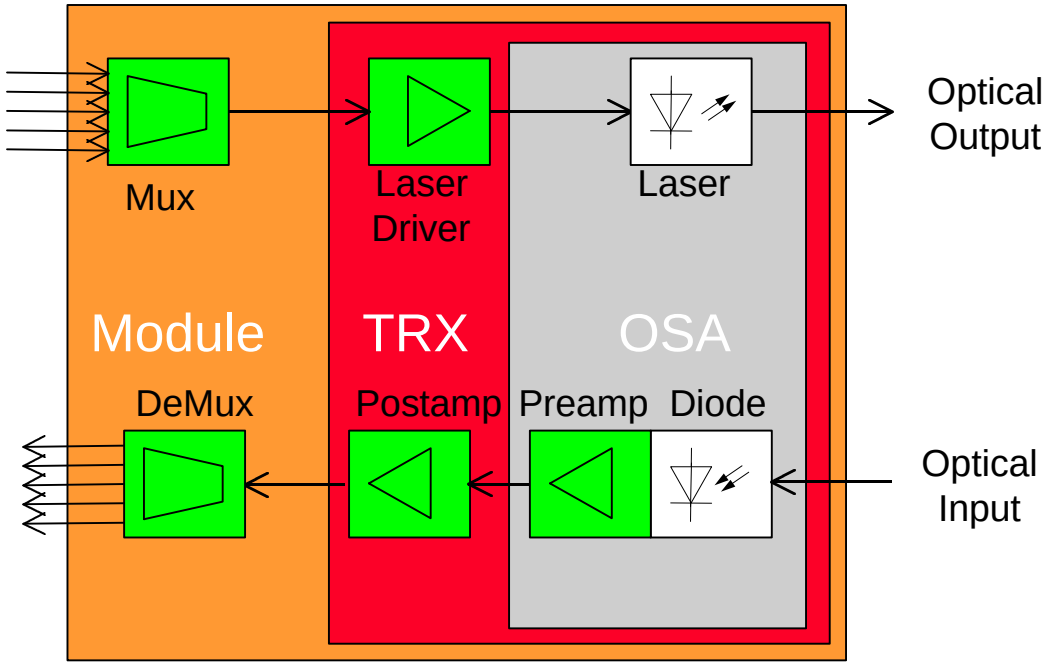
Technology Choices (1)

- Parallel Optical Transceiver
  - Unencoded Data rate on Fiber: 10 X1Gbps
  - Encoded Data rate on Fiber: 10 X1Gbps



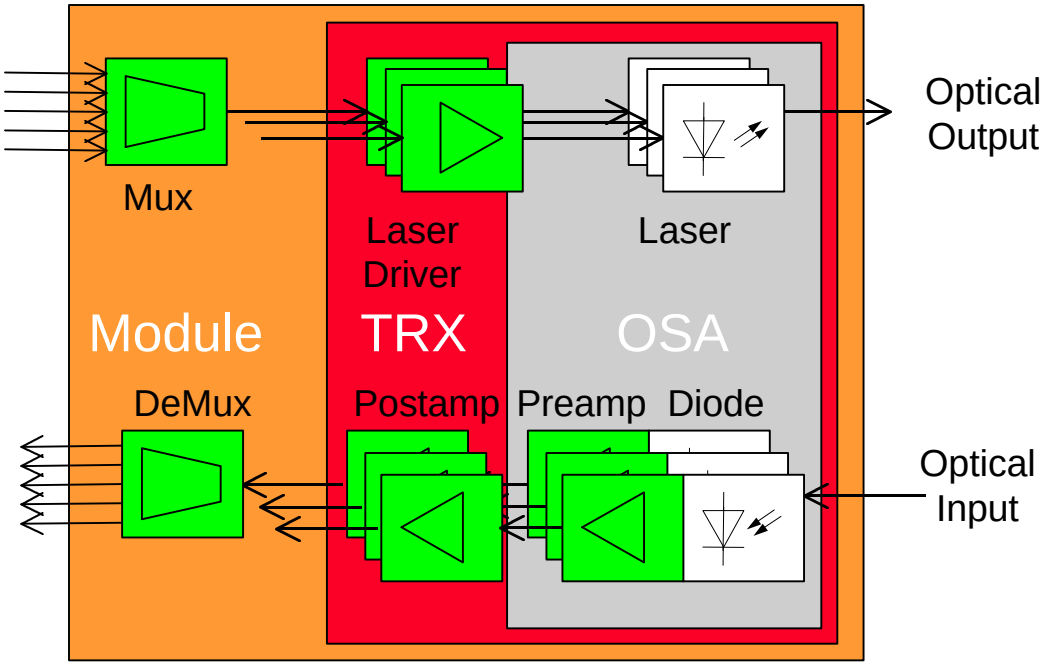
Technology Choices (2)

- Serial Optical Transceiver
  - Unencoded Data rate on Fiber: 10Gbps
  - Encoded Data rate on Fiber: 10Gbps, 11Gbps, 12.5Gbps



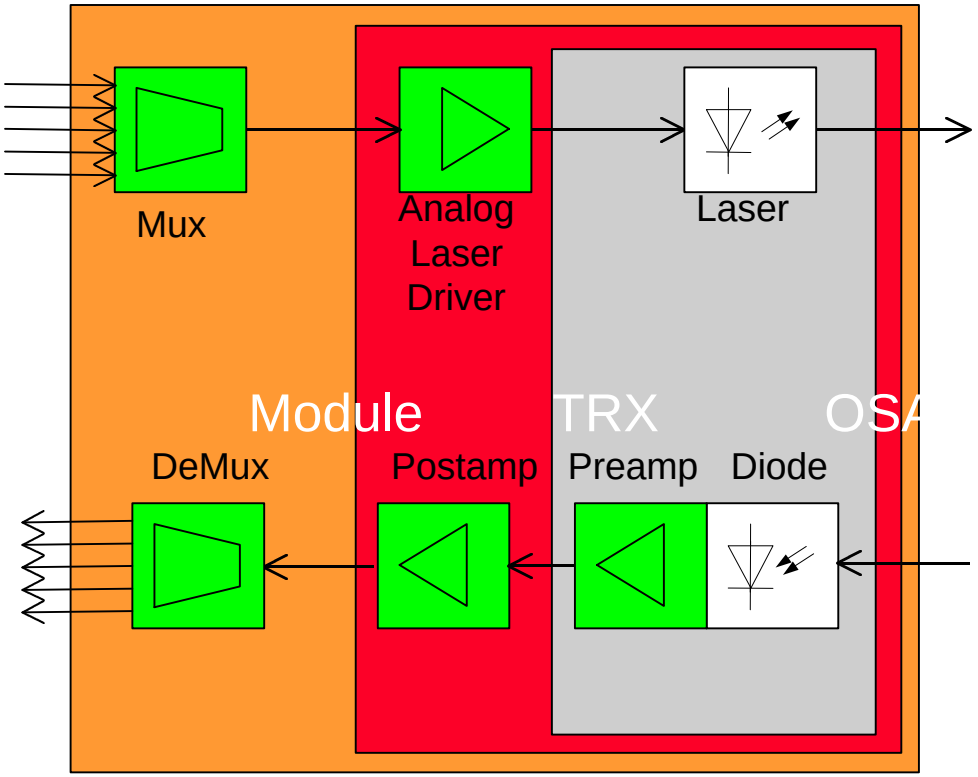
Technology Choices (3)

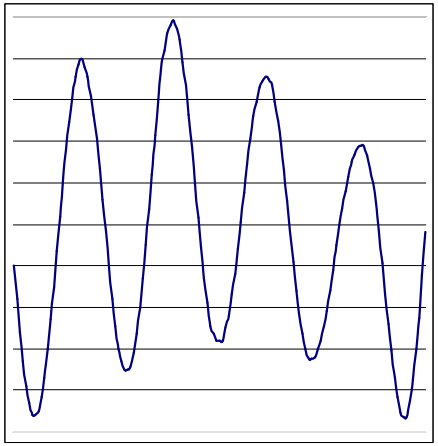
- WDM Module
  - Unencoded Data rate on Fiber: 10Gbps
  - Encoded Data rate on Fiber: <10Gbps (eg.4 X 2.5Gbps)



Technology Choices (4)

- Multilevel Coding (analog transmission)
  - Unencoded Data rate on Fiber: 10Gbps
  - Encoded Data rate on Fiber: <10Gbps





Technology Choices (5)

Coding:

8/10B	20% overhead	--> Excellent Balance
14/15B	10% overhead	--> Good Balance
Scrambling	No overhead	--> Uncontrolled Balance
Multilevel coding		--> Lower line rate

Partitioning:

"10 GMII", Module, Transceiver, Optical Sub Assembly

Interface:

CML 50/72 Ohm, LVDS, HSTL, …..

Physical media and distance:

Single Mode, Multimode, Copper, use of existing base

Distance Estimation of availible Technologies

	Fiber	Wavelength	Datarate	Distance
MMF	62.5 µm	850 nm	12.5 GBd	25 m
		850 nm	4 x 3 GBd WDM	100 m
		850 nm	10 x 1.25 GBd, par.	300 m
		1300 nm	12.5 GBd	50 m
	50 µm	850 nm	12.5 GBd	50 m
		1300 nm	12.5 GBd	50 m
SMF	9 µm	1300 nm	12.5 GBd	10 km
		850 nm	12.5 GBd	TBD
	5 µm	850 nm	12.5 GBd	TBD

Actions

- The Technology is ready we just have to pick the right one
- The Industry wants the speed and needs solutions

Siemens proposes to create a study group to determine the optimal solution(s)