Towards Optical PCI

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Frequency

Bus Speed (PCI Express)
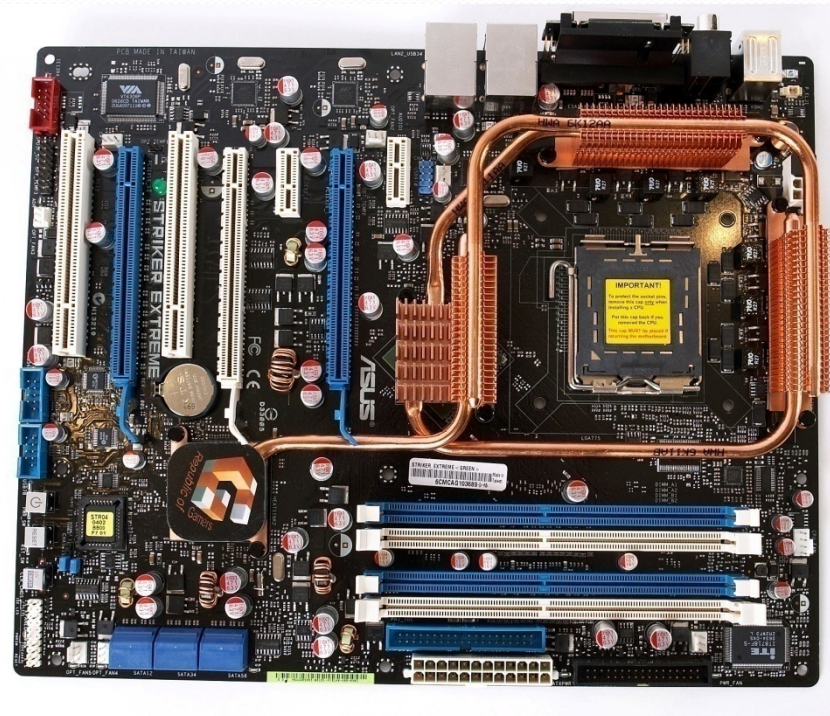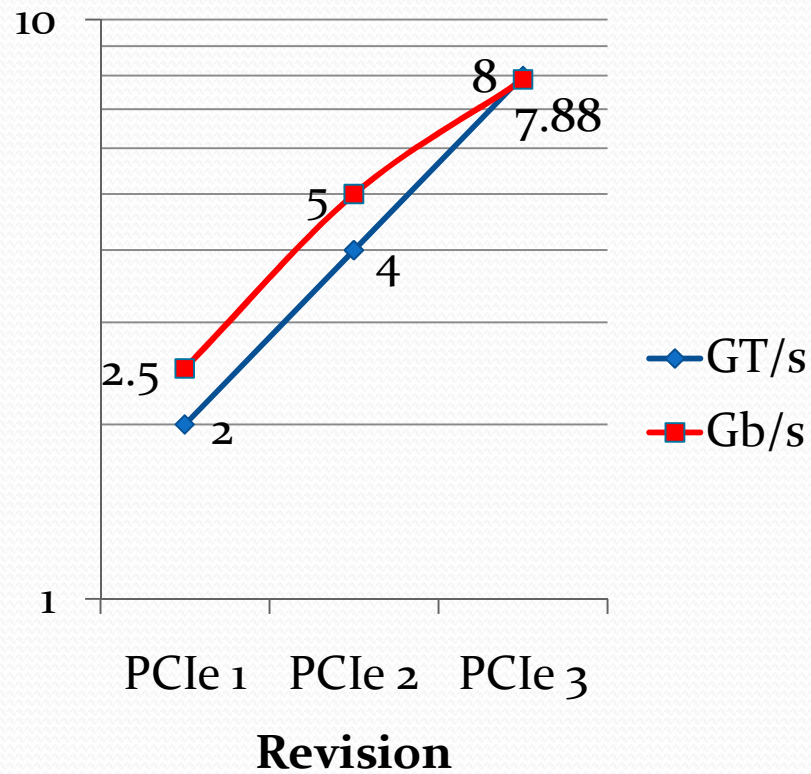
Power consumption

- Power density is a big problem for data centres

- Importance of energy management will only increase

- Heat dissipation also limits performance

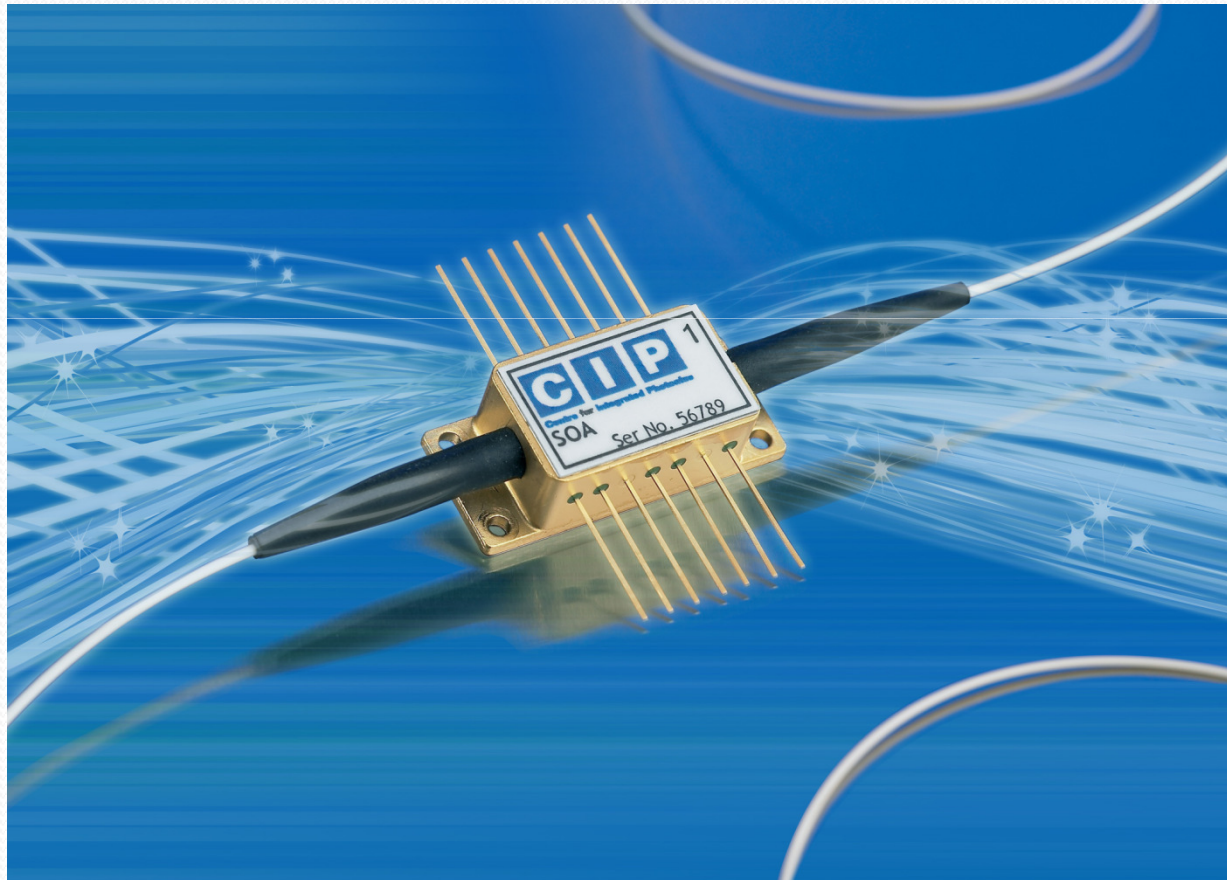Energy in == energy out

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Performance

- Latency lags bandwidth [Patterson 2005]
- PCIe packet oriented, not transaction oriented
  - Buffering
- PCIe must use split completions
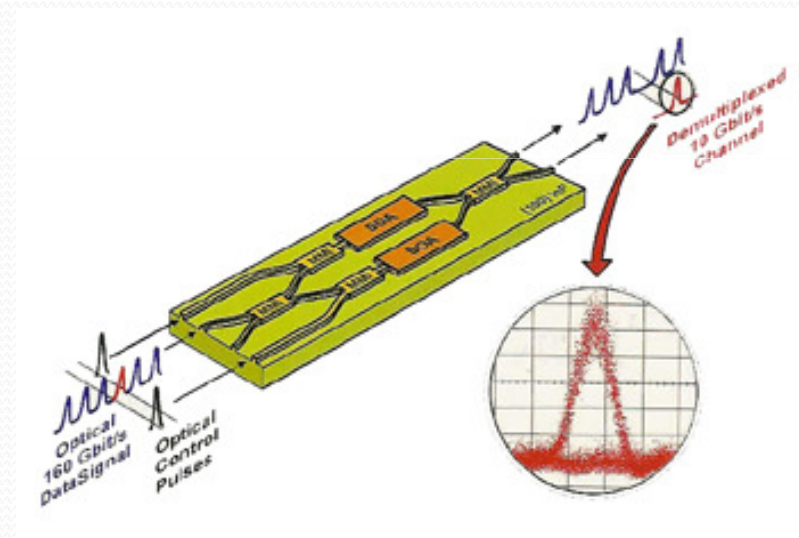

- Split completions harm latency

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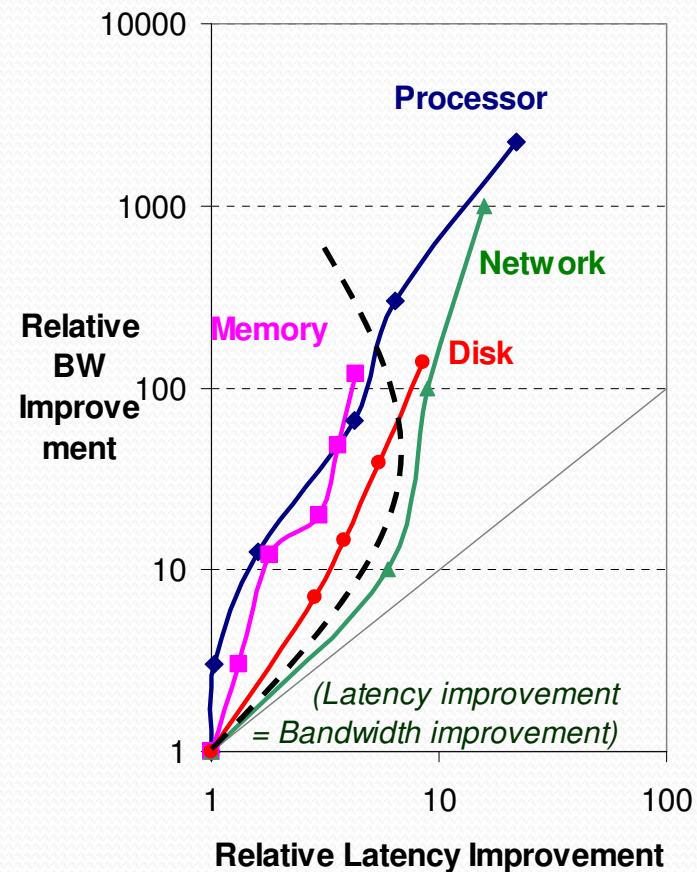
What can photonics offer?

Photonics vs electronics

- Bandwidth
  - Higher bit rates
  - More lanes (WDM)
- One switch switches all lanes
- Lower latency
- Power and performance decoupled

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One big disadvantage

- No equivalent to optical RAM
    - Lower latency
    - But scheduling must avoid contention
- Optical racetrack mem. slow and low density
- New approach required

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Current and future work

- Experiments in progress:
  - Show that latency has suffered
  - Investigate effect of latency on bus trans.
  - Build model PCI bridge, evaluate performance