Use Cases for Power-Aware Networks

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Background Power Consumption

• Network devices consume a high level (for routers, >80%) ‘background’ power even no load is being carried.

• IOW: power consumption of network devices is not proportional to traffic load.

• Idle devices should be put into low power mode (e.g., sleeping state) to save energy consumption.
Power Consumption of Line-Cards

• Line-cards are the most power-hungry part for high-end routers and switches.
• E.g., with chassis fully loaded with line cards, an EX8208 Switch can consume 5200 Watts, while nearly 70% is from the line-cards!
  – (chassis watts) + 8 (8-port SFP+ line card watts) = (1600 W + 8 (450 W)) = 1600W + 3600W = 5200W
  – This means 3600/5200 = 70%
L2 Sleeping Links

• Energy Efficient Ethernet (IEEE 802.3az)
  – Transceivers connecting an Ethernet link can enter Low Power Idle mode during the intervals of data streams.
  – Kind of opportunistic “sleeping”
L3 Sleeping Links

• Traffic can be aggregated on to part of links through Traffic Engineering.
• Therefore, idle links are ‘scheduled’ to go asleep to save energy consumption for ISPs.

(a) No sleeping opportunity; (b) link R1–R4 can sleep
Awareness of Sleeping State at L3

• We propose to add a new adjacency to represent sleeping links.
• L3 devices build an extended LSDB for sleeping links just as they build a regular LSDB.
• In this way, those sleeping links are “remembered”. In a proper time, it can be waken up.
L2 & L3 Coordination

• Different from the opportunistic sleeping, the L3 sleeping links can be planned and the sleeping period can be much longer.

• PHYs is probable to negotiate a longer time to enter LPI (deep sleeping modes).
Composite Links

• Composite links are widely deployed by ISPs.
• When the traffic load is lower than the overall bandwidth of a composite link, some component links can be put into sleeping state without cutting off the entire link.
• Advantage: the connectivity is preserved.
Thanks!