Cloud&Data Center 2020 Vision
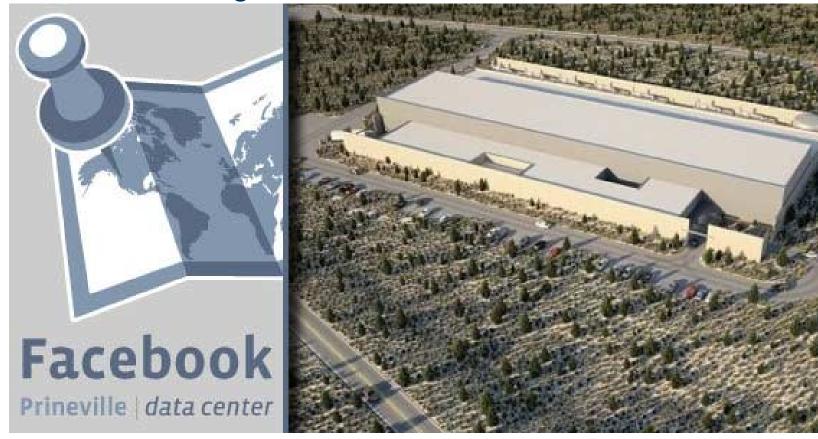
EPSRC Communications&Networking

Network meeting on Photonics, Oxford, 28.9.2011

Jon Crowcroft, Computer Lab, Cambridge
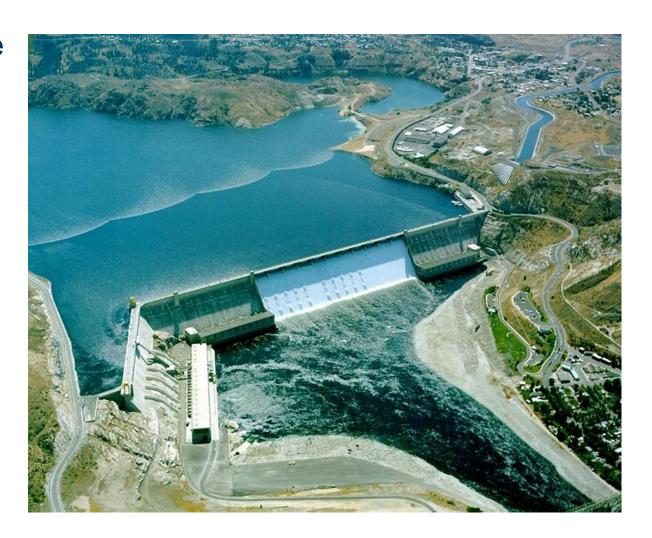
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- Somewhere in Oregon

A Data Center - 2

- Rows of Racks

- Coulie scale
- Engineering
- Thanks to
- Dave Clark

- Trust/Reliability (Woody Guthrie worked on Coulie Dam)

Interconnect Requirements

- Interconnect Service to external capacity (web/Cloud)
- Interconnect servers to each other (map/reduce)
- Unpredictable load/hotspot ->
    - VL2
    - Fat Tree
    - De Bruijn/BCube
    - Many others
- See: http://dl.acm.org/citation.cfm?id=1921189

    A Cost comparison of Data Center Network Architectures, Popa, Ratnasamy, Iannaconne, Krishnamurthy, Stoica

Performance Requirements

- Spint into Internal to Data Center and External
- Availability (MTTR < 200ms – e.g. for skype or youtube)
  - Capacity (Internal v. external)
  - Latency (Internal v. external)
  - Power
- Other? Yes
  - Flexibility

Server External Capacity Today
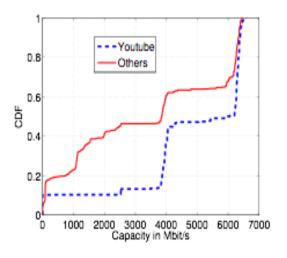
- From www.eurecom.fr/~ennajjar/PUB/YouTube.pdf

Figure 4: CDF of Servers Capacities: YouTube vs. Others

Data Center Switching Capacity Internal

- ## From http://www.aristanetworks.com/en/products/7500series
    - 192 * 10GigE
    - 2.3GB packet buffer per linecard module
    - 4.5usec port to port latency
    - 10 Terabit lossless switch fabric
    - 648Gb/s bandwidth per linecard Slot (1.25 Terabit full-duplex)
    - Less than 10 watts per wirespeed 10GbE port

Interconnect Capability

- Storage Area Net uniform access
- Fast Migration of Virtual Machines
- Hotspot mitigation
- Zero downtime recofig/scale up

Where are the photonics?

- Obviously a lot of the external capacity is met by telecom photonics already
- Internally, only for transmission
- Maybe one more level in (usally 2 layer) could be optically switched
- Future? Who knows
- Integration on processors – reduce energy cost?
- Desperate measures – wireless HDMI – 7Gbps 60GHz
- Alternative – decentralise data centers more

Questions?

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