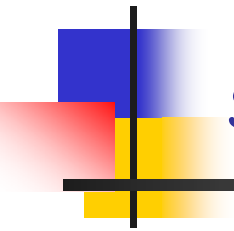

Stochastic Model for ISP-aware VoD Streaming

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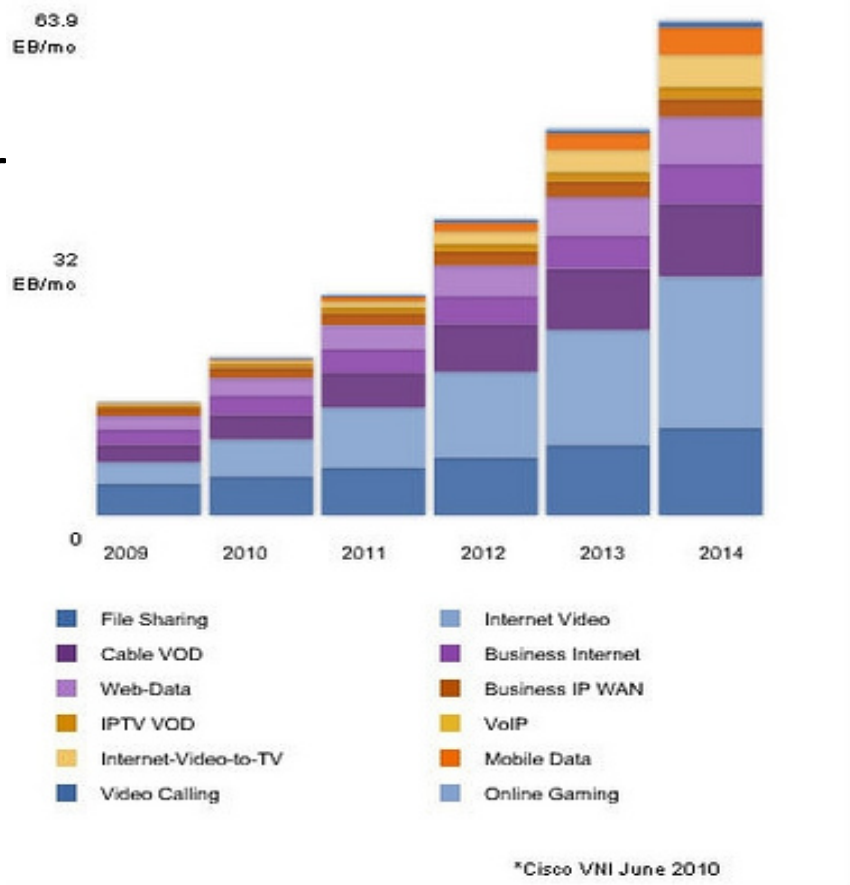
Tension between P2P and ISPs

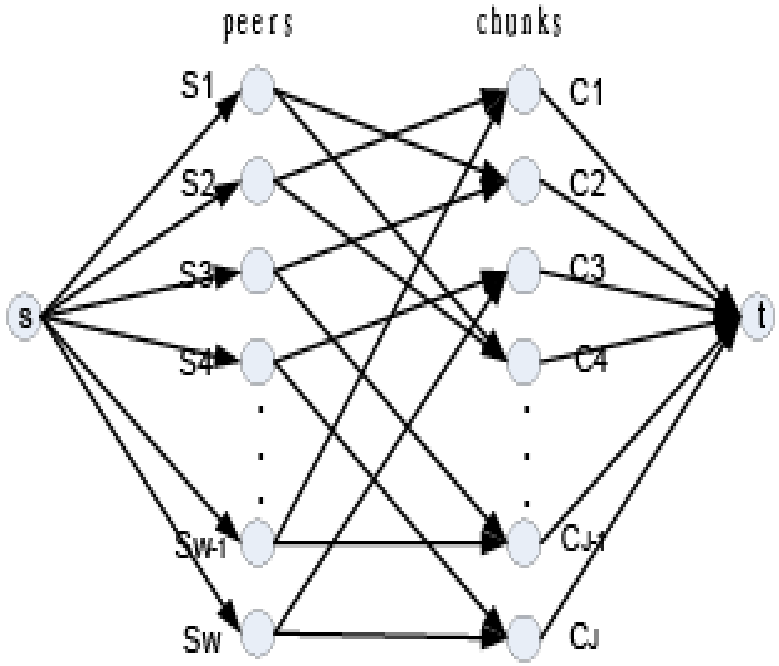
- Video traffic in the Internet increases largely. Cisco predicts video will make up 91% of all internet traffic by 2014.
- Peer-to-peer technology is applied to alleviate large bandwidth consumption of servers.
- ISP-agnostic P2P connections generate large volume of unnecessary inter-ISP traffic



What is the ISP-aware peer-to-peer connections with little impact on performance?

Loss Network Model

- Apply loss network model to calculate the proportion of loss chunk requests, which is used as a performance metrics.
- We find that the number of total served requests is the maximum bipartite flow of the bipartite graph on the right when using the 1-point approximation.



Minimum Chunk Loss

- Optimal Cache
  - The minimum chunk loss probability is determined by peers' total upload bandwidth and peers' total chunk requests.
  - Under different peer upload bandwidth allocation strategy, the corresponding optimal cache distribution is different.
  - We analyze the LRU algorithm and prove that the stationary states of LRU algorithm achieve the optimal cache distribution when peers allocate their upload bandwidth uniformly among cached chunks.
- Chunk Request Routing
  - When peers' total upload bandwidth is larger than the total demand of chunk requests, the chunk request routing strategy should satisfy that the upload bandwidth in any ISP can serve the chunk requests routed into it.
  - When peers' total upload bandwidth is smaller than the total demand of chunk requests, the chunk request routing strategy should satisfy that the upload bandwidth in any ISP can not serve all the chunk requests routed into it.

ISP-aware Peer Selection

- How to achieve the chunk request routing?
  - We find a feasible strategy is that peers select the number of neighbors from different ISPs proportionally to peers' total upload bandwidth.
  - On average, the upload bandwidth in any ISP can serve all chunk requests routed into the ISP when the upload bandwidth is larger than the demand or can not serve all chunk requests when the upload bandwidth is smaller than the demand.