Fundamental Design Issues for the Future Internet

Aka. Back to the Future

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Main Challenge

- Different applications have different 'demand functions', e.g. download vs. streaming video
- Common type of utility functions: elastic, hard, delay-adaptive, rate-adaptive.
- Total utility $V = \sum U_i(s_i)$ can be quite complex, so priorities of different services need to be varied.
- There is a need to recognize more delay-sensitive clients as video and audio performances degrades badly once bandwidth is below the intrinsic generation rate.

How to provide/request service

- Letting network classify service vs. users specify their types of service.
- Explicit Request
    - Pricing?
    - Flexibility in service model?
- Other forms of implicit services such as link sharing can be incrementally deployed.

Reasons for Admission Control

- Overloads can happen suddenly across the entire network. E.g. $n+1$ applications with hard utility function sharing a link which can support n of them.
- Even if network is over-provisioned, a few users will still cause congestion. Leading to a much worse overall user experience.

Summary of Discussions

- Most seem to think the Internet today controls congestion in a much less structured way than what the paper suggested.
- Some believe that we have yet to reach the point where such controls are needed, some believe over-provisioning makes them not as necessary.
- Quite a few mentioned the low cost of increasing bandwidth compared to the cost of deploying these control methods makes them less appealing.

Optional Readings

- Video Survey. Review of the state-of-art peer-to-peer Internet video broadcast, as well as some key challenges.
- CSZ92. Division of traffic into guaranteed traffic and predicted service, and gave a unified scheduling algorithm.
- Clark98. Demonstrated a need to distinguish users with different transfer objects, and use service allocation profiles to separate demands.
- CongestionManager99. Gave an end to end architecture for managing Internet congestion to ensure proper behavior and allow applications to easily adapt to congestion.