Fundamental Design Issues for the Future Internet
Aka. Back to the Future

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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.

Shenker 95
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.
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.