Current Research Topics

-Sigcomm Sessions
- -QoS
- -Network analysis & security
- -Multicast
- -giga/tera bit routers /fast classification
- -web performance
- -TCP
- -Diff Serv.
- -Routing
- -Network Topology

BEST-EFFORT VERSUS RESERVATIONS

A simple comparative Analysis

Lee Breslau & Scott Shenker

PROCEEDINGS OF ACM SIGCOMM' 98

MOTIVATION

-Current Internet

-single class of best-effort service

-no guarantees about if/when packets are delivered

-Best-effort service not suitable for real-time applications

-audio, video, soft real-time …

-Solution: Integrated Services

-Applications reserve bandwidth

-Network admits flows, enforces reservations...

KEY QUESTIONS

-Are reservations really necessary?

-Are we better off with an over-provisioned BE network?

*Arguments for reservations

-Applications needing higher quality benefit

*Arguments against reservations

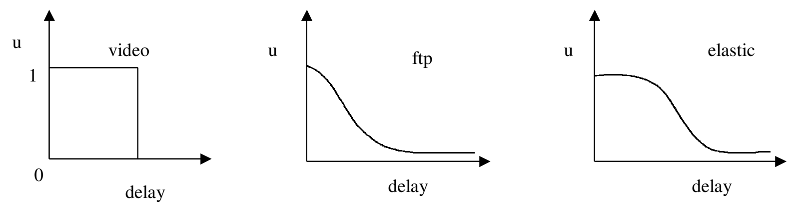
-Network must operate at low utilization levels for low blocking probability

-Low util =>over-provisioned BE network is ok

-Soft real-time applications are adaptive

GOAL OF NETWORK DESIGN

- A network should be designed to meet user needs
- Each user gets a utility u based on network bandwidth, delay, jitter
- Design the network to maximize total utility (Σui) =>provide maximum satisfaction to users



FIXED LOAD MODEL

Assume

-Single link of capacity C

-K identical flows, b/w b=C/k

-Utility fn π(0)=0, π(∞)=1

-Maximize v(k)=

•Elastic applications $\sum_{i=1}^{K} \pi i = k \cdot \pi(C/k)$

-v(k) increases as k-> ∞

=>admit ∞ flows to maximize v

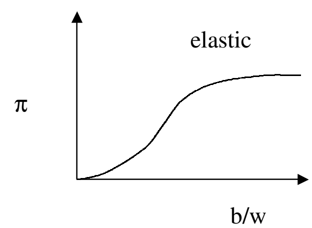
=>use B/E network

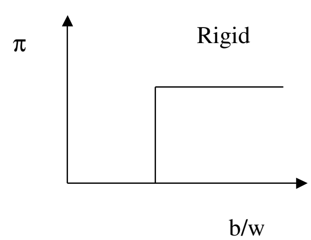
•Rigid applications

-v(k) drops to 0 beyond a certain k

-admit no more than k_{max} flows

=>use reservation





VARIABLE LOAD MODEL

-Number of flows is taken from a probability distribution

-V= $\sum_{k=1}^{\infty} P(k) \cdot k \cdot \pi(C/k)$

-Reservations=>

v= $\sum_{k=1}^{K\max} P(k) \cdot k \cdot \pi(C/k) + \sum_{K\max+1}^{\infty} P(k) \cdot K\max \cdot \pi(C/K\max)$

-Question: How much extra b/w do you need for BE network to match the performance of resv?

-trade b/w for complexity

-P(k): -exponential

-Poisson

-Algebraic (heavy tailed)

Results

-BE v/s rigid v/s adaptive application

-Fixed model : substantial difference between BE & resv-capable network

-adaptive applications change the picture

-less compelling case for reservations

-Poisson: equal costs except at highest prices

-Exponential: small difference

-Algebraic: Resv is better IF complexity is small

-B/W is expensive -?

-B/W is cheap -?