Incentive Compitible Multimedia Adaptation In the Internet

Motivations

- Current Approaches to Provide QoS for Mutlimedia:
  - Resource reservation and provisioning:
    admission control, scheduling, differentiated service
  - Application adaptation
- Problems
  - Resource reservation and provisioning tend to be conservative
  - Adaptation lack of incentive

Goals of our Work

- Enable a user to select from a set of available network services
- Enable the user and network to dynamically re-negotiate a contracted service
- Provide mechanisms for the network to dynamically formulate prices in a distributed manner
- Provide candidate algorithms for user adaptation

The Utility Function

- Represent benefit or value corrsponding to a QoS set
- The objective of adaptation is to maximize utility relative to cost

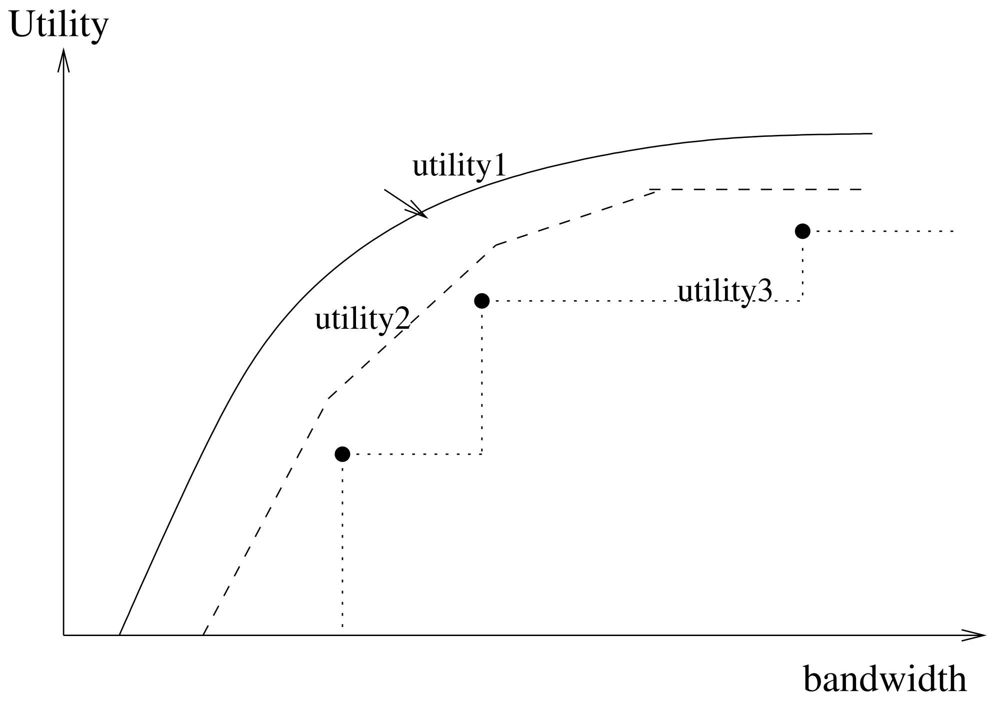
Utility Development

- MoS based
- Task oriented
- Perceived value based:

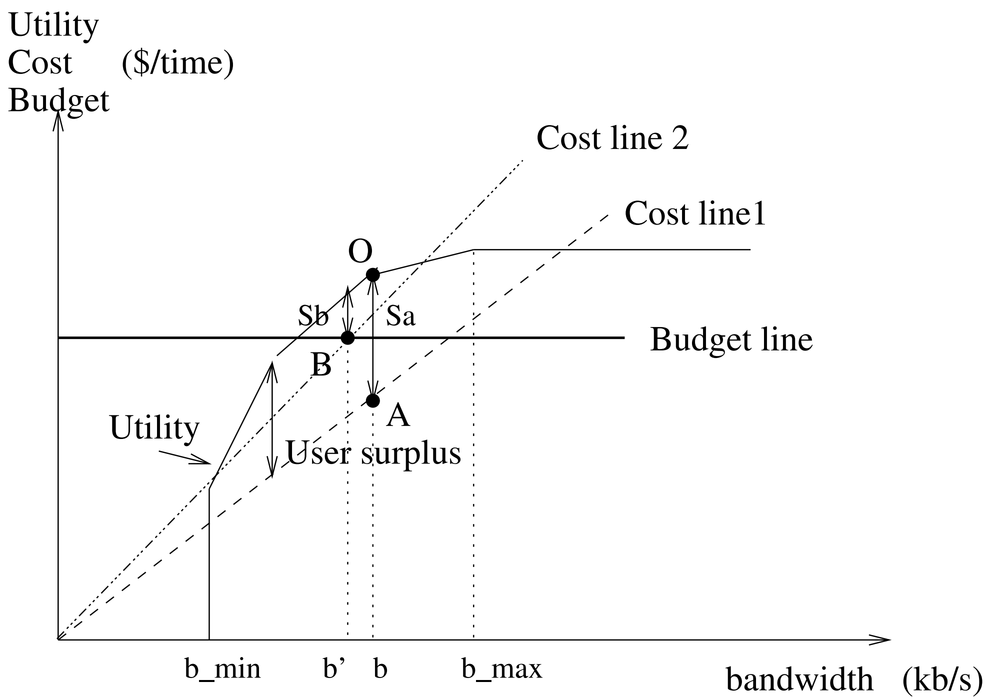
Utility Features

- Utility as perceived value vs. utility vs. perceived quality
- Utility as a function of bandwidth
- Effect of scaling
  - Additive
  - Multiplicative
- Time dependence of utility

Example Utility Functions



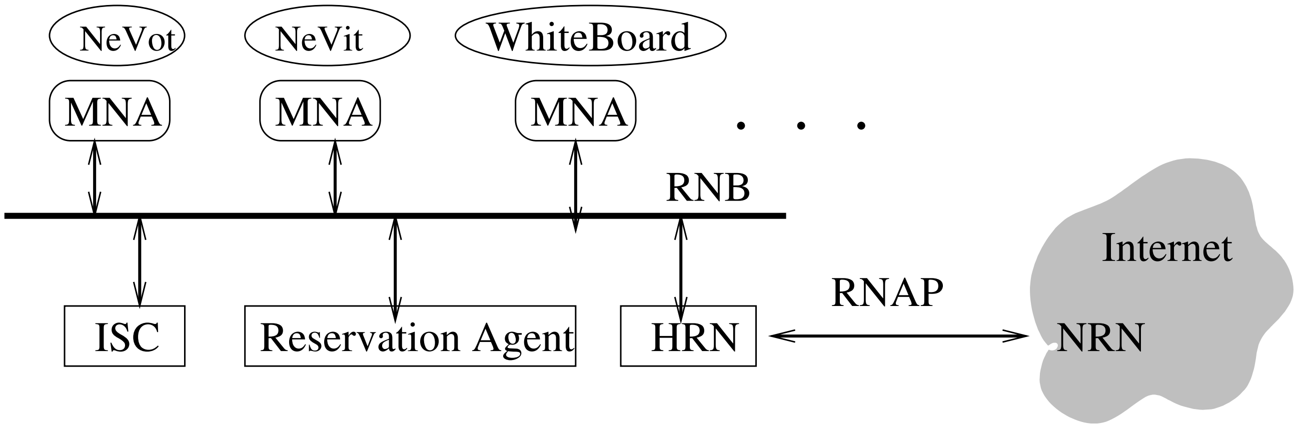
An Adaptation Model



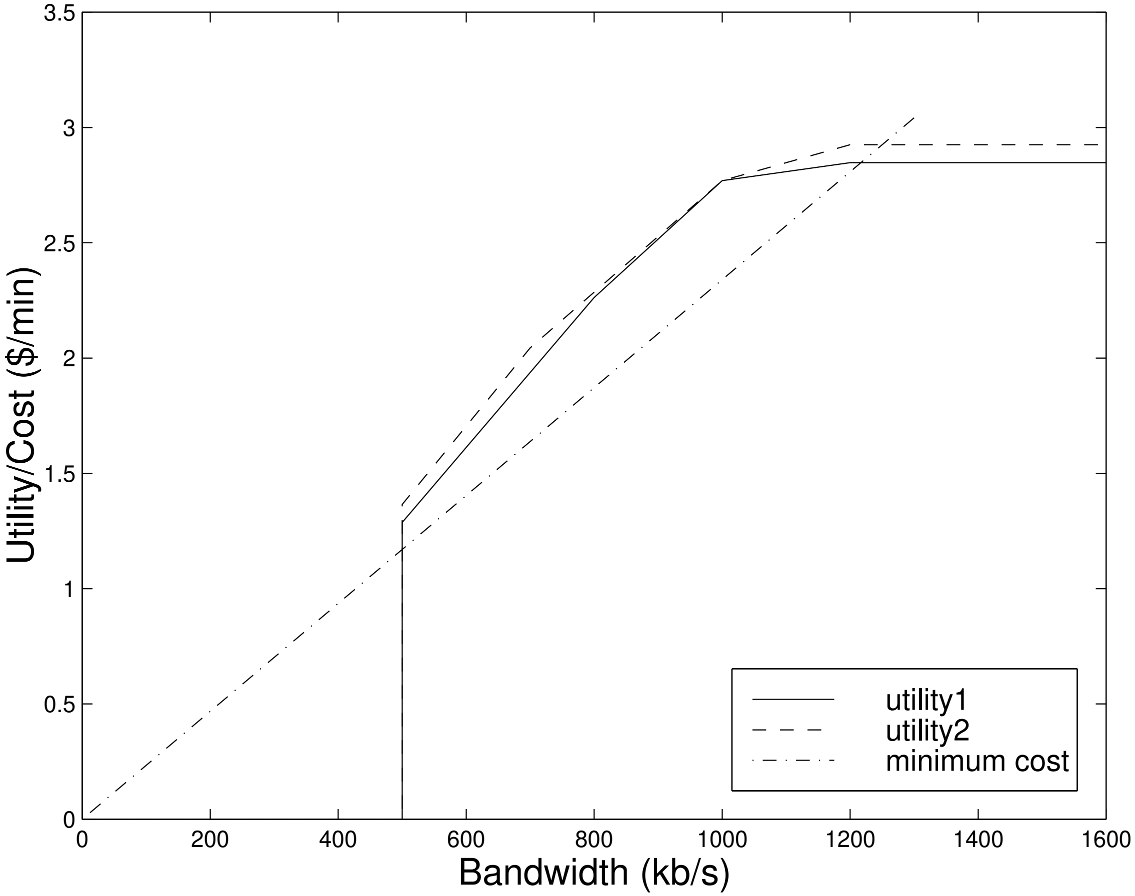
Application Adaptation

- Adaptation of Single Application over Fixed QoS
- Adaptation of Single Application over Multiple QoS
- Simultaneous Adaptation of Multiple Applications

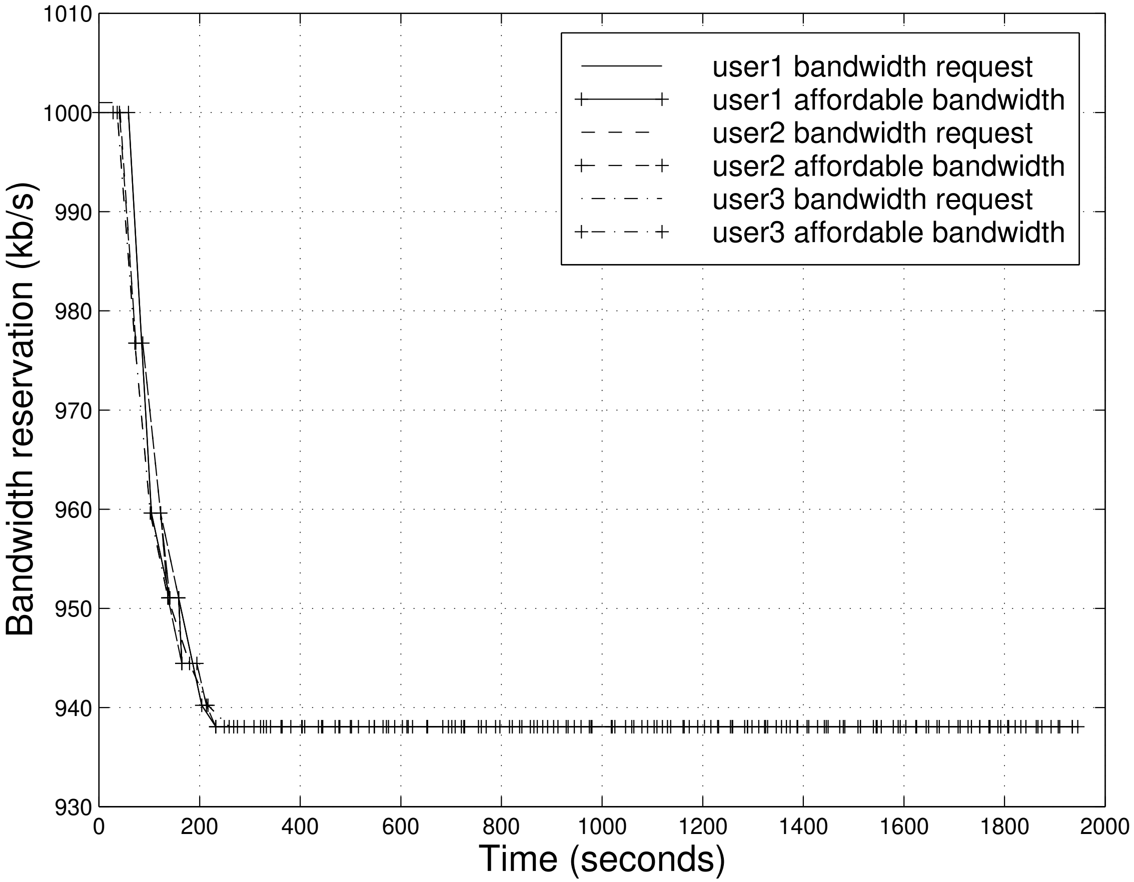
Extended Mint



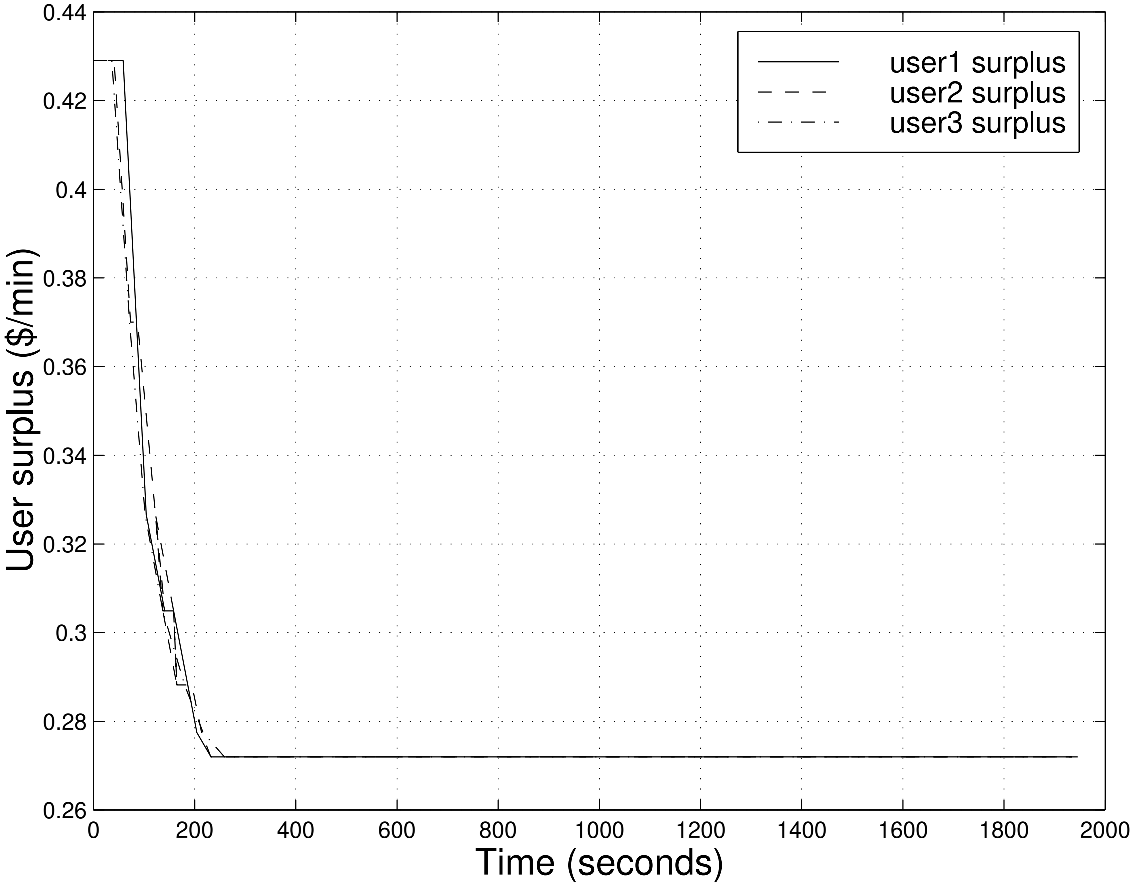
Utility for User Sharing



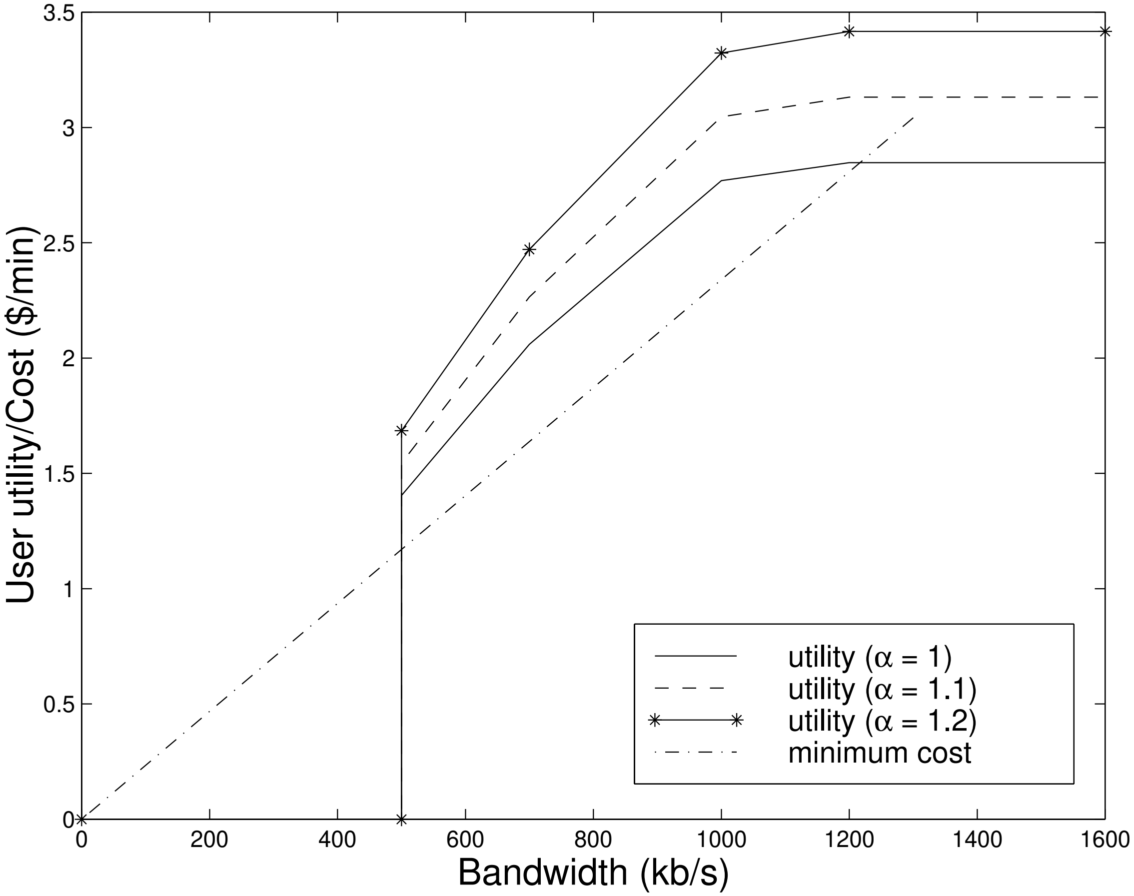
Bandwidth


1010
1000
990
980
970
960
950
940
930
Bandwidth reservation (kb/s)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Time (seconds)
user1 bandwidth request
user1 affordable bandwidth
user2 bandwidth request
user2 affordable bandwidth
user3 bandwidth request
user3 affordable bandwidth

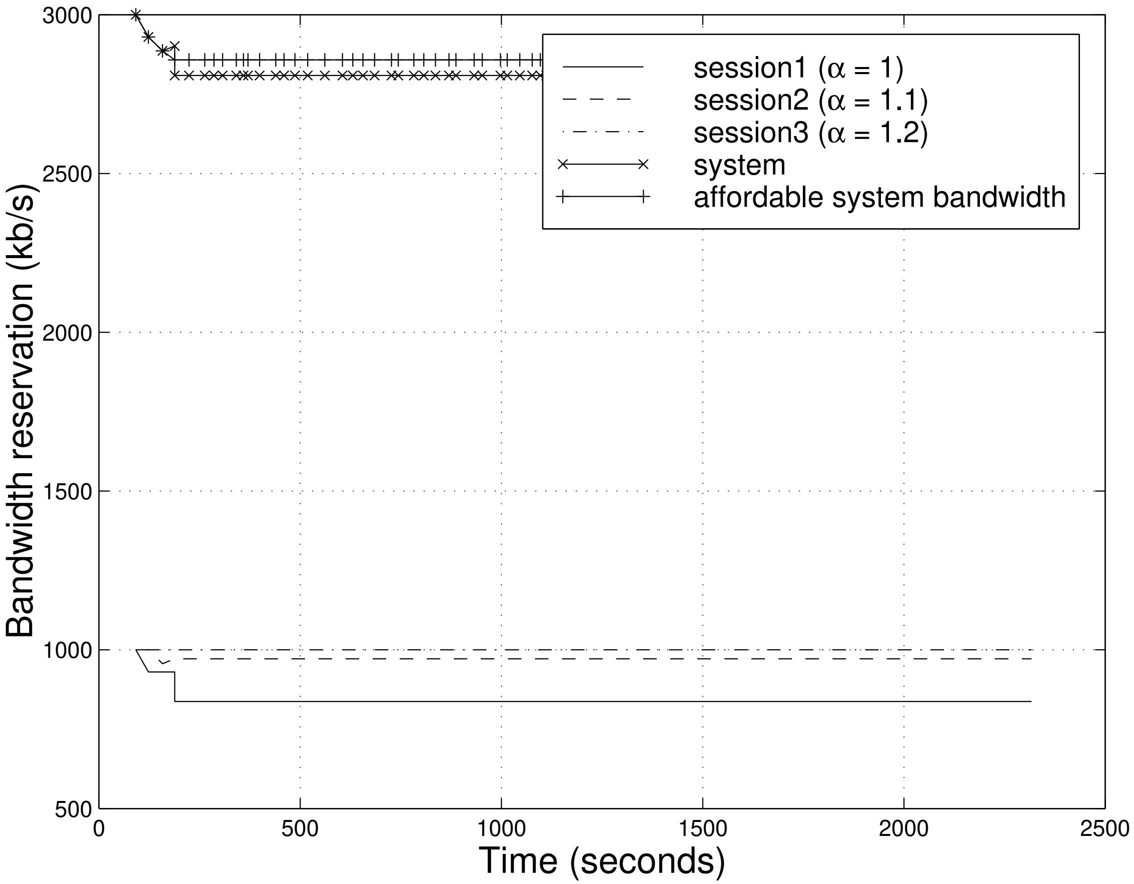
Surplus


0.44
0.42
0.4
0.38
0.36
0.34
0.32
0.3
0.28
0.26
User surplus ($/min)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Time (seconds)
user1 surplus
user2 surplus
user3 surplus

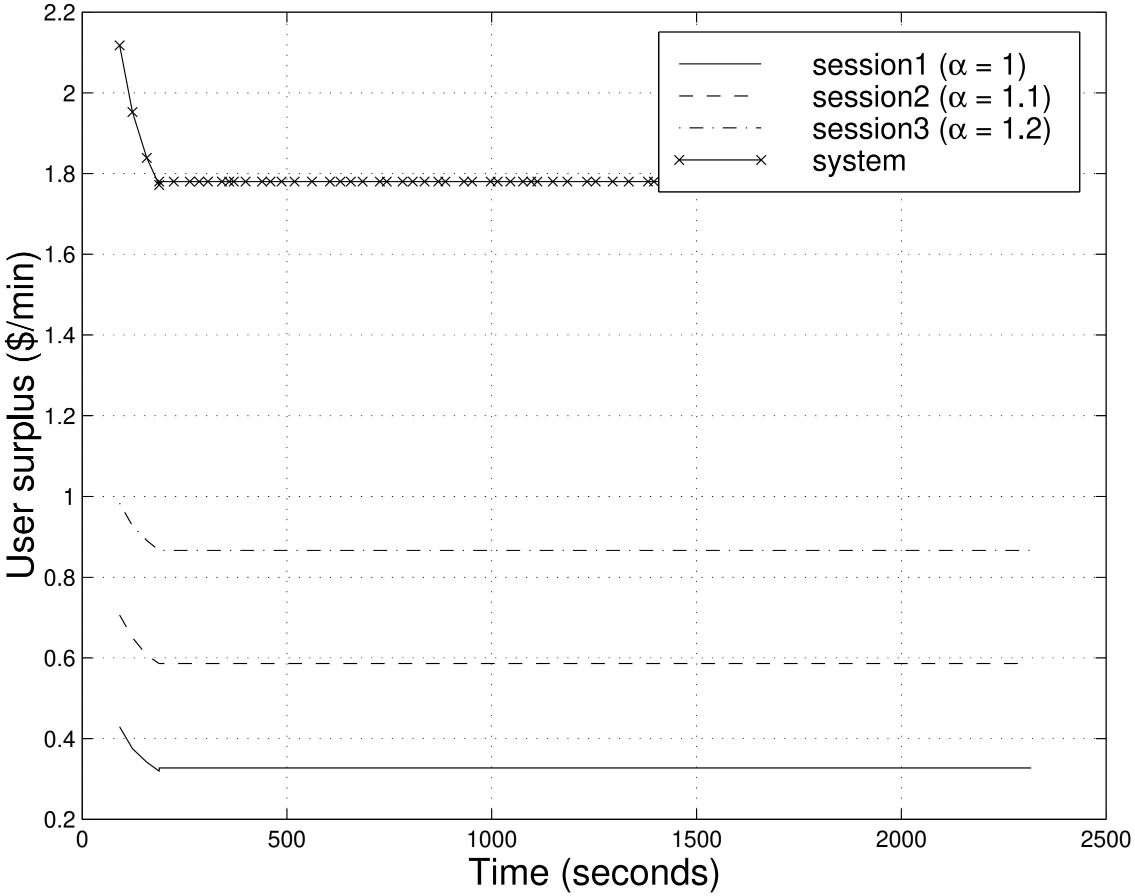
Utility for Multiplicative Scaling



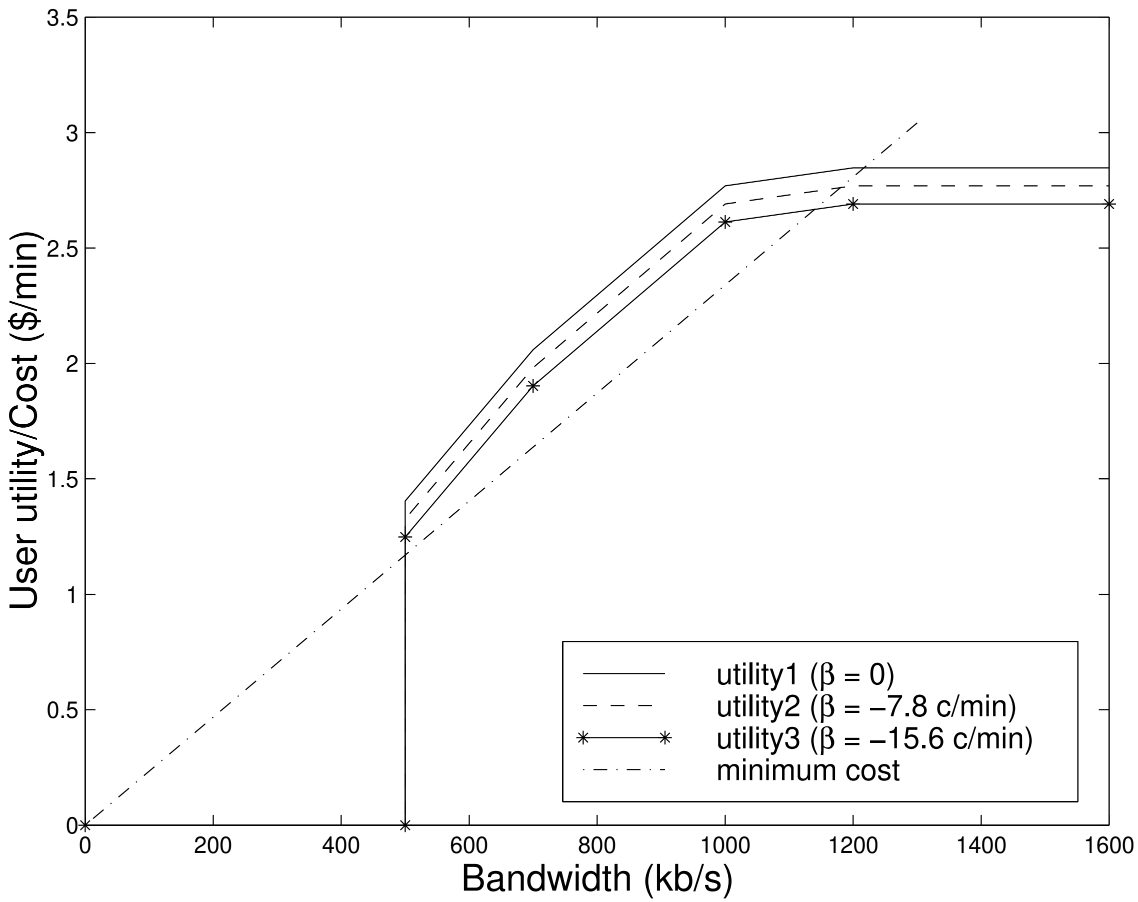
Bandwidth for Multiplicative Scaling



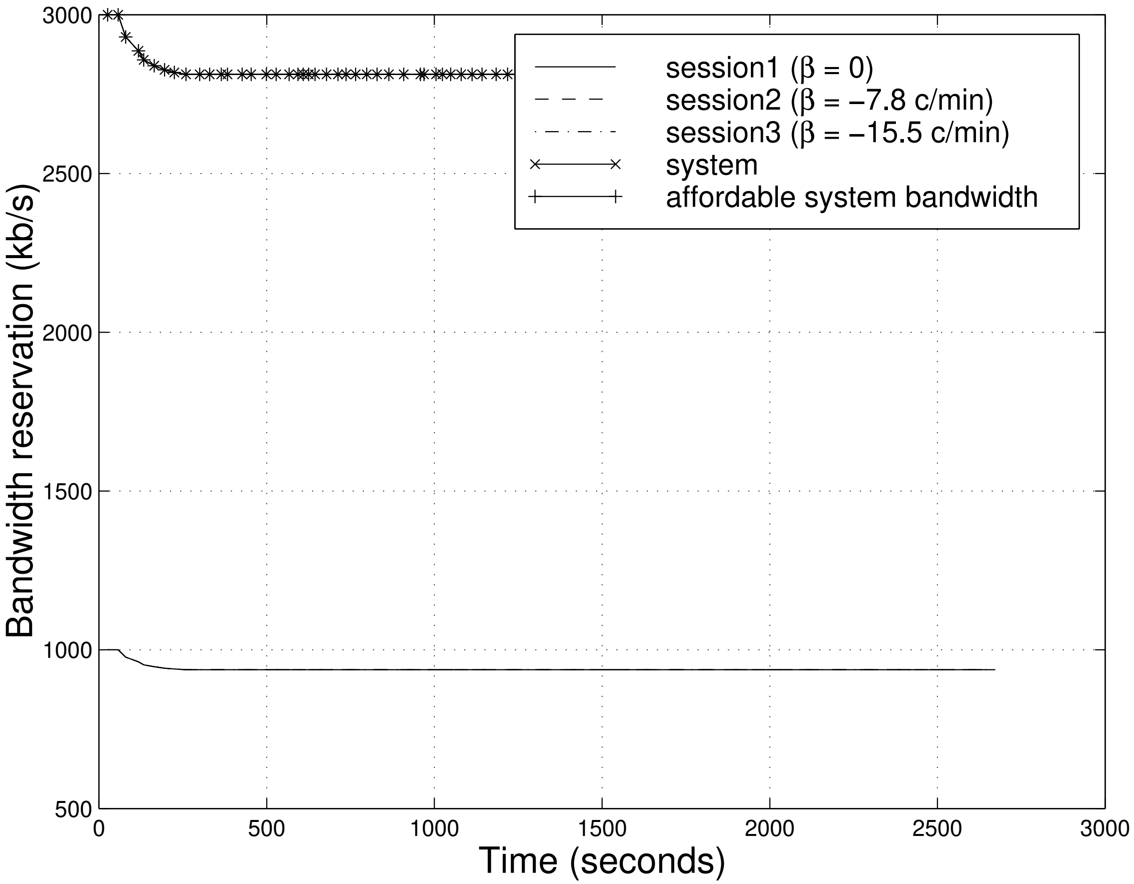
Surplus for Multiplicative Scaling



Utility for Additive Scaling



Bandwidth for Additive Scaling



Surplus for Additive Scaling