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CENTRE FOR ADVANCED INTERNET ARCHITECTURES

A Traffic Model for the Xbox Game Halo 2

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NOSSDAV 2005, June 13th-14th

Overview

- Motivation
- Experimental Setup
- Halo 2 Traffic Characteristics
- Halo 2 Traffic Model
- Conclusions and Future Work

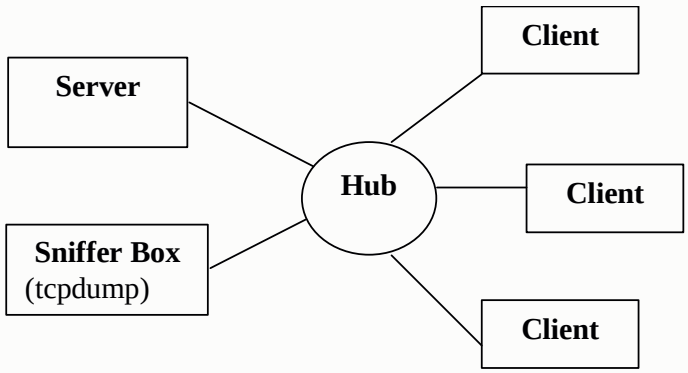
Motivation

- Increased amount of Xbox traffic in the Internet
  - Recent success of Xbox Live
  - Several tunnelling solutions (e.g. XBConnect)
  - Blockbuster games like Halo 2
- ISPs could offer premium service for game traffic
  ➡ need to know the traffic characteristics
- What impact does game traffic has on the network or other traffic?
- Provide realistic traffic models for (large scale) simulations (e.g. ns2 traffic models)

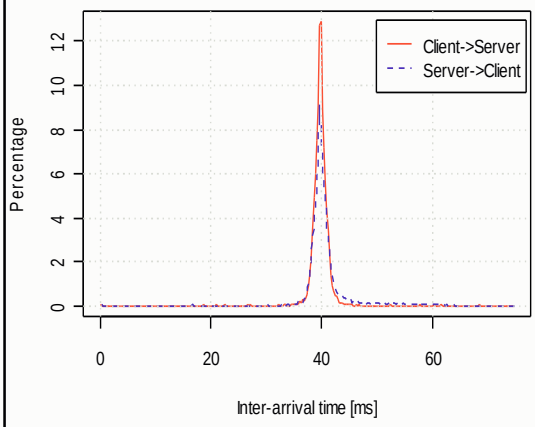
Experimental Setup

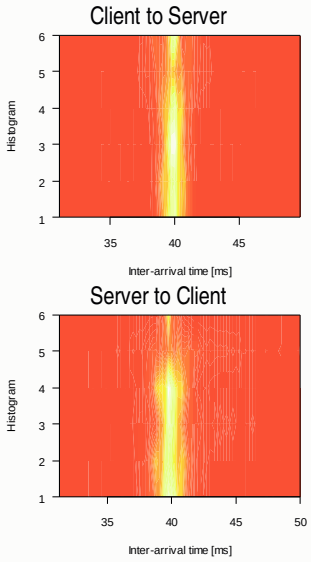
- 4 Xboxes (1 server and 3 clients)
- 9 time-limited (6 minutes) deathmatch games on same map
  - Total number of players per game varies between 3-11
  - Number of players on each client varies between 1-4
- Packet capturing with *tcpdump*
- Compute packet length histograms, inter-arrival time histograms, average bandwidth, packets per second with *pkthisto* (http://caia.swin.edu.au/genius/tools/pkthisto-0.3.4.tgz)
- Bandwidth and packet size is based on the length of the IP packet

Experimental Setup cont'd

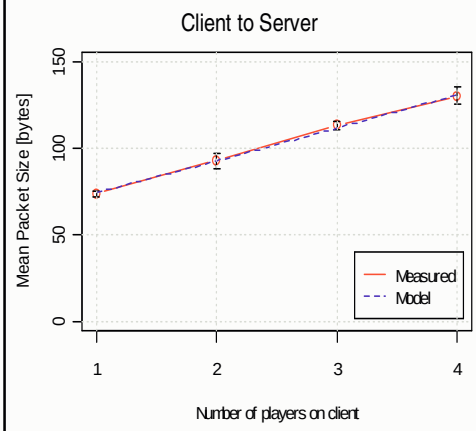


Halo 2 Inter-Arrival Times





Halo 2 Packet Length



$$PS(P_{client}) = 19.04 \cdot P_{client} + 55.12$$

No linear relationship

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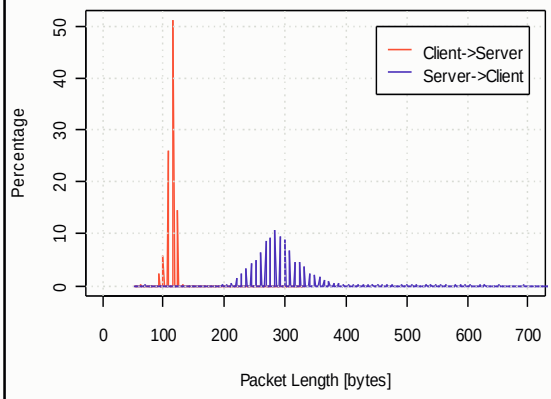
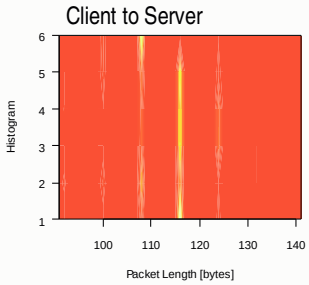
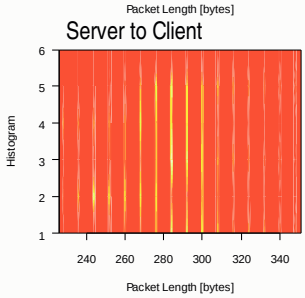
Halo 2 Packet Length







11 players in total, 3 players on client

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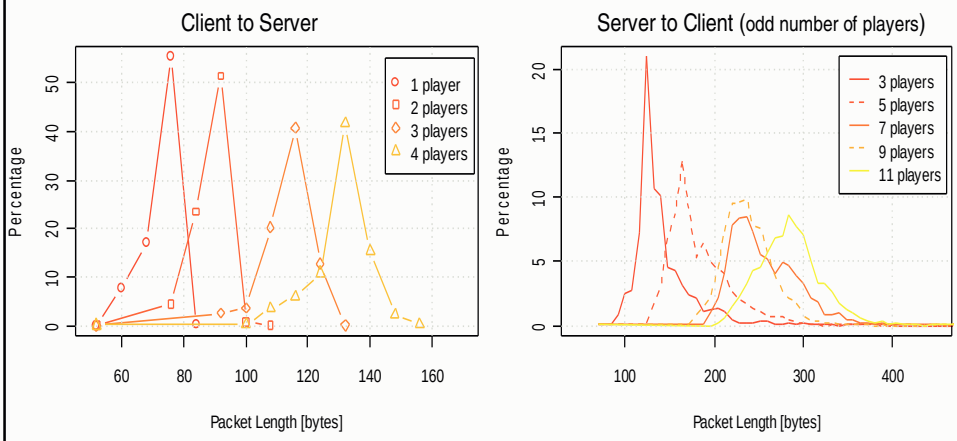
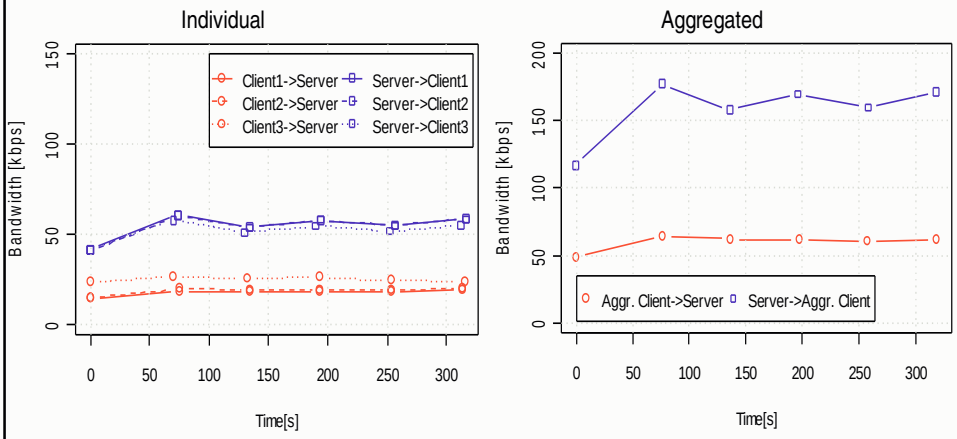
Halo 2 Packet Length

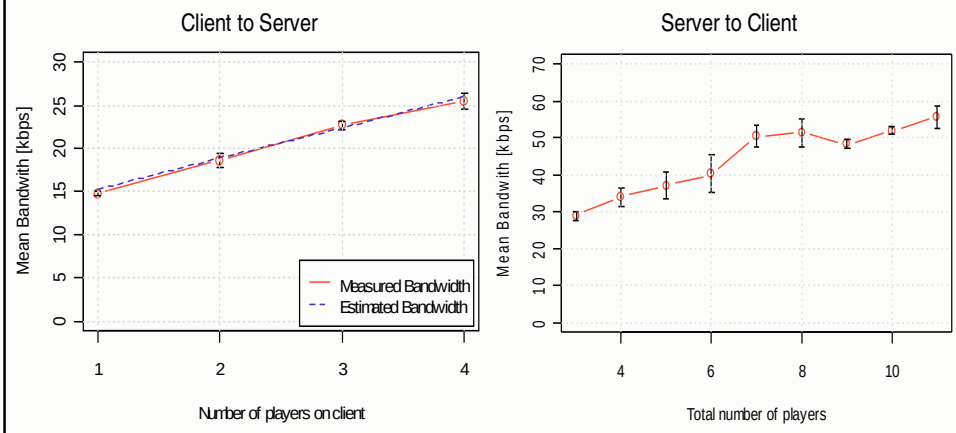


Halo 2 Bandwidth



Game with 11 players in total (4 players on client 3, 2 players on the other clients)

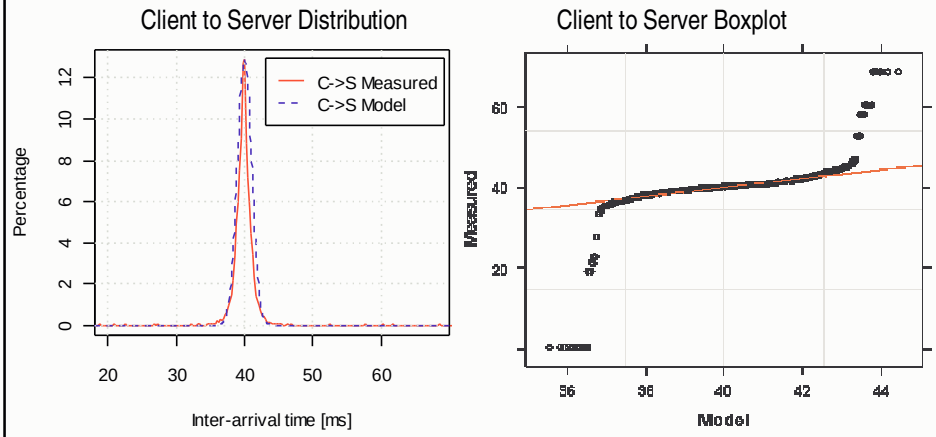
Halo 2 Packet Rate



$$BW(P_{client}) = 3.62 \cdot P_{client} + 11.33$$

No linear relationship

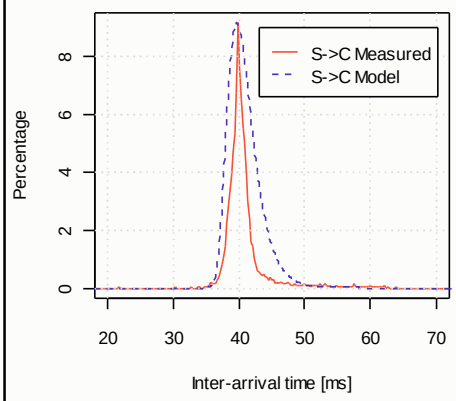
Halo 2 Inter-Arrival Time Model



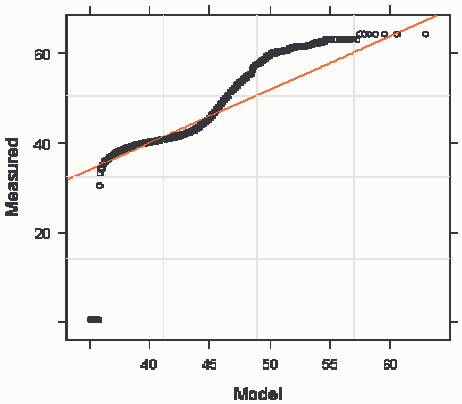
➡ **Normal** Distribution, 2% in heavy tails

Halo 2 Inter-Arrival Time Model

Server to Client Distribution



Server to Client Boxplot



➡ **Extreme** Distribution, 5% in heavy tails

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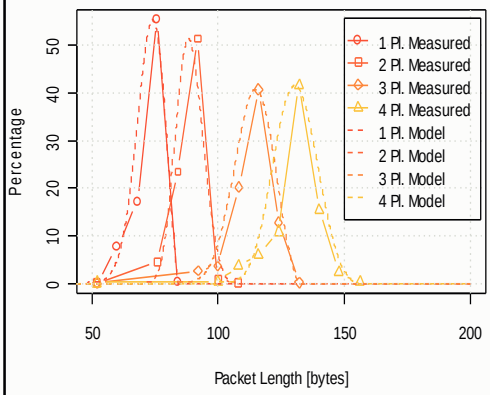
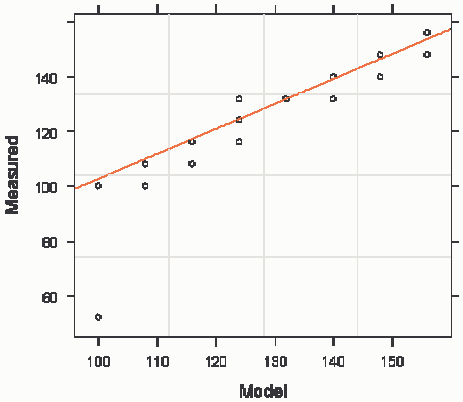
Halo 2 Packet Length Model

Client to Server Distributions



Client to Server Boxplot (4 players)



➡ **Extreme** Distributions + rounding to nearest characteristic packet length

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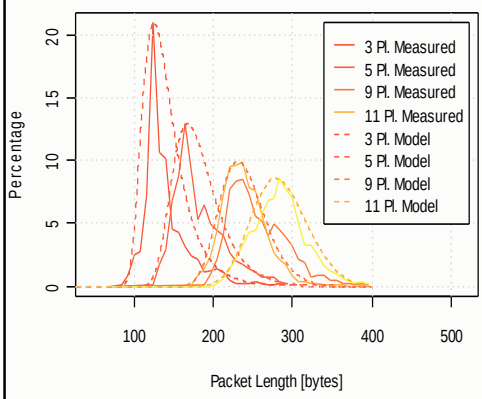
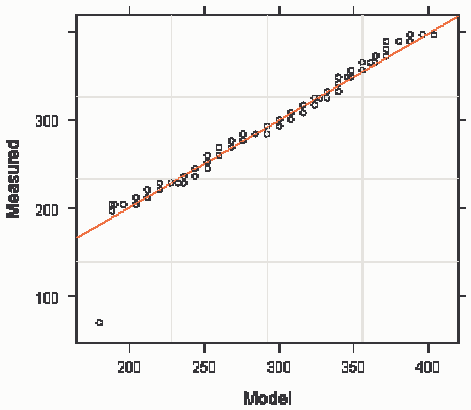
Halo 2 Packet Length Model

Server to Client Distributions (odd player numbers)



Server to Client Boxplot (4 players)



➡ **Extreme** Distributions + rounding to nearest characteristic packet length

Conclusions and Future Work

- Collect more data
  - Different maps
  - Different player combinations
  - Xbox Live traffic
- Implement ns-2 traffic generator
- Simulate impact of large number of Xbox clients and server on typical ISP network
- Identify Xbox traffic by its statistical properties to automate QoS provision

Thanks for your attention!