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Capturing Xbox System Link Traffic while playing Halo

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Introduction

This preliminary investigation of Xbox in-game network traffic aims to report upon the inter-packet arrival times, packet size distributions, packet per second rates and console data rates used by the game Halo and Microsoft's System Link networking interface. In doing so, a better understanding of Xbox networking traffic characteristics will be ascertained, that will aid further analysis into the possibilities of online Xbox games and their sensitivity to the effects of packet loss and delay.

Generating and Capturing Xbox Traffic

- [Equipment used for traffic generation](#)
- [Equipment used for capturing traffic](#)
- [Methods used to generate/capture Xbox Traffic](#)

Results/Discussion

- [2 Player Game](#)
- [3 Player Game \(with 1 player on Server console\)](#)
- [3 Player Game \(with 2 players on Server console\)](#)
- [4 Player Game](#)
- [Packets Per Second \(Overall\)](#)
- [Data Rate \(Overall\)](#)

Summary and Further Analysis

Microsoft use UDP/IP over Ethernet for System Link games, with each console being differentiated by their Ethernet MAC address. The UDP/IP information is fixed and apparently identical for each participating console. The MAC addresses have vendor code 00:50:F2. The IP address used in-game is the invalid address of 0.0.0.1. Also, the broadcast address of 255.255.255.255 is used in polling available client consoles. The traffic uses UDP port 3074 which is assigned as the Xbox port (as per [IANA](#)). It is also interesting to note that Microsoft have also registered this port for TCP traffic - although no TCP traffic was observed.

	Server to Client	Client to Server
Inter-packet Arrival Times	On average 40ms	On average 40ms
Packet Lengths	160 (2 players), 192 (3 players) or 216 bytes (4 players) 100% of time	72 bytes for 16.6% of time 112 bytes (1 player on client console)/136 bytes (2 players on client console) for the remaining period
Packets per second	25 packets per second	30 packets per second
Data Rate	32+ kbit/sec, depending on number of players	25+ kbit/sec, depending on number of players

The results clearly show the predictability of the inter-arrival packet time being 40ms for traffic flowing from the server and client consoles. It is interesting to note the low distribution of packets arriving between 0ms and 40ms for traffic flowing from the client to server consoles. This jittery behaviour appears to only occur in one direction and produces the "ramp-like" plots to 33% on the cumulative inter-arrival histograms prior to the sharp rise at 40ms to 100%. Whilst for the inter-arrival histograms, this appears cyclic and noise-like.

Our next steps involve analysing the effect of jitter, packet loss and link latency on game play. We plan to simulate the adversities of Internet game play in the lab, experiment with routing System Link traffic over public Internet paths, and explore the consequences of adding a third Xbox to our multiplayer LAN environment.

References

- ["Halo System Link Games and the Internet"](#), Bungie Studios/Microsoft

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