Comparing the Alloy NS-05C and Netgear FS608 v2 Switches Using Tcpdump

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Abstract-In this technical report, the Alloy NS-05C and Netgear FS608 v2 8-port switches are tested using a SmartBits2000 and Tcpdump. The purpose of these tests is to compare the number of errors that occur on the backplane of each switch and observe these results through Tcpdump timestamps. The Alloy and Netgear switches are both being used at CAIA for a variety of projects.

Keywords- Alloy, CAM, Netgear, Tcpdump, switch, timestamp

I. INTRODUCTION

This investigative report documents the methods used to compare the Alloy NS-05C and Netgear FS608 v2 in the same environmental conditions. The techniques used during the testing process were the same as those used in previous trials involving the Alloy NS-16J and Cisco Catalyst 2900 Series switches [1].

The first set of tests involved finding the actual size of the CAM table for each switch. The next set of tests was conducted in order to determine the number of errors that resulted by using each switch under the same incoming packet conditions. Tcpdump was used to capture flooded packets in order to visually document packet loss.

SmartBits2000 was used to generate UDP packet traffic from four SX-7410B 100Mbps Ethernet cards. The software to set the packet conditions in this investigation was the Windows-based SmartWindows. It outputs information for each card such as the number of packets transmitted, packets received and errors detected during and after each test is complete.

II. CAM TABLE SIZE

The method used to conduct the CAM table size test for each switch was identical. The payload size of each UDP packet was 60bytes plus 4bytes CRC and the utilisation on each card was set to 1%. Figure 1 shows the physical set up of the CAM table size tests.

To test the size of the CAM table for each switch, Card 2 was used to fill the CAM table with a set number of unique source MAC addresses. The number of unique MAC addresses and corresponding number of packets sent was based on the manufacturer's CAM size quote. The Alloy NS-05C was quoted to have a CAM table size large enough for 4,000 MAC addresses, while the Netgear FS608 v2 was quoted as having a CAM table size of 1,024 MAC addresses.
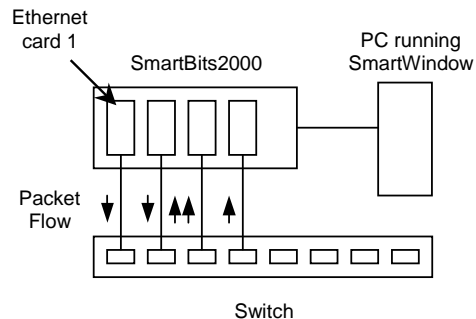

Figure 1: CAM Table Size Test Physical Set Up

When Card 2 sent packets through the switch, the switch did not know through which port to send these initial packets. The switch flooded the network and recorded the source MAC addresses and the source port from which the packets arrived. Card 1 was then used to send 100,000 packets, cycling through the same set of source MAC addresses as its packet destinations.

Card 3 and Card 4 were used to detect any packets that may be flooded. Flooding by the switch was an indication that although the switch may have seen a certain MAC address before, it did not know where to send a packet with this MAC address as its destination. This occured because the CAM table was full, there was not enough memory to note this MAC address and port combination when sent from Card 2.

If there were no packets flooded to Card 3 and Card 4 other than the initial Card 2 flooding, the number of unique source MAC addresses (and corresponding number of packets) initially sent by Card 2 was increased. The number of unique MAC addresses was adjusted by subsequent tests until the exact number at which flooding occured was found. In between each test, the switch was reset in order to clear the CAM table.

It was found that the Alloy NS-05C had a CAM table size of 8,320, well above the quoted number of 4,000. The Netgear FS608 v2 was found to have memory for 1,040 MAC addresses and port combinations.

III. TCPDUMP TESTS

A. *Using Tcpdump to test packet arrival times.*

There are three main ways in which SmartBits2000

cards may be prompted to begin sending packets. The first method is to allocate desired cards into a group using the Group function. When the Group function is used, all cards that belong to this group begin transmitting packets at the same time. The second method is to use the "Start All Cards" option that results in all Ethernet cards transmitting with a 50ms to 100ms interval between each card. The third option is to manually prompt each card to begin packet transmission.

All three methods of card transmission start were tested with both switches in order to investigate their performance. In these tests, all packets were 1,020bytes plus 4bytes CRC, the utilization was set to 1% on each card and the interpacket gap was set to 200ms. Each card sent 10,000 packets, purposefully configured to be flooded out of all ports by the switch.

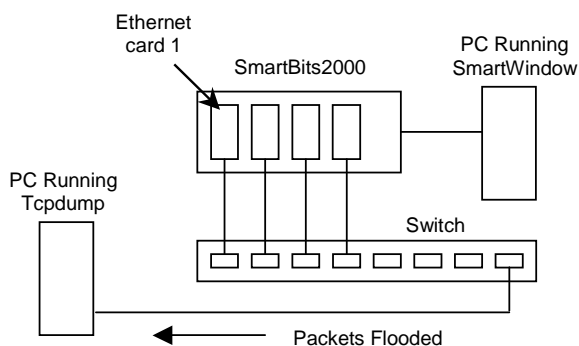Figure 2 shows the physical set up of the Tcpdump tests.

Figure 2: Tcpdump Test Physical Set Up

B. *Group option.*

In our investigation the four Ethernet cards were placed in the same group in order to test how the switch would handle simultaneously incoming packets. When the tests were carried out for both switches, the switches recorded CRC errors, fragmented packets and alignment errors as seen in Table 1 and Table 2.

	Card 1	Card 2	Card 3	Card 4
Total Received	28,726	28,649	29,694	28,878
CRC Errors	5	64	0	14
Alignment Errors	0	0	0	0
Frag/Undersized	5	0	68	15

Table 1: Alloy Switch Group Burst

	Card 1	Card 2	Card 3	Card 4
Total Received	28,875	28,798	29,686	29,035
CRC Errors	1	0	13	3
Alignment Errors	0	0	3	1
Frag/Undersized	5	0	53	15

Table 2: Netgear Switch Group Burst

The total number of packets received by Tcpdump was 38,649 and 38,798 for the Alloy and Netgear switches respectively. Although using the Netgear switch resulted in alignment errors, none were recorded from the Alloy switch.

C. *Start All Cards option.*

We can see from Table 3 and Table 4 that when the "Start All Cards" option was used to begin packet transmission, there were very few errors recorded for both switches.

	Card 1	Card 2	Card 3	Card 4
Total Received	29,923	29,922	29,845	29,845
CRC Errors	5	5	0	0
Alignment Errors	0	0	0	0
Frag/Undersized	5	5	0	0

Table 3: Alloy Switch Start All Cards Burst

	Card 1	Card 2	Card 3	Card 4
Total Received	29,926	29,926	29,852	29,852
CRC Errors	0	1	0	0
Alignment Errors	0	1	0	0
Frag/Undersized	5	5	0	0

Table 4: Netgear Switch Start All Cards Burst

The total number of packets received by Tcpdump was 39,845 and 39,852 for the Alloy and Netgear switches respectively. We can see that there were less errors when this transmitting start method was used and more packets were captured by Tcpdump from both switches. This is due to the four packets not converging on the switches' backplanes simultaneously.

D. *Manual option.*

The final test run on each switch was to start the card transmissions manually. This invloved starting each card individually from Card 1 to Card 4 at random packet transmission start times. This is more typical of real networking environments where packet arrival is not typically simultaneous. As can be seen in Table 5 and Table 6, no errors were recorded and all packets were accounted for. Tcpdump captured all 40,000 packets from both the Alloy and Netgear switches.

	Card 1	Card 2	Card 3	Card 4
Total Received	30,000	30,000	30,000	30,000
CRC Errors	0	0	0	0
Alignment Errors	0	0	0	0
Frag/Undersized	0	0	0	0

Table 5: Alloy Switch Manual Burst

	Card 1	Card 2	Card 3	Card 4
Total Received	30,000	30,000	30,000	30,000
CRC Errors	0	0	0	0
Alignment Errors	0	0	0	0
Frag/Undersized	0	0	0	0

Table 6: Netgear Switch Manual Burst

IV. TCPDUMP TIMESTAMPS

A. *Using Tcpdump to visually investigate switch packet loss.*

Tcpdump timestamps were used to visually compare the Alloy and Netgear switches in the above results. By plotting the cumulative time versus the cumulative number of packets for each test, the packet loss during

the three tests conducted on each switch can be compared.

The following Figures illustrate packets captured by Tcpdump indicating where packet loss occured. Each dot corresponds to one packet captured by Tcpdump.

It is evident in Figure 3 and Figure 6 that most packets were lost when the Group option was used to begin packet transmission for both switches. The change in slope as seen in the Group graphs is due to fewer packets arriving to Tcpdump over an interval of time.
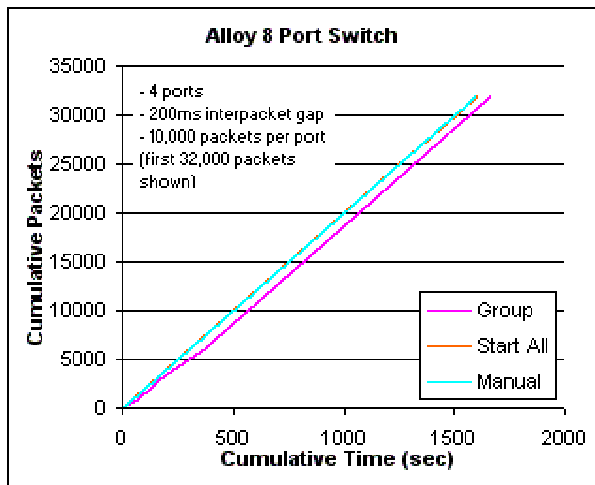

Figure 3: Alloy switch cumulative time vs packets for all start options
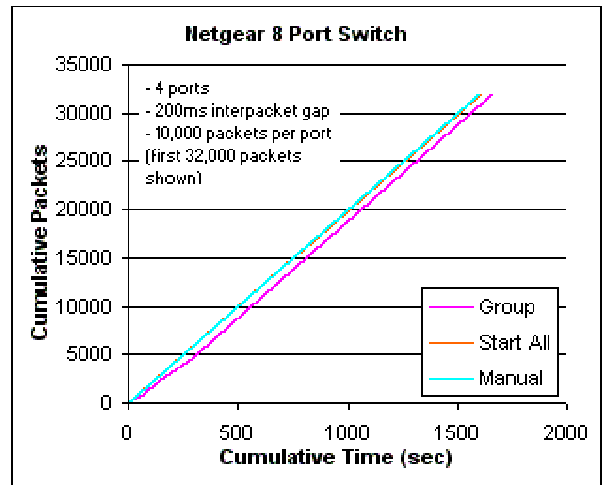
Figure 6: Netgear switch cumulative time vs packets for all start options
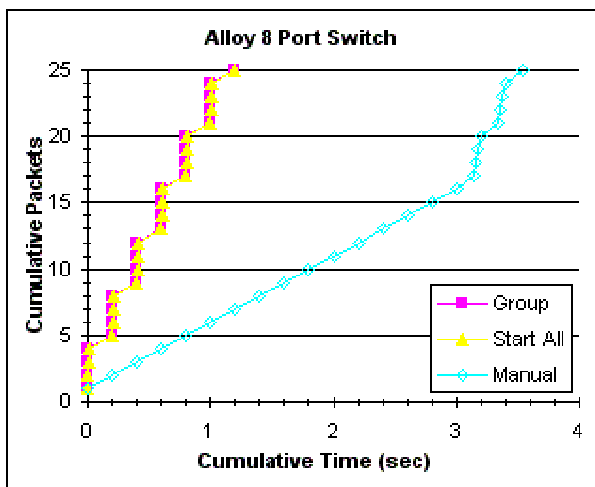
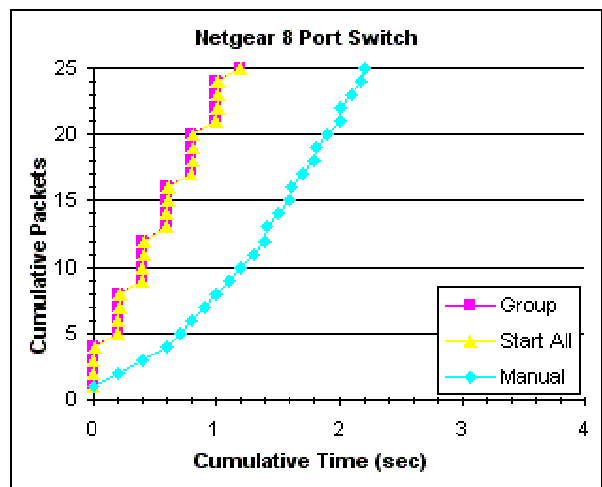Figure 4: Alloy switch initial packet bursts

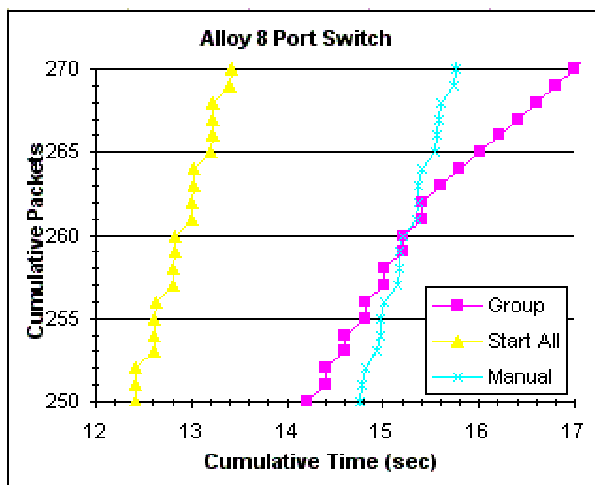Figure 7: Netgear switch initial packet bursts

Figure 5: Alloy switch gradient change in Group option due to packet loss
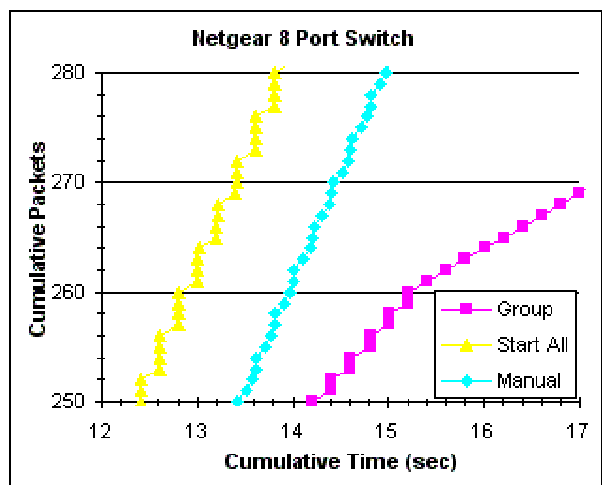

Figure 8: Netgear switch gradient change in Group option due to packet loss

Figure 4 and Figure 7 show the close-ups of the beginning of the tests for the Alloy and Netgear switches respectively. We can see that initially, the Manual graphs have a steady gradient as a result of the time between Card 1 and Card 2 being prompted to begin packet transmission. Both the Group and Start All graphs have a continuous pattern from the beginning of transmission.

Figure 5 and Figure 8 show packet loss occuring when the Group function was used. In Figure 5 we can see that Tcpdump is only receiving two packets per 200ms between 14.2sec and 15.4sec. This already indicates two packets are lost at each simultaneous SmartBits2000 burst. After this point only one packet is received by Tcpdump, indicating further packet loss at the Alloy switch. Figure 8 shows the same behaviour occuring with the Netgear switch.

V. CONCLUSION

In this investigation we focused on the Alloy NS-05C and Netgear FS608 v2 switches. Initially we tested the manufacturer's CAM table size claim. We found that although Alloy quoted the NS-05C switch has memory for 4,000 MAC address and port combinations, our results indicated the true number for the particular switch tested was in fact 8,320. The Netgear 1,024 MAC address and port quote for its FS608 v2 switch was more accurate with the actual number of addresses being 1,040.

The next set of tests was to compare how the two switches would perform under the same packet burst start conditions. It was found that when all cards were started using the Group option, both switches incurred errors and lost packets. The Netgear switch, however, bettered the Alloy switch by 149 packets in terms of packet loss. On the other hand the Alloy switch never introduced alignment errors whereas the Netgear switch did.

When the Start All Cards option was used, the Netgear switch bettered the Alloy switch in terms of the number of packets lost, but only by 7 packets. This small difference is insignificant to compare the performance capabilities of the two switches. Once more the Alloy switch incurred no alignment errors.

In the final test when all SmartBits2000 cards were started manually at random times, both switches performed with no packets lost and no errors introduced onto the network. This form of traffic is more accurate when describing real network conditions.

The results of this investigation showed the actual size of the CAM table for both an Alloy NS-05C and Netgear FS608 v2 switch as opposed to their manufacturer's claim. It also demonstrated how the two switches perform under the same network stress by using Tcpdump to capture packets and plot the cumulative arrival times against the cumulative number of packets received.

VI. REFERENCES

[1] A.M. Pavlicic, G.J. Armitage, "Testing the Alloy NS-16J Switch Using Tcpdump", CAIA Technical Report 031217A, http://caia.swin.edu.au/reports/031217A/CAIA-TR-031217A.pdf, December 17, 2003.