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COMPETITIVE ANALYSIS

MAX 4048 Performance with 56K Modems

Purpose

This document and the test results presented herein are intended to communicate the actual performance capabilities of the MAX™ 4048* with new DM-16 cards (Series56™ Digital Modem Modules) and software code revision 5.0Ai9. The performance testing was conducted in a way to replicate a dial-in environment using 56K client modems.

Test Environment

This test was intended to accurately measure the aggregate throughput and throughput/client of the remote access system under test (MAX 4048) up to a maximum of 48 PC clients dialing in to access the central server over two PRI lines. The clients and the server were set up to handle FTP transactions.

The client PCs dialed the system under test via a PBX using external analog modems running at 56 Kbps. The MAX 4048 was connected to an Ethernet switch, which in turn was connected to the central server. A network analyzer was connected to the Ethernet LAN between the system under test and the Windows NT server. The test bed is illustrated in Figure 1.

Performance was measured as a per client throughput of live FTP transfers with all clients running simultaneously over two PRI lines.

Hardware/Software used

1. A single Windows NT server – Sun Sparc
2. Client PCs – Windows 95 Cubix PC systems
3. Client analog modems (one per client PC) – Diamond SupraExpress and Zoom Telephonics running at 56K speed (All RAM-based K56 modems)
4. POTS PBX – Lucent Definity
5. Traffic Monitor that can provide cumulative bytes, relative time, and frames per second – Network General Sniffer
6. Ethernet switch – Xylan Omniswitch
7. Remote Access Concentrator device – MAX 4048 with Series56 DM-16 cards

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**The MAX 4048 is a fixed-configuration box consisting of 48 modem ports (three DM-16 cards) and two PRIs.*

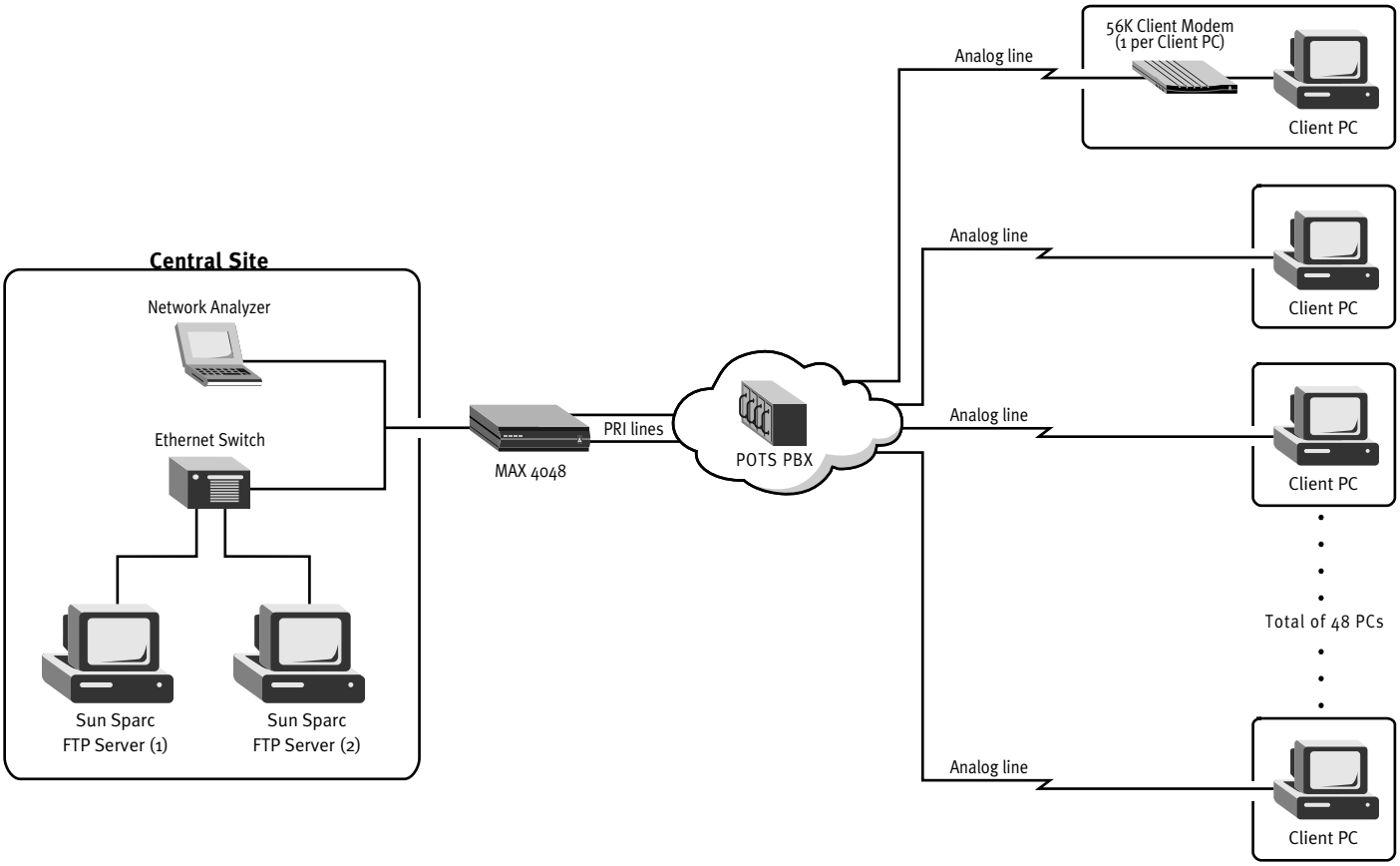

Figure 1—Performance test bed

Test Methodology

Each client PC logs into the central server via the system under test using Windows 95 dial-up networking software. For each data point session (data points were 1, 4, 8, 16, 24, 32, 40, 47 PC sessions).

Once a client PC logs in, the automatic script initiates the call, sets up the call session, authenticates user IP address and sets up a FTP file transfer session. After all the clients start transacting FTP files from the central server, the network analyzer, Network General Sniffer, measures the aggregate throughput of the system under test. Aggregate throughput is measured as the total number of bytes transferred to the server over a period of time (measured in seconds with three samples taken every 15 seconds). Throughput measurements are taken with compression enabled on the remote access concentrator (the system under test) as well as the remote clients and the modems.

Test Results

Total # sessions	4048 aggregate throughput (Kbps)	4048 TPT/client (Kbps)
1	71.6	71.6
2	131.9	66
4	244.2	61.1
8	391.7	49
16	817.9	51.1
24	1222.4	51
32	1704.5	53.2
40	2222.3	55.6
47	2750.9	58.5

Table A – Ascend 4048 Performance Results with DM-16 Series 56K cards

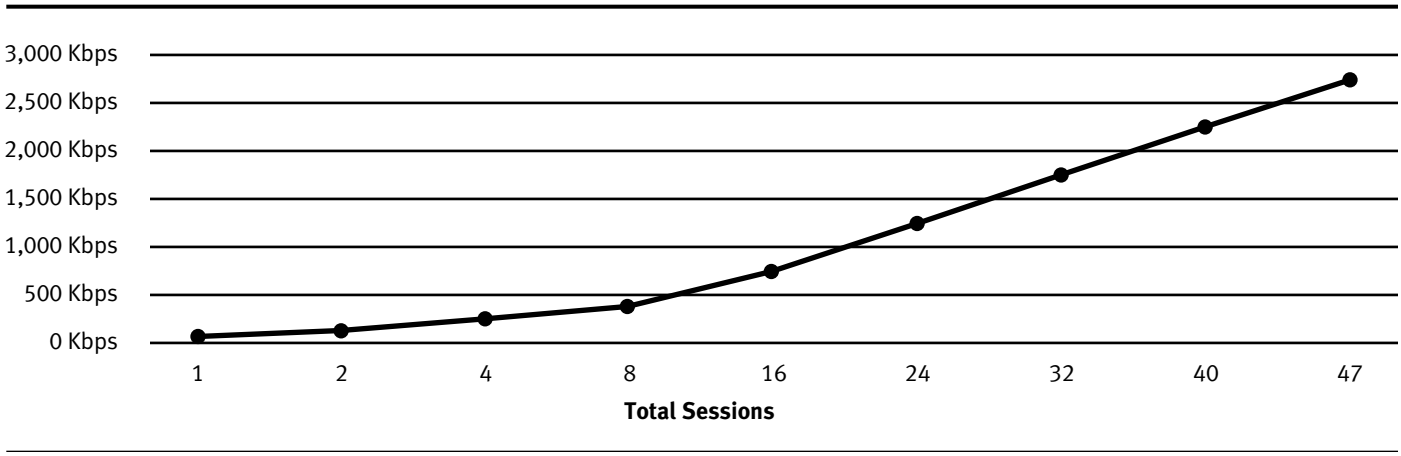

Figure 2—MAX 4048 Aggregate Throughput (Kbps)

Summary/Conclusion

The MAX 4048 with new Series56 DM-16 cards and software code 5.0Ai9 has demonstrated that the net (aggregate) throughput per system for 47 simultaneous sessions is 2750.9 Kbps and is linear as the sessions scale up (refer to Table A and Figure 2).

The per client throughput exceeds the raw link speeds of 56 Kbps (Table A) because of all the compression being turned on the client side as well as the MAX side. This data has been verified with Engineering for viability and accuracy.

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