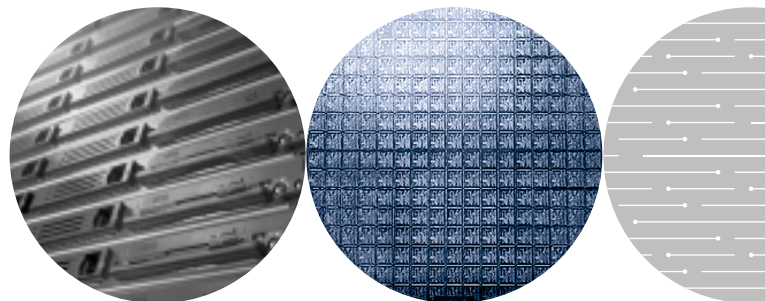




Intel® NetStructure™ DMN160TEC

ISDN Call Control Performance Testing

Intel in
Communications



Abstract

The Intel® NetStructure™ DMN160TEC network interface board with Intel® Dialogic® System Release 6.0 for the Linux* operating system was tested to ensure that it would achieve a call rate of one completed call every five seconds on all 480 ports simultaneously, and to ascertain its performance under “burst conditions.”

Tested in a controlled environment using the Abacus* bulk call generator from Spirent Communications, the board achieved a significant number of inbound busy hour call attempts (BHCA) with a busy hour call completion (BHCC) rate over 99% when using the ISDN Net5 protocol. During further testing, the board achieved a BHCC of 99.18% when receiving a call every 4.3 seconds. Applications running in the telco and service provider market segments require a BHCC of 99% or above. Based on these test findings, the Intel NetStructure DMN160TEC network interface board meets these qualifications.

Purpose

This Application Note characterizes the performance of the Intel NetStructure DMN160TEC board for the Net5 protocol and documents the test results so that system designers and integrators can reduce platform-development time and risk. This note describes the test configurations, and is primarily geared toward aiding telephony platform system integrators and their system designers in building an enhanced programmable switching platform using the Intel building blocks referenced — chassis, boards, and the enabling software. Using the test configuration and performance results described in this Application Note, integrators and designers should be able to build similar, albeit customized, integrated switching and media processing platforms for use by application developers in designing complete end customer solutions for enhanced programmable switches, integrated voice response (IVR), pre-paid, and voice messaging applications.

Test Environment

The following hardware and software components were used to conduct the system testing: one Intel® NetStructure™ ZT 5087 4U chassis containing an Intel® NetStructure™ ZT 5503 CPU board (using the 850 MHz Mobile Intel® Pentium® III Processor with 512 MB of RAM) and running the Red Hat* 7.2 Linux operating system, kernel version 2.4.9-31. The chassis contained one Intel® NetStructure™ DMN160TEC board, and was running Intel Dialogic System Release 6.0 for Linux software.

The Abacus bulk call generator was used to stimulate the Intel NetStructure DMN160TEC board with all channels performing simultaneous call control. Calls arrived and were terminated on all channels concurrently for more strenuous load testing. Testing parameters, as defined by Abacus, include:

- Call length — the precise duration of the call; the system starts clocking at call termination and stops at the disconnect
- Inter-call delay — the period of time between the end of one call on a channel and the beginning of another call on the same channel
- Total between calls – the sum of the call length plus the inter-call delay
- Call-to-call time – the maximum time between the start of one execution of the script on a channel and the start of the next execution of the script on the same channel during a test; applicable when call length plus inter-call delay does not equal total time between calls
- The formula used for deriving the BHCA — divide 3600 (the number of seconds in an hour) by the average call duration to find the total number of calls per channel; then multiply the result by 480 to find the number of calls handled per hour on the entire board
- The formula used for deriving the BHCC rate — divide the number of successfully completed calls by the BHCA and multiply by 100

Methodology

The Intel NetStructure DMN160TEC board was tested at a rate of one call every five seconds on all 480 ports simultaneously with the goal of achieving a BHCC over 99%. Once testing successfully reached the five-second interval, test engineers decided to continue testing the board at reduced time between call intervals to determine the breaking point where the BHCC rate would fall below 90%.

The additional tests were conducted using multiple calling scenarios, with varying call lengths and the mandatory Abacus inter-call delay. Scenario one used a four-second call with a one-second inter-call delay for a total of five seconds between calls. Results for scenarios two through five are detailed in Figure 1.

Although the call length and inter-call delay in scenarios two through five did not equal the call intervals, calls were originated from the Abacus at the rate of one call every 4.2-4.5 seconds. During the remaining time the Abacus was idle, noted as the call-to-call time.

The test switching application, created internally, was configured to make the Intel NetStructure DMN160TEC board answer only incoming calls, and then hold the calls until the Abacus test equipment disconnected them. All timing and logging of the host board and system events were performed by the Abacus system.

The call completion percentage was derived from the number of call completions divided by the total call attempts. Abacus defines a call attempt as the number of times a number is dialed. If the test equipment goes off hook and a dial tone is not present, this is not considered a call attempt. Similarly, a call completion would indicate the number of calls answered by the called channel. For example, failed calls may have occurred because the Abacus bulk call generator was attempting to make a call but the Intel NetStructure DMN160TEC board was not ready to accept the incoming call, i.e., the board may have been busy tearing down previous call.

Detailed Findings

The Intel NetStructure DMN160TEC board not only met the requirement of supporting a call rate of one completed call every five seconds on all 480 ports simultaneously, but it also exceeded it, achieving a BHCC of 99.18% for calls placed every 4.3 seconds. This testing validates that the board will work as it was designed to, and can handle the high performance and high-density needs of the telco market segment.

The Abacus bulk call generator was used to stimulate the Intel NetStructure DMN160TEC network interface board, with a new call generated every 5, 4.5, 4.4, 4.3, and 4.2 seconds. Test results are listed in Figure 1 for each call interval tested.

Scenario	Call Length (Seconds)	Inter Call Delay (Seconds) Fixed Variable	Total Between Calls (Seconds)*	Average CPU Load	BHCA**	BHCC / % Call Completion
1	4.0	1.0	5	14%	337141	99.88
2	3.0	1.0	4.5	14%	371885	99.82
3	3.0	1.0	4.4	14%	377646	99.37
4	3.0	1.0	4.3	14%	381013	99.18
5	3.0	1.0	4.2	14%	396941	77.44

* Call length plus inter-call delay does not always equal the total time; the Abacus test system is idle between calls.

** The BHCA results listed are less than the actual BHCA calculated numbers. The Abacus test system measured a call count for each independent channel. Not all channels achieved a 100% call count, lowering the total BHCA.

Figure 1: Results of the DMN160TEC with 480 Channels Under Stringent Testing

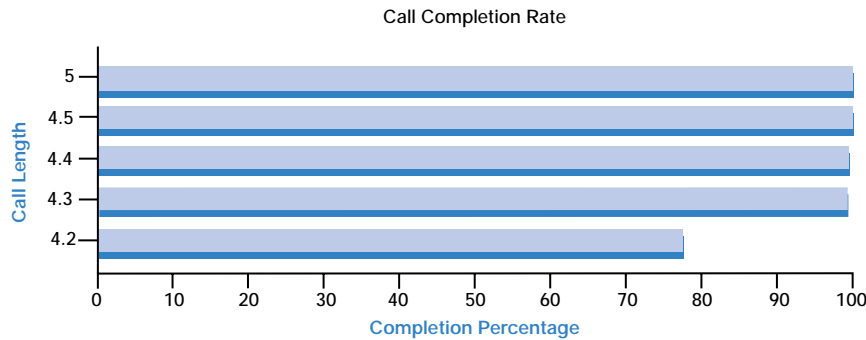


Figure 2: Call Completion Rate

Figure 2 illustrates the call completion rate of the Intel NetStructure DMN160TEC board when receiving 480 simultaneous calls from the Abacus test tool with various call intervals.

As indicated in Figure 2, the break point at which the BHCC rate fell below 99% was the point at which a call was placed every 4.2 seconds. At a time of 4.3 seconds between calls, the BHCC rate was 99.18%, a significantly lower call interval than the required five seconds and an acceptable rate for carrier-grade systems.

Product List

Boards	Intel NetStructure DMN160TEC Network Interface Board Intel NetStructure ZT 5503 System Master Processor Board using the 850 Mhz Mobile Intel Pentium III Processor
Chassis	Intel NetStructure ZT 5087 4U General Purpose Platform
Software	Intel Dialogic System Release 6.0
Operating system	RedHat 7.2 Linux, kernel version 2.4.9-31

Technical documentation is available at

<http://resource.intel.com/telecom/support/documentation/releases/index.htm>

For more information, contact your Intel account manager.

Glossary of Acronyms/Terms

BHCA	Busy hour call attempts
BHCC	Busy hour call completion
CPU	Central processing unit

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