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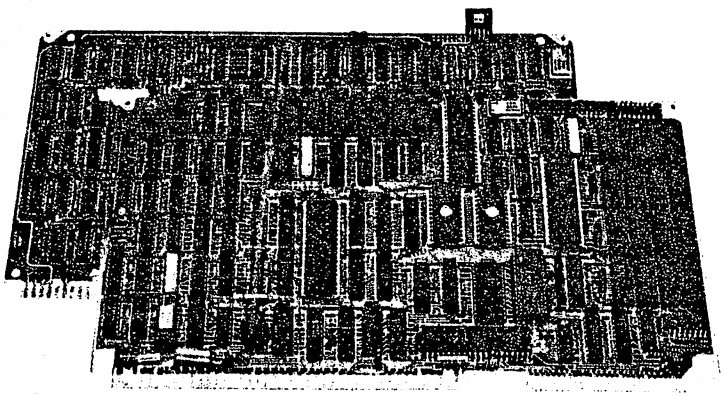
iSBC® 550 Ethernet Controller Performance Measurements

The iSBC 550 Ethernet* Controller was integrated into the new System 86/330 and the throughput and response time characteristics were measured. Measurement results are offered both for the standard iRMX 86 Real-Time Operating System and for a custom driver.

The iSBC 550 Ethernet Controller performed well in both the standard product and custom driver environments. In each case there are a variety of applications suitable for use of this controller. This is an added benefit as the focus of the Ethernet Controller is to provide a prototype device for software development which anticipates the VLSI solution from Intel.

* Ethernet is a trademark of Xerox Corporation.



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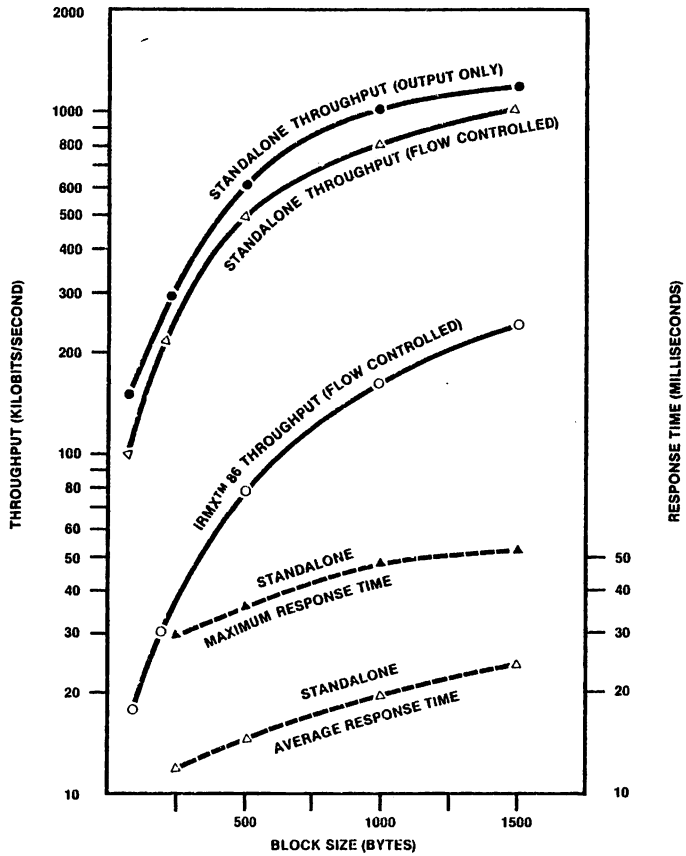
Purpose of Benchmark

The iSBC 550 Ethernet Controller is the first Ethernet OEM board level product offered by Intel and is intended as a prototype device for the development of user applications on a high-speed local area network. With most local area networks, the issue of performance is very important and network protocol developers must understand the performance characteristics of each feature. Even for a prototype vehicle, performance must be well known to identify potential problems elsewhere. This benchmark provides the performance values obtained in a System 86/330 with standard iRMX 86 operating system and custom driver code. These values are compared to other known measures for data communications.

Test Results

The results of the various test options are depicted in Figure 1. These results demonstrate the value of the iSBC 550 Ethernet Controller both as a development tool and as a communication con-

Figure 1



troller for a production system. The performance levels are comparable to expected performance for Winchester disks or moderate speed printers. Other communication methods such as RS422A/449 (SDLC) are comparable. See Figure 2.

Figure 2

DEVICE	PARAMETERS	THROUGHPUT
Winchester disk	50 msec access time, 1000 byte blocks	160K bits/sec
Moderate Speed Printer	1200 lines per minute, 50 bytes per line	14K bits/sec
SDLC (Intel 8274)	800K bits/sec clock rate, 30% line efficiency, half duplex	240K bits/sec

All throughput numbers are specified as effective user data bytes and do not include protocol headers or required envelope bits. Note that the Ethernet numbers represent only a fraction of the cable capacity and thus the cable can support several such systems before any one would experience degraded throughput performance.

The iSBC 550 Ethernet Controller can transmit data faster than it can receive data. Thus, the buffer pool at a receiving station can be exhausted by the uncontrolled transmission of frames. Higher layers of protocol must be provided to flow control a transmitting station. The receive buffer pool can contain 3 frames so a transmitting station must require an acknowledgement before transmitting a fourth frame. In some applications such as a centralized file, blocks which are lost due to buffer unavailability are recovered by higher level packet sequence control.

The difference between the average and maximum response time is due to the queueing of two frames in the network. The maximum is the worst case over the test interval. When only one block was queued the average and maximum times converged at 30% higher times than the plotted average, but throughput fell proportionately. When the test allowed more than 2 blocks outstanding (queued) the throughput and average response time were not affected. However, the maximum response time rose 10 msec for each additional block queued.

Conclusion

The iSBC 550 Ethernet Controller is a fully functional local area network controller which exceeds the required performance for a prototype development tool. It is also of moderate performance for some production systems and clearly out performs existing data communications products. Since it is a first product of a succession of Ethernet products, it can be a very effective device for early product introductions.

Test System

The test hardware was based on the System 86/330 as listed below. An MDS Series II System was used to load the test software via the 957B interface. The system memory was assigned so that executable code was held in private memory with the data held in memory accessible on the

MULTIBUS. When the iRMX 86 Real-Time Operating System was used, only the nucleus was contained on the iSBC 86/12A single board computer.

TEST SYSTEM HARDWARE	QUANTITY
1. System 86/330	2
2. iSBC 550 Ethernet Controller	2
3. TLC transceiver and tap	2
4. Belden Coax Cable	50 ft.
5. 957B	2
6. MDS Series II	1
7. Hazeltine 1510	1

RUN-TIME SYSTEM SOFTWARE

1. iRMX 86 Operating System, Release 4
2. iMMX 800 MULTIBUS Message Exchange, Release 2
3. E-Driver (part of iMMX 800 software)

The test software can perform two unique tests. First, the test program transmits data into the Ethernet at the maximum speed supported by the system. Second, the test program exchanges data between two stations with a rudimentary sequenced and flow controlled protocol.

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