

Cisco 7500 Gigabit Ethernet Interface Processor (GEIP)

This performance study shows the distributed Layer 3 packet switching performance (in Kpps) and the data throughput (in Mbps) of Gigabit Ethernet Interface Processor (GEIP) in the Cisco 7500 series router platform. The GEIP is based on the versatile interface processor 2-50 (VIP2-50) architecture and hence exhibits similar data throughput characteristics. The GEIP has a maximum aggregate throughput of 400 Mbps and a Layer 3 packet switching performance of about 110 Kpps, full duplex.

The GEIP provides the Gigabit Ethernet connectivity for the Cisco 7500 series routers. The GEIP is intended for use between Gigabit Ethernet backbones, such as those based on Cisco 85xx series switches and the WAN interconnects and services provided by the Cisco 7500 series router. In these applications, line-rate Gigabit Ethernet performance is secondary to reliable communications between the high-speed backbone and the slower speeds of the WAN infrastructure. Using the VIP architecture, the GEIP provides the Layer 3 services with sufficient performance for most WAN applications. In addition, the GEIP supports ISL data encapsulation for transporting different VLAN packets for point-to-point links, such as a Cisco Catalyst® 5000 switch to Cisco 7500 series router.

Performance Study

The actual performance numbers attained are a function of the GEIP under test, main route processor (RSP) selection and the Cisco IOS® image version.

Line rate for Gigabit Ethernet (in packets per second [pps]) refers to the maximum number of 64-byte Ethernet frames that is transmitted out of the maximum possible bit rate of 1000 Mbps (Gigabit Ethernet). The line rate for Gigabit Ethernet is 1,488,100 pps.

Test 1: GEIP in Distributed Optimum Switching Mode

Figure 1 below shows the switching performance and aggregate throughput of GEIP with Gigabit Ethernet Line Rate as the reference. GEIP is operating in full-duplex mode with traffic equally distributed on TX and RX ports.

Test Conditions

Platform	Cisco 7513
Processor	Route Switch Processor 4 (RSP4) with 128 MB
VIP	VIP2-50 with 4-MB SRAM, 32-MB DRAM, 512 K Layer 2 cache
IOS™ Image	rsp-jv-mz.111-22.CC
Switching Mode	Distributed optimum

Figure 1 GEIP Switching and Throughput Performance

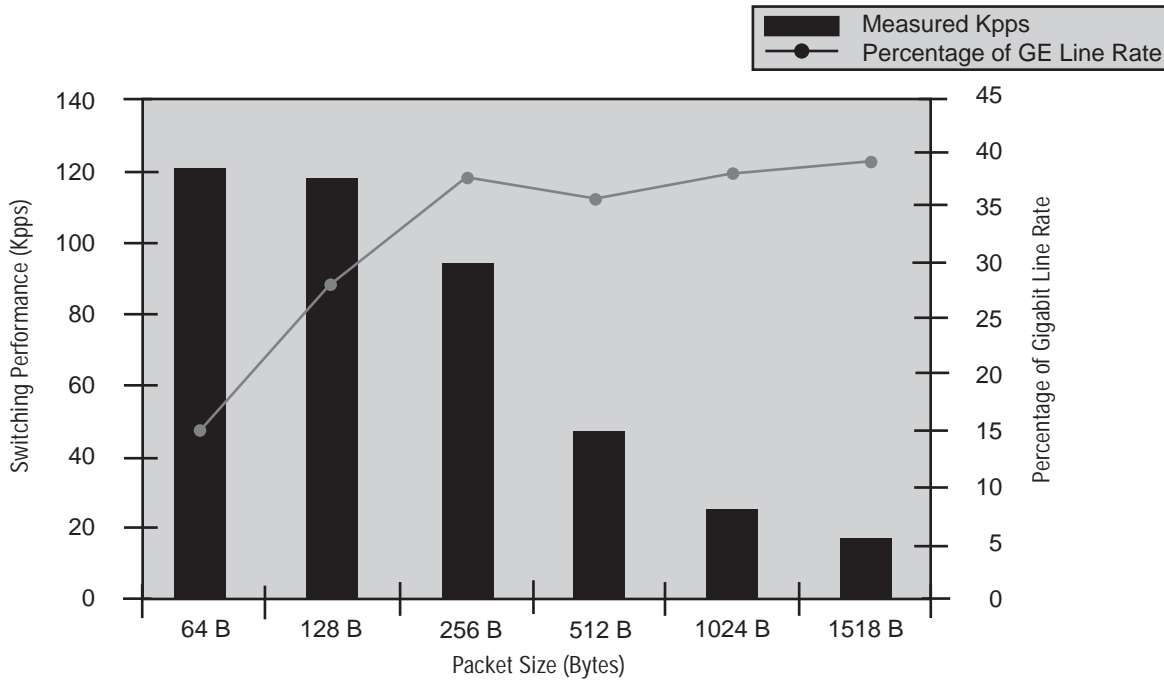


Table 1

Packet Size (Bytes)	64	128	256	512	1024	1518
Theoretical Maximum Kpps	1488	845	453	235	120	81
Measured Kpps	117	115	85	43	23	16

As shown in Figure 1 (and Table 1), the measured switching performance in Kpps is in accordance with the performance of VIP2-50, upon which GEIP is architecturally based.

As can also be noticed in Figure 1, the aggregate throughput improves with the increased size of the Ethernet frame size. This is attributed to the fewer cycles spent in packet processing. The best throughput as seen in Figure 1, is close to 40 percent of the Gigabit line rate, which translates to 400 Mbps, which incidentally is the aggregate throughput of VIP2-50 architecture.

Test 2: GEIP in Optimum Switching Mode

Figure 2 below shows the switching performance and aggregate throughput of GEIP with Gigabit Ethernet line rate as the reference. GEIP is operating in full-duplex mode with traffic equally distributed on TX and RX ports.

Test Conditions

Platform	Cisco 7513
Processor	RSP4 with 128 MB
VIP	VIP2-50 with 4-MB SRAM, 32-MB DRAM, 512 K Layer 2 cache
IOS Image	rsp-jv-mz.111-22.CC
Switching Mode	Optimum

Figure 2 GEIP Switching and Throughput Performance

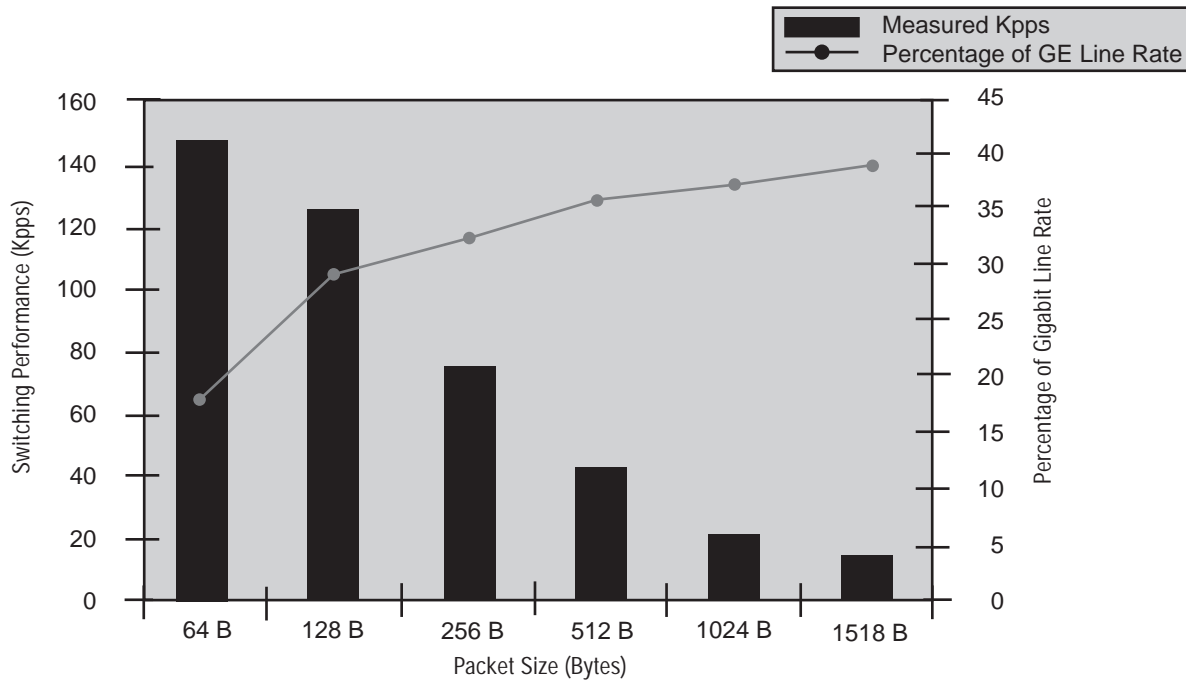


Table 2

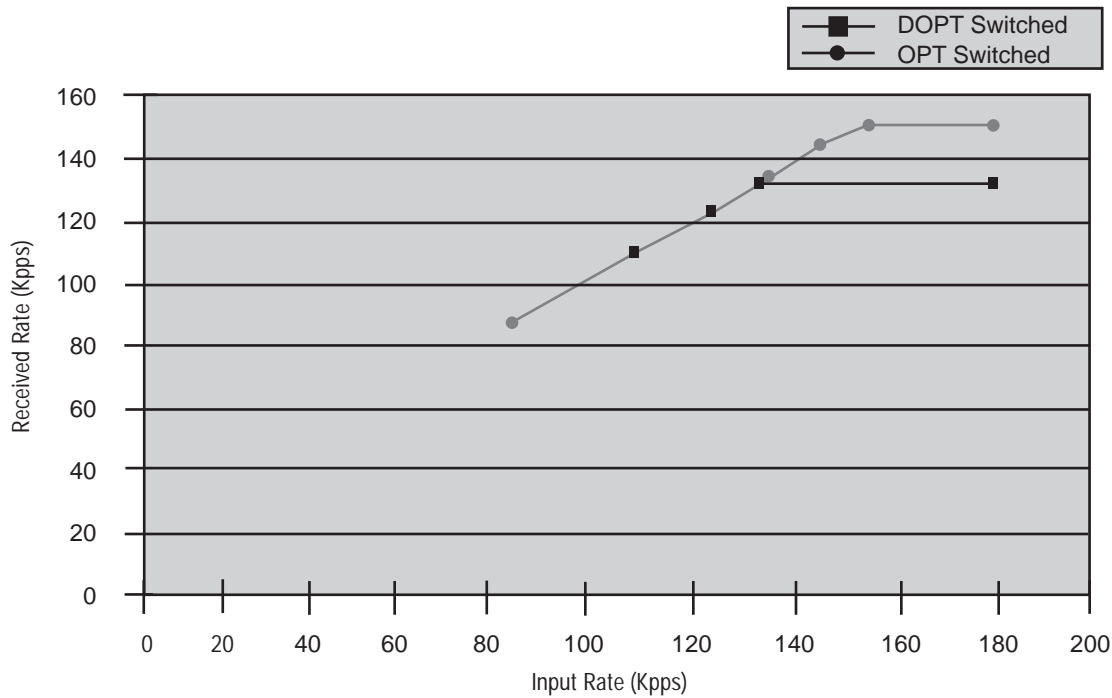
Packet Size (Bytes)	64	128	256	512	1024	1518
Theoretical Maximum Kpps	1488	845	453	235	120	81
Measured Kpps	147	125	76	43	23	16

Here again as seen in Figure 2 (and Table 2), the measured switching performance in Kpps is in accordance with the performance of VIP2-50. The maximum throughput is once again close to 40 percent of the Gigabit line rate, which translates to 400Mbps.

Test 3: GEIP Input Load Test

This test is done to see the switching performance of GEIP when the input load (unidirectional) is gradually increased to beyond what it can process. The result is, it is limited by the switching speed of GEIP.

Figure 3 GEIP Input Load Test



In this test, the number of 64-byte frames transmitted to GEIP is progressively increased by the packet generator and is switched back to the source for comparison. As can be noticed in Figure 3, the transmitted and received packet numbers go up in tandem until the fourth iteration and then diverge. This represents the saturation point for the interface to process packets. This is in accordance with the throughput performance numbers for VIP2-50. The same figure also shows a similar situation, while GEIP is configured for OPT switching.

Conclusion

The Layer 3 packet-switching performance and the aggregate throughput performance of GEIP is closely linked to the VIP2-50 performance. The packet processing power of the GEIP limits the throughput performance for small packets (64 bytes). This is seen very clearly in the input load test, where the received frames (feedback to the sender) trail transmitted frames (sent to GEIP) after a few iterations. On the contrary, maximum throughput (almost 400 Mbps) is realized with maximum size Ethernet frames (1518 bytes).



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