

Cisco 7600 Series Enhanced FlexWAN

Executive Summary

This paper describes in detail internal performance testing of the Enhanced FlexWAN module on the Cisco® 7600 Series Router. Several cases are discussed, including performance results with and without quality of service (QoS) applied, as well as the configurations to achieve that performance. These tests show that the Cisco 7600 Series Enhanced FlexWAN module is a high-performance carrier card capable of 624,000 pps per card.

Introduction

The Cisco 7600 Series Router is a high-performance edge router that meets the stringent requirements of service provider and enterprise customers. The Cisco 7600 Series delivers optical WAN and metropolitan-area network (MAN) functionality with IP services at the network edge. The Enhanced FlexWAN module extends these scalable WAN and MAN connectivity options to the Cisco 7600 Series and supports most Cisco 7200 and 7500 WAN single-wide port adapters, ranging from fractional T1/E1 to OC-3. The card offers flexible migration options from the Cisco 7500 Series and provides a bridge between existing LAN/WAN/MAN and traditional networks to future high-speed converged voice, video, and data networks.

This paper discusses the performance of the Cisco Enhanced FlexWAN in the following performance characteristics.

- The switching performance of the Enhanced FlexWAN module without any QoS features applied

- The switching performance of the Enhanced FlexWAN module with QoS features applied (five Class-Based Weighted Fair Queuing [CBWFQ] classes)
- The switching performance of the Enhanced FlexWAN module with QoS features applied (CBWFQ and Low-Latency Queuing [LLQ] classes)

Knowledge of the system architecture is necessary to understand the performance data in this paper. The test results are only in reference to the fabric-enabled Cisco 7600 Series Router, which assumes that a Supervisor Engine 2, a switch fabric module (SFM), and all fabric-enabled line cards are installed in the chassis (no classic card presence) or in a Supervisor Engine 720 with an integrated switching fabric. The test results in this paper are identical, regardless of the supervisor engine version.

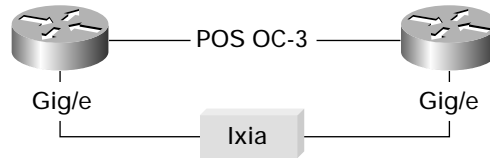
Test Setup

Equipment used:

- 2-port packet over SONET (POS) Port Adapter—only one port is used for all of the tests in this paper
- Enhanced FlexWAN module
- Ixia Test tool
- Supervisor Engine 2 with MSFC2 + SFM or Supervisor Engine 720



Figure 1
Test Setup



Performance Test

The test was designed to determine the maximum rate at which packets of various lengths can be forwarded through each bay of the Enhanced FlexWAN module without packet loss. This scenario consists of a series of frames with a particular source and destination IP address for traffic flow. On the receive end, the Ixia only counts frames generated by the sending port as valid frames. If the receiving port receives all frames from the transmitting Ixia ports, no further frames are sent and the maximum frame rate is recorded as the throughput. If a single frame is lost, the frame rate is halved and retried. If all frames are then received, a new frame rate is chosen halfway between the successful and unsuccessful frame rate and retried. This pattern repeats, using a simple binary search until the highest rate at which all frames sent are received can be determined.

Test Results

The test results are detailed in Figures 2–4, and summarized in Figure 5.

Figure 2
Enhanced FlexWAN Module with No QoS Enabled

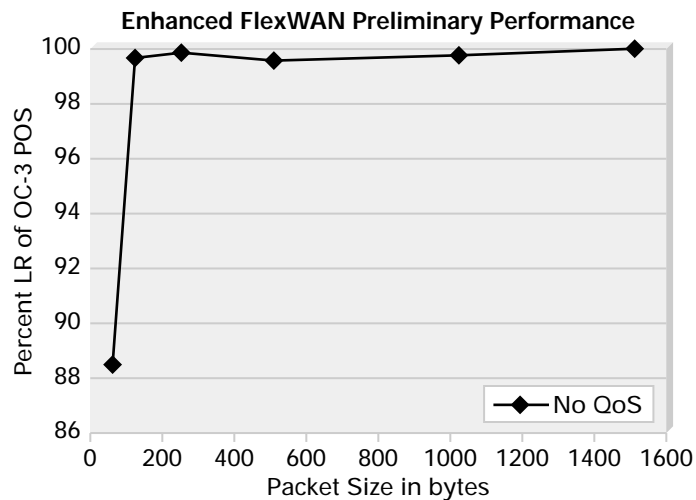
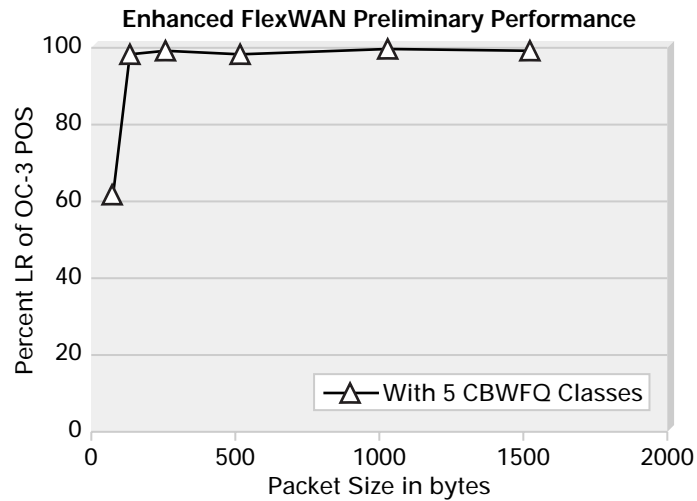




Figure 3
Enhanced FlexWAN Module with CBWFQ QoS Enabled¹



1. QoS configuration used

```
LLQ
class-map match-all class6
  match ip dscp 6
class-map match-all class7
  match ip dscp 7
class-map match-all class4
  match ip dscp 4
class-map match-all class5
  match ip dscp 5
class-map match-all class2
  match ip dscp 2
class-map match-all class3
  match ip dscp 3
class-map match-all class0
  match ip dscp default
class-map match-all class1
  match ip dscp 1
class-map match-all any
  match any
policy-map cbwfq_llq
  class class0
    bandwidth percent 12
  class class1
    bandwidth percent 12
  class class2
    bandwidth percent 12
  class class3
    bandwidth percent 12
  class class4
    bandwidth percent 12
  class class5
    bandwidth percent 12
  class class6
    bandwidth percent 12
  class class7
    priority percent 12
interface POS8/1/0
  service-policy output cbwfq_llq
```



Figure 4
Enhanced FlexWAN with CBWFQ/LLQ QoS Enabled

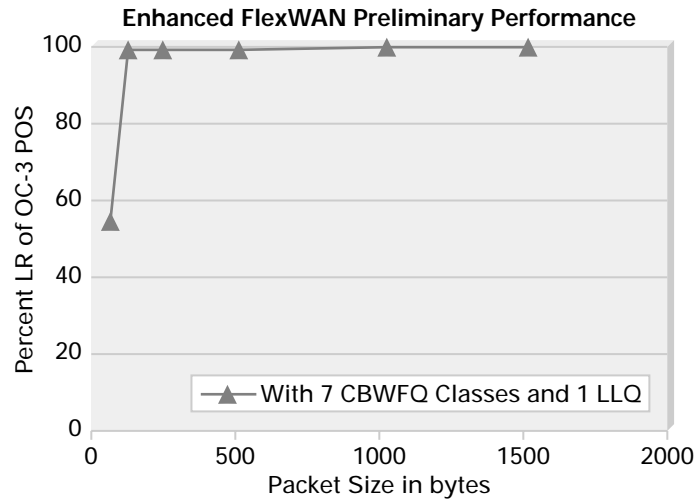
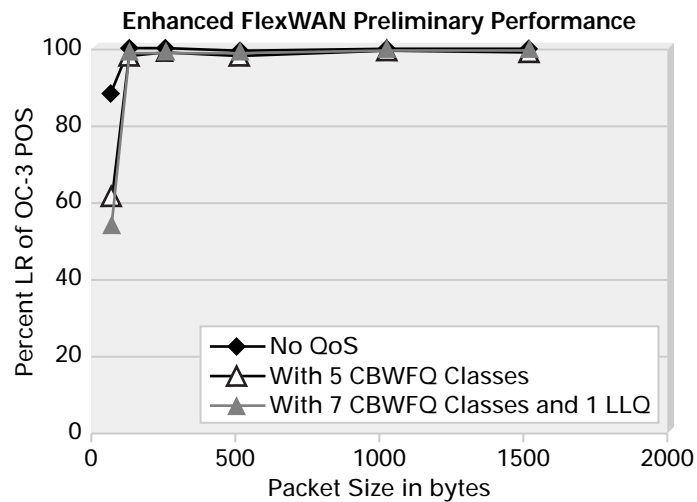


Figure 5
Combined Graphs



With CBWFQ/LLQ enabled and at 128-byte packets, the Enhanced FlexWAN modules achieves the same performance as no QoS. Figures 2-5 show that at 128-byte packets, the lines overlap, highlighting the high-performance switching capabilities with QoS enabled. The total overall performance is equal to 1.25 Mpps per Enhanced FlexWAN module.

Conclusion

The Cisco 7600 Series Enhanced FlexWAN module is a high-performance carrier card capable of upwards of 624,000 pps per card. Because of this performance level, the Enhanced FlexWAN module is able to handle WANs, MANs, and any other network application requiring high performance. When combined with industry-leading features in multicast, routing support, and resiliency, the Cisco 7600 Series provides a superior solution for today's and tomorrow's networks. Proper positioning of a Cisco 7600 Series Router with an Enhanced FlexWAN module can help a company's network infrastructure best support business operations.



Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters
Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters
Cisco Systems, Inc.
Capital Tower
168 Robinson Road
#22-01 to #29-01
Singapore 068912
www.cisco.com
Tel: +65 6317 7777
Fax: +65 6317 7799

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