MPLS L3VPN and Bundled Services Quality-of-Service Operation in the Windstream Network

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Contents

Introduction

The purpose of this document is to describe the operation of the Quality of Service (QoS) Product feature associated with MPLS Layer 3 VPN and Bundled Services in the Windstream MPLS Network.

Intended Audience

The intended audience for this document is Management, Executive Management, Sales, and Marketing.

MPLS Layer 3 VPN Quality of Service Operation

Quality of Service (QoS) provides end to end prioritization for Real-Time voice applications, Mission-Critical, and Business-Critical application. Voice traffic receives priority over traffic classified as Mission-Critical, Business-Critical, or Standard-Data at all times. This is achieved by establishing a priority queue that minimizes latency and jitter and has improved traffic loss characteristics. Mission-Critical and Business-Critical traffic within QoS profile limits is then given priority over Standard-Data during times of link congestion.

The Windstream MPLS Network uses DSCP packet markings to classify traffic. CE devices and/or CE Routers (managed or unmanaged) must mark IP packets with the correct DSCP values in order for QoS to function correctly. The following table shows the approved DSCP markings and associated queue names on the Windstream MPLS Network:

Service Class	DSCP markings	EXP markings
Standard-Data	be & all non-defined	EXP 0
Business-Critical	cs1,cs2, af11, af12, af13,af21, af22, af23	EXP 2
Mission-Critical	cs3,cs4, cs6,af31, af32, af33,af41, af42, af43	EXP 3
Real-Time	cs5, ef	EXP 5

QoS Service Class Descriptions

- **Standard Data:** This class of service enables customers to share latency and jitter tolerant data and Internet applications across all locations. Dedicated Internet and Ethernet Internet traffic are defaulted into Standard Data QoS. The traffic in this queue can exceed the percentage assigned to this queue if bandwidth is available from other queues.

- **Business Critical:** This class of service provides priority treatment to transactional and interactive data such as email, or client/server applications. The traffic in this queue can exceed the percentage assigned to this queue if bandwidth is available from other queues. Traffic exceeding the assigned percentage is treated like Standard-Data on the Customer's last mile link.

- **Mission Critical:** This class of service provides the highest priority treatment for data. Intended for applications with high business value requiring large bandwidth allocations and/or lower latency such as interative video conferencing, streaming video, credit cart transactions, and ERP applications slike SAP and PeopleSoft. The traffic in this queue can exceed the percentage assigned to this queue if bandwidth is available from other queues. Traffic exceeding the assigned percentage is treated like Standard-Data on the Customer's last mile link.

- **Real-Time:** This class of service delivers premium QoS to a customer's site and is optimized for low latency and low jitter performance required for voice communications. All managed VoIP services are defaulted into Real-time QoS. The traffic in this queue can NOT exceed the percentage assigned to this queue (even if bandwidth is available from other queues).

  Note: In some legacy service delivery scenarios, the Real-Time queue was capable of exceeding its assigned bandwidth percentage. This feature is longer available due to lack of support on next generation hardware provided by multiple network equipment vendors.

Diagram 1 below depicts the end-to-end operation of QoS on the Windstream MPLS Network.

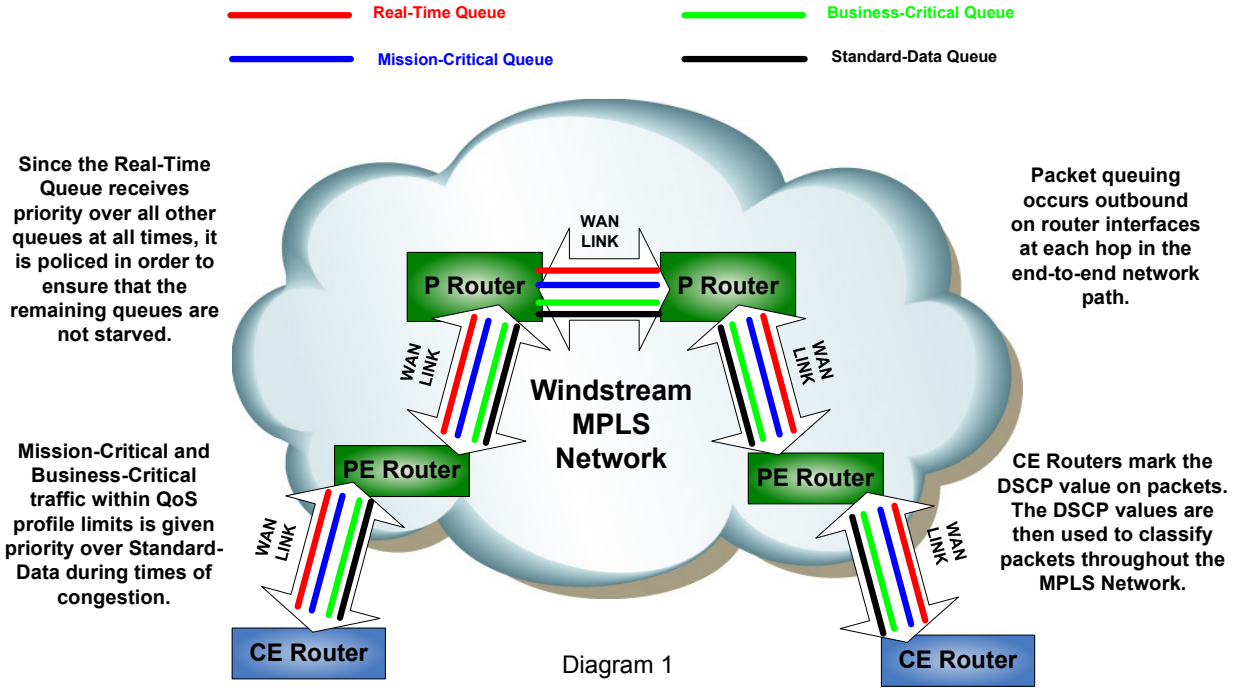

Diagram 1

QoS Profiles

The following standard QoS Profiles are available for use on Windstream MPLS Network PE to CE links. MPLS VPN Customers have the option to purchase QoS and choose from this set of profiles. If a customer requests QoS and no profile is selected, the default QoS profile "Q-90rt-10sd" will be provisioned. If a MPLS VPN Customer does not purchase QoS, all traffic in this Customer's VPN will receive equal priority in the Standard-Data queue.

Policy Name	% (Real-Time)	% (Mission-Critical)	% (Business-Critical)	% (Standard-Data)
Q-5rt-75mc-20sd	5	75	n/a	20
Q-5rt-75bc-20sd	5	n/a	75	20
Q-5rt-95sd	5	n/a	n/a	95
Q-5rt-60mc-30bc-5sd	5	60	30	5
Q-10rt-90sd	10	n/a	n/a	90
Q-10rt-60mc-30sd	10	60	n/a	30
Q-10rt-60bc-30sd	10	n/a	60	30
Q-10rt-50mc-30bc-10sd	10	50	30	10
Q-25rt-70mc-5sd	25	70	n/a	5
Q-25rt-70bc-5sd	25	n/a	70	5
Q-50rt-40mc-10sd	50	40	n/a	10
Q-50rt-40bc-10sd	50	n/a	40	10
Q-75rt-20mc-5sd	75	20	n/a	5
Q-75rt-20bc-5sd	75	n/a	20	5
Q-90rt-8mc-2sd	90	8	n/a	2
Q-90rt-8bc-2sd	90	n/a	8	2
Q-90rt-10sd (VOIP Default)	90	n/a	n/a	10
Q-25rt-40mc-30bc-5sd	25	40	30	5
Q-50rt-25mc-20bc-5sd	50	25	20	5
Q-75rt-10mc-10bc-5sd	75	10	10	5
Q-50mc-50sd	n/a	50	n/a	50
Q-50bc-50sd	n/a	n/a	50	50
Q-50mc-25bc-25sd	n/a	50	25	25
Q-100sd (Data Only Default)	n/a	n/a	n/a	100

Use Cases

Case 1 :

- Customer purchases 10mbps of Layer 3 VPN Service at 3 locations. Customer wants 1 Mbps of Real-Time, 2 Mbps of Mission-Critical, and 3 Mbps of Business-Critical QoS at all locations.
    - NDS should choose the "Q-10rt-50mc-30bc-10sd" QoS Profile for each location in this design.
    - Each location will have access to 1 mbps of Real-Time (anything over is discarded on the customer's last mile link), 5 Mbps of Mission-Critical (anything over is treated like Standard-Data on the customer's last mile link), and 3 Mbps of Business-Critical (anything over is treated like Standard-Data on the customer's last mile link). The Standard-Data queue would always have access to 1 Mbps of bandwidth and also have access to any unused bandwidth in other queues.

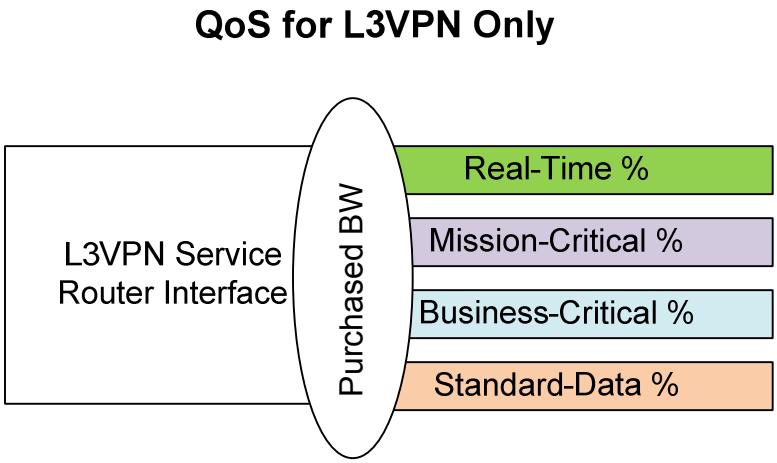

Diagram 2

Case 2 :

- Customer purchases 20 Mbps of Dynamic IP Service with SIP Bandwidth (maximum access to the Real-Time queue).
    - NDS should choose the "Q-90rt-10sd" QoS Profile for each location in this design.
    - Customer would get 18 Mbps of SIP Bandwidth (anything over is dropped on the customer's last mile link). The entire 20 Mbps circuit (minus active voice calls) would be available for Internet traffic.

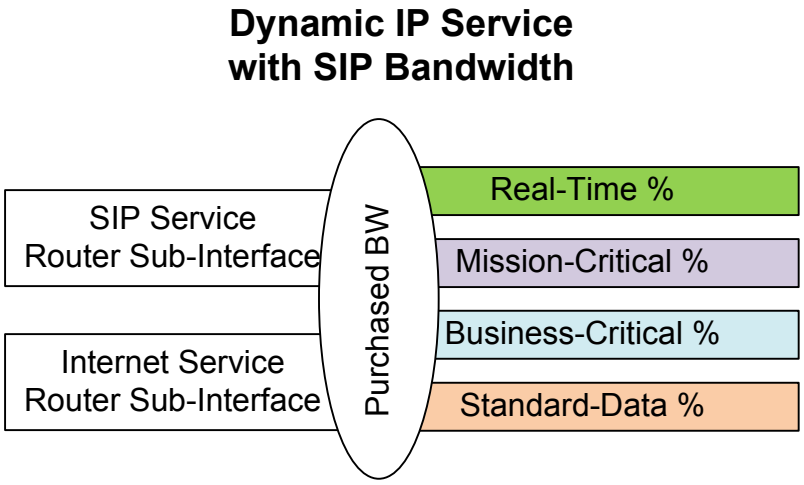

Diagram 3

Case 3 :

- Customer purchases 20 Mbps of Dynamic IP Service with a full PRI, and Layer 3 VPN service at 3 locations. Customer also requests 1 Mbps of Real-Time, 2 Mbps of Mission-Critical, and 6 Mbps of Business-Critical QoS for their Layer 3 VPN.

    - After consulting the VOIP BW Calculator, NDS should choose the "Q-25rt-40mc-30bc-5sd" QoS Profile for each location in this design.
    - The Customer will receive 5 Mbps of Real-Time QoS (736 Kbps of this allocation relates to the full PRI). The Customer would also receive 8 Mbps of Mission-Ciritical and 6 Mbps of Business-Critical QoS.
    - The Real-Time queue is limited to 5 Mbps at all times. Excess traffic in this queue is always dropped.
    - The 20 Mbps circuit to the Customer's hub location occasionally becomes congested during peak times. When the circuit is not congested, the customer is able to send more than 6 Mbps of Business-Critical traffic without packet drops. However, during periods of congestion the Business-Critical queue is limited to 6 Mbps and excess traffic is treated like Standard-Data and may be dropped.
    - When the circuit is not congested, the Standard-Data queue has access to the entire circuit bandwidth (minus traffic used by other queues). During times of circuit congestion, the Standard-Data queue has access to at least 1 Mbps.

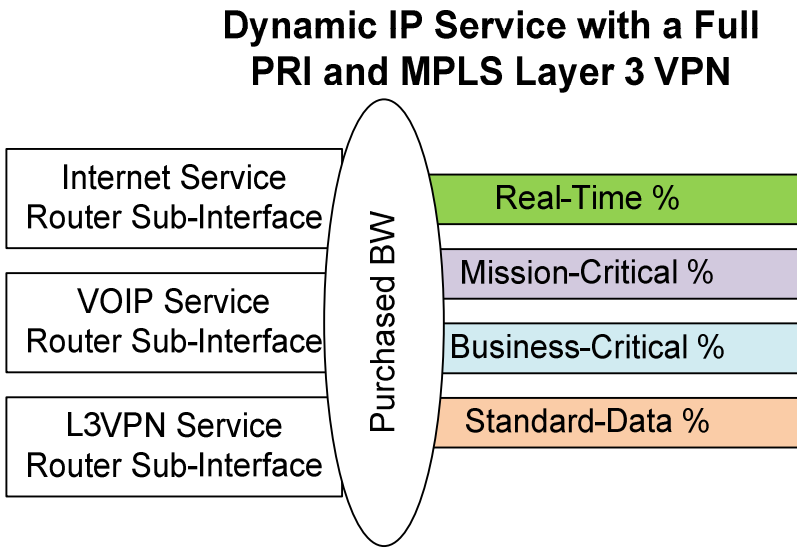

Diagram 3

Conclusion

The Windstream QoS Product Feature will support 4 egress queues to which 4 different classes of traffic can be mapped (Real-Time, Mission-Critical, Business-Critical, & Standard-Data). The QoS product is only supported for traffic that is contained within a Layer 3 MPLS VPN. Layer 3 MPLS VPN can be purchased separately or as part of a Bundled Service offering (Dynamic IP for example).