

Understanding DLSw Flow Control

Document ID: 10110

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Introduction

This document describes how data-link switching (DLSw) flow control is implemented.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

The information in this document is based on these software and hardware versions:

- Cisco IOS ® 11.2(24) and later

The information presented in this document was created from devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If you are working in a live network, ensure that you understand the potential impact of any command before using it.

Conventions

For more information on document conventions, refer to the Cisco Technical Tips Conventions.

DLSw Implementation

Cisco DLSw implementation uses this algorithm for flow control. The receiver grants permission for the sender to send. This means that if you issue the **show dlsw circuit detail** command on a circuit on both routers at the same time, the granted on one router is the permitted on the other, and the permitted is the granted on the other router. There may a difference due to packets that are in transit through the network (that is, sent by one end but not received by another).

When the granted count falls below the current window, the receiver sends a flow control indicator. The flow control indicator is sent as a Window Operator (WO). When a DLSw peer receives a WO, it modifies the permit (to send) count.

There are five types of operators, listed here:

- RWO (repeat) adds the Current Window (CW) to the permit count.
- IWO (increment) adds one to the CW and adds CW to the permit count.
- DWO (decrement) subtracts one from the CW and adds CW to the permit count.
- HWO (half) divides CW by two and adds CW to the permit count.
- ZWO (zero or reset) sets CW=0, no change to permit count.

The Flow Control Indicator (FCI) sent is dependent on the value of an internal Data Link Control (DLC) congestion value. These congestion values are listed here:

- MAX => ZWO (if the current window=0, even if you have a grant outstanding, you are not allowed to send).
- HIGH => HWO (half window. Current window is halved. Grant is incremented by new (smaller) value of window).
- MEDIUM => DWO (decrement current window by one, grant is incremented by new value of window).
- LOW => Send RWO (repeat) or IWO (increment)

Consider this sample output:

```
4043309695      0010.e359.7557(04)  4000.6bbb.0001(04)  CONNECTED
PCEP: 61072B78   UCEP: 611E84F8
Port:TB1        peer 172.16.207.246(2065)
Flow-Control-Tx CW:20, Permitted:22; Rx CW:49, Granted:95; Op: Repeat
Congestion: Low(02), Flow Op: Half: 0/0 Reset 0/0
                ^^^^^^^^^^^^^^^^^^^^^^^^^ - number of HWO/ZWO sent/rcvd
                ^^^^^^^^^^^^^^^^^^^^^^^^^ - congestion value (snapshot)
RIF = --no rif--
```

Based on the sample output, if this router sends three more packets, the permitted becomes 19, while the window is 20. At the remote side, the granted becomes 19 and the window becomes 20. The remote now has to send a WO. The remote sends one of the operators, dependent on the congestion at the remote end.

If a repeat WO is sent, the granted becomes 39, and the current window remains 20. If a IWO is sent, the granted becomes 40 and the current window 21. If a HWO is sent, the granted becomes 29, and the current window becomes 10.

Issue the **show dlsw circuit detail** command from Congestion: Low(02) in order to check the congestion level.

```
TokenRing3/0 DTE: 4000.3240.1001 0110.2122.33c1 04 04 state NORMAL
V(S)=52, V(R)=9, Last N(R)=52, Local window=7, Remote Window=127
akmax=7, n2=5,
xid-retry timer      0/0      ack timer          0/1000
p timer              0/2000   idle timer         3000/10000
rej timer            0/3200   busy timer         0/12000
akdelay timer        0/50     txQ count          0/200
RIF: 0690.0408.00A0
```

```
DA-rg9#sh int s5/2
Serial5/2 is up, line protocol is up
....
sdlc addr C1 state is CONNECT
cls_state is CLS_IN_SESSION
VS 4, VR 6, Remote VR 4, Current retransmit count 0
Hold queue: 0/200 IFRAMES 106581/25445
TESTs 0/0 XIDs 57/44, DMs 0/0 FRMRs 0/0
RNRs 0/0 SNRMs 12/0 DISC/RDs 6/0 REJs 0/0
Poll: clear, Poll count: 0, ready for poll, chain: C1/C1
```

Note: The only exception is a ZWO (or reset). In that case, the current window goes to zero, the permitted does not change, and the recipient is not allowed to send (even though the latter has a permitted count) until the window is opened again (by a IWO).

Related Information

- **DLSw (Data–Link Switching) & , DLSw+ (Data–Link Switching Plus) Technical Support**
 - **Technical Support – Cisco Systems**
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Updated: Sep 09, 2005

Document ID: 10110
