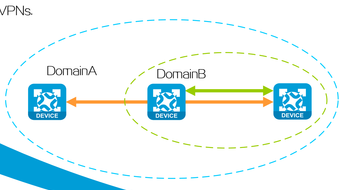
Connectivity Fault Detection

Technical Introduction

CFD

About CFD

Connectivity Fault Detection (CFD) is an end-to-end link layer Operation, Administration, and Maintenance (OAM) mechanism. CFD is used for link connectivity detection, fault verification, and fault location in Ethernet networks and MPLS Layer 2 VPNs.



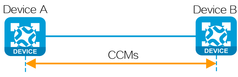
Benefits

- Widespread application: Can detect link connectivity in both Ethernet networks and MPLS Layer 2 VPNs, without requiring the configuration of IP addresses.
- Fast fault location: Rapidly locates faults by dividing a network into different-level domains.
- Traffic protection: Prevents traffic loss by shutting down or blocking the port for the failed link.
- Link quality detection: Detects the packet loss ratio, delay, and bit errors.

Functionality

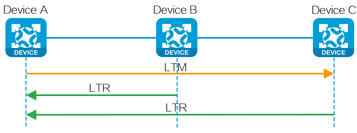
Continuity check

Continuity check (CC) examines the connectivity between two ports. This function is implemented through periodic sending of CCMs by the ports.



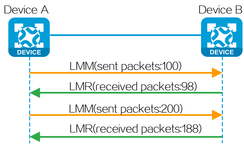
Linktrace

Linktrace (LT) is similar to the tracert function of the IP layer. The source device sends the linktrace messages (LTMs) to the target device. Based on the linktrace reply messages (LTRs), the source device can identify the path to the target device.



Loss measurement

Loss measurement (LM) detects the number of lost packets between two ports. The source device calculates the number of lost packets according to sent loss measurement messages (LMMs) and received loss measurement replies (LMRs). As shown in the figure, the number of lost packets on Device B is (200-100)-(188-98)=10.

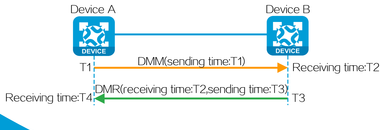


Delay measurement

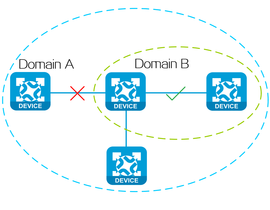
Delay measurement (DM) detects the link transmission delay between two ports.

- One-way DM: The target device (Device B) calculates the delay according to the time one-way delay measurement (1DM) frame is received. As shown in the figure, the delay is T2-T1.

- Two-way DM: The source device (Device B) calculates the delay as the difference between the time it sends a delay measurement message (DMM) and the time it receives a delay measurement reply (DMR). As shown in the figure, the delay is (T4-T1)-(T3-T2).



Typical Network Diagrams



Hierarchical design for fault detection

Divides a network into different-level domains to facilitate fault location. As shown in the figure, you can narrow down the fault to the area outside domain B.

Port collaboration

Shuts down or blocks the port and switches the traffic to a backup link when the primary link fails.