

Article Overview

Layer 2 Data Center Interconnect (DCI) enables VLAN and Ethernet segment extension across geographically dispersed data centers, supporting workload mobility, disaster recovery, and application continuity.

Overview of Layer 2 DCI

Layer 2 DCI allows organizations to extend VLANs, bridge domains, or Ethernet segments between separate data centers, creating a shared Layer 2 domain. This is essential for applications that require IP address continuity, subnet adjacency, or clustering, such as virtual machine live migration (e.g., VMware vMotion, Hyper-V Live Migration), database clusters, and storage replication systems . By maintaining the same Ethernet segment across sites, Layer 2 DCI simplifies workload mobility, reduces downtime, and avoids re-addressing or reconfiguring applications .

Key Technologies for Layer 2 DCI

o OTV (Overlay Transport Virtualization)

- o Cisco proprietary technology designed for large-scale Layer 2 extension over IP/MPLS networks.
- o Encapsulates MAC frames within IP packets, enabling transparent Layer 2 connectivity while preserving fault isolation and resiliency.
- o Supports multi-homing and loop prevention, making it suitable for complex enterprise environments .

o VXLAN (Virtual Extensible LAN)

- o Encapsulates Ethernet frames in UDP packets to extend Layer 2 over Layer 3 networks.
- o Supports segmentation and overlays, providing scalability for large data center fabrics.
- o Commonly used in leaf-spine architectures and multi-tenant environments .

o EVPN (Ethernet VPN)

- o Uses BGP as a control plane to manage Layer 2 and Layer 3 overlays.
- o Provides MAC address learning, multi-homing, and load balancing, mitigating issues like MAC flapping common in traditional Layer 2 extensions.
- o Considered the most scalable and resilient solution for multi-site Layer 2 DCI .

o Physical and Carrier-Based Options

- o Dark fiber: Provides a dedicated Layer 1 connection, allowing full control over traffic, including SAN and Ethernet, but can be costly and distance-limited.
- o DWDM and Ethernet circuits: Offer high-bandwidth Layer 2 connectivity over long distances, often provided by carriers.
- o Layer 2 VPN services: Enable enterprises to send native Ethernet frames over provider networks, sometimes combined with overlay technologies for flexibility .

Data Center Interconnect Layer 2

Design Considerations

- o Latency and Bandwidth: Layer 2 DCI must provide sufficient bandwidth and low latency to support east-west traffic and clustered applications.
- o Failure Domains: Extending VLANs increases the Layer 2 failure domain; careful design is needed to prevent broadcast storms, MAC flapping, and convergence issues .
- o Selective Extension: Modern designs often extend Layer 2 only for workloads that require it, while other traffic uses Layer 3 interconnects for simplicity and resilience .
- o Operational Complexity: Overlay technologies like VXLAN EVPN or OTV reduce the operational burden of managing stretched Layer 2 domains while providing loop prevention and multi-homing capabilities .
- o Integration with Services: Firewalls, load balancers, and other stateful services must be considered when extending Layer 2 across sites to maintain consistent service access .

Use Cases

- o Workload Mobility: Live migration of virtual machines without changing IP addresses.
- o Disaster Recovery: Active-active or active-standby data center configurations with seamless failover.
- o Clustered Applications: Databases, storage systems, and legacy applications requiring Layer 2 adjacency.
- o Multi-Tenant Connectivity: Service providers can offer Layer 2 DCI for cloud on-ramps, colocation, and metro networks .

Conclusion

Layer 2 DCI is a critical technology for enterprises and service providers that need transparent VLAN extension, workload mobility, and disaster recovery across multiple data centers. Choosing the right technology--OTV, VXLAN, EVPN, or physical/circuit-based options--depends on scale, latency, operational complexity, and application requirements. Modern designs favor overlay networks with selective Layer 2 extension to balance simplicity, resiliency, and performance .

ACME Enterprises has two data centers linked with a layer-2 Data Center Interconnect (DCI) implemented with Cisco's Overlay

Performance Implications Traffic Flow through the Service Layer Resiliency Data Center Multi-Tier Model Design This

Organizations use Layer 2 Data Center Interconnect when they need the same Ethernet segment, VLAN, or

Learn how data center interconnect technology links multiple data center facilities together to share resources

Data Center Interconnect Layer 2

At its core, Cross-Site Interconnect is a transparent, on-demand, layer 2 connectivity solution that leverages Google's

Data Center Interconnect Reference Design Guide Data centers of all sizes host significant amounts of business-critical data--data

Layer 2 data center interconnect technologies enable the extension of VLANs across multiple data centers, creating a shared Layer

This article aims to explore the fundamental DCI models, including Layer 2, Layer 3, and advanced models, helping

Layer 2 Extensions Layer 2 extension from one data center to another typically supports an application or a system that requires

Layer 2 Data Center Interconnect is used when applications, servers, or network services need to appear as if they

As data center consolidations occur, these business units/departments begin to share common floor and rack space.

What is data center interconnect (DCI) layer 2 encryption? Layer 2 is the data-link layer specified by the Open Systems

The connection between data center fabrics is referred to as a data center interconnect (DCI). Layer 2 and Layer 3

Figure 2-1 summarizes the three general types of connectivity required for a DCI solution. o LAN Extension: Provides a single Layer 2

The following is an example configuration of a Layer 2 Data Center Interconnect (DCI) with use of vPC. The example allows for First

This document describes how to configure a Layer 2 (L2) Data Center Interconnect (DCI) with the use of a Virtual Port

Web: <https://www.in-au.co.za>

