Micas Data Center Interconnect Solution

Background

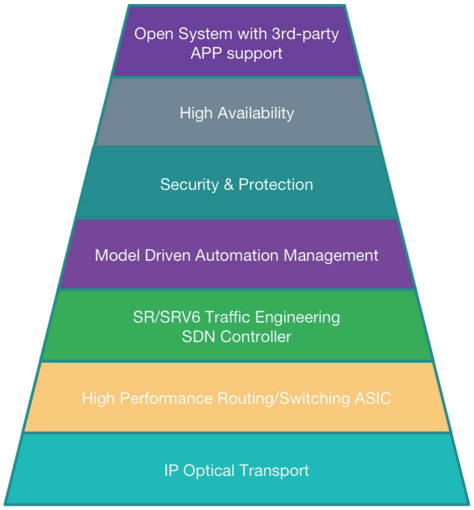
- With the rapid advancement of cloud computing, big data, artificial intelligence, and other technologies, the infrastructure architecture of Internet cloud service providers is rapidly transitioning to supporting high-speed 400G/800G bandwidth. The east-west traffic interactions between data centers becomes more and more frequent, highlighting the growing importance of backbone DCI networks for data center interconnections. Additionally, the emergence of new business requirements and the rapid growth in traffic volume are placing new demands on the underlying network infrastructure in terms of latency, bandwidth, reliability, security, and scalability.
- In most cloud service provider network designs, conventional DCI networks mainly handle high-speed, long-duration data flows (also known as elephant flows) between data centers in the east-west direction. Meanwhile, low-speed, short-duration data flows (also known as mice flows) between data centers and Internet gateways in the north-south direction are typically managed by a separate wide-area backbone network.

  However, there is a growing trend towards using a new type of DCI network. This network combines multiple roles and addresses the need for simplified network protocols, adaptability to changing traffic patterns and device requirements, and high-speed port demands.

  To achieve this, advanced technologies like high-speed programmable chips, L2/L3 EVPN, SR/SRv6, IP over DWDM, and others are used to streamline the overall architecture. The goal is to create a high-speed, low-latency, reliable, and secure interconnectivity network that can accommodate multiple services.

Solution Highlights

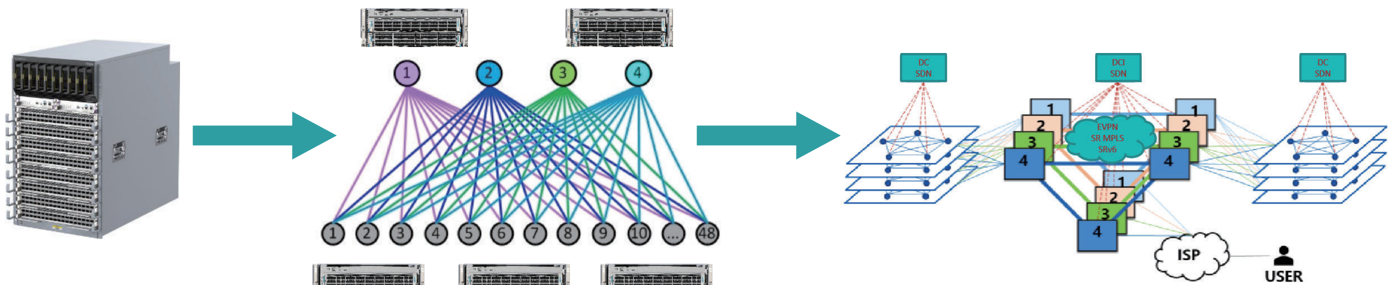
- Open OS – Provides multi-layered network APIs for third-party applications
- Redundancy design – Path detection, fast switchover protection, and multi-plane network design
- Security – Line Encryption (MACSec) and Control Plan Protection
- Automated Management – Netconf/Yang Model, Telemetry
- Deterministic Network Services – SDN SR/SRv6-TE traffic scheduling technology, multi-plane network design
- High-performance routing and switching chip – 10 TB+ performance with latency below 10 μs
- IP over DWDM – 400G ZR/ZR+, OLS



Solution Architecture Diagram - Small-sized Cluster Devices, Multi-plane Deployment

- The Node devices utilize a multi-device cluster architecture, while the DCI backbone network employs multi-plane design and deployment, allowing smooth network expansion and rapid iteration while maintaining high performance and availability.
- Multiple devices form a virtual management cluster, with each plane operating independently without any protocol or state synchronization. The design of a multi-plane network encompasses various dimensions, such as construction costs, technological innovation, maturity and stability, and supply chain security.
- Different network technologies like Native IP/SR/MPLS or SRv6 can be used in the multi-plane network design, even incorporating different generations of chip products.

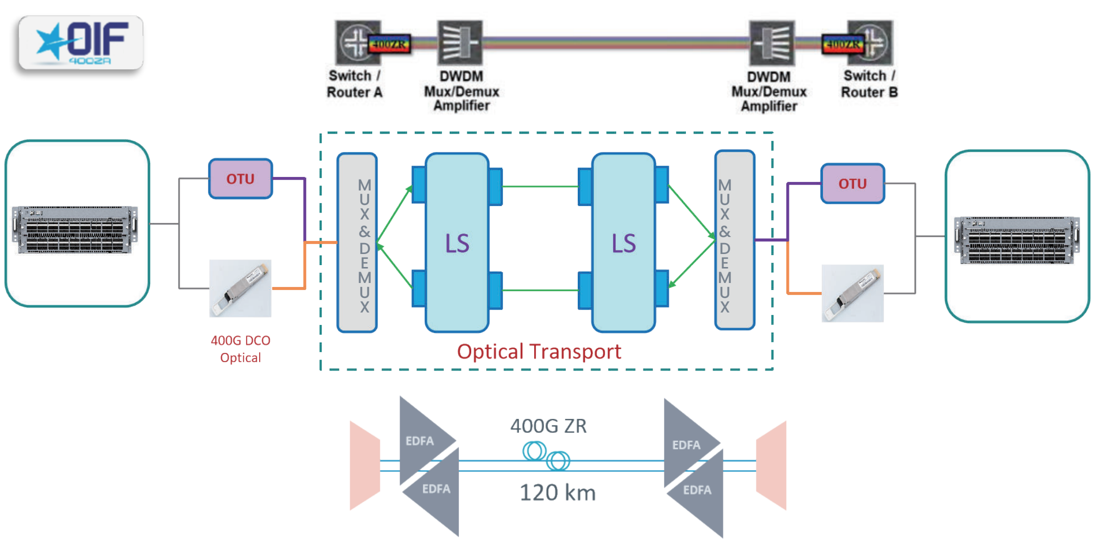
The emergence of new high-performance routing and switching chips, such as the Broadcom Jericho series, along with the adoption of multi-plane network design, has driven a shift towards small-sized devices. Users now have the option to utilize traditional large-scale chassis-based devices or build device clusters using smaller fixed or central-forwarding modular devices. These multi-device clusters then form multiple network planes, ensuring network forwarding capacity and design flexibility.



Chassis System

Multi-Plane

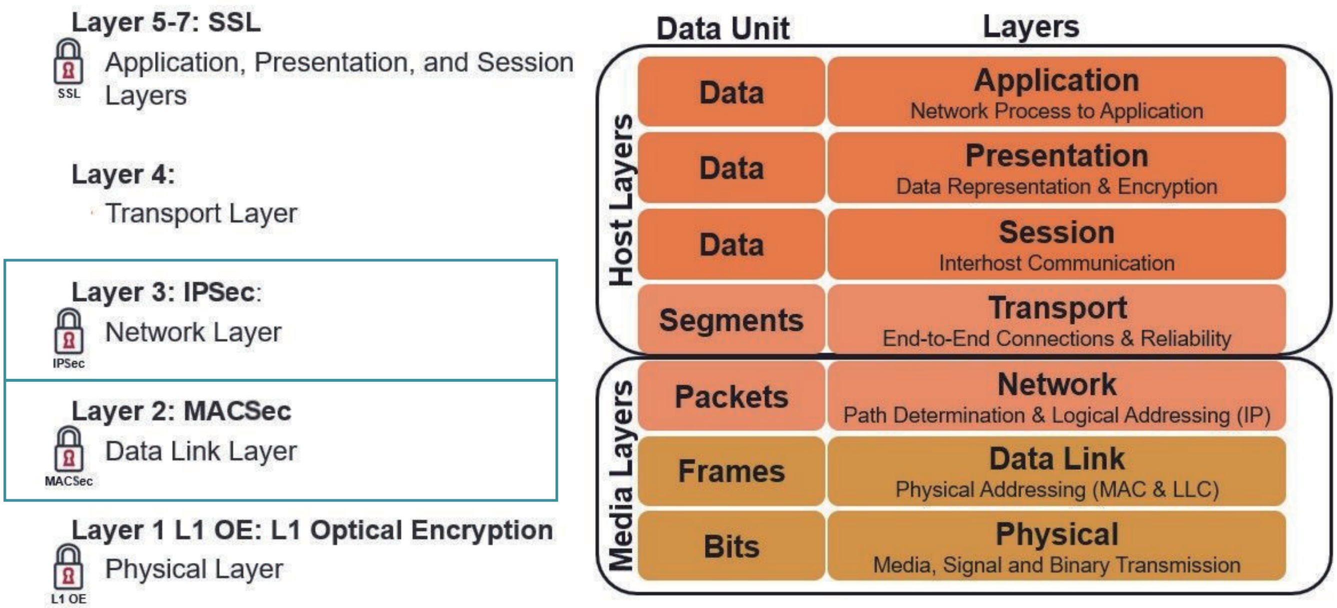
Solution Architecture Diagram - 400G ZR/ZR+ Integration of IP over DWDM and Transport Network

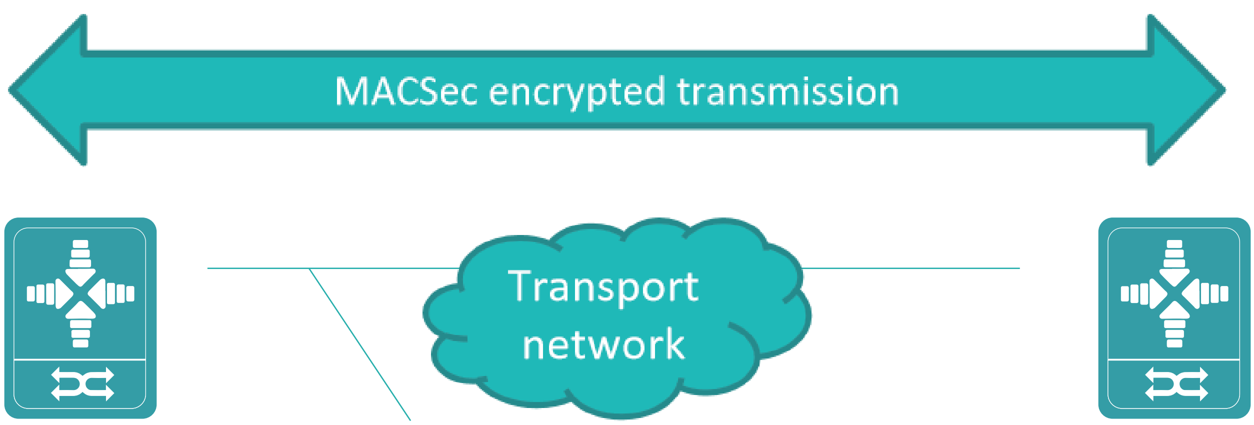


Supporting 400G ZR/ZR+ modules, allowing for up to 120 km long-distance interconnection between IDCs; no intermediate devices; reducing the TCO by 15%–30% when compared with the traditional architecture

Solution Architecture Diagram - Data Security and Encryption

The MACSec (Media Access Control Security) encryption technology ensures secure transmission of data across transport devices.





L2 Header	SecTAG	Encrypted Payload	ICV	FCS

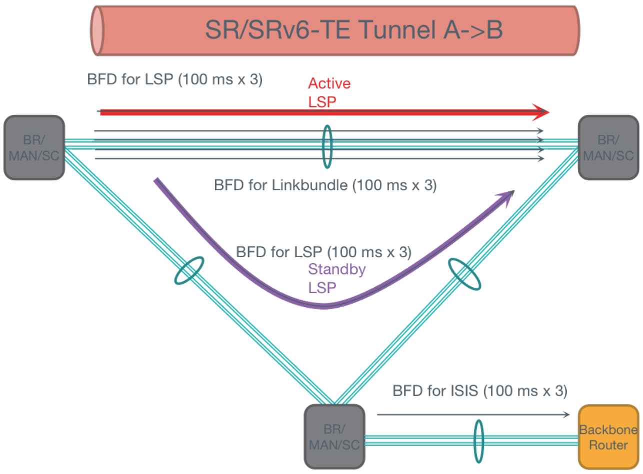
The J2C + 7.2 Tbps chip provides comprehensive line-rate encryption capabilities at the chip level.

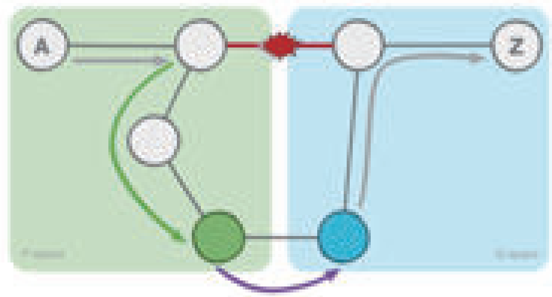
Layer 2 link-layer encryption, without the need for Layer 3 encryption, reducing transmission latency.

Hop-by-hop encryption can be implemented, enabling end-to-end encryption in an unknown network.

Unencrypted packets are discarded to prevent intrusion forgery.

Solution Architecture Diagram -- Fault Detection and Millisecond-Level Fast Switchover Protection





Solution Architecture Diagram - Open Modular OS

Based on an open Linux system, it offers flexible fault monitoring, hot patching for online upgrades, and open third-party APIs.

Fault collection and proactive fault alerts → **Fault information snapshotting** → **SDA hot restart** → **Development Programmability** → **Function-level Hot patches** → **Without the need of using CLI**

Fault collection and proactive fault alerts: Supports one-click fault collection and proactive fault alerts (DFx, a packet loss alarm is generated when the receiver receives a packet but does not respond to it).

Fault information snapshotting: Supports fault service chain tracing and fault replay, enabling fast fault location and on-site problem reproduction.

SDA hot restart: SDK-related problems can be fixed using patches, with no need to restart the system.

Development Programmability: The HulkOS system provides SDK local APIs, which allows customization of apps, such as traffic caching and monitoring.

Function-level Hot patches: The hot patch framework is optimized, and function-level hot patches can take effect and fix kernel bugs without restarting the process.

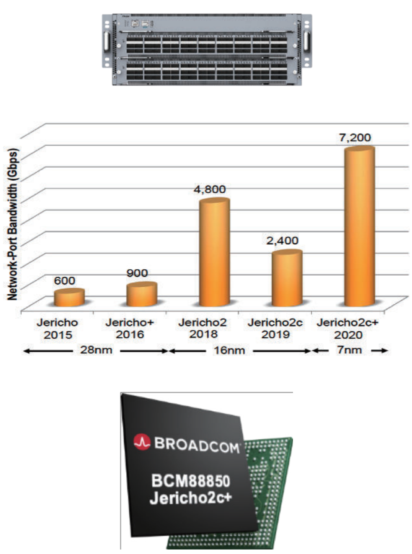
Without the need of using CLI: Remote APIs are provided for structured data collection, and CLI commands do not need to be executed one by one, which improves the access performance of northbound interfaces.

- The telemetry network monitoring technology is adopted to improve the collection accuracy of monitoring data and provide sub-second-level network monitoring in real time.
- The unified monitoring platform can visualize, monitor, and predict alarms at the network level.
- Network problems or faults can be accurately traced and quickly located.
- O&M management of data center networks can be more efficient and accurate, and the OPEX of customer data centers is substantially reduced.

Summary of DCI Network Characteristics

- **High bandwidth:** New form of devices based on high-speed routing and switching chips, regional/long-distance backbone OTN transmission →400/800G coherent optical open-routed network, traffic scheduling (SDN, Per-flow/Per-prefix SR/SRv6-TE), L3 EVPN (SR MPLS/SRv6) service isolation
- **Low Latency:** E2E latency Metro (ms → μs) – Low Latency for IoT/Game scenarios
- **Deterministic services:** SDN SR/SRv6 traffic scheduling, improved line bandwidth utilization, SLA QoS assurance
- **High Availability:** Fast fault recovery (millisecond-level fault detection, switchover protection), multi-plane redundancy, network reliability design rather than relying on the reliability of single-point devices.
- **Secure and trustworthiness:** The chip provides circuit encryption (MACSec/CloudSec/IPSec), the device hardware offers TPM secure boot, and the operating system runs securely and reliably.
- **Intelligent O&M Management:** Mode-driven management, configuration, and monitoring (Netconf/gRPC/Telemetry)
- **Open and decoupled system:** Open software/hardware platform that supports third-party application services
- **Low cost and low power consumption:** < 10 W/100 G

Solution Architecture Diagram -- A New Routing Switching Product Using Broadcom Jerico Chip



- MACSec
- SRv6/SR-TE
- EVPN/M-LAG
- BGP4/4+, ISISv4/v6, OSPFv2/v3,
- RIP/RIPng
- BFD for BGP/ISIS/OSPF/RIP/Static routing, NSR/GR/Hot patch/FRR
- Telnet/SNMP/SSH/OpenFlow/Telemetry/gRPC

For more information

+1(669)666-7653 | info@micasnetworks.com

250 W Tasman Dr. Ste 170, San Jose, CA 95134

www.micasnetworks.com or contact your local Micas Networks sales representative