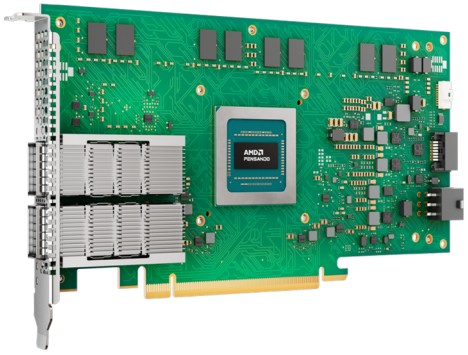
AMD PENSANDO™ DSC3-400 DISTRIBUTED SERVICES CARD

AMD PENSANDO

OVERVIEW

The AMD Pensando™ **DSC3-400 Distributed Services Card (DSC)** represents a revolutionary advancement in cloud data center architecture as the third generation of AMD's Pensando DPUs. This innovative solution offers a comprehensive suite of software-defined services at the compute edge, delivering significant performance improvements over its predecessors. The DSC3-400 is uniquely positioned to meet the escalating demands of AI workloads, providing essential SDN, security, storage offloads, and telemetry services for AI front-end networks. With its cutting-edge features, the AMD Pensando™ DSC3-400 transforms cloud data center architecture, establishing itself as a vital component of next-generation AI-driven infrastructure and revolutionizing how data centers operate and process information.

AMD PENSANDO™ DSC3-400 PCIe® CARD[1]



KEY FEATURES

SPECIFICATIONS	
FORM FACTOR	• Full-height 8" length PCIe
HOST INTERFACE	• Single Host: 16-lane PCIe Gen5.0, Multi-Host up to two
NETWORK PORTS	• 2 ports QSFP112 (NRZ/PAM4)
PORT CONFIGURATIONS	• 2 x 400 GE • 4 x 200 GE • 4 x 100 GE • 4 x 50 GE • 4 x 25 GE • NRZ (10/25G) • PAM4 (50/100/200/400G) • Quad 200/100/50/25 GE
RoCE SUPPORT	• V1/V2 support on L2/L3 networks
MANAGEMENT	• MCTP over SMBus

ENHANCED OBSERVABILITY

- Flow-based packet telemetry
- Stateful connection statistics
- Latency metrics, drop statistics,
- Session threshold alerting
- ERSPAN (bi-directional)
- NetFlow/IPFIX

ADVANCED SECURITY

- Stateful firewall
- Connection Tracking (L4)
- Security groups, Stateless and reflexive ACLs
- VPN termination (IPsec)
- NAT, PAT
- TLS/DTLS encryption, TLS Proxy

ENCRYPTION

- Bulk cryptography
- Public Key Encryption (PKE)
- Authentication
- Compression and Decompression (LZRW1-A)
- Inline IPsec & DTLS
- Secure hashes and CRC blocks are available to chain in a programmable fashion

CLOUD NETWORKING

- Routing (BGP), ECMP, VPN Overlays
- Flexible Encapsulation (VxLAN, NVGRE, Geneve, IP-in-IP, GRE)
- Load balancing
- Multi-Tenancy

STORAGE ACCELERATION

- RDMA, RoCEv2, UEC Ready RDMA
- NVMe virtualization
- NVMe-oF with RDMA or TCP transport
- Data-at-rest encryption (AES-CTS)
- Compression
- Deduplication: SHA2 128/256/512, CRC32, Azure CRC64, Adler32, and M-Adler32
- Checksum acceleration (CRC64/32)

AGILE PLATFORM FOR CLOUD PROVIDERS

The DSC3-400 is a cutting-edge software-defined platform designed to optimize cloud and AI front-end infrastructure performance. It enables developers to create customized data plane services that achieve 400G throughput with microsecond-level latencies, effectively scaling to millions of flows. The platform supports high-level programming languages such as P4, C++, and C, facilitating rapid development and deployment of new features and services.

USE CASES

- Multi-tenant SDN, virtual networking with flexible encapsulations (VXLAN, etc.)
- Routing, segment routing, MPLS, BGP/eBGP
- Comprehensive observability and troubleshooting of network, storage, and security functions
- ACLs, firewall, stateful connection tracking
- Flow capture/mirroring (bidirectional ERSPAN, per-packet IPFIX)
- Network load balancing, including TCP/TLS termination
- Storage virtualization and offload (NVMe-oF over TCP or RoCE)
- Data compression/decompression

ENABLING CLOUD INFRASTRUCTURE

- Virtual private cloud (VPC)
- Security groups, firewall, DDoS protection
- Transit gateway and VPC peering
- NAT gateway
- Metering, rate control and QoS marking
- SR-IOV for workload traffic/resource isolation
- IPsec/VPN gateway

DEPLOYMENT CONFIGURATION

The DSC3-400 offers versatile deployment configurations to meet diverse operational needs:

SERVER EDGE

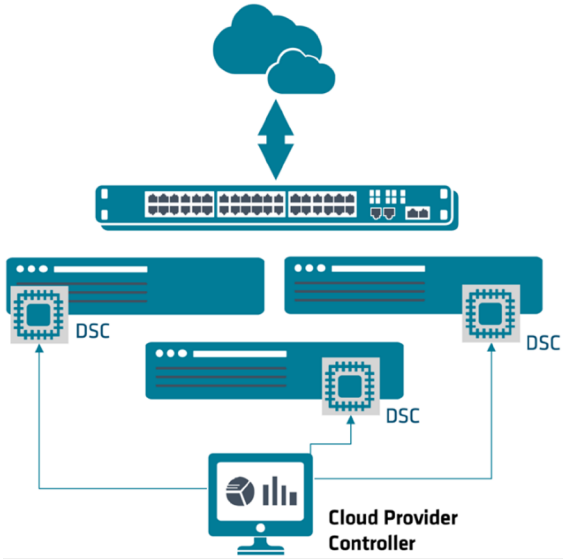
In the server edge configuration, DSCs are installed in every server within the data center, running network, security, and storage services related to the workloads on the hosting server. This approach offers horizontal scalability, as additional servers with DSCs can be added to the infrastructure. DSCs can operate in two modes:

- **Host-Mode:** Delivers networking and storage traffic to/from the host, implementing configured services for that traffic.
- **Bump-in-the-Wire Mode:** Connected between the switch and a regular NIC, forwarding traffic from one port to another while implementing required services and policies.

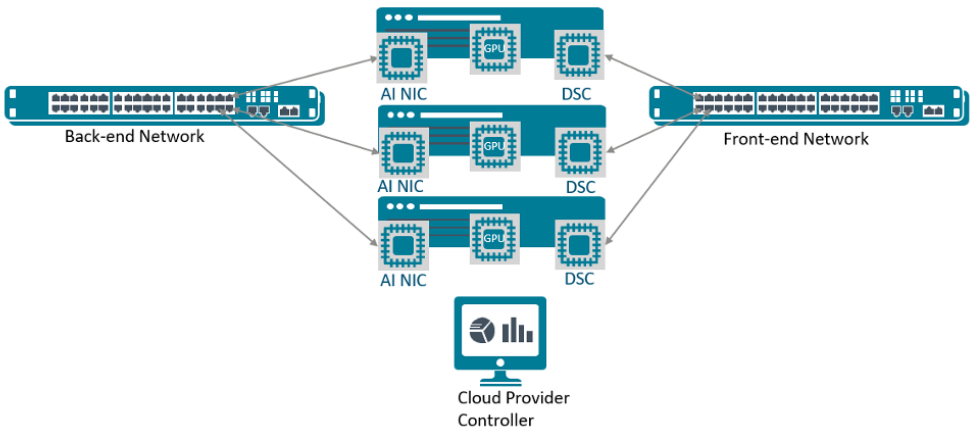
DSC HOST-MODE DEPLOYMENT

In host mode, DSCs are physically installed in servers and equipped with necessary drivers. This configuration allows bidirectional data traffic flow between the host (bare metal or virtual machines) and the DSC. Management can be conducted over the network in-band directly from the cloud provider management systems via the AMD Pensando platform's gRPC-based API or custom management APIs.

DISTRIBUTED SERVICES CARDS DEPLOYED IN STANDARD SERVERS



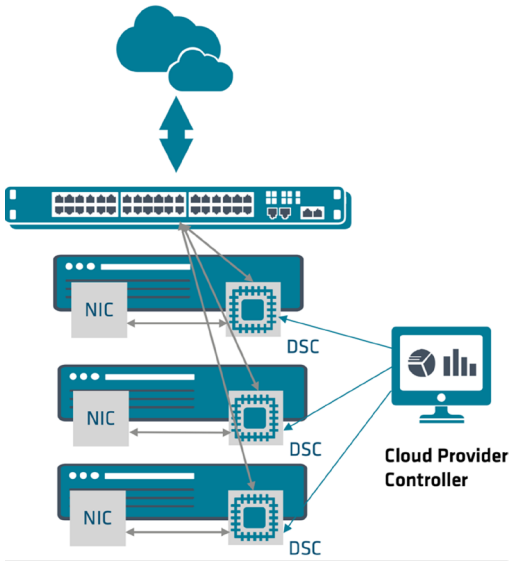
DISTRIBUTED SERVICES CARDS DEPLOYED IN AI/GPU SERVERS



DSC HOST-MODE DEPLOYMENT

This deployment mode positions DSCs as inline network devices, ideal for bare-metal solutions. The PCIe interface is solely used for power, eliminating the need for host drivers or agents. Management is conducted over the network, ensuring streamlined operations.

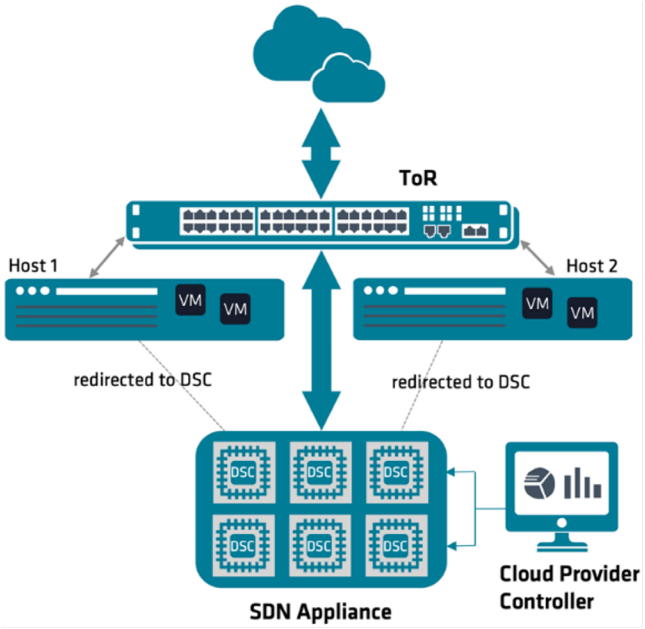
IN-LINE DISTRIBUTED SERVICES ("BUMP IN THE WIRE")



DSCS IN SDN APPLIANCE DEPLOYMENT

An alternative approach involves using multiple DSCs in a dedicated appliance, providing services to a group of servers. Traffic is redirected to the appliance between the servers and the network, offering a cost-effective solution for environments where bandwidth and latency requirements are less stringent or only a portion of the workloads require security enforcement, encryption, or other services. This approach is horizontally scalable by adding more DSC-based appliances as workload processing needs grow. A pair of DSCs installed within the same appliance or different appliances can provide high availability for the redirected workloads.

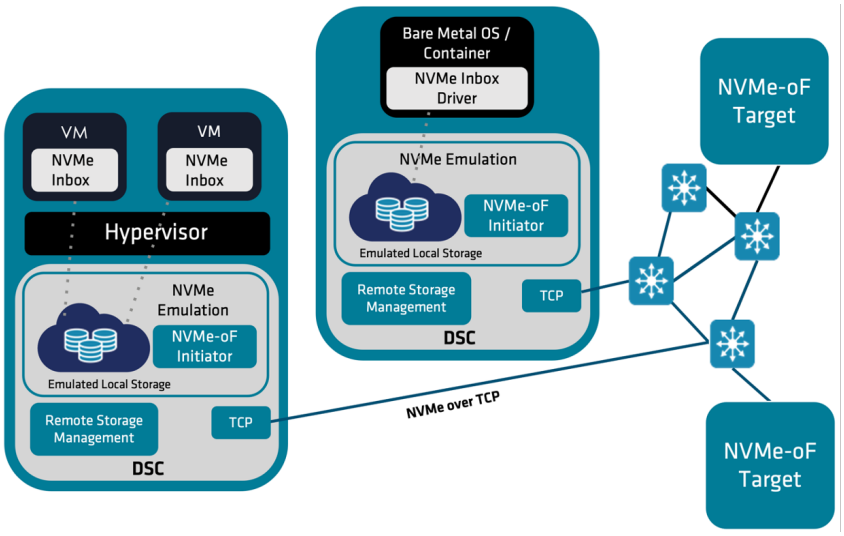
MULTIPLE DSCS DEPLOYED IN AN APPLIANCE



DSC NVME DEPLOYMENT

DSCs may be deployed on compute servers, emulating NVMe virtual functions (VFs) and all other network and security services listed above. The host operating system can then consume these in bare-metal workloads or by guest operating systems in pass-through mode in VM workloads. The NVMe VFs will be managed by standard inbox NVMe drivers. The NVMe driver issues NVMe commands over PCIe, which are terminated fully in the DSCs and originated as NVMe/TCP after encryption (AES-XTS: 128- or 256-bit keys with Header/Data Digest), NVMe/PCIe to NVMf PDU conversion and any applicable load balancing across NVMf target servers, achieving up to 2+M IOPS.

DSCS DEPLOYED TO EMULATE NVME VFS



ADAPTER CARD PORTFOLIO AND FORM FACTORS	
ORDERABLE PART NUMBER (OPN)	• DSC3-2Q400-64S64E64P
HOST INTERFACE (PCIE)	• PCIe Gen5.0 x16
FORM FACTOR	• Full Height 8" length
BANDWIDTH	• 400Gb/s
NETWORK PORTS	• 2 x QSFP112

All adapters are shipped with the tall bracket mounted and a short bracket as an accessory

ENDNOTES (FN -1)

1. Image shown is for illustrative purposes only; actual product may vary. Card shown with heatsink removed.

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