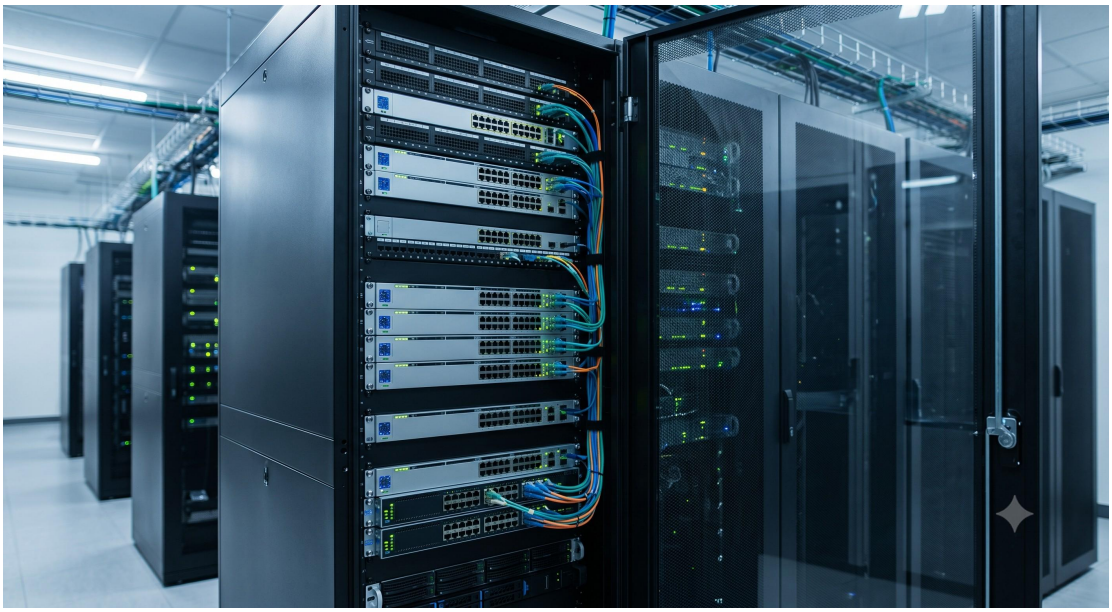
Campus Backbone Aggregation Reference Design Guide for future proofing enterprise campus networks with SDN

CAMPUS BACKBONE AGGREGATION REFERENCE DESIGN GUIDE FOR FUTURE PROOFING ENTERPRISE CAMPUS NETWORKS WITH SDN

EXECUTIVE SUMMARY

The modern enterprise campus is undergoing a profound digital transformation, driven by the proliferation of IoT devices, bandwidth-intensive applications such as 8K video and AR/VR, and the ubiquitous adoption of cloud-based services. Traditional campus networks, built on rigid, hierarchical architectures and manual configurations, are rapidly becoming obsolete. They lack the agility, scalability, and programmability required to support these dynamic demands. This document serves as a definitive reference guide for network architects and IT decision-makers. It details how a Software-Defined Networking (SDN)-enabled campus backbone, anchored by a new class of high-performance aggregation switches, delivers a future-proof infrastructure. This next-generation approach decouples the control plane from the data plane, centralizing network intelligence and enabling automated provisioning, policy-based management, and seamless network adaptability. By adopting this paradigm, enterprises can achieve unprecedented operational efficiency, enhance security posture, and create a network that can evolve with their

business for the next decade.



HARDWARE ARCHITECTURE & SILICON INNOVATION

The hardware foundation of this future-proof solution is built upon a purpose-built, high-density aggregation switch that redefines the core of the campus network. At its heart lies a programmable, merchant-silicon-based forwarding engine, purpose-built to balance high performance with the flexibility required for SDN protocols like OpenFlow and segment routing. The architecture employs a fully non-blocking, cut-through switching fabric capable of line-rate forwarding on all ports simultaneously, ensuring that performance scales predictably as the network grows. The modular chassis design supports a flexible mix of line cards, providing interfaces ranging from 1 Gigabit Ethernet for legacy access devices to 100 Gigabit Ethernet for high-capacity uplinks to

the core or SDN controller. Key to its future-proofing capability is the integration of an on-board, high-performance CPU complex dedicated to running the control plane software and communicating with the central SDN controller. This allows for the rapid implementation of new protocols and features via software updates, significantly extending the hardware's useful lifespan and protecting the capital investment.

KEY FEATURES & ROUTING LOGIC

- SDN-Enabled Architecture: Native support for OpenFlow, NETCONF, and RESTCONF interfaces, allowing for full programmability and integration with industry-leading SDN controllers. This enables zero-touch provisioning, dynamic traffic engineering, and intent-based networking.
- Segment Routing (SR-MPLS & SRv6): Built-in support for segment routing simplifies the control plane, enabling highly scalable and resilient traffic engineering without maintaining per-flow state. This is crucial for creating flexible underlay networks that can adapt to changing application paths.
- Intelligent Traffic Analytics: The hardware is equipped with an integrated telemetry engine that provides real-time, granular visibility into network traffic patterns, latency, and micro-bursts. This data is streamed to the SDN controller for closed-loop automation and proactive troubleshooting.
- High-Availability & Resiliency: The system is designed with dual,

hot-swappable supervisor modules, redundant power supplies, and N+1 fan trays. It supports Non-Stop Forwarding (NSF) and graceful restart (GR) for routing protocols (BGP, OSPF, IS-IS), ensuring sub-second failover and continuous network availability.

- Advanced Policy Enforcement: Deep packet inspection (DPI) capabilities, integrated with the SDN controller, allow for the granular enforcement of security policies on a per-application, per-user, or per-tenant basis. This micro-segmentation capability strengthens the security posture within the campus.

COMPLIANCE & STANDARDS

The platform is engineered to meet and exceed the most rigorous industry standards for interoperability, safety, and environmental sustainability. Compliance with these standards ensures seamless integration into existing heterogeneous network environments and prepares the infrastructure for future regulatory requirements.

The system adheres to IEEE 802.1Q, 802.1ad (Q-in-Q), and 802.1ax (Link Aggregation) for Layer 2 functionality. For routing, it fully supports IETF standards including OSPFv2/v3, BGP-4, and IS-IS. It is MEF 3.0 compliant, ensuring carrier-grade service delivery capabilities. Hardware safety

certifications include UL/CSA 60950-1 (now transitioning to UL/CSA 62368-1), IEC 60950-1, and EN 60950-1. Electromagnetic emissions compliance is verified for FCC Part 15 (Class A), EN 55022 (Class A), and VCCI Class A. Environmental standards are met with RoHS and WEEE compliance, and the platform is designed to adhere to ETSI environmental standards for temperature and humidity, ensuring reliability in a wide range of campus closet environments.

TECHNICAL SPECIFICATIONS

- Form Factor: 4RU Modular Chassis (up to 8 line card slots)
- Switching Capacity: Up to 6.4 Tbps / 3.2 Bpps (Full-Duplex) with optional fabric card upgrades.
- CPU: Dual-core, 2.2 GHz x86 Network Processor
- System Memory: 32 GB DDR4 ECC, with 8 GB dedicated to the data plane
- Storage: Dual 128GB M.2 SSD (RAID-1 for OS and logs)
- Management Ports: 1x 10/100/1000BASE-T Out-of-Band, 1x RJ-45 Console, 1x USB Type-A
- Power Supply: Dual, 2000W, hot-swappable AC (or -48V DC) with N+1 redundancy.
- Cooling: 6x Field-Replaceable, hot-swappable fan trays, front-to-back airflow.
- Environmental: Operating Temperature: 0°C to 40°C; Humidity: 10% to 90% (non-condensing).

- Physical Dimensions (HxWxD): 17.5 x 17.3 x 22.5 inches (444.5 x 439.4 x 571.5 mm)

Parameter	Specification
Form Factor	4RU Modular Chassis (up to 8 line card slots)
Switching Capacity	Up to 6.4 Tbps / 3.2 Bpps (Full-Duplex)
Power Supply	Dual, 2000W, hot-swappable AC (or -48V DC) with N+1 redundancy
Management Ports	1x 10/100/1000BASE-T OOB, 1x RJ-45 Console, 1x USB Type-A
Operating Temperature	0°C to 40°C (32°F to 104°F)
Operating Humidity	10% to 90% (non-condensing)

ORDERING SKU INFORMATION

This modular platform offers a comprehensive portfolio of line cards and optics to tailor the solution to specific campus aggregation requirements. The following table provides a summary of the primary SKUs for building a highly resilient and scalable SDN-enabled backbone.

- Base System: AGS-7000-Chassis (Includes 4RU Chassis, Backplane, and 2x Fan Trays)

- Supervisor Module: AGS-SUP-2X (Includes dual supervisor option)

- 10G Line Card (SFP+): AGS-LC-48S+ (48x 1/10G SFP+ ports)

- 25G Line Card (SFP28): AGS-LC-36S28 (36x 1/10/25G SFP28 ports)

- 40G Line Card (QSFP+): AGS-LC-8Q+ (8x 40G QSFP+ ports)

- 100G Line Card (QSFP28): AGS-LC-4Q28 (4x 40/100G QSFP28 ports)

- Power Supply: AGS-PWR-2000W-AC (2000W AC Power Supply Module)

- Optics: The platform supports a wide array of standard SFP, SFP+, SFP28, QSFP+, and QSFP28 transceivers, including SR, LR, ER, ZR, and BiDi variants for all fiber types and copper Cat6a.

