

Arista Cognitive Unified Edge (CUE) Solution Guide

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About this document

The Arista Cognitive Unified Edge (CUE) Solution Guide offers insights into the challenges many companies face in providing secure, reliable, and transparent connectivity services for all of their small and large office needs. This guide then provides an integrated building block approach, for addressing these challenges, including design and deployment recommendations.

For the most recent design guide information, please see www.arista.com

Introduction

The recent global pandemic has accelerated many workforce changes within retail, healthcare, financial, and education markets, where productivity is no longer being measured by the size of the office. Businesses within these markets are resetting their office models where the work environment going forward is virtual, collaborative, and flexible; specifically, where on-line productivity is location agnostic. The office of the future is therefore borderless, immersive, and inclusive, whether at home, at the company location, or somewhere in between. This redefines campus networking, where connectivity is based on highly transparent, yet highly secure edge services.

All buildings, including offices, restaurants, service centers, warehousing, classrooms, shipping centers, and many others must embrace the connected experience where every employee and every smart device is trusted, productive, and secure, especially as the number of connected devices per employee grows exponentially. Collaboration applications will grow in sophistication where everyone feels like they are in the same room, with equal opportunities to express themselves, irrespective of whether they are in the same room, or at home. This drives the real-time video experience where jitter, latency, points of presence, and enhanced security must be tightly networked.

Compounding these changes, is the onslaught of IoT devices, where anything that can be automated within a building, will be, with faceless devices coupled with smart applications. These devices require no human interaction, as they run 7x24 behind the scenes, while performing many critical tasks including smart power distribution, the control of heating, air conditioning, and lighting, automated security checkpoints, and for all customers the addition of video surveillance (IP cameras). While typically not bandwidth intensive, these devices are competing for POE power, RF signals, location intelligence, and cyber security protection. Networking teams are taking on the responsibility for managing these devices on the same network, while ensuring they do not interfere with business critical productivity applications.

Business Outcomes

Human resource managers, builder planners, global talent teams, retailers, and educators are tasked with business outcomes, including employee productivity, real estate cost savings, employee retention, regional talent pools, and where to locate stores. Networking that offers unified edge networking services, irrespective of location, allows them to act globally in meeting their business objectives. Different than 20 years ago, workforces are located around the globe, based upon a number of education, social, political, and economic factors.

Edge networking must evolve from its campus roots, where it offers a long list of technologies and protocols that mean nothing to business leaders, to a set of services that can be easily selected from, for achieving these business goals. While other IT infrastructures have moved in this direction, especially within application development groups, and data center infrastructures, campus networks have not.

Edge networking is the enabler, the protector of assets, and a rich information source for many security, troubleshooting and productivity tools. It needs to be presented to the business leaders as a productivity enabler.



Figure 1: Network Centric Productivity Enablers

The Next Evolution in Edge Communications

The next technology evolution in campus networks, whether small branches or large headquarter buildings stretches well beyond bandwidth capacity upgrades. Hardware is easily keeping pace with bandwidth needs, driven by Moore's productivity law where high volume commodity chip technologies are quadrupling bandwidth speeds every 2-3 years.

Of bigger importance is designing these networks where they can be easily deployed, maintained, secured, and amortized especially as the number of services these networks offer continue to expand. Customers must look beyond gigabits per second, and the latest Wi-Fi access points offerings when choosing their edge networking solutions. They must take a cloud centric networking approach where many of the design principles that have transformed data centers to cloud infrastructures are similarly leveraged. At a high level this cloud centric approach views infrastructure as a combined set of services, where business outcomes are more easily mapped to a set of integrated IT technologies.

Automation, artificial intelligence, pro-active remediation, advanced telemetry, virtualization, segmentation, video broadcasting, and simplified topology designs are just several of the technologies that embody a cloud centric network. All of these technologies are directly applicable to campus networks. The combination of these technologies, working together as a rich number of services, is what Arista defines as the Cognitive Unified Edge (CUE).

The below comparison tables illustrate the technology changes within campus networking over the last 20 years. Today's Unified Edge is borderless, collaborative, mobile, highly secure, and deployed as a service.

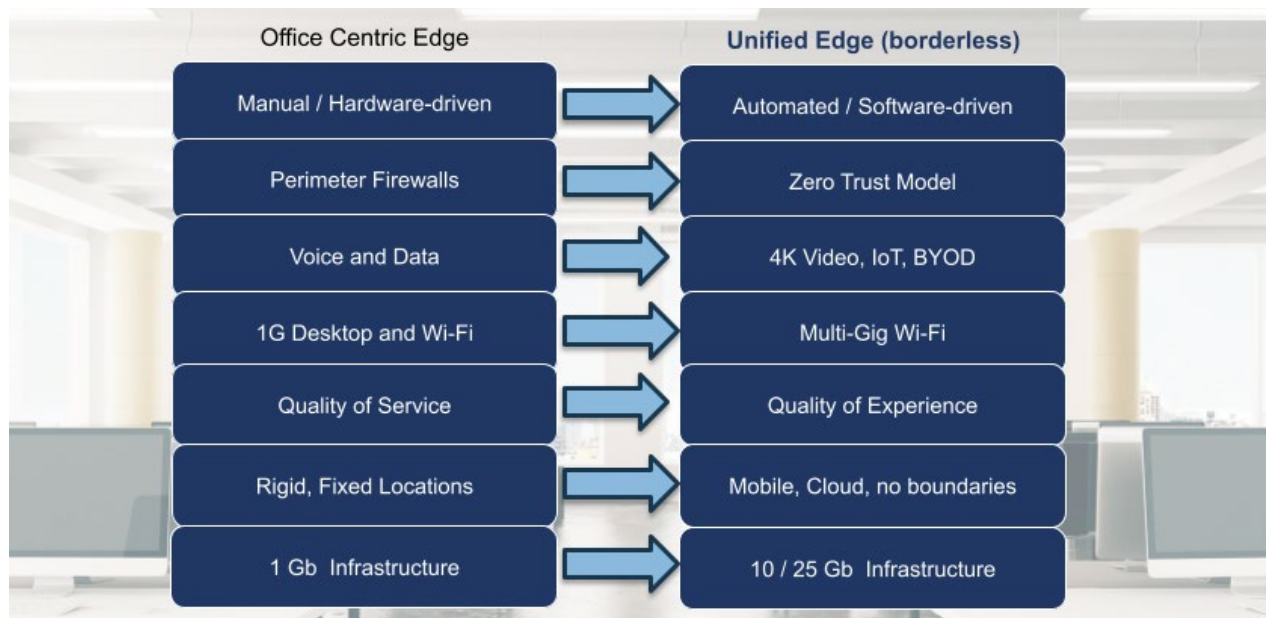


Figure 2: Unified Edge Networking Services

Unified Edge Use Cases

The Cognitive Unified Edge requires a rich understanding of the combined networking services, based upon their interdependence of each individual function. Multiple examples of these interdependencies include the following:

- VPN's need to be configured in conjunction with VLANs, and/or VXLANs.
- Access control to the network requires location and content awareness.
- Wireless intrusion requires awareness of neighboring networks and external devices.
- Application delivery performance requires prioritization of applications imperative to the operation of the business.
- Content control requires policies for both private and public web site access.
- IoT connectivity requires endpoint intelligence and authentication services.
- Flexible office, conference room, and workspace configurations require dynamic re-tuning of Wi-Fi access points.
- Collaborative workspaces require reservation management.
- Flexible office designs require adaptive PoE intelligence where devices can easily be moved around.
- Rapid remediation requires flow tracking where endpoint services are continually monitored.

As the interdependency of these services working together requires a great deal of intelligence, the need for machine learning and artificial intelligence is fundamental. All of these technologies are embodied within Arista's Cognitive Unified Edge (CUE) offerings.

Arista Cognitive Unified Edge (CUE)

Arista CUE is more than just a combination of switches, access points, firewalls, and bandwidth optimization technologies connected via wired and wireless Ethernet boxes. CUE leverages a rich cloud back-end where management data is collected, cached, scanned, and analyzed in delivering on the aforementioned use cases. This back-end has been designed with no single points of failure; Arista defines this as a controlless architecture, i.e. the Cognitive Campus. If the connection to the cloud becomes disrupted, all of the devices locally remain fully operational, as forwarding, filtering, and runtime operation functions are cloud-independent. Once the connection to the cloud is restored, the management data re-syncs for addressing any policy, or network-wide upgrade use cases.

As the number of networking services offered grow so do the interdependent use case complexities. Can you imagine trying to sort through multiple data sources in trying to solve the VPN connectivity issues back to headquarters, or trying to figure out why an employee cannot reach the inventory database, or trying to understand why there is a denial of service with one of your critical resources? Many help desks struggle here as they have layers of legacy networking technologies that do not interact with each other. This creates unacceptable outage windows, finger pointing, too many diagnostic tools, and overall productivity impacts (see diagram below).

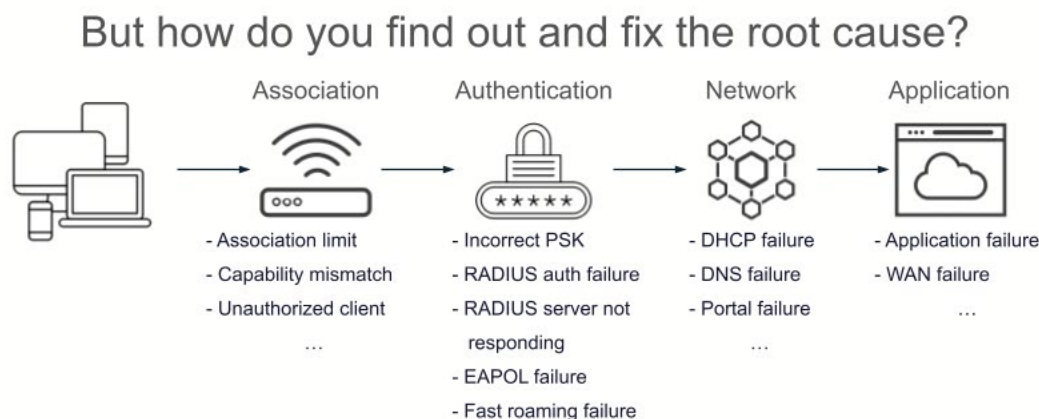


Figure 3: The Wi-Fi Blame Game

It is no longer a matter of collecting the data as most IT organizations will tell you that they are overloaded with data; it is now a matter of intelligently sorting through this data in resolving configuration, security, outage, cabling, power, and anomaly issues. This is where the power of machine learning and artificial intelligence (AI) comes in, especially as most businesses want to get out of the business of managing their IT infrastructures.

As mentioned, Arista CUE was designed with AI and ML capabilities where the more sophisticated troubleshooting use cases, whether configuration issues, and interdependent services outages are learned, and analyzed; these issues are then either manually or automatically remediated, or from the centralized datastore. This eliminates the need for IT administrators on site.

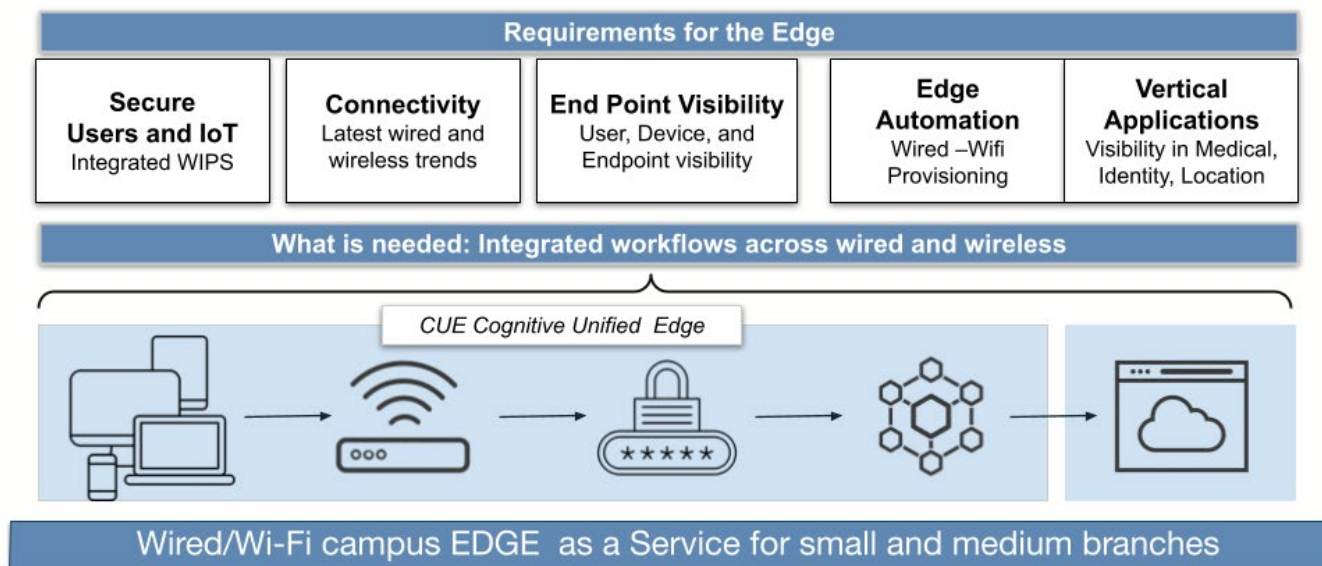


Figure 4: The Edge As A Service Concept

Arista Cognitive Unified Edge (CUE) Solution Features

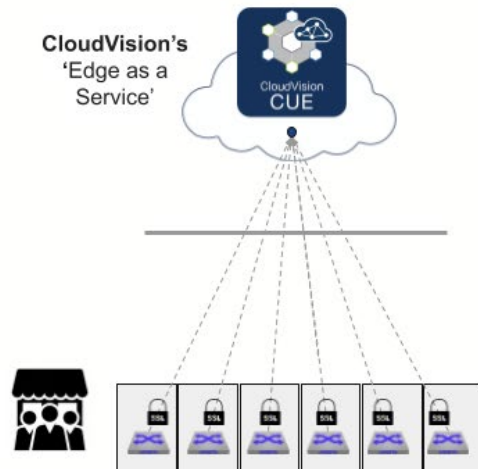
Listed below are several of the many CUE features:

1. Zero trust security including integrated IDS, WIPs, macsec, advanced segmentation and URL filtering.
2. Rich line of Power of Ethernet switches (PoE) that scale from small branch offices all the way to up to the world's largest office towers. These switches include adaptive power management, for accommodating a growing number of smart, in-line power endpoints (access points, phones, IoT, downstream switches etc), where plug and play is essential.
3. Comprehensive line of Wi-Fi 6, and Wi-Fi 6E access points, both indoor and outdoor. Arista offers the best of both worlds regarding the manageability of these, as the access points are configured centrally yet are controlled locally where all forwarding decisions are within the localized dataplane. This cognitive approach eliminates outage conditions.
4. Multi-services transaction checking (known as Client Journey) where every attached endpoint is monitored, and traced through the network to ensure all networking services are working. This includes DHCP, DNS, 802.1X, Authentication, QOS, and URL access services.
5. Cognitive edge operations management (CloudVision CUE) including zero touch deployment, pro-active remediation management, integrated Wireless Intrusion Protection, location tracing, dynamic RF retuning, and artificial intelligence for pinpointing where within the network there are problems.
6. Application performance monitoring, with predefined filters for the most widely used business critical applications. Infrastructure troublespots are represented within graphical views.
7. Centralized traffic forwarding and management via VXLANs for customers who want tightened security and traffic control.
8. Fully qualified, certified, and supported line of copper and optical fiber connectors. These are becoming increasingly important as customers move beyond 1 Gbps per port connectivity needs within the campus.
9. Edge Threat Management hardware and software appliances for perimeter firewalls, and edge security and wired and wireless WAN connectivity. This is the Arista Q series product line.

Product Offerings

1. Arista CloudVision Cognitive Unified Edge (Operations Management)

Arista offers a Cognitive Unified management platform, with embedded machine learning and adaptive artificial intelligence, for detecting, remediating, and reporting on the most common outage, performance and security issues. This platform provides actionable insights, via its client journey connectivity and services tracking and reporting utility. This offers the fastest mean time to resolution, for troubleshooting and restoring a myriad of networking services that impact users and endpoint devices. Further, CV CUE enables zero touch deployment. This eliminates the need to have highly trained networking experts set-up and configure the network within each site.



Enables distributed “Edge as a Service” deployments for commercial & medium businesses

- Simplified onboarding of switches and wireless with Zero Touch Provisioning
- Integrated wireless and wired secured Infrastructure with Zero Touch security
- AI enabled analytics and problem resolution
- Automated identification and mitigation of hacker attacks

Zero Touch Provisioning of Clients, Users & Devices “As a Service”

Figure 5: Introducing Cognitive Unified Edge (CUE) for Wired and Wireless

CloudVision CUE is unique within the market as it offers self contained management for edge networking deployments, for both wired and wireless platforms. Use cases include auto configuration, upgrading, patching, troubleshooting, packet capture, auto RF tuning, and location tracking/tracing (see picture below). CV CUE leverages a unified CloudVision database, known as DataLake, for customers who want to integrate their edge networks with other parts of their networking infrastructures. These customers can upgrade from CV CUE to CloudVision while preserving the datasource.

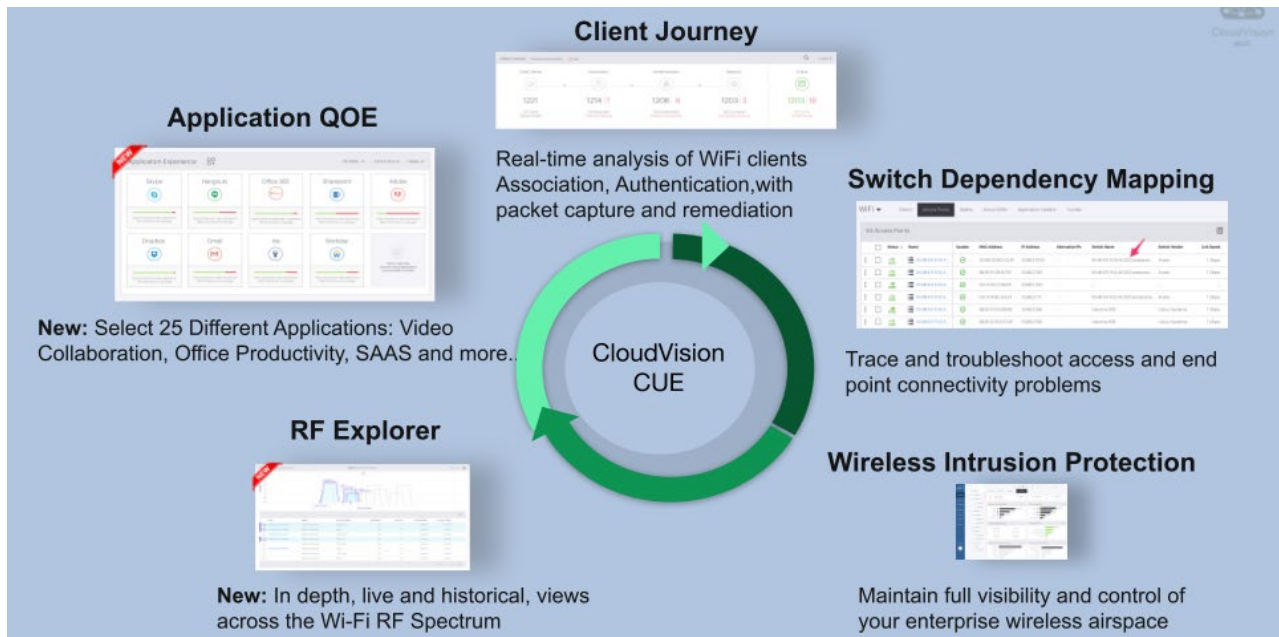


Figure 6: CloudVision CUE

2. Arista’s Compact PoE Edge Switch Series (CCS 710)

Small to medium size offices require one or several switches that can be deployed flexibly based upon many building limitations where there are no equipment closets. Additionally, these smaller offices require power distribution from these small form factor switches for connecting their access points, phones, IoT devices, IP cameras, and building controllers. As these switches form the core of these small offices, they must be secure, manageable, redundant, easy to mount, easy to wire, and smart on how they distribute power to the edge devices. All too often customers think they can use any switch bought online from Amazon only to realize that they underestimated the features required.

Arista offers a compact switch line, known as the CCS 710 that has been specifically designed for small to medium offices. The CCS 710 is available in several form factors depending on the number of ports required. The CCS offers Power of Ethernet (PoE), can be installed in a wiring closet, or mounted on a wall where there is no structured wiring or cooling, and distributes power adaptively based upon the power needs of the downstream devices.

The CCS 710 switch leverages Arista’s DNA from within the data center including a well proven, fully hardened, highly secured network operating system (EOS), advanced traffic engineering and optimization protocols, simplified topology designs when multiple switches are required, and best in class network telemetry for feeding in Arista AI driven CloudVision CUE manager. See diagram below.

1G-5G PoE Compact Switch

- Installs almost anywhere (no fans, no PSU's)
- Flexible mounting brackets
- Offered with 12 and 16 ports
- Tightly integrated with CloudVision CUE
- The front panel includes the following key components:
 - 12 ports of 10/100/1000BASE-T 30W
 - 2 ports of 2.5G/5GBASE-T downlinks 60W
 - 2 ports of 2.5G/5GBASE-T uplinks with PoE PD 60W
 - 2 ports of 1/10 GbE SFP+ limited to 1.5 W transceivers
 - USB 2.0 Type-A


Enables CUE Edge As A Service and Distributed Branch

Figure 7: Arista 710P Compact Switch

3. Arista Wi-Fi Access Points

Arista offers enterprise class Wi-Fi 6, and Wi-Fi 6E access points, with multi-radio offerings for ensuring the best floor coverage, best intrusion protection, zero touch deployment, auto RF re-tuning, cloud manageability, and integrated wired/wireless CV CUE operations management. This product line includes indoor and outdoor access points, with either self enclosed or external antenna options. The product line is based on a controlless architecture, where management data is managed centrally, yet the data and control planes are local, ensuring no single points of failure.

While Arista’s Wi-Fi Access Point line can be easily integrated with any industry standard based PoE switching infrastructure (for those that are just upgrading their Wi-Fi networks), this line is tightly integrated with Arista’s wired switch offerings, including dynamic PoE power management, cabling recommendations, and integrated operation management.



Indoor and Outdoor Enclosures and Antennas

C-260	O-235 / O-235E	C-230 / C-230E	C-200	C-360
<ul style="list-style-type: none"> 8x8:8 5GHz 4x4:4 2.4GHZ radios Dedicated multi-function radio 	<ul style="list-style-type: none"> 5 GHz: 4x4:4 2.4 GHz: 2x2:2 Dedicated multi-function radio 	<ul style="list-style-type: none"> 5 GHz: 4x4:4 2.4 GHz: 2x2:2 Dedicated multi-function radio 	<ul style="list-style-type: none"> 2x2:2 on both bands Dual radio 	<ul style="list-style-type: none"> Wi-Fi 6E Tri Band 4x4:4 OR Dual 5GHz+2.4GHz Wi-Fi 6E multi-function radio
<ul style="list-style-type: none"> Dual 5 GigE Uplink with power failover 	<ul style="list-style-type: none"> 1x 5G Uplink (PoE) 1x 1G Uplink 	<ul style="list-style-type: none"> 1x 5G Uplink (PoE) 1x 1G Uplink 	<ul style="list-style-type: none"> 1 x Gigabit Ethernet Port 	<ul style="list-style-type: none"> Dual 10 GigE Uplink with power failover
<ul style="list-style-type: none"> Full feature Wi-Fi 6 AP 2x2:2 Multifunction 3rd radio Integrated BLE Internal antenna All 802.11ax features at 802.3at with 8x8 5GHz & 4x4 2.4GHz Full Feature set at 802.3bt (<40W) 	<ul style="list-style-type: none"> Full feature Wi-Fi 6 AP 2x2:2 Multifunction 3rd radio Integrated BLE Internal & External antenna options Full feature set using 802.3at IP67 and Industrial operating temperature range TPM 	<ul style="list-style-type: none"> Full feature Wi-Fi 6 AP 2x2:2 Multifunction 3rd radio Integrated BLE Internal & External antenna options Full feature set using 802.3at TPM 	<ul style="list-style-type: none"> Mass market Wi-Fi 6 AP Internal antenna TPM 	<ul style="list-style-type: none"> Full feature Wi-Fi 6E AP Software configurable Wi-Fi 6 Dual 5GHz or Tri-band Wi-Fi 6E 2x2:2 Wi-Fi 6E multi-function radio Integrated BLE / Zigbee Dual 802.3bt PoE PD TPM

Figure 8: Wi-Fi 6 and 6E Portfolio

4. Edge Threat Management - NG Firewall

Arista’s NG (Next Generation) firewall simplifies network security with a modular software platform designed to fit the evolving needs of mid-sized and highly distributed organizations. NG Firewall provides a browser-based, responsive and intuitive interface enabling network administrators to quickly gain visibility into the traffic on the network, when auditing or fixing problems.

As a comprehensive next generation firewall and unified threat management solution, NG Firewall is the gateway security device that gives network administrators confidence in the performance and security of their network. From content filtering to advanced threat protection, and VPN connectivity, NG Firewall delivers a bulletproof network security platform.

NG Firewall can be deployed in various form factors allowing administrators to choose the best deployment method for their needs. Dedicated NG Firewall hardware appliances are available from Arista to drop into the network with zero touch deployment, with different models based on capacity and performance needs. Arista’s NG Firewall can also be deployed as a virtual machine, on customer provided X86 appliances, or in the cloud with AWS or Azure.

- Advanced Security
- Protection, encryption, control, and visibility anywhere
- NGFW, IPS, VPN and more
- Onboard security for small network appliances and IoT devices
- Flexible deployment on-premises or in the cloud
- Zero touch deployment
- Optional integrated 802.11 Wi-Fi b/g/n/ac MU-MIMO Wi-Fi



Figure 9: Network Security and Threat Management

5. Edge Threat Management - Micro Edge

Arista's Micro Edge is a small form factor edge device with advanced connectivity and security capabilities enabling businesses to have secure network edge connections. Arista's Micro Edge provides secure branch connectivity, optimizes existing internet infrastructure with caching services, and prioritizes business critical applications to maximize employee productivity. Zero touch deployment and centrally managed configuration profiles enable branch offices to be connected and protected in minutes.

Arista's Micro Edge uses optimal predictive path selection technology and sophisticated cloud intelligence to identify applications at the first packet. This advanced technology enables Micro Edge to choose the best path for specific applications or categories of network traffic. Leveraging sophisticated traffic engineering algorithms, Micro Edge will decide in real-time which link to use based on actual link utilization, link speed, and application throughput requirements.

Secure connections between Micro Edge at branch locations and NG Firewall at the Headquarters ensures that all users have access to the business critical applications and data needed for business operations to run smoothly and efficiently without compromising security.

6. Arista Optics and Transceivers

Arista offers a broad portfolio of optical transceivers and copper cables for their CUE networking products ranging from 1G to 400G port speed options. Arista eliminates the time, cost, and support issues associated with third party optic transceivers and copper cables. Arista tests and certifies compatibility of these layer-1 transport components with Arista switches, access points, and firewalls.

Design Solution Use Cases

The CUE solution can be adapted through many different use cases with the focus on these most common:

1. Single site office with under 5 employees with public cloud applications and local office needs
2. Multi-site environment with a corporate headquarters leveraging the public cloud in addition to distribute warehouses or hospitality/retail locations
3. Education with State and Local Government where the number of sites is less with the numbers of device and employees is much larger

All of these use cases have a common set of requirements that include, zero trust security, power over ethernet for phone/APs, zero touch deployments with proactive remediation management and wireless intrusion protection, application performance monitoring, location tracing and the use of AI/ML capabilities to reduce the overall operational costs and mean time to repair.

The Arista Cognitive Unified Edge solution will support all these use cases and more by integrating the expertise and knowledge that has built the world's largest networks, now leveraged and packaged into an operator experience for commercial and mid-market customers.

General Considerations

Leveraging the Arista CUE solutions enables users, IOT Devices and even internal systems to reliably connect to the network through different modalities. Users may connect over the Wi-Fi 6/6E network where the access points are powered by the CUE appliances. Likewise IoT devices may be wired or wireless connected to delivery services such as IP phones, printers and even surveillance for the office. Office systems will be connected at up to 10Gb speeds to ensure maximized bandwidth and throughput for the office environment.

Device Management

The Arista CUE environment is managed through a centralized application hosted in the cloud. The Arista CloudVision CUE (CV-CUE) management platform enables provisioning and management of the wireless access points and wired switch(s) enabling a single pane of glass for the operator to easily run the environment. The network operator is also enabled to configure the zero trust models through the use of CV-CUE and the command center. Utilizing Command Center to determine the network access policy and internet policy enables a simplified operational model with the simple click of a few buttons.

Use Cases

Simple Single Site Office Internet Connectivity

Based on the overall size of the office need and the number of devices, selecting the right device is important. For a smaller office where all end nodes are within the standard Ethernet wired distances of 100 meters a single Arista Q8 or Arista Q8W device will deliver the needed connectivity. The Q8 provides 8 ports of wired access and the Q8W provides 8 ports of wired access in addition to wireless connectivity. This solution generally accommodates between 5 and 25 users/devices.

This solution will give the customer access to the following capabilities:

Advanced Security

- Protection, encryption, control & visibility anywhere
- NG Firewall and IPS
- Onboard security for small network appliances & IoT devices
- Full security processing on-premises or in the cloud

Cloud Management at Scale

- Zero touch deployment
- Configure & push policies
- Advanced alerting & reporting
- Visibility across globally dispersed networks & endpoints

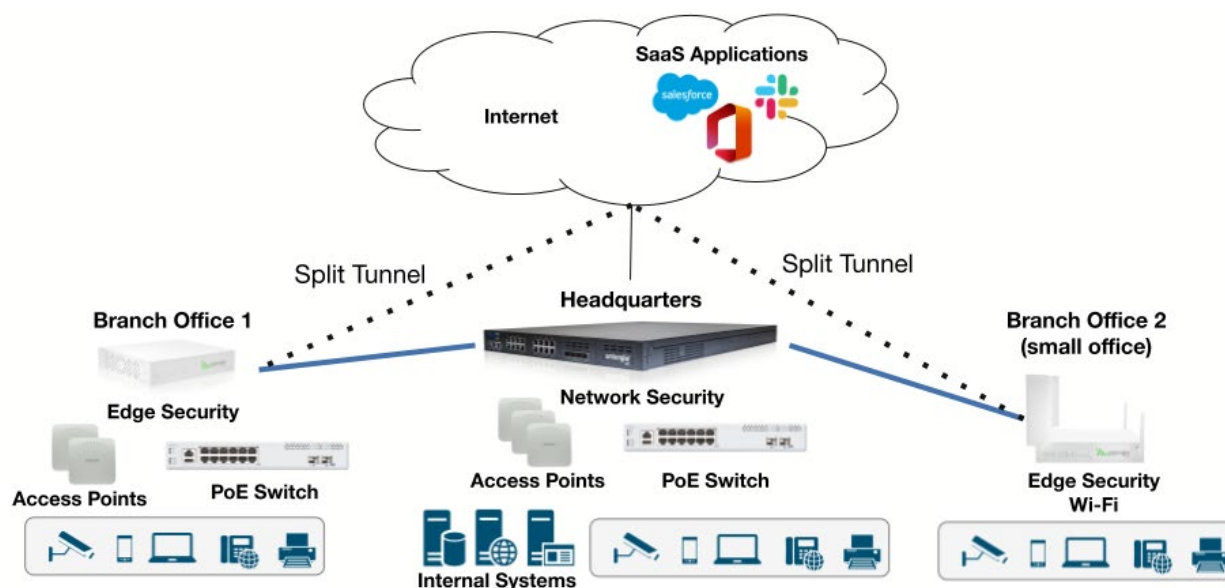


Figure 10: Simple Office Internet Connectivity

Utilizing the building blocks of the design above, the simple office with multiple access points solution builds on the initial capabilities, but adds the additional functionality of the Arista Wi-Fi bringing in the additional features:

- **Client Journey**
Connection troubleshooting dashboard to streamline identification of campus users' connectivity problems. The dashboard simplifies access troubleshooting including Wi-Fi association, authentication and address allocation, to name a few.
- **Inference based Wi-Fi client problem diagnosis**
CUE leverages AI/ML heuristics applied to individual client sessions to analyze and diagnose probable causes of degraded Wi-Fi client experience. The cloud based inference engine offers troubleshooting tips and possible remediation steps to administrators, reducing troubleshooting complexity and downtime while improving operations staff and client productivity.
- **Site specific Inference based troubleshooting**
The focus of CUE's inference tools can be expanded from individual devices, to AP, and site level views, to address issues impacting user groups or workloads. Power settings, channelization, interference and infrastructure deployment are among the factors evaluated for remediation recommendations.
- **Client and Infrastructure Location Services**
A properly instrumented Wi-Fi infrastructure offers both administrators and clients the ability to locate assets and resources in the cognitive campus network. Arista wireless platforms utilize Wi-Fi and BLE technologies to locate and facilitate mapping of client and infrastructure devices in the campus. CUE discovers and facilitates placement of devices in the mapped campus. Administrators can refine their view of the cognitive Wi-Fi network using a variety of filters/views aimed to identify:

- › Slow or intermittent clients
- › Clients exhibiting weak signals, high error or retry rates
- › Clients not meeting Quality of Experience (QoE) expectations for key applications.
- › Clients that are failing to connect.
- › Expanded applications monitoring for user Quality of Experience
- › CUE Wi-Fi can now monitor collaboration tools like Microsoft teams and Zoom, in addition to Webex, Skype, GotoMeeting and hangouts. With this expanded capability, administrators can ensure the productivity of users' collaborative applications

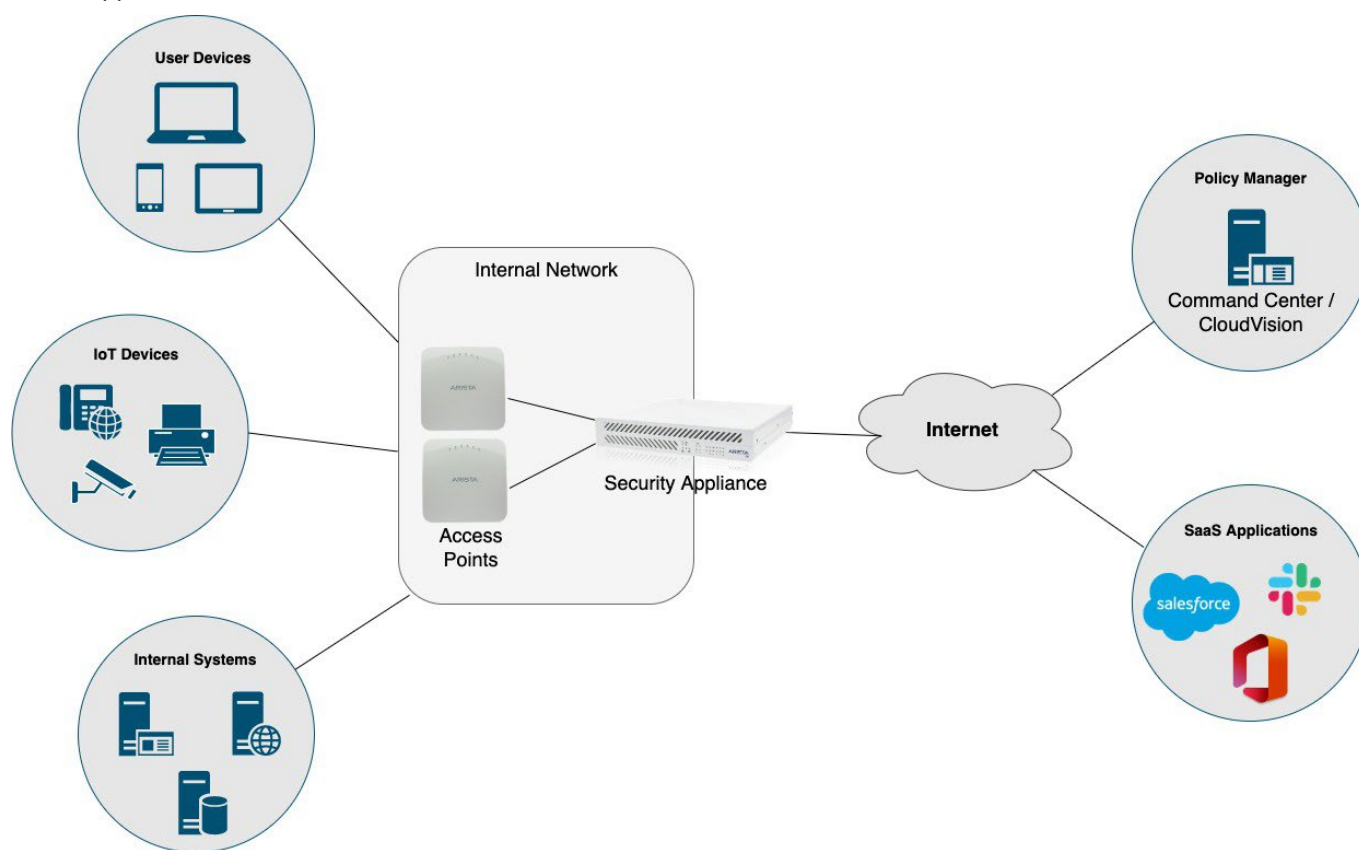


Figure 11: Simple Office with Multiple Access Points

Simple Office with multiple switches and Access points

As the office environment continues to grow north of 25 users and up to approximately 50 users and 150 devices, the need may arise for additional wired ports and wireless access point for the appropriate coverage. Leveraging the Simple Office with Multiple Access points design, the solution can expand to more floors and locations with the addition of the Arista 710P access switch.

With this design the 710P would uplink to the Arista Q8 or Q12 security appliance to provide robust network firewall functionality. The 710P would then be responsible for powering and delivering the wired and wireless services necessary for the office. Multiple 710P switches can be connected to the Q security appliance through the SFP based ports for longer distances or the 1Gb Ethernet ports. This solution delivers all the capabilities of the first two designs now with the addition of a fully managed PoE switch(s) that will provide further visibility and telemetry with integration into Arista CloudVision-CUE and the Arista Data Lake.

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