Not All Clouds Are Created Equal

How to Deliver Scalable, Resilient, and Automated WLAN Services with Juniper Mist Cloud

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Executive Summary

Companies are under growing pressure to reduce IT service costs without reducing service quality–so they are looking to the cloud, Artificial Intelligence (AI) and machine learning (ML) to solve this paradox. Users are demanding better connectivity, and networks are supporting more devices and applications than ever. In the world of Wi-Fi and WLAN management, IT executives have relied on controller-based architectures that just don't deliver the scale, resiliency, agility, and elasticity needed for today's business requirements.

In this white paper, we'll explore how moving WLAN management services from on-premises controllers to a microservices cloud architecture provides substantial cost savings and ROI. We will also explain how Juniper with Mist AI simplifies WLAN deployment and ongoing management, provides faster access to new features and functionality, and delivers the agility to scale dynamically as network needs change. Juniper has revolutionized the 24x7, always-on WLAN with cloud microservices and AI to create a wireless experience that is second to none.

Introduction

Companies are moving key applications like CRM, HR, and finance to the cloud to maximize IT efficiency, minimize IT costs, and improve the overall agility of business operations. For the same reasons, key infrastructure elements like security and storage are also being transitioned to the cloud.

Moving wireless to the cloud gives CIOs a more scalable and resilient infrastructure with better operational simplicity and efficiency. CIOs are increasingly looking to automate aspects of their WLAN environments, from provisioning equipment to onboarding users and tracking operations within the networks. The goal of a modern WLAN is not just to provide wireless connectivity but also to provide exceptional user experiences. AI and automation can remediate problems before they impact users, ensuring high-performance and consistent end user connections.

The first generation of cloud Wi-Fi management products introduced in 2007 were basically on-premises controllers that were virtualized and run as VMs in distributed data centers (with management functions in the cloud.) These products simplified the deployment and management of wireless networks and sparked a major shift in the industry away from on-premises hardware. However, because they are built on old technologies, they lack the agility and scale needed to satisfy today's mobile-first companies. They also lack a proper foundation for addressing key Wi-Fi requirements, such as automation using ML and AI and visibility into the user experience.

Modern technologies bring the possibility of true web scale, agility, and performance to the cloud-managed WLAN market. When combined with AI, ML, and Big Data analytics, the new generation of cloud-managed Wi-Fi not only simplifies Wi-Fi deployment, they automate ongoing operations like provisioning and configuration for substantial cost savings. This has allowed the modern WLAN to shift its focus from the infrastructure to the user experience, enabling Wi-Fi to be delivered as a predictable, reliable, and measurable service.

Enter the Juniper Mist Cloud

Juniper is leading the next generation of cloud-managed Wi-Fi. We looked at how big data companies like Amazon, Google, Facebook, and LinkedIn correlate massive amounts of information using ML in the cloud and asked, "How do we harness these same principles to build the first user-centric wireless network?"

The result is a truly innovative WLAN platform. Built on a microservices architecture using the latest cloud, AI, and wireless technologies, WLANs delivered from the Juniper® Mist™ cloud provide continuous learning and capabilities not available in other cloud-managed WLANs. Juniper Mist cloud, driven by Mist AI provides:

- Rapid deployment of new services without impacting existing services

- Elastic scale to support one to tens of thousands of sites

- Actionable insight using global data sets and ML

- Granular security across a full-stack architecture

- High availability for redundancy and reliability of network communications

Microservices Deliver Big Benefits

A microservice architecture is a method of developing software applications or functions as a distributed set of independently deployable and manageable modular services. Each service has a unique function that communicates with others via a well-defined mechanism. By leveraging a microservices architecture, Juniper Mist cloud provides service velocity without disruption and unprecedented elastic scale.

Service Velocity without Service Disruption

Network IT teams are increasingly expected to do more with shrinking budgets and resources. This includes rolling out new applications that maximize productivity, supporting new services that drive business revenue, and guaranteeing the high availability of existing resources. As a result, many IT departments have taken a DevOps mentality, where the process of software integration, testing, and deployment are automated and tightly monitored so new features can be built, tested, and released rapidly, frequently, and reliably.

Juniper Mist cloud strikes the perfect balance in the "optimize, innovate, disrupt" DevOps paradigm. On one hand, the Juniper Mist architecture offers the resiliency of a business-critical wireless service. On the other hand, the Juniper Mist cloud ensures the rapid roll-out of wireless functions with minimal downtime, which is unprecedented in the WLAN space.

This is achieved because different service modules are logically segmented in their own containers within Juniper Mist cloud. For example, the authentication module for the integrated guest captive portal is separate from the location engine, Wi-Fi analytics engine, Radio Resource Management (RRM), and other services. All of the individual modules are tied together by a real-time message bus (and share a long-term data store.) This allows Juniper cloud services, driven by Mist AI, the flexibility of rolling out new features or making modifications to a specific section of the platform without impacting other services. For example, single sign-on for guest portal authentication can be added without affecting location services, or site controls can be upgraded without affecting RRM management.
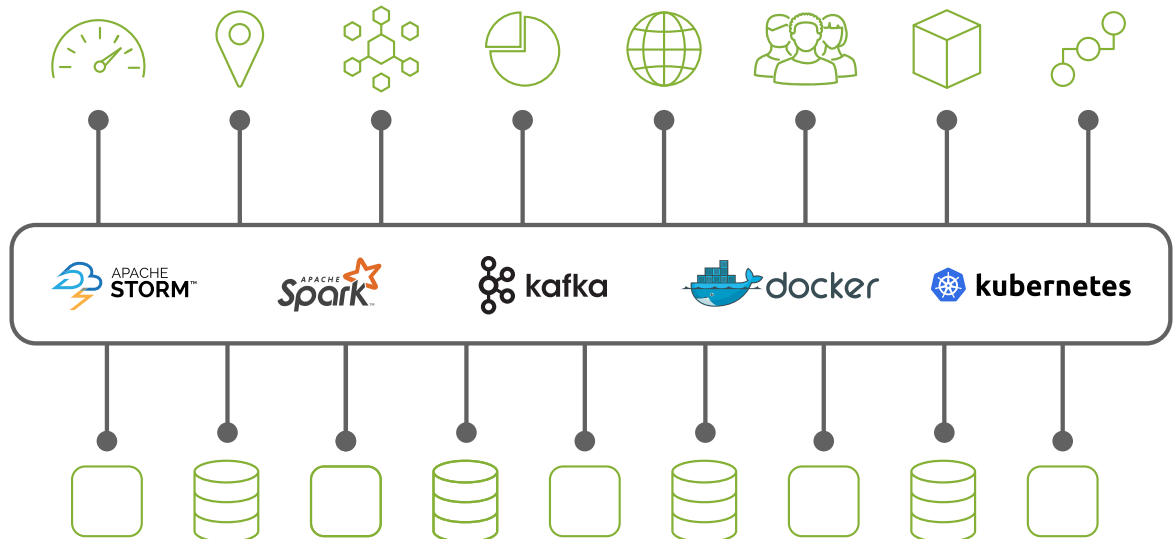

Figure 1: Juniper Mist cloud has a distributed microservices architecture.

When rolling out a new feature, Juniper Mist cloud heavily utilizes A/B testing to automatically measure performance and perform incremental rollouts. The microservice architecture allows multiple different versions of the same microservice to run in parallel, on the same data sources and environment. This allows a new service, or version of an existing service, to run on real data before being put into production. Once the data accuracy and performance is verified, the individual microservice switches over to the new version on the live system, with minimal downtime and customer impact.
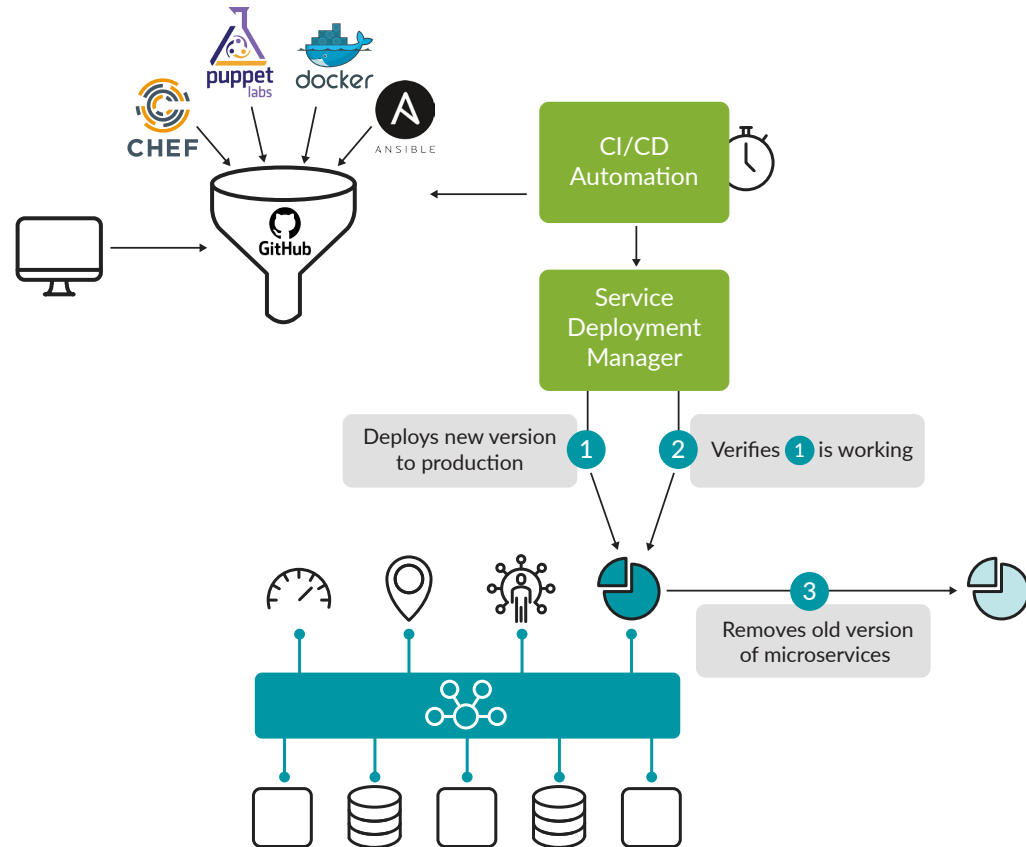
Figure 2: The workflow in Juniper Mist Cloud for a new feature rollout.

The distributed microservices architecture in Juniper Mist cloud enables new features and bug fixes to happen with extreme agility. The pace far eclipses what is possible with traditional Wi-Fi controllers and first-generation cloud architectures. With Juniper cloud services, driven by Mist AI, updates typically happen every two weeks. In contrast, alternative solutions require updates to take place on scheduled release cycles, which typically occur every few months or longer, and typically require network downtime.

Unprecedented Elastic Scale–Horizontally and Vertically

Traditional wireless architectures fail to deliver at scale due to monolithic designs that use vertically integrated systems. Take, for example, a distributed enterprise spread globally across hundreds to thousands of locations with 10,000-plus Access Points (APs). In the old world, on-premises or cloud-hosted controller pairs would have to be replicated for resiliency. In certain scenarios, additional controllers are required for providing management and troubleshooting, as packet captures, debug logs, and event logs, eat up substantial processing power. On top of this, some industries, such as, retail and hospitality, require even more controllers to be pre-instantiated to handle temporal surges in demand, such as an increase in RADIUS authentication requests, during the holidays.

When it comes to scale, Juniper Mist cloud's microservices architecture has a unique advantage. Juniper Mist cloud monitors utilization of different services and scales each module up or down dynamically without requiring end user intervention. The Juniper Mist cloud offers elastic scale, without a physical cap on the number of APs, client devices, or sites (per customer or globally.)

With Juniper Mist cloud, you can shrink and expand resources with minimal lead time. This is a fundamental advantage of being built on the modern cloud, as the network IT team no longer needs to worry before a critical event (such as Black Friday for retail stores) as to whether pre-instantiated resources will scale and perform to the demands on the network.

Juniper Mist cloud complements application performance management with infrastructure monitoring using purpose-built tools that provide real-time analytics and visibility into the health of the cloud. Juniper's internal network operations support team uses modern and comprehensive cloud application and infrastructure monitoring tools to provide IT teams the peace of mind needed to deliver a continuous 24x7 "always-on" Wi-Fi service. These tools monitor all the relevant services and provide insights and alerts to maintain the exacting performance of the Juniper Mist cloud.

> *Because the Juniper Mist platform is built using modern cloud elements, it is the first WLAN capable of using AI to automate Wi-Fi operations, simplify troubleshooting, detect anomalies, analyze trends, and provide predictive recommendations.*

Artificial Intelligence Turns Big Data into Big Knowledge

Cloud infrastructures like Amazon AWS, Google Cloud, and Microsoft Azure have turned AI into a mass market technology. Companies of all sizes can quickly and cost-effectively build AI platforms on massively scalable and secure global cloud infrastructures. Because the Juniper Mist platform is built using modern cloud elements, it is the first WLAN capable of using AI to automate Wi-Fi operations, simplify troubleshooting, detect anomalies, analyze trends, and provide predictive recommendations.

The Juniper Mist platform has a unique Proactive Analytics and Correlation Engine (PACE), which provides the foundation for AI data collection and analysis in the Wi-Fi and BLE domain. PACE collects over 150 pre- and post-connection user and location states in near real time from every wireless device. This state information is sent to Juniper Mist cloud, where AI algorithms are used for real-time analysis. In addition, the Juniper Mist platform uses design-intent metrics to classify and monitor the wireless user experience using AI. For example, with Juniper cloud services, driven by Mist AI, you can set, monitor, and enforce your own Service Level Expectations (SLE) for various key Wi-Fi metrics such as Time to Connect, Successful Connections, Throughput, Coverage, Capacity, Roaming, and AP uptime. These are then used to quantify the Wi-Fi performance of clients, APs, and entire locations. For example, you can define a throughput SLE of 30 Mbps for all users in your main campus.

Dashboards will tell you exactly what percentage of the time this SLE is being hit, which users are not getting this level of service, and which device types, operating systems, and applications are consistently causing problems. In addition, you can understand if this SLE will be achieved in the future based on current conditions.

The Juniper Mist cloud architecture allows for the capacity and performance to aggregate global metadata across customers. Not only is the Juniper Mist platform capable of collecting data for insight into a specific client behavior and location information, it can also provide insights and analytics across device types, operating systems, applications, and more. This is key for baselining and monitoring trends, and identifying macro issues early so they can be addressed proactively. For example, client roaming time, hardware radio performance, and device throughput can all be analyzed to identify global issues, such as performance degradation when a new client operating system version is released.
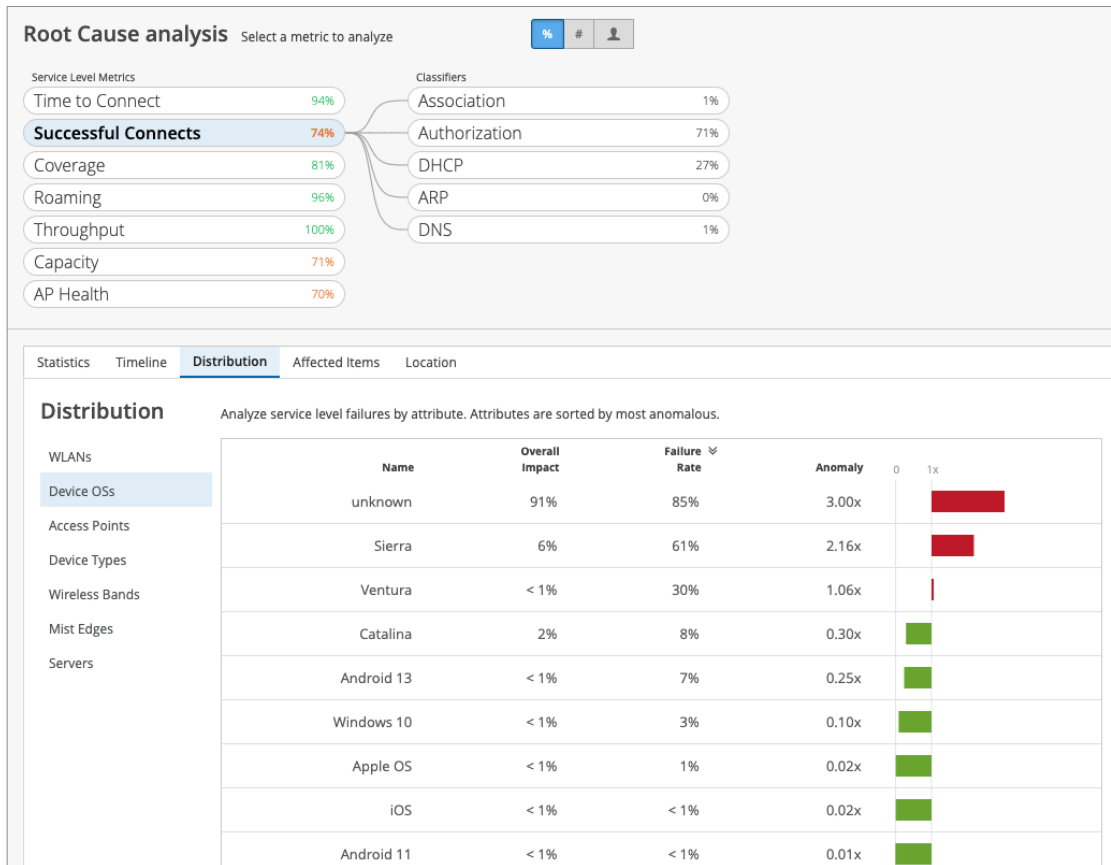

Figure 3: Juniper Mist collects state information and does event correlation for easy root cause identification.

It is worth noting that only metadata is collected and analyzed in Juniper Mist cloud. Payload or other sensitive data is never collected or stored, eliminating privacy concerns. Finally, the Juniper Mist cloud sets the stage for Marvis™ Virtual Network Assistant, which uses AI to answer questions and predict problems with high accuracy and reliability.

The Highest Level of Security

Data center breaches are in the headlines almost monthly, and there is a fear of data security in public clouds. The paranoia is due largely to the fact that the approach itself feels insecure, with your data stored on servers and systems you don't own or control.

The truth, however, is that cloud providers have robust security mechanisms in place. That is because cloud providers are more paranoid and attentive to security risks throughout their entire stack. They are efficient at systematic security services, such as looking out for attacks using pattern matching and AI technologies. In addition, they are always leveraging the most up-to-date security technologies and solutions for minimizing exploits.

Juniper takes additional measures to ensure the highest security in Juniper Mist cloud. These added measures are:

- Juniper uses a SOC2 Type 2 cloud data center

- User access is highly restricted

- HTTPS for all cloud connectivity

- SSH connectivity for administration, using public/private keys

- Industry standard encryption is utilized at various levels

- Any user information stored in the cloud is obfuscated with organization specific keys

- Security is integrated with the development cycles and pen tests are performed to detect vulnerabilities at the network and application levels

High Availability with an Always-On Wireless Network

Juniper has taken numerous steps to ensure the highest availability of our wireless services.

By leveraging the public cloud, the infrastructure components and services of Juniper Mist cloud are deployed redundantly (across clusters and zones) to provide 24x7 availability. In addition, Juniper Mist cloud is divided into microservices so issues with one microservice do not directly affect other microservices. Juniper Mist cloud buffers data in the event of a component disaster, such as the loss of backend microservice. Once the disaster has been addressed, the data is replayed to fill in the lost analytics. System upgrades and feature introductions also benefit from microservices so there is no service impact when performing either.

Juniper cloud services, driven by Mist AI, are designed so a disaster does not affect Wi-Fi users. All the business-critical services are delivered at the edge through the APs. In the rare event of a cloud connectivity disruption for the APs where the WAN is still functional, all business-critical services will continue to be delivered at the edge through the APs. Any

existing client device already authorized will continue to access applications through Wi-Fi without undergoing any disruption of services. In case of a WAN outage, all local services will continue to function through the wireless network while WAN services are restored. In other words, Juniper Access Points at the edge are completely site survivable in the case of a customer WAN outage or a catastrophic cloud outage.

Finally, the Juniper Mist engineering and support team acts as an extension of the customer. Using the Juniper Mist NOC with global data insights, we detect trends and proactively alert customers of potential issues. This avoids problems before they arise, eliminating the reactive troubleshooting issues that plagued earlier WLAN systems.

Conclusion

Outdated WLAN infrastructures cannot meet the needs of the modern enterprise. The move to the cloud was a great first step, but first-generation cloud architectures lack the scale, resiliency, agility, and elasticity needed for today's business requirements. Juniper with Mist AI is leading the charge to purpose-built cloud solutions based on modern elements, such as containers and microservices. On top of this, Mist AI is bringing new insight and automation to wireless networks with big data and ML. For the first time, Wi-Fi is reliable, predictable, and measurable. In addition, it is easy to deploy and cost effective to operate. This is the new wireless network, made possible by the modern Juniper Mist cloud.

Additional Resources

- Mist AI and Cloud

- Marvis Virtual Network Assistant

- Juniper Mist Wi-Fi Assurance

- Juniper Access Points

- Live Demo: Wired and Wireless Wednesday

About Juniper Networks

At Juniper Networks, we are dedicated to dramatically simplifying network operations and driving superior experiences for end users. Our solutions deliver industry-leading insight, automation, security and AI to drive real business results. We believe that powering connections will bring us closer together while empowering us all to solve the world's greatest challenges of well-being, sustainability and equality.

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