JUNIPER NETWORKS | Engineering Simplicity

DAY ONE GREEN: THE SUSTAINABLE BENEFITS OF AI DRIVEN ENTERPRISE NETWORKS

The Mist™ AI Platform can reduce a network's carbon footprint by way of virtualizations, reduced on-site visits, and automated energy management.

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Day One Green

The Sustainable Benefits of AI Driven Enterprise Networks

Abstract

Juniper has brought true innovation to the networking space with the world's first AI driven full stack network. The Juniper Mist™ AI Platform makes networking predictable, reliable, and measurable with visibility into the user experience, proactive automation, and self-healing capabilities. Apart from the technical and operational benefits, the solution can reduce a network's carbon footprint by way of virtualizations, reduced on-site visits, and automated energy management. All this is achieved through the Juniper's state of the art architecture featuring microservices cloud, the AI driven operational framework, integrated hardware platforms, and 100% API capabilities. This paper will illustrate some of those capabilities as an initial introduction to the sustainable potential of AI driven networks.

The Mist Cloud Architecture Minimizes Appliance Footprints

Juniper's Enterprise networking operations are managed via Mist's open, programmable, and elastic microservices cloud architecture. This delivers maximum scalability, performance, and DevOps agility with reduced equipment footprints at customer premises. The AIDE (AI Driven Enterprise) cloud architecture allows the inherent benefits of power savings to enterprises by eliminating the need to host and manage multiple server appliances. The traditional architecture of networking systems often involves hosting multiple on-prem systems to manage and operate like controllers, master controllers, NMS, assurance systems, and location appliances. With the cloud architecture, all these functions are virtualized and operate as micro-services (see Figure 1). Through economy

of scale, virtualization, and the elastic nature of the cloud to dynamically scale up and down, both horizontally and vertically, cloud-delivered services can provide sizable power savings for individual enterprises.
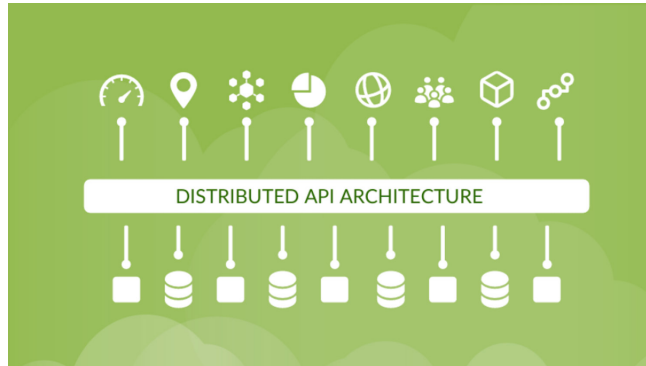

Figure 1   Mist Microservices Cloud

Integrated Hardware Reduces Overlay Equipments

Mist Access Point hardware is an integrated service delivery entity that combines Wi-Fi, RF security scanning, Bluetooth LE, and IoT so businesses can increase the value of their infrastructure deployments and reduce environmental impacts. Earlier, these services were available via SILO'ed systems and deployed in an overlay fashion with redundant cabling and power sources. The integrated hardware design of Mist APs means reducing everything from the number of pieces of equipment to cabling, mounting, switch ports, and power consumption without compromising the service quality or performance.

Figure 2   Mist Access Points with Integrated Wi-Fi, BLE, and IOT Sensors

The Mist AI Minimizes Inter-site Travels for IT Operation

Per industry research, IT teams managing network infrastructure often spend more than 40% of their time troubleshooting issues, the majority of which is spent on issue replication and data gathering. For enterprises having a distributed presence, troubleshooting serious issues in remote branches often involves on-site visits for effective problem replications and data gathering through debugs and packet captures. If escalations are bad enough, senior IT experts can be forced to travel thousands of miles, incurring additional environmental impacts.

The Mist Cloud uses AI and data science to analyze large amounts of rich metadata collected from Mist Access Points, Juniper switches, and gateway devices. This metadata provides actionable insights, proactive automation, and self-healing capabilities. For example:

- Supervised machine learning correlates events for rapid root cause identification.

- Time-series anomaly detection identifies negative trends and determines the magnitude of their impact.

- AI-driven Radio Resource Management (RRM) optimizes the RF settings in real-time based on changing conditions.

- Natural Language Processing (NLP) is used for making complex queries simple and fast.

- Unsupervised machine learning is used with Mist's vBLE technology to accurately locate users and devices.

Mist AIOps with its dynamic packet capture, seven-day historical record of network states, and data science tools to instantaneously analyze anomalies and identify the root causes, has reduced site visits by IT teams by a factor of 90% for several large, distributed enterprises.

Figures 3-6 show a few scenarios where Mist AI was able to proactively identify the root cause of a user issue and store the historic network state information, including the packet captures. In Figure 3, Marvis, the Mist Virtual Network Assistant, is shown proactively identifying the impacting issues for the full stack network in near real time.
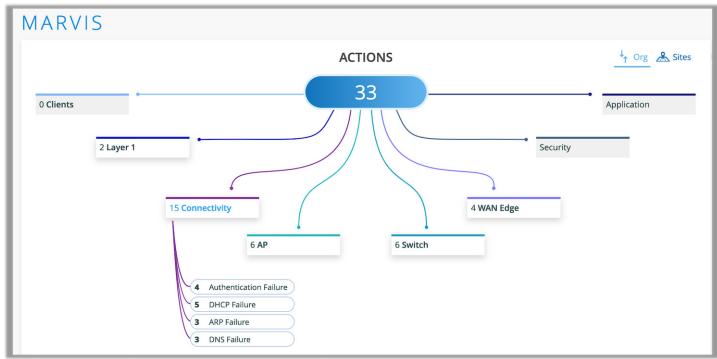
Figure 3   Mist Marvis Virtual Network Assistant

There are several scenarios where Mist AI can analyze the client issue and present the root cause and packet captures for the failure events, which previously required lengthy troubleshooting cycles and site visits. Figure 4 is a DHCP timeout issue: the client sends a broadcast discover packet but does not receive an offer packet from the server.
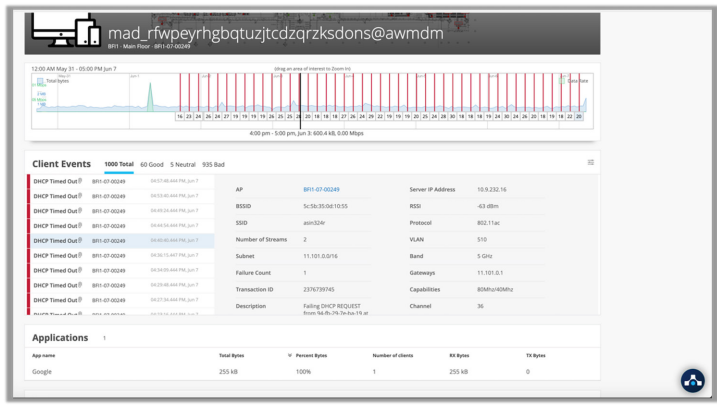

Figure 4   Client DHCP Events With Packet Captures

Figure 5 displays an authorization failure. This could be caused by various reasons such as MIC failure, the Radius server not responding, access reject from the Radius server, the client failing to complete the auth process, etc.
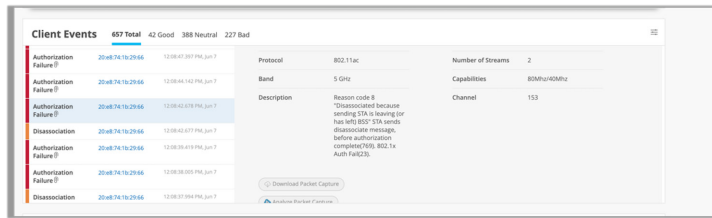
Figure 5   *Client Association Failure Events with Packet Captures*

And Figure 6 shows an 11r FBT failure, likely caused due to client failing 11r roam.
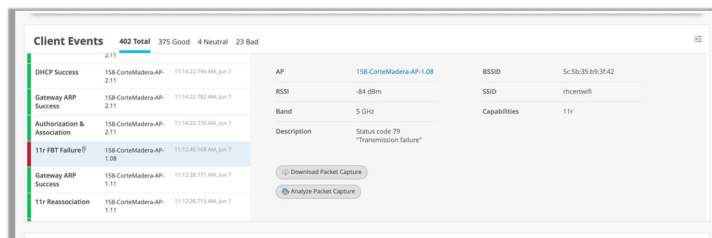

Figure 6   *Client Roaming Failure Events with packet captures*

Automation Eliminates Multi-hop Shipments and Multi Packaging

The Juniper Mist platform also has automation capabilities for Day0, Day1, and Day2 operations that can save time, travel, and money.

The platform supports zero touch provisioning (ZTP) for the full-stack products of wireless access points, switches, and WAN gateways. ZTP eliminates the two-step shipping process, wherein products had to be shipped first to a staging location to perform initial configuration before being sent to their final destination for deployment. With ZTP and cloud-driven services, products are no longer required to go through the staging process. They can be shipped directly from the vendor to the destination site, where they can be deployed out of the box. The ZTP process reduces carbon footprints and eliminates dual packaging and all the associated wastages.

ZTP and Day0 automation features even eliminate the need for IT personnel presence for the initial equipment setup on-site, thereby reducing travels even further. With the Mist AI mobile app, the technicians involved in cabling and electrical work can onboard the network devices, too. Every cloud-enabled Juniper AIDE product includes a QR code label on the packaging and on the appliance body. The workflow involves scanning

the QR code on the appliances and choosing a site for the devices to onboard. The app can even help offload the tasks like replacing or relocating the devices to the installers. See Figure 7 and Figure 8.
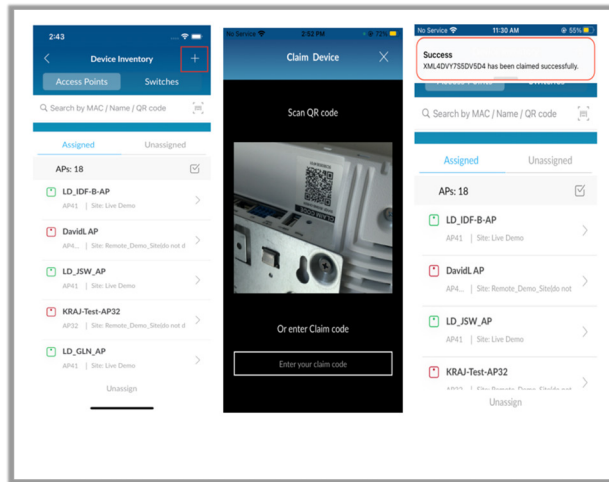

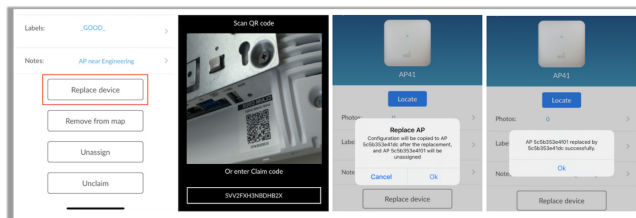*Figure 7   Mist AI App Performing Zero Touch Provisioning of AP*

Figure 8   Mist AI App Performing Replace AP Operation

Juniper Analytics Drives Green Benefits

HVAC systems are one of the prime contributors to higher greenhouse gases and their usage in office spaces largely remain unoptimized. In the post-pandemic world, most enterprises are operating in a hybrid work environment with less than half of typical office occupancy. Still, HVAC usage and expenses remain consistently on the higher side, because their operations are optimized for the space rather than the occupancy. Juniper AIDE's analytics can help in such situations by gathering the employee presence and occupancy details and feeding that information to HVAC systems to optimize by turning temperatures up or down.

In cases where HVAC systems are old and siloed, Juniper has forged partnerships with specialized technology vendors to offer a joint solution. One such example is a solution by Juniper and KODE Labs.

Juniper wireless architecture converges wi-fi and virtual Bluetooth LE (vBLE) to enable high-accuracy indoor location services, allowing occupancy analytics, asset tracking, indoor navigation, and proximity notifications. Mist wireless access points can sense the wi-fi and BLE signals emitted by user devices to compute device location and dwell times. Figure 9 shows a dashboard calculation of office space occupancies in real-time.
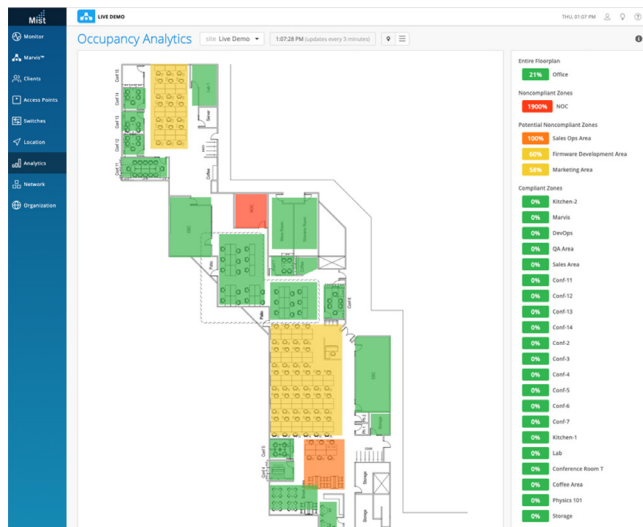

Figure 9   Mist Dashboard With Space Occupancy Insights of Office Floor

The platform's 100% open API support helps to easily export this location intelligence for consumption by other systems, such as KODE Labs.

KODE Labs platform is a data focused, vendor-agnostic, building IoT platform integrating building systems like HVAC, lighting, and fire sensing into a single dashboard. In the joint solution with Juniper, Mist provides data on occupancy, asset tracking, temperatures, and humidity to the KODE labs platform, which in turn leverages the intelligence to adjust building systems to provide an optimal experience for employees, reducing OPEX, and greenhouse emissions in the process as shown in Figure 10.
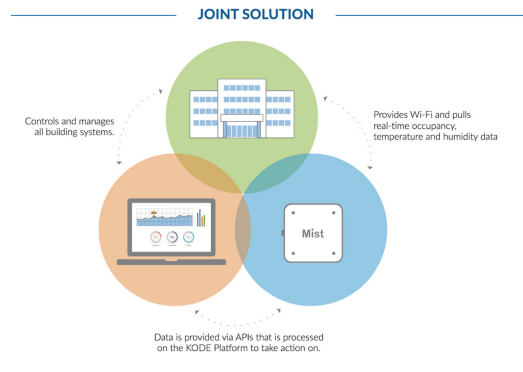
Figure 10   *Mist Kobe Joint Solution for Building HVAC Management*

MORE?   https://www.mist.com/wp-content/uploads/Mist_Kode_solution-Brief.pdf

Programmable Network Reduces Energy Consumption

Juniper Mist cloud services are 100% programmable, with all functions (provisioning, monitoring, alerts) available through open APIs. This capability enables enterprises to automate several use cases, including energy-optimizing ones.

In a typical enterprise, the wi-fi networks are deployed in a dense mode to handle high-density client environments. Further, all the access points are configured with complete feature sets and operate 24x7, irrespective of the employee presence in the office space and the actual network usage. While this deployment method offers the best user experience during office hours, it will result in significant unwanted energy consumption during non-office hours, holidays, and weekends when the user presence is negligible to nil. Juniper's API based automation can effectively address this challenge by applying timebound policies for the device operations.

For example, Juniper AP33 and AP32 Access points require 802.3at power to operate with full functionality but can also use 802.3af power to operate at reduced speeds and minimal features. These APs are powered by POE from switch ports in most deployments. In an open system like Juniper AIDE, a simple automation script executed via an API interface can change the power delivered from the switch ports to the Aps, from .3at to .3af, during non-working hours, thereby reducing power consumption on the wi-fi network by a significant amount. You can also apply similar policies to other systems like digital signage, collaboration systems, and kiosks to cut down energy consumptions.

The Future

As the world moves towards rapid digitalization, it will quickly see the additions of millions of mobile devices, users, and applications. Not only will this put enormous pressure on IT teams to deliver superior experiences with limited resources, but it will also continue to exert pressure on the environment due to manual and travel intensive IT operations.

Juniper's long-term vision and roadmap can help alleviate some of these concerns for Enterprises. The idea is to incorporate the innovations of Mist AI and microservices cloud architecture into the entire technology stack from client to cloud. The operational and green benefits of cloud architecture, AI-driven insights, self-driving framework, and open architecture will thus extend to multiple layers of the world's IT systems. The reasoning is the same: simplify IT operations and you will either directly or indirectly contribute to a greener planet.
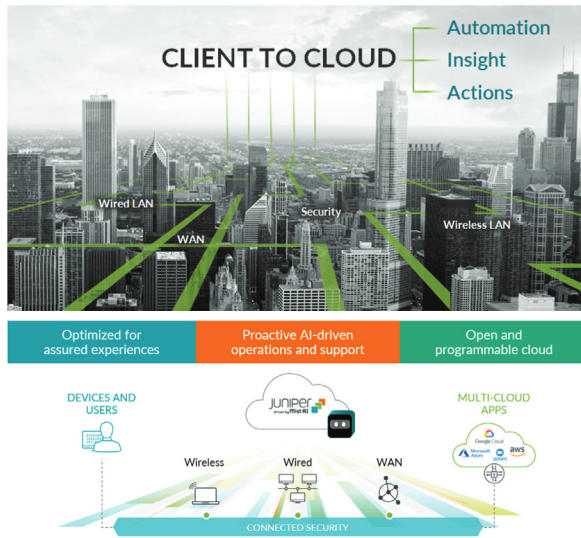

Figure 11   *Juniper Mist Client to Cloud AI-Driven Vision*

Speak to your Juniper Networks account manager or Professional Services rep about the future of Mist AI in your sustainable environment. For more information see https://www.mist.com.