A New Era of Business-Critical Wi-Fi Assurance

Mist

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Using Data Science for Proactive Wireless Insight and Automation

The explosive growth of smart mobile devices, applications, and Internet of Things (IoT) has created a big challenge for legacy Wireless LAN (WLAN) products, which were all designed when Smartphones and tablets didn't exist and cloud platforms like AWS were still in their infancy.

For example, smart devices have substantially increased the number of users on the wireless network. This not only creates capacity, coverage, and interference issues that adversely impact performance, but it severely complicates Wi-Fi troubleshooting. There are way more mobile hardware platforms, operating systems, and applications today than a decade ago, which cause IT to constantly react to user issues vs. proactively planning ahead of them. Using packet sniffers and manual processes to identify and remediate problems across all these different variables just won't scale, creating the need for a better solution for wireless operations in today's smart device era.

In addition, because mobile devices have become the predominate compute platform, Wi-Fi networks have moved from nice-to-have to business-critical in most environments. Flaky wireless coverage is no longer acceptable, nor is an inconsistent experience across users and devices. Network IT needs to be proactive to the mobile user's experience to mitigate issues before they impact user experience and resolve those problems that do appear in a fast and cost effective manner.

To achieve business criticality, the following age-old Wi-Fi operational challenges need to be addressed once and for all:

- **Packet sniffing is expensive, time consuming, and often ineffective.** Many wireless problems are ephemeral, disappearing shortly after they arise based on changing user and environmental conditions. Sending techs onsite to reproduce the problem can be expensive, and often yields lackluster results as the data needed to reproduce and resolve an issue can be long gone.

- **It is difficult to pinpoint the root cause of problems.** Often times when a mobile user cannot connect or is receiving sub-par performance, the wireless network is the first thing that is blamed.However, it could just as easily be an issue with DNS, DHCP, authentication servers, or a variety of other things. Administrators need a quick and easy way to identify root causes for fast remediation.

- **Network-centric perspective.** When problems occur, coverage and/ or capacity are the two things usually blamed. Suggested corrections are based on predictable RF models and other AP characteristics, such as power levels and channels. This methodology ignores many wireless and wired parameters, such as sticky roaming and asymmetry. Plus it does not take into account the differences in various types of mobile devices.

- **Administrators lack visibility into what users are actually experiencing.** Traditional WLAN systems take a network-centric view of the world. While they are good at telling you what an Access Point is experiencing, they provide little insight into the wireless experience from the users' perspectives. This complicates troubleshooting, and makes it all but impossible to monitor and enforce service level expectations for key metrics like connect time, capacity, coverage, and roaming.

Mist built a wireless platform from the ground up to address the above issues. With patent-pending machine learning technology, the Mist platform simplifies Wi-Fi operations through automation and proactive recommendations. This ensures a better wireless experience for IT administrators, which translates to an amazing Wi-Fi experience for mobile users.

Mist's Groundbreaking Architecture

The Mist platform lets you think centrally and act locally through a combination of cloud-based intelligence and on premise Access Points. The top 3 unique attributes of the Mist platform are:

- **A purpose-built micro-services cloud architecture.** The Mist cloud is designed to provide unprecedented visibility and control at web scale, with a micro services architecture for extreme agility when rolling out new features/services. Unlike other wireless solutions, the Mist cloud collects real-time streaming data from all mobile devices for a unique insight into every wireless user's "quality of experience. In addition, it uses modern elements like Storm and Spark for real-time classification and analysis of Wi-Fi metrics (connect time, coverage, and capacity), as well as global correlation of events.

- **Enterprise-Grade W-Fi and BLE Access Points.**
  In addition to delivering the best Wi-Fi 802.11 wave 2 range and performance, Mist APs have integrated 16 element vBLE arrays for the industry's most accurate location services. Mist is leading the convergence of Wi-Fi and Bluetooth Low Energy (BLE), ensuring both technologies can easily be deployed at scale, while complementing one another through better coverage detection, security, and more.

- **Data science meets wireless wizardry.**
  The "secrete sauce" of the Mist platform lies in its patent-pending machine learning technology. We've taken decades of wireless experience and put it into the platform to handle everything from event correlation to dynamic packet capture to service level monitoring. Mist automates manual, mundane operational tasks to ensure the wireless network is always optimized for constantly changing user requirements and device capabilities (with minimal manual IT intervention.)

Business-Critical Wi-Fi Assurance with Mist

By building a modern wireless platform for the smart device era, Mist solves the traditional challenges of deploying and operating Wi-Fi in the following unique ways:

- **No more manual packet sniffing**
  Mist is the first and only wireless vendor with dynamic packet capture (i.e. dPCAP).When a user is experiencing a network anomaly, the Mist system automatically detects it and starts capturing packets. This enables you to rewind back in time to see what was going on in the Wi-Fi network and the mobile device when the anomaly was detected. (See Figure 1). No more sending techs onsite with sniffers to chase problems that might not even exist anymore. The data needed to fix the problem is always available and at your fingertips, which reduces your IT costs and minimizes the Mean Time to Repair (MTTR) wireless problems. Given the fact that a single onsite visit with a packet sniffer can cost from $1000 to $2500, this feature alone can justify an investment in Mist.

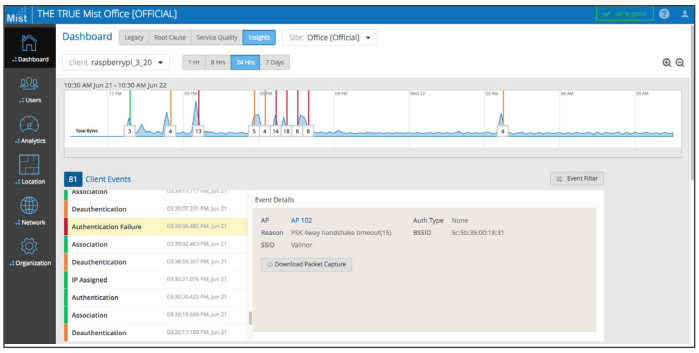

Figure 1 – The Mist platform performs dynamic packet capture when an anomaly is detected, with network rewind for historical analysis.

- **Easy and accurate one-click root cause analysis.**
  The Mist solution has a Proactive Analytics and Correlation Engine (PACE) with patent-pending machine learning technology to dynamically collect information from all Wi-Fi mobile devices and correlate events for quick root cause identification.

  Because PACE analyzes each and every mobile's users RF packets, it can easily identify if the user is having a "connection", "coverage", "capacity", "throughput" or "roaming" issue. Or, PACE identifies if it is not a wireless issue at all – i.e. maybe it is a DNS, DHCP, WAN or authentication problem.

  For example, in Figure 2 it is easy to see that 4% of users are having an issue with the time it takes to connect to the network, with the majority of problems taking place the morning of January 20th. The root cause of most of these Time to Connect issues is misconfigured IP services.

- **How is the Mist PACE solution better than alternative wireless solutions?** Given the scale and complexity of wireless networks, it is no longer acceptable to look at multiple dashboards and make sense of it all. The need of the hour is actionable insights. Current wireless vendors provide event logs and byte counts, but they do limited or no correlation for quick problem identification and remediation. For example, a "Connection" issue could be due to DHCP, ARP, DNS, or a misbehaving mobile client (association, 802.1x authentication). If a wireless vendor is just providing event logs, it could take you a lot of time and effort to determine the actual source of the problem. With Mist, the root cause of problems is always just one mouse clicks away, which lets you quickly see what the mobile users are experiencing and get to the source of problems way easier and quicker than ever before (see Figure 2).

  In addition, current wireless vendors only identify problems under certain circumstances, like when a connection state machine (with connection states being Associate->Authenticate->DHCP-ARP->DNS) is successful. These solutions cannot provide insights into why a state machine failed

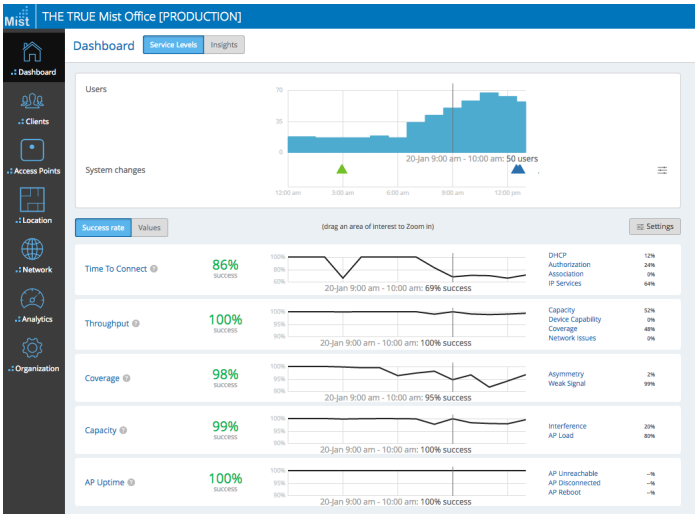

Figure 2 - Mist uses machine learning to correlate events and easily identify the root cause of problems (wired, wireless, and device).

or got prolonged, which means they only address part of the problem. In contrast, Mist looks at every RF packet from a mobile device and constructs a RF state machine per mobile device regardless of success or failure of the connection. This enables rapid detection and root-cause identification, regardless of the source of the connection problem.

Finally, because Mist handles correlation in the cloud, it collects and analyzes enormous amounts of data at scale. In contrast, many controller-based solutions experience severe performance degradation when debugging mode is enabled to collect and analyze the RF data. Performance should never be sacrificed at the expense of troubleshooting!

- **Visibility into user service levels.** Mist has the only wireless platform in the industry that collects realtime state information from every mobile device on the network. This has numerous benefits, among them is the ability to set service level expectation (SLE) thresholds for critical attributes that impact wireless performance, which include:

  • Connection
  • Coverage
  • Capacity
  • Roaming
  • Throughput
  • Latency
  • Jitter

If any of these parameters are violated, you are proactively given insight into the reasons why, top mobile devices affected, and top wireless networks affected. For example, in Figure 3 you can see that 2 seconds is the threshold set for Time to Connect, which is being hit 71% of the time.

With Mist's SLE dashboards, you can accurately understand, in realtime, the quality of service being offered and address issues before they become significant. In contrast, other vendors don't let you set any SLE thresholds, or limit you to one or two events that can be monitored (e.g. Time to Connect).

Mist puts all the information you need in one place, which lets you deliver a true wireless service that is responsive to your customers' needs while easy for you to design and operate.

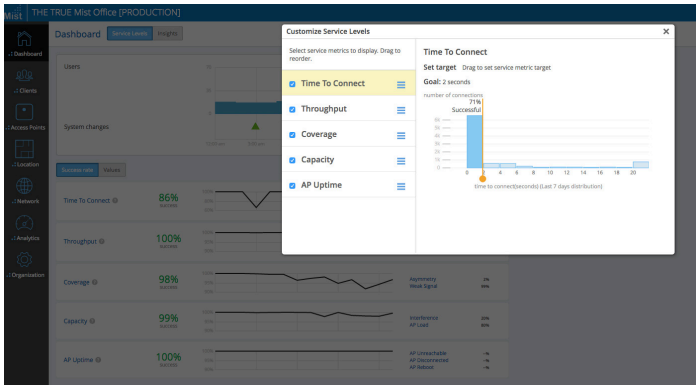

Figure 3 - Mist lets you easily setup, monitor and enforce service levels for connect time, capacity, coverage and more.

- **Visibility into user RF environment.** In addition, Mist is the only platform with "RF glasses", which gives you a real-time view of the RF environment from the mobile device's perspective. This lets you detect coverage holes (e.g. due to weak signals and interference), even as users move around and their RF coverage patterns change.

  If a wireless user complains about a Wi-Fi or BLE problem, you can easily visualize in real-time exactly what their wireless environment looks like for accurate troubleshooting (Figure 4).

  Mist's RF glasses provide a real-time view of the RF network and hence are way more accurate compared to other wireless vendors that offer predictive RF models that rely on power levels and channels. Unlike those solutions, Mist never uses simulated or outdated data.

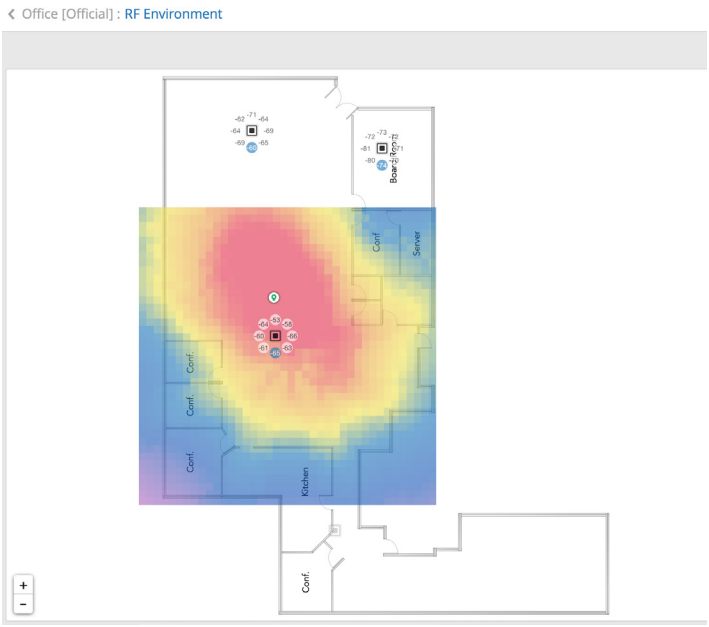

Figure 4 – RF glasses let you easily visualize in real-time exactly what the wireless environment looks like for accurate troubleshooting

Data science meets wireless wizardry

The time has come for wireless operations to move from a reactionary troubleshooting mode to a proactive one where actions can be taken that avoid problems before they arise. Plus, intelligence must be built into the wireless network so automated changes can be made in realtime, continuously optimizing Wi-Fi performance for every individual user and environment.

This is achieved with Mist's next generation wireless platform, which provides smart Wi-Fi assurance for the smart device era. By taking a user-first approach to wireless, the Mist platform simplifies Wi-Fi operations while delivering a robust wireless experience worthy of the moniker "business-critical".

For more information, visit www.mist.com

About Mist

Mist built the first wireless platform for the Smart Device era. By taking a user-first approach to networking, the Mist Intelligent Wireless Cloud (IWC) eliminates the operational burdens of legacy wireless architectures by replacing human interaction with machine learning and proactive automation. In addition, Mist takes unique advantage of user location and behavior to deliver a superior experience for wireless users.

The Mist team consists of leading experts in wireless, machine learning, and cloud, who are responsible for building the largest and most advanced networks in the world. Founded in June 2014, the company is based in Cupertino, CA. For more information, visit mist.com

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