

The background is a dark blue gradient with intricate, wavy, light blue lines that create a sense of depth and movement, resembling a stylized wave or a complex network pattern.

Haystack: A Software  
Solution to Manage  
Today's Increasingly  
Complex Smart Homes

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# Executive summary

In delivering WiFi services, Communications Service Providers (CSPs) face a recurring challenge. While they have visibility across the network and up to the modem inside the house, the WiFi network itself has been a black box. This problem is being exacerbated as more and more IoT devices, smart televisions, and other appliances are sprouting WiFi connectivity—and consumers expect their connectivity to be flawless.

Failing to meet this expectation can lead to rising support call volume due to customer complaints. And the lack of visibility into the WiFi network means having to send a technician out for every issue ticket raised—an extremely expensive and time-consuming proposition faced by CSPs.

With access to key network and customer insights and intelligence, CSPs may be able to manage their networks more efficiently and have better control of the customer experience.

This paper presents a comprehensive overview of Plume's Haystack solution. Haystack provides CSPs with the operational intelligence and tools to transform the way they manage their respective subscriber networks. We break down the four applications that make up this suite of services and the key features that help CSPs quickly identify issues, troubleshoot problems in real-time, and proactively resolve subscriber issues.

Research from Deloitte, McKinsey, and BARC shows that data-driven organizations are:

10%+

1.5 times more likely to grow revenue by more than 10%<sup>2</sup>

9X

9 times more likely to retain a customer<sup>1</sup>

8%↑

increasing profits by 8% when leveraging big data<sup>4</sup>

23X

23 times more likely to add customers<sup>3</sup>

<sup>1</sup> "B2B commercial analytics: What outperformers do," McKinsey & Company, December 14, 2021

<sup>2</sup> "Demistifying Data 2022," Deloitte, October 2022

<sup>3</sup> "Five facts: How customer analytics boosts corporate performance," McKinsey & Company, July 1, 2014

<sup>4</sup> "Benefits of Big Data Analytics: Increased Revenues and Reduced Costs," BARC, accessed Dec 16, 2022

# Introduction

In today's world, customer experience is everything. Unfortunately, high truck rolls and customer churn remain realities many CSPs deal with. But what if there were a way for CSPs to uncover the kind of insights that could dramatically transform the connected home experience and delight customers?

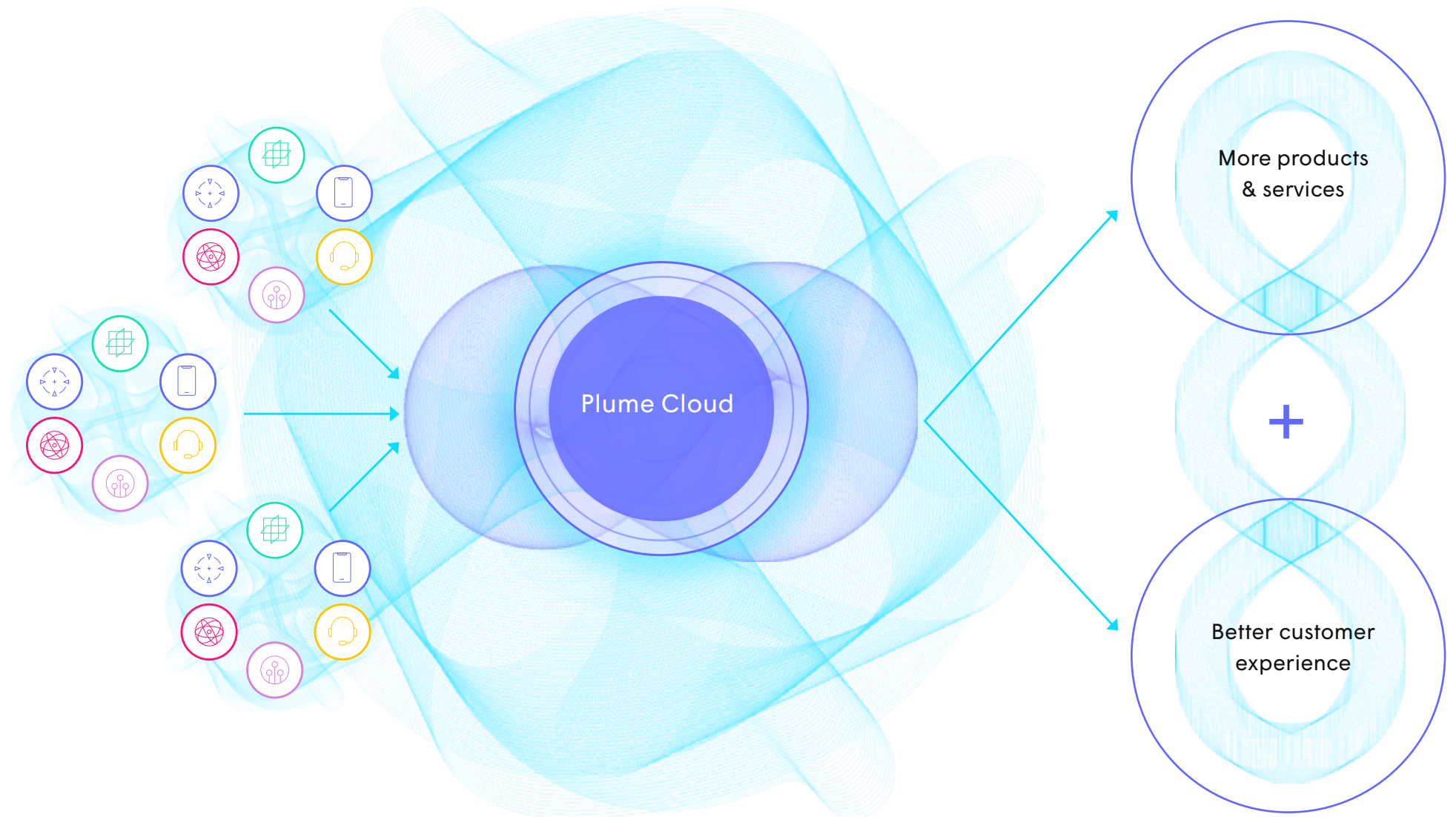


# Total network visibility is key to transforming your business

Plume has a unique, cloud-based architecture based on the open-source OpenSync protocol. This architecture offers many advantages. For example, it avoids hardware lock-in because OpenSync is open-source and can be implemented on any access point (AP) with applicable hardware capabilities. Furthermore, because it is cloud-based, powerful applications can be quickly and efficiently deployed to existing APs, reducing costs.

A major benefit of this architecture is data availability. Traditional WiFi APs—including WiFi mesh devices—typically have a RAM of 1 Gb or less. Limited RAM severely limits what can be done both in terms of applications and data collection. By leveraging the cloud, data collection is virtually unlimited for the simple reason that more RAM or storage can be added at any time. As a result, Plume is able to capture an incredibly broad array of data around network operation, consumer behaviors, and service quality.

Plume's cloud-based approach aims to give CSPs full visibility into the WiFi network so it is no longer a black box. With real visibility into your networks, a vast majority of issues can be resolved remotely, making proactive support possible and reducing truck rolls. CSPs can find and resolve issues before the subscriber reports them. Haystack is Plume's suite of services purpose-built for CSPs, putting the power of data in your hands.



**The Haystack services suite is designed to help CSPs:**

1



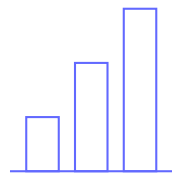
Identify and resolve problems remotely, reducing truck rolls by up to 50%<sup>5</sup>

2



Proactively support customers by tracking issues network-wide and sending custom push notifications.

3



Explore and visualize data to derive insights about customers, services, and service quality.

“Customer experience is at the forefront of everything we do at Ralls Technologies—we partnered with Plume to ensure that we attained the highest level of proactive customer support, and in doing so transformed our operational cost base. I’m delighted that we’re well on the way to achieving our target and since implementing Plume’s Haystack suite in 2020, have seen a massive 50% reduction in truck rolls alone.”

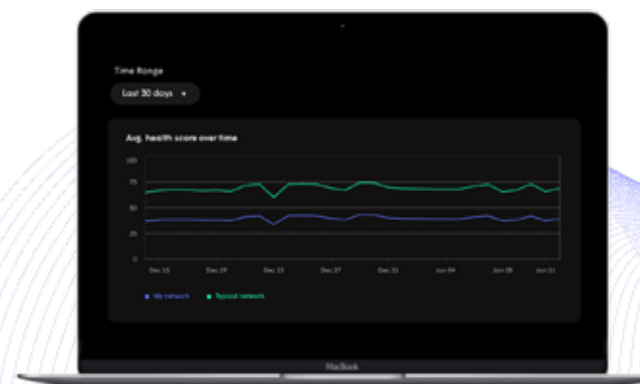
— Bob Winsel  
Chief Operating Officer  
Ralls Technologies, USA

**There are four applications that make up the Haystack suite:**

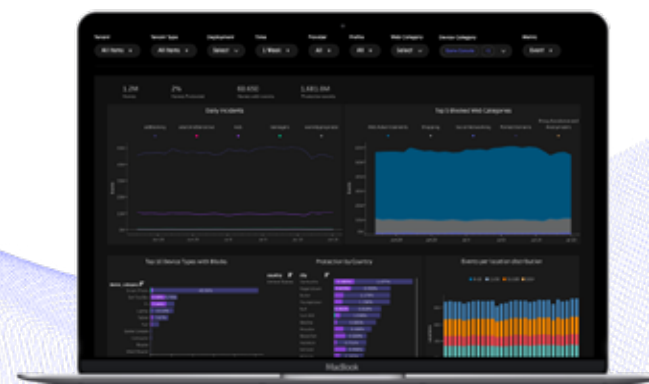
Frontline



Signal



Panorama



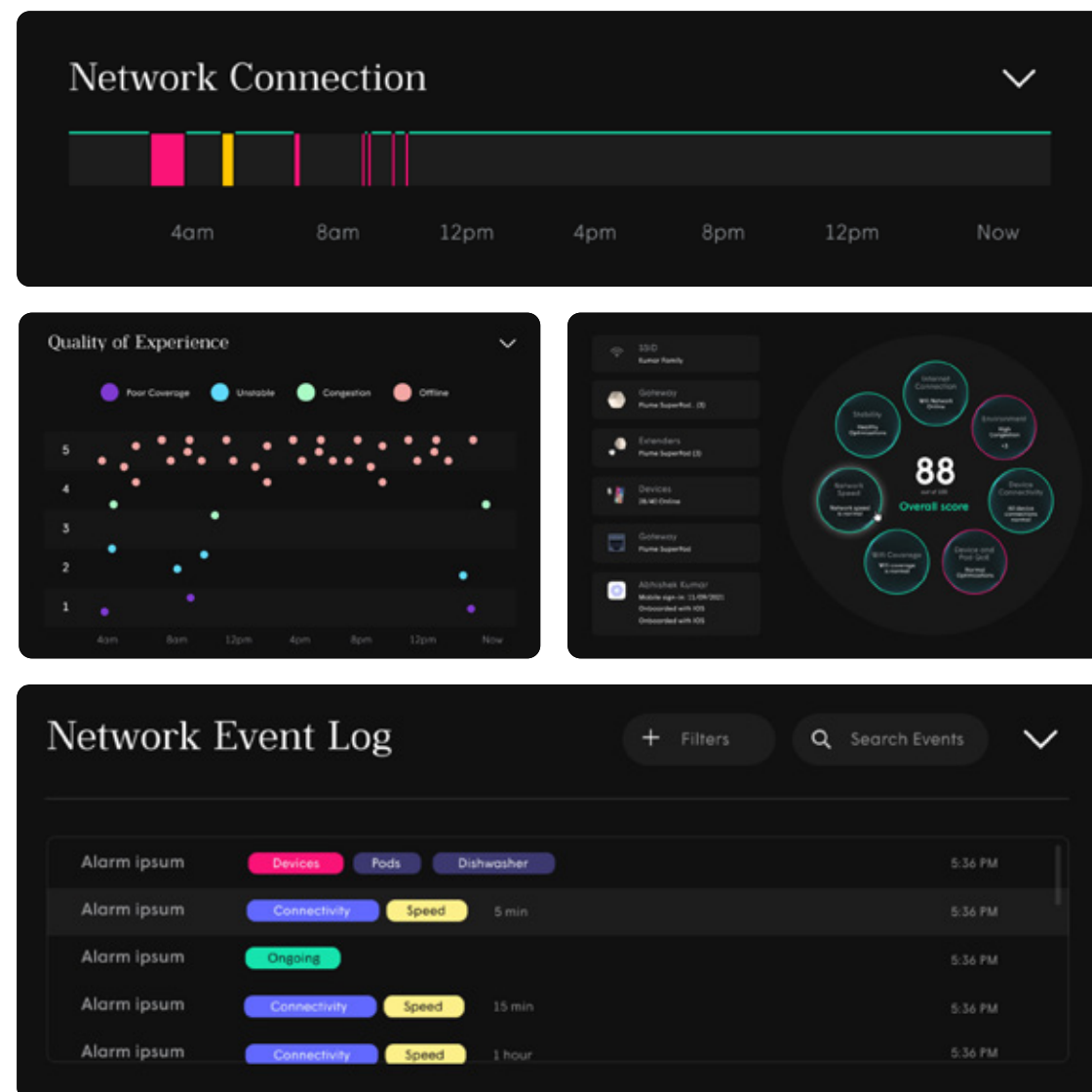
QuerySight



<sup>5</sup> Bob Winsel, Chief Operating Officer, Ralls Technologies, January 2023

# Frontline

Frontline is the tool that gives full visibility into an individual subscriber's location. When a subscriber contacts your support team about a problem, Frontline makes it possible for that support team to bring up details on that location including network topology, connected devices, security events, and quality of experience (QoE) for each device and AP so that they can pinpoint and resolve the issue.



## Examples of Frontline use cases:

A subscriber says he is seeing poor WiFi performance across his network. CSP support uses Frontline to check the topology, ensure all nodes and APs are connected and have good QoE, and check speed test results in order to pinpoint the problem.

A subscriber says she has parental controls enabled and a website her teenage daughter needed for homework is being blocked. CSP support can see all Guard events, isolate that which is causing the problem and whitelist it so that access to that site is enabled.

A subscriber says that their network performance is slowing during peak hours. CSP support personnel can check the traffic during peak hours, identify that WAN bandwidth is being saturated—and either set up application prioritization to ensure good performance for the most important applications or suggest upgrading to a higher speed tier.

## WHAT IS QOE?

Traditional assessments of home-internet connection quality measure whether a network is fast or slow, but they rarely consider the specific devices within the home and what they need to work as intended. With this in mind, Plume created the Quality of Experience, or QoE metric, providing CSPs with a more accurate way to measure customer experience.

The QoE metric can measure whether a device has sufficient WiFi connection to ensure that the user's experience of that device or service will be good. A device is scored from 1 (the lowest value, representing a device that is working very poorly) to 5 (the highest, indicating that a device will have no issues that can be detected by the consumer). Plume's QoE scores factor the type of device, its needs and applications, and the condition of the entire network in which the device is operating, including signal strengths, data rates, packet error rates, interference, and self-congestion on each hop required to traverse the entire network.<sup>6</sup>

<sup>6</sup> "Measuring Matters: the Plume Quality of Experience Metric," 2022

# Signal

Signal enables your support team to monitor which locations are experiencing issues and send custom push notifications to subscribers experiencing key issues and proactively help them resolve those issues. The monitors are flexible—including the selection of different criteria and optionally using AND/OR conditions—to help enable a very wide range of use cases.



## Examples of Signal use cases:

A CSP wants to identify locations that have been offline for a long duration of time (e.g., 30 days) that have unsubscribed from the service and may need to be “archived”. The operations manager creates a monitor to detect this offline identification and downloads the locations list for investigation.

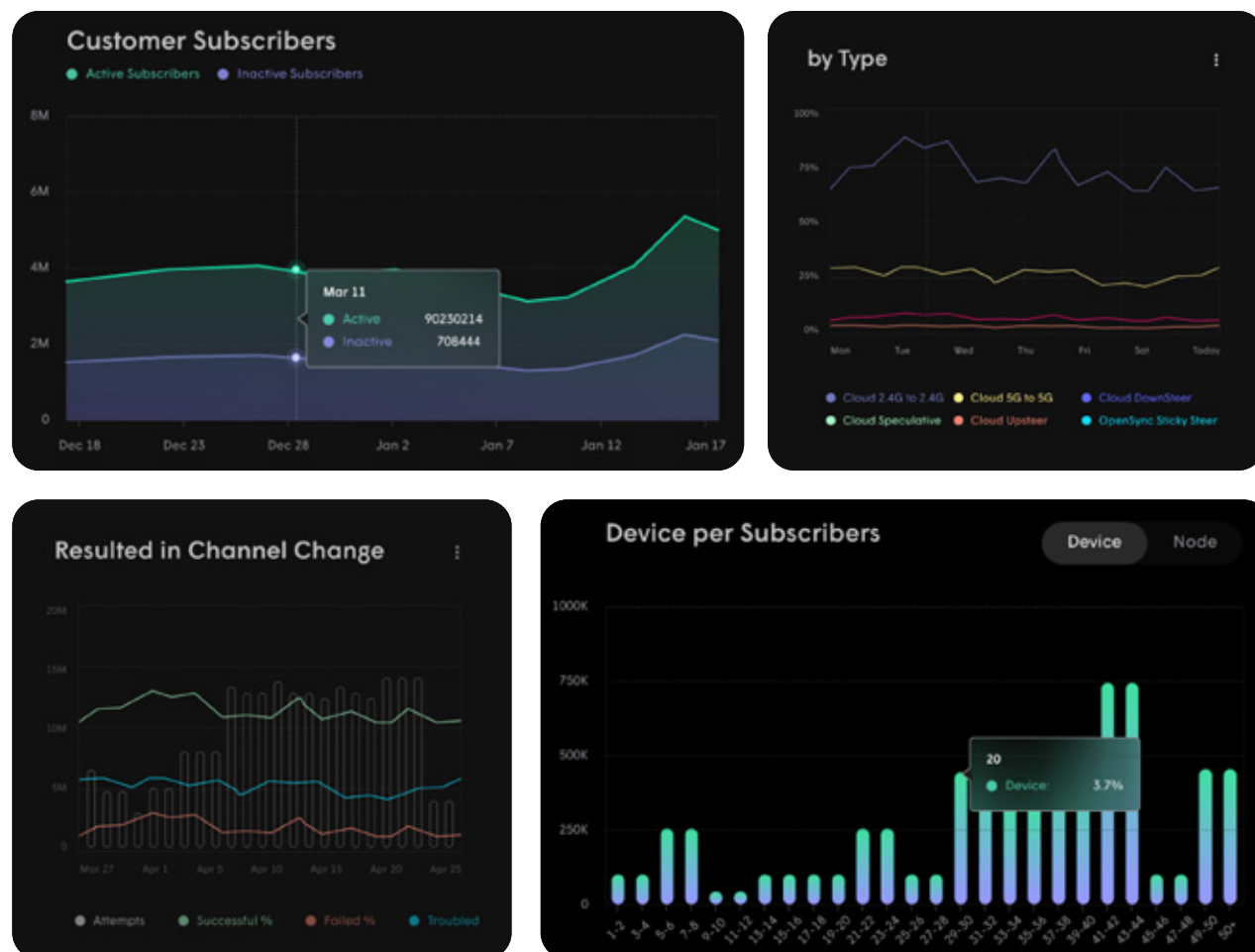
A CSP wants to proactively notify subscribers when there is an outage. The support manager sets up Signal to automatically send push notifications to subscribers as soon as an outage is detected using a machine learning algorithm that correlates users who go offline in a similar timeframe and location.

A CSP implements two different outreach messages for push notifications to alert subscribers with poor connectivity between pods that they need to move them closer together. The two messages are A/B tested to see which one more successfully resolves the issue.



# Panorama

With Panorama, you get a network and operations dashboard that provides a high-level, aggregated view of your Plume services. More than 25 individual dashboards help you see everything from threats that have been blocked by Guard, and the success of optimizations in Adapt, to which devices and device categories are most popular across the subscriber base.



## With Panorama, you can:

Compare the operational characteristics (interference, steering success rate, etc.) between different gateway or extender models. For example, the performance of a new model might be compared against an older model acting as a benchmark.

Use device type data to confirm a large percentage of customers have smart televisions. Then use speed chart to confirm that homes are receiving enough bandwidth to deliver at least two 4K video streams simultaneously.

Track threats such as malware, botnets, adware, phishing attacks, and other anomalies, and be ready to respond when a new threat emerges.

“Before our partnership with Plume, we had very limited insight into factors affecting the WiFi signals inside the home. We now have a much clearer view of customer issues through a range of diagnostics reports provided by Plume’s Haystack. This suite of customer service applications significantly enhances our ability to troubleshoot and remedy subscribers’ issues far more efficiently than we could before—this has led to increased customer satisfaction scores, which have risen from 6.3 out of 10 for standard Wi-Fi customers, to 9 out of 10 for JT Total Wi-Fi powered by Plume customers.”

— Tom Noel  
Chief Product Officer  
JT, U.K

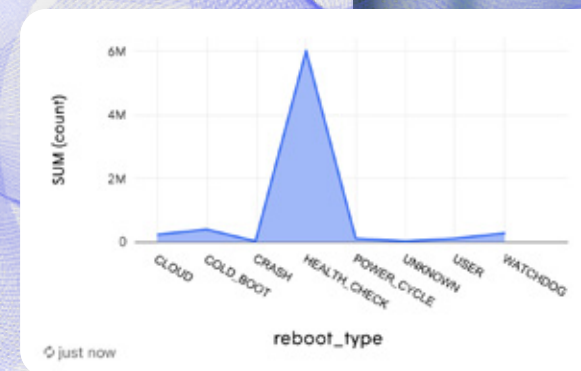
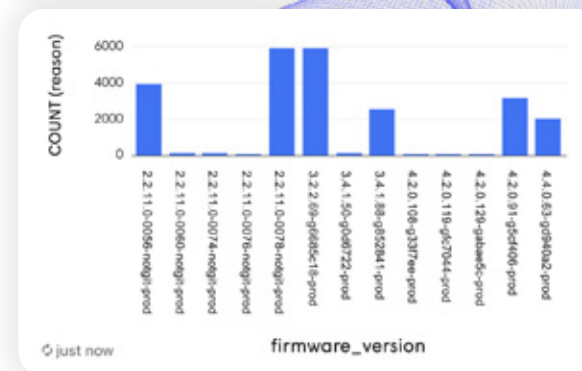
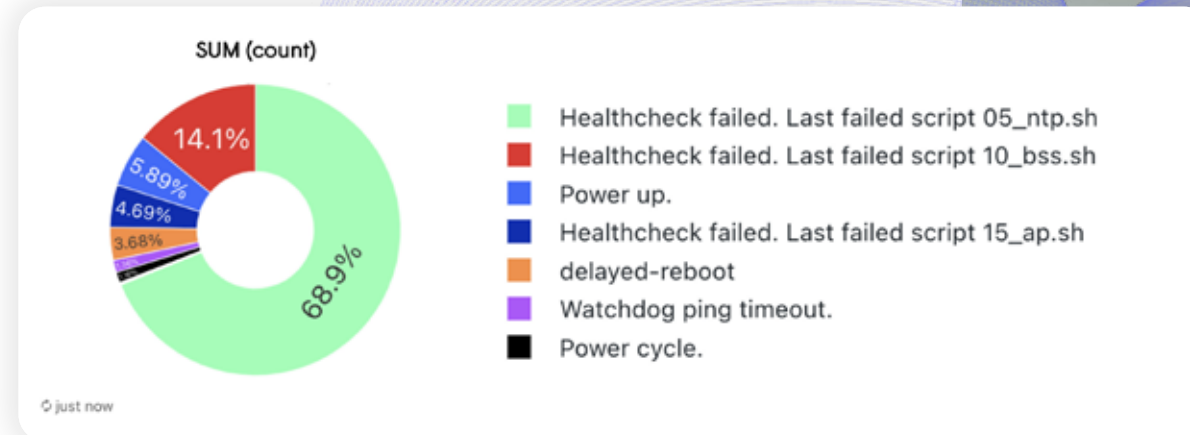
# QuerySight

QuerySight is the latest addition to the Haystack suite, designed to help CSPs collect, analyze, and visualize relevant datasets quickly. Using the query engine to access your data via SFTP, you can customize the data points to focus on what you care about. This includes location, license data, and access points (APs).

## With QuerySight, you can:

Directly access Plume data warehouse tables through Tableau (or a similar business intelligence tool) to create your own dashboard and display it alongside other dashboards for other services from other vendors.

Download tables from Plume and import them into your data warehouse. You can then perform queries that integrate Plume data with your data.



# Intelligent monitoring and proactive issue resolution with the new, updated Signal

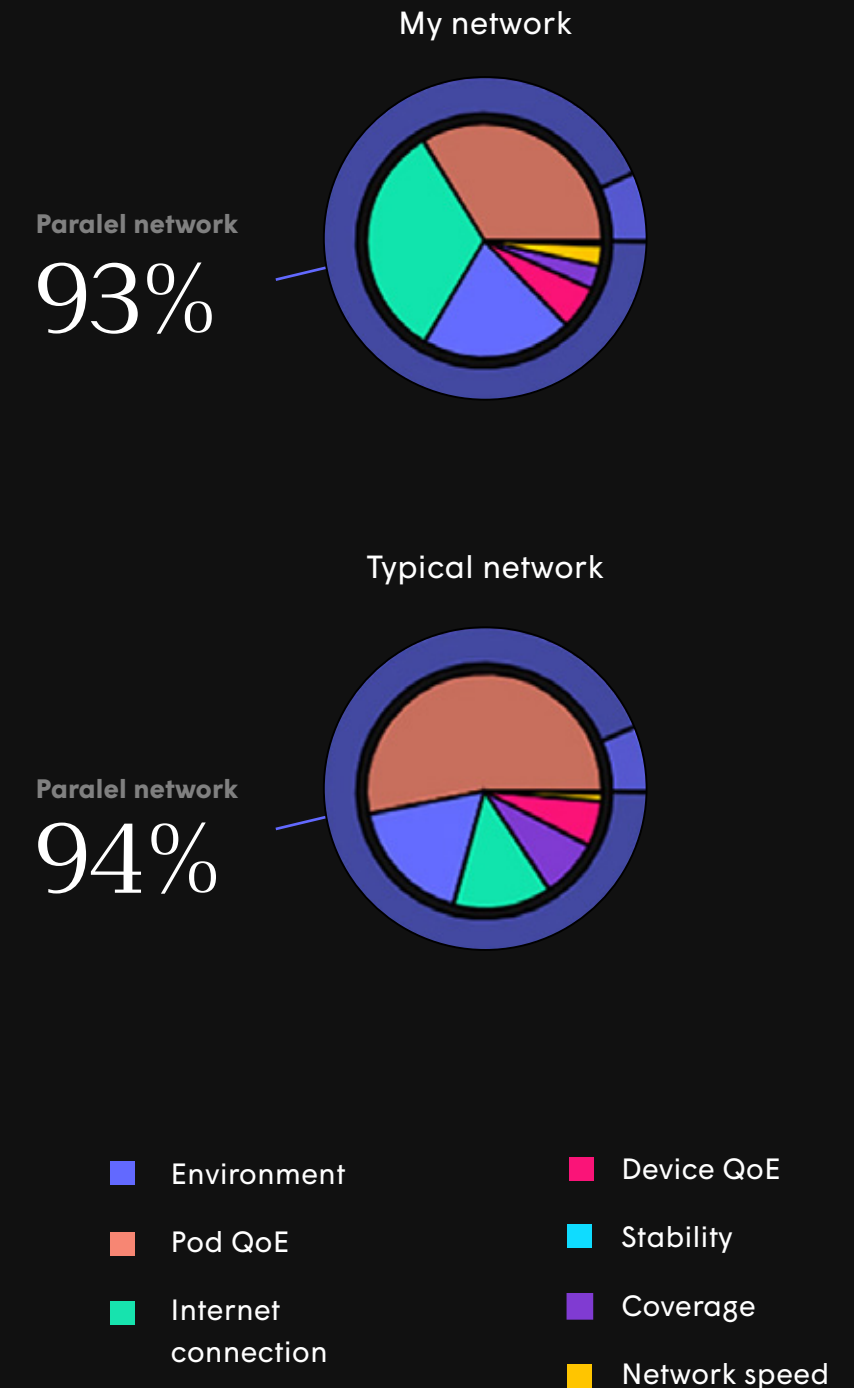
The combination of products in the Haystack suite can dramatically simplify the operations and support of subscriber networks. Bringing it all together is Signal, designed for CSPs to quickly and proactively serve their subscribers—offering CSPs a means to build goodwill and loyalty, and to reduce churn.

The updated version of Signal (released in 2023) is purpose-built to simplify the analysis of network issues and drill down to the specific locations being affected by those issues. It is designed to help support staff trouble-shoot faster or provide specific instructions to subscribers to help them solve their network problems.

Signal complements Frontline by aggregating data across all Service Provider locations, giving a bird's eye view of which locations are being impacted and allowing the Service Provider to take action accordingly. Its functionality is divided into two tabs: Health Summary and Monitor Summary.

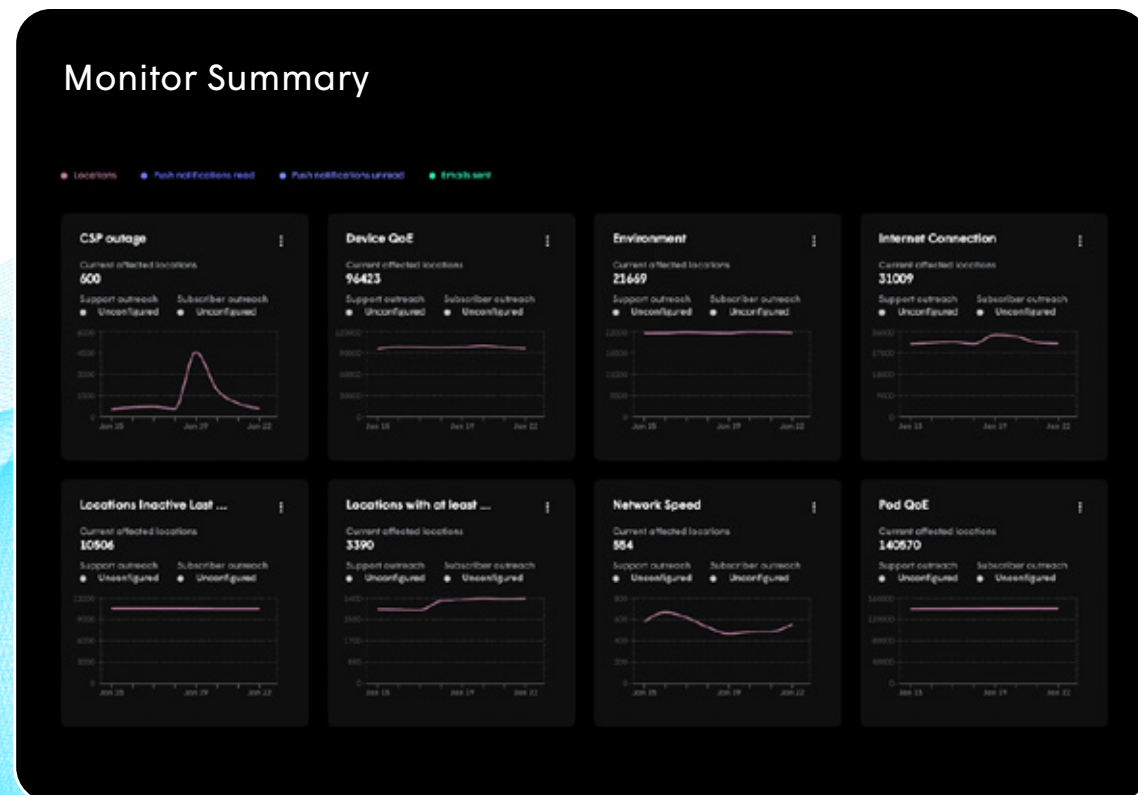
Health Summary provides a view of health scores and issue counts across the network. Issue categories and health scores in Signal mirror those from Frontline, thereby providing consistency across the two Haystack services. While the previous Signal version tracked four predefined issues, the new version tracks 15 different issues in seven different issue categories: Internet connection, stability, environment, network speed, coverage, device QoE, and pod QoE.

## BREAKDOWN OF HEALTH SCORE 0-100



The Monitor Summary tab incorporates monitoring (issue tracking with summary graphs) as well as the configuration of optional outreach (communications to support staff or subscribers).

With Monitor Summary, CSPs can dive deeper into these issues and track outages, duration, level of severity, and occurrence. For support staff, Signal can be configured to send real-time alerts to notify team members of network issues that need immediate attention. For subscribers, customize Signal settings to send push notifications communicating issues that subscribers can quickly resolve themselves, ideally without any assistance from the support team.



**Overall, Signal allows CSPs to get ahead of network issues before they negatively impact the customer experience, providing answers to questions such as:**

- Why do I have a lot more locations with a score of 0 than the “typical network?” And which issue type is driving that?
- I seem to have lower overall scores than the “typical network.” Is there one specific category or one specific issue that I have a lot more of? And which is driving those low scores?
- What is the most prevalent issue in my network?
- What is the most prevalent critical issue in my network?
- Do I have more critical issues than the typical network?
- Is my average health score better or worse than that in the typical network?
- Is my average health score getting better or worse over time?
- Are the push notifications I am sending to my subscribers causing an appreciable improvement in health scores?
- I saw a sudden drop in my health score. Is that a problem only for me, or has the “typical network” had a similar drop? And did an increase in issues in any specific category cause the change?

### HOW OFTEN ARE HEALTH SCORES AND ISSUES UPDATED?

Health scores and issues are updated in near real-time. There is generally, at most, a 15-minute delay since issues like device Quality of Experience (QoE) are calculated over 15-minute periods. Outreach based on thresholds must then be queued and sent, which may take, at most, another 15 minutes for a total maximum delay of 30 minutes.

### HOW DO I KNOW IF MY SCORES OR ISSUE COUNTS ARE GOOD OR BAD?

The Health Summary screen shows a comparison between “My network” (an aggregate view of your CSP network) and “Typical network” (scores across all networks on the same cloud). Issues and health scores for the “Typical network” are all normalized to the number of locations currently allocated to your network. If your average score is higher than that of the “typical network”, then yours is better than average.

# Conclusion

CSPs can gain a competitive advantage through the ability to capture, analyze and leverage AI and data to shape, customize, and optimize the customer experience. The combination of applications within Plume's Haystack suite puts CSPs in control, offering full network visibility so that they can achieve best-in-class support and higher subscriber satisfaction.

Available to both existing and new partners who deploy Plume, Frontline, Signal, QuerySight, and Panorama work together to offer:

- Browser-based data dashboards that provide visibility into WiFi health for each subscriber location and proactively alert support teams to issues.
- The ability to drill down and compare your network performance against a typical Service Provider's.
- Configurable monitoring rules to focus on the issues CSPs care about as well as support and subscriber outreach rules to help speed up resolution of these issues.
- Network performance tools capable of making automatic, performance-enhancing adjustments.

**To learn more about how Haystack can help transform your business, email us at [partner@plume.com](mailto:partner@plume.com) or visit [plume.com](https://plume.com) today.**



