SOLUTION OVERVIEW

ARUBA AI-POWERED MOBILITY

Autonomous network operation for smart digital experiences

In a recent survey covering 7,000 participants , the importance in providing a positive digital workplace experience was clearly illustrated. Organizations that implement a digitally-enabled workplace gain a competitive edge. The advantages of deploying new mobile first technologies go way beyond improving employee productivity. It also provides higher job satisfaction, as well as better overall customer and employee engagement.

To deliver an intelligent, personalized digital experience, the Wi-Fi infrastructure today must evolve. A self-learning and self-adjusting autonomous network is needed to keep up with the growth of mobility and IoT – one that is based on Machine Learning (ML), a branch of artificial intelligence. This document highlights examples of how Aruba is using ML to optimize wireless networks to deliver improved user experiences.

INTRODUCING ARUBA AI-POWERED MOBILITY

Aruba's AI-powered Mobility is based on optimizing three key areas of the wireless environment. First, the quality of the user's experience, second the radio frequency (RF) performance of a wireless network and finally, IT network operations. User connectivity, roaming and application performance metrics are monitored continually and baselined to ensure that users have a consistent and high-performing wireless connection.

Data is collected and analyzed via both supervised and unsupervised machine learning models. Aruba AI-powered Mobility implementations monitor, understand and automatically update RF and network settings to ensure that all users receive the optimal Wi-Fi experience – one that is reliable and keeps them productive.

WHAT IS MACHINE LEARNING?

Machine learning (ML) is an advanced branch of artificial intelligence that uses mathematical algorithms (models) to learn and make informed judgements from data, without being explicitly programmed for every situation. When presented with new inputs, ML then uses this data to provide intelligent insights or predict a specific outcome. Properly applied, ML is particularly well-suited to deal with complex problems such as Wi-Fi optimization or attack detection inside of an organization.

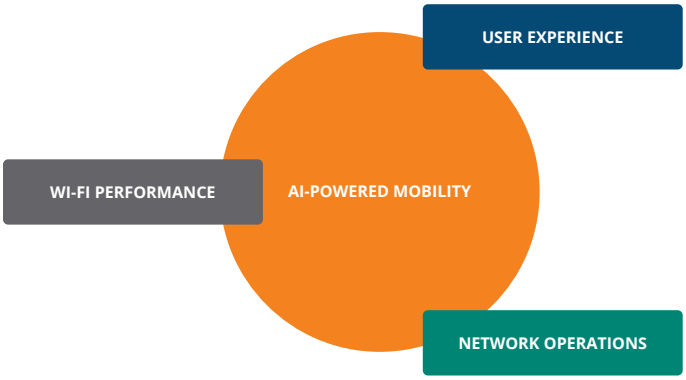


Figure 1. The three key components of Aruba's AI-powered Mobility solution

[1] The Right Technologies Unlock the Potential of the Digital Workplace, June 2018

By leading the mobile revolution and leveraging our domain expertise in Wi-Fi technologies, Aruba can use data science to optimize every aspect of performance across a wireless environment. The key components of AI-powered Mobility today are:

- **Aruba NetInsight.** NetInsight collects network operations data and applies both supervised and unsupervised machine learning algorithms to recognize changing patterns across the infrastructure and recommends network setting changes to improve Wi-Fi network performance for users, their devices and IoT.
- **AirMatch and ClientMatch.** As core components of ArubaOS 8, AirMatch and ClientMatch work in partnership with NetInsight to continuously monitor and optimize Wi-Fi settings such as power, channels, connections and bandwidth across the entire wireless network.
- **User-centric Service Assurance.** Simple-to-deploy sensors continuously assess network and application data from both wired and wireless connected users and devices. This combination of looking at both network and application performance metrics is what distinguishes Aruba from other client-centric solutions.

Aruba AI-powered Mobility operates both at the edge and in the cloud. While available separately, each component works in tight partnership by sharing the data and results, ensuring the Aruba infrastructure not only provides amazing experiences, but also increases the efficiency and effectiveness of the IT organization.

ARUBA NETINSIGHT FOR ADVANCED NETWORK ASSURANCE

There are two factors that influence how well a network performs and ultimately how the user's experience is measured. One is the wireless infrastructure and the other is the configuration and behavior of clients, including IoT devices. By collecting and analyzing traffic, client, RF characteristics and topology data for each access point and connected client, NetInsight uniquely understands both network operations and client behavior.

INTRODUCTION TO MACHINE LEARNING MODELS

Supervised Machine Learning models are built in collaboration between data scientists and domain experts. The goal is to develop a model that will make predictions based on data the model has never seen before. This is accomplished by training the algorithms on millions of data points related to the desired outcome.

Unsupervised Machine Learning is used to find previously unseen similarities in data (clustering) or associations between two data elements. The unsupervised models require no training or preparation. Data is simply presented to the model and the algorithm determines what the relevant patterns and outcomes are.

As a result, a network configuration or other variables can be tuned based on real data and activity. This includes how many clients are connected, what applications are being used, as well as changing roaming patterns.

NetInsight uses AI-powered analytics to proactively identify and preempt issues before users are impacted. The network acts as a sensor and delivers the precise data required for unsupervised and supervised machine learning models to automatically identify where efficiencies can be improved or potential problems may exist.

BOTH SUPERVISED AND UNSUPERVISED MODELS NEED TO WORK TOGETHER FOR PROBLEM SOLVING	
Use Case	**Benefit**
Unsupervised ML	
Best practice benchmarking	Learn optimal configurations from peer installations
Anomalous network behavior identification	Spot true service problems before they become user issues by separating random anomalies from underlying consistent patterns
Predict issues based on proposed configuration changes	Identify user impact before changes are made
Green AP's	Suggest turning off unused AP's in the evening to conserve power
Supervised ML	
Recommend configuration changes for improved performance	Change network settings based on model recommendations
Filter out false positives due to casual roaming	Reduce wasted time and effort on issues that have no user impact
Root cause analysis	Accelerated diagnosis and remediation

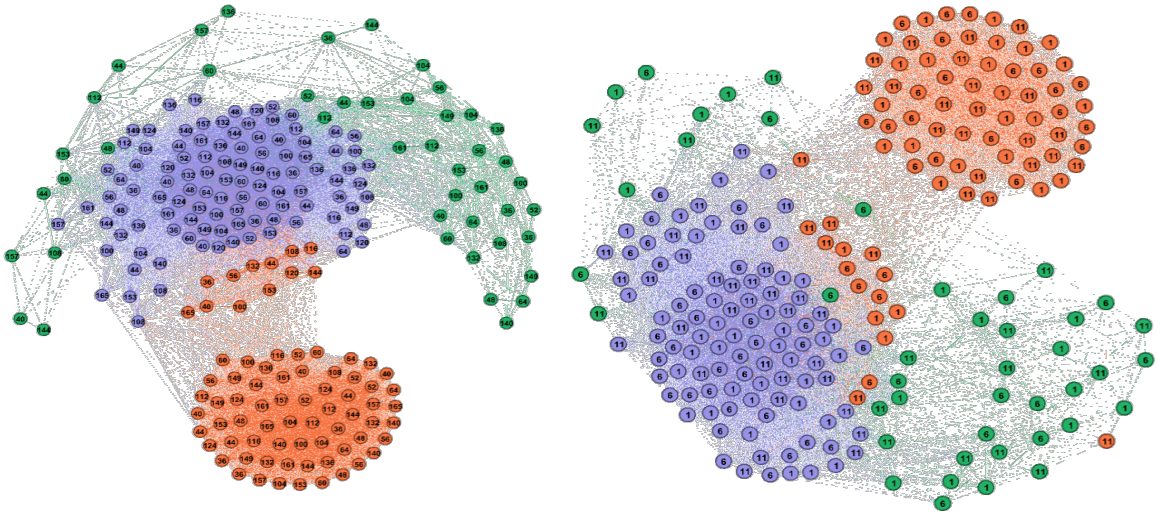
Once the analytics detect problems, NetInsight recommends specific remediation. This includes suggested wireless configuration changes, some which are RF specific, and are automatically implemented via AirMatch and ClientMatch. Change validation data can also be used to determine whether changes to a network configuration or settings will improve or degrade performance.

Proactive identification and repair of potential issues reduces the number of help desk calls and minimizes troubleshooting and problem resolution times. IT no longer needs to guess at what is causing potential problems, can understand where to make changes and focus on more proactive projects.

ARUBAOS 8 WITH ML OPTIMIZATION

ArubaOS8 features AirMatch and ClientMatch, which use advanced analytics to optimize network performance from both the RF as well as the client perspective. AirMatch uses proven, patented technology that automatically manages the RF spectrum for the entire network. The RF utilization in an environment is dynamically adjusted to maximize Wi-Fi stability and predictability, to ensure optimal performance for all clients and applications – without IT intervention.

Machine learning is utilized to automatically monitor channel, power and bandwidth settings to generate the best RF environment across all access points. AirMatch is especially effective in noisy and high-density environments where manual techniques make it difficult to find clean or free air space.



5GHz Channels 2.4GHz Channels

Figure 2. AI generated RF clusters

Unsupervised machine learning models create a network topology of similar access points. Once these clusters are identified, AirMatch uses proprietary algorithms, perfected through years of experience, to automatically set key power, channel and bandwidth settings to ensure even channel use, reduce interference and maximize system capacity.

ClientMatch has been supported since ArubaOS6.x and focuses on the problem of monitoring and proactively maintaining Wi-Fi device connectivity to the AP that will service it best. It addresses challenges with sticky clients, band selection and spectrum load balancing by intelligently updating connections based on device types and how they inter-operate with the network.

USER-CENTRIC SERVICE ASSURANCE

For IT teams that are tired of sending out user surveys to see how Wi-Fi is performing, Aruba's user-centric service assurance solution can help automate this process. Simple-to-deploy sensors and cloud-based analytics provide a wealth of data about a user's or device's experience while connecting to the network, and how business-critical applications are performing.

The sensor is placed at the same height where user's devices are typically placed and are programmed to run simulated user-centric tests over Wi-Fi or Ethernet connections. Pre-configured or custom defined tests help monitor the most important apps and services. Tests can be set up to measure the responsiveness of DHCP, DNS, authentication, captive portals, cloud and internal applications

In addition to providing real-life insights into the Wi-Fi experience, the data from sensors provide important context. By monitoring app responsiveness for worry-free access, IT is able to get in front of service issues before they occur, and also reduce the time and effort normally required to go on-site, diagnose a problem and put a resolution into place.

AUTONOMOUS WI-FI DELIVERS ROI

IT budgets are flat and talent is scarce. By seeing across the entire network and analyzing high volumes of user, network and RF data, techniques like Machine Learning are like highly intelligent IT "specialists" that are always working. Problems are seen before they cause disruptions, intermittent issues take minutes and not days to solve and intelligent filters block out the white noise that wastes time and energy. Doing more with less and getting a better result—that's the ROI of Aruba's AI-powered Mobility solution.

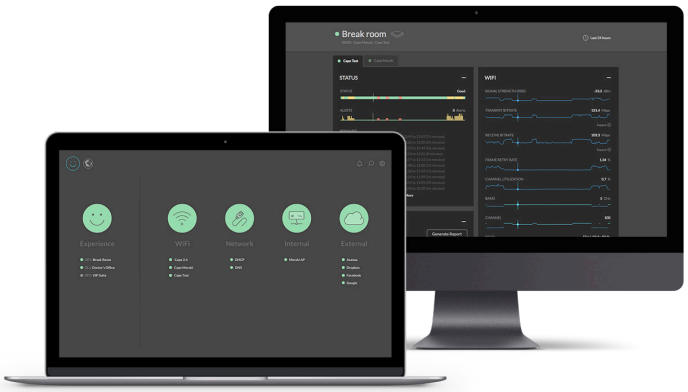


Figure 3. The simple to use web-based dashboard provides detailed diagnostics and insights.

SUMMARY

Aruba not only delivers intelligent, personalized user experiences, but also the automation and operational data to improve the efficiency and effectiveness of any IT team. With analytics and insights drawn from just the right data applied to proven machine learning models, only Aruba combines the practical domain expertise and over of 16 years of Wi-Fi leadership with the data science needed to deliver a highly tuned, autonomous mobile network.

SO_AIMobility_092118