

# TEApot: Proactive Wi-Fi Management Suite

## REDUCE SUPPORT COSTS & CHURN

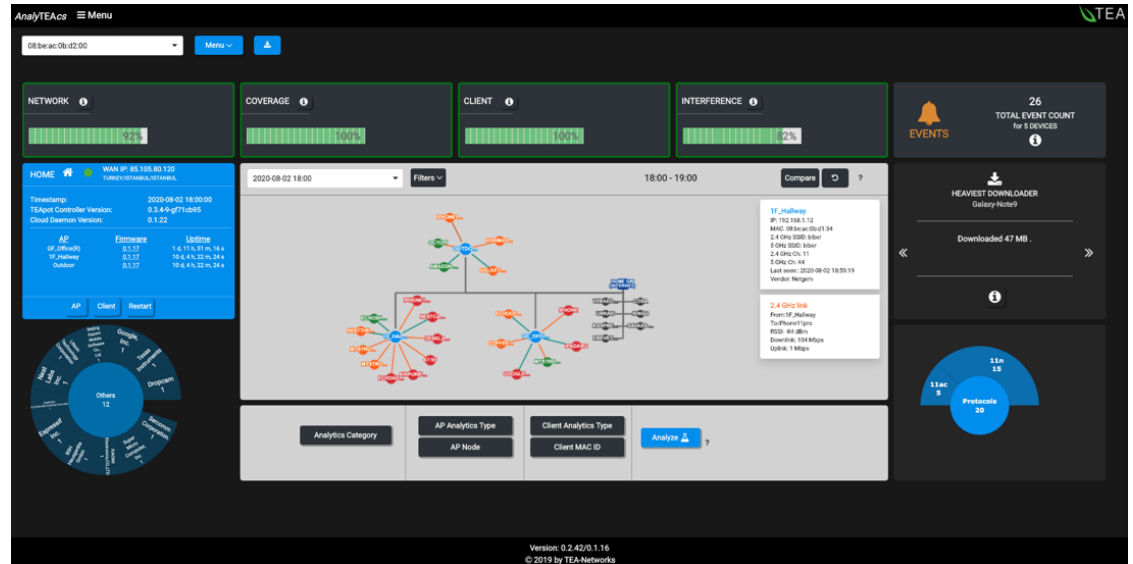
With predictive and proactive maintenance, support starts automatically long before the end-user calls.

## TARGET THE RIGHT CUSTOMERS FOR UPSELL

Identify users with poor Wi-Fi coverage, broadband speed bottlenecks, client and data consumption profiles who match for a higher tier subscription or hardware upgrade.

## TRACK KPIS AND TRENDS

Tracking Wi-Fi KPIs across customer portfolio provides valuable knowledge that allows ISPs to optimize their support process.



Available managed Wi-Fi and managed Wi-Fi Mesh solutions heavily rely on specific functionalities of hardware, which lack interoperability. These vertically integrated solutions are not embraced by the ISPs for residential Wi-Fi management due to high investment requirements for deep integration and maintenance costs. They also create a strong vendor lock-in, which ISPs try to avoid.

Moreover, existing solutions in the market are merely descriptive. They capture large amounts of data from equipment, display information, such as congestion, lack of network coverage and interference, and most importantly, necessitate professionals to analyze the results for diagnosis, which slows down the response time and increases the operational cost.

Simple problem detection, which is characteristic of descriptive analytics, might be helpful in responding to customer complaints to some extent. However, it often does

not avoid negative perception from customers. Reacting to a service problem after it has occurred, in most cases, is not good enough. However, it often does not avoid negative perception from customers. Reacting to a service problem after it has occurred, in most cases, is not good enough.

TEA's innovative solution, TEApot Proactive Wi-Fi Management Suite comprises (local) and cloud software modules that provide comprehensive, hardware-agnostic, real-time AI-driven, network management. TEApot facilitates predictive maintenance and proactive control of home Wi-Fi networks, thus avoiding customer dissatisfaction.

TEApot is architected fully embracing the Wi-Fi EasyMesh standard. A Wi-Fi network serviced by a CPE that supports EasyMesh standard is fully manageable by TEApot thus significantly reducing integration efforts enabling fast deployments without device vendor lock-in.

### VENDOR AGNOSTIC MESH SUPPORT

TEA's embedded controller leverages Wi-Fi EasyMesh standard to setup and manage CPEs from any vendor which support the standard.

### DASHBOARDS FOR EVERY USER LEVEL

Dashboards are available for end-user, first line support, second-line support and big picture population analytics.

### ADVANCED TOOLS FOR SECOND LINE SUPPORT

Further detailed on-demand analytic tools are available to agents to dig deep into the details of a particular problem effectively.

## Components

TEApot comprises two hardware-agnostic software modules

One of the modules, embedded (local) controller, runs at the embedded device, e.g., Gateway (GW), that resides in home, and the other module, cloud controller, runs at the cloud. TEApot's cloud controller (TEApot CC) is architected to carry out millions of concurrent real-time two-way communication with TEApot local controllers.

### TEApot Cloud Controller

Cloud controller is responsible for long term data analysis, such as, pattern recognition, inter-network data correlation, and long term decision and policy making. TEApot's local controller, TEApot Embedded Controller (TEApot EC), delivers collected and refined data, as well as, metadata to the cloud, and also receives and executes commands from the cloud controller. TEApot EC (Local controller) is responsible for intra-network, device-to-device communication, data collection, short term data analysis, and real-time network actions (such

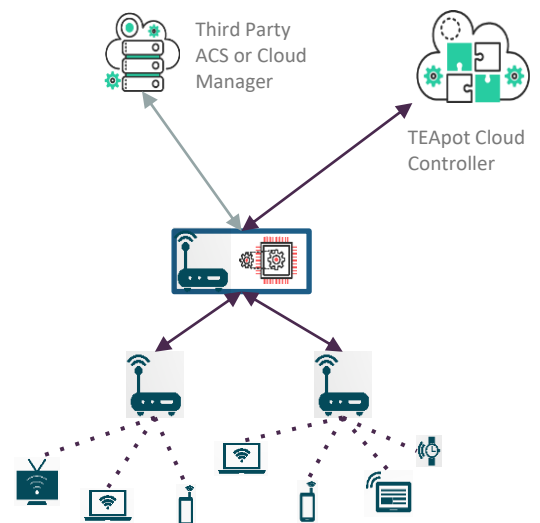
### TEApot Embedded Controller

TEApot EC supports Wi-Fi EasyMesh standard, thus, it can control/manage any EasyMesh compliant AP (running EasyMesh agent) in the network. TEApot detects coverage and performance problems by monitoring user statistics, and recommends solutions, such as, relocating the wireless modem (router) or adding a mesh AP to the network. TEApot recommends possible locations for placing the modem and mesh APs.

TEApot predicts problems and acts proactively to remedy these problems. Congestion in specific channels and AP resources are predicted and prevented by balancing the load between APs and channels before congestion happens. Misbehaving clients are learned automatically and treated specially across the home network. For example, clients which drop their connection when roaming across APs are learned and they are not allowed to roam when they are actively using a session sensitive service such as VPN, Voice over Wi-Fi or online gaming.

## Key Differentiators

- Predictive Wi-Fi channel management
- Cloud optimized client & AP steering
- Chipset and CPE vendor agnostic managed Multi-AP solution leveraging Wi-Fi EasyMesh standard
- Cost-effective analytics engine starting analytics right on the CPE.
- Interoperation/working alongside ISPs exiting ACS.



### ARCHITECTED GROUND UP FOR WI-FI

Smart algorithms applied at the CPE increase data entropy over 20 folds before sending it to cloud.

### INTUITIVE WEB APP

Secure device onboarding, problem resolution insights, upsell recommendations and QoE reports.

### API FOR ISP BACKEND AND MOBILE APP INTEGRATION

Full functionality supported through TEApot Apps are available also through API. TEApot can be integrated with ISPs' in-house systems as well as installer and end user companion mobile Apps.

## Architecture

### Proactive Maintenance

Predictive analytics service runs periodically and in real time in response to device initiated alarms warnings and notifications. Trained Machine Learning (ML) models (with domain optimized algorithms) for the home are utilized to enable fast and accurate inferences. This radically simplifies WLAN administrative tasks—from day-to-day management.

### Architected Ground-Up for Wi-Fi

Unlike TEApot, available solutions rely on continuous periodic data collection from CPEs without any smart algorithms applied at the local entity to determine which data to collect and how often to collect. At the cloud system, AI-based methods, which are not originally designed for analyzing Wi-Fi data, are applied to extract information from the collected data. Invaluable data with informational value constitutes a very small fraction of the total carried data due to huge amounts of misleading data unnecessarily carried to the cloud. These misleading data obfuscate data analysis and pattern recognition, and make the network diagnostics not only difficult but also slow and inefficient. Due to this inefficiency, unlike TEApot, available approaches lack capability to run population wide proactive maintenance.

### Smart Data Collection

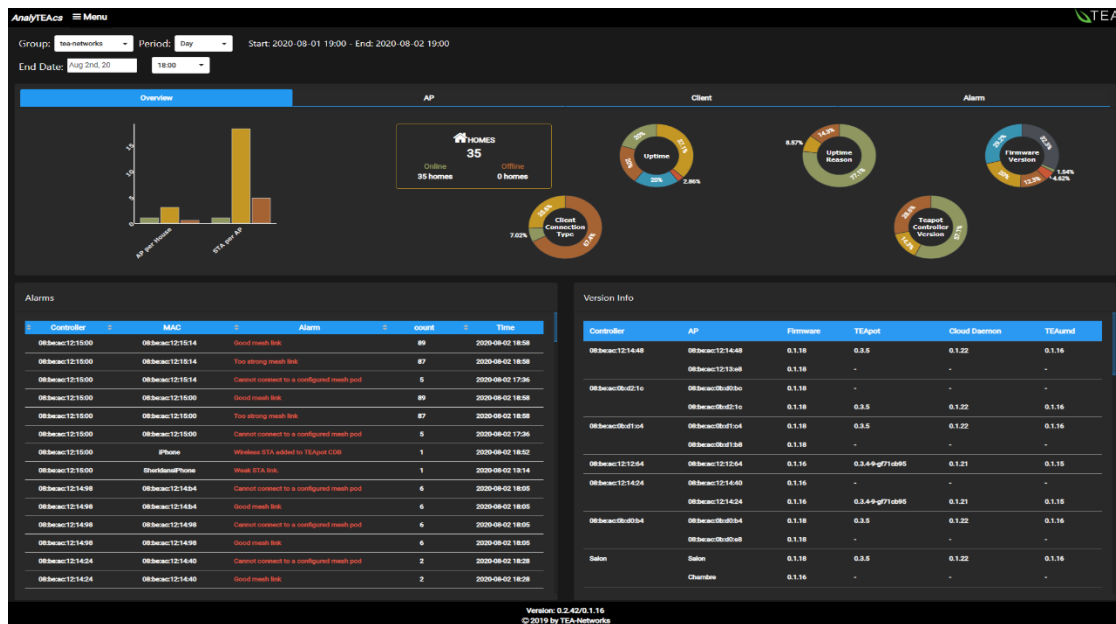
The frequency and types of data collected from each CPE is managed by profiles and self optimized at runtime for each device. Data collection frequency and parameters tracked are reduced automatically for CPEs with high network quality scores. Device or cloud originated alarms and notifications may change data collection profile of any device in the network independently.

### Intuitive Web App with Streamlined Workflows

ISPs can see the health of their network at a glance and identify issues before they affect users. End-users view and manage their home networks, have guidance in set-up and optimize their mesh networks. First and second level support agents can see real time and historical view of a particular home network with the ability to run on demand advanced analytics

### API

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## Features Summary

Proactive Management	<ul style="list-style-type: none"> <li>• Predictive Wi-Fi Channel management</li> <li>• Predictive Load balancing (available soon)</li> </ul>
Wi-Fi KPI tracking	<ul style="list-style-type: none"> <li>• Network, Coverage, Client and Interference scores for each home, groups to compare and entire population</li> <li>• KPIs for each prescribed time slot. (default is 1 hour)</li> </ul>
Wi-Fi Radio Control	<ul style="list-style-type: none"> <li>• Enable/Disable Radios</li> <li>• Remote Wi-Fi Credential management</li> <li>• Manual, client optimized and cloud optimized predictive channel management</li> <li>• Guest SSID with scheduling capability</li> </ul>
Client Access Control	<ul style="list-style-type: none"> <li>• Per BSSID client access control management across the customer network.</li> <li>• Scheduling cabality for access control per client</li> </ul>
Topology view	<ul style="list-style-type: none"> <li>• Real-time and historical topology view of a home network</li> </ul>
Alerts and Notifications	<ul style="list-style-type: none"> <li>• Ascyronous embedded controller initialed alarms and notifications trigger immediate auto-corrective actions and alert subscribed users when necessary (Ex. TOO_MANY_RESTARTS , STA_COVERAGE_PROBLEM, NODE_DISCONNECT, NODE_NOT_RESPONDING, WEAK_MESH_LINK, WEAK_STA_LINK, CONTROLLER_RESTART, POD_REBOOT, NEW_STA... etc)</li> <li>• Periodic alarms and notifications are generated by both embedded controller and cloud controller in tandem with analytics engine (Ex. DEGRADED_NETWORK_KPI , ABNORMAL_CLIENT_BEHAVIOR, ANOMALY_IN_TRAFFIC - ...ETCWEAK_STA_LINK, CONTROLLER_RESTART, POD_REBOOT, NEW_STA... etc)</li> </ul>
Client Steering	<ul style="list-style-type: none"> <li>• Cloud optimized client steering</li> </ul>
AP Steering	<ul style="list-style-type: none"> <li>• Cloud optimized AP steering in mesh networks</li> </ul>
Onboarding	<ul style="list-style-type: none"> <li>• One-touch secure mesh setup and configuration</li> <li>• Automatic Wi-Fi configuration and profile installation of first time installed controller.</li> <li>• Secure and automatic backend account creation when controller is installed for the first time</li> <li>• Secure account recovery flows leveraging end user physical pod access</li> </ul>
Advanced Analytics	<ul style="list-style-type: none"> <li>• On demand advanced AP analytics for arbitrary time slots such as; RSSI &amp; Download, TXRate &amp; Download, Daily Download Distribution, RSSI Histogram, TX Rate Histogram, Daily Activity Distribution, Activity Distribution per AP, Activity Distribution per Interface</li> <li>• On demand advanced Client analytics for arbitrary time slots such as; Tx Op. Timeseries, Tx Op. Histogram Tx Op. Daily Distribution, CCA Timeseries, CCA Daily Distribution</li> </ul>
Remote Upgrade	<ul style="list-style-type: none"> <li>• Firmware upgrade</li> <li>• Embedded controller upgrade with zero downtime</li> <li>• Embedded cloud daemon upgrade with zero downtime</li> </ul>