Why Wi-Fi is key to a successful broadband service

White paper

A broadband service is only as good as the weakest point which is usually the last few meters, namely the in-home Wi-Fi network. Service provider managed Wi-Fi gives the tools to manage both legacy and new Wi-Fi assets and provide a premium broadband service all the way to the connected device.

Contents

Introduction

Communications service providers (CSPs) deliver brilliant broadband to homes and businesses using various access technologies like fiber-to-the-home (FTTH), copper (VDSL2), or fixed wireless access (FWA). In many countries, residential customers can subscribe to 1 Gb/s broadband access services.

However, the broadband experience is only ever as good as the in-home Wi-Fi. If the Wi-Fi network performs below par, the whole experience is bad, regardless of how good the service to the home is. Of course, the customer doesn't know or care whether the problem is with their Wi-Fi or their broadband; their CSP will get the blame either way.

Wi-Fi coverage is an important parameter in the broadband experience, especially as family members are often spread out around the home, all needing a fast broadband connection at the same time. So, high-performing, whole-home Wi-Fi has become essential for CSPs to be successful in offering broadband services, especially higher-tier services. But there are two specific challenges for CSPs to consider:

1. Most customers don't know how to get the best performance from their Wi-Fi, let alone how to adjust all the Wi-Fi parameters.
2. Most homes still have Wi-Fi access points (APs) that support older Wi-Fi technologies, like Wi-Fi 5 or even Wi-Fi 4. If the broadband experience were improved for these customers, CSPs could prolong the life of these APs, avoiding a sudden spike in investment to upgrade them to the latest Wi-Fi 6.

CSPs get a lot of Wi-Fi-related calls at their helpdesks; we estimate that about 60% of all helpdesk calls are Wi-Fi related. Helpdesk agents have to follow a trial-and-error method to solve issues as they have no visibility into individual networks. This leads to long helpdesk calls (20-30 minutes each); and then 10% of those calls typically end up with a technician having to go on-site. All of this adds up to a significant operational expense.

The best way to ensure the best Wi-Fi performance for customers, and the best overall broadband experience across the whole customer base, is with a managed Wi-Fi service. The simpler, better user experience results in:

- The number of helpdesk calls and truck rolls being reduced by an estimated 30%.
- The net promotor score (NPS, indicative of customer satisfaction) increasing 10 to 40 percentage points.
- The number of premium customers increasing by 30-45%.

Service provider managed Wi-Fi

The objective of a "service provider managed Wi-Fi" solution is to help customers get the most from their Wi-Fi. The majority of Wi-Fi households have a single access point, likely integrated into their residential gateway or tethered to their broadband modem via Ethernet. A single AP home may benefit from the latest Wi-Fi technology, such as Wi-Fi 6, which would require new hardware deployments. Alternatively, it can be optimized with a managed Wi-Fi service or extended with a second access point, commonly known as mesh Wi-Fi or whole-home Wi-Fi. Mesh Wi-Fi improves Wi-Fi coverage and the quality of the customer experience. But the need for managed Wi-Fi grows exponentially with mesh Wi-Fi (multiple mesh APs) because it adds another layer of complexity that requires management of the mesh backhaul between two mesh access points.

A service provider managed Wi-Fi solution ensures the best possible broadband experience by:

- Automating the Wi-Fi optimization process as much as possible, resulting in a self-optimizing network.
- Dynamically adjusting Wi-Fi settings to mitigate any potential issues and provide the highest throughput to all devices.
- Giving CSPs the tools to effectively manage Wi-Fi-related problems when they occur.

This requires two levels of Wi-Fi optimization: local optimization in the in-home Wi-Fi network and remote, cloud-based optimization.

Local Wi-Fi optimization

Wi-Fi is a dynamic medium. The wireless environment constantly changes: think of interference from neighboring Wi-Fi networks; household appliances being switched on and off that can also interfere with Wi-Fi (microwave ovens, Bluetooth devices, baby monitors); users moving around; and so on. A lesser-known issue is with radar. If, for example, weather radars start scanning, regulations in many countries state that Wi-Fi access points in the neighborhood need to back off from the frequencies being used (Dynamic Frequency Selection or DFS channels).

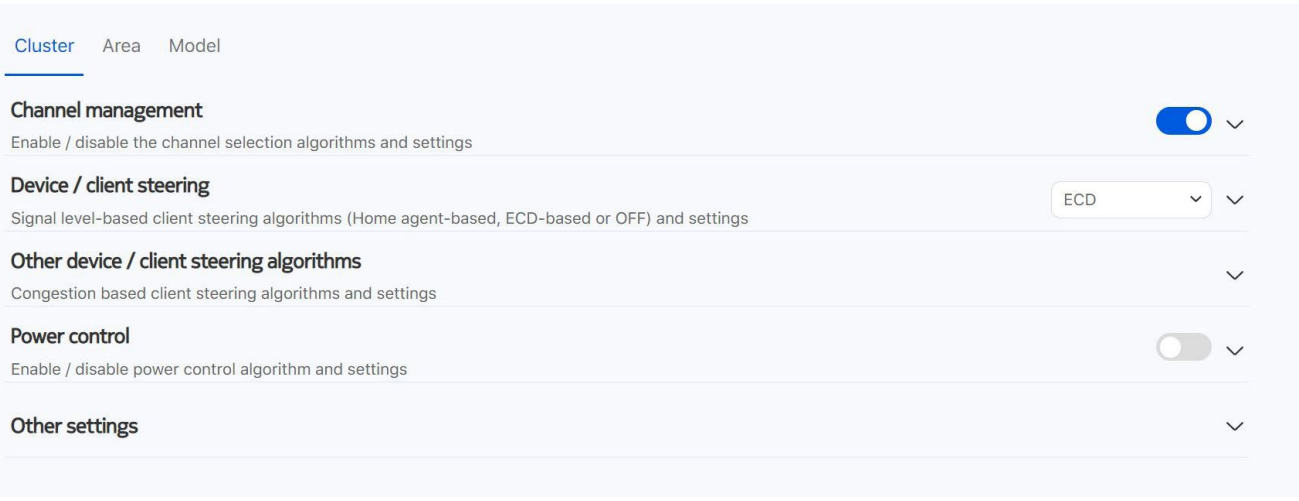
Wi-Fi APs need embedded algorithms to detect and mitigate issues like these in real-time. In the case of interference, a different channel needs to be selected. But think also of band steering and client steering that need to happen in real-time. This is what we refer to as real-time, reactive Wi-Fi optimization or “self-optimizing” Wi-Fi.

Cloud-based Wi-Fi optimization

Additional algorithms in the cloud can complement local optimization with a more thorough, proactive Wi-Fi optimization through data collection and computational power. The data is collected anonymously without any correlation to personal data (GDPR compliant) and the algorithms will analyze the data and take action, changing Wi-Fi parameters or even enforcing certain policies, and providing alerts and reports. In addition, the cloud brings visibility of neighboring Wi-Fi APs, so that the impact of one AP on another can be mitigated.

Typical examples of that proactive Wi-Fi optimization are transmit power control, long-term frequency planning, load balancing across channels and bands, and so on.

Figure 1: Cloud-based Wi-Fi management GUI



Managing various types and brands of AP is facilitated by the industry transition towards TR-369, also called User Services Platform (USP), as a common communication protocol between access points and the cloud platform.

Wi-Fi management use cases

There are four main use cases for Wi-Fi management.

Managing new deployments

CSPs always like to consider the future. Deploying devices today that have local intelligence combined with cloud-based optimization avoids complex and costly updates further down the line.

For new deployments, CSPs can balance the activities that need to be done locally (reactive actions in real-time) against those that can be done proactively in the cloud. Local actions can include band steering and client steering, while cloud-based actions can include channel selection, transmit power control, and load balancing traffic across the Wi-Fi channels.

Managing legacy deployments

The majority of Wi-Fi APs in homes today are Wi-Fi 5 capable. But in terms of client devices, the situation is far less predictable; most webcams today still only support Wi-Fi 4. If a CSP can manage Wi-Fi networks from the cloud and optimize them for the way client devices connect, then the CSP doesn't have to immediately replace APs. Prolonging the life of those devices equates to valuable CAPEX savings.

For legacy APs that do not have self-optimizing embedded algorithms, it is equally important to be able to manage them from the cloud, optimizing all the Wi-Fi parameters of the AP. This means CSPs can manage all Wi-Fi APs regardless of technology or vendor.

Some of the actions that need to be taken are:

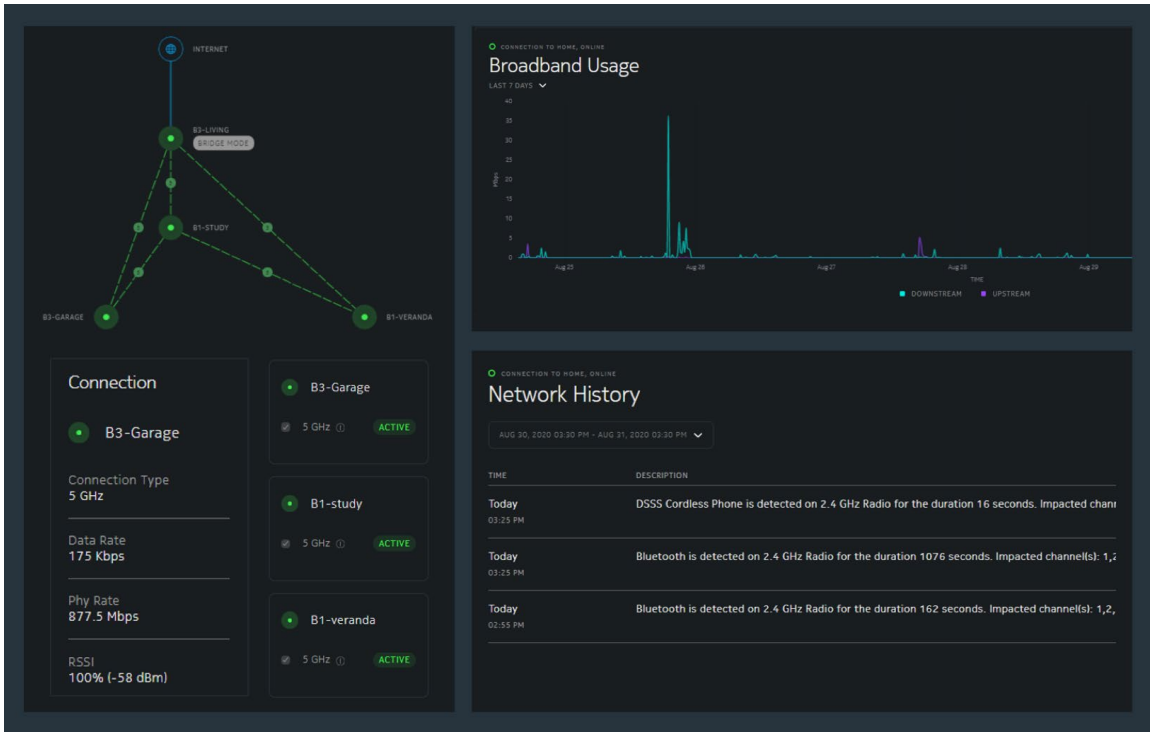
- Enforcing use of the correct channels (e.g., only using channels 1, 6, or 11 on the 2.4 GHz band) to minimize neighboring interference.
- Driving client devices as much as possible to the 5 GHz band.
- Ensuring client devices use a channel width of 80 MHz (if they support it).

In addition to the two-level Wi-Fi optimization, a cloud platform can bring two more benefits.

Give helpdesk agents real-time visibility

Wi-Fi is intangible to both the end-user and the help desk agent. What if a managed Wi-Fi service could help the help desk agent with troubleshooting end-user problems? A managed Wi-Fi platform can give agents real-time visibility of the in-home network, giving information about the network topology, the connected devices, traffic patterns, and so on. This information allows help desk agents to pinpoint anomalies and solve customers' issues very quickly. This way, both the time needed to solve an issue and the number of truck rolls can be reduced.

Figure 2: Real-time visibility of the in-home Wi-Fi network



Obtain network-wide KPI reporting to track Wi-Fi network performance

A CSP can also obtain detailed reports about the performance of all their Wi-Fi networks. These reports can then be used to detect anomalies offline and manually step in and further optimize performance.

Another useful tool is an AP ranking system that gives a list of, for example, the 100 APs that have been rebooting the most or that are most susceptible to interference, again to enable further investigation and performance optimization.

Conclusion

A service provider managed Wi-Fi solution can optimize Wi-Fi performance for all customers— both those with the latest Wi-Fi technology (ensuring that this technology is used to the maximum effect), and those with older Wi-Fi (giving these devices an improved performance and extended life). The key component of this Wi-Fi optimization is a cloud platform from which both types of device can be managed and optimized.

Combined with embedded algorithms in the Wi-Fi APs, CSPs can bring the best performance to their customer base, ensuring the best overall broadband experience. The outcomes are reduced OPEX, reduced customer churn, and increased revenue generation by selling more higher-tier broadband and other value-add services.

Abbreviations

AP	Access point
CAPEX	Capital expenditure
CSP	Communications service provider
DFS	Dynamic Frequency Selection
FTTH	Fiber-to-the-home
FWA	Fixed wireless access
GDPR	General Data Protection Regulation
GUI	Graphical user interface
KPI	Key performance indicator
NPS	Net promoter score
OPEX	Operational expenditure
USP	User Services Platform
VDSL	Very-high bitrate digital subscriber line

For more information about Nokia's WiFi solution, click here.

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