

Wi-Fi analysis from client perspective

White Paper

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1 Introduction

This white paper presents client based Wi-Fi scanning and analysis, explains its importance for effective network debugging and compares the solution to other, more classic, approaches.

2 What is the client perspective?

Wi-Fi clients connect to wireless networks thru Access Points (AP). Usually, multiple APs provide radio connectivity over larger areas.

Typical connectivity challenges in such environments include but are not limited to:

- Poor coverage in some areas
- Wi-Fi interference
- Non Wi-Fi interference/elevated noise
- Incorrect roaming behavior
- AP or Client failure/misconfiguration

Wi-Fi clients experience unique set of above problems, which are also location dependent. The Wi-Fi clients' mobility further complicates the situation by rendering those values time variant.

As the result, each Wi-Fi client is faced with different set of conditions at any given moment. Those conditions can negatively affect client's connectivity, in some cases even causing the connection drops.

Having insight in client perspective makes it a lot easier to understand, solve and possibly prevent connectivity problems in Wi-Fi networks. Compared to wired networks like Ethernet LAN, wireless networks are far more demanding and difficult to analyze.

3 Wi-Fi analysis approaches

With its inherent layer 2 complexity, analyzing and debugging Wi-Fi networks poses a considerable challenge. This section discusses how this can be done.

3.1 Third party analyzer

Often when deeper analysis of Wi-Fi network is required, an analyzer tool is used. They could be coverage or protocol analyzers, which help understand network behavior.

This approach provides a very detailed information but has one, fundamental weakness – “here and now”, a spot-check like testing that is very detailed in just a few spots and gives very little information what happens outside those points. Hence, it is very difficult to find intermittent problems with a third party analyzer.

3.2 Infrastructure perspective

Modern, controller based Wi-Fi networks provide very comprehensive information and statistics on various performance-related parameters. As powerful as they are, they still do not address all the issues – things like local radio interference, bad roaming behavior and, above all, what happens to clients when they are not connected stay below the radar for the controller.

Additionally, APs can act like sensors providing more useful data; however, they are bound to their physical locations and cannot follow the clients to collect more relevant measurements.

3.3 Client perspective

Debugging Wi-Fi networks using the same position and preferably the same network card as the Wi-Fi clients gives number of advantages. Radio conditions always reflect what client “sees”, position is always factual, an insight in client’s radio parameters and the IP stack helps understand if roaming decisions are taken correctly and what happens when the client loses connection to the network.

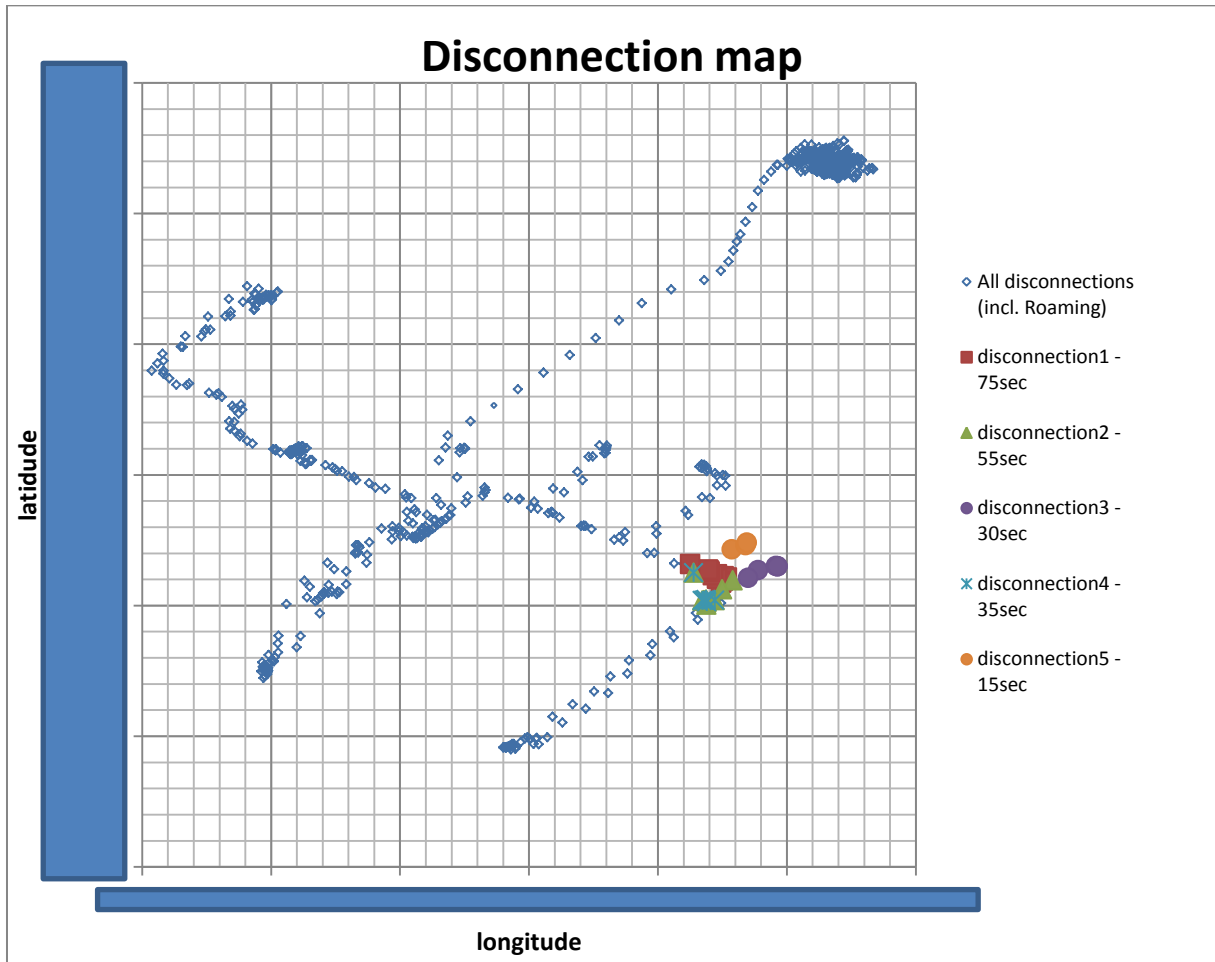
Analysis data can be collected continuously and on multiple clients at the same time. This distributed approach gives statistical view into networks performance.

4 AirMobile Collector

AirMobile Collector utilizes the client perspective analysis to collect data from Wi-Fi networks. Network quality is assessed by acquiring numerous radio and Windows IP stack parameters while continuously scanning the application server and the default gateway. By doing so it is possible to differ between Wi-Fi network and wired network problems. In this way AirMobile Collector is the end to end solution covering the entire path from the clients to the application server.

Client’s position is logged by a GPS receiver, which gives possibility to map network performance. Finding bad spots is much easier.

Picture below shows a typical disconnection map. Small blue circles represent all disconnections, most of them being roaming related. However, there are number of other, long time, disconnections, which are not roaming related. They represent a network connectivity issue, which after cross-correlation with other measurement data was diagnosed to be a faulty AP. Map coordinates are concealed due to confidentiality agreement.



A typical disconnection map