Solution Brief

Understanding the Concept of Client Health Score

Aerohive®

www.aerohive.com

Table of Contents

Introduction	**3**
The Difference Between Data and Actionable Data	**4**
Aerohive's Client Health Score	**5**
What Goes Into the Client Health Score?	**5**
Using Client Health Score	**6**
Monitoring Client Health with Service Level Assurance	**7**
SLA Actions Based on Client Health	**8**
Client Health Score and TeacherView	**8**
Conclusion	**9**

Introduction

The recent standardization of 802.11n has made the idea of wireless as a wired LAN replacement a real possibility. Not only would this enable client mobility, but such a move could serve to substantially reduce the cost associated with the wiring of a cube, switch ports and cable runs. But while WLAN speed may approach that of its wired counterpart, there remain significant differences between the two mediums. Ethernet networks have been a standard for 15-20 years, and deploying/managing them effectively is well understood. Wireless LANs, on the other hand, while a common feature of the enterprise network for 10 years, have mainly been used as convenience networks. The uptime required of the wired network has not been mandatory on the wireless network, first because the speed of the medium simply could not compare, and second because of real or perceived reliability issues. 802.11n has dramatically changed the reality and perception of Wi-Fi but there are hurdles in the way.

One challenge is the sheer number of clients now appearing in the enterprise, with many users having two or more Wi-Fi enabled devices. Laptops, dual mode phones, iPads and even desktop systems are being equipped with wireless LAN to reduce the cost of adds, moves and changes. This dramatically expands the diversity and volume of clients that IT has to support.

Another challenge is based on the medium of transmission for the WLAN itself – that is, radio over air. WLAN transmissions are greatly affected by interference from competing WLANs, or other wireless devices. And the fact is that the WLAN environment is constantly changing. Turning on the microwave in the break room may change the wireless picture completely. While Ethernet networks are well understood, the WLAN, with its use of often complex radio-based terminology, is not. When a client calls reporting poor performance, the network administrator is often at a loss as to how to fix the issue. The complexity of the reporting and volume of different client types can make WLANs somewhat difficult to manage day-to-day. Their higher operational costs can erode the capital gains and productivity benefits of moving to Wi-Fi.

In order for Wi-Fi to truly become a viable Ethernet replacement, these issues of day-to-day support must be addressed. IT departments and administrators need greater visibility and control of their users' Wi-Fi experience, including

- A more complete picture of how Wi-Fi clients are performing vs. deployment goals
- The ability to automatically or quickly resolve connectivity issues
- Deliver greater user satisfaction, improved productivity and reduced operational cost

The Difference Between Data and Actionable Data

Because of their basis in the world of radio, WLANs "grew up" with the ability to monitor client performance and report on dynamic environmental changes. Virtually every WLAN available today has the ability to provide visibility into what's going on with clients in real time. The problem is that this information is presented in a format that records details without assigning any meaning to them. The result is a huge cache of data that while accurate and meaningful to a Wi-Fi expert, is virtually impenetrable to a typical network administrator.

System Details			
Host Name	Abby-W7-Laptop	Association Time	2010-07-08 16:17:33
MAC Address	0023150B2A74	Association Duration	0 Secs
IP Address	10.16.5.23	Radio Mode	802.11na
SSID Name	HQ_8021x	RSSI	-61 dBm
User Name	Aerohive\ahassel	AP Name	AP8_Eng_3d40
Last Known transmit data rate (TX BW) in Kbps	130000	Last Known receive data rate (RX BW) in Kbps	130000
User Profile Attribute	19	CWP Used	No
Auth Method	wpa2-802.1x	Encryption Method	AES
VLAN	105	Channel	153
BSSID	001977033D61	Memo	Station 0023:150b:2a74 is authenticated to 0019:7703:3d61 thru SSID HQ_8021x

Statistics Details			
Stats Time	2010-07-08 16:22:55	Received MIC Failures	0
Received Last Rate (Kbps)	130000	Transmitted Last Rate (Kbps)	130000
Received Total Data Frames	4185	Transmitted Total Data Frames	6825
Received Data Octets	668895	Transmitted Data Octets	4649123
Received Mgt Frames	170	Transmitted Mgt Frames	87
Received Unicast Data Frames	3876	Transmitted Unicast Data Frames	6825
Received Multicast Data Frames	146	Transmitted Multicast Data Frames	0
Received Broadcast Data Frames	163	Transmitted Broadcast Data Frames	0
Received Airtime (ms)	446.73	Transmitted Airtime (ms)	1110.291
Transmitted WMM Best Effort Data Frames	6355	Transmitted WMM Background Data Frames	1
Transmitted WMM voice Data Frames	469	Transmitted WMM video Data Frames	0

Figure 1: Client Statistics

Being able to make sense of these statistics on the fly, particularly with an irate user on the other end of the phone, is very difficult for anyone who is not a Wi-Fi specialist. This difficulty is compounded by the fact that most admins are trying to maintain the wired network at the same time. Users aren't interested in the nuances of radio interference; they need the network to "just work." Some companies have attempted to rectify this problem by turning to outside vendors for analysis tools that turn the voluminous data into information they can actually use. But even these tools are usually reactive; that is, they are typically run after a client has reported an issue and the administrator is already behind the

curve. Not only does this hamper the administrator day-to-day, this issue serves to dramatically raise the operating cost of the WLAN and can hamper further deployment of WLANs as a wired replacement.

As Wi-Fi evolves, what is needed is a tool that can be run continuously in the background, digesting the myriad details of client performance and boiling them down to a simple, real-time picture of each client's "health" at that moment in time. The source statistics should still be available, as they are invaluable in getting to the root of a specific issue once the administrator knows where to look; the gap has always been in pointing out the correct direction in the first place. The answer is Aerohive's Client Health Score.

Aerohive's Client Health Score

Aerohive's Client Health Score provides easy "at-a-glance" visibility into the status or "health" of clients connected to the Wi-Fi network. It delivers an intuitive green, yellow or red aggregate representation of a client's Wi-Fi statistics, substantially demystifying Wi-Fi troubleshooting and reducing the management burden associated with supporting a wireless infrastructure. It effectively monitors client performance and the impact of client capability (e.g. 802.11a, b, n), signal strength, driver issues, WLAN and non-WLAN interference when normalized or calibrated for organizations Wi-Fi deployment goals. All of these details are compiled and presented in a simple format that enables the administrator to see where an issue exists, virtually in real time. Client Health Score can be used to identify and resolve issues before users start to notice a performance issue, which enables the administrator to react more quickly and make the WLAN performance much more deterministic.

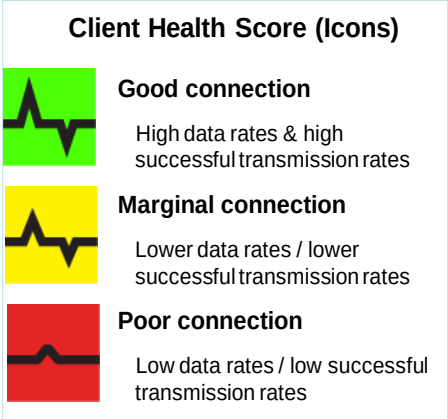

Figure 2: **Client Health Score Icons**

What Goes Into the Client Health Score?

A useful analogy to the Client Health Score is something that anyone who has ever applied for a loan is familiar with – the credit score. Credit scores were developed for financial institutions for the same reason that Aerohive has developed the Client Health Score for Wi-Fi – both analyze complex data that the layperson would have difficulty understanding when presented in its entirety. Credit scores result from the consideration of how you pay your bills, the amount of money you owe and the amount of available credit, the length of your credit history, the mix of credit types and any new credit applications. The result is a single digit that allows both individuals and lending institutions an at-a-glance composite look at borrowing performance.

Aerohive's Client Health Score works the same way. The green, yellow or red icons are the result of combining many statistics, including:

- The data rates used for transmission – the data rate that the client is actually delivering
- The transmission success rate – how often transmissions are successful

  Compared with
- The client's operational data rates – what the client is capable of
- The goals of the deployment – whether high density (such as a lecture hall), normal density (such as an office environment) or low density (such as a warehouse).

For example, say you have a client transmitting at 11 Mbps. If this client is an 802.11b client (which has a maximum throughput of 11 Mbps) and it is transmitting successfully, it will likely have a green Client Health Score unless it is experiencing some sort of interference. If the client is 802.11g, which is capable of faster performance, it may show more yellow or red icons, although it will show up as green if the transmissions are reliable. If the client is 802.11n, it will almost certainly be represented by a yellow or red icon, since this client is capable of much higher performance.

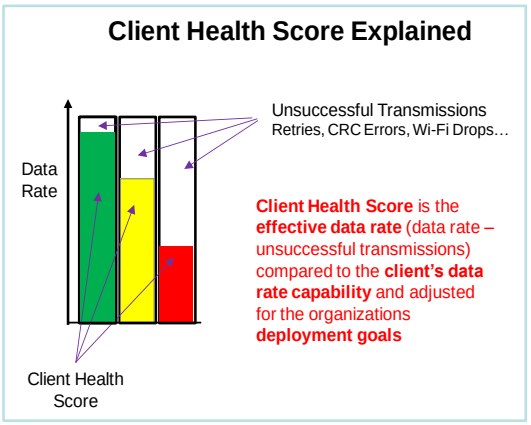

Figure 3: **Client Health Score versus Data Rate**

Using Client Health Score

Client Health Score are shown via an icon next to the client MAC address. This view provides quick "at a glance" visibility into a group of clients' network health.

When a client shows up as yellow or red, all the administrator has to do is to click on that client's name to get a real-time view of what is happening on the client. Subsequent views enable the admin to see performance over time, which helps to identify what has changed and when. Once the timing of a health change is identified, the admin can check transmissions of packets from the client, as well as receipt of packets from the AP. Additional data available shows dropped

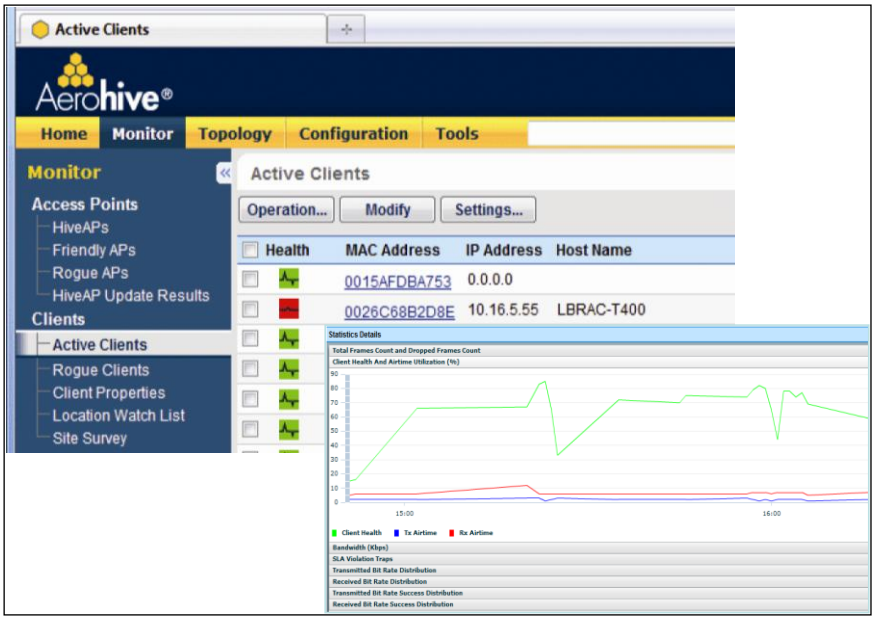

Figure 4: **Active Client View with Client Health Score Icons**

frames being both transmitted and received, making it easy to pinpoint where the problem is happening and what action to take to rectify it.

Monitoring Client Health with Service Level Assurance

Combining Client Health Score with SLA delivers real-time monitoring of every Wi-Fi client in the network to a single dashboard capable of viewing tens of thousands of clients simultaneously. This method is particularly useful for larger networks, where monitoring individual clients is not possible since they will not all show up on the same screen. The Client SLA screen can use a variety of data, including an aggregate view of client throughput, airtime and health. The admin can click on any single attribute to drill down into specific issues. Client Health with SLA delivers real-time monitoring of every Wi-Fi client in the network to a single dashboard capable of viewing tens of thousands of clients simultaneously. SLA also provides historical reports to aid troubleshooting and to help identify and proactively address potential future problems.

Figure 5: **Service Level Assurance (SLA) Dashboard**

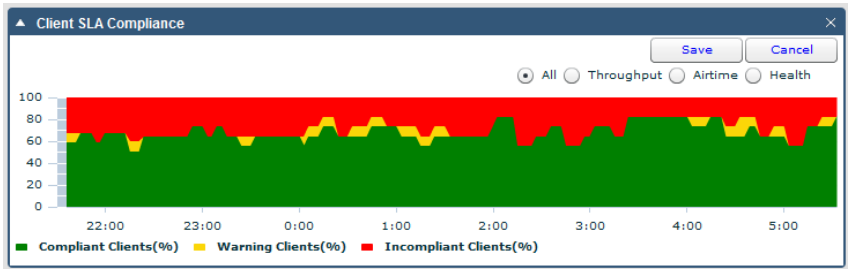

Figure 6: **SLA Client Dashboard with SLA filter options**

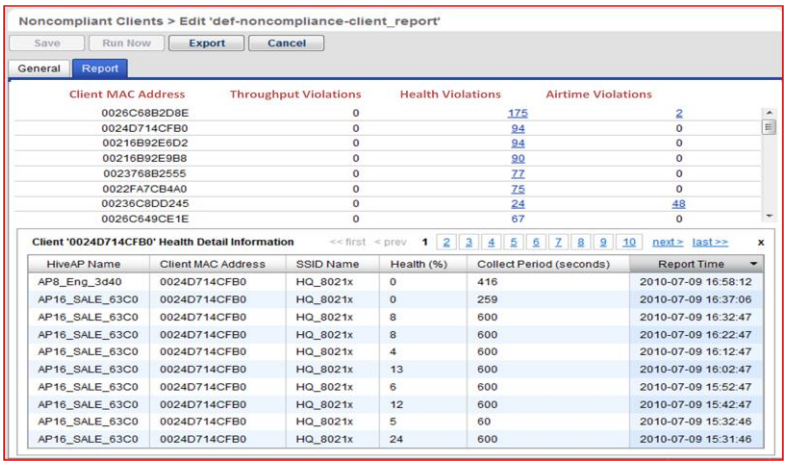

Figure 7: **SLA Non-compliant Client Reports**

SLA Actions Based on Client Health

In addition, SLA features policy-based remediation that automatically addresses many client health issues without any administrator intervention. There are a number of reasons for a poor client score, including:

- Too much distance between the client and the access point
- Too much congestion on the AP
- Too much interference

In most cases moving the client can address these issues and that is exactly what SLA attempts to do. SLA encourages the client with a poor Client Health Score to move to another radio, either to a different radio on the same AP (an action known as band steering) or to a different AP (an action known as load balancing). Once the most appropriate correction is determined, the Hive APs will automatically take the action in the background– no manual intervention is required.

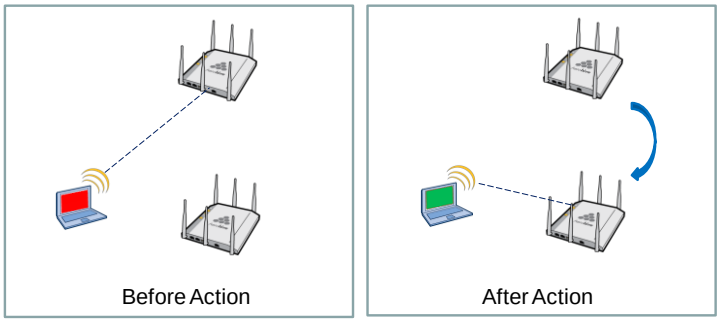

Figure 8: **SLA Client Actions using Client Health Score**

Client Health Score and TeacherView

The Client Health Score is key to a new Aerohive application, TeacherView, designed to help teachers make the most out of new 1:1 laptop programs.

Laptop programs can provide many benefits, but also have the downside of forcing the teacher into the daunting role of on-site network administrator.

The application uses the Client Health Score being generated by the HiveAPs on every client and presents it within the TeacherView console as Wireless Status. Wireless Status is synonymous with Client Health; we've used another

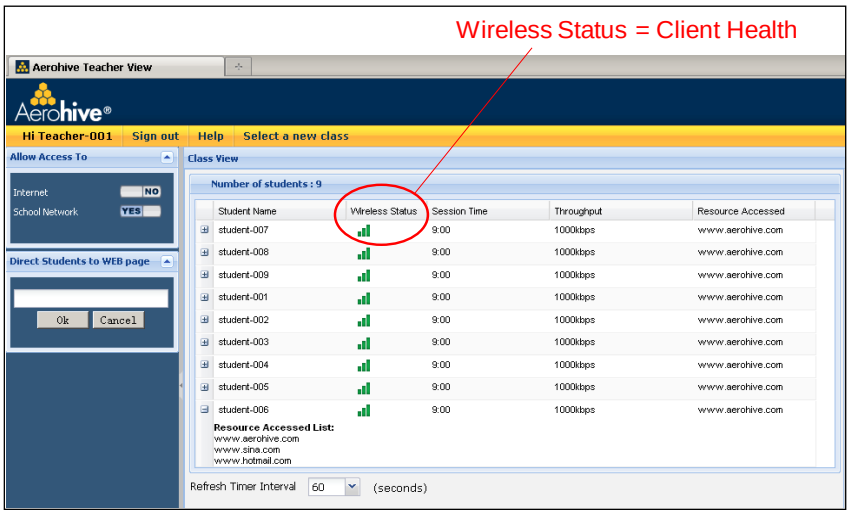

Figure 9: **TeacherView Application – Teacher Console**

term since “Wi-FI Client Health” is a phrase that teachers are likely unfamiliar with. TeacherView enables educators to see which clients in a classroom are connected, the state of the transmissions, and what students are connected to.

Conclusion

The Client Health Score works to remove a significant barrier to adoption of Wi-Fi as a wired LAN replacement by providing instant, easy-to-understand visibility of what’s going on in the network. Administrators can look at the overall client performance over time, and then drill down for actionable information of performance by individual clients. Because the Client Health Score is presented in virtually real time, this enables the administrator to make changes quickly; many times before an issue is even noticed by the users themselves. This reduces the operational cost of the WLAN and accelerates the pervasive deployment of Wi-Fi as the primary access layer in the enterprise.

About Aerohive

Aerohive Networks unleashes the potential of enterprise Wi-Fi, enabling customers to stop buying copper, move applications to the air, and maximize workforce productivity. The company's award-winning cooperative control architecture eliminates costly controllers, saving money and providing unprecedented resiliency, up to 10X better application performance, and an opportunity to start small and expand without limitations. Aerohive was founded in 2006 and is headquartered in Santa Clara, Calif. The company's investors include Kleiner Perkins Caufield & Byers, Lightspeed Venture Partners, and Northern Light Venture Capital.

Corporate Headquarters

Aerohive Networks
3150-C Coronado Drive
Santa Clara, CA 95054
United States
Phone: +1 408.988-9918
Toll Free: +1 866-918-9918
Fax: +1 408-492-9918
Email: info@aerohive.com

EMEA Headquarters

Aerohive Networks Europe LTD
27 Old Gloucester Street
London, WC1N 3AX
United Kingdom
Phone: +44 1428-712093
Fax: +44 207-856810
Email: emeasales@aerohive.com