

# Economic Value Validation

## Aerohive Controller-less Wireless Architecture

*By Bob Laliberte, Senior Analyst and Adam DeMattia, Research Analyst*

**March 2014**

## Contents

<b>Market Overview .....</b>	<b>3</b>
Market Drivers and User Needs .....	3
Market Situation Summary .....	5
<b>Controller-less Based Connectivity: Qualitative Examples of Customer Benefits.....</b>	<b>6</b>
Significantly Lower Relative CapEx .....	6
Significant Reduction in Data Center Footprint and Associated OpEx.....	7
Simplified Architecting and Installation of APs .....	7
Ease of Ongoing Management .....	8
Increased Solution Resiliency with No Single Point of Failure .....	9
<b>The Aerohive Architecture: An Economic Value Validation .....</b>	<b>10</b>
Objective.....	10
Methodology .....	10
Economic Value Model Overview.....	11
Cost Categories.....	11
Benefit Categories .....	11
Quantifying Relevant Cost and Benefit Differences .....	11
<b>Economic Value Validation Results .....</b>	<b>15</b>
Example Scenarios.....	15
A Note about Scenarios Selected for this Analysis.....	15
Summary of Results, Scenario 1: Highly Distributed Enterprise .....	15
Summary of Results, Scenario 2: Regionally Distributed Large Enterprise .....	17
Summary of Results, Scenario 3: Centralized Campus .....	19
<b>The Bigger Truth .....</b>	<b>22</b>

All trademark names are property of their respective companies. Information contained in this publication has been obtained by sources The Enterprise Strategy Group (ESG) considers to be reliable but is not warranted by ESG. This publication may contain opinions of ESG, which are subject to change from time to time. This publication is copyrighted by The Enterprise Strategy Group, Inc. Any reproduction or redistribution of this publication, in whole or in part, whether in hard-copy format, electronically, or otherwise to persons not authorized to receive it, without the express consent of The Enterprise Strategy Group, Inc., is in violation of U.S. copyright law and will be subject to an action for civil damages and, if applicable, criminal prosecution. Should you have any questions, please contact ESG Client Relations at 508.482.0188.

## Market Overview

Originally deployed as a convenience and as an alternative to Ethernet cabling, wireless LANs provide organizations with flexible campus connectivity for accessing IT resources and the Internet. Fast forward to present day, and wireless LANs have become an indispensable part of any organization. Employees, partners, guests, and customers rely on wireless LAN access to enable productivity, collaboration, and connectivity. Over the years, the technology has advanced to provide increasing levels of throughput with IEEE standards 802.11 (a/b/g/n) and now ac, which has reached gigabit speeds. The status quo for wireless networking solutions has involved deploying wireless access points, or APs, that are connected to and managed by centralized controller. However, vendors now offer controller-less access points with distributed intelligence and cloud-based management solutions. Proponents of this technology argue that this model offers significant benefits over the traditional controller-based model in terms of deployment simplicity, ongoing management, and cost. Indeed, Aerohive Networks, a pioneer in controller-less wireless LAN architectures, has been extremely successful increasing its business in a mature and crowded market. How has it been able to do that?

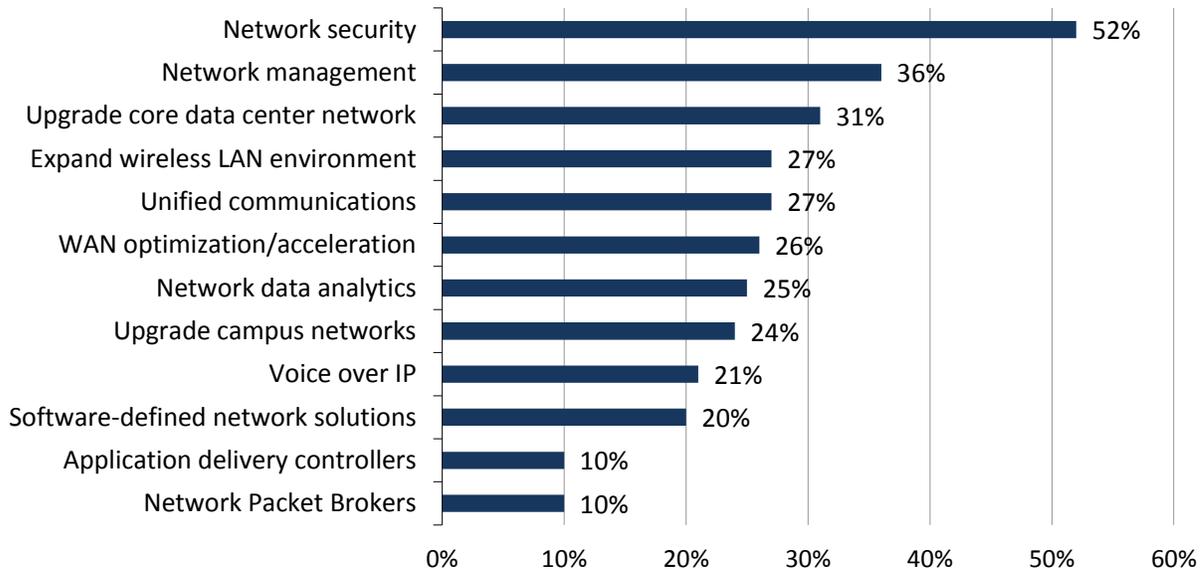
The answer lies in its differentiated solution architecture, which removes the controller hardware layer from wireless LANs and provides tangible differentiation from traditional controller-based solutions. The purpose of this report, and of ESG's Economic Value Validation (EVV) methodology overall, is to provide detailed measurement of that value; this first section provides the necessary background to that analysis, with an overview of the market.

## Market Drivers and User Needs

Expanding the wireless LAN is a top investment priority among surveyed network technology decision makers (see Figure 1). ESG research highlights where organizations will be making significant investments over the next 12 months, and expanding the wireless LAN environment falls in the top five most-cited areas of investment.<sup>1</sup>

Figure 1. Network Infrastructure Spending Plans

**We would like to learn a bit more about your specific spending plans for network infrastructure in 2014. In which of the following areas will your organization make the most significant investments over the next 12 months? (Percent of respondents, N=301, five responses accepted)**



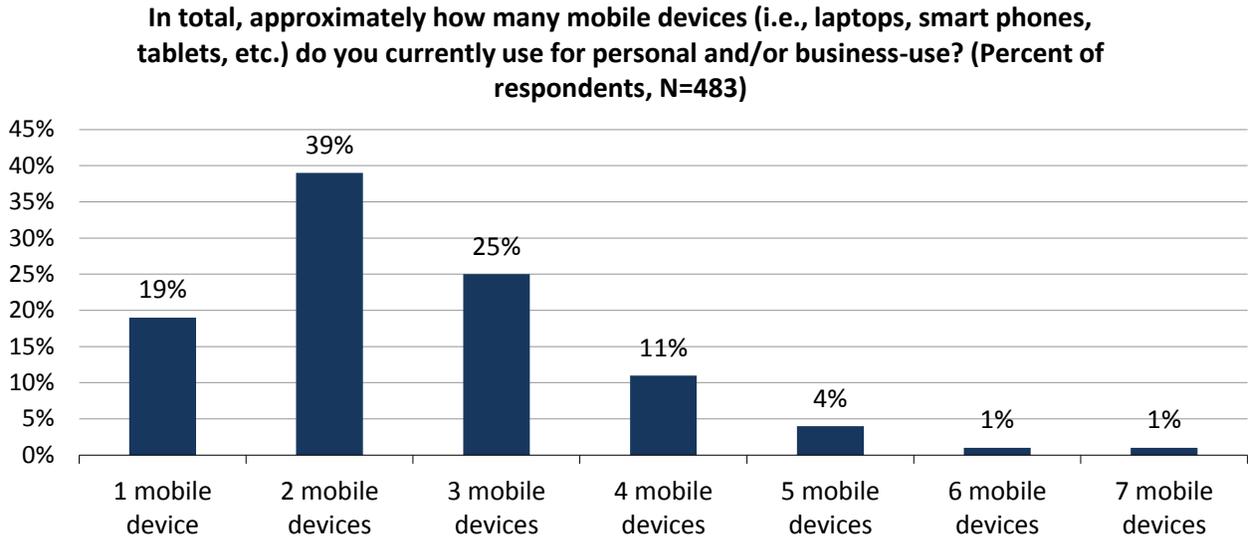
Source: Enterprise Strategy Group, 2014.

Why is there so much emphasis on wireless LANs? It shouldn't be much of a surprise that the ubiquity of mobile computing devices and workers' reliance on these devices to do their jobs are drivers for wireless LAN efficacy and

<sup>1</sup> Source: ESG Research Report, [2014 IT Spending Intentions Survey](#), February 2014.

investment. ESG’s past research indicates that about four-fifths of knowledge workers report using two or more mobile devices for personal and/or business purposes (see Figure 2).<sup>2</sup> Moreover, while supporting more devices is a burden for IT departments, additional ESG research validates that IT stakeholders fully realize the mandate from their constituents to enable wireless work modes. Among 242 IT workers surveyed by ESG, nearly nine-tenths report that their line of business (LOB) counterparts’ use of mobile devices is critical or very important to the organization’s business processes and productivity (see Figure 3).<sup>3</sup>

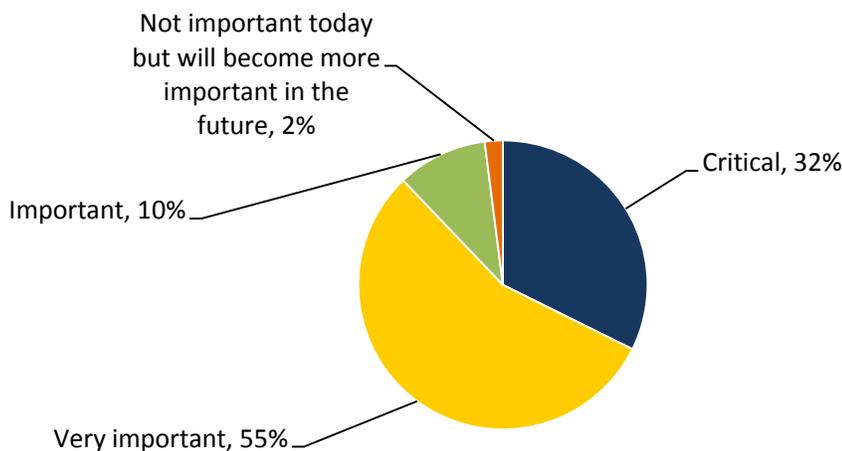
*Figure 2. Knowledge Worker Utilization of Mobile Devices*



Source: Enterprise Strategy Group, 2014.

*Figure 3. Criticality of Mobile Devices to Business Success*

**How important would you say the use of mobile devices by employees is to your organization’s business processes and productivity? (Percent of respondents, N=242)**



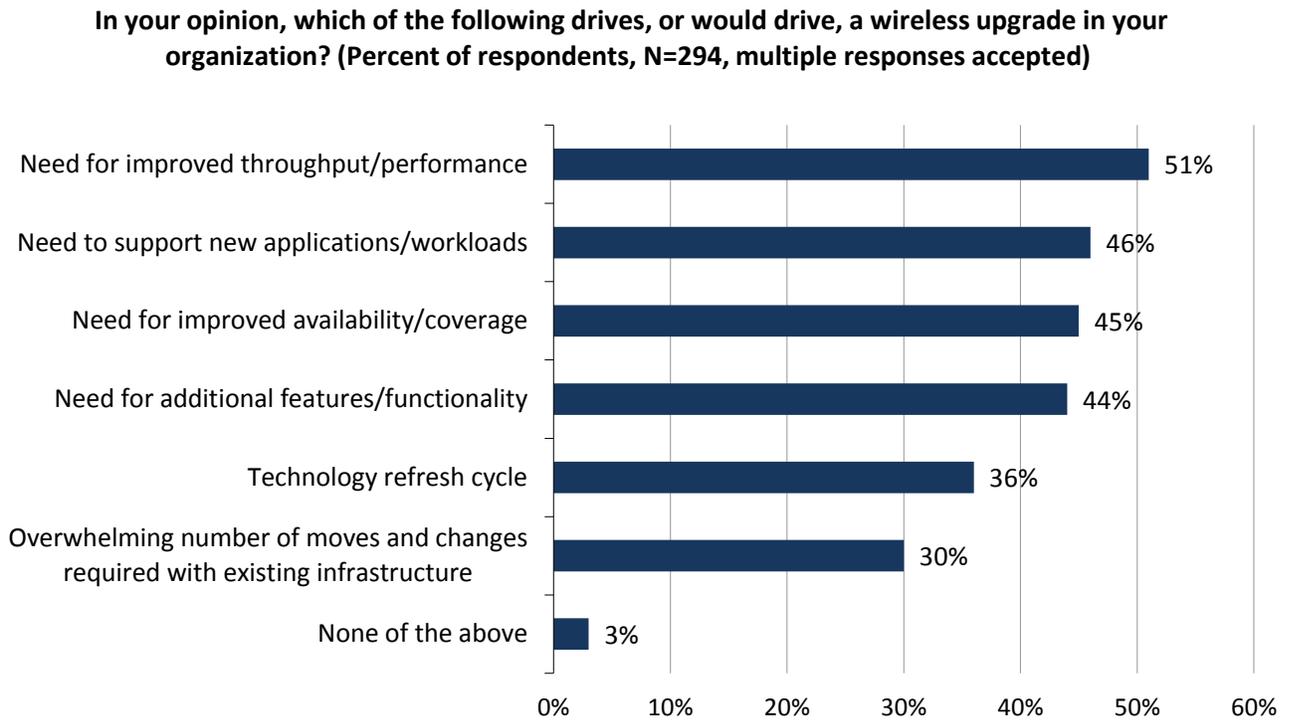
Source: Enterprise Strategy Group, 2014.

<sup>2</sup> Source: ESG Research Report, [Mobile Device and Application Usage Trends](#), August 2013.

<sup>3</sup> Source: Ibid.

While the influx of mobile computing devices puts pressure on the wireless LAN, it is not just the sheer volume of devices themselves—it’s also the myriad of transformational, more demanding use cases for these devices. In many organizations, new applications for unified communications and video are being used on mobile devices and are taxing the wireless network. Organizations have to be able to quickly respond to these challenges and provision the appropriate services to ensure users have the requisite levels of connectivity. The fact that wireless LAN connectivity in the modern enterprise is likely required not just at main campus locations, but at all the remote or branch offices as well further exasperates the issue. Again, referencing recent ESG research, when respondents were asked to identify the requirements that drive wireless upgrades, the need to support greater throughput, new applications, and improved availability or coverage were cited most frequently, all with incidences north of two-fifths of the sample (see Figure 44).<sup>4</sup> As organizations transition to a wireless-first mentality, it will be critical to ensure the wireless infrastructure is up to the task both in terms of performance and high availability.

*Figure 4. Drivers of Wireless Infrastructure Upgrades*



*Source: Enterprise Strategy Group, 2014.*

### Market Situation Summary

A number of evolutionary advances in wireless LAN technology with respect to throughput have been made in the past several years. Concurrent with those, more revolutionary advances, such as the controller-less wireless architecture and cloud-based management solutions like the ones pioneered by Aerohive, have also been introduced to the market. The concept behind these advances is to simplify the deployment and operations of wireless networks while providing high-availability solutions at a lower cost. Users with traditional controller-based technologies in place are beginning to recognize the benefits of this new controller-less architecture and are fast becoming ardent supporters of it, usually just during the proof of concept. Setup and deployment are extremely simple and fast, and the distributed intelligence in the APs (rather than centralized intelligence in the controller) means an inherently more reliable connection.

While individual customer success stories are impressive, the ability to generalize and quantify the typical cost savings and operational benefits of a controller-less wireless environment in financial terms helps organizations

<sup>4</sup> Source: ESG Research Report, *Wireless Network Trends*, to be published April 2014.

evaluating wireless investments or upgrades to understand the impact these advances can offer them—and that is the purpose of this ESG study.

## Controller-less Based Connectivity: Qualitative Examples of Customer Benefits

As outlined, Aerohive has established an evolutionary, if not revolutionary, approach to delivering wireless connectivity. Eliminating the previously required controller layer from wireless deployment architectures has a number of implications and offers many potential benefits to organizations and their IT departments. However, to accurately and defensibly quantify these benefits, real-world experiences must be gathered, vetted, and interpreted. To accomplish this goal, ESG interviewed current Aerohive customers to better understand their usage of and the benefits associated with Aerohive access points and accompanying HiveManager management platform in order to inform and validate the assumptions used in ESG's Economic Value Validation (EVV) modeling.

Based on these interviews, ESG concludes that the benefits of deploying an Aerohive controller-less architecture with a centralized management platform, compared with a traditional controller-based wireless infrastructure, are numerous and diverse. ESG's findings with respect to customer benefits are presented quantitatively in the EVV scenario analyses, but they are also summarized qualitatively—in the customers' own words—in this section.

### Key Customer Benefits Summary:

- Significantly lower relative CapEx
- Significant reduction in data center footprint and associated OpEx
- Simplified architecting and installation of APs
- Ease of ongoing management (including patching, troubleshooting, and policy changes)
- Increased solution resiliency with no single point of failure

### Significantly Lower Relative CapEx

One of the most straightforward cost comparisons taken into consideration by ESG's Economic Value Validation Model is the fact that Aerohive's flatter wireless architecture removes the controller hardware layer from its solution offerings. The result is significantly reduced hardware CapEx experienced as a result of avoiding those appliance purchases. This economic impact is compounded in environments that require a relatively higher controller to access point ratio, such as environments that are highly distributed or require highly available (redundant controllers are required) connectivity.

Another important CapEx consideration is tied to Aerohive's "all-in-one" licensing model. Aerohive has taken the approach of charging customers one license fee on a per-AP basis. This single fee includes all access point features and functionalities; from WIPs, to firewall enforcement, to layer 7 visibility. Alternatively, legacy solution providers often itemize solution features and charge separate licensing fees. The result is not only typically a higher software CapEx associated with legacy solutions to achieve comparable network functionality, but also time, effort, and frustration on the part of IT decision makers who do not have the time or interest to devote to understanding complex licensing models.

#### Qualitative Customer Insights:

*"We were very focused on the fact that we wouldn't have to buy controller appliances for any number of sites that we operate and wanted wireless connectivity at."*

*"It really came down to, for us, the ability to have wireless connectivity without controllers, which is a huge selling point. And it really makes a difference in cost for us."*

*"To get the same level of service with a controller-based solution, we'd have to put redundant controllers at every site, then put redundant controllers here at our data center, and redundant large controllers at our DR site and our hot site. After we were looking at just the controller prices, you're talking about huge dollars there. Then you tack on huge maintenance fee on top of that."*

*“With HiveManager, it’s all inclusive from a licensing perspective—they don’t nickel and dime you to death like some controller-based vendors do.”*

*“We’re already so leveraged as an IT organization that having to purchase and rollout incremental software modules is a nightmare we can avoid with Aerohive.”*

*“Our preference was that there was clear-cut, straightforward licensing that we could count on. That was one of the things that seemed to be a little iffy in the controller-based arena; how much did a license cover, when were costs for different functionalities going to kick in, and what kind of cost was that going to add? That was uncertainty we didn’t want to deal with.”*

## Significant Reduction in Data Center Footprint and Associated OpEx

A corollary to the reduced CapEx of Aerohive’s simplified architecture is a reduction in the number of appliances residing in organizations’ data centers and distributed IT closets compared with controller-based alternatives. This reduction carries with it a tangible decrease in OpEx for organizations in the form of freeing up rack space, reducing power and cooling requirements, removing unnecessary maintenance fees, and eliminating nodes which must be managed and monitored by IT staff. ESG’s Economic Value Validation Model considers this impact and conservatively quantifies the associated financial ramifications.

### Qualitative Customer Insights:

*“One of the things that’s frustrating with controller-based solutions is that you still have to pay for maintenance on your redundant backup controllers, whether or not they’re being used. I mean, they’re sitting there like the Cadillac in the garage, just waiting to be used, but I still have to pay for maintenance.”*

*“The more pieces of equipment (i.e., controllers) you add to your internal data center, the more things have to be covered underneath those types of access methods. So, when you talk about putting those in and implementing them, it might be easy to stick them in a data center and plug cables into them, but there’s also the DR piece and the business continuity piece that you have to make sure everything’s working and you have to make sure everything’s documented and tested.”*

## Simplified Architecting and Installation of APs

Removing the controller from the wireless architecture equation also greatly simplifies the technology deployment process. The Aerohive customers ESG spoke with cited numerous efficiency advantages when describing their Aerohive deployment processes as compared with deploying controller-centric alternatives. Common benefits referenced included the ability to leverage lower cost labor during installation, a faster mean time to deploy Aerohive on a per AP basis, time saved because controllers would not need to be configured and deployed at locations, and simpler capacity planning (i.e., not having to appropriately size controllers based on AP counts or add controllers as the environment scales). As evidenced by the qualitative customer insights, these deployment differences are material in nature.

### Qualitative Customer Insights:

*“It takes next to nothing to install a new access point with Aerohive. Once the access point touches our network, it automatically gets configuration [from HiveManager], does everything it does, and basically the field technician just looks for the light to be white, and then they’re done.”*

*“I’ve spent significant time with controller-based solutions and deploying APs can take as much as several hours sometimes, depending on the issues you come across.”*

*“It requires a much more skilled person out in the field to work on a controller-based access point. A person might have to put a serial port to that actual device, making sure the controller touches it and there might be extra configuration steps.”*

*“With Aerohive there are definitely significant savings from not having to preconfigure controllers, along with switches, rather than just switches. We had 647 buildings—you’re looking at almost 1,300 controllers that would have to be configured. It adds up quickly.”*

*“With controller-based solutions there’s pre-configuration prior to it leaving for its site and making sure it talks to the home office. Then someone has to set each controller up onsite and mount it in a 19-inch rack. Then there’s DR configurations that need to be created and documented. That whole process is avoided with Aerohive.”*

*“With Aerohive there’s no extra configuration. You could preset your ports before you go out to the site, add the VLANs you need for the access point, and you’re pretty much plugging it in and ready to go. We’re not having to configure controllers, changing router interfaces, etc. We don’t worry about any of that anymore.”*

*“Well from our standpoint, the whole benefit [of Aerohive] was the fact that, when you looked at the controller-based solution, if you were deploying across a wide campus or large campus, you’d have to pay attention to what the AP counts were and size your controllers accordingly. A lot more thought goes into how you map out that deployment. With Aerohive you can just deploy your APs based on need and not have to worry about that scaling issue.”*

## Ease of Ongoing Management

Customers also cited the centralized HiveManager management console as a significant differentiator providing operational efficiency benefits in an Aerohive environment compared with basic legacy wireless deployment scenarios where incremental centralized management infrastructure may not be in budget. The reported benefit associated with this fact was two-fold: First, training requirements have the potential to be both less expensive and occupy less time for wireless administrators. Second, IT organizations gain the flexibility to employ IT generalists, rather than potentially more expensive specialists, when it comes to wireless administration tasks.

The next consensus management difference with Aerohive involved the ease and granularity with which wireless administrators could apply software updates and patches. Again, Aerohive customers reported a much simpler and faster patching process with their current solution compared with standard controller-based configurations, which lack particularly in scenarios where redundant controllers had not been architected. Additionally, customers placed a high value on the ability to select any individual AP, or group of APs, on their network and apply an update or configuration change with that level of granularity and control. This experience compares favorably with controller-based alternatives, which funnel patch updates and configurations to all the APs tied to them.

Finally, customers expressed a materially improved troubleshooting experience with Aerohive compared with controller-based alternatives, particularly those scenarios where an additional investment in a centralized management console was forgone due to budgetary constraints. Users of Aerohive most frequently articulated that while the total number of troubleshooting tickets submitted remained consistent, Aerohive’s management capabilities and centralized nature had allowed for significantly reduced mean time to resolution and a significant reduction in required IT staff travel time when addressing issues in a distributed environment.

### Qualitative Customer Insights:

*“Aerohive’s HiveManager is much a simpler solution. It’s not very demanding from a technical perspective.”*

*“With Aerohive, usually I found with that one class, my guys are proficient enough to know how to use the system. I’ve sent guys for two weeks of training on alternative2s and some still don’t seem to get it.”*

*“Going through and updating code on all those controllers in our previous [controller-based] environment—we had about 90 controllers—was a big effort. It would take us about three weeks just to do code upgrades for the controllers. That was happening a couple times a year.”*

*“Being able to do software updates granularly from a centralized console, as opposed to trying to coordinate which controller has code and which one doesn’t, which one’s primary, which one’s secondary, etc. is a far easier and superior process.”*

*“We do everything remotely here with our engineering team. They cover all 7,000 APs out in the field, and the ability to remotely manage those through Hive Manager has been a very big selling point for us because we can take a look at a single WAP out in Wichita, Kansas, and we can up its power, or we can shut it down—anything we have to do we can do from our centralized location.”*

*“With controller-based solutions there are travel restrictions associated with AP troubleshooting. I have to get a higher level technical person there. If you’re talking 14,000 access points like we have here, if I have to even touch a couple of percentages of those, that’s a pretty significant cost.”*

*“The bundled layer 7 visibility really helps in shortening the troubleshooting time for my team, we can just pop into HiveManager, pull up the site and see what’s going on in their environment. That’s something we couldn’t do before.”*

*“With Aerohive we’ve probably reduced travel time associated with troubleshooting by about 45% to 50% because we can often look at the issue here at corporate and solve the problem without having to physically be onsite.”*

### **Increased Solution Resiliency with No Single Point of Failure**

One potential pitfall of legacy, controller-based wireless architectures is the fact that the controller serves as a single point of failure—if a controller fails, then all of the APs connected to that controller are impacted until the issue with the controller is resolved. In these instances, any controller failure is accompanied by a reduction in the productivity and satisfaction of wireless end-users. A way to remediate this vulnerability is to deploy controllers in a redundant fashion such that if the active controller fails, a passive HA controller will take up the slack. While this approach greatly reduces the risk of downtime, it increases the CapEx required by growing the number of controllers purchased. Aerohive’s offerings remove this single point of failure by eliminating the controller and distributing the intelligence in the APs so even when one AP fails, the others in the “hive” (wireless mesh network) will recognize that and compensate accordingly. Plus, in the event of losing connectivity to HiveManager, the APs will continue to function normally. In any of the aforementioned instances, an Aerohive deployment essentially eliminates AP downtime without impacting a customer’s CapEx.

#### **Qualitative Customer Insights:**

*“We like that we’re not relying on one piece of equipment or two pieces of equipment to run all the Wi-Fi infrastructure sitting behind it.”*

*“In the field, if we had one controller and we had a building that had, let’s say, 100 access points, I would insist that we would do redundant controllers. Just because it could affect, let’s say, 14 wings of that building at one time. And they could be down for a day until I get another controller configured, overnighted, and set up.”*

*“We have to have zero downtime and that’s the main reason we went with Aerohive—because of the mesh and no single point of failure with controllers.”*

*“With controllers, if that fails during the day, it’s a scramble to get people out there, to get a spare part, and to go out there and reinstall. Those situations tend to be like a full eight hours to get things turned around to where someone’s onsite, getting wireless back up and running.”*

These data points are just a sampling of the benefits Aerohive customers reported to ESG. The remainder of this paper discusses the process of quantifying these benefits in ESG’s Economic Value Model and discusses the model outputs for a number of hypothetical scenarios.

## The Aerohive Architecture: An Economic Value Validation

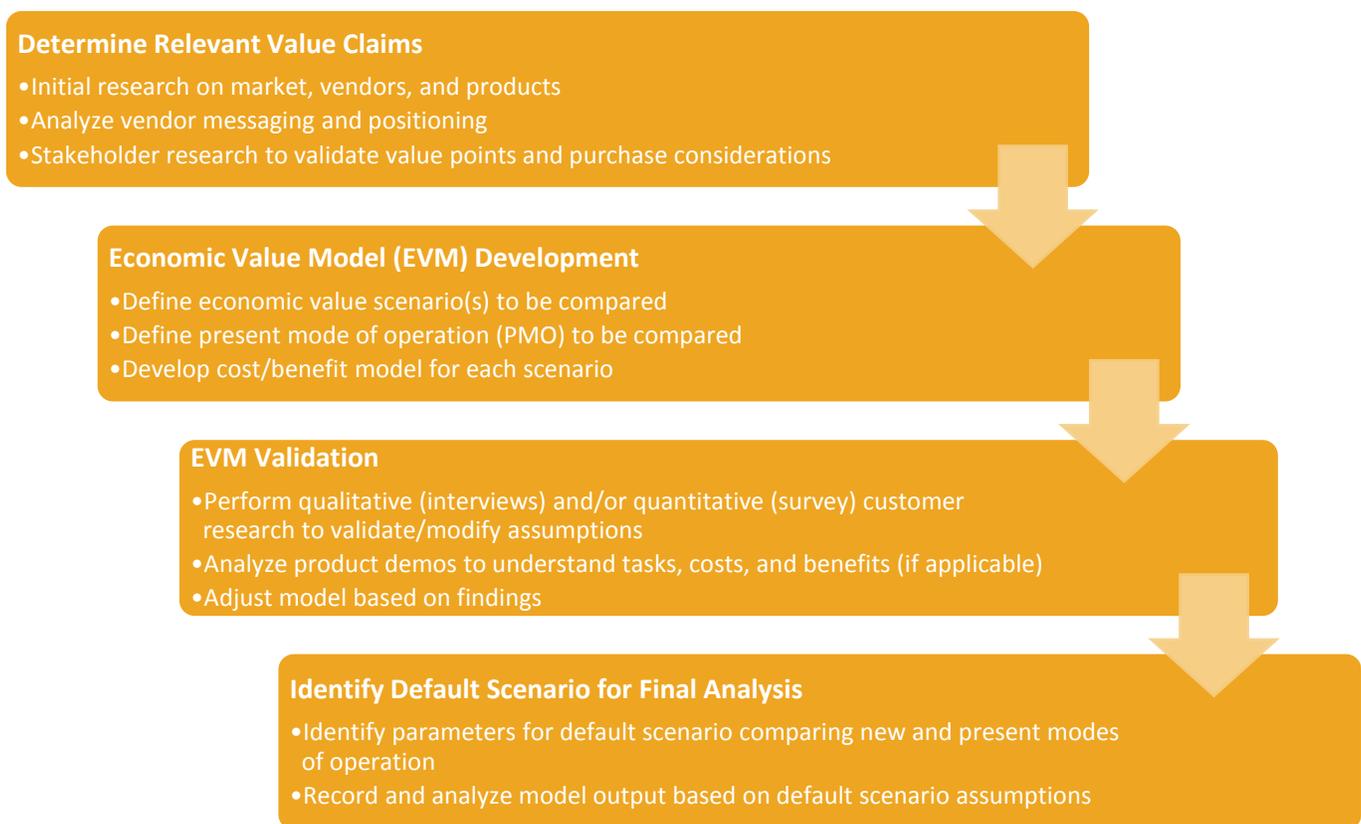
### Objective

ESG was engaged by Aerohive to develop a detailed EVV analysis designed to help IT organizations determine the relative costs and benefits of deploying Aerohive’s wireless solutions compared with a “present mode of operation” (PMO) that reflects the typical wireless network connectivity solutions based on a controller-centric architecture, which most customers today currently use to meet their requirements. This EVV analysis builds upon in-depth interviews with Aerohive customers and other IT professionals, additional ESG market research on wireless connectivity technologies and trends, and ESG’s familiarity with the myriad of alternative wireless network connectivity solutions available in the market today. This analysis is designed to provide potential customers with a comprehensive picture of the direct and indirect costs and benefits they should consider when evaluating Aerohive or any other wireless connectivity solutions.

### Methodology

For this project, ESG followed its standard, four-phase EVV methodology, depicted in Figure 5.

Figure 5. ESG EVV Methodology



Source: Enterprise Strategy Group, 2014.

Please note that the data and conclusions presented in this report regarding the costs and benefits associated with implementing an Aerohive solution compared with a typical controller-based wireless solution reflect the output of ESG’s economic value analysis based on the specific use case and default scenario assumptions modeled specifically for this report. ESG acknowledges that changes to these assumptions will lead to a different set of results and as such, advises IT professionals to use this report as one validation point in a comprehensive financial analysis process prior to making a purchase decision. Pricing assumptions for Aerohive products were provided to ESG by Aerohive.

Other IT equipment and labor cost assumptions were obtained from publicly available sources such as IT vendor websites and published price lists. ESG acknowledges that list prices, configuration details, or other data used as inputs may vary depending on the source of this information.

## Economic Value Model Overview

As previously noted, ESG's EVV methodology compares two scenarios: The first is an organization that elects to use Aerohive's controller-less APs and cloud-enabled management suite for its wireless LAN requirements. The second scenario is a "present mode of operation" that reflects the traditional approach that most customers currently take to meet their wireless LAN requirements: a controller-centric solution. The basic profiles for each scenario are:

- **Aerohive scenario:** In this scenario, the customer is using Aerohive APs and management software to meet its wireless LAN requirements. It includes a combination of Aerohive AP121 access points and the HiveManager management console deployed as a virtual appliance. The model takes into account all hardware, software, data center infrastructure, and support and maintenance costs associated with the Aerohive solution (see Appendix B), plus related IT labor costs for planning, implementation, ongoing administration, and training.
- **Present Mode of Operation scenario:** In this scenario, the customer is using an alternative wireless LAN solution, which includes both wireless APs and wireless controllers at each site covered. The model takes into account all hardware, software, and data center infrastructure costs associated with this solution, plus related IT labor costs for planning, implementation, ongoing administration, and training.

The tasks and processes used as the basis of comparison for both scenarios include:

- Deployment tasks including access point configuration and installation.
- Controller configuration and installation (if applicable).
- Periodic access point and controller (if applicable) software updates and patching.
- Periodic application of policy changes and AP/controller reconfigurations.
- Wireless network troubleshooting.
- Staff training activities associated with relevant management products.

Simply put, ESG's model estimates the likely cost and potential benefits – according to the tasks outlined – of deploying and using both an Aerohive connectivity solution and a PMO connectivity solution. Data sources used by ESG to inform and populate the assumptions regarding these tasks used in the model include in-depth interviews with current Aerohive customers and other IT professionals, product demos of the Aerohive HiveManager solution, and supplementary ESG market research data.

## Cost Categories

This ESG EVV considers five cost categories for both Aerohive and the PMO: hardware, software, training, maintenance, and support. The sum of these categories equals the total cost of ownership (TCO) of each solution.

## Benefit Categories

This ESG EVV quantifies the net benefit of Aerohive over the PMO in two primary benefit categories: IT efficiency savings and user productivity improvements. The sum of these categories equals the total incremental operational benefit of utilizing the Aerohive solution.

## Quantifying Relevant Cost and Benefit Differences

Economic models are, by definition, abstractions from reality. In any model, numerous estimates and assumptions must be made. ESG's EVV methodology leverages rigorous market research and in-depth interviews to estimate material differences between Aerohive's solution and the PMO, both in terms of how those solutions would be

configured in different environments (and the related differences in solution CapEx and OpEx) and how the solutions impact organizational efficiencies (both in terms of IT and end-user labor). The next two sections discuss important estimates incorporated into ESG's EVV model.

**Note:** Based on ESG's interviews with Aerohive customers and product demonstrations, we believe these assumptions to be a reasonable starting point for analysis. However, those same interviews and data also suggest that in some cases, these underlying assumptions may be conservative.

### **Comparative Cost Analysis**

All of the hardware and software components (and associated support/maintenance and training) required to both configure an Aerohive and a PMO wireless solution, given the inputs specified, are within the scope of ESG's EVV model. Included within the model's TCO calculations are costs for: wireless access points, software licensing for access points, guest management (if specified by inputs), controllers (if required by the architecture), licensing to add access point functionality (if required by the solution), management platform acquisition costs, training costs, and annual support/maintenance costs.

- **Wireless access points:** ESG's research indicates that WAPs are largely commodity hardware, and as such, ESG found that any cost differences between APs required in the Aerohive and PMO configurations are nominal. List prices are used for Aerohive AP models and a blended average of AP from alternative vendors is used for PMO pricing.
- **Access point licensing:** Both Aerohive and alternative wireless vendors typically charge a licensing fee for each AP deployed—for most combinations of inputs, this licensing fee is comparable between Aerohive and the PMO. However, one of the unique aspects of Aerohive's solution is its "all-in-one" licensing model where each AP license includes all advanced functionality such as layer 7 visibility, WIPs, and policy enforcement firewall. Alternative vendors often charge for these additional capabilities separately, thus if these capabilities are input as requirements in the model, additional costs are built into the PMO configuration based on publicly available list prices from alternative vendors.
- **Controllers:** As articulated previously, one of the biggest differentiators between Aerohive and the PMO is the fact that the PMO leverages a controller-based architecture. One of the many inputs in ESG's model is the number of locations covered by the configured wireless solution. In the PMO scenario, each location requires either one or two controllers: one if a highly available solution including a redundant controller is not selected, and two if such a solution is selected. Controller models are sized according to the number of APs required per location.
- **Management platform:** To effectively manage any enterprise-grade wireless solution, an advanced management console is frequently a requirement for environment monitoring, reporting, and troubleshooting. With Aerohive, base acquisition costs include the HiveManager console. With controller-based solutions, this centralized management console typically requires an additional capital outlay. As such, ESG's model allows the user to specify if centralized management capabilities are a requirement for her situation: If this is specified by the model user, a differential in solution acquisition cost is included to account for the incremental nature of procuring this functionality in the PMO scenario; if this is not specified by the model user, a differential in IT efficiency for various workflows is calculated to account for the limited functionality in the PMO scenario.
- **Training costs:** ESG's model assumes that any new or refreshed wireless system will come with the requirement to train some number of IT administrators to manage the solution. To account for this, ESG, by default, has included training costs from the vendor (whether Aerohive or the PMO). One of the consensus opinions from ESG's interviews was that HiveManager is an easier to use, less technically demanding solution. Participants in our research indicated that a typical administrator would benefit from four days of professional training with Aerohive and that to achieve an equivalent level of proficiency with alternatives in the market, approximately double the training time (and thus cost) would be required.

- **Support/maintenance costs:** ESG's model assumes that customers will procure three-year 24x7x365 support from Aerohive. The list price for this level of support, charged for each component, is included in model calculations and is charged as an annualized expense in the Aerohive scenarios. By default in the PMO scenario, support and maintenance costs are estimated as 10% of accrued hardware and software expenses charged on an annual basis. ESG believes this is a conservative estimate based on industry norms.

### **Comparative Benefit Analysis**

ESG quantifies the incremental benefit Aerohive can provide an organization over a comparable PMO by focusing in two areas: IT efficiency and wireless end-user efficiency. Most benefits are characterized as time saved to either of these two constituencies. For IT constituents, the main workflows modeled include solution deployment, software updates and patches, wireless network troubleshooting, and the application of AP policy changes. Additionally, differentials in infrastructure power requirements in the two solutions are categorized as an IT efficiency improvement. It is important to keep in mind that many differences in IT workflows have a trickle-down effect on wireless end-users. As such, ESG has modeled the impact of these differences on wireless end-users. A more detailed breakdown of benefit estimates follows:

- **Planning, configuration, and deployment benefits:** As articulated in the "Simplified Architecting and Installation of APs" section of this report, Aerohive customers reported a greatly eased deployment process for an Aerohive solution compared with controller-based alternatives. To account for this, ESG has, by default, conservatively estimated that an additional five hours of IT labor are required during deployment for every site requiring one or more controllers. Additionally, ESG has estimated that when deploying Aerohive APs, IT organizations can utilize less skilled labor, offering the opportunity to save 25% on labor costs.
- **Ongoing management/maintenance benefits:** ESG's model quantifies three main IT workflows associated with wireless management and maintenance: applying periodic software updates and patches, applying periodic policy changes to APs, and troubleshooting wireless network issues.

With respect to the application of software updates and patches, whether an organization utilizes Aerohive or an alternative controller-based solution, ESG's research indicates that most organizations can expect to apply software updates to their APs on a biannual basis. However, the time and effort this can take does vary depending on solution. In controller-based environments that leverage redundant controllers, this process can be cumbersome with IT administrators needing to migrate APs among the controllers in place in order to keep the network up while updating software on the balance of the APs. By contrast, with Aerohive an administrator can just select APs to update within HiveManager and apply that update in a non-disruptive manner. ESG conservatively estimates in these scenarios that applying a software update would take about three times the IT administration effort with the controller-based solutions compared with an Aerohive solution.

ESG's consideration of the application of policy changes to APs and troubleshooting wireless network issues is closely tied to the requirements specified by a model user. In scenarios where a user indicates a centralized management console is a requirement, ESG models both of these workflows to be comparable whether using an Aerohive solution or the PMO. The difference in this case would be that additional CapEx costs are modeled in the PMO scenario because with most controller-based solutions in market, additional infrastructure procurement is required. However, in situations where a centralized management console is not in place in the PMO solution, both troubleshooting and applying policy changes are much less burdensome with Aerohive. In these situations, ESG models the typical wireless troubleshooting remediation process to take one-third the time (or approximately 35 minutes) and the typical policy change to take one-fifth the time (or approximately two minutes) with an Aerohive solution compared with the PMO.

- **Training benefits:** As discussed previously in this report, ESG's interviews with Aerohive customers uncovered the consensus opinion that less training is required for IT administrators leveraging an Aerohive solution compared with typical controller-based alternatives. The impact of this fact is twofold: First, an

organization would need to spend less on training modules if it used Aerohive (this impact is captured in TCO calculations) and second, IT administrators would be taken away from their day-to-day responsibilities (to attend training) for less time. By default, the upfront productivity differential due to training is assumed to be four days per IT administrator trained. ESG also models a 20% annual retraining time burden for each year in modeled time horizon to account for turnover and onboarding in the IT department.

- **Data center/infrastructure OpEx savings:** The core architectural difference between Aerohive and its controller-based counterparts is obviously the fact that Aerohive has eliminated the need for controller appliances in the wireless environment. Not only does this greatly affect hardware CapEx, but also the reduction in appliances in the environment carries with it a tangible reduction in infrastructure costs including power, cooling, and rack space. ESG's model accounts for these costs by calculating the power consumption (and corresponding costs) that would be incurred for each appliance deployed in the PMO scenario (that would not be deployed in the Aerohive scenario) and by including a cost estimate for data center real estate. By default, ESG uses an estimate of \$.13/KwH and estimates additional data center costs (over and above power) as \$20,000 per rack per year.
- **End-user productivity gained from solution resiliency:** Another key impact area to consider when comparing a controller-less architecture with a controller-centric architecture is the downtime associated with the latter's single point of failure: the controller. ESG's research with IT administrators indicates that, while not rampant, controller failure is a real risk, especially given the less than ideal environmental characteristics present in many remote/branch offices. To account for this risk, ESG models the likelihood of a controller failure at 8% annually. In cases where a non-redundant architecture is utilized, the result of a controller failure would be a wireless network outage affecting that site. ESG has modeled the duration of such outages to be 15 hours and has estimated a 10% reduction in wireless end-user productivity for that timespan.
- **End-user productivity gained from faster time to resolve issues:** In scenarios where ESG has modeled Aerohive to have a quantifiable advantage in the time taken to troubleshoot wireless network issues (namely situations where the model user specifies to forgo the upfront centralized management investment required in the PMO scenario), it is important to also consider the impact on wireless end-users. In these cases, the shorter time to issue resolution means that wireless end-users are back online and fully productive sooner. Again, ESG has estimated a default 10% reduction in wireless end-user productivity for periods of time where wireless connectivity is unavailable.
- **End-user productivity gained from no wireless downtime associated with software updates:** With an Aerohive solution, there is no situation where a site's entire wireless network would need to be taken down in order to update that site's APs (barring a site having only one AP). Each AP can be selected, updated, and rebooted individually with the other APs at the site picking up the slack. By contrast, when using a controller-based solution, there are several situations where an update may take down the wireless network. First, in situations where there is no redundant controller, all APs would need to be updated and rebooted simultaneously and thus the network would be unavailable during that time. Second, if a site has redundant controllers but only a small number of APs, the organization may opt to reboot all APs simultaneously after an update. This would ease the effort from the IT team's perspective when updating APs but, again, would take down wireless connectivity at the site for a period of time. In these situations, ESG's model estimates that the typical wireless outage would last on the order of 20 minutes and reduce the affected wireless end-users' productivity by 10%.

## Economic Value Validation Results

### Example Scenarios

ESG developed baseline profiles of three generic organizations to illustrate the relative costs and benefits of leveraging an Aerohive solution compared with the PMO across a range of scenarios. For the purposes of this analysis, ESG has tuned its model assumptions as follows in Table 1:

*Table 1. Key Assumptions in Default Scenario*

Input	Scenario 1	Scenario 2	Scenario 3
Default AP model used	AP121 or equivalent	AP121 or equivalent	AP121 or equivalent
Total number of APs required	3,000	12,000	5,000
Number of sites covered by deployment	1,000	200	10
Number of employees covered by deployment	15,000	40,000	20,000
Number of IT administrators (FTEs) formally trained to manage/monitor deployment	3	3	3
Centralized management console a requirement for this deployment	Yes	Yes	Yes
Policy enforcement firewall a requirement for this deployment	Yes	Yes	Yes
Wireless intrusion prevention/spectrum analysis a requirement for this deployment	Yes	Yes	Yes
Average (unburdened) salary for an IT administrator	\$80,000	\$80,000	\$80,000
Average (unburdened) salary for a typical non-IT employee	\$65,000	\$65,000	\$65,000
Highly available wireless network a requirement for this deployment	Yes	Yes	Yes
Estimated average reduction in end-user productivity in the event of a wireless network outage	10%	10%	10%
Modeled time horizon	3 years	3 years	3 years

*Source: Enterprise Strategy Group, 2014.*

### A Note about Scenarios Selected for this Analysis

In all three scenarios, ESG assumed both the presence of redundant controllers and the upfront procurement of a centralized management console in the PMO scenario. Both of these assumptions will impact the model: It raises the TCO for the PMO; however, it also reduces both the IT efficiency and end-user productivity benefits offered by Aerohive. While these scenarios represent valid assumptions, it is important to keep in mind that changing these assumptions could materially change model outcomes.

### Summary of Results, Scenario 1: Highly Distributed Enterprise

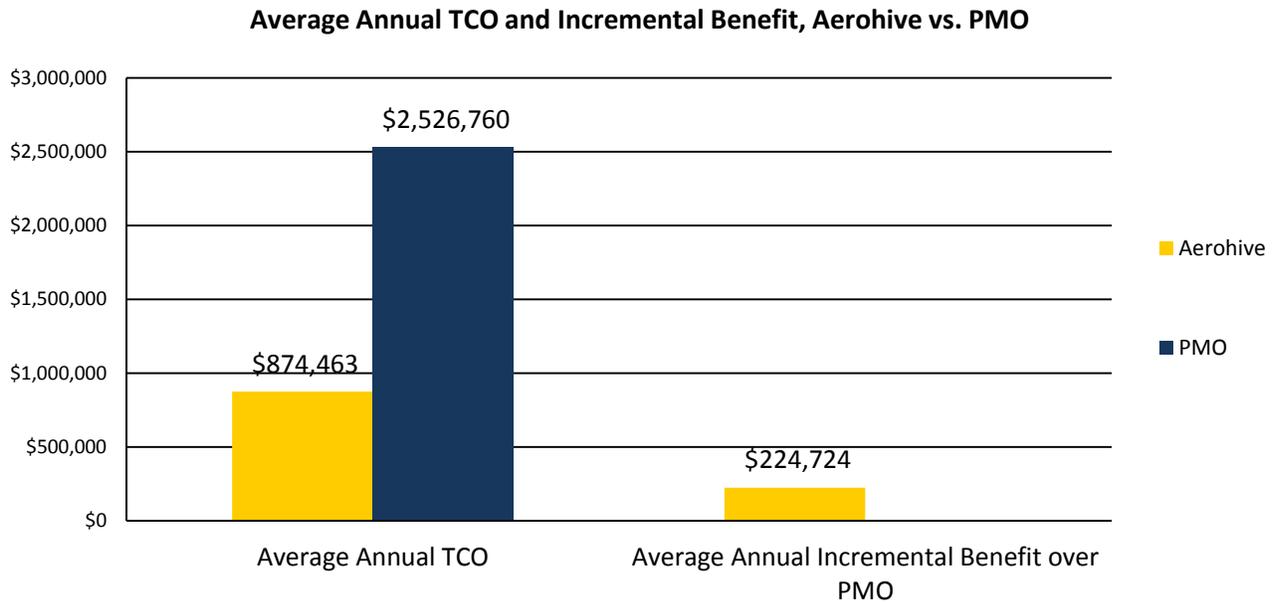
#### **Average Annual TCO and Benefit**

Annual TCO is the sum of all the cost categories included in the analysis averaged over the time horizon of three years. Similarly, ESG's model also calculates incremental benefits offered by Aerohive over the PMO averaged over three years. It is important to keep in mind that in both scenarios, an organization would achieve presumably large amounts of utility as a result of providing their constituents with wireless connectivity. This utility is considered out of the scope of analysis for this model because it would be comparable whether an organization was utilizing either

an Aerohive solution or a controller-based solution. Rather, this model only measures material differences in the areas of IT efficiency and end-user productivity inherent to each architecture. As such, any value attributed to providing customers or other non-employee constituents wireless connectivity when present at an organization's sites is also considered outside the scope of this model.

As displayed in Figure 6, the annual TCO for an appropriately configured Aerohive solution (given this scenario's inputs) is \$874,463, compared with \$2,526,760 for the PMO solution. This means that the TCO for an Aerohive solution in this scenario is over 65% less than a comparable controller-based solution. Of course, TCO should only be one part of the customer consideration. In this scenario, the drastically lower TCO for Aerohive is further augmented by an average annual benefit over the PMO of \$224,724.

*Figure 6. Scenario 1: Annual TCO and Benefit, Aerohive versus PMO*



*Source: Enterprise Strategy Group, 2014.*

### **Itemized TCO Analysis**

For the hypothetical highly distributed enterprise scenario described, the itemized three-year cost of ownership for Aerohive compared with the PMO is displayed in Table 2. As shown, the Aerohive solution is modeled to be significantly less expensive compared with the PMO over the time horizon. ESG estimates that Aerohive customers will realize the most significant cost advantages in the area of hardware, saving in excess of \$3,000,000 in that area alone. This is due to the extremely high CapEx associated with the controllers needed to operate a highly available wireless network at 1,000 distributed locations.

*Table 2. Scenario 1: Three-year TCO, Aerohive versus PMO*

Cost Component	Aerohive	PMO
Hardware	\$1,948,999	\$5,202,293
Software	\$240,000	\$606,553
Maintenance and Support	\$420,000	\$1,742,654
Training	\$14,390	\$28,781
<b>Total</b>	<b>\$2,623,389</b>	<b>\$7,580,280</b>

*Source: Enterprise Strategy Group, 2014.*

### Benefits Analysis

As previously discussed, cost is only one side of the equation when evaluating the true economic value of an IT product or service. Potential customers must also take into account the operational benefits they will achieve from that technology solution. The quantification of benefits offered by an Aerohive solution compared with the PMO for this scenario are displayed in Table 3. As shown, total benefits for Aerohive over the time horizon are modeled to equal \$674,173. Taking cost and benefit together, this scenario is modeled to result in a net financial benefit (relative to costs) of \$5,631,064 over three years for an organization choosing to invest in Aerohive rather than a controller-based solution (see Table 4).

*Table 3. Scenario 1: Three-year Benefit, Aerohive versus PMO*

Benefit Category	Aerohive	PMO
<b>IT Efficiency Improvements</b>	<b>\$589,310</b>	
Planning, Configuring, and Deployment Costs	\$132,771	\$472,076
Ongoing Management / Maintenance Costs	\$98,251	\$98,251
Training Costs	\$8,271	\$16,541
Data Center / Infrastructure OpEx Costs	\$-	\$241,735
Subtotal	\$239,293	\$828,603
<b>End-user Productivity Improvements</b>	<b>\$84,863</b>	
End-User Productivity Lost Due to Less Resilient Architecture	\$-	\$12,945
End-User Productivity Lost Due to Time to Troubleshoot	\$25,171	\$25,171
End-User Productivity Lost Due to Network Downtime Associated with AP Updates	\$-	\$71,918
Subtotal	\$25,171	\$110,034
<b>Total Three-year Benefits</b>	<b>\$674,173</b>	

*Source: Enterprise Strategy Group, 2014.*

*Table 4. Scenario 1: Three-year Net Financial Benefit, Aerohive*

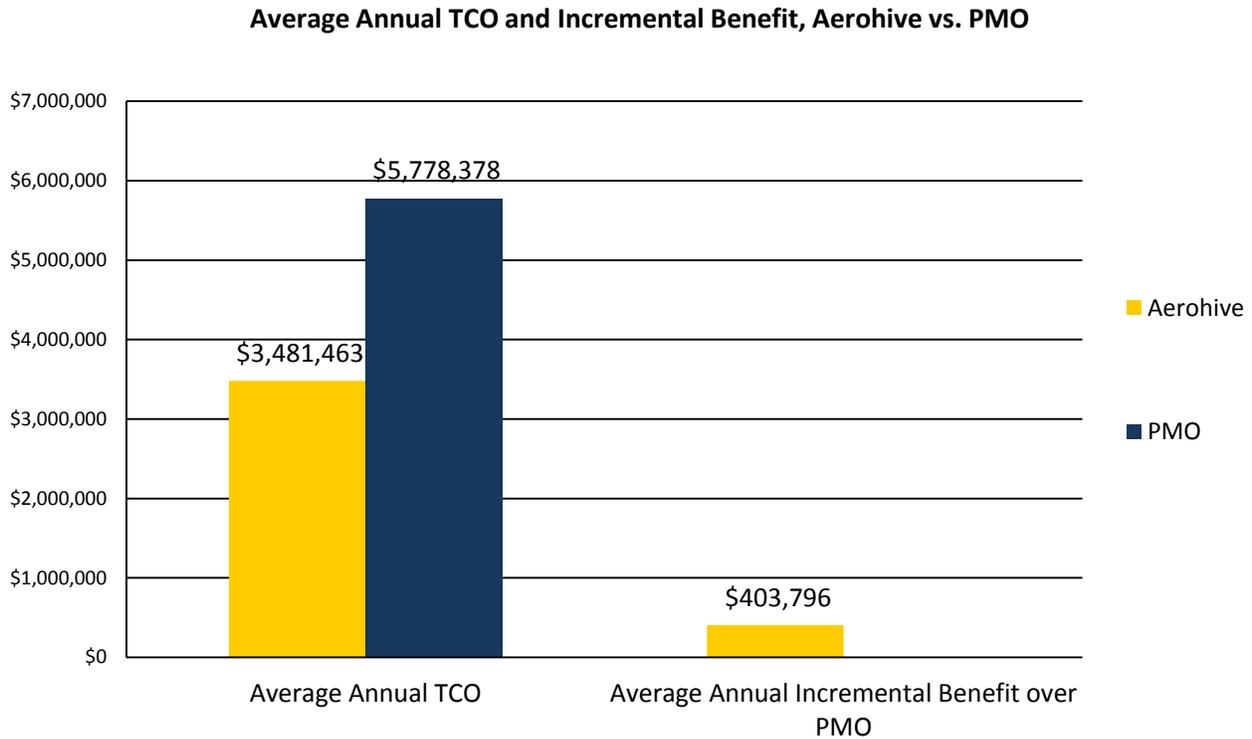
Category	Aerohive	PMO	Difference
Total Incremental Benefits	\$674,173	\$-	\$674,173
Total Costs	\$2,623,389	\$7,580,280	\$4,956,891
<b>Net Financial Benefit</b>			<b>\$5,631,064</b>

*Source: Enterprise Strategy Group, 2014.*

### Summary of Results, Scenario 2: Regionally Distributed Large Enterprise

#### Average Annual TCO and Benefit

Figure 7 displays the relative annual TCOs for both Aerohive and the PMO in scenario 2, representing a regionally distributed large enterprise. As shown, an appropriately configured Aerohive solution (given this scenario's inputs) is calculated to cost an average of \$3,481,463, compared with \$5,778,378 for the PMO solution. This means that the TCO for an Aerohive solution in this scenario is roughly 40% less than the TCO calculated for a comparable controller-based solution. Again, TCO should only be one part of the customer consideration. In this scenario, the significantly lower TCO for Aerohive is made even more appealing by an average annual benefit over the PMO of \$403,796.

**Figure 7. Scenario 2: Annual TCO and Benefit, Aerohive versus PMO**


*Source: Enterprise Strategy Group, 2014.*

### Itemized TCO Analysis

For the hypothetical, regionally distributed large enterprise scenario described, the itemized three-year cost of ownership for Aerohive compared with the PMO is displayed in Table 5. As shown, the Aerohive solution is modeled to be significantly less expensive compared with the PMO over the time horizon. In this scenario, while hardware is still the largest *absolute* cost differential driver, on a percentage basis, both software and maintenance represent greater differences when comparing Aerohive and the PMO.

**Table 5. Scenario 2: Three-year TCO, Aerohive versus PMO**

Cost Component	Aerohive	PMO
Hardware	\$7,789,999	\$10,922,359
Software	\$240,000	\$2,390,220
Maintenance and Support	\$420,000	\$3,993,774
Training	\$14,390	\$28,781
<b>Total</b>	<b>\$10,444,389</b>	<b>\$17,335,134</b>

*Source: Enterprise Strategy Group, 2014.*

### Benefits Analysis

Again, it is critical to also examine the operational benefits offered by Aerohive in addition to the TCO advantage in order to understand the full impact of a potential investment decision. The quantification of benefits offered by an Aerohive solution compared with the PMO for this scenario are displayed in Table 6. As shown, total benefits for Aerohive over the time horizon are modeled to equal \$674,173. Taking cost and benefit together, this scenario is modeled to result in a net financial benefit (relative to costs) of \$8,102,134 over three years for an organization choosing to invest in Aerohive rather than a controller-based solution (see Table 7).

**Table 6. Scenario 2: Three-year Benefit, Aerohive versus PMO**

Benefit Category	Aerohive	PMO
<b>IT Efficiency Improvements</b>	<b>\$1,168,238</b>	
Planning, Configuring, and Deployment Costs	\$531,085	\$767,123
Ongoing Management / Maintenance Costs	\$393,003	\$676,249
Training Costs	\$8,271	\$16,541
Data center / Infrastructure OpEx Costs	\$-	\$640,684
Subtotal	\$932,359	\$2,100,597
<b>End-user Productivity Improvements</b>	<b>\$43,151</b>	
End-User Productivity Lost Due to Less Resilient Architecture	\$-	\$43,151
End-User Productivity Lost Due to Time to Troubleshoot	\$67,123	\$67,123
End-User Productivity Lost Due to Network Downtime Associated with AP Updates	\$-	\$-
Subtotal	\$67,123	\$110,274
<b>Total Three-year Benefits</b>	<b>\$1,211,389</b>	

Source: Enterprise Strategy Group, 2014.

**Table 7. Scenario 2: Three-year Net Financial Benefit, Aerohive**

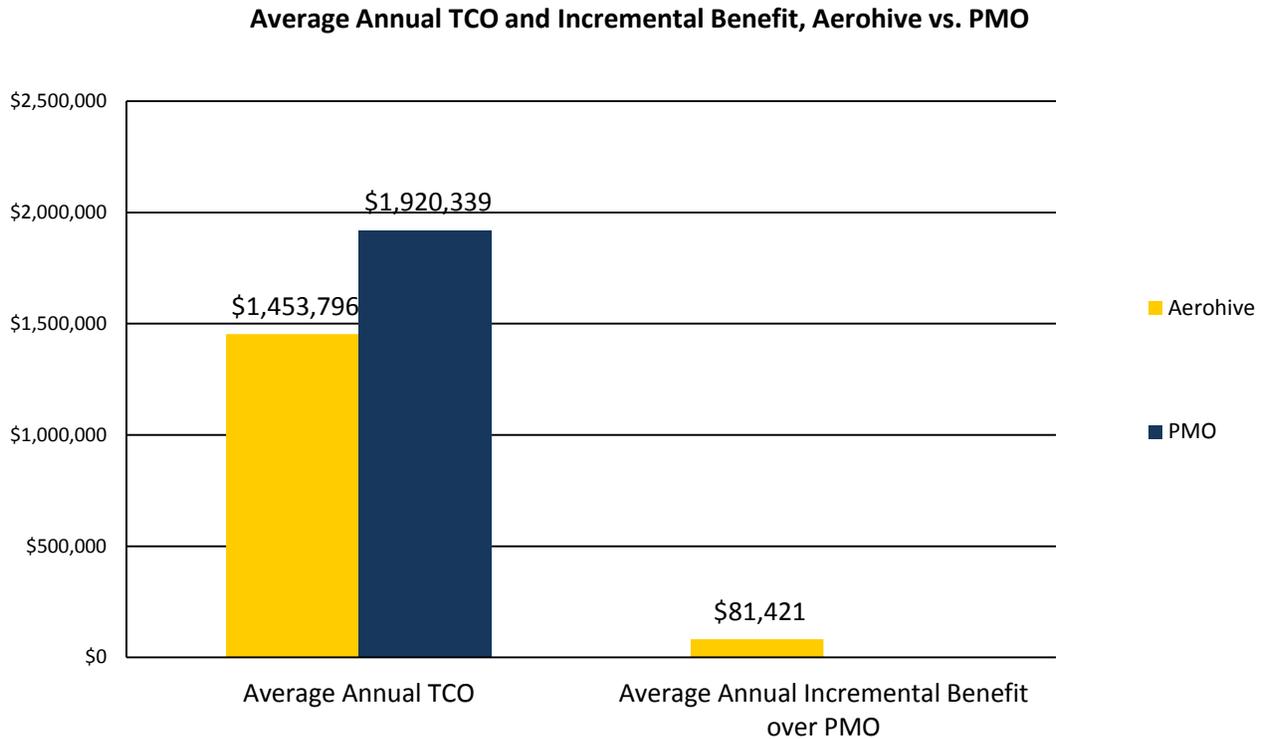
Category	Aerohive	PMO	Difference
Total Incremental Benefits	\$1,211,389	\$-	\$1,211,389
Total Costs	\$10,444,389	\$17,335,134	\$6,890,745
<b>Net Financial Benefit</b>			<b>\$8,102,134</b>

Source: Enterprise Strategy Group, 2014.

## Summary of Results, Scenario 3: Centralized Campus

### Average Annual TCO and Benefit

Figure 8 displays the relative annual TCOs for both Aerohive and the PMO in scenario 3, representing a centralized campus deployment. As shown, an appropriately configured Aerohive solution (given this scenario's inputs) is calculated to cost an average of \$1,453,796, compared with \$1,920,339 for the PMO solution. This means that the TCO for an Aerohive solution in this scenario is nearly 25% less than the TCO calculated for a comparable controller-based solution. As stated previously, TCO should only be one part of the customer consideration. In this scenario, the lower TCO for Aerohive is made more appealing by a non-trivial average annual benefit over the PMO of \$81,421.

**Figure 8. Scenario 3: Annual TCO and Benefit, Aerohive versus PMO**


*Source: Enterprise Strategy Group, 2014.*

### Itemized TCO Analysis

For the hypothetical centralized campus scenario described, the itemized three-year cost of ownership for Aerohive compared with the PMO is displayed in Table 8. As shown, the Aerohive solution is modeled to be significantly less expensive compared with the PMO over the time horizon. In this scenario, it is interesting to note that due to the relatively small number of sites, the delta between the solutions in terms of hardware is quite minimal with software and maintenance costs driving the bulk of the cost differential when comparing Aerohive and the PMO.

**Table 8. Scenario 3: Three-year TCO, Aerohive versus PMO**

Cost Component	Aerohive	PMO
Hardware	\$3,246,999	\$3,415,986
Software	\$400,000	\$993,428
Maintenance and Support	\$700,000	\$1,332,824
Training	\$14,390	\$28,781
<b>Total</b>	<b>\$4,361,389</b>	<b>\$5,761,018</b>

*Source: Enterprise Strategy Group, 2014.*

### Benefits Analysis

As stated previously, it is critical to also examine the operational benefits offered by Aerohive in addition to the TCO advantage in order to understand the full impact of a potential investment decision. The quantification of benefits offered by an Aerohive solution compared with the PMO for this scenario are displayed in Table 9. As shown, total benefits for Aerohive over the time horizon are modeled to equal \$244,263. Taking cost and benefit together, this scenario is modeled to result in a net financial benefit (relative to costs) of \$1,643,892 over three years for an organization choosing to invest in Aerohive rather than a controller-based solution (see Table 10).

**Table 9. Scenario 3: Three-year Benefit, Aerohive versus PMO**

Benefit Category	Aerohive	PMO
<b>IT Efficiency Improvements</b>	<b>\$244,263</b>	
Planning, Configuring, and Deployment Costs	\$221,286	\$297,998
Ongoing Management / Maintenance Costs	\$163,751	\$281,770
Training Costs	\$8,271	\$16,542
Data center / Infrastructure OpEx Costs	\$0	\$41,261
Subtotal	\$393,308	\$637,571
<b>End-user Productivity Improvements</b>	<b>No Difference<sup>5</sup></b>	
End-User Productivity Lost Due to Less Resilient Architecture	\$-	\$-
End-User Productivity Lost Due to Time to Troubleshoot	\$33,562	\$33,562
End-User Productivity Lost Due to Network Downtime Associated with AP Updates	\$-	\$-
Subtotal	\$33,562	\$33,562
<b>Total Three-year Benefits</b>	<b>\$244,263</b>	

Source: Enterprise Strategy Group, 2014.

**Table 10. Scenario 3: Three-year Net Financial Benefit, Aerohive**

Category	Aerohive	PMO	Difference
Total Incremental Benefits	\$244,263	\$-	\$244,263
Total Costs	\$4,361,389	\$5,761,018	\$1,399,629
<b>Net Financial Benefit</b>			<b>\$1,643,892</b>

Source: Enterprise Strategy Group, 2014.

<sup>5</sup> No material difference between solutions given specified assumptions.

## The Bigger Truth

Wireless networks have rapidly become a critical part of enterprise IT architectures. With the proliferation of employee-owned mobile devices, spanning smartphones, tablets, and PCs, organizations now face the daunting task of supporting double or triple the number of wireless devices that they did just a few years ago. In addition to the number of devices, the applications used on these devices are also driving the need for more bandwidth. Collaboration and communication applications like Microsoft Lync drive video communication and shared desktops over the wireless infrastructure. In a very short time, employees' wireless devices have become an integral part of the work day and are used to maintain productivity, regardless of their location in the business. As such, the wireless network supporting these devices has to adapt to support these needs. Organizations need solutions that are easy to use and deploy, that can rapidly scale to handle increased demands, and that provide the highest levels of availability.

Of course, these solutions also need to be cost effective to deploy and must deliver significant ROI to the business. According to ESG research, return on investment is actually the consideration for justifying IT investments to the business reported by the largest percentage of respondents, and has been for the last two years.<sup>6</sup> Typically, organizations that cite ROI to justify IT purchases would be looking for both a lower total cost of ownership (TCO) and increased benefits like improved processes or higher levels of productivity.

Fortunately, the controller-less architecture that Aerohive has pioneered is able to produce the requisite performance, scale, and operational efficiencies that also generate a significant ROI by delivering a solution that has lower costs and increased benefits over legacy wireless environments. The scenarios illustrated in this paper highlight the advantage controller-less architectures and Aerohive in particular have over legacy environments. The operational benefits are even greater in environments that do not have centralized management or redundant controllers. Organizations considering expanding existing or upgrading its wireless environments with 802.11ac to better support BYOD initiatives and new applications should carefully review this document to understand how a controller-less architecture could provide a compelling ROI to the business.

---

<sup>6</sup> Source: ESG Research Report, [2014 IT Spending Intentions Survey](#), February 2014.



Enterprise Strategy Group | **Getting to the bigger truth.**