

# UNIFYING WI-FI FOR PERFORMANCE AND PROFITABILITY

MOVING PAST TODAY'S WI-FI ISLANDS  
WITH A CENTRALIZED ARCHITECTURE

**JAY BESTERMANN,**  
SR. DIRECTOR OF SERVICE PROVIDER WI-FI

**DAVE BROWN,**  
DIRECTOR OF PRODUCT MANAGEMENT,  
SERVICE PROVIDER WI-FI



# TABLE OF CONTENTS

INTRODUCTION.....	3
WI-FI ISLANDS POSE A BARRIER TO SUCCESS.....	3
EVALUATING A UNIFIED APPROACH TO WI-FI.....	6
Establish the Key Considerations and Requirements.....	6
Architect a Unified Wi-Fi Architecture .....	7
UNIFIED WI-FI PROVIDES A PATH TO NEW SERVICE AND BUSINESS OPPORTUNITIES .....	8
Deliver High Quality, Seamless Subscriber Experiences.....	8
Unlock New Wi-Fi Revenue Opportunities.....	9
CONCLUSION.....	11
MEET OUR EXPERT - JAY BESTERMANN.....	12
REFERENCES.....	12

# INTRODUCTION

For consumers, Wi-Fi has quickly evolved from a “nice to have” service to a “must have” utility. Worldwide, the average home now has six media devices connected to its Wi-Fi network<sup>1</sup> - and according to Wi-Fi Alliance®, 6.5 million Wi-Fi devices are now shipping every day<sup>2</sup>. This growth rate not only reinforces the importance of Wi-Fi as an in-demand service, it also emphasizes the looming challenge that service providers face as they scale their Wi-Fi offerings in support of a massive volume of consumer devices.

Wi-Fi service revenues driven by the deployment of Next Generation Hotspot...will grow to over \$150B by 2018<sup>3</sup>

For service provider executives, delivering a highly scalable Wi-Fi offering that meets consumers’ needs and their own business goals has become a top priority. But beyond the basics of connectivity are several new possibilities that can help service providers maximize their network investments and monetize Wi-Fi in unprecedented ways. Whether it is delivering seamless connectivity from home to community, targeting advertisements based on user data, enabling “Wi-Fi first” calling or developing inter-operator roaming agreements with other carriers, today’s service providers have a range of options when it comes to extending their revenues with Wi-Fi.

While these new opportunities for monetizing Wi-Fi are abundant, there are significant challenges when it comes to deploying and managing high quality and profitable Wi-Fi services. Many of these challenges can be traced back to the way in which Wi-Fi networks have traditionally been built – as disparate islands of connectivity or management that don’t yet work together as a unified system. This paper highlights a new approach to Wi-Fi that unites these islands to help service providers deliver more consistent performance and new opportunities for monetization across their diverse service touch points.

## WI-FI ISLANDS POSE A BARRIER TO SUCCESS

Service providers who are deploying Wi-Fi are finding it to be challenging in that – unlike fixed broadband or residential video delivery – Wi-Fi service gets deployed in pockets rather than being launched from a centralized delivery point. Even when there is a centralized point for

managing basic performance and operations, Wi-Fi networks are often treated uniquely when it comes to more advanced features such as login management, data collection and other value-added functions. Since some service providers have built separate groups for business services or outsource Wi-Fi for multiple dwelling units (MDUs) and public places, they are left with large Wi-Fi islands that are completely disconnected from the home Wi-Fi networks of their residential subscribers, and each other. This divide makes the subscriber experience very fragmented as they travel from their homes out into the community.

This divide often makes the subscriber experience very fragmented as they travel from their homes out into the community.

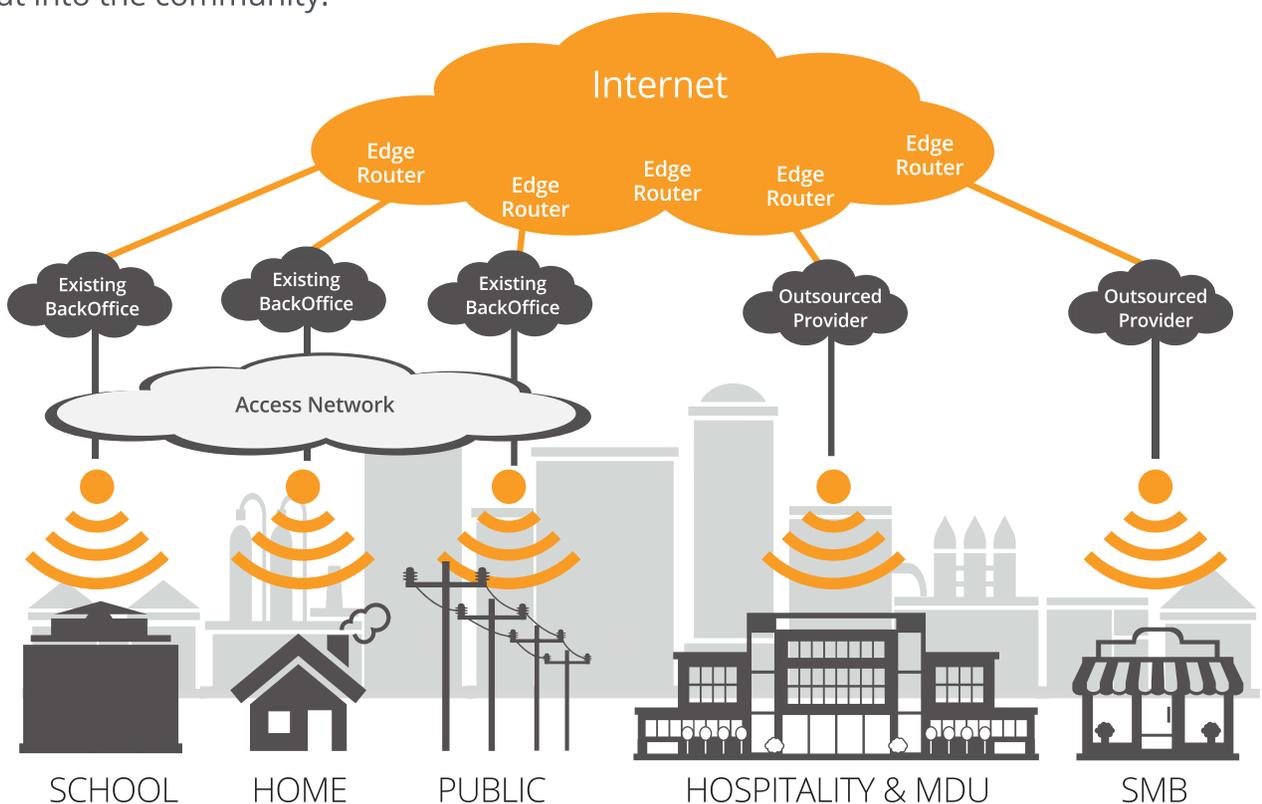


Figure 1: Today's Wi-Fi islands

Whether they are managing thousands of individual islands or a few service silos, any lack of Wi-Fi continuity threatens the successful implementation of a scalable, high-performance Wi-Fi service. Without a centralized, unified approach to Wi-Fi management, service providers are finding it difficult to maintain an end-to-end high quality experience for subscribers. This makes it impossible to extract maximum value from their Wi-Fi assets, and creates additional challenges as well.

## ***Limited Device Visibility***

While service providers have grown accustomed to unobstructed visibility into the performance characteristics of the entire broadband delivery network, today's Wi-Fi islands make it difficult to consistently understand what is happening with the service. This can be a result of limited management capabilities in the network, a lack of monitoring features within the Wi-Fi CPE, or a mix of access point types that provide inconsistent data to customer support systems. Regardless of the cause, without centralized visibility into Wi-Fi performance, service providers often find themselves in the dark when it comes to troubleshooting service issues.

## ***Insufficient Bandwidth Management and QoS Capabilities***

Without the ability to monitor and manage bandwidth and QoS capabilities across the entire Wi-Fi footprint, service providers are at a disadvantage when it comes to maintaining a high quality Wi-Fi experience. This makes it difficult to isolate network issues and implement policies that improve service for all users, in all locations and for all applications.

## ***A Lack of Mobility Between Wi-Fi Islands***

Today's Wi-Fi islands require consumers to log in to multiple networks as they move throughout the community. This can be a frustrating process that gives a competitive edge to Wi-Fi's cellular counterparts, and degrades service providers' plans for footprint expansion.

Users are seeking a continuous Wi-Fi experience that 'just works' – wherever they go.

## ***De-centralized Subscriber Management Functions***

As users rely more heavily on Wi-Fi, the service provider's ability to manage performance and the overall subscriber experience is growing increasingly important. However, with different subscriber management capabilities for residential, business, MDU and public Wi-Fi islands, service providers are unable to create and manage a high quality experience that is consistent wherever users travel.

## ***Limited Customer Insight***

In addition to hampering consistent user experiences, Wi-Fi islands impede the creation of the advanced new capabilities service that providers want to deploy. This includes the gathering of intelligence about user experiences, behaviors and activities, which has the potential to help service providers offer customized content, personalized experiences and targeted advertisements to their subscribers.

While it is important to move beyond Wi-Fi islands to improve the service providers' ability to manage and optimize Wi-Fi performance, it is even more critical to do so to unleash advanced new monetization opportunities that come with data collection, analytics and seamless mobility. These features provide a platform for new Wi-Fi opportunities that can pose a significant competitive advantage for service providers, and provide consumers with compelling new personalized experiences.

## EVALUATING A UNIFIED APPROACH TO WI-FI

To unite the Wi-Fi islands and overcome their many challenges, service providers must evolve to a centralized, unified Wi-Fi architecture. This approach must allow users to travel between multiple access points with a feeling of constant connectivity. This is not a 'natural state' for Wi-Fi, which means there are several challenges for service providers to consider if they are to manage this transition successfully.

### **Establish the Key Considerations and Requirements**

Bringing Wi-Fi under a common, centralized management framework requires that multiple systems and varied access points work together. And since the state of the art in hardware, management and operational systems is ever evolving, a vendor neutral or "best in class" approach can help prevent locking in to outdated solutions. This approach also enables service providers to readily support the varying deployment requirements within homes, businesses, MDUs and public places, preventing the creation of future Wi-Fi islands.

A centralized approach must meet the needs of thousands or even tens of thousands of access points. This requires an extremely high level of scalability, especially in the software management systems that span from the core network infrastructure to CPE. In the face of all of this scale, service providers must be able to easily understand Wi-Fi performance at both a macro and micro level. This requires a dashboard view, with drilldown capabilities into access points and visibility across the entire service delivery ecosystem.

In addition, the centralized Wi-Fi architecture must provide unprecedented levels of intelligence. This includes the ability to aggregate and analyze massive amounts of data and provide advanced insights into Wi-Fi usage, client device types, location, user demographics, behaviors and other key information. This intelligence is the key to evolving Wi-Fi beyond a connectivity tool and creating a wealth of new differentiated service opportunities.

## Architect a Unified Wi-Fi Network

For a truly unified Wi-Fi architecture, service providers must have several components in place. These include an access point (AP) controller, a wireless access gateway (WAG), a subscriber management platform (SMP) and a data and analytics platform (DAP).

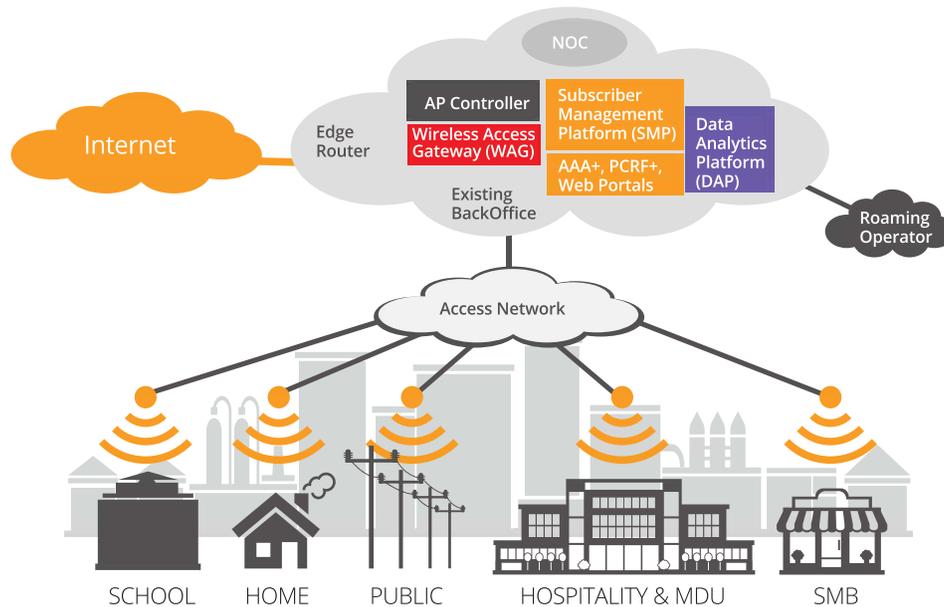


Figure 2: The unified Wi-Fi architecture

The **AP Controller**, among many other features, provides invaluable RF management that helps balance clients across APs and bands... as well as selecting optimum channels for each Wi-Fi Radio. By virtualizing this functionality into a software instance on multiple hardware servers, service providers can achieve the massive scale needed to deliver unified, high quality Wi-Fi across thousands and even millions of access points.

The **Wireless Access Gateway (WAG)** aggregates tunnels and sessions, provides intelligent IP subscriber management and oversees layer 2 networking capabilities for all Wi-Fi sessions. This centralized platform is a critical component of a unified Wi-Fi deployment, providing a full set of carrier-grade integrated IP services for routing, filtering and enforcing service policies at a very large scale.

The **Subscriber Management Platform (SMP)** is required for client authentication, policy control, access control and integration with existing operational and business support systems.

The **Data & Analytics Platform (DAP)** is a crucial component of the unified Wi-Fi architecture as it handles advanced monitoring and reporting & management of Wi-Fi elements and the entire Wi-Fi ecosystem. One of the critical functions of the DAP is to manage and report on back office server infrastructure including all threads and processes, disk utilization, network interfaces

and even uninterruptible power supplies (UPS). This unified dashboard serves as a central point for data collection and analysis.

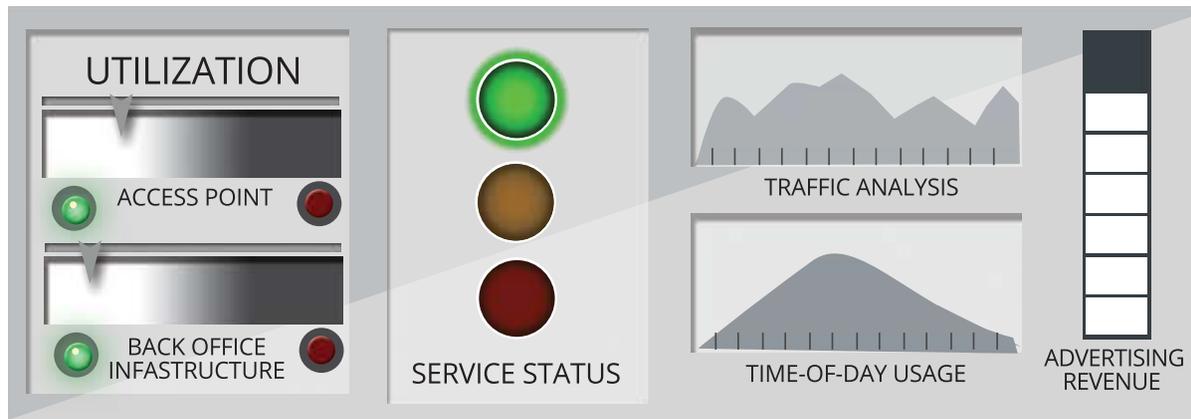


Figure 3: A unified dashboard view for Wi-Fi

Together, the components of this unified Wi-Fi architecture bring the service providers' Wi-Fi assets together into a single, centralized system capable of:

- Delivering consistent performance
- Supporting multiple vertical market applications
- Expanding the Wi-Fi footprint
- Centralizing Wi-Fi management functions

## UNIFIED WI-FI PROVIDES A PATH TO NEW SERVICE AND BUSINESS OPPORTUNITIES

By creating a unified Wi-Fi architecture, service providers are well positioned to improve their subscriber Wi-Fi experiences and develop new revenue opportunities such as fee-based Wi-Fi connections, location-based and social marketing, and footprint expansion through service provider roaming.

### Deliver High Quality, Seamless Subscriber Experiences

When service providers deploy a unified Wi-Fi architecture, they are creating a platform on which they can provide high performance, ubiquitous access to their subscribers, and seamless mobility between residential, MDU, business and public locations. Centralized subscriber

management functionality enables users to sign in once, with their credentials providing them access throughout their service provider's Wi-Fi footprint. In a sense, this seamless experience provides a similar level of mobility to that of a cellular data network, setting the stage for Wi-Fi to gain ground as the primary connectivity option for wireless users and opening the door for Wi-Fi first calling.

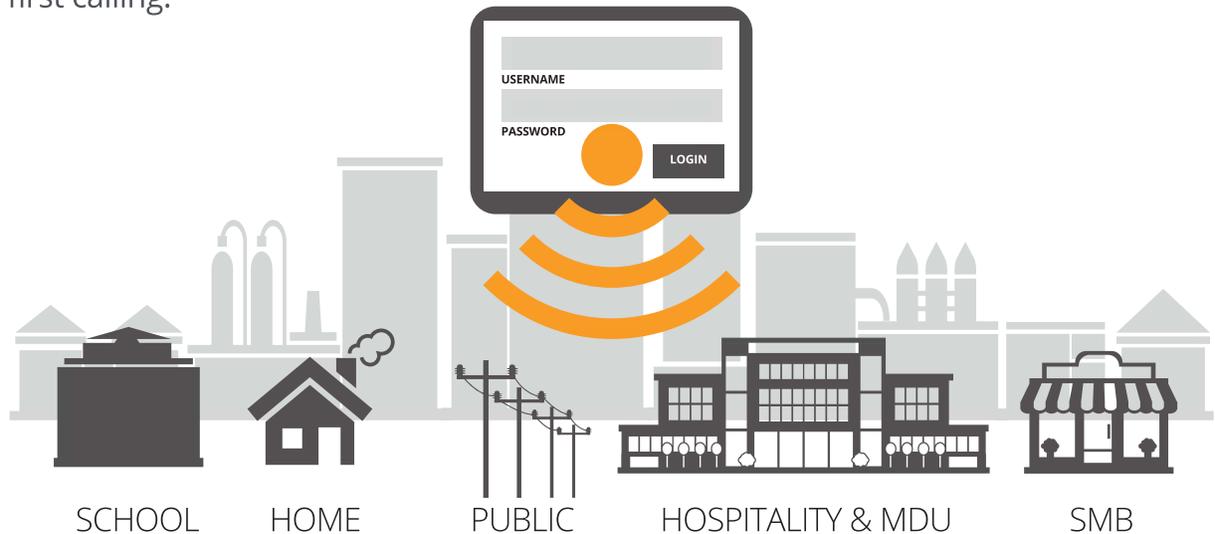


Figure 4: A unified Wi-Fi experience wherever subscribers connect

To ensure optimal performance for every connected user and device, advanced performance management features monitor the Wi-Fi network as a whole and enable granular visibility into status and performance at the access point level as well. When issues do arise, alerts are triggered automatically and root causes can be identified and resolved quickly through centralized element management capabilities that span every access point in the network.

In addition to providing their own high performance Wi-Fi networks, service providers are also interested in expanding their footprint through Wi-Fi roaming agreements with other network operators. To do so, service providers must be able to manage multiple SSIDs for each access point, and be able to share up-to-date subscriber authentication information from a central point in the network. By bringing network and subscriber management functions into the core, service providers can more easily collaborate with one another as they extend their reach through partnership.

Among the most powerful features of a unified Wi-Fi architecture is its ability to offer different login options for onboarding current subscribers and attracting passers by. This allows service providers to offer a range of Wi-Fi options such as complimentary access in a coffee shop, timed access at a train station or fee-based access in a hotel. With a centralized, extensible service interface, service providers can even use Wi-Fi as a marketing tool, capturing new leads in exchange for "free" connectivity.

Driven by centralized subscriber management and sophisticated operational and billing system integration, service providers can extend the value they are deriving from their Wi-Fi assets. Whether they are seeking to retain existing subscribers, expand their footprint, market to potential customers or create new service tiers, service providers can utilize a unified Wi-Fi architecture to create satisfied customers and generate new revenues. And these revenue opportunities transcend a pure connectivity play. With a centralized architecture, service providers can deliver advanced new services that bring Wi-Fi monetization to a whole new level.

## Unlock New Wi-Fi Revenue Opportunities

Once service providers move past today's Wi-Fi islands and establish a centralized, unified Wi-Fi architecture, a number of new service opportunities emerge. While consistent, high quality access is certainly the top priority, reaching Wi-Fi's full potential means delivering a wide range of targeted marketing opportunities that leverage location-based services, social networks and analytics to help convert Wi-Fi from a loss leader to a profit center.

With a unified Wi-Fi architecture, service providers can, with permission, understand where their subscribers are at a given time and where their travels take them over a series of days, weeks or months. With this information, service providers can begin to use Wi-Fi as a highly effective promotional tool, offering businesses a platform for permission-based advertising and promotions when customers enter their geographic areas. As service providers begin collecting rich data about subscriber locations, they can create sophisticated profiles that can make their promotions highly personalized and contextual. But location information is but one data point when it comes to Wi-Fi based personalization.

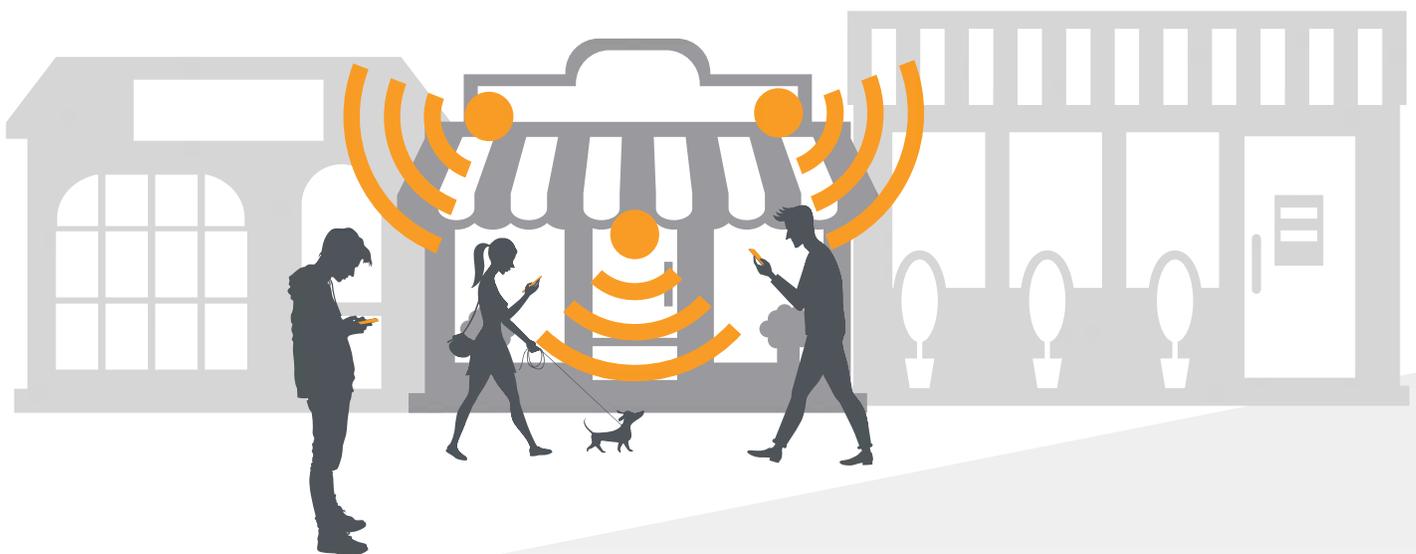


Figure 5: Wi-Fi enables new geographically targeted promotions

With subscribers' permission, service providers may also choose to offer Wi-Fi sign-in via popular social networks such as Facebook, Twitter or LinkedIn. In exchange for a secure, familiar sign-in experience, consumers agree to share details that can help service providers further personalize their promotions and offer sponsored redirects. For example, when a consumer enters a shoe store and logs in to a service provider's Wi-Fi network using Facebook, the information contained in her profile may suggest that she is a runner, triggering a coupon offer from a national running shoe brand.

This type of advanced, aggregated data utilization can help local and national brands reach the exact audiences they're looking for while they're at the point of sale. It can also help service providers better understand their own customers as they augment their existing customer profile information with rich, meaningful data and implement systems to analyze an act upon it.

Perhaps the most important and valuable benefit of unifying Wi-Fi lies in this ability to achieve new insights into consumers' preferences, interests and experiences. The data derived from a unified Wi-Fi architecture, combined with the information that is becoming available through IP video and multiscreen services can create advanced subscriber profiles, which can help guide content and programming choices, improve service promotions, and create extremely profitable advertising solutions. This comes at the right time for service providers, who are seeking to reclaim the customer touch they once enjoyed in the wired world, even as their subscribers increasingly migrate to untethered connectivity.

This comes at the right time for service providers, who are seeking to reclaim the customer touch they once enjoyed in the wired world.

## CONCLUSION

Growing interest in Wi-Fi from service providers and consumers is placing a renewed emphasis on the delivery of high performance, ubiquitous connectivity. In addition, there is a heightened interest in extending the value of Wi-Fi from a giveaway to a strategic platform for new service provider revenues. But in order to unleash new opportunities and create strong business cases, service providers must move past today's Wi-Fi islands, and implement a unified approach to delivering and managing this service.

Deploying a unified Wi-Fi architecture requires that service providers deploy a centralized wireless access gateway; a software-based access point controller and an advanced monitoring,

reporting and management platform. Together, these components work together to provide a simple yet comprehensive architecture that is capable of bringing today's isolated instances of Wi-Fi under a single management framework.

This unified approach to Wi-Fi can help service providers improve Wi-Fi performance while setting the stage for advanced revenue generating services that can transform Wi-Fi from a retention tool into a monetization engine. From location-based promotions and targeted advertising to inter-operator roaming and social network integration, service providers can leverage a unified Wi-Fi architecture to derive new revenue streams from Wi-Fi, no matter where their customers connect.

## MEET OUR EXPERT: Jay Bestermann



Meet Jay Bestermann, Sr. Director, Service Provider Wi-Fi at ARRIS. He's helping to build and deploy carrier grade Wi-Fi networks that improve the mobile experience for subscribers and unlock valuable new Wi-Fi monetization opportunities across a range of vertical markets. Jay has been taking products from concepts to reality for nearly 15 years, combining the technical and business expertise to apply innovative solutions to even the most complex service provider challenges. He has been awarded multiple mobile offload related patents, and holds a BS in Electrical Engineering and a Masters in Computer Engineering from Clemson University.

## REFERENCES

1. ARRIS. (2015). Consumer Entertainment Index. Retrieved from <http://www.arriseverywhere.com/category/consumer-entertainment-index>
2. Wi-Fi Alliance. (2015). Total Wi-Fi device shipments to surpass ten billion this month (Press release]. Retrieved from <http://www.wi-fi.org/news-events/newsroom/total-wi-fi-device-shipments-to-surpass-ten-billion-this-month>
3. Wireless Broadband Alliance. (2015) Towards 2020: Emerging Opportunities for Wi-Fi Services. Retrieved from <http://www.wballiance.com/wba/wp-content/uploads/downloads/2015/05/wba-interim-report.pdf>

©ARRIS Enterprises, Inc. 2015 All rights reserved. No part of this publication may be reproduced in any form or by any means or used to make any derivative work (such as translation, transformation, or adaptation) without written permission from ARRIS Enterprises, Inc. ("ARRIS"). ARRIS reserves the right to revise this publication and to make changes in content from time to time without obligation on the part of ARRIS to provide notification of such revision or change.