



MESH NETWORKS

The Ultimate WISP Customer Experience

A White Paper by
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Introduction

Every WISP provider knows that delivery of reliable bandwidth to the customer at reasonable cost is feasible. Technology within the industry has progressed such that providing service to the customer is generally cost effective, reasonably reliable and unfortunately, perceived by the customer to be only “sufficient”.

The ever exploding desire for more bandwidth to do streaming, VOIP and other high demand applications task the ability of the WISP network and impacts the Quality of Service (QoS) to the end customer. Saturating base towers as the area demand in customer count and bandwidth need grows is an ever expanding problem that eventually leads to higher cost for all and lower QoS across the spectrum.

This paper will look at a solution using currently available technology that will allow the WISP to provide substantially higher QoS to the end customer while limiting or reducing the operational and CAPEX needs, and will demonstrate how this can be achieved at a very favorable cost and provide additional revenue opportunities for the operator to the established customer base yielding very attractive ROIs.

At Issue – The Problem

Nearly all WISP networks are designed to handle a defined number of customers at a defined bandwidth rate. As a result, as the area customer count grows or the need per customer for additional bandwidth increases beyond the designed network assumptions, either QoS suffers or additional cost is incurred to add capacity. Additionally, there isn't a provider on the planet that doesn't struggle with providing bandwidth to their client base while being on guard for the network abusers, this is a worse problem for a WISP versus a terrestrial carrier since base tower quadrants can become saturated. Saturation is due to an inherent limitation in wireless since the bandwidth of the access points (APs) are shared. As APs become saturated not only is the transmission rate reduced, but the error rate increases further limiting throughput. The addition of a few bandwidth hogs or super users contributes additional pressures, and can quickly exceed the designed-in oversubscription rate.

To combat the problem additional APs can be added to the base towers if channel, signal noise ratios, transmission line of site and available space issues allow. Other solutions such as adding expensive base towers to the area can be employed as well if cost, zoning, power, lease and other issues don't interfere. However, these all have one issue in common, the need to deploy significant amounts of additional capital. In many cases, the IRR does not justify the expenditure thus leaving the area either underserved or with poor QoS.

Current Protocol- Not a Solution

In a conventional approach there is a tendency to focus on the problem of not enough bandwidth to go around. Where this is certainly the case, the current approach to solving this issue quickly leads to diminishing returns due to growth and bandwidth demand. Focusing on increasing bandwidth also does not address the problem directly; the customer's QoS and overall experience on the network. Just staying ahead of the bandwidth curve only insures that there is sufficient bandwidth on the network; it does nothing to insure high QoS for the majority of the average users. Good QoS leads to higher consumption rates, leading to increased capital expenditures that in many cases only fixes an issue rather than generating additional revenue.

Rather than using brute force and focusing on bandwidth, why not focus on QoS and customer experience? Resolve to insure QoS over strict bandwidth increases, isn't that how the customer really measures the service that is provided? Infinite bandwidth could be provided and the service would only be judged as excellent if QoS was high. In the case of a WISP, a customer can have an open pipe and the network could, and likely would, become saturated killing QoS. Supplying an open pipe is a direct case of giving the customer what they think they want and not solving the problem.

Exceeding Expectations- A Forward Thinking Solution

If focusing on providing additional bandwidth on a WISP network is problematic how do we resolve the issue? Since WISP networks are designed to provide service to a relatively fixed set of users why not focus on insuring high levels of QoS to those users for the given amount of bandwidth the network can provide?

When WISPs focus on trying to solve the bandwidth issue, they actually play right into the design constraints of a WISP network; they try to pull more bandwidth through an AP that has a defined limit. When they focus on insuring that the average end user has the highest QoS possible for the designed network bandwidth, they move away from design limitations of the network and directly to what they need to have, happy and satisfied customers with high QoS. Also, this allows the provider to focus capital on adding additional bandwidth to pick up new customers and not to resolve QoS issues of established ones.

Therefore, the WISP provider should not focus on insuring sufficient bandwidth, but instead focus on insuring high QoS for the average user, on a given network.

The Truth – Quality over Quantity

Most users and owners of networks understand that QoS is rooted in bandwidth availability. Assume for the sake of argument there is a fixed pool of bandwidth that a network can access and a set of average users. If that set of users equally share the designated bandwidth for the WISP system, and the system is designed to provide that set of users high QoS, customers are satisfied. However, high use services on the Internet do not generally work that way. When a user streams video, for example, most applications are designed to take as much bandwidth as possible and hang on to it. Couple this with the unavoidable bandwidth hog that disproportionately uses bandwidth and the WISP network can become compromised and the average users QoS is impacted. Since it only takes very few bandwidth hogs or super users to compromise the QoS for everyone except themselves on the network, the majority of users will have their QoS and experience adversely affected.

If a WISP then focuses on insuring that the majority of the average end users have high QoS for that given network and bandwidth, the WISP will solve the problem independent of the bandwidth issue, because the majority of the users on the network will have high QoS. The only users left with a QoS issue will then be a few bandwidth hogs and super users. In essence, the solution has insured that the average user has high QoS for any given designed bandwidth on a WISP network.

The Solution – The NetProfit® System

Thus, by focusing on QoS over bandwidth the majority of the users on the network can be guaranteed a high level of QoS for that bandwidth pool. So, how is that accomplished?

In a WISP network a very low-cost way to insure high QoS for a given bandwidth amount is the NetProfit® System. The NetProfit® System, developed by Mesh Networks, is a server based appliance that can be seamlessly integrated into most any WISP network and provide the quota based management that insures that each user has equal access to the bandwidth on the base tower and will not allow any user to violate the design capacity of the network.

Quota based management recognizes that heavy bandwidth users inherently use bandwidth more quickly than an average user in any given time period. This results in the heavy bandwidth user moving a fixed amount of data that is significantly greater than the average user in that same time period. By applying rules that say that each user has the same amount of quota per time period and then restricting the heavy user's access to additional bandwidth once the rule is violated, insures that the heavy user does not affect the QoS of the other users. If the quota is set such that the average user is only penalized for a continuous abuse situation and not a transitory one, then the result is to limit the effect on QoS from the heavy user. The NetProfit® System does this automatically via a simple interface and is unobtrusive. When a user violates the rule by exceeding their quota, they are reduced in bandwidth until

they no longer exceed their limit. The end result is that only the user abusing the network is penalized for that abuse, not everybody else. The network abusers are forced to become “Good Network Citizens” and must stop abusing the network, the System will soon restore the abuser to their full bandwidth allocation.

In a WISP environment by defining the end user receiving AP as the “user” and configuring the NetProfit® System to manage the fixed bandwidth through the tower AP, the NetProfit® System will also eliminate the saturation issue as it will automatically limit the impact of that user on the tower. In this way, other users on that tower’s AP are not affected by the end user’s Internet habits since the tower AP cannot saturate and each user has a defined bandwidth they can use and not exceed. Therefore, for any given amount of bandwidth the customers QoS is insured to be high and automatically guarded.

The NetProfit® System is a real world solution with a proven history, the benefits from this type of utilization management are astounding.

The NetProfit® System immediate benefits include:

- Increase in bandwidth utilization of up to 45%
- Reduces network peak traffic use by up to 50%
- Increases average user QoS metrics by 50% or more
- Reduces the need or delays the need to increase bandwidth

The use of the NetProfit® System in the WISP network will increase QoS and reduce the need to add more bandwidth, expand connections or deploy additional towers to solve what is fundamentally a QoS and customer experience issue.

Additional Revenue – The HomeNet™/BizNet™ Intelligent Router

Further advantage for the WISP provider and the customer can be achieved through the use of another value-added Mesh innovation called the HomeNet™ Intelligent Router. The HomeNet™ Router is an AC based wireless router that allows the home/business user the ability to direct their allocated bandwidth through the use of a simple and intuitive dashboard. When using the consumer friendly dashboard, the home user can set automatic functions to move bandwidth from device to device, limit bandwidth use on any device or optimize popular streaming services such as Netflix, Hulu, YouTube and Amazon Prime. Additional features include; parental controls over the home network, notifications when devices are used and real-time network monitoring. The HomeNet™ feature set and dashboard gives the user direct control over how and where they use their allocated bandwidth to further optimize QoS. The HomeNet™ Router is cloud based and accessible anywhere an Internet connection can be made.

Furthermore, as a distributor of the HomeNet™ Router additional revenue channels can be developed for the sale of the HomeNet™/BizNet™ Router with a recurring yearly component and other planned upgrades and integrations for Home Automation. White label for distributor branding is an available option.

Conclusion- An End 2 End Solution Equals QoS x 2

Providing the customer with high QoS for any allocated amount of bandwidth, the WISP provider can overcome technological limitations that a land based provider does not have, leveling the playing field. The NetProfit® System gives the WISP the ability to limit and perhaps reduce costs to achieve the goal of exceeding customer satisfaction expectations and compete with the land based provider. Even better yet, with the addition of the HomeNet™/BizNet™ Router the result is an amazing End 2 End WISP Network Management Solution. Introducing the HomeNet™ Router into an established customer base the WISP not only allows the customer to additionally optimize their own QoS, but also provides additional revenue channels for the WISP. The NetProfit® End 2 End WISP Network Management Solution provides the WISP the competitive edge to effectively compete with the land based provider, whether DSL or broadband, and remarkably raise customers perceived satisfaction levels.

About the Author



Leon Hubby is a co-founder and former CEO and President of Mesh Networks, LLC. Mesh is an industry leading bandwidth Management Company with a unique QoS focused and patent pending technology. Leon is an engineer by trade, a father of three, grandfather of two and enjoys the restoration of classic cars, boats and other toys in his spare time.

For more information please see the website: <http://www.themeshnetworks.com>

Case Studies can be located on the Mesh Networks website at:

<http://www.themeshnetworks.com/casestudies.php>