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Application White Paper

# The Successful Design and Marketing of a Rural Wireless Broadband Network



## The Successful Design and Marketing of a Rural Wireless Broadband Network

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March 2009

### Overview

The design of a rural wireless broadband network presents its own set of challenges that differ in significant ways from network design for urban areas. In addition to covering unserved and underserved locations with sufficient signal as cost-effectively as possible, a means of accurately assessing which of these users will be able to successfully subscribe to the network is also critical for effective customer service and retention. This paper will examine the critical pieces of these aspects of the rural wireless broadband business plans, citing the successful examples of the Arizona and Iowa networks designed and maintained by CommSPEED® of Chandler, AZ.

CommSPEED is a wireless high-speed broadband provider offering services in rural and smaller markets in Arizona and Iowa and holding spectrum licenses that enable it to expand into several other states. Founded in 2000, it is the largest privately held wireless ISP in the nation. CommSPEED has been using EDX® SignalPro® for network design since early 2006.

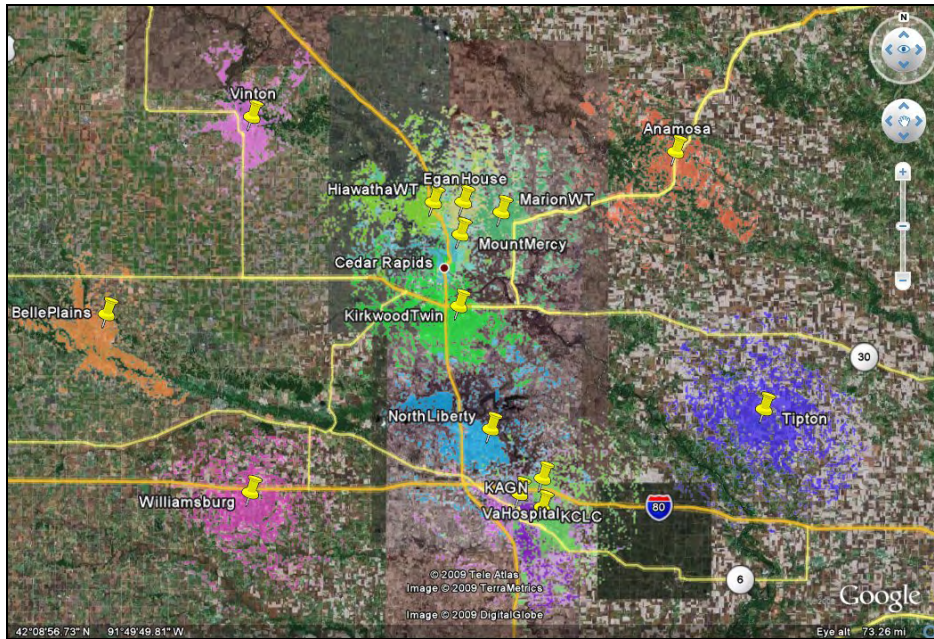
### The Network Design Process

The initial CommSPEED markets in Arizona were deployed in 2000. In these markets the terrain is diverse and often mountainous; potential subscribers are scattered throughout the network regions. A “point and shoot” network planning methodology was used where VVYO brand base stations were simply located on higher ground with antennas visually aligned toward the populated areas.

The network was expanded in 2006 to include pre-WiMAX Motorola Expedience® equipment for base stations. CommSPEED recognized the value of intelligent planning and was able to place sites and aim antennas more accurately by using EDX SignalPro for RF design to determine in advance the optimum base station situation. This allowed them to maximize their return on investment by reducing the expense of trial and error installations.

The Iowa markets, primarily designed with EDX SignalPro beginning in 2006, presented a terrain that was comprised of flatlands with hills. The areas served also contained areas of greater population density – especially the areas around Cedar Rapids, Iowa City, and Davenport. Therefore, more diverse land use morphology needed to be taken into account, with residential, industrial, and urban buildings mixed in with rural coverage.

In both cases, key decision criteria were used to determine the locations of the initial base station deployments and subsequent expansion of the network. Two of these criteria were balanced with each other: a) what is the population density of the area, and how much of it can be covered effectively by a given site; and b) which of these areas are minimally covered by other carriers – with either landline or wireless broadband services. The availability of towers or other usable sites was an additional limiting criterion in site selection.



**Figure 1 – EDX SignalPro most likely server study overlaid on Google™ Earth image**

SignalPro was used to develop detailed coverage maps of potential sites prior to final selection. CommSPEED typically uses terrain elevation and land use / clutter files with a 30-meter resolution to model the environment within the EDX tool. As a general practice, when CommSPEED finds a site of interest / potential tower location, they will run coverage studies to determine the covered population and use their key decision criteria to judge the market's revenue potential.

## Backhaul

An integral component to providing wireless broadband access to rural markets is the availability of backhaul data service at the tower location. The majority of rural tower sites are out of range to standard wired backhaul facilities so it becomes necessary to take advantage of wireless solutions to provide the necessary capacity. Microwave backbone networks in a variety of architectures are traditionally used to fulfill this service.

Wireless data backbones can be implemented using a Point-to-Multipoint (PTMP) architecture as well as converged solutions that utilize high capacity microwave point-to-point links to interconnect PTMP base stations. EDX SignalPro allows the flexibility to model and design these varied backhaul options and provides the necessary information to make a valid decision as to which option is best.

In Arizona, CommSPEED usually backhauls to a central point, while in Iowa the backhaul is set up in loops to multiple hubs to provide redundancy. They typically build 5.8 GHz microwave links for backhaul using Andrew brand one-meter parabolic antennas; microwave equipment suppliers include Dragonwave.



## The Initial Market Launch

When CommSPEED first launches a new market they generally start with a site at a location that will cover the best potential subscriber base (i.e. the densest population). Initial launch is usually done with an omni-directional antenna. Later, the site is sectorized to increase capacity based on customer demand. Also, where the site has a significant body of water nearby, directional antennas are used to exclude the unnecessary coverage.

The area coverage studies are used in conjunction with ZIP code population data obtained from third-party marketing data companies. A series of scripts are then run over the addresses to determine the potential subscriber base.

## Predetermining Subscriber Coverage

CommSPEED uses subscriber prequalification in several ways to acquire and retain their subscribers. Their prequalification system is based on wireless coverage results from the EDX SignalPro planning tool. First, as part of the launch of a new market an introductory mailing is often prepared. Batches of addresses are processed via the system and those meeting the necessary signal strength and C/I ratio targets are then contacted – essentially creating an already-qualified mailing list. This ensures a high confidence that an interested respondent will be able to take advantage of the offered service.

Both CommSPEED and their contracted distributors within the local markets also have access to a web-based prequalification system. An interested potential subscriber will call or visit a distributor, give their address (or show their location using Google™ Earth maps), and then the CommSPEED representative will use the system to determine if adequate coverage is available to them. In addition, the information stored in the system is used to determine whether an indoor wireless modem or an outdoor installation is most appropriate for the location.

To help broadband carriers design their own subscriber prequalification system, EDX provides SignalProof – a “toolkit” that is used to build a custom system to meet the particular requirements of the carrier. SignalProof works by automatically querying the accurate and detailed planning tool results (coverage maps and levels, C/I studies, best server locations, etc.) at particular geographic locations where potential subscribers reside or work and returning detailed information for each of those locations. This can be done on an individual location basis via a web site address inquiry or customer service call, or in a batch mode when readying a subscriber acquisition campaign.

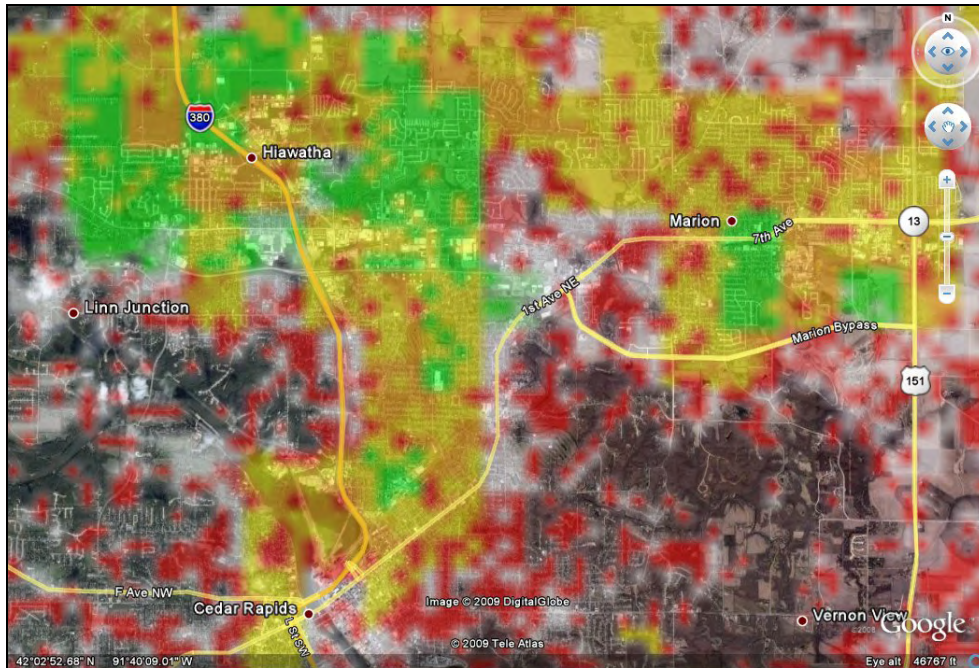


Figure 2 – EDX SignalPro coverage study overlaid on Google™ Earth image

## The Benefits of Subscriber Pre-Qualification

In the unserved and underserved rural markets, a subscriber prequalification system based on solid RF engineering is a valuable means of identifying the new broadband coverage areas and getting that information to the potential subscribers, as well as oversight agencies and other interested parties. Prior to using SignalPro and the subscriber prequalification system, CommSPEED relied on Microsoft® Map with virtual push-pins showing the locations of successful subscriber installations. New subscribers in areas adjacent to those with proven coverage were assumed to be pre-qualified. However, each new subscriber still required that a pre-qualification employee go to their home, perform measurements, and then determine if they could actually purchase and use the service. CommSPEED recognized this process was literally a "crapshoot" from the initial choosing of a site to aiming the antennas. They identified that a lot of money was being spent just to determine "whether a customer could in fact be a customer."

The prime benefit of using subscriber prequalification based on the wireless planning tool results is to much more accurately know which of the potential subscribers in a market can receive the signal, and which cannot. As CommSPEED emphasized, their staff now spends much less time and resources with those who cannot currently receive their services (while noting in a database the interested potential subscribers for later market expansion). Prior to using their prequalification system, they spent money on each inquiry, including a site visit. Now, they can say "yes" with confidence and also determine the necessary type of installation for each location.

Additionally, by using the system as a filter, CommSPEED has been able to target market-launch mailings much more precisely. In one recent launch, they were able to save hundreds of dollars in preparation and mailing costs by not mailing to locations without current coverage. The message to the potential subscribers was also phrased more confidently (an "enhanced sales presentation") because those receiving the message had been pre-qualified in that they could definitely take advantage of the service. CommSPEED uses a customized version of EDX SignalProof for some of their markets, along with other prequalification methods of their own design.



Clearwire® is another major user of EDX's SignalProof prequalification system. It is used in all of their markets across the entire U.S. using an address and Google Earth based pre-qualification system that potential subscribers can access from the Clearwire home page. Once pre-qualified via SignalProof, they are presented with various plans that can be immediately purchased. This has proved to be an invaluable and very cost-effective means to increase their subscriber base.

## Future Plans

Over time, CommSPEED has plans to expand coverage in its current two states and into other areas where it has licenses. A transition to WiMAX technology is anticipated within the next few years. Based on their success so far with assessing, designing, and launching markets using the EDX SignalPro planning tool, the process described in this paper will continue as a critical part of their engineering efforts. The combination of the planning tool and their subscriber prequalification system has helped CommSPEED acquire and retain customers in each new market, while using a process that "saves them a ton of money." Solid wireless engineering skills, effective decision-making, and the use of professional planning tools have helped them to realize a return on their network investment and build a strong high-speed wireless service that benefits the rural communities in which they operate.

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