

WiMAX Operators Can Cut Network Costs in Half by Using Beamforming Systems, finds Analysys Mason

While many operators often look for the lowest-cost base stations, a new study by research firm Analysys Mason shows that by investing in advanced beamforming networks, operators can reduce their total cost of ownership by more than 55% over a five year period.

Wireless Broadband Perspectives - WiMAX.com Weekly Series

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For the next several months, WiMAX.com and Cisco will be featuring weekly topics and perspectives from the WiMAX & wireless broadband industries. This week, we reviewed the results of a recent study comparing the total cost of ownership of beamforming-enabled WiMAX systems to more traditional systems.

With the proliferation of WiMAX and next-generation wireless broadband networks, service providers are looking for new ways to squeeze more performance and value out of their networks. A new study by telecom research firm Analysys Mason looks to determine which types of WiMAX solutions are commercially attractive to operators, by quantifying the TCO (total cost of ownership) of beamforming systems to more traditional non-beamforming WiMAX systems.

Although many WiMAX vendors have beamforming included on their roadmaps, to date only a handful of vendors offer commercial beamforming capabilities. Beamforming is considered a key technology for wireless broadband networks and is supported in the current 802.16e WiMAX standard and will be deployed in future 802.16m and Long Term Evolution (LTE) networks.

While advanced beamforming systems are often more expensive than other systems, operators must look at the entire cost of operating the network when building their networks.

Multiple Antennas & Beamforming Explained

The report begins by providing a basic understanding of how multiple-antenna and beamforming technologies work. To do this, they use a 'cocktail party' analogy, comparing the process of radio systems with multiple antennas, to a guest at a party with their eyes closed as they attempt

to listen to a second person walk a complete circle around the room. Based on how the brain processes the difference in signals received by each ear, the listener is able to determine where the other person is in the room. Similarly, radio systems with multiple antennas are better able to detect incoming signals by correlating the information from the separate antennas with each other. This is essentially what MIMO (multiple-in, multiple-out) antenna systems do in WiMAX networks.

Beamforming takes this a step further, which through processing techniques of the signals received from multiple antennas, it is able to eliminate interference and unwanted noise, and to tune-in to the desired signal. In the party analogy, this would be represented by the listener using their brain to 'tune-out' other conversations and 'actively listen' or eavesdrop on the distant conversation. If the listener then wanted to participate in the conversation, they would turn and direct their voice towards the recipient. Likewise, in a beamforming system, the antenna is able to direct its signal toward the receiver by determining the location of the receiver.

Methodology & Assumptions

In the Analysys Mason study, 3 separate WiMAX system scenarios are considered: 2-antenna systems without beamforming, and both 4-antenna and 8-antenna systems with beamforming. In addition, all 3 system types were modeled in both in a developed country market, with higher costs of labor and higher average revenue per user (ARPU), and in a developing market, with corresponding lower labor costs and ARPU.

Assumptions in the model included coverage for both urban and suburban areas, subscriber density, topography, WiMAX penetration and forecasted subscribers over a five year period. The models also assumed three sectors/base stations per site, and that the networks utilized 30MHz of 2.6GHz spectrum, with a unique 10MHz carrier for each sector.

To determine the number of sites required by a WiMAX operator, accurate capacity and coverage maps were then developed to model the performance of each of the 3 scenarios. In planning the coverage area for the network, a combination of both a 'link budget analysis' and 'capacity analysis' was used to accurately model the capacity loading effect on the cell. This occurs when more users are added to a cell and there is a corresponding decrease in the effective coverage of the cell.

Conclusions

Based on the results of their study, Analysys Mason found that by utilizing 8-antenna beamforming systems, WiMAX operators could offer 225% more coverage and 47% more capacity than traditional 2-antenna non-beamforming systems. This combination of greater coverage and capacity results in an astonishing 69% fewer sites needed compared to the non-beamforming systems.

While the cost of beamforming systems are 15%-20% more expensive per base station, this cost is more than offset by the significant opex reductions achieved from operating one-third the number of sites compared to a traditional WiMAX network. Since opex accounts for 60-70% of the total costs associated with each site, a reduction in the number of sites can have a huge

impact on the total cost of operating the network.

Over a five year period, these savings result in a 63% TCO of the access network. After adding in other costs for the core network capex and opex, sales and marketing and general & administrative costs, the overall cost of ownership of operating an 8-antenna beamforming network is 55% less than operating a traditional system.

The advantages of deploying a network with fewer sites can add up quickly, allowing operators more flexibility on where sites are located as well as a quicker launch of the network and faster payback.

Beamforming networks also have other performance advantages as well including less dead zones, fewer dropped calls and better quality and throughput at the cell boundaries. In the age of higher customer expectations this can prove invaluable - something not lost on operators as they look to grow their subscribers and reduce churn.

So why haven't more operators utilized beamforming in their networks considering the lower total cost of ownership? "The problem comes from who is involved in the vendor selection process," says Daryl Schoolar with Current Analysis. "The person responsible for selecting the base station vendor is often concerned only about CAPEX of the base station, so only looks at that cost. The long-term operational costs are the responsibility of a different group within the carrier's organization and is often not factored into the decision process."

With the performance and cost advantages becoming more apparent, there is little doubt that more operators will turn to beamforming-enabled systems to reduce cost and improve performance within their networks.

The report is available for [download here](#).

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