BEC TECHNOLOGIES

White Paper

Powering up your WLAN

Using HomePlug technology to expand your wireless LAN coverage

Overview

The emergence of **"Triple Play"** (voice, video and data) broadband access technologies have not just created exciting new revenue opportunities for telcos and Internet service providers, but also offer low cost telephony and entertainment alternatives to consumers. It is now possible to mass distribute high-quality voice and video to home and office broadband users over the existing copper telephone connections at a low cost, wired or wirelessly. The tremendous growth in mobile and WLAN markets is an undeniable testament to the fact that consumers will want to be able to enjoy the benefits of Triple Play services without sacrificing the convenience and freedom of wireless. While 802.11g product specifications utilizing this standard commonly quote data rate of up to 54Mbps and ranges of up to 100 meters, these performance levels are rarely, if ever experienced. This is mainly due to walls and obstructions in a typical home or offices that attenuate the 2.4GHz signals. Ranges experienced are generally less than 20 meters for the data rates required to run a multimedia application. Although there are WLAN products on the market now that are able to increase the range and data rate by boosting the 2.4GHz signal to a certain degree, position a second access point at the edge of coverage of the first access point or a "cold spot" will work far more efficient and reliable. As most homes do not have Ethernet sockets run through each room, and running a second Ethernet cable across the house may not seem practical, thus the ubiquity of electrical outlets in our homes becomes the attractive solution for bridging the broadband gateway and a remote wireless extension point.

BEC's PowerNet series consists of a 802.11g security gateway and a 802.11g wireless extension point which plugs into a standard power outlet, were designed with the combination of Homeplug technology, advanced routing, QoS, firewall, 802.11g, and hi-speed ADSL technologies. It is the ideal solution for increasing your wireless coverage to satisfy the bandwidth requirement for your Triple Play applications.

PowerLine Technology

Using powerline as a network medium can be a hostile environment due to the channel between any two outlets has an unpredictable interference caused by random interconnections such as switching power supplies, dimmers, or brush motors. BEC uses technology that is based on OFDM, which stands for Orthogonal Frequency Division Multiplexing. OFDM is a scheme in which numerous signals of different frequencies are combined to form

a single signal for transmission on the medium. To ensure the reliability of delivering packets, BEC PowerNet uses technology that automatically adapts to the specific transfer function by determining a threshold in which successful communication can occur. PowerNet is constantly monitoring the powerline medium for sudden changes in transfer function. If the transfer function changes, PowerNet senses the change and dynamically turns on and off signals to modulate. When the attenuation appears to be large enough to interrupt a successful communication, BEC's PowerNet products will turn off that specific signal and will not communicate. On those signals the attenuations are less than the threshold, PowerNet then turn on the data-carrying signals and communicate on those signals. For example, the transfer function will change if a hi-voltage load appliance such as vacuum cleaner or hair dryer is turned on. PowerNet will then adapt to that change. By constantly adapting to the powerline medium, reliable communication can be guaranteed at every power outlet.

In addition to combat unexpected noise spikes, BEC uses technology that incorporates sophisticated forward error correction (FEC), interleaving, error detection technologies to ensure the most reliable network service.

Powerline Security

Although Powerline is a wired network environment, it has the similar security issues as a wireless network. Multiple households may share the same power transformer in a residential neighborhood, which means they may share the same physical power line. It is more apparent when in an apartment or a community complex, which your neighbor's homes are attached or very close to yours. Data communication within your home may be picked up by your neighbor's powerline product by traveling across the same wire. The Homeplug technology was designed to minimize the amount of data sharing in these types of environments, while ensuring that maximum coverage is achieved. Furthermore, advanced 56bit encryption techniques were built into the BEC's PowerNet gateway and extension AP so that all packets were automatically encrypted before transmission over the Powerline. With such encryption in placed the transmission can be safely travels between your Powerline Gateway and the Powerline extension AP within your home while only appearing as noise to your neighbors.

BEC's Powerline products can decode, or decrypt, transmissions from other products in your home by using a key that is specific to your Powerline network only. Each of BEC's Powerline comes with an easy-to-configure tool that lets you enter and change your own security key as shown here in figure 1. Likewise, your neighbor using their specific key can only decode their transmissions. With the implementation of the 56 bit encryption keys, BEC

Powerline products ensure that transmission within your network is impossible for other networks to understand.

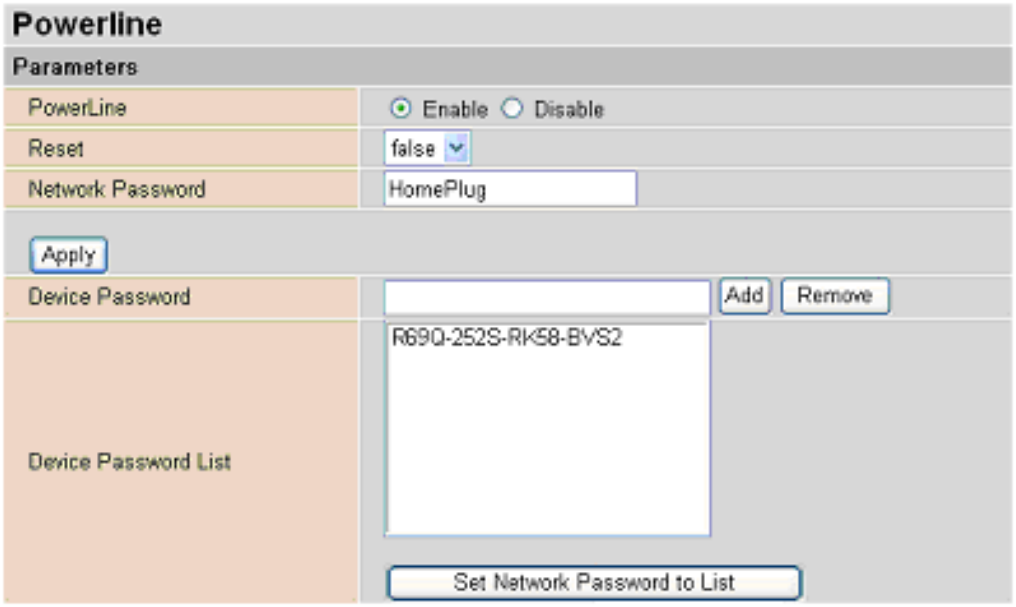

Figure 1

Powerline + 802.11g at work

For Home and small office Networks

By adapting the combination of Powerline technology and the convenience of the 802.11g WLAN, PowerNet can now solve the WLAN network coverage issues that typical homes and offices faced today. You will be able to turn your network into a Powerline ready network by plugging BEC PowerNet Wireless Gateway into one of the power outlets in your home or office. You can then use the PowerNet Wireless Extension Point as a second AP by plugging into another power outlet near the edge of the coverage.

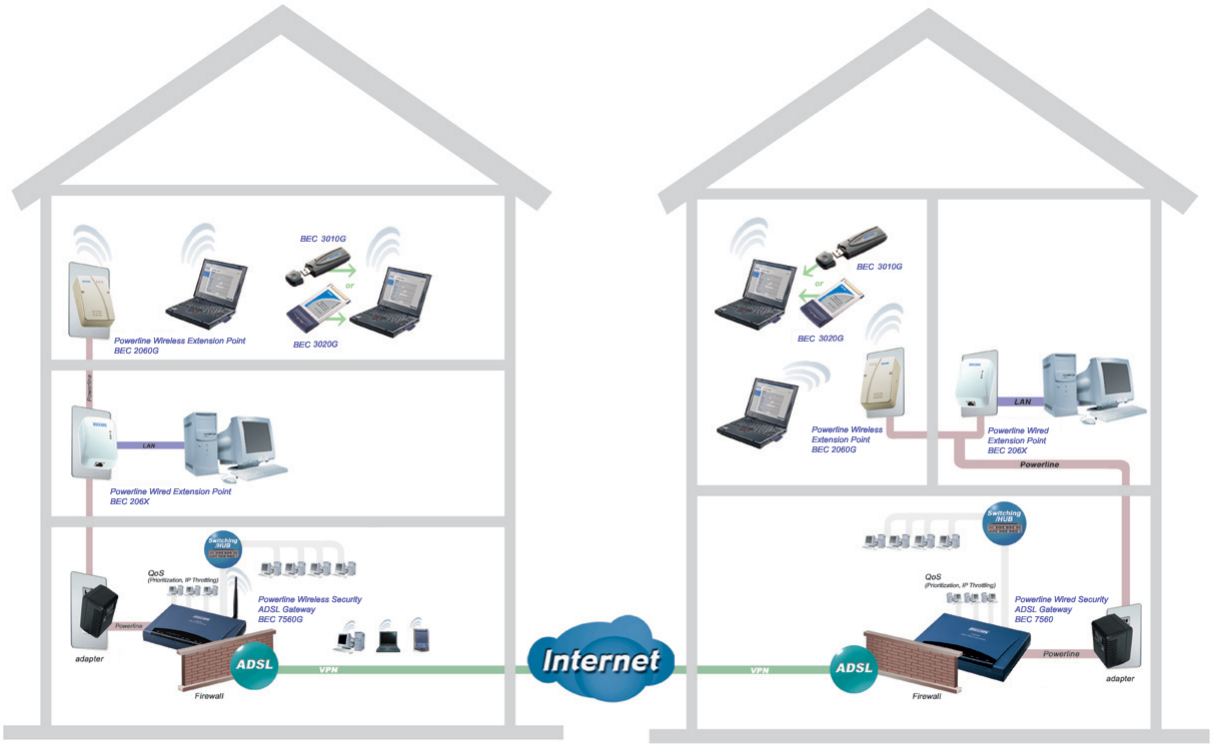

Figure 2 PowerNet connections in a typical home

As shown in the diagram, the simplest topology available using a PowerNet setup, consists of a single PowerNet Wireless Gateway and a PowerNet Wireless Extension Point connected to the electrical outlets in your home. Once PowerNet devices are plugged in, a Powerline network is automatically established. PowerNet Wireless Gateway becomes your backhaul of your network by connecting to your ADSL ready phone jack, (PowerNet Wireless Gateway is built-in with a high speed ADSL router, so there will be no need for you to purchase additional ADSL router). The PowerNet Extension Point becomes the remote Access Point connected to the backhaul (PowerNet Wireless Gateway) over the powerline.

Since the PowerNet Wireless Extension Point is built-in with a full function 802.11g access point, it immediately becomes the second WLAN access point for your network and seamlessly doubles the coverage of your wireless LAN. An embedded omni-directional antenna on the PowerNet wireless extension point will ensure the maximum range of operation.

For Hot Spots

The usual way to build broader coverage areas for a hot spot would be to use multiple access points with overlapping coverage throughout the coverage areas. This approach requires an Ethernet backhaul for each access point, thus using this approach on a large scale premise is not economically feasible, because of the logistical barriers and cost involved with wiring and installations. The cost issues alone render the economics of this model unworkable.

BEC's PowerNet Wireless Gateway is a unique, wireless network architecture that overcomes the challenges of large wireless LAN deployments. By using the existing powerlines as the network medium PowerNet eliminates the needs for additional Ethernet cables in a large-scale deployment and offers unprecedented economic advantages.

Summary

Multiple trends in the communications and telecommunications industries are driving the demand for distribution of high quality digital media, voice and data in the home and office environment. A large number of service providers stand to reap the economic benefits of these trends if the required equipment and networking technologies can be delivered to broadband users to meet quality requirements of these applications at consumer price points.

BEC Technologies occupies a leading position in offering core technology products which are uniquely focused on "Triple Play" and secured broadband networking market with strong attention to high quality delivery of video, voice and data applications as well as consumer-based pricing needed for this market. BEC products will enable highly differentiated carriers services to meet the growing demands for delivery of video, audio, voice, gaming and other digital forms of entertainment in the residential and office environment.

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