



Application Note

Configuring a Point-to-Multipoint Network Using Campus BridgeLINKs

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The RadioLAN Campus BridgeLINK was designed to provide a high-speed, point-to-point connection between physically separated LAN segments. Typical installations provide full Ethernet-speed communications between two buildings up to a mile apart. In a number of situations it may be desirable to provide a similar high-speed connection between one central point and two or more remote sites. A typical application for this network configuration would be an educational campus with several temporary portable classroom facilities connected to a main building for sharing Internet Access and IT resources .

Such point-to-multipoint operation can be accomplished by specially configuring Campus BridgeLINKs. In this Application Note, we will describe the process of setting up and configuring such a network.

The Campus BridgeLINK products are designed to operate in a point-to-point mode. In this mode it is important to limit inadvertent communication with other RadioLAN products. To accomplish this, the CBL software checks the senders address in each packet to make sure that the received packet is from the station to which it is supposed to be connected. Because of this checking process, point-to-multipoint communication cannot take place since it would require that packets from two or more CBLs be allowed through one CBL; however, IOBaseRadio LAN software accomplishes precisely this function.

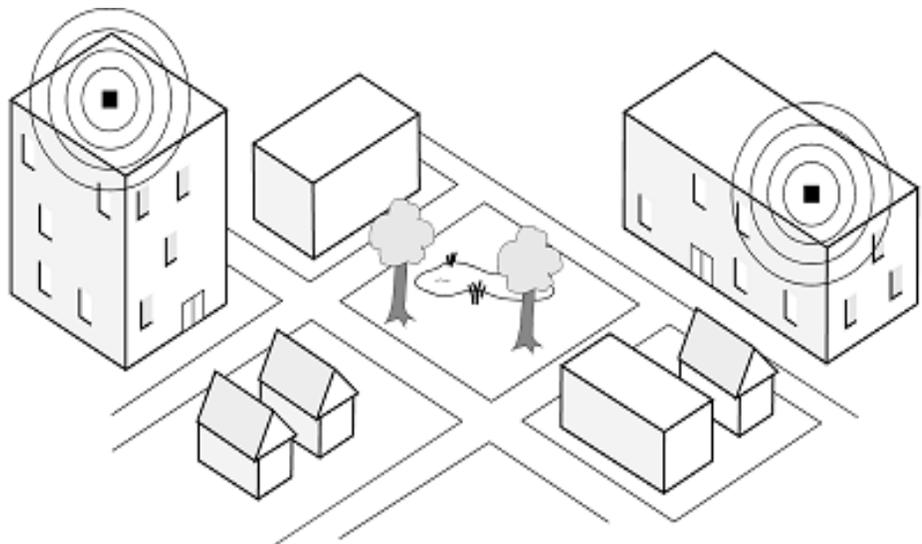


Fig 1: A Wireless Campus Area Network

Why It Works

The IOBaseRadio Access Point (BackboneLINK, or BBL) software maintains a table of the RadioLAN stations with which it has established communications. When a packet is received from the wired network addressed to one of the stations in a BBLs list of nodes, the packet is forwarded to that node. So, if we use BBL software in a CBL, a CBL could talk to many (up to 128) stations. By running the BBL software, a CBL could be the “hub” in a point-to-multipoint outdoor network.

The next problem comes at the other end of the link. A CBL can only talk to another CBL. The solution to this problem is to run the remote CBL as a BBL in the “Dock” mode. Thus at the end of the “spokes” of our point-to-multipoint network we would now have a station that could communicate with the “hub” station.

The last problem that must be surmounted in making our point-to-multipoint network accomplish the connection of multiple remote networks to the “hub” network is the fact that in the Dock mode, a CBL will connect only a single MAC address on the Ethernet side to the wireless network. If the remote site consists of only a single computer, the CBL in Dock mode is all that is needed. If the remote site has a LAN that must be connected to the central network, we need a device to make all the MAC addresses on the remote network look like a single MAC address to the Ethernet port of the Docked CBL.

There are two ways to solve this last problem: use a software Network Address Translator (NAT) or an inexpensive Internet Router. Since we would like to setup the point-to-multipoint configuration at minimum cost, we will consider the NAT approach. The NAT function is built in to Windows 98SE, ME, 2000, and XP and is called ICS or Internet Connection Sharing. NAT software is also available as a standalone application from several vendors, such as SyGate from SyberGen Networks. SyGate is available on the Internet from www.sygate.com.

The key to the implementation of the point-to-multipoint configuration is that the BackBoneLINK, and Campus BridgeLINK are built on a common hardware platform and both versions of the software are shipped pre-installed. So all that is necessary is to reconfigure the various remote stations on the point-to-multipoint network. The reconfiguration is easily accomplished either over the network using a standard Web browser (Netscape or Internet Explorer) or via the serial port on the CBL. The steps are as follows:



How To Do It

- 1) **Access the CBL either over the network by Browser or over the serial port by using a terminal emulator program like Hyperterm.**
- 2) **Once communication with the CBL has been established, go to “CBL Manager”.**
- 3) **In “CBL Manager” go to “System Feature”.**
- 4) **Enter the key code. The key code for each CBL can be gotten from RadioLAN Technical Support. Simply call or email the Technical Support address from the Installation Guide and supply the serial number of each CBL that you wish to reconfigure. A key code will be supplied for each serial number.**
- 5) **Select “System Operation Mode” and select “Dock Mode” for each unit is to be configured as a remote point.**
- 6) **Save the changes you have made.**
- 7) **Reboot the CBL.**

At this point the “hub” station is configured as a BackBoneLINK and the remote stations are configured in the “Dock” mode. There are three small caveats that need be mentioned at this point:

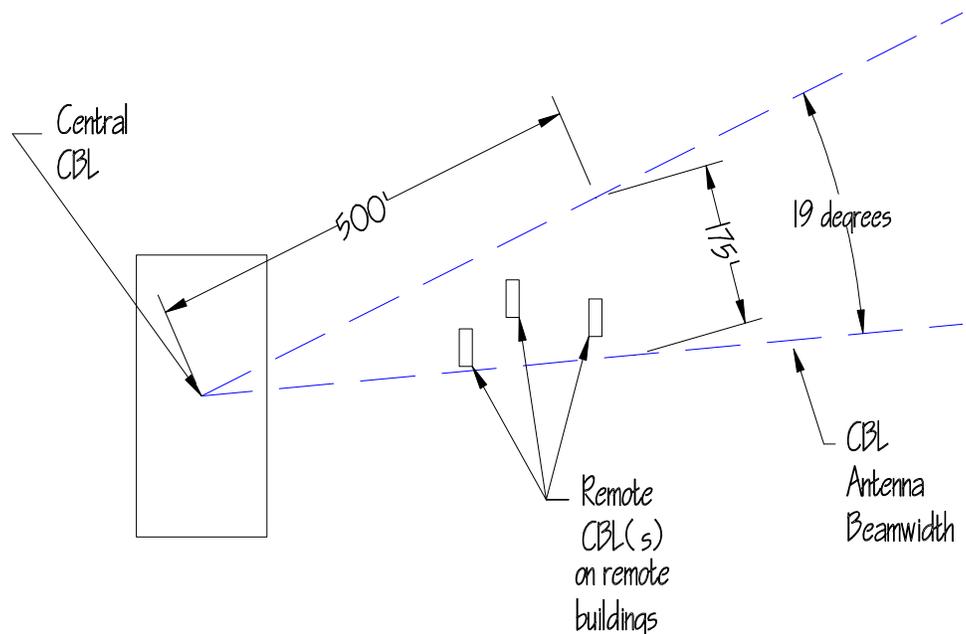


Fig 2: Point to Multi-Point Network Beam Coverage

- 1) Once a CBL has been configured in the Dock mode, the ability to communicate with it over the network (from the wireless side) is lost. Thus you must be sure that access to the serial port is available if it is ever desired to return to the CBL mode. You can, of course always access the Dock-LINK from its connected computer.
- 2) If the “Reset to Factory Default” mode is selected, any configuration changes will be lost and the unit will return to its CBL configuration.
- 3) All the remote sites must be located within the approximately 19 degree beamwidth of the central CBL. This is shown schematically in Figure 2.

If the remote site has multiple users, then either an Internet Router or a Remote Network Server containing Network Address Translation software must be installed. The Remote Network Server can be implemented with a standard PC with WIN98 installed. This PC needs only minimal resources since it will be running only the NAT functions. A good guideline for resources is a PC with 64 megabytes of memory and a 2 Gbyte hard drive. To support NAT, the Remote Network Server will need to have two Ethernet NICs installed, one for the specially-configured CBL, and one for the hub of the indoor LAN. The indoor LAN can be a wireless network too, and the hub can be an Access Point such as the BBL. The configuration for the remote site is shown in Figure 3.

Remote CBL

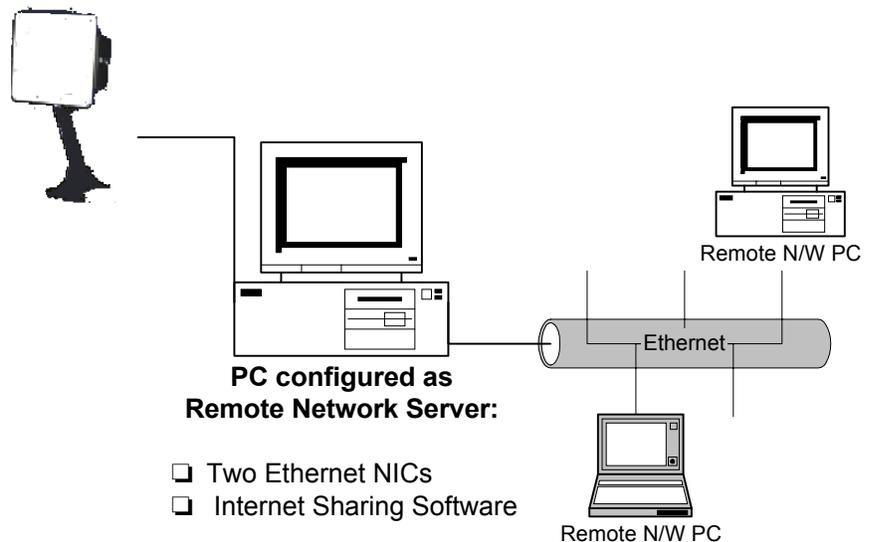


Fig 3: Remote Network Configuration

In Summary:

If Microsoft's "Internet Connection Sharing" NAT software is to be used, follow the instructions for configuration in the Windows help files. If Sygate is to be used, install it from its CD. Sygate will need to establish a connection to the Internet through to complete its configuration, so be sure that Internet access is possible from the central network.

If the central network is configured with a DHCP server, it will supply an IP address to the remote network server. Both SyGate and Windows contain DHCP servers so the remote network server will supply IP addresses to all the network members. Because of this, each remote network member will need to be configured via Windows Network function (in Control Panel) to "Obtain an IP Address Automatically". Also in the Network properties, each remote network PC will need to have "Disable DNS" checked.

One important network issue is that NAT software cannot operate behind a proxy server. Thus if the central network accesses the Internet through SOCKS or a similar Proxy Server, an Internet Router must be used to connect the remote CBL to the remote network.

The Campus BridgeLINK was designed to provide a high-speed, point-to-point connection between physically separated LAN segments. In cases where a point-to-multipoint operation is desired, there is a work-around solution:

Problem #1: In the point-to-point mode, communication is intentionally limited between two CBLs. Other RadioLAN Marketing Group products cannot interoperate with a CBL.

Solution: The Campus BridgeLINK can be reconfigured to act as a BackboneLINK wireless Access Point, and, therefore, talk to many stations.

Problem #2: A BackboneLINK cannot talk to either another BackboneLINK or a Campus BridgeLINK.

Solution: Activating the "Dock" mode in the remote CBL enables a station to be able to talk to the "hub" station in a point-to-multipoint network.

Problem #3: A device is needed to make all the MAC addresses on the remote network look like a single MAC address to the Ethernet port of the DockLINK.

Solution: There are two ways to solve this – Use software Network Address Translator (NAT), such as Windows ICS, third-party NAT software, or an inexpensive Internet router.