

### Internet Remotes Using the New Telos Zephyr/IP

by Tom Hansen

I do a lot of remotes. Between WRLT(FM), where I am Chief Engineer, and PE Audio, my location production company, I have personally set up over 1,200 remote broadcasts during the last 10 years. Many of them are from live performance venues in Nashville, but I also manage the radio broadcast compounds for the Vegoose and Bonnaroo Music Festivals.

#### FROM ISDN TO IP

For most broadcasts, we use Telos Zephyrs and Xstreams to transport audio back to the studios. ISDN digital phone lines have been the primary connection for these broadcasts. Over the years, I have had pretty good luck with ISDN lines, but now several IP codecs have emerged for broadcasters, promising good to high-quality audio, transported over commonplace IP connections – even over the public Internet.

My early experience, though, has shown that, without some technology in place to mitigate the unpredictable behavior of common IP connections, remote broadcasts done over the public Internet could not live up to the same quality and reliability that ISDN lines deliver.

Even so, the thought of being able to eliminate ISDN lines – going to IP connections – and still maintain live broadcast audio quality and reliability is very exciting to me. I could save money as well as time by having a “plug and play” audio transport solution if it works with existing IP networks.

#### MOVING PAST ISDN

These days, IP connections are usually easier to obtain than ISDN circuits. At last year’s Bonnaroo and Vegoose Music Festivals, I began experimenting with coded IP-audio using Telos Zephyr Xstreams. However, you must have well-provisioned IP links, preferably with Quality of Service (QoS), as part of the IP link provisioning.

Unfortunately, since QoS is not available over the public Internet, we would have to build our own private network to distribute audio programming that way. Moreover, I had to make sure that NAT routers at each end of the IP path were properly configured to forward the needed ports to the static, private IP addresses of my Xstreams. (All this configuration for a traditional IP codec is similar to that required for ISDN.)

At the April, 2007 NAB show, I learned about a new IP codec from Telos dubbed the “Zephyr/IP” (Z/IP). It is designed to work easily behind NAT routers and firewalls, and it is supposed to mitigate the ever-changing latency and bandwidth available across public Internet connections.



The Telos Zephyr/IP

The Zephyr/IP makes it possible to do remotes and one-time events cost effectively while maintaining the same level of audio quality. The Z/IP also lets me do high quality remotes using available WiFi or EV-DO wireless broadband connections.

#### KEY FEATURES

The big idea behind the Zephyr/IP, its new, standards-based codec, and the Z/IP server is that a user can take the Z/IP out to a remote site and connect to most any broadband Internet connection.

Once plugged into an Internet-connected network it is easy for the user to connect to any studio they are authorized to dial. It works just like an instant messenger program, as the user is shown a list of the other Z/IPs to

which he can connect. To establish a connection, he just highlights the name of the Zephyr/IP he wants, and then selects “Call.”

One of the cool features is how the Zephyr IP actually makes its connections. Most IP broadcast solutions require a public IP or a private point-to-point network – not the Zephyr/IP. It uses a free Z/IP “rendezvous” server provided by Telos. When you configure your Zephyr/IP, you simply pick a name, password and group name for your Zephyr/IP’s. Once you enter the information, you authenticate with the Z/IP server at Telos. It works much like Skype or many of the Instant Messaging services.

#### KEY FEATURES

The Zephyr/IP is really what professionals like me have been waiting for in terms of transmitting high-quality audio over commonly available IP links. Three reasons:

1) The Z/IP uses a new standard audio codec that incorporates real “elasticity” in terms of bit rate. It always seeks the best performance, but keeps working fine at lower bit rates.

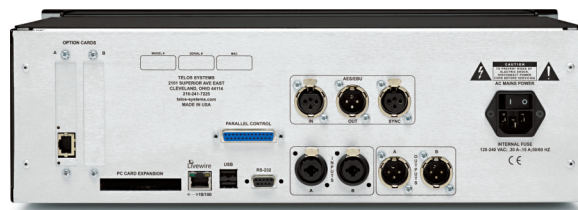
2) The Z/IP incorporates “Agile Connection Technology” (ACT). ACT monitors the IP link data budget and latency twice each second and responds instantly to varying bandwidth and latency across the link. It does not matter if the link is across the street or around the world, as long as you have an IP connection; it will monitor the link and make the necessary adjustments automatically for you.

3) Telos has set up some permanent rendezvous or Z/IP servers. These are servers that allow a given Zephyr/IP to login and make its presence known to other authorized Zephyr/IP’s on the public Internet. Just as an instant messaging service would do, these Z/IP servers track IP addresses of logged-in Zephyr/IP units, and group them according to private users and their groups.

#### A FAMILIAR FEEL

The first thing I noticed about the Zephyr/IP was the slick, clean look of the unit. Front and Back panel layouts are similar to the Zephyr Xstream, making hook-up very easy for existing Zephyr Xstream users. Also, there is no fan. The unit has an interesting heat sink design that insures adequate natural air circulation.

The WRLT-FM studios use Axia for audio routing and mixing, so when I saw the “Livewire” port on the back, I knew how easy it would be to supply audio to the unit; a simple plug and play – and 30 seconds to configure it via web browser and you will be hooked up. Of course, balanced stereo analog and AES3 inputs and outputs appear on XLR connectors.



The Z/IP can handle all the connections necessary.

Other rear-panel connections include an Ethernet port for wired IP connections, a parallel contact closure port for end-to-end closures, a USB port for supported EV-DO and UTM wireless data cards, another USB port for supported WiFi cards, and a PCMCIA slot for future expansion. There are also two PCI card slots for future expansion as well.

#### CLEAR, DETAILED MENUS

After powering up, I scrolled through the configuration menus quickly to familiarize myself with the available options and see where I would need to refer to the Zephyr/IP documentation.

The Zephyr/IP has a big color screen to show the user information about the IP link, dropped packets, buffer size

and packet latency. Years from now, when IP remote broadcasts are commonplace, this deep, graphical information may not be so necessary. But, as we are still figuring out such things as NAT traversal, dropped packets, error concealment, and bandwidth/latency, I am glad that Telos brought all this information out on a color screen.

The configuration menus are broken up into sections: Audio, Network, Codec, Status, Settings, Auto, and Connect.

- The Audio menu is for configuring selection of audio input and output parameters (Analog, AES/EBU inputs, sync, and nominal audio levels).

- The Network menu requires basic networking knowledge if you are manually configuring the Zephyr/IP. If you are letting your DHCP server assign the IP address, then it is plug-and-play. When configuring the Z/IP identity and Server, I would create a custom group to assign all of your Z/IP identities too. This will make the connection process easier and more straightforward later.

- The Codec allows you to set parameters for your Z/IP’s codec connection. There is also a compatibility mode for streaming audio to/from a “legacy” codec such the Telos Xstream.

- The Status screen is very cool. It shows all the hops that your connection takes, and even displays the names of cities along the path when the connection is established. You can flip to a histogram screen showing the IP connection quality over time, or a text screen showing updated connection stats.

- Auto Connect and Connect menus are straight forward as well. This is how I establish all of the Z/IP calls. You can dial an IP address directly, but usually you will pick from a list of other Z/IP’s that you are authorized to call.

- The Settings Menu is used to control the basic user settings, including a web interface for remote access.

All the menus listed are available not only from the front panel, but also from any web browser connected to the IP address of the unit. This feature implies that I can administer the Zephyr/IP from my desk, home, or even from my cell phone/PDA.

#### TESTING IT OUT

I made connection and audio tests using three different Internet service providers – all behind firewalls – and all were successful. The audio quality of each connection is directly dependent upon how much bandwidth is available.

At each end of the two-way audio connection, the buffer size is managed automatically by the Z/IP’s ACT function. The Zephyr/IP manages both the bit rate and the buffer size, using the maximum bandwidth available (up to your set point) and employing the minimum buffer size possible.

The result is you always get the lowest possible latency and the highest possible audio quality over a given IP connection. If the latency or available bandwidth should change, the Z/IP is designed to instantly react, using up what is in the buffer, and adjusting the bit rate as seamlessly as possible.

Telos is now shipping the Zephyr/IP. I received two early production units, but they seem ready for action. Although a couple of Wi-Fi and EV-DO cards are supported now, expect more to be supported through software updates in the future.

I expect that ISDN codecs will be around for a while longer. After all, ISDN is a regulated, tariffed service – state laws require it to work properly in the places it is sold. As we move into a new era of IP communications, though, broadcasters are looking for a reliable way to get high-quality audio from a remote site back to the studio. The Zephyr/IP now has all the tools to get that done in a professional, radio-friendly package.

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