TELOS iPort

Livewire-MPEG Gateway

USER'S MANUAL

Manual Version 1.1 for software version 1.0 and later
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Telos iPort Manual

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This product is covered by a one year limited warranty, the full text of which is included in this manual.

Updates

The operation of the iPort is determined largely by software. We routinely release new versions to add features and fix bugs. Check the Telos web site for the latest. We encourage you to sign-up for the email notification service offered on the site.

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You must contact Telos before returning any equipment for factory service. We will need the serial number, located on the back of the unit. Telos Systems will issue a Return Authorization number which must be written on the exterior of your shipping container. Please do not include cables or accessories unless specifically requested by the technical support engineer at Telos. Be sure to adequately insure your shipment for its replacement value. Packages without proper authorization may be refused. US customers please contact Telos technical support at +1 (216) 241-7225. All other customers should contact your local representative to make arrangements for service.

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⚠ This symbol, wherever it appears, alerts you to important operating and maintenance instructions. Read the manual.

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WARNING:

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1 Introduction

Welcome to the iPort

The Telos iPort is designed to help you achieve one of two objectives:

- Connect two Livewire-equipped facilities over a wide-area network, such that they appear to be local to each other. As many as 8 bi-directional channels are possible. In the simplest case, a single Livewire 8x8 interface Node and an iPort at each end provide 8x bi-directional codec links over an IP channel.
- Encode streams for Internet transmission to the public or for internal distribution systems. These are normally sent to a SHOUTcast or compatible server to generate the many streams needed to support individual listeners. As many as 16 encode-only streams are possible.

It uses state-of-the-art MPEG codec technology to conserve network bandwidth, while preserving high audio quality. A range of codec types and bitrates are supported.

Codec	Bitrates	Notes
AAC	24 - 320kbps	Standard AAC
AAC-HE	24 - 320kbps	High-efficiency AAC, also called AAC+
AAC-HEv2	24 - 320kbps	Latest generation AAC-HE with parametric stereo enhancements
AAC-LD	24 - 320kbps	Low-delay AAC
Layer 3 (MP3)	24 - 320kbps	Standard MP3

The codecs are all licensed from Fraunhofer IIS, the inventor of MP3 and co-inventor of AAC. They are the highest-possible quality implementations, running on a powerful Intel floating-point processor.

All audio is connected via a single RJ-45 jack. Because it uses Livewire for the local audio inputs/outputs, it does not need expensive and space-consuming onboard converters and connectors.

Configuration is via a web interface. A front-panel LCD offers a simple and immediate local display of basic operation status and parameters such as the assigned IP number.

There are two Ethernet jacks, one for connection to the local network and the other to the wide-area network.

In the link operating mode, the iPort is intended to be used over IP connections that have reasonably good Quality of Service (QoS), with controlled packet loss, jitter, and bandwidth. The AAC codec has a concealment mechanism to deal with occasional packet loss, but it is not intended for conditions where packet

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loss is routine such as on the public Internet. There are configurable buffers to accommodate jitter, but longer buffer lengths add to delay. When you need to use non-QoS-controlled links, the Telos Z/IP family products are a better choice because they have adaptive mechanisms to deal with network problems.

Features & Benefits

The iPort is an innovative approach to providing MPEG codec functionality, made possible by the use of Livewire for its audio interface. Its features include:

- High density. 8x8 codec or 16 encode-only channels in a 2U box.
- Low cost. We've built the iPort on a single industrial PC motherboard rather than on the usual multiple DSP cards in a frame approach. Together with the Livewire-only audio interface, we are able to manufacture the iPort at a fraction of the cost of the traditional way.
- Direct Livewire connectivity. For people who already have facilities based on Livewire IP audio, there is no need for any interface or conversion. The iPort simply plugs into a port on the Ethernet switch and all encode/decode channels are connected with 24-bit/48kHz quality.
- Web configuration. Can be done with a PC located anywhere on the network.
- Full range of state-of-the-art MPEG codecs. AAC-LD for delay-sensitive applications, AAC-HE and AAC-HEv2 for low bitrate requirements. Standard AAC for best quality and resilience to packet loss at higher bitrates.
- Excellent quality and high-density streaming encoder with the advantage of the Livewire IP Audio network interface.

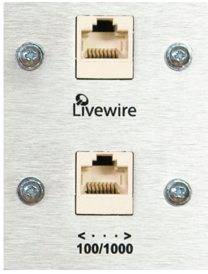
Installation

The iPort mounts in a 2RU high space in a standard 19" rack. The unit will operate in any environment where the stirred air temperature around the unit is between 0 to 40 degrees Celsius (32 to 104 degrees Fahrenheit) with a relative humidly of 0 to 98% (non-condensing). There are redundant ventilation fans on the rear panel which exhaust air that is taken in from openings in the box sides. All of these need to remain unobstructed.

The fan speed is controlled automatically, and is normally quite slow. If the fans are running at high speed, or if there is an over-temperature indication on the front panel LCD, a problem with air flow or high ambient temperature is probably to blame.

Connections

All audio input/output and control is via two rear-panel Ethernet Rj-45 jacks. The jack labeled **Livewire** is for connection of studio-side audio.



The jack labeled *100/1000* is for the compressed streams, which is normally connected to a Wide Area Network link. It automatically adapts its rate to the port at the other end of the connection.

For both jacks, the iPort's Ethernet mode is set permanently to *AUTO*, so the other end must be, as well. (Problems can result if the other end is set to 100BT or 1000BT.)

Usually, these jacks are connected to an Ethernet switch or an IP router and a PC is connected to a spare jack on one of these to support the Web control interface. An Ethernet cross-cable can be used for a temporary direct connection to a PC, allowing configuration.

Cat 5e cables may be used for the Livewire connection, though we recommend Cat 6 when possible. The 100/1000 connection may be Cat 5e if used with a 100BT port at the other end, or Cat 6 when the other end is 1000BT (gigabyte).

Front Panel LCD

The front panel LCD gives basic status indication. Together with the adjacent knob, it lets you enter IP values during initial set-up.

Initial Start-Up

Since all user interface is via a Web browser, the first step is to set the iPort's IP number and netmask values. There are two ways to do this:

♦ Using the iPort's default IP address, which is displayed on the LCD, connect a PC directly (via a cross-cable or small Ethernet switch) and change the values to your network's requirements with the Web interface. **Since the WAN port's Web access is disabled by default, you would use the LW Ethernet port.**

♦ Set the IP values you need using the LCD/knob front panel interface. Note that it only allows changing the values for the LW port, but that is what you need, anyway. Then, when you have Web access, configure the WAN values to your requirements.

Web User Interface

The iPort contains a Web server to support a PC with Web browser for configuration and control. We've tested with MS Internet Explorer, Firefox, Opera, and Apple Safari. Java must be installed in your browser so that dynamic functions such as meters will work.

Point your browser to the iPort by entering the unit's IP address, like this: http://192.168.1.7. You will be asked for a user name and password. The defaults are:

♦ User name: **user**

♦ Password: <blank>

When the home page is opened, you will see a top-level menu with the following links:

♦ **Codec configuration** - Enable / disable codec instances, assign Livewire channels and link addresses, set options, display status.

♦ **V-Mixer and V-mode** - Display virtual mixer and V-Mode modules settings.

♦ **Stream Statistics** - Display incoming stream performance statistics.

♦ **Network** - Set host name, IP address, subnet mask and gateway IP address.

♦ **System** - Display system and network status. Configuration backup / restore / reset to

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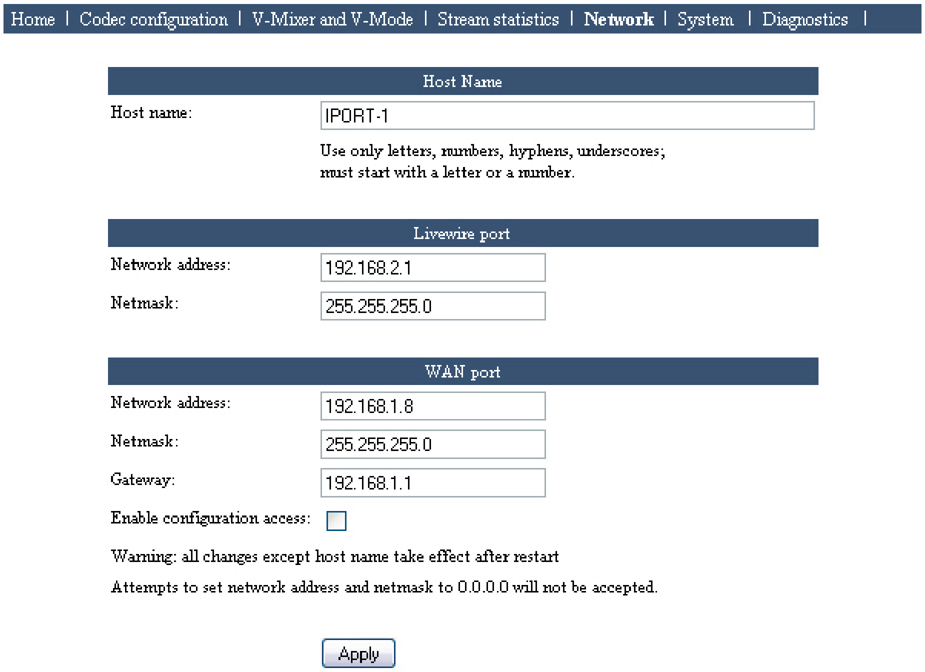
factory defaults. Firmware setup. Restart.

- **Diagnostics** - View and capture system diagnostics info.

The first step is going to be to configure the network parameters, so click on the **Network** link to open that page.


Home | Codec configuration | V-Mixer and V-Mode | Stream statistics | Network | System | Diagnostics |
Apply

Host Name

Host name: IPORT-1

Use only letters, numbers, hyphens, underscores; must start with a letter or a number.

Livewire port

Network address: 192.168.2.1

Netmask: 255.255.255.0

WAN port

Network address: 192.168.1.8

Netmask: 255.255.255.0

Gateway: 192.168.1.1

Enable configuration access: □

Warning: all changes except host name take effect after restart

Attempts to set network address and netmask to 0.0.0.0 will not be accepted.

Host Name

This is the Linux host name that is used for device identification, such as, for example, when system logs are being sent to an external machine. These should be unique for each device in your network, so if you have more than one iPort, you will want to change this from the default 'ZEPHYR' text., as we have done here. If this will be your only iPort, you can keep the default.

Livewire port

This is the value for the Livewire Ethernet port. Normally, this will set to a value in the 192.168.x.x range, since these are reserved for local use on LANs and are not routed out to the Internet or other WANs. For this reason, there is no gateway entry possible. Note that the netmask value needs to correspond with that of your other equipment, including the PC that is hosting the Web browser.

WAN port

The WAN port may be set to any needed value. Here, **you must enter a correct gateway IP address for the iPort to work correctly.** This will normally be the IP address of the router used to access the Internet or other WAN.

By default, Web access via the WAN port is disabled. Click the box if you want to enable it.

When the Livewire and WAN networks are independent, the two IP addresses *must* be in different subnets. In the example above, the 255.255.255.0 netmask means that any IP number with the same first three digits would be in the same subnet. The LW and WAN ports are in different subnets because we've entered different values in the third digit - 2 for the Livewire port and 1 for the WAN port. Other devices that need to communicate with the iPort must be on the corresponding subnets.

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However, if you *do* want only one connection to the iPort, then it's OK to enter the same subnet for both fields. In this case, both the Livewire and codec streams will be on whichever single physical port you connect. The other should remain unconnected.

Changing Passcodes

This may be done on the **System** page. You can do this for both the front panel LCD/knob and Web access.

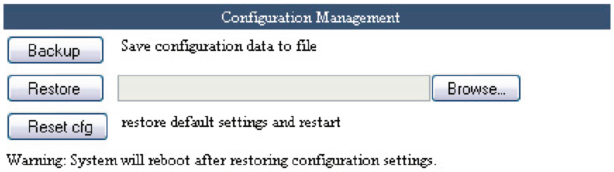
Default for the LCD/knob is <blank>, meaning no password is needed.

Default for the Web interface is also <blank>.

Backing-up and Restoring Configuration

This is on the **System** page.

It can be time-consuming to enter all the needed iPort configuration values. So we give you a way to save them all in a file on your local PC. This can also be used to "clone" additional iPorts after you have configured the first in a multiple iPort installation. (Don't forget to change the Host name, IP numbers, etc. before connecting to your network...)



Save configuration data to file

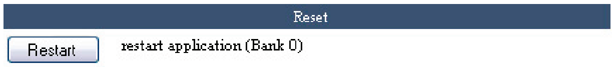
restore default settings and restart

Warning: System will reboot after restoring configuration settings.

You can also reset the iPort to factory defaults using the **Reset cfg** button.

Reset

This is on the **System** page.

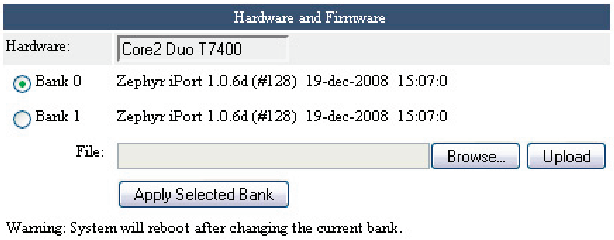


restart application (Bank 0)

Clicking the **Reset** button causes the iPort to reset and restart, while retaining all the current configuration values.

Firmware Upgrade

This is on the **System** page.



Hardware: Core2 Duo T7400

● Bank 0 Zephyr iPort 1.0.6d (#128) 19-dec-2008 15:07:0

○ Bank 1 Zephyr iPort 1.0.6d (#128) 19-dec-2008 15:07:0

File:

Warning: System will reboot after changing the current bank.

To install new firmware, the first step is to download it to your PC. You might receive this via email from our support department, or you might find it on our website. After it is on your PC, browse to locate it, then click the **Upload** button to install it into the iPort. It will be stored the in bank checked in the 'radio button' above. For a unit in active use, you would store this in the bank that is not currently active. When the firmware has been successfully uploaded, click the **Apply Selected Bank** button to activate it.

V-Mixer and V-Mode

These are additional functions that can be performed on Livewire streams. These are the same as in the Livewire Engine we provide as part of an Element mixing console package, so if you are familiar with that, you will know how to use this.

V-Mixer offers a way to sum streams to create mixed new ones. The iPort has two 5-input mixers. There is a main output, which includes the sum of all inputs, two submix outputs, which include the sum of each set of 5 inputs, and an individual unmixed output for each input. This latter is used when only gain control is required, with no mixing.

V-Mode offers a simple function that is useful to split left/right channels, sum L+R, etc. The iPort has 8 channels of V-Mode.

Normally, these would be used to pre- or post-condition LW channel audio before or after the iPort's inputs or outputs.

The virtual "fader" and other values may be entered into the **V-Mixer and V-Mod**e Web page for fixed, manual control. Or they can be supplied dynamically over a network connection, using a special Telos/Axia protocol. The PathfinderPC software application offered by Axia can control these values in realtime. The protocol description is available upon request to 3rd parties who want to remotely control these iPort functions.

To Learn More

The axiaaudio.com website has a wealth of information on Livewire technology, the wide range of LW-equipped gear, and partners. The telos-systems.com site has a lot of information on MPEG codecs, networks, IP streaming, etc.

Our support team is standing-by to answer specific questions. In the USA, contact +1 216 241.7225. Worldwide, email support@telos-systems.com.

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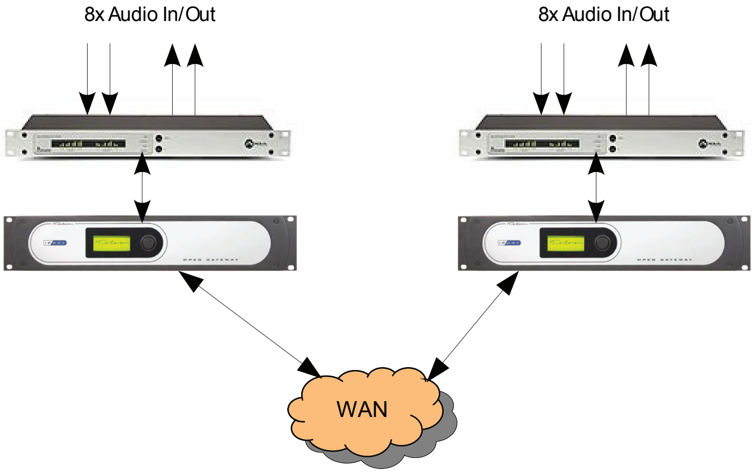
2 Livewire-WAN Link

Livewire is a professional-grade IP Audio system, used over controlled local area networks. As a modern replacement for older analog or TDM digital systems, it offers very low delay and high audio fidelity. There are a wide range of products made for broadcast studio facilities that take advantage of Livewire: interface nodes for analog and AES3 audio, routers, mixing consoles, dynamics processors, ISDN and POTS telephone interfaces, delay units, satellite encoders and receivers, PC-based delivery systems, and – of course – codecs. Facilities span the gamut from a single interface Node to multi-studio installations with dozens or even hundreds of connected devices.



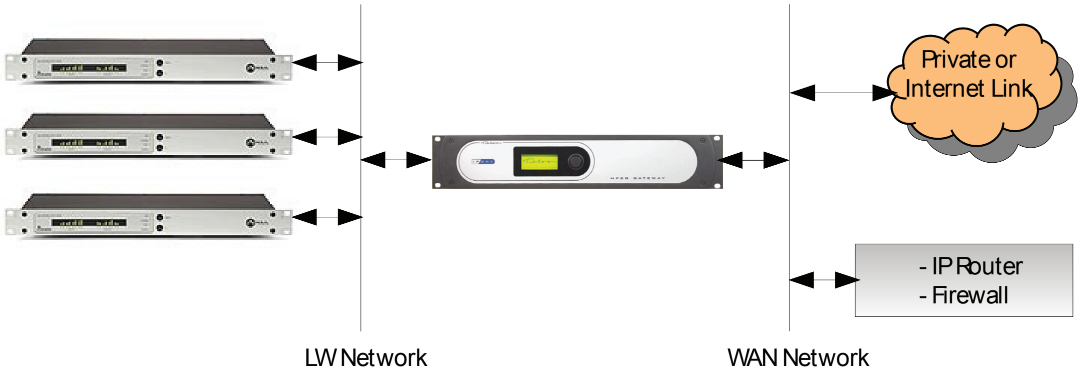
Because Livewire is uncompressed, it requires a lot of bandwidth: around 3Mbps for a stereo channel. And because Livewire needs to be very low delay, it cannot tolerate a network with too much latency or jitter. These conditions are easily fulfilled with an inexpensive switched Ethernet LAN. But these conditions don't generally exist for wide area networks, which use telephone lines and IP routers. The iPort bridges the two environments. It reduces the needed bandwidth and accommodates the delay and jitter caused by WANs. Remember that 3Mbps rate? After MPEG AAC compression, a typical rate would be 140kbps – over 20 times less. Most of the reduction comes from the compression process, but some comes from using larger packets with less header overhead.

If you already have a Livewire-based installation, the iPort is a simple and low-cost way to extend it over a wide-area IP network. Connect the local network to one of the iPort's jacks, the WAN to the other, make some configuration choices, and you are ready to go. This application nicely illustrates the advantages of IP Audio – were you to do the same thing with traditional equipment, you'd have a rack full of codec boxes, expensive router interface cards, and a plethora of cables.

If you don't already have a Livewire installation, no problem. You can use an audio interface Node, or two, and still benefit from the iPort's simplicity and low cost.

Getting Started

A simple installation would look like the one in the block diagram above. In this case, a LW Node is providing the audio interface. Both analog and AES3 Nodes are available. Since each Node provides 8 inputs and 8 outputs, you have a perfect correspondence with the channel capacity of the iPort. The Node could be connected with a small Ethernet switch. You could then connect a PC for configuration to a spare port. Or you could use an Ethernet cross-cable for a direct connection. The configuration PC would be connected only for set-up, in advance of use, then disconnected. Or it could be connected to the WAN port, if that has been configured to allow Web access.



If you will be using the iPort within a facility that is already Livewire-equipped, the Node will not be required. Just connect the LW port of the iPort to a free Ethernet port in your system. Livewire sources may be from/to either Nodes or PC software drivers, however **there must be at least one hardware Livewire Node in the system to provide the required clock signal to the network.**

Most Livewire installations will be like that in the diagram above, with separate networks for the Livewire audio and the general network, which has the WAN interface. The iPort is ready for this case, with its two Ethernet interface ports. It keeps the two networks isolated. However, some LW installations will have the audio and general networks combined.

Configuring the iPort

All configuration is via a Web interface. By default, this is accessible only via the Livewire port, but access over the WAN port can be enabled.

The first step is to set-up the network values. Open a Web browser and point it to the IP address of the iPort. For example: http://192.168.1.7. You will be asked for a user name and password. The factory defaults are:

User name: **user**

Password: <blank>

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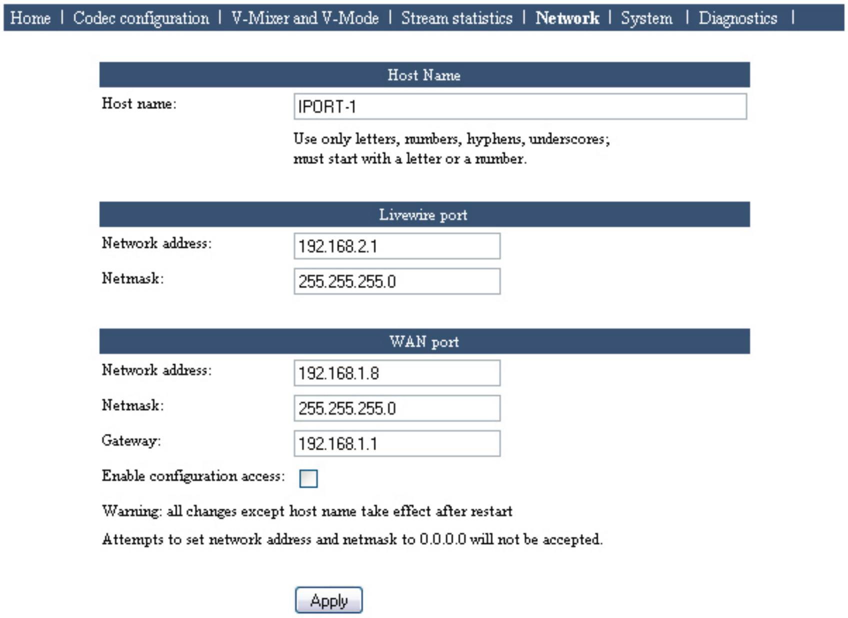
Network

Click on the **Network** link, and you will see this page:


Home | Codec configuration | V-Mixer and V-Mode | Stream statistics | Network | System | Diagnostics |

Host Name

Host name: IPORT-1

Use only letters, numbers, hyphens, underscores; must start with a letter or a number.

Livewire port

Network address: 192.168.2.1

Netmask: 255.255.255.0

WAN port

Network address: 192.168.1.8

Netmask: 255.255.255.0

Gateway: 192.168.1.1

Enable configuration access: □

Warning: all changes except host name take effect after restart

Attempts to set network address and netmask to 0.0.0.0 will not be accepted.

Host Name

Enter a convenient name, if you want to change from the **Zephyr** default. (Advanced note: This is the Linux host name, used for network identification.)

Livewire port

If you have not already done so via the front panel LCD interface, enter the IP number you would like the iPort to have within your LW network. Enter the netmask value used in your system. No gateway is needed for the LW port since this is going to a LAN and there is no need for offsite IP routing.

WAN port

Enter the values for the WAN-side network interface. Here, the gateway value is important and required.

If you want to have Web access via the WAN port, such as for offsite configuration and monitoring, click the checkbox for that.

When the Livewire and WAN networks are independent, the two IP addresses *must* be in different subnets. In the example above, the 255.255.255.0 netmask means that any IP number with the same first three digits would be in the same subnet. The LW and WAN ports are in different subnets because we've entered different values in the third digit - 2 for the Livewire port and 1 for the WAN port. Other devices that need to communicate with the iPort must be on the corresponding subnets.

However, if you *do* want only one connection to the iPort, then it's OK to enter the same subnet for both fields. In this case, both the Livewire and codec streams will be on whichever single physical port you connect. The other should remain unconnected.

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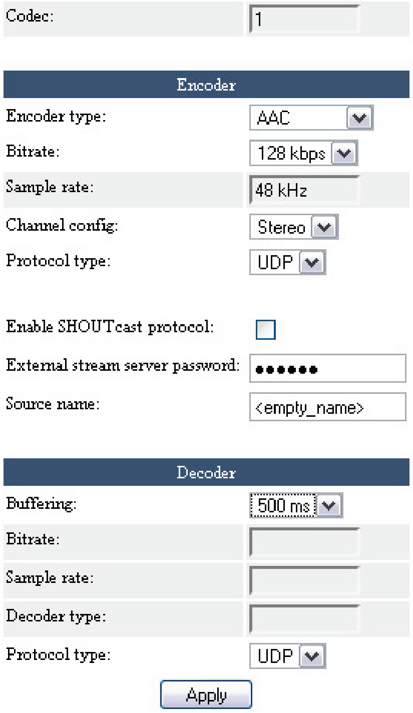
Codec configuration

Global Options

Confirm that the factory default is set for 8 encoder / decoder channels. (The 16-channel encode-only option is used for streaming applications.)

Codec and Channel Settings

Usually, the first step will be to click the **Options** button for the channel you are configuring to set the details of the codec and protocol parameters. Having done so, you will see this this page:



Codec:	1
Encoder	
Encoder type:	AAC
Bitrate:	128 kbps
Sample rate:	48 kHz
Channel config:	Stereo
Protocol type:	UDP
Enable SHOUTcast protocol:	□
External stream server password:	••••••
Source name:	<empty_name>
Decoder	
Buffering:	500 ms
Bitrate:	
Sample rate:	
Decoder type:	
Protocol type:	UDP

Encoder

Set the codec type, bitrate, and stereo/mono mode you want to use for this channel.

The **Protocol type** is either UDP or TCP. There are tradeoffs in this choice that are only fully understood if you have knowledge of this aspect of IP networks. Here is a simple overview: UDP is the usual choice because it offers lower delay than TCP and is not impaired by TCP's flow/rate control. However, with UDP, there is no network recovery of lost packets as there is with TCP, so the codec's concealment is used to reduce the audibility of these events.

With AAC, up to around 10% random packet loss can be effectively concealed. This is one of the strengths of AAC. The other codecs also have concealment, but it will not be as effective.

Network links with high and guaranteed Quality of Service will almost always let you use UDP without trouble.

The **Enable SHOUTcast protocol** option is used only for streaming with an external server, so is not checked.

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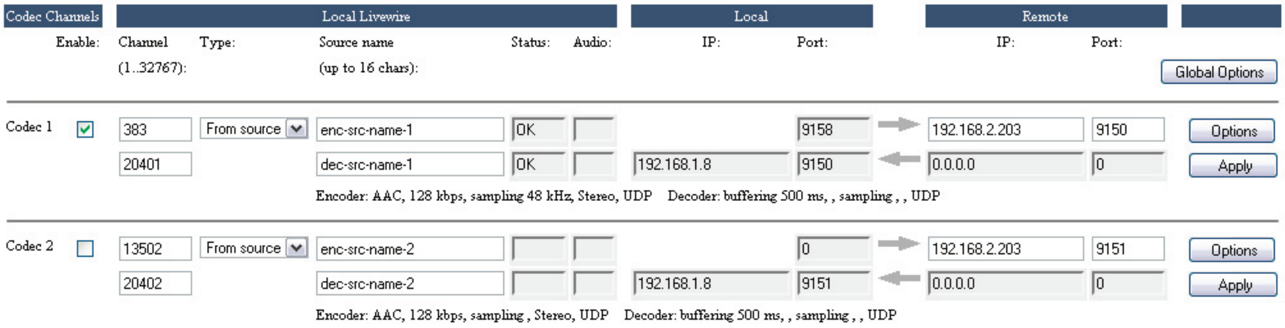
Decoder

The **Buffering** drop-down box lets you choose how much buffer is applied to the received streams. A lower value gives lower delay, but depends upon the network to have low jitter. There are a range of values, so that you can experiment to find the optimum for your network conditions. The usual procedure is to try successively lower values until you hear audio interruptions. Then back off to a higher value with a bit of margin.

The **Protocol type** is set to correspond to the value set at the encode side unit.

When all values are entered, click the **Apply** button. This both accepts your changes and takes you back to the main Codec page. Here are sample configurations for the first two channels:



Codec Channels		Local Livewire					Local			Remote		
	Enable:	Channel (1..32767):	Type:	Source name (up to 16 chars):	Status:	Audio:	IP:	Port:		IP:	Port:	Global Options
Codec 1	☑	383	From source	enc-src-name-1	OK			9158	→	192.168.2.203	9150	Options
		20401		dec-src-name-1	OK		192.168.1.8	9150	←	0.0.0.0	0	Apply
				Encoder: AAC, 128 kbps, sampling 48 kHz, Stereo, UDP Decoder: buffering 500 ms, , sampling , , UDP								
Codec 2	□	13502	From source	enc-src-name-2				0	→	192.168.2.203	9151	Options
		20402		dec-src-name-2			192.168.1.8	9151	←	0.0.0.0	0	Apply
				Encoder: AAC, 128 kbps, sampling , Stereo, UDP Decoder: buffering 500 ms, , sampling , , UDP								

The Livewire channel numbers and names are entered as you would for any LW device. While it's possible to enter separate channel numbers and names for the send and receive directions (as in this example), normally these would be the same, since Livewire channel numbers/names identify a bundle of both send and receive audio.

The **Status** box shows the condition of the LW channel. **OK** means that the Livewire audio stream is being correctly sent and/or received and has proper synchronization. The Audio box is a kind of simple level indicator that shows green when audio is present.

Under the **Local** heading, you can see the IP number and ports being used by the iPort for the MPEG stream. These are greyed-out because they are for your information only; the values cannot be changed.

Under the Remote heading are the values for the far-end iPort to which this one is connected. You should enter the IP number and port for the send stream destination. The greyed IP values are automatically filled-in to show the source of the MPEG streams from the remote iPort.

Don't forget to click the **Apply** button when all of your entries are made. This must be done individually for each channel.

The line of text at the bottom of each channel's field shows the configured codec and stream protocol values that were made on the page under the **Options** button.

Diagnostics and Troubleshooting

The **Stream Statistics** and **Diagnostics** pages offer information and functions useful for checking the iPort for proper operation and for troubleshooting when there are problems.

The iPort can log with various levels of detail to either an internal file that can be downloaded and inspected or to an external standard Linux-style syslog device. These options are selected on the **Diagnostics** page. These are mostly intended for our engineers. Should you have a problem that might be diagnosable via these logs, our support people will ask you to download and email us the files.

FAQs

Do all the channels need to go to a single unit at the other end?

No. Each of the iPort's channels are independent and may be used individually. Simply enter the IP numbers/ports for the unit you want to use at the other end.

Can I use the iPort with Telos Z/IP or ZXS codecs at the other end?

Yes, with proper configuration.

Can I use the iPort with codecs from other manufacturers?

The iPort creates and consumes standard MPEG streams with standard RTP/UDP/IP packet formatting - nothing proprietary or special. If another vendor's codec conforms to the standards, it should work with the iPort.

Does the iPort conform to the ITU N/ACIP specification?

No, it does not. The iPort is intended for a different class of applications. The N/ACIP standard envisions VoIP call-like operation with SIP control, whereas the the iPort is generally used in a 'nailed-up' way.

Our Z/IP codec family does conform to N/ACIP.

What about firewalls?

You will need to open the appropriate ports in your firewall. The IP and port numbers are easily set/determined from the iPort's Web pages, so you know which have to be opened. This follows from the usual nailed-up applications for which iPort is intended.

Our Z/IP codec family has sophisticated technology for automatically punching through many kinds of firewalls. To do so, it uses a special server that resides outside the firewall. (This can be the one we operate as a service to Z/IP users, or one you operate yourself.) The iPort has no way to use such a server because it does not use SIP for call set-up.

Which codec type should I use?

There are tradeoffs among those available in the iPort, with each having advantages and disadvantages. That's why we give you the choice. Here are some guidelines:

- AAC is the best all-round codec for bitrates of 96kbps and above (stereo). It has excellent packet-loss concealment.
- AAC-HE (AAC+) should be used at rates under 96kbps. It has good audio quality at 64kbps, and is pretty good even down to 48kbps. It also has good packet-loss resilience, but not as good as AAC.
- AAC-HEv2 is the most efficient codec for stereo. It has a new "parametric stereo" function that kicks-in at low bitrates. Rather than sending the left/right channels discretely, it sends a core mono signal together with steering control. This makes reasonable quality stereo possible down to 32kbps, and useful stereo even to 24kbps.

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- AAC-LD has the lowest delay of the codecs, so is the choice when inter-activity is important, such as for intercoms. It has about 30% less efficiency than AAC, which means that for equal quality, you would need to use 30% higher bitrate. Its packet-loss concealment is good, but not as good as AAC.
- MP3 (MPEG layer 3) is not as efficient as AAC and has the worst packet-loss concealment. It is included mostly for compatibility with codecs and software players that only support MP3.

Will you be including other codec types in future software releases?

Maybe. Please let us know your needs.

Where can I learn more about TCP and UDP?

Any good network engineering book would explain these in detail. One of our favorites is *Computer Networking* by Kurose and Ross. There is a section in our *Introduction to Livewire* that introduces networking concepts to audio engineers, including a discussion of TCP and UDP. If a copy was not included with your iPort, you can download one from our website. Indeed, the axia.com and telos.com sites have a number of papers and other resources that could be useful to you.

I need to calculate the actual network bitrate. There will be packet overhead, right?

Yes. The network rate is higher than the codec rate owing to the headers for the IP packets taking some additional bandwidth. MPEG streams are very efficient in this regard, however. The overhead varies with the specific codec, but should be under 10%.

Will the iPort work over the public Internet?

That depends. There are no guarantees of any kind on most Internet connections. This is certainly true when multiple ISPs are involved, since nobody can take full responsibility for the entire link. If you are lucky, all could be well. When you choose AAC as your codec, the iPort provides quite good packet-loss concealment up to 10% random loss. That's pretty good, and would probably allow many Internet links to work reasonably well. Higher buffer time helps, of course - but at the expense of delay.

If you can take even more delay, you can use the TCP protocol option. In this case, lost packets are recovered by re-transmission, making bad links more usable. (This, BTW, is why streaming audio over the Internet works pretty good. The streaming servers use TCP to connect to players. Delay is not an issue - indeed, multiple seconds of buffering is the norm.)

As we mentioned before, the Telos Z/IP is intended for such applications. It has a suite of adaptive technologies to accommodate bad and variable network conditions.

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3 Streaming

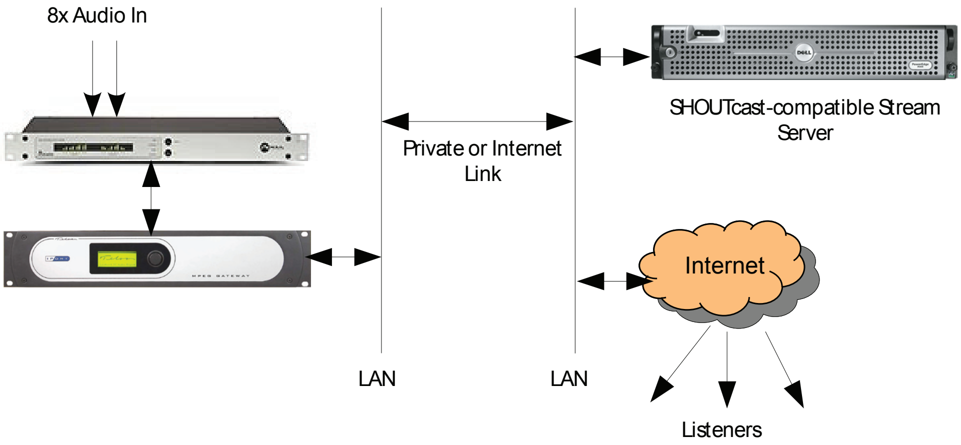
When used with an appropriate server, the iPort can be used as a simple, reliable encoder for Internet or internal audio distribution. Because the iPort generates standards-based MPEG streams, a wide variety of PC-hosted and hardware players can be used for listening.

The iPort is only an encoder, which can generate only a few output streams. To feed a large number of listeners, a server is required. SHOUTcast (yes, that is the way it is spelled), Steamcast, or other SHOUTcast protocol compatible servers are commonly used for this application.

For delivering audio over a LAN or private network, the encoder and server can be together in the same rack. For public streaming over the Internet, the encoder typically runs in the place where the audio is generated (e.g. a studio) and the server is in a place where a lot of bandwidth is available such as an Internet co-location site.

For those whose streaming requirements are more modest, or who prefer a PC-based solution, we offer a software product that runs on Windows PCs. This provides integrated Omnia processing and MPEG/WMA encoding.

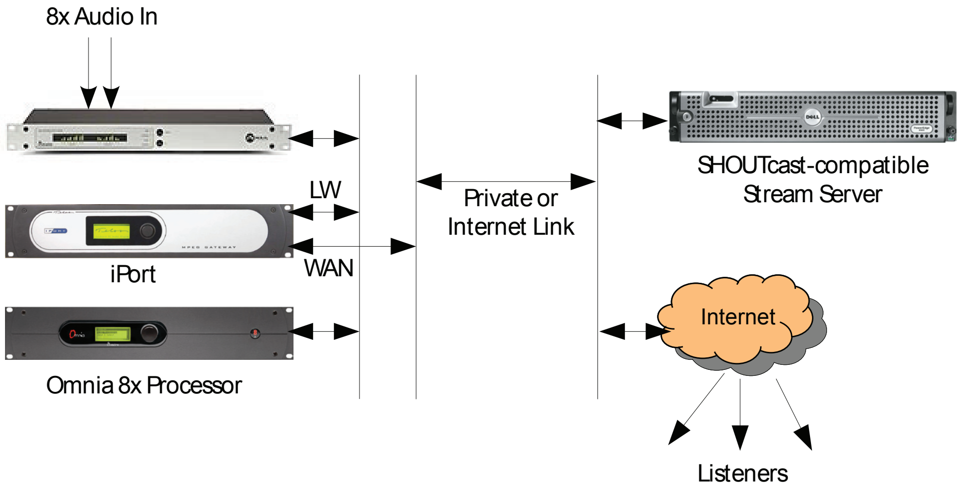
Streams that are served by SHOUTcast protocol servers can be heard on Winamp, Apple iTunes, XMMS, VLC, Foobar, MS Windows Media Player, and many other PC software players. Many hardware players are also on the market. Among the most popular are Logitech's SlimPlayer, and Freecom's network player.



The diagram above shows a simple set-up. A Livewire Node provides live audio input, which connects directly to the Livewire Ethernet jack on the iPort. The iPort's WAN jack goes to a LAN that connects to a link that leads to a remotely located server, which provides streams to listeners over the Internet. Many variants are possible. For example, a Livewire PC driver could provide the source audio rather than a hardware Node. (But there must be a hardware Node somewhere on the network to provide the timing clock.) An installation which already has Livewire equipment would not need a Node dedicated to the iPort - you would just select the channels you want to stream directly from the Livewire network.

The original idea for the SHOUTcast server is that it was to accept an audio input from the Winamp player which has a special 'DSP'plug-in. But since Nullsoft, the company that designed both Winamp and SHOUTcast, published the specifications for the interface, encoders like the iPort can connect, as well. The server 'thinks' the iPort is a Winamp player.

If you are planning to make public broadcasts via the Internet and you don't want the hassle of running your own server, or if you don't have enough network bandwidth, you can host your broadcast through a third party that will handle the streaming for you. You can search the Internet for the streaming host solution that fits your needs. The SHOUTcast forums would be a good place to start.



The installation would be like the one above. In this case, one LAN ties together the Node, iPort, and an Omnia dynamics processor. Another network links to the WAN (presumably with a firewall in the picture). This offers good security since the LW network is isolated from the WAN. It would also be possible to use a single network on the studio side. In this case, the firewall would be responsible for protecting the LW network.

The Omnia.8x is a perfect companion to the iPort. You get 8 channels of high-quality dynamics processing at low cost, and with the same simple one-RJ-45 connection advantage that the iPort offers.

Configuring the iPort for Streaming

Go to the "Codec Configuration" web page. For each stream:

1. Enter the Livewire channel number you want to use as your source
2. Enter the LW text name
3. Enter the stream server IP number and port (the port must correspond to that set in the server's configuration)

Press the **Options** button to access the codec detail configuration, then:

4. Enter the codec type, bitrate, and other parameters

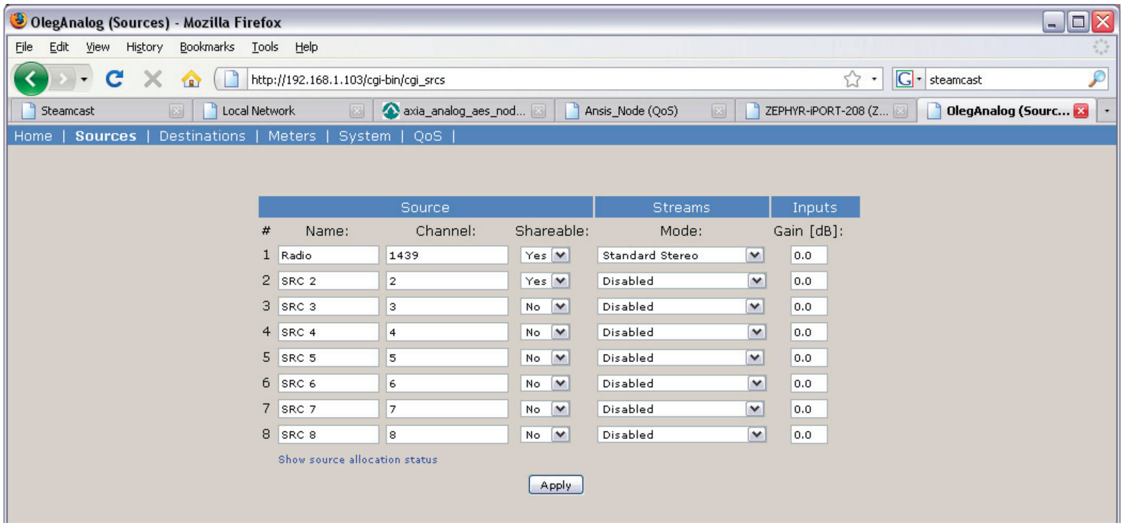
5. Select 'TCP' as the protocol (used for the iPort to server link)
6. Click the box **Enable SHOUTcast** and enter a password that will be used by the server to authenticate the stream

Install, configure, and start the server (Steamcast for our example)

7. Install Steamcast and its support files the host PC
8. Edit the config file (as described below)
9. Start the Steamcast server
10. Point a Web browser to Steamcast for monitoring

Enter the stream URL into a player and enjoy listening!

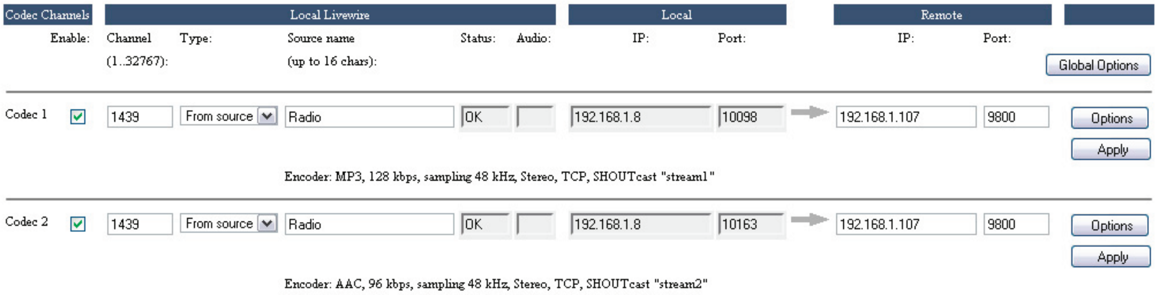
For our example app, an analog Livewire Node will be our audio source, with the configuration shown below. The stream is named 'Radio' and given LW channel number 1439.


OlegAnalog (Sources) - Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://192.168.1.103/cgi-bin/cgi_srcs
steamcast
Steamcast
Local Network
axia_analog_aes_nod...
Ansis_Node (QoS)
ZEPHYR-iPORT-208 (Z...
OlegAnalog (Sourc...
Home | Sources | Destinations | Meters | System | QoS |

Source				Streams	Inputs
#	Name:	Channel:	Shareable:	Mode:	Gain [dB]:
1	Radio	1439	Yes	Standard Stereo	0.0
2	SRC 2	2	Yes	Disabled	0.0
3	SRC 3	3	No	Disabled	0.0
4	SRC 4	4	No	Disabled	0.0
5	SRC 5	5	No	Disabled	0.0
6	SRC 6	6	No	Disabled	0.0
7	SRC 7	7	No	Disabled	0.0
8	SRC 8	8	No	Disabled	0.0

Show source allocation status
Apply

We've already set up the browser with tabs pointing to the Node, iPort, and Steamcast server. So, now we'll click on the tab that brings up the iPort stream configuration screen. Here, we will configure and enable two streams, one for MP3 and another for AAC, both being fed from the same Livewire source.



Codec Channels		Local Livewire					Local		Remote		
	Enable:	Channel (1..32767):	Type:	Source name (up to 16 chars):	Status:	Audio:	IP:	Port:	IP:	Port:	Global Options
Codec 1	☑	1439	From source	Radio	OK		192.168.1.8	10098	192.168.1.107	9800	Options Apply
Codec 2	☑	1439	From source	Radio	OK		192.168.1.8	10163	192.168.1.107	9800	Options Apply

Encoder: MP3, 128 kbps, sampling 48 kHz, Stereo, TCP, SHOUTcast "stream1"

Encoder: AAC, 96 kbps, sampling 48 kHz, Stereo, TCP, SHOUTcast "stream2"

In **Global Options** we have already set the iPort to be in the 16-channel encode-only mode, rather than the usual 8x8 codec mode. The LW source is entered to correspond to the Node settings. The Remote IP number and port is entered to be those for the streaming server. In this case, the server is running on a PC with IP number 192.168.1.107. The port is 9800, which is what the server is expecting from its configuration.

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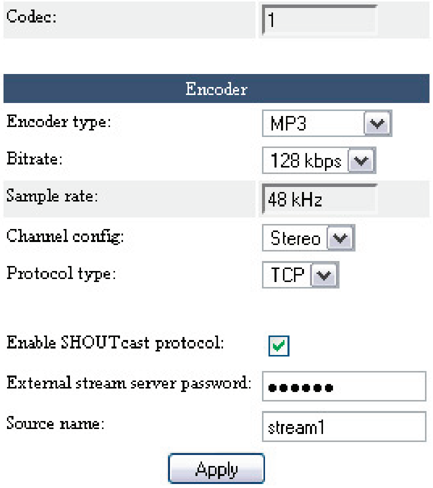
Clicking on **Options** gets us to the page that lets us enter the codec details.



Codec:	1
Encoder	
Encoder type:	MP3
Bitrate:	128 kbps
Sample rate:	48 kHz
Channel config:	Stereo
Protocol type:	TCP
Enable SHOUTcast protocol:	☑
External stream server password:	●●●●●●
Source name:	stream1

For this first stream, we've chosen the MP3 encoder, and a high-quality 128kbps bitrate. For communication with streaming servers, the Protocol type will be TCP. Click the **Enable SHOUTcast protocol** box and enter a password. This password will be used by the server to check that the stream is authorised. For this example we will enter 'telos1'. Enter a stream name. Here we have entered 'stream1'. This, too, will be used by the streaming server.

Streaming Servers

Following are the specific set-up details for Steamcast and general information about alternate server possibilities. The website associated with each provides a wealth of information, including user forums and other resources.

Steamcast

We've had the most experience with this server. It runs on both Windows and Linux, does all that usually needs to be done, and is very efficient with regard to both CPU and memory usage.

Steamcast is a freeware streaming media server that extends the capabilities of the Icecast2/SHOUTcast framework. The creators of Steamcast intend for the project to be format/codec agnostic and want to support as many encoding, listening and client systems as possible. Steamcast is currently available for Microsoft Windows, FreeBSD, and Linux.

Steamcast was created by Jay Krivanek of Radio Toolbox and was first introduced in 2004. The project has been in a beta state ever since, though many users have had success in production situations.

One of the features that sets Steamcast apart from other systems is the included web interface that allows for management of sources and clients. The server also supports a wide variety of source encoders and players that encompass other projects like Icecast2 and SHOUTcast. The server also supports multiple publishing points/mount points which can all stream on the same instance and ports. The support of the Icecast2 YP listing specification also allows the server to list on multiple listing services which helps to promote a

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web broadcast. Steamcast's backend XML sheets are supported by other services such as LoudCity for royalty requirements and the interface is also utilized by several IRC and PHP projects to include stats in varying listener locations.

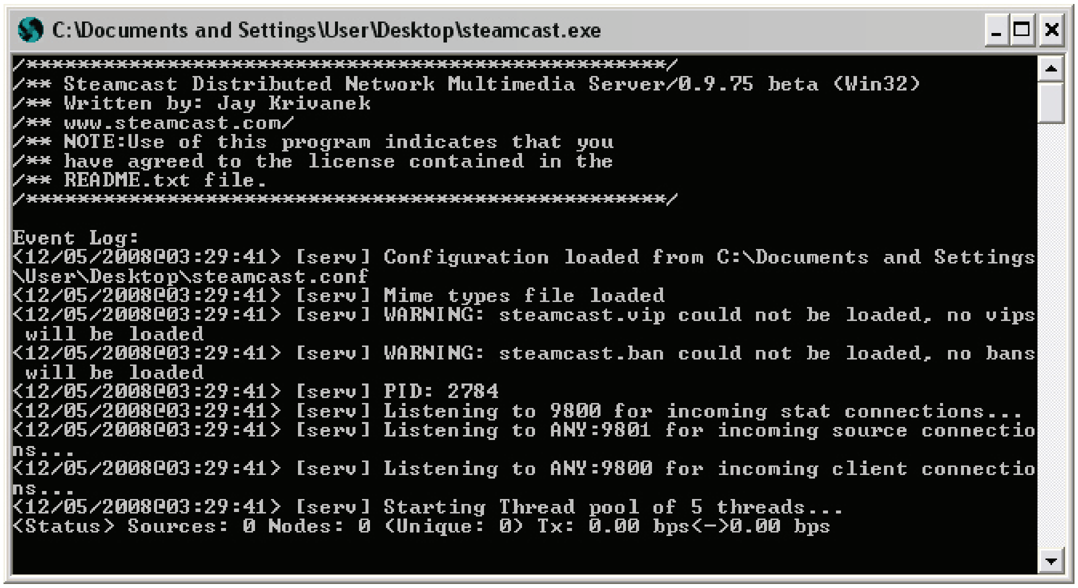
Installing and Using Steamcast

Download the server software from www.steamcast.com.

Windows Installation Procedure: Simply extract the .zip file to a folder (C:\Program Files\Steamcast\). Once extracted, you can create a shortcut to steamcast.exe on your desktop and edit the steamcast.conf file with your favorite text editor. The steamcast.conf file must be in the same folder as the steamcast.exe file. Once your changes are made and saved back to steamcast.conf you can start steamcast by double clicking either the shortcut or executable.

Unix Installation Procedure: To extract the tar.gz file you can gunzip the distribution file then un-tar the archive. Using a text editor such as vi or pico, open the steamcast.conf file and edit it to your needs. It does not matter where the server runs or what user the server runs under as long as that user has read/write access to the extracted files and the current working directory. To execute steamcast simply issue the command './steamcast'

Running under Windows, you will see something like the command-line window below:



```
/***************************************************/
/** Steamcast Distributed Network Multimedia Server/0.9.75 beta (Win32)
/** Written by: Jay Krivanek
/** www.steamcast.com/
/** NOTE:Use of this program indicates that you
/** have agreed to the license contained in the
/** README.txt file.
/***************************************************/

Event Log:
<12/05/2008@03:29:41> [serv] Configuration loaded from C:\Documents and Settings
\User\Desktop\steamcast.conf
<12/05/2008@03:29:41> [serv] Mime types file loaded
<12/05/2008@03:29:41> [serv] WARNING: steamcast.vip could not be loaded, no vips
 will be loaded
<12/05/2008@03:29:41> [serv] WARNING: steamcast.ban could not be loaded, no bans
 will be loaded
<12/05/2008@03:29:41> [serv] PID: 2784
<12/05/2008@03:29:41> [serv] Listening to 9800 for incoming stat connections...
<12/05/2008@03:29:41> [serv] Listening to ANY:9801 for incoming source connectio
ns...
<12/05/2008@03:29:41> [serv] Listening to ANY:9800 for incoming client connectio
ns...
<12/05/2008@03:29:41> [serv] Starting Thread pool of 5 threads...
<Status> Sources: 0 Nodes: 0 (Unique: 0) Tx: 0.00 bps<->0.00 bps
```

The first line shows that the configuration file has been successfully loaded. The second that the mime types file has loaded. Neither the .vip nor .ban files were present. The PID value was loaded from a .pid file. The encoder has not yet been enabled, so we see that the server is listening for, but has not yet found a source connection. It is also listening for player connections, but of course there are, as of yet, none.

Steamcast Configuration

You configure Steamcast by editing the .conf text file. Here, we will show you an example configuration to work with a typical iPort application. The text below is from the author of the software, who includes these comments in his sample .conf file. As you can see, he carefully explains all of the items. Following is a set-up for up to 16-channel streaming.

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```
; Steamcast Configuration File
; ================================
; This is the default Steamcast server configuration file, feel free to use
; it as a template for your server's configuration.  All lines beginning with ;
; or blank are ignored by the server's configuration parser.

; Server Configuration
; ====================
; PortBase [*8000]: The port that Steamcast will listen for connections on, generally it is
; acceptable to just leave this at the default, change it if you use port
; 8000 and/or 8001 for some other server.  Ports < 1024 are reserved, so try to
; stay above that.
PortBase=9800

; MaxUser: The maximum amount of streaming clients Steamcast should
; handle, this is a global setting for all multimedia connections.  Set this
; to a smart number.  Setting this too high could cause your network connection
; to be flooded and cause real problems for all end users.  In 0.9.7 this configuration
; option became optional.  Set this to set hard limits on max listener counts, otherwise
; cumulative SourceUserMax will be used to determine the overall UserMax.
MaxUser=20

; MaxBandwidth: This is the maximum amount of out-going bandwidth allowed by Steamcast
; in units of kilo-bits per second.  This is a soft limit so it is possible for the server to exceed this
; limit due to the average bandwidth system some enforcement latency may occur as well.  A
; setting of zero disables this feature.
; MaxBandwidth=0

; IPMaxUser [*0]: The maximum amount of streaming clients Steamcast should
; handle per IP, this is a global setting for all multimedia connections.
; A setting of 0 disables this feature.
; IPMaxUser=0

; LogFile [None|*steamcast.log]: The location you would like Steamcast to store
; it's log file, setting this to 'None' or blank disables this feature.  You can use use variable
; templates to control the name of the log in real time.  View the Readme for a full list of
; variables available.  Ex: %m-%d-%Y-steamcast.log to have steamcast create a different log
; every day.
LogFile=steamcast.log

; MimeFile [None|*mime.types]: The location of your mime types file.  The mime types file is
; critical in the implementation and usage of the on-demand capabilities of the server.  This file
```

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```
; also enables steamcast's auto extension feature so that the server will assign the correct
; extension to your mount points based on the audio format/codec in use.
MimeFile=mime.types

; BanFile [None|*steamcast.ban]: Use this variable to specify the location of your ban file.  The
; ban file contains information about pre-existing bans.  If the ban file does not exist, steamcast
; will attempt to create it.  A setting of None disables saving or loading of ban information.
BanFile=steamcast.ban

; VipFile [None|*steamcast.vip]: The file used to load pre-existing vip information.  VIP's are
; IPs and users designated as having a higher privilege level then average users.  A setting of
; None disables saving or loading of ban information.
VipFile=steamcast.vip

; ScreenLog [*Yes|No]: Setting this to Yes will allow steamcast to output log information
; the the screen in CLI environments.
ScreenLog=Yes

; RealtimeLog [*Yes|No]: Setting this to Yes will allow steamcast to output Realtime statistical
; information to the screen in CLI environments.
RealtimeLog=Yes

; YPLog [*Yes|No]: Enable the logging of YP Touches.  This setting has no effect on
; YP Errors, or YP Add or YP Removes.  It will only hide logging of Successful touches
; when set to No.
YPLog=Yes

; PidFile [None|*steamcast.pid]: The file location you would like Steamcast to store
; it's PID or Process ID, setting this to 'None' or blank disables this feature.
; Regardless of this setting, Process ID's will be stored in the Log on each startup.
PidFile=steamcast.pid

; NameLookups [Yes|*No]: Setting NameLookup to Yes will have Steamcast
; do a reverse dns lookup on each connection made to the server.  High Traffic servers
; should leave this setting disabled until I can come up with a better threading method.
NameLookups=No

; ShowLastSongs [*20]: This setting tells steamcast how many stream related meta updates
; to store in history.  This capability was added for compatibility with reporting agencies.
; A Setting of 1 through 50 is acceptable.
ShowLastSongs=20
```

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```
; ClientTimeout [*30]: Number of seconds a listener/viewer should stay connected while no
; source exists for thier mount.
ClientTimeout=30

; User Configuration
; ==================
; AdminUser & Admin Pass: This is the credentials that allow full control of the server remotely
; so be very careful in determining what to put here.  Essentially with these settings
; a user would be able to connect to the server using a CNTRL application and use
; the server as if they are sitting in front of it.  Please make sure that admin passwords are
; different from mount passwords in SHOUTcast compatibility mode.  Encoders passwords take
; precedence in the event they are, this is for compatibility and security reasons.
AdminUser=telos1

AdminPass=telos1

; Source Configuration
; ====================
; Each source that you wish to allow on the server needs to be configured
; here first.  The parser will read strait down the file so if you have
; multiple source mounts and you declare a new mount before finishing
; configuration of another, then those configurations after the new
; declaration will go to the new mount.

; SourceMount: This is the mount you would like to create, if you set
; this to /ghey then you would be able to access this mount by
; going to http://localhost:8000/ghey It is critical that you
; make sure to include the slash at the beginning.
SourceMount=/stream1

; SourceUser: The last SourceMount declared will require this Username
; in order to become a source for this mount.  Note: if you are running
; this mount in shoutcast compatibility mode, this is not required.  However
; it's best to set this anyhow as it allows your encoder users to administrate
; their mounts from a CNTRL app or web panel.
SourceUser=telos

; SourcePass: This is the last Source Mount's password, this is required
; for all connecting encoders.  Mounts without passwords are invalid.
SourcePass=telos1

; SourceUserMax [*5]: This particular mount's UserMax, if all of your source
```

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```
; UserMaxes combined exceed the global UserMax then the UserMax takes presedence.
SourceUserMax=5

; SourceRelay: This particular mount will pull data from the location specified below.
; If you publish both servers on yp.shoutcast.com and wish that they cluster at that
; yp server then enter your relay url without http:// or trailing path or slashes
; like the example below.  It is now permissable to make a list out of this variable
; to have in effect fallback masters in the event one is unavailable.
; SourceRelay=audio.str3am.com:4080

; SourceDisconnectWait: [*10]: Allows you to control the wait time in seconds between
; reconnect attempts if a relay fails.  Values from 1 and up are acceptable.
; SourceDisconnectWait=10

; SourceDirectory: This mount will be an on-demand mount for steamcast.  Any directory
; location is acceptable here.  This aspect of Steamcast still needs alot of work.  So stay tuned.
; SourceDirectory=./content

; SourceGateway: The location of a file you want to be played before the stream begins for each
; listener.  Use %s and Steamcast will only look for files with a matching extension.  Files must
; be the same in everyway with the stream currently playing.
; SourceGateway=/intro.%s

; SourceBackup: This is the mount you would like listeners directed to in the
; event that this source becomes unavailable.  These two mounts must be completely
; identical bitstreams in order for this feature to work properly.
; SourceBackup=/live_back

; SourceBitrateLimit: Set this to have Steamcast choke sources that exceed a
; certain average data rate.  This value is based on actual data transfer and not any particular
; format headers.  This is a great way to control users in community or hosting
; environments.  Default is no limits.  Steamcast waits 20 seconds into a connect before
; limiting, the choke takes affect after a source goes 10% over the limit.
; SourceAvgBitrateLimit=128

; SourceIsSC [*Yes|No]: Setting this to Yes will allow source applications
; which do not have a username capability to use the last source
; declared anyway.
SourceIsSC=Yes

; SourceNameFormat: Provides a new Stream name either derived from the source or
; completely replacing the sources option.  This title is used in client media players and
```

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```
; publishing outlets.  You can use %s anywhere in the title to have the encoder's option included
; into the final stream name.
; SourceNameFormat=%s powered by Steamcast

; SourceIsDefault [*Yes|No]: Setting this to Yes will make this particular
; mount available globally.  There can be only one global mount.  This
; is also the only mount that will be able to list at shoutcast.com
SourceIsDefault=Yes

; SourceIP: Setting this to a dotted IP address will make this particular
; mount available at the root of steamcast (much like SHOUTcast) for the IP
; specified here.  Note: You must own the IP you place here.  Inaccurate
; settings will have no effect.  This setting essentially will allow you to
; list multiple source points in the SHOUTcast directory.  It is not neccessary
; to set this setting if you only own one IP.  Setting this for any Source will
; disable the SourceIsDefault flag on any mount.
; SourceIP=123.45.67.89

; SourceAuth: [Yes|*No]:  Allows you to setup HTTP Basic Authorization on this
; mount point.  All Authentication is currently file based.  Please see steamauth.txt
; SourceAuth overrides the public bit and will force all SourceAuth'd streams to be
; private.
; SourceAuth=No

; SourceAuthMax: [*0]: Allows you to set the maximum amount of connections per
; authenticated
; user.  A setting of 0 is interpreted as unlimited.
; SourceAuthMax=0

; SourceListenerTimer: [*0]: Allows you to specify the amount of time a client can stay
; connected in minutes.  A value of 0 disables this feature and allows clients to stay connected
; for an unlimited amount of time.
; SourceListenerTimer=0

; SourcePublic: [*Default|Always|Never]: Allows you to specify whether to override the source's
; public bit setting.  When set to Always a source mount will list on directory services regardless
; of the encoder's specified preference.  When set to Never the source mount will refuse to list on
; directory services.  The default of... Default (heh) sets the source to let the encoder decide
; listing preference.
; SourcePublic=Default

; SourcePublicRelays: [*Yes|No]: Whether servers which relay steamcast should list on directory
```

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```
; services.
; SourcePublicRelays=Yes

; SourceRawKey: Set this variable to the key you would like passed in a parameter string to
; access the raw data stream in HTTP form.  This is great for things such as Flash.  If you use
; the example below then access to the raw data stream (unprotected by user-agent filters) can
; be obtained by passing http://localhost:8000/mountname.mp3?rawdata to the player, as always
; substitute the address with your specific implementation.  Leaving this option blank or
; commented disables this capability.
; SourceRawKey=rawdata

; SourceBuffUtil [*100]: This value allows you to control the start position
; of connecting clients within the buffer.  0 would effectively set a new connecting
; client to the write point of the buffer giving a more real-time like experience
; although due to the way the internet really works it can never be truely real-time.
; Setting this to 100 would start them all the way at the back of the buffer which
; gives most clients no buffer wait times.  It is highly recommended that you not mess
; with this parameter except in instances where the bitrate of the stream is extremely
; low and you require an interactive experience from the users connected to the server.
; (i.e. A talk show or other low bitrate interactive live program)  Most other broadcasts
; SHOULD NOT CHANGE THIS SETTING!!!  Doing so will make the connecting users
; feel like they are on dialup in 1996 listening to Real Player. :)
SourceBuffUtil=1


; Directory Configuration
; =======================
;Directory=http://www.steamcast.com/sbin/yp.php
;Directory=http://dir.xiph.org/cgi-bin/yp-cgi

; Advanced Configuration
; ======================
; Do not mess with these configuration values unless you know what you are
; doing, typically these are settings which should not need adjusting.  But
; are here for those users who feel they need more control over how the
; server behaves.

; ServIP [*Any]: This option allows you to control which interface or IP Steamcast
; should bind to.  Setting this option will limit which IP clients can connect through.
; ANY (case sensitive) will allow steamcast to bind to all and any ip interfaces available.
```

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```
; ServIP=ANY

; SrcIP [*Any]: SrcIP is the IP that Steamcast will listen for source connections.  For
; instance setting this option to 127.0.0.1 will limit SHOUTcast source connection attempts
; to only from the the machine steamcast resides on.  ANY (case sensitive) will allow
; steamcast to bind to all and any ip interfaces available.
; SrcIP=ANY

; ThreadPool [*5]: Set this to control the amount of available threads for incoming clients.
; Generally you should not have to change this setting.  Setting anything below 2 is not allowed,
; due to severe loss of performance.  Setting this too high will mean more memory and overhead
; will be needed to load the server, be sensible if you must change this number.  While you are
; allowed to set a number as high as 100 anything over 10 is generally considered excessive.
; ThreadPool=5

; MetaInterval [*8192]: Set this to control the meta data interval in bytes for audio types that
; utilize the Icy Meta Data protocol.  This is a server wide option.  Technical notes: Excessive
; CPU and unlistenable streams may result if you set this value too low.  Steamcast will go no
; lower then 1024bytes.
; MetaInterval=8192

; if I could smile I would.


; We’ve configured one source; now we’ll do all the others, following the same pattern...


; Stream 2 is MPEG AAC. We have to use the .aac suffix so that player will know what decoder
; to use
SourceMount=/stream2.aac
SourceUser=telos2
SourcePass=telos2
SourceUserMax=5
SourceIsDefault=No

SourceMount=/stream3.mp3
SourceUser=telos3
SourcePass=telos3
SourceUserMax=5
SourceIsDefault=No

SourceMount=/stream4.mp3
SourceUser=telos4
```

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```
SourcePass=telos4
SourceUserMax=5
SourceIsDefault=No

SourceMount=/stream5.mp3
SourceUser=telos5
SourcePass=telos5
SourceUserMax=5
SourceIsDefault=No

SourceMount=/stream6.mp3
SourceUser=telos6
SourcePass=telos6
SourceUserMax=5
SourceIsDefault=No

SourceMount=/stream7.mp3
SourceUser=telos7
SourcePass=telos7
SourceUserMax=5
SourceIsDefault=No

SourceMount=/stream8.mp3
SourceUser=telos8
SourcePass=telos8
SourceUserMax=5
SourceIsDefault=No

SourceMount=/stream9.mp3
SourceUser=telos9
SourcePass=telos9
SourceUserMax=5
SourceIsDefault=No

SourceMount=/stream10.mp3
SourceUser=telos10
SourcePass=telos10
SourceUserMax=5
SourceIsDefault=No
```

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```
SourceMount=/stream11.mp3
SourceUser=telos11
SourcePass=telos11
SourceUserMax=5
SourceIsDefault=No

SourceMount=/stream12.mp3
SourceUser=telos12
SourcePass=telos12
SourceUserMax=5
SourceIsDefault=No

SourceMount=/stream13.mp3
SourceUser=telos13
SourcePass=telos13
SourceUserMax=5
SourceIsDefault=No

SourceMount=/stream14.mp3
SourceUser=telos14
SourcePass=telos14
SourceUserMax=5
SourceIsDefault=No

SourceMount=/stream15.mp3
SourceUser=telos15
SourcePass=telos15
SourceUserMax=5
SourceIsDefault=No

SourceMount=/stream16.mp3
SourceUser=telos16
SourcePass=telos16
SourceUserMax=5
SourceIsDefault=No
```

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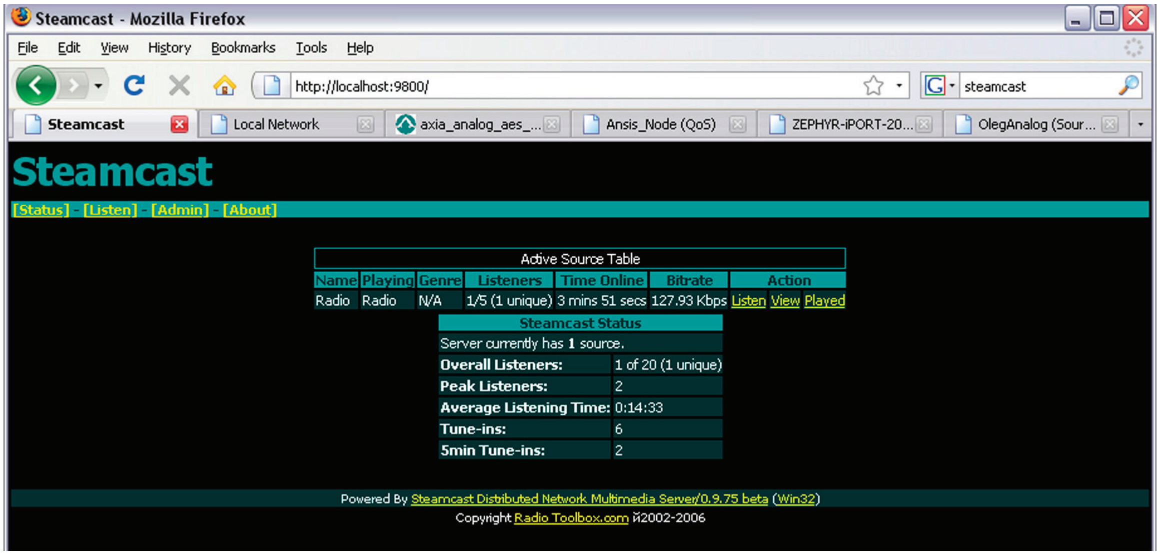
Web Interface

To use the Web interface on the same PC where Steamcast is running, open a Web browser and point it to: http://localhost:9800. The number after the colon is the IP port number, which we have set via the Steamcast configuration file to 9800 in our example. You can also use a browser on a remote machine, by entering the host PC's IP number in place of 'localhost'. Here is a screenshot of the Steamcast Web interface, showing one stream and one active listener:



Active Source Table								
Name	Playing	Genre	Listeners	Time Online	Bitrate	Action		
Radio	Radio	N/A	1/5 (1 unique)	3 mins 51 secs	127.93 Kbps	Listen	View	Played

Steamcast Status	
Server currently has **1** source.	
Overall Listeners:	1 of 20 (1 unique)
Peak Listeners:	2
Average Listening Time:	0:14:33
Tune-ins:	6
5min Tune-ins:	2

Powered By Steamcast Distributed Network Multimedia Server/0.9.75 beta (Win32)

Copyright Radio Toolbox.com й2002-2006

For administration, you will need to enter a user name and password. These are the ones you entered in the steamcast.conf file.

SHOUTcast

The SHOUTcast DNAS (Distributed Network Audio Software) server is available for Windows, Linux, and Mac OSX at: www.shoutcast.com. It is freeware, but not open source. This was the server that started it all, developed by Nullsoft, the people who created Winamp. The software is now in the hands of AOL, who don't seem to be investing much in its continued development. Neverthess, it gets the job done.

Here are the user instructions, taken from the SHOUTcast site:

Windows 95/98/ME/NT/2000/XP:

1. Download the SHOUTcast DNAS application for Windows.

2. Once the download has finished, extract all the files into a folder and create a shortcut for SC_SERV.EXE on the Desktop.

3. Start up the SHOUTcast Radio server by double-clicking on SC_SERV.EXE

4. Click on the "Edit Config" menu option located at the top. This will start the default text editor, opening the configuration file for SHOUTcast DNAS application. Follow all the directions that are written into the configuration file.

5. Once you are done making changes, save the file, close the editor, and restart the

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SHOUTcast Radio DNAS application.

UNIX, LINUX, FreeBSD and MAC OSX:

1. Download the SHOUTcast DNAS application version appropriate to your system by proceeding to this link.

2. Unzip the distribution and un-tar the archive.

3. Use a text editor to configure the sc_serv.conf file

4. Note that the user you run the server as requires read access to the config file, and write access for the files you define for file storage and log storage.

Configuration File

Like Steamcast, the SHOUTcast Radio Server configuration file contains several options that can be changed. See the SHOUTcast website for details.

ICEcast

Icecast is a free streaming media project maintained by the Xiph.org Foundation. It also refers specifically to the server program which is part of the project. The main website for information and download is: http://www.icecast.org. Kerry Cox offers an excellent online "book" devoted to Icecast at: http://www.gnuware.com/icecast/.

Icecast was created by Jack Moffitt and Barath Raghavan to provide an open source audio streaming server that anyone could modify, use, and tinker with.Version 2 was started in 2001, a ground-up rewrite aimed at multi-format support and scalability.

The Icecast server is capable of streaming MP3 and AAC over the SHOUTcast protocol. (AAC is only supported in version 2.2.0 and newer.) It runs on both Linux and Windows.

Icecast is generally regarded as being the most sophisticated and capable of the streaming servers, especially for users who want to use Linux and are comfortable with command-line interfaces. It supports detailed reporting of audience statistics. For simple in-house distribution applications, Icecast might be over-the-top. But for serious public Internet radio station-like streaming, this might be just what you need.

As of the writing of this manual, we have not yet tested Icecast in our lab, but there is no reason why it shouldn't work.

Configuration File

Like Steamcast and SHOUTcast, the icecast.conf configuration file contains several options that can be changed. Icecast2 uses an XML configuration approach. See the ICEcast website or the online book referenced above for details.

Stream and Track Names

The iPort sends the LW channel text name to the server, which uses it as the Stream name. The same text is sent as the Track name. However, this is only sent one time, so your source audio application can update the Track name via a direct and independent connection to the server.

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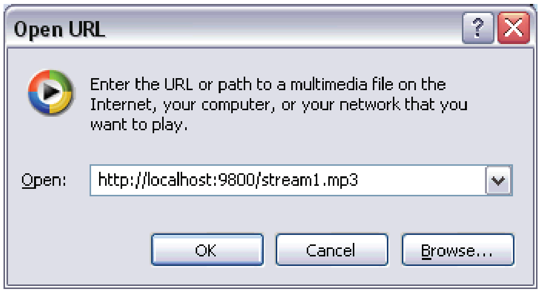
Using a PC Player to Listen

We will use the Windows Media Player 11 for our first test with the Steamcast server configured as above. Open the player, right click, go to the **File** menu and select **Open URL....** This window will appear:

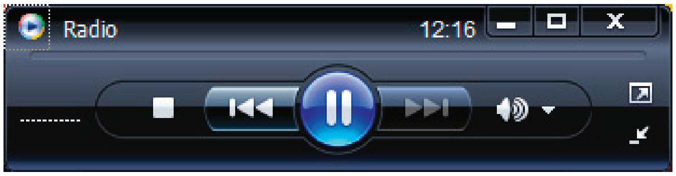


Open URL

Enter the URL or path to a multimedia file on the Internet, your computer, or your network that you want to play.

Open: http://localhost:9800/stream1.mp3

Enter the IP and port, then the stream name. Because the player is running on the same machine as the server in this case, 'localhost' is entered as the IP number. Were you to be listening on a another machine, you would enter the server's IP number, like this: http://198.168.1.107:9800/stream1.mp3. The stream name is the one that was configured in the steamcast.conf file. Click **OK** .



After some buffering time, you should have audio. Note that the player is showing 'Radio' as the stream name, as we expected it would. This is the Livewire text name being promulgated through the iPort to the server, and then on to the player.

Normally, a user would not have to enter the URL. Rather, this would be a link embedded in a web page.

We have tested MP3 streams with the WM player, Winamp, VLC player, Foobar, and iTunes. AAC streams will work on the players that support AAC decoding, which are all of the above except WM player.

(We've noticed that Winamp seems to have a bug playing 'localhost' URLs, but it works fine on a remote machine.)

Hardware Players

You can also play the streams on a variety of hardware devices. We've tested with the Logitech 'Slimplayer' and a few others. The device needs to support the codec you have chosen. MP3 has universal support, with AAC decoding being available on only a subset of devices.

Most hardware players are unable to open URLs directly. They need an intermediate server that drives the program listing on the device and translates the audio stream format, if necessary. The Logitech needs 'Slimserver' and many others need a server that conforms to the UPnP standard. This software could run on the same machine as the streaming server.

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MPEG License & Music Copyright

The MPEG encoders in the iPort are properly licensed for professional, non-public applications such as broadcast remotes, private distribution systems, and the like. We've paid the fees as part of the cost of making the iPort (in fact, it is a significant part of our expense), and the use license is passed to you when you buy the equipment. For this kind of application, you have no need to pay any additional fees.

However, public streaming applications may require additional license payments. It's your responsibility to investigate whether you have this obligation.

Musical compositions and sound recordings are creative works that are protected by the copyright laws of the United States (title 17, U.S. Code) and other countries. Under U.S. law, the owner of a copyright has the exclusive right to (and to authorize others to) reproduce the work, use parts of the work in a new creation, distribute the work in whole or in part, and to publicly display or perform the work (including on web pages and through webcasting). With few exceptions, it is illegal to reproduce, distribute or broadcast a sound recording without the permission of the copyright owner. It is your responsibility to comply with the copyright laws of the United States and other countries in which you broadcast and to pay all applicable royalties to the copyright owners when you become a webcaster.

There have been recent amendments to the copyright law regarding webcasting of sound recordings. These new provisions allow webcasting under the terms of a statutory license, as a way to help webcasters get permission without having to go to each sound recording's owner. The statutory license, however, has strict requirements that you must follow. Some of these requirements include the payment of license fees, limitations on the number of songs from the same album or artist that may be played in a three hour period (called the sound recording performance complement); a prohibition on publishing advance playlists; and a requirement to identify the song, artist and album on the website. There are other requirements as well. The Recording Industry Association of America provides quite a bit of information on copyright law as it applies to webcasting, and both ASCAP and BMI have created license agreements that they are willing to grant to webcasters that they believe conform to the provisions of the new copyright rules for webcasting. For additional information

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on the statutory license and other aspects of webcasting, please visit the following sites:

The U.S. Copyright Office

http://www.copyright.gov

The Recording Industry Association of America

http://www.riaa.com/issues/music/webcasting.

ASCAP

http://www.ascap.com/weblicense/webintro.html

BMI

http://www.bmi.com/iama/webcaster/index.asp

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