VX30 B-CAST

Real Time Encoding Software

Jonathan Miller

2/2005

Table of Contents

Introduction

Introducing B-Cast

Welcome to VX30 B-Cast!! The VX30 B-Cast Streaming Software is the world's first Real-Time Streaming Video Solution developed with the VX30 codec. The VX30 codec is one of the most powerful in the world with an unmatched compression ratio of over 100 to 1. B-Cast fully leverages this amazing compression tool to give the highest quality video stream possible.

Why Use B-Cast

B-Cast is a revolutionary new approach to streaming live video. Never before has a single streaming video product included all the features and advancements that B-Cast has to offer. Here is a quick rundown of what makes B-Cast so unique.

- **Security** - B-Cast only uses HTTP, the standard protocol of Internet communication. This allows for a higher level of security than many other streaming video technologies[1] because both the client and the server are not required to open up numerous backdoors on the firewall for the video stream to be delivered.

- **Savings -** By using the VX30 codec, B-Cast makes it possible to stream high quality video at stunningly low data rates - even to users on a dial-up connection. The savings derived by reducing bandwidth costs alone can make the B-Cast Server pay for itself!!

- **Player-less Technology** - B-Cast does not require the client to have a media player installed to view the video. In fact the video is rendered on the client's computer by using the Java Virtual Machine[2] that is installed on over 95% of the world's computers. This greatly simplifies deployment and lends itself to an improved customer experience. Finally because the user does not require the media player to launch before viewing the video the playback is immediate.

- **Relay Streaming** - B-Cast supports server to server streaming (a.k.a. relay streaming). The giant difference between a B-Cast relay and other video relay technologies is that the B-Cast Software does not require a full installation of the Server Software on the relay machine. This is important for a number of reasons:

  - Significant license savings when working with distributed networks.

  - Easily scalable architecture.

  - Unlimited client potential.

- **Performance** - B-Cast's architecture lends itself to incredible performance. Unlike other solutions the B-Cast Server is able to maintain as many client connections as the hardware can provide. For the first time the number of client connections is limited only by the bandwidth potential of the server.

---

[1] A commonly used protocols for streaming video include UDP, RTSP and RCP. These protocols require a range of ports on the firewall to be open to maintain streaming sessions. UDP is asynchronous which makes it particularly vulnerable to security breaches.

[2] The VX30 Player Applet is backward compliant to v1.1

- **Multi-platform support** - B-Cast is available for installation on both Windows and Unix/Linux platforms[3]. Giving IT departments ultimate flexibility for deployment.

How Does B-Cast Work?

The B-Cast Server Software is a server side application that thin clients can connect to send or receive video streams. Client's can upstream a live video feed using VX30 Live, a lightweight application that converts a digital video signal into a B-Cast compatible stream. Client's receiving the redirected video stream from the B-Cast server can either be another server in a relay network or a simple client who is just going to view the stream. The relay server will require an installation of the VX30 B-Cast Relay package - a lightweight software that manages the incoming and out going streams. A client can view the video stream as long as they have a Java enabled web browser.
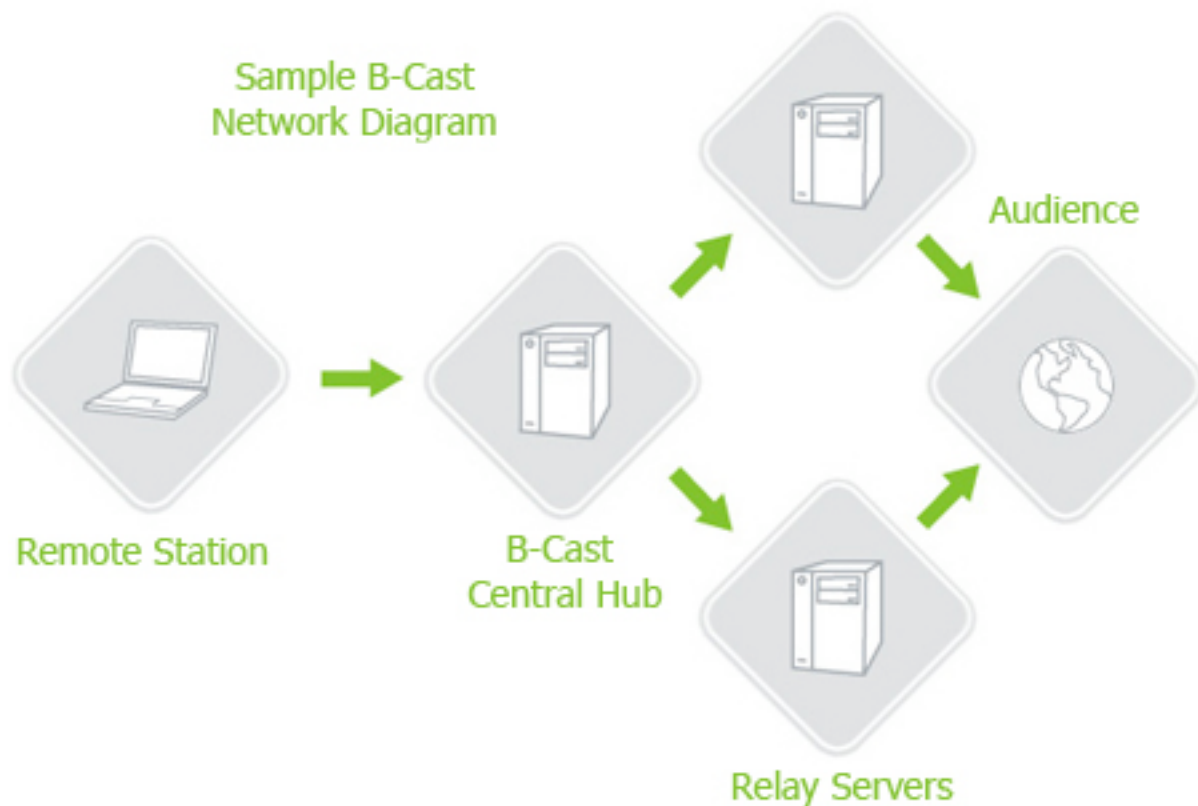
B-Cast Network Diagram

The Hub and Spoke architecture of the B-Cast Video Network gives it the strength of a Tier 1 data center without having the limitations of a single point of origin. For example let's imagine a reporter named Jane who is out on location reporting a story. Jane wants to stream her story live to her news organizations website. All Jane would require to accomplish this objective would be a 100 kbps Internet connection, a firewire or USB camera and a laptop computer running the VX30 Live Application. The camera (or other digital video input) would feed it's input into the laptop, where the feed would be converted by VX30 Live into a video stream. The video stream would than

---

[3] Unix/Linux version will be delivered 2nd quarter 2005

travel up through her Internet connection (Spoke) to the main B-Cast server (Hub). The B-Cast server would than pick up this stream and relay it out - either directly to the audience or through a relay network.

But that's not all! Now imagine that Jane is not the only reporter covering a new story at this time but her coworker, Sue, is also covering a story across town.   Sue, using the same process as Jane, could send her video stream to the same B-Cast server. In turn both feeds would be available to either the relay network or the viewing stations.
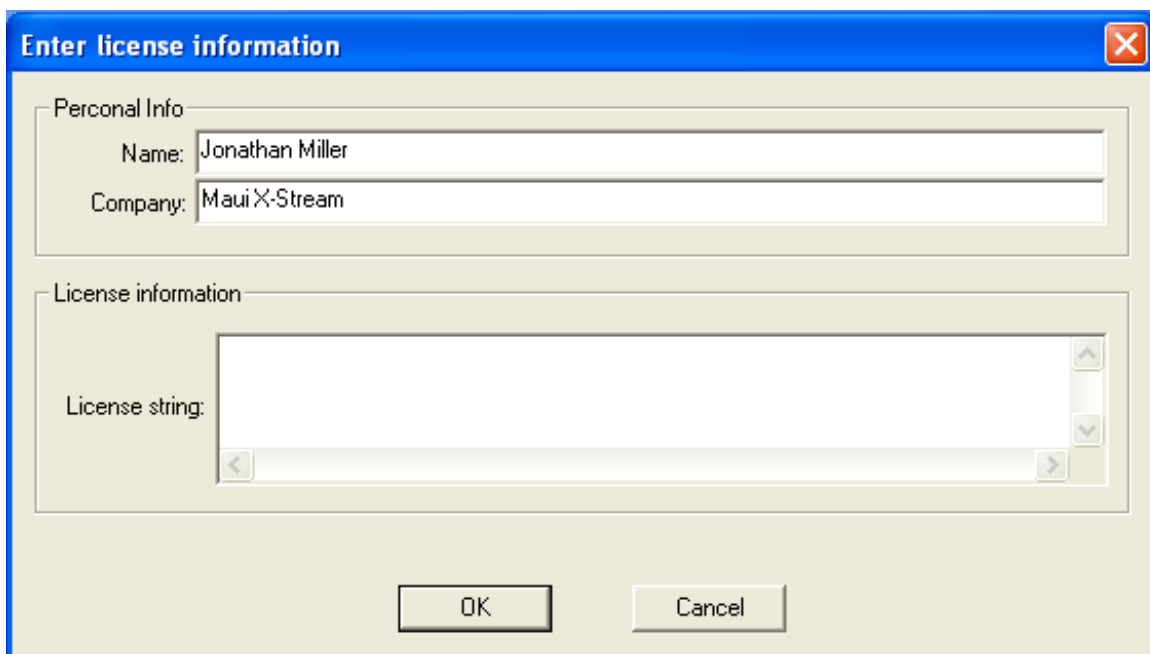
Setting Up B-Cast

Installation

The installation of a B-Cast system is done in two parts. The first step is to install the B-Cast (Multiplex mode) application on the server that will act as the central hub of your video network. Once you have successfully installed and configured your central server you will need to setup your client stations. The client stations will need to install *VX30 Live,* the application that creates a live feed for the B-Cast server. After you have initialized your Live Encoder you will be ready to add live video streams to your web page.

To begin installation of your VX30 B-Cast software simply decompress the zip file you downloaded from the MXS website. Double click the setup.exe file to launch the installation wizard. Please follow the on screen instructions to complete the installation process. You will not be able to install the software unless you agree to the terms of the License Agreement.

Activation

The first time you use your VX30 B-Cast application you will be prompted to enter your name, company name and the license string. To properly install the license you must enter the information from all three fields *exactly* as it appears in the license provided to you by MXS.


Activation Screen

If you cannot activate your encoder please contact your MXS Sales Agent. After successfully entering your license information you will be redirected to the Encoder's Workspace Area.

Starting the Application

The B-Cast server has two primary functions, sending and receiving video streams. In the nomenclature of the B-Cast program we define received streams as *content providers*. The content providers are video streams that are directed at the B-Cast server and are in turn reflected out to the audience. Before a content provider can send a video to a B-Cast server it must either know the IP address or the fully qualified domain name of that server. In addition a B-Cast server cannot send and receive video streams out of the same port so a port must be designated for the content providers.

To start your VX30 B-Cast Server go to *Start -> All Programs -> VX30 Live 1.0 -> VX30 B-Cast.* When started the B-Cast program opens up a windowed user interface that shows all the currently configured content providers.
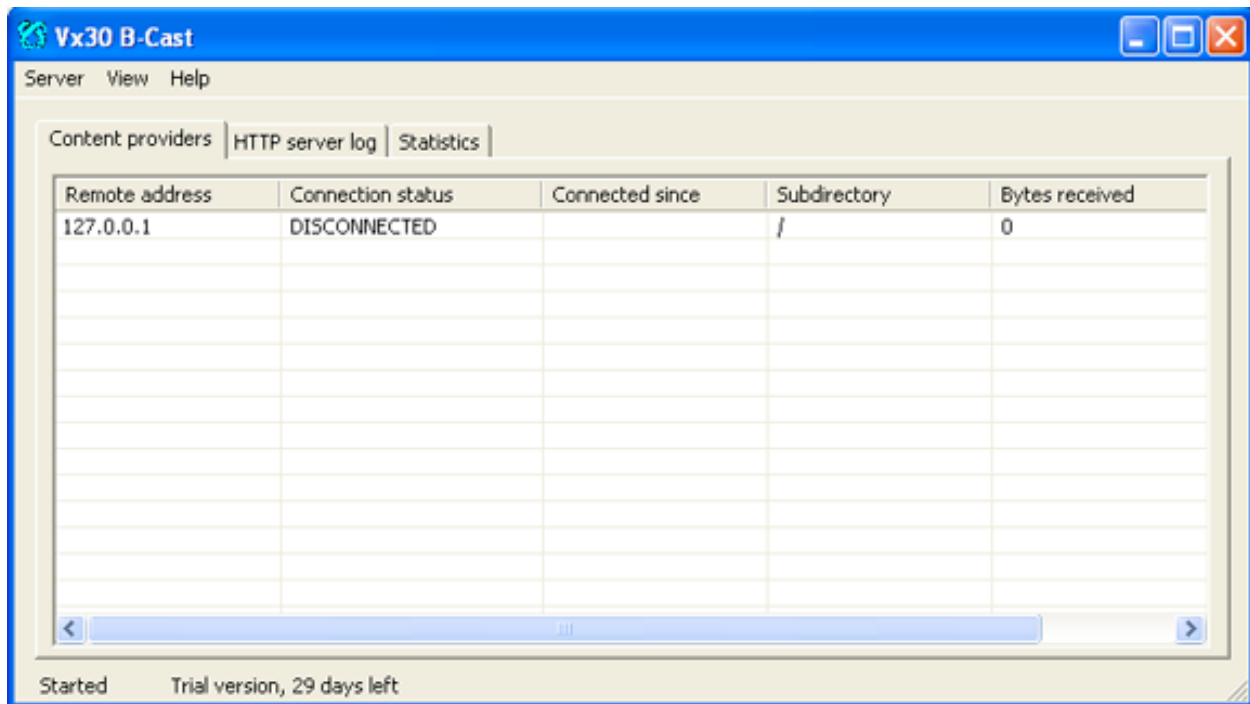
The Content Providers Screen

The window contains the following information about each currently configured content provider:

- **Remote Address** - This is the address from which the content provider is sending the stream. To be able to send a video to a B-Cast server the user must know their IP address.

- **Connection Status** - This simply signals whether the *Content Provider* is currently *Connected* or *Disconnected.* A *Connected* provider is actively sending a video feed to the B-Cast server.

- **Connected Since** - This column provides the date and time when the connection was first initiated.

- **Subdirectory** - This is the directory from which a client can connect to the video stream. For example if the client wanted to connect to a video that was playing at a B-Cast server with the fully qualified domain name of *http://cameras.mydomain.com* and the *subdirectory* equals "/ " than the video would be viewable at the root

level. If on the other hand the subdirectory was defined as *camera1* than the client would be able to connect to the video at *http://cameras.mxsinc.com/camera1*   The *subdirectory* will be defined in more detail later on.

- **Bytes Received** - This is the amount of bytes that have been received by the B-Cast server from the *content provider*.

Setting Up a Content Provider

As you can see from the previous section to configure a content providers will need to define three basic things.

1. The IP address of the Content Provider.

2. The port on which the Content Provider will be sending the video feed.

3. The Subdirectory on which the video stream will be relayed.

To configure these settings go to *Server -> Preferences* from the windows toolbar. After the configuration window has opened click the *Content Providers Settings* tab.
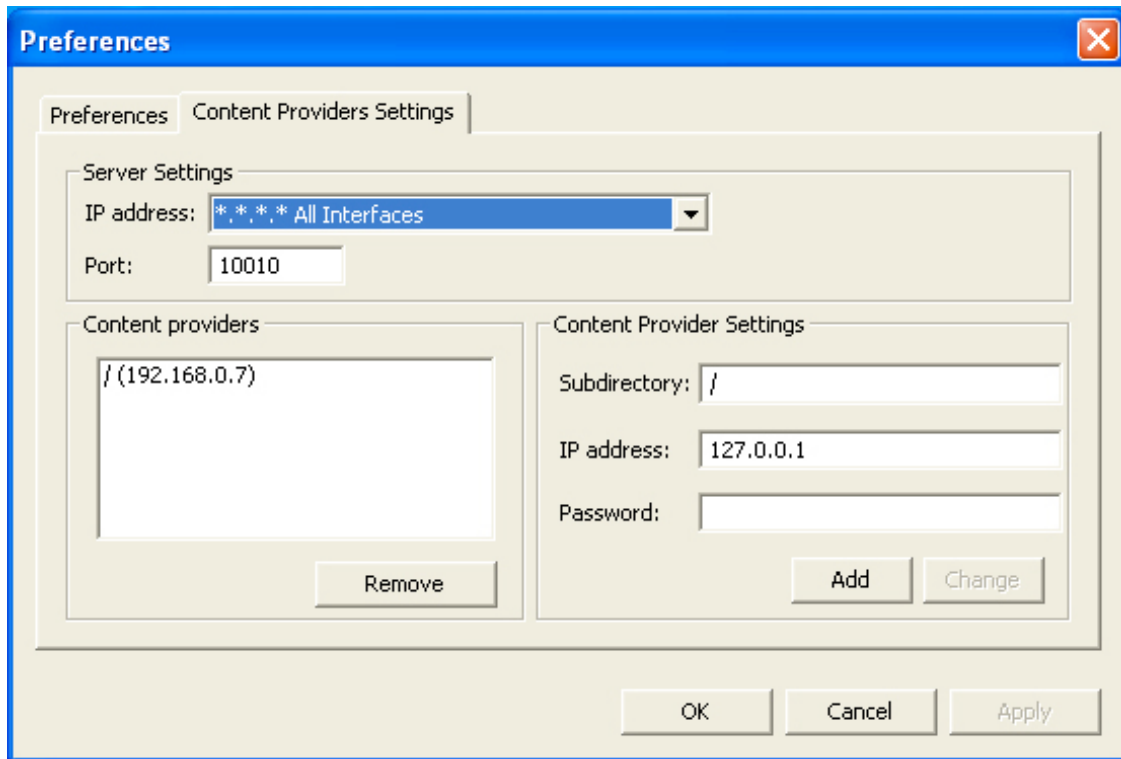
Content Providers Settings

In the top portion of this window the server defines which IP addresses it will for connecting *Connecting Providers*. The drop down menu automatically determines which IP addresses are available for this server. By default the server will listen on all interfaces for connecting streams. The *Port* setting is which port on the firewall that all Content Providers will be connecting to send their video feed. You can choose any port which is available on your system.

The bottom portion of this window is where you can add new and edit or remove current Content Providers. The box on the left, *Content providers*, lists the currently configured providers. To remove a Provider simply highlight the appropriate row and click the *Remove* button. To the right of this box is another section titled, *Content Provider Settings*. This is where the Providers are created and edited. To create a new Provider fill out the three input boxes and click the *Add* button. The three input boxes define the following settings:

1. **Subdirectory** - This is the virtual director from which your live feed will be available for viewing or relaying.

2. **IP Address** - This is the IP address from which the Content Provider will be sending its signal.

3. **Password** - This is the password that is used to authorize the Provider's connection. If the Provider doesn't have the corresponding password in its configuration it will not be allowed to connect to the B-Cast Server.

To edit a Provider's settings simply highlight the appropriate Provider's IP address in the *Content Providers* section and than input the correct values in the *Content Provider Settings* section. Click *Change* and than *Apply* for the settings to take effect. You will be prompted to restart the server should you change any settings.

Run Time

Starting the Server

The B-Cast Server starts automatically when the application is launched. To **start**, **restart**, or **stop** the B-Cast Server go to the **Server** section of the Windows Toolbar.
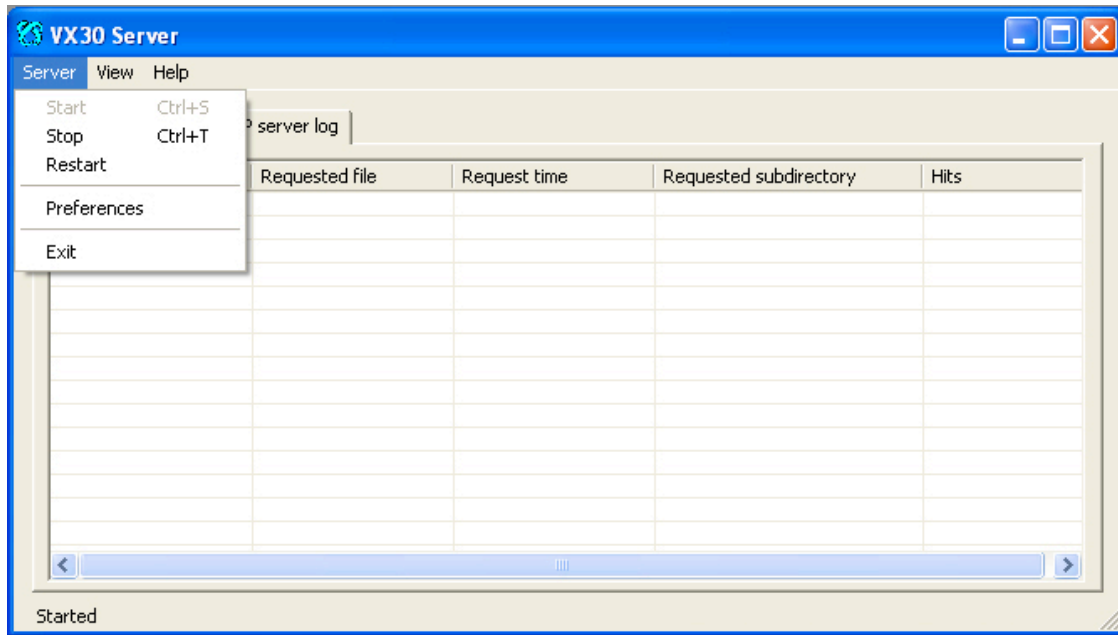
Server Control Tab

The Main User Interface

The **User Inferface** can be broken down into three basic categories, to page between the different sections use the tabs below the Windows Toolbar titled, **Content Providers**, **HTTP server log** and **Statistics**. The sections are described below:

1. **The Content Providers Window** - This is the section where you can see the currently configured content providers. The section also presents some information on each provider including the remote address, connection status, start time, subdirectory and the number of bytes received.

Content Provider Window
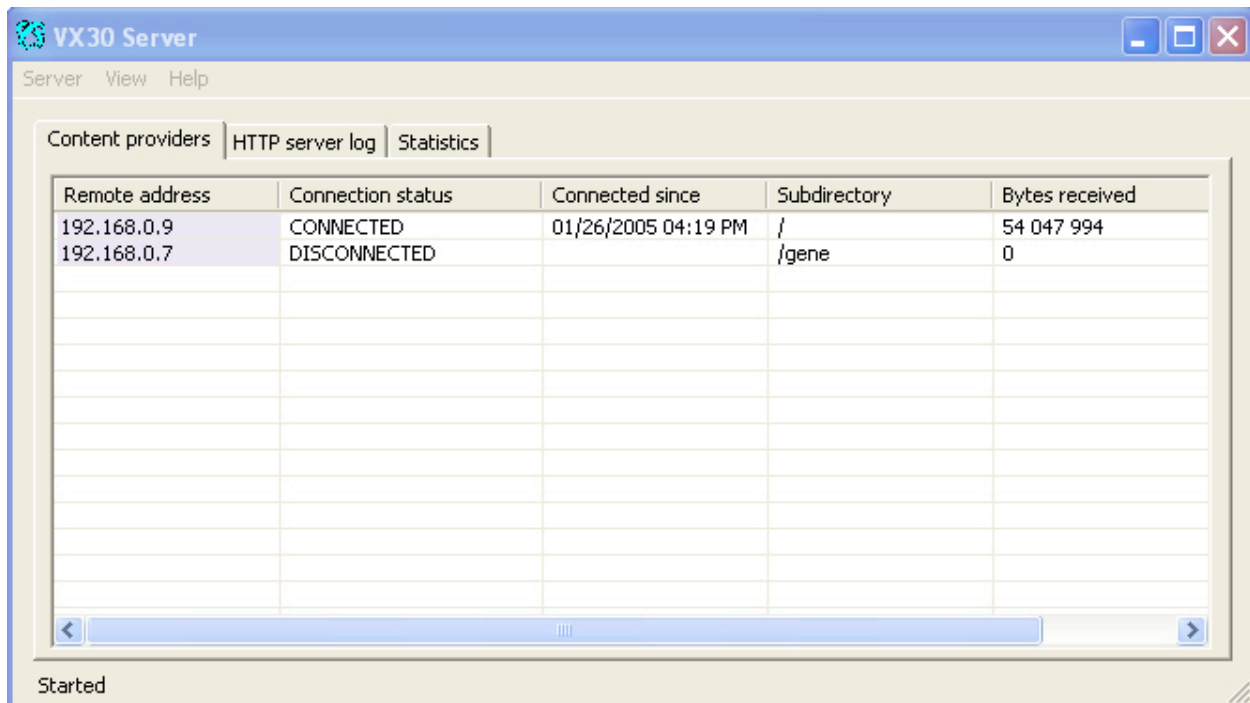
2. **HTTP server log** - This section shows the activity on the web server that is embedded in the B-Cast application. Some of the information collected from the server logs include the address from which the file was requested, the file name, the last request time, the directory from which it was requested and the total number of hits on that file.

HTTP Server Log
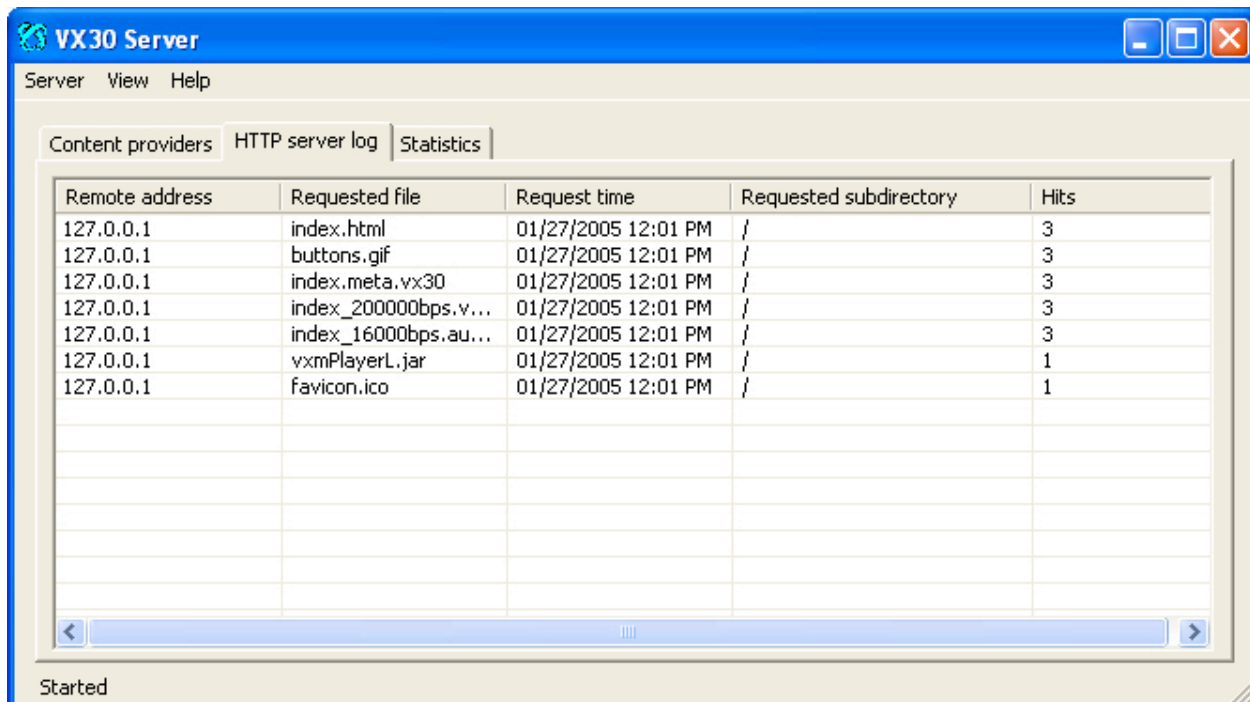
3. **Statistics** - The final statistics section gives more detailed information on the current streams that are being provided by the B-Cast Server. In the example image we can see that two streams are currently being provided. One stream for audio and another for video. In addition we can see the current bit rate, the total number of bytes sent, the buffer size, the amount of room still available in buffer and the number of dropped frames.


Statistics WIndow

Preferences

To open the Preferences Window go to *Server -> Preferences*. This section is divided into two areas, ***Basic Options*** and ***HTTP Server***. The basic options determine the standard operational characteristics of your application. The characteristics are:

- **Load at Windows Startup** - If checked the B-Cast Server will automatically start when Windows is booted.

- **Start as Service** - If checked the B-Cast server will run as a window service.

- **Minimize to the System Tray** - If checked the B-Cast server will be included in the Windows System Tray.

- **Auto start streaming** - If checked the B-Cast server will begin to stream a content provider as soon as they make an authorized connection.

B-Cast does not rely on IIS to stream video, it comes with its own built-in web server. The ***HTTP Server*** settings in the ***Prefernces*** window determine the basic characteristics of the B-Cast web server. The first field, ***IP Address***, sets which IP addresses will the HTTP server will broadcast on. By default it will select ***All Interfaces***. However should the server have multiple IP addresses or if you only want to do local streaming you can select the desired IP from the drop down menu. The second characteristic of your B-Cast web server is which Port do you want out going streams to be sent. You can choose any port that is available on your firewall.
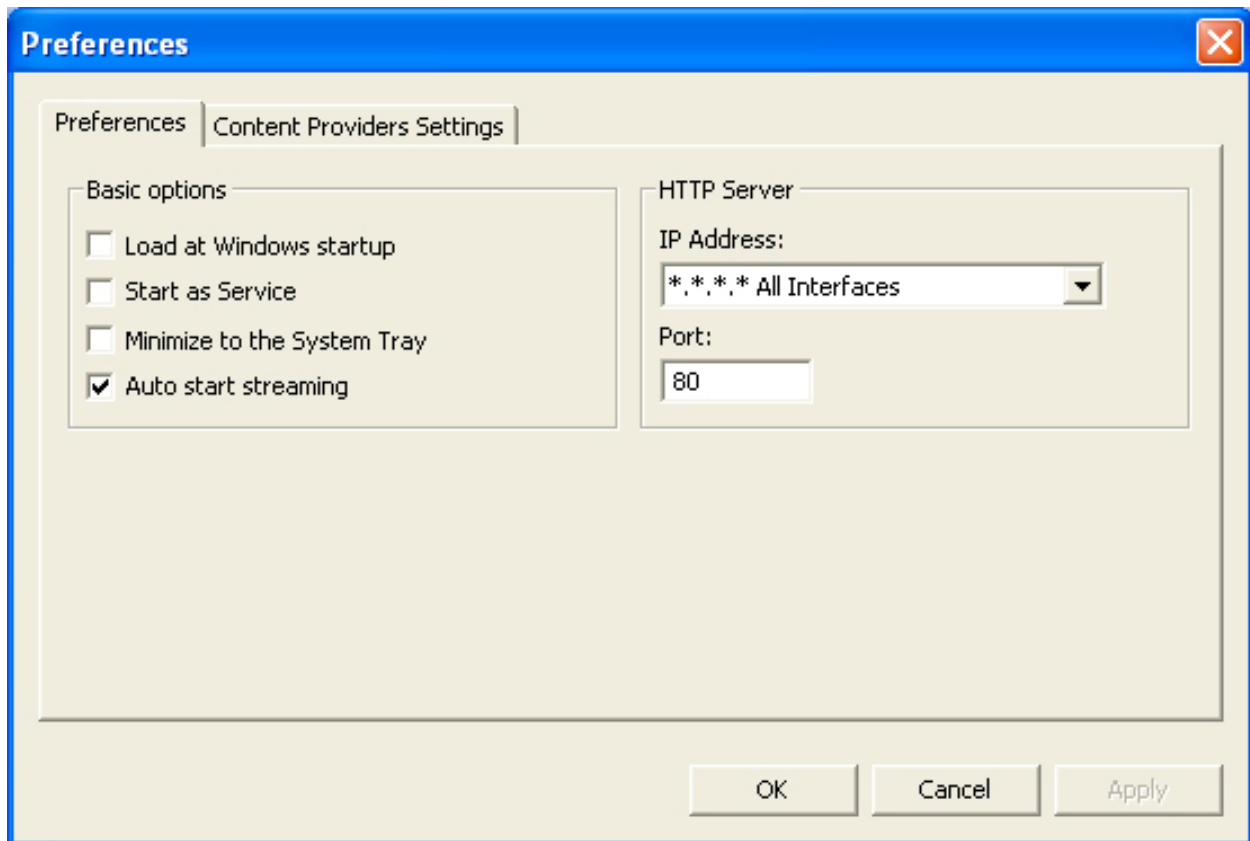
Preferences

Content Provider Information

If you need to see more detailed information on a *Content Provider,* highlight the appropriate row in the *Content providers* section of the main user interface than go to *View -> Content Provider Information.* This will bring up a window with detailed information on the types of streams being sent by the *content provider.* In the example given below we can see that the *provider* is sending from the local IP address 127.0.0.1 and it sending information to the root directory "/ ". In addition it currently sending two streams to the B-Cast server. The interface provides information on the individual streams including, height, width, frames per second, video signal data rate and audio signal data rate.
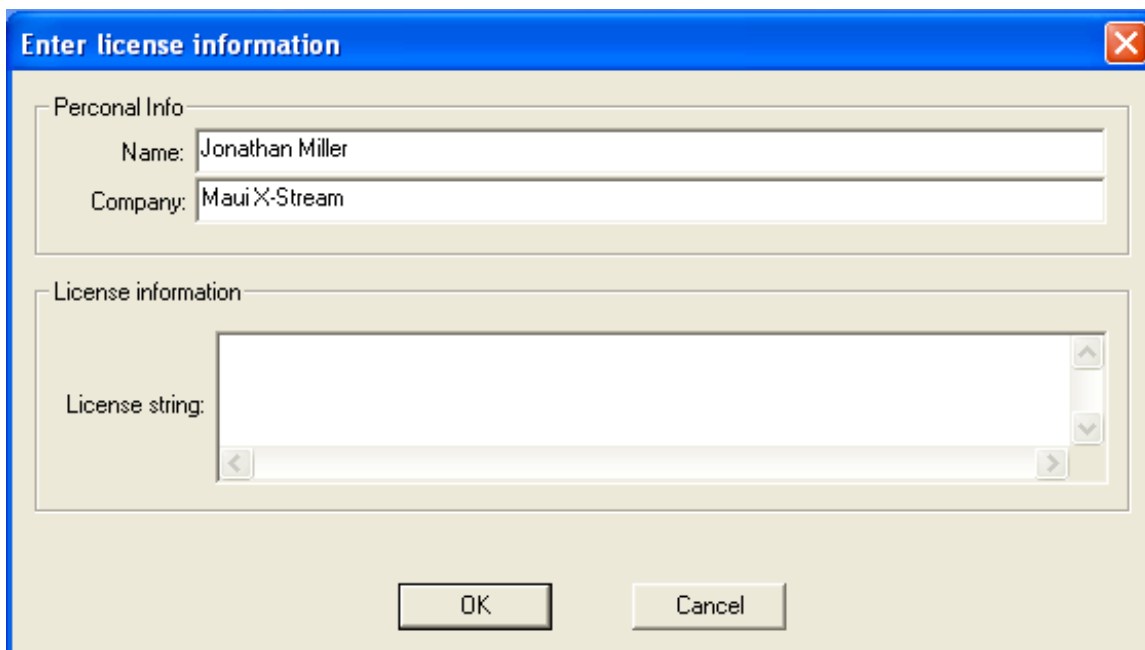
VX30 Live

Introduction

VX30 Live is lightweight encoding application that is installed on a Windows PC. VX30 Live can interface with cameras, video capture cards, or any other device that provides a live digital video signal[4]. The VX30 Live application is licensed in two different formats, integrated and standalone. The integrated version is designed to be a part of the B-Cast Video Network. It creates the live video streams that are *B-Casted* by the central server. The standalone version of *Live* creates a feed which is delivered without the use of a central server. While limited in scope the standalone application is perfect for situations where a live video feed needs to be sent to a limited audience or where the origin server has enough capacity to not require a centralized hub.

Installation

If you have successfully installed and configured the VX30 B-Cast software it is now time to set up the *Content Provider.* Launch the installation wizard by opening the *Setup.exe* file that is located in the VX30 Live directory of the software that you downloaded from MXS inc.[5]

Please follow the wizard's instructions to install the software. You will not be able to install the software unless you agree to the terms in the License Agreement. After you have completed installation you will need to Activate the software. Please fill out the fields in the Activation menu - exactly as they appear in the license provided to you by MXS.


Activation Screen

---

[4] VX30 Live will interface with any hardware device that supports the Video for Windows Driver.

[5] If you have purchased the VX30 Live Standalone application you automatically installed VX30 Live when you installed the B-Cast (Local Streaming Mode) software.

Starting the Application

To launch the VX30 Live Encoder goto *Start -> All Programs ->VX30 Live 1.0 -> VX30 Live.* When the application launches you will see the main user interface. In the main interface we set up the source video feed, determine the outgoing video feeds, design the characteristics of the player applet and control the live encoding. The main interface also has some basic video editing controls.
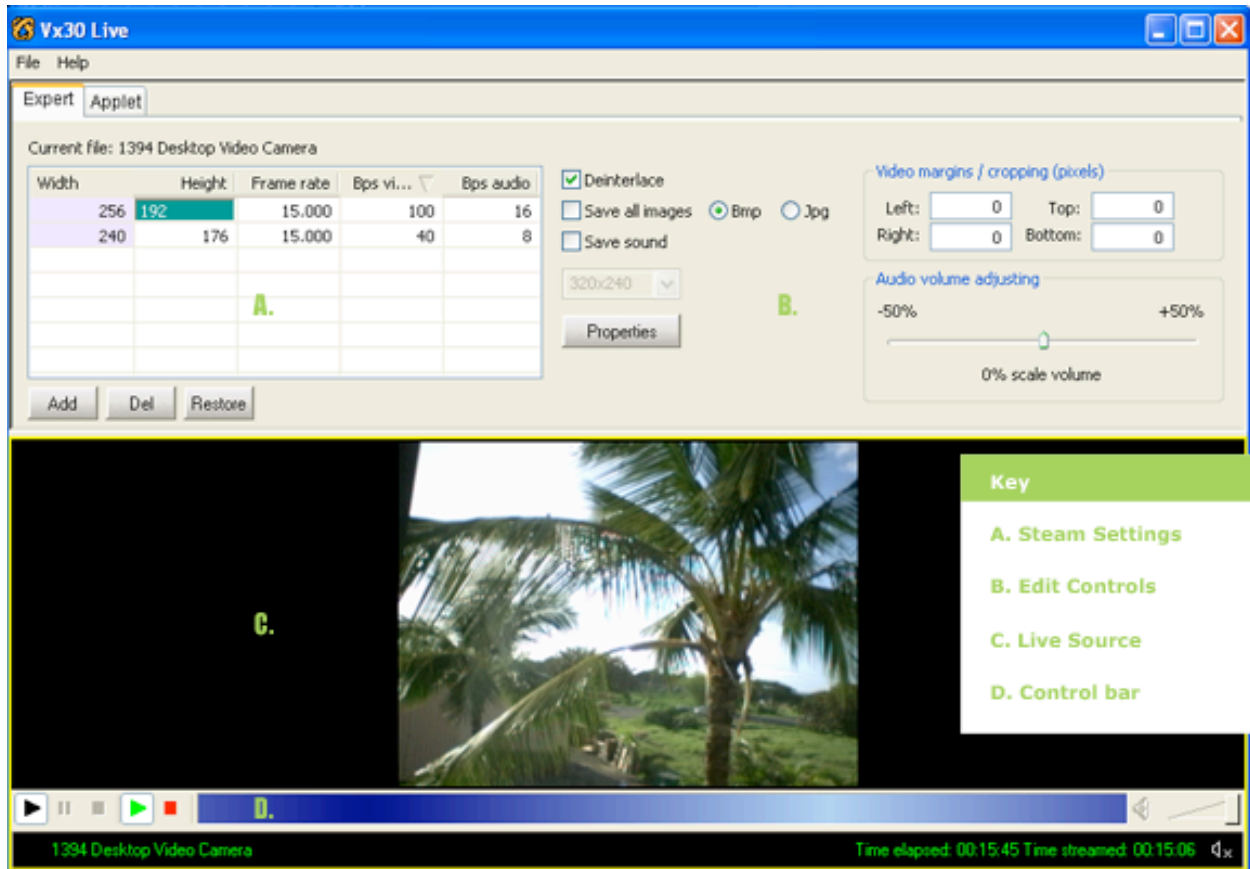
The Main Interface

Stream Settings

The VX30 Live Encoder can be configured to send multiple streams of different data rates. The purpose of sending different data rates is to make the stream available to users of varying connection type. This way you can still reach a dial-up client without sacrificing quality for the broadband client. Depending on your Upstream capability and the processor power of your encoding machine you may have limitations on the number of types and size of your data streams. Remember that the total bit rate of your streams cannot exceed your total upload capacity. For example if the encoding machine has an upload capacity of 250kbps[6] it could create the following data streams:

 a. 1 Stream @ 250kbps

 b. 2 Streams @ 40, 210kbps

 c. 3 Streams @ 30, 60 and 160kbps

---

[6] kbps - *Kilo Bits Per Second* a standard measurement of bandwidth

From within the *Expert Table* (found on the left hand side of the main interface) you can add, edit or delete profiles. There are three buttons at the bottom of the table for major actions. To edit a column in a profile use the mouse to click on the column and than add in the new value using your keyboard. Once you have highlighted a column within the table you can navigate it using the arrow keys.

Recommended Settings (assuming 500kbps upstream connection)

WIDTH	HEIGHT	FRAME RATE	BPS VIDEO	BPS AUDIO
240	180	10	40	8
320	240	13	112	16
320	240	15	268	32

Edit Controls

To the right of the table area are some additional settings. These settings have some basic editing tools that can be used if you need to make some simple changes to your video. A quick description of each section is provided below:

- **Deinterlace** - Commonly when video is prepared for television it is ***interlaced.*** This is the process by which "alternate raster lines of a frame are displaced vertically by half the scan line pitch and displaced temporarily by half the frame time, to form an odd and an even field.[7]" When displayed on a computer screen interlace can make the video look like it is segmented horizontally. To solve this problem choose the deinterlace option when encoding.

- **Save All Images** - If you choose this option every frame that is encoded will be saved as a jpeg or bmp image. This can be useful if you need to analyze every frame of motion i.e. sports training.

- **Save Sound** - If you choose this option the sound will be saved as an audio track.[8]

- **Time Range** - If you wish to encode only a portion of the original file you can use this section to set beginning and end points. The points are set in seconds. So for example if you wish to only encode the first 15 seconds of a clip you would set *Begin* to 0 and you would set *End* to 15.

- **Video Margins** - if your clip has unwanted margins you can set these crop marks to remove them. The measurement is done in pixels. Typically if your video suffers from "over-scan" you will need to set all your margins to 16.

- **Audio Volume** - this slider bar will adjust the volume of your audio track.

---

[7] Taken from www.sun.com

[8] This feature is not yet functional. Will be included in a patch soon.

Live Source & Player Controls

This *Live Source* section is where you can view the live source as it is being encoded. You may also choose to viewing the source without encoding. To begin previewing the source video press the black *play* button on the far left hand side of the *Player Control Bar*. You may pause or stop viewing the live source with the two corresponding buttons to the right of the *black play* button. The next control, *a green play button*, is used to start encoding the live feed. To stop the live feed press the *red stop* button. While the live feed is connected to the B-Cast server a blue progress bar will appear at the center of the *control bar*. At the far right hand of the control bar is the volume level controller.

Applet Settings

The VX30 Video is played through a tiny java applet that is downloaded to the user's computer at the beginning of the session. The applet has some customizable features that can be set within the encoding application. To alter your applet settings toggle the tab, labeled *applet*, at the top left hand side of the application. Each of the Applet Settings are described below:

- **Base URL** - This comes in two forms *Documentbase* or *Codebase.* You use the *Documentbase* if the web page and the video files reside in the same folder on the server. If the web page is going to link to a video that exists in a different folder or server entirely you need to use the *Codebase* parameter.

- **OnClick URL** - This value when left blank has no effect on the applet. However if you place a web address as the value, when a user clicks on the video it will redirect them to the value specified.

- **OnClick URL target window** - This value when used in conjuction with *OnClick URL* determines which web window will be used to load the URL. This uses the HTML standard code for determining which window will be opened.

  - _blank = new window

  - _parent = parent window

  - _self = this window

- **Enable auto playback** - this determines when the video will start playing. If set to *true* the video will start playing as soon as it has buffered. If you set it to *false* the video will start playing when the play button has been pressed. The final option is to set it to *Rollover,* which sets the video to start when the mouse rolls over the video.

- **Mute Audio** - determines whether to turn the sound on or off.

- **Applet's background color** - By default the applet's background color is white. However you can adjust this to another color by clicking on the *value* box. This will load a color chart in a new window. Choose your desired setting and press *OK.*

- **Video alpha value, 0..255** - This will set the transparency level of the video with 0 being fully transparent and 255 being opaque.[9]

---

[9] Not supported by all Java Virtual Machines - not recommended to use for public web streaming.

- **Disable zoom button** - When the mouse rolls over the video an image of a square in a square appears in the bottom right hand corner of the video. This image is a link that will open the video in its own resizable window. If you want to disable this *zoom button* set this value to **true.**

- **Use ascetic popup** - When a user right (pc)/ctrl (mac) clicks the player applet a dialog box will appear. If you want the dialog box to contain a full properties window you set this value to *false*. However if you want the window to only have a link to VX30 appear set this value to *true*.

- **Display status messages** - When set to *true* all buffering and loading messages will be printed to screen at the bottom of the applet. This can be very useful information for the client and we recommend that you set this value to *true*. However if you prefer you can turn off the status messages by setting this value to *false*.

- **Status messages color** - This value controls what color the status messages will be. We recommend that you use a color that will be visible against the background color you chose for the *applet's background color.*

- **Enable control panel** - You can turn on/off the control panel of the applet with this setting. The control panel is the bar that contains the play/pause, stop and mute buttons.

- **Controls layout string** - This setting can be broken down to two parts separated by a colon. The first two letters determine where the control panel will appear on the applet. Use the chart below to position your buttons.

Horizontal Alignment

	LEFT	CENTER	RIGHT
TOP	tl	tc	tr
BOTTOM	bl	bc	br

Vertical Alignment

	TOP	CENTER	BOTTOM
LEFT	lt	lc	lb
RIGHT	rt	rc	rb

The letters that appear after the colon determine which buttons will appear and in which order. You have four options with button on the horizontal control bar and three options with the vertical control bar. Your options are as follows

- **p** - play/pause

- **s** - stop

- **m -** mute

- **b** - timeline indicator[10]

The default setting for the *Controls layout string* is bc:psbm which would put the controls at the bottom center with the layout being: *play/pause - stop - timeline indicator - mute*.

- **Static Control Panel** - If set to *true* the control panel will always appear in the location specified by *Controls layout string*. If set to *false* the control panel will hide until the mouse rolls over the video.

- **Panel show delay, ms** - If *static control panel* is set to *true* this value (in milliseconds) will control how long the panel will be visible once the mouse has moved away from the video. After the delay has expired the control panel will disappear.

Preferences

Before you will be able to send a live stream you will need to configure your Proxy Server settings. If you have purchased the VX30 Live Standalone Product your Proxy settings will always be set to local streaming. However if your are using the Live application as part of a B-Cast system than you will need to configure your Proxy Settings to match your B-Cast Server. To open your Live Encoder's Preferences goto *File -> Preferences* from the Windows Toolbar. This will open a window where you can input the information required to connect to your B-Cast Server.
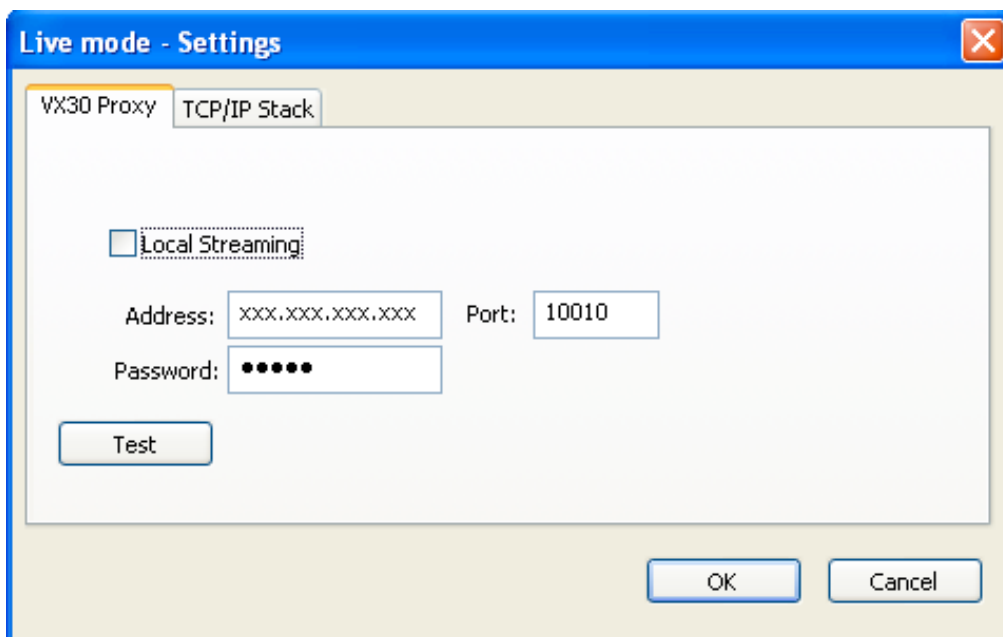
Proxy Settings

Below is a description of each field:

---

[10] When using the vertical alignment you cannot have a time line indicator.

- **Local Streaming** - Check this box if you are using the VX30 Live standalone application or if you are streaming off the same you are encoding on.

- **Address** - This value should be the IP address of the remote server running your B-Cast application.

- **Port** - This is the port number on which your B-Cast server is listening for streams. Make sure that the port specified exactly matches the port that was configured within the B-Cast application.

- **Password** - The password provided must exactly match the password that was configued in the B-Cast Server application. If you do not put in the correct value than the server will not be authorized to send the video feed.

Statistics

You can monitor statistical information on the live feeds in real time by using the statistics window. To open the statistics window goto *File -> Statistics.*

This window contains information on each stream that is being created by the VX30 Live application. The information collected in this window can be important in discovering network conditions before they become critical. Once a stream has been interrupted the rows containing the feed will turn red. You will need to stop and start the encoder from the *player controls* to restart the service.

Placing Live Video in a Web Page

Overview

Placing the video in your web page requires adding a java applet into your HTML code. To properly configure your applet you will need to know the IP address of the origin server and the port on which it is sending the stream. These values will be passed to the applet which in turn will initiate a connection to the server for each user who requests the page.

Sample Code

<applet archive="vxmPlayerL.jar" height="192" width="256" code="vxmPlayer.class" name="vxmPlayerL" mayscript viewastext codebase="http://192.168.0.9:10010">
<param name="autoplay" value="true">
<param name="metaurl" value="index.meta.vx30">
<param name="EnablePanel" value="false">
<param name="backgroundcolor" value="000000">
<param name="videotitle" value="Live From MXS HQ">
<param name="UrlBase" value="codebase">
<param name="RewindWhenDonePlaying" value="false">
<param name="ShowStatusMessages" value="true">
<param name="StatusMessagesColor" value="00FF00">
If you are not seeing graphics and video, your email reader or web browser is not equipped to show Java rich media. Please visit www.java.com !
</applet>

The parameters can all be configured to your specification as outlined in the *Applet Settings* section. The codebase parameter (highlighted in red) is where you define the B-Cast origin server. The value should contain either the fully qualified domain name of the server sending the stream or it's IP address and the port number. Make sure that in your connection string you place a ":" between the address and the port number.