Net-X-Code Server v8

User Guide

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1 Introduction

Net-X-Code is a series of interconnected applications for IP based video capture, output and conversion. The various applications auto-detect and join user-defined enterprise groups on one or more servers within a network. The following components are included:

Net-X-Base – this program is a single instance controller and API provider for the entire network. It may run on the Net-X-Cmd/Net-X-Code systems, or anywhere else on the local network. When it runs, it looks for members of the 230.7.7.7:57000 multicast group. Once it finds a new member (on start up or while running) it makes a TCP connection for status and commands on port 5800## where ## is the channel number (58001, 58002, etc). This connection uses the same protocol as the main API, but with a direct connection, as opposed to the HTML/Rest protocol that the main API uses. It should be noted that this protocol is order sensitive, and it should never be used directly. For controller applications, the HTML/Rest version is more robust, well defined and automatically creates a network level control instead of just a server level control.

Net-X-Cmd – this program is a daemon that runs on a capture server. It launches, and then communicates with Net-X-Code programs that do the actual capture. When Net-X-Cmd launches, it immediately initiates any Net-X-Code captures that have been set up on the system. It does not require interaction with any other program, as it stores this information locally. Once it has launched and connected with the Net-X-Code program(s), it joins a multicast group on address 230.7.7.7:57000. This allows Net-X-Base to see it and connect to it for command and control.

Net-X-Code – this program does the actual capture, transcode and saving of up to three incoming network streams to MP4, fragmented MP4, ISM smooth streaming, MOV, TS/HLS, or MXF. It is launched by Net-X-Cmd on a server with the parameters it needs to capture up to three streams. Once it has launched, it creates a TCP socket on port 7630.

Net-X-Copy – this program is called to index (RTIN), clip, restore, re-wrap and convert files on disc, tape, cloud or other sources to local or network storage.

Net-X-Player - provides an HTML5 based web player that can play time coded, frame accurate MP4 files, including playback while they are still recording. Net-X-Player can also generate clipping commands to use on live, or recorded streams.

Net-X-Schedule - capture recording scheduler

Net-X-SDI – Optionally capture or playback files via SDI, HDMI, NDI or SMPTE 2110/2022. Requires storage for capturing or playing back files. Supports RTIN and most standard broadcast files including MXF, MOV, AVI, TS, DPX, DNG, etc.

Net-X-Server - Take recording or pre-recorded network IP video streams from disk anywhere in the network, and re-stream them via RTP or UDP back out to the network.

Net-X-Stream/Net-X-Code - IP stream capture and playback using TS/h264/h265/JPEG2000/MPEG2/RTP/RTSP/S2110/S2022/TR01 protocols.

Net-X-Timecode – this program is used to distribute system clocks, from network or SMPTE

source, as a TCP/IP stream for browser components to use. As most browsers do not support UDP, this is the most efficient way to use time of day directly in them.

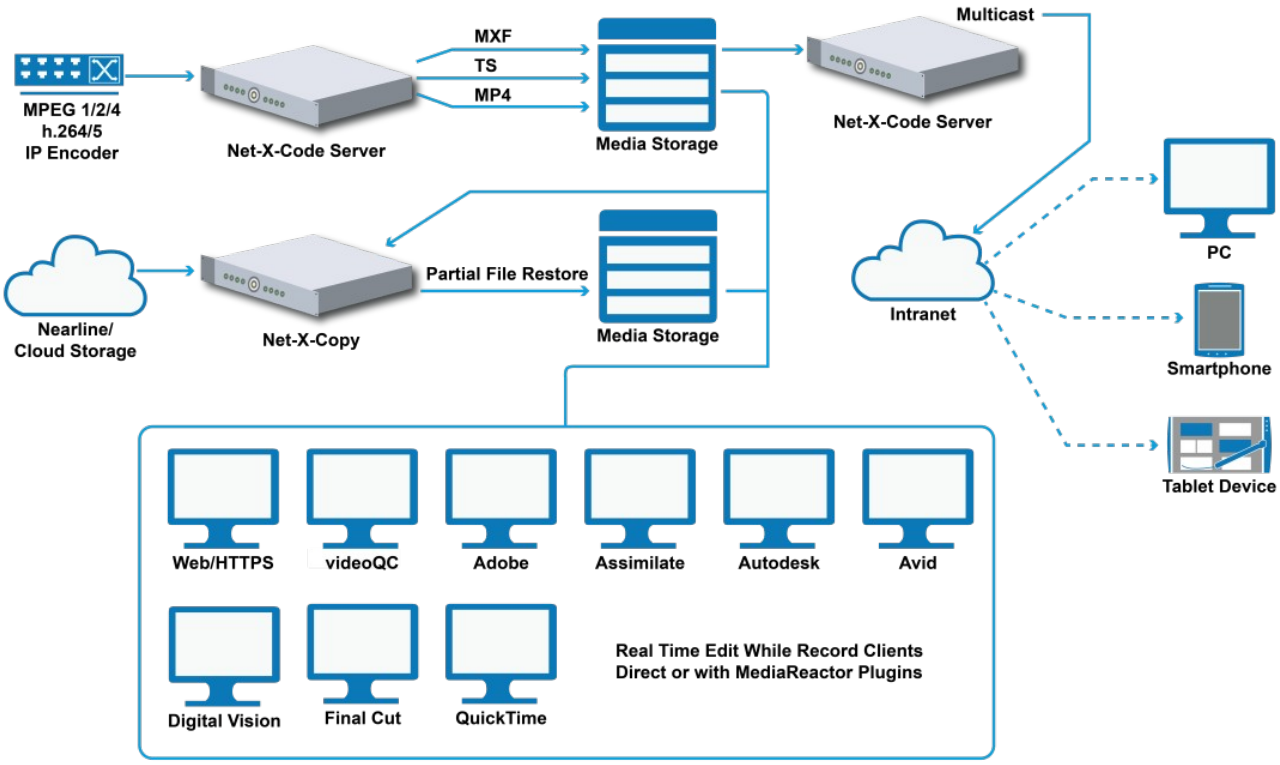
ccEmbed/ccExtract/ccConvert – embedding, extraction, and transcoding features for a wide range of closed caption formats. Command line functionality for automatable conversions.

Media File Scanner – is an optional plugin that can scan local, network, Amazon S3, Google Cloud or other file repositories to identify and organize your media. The scan creates media 'clips' that are the actual audio/video/metadata by combining and stitching together associated audio and video files. The result is a set of actual media files, rather than just every file, that can be used to extract metadata, make proxies, generate thumbnails and push all the information into a database or your choice of MAM.

videoQC – Video preview is available from on disk, live recording and network video sources. videoQC provides video waveform, vectorscope, histogram, chromaticity, and metadata displays, along with clipping and conversions. videoQC also plays captions within a video file, sidebar caption files with the same name as a video file, and supports playing arbitrary caption files over video, as well as over black.

MediaReactor Workstation – These plugins allow professional editing and finishing systems to access all the file types created by the Net-X-Code system, and access the real time recording files while they are still growing. MediaReactor Workstation is built into software like Assimilate and Nucoda, and available as an option for other systems like Adobe, Avid, Autodesk, Quantel, Final Cut, and even QuickTime compatible apps.

Once connected, the controller/user can configure the system in real time via the HTTP/RESTful interface. The below workflow diagram shows some of the major elements of the Net-X-Code workflow.



For the latest Net-X-Code information, please see:

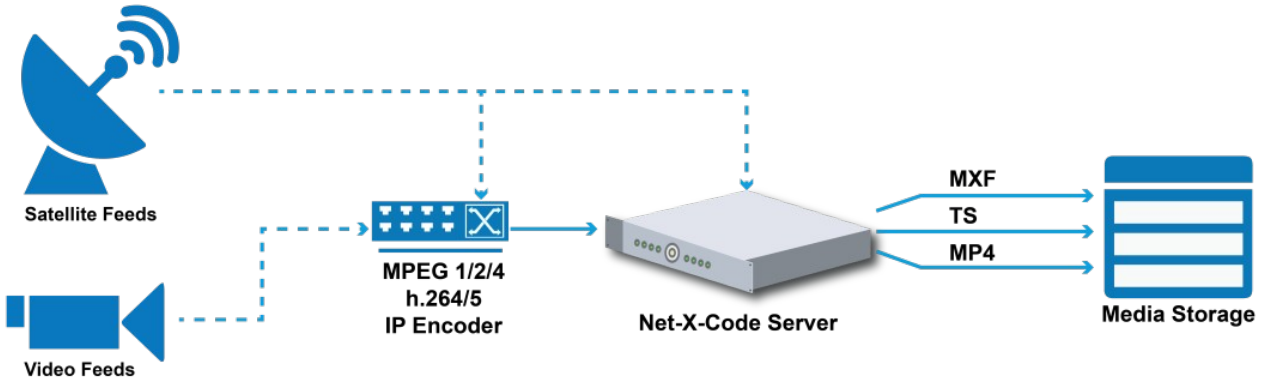
http://www.net-x-code.com

2 Theory of Operation

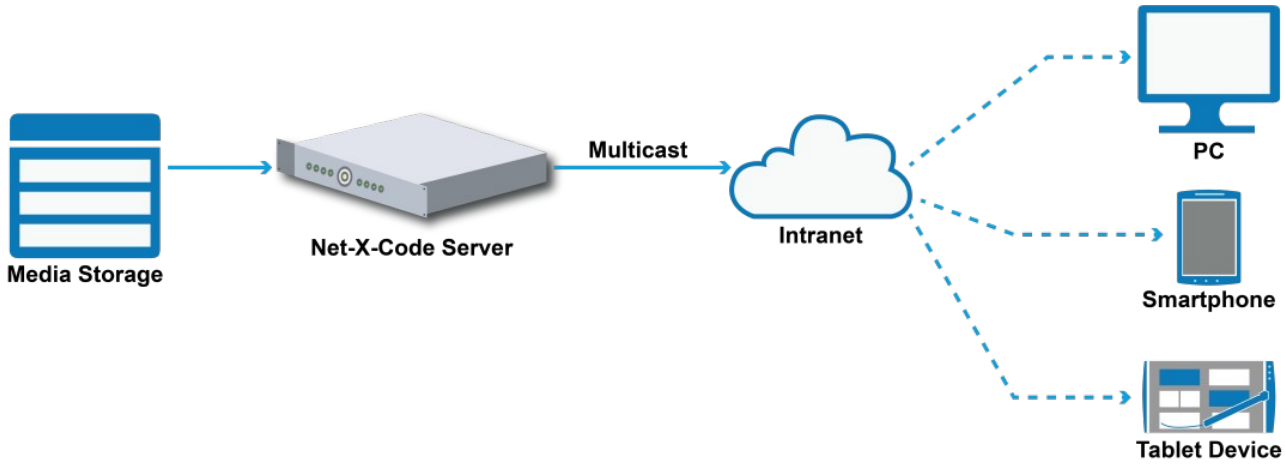
Net-X-Code is a distributed capture and conversion system. It can be run on one or more servers and be controlled from one, central interface. This section of the manual will give an overview of how the various parts of Net-X-Code interact to make it easier to design deployments and implement controllers using the API described in the next section.

2.1 Typical Applications

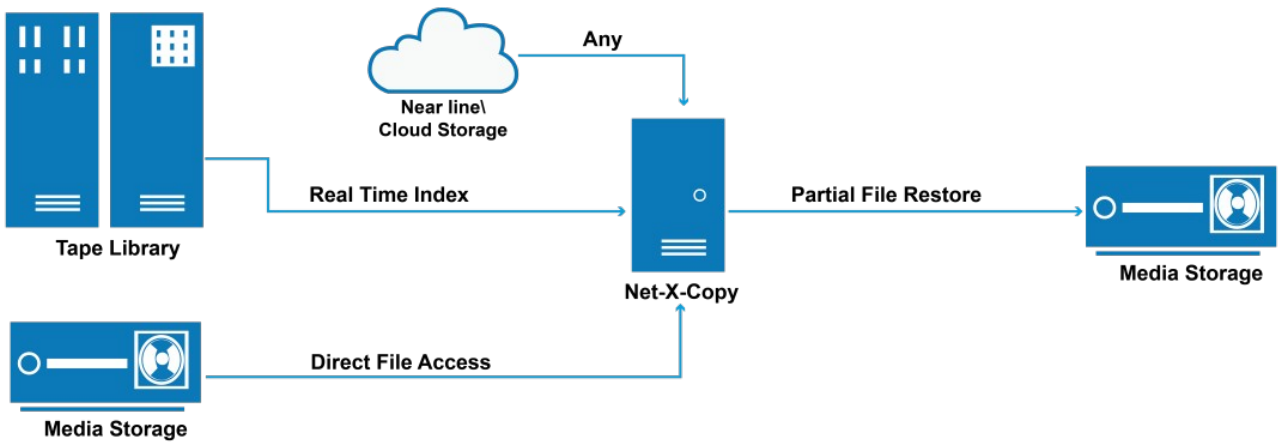
2.1.1 Net-X-Code IP Video Capture



2.1.2 Net-X-Code IP Video Streaming



2.1.3 Net-X-Code Partial File Restore, Conversion and Proxy



3 CentOS 8.x Installation – Quick Start

Net-X-Code is a self contained set of services that can be run on a bare metal 64 bit Linux system. It does rely on certain OS functionality, so we recommend using CentOS or Red Hat 8.x or greater, but it has been run on Ubuntu and other modern OSes. For the most flexible install, we also recommend installing a LAMP stack that can run the test/setup pages to control the Net-X-Code system. This document will list the basic setup of a Net-X-Code server.

3.1 Install Net-X-Code Required Packages

sudo yum -y install httpd php php-pear php-mysql SDL OpenEXR e2fsprogs log4cplus openldap libidn xz freeglut gstreamer gstreamer-plugins-base compat-libtiff3 libGLU xcb-util xcb-util-renderutil xcb-util-image xcb-util-keysyms xcb-util-wm mesa-libGL xcb-util-renderutil xcb-util-wm libpng12 opus qt5-qtbase llibpng12 qt5-qtbase qt5-qtsvg qt5-qtimageformats qt5-qtwebchannel qt5-qtwebkit qt5-qtwebsockets qt5-qtx11extras ibpng12 libXrandr nano wget unzip

Download:
wget the epel-release update for your Linux. The rpm should look like:

epel-release-#-##.noarch.rpm

sudo rpm -Uvh epel-release*rpm

sudo yum install libstatgrab

3.2 Installing CentOS + LAMP

Install CentOS 8.x
Under Software Selection choose GNOME Desktop

Add your logon user to the sudo list
As root:
vi /etc/sudoers
Add:
yourloginuser ALL=(ALL) ALL

Make sure it is up to date
sudo yum update

3.3 Install Apache

sudo yum install httpd
sudo nano /etc/httpd/conf/httpd.conf

Make sure the documentroot is the default /var/www/html/

Apache requires some changes in its config to support reaching our REST API at port 1080 from the web pages on port 80. The headers_module/mod_headers and rewrite_module/mod_rewrite must be enabled. The Access-Control-Allow-Origin should be changed to only allow connection from your expected sources

In the main part of the config:
LoadModule log_rotate_module "{APACHEPATH}/modules/mod_log_rotate.so”
LoadModule proxy_module "{APACHEPATH}/modules/mod_proxy.so"
LoadModule proxy_http_module "{APACHEPATH}/modules/mod_proxy_http.so"
LoadModule rewrite_module "{APACHEPATH}/modules/mod_rewrite.so"

In the config (<Directory"/var/www/html">) section that points to the document root, Add:

Header always set Access-Control-Allow-Origin "*"
Header always set Access-Control-Allow-Methods "POST, GET, OPTIONS, DELETE, PUT"
Header always set Access-Control-Max-Age "1000"
Header always set Access-Control-Allow-Headers "x-requested-with, Content-Length, Content-Type, origin, authorization, accept, accept-language, if-none-match, client-security-token, X-Auth-Token"
RewriteEngine On
RewriteCond %{REQUEST_METHOD} OPTIONS
RewriteRule ^(.*)$ $1 [R=200,L]
AddType application/x-httpd-php .html .htm
AddType application/x-mpegURL .m3u8
ReWriteEngine On
ReWriteRule ^netxjson 127.0.0.1:1080/netxjson [L]
ReWriteRule ^netx 127.0.0.1:1080/netx [L]

These should be in both the normal [80] section and the https [443] section.

For Apache, some of the sample files use php within the HTML. By default, this is disabled. To enable it, Edit:

sudo vi /etc/httpd/conf/httpd.conf

Set all instances of AllowOverride in httpd.conf to:
AllowOverride All

3.4 Install MySQL

sudo wget https://dev.mysql.com/get/mysql80-community-release-el7-3.noarch.rpm
sudo rpm -Uvh mysql80-community-release-el7-3.noarch.rpm
sudo rpm --import https://repo.mysql.com/RPM-GPG-KEY-mysql-2022
sudo yum install mysql-server
Set MySQL to run at boot and secure it
sudo systemctl enable mysqld

3.5 Install PHP

sudo yum install php php-pear php-mysql
Create a log dir for PHP/Apache
sudo mkdir /var/log/php
sudo chown apache /var/log/php

Start Apache
sudo systemctl enable httpd
sudo systemctl start httpd

3.6 Install Chrome (for GUI only)

sudo vi /etc/yum.repos.d/google-chrome.repo

Copy and paste the below repository information to the above repo file.

[google-chrome]
name=google-chrome
baseurl=http://dl.google.com/linux/chrome/rpm/stable/x86_64
enabled=1
gpgcheck=1
gpgkey=https://dl-ssl.google.com/linux/linux_signing_key.pub

sudo yum install -y google-chrome-stable

SELinux
Security-Enhanced Linux (SELinux) is a security mechanism implemented in the kernel. In enforcing mode, SELinux blocks Apache from loading content outside of default directories. By default under a strict enforcing setting, everything is denied and then a series of exceptions policies are added to allow access. To allow access to Apache's document and its subdirectories please see the “Permissions” section below.

3.7 Install Net-X-Code

Download the latest Net-X-Code for Linux installer package from our web site. Please contact Drastic for a valid download link.

Inside that zip is the installer. Unpack it in a temporary directory and set its executable bit (change the ### to version number):

chmod u+x ./Net-X-Code-Linux-x86_64-Install_5_0_###

The installer can be run in GUI or command line mode. To run it in GUI mode, double click on it.
To run it in command line mode, use the following command:
./Net-X-Code-Linux-x86_64-Install_5_0_### --mode console

Once installed, some systems may require a:
sudo ldconfig

To allow PHP to run in the demo web pages, rename the supplied php.htacces
cd /var/www/html
sudo mv php.htaccess .htaccess

The installer will install into the following directories
/opt/drastic/ (shared objects)
/usr/local/Net-X-Code/ (applications/servers)
/var/html/www/ (web gui)
/root/.config/Drastic/ (config files)

If you are going to use Net-X-Code as a user, please copy the default configs from /root/ to your user directory /home/<user>/

sudo cp root/.config/Drastic/NetXBase.conf ~/.config/Drastic
sudo cp root/.config/Drastic/NetXCmd.conf ~/.config/Drastic

You may need to mkdir ~/.config/Drastic

3.8 Setting Up Directories

The web interface assumes it can reach the video directories for playback, logging and clipping. To set this up, a set of standard directories are made on the recording drive/share/mount

/mnt/mountname/archive/
/mnt/mountname/live/
/mnt/mountname/media/
/mnt/mountname/proxy/

These can be actual directories in the storage, or links to other storage. To allow access to them from the web, a link must be made from the html directory (/var/www/html/) to the route of the mounted drive with the directories

cd /var/www/html/
sudo ln -s /mnt/mountname/ video

You should now be able to access files in /mnt/mountname/proxy/ as
http://<server>/video/proxy/<mpeg4filename.mp4>

3.8.1 Directory Configuration

You will need to setup the configuration files to match the live and proxy record directories. In /root/Drastic/config.xml, under <vvw><Internal#> (where # is 0..3), change/add the following

<Dir Type="1">/var/www/html/video/live/</Dir>
<proxydirectory Type="1">/var/www/html/video/proxy/</proxydirectory>
<proxymode Value="1" Type="2">

The main recording directory for IP/SDI capture and scheduling via Net-X-Code can be set for each capture, and the first <proxydirectory> in <Internal0> will be used as the proxy directory. To enforce that the IP/SDI and scheduling captures end up in the right place, you can also add to <VVW><Config>

<OverrideDir Type="1">/var/www/html/video/live/</OverrideDir>

Finally, the override dir can also be set for SDI/IP capture in /.config/Drastic/NetXCmd.conf. The default directory is /.config/Drastic, but it can also be /root/.config/Drastic, or if you set up the service as a user, /home/<username>/.config/Drastic

[General]
forcegui=0
directory=/var/www/html/video/live

3.9 Licensing Net-X-Code

Net-X-Code can be licensed via the GUI licenser (DTLicense) or in the terminal. For more information on the GUI, please see
http://license.drastictech.com
To license with the command line, start by getting your site code

/usr/local/net-x-code/ddrsetup -n “Firstname Lastname” -e “email@example.com”

this will return a site code you can send to authorization@drastictech.com to get a license

eg. 7MzuY29tLHJlY29yZGluZy1zZXJ2ZXIsLCwsLDM5MDBBMDBBMDE0MixEcmFzdGljIg=

Once you have the key, set it with ddrsetup

/usr/local/net-x-code/ddrsetup -n “Firstname Lastname” -e “email@example.com” -r jsadfjiweojfsdfjsdkfjsdfijfsd=

To check your license, use the web page, or

/usr/local/net-x-code/ddrsetup -l

3.10 Setting Up Net-X-Code

By default, CentOS/Red Hat’s networking does not allow some of the connections Net-X-Code requires. For production machines, please see the Firewall section of the Net-X-Code manual. For initial testing, make sure your server is not connected to any insecure networks, and turn off the Firewall temporarily

sudo systemctl stop firewalld
sudo firewall-cmd --permanent --add-port=1080/tcp
sudo firewall-cmd --reload

sudo iptables -A INPUT -m state --state NEW -m tcp -p tcp --dport 1080 -j ACCEPT -m comment --comment "NetXBase Server port"

To enable multicast, change the following setting:

sudo vi /etc/sysctl.d/99-sysctl.conf

net.ipv4.conf.default.rp_filter = 2

3.10.1 Permissions

The services will run as default as ‘root’. If you need them to run as a different user, this must be specified in the netxbase.service and netxcmd.service below, in the [Service] section with a User=<user to run as> and Group=<group to run as>

For the HTTPD files in /var/www/html, these should be set to the HTTPd user. By default this would be apache:apache

sudo chown -R apache:apache /var/www/html

If you are running SELinux, you may need to update its security parameters. This is especially important for the /var/www/html/video/xxx directories (archive, live, media, proxy) so that files inside them have the correct security to be read by the Apache HTTPD server.

sudo chcon -R unconfined_u:object_r:httpd_sys_content_t:s0 /var/www/html
sudo chcon -R unconfined_u:object_r:httpd_sys_content_t:s0 /var/www/html/video
sudo chcon -R unconfined_u:object_r:httpd_sys_content_t:s0 /var/www/html/video/archive
sudo chcon -R unconfined_u:object_r:httpd_sys_content_t:s0 /var/www/html/video/live
sudo chcon -R unconfined_u:object_r:httpd_sys_content_t:s0 /var/www/html/video/media
sudo chcon -R unconfined_u:object_r:httpd_sys_content_t:s0 /var/www/html/video/proxy

3.10.2 Net-X-Base Service

The Net-X-Base and Net-X-Cmd server should also be set to auto run. Please note, the server should be set up with a static IP. If it is using a DHCP allocated address, the address may not be set before the services run. If that happens, they will not attach, and that will not allow them to run properly. If this happens, both services will need to be restarted. To add the services:

sudo vi /etc/systemd/system/netxbase.service
Copy and paste the below information to the above service file.

```
[Unit]
Description=NetXBase
After=network-online.target
Wants=network-online.target

[Service]
```

```
ExecStart=/usr/local/net-x-code/NetXBase
Restart=on-failure
KillMode=process

[Install]
WantedBy=multi-user.target
```

and add the executable bit to the services
sudo chmod a+x /etc/systemd/system/netxbase.service

You can then use systemctl to start and stop the services
sudo systemctl start netxbase.service
sudo systemctl stop netxbase.service
and the service should be set to auto run on boot
sudo systemctl enable netxbase.service

3.10.3 NetXCmd Service

sudo vi /etc/systemd/system/netxcmd.service
Copy and paste the below information to the above service file.

```
[Unit]
Description=NetXCmd
After=network-online.target
Wants=network-online.target
Wants=netxbase.service

[Service]
ExecStart=/usr/local/net-x-code/NetXCmd
Restart=on-failure
KillMode=process

[Install]
WantedBy=multi-user.target
```

If you have to use DHCP, you can try forcing the services to start after the network has started. The services are set to wait for an IP address to be assigned and for Net-X-Cmd to wait for Net-X-Base. To make sure the wait service is running, run the following command:

systemctl is-enabled NetworkManager-wait-online.service

If it is not enabled, enable it.

If you need access to network resources, you should add a user, rather than access them as root. If you have a user, you should add
User=<username>
in the [Service] sections

You will also want to add the executable bit to the services
sudo chmod a+x /etc/systemd/system/netxcmd.service

You can then use systemctl to start and stop the services
sudo systemctl start netxcmd.service
sudo systemctl stop netxcmd.service
and the service should be set to auto run on boot
sudo systemctl enable netxcmd.service

3.10.4 Net-X-Code server configuration files

sudo mkdir ~/.config
sudo mkdir ~/.config/Drastic

To get the basic config for the server setup, unless you have your own REST API interface code, run

sudo /usr/local/net-x-code/ddrsetup -s Demo -f

If you are running your own REST API interface, you will still probably want to run

sudo /usr/local/net-x-code/ddrsetup -s NetXSDI -f

To configure NetXBase
sudo vi ~/.config/Drastic/NetXBase.conf

Copy and paste the below information to the above conf file. With each of these, if you want to see the UIs, which requires XWindows, then you can set the forcegui=1. If you do not have xwindows, the forcegui must be 0, as it is below.

```
[General]
forcegui=0
geometry=@Rect(290 203 900 480)
multicast=230.7.7.7
```

sudo vi ~/.config/Drastic/NetXCmd.conf

Copy and paste the below information to the above conf file.

```
[General]
autostart=true
forcegui=0
```

sudo vi ~/.config/Drastic/NetXCode.conf

Copy and paste the below information to the above conf file.

```
[General]
forcegui=0
geometry=@Rect(290 203 900 480)
multicast=230.7.7.7
```

A restart of the server will cause Net-X-Base and Net-X-Cmd to start.

They may need to be restarted. If the Firewall is not enabled, and was, enabling it with:

```
sudo systemctl start firewalld
```

By default, the servers run ‘headless’, or without any user interface. For testing, it is often useful to show the GUIs for the components. Changing

```
[general]
forcegui=1
```

In the config file for any component (stored in /home/%user%/.config/Drastic/) will cause it to display its interface on the local display.

4 Windows x64 Installation – Quick Start

Net-X-Code should be installed on Microsoft Windows Server 2016 or greater but also can be installed on Windows 10 or 11. You will also need to install a UwAmp server to host the web pages. This document will list the basic setup of Net-X-Code in Windows.

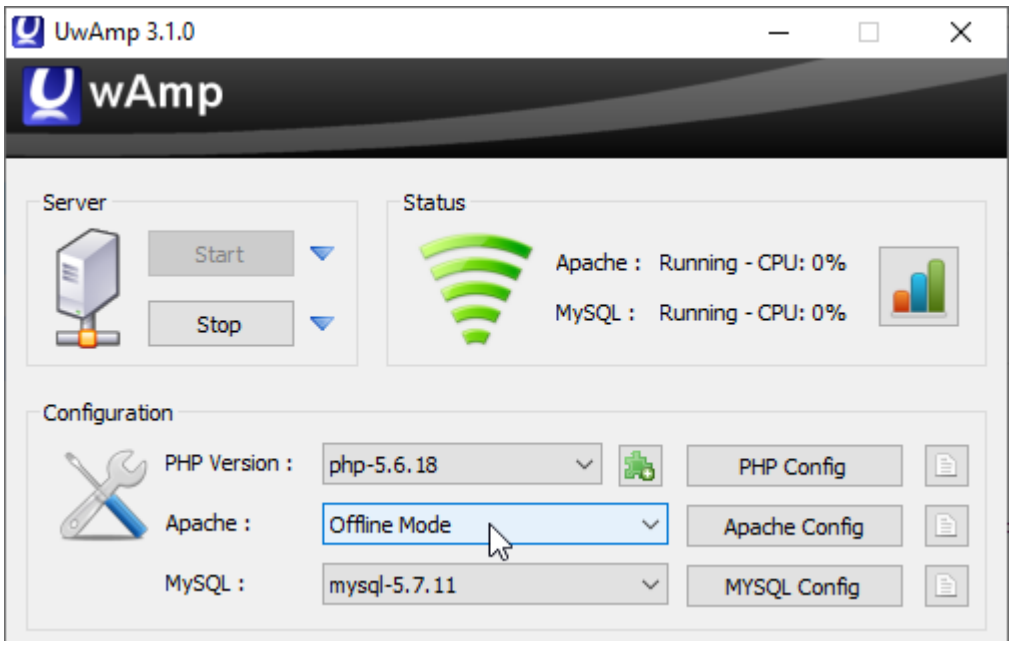
4.1 Install OS

- Install Windows 64 bit OS. Windows 10/11 or Windows Server 2016 or greater recommended

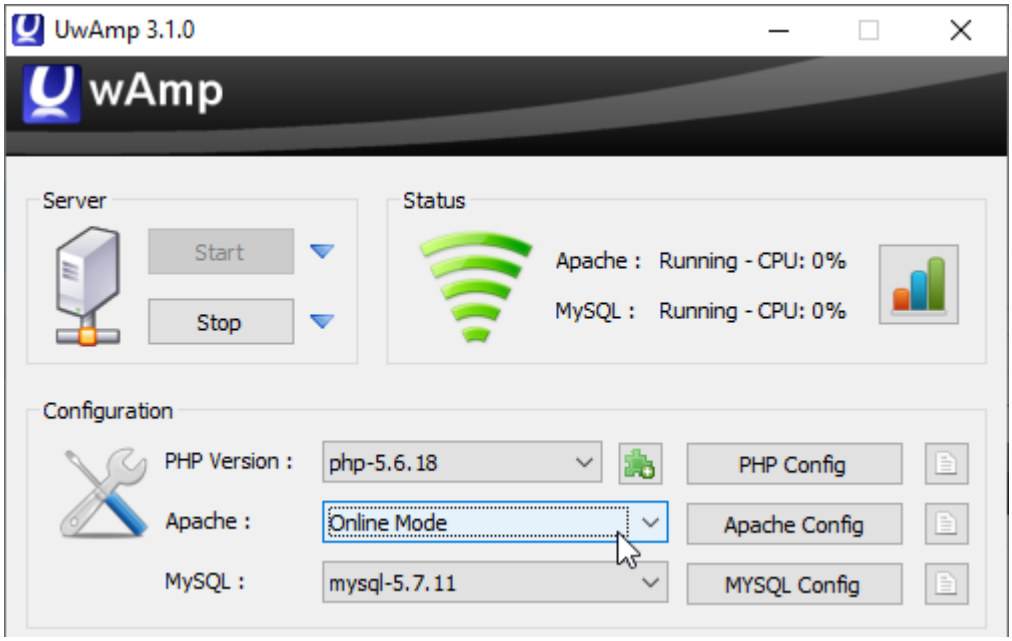
4.2 Install UWamp

- Download and install UwAmp
  - http://www.uwamp.com/en/?page=download
  - This will download and install apache, php, and mysql
  - You will also need to install the VC Runtime on this page, depending on which PHP you will be using (default is 7.2, so VC15 x86 (32 bit, not 64 bit))
  - Open the UwAmp application. This will automatically start up the server.
  - Navigate to localhost in a browser and confirm that the Apache server is running.
  - UwAmp should be installed first, so that the Net-X-Code install sets it up as a service
  - Make sure to run UwAmp as Administrator once, or make sure the HTTPD and MySQLD servers are allowed through the firewall

When UwAmp installs initially, it installs in offline mode. This stops external users from trying to access the site before it is ready.



You need to set it to online mode to use it from a non local IP address. Please run the UwAmp UI (it will throw an error about the service already running, but you can ignore that).



Change the mode from offline to online and restart the UwAmp service.

- Run the UwAmp interface
  - Make sure the Apache HTTP is set to ‘online’
  - Start HTTP and MySQL
  - Allow them through the firewall

- Under Apache Config, add this line to Others to allow PHP in HTML
  - AddType application/x-httpd-php php php4 php3 html htm
  - Header always set Access-Control-Allow-Origin "*"
  - Header always set Access-Control-Allow-Methods "POST, GET, OPTIONS, DELETE, PUT"
  - Header always set Access-Control-Max-Age "1000"
  - Header always set Access-Control-Allow-Headers "x-requested-with, Content-Length, Content-Type, origin, authorization, accept, accept-language, if-none-match, client-security-token, X-Auth-Token"
  - RewriteEngine On
  - RewriteCond %{REQUEST_METHOD} OPTIONS
  - RewriteRule ^(.*)$ $1 [R=200,L]
- Under Apache Config on the Modules tab
  - Make sure headers_module is checked
  - Make sure rewrite_module is checked
  - Make sure log_rotate_module is checked

4.3 Install Net-X-Code

If you are unsure which version you require, please contact Drastic for details.

- Download and unpack Net-X-Code. For version 8:
  - https://drastic.tv/downloads/net-x-code/SetupNet-X-Code_x64_8_0.zip
  - This will install the Net-X-Code servers to: C:\Program Files\Net-X-Code_8\
  - It will also install the web pages into UwAmp: C:\UwAmp\www\

- Update UwAmp
  - The Net-X-Code installer will add mod_log_rotate.so to your UwAmp install to rotate the logs daily. To make it rotate, two changes are needed in C:\UwAmp\bin\apache\conf\ httpd_uwamp.conf
  - Around line 128, add
    - LoadModule log_rotate_module "{APACHEPATH}/modules/mod_log_rotate.so”
    - LoadModule proxy_module "{APACHEPATH}/modules/mod_proxy.so"
    - LoadModule proxy_http_module "{APACHEPATH}/modules/mod_proxy_http.so"
    - LoadModule rewrite_module "{APACHEPATH}/modules/mod_rewrite.so"
  - Below the load module section, add
    - <IfModule log_rotate_module>
    - RotateLogs On
    - RotateLogsLocalTime On
    - RotateInterval 86400
    - </IfModule>

    - In the Apache Config windows, in the others box for 80 and 443
        - Header always set Access-Control-Allow-Origin "*"
        - Header always set Access-Control-Allow-Methods "POST, GET, OPTIONS, DELETE, PUT"
        - Header always set Access-Control-Max-Age "1000"
        - Header always set Access-Control-Allow-Headers "x-requested-with, Content-Length, Content-Type, origin, authorization, accept, accept-language, if-none-match, client-security-token, X-Auth-Token"
        - RewriteEngine On
        - RewriteCond %{REQUEST_METHOD} OPTIONS
        - RewriteRule ^(.*)$ $1 [R=200,L]
        - AddType application/x-httpd-php .html .htm
        - AddType application/x-mpegURL .m3u8

- License: You must get at least a trial license for Net-X-Code to function. Run ‘License Net-X-Code’, fill in the user and email, generate the code and email it to authorization@drastictech.com with a request for temporary license for Net-X-Code to test with. There is more information on licensing available here:
    - http://license.drastictech.com

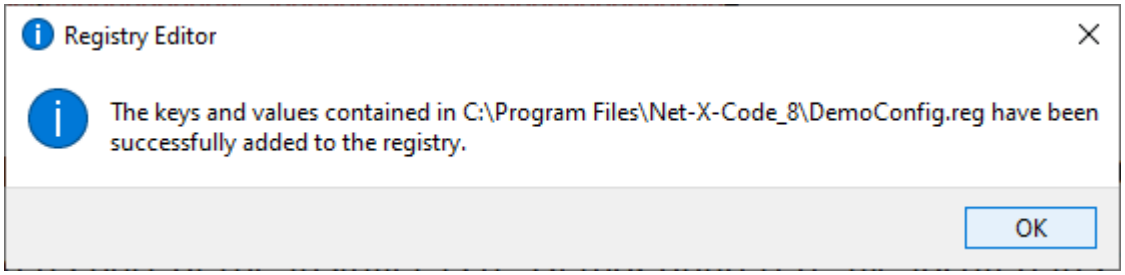
- If you are using RTP/UDP streams over 10 mbs, you should modify Windows buffers for higher multicast buffer sizes. In ‘HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\AFD\Parameters’ change or add the DWORDs ‘DefaultReceiveWindow = 6679200’ and ‘DefaultSendWindow = 6679200’.

- Disable Windows Defender Real Time monitoring. This is required or it will try to monitor all your records and that will cause the writes to slow down and the memory to eventually fill up, as it cannot keep up. Disabling it in the Control Panel is not enough, as Windows will turn it back on. It must be disabled in the MpPreference via a PowerShell
    - Open an elevated (as administrator) PowerShell and run the following:
    - Set-MpPreference -DisableRealtimeMonitoring 1

- Restart the system.

4.4 Configure and startup Net-X-Base & Net-X-Cmd

- Included as part of the installer is a “DemoConfig.reg” file located in C:\Program Files\Net-X-Code_#. Double-click on it and choose “yes” to import the configuration file to registry editor. A successful import will produce the following message:



- Start up NetXCode Master Control (netxbase.exe) and NetXCode Daemon (netxcmd.exe) (C:\Program Files\Net-X-Code_8).
  - You should see 3 groups in Net-X-Base if the configuration was successful.
  - Note: Turn off firewall or allow access for Net-X-Base & Net-X-Cmd.

- Open the UwAmp application to start Apache.

- Open a browser and navigate to your network address (fully qualified domain name, or dotted IP address like 192.168.0.100)

4.5 Configuring Windows Services/Firewall

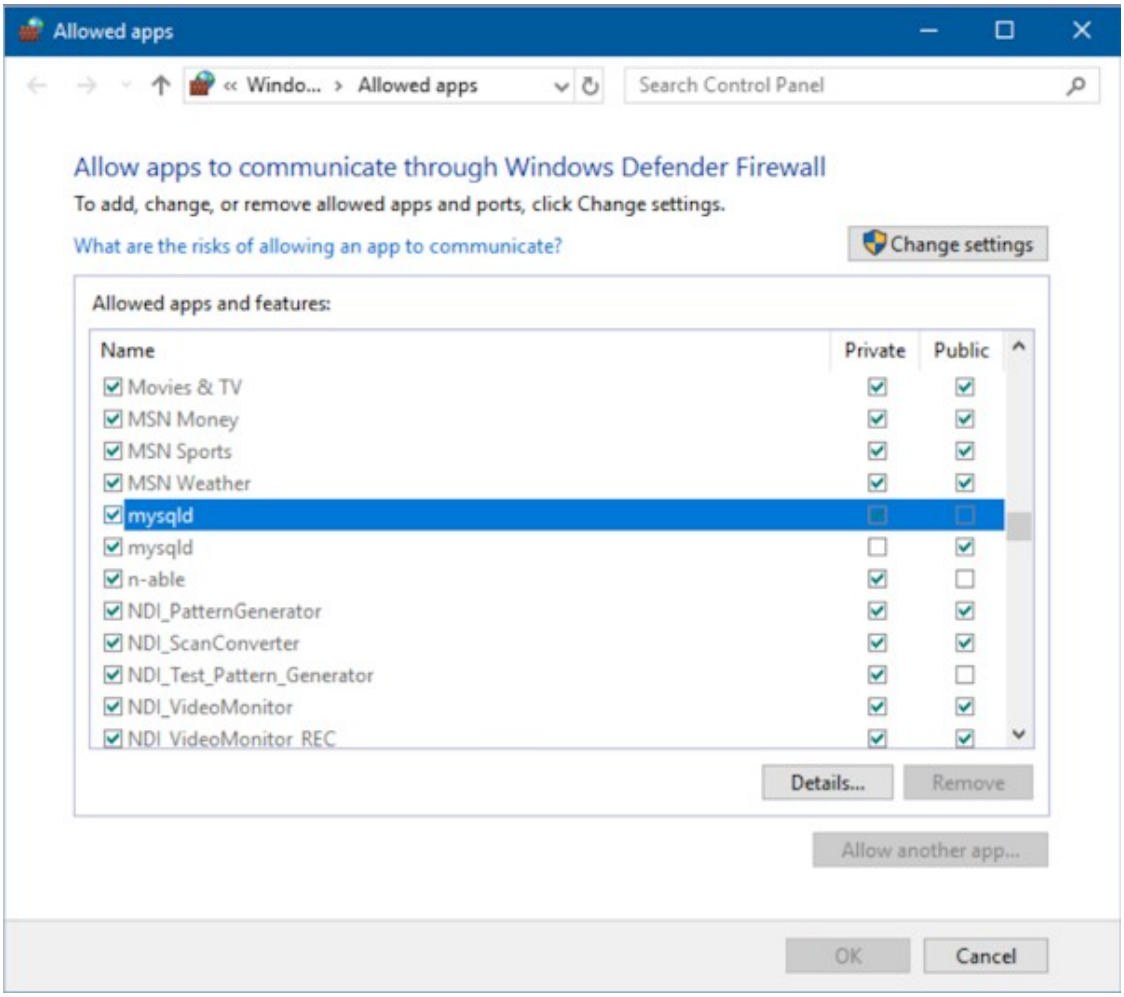
There is a section at the end of this manual that describes the necessary ports to allow through the firewall. If you do not want to set this up manually, Windows can set this up automatically. Stop the services (Net-X-Base, Net-X-Cmd and Media File Scanner) if running. Then run Net-X-Base manually. You will see one or more of the following dialogs. Click Allow Access on each. Then run Net-X-Cmd, and do the same. Finally run Media File Scanner and allow its ports.

For some installs, and always for the Apache HTTPd and MySQLd servers, you will need to explicitly allow them through your firewall. Run the “Allow application through your firewall app” from the start run box or your control panel

Make sure the following are allowed:

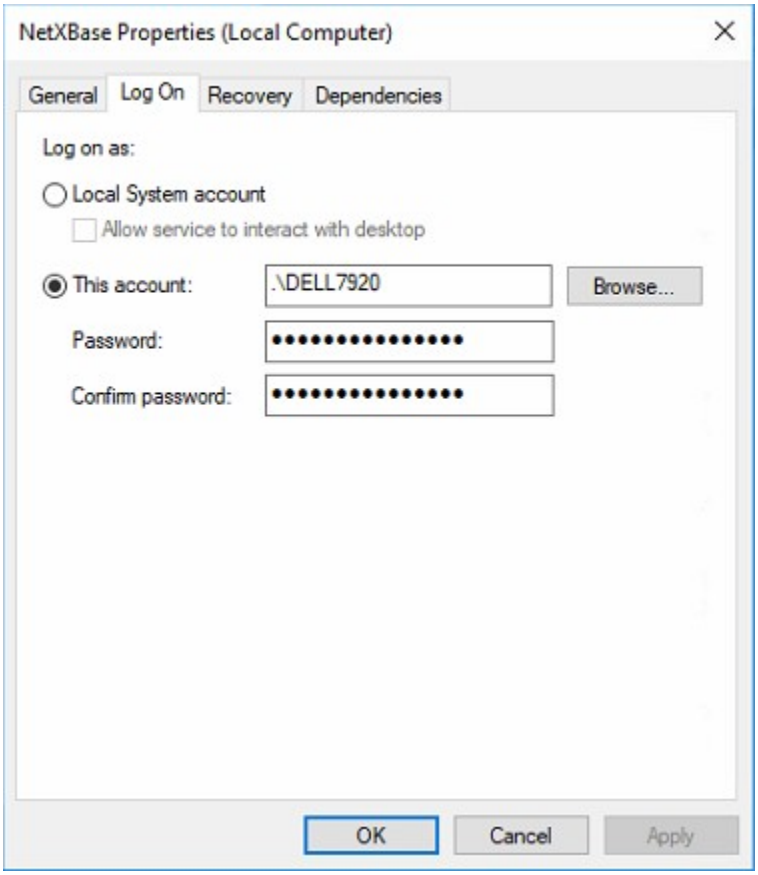
C:\Program Files\Net-X-Code_7\NetXBase.exe
C:\Program Files\Net-X-Code_7\NetXCmd.exe
C:\Program Files\Net-X-Code_7\NetXSDI.exe
C:\Program Files\Net-X-Code_7\MediaFileScanner.exe (optional component)
C:\UwAmp\bin\apache\bin\httpd.exe
C:\UwAmp\bin\database\mysql-5.7.11\bin\mysqld.exe

They can be allowed on just the private network, unless you need them to be publicly accessible. For pubic access, Net-X-Base, httpd and mysqld need to be accessible.



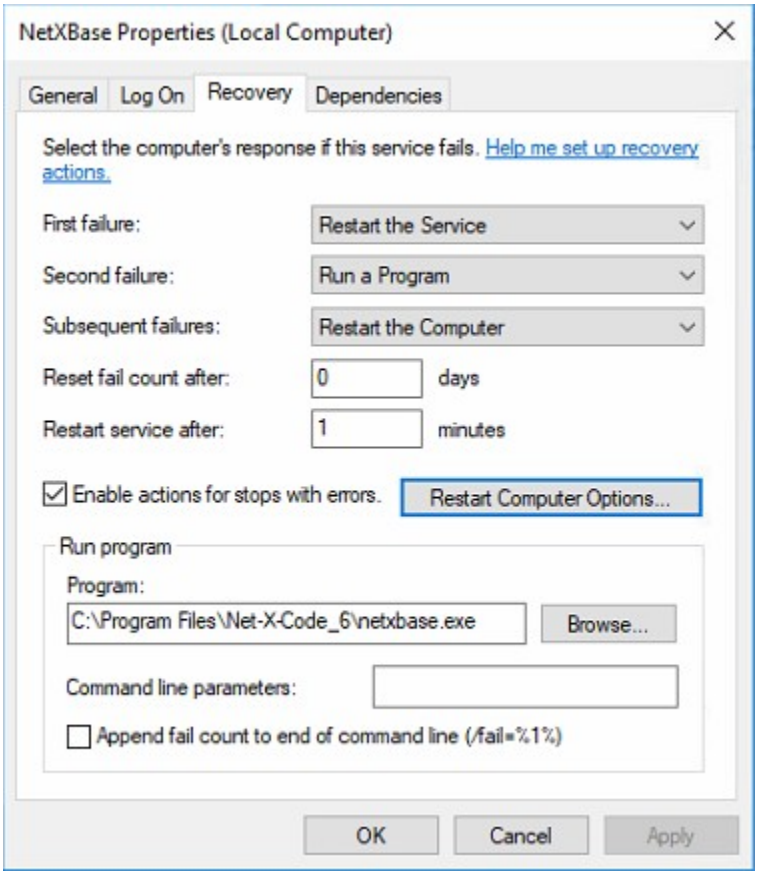
To automatically start the Net-X-Code servers on Windows, they can be enabled as Windows services. To set them up, run the Services dialog from the Control Panel or the Run Command area. The installer will have automatically made entries for the Net-X-Base and Net-X-Cmd in the services. To use them, right click on Net-X-Base and select the Properties menu. In the configuration dialog that pops up, on the General tab, set the Startup type to Manual.

Switch to the **Log On** tab, and you will need to set up the service to run as a specific user that has the permissions the service needs to work with the file system, network drives and any other shared resource:



If you are using a remote user as the account (e.g. an active directory user), the account must have the form DOMAIN\user, and **NOT** user@domain.com. Using the @ version of the login will cause the server to lock up on boot up. This is a Windows issue, and must be DOMAIN\user (eg. DRASTIC.CA\james).

Optionally, on the Recovery page, you can set up actions to occur if the service has problems. Normally these would be set up as “Restart the Service”, “Run a Program” (running the netxbase.exe) and then “Restart the Computer” with a 1 minute delay.

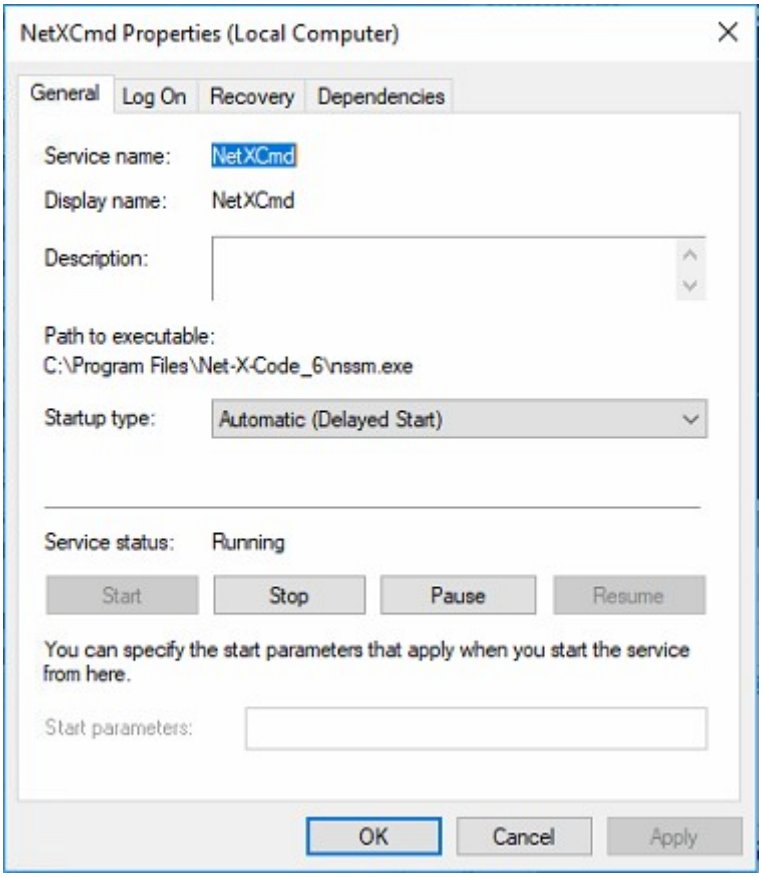


On the Dependencies page, the installer will have set up Net-X-Cmd to be dependent on Net-X-Base. Net-X-Base should be dependent on LanmanServer. Media File Scanner, if installed, should be dependent on Net-X-Cmd.

The process above has to be repeated for the Net-X-Cmd and, if installed, the Media File Scanner services as well. For all three services (Net-X-Base, Net-X-Cmd and Media File Scanner) the Startup Type must be set to “Delayed Start”. On some versions of Windows Server, there is no delay specified for Delayed Start, so if you are using DHCP, you will need to add a value of at least 30 seconds (30000 milliseconds). Depending on version, this will be

Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control
or
Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services

AutoStartDelay = 30000 (type DWORD 32 bits)



Note: Net-X-Base and Net-X-Cmd can be launched automatically on system start-up by adding shortcuts to the applications in the Startup folder at: C:\Users\user\AppData\Roaming\Microsoft\Windows\Start Menu\Programs\Startup

5 Net-X-Code Install for macOS

5.1 Apple Codec Support

Apple Pro hardware accelerated codec support is available for macOS installs. These should be installed on the system to enable specific codec support.

Pro Video Formats 3.1 (HW accel h.264/265/Prores)
https://support.apple.com/en-ca/106396

Rosetta 2 (for AVCi-100)
https://support.apple.com/en-us/102527

5.2 XAMPP

Download and install XAMPP for OS X 8.0.28, 8.1.17 & 8.2.4

https://www.apachefriends.org/download.html
https://sourceforge.net/projects/xampp/files/XAMPP%20Mac%20OS%20X/8.2.4/xampp-osx-8.2.4-0-installer.dmg
8.2.4 / PHP 8.2.4
?

This will download and install apache, php, and mysql

Important files: xamppfiles/etc/extra/httpd-xampp.conf (php config)
xamppfiles/etc/httpd.conf (main apache config)
etc/extra/http-vhosts.conf

5.2.1 XAMPP Setup

Open Xampp. This will automatically start up the server.
?
Navigate to localhost in a browser and confirm that the Apache server is running.
?
Xampp should be installed first, so that the Net-X-Code install sets it up as a service

5.3 Configure Apache Vhosts

AddType application/x-httpd-php php php4 php3 html htm
Header always set Access-Control-Allow-Origin "*"
Header always set Access-Control-Allow-Methods "POST, GET, OPTIONS, DELETE, PUT"
Header always set Access-Control-Max-Age "1000"
Header always set Access-Control-Allow-Headers "x-requested-with, Content-Length, Content-Type, origin, authorization, accept, accept-language, if-none-match, client-security-token, X-Auth-Token"
RewriteEngine On
RewriteCond %{REQUEST_METHOD} OPTIONS
RewriteRule ^(.*)$ $1 [R=200,L]
AddType application/x-httpd-php .html .htm
AddType application/x-mpegURL .m3u8

5.4 Install Net-X-Code Server

Download and unpack Net-X-Code:
http://www.drastic.tv/downloads/net-x-code/SetupNet-X-Code_Macx64_8_0.zip
?
This will install the Net-X-Code servers to:/Applications/NetXCodeServer with Xampp in /Applications/XAMPP
It will also install the web pages into UwAmp: /var/www/html

Main Apache Config xamppfiles/etc/httpd.conf
LoadModule headers_module modules/mod_headers.so
LoadModule rewrite_module modules/mod_rewrite.so

LoadModule proxy_module modules/mod_proxy.so

LoadModule proxy_http_module modules/mod_http_proxy.so

The Net-X-Code installer will add mod_log_rotate.so to your UwAmp install to rotate the logs daily. To make it rotate, ??? log_rotate_module is missing ???

Around line 128, add
LoadModule log_rotate_module modules/mod_log_rotate.so

?Below the load module section, add
<IfModule log_rotate_module>

RotateLogs On
RotateLogsLocalTime On
RotateInterval 86400
</IfModule>

5.5 License the Install

License: You must get at least a trial license for Net-X-Code to function. Run DTLicense, fill in the user (first and last name) and email, generate the code and email it to:
authorization@drastictech.com with a request for temporary license for Net-X-Code to test with.

There is more information on licensing available here:
http://license.drastictech. com

If you are using RTP/UDP streams over 10 mbs, you should modify Windows buffers for higher multicast buffer sizes.

5.6 Setting Up Directories

The web interface assumes it can reach the video directories for playback, logging and clipping. To set this up, a set of standard directories are made on the recording drive/share/mount

mkdir /video/archive
mkdir /video/live
mkdir /video/media
mkdir /video/proxy

These can be actual directories in the storage, or links to other storage. To allow access to them from the web, a link must be made from the html directory (/var/www/html) to the route of the mounted drive with the directories.

ln -s /video /var/www/html/video
You should now be able to access files in e:\video\proxy
as http://<server>/video/proxy/<mpeg4filename.mp4>

5.7 Configure and startup Net-X-Base & Net-X-Cmd

Check
DemoConfig.reg” file located in C:\Program Files\Net-X-Code_#

xml plist ~/Library/Preferences
binary format you want to convert to XML
plutil -convert xml1 ExampleBinary.plist

in XML format to binary
plutil -convert binary1 Example.plist

5.7.1 Startup XAMPP

higher multicast buffer sizes.
How to Increase Multicast Buffer Sizes on macOS:

System-Level (sysctl): You can increase the max socket buffer size using the sysctl command. This impacts the memory available to the kernel for network buffers.
Increase maximum socket buffer size: sudo sysctl -w kern.ipc.maxsockbuf=2097152 (set to 2MB, for example).
Increase UDP send/receive buffers: Specifically, increase net.inet.udp.recvspace and net.inet.udp.sendspace.

6 Server Demonstration – Quick Start

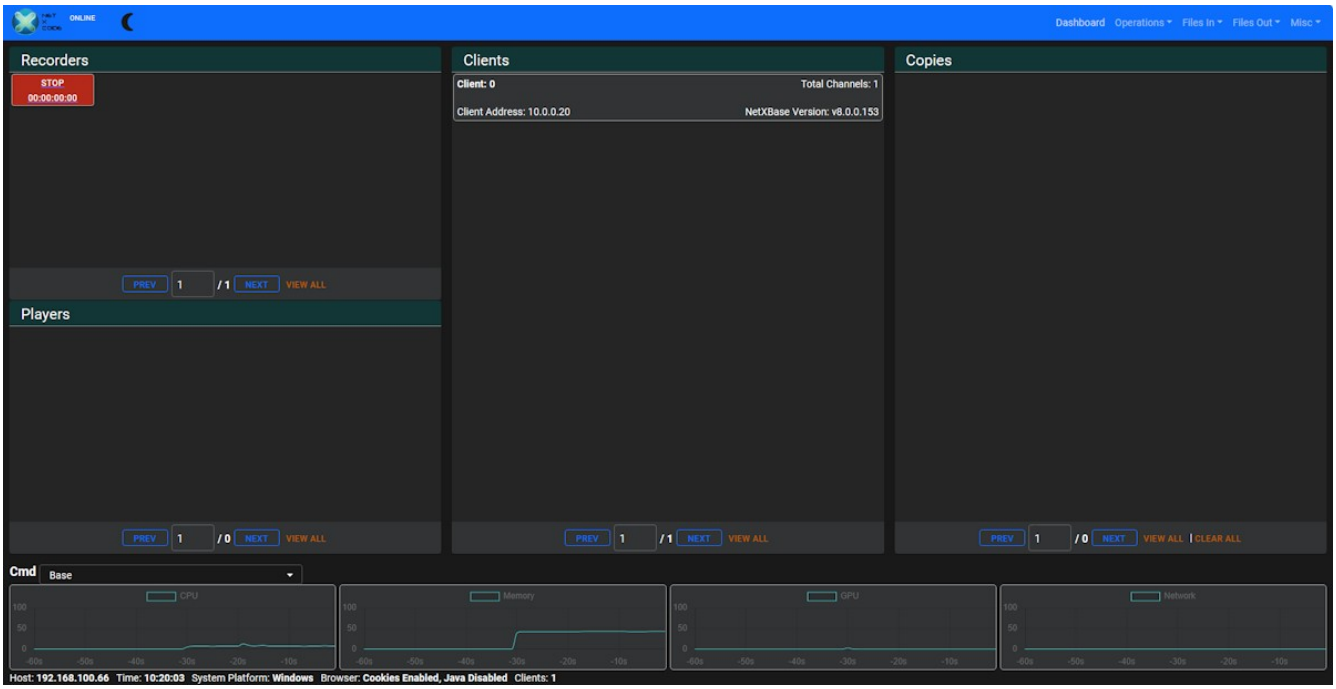
If you have followed the quick start setup above, your server is now ready to demonstrate all the major features of the Net-X-Code toolset.

The following section details the web GUI.

7 Net-X-Code Web GUI

7.1 Dashboard

Run the web GUI. This can be done by entering the IP address of the system running Net-X-Code Server software.



On open, the main page, or the **Dashboard** is displayed. It features five main sections.

- **Recorders** – displays all record channels that have been set up, and their details.
- **Players** – displays any players that are active, along with their details.
- **Clients** – displays each client that has been set up, with details.
- **Copies** – displays the copies details.
- **Cmd** – displays performance details for the CPU, Memory, GPU, and Network activities.

7.1.1 Recorders section

The **Recorders** section shows all active recorders that have been set up. In the above example, one recorder is present. It shows the transport state (in STOP mode), and the current time code location (00:00:00;00).

A **Prev/Next** dialog is provided so the user can cycle through recorders in a large list.

A **View All** control allows the user to show all of the available recorders in a scrollable list, to locate specific recorders and view their details.

Clicking on a recorder will load it into the **Channel0** window for further actions.

7.1.2 Players section

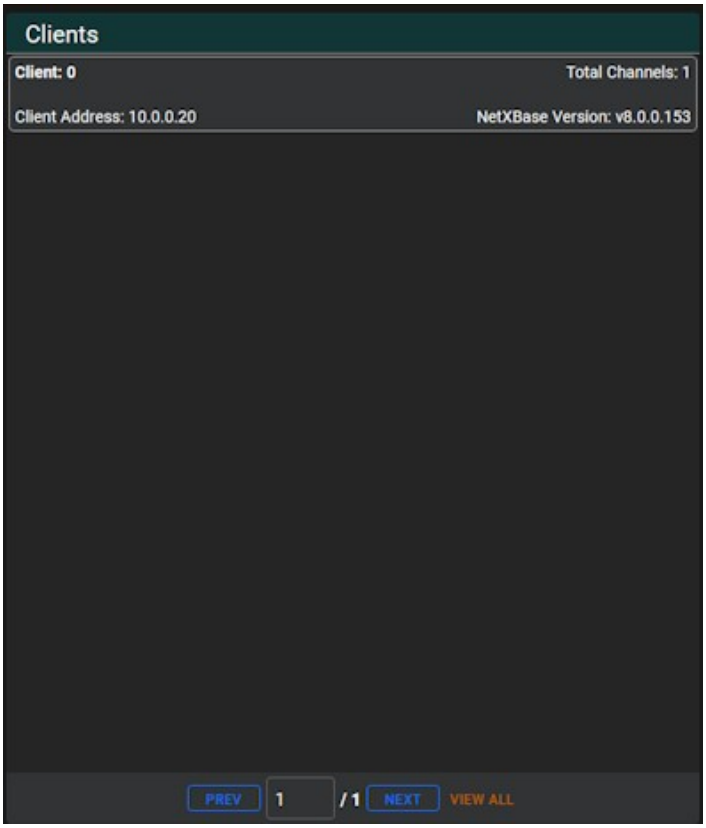
The **Players** section shows all players that have been set up. Because most video hardware BNC connectivity is not bi-directional, a channel is set to either record or playback during configuration, to avoid flipping the I/O on a board.

A **Prev/Next** dialog is provided so the user can cycle through players in a large list.

A **View All** control allows the user to show all of the available players in a scrollable list, to locate specific recorders and view their details.

Clicking on a player will load it into the **Channel0** window for further actions.

7.1.3 Clients section



The **Clients** section shows all clients that have been set up.

A **Prev/Next** dialog is provided so the user can cycle through clients in a large list.

A **View All** control allows the user to show all of the available clients in a scrollable list, to locate specific clients and view their details.

Clicking on a client will load it into the **Channel0** window for further actions.

7.1.4 Copies section

The **Copies** section shows all copies that have been made.

A **Prev/Next** dialog is provided so the user can cycle through the copies in a large list.

A **View All** control allows the user to show all of the available copies in a scrollable list, to locate specific clients and view their details.

Clicking on a copy will load it into the **Channel0** window for further actions.

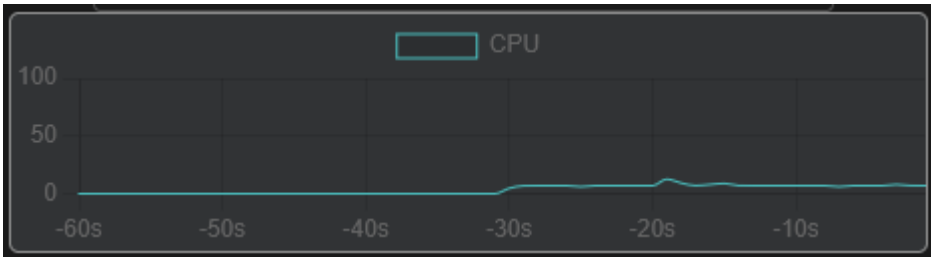
7.1.5 Cmd pulldown

Use the **Cmd** pulldown menu to select between **Base** and **Client**.

7.1.6 Performance section

Displays performance metrics for the system.

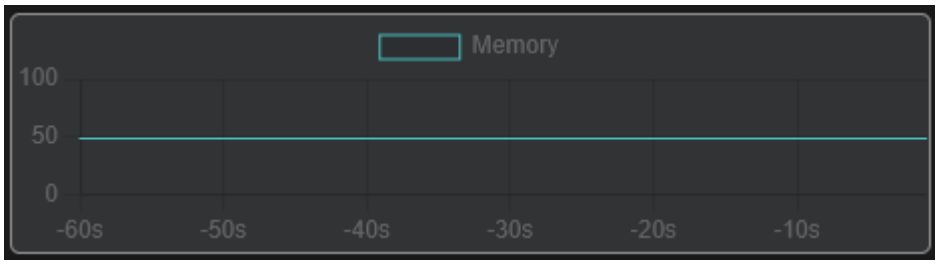
7.1.6.1 CPU Performance



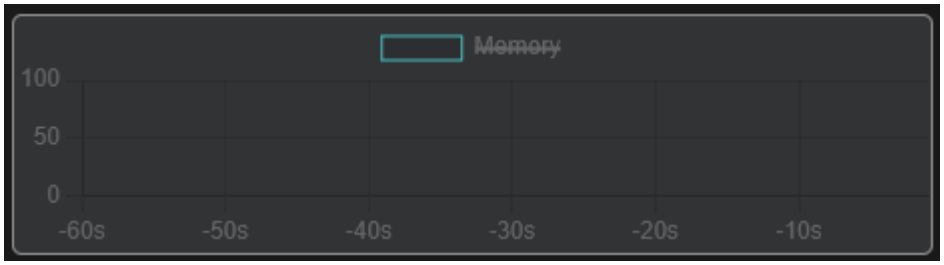
CPU performance is shown as a percentage of available CPU resources. The window shows the last 60 seconds in a sliding window with the most recent levels at the right. CPU metric display can be turned off by clicking the CPU label at the top of the section.

The levels are no longer being drawn, and the word “CPU” has been struck through to confirm the metrics are not being processed and displayed.

7.1.6.2 Memory Performance



Memory performance is shown as a percentage of available memory resources. The window shows the last 60 seconds in a sliding window with the most recent levels at the right. memory metric display can be turned off by clicking the Memory label at the top of the section.



The levels are no longer being drawn, and the word “Memory” has been struck through to confirm the metrics are not being processed and displayed.

7.1.6.3 GPU Performance

CPU performance is shown as a percentage of available GPU resources. The window shows the last 60 seconds in a sliding window with the most recent levels at the right. GPU metric display can be turned off by clicking the GPU label at the top of the section.

The levels are no longer being drawn, and the word “GPU” has been struck through to confirm the metrics are not being processed and displayed.

7.1.6.4 Network Performance

Network performance is shown as a percentage of available Network resources. The window shows the last 60 seconds in a sliding window with the most recent levels at the right. Network metric display can be turned off by clicking the Network label at the top of the section.

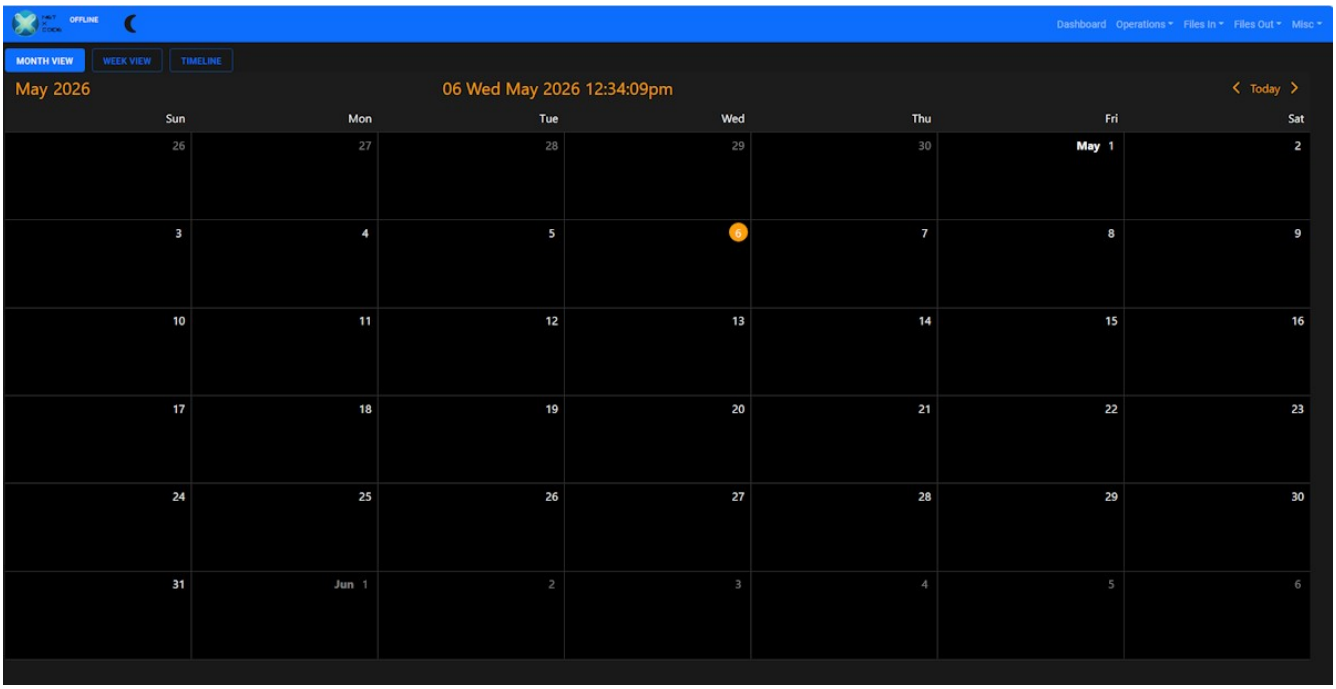
The levels are no longer being drawn, and the word “Network” has been struck through to confirm the metrics are not being processed and displayed.

7.1.6.5 System details

Details are provided for the **Host** IP address, the **Time** of day, the **System Platform**, the **Browser**, and the number of **Clients**.

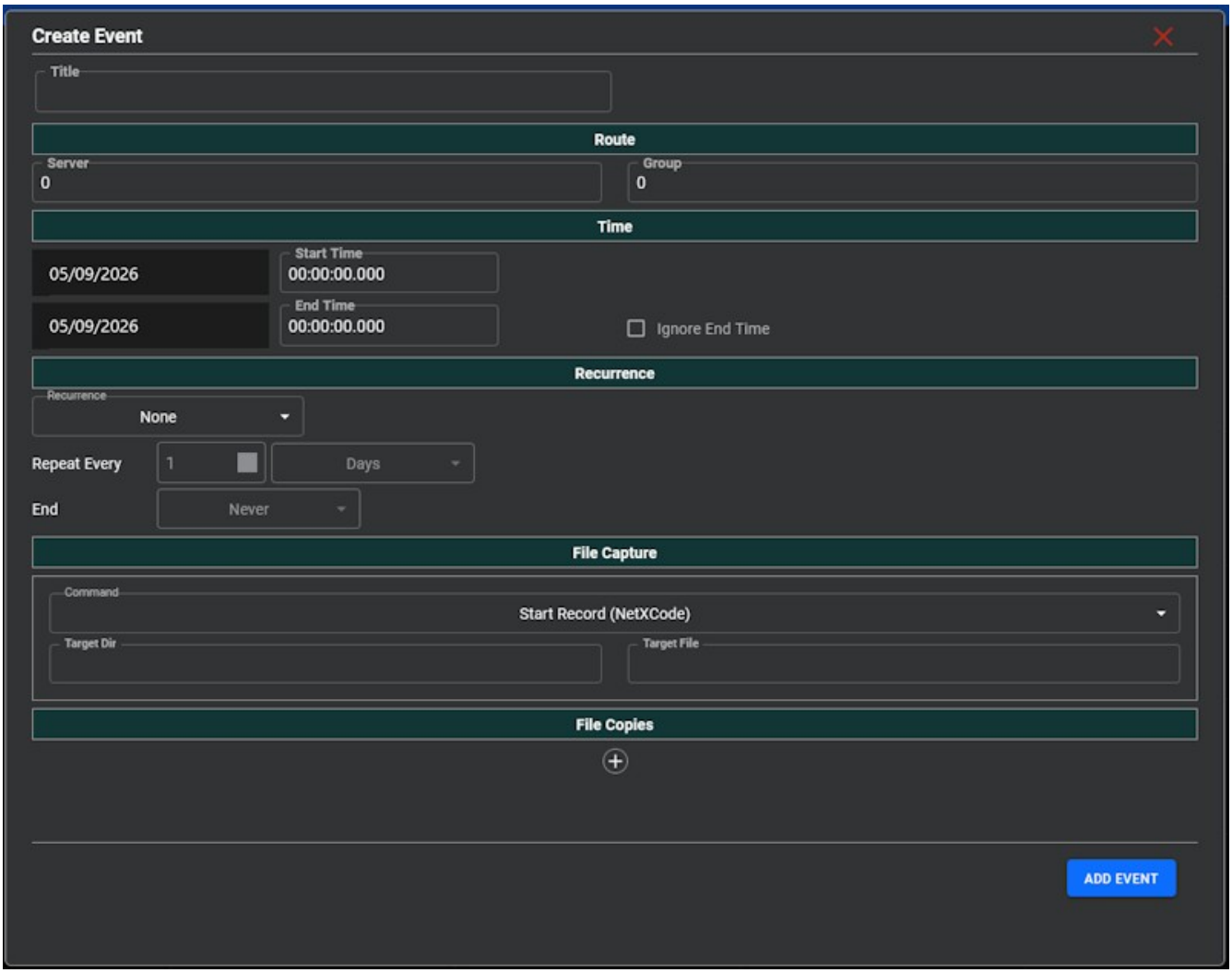
7.2 Operations | Scheduler

Clicking on the Scheduler option opens a scheduler calendar, so the user can view all scheduled records, edit their details, and create or delete scheduled events.



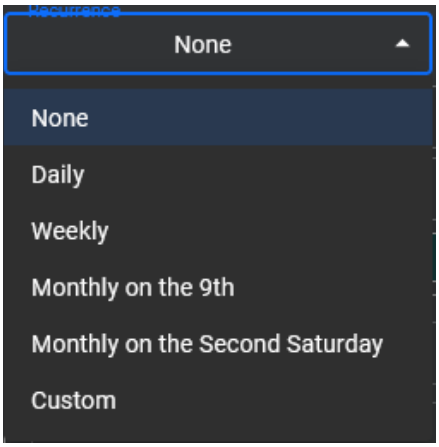
7.2.1 Create Event dialog

Clicking on a date in the scheduler opens the **Create Event** dialog. The user will need to fill in the details to create an event.

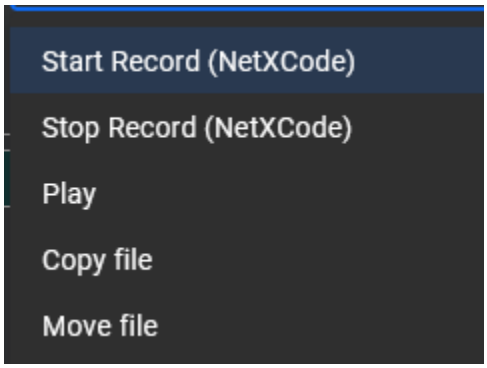


Title – enter a name for the event.
Route – specify the server and group to capture from.
Time – clicking on the scheduler populates this area with the date the user clicked on. A start time and an end time should be set, or the user can ignore the end time and manually end the capture.

Recurrence – if the event occurs on a regular schedule, the user can set the event to repeat. The choices are **None**, **Daily**, **Weekly**, **Monthly on the 9th** (based on the date the user clicked on), **Monthly on the Second Saturday** (also based on the date the user clicked on), or **Custom**. The event can be set to repeat every (X: number of) (time period: days/weeks/months), and (End: Never/Number of Occurrences)



File Capture – specify the **Command**, the **Target Directory**, and the Target Filename. For commands, the pulldown menu offers **Start Record (NetXCode)**, **Stop Record (NetXCode)**, **Play**, **Copy File**, and **Move File**.



File Copies – displays

7.3 Start Streams

This starts and stops the RTP streaming of the HBR (high bit rate), LBR (low bit rate) and ABR (web level bit rate) files. Channels 0, 1 and 2 in Group 2 have been pre-configured for streaming at 239.254.30.30, 239.254.30.31 and 239.254.30.32 respectively. Simply click on start/stop functions to stream.

The Re-stream section allows a user to re-stream a live capture. Simply configure the stream and specify the Net-X-Code client and target stream address and port.

7.4 Start Capture

The next section in the homepage is the Capture section. This provides a snapshot of the status of all Net-X-Code groups. The channels for each group are also denoted in ‘green’ when there is an active capture or ‘red’ otherwise. “More”, will provide detailed information on the group and its channels. Additionally, ‘Net-X-Base Status’ tab at the top-right of the web page also provides more information about Net-X-Code.

In the Capture Section, there are two main areas: Add Capture & Capture Functions.

Add Capture
This allows a user to create a new Net-X-Code client. In order to create a new client, a unique key name for the group is required. There are 2 ways to create a new client:

1. Enter a unique group name and add settings for each channel (or leave default values) and click on the Submit button.
2. Add settings for all channels, click on Apply to Channels and Submit.

In both instances an HTTP request is sent to Net-X-Base with the parameters used to create the group.
Return Messages:

- Empty field: Missing parameters
- SUCCESS: Group Created.
- FAIL: key already in use.
- ERROR: Net-X Connection Refused.

Capture Functions

This opens a dialog box with Net-X-Code functions such as start, stop, restart and delete capture functions.
Return Messages:

- FAIL: Could not complete operation.
- SUCCESS

7.5 Restream

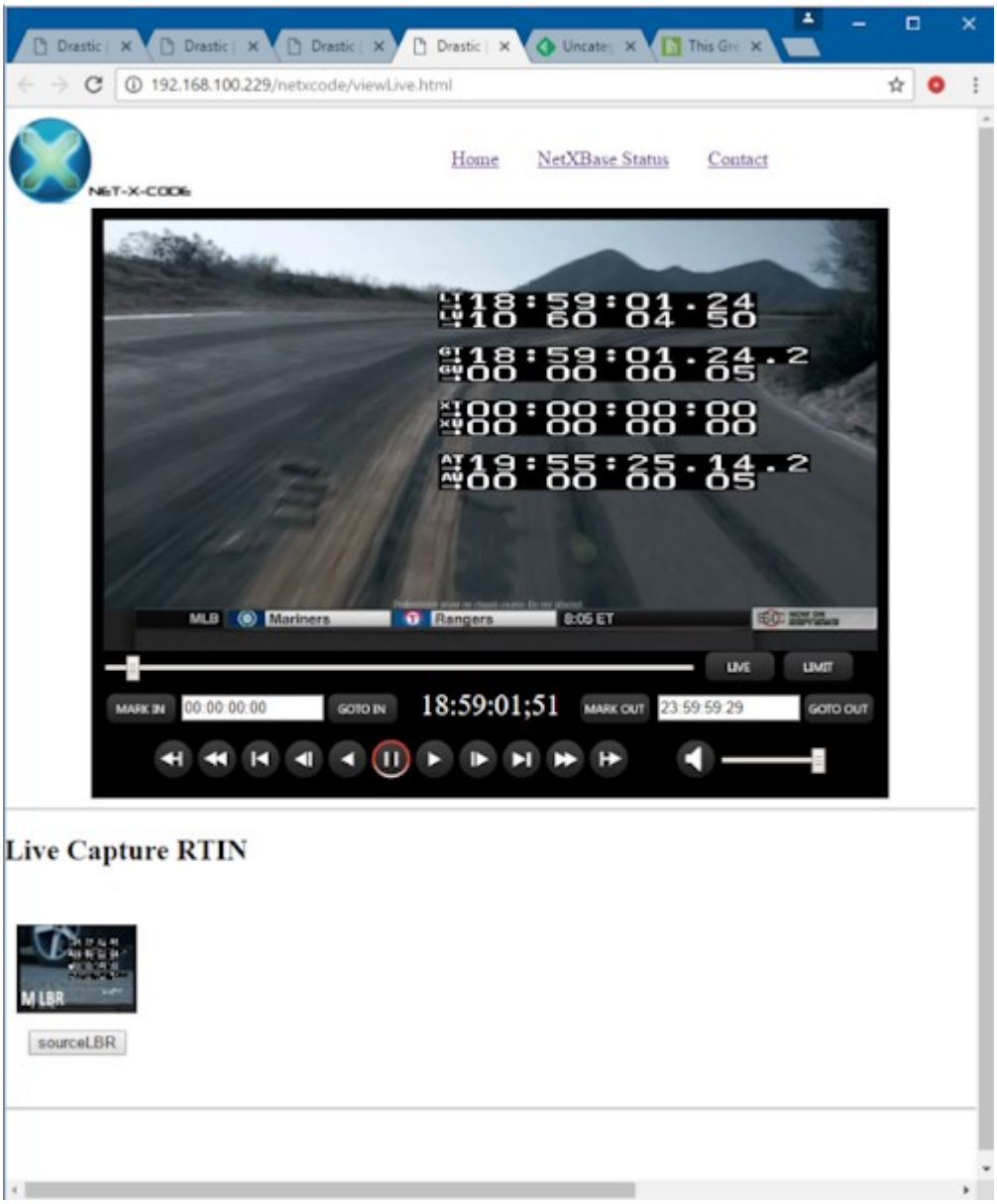
This starts streaming the live captures back out as RTP. Please note, the capture channels must be set to .TS for the re-stream to work. Contact support@drastictech.com for more information on this feature.

7.6 File Workflows

This section demonstrates both the live, playback and partial file restore functions.

7.6.1 View Live Captures

This button brings up a Net-X-Player instance and allows you to select and view any proxy or ABR level live streams being captured using their RTIN files. Clicking on the thumbnails or the name buttons will load the file. The transport controls can be used to move around the file, and the LIVE button will play at the head of the record.

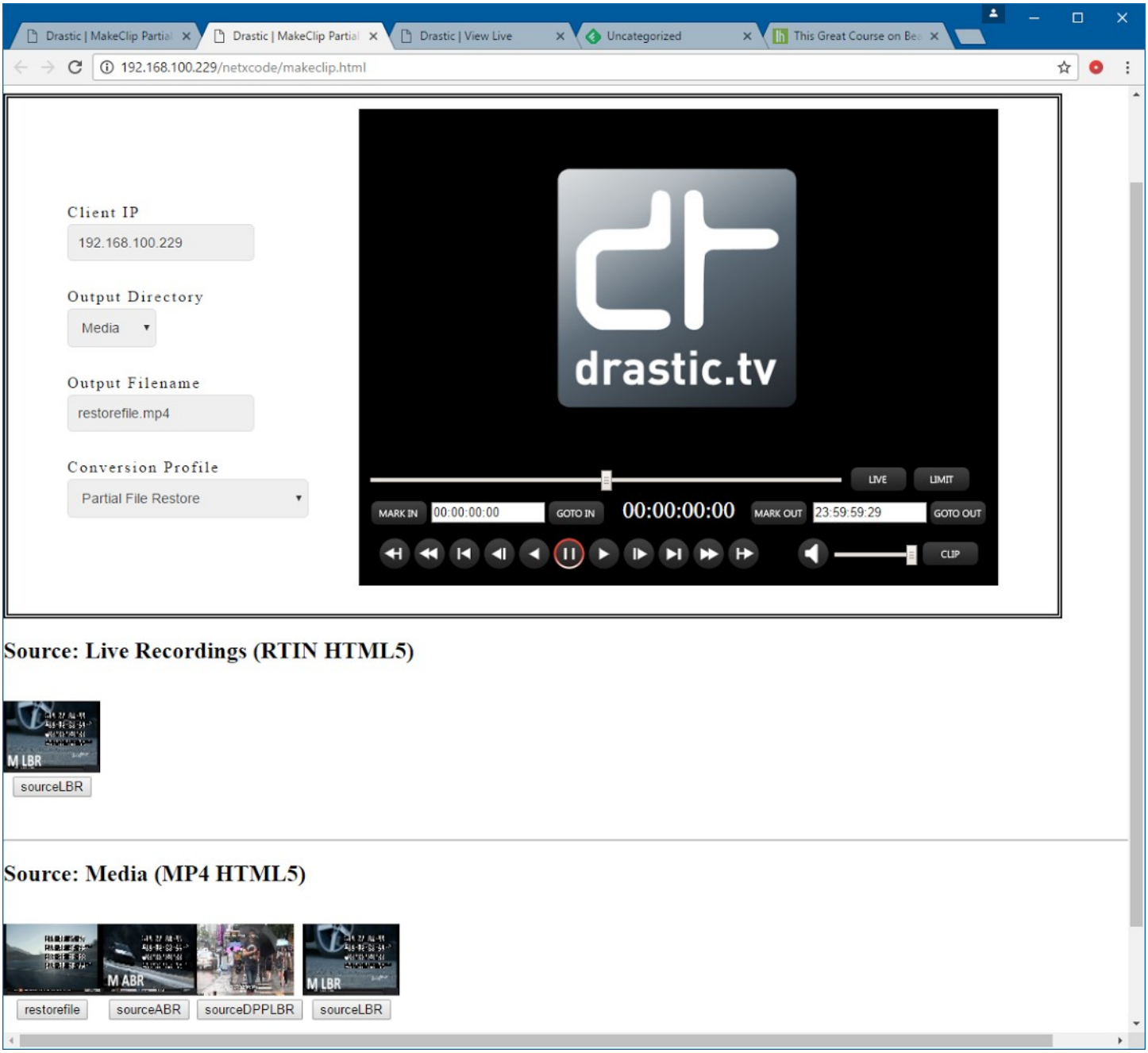


7.6.2 Make A Clip

This button will bring up a Net-X-Player in a new window and allow you to select a live recording RTIN or MP4 from the media folder. Once loaded, time code based in and out points can be set. The Net-X server IP to be used can be set along with an output directory, output file name, and output type. The output types include:

- Copy File – copy the entire file
- Create RTIndex – make an RTIN file for later partial file restore
- Partial File Restore – extract an audio/video/TC/CC section of a file and create a new file of the same type without recompressing the video/audio
- QuickTime MOV Uncompressed – full or partial file conversion
- QuickTime MOV DVHD – full or partial file conversion
- QuickTime MOV h.264/AVC1 – full or partial file conversion
- QuickTime MOV ProRes 4:2:2 – full or partial file conversion
- QuickTime MOV ProRes HQ – full or partial file conversion
- MXF OP1a DVCPro 720p HD – full or partial file conversion
- MXF OP1a DVCPro 1080i HD – full or partial file conversion
- MXF Sony XDCam 720p – full or partial file conversion
- MXF Sony XDCam 1080i – full or partial file conversion
- MXF OP1a XDCam 32 audio – full or partial file conversion
- MXF HDR XDCam 50 4:2:2 – full or partial file conversion
- MXF AS-11 DPP HD AVCi100 – full or partial file conversion
- MXF AS-11 DPP SD IMX 50 – full or partial file conversion
- MXF AS-02 10 bit h.264 50 – full or partial file conversion
- MXF OP1a JPEG-2000 10 bit 150 – full or partial file conversion

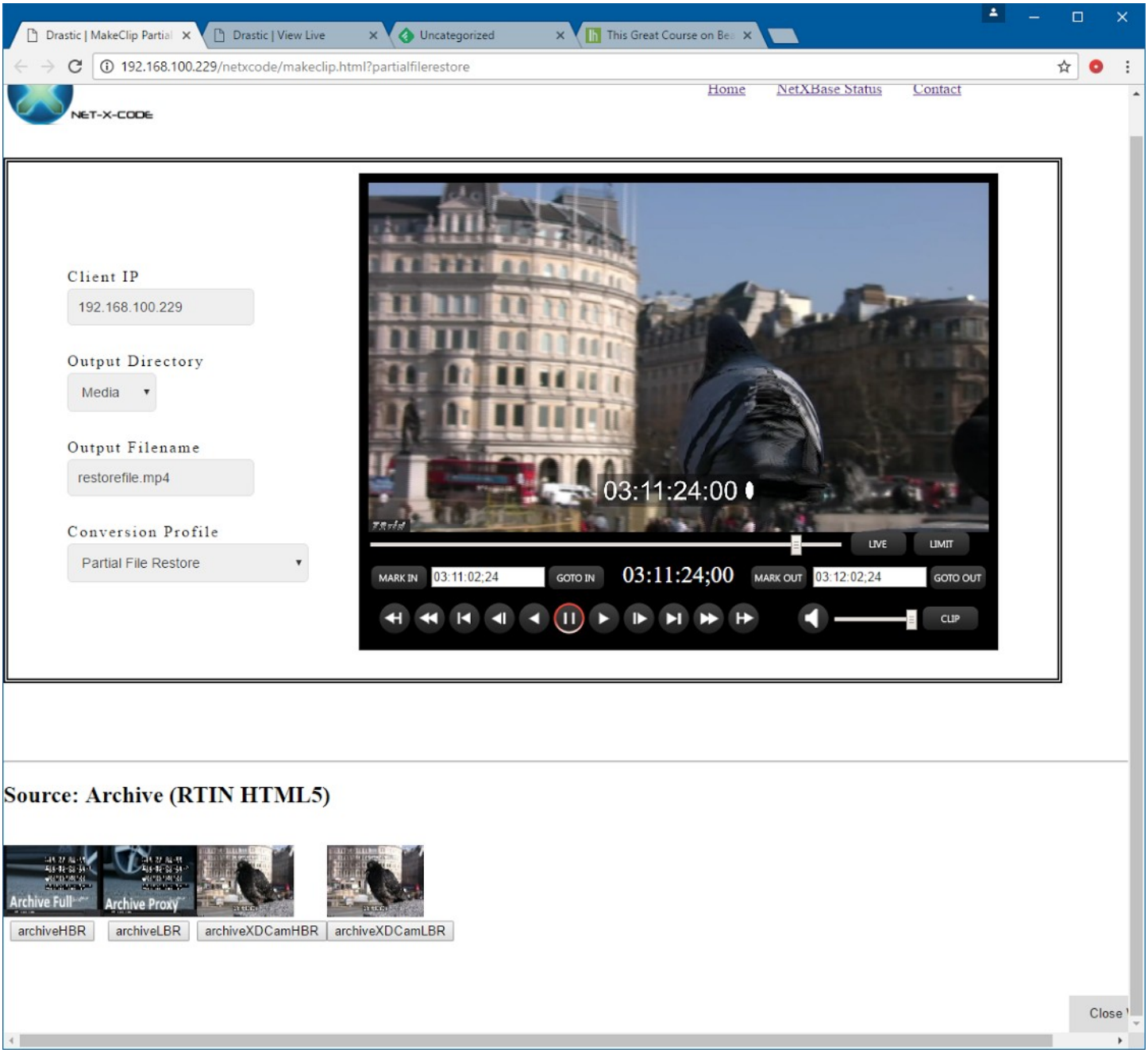
Once the conversion is set up, clicking the 'Clip' button in Net-X-Player will create the new file.



7.6.3 Partial Restore From Archive

This button demonstrates a partial file restore workflow. Loading the LBR or ABR clip from the archive files at the bottom of the page will load Net-X-Player so in and out points can be set. Like the Make Clip button (see above), this 'Clip' button on the Net-X-Player will cause a new file to be made, but in this case it will use the HBR file as the source for the conversion. This is conceptually how a partial file restore archive system would work, where the user loads MP4/RTIN files from a web store, and once the section of the file is selected, the command is set up to use the original, high quality file on

tape, slow storage, or cloud storage by replacing the source file and using the matching time codes.



7.6.4 Move Files Live/Media/Archive

The move files area is an example of how to use the Net-X-Code server system to move arbitrary files between the storage available to it.

Live Recordings (RTIN HTML5)

Source: Media (MP4 HTML5)

Source: Archive (RTIN HTML5)

In order to copy or move a clip:

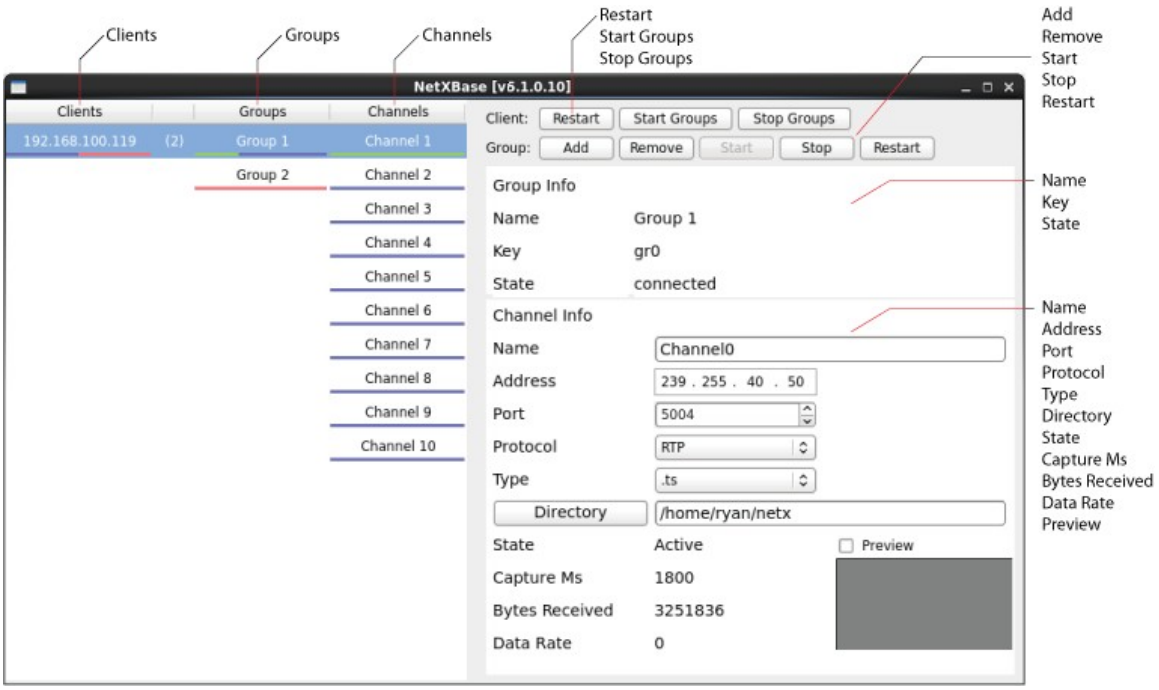
Double-click video thumbnail to get the file path.
Select target directory (Media, Live or Archive) from the drop-down box.
Enter target filename.
Click ‘Submit’ to copy/move clip to target destination.

8 Controls and Displays

Net-X-Code server components are normally run 'headless' (without any graphical user interface) on Linux servers. GUIs are available for each component, and they are outlined here.

8.1 Net-X-Base Window

The Net-X-Base component of Net-X-Code is installed on a workstation separate from the servers being used to record.



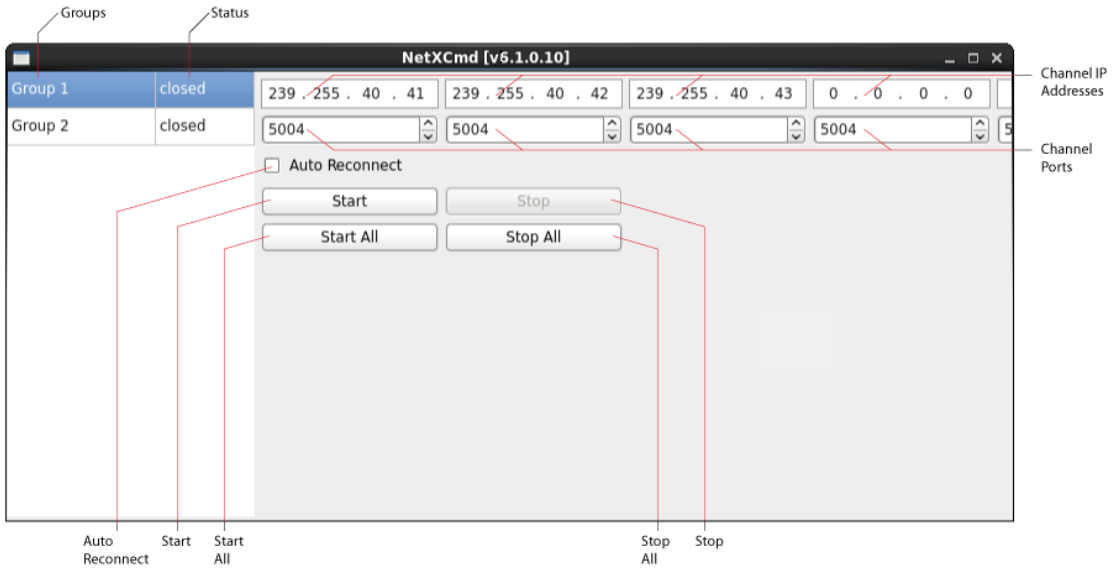
Clients column	This column displays all clients on the network. Each client represents a separate server running Net-X-Code software. Selecting a client by clicking on it allows the user to select any groups running on the client.
Groups column	This column displays all groups that are running on the client. Each group represents an instance of the Net-X-Code window running on the server capable of performing a multichannel capture. Selecting a group by clicking on it allows the user to select a capture channel, to display its state and change any adjustable parameters.
Channels column	This column displays all channels that are in each group. For example each group might run 3 channels of capture; (1) a HBR, or high bit rate stream, (2) a native stream, and (3) an LBR, or low bit rate stream. Selecting a channel by clicking on it allows the user to display its state and change any adjustable parameters. The color under each channel indicates its state: Red means inactive (stopped), Green means active and recording, and Blue means active but not recording; this can be either because no data is being received from the chosen address/port or because the chosen type is incompatible

		with the data being received.
Client	Restart button	Select a client that has stopped recording, and press the Restart button to resume the capture.
	Start Groups button	Select a client and press the Start Groups button to begin a capture on all the channels on that client.
	Stop Groups button	Select a client and press the Stop Groups button to stop a capture on all the channels on that client.
Group	Add button	Press the Add button to add a group into Net-X-Base.
	Remove button	Select a group and press the Remove button to remove it from Net-X-Base.
	Start button	Select a group and press the Start button to begin a capture on that group.
	Stop button	Select a group that is recording and press the Stop button to stop a capture on that group.
	Restart button	Select a group that has stopped recording and press the Restart button to resume a capture on that group.
Group Info	Name	Displays the name of the group
	Key	Displays the key associated with the group
	State	Displays the network state of the group, i.e. whether it is connected or not
Channel Info	Name display	Displays the name of the selected channel.
	Address display	Displays the IP address of the selected channel.
	Port control	Displays the port for the selected channel, and allows the user to select another port by clicking on the up/down arrows.
	Protocol setting	Displays the network protocol for the selected channel
	Type pulldown menu	Displays the file type for the selected channel. Clicking on the pulldown menu allows the user to select between available file types for the channel to record.
	Directory button and display	Pressing the Directory button opens a browser which allows the user to browse to and set a record directory for the selected channel.
	State display	Displays the capture state of the selected channel, i.e. whether active or not.
	Capture Ms display	Displays the millisecond at which the last frame was captured. This field should update during capture.
	Bytes	Displays the amount of bytes received during capture. This field

	Received display	should update during capture.
	Data Rate display	Displays the data rate setting for the capture, if applicable
	Preview checkbox and display	Clicking to select the Preview checkbox enables a mini confidence monitor for the selected channel in the Preview window

8.2 Net-X-Cmd Window

The Net-X-Cmd component of Net-X-Code is installed on a server, designed to communicate with Net-X-Base and to control each group being run on the server.



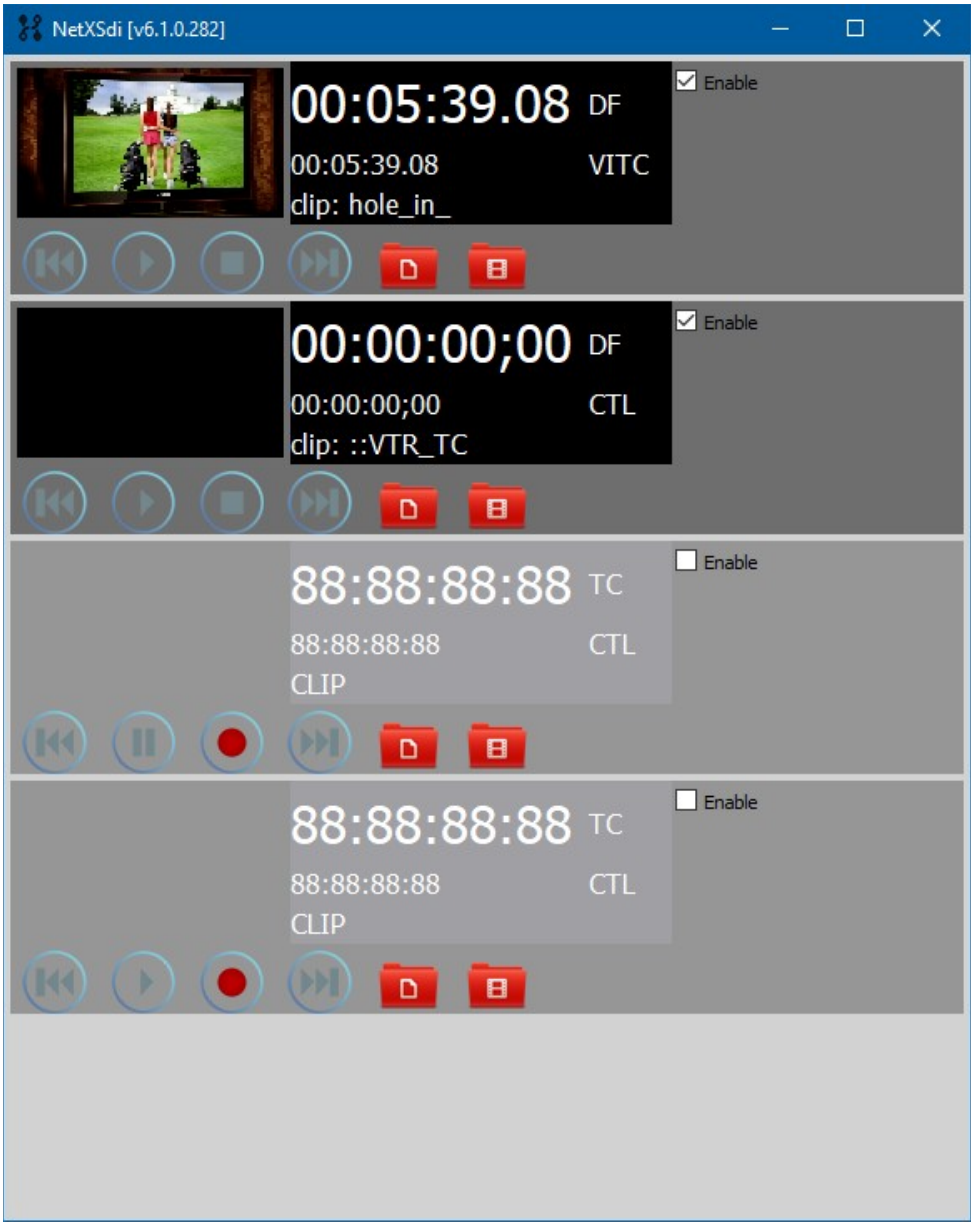
Group column	Each group is displayed in this column, and may be selected by clicking on the button. Selecting a group allows the user to start or stop recording for that group, and to enable or disable auto reconnect.
Status column	Displays whether the group is connected or closed.
Channel IP address display	Displays the IP address setting for the each channel of capture.
Channel Port display	Displays the port for each channel of capture, and offers up/down arrows the adjust the setting

Auto Reconnect checkbox	Click to enable automatic reconnection for the selected group. Where this has been enabled, Net-X-Cmd will attempt to restore any connections that may be dropped.
Start button	Click to start capture on the selected group.
Start All button	Click to start capture on all groups on the server.
Stop All button	Click to stop capture on all groups on the server.

Stop button	Click to stop capture on the selected group.

8.3 Net-X-SDI Window

The Net-X-SDI component of Net-X-Code is run automatically on any Net-X-Cmd server. It supports up to 10 channels of SDI, HDMI, 3G/6G/12G, NDI or SMPTE 2110/2022 capture and playback, depending on the hardware.



There are some basic controls on this windows available when the Enable check box is set. For full control, see the web based browser GUI below. The Net-X-SDI component of Net-X-Code Server allows for multiple channels of SDI baseband capture.

Configuration depends on hardware, but typical configuration include either one channel of 4K, or four channels of SD/HD capture. Each high resolution capture also creates a proxy version at the same time, with frame accurate time code, multichannel audio, closed captions and metadata. Net-X-Code's built in HTML5 web player can play the proxy file while recording, as well as mark and clip both the high res and proxy files while it is still recording. If the recording is set to the OpenMXF format, then the high res version can be edited while still be recording in Adobe Premiere, Avid Media Composer and other editors. Other formats like MOV, AVI, and other forms of MXF can be edited while recording using the Drastic MediaReactor Plugins.

Net-X-SDI also supports VTR control for frame accurately capturing older tapes. Scheduled captures are also fully supported form the Net-X-Code calendar web interface.
A variety of hardware and software capture is supported including:

- AJA KONA, Corvid, KONA IP
- Bluefish444 Epoch and Kronos
- Blackmagic DeckLink, Intensity
- Matrox SDI and IP
- NewTek NDI® Sources
- 10/25G NIC for SMPTE 2022 and 2110

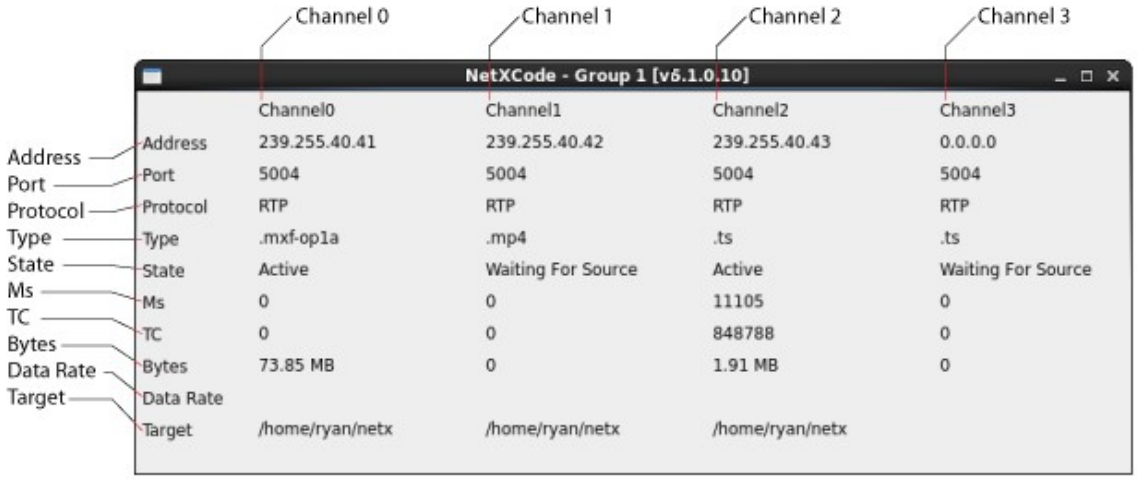
The proxy file will be an MPEG-4 with time code, captions, multi track audio and RTIN file for play while record.

The high resolution file can be any of the following

- OpenMXF, OP1a MXF, AS-02 MXF, HDF, Sony MXF
  - XDCam, AVCi, XAVC, DVHD/50/25, IMX, JPEG-2000, DNxHD
- MOV, MP4
  - MPEG-2, XDCam, h.264, RGB, AVCi, Uncompressed 8 and 10 bit, HQX, CineForm, ProRes, DNxHD
- AVI
  - Uncompressed, DVHD/50/25, HQX, CineForm
- TS (transport stream)
  - MPEG-2, h.264
- YUV
  - Uncompressed 8 and 10 bit

8.4 Net-X-Code Window

The Net-X-Code component of Net-X-Code is installed on a server, designed to perform the captures on the server.

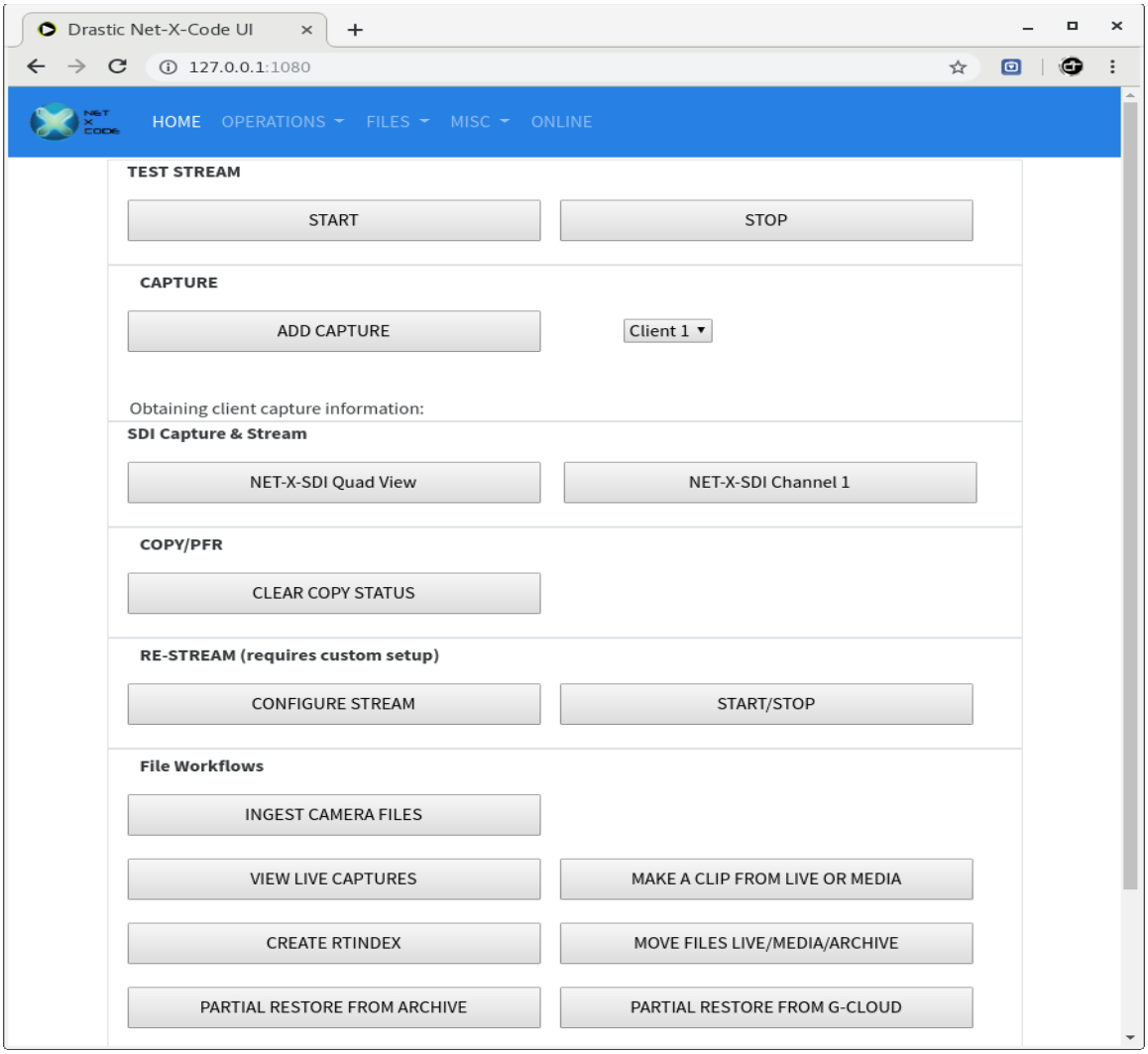


Channel 0 column	Displays information about the first channel in the group.
Channel 1 column	Displays information about the second channel in the group.
Channel 2 column	Displays information about the third channel in the group.
Channel 3 column	Displays information about the fourth channel in the group.
Address display	Displays the IP address assigned to each channel.
Port display	Displays the port setting for each channel.
Protocol display	Displays the network protocol setting for each channel.
Type display	Displays the file type each channel is set to capture.
State display	Displays the current state of the channel, i.e. whether “Active”, “Waiting for Source”, etc.
Ms display	Displays the number of milliseconds since the capture began
Bytes display	Displays the number of bytes captured so far.
Data Rate display	Displays the data rate setting for each channel, if applicable
Target display	Displays the record folder for each capture channel.

8.5 HTML/Web UI

Net-X-Base includes an HTTP server that can be used to control the Net-X-Code system, and also includes a remote status page that uses that API to display the current state of the system. You can access the main UI by going to:

http://<server-ip-or-name>



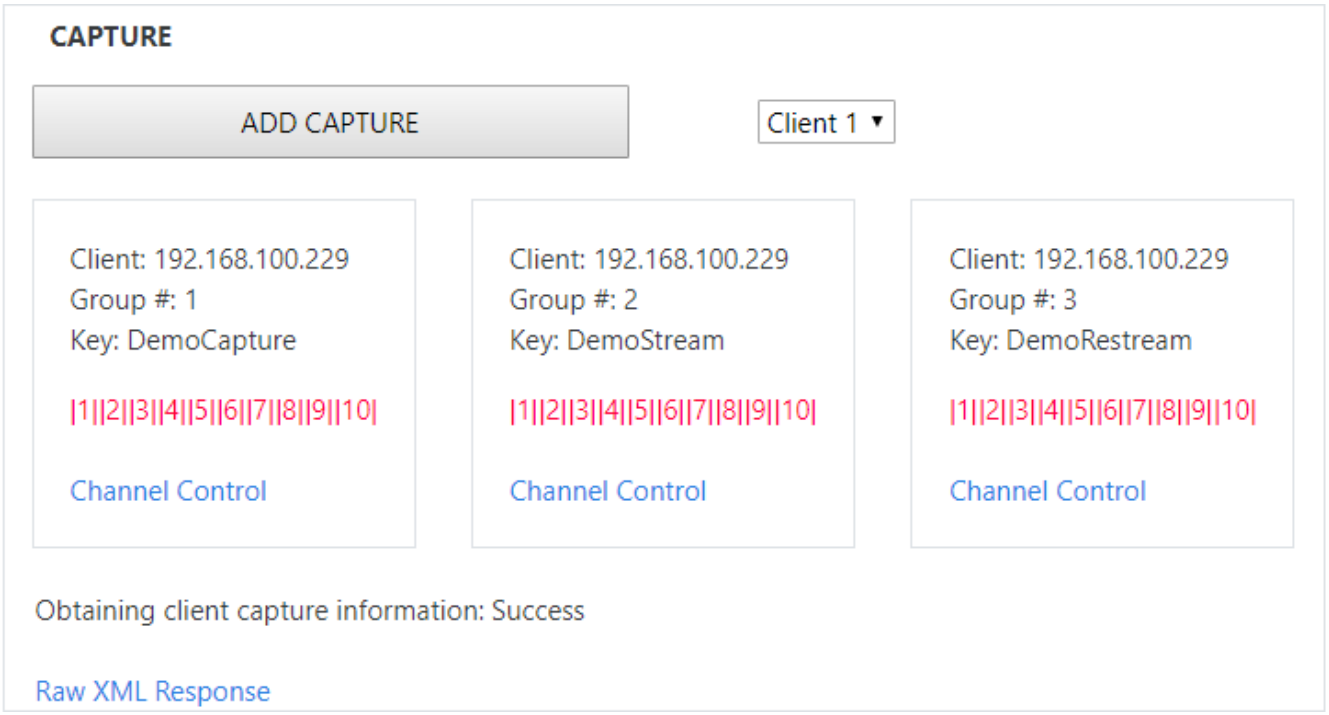
And you should see the default UI that is installed with Net-X-Code.

The major sections of this UI are:

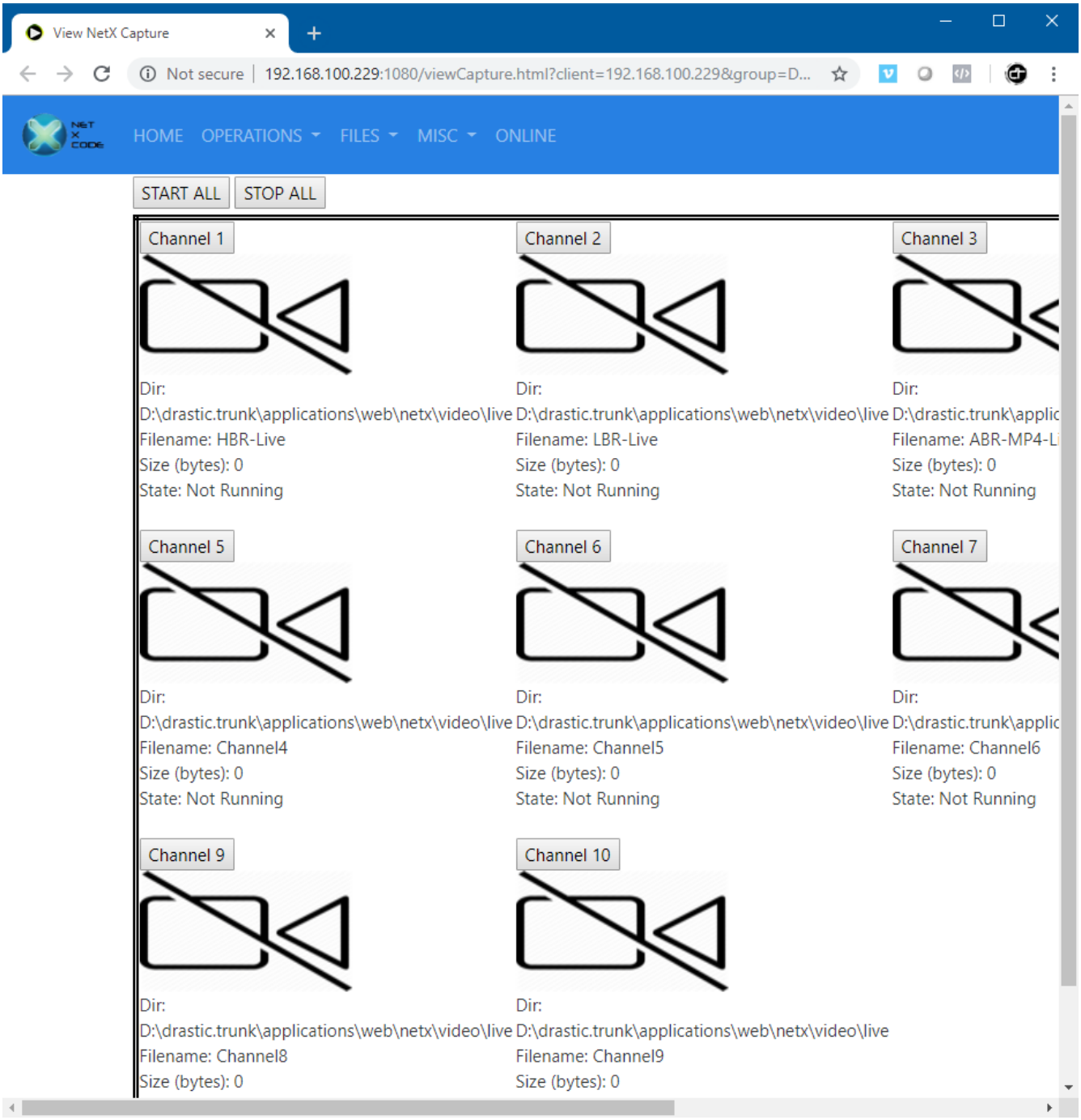
8.5.1 Test Stream

This will start and stop the streams configured in Group #2 / DemoStream. By default, these will be video/streamTS/HBR.ts, video/streamTS/LBR.ts, and video/streamTS/ABR.ts.

8.5.2 Capture/Status



This area lets you add captures and control the state of the capture Group #1 / DemoCapture. There is also one status box for each of the groups, capture, stream and re-stream.


View NetX Capture
Not secure | 192.168.100.229:1080/viewCapture.html?client=192.168.100.229&group=D...
HOME
OPERATIONS
FILES
MISC
ONLINE
START ALL
STOP ALL
Channel 1
Dir:
D:\drastic.trunk\applications\web\netx\video\live
Filename: HBR-Live
Size (bytes): 0
State: Not Running
Channel 2
Dir:
D:\drastic.trunk\applications\web\netx\video\live
Filename: LBR-Live
Size (bytes): 0
State: Not Running
Channel 3
Dir:
D:\drastic.trunk\applic
Filename: ABR-MP4-L
Size (bytes): 0
State: Not Running
Channel 5
Dir:
D:\drastic.trunk\applications\web\netx\video\live
Filename: Channel4
Size (bytes): 0
State: Not Running
Channel 6
Dir:
D:\drastic.trunk\applications\web\netx\video\live
Filename: Channel5
Size (bytes): 0
State: Not Running
Channel 7
Dir:
D:\drastic.trunk\applic
Filename: Channel6
Size (bytes): 0
State: Not Running
Channel 9
Dir:
D:\drastic.trunk\applications\web\netx\video\live
Filename: Channel8
Size (bytes): 0
Channel 10
Dir:
D:\drastic.trunk\applications\web\netx\video\live
Filename: Channel9
Size (bytes): 0

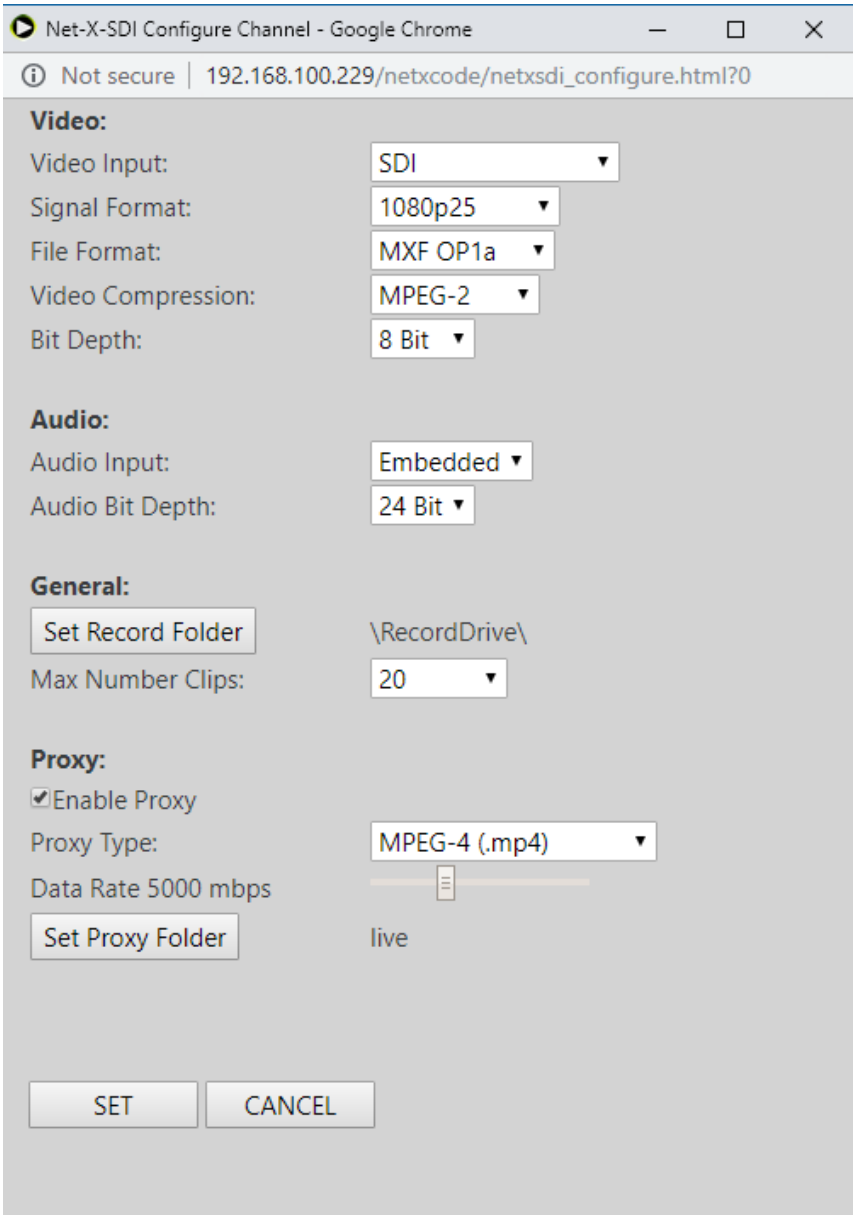
8.5.3 Re-Stream

By default, this is not set up for the demo. If the capture has an HBR, LBR and/or ABR TS stream added to the capture streams, then this section can be used to re-stream those files on a time delay back out to the network.

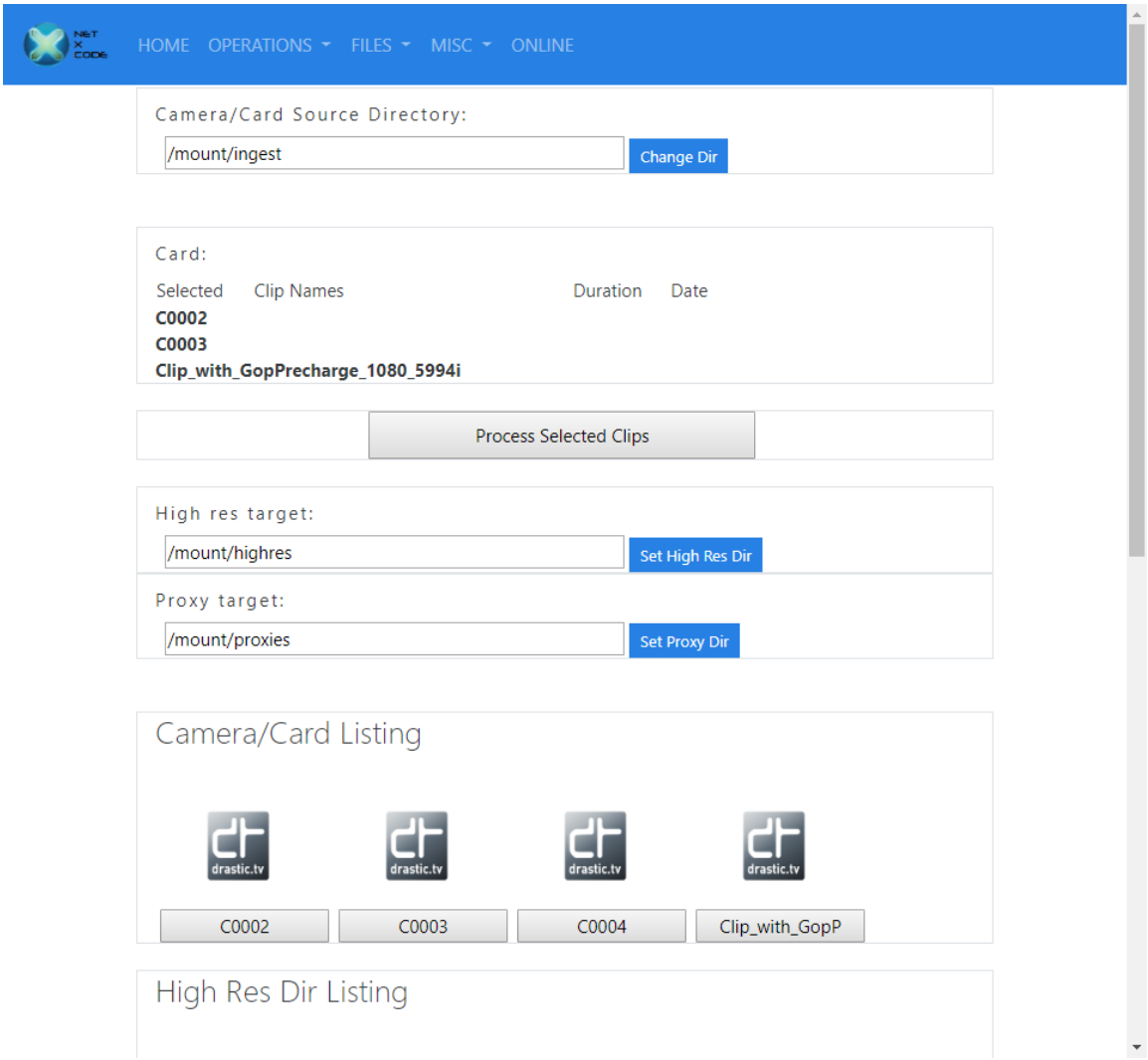
8.5.4 Net-X-SDI – Capture and Playback

Net-X-SDI's web interface has a preview video window and audio meters showing what is coming into (in stop or record), or going out of (in pause or play) the video hardware.

8.5.5 Net-X-SDI Configuration

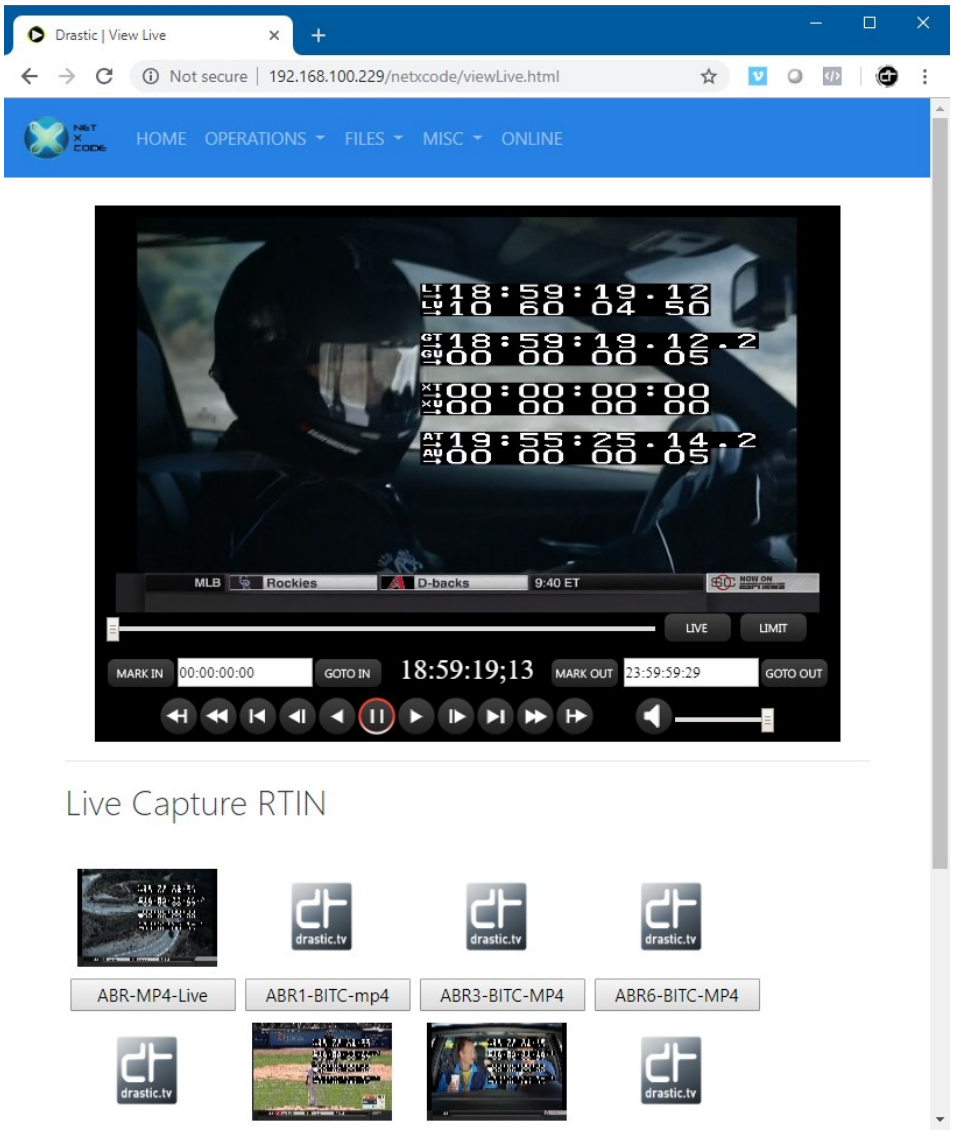


8.5.6 File Workflows – Ingest Camera Card



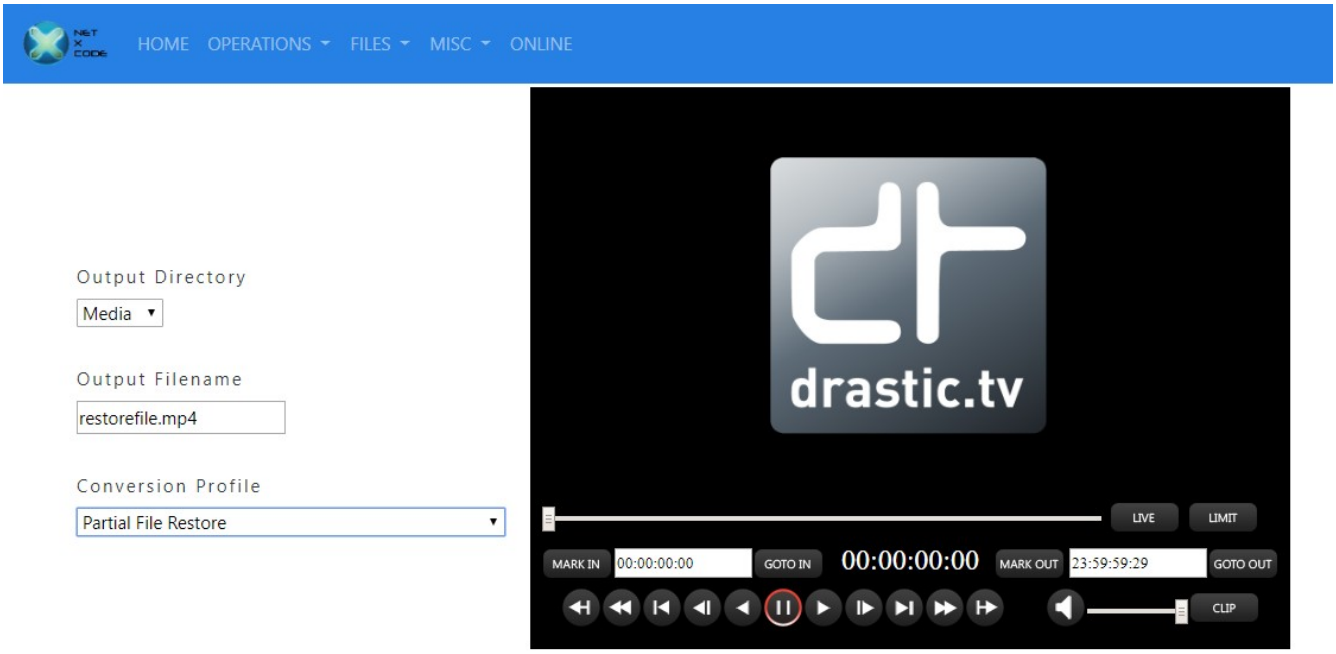
The ingest camera card page allows you to see an incoming camera card, or the directory it was copied to, as a series of recording (clips) rather than the native directory structure of the camera. These clips can be selected and then re wrapped into a single MXF, MP4 or other file, including all stitching for media elements, separate files for tracks and even spanning cards.

8.5.7 File Workflows – View Live Captures



This button brings up a Net-X-Player instance and allows you to select and view any proxy or ABR level live streams being captured using their RTIN files. Clicking on the thumbnails or the name buttons will load the file. The transport buttons can be used to move around the file, and the live button will play at the head of the record.

8.5.8 File Workflows – Make Clip From Live Or Media



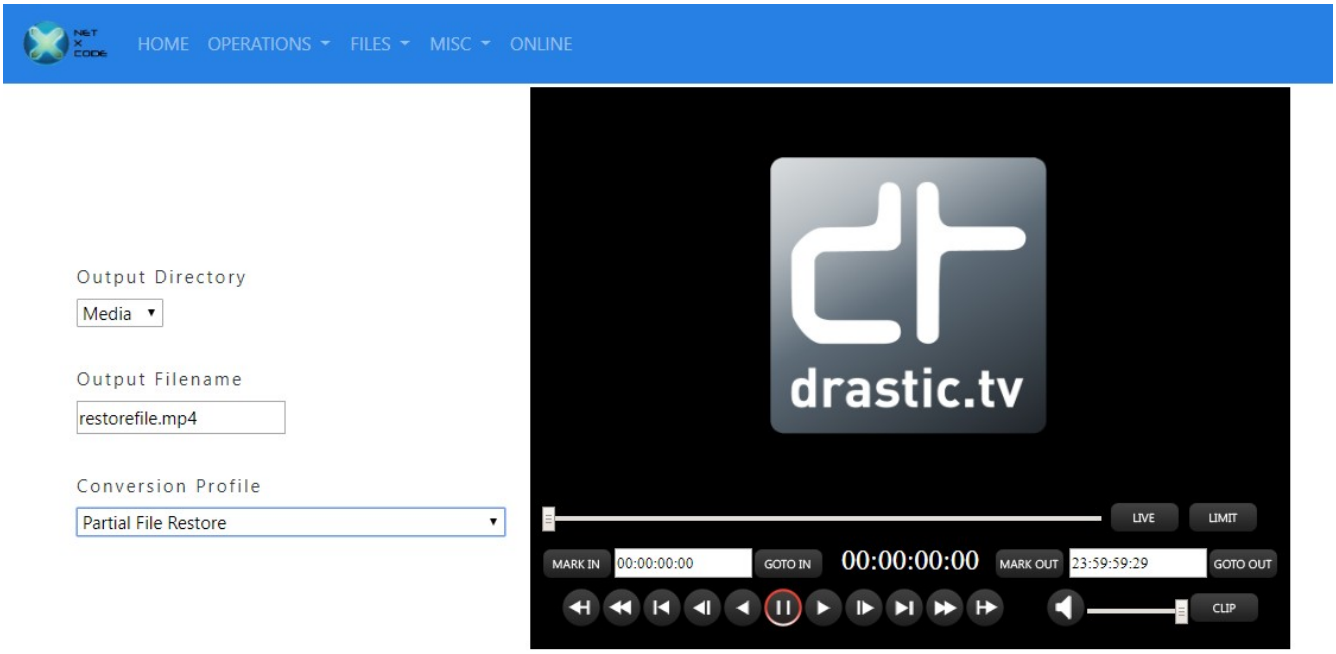
This button will bring up a Net-X-Player in a new window and allow you to select a live recording RTIN or MP4 from the media folder. Once loaded, time code based in and out points can be set. The Net-X server IP to be used can be set along with an output directory, output file name and output type. The output types include:

- copy - copy the whole file
- wrap - re wrap file or part of a file
- index - create an RTIndex for a file
- getCopyInOut - get the extents required for a pfr, or use them with a temp file
- mp3-128kbps - Audio MP3 file
- mov-YCbCr8Bit - QuickTime MOV 8 bit uncompressed YCbCr file
- mov-dvcprohd - QuickTime MOV DVCPro HD (1080/720)
- mp4-h264 - MPEG-4 h264 AAC Audio
- mxf-xdcam-720p - True XDCam MXF 8 channel audio
- mxf-dvcprohd-720p - MXF DVCPro HD 720p
- mxf-xdcam-1080i - True XDCam MXF 1080i 8 channel audio Net-X-Code API 27
- mxf-dvcprohd-1080i - MXF DVCPro HD 1080i 29/25 fps
- mxf-OP1a-MPEG - OpenMXF XDCam MPEG-2 16 channel audio
- mxf-OP1a-h264 - MXF h.264
- mxf-OP1a-HDF - MXF MPEG-2 HDF Standard
- mxf-as-11-sd-pal-dpp - MXF AS-11 SD PAL DPP
- mxf-as-11-sd-ntsc-dpp - MXF AS-11 SD NTSC DPP

- mxf-as-11-hd-dpp - MXF DPP AS-11 AVCi HD
- mov-proreshq - QuickTime MOV ProRes HQ
- mov-proreslt - QuickTime MOV ProRes LT
- mov-prores422 - QuickTime MOV ProRes 422
- mov-prores444 - QuickTime MOV ProRes 444(4)
- scaledown2000k - MP4 264 960x540, 2mbs, AAC
- scaledown500k - MP4 264 480x272, 0.5mbs, AAC
- hd1080-5000kbs - MP4 HD 1080 with a target bitrate of 5 mbs
- hd720-2500kbs - MP4 HD 720p with a target bitrate of 2.5 mbs
- hd360-1250kbs - MP4 HD 360p with a target bitrate of 1.25 mbs
- h264-7500kbs - MP4 Any resolution with a target bitrate of 7.5 mbs
- Proxy-h264-5000kbs - MP4 high quality proxy for web
- LBR-h264-10000kbs - Low bit rate, high quality local MP4
- mxf-OP1a-JPEG2K - Samma style JPEG2000 YCbCr
- mxf-AS-02-h264-10 - 10 bit 50 Mbs h.264 in AS-02 MXF
- DASH-MP4-Multibitrate - Multi bitrate MP4s with DASH files
- HLS-TS-Multibitrate - Multi bitrate TS streams with M3U8 files
- MP4-MultiOutput – Multiple MP4 with optional TC, name and watermark
- TS-TR-01-JPEG-2000 - TR-01 JPEG-2000 transport stream
- TS-MPEG2 - MPEG-2 4:2:0/passthrough transport stream
- TS-h264 - h.264 4:2:0/passthrough transport stream
- OP1a_HBR_50 - OP1a MXF h264 4:2:2 10 bit
- mp4-XAVC-S_4_2_0 - MP4 Sony XAVC-S 4:2:0
- mp4-XAVC-S_4_2_2 - MP4 Sony XAVC-S 4:2:2
- aces - ACES image files
- dnxhd-mxf-720p - DNxHD 720p 50, 59, 60
- dnxhd-mxf-1080p - DNxHD 1080p 25, 29
- dnxhd-mxf-1080i - DNxHD 1080i 25, 29
- dnxhr-mxf-10-hq - DNxHR High Quality 10 bit
- dnxhr-mxf-8-hq - DNxHR High Quality 8 bit
- dnxhr-mxf-sq - DNxHR Standard Quality
- dnxhr-mxf-lq - DNxHR Low Quality

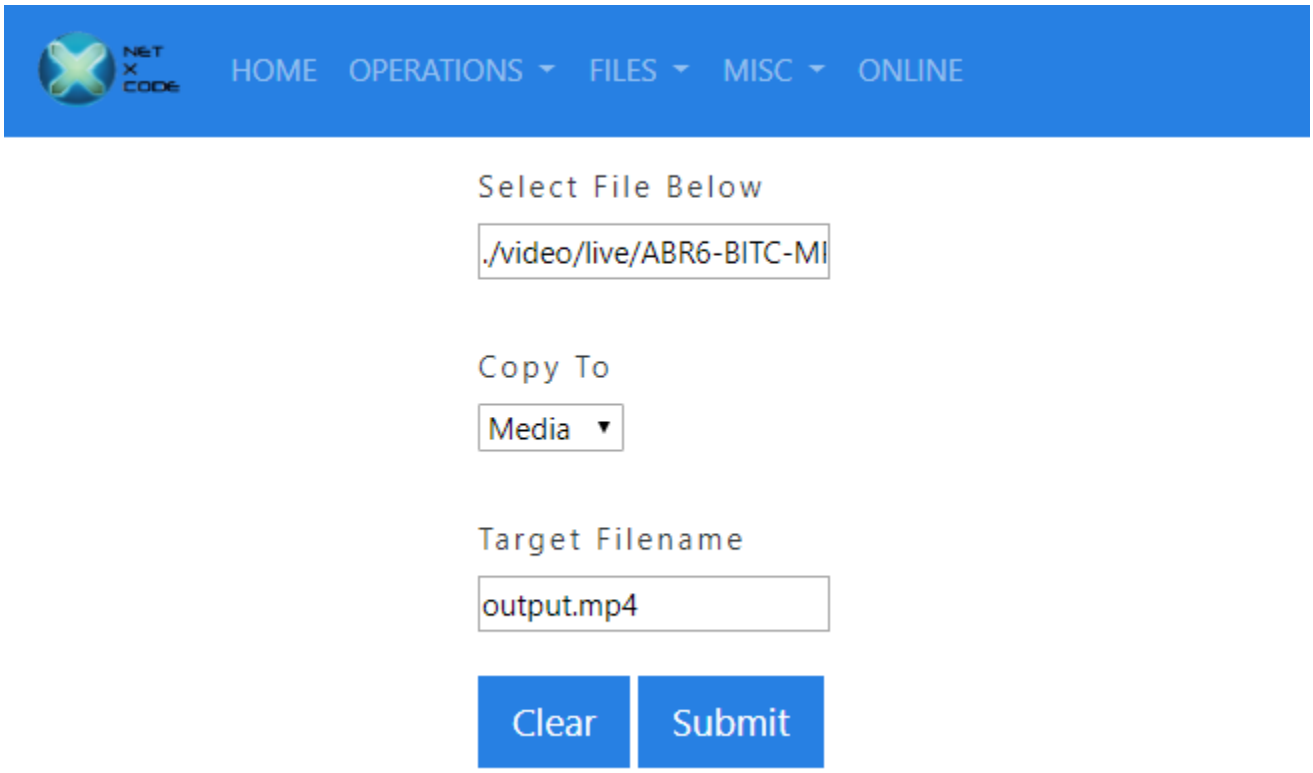
Once the conversion is set up, clicking the 'Clip' button in Net-X-Player will create the new file.

8.5.9 File Workflows – Partial File Restore From Archive



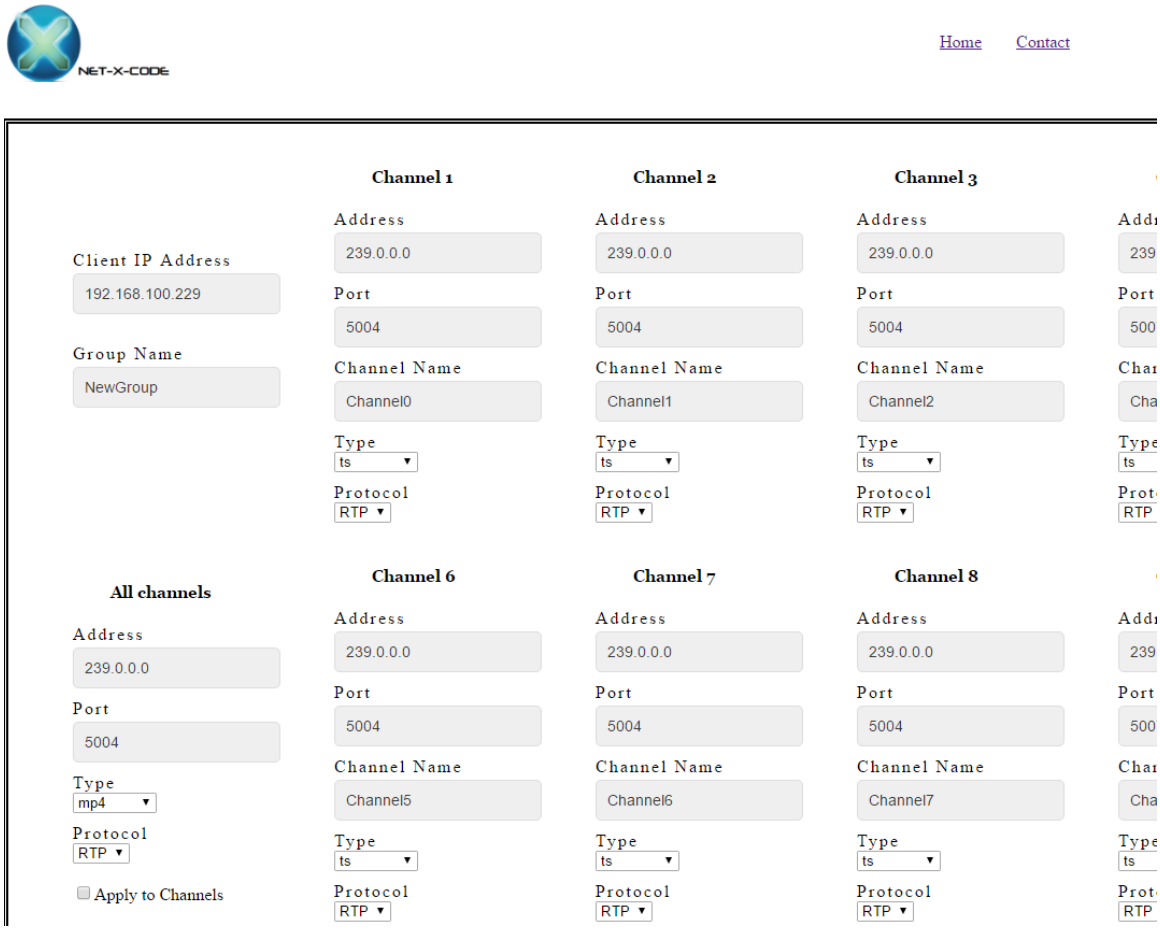
This button demonstrates a partial file restore workflow. Loading the LBR or ABR clip from the archive files at the bottom of the page will load Net-X-Player so in and out points can be set. Like the Make Clip button (see above), this 'Clip' button on the Net-X-Player will cause a new file to be made, but in this case it will use the HBR file as the source for the conversion. This is conceptually how a partial file restore archive system would work, where the user loads MP4/RTIN files from a web store, and once the section of the file is selected, the command is set up to use the original, high quality file on tape, slow storage or cloud storage by replacing the source file and using the matching time codes.

8.5.10 File Workflows – Move Files



The move files area is an example of how to use the Net-X-Code server system to move arbitrary files between the storage available to it.

8.5.11 Net-X-Code Config Page



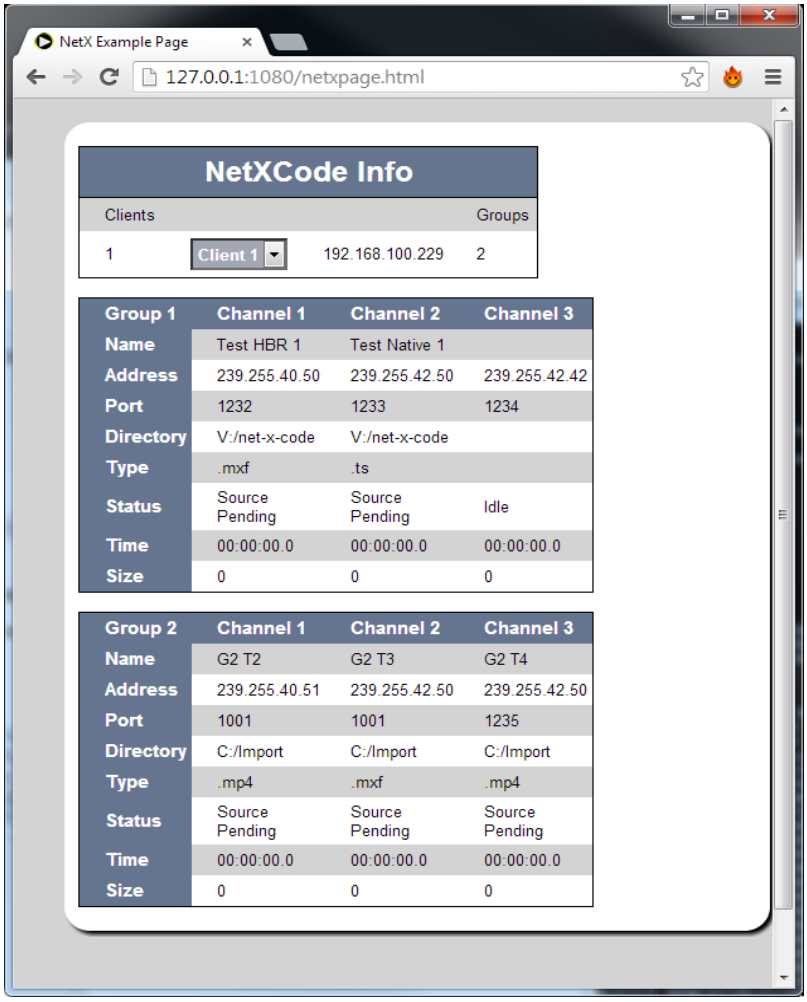
8.5.12 Net-X-Base Status

The Net-X-Base status page can be used to check the status of a multi server streaming system. It is available as a menu in the default UI page, or at this address:

http://<server-ip-or-name>/netxpage.html

If you are not running a web server on the Net-X-Base server, the page should also be available directly from the Net-X-Base at:

http://<server-ip-or-name>:1080/netxpage.html



9 Operations Guide

This section describes how to use Net-X-Code Server.

9.1 Theory of Operation

Net-X-Code is a distributed capture, stream, restore, and conversion system. It can be run on one or more servers, and still be controlled from one, central interface. This section of the manual will give an overview of how the various parts of Net-X-Code interact to make it easier to design deployments and implement controllers using the API described in the next section.

Net-X-Code includes the following components:

Net-X-Code – this program does the actual capture, transcode and saving of up to three incoming network streams to MP4, fragmented MP4, ISM smooth streaming, MOV, TS/HLS or MXF. It is launched by Net-X-Cmd on a server with the parameters it needs to capture up to three streams. Once it has launched, it creates a TCP socket on port 7630.

Net-X-Streamer – this program exists within Net-X-Code and allows RTP and UDP streaming of transport streams, or groups of transport streams, back to the network.

Net-X-SDI – Optionally capture or playback files via SDI, HDMI, NDI or SMPTE 2110/2022. Requires storage for capturing or playing back files. Supports RTIN and most standard broadcast files including MXF, MOV, AVI, TS, DPX, DNG, etc.

Net-X-Copy – this program is called to index (RTIN), clip, restore, re-wrap and convert files on disc, tape, cloud or other sources to local or network storage.

Net-X-Cmd – this program is a daemon that runs on a capture server. It launches, and then communicates with Net-X-Code programs that do the actual capture. When Net-X-Cmd launches, it immediately initiates any Net-X-Code captures that have been set up on the system. It does not require interaction with any other program, as it stores this information locally. Once it has launched and connected with the Net-X-Code program(s), it joins a multicast group on address 230.7.7.7:57000. This allows Net-X-Base to see it and connect to it for command and control.

Net-X-Base – this program is a single instance controller and API provider for the entire network. It may run on the Net-X-Cmd/Net-X-Code systems, or anywhere else on the local network. When it runs, it looks for members of the 230.7.7.7:57000 multicast group. Once it finds a new member (on start up or while running) it makes a TCP connection for status and

commands on port 5800## where ## is the channel number (58001, 58002, etc). This connection uses the same protocol as the main API, but with a direct connection, as opposed to the HTML/Rest protocol that the main API uses. It should be noted that this protocol is order sensitive, and it should never be used directly. For controller applications, the HTML/Rest version is more robust, well defined and automatically creates a network level control instead of just a server level control.

Net-X-Timecode – this program is used to distribute system clocks, from network or SMPTE source, as a TCP/IP stream for browser components to use. As most browsers do not support UDP, this is the most efficient way to use time of day directly in them.

Net-X-Player – is an HTML5 web video based player that allows frame accurate time code playback of proxy assets and can be used to send clipping commands for the proxy or original video files.

9.2 Physical Setup

First, set up a workstation (to run Net-X-Base). Connect the workstation to a network.

Second, set up one or more servers (to run Net-X-Cmd and any instances of Net-X-Code which become the “groups”), also connected to the same network.

The workstation and each server will need the software installed, and all of the systems will need to be licensed on a per-system basis.

9.3 Installing Net-X-Code

9.3.1 Installing Net-X-Code in Windows

GUI: Double click on the installer
Cmd: installer.exe --mode silent

9.3.2 Installing Net-X-Code in macOS:

GUI: Double click on the installer

9.3.3 Installing Net-X-Code in Linux:

Because the installer requires administrative rights, it must be started from the command line, even in GUI mode:

GUI: sudo ./Net-X-Code-Linux-x86_64-Install_#_#_###
Cmd: sudo ./Net-X-Code-Linux-x86_64-Install_#_#_### --mode console

9.3.4 Settings

For Windows, when running as a service, the settings are in the registry, but they are here

HKEY_USERS\.DEFAULT\Software\Drastic

rather than here

HKEY_CURRENT_USER\.DEFAULT\Software\Drastic

9.4 Licensing

Please note: to enable the features of this software, you must have at least a temporary license. The software *may* install and run without a license, but important features will not work.

Each system running Net-X-Code will need to be licensed to enable all the features of the software.

9.4.1 Command Line (Linux only)

To license the system from the command line, run ddrsetup with name/email to get a site code.

Sudo ddrsetup -l -n "First Last" -e first@last.com

This will dump the site code out to the terminal. Send the site code to authorization@drastictech.com. When you get the response, apply it as follows:

sudo ddrsetup -l -n "First Last" -e first@last.com -r "jdfigjewiofj8ut2348rtjweighefughdf"

9.4.2 Windows

Once you have installed Net-X-Code, please run the DTLicense app, and generate a site code to send to us. We will reply with a site key to provide the license.

Here is a page with more detailed information on how to request a license for testing:
http://license.drastictech.com/

9.5 Configuration

The configuration files/settings are stored in different places for different operating systems:

9.5.1 App Specific Configuration

Windows:
Registry
\HKEY_CURRENT_USER\Software\Drastic\NetXBase
\HKEY_CURRENT_USER\Software\Drastic\NetXCmd

\HKEY_CURRENT_USER\Software\Drastic\NetXCmd\Groups
\HKEY_CURRENT_USER\Software\Drastic\NetXCopy

Linux:
~/.config/Drastic/NetXBase.conf
~/.config/Drastic/NetXCmd.conf
~/.config/Drastic/NetXCopy.conf
NOTE: If you are running the netxbase/netxcmd services, the config will exist in the root user
/root/.config/Drastic/NetXBase.conf
/root/.config/Drastic/NetXCmd.conf
/root/.config/Drastic/NetXCopy.conf

macOS:
${HOME}/Library/Preferences/com.drastic.NetXBase.plist
${HOME}/Library/Preferences/com.drastic.NetXCmd.plist
${HOME}/Library/Preferences/com.drastic.NetXCopy.plist

9.5.2 General Configuration

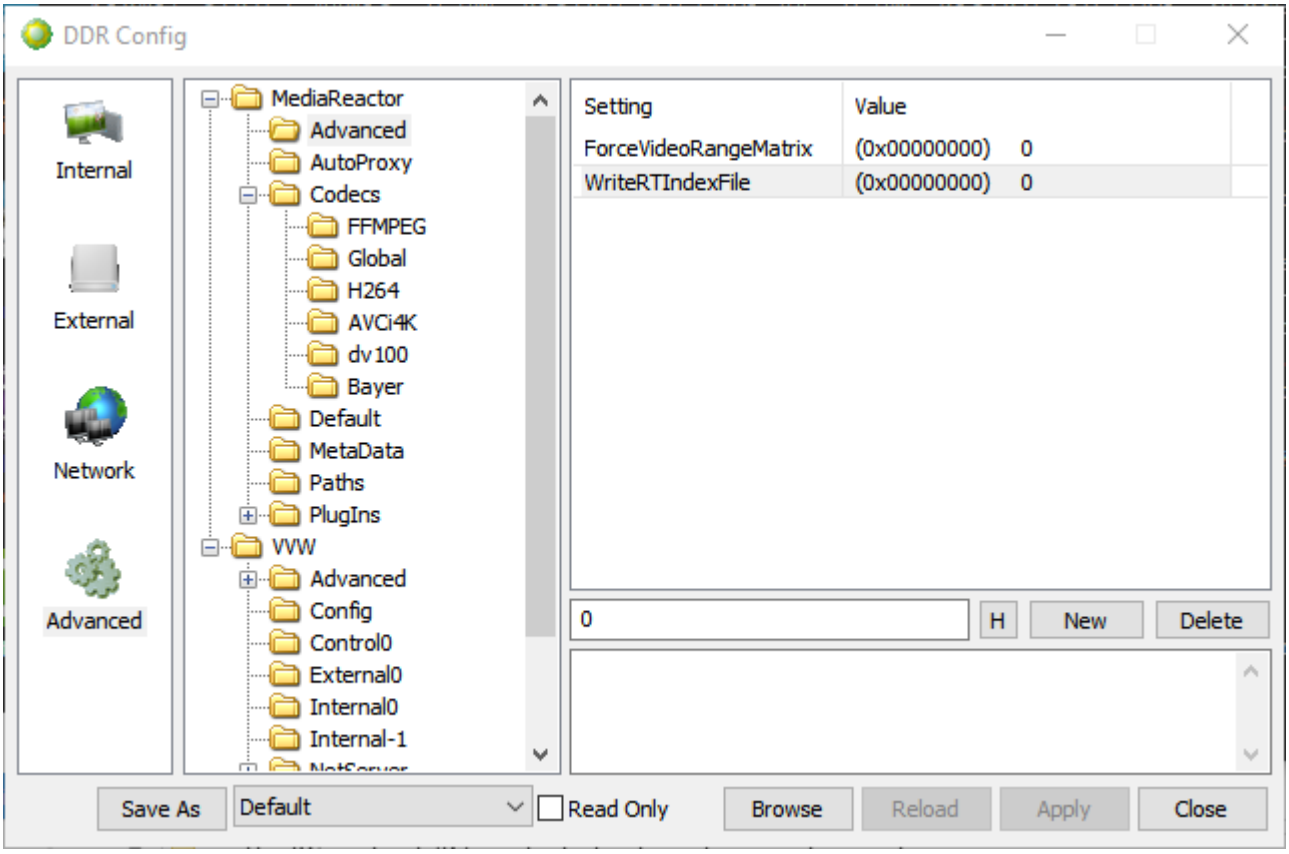
Windows:
C:\ProgramData\Drastic\config.xml
Alt - C:\Documents and Settings\<username>\Drastic\config.xml

Linux:
/etc/Drastic/config.xml
Alt - /Home/<username>/Drastic/config.xml

macOS:
/Library/Applications Support/Drastic/config.xml
Alt - /Home/<username>/Drastic/config.xml

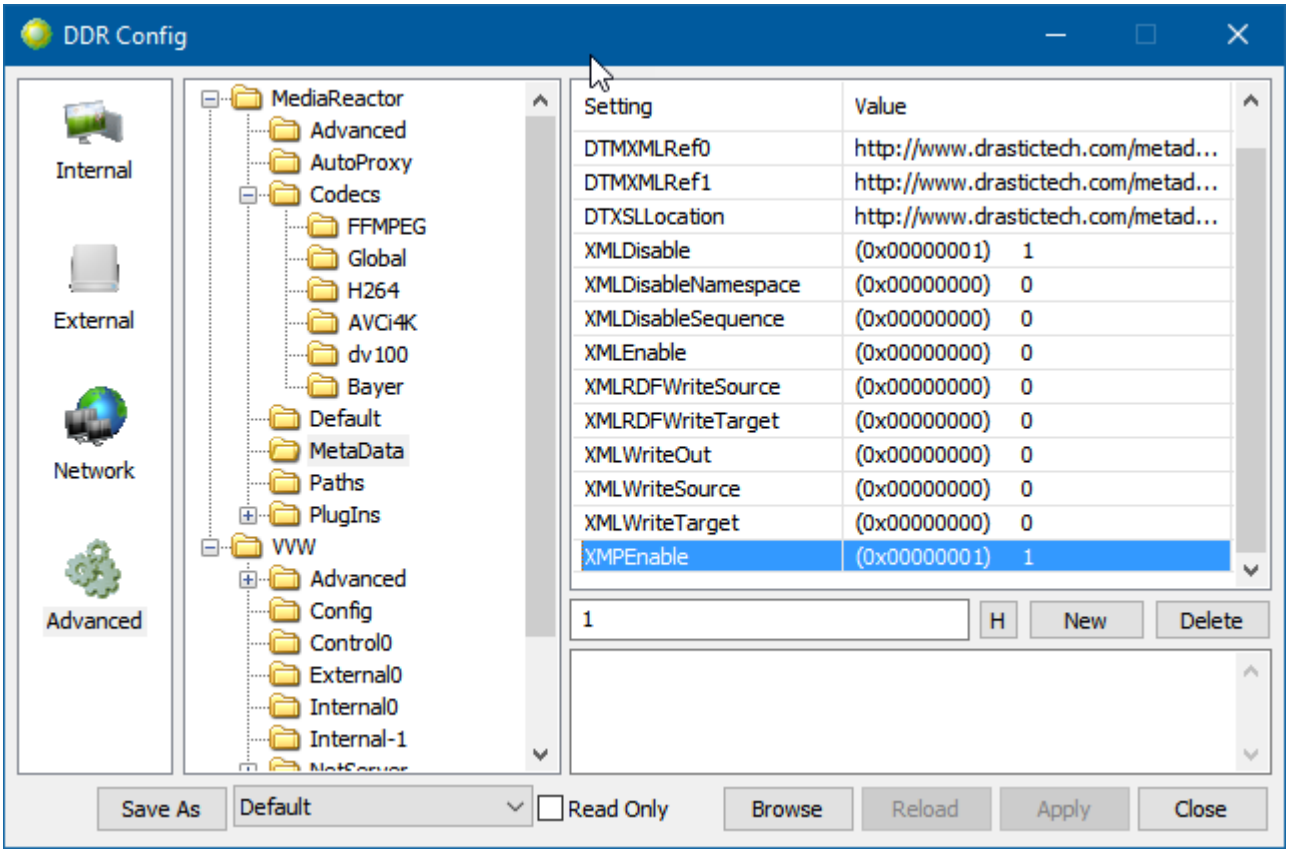
9.5.3 Enable/Disable RTIN File Generation

Use DDRConfig | Advanced to change \MediaReactor\Advanced WriteRTIndexFile



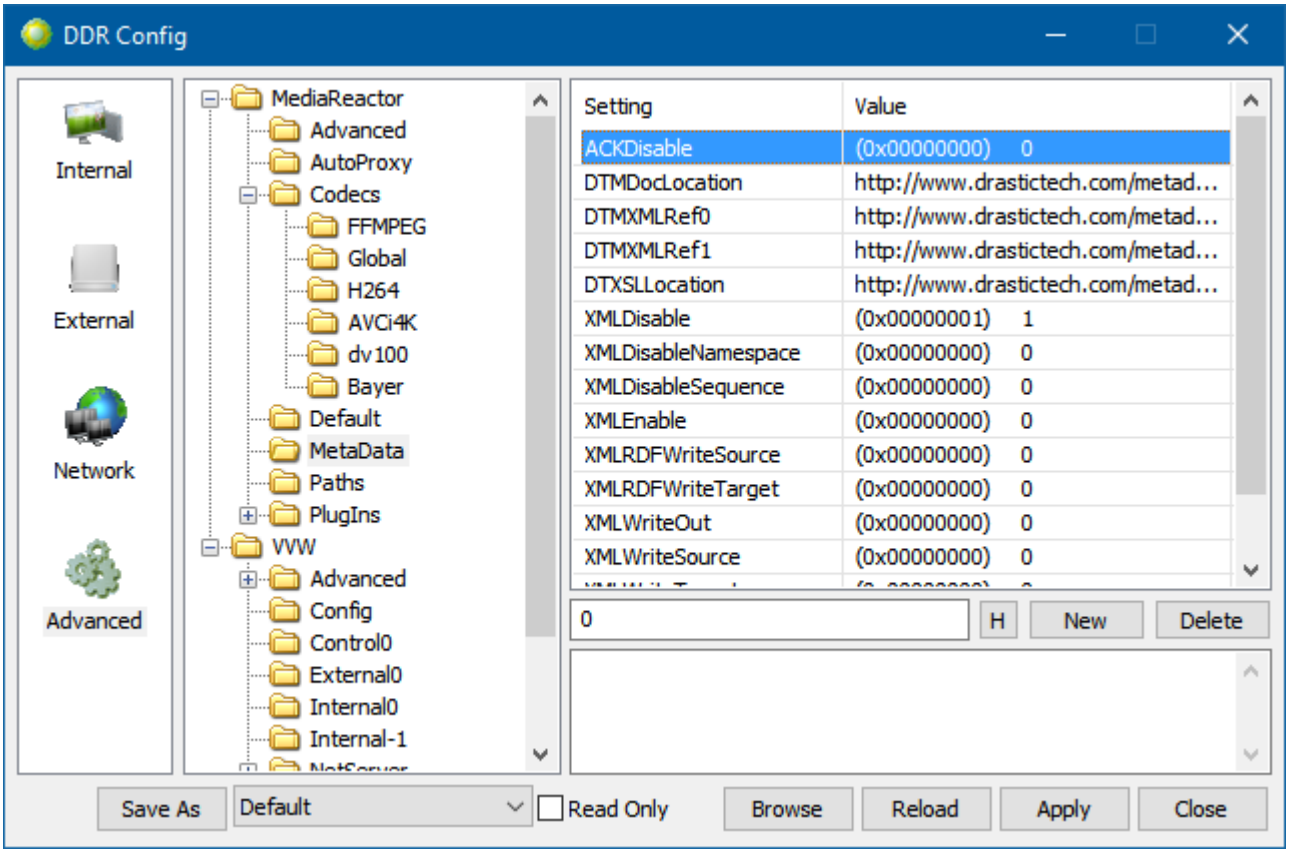
9.5.4 Enable/Disable XMP File Generation

Use DDRConfig | Advanced to change \MediaReactor\Advanced XMPEnable



9.5.5 Enable/Disable ACK Generation

Use DDRConfig | Advanced to change \MediaReactor\Advanced ACKEnable



9.5.6 Cloud / OAuth 2.0 Configuration

For oauth 2.0 access, the oauth access file should be placed in the same directory as the general configuration (config.xml) file. They should be named with their access identifier (e.g. google cloud would be www.googleapis.com.oauth). This file should be security protected so that only the server components can read them. The format of the file is the same as the Oauth 2.0 JSON return:

www.googleapis.com.json
```
{
  "access_token":
"WRQmiEJiibDX3XYrIV4wfKNkg1h70hfnWQZbJYibxdkkeyGu4tSbUFIpSBTLsr9ADCy7K_U",
  "token_type": "Bearer",
  "expires_in": 3600,
  "refresh_token": "hpOe0hALfn2RdnS5bSkwr8zL7lACVatZ-A"
}
```

For cloud access, the BASE64 encoded secret and client_id must also be added to the config.xml at /MediaReactor/oauth2/<name of access point> (e.g. /MediaReactor/oauth2/www.googleapis.com)

For more information, see: http://www.drastic.tv/support-59/supporttipstechnical/273-cloud-api-oauth-2-net-x-code-pfr

9.6 Net-X-Code Ports

Net-X-Code makes use of a number of TCP and UDP ports for discovery, connection and capture. All of these connections must be allowed to pass through any firewall or other network protection for Net-X-Code to work. The main ports Net-X-Code uses include:

80/443 – TCP - Apache server for standard HTML and Net-X-Player
1080 – TCP – Net-X-Code RESTful API port (http)
20/21 – TCP - Optional vsFtp for file access

7630 – TCP – Net-X-Cmd/Net-X-Code server command port
57500-57XXX – UDP = Communications server port
58500 – UDP – Net-X-Base multicast server port
58500 – TCP – Net-X-Cmd → Net-X-Base communication port (outgoing)
59000->59### – TCP – Net-X-Base → Net-X-Cmd communications port, where ### is the max number of channels (incoming)

By default, Net-X-Base uses this multicast address to join all of its components. Please note, this can

be changed in the configuration to allow multiple Net-X-Code groups to exist on the same network.

230.7.7.7 – Net-X-Code system discovery multicast address
The individual streams being captured or transmitted also use multi or unicast addresses, along with UDP or TCP ports. These are user configured, but by default, RTP and UDP traffic often use port 5004 (default for RTP) or port 1234 (the experimental port).

The basic connection process for the whole system is:

- Net-X-Base hosts multicast at 230.7.7.7:58500 UDP for Net-X-Cmds to connect to
- Net-X-Cmd joins 230.7.7.7:(57500 +offset) and sends a message to Net-X-Base
- Net-X-Base responds back through multicast
- Net-X-Cmd receives the message and gets the Net-X-Base IP from the messages
- Net-X-Cmd makes a TCP connect from Net-X-Cmd <ip>:58500 to Net-X-Base <baseip>:59000-50###
- Net-X-Code is spawned, it connects back to the local Net-X-Cmd on port 7630

To enable the multicast, you may have to change

/etc/sysctl.conf
net.ipv4.conf.default.rp_filter = 2

9.7 Using Multiple Network Interfaces

Net-X-Code supports servers with more than one network interface. Net-X-Code is commonly set up this way to allow a video IP network, and a separate command and sharing network to be bridged. By default, Net-X-Code components use the first network interface found. To specify the network interface to use, the IP can be specified in the NetXBase.conf and NetXCmd.conf (or registry areas). To specify the interface to capture video on, you need to set the videoip setting in the main area of the Net-X-Cmd config:

videoip – string – IP address of the interface for Net-X-Code to capture network video streams on

To change the network interface the commands and connections will be made on, the commandip must be set int the main area of the Net-X-Cmd and Net-X-Base configs.

commandip – string – IP address of the interface for Net-X-Cmd/Base to communicate on

For more information on configuration, see the Configuration section of the Net-X-Code API manual.

9.8 Multiple Net-X-Base/Net-X-Cmd Groups

Net-X-Base initiates communications with the Net-X-Cmd daemons using a shared group address. By default, this is 230.7.7.8. If you need to have different groups of Net-X-Base/Net-X-Cmd, this can be changed to any 230.7.7.# value. For Net-X-Base to find the Net-X-Cmd daemons, it has to be changed on all the servers that Net-X-Base needs to communicate with, as well as on the Net-X-Base system. The change must be made in the configuration file (in the location described above) as multicast = “230.7.7.7”

where the “230.7.7.7” is the new IP address. Deleting this setting will return it to the normal group address.

9.9 Net-X-Code in the Cloud/VM

Net-X-Code can be run in cloud VM instances as well as on LANs. Cloud VMs do not generally support multicast group connections, so all servers in a Net-X-Code group must be told which Net-X-Base API server to connect to. This is done by setting the ‘netxbaseip’ to the IP address of the Net-X-Base for each of the Net-X-Cmd servers that are going to be used by that Net-X-Base’s group of servers.
netxbaseip = 192.168.2.100

9.10 Running GUI Mode

Normally, Net-X-Cmd and Net-X-Code run 'headless', so they do not have a GUI that can be used to check their operation. To enable the GUI for debugging, the 'forcegui=1' setting must be set. To set this on Windows, run RegEdit and go to:

HKEY_CURRENT_USER\Software\Drastic\NetXCmd\

Add a new DWORD (if it is not already there) called 'forcegui', without the quotes, and set it to 1.

For macOS, the configuration file is stored here

$HOME/Library/Preferences/com.Drastic.NetXCmd.plist

For Linux, the configuration file is stored here

$HOME/.config/Drastic/NexXCmd.conf

Under [general] add 'forcegui=1' on a new line without quotes.

9.11Linux – SysLog Output

To set up syslog output, add the following lines to /etc/rsyslog.conf:

#route all dt messages to custom log
:app-name, isequal, "dtlog" /var/log/dtlog.log

and then create that file

sudo touch /var/log/dtlog.log

There is also an optional syslog output for Windows. Please contact support@drastictech.com for more information.

9.12 ACK(R) Files

After capturing or converting files, Net-X-Code generally creates an ACK or ACKR file that contains information on the file's source, video and audio parameters, length, time code, UUID and other metadata information. Internally, it is an XML file. For more information on its format, please see the Net-X-Code_API manual.

9.13 RTIN (real time index) Files

While Net-X-Code is capturing it will create an RTIN file alongside the actual media file. These files contain metadata for the media files as well as information on the locations of video and audio data within the media file. This allows Net-X-Player to play the files while they are being captured. They also allow for more efficient access to the files for editing.

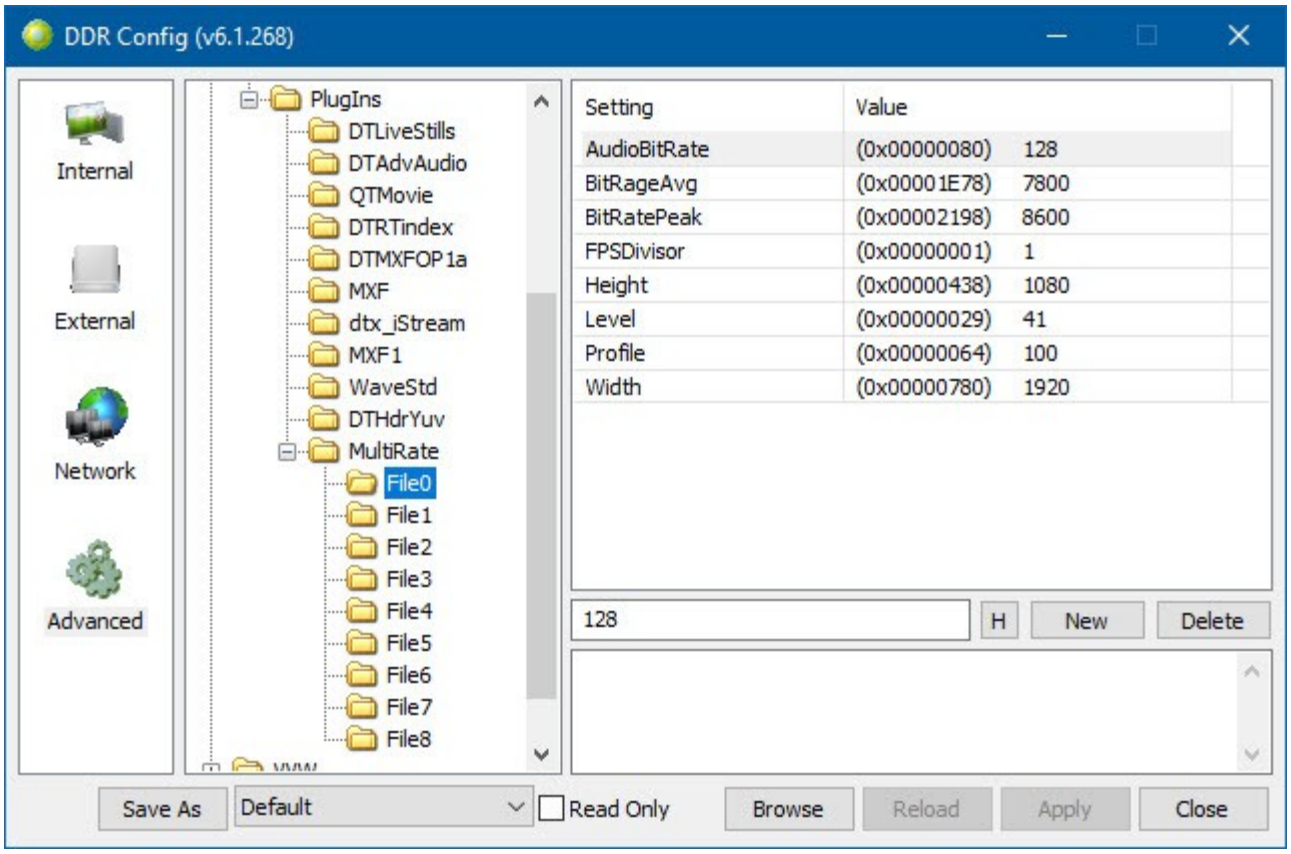
9.14 Multi Rate HLS and DASH Setup

Drastic conversion and capture software support single rate and multi rate file recording and conversion. Up to 10 different bitrate/fps/size variants are supported per multi rate output. The actual files may be TS, MP4 or DASH/Fragmented MP4 with associated MDP and HLS files for live replay of recording files, and automatic adaptation to varying connection conditions.

9.14.1 Low level setup

To set up the various levels of an adaptive bit rate set for HLS or DASH, the DDRConfig Advanced tab can be used. Run DDRConfig and select the Advanced tab. In the config tree, go to

/MediaReactor/PlugIns/MultiRate



Under the MultiRate key, there are 3 settings, all numeric:

HLSfMP4 - if set to 0, HLS will use TS (transport streams), otherwise it will use fragmented MPEG-4 files

TotalMultiRateFiles - the total number of files to create for each multirate output

UseDIrs - if this is not 0, then different rate files will each be put in their own subdirectories. Otherwise they will be in the output directory with the M3U8

For each of the active multirate outputs, as specified by TotalMultiRateFiles, a File# key must be made, starting with File0 and going up to File# where the # is the TotalMultiRateFiles - 1. Within each File# directory you will set up the bitrate/fps/size for that adaptation.

BitRateAvg - the average bit rate in kilobits per second (e.g. 5mbs == 5000kbs)
BitRatePeak - the highest allowable peak bit rate in kilobits per second
Height - the target height (ideally a multiple of the input height)
Width - the target width (ideally a multiple of the input width)
Level - the h.264 level for the target compression (e.g. 100 == 100 decimal)
Profile - the h.264 profile for the target compression (e.g. 4.1 == 41 decimal)
FPSDivisor - 1 == original frames per second, 2 == half, 3 == one third
AudioBitRate - AAC audio bit rate as kilobits per second (e.g. 128k == 128 decimal)

Default Settings

These settings assume a 1920x1080 source stream/sdi:

```
        File0
Width = 1920;
Height = 1080; // 4:3 - 1440
BitRateAvg = 7800;
BitRatePeak = 8600;
FPSDivisor = 1;
AudioBitRate = 128;
Profile = 0x64; // High
Level = 41; //
        File1
Width = 1280;
Height = 720; // 4:3 - 960
BitRateAvg = 6000;
BitRatePeak = 6500;
FPSDivisor = 1;
AudioBitRate = 128;
Profile = 0x64; // High
Level = 40; //
        File2
Width = 1280;
Height = 720; // 4:3 - 960
BitRateAvg = 4500;
BitRatePeak = 5000;
FPSDivisor = 1;
AudioBitRate = 128;
Profile = 0x64; // High
Level = 41; //
        File3
Width = 1280;
```

```
Height = 720; // 4:3 - 960
BitRateAvg = 3000;
BitRatePeak = 3300;
FPSDivisor = 1;
AudioBitRate = 96;
Profile = 0x4d; // Main
Level = 40; //
        File4
Width = 960;
Height = 540; // 4:3 - 720
BitRateAvg = 2000;
BitRatePeak = 2200;
FPSDivisor = 1;
AudioBitRate = 96;
Profile = 0x4d; // Main
Level = 40; //
        File5
Width = 768;
Height = 432; // 4:3 - 480
BitRateAvg = 1100;
BitRatePeak = 1200;
FPSDivisor = 1;
AudioBitRate = 96;
Profile = 0x4d; // Main
Level = 30; //
        File6
Width = 640;
Height = 360; // 4:3 - 480
BitRateAvg = 730;
BitRatePeak = 800;
FPSDivisor = 1;
AudioBitRate = 64;
//
// BASELINE IS ENCODING AS MAIN IN x264
Profile = 0x4d; // Main
Level = 31; //
        File7
Width = 480;
Height = 270; // 4:3 - 360
BitRateAvg = 365;
BitRatePeak = 400;
FPSDivisor = 2;
AudioBitRate = 64;
```

Profile = 0x4d; // Main
Level = 31; //
File8
Width = 416; // 4:3 - 400
Height = 234; // 4:3 - 300
BitRateAvg = 145;
BitRatePeak = 200;
FPSDivisor = 3;
AudioBitRate = 64;
Profile = 0x4d; // Main
Level = 30; //

9.15 Loop HLS Recording SDI/IP

Net-X-Code supports loop recording of multi bitrate HLS streams from IP or SDI sources. Setting this up requires configuration of the capture component and of the HLS adaptive bitrate settings. This article covers the SDI and IP capture. For the ABR setup, see https://www.drastic.tv/support-59/supporttipstechnical/56-multi-rate-hls-and-dash-setup

9.15.1 SDI Setup

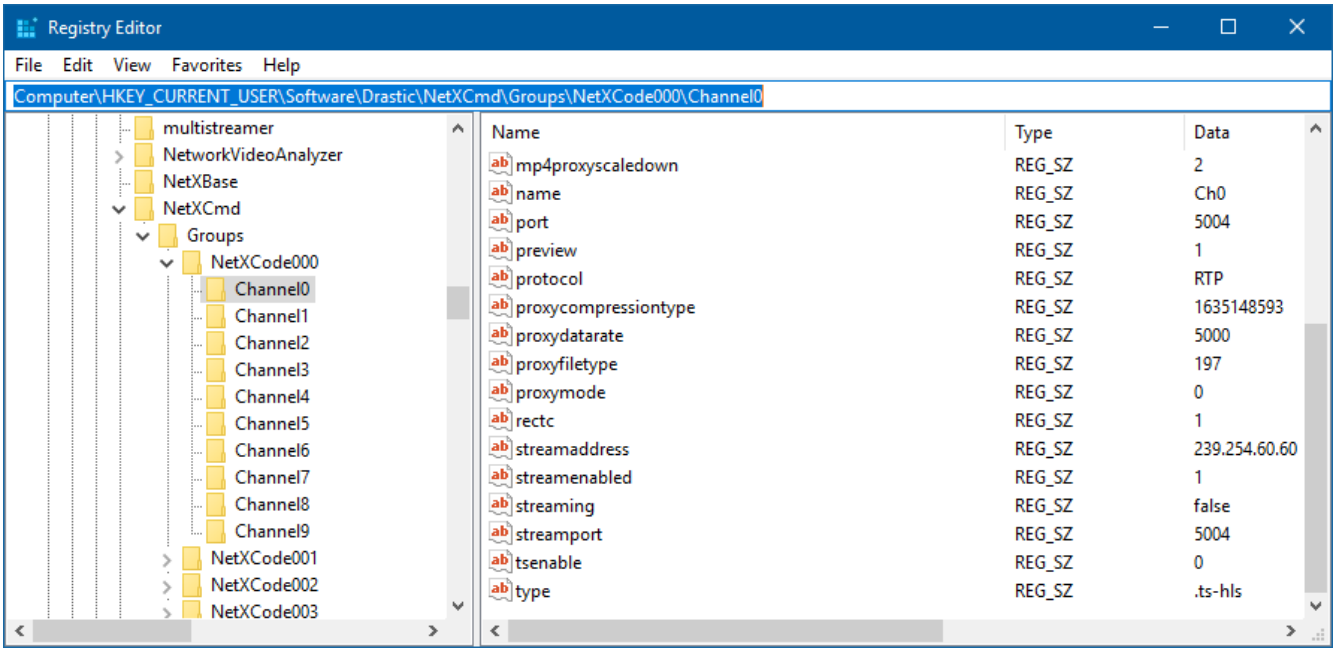
To record from SDI, go to the SDI configuration page on the web or in DDRConfig and select "ts-hls" as the record type. After setting up your input signal format and audio settings, set up the adaptive bit rates here:

https://www.drastic.tv/support-59/supporttipstechnical/303-multirate-hls-dash-setup

9.15.2 IP Setup

To set up an IP record, set up the multicase, port and IP type normally. For record type, select "ts-hls". For windows, this will be in the registry (please note, if running as a service it will be under HKEY_LOCAL_MACHINE instead of HKEY_CURRENT_USER):

Computer\HKEY_CURRENT_USER\Software\Drastic\NetXCmd\Groups\NetXCode000\Channel0



For Linux, this is stored in ~/.config/Drastic in the NetXCmd.conf file.

After setting up your input signal format and audio settings, set up the adaptive bit rates here:

https://www.drastic.tv/support-59/supporttipstechnical/303-multirate-hls-dash-setup

9.16 Status Returns

These are status returns that show up in the Net-X-Code setup and monitor pages.

switch (theState) {
case NetXState_Idle:
m_pStreamState[channel] = QString("Idle");
Net-X-Code has started and is setting up the connection

break;
case NetXState_Active:
m_pStreamState[channel] = QString("Active");
Net-X-Code has connected to a source and is working properly

break;
case NetXState_SourceConnectionPending:
m_pStreamState[channel] = QString("Connection Pending");
The connection has started, but no data has been sent/received yet

break;
case NetXState_SourceClosing:
m_pStreamState[channel] = QString("Source Closing");
The connection is in the process of closing, normally because Net-X-Code is shutting down

break;
New States

case NetXState_SourceDisconnected:
m_pStreamState[channel] = QString("Source Disconnected (waiting)");
The wait for connection has timed out, or closed, so it is waiting for a new connection

break;
case NetXState_SourceCapturePending:
m_pStreamState[channel] = QString("Waiting For Source Capture");
Net-X-Code is waiting for data from the source.

break;
case NetXState_SourcePending:
m_pStreamState[channel] = QString("Waiting For Source");
Net-X-Code is waiting for the source

```
        break;
        case NetXState_Error:
        m_pStreamState[channel] = QString("Error");
```
Catch all error. Check the error code for the specific issue.

```
        break;
        case NetXState_NotFound:
        m_pStreamState[channel] = QString("Not Running");
```
Net-X-Code is not running, and cannot receive connections. It must be started to change to another state.

```
        break;
        case NetXState_Invalid:
        m_pStreamState[channel] = QString("Invalid");
```
The settings for Net-X-Code are invalid and it cannot run properly

```
        break;
        case NetXState_TargetClosing:
        m_pStreamState[channel] = QString("Target Closing");
```
The target file/output is closed.

```
        break;
        case NetXState_Closed:
        m_pStreamState[channel] = QString("Closed");
```
Net-X-Code has closed, and should start listening again shortly

```
        break;
        case NetxState_NoLicense:
        m_pStreamState[channel] = QString("No License Found");
```
License not found, has expired, or is invalid.

```
        break;
        case NetXState_Unknown:
        m_pStreamState[channel] = QString("Unknown");
```
Net-X-Code cannot find another state, but there is no specific error.

9.17 Net-X-Code HTML/XML API

Please see the Net-X-Code_API.pdf for more information on this protocol.

9.18 Net-X-Player HTML API

Please see the Net-X-Player.pdf for more information on this component.

9.19 MediaReactor Workstation

For more information on editing live, recorded and offline files in Avid, Adobe, Assimilate, Nucoda, Autodesk, QuickTime and other products, please see:
http://www.mediareactor.ws

9.20 videoQC

For reviewing, checking and clipping live, recorded and offline files from Windows, macOS, and Linux, including full waveform, vector scope, video and audio tools, please see:
http://www.videoqc.com

9.21 Setting up Cloud (OAuth 2.0) Access for Drastic software

Drastic software supports direct access to cloud resources using http, http2, ftp and other file sharing methods. For cloud providers like Google, an authentication system is also required to access the stored files. All of Drastic's version 6 or greater software supports authenticating via OAuth 2.0 across an https transport. This is most useful for Net-X-Code's partial file restore system, but can also be used from videoQC or MediaReactor. Accessing these resources requires a second level of setup, beyond the basic software setup, and this article provides an overview on that process.

https://www.drastic.tv/support-59/supporttipstechnical/22-setting-up-google-cloud-oauth-2-0-access

9.21.1 Cloud file access - Direct

The simplest way to set up access to a cloud is to use a file system redirector (If this is not possible in

your scenario, please see the next section of this article). In the case of Google, the easiest way to do this is with their FUSE file system add on. For more information on setting this up, please see:

https://cloud.google.com/storage/docs/gcs-fuse

9.21.2 Cloud file access - https

As an example, this section will go over the steps required to set up access to a Google cloud 'bucket' from Drastic software. The steps are operating system independent, other than the directories in which the access files are stored. With the access file, they should be set up to be read only by the Drastic software, as they will contain sensitive information that could be used to access your cloud files. For the purposes of this article, you will need to use one of the following directories:

Windows:
C:\ProgramData\Drastic\
Alt - C:\Documents and Settings\<username>\Drastic\

Linux:
/etc/Drastic/
Alt - /Home/<username>/Drastic/

macOS:
/Library/Applications Support/Drastic/
Alt - /Home/<username>/Drastic/

In order to set up OAuth 2.0, you will need to get information and data from your cloud account. In this case, we will use Google's cloud service as an example.

First you need to authorize and get the application credentials' json. Using the gcloud command from the Google cloud SDK is the easiest way to do this. Run this command on your server:

gcloud auth application-default login

Alternately, you can create this json file from Google's developer API at:

https://console.developers.google.com/apis/credentials

This will let you log into the Google OAuth server, and then save a 'application_default_credentials.json' on your system. It should have data similar to this in it:

{

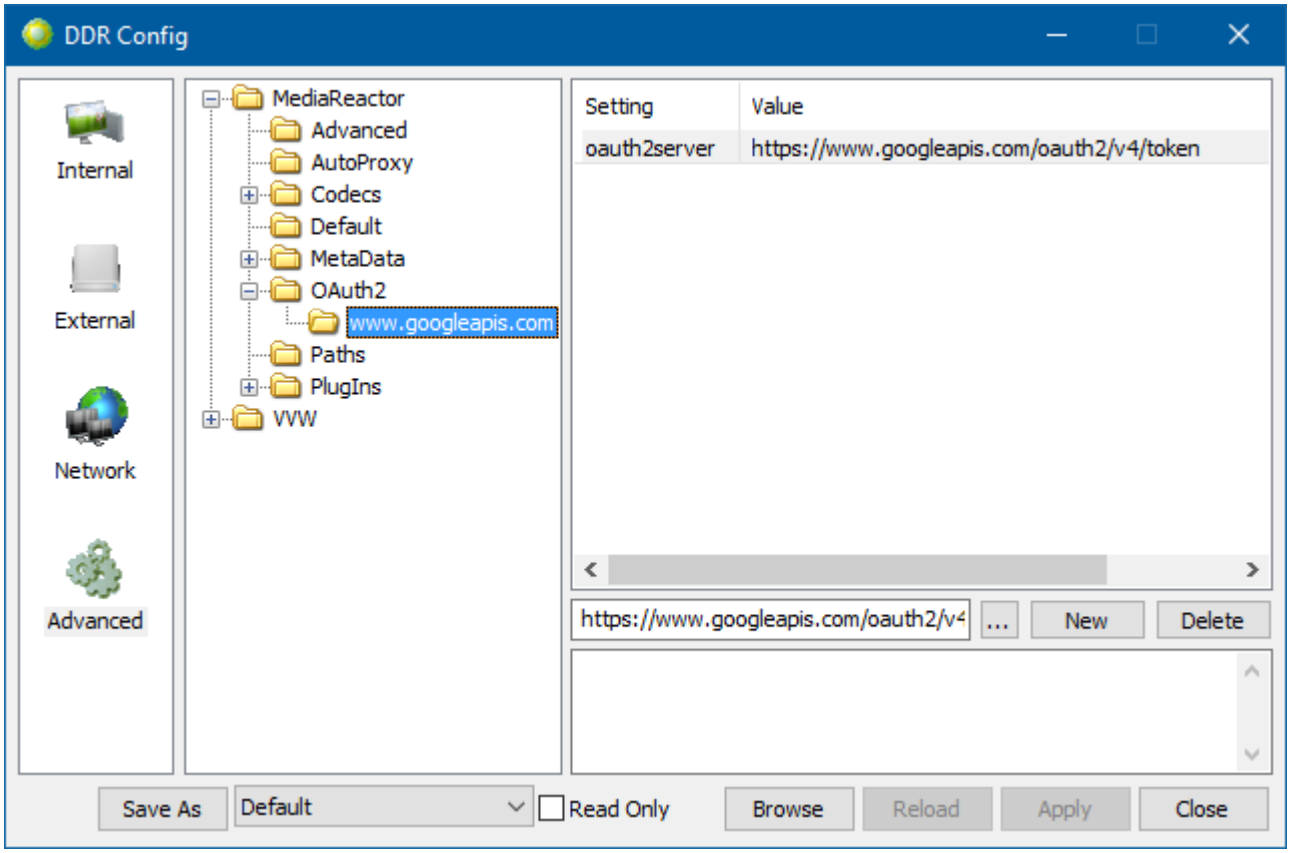
"client_id": "dasdsa850-6qr4p6gpi6hnwe654yrtjuq83di341hur.apps.googleusercontent.com",
"client_secret": "mgfei9jgf19q7MsssTy",
"refresh_token": "fw98jsduTmScuUjavQzchmf8wssssu5y5f85mAmcvaa",
"type": "authorized_user"
}

This file needs to be copied to the correct directory above, and renamed:

www.googleapis.com.json

Once you have the correct json file, you will also need to specify which OAuth 2.0 authentication server to use. This is done in the config.xml, normally with the DDRConfig utility. For each json file, there should be a matching folder under \MediaReactor\OAuth2\. Within that folder should be an oauth2server entry with the URL of the server you want to use, For Google cloud, this would normally be

\MediaReactor\OAuth2\www.googleapis.com\oauth2server = "https://www.googleapis.com/oauth2/v4/token"



Drastic software will use this config to create and refresh the access as needed so that it can access

your OAuth 2.0 protected files. To access them, simply specify them as URLs. For a bitbucket on Google called 'netxcode-pfr' with a file called 'sourceABR.mp4', the file URL to send would look like:

https://www.googleapis.com/storage/v1/b/netxcode-pfr/o/sourceABR.mp4?alt=media

The alt=media is recommended but optional in most cases. Not including it will cause a secondary request to be sent, based on the JSON return from google. Other cloud systems' URLs will vary, but the basic structure will be similar to this.

9.22 Setting up Amazon S3 AWS Access for Drastic software

Drastic software supports direct access to cloud resources using http, http2, ftp and other file sharing methods. For cloud providers like Amazon, an authentication system is also required to access the stored files. All of Drastic's version 6 or greater software supports authenticating directly with Amazon via AWSAccessKeyId/SecretKey through an https transport. This is most useful for Net-X-Code's partial file restore system, but can also be used from videoQC or MediaReactor. Accessing these resources requires a second level of setup, beyond the basic software setup, and this article provides an overview on that process.

https://www.drastic.tv/support-59/supporttipstechnical/24-setting-up-amazon-s3-aws-access

9.22.1 Amazon S3 Cloud file access - https

As an example, this section will go over the steps required to set up access to an Amazon S3 Cloud 'bucket' from Drastic software. The steps are operating system independent, other than the directories in which the access files are stored. With the access file, they should be set up to be read only by the Drastic software, as they will contain sensitive information that could be used to access your cloud files. For the purposes of this article, you will need to use one of the following directories:

9.22.1.1 Windows:

C:\ProgramData\Drastic\
Alt - C:\Documents and Settings\<username>\Drastic\

9.22.1.2 Linux:

/etc/Drastic/
Alt - /Home/<username>/Drastic/

9.22.1.3 macOS:

/Library/Applications Support/Drastic/
Alt - /Home/<username>/Drastic/

In order to access Amazon, you will need to generate a rootkey.csv with the AWSAccessKeyId and AWSSecretKey, and save it in the OS specific directory above. The file should look something like

this:

```
AWSAccessKeyId=MGIEOWJDSIONGFSUIGNW
AWSSecretKey=djJFASjfowjgwof8473sdjhHFDJSHFSO
```

Once that file is present, Drastic software will use it whenever access to Amazon S3 AWS is attempted. This does mean it will not be able to access public resources when the key is in place. If you need to access public S3 data, then simply rename or delete the rootkey.csv.

To generate the key, log into aws.amazon.com. Under your username at the top right, select 'My Security Credentials'. On that page, expand the 'Access keys (access key ID and secret access key)'. There you can create new access key(s) and save them to rootkey.csv on your server.

9.23 Running Net-X-Code In The Cloud

Net-X-Code can be run on a LAN or on VM instances in the cloud. When running on a LAN, Net-X-Code uses a multicast group address to all the various servers to find the correct base server to work with. When running in a cloud VM, multicast is disabled as there is no actual local network for it to be limited to. When running in the cloud, each work server must be configured to tell it where its base server is, so that it joins the right group. To do this, set the value of **netxbaseip** equal to the address of the Net-X-Base server for that servers group in the NetXCmd.conf, registry or plist. When this is set, the server will reach out directly to the base when it runs. The mode can also be used for LAN implementations, removing the need for a group address.

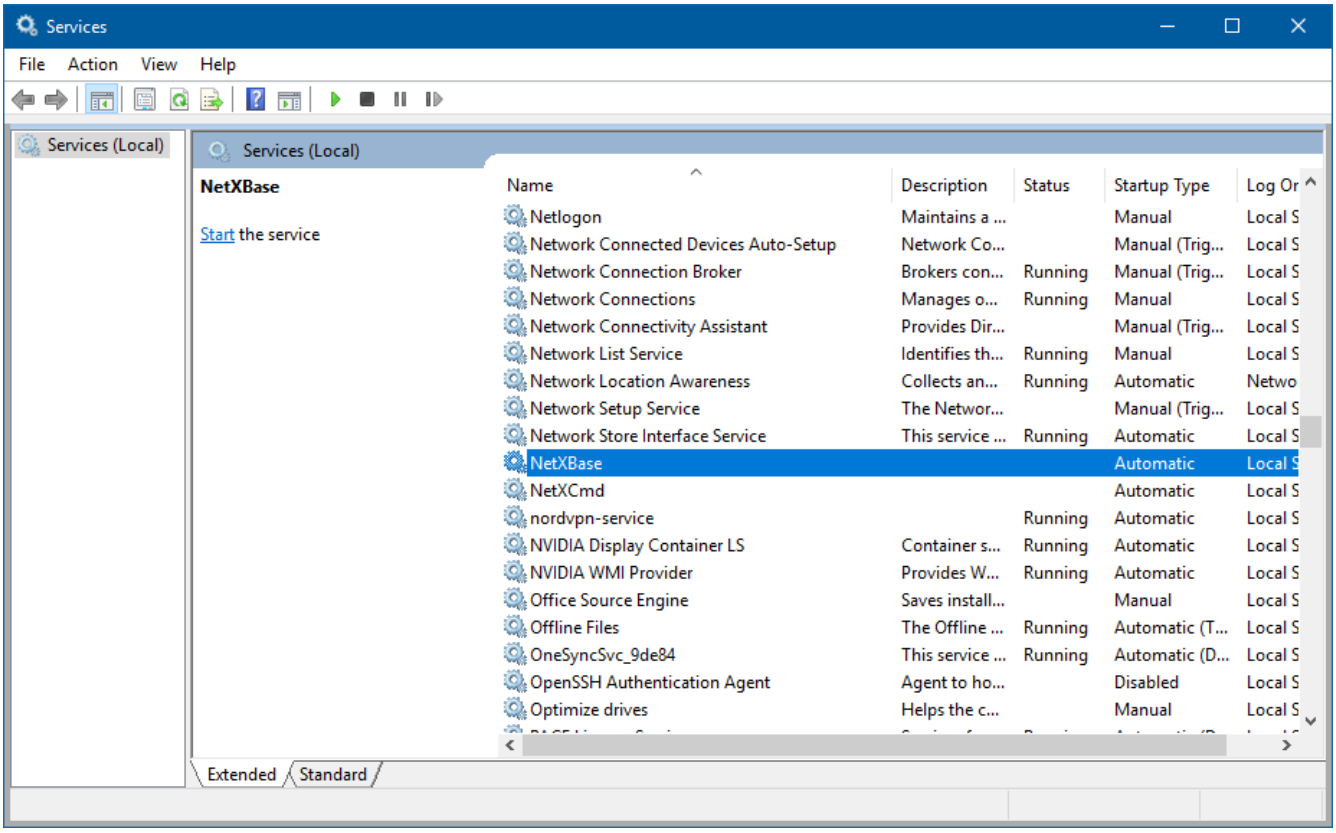
9.24 Running Net-X-Code With No Server

Net-X-Code is normally run as on a server, where the parts of Net-X-Code run automatically as services. For some applications, only part of Net-X-Code needs to be run, or it only needs to be run some of the time. This article explains how to set up Net-X-Code server on Windows so that its parts can be run manually.

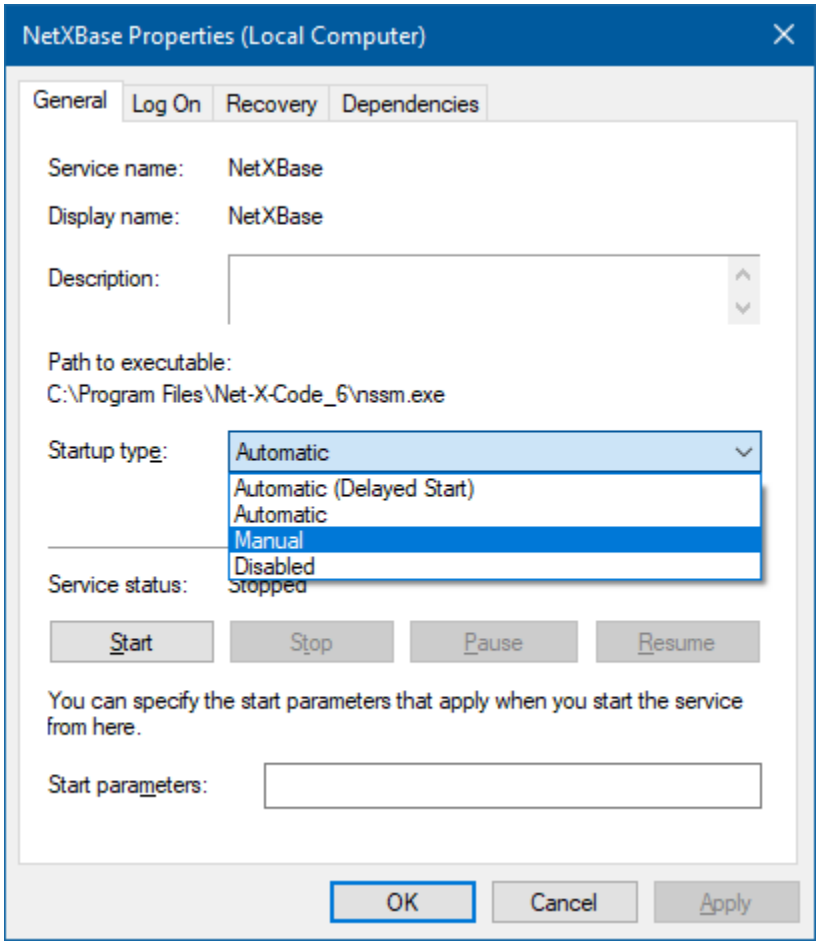
9.24.1 Net-X-Code No Server Setup

If you are setting up to only use part of the Net-X-Code system, you do not need to install the UwAmp/Apache/PHP/mySQL portions (unless you are using a local MySQL instance for the Media File Scanner add on). You can just install the Net-X-Code installer, and use its built in server at port 1080 when you run it. This means some features, like listing MP4 files on disk, will not work, but most of the major features will.

Once Net-X-Code is installed, you will want to stop the services from running automatically. In the Control Panel, bring up the Services window:



The two startup services for Net-X-Code are Net-X-Base and Net-X-Cmd. Right click on each, and select the Properties menu item. This will bring up the Properties dialog, where you can change the Startup Type from Automatic to Manual. Do this for both services.



This will stop Net-X-Base, Net-X-Cmd, Net-X-SDI and other services from running on your machine at startup.

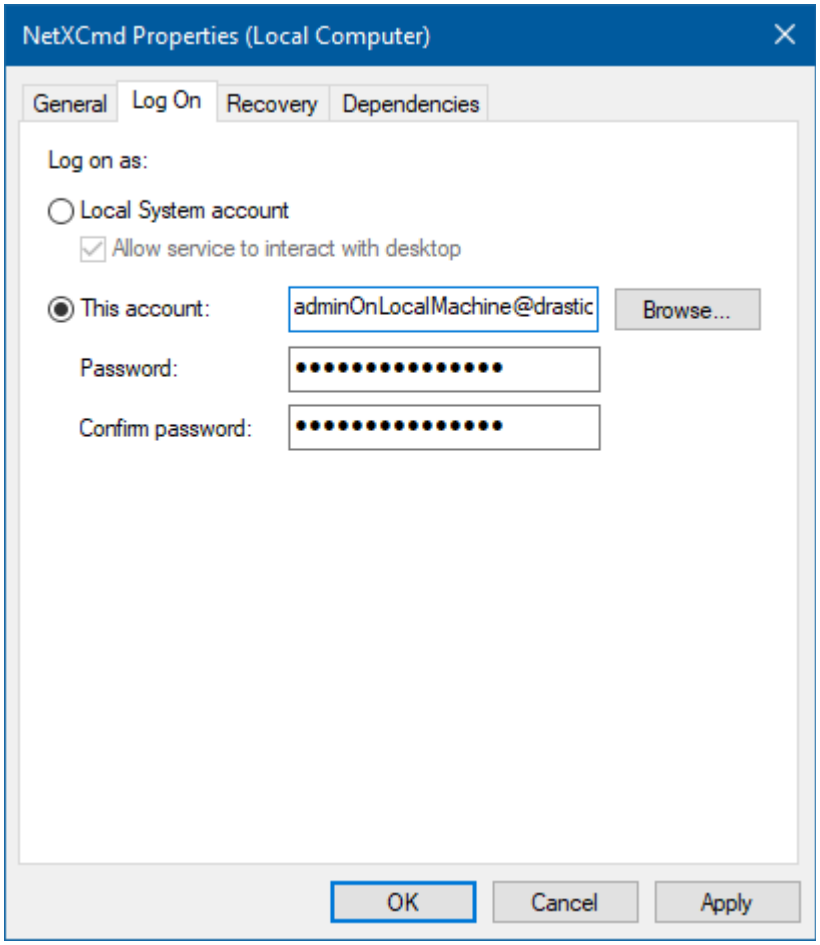
9.24.2 Service Config and Privileges

When running Net-X-Cmd/Net-X-Base as a service, there are two scenarios:

1. Run as a service with 'Allow Interaction with Desktop' enabled (the default)

2. Run as a specific user, to allow for that user’s configuration and access rights (recommended)

If you are running as a user, that user must have administration rights on the local server. To set up a user, go to the Services app and right click on Net-X-Cmd (and later Net-X-Base) and select Properties. Click on the Log On tab, and enter your user's name and password here.



If your Net-X-Code is running as a service, without specifying a user, then the configuration in Windows will be kept under HKEY_LOCAL_MACHINE in the registry, as opposed to HKEY_CURRENT_USER. If you have specific setups, like server grouping, the settings need to be moved from current user to local machine before running.

9.24.3 Running From Desktop

If you are running manually, you will want to see the graphical user interface as well (this is normally hidden when running as a service). To enable it, run RegEdit.exe from the Run box or command prompt. Follow the tree on the left to:

Computer\HKEY_CURRENT_USER\Software\Drastic\NetXCmd

Computer\HKEY_CURRENT_USER\Software\Drastic\NetXBase

Computer\HKEY_CURRENT_USER\Software\Drastic\NetXSdi

In each add or modify the "forcegui" string (REG_SZ) to "1". This will cause the GUIs to show, making it easier to start and stop them.

9.24.4 Using Net-X-Code With No Server

Without the startup, you will need to run the components from the startup menu or from the install directory. To get the system running, you need to run Net-X-Base and Net-X-Cmd, in that order:

NetXBase.exe - Net-X-Code Master Control

NetXCmd.exe - Net-X-Code Daemon

The Net-X-Cmd will automatically run Net-X-SDI for you. Once these three programs are up, you can point a browser at:

http://127.0.0.1:1080

and you will get the standard web interface up.

9.25 Net-X-Code and Avid Interplay/MediaCentral Setup

Avid Interplay/MediaCentral provides a convenient method to share media and projects among a group of Media Composer stations or other Avid products. Drastic's Net-X-Code Server supports direct communication with Avid Interplay/MediaCentral servers, include checkin, direct write and edit while capture (EWC) when using the Net-X-Convert module (file to file) or Net-X-SDI (SDI/IP to file).

9.25.1 Setting Up Net-X-Code for Interplay

Supported Platforms: Windows 64 bit

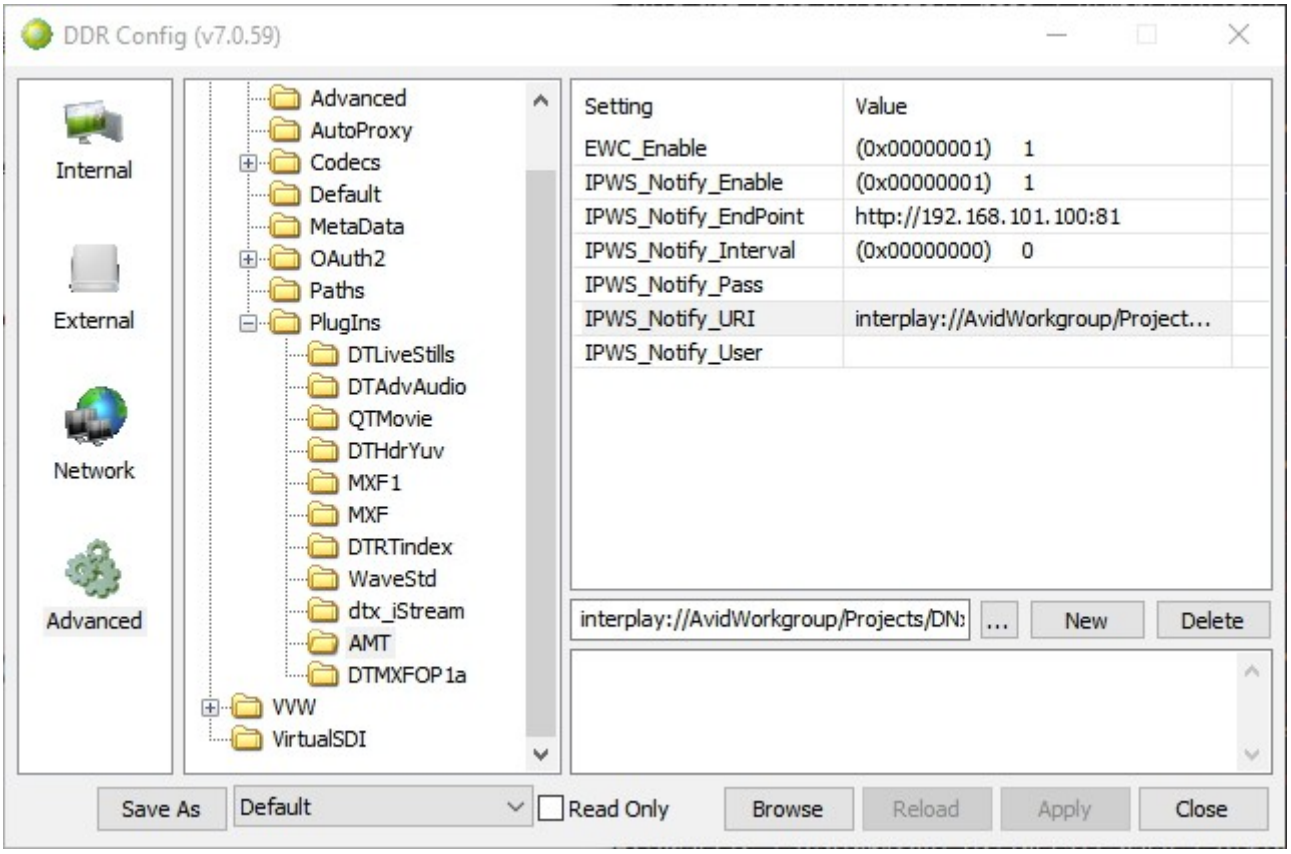
(we may add support for macOS in the future, if there is enough demand)

9.25.2 Interplay Requirements

Interplay/MediaCentral Server installed and configured
Interplay/MediaCentral Web Services installed and configured
If run on the main server, the ports must be changed from 80/443 to 81/444
This change must be reflected in the config below (IPWS_Notify_EndPoint)
The Firewall on the server must be configured to allow the server on these ports
Shared database on separate drive
Currently, the "project" folder must exist on Interplay/MediaCentral
Shared storage setup, usually via UNC path
The Interplay/MediaCentral server must be able to access the storage
The Net-X-SDI/Net-X-Code instance must be able to access the storage
Any Media Composer stations must be able to access the storage
The storage must be fast enough for the format being captured
Time of day on all systems must match (use NTP)

9.25.3 Net-X-Code Requirements

Net-X-Code supports both converting directly into Interplay/MediaCentral from any supported file format as well as recording directly into Interplay/MediaCentral with support for Edit While Capture (EWC). This requires selecting the Drastic AMT writer, and configuring the settings to match your Interplay/MediaCentral environment.



The setup variables are:

EWC_Enable - Enabled edit while record

IPWS_Notify_Enable - Notify an Interplay/MediaCentral server (otherwise just write the MXF/AAF locally)

IPWS_Notify_EndPoint - The Name/IP and port of the Web service for Interplay/MediaCentral

IPWS_Notify_Interval - How often to send the notifications

IPWS_Notify_URI - (interplay://AvidWorkgroup) Where the interplace database web notification exists. It will always starts with your interplay:// followed by the workgroup you want to use (eg. interplay://AvidWorkgroup/). To this, the default project string below, or the project set from the Web UI, will specify where the file is to be added. Please note, this project must exist, or the add will fail.

interplay:// this is the URL and must start the string
AvidWorkgroup/ this has to be an existing workgroup on the server

IPWS_DefaultProject - (Projects/Drastic) Where to place the new clips in the database. We automatically include the IPWS_Notify_URI and this setting specifies the project and bin strings. The

project specified here must exist on the Interplay/MediaCentral before recording starts. The format is

Projects/ this is the name of the projects folder on the server, it is made by default
<project> the string following the projects folder is the user project name. It must exist on the server.

Example IPWS_Notify_URI:

interplay://AvidWorkgroup/Projects/DNx36

IPWS_Notify_User - User name to access Interplay

IPWS_Notify_Pass - Password to access Interplay

9.26 eMAM Integration

eMAM provides a number of integrations with Drastic products including Net-X-Code, Net-X-Convert, and Net-X-Proxy. For most cases, the main configuration is done within eMAM itself. In the case of live capture, configuring the Drastic server to send messages to eMAM allows eMAM to detect new records and allow the user to start using them while they are still recording. This article has the details for that setup.

9.26.1 eMAM Notification Configuration

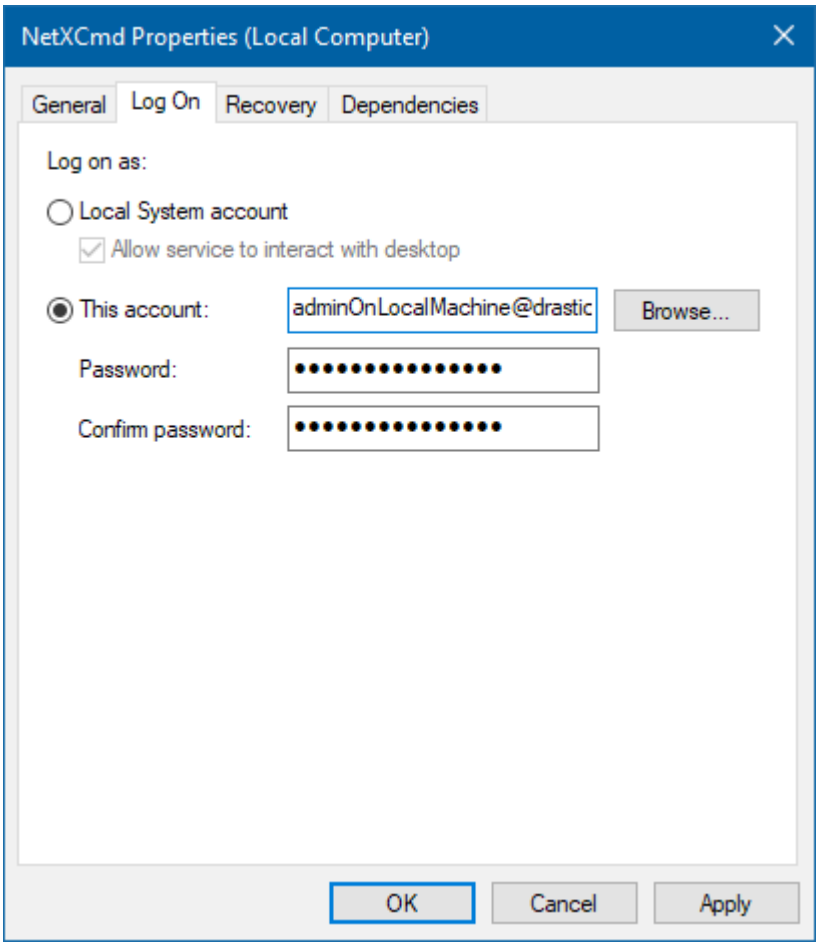
Net-X-Code uses eMAM's REST API to notify eMAM of new records. To use that API, the location of the eMAM server on the network must be specified and the authentication for the server must be set up on the Net-X-Code server. The eMAM server must have an IPv4 address (like '192.168.1.200') and it must have a name that can be resolved to that address (like 'mam'). This can be set up on your DNS server, or just in the host file of the Net-X-Code server. So long as you can ping 'mam' on the drastic server and get back the IP address, you are ready to configure.

9.26.2 Service Setup (Windows Only)

By default, the installer will set up two services: Net-X-Base and Net-X-Cmd. Net-X-Base is the API server, and Net-X-Cmd controls the services the server provides. As such, Net-X-Cmd is dependent on Net-X-Base, if they are on the same machine. In a multi server setup, only one machine will have a Net-X-Base service, and all machines will have a Net-X-Cmd service.

To run properly (to connect to network drive, Bluefish444/AJA, export network servers) the service

must be logged on as a user with administrator privileges on the local machine. Go to the control panel and run the Services app. Right clip on the Net-X-Cmd (and then the Net-X-Base) services and select Properties. Select the Log On tab and change the account and password to your local admin. Stop and re start the services to make sure they log in properly.



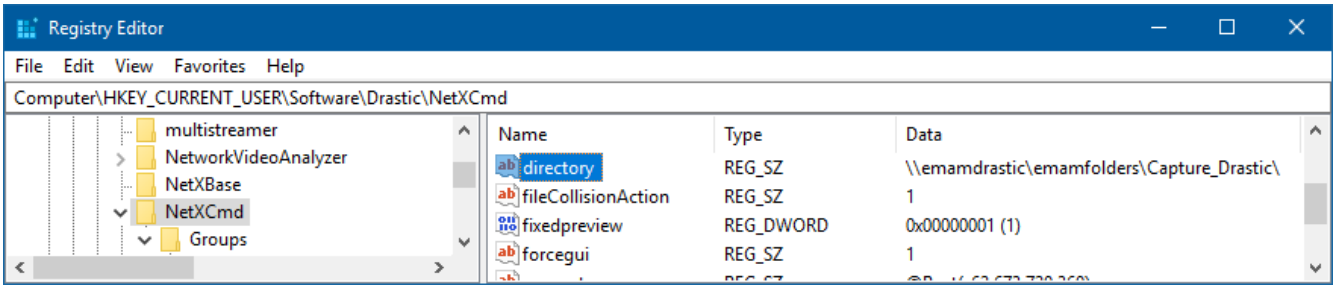
Please note: It is possible to run as 'Local System Account' with 'Allow service to interact with desktop' enabled, but in that case all the settings will be under HKEY_LOCAL_MACHINE instead of HKEY_CURRENT_USER, and any changes on the user side will need to be migrated to the local machine keys.

Record/Original Directory Overrides

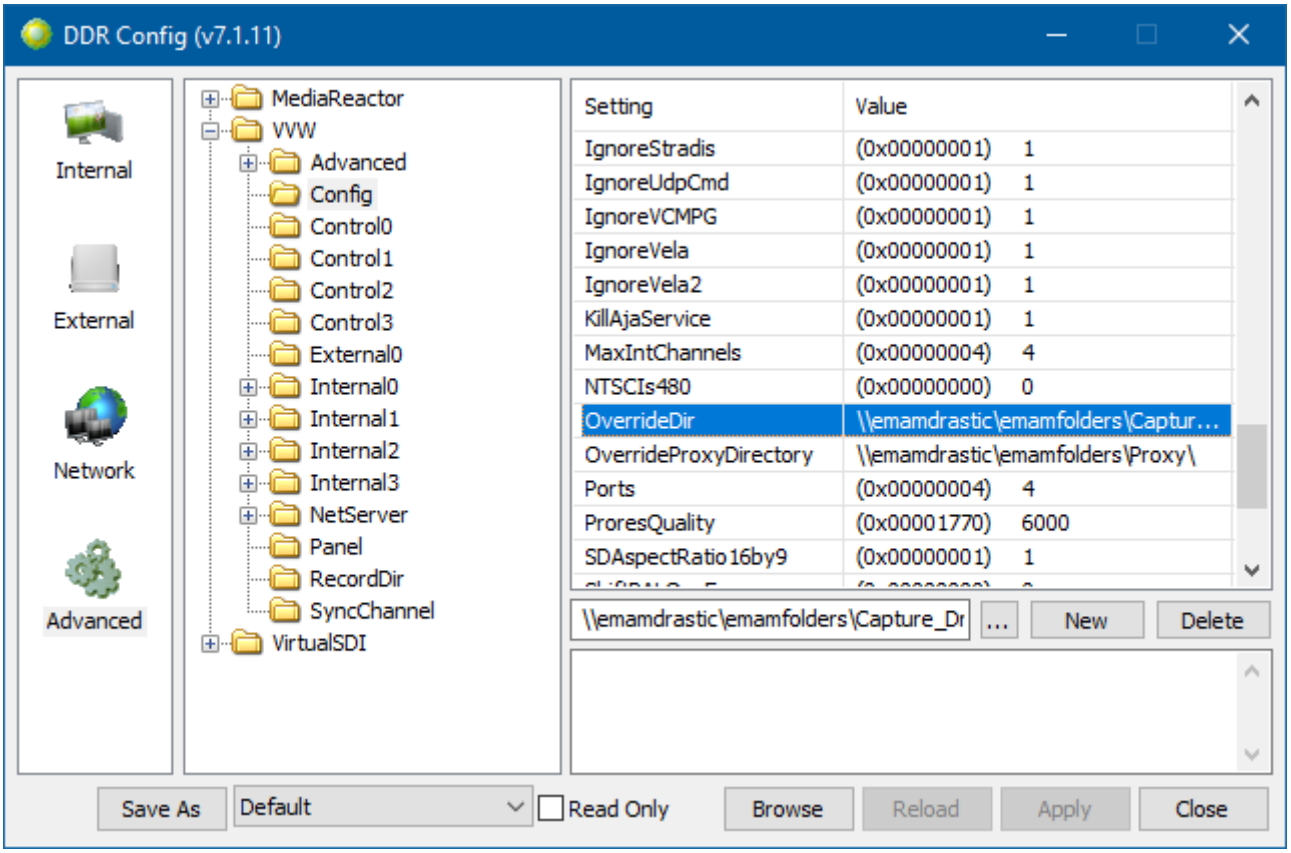
eMAM uses an 'original' and a 'proxy' directory to organize the incoming files. By default, Net-X-Code can record to any available storage. To limit the directories to the ones eMAM needs, it is best to set directory overrides for the IP capture, SDI capture and Proxy directories. For the IP capture, the override is set in the system settings, either the regedit for windows, the .conf files for Linux or the .prefs for macOS (there is more information on these here).

In either NetXCmd.conf/pref or "HKEY_CURRENT_USER\Software\Drastic\NetXCmd" (or under

HKEY_LOCAL_MACHINE for non user services), add the string variable "directory" and set it to the original directory for eMAM.



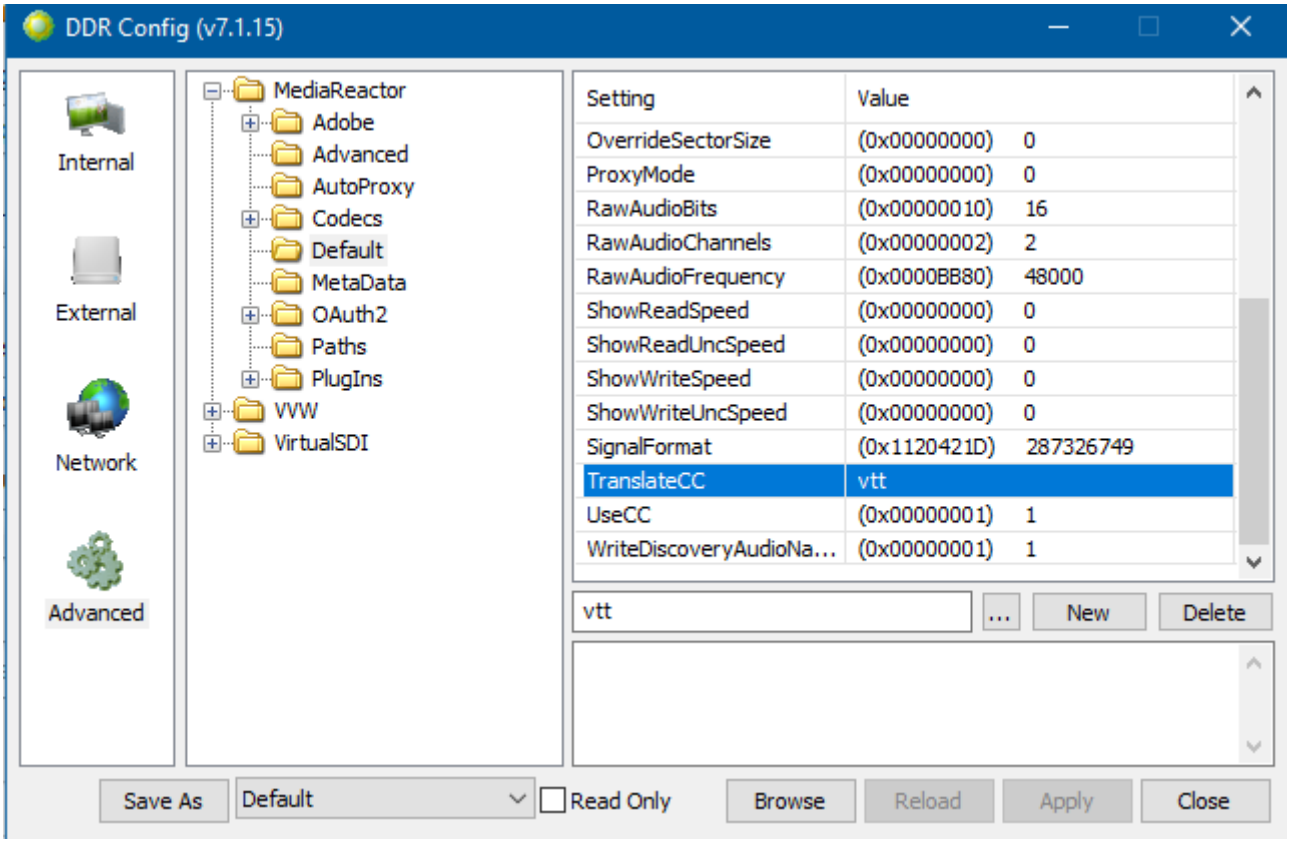
To override the SDI and Proxy directories, run DDRConfig (or modify the config.xml file as described here) and go to \\VVW\Config\ and change OverrideDir and OverrideProxyDirectory to the correct paths:



9.26.3 Automatic SRT or VTT Conversion

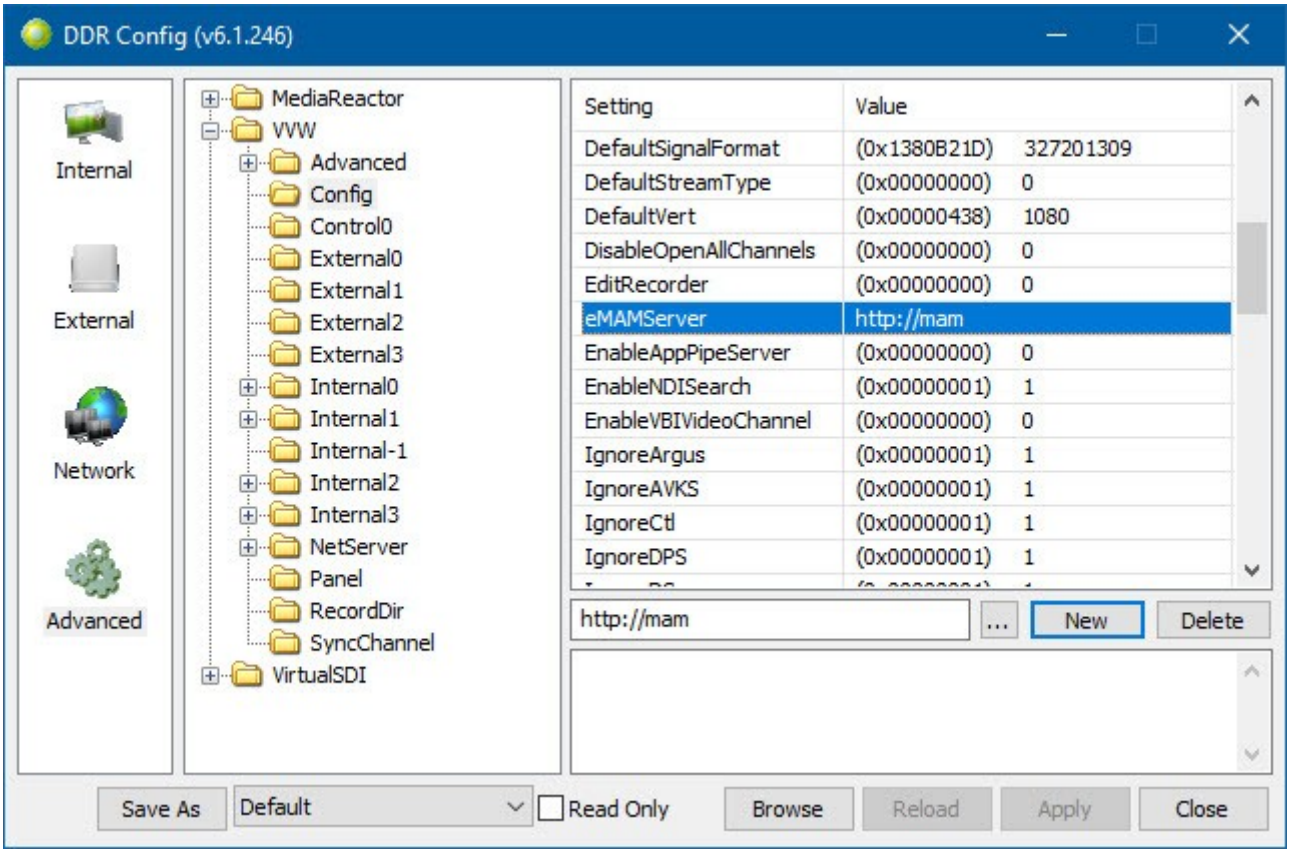
By default, Net-X-Code records SCC files for SD closed captions, and MCC files for HD closed captions, as well as embedding them into the media files, if possible. eMAM prefers SRT or VTT files,

so these can be generated automatically at the end of a record by setting the TranslateCC to VTT (or SRT) in **DDRConfig | Advanced** under **\MediaReactor\Default\TranslateCC**



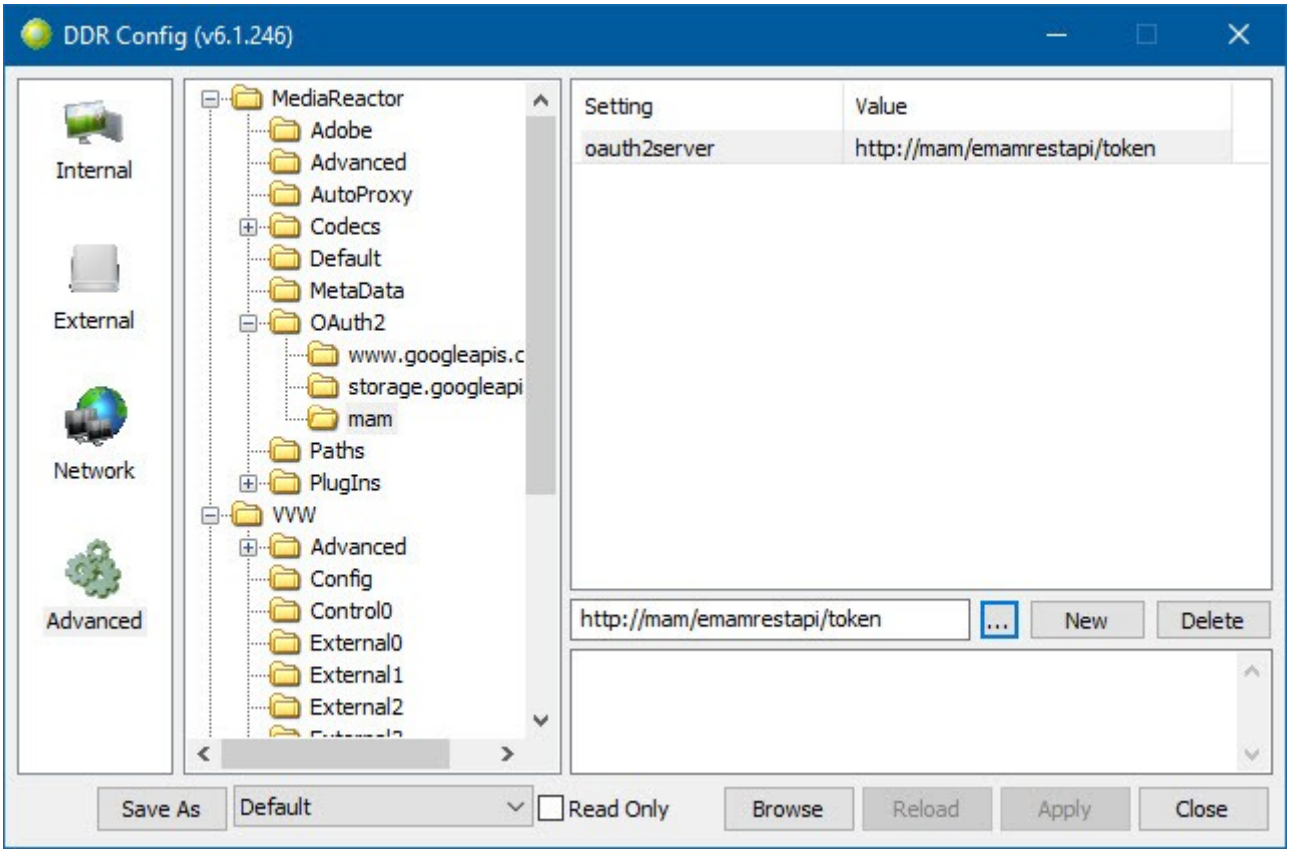
9.26.4 OAuth2 - secure authorization setup

To specify the eMAM location, run DDRConfig, select the Advanced tab and go to /VVW/Config. Add a new string called 'eMAMServer' (without the quotes) and specify the server name or address:



You will also need to set up the OAuth2/Token server address at /MediaReactor/OAuth2/<eMAMServer>, or in this case the key would be /MediaReactor/OAuth2/mam/. Please note, the 'mam' is an XML key, so it cannot begin with a number or other illegal XML key characters. If your domain begins with a number, then name the key removing any leading numbers, and any other illegal start characters from the front of the domain (e.g. 647.emamcloud.com would become emamcloud.com). The full address will be used to contact the server, but the search for the oauth server will use the shortened name.

Under that key, you will need a new string call oauth2server. That should be set to the token server address on the eMAM server.



To set up the authentication, you will need to create a JSON file in a text editor that will be used when connecting to the eMAM server. This file must have the same name as the server (in this case mam.json) and must be placed in the following location

Windows
C:\ProgramData\Drastic\

Linux
~/Drastic/

macOS
/Library/Application Support/Drastic/

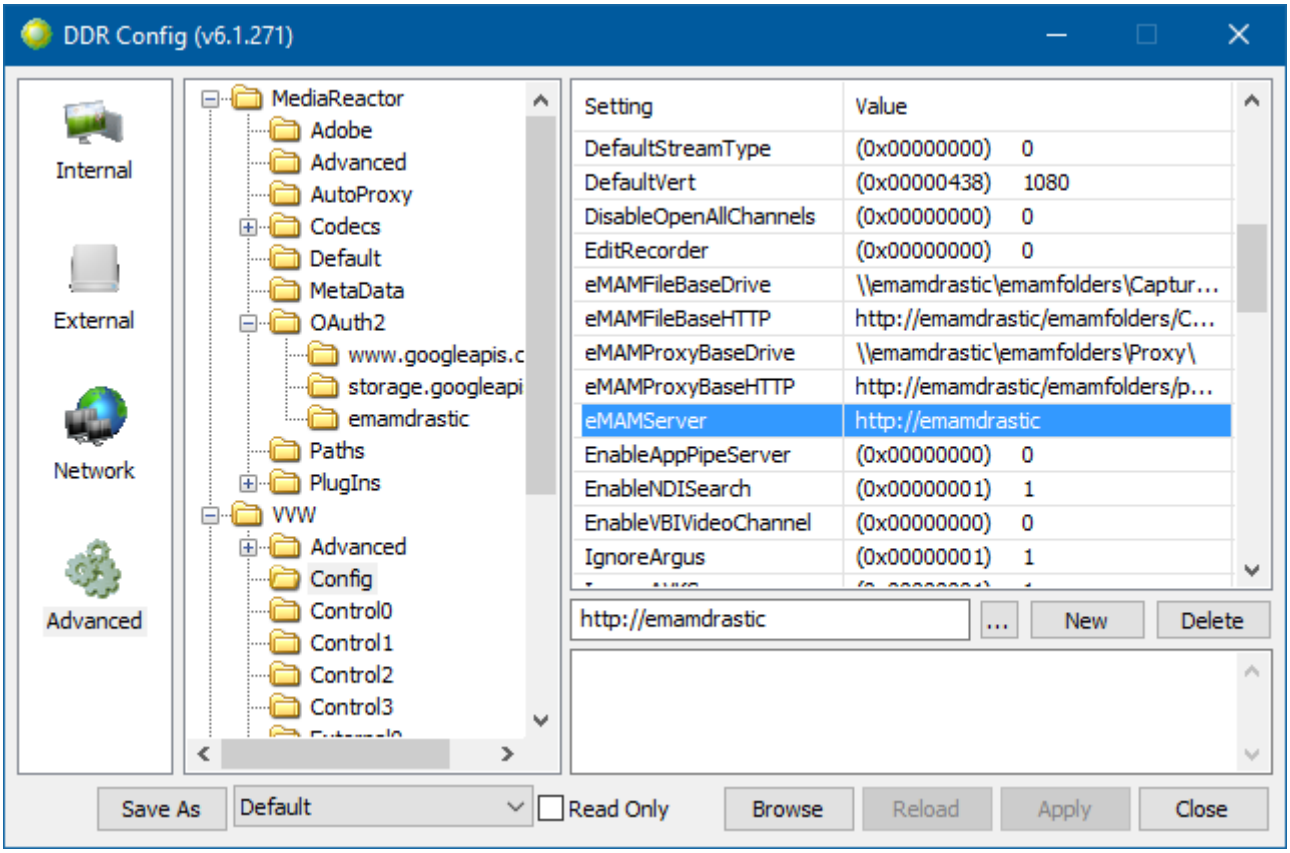
The file needs to contain the following items

```
{
  "grant_type": "password",
  "client_id": "0",
```

```
  "client_secret": "thesecretprovidedbytheemamserver",
  "username": "yourusername",
  "password": "yourpassword"
}
```

9.26.5 Server API Location

This setting lets the server know where to send the API commands. This is in the eMAMServer element under \VVW\Config\. It should be the base address of the HTTP server (e.g. http://emamdrastic or http://192.168.0.100 if using the IP address)



9.26.6 Record/Proxy Drives and HTTP Location

The record drive and location can be set on a per channel basis in /VVW/Internal0 (where 0 is between 0 and the number of channels you have). To allow eMAM to locate these file, the relationship between the base record drive and the http sharing of that location needs to be known. For example, if the record path is

\\emamdrastic\emamfolders\capture\today\new.mxf

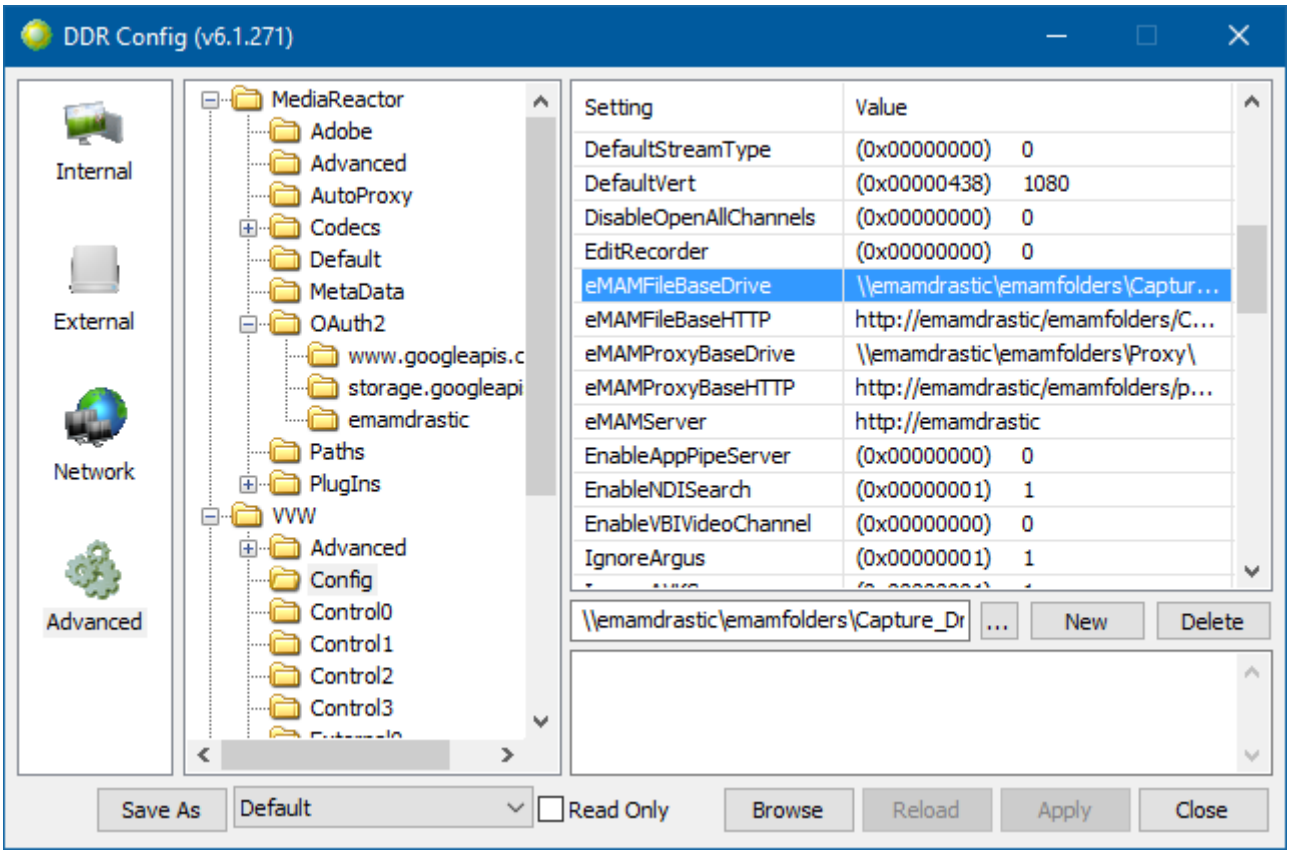
and from the HTTP server's point of view the file exists at:

http://emamdrastic/capture/today/new.mxf

then the server needs to know what the common base for both would be. In this case it would be:

\\emamdrastic\emamfolders\ == http://emamdrastic/

as the rest of the path is the same in both cases. There are two sets of settings for this: eMAMFileBaseDrive/eMAMFileBaseHTTP and eMAMProxyBaseDrive/eMAMProxyBaseHTTP. They are found under Advanced VVW/Config/



9.26.7 Other eMAM Specific Settings

If you are setting up to live edit with eMAM, you will also probably want to add/set the following in the config section

Numeric:

eMAMMetadataSetId
eMAMStorageId
eMAMProjectIdId
eMAMStorageVersionId
eMAMBinId
eMAMPlatformId
eMAMMetadataFieldId

String:

eMAMCategoryPath

Please check with your IT or eMAM support to get the correct values for these settings.

9.26.8 Conclusion

With this setup, whenever a new high res and proxy file pair start recording, a message will be sent to the eMAM server letting it know that the new records have started and where they are. This will allow eMAM to add the recordings to its database, and allow the user to open the proxy recording while it is still ingesting, and begin working with the media.

9.27 SMPTE 2110, 2202 & RTP Multicast Setup

Most operating systems are not set up out of the box to handle heavy multicast loads. With some, multicast reception is actually disabled. This article contains setup notes for the OS when using Net-X-Code, videoQC or 4KScope with network video sources.

9.27.1 CentOS/Red Hat 7

The main change needed here is the setting of the rp_filter for the ethernet card you are going to multicast to/from. This can be set up temporarily by changing

/proc/sys/net/ipv4/conf/all/rp_filter
/proc/sys/net/ipv4/conf/<ethernet>/rp_filter

to 2. This will allow the next run to read multicast packets from that ethernet device. These variables can also be changed via the sysctl utility

```
sudo sysctl -w "net.ipv4.conf.default.rp_filter=2"
sudo sysctl -w "net.ipv4.conf.all.rp_filter=2"
sudo sysctl -w "net.ipv4.conf.<ethernet>.rp_filter=2"
```

For a more permanent change, modify the contents of /etc/sysctl.conf to include

```
net.ipv4.conf.default.rp_filter = 2
net.ipv4.conf.all.rp_filter = 2
net.ipv4.conf.ens4.rp_filter = 2
```

You will also need to adjust your firewall to allow your ports/addresses through. For testing, you can temporarily disable the firewall with:

```
systemctl stop firewalld
```

You can also permanently disable your firewall, but this is NOT recommended.

```
systemctl disable firewalld
sysctl -w net.core.rmem_max=12582912
sysctl -w net.core.wmem_max=12582912
sysctl -w net.core.netdev_max_backlog=5000
```

Here is an optimized sysctl.con

```
# sysctl settings are defined through files in
# /usr/lib/sysctl.d/, /run/sysctl.d/, and /etc/sysctl.d/.
#
# Vendors settings live in /usr/lib/sysctl.d/.
# To override a whole file, create a new file with the same in
# /etc/sysctl.d/ and put new settings there. To override
# only specific settings, add a file with a lexically later
# name in /etc/sysctl.d/ and put new settings there.
#
# For more information, see sysctl.conf(5) and sysctl.d(5).
```

```
net.ipv4.conf.default.rp_filter = 2
net.ipv4.conf.all.rp_filter = 2
net.ipv4.conf.ens4.rp_filter = 2
```

```
### KERNEL TUNING ###
```

```
# Increase size of file handles and inode cache
        fs.file-max = 2097152

# Do less swapping
        vm.swappiness = 10
        vm.dirty_ratio = 60
        vm.dirty_background_ratio = 2

# Sets the time before the kernel considers migrating a process to another core
        kernel.sched_migration_cost_ns = 5000000

# Group tasks by TTY
        #kernel.sched_autogroup_enabled = 0

### GENERAL NETWORK SECURITY OPTIONS ###

# Number of times SYNACKs for passive TCP connection.
        net.ipv4.tcp_synack_retries = 2

# Allowed local port range
        net.ipv4.ip_local_port_range = 2000 65535

# Protect Against TCP Time-Wait
        net.ipv4.tcp_rfc1337 = 1

# Control Syncookies
        net.ipv4.tcp_syncookies = 1

# Decrease the time default value for tcp_fin_timeout connection
        net.ipv4.tcp_fin_timeout = 15

# Decrease the time default value for connections to keep alive
        net.ipv4.tcp_keepalive_time = 300
        net.ipv4.tcp_keepalive_probes = 5
        net.ipv4.tcp_keepalive_intvl = 15

### TUNING NETWORK PERFORMANCE ###

# Default Socket Receive Buffer
        net.core.rmem_default = 31457280

# Maximum Socket Receive Buffer
        net.core.rmem_max = 33554432
```

```
# Default Socket Send Buffer
        net.core.wmem_default = 31457280

# Maximum Socket Send Buffer
        net.core.wmem_max = 33554432

# Increase number of incoming connections
        net.core.somaxconn = 65535

# Increase number of incoming connections backlog
        net.core.netdev_max_backlog = 65536

# Increase the maximum amount of option memory buffers
        net.core.optmem_max = 25165824

# Increase the maximum total buffer-space allocatable
# This is measured in units of pages (4096 bytes)
        net.ipv4.tcp_mem = 786432 1048576 26777216
        net.ipv4.udp_mem = 65536 131072 262144



# Increase the read-buffer space allocatable
        net.ipv4.tcp_rmem = 8192 87380 33554432
        net.ipv4.udp_rmem_min = 16384

# Increase the write-buffer-space allocatable
        net.ipv4.tcp_wmem = 8192 65536 33554432
        net.ipv4.udp_wmem_min = 16384

# Increase the tcp-time-wait buckets pool size to prevent simple DOS attacks
        net.ipv4.tcp_max_tw_buckets = 1440000
        net.ipv4.tcp_tw_recycle = 1
        net.ipv4.tcp_tw_reuse = 1
```

Finally, most SMPTE 2110/2022 systems will be multi-homed (more than one ethernet adapter). To tell our software which is the video ip adapter, the RecieveInterface, RecieveAudInterface, and RecieveAncInterface will need to be set. There are Transmit versions of each of these as well.

9.27.2 Microsoft Windows

Generally, Windows is not recommended for direct SMPTE 2110/2022, as its network stack is not as good as Linux. If you are going to use it, the following may help.

9.27.3 Firewalls

Windows firewall can end up blocking all multicast network traffic. This will definitely happen if your 10G/25G network card ends up in the 'public' group, rather than the private or domain. In that case, the firewall will have to be completely disabled on the public network for SMPTE 2110/2022 to be received. Ideally, the NIC should be in the domain or private, and your IT group can enable the correct ports and protocols. If you are having trouble, try temporarily disabling the firewall. If that works, then the firewall configuration is still too restrictive/improperly configured.

9.27.4 Buffering

To increase the default buffering for UDP, save this as a .reg file and double click to add it to your registry.

```
Windows Registry Editor Version 5.00
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\services\AFD\Parameters]
"DefaultReceiveWindow"=dword:00200000
"DefaultSendWindow"=dword:00200000
```

9.28 Net-X-Copy - Partial File Restore

Net-X-Copy is part of the Net-X-Convert/Net-X-Proxy workstation and Net-X-Code server software. It is designed to convert audio/video files from one type to another and to perform partial file restores from indexed and non indexed files on disk, tape or cloud. This article contains the Linux/Windows command line API for this tool. A RESTful API is also available.

Net-X-Copy supports partial file restore for all the standard broadcast and postproduction formats we support without the need for a mezzanine or intermediate file format. The original files are indexed, a time code accurate proxy is created, and then any section of the original file can be recalled via time code or absolute offsets based on HTML5 playback of the proxy. The high resolution asset can be stored on near line storage, cloud storage (HTTPS/FTP/Amazon/Google/SMB), tape or any other kind of block, object or file storage your server can access.

There are four modes the partial file restore can operate in:

Full online - This is the simplest mode where access to the source file is fast. Here a call can be made with absolute offset values or time code values to determine the area to restore, and the header/metadata/index in the main file will be used to find the audio/video data and produce the newly wrapped/restored file in the same format.

Live online - For live files like MXF Open, transport streams or other growing files, an area can be clipped or restored while the file is still writing. This includes local, network and cloud sources. Here the header/metadata is pulled from the file and the index is calculated based on absolute or time code values to find the media for the new file.

Slow online - For files that are stored on very slow storage, like Amazon's Glacier or other cold storage systems, an index for the file should first be generated. The file is pushed to long term storage, and the small index file is kept locally available. To restore a clip, the index file is used to calculate the minimum amount of bytes required to create the new file. This byte range can then be retrieved from the file during the restore by Net-X-Copy.

Full offline - When the file is completely offline, using tapes, stored hard drives or other methods, an index must be generated before the file is stored. This index can then be used to calculate the minimum amount of the file (as a byte range) that needs to be retrieved to create the restore/wrap file. Once this byte range is available on temporary local storage, the actual restore is called to make the new file.

The index/proxy/restore can be controlled via our RESTful API in www.net-x-code.com or via the command line parameters described below.

9.28.1 Typical Scenarios

This section has some typical proxy, convert and partial file restore workflows. The first scenario is a complete list. The subsequent scenarios assume the first few steps in the first scenario have already been accomplished

9.28.1.1 Scenario 1 - full access/on line source

The file (MXF, MOV, AVI, CINE, etc) arrives at ingest
A “command=copy&profile=index” command is sent to index to original filename
A “command=copy&profile=mp4-h264” command is sent to make a proxy file with time code, multitrack audio, closed captions, metadata and proxy index filename
Two “command=copy&pisrc&pidst” commands are sent to create JPEG images for the source and proxy files

At this point, the proxy and main index can be stored in a real or near real time storage, and the main file may be moved to long term storage, tape, cloud (google/s3) or other offline storage

The user uses the HTML5 player's time code (or other time code source) to set one or more In and Out points on the file that needs to be restored

A "command=copy&profile=wrap" is sent to access the bytes of the original file and create a new file of the same type, without any recompression of audio or video, at the target location

9.28.1.2 Scenario 2 - tape restore

This assumes the basic processing in Scenario 1 has been done

A "command=getcopyinout" is sent with the absolute or time code based in and out points, and the index of source file it will come from

This returns a series of one or more file names with start and end byte locations

At this point, the controller restores those byte areas of the files to the name specified by the return

Once the areas are restored, a "command=copy&profile=wrap" is sent along with the temp folder to create the new output filename

9.28.1.3 Scenario 3 - cloud restore

This assumes the basic processing in Scenario 1 has been done

If the index file is stored on cloud, it can be restored locally first, or read directly from the cloud (https, ftps, aws)

If the main file is in Glacier, then a command will be sent to restore the section needed to S3 before the restore is done

Once there is access to the file, or file part, the "command=copy&profile=wrap" can be called normally

If the resource is in available cloud storage (e.g. not Glacier), then partial file restores may be done from the original file without indexing it first. This will cause more data to be read, but only the headers and tables necessary to find the audio/video/data the restoration needs

9.28.1.4 Scenario 4 - in line conversion

This assumes the basic processing in Scenario 1 has been done

For any restore scenario, the file restored can be a byte accurate re-wrap of the original into a new container, or it can be translated in process (on the fly) to any supported standard format. These formats include MXF Op1a, Op-Atom, P2, IMX, D11, IMF, MOV, Uncompressed and many other containers, with codecs including JPEG-2000, XDCam, MPEG-2, h.264, HEVC, AVCi 100/200, XAVC-S. XAVC, Long-G, TR-01, DV and many others

The commands can also be used with or without index files to convert all our part of local clips to any of these formats

9.28.2 PFR File Best Practices

Different workflows require different ways of saving and restoring files, but there are some general rules that can make it easier, especially when working with tape or other non sequential storage systems. Media files can be roughly broken down into a few categories:

Self contained, single files (MXF OP1a, MOV, AVI)
Multiple stream files (AVI+WAV, Avid OPAtom, MOV QT Reference)
Multiple files per stream (P2 MXF, XDCam MP4, Canon C300/700 MXF)
Sequences (DPX, TGA, TIFF)

If you are restoring from reasonable speed, random access devices, then all these types can be simply stored and retrieved as is. If there are sequential access, speed or cost issues, then it makes more sense to make each of these as easily accessible as possible before storing them.

9.28.2.1 Self Contained

These can be indexed and stored directly.

9.28.2.2 Multiple Stream Files

These can also be indexed and stored directly, as the RTIN can point at on file per stream. Net-X-Code automatically finds and joins the parts of the streams if it is a supported file type like Avid OPAtom, MOV reference, or video file with rationally named audio. If they are stored this way, there will be one chunk from each file that needs to be restored to make the output file, as the media is in separate files. This is handled in the getinoutbytes return as a series of temp names and start/end byte ranges. If you prefer a single chunk, please follow the guidelines in the Multiple Files Per Stream section.

9.28.2.3 Multiple Files Per Stream

The RTIN cannot describe streams that have multiple parts per stream. These are normally broken up to get around older disk format restrictions, often at 2 or 4 gigabytes. To deal with these, they should be pre processed (wrapped) to a self contained file like MXF OP1a before they are stored to tape. Using Net-X-Code to wrap them will cause the original audio/video to be copied to the new MXF without recompression and will automatically generate the RTIN as it is creating the new file. A proxy file can also optionally be created while rewrapping the file. This MXF now becomes the file you would restore from and that should be stored to tape.

Net-X-Code fully supports automatically joining the parts of most broadcast and post production files for playback and wrapping, including

Panasonic P2
IMF
AS-02
DCP
Canon C300/700
Sony XDCam MXF
Sony XDCam MP4
Avid OP-Atom
Grass Valley K2 Server Format
Multi card MXF capture

9.28.2.4 Avid OP-Atom – Special Case

Net-X-Code supports automatically joining Avid OP-Atom files and creating Avid OP-Atom files that can be directly dropped into the Avid bin for pickup on the next database refresh. If you are using this workflow, then the Multiple Stream Files method works best. If you are importing files into Avid then you will not be able to use OP-Atom, as Avid cannot import even its own. It will want to see the same essence, but in an OP1a container. In this case, you should re-wrap the OP-Atom to OP1a before storing them. It is also possible to restore OP-Atom to OP1a using the “type mxf-op1a” when doing the restore, but if they are stored as OP-Atom you will still need to restore a chunk from each stream to PFR them.

9.28.3 Sequences

As sequences can be restored ‘per file’, they do not need to be indexed.

9.28.4 Sample Command Lines

Basic Conversion Re-Wrap
NetXCopy -s <sourcefile.gxf> -t <targetfile.mxf> -p wrap

Create New Sony XDCam 50
NetXCopy -s <sourcefile.mxf> -t <targetfile.mxf> -p mxf-OP1a-MPEG

Make a Basic Proxy with Audio Mix Down

NetXCopy -s <sourcefile.lxf> -t <proxyfile.mp4> -p mp4-h264 -stereo

Make a Specific Proxy
NetXCopy -s <sourcefile.gxf> -t <proxyfile.mp4> -p mp4-h264 -width 360 -height 202 -h26xprofile main -h26xlevel 41 -gopsize 60 -kilobitrate 800

Make an AS-11 DPP
NetXCopy -s <sourcefile.mov> -t <as11dpp.mxf> -p mxf-as-11-hd-dpp

Make a 10 Bit h.264 OP1a MXF
NetXCopy -s <sourcefile.dpx> -t <mxfop1ah264_10.mxf> -p OP1a_HBR_50

Create An Index For Offline/Tape File
NetXCopy -s <sourcefile.mxf> -p index

9.28.5 Partial File Restore From a Tape

Request the start and end to restore from tape for the actual restore
NetXCopy -s <sourceindex.rtin> -p getCopyInOut -in 01:00:10:00 -out 02:04:30:00 -alignment 4096

This will return (tempFile=sourceindex_147894272_298274816.mxf, a start byte position u64in=147894272, and an end byte position u64out=298274816). Copy the byte section specified from the source= to the tempFile= into your temp directory (d:\record\).

Then call the actual restore:
NetXCopy-s <sourceindex.rtin> -t <targetfile.mxf> -p getCopyInOut -in 01:00:10:00 -out 02:04:30:00 -alignment 4096 -tempFolder d:\record\

Replace Audio and Captions in an MXF File
NetXCopy -s <sourcefile.mxf> -t <targetfile.mxf> -p mxf-xdcam-1080i -cc <newlanguage.mcc> -afile <newlanguage.wav>

Make A JPG From A Video Frame
NetXCopy -pisrc <sourcefile.avi> -pidst <sourcefile_100.jpg> -piframe 100

Make a Series Of JPG Frames For Each Second
NetXCopy -pisrc <sourcefile.avi> -pidst <sourcefile_100.jpg> -piskip 30

Write an XMP Metadata File To Disk
NetXCopy -s <sourcefile.avi> -m

Get Clip Info From a Camera Card
NetXCopy -s <path-to-card> -p cardinfo -t 2

9.29 Net-X-Copy - Create, Convert & Proxy

Net-X-Copy is part of the Net-X-Code server and Net-X-Convert/Proxy workstation software. It is designed to convert audio/video/media files to proxy or broadcast/post files, mix audio, extract metadata, and create one or more jpeg preview images. It can also embed captions into output files like MXF and MOV, and replace the audio or video tracks of a source file during conversion. This article contains the Linux/macOS/Windows command line API for this tool.

Net-X-Copy is a command line interface to the copy engine used in Net-X-Code, Net-X-Convert, Net-X-Proxy and videoQC's export feature. It can be used for a number of file extraction and conversion functions including clipping, proxy generation, metadata extraction and partial file restore. All these conversions are also available for our REST API. Some examples of typical command lines follow:

Basic conversion
NetXCopy -s <sourcefile> -t <targetfile> [-a <ackfile>] -p <profile>

Proxy Conversion
NetXCopy -s <sourcefile> -t <targetfile> -p mp4-h264

Proxy Conversion With Parameters
NetXCopy -s <sourcefile> -t <targetfile> -p mp4-h264 -width 640 -height 288 -h26xprofile high -h26xlevel 51 -gopsize 30 -kilobitrate 4000

HLS ABR Proxy Conversion
NetXCopy -s <sourcefile> -p <targetfile> -p HLS-TS-Multibitrate

DASH ABR Proxy Conversion
NetXCopy -s <sourcefile> -p <targetfile> -p HLS-TS-Multibitrate

Export XDCam With Embedded Captions
NetXCopy -s <sourcefile> -t <targetfile>.mxf -p mxf-sonyhd -cc <alternatecaptions>.mcc

Metadata Extraction
NetXCopy -s <sourcefile> -t <sourcefile>.xmp -m

Single JPG Frame Extraction
NetXCopy -pisrc <sourcefile> -pidst <targetfile>.jpg -piframe 100

Multiple JPG Frame Extraction (every 30 frames)
NetXCopy -pisrc <sourcefile> -pidst <targetfile>.jpg -piskip 30

9.29.1 Command Line Parameters

Net-X-Copy Command Line

netxcopy: Wrap, Convert, Extract, Thumbnail and Index Media Files (v8.0.2)
netxcopy -s <sourcefile> -t <targetfile> [-a <ackfile>] -p <profile> [-in <00:01:00:00> -out <00:02:00:00> -fg]

-s <sourcefile> - The source file name and path
-t <targetfile> - The target file name and path
-a <ackfile> - The ACK file name and path. This is the XML acknowledgment file made after a copy
-p metadata - Return XMP metadata for a media file
-p cardinfo - Return XML/JSON info on clips on a camera card
-p mkdir - Create directory structure
-p dir - Return XML/JSON directory listing
-p clipfiles - Return all the files associated with a media clip
-p md5 - Calculate or check the MD5 value source, send compare string as target
-p <profile> - Profile to use. Current profiles include:
> **copy** - copy the whole file
> **wrap** - re wrap file or part of a file
> **index** - create an RTIndex for a file
> **mp4faststart** - re wrap mp4 for fast start playback online
> **caption** - #- Extract captions from a file(see types below)
> **cardinfo** - cardinfo
> **dir** - dir
> **mkdir** - mkdir
> **clipfiles** - clipfiles
> **md5** - create md5
> **xmp** - create xmp
> **picon** - create picon
> **metadata** - show metadata
> **getCopyInOut** - get the extents required for a pfr, or use them with a temp file
> **examine** - Show file info
> **axfwrap** - Wrap files into an AFX
> **axfunwrap** - Un wrap files from an AFX
> **mov-YCbCr8Bit** - QuickTime MOV YCbCr 8 Bit
> **mov-dvcprohd** - QuickTime MOV DVCProHD

> **mp4-h264** - QuickTime MOV h264
> **mxf-xdcam-720p** - MXF OP1a XDCam 720p 50 4:2:2
> **mxf-dvcprohd-720p** - MXF OP1a DVCPro HD 720p
> **mxf-xdcam-1080i** - MXF OP1a XDCam 1080i 50 4:2:2
> **mxf-dvcprohd-1080i** - MXF OP1a DVCPro HD 1080i
> **mov-prores422** - QuickTime MOV ProRes 4:2:2
> **mov-proreshq** - QuickTime MOV ProRes HQ
> **mxf-OP1a-MPEG** - MXF OP1a MPEG 50 4:2:2
> **mxf-OP1a-h264** - MXF OP1a h.264
> **mxf-OP1a-HDF** - MXF OP1a HDF 50 4:2:2
> **mxf-as-11-hd-dpp** - MXF AS-11 HD DPP
> **scaledown2000k - MP4** - Scaledown to 960x540 with a target bitrate of 2mbits
> **scaledown500k - MP4** - Scaledown to 480x272 with a target bitrate of 500kbits
> **mxf-as-11-sd-pal-dpp** - MXF AS-11 SD PAL DPP
> **mxf-as-11-sd-ntsc-dpp** - MXF AS-11 SD NTSC DPP
> **hd1080-5000kbs - MP4** - HD 1080 with a target bitrate of 5 mbs
> **hd720-2500kbs - MP4** - HD 720p with a target bitrate of 2.5 mbs
> **hd360-1250kbs - MP4** - HD 360p with a target bitrate of 1.25 mbs
> **h264-7500kbs - MP4** - Any resolution with a target bitrate of 7.5 mbs
> **Proxy-h264-5000kbs - MP4** - Any resolution with a target bitrate of 5 mbs
> **LBR-h264-10000kbs - MP4** - Any resolution with a target bitrate of 10 mbs
> **mxf-OP1a-JPEG2K** - MXF OP1a JPEG-2000 4:2:2
> **mxf-AS-02-h264-10** - MXF AS-02 h.264 50 mbs
> **DASH-MP4-Multibitrate** - MP4 - DASH MP4 Multibitrate
> **HLS-TS-Multibitrate** - TS - HLS Multibitrate
> **TS-TR-01-JPEG-2000** - TS TR-01 JPEG-2000
> **mxf-OP1a_HBR_50** - MXF OP1a HBR 264 10 bit 50mbs
> **mp3-128kbps** - MP3 bit rate 128k
> **mp4-XAVC-S_4_2_0** - MP4 Sony XAVC-S 4:2:0
> **mp4-XAVC-S_4_2_2** - MP4 Sony XAVC-S 4:2:2
> **mov-prores444** - QuickTime MOV ProRes 4:4:4
> **mov-proresxq** - QuickTime MOV ProRes XQ
> **aces** - ACES Image Files
> **dnxhd-mxf-720p** - DNxHD 720p 50, 59, 60
> **dnxhd-mxf-1080p** - DNxHD 1080p 25, 29, 30
> **dnxhd-mxf-1080i** - DNxHD 1080i 25, 29, 30
> **dnxhr-mxf-10-hq** - DNxHR 10 Bit
> **dnxhr-mxf-sq** - DNxHR SQ
> **dnxhr-mxf-lq** - DNxHR LQ
> **TS-MPEG2** - TS-MPEG2 - MPEG-2 4:2:0/passthrough transport stream
> **TS-h264** - TS-h264 - h.264 4:2:0/passthrough transport stream
> **wave** - WAVE audio only
> **MXF-RDD-25** - MXF RDD-25 Proxy Writer

> **amt3-LowQuality** - MXF Avid Media Low Quality Writer
> **amt3-StandardQuality** - MXF Avid Media Standard Quality Writer
> **amt3-HiQuality** - MXF Avid Media High Quality Writer
> **amt3-HQX_10** - MXF Avid Media HQX 10 Writer
> **amt3-DNxHD36** - MXF Avid Media DNxHD 1080 Writer
> **MP4-MultiOutput** - MP4 - Multiple MP4 Output
> **HEVC-h265-10000kbs** - MP4 - HEVC Any resolution with a target bitrate of 10 mbs
> **mov-xdcam** - MOV - MPEG-2 50 4:2:2
> **mkv-ffv1** - MKV - FFV1 Lossless
> **dnxhr-mxf-hq** - DNxHR HQ
> **mov-proreslt** - QuickTime MOV ProRes LT
> **mov-proresproxy** - QuickTime MOV ProRes Proxy
> **mp4-vtt-h264** - QuickTime MOV h264
> **kipro-prores-lt** - KiPro MOV ProRes LT
> **amt3-XDCam** - MXF Avid Media XDCam Writer
> **amt3-Proxy** - MXF Avid Media Proxy Writer
> **amt3-Uncompressed** - MXF Avid Media Uncompressed Writer
> **transport_stream** - h264 transport stream
> **mxf-xdcam35-1080i** - MXF OP1a XDCam 1080i 35 4:2:0
> **mxf-xdcam35-1080p** - MXF OP1a XDCam 1080p 35 4:2:0
> **mxf-xdcam35-720p** - MXF OP1a XDCam 720p 35 4:2:0
> **mxf-avid-alpha** - MXF OP-Atom/AAF Main + Alpha
> **mxf-jpegxs-main10** - MXF OP1a JPEG-XS 4:2:2 Main 10 bit
> **mxf-jpegxs-light8** - MXF OP1a JPEG-XS 4:2:2 Light 8 bit
> **ts-jpegxs-main10** - TS TR-07 JPEG-XS 4:2:2 Main 10 bit
> t**s-jpegxs-light8** - TS TR-07 JPEG-XS 4:2:2 Light 8 bit
> **mxf-avci-x00** - MXF OP1a AVCi 100/200
> **fmp4-h264** - Fragmented MP4 DASH
> **ts-hevc** - HEVC transport stream 10 bit 4:2:0
> **ts-10bit** - HEVC transport stream 10 bit packed uncompressed 4:2:2
> **amt3-AVCi100** - MXF Avid Media AVCi 100/200 Writer
> **mxf-op1a-XAVC300** - MXF op1a Sony XAVC300 Intra-frame
> **mxf-op1a-XAVC480** - MXF op1a Sony XAVC480 Intra-frame
> **mov-YCbCr8Bit** - QuickTime MOV YCbCr 10 Bit

-type mxf-op1a – the exact file type to write, otherwise auto

> **mxf-op1a** - standard OP1a
> **mxf-sonyhd** - Sony XDCam compatible
> **mxf-open** - Adobe EWC/Sony XDCam
> **mxf-as02** - AS - 02 spec MXF
> **mxf-avid** - Avid OP-Atom (Drastic->bin)
> **mxf-amt** = Avid OP-Atom (Avid->aaf)
> **mxf-amt-op1a** = Avid OP-1a (Avid->aaf)
> **mp4-fmp4** - Fragmented MP4 (normal MP4 if not set)

> **mp4** - MPEG-4
> **mov** - QuickTime MOV
> **ts** - Transport stream

-in <00:01:00:00> - the starting point for the output file in time code or absolute position
-out <00:02:00:00> - the ending point for the output file in time code or absolute position
-absin <200> - the absolute (zero based) start time for the output file (overrides -in)
-tcoffset <00:01:00:00> - Offset the timecode by this amount
-tc <01:00:00:00> - Replace the output timecode starting with this timecode
-ub <ABCD0123> - Replace the output userbits with these userbits
-absout <400> - the absolute (zero based) end time, exclusive, for the output file (overrides -out)
-width <width> - output width of the video (only for arbitrary codecs like h264, hevc and prores)
-height <height> - output height of the video (if not set, the input size or codec size will be used)
-copy - make a copy of the file section we need, instead of reading directly
-dest - folder or folder and file name for the temp file when using copy
-dest <folder> - folder or folder and file name for the temp file when using copy
-cc <mcc/scc file> - replacement closed caption file>
-afile <path-audio-file> - replacement source audio track<s>
-v <path-video-file> - replacement source video track
-stereo - force a stereo pair (mix down) output
-aroute <12345678/auto> - route channels to specific outputs
-uuid <uuid string> - override the UUID of the file with this one
-uuidSource <uuid string> - override the Avid Source/Tape UUID of the file with this one
-kilobitrate <kbit rate> - override the kilo bit rate
-h26xprofile <baseline / main / high / high10 / high422 / high444> - override the profile type
-h26xlevel <51> - override the level
-encodemode <0 / 1> - 0 normal, 1 fastest
-gopsize <15> - size of encoded gop
-scenedetect <0> - aggressiveness of scene detection (0-100)
-tempfolder - Temporary folder to store partial file
-alignment - Alignment value for any temporary partial files, for GetCopyInOut profile
-flags flag - Extra flags for special operations

aafOnly, allowlive, allSubAudioTracks, aiProfileID-##,
audiofirstonly, audioforce8channels, ccExtractChannel-##,
ccOutputDirectory-**, convert708to608, use708CompatibilityBytes,
deinterlace-all, deinterlace-auto,deinterlace-sd,
deinterlace-hd1080, forceinterlaced, forceprogressive,
deinterlace-motionadaptive, deinterlace-yadif, deinterlace-edge,
deinterlace-triangle, deinterlace-fieldduplication,
disabletranscode, disableseperateaudio, forceseperateaudio,
forcemonoaudio, eMamAssetID-##, eMamCategory-**, eMamProxyID-##,
extractCCLine21, fixOut, forceCCVidStream, forceCaptions,
forceAudioMono, forceAudioStereo, forceAudioBlock,
forceOutputFramerate-##, fpsCompensation-##, frameAccurate,

ignorertinerr, interplay, interpretFileEncoding-## legacyTiming,
liveFollowDelay-##, markFirstTime, multi, nocache, notifyeMam,
offsetTC-##, overrideTC-##, outIsDuration, overlay,
proxyAfterRecord, overrideextension, pfrmode, proxyDisable,
proxyEnable, proxymp4, proxyamt, proxyfmp4, proxyts,
proxyRecord, processdiscontinuities, restripeTC, restoreUmid,
rtinReplaceSource, sampleaccurate, shuffleAudio, tapeName-**,
testMode, selecthac, tctype24/25/df/ndf/50/59/60,
timeConversion, timeIsMs, useExtension, use2channelsonly,
XdsCanada, XdsFrench, XdsMPA, XdsVChip, XdsShowAll,
zeroBasedOutput

-m - Save the metadata in an XMP file

-fg - force the GUI on

-fc - force command line

NOTE: the parameters in [square brackets] are optional.

For JPEG picons/thumbnails

-pisrc <file-to-picon> - source for the image

-pidst <where-to-make-picon> - target folder and name

-pisize <size> - size of picon, 100%-1%

-piframe <frame-offset-into-file> - frame to use to make the picon

-piskip <number-of-frames-to-skip> - if set, make a picon of each frame at this distance for the whole file

-width <width> - output width of the picon image

For Caption Extraction, these are the numbers to use with -p caption-#

> caption-# - eg caption-0=mcc, caption-6=SCCAUTO, etc

0=MCC, 1=AAF, 2=TEXT, 3=SCC, 4=SCCDF, 5=N0, 6=SCCAUTO,
100=Avid Caption, 101=Belle Nuit Subtitler,
102=CapMaker Plus, 103=Cheetah Caption, 104=Csv, 105=Csv2, 106=Csv3,
107=D-Cine SMPTE 2007, 108=D-Cine SMPTE 2010,
109=EBU STL, 110=Final Cut Pro Xml,
111=Final Cut Xml Gap, 112=Final Cut Pro X Xml,
113=Final Cut Pro XCM, 114=Flash Xml,
115=iTunes Timed Text, 116=JSON, 117=JSON Type 2,
118=JSON Type 3, 119=JSON Type 4, 120=QuickTime text,
121=SAMI, 122=SAMI modern, 123=Scenarist, 124=DVD_SCC,
125=DVD_SCCDF, 126=SoftNi sub, 127=Sony DVDArchitect,
128=Sony DVD Exp dur, 129=Sony DVD line/dur,
130=Sony DVD Tabs, 131=SubRip, 132=Sub Station Alpha,
133=Swift V2, 134=Timed Text 1.0, 135=TT 2006-04 .dfxp,
136=TT 2006-04 .ttml, 137=TT 2006-04 .xml, 138=WebVTT,
139=YT Annotations, 140=YouTube sbv,

141=YouTube Transcript, 142=D-Cinema interop,
143=WebVTT-webvtt, 144=SMPTE-TT 2052,
145=Netflix Timed Text,
-q Quiet mode.
-l Loud mode.
-r 01:00:00:00 Override timecode start
-R -00:30:00:00 Offset timecodes (eg. subtract half an hour)
-0 Zero based timecode output
-1 Mark this first timecode in file
-h # eMAM source clip ID
-S Force CC in video stream
-X Extract CC from line 21 (SD only)
-M # CC channel to extract (def: 1)
-C Use 608 compatibility bytes (not 708)
-c # Convert closed captioning to
-f # Force output frame rate (23, 24, 25, 29, 30)
-g # Compensate conversion (2324, 2423, 2930, 3029)
-o <out-dir> CC output directory
-E # Interpret input file using encoding
0=Auto, 1=UTF-8, 2=UTF-16, 3=IBM-850, 4=IBM-860, 5=Windows-1252

9.30 Net-X-Copy - Metadata Extraction

Net-X-Copy is part of the Net-X-Convert/Net-X-Proxy workstation and Net-X-Code server software. It supports, among other things, extracting an XMP XML of the metadata in a media file or series of media files. It extracts both the basic information for each channel and any camera/workflow specific metadata. This article contains the Linux/macOS/Windows command line API for this tool. A RESTful API is also available.
Net-X-Copy - Metadata Extraction

Net-X-Copy supports our standard range of proxy and broadcast file formats for extracting metadata to XMP XML.

9.30.1 Metadata Extraction Command Line

NetXCopy -m -s <sourcefile.r3d>

9.30.2 Metadata Extraction To A File

NetXCopy -m -s <sourcefile.r3d> -t <metadataout.xmp>

9.30.3 Command Line Parameters

netxcopy -m -s "M:\t3media\Streams\R3D - Red\Raven 4K\scarletw-standard-5k-24fps\
A106_C037_0118G5_001.R3D"

```
<x:xmpmeta xmlns:x="adobe:ns:meta/" x:xmptk="XMP Core 5.1.2">
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">
  <rdf:Description rdf:about="" xmlns:aux="http://ns.adobe.com/exif/1.0/aux/">
    <aux:SerialNumber>130-246-CE5</aux:SerialNumber>
  </rdf:Description>
  <rdf:Description rdf:about=""xmlns:tiff="http://ns.adobe.com/tiff/1.0/">
    <tiff:Model>SCARLET-W</tiff:Model>
  </rdf:Description>
  <rdf:Description rdf:about=""xmlns:xmpMM="http://ns.adobe.com/xap/1.0/mm/">
    <xmpMM:DocumentID>{0ACB8429-67BB-46F6-8555-CFFCE5F0777B}</xmpMM:DocumentID>
    <xmpMM:VersionID>6.1.0.225</xmpMM:VersionID>
  </rdf:Description>
  <rdf:Description rdf:about="" xmlns:xmpDM="http://ns.adobe.com/xmp/1.0/DynamicMedia/"
xmlns:stDim="http://ns.adobe.com/xap/1.0/sType/Dimensions#">
    <xmpDM:audioSampleRate>48000</xmpDM:audioSampleRate>
    <xmpDM:duration rdf:parseType="Resource">
    <xmpDM:value>872</xmpDM:value>
    <xmpDM:scale>1001/24000</xmpDM:scale>
  </xmpDM:duration>
  <xmpDM:videoFrameSize rdf:parseType="Resource">
    <stDim:unit>pixel</stDim:unit>
    <stDim:w>5120</stDim:w>
    <stDim:h>2560</stDim:h>
  </xmpDM:videoFrameSize>
  <xmpDM:startTimecode rdf:parseType="Resource">
    <xmpDM:timeFormat>23976Timecode</xmpDM:timeFormat>
    <xmpDM:timeValue>12:01:17:17 </xmpDM:timeValue>
  </xmpDM:startTimecode>
  <xmpDM:altTimecode rdf:parseType="Resource">
    <xmpDM:timeFormat>23976Timecode</xmpDM:timeFormat>
    <xmpDM:timeValue>12:01:17:17 </xmpDM:timeValue>
  </xmpDM:altTimecode>
  <xmpDM:audioChannelType>Stereo</xmpDM:audioChannelType>
    <xmpDM:audioSampleType>16Int</xmpDM:audioSampleType>
  </rdf:Description>
```

<rdf:Description rdf:about=""xmlns:dt="http://www.drastictech.com/metadata/elements">
<dt:File rdf:parseType="Resource">
<dt:track>
<rdf:Bag>
<rdf:li rdf:parseType="Resource">
<rdf:value/>
<dt:type>General</dt:type>
<dt:CompleteName>M:\t3media\Streams\R3D - Red\Raven 4K\scarletw-standard-5k-24fps\
A106_C037_0118G5_001.R3D</dt:CompleteName>
<dt:Format>Red R3D</dt:Format>
</rdf:li>
<rdf:li rdf:parseType="Resource">
<rdf:value/>
<dt:type>Video</dt:type>
<dt:Format>BI RGB</dt:Format>
<dt:Display_aspect_ratio>16:9</dt:Display_aspect_ratio>
<dt:Frame_rate>23.976 (24000/1001) FPS</dt:Frame_rate>
<dt:Width>5 120 pixels</dt:Width>
<dt:Height>2 560 pixels</dt:Height>
</rdf:li>
</rdf:Bag>
</dt:track>
</dt:File>
<dt:FileName>M:\t3media\Streams\R3D - Red\Raven 4K\scarletw-standard-5k-24fps\
A106_C037_0118G5_001.R3D</dt:FileName>
<dt:DeviceSerialNum>130-246-CE5</dt:DeviceSerialNum>
<dt:FullName>A106_C037_0118G5_001</dt:FullName>
<dt:Model>SCARLET-W</dt:Model>
<dt:NativeLocator>M:\t3media\Streams\R3D - Red\Raven 4K\scarletw-standard-5k-24fps\
A106_C037_0118G5_001.R3D</dt:NativeLocator>
<dt:Title>037</dt:Title>
<dt:UniversalLocator>M:\t3media\Streams\R3D - Red\Raven 4K\scarletw-standard-5k-24fps\
A106_C037_0118G5_001.R3D</dt:UniversalLocator>
<dt:VersionString>6.1.0.225</dt:VersionString>
<dt:Planes>1</dt:Planes>
<dt:BitCount>32</dt:BitCount>
<dt:Compression>00000000</dt:Compression>
<dt:CompressionString>BI RGB</dt:CompressionString>
<dt:VideoHandler>00000000</dt:VideoHandler>
<dt:AudioHandler>736F7774</dt:AudioHandler>
<dt:SizeImage>52428800</dt:SizeImage>
<dt:Reserved>32</dt:Reserved>
<dt:Scale>1001</dt:Scale>

<dt:Rate>24000</dt:Rate>
<dt:SuggestedBufferSize>52428800</dt:SuggestedBufferSize>
<dt:SampleSize>0</dt:SampleSize>
<dt:Pitch>20480</dt:Pitch>
<dt:FileType>182</dt:FileType>
<dt:FileTypeString>Red R3D</dt:FileTypeString>
<dt:A-Frame>0</dt:A-Frame>
<dt:AspectRatio>16:9</dt:AspectRatio>
<dt:PosterFrame>0</dt:PosterFrame>
<dt:TimeCode>1866642</dt:TimeCode>
<dt:VITCTimeCode>1866642</dt:VITCTimeCode>
<dt:VersionNumber>60100225</dt:VersionNumber>
<dt:TimeCodeType>1866642</dt:TimeCodeType>
<dt:LTCTimeCodeType>128</dt:LTCTimeCodeType>
<dt:VITCTimeCodeType>128</dt:VITCTimeCodeType>
</rdf:Description>
<rdf:Description rdf:about=""xmlns:dtdev="http://www.drastictech.com/metadata/deviceelements">
<dtdev:DTDeviceMetadataType>RED</dtdev:DTDeviceMetadataType>
<dtdev:anamorphic_mode>0</dtdev:anamorphic_mode>
<dtdev:brightness>0</dtdev:brightness>
<dtdev:camera_acceleration_x>0.094</dtdev:camera_acceleration_x>
<dtdev:camera_acceleration_y>0.094</dtdev:camera_acceleration_y>
<dtdev:camera_acceleration_z>0.956</dtdev:camera_acceleration_z>
<dtdev:camera_firmware_revision>98555</dtdev:camera_firmware_revision>
<dtdev:camera_firmware_version>6.2.34</dtdev:camera_firmware_version>
<dtdev:camera_id>A</dtdev:camera_id>
<dtdev:camera_model>SCARLET-W</dtdev:camera_model>
<dtdev:camera_model_id>12</dtdev:camera_model_id>
<dtdev:camera_network_name>S-WEAPON</dtdev:camera_network_name>
<dtdev:camera_pin>130-246-CE5</dtdev:camera_pin>
<dtdev:camera_rotation_x>0</dtdev:camera_rotation_x>
<dtdev:camera_rotation_y>-9.003</dtdev:camera_rotation_y>
<dtdev:camera_rotation_z>0</dtdev:camera_rotation_z>
<dtdev:clip_aspect_ratio>2</dtdev:clip_aspect_ratio>
<dtdev:clip_aspect_ratio_denominator>1</dtdev:clip_aspect_ratio_denominator>
<dtdev:clip_aspect_ratio_numerator>2</dtdev:clip_aspect_ratio_numerator>
<dtdev:clip_default_color_version>2</dtdev:clip_default_color_version>
<dtdev:clip_id>037</dtdev:clip_id>
<dtdev:contrast>0</dtdev:contrast>
<dtdev:digital_gain_blue>1</dtdev:digital_gain_blue>
<dtdev:digital_gain_green>1</dtdev:digital_gain_green>
<dtdev:digital_gain_red>1</dtdev:digital_gain_red>
<dtdev:dropped_frame_count>0</dtdev:dropped_frame_count>

<dtdev:exposure_compensation>0</dtdev:exposure_compensation>
<dtdev:exposure_time>20833.3</dtdev:exposure_time>
<dtdev:flip_horizontal>0</dtdev:flip_horizontal>
<dtdev:flip_vertical>0</dtdev:flip_vertical>
<dtdev:flut_control>0</dtdev:flut_control>
<dtdev:frame_guide_enabled>1</dtdev:frame_guide_enabled>
<dtdev:frame_guide_height>1</dtdev:frame_guide_height>
<dtdev:frame_guide_topleft_x>0</dtdev:frame_guide_topleft_x>
<dtdev:frame_guide_topleft_y>0</dtdev:frame_guide_topleft_y>
<dtdev:frame_guide_width>1</dtdev:frame_guide_width>
<dtdev:framerate>23.976</dtdev:framerate>
<dtdev:framerate_denominator>1001</dtdev:framerate_denominator>
<dtdev:framerate_numerator>24000</dtdev:framerate_numerator>
<dtdev:genlock_setting>0</dtdev:genlock_setting>
<dtdev:gmt_date>20160118</dtdev:gmt_date>
<dtdev:gmt_time>213555</dtdev:gmt_time>
<dtdev:hdr_mode>0</dtdev:hdr_mode>
<dtdev:image_height>2560</dtdev:image_height>
<dtdev:image_width>5120</dtdev:image_width>
<dtdev:iso>1280</dtdev:iso>
<dtdev:iso_calibration_version>1</dtdev:iso_calibration_version>
<dtdev:jamsync_setting>0</dtdev:jamsync_setting>
<dtdev:lens_aperture>49</dtdev:lens_aperture>
<dtdev:lens_aperture_units>0</dtdev:lens_aperture_units>
<dtdev:lens_distance_units>1</dtdev:lens_distance_units>
<dtdev:lens_focal_length>24</dtdev:lens_focal_length>
<dtdev:lens_focus_distance>4294967295</dtdev:lens_focus_distance>
<dtdev:lens_mount>Canon</dtdev:lens_mount>
<dtdev:local_date>20160118</dtdev:local_date>
<dtdev:local_time>213555</dtdev:local_time>
<dtdev:media_serial_number>15240FC80DE7</dtdev:media_serial_number>
<dtdev:monitor_sharpness>0</dtdev:monitor_sharpness>
<dtdev:original_filename>A106_C037_0118G5_002.R3D</dtdev:original_filename>
<dtdev:pixel_aspect_ratio>1</dtdev:pixel_aspect_ratio>
<dtdev:record_framerate>23.976</dtdev:record_framerate>
<dtdev:redcode>REDcode 8:1</dtdev:redcode>
<dtdev:reel_id>106</dtdev:reel_id>
<dtdev:reel_id_8_character>A106C037</dtdev:reel_id_8_character>
<dtdev:reel_id_full>A106_C037_0118G5</dtdev:reel_id_full>
<dtdev:resolution_format_name>5K 2:1</dtdev:resolution_format_name>
<dtdev:saturation>1</dtdev:saturation>
<dtdev:sensor_id>9</dtdev:sensor_id>
<dtdev:sensor_name>DRAGON 5K S35</dtdev:sensor_name>

```
      <dtdev:sensor_olpf_interchangeable>1</dtdev:sensor_olpf_interchangeable>
      <dtdev:sensor_olpf_name>STANDARD</dtdev:sensor_olpf_name>
      <dtdev:shadow>0</dtdev:shadow>
      <dtdev:shutter_degrees>180</dtdev:shutter_degrees>
      <dtdev:shutter_fractions>48</dtdev:shutter_fractions>
      <dtdev:start_absolute_timecode>21:36:16:18</dtdev:start_absolute_timecode>
      <dtdev:start_edge_timecode>01:49:54:11</dtdev:start_edge_timecode>
      <dtdev:stereo_setup>0</dtdev:stereo_setup>
      <dtdev:user_curve_black_x>0</dtdev:user_curve_black_x>
      <dtdev:user_curve_black_y>0</dtdev:user_curve_black_y>
      <dtdev:user_curve_high_x>0.75</dtdev:user_curve_high_x>
      <dtdev:user_curve_high_y>0.75</dtdev:user_curve_high_y>
      <dtdev:user_curve_low_x>0.25</dtdev:user_curve_low_x>
      <dtdev:user_curve_low_y>0.25</dtdev:user_curve_low_y>
      <dtdev:user_curve_mid_x>0.5</dtdev:user_curve_mid_x>
      <dtdev:user_curve_mid_y>0.5</dtdev:user_curve_mid_y>
      <dtdev:user_curve_white_x>1</dtdev:user_curve_white_x>
      <dtdev:user_curve_white_y>1</dtdev:user_curve_white_y>
      <dtdev:user_timecode_preference>1</dtdev:user_timecode_preference>
      <dtdev:white_balance_kelvin>4800</dtdev:white_balance_kelvin>
      <dtdev:white_balance_tint>0</dtdev:white_balance_tint>
     </rdf:Description>
   </rdf:RDF>
</x:xmpmeta>
```


9.31 Net-X-Copy - Camera Card Info

Net-X-Copy is part of the Net-X-Convert/Net-X-Proxy workstation and Net-X-Code server software. It supports, among other things, extracting clips from a native card format from cameras like P2, C300/700, RED, XDCam, AVCHD, AS-02, AS-11, GV Infinity and others. It extracts a list of clips, and then a list of elements within those clips and any camera/workflow specific metadata. This article contains the Linux/macOS/Windows command line API for this tool. A RESTful API is also available.

9.31.1 Net-X-Copy - Card Info

Net-X-Copy supports card info extraction from a wide range of camera types, including:

Panasonic P2 - DV/AVC/LongG/Varicam - OP-Atom, OP1b
Red R3D
Canon C300/500/700/XF

AVCHD/BDMV/HDV
Sony XDCam
Sony XAVC/XAVC-S
Grass Valley Infinity
Gemini/Codex/Arri Raw
Image sequences with sidebar audio

9.31.2 Card Info Extraction Command Line

NetXCopy -p cardinfo -s <sourcefile.r3d>
Card Info Extraction To A File

NetXCopy -p cardinfo -s <sourcefile.r3d> -t <metadataout.xmp>
Example Extraction

netxcopy -p cardinfo -s "M:\t3media\Streams\MXF\Panasonic\Varicam_2015\Intra_LT_Intra2K-LT\"

```
<cardinfo>
   <clips>
      <clip0>
         <clipname>001AA2KK</clipname>
         <cliproot>AVCLIP/001AA2KK.MXF</cliproot>
      </clip0>
      <clip1>
         <clipname>001BB1HD</clipname>
         <cliproot>AVCLIP/001BB1HD.MXF</cliproot>
      </clip1>
      <clip2>
         <clipname>002AA2KK</clipname>
         <cliproot>AVCLIP/002AA2KK.MXF</cliproot>
      </clip2>
      <clip3>
         <clipname>002BB1HD</clipname>
         <cliproot>AVCLIP/002BB1HD.MXF</cliproot>
      </clip3>
      <clip4>
         <clipname>003AA2KK</clipname>
         <cliproot>AVCLIP/003AA2KK.MXF</cliproot>
      </clip4>
      <clip5>
         <clipname>003BB1HD</clipname>
```

```
        <cliproot>AVCLIP/003BB1HD.MXF</cliproot>
      </clip5>
    </clips>
    <clip0>
      <metadata_xml>
        <Mediainfo version="drastic">
          <File>
            <Track type="General">
              <FileName>M:\t3media\Streams\MXF\Panasonic\Varicam_2015\Intra_LT_Intra2K-LT\
CONTENTS\AVCLIP\001AA2KK.MXF</FileName>
              <NativeLocator>M:\t3media\Streams\MXF\Panasonic\Varicam_2015\Intra_LT_Intra2K-
LT\CONTENTS\AVCLIP\001AA2KK.MXF</NativeLocator>
              <UniversalLocator>M:\t3media\Streams\MXF\Panasonic\Varicam_2015\
Intra_LT_Intra2K-LT\CONTENTS\AVCLIP\001AA2KK.MXF</UniversalLocator>
              <Title>Sample</Title>
              <Source>SHOOTING</Source>
              <FullName>001AA2KK</FullName>
              <Model>ModelName</Model>
              <EditData3>AVC-Intra2K_LT</EditData3>
              <VersionString>6.1.0.225</VersionString>
              <Manufacturer>Panasonic</Manufacturer>
              <DeviceSerialNum>ABCD01234</DeviceSerialNum>
            </Track>
            <Track type="Video">
              <Size>40</Size>
              <Width>2048</Width>
              <Height>1080</Height>
              <Planes>1</Planes>
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            <Thumbnail-Height>45</Thumbnail-Height>
         </DTDeviceMetadata>
      </metadata_xmp>
   </clip5>
</cardinfo>
```

9.32 Net-X-Copy SpotCheck

SpotCheck is a new feature in Net-X-Copy (and included in Net-X-Code Server) version 8 software.

It will compare a source A/V file against a copied, wrapped, or transcoded output file and write the result into the NetXCopy ACK XML.

9.32.1 Inputs

sourcePath – Original media file used as the copy/wrap/conversion source.
destPath – Destination media file to validate after NetXCopy finalization.
ackPath – ACK XML path to create or update.

9.32.2 Options

Optional thresholds and profile behavior. If NULL, use conservative default constants in the

implementation. Thresholds must remain configurable, but the function must still behave sensibly without an options object.

9.32.3 Required behavior

9.32.3.1 1. Initialize a SpotCheck Report

The report should contain:
- final result code
- comparison mode: wrap, same-codec, or conversion
- Info messages
- Warnings
- Errors
- thresholds used
- key metadata facts
- per-sample video/audio measurements
- aggregate min/avg/max measurements

9.32.3.2 2. Validate filesystem state using dtOS helpers

Check:
- source path is valid
- destination path is valid
- source exists and is readable
- destination exists and is readable
- source is non-empty
- destination is non-empty
- ACK directory exists or can be created according to existing project behavior
- ACK directory is writable
- a temporary ACK file can be created with dtOSCreateFile()

9.32.3.3 3. Verify destination finalization

The destination must be opened only after the conversion/copy operation is finalized.

Explicitly:
- open destination with mfOpen()
- read destination metadata with mfGetFileInfo()
- read near the head

- read near the middle when possible
- explicitly read the last comparable video frame and last comparable audio window
- fail on unreadable tail, missing tail samples, non-monotonic tail timestamps, or truncated media.

9.32.3.4 4. Open source and destination

Use mfOpen() for both files.

Error handling:
- source open failure returns SPOTCHECK_ERR_OPEN_SOURCE
- destination open failure returns SPOTCHECK_ERR_OPEN_DEST
- every successfully opened handle must be closed with mfClose() on every return path

9.32.3.5 5. Read source and destination metadata with mfGetFileInfo()

Collect and compare when exposed:
- container format
- file size
- duration/edit length in frames and/or samples
- start timecode
- end timecode
- LTC
- VITC
- timecode track presence
- caption track presence
- data track presence
- video stream count
- audio stream count
- total decoded audio channel count
- video codec/FourCC/profile/level
- width/height
- display width/display height
- pixel aspect ratio (PAR)
- display aspect ratio (DAR)
- frame rate as rational rate/scale
- drop-frame/non-drop-frame mode
- scan type
- field order
- bit depth
- chroma layout/subsampling
- color range

- color matrix
- color transfer
- color primaries
- audio sample rate
- audio bit depth
- audio channel layout if available
- audio/video/total bitrate if available

9.32.3.6 6. Determine comparison mode

Detect:
- exact wrap / same compressed essence
- same-codec but not guaranteed exact essence
- conversion / different codec

The profile/options may override or refine automatic detection.

9.32.3.7 7. Parse and compare timecode correctly

Do not compare timecode strings only.

Required:
- parse source and destination start TC to absolute frame numbers
- parse source and destination end TC to absolute frame numbers
- parse LTC separately where present
- parse VITC separately where present
- correctly handle drop-frame timecode
- use the correct edit rate for each parsed TC
- compare frame numbers, not only formatted text
- record both the original TC strings and parsed frame numbers in the report

Missing LTC/VITC is a warning unless profile options require it.
Mismatched LTC/VITC is fatal when the relevant TC type is required.

9.32.3.8 8. Compare duration and precharge/padding

Duration must match exactly unless a profile-configured precharge or padding allowance explains the difference.

Allowed precharge/padding requires:

- the destination duration delta is within the configured maximum
- the destination starts earlier or ends later by approximately the same number of frames
- the comparable source/destination timecode overlap is valid

Fail if:
- the duration mismatch is unexplained
- there is no valid comparable TC overlap
- the destination is shorter than the required comparable source range
- the destination tail cannot be read

9.32.3.9 9. Compare stream topology

Required:
- video stream count must match
- audio stream count must match unless profile options explicitly allow remapping
- total decoded audio channel count must match
- audio sample rate must match
- exposed timecode/data/caption tracks must be preserved when the profile requires preservation

Warn or fail, according to profile options, on
- audio bit depth reduction
- missing optional timecode/caption/data streams
- changed audio layout labels with identical decoded channel count

9.32.3.10 10. Compare video format

Required:
- compare rational frame rates, not float-only rates
- allow configured NTSC rational equivalents:
  - 24/1 <-> 24000/1001
  - 30/1 <-> 30000/1001
  - 60/1 <-> 60000/1001
- allow configured thin-raster/display-raster equivalents:
  - 1440x1080 -> 1920x1080
  - 1280x1080 -> 1920x1080
  - 960x720 -> 1280x720
- compare displayed geometry, PAR/DAR, and full-size decoded picture dimensions
- compare scan type
- compare field order
- compare color range
- compare color matrix

- compare color transfer
- compare color primaries
- compare bit depth
- compare chroma layout/subsampling

Field order mismatch is fatal unless explicitly allowed.
Missing destination color metadata is a warning.
Conflicting color metadata is fatal or warning according to profile options.

9.32.3.11 11. Build deterministic sample points

Work inside the source/destination overlapping timecode range.
Prefer timecode matching over raw frame-index matching.

Build:
- up to 100 primary video sample frames evenly distributed across the comparable file range
- 34 anchor sample points
  first comparable frame/window
  last comparable frame/window
  32 evenly spaced interior points

Then:
- merge the primary and anchor samples
- deduplicate by parsed timecode frame number
- sort by timecode
- for files shorter than the requested sample count, compare every comparable video frame and every comparable audio window

9.32.3.12 12. Compare compressed essence for wrap/same-codec modes

Use mfReadFrame() to read compressed packets/frames.
Match source and destination by parsed timecode.

For exact wrap mode:
- MD5 compressed video essence by timecode
- compare compressed video frame sizes
- compare compressed audio packet sizes/MD5 when accessible
- compare total bitrate within default 5%
- compare audio/video bitrates within default 10%
- compare PDFRAME flags
- compare keyframe flags

- compare GOP cadence
- compare IBP structure/order
- detect missing I-frames
- detect changed keyframe cadence
- detect repeated compressed frames

In exact wrap mode, compressed essence mismatch is fatal unless options explicitly relax exactness.

9.32.3.13 13. Compare decoded video frames

Use mfReadFrameUnc() for decoded video reads.

Required decoded format:
- request full-size YCbCr frames
- support 8-bit and 10-bit paths
- even for thin-raster codecs, request/normalize to full display-size YCbCr frames so PSNR is a 1:1 picture comparison
- do not PSNR compare a thin-storage source buffer directly against a full-raster destination buffer
- use vqPSNR_8() for 8-bit frames
- use vqPSNR_16() for 10/12/16-bit frames where applicable

Record:
- per-frame Y PSNR
- per-frame Cb/Cr or chroma PSNR where available
- minimum PSNR
- average PSNR
- count below warning threshold
- count below failure threshold

Default thresholds, configurable:
- exact wrap decoded fallback: avg Y >= 55 dB, min Y >= 50 dB
- same-codec fallback: avg Y >= 45 dB, min Y >= 38 dB
- conversion default: avg Y >= 35 dB, min Y >= 28 dB
- conversion chroma default: avg C >= 32 dB, min C >= 25 dB

9.32.3.14 14. Detect frame slip, frame reorder, and low-quality frames

When a sampled frame has low PSNR:
- compare source timecode T against destination T-2, T-1, T+1, T+2
- if a nearby destination frame scores materially better, classify the failure as video slip/reorder instead of generic low PSNR

- report the best offset and affected sample count

Detect recurring low/high PSNR patterns that suggest GOP reorder or B-frame ordering problems.

9.32.3.15 15. Detect freeze/repeat frames

Compare temporal deltas between adjacent decoded destination samples and adjacent decoded source samples.

Fail or warn when:
- adjacent destination samples are effectively identical but source samples changed
- repeated frames occur outside profile-allowed cadence conversion
- the tail appears frozen
- duplicated frame patterns suggest dropped or repeated output frames

9.32.3.16 16. Compare decoded audio

Use mfReadFrameUnc() or the existing project audio decode path to read PCM windows at matching timecodes.

For each channel and sampled audio window, compute:
- RMS level in dBFS
- peak level in dBFS
- clipping count
- silence/non-silence state
- DC offset
- SNR/PSNR or normalized PCM error against the matching source window

Default thresholds, configurable:
- RMS delta <= 3 dB when both channels are above -60 dBFS
- peak delta <= 3 dB unless limiting is allowed
- silence threshold: -60 dBFS
- unexpected clipping is warning or fatal according to profile
- audio offset tolerance is <= one video frame or <= 20 ms, whichever is smaller, unless profile options override

9.32.3.17 17. Detect audio channel order changes

Build channel level/signature vectors across all sampled windows.

Required:
- compare source channel N to destination channel N
- also compute best-fit source/destination channel mapping
- if best-fit mapping is not identity, report likely channel swap or remap. (Note: “Identical” means the same (stereo/mono/group) whereas “identity” means the channels when 1:1 2:2 3:3 etc. are the same when decoded.)
- fail or warn according to profile options

9.32.3.18 18. Detect audio slip/drift

Use PCM cross-correlation or nearby-window comparison.

Required:
- test destination audio at the nominal matching timecode
- test nearby offsets where practical
- detect consistent audio lead/lag
- detect drift by comparing first, middle, and last offsets
- fail on offset/drift beyond configured tolerance

9.32.3.19 19. Check A/V sync

Compare first, middle, and last relative A/V timing.

Fail when:
- audio/video timestamps are non-monotonic
- source/destination A/V relative timing differs beyond tolerance
- audio drift accumulates across the file
- video tail and audio tail do not end consistently

9.32.3.20 20. Classify findings

Info:
- expected facts and measured pass values

Warnings:
- suspicious but non-fatal differences

Errors:
- fatal differences that invalidate the output

Return 0 only when Errors is empty and ACK writing succeeds.

9.32.3.21 21. Write ACK XML

Preferred integration:
- add an optional SpotCheckReport parameter to OutputAckXml() so ACK generation remains centralized

Alternative integration:
- call OutputAckXml()
- insert or replace the <SPOTCHECK> block before </DETAILS>

Required:
- preserve the existing <FILE>/<INFO> structure
- place <SPOTCHECK> under <DETAILS>, after </FILE> and before </DETAILS>
- if <SPOTCHECK> already exists, replace it
- never append a second <SPOTCHECK>
- XML-escape every value
- write to a temporary file with dtOSCreateFile()
- atomically replace the final ACK path when the platform supports it
- if ACK writing fails, return SPOTCHECK_ERR_ACK_WRITE even when media comparison passed

9.32.4 Returns

SPOTCHECK_OK / 0 on pass.
Non-zero SpotCheckErrorCode on failure.

typedef enum SpotCheckErrorCode
{
SPOTCHECK_OK = 0,

Arguments / filesystem

SPOTCHECK_ERR_INVALID_ARGS = 1001
Invalid Arguments
SPOTCHECK_ERR_SOURCE_NOT_FOUND = 1002
Source Not Found
SPOTCHECK_ERR_DEST_NOT_FOUND = 1003
Destination Not Found
SPOTCHECK_ERR_SOURCE_EMPTY = 1004
Source folder is empty
SPOTCHECK_ERR_DEST_EMPTY = 1005

Destination folder is empty
SPOTCHECK_ERR_ACK_PATH = 1006
ACK path error
SPOTCHECK_ERR_ACK_TEMP_CREATE = 1007
ACK create temp error

Media open/info/read

SPOTCHECK_ERR_OPEN_SOURCE = 1101
Opening Source folder error
SPOTCHECK_ERR_OPEN_DEST = 1102
Opening Destination folder error
SPOTCHECK_ERR_SOURCE_INFO = 1103
Source Information error
SPOTCHECK_ERR_DEST_INFO = 1104
Destination Information error
SPOTCHECK_ERR_READ_SOURCE = 1105
Source read error
SPOTCHECK_ERR_READ_DEST = 1106
Destination read error
SPOTCHECK_ERR_DEST_NOT_FINALIZED = 1107
Destination not finalized error
SPOTCHECK_ERR_TAIL_READ = 1108
Tail read error
SPOTCHECK_ERR_TRUNCATED_OUTPUT = 1109
Truncated output error

Duration / timecode

SPOTCHECK_ERR_DURATION_MISMATCH = 1201
Duration mismatch error
SPOTCHECK_ERR_TIMECODE_PARSE = 1202
Time Code Parse error
SPOTCHECK_ERR_TIMECODE_MISMATCH = 1203
Time Code mismatch error
SPOTCHECK_ERR_DROPFRAME_TIMECODE = 1204
Drop frame time code error
SPOTCHECK_ERR_LTC_MISMATCH = 1205
LTC mismatch error
SPOTCHECK_ERR_VITC_MISMATCH = 1206
VITC time code mismatch error
SPOTCHECK_ERR_NO_TIMECODE_OVERLAP = 1207
No Time Code Overlap error

SPOTCHECK_ERR_PRECHARGE_MISMATCH = 1208
Precharge mismatch error
SPOTCHECK_ERR_NON_MONOTONIC_TIMESTAMPS = 1209
Non-monotonic timestamps error

Stream topology

SPOTCHECK_ERR_STREAM_COUNT_MISMATCH = 1301
Stream Count Mismatch error
SPOTCHECK_ERR_VIDEO_STREAM_COUNT = 1302
Video Stream Count error
SPOTCHECK_ERR_AUDIO_STREAM_COUNT = 1303
Audio Stream Count error
SPOTCHECK_ERR_AUDIO_CHANNEL_MISMATCH = 1304
Audio Channel Mismatch error
SPOTCHECK_ERR_AUDIO_RATE_MISMATCH = 1305
Audio Rate Mismatch error
SPOTCHECK_ERR_TIMECODE_TRACK_MISSING = 1306
Time Code Track Missing error
SPOTCHECK_ERR_CAPTION_TRACK_MISSING = 1307
Closed Caption Track Missing error
SPOTCHECK_ERR_DATA_TRACK_MISSING = 1308
Ancillary Data Track Missing error

Video format

SPOTCHECK_ERR_VIDEO_FORMAT_MISMATCH = 1401
Video Format Mismatch error
SPOTCHECK_ERR_VIDEO_RATE_MISMATCH = 1402
Video Frame Rate error
SPOTCHECK_ERR_VIDEO_RASTER_MISMATCH = 1403
Video Raster Mismatch
SPOTCHECK_ERR_VIDEO_ASPECT_MISMATCH = 1404
Video Aspect Ratio Mismatch
SPOTCHECK_ERR_VIDEO_PAR_DAR_MISMATCH = 1405
Video Pixel Aspect Ratio/Display Aspect Ratio error
SPOTCHECK_ERR_SCAN_TYPE_MISMATCH = 1406
Scan Type Mismatch error
SPOTCHECK_ERR_FIELD_ORDER_MISMATCH = 1407
Field Order Mismatch
SPOTCHECK_ERR_COLOR_RANGE_MISMATCH = 1408
Color Range Mismatch error
SPOTCHECK_ERR_COLOR_MATRIX_MISMATCH = 1409

Color Matrix Mismatch error
SPOTCHECK_ERR_COLOR_TRANSFER_MISMATCH = 1410
Color Transfer Mismatch error
SPOTCHECK_ERR_COLOR_PRIMARIES_MISMATCH = 1411
Color Primaries Mismatch error
SPOTCHECK_ERR_BIT_DEPTH_MISMATCH = 1412
Bit Depth Mismatch error
SPOTCHECK_ERR_CHROMA_LAYOUT_MISMATCH = 1413
Chroma Layout Mismatch error

Compressed essence / wrap checks

SPOTCHECK_ERR_BITRATE_MISMATCH = 1501
Bit Rate Mismatch error
SPOTCHECK_ERR_COMPRESSED_MD5 = 1502
Compressed MD5 Checksum error
SPOTCHECK_ERR_COMPRESSED_SIZE = 1503
Compressed Size error
SPOTCHECK_ERR_COMPRESSED_AUDIO_MD5 = 1504
Compressed Audio MD5 Checksum error
SPOTCHECK_ERR_COMPRESSED_AUDIO_SIZE = 1505
Compressed Audio Size error
SPOTCHECK_ERR_GOP_STRUCTURE = 1506
GOP Structure error
SPOTCHECK_ERR_KEYFRAME_CADENCE = 1507
Key Frame Cadence error
SPOTCHECK_ERR_IBP_ORDER = 1508
MPEG IBP Frame Order error
SPOTCHECK_ERR_PDFRAME_FLAGS = 1509
PDFrame Flags error

Decoded video comparison

SPOTCHECK_ERR_VIDEO_DECODE_FORMAT = 1601
Video Decode Format error
SPOTCHECK_ERR_VIDEO_PSNR = 1602
Video PSNR error
SPOTCHECK_ERR_VIDEO_CHROMA_PSNR = 1603
Chroma PSNR error
SPOTCHECK_ERR_VIDEO_SLIP = 1604
Video Slip error
SPOTCHECK_ERR_VIDEO_REORDER = 1605
Video Reordering error

SPOTCHECK_ERR_VIDEO_FREEZE = 1606
Video Freeze error
SPOTCHECK_ERR_VIDEO_REPEAT = 1607
Video Frames Repeat error
SPOTCHECK_ERR_VIDEO_TAIL_MISMATCH = 1608
Video Tail error

Decoded audio comparison

SPOTCHECK_ERR_AUDIO_DECODE_FORMAT = 1701
Audio Decode Format error
SPOTCHECK_ERR_AUDIO_LEVEL = 1702
Audio Level error
SPOTCHECK_ERR_AUDIO_PEAK = 1703
Audio Peak error
SPOTCHECK_ERR_AUDIO_CLIPPING = 1704
Audio Clipping error
SPOTCHECK_ERR_AUDIO_SILENCE_STATE = 1705
Audio Silence State error
SPOTCHECK_ERR_AUDIO_DC_OFFSET = 1706
Audio DC Offset error
SPOTCHECK_ERR_AUDIO_PSNR = 1707
Audio PSNR error
SPOTCHECK_ERR_AUDIO_CHANNEL_ORDER = 1708
Audio Channel Order error
SPOTCHECK_ERR_AUDIO_CHANNEL_REMAP = 1709
Audio Channel Remapping error
SPOTCHECK_ERR_AUDIO_SLIP = 1710
Audio Slip error
SPOTCHECK_ERR_AUDIO_DRIFT = 1711
Audio Drift error
SPOTCHECK_ERR_AUDIO_TAIL_MISMATCH = 1712
Audio Tail Mismatch error

A/V sync

SPOTCHECK_ERR_AV_SYNC = 1801
AV Sync error
SPOTCHECK_ERR_AV_SYNC_DRIFT = 1802
AV Sync Drift error
SPOTCHECK_ERR_AV_TAIL_MISMATCH = 1803
AV Sync Tail Mismatch error

ACK / internal

SPOTCHECK_ERR_ACK_WRITE = 1901
ACK Write error
SPOTCHECK_ERR_ACK_SPOTCHECK_REPLACE = 1902
ACK Spotcheck Replace error
SPOTCHECK_ERR_XML_ESCAPE = 1903
XML Escape error
SPOTCHECK_ERR_INTERNAL = 1999
ACK Internal error

} SpotCheckErrorCode;

9.33 MRAnalyze - Command Line Interface

MRAnalyze is a command line tool that compares an original media file with a compressed version of that file to determine the quality of the compression and note any major compression errors. It supports the traditional PSNR as well as the more accurate SSIM and MS-SSIM. It is part of the videoQC and Net-X-Code toolsets. This article contains the Linux/macOS/Windows command line API for this tool.

MRAnalyze requires two files: the original, or reference file, and the target, or compressed, file. It supports PSNR, SSIM and MS-SSIM analysis. It outputs CSV or SQLite results, along with a DT3D file to allow visual comparison in videoQC. There is more information on MRAnalyze in general available here:

https://www.drastic.tv/support-59/supporttipstechnical/46-mranalyze-command-line-interface

9.33.1 Basic PSNR Analysis

mranalyze -a <source_ref_file> -b <compressed_file> -p 0
Analyze Part of a Capture

mranalyze -a <source_ref_file> -b <compressed_file> -p 0 -f 1020 -l 1320 -b 15202
Create a CSV Gaussian SSIM Output

mranalyze -a <source_ref_file> -b <compressed_file> -s 1 -o <outputpathfile>.csv
Check Just The I-Frames

mranalyze -a <source_ref_file> -b <compressed_file> -m 0 -n 30

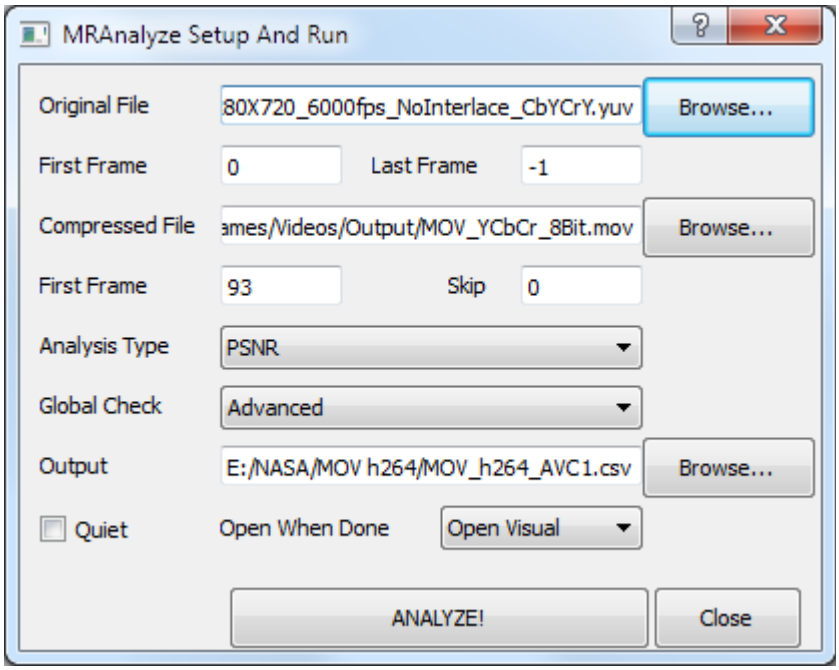
9.33.2 Command Line Parameters

mranalyze - Video/Audio analysis tool (www.drastic.tv)

Usage: mranalyze -a <source a> -b <source b> -q -p # -s # -m # -g # -f # -l # -x # -n # [-o <targetfile>]

-a <source a> Original file.
-b <source b> Compressed file.
-q Quiet (no output) must be first argument.
-p # PSNR type
-s # SSIM type (0-Square, 1=Gaussian)
-m # MS-SSIM type
-g # Global checks (0-none, 1-basic, 2-advanced)
-f # First frame to check
-l # Last frame to check
-x # B source first frame to check
-n # Next frame distance (def 1 = every frame)
-o [targetfile] Optional, csv output name (or '-o i' to generate the file name)

9.33.3 Optional GUI



The MRAnalyze GUI can be used to create the command line, run the analysis and then display the results.

9.34 Error Returns

#define netxErrorNone 0
No error, success. Normal response.

#define netxErrorUnknown -1
An undefined error.

#define netxErrorBadChannelParam -2
One of the parameters in the channel command is bad.

#define netxErrorClientMissing -3
A command was sent to a client that does not exist.

#define netxErrorStartFailed -4
A start command on a group failed.

#define netxErrorStopFailed -5

A stop command on a group failed.

#define netxErrorRemoveFailed -6
Unable to remove a group or a channel.

#define netxErrorBadGroupParam -7
One of the parameters in the group command is bad.

9.35 Error Returns – Net-X-Copy

- 0 – Success
- 1 – unable to create file (unix equivalent EPERM). The translation failed because the output file could not be created.
- 2 – no such file or directory (unix equivalent ENOENT). Either the source file or target directory does not exist.
- 5 – read or write error (unix equivalent EIO). During conversion, the source file could not be read or the target file cannot be written. The output will be truncated.
- 6 – no such device or address (unix equivalent ENXIO). Either the NetXCmd could not be found, of the network source or target does not exist.
- 12 – unable to allocate memory (unix equivalent ENOMEM). The translation will fail.
- 17 – file exists (unix equivalent EEXIST)
- 22 – invalid argument (unix equivalent EINVAL). The translation/conversion will not start, because one of the arguments is invalid.
- 86 – unable to complete copy or conversion. There may be a partial file, but it will not be complete.
- 255 – unable to create index file or unable to index source. The index failed when indexing. If translating, then the index file will not exist.
- 256 – unable to acquire information from source file. Without the source metadata, the translation will not proceed.
- 257 – unable to set conversion center information. There was no translation available from the source file type to the target file type. The translation will fail.
- 258 – unable to find TS associated with RTIN. If clipping an RTIN that is connected to a transport stream, this error means the transport stream is missing.
- 259 – unable to retrieve frame information from RTIN. If the source is an RTIN, this means the media file with the audio/video is missing, and the translation will fail.
- 260 – start position in file greater than end position. This is an invalid segment, and cannot be converted.
- 261 – unable to set target file information. The target file could not be created as specified and the translation will fail.
- 261 – DMF get bytes error. This error comes from CXFS when the disk manager cannot retrieve the bytes required for a partial file restore.

- 275 – general timecode error (deprecated). The translation will be aborted.
- 276 – in timecode greater than out timecode. The requested segment is invalid, and the translation will not proceed.
- 277 – tcin before first timecode in file. The area requested does not exist, and the translation will not proceed.
- 278 – timecode is invalid. The in or out timecode is in the incorrect format. The translation will not proceed.
- 279 – tcout after last timecode in file. The segment requested is not within the file, so the translation will not proceed.
- 290 – in timecode not in file range. The absolute in time is not within the file being translated and the translation will fail.
- 291 – out timecode not in file range. The absolute out time is not within the file being translated and the translation will fail.
- 1155 – insufficient permissions to use dmPut. On a CXFS file system, the dmPut command restoring the file area has failed due to file permissions.

9.36 Error Returns – QC

0 – Success
-1 – General error
-101 – Unable to open the original file
-102 – Unable to open compare file
-103 – Unable to get channel count from the original
-104 – Unable to get channel count from the compare
-105 – Video channel count does not match
-106 – Audio channel count does not match
-107 – Video frame rates do not match
-108 – Audio sample rates do not match
-109 – Stream length does not match
-110 – Video frame length does not match
-111 – Audio sample length does not match
-112 – Starting time codes do not match
-113 – Time code types do not match
-114 – Unable to read original video frame
-115 – Original video frame returned zero for size
-116 – Unable to read compare video frame
-117 – Compare video frame returned zero for size
-118 – Closed caption: original file has cc, compare file does not
-119 – Closed caption: compare file has cc, original file does not
-120 – Inner frame read returned error
-121 – Inter frame read has zero size

9.37 Error Returns – Net-X-SDI

These are Microsoft style returns, with error/warning/info bits, and then areas within the DWORD/HRESULT return for source, area and type.

```
#define ERR_SEVERITY_SUCCESS            0x00000000UL
#define ERR_SEVERITY_INFORMATIONAL             0x40000000UL
#define ERR_SEVERITY_WARNING            0x80000000UL
#define ERR_SEVERITY_ERROR              0xC0000000UL

#define ERR_CUSTOMER_CODE               0x20000000UL

#define FACILITY_AVHAL                  0x08010000UL
#define FACILITY_MEDIAFILE              0x08020000UL
#define FACILITY_VVW                    0x08030000UL
#define FACILITY_VVWEXT                 0x08040000UL
#define FACILITY_VVWINT                 0x08050000UL
#define FACILITY_VVWNET                 0x08060000UL
#define FACILITY_VVWCTL                 0x08070000UL
#define FACILITY_TCS                    0x08080000UL
#define FACILITY_CLIP                   0x08090000UL
#define FACILITY_UTIL                   0x080A0000UL
#define FACILITY_MEM                    0x08100000UL
#define FACILITY_MEDIABASE              0x08110000UL
#define FACILITY_DRASTIC                0x0FFF0000UL

#define DEFAULT_FACILITY                FACILITY_DRASTIC

//
// Generic sub areas for errors to occur
//
#define VVWSUB_HANDLE                           0x0000
#define VVWSUB_CHANNEL                          0x1000
#define VVWSUB_MEMORY                           0x2000
#define VVWSUB_FILE                             0x3000
#define VVWSUB_READ                             0x4000
#define VVWSUB_WRITE                            0x5000
#define VVWSUB_HARDWARE                         0x6000
#define VVWSUB_MEDIACMD                         0x7000
#define VVWSUB_DFRAME                           0x8000

#define VVWSUB_INTERNAL                         0xE000
#define VVWSUB_SOFTWARE                         0xF000

//
// Specific errors
```

```
//
enum {
	VVWERR_DLIST,		// Handling dlist
	0		0x00
	VVWERR_DOESNTEXIST,	// Handles, pointers, drivers
	VVWERR_UNKNOWN,		// Channel
	VVWERR_INVALID,		// Handles, pointers
	VVWERR_BAD,		// Handles, pointers, mediacmd, dframe
	VVWERR_NULL,		// Pointer
	VVWERR_SELECTION,	// Channel select, in/out, clip
	VVWERR_LOCAL,		// Memory
	VVWERR_GLOBAL,		// Memory
	VVWERR_SHARED,		// Memory, resource
	VVWERR_FREE,		// Memory, resource
	10		0x0A
	VVWERR_TOOSMALL,	// Memory area too small
	VVWERR_OPEN,		// File open
	VVWERR_END,		// End of File
	VVWERR_READ,		// File, memory
	VVWERR_WRITE,		// File, memory
	VVWERR_CLOSE,		// File
		16		0x10
	VVWERR_NOTFOUND,	// File, resource
	VVWERR_NOTOPEN,		// File
	VVWERR_PARAM,		// Calling
	VVWERR_PARAM1,		// Calling
	20
	VVWERR_PARAM2,		// Calling
	VVWERR_PARAM3,		// Calling
	VVWERR_PARAM4,		// Calling
	VVWERR_PARAM5,		// Calling
	VVWERR_INDIRECTION,	// Recursion
	VVWERR_ADD,		// Adding to list, tcspace, clipspace
	VVWERR_DEL,		// Deleting/Removing from list, tcspace, clipspace
	VVWERR_FIND,		// Finding
	VVWERR_CALLBACK,	// User error
	VVWERR_FILEEXISTS,	// Creating existing file                                30
	VVWERR_LOCKED,		// Lock exclusive by someone else
	VVWERR_NOALLOC,		// No Allocation available
	0x20
	VVWERR_EXCEPTION,	// Caused an exception
	VVWERR_SEEK,		// Unable to seek
	VVWERR_NOT_READY,	// File has not yet finished write
	VVWERR_NOT_ENOUGH_DATA,	// File has not yet finished write
	VVWERR_NOT_SUPPORTED,	// Not a supported operation
	VVWERR_TOLARGE,		// Too many too big
	VVWERR_NONEAVAIL,	// A request param was not available
	VVWERR_BAD_FORMAT,	// Item format not correct                               40
```

```
        0x28
        VVWERR_OUTOFRANGE,
// Sentinal
        __VVWERR_SENTINAL = 0xFFF  // last possible error
};
#define VVWERR_MASK  0xFFFFUL
```

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