WOWZA™ media systems

nDVR

User Guide

nDVR
User Guide

Version: 4

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Chapter 1

About nDVR

The nDVR feature in Wowza Streaming Engine™ media server software provides the ability to record a live stream while simultaneously allowing users to play or pause the stream, rewind to a previously recorded point, and resume viewing at the current live point. Custom configuration allows you to control the archive strategy and availability of your recorded streams.

Setup for playing recorded streams is similar to playing live streams from Wowza Streaming Engine.

For more information that may be useful for setting up nDVR, see these technical articles:

- Get started with nDVR
- Plan your nDVR workflow
- Set up and run nDVR in Wowza Streaming Engine
- Configure advanced properties for nDVR

Chapter 2

Licensing nDVR

The nDVR feature is part of the Wowza Streaming Engine and is supported on the same operating systems that are supported by Wowza Streaming Engine.

Licensing requirements for nDVR

Perpetual and Subscription licenses for Wowza Streaming Engine provide for unlimited connections to the media server instance and enable use of the nDVR technology that's integrated with each licensed instance.

A Perpetual license is best for stable, long-term demand. A Perpetual license key has either an **EPBP4** or **EPBU4** prefix (depending on date of purchase) and is for use with one Wowza Streaming Engine instance and the integrated nDVR technology. A Subscription license is best for variable demand. You can install as many instances of Wowza Streaming Engine as needed using the same license key and enable the nDVR technology integrated with each instance. A Subscription license key has an **ENGM4** prefix. For more information on plans, see Wowza Streaming Engine Pricing.

The license key you enter when you install Wowza Streaming Engine is displayed in the **License Keys** box in Wowza Streaming Engine Manager. If you switch your licensing option for the Wowza Streaming Engine instance, you can replace the existing license key with the new license key without reinstalling the software. If you purchased a license key to enable nDVR for use with the licensed server instance, you can add this license key.

All license key values are stored in the **[install-dir]/conf/Server.license** file in the Wowza Streaming Engine installation:

- **Windows** – %WMSCONFIG_HOME%\conf\Server.license
- **macOS** – /Library/WowzaStreamingEngine/conf/Server.license

- **Linux/Unix** – /usr/local/WowzaStreamingEngine/conf/Server.license

To add license keys in Wowza Streaming Engine Manager, do the following:

1. Click the **Server** tab, and then click **Server Setup** in the contents panel.
2. On the **Server Setup** page, click **Edit**.
3. In the **License Keys** box, enter your license key for Wowza Streaming Engine. If you need to enter multiple license keys (for example, for the Wowza Streaming Engine and for nDVR), enter each license key on a separate line.
4. Click **Save**, and then click **Restart Now** at the top of the **Server Setup** page when prompted to apply the changes. The new license(s) take effect after the server is restarted.

After restarting, Wowza Streaming Engine displays the only first and last five digits of the license keys you entered, for security.

Note

If you purchased Wowza Streaming Engine before January 1, 2015, contact sales@wowza.com to learn more about how to license nDVR.

Chapter 3

nDVR feature overview

The nDVR capabilities in Wowza Streaming Engine offer multiple ways to extend your streaming workflow. A live stream that's already configured for your streaming workflow can be modified easily and customized to suit your archiving needs.

Supported codecs

nDVR supports the following video and audio codecs:

Video

- H.264
- Video-only streams

Audio

- AAC
- MP3
- Audio-only streams

By default, nDVR records the source stream as ingested, provided that it's a supported codec format. The audio and video streams are passed through to the resultant recorded stream. nDVR accommodates different workflows and gives you the flexibility to record the video-only or the audio-only portion of your source stream.

It's a common mistake to try to record a live source stream that has an unsupported codec. However, if your source uses a codec that’s not supported by nDVR but *is* supported for ingest by Transcoder, you can transcode your source stream before recording. This setup can be accomplished with one application and doesn't require a two-step process. For more information, see Integrating Transcoder and nDVR.

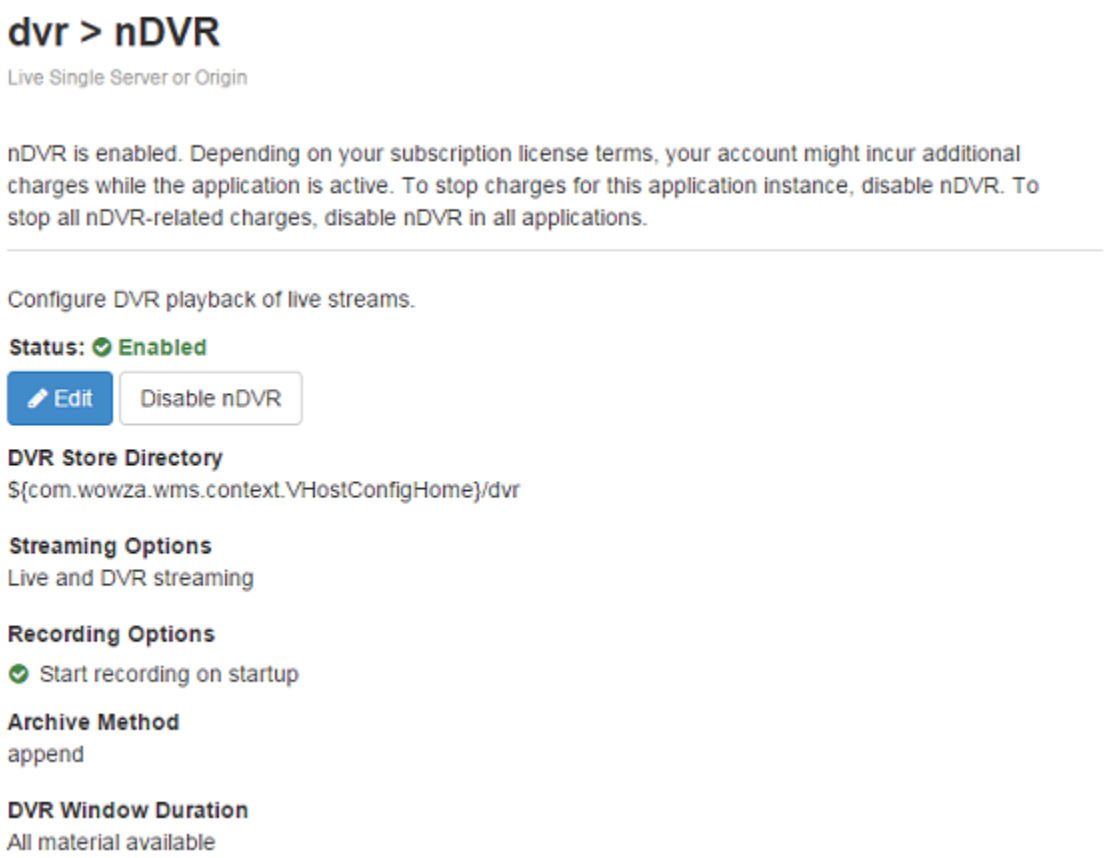
Supported protocols

nDVR supports HTTP playback of recorded streams using the following protocols:

- HLS through the Cupertino packetizer, but not CMAF or Low-Latency HLS
- MPEG-DASH through the MPEG-DASH packetizer, not the CMAF packetizer
- HDS (San Jose streaming)
- Microsoft Smooth Streaming (Smooth)

Recorded file location

You can set the location of recorded file and other options for nDVR in Wowza Streaming Engine Manager, as shown in the following screenshot. (For more information about setup, see Chapter 4, Setting up nDVR in Wowza Streaming Engine Manager.)



When nDVR starts recording, a storage directory is created. Inside the storage directory are time-based directories, each containing .m4fa audio and .m4fv video files, which are the

resultant chunks, and a **manifest.txt** file. If the incoming stream has metadata, .m4fm metadata files are created. By default, nDVR writes to the path and filename:

```
[install-dir]/dvr/[app-name]/_definst_/[streamName].[n]
```

For example, if the application name is **live** and the stream name is **myStream**, with the default settings, the new directory will be located at:

```
[install-dir]/dvr/live/_definst_/myStream.0
```

Directory structure

The directory naming convention is *HHHH_MM_SS*, where *H* = hours, *M* = minutes, and *S* = seconds.

By default, nDVR creates a new directory every 600 seconds (10 minutes) and the archive strategy appends new audio and video to the recording when the source encoder is restarted. This value is defined in the **dvrChunkGroupingSeconds** property in the **Application.xml** file.

The following is an example directory structure for a recorded stream of length 1 hour and 10 minutes:

```
0000_00_00
0000_10_00
0000_20_00
0000_30_00
0000_40_00
0000_50_00
0001_00_00
0001_10_00
manifest.txt
```

Using the folder named **0000_00_00** as an example, the initial contents would be:

```
A-0000_00_00_000.m4fa
dvrManifest_0000_00_00.txt
M-0000_00_00_000.m4fm
V-0000_00_00_000.m4fv
```

The file naming convention is the same as the directory naming with an additional millisecond value represented by mmm: *HH_MM_SS_mmm*.

.m4fa and .m4fv files

nDVR creates .m4fa audio and .m4fv video files, which are based on the MPEG-4 multimedia container format. Together, these files represent a chunk of recorded audio and video content that's used for playback of your recorded stream.

You can't play these files directly. However, they are required and referenced when you play your live recorded stream using nDVR. If you delete or move these files, playback errors will occur. If your configuration changes and you must move recorded files, make sure that the corresponding **DVR/StorageDir** property is updated in your configuration.

nDVR doesn’t concatenate these recorded files into a single on-demand file for later use.

Manifest files

Manifest files are for information only and shouldn't be edited, moved, or deleted.

manifest.txt

This manifest file contains information about the recorded stream. It's at the same level as the directories. By default, this location is:

```
[install-dir]/dvr/[app-name]/_definst_/[streamName].[n]
```

dvrManifest_[HHHH]_[MM]_[SS].txt

This manifest file is part of every directory that has .m4fa and .m4fv files and contains information about each recorded audio and video chunk. The file name corresponds to the directory's hours, minutes, and seconds description.

Recording playback

Example players are provided for playback of recorded files in Wowza Streaming Engine Manager and the **[install-dir]/examples/LiveDVRStreaming** folder in the Wowza Streaming Engine installation. If the application name is **live** and the stream name is **myStream**:

To play using HLS:

```
http://[wowza-ip-address]:1935/live/myStream/playlist.m3u8?DVR
```

To play using MPEG-DASH:

```
http://[wowza-ip-
address]:1935/live/myStream/manifest_mp[manifest-
profile]_mv[manifest-variation].mpd
```

To play using HDS:

```
http://[wowza-ip-address]:1935/live/myStream/manifest.f4m?DVR
```

To play using Smooth Streaming:

```
http://[wowza-ip-address]:1935/live/myStream/manifest?DVR
```

Adaptive bitrate delivery

Synchronized Multimedia Integration Language (SMIL)

When nDVR is added to your live workflow, you can leverage the same SMIL files you may have created for live streaming. The SMIL workflow requires you to have an encoder that can generate keyframe-aligned, multiple bitrate streams from the same source.

The smil: prefix is used when playing back a group using SMIL files.

To play using HLS:

```
http://[wowza-ip-
address]:1935/live/smil:myStream.smil/playlist.m3u8?DVR
```

To play using MPEG-DASH:

```
http://[wowza-ip-
address]:1935/live/smil:myStream.smil/manifest_mp[manifest-
profile]_mv[manifest-variation].mpd
```

To play using HDS:

```
http://[wowza-ip-
address]:1935/live/smil:myStream.smil/manifest.f4m?DVR
```

To play using Smooth Streaming:

```
http://[wowza-ip-
address]:1935/live/smil:myStream.smil/manifest?DVR
```

For more information about how to create SMIL files, see the technical article Stream adaptive-bitrate content with Wowza Streaming Engine.

Integrating Transcoder and nDVR

Transcoder and nDVR can work together to transrate/transcode and record a live stream at the same time. You can set this up with one application and one configuration. Extra post-processing isn't required. For more information about Transcoder, see any of the technical articles at Use Wowza Streaming Engine Transcoder.

nDVR records each output rendition from Transcoder in a separate directory structure. If you're using the sample Transcoder template **transrate.xml** with a live stream named **myStream**, then you'll see the following directories created in **[install-dir]/dvr/[app-name]/_definst_/[streamName][.n]**:

- myStream.0
- myStream_160p.0
- mySteam_360p.0

Extending nDVR

Wowza Streaming Engine can be extended by writing custom Java classes that load dynamically at runtime. The server includes a rich Java API to interact with and control the streaming and recording process. For information, see our Wowza Streaming Engine Java API technical articles.

Chapter 4

Setting up nDVR in Wowza Streaming Engine Manager

You can use Wowza Streaming Engine Manager to set up an application for live streaming with nDVR capability.

Creating a live application for nDVR

1. In Wowza Streaming Engine Manager, click the **Applications** tab and then click **Add Application** in the contents panel.
2. On the **Add Application** page, click **Live** to create a live streaming application.
3. In the **New Application** dialog box, enter a name, such as **dvr**, and then click **Add**.
4. Expand the **dvr** application in the contents panel, click **nDVR**, and then click **Enable nDVR**.
5. Click **Restart Now** to apply the changes.

   The **Status** shows that nDVR is enabled.
6. Click **Edit** to configure any of the following nDVR settings.

   DVR Store Directory – Specifies the top-level folder where DVR streams are stored. This can contain an explicit path (for example, **C:/myDvr**) or an environment variable (for example, **${com.wowza.wms.context.VHostConfigHome}**). The following environment variables are supported.

${com.wowza.wms.AppHome}	Application home directory
${com.wowza.wms.ConfigHome}	Configuration home directory

${com.wowza.wms.context.VHost}	Virtual host name
${com.wowza.wms.context.VHostConfigHome}	Virtual host config directory
${com.wowza.wms.context.Application}	Application name
${com.wowza.wms.context.ApplicationInstance}	Application instance name

Streaming Options – Specifies how an incoming live stream can be played by indicating if the *?DVR* query parameter must be appended to playback URLs.

To specify that a live stream can be played with or without nDVR playback controls, select **Live and DVR streaming**. This option means that the live stream is available for playback with or without the *?DVR* query parameter appended to playback URLs. If *?DVR* isn't appended to the playback URL, the live stream can still be played but DVR playback isn't supported.

To specify that a live stream can be played only by using the DVR playback controls in a player, select **DVR streaming only**. This option means that the *?DVR* query parameter must be appended to playback URLs.

Recording Options – Select **Start recording on startup** to automatically begin recording a live stream that's published to the application for DVR when the application starts.

Archive Method – Specify how nDVR handles recording a new stream that's published to the application with the same stream name. This often happens if the current live stream is disrupted when encoders restart.

The **Append** option is the best option to use to handle disruptions in the live stream. Each time a new stream with the same name is recorded, nDVR appends to the existing recording. This is the default setting.

The **Delete** option deletes the previous recording and starts a new recording.

The **Version** option starts a new recording in a new folder in the DVR store for each new stream. If the stream name is **myStream**, the first recording is written to **[install-dir]/dvr/[application-name]/myStream.0**, the second recording is written to a directory named **myStream.1**, and so on. Whenever there's a recording of the same stream name, the previous recording is preserved and isn't deleted or overwritten.

DVR Window Duration – Specify the amount of recorded content in the nDVR store that's available for playback.

To make the entire recording available for playback, select **All material available**. This option enables viewers who join the live stream in-progress to rewind and watch the stream from the beginning. This option also preserves the live stream recording after the stream ends.

To make only part of the live stream available for playback, select **Use window duration** and then specify the duration in **Hours:Minutes:Seconds**. The minimum supported duration value is 60 seconds. This option enables viewers who join the live stream in progress to rewind the stream for the duration that you specify and watch from that point forward. The duration window is a "floating window" that always ends at the current live point. Recorded data that falls outside this window is purged from the DVR store.

Note

You can record up to 30 hours of content for playback, however, you may encounter performance and playback issues if you make longer durations of content available. For best practices, see Recording length.

7. Click **Save**, and then click **Restart Now** to apply the changes.
8. Publish a live stream to the **dvr** application. For details, see the technical article Connect a live source to Wowza Streaming Engine. If you selected **Start recording on startup** as described above, the **dvr** application will automatically record the stream when the encoder begins sending it, and users can seek to earlier segments of the live stream.

Notes

- If you want to manually control when the recording starts, you must use the Wowza Streaming Engine Java API. See Use nDVR recording with the Wowza Streaming Engine Java API.
- Additional configuration is described in the article Configure advanced properties for nDVR. We recommend that you start with the default **append** archive strategy and test with your live stream before making advanced customizations.

Configuration notes

Align audio and video

nDVR expects incoming audio and video to be aligned. It relies on timecode information to create chunks where video key frames occur. If audio and video become unaligned, nDVR tries to compensate for this problem, but it can't always resolve it.

Alignment issues start before nDVR starts recording. They begin in the encoding process or originate as an issue with the live source. Typically, you can modify the encoder settings to address the issue. You should fix audio and video alignment issues upstream from Wowza Streaming Engine.

If alignment issues are pronounced, nDVR discards chunks and unexpected behavior can occur in time-based custom configurations. nDVR will log messages to alert you to alignment issues while recording. If the alignment problem can't be fixed at the source or encoder, you can use the **dvrPacketSortTime** property to add a packet sorter before the audio and video packets get to nDVR. Note that this property adds additional latency equal to its value. For more information about this and other properties, see the article Configure advanced properties for nDVR.

Configure live stream repeater (origin/edge)

nDVR supports origin/edge configuration. For information, see the article Set up a Wowza Streaming Engine live stream repeater for nDVR.

Optimize for performance

nDVR performance is dependent on disk I/O; therefore, a fast disk is critical for best performance.

Customize recordings

Instructions for customizing your recording and enabling nDVR are described in the article Set up and run nDVR in Wowza Streaming Engine.