WOWZA™
media systems

Deciding what event you want to stream live—that's the easy part. Figuring out how to stream it? That's a different question, one with as many answers as there are options. Cameras? Encoders? Origin and edge servers? Adaptive streaming protocols? Getting up and running with a live video stream doesn't actually have to be daunting.

Wowza® Media Systems provides all the pieces in the streaming puzzle, from capture to delivery, taking the complexity out of streaming live events.

How to Stream Live with Wowza Streaming Engine

Robust, customizable, and scalable, Wowza Streaming Engine™ server software accepts video input from a variety of sources and delivers video in multiple formats with the highest possible quality to any connected device, anywhere (**Figure 1**). With Wowza Streaming Engine, you can build video streaming applications and services with security and confidence, using the built-in browser-based Wowza Streaming Engine Manager to easily configure, manage, and monitor your stream.
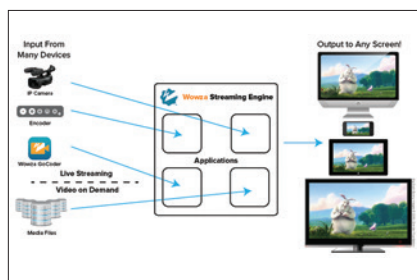

Figure 1: Wowza Streaming Engine accepts video in many formats—including live streams from most IP cameras and encoders, as well as pre-recorded media file— transcodes it once, and delivers it in multiple formats for playback on any screen.

1. Choosing Your Camera and Encoder

To stream a live event, the first piece of equipment you need is a camera. (In fact, as you gain experience, you'll probably want a few cameras to cover different angles, but one will get you going.) One option is to use an analog video camera and connect it to an encoder over a wired or wireless connection. The encoder takes the incoming analog video and audio, digitizes and compresses it, and feeds it to the Wowza Streaming Engine. The software can then transcode the incoming stream into H.264 and AAC codecs and create various quality levels before repackaging those into multiple streaming formats that can be viewed by your audience on computers and mobile devices.

Wowza Streaming Engine accepts streams created by a wide range of encoders, from free software RTMP encoders to broadcast-grade MPEG-TS hardware, so this is certainly a viable option. But an even easier solution, especially for a beginning live broadcast, is to use the Wowza GoCoder™ app.

Wowza GoCoder (see **Figure 2**) is a live audio and video encoding app for iOS and Android devices. With GoCoder, you can use your iPad—or your iPad Mini, iPhone 3GS or later, iPod Touch, or Android 4.2 or later device—to capture your live event in HD quality (1080p). The app encodes the video using the H.264 video and AAC audio codecs and connects to Wowza Streaming Engine via Wi-Fi, 4G, or 3G, allowing you to capture live video anywhere, on the fly, and deliver it to your viewers in real time.

Figure 2: Wowza GoCoder captures and encodes HD-quality video on iOS and Android devices and connects to the Wowza Streaming Engine to deliver live streams in real time.

You can download Wowza GoCoder from your device application marketplace (i.e., App Store or Google Play). For more flexibility and control, you can also purchase assorted filters, lenses, and tripods for your device at electronics stores and online retailers. Get full instructions for installing and configuring Wowza GoCoder at www.wowza.com/GoCoderTutorials.

2. Prepare Your Streaming Server

The next step is to prepare and configure Wowza Streaming Engine. To stream a live event using GoCoder to a relatively small, local audience, you can easily deploy Wowza Streaming Engine onsite using a robust laptop computer and broadcasting to numerous concurrent users, limited only by your hardware resources and available bandwidth. In this scenario, Wowza Streaming Engine acts as both the *origin server*—the server that receives the live video feed and performs the transcoding—as well as the *edge server*—the server the delivers the stream to client players.

(When you're ready to scale up to larger and more disparate audiences or you don't want to manage hardware or network operations in-house, you can deploy Wowza Streaming Engine in the cloud or scale out by using a Content Delivery Network [CDN] provider.)

Wowza Streaming Engine runs on any platform that supports Java Runtime Environment (JRE) 6, including Linux®, Windows®, and Mac OS®. For best performance, use a 64-bit OS on a quad-core system with at least 1GB of RAM per core. On late-model commodity server hardware with dual quad-core processors and multiple NICs that has been properly tuned, you can typically achieve up to 8Gbps of streaming performance per server.

When your hardware is ready for testing, download and install the free trial of

![Wowza media systems logo]

Wowza Streaming Engine by going to www.wowza.com and clicking the **Free Trial** button.

As with GoCoder, instructions for installing and configuring Wowza Streaming Engine, including how to install JRE6, are available on the Wowza Support website. See the Wowza Quick Start Guide at www.wowza.com/QuickStartGuide.

3. Create Your Streaming App

Wowza Streaming Engine delivers streaming content by using *applications*. An application is simply a collection of settings for a live or video on demand (VOD) stream. Wowza Streaming Engine comes with two preinstalled apps, one for live streaming and one for VOD, which you can use as a starting point. Or, you can create your own app from scratch. Either way, when your hardware and other equipment are in place, you can configure your live streaming app in the Wowza Streaming Engine Manager, the new admin panel included with Wowza Streaming Engine.

One of the conveniences of the manager is that it is browser-based and built using responsive web design techniques. This means you can log into it and set up your streaming app from almost anywhere—the Android™ or iOS device that's running GoCoder, the laptop or computer that's hosting Wowza Streaming Engine, or any other Web-browsing-capable device.

When you log in, the manager asks you to enter a publishing user name and password. Streaming Engine uses this information to authenticate incoming encoder connections, including from GoCoder on your mobile device. Enter a name and password and click **Done! Start Using Wowza Streaming Engine**.

In the manager (see **Figure 3**), go to the

Server tab to perform administrative tasks such as managing IP addresses and port-based virtual-hosting environments, and go to the **Applications** tab to configure apps.
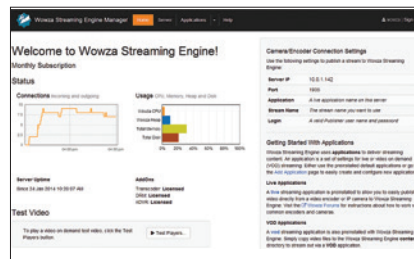

Figure 3: When you log in to Wowza Streaming Engine Manager, the Home page shows an overview of your resources, including CPU usage and the status of incoming and outgoing connections, as well as your Server IP and Port settings.

On the **Applications** tab, look for **Add Application** in the contents pane, as shown in **Figure 4**. For our basic streaming scenario in which you're delivering a live stream from an iOS or Android device directly to a small number of players, click on the **Live** button to create a live, single-server origin application. Give it a name, click the **+Add** button, and then enter a description and specify your desired playback types (see **Figure 5**).
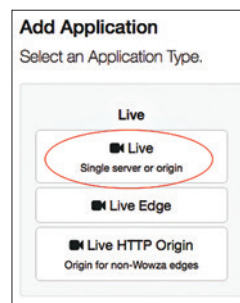
Figure 4: Create an application in Wowza Streaming Engine Manager.
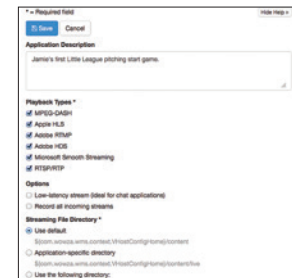
Figure 5: Wowza Streaming Engine supports multiple streaming formats.

Playback types are the streaming formats you want to use to send the content to players. The great thing about Wowza Streaming Engine is that you don't have to choose a single streaming protocol or format. You can publish your live stream in many different ones: Wowza Streaming Engine can transcode the source video once (if needed) and simultaneously package and deliver video and audio streams using all of the following streaming formats:

Apple® HTTP Live Streaming (HLS), for playback on iOS devices, in QuickTime 10 or later, in Safari 4.0 or later, some Android devices, and by some set-top boxes.

Adobe® HTTP Dynamic Streaming (HDS), for playback with Adobe Flash Player 10.1 or higher.

Microsoft® Smooth Streaming, for playback in clients such as Silverlight in web browsers on desktop computers, custom Smooth Streaming apps, and Xbox consoles.

RTMP (Real Time Media Protocol), for playback with Flash players.

RTSP/RTP (Real Time Streaming Protocol/Real-time Transport Protocol), for playback on devices such as most Android phones and many IPTV set-top boxes

MPEG-DASH, for MPEG-DASH clients.

Apple HLS, Adobe HDS, and Microsoft Smooth Streaming all work in a similar way. Each delivers small, discrete files, or "chunks," of video, using the HTTP protocol. Wowza Streaming Engine creates these chunks and packages them into different formats on the fly. When the chunks are also created at multiple bitrates, viewers can watch a dependable, uninterrupted, high-quality video stream on a variety of players and devices.

MPEG-DASH is a newer industry-standard streaming format developed by the ISO MPEG working group for Dynamic Adaptive Streaming over HTTP (DASH). It has many similarities to the three HTTP adaptive streaming formats above from Apple, Adobe and Microsoft, and in fact benefited from those companies' contributions to the specification. It includes Common Encryption, allowing you to protect content once and deliver to clients that support any of multiple DRM formats.

Although MPEG-DASH is not yet as widely used as the older Adobe, Apple, and Microsoft formats, it offers several key benefits. For example, until now, a content provider might package, protect, store, and deliver content in three different formats, typically using HLS for iOS devices, HDS for Flash-enabled desktops, and Smooth Streaming for Xbox consoles and Windows devices. With MPEG-DASH you only need to create one set of content to deliver to all of these endpoints. DASH also includes support for multiple language versions of the same content, allowing you to more easily reach an expanded audience.

4. Stream from Wowza GoCoder

Now we're ready to configure your Wowza GoCoder app to start streaming. Everything you need to configure is available from the GoCoder home screen (**Figure 6**).

Figure 6: Configure your video and streaming options in GoCoder.

There are also two easy ways to let the manager set the GoCoder configuration for you, saving some typing on your device. From the content pane for your live application in Streaming Engine Manager, click on **Incoming Publishers**. Below the provided encoder configuration, you will see a button labeled **Auto-configure GoCoder** (see **Figure 7**). Simply clicking this option is great if you are onsite at an event and using your mobile device to both manage Wowza Streaming Engine and run GoCoder. Otherwise, just below the Auto-configure option, enter the email address you use on the mobile device where GoCoder is installed, and click **Email Me**.

If you auto-configured GoCoder, it will have already launched for you. If you are manually configuring it, open GoCoder on your mobile device and tap the **Server** button. Under **Host** and **Application**, enter or verify the server and port settings, and the application and stream file names. Under **Login**, confirm or enter the publishing user name and password that you specified in Wowza Streaming Engine Manager (these do not get set through email auto-configuration).
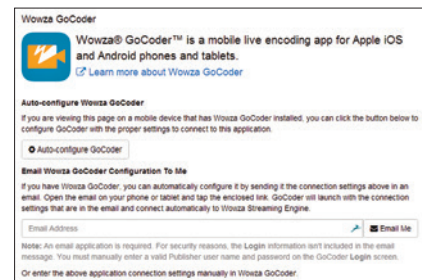
Figure 7: Auto-configure your video and streaming options for GoCoder from Wowza Streaming Engine Manager.

Tap the bitrate button to choose the highest bitrate value that you want to stream. (If you have limited bandwidth at any point between your mobile device and your Wowza server, you may need to lower the bitrate below the predetermined setting.) Wowza Transcoder AddOn can be used on the server to decode the stream at this bitrate and create multiple, lower-bitrate files with properly aligned key frames for adaptive bitrate delivery. Under **Options**, specify your video input settings: stream type, frame rate, key frame interval, and video size.

By default, Wowza Streaming Engine binds to TCP port 1935. Before you stream, make sure that the host server and port locations are not blocked from incoming streams by a firewall.

Now, believe it or not, you're ready to test your first live stream. Tap the Encode (record) button (see **Figure 8**) to broadcast to Wowza Streaming Engine and to the world. If

everything is configured correctly, you will see a "Stream Started" message appear for a moment in the middle of the GoCoder screen.

Figure 8: Tap the red button in GoCoder to start streaming your live event.

Best Practices

Test. It's always a good idea to test your players before you start streaming a live event. You can do this in Wowza Streaming Engine Manager.

First, from your live application in Streaming Engine Manager, select **Incoming Streams**. Under Active Streams in the content pane, you should see an RTSP or WOWZ address that matches the network address of your device.

Figure 9: The Test Players window in the Wowza Streaming Engine Manager.

Next, view the stream. Click the **Test Players** button in Streaming Engine Manager to launch the Test Players window (**Figure 9**),

which connects to Wowza Streaming Engine server software and lets you toggle through the various playback protocols: MPEG-DASH, Apple HLS, Adobe RTMP, Adobe HDS, and Microsoft Smooth Streaming. Click the Mobile tab for a URL that you can enter in to your mobile device's default browser to test it there.

Monitor. Stay logged in to the Wowza Streaming Engine Manager throughout your broadcast to see how many connections are hitting for each protocol, app uptime, network throughput, and customizable graphs of your connections and throughput over time (see **Figure 10**).

Figure 10: Track connections, usage, and throughput of your live app in the Monitoring panel.

Transcode. Since several of our output types—Apple HLS, Adobe HDS, Smooth Streaming, and MPEG-DASH—support adaptive bitrate streaming, a next step is for you to enable this in Wowza Streaming Engine to give your audience the best possible playback experience.

As explained earlier, Adobe HDS, Apple HLS, Microsoft Smooth Streaming, and MPEG-DASH all make use of small, "chunked" video files that are only a few seconds long, and these chunks are typically encoded at multiple bitrates. Every few seconds, the player requests the chunk that has best

bitrate for the viewer's currently available bandwidth and device processing power. As playback resources change—perhaps more bandwidth becomes available—the player can switch to a better bitrate to keep playback fluid and of the highest possible quality.

One of the easiest ways to enable adaptive streaming is to turn on the optional Wowza Transcoder AddOn, which transcodes and transrates live incoming audio and video into several quality levels before repackaging and delivering them in multiple formats. It is often much easier to use your existing encoder to create just a single HD stream at the site of your live event, send that to Wowza Streaming Engine (whether onsite or in the cloud), and let Streaming Engine handle all the slicing and dicing needed to best reach your viewers, no matter what device they are on.

For more information on setting up Wowza Transcoder AddOn for live streaming, see www.wowza.com/LiveTranscoding.

Learn. Take advantage of the robust support site and network of community experts at Wowza.com to get advice, read documentation, ask questions, and learn from peers and partners. Go to www.wowza.com/support.

About Wowza Media Systems

Wowza Media Systems helps organizations harness the power of streaming by reducing the complexities of audio and video delivery to any device anywhere. Organizations in more than 150 countries count on innovative and award-winning Wowza software to build, deploy, and manage customized streaming solutions that deliver high-quality and engaging live and on-demand experiences.