



Delivering content to Apple iPhone, iPod Touch and iPad using RealNetworks

Helix  Solutions

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Mobile Multimedia Overview

In recent years, the adoption of mobile multimedia has grown steadily to a point where over 50% of mobile devices have the ability to support playback of some kind of video and video content. While delivering live or on-demand content to these devices has been difficult based on the range of protocols, codecs, networks and standards available as well as end users reluctance to pay additional data charges for such content, RealNetworks Helix Media Delivery Platform is seen as the market leader in meeting the requirements for mobile delivery supporting devices on a number of different mobile platforms including Apple OS, Android, Symbian, RIM and Windows 7 Mobile.

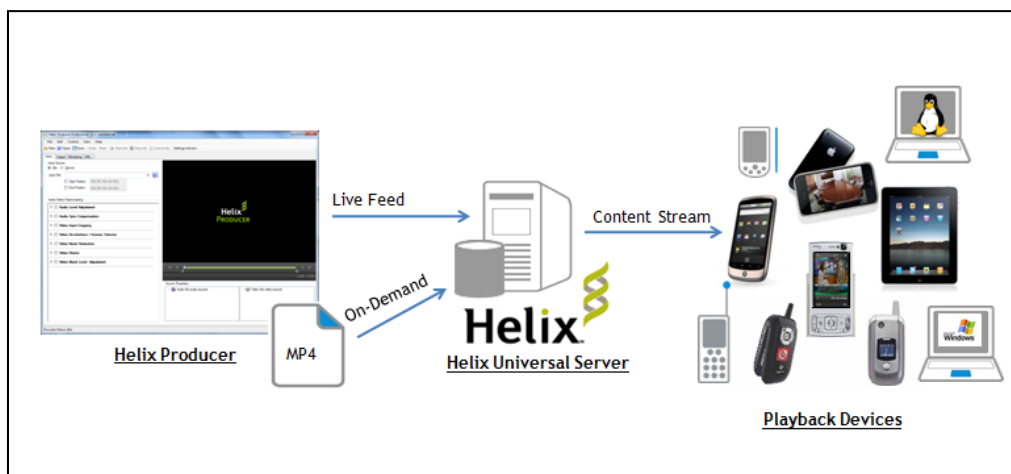


Figure 1: Helix Producer -> Helix Universal Server -> Playback Device

Today, mobile video has taken a different direction thanks to the new wave of smart-phones which have larger high resolution touch screen displays, high speed data access (3G/4G/Wifi) and simple to use interfaces alongside more reasonably priced (and sometimes unlimited) data-plans from the mobile operators. This change in the market has seen the usage of mobile video increase dramatically and will continue to do so.

The iPhone has always been seen as a market leader in the smart-phone device category and with Apple leading the way with other multimedia capable devices such as the iPod Touch & iPad, many more people today will enjoy high end video experiences on their mobile devices than ever before.

When looking to deliver content to Apple devices, a new methodology is required to be implemented which is different than has been used today for other 3GPP compliant

mobile/smart phones. RealNetworks have incorporated this new technique into the latest Helix Media Delivery Platform to make it quick and easy to deliver media to Apple devices while maintaining compatibility with other mobile devices as well as desktop media players. This one simple solution ensures that end users on any device are able to access multimedia content wherever they are.

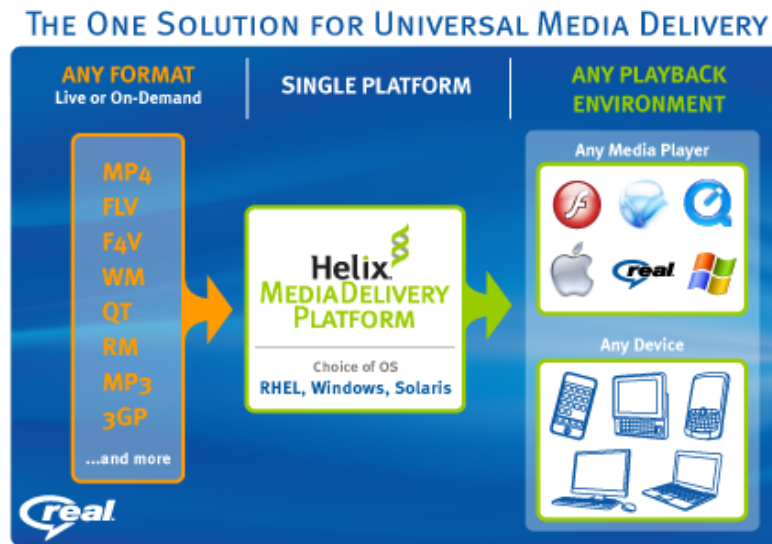


Figure 2: Helix Media Delivery Platform

This document specifically focuses on how RealNetworks have approached the market requirement to quickly, easily and reliably support the delivery of content to Apple's iPhone/iPad/iPod Touch devices (running iPhone OS 3.0 and later) using the Helix Producer and the Helix Universal Server without the need to implement new and expensive encoding solutions or unsupported 3rd party segmentation tools.

Following Apple's HTTP streaming specification, RealNetworks solution meets the delivery requirements of Apple devices today and into the future.



Figure 3: iPhone 4 (Released June 2010) fully supported by Helix Media Delivery Platform



Media Delivery to Apple Devices

RealNetworks possesses many years of experience when it comes to delivering multimedia in many different formats, over multiple different networks, to multiple different devices in the most reliable way possible. RealNetworks always strives to ensure that this is performed efficiently and securely with the most accurate statistics gathering and following the specifications followed by the device manufacturer.

In the case of Apple OS, the methods used for accessing media is very different than delivering content through RTSP (as other mobile clients use) or RTMP (as Adobe flash media clients use). Apple have implemented a client-driven system for downloading full or segmented audio and video files through the HTTP or HTTPS protocol.

The Apple client (running iPhone OS 3.0 and later) also supports the ability to switch to alternative versions of the content (if available) based on changing network throughput or content availability. The device also supports the ability to request, decode and playback of AES-128 encrypted content which is used when a content owner would like to ensure their media is protected.

The Helix Media Delivery Platform fully supports all the methods used by the Apple devices to access media complete with support for Android, Symbian and Windows 7 Mobile OS clients.

For content delivery, there are two methods the Apple devices use:

- Progressive Download
- Segmented Download (also known as 'HTTP Live Streaming').

The following section summarizes these two methods from a high level:

Progressive Download

The iPhone client has the option to use HTTP or HTTPS to progressively download a pre-created media file formatted in the relevant codecs for the device to play. As the file begins to progressively download, playback is initiated allowing an almost immediate viewing of the content. In the background, the media player continues to download the rest of the content. By contrast, without progressive download the user would have to wait for the entire file to download to the device before viewing would commence.



During the playback process, viewers are able to seek back and forth through the entire media file. If the viewer seeks forward to a point in the timeline that has not yet downloaded, the media player pauses playback until the data arrives.

Segmented Download - 'HTTP Live Streaming'

While this is often referred to as 'HTTP Live Streaming' this method is used for both live and on-demand content.

With on-demand media files, these are delivered to the Apple OS device by converting the source media file into a series of 10 second segmented media files encapsulated in a MPEG-2 transport stream (.ts) container and making them available to be delivered to the client through the HTTP or HTTPS protocol.

Live streaming is achieved in a similar manner as with on-demand files though requires a live source. By taking the output from a live RTP encoder and producing a series of 10 second media files encapsulated in a MPEG-2 transport stream (.ts) container, these files are then delivered to the Apple client through either HTTP or HTTPS protocols.

After creating the MPEG-2 TS segments, an index file (.m3u8) is created (or updated if the content is live) that lists the order of and URLs to each segmented media file. This index file is also known as a playlist and will also include some additional information about the content itself (segment length, if content is encrypted where the decryption key can be found, multirate bandwidth information etc). After receiving the index file, the iPhone OS media client downloads each segment files listed in the playlist using HTTP(S) and plays back the media in order listed.

During the playback process the viewer is able to seek backward and forward through media segments that have arrived.



NOTE: When deciding whether to use Progressive Download or 'HTTP Live Streaming' techniques for on-demand content, remember that Apple Inc states the following for mobile applications which are to be submitted to the App Store:

- If your application delivers video over cellular networks, and the video exceeds either 10 minutes duration or 5 MB of data in a five minute period, you are required to use HTTP Live Streaming. (Progressive Download may be used for smaller clips.)
- If your application uses HTTP Live Streaming over cellular networks, you are required to provide at least one stream at 64 Kbps or lower bandwidth (the low-bandwidth stream may be audio-only or audio with a still image).
- Non-compliant apps may be rejected or removed, at the discretion of Apple Inc.

Based on the above, RealNetworks would recommend that all on-demand content is delivered as a 'HTTP Live Stream'. This also allows additional security over the content as the full media file isn't available as a download for users to view offline and allows media file encryption for additional security.

The Helix Universal Server offers further flexibility by allowing content to be started from a designated start point. This enables the content owner to choose where to view from, for example content previews. In addition Helix Universal Server incorporates bookmarking enabling a viewer to stop playback and then resume at a later time without having to start viewing from the beginning. The Helix bookmarking capability operates across all Helix Universal Server media clients from PCs to mobile devices.



On-Demand Content Creation for Apple Devices

Creating on-demand content for an Apple device is something very easy when using the Helix Media Delivery Platform, taking a few minutes to configure it does not even require you to change your content production methods if you are already creating media in a format that is supported by the Apple devices. For example, if you use Helix Mobile Producer or 3rd Party Encoders today to create media files for other non-Apple based Mobile clients then this same content is used from the Helix Universal Server to deliver to Apple devices without any changes to your existing content creation architecture.

Depending on the method the content is to be accessed (Progressive Download or 'HTTP Live Streaming') the formats supported by Apple devices are varied.

For Progressive Download:

- File: 3GPP (.3gp), MPEG-4 (.mp4, .m4v), MP3 (.mp3), QuickTime (.mov)
- Video Codecs: MPEG-4, H.263, H.264
- Audio Codecs: AAC, AAC+, AMR-NB, AMR-WB, MP3

For "HTTP Live Streaming":

- File: 3GPP (.3gp), MPEG-4 (.mp4, .m4v, .f4v), QuickTime (.mov)
- Video: H.264 Baseline Profile Level 3.0 (iPhone/iPod Touch), Main Profile Level 3.1 (iPad)
- Audio: HE-AAC or AAC-LC up to 48 kHz, stereo audio

Media files using these codecs are delivered by the Helix Universal Server to an Apple OS client either as a Progressive Download file or as a 'HTTP Live Stream' without the content creator needing to do anything except place the media file in the relevant location on the Helix delivery server for the iPhone to access (Point 1 in Figure 4 below).

If you require to deliver on-demand files as a 'HTTP Live Stream', the Helix Server has the ability to on-the-fly segment (and encrypt if required for security) a correctly formatted on-demand media file into the components required by the Apple device (the TS media segments and the m3u8 playlist file as seen in Point 3 in Figure 4

below). This process happens instantaneously on the first request by an Apple device (Point 2 in Figure 4 below) and the playlist is then delivered back to the device (Point 4 in Figure 4 below).

Once the device reads the playlist and works out the bandwidth available (if required for a multi-rate clip) the client then requests the relevant .TS media segment for playback to start (Point 5 in Figure 4 below).

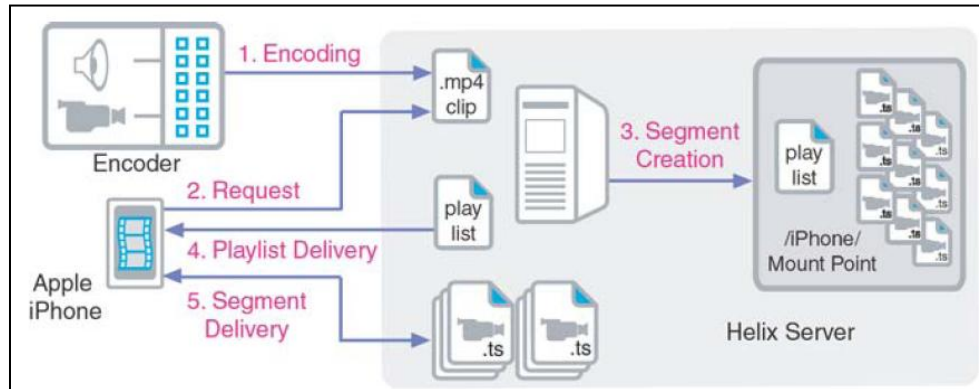


Figure 4: Helix Segmentation of On-Demand Content

The Helix Server also caches the resultant segmented components to deliver to future requests for the same media file. This process is completely automated and as an additional benefit for both the content owner and the server administrator it means content management is simplified to the original on-demand file only.

This whole process has a number of benefits:

- The content creator doesn't need to invest in the purchase of and training in the use of new content creation tools.
- The content creator doesn't need to worry about how they are going to handle the segmentation of content and the resultant TS files along with updating the playlist file based on the delivery requirements; this is fully automated within the Helix Server.
- If the content owner updates the original media file then they only need to change and upload one media file.
- If source content is updated, the Helix Server will replace the cached segments automatically the next time the content is requested so there is no need to worry about users getting old content.



- If the content owner deletes the original media file then the Helix Server will no longer deliver the segmented version of the file and at a configured purge interval will delete the segmented version from the cache.
- The Helix Server administrator doesn't need to worry about all the TS and m3u8 files as they are held in a specific designated directory which is self managed.
- Single pieces of H264/AAC Content are delivered to Apple devices, other 3GPP Release 6 compliant RTSP mobile devices and even Flash media players without the need of recreating different files.
- The process is fully supported and developed by RealNetworks.

Live Content Creation for Apple Devices

Like creating on-demand content, creating a live broadcast is something very easy when using the Helix Media Delivery Platform and does not even require any changes to your content production methods if you are already broadcasting content in a format that is supported by the Apple devices. For example, if you use Helix Mobile Producer with Helix Universal Server today to create single or multi-rate live RTP or 'Helix Push' broadcasts for other non-Apple based Mobile clients, then this is now used to create live broadcasts for Apple devices too.



Figure 5: "HTTP Live Streaming" from RTP Encoder Source

Live broadcasts are optionally archived on the Helix Server to create an on-demand media files after a live event.

To support live, content must be encoded using the formats supported by the 'HTTP Live Streaming' specification and the Apple devices. These formats are:

- Video: H.264 Baseline Profile Level 3.0 (iPhone/iPod Touch), Main Profile Level 3.1 (iPad)
- Audio: HE-AAC or AAC-LC up to 48 kHz, stereo audio OR MP3 (MPEG-1 Audio Layer 3) 8 kHz to 48 kHz, stereo audio

Live broadcasts using these codecs are delivered by the Helix Server to an Apple client as a 'HTTP Live Stream' without the content creator needing to do anything. The Helix Server will simply:

- Accept the live broadcast feed from the encoder (Point 1 in Figure 6 below),
- Create (and encrypt if required) the relevant TS media chunks and m3u8 playlist files (Point 2 in Figure 6 below)
- Generate an archive file if required (Point 3 in Figure 6 below).

When an Apple device requests the live broadcast (Point 4 in Figure 6 below) the Helix Server will redirect the client to the relevant playlist (Point 5 in Figure 6 below) where it will then make the request for the actual media on the Helix Server (Point 6 in Figure 6 below) and start playback of the live feed.

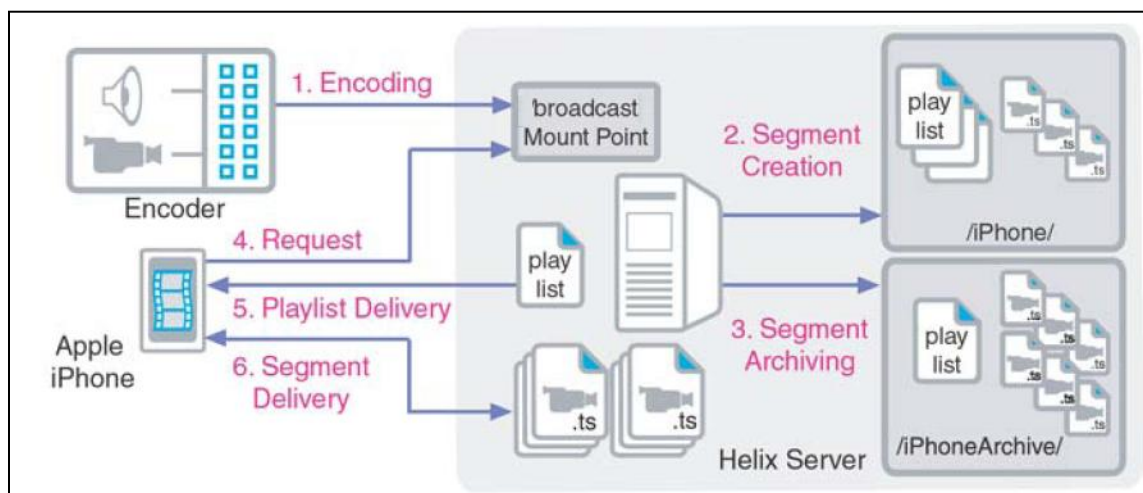


Figure 6: Live Broadcast to Apple Devices

Based on the server configuration, the Helix Server will rotate the segments and playlists created during a live feed such that any connecting client will always receive the live feed and not content from the start of the broadcast. This also ensures that the server administrator will not need to manage multiple TS files/playlists being created by a 24x7 live feed which may fill up the hard disk.

This process is completely automated allowing content creators to deliver the same live broadcast to multiple devices without the need for deploying any Apple specific solutions.

This whole process has a number of benefits including:

- o The content creator doesn't need to invest in the purchase of and training in the use of new broadcast tools.



- The content creator doesn't need to worry about how they are going to handle the segmentation of content and place the resultant TS files on the delivery platform throughout a live event, this happens automatically.
- Live feeds are optionally protected through HTTPS delivery and AES-128 segment encryption with rotating keys by the Helix server.
- When a content owner stops a live broadcast, the server provides a clean disconnect point to the Apple device to take the user back to the page used to launch the playback.
- The Helix Server automatically cleans up during and after a live broadcast such that no 'non live' content is available to be delivered to end users.
- Full support for live multi-rate feeds that are dynamically delivered to the Apple devices based on available network throughput.
- Ability to support delivery of content from a redundant location should a failure happen to the primary live content.
- Live H264/AAC feeds are simultaneously delivered to Apple devices, other 3GPP Release 6 compliant RTSP mobile devices and even Flash media players without the need of broadcasting multiple feeds reducing live encoder requirements.
- The process is fully supported and developed by RealNetworks.

Advanced Functionality

When delivering content to any device including those from Apple, components within the Helix Media Delivery Platform offer additional advanced functionality to provide:

- Authorization/Access Control: Only allow users you want to access content and disallow those who don't have permission through the Helix Security Manager ticketing system ([Learn More](#))

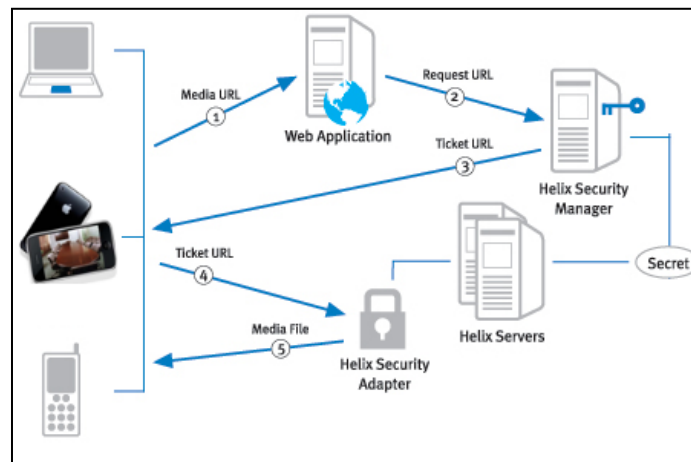


Figure 7: Helix Security Manager

- Session Management: Monitor, Control, Log and Charge for the real-time usage of media through the integration of Helix Session Manager with middleware components ([Learn More](#))

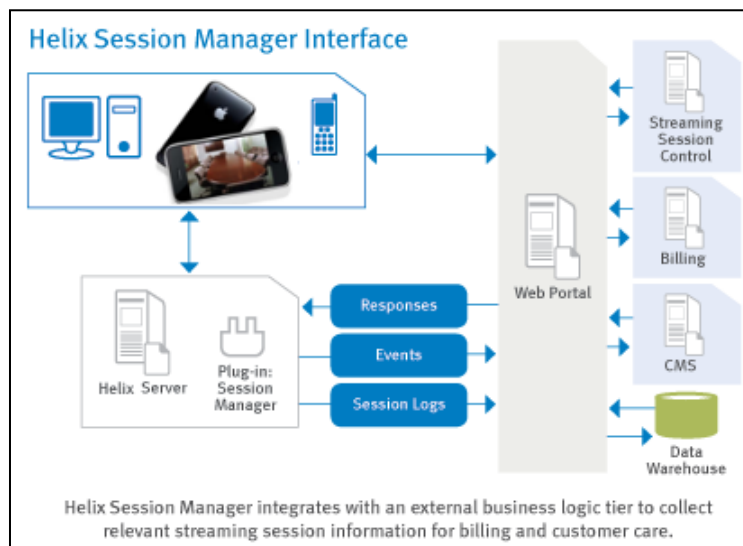


Figure 8: Helix Session Manager

These additional components provide a more comprehensive solution for media delivery and when combined allows for multiple different business models and full AAA (authentication, authorization and accounting) requirements to be met.



Benefits of Apple Content Delivery from Helix

FEATURE	SUPPORTED
Full ability To Deliver Single / Multi-rate Media	✓
Automatically Create & Manage Content Segments / Playlists For “HTTP Live Streaming”	✓
Deliver & Archive Live Broadcasts	✓
Support Re-Broadcasting / Looped Content to Apple Devices	✓
Deliver On-Demand Content Files	✓
Secure / Encrypted Content Delivery including key rotation and random segment naming	✓
Full Flexibility to use HTTP or HTTPS protocols	✓
Ability To Easily Specify Start Playback Positions for On-Demand Content	✓
Automatic Client Redirect on Errors	✓
Simultaneously Deliver Content to Apple and other Mobile Devices	✓
Extensive Client And Session Logging for Report Generation including Full Query Parameter Support	✓
Automatically deliver content through Distribution Models across multiple Servers to provide Scalability	✓
Fully supported solution by a dedicated team of professionals	✓



Conclusion

RealNetworks Helix Media Delivery Platform is able to **easily** and **compliantly** support the delivery of content to Apple and other mobile devices. The solution is **fully interoperable** with 3rd party encoding solutions, as well as RealNetworks own Helix Producer software, which create standards compliant content compatible with the Apple devices.

The solution has many features included to help:

- **Content creators** to securely deliver their live or on-demand media to Apple devices with minimal impact to their established workflows for other media players.
- **System administrators** by providing a simple, automated ways to handle the generation and management of multiple segmented files on one or a multitude of servers for scaling purposes.
- **End users** to access the content they want on the devices they are using today or planning to upgrade to in the future.

The Helix Media Delivery Platform continues to add support for popular formats, delivers multiple features to improve the end user experience when accessing media, operates on multiple operating systems and keeps pace with industry standards for streaming and downloadable media, making it the best choice for multi-format media delivery.

Further Information

For a [free evaluation](#) of RealNetworks Helix Universal Server and to see how easy it really is to deliver content to Apple devices, go to:

<http://www.realnetworks.com/forms/helix-server-evaluation.aspx>

To find out more about the Helix Media Delivery platform and the additional functionality it can provide see [RealNetworks Web Site](#).

For specific information on Apple and 'HTTP Live Streaming' see the [iPhone OS Reference Library](#).