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WHITE PAPER

How To Create Mobile Video Pages

Generating Attractive Content For Mobile Sites

ERICSSON

Preface

Video clips can significantly increase the attractiveness of mobile sites. This document provides an introductory guide to adding video to your mobile service; it describes required content creation tools and settings, and lists solutions to some commonly occurring problems when setting up a mobile video service.

More information about formatting content for specific devices can be obtained from the respective device manufacturers.

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1 Video Delivery Methods

The two most common delivery methods for video are streaming and downloading. Streaming video starts faster, but downloading is more robust.

At the time of writing, all mobile phones on the market that are capable of video playback, use separate applications for WML/XHTML browsing and for video playback. The use of “plug-ins” to allow video playback inside a WML browser window is currently not implemented. Therefore, to view a video clip, either the entire clip, or a reference to it, first needs to be downloaded in the browser, before automatically switching to the video player application.

1.1 Streaming

Streaming is the preferred method of video or audio delivery to mobile phones, thanks to its superior bandwidth utilisation, fast playback start and the possibility to receive live feeds, and the better possibility to avoid unauthorised re-distribution of copyrighted media material.

There are several competing systems for media streaming that are implemented slightly differently. This document describes the two most widely used systems; standardised 3GPP streaming (based on the MP4 media format) and the proprietary RealVideo system with the proprietary RealMedia media format.

To offer streaming to your customers, you will need access to a streaming server, such as the Ericsson Content Delivery Solution, the Darwin Streaming Server from Apple (3GP/MP4 formats only, no security, no billing) or the Helix Server from RealNetworks (all formats, no security, no billing).

The Ericsson Content Delivery Solution (ECDS) is a solution that allows mobile operators to deliver streaming content to mobile subscribers. The architecture (based on 3GPP standardisation) involves the use of a special streaming server located within an operator domain to provide streaming video and audio content to subscribers as well as handle content hosting, billing and security functions. The ECDS solution is specially designed to manage distribution of streaming content to mobile users that have various mobile devices using a variety of different media players. In addition, the solution handles volatile mobile network conditions by maintaining a steady stream of data and compensating for lost data on the wireless link.

1.1.1 Starting A Stream

A streaming session is started by the user selecting a clip or live feed to be streamed, for example by clicking on a link in a WML page. Depending on the implementation in the WML browser, the link can either generate a normal HTTP GET request of a streaming metafile (a simple text file that contains the URL for the RTSP request), or make an RTSP request directly to the streaming server. Once the RTSP URL is known, the phone switches to the video player and starts the video playback.

1.1.2 Linking To A Metafile

To link to a 3GPP-compliant stream on a streaming server with public IP address 222.222.222.222, without using a metafile, a link could look like this:

```
<a href=”rtsp://222.222.222.222/videoclip.3gp”>Start video</a>
```

In the above example, the streaming server needs to have the mount point / defined to point to the location of the directory where the clip is stored.

To link to a 3GPP-compliant stream on a streaming server with public IP address 222.222.222.222, and by using a metafile, a link could look like this:

```
<a href=”http://222.222.222.222/videoclip.sdp”>Start video</a>
```

For this to work, you will need a metafile generator that creates SDP-files that are compatible with the target mobile phone, and places them in the appropriate directory of your web server. Creation of SDP-files is regrettably not a standard feature of the most commonly used content low-cost encoding tools, nor of the most commonly used low-cost streaming servers. In addition, some mobile phones are equipped with video players that are not 100% compatible with the SDP-file standard.

To link to a RealMedia stream on a streaming server with public IP address 222.222.222.222, by using a metafile, a link could look like this:

```
<a href=”http://222.222.222.222/ramgen/videoclip.rm”>Start video</a>
```

In the above example, the clip “videoclip.rm” should be placed into the default content directory of the streaming server for the “Ramgen” metafile generator (which is a standard feature of all RealNetworks servers) to find it.

1.1.3 Common streaming video problems

1.1.3.1 Video player incompatible with metafiles

Although the format of SDP and RAM metafiles may seem simple and well-defined enough, early versions of the mobile video players were known to suffer from incompatibilities with standards-compliant metafiles.

Metafiles generated with the Packetvideo Encoder, and the Ericsson ECDS are compatible with the Sony Ericsson P800, and the RealNetworks server – generated metafiles are compatible with the RealOne Mobile Players used in Series 60 phones.

1.1.3.2 Video player incompatible with clip

Early MP4/3GP encoders from various suppliers suffered severe compatibility problems with the mobile video players. Most of these problems have been solved, and recent versions of the most common encoders are not known to have any severe compatibility problems. Refer to the enclosed list of recommended encoders to ensure best compatibility.

1.1.3.3 Direct RTSP link incompatible with WML browser (WML validation/page rendering error)

Either use a metafile, or prompt the user to upgrade their software on the phone to support RTSP links.

1.1.3.4 File type not accepted by WAP gateway or by mobile phone (HTTP Error 406)

It is important to ensure that the server that is serving the files has been configured to indicate the correct MIME types, listed in section 0.

In addition, the phone needs to have a video player installed that claims compatibility with the above MIME-types. Usually, the phone needs to be restarted after installing a video player for the MIME-type claims of the video player to be registered by the phones WML-browser.

Especially for phones that were not shipped with a video player pre-installed, such as early Series 60 phones, it is a good idea to browse the HTTP header for accepted MIME types. If neither video/3gp nor audio/x-pn-realaudio is explicitly listed as accepted, the phone does not have a video player installed, and the user should be prompted to download a video player before proceeding.

1.1.3.5 Stream does not start buffering (Mobile network not configured for streaming)

Many operators offer a secondary Internet APN intended for laptop users in parallel to their WAP APN. In many cases this APN is configured to allow streaming, whereas the WAP APN is not. Check with your mobile network operator.

1.1.3.6 Stream encoded at higher bandwidth than available in the mobile network

Most GPRS networks are capable of reliably allocating two time slots, corresponding to 28.8 kbit/s to a phone. Experience shows that encoding at 24 kbit/s provides a good compromise between performance and stability. Still, in areas with many mobile phone users, some mobile networks might not be able to allocate sufficient bandwidth. Try again in a different location or at a different time of day.

1.2 Download

Downloading video is technically less suitable for mobile devices, due to the long wait before the start of playback, the large memory requirements among other factors. The advantage is that for networks that are not configure for streaming, download usually works, making it a suitable back-up solution. In addition, clips can be encoded at a higher bitrate than can be served by the mobile network, which can be desirable at times when the network capacity is limited, or for short clips that do not look good enough when encoded to a streamable bitrate. Downloaded clips can be locally stored and played back multiple times, without using mobile network and streaming server resources.

At present, no forward-lock or other DRM mechanisms have been commonly implemented therefore downloaded clips can be forwarded by the user to other users.

To offer video downloads to your customers, only a regular web server is required, but remember to configure the MIME-types correctly (see section 0)!

1.2.1 Starting a download

A download session is started by the user selecting a clip to be downloaded, for example by clicking on a link in a WML page. The link generates a normal HTTP GET request of the video file directly to the server.

Depending on the Internet configuration of the WML browser in the mobile phone, the HTTP request may or may not go through the operator's WAP gateway. Most, if not all WAP gateways set a limit to the maximum file size they accept to deliver to a mobile phone. The de-facto standard limit is today 300000 Bytes, which corresponds to a file size of approximately 292 kB.

Once the entire clip has been downloaded, the clip playback normally starts automatically.

1.2.2 Linking to a downloadable clip

To link to a 3GPP-compliant clip on a web server with public IP address 222.222.222.222, a link could look something like this:

```
<a href=”http://222.222.222.222/videoclip.3gp”>Download video</a>
```

In the above example, the web server need to have the mount point / defined to point to the location of the directory where the clip is stored.

To link to a RealMedia stream on a web server with public IP address 222.222.222.222, a link could look something like this:

```
<a href=”http://222.222.222.222/videoclip.rm”>Download video</a>
```

In the above example, the web server need to have the mount point / defined to point to the location of the directory where the clip is stored.

1.2.3 Common video download problems

1.2.3.1 Video player incompatible with clip

Early MP4/3GP encoders from various suppliers suffered severe compatibility problems with the mobile video players. Most of these problems have been solved, and recent versions of the most common encoders are not known to have any severe compatibility problems. Refer to the enclosed list of recommended encoders to ensure best compatibility.

1.2.3.2 Clip too large to download (WAP timeout error or file too large error)

Ensure that the clip is smaller than 292kB to go through most WAP gateways. Series 60 phones support files up to 357kB, provided that there is enough free memory on the phone. The Sony Ericsson P800 supports files up to 10 MB, provided that there is enough free memory on the phone.

1.2.3.3 File type not accepted by WAP gateway or by mobile phone (HTTP Error 406)

It is important to ensure that the server that is serving the files has been configured to indicate the correct MIME types, listed in section 0.

In addition, the phone needs to have a video player installed that claims compatibility with the above MIME-types. Usually, the phone needs to be restarted after installing a video player for the MIME-type claims of the video player to be registered by the phones WML-browser.

Especially for phones that were not shipped with a video player pre-installed, such as early Series 60 phones, it is a good idea to browse the HTTP header for accepted MIME types. If neither video/3gp nor audio/x-pn-realaudio is explicitly listed as accepted, the phone does not have a video player installed, and the user should be prompted to download a video player before proceeding.

1.2.3.4 Mobile network not configured for downloads

Many operators offer a secondary Internet APN intended for laptop users in parallel to their WAP APN. In many cases this APN is configured to allow download of file formats such as video clips, that may be unknown to the operator's WAP gateway, or too large to be allowed to pass through the WAP gateway. Check with your mobile network operator.

2 Content encoding formats

2.1 MP4 / 3GP

Compression type	Suitable settings
MPEG-4/3GP for download (SonyEricsson P800, iPaq, etc.)	Size: Up to 176x144 pixels, recommended: 160x120 pixels. Total bit rate (Video + Audio): Max 45 kbit/s Video bit rate: Up to 45kbit/s (Variable bit rate recommended) Video frame rate: 5-10 fps Audio bit rate (AAC): At least 16kbit/s for music, 8kbit/s for voice Max file size: 300 kB
MPEG-4/3GP for GPRS streaming (SonyEricsson P800, iPaq, etc.)	Size: Up to 176x144 pixels, 160x120 pixels recommended Total bit rate (Video + Audio): 24 kbit/s Video bit rate: 16kbit/s recommended (Variable bit rate not allowed) Video frame rate: 3-7 fps Audio bit rate (AAC/AMR): 4,5-8kbit/s for voice Hinting: Basic hinting required. Max packet size: 1200

2.2 RealVideo

Compression type	Suitable settings
Realvideo for download (Series 60, Series 80, iPaq, etc.)	Size: Up to 176x144 pixels allowed. Total bit rate (Video + Audio): Max 45kbit/s Video bit rate: 28kbit/s recommended, RealVideo 8 only (RealVideo 9 not supported, SureStream not supported) Video frame rate: 10-15fps (Smoothest motion) Audio bit rate: At least 16kbit/s for music, 8,5kbit/s for voice, RealAudio G2 Max file size: 300kB
Realvideo for GPRS streaming (Series 60, Series 80, iPaq, etc.)	Size: 160 pixels width recommended, maintaining source's aspect ratio. Total bit rate (Video + Audio): 24 kbit/s Video bit rate: 15kbit/s recommended; RealVideo 8 only (RealVideo 9 not supported, SureStream not supported) Video frame rate: 5-10 fps (Smoothest motion) Audio bit rate: 8,5kbit/s for voice or 8kbit for music, RealAudio G2, 8KHz Default buffer time: 10 seconds

3 MIME types

The following MIME-types may need to be configured on the video server:

```
*.sdp                       : application/sdp
*.mp4, *.mpeg4              : video/mp4
*.3gp, *.3gpp               : video/3gp
*.rm, *.ram, *.ra, *.rmvb   : audio/x-pn-realaudio
```

4 Content formatting guidelines

The limited bandwidth and display size put severe constraints on how content should be formatted to display in acceptable quality on a mobile phone.

Best video results are achieved where the video content is "predictable", so that it can be well compressed; avoid short cuts, fast motion, flashes, etc. Best video results are achieved with little background activity in the clip.

Best audio results are achieved with low background sound levels. Avoid background music to spoken text, for example. When suitable, remove low frequency sounds, and equalize the overall sound amplitude over the entire clip. Since mobile phone speakers typically have a very low output level, and phones often are used in very noisy surroundings, it is recommended that the audio amplitude should always be maximized to ensure that the audio is at all audible.

Recommended clip length: 30 seconds to 2 minutes 30 seconds.

Recommended content encapsulation: Start each clip with an “intro” identifying the content. After the payload content, end clip with an “outro” identifying the content provider.

Example, Music video: Play jingle, display name of song, artist and album for 2-5 seconds. Play content. Display name of record label for 2-5 seconds and fade to black.

5 Recommended Video Encoders (August 2003)

5.1 MPEG-4/3GP

Apple Quicktime 6.3 Pro is the recommended tool for encoding MPEG-4/3GP, because of superior price/performance, and excellent audio compression.

Popwire Compression Master, Popwire Compression Engine, Helix Mobile Producer, PacketVideo Pvauthor can also be used.

The Popwire Compression Master produces high quality video, and allows tweaking encoding settings, but is only available for Mac OS X.

RealNetworks Helix Producer Plus does not support encoding of 3GP-compliant MP4; this feature is however included in the currently available, but expensive Helix Mobile Producer.

The PacketVideo PvAuthor produces decent MP4 clips, but is not 100% compatible with the 3GP-standard.

5.2 RealVideo

RealNetworks Helix Producer Plus

6 Firewall and router set-up information

A streaming session can open one to five simultaneous connections between the video server and the mobile phone, depending on set-up. This may put extra requirements on the set-up of firewalls and routers.

First, an HTTP connection is made to port 80 of the video server to request a metafile, which contains the URL of the actual clip, and possibly some metadata information such as clip title etc. Once the metafile has been downloaded, this connection is normally closed.

The downloaded metafile is used by the video player application in the mobile phone to make an RTSP connection to port 554 of the video server. This connection commonly remains open during the streaming session to send user generated start, pause and stop commands from the mobile phone's video player to the video server.

If the RTSP request corresponds to a clip that exists on the server, the server and video player software will negotiate which two ports to be used for the data delivery from the server to the phone, and the delivery of quality of service information from the phone to the server.

Most mobile networks assign private IP addresses to the mobile phones, and use network address translation (NAT) in combination with a firewall. The firewall needs to be set to listen in to which ports are being negotiated between the mobile phone's video player and the video server, in order to route the video stream to the right phone. Most major firewall products support this feature by setting the firewall into Stateful Inspection Mode, allowing TCP communication on port 554 and UDP communication on the port range 6170-7170.

The quality of service stream from the mobile phone's video player to the video server is not always present, and can often be ignored. However, blocking this connection in firewalls in the mobile network or in front of the video server could cause a large number of messages to bounce on the blocking firewall, causing all kinds of alert messages to be sent back and forth, generating unnecessary traffic over the radio link.

In addition to the four above connections, some video players attempt to determine the available bandwidth and round-trip-time to the streaming server by repeatedly sending ICMP "ping" messages to the streaming server. As with the control stream, this connection can largely be ignored. However, blocking this connection in firewalls in the mobile network or in front of the video server could cause a large number of messages to bounce on the blocking firewall, causing all kinds of alert messages to be sent back and forth, generating unnecessary traffic over the radio link.

After successful playback of a clip, the video player in the mobile phone tears down the streaming connections by issuing control commands on the RTSP connection on port 554, and then returns to an idle state.

Some mobile phones are capable of skipping the first step, downloading the metafile with the URL to the clip, by accepting RTSP references directly in a WML or XHTML page. For example, all software versions of the Sony Ericsson P800 after R2E include this convenient feature.

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