Program Files in ACNS Software

ACNS 5.5 software uses programs to enable support for live multicast and scheduled rebroadcast events. A program in ACNS software is defined as a scheduled event in which the content is presented to the end user. The three attributes of a program are:

- Schedule—Defines when the content is presented to the end user.
- Content—Defines what is presented to the end user. In ACNS software, this can be pre-positioned or live content.
- Presentation—Defines how the content is presented to the end user. The presentation attributes include the set of Content Engines that know about the program, and a service type that identifies the streaming server used to deliver the content. The streaming server can exist in the Content Engine (Windows Media Technologies [WMT], RealServer, or Cisco Streaming Engine) or outside (for example, in set top boxes).

A program file contains the elements that define the schedule, content, and presentation parameters. It is a text file written in XML format, similar to the manifest file. For more information about manifest files, refer to the *Cisco ACNS Software Configuration Guide for Centrally Managed Deployments, Release 5.5*.

Program types determine the hardware or software component involved in delivering content to the user. Different program types are:

- Cisco Streaming Engine
- WMT
- RealMedia
- TV-out
- Export (meant for a third-party device such as a set top box)

The Content Distribution Manager manages multicast addresses to be used for programs. Each Content Engine assigned to the program uses the multicast address for broadcast. The Content Engine determines which multicast address is to be used based on the program data. A set of multicast addresses can be specified either in the Program API or by using the Content Distribution Manager. Each time a program requires a multicast address, the Content Distribution Manager associates one of the addresses with the program. Addresses are allocated for the life of a program. Programs can be configured with an autodelete feature, which allows program addresses to be freed up automatically about 24 hours after a program schedule is complete.

When you configure a pool of addresses for programs, ACNS software ensures that none of these addresses are currently in use by any of the multicast clouds. When users request a specific address or a set of addresses to be used for a program, ACNS software issues only those addresses that have not been

configured for multicast clouds and are not used by any of the existing programs. Users will receive an error message if there is no multicast address associated with the imported program file and no addresses are available to be configured from the pool or if the multicast pool has not been configured.

When you define a Cisco Streaming Engine live program using the createProgram API, you can specify a single backup broadcast server for the program. To do this, you must specify the IP addresses of the primary and backup broadcast servers in the program file using the <media> tag. The <media> tag in the program file should be in the following format:

<media index="*number*" src="*primary_broadcast_server*:*port*;*backup_broadcast_server*:*port*"/>

Program File DTD

This section describes the Document Type Definition (DTD) for ACNS software program files. You can use the DTD to create program files for importing programs from third-party systems or IP/TV, and exporting programs to set top boxes (STBs).

The following is the DTD for an ACNS software program file:

```
<?xml version="1.0"?>
<!DOCTYPE program[
  <!ELEMENT program (media+, ucastInfo?, mcastInfo?, overlay*, schedule*, attribute?)>
  <!ATTLIST program
       version                CDATA "1.0"
       name                   CDATA #REQUIRED
       serviceType            (tvOut | export | wmt | real | ciscoStreamingEngine) "tvOut"
       description            CDATA #IMPLIED
       playTime               CDATA #IMPLIED
       lastModificationTime   CDATA #IMPLIED
       gracefulExit           (false | true) "false"
       shuffle                (false | true) "false"
       autoDelete             (false | true | default) "default"
       live                   (false | true) "false"
  >
  <!ELEMENT media EMPTY>
  <!ATTLIST media
       index                  CDATA #IMPLIED
       src                    CDATA #REQUIRED
       id                     CDATA #IMPLIED
       playTime               CDATA #IMPLIED
       overlayName            IDREF #IMPLIED
  >
  <!ELEMENT ucastInfo EMPTY>
  <!ATTLIST ucastInfo
       referenceUrl           CDATA #REQUIRED
  >
  <!ELEMENT mcastInfo (addrPort*)>
  <!ATTLIST mcastInfo
       referenceUrl           CDATA #REQUIRED
       TTL                    CDATA #IMPLIED
  >
  <!ELEMENT addrPort EMPTY>
  <!ATTLIST addrPort
       addrVal                CDATA #REQUIRED
       portVal                CDATA #REQUIRED
       id                     CDATA #IMPLIED
  >
  <!ELEMENT overlay EMPTY>
  <!ATTLIST overlay
       name                ID    #REQUIRED
       src                 CDATA #REQUIRED
```

```
      id                  CDATA #IMPLIED
      placement           (center | ll | lr | ul | ur ) "lr"
      height              CDATA "0"
      width               CDATA "0"
      opacity             CDATA "7"
      colorTransparency   (false | true) "false"
  >

  <!ELEMENT schedule (repeats?)>
  <!ATTLIST schedule
      timeSpec        (local | gmt) "local"
      startTime       CDATA #IMPLIED
      activeDuration  CDATA #IMPLIED
  >
  <!ELEMENT repeats (dayOffset*)>
  <!ATTLIST repeats
      type            (timeInterval | days) "timeInterval"
      interval        CDATA #IMPLIED
      endTime         CDATA #IMPLIED
  >
  <!ELEMENT dayOffset EMPTY>
  <!ATTLIST dayOffset
      value        (0 | 1 | 2 | 3 | 4 | 5 | 6) "0"
  >
  <!ELEMENT attribute EMPTY>
  <!ATTLIST attribute
      value         CDATA #REQUIRED
  >
]>
```

Table A-1 describes the elements in the DTD and their attributes.

Table A-1 Program File DTD Elements and Attributes

Element	Attributes	Description
program	version	Version of the program file. ACNS software, Release 5.5 generates playlist files with a version level of 1.
	name	Name of the program.
	serviceType	Type of program, which dictates the mode of delivery. This element identifies the software or hardware component involved in delivering the content to the user.
	description	Brief description of the program.
	playTime	Total playtime in seconds. This is the sum of the playtime values of the media files, if set. If there are files in the program that have invalid playtimes, then this field is set to –1.
	lastModificationTime	Time when the playlist was created or modified last, as recorded in the Content Distribution Manager. The format is hh:mm:ss. The assumption is that all devices in the ACNS network are time-synchronized (for example, using the Network Time Protocol [NTP]).
	gracefulExit	Specifies how to handle scheduled exits. Options are: • True—Exit after the current media file is played completely. • False—Exit immediately.

Table A-1 Program File DTD Elements and Attributes (continued)

Element	Attributes	Description
	shuffle	Specifies whether the media files should play in any order. Options are: • True—Play media files at random. • False—Play media files in order. When this attribute is not specified, it is set to false by default.
	autoDelete	Specifies whether the program should be automatically deleted 24 hours after it is last played. Options are: • True—Delete the program 24 hours after it is last played. • False—Retain the program for more than 24 hours after it is last played. • Default—When the value for the live attribute is set to true, the default value is true for *autoDelete*, and false if the live attribute is set to false.
	live	Specifies whether the program contains live content. Options are: • True—The program contains live content. • False—The program does not contain live content.
media	index	Order of the media file in the list of files, ranging from 1 to mediaCount (the number of media files in the program). The index attribute specifies the order of the media files when the shuffle attribute in the <media> tag is set to false.
	src	Reference to the source of the media file. • For live content, this field contains information about how the streaming server will correlate with the live feed. • For pre-positioned content, this field contains the portion of the URL that follows the origin server, that is, the fully qualified domain name (FQDN). For example, if the source file URL is http://myWebSite/myDirectory/myFile, the value assigned to this field is myDirectory/myFile. **Note** When pre-positioned content is exported, this field contains the URL for the file that can be routed in the ACNS network, without the protocol specification. • Live source failover is supported. For WMT live, multiple encoders or streaming servers can be specified. src="http://encoder_1:8080";"rtsp://source_hostIP/fileName" For CSE live, only a single backup can be specified. src="sourceAddress1:destinationPort1;sourceAddress2:destinationPort2"

Table A-1 Program File DTD Elements and Attributes (continued)

Element	Attributes	Description
	id	Media file identifier. For rebroadcast events, this field contains the ID of the channel containing this media file. In the case of live events, this field is used to correlate a stream source with a multicast address.
	playTime	Playtime for the file in seconds, when it is known. This attribute is used only for MPG media files. Options are: • –2—If the file is not an MPG file • –1—If the file is an MPG file but the ACNS software cannot determine the playtime • 0 or greater—If the playtime is correctly determined from the file
	overlayName	Name of the overlay to be displayed along with this media clip. This field is optional.
ucastInfo	referenceUrl	URL used by the end user to request this program over the network.
mcastInfo	referenceUrl	URL used by the end user to request this program over the network.
	TTL	Multicast Time To Live (TTL) value to be used for the packets sent using multicast.
addrPort	addrval	Address to be used when this program is multicast.
	portVal	Port (within the multicast address) to be used when this program is multicast.
overlay	name	Unique name for identification (defined by the user). The name must start with a letter and should be a valid XML name.
	src	Source of the given overlay file. For imported programs, the *src* attribute contains the portion of the URL that follows the origin server, that is, the FQDN. For example, if the source file URL is http://myWebSite/myDirectory/myFile, the value assigned to this field is myDirectory/myFile. **Note** When pre-positioned content is exported, this field contains the URL for the file that can be routed in the ACNS network, without the protocol specification.
	id	Identifier to be used with the overlay file. This field is used only when programs are imported, and it contains the ID of the channel containing this media file.

Table A-1 Program File DTD Elements and Attributes (continued)

Element	Attributes	Description
	placement	Placement of the overlay in the media file. This field is optional. Options are: • Center • Lower left • Lower right • Upper left • Upper right The default value is lower right.
	height	Vertical placement of the overlay, from –40 to 40 pixels. • –40—Moves the image to the lowest possible position on the display. • 40—Moves the image to the topmost position on the display.
	width	Horizontal placement of the overlay, from –6 to 60 pixels. • –6—Moves the image to the left-most possible position on the display. • 60—Moves the image to the right-most possible position on the display.
	opacity	Opacity of the overlay, from 0 to 15. A value of 0 makes the overlay completely opaque. A value of 15 renders the image nearly transparent.
	colorTransparency	Specifies whether a transparent color should be defined in the overlay. When set, the color of the pixel in the lower left corner is to be transparent over the entire image. When a transparent image is used, the background color of the overlay is not visible against the video playing behind it. The default value is false.
schedule	timeSpec	Specifies how time values should be interpreted. Options are: • Local • Greenwich mean time (GMT)
	startTime	Time (in seconds) since the epoch (January 1, 1970) when the program should start playing. **Tip** For UNIX operating systems, the epoch is 00:00:00 GMT, January 1, 1970. This represents the time and date corresponding to 0 in the UNIX operating system's date and time stamp. System time is measured in seconds past the epoch.
	activeDuration	Duration of the program (in seconds). For a scheduled rebroadcast, this value specifies how long the files should loop (that is, loop for *x* seconds). If there is no looping, this value is 0. For live programs, this value is the duration of the event.

Table A-1 Program File DTD Elements and Attributes (continued)

Element	Attributes	Description
repeats	type	Type of repeat. For example, you can set the program to repeat every *x* seconds, or repeat on specified days of the week at the same time specified in the start time. Options are: • TimeInterval • Days
	interval	Time interval (in seconds) for the repeat broadcast of the program. For example, if this value to 28800 seconds, the program repeats every 8 hours.
	endTime	Time (in seconds) since the epoch (January 1, 1970) when program repeats should end. For a program that repeats forever, this value is 0.
dayOffset	value	Day to repeat the program, for example, every Monday. The time (during the day) of the repeat is inherited from the startTime attribute.
attribute	value	Element used if a third-party device such as a set top box is used to import some data that is transparent to an ACNS network, and that is directly used by the software or hardware component involved in delivering the content to the user. The Centralized Management System (CMS) relays the data without interpreting it. A recommended method for encoding this field is to use a name/value pair in the string, for example, name1=value1; name2=value2.

Program File Examples

This section contains program file examples, each describing the contents for specific event types. The examples are provided for the following event types:

- WMT Multicast Live Event, page A-7
- WMT Multicast Rebroadcast Event, page A-8
- Cisco Streaming Engine Multicast Event, page A-9
- Cisco Streaming Engine Live-Split Event, page A-9

WMT Multicast Live Event

The following example shows the program file for a WMT multicast live event in which the multicast address is chosen by the Content Distribution Manager. The *addrPort* attribute is not shown in this example:

```
<?xml version="1.0" ?>
<!DOCTYPE program SYSTEM "program.dtd">
<program version="1.0" name="prog1" serviceType="wmt" live="true">
  <media src="http://wmt_encoder:8080" />
  <mcastInfo referenceUrl="http://rootCE/prog1.nsc"/>
  <schedule timeSpec="gmt" startTime="1010170800" activeDuration="3600"/>
</program>
```

The following example shows the program file for a WMT multicast live event in which the multicast address is specified using the *addrPort* attribute.

```
<?xml version="1.0"?>
<!DOCTYPE program SYSTEM "program.dtd">
<program version="1.0" name="liveProgram" serviceType="wmt" description="test"
autoDelete="true" live="true">
    <media index="1" src="http://WMT_encoder:8080" id="media0"/>
    <mcastInfo referenceUrl="http://rootCE/liveProgram.nsc" TTL="22">
     <addrPort addrVal="239.232.25.95" portVal="61248" id="media0"/>
  </mcastInfo>
  <schedule timeSpec="gmt" startTime="0" activeDuration="0"/>
</program>
```

WMT Multicast Rebroadcast Event

This example shows the program file for a WMT multicast rebroadcast event:

```
<?xml version="1.0"?>
<!DOCTYPE program SYSTEM "program.dtd">
<program version="1.0" name="chanrebroad" serviceType="wmt" description="test"
autoDelete="false" live="false">
  <media index="1" src="sen/beck.asf" id="Channel_35748"/>
  <media index="2" src="sen/CSCin53585.wmv" id="Channel_35748"/>
  <media index="3" src="sen/starsnstripes.asf" id="Channel_35749"/>
  <mcastInfo referenceUrl="http://root_CE/chanrebroad.nsc">
    <addrPort addrVal="239.232.25.195" portVal="61248" id="Channel_35748"/>
  </mcastInfo>
  <schedule timeSpec="local" startTime="1010170800" activeDuration="1300">
    <repeats type="timeInterval" interval="2600"/>
  </schedule>
</program>
```

The *referenceUrl* attribute is the link that the user clicks to join the program. You can provide the external IP address of the root Content Engine (for example, http://ContentEngine/prog1.nsc) in the *referenceUrl* attribute.

Note A media file can be uniquely identified using a URL of the form <protocol>://<FQDN>/<relative_URL>. The *id* attribute in the media element specifies the ID of the channel containing the media file. Each channel is associated with the FQDN of a Content Engine or that of an origin server. The *src* attribute in the media element provides the relative part of the URL, which along with the *id* attribute identifies the file.

You can provide the FQDN of the Content Engine that hosts the media file if a Content Router is used to direct the user request to the appropriate Content Engine. In this case, the FQDN must be associated with a website or channel that maps to the same Content Engines that can serve the program.

You can provide the name of the Content Engine if the user request goes to a preselected Content Engine. If a third-party device such as a set top box assigns the Content Engines directly to the program, you can use any one of the Content Engines assigned to the program in the *referenceUrl* attribute. If the third-party device assigns a channel to the program, you can use the name of any Content Engine in that channel (for example, the root Content Engine) in the *referenceUrl* attribute.

Cisco Streaming Engine Multicast Event

This example shows the program file for a Cisco Streaming Engine multicast event. This event can also be accessed using unicast by specifying the *referenceUrl* attribute in the ucastInfo element.

```
<?xml version="1.0" ?>
<!DOCTYPE program SYSTEM "program.dtd">
<program version="1.0" name="prog5lfs_1673" serviceType="ciscoStreamingEngine"
description="prog5lfs" playTime="3600" autoDelete="false" live="true">
  <media index="0" src="source_ip_address:destination_port" id="media0"/>
  <media index="1" src="source_ip_address:destination_port" id="media1"/>
  <ucastInfo referenceUrl="rtsp://PM_FQDN_or_IP_addr/PM_1673.sdp"/>
  <mcastInfo referenceUrl="http://PM_FQDN_or_IP_addr/programs/1673" TTL="15">
    <addrPort addrVal="224.2.250.195" portVal="61036" id="media0"/>
    <addrPort addrVal="224.2.250.196" portVal="61038" id="media1"/>
  </mcastInfo>
  <schedule timeSpec="gmt" startTime="3264429600" type="playOnce"/>
<attribute value="unicastPushSDP:http://2.43.12.6/programs/1673"/>
</program>
```

Note The media source (src) is the live feed, pushed from Cisco IP/TV Broadcast Server. The *src* attribute contains the IP address of IP/TV Broadcast Server and the destination port of the root Content Engine. The root Content Engine listens for the program stream on the specified destination port. There is more than one media source, because audio, video, and other feeds may be broadcast on a separate stream, using a separate multicast address. The *id* attribute in the media element and the *id* attribute in the addrPort element are used to correlate the address to the stream.

Cisco Streaming Engine Live-Split Event

This example shows the program file for a Cisco Streaming Engine live-split event:

```
<?xml version="1.0" ?>
<!DOCTYPE program SYSTEM "program.dtd">
<program version="1.0" name="prog5lfs_1674" serviceType="ciscoStreamingEngine"
description="prog52fs" playTime="3600" autoDelete="false" live="true">
  <media index="0" src="source_ip_address:destination_port" />
  <media index="1" src="source_ip_address:destination_port" />
  <ucastInfo referenceUrl="rtsp://PM_FQDN_or_IP_addr/PM_1674.sdp"/>
  <schedule timeSpec="gmt" startTime="3264429600" activeDuration="7200" type="playOnce"/>
<attribute value="unicastPushSDP:http://2.43.12.6/programs/1673"/>
</program>
```

Note Attributes for the schedule element must be specified for the Cisco Streaming Engine streaming server. The *id* attribute is not required because there are no separate multicast addresses for the program streams.