

**Technical specification of interface between Content Depot Delivery
Subsystem and Station Automation System**

version 1.2

Revision History

Date	Version	Description	Author
November 16, 2004	1.0	Initial Release	Waldek Kozaczuk
December 3, 2004	1.1	Updates per questions from Marty on 11/17	Charles Cook
January 26, 2005	1.2	<p>Cut IDs are only assigned when the episode is created and are based upon the day of the week. Delivery priority, which is based on frequency, gets frequency from a value selected by the producer at the program level</p> <p>1. General: Change all instances of <exposedToBeAutomaticallyPulledBySAS> to <CDLongname>.</p> <p>2. "How SAS Interacts with Storage Receiver", sixth bullet: rework file structure to current understanding/specification.</p> <p>3. "How SAS Interacts with Storage Receiver": Add bullet point with default hostname of storage receiver: CDFile1.</p> <p>4. "How SAS Interacts with Storage Receiver", bullet point starting "There is a global range . . .": Make the global range 60001 - 90000.</p> <p>5. "Flow", point 3, first bullet, "This logic will support varying number of segments per episode": Remove or add a sentence to clarify (I know this is an open issue of sorts, but we really should remove it from a published document until it's decided),</p> <p>6. "Flow", point 16, "SAS interrogates. . .": Same as #7 above; it's unclear exactly what the desired behavior is. Recast, please.</p>	Charles Cook

Purpose of this document is to provide detailed specification of interface between Content Depot [CD] Delivery Subsystem and Station Automation System [SAS].

Business Rules of CD Delivery System

Terms:

- Begin Air Date – date with time specific for each episode when a station is allowed to start broadcasting any related essence file [segment file]
- End Air Date – date with time specific for each episode when a station is supposed to stop broadcasting any related essence file [segment file]
- Delivery Window – time frame within which given content file **has to be delivered** [made available] to Storage Receiver at station
- Scheduled Delivery Time - time when given content file **is scheduled to be delivered** [made available] to Storage Receiver at station; this time has to fall within Delivery Window
- Kill Date – time when given content file gets automatically deleted from Storage Receiver; currently it is set to 3 days [configurable] after End Air Date
- Essence Due Date and Time – Assigned to episodes to determine when the producer must have essence uploaded on the portal in order to have the episode delivered to the station on time. Will be set according to the following:
 - 4 hours [configurable] before begin air date for daily programs
 - 11 hours [configurable] before begin air date for weekly programs
 - 14 hours [configurable] before begin air date for monthly programs
 - 4 hours [configurable] begin air date for one-time programs

Note: the frequency of a program for delivery priority purposes is determined by the producer selecting a frequency value at the program level.

- Begin-Air-Date-based Delivery Strategy – strategy of determining Delivery Window for essence content when the upload time is earlier than the essence due date and time. The window will be assigned according to the following:
 - Delivery window start – set to essence due date and time
 - Delivery window end - is set to Begin Air Date minus 2 hours business safety margin [configurable]
- As-Soon-As-Possible Delivery Strategy - strategy of determining Delivery Window for essence content when the upload time is after essence due date and time or for non-essence:
 - Delivery window start – when the file was uploaded by the producer
 - Delivery window end – 1 hour after the time the file was uploaded by the producer [configurable]
- Delivery Priority – priority utilized to resolve any time conflicts when scheduling delivery of a file; there are following priorities starting with top one:
 - Urgently requested delivery of essence content
 - Urgently requested delivery of non-essence content
 - Subscription-based delivery of essence content
 - Subscription-based delivery of non-essence content
 - On-demand delivery of essence content
 - On-demand delivery of non-essence content
 - Carouseling
- Delivery Triggering Event – event that triggers delivery of a file to be scheduled and **later** exported and executed based on the scheduling logic outcome: there are following triggering events:

- Station requests content delivery [download of content]
- NOC operator requests content delivery [refresh of content]
- Producer adds content [upload of content]
- Producer updates content [upload of content]
- Station activates subscription for episode [subscription activation]
- Station activates subscription for program [subscription activation]
- System requests carousel ling [system internal]
- Essence files – aka segment files
- Non-essence files – aka non-segment files - program or episode promo files, audition files, rundowns, images, etc
- Carouseling – the strategy to increase probability of receiving intact files at station receiver; it is realized by re-delivering exact same file extra 3 times [configurable] every 2 hours [configurable] period
- Export – process of packaging MPEG 1/2 raw content files into BWF wave files; following types of content are subject to this process:
 - segments files
 - evergreen files
 - episode and program promo files
- Subscription – a concept in Content Depot that allows stations to mark programs or individual episodes which essence or non-essence content they want to get automatically and implicitly delivered to their storage receiver

Behavior:

CD Delivery System:

- guarantees with high probability ratio that each file shall get delivered [made available] within its Delivery Window to Storage Receiver at station
- optimizes utilization of transfer bandwidth by taking into account priority and delivery window of each file
- employs broadcast paradigm of sending files which means that in most cases exact same file [that contains for example MPEG 1/2 essence and BWF chunks] gets delivered to all targeted stations at the same time.
- Selection of Delivery Strategy:

	As-Soon-As Possible	Begin-Air-Date-based
Essence Content	If the time of uploading content is later than the Essence due date and time	If the time of uploading content is earlier than the essence due date and time
Non-Essence Content	Always uses this strategy	N/A

- assigns the “Subscription-based delivery of essence content” priority for essence files and the “Subscription-based delivery of non-essence content” priority for non-essence files if delivery is triggered by an event of producer uploading content or station activating subscription to corresponding program or episode
- assigns the “Urgently requested delivery of essence content” priority for essence files and the “Urgently requested delivery of non-essence content” priority for non-essence files if delivery is triggered by an event of NOC operator requesting network refresh.

- assigns the “[On-demand delivery of essence content](#)” priority for essence files and the “[On-demand delivery of non-essence content](#)” priority for non-essence files if delivery is triggered by an event of Station downloading content [on-demand paradigm].

Business Rules of assigning cut numbers in CD Delivery System

Assumption: Most stations use weekly play-lists which means that they either have almost constant play-list [with same cut IDs] that they reuse each week or they build a play-list each week however it still refers to same cut IDs each week.

The CD Delivery Subsystem shall assign cut numbers [aka cut ID] for each segment file that is to be delivered to the stations. The idea is to have a pool of designated cut IDs for a week of programming for each show [aka program]. It means that each segment file of each episode of given program that falls within same week gets unique designated cut ID. This implies that cut IDs get repeated every week regardless what frequency given show is.

If a show’s end air date spans multiple cycles (for example, a daily show has a Monday episode that has an end air date spanning multiple Monday’s) then there will be two Monday episodes that are available to the station to be broadcast at one time. Because the cut IDs will be the same for the two Monday episodes, the latest episode will be placed in the station schedule. The latest episode will be the last episode delivered as part of the subscription push model. This will likely be the episode with the latest begin air date except in cases where the producer retransmits the earlier episode after the later episode was delivered. The station operator will be responsible for manually changing the file on his schedule to the earlier episode if they so desire.

Example:

- Daily - show with 6 segment files for each episode [pool 80200-80241]:
 - Monday – 80200, 80201, 80202, 80203, 80204, 80205
 - Tuesday – 80206, 80207, 80208, 80209, 80210, 80211
 - Wednesday – 80212, 80213, 80214, 80215, 80216, 80217
 - Thursday – 80218, 80219, 80220, 80221, 80222, 80223
 - Friday – 80224, 80225, 80226, 80227, 80228, 80229
 - Saturday – 80230, 80231, 80232, 80233, 80234, 80235
 - Sunday – 80236, 80237, 80238, 80239, 80240, 80241
- Weekly - show with 5 segments for each episode [pool 80300-80304]
 - Tuesday – 80300, 80301, 80302, 80303, 80304
- Bi-Weekly – show with 5 segments for each episode [pool 80500-80509]
 - Tuesday – 80500, 80501, 80502, 80503, 80504
 - Thursday – 80505, 80506, 80507, 80508, 80509
- Monthly (1st Monday of every month) show with 7 segments for each episode [pool 80400-80406]
 - Monday – 80400, 80401, 80402, 80403, 80404, 80405, 80406

The assignment of cut IDs will be based upon the day of the week. Any episode for a program created on a particular day of the week (Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, or Sunday) regardless of the frequency of the program will have the same cut ID.

The pool of cut IDs for each program gets assigned by CD Delivery System and made exposed in portal for a station operator.

How SAS interacts with Storage Receiver

Assumptions:

- Begin Air Date of episode is used as a good enough indicator of what day of a week given episode belongs to. For example Begin Air Date of 1st episode of a daily program could be equal to 11/10/2004, of 2nd episode - 11/11/2004, of 3rd episode – 11/12/2004 and so on.
- As far as how CD Delivery System interacts with SAS all content files fall into two categories:
 - automatically imported into SAS
 - manually imported into SAS
- All content files [both essence and non-essence] get delivered to Storage Receiver and placed under so called <archive> directory and are available to be manually pulled to SAS
- The essence files [segment files] whose delivery to Storage Receiver is triggered by producer uploading content to CD portal are exposed as symbolic links in a designated directory <CDLongname> to be automatically pulled to SAS
- The <CDCutID> directory will have symbolic links created using the same rules as the <CDLongName> except the name of the file will match the cutnum field. This directory is optionally available for SAS systems to pull content files into the SAS cut library based on the file name instead of the cutnum metadata field.
- All content files on Storage Receiver are exposed via Samba drive that could be mounted as a Windows drive
- The file structure on Storage Receiver shall be similar to this example:
<Receiver Host Name>
 - \<archive>
 - \PROGx_EpisodeY_Seg1>
 - ... And so forth...
 - \<CDLongname>
 - \<symbolik_link_to_PROGx_EpisodeY_Seg1>
 - ... And so forth. . .
 - \<CDCutID>
 - \<symbolik_link_to_PROGx_EpisodeY_Seg1>
 - ... And so forth. . .
- The default hostname of the storage receiver is CDFile1
- The content files placed under <archive> directory shall follow regular CD Content Repository naming convention
- The symbolic links to content files exposed via <CDCutID> directory shall have names equal to cut IDs nominated by CD Delivery System
- The symbolic links to the content files exposed via <CDLongName> directory shall have names equal to the CD Content Repository naming convention.
- The SAS shall have ability to provide Station Operator with means to specify mapping [shifting] between CD nominated cut IDs and those used in SAS library
- The SAS shall have ability to detect scenario when newly delivered and exposed content file in <CDLongname> has same cut ID as the cut existing in SAS library for which Begin Air Date is later [NEWER] than present time; these should be locked or queued or ignored until this condition becomes false
- The Cut Num field in Cart Chunk shall hold Cut ID value nominated by CD Delivery System

- The Title field in Cart Chunk shall hold a human-friendly text value informing what program, episode [unique number or Begin Air Date] and segment number; the idea is to have this information be exposed to Station Operator as much as possible
- There is a global range [CD system wide] of reserved cut IDs for all programs in CD starting from 60001 and ending at 90000.

Flow:

1. Producer creates program P and among others specifies frequency of episodes and number of segments per each episode [=Sp].
2. Producer creates new episode E1 for program P and among others specifies Begin Air Date and optionally number of segments for this episode [=Se1].
3. The CD Delivery System pre-allocates a range R of consecutive cut IDs from a global range of reserved ones [locks it in a global range] for this episode.
 - The logic to determine range R is based on the assumption that the first episode ever created for given day of the week could serve as a good indicator of how many segments this episode will have for same day of any week in the future.
 - The formula should be number of segments for the episode created [Sp or Se1 if specified] multiple 1.5 rounded to the closest integral number. In case of an average number of segments equal to 10 we would get R equal to 15. This implies that in worst case scenario [all programs are daily] we may need a global range of 15 multiply 7 multiply number of programs unless there is a consistent way to release unused cut IDs.
4. CD Delivery System selects first S [Sp or Se1 if specified] cut IDs from identified range of R and stores this information in CD database [selected IDs along with the episode and range R along with program meta-data respectively].
5. Producer creates another episode En for program P and among others specifies Begin Air Date and optionally number of segments for this episode [=Sen].
6. CD Delivery System looks up for last existing episode with Begin Air Date that is shifted a number of weeks and same or closest number of segments [in other words it looks for latest episode with Begin Air Date equal to the new episode's Begin Air Date plus or minus N number of weeks and same or closest number of segments as the new episode].
 - If such episode is found then CD assigns and stores same set of Cut IDs as for a found one. If the number of segments for new episode is greater than for the found one it allocates extra number unused one from the range R [identified when first episode created].
 - If such episode is not found then CD applies same logic as described in step 3 and 4.
7. Station Operator looks up Cut IDs of segment files he wants to use in a play-list using CD Portal and creates empty cuts in SAS library with same IDs. This would only have to be done once per program or any time Content Producer decides to change number of segments for entire program or specific episode.
8. Producer uploads segment content files of given episode into CD Content Repository.
9. CD Delivery System calculates Scheduled Delivery Time for each segment based on priority and triggering event.
10. When Scheduled Delivery Time comes then CD Delivery System exports [packages] content file into BWF and stores Cut ID into Cut Num field of Cart Chunk.
11. CD Delivery System transfers the exported content file to all Storage Receivers of the subscribed stations.

12. CD Delivery System places copy of a received file on the Storage Receivers under <archive> directory.
13. CD Delivery System creates a symbolic link to the physical file under <CDCutID> directory with name equal to cut ID and under <CDLongname> directory with name equal to CD Repository
14. SAS detects new link.
15. SAS interrogates given station's mapping and either uses a cut ID determined by CD or assigns new one based on station mapping.
16. SAS interrogates SAS library and searches for a cut with the same ID.
If no Cutnum matches in the SAS cut library:
 - The SAS system will import the file into the SAS cut libraryIf a cutnum matches a file in the SAS cut library:
 - If the last modified date of the new file is older than the last modified date of the existing file in the SAS cut library, the SAS system will not import the file.
 - If the last modified date of the new file is newer than the last modified date of the existing file in the SAS cut library, the SAS system compares the StartDate of the new file:
 - If the StartDate of the new file is newer/more recent than the StartDate of the existing file in the SAS cut library, the SAS system replaces the file.
 - If the StartDate of the new file is older/before the StartDate of the existing file in the SAS cut library, the SAS system ignores the new file
17. Storage Receiver deletes the content file at predetermined Kill Date.