White paper

QoS IN FILE BASED PLAYOUT SYSTEMS

June 2018

The dictionary on Google says:

> ***"prevention is better than cure" (an ounce of prevention is worth a pound of cure)***
> phrase of prevention
> 1. *proverb*
>
> It's easier to stop something from happening in the first place than to repair the damage after it has happened.

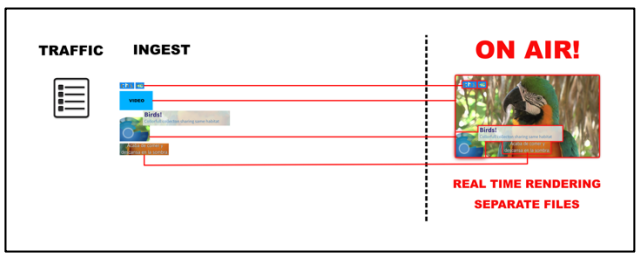
In this white paper, we compare how potential on-air errors are prevented by the VIPE pre-rendering concept compared to traditional channel-in-a-box (CiaB) systems.

We will prove that pre-rendering for a file-based playout channel, by concept, results in a superior quality of service (QoS) with a lower operator effort (OPEX). Ultimately resulting in a far better MCR operator to channel ratio or even lights-out-operation.

We conclude a <u>10 times higher</u> QoS for VIPE and a <u>lower effort</u> for the operator to maintain that higher QoS.

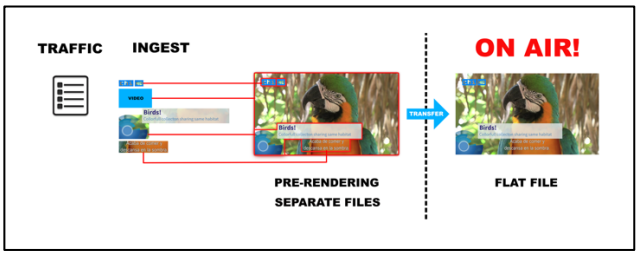
Conceptual change

Traditional CiaB systems assemble all video, audio and graphics components in real-time, even when for a file based playout channel all the schedules are known in advance. As such, any problem occurring during the assembly of the components directly results in an on-air error. Dealing with such an error can only be done by a MCR operator who needs to be available 24/7 to detect and correct the on-air error.



Real-time rendering

On the contrary, VIPE pre-renders the output in the final deliverable compressed output stream directly upon schedule reception. All events are pre-rendered (video, audio, graphics and ancillary data) ahead of on-air time. The final output process is a simple streaming process, with minimal complexity in software and hardware. The balance of the performance and complexity in the broadcast process happens non-realtime on the very efficiently utilized pre-render servers. Any problem during the assembly process results in an error before it is aired. The operator can fix the problem before it ever reaches on-air time.



pre-rendering

In a typical file based playout system on-air errors or on-air incidents are typically caused by 3 types of source errors:

1. **Schedule induced errors**
   A technical or logical error in a schedule will result in an incorrect on-air playlist. The playlist event aired does not contain the right asset, graphic or sequence.

2. **Content induced errors**
   A technical or logical error in the content will result in the corruption of the playout or delivery of the asset. The asset playout will be disrupted, show unwanted artefacts or is logically wrong.

3. **Technical system failures**
   - *A hardware failure or software bug will result in a disruption of the on-air*

playout, normally fixed by a switch to the backup system.

- While *(1) Schedule-induced-errors* and *(2) Content-induced-errors* can be avoided before the actual time of playout by a well-defined workflow and strict rules, in the real-world these errors still exist as the delivery of the playlist and content is typically the interface between different departments, parties and systems. These types of errors are existing over the lifetime of the channels in the MCR on-air environment.
- *(3) System failures* will always exist as even with completely virtualized systems; hardware ultimately will fail and even the best developed software might contain bugs. QoS is not only determined by the quality of the system, but as important, the way we deal with failures.
- So; let's simplify things and work on a variety of source errors and analyse how they manifest themselves in the output of VIPE vs traditional CiaB systems.
- We assume a MCR environment where the operator manually or automatically receives the playlist for the next day and the content is prepared by a 3rd party MAM.
- For the impact of any error it is important to understand *when* they arise and *how* they are dealt with by the operator.
- We list the different types of error's below and work with a real-life example of each error:

- **(1a) Schedule-induced-error; technical**
- A playlist contains an incompatible language character which results in a cut-off text in a graphic caption.
- **(1b) Schedule-induced-error; logical**
- A logo is incorrectly scheduled and results in commercials wrongly being displayed with the channel's logo.
- **(2a) Content-induced-error; technical**
- The MXF content on disk contains an error resulting in blocking artefacts of the main video asset.
- **(2b) Content-induced-error; logical**
- The video asset's audio mapping of the language is wrong, the English audio track is broadcast on what should have been the Spanish audio track.
- **(3a) Technical system failure; hardware**
- The hardware fails due to a memory or disk error, the on-air stream will stop playing on the main channel.
- **(3b) Technical system failure; software**
- A busy video and graphic sequence of events triggers a software bug or delay in the playout software resulting in stuttering of the on-air stream or a delayed/missed event.
- For the sake of simplicity, we assume that each of the 6 errors above happen proportionally, so each error occurs with a simplified frequency of 16%.

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- *(the table on the next page accounts for the numbers for each error in more detail)*

- In the table below we note the implication of a type of error on the on-air output and the operator effort required to correct and prevent further issues.

		VIPE		CiaB	
		on-air error	operator effort	on-air error	operator effort
(1a) Schedule-induced-error; technical	16%	*none*	*low*	16%	*high*
(1b) Schedule-induced-error; logical	16%	*none*	*low*	16%	*high*
(2a) Content-induced-error; technical	16%	*none*	*low*	16%	*high*
(2b) Content-induced-error; logical	16%	*none*	*low*	16%	*high*
(3a) Technical system failure; hardware	16%	8%	*high*	16%	*high*
(3b) Technical system failure; software	16%	*none*	*low*	16%	*high*
Total result		***8%!***	***less effort***	***100%***	***more effort***

The conclusion from the table below and on the detailed table on the next page is;

1. **The QoS for the VIPE channel is improved by *10 times* over a traditional CiaB**
2. **It takes less effort for the operator to maintain the higher QoS, and more of that time is spent during office hours**
3. **VIPE moves the traditional 24/7 MCR operator tasks to office hours enabling light-out-operation.** The remedy for possible on-air errors can be automated and dealt with by service engineers on call, remotely.

	VIPE	*Traditional CiaB*
(1a) Schedule-induced-error; technical A playlist contains an incompatible language character which results in a cut-off text in a graphic caption.	Upon import of the playlist, VIPE will detect the caption being cut off by the incorrect language character. The operator will see the error and ask the scheduling department for a correct playlist. **when:** shortly after import of the playlist, during office hours **on-air impact:** **none** **operator impact:** **low**; feedback to scheduling department by phone	The operator notices (if he/she actually does in real-time) the cut-off caption and makes a decision to air or remove the caption. Typically, the operator will then look for a re-occurrence of the error in the playlist and correct when required. The incident will be logged and fed back to the scheduling department to fix items in the future. **when:** 24/7 **on-air impact**: **high** **operator impact:** **high**; introduces work for the operator in expensive operator hours. And will have to feedback in a rapport for the next day to the scheduling department
(1b) Schedule-induced-error; logical A logo is incorrectly scheduled and results in commercials wrongly being displayed with the channel's logo.	The logo out secondary event is not correctly scheduled; during the quick QC (3-point check or quick smart run of the playlist) the stuck logo is detected and corrected. **when:** during QC, during office hours **on-air impact:** **none**[1] **operator impact:** **low**; correct the schedule and feedback to scheduling department Fallback	The logo out secondary event is not correctly scheduled. The logo is stuck on the commercial and the operator will remove the logo from on-air playout. **when:** 24/7 **on-air impact**: **high** **operator impact:** **high**; operator needs to react quick which is hard in an MCR where he/she is responsible of 10+ channels in playout
(2a) Content-induced-error; technical The MXF content on disk contains an error resulting in blocking artefacts of the main video asset.	The pre-rendering process detects the errors in the clips and errors out the specific asset. The operator is warned about the error in the clip and deals with the issue. **when:** during office hours in the pre-rendering process **on-air impact:** **none** **operator impact:** **low**; the operator needs to contact the channel owner and ask for a correction of the clip	The clip has errors during real-time playout, the clip has to be removed from the playlist and substituted with an alternative. **when:** 24/7 **on-air impact**: **very high**, the specific piece of content is not aired. **operator impact:** **very high**; the operator has to search the item, contact the channel owner to find alternative content
(2b) Content-induced-error; logical The video asset's audio mapping of the language is wrong, the English audio track is broadcast on what should have been the Spanish audio track.	The audio mapping is wrong, during the quick QC (3 point check or quick smart run of the playlist) the wrong language is detected. The operator asks for a corrected asset or fixes the mapping in the schedule. **when:** during QC, during office hours **on-air impact:** **none**[1] **operator impact:** **low**; ask the content owner for a corrected asset Fallback	The on-air audio mapping is wrong. The operator – if possible at all – corrects the audio mapping on-air and will look for re-occurrence of the asset and tries to correct in the schedule as this error might occur out of office hours. **when:** 24/7 **on-air impact**: **very high**, the specific piece of content is not aired. **operator impact:** **very high**; the operator has to search the item, contact the channel owner to find alternative content as soon as possible
(3a) Technical system failure; hardware The hardware fails due to a memory or disk error, the on-air stream will stop playing on the main channel.	A hardware failure will result in a corrupt output stream, since the output hardware in VIPE is considerably less complex, hardware failures will occur less often (less components). Assume twice as less. **when:** 24/7 **on-air impact:** **high**, but less often, assume twice as less **operator impact:** **medium**; switch to backup is quick (can be automated)	A hardware failure will result in a corrupt output stream, since the hardware is considerably more complex than in VIPE hardware failures will more often (more components). **when:** 24/7 **on-air impact:** **high** **operator impact:** **medium**; switch to backup is quick (can be automated)

[1] When QC is not performed on the pre-rendering process, the system behaves identically to a traditional CiaB

(3b) Technical system failure; software A busy video and graphic sequence of events triggers a software bug or delay in the playout software resulting in stuttering of the on-air stream or a delayed/missed event.	The streaming process is very simple, a comparable bug in VIPE would happen in the pre-rendering process where many, many lines of code exist (similar to CiaB). However, a bug here will stop the pre-rendering process and not result in an on-air issue. **when:** during the rendering process, during office hours **on-air impact: none** **operator impact: none or low**; re-rendering is automatic – bug will be logged and will need to be fed back to BCNexxt	The CiaB real-time assembly process is complex with many, many lines of code. A bug here will directly result in an on-air issue. **when:** 24/7 **on-air impact: high** **operator impact: high;** operator needs to restart systems and deal with the issue. In many cases the problem (as it is identical software) exists in the main and backup chain. Bug will be logged and fed back to the CiaB vendor.