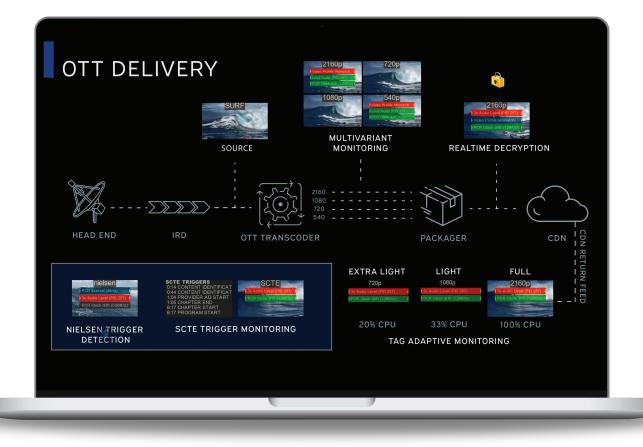
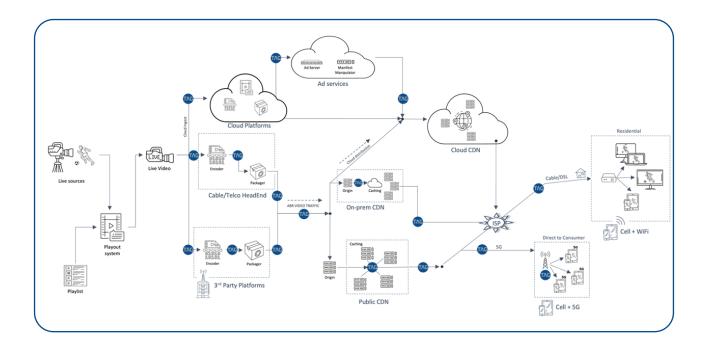


OTT WORKFLOW MONITORING: BEST PRACTICES



OTT WORKFLOW MONITORING: BEST PRACTICES

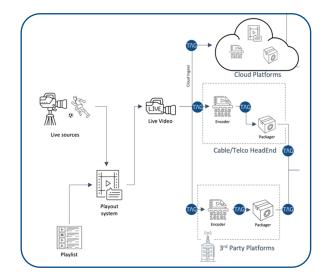
Effective monitoring across the OTT workflow is essential for maintaining high-quality content delivery. This involves establishing strategic monitoring setups at various stages of the delivery chain, from content acquisition to DRM/metadata to include the whole end-to-end infrastructure. This guide provides best practices for setting up a monitoring system at each critical point in the workflow, ensuring issues are promptly identified and resolved to maintain content integrity and service quality.



Content Acquisition and Playout System:

- · What to Monitor: Source content acquisition, live feeds, and playout system
- Why Are We Monitoring: Ensures the integrity of the original content and checks for issues in live feeds
- Probing Point Actions: Real-time monitoring for signal integrity, frame rate, and resolution

Configure monitoring at the Content Acquisition and Playout System to ensure the quality of source feeds. Implement real-time monitoring to assess signal integrity, frame rate, and resolution. This stage is crucial for maintaining the quality of the content at the start of the workflow.



Thresholds/Alarms

- We recommend monitoring video, audio, subtitles, and possibly SCTE markers to make sure originally
 received stream is good quality and complies with all internal relevant requirements. For example, ensuring the
 stream includes audio tracks for all of the different available languages for the specific programming and
 associated subtitles.
- The major thresholds are relevant to video: **black video, video freeze, blocking, bars and no video.**

Label								Thresholds Q 2/2	
nir plan								Default	
								nir plan	
# 1 1	Label	Group	Standard	Threshold	Severity	Record	Default		
38	Black frame detection	Video	All	12500 ms 👻	🔴 Major 👻	OFF			
43	Detect decoding errors	Video	All		🛑 Major 🛛 👻	OFF	ON		
49	Black frame with logo detection	Video	All	12500 ms 👻	🛑 Major 🔫	OFF	ON		
59	Freeze frame	Video	All	12500 ms 👻	🛑 Major 👻	OFF	ON		
60	No Video	Video	All	1500 ms 👻	Critical 👻	OFF	ON		
84	Video bitrate, max threshold	Video	All	25% -	ONTICE -	OFF	ON O		
85	Video bitrate, min threshold	Video	All	15 %	ONTICE -	OFF	ON		
116	Detect color-space mismatch (ex, YU	Video	All		🔴 Critical 👻	OFF)	(ON ()		

Video blocking detection - scene Video All SD relative Minor Image: scene in the scene in th	124	Detect video codec mismatch	VIGEO	All		- Majoi		
Video blockling detection - peak Video All S0 relative Minor Image: S0 relative P HDR SEI data Video All S0 relative Disabled Image: S0 relative Imag	134	Missing SPS	Video	All	4000 ms 👻	Critical 👻	OFF	ON
P HDR SEI data Video All Disabled • Disabled • 0 HDR SEI data missing Video All 10 sec Disabled • Image: Constraint of the constra	172	Video blocking detection - scene	Video	All	50 relative 👻	Minor 💌	OFF	
HDR SEI data missing Video All 10 sec Disabled Disabled Image: Constraint of the second o	173	Video blocking detection - peak	Video	All	50 relative 👻	Minor 🔻	OFF	
A Video PTS variance detection Video All Disabled \checkmark Disabled \checkmark 0 Missing AFD Video All Disabled \checkmark On	229	HDR SEI data	Video	All		Disabled 🔻	OFF	ON O
0 Missing AFD Video All Disabled -	230	HDR SEI data missing	Video	All	10 sec 👻	Disabled 💌	OFF	ON O
	234	Video PTS variance detection	Video	All		Disabled 💌	OFF	ON O
AFD Value Changed Video All Disabled -	320	Missing AFD	Video	All		Disabled 🔻	OFF	ON O
	321	AFD Value Changed	Video	All		Disabled 👻	OFF	ON O
4 Detect Video Bars Video All 2000 ms 🔹 🔴 Major 👻 🔘	374	Detect Video Bars	Video	All	2000 ms 👻	🛑 Major 👻	OFF	

• For audio we will most importantly monitor **silence/no audio** and then additional thresholds based on type (i.e **dolby**) and if it was **uncompressed also audio phasing.**

hreshold Configu	ration						ପ୍ 19/510 ∷≣	= 🖬 + 🗊 🗇 🗌
Label								Thresholds Q 2/2 X
nir plan								Default
								nir plan
# 1 1	Label	Group	Standard	Threshold	Severity	Record	Default	
61	No Audio	Audio	All	2000 ms 👻	Critical 👻	OFF		
62	Audio Silence	Audio	All	5000 ms 👻	Critical 👻	OFF	ON	
63	Audio Phase	Audio	All	60000 ms 👻	🛑 Major 🔻	OFF	ON O	
73	True-peak audio level above X dBTP	Audio	All	-1 dBTP 👻	🛑 Major 🔻	OFF	ON O	
74	Short term (3sec) audio level above	Audio	All	-6 LUFS 👻	🛑 Major 🔻	OFF	ON	
86	Audio bitrate, max threshold	Audio	All	24 %	Notice 👻	OFF		
87	Audio bitrate, min threshold	Audio	All	14 % 🗸	Notice 👻	OFF	ON	
107	Detect Mono audio (on streams with	Audio	All	120000 ms 👻	Notice 👻	OFF	ON O	

• This monitoring allows us even to troubleshoot the workflow because, obviously, if the source is bad, it will be bad throughout.

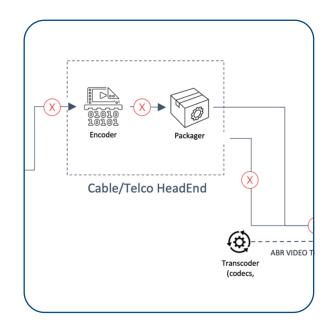
Encoders:

- What to Monitor: Encoding process for format conversion and compression
- Why Are We Monitoring: Verifies proper encoding to avoid quality degradation and format incompatibility
- Probing Point Actions: Check for compression artifacts and conformity to specified codecs and resolutions

Set up the monitoring system to scrutinize the encoding process, focusing on compression and format conversion. Include checks for compression artifacts and verify codec compliance and resolution accuracy. Proper monitoring at this stage prevents quality degradation and format incompatibility.

There are two common formats of Packager created wrapping of compressed sources: DVB (Digital Video Broadcasting – European Consortium) and ATSC (Advanced Television Systems Committee – American set).

DVB is often used for satellite and fiber feeds of signals, there are recommended set of thresholds for SDT, BAT, EIT, NIT, AIT, TDT tables used in this standard.



abel Default						
# † 1	Label	Group	Standard	Threshold	Severity	Record
146	STT Table error	STT, RRT	ATSC		Critical 🔻	0
147	STT accuracy error	STT, RRT	ATSC	5 sec 🔻	Critical 👻	0
148	STT Table missing	STT, RRT	ATSC	10000 ms 🔻	🔴 Major 🔻	0
149	STT Table repetition rate too slow	STT, RRT	ATSC	1000 ms 🔻	🔴 Major 🔻	0
154	RRT Table missing	STT, RRT	ATSC	120000 🔻	🔴 Major 🔻	0
155	RRT Table repetition rate too slow	STT, RRT	ATSC	60000 ms 🔻	🔴 Major 🔻	0
159	RRT is illegal	STT, RRT	ATSC		🔴 Major 🔻	0
160	STT is illegal	STT, RRT	ATSC		🔴 Major 🔻	0
170	RRT CRC change (Monitor changes to RRT crc)	STT, RRT	ATSC		Critical 🔻	0
171	RRT Version Change	STT, RRT	ATSC		Major 🔻	6

Starting off the recommended SDT (Service Description Table), and BAT (Bouquet Association Table)
 Thresholds, all alarms on these sub-tables of DVB are either Critical or Major
 The DVB's EIT (Event Information Table) is an optional table, but if it is enabled 'after scan' we recommend these alarms.

.abel							
Default							
# 个 1	Label	Group	Standard	Threshold		Severity 12	Record
41	EIT actual not found	EIT	DVB	5000 ms	-	🛑 Major 🔻	O OFF
42	EIT actual repetition rate too slow	EIT	DVB	2250 ms	•	🛑 Major 🔻	OFF
44	EIT other not found	EIT	DVB	20000 ms	•	Notice 👻	O OFF
45	EIT other repetition rate too slow	EIT	DVB	11000 ms	•	Minor 🔻	OFF
46	EIT Actual Version Change	EIT	DVB			🛑 Major 🔻	OFF
47	EIT Schedule Actual not found	EIT	DVB	20000 ms	•	Disabled 🔻	O OFF
48	EIT Schedule Actual repetition rate too slow	EIT	DVB	11000 ms	•	Disabled	OFF

\bigcap	51	EIT Schedule Other repetition rate too slow	EIT	DVB	30000 ms 👻	Disabled 💌	OFF
	53	Table ID error on PID 0x12 (EIT)	EIT	DVB		Critical 🔻	OFF
	79	EIT is illegal	EIT	DVB		Critical 🔻	OFF
	100	CC errors on EIT	EIT	DVB	1 CC/sec 🗸	Critical 🔻	OFF
	139	Service EIT not found	EIT	All	5000 ms 🗸	Notice 🔻	OFF

abel Default						
# 1 1	Label	Group	Standard	Threshold	Severity † 2	Record
27	NIT Actual not found	NIT	DVB	20000 ms 🗸	Minor 🔻	0 0
28	NIT Actual repetition rate too slow	NIT	DVB	10000 ms 👻	Minor 🔻	0
30	NIT Other repetition rate too slow	NIT	DVB	10000 ms 👻	Minor 👻	0
31	Table ID error on PID 0x10 (NIT)	NIT	DVB		🛑 Major 🔻	0
78	NIT is illegal	NIT	DVB		Critical 👻	0
103	CC errors on NIT	NIT	DVB	1 CC/sec 🗸 🗸	Critical 👻	0
174	Carrier ID field missing	NIT	DVB	30000 ms 👻	Disabled 💌	0
175	Carrier ID Repetition rate	NIT	DVB	2000 ms 🔻	Minor 🔻	0
176	Carrier ID illegal	NIT	DVB		🛑 Major 🔻	0
177	Carrier ID mismatch (not as expected)	NIT	DVB		Major 🔻	0

• DVB's NIT (Network Information Table) gives information on organization of multiplexes carried via network.

• DVB's AIT (Application Information Table) gives full information on the data broadcast and the required state of applications used.

reshold Config	uration					
Default						
# 1 1	Label	Group	Standard	Threshold	Severity 12	Record
532	AIT is illegal	AIT	All		Critical 🔻	O OFF
533	AIT repetition too slow	AIT	All	3000 ms 🔻	Major 🔻	O OFF
534	Table ID error on AIT PID	AIT	All		Critical 🔻	O OFF
535	AIT Is Scrambled	AIT	All		Critical 🔻	OFF
536	AIT Missing	AIT	All	5000 ms 🗸	Disabled 🔻	OF

- Threshold Configuration Label Default # 1 Label Group Standard Threshold Severity 12 Record 54 Table ID error on PID 0x13 (RST) -OFF TDT DVB Critical 55 TDT Not Found TDT DVB 60000 ms • OFF 56 TDT repetition rate too slow TDT DVB 30000 ms • OFF Major 58 Table ID error on PID 0x14 (TDT) OFF -TDT DVB Critical 80 TDT is illegal TDT DVB OFF -Critical RST is illegal OFF 81 DVB TDT Critical -OFF 102 CC errors on TDT/TOT TDT DVB 1 CC/sec Critical -OFF 180 TDT Accuracy error TDT DVB 5 sec • Critical O OFF 207 RST Not Found TDT DVB 60000 ms Disabled **T** 208 RST repetition rate too slow TDT DVB 30000 ms Major
- Finally, the last DVB Table we have alarms on is the TDT (Time and Date Table) time signals are required for smooth playback of DVB streams

In North America, a simpler wrapping is used by packagers, especially if OTT streams originated in over-the-air broadcasts; that wrapping standard is ATSC (Advanced Television Systems Committee – American set). Here are thresholds for MGT, VCT, STT, and RTT tables used in this standard.

DVB

OFF

Maior

-

• ATSC's MGT (Master Guide Table) is the primary description of the stream, and we recommend these thresholds.

TDT

RST running status not as expected

209

abel Default						
# 1 1	Label	Group 个	Standard	Threshold	Severity	Record
150	MGT Table missing	MGT	ATSC	2000 ms 🔻	Major 🔻	0.
151	MGT Table repetition rate too slow	MGT	ATSC	150 ms 🔻	🔴 Major 🔻	0
156	MGT Version Change	MGT	ATSC		🔴 Major 🔻	0
157	MGT is illegal	MGT	ATSC		Critical 🔻	0
163	MGT CRC change (Monitor changes to MGT crc)	MGT	ATSC		Critical 🔻	0

ATSC's VCT (Virtual Channel Table) contains a list of attributes for the channels within the stream, most probed element of this table are critical.

•

abel Default						
# 1 1	Label	Group	Standard	Threshold	Severity	Recor
152	VCT Table missing	VCT	ATSC	4000 ms 🔻	🛑 Major 🔻	0
153	VCT Table repetition rate too slow	VCT	ATSC	400 ms 🔻	Major 🔻	0
158	VCT is illegal	VCT	ATSC		Critical 🔻	0
161	VCT Version Change	VCT	ATSC		🛑 Major 🔻	0
162	VCT CRC change (Monitor changes to VCT crc)	VCT	ATSC		Critical 🔻	0
164	VCT Table type mismatch	VCT	ATSC		Critical 🔻	0
165	VCT channel number mismatch (major or minor)	VCT	ATSC		Critical 👻	0
166	VCT service type mismatch	VCT	ATSC		🔴 Critical 🔻	0
167	VCT source id mismatch	VCT	ATSC		Critical 👻	0
168	Channel missing in VCT	VCT	ATSC		Critical 👻	0
169	Check for VCT channel short name matching	VCT	ATSC		Major 🔻	6

• ATSC's SST (System Time Table) and RRT (Rating Region Table) are either for packet timing or ratings for multiple geographical regions.

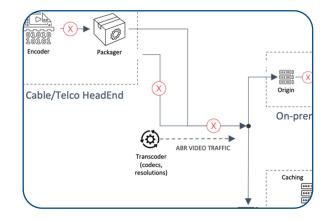
abel Default						
# 个 1	Label	Group	Standard	Threshold	Severity	Recor
46	STT Table error	STT, RRT	ATSC		Critical 👻	0
147	STT accuracy error	STT, RRT	ATSC	5 sec 🔻	🛑 Critical 🔻	0
148	STT Table missing	STT, RRT	ATSC	10000 ms 🔻	🛑 Major 🔫	0
149	STT Table repetition rate too slow	STT, RRT	ATSC	1000 ms 🔻	🛑 Major 🔻	0
154	RRT Table missing	STT, RRT	ATSC	120000 🔻	🛑 Major 🔻	0
155	RRT Table repetition rate too slow	STT, RRT	ATSC	60000 ms 🔻	🛑 Major 🔻	0
159	RRT is illegal	STT, RRT	ATSC		🛑 Major 🔻	0
60	STT is illegal	STT, RRT	ATSC		🛑 Major 🔻	0
170	RRT CRC change (Monitor changes to RRT crc)	STT, RRT	ATSC		Critical 👻	0
171	RRT Version Change	STT, RRT	ATSC		Major 🔻	0

Transcoders (if applicable):

- · What to Monitor: Transcoding operations for multiple formats and bitrates
- · Why Are We Monitoring: Ensures availability of content in formats suitable for various devices
- Probing Point Actions: Monitor for successful creation of all required profiles and bitrates

For transcoding operations, extend monitoring to oversee the creation of multiple-format profiles and bitrates. Ensure all required profiles are generated accurately and bitrates align with specified standards. This monitoring ensures content compatibility across various devices and network conditions.

Transcoded OTT signals into HLS and other formats can have numerous errors; the number of these OTT thresholds and alerts is such a large group that three screens are needed to show all the settings, with TAG's recommendation on Critical and Major levels highlighted.



Label						
Default						
#	Label	Group	Standard	Threshold	Severity	Record
213	HLS block doesn/'t start with PAT	отт	All		Critical 🔻	OFF
214	HLS block doesn/'t start with PMT	отт	All		Critical 🔻	O OFF
215	HLS Block sequence error	отт	All		Critical 🔻	O OFF
216	HLS Block sequence stopped changing	отт	All		Critical 🔻	O OFF
217	HLS Profile not found on the master M3U8 file	отт	All		Critical 🔻	O OFF
218	HLS M3U8 / Mpeg-Dash MPD / MSS ISM parsing er	отт	All		Critical 🔻	O OFF
219	HLS/Mpeg-Dash/MSS Block download fail	отт	All		Critical 🔻	O OFF
220	HLS/Mpeg-Dash/MSS Block download time too long	отт	All	10000 ms 🔻	Critical 🔻	OFF
221	HLS Profile version not equal to playlist version	отт	All		🛑 Critical 🔻	O OFF
222	HLS Version not as expected	отт	All		🛑 Critical 🔻	O OFF
223	HLS/Mpeg-Dash/MSS download retry (but success	ОТТ	All		Minor 🔻	O OFF
224	HLS content not scrambled	отт	All		🛑 Major 🔻	O OFF
225	OTT content scrambled (and not decrypted)	отт	All		🛑 Major 🔻	
226	RTMP/CTP Connection failure	отт	All		Critical 🔻	O OF
227	RTMP/CTP Underrun	οττ	All		Critical 🔻	O OFF

Threshold	

(Label Default						
	#	Label	Group	Standard	Threshold	Severity	Record
	228	HLS/Mpeg-Dash/MSS Block download started too I	отт	All		Critical 🔻	OFF
	235	HLS/Mpeg-Dash/MSS Block shorter from expected	OTT	All	1% 👻	Minor 🔻	OFF
	226	UI S/Maag-Dach/MSS Block Jangar from expected	OTT	All	1 🛛 🗸 👻	Minor -	0.055

240	HLS Block audio vs video PTS mismatch (Neg - au	OTT	All	500 ms 🔻	Minor 🔻	OFF
241	Compare Video PTS increment with EBP	ОТТ	All	5 ms 🔻	Critical 🔻	OFF
242	Compare Video PTS/EBP drift	отт	All	5 ppm 🔻	Critical 🔻	OFF
243	EBP information is missing	OTT	All		Disabled 🔻	OFF
244	EBP presented after initial video PTS	отт	All		Critical 🔻	OFF
245	No PTS/EBP reference info found	отт	All		Critical 👻	OFF
246	Profiles PTS out of sync	отт	All	2500 us 🔻	Critical 👻	OFF
247	Profiles EBP out of sync	отт	All	2500 us 🔻	Critical 🔻	OFF
240	Niscina program dataltimo on ULC m240	OTT	A.II.		Disabled -	0.055

abel						
Default						
#	Label	Group	Standard	Threshold	Severity	Record
249	HLS/Mpeg-Dash/MSS Block download fail due to ti	отт	All		Disabled 🔻	O OF
250	HLS/Mpeg-Dash/MSS Block download fail except fo	ΟΤΤ	All		Disabled 🔻	OF
343	Missing OTT audio component	отт	All		Critical 👻	OF
344	Missing OTT subtitle component	отт	All		Critical 👻	OF
345	Anvato content type change	OTT	All		Disabled 💌	O OF
346	Anvato content type is not program	ΟΤΤ	All		Disabled 🔻	OF
347	Anvato no content type change	OTT	All	15 min 🔻	Disabled 🔻	OF
348	OTT discontinuity marker received	отт	All		Disabled 🔻	O OF
349	OTT sequence discontinuity	отт	All		Disabled 🔻	OF
378	OTT chunk burst (m3u8/ism/mpd updated with mu	σττ	All	3 chunks 🔻	🛑 Major 🔻	OF
379	OTT playback jump (m3u8/ism/mpd updated refer	отт	All	5 sec 🔻	Critical 👻	OF
540	Detect certificate error (any)	отт	All		Critical 👻	OF
541	Detect expired certificate	отт	All		Critical 👻	OF
542	Detect certificate verification error	отт	All		Critical 🔻	(or

ISPs or Final Delivery to Customers

Subtitles, Teletext or Closed Captions not only assist hearing-impaired persons, but also OTT streams being monitored with audio turned down in waiting rooms and the like.

Label Default						
# 个 1	Label	Group	Standard	Threshold	Severity	Record
122	Subtitle CC Error	Subtitle	All	2 CC/sec 🔻	Critical 👻	0 01
131	Zero bitrate on subtitle PID	Subtitle	All	5000 ms 🔻	🛑 Major 🔻	0 0
132	Subtitle PES Drop - Subtitle PTS and PCR mismatch	Subtitle	All		Critical 🔻	0 01
133	Subtitle content error	Subtitle	All		Critical 🔻	0
145	Teletext Subtitle content error	Subtitle	All		🔴 Critical 🔻	0
197	Subtitle data_identifier is not 0x20	Subtitle	All		Minor 🔻	0 0
210	No Subtitles content	Subtitle	All	2 min 🔻	🛑 Major 🔻	0
488	No OP-47/OP-42/Teletext carrier	Subtitle	All	30 sec 🔻	Disabled 💌	0.
489	No OP-47/OP-42/Teletext subtitles content	Subtitle	All	30 sec 🔻	Disabled 🔻	0.

abel						
Default						
		1	1		1	
#	Label	Group	Standard	Threshold	Severity	Record
185	Closed Captions, All channels missing (EIA-608)	Closed Captions	All	30 sec 🔻	Disabled 🔻	OF
186	Closed Captions, All channels not updated (EIA-60	Closed Captions	All	30 sec 🔻	Disabled 🔻	O OF
187	Closed Captions, Parse parity error (EIA-608/708)	Closed Captions	All		🛑 Major 🔻	OF
188	Closed Captions (EIA-608), Channel 1 missing	Closed Captions	All	30 sec 🔻	Disabled 🔻	6

195	Closed Captions (EIA-608), Channel 4 not updated	Closed Captions	All	30 sec 🔻	Disabled 🔻	OFF
341	OTT Closed Captions missing	Closed Captions	All	30 sec 🔻	Major 🔻	OFF
342	OTT Closed Captions not updated	Closed Captions	All	30 sec 🔻	Critical 🔻	OFF
490	Closed Captions (EIA-708), Channel 1 missing	Closed Captions	All	30 sec 🔻	Disabled 💌	OFF
491	Closed Captions (EIA-708), Channel 2 missing	Closed Captions	All	30 sec 🔻	Disabled 🔻	OFF

Then, we probe the primary content of the OTT streams and recommend these threshold settings, including mismatches of signals to the reference in the stream.

abel Default						
#	Label	Group	Standard	Threshold	Severity	Record
432	Video mismatch detection compared to reference	Content	All	1 sec 🔻	Critical 🔻	0 •
433	Audio mismatch detection compared to reference	Content	All	1 sec 🔻	Critical 🔻	0 .
434	Detecting audio-video offset compared to reference	Content	All	50 ms 🔻	Critical 🔻	0.
435	Latency to reference channel changes	Content	All		Critical 🔻	0.
436	Latency to reference channel outside of expected r	Content	All	50 ms 🔻	Critical 🔻	0 •
437	Detect reference channel change (requires multipl	Content	All		Critical 🔻	0.
438	Detection of video match to reference	Content	All		Critical 🔻	0 0
537	Detect Good & Bad A/V sync marker	Content	All		Critical 👻	0
538	Detect Bad A/V sync marker (audio out of threshold)	Content	All	5 ms 🔻	🔴 Critical 🔻	0
539	Detect Good A/V sync marker (audio within thresho	Content	All	5 ms 🔻	Critical 🔻	6

Packagers:

- What to Monitor: Segmenting and packaging content for adaptive streaming (eg, HLS, DASH)
- · Why Are We Monitoring: Critical for smooth adaptive bitrate streaming, crucial for different network conditions
- · Probing Point Actions: Validate segment availability, integrity, and compliance with streaming protocols

TAG MCM has many thresholds for things like expired DASH certificates that we have developed over the years with input from our clients to catch common errors with packagers.

Content Delivery Networks (CDNs):

- What to Monitor: CDN performance, including edge servers
- Why Are We Monitoring: Affects content delivery speed and buffering; key for global distribution
- Probing Point Actions: Monitor latency, packet loss, and throughput at various geographic locations

If a CDN server gets overwhelmed with clients but has not yet failed, it will often increase the inter-packet timing, and the MCM has an alarm threshold to report that change.

Origin Servers:

These servers are usually the last point before CDN servers, where video is stored or composed.

- · What to Monitor: Server performance and content availability
- Why Are We Monitoring: Ensures content is readily available for distribution to CDNs
- Probing Point Actions: Check server health, load, and response times

Many clients use TAG MCMs to confirm high-quality audio, video, and metadata in all streams from Origin Servers. An example would be our video blocking level alerts, where the compression blocks are evident to the viewer.

Cloud Computing Resources (if used):

- What to Monitor: Cloud infrastructure and services
- Why Are We Monitoring: Cloud failures can impact content availability and delivery
- · Probing Point Actions: Monitor cloud resource utilization, scalability, and redundancy

Most cloud providers provide monitoring services, but the TAG MCS software just shows the health of the cloud instances where MCM is running.

Edge Devices (Set-top boxes, Sticks like Chromecast, Roku, and Amazon Fire Stick):

- What to Monitor: Final content delivery and playback on consumer devices
- Why Are We Monitoring: Directly impacts viewer experience, crucial for QoE
- Probing Point Actions: Collect data on playback issues, buffering, app crashes, and device compatibility

Some non-TAG software products monitor devices; we can only monitor one of these devices if its output is converted to an IP stream by a third-party converter and sent back to an MCM.

Metadata and DRM Systems:

- · What to Monitor: Metadata accuracy and DRM (Digital Rights Management) functionality
- Why Are We Monitoring: Ensures content discoverability and compliance with licensing agreements
- Probing Point Actions: Validate metadata integrity and DRM effectiveness

TAG MCMs have several thresholds for OTT certificate errors, and DVB Conditional access specific data to help monitor DRM before being sent to the end customer. It is also common for the DRM vendors to also have monitoring tools in this area.

Network Infrastructure:

- What to Monitor: Internal and external network performance
- Why Are We Monitoring: Network issues can lead to delivery failures or degraded quality
- Probing Point Actions: Continuous monitoring of network health, bandwidth, and connectivity

Many MCMs alert thresholds can be used to detect network issues, like continuity errors or even an increase in Inter Packet Timing.

#	Description	Short name displayed on tile	Group	Default setting	Standard DVB or ATSC	Content Acquisition	Encoders	Transcoders	Packagers	CDNs	Origin Servers	Cloud Computing	Edge Devices	DRM & Metadata Systems	Network Infrastructure
1	No Input Stream	No Input Stream	Stream	Critical											
30	NIT Other repetition rate too slow	NIT-other Rep slow	NIT, AIT	Minor	DVB										
31	Table ID error on PID 0x10 (NIT)	NIT Table ID Error	NIT, AIT	Major	DVB										
35	Detect unreferenced pids	Unreferenced PID	PAT	Disabled											
36	SDT Actual not found	SDT-actual	SDT, BAT	Major	DVB										
37	SDT Actual repetition rate too slow	SDT-actual Rep slow	SDT, BAT	Major	DVB										
38	Black frame detection	Black Frame	Video	Major											
39	SDT Other repetition rate too slow	SDT-other Rep slow	SDT, BAT	Minor	DVB										
40	Table ID error on PID 0x11 (SDT)	SDT Table ID Error	SDT, BAT	Critical	DVB										
41	EIT actual not found	EIT-actual	EIT	Major	DVB										
42	EIT actual repetition rate too slow	EIT-actual Rep slow	EIT	Major	DVB										
43	Detect decoding errors	Decoding Error	Video	Major											
44	EIT other not found	EIT-other	EIT	Notice	DVB										
45	EIT other repetition rate too slow	EIT-other Rep slow	EIT	Minor	DVB										
46	EIT Actual Version Change	EIT Version Changed	EIT	Major	DVB										
47	EIT Schedule Actual not found	EIT-actual/sch	EIT	Disabled	DVB										
52	PAT CRC change (Monitor changes to PAT crc)	PAT CRC Changed	PAT	Major											
53	Table ID error on PID 0x12 (EIT)	EIT Table ID Error	EIT	Critical	DVB										
54	Table ID error on PID 0x13 (RST)	RST Table ID Error	TDT	Critical	DVB										
55	TDT Not Found	TDT	TDT	Major	DVB										
56	TDT repetition rate too slow	TDT Repetition slow	TDT	Major	DVB										
57	PMT CRC change (Monitor changes to PMT crc)	PMT CRC Changed	PMT	Critical											
58	Table ID error on PID 0x14 (TDT)	TDT Table ID Error	TDT	Critical	DVB										
59	Freeze frame	Freeze Frame	Video	Major											
60	No Video	No Video	Video	Critical											
61	No Audio	No Audio	Audio	Critical											
62	Audio Silence	Audio Silence	Audio	Critical											
63	Audio Phase	Audio Phase Error	Audio	Major											
64	PAT Version Change	PAT Version Changed	PAT	Major											
77	SDT is illegal	SDT illegal	SDT, BAT	Critical	DVB										
78	NIT is illegal	NIT illegal	NIT, AIT	Critical	DVB										
79	EIT is illegal	EIT illegal	EIT	Critical	DVB										
80	TDT is illegal	TDT illegal	TDT	Critical	DVB										
81	RST is illegal	RST illegal	TDT	Critical	DVB										
82	CAT is illegal	CAT illegal	CAT	Critical											
99	CC errors on PAT	CC Error on PAT	PAT	Critical											
100	CC errors on EIT	CC Error on EIT	EIT	Critical	DVB										
101	CC errors on SDT/BAT	CC Error on SDT	SDT, BAT	Critical	DVB										
102	CC errors on TDT/TOT	CC Error on TDT	TDT	Critical	DVB										
103	CC errors on NIT	CC Error on NIT	NIT, AIT	Critical	DVB										
104	CC errors on CAT	CC Error on CAT	CAT	Critical											
145	Teletext Subtitle content error	Tele-Sub Error	Subtitle	Critical											
146	STT Table error	STT Error	STT, RRT	Critical	ATSC										
147	STT accuracy error	STT accuracy	STT, RRT	Critical	ATSC										
148	STT Table missing	STT	STT, RRT	Major	ATSC										
149	STT Table repetition rate too slow	STT rep slow	STT, RRT	Major	ATSC										
150	MGT Table missing	MGT	MGT	Major	ATSC										
150	MGT Table missing	MGT	MGT	Major	ATSC										

#	Description	Short name displayed on tile	Group	Default setting	Standard DVB or ATSC	Content Acquisition	Encoders	Transcoders	Packagers	CDNs	Origin Servers	Cloud Computing	Edge Devices	DRM & Metadata Systems	Network Infrastructure
151	MGT Table repetition rate too slow	MGT rep slow	MGT	Major	ATSC										
152	VCT Table missing	VCT	VCT	Major	ATSC										
153	VCT Table repetition rate too slow	VCT rep slow	VCT	Major	ATSC										
154	RRT Table missing	RRT	STT, RRT	Major	ATSC										
155	RRT Table repetition rate too slow	RRT rep slow	STT, RRT	Major	ATSC										
156	MGT Version Change	MGT Version Changed	MGT	Major	ATSC										
157	MGT is illegal	MGT Illegal	MGT	Critical	ATSC										
158	VCT is illegal	VCT Illegal	VCT	Critical	ATSC										
159	RRT is illegal	RRT Illegal	STT, RRT	Major	ATSC										
160	STT is illegal	STT Illegal	STT, RRT	Major	ATSC										
161	VCT Version Change	VCT Version Changed	VCT	Major	ATSC										
162	VCT CRC change (Monitor changes to VCT crc)	VCT CRC Changed	VCT	Critical	ATSC										
163	MGT CRC change (Monitor changes to MGT crc)	MGT CRC Changed	MGT	Critical	ATSC										
164	VCT Table type mismatch	VCT type mismatch	VCT	Critical	ATSC										
165	VCT channel number mismatch (major or minor)	VCT channel mismatch	VCT	Critical	ATSC										
166	VCT service type mismatch	VCT service mismatch	VCT	Critical	ATSC										
167	VCT source id mismatch	VCT source id mismatch	VCT	Critical	ATSC										
168	Channel missing in VCT	Entry missing in VCT	VCT	Critical	ATSC										
169	Check for VCT channel short name matching	VCT Name mismatch	VCT	Major	ATSC										
170	RRT CRC change (Monitor changes to RRT crc)	RRT CRC Changed	STT, RRT	Critical	ATSC										
171	RRT Version Change	RRT Version Changed	STT, RRT	Major	ATSC										
172	Video blocking detection - scene	Video Blocking	Video	Minor											
173	Video blocking detection - peak	Frame Blocking	Video	Minor											
174	Carrier ID field missing	Carrier ID	NIT, AIT	Disabled	DVB										
175	Carrier ID Repetition rate	Carrier ID rep too slow	NIT, AIT	Minor	DVB										
176	Carrier ID illegal	Carrier ID illegal	NIT, AIT	Major	DVB										
177	Carrier ID mismatch (not as expected)	Carrier ID changed	NIT, AIT	Major	DVB										
178	Detect PCR clock jitter	PCR Jitter	Stream	Minor											
179	Service EIT empty	Service EIT error	EIT	Minor											
180	TDT Accuracy error	TDT Accuracy	TDT	Critical	DVB										
181	Embedded teletext clock error	Teletext Error	More	Critical											
207	RST Not Found	RST	TDT	Disabled	DVB										
208	RST repetition rate too slow	RST Repetition slow	TDT	Major	DVB										
209	RST running status not as expected	RST Running state mismatch	TDT	Major	DVB										
210	No Subtitles content	Subtitle Empty	Subtitle	Major											
211	Audio level below X LUFS for 60 seconds (or channel defined time)	Low Audio	Audio	Major											
212	New HLS/Mpeg-Dash/MSS Block	New OTT Block	отт	Info											
213	HLS block doesn't start with PAT	HLS PAT missing	OTT	Critical											
214	HLS block doesn't start with PMT	HLS PMT missing	OTT	Critical											
215	HLS Block sequence error	HLS sequence error	OTT	Critical											
216	HLS Block sequence stopped changing	HLS sequence stopped	OTT	Critical											
217	HLS Profile not found on the master M3U8 file	HLS Profile Missing	отт	Critical											
218	HLS M3U8 / Mpeg-Dash MPD / MSS ISM parsing error	OTT Parse Error	отт	Critical											
219	HLS/Mpeg-Dash/MSS Block download fail	OTT Download Failed	OTT	Critical											
220	HLS/Mpeg-Dash/MSS Block download time too long	OTT Download Slow	отт	Critical											
221	HLS Profile version not equal to playlist version	HLS version mismatch	отт	Critical											
222	HLS Version not as expected	HLS wrong version	OTT	Critical											
223	HLS/Mpeg-Dash/MSS download retry (but successful)	OTT Download Retry	OTT	Minor											
224	HLS content not scrambled	HLS Not Scrambled	OTT	Major											
225	OTT content scrambled (and not decrypted)	OTT Scrambled	OTT	Major											
226	RTMP/WebRTC/CTP Connection failure	Connection Failure	OTT	Critical											
227	RTMP/WebRTC/CTP Underrun HLS/Mpeg-Dash/MSS Block download	Underrun	OTT	Critical											
228	started too late (Network load)	OTT Download Late	OTT	Critical											
229	HDR SEI data HLS Block audio vs video PTS mismatch	HDR SEI	Video	Disabled											
	(Neg - audio before video)	HLS A/V PTS error	OTT	Minor											
240 241	Compare Video PTS increment with EBP	EBP Offset	OTT	Critical											

#	Description	Short name displayed on tile	Group	Default setting	Standard DVB or ATSC	Content Acquisition	Encoders	Transcoders	Packagers	CDNs	Origin Servers	Cloud Computing	Edge Devices	DRM & Metadata Systems	Network Infrastructure
243	EBP information is missing	EBP Missing	OTT	Disabled											
244	EBP presented after initial video PTS	EBP after PTS	OTT	Critical											
245	No PTS/EBP reference info found	Missing EBP/ PTS reference	OTT	Critical											
246	Profiles PTS out of sync	PTS Misalignment	OTT	Critical											
247	Profiles EBP out of sync	EBP Misalignment	OTT	Critical											
248	Missing program date/time on HLS m3u8	Missing Timestamp	OTT	Disabled											
249	HLS/Mpeg-Dash/MSS Block download fail due to timeout or error 503	OTT Download Timeout	отт	Disabled											
250	HLS/Mpeg-Dash/MSS Block download fail except for timeout and error 503	OTT Download Failed	отт	Disabled											
342	OTT Closed Captions not updated	CC not updated	Closed Captions	Critical											
343	Missing OTT audio component	Audio Missing	OTT	Critical											
344	Missing OTT subtitle component	Subtitle Missing	OTT	Critical											
345	Anvato content type change	Content Change	OTT	Disabled											
373	V-Chip rating changed	VCHIP Changed	Program	Minor											
374	Detect Video Bars	Video Bars	Video	Major											
375	PAT Service count changed	PAT Service Count Change	PAT	Critical											
376	EIT expired	EIT Expired	EIT	Minor	DVB										
377	No EIT current, only in the past (or far in the future)	EIT in past	EIT	Minor	DVB										
378	OTT chunk burst (m3u8/ism/ mpd updated with multiple files at once)	OTT chunk burst	ΟΤΤ	Major											
379	OTT playback jump (m3u8/ism/ mpd updated reference time jumped)	OTT playback jump	ΟΤΤ	Critical											
532	AIT is illegal	AIT illegal	NIT, AIT	Critical											
533	AIT repetition too slow	AIT Repetition slow	NIT, AIT	Major											
534	Table ID error on AIT PID	AIT Table ID Error	NIT, AIT	Critical											
535	AIT Is Scrambled	Scramble Flag on AIT	NIT, AIT	Critical											
536	AIT Missing (is on PMT but not in the stream)	AIT	NIT, AIT	Major											
537	Detect Good & Bad A/V sync marker	AV-SYNC	Content	Critical											
538	Detect Bad A/V sync marker (audio out of threshold)	Bad AV-SYNC	Content	Critical											
539	Detect Good A/V sync marker (audio within threshold)	Good AV-SYNC	Content	Critical											
540	Detect certificate error (any)	Certificate Error	OTT	Critical											
541	Detect expired certificate	Certificate Expired	OTT	Critical											
542	Detect certificate verification error	Certificate Failure	OTT	Critical											
543	Detect missing certificate for host url	Certificate URL Error	OTT	Critical											
544	Logical Audio Silence (L/R/C for 5.1 or L/R for 2.0)	Logical Silence	Audio	Disabled											
999	Activated by user Snooze	Snooze	More	Critical											