

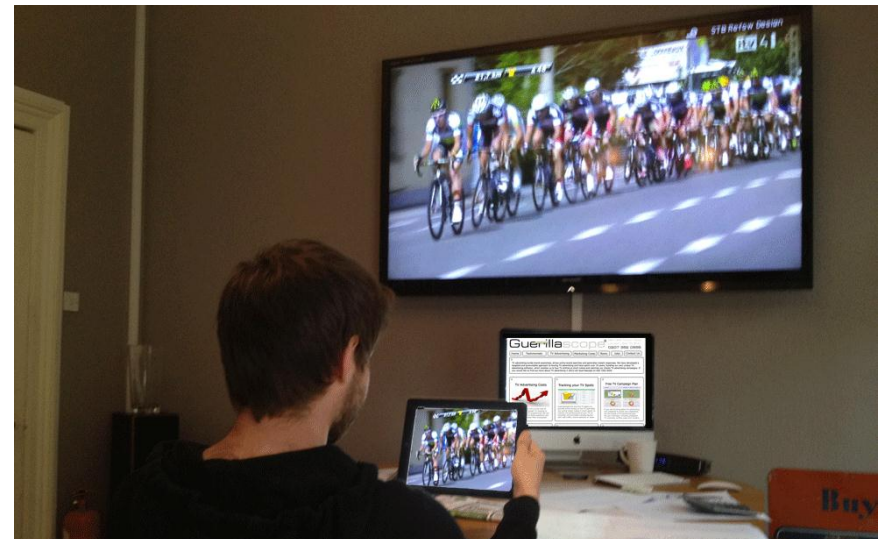
QC in Multiscreen services

PSS Istanbul 2014

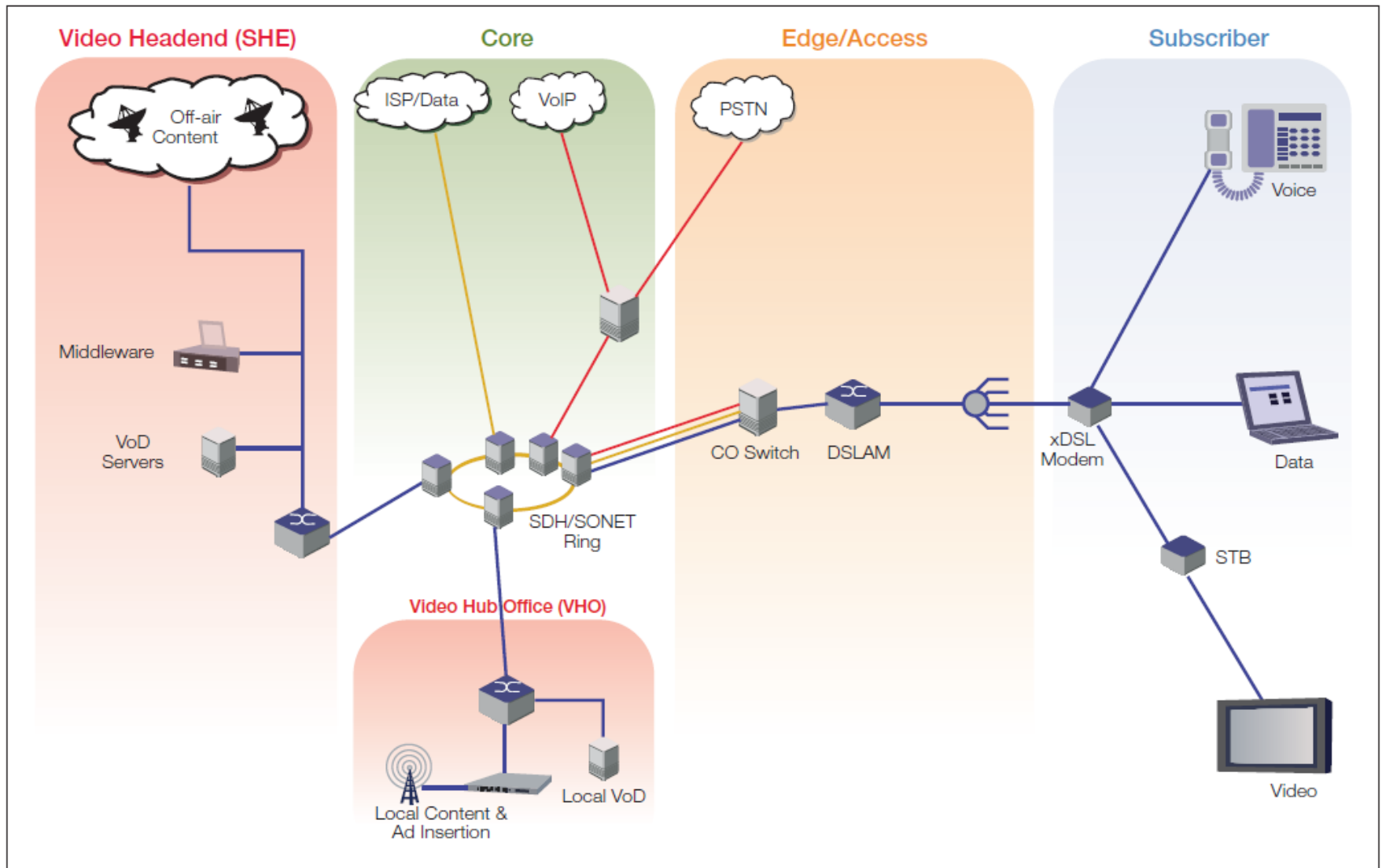


The demand for Over the Top (OTT) or TV Everywhere

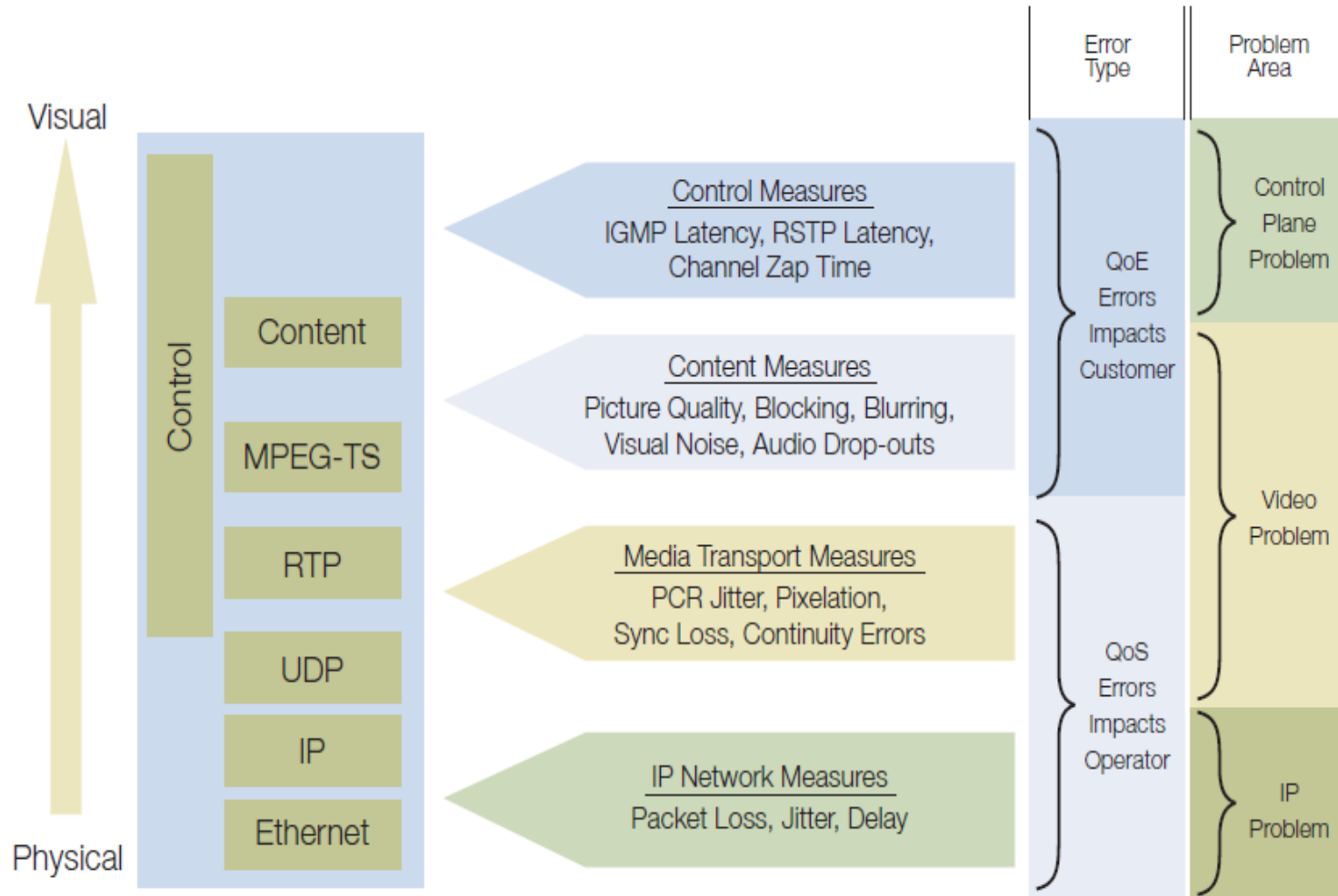
- There is now a massive demand for delivery of video services outside of traditional linear TV models
- This is driven by the boom in video enabled devices such as smartphones, tablets, gaming consoles and connected TVs and expansion of 3G/4G mobile networks.
- Consumers have moved quickly and now expect that media should be available
 - When they want it
 - At a high quality
 - On any network connection
 - On multiple devices
- Adaptive Bit Rate (ABR) streaming is the key enabling technology for delivering the OTT & TV Everywhere experience



IPTV services – Network architecture

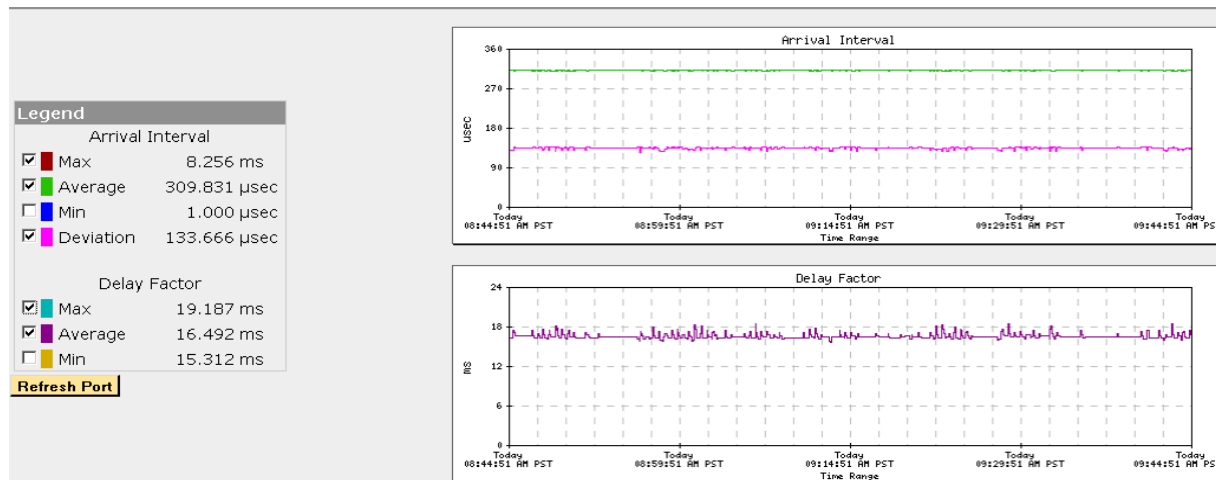


IPTV services – Protocol stack



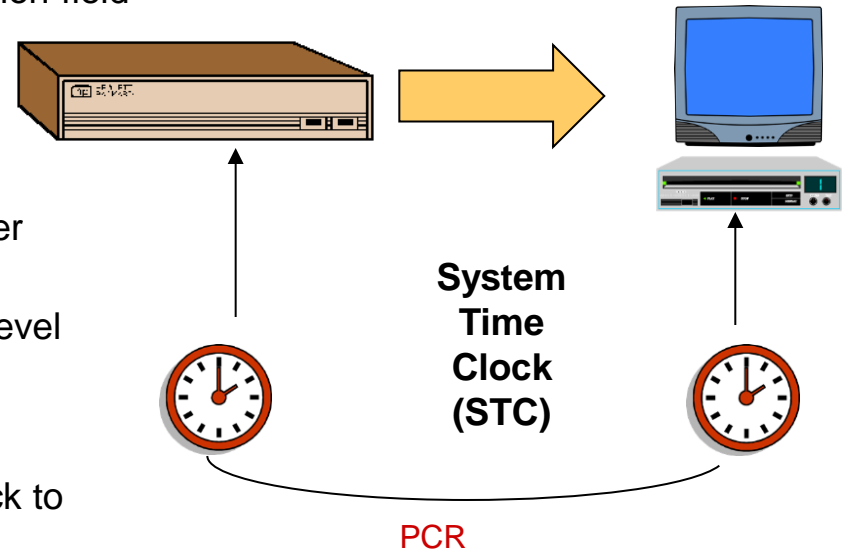
IPTV challenges

- Packet loss
 - Can be mitigated by using error correction schemes
- Network jitter
 - Can be mitigated with de-jitter buffers in receiving device



Program Clock Reference (PCR)

- What is it
 - Sampled 27MHz clock reference
 - Inserted by encoder or multiplexer in the adaptation field every 40-100ms
- What it is for
 - Re-establish the system time clock at the decoder
 - Synchronizes an encoder with a decoder
 - PTS/DTS are at the PES not Transport Stream level
- Why it is important
 - Decoders use the re-generated system time clock to generate video timing, colour burst etc.
 - Timing errors arise if PCR value is either inaccurate or if it is received late because of network delays



Monitoring Quality of Experience (QoE)

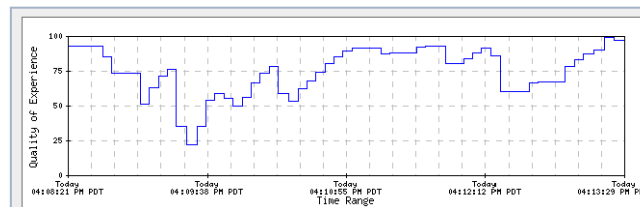
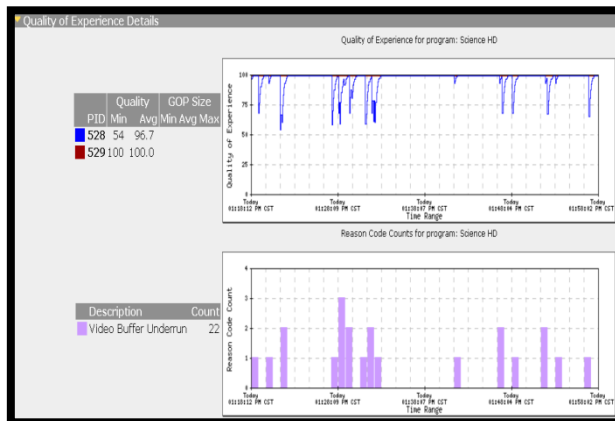
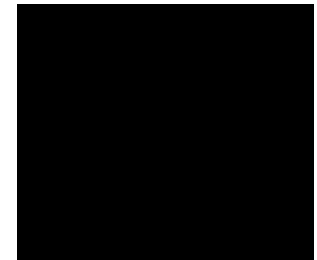
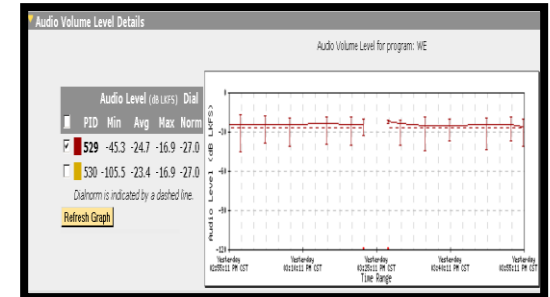
Quality monitoring – The old way



What to monitor

Customer Impacting Issues

- Video Freeze / Black
- Audio Silence
- Blocking / Tiling
- Blurred / Soft Picture / Over compression
- Program Unavailable
- Errored Seconds



Video artefacts – slice errors



Compression artefacts

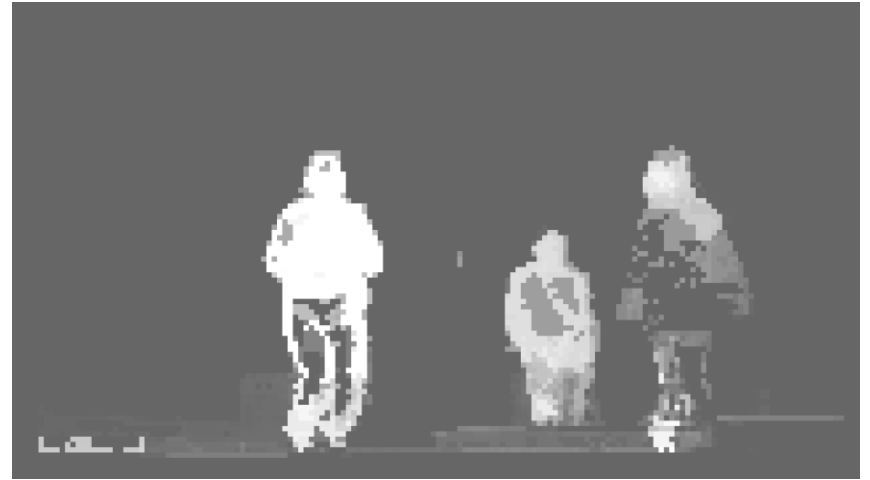


- In block-based DCT encoding algorithms, the quantization step is the most common cause of compression artifacts.
- Compression artefacts include blocking, blur, mosquito noise, flickering and false edges.

Attention Model



Reference



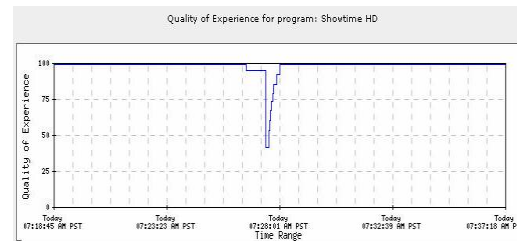
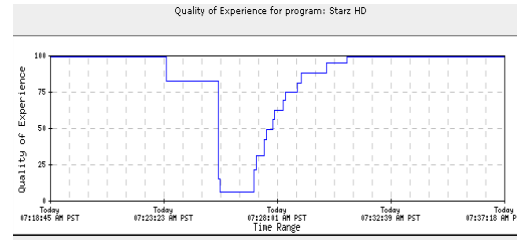
Attention Map

- Highlighted on the jogger. Less attention on the other 2 walkers.
- This model can work as the weighting for the PSNR and DMOS scores.

Video and Audio QoE score

Video & Audio QoE Scoring

- 🔧 Reflects the overall subscriber TV viewing and audio experience
- 🔧 Scores subscriber impacting events independently from continuity counter errors, network jitter, or TR 101-290
- 🔧 Automatically & continuously evaluates all video programs in real time
- 🔧 60-day historical graphing with real time alerting capability



Serious tiling present for an extended period of time



Minor tiling present for a very short period of time



Alerts

Creating Program Alerts

1

Select alert type:

Video QoE

Use program template:

TestSDP

Out of a possible score of 100, generate an alert when the video QoE score for any program goes

below

75

 on

the primary video PID

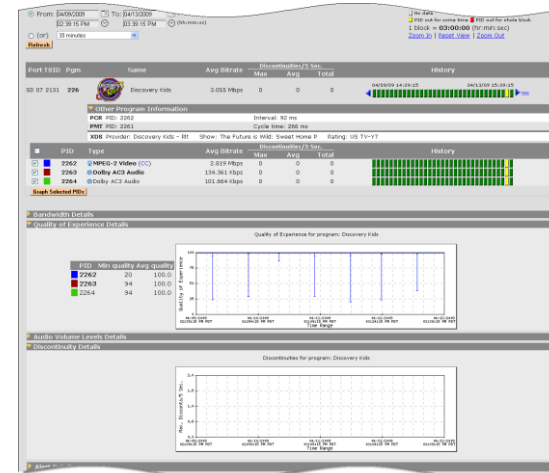
☒ Whenever these conditions are reached (or)

☐ Only if these conditions are sustained for second(s)

☒ Each time the condition occurs (or)

☐ Only after condition(s) occur in minute(s)

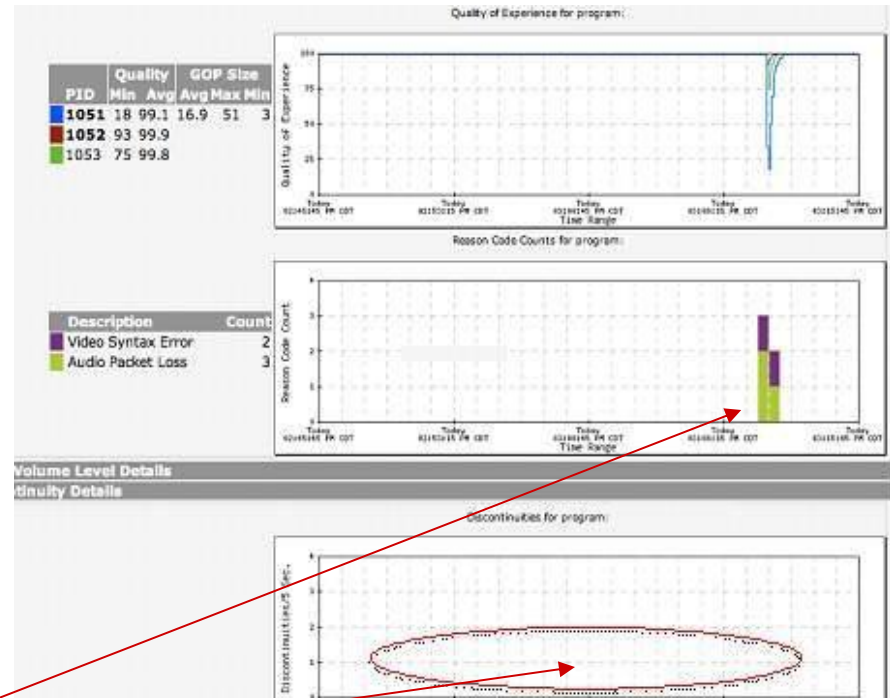
Reports



Video errors – Reason codes

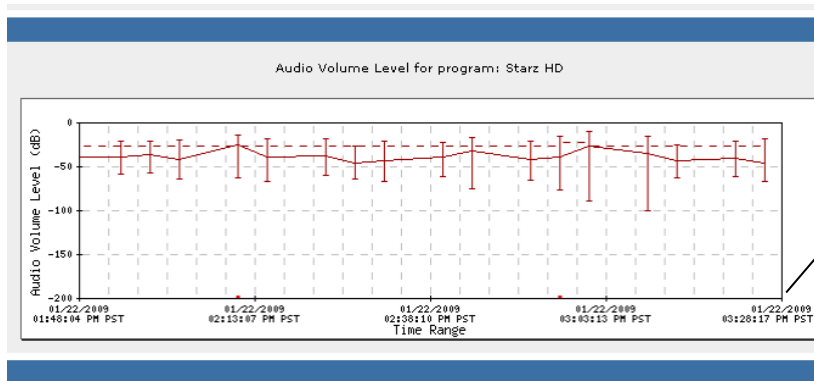


Video error with no
transmission error



Audio Loudness Monitoring

- Reflects what the subscriber actually hears while watching TV - monitor audio level in weighted dB scale
- Automatically & continuously evaluates across *all* programs & *all* audio channels in real time



Subscriber perceived audio volume variations
(against mean value and Dialnorm)

Absolute audio level alert

☒ Select alert type: Absolute Audio Level
☐ Use program template: Testtemp
Generate alert when the absolute audio level goes above -5 dB on the primary audio PID

Mean audio level alert

☒ Select alert type: Mean Audio Level
☐ Use program template: Testtemp
Generate alert when the mean audio level increases by 30 dB within a period of 20 second(s)

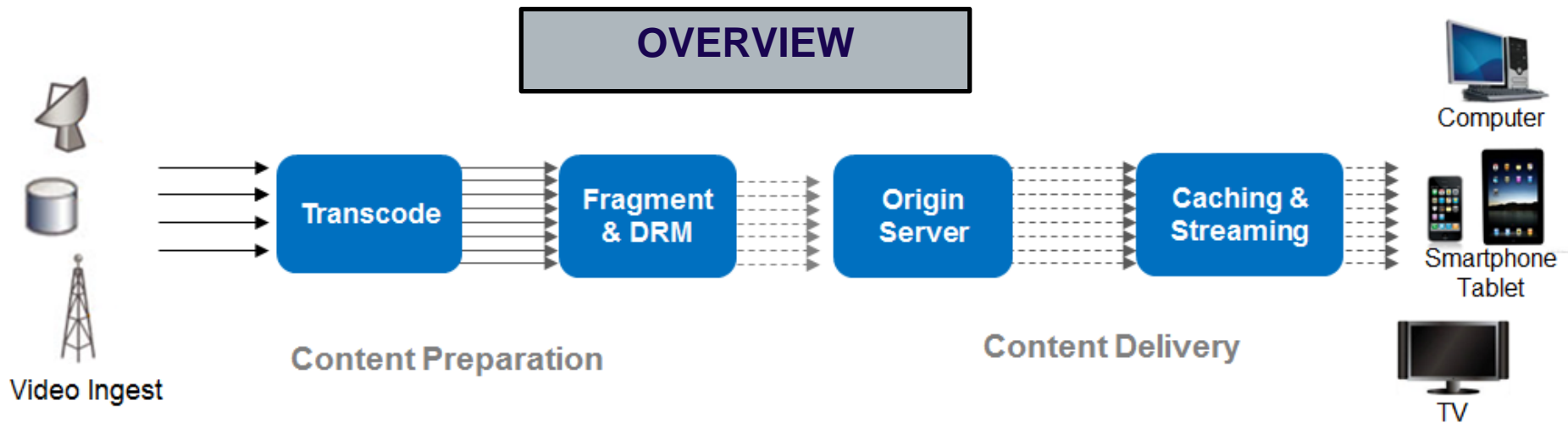
Threshold based alerts on audio
level issues

Example Profile Bit Rates by Device Type

Network	Device	Profile: Bitrate	Resolution
3G Mobile (3 profiles)	Phone	3G-Low: 100kbps	320x180
		3G-Medius: 250kbps	320x180
		3G-High: 350kbps	416x240
4G (3G profiles + 1)	Phone	4G-High: 650kbps	640x360
WiFi (5 profiles)	Smart Phone / PAD / PC	WiFi-ulow: 350kbps	320x180
		Wifi-Low: 500kbps	416x240
		WiFi-Mid: 850kbps	640x360
		WiFi-High: 1.5Mbps	640x360
		WiFi-uHigh: 2.5Mbps	1280x720
Broadband (8 profiles)	Pad / PC / STB / Console	350 kbps	320x180
		150 kbps	320x180
		500 kbps	416x240
		750 kbps	640x360
		1.0 Mbps	640x360
		1.25 Mbps	864x486
		1.5 Mbps	960x540
		3 Mbps	1280x720

ABR Overview

From video ingest to final delivery



Manifest errors

■ Manifest Alerts

- Parsing Error: If an error is detected in parsing a port level manifest file
- HTTP Error: If an HTTP error is returned when attempting to request a manifest file.
- URL Error: This is an illegal URL. Illegal syntax for the 'origin server / hostname' in a URL.

Summary

ABR

Summary | Manifests | Representations

Creating ABR Manifest Alerts

1 Select alert type: HTTP Error
Generate alert when the manifest contains an HTTP error

☒ Each time the condition occurs (or)
☐ Only after condition(s) occur in minute(s)

2 Choose input manifest:

<input type="checkbox"/>	Port #	Port Name	Manifest Details
<input type="checkbox"/>	0	Show Time -1	ABR
<input type="checkbox"/>	1	Show Time -2	ABR
<input type="checkbox"/>	2	Show Time -3	ABR
<input type="checkbox"/>	3	Port 3	ABR
<input type="checkbox"/>	4	Port 4	ABR
<input type="checkbox"/>	5	NTSC Test - 1	ABR

3 When alert is generated:

☒ Save in [Alert History](#)
☐ Send SNMP trap (configure trap host in the [System Settings](#))
☐ Send email ☒ Always (or)
☐ At most email(s) in minute(s)

Media Set Detail Report



Welcome to Sentry Demo ABR 11-19, Administrator [[Logout](#)]

Reports: Media Set Detail

October 10, 2013 02:09:17 PM PDT

☐ From: To: (mm/dd/yyyy)
 (hh:mm:ss)
☒ (or)

Report On:

[Refresh](#)

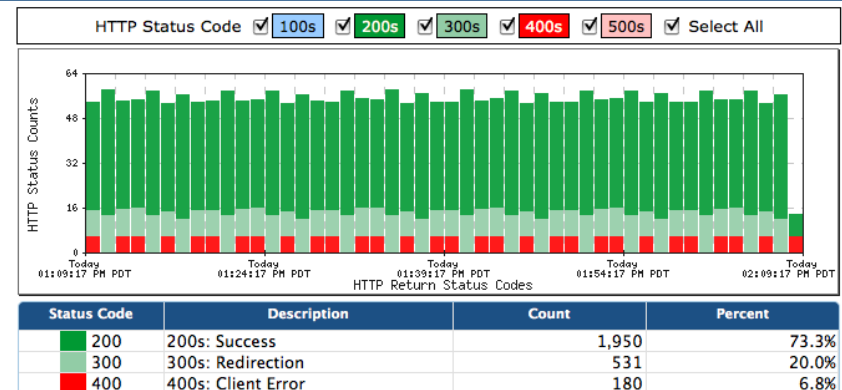
[Zoom In](#) | [Reset View](#) | [Link](#) | [Zoom Out](#)

0: Show Time -1

HTTP Status Codes

<input checked="" type="checkbox"/>	Rep.	Manifest Bitrate	Fragment Size	Alert Count	HTTP Status
<input checked="" type="checkbox"/>	1	6 Mbps	7.49 MB	Open: 0 Period: 0	
<input checked="" type="checkbox"/>	2	5 Mbps	6.26 MB	Open: 0 Period: 0	
<input checked="" type="checkbox"/>	3	4 Mbps	5.01 MB	Open: 0 Period: 0	
<input checked="" type="checkbox"/>	4	3 Mbps	3.76 MB	Open: 0 Period: 0	
<input checked="" type="checkbox"/>	5	1.50 Mbps	1.88 MB	Open: 0 Period: 0	
<input checked="" type="checkbox"/>	6	501.34 Kbps	632 KB	Open: 0 Period: 0	

[Graph Selected](#)



Representations Statistics



Transport Errors

- Fragment Load Time
- Fragment Load Latency
- Playlist Parsing Error: (HLS is the only ABR standard which uses Playlists) An alert is generated when there is a corrupted playlist file or unrecognized syntax.
- Playlist HTTP Error: If an HTTP error is returned when attempting to request a playlist file (HLS only).
- Media HTTP Error: If an HTTP error is returned when attempting to request a media fragment
- Incomplete Media Fragment: If another HTTP header is detected before receiving the previous fragment completely
- Bandwidth Mismatch: The manifest file(s) contain a 'max' bandwidth for each representation (profile / quality level). The user can define an alert which will trigger if the bandwidth falls below (or goes above) by a % specified.

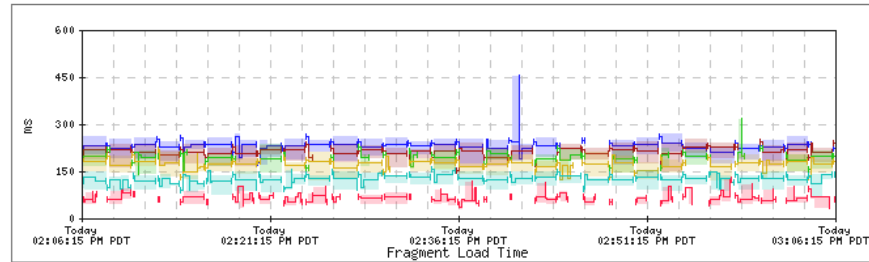
Detail Report: Statistics & Graphs

- **Fragment Load Time:** This is the time measured between when the HTTP header for a fragment is detected and when enough bytes have been received to equal the fragment size.

Fragment Load Time

	Rep.	Min	Avg	Max
<input checked="" type="checkbox"/>	1	177 ms	230 ms	455 ms
<input checked="" type="checkbox"/>	2	152 ms	213 ms	257 ms
<input checked="" type="checkbox"/>	3	141 ms	194 ms	317 ms
<input checked="" type="checkbox"/>	4	125 ms	172 ms	217 ms
<input checked="" type="checkbox"/>	5	78.0 ms	126 ms	156 ms
<input checked="" type="checkbox"/>	6	36.0 ms	65.0 ms	125 ms

Graph Selected

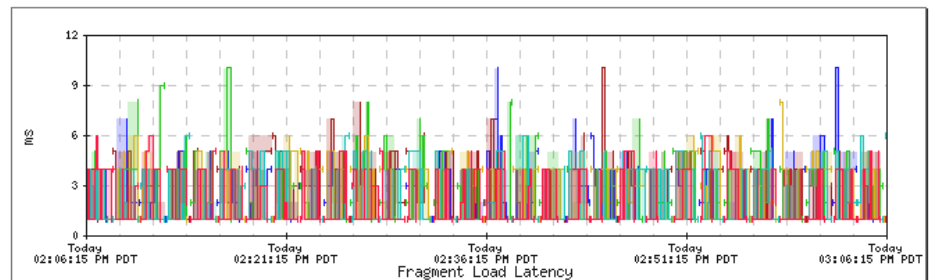


- **Fragment Load Latency:** This is the time between when a request is made for a fragment (at the socket level) and when the HTTP header for the fragment is detected.

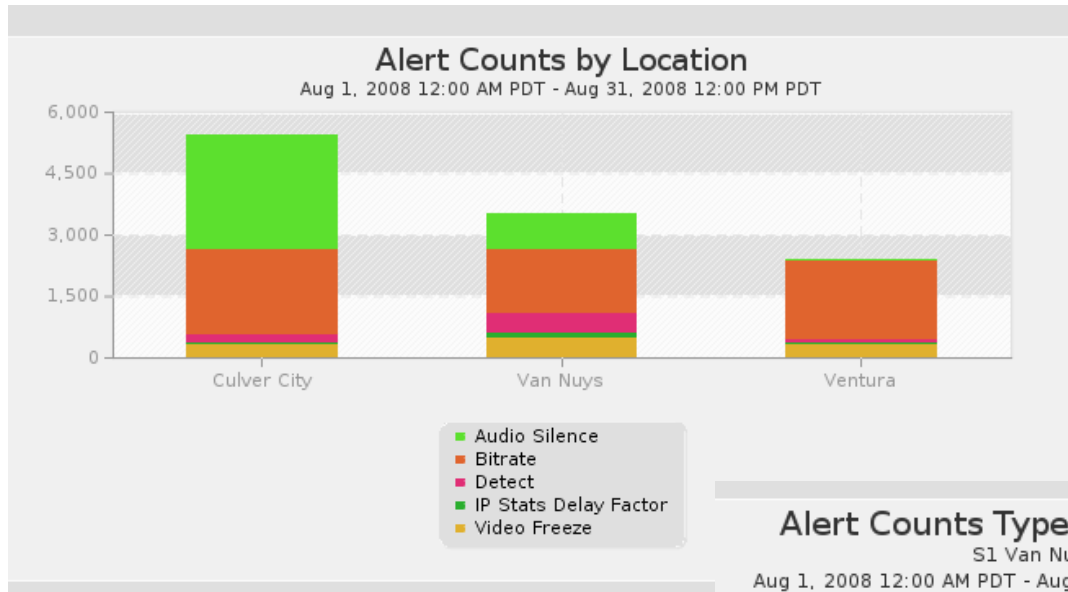
Fragment Load Latency

	Rep.	Min	Avg	Max
<input checked="" type="checkbox"/>	1	1.00 ms	3.00 ms	10.0 ms
<input checked="" type="checkbox"/>	2	1.00 ms	2.00 ms	10.0 ms
<input checked="" type="checkbox"/>	3	1.00 ms	3.00 ms	10.0 ms
<input checked="" type="checkbox"/>	4	1.00 ms	3.00 ms	8.00 ms
<input checked="" type="checkbox"/>	5	1.00 ms	2.00 ms	6.00 ms
<input checked="" type="checkbox"/>	6	1.00 ms	2.00 ms	6.00 ms

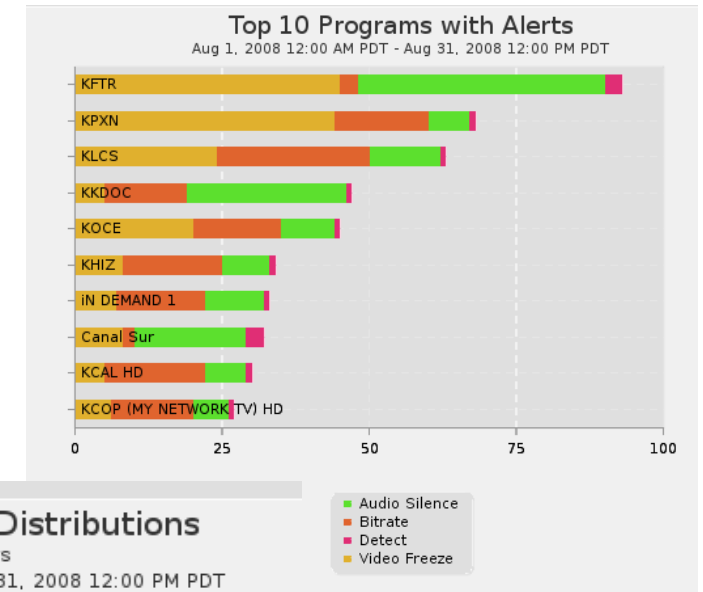
Graph Selected



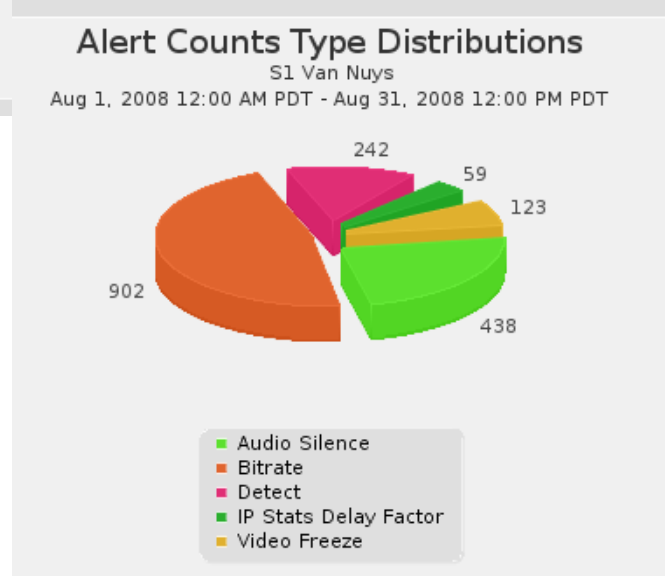
Reporting and Alerting



Alert Counts by Location

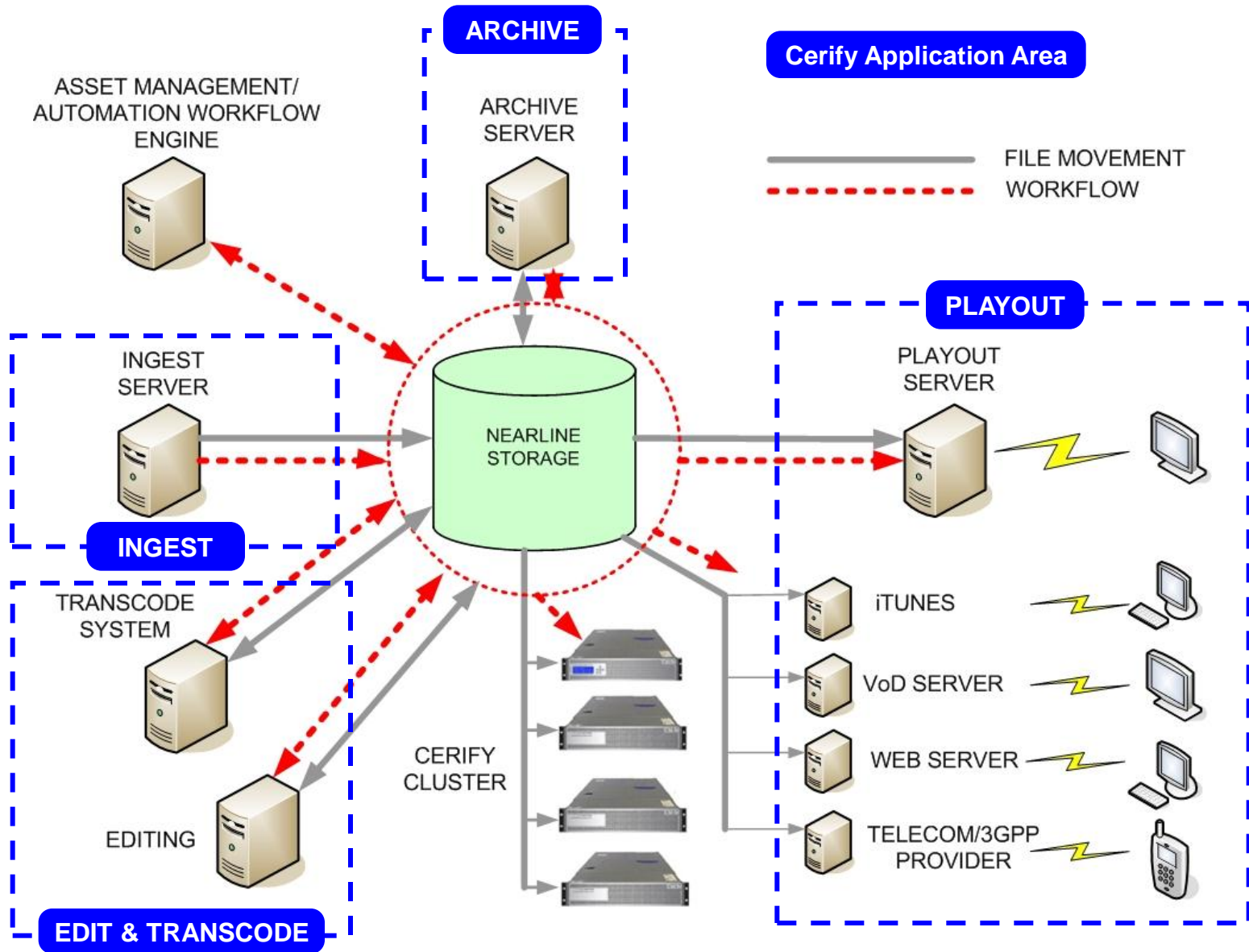


Top 10 Programs with Alerts



Alert Counts Type Distributions

Typical Broadcast Workflow – File-based QC





Tektronix®