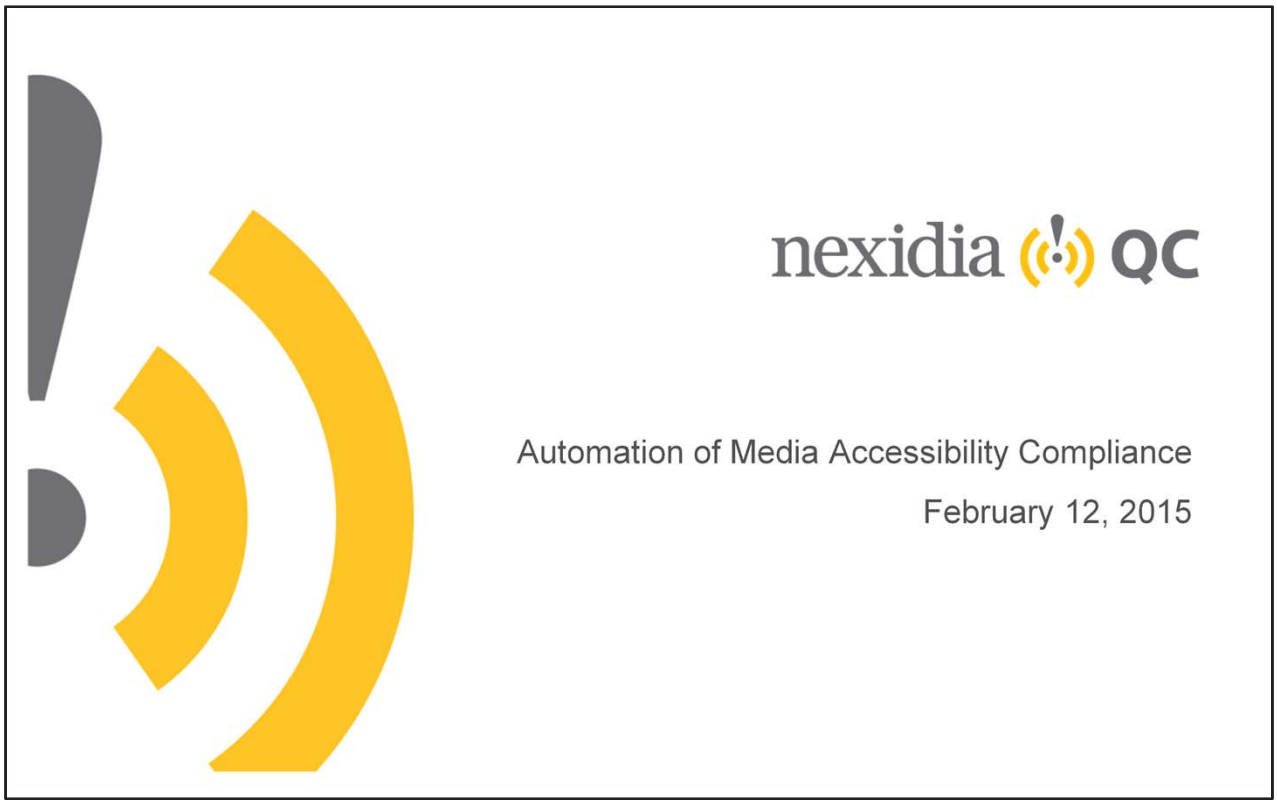

nexidia QC
Automation of Media Accessibility Compliance
February 12, 2015

Corporate Background

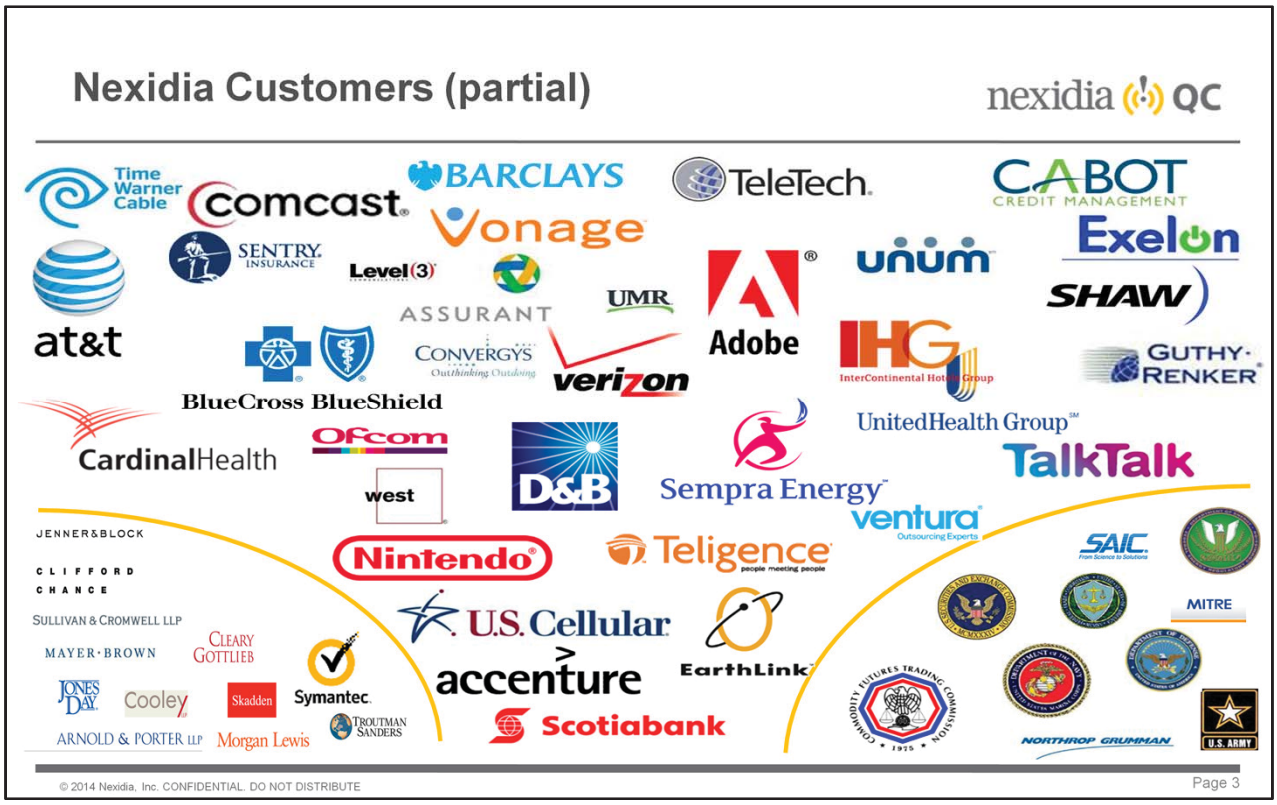
nexidia QC

- Georgia Tech spinoff
  - Nexidia founded in 2000; profitable, HQ in Atlanta, 225+ employees
- Unique, patented audio search and processing
  - Core technology enables search of spoken content at unprecedented scale, performance and accuracy
- Focused on contact center, media, government, & legal
  - Successful products and market leading customers in all markets
  - $50M+ sales in 2014
- Nexidia owns 100% of technology and applications
  - In-house R&D, 18 patents issued, 25+ pending, 40 languages supported
  - 130+ years of PhD level speech research and development experience
  - $50M+ invested in R&D to date

Nexidia began as a research project at Georgia Tech in 1997. This research led to the development of Nexidia's unique and patented phonetic based ability to search spoken word content.

Nexidia applies this and other technologies to four key markets including contact center, media & entertainment, government and legal. We have successful products and market leading customers in all markets.

Nexidia owns 100% of our technology and applications and we invest heavily to constantly improve our products.



This is a partial list of Nexidia Speech Analytics, Legal and Government customers. The government customers include: SEC, Commodity Futures Trading Commission, Department of the Navy, Federal Trade Commission, Department of Defense, Department of Energy, U.S. Army, MITRE, and Northrop Grumman.

This is a partial list of Nexidia Media & Entertainment specific customers.

The Nexidia Media & Entertainment business unit's products have received exceptional industry support and have won thirteen product technology and innovation awards, for either products powered by Nexidia or direct Nexidia M&E products. Nexidia is the only company to win two IABM Awards in the same year.

Nexidia QC Overview

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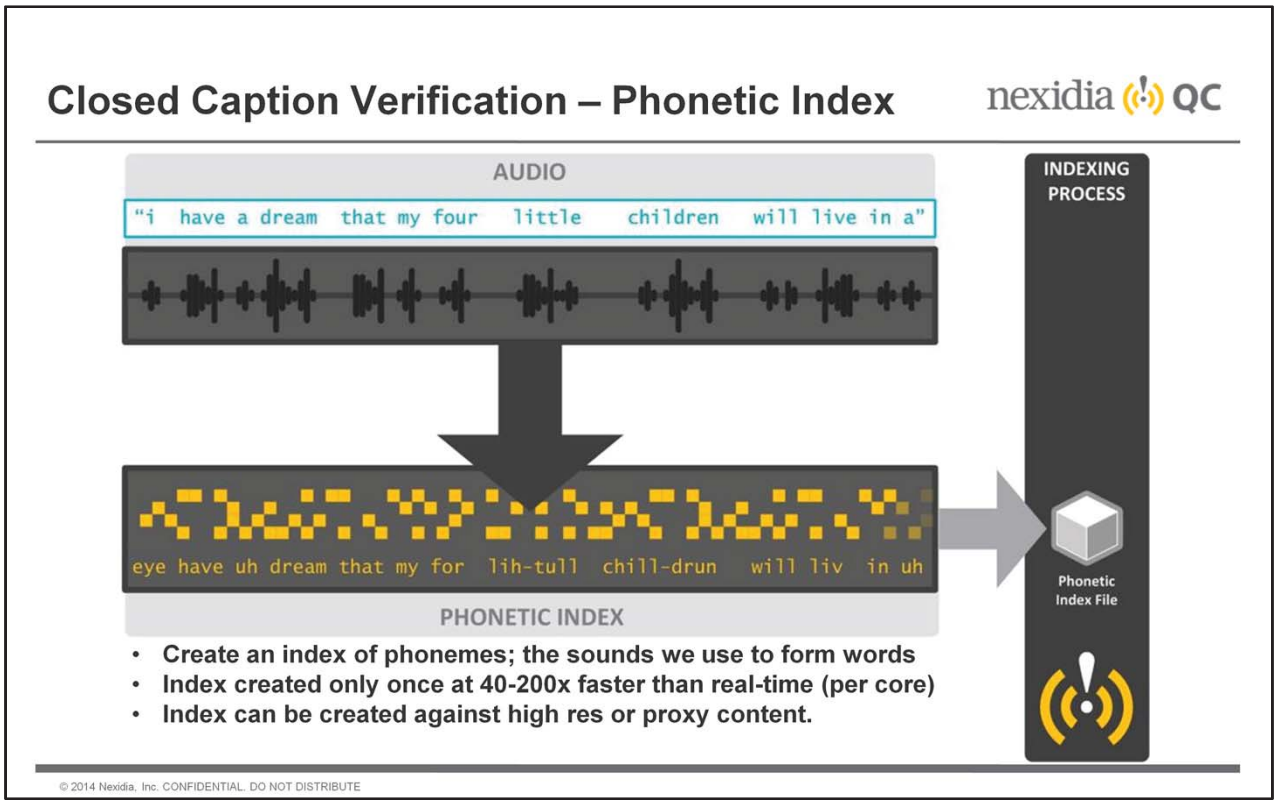
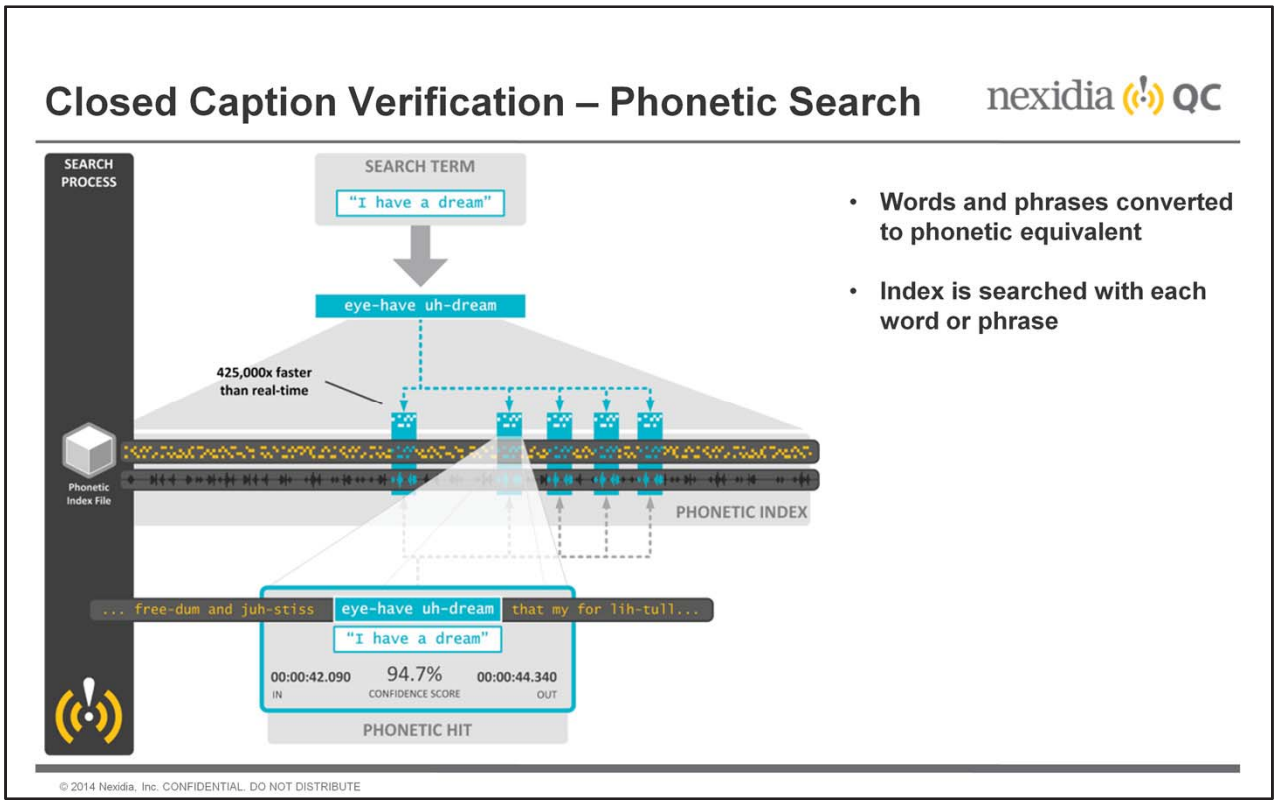
- Automated file based QC of media content for the following tests:
  - Closed caption verification
  - Video description verification
  - Language verification (audio and text / caption)
- Automated actions based on the results of these tests include:
  - Closed caption alignment / re-timing



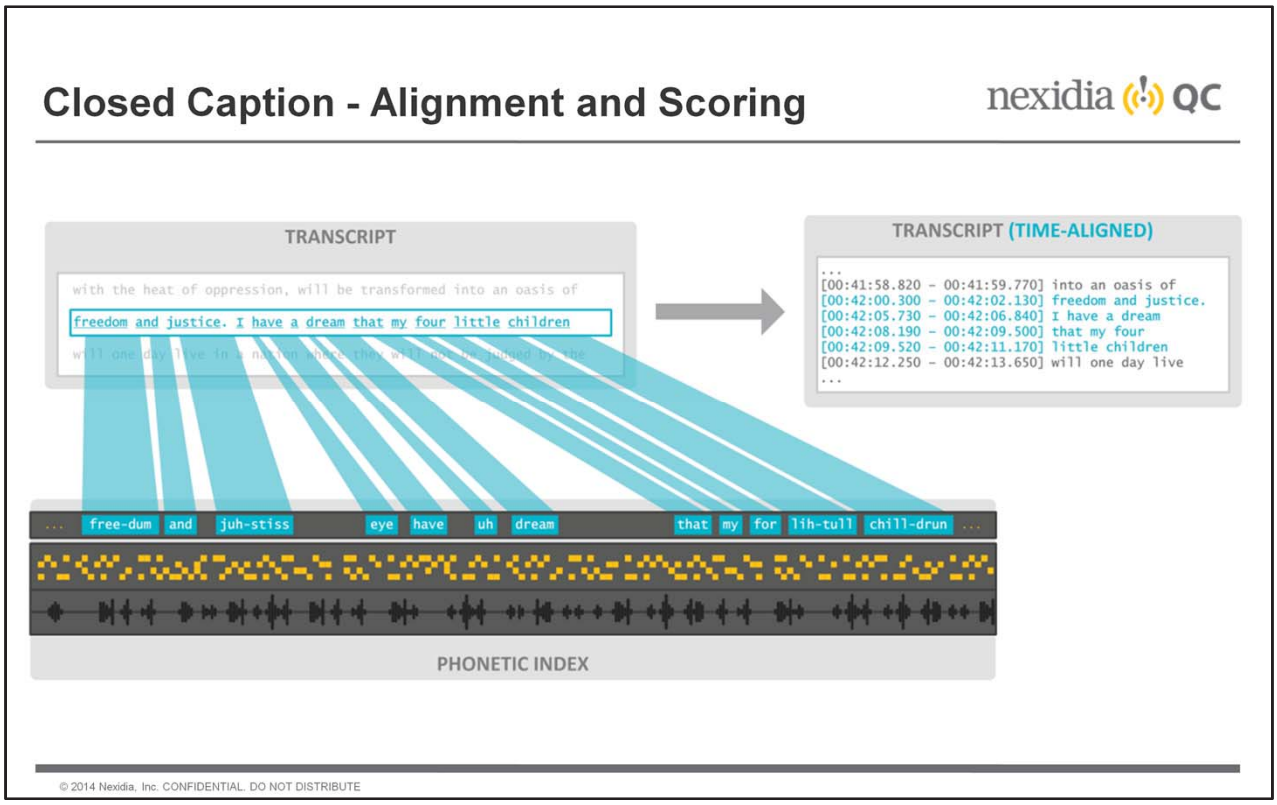
In caption verification, we first create a phonetic index. This phonetic index is comprised of phonemes, the sounds we all use to speak. This index only needs to be created once for each media file and it is generated at 40 to 200 times faster than real time per core. This process can leverage high res or proxy content.

If we assumed an average of 60 times faster than real time, this means each core is indexing one hour of media in a single minute

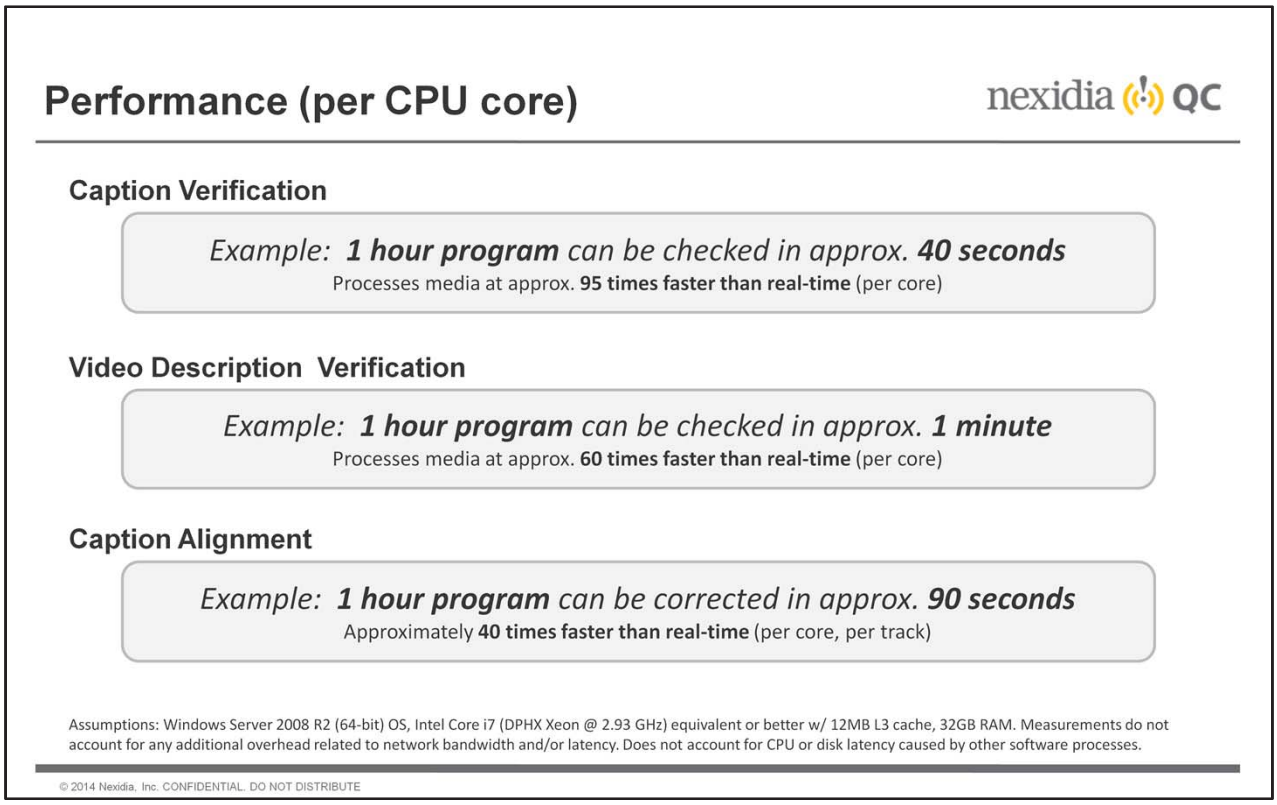


Once the phonetic index is created, we convert the words and or phrases to their phonetic equivalent and then search the phonetic index. The search returns the time code information for each word or phrase searched and a confidence score for each hit. The score represents our engines confidence in the accuracy of each search result.

The advantage of breaking words into sounds is we are able to search for any word or phrase. Unlike other speech technologies, this prevents us from being limited to a dictionary or require ongoing training and or frequent updates.



The index and search processes can be used to match caption segments with the dialogue. This alignment process creates a start and end time, as well as a confidence score for each caption segment. The time code information is compared with the original caption segment timing to determine if the captions are in sync. The confidence scores are used to determine the degree to which the captions may or may not match the spoken words in the audio.



The time required for each test on a 1 hour program using a single core is 40 seconds for caption verification, 60 seconds for video description verification and 90 seconds for caption alignment. Each test is serial in nature.

Closed Captioning Verification

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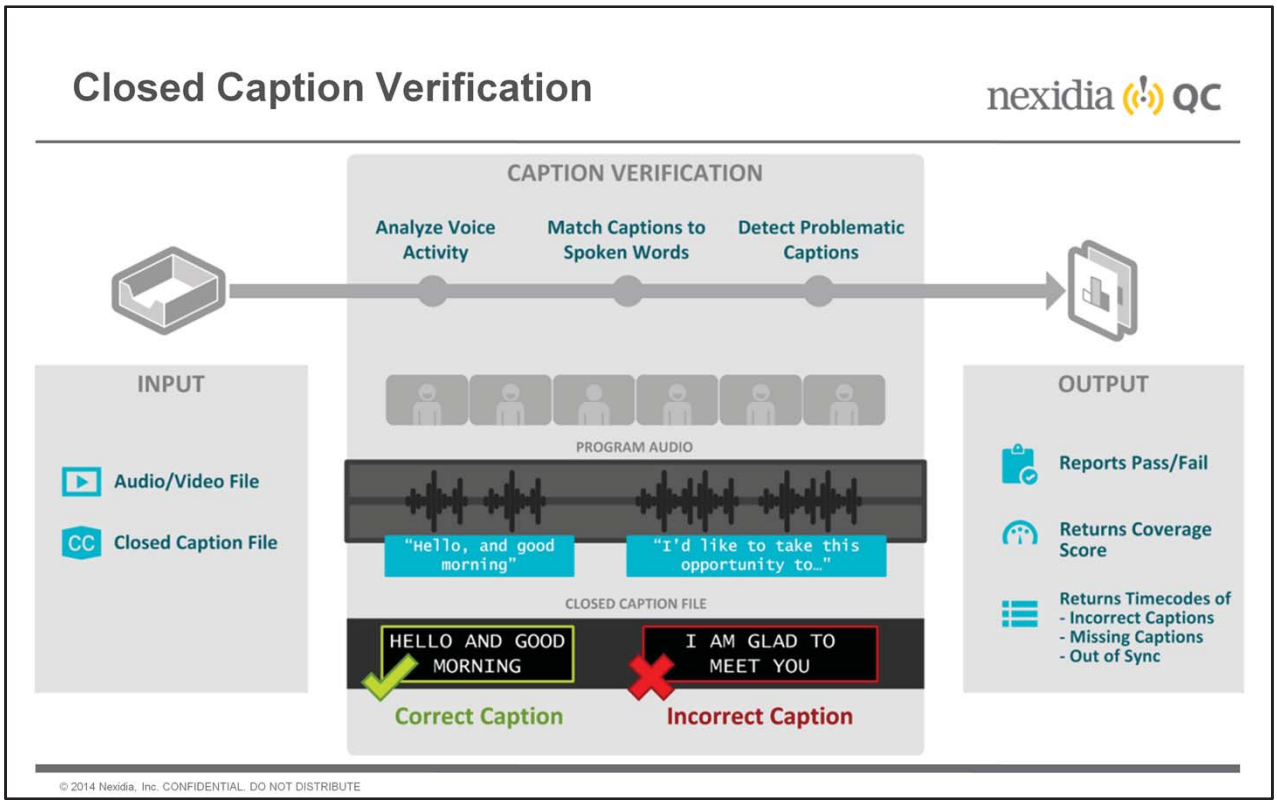
- Verify closed captioning is representative of words spoken in the audio
- Identify missing or incorrect captions
- Verify caption timing is correct
- Tests based on configurable parameters in user-defined profiles, outlining acceptable levels of caption coverage and alignment
- Broad caption format support
  - SCC, SMPTE TT, SAMI, CAP, EBU-STL, EBU-TT, iTunes Timed Text, and SRT
- Broad language support
  - Currently support 22 languages, Including English and Latin American Spanish

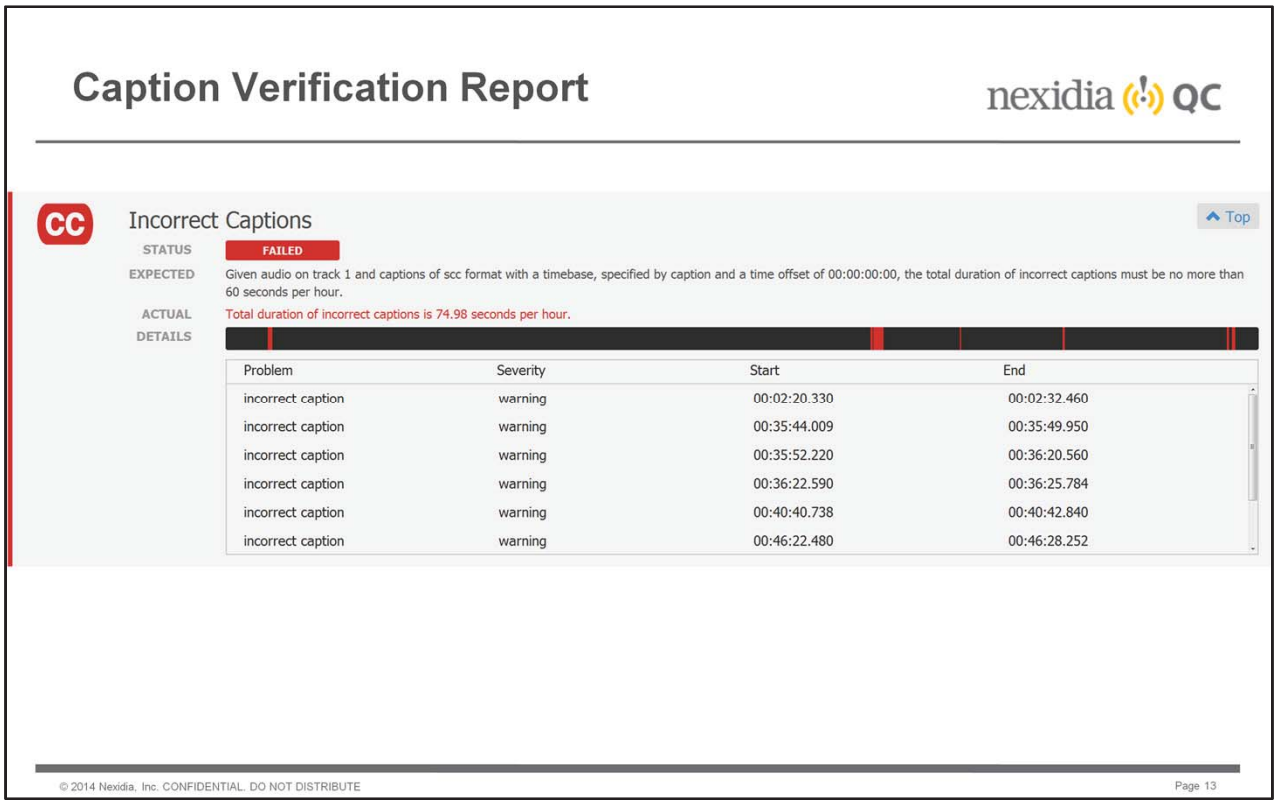


The process accepts audio or video files and their corresponding caption files.

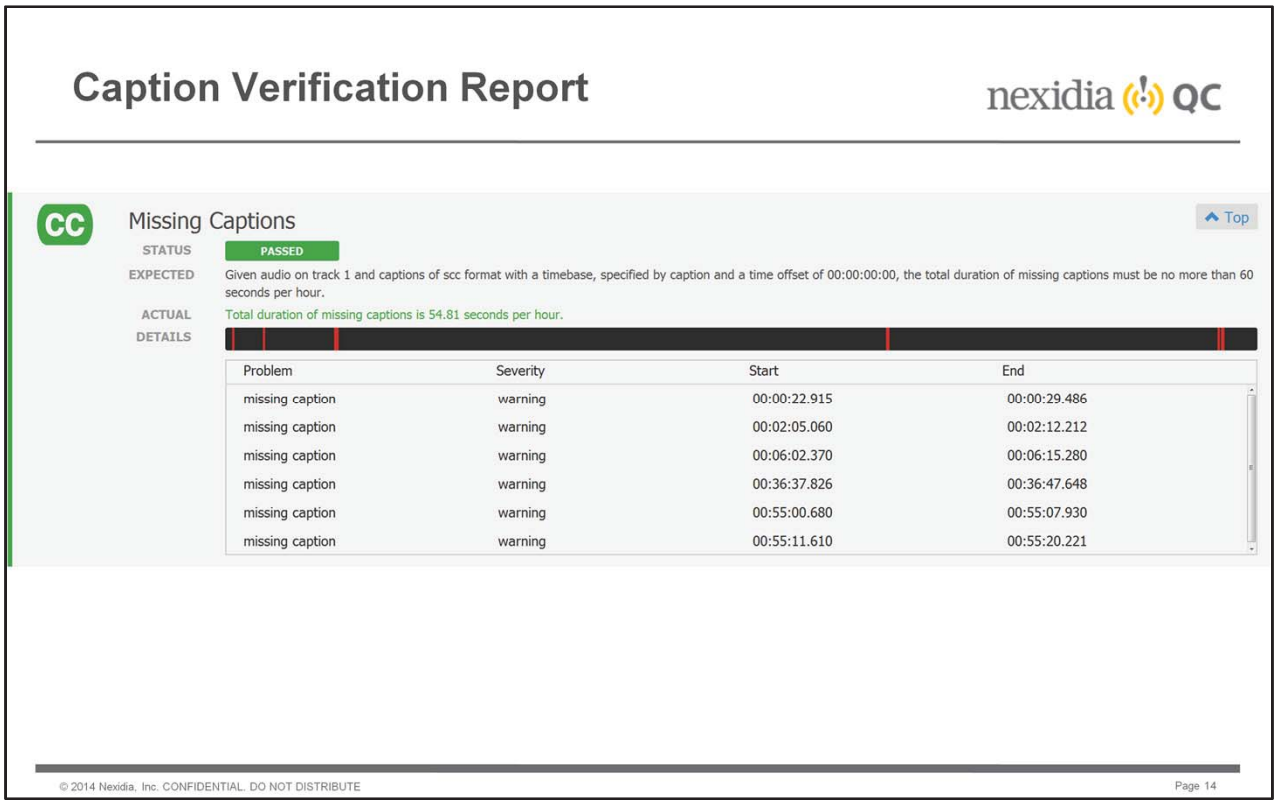
If, based on phonetic alignment, the caption file matches the spoken words with a sufficiently high score, the process will then determine areas of voice activity and then compare these time coded areas to the time coded areas of captions. The process then determines the level of caption coverage by comparing the delta voice activity and captions.

The process returns a Pass or Fail grade based on configurable parameters. These test parameters are stored as persistent profiles. The report will provide time coded areas of missing or incorrect captions and whether the captions are in sync.

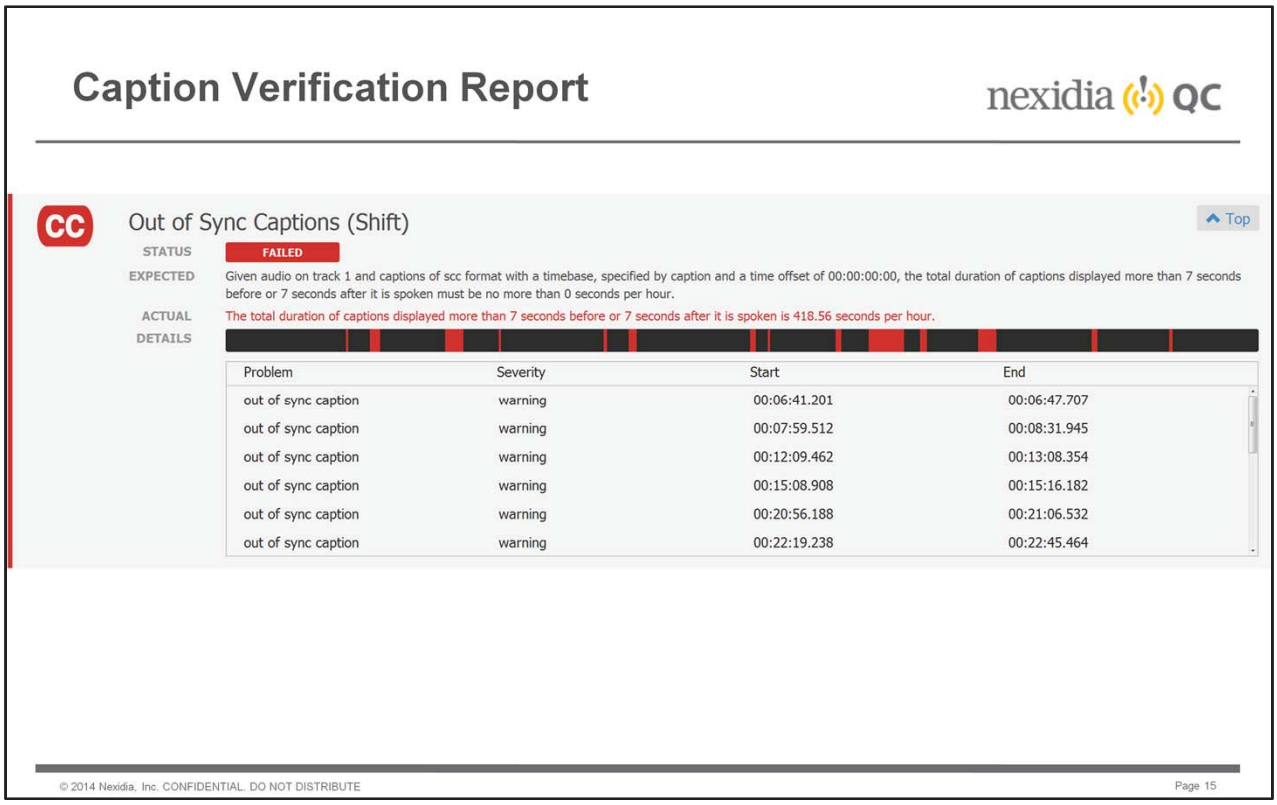
[Reference slide graphic. The first caption segment on the left matches, but the second caption segment does not]



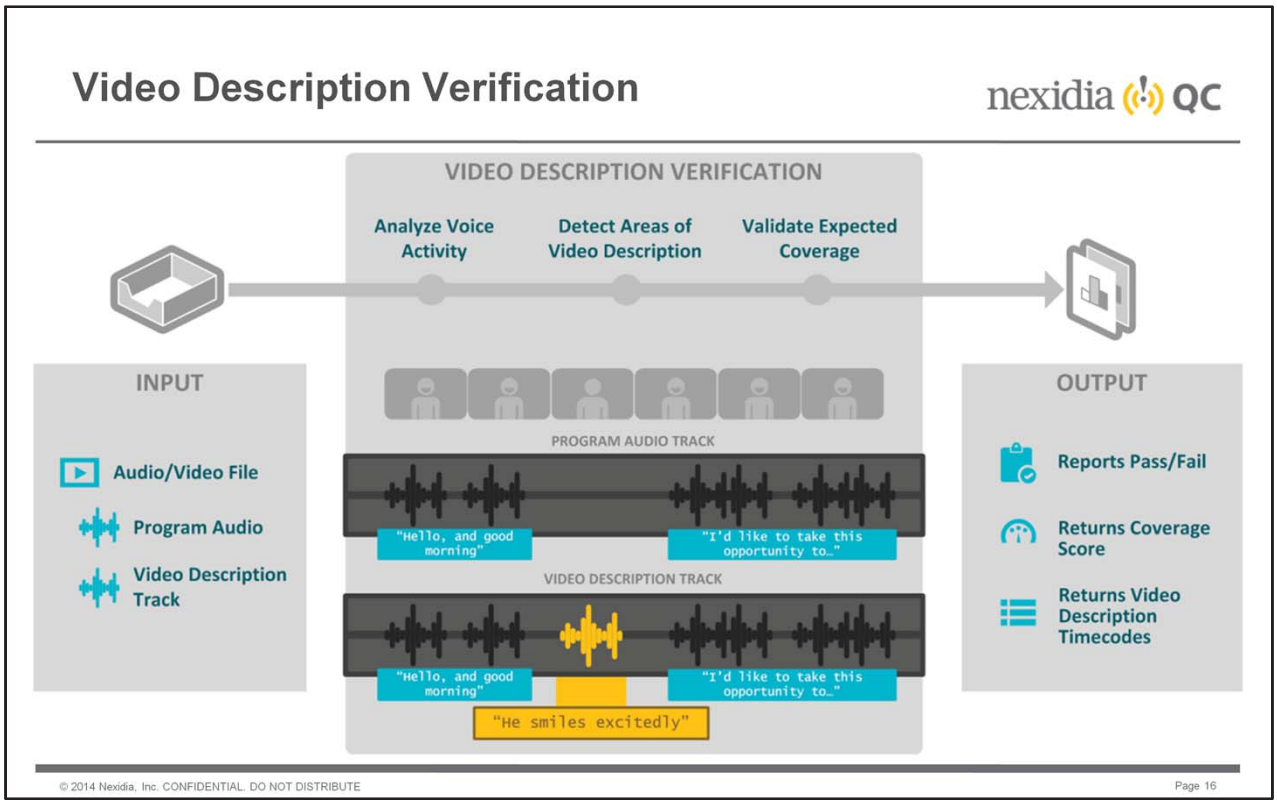
In this report, the captions failed based on the duration of incorrect captions exceeding the 60 seconds per hour threshold configured by the user in the test profile. NQC provides information on the nature and the time (location) of the error. This report information is provided to the user as an HTML report that can be easily distributed. The information is also provided as XML, which can be aggregated into third party applications. Examples of 3rd party applications using the NQC XML are: Volicon, Telestream, Digital Nirvana, Triveni Digital, Aspera Orchestrator, Evertz Mediator, and Dalet / Amberfin.



In this report, the caption file passes because the missing captions do not exceed the threshold defined in the test profile. While the file still passes, NQC still details the location and nature of the errors.



In this report, the captions failed based on the duration of out of sync captions exceeding the 0 seconds of captions displayed more than 7 seconds before or after the words are spoken, as configured in the NQC test profile. NQC provides information on the nature and the time (location) of the error.



Like QC for Captions, Nexidia QC for Video Description is media source agnostic, but instead of comparing captions to the audio, we are comparing the original program audio and the audio for the voice description programming.

QC will compare the program and the voice description audio to determine if video description occurs and where it occurs in the video description track.

The graphic illustrates the comparison of the program and video description tracks. We have determined the section in yellow is the voice description insertion.

The output is a report providing a pass or fail grade based on configurable settings.

Nexidia also has knowledge of where speech is occurring within the program which may be useful in the creation and insertion of video description content.

Video Description Verification

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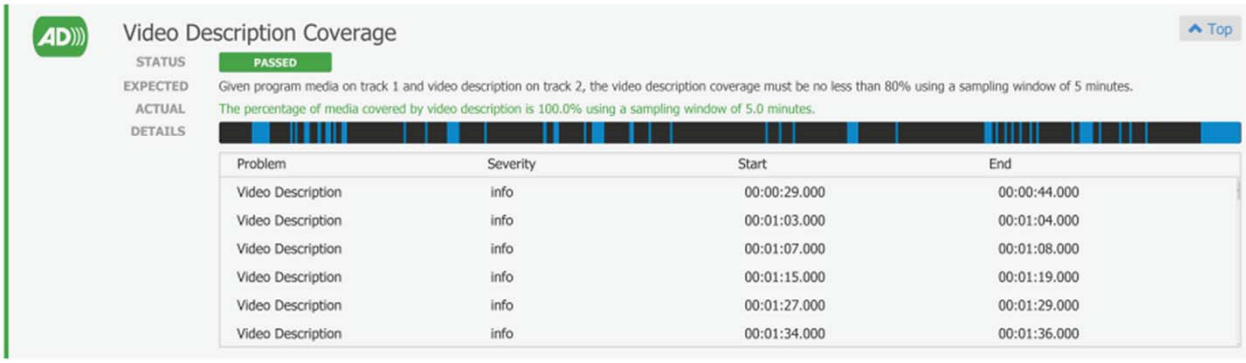
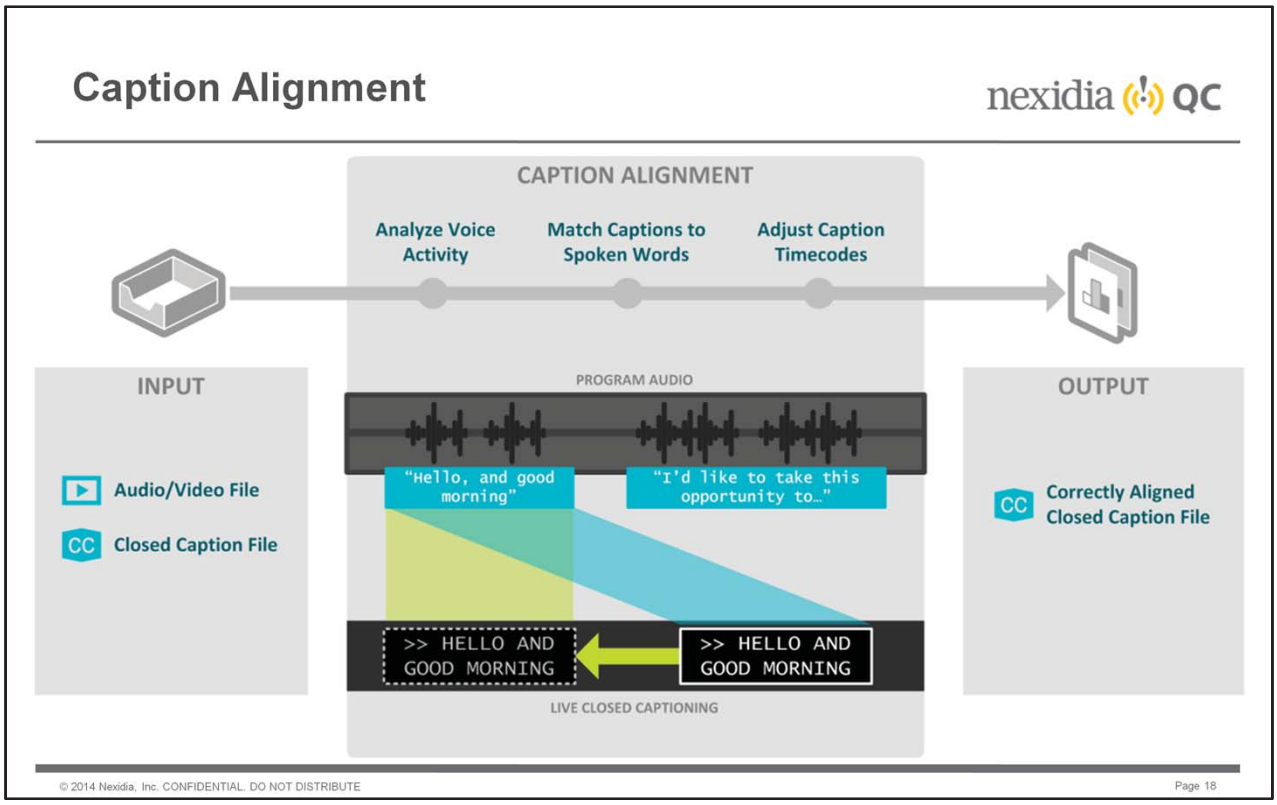
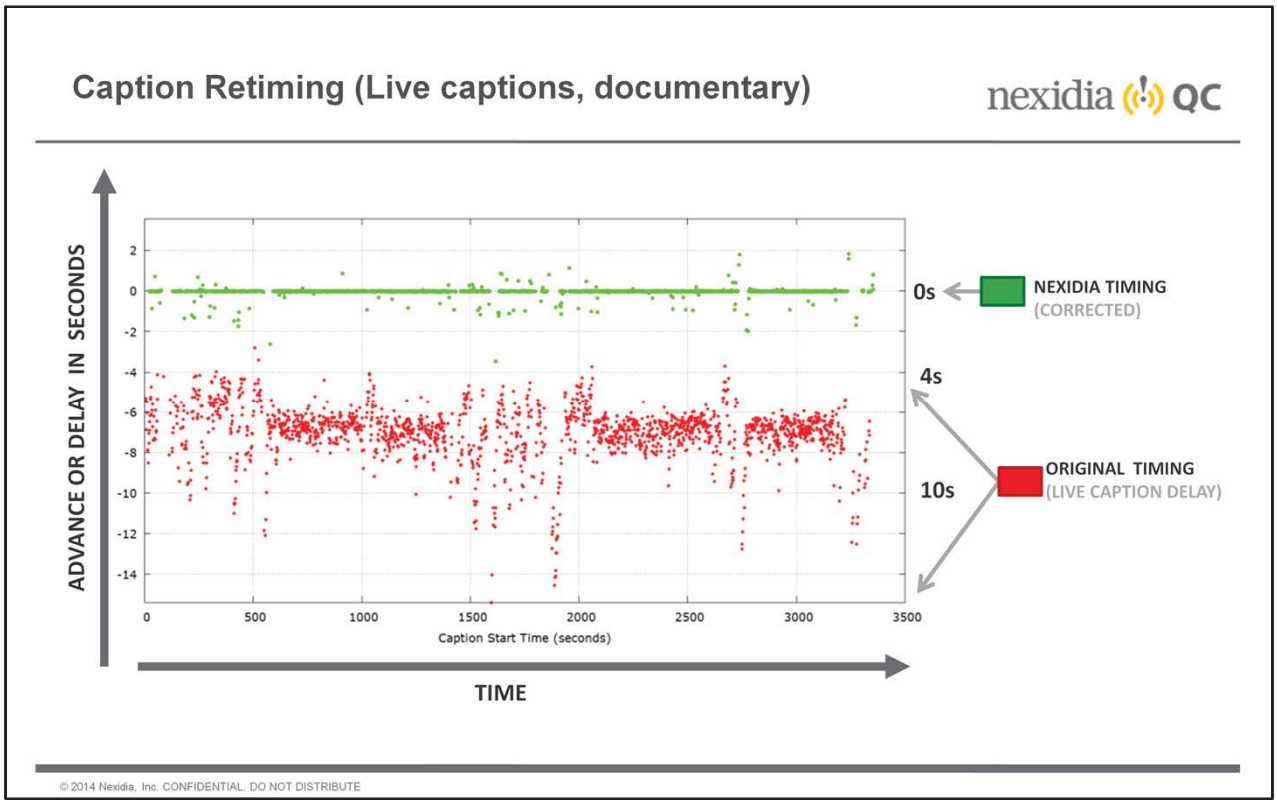
Verifies video description content was aired and present throughout the entire program



The XML information is human readable and is readily available 3rd party applications.



Nexidia can fully automate the alignment of live and frame rate converted captions at a speed of greater than 40x faster than real time per core. This means an hour long program would only require a couple of minutes to retime. This capability is available within 3rd party applications like Volicon Share, which is designed to enable the user to review previously broadcast content, define a clip, and then distribute to the broadcaster's website and a myriad of pre-defined content distributors. NQC's performance means the caption alignment will not add latency or significant computational requirements to the distribution of video.

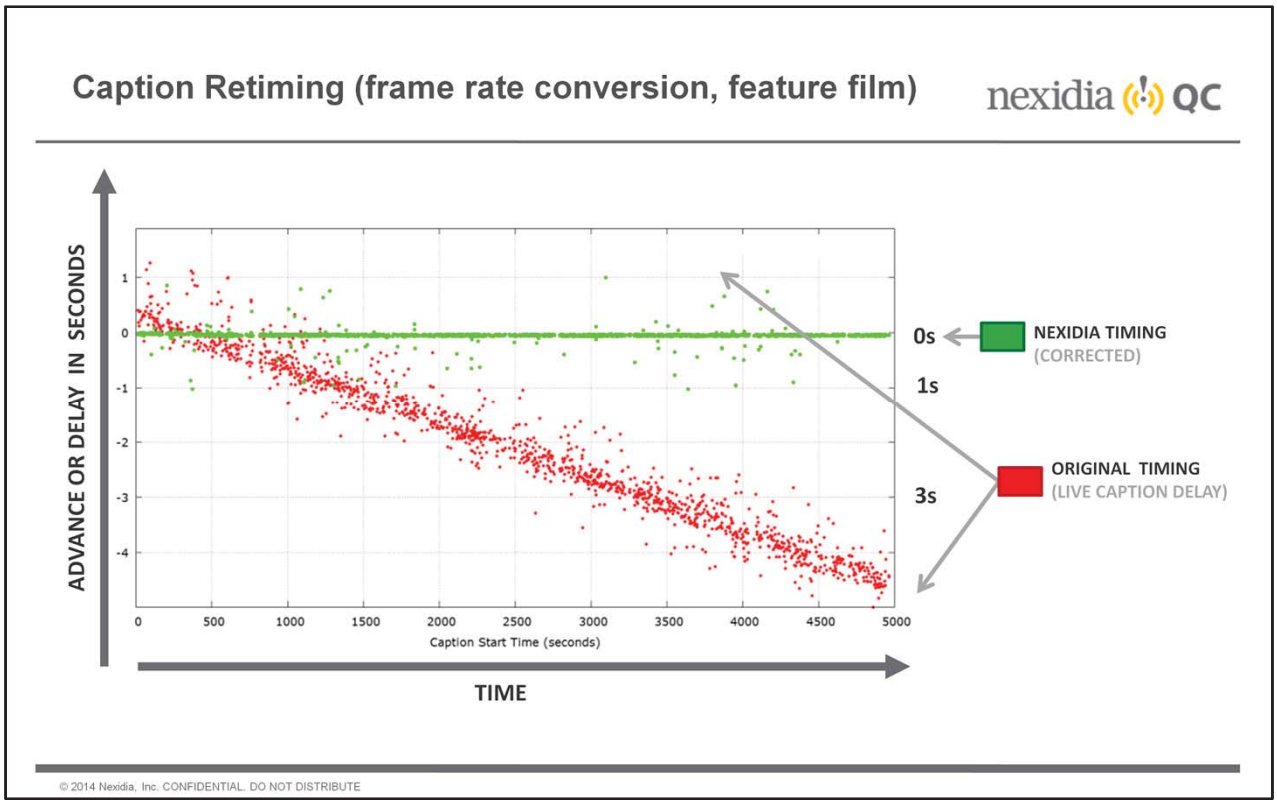


PBS Documentary (live, drama),

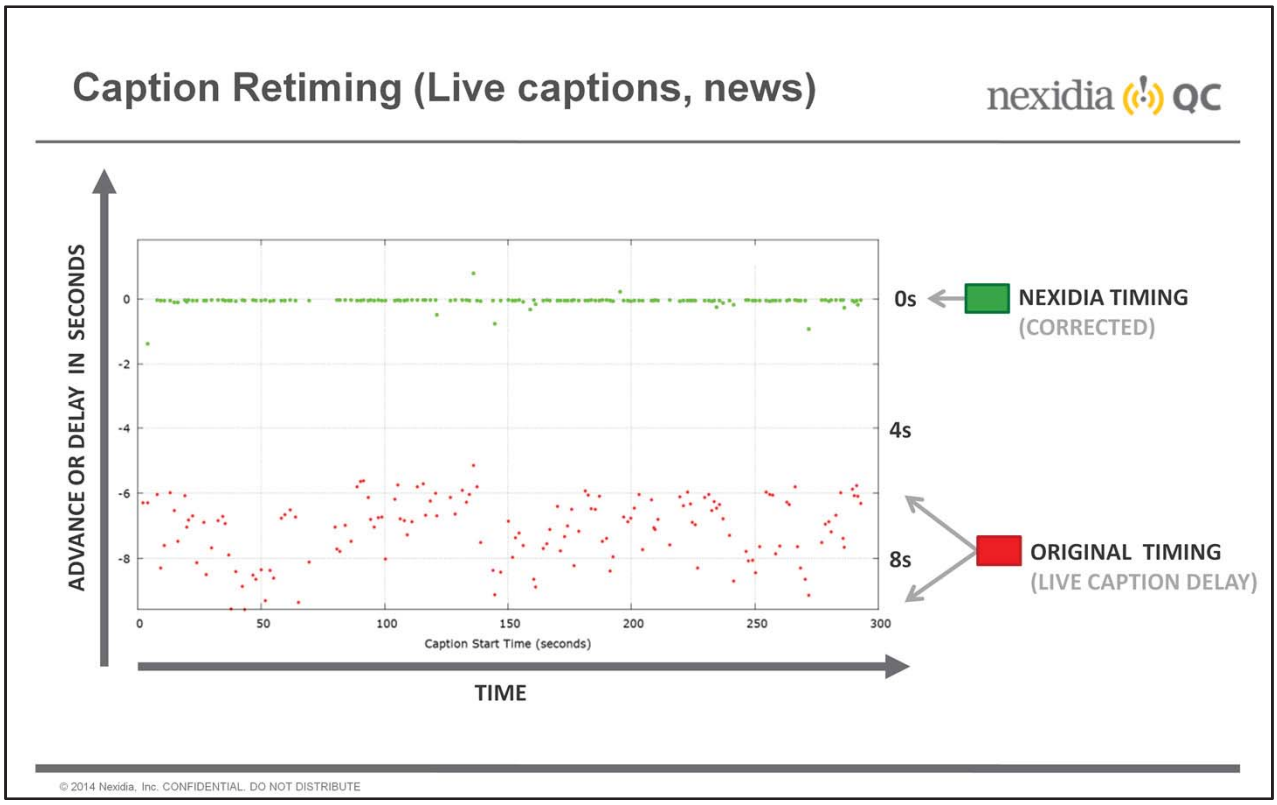
This chart illustrates the differences in live caption timing and caption timing corrected by Nexidia.

X Axis – length of file in time
Y Axis – difference in time between words spoken and captions shown onscreen

Red dots – distribution of live caption timing
Green dots – captions corrected by Nexidia alignment process



Frame rate conversion, feature film (Inception)



CNN Live captioned clip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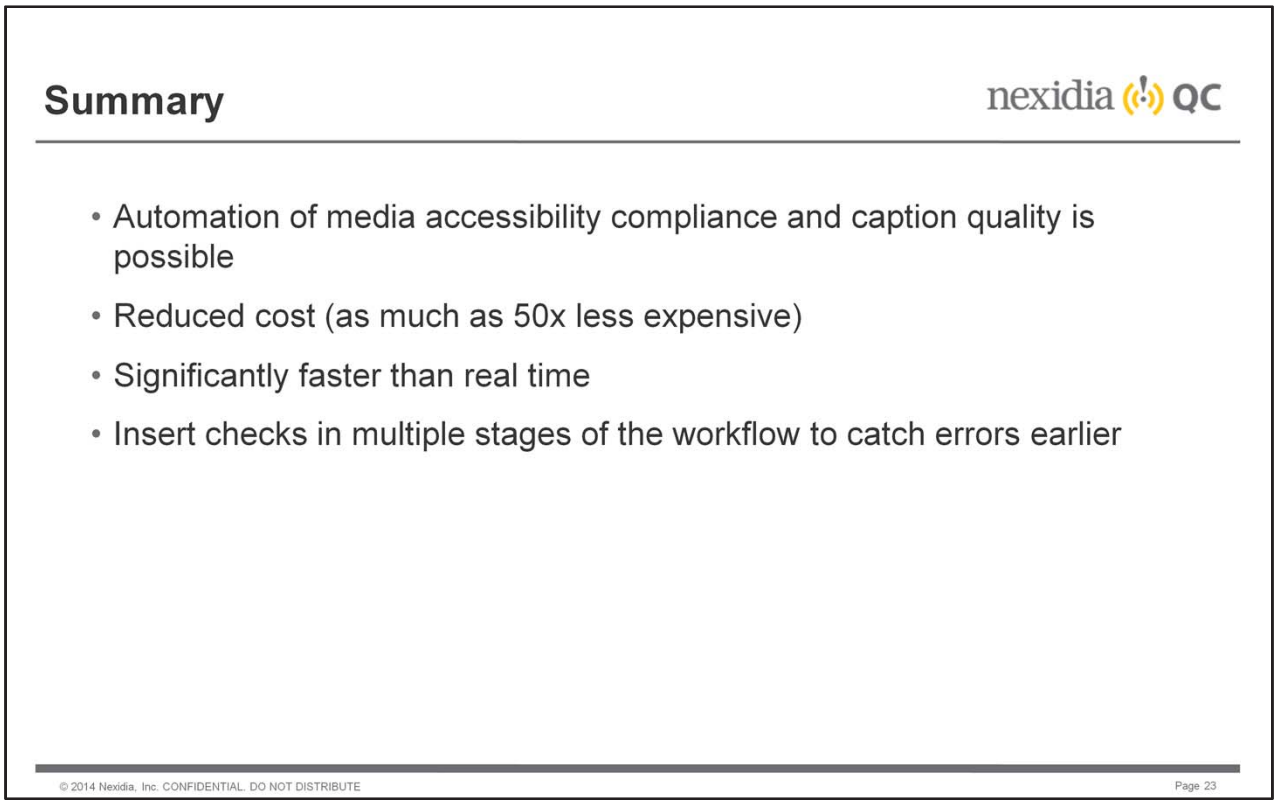
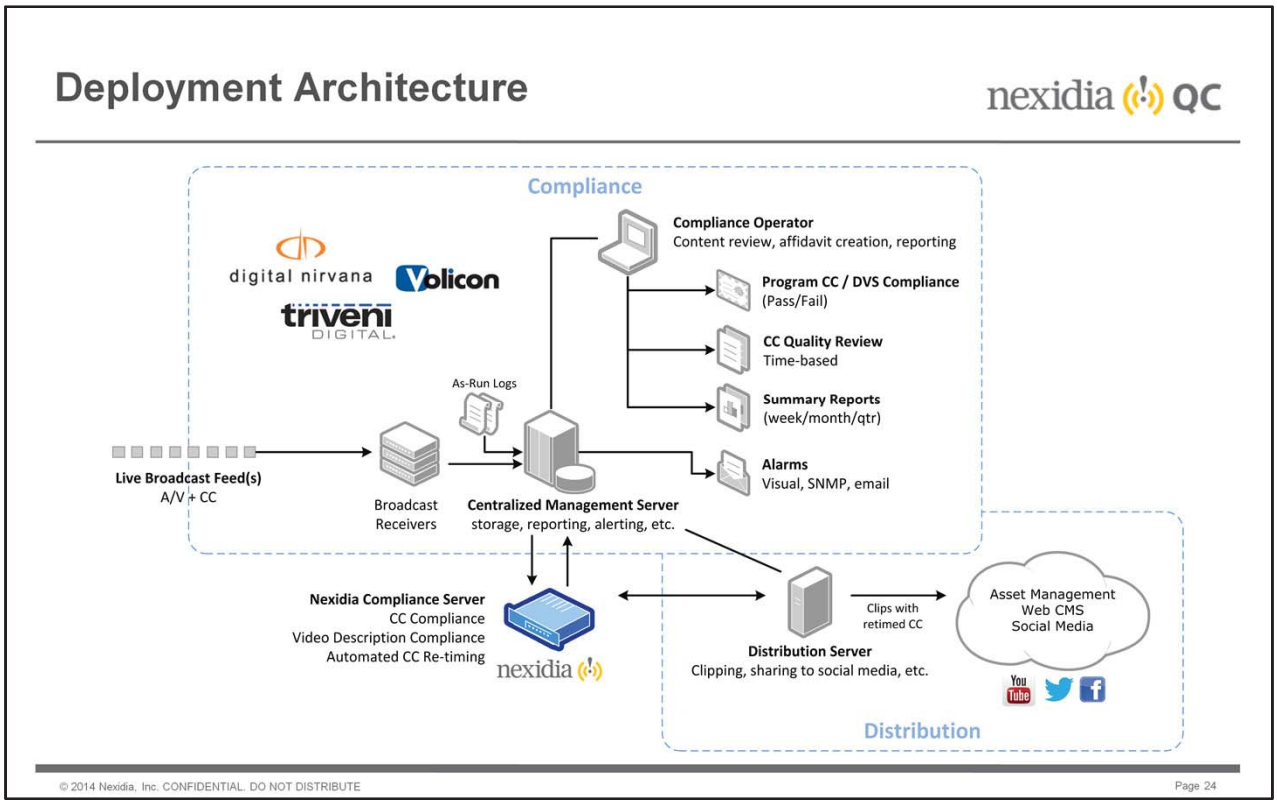
Demonstration



In summary, automation of media accessibility compliance and caption quality is possible, it is significantly less expensive and more efficient than existing processes, can be used in a myriad of 3rd party tools both now and in the future and produces accurate results. This makes it possible to have checks in multiple stages of the workflow to catch errors earlier.



Nexidia QC is able to leverage the existing monitoring infrastructure to enable media accessibility and caption quality reporting.

Nexidia QC is designed to be a processing engine and simple to integrate into a myriad of workflows and 3rd party applications. Nexidia QC is currently integrated with Telestream Vantage, Dalet Galaxy, Dalet Amberfin UQC, Evertz Mediator, and Aspera Orchestrator. Nexidia is currently collaborating with Volicon, Digital Nirvana, and Triveni Digital for integration into their monitoring systems.

Industry Praise

nexidia QC

- "We are using Nexidia QC on every piece of media leaving the Media Operations Center. In order to have the same assurance of program caption quality I would have to hire two to three more staff members to do the end to end QC pass that would be needed to assure caption quality standards are meet. I see my investment being returned in less than a year."
- "Caption Alignment is probably the single most valuable feature of Nexidia QC. It allows caption sync problems to be adjusted in minutes rather than time-consuming and expensive manual attempts to fix caption sync."

  — Steve Scheel, Senior Director, PBS Media Operations Center

- "Nexidia QC is in use across Turner's television networks for both descriptive video and closed caption monitoring. Nexidia QC is an important part of our delivery."

  — Ken Brady, SVP, Media Technology and Operations, Turner Broadcasting System, Inc.