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# The Rise Of Big Video



**4k Video**  
From camera to cloud

**Global Partners**

Workflows that connect  
anywhere



**The New Digital  
Economy**

Video ecosystem  
now worth billions



# CONTENT



## 01 Inbound Delivery Bottleneck

The inbound delivery bottleneck is the time it takes to get the video from the remote location back to the central facility.



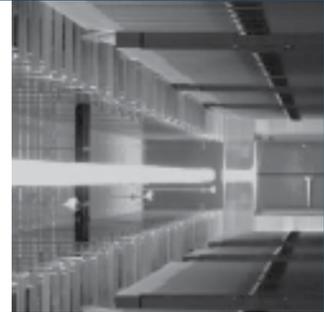
## 02 Review Bottleneck

The review bottleneck is the processing and delivery times associated with this transcoding.



## 03 Ingest Bottleneck

Production would be most efficient if the video is available and waiting when editors sit down with their first morning cup of coffee.



## 04 Distribution Bottleneck

The distribution bottleneck is the time it takes to encode and deliver multiple video renditions.



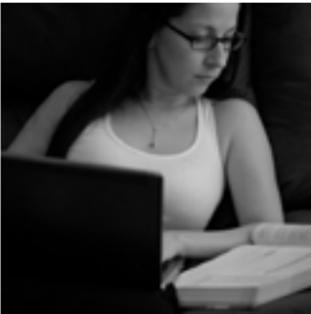
## 05 The Bottleneck Buster

Brevity automates the transcoding and delivery of video files inside and outside your enterprise, with multiple features that accelerate 4K workflows.



## 06 Brevity at Work

Explore how Brevity helps you minimize or eliminate the 4K-related bottlenecks



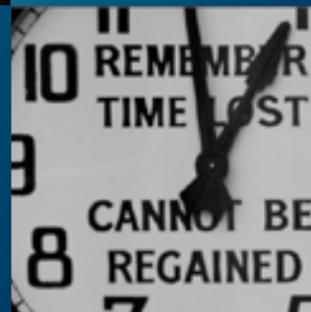
## Overview:

4K formats present a significant opportunity for producers, but the sheer size of the associated files creates multiple production bottlenecks, which may include the:

- Inbound delivery bottleneck
- Review bottleneck
- Ingest bottleneck
- Distribution bottleneck

This white paper will define and discuss these bottlenecks, and present how AllDigital Brevity can help you eliminate or minimize them to accelerate your 4K workflows.

# 1 - Inbound Delivery Bottleneck



Though all productions are different, most share some common elements. For example, after shooting, the next step for many productions is to distribute the footage to various stakeholders for review, which is obviously more challenging if the shoot is remote. The inbound delivery bottleneck is the time it takes to get the video from the remote location back to the central facility.

	BlackMagic	Canon	JVC	Panasonic	Red	Sony
	URSA	EOS C500	HM-200	HC-X1000	Epic Dragon	MPW-F55
<b>Max delivery resolution</b>	4608x2592	4096x2160	3840x2160	4096x2160	6144x3160	4096x2160
<b>Format</b>	Various	ProRes 444	MP4/MOV	MP4/MOV	RedMag Standard	XAVC 4K
<b>Max Gigabytes/min</b>	10.8	11.9	1.125 GB	1.125 GB	~5.2 GB	1.8 GB

Table 1. 4K source formats, max resolution and file sizes.

The traditional approach for remote shoots is to ship hard drives, SD cards, or other storage media via FedEx or other overnight service, which is expensive, and precludes any kind of intra-day review. If you need a quick review of a critical shot or sequence, it will have to wait until the following morning.

As an alternative to overnight delivery, you could FTP or upload the video. The data rate and associated file size of 4K video depends upon the selected storage format (Table 1), and can range from about 1.125 GB/minute for video compressed using H.264, to 11.9 GB/minute for footage captured in ProRes 444. Let's assume that you shoot ten usable minutes a day,

which translates to between 11 and 120 GB of data to send back to the studio.

If you upload the original source using a 12 Mbps Internet connection, which may be all that's available at a remote location, 11 GB of data would take about 3.5 hours, which is manageable, though the 120 GB would take an unworkable 35 hours. Alternatively, you could compress the video before transmission; say to 1080p at 30 Mbps using the H.264 codec, which would cut transmission time significantly. However, this would also add compression time to the workflow, degrade the quality of the video, and likely make the transferred video unusable for production.

## 2 - REVIEW BOTTLENECK

Once the video is in house, you have to format it for the various reviewers and their viewing platforms, from 4K production monitors, to computers, tablets, or even smartphones (Table 2). Then you have to deliver it to various computer drives, websites, S3 or Dropbox accounts, or other targets for viewing. The review bottleneck is the processing and delivery times associated with this transcoding.

When you're delivering your dailies via Fedex or other overnight delivery, the transcoding for review process can't start until the package is received, and the video is copied over to an encoding station, delaying the start of review for several hours. With FTP or other file transfer, processing won't start until a technician arrives to retrieve the files and begin encoding, introducing a similar delay. Either way, you're likely looking at mid-morning or later before the reviewers can watch the videos.



	Production Monitor	Computer – 4K Display	Computer – HD Display	Hi-Res Tablet	Low Res Tablet	Smart-Phone
Codec	H.264	H.264	H.264	H.264	H.264	H.264
Max delivery resolution	3840x2160	3840x2160	1920x1080	1920x1080	720x480	960x540

**Table 2. Common formats for video review.**





### 3 - INGEST BOTTLENECK



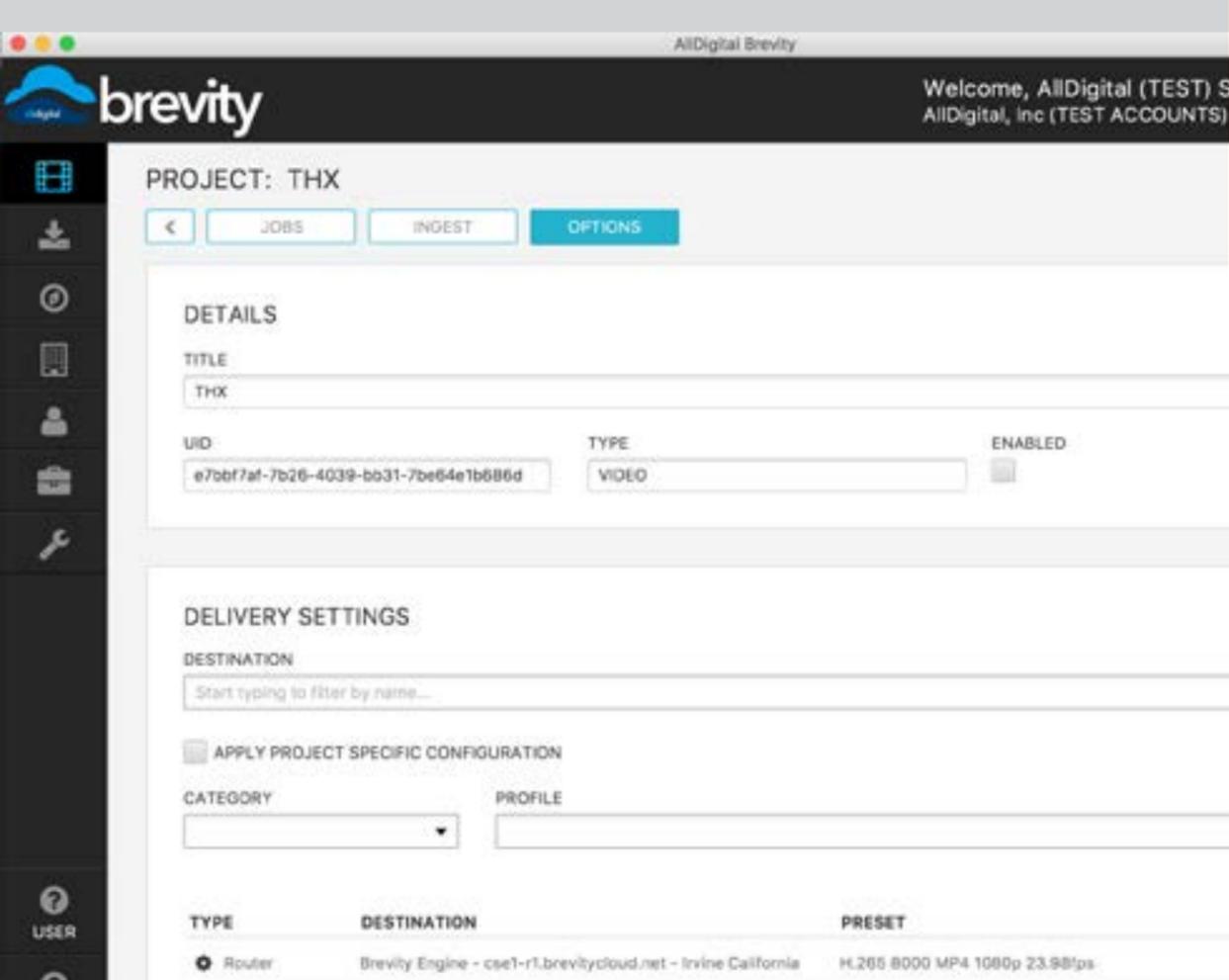
Unique to the AllDigital Brevity product is the ability to compress, transcode and deliver in a single step. This parallel processing can improve workflow speeds 200% or more.

Once the source videos are in-house, your editors can start post-production. In many cases, however, the video must be transcoded for compatibility with a specific video editor or for maximum efficiency while editing. For example, though Premiere Pro CC can input Sony XAVC natively, editing 4K video in a highly-compressed long GOP format could render even the most powerful workstation sluggish and unresponsive. Instead, it might be more efficient to edit in Apple

ProRes or Avid DNxHD, necessitating what can be a time-consuming transcode. The ingest bottleneck is the processing and delivery times associated with this transcoding.

As with the review bottleneck, if the source video arrives via overnight delivery service or FTP, processing can't begin until a technician arrives, delaying the start of production for several hours. Obviously, production would be most efficient if the video is available and waiting when editors sit down with their first morning cup of coffee.





## 4 - DISTRIBUTION BOTTLENECK

Once the 4K project is complete, your editor will produce a master for archival and distribution. In many cases, you'll have to transcode that master for multiple targets with disparate requirements as shown in Table 3. With many encoding/file conversion tools, encoding is a serial process, and producing multiple outputs can be time consuming. In addition, transmission to the content distributor can't start until the encoding is complete. The distribution bottleneck is the time it takes to encode and deliver these multiple renditions.

Depending upon the project, the accumulated delays from the four bottlenecks can cost anywhere from a few hours to a few days or even weeks, which is expensive and inefficient. When rushing to get video delivered to news or social media sites, these delays can mean the difference between going viral and going nowhere.

	Neflix	Apple	YouTube
Resolution	DCI 4096x2160	4096x2160	2160p (4k)
Data rate	250+ Mbps	155 - 388 Mbps	35-45 Mbps
Codec	MXF OP 1(a)	ProRes	MP4

Table 3: Distribution requirements for the designated sites.

## 5 - INTRODUCING BREVITY: THE BOTTLENECK BUSTER

Brevity automates the transcoding and delivery of video files inside and outside your enterprise, with multiple features that accelerate 4K workflows. These include three transport codecs, Image Warp, Data Warp, and Raw Warp, that deliver up to 30x compression of uncompressed formats such as YUV and DPX 2K and 4K, or, if required, less compression with mathematically lossless compression for absolute top quality.

Brevity includes multiple hardware and software clients for interfacing with the system; some browser-based, some contained in appliances. Some Brevity clients can transmit packets while encoding the video, so total delivery time is the longer of encoding or delivery time, not the sum of the two.

By using a more compact transport format, and encoding during delivery, Brevity can dramatically accelerate transmission times over most existing delivery workflows. This is shown in Figure 2, for three common acquisition formats, XDCAM 50, ProRes 422HQ and Canon 7D footage delivered as DNx 220. As you can see, when shooting in relatively uncompressed formats like ProRes, Brevity can cut transmission time by as much as 85%.

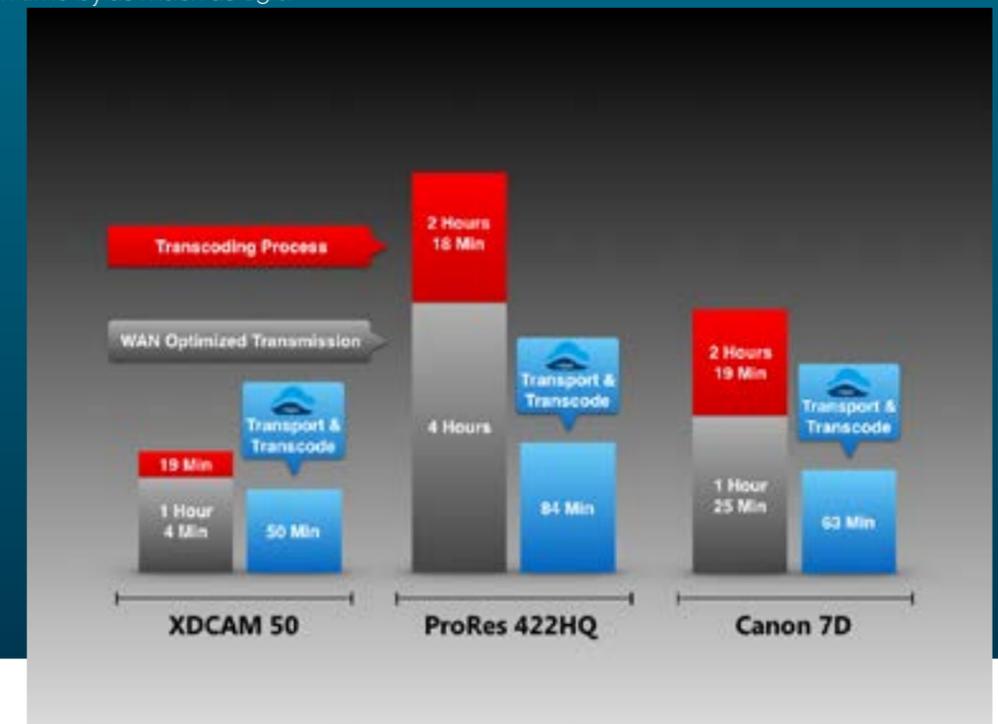


Figure 2. One hour of footage sent on a 50 Mbps line and transcoded to DNx 220.

# 6 - BREVITY AT WORK

To further accelerate your workflow, Brevity uses UDP delivery for transport, which is up to 60% more efficient than systems delivering via TCP. Briefly, TCP is slower because it deploys error checking on all packets, stopping to re-transmit lost packets when errors are reported. In contrast, UDP doesn't use inter-stream error correction. Instead, Brevity guarantees file integrity by transmitting a map of the data, which the receiving app uses to verify the packets as received. If any packets are lost, they are retransmitted after the initial file transfer, which is much more efficient than periodically interrupting the transfer mid-stream.

In addition, depending upon your service plan, Brevity can perform multiple transcodes concurrently to accelerate the production of your high-priority items. For example, if you need to transcode and deliver the daily rushes to six different executives that need six different formats, you can perform all jobs simultaneously, dramatically reducing encoding time as compared to serial encoders.

AllDigital has an ROI calculator on its website that illustrates the cumulative benefits of all these technologies, which is shown as Figure 3. On the website, use the sliders to choose the file size of the original file in GB, the upload speed of your internet connection, the file duration in minutes, and the number of files that will be transcoded from the transferred file. With this input, the calculator will show total processing and transfer time, and the percentage improvement that Brevity delivers.



Those are the high-level benefits; now let's briefly explore how Brevity works and its key components. At its core, the Brevity platform is composed of a number of web services, which can be run on public, hybrid or private clouds, including on-premise. You can access Brevity as a Software as a Service with different service levels, or have it custom configured and installed for your particular needs. So the configuration shown in Figure 4 is just an example, and will likely be different for each organization that deploys Brevity. Most users, however, will input content into a centralized data center for multiple point distribution, both inside and outside the enterprise.

In all cases, you control operations in the Brevity Control Panel. This is where you create projects, which can have multiple delivery destinations, both internal and external, in multiple formats. Brevity can ingest most native camera formats, and supplies output templates for most common editing and web delivery formats.

As mentioned previously, Brevity offers multiple clients with different performance characteristics. Specifically, the Brevity desktop client is a downloadable application available for Windows, Mac and Linux that delivers 200% transport acceleration or more. Alternatively, locations requiring higher performance can use the Brevity Appliance, which can encode and transmit simultaneously, enabling 400% transport acceleration or more.

The final component is the Brevity Engine, which manages multiple GPU-based processes to run sophisticated compression transport algorithms with simultaneous transcoding. The Brevity Engine can be run in the cloud, or on server-grade hardware on premise, usually at a centralized data center. You can run the individual encoding, transcoding, and delivery tasks serially or concurrently, based upon the selected service level.

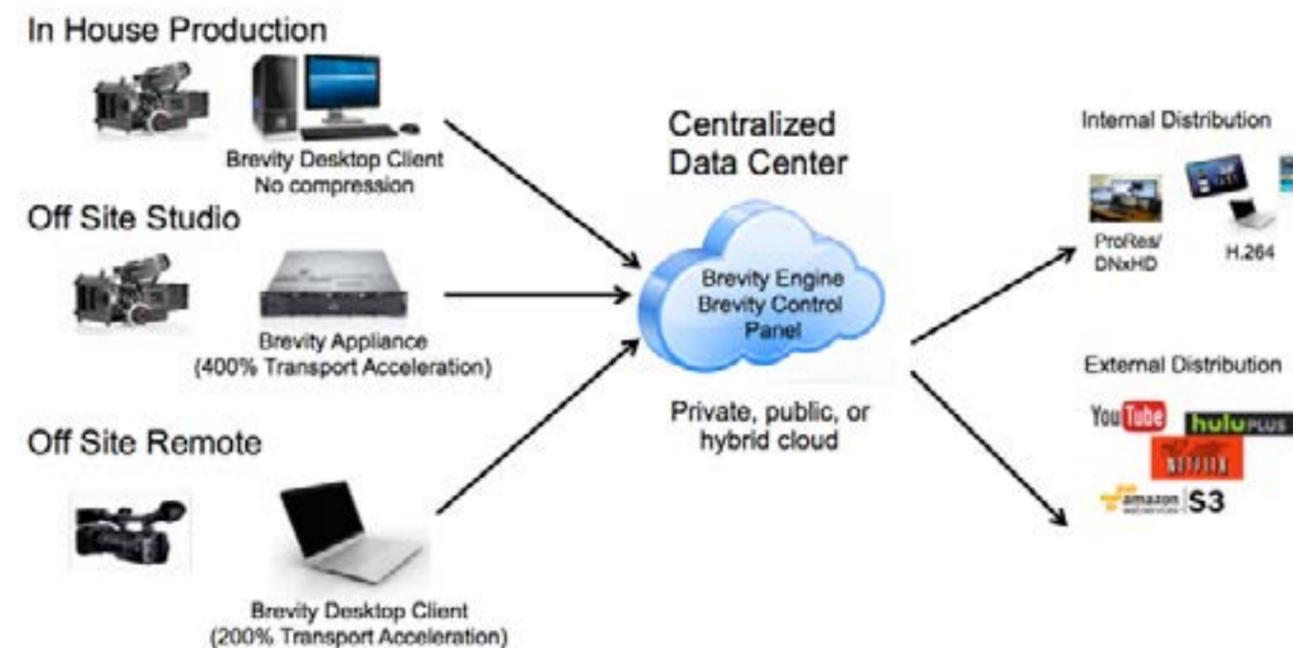
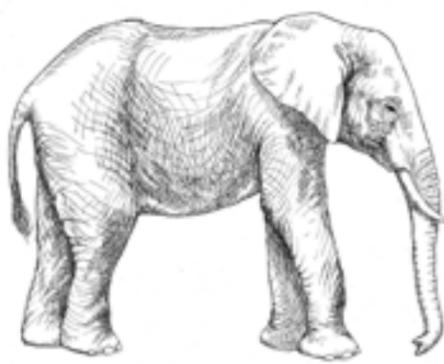


Figure 4. A sample Brevity configuration and workflow.



## BREVITY CONTINUED



With this as background, let's explore how Brevity helps you minimize or eliminate the 4K-related bottlenecks described above.

### Inbound Delivery Bottleneck

This bottleneck relates to delivering footage shot remotely back to the data center for processing, review and ingest. As shown in the Figure 4, there are two options.

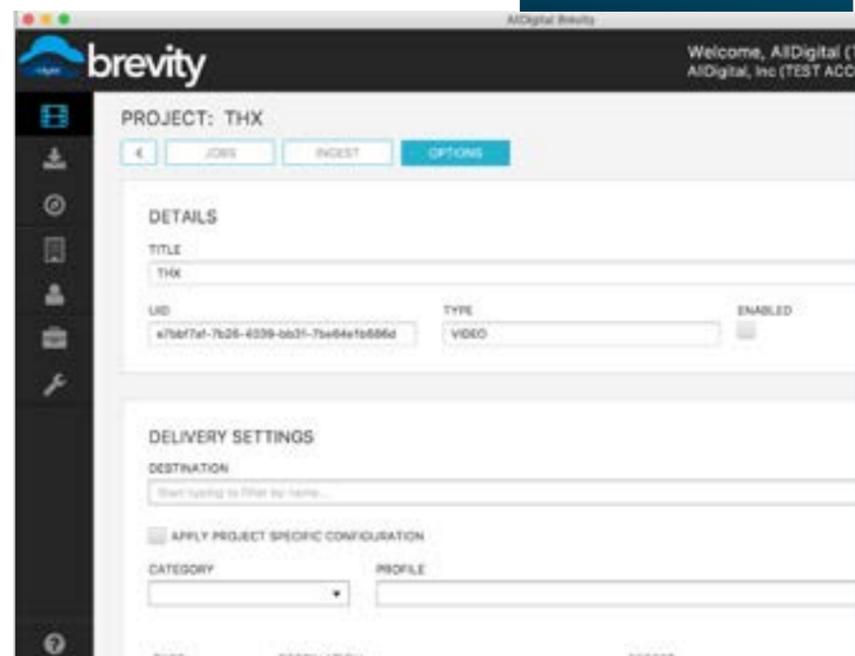
For smaller shoots, the Brevity Desktop client can deliver up to 200% transport acceleration, potentially more depending upon the source format and the selected transport codec. For faster performance, you can deploy the Brevity Appliance, which delivers up to 400% transport acceleration over traditional approaches.

In the example discussed earlier, we saw that it would take 35 hours to transmit 120 GB of data over a 12 Mbps connection, which is too long for most productions. Brevity's 400% transport acceleration would cut the transmission time to less than 7.5 hours, which likely would be sufficient to eliminate the need to deliver source materials via overnight services. For shorter clips, the transfer acceleration enabled by Brevity can also enable intra-day review, potentially speeding the production process even further.

### Review Bottleneck

This bottleneck relates to how long it takes to format and deliver the incoming video for review once actually received. This bottleneck can be significant, depending upon the time of day you receive the video, its source format, and number of output formats you need to create and deliver.

Figure 5. Assigned reviewers for the project



With Brevity, when you create the project, you define the delivery location and required format for each reviewer, as shown in Figure 5. Once the video is received, it's automatically transcoded and delivered, in many instances before the reviewer even arrives at work, either minimizing this bottleneck, or eliminating it all together.

### Ingest Bottleneck

As discussed, you may need to transcode the source videos received from the remote crews before editing. As with the review bottleneck, when you receive video via overnight delivery or FTP, these conversions typically doesn't start until a technician arrives at work in the morning.

With Brevity, the required formats and target locations are programmed into the project, so both transcoding and delivery occurs automatically once the file is received, with parallel transcoding available via the Brevity Engine when necessary. Again, the ingest bottleneck is either greatly minimized or eliminated.

### Distribution Bottleneck

Once editing is complete, the master needs to be transcoded and delivered to various targets, internal and external. Brevity can accelerate this process by processing multiple outputs in parallel, and by beginning the transmission process while still encoding the content.

Beyond these techniques, Brevity supports the accelerated upload APIs for common targets like Vimeo, and supplies presets for common output formats. This ensures both the fastest possible delivery and a problem-free submission.

### Conclusion:

Roughly speaking, 4K video has four times the resolution of 1080p video, and up to four times the raw file size. If you simply integrate 4K video into your existing workflows, many transcode and delivery tasks will potentially take four times longer. That's a real problem in an environment where time to publish and time to air are critical measurements.

AllDigital Brevity accelerates your 4K production workflows by automating all transcode and delivery tasks, applying exclusive compression technologies, and through innovative techniques like transcoding during delivery and parallel processing. In an environment where literally every second matters, this can shave minutes, hours, or even days from your overall production time.

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