Streamlining Multi-Camera Recording & Data Management.

RED T|second

Evolving the Use of Multi-Camera Systems

Filming with multiple cameras simultaneously is nothing new. Whether it's to capture a live event or an expensive stunt, or to support a specialty format (remember Cinerama?) or creative effect (those breathtaking nested zooms in *300*), shooting with multiple cameras has often been a go-to methodology to get coverage, ensure flexibility in directing and editorial, and present the full scope of the subject.

Multi-camera has been the norm for live broadcast applications such as sports, news, award shows for a long time, as well as for sitcoms. But the practice of using cinema cameras (35mm-sized and larger sensors) rather than broadcast and studio cameras (2/3-inch sensors) has gained in popularity in the last few years. Creatively, cinema cameras provide more flexibility and control, as they offer more varied and exotic lens choices, and record files with greater resolution and latitude, providing better source material for postproduction workflows such as VFX and color correction.

RED cameras such as the <u>V-RAPTOR</u> or the <u>KOMODO</u> have become a particularly attractive choice for concert films, comedy specials and reality television, allowing cinematographers and directors to achieve more evocative, cinematic visuals, and to express bold new visions.

Most cinema cameras can be configured to integrate in a broadcast workflow, cabled to transmit their video output at either HD or UHD via SDI or SMPTE ST 2110 to a centralized video-recording server, a single destination device that will capture the footage from multiple cameras, and encode it to a compressed video codec. These storage systems make the footage easy to access and manage, and offer lots of storage capacity, allowing cameras to roll without cutting for hours. However, recording UHD or HD signals in a display-referred color space, to a compressed—often lossy—codec reduces the options for creative look development, refinement and enhancement in postproduction.

Cinema cameras offer the option to record at higher frame rates than broadcast cameras, and at resolutions greater than UHD, with less compressed encoding that encapsulates the full latitude of their sensors. The trade-off (until now) has been that image files had to be captured to onboard removable storage drives with more limited capacity, requiring regular replacement and management of this media throughout filming, and lots of data transfers to compile, backup and distribute all the image files. This complexity is relatively manageable by a single technician when there are just two or three cameras on a set. But for a team capturing plates in a remote location with a 9-camera array, or a production filming an hours-long event with 16 camera positions, recording to on-camera media creates significant complications. It delays access to the footage for downstream technical and creative work such as dailies, review, logging, analysis, editing and archiving.

RED and Tsecond partnered to develop a workflow that allows producers to leverage the full creative and technical imaging benefits of utilizing RED digital cinema cameras for multicamera production while eliminating burdensome media and data management.
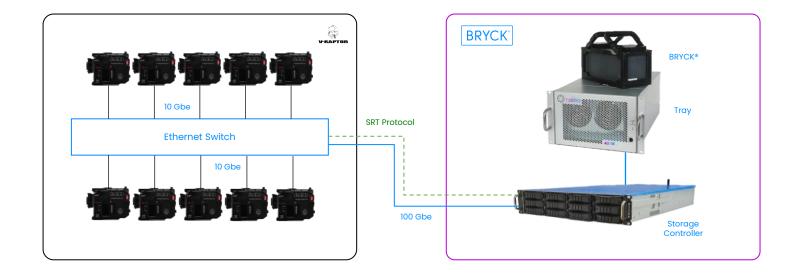
Utilizing RED Connect, ten RED V-RAPTOR 8K cameras can record directly to Tsecond's BRYCK storage platform. With up to 40-gigabytes-per-second of available throughput, the BRYCK easily sustains recording ten concurrent 8K 120fps streams, with room for ten more. The resulting high-resolution, high-latitude R3D files are then immediately available to the workstations connected to the BRYCK, ready to be processed, edited and transferred.

System Overview

As a proof of concept, RED and Tsecond tested simultaneous recording of 10 RED V-RAPTOR Cameras, set to capture at 8K 17:9 at 120 frames-per-second in MQ R3D quality. This yielded an 800 MBps stream from each camera, which was output through the built-in RED Connect module's fiber connector and fed to a network switch's 10Gbe fiber port. (While fiber cabling was utilized in this instance, a simple adapter can be used to transmit over copper ethernet instead.) The switch is connected to the BRYCK storage system's server via dual 100Gbe connections.

The NVMe based – BRYCK® Platform is a secure portable storage solution that offers up to 1PB of capacity and very high throughput (up to 40 GB/s) in a rugged, compact and tamper-proof form factor. The NVME drives are contained in a brick-shaped weatherproof 4"x4"x9.5" enclosure that connects via its docking station—or Tray—to a high-performance server through which clients access the storage. This design enables the rapid and safe physical transit of large volumes of data; the high-capacity portable BRYCK storage module can easily be transported and connected to another Tray for data access, with AES 256-bit encryption, failure protection and military grade construction protecting its contents.

In our multi-camera setup, the BRYCK® system communicated with the V-RAPTORS via SRT over TCP/IP. Stream Receiver, a simple utility within BRYCK's management software, allows users to set cameras as the data streams' sources and to configure the destination folders on the BRYCK® for each camera's feed. Stream Receiver leverages the RED Connect library to verify the data and write it to the BRYCK storage as standard R3D files.

Once the cameras and storage system are configured, recording can be triggered by the camera. A single BRYCK® system can sustain recording from up to 20 cameras running at 8K/17:9/120fps/MQ, with a 256 TB BRYCK offering about 80 hours of capacity for those settings. All this available bandwidth and capacity also makes it possible to connect workstations to the system for immediate processing, review and transfer of the footage.

T|second

"BRYCK® was built for this kind of workflow: effortlessly enabling capture at the highest possible quality and ensuring immediate access to the resulting data so that productions don't get bottlenecked by limited performance, or bogged down by data and media management,"

**Manavalan Krishnan,
CTO – Tsecond Inc.**

RED

"BRYCK's integration with RED Connect opens the door to streamlined workflows and configurations for high-resolution and high-framerate multicamera, live-to-tape, volumetric and immersive video projects in all types of environments. We're always looking to remove limitations that create complexity and compromises, and that's exactly what we've done here."

**Jeff Goodman,
VP of Product Management - RED**

With BRYCK®, big data can be captured, stored, accessed and transferred efficiently **and** cost-effectively, **at the speed of CREATIVITY.**

RED Digital Cinema is a leading manufacturer of professional digital cameras and accessories. In 2006, RED began a revolution with the 4K RED ONE digital cinema camera. RED's latest technology includes the highly advanced V-RAPTOR [X] and V-RAPTOR XL [X] systems, the flagship DSMC3 generation systems and the first available large format global shutter cinema cameras. The RED lineup also includes KOMODO-X and KOMODO, which features a global shutter sensor in a shockingly small and versatile form factor. Also available is RED Connect, a license-enabled feature that unlocks up to 8K 120FPS live cinematic streaming from the V-RAPTOR line of cameras.

Tsecond is an emerging leaders in EDGE data space, enabling enterprises and organizations to activate big data and drive insights from the Edge to Data Centers or the Cloud.
Founded in 2020, Tsecond Inc. is an AEI HorizonX growth stage portfolio company based in San Jose, California, USA.
They have developed a petabyte-capable and differentiated storage platform–BRYCK®'–to capture, process, move and store data from any system, anywhere. This platform provides compute and storage capabilities to rapidly store, locally analyze and efficiently move data from one location to another, enabling faster data-driven-decision-making.