

Using Creative Grading for Distributed Production

Introduction

Camera shaders are a critical part of maintaining picture quality during the constantly changing conditions of a multicamera live production. In today's socially distanced environments, media production teams would like to reduce the number of crew members on-site by allowing the camera shaders to work off-site. But they still must maintain the responsive reaction times needed for live shading.

Creative Grading Solution

The Creative Grading solution for camera shading consists of three components with standard RJ45 Ethernet connectivity using IP based protocols:

- A CCS-ONE control server serving the Creative Grading Engine and Camera Connect applications
- One or more CGP 500 or OCP 400 control panels
- One or more instances of the Creative Grading App running on a user-provided iPad

These components connect together with off-the-shelf infrastructure using a standard 10/100Base-T Ethernet network supporting IP protocols. Communication across this network uses Grass Valley C2IP (Camera Control over IP) protocol, which is supported by all digital Grass Valley LDK and LDX series cameras (including LDX Compact).

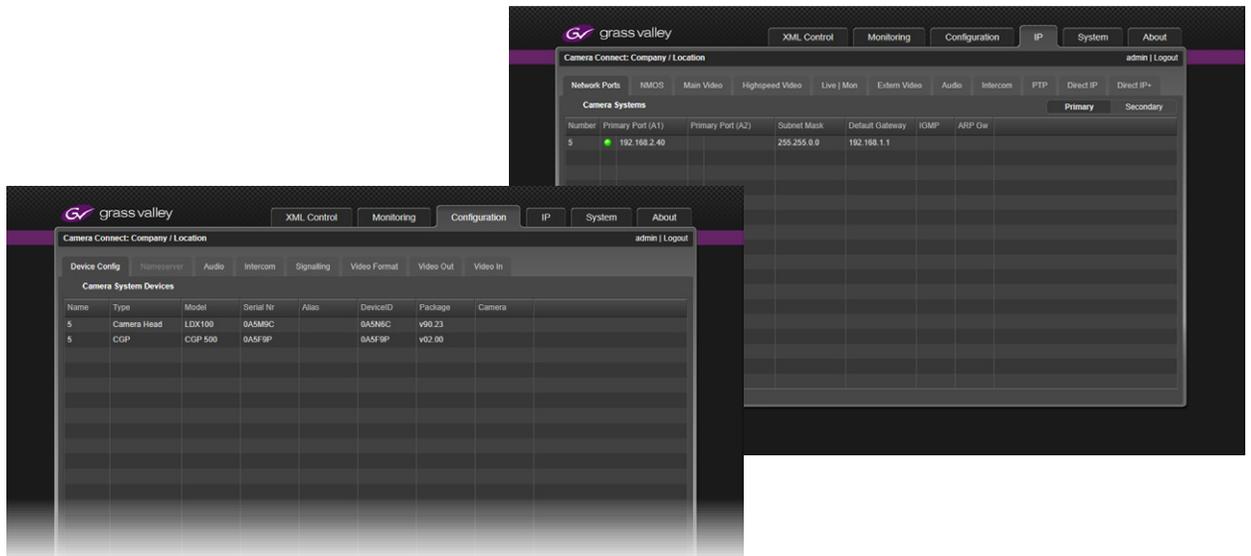
Grass Valley's Creative Grading solution provides the ability to shade live cameras in real time over IP connections, including those available in a home office. There are three aspects to consider when setting up the remote shading solution:

- Components of the control network
- Components of the video monitoring stream
- Managing security and permissions

CCS-ONE — Camera Control Server

The CCS-ONE contains the pre-installed Creative Grading Engine, which creates a camera control interface for one or more instances of the Creative Grading App. The CCS-ONE also contains the Camera Connect application, which extends the functionality of the overall system to include optional interfaces for configuration of IP connections for Grass Valley cameras and control for third-party integration.

The CCS-ONE uses a Windows 10 LTSB operating system to ensure updates for the latest security threats. It is equipped with two RJ45 Ethernet ports that can be used to physically separate the Camera Control network from other networks.



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CGP 500 — Creative Grading Panel

Many operators find a physical panel to be the fastest way to shade. The completely re-engineered CGP 500 provides a large color display, multiple user assignable rotaries and a unique joystick with three customizable rings for easy single-handed control of three functions. Its capabilities are further enhanced when paired with the Creative Grading App. Using the App, the panel can be customized to have preferred functions available for direct operational access.

The CGP 500 creates a direct camera connection for real-time camera shading. It is equipped with an RJ45 Ethernet port with POE capability, which eliminates the need for a separate power supply.



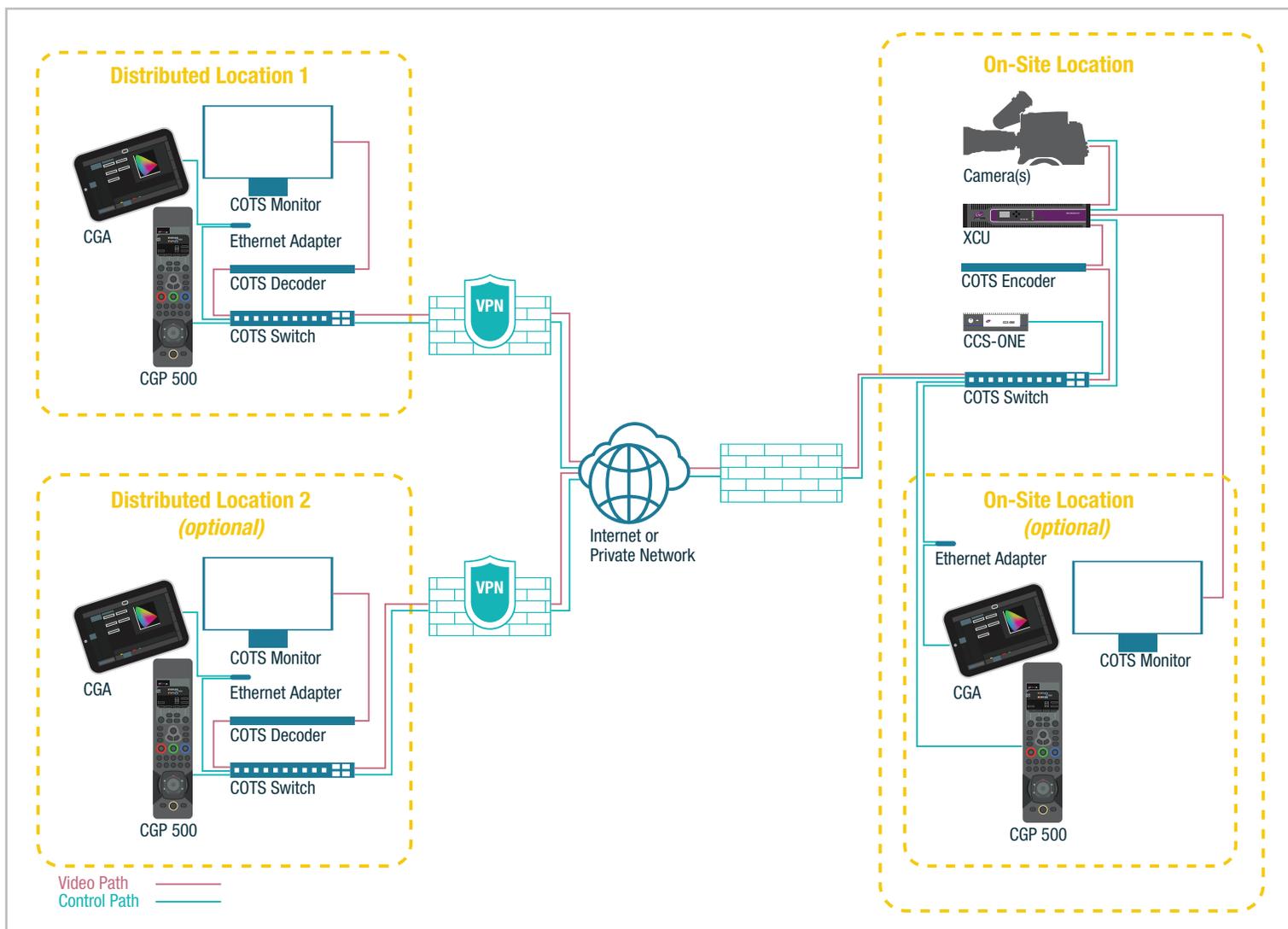
CGA — Creative Grading App

The Creative Grading App is available, free of charge, for the Apple iPad via the Apple Store. A Google Android version is not yet released. The CGA is used by the shader — either by itself or paired with the CGP 500. The CGA requires a CCS-ONE in the system to operate.

For best performance of the tablet, use a suitable USB-to-Ethernet adapter for an uninterrupted reliable connection. An external power supply for the tablet is recommended as most USB-to-Ethernet adapters draw too much power for the internal battery.



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The Video Monitoring Stream

Video and control streams are handled separately. Using a VPN provides the best picture quality and fastest response times (less than one second delay).

If delay is not critical or network bandwidth is limited, the alternative is to send one encoded stream per camera to a cloud-based CDN. Each distributed shader can access the monitoring video feeds needed at the shader's location by connecting to the CDN. The CDN will manage the distribution and data rates for the video feeds. If connections to a home office are very small, the system may require fine tuning of encode packet sizes to accommodate the available bandwidth.

On-site Configuration

Using a second output from the camera, or a distribution amplifier, encode the camera output using a standard off-the-shelf encoder, such as the Haivision Makito, and send through the network to the CDN. These camera signals will then be available to any authorized user for decoding and monitoring.

Off-site Configuration

Monitors for the camera signals are connected to an off-the-shelf decoder and the CDN. Instructions for establishing these connections are available from the decoder manufacturer. Using the same video decoder for all distributed operator locations is recommended as a best practice.

Note: The CGP 500 and CGA can access any camera available on the C2IP network. All camera sources would be available on the CDN. Because control and monitoring are configured in separate systems, there is not an automatic "monitor-follow-control" mode when switching between cameras on the CGP 500 and CGA. For live productions we recommend setting up all video streams to be monitored in advance of the production.

Note: Both the up and down signal bandwidth available for each distributed shading location is important. For best results, a minimum download speed of 8 Mb/s per HD monitor and a minimum upload speed of 1 Mb/s (as noted below) is recommended.

Security and Permissions

Standard networking best practices should always be applied when enabling distributed network access.

Due to its IP-based nature, Creative Grading is prepared for distributed productions across separate physical locations. We recommend the use of VPN connections between these physical locations. In this way, a distributed Creative Grading solution offers the same functionality as locating everything on-site.

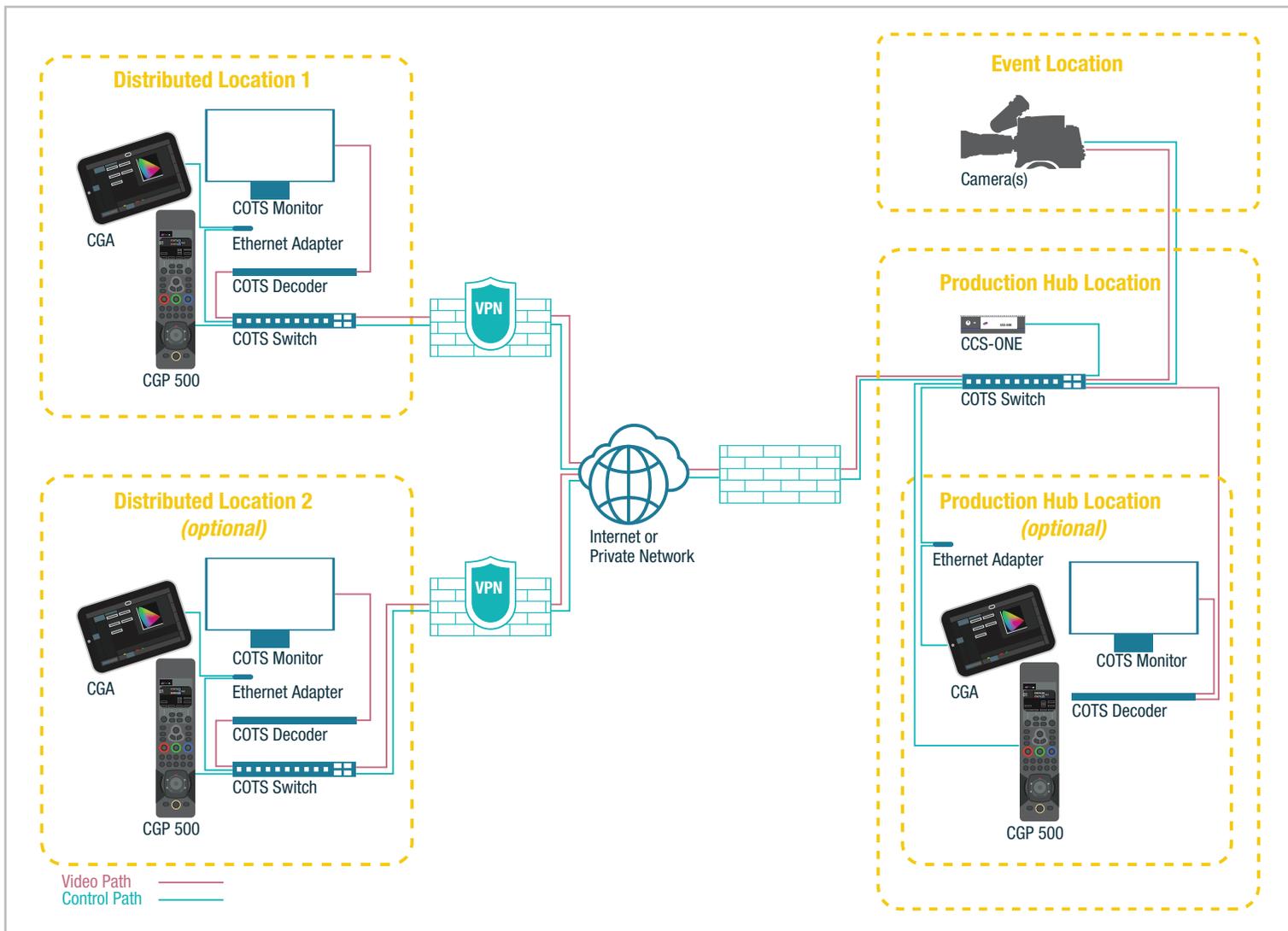
Best practices when using a VPN for Creative Grading:

- VPN-based networks often use different IP subnets. When the Creative Grading solution is spread across multiple IP subnets, a C2IP Nameserver is required to establish connections between components in different IP subnets. This C2IP Nameserver is part of the Camera Connect application running on the CCS-ONE and available with a separate license.
- The IP address of the C2IP Nameserver must be configured in every C2IP-enabled device (camera, XCU, CGP 500 and CCS-ONE). The web-based UI of the Camera Connect application offers an overview of all devices connected to the C2IP Nameserver.
- The C2IP Nameserver is queried by C2IP devices to retrieve IP addresses of devices located in other IP subnets. These queries are only required for connection setup. Once a connection is established, presence of the C2IP Nameserver is not critical anymore. In the unlikely situation that a CCS-ONE fails, it will not affect active connections between CGP500 panels and cameras. If preferred, the C2IP Nameserver can be deployed redundantly by adding an extra CCS-ONE with a second C2IP Nameserver.
- The CCS-ONE can be physically located at any location, as long as it is always available during productions. The CCS-ONE is typically co-located with the XCU basestations.
- The CCS-ONE has two RJ45 Ethernet ports, named C2IP and Public. In a distributed setup, it is recommended to connect all devices, cameras and Creative Grading components (including the Creative Grading App) to the C2IP port, creating one network. This network can be split across different locations using a VPN.
- Off-the-shelf VPN routers (with POE) can be ideal for small and low-cost remote shading sites, minimizing the equipment needed.
- An iPad has built-in support for VPN connections, which makes it possible to connect the Creative Grading App from any location. Dedicated VPN client apps are also available.
- The security of the distributed Creative Grading solution and connections between the different locations depends on the VPN protocol. VPN connections using IPSec offer a secure network across different physical locations.
- The required bandwidth for a distributed Creative Grading solution is minimal. We recommend a minimum of 1 Mb/s, but preferably 5 Mb/s or more. The available bandwidth only affects the initialization and connection setup times, not the real-time performance.

For additional information, please see: [Application Note — Multiple LAN support for C2IP](#).

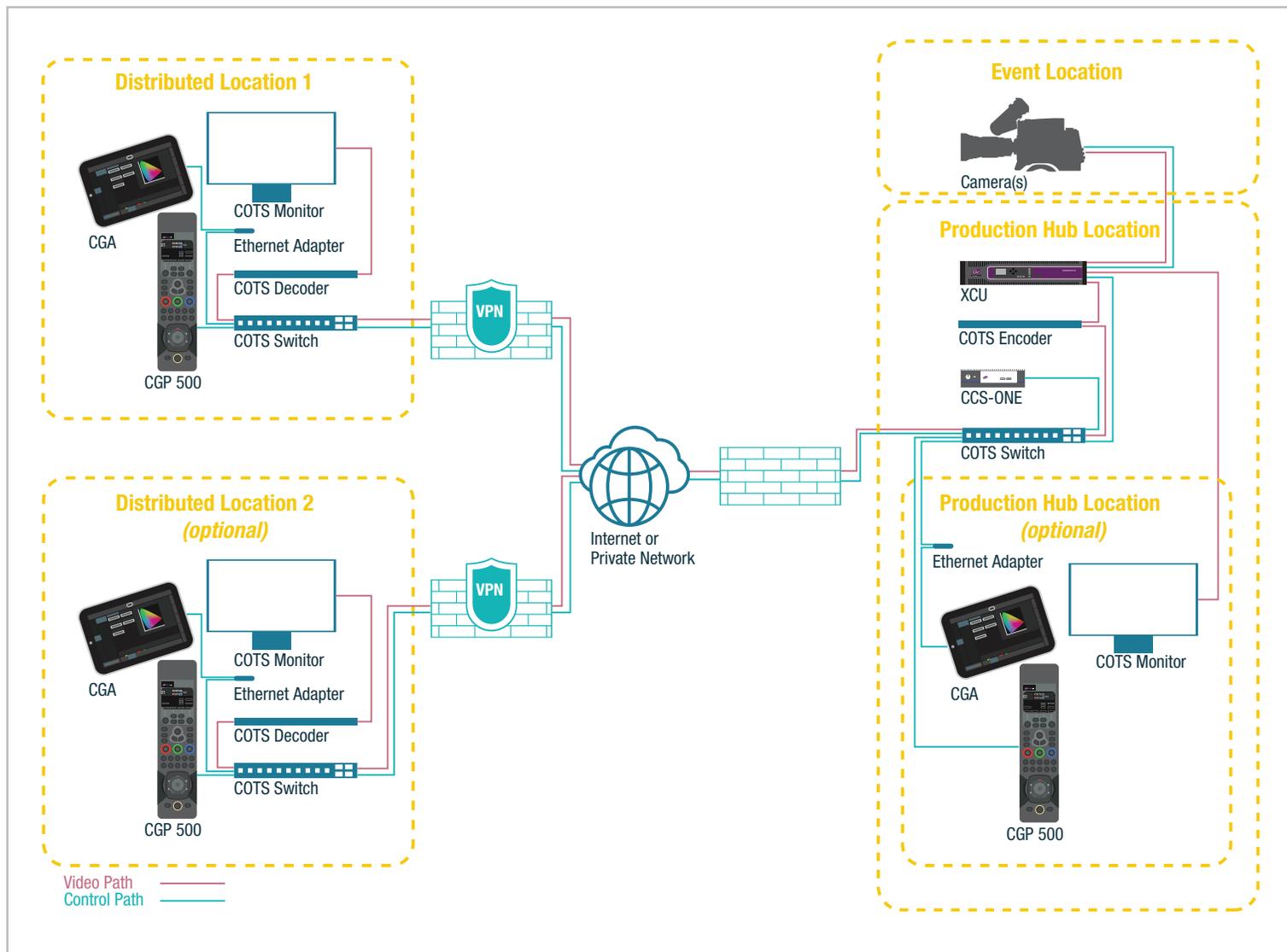
Alternate Configuration: NativeIP

Grass Valley cameras with NativeIP can connect directly over the network to IP enabled devices, including the CCS-ONE and CGP 500. Depending on the desired network setup, VLANs can be used to create a separate control network for cameras, independent from the media network setup.



Alternate Configuration: DirectIP

DirectIP and DirectIP+ enable full live IP remote productions with remote camera locations and XCUs located at a central production center. DirectIP uses high-bandwidth IP networks for the connections between cameras and XCUs. Remote productions using DirectIP can easily be extended with distributed Creative Grading operations. Only the C2IP RJ45 Ethernet port of the XCU needs to be connected to the Creative Grading network to make the camera available for shading.



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