

The Business Case for Broadcast Cameras

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Purchasing cameras represents a significant investment on the part of any content creator. As you investigate the options for your organization, consider the following: What are the long-term commercial and strategic considerations when making decisions about cameras? What are the pressures on broadcasters, outside broadcast companies and the rental houses that serve them? Given the competitive market for live broadcast cameras, how should you make a final decision?

Adapting to Pressures on Broadcasters

The shape of the video/media market is changing. Research commissioned by advertising specialist Thinkbox found that viewing grew by 40 minutes per person per day in 2020 over 2019. Of that, broadcast television accounted for 64% of the total.

Demand for television remains strong, but in an increasingly competitive marketplace. To capture an audience, broadcasters have to play to their strengths. Top amongst them is the delivery of high quality, live television: sports, news and events (concerts, entertainment competitions and so on).

The cost of producing this live television is rising. In addition to the ever-higher payments for broadcast rights expected by sports federations and leagues, audiences expect continuing innovation in production values. That innovation frequently requires additional equipment, and infrastructure bandwidth for improved picture quality.

Another audience expectation that adds to the pressure is the desire to watch that live content on many different devices. Supporting a range of distribution options is complex and requires additional time and equipment expenditures.

Changes in Technology

In technology there is a fundamental shift. For many years, an SDI interface was the only way to transmit a steady stream at what was then considered a high speed. What once required customized hardware connected via SDI is now replaced by IP connectivity. Video and audio signals can now be transmitted with a much higher bandwidth and over greater distances, using standard off-the-shelf IP networking equipment.

While it has taken a lot of work to make IP suitable for broadcast, there is now a widely recognized suite of interoperability standards. This has made the migration towards IP connectivity a practical and secure proposition. It also enables many new and exciting possibilities where all elements in a production can be rapidly configured and made aware of each other.

But SDI and IP will co-exist for many years to come. This is a transition — not an overnight revolution. All broadcast technology should recognize the need to work in a hybrid environment.

Changes in Commercial Models

The move to software-centric technology has brought a major shift in commercial considerations. Traditional broadcast equipment was largely fixed in functionality and scale, and was regarded as a capital investment, written down over a typical working life of five to seven years.

Software systems running on standard computer hardware have a different commercial case. There is a move away from the traditional capital expenditure (capex) basis towards operational expenditure (opex).

In an on-premise data center, the off-the-shelf hardware itself is relatively low cost, and might be expected to be renewed on the same basis as any other computer — after maybe three to five years. It is also possible to outsource the hardware to the cloud, entirely eliminating hardware capital expenditures, while maintaining the expectation that there will be continuing improvements in performance.

The software which creates the broadcast-specific functionality should be regarded like any other commercial software. It will be routinely updated and extended, may have optional feature sets, and is licensed for a specified period of time.

Licensing software typically changes a purchase model from a large upfront payment based on the largest expected capacity of a system to smaller incremental payments based on the requirements of the moment. Not only does this preserve cash for other investment, it allows a much better ROI evaluation of content, as licenses for additional functionality or capacity can be directly linked to specific projects or outputs, and a direct link drawn between revenues and opex outlay.

SOME THINGS CAN'T BE VIRTUALIZED: THE BROADCAST CAMERA

While much of the broadcast technology platform can be transferred to software applications on standard computers, there is still the requirement for some customized hardware. The most obvious of these is the broadcast camera, designed for live coverage of studio or remote events. The function of the camera is to capture light at the venue, so the camera depends upon very specific sub-systems, like the optical block and image sensors. These remain unique to live broadcast cameras.

That is not to say that software does not play a large part in the broadcast camera. The extensive operational functionality is provided by software and firmware applications, housed within the device-specific hardware.

Productions need numbers of cameras — and that number continues to grow — so having an inventory of high-performance cameras will remain a critical part of media production equipment. The choice of preferred camera may therefore lead to significant expenditure if you are buying a fleet of them, so it is vital to make the right decisions.

Considerations for Choosing a Camera

When you make your choice of camera, you need to be sure that you will get high utilization out of it, to spread the cost, and of course you must be sure that it meets your creative and technical requirements. You will be asking questions like:

- ? Should the new camera support HD only or UHD as well?
- ? Is high dynamic range and extended color gamut relevant to your operation?
- ? Do you need to create high-quality slow-motion replays from the camera, calling for a high frame rate?
- ? Will it operate on an SDI network, or have you moved to live production over IP?
- ? Will you always use the cameras locally — in a studio or directly connected to a remote production truck — or have you moved to distributed production model?

You need to answer these questions not just for today's operations, but for the expected lifetime of the camera. Will your requirements change over the next five to seven years? Will your choice of camera meet all your future requirements?

At the same time, the new camera should ideally be compatible with existing equipment. Certainly it should accept standard lenses and mounts for tripods, pedestals and cranes — these, too, are high-value capital purchases which should be retained.

In an ideal world, the camera itself should work with existing base stations. Again, this reduces the new investment and writing off of previous capital expenditure. It also reduces training and acceptance time because staff are familiar with its operations.

Getting answers to these key questions is vital. You are making a capital investment that will last perhaps seven years. You want to achieve the highest possible utilization over that time, and rental houses want the products earning revenue not sitting on a shelf. And, of course, you want them to be operationally and technically viable for the entire life of the investment.

At the same time, you do not want to over-specify and risk spending more than you need. That is particularly important when you remember that cameras are rarely bought individually; the choice of a new camera model typically involves a significant capital investment.

THE GRASS VALLEY APPROACH

In its latest models, part of the LDX 100 Series (LDX 100 & LDX 150), Grass Valley has addressed all of these concerns.

Selection of functionality via software: Drawing on the principles of software-centric designs, the camera is inherently flexible. Internally, it has the processing power to operate at any standard and format, right up to 3x super slo-mo in UHD with wide color gamut.

But all of this functionality is driven by software, selectable at the camera for virtually instantaneous access. So a camera can be providing HD super slo-mo coverage of rugby one day, and UHD capture of an opera the next.

Temporary licensing: Most important for the business case, this switchable functionality is managed by software license, an à la carte system that has been introduced with the LDX 100 Series. This new licensing scheme allows you to enable each individual feature, to make sure the camera does exactly what is required for each specific production. You only pay for the functionality you are actually going to use. And if you find you need something extra, you can add it in moments, even in the field, using the unique NFC functionality within the LDX 100 Series and the LDX Scanner app for Apple and Android.

Licenses can be managed online in a customer-specific environment, so you can select the functionality you need from each camera on a production-by-production basis, meaning that all cameras are capable of anything when you need it. When you want to try a new capability, Grass Valley allows every available option to be tested free of charge for three minutes at a time. For example, this enables you to test the infrastructure before moving to the game. With the flexibility unlocked by IP, features like these are of key importance because the number of possible configurations is huge.

Native IP: The camera connects over a standard, robust SMPTE hybrid fiber cable, familiar to everyone. This is an important feature as this cable is permanently installed in leading sports stadiums worldwide. The LDX 100 Series cameras simply plug in to the existing cabling, eliminating the need for special cables and the expense of rigging them.

The camera output is native SMPTE ST 2110 IP, so it can connect direct to your data infrastructure.

Hybrid operations and reuse of existing equipment: The LDX 100 Series is also compatible with existing Grass Valley XCU Universe camera control units, again for plug-and-play convenience. This means you are free to choose, on a production-by-production basis, whether the output is SDI or IP, or any hybrid form.

If your facility has already made the move to live IP production, you eliminate the need for the CCU, which is replaced by a simple power supply with transparent pass through of the signals on fiber. As well as reducing complexity, it makes for significant savings in rack space: the CCU occupies 2 RU per camera; the power supply and IP connections occupies one third of a 2 RU rack. In cramped installations like outside broadcast trucks, reducing the camera connectivity overhead to one-third saves vital space, as well as cutting the demand on power supplies and air conditioning.

As would be expected, lens mounts and grips are industry standard, allowing the camera to be used with existing stocks of lenses and pan and tilt heads.



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Multiformat image transmission: While we talk about IP, in truth today's standards allow the use of a number of codecs and interface standards. 3x super slo-mo in UHD delivers a native 48 Gb/s stream. This is because the camera outputs the three razor-sharp phases, as well as a combined signal which delivers an additional feed with the visual impression of a "normal" single-speed camera.

The Grass Valley approach to super slo-mo means that it isn't just a specialist camera, but can also be used as a normal production feed simultaneously, matched to the rest of the production cameras, making it a very cost-effective position. If you have 100 gigabit Ethernet available, the camera can deliver the required 48 Gb/s without problem. But if only lower bandwidths are available, the camera has the ability to output at a range of bitrates.

Particularly important is support for the new codec standard JPEG XS. This is rapidly becoming the de facto standard for high-quality delivery over restricted bandwidths. It achieves excellent image compression with very low latency — only 12 television lines, regardless of the format — making it ideal for contribution circuits, whether around a large event like a golf course or for remote production when the camera output is carried over the internet. The very low latency is of particular value in remote production when multiple cameras have to be resynchronized in the distant control room and you want to be as close to reality as possible for all the obvious reasons.

To meet the needs of different codecs and bitrates, Grass Valley has adopted the simple method of connectivity through SFP. The small form-factor plug-gable (SFP) transceiver is a standardized and widely recognized interface module concept in the IT industry. It allows you to choose the IP bandwidth that best fits the infrastructure and video bandwidth available, today as well as in the future. The LDX 100 Series offers room for one 100 Gb/s QSFP and two 10/25 Gb/s SFPs. You simply open the SFP bay at the side of the camera and connect the fibers directly to the appropriate SFP.

The option to connect two 10/25 Gb/s SFPs in the camera allows you to use bidirectional SFPs. Each SFP communicates bidirectionally over one of the two fibers in the SMPTE cable, to a redundant connection direct from the camera.

Shading that reduces time and personnel: One final and very important point is that the camera supports Creative Grading — Grass Valley's new and revolutionary way of camera shading. It consists of two main ingredients: First is a new control panel with many more continuous controls to balance any live condition while on-air. Second is a completely new graphic user interface that shows you exactly what you are controlling in a visual way.

When required, Creative Grading can apply a distinctive look to suit the needs of the production. This means that the director's intentions can be realized out of the camera, saving a time-consuming post production process.

Conclusion

Selecting a camera type is a difficult decision, particularly as it may involve a large number of units and commitment to a particular choice for a lengthy period. Ultimately, the choice will be determined by:

- ✓ Uncompromised image quality
- ✓ The ability to meet the requirements of today and tomorrow, in terms of output resolution and connectivity
- ✓ Compatibility with camera accessories and the rest of the production chain
- ✓ Familiar and secure operation
- ✓ Creative capabilities, including high-quality slow-motion replays and advanced color grading
- ✓ A solid investment case

The LDX 100 Series from Grass Valley, through its inherent flexibility, is unique in delivering on all of these requirements.

Grass Valley Creative Grading, consisting of a newly designed controller giving shaders more control and a tablet app to visualize changes in real time as a shader makes them.



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