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## The transition to 3G for Events signal distribution

### The history

The Events industry has seen a significant amount of change in signal distribution over the last 30 years. We started with composite and component video signals, which, while easy to distribute, didn't offer the highest resolution or quality over long distances. As projection technology increased in resolution and clarity, there was a need to pull video signals directly off of computers in the native RGBHV format provided by the video card. As signals turned digital, DVI became the new standard. Today, computer video signals still provide the biggest challenge in the Events industry.

Many may remember alligator clips connected to the video cards, followed by the amazing discovery of the computer interface that would give us an analog RGBS or RGBHV component video signal with minimal effort. RGBHV is still a very active signal type in the Events market, although not optimal for projection or transmission over long distances. Remember, the spec for VGA was previously only six feet of cable length (max). Then, along came DVI with the promise of "digital signals" (remember the buzz?), featuring no loss and perfect pictures everywhere, as long as cable length did not exceed 10 meters.

Today, we achieve long cable runs through the use of costly and fragile DVI-to-fiber converters, or even worse, a long VGA cable. And, while HDSI showed early promise, 1080i still has not been widely accepted by the corporate events industry. After eight years of pushing DVI's progressive signals into the minds of Events professionals, we're finally seeing a new, promising alternative. Here comes 3G HDSI, the higher bandwidth "big brother" of 1.5Gbps HDSI. Is this the solution we have been looking for? Brace yourselves: it's time to dust off the coax cable – we can run copper again!

### What is 3G

3G is the latest HDSI spec from the SMPTE gang, called SMPTE 424. 1.5G HDSI, or SMPTE 292, is capable of 1080i @59.94 at best. SMPTE 292 supports 1.5 Gigabits per second stream of data. 3G brings us into the world of 1080p @60. It has twice the bandwidth to enable 3 Gigabits per second in the data stream. With the bigger pipeline, we can send full 1920x1080p@60 down a single coax cable.

By going progressive, not only do we gain better clarity in fast motion, but also better lip sync for our live camera images. Since the input cards in the displays do not need to de-interlace, we can scale and convert much faster. And, because most of the high light output projectors have a 1920x1080 native resolution, we can push the signal straight through to the DLP chip with minimal processing.

### Benefits of 3G

*Increased distance.* 3G enables a usable distance of about 75m (246')-130m (426') depending on cable type, so no fiber is needed. Additionally, 3G has a 10-bit color depth, where DVI only supports 8-bit.

Blending with 3G looks great, and is an HD video signal -- so no extra conversion is required for the record feeds once the record devices support 3G.

*Industry-standardization.* 3G uses standard broadcast equipment for routing and distribution, so there is a wide range of professional products at your disposal. From distribution amplifiers, to re-clockers, to matrix switchers, you should have no problem finding the right method to move your signal. It is practically a requirement for a modern broadcast switcher to leverage 3G. While older analog and SDI switchers are unable to handle the 3G signals, many of the newer presentation systems are 3G ready. Some manufacturers are even making upgrade kits for their older digital presentation systems to support 3G distribution to projectors and displays.

*Easy implementation and maintenance.* Most of the high bandwidth copper cable is already rated for 3G. Field repair of the cable is easy, with most technicians are able to replace a BNC connector in about five minutes. When the signal must extend beyond 130 meters, re-clockers or one of several professional fiber options available can be used.

## What 3G is not

Currently there are a limited number of sources that output 3G. Cameras and playback devices are starting to emerge, but there have been some delays in market and product proliferation. Even so, the benefit of 3G for distributing signals to projectors and monitors cannot be overstated. Most of the long haul applications are not for playback sources, but for a projector or display far away from video village.

While 3G is 10bit color and the color information is lightly compressed to 4:2:2, DVI gives us full 4:4:4 with a full color information per color. This illustrates the give and take of video signal distribution: better color depth with 3G, or no color compression with DVI. 4:2:2 compression can be slightly noticeable in certain graphics sources, but for the live event environment, it is typically not an issue. The increased color depth of 3G will generally win when blending projectors for widescreen applications.

The consumer graphics cards have not embraced HDSDI as an output standard, and are moving toward HDMI or DisplayPort. Most computers will still need to be converted to 3G using professional signal converters that support 3G outputs.

One limitation of 3G is that it is limited to broadcast video resolutions. Many events are using 16:9 aspect ratio screens, so it is not a problem to send either 720p or 1080p to the projectors. 4:3 aspect ratio screens can still use 3G, but the signal needs to be cropped or scaled somewhere in the signal chain. Also, most 4:3 projectors do not have 3G or HDSDI inputs. If a native XGA, SXGA+, or WUXGA format is required, you will still need to convert the 3G to a DVI or analog signal at the projectors.

## Conclusion

While 3G will not solve all the signal distribution problems in the Events market, it does answer the long haul signal challenge for most events. While DVI will still be required for intense graphics environments like simulation or virtual reality, 3G provides the ideal approach when using IMAG (live cameras) and PowerPoint presentations with embedded computer demos and video playback.

# White paper

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The budgetary benefit of moving to 3G cannot be ignored. The labor savings alone is a great reason to switch. No longer will you need to re-run cable because the first install was backwards or potentially destroy the fiber when pulling through conduit and truss. You can also say good-bye to providing additional power to the projector for the fiber receiver. Spare lines or cases of spare cable can be provided without affecting bottom line profits of the staging company. Soon over/under coiling will return, replacing the expensive and bulky reels for the fiber runs. The projectionist can relax when it comes time to feed the projectors, rather than worrying over which feed will break this time. The engineer will no longer bark at you when you step on the fiber cables, and your beautiful black truss will no longer be adorned with blue and orange streaks.

Quite simply, signal distribution can go back to what it used to be: simple.