

(This whitepaper was ghost written for someone else, a common PR practice.)

Revolution in Realtime:
Live Broadcast Graphics Accelerate and Proliferate
By: Petter Ole Jakobsen, chief technology officer for Vizrt, Bergen, Norway

Technological advancements in graphics creation software and processing hardware have impacted the volume and quality of graphics that broadcasters can generate for live programs as well as the very way they work.

In the last 15 years, the broadcast industry has seen an incredible revolution that has transformed the viewing experience by enabling a virtually unlimited creative palette and dynamic eye candy effects.

To fully appreciate how dynamic the live broadcast graphics business has become, we need only look back over the last 15 years. The first live graphics systems were limited to relatively simple moves like spins, warps, flips, and page turns. And early versions of character generators did just that—generate characters on screen.

Because of this, an entire control room full of equipment—including the production switcher, DVE, CG, and still store—needed to be pressed into service to create sophisticated, multilayered looks, especially for live sports telecasts. Or graphics packages had to be outsourced to post houses and boutiques that charged stations hourly to build all the graphics roll-ins and channel branding pieces broadcasters needed.

Realtime 3D Animation

While the term live broadcast graphics refers to push-button triggering of realtime graphics during live applications, such as newscasts, sports, elections, and special events like concerts and award shows, a good deal of the work takes place in advance. Graphics must be designed and in some cases rendered; 3D animated elements need to be imported from 3D animation systems; and other post production finishing may be needed to give the graphics an enhanced, polished look.

In just a decade, the character generator has grown to become a live graphics system; and many of the high-end models now incorporate 2D, 3D, HD, SD, animation, production, and delivery tools in one system.

The 2D systems dominant in the 1990's—many of which were designed to give the illusion of a 3D look—have yielded to realtime, 3D-animated graphics systems. Realtime 3D animation is fast-becoming the standard for live graphics for broadcast news and sports.

Increased Reliability

Well into the 1990's, broadcast customers still relied on dedicated, proprietary graphics systems because they believed that these black boxes were the only way to get sufficient processing power to fire up live broadcast graphics. In fact, when Windows-based systems first appeared, there was justified distrust in their reliability as everyone feared they would crash in the middle of a live show.

Today, most live broadcast graphics systems are PC-based, and the high-end models have proven their ability to deliver enough processing power to handle realtime output of multiple channels of 3D animated graphics, text, video and audio, in HD, SD, or a mix of the two.

Automated for Efficiency

We also see features being built into high-end live graphics systems that are intelligent enough to adjust the position of one graphic on the screen to make room for a new one that is joining it. This capability is intuitive enough to adjust the composition on-the-fly without an operator's manual intervention.

As a result of these advances, broadcasters need fewer operators and gear to man a live show, which means that they can lower production costs without compromising production standards. Also, broadcasters view the ability to distribute their branded content to multiple outlets as critical for broadening their audience and generating new revenue streams.

Distribution to Multiple Outlets

Today's live graphics systems are also revolutionary in that they can handle a wide range of resolutions and formats—from widescreen, high-definition resolution; to SD 4:3; to formats for the Web; and even scale down to the display requirements of a cell phone.

We're moving into a world where the multilayering of graphics, and the positioning of foreground and background elements, will be a function of the distribution of those graphics and their display on various devices.

While today, graphics are composited in the production control room and sent out as part of the broadcast signal; in the future, graphics elements may be sent separately to different devices, such as the STB (set top box), the PC, or the cell phone, where they would then be pulled together into a single, multilayered composite on-the-fly as the image displays.

Also, some of the graphical elements can even be customized or personalized at the point of delivery per the particular display medium or viewer's interests, location, or demographics. Broadcasters may find that this is a clever, easy way to generate new revenue streams without drastically altering their business models.

Distributed Creativity

The workflow has also been irrevocably impacted. Compared to the days when only the artist could sit at an expensive graphics workstation and design the graphics, journalists and producers can now actively participate in the graphics creation process.

As graphics creation software has become detached from the processing hardware, such as the rendering engine, the creative process can move to less expensive laptops, desktop PCs, newsroom computer systems, networked across the station's operation.

People can now do what they do best. The graphics artist can concentrate on creating an innovative graphics look that can serve many graphics needs at that station or network. Artists can also ensure that the established channel branding image remains consistent from one graphic to the next.

Not that long ago, journalists and producers would tell the station's resident artist what graphics would be needed, and the artist would then go and create each graphic individually.

Template-based Graphics

Today, however, there is a growing trend for artists to create a single graphic that then serves as a template that non-artists can fill with specific information, without affecting the graphics look. A sports template might be designed to designate places for the player's name, position, and player stats, as well as the team's name and logo.

With template-based graphics, the journalists and producers who are most familiar with the details of the news or sports story can enter the names, places, and video and audio elements for that graphic—and get them ready in time for the next newscast or sports show. All of the creative attributes that the artists built into the templates—such as shadows, 3D moves, banners, colors, and font styles—do not change when the user fills in the content.

Instead of having to create a dozen or more graphics for every member of the team, only one graphics template is needed because the content can be repeatedly changed without building the graphic from scratch. They can stamp out versions of a graphic while maintaining a consistent on-air presentation.

Broadcasters are finding this technology to be a significant time-saver; and one that also enriches their live shows with more unique graphics than would be practical for an artist to create from scratch.

Data-driven Graphics Templates

The latest trend in live broadcast graphics takes the idea of the graphics template one step further. Many high-end graphics systems now support RSS feeds, and other third-party data feeds, that deliver timely, realtime data—such as sports scores, team statistics, stock prices, and polling results—and feed them directly into the graphics templates. Values, such as percentages, can be used by live graphics systems to generate bar graphs and pie charts, among other visuals that help viewers better understand the information.

This capability has proven to be particularly useful during fast-paced, data-driven events, such as election coverage or major sports telecasts. Since this process is automated, graphics can be created live, on-the-fly, without data entry errors. And broadcasters can generate an impressive quantity of live graphics, far more than could be created manually, because a single graphics template can be used over and over, and automatically refilled as new or updated data streams in.

While realtime, data-driven 3D graphics displays were considered a luxury that only national networks could afford, today we see smaller broadcast operations, such as local market stations, adopting the technology because the costs have come within reach.

Image Tracking for Graphics

Graphics templates can also be filled or influenced by other live data sources, such as camera tracking or GPS (Global Satellite Positioning) coordinates. We've seen this type of technology used for auto racing, marathons, horse racing, or other instances where cameras and/or GPS tracking devices are placed on moving objects.

This data is then relayed back to the graphics systems to enable them to position the live graphics relative to the moving objects so that the graphics follow the objects wherever they move on the screen. For example, a flag displaying a car's speed, driver, and position can be made to stay right above that respective car as it whizzes around the track.

With image tracking technology, sports graphics have become an integral part of the sportscast itself because graphical objects can be keyed or superimposed onto specific spots on the playing field. NFL games routinely employ a yellow line—known as the First and Ten line—across the football field that serves as a first down marker. And many soccer games key bright lines onto the playing field to show off-side lines, or the distance from the kicker to the goal.

In addition, sports, such as baseball, key ads directly onto stadium billboards or displays behind the batter. And swimming events can key ads so they appear to be at the bottom of the pool. By overlaying graphics onto the playing field, broadcasters can realize a new advertising revenue stream, as well as give their sophisticated viewers a better understanding and analysis of the game.

3D Virtual Sets

Another significant trend in live broadcast graphics has been moving graphics from the control room to the set. While over the shoulder graphics have commonly been keyed behind news anchors, over the past decade, we have seen 3D graphics come to fill the entire background of the set—an effect made possible by Virtual Set Systems.

With the use of camera tracking technology, the perspective of the graphics can be tied to the movement of the cameras. As the camera pans, tilts, zooms, and trucks, the graphics background moves accordingly for a more realistic viewing experience.

The advantage of virtual sets is that a small studio can be used to produce a variety of set-based shows—talk shows, magazine news shows, sports wrap-ups, and more. Changing the set or the look of a show is as easy as keying a different 3D virtual environment into the blue or green screen. For this reason, virtual set technology can be a more affordable alternative to building and storing large, elaborate, physical sets.

The disadvantage of virtual sets is that the talent is surrounded by a solid blue or green screen or cyc (cyclorama), making it difficult for them to react to the graphics display unless they are looking at a reference monitor that shows the video-graphics composite. Another criticism of virtual sets is that they can look cartoonish or like video games, which might not be appropriate for a serious news show.

However, the virtual set has been widely embraced in places that don't have a tradition of using physical sets, or unionized crews that make their living building physical sets. In many ways, broadcasters in emerging countries have leapfrogged over legacy technology, with no resistance to change impeding their progress.

Interacting with Video Walls

Compared to the virtual set, the video wall is a much simpler technology that doesn't involve complex camera tracking and calibration, or realtime rendering of large graphics image files. A video wall can be HD or SD; and a single, large-screen plasma monitor can be used to display many individual video sources.

Since it is a more accessible yet splashy effect, the video wall is gaining in popularity as an effective way to splash live graphics prominently onto the live set, especially when space is not an issue.

CNN's "Situation Room," "Oprah," and ABC's "The View" are among the high-profile television shows using video walls. In fact, CNN has a single monitor with eight to ten displays of moving video.

With video walls as part of the set design, the talent can see the graphics and video running on the display; react to people being interviewed from remote locations; and interact with the video like a teacher pointing to a blackboard.

Moving towards Integrated Production

As the set becomes a more dynamic environment of moving images, we're likely to see a trend where anchors and talent finally get up from their chairs—and the way news and information has traditionally been delivered on television—and stand in front of the images and interact with the video.

As we look to the future, the trend will be for more production capability to be integrated within a single system so that one operator can take charge of all aspects of a live broadcast, including realtime graphics. And we will see a proliferation of graphics in a wide range of resolutions and formats, pushing the envelope for creative expression on

the biggest to the smallest screen. Not only are 3D graphics being used to enhance the live broadcast; they are also becoming an integral part of the studio set.

Judging by the way that the live graphics business has evolved, in the future, we're likely to see more firepower within live graphics systems, and these tools will enable a greater volume of eye catching, 3D animated graphics to be produced for distribution to a wide array of media devices.

END