Times Square's Digital New Year's Eve Ball

A revered tradition gets a very modern upgrade for its 100th birthday

By: David Barbour

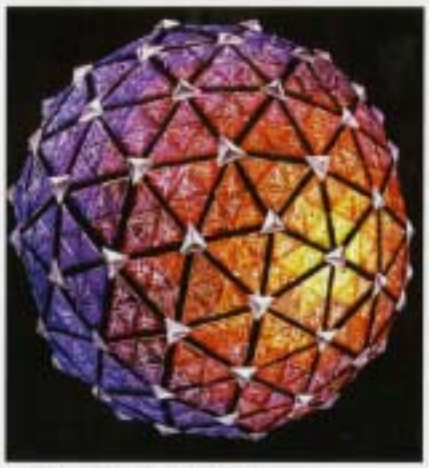

Fig. 1: A Rendering of the ball.

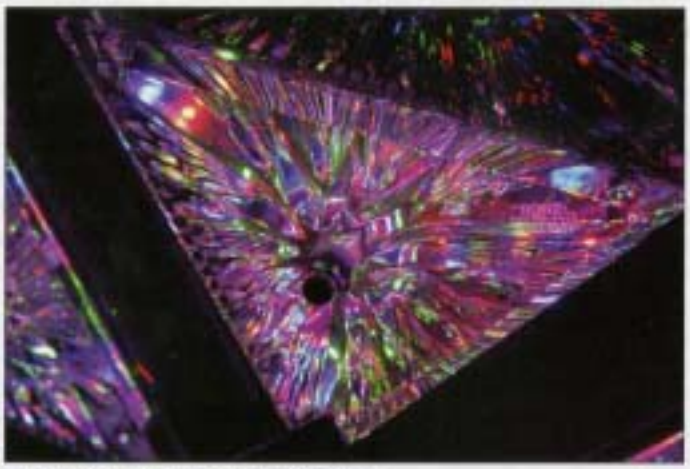

Fig. 2: A close view of the illuminated crystal.

This year marks the 100th anniversary of the dropping of the Times Square Ball on New Year's Eve—and, for 2007, the tradition has been redesigned and re-engineered for the 21st century. Taking advantage of solid-state technology, the design team at Focus Lighting has transformed the ball into a glowing crystal asteroid that is certain to make a big impression. Working with Countdown Entertainment, the sponsor of the New Year's Eve event; Waterford Crystal, the maker of the ball; and a number of entertainment technology specialists, including Philips Lighting, Hudson Scenic Studios, and E:Cue Lighting Control on the project, Focus has given this revered tradition an entirely new look, while honoring its storied past.

The history of the ball

The first New Year's Eve Ball dropped from One Times Square in 1907. It was constructed of iron and wood, contained one hundred 25W bulbs, was 5' in diameter and weighed 700lbs. (Today, one imagines, it would barely be visible.) It was replaced in 1920 with a 400lb. ball made entirely of iron. For a century, dropping of the ball has been an annual event, except for 1942 and 43, when wartime dim-out rules applied.

The ball was redesigned in 1955; the new version was made of aluminum, cutting the weight to 150lbs. The next major do-over was in the '80s, when the implementation of red light bulbs and a green stem turned it into an apple for the famous "I Love New York" campaign. The next major upgrade was in 1995, when the ball got an aluminum skin, rhinestones, strobes, and computer controls. Then in 2000, for the millennium celebration, a new ball, designed by Waterford Crystal of Ireland, was implemented.

In 2006, says Jeff Straus, president of Countdown Entertainment, "We knew we wanted to do something special for 2007, the hundredth anniversary. We put out a request for a proposal, with Waterford and Philips Lighting. Part of our brief was to include LED technology. We wanted to maintain the ball's tradition, but we wanted to use new lighting technology. We also wanted a plug-and-play philosophy—the old ball took three days to assemble, plus testing. The new ball can be assembled in a day."

Focus Lighting—Paul Gregory, principal lighting designer, Christine Hope, project lighting designer—won the competition. According to a statement from Focus, "The challenge was to explore and enhance the brilliant facets of the Waterford crystal, creating the appearance of a sparkling gem in the above Times Square—not only for the more than one million revelers below, but also for the more than one billion television viewers worldwide."

The ball that Waterford designed for this year's event is named "Let There Be Light;" it's the first of a series of designs, which fall under the rubric "World of Celebrations." This year's ball features a stylized, radiating sunburst made of 672 Waterford crystal triangles, an increase of 168 triangles over last year. The additional triangles replace the areas previously occupied by lightbulbs and their bases.

The crystal triangles measure 4.75" to 5.75" on each side, and are approximately 3/8" thick; each triangle weighs 6.8oz. For the first time, the triangles will feature cutting on both sides (more

Good Morning America broadcast earlier that day, it was run at 5%.) "We looked at a wide range of control systems, trying to find the right mix of theatrical programming with video mapping," says Jeff Shepard of Focus Lighting.

The lighting cues, like the ball drop, and just about everything else associated with the event, will be controlled by SMPTE time code linked to the music and video feeds. The control center for the event is located on the roof of One Times Squsre. (The actual space is an elevator machine room.)

When illuminated, the ball glows eerily brightly, its geodesic structure reminding one of an asteroid in a science fiction film. It will be on display at Macy's Herald Square store, November 7 through December 12.

"We wanted to take a very theatrical approach," says Gregory, who adds that the ball is designed to work for the event's many different constituencies. "We analyzed different views of the ball, depending on the location of the audience. A person standing 10' away will experience the beauty and intensity of each individual crystal triangle. A television camera from 50' away will enable television viewers to experience the kaleidoscopic moving patterns of light and color radiating from the crystal triangles. A reveler celebrating 500' down on the street in Times Square will see the intricate colorful moving patterns of light sparkling in the sky. Each view of the ball will be equally dramatic." Expect cheering crowds on December 31.

Fig. 7

Fig. 8

Fig. 9

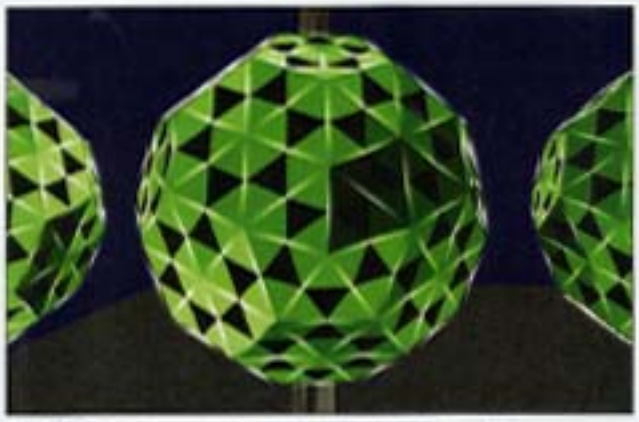

Fig. 5: An Ecue screen capture, showing the pixel mapping.

Fig. 6: Another image from Ecue.

look like from five different directions. (A custom patch file was required to map the video file, which is square, to the globular ball surface.) The software can play up to 24 lighting cues at a time, and there is no reasonable limit to the number of cues a show can store.

The control system is 100% redundant; in the event of a lighting server failure, a backup server will immediately take over, without so much as a hiccup in the show's playback. In the extremely unlikely case of both servers failing, playback units in the equipment rack can be pre-programmed to operate in stand-alone mode.

Because of the LEDs' color capabilities, and the pixel-mapping function of the Ecue system, it is possible to create all sorts of new effects that have not been seen before (Figs. 7, 8, and 9). This was evident when the ball was shown off at a press conference at Hudson Scenic Studios, where it was built. Put through its paces, the ball did rainbow patterns, arrangements of colored triangles, color sweeps and chases, and pentagrams. (Gregory pointed out that the ball, which was extremely bright, was run at about 20% at Hudson Scenic; for a TV feature on

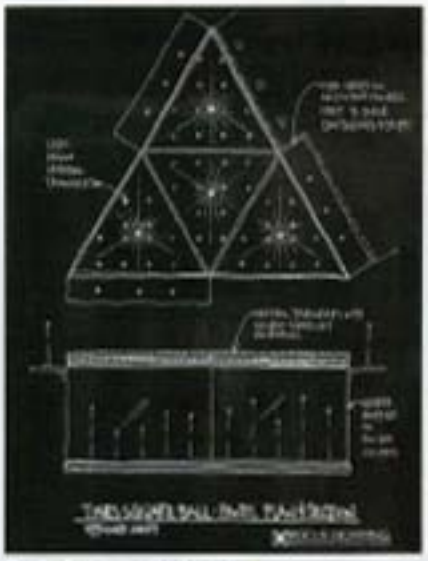

Fig. 3: A plan for the housing.

Fig. 4: A plan showing the mirrors' structure.

about his later). They are affixed to the outer skin of the ball via a single nut and bolt, to compensate for the differences in the coefficient of expansion of the crystal and clear acrylic.

Embracing the crystal

The point of the Focus design was to make a larger-than-life effect; it's Gregory's signature style to look for the theatrical element in each of his firm's designs. Various ideas were floated, including the notion of having the ball expanding on telescopic arms as it descended, as well as the use of very narrow laser beams clustered at the center of each crystal to create rays of light shooting into the night. There was also talk of mounting the crystals in a three-dimensional pyramid shape, creating a ball structure that was more pronouncedly crystalline. Ultimately, the decision was taken to enhance the beauty of the existing ball structure (Fig. 1: Rendering).

At the same time, Focus wanted to exploit the ball's reflective qualities to the fullest, so Waterford was asked to create a pattern in which the crystal was cut on both sides, in order to create better refractions of light. Meanwhile, Focus worked with Philips to install solid-state lighting technology that would dramatically increase the efficiency, brightness, and color capabilities of the ball. Thus the 600 lightbulbs used on the previous ball were replaced by Philips Luxeon LEDs, the vast majority of which were placed behind the crystals in the ball's interior (Fig. 2).

However, tests with the LEDs revealed a new problem; they created vibrant colors, but the lighting's full effect was muddled by the multiple layers of refraction from the crystal triangles. A series of mockups was created that led to the development of a mirrored baffle that isolated each crystal triangle into its own chamber of light. (The mirrors were provided by Dickmann Manufacturing.) This structure enhanced the colors produced by the LEDs and added a series of infinite mirrored inner reflections that gave the brilliance the designers were looking for (Figs. 3 and 4).

Focus also added a second layer of LEDs, tracing out the lines of the ball's geodesic structure; this created a look that revealed the ball's skeleton, which also added a glint of front light on the crystals. The surface LEDs are pure white, creating a strong contrast to the colored LEDs of the interior.

The ball, which is 6' in diameter, contains 9,576 LEDs in red, green, and blue, each of which can be controlled independently. The units had a lifetime of 50,000. The red LEDs use 2W of power; the green and blue use only 1W. Overall, says Philips, it will take only 24W of power to operate one red, one green, one blue, and one white bulb on the ball, compared to the 180W required to run the equivalent bulbs last year; this represents an 87% reduction in electricity consumption per four-color series. Susan Bloom, director of corporate communications for Philips, says that the same amount of power that runs the ball could be used to run ten toasters.

Making the LEDS work

Each of the 672 triangles is backlit by 12 LEDs—three each in red, green, blue, and white. The triangles are divided into groups of four fixtures to make up 168 modules, or main triangles; each module consists of an LED circuit board, a mirrored baffle to separate the triangles and multiply the individual points of light, and the four crystals. The chamber, which contains all of these elements, with the crystal affixed to it, is approximately 3.5" wide. LED Effects did the engineering of the mirrored chambers. ("Waterford did studies to understand the heat differential—the difference between storing the lights inside the chamber, as opposed to placing them on the ball's surface," says Gregory.) Each side of the triangle has an additional white three-LED fixture that interlocks with other modules to form the skeleton of the ball. The skeleton lights are placed inside plastic cases that contain three LEDs each.

The ball receives 3,226 individually controllable channels of data, each with 256 unique settings. Every small triangle consists of four channels: One each for red, green, blue, and white. This apparently gives the ability to create more than four billion colors, which are, in any event, more than the human eye can distinguish.

The ball uses DMX512 protocol; although its 3,000-plus channels could fit into as few as seven DMX universes, nine were required for the ball to be broken up into three equal pieces for easy shipping. It is controlled by the E:cue system, which is a PC-based programming and playback interface; E:cue staff devised a custom show file specifically for the ball, which allows designers to map 2-D images on the ball's 3-D face, and to mesh video graphics with standard lighting cues. (Figs. 5 and 6.) Video and static and images can be mapped to the ball simultaneously with a wide variety of effects. Using the E:cue visualizer, one can see what the ball will