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Data visualization focus - starts on Page 26

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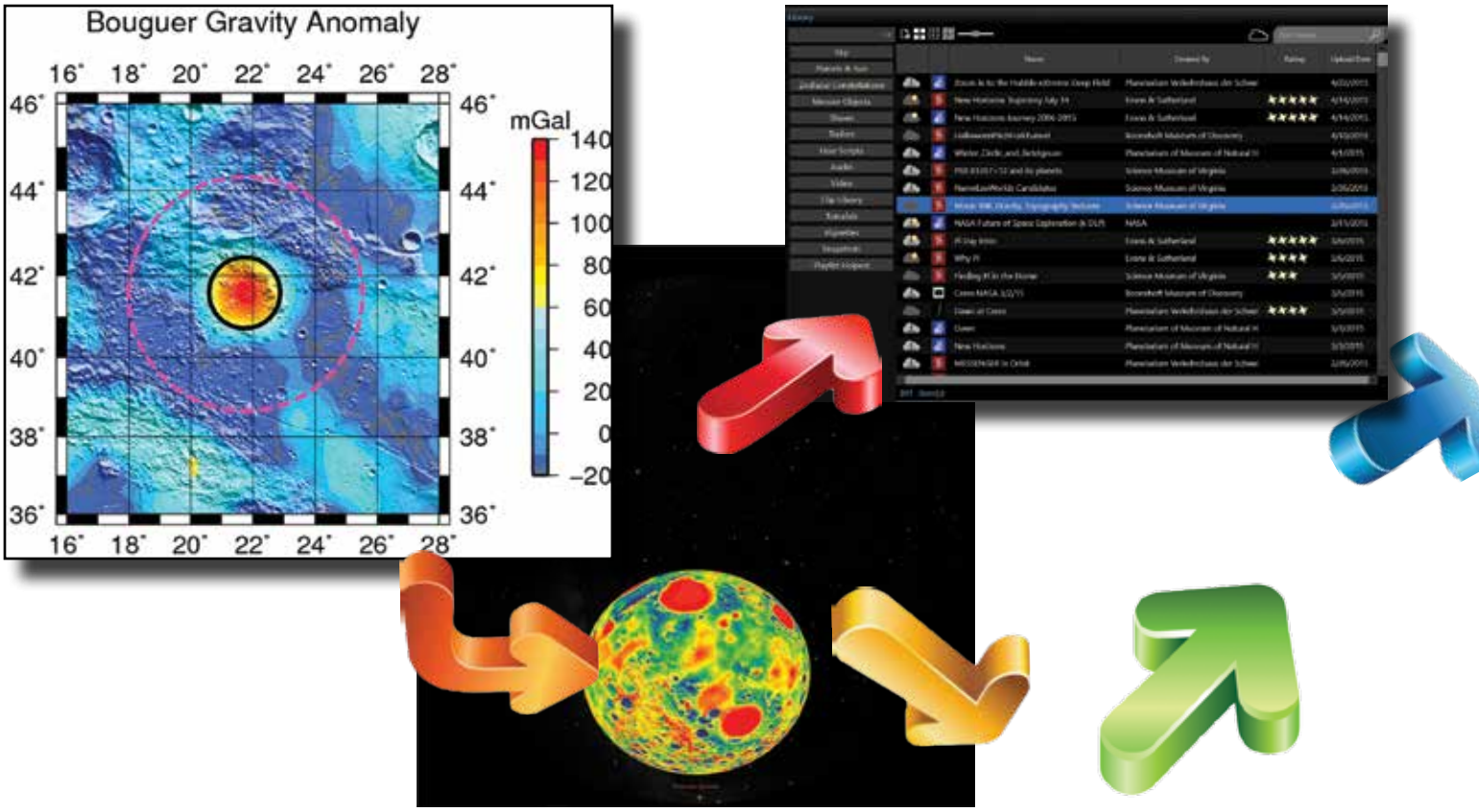


Hopping on the cloud to sharable media

By Joe Kleiman and Judith Rubin

On the morning of March 17, 2015, Justin Bartel, Fulldome System Lead at the Science Museum of Virginia (Richmond), read the news that scientists at Purdue University had located a giant, buried crater on the moon by studying data from the GRAIL spacecraft. They had named the crater after famed aviator and former Purdue faculty member Amelia Earhart.

Bartel wanted to incorporate something about the crater into that day's live shows, to be presented on the Museum's 8K Digistar 5 projection system in The Dome. He obtained a high-resolution map from NASA, which he incorporated in fulldome video format.

In addition to being able to share it with audiences the same day, he was able to immediately share his accomplishment with other D5 users by uploading his modified maps into the Digistar Cloud Library.

Free content

Designed to facilitate a community of planetarium professionals freely sharing their abilities with their colleagues in the easiest way possible, the Digistar Cloud Library has caught on quickly with users since its introduction by Evans & Sutherland in May 2014. The library is a free feature, integrated into the infrastructure of the E&S D5 system. All the content designed and uploaded by users is free to all other users.

In the planetarium industry, this can help operators get more out of tight content budgets and create better shows. The collaborative nature of the product paves the way for the content shared in the library to be current and of high quality. (This refers to in-planetarium use. A user wishing to apply shared elements from the Library to a commercial show would need to proceed more formally.)

Its efficiency as a vehicle for users to share content with one another and the power it gives to enhance production of live planetarium shows are why Michael Daut, director of Show Production/Marketing at E&S and his colleagues describe the Digistar Cloud Library as "revolutionary."

We spoke with four users in the United States and Europe to find out how they're employing the Digistar Cloud Library:

- Joe Childers of the Boonshoft Museum of Discovery, which features a 102-seat, 15-m dome theater in Dayton, Ohio.
- Christian Koeberl, executive director of the Naturhistorisches Museum Wien in Vienna, Austria, home of a new, 60-seat planetarium with an 8-m dome featuring a 10 degree tilt. This is the museum's first planetarium.
- Justin Bartel, Science Museum of Virginia. The museum's former IMAX dome theater was upgraded to "The Dome" with an 8K D5 system with 3D capabilities. The 243-seat theater features a tilted, 23-m dome.
- Rainer Christiansen, Menke Planetarium, Flensberg, Germany. The 55-seat theater with a non-tilted, 6-m dome upgraded in 2011 from an opto-mechanical system to Digistar 4, and in 2012 installed the first D5 system in Europe.

Sharing the wealth

The Cloud Library is continually modified with regular updates added by E&S as well as by a growing number of users' contributions. All D5 users can access the materials for live shows, as did Justin Bartel with the GRAIL spacecraft story. They also have the ability to share scripts that can be downloaded and customized to the needs of their particular venue.

In the course of doing so, they learn from one another, and skills as well as resources are shared. By observing how colleagues create complicated scripts or packages, for example,

Facing page, left: The Earhart crater, a previously unknown lunar crater, is outlined in the magenta dash circle. A team of researchers at Purdue University found the crater through an analysis of data from NASA's Gravity Recovery and Interior Laboratory mission. The team provisionally named the crater Earhart, after the famous aviator Amelia Earhart. Purdue University image/courtesy of Rohan Sood.
Center: Image from Science Museum of Virginia's demo showing a texture map from NASA in the Cloud Library, and (right) a screen shot of the Cloud Library with the center image highlighted. Both courtesy E&S.

users may improve their own programming skills. Likewise, E&S can observe and learn how to improve the product.

Ben Buckwalter, E&S Software Engineering manager, said, "We went through an extensive beta testing process with our D5 users to determine what features best met their needs and we continue to listen and improve upon the system based on our Cloud users' input."

Cloud users get things early as well as often: Nathan Hanson, a senior software engineer with E&S, noted that the distribution of packages and content directly from E&S makes them readily and immediately available, as opposed to having to wait for a scheduled software update. Based on the information gathered for this article, E&S Cloud users quickly get into the habit of checking the library numerous times a day to see what's new.

Storage details

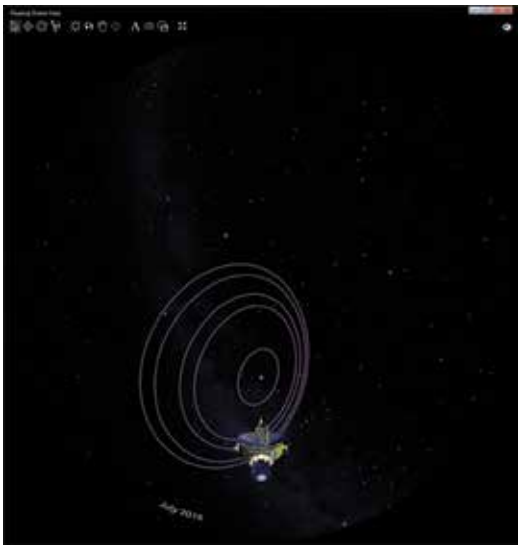
"Cloud" storage means that content is stored on and relayed from servers at a remote location. Content such as generated elements and full data packages (a package could be any number of files bundled together, such as a series of images) is available for users to select and download from those remote servers. This saves on storage space in the user's system.

If a user determines that he or she is not interested in a particular item after downloading, a simple delete command removes it. "You just click an icon. It takes a few seconds to download content; then you can view it right away," said Bartel, who, since The Dome premiered their D5 system on March 15, 2014, has acquired a sizable local following for his real-time astronomy presentations that complement the theater's pre-rendered shows.

E&S endeavored to design the Digistar Cloud Library to be as user friendly as possible, with universal interface details such as drag-and-drop, cross-referencing for multiple ways to search, graphic icons, and a user interface similar to other content the company supplies. There's also instant feedback, useful on many levels: The Cloud menu lists the size of the element, the user who uploaded it, and a rating for user satisfaction. Element descriptions also feature a download counter. Some users, such as Rainer Christiansen of the Menke Planetarium in Flensberg, use the counter to determine which downloadable elements are most popular. Others, like Bartel, monitor how many others have downloaded items they have shared in the Cloud.

Awareness of planetariums' real-life staffing and funding limitations was a driving factor in designing the library. "D5 users save time and money in programming their original live shows, thanks to the Cloud feature, and they can produce better shows that are more timely and relevant, with better visuals, more quickly than ever before," said Hanson. "Users are turning to the Cloud as a resource before starting their productions and as a resource throughout the process. A model that everyone will want to use is often already available in the Cloud. This means that each user won't have to build the model themselves, but can download, tweak, modify, and customize the model and then re-upload it again. This is one of the key benefits."

Users concur that the library has enabled them to reduce production time while improving their real-time programming with better data visualization and more inclusion of current astronomical and scientific events. The flexibility has resulted in a wide range of how they think about and approach the service.



In this sequence E&S designed for the Cloud Library, New Horizons approaches Pluto in July 2015.

"It makes the planetarium look good"

Koeberl in Vienna, Austria, reports that his facility's planetarium runs "nine fulldome films each day, making up 80-85% of our programming. For the rest, we pre-program 40-minute shows to run with a live narrator. We usually include one item per show from the Cloud, often something that's not in the regular D5 library but that meets our needs. The Rosetta spacecraft model is one that we recently downloaded. We also downloaded updated models of the DAWN spacecraft, and we can update as needed."

At the Menke Planetarium, Christiansen, whose planetarium specializes in real-time presentation, also uses the Cloud to download spacecraft models. "We wanted an accurate visual of spacecraft paths through the solar system. Then, through the Cloud, we downloaded a Python script conversion program created by E&S' Brian Moore and downloaded data through JPS. The conversion tool allows the spacecraft paths to be seen in Digistar 5. The Cloud is an easy way to share now with

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The Digistar Cloud Library: 100+ users and counting

Since the Digistar Cloud Library was integrated into the existing Digistar 5 infrastructure in May 2014, more than 5,000 items have been downloaded and 400 items shared for free in the Cloud (more than one contribution per day), including entire shows, scripts, video clips, teaching demos, etc.

Users can browse and choose among a selection of full packages or individual scripts, audio, video, and still image elements.

- Number of Digistar 3, 4 & 5 systems installed around the world: more than 300
- Number of Digistar 5 Users (installed systems): more than 100
- New D5 systems E&S estimates likely to come online in next 12-24 months: 80+
- Training: Digistar Users Groups (DUG) meet regularly, with the next meeting at E&S headquarters in Salt Lake City in August 2015.
- Free training classes are offered before, during, and after DUG meetings.
- Number of D5 users making use of the Digistar Cloud Library: According to E&S, essentially all D5 users are browsing and downloading items from the Cloud, and a smaller but steadily growing percentage is creating and uploading content, but the number of users who contribute to the Cloud is steadily growing.
- Who can use it: the Cloud Library is available within the D5 system only. ☆

(Cloud, continued from page 41)

other users. It's a big extra value."

According to Childers of the Boonshoft Museum of Discovery in Dayton, Ohio, "We check the Cloud pretty frequently when current events are taking place. We also check sporadically throughout the day when putting together shows." For Pi Day on March 16, Childers was able to locate a short clip about pi, which he then incorporated into that day's live shows. "Having that ability," he adds, "makes the planetarium look good."

As mentioned, Cloud users are using downloadable content to improve their own professional programming skills. Childers enjoys trying to build upon "the downloadable content, images, movies, 3D models that can be integrated and used in a way different than exchange programming elements with other Cloud users."

"We can use the elements for a slightly different topic in similar ways," added Bartel, who now has the Cloud and sharing in mind when he designs custom content. He will upload if it's a "widely talked about topic or a resource that he's spent lots of time tracking down."

Some users also earmark the best sequences from their own shows to share with the community. "Things that I create are nice for others to have too," says Koeberl. "We share the same enthusiasm for astronomy. It's an easy way to share content through the customer sites."

Once he has perfected all his elements, Childers also uploads his work to the Cloud. "I know it will be useful to a bunch of people, so I do it right and make it 'crowd-worthy.' If there's some sloppiness in my sequence that needs fixing or the documentation's not done, I won't upload it yet until it's ready and really useful. I will upload smaller elements first while I'm optimizing the full sequence."

"A lot going on under the hood"

What's next? Childers envisions also using the Cloud for tutorials between different Cloud users. "We are discussing creating tutorial material and uploading it to the Cloud, using screen capture. These tutorials would not be used in front of audiences, but they could easily be uploaded and shared."

According to Buckwalter, E&S Cloud users can expect a greater infusion of content in the Cloud. He promises "more new models and sequences in addition to all the great content our users are uploading," and notes the recent addition of several new scripts in showing the New Horizon mission's trajectory, the story of its journey, and the new scientific data that will be returned in just a few months' time. "We have also begun hosting free prerendered shows, such as NASA's The Future of Human Space Exploration, and Michigan Science Center's Sunstruck for our community to download," he says.

"It extends the media content available and helps make production skills better — not just my skillset; everyone's skillset," adds Childers. "Content is easier to tweak afterwards, because there's an improved production level due to the intent to share. There's a lot going on under the hood that I'm impressed with."

"It brings lots of resources to D5 that I might not find on my own," says Bartel. "It can be a source of inspiration as well." ☆

Co-author Joe Kleiman, a consultant and journalist, has 25+ years' experience in specialty cinema, AV, museums, zoos, and attraction design. His articles have been published in *LF Examiner, Informal Learning Review, Sound & Communications*, IMERSA.org, miceage.com, and TEA's Thea Awards Program, as well as *InPark Magazine*, where he is online news editor, and his own blog, Themed Reality. He has been a giant-screen projectionist and theater director, and played a key role in the opening of five IMAX theaters. (themedreality.wordpress.com)

Judith Rubin's biography appears on page 28.

ART 360: Bringing art to fulldome

Left: The ART 360 show logo showcases one of the fulldome styles used in the real-time art shows at Arizona Science Center's Dorrance Planetarium. Below: The artwork of Lisa Albinger (left) and Dean Reynolds (right), showcased in real time on the Digistar 5 system. All images courtesy Mike George.

By Carolyn Collins Petersen

When the Dorrance Planetarium at the Arizona Science Center in Phoenix renovated a few years ago and updated its projection system to a Digistar 5, Mike George, director of Theaters, decided it was a good time to try out an idea for an experimental show that he'd long thought about: bringing art to the dome.

The resulting show series, called ART 360, turns the theater—used prominently for astronomy and other science programs—into a digital art gallery one evening a month. Audiences are treated to fulldome visions of works by local artists, recreated as immersive "performance" pieces through the magic of animation programs and the real-time capability of the Digistar 5 system.

The first ART 360 opened on September 6, 2013 and since then Mike and show producer Liz Davison have created 14 digital art exhibitions. Each one is 7- to 10-minutes long, and plays multiple times during the popular Adults Night Out event, which offers a decidedly grown-up approach to the science center the first Friday of each month.

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ART 360 is an experiment that Mike says pays off well in terms of artist engagement and expanding audience perceptions of art. "I wanted to create a show that was a marriage of art and science and technology," he said. "There are many incredible examples of science in art, such as Van Gogh's Starry Night, and of course, who doesn't see the beauty in science?"

Audiences have come to love the idea, filling up the house for each showing. "They use words like 'stunning' and 'beautiful' when they see it," Mike said. "For many, it's the first time they've been immersed in art. They feel like they're in it. They've never experienced art in that way. They become part of the art themselves."

Mike and Liz work hard to bring a new perception of art to their guests, to break down the perceived walls that separate science and art. "But, we also try to break down the separation of the artist and observer," said Mike. "The artist attends their show and is completely available to our guests for conversation and inspiration. We want to bring the audience into the artist's universe. The immersive nature of the dome is perfect for transporting the guests into the art."

Right: Patrons have the chance to see other artworks by the guest artist before and after the ART 360 presentation. Below: Artists in attendance interact with and explain their artwork to audience members.

Creative collaboration, production

Each ART 360 show is a unique piece of performance art which relies heavily on the real-time compositing, programming and projection capabilities of the Digistar 5. The shows are not pre-rendered videos, but are real-time presentations. They showcase works ranging from paintings to digital photography and computer animation. Each one takes about three weeks to produce, starting with art selection from among the 15-20 pieces of art an artist sends in.

Every ART360 is a collaborative work with the artist. It begins with weekly production meetings, with the artist participating. "We always ask for their input," said Mike. "They talk to us about the different pieces, what they were thinking about when they created them. That drives ideas on our end. Yet, ART 360 remains their art show. We disappear into the background and make the entire experience about the artist, not the planetarium staff."

Creating a show is always a learning experience for the artists, Mike said, pointing out that each one also teaches him and Liz new tricks with AfterEffects or Digistar 5.

"Although many artists have seen the show and understand the idea behind it, in the beginning, they had to wrap their brains around what we were trying to do. There wasn't any frame of reference for them. Now, they have a better idea as to what the show is. All the artists have been very cool about our production decisions and allowed us to deconstruct their art as part of the show. And, at the end, we put it back together to show the audience what the original piece is like."

After art is selected, Liz Davison takes charge of the project. She works to deconstruct the selected pieces in Adobe Photoshop and adds in animation and effects work using AfterEffects.

Then the rendered elements go into Digistar 5 for final real-time compositing. "Without Digistar, the show would be much more difficult to produce," said Mike. "With it, we can add particle effects, play dome videos, add elements one at a time, chroma key video, and so on. But, it is in Digistar 5 that the entire show comes together."

Liz sticks mainly to the material provided by the artist since that is the focal point of the show.. "From the beginning, we made it a point that all effects include only elements from the art itself, unless built-in Digistar 5 content—such as stars—complements and adds to a particular piece or the theme of the art," said Mike. "That has happened a few times in almost two years we have been doing this."

The future of ART 360

ART 360 has a bright future at the Dorrance Planetarium. Audiences and donors love the shows, and artists are booked well into 2016, with more asking to participate. Mike wants to see the content expand even further, and to immerse guests in all forms of art. "So far, the artists have all been predominantly painters," he said, noting that he would like to see creators from other media get involved.

Looking farther ahead, Mike would like to see a play or even a movie produced where the dome takes an integral part in advancing the story. "Theaters with fulldome technology have evolved to tell more than stories of stars, planets, and galaxies," he said "If we are truly going to tell the story of the universe, that includes using all forms of art. Complementing our traditional astronomy and science programming, ART 360 is only the beginning of what we can do artistically with the space."

You can watch a video of an ART 360 performance featuring the work of artist Dean Reynolds at: tinyurl.com/ART360-Reynolds. ☆

Carolyn Collins Petersen is CEO of Loch Ness Productions and a long-time fulldome show producer. She can be reached at Carolyn@LochNessProductions.com

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