



## Bringing digital museum theaters together

By John W. Jacobsen

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The familiar world of museum theaters, which for decades has consisted primarily of analog giant-screen film theaters and old-style planetariums with electromechanical star projectors, is giving way to the disruptive technology of digital projectors. As with most transitions from analog to digital, the new technology promises lower costs, exciting new capabilities, and many other advantages. But it will also force us to re-examine what we are doing and how we can best use these new tools to achieve our respective missions.

In the digital world, theatrical experiences within museums could become compatible and inter-operable, regardless of screen size, shape, or configuration. The umbrella term I use for all of them is Museum Experiential Theaters, or METs. METs include giant screens, digital 3D screens with 1.9 aspect ratios, fulldomes, and planetariums.

We now have the opportunity to establish a global network for information exchange among these museum-based platforms. To do this, we have to take steps early on to define the highways, liberate the toll booths, and set traffic rules that will facilitate safe and professional digital travel among all these formats.

Linked properly, METs that rely on a library of museum-quality programs may be able to achieve a sustainable business model, provided enough compatible theaters exist to form a network capable of supporting new program development, and provided we get serious about understanding how METs work as learning resources.

### Convergence

Fulldomes and giant-screen domes may someday have technically compatible equipment, sharing industry-wide digital exchange protocols. It used to be that planetariums only put starfields on their domes, and GS theaters only put motion pictures on theirs, but in the digital future, both may be able to do both, if they want. In the long run, convergence of fulldomes and GS dome theaters could be more a policy choice and less a technology distinction.

As the industry shifts to digital, we should not separate content from technology and hope that showing the same old films through new types of projectors will work. Digital offers significantly different opportunities from analog, and because of the declining spiral of the current GS model, the shift to digital needs to be part of a global transformation of the giant-screen field, not just a new set of black boxes in the projection booth.

The solution may hinge on authentic and live digital information. An image from the Hubble Space Telescope is a digital file; so is an X-ray scan of an overpainted Van Gogh and a New York Stock Exchange feed. Some of this authentic original information can be visualized, and theaters are potential digital visualization venues. The creative challenge is to make box office hits by letting the new digital medium sing in its unique and compelling way – the way *To Fly!* kick-started the GS film network in the 1970s.

### Establish digital protocols

Funding from the **National Science Foundation** enabled the **White Oak Institute** to convene giant-screen industry leaders and a team of experts to meet over three days in Marblehead, MA, in June. The group reached consensus on the first draft of DIGSS. After a period of open comments, it has evolved into the fourth draft.

The objective is a digital GS theater format that suits the educational needs of the museum community for an immersive learning venue and creates a sustainable business model with a supply of quality educational experiences that are as good as or better than those of film-based GS theaters. Such shared protocols will set the stage for transformations and innovations in museum-quality equipment and productions in the digital age.

DIGSS builds on the research and standards developed by the DCI, the global standard for conventional movie theaters established by seven Hollywood studios in 2005. In areas not unique to giant screens, such as security and encryption protocols, DIGSS defaults to the DCI specifications. Both DCI and DIGSS are non-proprietary, open-platform standards. DCI and DIGSS contain many specifications that can be shared by all METs, such as compression methods, so that communication and distribution of programs will be facilitated by as much alignment as possible.

When DIGSS 1.0 is released as a part of the DIGSS Proceedings, it will focus on just the flat and dome giant screens. The most demanding theaters are the domes with diameters greater than 70 feet (21 meters), because no other format requires as much light, as many pixels, or as tall an aspect ratio. For this reason, producers who wish to reach the largest possible market should capture images at the highest possible quality and with an aspect ratio that will play



well on domes. Starting with that high standard they should have few problems providing for the less demanding theaters.

In addressing digital theaters, DIGSS is aspirational in many areas. About 45% of DIGSS' core specifications are listed as provisional, pending testing. The specifications are bound to evolve as discussion, technological innovation, and research proceed over the next years. For several key specifications (resolution, brightness and color depth), digital projection technology does not yet match, much less exceed, the quality of 15/70 film. Also, current data channels may not have enough capacity to handle uncompressed 4K at 24 frames per second, to say nothing of the higher resolutions and frame rates listed as future goals.

DIGSS 1.0 may not be achievable without tiling multiple projectors on larger domes and flat screens. Tiling is common in fulldome theaters and works well for CGI images, but until it can provide bright, clear, live-action images without noticeable seams, GS managers may prefer to wait for a single-projector solution. Prototype digital projectors powered by lasers have recently been announced that may offer a path to brighter, sharper images for giant screens.

### **Supporting a production ladder**

Live theater is sustainable because of its diversity and its inherent focus on the needs and interests of its audiences. The production ladder for live-stage talent offers the museum theater world a useful analogy, starting in high school theater, moving up to university drama schools, regional theaters, off-Broadway, and at the pinnacle, Broadway. Performing arts centers often have an experimental theater, a more formal traditional stage, and other types of performance spaces. The experimental theater is open, informal, and intentionally funky; an edgy venue for vanguard work, whose audiences are looking for "new and exciting" rather than "polished and popular." The opera house, on the other hand, has posh detailing and plush seats facing a large stage for operas, dramas, musicals, and other professionally staged presentations with proven popular appeal.

Some fulldomes may choose to follow the experimental route, offering live presentations of tonight's sky, while developing in-house presentations that emphasize live feeds and local artists. Others may join the giant-screen theaters in showing first-run feature films, while some will work a middle ground of film festivals, classics, and offbeat productions. Once networked technical compatibility is achieved, and we share annual conferences and screenings, these layers will interact more and provide a more robust economic model.

This continuum will finally provide the GS field with a scalable route through other formats to develop new ideas, starting in low-budget student and staff productions, up to big box-office studio productions.

### **Multi-platform production**

If DIGSS can establish standards of excellence for the top of the ladder while sharing technical protocols with other rungs, producers will be able to book their programs across a variety of platforms, expanding the size of the global museum theater network. For example, a giant-screen title that can be released to fulldome theaters and to smaller digital 3D theaters has better economic hopes than one that is restricted to only part of the global network of METs. Why produce a project for only 200 theaters when you can reach 350 or more?

This multi-platform approach is not new, as distributors have been doing videos, Blu-rays, books, exhibits, and other versions of their GS films for a long time. However, very few filmmakers have consciously produced for giant screens, fulldomes, and digital 3D screens from the start, capturing scenes specifically for each format and building lease models for each of these categories.

I do not suggest that the same film should simply be edited and reframed. Rather, producers should look for the inherent strengths of each of these media and create versions that play to that medium's strengths.

### **A global business model**

High-quality GS and fulldome productions for museums can seldom be produced by individual institutions. The business model for the future depends on a network of compatible theaters that can collectively support the production and distribution of a steady stream of new programs. This will require a level of standardization – the DIGSS initiative – and perhaps more challenging, agreement among museum leaders globally to accept those specifications so that equipment suppliers and film producers will provide the hardware and software that the museum field collectively says it wants.

The optimistic long view for institutional giant screens and fulldomes is that digital technologies will allow a continuum of METs, from scrappy, experimental theaters to large and elegant houses. The 200 giant-screen theaters might be joined by some of the 155 fulldomes and the 50 or so smaller digital 3D screens in museums to create a global network of 350–400 compatible digital immersive theaters.



Of course, there are extra costs to shooting and releasing a program that will look great on a large dome. Some say a great dome film is different *in kind* from a great flat-screen GS or conventional film, which might mean two or more versions. Is the extra cost worth it? Why not just make shorter, less expensive films for the 50 digital 3D museum theaters?

This is a business question for any producer planning on reaching only a segment of the MET network. How many METs regularly lease shows in my format? What share will we get of this subset? What does that subset earn in admissions? What share of that revenue comes back to distributors? How many films share that revenue? And finally, will my film's share of the returns justify my expenses?

When we play with these what-ifs to calculate the size of the network needed, using current GS classic film budgets and sponsorship assumptions, and assuming only four new classic films per year, we get about 200 theaters, which is roughly the number of currently active GS theaters. Not surprisingly, smaller networks only work with smaller film budgets. Fulldome production budgets and lease amounts are about one-fifth to one-tenth those of GS films. Digital 3D theaters tend to run 20-minute shows, and some of them are not directly ticketed or only show their own signature film.

In short, giant screens are the main revenue generators among MET, and if we kill them off, we kill the golden goose that could sustain the MET network.

Dome giant screens are particularly important. They account for close to half of all GS theaters in museums, but once the MET network includes fulldomes, domes will be the majority of leasing venues. Their expensive architecture, if nothing else, gives domes staying power.

There are other models out there, like **CineMuse** (high-definition nature videos to non-paying audiences) and motion simulators, that survive on smaller networks, largely through lower budgets. Digital 3D theaters might be on the line between these more casual, lower-cost venues and the potentials of the MET global network.

These other forms of museum theater could fragment into smaller, separate networks, driving down production, distribution, and marketing budgets, and there will always be bottom feeders and mavericks encouraging this fragmentation. But will the museum field achieve its mission that way? Will those fragmented markets attract the funding needed to engage top talent and make high-impact, high-attendance programs?

If we work together to create one world of METs, even with sub-categories, producers will be able to reach their share of 350–400 theaters, perhaps with several versions, but all distributed as standardized Digital Cinema Packages.

## Conclusions

Museum GS theaters, fulldomes, and digital 3D theaters can combine to form one global network by using shared standards for exchange and distribution, such as DCI and DIGSS. To achieve this we will need collaboration at a global scale and the involvement and support of professional associations such as the **Giant Screen Cinema Association**, **International Planetarium Society**, and **IMERSA**. It is a major effort, and DIGSS 1.0 is only a beginning. But it is a beginning, and I urge all professionals to support it, and all museum GS theaters to adopt it as a goal for their conversions. When talking to potential digital system providers, ask them “Are you DIGSS compliant? If not now, what is your upgrade path?” While there are aspects of DIGSS 1.0 that some may consider “wish lists,” most of its specifications are currently achievable for smaller screens, and innovation over the next few years promises to address the remaining desired specifications.

The GCSA's Technical Committee, with board support, will soon be conducting tests to compare current digital systems with GS film. The first of these tests will be held in Galveston, TX, in January.

In addition to this screen testing, which may take a few years, we need learning research to understand how each format – dome/flat, giant/small, 2D/3D – works as a learning methodology. And we need economic research to understand the popular appeal and perceived value of the different formats.

Strategically, METs must mature and collaborate to fulfill their host museums' mission. Together we must discover how METs can support museums' goals of building 21<sup>st</sup>-century learning skills, create programs through a culture of community partnerships, invest in lasting social and creative capital, and, of course, respond to the growing expectation of audience participation. We can expand the network of collaborating institutions by recognizing a continuum of museum experiential theaters with a shared purpose, and yet distinct artistic and technological potentials. And we can respond to changing audience expectations by constantly experimenting with different kinds of immersive learning experiences.



As we start to understand how the medium actually works as a learning methodology, and how immersion fills audience needs, we can begin to make a clearer case for METs' public value and their contribution to community learning infrastructure.

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