



Across the Universe

A planetarium in the south of England recently unveiled the sophisticated audiovisual and control technology it is using to provide a truly immersive experience for its visitors. Dan Goldstein reports

Nestled discreetly within England's picture-book Hampshire countryside, the INTECH Science Centre has been inspiring young people to learn about science and technology since it opened its doors in 2002. Located close to the city of Winchester, Intech attracts around 90,000 visitors a year with a mix of interactive displays, shows and other hands-on opportunities.

From the outside, the most distinctive thing about Intech is the large domed structure that has been built to one side of the main exhibit hall. Phil Winfield, INTECH's Director, explains: "The Center succeeded in attracting [UK National] Lottery funding for its new facility in 2000, but it wasn't quite enough to carry out

2007 management buyout from the Visualization Systems Division of SEOS. Martin Howe, CEO of Global Immersion, says that when it came to designing and implementing the audiovisual and control systems at Intech, his company was able to draw on much of the experience gained during the SEOS years.

"The front end of the INTECH system is AMX-based and was first developed by us about four years ago. The system has around 50,000 lines of code that have been compiled over that time, and it is our intellectual property because we purchased it as part of the buyout from SEOS. It allows us to build our own interface for each show, and it allows the end client to write their own updates if they need to. "It's designed to be very easy to use. In an environment like this, where you've got a single person trying to control 170 kids and keep them entertained, the last thing you want to do is worry about a GUI."

Combining new and old

Using an AMX 3100 series processor as its hub, the Global Immersion solution – which the company brands as 'Fidelity Bright' – gives the company the opportunity to include both new and legacy equipment in its designs, depending on the project. "We decided to use industry standard hardware, and what we have is a central engine that understands everything that goes on in the theater – the status of every device," says Howe. "It's peer-to-peer, so anything can control, or be controlled by, anything else. Wherever possible we communicate over IP, and if we can make a device wireless, then we will. If not, it goes over Cat-5. The AMX acts as a protocol converter that allows us to talk any language to any device. If something can't communicate over IP, then we can use RS-232 or even simple relays to bring the hardware into the system."

Other key elements of the Fidelity Bright solution include Global Immersion's own Media Director, Media Server and Media Player platforms, which are all linked to an AMX 8400 touch screen controller. For Intech, Global Immersion has created custom content in the form of 'Neighborhood Earth', a presenter-led tour of the universe that combines Media



with Uniview, a real-time astronomical visualization package developed by Swedish company SCISS.

While Uniview produces fully scaled, 360° rotatable mapping of the planets, moons and stars that lie above our heads, Media Director allows INTECH's newly appointed Planetarium Manager, Dr Jenny Shipway, to pause the show, speed it up, slow it down, or repeat sections – depending on the average age of the audience and on feedback from the children.

"It's an incredible feeling to sit at the controls and fly through the Universe," says Shipway. "The model we use is based on data from the latest NASA databases, and can be updated to show recent developments and discoveries, and the shape of the dome somehow gives a strange 3D effect to the images. There really is nothing else like it."

The 16.5m diameter tilted dome sits above a seating area that now has a slightly reduced capacity of 176. Offering a 360° x 165° field-of-view, the dome is colorfully illuminated by 160 segments of wirelessly controlled LED cove lighting. These lights work alongside stage spotlighting and audience floodlights to support the planetarium host during presenter-led shows, and can be fully synchronized with the theater's audiovisual content via Media Director.

'We have a central engine that understands the status of every device'

Martin Howe, Global Immersion

everything that was planned. We wanted to build a planetarium, but had to settle for a 200-seat auditorium that could be converted at a later date – hence the dome shape of this part of the building."

Last year, Winfield managed to persuade SEEDA (the South East England Development Agency) to back the dome's conversion. "It could see the enormous potential of having a planetarium in its region," says Winfield. "So what was a conventional conference space for science shows and corporate events could now become what it was always intended to be."

The INTECH planetarium project was the first to be won by Global Immersion after its



The screen surface itself was supplied by Astro-Tec. "We suggested that the client buy the screen directly because it is such a big product," says Howe. "Astro-Tec supplied the hardware and a supervisor, and we provided the supporting local labour to install and fit the screen. It's a very precise metal exoskeleton framework, onto the front surface of which are attached perforated aluminum panels, finished on site to achieve a particular screen gain and reflectivity that we specify. Because the screen is curved, scatter is a big factor that can seriously impact on contrast. So we target a particular contrast ratio and then tell the screen manufacturer what screen gain we need to achieve that."

Costs not astronomical

While the screen may be a bespoke product, much of the rest of the INTECH system uses industry standard technology, albeit carefully selected and tailored to Global Immersion's needs. "This is an exotic application, but there isn't always exotic money for it," reflects Howe.

"The dynamics of the market are such that many of the projects are driven by a combination of grants and gifts, and operating budgets are quite modest. "So we adopt an approach known as 'COTS plus', where 'COTS' stands for 'commercial off-the-shelf'. It's a term that comes from the military and visualization combination of grants and gifts, and operating budgets are quite modest. "So we adopt an approach known as 'COTS plus', where 'COTS' stands for 'commercial off-the-shelf'. It's a term that comes from the military and visualization markets, where you take a commercial product and then fiddle with the process to get it to the level you need it to be. This is more cost-effective than taking an exotic product which has fewer examples out there in the field and might potentially give you reliability and support issues."

A prime example of 'COTS plus' is Global Immersion's use of DLP video projectors from Norway's projectiondesign. The INTECH system uses six F30 sx+ projectors, five of which are positioned around the dome's perimeter while the sixth fires up from the middle. Each projector was selected, graded and color-matched specifically for the project, after consultation between manufacturer and integrator.

"This is a very large, visual space, so you need a lot of resolution to give nearly 200 people the immersive experience they each

expect, all at the same time and all from different viewing angles," comments Howe. "All the projectors have to be a perfect match in terms of dynamic range, highlights, lowlights and so on, and as soon as you adjust the edge of one projector you affect all the others.

"So it's not easy. We go through a really time-consuming, expensive, difficult and problematic process to get everything looking as good as it does. But the fact that projectiondesign let us come into their factory in Norway and be part of their production process is exceptional. They put up with our fussiness, and that's really helpful. We think it gives the best results anyone could get from the technology at that price point."

As a full-dome multimedia solution, the Fidelity Bright system uses a combination of edge blending and optical blending to trick audiences into thinking they are viewing a single projected image.

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For edge blending, Global Immersion uses the Mercator system from SEOS, for which the company has a distribution agreement. Mercator uses its own dedicated hardware, rather than the system's central PC, which gives the integrator more control over individual pixel parameters without impacting on the theater's content.

For optical blending, Global Immersion uses a proprietary CAD system to plot where each pixel is going to be, from when it is created to when it hits the screen. "We start by feathering the 'grey' out into the black, then doing the same for all the colours across the range," says Howe. "If you get the black right, then you get the rest right."

3D sound

Global Immersion has adopted a similarly granular approach to the audio at Intech, having designed an 8.1 surround sound system around self-powered Martin Audio Blackline series loudspeakers and Peavey MediaMatrix Nion signal processors. "It is basically a 5.1 system with additional vertical channels, because we need to move audio around the dome vertically as well as horizontally," explains Howe. "When you buy standard planetarium shows such as 'Black Holes' [which Intech is also showing alongside 'Neighborhood Earth'], they come with their own audio mix.

We work with the show's producers and ask them to give us a mix of discrete channels of various parts of the content. That gives us music, effects and voice on individual tracks, and we then mix those down on site at the theatre. "The voice always comes from the same place – at a certain elevation of, say, 30° up, so the vertical channels are useful for that.

Planets don't make any sound but people expect them to 'whoosh' above their heads, and



that's done using the vertical plane as well. The rest of the surround channels we can move around quite easily using the horizontal surround plane."

Howe feels that audio plays a key role in the success (or otherwise) of an immersive environment because of the way the human brain deals with it. "Audio is very good at giving the brain information without troubling it," he says. "As a human you're worried about what you're seeing; hearing is a 'back channel' that you don't worry about. It's another information channel to the brain which, in a dome like this, is very important to use properly."

While the focus (no pun intended) of INTECH's new venue will initially be astronomy, the Global Immersion solution has been designed to be modular so that other subjects can easily be addressed by adding alternative shows to the repertoire. "We are initially focusing on astronomy, but there's no reason why we can't embrace architecture, music, the environment and storytelling," says Shipway. "We also hope to give people the opportunity to produce their own content to be displayed on the dome."



The idea of schoolchildren being given access to intergalactic multimedia content creation tools might terrify some, but it would be all in a day's work for Howe, whose company clearly revels in the challenge of supporting the systems it designs and installs.

"Remote diagnostics are very much a part of our systems, so if INTECH wants to update or change its content, we can do it via IP from anywhere in the world," he says. "We have access to parameters, such as amplifier status, projector lamp life and so on, but we can go way beyond that to literally changing where we are in the universe – all from a hotel room if need be!" IE

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INTECH Planetarium showing *Black Holes: The Other Side of Infinity*, © Denver Museum of Nature & Science

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