X SERIES

Datapath processors power stunning 360º spherical theatre in South Korea

Engineering the world's best visual solutions

DATAPATH
EXCELLENCE BY DESIGN

BACKGROUND

Using the power and flexibility of Datapath's award-winning Fx4, the Gwangju National Science Museum hosts South Korea's first spherical projection theatre – Space 360.

This spherical projection theatre – 12 meters in diameter - can be considered a true VR theatre of the future. When visitors step inside, they find themselves on a transparent glass observation bridge, which crosses the sphere's interior. A crisp 360 video projection around, above, and below the viewers fully immerses them as they stand and watch. They literally dive into a virtual world without having to use VR headsets.

THE CHALLENGE

Full spherical projection theatres can be considered movie theatres of the future. However, most of them are experimental one-of-a-kind installations utilizing technologies that are already outdated.

The aim of specialist AV integrator Front Pictures was to create a projection sphere of the next generation by accumulating the world's best practices and implementing the newest technologies. To be sustainable the future, the system also needed to have the highest possible resolution and brightness of projection, high energy efficiency and cost effectiveness.

Front Pictures has vast experience in engineering fulldome theatres and planetariums. By the mid 2017, the company has delivered around 150 fulldome systems to many countries around the world. But when designing the projection system for Space 360, the company's team had to come up with unique technological and engineering solutions.

Unlike in a conventional digital planetarium, where projectors are located along the dome's perimeter, the options for placing them in a full sphere are substantially limited. One of the challenges was to devise a layout that would avoid shadows being cast by the observation bridge, minimize openings for the projectors, while, at the same time, maximizing the resolution and brightness of the projection. It was also important to position the projectors in a way that would prevent them from shining light into the viewers' eyes.

THE SOLUTION

Taking all the factors into account, Front Pictures team decided to use 12 projectors and locate them around two entrance doors.

Engineers devised a dozen types of projection layouts, considering models from four different vendors.

Front Pictures used precise 3D models of the venue and calculated each projector position and tilt taking into account its aspect ratio, resolution, and available lenses. The projector size was taken into consideration as well, because of the limited space behind the spherical screen where the projectors had to be located. Price constraints were also important for meeting the budget. After doing research, Front Pictures opted to use Barco PGWU-62L WUXGA projectors with a laser phosphor light source.

"The spherical projection theatre creates new possibilities for education and entertainment. It can 'teleport' viewers to any place on Earth or in the Universe with its unbelievable immersive effect. It was a great pleasure for us to be a part of this futuristic project, which truly embodies the innovative spirit of South Korea. We also believe it is a significant step towards the future of cinematography,"

Yuri Kostenko, CEO, Front Pictures

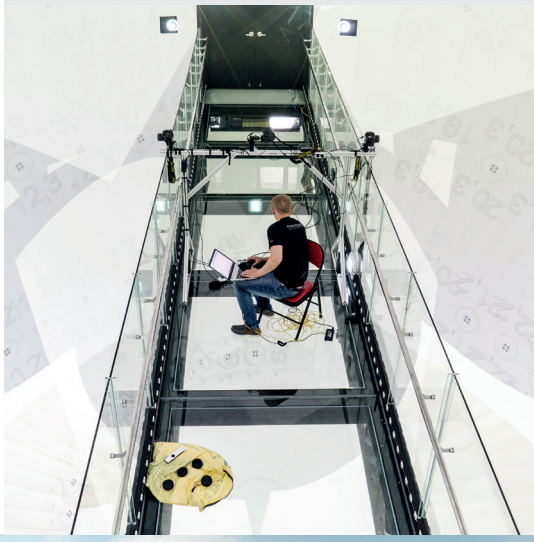


Image calibration

The spherical screen creates significant geometrical distortions of the projected image. The distortions become even larger due to the fact that in a full projection sphere, it is impossible to place projectors along the perimeter, as a sphere has no edge. They need to be located around the entrance doors on the opposite sides of the sphere.

This scheme has many advantages, but positioned this way, projectors create uneven and elongated spots of light with uneven pixel density and brightness. The task of creating a seamless picture with uniform brightness becomes even more challenging when the projected images overlap with each other in this way.

Media server

The previous generation of multi-projector systems were built around the "one computer per one projector" paradigm. But this approach has significant drawbacks such as a relatively big budget for computer hardware, more possible points of failure, difficulties with implementing proper failover solution, as well as higher electricity consumption. Another downside of the cluster systems is a discrepancy in video playback speed on different computers, which can result in rough, jerky video playback.

An alternative to the multi-server system is a single server approach. In 2010, Front Pictures developed a video engine which can use every single bit of power of the media-server hardware and process extremely high resolution media in real-time. An efficient render engine can handle many more displays per single machine than most other solutions available. This technology, called Screenberry, can smoothly playback 8 x 8K video on up to 72 output devices, all the while connected to just one computer.

With a trio of Datapath Fx4 splitting the single GPU input into 12WUXGA outputs, the project not only delivered stunning picture quality, but by using this unique approach also proved highly cost effective.

REFERENCE

Datapath
www.datapath.co.uk

Gwangju National Science Museum
www.sciencecenter.or.kr

Korea Hydro & Nuclear Power Co.
www.khnp.co.kr

Front Pictures (Ukraine)
www.frontpictures.com

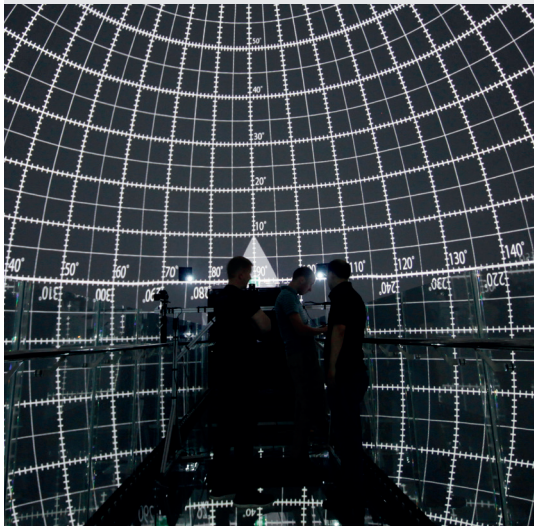
Redrover (South Korea)
www.redrover.co.kr

EL Architects (South Korea)

Baekje (South Korea)

KIT LIST

- Datapath Fx4
- GPU: nVidia GTX1080-8G
- CPU: Intel Core i7-5960X
- RAM: DDR4 64GB
- Data storage: 1TB SSD
- Audio Interface: RME M-16 DA + RME HDSPe MADI Card
- Signal processing: Datapath Fx4. Three high resolution signals of a single GPU are split into 12 WUXGA outputs with the help of 3 x Datapath Fx4 – the latest model from the line of Datapath video wall processors
- The media server can play standard 360 VR (equirectangular) format video or 2x Dome Master video files. The server also supports external video signal capture as well as web streaming
- Screenberry is also responsible for 11 channel audio playback



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