



SINGAPORE

National Day Celebrations Throws Up A Number Of Firsts

Technical team meets challenges head-on to offer a memorable experience for the audience

- Celebrations features World's Biggest 360 degrees real-time tracking 3D projection mapping to date.
- The most extensive use of lasers for any show in Singapore.
- Saw the inaugural use of Pixmob's new Wristband X.

It has been 10 years since the last National Day celebrations was held at the National Stadium. The Stadium now part of the Sports Hub was torn-down and built back as a modern state-of-the-art venue designed to hold a variety of events. Holding the 51st National Day celebrations at the stadium also meant that more people could watch it. About 50,000 spectators packed the stadium to immerse themselves in the spectacular celebrations, in this dome-shaped roofed venue.

Unlike the past 10 years, where the celebrations were held in an open space, the closed roof of the stadium meant that there were opportunities to create a different type of experience for the audience. Indoor Fireworks,

3D Projection Displays, Unmanned Technologies such as Drones and Dynamic Aerial Performances were just some of the new elements that were part of this year's celebrations. This, however, also meant that there were unique challenges that the technical team had to sort out.

As in every major celebration, there was a theme to work around. This year's theme was "Building a Singapore of Tomorrow". This was enacted through story telling which started with the "Singapore Stone". Altogether the 6 Acts plus the finale show lasted around 50 minutes. The Creative and Production Team for NDP16 started work in September 2015, helmed by Creative Director Beatrice Chia-Richmond and Technical Director, Kenny Wong. From the onset there was close collaboration within the team from concept to development to production. This spirit of collaboration between the creative and technical eventually carried through to the contractors as well. Through this culture of collaboration, plus a sense of adventure, the show that resulted featured quite a few ground breaking elements for Singapore, the region, and even the world.



Boulder on cablenet

Set & Props

One of the stunning set pieces is a gigantic boulder, measuring 13.5 metres across and 7.2 metres tall, which was suspended over the main stage. This boulder 'exploded' and split into 8 fragments at the start of the show. Due to the limitation of what the stadium roof can hold, all the flown elements needed to be lightweight. The lightweight solution for the boulder was made out of inflatables with a digitally printed skin.

Nestled within the boulder is the Stone, an enlarged replica of the Singapore Stone, which was constructed with an aluminium frame skinned with moulding cloth. This option was chosen in order to accommodate lights within which internally illuminated the inscriptions on the Stone. These two items were fabricated by Stage One Creative Services (UK).



The Sky City was made up of 15 clusters of buildings that went up to 35 metres in height with projection mapping from Hexogon Solution.

The other jaw-dropping set piece was the Sky City, which was made up of 15 clusters of buildings, that rose from the stage and eventually floated above it. Each cluster had an average footprint of 5 metre square and the buildings went up to 35 metres in height. The challenge of the Sky City is that it not only needed to be lightweight but each of the building cluster had to be able to collapse into a cart that is no taller than 70 centimetres. So in order to achieve this, the Sky City was constructed primarily of fabric with aluminium and carbon fibre frames. The Sky City was fabricated by Showtex (HK).

The other large scenic item was the pair of tree trunks which 'grew' out from the stage floor. These were inflatables that had a controlled inflation system that made them look like they are growing rather than being inflated. These tree trunks helped transform the Sky City into a giant Tree, with some help from projection. This was also fabricated by Stage One.

One of the iconic moments of the show was when a Unicorn flew across the stadium. This Unicorn is a life-size automaton prop, clad with a skin of over 14,000 LEDs. Both the motion and LEDs were controlled via wireless DMX. This prop was constructed by Q's Advertising (SG).

Aerial Flysystem

The bespoke fly system installed by Stage One (UK) consisted of a cable net system and a series of point hoists.

The cable net had 8 catenary lines anchored onto the stadium roof, each line carrying a trolley hoist, plus 2 point hoists in the central hub. Another series of 15 point hoists were suspended off pulleys bridled to the stadium roof.

The trolley hoists allowed the technical to suspend and move the boulder fragments horizontally. One of the trolley hoists was also used to fly the Unicorn across the stadium. The 15 bridled point hoists had the job of lifting the Sky City of 15 clusters of buildings up in the air. The combination of the point hoists and some of the trolley hoists enabled the flying of 20 aerialists simultaneously. All of these axes, plus 6 slide trap doors and the 2 inflatable tree trunks were controlled by Stage One's Q-Motion automation system.

"We had to check back with the consultants for the Stadium, ARUP, to ensure that all our weight demands on the roof were within limits. This also meant we had to choose materials where possible that were lightweight but also able to be used to create the impact that we were looking for and mapping friendly."

Technical Director, Kenny Wong

Main Stage

The creative team decided early on that a stage was needed instead of using the entire field-of-play. The 60 metre diameter stage provided the audience with an area to focus on. The stage being raised 2.5 metres above the ground provided an understage from which elements could be introduced on stage through a series of traps. The stage and 7 hydraulic drop traps, were built by Pico Art (SG). An

additional 6 slide traps by Stage One were incorporated into the stage.

Projection Mapping

3D Projection Mapping added another dimension to the Large Boulder and the Sky City. This made the already impressive scenic pieces more dynamic. There were two huge challenges to achieving this. Firstly, the projection mapping needed to be 360 degree and the object being projected on was not monolithic – it was made up of 15 independent clusters which cast shadows on each other. Secondly, the challenge was that each of these objects did not hang perfectly still. Each cluster of the Sky City was suspended off a single point which meant they could spin and sway.

YV (CA) was engaged during the conceptual phase as a consultant on the feasibility of the concept. What resulted is the largest scale 360 degree real-time tracking 3D projection mapping project. Hexogon Solution (SG) helped achieve this. The system included [66 Christie Boxer 4K30 digital projectors](#), [12 Photon Media Servers](#), plus 250 tracking beacons with 40 tracking cameras.

Lighting & Laser

The principal considerations for the lighting design was firstly, being bright enough for broadcast; secondly, providing a backdrop for cameras and lastly, lighting for a 360 degree live audience. With these considerations in mind, the lighting design team decided on the following inventory: [400 Robe BMFL Blade](#), [100 Robe BMFL Spot](#), [100 DTS Raptor](#), [72 Martin Viper](#) and [12 DTS Wonder](#). [12 Haze Master](#) were also deployed. The control was two Grand MA 2 Full Size – one main and one back-up.





The Robe BMFLs were rigged on three layers of trussing running along the stadium roof, both sides of the FOP

The design and programming began a full month before the lighting team moved into the stadium using [Light Converse visualisation](#) software. The lighting system was provided by Showtec Communications (SG).



The DTS Raptors were deployed on the floor facing the VIPs and the broadcast cameras, helping to create a major memorable picture

end of the stadium roof. The BMFL Spots on the four end-trusses mainly illuminated the stage area, which featured most of the acting, story-telling and ceremonial action played out by a cast of several thousand.



The Light Converse visualiser working in tandem with the Grand MA 2

Mac Chan, from Lighting Design team adds, "The Light Converse is a real time visualiser and the quality of rendering is excellent. It helped tremendously in letting us understand how our designs would look in real life."

As for the Robe BMFLs he states, "One key factor in us specifying the BMFL is due to its brightness. As the lighting had to compete with the LED Walls and projectors, we had to ensure that it did not get pushed to the background. It is one of the brightest fixtures available in the market currently."

The BMFL Blades were rigged on three layers of trussing running along the stadium roof, both sides of the FOP, with the 100 x BMFL Spots located on four trusses, two at each

At an early stage, the lighting design team decided to employ lasers to provide an added dimension to the lighting design, in keeping with the futuristic concept of the show. It was also part of the original concept to use laser projection on the floor of the stage. Therefore, a total of 12 units of Kvant Atom 20 RGB Laser units were flown to project images on the stage floor; while another 24 of the same units were deployed on the ground providing beam and wave effects, plus projecting images on the roof. This is the most extensive use of lasers for any show in Singapore.



LED Costumes controlled individually via Wireless DMX micro receivers

There was also an extensive use of [Wireless-DMX transmitters and micro receivers](#). Items controlled included

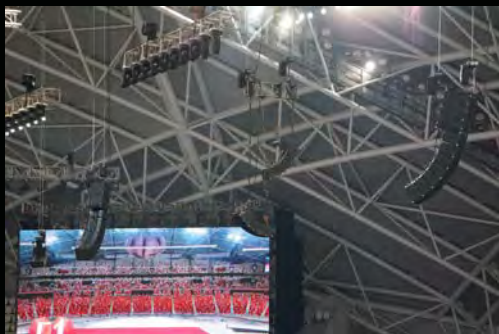
the lights in the Stone, the LEDs and movement of the Unicorn and more than a hundred LED costumes.

Kenny Wong, Technical Director, highlights, "About 120 LED vests that the performers wore, we controlled with a W-DMX micro receiver. So every vest had a unique address and transmitter. We had to work closely with the costume side to ensure that the transmitters fitted in proper onto the vest and the choreographer to switch on the right colour at the right moment. These costumes had more colours than the basic LED costumes. They helped to create a different feel to the whole performance."

For this event, Mac roped in Michael Chan for the lighting design. "I started the practice of working as a pair two years ago. I find the collaboration process very interesting as each party brings something to the table."

Michael adds, "For me it is a great experience to work with someone of Mac's experience. It is not just the dialogue between us but also the sharing of ideas and mindsets."

Sound



26 Arrays of CODA Audio were strategically flown throughout the stadium

The National Stadium, with its dome roof, poses an enormous acoustic challenge. To address this highly reverberant environment, the design was for speaker clusters with very focused dispersion and to only have the minimal amount of foldback speakers in the field-of-play, which is only used for the parade segment. All performers in the show segment were furnished with FM receivers as monitors.

The Show Company (SG) set out orchestrating an intricate setup based on their comprehensive inventory of **CODA Audio**. At a glance, this consisted of 138 AiRay modules,

44 ViRay modules, 38 SC2 bass extenders, 32 G715 speakers, 110 Linus10 amplifiers, 6 Linet Masters and 12 Linet Switches, culminating in 26 arrays strategically flown throughout the stadium. At the helm is an **AVID Venue S6L** with much welcomed 96kHz sampling. Over a kilometre's worth of heavy 6mm speaker cables were made specifically for this massive show to ensure consistent and stable sound over long cable runs.

LED Screens



Seen here 2 huge IMAG Screens at the sides that was set up for the celebrations with the Stadium's permanent LED screen in the centre

This year's NDP proved to be significantly different from previous years, at least in the video department. While a considerable amount of LED found its way to the stage design, majority of the whopping 2200 LED panels went into four huge IMAG screens securely tucked in four corners of the stadium. Measuring 16 by 9 metres, these big screens underwent multiple alterations to fit snugly in their respective corners while maintaining the largest possible viewing area, almost coming close to reaching the roof beams of the stadium! Four 32-metre curved stage "fascia" LED screens clad the sides of the stage. The multimedia control comprising of four fully utilised Coolux quad-output media servers and three 17x17 Lightware matrices provided reliable distribution to each screen. The Show Company provided the LED screens and the multimedia control.

LED Wristbands & Prop

One of the challenge for creating a show with audience surrounding the action in 360 degrees is that there is no 'backdrop' to the performances. Therefore, to create a 'backdrop', each of the 55,000 audience was given an LED wristband which was remotely controlled. This turned the audience into a sea of LED lights. This also helped make the audience feel very much part of the show. **Pixmob (CA)**



Remotely controlled LED wristband

provided the show with its infra-red controlled solution - Pixmob Pro. The choice of using infra-red, instead of RF, also helped ease the already crowded RF environment at the event. NDP 2016 saw the inaugural use of Pixmob's new Wristband X, which is more cost-effective and environmentally-friendly than their other LED objects. In addition to the audience wristbands, Pixmob also supplied and controlled the LED props used by 600 dancers to create a variety of images onstage.

Communications

The backbone of any show is the communication system. Riedel Rental (DE) provided NDP2016 with a comprehensive show communication system based on their [Artist Digital Matrix Intercom](#) platform. This allowed seamless integration of intercom panels, wired and wireless backpacks and walkie-talkie radios. Riedel also provided the Mass Cast FM system for performer monitoring.

Fireworks

Glorious (SG) designed and delivered all the indoor pyrotechnics and outdoor fireworks, including the confetti venturi effect and flame projectors. Working closely with the lighting and laser design team, Glorious designed the largest indoor pyrotechnics spectacle Singapore has ever seen, in addition to the fireworks fired from Kallang Basin outside and the roof of the National Stadium.



Kenny Wong, Technical Director

Final Analysis

Kenny Wong, Technical Director comments, "It was a challenging job. I am pleased with the dedication, commitment and especially collaboration amongst the different stakeholders to make this work."

Photos courtesy of NDP Technical Committee, Hexagon Solution, ROBE Asia Pacific and ETA.



SINGAPORE

World's Biggest Real-Time Tracking 3D Projection Achieved At National Day Celebration

Hexogon Solution achieved World's Biggest Real-Time Tracking 3D Projection Mapping in celebration of Singapore's 51st National Day at the new Singapore National Stadium.

The brief by the National Day Parade Multimedia Committee was to provide 360 degrees real-time tracking 3D projection mapping onto two objects – a large moving bolder that will be split into 8 pieces, and Sky City that is made up of fifteen collapsible fabric structures which stands 20 meters tall and 60 meters in diameter. The Sky City, hoisted to 35m above the central stage was the highlight of the show, which represented the future and dreams of modern Singapore in the spectacular grand finale. A total of 40 tracking cameras, 66 Christie Boxer 4K30 (30,000 lumens, 4K resolution) digital projectors, 250 tracking beacons, 12 Photon Servers and together with VYV tracking solutions were deployed for this task. This event also marked the debut of the Christie Boxer 4K30s at the National Stadium since the completion of this state-of-the-art sports facility in 2014.



Adrian Goh, Group Managing Director of Hexogon Solution highlighted, "We are immensely honoured to be part of Singapore's National Day Parade for the 5th consecutive year. The challenges faced at this National Day Parade were firstly the constraints of having to map on empty space without actual objects in the initial mapping stage and secondly the short turnaround time allocated for calibrating and alignment on the complex structures after they were erected."





He added that, "the unpredictable on-site wind conditions played a significant factor, as it caused the fabric structures to move and deform as we mapped onto the structures. This issue was greatly resolved through our sophisticated state-of-the-art VYV tracking system as it instantaneously calibrated, rendered and mapped onto the uneven moving surfaces."

Adrian also commented on the Christie Boxers, "The Christie Boxer 4K30 is easy to handle and it allows us to spread the projected image without compromising the result. With strong features such as 4K resolution, 30,000 lumens, a significantly smaller footprint and omnidirectional capability, it was a breeze (no pun intended) to position the

projectors in different angles to cover the whole Sky City structure."

Beatrice Chia-Richmond, Creative Director of 2016 Singapore National Day Parade commended, "Hexogon Solution has delivered world-class projection mapping for this 51st National Day Parade, and together we are elated to claim a World Record for the Biggest Real-Time Tracking Projection."

Hexogon Solution continues to remain at the forefront of digital projection and will continuously strive to break records.

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