



**JUSILEE CELEBRATIONS:**  
The 16 unmanned drones forming the number '50' to commemorate SG50.

**Event info**

**WHAT:** Multi-drone aerial display  
**WHERE:** Outside The Future of Us Exhibition at The Marketplace,

Gardens by the Bay (Bayfront MRT Station – Exit B)  
**WHEN:** Tomorrow, Saturday, Jan 15 and 16, 7.20pm and 8.20pm



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**For six minutes, the 16 brightly-lit drones danced in the sky over Gardens by the Bay.**

Synchronised to upbeat music, the unmanned drones lit up like neon lights at times, to form blinking images in the sky. They went from lighting up in sequence like a Christmas tree, to whirling and illuminating the night sky like fireflies.

The drones even morphed into figures significant to Singapore, such as '50' turning into '100' to symbolise our present and future.

It is believed to be the first public display in Singapore involving so many software-driven drones.

The display on Tuesday was a preview for shows at Gardens by the Bay as part of 'The Future of Us' Exhibition. (See report above)

The shows are the culmination of 12-hour workdays and emotional ups-and-downs lasting 16 months for an 11-member team.

It comprised research staff and students from Temasek Laboratories, which has labs at the National University of Singapore, Nanyang Technological University and Singapore University of Technology and Design (SUTD). The team is supported by the Ministry of Defence's Future Systems and Technology Directorate.

Said research scientist Kevin Ang, who heads the team: "There were

many times we felt like giving up. Every time we heard the phrase 'we have to change', we felt really frustrated as every minor change involved altering as many as 30 drones."

There are 14 extra drones, in case any of the others malfunction.

The NUS PhD graduate said their practice sessions usually took place at open fields in Tuas or Upper Bukit Timah. While developing the drones from scratch, safety concerns were a priority, said Dr Ang.

To overcome the challenge of not being able to build a physical fence outdoors, the team configured three layers of invisible fencing within the software to ensure the drones do not fly outside a certain area.

Technical difficulties included making sure the drones were properly aligned during formations.

They had to write software to programme the drones to fly at the right altitude and avoid mid-air collisions while flying in formations.

The current drone model is the sixth generation.

SUTD undergraduate Pheh Ying Hong, 24, and his three university mates had a different kind of challenge: They were tasked to film the aerial display using a single drone.

As members of SUTD's Multi-Rotor Society, they had filmed an aerial view of the fireworks at the Marina Bay Singapore Countdown 2016 and the National Museum of Singapore.

"Filming the drone display is definitely more difficult than filming buildings," said Mr Pheh. "We have to capture the ever-changing drone formations and include the surrounding landscape, such as the Supertrees at Gardens by the Bay and Marina Bay Sands, for a better view."

**TEAM EFFORT:** The team from Temasek Laboratories (left and above) getting ready for the aerial display preview.

TNP PHOTOS: PHYLICIA WANG

Software-driven  
drones light up the sky  
at Gardens by the Bay

# A blinking good time