



Super Bubba

By February 2019 DUG will unveil the largest supercomputer in the world, writes Ros Davidson

AS profit margins are sharpened, the cost of oil and gas exploration is especially under scrutiny. And time is money, more than ever before. That's especially the case when processing the increasingly massive datasets produced during geophysical exploration; seismic data processing is simply one of the biggest users of computer power anywhere.

Because of this trend, a supercomputer named Bubba is not only moving house; it is increasing in capacity more than 20-fold. By February 2019 the new supercomputer – owned and operated by DownUnder GeoSolutions (DUG) – will be unveiled. It is expected to be the largest supercomputer anywhere.

The new Bubba will be almost exclusively used for oil and gas data processing, although about 1% of DUG's clientele is from other sectors, said Dr Matt Lamont, co-founder of DUG, in an interview with InnovOil. Lamont would not disclose the price-tag for the project except to say that it was “well into” the nine digits in US dollars.

Once expanded, Bubba will have the capability of more than 250 single-precision petaflops (PF) of computing speed, bringing greater accuracy to oil and gas exploration. One petaflop of computing speed is the ability to execute one thousand trillion – or a quadrillion – floating-point operations per second. DUG, based in Perth, Australia, is the third largest seismic proprietary processing and imaging company globally. The company has one of the largest networks of supercomputers, in Perth, Houston, London and Kuala Lumpur.

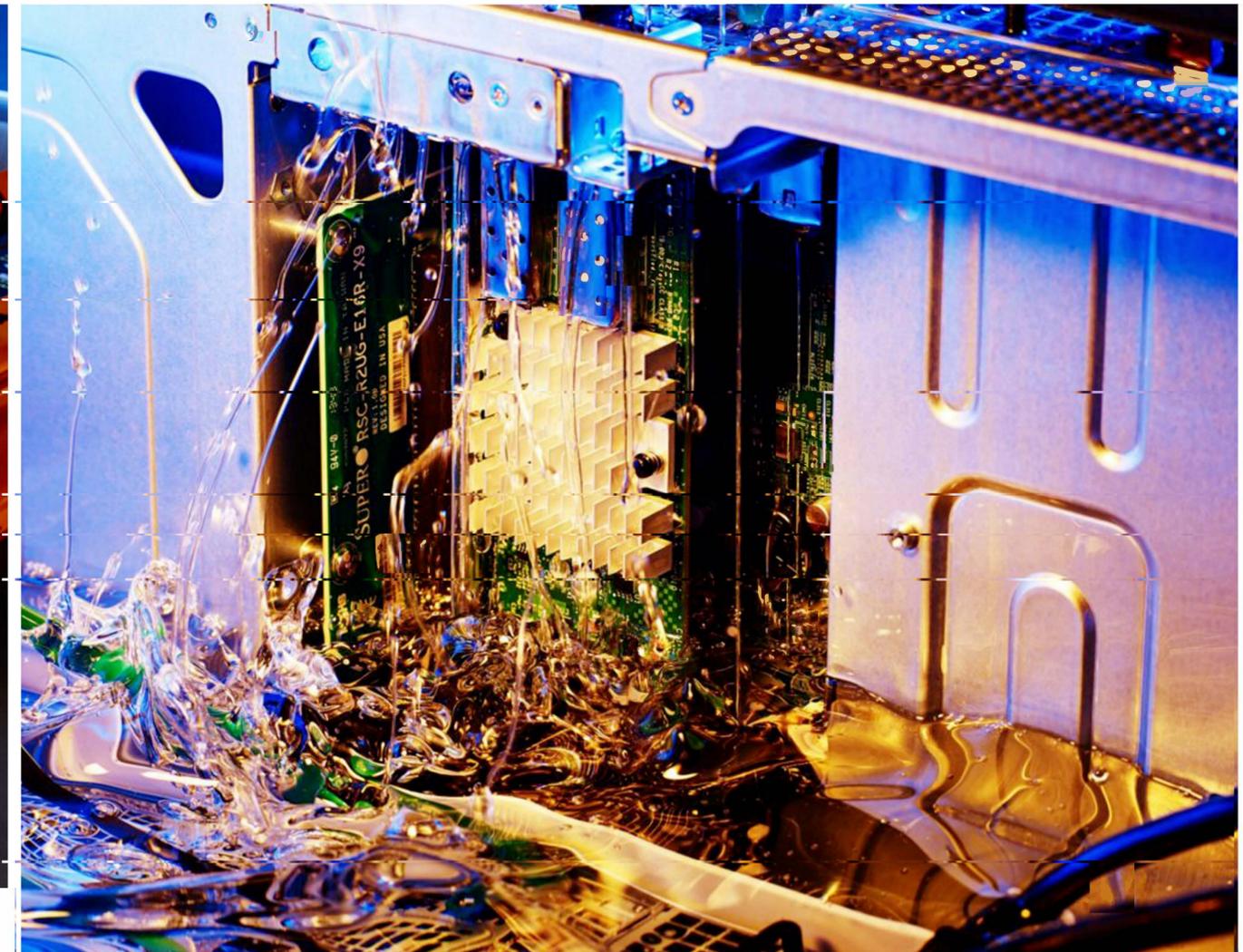
Cloud computing

The company decided to expand Bubba for three reasons, said Lamont. The company needed more computing capacity than Bubba's current 12 PF. DUG will also soon offer a new cloud service, dubbed DUG McCloud, to be backed by the expanded Bubba and DUG's other supercomputers globally. The cloud service will include an integrated hardware, software and services offering.

DUG McCloud, which will be available starting in the second quarter of 2019, will be offered to external companies to expand their computational resources on demand. Not only will clients have access to DUG's proprietary software, with the option of source code, to accelerate their research, development and production, but as Lamont explained in a recent blog: “They can use our existing solutions, or modify them, or replace them completely; of course, always owning their own IP.”

Thirdly, DUG is also bringing out its own more advanced computer-hungry algorithms. Lamont says DUG will be able to offer ever more cutting-edge imaging technologies more easily once the new Bubba is up and running, such as high-frequency elastic full waveform inversion (FWI) and reverse time migration (RTM).

FWI's high-resolution models allow oil and gas companies to have an analysis that is more than imaging, says DUG, but which also allow interpretation and characterisation.



Left: CTO Phil Schwan [left] and managing director Dr. Matthew Lamont. Above: node in non-conducting oil-based polyalphaolefin liquid coolant

“It's pretty cool,” said Lamont about the utilisation of the company's new algorithms for a major ‘name’ client, an oil company. “It will probably be the first time the data from a large 3D survey has been brought off a seismic acquisition vessel via satellite in real time.”

Bubba's new look

The new Bubba will consist of 40,000 servers containing Knights Landing chips from Intel, or Xeon Phi x86 manycore processors. They will be submerged in a tank full of oil-based polyalphaolefin liquid coolant that does not conduct electricity, the so-called DUG Cool system, which the company says can reduce electricity bills by 43-45%. That is compared with traditional methods of lowering the temperatures of supercomputers, such as air-cooling fans or refrigerators.

The expanded Bubba will draw on just 15 MW of power capacity. DUG's other supercomputers, using DUG Cool, already have a very efficient ‘power usage effectiveness’ (PUE) rating of 1.05 or less. The proprietary method of cooling also extends

the servers' life by avoiding the corrosion or hot spots that he says can result from more traditional systems.

DUG says its supercomputers are the only ones to use such an energy efficient cooling system. “It gives us the greenest computer rooms on earth,” says Lamont. “DUG McCloud certainly offers more than just a silver lining.”

By February, Bubba will have been moved just six miles from its existing location in Houston to a building with a six-inch thick concrete roof deck that can withstand hurricanes of more than 190 mph. The site is in Skybox Datacentres' 20-acre (17.5-hectare) campus and LEED Gold data centre in Houston's Energy Corridor.

Houston was chosen for the expanded Bubba not because of the proximity to the current site, or because the city is the world's oil and gas capital. The new site was chosen because electricity is cheap in Houston, and the tax regime and regulatory environment are welcoming.

“Houston was a natural choice given the

low cost of power and the fact that Skybox had the available infrastructure ready to go,” said Lamont. “[The power] is very cheap compared with the rest of the world,” he said. Other locations were scouted in Ireland, the UK, Norway, Canada, Australia and Malaysia.

The move has been 18 months in the making, with much of that time taken up by the search for the new home for Bubba. Construction and installation in Houston is already under way on the initial expanded facility, which is 20,000 square feet (1,858 square metres).

A second hall of the same size is being built so that Bubba can be expanded even more – to at least an exaflop of computing capacity, or the ability to conduct a billion billion, or a quintillion, calculations per second.

Construction of the exascale supercomputer should hopefully start in 2020, says Lamont. ■

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