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As Rack Densities Rise, Liquid Cooling Specialists Begin to See Gains

BY [RICH MILLER](#) - JUNE 14, 2019 — [LEAVE A COMMENT](#)



Dr. Matthew Lamont (left), DownUnder GeoSolutions (DUG) managing director, and Phil Schwan, DUG CTO, stand among the cooling tanks that make up the "Bubba" supercomputer at the Houston Skybox data center. (Credit: DownUnder GeoSolutions)

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As artificial intelligence boosts demand for more powerful hardware, are data centers turning to liquid cooling to support more high-density server racks? The picture is mixed, as end users report a gradual increase in rack density, and there have been some large new installations for technical computing applications. Hyperscale operators, who are the largest potential market, continue to remain wary about wholesale adoption of liquid cooling.

Some cooling specialists report growing demand, and are investing in additional production capacity. But others say demand for liquid cooling from the data center sector remains "lumpy," and are shifting their focus to water-cooled for the fast-growing eSports market.

We've been tracking progress in rack density and liquid adoption for years at Data Center Frontier as part of our focus on new technologies and how they may transform the data center. The rise of [artificial intelligence](#), and the hardware that often supports it, is reshaping the data center industry's relationship with servers.

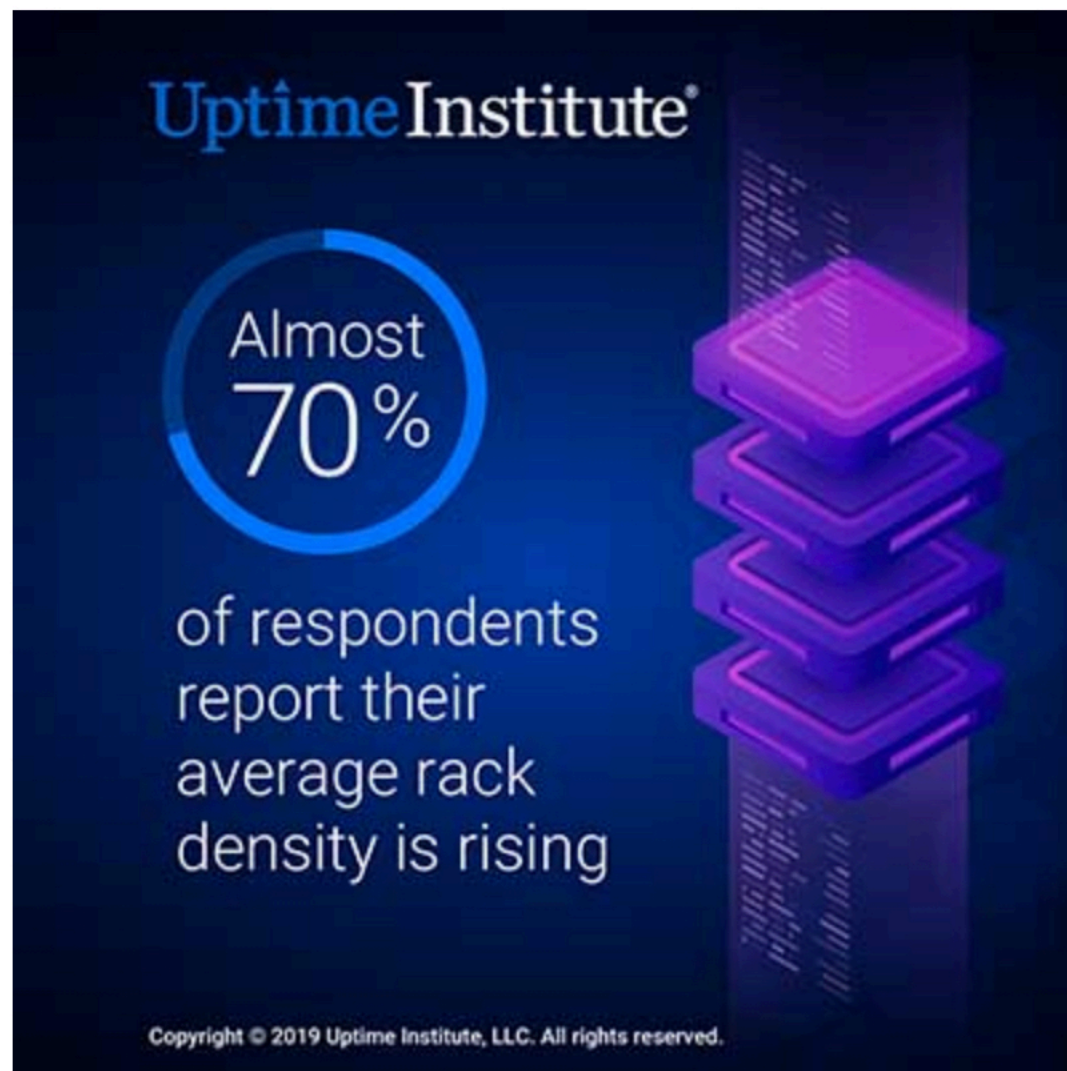
New hardware for AI workloads is packing more computing power into each piece of equipment, boosting the power density – the amount of electricity used by servers and storage in a rack or cabinet – and the accompanying heat.

Almost 70 percent of respondents in a recent [Uptime Institute](#) survey of enterprise data center users report that their average rack density is rising. Uptime notes that the increase “follows a long period of flat or minor increases, causing many to rethink cooling strategies.” Uptime Intelligence says it regards this as “a medium- to long-term trend.”

The [AFCOM State of the Data Center](#) survey for 2019 also cited a trend towards denser racks. Twenty seven percent of data center users said they expected to deploy high performance computing (HPC) solutions, and another 39 percent anticipated using converged architectures that tend to be denser than traditional servers.

Most servers are designed to use air cooling. Google's decision to [shift to liquid cooling](#) with its latest hardware for artificial intelligence raised expectations that others might follow. Alibaba and other Chinese hyperscale companies have adopted liquid cooling, and Microsoft recently indicated that it has been [experimenting with liquid cooling](#) for its Azure cloud service. But Microsoft has decided to hold off for now, and Facebook has instead opted for a [new approach to air cooling](#) to operate in hotter climates.

At the recent DCD Enterprise event in New York, several panelists said they believe the widespread interest in AI will lead to more high-density computing.



"As chip densities continue to do more and more, cabinet densities are going to skyrocket," said Brian Cox, CEO of [STACK Infrastructure](#). "That technology will rattle through over the next decade. The guts of what's going on in these data centers is going to change."

A key question is where those high-density racks will reside. [Switch](#) has long been a leader in high-density computing, with companies seeking out its Las Vegas campus to handle workloads that need lots of cooling.

"Most of our customers are involved in AI," said Eddie Schutter, the Chief Technology Officer at Switch. But Schutter said that most continue to use standard x86 platforms and few are exceeding 20 kW per cabinet, which Switch can easily support with air cooling.

Schutter said that many companies may choose to provision data-intensive AI applications through the cloud computing model, taking advantage of the data center expertise of hyperscale platforms and hosting specialists.

"I think what you will see is shared services through MSPs (managed service providers) offering AI-based leasing time," said Schutter. "There are some use cases that make a lot of sense today, but the use cases aren't pushing (higher densities)."

DUG McCloud

That's the case with [DUG McCloud](#), a new cloud service providing on-demand access to computer modeling of seismic data for energy companies, bringing new levels of precision to oil and gas exploration. The huge system from DownUnder GeoSolutions (DUG) has just gone live at the [Skybox Datacenters](#) facility in Houston's Energy Corridor, where DUG has leased 15 megawatts of capacity.

The DUG cooling system fully submerges standard HPC servers into tanks filled with a dielectric fluid. The project will deploy more than 720 enclosures using the DUG Cool liquid cooling system, which reduces the huge system's energy usage by about 45 percent compared to traditional air cooling, the company said.

DUG is one of the world's largest users of Intel Xeon Phi Knights Landing (KNL) nodes, and will use more than 40,000 KNL nodes for the DUG McCloud data center in Houston, which has been dubbed "Bubba."

DUG has leased a second data hall at Skybox, with plans in place to commence build out in late 2019. The massive system is expected to deliver 250 petaflops – more computing power than the world's top supercomputers. Skybox has additional land available for long-term growth, which DUG believes can exceed 1 exaflop by 2021.