

3M, Orange Silicon Valley, Allied Control and U.S. Naval Research Laboratory Demonstrate High-Density Supercomputing at SC'17

Collaboration enables new ways of achieving high compute density and deploying data centers in locations where energy and real estate come at a premium

3M announced today it has collaborated with Orange Silicon Valley, the U.S. Naval Research Laboratory, and Allied Control to demonstrate high-density, high-efficiency graphics processing unit (GPU) computing. The high-density server – operating in an Allied Control two-phase immersion cooling system – is on display in 3M booth #2081 at Supercomputing 2017.

The 20 GPU server, specially-configured and donated by Orange Silicon Valley, is packaged in a compact, three rack unit form factor. Each GPU has an original thermal design power (TDP) of 235 watts and potentially more with overclocking. Operation of such a high-density configuration is made possible by the unique properties of 3M's immersion cooling fluid. The fluid is more efficient at removing heat, enabling an increase in hardware density and higher processor utilization – creating a more efficient and greener data center. The server is cooled using 3M™ Fluorinert™ Electronic Liquid FC-72 in a two-phase immersion cooling system designed by Allied Control, yielding optimal compute performance with an ultralow 1.01 power usage effectiveness (PUE).

“Our extremely dense, two-phase immersion cooling systems not only enable high-performance computing (HPC) applications and hyperscalers to realize enormous cost-savings, but can also radically redefine the capability of usually very limited edge data centers,” said Kar-Wing Lau, CEO of Allied Control. “A broad range of applications could be supported, such as artificial intelligence augmented medical imaging and networks of rooftop edge data centers in dense urban centers to help improve self-driving cars.”

Orange Silicon Valley provided and overclocked the GPUs, utilizing this optimized performance to experiment with power-hungry cryptocurrency software Zcash, whose Equihash proof-of-work algorithm pushes the GPU cores to maximum utilization, taking up all the power headroom. The U.S. Naval Research team demonstrated MAGMA, DGEMM benchmarks to maximize the performance of the GPUs to utilize all the power headroom available.

The server platform supports 20 GPUs in a single, PCIe root complex and can be used for deep learning, traditional HPC workloads, and cryptocurrency mining during idle time. Two-phase liquid immersion cooling allows all the GPU SoC to be under 55 degrees Celsius at 100 percent GPU utilization at 120 percent TDP.

“With liquid immersion cooling, we can significantly increase the computation density of infrastructure for heavy duty HPC applications. Thermal engineering becomes increasingly difficult with air-cooled systems as we pack more GPUs in a smaller space. With a lower PUE and smaller physical footprint, we can envision new ways of designing our future data centers in regions where both energy and real estate come at a premium cost,” says Jérôme Laudouar, vice president of infrastructure for Orange SA.

Orange Silicon Valley is a business innovation subsidiary of global telecommunications operator, Orange SA.

Allied Control is a high-tech company, building world-leading, two-phase immersion cooling solutions for high-density electronics, and a Technology Collaborator for 3M Immersion Cooling.

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Multimedia Files:

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Drastic space reduction allows single width or denser GPU installation. (Photo: Allied Control)

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Bulky heat sink with noisy fan replaced with 1mm (1/25 inch) thin copper plate. (Photo: Allied Control)

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