



Liquid Composable Infrastructure

Overview

Composable Infrastructures direct-connect compute and storage resources, dynamically, using virtualized networking techniques controlled by software. Instead of physically constructing a server with specific internal devices (storage, NICs, GPUs or FPGAs), or cabling the appropriate device chassis to a server, composable enables the virtual connection of these resources at the device level as needed, when needed.

Not bound by a fixed ratio of CPUs to storage or networking, etc., these products can assemble or “compose” a bare-metal compute system with the desired hardware configuration, essentially at run time. And, they can “disassemble” it when no longer needed, returning those resources to a common pool. Many solutions also compose GPUs and / or FPGAs.

Liquid creates bare metal server instances from industry-standard chassis containing flash, GPUs, FPGAs, NICs and CPU and memory modules, including Intel® Optane™ persistent memory devices. The Liquid product is a PCIe switch that runs the Liquid Command Center composable management software connecting resources from approved hardware. Liquid is hardware agnostic. Liquid also manufactures NVMe storage devices in U.2 and PCIe AIC formats. The PCIe cables connecting the switch to these chassis essentially replaces the backplane - Liquid calls it a “rack-level backplane”. This allows Liquid to connect storage, GPUs and FPGAs into the composable fabric servers.

Highlights

- PCIe switch-based architecture direct-connects resources to servers
- Can compose multiple GPUs to single compute node
- Uses industry-standard storage, servers, GPUs - lower cost than proprietary modular chassis
- Supports Intel Optane devices as faster storage or lower-cost memory

Liquid Grid

At the heart of Liquid’s technology is Liquid Grid, a 2U managed PCIe switching fabric with 24 PCIe Gen3 x4 ports (configurable to x8 or x16). Liquid Grid provides 192 GB/s of full duplex bandwidth with a fabric latency of ~150ns. This system runs the Liquid Command Center software which controls the composing process. Liquid Command Center 2.2 extends the company’s capabilities to compose infrastructure across multiple fabric types, including PCIe Gen 3, PCIe Gen 4, Ethernet and Infiniband.

Storage Components

Liquid manufactures the following storage devices for use in industry standard chassis. The LQD3925 and LQD3900 provide Intel Optane technology, with faster performance than traditional NAND flash SSDs and better resistance to write cycle wear. Optane with Intel Memory



Drive Technology (IMDT) appears like DRAM to the OS, extending system memory to support higher-capacity use cases, such as in-memory applications, and lowering cost compared to DRAM. IMDT requires no changes to the OS or applications.

Element LQD3925x/xd – U.2 Intel Optane SSDs, single or dual-port, NVMe PCIe Gen 3.0 x4 interface, up to 1.5TB capacity, Intel Memory Drive Technology (IMDT) for DRAM emulation.

Element LQD3250d/x/xd – U.2 flash SSD, single or dual-port, NVMe PCIe Gen 3.0 x4 interface, up to 16TB capacity.

Element LQD3900 – PCIe Add-In Card (AIC) HHHL form factor, Intel Optane SSD, PCIe Gen 3.0 x8 interface, up to 1.5TB capacity, Intel Memory Drive Technology (IMDT) for DRAM emulation.

Element LQD3000 – PCIe AIC HHHL form factor, SSD flash, NVMe PCIe Gen 3.0 x8 interface, up to 16TB capacity.

Element LQD4500 – PCIe AIC FHFL form factor, SSD flash, NVMe PCIe 4.0 x16 Interface, up to 32 TB capacity.

Usage and Deployment

Liquid's technology, the Liquid Grid PCIe switch and Command Center software, are designed to create high-performance, rack-scale infrastructures for "next generation" applications such as AI and machine learning. Where most server chassis can only support a limited number of GPUs, Liquid composable architecture can incorporate large numbers of GPUs into a dedicated server instance.

Liquid offers Development Kits for Media and Entertainment, AI / HPC industry verticals, and vSAN, as well as composable expansion solutions for FPGA, GPU, NVMe and Intel Optane. Each Dev Kit consists of the Liquid Grid PCIe switch, Command Center software, a 4-slot (x16) Expansion Chassis for composable elements (listed above), two compute nodes, two GPUs, plus NICs and SSDs, configured for industry-specific workloads. Liquid also sells a "GPU Composable Half Rack" 24U configuration with 3 Liquid Grid switches and 12 compute nodes (each with 6 SSDs), plus 24 GPUs in 6 Expansion Chassis.

Liquid currently partners with Dell EMC, Inspur, Xilinx and other infrastructure OEMs.



Evaluator Group Opinion: Differentiating Elements for Liquid Composable Infrastructure

Liquid, a Colorado-based start-up company founded in 2013, has been one of the early entrants in this developing market. Their sweet spot is high performance applications that use multiple GPUs. Most servers have limited slots for GPUs, which makes it difficult and inefficient to expand this capacity. By composing GPUs, like they do flash, Liquid makes it easy to create a server instance with any number of GPUs and then to add more with a few software clicks. These resources can also be shifted to other workloads when needed, even on a short-term basis.

Unlike the composable products built around proprietary modular chassis, Liquid allows industry-standard storage, compute and other resources to be used, potentially reducing cost. The ability to leverage Optane as flash capacity or memory with Intel's IMDT is also a valuable feature.

Liquid's focus on GPU-heavy use cases is somewhat unique in this nascent industry, as is its recent software update that enables multi-fabric composability. The company is making the most of their current success but will need to leverage their OEM partnerships with the large infrastructure vendors over the long term, as this industry matures.

Link to vendor site for specifications: <https://www.liquid.com>

More detailed information is available at <http://evaluatorgroup.com>

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