

Meeting Intense Performance Demands in Cloud Environments

Joyent, Inc. drives up cloud network performance with a unique virtualization approach and Intel® Ethernet 10 Gigabit Server Adapters.



“With Intel® Server Adapters, we have a single, solid component designer behind the NIC, the CPU, the chipset, and the SSDs. And 10 Gigabit Ethernet is a no-brainer for avoiding trouble from congestion—the same reason we need more lanes on the freeways.”

– Jason Hoffman,
Co-Founder and Chief
Scientist, Joyent

Organizations increasingly place demanding performance requirements on cloud networks. Many find that using an external cloud service provider lets them take advantage of established expertise to meet emerging technical requirements. Other customers building their own cloud environments likewise stand to gain from the innovation of a vendor experienced in building cloud software, running cloud data centers, and servicing private cloud infrastructures.

Joyent, based in San Francisco and with locations all over the world, provides cloud computing products and services for web-based segments such as social network gaming and real-time mobile applications. The company is unique in its combination of having developed a cloud software stack, running a large public cloud based on it, and offering its software to outside companies that want to build their own cloud environments. Joyent solutions are highly optimized for Intel® architecture throughout the stack, from the processor out to the Intel® Ethernet 10 Gigabit Server Adapters.

CHALLENGE

Deliver high performance from cloud infrastructure while keeping equipment costs and TCO as low as possible. Support a growing customer base that presents the demands of real-time, data-intensive applications.

SOLUTION

Joyent developed a novel OS-level virtualization approach that currently supports as many as 2,000 application tenants across five physical hosts, and the team thinks it likely that the system is capable of even more.¹ The company meets the intensive I/O requirements for this environment with Intel Ethernet 10 Gigabit Server Adapters.

BUSINESS BENEFIT

In addition to maintaining headroom for high transaction rates and user counts in real time, Joyent has simplified its network environment. Deploying Intel Ethernet 10 Gigabit Server Adapters rather than multiple Gigabit Ethernet (GbE) adapters lowered the number of physical server adapters needed and reduced cable clutter and switch requirements, enabling more compute capacity per rack and lowering both capital and operating expense.



Joyent Smart Technologies Architecture: A Novel Approach to Hardware Abstraction

The value of cloud-based computing, from a customer perspective, comes largely from the agility benefit of being able to provision additional resources when needed. Organizations can spin up more virtual machines (VMs) at any time, allowing them to scale up during usage peaks and back down when usage decreases. While that elasticity is efficient, it has some inherent limitations in conventional cloud environments:

- **Scaling requires starting more VMs** because fixed amounts of resources are assigned to each VM.
- **Starting up VMs is not instantaneous** because it requires time to boot the OS in each VM.
- **The OS in each VM must be managed**, adding complexity to the environment that can create cost and stability challenges.

Joyent builds on the foundation of Intel® Virtualization Technology to provide an innovative virtualization stack with its Smart Technologies Architecture. As shown in Figure 1, virtualization with Joyent SmartMachines* pools physical resources such as processors and network hardware so that each application directly accesses those resources through the Joyent SmartOS*.

In the Joyent cloud architecture, applications can dynamically reach additional hardware resources as needed, without the overhead of spinning up another VM. Moreover, resource utilization is improved because static assignment of resources on a per-VM basis is avoided, removing the need for over-provisioning. As a result, system utilization is increased, with each physical host currently supporting 400 tenants per physical server. Further, the Joyent team is confident that they will be able to push that number even higher in the future.¹

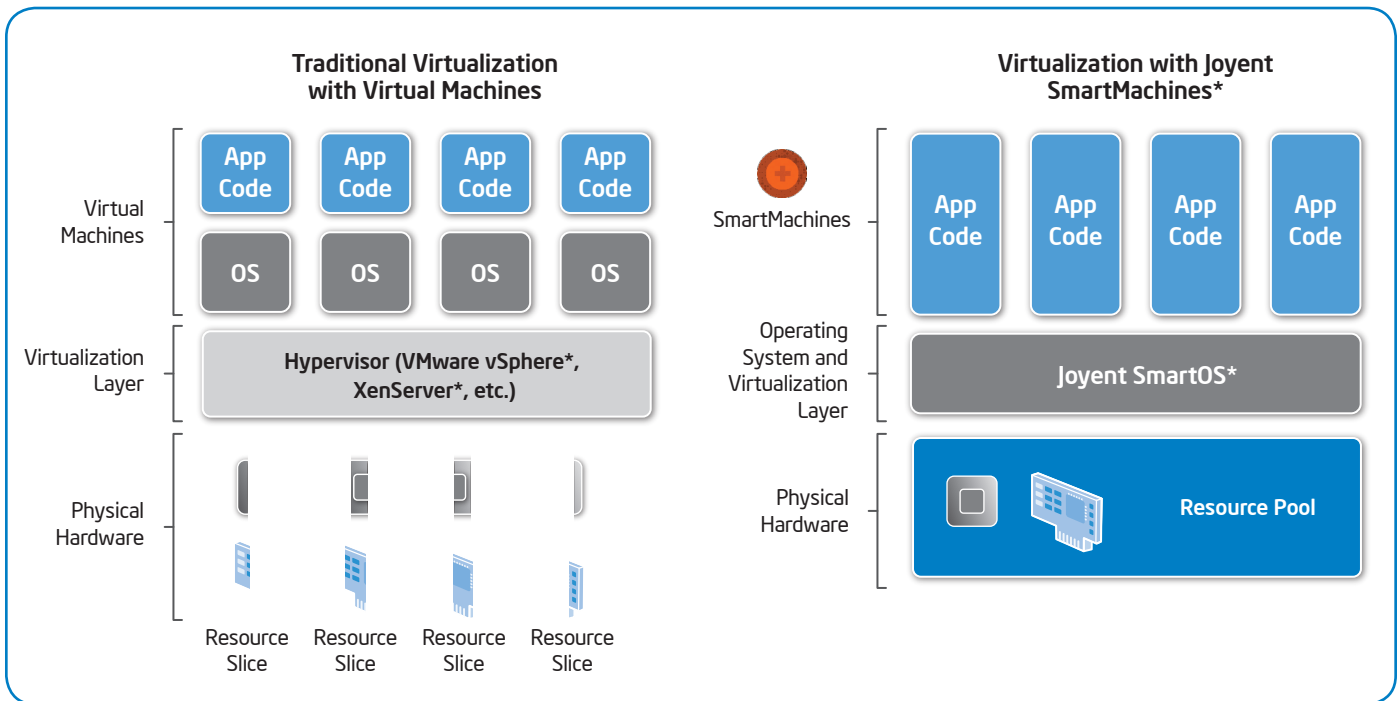


Figure 1. The Joyent SmartMachine* abstracts hardware more fully than conventional virtual machine architectures, presenting a pool of hardware resources rather than resource slices.

Intel Ethernet 10 Gigabit Server Adapters: Improved Throughput at Lower Cost

The ability of Joyent Smart Technologies Architecture to drive up the number of tenants per server places increased demands on network I/O. Bryan Cantrill, Joyent VP of engineering, notes that the high performance of the latest Intel® Xeon® processors is a huge asset, but Intel Ethernet 10 Gigabit Server Adapters are at least as important a factor in obtaining high-performance cloud infrastructure.

Growing core counts and raw processor performance demand the ability to move massive amounts of data over the network, and high levels of bandwidth are needed to avoid I/O bottlenecks. Intel® Ethernet 10 Gigabit Server Adapters handle that requirement while cutting down port count and complexity, compared to older Gigabit Ethernet networking, together with the industry-leading dependability that comes from working with trusted, proven solutions from Intel.

The company depends exclusively on Intel Ethernet 10 Gigabit Server Adapters as it deploys new server hardware in its cloud environments to keep up with the ability of modern processors such as the Intel® Xeon® processor 5600 series to push massive amounts of data. Cantrill said, "I love Intel's 10Gb NICs. They perform well, and Intel gets it right standing behind them. That's important because a lot of thorny issues can come up with these complex environments." Indeed, that type of confidence is a key benefit of Intel's offerings across the board.



From a day-to-day operational standpoint, Intel Ethernet 10 Gigabit Server Adapters provide a robust, forward-looking basis for network connectivity of Joyent's cloud infrastructure:

- **Supporting data-intensive applications** with controllers that are designed in conjunction with the latest Intel® server platforms, including the Intel Xeon processor 5600 series, for highly optimized performance.
- **Cutting network cost and complexity** by consolidating as many as six or eight GbE ports onto two 10GbE ports.
- **Counting on mature, stable drivers** for Intel® Ethernet that help ensure trouble-free, dependable operation on the UNIX*-based Joyent SmartOS.

Intel is the industry leader in Ethernet controllers and adapters, with 30 years of experience. Intel Ethernet 10 Gigabit Server Adapters give cloud infrastructure based on Joyent Smart Technologies access to high-performance networking with a well-earned reputation for dependability while cutting down on cabling and switch requirements.

The Forward-Looking Cloud: Low Latency for Data-Intensive, Real-Time Apps

Looking ahead, Joyent has aligned its roadmap and strategy with what it sees as a newly emerging class of web applications. Usages such as social network-based interactive gaming and real-time communication have the potential to drive business needs for data-intensive handling of compute workloads with very stringent latency requirements. Commodity clouds are not built to address this type of usage model, and Joyent sees opportunity for providing very high quality of service and low-latency cloud services.

"As our customers build more data-intensive, real-time applications, we look to Intel® Ethernet 10Gb Server Adapters to drive down latency."

– Bryan Cantrill, Vice President of Engineering, Joyent

Joyent's vision is that timeliness will increasingly define correct operation of compute systems and services. As computing as a whole increasingly migrates to cloud infrastructures, cloud services that can support low-latency operation may be in higher demand to support applications with requirements such as the following:

- **Real-time social media** such as interactive games require low latency because a piece of data arriving late represents an error.

- **Real-time communications** such as voice, video, and remote control of automated systems demand timely delivery of every data packet, and latency or loss of any significant amount is unacceptable.

- **Storage networking** with mechanisms such as network-based storage or storage area networks based on Ethernet must maintain low latency and lossless delivery.

Too many breaches of timeliness mean that the system or service is not capable of handling these applications' core requirements to provide an acceptable user experience. Bringing together a history of performance and stability with a future of continuing innovation, Joyent is poised to help deliver the next generation of cloud infrastructure.

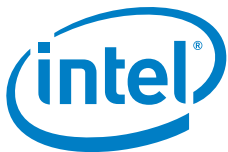
About Intel® Ethernet

Intel is the industry leader in Ethernet controllers and adapters with a broad product portfolio and 30 years of experience delivering connectivity that IT customers depend on.

www.intel.com/go/ethernet

Learn more about Joyent: www.joyent.com

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