Datacenters look to the moon to meet the cloud’s requirements

Chris Warner, Executive Editor

Specialized servers aim to revolutionize the fast-growing data center

 When technology experts talk about the “Internet of Things,” it’s not an understatement. The sheer number of connected devices is growing at an unprecedented rate. IDC estimates mobile devices will total 1,832.3 million units in 2013 while predicting the total mobile phone shipments will reach 2,281.4 million units worldwide in 2017.[1] That’s just the tip of the iceberg, as machine-to-machine communications become more common, while traditional home appliances are becoming increasingly connected. Despite cloud computing’s promise, storing and processing all the data these connected devices generate across a wide variety of applications puts traditional server environments in an untenable position to scale up to the massive levels needed to efficiently deliver the high performance our data-hungry world requires.

Software defined servers have emerged to address specific workloads that general purpose servers may not be able to efficiently handle. Today’s datacenter demands efficiency in data processing, connectivity and power consumption, and the cloud is evolving with new purpose-driven or “specialized” servers. Building up the huge datacenter infrastructure needed to handle the oceans of new, context-rich data services is known as “hyperscaling.” The trend hinges on balancing specialized tasks such as compute, memory, storage and scalability with the expenses for each workload. Recently, HP announced its HP Moonshot system designed for specialized workloads, particularly small computing tasks that must be performed in extremely high numbers such as web app serving, media streaming, serving HTML pages and runtime scripts, cloud utility services, analytics, data storage and retrieval, and caching.[2]

New systems aim to eclipse traditional server performance

The system consists of the HP Moonshot 1500 chassis and application-optimized HP ProLiant Moonshot servers which when introduced will contain processors from multiple vendors, each targeting a specific workload. Each chassis shares traditional components including the fabric, power supply and cooling fans to reduce complexity, energy consumption and space. The first server, the HP Moonshot 1500 includes a 4.3-U chassis which hosts 45 independent, hot-plug HP Proliant servers. These servers leverage the Intel Atom S1260 2-GHz processor which includes two integrated 1 GbE ports routed to a separate Ethernet switch. In addition to the processor, the server cartridge features 8 GB RAM, 1 MB of cache and dedicated HDD storage up to 1 TB. According to HP, these servers deliver maximum density while requiring up to 89 percent less energy, occupying 80 percent less space and costing 77 percent less than traditional servers.[3] “These server cartridges will offer unique designs and processors, each targeting a specific workload,” says John Gromala, Director, Hewlett Packard’s Hyperscale Business. “With support for up to 1,800 servers per rack, Project Moonshot occupies one tenth of the space required by traditional servers, when running one of these new classes of internet applications.”

Mobile devices are a prime application for software defined servers because disparate voice conversations must be transcoded from one voice format to another as they go through the network infrastructure between devices. As mentioned earlier, mobile phone shipments continue to grow, and servers are expected to handle not only voice but music and video. Therefore, servers specialized for massive signal processing workloads would be ideal for today’s – and tomorrow’s – mobile demands.

Processors make servers “special”

Servers specialized for specific tasks mean the processors must be equally suited for specific tasks, and the leading chip vendors are responding with solutions to customize and optimize them for their requirements. Keystone II SoCs from Texas Instruments Incorporated (TI) are among HP’s growing roster of processing devices from which the company hopes to expand the scope of its server cartridges. The SoCs are positioned for advanced signal- processing and floating-point intensive server needs, as well as applications requiring 3G/4G wireless processing capabilities. They feature up to four ARM Cortex-A15 processors and eight C66x DSP cores for RISC and DSP processing in cloud environments.

When selecting embedded SoCs for scaling infrastructure, the architecture should incorporate the right amount of peripheral sets to go with interfaces such as Ethernet, Serial RapidIO, PCIe and others. Hyper scaling also benefits from efficient packet processing. An SoC environment with a queue manager subsystem can relieve the CPU core from moving data in and out of high bit rate peripherals while eliminating the need for a direct memory access (DMA) master for peripherals that do not need routing. A highly efficient subsystem coupled with the optimum amount of IO helps enable the “extreme” scaling that specialized servers can provide the datacenter. Using a packet-based infrastructure like the Keystone II’s Multicore Navigator, explains Sanjay Bhal, focused end equipment manager, HPC and cloud, TI, “helps software running on one SoC to easily extend from the application to the software running on the other SoC or multiple SoCs. When you offload the cores, you can use them for some other purpose. Now that combination of offloaded packet processing and freeing up the core results in better application performance for the SoC.”

Power consumption is also an important concern for hyper scaling datacenters because adding all the hundreds or thousands of densely configured servers sharing the same power has the potential to add prohibitive costs and thermal management

issues to the datacenter. Therefore, embedded SoCs must ensure servers meet their extreme low energy requirements. Gromala notes that HP Moonshot’s low energy processing characteristics are possible because of its ultra-small form factor and use of low-energy SoCs that target smartphones rather than traditional microprocessors. “These processers have lower wattage requirements and a dramatically reduced energy and space footprint,” he said, which in turn dramatically helps lower costs.

Bhal counts the Keystone II’s desirable integration and features that help control voltage, frequency and power based on device activity as keys to enhanced energy efficiency. “It is the best SoC out there at integrating the DSP plus ARM accelerator switching as well as IO. Now when you put everything together on a single die, you’re going to get a lot more energy efficiency versus having everything on different die.”

Sunny skies ahead?

There’s no doubt that the datacenter must dramatically scale up to meet the data processing needs brought about by the arrival of the Internet of Things. While many enterprises will stick to the tried and true one-size-fits-all server, HP plans to take its high-density, modular approach to a range of diverse markets while uncovering newer applications along the way. Gromala expects the company to roll out server cartridges for emerging web, cloud, massive scale environments and telecommunications later this year, with big data, high performance computing, gaming, financial services, genomics and facial recognition to follow. By marrying customer requirements with emerging technologies, he hopes to “dramatically improve the efficiency of not only a customers’ application performance, but the whole datacenter environment, including management.”

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