

HP ProLiant Server Customers Are Assured of Integrity— In the Test Equipment. In the Signals. In the Product.



Solution Summary

Challenge	Running a wide assortment of board debug tests on industry-standard HP ProLiant servers with rapid data capture and simultaneous viewing of multiple signals for overall 24x7 trouble-free server operation.
Solution	Tektronix TLA700 Series logic analyzer with TLA7AA4 logic analyzer modules and connectorless probing system.
Benefits	Unprecedented measurement speed, minimal required setup, simultaneous analog and digital signal readings from one instrument and probe, and high signal quality.

When you're dubbed the undisputed global leader in industry-standard servers (ISS) by market analysts and have sold more than six million units since the first server rolled off the production line 13 years ago, retaining that lead means a continuing commitment to meeting customer requirements and transcending their expectations. In essence, it's maintaining a focused development effort, pioneering new technological advances, and delivering exceptionally reliable, robust, trouble-free servers to customers the first time, every time for applications ranging from simple and single-function to highly complex and mission-critical.

HP is doing just that with its ProLiant server family. High-level performance, ready availability, ease of management and solutions integration are the hallmarks of this comprehensive server line. Ultra-dense server

blades optimized for rapid deployment and provisioning are packaged for space-constrained enterprises and service providers. Density-optimized servers have been designed for flexibility and manageability in multi-server deployments. Tower servers offer maximum internal storage and I/O flexibility for remote locations and branch offices, as well as data centers.

In addition to conforming to and, in some instances, leading the charge in industry-standard server developments, HP has incorporated a continuing stream of bold innovations into its ProLiant servers. Because of the impact of downtime as a result of memory failure, memory protection advances have been a priority. These include online spare memory, hot-plug mirrored memory, and soon, hot-plug RAID (redundant array of industry-standard DIMMS) for eight-way servers. Another HP technical breakthrough has been the development of PCI-X technology for its Integrated Lights Out processor, which raises the bar in remote management and diagnostics.

When dealing with business applications where database protection is paramount, a dependable server that is problem-free 24x7 is mandatory. To create a server design that is as close to 100-percent perfect as possible without an imminent threat of downtime, stringent testing to troubleshoot, debug and eliminate any potential glitches is necessary. Test equipment must stand up to demanding performance requirements and esoteric tests without subjecting the design engineer to complicated setup procedures. Tektronix test instrumentation has helped HP meet the challenge for its last three generations of server products and is currently being used to debug the newest ProLiant design – a high-end, 8-way tower server with hot-plug RAID memory.

"Debugging is a lengthy process and may take a year before all the problems are thoroughly fixed," said an HP hardware engineer responsible for ProLiant board debug. "We'll re-spin our boards and ASICs until everything is just right, which can mean a couple of iterations." When the ProLiant group is ready to start a new server design, it will bring in different test vendors' products to compare functionality. HP says there's generally a specific sample rate in mind for capturing data when debugging. "Our two main parameters are how fast can we acquire data and how many signals can we look at simultaneously with the test equipment. Cost is also a highly relevant factor."



For the past few years, the HP ISS Enterprise Server Lab has used Tektronix oscilloscopes and logic analyzers because they have measured up to HP's requirements in terms of technology, ease of use, cost efficiencies and more space-efficient packaging, making them "bench-friendly." But while the scopes are important, "a lab without logic analyzers would make it impossible for me to do my job," the HP engineer noted. ProLiant engineers have been using the Tektronix TLA700 Series, a configurable, modular logic analyzer family that includes mainframes, digital acquisition modules and pattern generator modules, among others. HP is currently using the 136-channel TLA7AA4, one of six new acquisition module additions.

Like its module counterparts, the TLA7AA4 logic analyzer has an industry benchmark 8-GHz timing acquisition rate for debugging problems caused by very fast glitches and narrow setup/hold violations; a 120-MHz to 800-MHz state clock with up to 1.25 Gb/s state data rate for tracing and analyzing the real-time behavior of the fastest processors and buses used in today's designs; and simultaneous timing, state acquisition and analog measurements through the same

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- HP ProLiant Server Group Hardware Engineer

logic analyzer probe for complete real-time system visibility with correlated analog measurements, digital timing, state acquisition and software trace. These new modules provide measurement speed currently unmatched by competitors' products, flexibility and ease-of-use together with a one-of-a-kind connectorless probing system that reduces development board costs, and enables engineers to access the signal directly.

The TLA7AA4 is set up at two ProLiant test stations to run the server boards through myriad tests for every conceivable factor – even for conditions that would most likely never occur in the real world. The ProLiant engineers run tests for simultaneous access to the network, to the hard drive, to memory and to the I/O cards using a random assortment of variables, and catching a good number of errors as a result. Operating systems are also tested for bugs, and then other ProLiant groups perform wide area test and run real system applications to ensure smooth operation.

A critical board debug test using the logic analyzer views all signals coming out of the Intel CPU or the front-side bus and at the communications between the ASIC and the CPU. "If the system locks up and hangs, we want to know why," said the HP engineer. "We'll set

up triggers on the logic analyzer, trigger it, capture all the data from the point where the failure occurred, and then track back until we identify the point of failure and correct it."

The speed of the TLA7AA4 has made the HP engineer's job easier. "The new 450-MHz cards are a real boost in speed over the previous generation's 200-MHz cards. The 200-MHz cards would make it very difficult for us to test the servers' really fast memory subsystem buses. There was a complicated setup procedure that was time-consuming. And when you're going in and out of the lab and not using the logic analyzer for months at a time between designs, you tend to forget the process and have to relearn it. That's not the case now."

A bonus of the TLA7AA4 analyzer is the connectorless probing system. The ProLiant group is using the 34-channel P6860 high-density compressor probe with differential clock and single-ended data. "It was impossible to get a thorough look at signal integrity because the previous probes' passive connectors had difficulty dealing with bad signal quality," said HP. "The new probes have embedded active electronics so we can extract data even with inferior signal quality."

Stubs and vias that run through PCB boards for connection and routing signals can contribute to poor signal performance. The P6860 probe connects directly to a land pattern on the board, alleviating this degradation problem and enhancing signal quality, which is essential for increasingly higher-speed signals.

The new probes are also "more forgiving," said HP. Performing a digital/analog signal reading at the same time with an old probe system involved hooking up the logic analyzer probe to a specific point on the board for digital signal analysis. Assessing an analog signal entailed connecting an oscilloscope to a separate point on the board for two different connections to the same signal. The TLA7AA4 and P6860 probe enable HP engineers to look at analog and digital signals simultaneously to extract requisite information using one instrument and one probe.

HP calls the ability to acquire innumerable signals with the TLA7AA4 and time-correlate everything to 500 picoseconds across all signals "magical." The ProLiant group has already tested more than 2,000 signals, without even approaching the TLA7AA4's maximum capacity.

"The new logic analyzer and probe put Tektronix well ahead of its time in terms of speed and power," said the HP engineer. "And its compatibility with our older Tektronix equipment made the transition easy and seamless."