VirtualWisdom®
ProbeVM Family

VirtualWisdom provides unified, end-to-end performance insights across virtualized infrastructures running mission-critical applications

The VirtualWisdom solution is comprised of the VirtualWisdom Management software and dedicated Platform Appliance along with a unique combination of software (ProbeVM, ProbeSW, ProbeNTAP) and hardware (ProbeFC, ProbeNAS) probes. This fully integrated platform correlates and analyzes data collected throughout the infrastructure – something that was never before possible. This highly granular and comprehensive solution enables customers to start managing performance, stop reactive troubleshooting, and achieve cost optimization.

Software-based ProbeVM Family

The ProbeVM family of software-based virtual machine probes collects and correlates a comprehensive set of metrics that enable IT, server, and VM administrators to optimize the performance, utilization, and availability of their virtualized IT infrastructure. ProbeVM is unique in its ability to eliminate the risk of using virtualization with I/O-intensive, latency-sensitive applications.

The current release of VirtualWisdom and the ProbeVM family support VMware vSphere®, IBM PowerVM®, and Microsoft Hyper-V® environments, presenting hundreds of performance and utilization metrics from across the virtual estate.

Key Benefits

- Accelerates deployment with realtime monitoring of virtual machines, physical servers, and clusters across vSphere, PowerVM and Hyper-V environments via agentless architecture

- Collects data and calculates hundreds of different metrics including CPU utilization and status, memory utilization, disk I/O requests and capacity, network requests and utilization

- Enables monitoring, benchmarking, and optimization of virtual machines for performance and availability based on historical data and trends

- Delivers customizable reports and charts that provide visual insight into performance of the entire IT stack

- Case-based alarming driven by thresholds and policy-based event notifications

ProbeVM for vSphere

Delivers deep SAN/NAS intelligence and operational visibility to VMware deployments to model ESX/ESXi server performance and better balance the deployment of virtual machines

ProbeVM for PowerVM

Provides greater insight into the virtualization stack to enable proper placement of workloads as well as the intelligence needed to properly size the LPARs

ProbeVM for Hyper-V

Gives greater insight into the virtualization stack to rapidly diagnose cause of application slowdowns and optimize Hyper-V environments

VirtualWisdom enables support for virtualization platforms and correlates across the complete I/O stack

The latest release of VirtualWisdom enables expanded support for more virtualization platforms. This provides unparalleled visibility into the performance, health, and utilization of the entire open systems infrastructure, including VMware, Microsoft and IBM Power Systems™ environments. As a result, customers are empowered to guarantee the performance and availability of their mission critical applications across physical, virtual, and cloud computing environments.

ProbeVM for vSphere is the perfect complement to vCenter™. It correlates vCenter information in realtime with actual I/O performance data measured directly from the SAN or NAS infrastructure by the Virtual Instruments family of probes. This high level of virtual I/O visibility makes risk-mitigated optimization and ESX™/ESXi™ server performance modeling possible. This enables mission-critical deployment of virtualized applications by verifying performance-based service level agreement (SLA) metrics in real-time.

With ProbeVM for vSphere, customers can:

- Correlate views on VM, ESX, network, and storage performance

- Predictively optimize VM workload placement across ESX clusters for higher, and more stable, utilization

- Identify trends and patterns of utilization for key metrics like CPU, memory and I/O

- Give insight into real-time storage metrics via correlation with other VirtualWisdom Probes

ProbeVM for PowerVM is an agentless solution that discovers the PowerVM environment and integrates fully with the VirtualWisdom platform to provide LPAR to disk LUN visibility. This provides PowerVM customers with greater insight into the virtualization stack to enable proper placement of workloads as well as the intelligence needed to properly size the

LPARs. VirtualWisdom, along with ProbeVM for PowerVM delivers objective and platform-aware monitoring and problem resolution using realtime, deterministic performance information. Also, proactive alerts on trends that indicate emergent performance problems greatly reduce risk.

With ProbeVM for PowerVM, customers can:

- Display System CPU state across the entire PowerVM estate

- Identify busiest LPARs by CPU

- Optimize LPAR CPU Entitlement

- Show disk I/O Mapping Performance Management

ProbeVM for Hyper-V enables comprehensive cross-domain, real-time measurement capabilities. Server and VM administrators are then empowered to optimize the performance, utilization, and health of their virtualized IT infrastructure running on Hyper-V. This probe offers the ability to correlate Hyper-V CPU and disk metrics in order to improve overall application performance. ProbeVM for Hyper-V enables deep SAN/NAS I/O intelligence and operational visibility to Hyper-V deployments, which in turn enables administrators to achieve higher performance and better balance virtual machine deployments based on real-time measurement and analysis of I/O performance.

With ProbeVM for Hyper-V, customers can:

- Correlate views of Hyper-V partitions and storage performance

- Ensure optimum use of server and storage resources

- Identify utilization trends and patterns for key metrics like CPU, memory, and I/O

- Give insight into real-time storage metrics via correlation with other VirtualWisdom Probes

- Rapidly diagnose causes of application slowdowns in Hyper-V environments

Using VirtualWisdom and the ProbeVM family results in significantly higher virtual infrastructure utilization and helps server and VM administrators reduce and control server and storage related costs. VirtualWisdom provides granular visibility into continuous, real-time performance, health, and utilization metrics throughout the open systems stack, driving peak performance and availability while lowering the total cost of infrastructure that supports your mission-critical applications and workloads.

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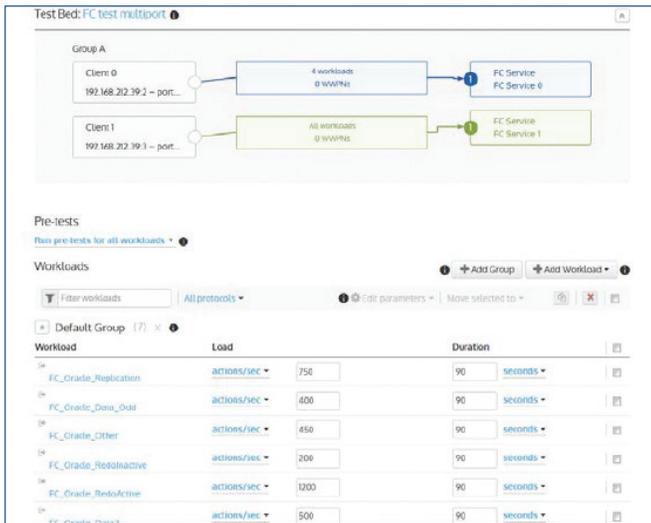
Figure 5: Sample Composite Workload Editor configuration screen, with a multi-LUN Oracle DB.

Other important features include:

- **Simple Test Execution**
  Load, run and configure tests with a simple "push button" interface. LDX Enterprise allows storage and network administrators to configure and execute tests without requiring specialized protocol expertise.

- **Historical Data Capture and Presentation**
  Recall any output results and statistics from previous test runs for comparison and analysis.

- **Test Lab Administration**
  Create and save configurations (network profiles) for test beds, devices under test, etc. Allows users to simply deploy their tests to pre-configured test beds, and allows network administrators to enforce network constraints, lowering incidences of IP space conflicts, VLAN congestion, and other conflicts.

- **Batch Mode with Pass / Fail Conditions**
  Launch an execution of test series governed by logical conditions. Allows users to efficiently execute batteries of tests, sequentially or in parallel, which is common in regression testing.

- **Automation**
  Control all shared resources from a web service API. Allows for easy integration of Load DynamiX Enterprise into an existing test automation harness.

- **Usage Tracking**
  Administrators of Load DynamiX appliances can now see periodic metrics on actual usage of each device or groups of devices, such as: port utilization, number of tests actually used, test duration, and total port hours. Such capability helps you determine if the appliances are being used to their full capacity.

- **Simple Collaboration**
  Share Load DynamiX resources such as appliances, ports, tests, and test results with specified groups or individuals based on their role within the organization. Access to specific resources and tests can be dynamically determined to support higher levels of security and efficiency. Such functionality allows team members to work more effectively with each other and increase the ROI in Load DynamiX appliances.

Load DynamiX Enterprise Reporting

Load DynamiX Enterprise comes with a broad array of standard output reports as well as the flexibility to create custom reports that are most valuable to your organization. You may choose to view reports as a summary table, a time-based line graph, or as a histogram, in real-time, as the test runs.

Figure 6: Example of summary table, response time delivered by the storage infrastructure to I/O requests
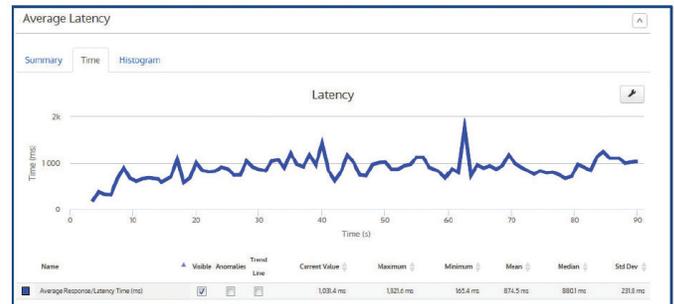

Figure 7: Example of time-based graph, response time delivered by the storage infrastructure to I/O requests
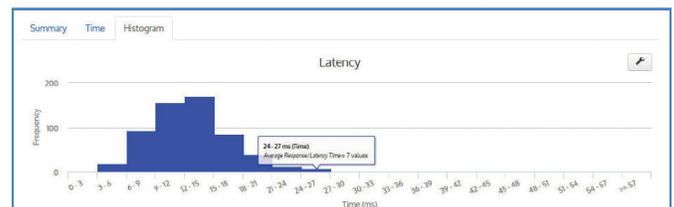

Figure 8: Example of a response time histogram delivered by the storage array / infrastructure to I/O requests

Custom reports are available as baseline charts and multi-statistic charts. A baseline compares the same statistic from different test runs, where one of the test runs is the baseline. For example, if you are creating a report that compares how 5 different firmware versions perform when handling the same

workload, and you want the performance obtained with the current firmware version to be the baseline,

Use a multi-statistic chart if you want to plot different statistics on the same chart. For example, if you want to plot throughput, IOPS and latency on the same time-series chart, you can see how these statistics relate and/or correlate to each other over the course of a workload, as shown below.

Figure 9: Multi-statistics report, showing IOPS, latency, and throughput on a single graph

Primary Testing Methodologies for Load DynamiX Enterprise

When using Load DynamiX storage performance validation products, there are two common methodologies for assessing the performance capabilities of networked storage infrastructure. Workload Modeling is the primary methodology as described above, but many architects and engineers also conduct Performance Profiling.

Performance Profiling

The objective of Performance Profiling is to fully characterize the behavior of a storage system under a large set of workload conditions. This method is sometimes referred to as "four corners testing" or "sweet spot / blind spot analysis" or "multi-dimensional benchmarking". Doing so provides the storage engineer with a map of the behavior of the storage system - making it easy to understand the strengths and weaknesses of the array and which workload attributes most directly affect performance. Engineers and architects can then use this information to optimally match their workloads to storage system purchases and deployment decisions.

Figure 10: Input screen of Load DynamiX Enterprise Workload Iterator; testing for the effect of varying 5 different parameters on performance.

In the Load DynamiX Enterprise interface, this methodology is enabled by an iteration workflow (input screen above) that allows the user to iterate on any of the many workload characterization attributes exposed by Load DynamiX workload models (examples: load profile, block size, command mix, queue depth settings, etc). The workflow can result in a suite of tests that stress the storage system under hundreds or even thousands of workload configurations, with automated test execution, aggregation of data and presentation of results.

Figure 11: Extract of output report of Workload Iterator function, showing effect of access pattern, block size, queue depth, load throughput, and data reduction ratio on key performance metrics

Load DynamiX Enterprise Licensing and Packaging

Each Load DynamiX Enterprise appliance, whether physical or virtual, requires activation. Every Load DynamiX Workload Generation Appliance that Enterprise manages requires an add-on software license. Load DynamiX Enterprise works with all Load DynamiX appliances including the Load DynamiX 1G Series, 10G Series, FC series, Unified Series, Enterprise Series, and Virtual Series. For more information on these appliances, please refer to the Enterprise IT Solutions datasheet.

Load DynamiX Enterprise is available in two implementations: It can be pre-configured on a physical appliance for superior performance and stability for faster time to value. It is also available as a Virtual Machine for flexible deployments on any server in your data center. The appliance is equipped with 10TB of storage for saving test projects and results. External storage can be also used for additional space.

Complementary Products

Workload Generation Appliances

Workload Generation Appliances are used to generate traffic based on workload models and access patterns that have been configured by Load DynamiX Enterprise software. There are both hardware and virtual versions of the appliances. The hardware appliances are purpose-built 2RU devices with a software and hardware architecture that has been specifically engineered to cost-effectively generate massive traffic loads that can test the performance and scalability limits of any storage subsystem, including the highest-end all flash or hybrid storage systems.

VirtualWisdom Performance Probes

Performance Probes are hardware-based monitoring devices that enable storage engineers and operations teams to capture network switch data and statistically analyze the workloads in real-time. Using optical TAPs on 10G Ethernet and 8/16G Fibre Channel, this data can be captured and then further analyzed by the Workload Analyzer module of Load DynamiX Enterprise, to generate a highly accurate workload for replay in a test lab. This capture/analyze/replay capability will dramatically accelerate storage performance problem identification and resolution.