LOAD DYNAMIX: COMPARISON AND COMPLEMENTATION OF EXISTING IT MANAGEMENT TOOLS

The industry's only workload-centric storage performance analytics solution

Load DynamiX brings advanced workload acquisition, workload modeling and workload performance analytics to IT organizations. Our solutions provide critical insight to help our customers optimize the performance, availability, and cost-effectiveness of their storage systems. Load DynamiX storage performance analytics solutions provide detailed workload analysis that enables the accurate emulation of production application workloads at extreme scale. This empowers storage professionals to optimize storage system deployments, find storage system limits before being deployed in production, and accelerate resolution of troublesome performance issues.

Though most IT management products in use today do some level of performance monitoring, they all lack physical, real-time monitoring of the entire I/O path with all the metrics of the application workload, and none can easily prove whether an application performance problem is caused by the storage infrastructure or application workload. Legacy load generation and performance testing products are mostly useful for small one-off projects because they require a significant effort to deploy and execute, lack realism and scale, and fail to offer repeatable results.

Load DynamiX performance analytics is the only solution that combines workload generation and workload acquisition hardware, with software to acquire, analyze and model workload profiles, and run tests to accurately emulate real-world application workload behavior.

Load DynamiX Advantages for Workload Generation and Performance Testing

Nearly all of our customers started out using freeware tools like Vdbench, fio, and Iometer, and moved to Load DynamiX. The points on the next page describe the key reasons why so many IT organizations have upgraded to Load DynamiX.

> " Load DynamiX Workload Sensors and Workload Analyzers will, for the first time, give enterprises a full picture of their application's storage behavior and use that data to see how their applications will work on next generation storage systems."
>
> **Howard Marks**
> Founder
> **DeepStorage.Net**

Load DynamiX Advantages over Freeware Tools

1. **Ease of use & deployment** – Using Load DynamiX results in up to 10X more tests per month equating to higher storage engineer productivity and better storage decisions. Through our Workload Data Importer, LDX includes a completely industry-unique automated workload acquisition, analysis, and modeling solution that relieves the manual burden of building the simulated workload. Novice users can create very complex models that support composite workloads with temporality. LDX enables you to iterate hundreds of tests from a single command, eliminating the need to write, spawn, and track results from dozens or hundreds of separate test/threads. Sample workload models are available for iSCSI, NFS, SMB, FC, object storage, VDI, database OLTP, fileserver, photo server, streaming video and many others.

2. **Best in Class Realism –** Using the LDX workload acquisition and profiling tools results in better purchase and deployment decisions that minimize cost and assure performance. Load DynamiX offers a richer set of test parameters, such as the ability to generate compressible and deduplicable content; more closely simulating your actual production environment. The Workload Sensor offers unparalleled, granular data acquisition from your existing storage infrastructure for the most accurate workload models. LDX support of meta-data file system calls mimic real-world applications, which can constitute well over 50% of all I/Os. LDX support of composite workloads allows you to run multiple workloads, even with different protocols, concurrently, for a more granular application emulation. Additionally, LDX is the only platform that enables you to develop application workloads that simulate both temporal and spatial localities, and hotspot drift.

3. **Repeatability and Consistency of results** – By being an appliance-based solution with an integrated test management platform and database, you can have 100% confidence in all comparisons across products, locations, users, and time. And our automated Workload Acquisition eliminates the human error that easily sneaks in through analysis mistakes or even simple data input errors.

4. **Comprehensive charting and reporting tools –** LDX greatly reduces the time it takes to generate, compile and share reports for faster time to insight. There's no need to find the ASCII or html output files from each load generator / server, and consolidate them into a format that you can use. LDX allows you to easily share the results of your tests by creating a reusable report template as the basis for generating reports.

5. **Professional services and support** – you've got an active partner in solving your problems and evolving the product in a timely basis. Trained experts answer your questions immediately. And perhaps most importantly, we can help you to avoid flawed testing methodologies that can easily lead to bad decisions. You have direct input on roadmap items and you can count on 2-3 significant product updates per year vs. updates every few years, ensuring that you're keeping current with new technologies, protocols, etc.

6. **Performance –** LDX purpose-built load generation appliances are optimized to generate and drive extreme storage workloads across a wide variety of storage protocols and interfaces. LDX appliances include a real-time operating system and customized network drivers that have been engineered to drive massive loads onto any storage system. You can run multiple tests concurrently, without interfering with

other tests; better utilizing your IT staff and lab hardware resources. Scale to nearly 8 Million IOPS on a single 2RU Workload Generation Appliance.

7. **Best in Class Test Management –** LDX offers a single pane of glass and global sharing of test functions to simplify the storage testing process across your organization. You can manage many concurrent applications and workload emulations, provide a global, centralized reporting repository, and manage your historical database of tests, workloads, templates and reports.

8. **A new Level of Vendor Collaboration –** The workload generators and workload modeling software that you use in your test labs are the same ones that nearly every storage vendor on the planet uses. By deploying LDX, you can refine and improve your POC evaluations by sharing workloads with your vendors, resulting in a better, more informed buying decision. For troubleshooting, your vendors can replicate your production environment in their support sites and run identical tests for dramatically faster problem resolution.

9. **Broadest Protocol coverage** – LDX supports every File, Block and Object protocol inside of one easy to use testing platform instead of multiple different tools. Includes support for SMB2.x, SMB 3.0 dialect, MS-RPC, NFSv3, NFSv4, NFSv4.1, iSCSI, Fibre Channel, HTTP/S, OpenStack Swift & Cinder, SNIA CDMI, and Amazon S3.

10. **Lower total testing costs** – LDX enables substantial savings on people and capital expenses for a more productive engineering team. With freeware, you still need to buy servers and VMs, provision them, and staff and support a testing lab. One Load DynamiX 2U appliance can do what 10-20 physical servers can do, which saves on setup, administration, virtualization software licenses, power, cooling, & floor space. With LDX, engineers spend 80% of their time doing actual testing, as opposed to spending 80% of their time administering their test lab, creating workload models, writing test scripts and creating reports. It's easier to justify ROI for a dedicated test/dev lab, as Load DynamiX is a "test lab in a box".

Load DynamiX Complements Your Existing Software-based IT Monitoring Tools

Storage Resource Management (SRM), Application Performance Management (APM), Network Monitoring, and Virtual Server Monitoring software-only solutions excel at performance monitoring with thresholds and alerts. To these useful products, the Load DynamiX solution:

1. **Recreates the workload in the lab**, so problems can be more easily diagnosed and remediated. Its common practice to test fixes on the production floor, just to discover that it doesn't really fix the problem. Prove in the lab that the fix works instead of turning your users into guinea pigs.

2. **Loads the backend (storage)** to significantly improve the realism of APM testing so that together they can do end to end testing that approaches production workloads. The issue here is that application load testing and functional testing currently cannot provide an accurate representation of what they see in production. The application tiers prevent the APM tools from effectively loading the backend so they always see great performance on the storage side because it's not carrying a production level load.

3. **Adds real time filtering** and pattern analysis that calculates statistics based on seeing every storage network transaction, while adding no latency or risk. Software-only products use polling or averaging techniques that simply do not see every transaction and frequently miss the causes of business-impacting problems.

4. **Enables you to do "what if" performance analyses** using actual application workload data, substantially improving the performance capacity planning and optimization of your storage infrastructure.

5. **Adds event recording and real time capture capabilities** and does not rely on "averages" or polling, which often occurs in 5-40 minute intervals. Polling and averaging invariably miss meaningful transaction events. Software-only tools rely on resources in the environment to monitor themselves and then they query those resources for what that resource "believes" to be the state of the transactions and its health, which changes from one firmware release to the next, and one product to the next. LDX enables the full workload capture and replay of production workloads in the lab environment.

6. **Supports any storage device –** LDX does not requiring adherence to specific firmware releases or API changes, as long as the storage device adheres to one of the standard block, file, or object protocols.

7. **Enables more effective use of storage tiering**, especially in environments using storage virtualization techniques. Most tiering products use IOPS, MB/s or more commonly, access frequency, to recommend moving data to another tier. Only by seeing the actual effect of the move on application response time can you eliminate all performance risks in tiering decisions.