

Product Release Highlights

30 month summary of product release highlights

As detailed on the following pages, Load Dynamix continues to enhance its software and hardware capabilities with significant new releases each year. We are committed to:

- Improving product ease of use,
- Expanding our protocol and workload modeling capabilities to increase realism,
- Broadening our range of supported protocols, and
- Increasing the load generation capabilities of our appliances.

All such efforts are made to enable our engineering and QA customers to be more productive and to make better decisions. Some of the more important additions over the last 30 months include:

1. Many enhancements to **Load Dynamix Enterprise** that simplify and improve **workload modeling**.
2. Various new **higher density appliances** that offer Fibre Channel, FCoE, and Unified FC/10G ports in a single appliance.
3. The **Workload Iterator** that determines storage array breaking points and sweet spots.
4. The **Composite Workload Editor** that models application workloads by independently defining multiple unique I/O profiles, then combining them into a single Composite Workload.
5. Various **workload models** added to the product library within Load Dynamix Enterprise including ones for VDI, NFS, SMB, FC, and iSCSI.
6. Support for **new protocols** including SMB3, NFSv4.1, CDML, OpenStack Swift/Cinder, Amazon S3, FC and FCoE.



Load Dynamix takes networked storage validation to the next level, and does it more cost-effectively and efficiently than any other vendor

What’s New in Version 4.2 / 3.0

Product release highlights

Load DynamiX launches another exciting release with multiple major additions to the existing products.

As a minor release, the Load DynamiX Appliance 4.2 and the LDX-E 3.0 release focuses on hardening of the products and improving existing features. At the same time, several high value key additions have also been included to deliver more use cases and better usability.

These key additions are focused around the following areas:

- Major Workloads additions and updates,
- Productivity improvement, and
- Expansion of existing protocol emulations.

The September 2015 product launch focuses on hardening of the products and improving existing features.

Feature	Function / Benefit
New Appliance Features (v.4.2)¹	
SMB 3.x Encryption (TDE only)	SMB Encryption provides secured connections between SMB3+ Clients and SMB3+ Servers by optionally encrypting the SMB data, applied at the Session level, or applied as granular as on a per Share basis. LDX adds support for this crucial feature with AES-128-CCM (for SMB3.0 and SMB3.1.1) and AES-128-GCM (for SMB3.1.1) algorithms. For best performance, SMB3 Encryption should run on the new Appliance model (310x, 510x, U10xx, E10xx series).
SMB 3.1.1 Dialect (TDE only)	SMB version 3.1.1 is the newest version used by Windows 10 / Windows Server 2016 TP2. SMB3.1.1 provides better integrity among other improvements. The LDX SMB Client emulation adds the ability to negotiate the 3.1.1 dialect, along with Pre-Authentication Integrity and AES-128-GCM encryption algorithm which is the default for new Windows versions.

¹ All features labeled as “TDE only” in this section are supported in LDX-E using the Run As-Is function in LDX-E.

Feature	Function / Benefit
New Appliance Features (v.4.2)² Continued	
HTTP(S) Redirect with DNS (TDE only)	<p>URL Redirection is a very common feature to allow a webpage to be accessed via multiple URLs. In Object Storage, this capability allows for load balancing to different web servers, to help alleviate load. LDX extends its support for URL Redirection to also include cases when URL redirection uses the DNS format (in addition to the previously available support for redirect URLs that use IP Address literals).</p>
TCP Selective ACK (SACK) (TDE only)	<p>TCP Selective Acknowledgement (SACK) allows a TCP endpoint to optionally acknowledge non-contiguous streams of TCP segments, in addition to the existing behavior of acknowledging contiguous streams of TCP segments. One of the benefits of this SACK behavior is to potentially achieve better overall throughput in the event of lost / late TCP segments. Here, the sender of the TCP stream now has more precise knowledge of the exact segments that were lost, so that it does not have to resend every TCP segment after an earlier lost segment. LDX adds support for TCP SACK functionality for both the Client side and Server side, for all available LDX TCP/IP-based protocols.</p>
Data Content generation optimization	<p>The ability to generate various types of Data Content at high speed is a key differentiator of LDX. However, these operations are quite resource intensive, which leads to lower performance when Data Content is enabled. Although LDX delivered an acceptable level of performance when Data Content is enabled, massive performance optimization has been completed in this release to give you performance boost of 15% to 450% from the previous release, depending on the exact type of Data Content used.</p>

² All features labeled as “TDE only” in this section are supported in LDX-E using the Run As-Is function in LDX-E.

Feature	Function / Benefit
New Appliance Features (v.4.2): TDE Only	
Common Project Library (Part 1) (early access)	As more customers deploy both TDE and LDX-E in the same environment, collaboration between both types of users in these organizations has been steadily increasing. In addition to the collaboration features added in previous releases, this release now gives TDE users the ability to connect to an LDX-E Server, browse the Projects on the LDX-E Server, and seamlessly modify and save Projects on the LDX-E Server directly from TDE. Documentation will be added in a future release.
Alias for Variables and Formulas (early access)	Variables and Formulas are among the most important Scenario Control Actions used by advanced TDE users. This release adds the ability for the user to create an Alias for each Variable / Formula created, so that referencing of these Variables / Formulas no longer has to be based on an index number. Documentation will be added in a future release.
LDX-V Duration Increase	The maximum Project run duration on an LDX-V Appliance has been increased from 8 hours to 72 hours.

Feature	Function / Benefit
Load DynamiX Enterprise (v2.6)	
FC / iSCSI HotSpots Workload (Beta)	Real world applications often generate I/Os in multiple non-contiguous sections, as opposed to an evenly distributed continuous section. The all new HotSpots Workload for FC and iSCSI is an innovative Protocol Workload Model that provides simplicity and ease of use for a complex use case. The user can now simply specify a set of I/O offsets (i.e. hotspots) when defining the workload parameters to generate a workload that simulates the described scenario. Note: the FC / iSCSI HotSpots Workload Model is in Beta in the 3.0 release.
Hi-Scale Protocol Workload Models: SMB2 and NFSv3	The existing SMB2 and NFSv3 Protocol Workload Models are updated with a new internal algorithm. This improves reliability in producing desired command and block distributions even when large numbers of users are specified. Enables them to support very deep tree structures without performance impact. And improves overall performance. The FC, iSCSI and NFSv4.1 Protocol Workload Models in the 2.6 release are also running on the same new internal algorithm.

Feature	Function / Benefit
Load Dynamix Enterprise (v2.6), Continued	
Example Workloads Library	<p>In addition to the standard Protocol Workload Models and Application Workload Models that are provided by default, the 3.0 release also adds a set of Example Workloads that provide an example instance of an application workload such as streaming, photo server, webserver, etc.</p> <p>It is important to note that these example workloads are simply examples, based on a specific characterization of a specific application in a specific deployment.</p>
Iteration Analyst: Highest / Lowest KPIs	<p>When profiling the performance of a storage array using an Iteration Suite, sometimes the number of iterations can be in the hundreds or more. The brand new Iteration Analyst: Highest / Lowest KPIs feature automatically searches for the iterations that produce the highest KPIs and the lowest KPIs, and rolls up those iterations in a simple to read summary table.</p>
CWE Improvement: Mass Edit Duration	<p>The Composite Workload Editor introduced in the 2.6 version is an innovative workload modeling editor that allows you to closely model application workloads by independently defining multiple unique I/O profiles and combine them together into a single Composite Workload. In the 3.0 release, improvements are added to allow mass editing of the Duration of the individual workloads that make up the Composite Workload. You will be able to set a fixed Duration value across multiple workloads, or scale the existing Duration across multiple workloads.</p>
HTTPS-enabled Test Beds	<p>HTTPS is a well-known secured connection technology for encrypting HTTP data. HTTP-based Test Beds such as OpenStack Swift can now optionally enable HTTPS, along with a list of supported ciphers and algorithms.</p>

What's New in Version 4.0 / 2.6 (June 2015)

Product release highlights

Load Dynamix launches completely redesigned application workload modeling solution, and broadens protocol workload modeling in its award winning Load Dynamix Enterprise product. The June 2015 release featuring LDX-E version 2.6 and TDE / Appliance version 4.0 is built on the following key pillars:

- Simplify Application Workload Modeling
- Expand Workload Modeling coverage
- Add support for emerging technologies

Simply Application Workload Modeling

Benchmarking storage arrays and infrastructure designs with synthetic load is a good process to understand whether the minimum bar is met. However, certifying storage arrays and infrastructure designs using realistic application workload models is far more proving and insightful in preparing for a production rollout. The redesigned Composite Workload Editor (CWE) in 2.6 is specifically designed to make it easy to model application workloads where the application executes several different distinct concurrent jobs, each producing different workload characteristics. CWE in 2.6 gives you the ability to compose, modify and manage application workload models at scale, up to 100 workload profiles in each Composite Workload.

Expand workload modeling coverage

LDX-E launched initially with a set of Basic protocol workload models, and then followed up with a set of High Fidelity protocol workload models. The 2.6 release gives you several additional workload models to work with. Version 2.6 adds Object Protocol Workload Models support with Amazon S3 and OpenStack Swift models, and expands File Protocol Workload Models support with the NFSv4.1 model. In addition, version 2.6 introduces additional VDI Runtime Application Workload Models over Fibre Channel and iSCSI.

Add support for emerging technologies

The storage industry is in an exciting inflection point where open-source technologies are being evaluated by enterprises, small and large, across different industries. In the previous release, we added support for OpenStack Swift on our load generating appliances. In 4.0, we continue to add support in this area with OpenStack Cinder emulation, a block storage management protocol in the widely backed OpenStack project. In addition, version 4.0 adds FCoE support to the FC Series Appliance.

The latest product launch streamlines performance validation for OpenStack and Software Defined Storage Systems

Other exciting features include support for DNS, Arithmetic functions, a highly streamlined SCSI layer, and performance improvements in LDX-E.

Feature	Function / Benefit
New Appliances (v.4.0)	
FCoE-enabled Appliances	<p>Load DynamiX now supports FCoE. Specifically designed to provide seamless compatibility between FC and FCoE, you can run the same exact workloads over both technologies, giving you objective comparison between the two transports. The following FCoE-enabled configurations are offered:</p> <ul style="list-style-type: none"> • LDX-6202E: 2-port FCoE Appliance • LDX-U1122: 2-port FC + 2-port FCoE Unified Appliance
Appliance Features (v.4.0)	
OpenStack Cinder	<p>Emulate realistic OpenStack Cinder clients with the support of over 50 commands, from managing volumes to creating snapshots and backups. Built on top of the highly scalable LDX HTTP engine, stress test the largest OpenStack Cinder deployments by emulating millions of Cinder clients concurrently alongside existing powerful block protocols such as FC and iSCSI, and measure key performance indicators such as response time for each and every Cinder operation.</p>
Amazon S3 Multiport Import	<p>Measure the performance of the S3 service's large object uploads handling with the newly added Multipart Upload feature. Create Multipart Uploads with varying part sizes, and verify data integrity of the uploaded objects.</p>
FCoE Initiator (TDE only)	<p>Specifically designed to seamlessly run the same workload over FC and FCoE ports, the LDX FCoE Initiator emulation leverages the same SCSI stack that is common to both FC technologies. Take any existing FC Project you have, and simply run it over an FCoE port to get objective comparisons right away.</p>
IO Manager (TDE only)	<p>The new IO Manager Action is an innovative function that takes the complexity of test scenario definition away from the user to the backend. A typical use case for LUN population, the IO Manager will automatically ensure the entire region of a LUN is populated with user-specified data patterns in sequential or completely random offsets order.</p>

Feature	Function / Benefit
Appliance Features, Continued (v.4.0)	
Arithmetic Functions (TDE only)	An innovative LDX feature that allows you to use formulas to define a huge array of values to use in test scenarios. With Arithmetic Functions, you can define millions of unique file / folder / user names with a single line, or easily create highly dynamic workload configurations where Chunk Sizes are fractions of total Transfer Sizes, or many other possibilities.
SCSI Retry	The LDX Initiators will now automatically retry IO Read / Write requests that encounter a UNIT NOT READY or TASK SET FULL response, up to 5 consecutive retries for each IO request. New statistics are also added to track the number of times IO Retries are transmitted.
Big IOs (FC)	The maximum Chunk Size for FC is now increased to 128MB, which is sometimes used by streaming backup devices such as Tape / VTL.
Increased PQD (FC)	The LDX FC Port Queue Depth (PQD) is now increased to 2048 per FC Port.
Per LUN Stats Logging (SCSI)	New checkbox that allows you to enable per-LUN stats logging for FC, FCoE and iSCSI in the post-test Client Port Log, giving you the ability to see the Commands Attempted, Succeeded, Aborted or Failed on a per-LUN basis.
DNS (TDE only)	Designed to support testing of clustered storage deployments that require the use of hostnames, LDX also supports multiple caching and load-balancing options.
Two-way CHAP (iSCSI)	Two-way CHAP, also known as mutual CHAP or bidirectional CHAP, is now supported by the LDX iSCSI Initiator. In addition to providing credentials that allow iSCSI Targets to verify, the LDX iSCSI Initiators will also authenticate the credentials provided by the iSCSI Targets.
New NFS Handles (TDE only)	The CREATE and UPDATE commands for NFSv4.1 now have Output Handles that can be used by subsequent Actions in the Scenario.

Feature	Function / Benefit
Load DynamiX Enterprise (v2.6)	
New Object Protocol Workload Models	Object Protocol Workload Models are now available in LDX-E! In 2.6, two Object workloads are added: Amazon S3 and OpenStack Swift. With the new Object Protocol Workload Models, you can easily create versatile Object workloads by fine-tuning the amount of metadata operations and data operations, as well as the distribution of PUT versus GET operations, and other metadata operations on both Objects and Buckets / Containers, all using intuitive sliders.
New File Protocol Workload Model	In addition to the existing NFSv3 Protocol Workload Model, NFSv4.1 is now available with 2.6. Similar to the NFSv3 workload, you can apply granular control the distribution of Read / Write operations and many metadata operations, specify Block Sizes, and define the scale and size of the file system.
New Application Workload Models	Two new VDI Application Workload Models are added to 2.6: FC VDI Runtime Workload and iSCSI VDI Runtime Workload. These workloads simulate the behavior of operational VDI Guests deployed over block storage, giving you the ability to specify the size and load created by each VDI Guest.
Other Protocol Workload Models Improvements	The existing FC and iSCSI Protocol Workload Models are internally optimized to use more efficient modeling logic, which in turn provides finer precision, faster response and higher scaled workload configurations. One of the key benefits of the optimization is the ability to precisely precondition the LUNs to the way you want.
Composite Workload Editor (CWE)	The highly intuitive and straightforward Composite Workload Editor allows you to closely model application workloads by independently defining multiple unique I/O profiles and combine them together into a single Composite Workload. For example, in an Oracle DB deployment where there are multiple processes such as OLTP, Redo, etc., you can independently define an I/O profile for each process, and combine them together to simulate an Oracle DB workload. In addition, the Scale Factor, which is a part of the CWE, gives you the ability to easily scale the Composite Workload up and down with a simple knob.

Feature	Function / Benefit
Load Dynamix Enterprise (v2.6), Continued	
LDX-E Database Backup & Restore	Backup your entire LDX-E Database, which includes important Resources such as Results, Workloads and Iteration Suites, permanently to an on-premise FTP Server. Selectively restore different Resources independently. You can even Backup one LDX-E Database and Restore its Resources to a different LDX-E deployment.
Performance Improvements	As the number of Resources increases on your LDX-E Deployment over time, the stress on the system also increases. The 2.6 release introduces several internal optimizations that allow you to experience the same, and in some cases better, performance from LDX-E even as your database size increases significantly.
New System Management Functions	Several System Management functions are added to give you visibility into the health of your LDX-E deployment and to give you the ability to send useful information to LDX Support to better help you. <ul style="list-style-type: none"> • CPU utilization: provides a breakdown of CPU utilization by each running process in real-time • New tools: gives you the ability to verify all your Resources are properly updated, create detail reports of the health of the LDX-E web services, and provide anonymous usage logs.
Tracing Parameters	When enabling Tracing for a running Workload or Project, you can now specify triggers and limits for the Trace you want to collect.
Misc. UI improvements	<ul style="list-style-type: none"> • Spinners for loading charts • Categorized System Management functions

What's New in Version 3.8 (Oct 2014)

Product release highlights

DynamiX unveils major updates in LDX-E version 2.5 and TDE version 3.8. The October 2014 release is built on two primary objectives:

1. Boost test engineering productivity
2. Improve testing realism

Boost test engineering productivity

Set up hundreds of test iterations in minutes

Often the exact production workload characteristics are not known. To make sure the right applications will be deployed on the optimal storage systems and configurations, it is essential to scan your storage systems with a very wide range of diverse workload characteristics to analyze what types of workloads the storage systems are optimized for, and what types of workloads will cripple the storage systems.

The LDX-Enterprise Workload Iterator feature allows the user to very quickly set up hundreds of iteration tests, ranging from extremely simplistic workloads such as 100% sequential reads on 8KB, to extremely complex workloads encompassing a mixture of block sizes with different values, sequential and random read / write operations, and different degrees of compressible and deduplicable data patterns. All tests and permutations run unattended from a single command. At the end of the run, a tabular report is automatically generated, providing critical insight for storage engineers to make business decisions.

Improve testing realism

Measure the effect of compression and deduplication

Data compression and deduplication are among the top features used in reducing enterprise storage footprint, especially in flash storage. Validating the implementation and effect on storage performance of data compression and deduplication algorithms at scale is the key capability storage architects need in addressing this critical aspect of enterprise storage. The all new Fibre Channel and iSCSI LDX-Enterprise Protocol dedupe and compression workload models hide the complex testing methodology behind the scenes, and opens up simple and self-explanatory parameters for storage engineers to validate data compression and deduplication implementations.

Verify production storage network readiness with realistic Composite Workloads

In a virtualized or converged data center with a shared infrastructure, dedicated storage, physical server and physical links are no longer reserved for specific applications. Rather, virtualization serves as the infrastructure platform, and storage, servers and links are shared resources where any

“Our latest product release will boost your productivity and significantly improve storage testing realism.”

Henry He

Director,
Product Management

application can be running on any component at any time. In many cases, different applications that are diverse in nature can be running on the same shared resources simultaneously. Taking a leap from traditional workload benchmarking methods where storage protocols are validated one at a time, independently, the LDX-Enterprise Composite Workload feature allows the user to create many different workloads, across different storage protocols, and run them all at the same time against the converged infrastructure.

Other exciting features include the official release of the LDX Virtual Appliance, Amazon S3 support, a brand new SCSI CDB builder, and more.

TDE v3.8 Feature	Function / Benefit
New Appliance	
Virtual Appliance (LDX-V)	Significantly improve time-to-market and/or product quality by enabling all engineers and developers to perform functional testing with their own dedicated Load Dynamix Virtual load generation appliance. LDX-V uses the same software UI, same workflow, same statistics, same Projects and same API used by the physical appliances. Engineering and QA can share test Projects, test results and scripts. It can be installed on any server running VMware ESXi.
Appliance Features	
Amazon S3	Extends our S3 support by providing easy creation of Amazon S3 test scenarios and workloads with pre-built commands for the most common S3 operations. Also includes per-command statistics.
Openstack Keystone Authentication	Enables running Openstack Swift test scenarios that include token-based authentication with Openstack Keystone. Both XML and JSON request / response bodies are supported.
Unicode Support (UTF-8)	Enables test scenarios and workloads that operate on file names, folder names, Shares, user names, and more with international characters encodings.
MPIO enhancement – Weighted Path load balancing	Adds the commonly used Weighted Path load balancing algorithm for MPIO on the FC Series Appliances. Gives the user the ability to specify the weight to each MPIO Path independently for I/O load balancing.
FC Initiator Queue Depth control	Provides the ability to assess the optimized Initiator Queue Depth configuration for the storage array under test.

TDE v3.8 Feature Function / Benefit	
Appliance Features, Continued	
Auto population of discovered FC Targets	Significantly improves the usability in specifying one or more available FC Targets in a test scenario. Once discovered, the available FC Target(s) can be drag-and-dropped into the scenario editor or populated into a User Parameter file.
New SSC and SMC commands for VTL	Enriches VTL testing with a total of 8 new SSC commands and 21 new SMC commands. All supported SSC and SMC commands are applicable to testing traditional tape devices as well.
MPIO / ALUA integration	Updates MPIO implementation to dynamically initiate a failover based on ALUA port states reported by the storage array under test. Provides more realistic simulation of MPIO implementation from real world initiators and MPIO controllers.
Additional Updates	
SCSI Custom CDB Builder	Enables the user to create customized SCSI commands for functionality testing and negative testing. The Custom CDB (Command Descriptor Block) Builder is highly integrated with the TDE, which allows the user to use the custom SCSI commands in test scenarios, retrieve per-command statistics and share the custom SCSI commands with teammates using import / export.

LDX-E v2.5 Feature	Function / Benefit
New Appliance	
Virtual Appliance (LDX-V)	Significantly improve time-to-market and/or product quality by enabling all engineers and developers to perform functional testing with their own dedicated Load DynamiX Virtual load generation appliance. LDX-V uses the same software UI, same workflow, same statistics, same Projects and same API used by the physical appliances. Engineering and QA can share test Projects, test results and scripts. It can be installed on any modern x86 server running VMware ESXi.
Appliance Features	
Unicode Support (UTF-8)	Enables test scenarios and workloads that operate on file names, folder names, Shares, user names, and more with international characters encodings.
MPIO enhancement – Weighted Path load balancing	Adds the commonly used Weighted Path load balancing algorithm for MPIO on the FC Series Appliances. Gives the user the ability to specify the weight to each MPIO Path independently for I/O load balancing.
FC Initiator Queue Depth control	Provides the ability to assess the optimized Initiator Queue Depth configuration for the storage array under test.
MPIO / ALUA integration	Updates MPIO implementation to dynamically initiate a failover based on ALUA port states reported by the storage array under test. Provides more realistic simulation of MPIO implementation from real world initiators and MPIO controllers.

LDX-E v2.5 Feature	Function / Benefit
Additional Updates	
Workload Iterator	Boost productivity exponentially by enabling the user to set up hundreds of automated tests within minutes that will provide insight into what types of workloads the storage array / infrastructure is optimized for, and what types of workloads will cripple the storage array / infrastructure.
Composite Workloads	Enables testing and validating a storage array / infrastructure that is handling multi-protocol multi-application workloads that are commonly found in highly converged and virtualized data center infrastructures.
Test Bed 2.0	Delivers massive update and improvement to the LDX-E Test Bed framework with the ability to create multi-protocol Test Beds, and the ability to run workloads on multiple test ports.
TDE Project Test Bed Extractor^{BETA}	Enables running imported TDE Projects over different Test Beds by automatically extracting information relevant to a Test Bed (e.g. source address(es), destination address(es), Shares, LUNs, etc.) from the imported TDE Project.
Protocol Workload Models 2.0	Enhances all LDX-E Protocol Workload Models to support the ability to specify I/O characteristics for Read and Write operations independently and select Data Content in payload.
Compression / Deduplication FC Workload and iSCSI	Enables simple testing of data compression and deduplication with three simple parameters: compression percentage, deduplication percentage and the number of unique duplicates. LDX-E calculates the complex data compression percentages and data replication algorithms behind the scenes.
Queue Depth control	Finds the optimized initiator Queue Depth setting for workloads by giving the user the ability to control the FC Series Appliance ports' Queue Depth then measure the performance obtained from different Queue Depth settings.
Misc. UI improvements	<ul style="list-style-type: none"> ▪ Adds a global “New” button that allows the user to access the creation of new LDX-E resources such as Appliances, Test Beds, Workloads, Iteration Suites, and more from anywhere with a single click. ▪ Adds Unified Search that returns all LDX-E resources that match the search keywords, allowing the user to quickly find available resources. ▪ Histogram^{BETA} Sorts the response time delivered by the storage array / infrastructure to I/O requests from one or more workloads in a series of highly visual and intuitive latency bins

What's New in Version 3.6 (April 2014)

Product release highlights

Load Dynamix proudly introduces the **version 3.6 release** with a wide selection of new appliances, workload models and analysis features. The new appliances allow customers to “do more with less” by packing higher performance and more test port configurations in the same 2U rack space. New workload models include an all-new VDI application workload model as well as highly customizable protocol workload models for NFSv3, Fibre Channel and iSCSI. New analysis features allow users to get insight faster with multi-dimensional views into the test results.

v3.6 Feature	Function / Benefit
New Appliances	
Enterprise Series Appliances (LDX-E+10GbE and/or FC)	Delivering the entire Load Dynamix products portfolio in a single box, the LDX Enterprise Series Appliances provide the LDX Enterprise solution together with 10GbE and/or FC test ports, in the same 2U rack space.
Unified Series Appliances (10GbE + FC)	Harness the power of the Load Dynamix IP-based storage and FC-based storage validation solutions in the industry's first and only unified storage validation appliance. The LDX Unified Series offers both 10GbE test ports and FC test ports in a single appliance, in the same 2U rack space.
Higher density FC Series Appliances	Increase total throughput and total IOPS with the all new LDX FC Series 6204 (4 ports) and LDX FC Series 6208 (8 ports) appliances, in addition to the original LDX FC Series 6202 (2 ports), in the same 2U rack space.
Appliance Features	
16G FC support³	The powerful LDX FC Series Appliances now support 16G FC. The LDX FC Series (6200s line) support 4G, 8G and 16G FC port speeds, with 2X throughput and 2X IOPS per port.
MPIO / ALUA for FC	Validate failover / failback designs and load balancing designs over Fibre Channel. Control over the I/O behavior over the entire MPIO group as well as specific MPIO paths. Supports MPIO over a 2-port MPIO group & over the entire FC appliance. Ability to generate and verify ALUA commands and responses.

³ Requires LDX appliances with FC ports released with v3.6 or later.

v3.6 Feature	Function / Benefit
Appliance Features, Continued	
Data Compressibility Algorithm	Innovative algorithm and design to allow the user to easily set the degree of data compressibility and deduplicability.
HTTP/S Encoding	Supports advanced testing of HTTP web servers and HTTP-based storage by verifying the handling of Content-Encoding and Transfer-Encoding data, which allow HTTP clients to specify media types, content encodings, and chunked transfer encodings.
HTTP/S Redirect	Validates the common web functionality of URL redirection by listening for the redirect request and dynamically adjusting the HTTP/S Request Headers.
HTTPS Performance improvement	Significantly improves the maximum HTTPS connections per second supported per port.
LUN Size discovery	Discovers and maintains a list of LUN Sizes for each discovered LUN.
NFSv4.1 Byte Range Locking	Supports the ability to Lock File, Unlock File, and Test Lock in NFSv4.1.
Output Handles for NFSv3 CREATE, MKDIR, and SYMLINK	Enhances the existing NFSv3 CREATE, MKDIR and SYMLINK commands by producing an Output Handle that can be used by other subsequent NFS operations.
Rediscover FC Targets	On-demand trigger to rediscover the Targets and LUNs accessible by the LDX FC Initiators.
SMB3.0 Server support	Supports performance and scalability testing of WAN Optimization devices, switches and routers with LDX SMB3.0 Clients and the new SMB3.0 Server.

v3.6 Feature	Function / Benefit
Load Dynamix (LDX) Enterprise (v2.3)	
Analysis Charts	Get better insight into your workloads with the new Analysis Charts in LDX Enterprise. Three Analysis Chart types are available for the user to customize: Multi-Stat Chart, Scatter Plot and Baseline Chart. Multi-Stat Chart allows the user to plot multiple stats from the same test run (e.g. throughput, latency, etc.). Scatter Plot allows the user to plot two statistics on the X-axis and Y-axis to understand the correlation between two statistics. Baseline Chart allows the user to plot the same statistics from multiple test runs.
Application workload model: VDI over NFSv3	Purpose built application workload model for VDI over NFSv3. Stress test storage systems and infrastructure for VDI deployment over NFSv3 by creating a large number of VDI Linked Clones and measure VDI Boot Storm performance.
MPIO Support	Verify load balancing performance and failover designs with built-in FC MPIO support.
Hi-Fi FC/iSCSI workload model	Provides a highly customizable workload model for Fibre Channel and iSCSI. Allows the specification of access patterns, I/O load characteristic and IO Regions independently for the Read direction and Write direction.
Hi-Fi NFSv3 workload model	Provides a highly customizable workload model for NFSv3. Allows the specification of command mix, I/O load characteristic and file system structure (folders depth, files per folder, file sizes, etc.).
Landing page dashboard	A brand new dashboard is now available as the landing page for LDX Enterprise. The dashboard provides a summary of the number of resources (e.g. workloads, test beds, appliances, test results, etc.) available on LDX Enterprise, as well as offering a workflow guide for new users.
Minimalist UI with sorting and filtering	The LDX Enterprise UI is now enhanced with a minimalist look-N-feel that collapses detail information by default, allowing the user to get a wider view of the items on the screen. In addition, sorting and filtering functions are now available to allow users to find items faster.
Various UI improvements	<ul style="list-style-type: none"> • Progress indicator now displayed when updating the LDX Enterprise firmware • Test Bed used for a test run is now identified in the test results • Test Bed used by an Appliance is now listed in each Appliance's page • A Description box is available for each Workload / Project to allow the user to enter custom text as desired • Get Help quicker and easier with the new In-app Help which is available under each menu item • Performance assurance: Assure chosen storage solutions will meet performance SLAs under their specific workloads.

v3.6 Feature	Function / Benefit
Test Development Environment (TDE)	
Archived Project Configuration per Results Folder	Retrieve project configuration for any test result to reproduce test runs at any time. Each time a test is executed, a Project Configuration is automatically created and archived in the Results Folder.
Custom Charts	Gain better insight into test results by plotting multiple key performance indicator statistics from the same test run, such as Throughput (Bandwidth), IOPS (Actions per Second), and Latency (Response Time).
Project Configuration in TDE Test Reports	TDE Test Reports now allow the user to include an auto-generated Project Summary in the PDF Test Report.
Automation	
C# API Support	Windows C# API is now supported as an additional automation API. Allows the user to create a test, run a test, and collect statistics using Windows C#.

What's New in Version 3.4 (November 2013)

Product release highlights

With the latest 3.4 release, Load DynamiX introduces the most intuitive, most insightful and highest fidelity production workload simulation solution in the industry. In addition, Load DynamiX delivers the industry's highest density and highest performance 10GE storage validation appliance, along with support for cloud object storage protocols to methodically assess the object storage system and cloud storage infrastructure's maximum bandwidth, IOPS, scalability and concurrency.



Figure: Load DynamiX Enterprise Workload Characterization Methodology

v3.4 Feature	Function / Benefit
New Appliances	
Load DynamiX 10G Series 8-port appliances: 5108S (SFP+) & 5108T (10GBASE-T)	<p>Supports 8 x 10GE high performance test ports in a single appliance.</p> <p>Significantly boost total bandwidth, IOPS and user utilization from a single appliance to severely stress the fastest storage systems and infrastructures</p> <p>Provides flexible connectivity into the systems under test with 10GE SFP+, which supports fiber and direct attached copper, and 10GBASE-T</p>

v3.4 Feature	Function / Benefit
Load Dynamix Enterprise Features	
Hi-Fi Workloads for SMB2.0	Specify the file system hierarchy and block sizes as part of a workload model. Provides a more accurate model of the workload as it pertains to file system depth, files per folder, file size distribution, block size, and number of sub-folders.
Application Workloads Library	Pre-defined Workloads characterization for specific application workloads. Instantly generate application workloads without going through massive amounts of research and data to characterize the workload dimensions.
I/O Parameters	Define I/O characteristics such as Block and Chunk size, Read and Write directions. Gain broader insight into the behavior of the storage infrastructure in handling workloads that vary vastly in block size distributions, chunk size distributions, and sequential and random read/write patterns.
Visual Test beds	Graphically define client – server/target relationships as Visual Test Beds, and flexibly deploy any workload over any applicable Visual Test Bed. Simplifies the execution of workloads and tests over a set of available Visual Test Beds.
User Parameters Editor	Supports the TDE User Parameters resource in Load Dynamix Enterprise. Get granular control over parameters used by a workload such as file sizes, file names, block sizes, and more.
CSV Exporting	Produces a .csv output of workload test results. Easily export detailed workload test results into .csv format for further post-test analysis and data organization.
Virtual STE Server Deployment	Installs the Load Dynamix Enterprise server over an on-premise virtualized server. Easily integrate Load Dynamix Enterprise into an existing virtual infrastructure for environments where it is challenging to install a physical Load Dynamix Enterprise server.

v3.4 Feature	Function / Benefit
New TDE Features	
Reporting Tool	Automatically creates a PDF test report from test results. Easily create, present and publish Load DynamiX reports with detail-oriented graphs and data. Quickly share test data with colleagues to point out performance limitations and critical problems. Includes a report wizard to customize test reports.
Persistent Chart settings	Maintain user-modified settings on chart displays. Improves usability of navigating and viewing statistics by automatically saving user modified settings on individual charts, and then using those modified settings by default.
New TDE Features	
Object Storage protocols: <ul style="list-style-type: none"> ▪ OpenStack Swift ▪ SNIA CDMI 	Emulate data center and cloud application clients performing a large variety of data and metadata operations using pre-built OpenStack Swift commands and SNIA CDMI commands. Validate the storage system and storage infrastructure's compatibility with OpenStack Swift and SNIA CDMI operations, and their ability to handle these operations at production scale, with repeatable results, while ensuring data integrity.
pNFS	Emulate advanced NFS clients that support Parallel NFS, capable of operating on different metadata nodes and data nodes. Efficiently measure the performance, capacity and data integrity of a highly stressed pNFS cluster in handling a large amount of simultaneous metadata requests and data IO operations.
NFSv4.1 Threading	Configure NFSv4.1 operations and generate high volumes of IOs over multiple threads simultaneously. Create more stressful loads on the NFS server in a more realistic manner with asynchronous NFSv4.1 IO operations, which allows the user to measure the performance trend of the NFS server in the presence of IO parallelism.
Enhanced NFS Results OK	Provide granular test scenario execution control based on specific response codes from the file server while running a test. Enable highly granular per command validation of expected error code responses to specific NFS commands.
SCSI Streaming Commands (SSC)	Emulate SCSI tape clients over Fibre Channel and iSCSI. Enable performance assessment of tape storage backups and virtual tape library (VTL) storage backup solutions to validate the data integrity and performance of backup and recovery jobs.
SCSI layer tracing for Fibre Channel	Support Load DynamiX tracing for SCSI operations over Fibre Channel. Allows users to validate SCSI operations and CDB encodings with Wireshark.

What's New in Version 3.2 (April 2013)

Product release highlights

Load Dynamix is excited to introduce Load Dynamix Enterprise - a new software platform offering available in this release that delivers powerful collaboration features and productivity benefits for customers that need to improve team synergy. The latest 3.2 product release also adds support for validating Web Services and Object storage with new HTTP parsing constructs for dynamic content and HTTPS protocol support. Users can subject storage systems under test to stressful conditions found in virtualized environments with the ability to simulate hypervisor behaviors using newly added VAAI emulation. Advanced Load Profiles allow complex workloads to be modeled that exhibit transient read and write spikes found in production data centers.

Load Dynamix empowers customers with the ability to assess additional advanced network storage technologies that deliver higher performing virtualized data centers. Next generation features such as Data Center Bridging, VAAI, and Object storage allow datacenter operators to deliver higher performing storage infrastructures by optimizing the network storage I/O utilization. New usability features such User Parameter Aliases were implemented to reduce the time to test.

v3.2 Feature	Function / Benefit
Collaboration / Productivity	
Load Dynamix Enterprise	<p>Features</p> <ul style="list-style-type: none"> ▪ New simple Web interface with API services ▪ Simple test execution for test runners that have limited protocol or Load Dynamix expertise ▪ Efficiently manage and run projects across Load Dynamix appliances ▪ Create test suites and execute in batch mode <p>Benefits</p> <ul style="list-style-type: none"> ▪ Allows more users to harness the value of Load Dynamix improving overall team productivity ▪ Share tests and results within and across teams allowing teams to collaborate synergistically ▪ Higher test port utilization with resource management and test suite execution ▪ Enables lab administrators to manage test beds and systems under test lowering incidences of IP space collisions, MAC floods, VLAN congestion and reducing time spent configuring

v3.2 Feature	Function / Benefit
Virtual / Network Emulation	
VAAI	Enables emulation of VAAI-capable hosts to drive storage I/O offload operations onto the storage controllers, based on standards-based SCSI commands. Verifies the functionality and performance of key VAAI tasks by injecting Block Zeroing, Full Copy, Thin Provisioning Reclaim, and Hardware Assisted Locking jobs. Find the breaking points by scaling up to thousands of parallel jobs with any data pattern. Get started quickly with several pre-built Sample Projects.
Granular NPIV control	Enables NPIV configurations at the Network Profiles level. Gives the user the ability to assign different Load DynamiX Scenarios to different sets of NPIVs, providing more granular control of I/O operations on a per-NPIV level
DCB Transport	Enables lossless Ethernet support for iSCSI with full DCBX, PFC and ETS implementation. Gain insight into congestion performance of iSCSI storage with Ethernet-based priority-based flow control (PFC) by analyzing throughput performance, response times and TCP retransmissions with and without DCB. In addition, verify DCBX interoperability with IEEE Baseline 1.01 and IEEE Std. 802.1Qaz versions.
Load Testing / Client Realism	
Advanced Load Profiles	<p>Features</p> <ul style="list-style-type: none"> ▪ Time-based load modeling on a per Scenario basis ▪ Templates for various waveforms including square, triangle and stair-step <p>Benefit</p> <p>Enables simulation of complex storage I/O load changes over time for a given Load DynamiX Scenario, providing the user with more realistic traffic patterns that fluctuate over time.</p>
Restart Scenario	<p>Feature</p> <p>Restart scenario checkbox in Load Profile resource.</p> <p>Benefit</p> <p>Force a Scenario to restart with the same IP address (if applicable) and current User Parameters file settings under failover scenarios.</p>

v3.2 Feature	Function / Benefit
Virtual / Network Emulation, Continued	
NFS Client Realism	<p>Features</p> <ul style="list-style-type: none"> ▪ OwnerID options added to Open File commands (v4/4.1) ▪ AUTH_UNIX UID/GID credential options added to NFS Open TCP Connection commands (v3/4/4.1) <p>Benefits</p> <ul style="list-style-type: none"> ▪ OwnerID Per Client option allows multiple processes to be simulated for each emulated NFS client ▪ UID/GID credential editing allows credentials to be submitted to the server during mount operations
Additional MS-RPC Commands	<p>Features</p> <p>Commands added to:</p> <ul style="list-style-type: none"> ▪ Add/delete SMB shares ▪ Retrieve info on or delete network sessions ▪ Retrieve info on or close files <p>Benefits</p> <ul style="list-style-type: none"> ▪ Build scenarios that mimic Windows applications with MS-RPC. Microsoft workloads extensively make use of MS-RPC ▪ Ability to add, delete and enumerate SMB shares for device under test orchestration ▪ Validate MS-RPC security holes
Cloud / Object Storage	
HTTP Parsing with Dynamic HTTP Body Content	<p>Features</p> <ul style="list-style-type: none"> ▪ Extract and Insert HTTP Header/Body Content ▪ New Dynamic Content Resource <p>Benefit</p> <p>This capability can be used to parse RESTful sever responses used in Web Services. Object storage variants CDMI, OpenStack Swift and Amazon S3 can be validated with persistent content. Dynamic HTTP Body Content can be used for form submissions and authentication interfaces with client scale and realism.</p>

v3.2 Feature	Function / Benefit
Cloud / Object Storage, Continued	
HTTPS	<p>Features</p> <ul style="list-style-type: none"> ▪ User-defined Client Certificates ▪ 2-way handshakes ▪ Robust cipher support ▪ Client and Server emulation <p>Benefit Allows users to find performance limits of Web/Object Storage Services and intermediate network devices such as application delivery controllers and security devices handling encrypted HTTP sessions in terms of peak handshakes, total throughput and session concurrency.</p>
Usability	
User Parameter Aliases	<p>Features</p> <ul style="list-style-type: none"> ▪ Column Aliases in UP files ▪ Reference column aliases within functions and command attributes <p>Benefit Allows test composer to put key configurable parameters into UP files and label intelligently. Test runners can navigate TDE sample projects more easily without deep test-case knowledge.</p>
SCSI Auto-Offset	<p>Feature SCSI Read/Write commands within iSCSI/FC can access entire data regions automatically.</p> <p>Benefit User does not have to setup User Parameter files with offsets manually saving time.</p>
Threads by Count	<p>Feature Set number of concurrent threads in SMB/iSCSI in Begin Thread command.</p> <p>Benefit Supports usability where user can incrementally add threads without having to explicitly configure manually within the Thread Block construct.</p>

v3.2 Feature	Function / Benefit
Usability, Continued	
Response Handling for iSCSI and Fibre Channel	<p>Feature Allows the user to define how the test proceeds after receiving an unsuccessful response to a request.</p> <p>Benefit Enables other tests to continue to run in the event of one or more unsuccessful Scenarios.</p>
Port Delay ARP/NDP Controls	<p>Features</p> <ul style="list-style-type: none"> ▪ Port delays can be configured within the timeline view in TDE ▪ ARP/NDP provisions added in Network Profile <p>Benefit Spanning tree and load balancing issues can be alleviated by inserting port delays and using newly added ARP/NDP resolution options.</p>
Licensing	<p>Feature New licensing platform with license management.</p> <p>Benefit Allows users to manage and track software licenses on their Load Dynamix appliances.</p>