

EMC E-Lab: A True Competitive Advantage

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EMC E-Lab is much more than an impressive collection of technology and experience – it is a “state of mind”. Nearly a billion dollars’ worth of computer equipment, over a hundred engineers with backgrounds in storage, networking and operating environments and where EMC and non-EMC products are tested for interoperability and much more, E-Lab is often taken for granted by many EMC users and partners alike. In reality it is a deadly competitive weapon for EMC. It separates them not only from other storage vendors but also from server vendors that sell storage. Taneja Group could not believe the level of focus EMC places on this lab and the intensity of testing that is conducted here to ultimately benefit IT users, partners, competitors and several internal EMC constituencies alike. For the IT user the benefit is simple: If it shows up as a tested product on the EMC Support Matrix (ESM), EMC will stand behind in fixing any problems, no matter how many vendors are involved and how long it takes to get the job done - period. Many customers have obviously bet on that guarantee. EMC hopes that many prospects will do so as well. We couldn’t agree more.

The Multi-Vendor World

The age of the 1960’s and 1970’s were, in many ways, a lot simpler from a computing perspective. A few mainframe players, most notably IBM, supplied all the equipment you needed to run IT. The mainframes came with all the software (including application software), storage, printers, tape drives, interconnect hardware and software and anything else that was needed to run the total environment. The support contract came with the equipment. An army of installers came with the contract. One could even have IBM operate and maintain the entire infrastructure. The CIO basically ordered IBM to deliver a certain application and got out of the way. Everything was homogeneous and life was simpler, if not easier.

How the world has changed in a few decades.

Today we have at least four major server vendors, a dozen or more large storage suppliers, four FC switch suppliers, at least two major HBA suppliers, five major operating systems, three major processor architectures, half a dozen major tape automation suppliers, software that not only comes from these vendors but also from a large number of independents. Then you have at least four large database suppliers and hundreds of systems and application software vendors. And somehow all of these are supposed to work together and keep working. While standards have certainly been a key factor in making things easier to interoperate, they generally do not dictate how efficiently the units must work together. It is apparent that we are living in a much more complex world from an IT perspective. And yet today our expectations are extraordinary. Applications must be available 7x24x365. Users do not care whether it is

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night or day, warm or cold, stormy or calm; they want access to data and applications when they are ready, regardless of anything else.

To make matters worse for vendors, users want to pick best of breed products. There is no such thing as a homogeneous IT site. Even if a majority of equipment comes from one vendor, if you look under the labels, you discover many pieces are manufactured by other vendors. Indeed no vendor today can even produce all the varied types of equipment, both hardware and software, to satisfy the needs of IT across all industries.

And yet the user doesn't care. And, frankly, they shouldn't. It is the vendors' (collective) responsibility to solve the problem. It is another matter that not all vendors do an effective job at this but, nevertheless, the onus is on the vendors, not the user.

So how does a vendor even go about solving this problem? We look at EMC as an example of a vendor who has not only solved this problem but has done so in an exemplary fashion.

Born Out of Necessity

EMC is not a server vendor. Traditionally, storage was integral to a server and supplied by the server vendor. EMC was instrumental in breaking that lock over a decade ago. Clearly the existence of SCSI made that possible but, regardless, it opened up a Pandora's Box. EMC storage had to work with servers from IBM, HP, Sun, Dell, UNISYS, Bull, FSC and others. It needed to work with Wintel along with Sun

SPARC/Solaris, HP PA/HP/UX, IBM PowerPC/AIX/MVS and many other combinations. Even before FC came into existence EMC's storage needed to attach directly with all these server/OS combinations. Once FC came in the picture, the complexity rose exponentially. Now many servers could use the same storage or vice versa. In addition, a lot of interconnect hardware/software came in between servers and storage.

It was pretty apparent that previously standard applications of tools and procedures for testing would not work anymore.

As standards came about vendors created common interoperability facilities. University of New Hampshire Interoperability Lab (UNH IOL) is an excellent example of this. When a new rev of FC is finalized, for instance, vendors implement the new standard and, at an agreed upon time, they all converge on the UNH IOL to test their hardware or software with each others to determine interoperability. These are called plugfests and they serve a very important purpose. But they fall short of what is ultimately needed by IT. Interoperability focuses on whether a spec is met and whether two pieces of equipment that meet the spec work with each other. Do they work well? Do they fail under stress? At what point do they fail under stress? Do they recover gracefully? These questions are not answered by interoperability testing.

The other common testing criteria used is called compatibility testing and compliance testing. Once again the focus here is to

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ensure that the vendor's equipment works correctly (or is compatible with) someone else's equipment. How effectively it works and if and where it fails is not the purview of these tests. You could also be compliant with a certain requirement (Compliant with SEC 17a-4, for instance) but there is no judgment on how effectively the combination works.

Quality Assurance is another testing term that often causes confusion in the market. QA simply means the equipment works according to the spec that it was designed to. Period. Once again there is no judgment on how effectively the equipment (hardware or software) works.

None of these tests yield what the user truly cares about. If I buy this equipment from EMC, will it work *effectively* across the entire range of usage with *acceptable performance*, when implemented along with other vendor's products? *And if it fails can I be sure that it does not drag the entire infrastructure down or destroy data integrity?* That's what an IT user really cares about. This is called *qualification* testing.

EMC's E-Lab was born out of the necessity to deliver *Qualification*.

EMC E-Lab

What it is

EMC's E-Lab facilities occupy two very large and several smaller physical labs and located near all the major R&D, QA and support facilities at EMC's' Hopkinton, MA headquarters. It is further complemented by resources located in EMC solution centers throughout the globe. However, after my

investigation of ELab, I've come to view it not so much as a physical facility, but more as EMC's approach to an overarching philosophy of interoperability. It consists of a vast array of EMC and non-EMC equipment, with an estimated value of \$700M+ and a total investment of over \$3B over the past decade. More importantly, though, it's the 120 dedicated engineers, with vast experience in servers/hosts, storage and storage networking. The equipment can be segregated as follows:

- The complete portfolio of EMC hardware and software, many times over and with all versions
- Competitive hardware and software products, including storage arrays from all major and many smaller competitors
- In excess of 1000 servers from 27 server vendors
- Multiple versions of 42 operating systems that include 272 variations
- Multiple layers of volume management, file systems and MPIO
- Over 100 software products, including clustering software
- Over 160 connectivity elements, including HBAs, switches, WAN and metro extension devices
- Over 100 engineers that manage the various testing processes and interpret the results

The platform testing occurs in one lab whereas all the connectivity testing and management happens in another. This is explained in more detail later.

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What it Does

The primary purpose of the testing conducted in E-Lab is to ensure compatibility and interoperability and then go all the way to “qualification.” This entails putting the products to rigorous stress testing to determine where and how a product fails. The product is not only individually tested but also tested while operating in configurations that represent true IT environments.

It is important to confirm that the product meets certain interoperability requirements but even more important to understand where and how a product fails and how it impacts the rest of the configuration. Beyond that, it is just as important to determine how the product recovers from failure and to ensure that the failure does not result in data loss or corruption. These tests often are more rigorous than those the product endures in the R&D lab where it was developed. This is especially true for products from startups and smaller companies that cannot afford large amounts of equipment required to conduct such testing on their own. EMC requires that the product meet certain minimum entrance requirements before they are allowed in the lab. They often have to run EMC-supplied test suites before they become eligible for E-Lab testing. While often viewed as unnecessary “hurdles”, they are ultimately a large timesaver for all players. The rules are the same for all EMC products as they are for partner or competitor products.

The tests conducted in the E-Lab include those for scalability, functionality and real world performance. As stated before, the aim is qualification and goes way beyond

interoperability and compliance testing. It is not unusual for partners and competitors to physically locate their own engineers in the E-Lab to fix problems as they arise and to learn from the rigorous testing that they may or may not have in their own environments.

After the product meets the qualification criteria it is included in a master database that in turn feeds a number of valuable products and tools. The original and best known is a document called the EMC Support Matrix, or ESM. ESM is used in conjunction with a query tool called E-Lab Navigator. Together they form a powerful basis upon which the entire supportability philosophy of EMC is based. If it is in ESM, EMC will support it without reservations and without finger pointing, even if it involves non-EMC products.

How it Does it

The qualification process takes a logical routing through the E-Lab. It all starts with *platform testing* where the product is tested with a variety of server platforms, operating systems, HBAs and associated drivers. The next stage involves testing the product in a SAN environment (*SAN testing*). This means testing the product in a FC or an iSCSI SAN made up with a variety of switches from all major switch vendors to ensure the customer will have a choice of vendors. This stage also tests for multi-pathing through the SAN. Following this, the product undergoes testing with *SAN management* software, including data protection and local replication.

Complexity is increased next by adding distance to the SAN and the product tested in a remote replication environment (*Extended*

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SAN testing). High availability tests include *clustering*, both locally and remotely, depending on the product. But even this is not enough for EMC. If all has gone well, this completes the qualification process, but there is frequently additional testing that takes place to serve as a final check, both for interoperability and overall product quality. An additional optional stage may include introducing the technology into the EMC Global Solution Center where it is integrated into configurations that truly reflect a customer's IT infrastructure, including databases, ERP, CRM and other applications. By this time the product has been brutally tested under the harshest conditions.

When qualification is complete, the product or configuration is added to the ESM and to the E-Lab Navigator. Once it does, EMC commits to support its interoperability, no matter if the product is developed or OEM'd by EMC or not. In addition to ESM and the E-Lab Navigator, the test data also provides the foundation for a variety of other documents such as EMC Topology Guide, which is a best practices reference for storage networking equipment; a number of Host Connectivity Guides, which are best practices documents for major operating systems when used with EMC storage; and the EMC SAN Advisor. All the tools above are made available to EMC partners and customers. Whatever is learned during the testing process, including best practices, makes it into one or more of these resources.

The SAN Advisor is particularly important in that it provides predictive data on what impact would occur on the SAN, once an anticipated change is made. This advance

guidance results is reduced or eliminated downtime when SAN configuration changes are actually implemented.

Who Does the E-Lab Benefit?

The benefits of E-Lab reach many constituencies, including IT users, EMC partners and competitors and several EMC internal groups such as R&D, QA, Support and Professional Services.

Unquestionably, the overarching benefit is to EMC's customer. E-Lab testing and the resulting knowledge made available via the various tools mentioned above, allows IT to make better decisions in terms of what to buy, how to implement, what to expect and what to avoid. The end result is shortened implementation schedules and reduced costs. Support costs are reduced both on the customer's side and EMC's side. This was corroborated by a large US mutual funds manager that has been relying on E-Lab results for years and considers it an important reason to continue doing business with EMC.

Partner's benefit big time since they enjoy the benefits of such mass-scale testing that many are not able to perform themselves. Even competitors benefit since they get access to data that they would otherwise have to develop themselves, often at great costs. One large computer vendor with a large European presence stated to us that the partnership with EMC on E-Lab is a major time saver to them. The level of partnership has reached a point where anything tested in E-Lab is considered proven and included

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within its own support matrix without question.

Internal functions within EMC benefit as well since their products undergo testing that they would otherwise have to undertake themselves. This way they focus on what they do best. Of course, amongst internal functions, EMC Customer Support is the largest winner in that the tools make it easier for them to diagnose and resolve issues more efficiently, resulting in greater satisfaction for the customer.

It is a win-win all around.

Taneja Group Opinion

In many ways, the EMC E-Lab was born out of necessity. Most of us remember the time when storage was sold strictly as an integral part of the server. Then EMC designed and sold storage that could be attached to any server that supported SCSI. This paradigm-shifting strategy impacted almost everything relating to storage in the market. It created new winners and losers. It shifted power from server vendors to storage vendors. Some companies, especially Sun, didn't understand this shift and paid the price. EMC was at the heart of this change.

Over the years, the scope of this challenge has grown, as has EMC's commitment to not only continue with it but to improve upon it. Their storage had to be tested with all popular server platforms and every operating system that ran on them. It needed to work with multiple heterogeneous servers sharing the same storage array, with multiple SCSI host adapters, with multiple applications

running on each server. Testing all these variations was critical to the success of the product. EMC did what it had to in order to make the products enterprise-capable.

It is the fact that, from a storage perspective, it all has to work with everything surrounding it that gives EMC the edge. Server vendors recognize that. They work closely with EMC E-Lab to exchange data and support each other, especially during a "customer down" situation.

But without question the biggest winner is the end user. They buy from EMC knowing the products are well tested to work in large, heterogeneous configurations before they are shipped. They know that if the product is listed on ESM, it has undergone more than interoperability and compatibility testing. That it is qualified to take the abuse it will get in the real world. And they buy knowing that if something went wrong they only have to invoke EMC support, even if the problem ultimately turns out to be in a product EMC did not sell them.

With the amount of investment that goes into fueling and managing the E-Lab, the risk is that the end user actually takes it all for granted. We believe most large IT shops know the value an entity like E-Lab brings.

It is hard to come across scenarios where all parties, including competitors, win. E-Lab is one such example. No matter how it arrived here, EMC continues to fuel the fires of E-Lab. The payoff is unquestionable. A happy customer!



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