TRANSFORMING
SAP INFRASTRUCTURE with
Game-changing EMC XtremIO

Proven all-flash solution for SAP enables businesses to be more agile and innovative
**Benefits**
- Simplify the SAP system landscape
- Reduce the total cost of ownership (TCO) of non-production copies
- Streamline management of performance and growth
- Boost recoverability while minimizing costs
- Innovate at the speed of business

**Challenges**
- Complexity of SAP application lifecycle management
- High cost of change management
- Poor performance and difficulty enabling growth
- High cost of recoverability
- Roadblocks to innovation

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Abstract: This white paper explains how any SAP systems environment can benefit from EMC’s innovative flash storage array, XtremIO, to simplify the SAP system landscape, reduce TCO, enable better performance, and provide a consolidated platform. All of these advantages then help to improve recoverability, and help businesses to be more innovative. Ultimately, XtremIO achieves the unprecedented: enabling infrastructure teams to say “yes” to more of the requests they get from the SAP functional teams, enabling those teams to more efficiently serve business users, driving better time to market, and in the end, greater agility for the business.

Executive Summary

SAP is the key part of IT for many businesses. SAP applications run critical aspects of enterprise finance, manufacturing, operations, enterprise resource planning (ERP), and supply chain functions, and they are increasingly used to run analytics reports for making important business decisions based on real-time facts. As such, they are often the system of record for critical data and transactions. Anything less than 100 percent availability—and optimal performance—is unacceptable.

SAP development teams and infrastructure teams need to collaborate to overcome the various challenges of SAP implementation and management. But often they find themselves at cross-purposes, with the SAP development teams requesting storage resources to aid in more agile development and testing, and infrastructure teams being unable to respond adequately because of the limitations of traditional storage resources.

In this white paper, we explore the various challenges that SAP and infrastructure teams face and explain how EMC XtremIO all-flash storage array addresses these issues and more.
Challenges facing SAP functional and infrastructure teams

Here’s an overview of five major roadblocks to the infrastructure team’s ability to satisfy the SAP team, which in turn needs to answer to business users:

1. Complexity of SAP application lifecycle management
2. The high cost of non-production systems—adding to the difficulty of SAP change management
3. Poor performance and difficulty enabling growth
4. High cost of backup and recoverability
5. Roadblocks to innovation
SAP teams must follow rigorous processes to ensure code changes are thoroughly tested and vetted before reaching production. Typically, code changes, bug fixes, and enhancements are rolled out in a release strategy, starting from sandbox, to development, to QA, to preproduction, and then to production. Any change results in delays because of the time-consuming tasks required to roll that change into your existing release strategy set in your calendar—a calendar that business owners and business process specialists depend on.

**Needed: Cost-effective storage for non-production systems**

This rigorous application lifecycle management ensures the integrity of SAP applications. However, the SAP landscape is vast, consisting of an application landscape and a system landscape, both of which are exceedingly complex. It is not uncommon for organizations to have four, six, eight or even 10 or more SAP applications running simultaneously: for example, ERP Central Component (ECC), Customer Relationship Management (CRM), Supplier Relationship Management (SRM), Business Warehouse (BW), and many others. Although each application exists in its own infrastructure silo, there are complicated interdependencies between them that mean making a change to one reverberates through others.

In addition, each of these multiple SAP applications has various test, development, and QA systems associated with it. The data in these systems needs to be regularly refreshed from production. The result is a large conglomerate of systems and a constant duplicating of data, making SAP infrastructure very costly, inflexible, and difficult to manage.

**Challenge No. 2: The high cost of non-production systems—adding to the difficulty of SAP change management**
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Production and non-production systems often are kept on different storage systems, primarily for cost reasons. Tier 1, or premium, storage is used for production systems to ensure performance, reliability, and reduced risk. Non-production systems are typically relegated to slower and cheaper Tier 2 storage systems since performance and reliability are viewed as less important.

Even so, for cost reasons, enterprises rarely procure sufficient storage for non-production systems, frequently leaving SAP test and development teams starved for resources. This raises difficulties for the SAP teams attempting to apply their required rigorous change management processes to code changes or upgrades.

Needed: Cost-effective storage for non-production systems

For example, for cost and long system refresh outages, the SAP team is frequently unable to update QA systems with a full copy of production data. That means the production copies aren't as up to date as developers and testers require for them to be effective at doing their jobs. This inhibits the team's ability to perform comprehensive testing as frequently as it would like.

So far, we’ve talked about the capital expense (CapEx) of storage related to change management. But there is also high operational expense (OpEx). That’s because the large movements of data between Tier 1 production systems and Tier 2 non-production storage is exceedingly slow and time-consuming, requiring manual intervention from the IT staff, and racking up large numbers of person-hours.

Challenge No. 3: Poor performance and difficulty enabling growth

From the perspective of the SAP team—as well as users—batch performance in production is never good enough. This is because databases frequently need to extract large amounts of data from storage, which generates intensive I/O—and if I/O performance is inadequate, overall performance will suffer. Performance is also an issue when attempting to test on non-production systems. Unit testing and performance testing in development phases is always a challenge since in most cases development and test systems have an outdated data set. It can also be difficult to achieve similar runtimes in non-production systems and production systems. For example, it’s not uncommon for processes that take one hour in production to take 10 hours for non-production systems.

Challenge No. 4: High cost of backup and recoverability

Creating backups impacts SAP system performance, so, to decrease the impact, organizations typically use storage copy/clone technology to create separate duplicated images for backup. However, the inability to make duplicates of production systems at frequent-enough intervals forces SAP
teams to make hard choices between cost and recoverability. Recovery time objectives (RTOs) are longer than required. Recovery point objectives (RPOs) are also higher than desired.

**Challenge No. 5: Roadblocks to innovation**

The SAP team continuously gets requests from the business for fixes, enhancements, and new functionality, which in turn requires more copies of production systems for testing.

This can be problematic for two reasons. First, if the development team gets a request for new functionality, it might not know whether it involves a forthcoming feature for SAP, or whether it’s simply a component the team hasn’t installed yet. Developers must be able to spin up sandbox systems quickly and cheaply to answer this question. They then must be able to quickly and simply destroy these environments. This is not possible in traditional storage systems.

A second, related challenge is that development teams in general have to be more productive and bring benefits to the business faster. This is difficult when resources aren’t available for creative exploration of ideas.

**XtremIO Characteristics**

All these challenges demand innovative thinking at a time when IT staffs are asked to do more with less. Despite growing datasets—many SAP databases increasingly store tens of terabytes of data, much of which is duplicated in test systems and for production backups—and growing demands on the business, IT budgets and staff numbers are stagnant. There’s frustration in businesses that the majority of IT budgets are spent just maintaining the status quo and managing the existing infrastructure, and not investing strategically in business priorities. According to a recent Forrester study, 72 percent of IT budgets go to routine IT maintenance and management, versus just 28 percent invested in business innovation.

XtremIO characteristics address all these challenges while advancing the competitiveness of the business at large.

IDC confirms that EMC continues to be the preferred storage platform for SAP workloads, with the majority of Global 1000 SAP customers relying on EMC storage and data protection solutions for their critical SAP workloads.²

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¹ How to balance maintenance and IT innovation, Minda Zetlin, ComputerWorld, October 21, 2013.
² IDC, 2014
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   **XtremIO Snapshots**

2. Reduce the total cost of ownership (TCO) of non-production copies

3. Streamline management of performance and growth

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**Revolutionary agile snapshots**

Snapshots are virtual instantaneous copy images of volume data that capture the data exactly as it appears at a specific point in time. They leverage inline data reduction capabilities to only write unique changed storage blocks. As a result, all snapshots are created in memory in milliseconds with a tiny data footprint, and the source and target SAP systems using this data experience no performance impact regardless of the number of snaps.

**Simple setup**

XtremIO eliminates the need for disk management, tier management, or certain manual administration tasks, and can be set up in just a few minutes.

**Inline data reduction**

XtremIO writes only unique changed storage blocks. Duplicate data blocks never translate into physical data writes, and are replaced with in-memory metadata pointers that allow a single physical block on SSD to be referenced multiple times. After data blocks are globally deduplicated, the remaining unique data blocks are compressed inline, delivering an optimal storage footprint.

**Linear performance scalability**

Both aggregate capacity and aggregate performance increase linearly with every additional X-Brick—XtremIO’s unit of storage—added to the cluster.

**Data protection & encryption**

XtremIO’s new data protection scheme, XDP, leverages the random access nature of flash and the unique XtremIO dual-stage metadata engine. The result is the world’s first flash-native data protection that delivers much lower capacity overhead, superior data protection, and much better flash endurance and performance compared to any RAID algorithm.

Additionally, XtremIO snapshot functionality can give customers a choice for data protection by accelerating data recovery.

Finally, Data at Rest Encryption (DARE) enables XtremIO arrays to utilize a high-performance inline encryption technique to ensure that all data stored on the array is unusable if the SSD media is removed.
EMC’s uniquely capable all-flash XtremIO can help address all the IT challenges listed previously. Since its launch in 2013, EMC XtremIO has achieved market leadership. With its scale-out clustered design, XtremIO provides the linear capacity and performance needed to meet the demanding workloads required by SAP customers. Migration to or implementation of SAP on XtremIO results in dramatic performance gains, cost savings, and operational efficiencies through SAP landscape consolidation and simplification without any modifications to database or SAP parameters.
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Benefit No. 1: Simplify the SAP system landscape

Agile snapshot

Consolidation with ONE Platform Efficient, Faster & Simpler

Every team gets a full DB, all data, flash speeds

Several productions on one XtremIO

Every engineer gets a full DB copy, all data, high performance

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A well-known rule of thumb is to never do anything for the first time in production. But, as discussed, with traditional storage systems the difficulty of managing the application lifecycle is tied to the complexity of the SAP system and application landscape. XtremIO provides a single platform for all systems: OLAP and OLTP alike; and for non-production, development, testing, QA, pre-production, production. You name it; it can run easily on the same XtremIO platform.

XtremIO does this in part through its deduplication feature. If you write the same block at the storage level three times, you only occupy the space of one block. You can copy things as large as you like, as often as you like, and you will only occupy the space of the source. This dramatically simplifies both the application and system landscapes, as you have no need for different storage system silos for different SAP applications or for production and non-production systems.

**Accelerate and improve development-test cycles while saving budget**

This simplicity benefits you in testing. You are probably used to development systems that in many cases are not recent production copies. So you often have a situation where unit testing alone has to move to QA, because it needs to rely on more relevant data. Transporting unit testing into QA slows down your development cycle and makes developers dependent on the infrastructure team for the transport. They then have to do this transport iteratively until the code is right before they can even get to user acceptance or regression testing.

You’ve probably become resigned to scenarios like this one. But XtremIO easily avoids it—and similar scenarios—by offering you the ability to refresh full production copies in development as often as you like without the typical associated storage costs or time penalties.

Finally, you have no complex setup or application tuning to do when setting up or adding to an XtremIO all-flash storage system. This is possible because XtremIO arrays do not require facility changes; they can utilize the same racks, power connections, and networking configurations that were in place previously, saving significant time. Also the unique placement mechanism where XtremIO evenly distributes data blocks across all X-bricks in the XtremIO cluster, and all SSD drives in each X-brick, ensures optimal performance, and no hotspots. For example, this avoids the complex analyses of table space distribution and table placement typical of any database administration.
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XtremIO Snapshots: A Revolutionary Capability

XtremIO’s unique snapshot capability solves the challenges of an organization’s non-production system deployment for testing.

Snapshots are virtual instantaneous copy images of volume data that capture the data exactly as it appears at a specific point in time. Snapshots enable you to save the volume data state and then access that specific volume data at a later time, whenever needed—even after the source volume has changed.

Unlike traditional array snapshots, XtremIO snapshots are natively integrated into the XtremIO scale-out Metadata memory, data reduction & copy services architecture. All snapshot functions are executed in memory at memory speeds delivering unmatched capability, capacity, performance & scale.

Snapshots are a “clean-sheet” elegant architectural element of the XtremIO product, designed singularly for flash, memory & metadata; rather than being an after-thought bolt-on feature providing rudimentary brute-force functionality for flash (like most other arrays).

Snapshots can be writeable, read-only, scheduled and managed via consistency groups. They are highly optimized space efficient logical entities. Snapshots deliver unmatched dedicated application performance where there is zero performance penalty between the parent and children, at any scale and for any workload.

Capability 01
Better batch performance with new low-latency flash technology

Capability 02
Reduced cost and lower TCO by reducing storage requirements for non-production system

Capability 03
Simplified SAP deployment, optimization, and management

Capability 04
Strengthened SAP system data protection capability through the XtremIO snapshot technology
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**Benefit No. 2: Reduce TCO**

![Diagram showing storage consolidation and server infrastructure reductions]

XtremIO also lowers TCO with storage consolidation, server infrastructure reductions, lower power and cooling costs. All this means reductions in both OpEx and CapEx.

In EMC customer testing, we have achieved 40 percent TCO reduction, with the following:

- 80 percent reduction in space consumed by copies
- 50 percent consolidation for virtual server vCPUs
- Seven times more production snapshots maintained on a live system (with massively reduced RTO)

Given cost as well as risk concerns, most enterprises have traditionally designed and managed their non-production systems differently from their production systems. The result is different storage platforms, different storage layouts, different I/O requirements, and different performance requirements—all these factors add to expense, even though you initially designed the different architectures to drive costs down. XtremIO's ability to run all systems on the same storage array saves significant CapEx.
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In addition, XtremIO offers out-of-the-box real-time data services—which incorporate “always-running” thin provisioning, deduplication, inline compression, data protection, data-at-rest encryption, and writable snapshots—with a tremendous impact on your consolidation capabilities. You can finally consolidate all of your SAP instances into a tiny fraction of the space, saving CapEx. Then you also save OpEx due to consuming significantly less power, less data center space, and less person hours to manage the storage arrays.

Smarter, safer data storage at lower cost

In legacy storage environments, deduplication and compression are done only after the data has been put on the disks, increasing storage processing overhead. XtremIO's innovative architecture “finger prints” incoming data streams into the XtremIO service processor, which compares that data for duplication and only writes that data once to the flash drive in a compressed format. This allows inline de-duplication and inline compression to work together at the time data is initially brought into your SAP system, enabling a much more efficient consolidation of data and expanding the life of flash drives. It also creates a more agile, writable snapshot, which saves storage space, and therefore CapEx.

To prove the unique benefits of XtremIO for SAP in regards to simplification, consolidation, performance, and cost, we set up a test scenario that involved using the XtremIO snapshot function to reduce the SAP landscape storage footprint and aid in the refresh process of running all of test/dev and production systems on the XtremIO array. We created two snapshots of the production (PRD) system to be used as the base for quality assurance (QAS) and preproduction (PRE), and one snapshot of the development (DEV) system to be used as the base for a sandbox (SDX). We also simulated an additional workload on QAS using SAP client copy to demonstrate that the snapshot of PRD would have no performance impact on PRE.

Stunning XtremIO test results

What we found: when fully consolidating SAP infrastructure on XtremIO, businesses can consolidate both SAP physical and virtual landscapes to a scale-out all flash array without performance degradation, resulting in dramatic data reduction for a smaller footprint in the data center.

And architecture does matter: in our tests, XtremIO showed predictable all-flash performance in a scale-out architecture with rich data services allows many SAP application workloads to be run on the same platform (OTLP, DW, analytics, reports, test & development).
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Fact Table: Summary of XtremIO Workload Test Statistics for SAP

<table>
<thead>
<tr>
<th>SAP System Landscape</th>
<th>Overall Efficiency</th>
<th>Data Reduction Ratio</th>
<th>Thin Provisioning Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculation</td>
<td>VC/OC</td>
<td>System Calculated</td>
<td>(VC-TP)/(VC)</td>
</tr>
<tr>
<td>PRD, DEV</td>
<td>7:1</td>
<td>2:1</td>
<td>68%</td>
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<tr>
<td>PRD, DEV, PRE, QAS &amp; SDX</td>
<td>17:1</td>
<td>2:1</td>
<td>86%</td>
</tr>
</tbody>
</table>

Additionally, XtremIO’s real-time data services, which incorporate “always running” thin provisioning, deduplication, inline compression, data protection, data-at-rest encryption, and writable snapshots, have a huge impact on the consolidation of SAP environments. The result was significant savings due to reduced storage space consumption, optimum agility, improved availability, and security with every SAP application and for each user, during both peak and normal times.

Overall, we achieved a data-reduction ratio of two-to-one across the board—across production, development, preproduction, QA, and sandbox, with thin provisioning savings of 68 percent for production and development systems, and 86 percent for production, development, preproduction, QA, and sandbox systems. Actual storage only increases by 7GB or less than 4%, instead of 150%. The impact on the production system (PRD) is near zero.

Moreover, overall efficiency (volume capacity/physical occupied capacity) in production and development systems improved by a seven to one ratio over traditional systems simply by using XtremIO without any tuning or other changes. After creating QAS, PRE, and SDX through the snapshot, that figure went to an astounding 17-to-one ratio. In general, the more snapshots you create, the higher overall efficiency you achieve.

The speed of snapshots means you save many person hours of time in creating non-production systems—and that you achieve a major savings of OpEx. And
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not incidentally, XtremIO provides you with the best usable capacity in the industry—82 percent of raw capacity. XtremIO also delivers the longest life expectancy of enterprise-grade SSDs. No tuning is ever needed, and the array self-heals if an SSD fails.

 Benefit No. 3: Streamline management of performance and growth

Most companies still have the majority of their systems on rotating disks. And no matter how good such systems are, they are never as fast as the business would like.

Additionally batch jobs and batch performance are issues for anyone managing an SAP infrastructure. SAP customers must manage long-running jobs of this kind that deploy operational, transactional, structural, or transformative updates. They also have to plan and size their environment to accommodate these performance-hungry SAP jobs, adding additional cost and complexity.

Batch jobs raise performance issues because of the very large datasets. Not all that data can be buffered, so batch processing typically requires that you fetch the data from your storage system and bring it into your database and SAP system buffers for processing.

XtremIO drives significant performance gains in batch processing. EMC created a test scenario to measure SAP performance improvement through the use of an XtremIO array with default system settings. To simulate a massive data transfer, we created seven SAP ERP systems to run client copy simultaneously. After running client copy on the non-XtremIO hybrid-array with tiered storage we migrated the seven systems to the all-flash XtremIO array without changing any applications, databases, or operating system levels.
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The EMC XtremIO flash array effectively delivered higher bandwidth performance and ultra-low latency as compared to the non-XtremIO array. On average and standard storage arrays, it took 84 minutes to complete the client copy operation for each SAP system using the non-XtremIO array. After we migrated the entire environment to the XtremIO array (without any system tuning), the client copy operation took only 38 minutes to complete for each SAP system. Overall, with XtremIO, the duration of the client copy operation decreased by 55 percent, disk response time was reduced by 90 percent, and the total bandwidth increased by 180 percent.

Elimination of system bottlenecks and wait times

Another performance challenge arises when the combination of high random reads found in SAP ECC applications, and the high writes found in SAP BW applications are handled concurrently. Traditional storage arrays simply can’t handle the demands of thousands of users and hundreds or thousands of batch processes concurrently hitting the same storage, storage cache, and spinning disks. The result: bottlenecks in the storage and the database, with wait times that impact the business.
XtremIO arrays, on the other hand, can run mixed workloads of SAP production and non-production applications without any performance penalties; with XtremIO arrays, performance and capacity always scale linearly with no performance bottlenecks. In fact, the XtremIO architecture achieves its highest performance while handling the very different workloads found in SAP ECC and SAP BW.

In our test scenarios, working at flash speed, XtremIO frees up the host waits in an active-active architecture. Eliminating IO bottlenecks reduces database server IO wait times and improves database performance. It also improves SAP average response time, and, in turn, provide the business with the required responsiveness. Data-extract performance between BW and ECC based on our proof-of-concept testing required no tuning.

Growing your storage infrastructure to respond to business needs is also easier under XtremIO. This allows you to “start small” and then grow big through scale-out functionality as your business increases. Because of this, you not only simplify infrastructure changes but also create a fantastic opportunity for smart investing.

**Benefit No. 4: Boosts recoverability while minimizing costs**

Another significant benefit of XtremIO snapshots is that you can now enhance your data protection scheme.

With traditional storage arrays, you might create an end-of-the-day snapshot or an end-of-the-day clone for backup to decrease the production performance impact—you do it only once daily because of process inefficiencies or storage costs. With XtremIO, you can make more—many more—of these backup snapshots in milliseconds and with almost zero data footprints. This capability increases your recovery point objective (RPO), because you have more recovery points in your system.

Because of this, you can also recover from data corruption much faster—data corruption that would otherwise require time-consuming database restore and recovery from backup media. Instead of keeping seven days of backup on external media (like a tape device), you can perform these backups on XtremIO as snapshots.

**Have it all: data capacity, performance, and protection**

XtremIO thus eliminates trade-offs organizations were previously forced to make between capacity, data protection, and performance. XtremIO represents a new type of data protection scheme that combines the best attributes of pre-existing RAID (redundant array of independent disk) levels, while avoiding their drawbacks. For example, although performance-hungry workloads are typically provisioned on RAID 1, this is done at a high cost: 50-percent capacity overhead.
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Transforming SAP Infrastructure With Game-Changing EMC XtremIO

Less sensitive workloads can use RAID 5, and large, but sensitive, data sets with lower performance requirements must be protected with RAID 6.

But there’s another issue: data is constantly changing, and so it’s not always possible to know which type of data you are storing. Today’s choice of a RAID level might leave critical data on a less-than-optimal RAID level in the future.

Rather than simply adopting one of the existing RAID algorithms and implementing it on top of solid-state drives (SSDs), EMC built from scratch the only new data-protection schema exclusively for flash. XtremIO only writes, on average, 1.22 writes for every I/O that comes in, compared to the three or more writes that are required to serve every I/O with RAID 6. On top of that, the overall performance aspect is close to two times better than any of the RAID systems in place today.

In short: XtremIO data protection (XDP) provides the Best AFA Data Protection on The Market delivering the superior protection of RAID 6, the superior performance of RAID 1, and the superior capacity utilization of RAID 5. The total overhead for protection is a mere 8% of the total flash media, with no need for reserved hot spare devices. XDP is able to sustain 2 simultaneous SSD failures per X-Brick (Up to 16 failures per cluster) with zero degradation in performance.

XtremIO also delivers a better solution for organizations that require HIPAA or PCI compliance. XtremIO has an optional inline data encryption feature that you can use for all your data, without having to go through any classification process. Universal encryption is delivered without any performance hit, because it comes as part of the rich feature set XtremIO provides.

🏆 Benefit No. 5: Innovate at the speed of business

Users always want information faster, so better business decisions can be made. New business initiatives therefore typically come to SAP application teams with aggressive deadlines. Whether opening a new store, launching
a new product, opening a new online channel, or updating pricing rules, the business nearly always wants changes deployed faster in production than development teams can reasonably do it.

This is normal in today’s economy where competitiveness is ever fiercer, and where being first to market can make or break a business initiative. It's why concepts like “agile development” and “devops” are gaining such popularity.

Having production copies for development means better and faster code development, break-fix responses, and SAP Enhancement Package testing. You get more independent, production-like snapshots to initiate new projects at extremely low cost. XtremIO also supports SAP HANA TDI so you can consolidate SAP HANA and EMC XtremIO to innovate more at the speed of business than was previously possible. Also, building parallel landscapes for large projects like a version upgrade or an OS or database migration become simpler as the copies from production occupy only minimal space, and companies can now update their systems at a more regular pace, as a significant proportion of infrastructure costs go away.
Best Practices for XtremIO Storage Design Considerations for SAP

This section describes design considerations for SAP systems as they specifically relate to XtremIO storage. The simplicity of the XtremIO design means many improvements come automatically. Work for IT staff is significantly reduced, leaving just a handful of actions that can be taken to make everything run even more smoothly.

For example, XtremIO uses its multi-controller scale-out design and remote direct memory access (RDMA) fabric to maintain all metadata in memory. This makes XtremIO arrays impervious to changes in workload. It does not matter what Logical Unit Numbers (LUNs) are used, whether the I/O patterns are random or sequential, or whether there is locality of reference. The performance is always consistent and predictable.

Additionally, XtremIO’s patented data protection (XDP) scheme is extremely efficient in every situation at limiting extra writes for parity. With overhead for parity at only 8 percent, it is the industry’s most efficient data protection scheme, optimized for flash media. XDP eliminates the need to configure different RAID protection levels for database and log files to balance the performance and cost, which dramatically simplifies management.

So what can you do? A couple of things.

• **With XtremIO virtual provisioning, you can simplify the database storage design.** In one test scenario, two SAP systems running on vSphere ESXi (one for production and one for development) were deployed on the XtremIO array. We created uniform volumes for the database data, log, and SAP binary files for easy management, allocating storage as needed. Our only departure from this model of simplicity and efficiency was in the separation of the redo volumes, not only for performance considerations, but also for database recovery.

• **For SAP production systems with Oracle databases, we suggest multiple XtremIO volumes for both data files and log files.** We recommend starting with 4 LUNs for data and 4 LUNs for logs for heavy Oracle workloads. If using Oracle Automatic Storage Management (ASM), we suggest setting the ASM disk group sector size attribute to 4KB to maximize the I/O performance on the XtremIO storage. We also suggest setting the block size of the online redo log files to 4KB to match the group sector size above.

• **With built-in thin provisioning, storage is only allocated when it is needed.** This enables you to create larger LUNs to accommodate future or unexpected growth for databases, without wasting any physical space on storage.

• **Most importantly, heavy metadata operations such as inline data reduction, thin provisioning allocations, and internal array copy operations are conducted entirely in memory without impacting I/O.**
Executive Summary

Challenges facing SAP functional and infrastructure teams
1. Complexity of SAP application lifecycle management
2. High cost of change management
3. Poor performance and difficulty enabling growth
4. High cost of recoverability
5. Roadblocks to innovation

XtremIO Characteristics

Benefits of XtremIO
1. Simplify the SAP system landscape
   - XtremIO Snapshots
2. Reduce the total cost of ownership (TCO) of non-production copies
3. Streamline management of performance and growth
4. Boost recoverability while minimizing costs
5. Innovate at the speed of business

Conclusion

The majority of SAP customers have already experienced the benefits of running their systems on EMC storage solutions. With XtremIO, EMC’s all-flash storage array, these customers have a chance to keep improving their experience.

For customers new to EMC, XtremIO will demonstrate why so many organizations prefer our solutions. XtremIO’s revolutionary snapshots, simple setup, inline data reduction, linear performance and scalability, and cost-effective data protection and encryption making the value proposition extremely attractive, especially when compared to competitive offerings.

XtremIO directly addresses challenges facing SAP application and infrastructure teams, including the complexity of SAP application lifecycle management, the high cost of change management, poor performance and difficulty in enabling growth, the high cost of backup and recovery, and roadblocks to business innovation. XtremIO achieves what few pieces of infrastructure hardware have achieved: the ability to make a real difference to the business, specifically greater agility and lower TCO resulting in higher ROI on technology investments.

Recommended Next Steps

You have numerous ways to benefit from the tremendous advantages of implementing XtremIO for SAP. Please consider the following next steps:

- Contact your EMC Sales Team or EMC Business Partner
- Visit our XtremIO for SAP Resources Page on Everything SAP at EMC at: https://community.emc.com/docs/DOC-38703
- Refer to: www.xtremio.com/sap for relevant materials within the XtremIO Resource Library
- Request an XtremIO demo from your local XtremIO representative or go to www.emc.com/XtremIO
- Join one of our SAP week events by viewing our SAP Travel Guide for dates and places https://community.emc.com/docs/DOC-33218.