



Highlights

- Deploy open-source relational database management systems to consolidate database instances and lower costs
 - Accelerate application performance by adding IBM® FlashSystem® V9000 to your storage architecture
 - Enable more business innovation by deploying EDB Postgres Advanced Server with IBM FlashSystem V9000
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Accelerating innovation

IBM FlashSystem and EDB Postgres Advanced Server help lower costs and accelerate innovation

The business world is changing: New technologies such as flash storage, mobile and social systems of engagement, big-data analytics, and cloud computing are empowering enterprises to accomplish more than ever before. However, many IT organizations aren't prepared to fully invest in these new technologies. According to Rita Gunter McGrath, business strategy expert and professor at Columbia Business School, many organizations are dedicating between 80 and 90 percent of their IT budgets to basic maintenance instead of investing in these 21st-century technologies that can offer competitive business advantage.¹

When it comes to shifting budget dollars from maintenance to innovation, a key area to examine for cost savings is database management systems (DBMS). Many opportunities are available to consolidate both the number of DBMS instances and the hardware on which those instances reside. This consolidation also provides a chance to reduce the total number of DBMS instances supported, further reducing hardware, licensing and maintenance expenditures. Open-source relational DBMS (RDBMS) offerings have matured and today provide some very compelling choices for a large majority of new enterprise applications.

EDB Postgres Advanced Server from IBM Business Partner EnterpriseDB (EDB) is a leading open-source RDBMS that is helping organizations save money and pursue new technology. With EDB Postgres Advanced Server, users get an enterprise-class open-source RDBMS that can optimize cash flow and pave the way to innovation.



IBM and EDB have been working together to provide high-performance, cost-effective IT infrastructure solutions based on open-source RDBMS technologies. Recent benchmark testing² has confirmed that IBM FlashSystem V9000 is the optimal storage on which to run EDB Postgres Advanced Server. IBM FlashSystem V9000 offers attractive total cost of ownership (TCO) advantages plus other important benefits that help organizations make the most of their investment in EDB Postgres Advanced Server solutions.

EDB Postgres Advanced Server

EDB Postgres Advanced Server is a complete data platform that is open-source-based, enterprise-grade, relational, compatible with leading commercial database technology and capable of supporting mixed data types. It helps mitigate the risk and pain of migrating from the costly licenses of feature-rich (but function-overkill) enterprise DBMSs, thanks in part to a subscription support pricing model with no upfront licensing fees.

EnterpriseDB

EDB is a leading worldwide provider of Postgres software and services. More than 2,700 enterprises, governments and other organizations worldwide use EnterpriseDB software, support, training and professional services to integrate open-source software into their existing data infrastructures. EDB is a primary contributor to the Postgres community and responsible for recent features such as JSON support, materialized views and partitioning. With powerful performance, availability and security enhancements for PostgreSQL, sophisticated management tools for global deployments, and database compatibility for Oracle, EDB software supports both mission-critical and non-mission-critical enterprise applications.

Open source

From the standpoint of an organization looking to cut costs in its database environment, the appeal of an open-source solution is clear. Some proprietary commercial databases charge high prices for licenses, which can place significant strain on IT budgets. An open-source solution can help remove the cost of these licenses and create more room in an organization's budget. Over the years, open source has replaced proprietary options for components such as operating systems, virtual machines and middleware. It should come as no surprise to see the same thing happening now with databases.

Enterprise-class

Before enterprises can optimize cash flow by adopting open-source databases, they need to find an offering that truly meets their needs. While there are many open-source relational databases available today, very few are capable of supporting mission-critical enterprise applications—those applications that simply cannot go down or lose data under any circumstances. In order to offer a true alternative to higher-priced commercial databases, an open-source database must support mission-critical online transaction processing (OLTP) with high levels of reliability, scalability and data integrity. EDB Postgres is one of the few that does.

Relational

As a relational database, EDB Postgres Advanced Server is well positioned to support OLTP environments, without which everyday business operations could not take place. Many organizations today are seeking an alternative to the relational database, which they associate with proprietary SQL languages, vendor lock-in, and high license and maintenance costs. However, the term “relational” is not necessarily synonymous with “expensive.” As EDB demonstrates, it is entirely possible to get a relational database—and the reliable transaction processing it provides—without having to overpay for it.

Support for mixed data types

EDB Postgres Advanced Server includes the powerful combination of unstructured, semi-structured and structured data storage in a single enterprise DBMS. This allows enterprises to preserve the long-term viability of their valuable data assets.

Compatible with leading commercial databases

Finally, by offering compatibility with leading commercial relational database offerings, EDB Postgres Advanced Server makes the process of migrating applications to open-source applications straightforward and streamlined. One example of this is EDB's compatibility with Oracle. EDB offerings run native PL/SQL, the proprietary SQL language for Oracle, and include automated migration tools to help save time and minimize uncertainty in the migration process. Together, these features make migrating to EDB Postgres Advanced Server substantially less risky and time consuming for existing Oracle users.

IBM FlashSystem V9000

IBM has tested both IBM FlashSystem 900 and IBM FlashSystem V9000 in EDB Postgres Advanced Server environments; the results were very similar. For brevity, only IBM FlashSystem V9000 will be highlighted in this white paper. IBM FlashSystem V9000 offers the advantages of software-defined storage at the speed of flash. It makes an excellent complement to open-source database solutions such as EDB Postgres Advanced Server. IBM FlashSystem V9000 solutions deliver the full capabilities of IBM FlashCore® technology's hardware accelerated I/O, IBM MicroLatency® modules and advanced flash management, coupled with a rich set of the features found in the most advanced software-defined storage solutions. These include IBM Real-time Compression™, dynamic tiering, thin provisioning, snapshots, cloning, replication, data copy services and high-availability configurations.



IBM FlashSystem V9000

IBM FlashSystem V9000 is designed to accelerate all types of applications and infrastructures, but it is most often deployed to support high-performance database applications such as EDB Postgres Advanced Server, Oracle, SAP or IBM DB2® databases. IBM FlashSystem V9000 can function as the virtualization layer between the host and other external storage systems, providing flexibility and extending functionality to the virtualized external storage capacity. Up to 32 PB of external storage can be managed by a single IBM FlashSystem V9000 array, and because the storage is virtualized, volumes can be nondisruptively moved between external and internal storage capacity. This functionality enables agile integration into existing storage environments with smooth data migration between IBM FlashSystem V9000 and legacy storage systems.

IBM FlashSystem V9000 can multiply the cost benefits of EDB Postgres Advanced Server by replacing multiple racks of hard disk drives to lower power, space and cooling costs. Plus, it can increase server efficiency, which can further cut power and cooling costs. Server efficiency also can reduce the need for instances of the application, which can reduce software licensing expenses.

Open-source advantages

Separately, EDB Postgres Advanced Server and IBM FlashSystem V9000 all-flash storage offer many benefits to enterprises looking to lower costs while actually increasing application performance. As noted previously, open-source RDBMS solutions offer inherently lower licensing costs than feature-dense proprietary DBMS offerings. IBM FlashSystem V9000 also offers significant TCO benefits. IT industry analyst firm Enterprise Strategy Group (ESG) performed a detailed economic value validation (EVV) comparing IBM FlashSystem V9000 to equivalent conventional storage configurations. *The “...ESG analysis of a typical heterogeneous enterprise workload running on IBM FlashSystem yielded an estimated 76 percent ROI over the baseline of traditional performance storage...”*³

If EDB Postgres Advanced Server and IBM FlashSystem V9000 separately provide substantial cost benefits, imagine what they can offer when deployed together. These cost savings can be applied to infrastructure modernization, which complements new business innovation. But the combined solution offers a number of advantages beyond TCO, such as:

- **Faster application performance:** IBM FlashSystem V9000 enables EDB Advanced Server to process significantly more transactions per second.
- **Extreme reliability:** IBM FlashSystem V9000 offers multiple layers of data protection, from two dimensional RAID at the hardware level to highly efficient snapshots and replication at the software level.
- **Reduced storage complexity:** EDB Advanced Server allows consolidation of RDBMS instances while IBM FlashSystem V9000 increases CPU utilization, enabling storage solutions to do more with less.
- **Dynamic and flexible resource utilization:** IBM FlashSystem V9000 provides storage virtualization that enables agile data movement between storage tiers and nearly 400 different external storage systems.

Solution design and test results

To help enterprises gain all the advantages possible from deploying the combination of flash storage and open-source RDBMS technology, IBM and EDB have jointly developed and tested a solution reference architecture based on IBM FlashSystem V9000 and EDB Postgres Advanced Server.² The joint team tested the solution design against the same architecture powered by only conventional disk-based storage. The results clearly demonstrated the benefits of deploying IBM FlashSystem V9000 with EDB Postgres Advanced Server.

Test results

Figure 3 shows a comparison between a conventional disk-based storage system and IBM FlashSystem V9000 running the Postgres pgbench benchmark on a Microsoft Windows x86 32 CPU server with 128 GB of memory running EDB Postgres v9.2 with a 1.2 TB database. In these comparisons, higher reads and processor utilization are better. As noted previously, IBM FlashSystem 900 was also tested under identical conditions and achieved very similar results.

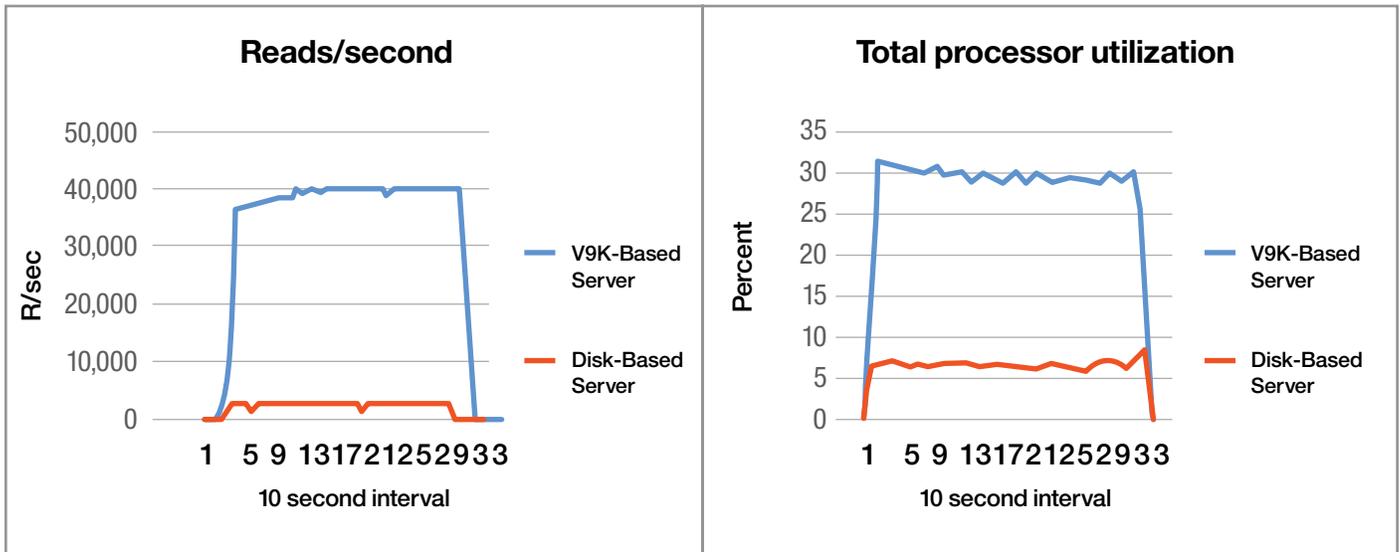


Figure 1. Performance comparison between conventional storage and IBM FlashSystem V9000

Figure 1 clearly shows the superiority of IBM FlashSystem V9000 for use with EDB Postgres Advanced Server. This configuration delivered nearly eight times more reads per second and more than five times the processor performance

compared to conventional storage. This translates into six times more database transactions processed, due to the greatly reduced latency per transaction as shown in Figure 2.

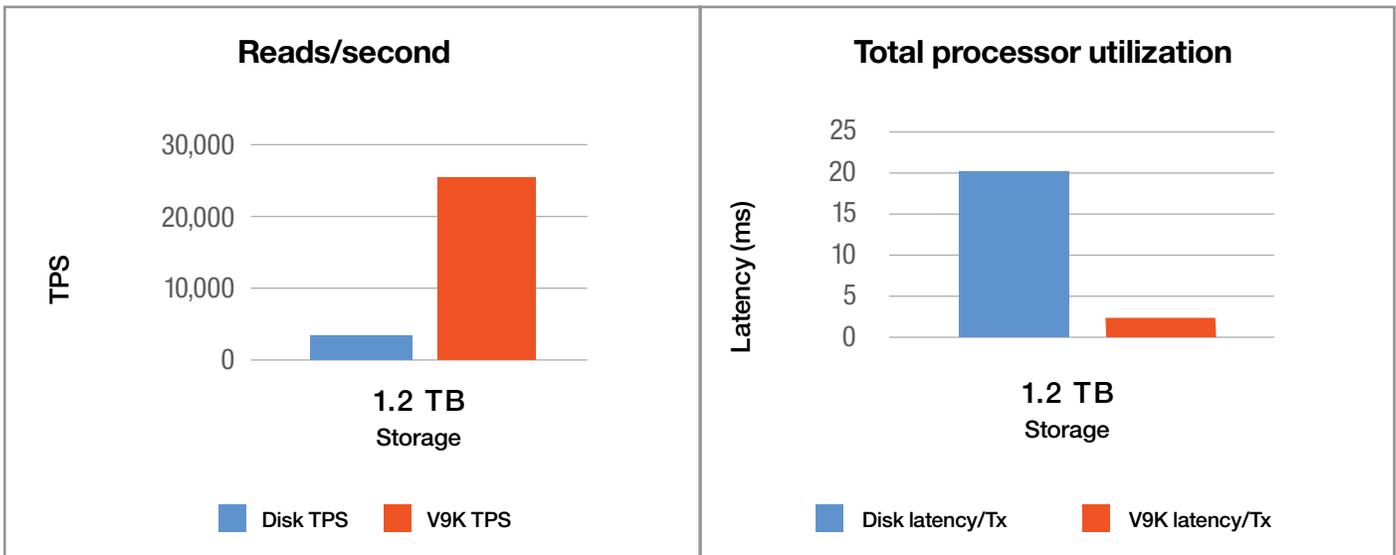


Figure 2. Transactions per second and latency between conventional storage and IBM FlashSystem V9000

Another consideration is scalability. Many disk-based solutions will experience greatly increased latency as the disk capacity is used up. During the IBM and EDB testing, a 100 GB

and a 1 TB database were tested. Figure 3 shows how this increase in database size dramatically increased disk storage latency while producing very little latency change on IBM FlashSystem V9000.

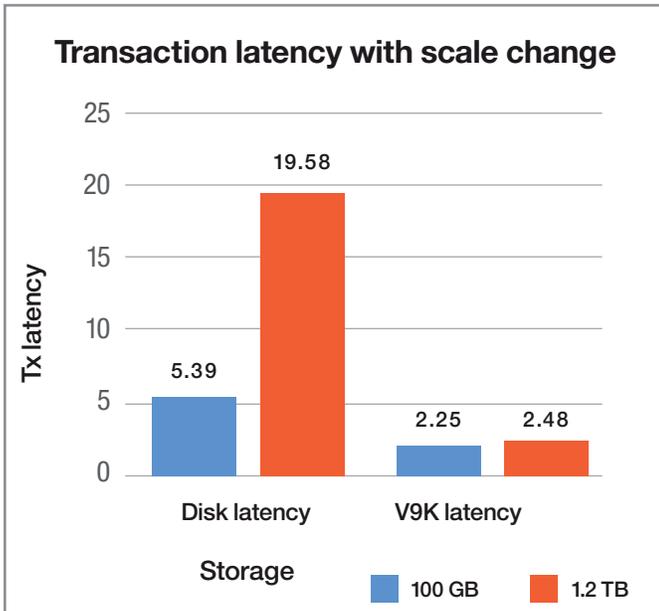


Figure 3. Change in transaction latency with increased scale

For organizations concerned about the high cost of proprietary relational databases, running EDB Postgres Advanced Server on IBM FlashSystem V9000 is an especially attractive proposition. By helping users experience a level of performance up to five times better than that offered by conventional storage,

while using fewer processing cores, IBM FlashSystem allows organizations to save money on the price of per-core EDB Postgres Advanced Server annual subscriptions. And the reduced latency provided by IBM FlashSystem V9000 enables more efficient use of existing cores by allowing them to do processing rather than waiting for responses from the storage. This means that enterprises can accomplish more while moving scarce resources away from IT maintenance and toward greater business innovation.

Conclusion

By running EDB Postgres Advanced Server on IBM FlashSystem all-flash arrays such as IBM FlashSystem V9000, enterprises can achieve database costs significantly lower than those offered by proprietary database solutions. In an era when moving funds away from basic maintenance tasks in order to better support innovation is a top priority, test results show that EDB Postgres Advanced Server on IBM FlashSystem V9000 is an outstanding option to help meet that goal.

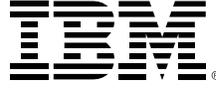
As two leading organizations in the field of database technology, IBM and EDB have a long history of collaborating in order to help their shared customers attain the best possible results. Today, technology from both companies is used to support database transformation initiatives across industries and in organizations of all sizes. In short, IBM and EDB are working together to ensure that their customers can lower database costs while also supporting the innovation initiatives to enable competitive advantage in the 21st century.

For more information

To learn more about IBM FlashSystem V9000, please contact your IBM representative or IBM Business Partner, or visit:

ibm.com/storage/flash/v9000

Additionally, IBM Global Financing provides numerous payment options to help you acquire the technology you need to grow your business. We provide full lifecycle management of IT products and services, from acquisition to disposition. For more information, visit: ibm.com/financing



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Actual available storage capacity may be reported for both uncompressed and compressed data and will vary and may be less than stated.

¹ Rita Gunther McGrath, "The End of Competitive Advantage: How to Keep Your Strategy Moving as Fast as Your Business," *Harvard Business Review Press*.

² Tests conducted by IBM Flash Center of Competency, Research Triangle Park, October 18, 2016.

³ ESG, "Analyzing the Economic Value of IBM FlashSystem Compared to Traditional Performance Disk Systems," February 2015.



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