



#225110

February 2025

Commissioned by
Dell, Inc.

Dell PowerEdge 17th Generation R6725 with AMD EPYC™ Processors & Emulex LPe38102 Secure HBA

64G FC End-to-End Server-to-Storage Benefits vs. 32G Fibre Channel

EXECUTIVE SUMMARY

64G Gen 7 Fibre Channel interfaces in servers and in mission-critical storage allow for end-to-end 64G FC connectivity that can dramatically increase storage network throughput while reducing transaction processing times which would have direct benefits to application performance leading to better business outcomes. The Dell PowerEdge 17th Generation servers now offer the new Emulex LPe38102 64G Fibre Channel Secure HBA. Together, with Dell now offering a 64G FC interface option in the PowerMax 2500, this brings the power of 64G FC to Dell datacenter solutions.

Dell commissioned Tolly to benchmark the database performance of the Broadcom Emulex LPe38102 64G Fibre Channel dual-port host bus adapter (HBA) running in the Dell PowerEdge 17th Generation R6725 Rack Server with AMD EPYC™ processors and communicating with a Dell PowerMax storage solution also running 64G FC. This was compared to the same solutions running at 32G (Gen 6) FC speeds.

Tests showed that 64G FC end-to-end improved Oracle in-memory database load time by 37.8% and storage throughput 66.6%. Similarly, SQL Server transaction throughput was improved by 48.6% and storage throughput improved by 87.5%. See Figure 1 for Oracle load time results. In addition, previous Tolly testing demonstrated 4:1 server consolidation when moving from 16G FC servers to 64G FC servers.

THE BOTTOM LINE

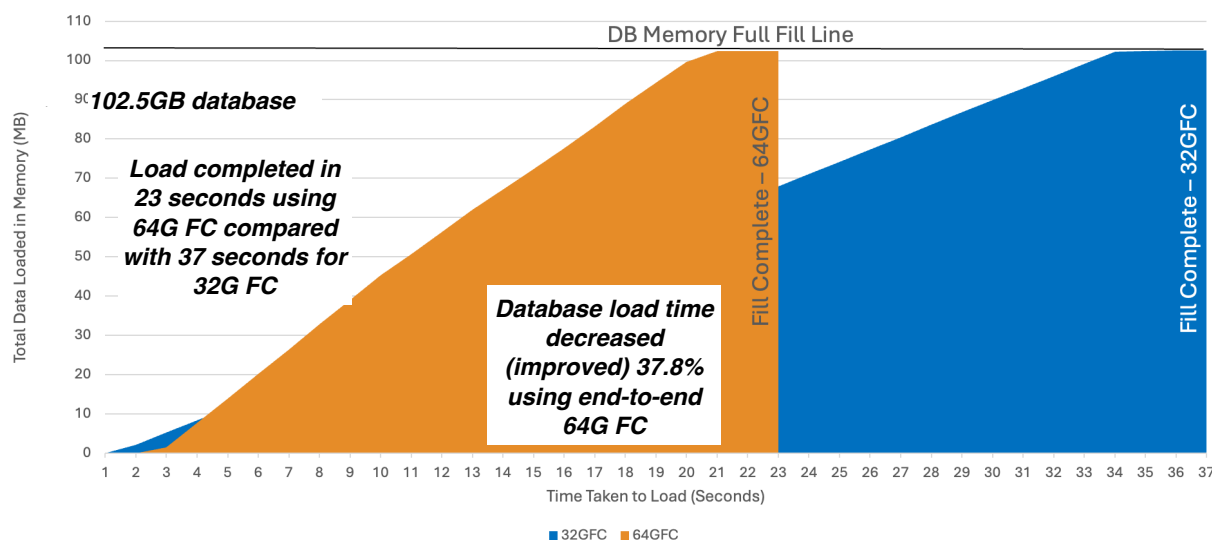
Dell PowerEdge 17th Generation R6725 Server with AMD EPYC processors & Emulex LPe38102 Secure FC HBAs running 64G FC end-to-end to Dell PowerMax 2500 Storage:

- 1 Improved Oracle TimesTen in-memory DB load time by 37.8%
- 2 Improved Oracle TimesTen storage throughput by 66.6%
- 3 Improved SQL Server transaction execution time by 48.6%
- 4 Improved SQL Server storage throughput by 87.5%

Dell PowerEdge 17th Generation R6725 with AMD EPYC Processors & Emulex LPe38102 64G HBA

Oracle TimesTen In-Memory Database

DB Load Time Improvement: 32G FC vs. 64G FC



Notes: Load completed within 23 seconds for 64G FC, and within 37 seconds for 32G FC. Single port used for all testing.

Source: Tolly, January 2025

Figure 1



Overview

The goal of this test was to illustrate, simply, that the Dell PowerEdge 17th Generation R6725 Rack Server¹ with Emulex LPe38102 HBAs connecting at 64G FC to a Dell PowerMax 2500 with 64G FC interface Server using a single port of a PCIe 4.0-based, dual-port Emulex 64G FC adapter, can dramatically improve performance over older, Gen 6 32G FC connectivity.

To demonstrate the performance improvements empirically, tests were run in both Oracle and Microsoft database environments using 64G FC connectivity and then using 32G FC connectivity and comparing the results with respect to elapsed time and storage system throughput.

Testing with AMD EPYC™ processors demonstrated significant performance improvements in database load times and storage throughput when integrated with 64G FC technologies, contributing to the overall efficiency of the solution.

Through collaboration with Emulex's advanced encryption technologies, AMD supports resilient and compliant enterprise solutions, contributing to a secure and future-ready data center environment.

The next-generation AMD server architecture is designed for performance and efficiency, featuring the SP5 socket with support for PCIe 5.0 and DDR5 technologies.

Through collaboration with technology leaders like Dell and Broadcom, AMD

Dell, Inc.

Dell PowerEdge 17th
Generation R6725
Rack Server & Emulex
LPe38102 Secure FC
HBA



64G FC End-to-End
Server-to-Storage

*Tested
January
2025*

supports robust and reliable solutions for mission-critical enterprise applications, delivering enhanced performance and operational efficiency.

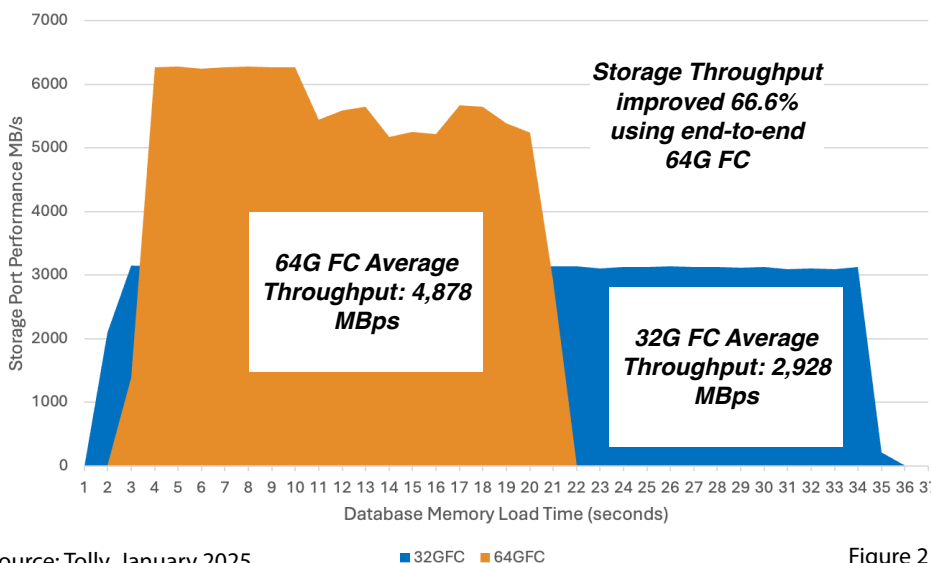
Oracle TimesTen In-Memory Load Performance

Oracle's TimesTen database is a high-performance database that runs in server memory rather than accessing SSD or HDD internal or external drives. The database is not available to service transactions until it is fully loaded into memory. Thus, load time directly impacts availability and user experience.

For this test, a 102.5GB database was loaded from the Dell PowerMax 2500 to the "in-memory" TimesTen database environment running in a Dell PowerEdge 17th Generation R6725 Rack Server. Testers measured both the time required to load the full database and the network throughput during the test.

Dell PowerEdge 17th Generation R6725 with AMD EPYC Processors & Emulex LPe38102 64G HBA

Oracle TimesTen In-Memory Database DB Load Time vs. Throughput: 32G FC vs. 64G FC

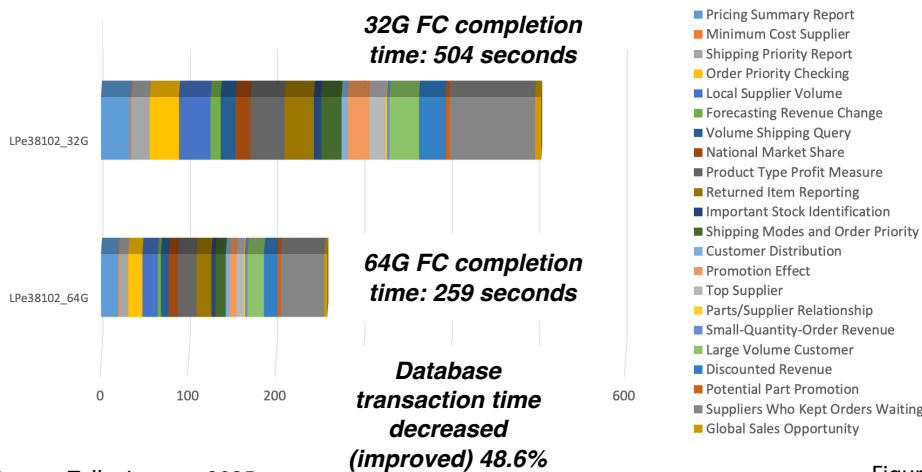


¹ AMD's next generation server architecture built for performance and efficiency with all new SP5 socket and supporting PCIe 5.0 and DDR5.

Dell PowerEdge 17th Generation R6725 with AMD EPYC Processors & Emulex LPe38102 64G HBA

Microsoft SQL Server 2022

HammerDB TPROC-H Query Completion Time: 32G FC vs. 64G FC



Using 32G FC connectivity, 37 seconds were required to load the database completely. Using 64G, this went down to 23 seconds. This is a decrease (improvement) of 37.8%. Again, See Figure 1.

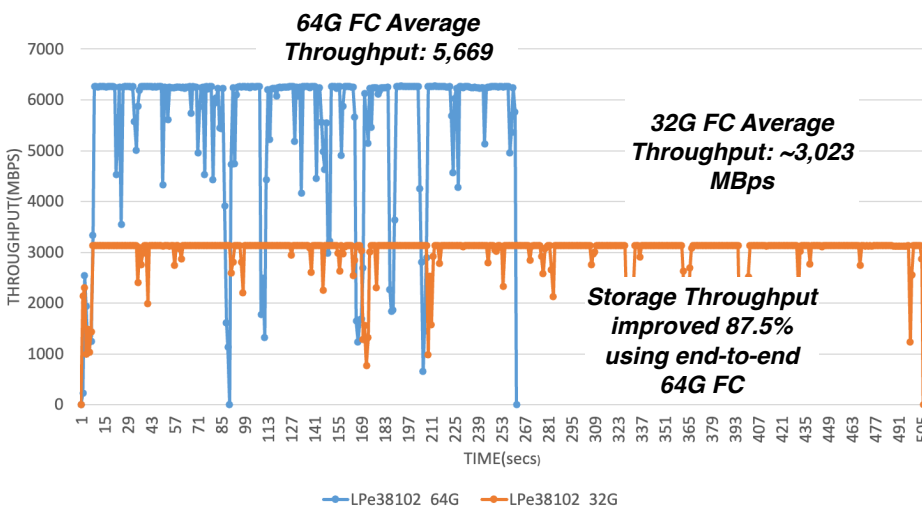
Testers evaluated the same test results with respect to average storage throughput. Using 32G FC connectivity, the storage throughput across the network was 2,928 MBps. Using 64G, it was 4,878 MBps. This is an improvement of 66.6%. See Figure 2.

SQL Server HammerDB Performance

Dell PowerEdge 17th Generation R6725 with AMD EPYC Processors & Emulex LPe38102 64G HBA

Microsoft SQL Server 2022

HammerDB TPROC-H Query Completion Time: 32G FC vs. 64G FC



Tests were also run on the Microsoft SQL Server database platform to illustrate that the benefits of end-to-end 64G FC connectivity are applicable across different environments and applications.

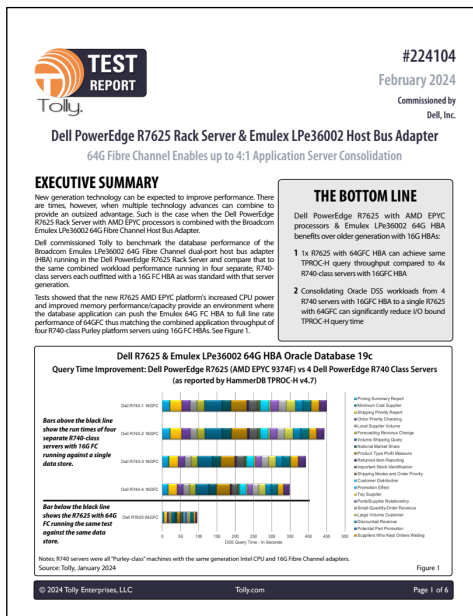
Testers used the open-source HammerDB performance tool to benchmark the completion time for running the TPROC-H analytics workload of HammerDB² across 32G FC and then 64G FC.

The TPROC-H workload measures how long it takes to run a series of 22 different types of decision support queries. This type of workload is "read only" with no database updates taking place.

Using 32G FC connectivity, 504 seconds were required to load the

² <https://www.hammerdb.com/docs/ch11.html>

64G FC - Application Server Consolidation



Note: Report available at: <https://infohub.delltechnologies.com/en-us/p/poweredge-r7625-rack-server-emulex-64g-fibre-channel-enables-up-to-4-1-application-server-consolidation/>

Source: Tolly, January 2025

Figure 5

database completely. Using 64G, this went down to 259 seconds. This is a decrease (improvement) of 48.4%. See Figure 3.

Testers evaluated the same test results with respect to average storage throughput. Using 32G FC connectivity, the storage throughput across the network was 3,023 MBps. Using 64G, it was 5,669 MBps. This is an improvement of 87.5%. See Figure 4.

It is important to note that, since applications access storage differently, the improvement for 64G FC over 32G FC will vary across tests.

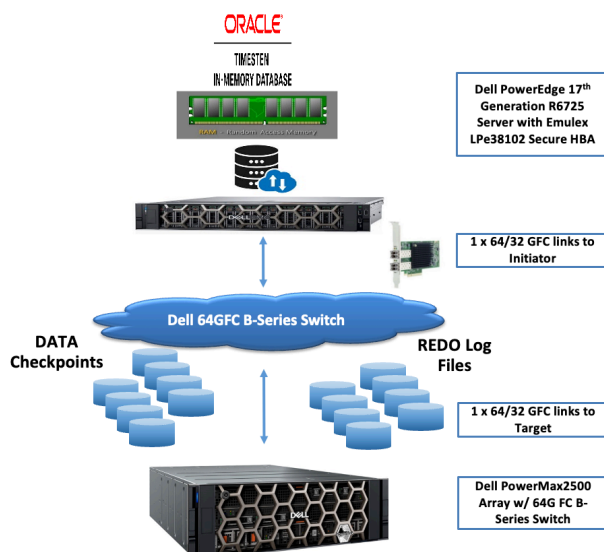
App Server Consolidation

Previous Tolly tests illustrated that a single server outfitted with 64G FC could outperform up to four servers that were using older generation 16G FC technology. See Tolly report #224104 for the details of that testing.

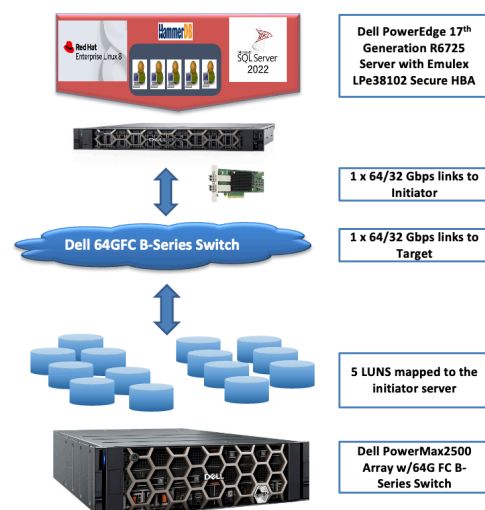
With the adoption of AMD EPYC processors, organizations can achieve substantial server consolidation, reducing hardware footprint and power consumption while maintaining or enhancing performance levels.

Test Topologies

Oracle TimesTen Test



SQL Server Test



Source: Tolly, January 2025

Figure 6



Test Configuration Summary - 1 of 2

64G HBA Under Test

| Vendor | Product Name | Bus Architecture | Firmware | Driver |
|----------|-----------------|------------------|-------------|-------------|
| Broadcom | Emulex LPe38102 | PCIe 4.0 | 14.4.393.39 | 14.4.393.31 |

Table 1

R6725 Server Configuration

| | |
|-------------------|---|
| Vendor/System | Dell PowerEdge 17th Generation R6725 |
| CPU | 2 socket AMD EPYC 9555 32-core processor @ 3.2GHz |
| Number of CPUs | 64 physical, 128 logical |
| Memory (RAM) | 966 GB |
| Logical Processor | Enabled |
| Power Mode | Performance |

Table 2

Operating System Settings

| | |
|-----------------|--|
| OS | Red Hat Enterprise Linux 8.9 |
| Kernel | 4.18.0-513.5.1 |
| Kernel settings | SCSI DM multipath = enabled Numa = off Transparent huge pages = disabled Huge pages size = 2MB Huge pages allocated = DB storage |

Table 3

Oracle TimesTen Database Configuration

| | |
|-------------------|---|
| Database | Oracle TimesTen In-Memory Database Software v22.1 |
| Database Settings | PremSize = 102400, CkptReadThreads = 3, LogBufParallelism = 16, RecoveryThreads = 16, MemoryLock = 4, CkptFrequency = 30, LogBufMB = 16384, TempSize = 16384, PrivateCommands = 1 |

Table 4

Storage Configuration

| | |
|---------------------------------|---|
| Vendor/Device | Dell PowerMax 2500 |
| Details | Number of Nodes/Controllers = 2 nodes, 1 node pair Drives = 16 x 3.8TB disks Cache = 768GB (1024 NVDIM) RAID level = 8 RAID 5 OS/Firmware version = Powermax OS = 10.2.0.0 (Release 01, Build 6079_275/0116, 2024-09-11 21:02:28), Microcode Version = 6079.275.0 Multi mode Optics Kit 64G 750-BBLX PowerMax NX 8 Port FCHL Ficon 64G 590-TFNX |
| Configuration - Oracle TimesTen | XFS file system, 8 SCSI disks each for DATA and LOGS, LVM, 128K stripe size |
| Configuration - SQL Server | SCSI volume = 5 |
| Network Fabric | Dell Connectrix B-Series 64G FC Switch |

Table 5

Source: Tolly, January 2025



Test Configuration Summary - 2 of 2

Database Test Tool - SQL Server Test

| | |
|-------------------------|--|
| Vendor | Open Source |
| Application | HammerDB 4.12 |
| TPROC-H settings | Scale factor = 100 Virtual users = 1 Max DOP = 32 |
| Notes | HammerDB out is used to capture the time required to run queries. Linux "dstat" command was used to capture throughput. |

Table 6

About AMD

For more than 50 years, AMD has been a leader in high-performance computing and innovation. In close partnership with Dell, AMD delivers a full portfolio of advanced processors and accelerators, offering exceptional performance, scalability, and efficiency for digital transformation. Trusted by leading enterprises, scientific institutions, and Fortune 500 companies, AMD solutions accelerate workloads, drive business agility, and empower organizations to solve the world's most complex challenges.

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Source: AMD

Test Setup & Methodology

Test bed diagrams for the Oracle and SQL Server tests can be found in Figure 6.

Relevant test steps were described in the results sections above. Details of system hardware and software and related information can be found in Tables 1 through 6 on the next page..



About Tolly

The Tolly Group companies have been delivering world-class IT services for over 35 years. Tolly is a leading global provider of third-party validation services for vendors of IT products, components and services.

You can reach the company by E-mail at sales@tolly.com, or by telephone at +1 561.391.5610.

Visit Tolly on the Internet at:
<http://www.tolly.com>

Broadcom Emulex LPe38102 Secure FC HBA

Emulex Secure HBAs introduce a cost-effective, easy-to-manage solution that encrypts all data in-flight (EDIF), protecting data as it moves across databases, applications, servers, and storage. Emulex Secure HBAs integrate post-quantum cryptography (PQC) algorithms to ensure that encrypted data remains encrypted even as quantum computing and AI put legacy encryption at risk. The session-based key management solution, based on the emerging ANSI/ INCITS FC-SP-3 standard, does not require complex and prohibitively expensive key management software. Compared to other encryption methods, such as application-based encryption, Emulex Secure HBAs can encrypt all applications, at a lower cost, and with no impact to storage array services such as compression, dedupe, and ransomware detection.

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