



CMA MICROTHERABYTE

Leveraging NVMesh® Server SAN for High-performance Databases

CASE STUDY



INTRODUCTION

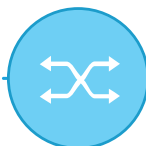
CMA has been providing information technology products and services since 1984. Leveraging decades of experience in Data Warehouse, Health & Human Services, and Systems Integration, CMA delivers database and data analytics solutions that help clients manage their business more effectively. The company, which is headquartered in New York's Tech Valley and has offices around the USA, serves commercial, industrial, and public-sector industries.

One of CMA's flagship solutions is MicroTerabyte, an enterprise business analytics platform. MicroTerabyte integrates best-of-breed hardware and software technologies with CMA expertise to create a high-performance, fully-functional Oracle Real Application Cluster (RAC), a clustered version of Oracle Database based on a comprehensive high-availability stack, ensuring high availability, scalability, and agility for any application. This packaged "data warehouse in a box" solution reduces integration risk, accelerates project delivery, and is scalable to meet customers' current and future reporting and analysis needs. CMA uses the solution for its hosted DataBase as a Service (DBaaS) offering, for which it has a large, Oracle RAC on MicroTerabyte setup. The hosted service supports thousands of users concurrently hitting the databases in the CMA RAC.

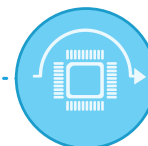
For the newest release of its MicroTerabyte Oracle RAC Cluster, CMA engaged with Excelero to add a next-generation, low-latency NVMe storage tier to the platform. CMA's customers have an insatiable need for advanced analytics, but getting efficient performance from large databases demands a storage infrastructure with high performance and ultra-low latency, which is exactly what Excelero's NVMesh enables. The additional NVMe storage tier also enables customers to boost their Oracle ROI as fewer licenses (and hardware) are needed to run their analytics processes.



SCALABILITY



FLEXIBILITY



EFFICIENCY

THE STRATEGIC VALUE OF DATA IS SKYROCKETING



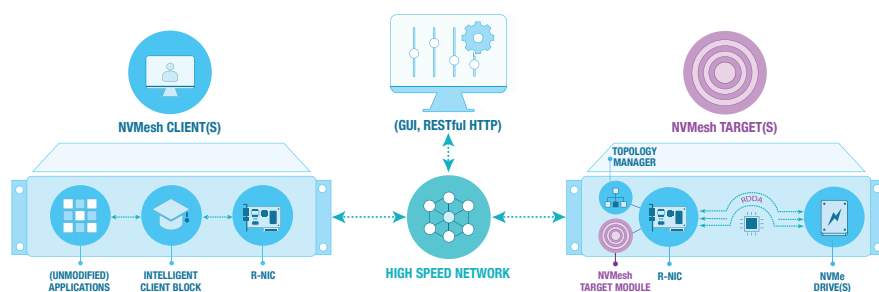
There is nothing new about data being a strategic resource, but the amounts of data companies collect today, and the insights that we can get from analyzing these massive data sets (at high speed), are at a never-before-experienced high. Top-performing companies are more effective in every aspect of data analytics: they have optimized infrastructures and applications to capture, store and analyze more data faster to make better business decisions. Today more than ever, there is a real opportunity to create competitive advantage by deploying advanced data analytics infrastructures.

Analytics capabilities are heavily influenced by the volume of data that can be analyzed and the speed at which this can be done. The ability to capture, store and analyze more data faster, drives innovations in the analytics space. The ability to scale the capacity and performance of database storage is crucial. Using low-latency NVMe SSD's for its MicroTerabyte platform, and the ability to deploy NVMe devices as a single, scale-out pool of high-performance storage without latency-loss, is a game changer for CMA.

BENEFITS AND CHALLENGES OF NVMe



An NVMe SSD is technically just flash storage, but with an optimized controller and protocol (that supersedes AHCI and SCSI by leveraging PCIe technology). Today's NVMe controllers can handle four times more parallel IO commands than SAS/SATA SSD controllers. NVMe delivers better performance and reduced latency - using less hardware to achieve the concurrent performance levels required for the customer's workload. This makes it a lot easier to maintain a balanced CPU/IO ratio. But there is an important caveat: to enjoy the performance benefits of NVMe flash, the storage needs to be used by the application locally, in-server.

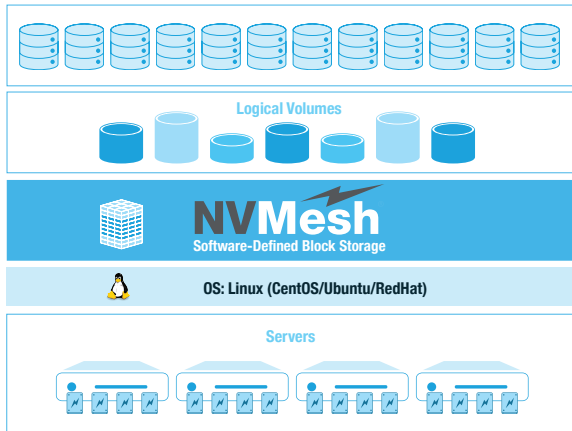


The inability to leave the confines of the server is a serious limitation that directly affects all requirements of modern database designs, especially for Oracle's RAC architecture: the capacity and performance of the NVMe drives, within each server, limits custom-

ers, and it's virtually impossible to level out utilization across entire infrastructures. Without a management layer to orchestrate beyond these boundaries, capacity and performance are wasted, e.g., for RAID setups, or use of cumbersome volume management tools not designed for modern SDS requirements.

NVMe® ENABLES DISTRIBUTED NVMe FOR ORACLE RAC

NVMe is a Software-Defined Block Storage solution that features Elastic NVMe, a distributed block layer that allows applications to utilize pooled NVMe storage devices across a network at local speeds and latencies. NVMe storage resources are pooled with the ability to create arbitrary, dynamic block volumes that can be utilized by any host running the NVMe block client. These virtual volumes can be striped, mirrored, or



both while enjoying centralized management, monitoring, and administration. In short, database applications can enjoy the latency, throughput, and IOPS of a local NVMe device while at the same time getting the benefits of centralized, redundant storage. NVMe provides the ability to attach volumes ubiquitously, enabling users to mount databases on any server at any time. NVMe is deployed as a virtual, distributed non-volatile array and supports both converged and disaggregated architectures, giving customers full freedom in their architectural design.

In using CMA's solutions powered by Excelero's NVMe, CMA MicroTerabyte users can self-provision their data – no shipping encrypted drives, no requisitioning time – with point-click-and-ship ease. They can iterate endlessly on hundreds of terabytes of data, expediting both time-to-results and time-to-market with their ideas. Customers avoid the need for database administrators (DBAs), significant data center equipment and conversion teams to write scripts for performing analytics queries.

NVMe BENEFITS

SCALE & PERFORMANCE

- Leverage the full performance of NVMe flash at any scale, over the network
- Predictable database performance – ensure that storage is not a database bottleneck
- Scale performance and capacity linearly
- Leverage high IOPS, high bandwidth or mixed

EFFICIENCY

- Maximize the utilization of NVMe flash devices
- Choose hardware from any server, storage and network vendor
- Easy to manage & monitor, reduces the maintenance TCO
- Balance CPU and storage resources

FLEXIBILITY

- Scale databases up and down
- Move databases seamlessly from server to server
- Run RDBMS or NoSQL solutions within containers or virtual machines to conserve computing resources when unused without sacrificing performance
- Choice of architecture: converged, disaggregated or mixed
- Mix different storage media types to optimize for cost, scale or performance
- Scale storage and compute separately, as needed

ORACLE RAC 12C BENCHMARK: NVMe OUTPERFORMS COMPETITION

The CMA Microterabyte Oracle RAC Cluster V2 includes a storage node with next-generation, ultra-high performance and low latency NVMe SSD's. CMA engaged with Excelero to build, test and execute a suite of Oracle RAC 12c database benchmarks based on the Microterabyte V2 architecture and Excelero's NVMe software-defined storage, which enables pooling NVMe storage devices across a network at local speeds and latencies leveraging a RoCE v2 storage fabric.

NVMe passed the Oracle RAC 12c benchmark with flying colors: not only did Excelero provide the fastest tablespace creation time of any storage hardware platform CMA has ever tested, it also demonstrated that administration is easy and saves valuable time. The benchmark showed a single 20TB (terabyte) Oracle 12c bigfile tablespace was created in 1 hour, 3 minutes and 41 seconds. This is a rate of about 1/3 terabyte per minute. The result was 3 times faster than the previous highest performing storage node CMA had ever tested and up to 10 times faster than most traditional storage nodes.

„Our original DBaaS infrastructure used NVMe for hot tables and flash for cold tables. Excelero enabled us to increase efficiency to the extent that we were able to switch to a full NVMe infrastructure, which simplifies and optimizes operations even more.”

Brian Dougherty Chief Technology Officer

ABOUT CMA

Every IT solution from CMA, from off-the-shelf software to enterprise-level implementation, fits our clients' business needs. We provide the highest quality solutions and IT services possible on the market today: software, systems, big data analytics, data warehouse services, professional services, training, and more.

ABOUT EXCELERO

Excelero enables enterprises and service providers to design scale-out storage infrastructures leveraging standard servers and high-performance flash storage. Founded in 2014 by a team of storage veterans and inspired by the tech giants' shared-nothing architectures for web-scale applications, the company has designed a software-defined block storage solution that meets performance and scalability requirements of the largest web-scale and enterprise applications.

With Excelero's NVMe, customers can build distributed, high-performance server SAN for mixed application workloads. Customers benefit from the performance of local flash, with the convenience of centralized storage while avoiding proprietary hardware lock-in and reducing the overall storage TCO. The solution has been deployed for hyper-scale Industrial IoT services, machine learning applications and massive-scale simulation visualization.