IBM Software Group
White Paper

Why is DB2 for z/OS better than Oracle RAC?

It's simple, really—proven capabilities and experience.

Contents

Executive summary

A majority of Fortune 500 companies, including the world's top banks, retailers and insurance providers,[1] store mission critical operational data in IBM® System z® and DB2® for z/OS®.

Why? It seems everyone offers a marketing bundle "just like the mainframe," and while some of these solutions have some basic capabilities, DB2 for z/OS and System z continue to lead the way with fresh capabilities to handle rapidly changing, diverse and unpredictable workloads while maximizing resource utilization and investment. Simply put, DB2 for z/OS is the most scalable, reliable and cost-effective data server available.

In this white paper, we size up the database clustering architecture provided by DB2 for z/OS with the Oracle RAC product. When all is said and done, compared and contrasted, DB2 for z/OS differentiates itself with superior characteristics.

DB2 for z/OS scales efficiently vs. wasted computing resources

DB2 for z/OS takes advantage of the unique System z IBM Parallel Sysplex® clustering design. Features like the centralized Coupling Facility hardware allow DB2 for z/OS to exhibit near-linear scalability as workload requirements grow for a proportional increase in overall database throughput. In contrast, Oracle RAC clusters use a distributed lock and cache management architecture that requires constant inter-node network communication. As nodes are added the Oracle RAC cluster overhead increases rapidly, significantly limiting scalability and reducing return on hardware investment. Addressing these limitations requires complex tuning and (oftentimes) costly changes to client applications.

DB2 for z/OS provides highly available vs. unavailable data

The design philosophy of DB2 is to deeply integrate with System z and exploit its core strengths. For instance, DB2 for z/OS and connected applications can continue to work seamlessly across the cluster if DB2 nodes are taken offline, minimizing not only unplanned but planned outages. DB2 for z/OS and System z provide the unique ability to support rolling upgrades. Customers can install hardware and software upgrades, including common administration and maintenance activities, without application downtime. When a node fails in an Oracle RAC cluster, however, the distributed lock and cache data must be "remastered" during which time data is unavailable to the application.

System z provides unmatched security vs. security holes

The cost of security breaches can be significant. The centralized System z security model has proven in tests to be the most secure system for 40-plus years in the most demanding of enterprises. Oracle RAC has had as many updates and security patches in a quarter as DB2 for z/OS has had in a quarter-century.

DB2 for z/OS provides support for new technology trends vs. long waits

As the world's largest middleware company, IBM is in step with the latest needs of application programmers and the Independent Software Vendor (ISV) community. For example, new releases of DB2 for z/OS are typically certified for SAP within 60–90 days of its general availability. Conversely, SAP certifies only "terminal"[2] releases of Oracle database software and customers must wait years to upgrade their database software.[3]

DB2 9 for z/OS provides pureXML, a native XML storage technology that provides hybrid relational and XML storage capabilities. Unlike LOB storage, pureXML leverages the mature optimized data management infrastructure, such as universal table spaces and B-tree indexes, and provides XML data the same enterprise-class support as other relational data that users have come to expect from DB2 for z/OS, including compression, logging, data sharing and replication. In DB2 10, XML storage provides true sub-document update with partial re-validation and sub-document multi-versioning for concurrency control to drastically improve XML functionality and usability.

Oracle's XML implementation is a complex set of options based on traditional relational database storage structures. With Oracle 11g, a new "Binary XML" storage feature was introduced, further complicating their XML offering.

DB2 takes advantage of unique hardware based compression in z/OS, saving storage while improving I/O performance. Hardware based compression can bring some of the most efficient results in the industry and internal studies show DB2 9 compresses data 2.2 times better than Oracle 11g.

DB2 for z/OS provides lower total cost of ownership vs. more for the same workload

Customers know cost elements like hardware, software, storage, labor, power, and floor space contribute to overall Total Cost of Ownership (TCO). The efficient design of DB2 for z/OS requires the fewest possible processor cores and significantly fewer people to manage, maintain and administer the system. DB2 for z/OS and System z can run multiple applications on a single DB2 subsystem and leverage Workload Manager (WLM) to ensure workload and system resources are prioritized based on business requirements.

Oracle RAC typically requires more processor cores to handle the same workload. Since software is often licensed by core, requiring more adds to costs. This becomes ever more evident when designing systems to meet high availability standards and changing performance demands.

System z solutions also typically require fewer storage, labor, power and space elements. Let's analyze the costs for a new data warehouse to illustrate the significant savings realized when running DB2 for z/OS and System z.

Comparing architectures: DB2 for z/OS vs. Oracle RAC

At the heart of any application and IT infrastructure is the underlying data server. With increasing globalization, business integration and consolidation, business critical processes are extremely sensitive to data server scalability, reliability, security and availability. The System z platform and DB2 for z/OS have continually set the "gold standard" by which other system implementations are measured. Oracle will often describe its distributed database architecture known as "RAC" or "Real Application Clusters" as providing "mainframe-like" qualities, but this is simply not an accurate categorization. This section explains the important differences between DB2 for z/OS and Oracle RAC, and how these differences result in excessive overhead and limited scalability of the Oracle RAC architecture.

Understanding the different approaches to data server scalability

When planning for the workloads that a data server must support, a systems architect has two primary options for "scaling," or providing the required hardware processing capacity and resources to a data server. The first approach is to "scale up," where capacity is increased by adding processors and memory to a single physical machine up to the maximum capability of the hardware. With this approach, the data server cannot share data processing tasks with other separate systems. This means that once the database workload has exceeded the limitations of this system's hardware, it must be replaced with hardware of higher capacity.

Another approach is to "scale out," where a cluster of data servers executing on multiple separate hardware systems operate together in a coordinated manner as a single logical system. Any "node" in the cluster can respond to any incoming client request for shared data. During maintenance or during a node failure, client applications can connect to any operational node in the cluster. Both IBM and Oracle offer scale-out architectures in their data server products. DB2 for z/OS provides a feature known as "data sharing" that leverages the unique Parallel Sysplex clustering technology in System z.[4] Oracle offers its RAC feature which is designed to run on distributed hardware and multiple operating systems.

DB2 for z/OS data sharing leverages System z and Parallel Sysplex

Parallel Sysplex is a System z clustering technology that provides centralized communication and cooperation between separate z/OS systems. DB2 for z/OS data sharing technology leverages the unique capabilities of System z hardware and Parallel Sysplex to allow up to 32 different DB2 subsystems to concurrently read from and write to the same shared data.

These different DB2 subsystems constitute what is known as a DB2 "data sharing group." Subsystems can be spread across multiple logical partitions (LPARs) within the same physical system, or spread across multiple and separate System z hardware units within the cluster. Database administrators, however, and applications that connect to the DB2 for z/OS cluster are presented with a single unified database. At the core of this technology is a specialized processor known as the Coupling Facility (CF) which provides high-speed caching and locking functions. Each individual DB2 subsystem has access to shared DB2 caches within the CF called group buffer pools that provide shared caches from which any member DB2 subsystem can access data without requiring disk I/O. To coordinate simultaneous access to this shared data, DB2 utilizes specialized resource locking functions provided by the CF. Most customers now use Internal Coupling Facility (ICF) which uses "linkless" connections between the z/OS LPARs executing DB2. The CF helps manage both the DB2 and other System z workload that interacts with DB2 so the entire z/OS system gets the benefit of data sharing and full availability. This allows transmitting shared cache and lock data at machine speeds (microseconds) without the overhead of a communication protocol like TCP/IP. With current technology, the CF can support over 100,000 requests per second.

The global locking mechanisms and the synchronization state or "coherency" of the group buffer pools are directly and centrally managed by the specialized CF hardware. Individual DB2 subsystems do not expend their processing resources maintaining the state of shared cache data and locks. And, because individual DB2 subsystems communicate with only the CF for shared cache and lock data and not with one another, there's little increase in communication overhead as the number of member subsystems increases. That's a unique benefit offered by the CF hardware and a key reason why DB2 for z/OS data sharing exhibits near-linear scalability as additional DB2 subsystems are added to the data sharing group. IBM has measured the overhead of adding DB2 subsystems to a data sharing group and shown that each additional member in a DB2 data sharing group adds a minor incremental performance overhead of not more than one percent.

To provide redundancy, multiple facilities can be configured within the same Parallel Sysplex and the cache and lock data stored within them "duplexed" or synchronized so no cache or lock data will be lost in the unlikely event of a hardware failure.

This unique synergy of hardware and software gives the unique ability for DB2 to scale in near-linear fashion while supportting huge transaction workloads against a single logical database image. No other database solution can match this scalability.

Oracle RAC clusters have high overhead due to an inefficient design

Oracle RAC is the Oracle database scale-out solution. Oracle RAC clusters individual servers together, each running the Oracle database software and each having simultaneous access to all the data. Each RAC node is connected to the other RAC nodes via a network interconnect and to a Storage Area Network (SAN).

Oracle RAC must also provide global locking and shared cache management functions but, since it cannot leverage a central hardware cache like the CF, must implement these functions in software through a complex message-passing algorithm.[5] All nodes in the cluster constantly communicate with each other to coordinate the state of the distributed locks and shared cache. Whenever multiple nodes in the cluster require read or write access to the same element of data, a series of messages must pass between several of the nodes involved to establish the correct state of the locks and cache.

Unlike DB2 for z/OS that benefits from centralized lock and cache management within the System z coupling facility, the distributed lock and cache management of Oracle RAC requires significant inter-node communication and consumes processing resources in each node to service lock and cache requests from the other nodes, thus reducing transaction throughput. As additional nodes are added to the RAC cluster, the amount of inter-node messaging and processing overhead increases while the scale-out benefits from adding additional hardware decrease.

Figure 1 illustrates an example that requires six separate IP network communications as well as processor context switches to update a shared row.

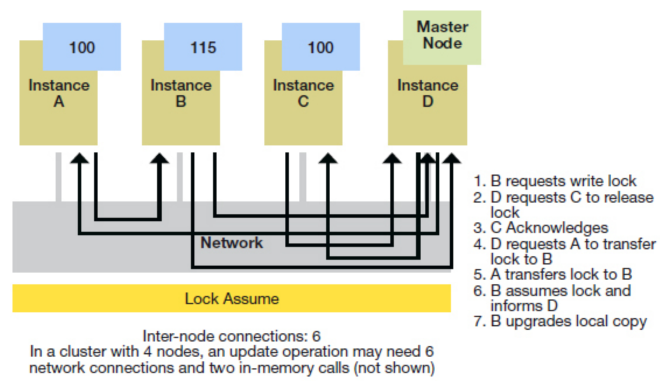

Figure 1: Oracle RAC requires internode communications to manage locks and cache.

For some workloads, when quadrupling the resources of an Oracle RAC cluster while performance throughput is measured using the TPC-C benchmark workload driver, one could expect an Oracle RAC cluster to scale less than 50 percent. As the RAC cluster grows, it requires an increasing number of network packets to process each transaction.

As the cluster becomes more inefficient, nodes would be forced to dedicate an increasing amount of processing resource to inter-node requests for managing distributed locks and cache. Each node processes fewer transactions as cluster grows.

Other studies have shown similar results using Oracle RAC. Figure 2 shows the results from a study published by Dell Corporation. In this study, a series of four tests increased Oracle RAC processor resources by a factor of sixteen times (from one single-core node to eight dual core nodes) and achieved only a 43 percent performance improvement.

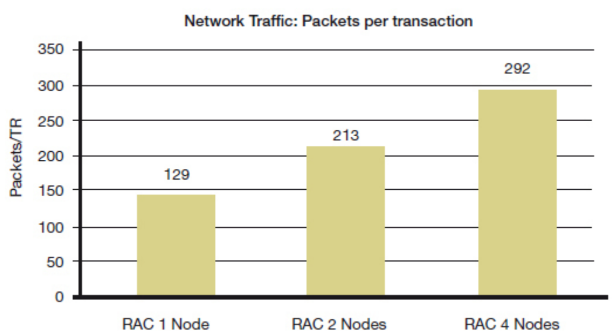

Figure 2: Dell study shows Oracle RAC inefficiencies.[6]

Winter Corporation also highlighted the vast differences in scalability between DB2 for z/OS and Oracle RAC in their "2005 Top Ten" awards publication.[7] DB2 for z/OS supported an online transaction processing (OLTP) workload over 100 times larger than the largest reported Oracle RAC configuration.

To alleviate these negative performance effects, Oracle RAC administrators must reduce the amount of inter-node communication occurring in their system by limiting the extent to which multiple nodes share the same data. This is known as "partitioning" and can require complex changes to the application code and the database schema. Insight Technology performed a study[8] that clearly demonstrates the performance decreases and required tuning that should be expected when applications are moved to Oracle RAC.

Partitioning essentially eliminates the advantage of the shared data scale-out architecture because the emphasis is on configuring the system to avoid sharing data. In addition, partitioning makes the process of adding an additional node more complex because the database must be repartitioned to spread the workload. Due to the complexity and high overhead of the Oracle RAC distributed message-passing architecture and the consequent need to make application changes to implement partitioning between RAC nodes, most customers find that Oracle RAC is better suited as an availability failover mechanism rather than as a scale-out architecture. In fact, the vast majority of RAC clusters are only two to four nodes.[9]

DB2 for z/OS efficiently supports the world's largest workloads; Oracle RAC wastes computing resources

The fundamental architectural differences described above are the reason that DB2 for z/OS can support much larger workloads than Oracle RAC. Figure 3 shows that in two IBM internal benchmarks, DB2 for z/OS supported workloads far beyond what was possible with Oracle RAC in the largest available banking application benchmark using a similar workload.

DB2 for z/OS offers sophisticated workload management

System z provides the z/OS Workload Manager (WLM) to best use system resources, maintain the highest possible throughput and achieve optimal system responsiveness. WLM, an integral part of z/OS, lets you define and assign importance to performance goals then helps ensure these goals are met by monitoring the system to determine how much resource, such as CPU and storage, should be given to a particular workload. Applications running on a mainframe benefit from the virtualization capabilities in the Processor Resource/System Manager (PR/SM) and Intelligent Resource Director (IRD) functions. WLM can be configured to prioritize different types of workload according to business goals, allowing for configuration of WLM with requirements like, "When this work is ready, be sure it runs without delay."

WLM not only manages and prioritizes DB2 workload but all system resources on the fly, adapting to ever changing business conditions. It's more than just the database; you're only as strong as the weakest link in the entire system and on System z, there is no weakest link.

Oracle RAC provides only rudimentary workload management capabilities with its basic workload management feature, Services. Designed to help with the partitioning process, it distributes incoming work requests to particular nodes within the RAC cluster. As applications connect to a RAC cluster they request a service by name, but only cluster nodes configured to offer that particular service can service the request. This partitioning mechanism must be supported by the connecting applications requiring application changes. Beyond Oracle RAC Services, Oracle offers only Runtime Connection Load Balancing that distributes incoming connections evenly between multiple RAC nodes.

Applications achieve higher availability with DB2 for z/OS, and DB2 for z/OS is more resilient to failures than Oracle RAC

With DB2 for z/OS, unplanned outages from hardware or software failure are highly unlikely. The System z environment is inherently resilient to hardware and software failures and can recover from or adjust to most problems transparently and without impacting availability or response times. If a DB2 subsystem is lost or taken offline due to hardware or software failure, however, existing connections and new incoming requests are automatically routed to an available member of the DB2 data sharing group, keeping the data available to the application.

A unique characteristic of DB2 for z/OS and System z is that each system component is architected and designed together with continuous availability as a key driving factor.

The CF prevents loss of cache or locks with no impact to running queries. Recovery of the locks held by in-flight transactions on the failed node is completed when the failed DB2 subsystem is automatically restarted; with the exception of data pages locked by the failed DB2 instance, all shared data is continuously available to the other DB2 group members. DB2 allows for graceful workload transition in case of a node failure—the workload is recovered on surviving members, no new workload is sent to the failed node and any hardware or software failure is transparent to the application.

With Oracle RAC unplanned downtime is more likely. Oracle RAC is designed with a common architecture across many distributed platforms (like Linux®, UNIX® or Microsoft® Windows®) and sits on top of hardware that offers few of the reliability and redundancy benefits of System z. For example, with Hewlett Packard's limited virtualization capability, hardware resources are dedicated to a single operating system partition – any hardware failure leads to a total partition outage resulting in the loss of an Oracle RAC node and productive use of all hardware resources assigned to the partition. Plus, Oracle RAC's distributed cache and lock design guarantees when a node is lost, the cache and lock data managed by that node is lost as well. While RAC pieces this lost cache and lock data back together on the remaining nodes (a process known as "remastering") the entire RAC cluster may be unavailable for a span corresponding to the amount of locking activity at the time of failure.

For disaster recovery solutions, IBM takes database availability to the highest level possible with DB2's support of Geographically Dispersed Parallel Sysplex (GDPS). GDPS is a unique System z solution and extension of Parallel Sysplex capabilities. Its disk mirroring capabilities let you automate disaster recovery failure based on customer policies, continuously and safely maintaining a time consistency copy of critical DB2 and non-DB2 data for failover. It automatically switches the workload to a backup site when the primary site shuts down, accessing the copied data and rapidly restarting critical applications without fail. This enables database restart in minutes with no manual intervention. It can be set up as active/active or active/standby.

With GDPS, DB2 for z/OS data sharing group member subsystems can execute on systems in different geographical locations. GDPS provides continuous availability (24x7x365) for an entire System z cluster, including DB2 for z/OS. Oracle provides a "log shipping" capability called Data Guard that allows for cluster failover and third party data replication products to provide disaster recovery for RAC. Oracle RAC was not designed to support placing cluster nodes in dispersed geographical locations and cannot achieve this level of continuous availability.

Applications keep running during DB2 for z/OS maintenance and upgrades

An advantage of the DB2 for z/OS data sharing environment for applications, DB2 software maintenance and upgrades can be performed in a "rolling" fashion that has minimal, if any, impact on running DB2 applications. Rolling upgrades allow DB2 data sharing group members to be taken offline and upgraded separately while others remain online and available. This high availability feature is possible because DB2 subsystems within the same data sharing group can simultaneously share data even when running different levels of DB2 software (or even different System z hardware levels.)

Once application servers have been redirected, a DB2 member subsystem can undergo maintenance with no impact to connected end users because incoming work processes are routed to active DB2 data sharing group members.

Oracle claims to have a rolling upgrade capability in Oracle RAC, but the function offers few benefits and database upgrades are not supported by this mechanism. As described by Oracle, only "one-off" patches can be applied in a rolling fashion and each patch must be certified. Because of the many and significant limitations on rolling upgradeable patches (for example: patches cannot affect the contents of the database, the RAC internode communication mechanism, utilities, network communications, no patchsets[10]), rolling upgrade-certified patches are not automatically provided by Oracle. Plus, many Oracle patches require the entire RAC cluster to be shut down,[11] requiring longer periods of planned downtime.

DB2 leverages inherent System z I/O advantages; Oracle RAC requires third-party storage solutions

One of the main strengths of the System z environment is a sophisticated I/O design allowing extremely high bandwidth parallel data transfer with physical disk subsystems. DB2 for z/OS operates as a formal subsystem of the z/OS operating system and benefits from direct integration with System z hardware, the z/OS operating system and other z/OS subsystems. Two examples of these benefits are the System z System Assist Processors (SAPs) and the z/OS SMS subsystem. SAPs are dedicated I/O processors that manage the execution of I/O operations and relieve the operating system and the general processors from this responsibility. SAP processors help provide sophisticated System z I/O capabilities like dynamic channel path selection, priority queuing, load balancing and transparent I/O failover. DB2 for z/OS administrators can use the z/OS DFSMS software suite as a comprehensive data management solution. Capabilities such as DFSMS System-Managed Storage (which automatically manages DB2 storage) reduce workload by automating and simplifying the management of storage. While DB2 for z/OS directly supports the integrated storage features of the z/OS operating system, Oracle RAC cannot use standard file systems, only a special clustered file system. Customers must choose either Oracle's Automatic Storage Management (ASM) product or implement a third party cluster file system product such as IBM GPFS.

Differentiating technical features

DB2 Compression

DB2 utilizes hardware support in System z to compress data. Data compression reduces the amount of storage required for a given database and can be beneficial to performance by improving the buffer pool hit ratio and reducing row fetching. DB2 achieves superior data compression factors compared to an Oracle solution, reducing the amount of storage needed.

The cost of storage for DB2 on System z is also reduced. The System z platform includes support for virtualized storage and hierarchical storage management, capabilities not accommodated when Oracle runs on a distributed server. Such solutions would require additional funding to implement a SAN and SAN Volume Controller and software to move data across storage devices with different access and cost profiles.

Granular security

Rock solid and proven security is one reason that 66 of the top 67 banks in the Global Fortune 500 run their core workloads on DB2 for z/OS. They trust the System z platform for handling billions of dollars worth of transactions every day. By contrast, Oracle has released security patches for their products with a steady consistency.

DB2 has carried security to a level beyond with the introduction of Multi-Level Security (MLS). This feature allows different users with different authority levels to share access to a DB2 table, each seeing only the data they're authorized to view. MLS supports assignments of labels (consisting of hierarchical security levels and non-hierarchical categories) to users, groups and database objects such as tables, views, records and fields to provide a granular mapping of user and group access of the database entities. The RACF framework is used to enforce the security policies determined by the labels. With MLS, customers need only maintain a single image of the database. Without MLS, customers with stringent requirements for separation of access authority may be forced to maintain multiple images of the database, one for each security authorization level.

pureXML

Traditionally, XML data has been stored either in file systems, as Large Objects (LOBs) within the database or shredded to store in a flat relational structure where the hierarchical relationship is lost. DB2 9 introduced a unique storage and indexing mechanism for XML data using an approach called IBM pureXML®. A new XML data type was introduced for columns in a table where XML documents with different schema can be stored in the same column. The documents are parsed and the hierarchical tree structure is directly stored for optimal query processing. XML parsing in DB2 9 can be redirected to zIIP processors or zAAP processors, resulting in better performance and lower cost (in DB2 10, XML schema validation will be able to be redirected to zIIP or zAAP processors.) New indexing technology in DB2 9 speeds up searches involving XML data. Because pureXML provides the most efficient storage and indexing of XML documents, the query performance is significantly faster. Like the rest of DB2 9, when the volume of XML data increases, pureXML can scale linearly.

The capability to store XML natively offers DB2 a significant performance advantage over Oracle databases for XML operations. A recent benchmark compared the performance of XML data inserts and queries. TPoX data was used in this benchmark. DB2 performed significantly better in every test, regardless of the XML index configuration. DB2 pureXML was six to 85 times faster on inserts and four to 77 times faster for queries. DB2 10 extends pureXML with improvements in performance, in usability and in productivity with XML schema validation, partial document update, binary format, improved checking and indexing.

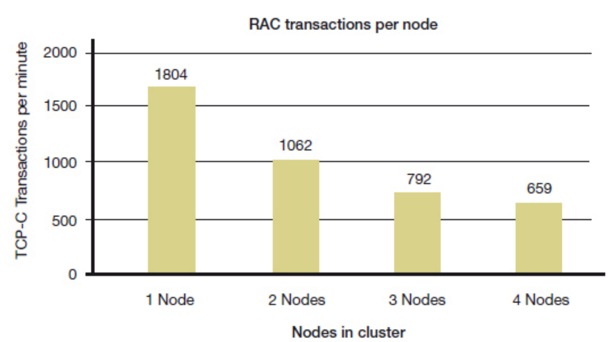

Figure 3: DB2 vs. Oracle Binary XML—Insert and query performance comparisons (TPoX).

Data warehousing tooling with InfoSphere Information Server and Cognos

IBM provides the tools needed to build a complete data warehouse solution on System z. The IBM InfoSphere™ Information Server is the first integrated software package to support the four essential steps of building a data warehouse. With InfoSphere Information Server, customers can understand and cleanse existing data, transform it to match the data warehouse schema and deliver it from the source to the data warehouse. The latter steps are often referred to as extract, transform, and load (ETL) jobs. The entire family of tools to provide these services are built on a common foundation of platform services that includes metadata support, web service enablement, scalability through parallel processing and connectivity to major third-party data sources (such as SAP, Siebel, JD Edwards and others.)

IBM Cognos® is a consolidated platform for business intelligence and performance management. Cognos 8 BI is a set of reporting and analysis tools for data warehouses or other data sources. Cognos provides a unified platform, "purpose-built" from modern SOA technologies and open standard protocols that leverage the real power of Java™ Enterprise application servers. With a common metadata model and a common report format, users can access a unified view of enterprise information, using only a browser, and create, view or share reports, dashboards and analysis of data in the warehouse.

Both InfoSphere Information Server and Cognos run on Linux for System z.

Oracle provides a business intelligence bundle called Oracle Business Intelligence Enterprise Edition (OBIEE). OBIEE is a collection of technology built by Oracle and acquired from Siebel, Hyperion, Brio and others. OBIEE has multiple desktop products that must be deployed to user workstations, has multiple different metadata layers that can lead to inconsistent views of information and lacks the ability to share assets between tools implemented in different technologies.

Total cost of ownership

In recent years, IBM has delivered important price concessions that significantly reduce the cost of running a new database or data warehouse on System z.

IBM introduced zIIP processors in 2006, which dramatically reduced the cost of new data workloads running on z/OS. The zIIP processor is the same as a regular full-size general purpose zEnterprise z196 or z10 processor; however, its price is discounted by approximately 92 percent. Any DB2 workload that is executed on zIIP is exempt from MLC charges.

In the following cost study scenario, a hypothetical z10 EC mainframe customer with two general purpose processors (1720 MIPS) needs to add a new data warehousing workload.

We estimate the incremental cost of running the new data warehousing workload on the mainframe including hardware, software and maintenance for three years and then compare this price to what it would cost to run the same workload on a competitive platform such as HP Superdome with Oracle. The incremental workload on System z can be handled by configuring an additional LPAR running DB2 and requiring three additional engines (2184 MIPS), which includes two general purpose processors and one zIIP.

The same workload can be handled by an HP Superdome server with 24 chips/48 cores based on a performance equivalence of 87 Performance Units per MIP. Figure 4 shows how an IBM System z solution for a 10 TB data warehouse with disaster recovery is approximately 55 percent less expensive than a system from Oracle and HP.

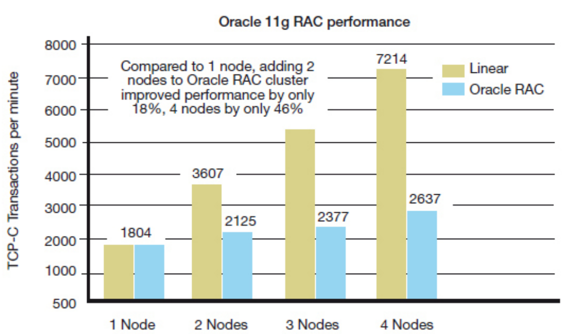

Figure 4: Three-year TCO for 10 TB Data Warehouse on DB2 for z/OS vs. Oracle with disaster recovery.

List prices were used for both servers and software. The breakdown of hardware, software one time charges, and yearly costs are shown in Figure 5. Analyzing the key cost differentiators, software cost shoots up with the core proliferation of 48 HP Superdome cores required to match the performance of three z10EC cores. The zIIP processor hardware cost reduces the cost of the mainframe solution. There is also a storage savings due to DB2 storage compression advantages over Oracle. Assuming 62 percent compression with DB2, we required 3.8 TB capacity for a 10 TB Data Warehouse versus 7.3 TB with Oracle running at 27 percent compression.

Conclusion

Both IBM and Oracle provide ANSI compliant relational databases, but that's where the similarity ends. DB2 for z/OS and System z together provide a superior enterprise data server for business critical OLTP and data warehouse requirements that offers:

- More efficient design that leverages the unique Parallel Sysplex architecture of System z, resulting in efficiency and huge scalability.
- Unmatched reliability and availability, including recovery from data center disaster.
- Proven security and stability with multi-level access control.
- Better administrator productivity.
- Superior XML handling and performance due to pureXML native implementation.
- Superior data compression and included storage virtualization.
- A complete set of integrated tools to support data warehouse solutions.
- Lower incremental cost than Oracle running on a distributed server.
- Unique capability of DB2 and System z to easily handle mixed workload environments—there's no need to duplicate data.
- Easier and more efficient management of the system, saving time and money.

References

1 Sixty-six of the top 67 banks, 23 of the top 25 retailers and 9 of the top 10 insurance providers in Global Fortune 500, according to an IBM Internal Study in 2007.

2 http://www.oracle.com/technology/deploy/security/alerts.htm

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4 DB2 for Linux, UNIX, and Microsoft Windows (LUW) supports scale-out using a different design called "shared nothing" which is available as a feature called the Database Partitioning Feature (DPF).

5 Based on Oracle's U.S. Patent 7,107,319 B2

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