Migrating from Oracle Exadata to IBM Power Systems — No magic required

Oracle introduced its family of “Engineered Systems” in 2008 with the announcement of the “Oracle Exadata Database Machine.” It was followed in October 2010 with the introduction of “Exalogic,” and then “Exalytics” in 2012.

Each has its own specific focus:

- Exadata is specialized for running Oracle databases.
- Exalogic is specialized for running Oracle middleware.
- Exalytics in memory machine is described as the world’s first Engineered System specifically designed to deliver high-performance analytics, modeling and planning.

Oracle spends a lot of time emphasizing the fact that these are “Engineered Systems,” giving special consideration to how they are designed, integrated and manufactured. Clients have limited ability to modify these systems, which probably gives them an aura of “untouchability.” If they can’t be easily modified, then it must be difficult, if not impossible, to migrate workloads from these systems to another platform.

Let’s see if this claim is true.

At its core, Exadata is an x86 system running Oracle Linux

The one common thread across all Oracle Engineered Systems is that they are scale-out industry standard servers built with industry standard components, including:

- Intel x86 processors
- Infiniband networking
- Storage servers built with PCI flash technology
- Exadata Smart Flash cache and hard disks
- Oracle RAC
- Other Oracle software products

Exadata runs the standard Oracle database, the same one that runs on IBM Power Systems™ and IBM AIX®. It could also run any application that works with Oracle databases, just as Power® does, although Oracle strongly discourages running application code on Exadata.

The key Exadata components are:

- Database server
- Storage server
- InfiniBand networking
- Management components

Exadata and the other Engineered Systems run Oracle Linux, which, while not an industry standard, is compiled from RedHat Enterprise Linux source code.

What these Engineered Systems do not come with are Oracle software licenses. Clients are required to purchase licenses for the Oracle database and the Oracle Exadata systems software. They are also encouraged to acquire licenses for Oracle RAC and Oracle partitioning.

What are some of Exadata's special features and do they present migration issues?

HCC (Hybrid columnar compression)

HCC is a special type of compression that uses a combination of both row and columnar methods for storing data. This feature only supports "bulk loaded data" and is not designed to be used with data that is frequently modified, like OLTP, and not suitable for every client situation.

HCC data storage is organized in logical structures called compression units (CUs), and each CU contains multiple Oracle blocks. HCC only applies to table segments and not to index or log segments.

This compression method typically allows for greater compression than other methods like Oracle Advanced (OLTP) Compression and may reduce the amount of physical disk space and data scanning time required, but high compress/decompress overhead may have a negative impact on certain workloads.

The HCC tables need to be converted to regular tables before migration to another platform. This does not present any migration issues. The "alter table move" command is used to convert these tables. The conversion needs to be done during downtime, and the duration will depend on the size of the table.

(Refer to MOS#1910687.1 for more information.)

While this feature can result in some increased migration complexity, it does not prevent a successful database migration. IBM has tools that help evaluate and analyze the HCC feature as well as all other Exadata special features described in this paper.

Smart Flash Caching

The Exadata Storage Server includes some flash storage implemented as PCI flash cards. This feature acts as an intelligent read/write cache in front of persistent storage but does not create any migration issues. IBM Flash Storage for IBM Power and AIX systems can be used in place of this feature.

Smart scans, cell offloading and offloading to storage

Eliminating the time spent transferring completely unnecessary data between storage and the database tier is the main issue Oracle

Exadata was designed to solve. This is probably why offloading was once considered to be the secret sauce of Oracle Exadata systems.

The main concept of offloading is to move the processing from the database nodes (database server) to the intelligent storage layer. Storage offloading, which is only applicable to full table scans and fast index scans, allows data to be filtered as soon as it is read from storage, reducing the amount of data that the database hosts need to process, one of the major bottlenecks in systems with multi-terabyte or larger databases.

Performance is a key factor in Exadata to Power Systems or AIX migrations, so it is important, during the assessment phase, to understand and analyze the number of I/O offloading queries doing full table scans because this feature is not available on Power Systems.

These queries can be handled several ways to ensure there is no impact on performance when running on Power Systems.

The important takeaway is that offloading is an Exadata feature that can enhance performance on the Exadata system but does not in any way introduce migration issues.

I/O Resource Manager (IORM)

Designed to enhance the functionality of the Oracle Resource Manager, the I/O Resource Manager actually restricts I/O at the database instance level. There are alternative I/O throttling features available at the storage level in non-Exadata environments. Very few Exadata customers use this feature, and its use does not introduce any migration issues.

Storage indexes

Storage indexes are memory-based structures that help reduce the amount of physical I/O required by an Exadata Storage Server. Storage indexes basically improve performance but do not impose any restrictions on migrating the Exadata Oracle database to Power or AIX.

Although Exadata has some features that are only available on these systems, most of them can be replaced with more standard Oracle features and hardware alternatives when migrating to IBM Power Systems. That has the added benefit of reducing overall system complexity and ongoing support challenges.

And, as mentioned before, IBM has specific tools to help analyze, assess and understand how all the Exadata features are utilized by the client workload. This provides the insight and knowledge on how best to implement these applications on Power Systems.

In conclusion, there are no Exadata features, special or otherwise, that would prevent a migration to Power Systems, and we would treat such a migration as we would any other migration of an Oracle database running on x86 to Power Systems or AIX.

Exadata to Power Systems migrations: The process

- Assessment is the first step and is usually at no charge to the client.
- Once the assessment has been completed, the appropriate migration methodology will be chosen based on the following database metrics:
  - Size
  - Versions
  - Outage window (downtime)
  - Applications being used
  - Complexity (data types, database layout and so forth)
  - Source and target architecture/ configurations
  - Connectivity (location and connection speed between source and target
- The client's business requirements including downtime, application dependencies and blackout periods are critical to the overall migration plan.
- Different migration tools can be leveraged, including standard Oracle utilities like export/import, transportable tablespaces (TTS), incremental TTS, Golden Gate and other replication tools as well as the IBM XenoBridge database migration tool.
- Remote access is preferred, and onsite migration assistance is available if required.
- The client is responsible for testing the migration.

Exadata to IBM Power Systems success stories

The following are a few examples of organizations that have migrated from Exadata to Power Systems.

The largest convenience store chain in Latin America

- Scope – migrate one 120 TB database
- Workload – DSS
- Outage window – 12 hours
- Length of engagement – eight weeks
- Methodology/tools – hot/cold using XenoBridge and Shareplex replication
- Benefits – Higher performance, smaller footprint, higher reliability and reduced license costs

A Scandinavian utility company

- Scope – migrate one 19 TB database
- Workload – OLTP
- Outage window – three hours
- Length of engagement – three days
- Methodology/tools – Transportable Table Spaces (TTS)
- Benefits – Doubled performance per core, higher utilization rate, reduced costs. Flexibility to scale and grow according to their needs, not limited by vendor packages.

Read "Database migration from Oracle Exadata to IBM Power Systems" at www.ibm.com/blogs/systems/database-migration-from-oracle-exadata-to-ibm-power-systems describing another Exadata to Power Systems success story.

Summary

Hopefully this paper has given you the confidence to approach existing Exadata clients knowing that these are not mysterious systems that are difficult to migrate to IBM Power Systems, that IBM and its Business Partners have the skills to do these migrations and that Power Systems can provide a better overall platform for Exadata clients.

IBM Systems Lab Services offers infrastructure expertise to help organizations build the foundation of a smart enterprise. Contact Lab Services today if you have questions about a migration from Oracle Exadata to IBM Power Systems.

Contact us

ibmsls@us.ibm.com

For more information

IBM Systems Lab Services is available at: ibm.com/it-infrastructure/services/lab-services

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Skip Garvin, Israel Oros, Sandeep Redkar and Ralf Schmidt-Dannert collaborated to write this paper.

Alexander Hartman, Himanshu Kulkarni, Norbert Pistoor, Mark Short, Kamal Tandon and Nikolai von Dehn provided editorial oversight and comment.

IBM Corporation
Route 100
Somers, NY 10589

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