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13.06.2023

Running your Oracle databases in a (multi-) cloud environment

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About

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- Cloud Advisor at **Nordcloud**
- Former Principal Cloud Architect at **Oracle**
- Certified Cloud Architect on OCI, AWS, Azure and Google Cloud

- Have been writing about OCI-Azure interconnect and Oracle Database Service for Oracle (ODSA) since 2020
- Terraform module for interconnect setup

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Introduction

Why public cloud should be on your radar

Resistance is futile !?

Most enterprises today are in the middle of their cloud journey.

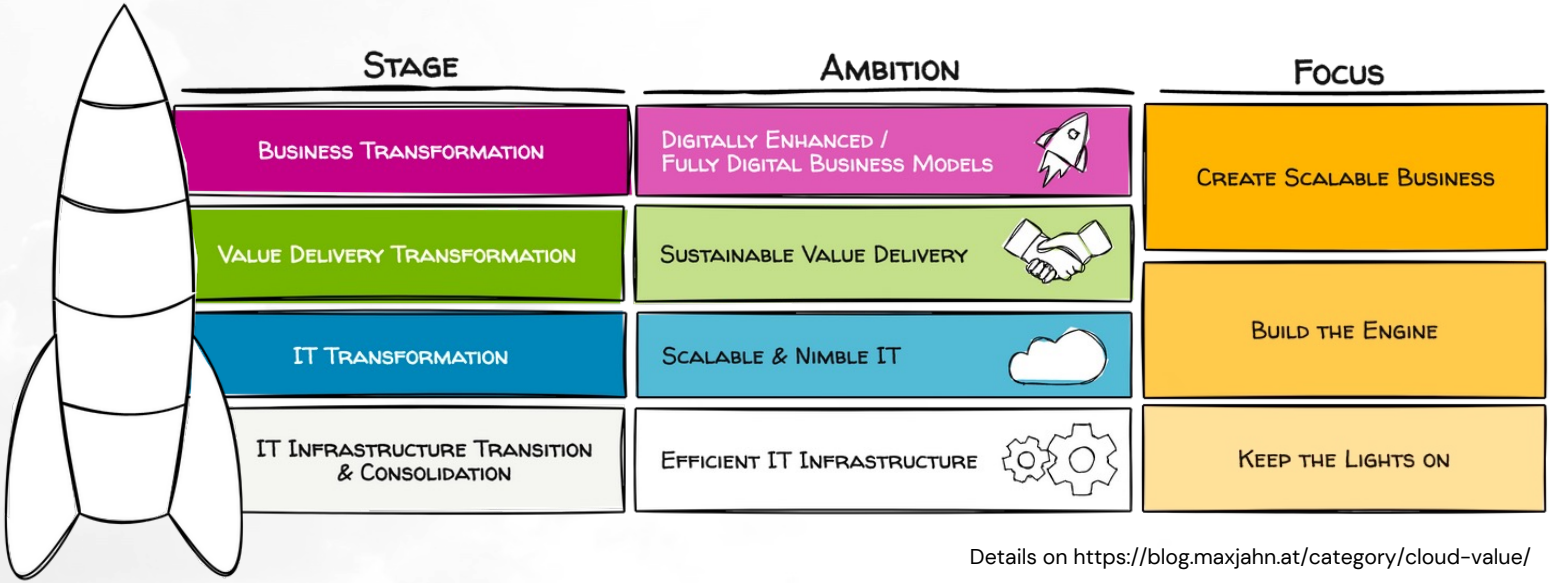
Some have just tipped their toes in the cold water and launched some proof of concept implementations, while others have already started to migrate their entire IT estate to a public cloud provider.

But the adoption of public cloud to some degree seems to be inevitable. (We will not talk about private cloud in this session)

… but moving the Database?

- Databases often are the heart of the enterprise IT environment
- Data is the new oil – do you want to sell and lease back your own oilfields?
- There are legal and regulatory requirements that need to be covered
- You will be dependent on your cloud service provider (CSP)
- The complexity of your architecture doesn‘t make it easy to move only parts of the environments
- The implementations heavily rely on proprietary features of your database
- Legacy and technical debt scares everybody who is touching the database
- The team has not yet the required skills and knowledge for cloud adoption

The Cloud Value Rocket

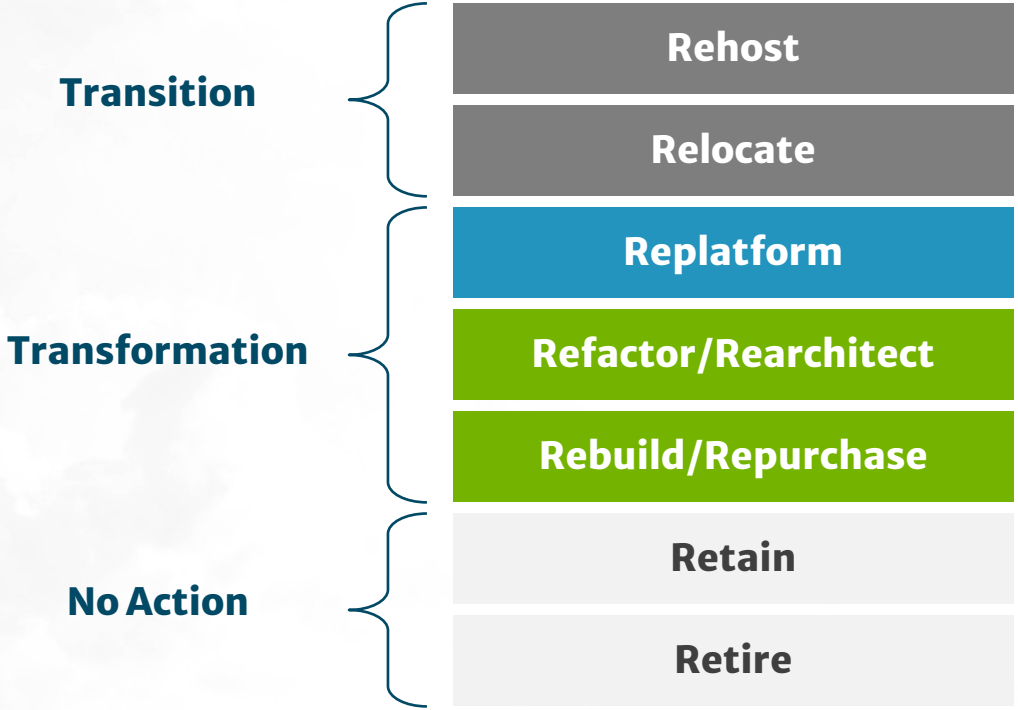


Details on https://blog.maxjahn.at/category/cloud-value/

Migration Styles

Moving your database to the cloud

The 7Rs


Transition
Transformation
No Action
Rehost
Relocate
Replatform
Refactor/Rearchitect
Rebuild/Repurchase
Retain
Retire

Rehost

Lift & Shift

- Move the current environment with **minimal changes** to the cloud
- **For our context:** Physical or virtual machine to virtual machine or bare metal server
- **Lowest effort to move**
- **Lowest potential for gains**
- Managed as in the good old days

Lift, Shift & Tinker

- Move the current environment with **significant configuration changes** to the cloud
- **For our context:** Physical or virtual machine to a managed Oracle DB platform (PaaS)
- **Some effort to move, but still mostly on configuration level**
- **Good potential for benefiting from move to cloud**

Refactor/ Rearchitect

Cloud Native Transformation

- Rethink the whole database
- **For our context:** Move to a non-Oracle (managed) DBMS
- Might require the biggest effort when moving a database to cloud
- Potential for the biggest positive impact: managed DB with consumption/usage based pricing, scalable and flexible, robust

Hybrid Deployment

- **For our context:** No changes to the current database, including deployment location (= on-premises)
- Minimal effort on DB side, but a lot of networking and application headaches
- Good mix of cost and benefits if the application architecture can handle the additional complexities and challenges

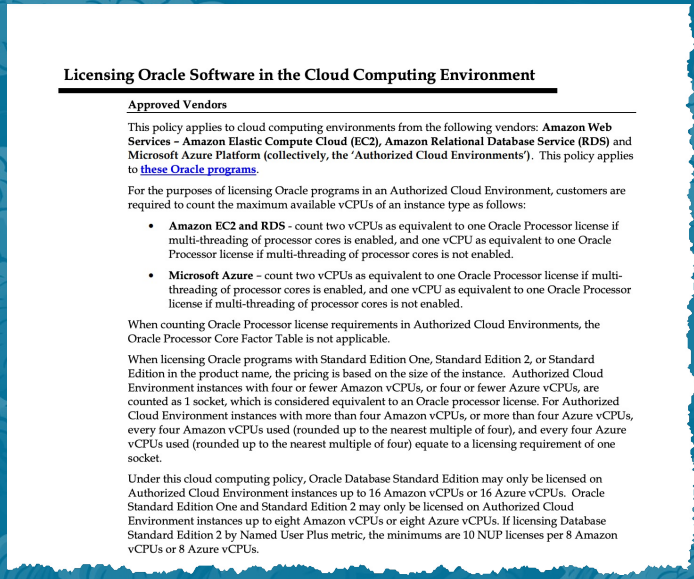
AWS, Azure & Google Cloud

Running Oracle DBs on hyperscaler infrastructure

Documents to Know

- Licensing Oracle Software in the Cloud Computing Environment
- Eligibility for Authorized Cloud Environments
- Oracle Real Application Clusters (RAC) Support on Third-Party Clouds

Oracle Licensing



Licensing Oracle Software in the Cloud Computing Environment

Approved Vendors

This policy applies to cloud computing environments from the following vendors: **Amazon Web Services – Amazon Elastic Compute Cloud (EC2), Amazon Relational Database Service (RDS)** and **Microsoft Azure Platform (collectively, the 'Authorized Cloud Environments')**. This policy applies to **these Oracle programs**.

For the purposes of licensing Oracle programs in an Authorized Cloud Environment, customers are required to count the maximum available vCPUs of an instance type as follows:

- **Amazon EC2 and RDS** - count two vCPUs as equivalent to one Oracle Processor license if multi-threading of processor cores is enabled, and one vCPU as equivalent to one Oracle Processor license if multi-threading of processor cores is not enabled.
- **Microsoft Azure** – count two vCPUs as equivalent to one Oracle Processor license if multi-threading of processor cores is enabled, and one vCPU as equivalent to one Oracle Processor license if multi-threading of processor cores is not enabled.

When counting Oracle Processor license requirements in Authorized Cloud Environments, the Oracle Processor Core Factor Table is not applicable.

When licensing Oracle programs with Standard Edition One, Standard Edition 2, or Standard Edition in the product name, the pricing is based on the size of the instance. Authorized Cloud Environment instances with four or fewer Amazon vCPUs, or four or fewer Azure vCPUs, are counted as 1 socket, which is considered equivalent to an Oracle processor license. For Authorized Cloud Environment instances with more than four Amazon vCPUs, or more than four Azure vCPUs, every four Amazon vCPUs used (rounded up to the nearest multiple of four), and every four Azure vCPUs used (rounded up to the nearest multiple of four) equate to a licensing requirement of one socket.

Under this cloud computing policy, Oracle Database Standard Edition may only be licensed on Authorized Cloud Environment instances up to 16 Amazon vCPUs or 16 Azure vCPUs. Oracle Standard Edition One and Standard Edition 2 may only be licensed on Authorized Cloud Environment instances up to eight Amazon vCPUs or eight Azure vCPUs. If licensing Database Standard Edition 2 by Named User Plus metric, the minimums are 10 NUP licenses per 8 Amazon vCPUs or 8 Azure vCPUs.

Oracle Licensing in 3rd Party Cloud

- Oracle Databases are allowed to be deployed to virtualized environments **only** on AWS and Azure, not in Google Cloud
- Core factors do not apply for AWS and Azure, e.g.
  - AWS & Azure: 1 Processor license = 2 vCPU (multithreaded)
  - OCI: 1 Processor license = 2 OCPU = 4 vCPU (multithreaded)
- Some options are **not available or supported** on AWS or Azure, including Real Application Clusters (RAC)
- General rule: You will need to bring your own license (BYOL)
- There is a limit on the size in terms of CPU for the database deployments of Standard Edition (8 vCPU for SE 2/ SE One, 16 vCPU for SE)
- Standard Edition is licensed in batches of 4 vCPU (=1 Socket)

Infrastructure Performance

Drivers for Oracle Performance

- CPU Performance
- Available Memory
  (often tied to number of vCPUs)
- Storage Performance
  (tied to size of storage)
- Network

AWS

- Oracle DB on virtual machines (EC2, license optimized shapes available) or on bare metal instances
- Amazon RDS for Oracle (PaaS)
  - Standard Edition: License Included or BYOL
  - Enterprise Edition: BYOL
- AWS Database Migration Service (Oracle to Oracle, Oracle to other DBMS)
- Oracle DB on VMware Cloud
- Flashgrid for Oracle RAC (3rd party support only)

Azure

- Oracle DB on virtual machines (license optimized shapes available) or bare metal, Oracle-provided images available on Azure Marketplace
- Oracle Database Service for Azure (ODSA)

- Azure Database Migration Service (Oracle to SQL Server, Azure SQL)
- Oracle DB on VMware Cloud
- Flashgrid for Oracle RAC (3rd party support only)

Google Cloud

- Currently you **cannot** deploy your Oracle databases to virtual machines on Google Cloud. The **only option** is to go for bare metal instances either using an Oracle Hypervisor or make sure the whole machine is fully licensed (BYOL)
- No managed service by Google for Oracle databases

- Google Database Migration Service (to Postgres)
- Oracle DB on VMware Cloud
- Flashgrid for Oracle RAC (3rd party support only)

OCI

Running Oracle DBs on Oracle cloud infrastructure

Oracle on Oracle Cloud

- Oracle in general claims that OCI is the best public cloud infrastructure to run Oracle products on
- As additional incentive, some features and products are exclusive to OCI or introduced first on OCI
- License included / Pay per Use options available
- Autoscaling options
- RAC is supported on OCI

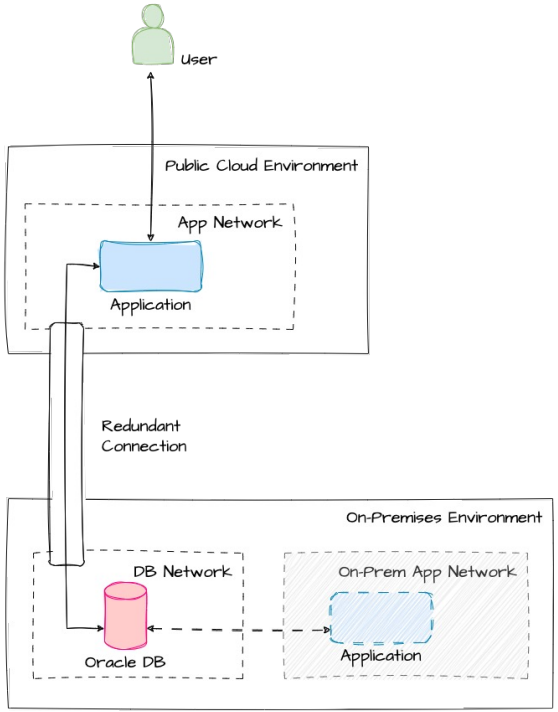
Oracle on OCI

- Oracle Base Database Service (Virtual Machine or Bare Metal)
  - Standard Edition
  - Enterprise Edition
- Exadata Database Service (shared or dedicated infrastructure)
- Autonomous Database (shared or dedicated infrastructure)

You probably have been already informed by your Oracle Sales Rep extensively about properties and advantages of Autonomous Database

Hybrid Cloud

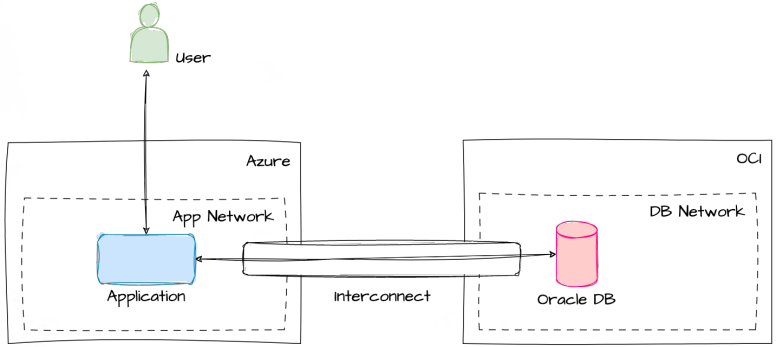
- Databases stay on-premises, parts of the applications move to cloud.
- There are cloud-like deployments for Oracle DBs like *Exadata Cloud@Customer*
- *(Redundant) Connection* between on-premises and cloud service provider will be needed.
- Architect for latency, bandwidth and reliability



Multi-Cloud!

Best of two worlds

- In most cases, we try to keep application and data(base) as close together
- A multi-cloud setup that includes OCI-Azure interconnect enables scenarios to run Oracle databases in OCI and applications and other infrastructure in Azure without negative impact on latency and performance



OCI-Azure Interconnect

- Fast, low-latency dedicated connections between Azure and Oracle Cloud (OCI) datacenters.
- As a consequence, this means that it will be available only in a few locations in Europe
  - Germany Central (Frankfurt) / Germany West Central (Frankfurt)
  - Netherlands Northwest (Amsterdam) / West Europe (Amsterdam)
  - UK South (London) / UK South (London)
  - More locations in other geographies
- Supported by both Microsoft and Oracle

OCI-Azure Interconnect

- Remember, this is for connectivity only: You need to be able to work with your databases in OCI, i.e. **you need OCI skills for operations and management**
- Full performance needs some specific options activated in Azure (FastPath)
- Not trivial to deploy, terraform module available

Oracle DB Service for Azure

- Service to create, use and manage Oracle databases in OCI easily from Azure
  - Oracle Base Database Service
  - Exadata Database Service
  - Autonomous Database
- Look and feel follows Azure guidelines, i.e. it looks like a native Azure service
- Integrated offering that is supported by both Microsoft and Oracle
- Relies on OCI-Azure interconnect, therefore available only in the same regions as the interconnect

Oracle DB Service for Azure

- Adds a layer of convenience on top of the interconnect for deploying Oracle databases to be used in Azure
  - Sync of user directories
  - Streams database **metrics** to Azure Application Insights
  - Streams database **events** to Azure Log Analytics
  - Azure dashboards for each database
  - Automation of creating interconnect
  - Cost of egress traffic included
  - Most tasks can be done in Azure, not every admin or developer will need to learn OCI
- **For troubleshooting, you will need access to people with OCI skills! Make sure to train your people or get a support contract with a 3rd party.**

Detailed analysis at https://blog.maxjahn.at/2022/09/a-brief-look-at-oracle-database-service-for-azure-odsa/

Frequent Questions

- But what about the latency?

Connection (ICMP round trip tme in ms)*	Avg	Min	Max
Azure - Azure internal	0,97	0,06	1,09
Azure - OCI via Interconnect	2,91	0,44	3,75
Azure - OCI via Interconnect Fastpath	1,79	0,21	2,34
Azure - OCI via public internet	3,24	0,86	7,22
Azure - OCI via VPN	5,84	1,04	7,02
OCI - OCI internal	0,30	0,04	0,40

*https://blog.maxjahn.at/2020/02/azure-oracle-cloud-oci-interconnect-network-latency-shootout/

- Do I need both Azure and OCI expertise?
- Do I need subscriptions both in Azure and in OCI?

Conclusions

Migration Style Options

	Rehost	Replatform	Refactor/ Rearchitect	Retain
AWS	++	++	+++	+
Azure	++	-	+++	+
Google Cloud	+	-	+++	+
OCI	+++	+++	++	++
Multi-Cloud with OCI	+++	+++	+++	+

General Recomendations

- **Rehost:** Don't do this, unless you have some critical need to do so:
  - Need to leave current platform (hardware refresh, datacenter exit or carve out)
  - Configurations and Customizations not available on managed platforms.
- **Replatform:** Do this to move on to a managed platform. Make sure that your target environment supports your needs in terms of scalability and flexibility.
- **Refactor/Rearchitect:** Do this to break dependencies to your current Oracle databases. Get a good understanding of your technical migration implementation options.
- **Retain:** Do this only if your architecture or IT strategy requires keeping the data on-premises

Thank you!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