1 Managed Enterprise Database Service Description

1.1 Overview of Service

This service provides configuration and management of Relational Enterprise Database(s) on supported operating systems in the cloud or in the Client's on-premises or colocation data center.

This service does not include the management of the underlying operating systems, which must be contracted separately, and specifically identified as in scope per the Statement of Work.

1.2 Client Responsibilities

(a) Except in cases where database software is provided by NTT, any licensing, software or use rights are Client responsibility

(b) Client applications do not use an Admin (dba role) user to access the database

(c) Client must delegate authority to NTT to contact the vendor of the storage devices directly

(d) Query Construction and/or Reconstruction

(e) Identification of Audit and Compliance Requirements

(f) Use, Management, Configuration of any 3rd Party Tooling and Vendors

1.3 Service Specific Operations

(a) Monitors

The following monitors can be configured by default, if supported by the hardware and software:

Monitor	Description	Alerts	Performance Info	Action
Listener processes	Existence of the listener processes running on the server	Yes	N/A	Engineering Teams will attempt to diagnose, try to solve the issue and escalate to the Client if needed.
System Monitor (SMon)	Oracle instance is running	Yes	N/A	Engineering Teams will attempt to diagnose, try to solve the issue and escalate to the Client if needed.
Tablespace usage	Use of table Space	Yes	Graphs of the usage	Engineering Teams will attempt to diagnose, try to solve the issue and escalate to the Client if needed.
ASM diskgroup	Use of disk space	Yes	Graphs of the usage	Engineering Teams will attempt to diagnose, try to solve the issue and escalate to the Client if needed.
Current connections	Number of active sessions relative to the maximum configured	Yes	Graphs of the usage	Engineering Teams will attempt to diagnose, try to solve the issue and escalate to the Client if needed.
Instance status	Checks that the database status is OPEN	Yes	N/A	Engineering Teams will attempt to diagnose, try to solve the issue and escalate to the Client if needed.
Listener status	Checks that all services are up and running	Yes	N/A	Engineering Teams will attempt to diagnose, try to solve the issue and escalate to the Client if needed.

Alerts related to elements not under NTT management will be escalated to the Client.

(b) Service Requests

As part of the Service, the fulfillment of the following types of requests are included, if identified as in scope in the SOW:

Task	Description
Management of storage (tablespaces, datafiles, SAM volumes)	Creation, change and deletion of the files that support the storage subsystem of the database; this includes management of growth settings and policies.
Management of performance (RAM and CPU allocation, disk use, Oracle: SGA, PGA, disk subsystem)	Implementation of changes to settings that affect how the instance uses the underlying operating system resources; this includes RAM allocation, CPU affinity, Disk use, etc.

Management of name resolution and network protocols (Oracle: listeners, tnsnames, easyconnect, oracle services, etc.)	Changes to how the instance is accessible from the servers that need to connect; this includes changes to the protocols and ports.
Oracle: Statistics recalculation	Management of statistics recalculations through DBMS_stats.
Management of database and schema objects (catalogues, indexes, tables, etc.)	Object creation as requested by Client.
Management of security (users, groups, etc.)	Creation, change and deletion of users, groups and roles in the database; includes changes to group membership and permission assignment to databases with different roles.
Database creation and deletion	Creation and removal of additional databases.
Import and export of data using native tools	Import and export data to and from the DB Server using native tools; the files generated will be made available via FTP or any alternate method. These actions can also be scheduled.
Oracle: management of replication (using DBLink and materialized views)	Replica of tables to a different Oracle DB (if Client has the appropriate level of licensing).
Replication recreation and configuration (replicated instances only)	Creation and recreation of the replication configuration to recover from loss of sync or any other issue.
Standby instance promotion (replicated instances only)	Change the roles of the servers to promote the slave to master and to demote the master to slave; the reverse operation is also included.
Add and delete cluster nodes (clusters only)	Addition and removal of cluster nodes in the cluster, and implementation of changes to the cluster group.
Management of networks and services (clusters only)	Addition and removal of networks and resources in cluster groups; changes to settings of the cluster group (node affinity, priority) and the cluster resources (retry policy, service affection).
Failover management (clusters only)	Failover and failback-triggering to move cluster groups between nodes.
Oracle RAC node additions and deletions	Addition and removal of cluster nodes in the cluster, and implementation of changes to the cluster group. Only Oracle Enterprise licenses may have more than 2 nodes, and addition of RAC nodes may imply additional management and Oracle licenses fees.
Management of networks and services (Oracle RAC)	Addition and removal of networks and resources in cluster groups; changes to settings of the cluster group (node affinity, priority) and the cluster resources (retry policy, service affection)

All of the above tasks will be performed according to the Change Management process defined in the Client Service Description.

(c) Ongoing Maintenance Tasks

The following ongoing tasks will be performed in an effort to maintain solution stability, ensure optimal performance and to prevent the occurrence of Incidents:

Task	Frequency	Description
Index recreation	Monthly	Recreation of all the indexes in the database to avoid fragmentation which can severely affect performance.
FlashBack Recovery Area	N/A	Activation or deactivation of FRA feature.
Log rotation	Weekly	Compression and deletion/backup of the logs associated with the database.
Statistics recalculation	Weekly	Calculation of statistics of the tables and index to hint the SQL optimizer find the most efficient execution plan; the accuracy of this information degrades over time, and the recalculation refreshes it.

Performance improvement report of the Database	Quarterly	On-demand only: creation of a report with information about how the database has performed, the evolution of disk space usage and trends; (does not include changes to data structure or application logic).

1.4 Supported Technologies

Only the following technologies are supported:

(a) Oracle Standard/Enterprise 19c RAC, in RHEL 7 and above

(b) Oracle Standard/Enterprise 19c Standalone, in RHEL 7 and above, and Windows 2012R2 and above

The following configurations are supported and must be met in its entirety:

Configuration	Requirements
Standalone server	A single server
Transparent Data Encryption (TDE)	Oracle only
Oracle Failover Cluster	Two or more clustered servers: . Must use supported clusterware (RHCS or Windows Clustering) . Up to two database instances running active/passive
Oracle Data guard	A primary server (standalone or Oracle RAC setup) replicating to a secondary: . Replication mechanism is Data Guard (any of the available protection options) . Typically used for Disaster Recovery . Requires Oracle Enterprise licenses for all servers involved
Oracle replicated instance	A master server replicating to a secondary: . Replication mechanism can be either RMAN recovery or third-party software (such as Tungsten Continuent) . SLA for this setup is reduced because of nature of the replica . Used mostly for Disaster Recovery . Licenses may be Standard Edition
Oracle RAC	Two or more servers clustered using Oracle Clusterware: . Up to two database instances running active/active . Oracle RAC is not supported in Private or Public Cloud environments

1.5 Supported Environments

The following environments are supported:

(a) Client premises

(b) Colocation data center

(c) Supported Private Cloud

(d) Public Cloud

1.6 Limitations

(a) General Prerequisites

(i) Client applications do not use an Admin (dba role) user to access the database

(ii) Disk size has to be greater than or equal to the primary/production site if any kind of replication between different servers is in place

(iii) Available disk space on the server is 3 times the size dedicated to datafiles to save backup data (which needs at least twice the value provided for datafiles) into a local or remote file system

(b) Oracle Specific Prerequisites

(i) Red Hat Enterprise License (if the operating system is based on GNU/Linux)

(ii) Diagnosis and tuning pack license

(iii) Verification that Client has all additional licenses required by additional features

(iv) Storage must be accessible via iSCSI or fiber channel

(v) RAC solutions must have at least four NIC's, all of which are 1 Gbps or higher:

- one public for accessing the service
- one for storage if iSCSI storage technology is used

- two with bonding for Oracle cross-connect (cannot be a crossover cable between the servers of the RAC, it has to be connected through switching)

(c) Supported storage for Oracle

(i) ASM

(ii) Those supported by the OS

1.7 Tasks Included in the Standard Transition

As part of the Service, the following tasks are included in the setup fee:

(a) Common:

(i) Installation and configuration of the necessary packages or Windows components

(ii) Configuration of the required operating system parameters, kernel/ libraries (Linux) or registry setting (Windows)

(iii) Creation and configuration of the users/databases/permissions required

(iv) Creation of services within listeners

(v) Database configuration (RAM allocation, compatibility modes, recovery model, etc.)

(vi) Data import using native DB tools (export/import); other methods may be chargeable

(vii) Q&A activities for HA and clustering

(b) Oracle:

(i) Configuration of the storage system (AM)

(ii) Database configuration (archiving log mode, SGA tuning, redo multiplexing, resource plans, etc.)

(iii) Configuration of the name/services resolution (DNS, sqlnet)

(c) Oracle with TDE:

(i) Create a master key

(ii) Create or obtain a certificate protected by the master key

(iii) Create a database encryption key and protect it by certificate

(iv) Set the database to use encryption

(d) Oracle RAC*:*

(i) Configuration of the Shared Storage Subsystem (iSCSI, FC SAN)

(ii) Configuration of the Networking Parameters (VIP's, Cross Connect Segment, etc.)

(iii) Oracle Clusterware/Grid Infrastructure installation and configuration

Oracle replicated instances: Replication Job setup (Replicated Instance) or 3rd party software setup.

(e) Tasks Included in the Takeover of a Client's Systems

In addition to the tasks described in the *App Management - Common Functions* service description, NTT will perform the following for an existing Client Solution:

(i) Reconfiguration of the storage policy

(ii) Reconfiguration of the replication/clustering policy

(iii) Tuning of the service (load testing or performance testing not included)

(iv) Installation and Configuration of NTT Tools for Management

(v) Password Management and Sharing of existing system accounts

(vi) Re-evaluation of existing user access

1.8 Tasks Not Included in the Standard Transition

The following tasks are not included as part of the Service, and should be fulfilled by the Client's development team:

(a) Script creation, code development: Development activities such as the creation of scripts to modify the data structure in tables or databases; development of scripts or code for the optimization of the databases and tables

(b) Data structure analysis: Audit and review of the Client data/database structure or architecture and creation of recommendations or improvement reports

(c) Application logic analysis: Audit and review of the application logic, including creation of optimization or improvement reports of the Client's code