Oracle® Enterprise Manager

Database Migration Workbench Guide

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Preface

Enterprise Manager Database Lifecycle Management Administrator's Guide familiarizes you with Oracle Enterprise Manager database lifecycle management solutions. It enables you to employ its services for tasks like provisioning databases, applying patches for updates and upgrades to databases and grid infrastructure, monitoring configuration and compliance, and ensuring database security in both on-premises data centers and the cloud.

Audience

This guide is intended for administrators seeking to address the complexities of database lifecycle management, specifically in the realms of discovery, provisioning, patching (updates and upgrades), and monitoring. This guide caters to administrators assuming two distinct roles: *designer* and *operator*.

In the designer role, an administrator takes on the role of a system administrator, carrying out pivotal database operations such as Image Creation and Image Refresh. As an operator, an administrator executes update and upgrade of databases and grids, monitor configuration and compliance of targets within Enterprise Manager.

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Related Resources

For more information, see the documents available in the Oracle Enterprise Manager documentation library: Enterprise Manager Documentation.

Conventions

The following conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.

Convention	Meaning
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

1

Database Migration Planner

Database Migration Planner provides a comprehensive end-to-end solution for managing database consolidation. It enables you to match managed sources you want to consolidate with new or existing destinations. Database Migration Planner supports the following combinations:

- Consolidate source databases (single instance or RAC) to fewer destination databases, using the database to database (D2D) consolidation type (consolidation to multi-tenant). Destinations can be existing databases (both non-CDB and CDB) or new databases on new servers, which can be Oracle Exadata Database Machines, Oracle Compute Cloud shapes, or generic servers.
- Consolidate source databases (single instance or RAC) to fewer servers where the number of databases stays the same, using the database to server (D2S) consolidation type. Destinations can be existing servers or new servers, which can be Oracle Exadata Database Machines, Oracle Compute Cloud shapes, or generic servers.
- Migrate source databases to another server with more resources. You can perform consolidation at a later time.

Database Migration Planner uses database metrics in assessing resource requirements for database consolidation. You must have Oracle Enterprise Manager 13.5 Release 5 (13.5.0.5) Database Plug-in or later to collect the database metrics Database Migration Planner uses.

The following sections describe Database Migration Planner:

- Overview of Database Migration Planner
- Creating a Database Migration Planner Project
- Creating a Database Migration Planner Scenario
- Other Database Consolidation Scenario Creation Options
- Evaluating Database Consolidation Scenarios
- About the Advisor Feature of Database Migration Planner
- About Compression Advisor
- Estimating Compressed Storage Requirements
- Assessing the Performance Impact of Database Migration on SQL Workload

Overview of Database Migration Planner

Database Migration Planner offers flexibility for various customer scenarios:

- Consolidate 10.2 and higher database versions.
- Consolidate to Oracle private or public cloud or to Exadata.
- Use high availability options to minimize downtime, subject to source and destination database platform and version.

Database Migration Planner takes the guess work out of consolidation by basing analysis on historical workload (database and host metrics). It eliminates human error by automating all phases of consolidation from planning to deployment.

Consolidation optimization advice enables you to estimate resource allocation under various consolidation scenarios, from ultra conservative, representing a peak maximum load, to aggressive, measured as the average daily usage per hour. Use optimization advice to identify conflicts based on workload characteristics and Exadata suitability. Assess the impact of compression on I/O and storage, including I/O offloading and Flash Cache technology.

As servers have become more and more powerful, with much greater workload capacity, enterprises with many small databases running on different servers find that their servers are greatly underutilized. Their aim is to consolidate these small databases onto fewer servers, thereby reducing their hardware purchasing cost and ongoing maintenance expenditures.

At the same time, database customers, in assessing their performance needs, want to evaluate resource utilization over a total specified time period to ensure meeting peak demand.

When weighing source I/O requirements to determine needed destination capacity, the key is I/O capacity of external storage units of Oracle Engineered Systems such as Exadata and Exalogic typically shared by databases.

Database Migration Planner collects detailed storage information regarding total space allocated and total space used for each source database by segment type (Table, Index, LOB, Other). It then estimates how much space can be saved by compressing the data. Depending on the segment type and database version, estimates are given for several types and levels of compression.

- At the project level, Database Migration Planner displays data storage requirements by database and segment type, with compressed and uncompressed values.
- At the scenario level, Database Migration Planner recommends a specific type and quantity of Exadata external storage system, based on the requirement and customer input with regard to compression and other storage options.

Database Migration Planner collects the following I/O requirements:

- I/O requests per second (IOPS)
- I/O bandwidth (MB/Second)

Database Migration Planner fits the requirements to external storage unit I/O capacity, using the ratio of I/O bandwidth to IOPS to characterize each source database workload as either OLTP or DSS. These findings determine whether Database Migration Planner considers IOPS, I/O bandwidth, or both when consolidating to external storage. Note, however, that users can override these recommendations.

Thus, when consolidating databases, Database Migration Planner attempts to fit CPU and memory capacity to the destination, but not database storage and I/O capacity.

Creating a Database Migration Planner Project

You create a database consolidation project for each consolidation effort, then add individual consolidation scenarios within it. You can then compare consolidation scenarios to determine which consolidation strategy makes the most sense.

After the project is defined, a job is submitted to collect available data for the specified targets from the Management Repository. Once the job finishes, the project becomes an active project. As long as the project is in an active state, data collection will continue.

Creating a project involves the following steps:

- Selecting the Database Migration Project Type
- Specifying Database Source Candidates
- Specifying Database Destination Candidates
- Setting Data Collection Parameters
- Choosing a Pre-configured Scenario
- Reviewing and Saving the Database Consolidation Project

Selecting the Database Migration Project Type

Complete Step 1 of the database migration project creation process as follows:

1. From the **Database** menu, select **Migration and Consolidation**, then select **Database Migration Planner**. This selection is also available from the **Administration** menu on the Databases target home page.
2. Click the **Create Project** button.
3. Enter the consolidation project name and, optionally, a description.
4. Select the appropriate consolidation type.
   - From databases to server containers (D2S)
   - From databases to database containers (D2D).
5. Click **Next** to specify source candidates.

Specifying Database Source Candidates

Complete Step 2 of the database consolidation project creation process as follows:

1. SPECrate®2017_int_base, as the appropriate benchmark for database consolidations, is preselected. Click **Select Source Databases** to select the source databases to be consolidated from a list of Oracle Enterprise Manager-managed database candidates. Use the filtering criteria to refine your target search. Choose from the filtered results, then click **Select**.

   The sources you select appear in the table. Note that you can subsequently cull the list by removing selected source databases.
2. Optionally edit estimated CPU capacity rates by clicking in a row and changing the value.
3. Click **Next** to specify destination candidates.

Specifying Database Destination Candidates

Complete Step 3 of the database consolidation project creation process as follows:

1. Optionally select one or more existing destinations to consolidate the sources to.
   - If you are consolidating from databases to server containers (D2S), click **Add Existing Servers as Destinations** to view a list of existing destination servers to consolidate the source databases to. Use the filtering criteria to refine the search. Select the servers you want to add, then click **Select**.

     The destinations you select appear in the table. Note that you can subsequently cull the list by removing selected destination server containers.

- If you are consolidating from databases to database containers (D2D), click **Select Destinations** to search for the database containers to consolidate the source databases to. Use the filtering criteria to refine the search. Select the database containers you want to add, then click **Select**.

  The destinations you select appear in the table. Note that you can subsequently cull the list by removing selected destination database containers.

> **Note:**
>
> If you do not select existing destinations, the consolidation will be to new (phantom) destinations.

2. Click **Next** to set up data collection.

Setting Data Collection Parameters

Specify the duration over which data used to generate database consolidation scenarios will be collected for the source databases specified in the project. This data will be used to determine the resource requirements that a destination server or database must meet.

1. Specify the minimum number of days to collect data. The default minimum value is 21 days. To use existing historical data to run and view consolidation scenarios immediately, set the minimum number of days to 0.
2. Specify the maximum number of days to collect data. The default maximum value is 90 days.
3. Specify when to begin the data collection process.

   Note that once data collection begins, you can elect to suspend and resume collecting at any time from the **Actions** menu in the Consolidation console.
4. Optionally select **Continue Data Collection Over the Maximum Days** to purge the oldest day's data when data for a new day is added.
5. Click **Next** to choose a pre-configured scenario.

Choosing a Pre-configured Scenario

When creating a database consolidation project, you can optionally choose to generate pre-configured consolidation scenarios to add to the project.

These scenarios are generated using data collected for the sources defined in the consolidation project at the time the project is created. If insufficient data is available when the project is created, the pre-configured scenarios will be automatically generated once the minimum amount of data has been collected.

Enterprise Manager Consolidation ships with three out-of-the-box scenarios that represent aggressive, medium, and conservative consolidation schemes.

1. Choose whether to use a pre-configured scenario by clicking the appropriate radio button. Choosing the option displays a list of the out-of-the-box consolidation scenarios available. By default, the scenarios are designated by the method used to aggregate source target resource usage:

   - Aggressive: Aggregate data based on *average* daily usage per hour.

This typically results in a high consolidation (source:destination) ratio, because more sources will “fit" into each destination. But because more sources are involved, the odds that one or more will not meet the resource requirements are higher.

- Medium: Aggregate data based on the 80 percentile usage.

  This typically results in a source:destination ratio somewhere between Aggressive and Conservative aggregations.

- Conservative: Aggregate data based on *maximum* daily usage per hour.

  This typically results in a lower source:destination ratio, because fewer sources will “fit" into each destination.

Usage statistics are calculated based on the following criteria:

- Resource Requirements: Source requirements, such as CPU, memory (GB) and disk capacity, that must be met by destinations.
- Applicable Dates: The days of the week on which resource usage metrics are collected.
- Target Server Utilization Limit: The maximum resource utilization (percentage) that can be used on destinations. The scenario method in effect determines utilization percentage.

2. Select the pre-configured scenario you want to use.
3. Select whether to factor new or existing destinations in the scenario. For a D2S project, the choice is either a new (phantom) or existing Exadata Database Machine. For a D2D project, you have to select the appropriate database architecture in addition to choosing a new or existing database on a new or existing Exadata Database Machine.
4. Click **Next** to review the consolidation project.

The pre-configured scenarios will be generated when the project is created using data collected for the databases defined in the consolidation project.

You can also opt to create your own custom scenario once the consolidation project has been completed.

Reviewing and Saving the Database Consolidation Project

Review the specifics of the database consolidation project. Use the **Back** button to return to a given step to make changes. If satisfied, click **Submit**. A message confirms that the project has been created and the job has been submitted.

Once the project is created, it will show up in the Consolidation console. Consolidation scenarios can then be defined for this project.

Creating a Database Migration Planner Scenario

You can create custom database consolidation scenarios instead of or in addition to using the pre-configured scenarios. Multiple scenarios can be created within a project, enabling you to compare different scenarios before deciding on a solution. New consolidation scenarios are created within an existing consolidation project.

> **Note:**
>
> Because a scenario can include a subset of all databases, in this situation it can be considered somewhat separate from a project.

You can create consolidation scenarios for planning purposes. You also can implement the scenario, which enables you to perform the database migration on-demand.

Creating a scenario involves the following steps:

- Setting Up the Scenario
- Defining Constraints for Database Consolidation
- Planning the Destination for a Database to Database Project
- Planning the Destination for a Database to Server Project
- Mapping Database Sources to Destinations
- Reviewing and Saving the Database Consolidation Scenario

Setting Up the Scenario

Complete Step 1 of the database consolidation scenario creation process as follows:

1. From the **Database** menu, select **Migration and Consolidation**, then select **Database Migration Planner**. This selection is also available from the **Administration** menu on the Databases target home page.
2. Click the consolidation project for which the scenario is intended.
3. Click the **Create Scenario** button.
4. Specify the scenario details, such as scenario name.
5. Under Destination Overview, choose the destination database candidates with the following options:
   - Click **Use New (Phantom) Database on New Phantom Servers** if you plan to use a destination database that does not yet exist. Specify destination database requirements:
     - Is the destination to be a container database (CDB) or a single instance database?
     - Is the database to be clustered?
     - If clustered, what is the minimum number of RAC instances (at least 2)?
     - Is the server to be Exadata, Cloud, or generic?

     Adjust the memory and storage estimates as necessary.
   - Click **Use Existing Databases** to view a set of existing qualified destination database candidates for the project.
6. Specify the source resources to consider. Database Migration Planner will aggregate the specified resources to determine the total requirements.
   - **Resource Type**: The server requirements such as CPU and memory (GB) that must be considered.
   - **Scale Factor**: Provide room for growth on the destination for each source. The resource requirement estimate uses the scale factor to pad the estimate for

consolidation. So, for example, if the estimated requirement for a given source, based on usage data, is 2 GB of memory, which equates to a scale factor of 1, and you specify a scale factor of 1.1, 2.2 GB will be required to consolidate that source.

- **Applicable Days**: The days of the week on which resource usage metrics are collected.
- **Resource Allocation**: The method used to aggregate overall database source resource usage. Values are:
  - **Aggressive**: Aggregate data based on *average* daily usage per hour.
    This typically results in a high consolidation (source:destination) ratio, because more sources will “fit" into each destination. But because more sources are involved, the odds that one or more will not meet the resource requirements are higher.
  - **Medium**: Aggregate data based on the *80 percentile* usage.
    This typically results in a source:destination ratio somewhere between Aggressive and Conservative aggregations.
  - **Conservative**: Aggregate data based on *maximum* daily usage per hour.
    This typically results in a lower source:destination ratio, because fewer sources will “fit" into each destination.
  - **Ultra Conservative**: Do not aggregate data by hourly usage. Instead uses the highest usage observed across the specified date range. This is the default for database consolidations.
- The **Date Ranges** should define a period of time that is typical of standard resource requirements.

7. Click **Estimated Requirements** to view the estimated total resource requirements. For database consolidations, it is the single value that characterizes requirements over the date range.
8. Optionally exclude or include sources, as appropriate.
9. Click **Next** to define consolidation constraints.

Defining Constraints for Database Consolidation

Specify business, corporate or technical constraints that must be enforced. Constraints can guide the allocation process during automatic source-to-destination mapping. For manual mappings between sources and destinations, constraints can calculate violations.

Complete Step 2 of a database consolidation scenario as follows:

1. Select compatible database criteria.

   Databases are considered compatible if they have the same specified target properties and configurations. Use target properties and configurations to consolidate databases based on functional area or database release and version.
2. Specify mutually exclusive source database criteria.

   Use conditions to restrict consolidation of Data Guard/standby databases.
3. Click **Preview Effect of Constraints** to view a list of source databases that are not compatible based on the defined constraints.
4. Click **Next** to specify destination server candidates.

Planning the Destination for a Database to Database Project

For a D2D project:

1. Proceed according to your Destination Overview (candidate) selection in Step 1:
   - **For new**:
     - If you selected Oracle Exadata for server in Step 1, click the search icon to select an Exadata Database Machine configuration type.
     - If you selected Oracle Compute Cloud for server in Step 1, click the search icon to select the cloud computing configuration, or shape, to use as the destination. See About Oracle Compute Cloud Shapes, for information on shapes.
     - If you selected Generic Server for server in Step 1, provide the estimated CPU capacity if available; otherwise, click the search icon next to the CPU capacity input field, then select a server configuration that most closely matches your needs. Enter a memory capacity in gigabytes.
   - **For existing**: No action needed. You can only view the candidates.
2. Configure shared storage.
   - **Shared Storage Unit**–Selection can be a generic storage unit (default for generic server) or one of many Exadata storage units.
     - Destination databases running on generic servers share a single storage system for usable storage space, IOPS, and I/O bandwidth. Accept the defaults or specify capacity values for the respective metrics.
     - Destination databases running on Exadata Database Machines share a single storage system at a particular rack level; that is, usable storage space, IOPS, and I/O bandwidth are shared across one rack of the database machine. Capacity values for these metrics are not editable.
   - **ASM Redundancy**–Specify the level of redundancy to use. You may, for example, want to set the level to high for mission critical systems, whereas, normal would be adequate for test and development systems.
3. Specify the compression to use for various segment types. Use compression type to adjust the storage space requirement.
   - **Table Compression Type**–Choices include BASIC, OLTP, QUERY HIGH or LOW, ARCHIVE HIGH or LOW. For database versions earlier than 11.2, only OLTP is supported.
   - **Index Compression Type**–Choices include HIGH or LOW.
   - **LOB Compression Type**–Choices include HIGH, MEDIUM, or LOW.
4. Accept the defaults or edit the percentages for **Maximum Allowed Resource Utilization on Destination Servers**. Contrast these allowances, which provide headroom on destination servers, with the scale factor, which provides headroom for individual source servers.
5. Click **Next** to map the source databases to the destination database.

Planning the Destination for a Database to Server Project

For a D2S project:

1. Choose destination server candidates using either of the following options:

- Click **Use New (Phantom) Servers** if you plan to use destination servers that have yet to be provisioned or purchased, then select one of the following options:
  - **Oracle Exadata On Premise** and click the search icon to select a configuration type appropriate Exadata Database Machine.
  - **Oracle Exadata Cloud at Customer** and click the search icon to select a configuration type appropriate Exadata Database Machine.
  - **Oracle Exadata Cloud Service** and click the search icon to select a configuration type appropriate Exadata Database Machine.
  - **Generic Server** and provide the estimated CPU capacity if available; otherwise, click the search icon next to the CPU capacity input field, then select a server configuration that most closely matches your needs.

    Adjust the memory estimate as necessary.
  - **Oracle Compute Cloud** and click the search icon to select the cloud computing configuration, or shape, to use as the destination. See About Oracle Compute Cloud Shapes, for information on shapes.
- Click **Use Existing Servers** to specify a set of existing managed servers to use as destinations for the project.

  These are the servers you specified when defining the scope for the consolidation project. Database Migration Planner will determine the available hardware resources based on collected usage data.

  By default, the consolidation process will try to use as few destination servers as possible. If you prefer, choose to balance the source load across all destinations.

2. Configure shared storage.
   - **Shared Storage Unit**–Selection can be a generic storage unit (default for generic server) or one of many Exadata storage units.
     - Destination databases running on generic servers share a single storage system for usable storage space, IOPS, and I/O bandwidth. Accept the defaults or specify capacity values for the respective metrics.
     - Destination databases running on Exadata Database Machines share a single storage system at a particular rack level; that is, usable storage space, IOPS, and I/O bandwidth are shared across one rack of the database machine. Capacity values for these metrics are not editable.
   - **ASM Redundancy**–Specify the level of redundancy to use. You may, for example, want to set the level to high for mission critical systems, whereas, normal would be adequate for test and development systems.
3. Specify the compression to use for various segment types. Use compression type to adjust the storage space requirement.
   - **Table Compression Type**–Choices include BASIC, OLTP, QUERY HIGH or LOW, ARCHIVE HIGH or LOW. For database versions earlier than 11.2, only OLTP is supported.
   - **Index Compression Type**–Choices include HIGH or LOW.
   - **LOB Compression Type**–Choices include HIGH, MEDIUM, or LOW.
4. Accept the defaults or edit the percentages for **Maximum Allowed Resource Utilization on Destination Servers**. Contrast these allowances, which provide headroom on destination servers, with the scale factor, which provides headroom for individual source servers.

5. Click **Next** to map the source databases to the destination servers.

Mapping Database Sources to Destinations

Next, map the database sources to the destinations they will be consolidated to. The objective is to fit source requirements with each destination's available resources as tightly as possible.

Oracle recommends that you allow Database Migration Planner to perform this mapping automatically. This will allow the tool to maximize resource utilization of destinations based on resource capabilities and the various consolidation constraints specified. If you use manual mapping, the source will be mapped to the destination even if the destination lacks sufficient capacity. In addition, manual mapping may violate previously declared constraints.

When you have chosen existing destinations, you can optionally map each source and destination manually:

1. Click a source in the list.
2. Click the flashlight icon to select the destination to map to the source. Note that you can map a single source to a destination or multiple sources to a destination, but there can be only one destination

   The resulting consolidation report will show any resource and/or constraint violations due to such manual mapping.
3. Click Next to review the consolidation scenario.

Reviewing and Saving the Database Consolidation Scenario

Finally, review the various parameters set in the new database scenario. Use the **Back** button if you need to make changes; otherwise, proceed as follows:

- Optionally, you can save the scenario as a template, which can then be shared with other users. If you want to do this, click **Save Scenario as a Template**. In the dialog that opens, browse to a location in the local file system and save the template as an XML file.
- Click **Submit**. A message appears confirming that a job has been submitted for further analysis of the scenario. Results appear at the bottom of the Consolidation home page when done.

Other Database Consolidation Scenario Creation Options

You can create a database consolidation scenario based on an existing scenario. Select an applicable scenario under a consolidation project and then select **Create Like Scenario** from the **Actions** menu. Modify the scenario as desired, provide a meaningful name, and submit for analysis as usual.

If you saved a scenario as a template, you can subsequently import the scenario into another environment.

1. On the Database Migration Planner home page, select **Create Scenario from Template** from the **Actions** menu.
2. Browse to a saved template XML file in the local file system. Click **Open**.
3. Indicate the extent to which you want to replicate the saved template; that is, in terms of the resources, constraints, and destinations planning represented by the template. Click **Update** if you make any changes.
4. Click **OK** to import the saved template.

The imported scenario opens in the wizard where you can edit and save it in Database Migration Planner.

Evaluating Database Consolidation Scenarios

You can view details for your consolidation scenarios using the Consolidation console. After evaluating the consolidation scenario results, you can define different scenarios as well as rerun existing scenarios to re-evaluate them based on the previously specified conditions with the latest available data. The results of the previous analysis will be over-written. You can also create a new scenario based on an existing scenario, where you tweak certain values to customize the new scenario. This iterative process helps you obtain the optimized consolidation scenario which is generated by compromising various factors and weighing different trade-offs.

Compare the consolidation scenarios you create to determine which consolidation strategy best meets your requirements.

Your objective is to:

- Match source resource requirements with destinations best able to meet those requirements.
- Ensure that the destination's available capacity can accommodate the combined calculated workloads of all source databases.
- Provide room for growth on destinations by allowing for headroom as a factor of resource requirements.
- Optionally balance the source workload across all available destinations.

1. From the **Databases** menu, select **Migration and Consolidation**, then select **Database Migration Planner**. This selection is also available from the **Administration** menu on the Databases target home page.
2. First, examine the project containing the scenario you want to view.
    - The Status column indicates the status of data collection, based on the minimum and maximum collection days specified for the project.
    - The **General** tab summarizes the project in terms of type, collection details, number of sources, and so forth.
    - Click the **Source Candidates** tab to view various usage data collected for the sources defined in the project. Data can include utilization rates for CPU, memory, storage, and disk and network I/O, depending on the project type.

      Data might include the estimated compression ratio. As noted on the page, if listed as not available, you can gather compression estimates prior to creating scenarios. Click the **Deploy Database Migration Planner Packages** link in the on-screen text above the details to submit a compression advice job.
    - Click the **Source Workload** tab to view source resource usage data collected. The default display is a line graph. Alternatively, you can view the same data as a heat map, a grid of 24 hours by 30 days, showing the workload for a given hour as a color indicating the load relative to 100% of capacity, and a number showing the actual percentage. You can filter either view by source, resource type, and month.
    - Click the **Destination Candidates** tab to view a breakdown of hardware details and projected resource utilization by destination candidate, based on the sources to be consolidated.

- Click the **Advisor Findings** tab to view the results of checks run on database performance data. Findings reveal potential performance bottlenecks and recommend ways of reducing or eliminating them.

  Severity may be informational, a warning, or critical in nature. Mouse over the rule for a description of what the rule checks for and suggestions for a resolution. The finding may be truncated. Mouse over it to see the complete description.

- Click the **Report** button above the table when the project is selected to view summarized information and more details.

3. Next, view the data for a specific scenario. The **General** tab summarizes the scenario in terms of resource type and allocation, constraints, destination types, and so forth. For a completed analysis, click any metric in the row to view details on the respective tab, as follows:

   - **Sources**: The list of sources to consolidate, including their projected CPU and memory capacities and requirements.
   - **Destinations**: The list of destinations to which the sources will be consolidated. Resource configuration and calculated utilization are shown for each destination.

     For consolidations to the cloud, resources of consequence are CPU capacity and memory.
   - **Ratio**: The ratio of sources to destinations. By default, Database Migration Planner will try to “fit" sources into as few destinations as possible.
   - **Mapping**: The destinations to which specific sources will be mapped. The analysis includes estimated CPU and memory requirements and utilization, enhanced by suggested CPU and memory allocation figures to consider. These suggestions represent a reasonable compromise between requirements and destination server capacity. See Figure 1-1 for a screen capture of a representative consolidation mapping.
   - **Storage**: Summary of storage requirements and compression estimates for each source database. In calculating storage estimates, Database Migration Planner ignores local storage on Exadata compute nodes (local disks that contain system software), and focuses on data storage contained in Exadata storage units. The system recommends the number of such units needed, based on the source storage requirements and the compression specifications in the scenario.

     Drill down for detailed information. For example, numbers in the Space (GB) (Estimated) column are links. Click the link for a source database to open a compression estimates pop-up. The highlighted row represents the table compression type selected when creating the scenario.

     Similarly, click the links in the IOPS and IO Bandwidth columns to see a breakdown of IOPS and IO bandwidth into read and write components, and in some cases, into small and large I/O subcomponents. You can also see the impact of Exadata Simulation on a source database, in the event of a SQL Performance Analyzer simulation.

     When the destination is an existing server or database that uses Automatic Storage Management (ASM), the system checks and reports the storage space capacity, projected utilization (%), projected space usage (GB), and additional storage capacity (GB) required, if any, on each ASM destination.
   - **Confidence**: The percentage of the data collected for sources that meet the source usage requirements defined in the scenario. This value is aggregated for all sources defined with the project.

- **Violations**: The number of violations of technical or business constraints defined in the scenario. This metric is applicable only if the scenario uses auto-mapping of sources to destinations.
- **Exclusions**: The number of sources that do not have a qualified mapping to a destination. These are sources that exceed the capacity of available destinations. An exclusion can occur simply because there is not enough of a resource to accommodate a source.

  A different set of constraints may result in a different optimal scenario. Modify the constraints to come up with different scenario results.
- **Schema Conflicts**: Lists schemas that exist in more than one source database or that also exist in the destination database. This is specific to D2D scenarios where you chose a non-CDB (single instance) database architecture in the Destinations Planning step of scenario creation. Schema conflicts do not involve Oracle-supplied system schemas.
- **Advisor Findings**: Potential performance bottlenecks and recommended ways of reducing or eliminating them. Also indicates possible problems that can arise based on the consolidation specification.

  Severity may be informational, a warning, or critical in nature. Mouse over the rule for a description of what the rule checks for and suggestions for a resolution. The finding may be truncated. Mouse over it to see the complete description.

Figure 1-1shows the mapping for a simple database-to-database consolidation using the default phantom destination (clustered CDB/PDB). The figure illustrates the key points of mapping as explained in Table 1-1.

Figure 1-1 Database Consolidation Mapping

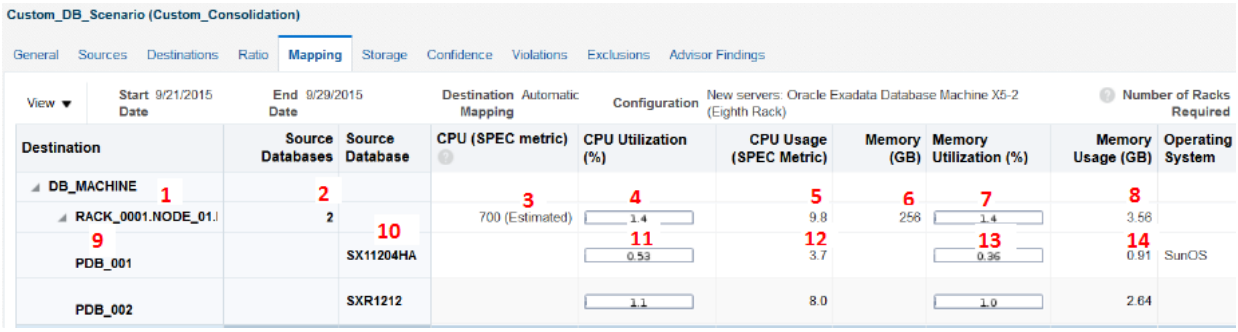


Table 1-1 explains the key points of mapping as annotated in Figure 1-1.

Table 1-1 Legend for Figure 1-1

Reference Point	Explanation
1	Name of rack, compute node, and consolidated database instance
2	Number of databases consolidated to this instance
3	CPU capacity of compute node
4	Total CPU utilization (%) for this compute node, including CPU utilization for existing destinations when applicable
5	Total CPU usage for this compute node

Table 1-1 (Cont.) Legend for Figure 1-1

Reference Point	Explanation
6	Memory capacity of the compute node
7	Total memory utilization (%) for this compute node, including utilization for existing destinations when applicable
8	Total memory usage for this compute node
9	Name of the pluggable database
10	Name of source database consolidated to this PDB
11	Percentage of compute node's CPU consumed by this source database
12	CPU usage for this source database on the compute node
13	Percentage of compute node's memory consumed by this source database
14	Memory usage for this source database on the compute node

About the Advisor Feature of Database Migration Planner

The Advisor gathers database performance data from the Automatic Workload Repository (AWR) and uses the data as input to rules. The rules are evaluated to determine if performance bottlenecks exist in the source or destination databases, and provide advice on how to relieve the problem. At the scenario level, the rules also look at source databases in combination as well as at destination specifications to determine if the consolidation might experience performance problems.

Advisor findings are viewable for both projects and scenarios, as a column on the Database Migration Planner home page, and as a tab in the respective project and scenario details region.

About Compression Advisor

The Compression Advisor estimates how much space compression savings each source database can potentially benefit from for different types of supported compression types, and calculates how much space the uncompressed data would require. The results appear on the **Storage** tab of a database consolidation scenario. You can also specify how to compress data in the destination, so that reductions can be applied when determining how much storage will be needed. To enable the estimation of compression, you have to deploy a job to each source database and run compression advice to make the results available to Database Migration Planner.

Estimating Compressed Storage Requirements

If you want to factor in compression ratios on source databases as part of a database consolidation, you have to submit a Deploy Database Migration Planner Packages job to gather compression advice on each source. You can do this beforehand or following project creation.

1. From the **Enterprise** menu, select **Jobs and Procedures**, then select **Job Activity**.
2. On the Jobs page, click the **Create Job** button.

3. Locate **Deploy Database Migration Planner Packages** in the Job Type list and click **Select**.

   This takes you to the job creation page, where you also land when you click the Deploy Database Migration Planner Packages link on the **Source Candidates** tab within a database consolidation project that has already been created.

4. Enter a name for the compression advice job.
5. Add database targets that are source candidates to a consolidation. You can multiselect, but the target type (single instance or cluster), must be the same. Select in the table the target instances you want to include in the job.
6. On the **Parameters** tab, set **Run Compression Advice** to **Yes**.
7. Complete the rest of the job creation process and submit the job. Note that the job needs to run with SYSDBA credentials on the target databases.

The result of these actions makes estimated compression ratios available to Database Migration Planner. Note that it may take up to 24 hours after compression advice is run for the metrics to collect the data into Enterprise Manager for scenario analysis.

Database Migration and Encrypted Tablespace

If a source database uses encrypted tablespace, you will not be able to access data in these tables on the destination following the migration until you copy the wallet from the source location to a location on the destination. You can find the wallet location in the `sqlnet.ora` file. The default location of the file is based on the TNS Admin or `ORACLE_HOME/network/admin` location.

After you copy the wallet to the destination, update the `sqlnet.ora` file on the destination with the location where you copied the wallet. For example:

```
ENCRYPTION_WALLET_LOCATION =
     (SOURCE =
     (METHOD = FILE)
     (METHOD_DATA =
     (DIRECTORY = /scratch/jdoe/app/jdoe/admin/dben/wallet)
     )
   )
```

After updating the file, you have to open the wallet before you can access data in the encrypted tablespace.

1. From the **Targets** menu, select **Databases**, then search for the destination database.
2. On the destination database home page, select **Transparent Data Encryption** from the **Security** menu.
3. Open the wallet by providing the requisite password.

You can now access data in the encrypted tablespace.

For detailed information on encryption, wallets, and other security-related issues, see the *Oracle Database Advanced Security Guide*.

Assessing the Performance Impact of Database Migration on SQL Workload

System changes such as migrating a database may cause changes to execution plans of SQL statements, resulting in a significant impact on SQL performance. You can analyze performance impact of database migration on SQL workload using SQL Performance Analyzer to identify the SQL statements that have improved, remained unchanged, or regressed after the system change.

The typical flow to assess the performance impact on SQL workload using SQL Performance Analyzer is as follows:

1. Capture the SQL workload that you intend to analyze and store it in a SQL tuning set.
2. Pre-system change, create a SQL Performance Analyzer task.
3. Build the pre-change SQL trial by test executing or generating execution plans for the SQL statements stored in the SQL tuning set.
4. Perform the system change.
5. Build the post-change SQL trial by re-executing the SQL statements in the SQL tuning set on the post-change system.
6. Generate a report to identify the impact of change on the SQL statements.
7. View the SQL Performance Analyzer report to compare pre- and post-change SQL performance. You can access the report from the destination database home page by selecting SQL then SQL Performance Analyzer Home from the Performance menu.

As noted, this is the *typical* flow to use SQL Performance Analyzer. In the case of a database migration, you only need to perform the first and last steps listed above—create the SQL tuning set and view the report. The migration job does the rest:

- Creates the SQL Performance Analyzer task.
- Builds the pre-change SQL trial.
- Performs the database migration.
- Builds the post-change SQL trial.
- Generates the report.

For detailed information on using the feature, see "Part I SQL Performance Analyzer" in the *Oracle Database Testing Guide*.

2

Database Consolidation

The following sections cover topics that are common to host and database consolidations:

- How Enterprise Manager Consolidation Analyzes a Consolidation Scenario
- Viewing Consolidation Reports
- Managing Data Collections
- About Oracle Compute Cloud Shapes
  For more information on Host Consolidation see: Host Consolidation Planner in *Enterprise Manager Host Lifecycle Management Guide.*

How Enterprise Manager Consolidation Analyzes a Consolidation Scenario

To analyze a consolidation scenario, Enterprise Manager Consolidation follows a defined process.

For host consolidations, Enterprise Manager Consolidation estimates the hourly and overall resource requirements for each of the consolidation sources. Using metric data collected by Enterprise Manager, it calculates the requirement for each hour and for all hours (in the specified collection days), selecting the average, 80th percentile, or maximum value, depending on the selected resource allocation style (Aggressive, Medium, or Conservative).

For database consolidations, Enterprise Manager Consolidation uses the Ultra Conservative resource allocation style, which selects the maximum value of the resource over the entire time period.

Enterprise Manager Consolidation adjusts the value if a scale factor is specified. It further adjusts memory requirements in D2D scenarios by reducing the portion of memory used for the SGA by 50%, 40% or 30%, again depending on the resource allocation style. The resource requirement displayed for the source is the overall requirement determined by the resource allocation style and adjustments.

If the consolidation scenario includes existing destinations, Enterprise Manager Consolidation performs a similar calculation to determine the hourly and overall usage values for each destination. It does not scale or otherwise adjust these values, but calculates them using average, 80th percentile, or maximum values depending on the resource allocation style.

For host consolidations into new or existing destinations, Enterprise Manager Consolidation matches the hourly requirements for each source against the available hourly capacity of a destination. (Existing destinations start this process populated with their existing hourly workloads; new destinations start in an empty state.) If the destination can accommodate all hourly requirements for all resources, a successful consolidation occurs.

For database consolidations, Enterprise Manager Consolidation adds together the single workload values for each source database to determine which databases map to each destination.

If any requirement cannot be consolidated, Enterprise Manager Consolidation tries the next destination until one is found with sufficient capacity. If the consolidation is to existing

destinations and none have sufficient remaining capacity, the source is excluded from the consolidation. For consolidation to new destinations, another destination is created to accommodate the source.

- For D2D scenarios with RAC database destinations, where the workload is shared across multiple instances, the process differs. Each source database's workload is consolidated onto all instances in the RAC database, and the total workload is balanced across all instances. This is also true for D2S scenarios with Exadata or cluster destinations.
- For D2D scenarios with Container database (CDB) destinations, each source database is consolidated to a separate pluggable database (PDB) within the CDB. Source databases that are in conflict due to user-specified constraints are consolidated to separate CDBs.
- By default, Enterprise Manager Consolidation consolidates sources to the fewest possible destinations. However, for scenarios with multiple existing destinations, you can choose to spread the workload across all destinations instead.

The scenario Mapping page displays the results of the consolidation. The contents of this page vary depending on the project type and the resources selected for consolidation, but in general displays the following:

- Projected destinations, and the sources consolidated to each destination.
- For each resource, the capacity of the destination, together with the percentage and amount of that resource that will be consumed by the sources consolidated to it and existing workload, if any. Enterprise Manager Consolidation estimates this amount by finding the largest hourly usage for the resource on the destination. The source line shows the percentage of the destination's resources that will be used by that source.

Managing Data Collections

Manage data collections by viewing the status of your host or database projects.

1. On the respective Consolidation home page select **View Data Collection** from the **Actions** menu.
2. The view lists sources within a project where you can perform the following tasks:
   - View the latest collection status by project.
   - Select a source to see its collection history and troubleshoot potential problems with the collection.
   - Click the link under Data Collection Jobs to go to the job activity page where you can view and administer the latest data collection job.
   - Update the latest CPU performance metric values by following the instructions to download a CSV file with the latest rates. After downloading the file, click **Browse** to locate the file in the local file system and click **Load** to update the rates in Enterprise Manager Consolidation.

Viewing Consolidation Reports

You can repurpose consolidation project and scenario details in report form that you can capture in a variety of formats and distribute to a wider audience, as described in the following sections:

- Viewing Consolidation Project Reports
- Viewing Consolidation Scenario Reports

Viewing Consolidation Project Reports

To view a project report, select the host or database project on the respective Consolidation home page and click the **Report** button above the table. The report page repurposes project details as stacked, scrollable tables representing the tabbed information that appears in the project's details on the home page.

Click **Publish Report** to capture report contents. This action integrates with BI Publisher, where you can:

- Save reports in a variety of formats (Excel, PowerPoint, HTML, PDF).
- Distribute generated reports to e-mail lists (users who do not have access to Enterprise Manager, for example) on a defined schedule.

Click **OK** to return to the Consolidation home page.

Viewing Consolidation Scenario Reports

To view a project scenario report, select the host or database scenario within the project on the Consolidation home page and click the **Report** button above the table. The report page repurposes scenario details as stacked, scrollable tables representing the tabbed information that appears in the scenario's details on the home page.

Click **Publish Report** to capture report contents. This action integrates with BI Publisher, where you can:

- Save reports in a variety of formats (Excel, PowerPoint, HTML, PDF).
- Distribute generated reports to e-mail lists (users who do not have access to Enterprise Manager, for example) on a defined schedule.

Click **OK** to return to the Consolidation home page.

About Oracle Compute Cloud Shapes

A shape defines the number of Oracle Compute Units (OCPUs) and the amount of RAM available for an instance. An OCPU provides the equivalent CPU capacity of the current 3.0 GHz 2012 Intel Xeon processor with hyper threading enabled. Each OCPU corresponds to two hardware execution threads, known as vCPUs.

A wide range of shapes is available to help you select a combination of processing power and memory for your instances that best suits your business requirement. While selecting a shape for your instance, consider the nature of applications that you will deploy on the instance, the number of users that you expect to use the application, and also how you expect the load to scale in the future. Remember to also factor in the CPU and memory resources that will be used by the OS.

To determine the shape that meets your resource requirements, you may want to experiment with a shape and test it with a representative workload.

For complete information see Oracle Cloud Infrastructure.

3
Database Migration Workbench

About Migration Workbench

The decision to move workloads starts at the application level. As an organization decides, a particular application is chosen to move with its entire stack to a different location or service. In these cases, the challenge for administrators is how to find the right set of schema and/or databases to move. With years of investment into building and fine tuning applications, dependencies within applications and database, it becomes nearly impossible to maintain a stable relationship among all dependent components using traditional methods.

Oracle Enterprise Manager Database Migration Workbench provides an accurate approach to migration and consolidation by eliminating human errors allowing you to easily move your on-premises databases to Oracle Cloud, Multitenant architecture or upgrade your infrastructure. Some advantages of using Database Migration Workbech are: near zero downtime, assured zero data loss, seamless on-premises or Cloud migrations and, MAA and Cloud Security compliant.

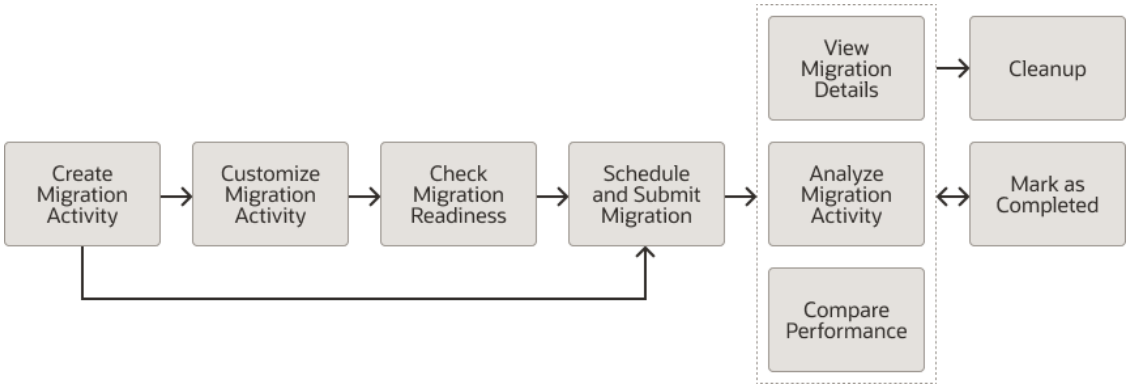
For information on Database Migration Workbench licensing, see: Oracle Real Application Testing.

Migration Activity

Migration Workbench can be separated into 3 main steps that help make migrations easier: Plan, Migrate and Analyze.

1. **Plan:** Identify databases to migrate. As part of the Plan activities using the *Sizing and Consolidation Advisor*, databases are consolidated into a single destination database optimized for size and performance.
2. **Migrate:** The actual migration of the databases, moving data to autonomous and non-autonomous databases. The methods available are Datapump (Logical Data Migration), and Transportable Tablespace (TTS with RMAN).
3. **Analyze:** Monitors and tracks the migration process, after migration users can see log reports that show what migrated successfully and help diagnose any errors that may have occurred. Comparison reports are also available to assess database performance before of after migration.

Figure 3-1 Complete Migration Process with Database Migrations Workbench



Plan a Database Migration with Database Migration Workbench

Review the following information in order to plan a migration using Database Migration Workbench.

- Migration Workbench Support Matrix
- Migration Methods
- Migration Workbench Customization
- Database Migration Prerequisites

Migration Workbench Support Matrix

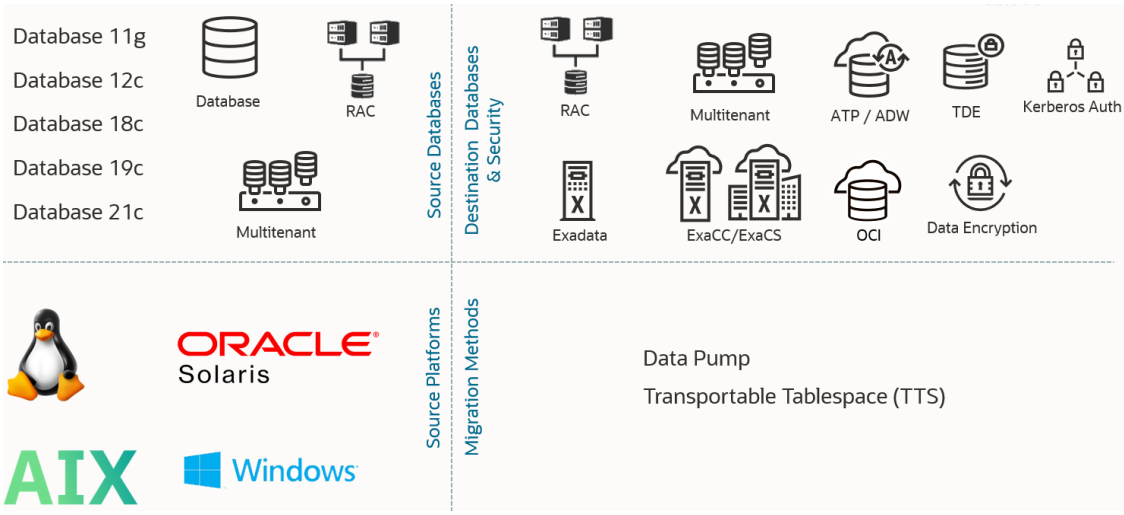
Oracle Enterprise Manager Database Migration Workbench provides an accurate approach to migration and consolidation by eliminating human errors allowing you to easily move your on-premises databases to different services like cloud, physical or virtual server, on-premises Exadata.

The Migration Support Matrix shows the different types of migrations you can perform with Enterprise Manager, review the matrix to determine the Migration method most desirable for migrating your database. This will help you choose the specific topics and migration path in this chapter.

Highlights of this matrix are as follows:

- Migrations can be performed with all Enterprise Manager Migration Methods (Migration Workbench, EM CLI and REST API)
- Source destination database version for all migration types can be from 11.2.0.4 to 21c
- Source operating systems can be Linux, Sun Solaris, AIX or Windows
- All migration types offer Cross Platform Support, allowing you to choose the best combination of database type, database version and operating system for your environment going forward.

Figure 3-2 Database Support Matrix



> **Note:**
>
> Transportable Tablespace Migrations are currently not supported for Windows Destination Databases.

Migration Methods

There are two main types of migration methods available in Migration Workbench: Data Pump and Transportable Tablespaces. Review the information on each so you can choose the correct migration method for your needs.

Guideline for Migration Workbench Method Selection

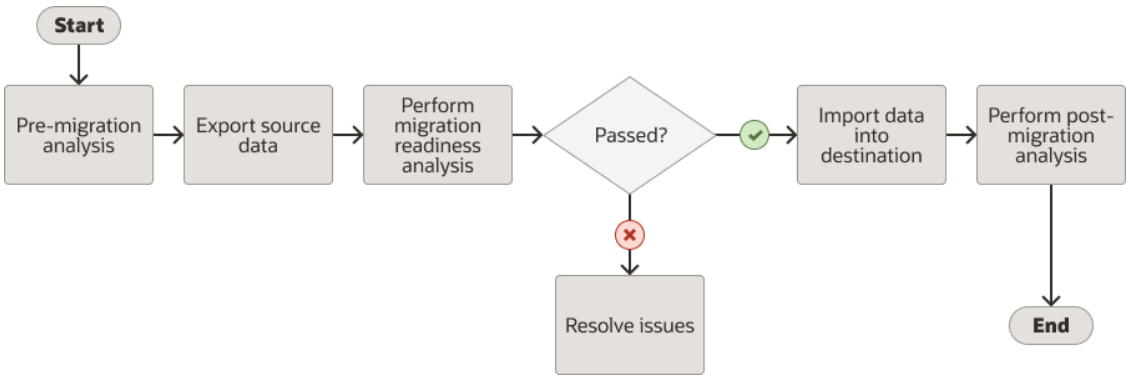
The following table is a guideline for selecting the proper Database Migration Workbench Migration Method for your particular scenario:

Migration Method	Size of Source Database	Move to New Server	Change in Endianness	Operating System Change	Character Set Change	Architecture Layout Change	Selected Object (Table/ User) Migration	Tablespace Migration	Downtime Required
Data Pump	< 500 GB	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Transportable Tablespace	> 500 GB (or any size)	Yes	Yes	Yes	No	No	No	Yes	Minimal

Data Pump

Data Pump provides an Export and Import way of moving data and metadata from one database to another. It begins the Export by unloading table data, database object metadata, and control information into a file dump. During the Import portion, the file dump is loaded into the destination database. Some of its main benefits include metadata filtering based upon object and object types, you can specify how partitioned tables are handled during import operations, as well as a full range of data types that can be exported and imported.

Figure 3-3 Data Pump Migration Overview



Data Pump supports the following migration modes:

- Full Database: In this mode, the entire content of the source database is moved to the File Dump and loaded into the destination database.
- Schema: In this mode, only objects owned by the specified schema are moved to the File Dump and later loaded.

> **Note:**
>
> When performing Data Pump migrations do not use `SYSDBA` as the named credentials for Export and Import.

For more information on Data Pump see: Oracle Data Pump in *Oracle Database Utilities 21c*.

Transportable Tablespace (TTS)

Transportable Tablespace provides a Near Zero Downtime (NZDT) way to create a duplicate database from incremental backups of the source database, while retaining the original target database. The duplicate database can be identical to the source database or contain only a subset of the tablespaces in the source database. A duplicate database created in RMAN, is not intended for failover scenarios and does not support the various standby recovery and failover options.

> **Note:**
>
> Starting with Enterprise Manager 13.5c Release Update 10 you can perform non-CDB to non-CDB TTS migrations.

Transportable Tablespace supports the following migration modes:

- Single-phase: In this mode, the entire content of the source database is moved via a single full backup and loaded into the target database.
- Multi-phase: In this mode you decide what to migrate (migrate full database or selected table spaces), and how to migrate (single phase or user controlled multiple phases). The entire content of the source database is moved via an initial full backup and multiple user defined incremental backups.
- Tablespace: In this mode, only selected tablespace objects are moved to the target database.

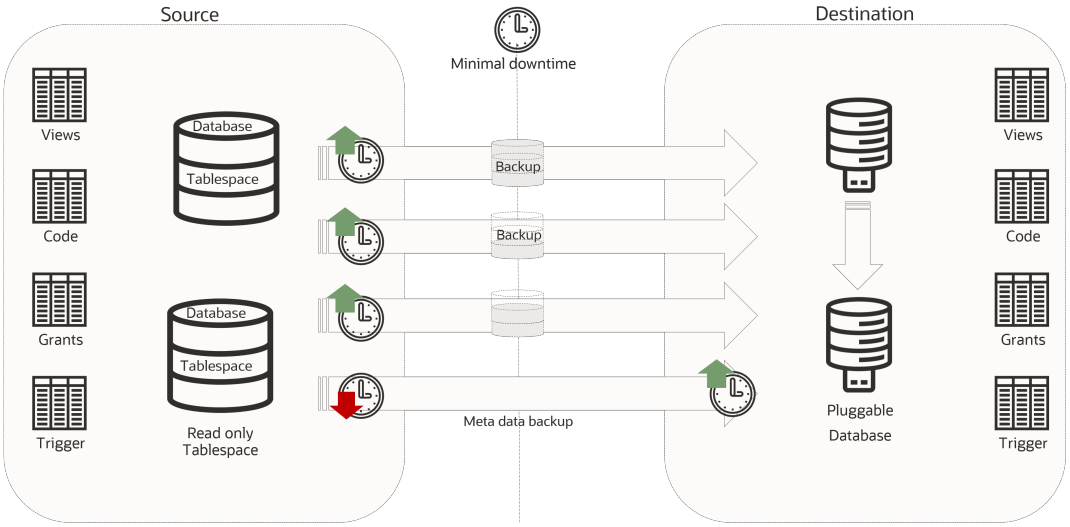
> **Note:**
>
> When performing Transportable Tablespace migrations you will need to use `SYSDBA` as the named credentials.

For more information on Transportable Tablespace see: Creating Transportable Tablespace Sets in *Oracle Database Backup and Recovery User's Guide*

Migration Workbench Architecture

The following is an architecture diagram example for a TTS multi-phase migration. TTS migration support multi-phase and single-phase migration.

For example: If you want to migrate huge-size database with minimum downtime, then a multi-phase migration with a full and incremental backup combination is performed. For a small database, you can go for single-phase Transportable Tablespace migration which will take a full backup and complete the migration process without taking any incremental backups. During the cutover phase TTS migration puts your tablespaces in a read-only mode, takes the final incremental backup with a metadata backup, completes the migration, and the cutover process.



Customization Support for Migration Workbench

Migration Workbench allows customization of both Data Pump and Transportable Tablespace migration methods by allowing the user to upload and use Pre and Post migration scripts.

About Pre and Post Scripts

You can run custom scripts before and after a database has been created or provisioned. These requests are additional commands that can run on the machine on which the database is originating or commands to perform additional activities and operations on the newly migrated database. Scripts can be Shell scripts or Perl scripts (SQL scripts cannot be called directly but can be called internally from Shell or Perl scripts).

Pre and Post scripts need to be uploaded as EM Software Library Entity (Directive) prior to their usage with database migration activities. With the Pre and Post scripts in Software Library, the whole process is centralized and automated with the script staged at a common place within the Software Library, the script is staged and cleaned up on the target host as part of the deployment execution itself.

Pre and Post Script Requirements

The custom script must follow certain guidelines and consists of four parts:

- **Response File**: The response file contains the service template and request specific information. Before the custom script is executed, the request procedure, the request procedure generates a response file (file with name-value pairs) containing the data from

the service template as well as the request-specific data such as the SID that is auto computed, the hosts on which the database will be deployed, and so on.

- **Driver Script**: This is the key driver script that will be invoked by the request procedure. The driver script accepts only one argument which specifies the location of the response file.
- **Other Scripts**: Apart from the driver script, you can specify other perl or sql scripts. These scripts must be invoked from the driver script.
- **Additional Variables**: You can include a file containing additional variables that can used by the custom script as applicable.

Creating a Software Library Entity For Uploading The Script

Create a Software Library entity of type Directive (for uploading the custom scripts to EM).

1. Select **Targets**, then **Databases**, next select **Administration**, and then **Provisioning and Patching** and click on **Software Library**.
2. Select the **directory** where you want to create the Software Library entity.
3. Select Actions, then select Create Entity and Click **Directives**.
4. Provide all the basic details on the Directive screen.
5. Click **Add** under Command Line Arguments on the Configure screen.
6. The **INPUT_FILE** to be added as mentioned in the list below. Click OK.
   - `Argument Prefix="`
   - `Argument Suffix="`
   - `Property Name=INPUT_FILE`
7. Click **Next**.
8. Click **Add** in Specify Source and select the script files to upload the custom script on the Select File screen. Choose the driver script as the main file.
9. Click **Next**.
10. Click **Save and Upload**.
11. An entity is created successfully in the Software Library.

How to Get URN for SWLIB Entity

- **To get URN for the SWLIB through EMCLI**: `$OMS_HOME/bin/emcli list_swlib_entities -show_entity_rev_id -name=""`
- **To get URN for the SWLIB through EM UI**:
  1. Select Enterprise, then Provisioning and Patching and click on **Software Library**.
  2. Click View, select Columns and click on **Internal ID**.
  3. Go to the uploaded entity and copy the **Internal ID** for the uploaded entity, this is the URN.

Custom Scripts for Transportable Tablespace

You can use Pre and Post scripts to further customize your Transportable Tablespace migrations. This topic lists Pre and Post scripts available for Transportable Tablespace migrations.

Pre Scripts for Transportable Tablespace

- **Pre Complete Migration Backup**: This script will run on the source database prior to taking the initial full backup.

Post Scripts for Transportable Tablespace

- **Post Complete Migration Backup (Final Incremental)**: This script will run on the destination database after migration is complete.
- **Post Migration SQL**: This SQL script will run on the destination database after the Post Complete Migration phase completes.

Database Migration Prerequisites

Before you can migrate on-premises Oracle Databases to Oracle Cloud, certain general prerequisites need to be met whether you are migrating via Database Migration Workbench, EM CLI or REST API.

Common Prerequistites for Migration Workbench

> **Note:**
>
> Oracle Enterprise Manager Migration Workbench only supports Enterprise Edition database targets. Standard Edition (SE/SE2) database targets are not supported.

- For **NEW** installations of Enterprise Manager 13.5 Release Update 18 and onward the `DOWNLOAD_DB_MIGRATION_PREREQS` job that downloads the Database Migration Prerequisites is disabled. For existing Enterprise Manager customers the job will remain enabled for three months after the last Migration Workbench activity. Run the following REST API to enable:

Feature	Description
Request Method	Post
URI	/em/websvcs/restful/db/migration
Payload	`{ "action": "ENABLE_DOWNLOAD_DB_MIGRATION_PREREQS", "jobName": "DOWNLOAD_DB_MIGRATION_PREREQS" }`

- Source Database and Host credentials. Host credentials need to be supplied for any operation which needs to log into the host and are mandatory for any job. Database credentials are used to make database management easier. For more information on setting up credentials see: Setting Up Credentials in *Oracle Enterprise Manager Database Lifecycle Management Administrator's Guide*.
- VPN connectivity or an existing connectivity between on-premises data center and destination service.

> **Note:**
>
> Destination will be the OCI data center for Autonomous Databases (required for calls to APIs and Autonomous Database connections)

- Enterprise Manager Migration Workbench requires open connections (direct or via proxy) to the following URLs:
  - https://download.oracle.com/*
  - https://objectstorage.us-phoenix-1.oraclecloud.com/*
- In Enterprise Manager assign the following privileges to each corresponding target:

Required Privilege:	Resource to Apply Privilege to:
Connect to Target	Source and Destination Database
Execute Command	Source Database Host
Configure Target	Destination Database
Execute Command	Monitoring Agent host of Destination Database
Create New or Existing Views	Named Credential
Create Any Software Library Entity	Software Library Entity
View Any Software Library Entity	Software Library Entity

For more information on how to grant privileges see: About Deployment Procedures and Granting Roles and Privileges to Administrators in *Oracle Enterprise Manager Database Lifecycle Management Administrator's Guide*.

- For Oracle 11.2.0.4 databases migrating to a higher release version, DBCONTROL should be present at the source database and verify compatibility of the APEX version at the source database matches with that at the destination database.
  - To verify if the `DBCONTROL` utility is present on the database use the following query:

```
select count(*) as object_count from dba_segments where owner i n
('SYS','SYSMAN','SYSTEM') and tablespace_name not in
('SYSTEM','SYS','SYSMAN', 'UNDO','SYSAUX') and segment_type not in
('INDEX')
and segment_type not like ('% UNDO%')
```

  - Migrate any user objects reside in SYS, SYSMAN, SYSTEM schema separately outside of the Migration Workbench. For databases not 11.2.0.4 database, you can skip this step.
  - To check for APEX certifications MyOracle Support's Certification Tab
    1. Go to https://support.oracle.com.
    2. Click **Certifications**.

3. Enter **Oracle Application Express** as the Product.
4. Select **APEX version** from the Release List.

- Enterprise Manager agents use `PUT_FILE` and `GET_FILE` requests to copy backup data from source to destination server, make sure the default port `3872` is available to ensure proper communication between servers.
- Remote agents are supported for Lifecycle Management activities, for more information on remote agents see: Installing Oracle Remote Management Agents.

Data Pump Migration Prerequisites

The following is a list of prerequisites needed for a Data Pump type migration.

Prerequisite	Description
Privileges on the source database target (in Enterprise Manager)	• Database discovered and visible in Enterprise Manager. For more information see: Discovery in *Oracle Enterprise Manager Administrator's Guide*. • The following privileges and roles must be granted to the user: – CREATE SESSION – SELECT ANY TABLE – CONNECT – ALTER USER <USER> QUOTA <QUOTA> ON <TABLESPACE>
Privileges on the export working directory	• Create a local directory with sufficient space to host the export dump file. • Write privilege to the directory where the export will be stored for the import database user.
Privileges on the source database	Grant the `DATAPUMP_EXP_FULL_DATABASE` role to the export database user. This role grants the user performing the export additional privileges that aid Data Pump migrations: • Perform Export operations outside the scope of their assigned schema. • Monitor jobs that were initiated by another user. • Export objects such as table space definitions that unprivileged users cannot reference. Example of Datapump Export Full Database role grant: `SQL> GRANT DATAPUMP_EXP_FULL_DATABASE TO exp_user;`
Destination database	Destination database is discovered and visible in Enterprise Manager. For more information see: Discover Autonomous Databases in *Oracle Enterprise Manager Administrator's Guide for Oracle Autonomous Databases*.

Prerequisite	Description
Privileges on destination database	Grant the `DATAPUMP_IMP_FULL_DATABASE` role to the import database user. This role grants the user performing the import additional privileges that aid Data Pump migrations: • Perform Import operations outside the scope of their assigned schema. • Monitor jobs that were initiated by another user. • Import objects such as directory definitions that unprivileged users cannot reference. Example of Datapump Import Full Database role grant: `SQL> GRANT DATAPUMP_IMP_FULL_DATABASE TO imp_user;` • When performing a Data Pump migration to a new PDB `SYSDBA` credentials are required for the destination database. • For Data Pump migrations to an existing PDB normal credentials with necessary privileges can be provided.
Privileges on the import working directory	Write privilege to the directory where the data dump will be stored for the import database user.
Prerequisites for the destination Autonomous Database	• An Oracle Cloud Account is required for the destination Autonomous Database and storage to upload the data dump files. For more information see: About Oracle Cloud Accounts in *Oracle Cloud Getting Started with Oracle Cloud Applications*. • The wallet file that is used to connect to the Autonomous Database (automated from Enterprise Manager). For more information see: Discover Autonomous Databases in *Oracle Enterprise Manager Administrator's Guide for Oracle Autonomous Databases*. • Configure cloud credentials in the Autonomous Database for data import from the *Object Store*. For more information see: CREATE_CREDENTIAL Procedure in *Oracle Cloud Using Oracle Autonomous Data Warehouse on Shared Exadata Infrastructure*.

Prerequisite	Description
Prerequisites for SQL Performance Analizer (SPA)	In order to compare performance after migration using SPA the following user privileges are required: • Source Database: – ADMINISTER SQL TUNING SET – UNLIMITED TABLESPACE – EXECUTE ON DBMS_WORKLOAD_REPOSITORY – SELECT ANY DICTIONARY – ADVISOR • Destination database: – ADMINISTER ANY SQL TUNING SET – CREATE ANY TABLE – INSERT ANY TABLE – ADVISOR

Additional Prerequisite Information for REST and EM CLI:

- If you are planning to migrate using REST, you will need to upload the migration tools as part of the prerequisites follow the steps outlined in: Prerequisites for REST API Data Pump Based Database Migration.
- If you are planning to migrate using EM CLI, you will need to upload the migration tools as part of the prerequisites, follow the steps outlined in: Prerequisites for EM CLI Data Pump Based Database Migration.

Data Pump Migration Best Practices

The following is a list of best practices for a Data Pump type migration.

These best practices can be validated before submission in the *Review & Submit* page of a Migration Workbench activity. To perform a validation for a Data Pump based migration see Migrate Using Data Pump.

Best Practices validation checks are available starting with Oracle Enterprise Manager 13 Release 5 Update 11 (13.5.0.11).

Recommendation	Parameter	Recommended Value	Default Value	Comments
Exclude statistics from export & import operation. After import collect statistics	EXCLUDE	`Set parameter EXCLUDE=STATISTICS` or `EXCLUDE=TABLE_STATISTICS,INDEX_STATISTICS`	EXCLUDE=STATISTICS	Import and export statistics that need to be excluded. Can be excluded in `expdp`

Recommendation	Parameter	Recommended Value	Default Value	Comments
Setup parallelism parameter	PARALLEL	Set Parallel parameter with twice the number of physical CPU/cores	Sum of (2 x (no. of physical CPU) per node) but no greater than 32	Maximum cap of 32
Gather accurate statistics before and after data pump operation	dbms_stats	Collect statistics using the `dbms_stats` package with `gather_database_stats` using Auto sample size	`DBMS_STATS, gather_schema_stats` for user schema	NA
Setup resource utilization appropriately	STREAMS_POOL_SIZE	Set `STREAMS_POOL_SIZE` to a value in a range of 64mb-256mb	Validate if `SGA_TARGET` initialization parameter is set. The `STREAMS_POOL_SIZE` initialization parameter is automatically set to a value in range.	NA
Setup compression for data pump file size	compression compression_algorithm	Setup Compression with default Basic algorithm	`compression=all compression_algorith=medium`	Setup Basic compression to reduce dump file size for export, as well as the size of the data stream during import . Requires Database Options license license.
Check AQ_TM_PROCESSES parameter value is not 0	AQ_TM_PROCESSES	Setup `AQ_TM_PROCESSES` parameter value to `null` or greater than `0`.	`AQ_TM_PROCESSES=1`	Zero can reduce advance queue operation.

Recommendation	Parameter	Recommended Value	Default Value	Comments
Use of _OPTIMIZER_GATHER_STATS_ON_LOAD	_OPTIMIZER_GATHER_STATS_ON_LOAD	Ensure _OPTIMIZER_GATHER_STATS_ON_LOAD is not set during the data pump operation. You may set _OPTIMIZER_GATHER_STATS_ON_LOAD=TRUE after the data pump operation is complete.	User Configurable	Analyze hidden parameters from DB.

For more information on Data Pump best practices see Oracle Data Pump Best Practices from *Oracle Database Utilities*.

Upload Migration Tools

Migration Workbench uses Instant Client and the Cloud Premigration Advisor Tool (CPAT) as part of its migration toolkit. Make sure these utilities are uploaded into the Enterprise Manager software library for Database Migration to work successfully on all Data Pump migrations.

> **Note:**
>
> Enterprise Manager automatically downloads the latest version of the tools when setup with either a MOS Proxy or direct internet connection. If these utilities are not available from the Software Library for your operating system you will need to download them manually. This usually occurs when the latest version of the Migration Tools are not compatible with your current version of the Operating System.
> Upload Migration tools are required for Data Pump based migrations only, they are not required for Transportable Tablespace based migrations.

Instant Client

Oracle Instant Client provides the necessary Oracle Database client-side command-line utilities: *SQL*Plus*, *SQL*Loader* and *Oracle Data Pump*. Instant Client simplifies the deployment of applications by eliminating the need for an Oracle home on the client machines, leading to a significantly smaller footprint.

Operation	Tools Used	Comments
Export	`expdp`	This will be used from the source Database home as part of the Lift operation.
Upload	N/A	OCI REST APIS will be used

Operation	Tools Used	Comments
Import	`sqlplus/impdp`	These are required in the destination Database, make sure you have the latest version matching the OCI Database version.

For more information on Instant Client see: Oracle Instant Client. To download *SQL*Plus*, *SQL*Loader* and *Oracle Data Pump* zip files see: Oracle Instant Client Downloads, make sure you download the correct version corresponding to your operating system. To download the zip files, first select your operating system to view the available zip files.
To upload the Migration Tools into Enterprise Manager for a migration see step 3 Migrate Using Database Migration Workbench User Interface in Migrate Using Database Migration Workbench.

Cloud Premigration Advisor Tool (CPAT)

CPAT is a modern robust tool that will give you a detailed analysis of your databases before migration ensuring all possible Failures, Action Requirements, Required and Suggested Reviews are addressed beforehand. To use CPAT you will need Enterprise Manager 13.5 Release 5 Update 4 (13.5.0.4) or higher. Select **Cloud Premigration Advisor Tool** (CPAT), and select to upload from a **Local Machine** (uploaded using browser) or from the **Agent Machine** (Agent uploads the tool). CPAT can be used for on-premise to on-premise migration with Oracle Enterprise Manager 13.5 Release 5 Update 6 (13.5.0.6) or higher.
You can run CPAT by **Creating a Migration Activity** from **Migration Workbench**. You can access this by going to **Enterprise**, then the **Migration and Consolidation** menu and clicking on **Migration Workbench**.

Perform the steps outlined in the Migration Wizard, in the last step press the **Check Migration Readiness** button (but do not submit the migration) to open the Analysis Report will in a new browser window. The report generation may take few minutes to complete.

Do not submit a migration until you are satisfied with the CPAT results. Submitting a migration activity is not required to run and view the CPAT results.

CPAT Utility has the following features, aiding in your migration:

- CPAT helps to determine the suitability of migrating an Oracle database instance to on premise or Cloud database.
- CPAT assess source database instance, checks for potentially problematic content, other factors that could impede a successful migration.
- CPAT pre-migration advisory report categorize results into Failure, Action Required, Review Required, and Review Suggested categories with pass information including severity wise breakdown.
- The overall result of the CPAT advisory report will be the most severe result of all checks performed.

For more information on CPAT see: Cloud Premigration Advisor Tool (CPAT) Analyzes Databases for Suitability of Cloud Migration (Doc ID 2758371.1)

Prerequisites for EM CLI Data Pump Based Database Migration

Before you can begin a Data Pump based database migration with the EM CLI verb `migrate_db` you will need to review, install and configure the following:

- EM CLI Overview and Concepts
- Downloading and Deploying EM CLI

Migration Workbench migrations using EM CLI `migrate_db` verb, use a JSON payload file exclusively.

Validate if Prerequistes are Met

```
emcli migrate_db
-file="/home/migrations/prereqs.json"
```

The JSON file `prereqs.json` contains the following payload:

```
{
    "action": "VALIDATE_PREREQS",
    "type": "DATAPUMP",
    "platform": "linux32|linux_64|windows64|solaris_sparc64|solaris_x64|
aix_ppc64"
}
```

Upload Migration Tools Using EM CLI

```
emcli migrate_db
      -file="/home/migrations/prereqsupload.json"
```

The JSON file `prereqsupload.json` contains the following payload:

```
{
    "action": "UPLOAD_PREREQS",
    "type": "DATAPUMP",
    "hostTarget": "<host-target>",
    "hostTargetCred": "<hostCredName>:<hostCredOwner>",
    "tools": {
             "instantClient": {
         "version": "<DB Version e.g.: 19.16.0.0.0>",
               "platform": "linux32|linux_64|windows64|solaris_sparc64|
solaris_x64|aix_ppc64",
               "files": [
                    "/u01/db/insClients/instantclient-basic-<Operating
System>-<DB Version>dbru.zip",
                    "/u01/db/insClients/instantclient-sqlplus-<Operating
System>-<DB Version>dbru.zip",
                    "/u01/db/insClients/instantclient-tools-<Operating
System>-<DB Version>dbru.zip"
          ]
        },
        "schemaAdvisor":{
            "files":[
                    "/u01/db/tools/install_adb_advisor.sql"
            ]
        }
    }
}
```

> **Note:**
>
> Schema Advisor is currently available for Oracle Enterprise Manager 13 Release 5 Update 3 (13.5.0.3) and below. For Oracle Enterprise Manager 13 Release 5 Update 4 (13.5.0.4) use the CPAT tool noted below.

Upload CPAT Into the Software Library

Starting with Oracle Enterprise Manager 13 Release 5 Update 4 (13.5.0.4) you can use the Cloud Premigration Advisor Tool (CPAT). CPAT is a modern robust tool that will give you a detailed analysis of your databases before migration ensuring all possible Failures, Action Requirements, Required and Suggested Reviews are addressed beforehand.
To upload CPAT execute the following EM CLI command:

```
emcli migrate_db
      -file="/home/migrations/prereqsupload.json"
```

In the JSON file, add the following additional parameter after removing `schemaAdvisor`:

```
{
    "action": "UPLOAD_PREREQS",
    "type": "DATAPUMP",
    "hostTarget": "<hostname>",
    "hostTargetCred": "<host-cred-name>:<cred-owner>",
    "tools": {
        "cpat":{
            "files":[
                    "<Complete file path with zip file>"
            ]
        }
    }
}
```

Perform a CPAT Analysis with EM CLI

The following are examples on how to run CPAT and view a CPAT report using EM CLI

Run the Cloud Premigration Advisor Tool (CPAT)

Before starting a migration it is strongly suggested you run the Cloud Premigration Advisor Tool (CPAT) available from Oracle Enterprise Manager 13 Release 5 Update 4 (13.5.0.4) onward. CPAT is a modern robust tool that will give you a detailed analysis of your databases before migration ensuring all possible Failures, Action Requirements, Required and Suggested Reviews are reported, allowing you to address them before submitting a migration.
To run CPAT in EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/DB_Migration.JSON"
```

Where the file `DB_Migration.JSON` contains the following parameters:

```
{
    "action": "CHECK_MIGRATION_READINESS",
```

```
    "type": "DATAPUMP",
    "srcDatabaseInfo":{
        "targetName":"<source database target name>",
        "targetType":"<source database target type>",
        "dbCredName":"<db-creds-name>:<db-creds-owner>",
        "hostCredName":"<host-creds-name>:<host-creds-owner>"
    },
    "destDatabaseInfo":{
        "targetName":"<destination database target name>",
        "targetType":"<destination database target type>",
        "dbCredName":"<db-creds-name>:<db-creds-owner>",
        "hostCredName":"<host-creds-name>:<host-creds-owner>"
    },
    "schemas":<list of schema names to analyze>,
    "excludeSchemas":<list of schema names to be excluded>,
    "srcStageDir":"<Stage directory on source target>",
    "destStageDir":"<Stage directory on destination target>",
    "targetCloud":"<ATPD|ATPS|ADWD|ADWS|DEFAULT>"
}
```

Note:

- `schemas` and `excludeSchemas` are mutually exclusive. Use only one or the other, depending on your environment's needs.
- `schemas` or `excludeSchemas` need to be included in the JSON for CPAT to properly run.
- `targetCloud` is an optional parameter. If not provided, information is obtained from `destDatabaseInfo` if available. If neither are available it will be set to a DEFAULT value.
- If both `destDataaseInfo` and `targetCloud` are available, `destDatabaseInfo` will be used and overrides `targetCloud`.

View a CPAT Report

To view the CPAT report in EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/DB_Migration.JSON"
```

Where the file `DB_Migration.JSON` contains the following parameters:

```
{
"action": "GET_MIGRATION_READINESS_REPORT",
"executionId":"<DP_Execution_ID>"
}
```

For more information on **migrate_db** and the accepted parameters required for migration, see: migrate_db in *Oracle Enterprise Manager Command Line Interface* .

Prerequisites for REST API Data Pump Based Database Migration

If you are migrating via REST API, part of the specific prerequisites for this method involve reviewing and uploading the Migration Tools. For more information on Migration Tools see: Upload Migration Tools

Validate if Prerequistes are Met

This REST request verifies that the Migration Tools are available within Enterprise Manager.

Feature	Description
Request Method	`POST`
URI	`/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Payload	`{`
	`"action": "VALIDATE_PREREQS",`
	`"type": "DATAPUMP",`
	`"platform": "linux32|linux_64|windows64|solaris_sparc64|solaris_x64|aix_ppc64",`
	`}`

Feature	Description

Response	{
	"statusCode": 200,
	"platform": "linux_64",
	"instantClient": true,
	"customInstantClients": false,
	"schemaAdvisor": true,
	"tools": {
	"instantClient": [
	{
	"platform": "linux32|linux_64|windows64|solaris_sparc64|solaris_x64|aix_ppc64",
	"version": "<DB Version e.g.: 19.16.0.0.0>",
	"available": true,
	"compUrn": "oracle:defaultService:em:provisioning:1:cmp:COMP_Component:SUB_Generic:AFD8D0B13D4E7A7EE053CB98F70AF63B:0.1",
	"compPath": "Database Migration/Tools/linux_64/Instant Client/Default Instant Client",
	"files": [
	"instantclient-sqlplus-<Operating System>-<DB Version>dbru.zip",
	"instantclient-tools-<Operating System>-<DB Version>dbru.zip",
	"instantclient-basic-<Operating System>-<DB Version>dbru.zip"
	],
	"lastModifiedUser": "SYSMAN",
	"uploadSource": "USER",
	"lastModifiedDate": "Sep 21, 2023 07:30:31 PM UTC"
	}
	],
	"schemaAdvisor": [
	{
	"available": true,
	"compUrn": "oracle:defaultService:em:provisioning:1:cmp:COMP_Component:SUB_Generic:AFD8D0B13D547A7EE053CB98F70AF63B:0.1",
	"compPath": "Database Migration/Tools/

Feature	Description
	all_platforms/ADB Schema Advisor/ Default ADB Schema Advisor", "files": ["install_adb_advisor.sql"], "lastModifiedUser": "SYSMAN", "uploadSource": "USER", "lastModifiedDate": "Sep 21, 2023 07:30:32 PM UTC" }] }, "toolsFolders": { "instantClient": "Database Migration/Tools/linux_64/Instant Client", "schemaAdvisor": "Database Migration/Tools/all_platforms/ADB Schema Advisor" }, "scriptsFolder": "Database Migration/User Defined Scripts", "msgs": ["Usage: Valid platforms for Instant Client are: [solaris_sparc64, linux32, windows64, solaris_x64, aix_ppc64, linux_64]", " Multipart form data file type keys are: basicfile, sqlplusfile, toolsfile, and safile"] }

Upload Migration Tools Using REST-API

This REST request will upload the Migration Tools and CPAT before starting a migration. To download the correct Migration Tools see: Upload Migration Tools.

> **Note:**
>
> This API requires the files to be available at a host that is managed by Enterprise Manager. It will pull the files from that host and upload the Enterprise Manager Software Library.

Feature	Description
Request Method	`POST`
URI	`/em/websvcs/restful/db/migration`

Header	`Content-Type: application/json`
	`Authorization: Basic`
	`Connection: keep-alive`

Feature	Description

Payload	{
	"action": "UPLOAD_PREREQS",
	"type": "DATAPUMP",
	"hostTarget": "<host-target>",
	"hostTargetCred": "<hostCredName>:<hostCredOwner>",
	
	"tools": {
	"instantClient": {
	"version": "<DB Version e.g.: 19.16.0.0.0",
	"platform": "linux32|linux_64|windows64|solaris_sparc64|solaris_x64|aix_ppc64",
	"files": [
	"/u01/db/insClients/instantclient-basic-<Operating System>-<DB Version>dbru.zip",
	"/u01/db/insClients/instantclient-sqlplus-<Operating System>-<DB Version>dbru.zip",
	"/u01/db/insClients/instantclient-tools-<Operating System>-<DB Version>dbru.zip"
	]
	},
	"cpat":{
	"files":
	[
	"<Complete file path with zip file>"
	]
	}
	}
	}

Feature	Description

Response	<pre>{
	    "statusCode": 200,
	    "instantClient": true,
	    "schemaAdvisor": false,
	    "cpat": true,
	    "msgs": [
	        "Instant Client files uploaded to URN:
	oracle:defaultService:em:provisioning:1:cmp
	:COMP_Component:SUB_Generic:<GUID>:0.1",
	        "URN Version: 1",
	        "CPAT files uploaded to URN:
	oracle:defaultService:em:provisioning:1:cmp
	:COMP_Component:SUB_Generic:<GUID>:0.1",
	        "URN Version: 1"
	    ]
	}</pre>

> **Note:**
>
> If your Oracle Enterprise Manager version is 13 Release 5 Update 3 (13.5.0.3) or below, CPAT is not available. You will need to use Schema Advisor instead.

Perform a CPAT Analysis with REST API

The following is sample code to perform a CPAT analysis with REST API. To run the CPAT advisor Enterprise Manager 13 Release 5 update 5 (13.5.0.4) and above is required.

Run the Cloud Premigration Advisor Tool (CPAT)

Before starting a migration it is strongly suggested you run the Cloud Premigration Advisor Tool (CPAT) available from Oracle Enterprise Manager 13 Release 5 Update 4 (13.5.0.4) onward. CPAT is a modern robust tool that will give you a detailed analysis of your databases before migration ensuring all possible Failures, Action Requirements, Required and Suggested Reviews are reported, allowing you to address them before submitting a migration.
Use this REST call to enter the migration parameters:

Feature	Description
Request Method	POST
URI	<pre>/em/websvcs/restful/db/migration</pre>

Header	<pre>Content-Type: application/json
	Authorization: Basic</pre>

Feature	Description

Payload	{
	"action":
	"CHECK_MIGRATION_READINESS",
	"type": "DATAPUMP",
	"srcDatabaseInfo":{
	"targetName":"<source
	database target name>",
	"targetType":"<source
	database target type>",
	"dbCredName":"<db-creds-
	name>:<db-creds-owner>",
	"hostCredName":"<host-creds-
	name>:<host-creds-owner>"
	},
	"destDatabaseInfo":{
	"targetName":"<destination
	database target name>",
	"targetType":"<destination
	database target type>",
	"dbCredName":"<db-creds-
	name>:<db-creds-owner>",
	"hostCredName":"<host-creds-
	name>:<host-creds-owner>"
	},
	"schemas":<list of schema names
	to analyze>,
	"excludeSchemas":<list of schema
	names to be excluded>,
	"srcStageDir":"<Stage directory
	on source target>",
	"destStageDir":"<Stage directory
	on destination target>",
	"targetCloud":"<ATPD|ATPS|ADWD|
	ADWS|DEFAULT>"
	}

Response	{
	"statusCode": 200,
	"status": "SUCCESS",
	"message": "....",
	"submissionName": ".....",
	"submissionBy": "SYSMAN",
	"submissionId": "<Unique Submission
	ID>",
	"executionId": "<Unique Execution ID>",
	"uiActivityUrl": "/em/faces/core-jobs-
	procedureExecutionTracking?
	executionGUID=<Submission ID>",
	"restActivityUrl": "/em/websvcs/
	restful/db/migration/activities/
	<Submission ID>"
	}

> **Note:**
>
> - `schemas` and `excludeSchemas` are mutually exclusive. Use only one or the other, depending on your environment's needs.
> - If neither `schemas` or `excludeSchemas` are included in the JSON, CPAT will not run in full mode.
> - `targetCloud` is an optional parameter. If not provided, information is obtained from `destDatabaseInfo` if available. If neither are available it will be set to a DEFAULT value.
> - If both `destDataaseInfo` and `targetCloud` are available, `destDatabaseInfo` will be used and overrides `targetCloud`.

View a CPAT Report

Feature	Description
Request Method	Post
URI	`/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Payload	`{`
	`"action":`
	`"GET_MIGRATION_READINESS_REPORT",`
	`"executionId":"<DP_Execution_ID>"`
	`}`

Response	`{`
	`"statusCode": 200,`
	`"status": "SUCCESS",`
	`"message": "....",`
	`"submissionName": ".....",`
	`"submissionBy": "SYSMAN",`
	`"submissionId": "<Unique Submission ID>",`
	`"executionId": "<Unique Execution ID>",`
	`"uiActivityUrl": "/em/faces/core-jobs-procedureExecutionTracking?executionGUID=<Submission ID>",`
	`"restActivityUrl": "/em/websvcs/restful/db/migration/activities/<Submission ID>"`
	`}`

Transportable Tablespace Based Migration Prerequistes

The following is a list of prerequisites needed for a Transportable Tablespace based migration.

Prerequisite	Description
Software Library Configuration	The Software Library should be configured in EM and the EM user should have the following privileges assigned: `SWLIB_VIEW_ANY_ENTITY`, `SWLIB_CREATE_ANY_ENTITY`.
Source Database	The source database should be open in Read-Write mode and in `ARCHIVELOG` mode.
OS Authentication	OS Authentication must be enabled at both source and destination.
Working Directory	The source and destination working directories should be present and have read-write permissions. The destination directory should also have sufficient disk space to stage the backup.
Source Tablespace	• `SYS`, `SYSAUX` and `TEMP` tablespaces are not allowed. • The tablespace type should be permanent. • The tablespace should be in Read-Write mode. • Tablespace Datafiles should be online.
Compatibility	• The source database version should be lower or equal to that of the destination. • The character set of source should be supported by destination. • The timezones of source and destination databases should be same.
Source Tablespace	Ensure there are no logical or physical dependencies between the database objects in the transportable set and the database objects outside of the transportable set. Only self-contained tablespaces can be transported.
Source Database	The Source Database should always be Primary. Standby Database is currently not supported.
Working Directory	In case, Source or Destination being RAC then Working directory should be a shared location across all the nodes of RAC

Perform a Migration Readiness Check with EM CLI

The following is sample code to perform a Migration Readiness Check with EM CLI on a Transportable Tablespace (TTS) based migration. To run the Migration Readiness Check Enterprise Manager 13 Release 5 update 15 (13.5.0.15) and above is required.

Run the TTS Migration Readiness Check Tool

Before starting a TTS based migration it is strongly suggested you run the Migration Readiness Check Tool for TTS based migrations available from Oracle Enterprise Manager 13 Release 5 Update 15 (13.5.0.15) onward. This is a modern robust tool that will give you a detailed analysis of your databases before migration ensuring all possible Failures, Action Requirements, Required and Suggested Reviews are addressed beforehand.

To run the Migration Readiness Check in EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/DB_Migration.JSON"
```

Where the file `DB_Migration.JSON` contains the following parameters:

```
{
    "action": "CHECK_MIGRATION_READINESS",
    "type": "ONLINE_TTS",
    "srcDatabaseInfo":

    {
        "targetName": "SRCDB",
        "targetType": "oracle_database",
        "dbCredName": "SYS_SRC:EM_ADMIN1",
        "hostCredName": "HOST_SRC:EM_ADMIN1"
    },
    "destDatabaseInfo":
    {
        "targetName": "DESTDB",
        "targetType": "oracle_database",
        "dbCredName": "SYS_DEST:EM_ADMIN1",
        "hostCredName": "HOST_DEST:ADMIN1"
    }
}
```

View the Migration Readiness Report

To view the Migration Readiness report in EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/DB_Migration.JSON"
```

Where the file `DB_Migration.JSON` contains the following parameters:

```
{
"action": "GET_MIGRATION_READINESS_REPORT",
"executionId":"<DP_Execution_ID>"
}
```

For more information on **migrate_db** and the accepted parameters required for migration, see: migrate_db in *Oracle Enterprise Manager Command Line Interface* .

Perform a Migration Readiness Check with REST API

The following is sample code to perform a Migration Readiness Check with REST API on a Transportable Tablespace (TTS) based migration. To run the Migration Readiness Check Enterprise Manager 13 Release 5 update 15 (13.5.0.15) and above is required.

Run the Migration Readiness Check Tool

Before starting a TTS based migration it is strongly suggested you run the Migration Readiness Check Tool for TTS migrations is available from Oracle Enterprise Manager 13 Release 5

Update 15 (13.5.0.15) onward. This is a modern in house robust tool that will give you a detailed analysis of your databases before migration ensuring all possible Failures, Action Requirements, Required and Suggested Reviews are addressed beforehand. Use this REST call to enter the migration parameters:

Feature	Description
Request Method	POST
URI	`/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Payload	`{`
	`"action": "CHECK_MIGRATION_READINESS",`
	`"type": "ONLINE_TTS",`
	`"srcDatabaseInfo":`
	`{`
	`"targetName": "SRCDB",`
	`"targetType": "oracle_database",`
	`"dbCredName": "SYS_SRC:EM_ADMIN1",`
	`"hostCredName": "HOST_SRC:EM_ADMIN1"`
	`},`
	`"destDatabaseInfo":`
	`{`
	`"targetName": "DESTDB",`
	`"targetType": "oracle_database",`
	`"dbCredName": "SYS_DEST:EM_ADMIN1",`
	`"hostCredName": "HOST_DEST:ADMIN1"`
	`}`
	`}`

Feature	Description

Response	<pre>{
	"statusCode": 200,
	"status": "SUCCESS",
	"message": "....",
	"submissionName": ".....",
	"submissionBy": "SYSMAN",
	"submissionId": "<Unique Submission ID>",
	"executionId": "<Unique Execution ID>",
	"uiActivityUrl": "/em/faces/core-jobs-procedureExecutionTracking?executionGUID=<Submission ID>",
	"restActivityUrl": "/em/websvcs/restful/db/migration/activities/<Submission ID>"
	}</pre>

View the Migration Readiness Report

Feature	Description
Request Method	Post
URI	<pre>/em/websvcs/restful/db/migration</pre>

Header	<pre>Content-Type: application/json
	Authorization: Basic</pre>

Payload	<pre>{
	"action":
	"GET_MIGRATION_READINESS_REPORT",
	"executionId":"<DP_Execution_ID>"
	}</pre>

Feature	Description

Response	{
	"statusCode": 200,
	"status": "SUCCESS",
	"message": "....",
	"submissionName": ".....",
	"submissionBy": "SYSMAN",
	"submissionId": "<Unique Submission ID>",
	"executionId": "<Unique Execution ID>",
	"uiActivityUrl": "/em/faces/core-jobs-procedureExecutionTracking?executionGUID=<Submission ID>",
	"restActivityUrl": "/em/websvcs/restful/db/migration/activities/<Submission ID>"
	}

Analyze Migration Activities

Database Migration Workbench offers robust tools for monitoring and troubleshooting your recently complete migrations. Database Migration Workbench also offers clean up tools that aid in recovering important disk space from dump files.

The section covers the following topics

- Database Migration Activities Dashboard Screen
- Analyze Migrated Database Performance
- Review Migration Status and Complete Migration
- Clean Up Migration Files
- Troubleshoot the Migration Process

Database Migration Activities Dashboard Screen

In the main **Database Migration** screen you are presented with the latest **Migration Activities** information:

- **All**: Migrations occurred in the last 24 hours (default), 7 days or all.
- **Completed**: Completed migrations in the last 24 hours
- **In Progress**: Migrations currently in progress
- **Problem**: Migrations that encountered problems in the last 24 hours
- **Scheduled**: Migrations scheduled to occur in the next 24 hours
- **Warnings**: Migrations that completed with warnings in the last 24 hours

> **Note:**
>
> You can modify the dashboard views by selecting the time range in View Data to **7 Days** or **All** on the top right corner of the dashboard.

The **Migration Activity** table, lists detailed information for each specific migration including Activity, Status, Source, Destination, Start, End, Elapsed Time and Owner.

Clicking on the right hand menu specific to each Activity, you can perform the following operations:

- **Cleanup**: Deletes the dump files created during the migration from the Data Pump directory and Object Storage. For more information on Cleanup see: Clean Up Migration Files.

> **Note:**
>
> The Cleanup activity will not remove, cancel, rollback or stop an ongoing migration.

- **View Details**: Takes you to a new screen with specific details for the selected Activity. You can see specific steps and results for each step in this view.
- **View Analysis**: Takes you to a new screen with Input Validation, Pre-migration and Post-migration analysis dashboards with detailed information allowing you to drill down to specific validations and schema to best analyze performance for your migrated database.
  - Input Validation: Carries out pre-check validations for the source and destination databases, login, database status, disk space, and privileges. Validation are carried out during the input or run-time stage of every migration job submitted and display severity-wise results. Database administrators can then take action on all issues reported by the Validation report.
    Once all issues reported by the Input Validation are resolved, click **Submit** to migrate.
  - Pre-migration Analysis: Performs an analysis of the source database with severity-wise result breakdown. Each result includes a recommendation and action item to be performed to fix the issue detected. The table below shows a breakdown of severity and required action on your part.
  - Post-migration Analysis: Performs a comparison of the source database and migrated database object and lists a detailed analysis with a severity wise result breakdown. Post migration analysis checks if any scheduled DBMS or CRON jobs need to be rescheduled, object counts and status, object record counts, character set, time zone, and size of database. All elements that need to be validated by a database administrator prior to the database being released to for testing.

Table 3-1 View Analysis Results Severity Breakdown

Severity Level	Action
Failed	The source and destination databases selected are not compatible or suitable for migration and need to be changed or the particular validation could not be completed due to internal errors.
Action Required	Validation failed, review and take action to resolve the issue. The migration will fail if the issue is not corrected before submission.
Review Required	Warning message, review and if necessary take action to correct. Migration may be impacted.
Review Suggested	Informational message, read and review.
Passed	Validation succeeded, you can proceed with the migration.

- **View Performance**: In this screen you can compare database performance from both the source database and the destination database with the SPA report. For more information see: Analyze Migrated Database Performance

> **Note:**
>
> For ADB and ATP migrations, an additional **Compare Performance** option will be shown with a second HTML based report, this is due to system constraints.

- **Mark as Complete**: Migration activities that encounter warnings are reported with Status **Completed with Errors**, you can review and can mark the migration as **Completed**. For more information see: Review Migration Status and Complete Migration

Analyze Migrated Database Performance

Migrating a database can change the execution plans of SQL statements improving performance. Migrating to Oracle Cloud changes the platform on which database workloads are running. Oracle Cloud Infrastructure provides a high performing platform to run a database workload.

SQL Performance Analyzer (SPA): Automates the process of assessing the overall effect of a change on the SQL workload by identifying performance divergence for each SQL statement. A report that shows the net impact on workload performance due to the change is provided. For regressed SQL statements, SQL Performance Analyzer also provides appropriate executions plan details along with tuning recommendations. As a result, you can remedy any negative outcome before the end-users are affected. Furthermore, you can validate—with time and cost savings—that migration will result in net improvement.

> **Note:**
>
> - When running SPA make sure to export your schema as it is needed to stage the tuning set. Failure to do so will generate an error while performing validations.
> - SPA is not applicable for Metadata only migrations using Data Pump.

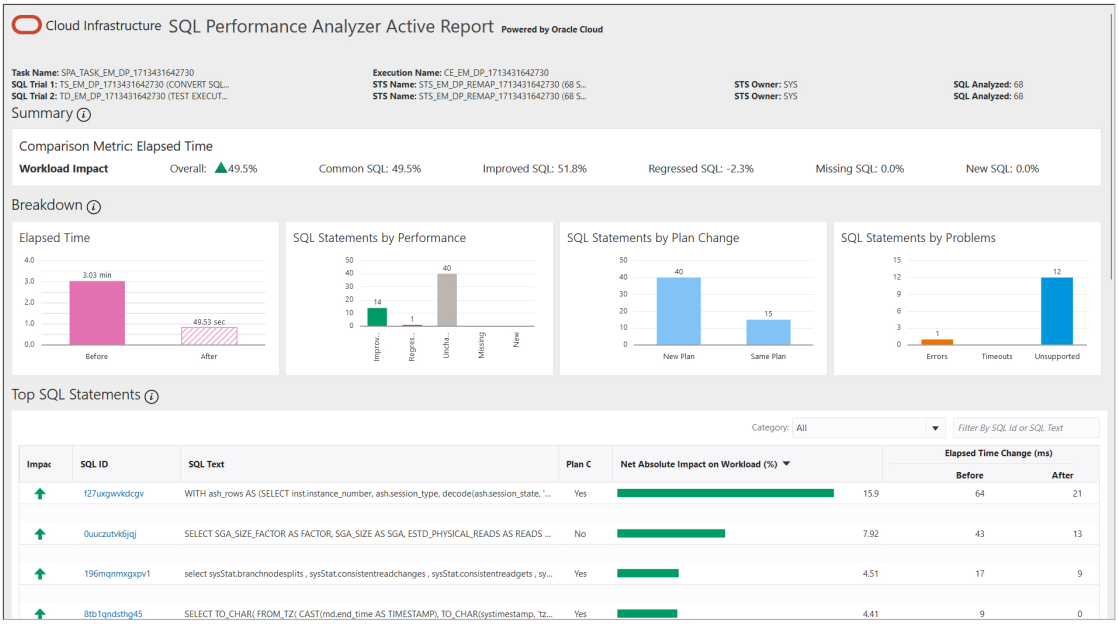
An **SQL Tuning Set (STS)** containing the SQL and relevant execution metadata from the source database can be passed to the migration procedure. A SPA task will be created which can then be used to compare the change in SQL Performance due to migration.

Should you need to use out-of-the-box performance management provided by the Autonomous Databases, Database Migration Workbench provides an option to verify performance by disabling indexes. You can then choose to disable indexes and let the Autonomous Database handle performance tuning. For more information see: Managing Auto Indexes in *Oracle Database Administrator's Guide* .

View a SPA Report

Follow these steps to view a SPA report of a specific migration with Database Migration Workbench:

> **Note:**
>
> When opening a SPA report you may be prompted to log in to the destination database, if you have not done so previously.



1. Navigate to the Migration Activities Dashboard.
2. Locate a recently completed Migration Activity you wish to review within the Migration Activity table.
3. Click on the **Action Menu** located at the far left of the specific Migration Activity you want to analyze and click on **View Performance**, this will open the SPA Report.
4. In the SPA report you can verify the following:
   - Compare elapsed time by workload impact, allowing you to review the overall time, improved, regressed, missing and new SQL statements.
   - Within the Breakdown you can review elapsed time, SQL statements by performance, SQL statements by plan change, and SQL statements by problems.
   - Additionaly the report shows a listing of SQL statements by workload impacts

   .

View a Migration Analysis

Follow these steps to view an analysis of a specific migration with Database Migration Workbench:

1. Navigate to the Migration Activities Dashboard.
2. Locate a recently completed Migration Activity you wish to review within the Migration Activity table.
3. Click on the **Action Menu** located at the far left of the specific Migration Activity you want to analyze and click on **View Analysis**.
4. In the View Analysis dashboard screen you can analyze the results from the three main steps:

- **Validation**: Shows the results of the pre-migration checks.
- **Export** (data pump only): Shows the amount of successfully and unsuccessfully exported database objects.
- **Import** (data pump only): Shows the amount of successfully and unsuccessfully imported database objects.

Underneath the analysis dashboards you can further drill down and analyze in detail each database object's performance and errors during the migration by selecting clicking on **Validation**, **Export** and **Import**.

View SQL Performance Using REST API

Obtain the SPA Report Using REST API

> **Note:**
>
> When viewing SQL performance for a TTS multi-phase migration using REST API, the execution ID to be used in the input payload should be that of the final *complete migration* step.

Feature	Description
Request Method	POST
URI	`https://hostname:port/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Payload	`{`
	`"action": "SPA_REPORT",`
	`"executionId": "9F26EECBE89B5E9FE053356A580A2CDA",`
	`"reportType": "html",`
	`"reportLevel": "typical",`
	`"reportSection": "ALL"`
	`}`

Feature	Description
Response	{"report": "<html> <head> <title> SQL Performance Impact Analyzer Report </ title> <style type=\"text/css\"> body, table, input, select, textarea {font:normal normal 8pt Verdana,Arial;text-decoration:none;color:#000000;} .s8 {font-size:8pt;color:#006699} .s9 {font-size:10pt;color:#006699} .s10 {font-size:14pt;color:#006699;} .s16 {border-width : 1px; border-color : #CCCC99; border-style: solid;color:#006699;font-size:8pt;} .s17 {border-width : 1px; border-color : #CCCC99; border-style: solid;font-size:8pt;} .s27 {border-width : 1px; border-color : #CCCC99; border-style: solid;} </ style> </head> <body> <a name=\"general\"/> General Information .... }

Run SQL Performance Analyzer Using EM CLI

The following is an example on how to run SQL Performance Analytics (SPA) on EM CLI.

Run SPA Using EM CLI

To run SPA using EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/DB_SPA.JSON"
```

Where the file `DB_SPA.JSON` contains the following parameters:

```
"analyzePerformance":
{
    "useSPA": true,
    "createSTS": true,
    “usePreferredSTS”:  false –optional
    “stsName”: “stsname01”  –optional
    “stsOwner”: “stsOwnedSchema”  –optional
    "stsOwner": "EXPUSER" --optional
}
```

View SPA Report Using EM CLI

To view SPA report using EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/DB_SPA.JSON"
```

Where the file `DB_SPA.JSON` contains the following parameters:

> **Note:**
>
> When viewing SQL performance for a TTS multi-phase migration using EMCLI, the execution ID to be used in the input JSON file should be that of the final *complete migration* step.

```
{
    "action": "SPA_REPORT",
    "executionId": "<ID>",
    "reportType": "html",
    "reportLevel": "typical",
    "reportSection": "ALL"
}
```

For more information on **migrate_db** and the accepted parameters required for migration, see: migrate_db in *Oracle Enterprise Manager Command Line Interface* .

Analyze a Migration Activity Using REST API

You can review the migration analysis for a recent Migration Workbench activity using REST API, see the sample file below.

Feature	Description
Request Method	POST
URI	`https://hostname:port/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Payload	`{`
	`"action": "ANALYZE_ACTIVITY",`
	`"executionId": "<DP execution ID>"`
	`}`

Feature	Description

Response	{
	"validationResults": {...},
	"exportResults": {...},
	"importResults": {...},
	"status": "Succeeded",
	"migrationMethod": <DATAPUMP/ONLINE_TTS>
	}

Analyze a Migration Activity Using EM CLI

You can review the migration analysis for a recent Migration Workbench activity using EM CLI.

Migration Analysis Using EM CLI

To run a Migration Workbench Analysis using EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/DB_ANALYZE.JSON"
```

Where the file `DB_SPA.JSON` contains the following parameters:

```
{
    "action": "ANALYZE_ACTIVITY",
    "executionId": "<DP execution ID>"
}
```

For more information on **migrate_db** and the accepted parameters required for migration, see: migrate_db in *Oracle Enterprise Manager Command Line Interface* .

Review Migration Status and Complete Migration

As part of the *Analyze* section of the Database Migration work cycle, you can review completed migrations to verify any errors or warnings. When satisfied with the migration results you can also mark migrations as Complete.

Follow these steps to review errors and warnings that might have come up during a migration using the Database Migration Workbench:

1. Navigate to the Migration Activities Dashboard.
2. Locate a recently completed Migration Activity you wish to review within the Migration Activity table. You can further filter migration activities by clicking on the different Migration Activities statuses:
   - **All**: Shows all migrations including scheduled and in progress migrations.
   - **Completed**: Shows all migrations that successfully completed. These will be marked as completed.
   - **Problems**: Shows migrations that completed with errors.
   - **Warnings**: Shows migrations that completed with warnings.

3. On the Migration Activities Dashboard click on the left hand navigation menu specific to the reviewed activity, click **View Details** to review procedure details, analyze migration details and compare performance. Once you are satisfied that all warnings/errors reported are addressed return to the previous screen.
4. On the Migration Activities Dashboard click on the left hand navigation menu specific to the reviewed activity, select **Mark as Completed** enter a comment in the pop up and click **Yes**. The *Status* of the Migration Activity will now show a blue check mark.

> **Note:**
>
> To reverse a status of a migration appearing as Completed, click on the Migration Activities Dashboard click on the left hand navigation menu specific to the reviewed activity and select **Revert Status**.

Review Migration Status Using REST API

As part of the *Analyze* section of the Database Migration work cycle, you can review, and mark as Complete, completed migrations to verify any errors or warnings.

> **Note:**
>
> `POST` can be used if user wants the OMS to pull the files from the Host. The Host needs to be discovered in Enterprise Manager.

Table 3-2 Review all Migration Activites

Feature	Description
Request Method	Post
URI	`/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Table 3-2 (Cont.) Review all Migration Activites

Feature	Description

Payload	<pre>{
	"action": "LIST_ACTIVITIES",
	"targetName": "<Source target/ Destination database>",
	"targetType": "<Target type of the database>"
	"filters": {
	"activityStatus": "ALL | IN_PROGRESS | PROBLEM | SCHEDULED | COMPLETED"
	"timePeriod": "<startTimestamp>", "<endTimestamp>"
	}
	}</pre>

Table 3-2 (Cont.) Review all Migration Activites

Feature	Description

Response	<pre>}
	"statusCode": 200,
	"activities": [
	{
	"instanceGuid":
	"B07C1E3035C725F5E0538052F20A290C",
	"executionGuid":
	"B07C1E3035CA25F5E0538052F20A290C",
	"lastUpdated": 1601418294000,
	"sourceTargetType":
	"sample_pdb",
	"sourceTargetName":
	"CDBSample.example.com_DB2",
	"destTargetType":
	"oracle_cloud_atp",
	"destTargetName":
	"ATPD_USER",
	"createdBy": "SYSMAN",
	"instanceName": "Database
	Migration Tue Sep 29 2020 14:34:38
	PDT",
	"elapsedTime": "4 minutes,
	57 seconds",
	"status": {
	"code": 9,
	"displayName": "Completed
	(with errors)",
	"name":
	"COMPLETED_WITH_ERRORS"
	},
	"completed": 1601418294000,
	"sourceDisplayName":
	"CDBSample.example.com_DB2",
	"destDisplayName":
	"ATPD_USER",
	"hasChildActivities": true,
	"started": 1601417997000,
	"action": "MIGRATE"
	} ......
	],
	"summary": {
	"all": 3,
	"in_progress": 0,
	"problem": 0,
	"scheduled": 0,
	"warning": 2,
	"completed": 1</pre>

Table 3-2 (Cont.) Review all Migration Activites

Feature	Description
	} }

Table 3-3 Review a Specific Migration Activity

Feature	Description
Request Method	Post
URI	`/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Payload	`{`
	`"action": "VALIDATION_RESULTS",`
	`"executionId": "<Execution_ID>"`
	`}`

Response	The generated **Response** will be a summary of the specific Migration Activity giving you a status of `Failed`, `Completed with Errors` or `Completed` and the specific details for each step.

Table 3-4 Complete a Migration Activity

Feature	Description
Request Method	Post
URI	`/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Table 3-4 (Cont.) Complete a Migration Activity

Feature	Description

Payload	{
	"action":
	"MARK_ACTIVITY_AS_COMPLETED",
	"executionGuid":
	"<activity_execution_GUID>",
	
	"comment":"<optional_user_comment>",
	}

Response	{
	"statusCode": 200,
	"status": "SUCCESS",
	"statusMessage": "Marked
	activity as completed",
	"submissionBy": "SYSMAN"
	}

Table 3-5 Revert Status for a Migration Activity

Feature	Description
Request Method	Post
URI	/em/websvcs/restful/db/migration
Header	Content-Type: application/json Authorization: Basic

Payload	{
	"action":
	"MARK_ACTIVITY_AS_COMPLETED",
	"executionGuid":
	"<activity_execution_GUID>",
	"comment":
	"<optional_user_comment>",
	"revertStatusChange": "true"
	}

Table 3-5 (Cont.) Revert Status for a Migration Activity

Feature	Description

Response	<pre>{
	"statusCode": 200,
	"status": "SUCCESS",
	"statusMessage": "Reverted activity status to 'Completed with Errors'",
	"submissionBy": "SYSMAN"
	}</pre>

Review Migration Status Using EM CLI

As part of the *Analyze* section of the Database Migration work cycle, you can review completed migrations to verify any errors or warnings. To review migrations with EM CLI use the following:

Review Migration Status

To view the status of a migration in EMCLI use the following command:

```
emcli migrate_db
-file="/home/migrations/Analyze_Migration.json"
```

Where the `Analyze_Migration` file contains the following JSON payload format to review a list of activities:

```
{
    "action": "LIST_ACTIVITIES",
    "targetName": "<Source target/Destination database>",
    "targetType": "<Target type of the database>"
    "filters": {
        "activityStatus": "ALL | IN_PROGRESS | PROBLEM | SCHEDULED |
COMPLETED"
        "timePeriod": "<startTimestamp>", "<endTimestamp>"
    }
}
```

Or where the `Analyze_Migration` file contains the following JSON payload format to review a specific activity:

```
{
    "action": "VALIDATION_RESULTS",
    "executionId": "<Execution_ID>"
}
```

Mark a Migration Activity as Complete and Revert Status

To mark a migration activity that was labelled as *Completed With Errors* to *Complete* after reviewing, use the following EM CLI command:

```
emcli migrate_db
-file="/home/migrations/Complete_Migration.json"
```

Where the `Complete_Migration` file contains the following JSON payload format to mark a migration as *Complete*:

```
{
    "action": "MARK_ACTIVITY_AS_COMPLETED",
    "executionGuid": "<activity_execution_GUID>",
    "comment":"<optional_user_comment>",
}
```

Should a revert of the migration status be required, a Completed migration can be reverted to *Completed With Errors* the following JSON payload format can be used:

```
{
    "action": "MARK_ACTIVITY_AS_COMPLETED",
    "executionGuid": "<activity_execution_GUID>",
    "comment": "<optional_user_comment>",
    "revertStatusChange": "true"
}
```

Clean Up Migration Files

As part of the *Analyze* section of the Database Migration work cycle, you can clean up dump files with ease in the Database Migration Workbench. The Cleanup operation will identify the exported dump files for the migration activity and delete them from the Dump Directory where they were exported and the Object Storage where they were uploaded. The cleanup operation can be used to remove dump files for completed or failed database migrations.

Clean Up can be used to clean up files and Data Pump master table after a failure or after success. We recommend you analyse the results of the migration before taking this action.

> **Note:**
>
> Cleanup will not rollback the destination database or drop the PDB (if a new PDB was created) at this time.

Clean Up Using the Database Migration Workbench

Follow these steps to cleanup database dump files after a migration with the Database Migration Workbench:

1. To begin cleanup, navigate to the Migration Activities Dashboard.
2. Locate the specific Migration Activity to be cleaned up within the Migration Activity table.

3. Click on the left hand hamburger menu specific to the activity, select **Cleanup** and click on **Yes**.

Cleanup will now run, identifying the exported dump files for the selected Migration Activity and delete them from the export Dump Directory and the upload Object Storage.

> **Note:**
>
> The Cleanup activity will not remove, cancel, rollback or stop an ongoing migration.

Perform Migration Activity Cleanup Using REST API

After a migration has successfully completed it is recommended you run a Cleanup operation to free resources in your environment.

Feature	Description
Request Method	`POST`
URI	`https://hostname:port/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Payload	`{`
	`"action": "CLEANUP_ACTIVITY",`
	`"executionId": "<Execution Id>"`
	`}`

Feature	Description

Response	{
	"statusCode": 200,
	"status": "SUCCESS",
	"message": "Successfully submitted the requested activity: Cleanup Database Migration",
	"validations": {
	"resultsList": [],
	"result": false
	},
	"submissionName": "Cleanup Database Migration Tue Aug 10 2021 06:09:01 UTC",
	"submissionBy": "SYSMAN",
	"submissionId": "C92F546493DC1569E0538F0B4B6409E9",
	"executionId": "C92F546493DF1569E0538F0B4B6409E9",
	"restActivityUrl": "/em/websvcs/restful/db/migration/activities/C92F546493DF1569E0538F0B4B6409E9",
	"uiActivityUrl": "/em/faces/core-jobs-procedureExecutionTracking?executionGUID=C92F546493DF1569E0538F0B4B6409E9"
	}

Perform Migration Activity Cleanup Using EM CLI

After a migration has successfully completed it is recommended you run a Cleanup operation to free resources in your environment.

Cleanp Using EM CLI

To perform a cleanup after a migration with EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/DB_Migration.JSON"
```

Where the file `DB_Migration.JSON` contains the following parameters:

```
{
"action": "CLEANUP_ACTIVITY",
"executionId": "<Execution Id>"
}
```

For more information on **migrate_db** and the accepted parameters required for migration, see: migrate_db in *Oracle Enterprise Manager Command Line Interface* .

Troubleshoot the Migration Process

Database Migration Workbench reviews and informs at several steps during the process that all prerequisites, requirements, databases, and schema are met, available, and ready. Should

an issue or error come up during the Database Migration Workbench process this section can help you troubleshoot your migration.

The following table is a list of the most common migration issues and potential solutions:

Issue	Reason	Category	Workaround	Database Version
Upload dump file step generates error because the agent is down.	The agent may have run out of memory. Review the log files.	EM Agent	You can update the degree of parallelism within the failed step to a lower number and retry. Pending files will upload.	All versions
Creation of Table Space fails at destination Autonomous Database	Autonomous Databases do not allow Table Space creation with small Data Files	ADB	Create a tablespace at the destination ADB with a large data file and specify `remap_tablespace`.	All versions
Creation of schema fails at destination ADB	The user profile does not get created at the destination ADB, causing schema creation failure. Data Pump does not export Profiles when not run in `Full` Mode.	ADB	Pre-create profile at the ADB, or use `remap_schema`. Example: `remap_schema=<op_source>:<op_target>`	All versions
Export failed because of error: `DETERMINE_FATAL_ERROR with ORA-20005: object statistics are locked (stattype = ALL)`	Tables used for statistic gathering are blocked.	Data Pump	Unlock the tables for statistics using the command: `SQL> exec dbms_stats.unlock_table_stats('owner', 'tablename');` To get a list of tables that are locked you can execute: `SQL> select owner,table_name,STATTYPE_LOCKED from dba_tab_statistics where STATTYPE_LOCKED = 'ALL'`	All versions

Issue	Reason	Category	Workaround	Database Version
Data remapped to the USERS table space might not get imported.	USERS table space is missing at the destination database.	On Premise Migration	Create the USERS table space and retry. Alternative solution is to remap to an existing available table space that can replace USERS.	All versions
While moving the data to a new Pluggable Database (PDB), the data remapped to USERS tables pace might not get imported.	USERS table space failed to create in the new PDB.	Migration into a new PDB.	Remap to a SYSTEM table space with some caveats or select an existing PDB.	All versions

Migrate Databases with Migration Workbench

Databases can be migrated using the Migration Workbench user interface, REST API or EM CLI. See the following links for specific instructions on each:

- Migrate Using Database Migration Workbench User Interface
- Migrate via REST API
- Migrate via EM CLI

Migrate Using Database Migration Workbench User Interface

Migrating Databases with Database Migration Workbench user interface is a simple intuitive process that will guide you through setting up and moving your on-premises databases to different Oracle database solutions.

To begin a database migration using Database Migration Workbench, first review the Migration Workbench Prerequisites.

> **Note:**
>
> Underneath **Data Migration**, click on the arrow next to **Getting Started** to see the flow diagram for Database Migration Workbench.

The following type of migration activities are available in Enterprise Manager Migration Workbench:

- **Full Database:** Migrates the entire database from on premise to on premises, PDB or Oracle Cloud. For step by step instructions see: Migrate a Full Database.
- **Schema**: Migrates only the schema, this is recommended as a starting point when migrating with Migration Workbench to ensure proper migration when performing a Full Database migration. For step by step instructions see: Migrate Selected Schema.

- **Transportable Tablespace**: Moves database tablespaces to either a newly created or existing PDB, providing minimum downtime. For step by step instructions see: Migrate Using Transportable Tablespace.

> **Note:**
>
> Transportable Tablespace from the Migration Workbench user interface is available starting with Oracle Enterprise Manager 13 Release 5 Update 5 (13.5.0.5).

Migrate Using Data Pump

Data Pump provides an Export and Import way of moving data and metadata from one database to another. The following is a list of available migrations using Data Pump.

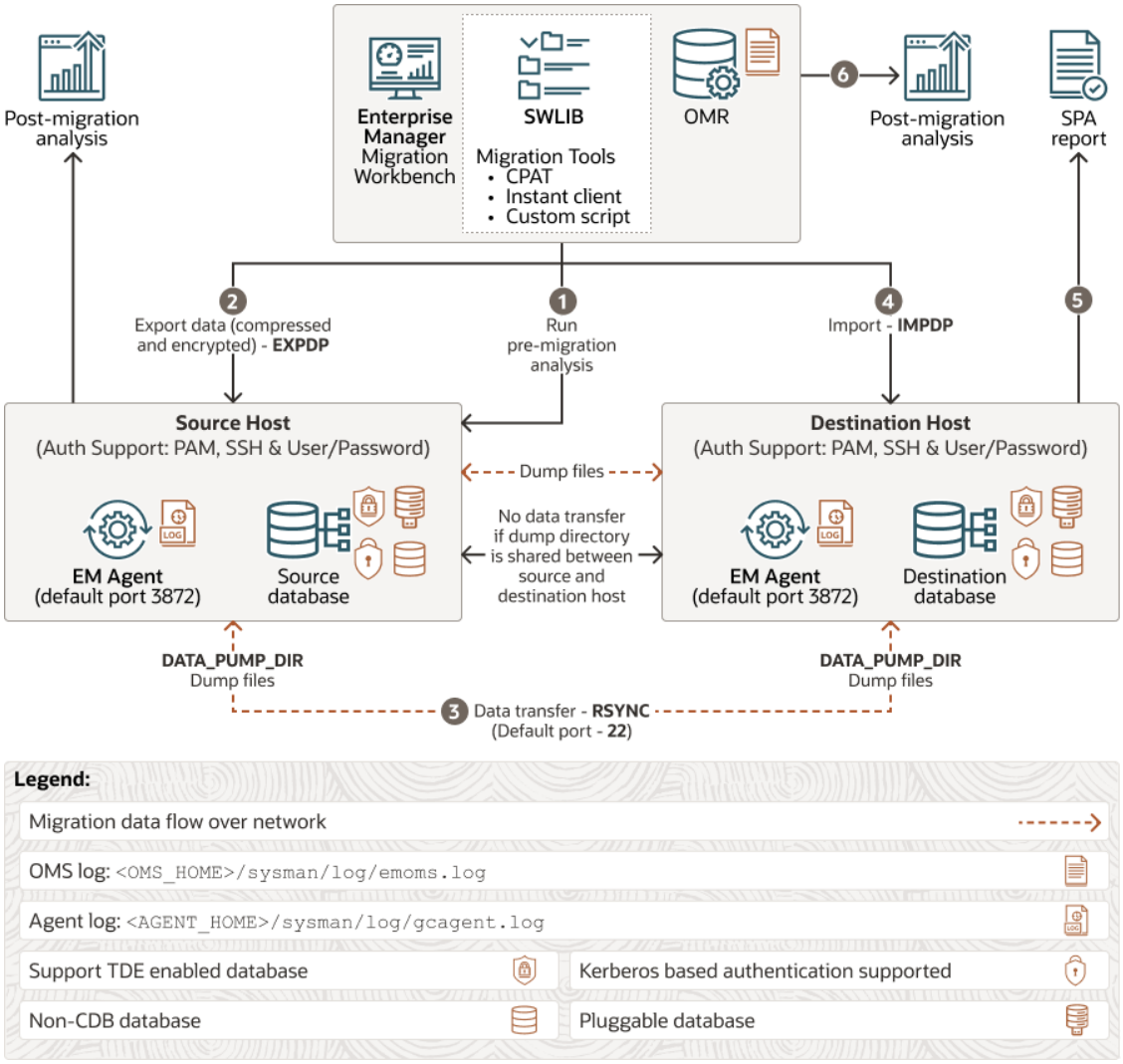
- Migrate a Full Database
- Migrate Selected Schema

> **Note:**
>
> Oracle Enterprise Manager's Migration Workbench now supports authentication using **Database Kerberos** Credentials and **Database Kerberos Keytab** Credentials with Data Pump migrations. Microsoft Active Directory users can be exclusively mapped to a database account and authenticated with a Kerberos password or a Keytab file without password and human interaction. If these are configured they will appear from the credential drop down menu.

Data Pump Migration for a Single Instance Database

The following is a complete diagram for a single instance database performing a Data Pump migration:

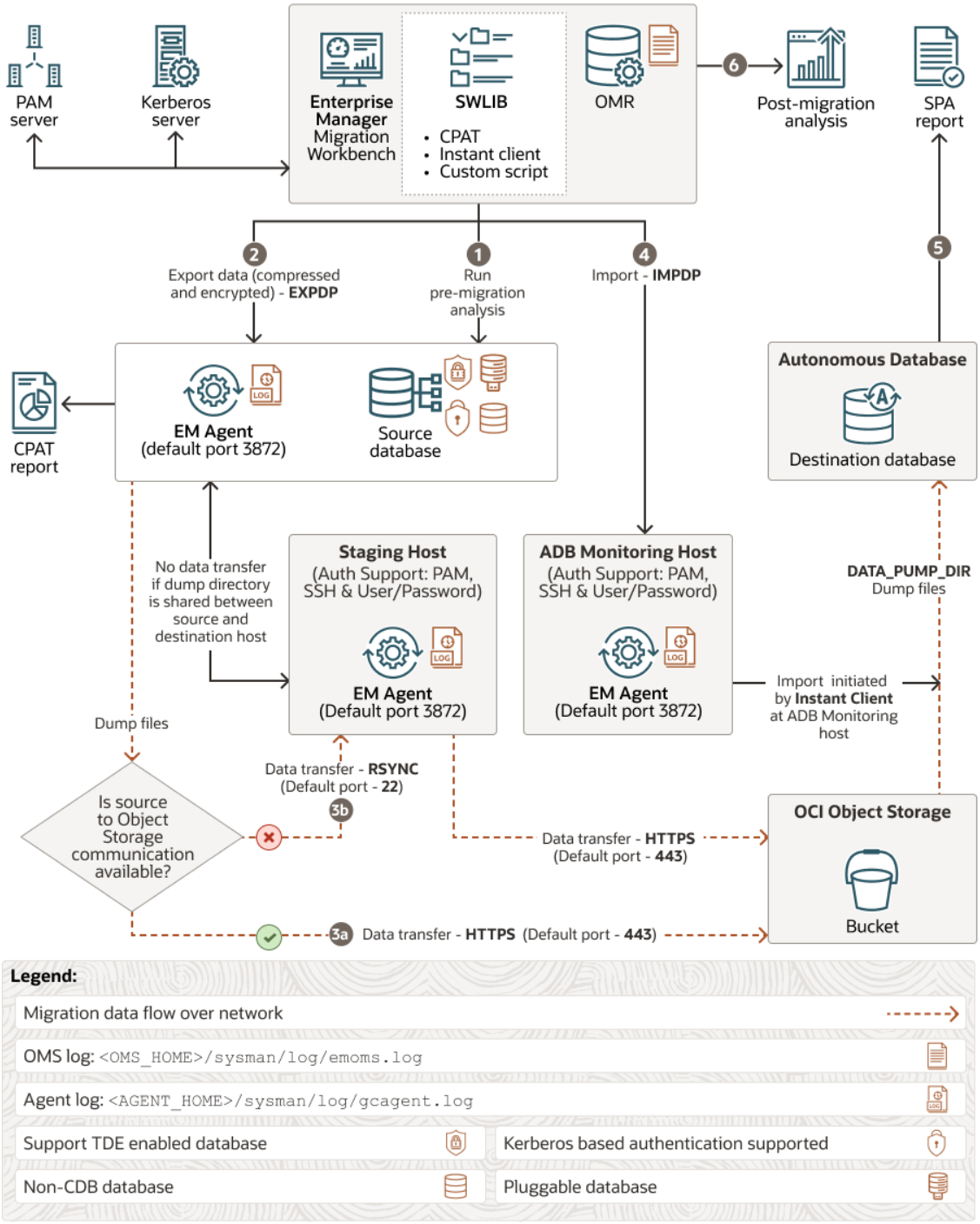
Figure 3-4 Data Pump Migration for a Single Instance Database



Data Pump Migration for an Autonomous Database

The following is a complete diagram for an autonomous database performing a Data Pump migration

Figure 3-5 Data Pump Migration for an Autonomous Database



Migrate a Full Database

Follow these steps to migrate a full database using Migration Workbench and Data Pump:

1. From **Databases**, select **Migration and Consolidation**, then **Database Migration Workbench**, this loads the Database Migration screen. Select **Data Pump** under **Migration Method**.
   Click **Create Migration Activity**.

2. Enter a migration name under **Name Activity**. Under **Migrate** select **Full Database**.

   a. **Select Source Database**, click on the bar and select a database or search for a database.
   Click on the Source Database to be migrated.

   b. **Select Destination Database**, click on the bar and select a database, search for a database or create a new PDB.

   > **Note:**
   >
   > When selecting any non ADB migration you have an option to create a new PDB in the drop down menu. A dialog appears for you to enter required information for a new PDB.

   Click on the Destination Database that will receive the migration.

   Review the summary of both Source and Destination databases, then click **Continue**.

3. **Upload Migration Tools**: **(Optional)** Enterprise Manager automatically downloads the latest version of the tools, however if they are not available from the Software Library for your operating system you will need to upload them, click on **Upload Migration Tools**. For more information see Upload Migration Tools.

   - Select **Upload Instant Client** to upload Instance Client files to the Software Library. This is only needed for ADB migrations only.
   - Select **Cloud Pre-migration Advisor Tool (CPAT)** to upload the CPAT files to the Software Library. For Oracle Enterprise Manager 13 Release 5 Update 3 (13.5.0.3) and below CPAT is not available, use Schema Advisor for Autonomous Database migrations.

   Select whether to upload the ZIP files from a local or agent machine, click on **Upload** and **Continue**.

4. The Add Details page shows a summary of the information entered:

   - **Source**: Ensure the information is correct, select the Agent Host Credentials and Database Credentials (Preferred or Named).

   > **Note:**
   >
   > Oracle Enterprise Manager's Migration Workbench now supports authentication using **Database Kerberos** Credentials and **Database Kerberos Keytab** Credentials with Data Pump migrations. Microsoft Active Directory users can be exclusively mapped to a database account and authenticated with a Kerberos password or a Keytab file without password and human interaction. If these are configured they will appear from the credential drop down menu.

   - **Destination**: Ensure the information is correct and select the Database Credentials and Monitoring Agent Host Credentials (Preferred or Named). If required you can specify the **Service Name**.
   Enter the **Wallet Password** for TDE enabled databases.
   - **Action**:

> **Note:**
>
> Do not use `SYSDBA` as the named credentials for Data Pump Export and Import. `SYSDBA` should only be used at the request of Oracle technical support.

- Select **Recompile Invalid Objects After Migration** to recompile all invalid objects within schema once a migration successfully completes.
- Under **Source Data Pump Directory**
  For On Premise to ADB: Enter and confirm the **Encryption Password**, enter the **Cloud Storage URL**, **Bucket Name** and **Credentials**.

  For On Premise to non ADB: Enter and confirm the **Encryption Password**. **Cloud Storage URL** and **Bucket Name** are not needed as the dump is passed from host to host.
- Under **Database OCI Auth Credential** the default cloud credential will be shown and preselected, you can select a different credential from the list if required. This field is for ADB migrations only.
- Enter and confirm the **Encryption Password** if required.

Click **Next**.

5. In the Customize page, set the export and import options as needed:
   - **Export Options**:
     - EXCLUDE: Tables that are to be excluded and not migrated.
     - ENCRYPTION: Password to encrypt/decrypt datapump dump files.
     - ENCRYPTION ALGORITHM: Specifies which cryptographic algorithm should be used for encryption (AES128, AES192, AES256).
     - CONTENT: Select whether to export DATA, METADATA, or both. It is recommended to first perform a METADATA only migration as a test before performing a DATA migration.
     - PARALLEL: Specifies the maximum number of processes of active execution operating on behalf of the export job.
   - **Import Options**:
     - TABLE EXISTS ACTION: Action to be taken if the table exists at the destination database (skip or replace).
     - DATA_OPTIONS: This parameter designates how certain types of data should be handled during import operations.
     - PARALLEL: Specifies the maximum number of processes of active execution operating on behalf of the import job.
     - REMAP SCHEMA: Loads all objects from the source schema into a target schema.
     - REMAP TABLESPACE: Remaps all objects selected for import with persistent data in the source tablespace to be created in the target tablespace.
     - TRANSFORM: Enables you to alter object creation DDL for objects being imported.

- **Upload Options**: Select whether a Monitoring Agent from the Source Database or a Different Agent will be used. If you select **Different Agent** enter the Agent, Host Credential and Stage Directory where it is located.
- Select **Compare Performance After Migration** to configure and allow performance and comparison analytics after migration using SQL Performance Analyzer (SPA).

> **Note:**
>
> When running SPA make sure to export your schema as it is needed to stage the tuning set. Failure to do so will generate an error while performing validations.
> SPA is not available for Metadata only Data pump migrations.

- **Custom Scripts**: Enter any custom Pre or Post scripts you may require for the migration. These scripts must be uploaded to the Software Library beforehand.
  - Script Location: Location of the Pre/Post scripts within the Software Library.
  - Pre-Migration Script: Default is **No**, select the script you wish to run.
  - Post-Migration Script: Default is **No**, select the script you wish to run.
  - Post-Migration SQL Script: Default is **No**, select the script you wish to run.

Click **Review**.

6. The Review & Submit page, allows you to review all information before proceeding to migrate and can run tests to ensure a proper migration. We recommend you run the **Cloud Pre-Migration Advisor Tool (CPAT)** by clicking **Check Migration Readiness** under **Source**. This will open a new window where CPAT will run and analyze your databases for any migration blockers. When complete, the CPAT report will show:
   - Failed: Errors that will cause a fatal error resulting in an unsuccessful migration. Fix these issues before continuing with the migration.
   - Action Required: Issues that will most likely cause an unsuccessful migration. Fix these issues before continuing with the migration.
   - Review Required: The migration may succeed or partly succeed, however not everything may work or be exactly like at the source database causing post migration cleanup work. It is recommended to also fix these issues before migrating
   - Review Suggested: Migration will succeed and applications will likely see no functional difference but Database Administrators need to evaluate each for unforeseen issues.
   - Passed: CPAT is analysis indicates that migration will be successful with no difference in behavior.

   Click **Validate** to validate the inputs to your migration activity. A pop up, where the pre-check runs will appear.

   Once all issues presented by **Analyze Source** and **Validation** are resolved, click **Submit** to migrate.

7. A pop up will require you to confirm that you have done the source analysis and when to start the migration **Immediately** or **Later** (requires a date and time when the migration will start).
   Click **Submit**.

Migrate Selected Schema

A schema migration can be performed on a database to update or revert a database's schema to newer or older version.

1. From **Databases**, select **Migration and Consolidation**, then **Database Migration Workbench**, this loads the Database Migration screen. Select **Data Pump** under **Migration Method**.
   Click **Create Migration Activity**.
2. Enter a migration name under **Name Activity**. Under **Migrate** select **Full Database**.
   a. **Select Source Database**, click on the bar and select a database or search for a database.
      Click on the Source Database to be migrated.
   b. **Select Destination Database**, click on the bar and select a database or search for a database.

      > **Note:**
      >
      > When selecting any non ADB migration you have an option to create a new PDB in the drop down menu. A dialog appears for you to enter required information for a new PDB.

      Click on the Destination Database that will receive the migration or enter the name for the new PDB to be created.

   Review the summary of both Source and Destination databases, then click **Continue**.
3. **Upload Migration Tools**: **(Optional)** Enterprise Manager automatically downloads the latest version of the tools, however if they are not available from the Software Library for your operating system you will need to upload them, click on **Upload Migration Tools**. For more information see Upload Migration Tools.
   - Select **Upload Instant Client** to upload Instance Client files to the Software Library. This is only needed for ADB migrations only.
   - Select **Cloud Pre-migration Advisor Tool (CPAT)** to upload the CPAT files to the Software Library. For Oracle Enterprise Manager 13 Release 5 Update 3 (13.5.0.3) and below CPAT is not available, use Schema Advisor.

   Select whether to upload the ZIP files from a local or agent machine, click on **Upload** and **Continue**.
4. The Add Details page shows a summary of the information entered:
   - **Source**: Ensure the information is correct, select the Agent Host Credentials and Database Credentials (Preferred or Named). When selecting Named credentials select the credential from the drop down menu.

> **Note:**
>
> Oracle Enterprise Manager's Migration Workbench now supports authentication using **Database Kerberos** Credentials and **Database Kerberos Keytab** Credentials with Data Pump migrations. Microsoft Active Directory users can be exclusively mapped to a database account and authenticated with a Kerberos password or a Keytab file without password and human interaction. If these are configured they will appear from the credential drop down menu.

- **Destination**: Ensure the information is correct and select the Database Credentials and Monitoring Agent Host Credentials (Preferred or Named). When selecting Named credentials select the credential from the drop down menu. If required you can specify the **Service Name**, a default is loaded if not.
  Enter the **Wallet Password** for TDE enabled databases.
- **Action**:

  > **Note:**
  >
  > Do not use `SYSDBA` as the named credentials for Data Pump Export and Import. `SYSDBA` should only be used at the request of Oracle technical support.

  – Select **Recompile Invalid Objects After Migration** to allow Migration Workbench to recompile all invalid objects within schema once a migration successfully completes. This option is unchecked by default

  – Under **Source Data Pump Directory**
  For On Premise to Autonomous Database: Enter and confirm the **Encryption Password**, enter the **Cloud Storage URL**, **Bucket Name** and **Credentials**.

  For On Premise to non Autonomous Database: Enter and confirm the **Encryption Password**. **Cloud Storage URL** and **Bucket Name** are not needed, the process does not stage the dump files to cloud storage.

  – Under **Database OCI Auth Credential** the default cloud credential will be shown and preselected, you can select a different credential from the list if required. This field is for ADB migrations only.

  – Enter and confirm the **Encryption Password** if required.

Click **Next**.

5. In the Customize page, set the following:

> **Note:**
>
> - In schema based migrations, a combo box will appear above **Export Options**, select the schema to be migrated. The process will honor the sequence in which the schema are input in case there is a schema dependency.
> - Select the Question mark next to the Export or Import option for more details.

- **Export Options**:
  - EXCLUDE: Select which tables are to be excluded and not migrated.
  - ENCRYPTION: Password to encrypt/decrypt datapump dump files.
  - ENCRYPTION ALGORITHM: Specifies which cryptographic algorithm should be used to perform the encryption (AES128, AES192, AES256)
  - CONTENT: Enables you to determine whether the migration should export DATA only, METADATA only or both. It is recommended to first perform a METADATA only migration as a test before performing a DATA migration.
  - PARALLEL: Specifies the maximum number of processes of active execution operating on behalf of the export job.
- **Import Options**:
  - TABLE EXISTS ACTION: Action to be taken if the table exists at the destination database (skip or replace).
  - DATA_OPTIONS: This parameter designates how certain types of data should be handled during import operations.
  - PARALLEL: Specifies the maximum number of processes of active execution operating on behalf of the import job.
  - REMAP SCHEMA: Loads all objects from the source schema into a target schema.
  - REMAP TABLESPACE: Remaps all objects selected for import with persistent data in the source tablespace to be created in the target tablespace.
  - TRANSFORM: Enables you to alter object creation DDL for objects being imported.
- **Upload Options**: Select with the radio buttons whether a Monitoring Agent from the Source Database or a Different Agent will be used. If you select **Different Agent** enter the Agent, Host Credential and Stage Directory where it is located.
- Select **Compare Performance After Migration** to configure and allow performance and comparison analytics after migration using SQL Performance Analyzer (SPA).

> **Note:**
>
> When running SPA make sure to export your SQL Tuning set schema from where the SQL Workload is captured. It is needed to properly stage the tuning set. Failure to do so will generate an error while performing validations.
> SPA is not available for Metadata only Data pump migrations.

- **Custom Scripts**: Enter any custom Pre or Post scripts you may require for the migration. These scripts must be uploaded to the Software Library beforehand.
  - Script Location: Location of the Pre/Post scripts within the Software Library.
  - Pre-Migration Script: Default is **No**, select the script you wish to run.
  - Post-Migration Script: Default is **No**, select the script you wish to run.
  - Post-Migration SQL Script: Default is **No**, select the script you wish to run.

Click **Review**.

6. The Review & Submit page, allows you to review all information before proceeding to migrate and can run tests to ensure a proper migration. We recommend you run the **Cloud Pre-Migration Advisor Tool (CPAT)** by clicking **Check Migration Readiness** under **Source**. This will open a new window where CPAT will run and analyze your databases for any migration blockers. When complete the CPAT report will show:
   - Failed: Errors that will cause a fatal error resulting in an unsuccessful migration. Fix these issues before continuing with the migration.
   - Action Required: Issues that will most likely cause an unsuccessful migration. Fix these issues before continuing with the migration.
   - Review Required: The migration may succeed or partly succeed, however not everything may work or be exactly like at the source database causing post migration cleanup work. It is recommended to also fix these issues before migrating
   - Informational: Migration will succeed and applications will likely see no functional difference but Database Administrators need to evaluate each for unforseen issues.
   - Passed: CPAT is analysis indicates that migration will be successful with no difference in behavior.

   > **Note:**
   >
   > **Cloud Pre-Migration Advisor Tool (CPAT)** is available on Oracle Enterprise Manager 13 Release 5 Update 4 (13.5.0.4) and onward. If you are using an earlier version Schema Advisor needs to be used instead.

   Validate your migration inputs, click the **Validate** button. A pop up, where the pre-check runs will appear.

   Once all issues presented by **Check Migration Readiness** and **Validation** are resolved, click **Submit** to migrate.

7. A pop up will require you to confirm that you have done the Check Migration Readiness and when to start the migration **Immediately** or **Later** (requires a date and time when the migration will start).
   Click **Submit**.

Migrate Using Transportable Tablespace

Transportable Tablespace provides a fast and efficient mechanism to move large volumes of data from one database system to another using a Near Zero Downtime (NZDT) way to create a destination database. This is achieved by using full and incremental backups of the source database, while retaining the original source database.

> **Note:**
>
> Migration Workbench Transportable Tablespace migrations are available starting with Oracle Enterprise Manager 13 Release 5 Update 5 (13.5.0.5).
> Destination databases can be both a non-CDB as well as PDB starting with Oracle Enterprise Manager 13 Release 5 Update 10 (13.5.0.10).
>
> The pre-migration analyzer (migration readiness check) will run as part of a Transportable Tablespace deployment procedure starting with Oracle Enterprise Manager 13 Release 5 Update 15 (13.5.0.15)

The following is a list of available migrations using Transportable Tablespace:

- Migrate a Full Database with Transportable Tablespace
- Perform a Multiphase Migration with Transportable Tablespace
- Migrate Selected Tablespaces Only

Migrate a Full Database with Transportable Tablespace

This method performs a full database migration on-premises to on-premises using TTS instead of Data Pump.

1. Click on **Databases**, select **Migration and Consolidation** then **Database Migration Workbench**, this loads the Database Migration screen.
   Click **Create Migration Activity**.
2. Enter a migration name under **Name Activity**. Under **Migrate** select **Full Database**.
   a. **Select Source Database**, click on the bar and select a database or search for a database.
      Click on the Source Database to be migrated.
   b. **Select Destination Database**, click on the bar and select a database or search for a database. You also have an option to create a new PDB in the drop down menu.
      A dialog appears for you to enter required information for a new PDB:
      - Container Database
      - PDB Name
      - Administrator Name
      - Administrator Password
      - Confirm Password

      Click on the Destination Database that will receive the migration.

   Once selected, you will see a summary of both Source and Destination databases. Click **Continue**.
3. The Add Details page shows a summary of the information entered:
   - **Source**: Ensure the information is correct, select the Agent Host Credentials and Database Credentials (Preferred or Named).
     Starting with Oracle Enterprise Manager 13.5 Release Update 12 (13.5.0.12) PDB administrator can be used as a named credential for a new PDB.

     For Transportable Tablespace migration use SYSDBA for the Database Credential, and use the Oracle Home Owner for the Host credential.

Enter the **Wallet Password** for TDE enabled databases.

- **Destination**: Ensure the information is correct, select the Agent Host Credentials and Database Credentials (Preferred or Named).
  For Transportable Tablespace migration use SYSDBA for the Database Credential, and use the Oracle Home Owner for the Host credential.

  Enter the **Wallet Password** for TDE enabled databases.

- **Action**:
  - Select **Compare Performance After Migration** to run SQL Tuning Set (STS) after migration.
  - Enter the **Source Working Directory**, use the default or a directory of your choice.
  - Enter the **Destination Working Directory**, use the default or a directory of your choice.
  - Enter the **Destination Storage Directory**, supported storage is Filesystem and Oracle Automatic Storage Management (ASM).
  - Enter and confirm the **Encryption Password** for the metadata dumps.

Click **Next**.

4. In the Customize page, set the following:
   - **Migration Details**: Select the Tablespaces to be Migrated. By default all Tablespaces will be migrated.
   - **Compare Performance After Migration**: Select whether to use a new SQL Tuning Set (STS) or use an existing and set for how many days STS will run.
   - **Custom Scripts**: Enter any custom Pre or Post scripts you may require for the migration. These scripts must be uploaded to the Software Library beforehand.
     - Script Location: Location of the Pre/Post scripts within the Software Library.
     - Pre-Migration Script: Default is **No**, select the script you wish to run.
     - Post-Migration Script: Default is **No**, select the script you wish to run.
     - Post-Migration SQL Script: Default is **No**, select the script you wish to run.

   Click **Review**.

5. The Review & Submit page, allows you to review all information before proceeding to migrate, can run validation tests, and presents a report to ensure a proper migration. Starting with Oracle Enterprise Manager 13.5 Release Update 12 (13.5.0.12) you can perform a Migration Readiness Check analysis before starting a TTS migration.

   To analyze your migration activity inputs and view the report, click the **Check Migration Readiness** button.

   The Migration Readiness Report shows the following information:

   - The **Summary** section shows the Status for the analysis and Recommendation. For further details you can click on **Database Detail** and **Analyzed Tablespaces**.
   - The **Results Breakdown by Severity** shows a bar graph with the number of issues found grouped by severity. These are presented left to right from most serious to non-issue, these are:
     - Failed: The source and destination databases selected are not compatible or suitable for migration and need to be changed or the particular validation could not be completed due to internal errors.

  - Action Required: Validation failed, review and take action to resolve the issue. The migration will fail if the issue is not corrected before submission.
  - Review Required: Warning message, review and if necessary take action to correct. Migration may be impacted.
  - Review Suggested: Informational message, read and review.
  - Passed: Validation succeeded, you can proceed with the migration.
- The lower section shows the **Result Detail**, to view in detail issues from a specific severity field click on the arrow to expand each field. To view the specific details for an issue, click the arrow to expand the issue details.

Next click **Validate** to analyze and validate the migration activity inputs.

Once all issues presented by the Migration Readiness Report are resolved, and the migration activity inputs have been validated click **Submit**

6. A pop up will require you to confirm when to start the migration **Immediately** or **Later** (requires a date and time when the migration will start).
Click **Submit**.

Perform a Multiphase Migration with Transportable Tablespace

This section will discuss the multiphase migration approach by performing incremental backups of the source database, while retaining the original target database.

When performing a Multiphase Migration with Transportable Tablespace (TTS) you have more control over the backup phases unlike a a Transportable Tablespace Single phase Migration. A Transportable Tablespace Single phase Migration is performed in one go, starting at the scheduled time and running until complete. In a TTS Multiphase Migration, you can take an initial backup, return at any other time for an incremental backup by selecting **Update Backup**, or simply initiate the final migration step by selecting **Complete Migration**. This feature is available starting with Oracle Enterprise Manager 13 Release 5 Update 7 (13.5.0.7).

Creating the Initial Backup

1. Click on **Databases**, select **Migration and Consolidation** then **Database Migration Workbench**, this loads the Database Migration screen. Select **Transportable Tablespace** under **Migration Method**.
Click **Create Migration Activity**.
2. Enter a migration name under **Name Activity**. Under **Migrate** select **Full Database**.
   a. **Select Source Database**, click on the bar and select a database or search for a database.
   Click on the Source Database to be migrated.
   b. **Select Destination Database**, click on the bar and select a database or search for a database.

> **Note:**
>
> When selecting any non CDB migration you have an option to create a new PDB in the drop down menu. A dialog appears for you to enter required information for a new PDB.

Click on the Destination Database that will receive the migration.

Once selected, you will see a summary of both Source and Destination databases. Click **Continue**.

3. The Add Details page shows a summary of the information entered:

   - **Source**: Ensure the information is correct, select the Agent host credentials and database credentials (Preferred or Named).
     Starting with Oracle Enterprise Manager 13.5 Release Update 12 (13.5.0.12) PDB administrator can be used as a named credential for a new PDB.

     For Transportable Tablespace migration use SYSDBA for the database credential, and use the Oracle Home Owner for the host credential.

     Enter the **Wallet Password** for TDE enabled databases.
   - **Destination**: Ensure the information is correct, select the Agent host credentials and database credentials (Preferred or Named).
     For Transportable Tablespace migration use SYSDBA for the database credential, and use the Oracle Home Owner for the host credential.

     Enter the **Wallet Password** for TDE enabled databases.
   - **Action**:
     - Select **Compare Performance After Migration** to run SQL Tuning Set (STS) after migration.
     - Enter the **Source Working Directory**, use the default or a directory of your choice.
     - Enter the **Destination Working Directory**, use the default or a directory of your choice.
     - Enter the **Destination Storage Directory**, supported storage is Filesystem and Oracle Automatic Storage Management (ASM).
     - Enter and confirm the **Encryption Password** for the metadata dumps.

   Click **Next**.

4. In the Customize page, set the following:

   - **Migration Details**:
     a. Select the Tablespaces to be Migrated or select All Tablespaces to migrate the entire set.
     b. Under Migration Phase select **Create Backup**.
   - **Compare Performance After Migration**: Select whether to use a new SQL Tuning Set (STS) or use an existing and set for how many days STS will run.
   - **Custom Scripts**: Enter any custom Pre or Post scripts you may require for the migration. These scripts must be uploaded to the Software Library beforehand.
     - Script Location: Location of the Pre/Post scripts within the Software Library.
     - Pre-Migration Script: Default is **No**, select the script you wish to run.
     - Post-Migration Script: Default is **No**, select the script you wish to run.
     - Post-Migration SQL Script: Default is **No**, select the script you wish to run.

   Click **Review**.

5. The Review & Submit page, allows you to review all information before proceeding to migrate, can run validation tests, and presents a report to ensure a proper migration.

Starting with Oracle Enterprise Manager 13.5 Release Update 12 (13.5.0.12) you can perform a pre-migration analysis before starting a TTS migration. To analyze your migration activity inputs and view the report, click the **Check Migration Readiness** button.

The Pre-Migration Report shows the following information:

- The **Summary** section shows the Status for the analysis and Recommendation. For further details you can click on **Database Detail** and **Analyzed Tablespaces**.
- The **Results Breakdown by Severity** shows a bar graph with the number of issues found grouped by severity. These are presented left to right from most serious to non-issue, these are:
  - Failed: The source and destination databases selected are not compatible or suitable for migration and need to be changed or the particular validation could not be completed due to internal errors.
  - Action Required: Validation failed, review and take action to resolve the issue. The migration will fail if the issue is not corrected before submission.
  - Review Required: Warning message, review and if necessary take action to correct. Migration may be impacted.
  - Review Suggested: Informational message, read and review.
  - Passed: Validation succeeded, you can proceed with the migration.
- The lower section shows the **Result Detail**, to view in detail issues from a specific severity field click on the arrow to expand each field. To view the specific details for an issue, click the arrow to expand the issue details.

Once all issues presented by the Pre-migration Report are resolved, click **Submit** to migrate.

6. A pop up will require you to confirm when to start the migration **Immediately** or **Later** (requires a date and time when the migration will start).
   Click **Submit**.

Complete a Multiphase Transportable Tablespace Migration

After submitting a **Create Backup** migration you can perform an incremental backup or complete the multiphase migration.

1. Once the backup completes, click on **Enterprise** from the main menu bar, select **Migration and Consolidation** then **Database Migration Workbench**, this loads the Database Migration screen.
2. In the Migration Activity page, look for a red exclamation icon and **Status** as **Awaiting User Action**. Go to the action menu to the left of the Migration Activity with pending action and select **Complete Migration**. A pop up will require you to confirm whether to:
   - **Update Backup**: Takes an incremental backup.

     > **Note:**
     >
     > If the database has undergone significant updates since the initial backup, it is recommended you choose this option. This will take an incremental backup of the database without incurring in downtime.

   - **Complete Migration**: Performs final backup and complete migration. In this step, an incremental backup is taken as well as an export/import of metadata into the destination database. It is recommended that the finals step be triggered during a

scheduled maintenance window since a Complete Migration sets the tablespace in Read Only mode.

> **Note:**
>
> Complete Migration sets the tablespace in Read Only mode during the export and import of data.

3. In the Migration Activities page, expand the left hand arrow to view the additional incremental backups performed and their status.
   - Incremental backups will be labeled as: Incremental Database Migration *WD MM DD YYYY HH:MM:SS* UTC.
   - Complete Migrations will be labeled as: Final Database Migration *WD MM DD YYYY HH:MM:SS UTC*
4. Repeat steps 2 and 3 for further incremental **Update Backups** and to **Complete Migration**.

Migrate Selected Tablespaces Only

In this option only the selected tablespaces are migrated. This option allows for only certain parts of a database being migrated. Tablespaces are migrated in the order selected in case of dependencies.

> **Note:**
>
> Full and Multiphase migration options can also be performed using only selected tablespaces.

1. Click on **Databases**, select **Migration and Consolidation** then **Database Migration Workbench**, this loads the Database Migration screen.
   Click **Create Migration Activity**.
2. Enter a migration name under **Name Activity**. Under **Migrate** select **Tablespaces**.
   a. **Select Source Database**, click on the bar and select a database or search for a database.
      Click on the Source Database to be migrated.
   b. **Select Destination Database**, click on the bar and select a database or search for a database.
      Click on the Destination Database that will receive the migration.

   Once selected, you will see a summary of both Source and Destination databases. Click **Continue**.
3. The Add Details page shows a summary of the information entered:
   - **Source**: Ensure the information is correct, select the Agent Host Credentials and Database Credentials (Preferred or Named). For Transportable Tablespace migration use SYSDBA for the Database Credential, and use the Oracle Home Owner for the Host credential.
     Enter the **Wallet Password** for TDE enabled databases.
   - **Destination**: Ensure the information is correct, select the Agent Host Credentials and Database Credentials (Preferred or Named). For Transportable Tablespace migration

use SYSDBA for the Database Credential, and use the Oracle Home Owner for the Host credential.
Enter the **Wallet Password** for TDE enabled databases.

- **Action**:
  - Select **Compare Performance After Migration** to run SQL Tuning Set (STS) after migration.
  - Enter the **Source Working Directory**, use the default or a directory of your choice.
  - Enter the **Destination Working Directory**, use the default or a directory of your choice.
  - Enter the **Destination Storage Directory**, supported storage is Filesystem and Oracle Automatic Storage Management (ASM).
  - Enter and confirm the **Encryption Password** for the metadata dumps.

Click **Next**.

4. In the Customize page, set the following:
   - **Migration Details**: Select the Tablespaces to be Migrated.
   - **Compare Performance After Migration**: Select whether to use a new SQL Tuning Set (STS) or use an existing and set for how many days STS will run.
   - **Custom Scripts**: Enter any custom Pre or Post scripts you may require for the migration. These scripts must be uploaded to the Software Library beforehand.
     - Script Location: Location of the Pre/Post scripts within the Software Library.
     - Pre-Migration Script: Default is **No**, select the script you wish to run.
     - Post-Migration Script: Default is **No**, select the script you wish to run.
     - Post-Migration SQL Script: Default is **No**, select the script you wish to run.

   Click **Review**.
5. The Review & Submit page, allows you to review all information before proceeding to migrate, can run validation tests, and presents a report to ensure a proper migration. Starting with Oracle Enterprise Manager 13.5 Release Update 12 (13.5.0.12) you can perform a pre-migration analysis before starting a TTS migration. To analyze your migration activity inputs and view the report, click the **Check Migration Readiness** button.

   The Pre-Migration Report shows the following information:
   - The **Summary** section shows the Status for the analysis and Recommendation. For further details you can click on **Database Detail** and **Analyzed Tablespaces**.
   - The **Results Breakdown by Severity** shows a bar graph with the number of issues found grouped by severity. These are presented left to right from most serious to non-issue, these are:
     - Failed: The source and destination databases selected are not compatible or suitable for migration and need to be changed or the particular validation could not be completed due to internal errors.
     - Action Required: Validation failed, review and take action to resolve the issue. The migration will fail if the issue is not corrected before submission.
     - Review Required: Warning message, review and if necessary take action to correct. Migration may be impacted.
     - Review Suggested: Informational message, read and review.

  - Passed: Validation succeeded, you can proceed with the migration.
- The lower section shows the **Result Detail**, to view in detail issues from a specific severity field click on the arrow to expand each field. To view the specific details for an issue, click the arrow to expand the issue details.

Once all issues presented by the Pre-migration Report are resolved, click **Submit** to migrate.

6. A pop up will require you to confirm when to start the migration **Immediately** or **Later** (requires a date and time when the migration will start).
Click **Submit**.

Migrate via REST API

This topic outlines the steps required to migrate Database, Schema or Transportable Tablespace via REST API.

The following Migration Methods are available using REST API

- Data Pump Migration REST API
- Transportable Tablespace Migration using REST API

> **Note:**
>
> Transportable Tablespace migrations are available starting with Oracle Enterprise Manager 13 Release 5 Update 5 (13.5.0.5).

Data Pump Migration REST API

Data Pump provides an Export and Import way of moving data and metadata from one database to another. The following is a list of available REST API data pump migrations.

- Full Database Data Pump REST API Migration
- Migrate Schema Using REST API

Full Database Data Pump REST API Migration

The following is a sample code for a full database data pump migration using REST API.

Perform a full migration operation using Data Pump

To perform a full migration using the Data Pump method use the following REST request. This sample code loads data from an on-premises database into a cloud database:

> **Note:**
>
> - Do not use `SYSDBA` as the named credentials for Data Pump Export and Import. `SYSDBA` should only be used at the request of Oracle technical support.
> - `POST` can be used if user wants the OMS to pull the files from the Host. The Host needs to be discovered in Enterprise Manager.

Use this REST call to enter the migration parameters:

Feature	Description
Request Method	POST
URI	`/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Feature	Description

Payload	<pre>{
	    "action": "MIGRATE",
	    "type": "DATAPUMP"
	    "proxy":{ --> Required if you have a proxy connection setup
	        "host":"<proxy-host>",
	        "port":"<proxy-port>"
	    },
	
	    "source":[{
	        "databaseInfo":{
	                "targetName":"<db-pdb-target-name>",
	                "targetType":"<db-pdb-target-type>",
	                "dbCredName":"<db-cred-name:em-cred-owner>", --> If not provided, preferred credentials will be used
	
	"hostCredName":"<host-cred-name:em-cred-owner>" --> If not provided, preferred credentials will be used
	             },
	
	        "export":{
	            "args":{
	                    "LOGTIME":"ALL",
	                    "METRICS":"YES",
	
	"COMPRESSION":"ALL",
	
	"COMPRESSION_ALGORITHM":"MEDIUM",
	
	"KEEP_MASTER":"YES",
	                    "PARALLEL":"1",
	
	"directory":"<dump directory name>",
	
	"EXCLUDE":"index,cluster,indextype,materialized_view,materialized_view_log,materialized_zonemap,db_link",
	
	"ENCRYPTION":"ALL",
	
	"ENCRYPTION_PASSWORD":"<Encryption Password>",
	
	"ENCRYPTION_ALGORITHM":"AES128"
	            }
	        }</pre>

Feature	Description

	}],
	
	"storage":{
	"type":"OBJECTSTORE"
	"useProxy": <boolean, true/false> --> If true, the proxy from main section will be used to upload objects to OCI Object store
	"objectstore":{
	"credName":".."
	"baseUrl":"..",
	"bucketName":".."
	},
	},
	
	"destination":[{
	"useProxy": <boolean, true/false> --> If true, the proxy from main section will be used to connect to ADB
	"databaseInfo":{
	"targetName":"<adb-target-name>",
	"targetType":"<adb-target-type>",
	"dbCredName":"<db-cred-name:em-cred-owner>", --> If not provided, preferred credentials will be used
	"hostCredName":"<adb monitoring host-cred-name:em-cred-owner>" --> If not provided, preferred credentials will be used
	"tdeWalletPassword": "<password>", --> TDE wallet password is required when a new PDB is created at the
	destination
	},
	
	import": {
	"args": {
	"TABLE_EXISTS_ACTION": "SKIP",
	"PARALLEL": "6",
	"TRANSFORM": "SEGMENT_ATTRIBUTES:N,DWCS_CVT_IOTS:Y,CONSTRAINT_USE_DEFAULT_INDEX:Y",
	"REMAP_TABLESPACE" : "<source_tablespace:target_tablespace> [,

Feature	Description
	<source_tablespace:target_tablespace> , ...]" "NOLOGFILE": "YES", "DIRECTORY": "DATA_PUMP_DIR" }, "dbOciAuthCred": "<cloud-cred-name:cloud-cred-owner>" }, "tnsName": "<adb-service-name>", "recomplieInvalidObjects": <true|false>, -->After migration recompiles all invalid objects within the migrated schemas }], "analyzePerformance": -->optional { "useSPA": true/false, "createSTS": true/false, "usePreferredSTS": true/false -->optional "stsName": "stsname01" -->optional "stsOwner": "stsOwnedSchema" -->optional "stsOwner": "EXPUSER" -->optional "baselineDurationDays": 7 -->optional, set duration for SPA to analyze } }
Response	{ "statusCode": 200, "status": "SUCCESS", "message": "....", "submissionName": ".....", "submissionBy": "SYSMAN", "submissionId": "<Unique Submission ID>", "executionId": "<Unique Execution ID>", "uiActivityUrl": "/em/faces/core-jobs-procedureExecutionTracking?executionGUID=<Submission ID>", "restActivityUrl": "/em/websvcs/restful/db/migration/activities/<Submission ID>" }

At this point the database has been successfully initiated.

Migrate Schema Using REST API

The following is a REST API sample code for a schema migration using REST API

Perform a complete Migration Operation using Data Pump

To perform a Schema Migration using the Data Pump method use the following REST request. This sample code loads data from an on-premises database into a cloud database:

> **Note:**
>
> - Do not use `SYSDBA` as the named credentials for Data Pump Export and Import. `SYSDBA` should only be used at the request of Oracle technical support.
> - `POST` can be used if user wants the OMS to pull the files from the Host. The Host needs to be discovered in Enterprise Manager.

Use this REST call to enter the migration parameters:

Feature	Description
Request Method	POST
URI	`/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Feature	Description

Payload	<pre>{
	    "action": "MIGRATE",
	    "options": "SPA",
	    "type": "SCHEMA"
	    "proxy":{ --> Required if you have a proxy connection setup
	        "host":"<proxy-host>",
	        "port":"<proxy-port>"
	    },
	
	    "source":[{
	        "databaseInfo":{
	                "targetName":"<db-pdb-target-name>",
	                "targetType":"<db-pdb-target-type>",
	                "dbCredName":"<db-cred-name:em-cred-owner>", --> If not provided, preferred credentials will be used
	
	"hostCredName":"<host-cred-name:em-cred-owner>" --> If not provided, preferred credentials will be used
	        },
	
	        "export":{
	            "args":{
	                    "LOGTIME":"ALL",
	                    "METRICS":"YES",
	
	"COMPRESSION":"ALL",
	
	"COMPRESSION_ALGORITHM":"MEDIUM",
	
	"KEEP_MASTER":"YES",
	                    "PARALLEL":"1",
	
	"directory":"<dump directory name>",
	
	"EXCLUDE":"index,cluster,indextype,materialized_view,materialized_view_log,materialized_zonemap,db_link",
	
	"ENCRYPTION":"ALL",
	
	"ENCRYPTION_PASSWORD":"<Encryption Password>",
	
	"ENCRYPTION_ALGORITHM":"AES128"
	            }</pre>

Feature	Description

	`}`
	`}],`
	
	`"storage":{`
	`"type":"OBJECTSTORE"`
	`"useProxy": <boolean, true/ false> --> If true, the proxy from main section will be used to upload objects to OCI Object store`
	`"objectstore":{`
	`"credName":".."`
	`"baseUrl":"..",`
	`"bucketName":".."`
	`},`
	`},`
	
	`"destination":[{`
	`"useProxy": <boolean, true/ false> --> If true, the proxy from main section will be used to connect to ADB`
	`"databaseInfo":{`
	`"targetName":"<adb-target-name>",`
	`"targetType":"<adb-target-type>",`
	`"dbCredName":"<db-cred-name:em-cred-owner>", --> If not provided, preferred credentials will be used`
	`"hostCredName":"<adb monitoring host-cred-name:em-cred-owner>" --> If not provided, preferred credentials will be used`
	`"tdeWalletPassword": "<password>", --> TDE wallet password is required when a new PDB is created at the destination`
	`},`
	
	`import": {`
	`"args": {`
	`"TABLE_EXISTS_ACTION": "SKIP",`
	`"PARALLEL": "6",`
	`"TRANSFORM": "SEGMENT_ATTRIBUTES:N,DWCS_CVT_IOTS:Y,CONSTRAINT_USE_DEFAULT_INDEX:Y",`
	`"REMAP_TABLESPACE" : "<source_tablespace:target_tablespace`

Feature	Description

	> [,
	<source_tablespace:target_tablespace>
	, ...]"
	"NOLOGFILE": "YES",
	"DIRECTORY":
	"DATA_PUMP_DIR"
	},
	"dbOciAuthCred": "<cloud-
	cred-name:cloud-cred-owner>"
	},
	"tnsName": "<adb-service-
	name>",
	"recomplieInvalidObjects":
	<true|false>, -->After migration
	recompiles all invalid objects
	within the migrated schemas
	}],
	"analyzePerformance": -->optional
	{
	"useSPA": true/false,
	"createSTS": true/false,
	"usePreferredSTS": true/
	false -->optional
	"stsName": "stsname01" --
	>optional
	"stsOwner": "stsOwnedSchema"
	-->optional
	"stsOwner": "EXPUSER" --
	>optional
	"baselineDurationDays": 7 --
	>optional, set duration for SPA to
	analyze
	}
	}

Response	{
	"statusCode": 200,
	"status": "SUCCESS",
	"message": "....",
	"submissionName": ".....",
	"submissionBy": "SYSMAN",
	"submissionId": "<Unique Submission
	ID>",
	"executionId": "<Unique Execution ID>",
	"uiActivityUrl": "/em/faces/core-jobs-
	procedureExecutionTracking?
	executionGUID=<Submission ID>",
	"restActivityUrl": "/em/websvcs/
	restful/db/migration/activities/
	<Submission ID>"
	}

At this point the database has been successfully migrated.

Transportable Tablespace Migration using REST API

Transportable Tablespace provides a Near Zero Downtime (NZDT) way to create a duplicate database from incremental backups of the source database, while retaining the original target database.

> **Note:**
>
> Migration Workbench Transportable Tablespace migrations are available starting with Oracle Enterprise Manager 13 Release 5 Update 5 (13.5.0.5).
> Migration Workbench can support On-Premise to On-Premise migrations and On-Premise to PDB Transportable Tablespace migrations starting with Oracle Enterprise Manager 13 Release 5 Update 10 (13.5.0.10) .
>
> The pre-migration analyzer (migration readiness check) will run as part of a Transportable Tablespace deployment procedure starting with Oracle Enterprise Manager 13 Release 5 Update 15 (13.5.0.15)

The following is a list of available migrations using Transportable Tablespace:

- Migrate a Full Database with Transportable Tablespace
- Perform a Multiphase Migration with Transportable Tablespace
- Migrate Selected Tablespaces Only

Validate a Transportable Tablespace Migration With REST API

It is recommended that before you execute a Transportable Tablespace Migration, you first perform a validation.

Validate a Transportable Tablespace Migration

To validate a possible Transportable Tablespace Migration use the following REST sample:

Feature	Description
Request Method	POST
URI	`https://hostname:port/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Feature	Description

Request	<pre>{
	    "action": "VALIDATE",
	    "type": "ONLINE_TTS",
	
	    "source":[{
	        "databaseInfo":{
	            "targetName":"source target name",
	
	"targetType":"oracle_database",
	            "dbCredName" : "namedcred:owner",
	            "hostCredName" : "sourcehostcred:owner"
	            "tdeWalletPassword": "<password>"
	        },
	       "stageDir":"directory location in source host",
	       "tableSpaceList":"<comma separated or empty>"
	    }],
	    "encryptionPassword": "<encryption password>",
	    "destination":[{
	        "databaseInfo":{
	             "targetName" : "destination target name",
	             "targetType" : "oracle_database",
	             "dbCredName" : "namedcred:owner",
	             "hostCredName" : "destinationhostcred:owner",
	             "tdeWalletPassword": "<password>"
	             "newPdbInfo":{
	                 "name":"new pdb name",
	                 "adminUser":"new pdb admin username",
	
	"adminPassword":"new padb admin username password"
	              }
	        },
	        "stageDir":"directory location in destination host"
	    }],
	    "storage":{
	        "type":"FILESYSTEM or ASM",</pre>

Feature	Description

	<pre>"storageDir":"directory location in destination host",
	"asmCredName":"asmCred:owner"
	},
	"analyzePerformance":{
	"useSPA": false
	}
	"customScripts":
	{
	"preMigrationScriptUrn":
	"<SWLIB URN>,
	"postMigrationScriptUrn":
	"<SWLIB URN>",
	"postMigrationSqlScriptUrn":
	"<SWLIB URN>"
	}
	}</pre>

Response	<pre>{
	"statusCode": 200,
	"status": "SUCCESS",
	"message": "Successfully submitted Validate Database Migration procedure.","submissionName":
	"Validate Database Migration Mon Jul 26 2021 09:22:00 UTC",
	"submissionBy": "SYSMAN",
	"submissionId":
	"C80442152B282C78E05342104B64A611",
	"executionId":
	"C80442152B2B2C78E05342104B64A611",
	"uiActivityUrl": "/em/faces/core-jobs-procedureExecutionTracking?executionGUID=C80442152B2B2C78E05342104B64A611",
	"restActivityUrl": "/em/websvcs/restful/db/migration/activities/C80442152B2B2C78E05342104B64A611"
	}</pre>

Transportable Tablespace Validation Results

To review results of a Transportable Tablespace Migration Validation run the following command:

Feature	Description
Request Method	POST

Feature	Description
URI	`https://hostname:port/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Payload	`{`
	`"action": "VALIDATION_RESULTS",`
	`"executionId": "<executionId>"`
	`}`

Feature	Description
Response	"status": "SUCCESS", "description": " Database is not standby(which is valid),Database is valid container database,Database is in archive mode (which is valid),Database has primary role (which is valid)", "name": "Destination database status validation" }, { "id": "DESTINATION_WORKING_DIRECTORY_VALIDATION", "status": "SUCCESS", "description": " Working directory is validated successfully", "name": "Destination working directory validation" }, { "id": "DESTINATION_DISK_SPACE_VALIDATION", "status": "SUCCESS", "description": " \n \tINFORMATION : /scratch/ has enough space. Required space is 7020 MB , available space is 199805 MB.", "name": "Destination target disk space validation" }, { "id": "DESTINATION_TARGET_PRIVILEGES_VALIDATION", "status": "SUCCESS", "description": " User has VIEW_TARGET privilege,User has CONNECT_TARGET privilege,User has CONFIGURE_TARGET privilege,User has GET_CREDENTIAL privilege for oracle_database,User has PERFORM_OPERATION privilege,User has GET_CREDENTIAL privilege for host,User has ORACLE_HOME_OWNER privilege", "name": "Destination target privilege validation" }, { "id": "SOURCE_DATABASE_ENCRYPTION_VALIDATION", "status": "SUCCESS", "description": " Database is not encrypted (which is valid)", "name": "Source database encryption validation" }, { "id": "DESTINATION_DATABASE_ENCRYPTION_VALIDATION", "status": "SUCCESS",

Feature	Description

	"description": " Database is not encrypted (which is valid)",
	"name": "Destination database encryption validation"
	},
	{
	"id": "COMPATIBILITY_VALIDATION",
	"status": "SUCCESS",
	"description": " Source & Destination database are compatible",
	"name": "Compatibility validation"
	},
	{
	"id": "PDB_VALIDATION",
	"status": "SUCCESS",
	"description": " PDB name is valid",
	"name": "PDB validation"
	},
	{
	"id": "DESTINATION_SPA_VALIDATION",
	"status": "SUCCESS",
	"description": " Database user has all the required privileges(s) for analysing performance using SPA",
	"name": "Destination database SPA validation"
	},
	{
	"id": "STORAGE_VALIDATION",
	"status": "SUCCESS",
	"description": " Storage validation successfull",
	"name": "Storage validation"
	}
	],
	"totalValidation": 20,
	"successValidation": 20,
	"validationPerformed": 20,
	"skippedValidation": 0,
	"failedValidation": 0,
	"ignorableValidation": 0,
	"warningValidation": 0,
	"status": "COMPLETED"
	}

Transportable Tablespace Full Migration Using REST API

The following is a sample code for a Transportable Tablespace Full migration using REST API. It is recommended you first validate and analize your results before doing a Transportable Tablespace migration.

Perform a Transportable Tablespace Migration

Starting with Enterprise Manager 13 Release 5 Update 5 (13.5.0.5) you can now perform tablespace migrations using Migration Workbench.

Feature	Description
Request Method	POST
URI	`https://hostname:port/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Feature	Description

Request	<pre>{
	"action": "MIGRATE",
	"type": "ONLINE_TTS",
	"source":[{
	"databaseInfo":{
	"targetName":"<source target name>",
	"targetType":"<oracle_database>",
	"dbCredName" : "<namedcred>:<owner>",
	"hostCredName" : "<sourcehostcred>:<owner>"
	"tdeWalletPassword": "<password>"
	},
	"stageDir":"<directory location in source host>",
	"tableSpaceList":"<comma separated or empty>"
	}],
	"encryptionPassword": "<password>",
	"destination":[{
	"databaseInfo":{
	"targetName" : "<destination target name>",
	"targetType" : "oracle_database",
	"dbCredName" : "<namedcred>:<owner>",
	"hostCredName" : "<destinationhostcred>:<owner>",
	"tdeWalletPassword": "<password>"
	"newPdbInfo":{
	"name":"new_pdb_name",
	"adminUser":"new_pdb_admin_username",
	"adminPassword":"<new pdb admin password>"
	}
	},
	"stageDir":"<directory location in destination host>"
	}],
	"storage":{
	"type":"<FILESYSTEM or ASM>",
	"storageDir":"<directory</pre>

Feature	Description

	location in destination host>",
	"asmCredName":"asmCred:owner"
	},
	"analyzePerformance":{
	
	"useSPA": false
	}
	"customScripts":
	{
	"preMigrationScriptUrn":
	"<SWLIB URN>,
	"postMigrationScriptUrn":
	"<SWLIB URN>",
	"postMigrationSqlScriptUrn":
	"<SWLIB URN>"
	}
	}

Response	{
	"statusCode": 200,
	"status": "SUCCESS",
	"message": "Successfully submitted
	Database Migration procedure.",
	"submissionName": "Database
	Migration Fri Jul 09 2021 07:42:07
	UTC",
	"submissionBy": "TESTSUPERADMIN",
	"submissionId":
	"C6AC9AC151535A3C10F4B6433A0",
	"executionId":
	"C6AC9AC151565A3C10F4B6433A0",
	"uiActivityUrl": "/em/faces/core-
	jobs-procedureExecutionTracking?
	executionGUID=C6AC9AC15156053C10F4B64
	33A0",
	"restActivityUrl": "/em/websvcs/
	restful/db/migration/activities/
	C6AC9AC151565A3F4B6433A0"
	}

Transportable Tablespace Multiphase Migration REST API

Transportable Tablespace migrations can also be performed with incremental backups giving you more control of your migration.

In a TTS Multiphase Migration, you can take an initial backup, return at any other time for an incremental backup by requesting action `INCREMENTAL_ROLLFORWARD`, or simply initiate the final migration step by requesting action `FINAL_CUTOVER`.

This feature is available starting with Oracle Enterprise Manager 13 Release 5 Update 7 (13.5.0.7). This is a sample REST API for an incremental backup.

TTS Incremental Backup

Feature	Description
Request Method	POST
URI	`https://hostname:port/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Request	`{`
	`  "action": "INCREMENTAL_ROLLFORWARD",`
	`  "executionId": "<Execution Id>"`
	`}`

Response	`{`
	`  "statusCode": 200,`
	`  "status": "SUCCESS",`
	`  "message": "Successfully submitted Database Migration procedure.",`
	`  "submissionName": "Incremental Database Migration Wed Oct 27 2021 10:59:33 UTC",`
	`  "submissionBy": "SYSMAN",`
	`  "submissionId": "CF5476B1A2B90BCEE05324124B641F00",`
	`  "executionId": "CF5476B1A2BD0BCEE05324124B641F00",`
	`  "restActivityUrl": "/em/websvcs/restful/db/migration/activities/CF5476B1A2BD0BCEE05324124B641F00",`
	`  "uiActivityUrl": "/em/faces/core-jobs-procedureExecutionTracking?executionGUID=CF5476B1A2BD0BCEE05324124B641F00"`
	`}`

Complete a Transportable Tablespace Migration

After you have performed one or several incremental backups use this REST API code sample to finalize the migration. In this step, an incremental backup is taken as well as an export/import of metadata into the destination database. It is recommended that the finals step be

triggered during a scheduled maintenance window since a Complete Migration sets the tablespace in Read Only mode.

Feature	Description
Request Method	POST
URI	`https://hostname:port/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Request	`{`
	`"action": "FINAL_CUTOVER",`
	`"executionId": "<Execution Id>"`
	`}`

Response	`{`
	`"statusCode": 200,`
	`"status": "SUCCESS",`
	`"message": "Successfully submitted Database Migration procedure.",`
	`"submissionName": "Final Database Migration Wed Oct 27 2021 11:10:04 UTC",`
	`"submissionBy": "SYSMAN",`
	`"submissionId": "CF5476B1A2DC0BCEE05324124B641F00",`
	`"executionId": "CF5476B1A2E00BCEE05324124B641F00",`
	`"restActivityUrl": "/em/websvcs/restful/db/migration/activities/CF5476B1A2E00BCEE05324124B641F00",`
	`"uiActivityUrl": "/em/faces/core-jobs-procedureExecutionTracking?executionGUID=CF5476B1A2E00BCEE05324124B641F00"`
	`}`

Transportable Tablespace Only Migration With REST API

With Transportable Tablespace Migrations you can perform a Tablespace only migration. It can be all the tablespaces or just a selection of these.

> **Note:**
>
> Full and Multiphase migration options can also be performed using only selected tablespaces.

To perform a tablespace only migration use the same REST API template for **MIGRATE**, to convert it to a tablespace only migration add the `tableSpaceList` parameter with a complete list of all tablespaces to be migrated. The following sample code is an example of a tablespace only migration:

Feature	Description
Request Method	POST
URI	`https://hostname:port/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Feature	Description

Request	<pre>{
	    "action": "MIGRATE",
	    "type": "ONLINE_TTS",
	
	    "source":[{
	        "databaseInfo":{
	            "targetName":"source target name",
	
	"targetType":"oracle_database",
	            "dbCredName" : "namedcred:owner",
	            "hostCredName" : "sourcehostcred:owner"
	            "tdeWalletPassword": "<password>"
	        },
	       "stageDir":"directory location in source host",
	
	"tableSpaceList":"<tablespaces to migrate comma separated>"
	    }],
	    "encryptionPassword": "<password>",
	    "destination":[{
	        "databaseInfo":{
	             "targetName" : "destination target name",
	             "targetType" : "oracle_database",
	             "dbCredName" : "namedcred:owner",
	             "hostCredName" : "destinationhostcred:owner",
	             "tdeWalletPassword": "<password>"
	             "newPdbInfo":{
	                 "name":"new pdb name",
	                 "adminUser":"new pdb admin username",
	
	"adminPassword":"new padb admin username password"
	              }
	        },
	        "stageDir":"directory location in destination host"
	    }],
	    "storage":{</pre>

Feature	Description

	<pre>"type":"FILESYSTEM or ASM",
	"storageDir":"directory location in destination host",
	"asmCredName":"asmCred:owner"
	},
	"analyzePerformance":{
	
	"useSPA": false
	}
	"customScripts":
	{
	"preMigrationScriptUrn": "<SWLIB URN>,
	"postMigrationScriptUrn": "<SWLIB URN>",
	"postMigrationSqlScriptUrn": "<SWLIB URN>"
	}
	}</pre>

Response	<pre>{
	"statusCode": 200,
	"status": "SUCCESS",
	"message": "Successfully submitted Validate Database Migration procedure.","submissionName": "Validate Database Migration Mon Jul 26 2021 09:22:00 UTC",
	"submissionBy": "SYSMAN",
	"submissionId": "C80442152B282C78E05342104B64A611",
	"executionId": "C80442152B2B2C78E05342104B64A611",
	"uiActivityUrl": "/em/faces/core-jobs-procedureExecutionTracking?executionGUID=C80442152B2B2C78E05342104B64A611",
	"restActivityUrl": "/em/websvcs/restful/db/migration/activities/C80442152B2B2C78E05342104B64A611"
	}</pre>

Transportable Tablespace Validation Results

To review results of a Transportable Tablespace Migration Validation run the following command:

Feature	Description
Request Method	POST

Feature	Description
URI	`https://hostname:port/em/websvcs/restful/db/migration`
Header	`Content-Type: application/json` `Authorization: Basic`

Payload	`{`
	`"action": "VALIDATION_RESULTS",`
	`"executionId": "<executionId>"`
	`}`

Feature	Description
Response	"status": "SUCCESS", "description": " Database is not standby(which is valid),Database is valid container database,Database is in archive mode (which is valid),Database has primary role (which is valid)", "name": "Destination database status validation" }, { "id": "DESTINATION_WORKING_DIRECTORY_VALIDATION", "status": "SUCCESS", "description": " Working directory is validated successfully", "name": "Destination working directory validation" }, { "id": "DESTINATION_DISK_SPACE_VALIDATION", "status": "SUCCESS", "description": " \n \tINFORMATION : /scratch/ has enough space. Required space is 7020 MB , available space is 199805 MB.", "name": "Destination target disk space validation" }, { "id": "DESTINATION_TARGET_PRIVILEGES_VALIDATION", "status": "SUCCESS", "description": " User has VIEW_TARGET privilege,User has CONNECT_TARGET privilege,User has CONFIGURE_TARGET privilege,User has GET_CREDENTIAL privilege for oracle_database,User has PERFORM_OPERATION privilege,User has GET_CREDENTIAL privilege for host,User has ORACLE_HOME_OWNER privilege", "name": "Destination target privilege validation" }, { "id": "SOURCE_DATABASE_ENCRYPTION_VALIDATION", "status": "SUCCESS", "description": " Database is not encrypted (which is valid)", "name": "Source database encryption validation" }, { "id": "DESTINATION_DATABASE_ENCRYPTION_VALIDATION", "status": "SUCCESS",

Feature	Description

	"description": " Database is not encrypted (which is valid)",
	"name": "Destination database encryption validation"
	},
	{
	"id": "COMPATIBILITY_VALIDATION",
	"status": "SUCCESS",
	"description": " Source & Destination database are compatible",
	"name": "Compatibility validation"
	},
	{
	"id": "PDB_VALIDATION",
	"status": "SUCCESS",
	"description": " PDB name is valid",
	"name": "PDB validation"
	},
	{
	"id": "DESTINATION_SPA_VALIDATION",
	"status": "SUCCESS",
	"description": " Database user has all the required privileges(s) for analysing performance using SPA",
	"name": "Destination database SPA validation"
	},
	{
	"id": "STORAGE_VALIDATION",
	"status": "SUCCESS",
	"description": " Storage validation successfull",
	"name": "Storage validation"
	}
	],
	"totalValidation": 20,
	"successValidation": 20,
	"validationPerformed": 20,
	"skippedValidation": 0,
	"failedValidation": 0,
	"ignorableValidation": 0,
	"warningValidation": 0,
	"status": "COMPLETED"
	}

Migrate via EM CLI

Migration Workbench operations can be done using the EM CLI verb `migrate_db` woth a JSON file.

> **Note:**
>
> Before attempting a migration using `migrate_db` on Oracle databases 13.3.2.0.0 and later, make sure patch 12.1.0.2.210119 is deployed.

The following migration methods are available using EM CLI:

- Migrate Using Data Pump
- Migrate Using Transportable Tablespace

> **Note:**
>
> Transportable Tablespace migrations are available starting with Oracle Enterprise Manager 13 Release 5 Update 5 (13.5.0.5).

Migrate Using Data Pump

Data Pump provides an Export and Import way of moving data and metadata from one database to another. The following is a list of available migrations using Data Pump.

Before attempting a Full Database or Schema migration it is recommended you run the Cloud Premigration Advisor Tool (CPAT). For more information see: **Perform a CPAT Analysis with EM CLI**.

- Full Database Data Pump Migration using EM CLI.
- Data Pump Schema Migration using EM CLI.

Full Database Data Pump Migration using EM CLI

The entire database from on premise to on premise, PDB or Oracle Cloud.

Full Database Data Pump Migration Using EM CLI

To migrate using EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/DB_Migration.JSON"
```

Where the file `DB_Migration.JSON` contains the following parameters:

```
{
    "action": "MIGRATE",
    "options": "SPA",
    "type": "DATAPUMP"
    "proxy":{  --> Required if you have a proxy connection setup
        "host":"<proxy-host>",
        "port":"<proxy-port>"
    },

    "source":[{
        "databaseInfo":{
                "targetName":"<db-pdb-target-name>",
                "targetType":"<db-pdb-target-type>",
                "dbCredName":"<db-cred-name:em-cred-owner>", --> If not
provided, preferred credentials will be used
                "hostCredName":"<host-cred-name:em-cred-owner>" --> If not
provided, preferred credentials will be used
        },
```

```
        "export":{
            "args":{
                    "LOGTIME":"ALL",
                    "METRICS":"YES",
                    "COMPRESSION":"ALL",
                    "COMPRESSION_ALGORITHM":"MEDIUM",
                    "KEEP_MASTER":"YES",
                    "PARALLEL":"1",
                    "directory":"<dump directory name>",

"EXCLUDE":"index,cluster,indextype,materialized_view,materialized_view_log,mat
erialized_zonemap,db_link",
                    "ENCRYPTION":"ALL",
                    "ENCRYPTION_PASSWORD":"<Encryption Password>",
                    "ENCRYPTION_ALGORITHM":"AES128"
            }
        }
    }],

    "storage":{
        "type":"OBJECTSTORE"
        "useProxy": <boolean, true/false> --> If true, the proxy from main
section will be used to upload objects to OCI Object store
        "objectstore":{
            "credName":".."
            "baseUrl":"..",
            "bucketName":".."
        },
  },
    "destination":[{
        "useProxy": <boolean, true/false> --> If true, the proxy from main
section will be used to connect to ADB
        "databaseInfo":{
             "targetName":"<adb-target-name>",
             "targetType":"<adb-target-type>",
             "dbCredName":"<db-cred-name:em-cred-owner>", --> If not
provided, preferred credentials will be used
             "hostCredName":"<adb monitoring host-cred-name:em-cred-owner>" --
> If not provided, preferred credentials will be used
             "tdeWalletPassword": "<password>", --> TDE wallet password is
required when a new PDB is created at the
      destination
        },

        import": {
        "args": {
          "TABLE_EXISTS_ACTION": "SKIP",
          "PARALLEL": "6",
          "TRANSFORM":
"SEGMENT_ATTRIBUTES:N,DWCS_CVT_IOTS:Y,CONSTRAINT_USE_DEFAULT_INDEX:Y",
          "REMAP_TABLESPACE" : "<source_tablespace:target_tablespace> [,
<source_tablespace:target_tablespace>, ...]"
          "NOLOGFILE": "YES",
          "DIRECTORY": "DATA_PUMP_DIR"
        },
        "dbOciAuthCred": "<cloud-cred-name:cloud-cred-owner>"
```

```
      },
      "tnsName": "<adb-service-name>",
      "recomplieInvalidObjects": <true|false>, -->After migration recompiles
all invalid objects within the migrated schemas
    }],

   "analyzePerformance": --optional
    {
        "useSPA": true/false,
        "createSTS": true/false,
        "usePreferredSTS":  true/false -->optional
        "stsName": "stsname01" -->optional
        "stsOwner": "stsOwnedSchema" -->optional
        "stsOwner": "EXPUSER" -->optional
        "baselineDurationDays": 7 -->optional, set duration for SPA to analyze
    }
}
```

For more information on **migrate_db** and the accepted parameters required for migration, see: migrate_db in *Oracle Enterprise Manager Command Line Interface* .

Data Pump Schema Migration using EM CLI

Migrates only the schema, this is recommended as a starting point when migrating with Migration Workbench to ensure proper migration when performing a Full Database migration.

Migrate Using EM CLI

To migrate schema using EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/DB_Migration.JSON"
```

Where the file `DB_Migration.JSON` contains the following parameters:

```
{
    "action": "MIGRATE",
    "options": "SPA",
    "type": "SCHEMA"
    "proxy":{  --> Required if you have a proxy connection setup
        "host":"<proxy-host>",
        "port":"<proxy-port>"
    },

    "source":[{
        "databaseInfo":{
                "targetName":"<db-pdb-target-name>",
                "targetType":"<db-pdb-target-type>",
                "dbCredName":"<db-cred-name:em-cred-owner>", --> If not
provided, preferred credentials will be used
                "hostCredName":"<host-cred-name:em-cred-owner>" --> If not
provided, preferred credentials will be used
        },

        "export":{
```

```
            "args":{
                    "LOGTIME":"ALL",
                    "METRICS":"YES",
                    "COMPRESSION":"ALL",
                    "COMPRESSION_ALGORITHM":"MEDIUM",
                    "KEEP_MASTER":"YES",
                    "PARALLEL":"1",
                    "directory":"<dump directory name>",

"EXCLUDE":"index,cluster,indextype,materialized_view,materialized_view_log,mat
erialized_zonemap,db_link",
                    "ENCRYPTION":"ALL",
                    "ENCRYPTION_PASSWORD":"<Encryption Password>",
                    "ENCRYPTION_ALGORITHM":"AES128"
            }
        }
    }],

    "storage":{
        "type":"OBJECTSTORE"
        "useProxy": <boolean, true/false> --> If true, the proxy from main
section will be used to upload objects to OCI Object store
        "objectstore":{
            "credName":".."
            "baseUrl":"..",
            "bucketName":".."
        },
  },
    "destination":[{
        "useProxy": <boolean, true/false> --> If true, the proxy from main
section will be used to connect to ADB
        "databaseInfo":{
             "targetName":"<adb-target-name>",
             "targetType":"<adb-target-type>",
             "dbCredName":"<db-cred-name:em-cred-owner>", --> If not
provided, preferred credentials will be used
             "hostCredName":"<adb monitoring host-cred-name:em-cred-owner>" --
> If not provided, preferred credentials will be used
             "tdeWalletPassword": "<password>", --> TDE wallet password is
required when a new PDB is created at the
      destination
        },

        import": {
        "args": {
          "TABLE_EXISTS_ACTION": "SKIP",
          "PARALLEL": "6",
          "TRANSFORM":
"SEGMENT_ATTRIBUTES:N,DWCS_CVT_IOTS:Y,CONSTRAINT_USE_DEFAULT_INDEX:Y",
          "REMAP_TABLESPACE" : "<source_tablespace:target_tablespace> [,
<source_tablespace:target_tablespace>, ...]"
          "NOLOGFILE": "YES",
          "DIRECTORY": "DATA_PUMP_DIR"
        },
        "dbOciAuthCred": "<cloud-cred-name:cloud-cred-owner>"
      },
```

```
      "tnsName": "<adb-service-name>",
      "recomplieInvalidObjects": <true|false>, -->After migration recompiles
all invalid objects within the migrated schemas
    }],

   "analyzePerformance": --optional
    {
        "useSPA": true/false,
        "createSTS": true/false,
        "usePreferredSTS":  true/false -->optional
        "stsName": "stsname01" -->optional
        "stsOwner": "stsOwnedSchema" -->optional
        "stsOwner": "EXPUSER" -->optional
        "baselineDurationDays": 7 -->optional, set duration for SPA to analyze
    }
}
```

For more information on **migrate_db** and the accepted parameters required for migration, see: migrate_db in *Oracle Enterprise Manager Command Line Interface* .

Migrate Using Transportable Tablespace

Transportable Tablespace provides a Near Zero Downtime (NZDT) way to create a duplicate database from incremental backups of the source database, while retaining the original target database.

> **Note:**
>
> Migration Workbench Transportable Tablespace migrations are available starting with Oracle Enterprise Manager 13 Release 5 Update 5 (13.5.0.5).
> Migration Workbench can support On-Premise to On-Premise migrations and On-Premise to PDB Transportable Tablespace migrations starting with Oracle Enterprise Manager 13 Release 5 Update 10 (13.5.0.10) .
>
> The pre-migration analyzer (migration readiness check) will run as part of a Transportable Tablespace deployment procedure starting with Oracle Enterprise Manager 13 Release 5 Update 15 (13.5.0.15)

The following is a list of available migrations using Transportable Tablespace:

- Migrate a Full Database with Transportable Tablespace
- Perform a Multiphase Migration with Transportable Tablespace
- Migrate Selected Tablespaces Only

Validate a Transportable Tablespace Migration Using EM CLI

It is recommended that before you execute a Transportable Tablespace Migration, you first perform a validation.

Validate a Transportable Tablespace Migration

To validate a TTS migration using EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/TTS_Migration.JSON"
```

Where the file `TTS_Migration.JSON` contains the following parameters:

```
{
    "action": "VALIDATE",
    "type": "ONLINE_TTS",

    "source":[{
        "databaseInfo":{
            "targetName":"<source target name>",
            "targetType":"<oracle_database>",
            "dbCredName" : "<namedcred:owner>",
            "hostCredName" : "<sourcehostcred:owner>"
            "tdeWalletPassword": "<password>"
        },
       "stageDir":"<directory location in source host>",
       "tableSpaceList":"<comma separated or empty>"
    }],
    "encryptionPassword": "<password>",
    "destination":[{
        "databaseInfo":{
             "targetName" : "<destination target name>",
             "targetType" : "<oracle_database>",
             "dbCredName" : "<namedcred:owner>",
             "hostCredName" : "<destinationhostcred:owner>",
             "tdeWalletPassword": "<password>"
             "newPdbInfo":{
                 "name":"<new pdb name>",
                 "adminUser":"<new pdb admin username>",
                 "adminPassword":"<new pdb admin username password>"
              }
        },
        "stageDir":"<directory location in destination host>"
    }],
    "storage":{
        "type":"<FILESYSTEM or ASM>",
        "storageDir":"<directory location in destination host>",
        "asmCredName":"asmCred:owner"
    },
    "analyzePerformance":{

            "useSPA": false
    }
```

```
    "customScripts": {
        "preMigrationScriptUrn": "<SWLIB URN>,
        "postMigrationScriptUrn": "<SWLIB URN>",
        "postMigrationSqlScriptUrn": "<SWLIB URN>"
    }
}
```

View Transportable Tablespace Validation Results

To verify using EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/TTS_Verify.JSON"
```

Where the file `TTS_Verify.JSON` contains the following parameters:

```
{
"action": "VALIDATION_RESULTS",
"executionId": "<executionId>"
}
```

Transportable Tablespace Full Migration Using EM CLI

The following is an example of a Transportable Tablespace migration using EM CLI

To perform a TTS Full migration using EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/TTS_Migration.JSON"
```

Where the file `TTS_Migration.JSON` contains the following parameters:

```
{
    "action": "MIGRATE",
    "type": "ONLINE_TTS",
    "source":[{
        "databaseInfo":{
            "targetName":"<source target name>",
            "targetType":"<oracle_database>",
            "dbCredName" : "namedcred:owner",
            "hostCredName" : "sourcehostcred:owner"
         "tdeWalletPassword": "<password>"
        },
       "stageDir":"<directory location in source host>",
       "tableSpaceList":"<comma separated or empty>"
    }],
    "encryptionPassword": "<password>",
    "destination":[{
        "databaseInfo":{
             "targetName" : "<destination target name>",
             "targetType" : "<oracle_database>",
             "dbCredName" : "namedcred:owner",
             "hostCredName" : "destinationhostcred:owner",
             "tdeWalletPassword": "<password>"
```

```
                "newPdbInfo":{
                    "name":"<new pdb name>",
                    "adminUser":"<new pdb admin username>",
                    "adminPassword":"<new pdb admin username password>"
                 }
            },
            "stageDir":"<directory location in destination host>"
        }],
        "storage":{
            "type":"FILESYSTEM or ASM",
            "storageDir":"<directory location in destination host>",
            "asmCredName":"<asmCred:owner>"
        },
        "analyzePerformance":{

                "useSPA": false
        }
        "customScripts": {
            "preMigrationScriptUrn": "<SWLIB URN>,
            "postMigrationScriptUrn": "<SWLIB URN>",
            "postMigrationSqlScriptUrn": "<SWLIB URN>"
        }
}
```

For more information on **migrate_db** and the accepted parameters required for migration, see: migrate_db in *Oracle Enterprise Manager Command Line Interface* .

Transportable Tablespace Multiphase Migration Using EM CLI

Transportable Tablespace migrations can also be performed with incremental backups giving you more control of your migration.

Transportable Tablespace migrations can also be performed with incremental backups giving you more control of your migration. In a TTS Multiphase Migration, you can take an initial backup, return at any other time for an incremental backup by requesting action `INCREMENTAL_ROLLFORWARD`, or simply initiate the final migration step by requesting action `FINAL_CUTOVER`.

This feature is available starting with Oracle Enterprise Manager 13 Release 5 Update 7 (13.5.0.7).

Incremental Backup for a Transportable Tablespace Migration with EM CLI

```
emcli migrate_db
-file="/home/migrations/TTS_Migration.JSON"
```

Where the file `TTS_Migration.JSON` contains the following parameters:

```
{
  "action": "INCREMENTAL_ROLLFORWARD",
  "executionId": "<Execution Id>"
}
```

Finalize a Transportable Tablespace Migration with EM CLI

To finalize a TTS migration after performing incremental backups using EM CLI use the following command:In this step, an incremental backup is taken as well as an export/import of metadata into the destination database. It is recommended that the finals step be triggered during a scheduled maintenance window since a Complete Migration sets the tablespace in Read Only mode.

```
emcli migrate_db
-file="/home/migrations/TTS_Migration.JSON"
```

Where the file `TTS_Migration.JSON` contains the following parameters:

```
{
"action": "FINAL_CUTOVER",
"executionId": "<Execution Id>"
}
```

> **Note:**
>
> Enter the `executionId` of the parent migration.

For more information on **migrate_db** and the accepted parameters required for migration, see: migrate_db in *Oracle Enterprise Manager Command Line Interface* .

Transportable Tablespace Only Migration Using EM CLI

It is recommended that before you execute a Transportable Tablespace Migration, you first perform a validation.

> **Note:**
>
> Full and Multiphase migration options can also be performed using only selected tablespaces.

Transportable Tablespace Only Migration

To perform a tablespace only migration using EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/TTS_Migration.JSON"
```

Where the file `TTS_Migration.JSON` contains the following parameters:

```
{
    "action": "MIGRATE",
    "type": "ONLINE_TTS",

    "source":[{
```

```
        "databaseInfo":{
            "targetName":"<source target name>",
            "targetType":"<oracle_database>",
            "dbCredName" : "<namedcred:owner>",
            "hostCredName" : "<sourcehostcred:owner>"
            "tdeWalletPassword": "<password>"
        },
       "stageDir":"<directory location in source host>",
       "tableSpaceList":"<tablespace list comma separated"
    }],
    "encryptionPassword": "<password>",
    "destination":[{
        "databaseInfo":{
             "targetName" : "<destination target name>",
             "targetType" : "<oracle_database>",
             "dbCredName" : "<namedcred:owner>",
             "hostCredName" : "<destinationhostcred:owner>",
             "tdeWalletPassword": "<password>"
             "newPdbInfo":{
                 "name":"<new pdb name>",
                 "adminUser":"<new pdb admin username>",
                 "adminPassword":"<new pdb admin username password>"
              }
        },
        "stageDir":"<directory location in destination host>"
    }],
    "storage":{
        "type":"<FILESYSTEM or ASM>",
        "storageDir":"<directory location in destination host>",
        "asmCredName":"asmCred:owner"
    },
    "analyzePerformance":{

            "useSPA": false
    }
    "customScripts": {
        "preMigrationScriptUrn": "<SWLIB URN>,
        "postMigrationScriptUrn": "<SWLIB URN>",
        "postMigrationSqlScriptUrn": "<SWLIB URN>"
    }
}
```

View Transportable Tablespace Validation Results

To verify using EM CLI use the following command:

```
emcli migrate_db
-file="/home/migrations/TTS_Verify.JSON"
```

Where the file `TTS_Verify.JSON` contains the following parameters:

```
{
"action": "VALIDATION_RESULTS",
```

```
"executionId": "<executionId>"
}
```