Attunity Enterprise Manager User and Installation Guide, Version 3.3.0

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1 | Introduction

Attunity Enterprise Manager, also referred to as AEM, provides a single point of control for designing, executing, and monitoring data replication tasks throughout your organization. If your site has multiple Attunity Replicate servers with tens, if not hundreds of replication tasks, AEM greatly eases the design, management, and monitoring of these tasks. Whether your site deploys a single Attunity Replicate server or multiple servers, AEM is your single go-to interface to create data endpoints, design tasks, execute them, and monitor the replication process in near real-time. In addition, AEM lets you view all tasks in a tabular format that offers advanced grouping and filtering capabilities.

The following figures show a high-level view of a possible AEM installation environment and a more detailed architecture diagram.

Figure 1.1 | Example AEM Environment
2 | Installation and Setup

This chapter describes how to install and set up Attunity Enterprise Manager (AEM).

**Note** For instruction on installing AEM in a Windows Cluster, see [Installing AEM in a Windows Cluster](#).

AEM collects information from Replicate Servers to allow a central point of monitoring for all Replicate Servers in your organization. Therefore, you also need to install Attunity Replicate in your organization. For a description of the Replicate installation procedure, refer to the *[Attunity Replicate User Guide and Reference](#)*.

**In this chapter:**
- Preparing your System for AEM
- Setting Up HTTPS for the AEM Console
- Installing AEM
- Setting the Hostname and Changing the SSL Port
- Logging into AEM
- Starting to Work with the Attunity Enterprise Manager Console

### Preparing your System for AEM

This section describes the hardware and software requirements for Attunity Enterprise Manager and the monitored Replicate Servers.

**In this section:**
- [Hardware Requirements](#)
- [Software Requirements](#)

#### Hardware Requirements

It is strongly recommended to install Attunity Enterprise Manager on a machine that is:

- A dedicated Windows server, separate from the Replicate Servers that it manages.
- Located in the same data center as the monitored Replicate Servers, with direct access to all of them to ensure good connectivity and high performance, and to avoid latency issues.
AEM can be installed on any of the following Windows platforms:

- Windows Server 2008 R2 (64-bit)
- Windows Server 2012 R2 (64-bit)

In addition, it is recommended that the machine hosting AEM meets the configuration requirements listed in the following table.

**Table 2.1 | Recommended Hardware Configuration**

<table>
<thead>
<tr>
<th>Component</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>8-core base</td>
</tr>
<tr>
<td>Memory</td>
<td>16 GB</td>
</tr>
<tr>
<td>Disk requirements</td>
<td>500 GB</td>
</tr>
<tr>
<td></td>
<td>10,000 RPM</td>
</tr>
<tr>
<td>Network</td>
<td>1 Gb</td>
</tr>
</tbody>
</table>

Firewall port 443 should be open inbound on the AEM machine.

**Software Requirements**

Attunity Enterprise Manager requires the following software:

- Microsoft Visual Studio C++ 2010 X64 Redistributable and 2015 X64 Redistributable
- .NET Framework 4.5.2 or above

- **Supported Browsers**: The following browsers can be used to access the AEM Console:
  - **Google Chrome (recommended)**: Latest version
  - **Mozilla Firefox**: Version 38 and above
  - **Microsoft Internet Explorer**: 11
    - Required Resolution: 1366x768 pixels and above

See also: [Attunity Replicate Compatibility](#).

**Attunity Replicate Compatibility**

AEM 3.3.0 is compatible with Replicate 5.2 and above for all functionality except **Designer** mode, which is only compatible with Replicate 5.5.

**Setting Up HTTPS for the AEM Console**

Industry-standard security practices dictate that web user interface for enterprise products must use secure HTTP (HTTPS). Attunity AEM enforces the use of HTTPS and will not work if HTTPS is configured incorrectly.
As AEM uses the built-in HTTPS support in Windows, it relies on the proper setup of the Windows machine it runs on to offer HTTPS access. In most organizations, the IT security group is responsible for generating and installing the SSL server certificates required to offer HTTPS. It is strongly recommended that the machine on which AEM is installed already has a valid SSL server certificate installed and bound to the default HTTPS port (443).

Checking if an SSL Certificate is Installed

To check whether an SSL certificate is installed, you can use the following command:

```
netsh http show sslcert | findstr /c:"443"
```

If an SSL certificate is installed, the output should look like this:

```
netsh http show sslcert | findstr /c:"443"
IP:port : 192.168.1.11:443
IP:port : [fe80::285d:599c:4a55:1092%11]:443
IP:port : [fe80::3d0e:fb1c:f6c3:bc52%23]:443
```

With a valid SSL certificate installed, the AEM web user interface will automatically be available for secure access from a web browser using the following URL:

```
https://<machine-name>/attunityenterprisemanager
```

Using the Self-Signed Certificate

Due to the way the HTTPS protocol works, there is no way for AEM to automatically provide and install a valid SSL server certificate. Still, in the event that no SSL server certificate is installed, AEM automatically generates and installs a self-signed SSL server certificate (as a temporary measure). This certificate is generated on the AEM machine and cannot be exported or used elsewhere.

It should be noted that browsers do not consider the certificate to be valid because it was not signed by a trusted certificate authority (CA). When connecting with a browser to a server that uses a self-signed certificate, a warning page is shown such as this one in Chrome:
Or this one in Firefox:

The warning page informs you that the certificate was signed by an unknown certificate authority. All browsers display a similar page when presented with a self-signed certificate. If you know that the self-signed certificate is from a trusted organization, then you can instruct the browser to trust the certificate and allow the connection. Instructions
on how to trust the certificate vary between browsers and even between different versions of the same browser. If necessary, refer to the help for your specific browser.

**Note** Some corporate security policies prohibit the use of self-signed certificates. In such cases, it is incumbent upon the IT Security department to provide and install the appropriate SSL server certificate (as is the practice with other Windows products such as IIS and SharePoint). If a self-signed certificate was installed and needs to be removed, then the following command can be used:

```
<product_dir>\bin\AemCtl.exe certificate clean
```

Note that after the self-signed certificate is deleted, connections to the Attunity Enterprise Manager machine will not be possible until a valid server certificate is installed. Should you want to generate a new self-signed certificate (to replace the deleted certificate), simply restart the Attunity Enterprise Manager service.

## Installing AEM

The following section describes how to install Attunity Enterprise Manager.

**To install AEM:**

1. Run the AEM setup file (AttunityEnterpriseManager_<version.build>_<systemtype>.exe, such as AttunityEnterpriseManager_3.0.0.105_X64.exe).
   The **Attunity AEM** setup wizard opens.
2. Click **Next**. Select I accept the terms of the license agreement and then click **Next** again.
3. Optionally, change the installation directory; then click **Next**.
4. Optionally, change the data directory; then click **Next**.
   All of the data that is created when you use Attunity Enterprise Manager is stored in a directory called **data**. By default, this directory is located in the installation directory where you install Attunity Enterprise Manager.
   **Note:** If you change the data directory, you must prefix all command line actions with:
   ```
   AemCtl.exe -d<path to the data directory>
   ```
   **For example:**
   ```
   <product_dir>\bin\AemCtl.exe -d<path do the data directory> configuration set -a <host address>
   ```
5. Click **Next** again to start the installation.
6. When the installation completes, click **Finish** to exit the Wizard.

**Note** As part of the installation, a new Windows Service called **Attunity Enterprise Manager** is created.
7. Open the Attunity Enterprise Manager console as described in Starting to Work with the Attunity Enterprise Manager Console.

Setting the Hostname and Changing the SSL Port
After installing Attunity Enterprise Manager, you can use the AEM CLI to set the hostname and SSL port for accessing the Attunity Enterprise Manager server machine.

Under normal circumstances, you should not need to set the hostname. However, on some systems, connecting using HTTPS redirects to localhost. If this occurs, set the hostname of the Attunity Enterprise Manager machine by running the command shown below.

**To set the hostname:**
Run the following command:

```
<product_dir>\bin\AemCtl.exe configuration set -a hostAddress
```
where *hostAddress* is the address of the AEM server machine.

**To change the SSL port:**
Run the following command:

```
<product_dir>\bin\AemCtl.exe configuration set -s httpsPort
```
where *httpsPort* is the SSL port number of the AEM server machine.

Logging into AEM
AEM uses Windows Authentication to authenticate users as part of the login process. Depending on the browser and its configuration, the login process is either automatic or explicit. When you use a browser on a Windows machine that has single sign-on enabled, the login process occurs automatically. The current logged-in Windows user’s identity is used to authenticate the user to AEM.

Starting to Work with the Attunity Enterprise Manager Console
To start working with AEM, you need to open the Attunity Enterprise Manager Console. You can use a Web browser to access the Console from any computer in your network. For information on supported browsers, see Preparing your System for AEM.

**Note** The user logged into AEM must be an authorized Attunity Enterprise Manager user.
To access the Attunity Enterprise Manager Console:

1. To access the Attunity Enterprise Manager Console from:
   - The machine on which it is installed, from the Windows Start menu, select All Programs > Attunity Enterprise Manager > Attunity Enterprise Manager Console.
   
   **Note** On a machine running Microsoft Windows 10 or Windows Server 2012, you need to run the Console as Administrator.

   - A remote browser, type the following address in the address bar of your Web browser:
     
     https://<computer name>/attunityenterprisemanager
     
     where <computer name> is the name or IP address of the computer where Attunity Enterprise Manager is installed.

2. If no server certificate is installed on the AEM machine, a page stating that the connection is untrusted opens. This is because when AEM detects that no server certificate is installed, it installs a self-signed certificate. Because the browser has no way of knowing whether the certificate is safe, it displays this page. For more information, see Setting Up HTTPS for the AEM Console.

   When prompted, enter your user name and password.

   The user name may need to include domain information in the following format:

   <domain name>@<user name>

   For more information, see Logging into AEM.
Managing Servers

**Servers** View is where you manage the Replicate Servers to be monitored by AEM. This view also provides information about the number of tasks defined on each server as well as their current status. To switch between Tasks View and Servers View, click the Servers tab in the top left of the console.

### In this chapter:
- Attunity Replicate Server Requirements
- Adding Servers
- Server Monitoring
- Additional Server Management Options
- Viewing Server Messages

#### Attunity Replicate Server Requirements

To be able to connect to a Replicate Server, AEM requires the following for each Replicate Server to be monitored:

- A Replicate administrator user. AEM uses this user to connect to the Attunity Replicate instance. This means:
  - If the connection is made directly to the replication server, you can use the fixed user name admin. In this case, the default port is 3552. You set the admin user password on the Replicate server using the repctl setserverpassword command, as follows:
    - On the Replicate server, run the following command from the bin directory; then restart the Replicate service:
      ```
      Repctl.exe setserverpassword <adminPassword>
      ```
    - For more details, see the Replicate documentation.
  - If the connection is made to the Attunity Replicate UI server, you must use a user with Admin role, as defined in the UserConfiguration.xml in the product’s data folder. The default port is 443.

- It is recommended that you configure this user with a strong password that does not need to be changed frequently. If the administrator password changes, you also need to change it in AEM.

- The port that AEM uses for connecting to Attunity Replicate needs to be opened inbound on the Replicate server machine. Depending on your network architecture (for example a WAN environment), you may also need to open ports on routers and border firewalls.
If you block outbound traffic from the AEM machine, you need to make an exception on the AEM machine for the ports used to connect to the Replicate Server. For additional information, see Attunity Replicate Compatibility.

Adding Servers

For AEM to display information on tasks and messages on a replication server, you need to add this server. Once a server is added as Monitored, AEM establishes a connection to it and automatically discovers and retrieves all tasks and messages, along with basic information about the server.

**Note** You need the admin role to be able to add a server.

**To add a server:**

1. Open Attunity Enterprise Manager.
2. Click **Add Server**. The **Add Server** dialog box opens.
3. Provide the following information:
   - **Name**: A unique name not exceeding 64 characters. The name can contain Latin characters, spaces, dots, dashes, and underscores.
   - **Description**: Optional. Cannot exceed 250 characters.
   - **Host**: The server’s host name or IP address. The combination of host and port must be unique.
   - **Port**: The port on which the host listens. The combination of host and port must be unique.
   - **Username**: The user name for the Replicate Server. AEM uses this user to connect to the Replicate Server. The name can contain Latin characters, spaces, dots, dashes, and underscores.
     For a domain user, use the following format: `<domain>\<user name>
     For example: ATTUNITY_LOCAL\JohnMiller
   - **Password**: The user password for the Replicate server. For details, see Attunity Replicate Server Requirements.
4. Select the **Monitor this server’s tasks and messages** check box if you want AEM to retrieve tasks and messages from this server.
5. Click **Test Connection** to verify that Attunity Enterprise Manager is able to establish a connection to the Replicate Server.
6. Click **OK** to save your settings.
Server Monitoring

Attunity Enterprise Manager shows server information in table format. The following columns are available. Note that columns marked with an asterisk are not displayed by default.

**General Columns:**
- **Days to Expiration:** Days remaining until the license expires
- **Description:** A description of the server
- **Host:** The server’s hostname or IP address
- **Issue Date:** When the license was issued
- **Last Connection:** The date and time of the last successful sync/retrieval of tasks and messages
- **License Expiration:** The expiration date of the server license
- **License State:** The current license state (e.g. valid, expired, etc.)
- **Name:** The server’s display name
- **Platform:** The operating system on which the server is installed, which can be Windows or Linux
- **Port:** The port through which the server is accessed
- **Replicate Version:** The Replicate version
- **State:** The current state of the server. When the server is being monitored, the state can be **Monitored** (green icon), which means that the AEM connected and synchronized successfully, or **Error**, including error details (red icon). When the server is not being monitored, the state is **Not Monitored** and the connection icon is grayed out.

**Note** When a server experiences connection issues, tasks for this server are grayed out in the Tasks View.

**Message:** The error message displayed if Attunity Enterprise Manager cannot connect to the server

**Server Statistics Columns:**
- **Disk Usage (MB):** The amount of disk space that the server is currently consuming. This is the sum of disk usage of all tasks on this server. For details about a task’s disk usage, see Task Progress Summary.
- **Memory (MB):** The amount of memory that the server is currently consuming. This is the sum of memory usage of all active tasks on this server, not including stopped tasks. For details about a task’s memory usage, see Task Progress Summary.

**Task Summary Columns:** The number of tasks for each state.
Table 3.1 | Task States

<table>
<thead>
<tr>
<th>Task State</th>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stopped</td>
<td>🛄</td>
<td>The number of stopped tasks</td>
</tr>
<tr>
<td>Error</td>
<td>🚫</td>
<td>The number of tasks that encountered a fatal error</td>
</tr>
<tr>
<td>Recovering</td>
<td>🕐</td>
<td>The number of recovering tasks</td>
</tr>
<tr>
<td>Running</td>
<td>🌟</td>
<td>The number of running tasks</td>
</tr>
</tbody>
</table>

Customizing Server Columns
You can use the **Columns Settings** dialog box to select the columns to display and to arrange the order in which they appear. In addition, from the context menu, you can hide a column, export the list to a TSV file, or sort by column in ascending or descending order. For more information, see **Customizing Task Columns**.

Searching for Servers
You can search for specific servers by typing a string into the **Search Servers** box above the table. Note that AEM searches only textual columns, not numeric columns. The following columns are included in the search, even if a column is not displayed in the user interface:
- State
- Name
- Host
- Port
- Description
- License Expiration
- Message
- Platform
- Replicate Version

You can also restrict a search to a specific column by preceding the search string with the column name and a colon, as follows: *ColumnName:value* (for example: Name:john-vm.abc.local). This is applicable to all available columns, not only the columns listed above.

**Note**  When searching for a number, only enter whole numbers, no commas or special characters. For example, to search for 2,500, as displayed in the user interface, enter **2500**; to search for 100%, enter **100**.
Additional Server Management Options

In addition to adding servers, you can also edit, stop monitoring, or delete servers, and register a license, as described in the following table. Note that before performing any of the actions, you must first select the desired server or servers (multiple selection is supported for several actions).

<table>
<thead>
<tr>
<th>To</th>
<th>Do this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edit a server</td>
<td>Double-click the server.</td>
</tr>
<tr>
<td></td>
<td>-OR- Right-click the server and select <strong>Connection Properties</strong>.</td>
</tr>
<tr>
<td></td>
<td>-OR- Select the server and then click the <strong>Connection Properties</strong> button on the toolbar. Edit the information as described in <strong>Adding Servers</strong>.</td>
</tr>
<tr>
<td>Manage Endpoints Connections</td>
<td>Click <strong>Manage Endpoints</strong>.</td>
</tr>
<tr>
<td></td>
<td>Edit the information as described in <strong>Adding an Endpoint</strong>.</td>
</tr>
<tr>
<td>Create a new task on the server</td>
<td>Click <strong>New Task</strong>.</td>
</tr>
<tr>
<td></td>
<td>Edit the information as described in <strong>Setting up Tasks</strong>.</td>
</tr>
<tr>
<td>View server log files</td>
<td>If you need more detailed information about a Replicate server, you can view the log files directly from within AEM. See <strong>Viewing and Downloading Log Files</strong>.</td>
</tr>
<tr>
<td>Start monitoring or stop monitoring a server</td>
<td>Right-click the server and select <strong>Stop Monitoring/Start Monitoring</strong> accordingly.</td>
</tr>
<tr>
<td></td>
<td>-OR- Select the server and then click the <strong>Stop Monitoring</strong> or <strong>Start Monitoring</strong> button on the toolbar.</td>
</tr>
</tbody>
</table>

**Note** When you stop monitoring a server, the server appears as disabled in the Servers View.
To Do this

<table>
<thead>
<tr>
<th>To</th>
<th>Do this</th>
</tr>
</thead>
<tbody>
<tr>
<td>the Tasks View does not include any tasks for the respective server, and the Message Center does not show new messages for the respective server.</td>
<td></td>
</tr>
<tr>
<td><strong>Note</strong> You need the admin role to be able to start or stop monitoring a server.</td>
<td>Right-click the server and select <strong>Delete</strong>.</td>
</tr>
<tr>
<td><strong>Note</strong> Deleting a server deletes the tasks and the message history for the respective server.</td>
<td>-OR- Select the server and then click <strong>Delete</strong>.</td>
</tr>
<tr>
<td><strong>Note</strong> You need the admin role to be able to delete a server.</td>
<td>When prompted to confirm the deletion, click <strong>Yes</strong>.</td>
</tr>
</tbody>
</table>

Delete a server

Register a server license

Edit user permissions on the server level, for all tasks on the server, or for all endpoints on the server.

See **Registering a Replicate Server License**.

Click **Server Permissions**. Follow the instructions in **Managing User Permissions**.

Registering a Replicate Server License

You can update an existing Replicate Server license or register a new license directly from Attunity Enterprise Manager.

**To register a license:**

1. Copy the license file to your computer or any computer in your network you have access to.
2. Click **Register License** button or right-click the server and select **Register License**.
   The **Register License** dialog box opens.
3. Do one of the following:
   » Click **Load** and browse to locate and select the license file.
   » Copy the license text and paste it into the **License text** field.
   The license text is displayed in the dialog box as shown below. Check to be sure that the details are correct.
4. Click **Register License** to register the license.
   A message indicating that the license was registered successfully appears.

### Viewing Server Messages

You can view server messages in the Message Center. The Message Center is located at the bottom of the console and contains messages about the Replicate servers and tasks. For more information, see [Viewing Task and Server Messages](#).
4 | Designing Tasks

This section describes how to design a replication task. To design a replication task, you must first be sure that you have configured at least one source endpoint and one target endpoint to work with Attunity Replicate.

It is also possible to customize a task by creating new tables or columns for the target endpoint or by selecting only some of the data from each column to be replicated. This is done using transformations and filters.

**Note** A number of variables affect the amount of tasks that can be run on a single Replicate Server, including the task configuration (e.g. how many tables are being replicated), the size of the source tables and the hardware configuration of the Replicate Server machine. Bearing this in mind, the number of tasks that can be run on a single Replicate Server should not exceed 100 (and may need to be significantly less depending on the aforementioned variables). Best practice is to perform load testing in a Test environment before moving to Production.

For more information, see "Replication Tasks" in the *Attunity Replicate User and Reference Guide*.

**In this chapter:**
- Setting up Tasks
- Working with Endpoints
- Adding a Source and Target Endpoint to a Task
- Adding Tables and/or Views to a Task
- Editing a Replication Task
- Searching for Tasks
- Deleting a Replication Task

**Setting up Tasks**

Before you get started with designing the features that you need for a task, you must define the task's default behavior.

**To get started setting up a task:**

1. In Tasks view or Servers view, click **New Task**. The **New Task** dialog box opens.

   When you open this dialog box from the Servers view, the server is already selected and cannot be changed.
2. From the **Server Name** list, select the server for the task.
   You can only select the server name when you open the dialog box from the Tasks view.
   When you open the dialog box from the Servers view, it opens in context of the selected server.

3. Enter a name for the task. The name should be descriptive to indicate the purpose of the task.
   The name cannot exceed 32 characters, contain non-Latin characters, or contain any of the following characters: `\ : * ? " < >`

4. Optionally, enter a description for the task.
5. Choose one of the following replication profiles:
   » **Unidirectional** - Choose to replicate between endpoints for the purpose of data warehousing or business intelligence.
   » **Bidirectional** - Choose to synchronize records between two endpoints.
     For more information, see the instructions on setting up Bidirectional Replication.

6. Select task options:
   » **Full Load**: Click to enable or disable Full Load options for this task.
     When full load is enabled, AEM loads the initial source data to the target endpoint. By default a full load is carried out for this task. If you want to change this setting after you begin working with this task, you make the change in the Task Settings, Full Load tab.
   » **Apply Changes**: Click to enable or disable Apply Changes (Change Processing).
     When this option is enabled, AEM processes the changes. By default, change processing is carried out for this task. You can view the change processing in the Monitor view.
     For more information, see Monitoring Change Processing Replication. If you want to change this setting after you begin working with this task, you make the change in the Task Settings, Change Processing tab.

   **Note** When the Bidirectional replication option is selected, the Apply Changes option cannot be disabled.

   » **Store Changes**: Click this button to enable or disable Store Changes.
     If this option is enabled, changes are stored in change tables or in an audit table. By default, changes are not stored.
     For information about storing and applying changes, see the Attunity Replicate User and Reference Guide.

   **Note** When the Bidirectional replication option is selected, the Store Changes button will be unavailable.

7. Click **OK** to close the New Task dialog box and save your settings.

**Bidirectional Replication**

Bidirectional replication enables organizations to synchronize data between two endpoints (henceforth referred to as Endpoint A and Endpoint B), ensuring that both endpoints contain identical records. The endpoints can either be the same type (e.g. Oracle-to-Oracle) or different types (e.g. Microsoft SQL Server-to-Oracle). To implement bidirectional replication, two Bidirectional Replication tasks need to be defined: one that captures changes made to Endpoint A and replicates them to Endpoint B (Task 1) and another that
captures changes made to Endpoint B and replicates them to Endpoint A (Task 2). An explanation of how to set up these tasks is provided below.

**Limitations**

The following limitations apply to Bidirectional replication tasks:

- Bidirectional replication does not currently support conflict resolution. To prevent conflicts, organizations should ensure that the application that updates the endpoints participating in a bidirectional replication task, does not simultaneously update the same record in both endpoints.
  
  In other words, if a record in Endpoint A was updated, the equivalent record in Endpoint B should only be updated after the update from Endpoint A is replicated to Endpoint B.

- Bidirectional replication tasks currently only support DDL statements from one source only.

  **Note** The CREATE TABLE DDL is not supported.

- To ensure that the source and target endpoints are identical, transformations and filters should not be used in bidirectional replication tasks.
- The task’s Change Processing Mode must be set to Transactional apply.

**Supported Endpoints**

Bidirectional tasks support the following endpoints:

**Source Endpoints:**
- Oracle
- Microsoft SQL Server
- MySQL
- PostgreSQL
- All AIS sources
- File Channel
- SAP Sybase ASE

**Target Endpoints:**
- Oracle
- Microsoft SQL Server
- MySQL
- PostgreSQL
- ODBC
- File Channel
- SAP Sybase ASE
Setting up Bidirectional Replication

This section describes how to set up a Bidirectional replication task in AEM. Note that if Endpoint B contains tables that do not exist in Endpoint A, you must first set up and run a data warehousing or business intelligence task that replicates data from Endpoint B to Endpoint A.

To replicate data from Endpoint B to Endpoint A:

1. Define and run a Data Warehousing or Business Intelligence task that replicates data from Endpoint B to Endpoint A with Full Load enabled only (make sure to disable the Apply Changes option).
2. When the task completes, first verify that all the required tables exist in Endpoint A.
3. Continue with setting up Bidirectional Task 1, as described in the following procedure.

To set up Bidirectional Task 1:

1. Define a Bidirectional Replication task that replicates data from Endpoint A to Endpoint B.

   **Note** In a bidirectional replication task, Full Load replication is not enabled by default since it is assumed that both endpoints contain identical tables. If this is not the case (for instance, if Endpoint A contains tables that do not exist in Endpoint B), enable Full Load replication as well.

2. Specify a source and target Loopback prevention table schema in the task settings’ Loopback Prevention tab. For more information about loopback prevention settings, see Bidirectional.
3. Run the task.

To set up Bidirectional Task 2:

1. Define another Bidirectional Replication task that replicates data from Endpoint B to Endpoint A.
2. Specify a source and target Loopback prevention table schema in the task settings’ Loopback Prevention tab. For more information about loopback prevention settings, see Bidirectional.
3. Run the task. If Full Load was enabled when replicating data from Endpoint A to Endpoint B, you must first wait for the Full Load replication to complete before running the task.

Using Bidirectional Replication with the File Channel Endpoint

You can use bidirectional replication together with the File Channel endpoint. This is useful if you need to synchronize two endpoints that are either not able to communicate with each other (i.e. are not physically connected) or are located in the WAN. The process involves setting up six separate tasks: Two Full Load-only Data Warehousing or Business Intelligence tasks and four Apply Changes-only Bidirectional tasks.
For information on setting up the File Channel endpoint, see the *Attunity Replicate User and Reference Guide*.

**To set up bidirectional replication with File Channel Endpoints**

1. Set up and run two Full Load only Data Warehousing or Business Intelligence tasks.
   
   **Example (FC = File Channel):**
   
   **Task 1:** MySQL --&gt; FC Target **Task 2:** FC Source --&gt; Oracle

2. Wait for the *Full Load-only* tasks to finish.

3. Set up and run four *Apply Changes-only* Bidirectional tasks.

   **Example (FC = File Channel):**
   
   **Task 1:** MySQL Source --&gt; FC Target **Task 2:** FC Source 1 --&gt; Oracle Target
   **Task 3:** Oracle Source --&gt; FC Target 2 **Task 4:** FC Source 2 --&gt; MySQL Target

**Working with Endpoints**

AEM requires information to connect to the source and target endpoints that you want to use in a task. For a list of endpoints you can work with in Attunity Replicate, see the *Attunity Replicate User and Reference Guide*.

You use the **Manage Endpoint Connections** window to add endpoints and edit and view the endpoint connection information.

**Note**  The name cannot exceed 32 characters, contain non-Latin characters, or contain any of the following characters: \ / : * ? " &gt ;

» Adding an Endpoint

» Editing Endpoint Configuration Information

» Viewing Endpoint Configuration Information

**Adding an Endpoint**

Before you can begin to design a task, you must add endpoints to the Replicate server. To use an endpoint, you must have access to it somewhere in your system. When you add the endpoint to the Replicate server, you must provide connection information and proper user credentials.

Once you add endpoints to the Replicate server, you can begin to use them to build a replication task. For information on how to add an endpoint to a replication task, see **Adding a Source and Target Endpoint to a Task**.
To add an endpoint:

1. In the Servers view or on a dedicated task tab, click **Manage Endpoints**.
   The Manage Endpoint Connections window opens. The server is already selected and cannot be changed.

2. In the Manage Endpoint Connections window, click **New Endpoint**.

3. Select the type of endpoint you are using. The information that you must enter depends on which endpoint you select.
   For a list of supported endpoints and for more information on setting up a specific endpoint, see the *Attunity Replicate User and Reference Guide*.

Editing Endpoint Configuration Information

After you add the endpoint to the Replicate server and provide the connection information, you can make changes to some of the information.

**Note** You cannot change the following information in the endpoint window:

- The name you provided for the endpoint.
- The endpoint **Type**, for example Oracle or Microsoft SQL Server.
- The endpoint **role**, either SOURCE or TARGET.

To edit endpoint configuration information:

1. In the Manage Endpoint Connections window, select the endpoint you want to edit.
   or
   In the Endpoints list on the left of the Designer view, double-click the endpoint you want to edit. Note that this option is only available when editing a specific task.
   The Manage Endpoint Connections window opens with the selected endpoint settings.

2. Make changes to the information in any of the tabs in the window.
   For more information about the information you can edit, see the chapter for the specific Attunity Replicate endpoint you are using in the *Attunity Replicate User and Reference Guide*. For a list of supported endpoints, see Chapter 4 in the *Attunity Replicate User and Reference Guide*.

Viewing Endpoint Configuration Information

After you add the endpoint to the Replicate server and provide the connection information, you can view the information in the Manage Endpoint Connections window.

To view endpoint configuration information:

- Select an endpoint from the Endpoints list in the left pane; then click the tabs to view the information.
Testing an Endpoint Connection
You can try to contact the endpoint to make sure that you are connected to the endpoint you want to work with.

To test the endpoint connection:
1. In the **Manage Endpoint Connections** window, select the endpoint you want to work with.
2. At the bottom of the endpoint’s **General** tab, click **Test Connection**.
   - If the connection is successful, a success message is displayed and a green check mark icon appears next to the **Test Connection** button.
   - If the connection fails, an error message is displayed at the bottom of the dialog box and the **View Log** button becomes available.
3. If the connection is successful, click **Close**.
   - If the connection fails, click **View Log** to view the server log entry with information for the connection failure.

Duplicating Endpoints
You can duplicate an endpoint if you need to define a new endpoint with similar settings. Except for the name, all endpoint settings are duplicated to the new endpoint.

To duplicate an endpoint:
1. In the left panel of the **Manage Endpoint Connections** window, click the endpoint you want to duplicate.
2. Click **Duplicate**.
3. On the General tab, edit the name for the endpoint.
4. Make any other necessary changes.
5. Click **Save**; then click **Close**.

Searching for Endpoints
You can search for endpoints by typing a sequence of letters in the **Filter by** box above the endpoints list. For example, to search for all endpoints whose names contain the string "Oracle", type "or". Only endpoints that match the search string are displayed.

Deleting Endpoints
You can delete endpoints that you no longer require. Note that to delete an endpoint that is defined as a source or target in a task, you first need to remove the endpoint from the task.
To delete an endpoint:

- In the left panel of the Manage Endpoint Connections window, Select the endpoint and click Delete.

Adding a Source and Target Endpoint to a Task

Once you have added the endpoints, you can design the replication task. The first step in this process is to define the source endpoint where your data is currently stored and the target endpoints where you want to replicate the data. To do this, you just drag one of the endpoints you added into the task map (in Designer mode).

Once you select the endpoint for your task, you must select the tables from the source endpoint to be replicated. The next step in creating a replication task is Adding Tables and/or Views to a Task.

To add source and target endpoints to a task:

1. Do one of the following:
   - Create a new task. When you click OK in the Create New Task dialog box, the task opens on a dedicated tab. For more information, see Setting up Tasks.
   - In the Tasks view, select the task to which you want to add endpoints and click View Task. The task opens on a dedicated tab.
2. On the dedicated tab for the task, click Designer to switch to Designer mode.

   The Task map is displayed, with the available endpoints listed in the pane on the left, as shown in the following figure.
3. Drag a source endpoint to the top circle in the task map (that contains the text Drop source endpoint here). If dragging is not possible, make sure that the endpoint you are using is defined as a source endpoint.

4. Drag a target endpoint to the bottom circle in the task map (that contains the text Drop target endpoint here). If dragging is not possible, make sure that the endpoint you are using is defined as a target endpoint.

5. Click Save.

Adding Tables and/or Views to a Task

This procedure describes how to select the source tables or views that you want to replicate. Note that tables can be selected from any supported endpoint, but views can only be selected from the ODBC or ODBC with CDC source endpoints.

Views are replicated to the target endpoint as tables.
When working with an ODBC with CDC source, any views and tables that you want to replicate must have the same context field(s). If you only want to replicate views, then all of the views must have the same context field(s).

For information on setting up context fields, see "Configuring Change Processing" in the "Using ODBC with CDC as a Source" chapter of the Attunity Replicate User and Reference Guide.

Once you have selected tables/views to replicate, you can run the replication task. However if you want to make any changes to the structure of the tables in the target endpoint or only select specific columns, you will need to carry out one or both of the following procedures:

**To select tables/views:**

1. Open the task you are working with if it is not already displayed in a dedicated tab. For information on opening a task, see Editing a Replication Task.
2. In Designer mode, on the right side, click Table Selection. If the source endpoint does not support view selection, the Select Tables dialog box opens. If the source endpoint supports view selection, the Select Tables/Views dialog box opens.

   See the following for information on how to work with the Select Tables/Select Tables/Views dialog box:
   - Searching for Tables/Views to use in a Replication Task
   - Selecting Specific Tables/Views for Replication
   - Creating Table/View Selection Patterns
   - Setting Load Order

Searching for Tables/Views to use in a Replication Task

This topic walks you through searching for specific tables/views in preparation for including them in a replication task. You first search for tables that match specific criteria. Then you select the required tables/views from the search results to include them in the task. You can also carry out another search with new criteria and then add additional tables/views to the replication task.

After you finish searching, you can select tables/views for replication. Continue with Selecting Specific Tables/Views for Replication.

**To search for tables/views to use in a replication task:**

1. In Designer mode, click Table Selection.
2. In the Select Tables dialog box, if the source endpoint supports view selection, select one of the following:
- **All** to search for tables and views
- **Tables** to search for tables only
- **Views** to search for views only

Otherwise, skip to the next step.

3. From the **Schema** drop-down list, select a table/view schema.

   **Note** When selecting tables from the SAP Application endpoint, "Business Groups" will appear instead of "Schema".

4. In the **Table/View** field, type the name or partial name of a table/view.

   **Note** You can also include special characters in your search string. For more information, see the Note in **Creating a Record Selection Condition for One or More Columns**.

5. Click **Search** to display a list of tables/views.

   **Note** When selecting tables from the SAP Application endpoint, the **Table List** will display all of the tables in the selected Business Group. Hovering your mouse cursor over a table will display a tooltip as shown below.

   ![](image)

   The **Table List** field displays any table/view that matches the specified.

   If the source endpoint supports view selection, an additional **Type** column indicates whether the database object is a table or a view.

6. Click **OK**.

**Selecting Specific Tables/Views for Replication**

This topic walks you through selecting tables/views to replicate in full. It assumes that you have already searched for the tables/views to use in the replication task. If you have not, start here: **Searching for Tables/Views to use in a Replication Task**

When you explicitly select tables/views, all selected tables/views are replicated in full unless you define transformations or filters for the table/view. If you need to make changes to the table/view structures in the target endpoint or if you only want to select
specific columns, then you need to perform the procedures described in Defining Transformations for a Single Table/View and Using Filters respectively.

**To explicitly select tables/views for replication:**

1. In the **Select Tables** dialog box, from the **Table List** field, select one or more tables that you want to include in the replication task.
2. To select a table, click the button with a single right-facing arrowhead (**Add**).
   
   To select all tables in the **Table List**, click the button with two right-facing arrowheads (**Add All**).
   
   The selected tables are added to the **Selected Tables** list.
3. Click **OK** to close the **Select Tables** or **Select Tables/Views** dialog box.
4. Click **Save** to make sure that AEM saves the table information for this task.

**Setting Load Order**

You can set the load order for each of the selected tables. This may be useful, for example, if your selected tables list contains tables of different sizes and you want the smaller tables to be loaded before the larger tables. When a group of tables are set with the same load order, Replicate will load the tables according to the table ID.

Load order can be set and modified (see **note** below) in the following places:

- The **Select Tables** window (opened in Designer view by clicking the **Table Selection** button in the right of the console).
- The **Patterns and Select Tables** list in the right of the console (in Designer view).

**Note** Load order cannot be changed during a task. If you want to change the load order, first stop the task, then change the load order as desired, and finally reload the target.

**Note** Load order conflicts are handled as follows:

- If load order is set for a specific table and for a table pattern that includes that table, the load order priority for the specific table takes precedence.
- If several patterns include the same table and each of the patterns has a different load order priority, the pattern with the highest priority takes precedence.

**To set the load order for a specific table or table selection pattern**

1. Select the desired table in the **Selected Tables** list.
   
   - OR-
     
     Select the desired pattern (if defined) in the **Table Selection Patterns** list.
2. From the **Load Order** drop-down list, select one of the available priority levels (Lowest Priority, Low Priority, Normal Priority, High Priority, and Highest Priority).
3. This step is only relevant if you are setting load order in the Select Tables window. Click OK to save your settings and close the Select Tables window.

To set the same load order for multiple tables or table selection patterns
1. Select the desired tables in the Selected Tables list.
   -OR-
   Select the desired patterns (if defined) in the Table Selection Patterns list.
2. From any of the selected items' Load Order drop-down list, select one of the available priority levels.
3. This step is only relevant if you are setting load order in the Select Tables window. Click OK to save your settings and close the Select Tables window.

Removing Specific Tables/Views from a Replication Task
This topic walks you through removing specific tables/views from the replication task.

To remove tables from the Selected Tables list:
1. From the Selected Tables list, select a table that you want to remove from the replication task and then click the button with a single left-facing arrowhead (Remove).
2. To remove all of the tables/views from the Selected Tables or Selected Tables/Views list, click the button with two left-facing arrowheads (Remove All).
3. Click OK to close the Select Tables or Select Tables/Views dialog box.
4. Click Save to make sure that AEM saves the table information for this task.

Creating Table/View Selection Patterns
This topic walks you through selecting tables/views using patterns. For example, you can include all tables/views that belong to the HR schema except for one or two tables/views that you exclude. You can also only exclude one or more table/view schemas or tables/views. This replicates the entire endpoint, except for those tables/views that you excluded.

The following example shows a pattern that replicates all tables that are members of the HR schema except for the HR.EMPLOYEES table.

Include HR.%
Exclude HR.EMPLOYEES%

When you explicitly select tables/views, all selected tables/views are replicated in full unless you define transformations or filters for the table/view. If you need to make changes to the table/view structures in the target endpoint or if you only want to select specific columns, then you need to perform the procedures described in Defining Transformations for a Single Table/View and Using Filters respectively.
To view all of the tables/views included when you use a table selection pattern, click the Full Table List tab in Designer view. The Full Table List lists all of the tables/views included in any table pattern you defined as well as all explicitly selected tables/views. To view only patterns and explicitly selected tables/views, click the Patterns and Selected Tables tab in Designer view.

To create table/view selection patterns:
1. In the Designer view, in the Select Tables/Views dialog box, do any of the following:
   » Select a schema from the Schema drop-down list. All tables/views that belong to that schema are included in the table/view selection pattern.
   » Type the name or partial name of a table/view in the Table/View field. Any string that you enter here is included in the table/view selection pattern.
   » If the table/view that you type here is a member of the schema you selected in the Schema drop-down list, then you only have to type the name of the table/view.
   » If you did not select a schema or the table/view belongs to another schema, include the schema with the table name in the following format: HR.Employees, where HR is the schema.
2. Click Include to include all of the tables/views that match the selection criteria.
3. Click Exclude to exclude any tables that match the selection criteria.
4. Click OK to close the Select Tables/Views dialog box.
5. Click Save to make sure that AEM saves the table/view information for this task.

Editing a Replication Task
You can make changes to tasks that you previously created. Just open the task and make the changes in the same way that you did when you created the task.

To edit a task:
1. In Tasks view, select the task and click Open.
   The task opens, displaying the source and target endpoints and which tables have been selected for replication.
2. Continue with any of the following procedures:
   » Adding a Source and Target Endpoint to a Task
   » Adding Tables and/or Views to a Task
   » Defining Transformations for a Single Table/View
   » Using Filters
   » Task Settings
Searching for Tasks

In Tasks view, you can search for tasks by typing a sequence of letters in the Search Tasks box above the tasks. For example, to search for all tasks with names that begin with "Oracle-to", type "or". Only tasks that match the search string are displayed.

Deleting a Replication Task

You can delete tasks that you created. To prevent complications, it is recommended that you not use the name of a deleted task for a new task you create. Such a task would be created with the same settings as the deleted task.

**Note** If you use a Microsoft SQL Server endpoint, a Microsoft SQL Server system administrator must delete the Microsoft SQL Server Replication Publisher definitions for the endpoint that was used in the task from SQL Server.

For more information, see the "Limitations" section in the Microsoft SQL Server chapter in the Attunity Replicate User and Reference Guide.

To delete a task:

1. Stop the task that you want to delete.
2. In Tasks view, click Delete Task.
   The task is deleted.
This section describes how to customize a replication task. For example, you can create new tables or columns for the target endpoint or select only some of the data from each column to be replicated. This is done using transformations and filters.

**Note** Although the descriptions in this section only refer to tables, the procedures described herein are applicable to views as well. When a transformation is defined for a view, the word "View(s)" appears in the UI instead of the word "Table(s)".

---

**Table Settings**

In the **Table Settings** dialog box, you can define how the data for each individual table/view is replicated to the target.

**To open the Table Settings dialog box:**

1. Open the task you are working with. For information on opening a task, see *Editing a Replication Task*.
2. In Designer view, on the right, select the table on which you want to perform the transformation.
3. Click **Table Settings**. If the table you want to perform the transformation on was defined by creating a table selection pattern, select the **Full Table List** tab. For information on how to define table selection patterns, see *Creating Table/View Selection Patterns*.
4. In the **Table Settings** window, perform any of the following tasks:
   - **Carrying out General Tasks for a Single Table/View**
   - **Defining Transformations for a Single Table/View**
   - **Using Filters**
5. Click **OK** to close the **Table Settings** window.
6. Click **Save** to preserve the table and column information for this task.
7. To revert changes you made to tables to their default values, click **Reset Table Defaults** at the bottom left of the **Table Settings** window. This option is available in all tabs.

That this changes the data for all columns in the table to their default and removes any calculated columns that were added.

**Note** This option is only available for tables with changes. Modified tables include the word *(changed)* in the table list.

**Carrying out General Tasks for a Single Table/View**

**Note** Although the descriptions in this section only refer to tables, the procedures describe herein are applicable to views as well. When a task is being performed for a view, the word "View(s)" will appear in the UI instead of the word "Table(s)"

The **General** tab in the Table Settings window displays basic information about the selected table. See figure **Carrying out General Tasks for a Single Table/View** to view an example of this information. You can also rename the target table or schema in this tab.

**To edit the General table settings:**

1. Open the **Table Settings** window.
2. Click **General** on the left side of the window.
   
   The following figure shows the information in the **General** tab of the **Table Settings**
To rename the table or table schema:

In the **Map to target table** section, type one or both of the following:

- Type a new schema in the **Table Schema** field. This will add the schema name to the table. For example, if your table is `HR.Department`, type `PERS` to change the table name to `PERS.Department`.

- Type a new table name in the **Table Name** field. For example, if your table is `HR.Department`, type `DEPT2` to change the table name to `DEPT2`.

**Note** If your table name includes a Schema, for example, `HR.DEPT`, when you add a value to both the Table Schema and Table Name fields, then the new table name in the example above is `PERS.DEPT`. 
Defining Transformations for a Single Table/View

**Note** Although the descriptions in this section only refer to tables, the procedures describe herein are applicable to views as well. When a transformation is defined for a view, the word "View(s)" will appear in the UI instead of the word "Table(s)".

This section describes how to define data transformations. Data transformations are performed when the task is run. They are optional. If you do not define any transformations, the data is replicated "as is" from the source to the target.

AEM lets you make the following changes to the tables and columns:
- Rename any column for the target table
- Delete a target column
- Change the data type and/or the length of any target column
- Add additional target columns
- Designate which target columns (i.e. segments) will comprise the Unique Index
- Recalculate the data

**Limitations**

Transformations are subject to the following limitations:
- They are not supported for calculating columns of Right-to-Left languages.
- They cannot be performed on columns that have a pound character (#) in their name.
- The only supported transformation for LOB/CLOB data types is to drop the column on the target.

You can use the method described here for transformations that are specific to a single table or a few tables in your task. To make a similar change over multiple tables, see Defining Global Transformations.

For an explanation of how to configure transformations, see Using the Transform Tab.

**To define a data transformation for a single table:**

1. Select the table you want to transform and open the Table Settings window.
2. Click Transform on the left side of the window.
   - The following figure shows the information in the Transform tab of the Table Settings window.
Using the Transform Tab

The Transform Tab in the Table Settings window has the following components:

- **Input**: This lists the columns on which you can perform transformations.

**Note**  When creating a transformation for the SAP Application source endpoint, you can hover your mouse cursor over an **Input** column to see a tooltip with the table’s actual name:

- BELNR
- GIAHR
- BUZEL
- MANDT

- **Output**: This table shows the defined output for the columns in the table where you are performing the transformations. It contains the following columns:
  - **Key**: This indicates whether the column is a segment of the Unique Index. A key icon is displayed next to columns that are segments of the Unique Index. Click the column
to add and remove keys.

» **Name**: The name of the column. To change the name of the column, select the field with the column name you want to change and type a new name in this column if you want to change the name of the column or if the column is calculated (added to the table). See the table Transformation Actions for more information.

» **Type**: The data type for the column. To change the data type for the column, select the field with the data type you want to change and select a new data type. See the following table for more information.

» **Expression**: An expression using SQLite operators to define the data in the column. For information on how to create an expression, see the following table.

The following table describes the actions you can carry out in the Transform Table window.

**Table 5.1 | Transformation Actions**

<table>
<thead>
<tr>
<th>To</th>
<th>Do This</th>
</tr>
</thead>
</table>
| Rename a column         | Select the **Name** column for the table column you want to change. Type in a new name.  
                        | The top right corner turns blue when the name is changed. To view the original name, hover the mouse pointer over the field and the original name is displayed. |
| Change the data type for a column | Select the **Type** column for the table column you want to change and select a new data type from the drop-down list.  
                        | Make sure that the data type you select is compatible with the data in that column.  
                        | For a description of Attunity Replicate data types, information about data-type mapping from the native endpoint to Attunity Replicate, and for a list of endpoints supported by Attunity Replicate, see the Attunity Replicate User and Reference Guide. |
| Add a new column        | Click **Add Column** to add a new column.  
                        | When you add a column, the **Name** is blank and the **Type** is listed as string(50).  
                        | Type a name for the new column in the **Name** column.  
                        | Click in the **Type** column and select a data type from the list. |
| Add an existing         | From the **Input** pane, select one or more
To add all of the columns, click the right-facing double arrow.

Note: By default all tables columns are included in the Output list. To include only some of the columns clear the By default include all columns check box at the top of the Transform tab. This removes all of the columns from the list. You can then add back any existing column.

Delete a column

From the Output list, select the row with the column you want to delete and click the left-facing arrow button.

To remove all columns, click the left-facing double arrow. Note that all the columns except for columns defined as a primary key are deleted.

Add/Remove a Unique Index segment to/from a target column

A key icon indicates which target columns segments of the Unique Index.

To add a Unique Index segment, click in the Key column to the left of target column to which you want to add the segment. A key icon will appear.

To remove a Unique Index segment, click the key icon to the left of the target column from which you want to remove the segment. The key icon will disappear.

Recalculate the data for a column in the target endpoint

Click in the Expression column in the row with the table column you want to change the data for. Enter an expression using SQLite syntax.

See Creating an Expression for Transformations and Using SQLite Syntax with Transformations for information on creating expressions.

Once you add a calculated expression, you can test the expression. See Using the
<table>
<thead>
<tr>
<th>To</th>
<th>Do This</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change the Character Set for a specific input column</td>
<td><strong>Expression Builder</strong> (for Filters, Transformations, and Global Transformations). This is required if a source character column is wrongly encoded. For example, if a source character column is described as encoded in <strong>CCSID X</strong>, but the data stored in that column is actually encoded in <strong>CCSID Y</strong>. In the <strong>Input</strong> table:</td>
</tr>
<tr>
<td></td>
<td>1. Click the relevant cell in the <strong>Type</strong> column and select <strong>STRING</strong> from the drop-down list.</td>
</tr>
<tr>
<td></td>
<td>2. Click the relevant cell in the <strong>Character Set</strong> column and then select the appropriate character set from the drop-down list.</td>
</tr>
<tr>
<td><strong>Note</strong> Supported on IBM DB2 for iSeries and IBM DB2 for z/OS only.</td>
<td><strong>Note</strong> Modified cells will display a triangle in the top right corner. To see the original value, click the triangle.</td>
</tr>
</tbody>
</table>

| Change the data type for a specific input column | This is required if a source column is defined as character type but the data stored in that column is binary or vice versa. In the **Input** table, click the relevant cell in the **Type** column and then select either **STRING** or **BYTES** from the drop-down list as required. Note that if you select **STRING**, you can also change the character set as explained above. |
| **Note** Supported on IBM DB2 for iSeries and IBM DB2 for z/OS only. | **Note** Modified cells will display a triangle in the top right corner. To see the original value, click the triangle. |

**Creating an Expression for Transformations**

Use an expression to define the contents of a new or re-calculated column.
To create an expression:
1. In the Transform tab, select the row with the column for which you want to create an expression.
   or
   Click Add Column to add a new column.
2. Click the pencil icon in the Expression column.
   The Expression Builder opens.
3. Build an expression as described in Using the Expression Builder (for Filters, Transformations, and Global Transformations).

Using SQLite Syntax with Transformations
The following table lists the SQLite operators that are supported with transformations.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
</table>
| || | Concatenate strings.  
FIRST_NAME||LAST_NAME  
PHONE_NUMBER||<Office Only> (adds the string Office Only to the telephone number).
| + | Adds two values together.  
DEPARTMENT_ID+100 (adds 100 to each ID number). Any column used in an expression with this operator must be a numeric data type.
| - | Subtracts a value from another value.  
MANAGER_ID-100 (subtracts 100 from each ID number). Any column used in an expression with this operator must be a numeric data type.
| % | Uses the remainder of a division expression as the value.  
%SALARY/7 (Divides the value of the Salary column by 7 and uses any remainder from the expression as the column value).
| / | Divides one value into another.  
SALARY/.16 (Divides the value of the Salary column by .16.

Note: If the two values in the division expression are integers (two NUMERIC columns with no digits after the decimal) and the result is a fractional value, the result returned will be 0.

* | SALARY*.16 (Multiplies the value of the Salary column by .16.)
Table 5.2 | SQLite Operators used by Attunity Replicate

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This could be used to calculate taxes that are subtracted from a salary.</td>
</tr>
</tbody>
</table>

For more information about SQLite syntax, see the SQLite documentation.

Using Filters
The filtering operation lets you create filters that define the information from a column to include in/exclude from a replication task. This lets you replicate only the specific data that you need.

**In this section:**
- Filter Limitations
- Opening the Filter Tab
- Creating a Filter Condition for a Specified Column
- Creating a Record Selection Condition for One or More Columns
- Adding or Removing Filter Ranges
- Using SQLite Syntax with Filtering

**Filter Limitations**
When creating a filter, the following limitations apply:
- Filters are not supported for calculating columns of Right-to-Left languages.
- Filters can only be applied to immutable columns.
- When a filter is created to exclude specific rows in a column, the specified rows will always be excluded, even if the rows that were initially excluded are later changed. For example, if you chose to exclude rows "1-10" in a column named "Age" and those rows were later changed to "11-20", the rows will continue to be excluded, even though the data is no longer the same.
- Filter cannot be applied to LOB columns.

**Opening the Filter Tab**
The Filter Table tab contains the following information:
- **Data Columns** list: This list contains a list of the columns for the table where you filtering data. You can use these to select the columns to use in the filtering operations. This list has the following tabs:
  - **Source**: This tab lists the original source columns in the table.
  - **Header**: This tab lists the available header columns. You can create filters using these columns and include them in expressions. For information on these header columns, see **Header Columns**.
» **Calculated**: This tab lists the columns added to the table. You add columns through transformations. For more information, see [Defining Transformations for a Single Table/View](#).

» **Filter Conditions** table: This table has the following columns:
  - **Name**: The name of the column where you are filtering the data.
  - **Type**: The data type for the column.
  - **Include/Exclude**: Indicate whether to include or exclude the filtered data for this column.
  - **Ranges**: Click the button on the right of the **Ranges** field to open the Range Builder. For information on creating a value or ranges with the Range Builder, see [Adding or Removing Filter Ranges](#). For more information on typing in the filter ranges manually, see [Using SQLite Syntax with Filtering](#).

» **Record Selection Condition**: Enter a complex condition that can include multiple columns. The condition must evaluate to TRUE to be accepted. You can create a condition using SQLite operators or by Using the Expression Builder (for Filters, Transformations, and Global Transformations). For information on using the SQLite operators, see [Creating a Record Selection Condition for One or More Columns](#).

The following figure is an example of the information in the **Filter** tab of the **Table Settings** window.

**Figure 5.1 | Table Settings: Filter**
To open the Filter tab:
1. Select the table you want to filter and then open the Table Settings window.
2. Click the Filter tab on the left side of the window.

Creating a Filter Condition for a Specified Column
You can create a simple condition for a single column in the table you are working with. You can include any combination of ranges or specific values in the filter and determine whether to include or exclude the defined data.

To create a filter condition:
1. Select a column from the data columns list and then click the right-facing arrow next to the Filter Conditions table.
   To remove the column, click on it in the Filter Conditions table and then click the left-facing arrow. Any data entered for this column in the Include/Exclude or Values columns is also deleted.
2. Click in the Include/Exclude column to select whether to include or exclude the data that meets this condition.
3. Click the Edit Ranges button in the Ranges column.
4. The <Name> <Include|Exclude> Ranges window opens. Continue from Adding or Removing Filter Ranges.

Creating a Record Selection Condition for One or More Columns
You can create a record selection condition manually and/or by using the Expression Editor. When entering a string, you can use the following special characters:

- %: Matches any string of zero or more characters. For example, Mc% searches for every name that begins with Mc or %bob% includes every name that contains bob.
- _:Matches a single character (as a wildcard). For example: ‘Sm_th’ includes names that begin with Sm and end with th, such as Smith or Smyth. To search for an underscore character, use \[\].
- [...]: Includes a range or set of characters. For example, [CK]ars[eo] includes names Carsen, Karsen, Carson, and Karson or [M-Z]inger includes all words that end in inger with the first letter between M and Z, such as Ringer, Singer, or Zinger.

For more information, see documentation on how to use Transact-SQL.

For information on what SQLite operators can be used to create Record Selection Condition filters, see Using SQLite Syntax with Filtering.

To create a record selection condition:
1. From the Data Columns list, select a source column, header column or calculated column and then click the arrow to the left of the Record Selection Condition pane.
2. Use SQLite operators, such as < or = to create the condition. Use any amount of strings or columns as you need to create a condition.

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For example $EMPLOYEE_ID < 100 AND $SALARY > 100,000
In this case only rows that satisfy both of these conditions are replicated in the replication task.

The following example provides an example using SQL search pattern strings. Only rows that satisfy this condition are replicated.

$EMPLOYEE_NAME IS 'Sm_th'

To create a record selection condition using the Expression Builder:
- Click Open Expression Builder. This button is located directly under the record selection condition box. Follow the directions for creating an expression in the section Using the Expression Builder (for Filters, Transformations, and Global Transformations).

Adding or Removing Filter Ranges
You can add one or more values to the Ranges column using the Range Builder. Values that match any of the ranges in the list are included in the replication.

You can also delete a filter range using the Range Builder.

**Note** Filter ranges that you enter manually are also displayed in the Filter Builder. You can use the Filter Builder to delete them.

To use the Range Builder:
1. In the Filter tab of the Table Settings window, select a column to filter. For more information, see Using Filters.
2. Click the button to the right of the Ranges column. The Ranges Builder opens.
3. Click Add Range. Select any of the following from the drop-down list displayed.
   - **Equal to**: Select Equal to to enter a single value. The following is displayed in the range list.
     - Equal to = [N]
     - Click the [N] and type a value in the field that is displayed.
     - When the value in the selected column equals the value you enter, the result is included or excluded in the replication task depending on the option selected in the Include/Exclude column.
   - **Between**: Click Between to enter a range of values. The following is displayed in the range list.
     - Between [N] - [N]
     - Click each [N] and type a value in the fields that are displayed.
     - When the column contains the values between the two values entered, the result is included or excluded in the replication task depending on the option selected in the Include/Exclude column.
» **Less than or equal to**: Select **Less than or equal to** and enter a maximum value. The following is displayed in the range list.

**Less than or Equal to =< [N]**

Click the [N] and type a value in the field that is displayed.

When the value in the selected column is equal to or less than the value you enter, the result is included or excluded in the replication task depending on the option selected in the **Include/Exclude** column.

» **Greater than or equal to**: Select **Greater than or equal to** and enter a minimum value. The following is displayed in the range list.

**Greater than or Equal to => [N]**

Click the [N] and type a value in the field that is displayed.

When the value in the selected column is equal to or more than the value you enter, the result is included or excluded in the replication task depending on the option selected in the **Include/Exclude** column.

**To delete a filter range from the Range Builder:**

1. In the **Filter** tab of the **Table Settings** window, select the column with the filter condition you want to delete.
2. Click the button to the right of the **Ranges** column. The Ranges Builder opens.
3. Click the X next to the range you want to delete. The deleted range is removed from the list.

**Using SQLite Syntax with Filtering**

Attunity Replicate supports the following SQLite operators when creating Record Selection Condition filters.

**Note**  You must put the ($) in front of each input as shown below.

**Table 5.3 | SQLite Operators used by Attunity Replicate for Filtering**

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;</td>
<td>Is less than.</td>
</tr>
<tr>
<td>$SALARY&lt;100000</td>
<td></td>
</tr>
<tr>
<td>&lt;=</td>
<td>Is less than or equal to</td>
</tr>
<tr>
<td>$SALARY&lt;=100000</td>
<td></td>
</tr>
<tr>
<td>&gt;</td>
<td>Is greater than</td>
</tr>
<tr>
<td>$SALARY&gt;100000</td>
<td></td>
</tr>
<tr>
<td>&gt;=</td>
<td>Is more than or equal to</td>
</tr>
<tr>
<td>$SALARY&gt;=100000</td>
<td></td>
</tr>
</tbody>
</table>
Table 5.3 | SQLite Operators used by Attunity Replicate for Filtering

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>=</td>
<td>Is equal to</td>
</tr>
<tr>
<td></td>
<td>$SALARY=100000</td>
</tr>
<tr>
<td>!= or &lt;&gt;</td>
<td>Is not equal to</td>
</tr>
<tr>
<td></td>
<td>$SALARY!=100000</td>
</tr>
<tr>
<td>IS</td>
<td>Is the same as</td>
</tr>
<tr>
<td></td>
<td>$HIRE_DATE IS 2014-09-29</td>
</tr>
<tr>
<td></td>
<td>IS functions the same as = unless one or both of the operands are NULL. In this case, if both operands are NULL, then the IS operator evaluates to 1 (true). If one operand is NULL and the other is not, then the IS operator evaluates to 0 (false).</td>
</tr>
<tr>
<td>IS NOT</td>
<td>Is not the same as</td>
</tr>
<tr>
<td></td>
<td>$HIRE_DATE IS NOT 2014-09-29</td>
</tr>
<tr>
<td></td>
<td>IS NOT functions the same as != unless one or both of the operands are NULL. In this case, if both operands are NULL, the IS NOT operator evaluates to 0 (false). If one operand is NULL and the other is not, then the IS NOT operator evaluates to 1 (true).</td>
</tr>
<tr>
<td>AND</td>
<td>Both operands are true.</td>
</tr>
<tr>
<td></td>
<td>$MANAGER_ID AND EMPLOYEE ID &gt;100</td>
</tr>
<tr>
<td>OR</td>
<td>Either operand is true.</td>
</tr>
<tr>
<td></td>
<td>$MANAGER_ID OR EMPLOYEE ID &gt;100</td>
</tr>
</tbody>
</table>

For more information on how to use the SQLite syntax, see the SQLite documentation.

Defining Global Transformations

Use Global transformations to make similar changes to multiple tables, owners, and columns in the same task.

You may need to use this option when you want to change the names of all tables. You can change the names using wildcards and patterns. For example, you may want to change the names of the tables from account_% to ac_%.

This is helpful when replicating data from an Microsoft SQL Server endpoint to an Oracle endpoint where the Microsoft SQL Server endpoint has a limit of 128 characters for a table name and the Oracle endpoint has a limit of 31 characters.

You may also need to change a specific data type in the source to a different data type in the target for many or all of the tables in the task. Global transformation will accomplish this without having to define a transformation for each table individually.
Note  Table-specific transformations override global transformations. For example, you can define a global transformation that changes the data type for all tables from DATE to DATETIME(6) and then define another transformation for a specific table that changes the data type from DATE to STRING(50).

For information on defining a transformation for a specific table, see Defining Transformations for a Single Table/View.

This section includes the following topics:
- Limitations for Global Transformations
- Starting the New Transformation Rule Wizard
- Selecting the Transformation Type
- What to Transform
- Defining the Transformation Rule
- Viewing all Global Transformation Rules

Limitations for Global Transformations

The following limitations apply to global transformations:
- Transformations are not supported for columns with Right-to-Left languages.
- Transformations cannot be performed on columns that contain special characters (e.g. #, \, /) in their name.
- The only supported transformation for columns that are mapped to BLOB/CLOB data types (by Replicate) is to drop the column on the target.

Starting the New Transformation Rule Wizard

You define a rule for global transformation using the New Transformation Rule wizard. The transformation affects all of the tables in the task as you define them using the wizard.

To start the New transformation Rule wizard:
1. Open the task for which you want to create a global transformation.
   You can click View Task above the Tasks list or double-click the task.
2. If you are not in the Designer mode, click Designer at the top right of the screen.
   For more information on the Designer mode, see Designer Mode.
3. In Designer mode, click Global Transformations.
   The Global Transformation Rules window opens.
5. Enter the information to define a global transformation rule. The first step is Selecting the Transformation Type.

Selecting the Transformation Type
In the Which Global Transformation step of the New Transformation Rule wizard, you define the type of transformation you want to be performed.

**Note** You can only create one rule for each transformation type on the same object (e.g. a column). If you create multiple rules for a single transformation type on the same object, only the last rule you create will be valid. For example, if you create the following rules (in order) to rename a schema:

- Rename Schema: Add Prefix
- Rename Schema: Add Suffix
- OR-
- Rename Column: Add Prefix
- Rename Column: Add Suffix

Only the second rule (adding a suffix) will be executed.

**To select the transformation type:**
1. Enter a name for the rule.
   The name cannot exceed 32 characters, contain non-Latin characters, or contain any of the following characters: `\*:?"<>|`
2. Select one of the following:
   - **Rename Schema**: Select this if you want to change the schema name for multiple tables. For example, if you want all HR tables to be renamed PERS.
   - **Rename Table**: Select this if you want to change the name of multiple tables. For example, if you want all tables named SALARY to be called WAGES.
   - **Rename Column**: Select this if you want to change the name of multiple columns. For example, if you want to change all columns with word MINIMUM to MIN.
   - **Add Column**: Select this if you want to add a column with a similar name to multiple tables.
   - **Drop Column**: Select this if you want to drop a column with a similar name from multiple tables.
   - **Convert Data Type**: Select this if you want to change a specific data type to a different one across multiple tables. For example, if you want to change all Integer data types to a string.
3. Click **Next** to proceed to the What to Transform step.
What to Transform

In the **What to Transform?** step of the **New Transformation Rule** wizard, you define to which tables the transformation rule is applied. For example, you can apply the rule to all tables that contain the word **SALARY** as part of its name.

**Note** The options displayed in this screen depend on the **Transformation Type** selected.

The following table describes the available options.

**Table 5.4 | Apply transformation rule if...**

<table>
<thead>
<tr>
<th>Option</th>
<th>Available when transformation type is:</th>
<th>Description</th>
</tr>
</thead>
</table>
| Schema name is like % | Always | Leave the % sign to include all schemas in your global transformation.  
Click the % sign to add a filter. In this case you can enter any name combination to include only that schema in your global transformation rule.  
For example, enter **HR** to include only tables that have the schema **HR**.  
You can use the % sign as a wild card. For example, **H%** includes all tables with a schema that begins with the letter **H**, such as **HR, HELLO, or HQ**.  
The % wildcard can be used in any position. For example, if you use it at the beginning, **%H**, then all table names that end in **H** are included in the transformation rule. The % can also be used in a middle position. |

**Note** If you are using an Oracle target, you must enter a schema that exists on the target endpoint. Attunity Replicate does not create new schemas on an Oracle endpoint. If you want to use a new schema for the target, create the schema on the Oracle endpoint before running the task. For more information, see the topic "Configuring an Oracle database as an Attunity Replicate Target" in the **Attunity Replicate User and Reference Guide**.

| Table name is like % | Always | Leave the % sign to include all table names in your global transformation rule.  
Click the % sign to add a filter. In this case you can enter any name combination to include only tables with that specific |
### Table 5.4 | Apply transformation rule if...

<table>
<thead>
<tr>
<th>Option when transformation type is:</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Column name is like %</td>
<td>You can use the % sign as a wild card. For example, J% includes all tables with a name that begins with the letter J, such as JOBS, JOBS_HISTORY, or JACKSONVILLE. The % wildcard can be used in any position. For example, if you use it at the beginning, %H, then all table names that end in H are included in the transformation rule. The % can also be used in a middle position.</td>
</tr>
<tr>
<td>Rename Column</td>
<td>Leave the % sign to include all column names in your global transformation rule. Click the % sign to add a filter. In this case you can enter any name combination to include only columns with that specific name in your global transformation rule. You can use the % sign as a wild card. For example, N% includes all columns with a name that begins with the letter N, such as NAME, NAME_FIRST, or NAME_LAST. The % wildcard can be used in any position. For example, if you use it at the beginning, %IES, then all column names that end in with the string &quot;IES&quot; are included in the transformation rule. The % can also be used in a middle position.</td>
</tr>
<tr>
<td>Drop Column</td>
<td>Select a new data type from the drop-down list. Make sure that the data type you select is compatible with the data in that column. For a description of Attunity Replicate data types, information about data type mapping from the native endpoint to Attunity Replicate, or for a list of endpoints supported by Attunity Replicate, see the <em>Attunity Replicate User and Reference Guide</em>.</td>
</tr>
<tr>
<td>Convert Data Type</td>
<td>Select a new data type from the drop-down list. Make sure that the data type you select is compatible with the data in that column. For a description of Attunity Replicate data types, information about data type mapping from the native endpoint to Attunity Replicate, or for a list of endpoints supported by Attunity Replicate, see the <em>Attunity Replicate User and Reference Guide</em>.</td>
</tr>
</tbody>
</table>

After you complete defining the transformation rule definitions, click **Next** to go to the **Defining the Transformation Rule** step.

**Note**  If the global transformation type you are defining is **Drop Column**, you do not need to create a **Transformation Rule**. In this case, click **Finish** to add the rule to the **Global Transformation Rules** list.
Defining the Transformation Rule

In the **How to transform** step, you define what happens to the tables that the transformation rule is applied to. For example, you can define a new name for the affected tables or add a prefix to the table names. For more information on defining the affected tables, see *What to Transform*.

You define the rule to be carried out using the options on this page. **Limitations for Transformation Rules** apply. See the section for any of the following transformation types you are using:

- Rename Schema
- Rename Table
- Rename Column
- Add Column
- Drop Column
- Convert Data Type

When done, click **Next**.

**Limitations for Transformation Rules**

The following limitations apply to transformation rules:

- Transformations are not supported for columns with Right-to-Left languages.
- Transformations cannot be performed on columns that contain special characters (e.g. #, \, /) in their name.
- The only supported transformation for columns that are mapped to BLOB/CLOB data types (by Replicate) is to drop the column on the target.

**Note** The options displayed in this screen depend on the **Transformation Type** selected.

**Rename Schema**

If your transformation type is **Rename Schema**, you can do the following:

- Rename schema to (string)
- Add a Prefix or Suffix
- Remove a Prefix or Suffix
- Replace a Prefix or Suffix with Different Characters
- Convert schema name to uppercase
- Convert schema name to lowercase
- Rename schema (expression)

**Rename schema to (string)**

Use the **Rename schema to: [string]** option to change the name of all table schemas that you defined in the **What to Transform** step to a different name. For example, if you
have a schema called Human_Resources and want to change all instances of this name to HR then enter the string HR. You can enter any string in this field.

Add a Prefix or Suffix
Use the Add a prefix or suffix option to add additional characters to the beginning or end of the schema name for all schemas that fit the definition you created in the What to Transform step. For example, if the schema name is HR, you can add a suffix, such as TAR or _TAR to the schema name for all tables with that schema name. In this case, the resulting schema name will be HRTAR or HR_TAR.

Note If you are using Oracle as your target endpoint, Attunity Replicate does not create a new schema. Therefore, the schema name that is the result of replacing a prefix or suffix with a different string of characters must exist in the Oracle target endpoint. If the resulting schema name does not exist, you must create the schema in the Oracle endpoint before carrying out this task.

For more information, see the Attunity Replicate User and Reference Guide.

To globally add a prefix or suffix
1. Select Add <Prefix/Suffix> Insert Characters to matching schema names.
2. Click the word Prefix or Suffix and select one of these two from the list.
3. Click [string] to activate the field.
4. Type the characters you want as the prefix or suffix. If you want to include an underscore or other legal character to separate the prefix/suffix from the original name, you must add it as part of the character string.
5. Click Finish to add the rule to the Global Transformation Rules list.

Remove a Prefix or Suffix
Use the Remove a prefix or suffix option to remove a string of characters from the beginning or end of a schema name for all schema that fit the definition you created in the What to Transform step.

For example, you can use this option to remove the letters _REV from the schema name for all tables in the schema HR_REV. In this case the schema name in the target will be HR.

Note If you are using Oracle as your target endpoint, Attunity Replicate does not create a new schema. Therefore, the schema name that is the result of replacing a prefix or suffix with a different string of characters must exist in the Oracle target endpoint. If the resulting schema name does not exist, you must create the schema in the Oracle endpoint before carrying out this task.

For more information, see the Attunity Replicate User and Reference Guide.
To globally remove a prefix or suffix

1. Select **Remove <Prefix/Suffix> Insert Characters from matching schema names.**
2. Click the word **Prefix** or **Suffix** and select one of these two from the list.
3. Click **[string]** to activate the field.
4. Type the characters you want to remove. If you want to remove an underscore or other legal character from the original name, you must add it as part of the character string.
5. Click **Finish** to add the rule to the **Global Transformation Rules** list.

Replace a Prefix or Suffix with Different Characters

Use the **Replace a prefix or suffix** option to replace a string of characters with a different string of characters. You determine whether to replace the characters at the beginning or end of a schema name for all schema that fit the definition you created in the **What to Transform** step.

For example, you can use this option to replace the letters **_ORIG** with **_REPL** in the schema name for all tables in the schema **HR_ORIG**. In this case the schema name in the target will be **HR_REPL**.

**Note** If you are using Oracle as your target endpoint, Attunity Replicate does not create a new schema. Therefore, the schema name that is the result of replacing a prefix or suffix with a different string of characters must exist in the Oracle target endpoint. If the resulting schema name does not exist, you must create the schema in the Oracle endpoint before carrying out this task.

For more information, see the **Attunity Replicate User and Reference Guide**.

To globally replace a prefix or suffix

1. Select **Replace <Prefix/Suffix> Insert Characters by Insert Characters for all matching schema names.**
2. Click the word **Prefix** or **Suffix** and select one of these two from the list.
3. Click the first **[string]** to activate the field.
4. Type the characters from the existing (source) schema that you want to replace. If you want to include an underscore or other legal character from the original name in the string that you want to replace, you must add it as part of the character string.
5. Click the second **[string]** to activate the field.
6. Type the characters you want to use in the target. These characters replace the original (source) characters in the target.
7. Click **Finish** to add the rule to the **Global Transformation Rules** list.
Convert schema name to uppercase
Use the convert to uppercase option to convert all of the letters in a schema name to uppercase. For example:
Schema_cat, becomes SCHEMA_CAT
schema_cat, becomes SCHEMA_CAT
sChEMa_Cat, becomes SCHEMA_CAT

To globally change the schema name to all uppercase
1. Select Convert schema name to uppercase.
2. Click Finish to add the rule to the Global Transformation Rules list.

Convert schema name to lowercase
Use the convert to lowercase option to convert all of the letters in a schema name to lowercase. For example:
Schema_cat, becomes schema_cat
SCHEMA_CAT, becomes schema_cat
sChEMa_Cat, becomes schema_cat

To globally change the schema name to all lowercase
1. Select Convert schema name to lowercase.
2. Click Finish to add the rule to the Global Transformation Rules list.

Rename schema (expression)
Use the Rename schema to [expression] option to change the name of all table schemas that you defined in the What to Transform step to a different name. For example, if you have a schema called Human_Resources and want to change all instances of this name to HR.

Note  If you are using Oracle as your target endpoint, Attunity Replicate does not create a new schema. Therefore, the schema name that is the result of replacing a prefix or suffix with a different string of characters must exist in the Oracle target endpoint. If the resulting schema name does not exist, you must create the schema in the Oracle endpoint before carrying out this task.
For more information, see the Attunity Replicate User and Reference Guide.

To globally change a schema name
1. Select Rename schema to [expression]
2. Click the button to the right of the Rename schema option to open the Expression Editor. For information on how to use the Expression Editor, see Using the Expression...
Builder (for Filters, Transformations, and Global Transformations). Then go to step 4.

or

Click [expression] to activate the field and continue with step 3.

3. Type an SQLite expression or a string (in quotes) to rename the schema. For example:
   » "New_Schema"
   » 'PREF_''$SCHEMA_NAME_VAR''_SUFF'

You can use the following variables in the SQLite expression:
   » $SCHEMA_NAME_VAR
   » $TABLE_NAME_VAR
   » $COLUMN_NAME_VAR
   » $COLUMN_DATATYPE_VAR

4. Click Finish to add the rule to the Global Transformation Rules list.

Rename Table

If your transformation type is Rename Table, you can do the following:
   » Rename table to (string)
   » Add a Prefix or Suffix
   » Remove a Prefix or Suffix
   » Replace a Prefix or Suffix with Different Characters
   » Convert table name to uppercase
   » Convert table name to lowercase
   » Rename table (expression)

Rename table to (string)

Use the Rename table to: [string] option to change the name of all tables that you defined in the What to Transform step to a different name. For example, if you have a table called EMPLOYEE and want to change all instances of this name to EMP then enter the string EMP. You can enter any string in this field.

Add a Prefix or Suffix

Use the Add a prefix or suffix option to add additional characters to the beginning or end of the table name for all tables that fit the definition you created in the What to Transform step. For example, if the table name is EMPLOYEES, you can add a suffix, such as TAR or _TAR to the table name for all tables with that table name. In this case, the resulting table name will be EMPLOYEESTAR or EMPLOYEES_TAR.

To globally add a prefix or suffix:

1. Select Add <Prefix/Suffix> Insert Characters to matching table names.
2. Click the word Prefix or Suffix and select one of these two from the list.
3. Click [string] to activate the field.
4. Type the characters you want as the prefix or suffix. If you want to include an underscore or other legal character to separate the prefix/suffix from the original name, you must add it as part of the character string.

5. Click **Finish** to add the rule to the **Global Transformation Rules** list.

**Remove a Prefix or Suffix**

Use the **Remove a prefix or suffix** option to remove a string of characters from the beginning or end of a table name for all tables that fit the definition you created in the **What to Transform** step.

For example, you can use this option to remove the letters \_REV from the table name for all tables with the name **EMPLOYEES**. In this case the table name in the target will be **EMPLOYEES**.

**To globally remove a prefix or suffix:**

1. Select **Remove <Prefix/Suffix> Insert Characters from matching table names**.
2. Click the word **Prefix** or **Suffix** and select one of these two from the list.
3. Click **[string]** to activate the field.
4. Type the characters you want to remove. If you want to remove an underscore or other legal character from the original name, you must add it as part of the character string.
5. Click **Finish** to add the rule to the **Global Transformation Rules** list.

**Replace a Prefix or Suffix with Different Characters**

Use the **Replace a prefix or suffix** option to replace a string of characters with a different string of characters. You determine whether to replace the characters at the beginning or end of a table name for all tables that fit the definition you created in the **What to Transform** step.

For example, you can use this option to replace the letters \_ORIG with \_REPL in the table names for all tables called **EMPLOYEE_ORIG**. In this case the table name in the target will be **EMPLOYEE_REPL**.

**To globally replace a prefix or suffix:**

1. Select **Replace <Prefix/Suffix> Insert Characters by Insert Characters for all matching schema names**.
2. Click the word **Prefix** or **Suffix** and select one of these two from the list.
3. Click the first **[string]** to activate the field.
4. Type the characters from the existing (source) schema that you want to replace. If you want to include an underscore or other legal character from the original name in the string that you want to replace, you must add it as part of the character string.
5. Click the second **[string]** to activate the field.
6. Type the characters you want to use in the target. These characters replace the original (source) characters in the target.

7. Click Finish to add the rule to the Global Transformation Rules list.

Convert table name to uppercase
Use the convert to uppercase option to convert a table name to all upper case. For example:
Table_cat, becomes TABLE_CAT
table_cat, becomes TABLE_CAT
taBLE_Cat, becomes TABLE_CAT

To globally change the table name to all uppercase:
1. Select Convert table name to uppercase.
2. Click Finish to add the rule to the Global Transformation Rules list.

Convert table name to lowercase
Use the convert to lowercase option to convert a table name to all lower case. For example:
Table_cat, becomes table_cat
TABLE_CAT, becomes table_cat
taBLE_Cat, becomes table_cat

To globally change the table name to all lowercase:
1. Select Convert table name to lowercase.
2. Click Finish to add the rule to the Global Transformation Rules list.

Rename table (expression)
Use the Rename table to [expression] option to change the name of all tables that fit the definition you created in the What to Transform step. For example, if you have a table called EMPLOYEE and want to change all instances of this name as defined in the previous step it to EMP.

To change the table name:
1. Select Rename table to: [expression]
2. Click the button to the right of the Rename table option to open the Expression Editor. For information on how to use the Expression Editor, see Using the Expression Builder (for Filters, Transformations, and Global Transformations). Then go to step 4.
   or
Click [expression] to activate the field and continue with step 3.
3. Type an SQLite expression or a string (in quotes) to rename the table. For example:
   » "New_Table"
   » ‘PREF_-'||$TABLE_NAME_VAR||'_SUFF’
3. You can use the following variables in the SQLite expression:
   » $SCHEMA_NAME_VAR
   » $TABLE_NAME_VAR
   » $COLUMN_NAME_VAR
   » $COLUMN_DATATYPE_VAR

**Rename Column**

If your transformation type is **Rename Column**, you can do the following:
   » Rename column to (string)
   » Add a Prefix or Suffix
   » Remove a Prefix or Suffix
   » Replace a Prefix or Suffix with Different Characters
   » Convert column name to uppercase
   » Convert column name to lowercase
   » Rename Column (expression)

**Rename column to (string)**

Use the **Rename column to: [string]** option to change the name of all columns that you defined in the **What to Transform** step to a different name. For example, if you have a table called **SALARY** and want to change all instances of this name to **EMP** then enter the string **SAL**. You can enter any string in this field.

**Add a Prefix or Suffix**

Use the **Add a prefix or suffix** option to add additional characters to the beginning or end of the column name for all columns that fit the definition you created in the **What to Transform** step. For example, if the column name is **SALARY**, you can add a suffix, such as **_TAR** or **TAR** to the table name for all tables with that table name. In this case, the resulting table name will be **SALARYTAR** or **SALARY_TAR**.

**To globally add a prefix or suffix:**

1. Select **Add <Prefix/Suffix> Insert Characters to matching column names**.
2. Click the word **Prefix** or **Suffix** and select one of these two from the list.
3. Click the **[string]** to activate the field.
4. Type the characters you want as the prefix or suffix. If you want to include an underscore or other legal character to separate the prefix/suffix from the original name, you must add it as part of the character string.
5. Click **Finish** to add the rule to the **Global Transformation Rules** list.
Remove a Prefix or Suffix

Use the **Remove a prefix or suffix** option to remove a string of characters from the beginning or end of a column name for all columns that fit the definition you created in the **What to Transform** step.

For example, you can use this option to remove the letters \_REV from the column name for all columns with the name SALARY. In this case the column name in the target will be SALARY.

**To globally remove a prefix or suffix:**

1. Select **Remove <Prefix/Suffix> Insert Characters from matching column names**.
2. Click the word **Prefix** or **Suffix** and select one of these two from the list.
3. Click **[string]** to activate the field.
4. Type the characters you want to remove. If you want to remove an underscore or other legal character from the original name, you must add it as part of the character string.
5. Click **Finish** to add the rule to the **Global Transformation Rules** list.

Replace a Prefix or Suffix with Different Characters

Use the **Replace a prefix or suffix** option to replace a string of characters with a different string of characters. You determine whether to replace the characters at the beginning or end of a column name for all columns that fit the definition you created in the **What to Transform** step.

For example, you can use this option to replace the letters \_ORIG with \_REPL in the column names for all columns called SALARY\_ORIG. In this case the column name in the target will be SALARY\_REPL.

**To globally replace a prefix or suffix:**

1. Select **Replace <Prefix/Suffix> Insert Characters by Insert Characters for all matching schema names**.
2. Click the word **Prefix** or **Suffix** and select one of these two from the list.
3. Click the first **[string]** to activate the field.
4. Type the characters from the existing (source) column that you want to replace. If you want to include an underscore or other legal character from the original name in the string that you want to replace, you must add it as part of the character string.
5. Click the second **[string]** to activate the field.
6. Type the characters you want to use in the target. These characters replace the original (source) characters in the target.
7. Click **Finish** to add the rule to the **Global Transformation Rules** list.
Convert column name to uppercase
Use the convert to uppercase option to convert a column name to all upper case. For example:
Column_cat, becomes COLUMN_CAT
column_cat, becomes COLUMN_CAT
coLUMnM_Cat, becomes COLUMN_CAT

To globally change the table name to all uppercase
1. Select Convert column name to uppercase.
2. Click Finish to add the rule to the Global Transformation Rules list.

Convert column name to lowercase
Use the convert to lowercase option to convert a column name to all lower case. For example:
Column_cat, becomes column_cat
column_cat, becomes column_cat
coLUMnM_Cat, becomes column_cat

To globally change the column name to all lowercase:
1. Select Convert column name to lowercase.
2. Click Finish to add the rule to the Global Transformation Rules list.

Rename Column (expression)
Use the Rename column to [expression] option to change the name of all tables that fit the definition you created in the What to Transform step. For example, if you have a column called SALARY and want to change it to SAL.

To change the column name:
1. Select Rename column to: [expression]
2. Click the button to the right of the Rename column option to open the Expression Editor. For information on how to use the Expression Editor, see Using the Expression Builder (for Filters, Transformations, and Global Transformations). Then go to step 4.
   or
   Click [expression] to activate the field and continue with step 3.
3. Type an SQLite expression or a string (in quotes) to rename the column. For example:
   > "New_Column"
   > 'PREF_'||$COLUMN_NAME_VAR||'_'||SUFF'
   You can use the following variables in the SQLite expression:
   > $SCHEMA_NAME_VAR
   > $TABLE_NAME_VAR
Add Column
When you add a column to multiple tables, you must provide a name, define the data type for the column and define the data that the column contains. The column that you define here is added to all tables that fit the definition you created in step What to Transform.

The following describes the information you must enter in the transformation rule page for adding a column.

- **Column name**: Click the [string] to activate the field. Type the name for the column in the field. A column with this name is added to all tables that fit the definition you created in step What to Transform.

- **Column data type**: Click the drop-down for a list of data types and select a new data type from the drop-down list. Make sure that the data type you select is compatible with the data in that column.

  For a description of available data types and for a list of endpoints supported by Attunity Replicate, see the Attunity Replicate User and Reference Guide. For information about data type mapping from the native endpoint to Attunity Replicate data types, see the chapter for the endpoint you use.

- **Computation expression**: Click the button to the right of this field to open the Expression Editor or type an expression using SQLite operators to define the data in the column.

  For information on how to use the Expression Editor to create an expression, see Using the Expression Builder (for Filters, Transformations, and Global Transformations).

  For more information on creating expressions, see Creating an Expression for Transformations and Using SQLite Syntax with Transformations.

Drop Column
This option does not require a transformation rule. For this option you complete the Global transformation Rule after the What to Transform step.

Convert Data Type
When you convert the data type for a column, use this page to select the data type you want to convert to. The data type that you define in this step is applied to all columns and tables that fit the definition you created in the What to Transform step. Make sure that the data type you select is compatible with the data in columns you defined.

To select a converted data type:
- Select an Attunity Replicate data type from the drop-down list.

For a description of Attunity Replicate data types, see the Attunity Replicate User and Reference Guide.
For information about data type mapping from the native endpoint to Attunity Replicate data types, see the chapter for the endpoint you are using. For a list of endpoints supported by Attunity Replicate, see the *Attunity Replicate User and Reference Guide*.

Viewing all Global Transformation Rules
The **Global Transformation Rules** dialog box lists the name and description of all notification rules that are defined for the Attunity Replicate instance you are working with. This is where you go to edit or delete a transformation rule.

**In this section:**
- Edit a Global Transformation Rule
- Delete a Global transformation Rule

**Edit a Global Transformation Rule**
You can make changes to any transformation rule.

*Note* You cannot change the name of a transformation rule

**To edit a global transformation rule:**
1. In the **Global Transformation Rules** dialog box, select the transformation rule you want to edit.
2. Click **Open** (at the top of the list).
   The **Edit Existing Transformation Rule** wizard opens.
3. Make any changes you need in the wizard. For information on how to work with each of the pages in the New transformation Rule wizard, see *Defining Global Transformations*.

**Delete a Global transformation Rule**
You can delete a Global transformation rule.

**To delete a global transformation rule:**
1. In the **Global Transformation Rules** dialog box, select the transformation rule you want to edit.
2. Click **Delete** (above the list).
3. When prompted for confirmation, click **OK**.
   The transformation rule is removed from the list and deleted from the system.
Using the Expression Builder (for Filters, Transformations, and Global Transformations)

The Attunity Replicate Expression Builder provides an easy way to build an expression. It provides you with easy access to the required elements for your expression without having to type out any information manually. You access the Expression Builder through the dialog boxes where you define Filters, Defining Transformations for a Single Table/View, and Global Transformations when you do any of the following:

- Rename Schema
- Rename Table
- Rename Column

The following topics describe the Expression Builder:

- Overview of the Expression Builder
- Build an Expression
- Evaluate an Expression
- Test an Expression
- Using Elements in the Expression Builder

Overview of the Expression Builder

The following is an example of the Expression Builder with its four main parts shown. The Expression Builder you are working with may look different depending on whether you want to build an expression for a filter, a transformation, or a global transformation.
The following sections describe what you can do in each part of the Expression Builder:

- **Elements Pane (on the left):** This pane contains elements that you can add to an expression. Select elements and move them into the Expression Builder box to create the expression. For more information, see [Build an Expression](#).

  - **Metadata** (available only when working with Global transformations)
  - **Input Columns** (available only when working with transformations or filters)
  - **Header Columns** (for Global transformations, this tab is available only when you select [Add Column](#))
  - **Operators**
  - **Functions**

- **Build Expression Panel:** The Build Expression Panel is where you put together the expression you are building. You move elements, such as columns or operators into the box. You can also type all or part of an expression in this box. For more information, see [Build an Expression](#).

- **Evaluate Expression Panel:** This panel displays the parameters for the expression.
After you build the expression, click Evaluate to list the expression parameters. You can then enter a value or argument for each of the parameters. For more information, see **Evaluate an Expression**.

The top part of the Expression panel contains the **Operator** toolbar. This toolbar contains the most common operators. Click the operator you want to use to add it to the expression. You can also add operators from the Element Pane, **Operators** tab.

**Test Connection Expression Panel:** This panel displays the results of a test that you can run after you provide values to each of the parameters in your expression. For more information, see **Test an Expression**.

**Build an Expression**

The first step in using the expression builder is to build an expression. The expression that you build is displayed in the top section of the right pane. You can open the Expression when:

1. You define **Defining Transformations for a Single Table/View** for a single table.
2. You define **Filters** for a single table.
3. You use the Global transformations dialog box to **Rename Schema**, **Rename Table**, **Rename Column**, or **Add Column**.

**Note:** To add operators to your expression, you can use the **Operator** tab in the Element pane or the Operator buttons at the top of the Build Expression panel or any combination of these. See **Operators** and **Operator toolbar**.

For example, to create an expression that will combine the first name and last name, do the following:

1. In the **Input Columns** tab add the FIRST_NAME column to the **Build Expression** box.
2. Click the concatenate (||) operator from the **Operator** bar at the top of the Build Expression box.
3. In the Input Columns tab add the LAST_NAME column into the **Build Expression** box.

**To build an expression:**

1. In the Elements Pane, select any element you want to include in your expression. For information on the elements you can use in an expression, see **Functions**.
2. Add an element to the **Build Expression** panel by selecting it and then clicking the arrow to the right of the element.
3. Continue to add elements as needed.

**Operator toolbar**

The Operator toolbar is above the Build Expression box. It contains the most common operators so you can easily add them to an expression.

The following operators are available in the Operator toolbar:
For information on these operators, see Operators.

**To use the Operator toolbar:**
1. Click the space in the Build Expression box where you want to add the operator.
2. Click the operator you want to add. It is added to the expression.

**Evaluate an Expression**
You can evaluate an expression to determine its parameters and to determine whether the expression is valid.

**To evaluate an expression:**
1. From the Expression Builder window, click Build an Expression.
2. Click Evaluate.
   - If the expression is not valid, an error message is written in red at the bottom of the Expression Builder window.
   - If the expression is valid, the expression parameters are displayed in the Parameter column in the Evaluate Expression section. See the figure under Test an Expression.
3. Type a valid value for each of the parameters in the Value column to Test an Expression.
   - For example, type John for the FIRST_NAME and Smith for the LAST_NAME in the Value column. Once you type in values, you can Test an Expression.

**Test an Expression**
You can use the Attunity Replicate Test procedure to display the results of a test expression. The following figure is an example of a built expression that is evaluated and contains a test result.
To test an expression:

1. From the Expression Builder window, Build an Expression.
2. Click Evaluate. See Evaluate an Expression for more information.
3. View the parameters that are displayed. If your expression is not valid, an error message is displayed. See Evaluate an Expression.
4. Type values for each parameter then click Test to see the calculated expression.

For example, type John for FIRST_NAME and Smith for LAST_NAME. The result displayed is JohnSmith. If you want a space between the words add it to the end of the FIRST_NAME value or the beginning of the LAST_NAME value.
**Note:** Testing calls to the `source_lookup` and `target_lookup` functions is not supported.

Using Elements in the Expression Builder

You can use the following types of elements to build expressions for transformations, filters, and global transformations. Select the appropriate tab to select the elements.

- **Input Columns (transformations and Filters only)**
- **Metadata (Global Transformations Only)**
- **Operators**
- **Functions**
- **Header Columns**

**Input Columns (transformations and Filters only)**

This section lists the columns for the table you are working with. The table you are working with is the table you selected when you opened the Table Settings dialog box.

**Metadata (Global Transformations Only)**

The **Metadata** tab contains the following variables that you can use in an expression:

- `AR_M_SOURCE_SCHEMA` - The name of the source schema.
- `AR_M_SOURCE_TABLE_NAME` - The name of the source table.
- `AR_M_SOURCE_COLUMN_NAME` - The name of a column in the source table.
- `AR_M_SOURCE_COLUMN_DATATYPE` - The data type of a column in the source table.

For example, to rename all columns named "metadata" to "source_schema.table_name", enter "metadata" in the **Column name is like** field (in the **What to transform?** screen) and then enter the following expression in the **Rename column to** field (in the **How to transform?** screen):

```$AR_M_SOURCE_SCHEMA || "." || $AR_M_SOURCE_TABLE_NAME```

**Operators**

The sections below describe the SQLite operators you can use to build an expression with the Expression builder. The Expression builder divides the operators into the following categories:

- **Strings**
- **Logical**
- **Mathematical**

**Note**  All operator symbols must be preceded and followed by a space. For example, the expression for concatenating a first and last name should be specified like this:

```FIRST_NAME || LAST_NAME```
Strings
You can use the following string:

||

**Name**: Concatenate strings.

**Examples**:

FIRST_NAME || LAST_NAME

PHONE_NUMBER || <Office Only> *(adds the string Office Only to the telephone number).*

Logical
The following table describes the logical SQLite operators used by the Attunity Replicate Expression Builder.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!= or &lt;&gt;</td>
<td>Is not equal to $SALARY!=100000</td>
</tr>
<tr>
<td>IS</td>
<td>Is the same as $HIRE_DATE IS 2014-09-29 IS functions the same as = unless one or both of the operands are NULL. In this case, if both operands are NULL, then the IS operator evaluates to 1 (true). If one operand is NULL and the other is not, then the IS operator evaluates to 0 (false).</td>
</tr>
<tr>
<td>IS NOT</td>
<td>Is not the same as $HIRE_DATE IS NOT 2014-09-29 IS NOT functions the same as != unless one or both of the operands are NULL. In this case, if both operands are NULL, the IS NOT operator evaluates to 0 (false). If one operand is NULL and the other is not, then the IS NOT operator evaluates to 1 (true).</td>
</tr>
</tbody>
</table>
| IN       | The IN operator takes a single scalar operand on the left and a vector operand on the right formed by an explicit list of zero or
more scalars or by a single subquery. When the right operand of an IN operator is a subquery, the subquery must have a single result column. When the right operand is an empty set, the result of IN is false regardless of the left operand and even if the left operand is NULL.

Note  SQLite allows the parenthesized list of scalar values on the right-hand side of an IN operator to be an empty list but most other SQL endpoint engines and the SQL92 standard require the list to contain at least one element.

LIKE  The LIKE operator does a pattern matching comparison. The operand to the right of the LIKE operator contains the pattern and the left operand contains the string to match against the pattern. A percent symbol ("%") in the LIKE pattern matches any sequence of zero or more characters in the string. An underscore ("_") in the LIKE pattern matches any single character in the string. Any other character matches itself or its lower/upper case equivalent. (By default SQLite only understands upper/lower case for ASCII characters. The LIKE operator is case sensitive by default for unicode characters that are beyond the ASCII range.

For example, the expression 'a' LIKE 'A' is TRUE but 'æ' LIKE 'Æ' is FALSE.)

LIKE can be preceded by the NOT keyword.

CASE  Evaluates a list of conditions and returns one of multiple possible result expressions.

Example 1:
WHEN $NEWEST = 'Y' THEN '1' ELSE '0' END

Example 2:
case length($month)
when 2 then $year||$month
when 1 then $year||0||$month end

GLOB  The GLOB operator acts in the same way as the LIKE operator but uses the UNIX file globbing syntax for its wildcards. GLOB is case sensitive.
GLOB can be preceded by the NOT keyword to invert the sense
### Table 5.5 | Logical SQLite Operators used by Attunity Replicate Expression Builder

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GLOB</strong></td>
<td>of the test. The infix GLOB operator is implemented by calling the function glob(Y,X) and can be modified by overriding that function.</td>
</tr>
<tr>
<td><strong>MATCH</strong></td>
<td>The MATCH operator is a special syntax for the match() application-defined function. The default match() function implementation raises an exception and is not really useful for anything. But extensions can override the match() function with more helpful logic.</td>
</tr>
<tr>
<td><strong>REGEXP</strong></td>
<td>The REGEXP operator is a special syntax for the regexp() user function. No regexp() user function is defined by default and so use of the REGEXP operator will normally result in an error message.</td>
</tr>
<tr>
<td><strong>AND</strong></td>
<td>Both operands are true. $\text{MANAGER}<em>\text{ID}$ AND $\text{EMPLOYEE}</em>\text{ID} &gt; 100$</td>
</tr>
<tr>
<td><strong>OR</strong></td>
<td>Either operand is true. $\text{MANAGER}<em>\text{ID}$ OR $\text{EMPLOYEE}</em>\text{ID} &gt; 100$</td>
</tr>
<tr>
<td><strong>&lt;&lt;</strong></td>
<td>Bitwise shift left. $x &lt;&lt; n$ A bitwise shift to the left of $x$ by $n$ bits.</td>
</tr>
<tr>
<td><strong>&gt;&gt;</strong></td>
<td>Bitwise shift right. $x &gt;&gt; n$ A bitwise shift to the right of $x$ by $n$ bits.</td>
</tr>
<tr>
<td><strong>&amp;</strong></td>
<td>Unary and</td>
</tr>
<tr>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td><strong>&lt;</strong></td>
<td>Is less than. $\text{SALARY} &lt; 100000$</td>
</tr>
<tr>
<td><strong>&lt;=</strong></td>
<td>Is less than or equal to $\text{SALARY} \leq 100000$</td>
</tr>
<tr>
<td><strong>&gt;</strong></td>
<td>Is greater than $\text{SALARY} &gt; 100000$</td>
</tr>
<tr>
<td><strong>&gt;=</strong></td>
<td>Is more than or equal to $\text{SALARY} \geq 100000$</td>
</tr>
<tr>
<td><strong>=</strong> or <strong>==</strong></td>
<td>Is equal to $\text{SALARY} = 100000$</td>
</tr>
</tbody>
</table>
Mathematical

The following table describes the mathematical SQLite operators used by the Attunity Replicate Expression Builder.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Adds two values together.</td>
</tr>
<tr>
<td></td>
<td>DEPARTMENT_ID + 100 (adds 100 to each ID number). Any column used in an</td>
</tr>
<tr>
<td></td>
<td>expression with this operator must be a numeric data type.</td>
</tr>
<tr>
<td>-</td>
<td>Subtracts a value from another value.</td>
</tr>
<tr>
<td></td>
<td>MANAGER_ID - 100 (subtracts 100 from each ID number). Any column used in</td>
</tr>
<tr>
<td></td>
<td>an expression with this operator must be a numeric data type.</td>
</tr>
<tr>
<td>%</td>
<td>Uses the remainder of a division expression as the value.</td>
</tr>
<tr>
<td></td>
<td>%SALARY/7 (Divides the value of the Salary column by 7 and uses any</td>
</tr>
<tr>
<td></td>
<td>remainder from the expression as the column value).</td>
</tr>
<tr>
<td>/</td>
<td>Divides one value into another.</td>
</tr>
<tr>
<td></td>
<td>SALARY/.16 (Divides the value of the Salary column by .16.</td>
</tr>
<tr>
<td></td>
<td>Note: If the two values in the division expression are integers</td>
</tr>
<tr>
<td></td>
<td>(two NUMERIC columns with no digits after the decimal) and the result is</td>
</tr>
<tr>
<td></td>
<td>a fractional value, the result returned will be 0.</td>
</tr>
<tr>
<td>*</td>
<td>Multiplies the value of the Salary column by .16.</td>
</tr>
<tr>
<td></td>
<td>SALARY*.16 (Multiplies the value of the Salary column by .16. The</td>
</tr>
<tr>
<td></td>
<td>This could be used to calculate taxes that are subtracted from a salary).</td>
</tr>
</tbody>
</table>

Functions

The sections below describe the SQLite functions you can use to build an expression with the Expression builder. The Expression builder divides the functions into the following categories:

- Strings
- LOBs
- Numeric
- NULL check
- Date and Time
- Data Enrichment
- Operation
- Other Functions
Strings

The following table describes the string functions used by the Expression Builder in AEM.

**Table 5.7 | SQLite String Functions used by the Expression Builder**

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>lower(x)</td>
<td>The lower(x) function returns a copy of string x with all characters converted to lower case. The default built-in lower() function works for ASCII characters only.</td>
</tr>
<tr>
<td>ltrim(x,y)</td>
<td>The ltrim(x,y) function returns a string formed by removing all characters that appear in y from the left side of x. If there is no value for y, ltrim(x) removes spaces from the left side of x.</td>
</tr>
<tr>
<td>replace(x,y,z)</td>
<td>The replace(x,y,z) function returns a string formed by substituting string z for every occurrence of string y in string x.</td>
</tr>
<tr>
<td>rtrim(x,y)</td>
<td>The rtrim(x,y) function returns a string formed by removing all characters that appear in y from the right side of x. If there is no value for y, rtrim(x) removes spaces from the right side of x.</td>
</tr>
<tr>
<td>substr(x,y,z)</td>
<td>The substr(x,y,z) function returns a substring of input string x that begins with the y-th character and which is z characters long. If z is omitted then substr(x,y) returns all characters through the end of the string x beginning with the y-th. The left-most character of x is number 1. If y is negative then the first character of the substring is found by counting from the right rather than the left. If z is negative then the abs(z) characters preceding the y-th character are returned. If x is a string then characters indices refer to actual UTF-8 characters. If x is a BLOB then the indices refer to bytes.</td>
</tr>
<tr>
<td>trim(x,y)</td>
<td>The trim(x,y) function returns a string formed by removing all characters that appear in y from both sides of x. If there is no value for y, trim(x) removes spaces from both sides of x.</td>
</tr>
<tr>
<td>upper(x)</td>
<td>The upper(x) function returns a copy of string x with all characters converted to upper case.</td>
</tr>
</tbody>
</table>

LOBs

The following table describes the LOB functions used by the Expression Builder in AEM.

**Table 5.8 | SQLite Lob Functions used by the Expression Builder**

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hex(x)</td>
<td>The hex() function receives an argument as a BLOB and returns an uppercase hexadecimal string version of the BLOB content.</td>
</tr>
<tr>
<td>randomblob(N)</td>
<td>The randomblob(N) function returns an N-byte BLOB that contains pseudo-random bytes. If N is less than 1 then a 1-byte random BLOB is returned.</td>
</tr>
<tr>
<td>zeroblob(N)</td>
<td>The zeroblob(N) function returns a BLOB that consists of N bytes of 0x00.</td>
</tr>
</tbody>
</table>
Numeric

The following table describes the numeric functions used by the Expression Builder in AEM.

**Table 5.9 | SQLite Numeric Functions used by the Expression Builder**

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>abs(x)</td>
<td>The abs(x) function returns the absolute value of the numeric argument X. Abs(x) returns NULL if x is NULL. Abs(x) returns 0.0 if x is a string or BLOB that cannot be converted to a numeric value.</td>
</tr>
<tr>
<td>random()</td>
<td>The random() function returns a pseudo-random integer between -9223372036854775808 and +9223372036854775807.</td>
</tr>
<tr>
<td>round(x,y)</td>
<td>The round(x,y) function returns a floating-point value x rounded to y digits to the right of the decimal point. If there is no value for y, it is assumed to be 0.</td>
</tr>
<tr>
<td>max(x,y...)</td>
<td>The multi-argument max() function returns the argument with the maximum value, or returns NULL if any argument is NULL. The multi-argument max() function searches its arguments from left to right for an argument that defines a collating function and uses that collating function for all string comparisons. If none of the arguments to max() define a collating function, then the BINARY collating function is used. Note that max() is a simple function when it has two or more arguments but operates as an aggregate function if it has a single argument.</td>
</tr>
<tr>
<td>min(x,y...)</td>
<td>The multi-argument min() function returns the argument with the minimum value. The multi-argument min() function searches its arguments from left to right for an argument that defines a collating function and uses that collating function for all string comparisons. If none of the arguments to min() define a collating function, then the BINARY collating function is used. Note that min() is a simple function when it has two or more arguments but operates as an aggregate function if it has a single argument.</td>
</tr>
</tbody>
</table>

NULL check

The following table describes the NULL check functions used by the Expression Builder in AEM.

**Table 5.10 | SQLite NULL Check Functions used by the Attunity Replicate Expression Builder**

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>coalesce(x,y...)</td>
<td>The coalesce() function returns a copy of its first non-NULL argument, it returns NULL if all arguments are NULL. Coalesce() have at least two arguments.</td>
</tr>
<tr>
<td>ifnull(x,y)</td>
<td>The ifnull() function returns a copy of its first non-NULL argument, it returns NULL if both arguments are NULL. Ifnull() must have exactly two arguments.</td>
</tr>
</tbody>
</table>
### Table 5.10 | SQLite NULL Check Functions used by the Attunity Replicate Expression Builder

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>ifnull()</code></td>
<td>The <code>ifnull()</code> function is the same as <code>coalesce()</code> with two arguments.</td>
</tr>
<tr>
<td><code>nullif(x,y)</code></td>
<td>The <code>nullif(x,y)</code> function returns a copy of its first argument if the arguments are different and returns NULL if the arguments are the same. The <code>nullif(x,y)</code> function searches its arguments from left to right for an argument that defines a collating function and uses that collating function for all string comparisons. If neither argument to <code>nullif()</code> defines a collating function then the BINARY is used.</td>
</tr>
</tbody>
</table>

### Date and Time

The following table describes the Date and Time functions used by the Expression Builder in AEM.

### Table 5.11 | SQLite Date and Time Functions used by the Attunity Replicate Expression Builder

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>date(timestring, modifier, modifier...)</code></td>
<td>Returns the date in the format YYYY-MM-DD.</td>
</tr>
<tr>
<td><code>time(timestring, modifier, modifier...)</code></td>
<td>Returns the time in the format HH:MM:SS.</td>
</tr>
<tr>
<td><code>datetime(timestring, modifier, modifier...)</code></td>
<td>Returns the date and time in the format YYYY-MM-DD HH:MM:SS.</td>
</tr>
<tr>
<td><code>julianday(timestring, modifier, modifier...)</code></td>
<td>The <code>julianday()</code> function returns the number of days since noon in Greenwich on November 24, 4714 B.C.</td>
</tr>
<tr>
<td><code>strftime(format, timestring, modifier, modifier...)</code></td>
<td>The <code>strftime()</code> routine returns the date formatted according to the format string specified as the first argument. It supports the following variables: &lt;br&gt; %d: day of month &lt;br&gt; %H: hour 00-24 &lt;br&gt; %f: ** fractional seconds SS.SSS &lt;br&gt; %j: day of year 001-366 &lt;br&gt; %J: ** Julian day number &lt;br&gt; %m: month 01-12 &lt;br&gt; %M: minute 00-59 &lt;br&gt; %s: seconds since 1970-01-01</td>
</tr>
</tbody>
</table>
Table 5.11 | SQLite Date and Time Functions used by the Attunity Replicate Expression Builder

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%s:</td>
<td>seconds 00-59</td>
</tr>
<tr>
<td>%w:</td>
<td>day of week 0-6 sunday==0</td>
</tr>
<tr>
<td>%W:</td>
<td>week of year 00-53</td>
</tr>
<tr>
<td>%Y:</td>
<td>year 0000-9999</td>
</tr>
<tr>
<td>%:</td>
<td>%</td>
</tr>
</tbody>
</table>

Time strings can be in the following formats:
- YYYY-MM-DD
- YYYY-MM-DD HH:MM
- YYYY-MM-DD HH:MM:SS
- YYYY-MM-DD HH:MM:SS.SSS
- YYYY-MM-DDTHH:MM (T is a literal character that separates the date and time)
- YYYY-MM-DDTHH:MM:SS (T is a literal character that separates the date and time)
- YYYY-MM-DDTHH:MM:SS.SSS (T is a literal character that separates the date and time)
- HH:MM
- HH:MM:SS
- HH:MM:SS.SSS
- now (Converted to current date and time using UTC)
- DDDD.DDDD (The Julian day number expressed as a floating point value).

Data Enrichment

Data Enrichment functions allow the selected source tables to be augmented with data from other records located in either the source or target endpoints. Practical applications of data enrichment functions include code lookup or master record lookup (e.g. social security number lookup to find a person’s name).

You can enrich the target tables with supplemental data retrieved from the source or target endpoint by defining a transformation on the table. For more information about defining transformations on a single table, see Defining Transformations for a Single Table/View.

Limitations

Amazon Redshift is not supported.

Data Enrichment Functions

The table below describes the source and target lookup functions, which can be used both for table transformations and for global transformations. For a description of the
parameters available for these functions, see Input Parameters.

Table 5.12 | SQLite Data Enrichment Functions used by Expression Builder

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>source_lookup</td>
<td>Use to retrieve additional data from the source endpoint.</td>
</tr>
<tr>
<td>target_lookup</td>
<td>Use to retrieve additional data from the target endpoint.</td>
</tr>
</tbody>
</table>

Input Parameters

The possible input parameters for the lookup functions are described in the table below. For a usage example, see Data Enrichment Example.

Table 5.13 | Lookup Input Parameters for Data Enrichment Functions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTL</td>
<td>TTL (Time to Live) is the amount of time the 'COND' return value will be cached. Caching the 'COND' return value improves performance by reducing the frequency that AEM needs to access the source/target endpoint. As there is no default, you must specify a TTL value, which can be one of the following: &lt;SECONDS&gt; - The time to cache the 'COND' return value in seconds. Specify a short caching time (e.g. 3) for data that is frequently updated or a long caching time for data that rarely changes. 'NO_CACHING' - Specify 'NO_CACHING' if you do not want to cache the 'COND' return value. This is recommended for data that is constantly updated (e.g. share prices). 'NO_EXPIRATION' - For data that is never updated (e.g. a street name), specify 'NO_EXPIRATION' to store the Functions return value permanently in the cache.</td>
</tr>
<tr>
<td>'SCHM'</td>
<td>The schema name.</td>
</tr>
<tr>
<td>'TBL'</td>
<td>The table on which to perform the lookup.</td>
</tr>
<tr>
<td>'EXP'</td>
<td>The expression to retrieve data from the lookup table.</td>
</tr>
</tbody>
</table>

**Note:** The expression syntax must be native to the endpoint it accesses. The result should be a single column. Possible expressions include: col1, col1+5, max(col1).

**Note:** Full LOB columns are not supported. For information on including Limited-size LOB columns in the replication, see the description of the Metadata tab.
### Table 5.13 | Lookup Input Parameters for Data Enrichment Functions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>'COND'</td>
<td>The condition for the lookup statement. Note: The condition syntax must be native to the endpoint it accesses. The <strong>COND</strong> is a single field referencing all required fields. <strong>Example if the lookup table is located in Oracle:</strong> 'Fieldname1=:1 and Fieldname2=:2 and Fieldname3=:3' <strong>Example if the lookup table is located in Microsoft SQL Server:</strong> 'Fieldname1=? and Fieldname2=? and Fieldname3=?' <strong>Input Columns (transformations and Filters only), Header Columns, and Metadata (Global Transformations Only) can also be used in the expression and are evaluated before the lookup statement is performed against the endpoint.</strong></td>
</tr>
<tr>
<td>COND_PARAMS</td>
<td>Any parameters required by the <strong>COND</strong> parameter. The <strong>COND_PARAMS</strong> (condition parameters) is not a single field, but a list of fields. <strong>Syntax:</strong> $FIELDNAME1, $FIELDNAME2, $FIELDNAME3 <strong>Full example:</strong> source_lookup(10000, 'HR', 'DEPARTMENTS', 'DEPARTMENT_NAME', 'COMPANY_ID=? and DIVISION_ID=? and DEPT_ID=?', $COMP_ID, $DIV_ID, $DEPT_ID)</td>
</tr>
</tbody>
</table>

**Note** To improve efficiency, the source/target lookup tables should be indexed for the specified lookup fields.

### Data Enrichment Example

In the following example, Mike needs to add the **DEPARTMENT_NAME** column to the **HR.JOB_HISTORY** table. The **DEPARTMENT_NAME** column is located in the **HR.DEPARTMENTS** table in the source endpoint.

© 2017 Attunity Ltd.
This is how the `HR.JOB_HISTORY` table appears before the column is added:

<table>
<thead>
<tr>
<th>EMPLOYEE_ID</th>
<th>START_DATE</th>
<th>END_DATE</th>
<th>JOB_ID</th>
<th>DEPARTMENT_ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>102</td>
<td>2001-01-13</td>
<td>2006-07-24</td>
<td>IT_PROG</td>
<td>60</td>
</tr>
<tr>
<td>101</td>
<td>1997-09-21</td>
<td>2001-10-27</td>
<td>AC_ACCOUNT</td>
<td>110</td>
</tr>
<tr>
<td>101</td>
<td>2001-10-28</td>
<td>2005-03-15</td>
<td>AC_MGR</td>
<td>110</td>
</tr>
<tr>
<td>14</td>
<td>2004-02-17</td>
<td>2007-12-19</td>
<td>MK_REP</td>
<td>20</td>
</tr>
<tr>
<td>114</td>
<td>2006-03-24</td>
<td>2007-12-31</td>
<td>ST_CLERK</td>
<td>50</td>
</tr>
<tr>
<td>122</td>
<td>2007-01-01</td>
<td>2007-12-31</td>
<td>ST_CLERK</td>
<td>50</td>
</tr>
<tr>
<td>200</td>
<td>1995-09-17</td>
<td>2006-06-17</td>
<td>AD_ASST</td>
<td>90</td>
</tr>
<tr>
<td>176</td>
<td>2001-09-09</td>
<td>2010-09-09</td>
<td>SA_REP</td>
<td>60</td>
</tr>
<tr>
<td>176</td>
<td></td>
<td>2001-09-09</td>
<td>SA_MAN</td>
<td>60</td>
</tr>
<tr>
<td>200</td>
<td>2002-07-01</td>
<td>2006-12-31</td>
<td>AC_ACCOUNT</td>
<td>90</td>
</tr>
</tbody>
</table>

This is how the `HR.JOB_HISTORY` table appears after the Full Load completes:

<table>
<thead>
<tr>
<th>EMPLOYEE_ID</th>
<th>START_DATE</th>
<th>END_DATE</th>
<th>JOB_ID</th>
<th>DEPARTMENT_ID</th>
<th>DEPARTMENT_NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>102</td>
<td>2007-01-13</td>
<td>2006-07-24</td>
<td>IT_PROG</td>
<td>60</td>
<td>Warehouse</td>
</tr>
<tr>
<td>101</td>
<td>1997-09-21</td>
<td>2001-10-27</td>
<td>AC_ACCOUNT</td>
<td>110</td>
<td>ProductManagement</td>
</tr>
<tr>
<td>201</td>
<td>2004-02-17</td>
<td>2007-12-19</td>
<td>MK_REP</td>
<td>20</td>
<td>HRProductManagement</td>
</tr>
<tr>
<td>114</td>
<td>2006-03-24</td>
<td>2007-12-31</td>
<td>ST_CLERK</td>
<td>50</td>
<td>Bookkeeping</td>
</tr>
<tr>
<td>122</td>
<td>2007-01-01</td>
<td>2007-12-31</td>
<td>ST_CLERK</td>
<td>50</td>
<td>Bookkeeping</td>
</tr>
<tr>
<td>200</td>
<td>1995-09-17</td>
<td>2006-06-17</td>
<td>AD_ASST</td>
<td>90</td>
<td>Management</td>
</tr>
<tr>
<td>176</td>
<td>2001-09-09</td>
<td>2010-09-09</td>
<td>SA_REP</td>
<td>60</td>
<td>WarehouseENg</td>
</tr>
<tr>
<td>176</td>
<td></td>
<td>2001-09-09</td>
<td>SA_MAN</td>
<td>60</td>
<td>WarehouseENg</td>
</tr>
<tr>
<td>200</td>
<td>2002-07-01</td>
<td>2006-12-31</td>
<td>AC_ACCOUNT</td>
<td>90</td>
<td>Management</td>
</tr>
</tbody>
</table>

To add the `DEPARTMENT_NAME` column, Mike needs to:

1. Create a new task and select the `HR.JOB_HISTORY` table for replication.
2. Apply a "New Column" transformation to the `HR.JOB_HISTORY` table. For more information on defining transformations, see Defining Transformations for a Single Table/View.
3. Open the Expression Builder and choose Data Enrichment from the Functions tab. For more information on the Expression Builder, see Using the Expression Builder (for Filters, Transformations, and Global Transformations).
4. Select the source_lookup function and configure it as follows (using the native syntax of the source endpoint):

   **If the lookup table is located in Oracle:**
   
   ```
   source_lookup(10000, 'HR', 'DEPARTMENTS', 'DEPARTMENT_NAME', 'DEPARTMENT_ID=:1', $DEPARTMENT_ID)
   ```

   **If the lookup table is located in Microsoft SQL Server:**
   
   ```
   source_lookup(10000, 'HR', 'DEPARTMENTS', '[DEPARTMENT_NAME]=?', '$DEPARTMENT_ID')
   ```

   Where:
» 10000 is the TTL parameter.
» HR is the schema name.
» DEPARTMENTS is the table name.
» DEPARTMENT_NAME is the expression.
» DEPARTMENT_ID=:1 (or ? on Microsoft SQL Server) is the condition.
» $DEPARTMENT_ID is the condition parameter.

5. Run the task.

Operation
The following table describes the Operation functions used by the Expression Builder in AEM.

Table 5.14 | SQLite Operation Functions used by the Attunity Replicate Expression Builder

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
</table>
| operation_indicator | When the operation_indicator function is invoked on its own or as part of an expression, records deleted from the source endpoint will not be deleted from the target endpoint. Instead, the corresponding target record will be flagged (with a user-provided value) to indicate that it was deleted from the source. The operation_indicator function also requires you to provide values to indicate records that were inserted or updated in the source endpoint.  
  
  **Note:** The operation_indicator function is not supported on tables that do not have a Primary Key.  
  
  **Note:** It is recommended to add a dedicated column for the flag values, for example, OPERATION. For an explanation of how to add a column, see Using the Transform Tab.  
  
  **To specify the function values:**  
  Replace value_on_delete, value_on_insert and value_on_update with the values that you want to appear in the target endpoint. Values should be formatted according to the corresponding column type.  
  
  **Example when the column type is INT4:**  
  operation_indicator(‘1’, ’0’, ’0’)  
  
  **Example when the column type is STRING:**  
  operation_indicator(‘Deleted’, ’Updated’, ’Inserted’)  

Other Functions
The following table describes additional functions used by the Expression Builder in AEM.
### Table 5.15 | SQLite Functions used by the Attunity Replicate Expression Builder

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>length(x)</td>
<td>For a string value x, the length(x) function returns the number of characters (not bytes) in x before to the first NULL character. If x is NULL then length(x) is NULL. If x is numeric then length(X) returns the length of a string representation of X.</td>
</tr>
<tr>
<td>like (x,y,z)</td>
<td>The like() function is used to implement the &quot;Y LIKE X [ESCAPE Z]&quot; expression. The ESCAPE (z) clause is optional. If there is a z clause, then the like() function is invoked with three arguments. Otherwise, it is invoked with two arguments.</td>
</tr>
<tr>
<td>typeof(x)</td>
<td>The typeof(x) function returns a string that indicates the datatype of the expression x: null, integer, real, text, or BLOB.</td>
</tr>
</tbody>
</table>

### Header Columns

By default, header columns for source tables are not replicated to the target. You can determine which, if any, header columns to replicate when you define a transformation by creating an expression that includes the header field.

You can create a filter using header field values. Header column filters are applied during change processing. See Using Filters for additional information.

**Note**  The Header Column tab in the Expression builder is available for Filters and transformations. It is available for Global transformations only when you select Add Columns. See Selecting the Transformation Type.

The following table describes the header field columns.

### Table 5.16 | Header Columns

<table>
<thead>
<tr>
<th>Header Column Name</th>
<th>Value in Change Process</th>
<th>Value in Full Load</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR_H_STREAM_POSITION</td>
<td>The stream position value from the source (For example, the SCN or LSN depending on the source endpoint).</td>
<td>Empty string</td>
<td>STRING</td>
</tr>
<tr>
<td>AR_H_TIMESTAMP</td>
<td>Change timestamp</td>
<td>Current timestamp</td>
<td>DATETIME</td>
</tr>
<tr>
<td>AR_H_COMMIT_TIMESTAMP</td>
<td>Commit timestamp</td>
<td>Current timestamp</td>
<td>DATETIME</td>
</tr>
<tr>
<td>AR_H_INSERT/UPDATE/DELETE</td>
<td>INSERT/UPDATE/DELETE</td>
<td>INSERT</td>
<td>STRING</td>
</tr>
</tbody>
</table>
Table 5.16 | Header Columns

<table>
<thead>
<tr>
<th>Header Column Name</th>
<th>Value in Change Process</th>
<th>Value in Full Load</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPERATION</td>
<td></td>
<td>Empty</td>
<td>STRING</td>
</tr>
<tr>
<td>AR_H_ USER</td>
<td>The user name, ID or any other information that the source provides about the change initiator.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>This header column is supported on the Microsoft SQL Server, IBM DB2 on iSeries (AIS), and Oracle (version 11.2.0.3 and higher) source endpoints only.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Task Settings

Each task has settings that you can configure according to your needs for replication. You configure the settings in the Task Settings dialog box.

**To open the Task Settings dialog box:**

1. Open the task you are working with if it is not displayed in the AEM Console. For information on opening a task, see Editing a Replication Task.
2. Click **Task Settings**.
3. In the **Task Settings** dialog box, select the tab on the left with the task setting you want to configure. The following tabs are available:
   - Metadata
   - Bidirectional
   - Full Load Settings
   - Change Processing
   - Error Handling
   - Logging

Metadata

When you click **Metadata** in the Task Settings dialog box, you can configure the **Target Metadata Settings** for a replication task.

**Target Metadata**

**Target table schema: (if empty, use the schema from the source table):** This will automatically add the owner prefix for the target endpoint to all tables if no source schema is defined.
Note When replicating to a Hadoop target endpoint, the value specified in this field will be interpreted as a database name (as opposed to a schema name).

Replicate LOB columns (BLOB, CLOB and similar large object data types): Select this if the source tables include LOBs.

Note LOB data types are supported only in tables that include a primary key.

If you select Replicate LOB columns, you must also select one of the following:

» Allow unlimited LOB size: If you select this option then enter a value for the following parameter:

  Chunk size (KB): Specify the size of the LOB chunks to use when replicating the data to the target.

» Limit LOB size to: If you select this option, specify the maximum permitted LOB size.

Important: In some scenarios, tasks configured to replicate tables with multiple LOB columns may consume a large amount of memory. This is because Replicate allocates memory by multiplying the Limit LOB size to value by the Commit rate during full load value, the sum of which it multiplies by the number of LOB columns being replicated. So, for example, if LOB size is limited to 5 MB and the default commit rate is used (10000 events), a task replicating 6 LOB columns will consume 30 GB of memory.

Should you encounter memory consumption issues and suspect that a combination of the above factors may be the cause, stop the task and lower the value in the Commit rate during full load field. Then resume the task. Repeat this process until acceptable performance/memory levels are reached.

These instructions apply to Change Processing and Full Load tasks.

Note Changes to a column’s LOB size while a task is running will not be reflected in the Change Table, unless the target tables are created by Attunity Replicate. In such cases, the task must be configured to drop and create the Change Table (the default) and the target tables need to be reloaded (after the LOB size has changed).

For more information on the Change Table, see Store Changes Settings. For information on reloading target tables, see the Attunity Replicate User Guide and Reference.
Control Tables

Control Tables provide information about the replication task as well as useful statistics that can be used to plan and manage both the current replication task and future replication tasks. Aside from the Apply Exceptions table which is always created, you can choose which of the following Control Tables to create on the target:

- **Replication Status**: Provides details about the current task including task status, amount of memory consumed by the task, number of changes not yet applied to the target and the position in the source endpoint from which Attunity Replicate is currently reading.

- **Suspended Tables**: Provides a list of suspended tables as well as the reason they were suspended.

- **Replication History**: Provides information about the replication history including the number and volume of records processed during a replication task, latency at the end of a CDC task, among others.

- **CDC Partitions**: The attrep_cdc_partitions table contains records of partitions created on the target database when Change Data Partitioning is enabled for a Replicate task. You can use this information to identify partitioned data that needs to be further processed.

For a detailed description of these tables, see the *Attunity Replicate User and Reference Guide*.

**Create control table in target using schema**: Enter the endpoint schema for the target Control Tables. If you do not enter any information in this field, then the tables are copied to the default location in the endpoint.

**Note**  When this field is left empty, the target endpoint is MySQL, and the Multiple Endpoints option is enabled, a default database named attrep_control will be created on the MySQL server. The selected control tables will be created in this database.

For more information on the Multiple Endpoints option, see the *Attunity Replicate User and Reference Guide*.

**Note**  When replicating to a Hadoop target endpoint, the value specified in this field will be interpreted as a database name (as opposed to a schema name).

**Replication history time slot (minutes)**: The length of each time slot in the Replication History table. The default is 5 minutes.

Table Selection

In addition to the Apply Exceptions table (required), select which of the following Control Tables you want Attunity Replicate to create on the target endpoint: Replication Status, Suspended Tables and Replication History.
Bidirectional

This tab is only applicable to bidirectional replication tasks. When you click Bidirectional in the Task Settings dialog box, the Loopback Prevention tab is displayed. In bidirectional replication, loopback prevention is a mechanism that prevents the same data from being replicated back and forth in an endless loop. To enable loopback prevention, you need to specify a source and target Loopback prevention table schema.

Bidirectional replication consists of two separate tasks: Task 1 captures changes made to Endpoint A and replicates them to Endpoint B. Task 2 captures changes made to Endpoint B and replicates them to Endpoint A. When configuring Task 1 of a bidirectional replication setup, the source loopback prevention table schema must be identical to the target loopback prevention table schema specified in the Loopback Prevention settings of Task 2.

Likewise, when configuring Task 2 of a bidirectional replication setup, the source loopback prevention table schema must be identical to the target loopback prevention table schema specified in the Loopback Prevention settings of Task 1.

Note  Oracle schemas are case-sensitive. Therefore, when specifying an Oracle table schema, make sure to use the correct case in the Loopback Prevention settings in both Tasks.

For instructions on setting up bidirectional replication, see Bidirectional Replication.

Full Load

When you click Full Load in the Task Settings dialog box, you can configure the following:

» Full Load Settings
» Full Load Tuning

Full Load Settings

Click the Full Load Settings sub-tab to configure the following:

Full is ON/OFF.

Click this button to toggle full load on or off. The initial setting is determined when Setting up Tasks.

When full load is ON, Attunity Replicate loads the initial source data to the target endpoint.

Note  Full load can be turned on or off at any stage even if change processing is on. Once the task begins to process changes, the full load on/off switch is used only as additional protection against accidental or unauthorized reload.

Target table preparation:
If target table already exists: Select one of the following from the list to determine how you want to handle loading the target at full-load start up:

- **DROP and Create table**: The table is dropped and a new table is created in its place.
- **TRUNCATE before loading**: Data is truncated without affecting the table metadata.
- **Do nothing**: Existing data and metadata of the target table will not be affected. New data will be added to the table.

Resuming an incomplete full load: This lets you set the policy for determining whether to allow tables to resume processing from the point of interruption during a full load. You can do this ONLY if the interruption was caused by clicking the "Stop Task" button. Interruptions caused by errors cannot be so resumed. Allowing the restarting of tables from the point of interruption can cause a slowdown in the full-load processing. However, starting extremely large tables from the beginning may cause long delays in completing the full load. In addition, for tables to be restarted from the point of interruption, they must have a unique index. It is recommended that they have a clustered primary key.

For tables interrupted while in full load: Select how you want to handle loading tables that were interrupted during a full-load operation.

Use the following options to determine the policy for reloading tables after an interruption of a full-load process:

- **Allow resuming table full load**: Select this to allow tables loading when a full-load process is interrupted to begin loading from the point where the loading was interrupted. When you select this option, you must define which tables can be reloaded in the Resume interrupted full load only for tables option.
- **Always restart table full load**: Select this option to restart the loading for all tables even those that were partially loaded when the full-load process was interrupted.

Resume interrupted full load only for tables: This option is available when you select Allow resuming table full load. Use this option to define which tables should resume loading when the full-load operation begins again. You can define the following options:

- **Larger than (rows)**: Use the arrows (or type) to select the minimum number of rows that a table must have to resume loading. Tables with fewer rows than the number entered in this field will restart the full load. The default value is 1000000.
- **That have**: You must select one of the following. Source tables must have a clustered primary key or a unique index to be reloaded automatically.
  - **A clustered primary key**: Only tables with a clustered primary key are reloaded. This is the default selection.
  - **Any unique index**: Tables with any type of unique index are reloaded. Note that this may slow down the full-load process.

Create primary key or unique index after full load completes: Select this option if you want to delay primary key or unique index creation on the target until after full load completes.
Stop the task after Full Load completes and: You can set the task to stop automatically after Full Load completes. This is useful if you need to perform DBA operations on the target tables before the task’s Apply Changes (i.e. CDC) phase begins.

During Full Load, any changes to the source tables are cached. When Full Load completes, the cached changes are automatically applied to the target tables.

Note This feature is not available for bidirectional replication tasks.

Select Cached changes have not yet been applied to stop the task before the cached changes are applied and/or Cached changes have been applied to stop the task after the cached changes are applied.

Selecting the Cached changes have not yet been applied option will stop the task immediately after Full Load completes. Selecting the Cached changes have been applied option will stop the task as soon as data is consistent across all tables in the task.

Note When configuring Replicate to stop the task after Full Load completes, note the following:
- The task will stop after Full Load completes even if there are no cached changes to apply.
- Choosing to stop the task before cached changes have been applied may adversely affect performance, since the cached changes will only be applied to tables (even those that have already completed Full Load) after the last table completes Full Load.
- When working with the File Channel endpoint, these options should be set in the remote File Channel task and not in the local File Channel task.

For more information on the File Channel endpoint, see the Attunity Replicate User and Reference Guide.

Full Load Tuning
Click the Full Load Tuning sub-tab to configure the following:

Tuning settings
- Maximum number of tables to load in parallel: Enter the maximum number of tables to load into the target at one time. The default value is 5.
- Transaction consistency timeout (seconds): Enter the number of seconds that Attunity Replicate waits for transactions to close, if they are open when the task starts,
before beginning the Full Load operation. The default value is 600 (10 minutes). Attunity Replicate will begin the full load after the timeout value is reached even if there are open transactions.

**Note:** To replicate transactions that were open when Full Load started but were only committed after the timeout value was reached, you need to reload the target tables.

» **Commit rate during full load:** The maximum number of events that can be transferred together. The default value is 10000.

**Change Processing**

When you click Change Processing in the Task Settings dialog box, you can configure the following:

» Apply Changes Settings
» Store Changes Settings
» Changes Processing Tuning

**Apply Changes Settings**

Click the Apply Changes Settings sub-tab to configure the following:

**Apply Changes is ON/OFF.**

Click this button to toggle Apply Changes (Change Processing) on or off. The initial setting is determined when Setting up Tasks.

When Apply Changes is ON, Attunity Replicate processes the changes. You can view the change processing in the Monitor. For more information, see the Attunity Replicate User and Reference Guide.

**Note** When you turn on apply changes you must reload the task or position back to the point of the previous reload.

**DDL handling policy:** Determine how to handle the target table for the change capture:

» When source table is dropped, select one of the following:
  » DROP target table
  » Ignore Drop

» When source table is truncated, select one of the following:
  » TRUNCATE target table
  » Ignore TRUNCATE

» When source table is altered, select one of the following:
  » ALTER target table
  » Ignore ALTER
Store Changes Settings

When you click **Store Changes** in the Task Settings dialog box, you can configure the **Store Changes Settings** for a replication task.

**Store changes processing is ON/OFF**

Click this button to toggle **Store Changes** on or off. The initial setting is determined when **Setting up Tasks**. If this option is ON, changes are stored in either change tables or an audit table.

For more information about storing and applying changes, see the *Attunity Replicate User and Reference Guide*.

**Note**  Store Changes can be turned on or off at any time without affecting anything in the task. Changes that are processed and not stored as a result of change storage being turned off can be recovered only by setting the task to an earlier point in time.

If Store Changes is **ON**, use the following options to determine how to store changes. Changes can be stored in Change Tables or in a single Audit table. From the **Store changes in** drop-down list, choose either **Change tables** or **Audit table** according to your needs.

**Storing Changes in Change Tables**

The following section describes the options that are available when storing changes in Change Tables.

» **Suffix**: Type a string to use as the suffix for all Change Tables. The default value is __ct.

The Change Table names are the name of the target table with the suffix appended. For example, if you have a table called HR and use the default value, the name of the Change Table will be **HR__ct**.

For more information, see the *Attunity Replicate User and Reference Guide*.

» **Header column prefix**: Type a string to use as the prefix for all of the Change Table header columns. The default value is **header__**.

For example, the header column **stream_position** when using the default value is called **header__stream_position**.

For more information, see the *Attunity Replicate User and Reference Guide*.

» **DDL options**: Select one of the following options to determine how to handle DDL operations on the source tables:

» **Apply to change table**: Apply the DDL to the Change Table as well. For example, when this option is enabled and a column is added to one of the source endpoint tables, the column will also be added to the corresponding Change Table.

» **Ignore**: The change event from any DDL is ignored.
On **UPDATE**: Select one of the following options to determine how to store UPDATEs to the source tables:

- **Store before and after image**: To store both the pre-UPDATE data and the post-UPDATE data.
- **Store after image only**: To store only the post-UPDATE data.

**Change table creation**:

**If change table exists when full load starts**: Select one of the following from the list to determine how you want to handle loading the Change Tables at *full-load startup*:

- **DROP and CREATE table**: The table is dropped and a new table is created in its place.
- **Delete old changes and store new changes in existing change table**: Data is truncated and added without affecting the table metadata.
- **Keep old changes and store new changes in existing change table**: Data and metadata of the existing Change table are not affected.

**Change Data Partitioning**

Note This feature is currently only supported with the Hadoop target endpoint.

In a standard replication task, changes are replicated to the target in no particular order. Change Data Partitioning enables processing of Change Data from many tables in a consistent fashion. You can define the duration of partitions as well as the partitioning base time, thereby ensuring overall consistency of the partitioned data (i.e. no partial transactions, no order headers without order lines, and so on.)

The partitioned data is stored in the Replicate Change Tables. When the **attrep_cdc_partitions** table is selected (in the Control Tables tab), information about the partitions will be recorded in the **attrep_cdc_partitions** Control Table on the target database. This information can be used to identify partitioned data that needs to be further processed.

For more information about the **attrep_cdc_partitions** Control table, refer to the **Attunity Replicate User Guide and Reference**.

The partitioning options are as follows:

- **Off** - Replicate Change Data without partitioning.
- **Partition every** - Specify the length (in hours and minutes) of each partition.
- **Partition base time** - Partitions are created during a 24 hour time period, which is calculated according to the specified “Partitioning base time” on the source database (in UTC time). For example, a partition interval of 8 hours with a “Partitioning base time” time of 02:00 will create the following partitions: 02:00-10:00, 10:00-18:00, 18:00-02:00 - but not necessarily in that order. For instance, if a task started at 01:00, then the timeframe of the first partition will be 18:00-02:00. Additionally, if a task started in the middle of a partition (e.g. at 04:00), its Change Data will be inserted into the 02:00-10:00 partition (even though no changes were captured before 04:00).
Note  If there are existing Change Tables that were created before Change Data Partitioning was enabled, you need to drop/rename them so that they can be recreated with the additional "partition_name" column.

Selecting Change Table Header Columns

The Change Table header columns provide information about the Change Processing operation such as the type of operation (e.g. INSERT), the commit time, and so on. If you do not need this information, you can configure Replicate to create the Change Tables without some or all of the header columns, thereby reducing their footprint in the target database. To do this, clear the check boxes next to the header columns that you wish to exclude.

Note that you cannot remove additional columns or restore columns while a task is running. To change your initial selection, you first need to stop the task, then modify your selection, and finally reload the target tables.

Note  When Change Data Partitioning is enabled, an extra header column named "partition_name" is added to the Change Tables and automatically selected in the UI. As this column is required, it cannot be excluded.

For a description of the header columns, refer to the Attunity Replicate User Guide and Reference.

Storing Changes in an Audit Table

The following section describes the options that are available for storing changes in an Audit table.

Note  LOB columns with unlimited size are not supported in the CHANGE_RECORD and BU_CHANGE_RECORD fields. The other fields will be recorded but the LOB will have a NULL value.

For a description of the audit table structure, see the Attunity Replicate User and Reference Guide.

Audit table schema: Specify a schema if you do not want the Audit table to be created under the target endpoint’s default schema.

The default schema are as follows:
**Endpoint** | **Default Schema**
--- | ---
Pivotal Greenplum | Public
Amazon Redshift | Public
Oracle | The connected user’s username.
Teradata | The endpoint name.
All others | The user’s default schema.

- **Audit table name**: Specify a name for the Audit table. The default value is `attrep__audit_table`.

**Audit table creation:**

- **If audit table exists when the target is reloaded**: Select one of the following to determine how you want to handle the Audit table when the target is reloaded:
  - **DROP and CREATE audit table**: The Audit table is dropped and a new table is created in its place.
  - **Delete old changes and store new changes in existing audit table**: Data is truncated and added without affecting the Audit table metadata.
  - **Keep old changes and store new changes in existing audit table**: Data and metadata of the existing Audit table are not affected.

For a description of the audit table structure, see the *Attunity Replicate User and Reference Guide*.

**Changes Processing Tuning**

Click the **Change Processing Tuning** sub-tab to fine-tune the Apply Changes settings.

**Change processing mode**

Determine which method will be used to apply changes.

- **Note**: Changes to tables without a Unique Index or Primary Key will always be applied in **Transactional apply** mode.

- **Transactional apply**: Select this to apply each transaction individually, in the order it is committed. In this case, strict referential integrity is ensured for all tables.

- **Batch optimized apply**: Select this to commit the changes in batches. In this case, a pre-processing action occurs to group the transactions into batches in the most efficient way. This may affect transactional integrity. Therefore, you must select one of the following to determine how the system will handle referential integrity issues:
  - **Preserve transactional integrity**
  - **Allow temporary lapses in transactional integrity to improve performance**
Note These options are not displayed in bidirectional tasks since such tasks always use the "Preserve transactional integrity" option.

Note The following target endpoints do not support applying binary data types in Batch Optimized Apply mode:
ODBC, SAP Sybase IQ, SAP Sybase ASE, HP Vertica, IBM Netezza, Teradata Endpoint, and Amazon Redshift.

Note When LOB columns are included in the replication, **Batch optimized apply** can only be used with the **Limit LOB size to** option. For more information about including LOB columns in the replication, see **Metadata**.

**Batch tuning**

The following options are available when **Batch optimized apply** is selected as the **Change Processing Mode**:

- **Apply batched changes in intervals:**
  - **Longer than:** The minimum amount of time to wait between each application of batch changes. The default value is **1**.
    
    Increasing the **Longer than** value decreases the frequency with which changes are applied to the target while *increasing* the size of the batches. This can improve performance when applying changes to target endpoints that are optimized for processing large batches, such as Teradata, HP Vertica, and Pivotal Greenplum.
  
  - **But less than:** The maximum amount of time to wait between each application of batch changes (before declaring a timeout). In other words, the maximum acceptable latency. The default value is **30**. This value determines the maximum amount of time to wait before applying the changes, after the **Longer than** value has been reached.

- **Force apply a batch when processing memory exceeds (MB):** The maximum amount of memory to use for pre-processing in **Batch optimized apply mode**. The default value is **500**.
  
  For maximum batch size, set this value to the highest amount of memory you can allocate to Attunity Replicate. This can improve performance when applying changes to target endpoints that are optimized for processing large batches, such as Teradata, HP Vertica, and Pivotal Greenplum.

- **Limit the number of changes applied per change processing statement to:** To limit the number of changes applied in a single change processing statement, select this check box and then optionally change the default value. The default value is **10,000**.
The following options are available when **Transactional apply** is selected as the **Change Processing Mode**:

- **Minimum number of changes per transaction**: The minimum number of changes to include in each transaction. The default value is **1000**.

  **Note** Replicate applies the changes to the target either when the number of changes is equal to or greater than the **Minimum number of changes per transaction** value OR when the batch timeout value is reached (see below) - whichever occurs first. Because the frequency of changes applied to the target is controlled by these two parameters, changes to the source records may not immediately be reflected in the target records.

- **Maximum time to batch transactions before applying (seconds)**: The maximum time to collect transactions in batches before declaring a timeout. The default value is **60**.

**Transaction offload tuning**

The following tuning options are available, regardless of which **Change processing mode** is selected:

- **Offload transaction in progress to disk if**:
  
  Attunity Replicate usually keeps transaction data in memory until it is fully committed to the source and/or target. However, transactions that are larger than the allocated memory or that are not committed within the specified time limit will be offloaded to disk.

  - **Transaction memory size exceeds (MB)**: The maximum size that all transactions can occupy in memory before being offloaded to disk. The default value is **1000**.
  
  - **Transaction duration exceeds (seconds)**: The maximum time that each transaction can stay in memory before being offloaded to disk. The duration is calculated from the time that Attunity Replicate started capturing the transaction. The default value is **60**.

**Miscellaneous tuning**

- **Statements cache size (number of statements)**: The maximum number of prepared statements to store on the server for later execution (when applying changes to the target). The default is 50. The maximum is 200.

- **Store task recovery data in target database**: Select this option to store task-specific recovery information in the target database. When this option is selected, Replicate creates a table named `attrep_txn_state` in the target database. This table contains transaction data that can be used to recover a task in the event that the files in the **Data** folder are corrupted or if the storage device containing the **Data** folder has
failed.
For more information about this option, see Recovering from Data Folder Loss or Corruption.

Error Handling
When you click Error Handling in the Task Settings dialog box, you can configure the following:
» Error Handling Settings
» Environmental Errors
» Data Errors
» Table Errors
» Apply Conflicts
For more information on error handling in Attunity Replicate, see the Attunity Replicate User and Reference Guide.

Error Handling Settings
The option to switch between the Global Error Handling policy and a Task-Specific Error Handling policy is available in each of the Error Handling sub-tabs. However, the policy you enable will be applied to all error types, regardless of where it was enabled. For example, you cannot enable a Task-Specific Error Handling policy for Data Errors and then enable the Global Error Handling policy for Table Errors and Environmental Errors.

For information on setting the global error handling policy, see the Attunity Replicate User and Reference Guide.

To set a Task-Specific Error Handling policy:
» Click the Change to Task Specific Policy button in any of the Error Handling sub-tabs.

To revert to the Global Error Handling policy:
1. Click the Change to Global Policy button in any of the Error Handling sub-tabs.
2. Click OK when prompted to confirm your action.

Environmental Errors
Click the Environmental Errors sub-tab to configure the following:
» Maximum retry count: Select this option and then specify the maximum number of attempts to restart a task when an environmental error occurs.
  Specify "0" to never restart a task.
  When the check box is not selected, Attunity Replicate will attempt to restart the task an infinite number of times.
When the system attempts to restart the task the designated number of times, the task is stopped and manual intervention is required.

- **Interval between retry attempts**: Use the counter to select or type the number of seconds that the system waits between attempts between attempts to restart a task.
- **Increase retry interval for long outages**: Select this check box to increase the retry interval for long outages. When this option is enabled, the number of seconds between retry attempts increases each time.
- **Maximum retry interval**: Use the counter to select or type the number of seconds to wait between attempts to restart a task when the **Increase retry interval for long outages** option is enabled.

For information about environmental errors and the configuration properties, see the appendix on Error and Crash Handling in the *Attunity Replicate User and Reference Guide*.

### Data Errors

Click the **Data Error** sub-tab to configure the following:

- **Policy**: Click the triangle to open the list and select what happens when an error occurs in one or more specific records. You can select one of the following from the list:
  - **Ignore record**: The task continues and the error is ignored.
  - **Log error** (default): The task continues and the error is written to the task log.
  - **Suspend table**: The task continues but data from the table with the error record is moved into an error state and its data is not replicated
  - **Stop task**: The task is stopped and manual intervention is required.
- **Escalation**: Select the Escalation check box to implement the escalation policy for data errors. If this is not selected, escalation is not implemented.
- **Escalation count**: Use the counter to select or type the number of errors that can occur to the data for a specific record before carrying out the escalation policy.
- **Escalation policy**: Click the triangle to open the list and select what happens when the Escalation Count you entered is reached. You can select one of the following from the list:
  - **Log error**: The task continues and the error is written to the task log.
  - **Suspend table** (default): The task continues but data from the table with the error record is moved into an error state and its data is not replicated
  - **Stop task**: The task is stopped and manual intervention is required.
- **Truncation policy**: Click the triangle to open the list and select what happens when an truncation occurs in one or more specific records. You can select one of the following from the list:
  - **Ignore record**: The task continues and the error is ignored.
  - **Log error** (default): The task continues and the error is written to the task log.
  - **Suspend table**: The task continues but data from the table with the error record is moved into an error state and its data is not replicated
  - **Stop task**: The task is stopped and manual intervention is required.
For information about environmental errors and the configuration properties, see the appendix on Error and Crash Handling in the Attunity Replicate User and Reference Guide.

**Table Errors**

Click the Table Error sub-tab to configure the following:

- **When encountering a table error**: Select one of the following from the drop-down list:
  - **Suspend table** (default): The task continues but data from the table with the error record is moved into an error state and its data is not replicated
  - **Stop task**: The task is stopped and manual intervention is required.
  - **Escalation**: Select the Escalation check box to implement the escalation policy for table errors. If this is not selected, escalation is not implemented.
  - **Escalation count**: Use the counter to select or type the number of errors that can occur to the data for general table data for a specific table before the task is stopped.
  - **Escalation policy**: You cannot take any action in this option. The escalation policy for table errors is automatically set to Stop task.

For information about environmental errors and the configuration properties, see the appendix on Error and Crash Handling in the Attunity Replicate User and Reference Guide.

**Apply Conflicts**

Click the Apply Conflicts sub-tab to configure the following:

- **No record found for applying a DELETE**: Click the triangle to open the list and select what happens when there is a conflict with a DELETE operation. You can select one of the following from the list:
  - **Ignore record** (default): The task continues and the error is ignored.
  - **Log record to the exceptions table**: The task continues and the record is written to the exceptions table.
  - **Suspend table**: The task continues but data from the table with the error record is moved into an error state and its data is not replicated
  - **Stop task**: The task is stopped and manual intervention is required.

- **Duplicate key when applying an INSERT**: Click the triangle to open the list and select what happens when there is a conflict with an INSERT operation. You can select one of the following from the list:
  - **Ignore record**: The task continues and the error is ignored.
  - **Log record to the exceptions table** (default): The task continues and the record is written to the exceptions table.
  - **Suspend table**: The task continues but data from the table with the error record is moved into an error state and its data is not replicated
  - **Stop task**: The task is stopped and manual intervention is required.
  - **Update the existing target record**: The target record with the same primary key
as the INSERTED source record is updated.

**Note** When this option is selected, LOB columns in the source tables will not be replicated to the target.

**No record found for applying an UPDATE:** Click the triangle to open the list and select what happens when there is a conflict with an UPDATE operation. You can select one of the following from the list:

- **Ignore record:** The task continues and the error is ignored.
- **Log record to the exceptions table** (default): The task continues and the record is written to the exceptions table.
- **Suspend table:** The task continues but data from the table with the error record is moved into an error state and its data is not replicated
- **Stop task:** The task is stopped and manual intervention is required.
- **Insert the missing target record:** The missing target record will be inserted into the target table. When the source endpoint is Oracle, selecting this option requires supplemental logging to be enabled for all the source table columns.

**Escalate on repeating table apply conflicts:** Select this check box to implement the escalation policy for table apply conflicts. If this is not selected, escalation is not implemented.

**Escalation count:** Use the counter to select or type the number of apply errors that can occur before carrying out the escalation policy.

**Escalation policy:** Click the triangle to open the list and select what happens when the Escalation Count you entered is reached. You can select one of the following from the list:

- **Log error** (default): The task continues and the error is written to the task log.
- **Suspend table:** The task continues but data from the table with the error record is moved into an error state and its data is not replicated
- **Stop task:** The task is stopped and manual intervention is required.

For information about environmental errors and the configuration properties, see the appendix on Error and Crash Handling in the Attunity Replicate User and Reference Guide.

**Note** When you select Fix record you must be sure that you are using full supplemental logging to ensure that an UPDATE is not turned into an INSERT. In other cases, FIX_RECORD can cause an async full load of a record similar to the LOB channel.

**Logging**

You can set the logging level for task logs by selecting the **Logging** tab in the **Task Settings** dialog box and then selecting the **Logging Level** sub-tab. The level you set determines what information is written to the log.
The following are the available logging levels. The list is in order from the lowest level to the highest level.

1. Error
2. Warning
3. Info
4. Trace
5. Verbose

The higher levels always include the messages from the lower levels. Therefore, if you select Error, only error messages are written to the log. However, if you select Info, informational messages, warnings, and error messages are included. Selecting Verbose writes all possible messages to the log.

For information on how to set the logging level in Attunity Replicate, see the Attunity Replicate User and Reference Guide.
6 | Monitoring and Controlling Tasks

By default, Attunity Enterprise Manager opens in Tasks View. Tasks View is where you monitor and control your Replicate tasks. To switch between Servers View and Tasks View, click the Tasks tab in the top left of the console.

To manage user permissions for all tasks on a server or for a specific task, see Managing User Permissions.

This chapter describes the various options for monitoring tasks.

In this chapter:
- Task Progress Summary
- Viewing Specific Tasks
- Monitoring Full Load Replication
- Monitoring Change Processing Replication
- Grouping Tasks
- Running a Task
- Error Handling

Task Progress Summary

The Tasks View displays a list of tasks in tabular format in the middle pane.

For each task, AEM can display the following columns:

» General Columns:
  » Data Errors: The total number of data errors in all tables involved in the task. The count is affected by data errors and the Reset Data Errors option available when you drill down to a task.
  » Description: A description of the task, as entered by the user
  » Disk Usage (MB): The current utilization of disk space, in MB. A task’s disk utilization is sampled every minute.
  » Full Load Ended: Indicates whether full load has completed
  » Memory (MB): The current utilization of memory, in MB. A task’s memory utilization is sampled every 10 seconds. When the task is not running, the value is set to zero (0).
  » Profile: The task profile, which can be either unidirectional or bidirectional
  » Reason: An explanation for the current state
» **Server:** The name of the server

» **Source Name:** The name of the source

» **Source Type:** The database type of the source

» **Stage:** The current stage of the task: Full Load or Change Processing.

» **State:** The current state of a task. Possible states are described in the table below. You can filter the table by state by selecting or clearing the respective check box in the **States** pane above the table.

### Table 6.1 | Task States

<table>
<thead>
<tr>
<th>Task State</th>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stopped</td>
<td>🎨</td>
<td>The task has not been run yet or has stopped at some point during the replication.</td>
</tr>
<tr>
<td>Error</td>
<td>🎨</td>
<td>The task has stopped due to a fatal error.</td>
</tr>
<tr>
<td>Recovering</td>
<td>🎨</td>
<td>The task is recovering from a recoverable error.</td>
</tr>
<tr>
<td>Running</td>
<td>🎨</td>
<td>The task is running.</td>
</tr>
</tbody>
</table>

» **Tables with Error:** The number of tables with an error

» **Tags:** The tags associated with a task

» **Target Name:** The name of the target

» **Target Type:** The target’s database type

» **Task:** The name of the task

» **Type:** The type of task, such as Full Load, CDC, or Full Load & CDC

» **Full Load Columns:**

  » **Ended:** The date and time the full load ended

  » **Load Duration:** The duration of the load process, in hh:mm:ss

  » **Progress (%):** The percentage of total completion

  » **Records Completed:** The number of completed records

  » **Records Left:** The number of records remaining to be loaded

  » **Source Throughput (kbyte/sec):** The current source throughput, in kbyte/sec

  » **Source Throughput (rec/sec):** The current source throughput, in rec/sec

  » **Table Notes:** Table notes, such as "0 tables failed loading"

  » **Tables Completed:** The number of completed tables

  » **Tables Left:** The number of tables remaining to be loaded

  » **Tables Loading:** The number of tables currently loading
» **Tables Queued:** The number of tables in queue

» **Target Throughput (kbyte/sec):** The current target throughput, in kbyte/sec

» **Target Throughput (rec/sec):** The current target throughput, in rec/sec

» **Total Records:** The total number of records

» **Total Tables:** The total number of tables

» **Change Processing Columns:**

  » **Applied Changes:** The number of changes applied

  » **Apply Latency:** The apply latency

  » **Apply Throughput (kbyte/sec):** The apply throughput, in kbyte/sec

  » **Apply Throughput (rec/sec):** The apply throughput, in rec/sec

  » **Changes for Apply - In Memory (Target):** The number of changes in memory during apply and until target commit

  » **Changes for Apply - On Disk (Target):** The number of changes on disk during apply and until target commit

  » **Changes In Memory (Source):** The number of changes accumulated in memory until source commit

  » **Changes on Disk (Source):** The number of changes accumulated on disk until source commit

  » **COMMIT Change Records:** The number of COMMIT change records

  » **COMMIT Change Volume:** The number of COMMIT change volume, in MB

  » **COMMIT Transactions:** The number of COMMIT transactions

  » **DDLs:** The total number of applied DDLs

  » **DDLS (%):** The percentage of applied DDLs

  » **DELETEs:** The total number of DELETEs applied

  » **DELETEs (%):** The percentage of DELETEs applied

  » **Incoming Changes:** The number of changes currently being processed

  » **Incoming Transactions:** The number of incoming transactions

  » **INSERTs:** The total number of INSERTs applied

  » **INSERTs (%):** The total percentage of INSERTs applied

  » **ROLLBACK Change Records:** The number of ROLLBACK change records

  » **ROLLBACK Change Volume:** The number of ROLLBACK change volume, in MB

  » **ROLLBACK Transactions:** The number of ROLLBACK transactions

  » **Source Latency:** The current source latency, in hh:mm:ss

  » **Source Throughput (kbyte/sec):** The current source throughput, in kbyte/sec

  » **Source Throughput (rec/sec):** The current source throughput, in rec/sec

  » **Total Latency:** The overall latency, in hh:mm:ss

  » **Transactions (Source):** The number of transactions accumulated until source commit
» **Transactions for Apply (Target):** The number of transaction during apply and until target commit
» **UPDATES:** The total number of UPDATEs applied
» **UPDATES (%):** The percentage of UPDATEs applied

**Status Summary**

The **Status Summary** at the bottom of the window provides a quick overview of the current status of all monitored tasks and servers. It lists the following information:

» **For tasks:** The total number of monitored tasks as well as the number of tasks that are running (green icon), stopped (gray icon), recovering (orange icon), and encountered an error (red icon)

You can double-click the task counters to open the corresponding **Tasks View**.

**Note:** The task counters do not consider tasks on servers that are not currently monitored. For more information, see **Additional Server Management Options**.

» **For servers:** The total number of servers, the number of servers that are running and successfully monitored (green icon), the number of faulty servers that AEM cannot monitor (red icon), and the number of servers that are not being monitored (gray icon)

**Figure 6.1 | Status Bar Example**

<table>
<thead>
<tr>
<th>Status Summary</th>
<th>Tasks (126)</th>
<th>Servers (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="81" alt="Green icon" /></td>
<td><img src="3" alt="Green icon" /></td>
</tr>
<tr>
<td></td>
<td><img src="44" alt="Gray icon" /></td>
<td><img src="1" alt="Gray icon" /></td>
</tr>
<tr>
<td></td>
<td><img src="0" alt="Orange icon" /></td>
<td><img src="0" alt="Orange icon" /></td>
</tr>
<tr>
<td></td>
<td><img src="1" alt="Red icon" /></td>
<td><img src="0" alt="Red icon" /></td>
</tr>
</tbody>
</table>

**Customizing Task Columns**

You can choose to display or hide certain columns as well as sort columns as desired.

<table>
<thead>
<tr>
<th>To</th>
<th>Do this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hide a column</td>
<td>Right-click the heading of the column you want to hide and select <strong>Hide Column</strong>. Note that once you hide a column, if you want to display it again, you need to select it in the <strong>Column Settings</strong> dialog box (see below).</td>
</tr>
<tr>
<td>Select which columns to display</td>
<td>1. In the toolbar, click <strong>Column Settings</strong>, or right-click a column heading and select <strong>Column Settings</strong>. The <strong>Column Settings</strong> dialog box opens. 2. To display additional columns, in the left pane, select the columns you want to display and click the right arrow to move them to the right pane. 3. To hide columns, select them in the right pane and use the left arrow to move them to the left pane. 4. To change the column order, select a column in the right pane and use</td>
</tr>
</tbody>
</table>
To Do this

5. To reset column selection and order, click Restore Defaults.
6. Click OK.

---

<table>
<thead>
<tr>
<th>To</th>
<th>Do this</th>
</tr>
</thead>
</table>
| Restore default columns | 1. In the toolbar, click Column Settings.  
The Column Settings dialog box opens.  
2. To reset the column selection and order, click Restore Defaults.  
3. Click OK. |

---

<table>
<thead>
<tr>
<th>To</th>
<th>Do this</th>
</tr>
</thead>
</table>
| Sort by column | Click anywhere in the column heading to change the sorting order.  
-OR-  
Right-click the column and select Sort Ascending or Sort Descending as desired.  
An upward facing arrow indicates ascending order whereas a downward facing arrow indicates descending order. |

---

<table>
<thead>
<tr>
<th>To</th>
<th>Do this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export the list to a TSV file</td>
<td>Right-click any of the column headings and select Export to TSV file. When prompted, save the file in your desired location. Note that only currently displayed columns will be exported.</td>
</tr>
</tbody>
</table>

---

Searching Tasks

You can search for specific tasks by typing a string into the Search Tasks box above the table. AEM searches only textual columns, not numeric columns. The following columns are included in the search, even if a column is not displayed in the user interface:

- State
- Reason
- Server
- Task
- Profile
- Type
- Stage
- Full Load Ended
- Source Name
- Source Type
- Target Name
- Target Type
- Tags

You can also restrict a search to a specific column by preceding the search string with the column name and a colon, as follows: ColumnName:value (for example: Server:john-
vm.abc.local). This is applicable to all available columns, not only the columns listed above. **Note:** When searching for a number, only enter whole numbers, no commas or special characters. For example, to search for 2,500, as displayed in the user interface, enter 2500; to search for 100%, enter 100.

**Viewing Specific Tasks**

From the **Tasks** view, you can drill down to an individual task, provided you have already created at least one task (see **Designing Tasks** for more information). Two modes display different sets of information for each task:

- **Designer Mode:** Here you define endpoints, select tables, modify table settings (including filters and transformations), and create global transformation rules.
- **Monitor Mode:** Default mode when you open a task. Here you view replication task activities in real time, along with log messages and notifications.

**To view a specific task:**

1. In the **Tasks** view, select the task you want to work with.
   
   The right pane displays the task diagram on the right side of the page.
2. On the **Tasks** view toolbar, click **Open**.

**Designer Mode**

In **Designer** mode, you define endpoints, select tables to be replicated, modify table settings (including filters and transformations), and create global transformation rules.

**Figure 6.2 | Viewing a Task in Designer Mode**

The **Designer** mode includes the following elements:

- **Endpoints list:** Lists the source and target endpoint connections that you added to Attunity Replicate. For more information, see **Working with Endpoints**. The figure shows
the Endpoints List in a collapsed state, hiding the endpoints. To expand the list, click the right arrow at the top or anywhere below it. To close the panel, click the left arrow.

» **Endpoints map**: Illustrates the connection between the source and target endpoints for the task. The round icon between the endpoints represents the task type, which can indicate Full Load only, Full Load and Apply Changes, or Apply Changes only.

» When you create a task, you can drag the endpoints to the source and target drop spots as required. For more information, see [Adding a Source and Target Endpoint to a Task](#).

» **Monitor and Designer buttons**: Switch between Monitor mode and Designer mode. See also [Monitor Mode](#).

» **Run button**: Lets you run the task at hand.

» **Task Settings button**: Opens the Task Settings dialog box. For more information, see [Task Settings](#).

» **Manage Endpoint Connections button**: Lets you view the endpoints defined, edit them, or add new endpoints. For more information, see [Working with Endpoints](#).

» **Select and Define Tables**: Lets you select the tables you want to include in your replication task. In addition, you can use transformation and filter operations to create new tables or to replicate parts of tables. For more information, see [Adding Tables and/or Views to a Task](#), [Using Filters](#), and [Defining Transformations for a Single Table/View](#).

» **Global Transformations option**: Lets you create transformations for all tables in a task. For more information, see [Defining Global Transformations](#).

**To display a task in Designer mode:**

» On the right side of the toolbar, click Designer.

**Monitor Mode**

In **Monitor** mode, you view the replication task activities in real time. This is the default mode when you open a task.
The **Monitor** mode includes the following elements:

- **Run button**: Lets you run the task at hand.
- **Manage Endpoint Connections button**: Lets you view the endpoints defined, edit them, or add new endpoints. For more information, see Working with Endpoints.
- **Monitor and Designer buttons**: Switch between Monitor mode and Designer mode. See also Designer Mode and Designing Tasks.
- **Tools list**: Provides access to history, log management, and status information.
- **Change Processing/Full Load tabs**: Lets you select the information you want to focus on. By default, AEM displays the Change Processing view.
- **Task Map**: Illustrates the connection between the source and target endpoints for the task. The round icon between the endpoints represents the task type, which can indicate Full Load only, Full Load and Apply Changes, or Apply Changes only.
- **Message Center**: Displays notifications and logging messages. By default, the Message Center is minimized to a message tray at the bottom left of the console. For more information, see Viewing Task and Server Messages.

**To display a task in Monitor mode:**
- On the right side of the toolbar, click **Monitor**.

**Monitoring Full Load Replication**

You can view general information on the progress of a full-load operation in the Full Load tab, which is located in the Task Dashboard to the right of the Task List. You also have the option to drill down to more detailed information in a dedicated tab for the task by clicking a bar or gauge in the Task Dashboard, or by double-clicking the task in the table.
In this section:
» General Information for Full Load Replication
» Detailed Information for Full Load Replication

General Information for Full Load Replication

The Full Load tab in the right pane shows the following general progress information in a graphical format:

» **Load Duration**: The duration of the Full Load operation
» **End time**: When the Full Load operation completed
» **Overall Progress bar**: The overall progress of the full load operation
» **Table bars**: The status of the tables being loaded, which can be:
  » **Completed** - The number of tables that have been loaded into the target endpoint
  » **Loading** - The number of tables that are currently being loaded into the target endpoint
  » **Queued** - The number of tables that are waiting to be loaded into the target endpoint
  » **Error** - The number of tables that could not be loaded due to an error
    See Viewing Task and Server Messages and Data Error Handling for more information about error messages.

» **Tables**: The number of total tables, tables that have completed loading into the target endpoint, and tables remaining to be loaded into the target endpoint

» **Records**: The number of total records, records that have completed loading into the target endpoint, and records remaining to be loaded into the target endpoint

» **Throughput gauge**: The current throughput, which is the number/volume of records being retrieved from the source and applied to the target at any given time

For more information, see Setting the Unit of Throughput Measurement.
Figure 6.4 | Task Dashboard - Full Load Status

<table>
<thead>
<tr>
<th>Full Load</th>
<th>Change Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Completion</strong></td>
<td></td>
</tr>
<tr>
<td>Load Duration</td>
<td>00:00:02</td>
</tr>
<tr>
<td>Ended</td>
<td>May 19, 2016 2:03:09 PM</td>
</tr>
<tr>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tables</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed</td>
<td>Loading</td>
<td>Queued</td>
<td>Error</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tables</th>
<th>Total</th>
<th>Completed</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Records</th>
<th>Total</th>
<th>Completed</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>(*) 3,250</td>
<td>3,250</td>
<td>(*) 0</td>
<td></td>
</tr>
</tbody>
</table>

**Throughput**

rec/sec

Detailed Information for Full Load Replication
You can view more detailed information about the Full Load status by double-clicking a status bar or about throughput by double-clicking the throughput gauge. This opens the task in the <task name> tab, in context of the bar or gauge that you clicked. The information that displays is the same information that you would see if you were monitoring the task in Replicate.
In this section:
- Information about the Overall Progress
- Information about All Tables that are Being Loaded
- Information about Tables that Replicate has Finished Loading
- Information about Tables that are being Loaded
- Information about Tables that are Waiting to be Loaded
- Information about Tables with Errors
- Information about Throughput
- Setting the Unit of Throughput Measurement

Information about the Overall Progress
To view additional details about the overall progress, in the <task name> tab, click the Total Completion bar. The Progress Details area displays a grid with the following information:

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Completed</th>
<th>Remaining</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tables</td>
<td>The total number of tables that are included in the task.</td>
<td>The total number of tables that completed loading at the current time.</td>
<td>The total number of tables waiting to be loaded.</td>
<td>Additional information, such as how many tables failed loading.</td>
</tr>
<tr>
<td>Records</td>
<td>The total records that are included in the task the current time.</td>
<td>The total number of records that completed loading at the current time.</td>
<td>The total number of records waiting to be loaded.</td>
<td>Additional information.</td>
</tr>
<tr>
<td>Time</td>
<td>The estimated time to load all of the selected tables in the task.</td>
<td>The total elapsed time.</td>
<td>The estimated amount of time to load the remaining tables.</td>
<td>Additional information.</td>
</tr>
</tbody>
</table>

Information about All Tables that are Being Loaded
To view additional details about the tables, or to reload data to selected tables, in the <task name> tab, click Select All.
Figure 6.5 | Select All Tables

The Tables - All area displays a grid with the following information:
- **Table Name**: The name of the source table that is included in the task
- **Status**: The task status, which can be any of the following:
  - **Queued**: The table is in the queue waiting to be loaded to the target endpoint.
  - **Loading**: The table is being processed but is not finished loading.
  - **Completed**: All of the table records are loaded to the target.
  - **Error**: The table stopped loading due to an error.
  
  See Viewing Task and Server Messages and Data Error Handling for more information about error messages.
- **Estimated Count**: The estimated number of records that have been loaded to the target
- **Elapsed Time**: The total elapsed time since Replicate started processing the records
- **Progress**: The loading progress in terms of percentage
- **Reload**: To reload selected tables, select the tables you want to reload and then click **Reload** above the table list. When prompted to confirm the operation, click **OK**. The data in the selected tables will be reloaded to the target endpoint. Note that this option is not available for **Apply Changes Only** tasks.

Information about Tables that Replicate has Finished Loading

To view more information about tables that Replicate has finished loading, or to reload data to selected tables, in the <task name> tab, click the **Completed** bar. The Tables - Completed area displays a grid with the following information:
- **Table name**: The name of the source table that has completed loading.
- **Loaded On**: The time that the table completed loading all of its records to the target.
- **Transferred Count**: The number of records loaded to the target.
- **Transferred Volume (MB)**: The volume of the records (in KB) loaded to the target.
- **Load Duration**: The amount of time that it took for all records to load to the target.
Throughput Records: The average throughput rate for the table. Throughput describes the number of records read per second. See also Setting the Unit of Throughput Measurement.

Throughput Volume (KB/sec): The average throughput rate for the table. Throughput describes the volume of records (in KB) read per second. See also Setting the Unit of Throughput Measurement.

You can also reload tables. To reload selected tables, select the tables you want to reload and then click Reload above the table list. When prompted to confirm the operation, click OK. The data in the selected tables will be reloaded to the target endpoint. Note that this option is not available for Apply Changes Only tasks.

Information about Tables that are being Loaded

To view more information about tables that Replicate is currently loading, or to reload data to selected tables, in the <task name> tab, click the Loading bar. The Tables - Loading area displays a grid with the following information:

- Table Name: The names of the source tables that are currently loading.
- Load Name: The amount of time that it took for all records to load to the current point in time.
- Estimated Count: The estimated number of rows that are waiting to be loaded in the full load operation.
- Transferred Count: The number of records that are loaded to the target endpoint.
- Current Throughput: The current throughput rate for the table. Throughput describes the number of records read per second. For more information about throughput, see also Setting the Unit of Throughput Measurement.
- Cached Changes: The number of changes that were cached during full load when the source tables changed. Cached changes are typically applied to tables after the last table completes full load.
- Estimated Finish Time: The approximate date and time the task will finish loading the tables.
- Progress: The table status and the time the table entered that status.

You can also reload tables. To reload selected tables, select the tables you want to reload and then click Reload above the table list. When prompted to confirm the operation, click OK. The data in the selected tables will be reloaded to the target endpoint. Note that this option is not available for Apply Changes Only tasks.

Information about Tables that are Waiting to be Loaded

To view more information about tables in the loading queue, in the <task name> tab, click the Queued bar. The Tables - Queued area displays a grid with the following information:

- Table Name: The names of the source tables that are currently in the queue waiting to be loaded.
» **Estimated Count:** The estimated number of rows that are waiting to be loaded in the full load operation.

**Information about Tables with Errors**

To view more information about tables that could not be loaded due to an error, in the <task name> tab, click the **Error** bar. The **Tables - Error** area displays a grid with the following information:

» **Table Name:** The names of the source tables that could not be loaded to the target.

» **Failed On:** The time that the error occurred.

» **Loaded Count:** The number of records loaded when the error occurred.

You can also reload tables. To reload selected tables, select the tables you want to reload and then click **Reload** above the table list. When prompted to confirm the operation, click **OK**. The data in the selected tables will be reloaded to the target endpoint. Note that this option is not available for **Apply Changes Only** tasks.

For more information, see **Data Error Handling**.

**Information about Throughput**

To view a graph representing the number or volume of records (depending on the selected measurement unit) processed during the Full Load operation, click the **Throughput** gauge. The **Throughput Details** area displays a graph illustrating the source and target throughput rate. This rate indicates how fast the table records are being replicated to the target endpoint.

**Setting the Unit of Throughput Measurement**

You can set the throughput measurement values either to the number of records replicated per second or to the number of kilobytes replicated per second. The display is always based on the current load operation.

**To set the unit of throughput measurement:**

» From the list above the **Throughput** gauge, select **rec/sec** or **kbyte/sec**.

**Monitoring Change Processing Replication**

You can view general information on the progress of change data processing (CDC) in the **Change Processing** tab, which is located the **Task Dashboard** to the right of the Task List. You also have the option to drill down to more detailed information in a dedicated tab for the task by clicking a bar, graph, or gauge in the **Task Dashboard**, or by double-clicking the task in the table.
In this section:
» General Change Processing Information
» Detailed Change Processing Information

General Change Processing Information
General information about change processing is presented in a graphical format, as shown in the following figure.
This following information is displayed:

- **Overall Progress bar**: The overall progress of the task.
- **Incoming Changes**: The number of records that were processed for the task.
- **Transactions**: The number of transactions that were processed for the task.
- **Applied Changes**: A pie chart showing information about the processed changes:
» The number of INSERT operations processed. Roll over the **Inserts** section with your mouse to see the number and percentage of the accumulated inserts.

» The number of UPDATE operations processed. Roll over the **Updates** section with your mouse to see the number and percentage of the accumulated updates.

» The number of DELETE operations processed. Roll over the **Deletes** section with your mouse to see the number and percentage of the accumulated deletes.

» The number of metadata changes (DDL) processed. DDL changes include information about events like changes to table names or to column names.

» **Commit**: The number of committed transactions and change records as well as the change volume, in MB

» **Rollback**: The number of rolled back transactions and change records as well as the change volume, in MB

» **Apply Throughput**: A gauge that describes the number of change events read per second. For additional details, see Information about Change Processing Throughput.

» **Apply Latency**: A gauge that displays latency information.

> The latency values in Attunity Enterprise Manager measure the time delay (latency) between the time when a change is visible to the source (and committed), and the time when this same change is visible to the target. The display is always based on the current change being applied.

For additional details, see Information about Change Processing Latency.

**Detailed Change Processing Information**

You can view more detailed information about the Change Processing status by double-clicking the status bar, the pie chart, or a gauge, or by double-clicking the task in the table. This opens the task in the `<task name>` tab, in context of the bar, chart, or gauge that you clicked (if any). The information that displays is the same information that you would see if you were monitoring the task in Replicate.

**In this section:**

» Information about Incoming Changes

» Information about Applied Changes

» Information about Change Processing Throughput

» Information about Change Processing Latency
Information about Incoming Changes

To view more information about incoming changes, in the Change Processing tab, double-click the Incoming Changes bar. A dedicated tab opens for the task, displaying at the top the Incoming Changes bar and at the bottom the Incoming Changes Details area with bar graphs that show the following information:

» Accumulating: Two bars indicating the number of records currently being read from the source endpoint. These records are accumulated in a queue until they are applied to the target.
  » In Memory: The number of accumulating records that are currently in the computer memory.
  » On Disk: The number of accumulating records that are currently stored on disk.

» Applying: Two bars indicating the number of records currently being written to the target. These are the applied changes.
  » In Memory: The number of records being applied that are currently in the computer memory.
  » On Disk: The number of records being applied that are currently stored on disk.

Figure 6.7 | Incoming Changes Bar
Figure 6.8 | Incoming Changes Details Area

<table>
<thead>
<tr>
<th>Incoming Changes Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Memory</td>
</tr>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
</tr>
<tr>
<td>1: Accumulating (1 transactions) (until source commit)</td>
</tr>
</tbody>
</table>

**Information about Applied Changes**

To view more information about applied changes, in the `<task name>` tab, click the **Applied Changes** pie chart. The **Incoming Changes Details** pie chart displays two grids, each in its own tab, with information about the applied changes.

Figure 6.9 | Applied Changes

**Recent Activity**

The grid in the **Recent Activity** tab includes information about which changes occurred in each table:

- **Table Name**: The names of the source tables that are included in the task.
- **Update**: The number of UPDATE operations processed for the specific table.
- **Insert**: The number of INSERT operations processed for the specific table.
- **Delete**: The number of DELETE operations processed for the specific table.
**DDL:** The number of metadata changes (DDL) processed. DDL changes include information about events like changes to table names or to column names.

**Total Applied:** The total number of changes applied to the target.

**Data Errors:** The number of errors related to data processing at the record level, such as conversion errors, errors in transformations, or bad data.

**Last Modified:** The time the last change occurred for the specific table.

You can also:

- Filter the grid by entering a string in the **Filter By** box. This allows you to focus on specific tables.
- Reload tables. To reload selected tables, select the tables you want to reload and then click **Reload** above the table list. When prompted to confirm the operation, click **OK**. The data in the selected tables will be reloaded to the target endpoint. Note that this option is not available for **Apply Changes Only** tasks.
- Reset data errors for a specific table. For details, see **Data Error Handling**.

**Aggregates**

The grid on the **Aggregates** tab includes information about the total number of changes (for all tables) per change type (INSERT, UPDATE, DELETE, DDL) and transaction type (COMMIT, ROLLBACK).

**Information about Change Processing Throughput**

To view information about how fast change records are loaded to the target endpoint during a change processing operation, in the **<task name>** tab, click the **Apply Throughput** gauge. The **Apply Throughput Details** area displays a graph illustrating the source and target throughput rate.

See also **Setting the Unit of Throughput Measurement**.

**Figure 6.10 | Apply Throughput Gauge**

![Apply Throughput Gauge](image)

**Information about Change Processing Latency**

To view information about the time delay (latency) between the time when a change is visible to the source (and committed) and the time when this same change is visible to the
target, in the <task name> tab, click the Apply Latency gauge. The Apply Latency Details area displays a graph illustrating the source and target latency. The display is always based on the current change being applied.

You should take the following into consideration:

- **Latency when applying large transactions:**
  For example, when the most recent latency value was 10 seconds and now a transaction of one million rows gets committed at the source endpoint, Attunity Enterprise Manager starts to apply that transaction to the selected target and it will take some time to write all the changes to the target (for example 60 seconds). During the next 60 seconds, the latency value gradually grows to 70 seconds for the last change in the transaction. Once the transaction is committed, the latency drops back to the 'regular' latency (10 seconds in this case).

- **Latency when no transactions are being applied:**
  When a time period passes with no changes applied to the target, the latency calculation is based on the time difference between the current time and the timestamp of the last change event read from the transaction log. This could happen if, for example, there is high activity on tables that are not selected for replication in the current task.

**Figure 6.11 | Apply Latency**

![Apply Latency Graph](image)

**Grouping Tasks**

In the **Tasks** View, the left side (expanded by default) represents the **Tags** pane. It displays all available tags. Tags serve as attributes that you can attach to tasks to arrange them in AEM. Tags allow you to group tasks that have a common denominator, and to filter by them, too. For example, you can organize tasks by flavor, such as all tasks that are part of a particular distribution process, by organization structure, by environment, by location, by application, by customer, and so on.

All tags:

- **Are static:** They remain constant during a task’s life time. For example, the task type (CDC, FL, or both), source database type, or region of a task do not change as long as
the task exists.

- **Are public:** All tags are available to all AEM users.
- **Can be associated with any number of tasks:** You can associate a task with more than one tag.

AEM comes with built-in tag categories as well as built-in tags. The following table lists all categories that are built in.

<table>
<thead>
<tr>
<th>Table 6.2</th>
<th>Built-In Tags</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Category</strong></td>
<td><strong>Tag</strong></td>
</tr>
<tr>
<td>Custom</td>
<td>&gt;Untagged</td>
</tr>
</tbody>
</table>
| Task Type | Full Load Only
| | CDC Only
| | Full Load & CDC |
| Task Profile | Bidirectional
| | Unidirectional |
| Source Database Type | If more than one source database type is available in your task list, one tag for each available source database type |
| Target Database Type | If more than one target database type is available in your task list, one tag for each available target database type |
| Replicate Servers | One tag for each managed Replicate server |

AEM automatically associates built-in tags with a task based on the task’s characteristics, as derived from its definition. You cannot change the association of tasks with such tags.

In addition, you can create your own custom tags and assign tasks to them. You can delete such tags at any time. All tag names must:

- Be unique.
- Not exceed 64 characters.
- Only contain Latin characters, digits, spaces, dots (.), dashes (-), and underscores (_).
- Start with a digit or character.

**Note** Deleting a custom tag does not delete its associated tasks, and vice versa.

For each tag, AEM displays the following information:

- The tag name
- The total number of tasks associated with this tag
An icon that indicates when any associated task experiences a problem.

If a task with a problem is associated with more than one tag, all corresponding tags indicate a problem.

The **Tags** column in the **Tasks** view presents a quick way to identify which tags are associated with each task.

The following table describes all options for viewing and managing tags.

<table>
<thead>
<tr>
<th>To</th>
<th>Do this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add a custom tag</td>
<td>In the <strong>Tags</strong> pane on the left, under <strong>Custom</strong>, in the <strong>New tag</strong> text box, enter a name for the tag and click the check mark to the right (or press Enter).</td>
</tr>
<tr>
<td>Delete a custom tag</td>
<td>In the <strong>Tags</strong> pane, under <strong>Custom</strong>, right-click the tag you want to delete and select <strong>Delete</strong>. <strong>Note:</strong> Deleting a tag does not delete the tasks associated with it.</td>
</tr>
<tr>
<td><strong>Note:</strong> Deleting a tag does not delete the tasks associated with it.</td>
<td>When prompted for confirmation, click Yes. The tag is removed from the list.</td>
</tr>
<tr>
<td>Filter by tags</td>
<td>In the <strong>Tags</strong> pane, do one of the following:</td>
</tr>
<tr>
<td><strong>Note:</strong> In the <strong>Assign Tags</strong> window, select the required tag(s) or enter a new tag name in the <strong>New tag</strong> text box and click the check mark.</td>
<td></td>
</tr>
<tr>
<td><strong>Filter by tags</strong></td>
<td><strong>Select the check boxes of tags you want to include in the Tasks View.</strong></td>
</tr>
<tr>
<td><strong>In different categories</strong></td>
<td><strong>Select the check boxes of tags you want to exclude from the Tasks View.</strong></td>
</tr>
<tr>
<td><strong>When you select different tags:</strong></td>
<td><strong>Within the same category</strong>, AEM uses the logical OR operator. For example, if you select both Oracle and Netezza in the Target DB Type category, Replicate displays tasks to Oracle or Netezza targets.</td>
</tr>
<tr>
<td><strong>In different categories</strong></td>
<td><strong>In different categories</strong>, AEM uses the logical AND operator. For example, if you select the Oracle tag in the Target DB Type category and the Finance tag in the Custom category, Replicate displays only task to an Oracle target that are also associated with the Finance tag.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assign custom tags to a task or remove tag assignments</th>
<th><strong>Note:</strong> This is only possible for custom tags. Built-in tags are assigned by default. Those assignments cannot be removed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In the task list, select one or more tasks to which you want to assign a tag and click <strong>Assign Tags</strong>.</td>
<td></td>
</tr>
<tr>
<td>2. In the <strong>Assign Tags</strong> window, select the required tag(s) or enter a new tag name in the <strong>New tag</strong> text box and click the check mark.</td>
<td></td>
</tr>
<tr>
<td>3. Click <strong>OK</strong>.</td>
<td></td>
</tr>
</tbody>
</table>
Running a Task

After you design a task (see Designing Tasks), you can run and monitor its progress with one click in AEM. This simple Click-2-Replicate function is described in this topic. In addition, the various types of run options available are also described. This topic has the following sub-topics.

» How to Run a Task
» Using the Run Button Options

Note The task run buttons area available in the toolbar at the top of the console in the following views:
» Tasks View (in both Designer Mode and Monitor Mode)
» When Viewing Specific Tasks

How to Run a Task

Click the Run button to execute a replication task. The task process continues to run until you click the Stop button to stop the task.

Note When you click Run, the following occurs:
» If this is the first time that a task is run, the Start Processing operation is run.
» If the task has been started and stopped, the Resume Processing operation described in Using Advanced Run Options is run.
» If changes were made to the endpoint, change processing takes place after the full load operation. If you do not want change processing to occur or if you want to start change processing from a pre-determined point, you must make the appropriate Using Advanced Run Options selection.

In some cases, task replication may stop due to an error although the task process is still running.

See Task Progress Summary for information on the task status and how Attunity Replicate displays information on the current task status.

The Run button is available in the following views:
» The Tasks view when you select a task from the Task List.
» In the individual task, both the Designer mode and Monitor mode have the Run and Stop buttons available.

Note You must be in the Monitor mode to view the task progress.
Using the Run Button Options

Clicking the Run button runs a full-load replication task from the source to the target. This is a first time task that creates the target endpoints and loads the source data to the target according to your task definitions.

Subsequent runs allow you to resume processing from a specific point and process changes. In addition, you can also specify from what point you want the replication to start.

The following options are available:

- **Start Processing** (switches to Resume Processing after the task has started)
- **Resume Processing**: Resumes task execution from the point that it was stopped. You can also resume processing by clicking the Run button if the task has been stopped.

  **Note**  If the schema or a filter was changed after the task stopped, the task should be reloaded as opposed to resumed (see below).

- **Reload Target** (Only available when the Full Load or Full Load and Apply Changes replication options are enabled)
- **Using Advanced Run Options**

Start Processing

This is available the first time you run the task only. This will execute the initial full load operation. If CDC is also enabled for the task, change processing will start as soon as any changes are made to the source endpoint.

Reload Target

Starts the full load and change processing (if enabled) from the beginning. Already processed tables are handled according to the Task Setting, Initial Table Creation; If target table already exists. See Full Load Tuning for more information about this setting.

  **Note**  To replicate tables that were added to the local file channel task after the initial full load, you need to reload both the local and the remote file channel tasks.

Using Advanced Run Options

Advanced Run Options provide you with additional options for resuming and restarting tasks.

To use Advanced Run Options, click the triangle next to the Run button and select Advanced Run Options.

The Advanced Run Options dialog box opens.
The **Advanced Run Options** dialog box lets you do the following:

- **Restart task and start processing changes from current time**: This starts the Apply Changes replication task from the beginning (as if the task has not run before).
- **Only available for Apply Changes replication tasks.**
- **Tables are already loaded. Start processing changes from**: Select the date and time to create a timestamp to define the point from where you want to process changes.

**Notes**
- The timestamp uses the local time of the browser machine.
- This option is not relevant for the File Source endpoint.

**Metadata Only:**
- The "Metadata only" options described below allow you to:
  - Create empty tables on the target and then manually edit them.
  - Create tables during a task.
- Enabling the options will also ensure that supplemental logging is set up correctly on the source tables before starting the actual replication task.

- **Recreate all tables and stop**: Select this option to recreate the target tables as defined in the **Full Load Settings** tab. When "Store Changes" is enabled, the Change tables/The Audit table will be created as defined in the **Store Changes Settings** tab. To use this option, stop the existing task, run the task with this option enabled (the task will stop automatically) and finally, resume the task.

- **Create missing tables and stop**: Select this option to create missing target tables including Change Tables. You can use this option to create Change Tables on the target after enabling the "Store Changes" option (in the **Store Changes Settings** tab) for an existing task. To use this option, stop the existing task, run the task with this option enabled (the task will stop automatically) and finally, resume the task.

**Recovery:**
- **Recover using locally stored checkpoint**: Use this option if recovery is not possible using the **Resume Processing** or **Start process changes from** options (due to corrupt swap files, for example). When this option is selected, Replicate uses the checkpoint data stored in `<Data_Folder_Path>\data\tasks\<task_name>\StateManager` to recover the task.

**Note** When using this option, the following limitations apply:
- The following source endpoints are supported only:
  - Oracle
  - Microsoft SQL Server
- Tasks can only be recovered during Change Processing (i.e. after Full Load Completes)
With the exception of the File Channel endpoint, all target endpoints are supported. The following limitations apply:

- **In Transactional apply Change Processing mode:** All target endpoints that support transactions are supported.

- **In Batch optimized apply Change Processing mode:** Oracle target endpoint only is supported. Also requires the *Preserver transactional integrity* option to be enabled.

- For all other target endpoints or Change Processing modes, recovery is supported, but may cause duplicates on the target.

**Recover using checkpoint stored on target:** Select to recover a task using the `CHECKPOINT` value from the `attrep_txn_state` table (created in the target database).

**Note** When using this option, the following limitations apply:
- Only the following source and target endpoints are supported:
  - Oracle
  - Microsoft SQL Server
- Tasks can only be recovered during Change Processing (i.e. after Full Load Completes)
- The task Change Processing mode must be set to either:
  - *Batch optimized apply* with the *Preserver transactional integrity* option enabled. Note that setting this mode may cause duplicates on Microsoft SQL Server target.
  - *OR-
  - *Transactional apply*
  - For information about setting the Change Processing mode, see *Changes Processing Tuning*.

This option will only be available if the *Store task recovery data in target database* option was enabled in the Task Settings' *Changes Processing Tuning* tab before Change Processing completed.

Select this option (as opposed to the *Recover using locally stored checkpoint* option) if the files in the **Data** folder are corrupted or if the storage device containing the **Data** folder has failed.

For a detailed explanation of how to set up and implement recovery using the `attrep_txn_state` table, see *Recovering from Data Folder Loss or Corruption*.

**Recovering from Data Folder Loss or Corruption**

During normal operation, Attunity Replicate maintains the replication state in the following location:

```
<Data_Folder_Path>\data\tasks\<task_name>\StateManager
```
This enables tasks that cannot be resumed normally (due to corrupt swap files, for example) to be recovered using the **Recover using locally stored checkpoint** option described in Using Advanced Run Options.

However, if the files in the **data** folder become corrupted or if the storage device containing the **data** folder fails, tasks must be recovered using the means described below.

### Setting Up and Initiating Task Recovery

For recovery to be successful, the source database transaction logs must be available from the time the task failed.

#### To set up a task for recovery

1. Design a task. Make sure to enable the **Store task recovery data in target database** option in the Task Settings' Changes Processing Tuning tab. This option can be enabled at any time during Change Processing, although it must be enabled *before* Change Processing completes.

2. Export the task definitions as described in the *Attunity Replicate User Guide and Reference*.

3. Run the task.

   In addition to the selected source tables, the task will write the checkpoint data to the following table in the target database (and automatically create the table if it has not already been created by another task):

   ```
   attrep_txn_state
   ```

#### To initiate recovery

1. Import the task definition exported when you set up the task.

2. Enter the passwords in the endpoint connection settings.

3. Access the **attrep_txn_state** table on the target database and locate the failed task in the **TASK_NAME** column. If there are tasks with the same name running on multiple Replicate Servers, you will also need to locate the appropriate server in the **SERVER_NAME** column. After locating the relevant task, copy the value in the corresponding **CHECKPOINT** column.

4. Select the **Recover using checkpoint stored on target** option and then provide the **CHECKPOINT** value (preferably by pasting) as described in Using Advanced Run Options.

5. Click **OK** to start the recovery.

   During recovery, Replicate does not write anything to the target database until it identifies the commit event corresponding to the **CHECKPOINT** value. Once it identifies the **CHECKPOINT** commit event, recovery is performed and the task reverts to standard operation.
Error Handling

The following sections describe how to best handle task and data errors:

- Task Error Handling
- Data Error Handling

Task Error Handling

When a task fails with an error, the Task View displays a red error icon in the State column. The following flow suggests a proper action path for handling task errors.

1. Move the pointer over the error icon to display a ToolTip with a high-level error message and a time stamp.

2. For more information on the problem, do one of the following:
   - Open the Viewing Task and Server Messages to view all messages for the task.
     If you do not see any relevant messages, you may need to:
     - Select Selected Item to only view messages for the selected task.
     - Change the time frame.
     The Message Center only displays the last 20,000 messages.
   - Click View Logs to find the error message in the log files.
   - Click View Task to see more detailed information about the current state of the task.

3. If possible, fix the error based on the information provided in the message.

For more information on error handling in Attunity Replicate, see the Attunity Replicate User Guide and Reference.

Data Error Handling

Data errors are errors related to data processing at the record level. When Attunity Replicate encounters a data error during replication, it issues an error warning. AEM indicates when a task has data errors in any of its tables. For each task in the task list, AEM shows its data error count, which is the sum of all data errors that occurred in the task’s tables.

You can drill down to the task to view this information per table. You have the option to reset the counter per table when the data errors are no longer of interest to you. To view this information per task in the task list, you can display the Data Errors column. For information on column selection, see Customizing Task Columns.

Note: Take the following into account:

- Reloading a table automatically resets the corresponding counter.
- Resetting has no effect on the task’s exception table.
The error handling behavior of escalation handling for repeating data errors is affected by counter reset.
7 | Viewing Task and Server Messages

The Message Center is located at the bottom of the console and contains messages about Replicate servers and tasks. This chapter describes the various options for viewing and handling messages.

In this chapter:
- Message Center Overview
- Customizing the Message Center
- Viewing Additional Information

Message Center Overview

By default, the Message Center is minimized to a message tray at the bottom left of the console. The message tray notifies you of how many messages were received, during which time-period they were received, and the highest severity of all the messages (indicated by a color-coded callout icon). It is always global in scope, showing information for all servers and tasks.

In the message tray, the message severity icon indicates the highest severity of the received messages. For example, if 11 messages were received but only one of them was an error message, the severity icon is red. Other callout colors are orange for warning messages and blue for informational messages.

Figure 7.1 | Message Tray Example

To open or close the Message Center:

- Click the diagonal arrows to the right of the message summary.

To maximize the Message Center:

- When the Message Center is half-way open, click the Maximize icon in the top right corner.
To reduce the size of the Message Center:

When the Message Center is fully open, click the Restore Down icon to the right of the message summary.

The following types of messages can be displayed: Info, Notification, Warning and Error. The actual message types that Attunity Enterprise Manager displays as well as the display time period depend on your Message Center preferences.

Each message type has its own icon, as shown in the figure below.

Figure 7.2 | Message Types

For each message, the following information is available:

- **Severity Icon**: Info, notification, warning or error
- **Time**: When the event occurred
- **Reported By**: The display name of the Replicate server. For messages reported by AEM, this field has a value of **Attunity Enterprise Manager**.
- **Task**: The task that generated the message
- **Type**: The event that generated the message, such as TASK_START
- **Message**: The actual message as issued by the Replicate Server or AEM
- **ID**: A unique ID that serves as a reference number. You can copy the ID to the clipboard for easy reference, for example to paste it into an email when you need to refer to a specific message or to search for the message later.

Customizing the Message Center

You can customize the Message Center according to your business needs. The table below describes the available options.
<table>
<thead>
<tr>
<th>To</th>
<th>Do this</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display messages for all tasks</td>
<td>Under <strong>Showing Messages for</strong>, select <strong>All</strong>.</td>
</tr>
<tr>
<td>Display messages only for the selected tasks or servers</td>
<td>Under <strong>Showing Messages for</strong>, select <strong>Selected Tasks</strong> or <strong>Selected Servers</strong>, respectively.</td>
</tr>
<tr>
<td>Hide current messages</td>
<td>Click <strong>Hide Current Messages</strong> above the message list to only show new messages coming in. Note that this option is only available when you view all system tasks. To bring back all messages, click <strong>Show All Messages</strong>.</td>
</tr>
<tr>
<td>Change the time period</td>
<td>From the drop-down list at the top left of the Message Center, select one of the available time periods: <strong>Last 6 hours</strong>, <strong>Last 12 hours</strong>, <strong>Last day</strong>, <strong>Last 3 days</strong>, or <strong>Last week</strong>.</td>
</tr>
<tr>
<td>Filter message severity</td>
<td>Select or clear the <strong>Errors</strong>, <strong>Warnings</strong>, <strong>Notifications</strong> or <strong>Info</strong> check boxes above the message list as desired.</td>
</tr>
</tbody>
</table>

The Message Center also includes buttons to view log files, open the Task tab to view a task, or view server information. In addition, you can:

- Customize the columns to display. For more information, see [Customizing Task Columns](#).
- Configure the message purge policy. For more information, see [Message Center Purge Settings](#).

### Searching Messages

You can search for specific messages by typing a string into the **Search messages** box above the table. Note that AEM searches only textual columns, not numeric columns. The following columns are included in the search, even if a column is not displayed in the user interface:

- **Reported By**
- **Task**
- **Message**
- **ID**
- **Server**
- **Severity**

You can also restrict a search to a specific column by preceding the search string with the column name and a colon, as follows: **ColumnName:value** (for example: **Type:TASK_STOP**). This is applicable to all available columns, not only the columns listed above.
Viewing Additional Information

From the Message Center, you can directly open the task or server for a particular message or view its log file.

<table>
<thead>
<tr>
<th>Click To View</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Log information" /></td>
</tr>
<tr>
<td><img src="image" alt="Task information" /></td>
</tr>
<tr>
<td><img src="image" alt="Server information" /></td>
</tr>
</tbody>
</table>

**Note** These buttons are only available at a certain window size. If the window is too small, they do not display. In this case, these options are only available from the context menu that appears when you right-click a table row.
This chapter describes how to configure message purge and logging settings in Attunity Enterprise Manager.

### In this chapter:
- AEM Logging Settings
- Message Center Purge Settings
- User Permissions
- Viewing and Downloading Log Files
- Generating Audit Trail Files
- Configuring AEM using the CLI

## AEM Logging Settings

In AEM, you can modify the logging settings for system log files. This includes specifying:

- **Logging Levels**
- **Automatic Rollover and Cleanup**

To modify logging settings for server and task log files, you need to access the web console for the respective monitored Replicate server.

### Logging Levels

The logging level you set determines what information is written to the system log file, `EnterpriseManager.log`, and whether information is written to the `Attunity.WebLog.log` file. The system log file provides information about events, warnings, and errors occurring in AEM, but not for the monitored Replicate servers and their respective tasks. The WebLog file captures requests and responses between the client and server, but only when the logging level for the WebLog component is set to Trace or Verbose.

**Note** Because the WebLog file grows quickly in size, it is recommended that you only set the logging level for the WebLog component to **Trace** or **Verbose** for short periods of time, such as when troubleshooting an issue.

The following logging levels are available, from the lowest to the highest:

- **Error**: Include only error messages.
- **Warning**: Include error and warning messages.
- **Info**: Include error, warning, and info messages.
Trace: In addition to error, warning, and info messages, include debug data.

Verbose: In addition to error, warning, and info message, include detailed debug data.

Within the log file, the logging level is indicated by the initial letter: E for error, W for warning, and so on. The higher levels always include the messages from the lower levels. Therefore, if you select Error, only error messages are written to the log. However, if you select Info, informational messages, warnings, and error messages are included. Selecting Verbose writes all possible messages to the log.

You can set a global logging level for all log components or separate logging levels for each component. For example, you can define a logging level of Info for Message Center logs and a logging level of Warning for Replicate tasks.

To set the logging level:
1. In the top right corner, click the gear icon.
2. In the Settings window, in the Logging Levels tab, move the top slider to the log level you want.
   - This sets the log level for all components. Note that the sliders for all components move along to the same position.
3. Optionally, modify the individual logging level for any component.
4. Click OK.

Automatic Rollover and Cleanup
You can define when AEM should roll over the system log file and WebLog file and when to purge old log files. The current log files are called EnterpriseManager.log and Attunity.WebLog.log, respectively. Rolled over log files have a 12-digit timestamp appended to their name, such as EnterpriseManager_160407111842.log or Attunity.WebLog_160717115348.log.

Automatic rollover is enabled by default. You can also perform rollover manually if needed. See Manual Rollover.

To configure automatic rollover and cleanup:
1. In the top right corner, click the gear icon.
2. In the Settings window, on the Logging > Log File Management tab:
   - Select the Enable automatic rollover check box to have log files rolled over at the default size of 500 MB. By default, this check box is selected.
   - If you prefer a different cutoff size for rollover, select the check box Roll over the log if the log file is larger than (MB): and specify a different file size. When the log file reaches the specified size, the old log is saved with a timestamp appended to its name and a new log file is started. The maximum file size is 2,000 MB.
   - Under Maximum number of newest log files to keep, specify the maximum number of log files to keep. By default, this is 10 files. The maximum number of files
cannot exceed 365. AEM keeps the newest log files and removes any files beyond the specified number.

3. Click **OK**.

**Manual Rollover**

If you need to start a new system log file or WebLog file before the current file has reached the size specified for automatic rollover, or if you want to start a new server or task log file, you can do this manually. Manual rollover is only available for active log files and for log files pertaining to tasks that are currently running.

**To manually roll over a log file:**
1. In the top right corner, click the **View Logs** icon.
2. In the **Log Viewer** window, select the current log file and click **Roll Log File**.
   - AEM starts logging to a new log file. Rolled over log files have a 12-digit timestamp appended to their name, such as **EnterpriseManager_160407111842.log** or **Attunity.WebLog_160717115348.log**.
3. Click **Close**.

**Message Center Purge Settings**

AEM pulls error, warning, information, and notification messages from all managed Replicate Servers and stores them locally on the machine where AEM is installed. The AEM console then retrieves these messages from the local storage and displays them in the **Viewing Task and Server Messages**.

To avoid storage issues, you can specify the interval at which AEM should purge messages from the Message Center and the maximum number of messages to be stored. By default, AEM purges messages after 14 days and when the number of messages exceeds 200,000. Purged messages are no longer available for retrieval.

**Note** The message purge policy you define in AEM does not affect any log purge policy of the monitored Replicate servers.

**To modify Message Center purge settings:**
1. Click the gear icon in the top right corner.
2. In the **Settings** window, in the **Message Center** tab, select the required check box and specify:
   - After how many days or weeks to purge messages. The default value is 14 days; the maximum value 91 days (13 weeks). You can enter any value between 1 and 91.
The maximum number of messages to be stored in AEM. The default value is 200,000. The maximum value is 1,000,000; the minimum 100. You can enter any value between 100 and 1,000,000.

3. Click **OK.**

### User Permissions

Security roles allow you to grant AEM users different roles according to the tasks you want them to perform. AEM comes with the following predefined security roles: Admin, Designer, Operator and Viewer. Each role has its own set of permissions, as described in **Availability of Console Elements.** For more information on permissions, see **Granular Access Control.**

You can associate a user with a security role by adding the user to the appropriate Active Directory group or by assigning a role directly to the user. By default, the user under whose account you install AEM is associated with the Admin role. In addition, you can fine-tune access control per user or group. For more information, see **Granular Access Control.**

As a user with the relevant permissions, you can view and change the permissions for existing users or groups, or add users or groups that do not yet exist in AEM.

The advantage of adding groups over users is that you can assign a security role to a group as a whole, instead of to individual users, and any new user that gets added to an existing group automatically acquires the security role granted to that group.

You can also:

- Add users as domain users that are not related to an active directory group.
- Add local groups. However, this is not possible by default. To set up AEM to work with local groups, perform the steps in **Working with Local Groups.**

To set user permissions using Active Directory groups, you can either create Active Directory groups with the names listed in the table **Roles and their Corresponding Active Directory Names**, or you can create Active Directory groups with different names. Then, add users to the groups according to the role you want them to perform.

If you create your own Active Directory groups, you need to add them to the **User Permissions** tab in the **Settings** window and set their permissions as described in **Managing User Permissions.**

### Table 8.1 | Roles and their Corresponding Active Directory Names

<table>
<thead>
<tr>
<th>Role</th>
<th>Active Directory Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrator</td>
<td>AttunityEnterpriseManagerAdmin</td>
</tr>
<tr>
<td>Designer</td>
<td>AttunityEnterpriseManagerDesigners</td>
</tr>
<tr>
<td>Operator</td>
<td>AttunityEnterpriseManagerOperators</td>
</tr>
<tr>
<td>Viewer</td>
<td>AttunityEnterpriseManagerViewer</td>
</tr>
</tbody>
</table>
Effective permissions are the permissions that take effect when a user is part of more than one group, or when there is a conflict between the user's permission and the group's permission, or in the hierarchy. For details, see Inheritance and Overrides.

Availability of Console Elements

In the AEM Console, you see menu items and buttons based on your particular security role. For example:

- The **Servers** view is available to all roles, but Designers only have read access to user permissions, and operators cannot add servers and can only view the different settings, but not edit them. Viewers do not see the options to view logs, edit settings, add, edit, or delete a server, register a license, or start/stop monitoring.

- The **Server** dialog box is available to Admins, Designers, and Operators. Operators can test the connection, but they cannot edit any fields. Viewers do not have access to this dialog box.

- In the **Tasks** view, Operators see the **Open**, **Run**, and **Stop** options, but Viewers only see **Open** option. Operators can search and assign tags, but they cannot add new tags or delete tags.

- In the dedicated **Task** tab, Operators see all available options (**Run**, **Stop**, **Reload**, **Resume**, **Reset data errors**, and so on) as well as the **Monitor** tab, but they do not see the **Designer** tab. Viewers only see the **Monitor** tab. They do not have access to any actions.

- In the **Message Center**, Viewers do not see the option to view logs.

The following table describes the predefined security roles and the permissions they grant. The list of permissions is not comprehensive.

### Table 8.2 | Default User Permissions According to Role

<table>
<thead>
<tr>
<th>Permission</th>
<th>Admin</th>
<th>Designer</th>
<th>Operator</th>
<th>Viewer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servers view</td>
<td>Yes</td>
<td>Read Only</td>
<td>Read Only</td>
<td>Read Only</td>
</tr>
<tr>
<td>Add and delete server</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>View connection properties</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Edit connection properties</td>
<td>Yes</td>
<td>Read Only</td>
<td>Read Only</td>
<td>No</td>
</tr>
<tr>
<td>Test connection</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Register license</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Edit column settings, search for server, access context menu</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Edit logging levels, log file management, Message Center settings</td>
<td>Yes</td>
<td>Yes</td>
<td>Read Only</td>
<td>No</td>
</tr>
</tbody>
</table>
Granular Access Control

For each user, AEM lets you set granular access permissions for different hierarchy levels in the system and for different objects at the same hierarchy level. This granular access control facilitates decentralization of control, effectively preventing the same user from, for example, accessing endpoints and defining and running tasks. As such, granular access control lets you create a buffer between those who can create and access endpoints (DBAs) and those who can create and run tasks.

AEM handles permissions as follows:

- Admins can add, remove, and change permissions.
- Designers and Operators can view permissions.
- Viewers cannot view permissions.

By default, each object inherits its permissions from its parent. The following hierarchy is in place, where:

- **AEM Root** refers to all AEM server settings and all Replicate servers monitored by AEM.
- **All Servers** refers to all Replicate servers monitored by AEM. This level does not have access to AEM server settings.
- **Specific Server** refers to a server monitored by AEM and all its child objects (server settings, tasks, and endpoints).
- **All Tasks** refers to all tasks that run on a specific Replicate server.
- **Specific Task** refers to all parameters of the particular task.

---

**Table 8.2 | Default User Permissions According to Role**

<table>
<thead>
<tr>
<th>Permission</th>
<th>Admin</th>
<th>Designer</th>
<th>Operator</th>
<th>Viewer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edit user permissions</td>
<td>Yes</td>
<td>Read Only</td>
<td>Read Only</td>
<td>No</td>
</tr>
<tr>
<td>View logs</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Perform runtime operations (such as start, stop, or reload targets)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Create and design tasks</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Delete tasks</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Search for and assign tags</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Add and delete tags</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Access Design mode</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Access Monitor mode</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Access Message Center</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

© 2017 Attunity Ltd.
To make a user a designer on a task, the user must be at least a viewer on All Endpoints.

- **All Endpoints** refers to all endpoints connected to a specific Replicate server.
- **Specific Endpoint** refers to all parameters of the particular endpoint.

AEM 3.2 does not support granular access control at the specific endpoint level. However, you can control permissions for all endpoints, which allows for complete separation between Replicate operators (who manage tasks) and DBAs (who maintain databases).

### Inheritance and Overrides

Group permission may contradict the permission that a particular user was granted. In this case, the higher permission overrides the lower permission, as illustrated in the following figure.
By default, the permission of a user or group object is inherited from the access control list (ACL) of the object’s parent. However, a lower or higher permission may override this permission. In this case, the overriding higher permission is the effective permission for the object, stopping inheritance from the parent. As a result, any changes to the parent no longer affect this user or group.
The following figures illustrate these concepts.

Figure 8.2 | Inheritance Override by Higher Permission

John Smith

- All servers: VIEWER
  - Server X: DESIGNER

- Server X (including all tasks and endpoints on Server X): DESIGNER

- All other servers (including all their associated tasks and endpoints): VIEWER

Granted Permissions

Effective Permissions
In the **User Permissions** window, inheritance is indicated by a check mark in the **Inherited** column. By default, inheritance is enabled for all users and groups on any level. Changing permissions by using the slider automatically stops inheritance for the selected user or group. AEM also lets you disable inheritance by disconnecting the entire authorization level from the parent level. For information on how to do this, see Managing User Permissions.

**Override Exceptions**

When a user or group is granted any permission higher than None on an object (except an endpoint), it automatically receives Viewer permission on all parent objects in the hierarchy. However, the Viewer permission granted to the parent objects does not enable the user or group to see items in the hierarchy that they were not permitted to see before they received Viewer permission. For clarification, see the example in the following table.
### Table 8.3 | Minimum Permission: None

<table>
<thead>
<tr>
<th>Server X</th>
<th>Granted Permission</th>
<th>Effective Permission</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Tasks on Server X</td>
<td>None</td>
<td>Viewer (limited to Task Z)</td>
</tr>
<tr>
<td>Task Z on Server X</td>
<td>Designer</td>
<td>Designer</td>
</tr>
</tbody>
</table>

### Working with Local Groups

By default, AEM only supports working with domain users and groups. To set up support for local groups, you must update the aemctl.exe.config file, which is located in the bin folder of your AEM installation directory (by default, this is `\Program Files\Attunity\Enterprise Manager\bin`).

#### To set up support for local groups:

1. Stop the Attunity Enterprise Manager service.
2. Open the following file in a text editor: `installation directory\bin\aemctl.exe.config`
3. Under `<appSettings>`, add the following row:
   ```xml
   <add key="UseLocalGroups" value="true"/>
   ```
   For example:
   ```xml
   <appSettings>
     <!-- LogOverwrite: comma seperated list of loggers ot '*' for enabling global debug -->
     <!-- Loggers: Root,Service,Repository,Host,Command,Security,WebLog-->
     <add key="LogDebugOverwrite" value=""/>
     <add key="AssemblyList" value="AemGlobals,RepuiGlobals"/>
     <add key="ClientSettingsProvider.ServiceUri" value=""/>
     <add key="DisableToken" value="false"/>
   </appSettings>
   ```
4. Save and close the file.
5. Restart the service.

### Managing User Permissions

This section explains how to edit user permissions, add and remove users or groups, disable or enable inheritance, restore inherited permissions if they were overridden, and view effective permissions for a user.

By default, inheritance is enabled for all objects (users and groups). This means that permissions are automatically carried over from the parent object. You can turn inheritance on or off for all objects at the current level.
Effective permissions are the permissions that are in effect for a user at any particular level.
For more information on the underlying concepts, see Granular Access Control and Inheritance and Overrides.

**To access user permissions at the AEM-wide or All Servers level:**
1. Click the user permissions icon in the top right corner.
2. In the **AEM User Permissions** window, select:
   - The **AEM** tab if you want to specify AEM-wide user permissions.
   - The **All Servers** tab if you want to specify permissions for all monitored Replicate servers.

**To access user permissions for a specific Server, All Tasks, or All Endpoints:**
1. In Servers view, click the server permissions icon in the servers toolbar.
2. In the **User Permissions for server: *{server name}*** window, select:
   - The **Server** tab if you want to specify server-wide user permissions.
   - The **All Tasks** tab if you want to specify permissions for all tasks on this server.
   - The **All Endpoints** tab if you want to specify permissions for all endpoints on this server.

**To access user permissions for a specific Task:**
- In the tab for a specific task, click the task permissions icon in the task toolbar.
  - The **User Permissions for task: *{task name}*** window opens.

**To disable inheritance:**
1. In the **User Permissions** window, click **Disable Inheritance**.

Caution: This option disconnects the entire authorization level from the parent level.

2. In the **Disable Inheritance** dialog box, select whether you want to:
   - **Convert inherited permissions on this object into explicit permissions:** This option changes inherited permissions to explicit permissions. Any new users or groups will not inherit permissions from the parent.
   - **Remove all inherited permissions from this object:** This option removes all existing permissions inherited from the parent level. Any new users or groups will not inherit permissions from the parent.
3. Click **Disable**.
   - If you chose to convert inherited permissions, the check mark in the Inherited column changes into an X. If you chose to remove inherited, all users and groups disappear from the list.
4. Click **Save** or **OK** to accept the changes, or **Discard Changes** or **Cancel** to undo them.
To enable inheritance:
1. In the User Permissions window, click Enable Inheritance.

   Caution: This option enables inheritance for all users and groups on this level.

2. In the Enable Inheritance dialog box, select whether you want to:
   - Inherit all permissions from parent and override any definition manually made at this level: This option reinstates inherited permissions for all users and groups that are already defined, and new users and groups will inherit their permissions from the parent level.
   - Inherit all permissions from parent but keep definitions manually made at this level: This option preserves the permissions already defined for the existing users and groups and adds all permissions from the parent level. New users and groups will inherit permissions from the parent level.

3. Click Enable.
4. Click Save or OK to accept the changes, or Discard Changes or Cancel to undo them.

To edit user permissions:
1. In the User Permissions window, adjust the permission slider for a user or group as desired.

   Caution: Adjusting the slider stops inheritance from the parent object.

2. Click Save or OK to accept the changes, or Discard Changes or Cancel to undo them.

To add a user or group:
1. In the User Permissions window, click Add.
2. In the Add User/Group dialog box, select User or Group.
3. Enter the name for the new user or group in the following format:
   - NetBIOS_name\user (for example: qa\qa)
   - machine_name\local_user (for example: re2008r2js1\JohnMill)
4. Click OK to add the group and close the dialog box.
5. Click Save or OK to accept the changes, or Discard Changes or Cancel to undo them.

To remove a user or group:
1. In the User Permissions window, select the user or group you want to remove.
2. Click Remove.
3. When prompted, click Yes to confirm.
4. Click Save or OK to accept the changes, or Discard Changes or Cancel to undo them.
To restore inherited permissions for a single user or group if they were overridden:
1. In the User Permissions window, select the user or group.
2. Click Restore Inheritance.
   The check mark returns to the Inherited column to indicate that permissions for this user or group are inherited from the parent.

To view effective permissions for a user:
1. In the User Permissions window, do one of the following:
   » Select a user in the list on the left.
   » If a user does not appear in the list but exists in the system and is part of a group, enter the user name in the text field in the Effective Permissions pane on the right.
      Make sure to use the following format:
      » NetBIOS_name\user (for example: qa\qa)
      » machine_name\local_user (for example: re2008r2js1\JohnMill)
2. Click Get Effective Permissions.
   The effective permissions for the user you entered appear below the button.

Viewing and Downloading Log Files
In AEM, you can view different kinds of log files:
» Server log file (repsrv.log): Retrieved from the monitored Replicate server.
» Task log file (reptask_<task_name>.log): Retrieved from the monitored Replicate server.
» System log file (EnterpriseManager.log): Created by and managed in AEM.

To view a log file:
1. Do one of the following:
   » For server log files: In the server list, select a server and click View Logs above the list.
      Note This option is only available for servers that are connected.
   » For task log files: In the task list, select a task and click View Logs above the list.
      Note This option is only available for tasks pertaining to servers that are connected.
   » For the Enterprise Manager log file: Click the View Logs icon in the top right corner.
You can also view log files for messages in the Message Center. The View Logs option is available for all messages reported by AEM, for messages reported by a server that is connected, and for tasks pertaining to a server that is connected.

2. In the Log Viewer window, in the Log Files pane on the left, select the log file you want to view.

The content of the log file displays in the right pane. When you select a row in the log file, a tooltip displays the full message of the selected row.

3. Browse through the log file using the scroll bar on the right.

4. To search for a specific string in the log file, enter the search string in the search box at the top of the window.

Any terms that match the specified string are highlighted blue. The number of matches is displayed next to the search box. You can use the navigation errors to move to the first, next, previous, or last occurrence of the search string.

5. To start a new log file, click Roll Log File.

The log file is saved with a 12-digit timestamp appended to its name, such as EnterpriseManager_160619073410.log or repsrv_160703131920.log.

Note: This option is not available when you open the Log Viewer window from the Message Center.

6. Click Close.

To download a log file:

» In the Log Viewer window, select the log file you want to download and click the Download Log File icon at the top right.

Generating Audit Trail Files

An audit trail provides you with information about the transactions executed in AEM. AEM traces operations that require a minimum role of operator. For these operations, the audit trail shows who did what, when, and on which objects. By default, the audit trail is enabled. Audit trail files are located in the following folder: <AEM installation folder>\data\AuditTrail\audit_service.

Note: The audit trail is secure. Audit files are compressed and protected by checksum.

Warning: Do not edit or delete the audit files. Any changes to these files might cause
the system to crash.

AEM retains audit files for 2 weeks or until they reach a total size of 500 MB (50 files). You can configure these settings through the command line interface (CLI). For more information, see Configuring AEM using the CLI, in particular the aemctl.exe audit_trail control command.

In addition, you can manually download an audit trail file in .csv format. This file includes filtered actions for a specific time frame or a custom time range.

All audit trail files capture the following information:

- Timestamp (UTC)
- User
- Node
- Requested Action
- Required Permission
- Effective Permission
- Security Result
- Action Result
- Error Message
- Server
- Task
- Endpoint
- Enable
- Delete_task_logs
- Payload

To view payload information, you can copy the link in the Payload column and paste it into the address bar of a browser window.

**Note**  The REST information listed in the following table is not presented in the audit trail columns. It is only accessible via the payload.

<table>
<thead>
<tr>
<th>REST</th>
<th>Info Access From</th>
</tr>
</thead>
<tbody>
<tr>
<td>puterrorbehavior</td>
<td>payload - task name</td>
</tr>
<tr>
<td>tablecontrol</td>
<td>payload - task name</td>
</tr>
<tr>
<td>test_database_async</td>
<td>payload - endpoint name</td>
</tr>
<tr>
<td>browse_connection_async</td>
<td>payload - endpoint name</td>
</tr>
</tbody>
</table>
To manually download an audit trail file:

1. Click the Audit Trail icon in the top right corner.
2. In the Audit Trail dialog box, from the Time Range list, select a time range.
3. If you select Custom, also specify the From date and time and the To date and time.
   The time you select is the local machine time. This gets converted to coordinated universal time (UTC) in the resulting CSV file.
4. Click Generate.
   The AuditTrail.csv file is created and downloaded. Depending on your browser, you should see it at the bottom of your browser window or in a separate window.

Configuring AEM using the CLI

You can use the AEM command line interface (CLI) to modify the data directory, configure existing configuration settings, and manage the AEM service during installation or when configuring AEM to run on a cluster.

The name of the command line executable is aemctl.exe.

To get help when using the command line, you can run the Help command. For example, for help about the parameters available with the service command, run the following command:

aemctl.exe service help

This brings up the list of help parameters.

The following table specifies the available commands and parameters, where applicable.

Note: Running CLI commands requires the admin role. For more information, see User Permissions.

### Table 8.4 | AEM CLI Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Parameter Long</th>
<th>Parameter Short</th>
<th>Use To</th>
</tr>
</thead>
<tbody>
<tr>
<td>aemctl.exe</td>
<td>--data</td>
<td>-d</td>
<td>Change the data directory.</td>
</tr>
<tr>
<td>aemctl.exe configuration set</td>
<td>--address</td>
<td>-a</td>
<td>Set the AEM host</td>
</tr>
<tr>
<td>Command</td>
<td>Parameter Long</td>
<td>Parameter Short</td>
<td>Use To</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>-----------------</td>
<td>--------</td>
</tr>
<tr>
<td>hostAddress</td>
<td>hostAddress</td>
<td>address.</td>
<td></td>
</tr>
<tr>
<td>--https_port</td>
<td>-s httpsPort</td>
<td>Set the AEM HTTPS port. Default: 443.</td>
<td></td>
</tr>
<tr>
<td>--root_url</td>
<td>-r</td>
<td>Set the root URL.</td>
<td></td>
</tr>
<tr>
<td>--help</td>
<td></td>
<td>Show the a list of supported commands and/or parameters.</td>
<td></td>
</tr>
<tr>
<td>--version</td>
<td></td>
<td>Display version information.</td>
<td></td>
</tr>
</tbody>
</table>

**aemctl.exe service stop**

```
--name serviceName
--timeout <sec>
```

Stop the AEM service

**aemctl.exe service start**

```
--name serviceName
--timeout <sec>
```

Start the AEM service.

**aemctl.exe service...**

Run other supported service commands.

**aemctl.exe certificate clean**

Clean the self-signed certificate

**aemctl.exe help**

Display a list of supported commands and/or parameters

**aemctl.exe audit_trail control**

```
--age -a
```

Control the retention age, in hours. Default: 2 weeks. If the value is 0, the parameter is ignored.
### Table 8.4 | AEM CLI Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Parameter Long</th>
<th>Parameter Short</th>
<th>Use To</th>
</tr>
</thead>
<tbody>
<tr>
<td>aemctl.exe [-d <code>aemDataFolderFullPath</code>]</td>
<td><code>--directory</code> <code>-d</code></td>
<td></td>
<td>Set the location of the AEM &quot;data&quot; folder.</td>
</tr>
<tr>
<td><code>masterukey set -p password</code></td>
<td></td>
<td></td>
<td>Note Only required if the &quot;data&quot; folder is not on the same drive as the “bin” folder.</td>
</tr>
</tbody>
</table>

**Used to:**
Set the AEM MUK (Master User Key) when configuring AEM to work in a cluster.
For more information, see [Installing AEM in a Windows Cluster](#)

<table>
<thead>
<tr>
<th>Command</th>
<th>Parameter Long</th>
<th>Parameter Short</th>
<th>Use To</th>
</tr>
</thead>
</table>
| aemctl.exe [-d `aemDataFolderFullPath`]
`masterukey set -p new_password -c old_password` | `--password` `-p` | Specify the password used to encrypt the MUK. |
| | | Note The password must be at least 32 characters. |

**Used to:**
Change the AEM MUK (Master User Key).

<table>
<thead>
<tr>
<th>Command</th>
<th>Parameter Long</th>
<th>Parameter Short</th>
<th>Use To</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Specify the new password.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>--current</code> <code>-c</code></td>
<td>Specify the current password.</td>
<td></td>
</tr>
</tbody>
</table>
9 | Setting Up High Availability

This chapter describes how to set up AEM in a Windows High Availability Cluster.

Note Throughout this chapter "Node 1" and "Node 2" are used to refer to the primary and secondary clustering nodes respectively.

In this chapter:
Installing AEM in a Windows Cluster
Upgrading AEM in a Windows Cluster
Uninstalling AEM from a Windows Cluster

Installing AEM in a Windows Cluster
This topic explains how to install Attunity Enterprise Manager in a Windows 2012 R2 cluster and a Windows 2008 R2 cluster.
For information on upgrading and uninstalling Attunity Enterprise Manager in/from a Windows cluster, see Upgrading AEM in a Windows Cluster and Uninstalling AEM from a Windows Cluster respectively.

Installing AEM in a Windows 2012 R2 Cluster

Note All commands should be run from the AEM bin folder. The default location is: C:\Program Files\Attunity\Enterprise Manager\bin

To install AEM in a Windows 2012 R2 Cluster
1. Open Failover Cluster Manager and connect to a network that contains the cluster nodes and a clustered disk (for the AEM "data" folder).
2. Install AEM on Node 1. This node should be the Cluster Disk owner. During the installation, you can specify any Destination Location, but the "data" folder must be
installed on a clustered disk (i.e. a disk that is accessible to the other cluster node).

3. Set the AEM Master User Key by opening a command prompt and running the following command:
   
   ```
   aemctl.exe -d [data_folder_path] masterukey set -p password
   ```

4. On Node 1, open the **Windows Services** console and stop the **Attunity Enterprise Manager** service.

5. Move the shared Cluster Disk to Node 2.
6. Install AEM on Node 2. The **Destination Location** can be any local folder, but make sure to install the "data" folder on the same clustered disk specified in step 2 above.

7. Make sure the **Attunity Enterprise Manager** service is stopped on Node 2.

8. Set the AEM Master User Key by opening a command prompt and running the following command:
   
   ```
   aemctl.exe -d [data_folder_path] masterukey set -p password
   ```

9. Configure the host name by opening a command prompt and running the following command:
   
   ```
   aemctl.exe -d [data_folder_path] configuration set -a host_name
   ```

   **Note**  The host name must be specified without domain information (e.g. *mycompany* and not *mycompany.qa.int*)

10. Configure the AEM cluster role as follows:
    a. Right click on **Roles** and select **Configure Role**.
    b. In the **Select Role**: Choose "Generic Service" and then click **Next**.
c. In the **Select Service** screen, choose "Attunity Enterprise Manager". Click **Next**.
d. In the **Client Access Point** screen, enter the AEM host name (set earlier in step 9). Click **Next**.
e. In the **Select Storage**, select the location on the clustered disk where the AEM "data" folder was installed. Click **Next**.
f. Continue clicking **Next** until the **Finish** button is displayed and then click **Finish**.

**11. AEM Cluster Role Dependencies:** Verify that the AEM cluster role has set dependency on the clustered disk and the AEM service. You can view the dependencies in the role properties.
Your AEM cluster should now be ready for use.

---

**Installing AEM in a Windows 2008 R2 Cluster**

**Note** All commands should be run from the AEM bin folder. The default location is:

C:\Program Files\Attunity\Enterprise Manager\bin

**To install AEM in a Windows 2008 R2 Cluster**

1. Open Failover Cluster Manager and connect to a network that contains the cluster nodes and a clustered disk (for the AEM "data" folder).
2. Install AEM on Node 1. This node should be the Cluster Disk owner. During the installation, you can specify any **Destination Location**, but the "data" folder must be
installed on a clustered disk (i.e. a disk that is accessible to the other cluster node).

3. Set the AEM Master User Key by opening a command prompt and running the following command:
   ```
aemctl.exe -d [data_folder_path] masterukey set -p [password]
   ```

4. On Node 1, open the **Windows Services** console and stop the **Attunity Enterprise Manager** service.

5. Move the clustered disk to Node 2. This can either be performed using a command line in PowerShell or by adding a service to the cluster that allows both of the cluster nodes to communicate with the clustered disk.

6. Install AEM on Node 2. The **Destination Location** can be any local folder, but make sure to install the Data folder in the same clustered disk specified in step 2 above.

7. Make sure the **Attunity Enterprise Manager** service is stopped on Node 2.

8. Set the AEM Master User Key by opening a command prompt and running the following command:
   ```
aemctl.exe -d [data_folder_path] masterukey set -p [password]
   ```

9. Configure the host name by opening a command prompt and running the following command:
   ```
aemctl.exe -d [data_folder_path] configuration set -a [host_name]
   ```
Note  The host name must be specified without domain information (e.g. mycompany and not mycompany.qa.int)

10. Configure the AEM cluster service as follows:
   a. Right click on Services and applications and select Configure Service or Application.
   
   ![Diagram of Services and applications]

   b. In the Select Service or Application screen, choose "Generic Service". Click Next.
   c. In the Select Service screen, choose "Attunity Enterprise Manager". Click Next.
d. In the **Client Access Point** screen, enter the AEM host name (set earlier in step 9). Click **Next**.

e. In the **Select Storage** screen, select the location on the clustered disk where the AEM "data" folder was installed.

f. Continue clicking **Next** until the **Finish** button is displayed and then click **Finish**.

11. **AEM Cluster Service Dependencies**: Verify that the AEM cluster service has set dependency on the clustered disk and the AEM service. You can view the dependencies in the service properties.

    Your AEM cluster should now be ready for use.

### Upgrading AEM in a Windows Cluster

This topic explains how to upgrade AEM in a **Windows 2012 R2** cluster and in a **Windows 2008 R2** cluster.

### Upgrading AEM on a Windows 2012 R2 Cluster

This section explains how to upgrade AEM in a Windows 2012 R2 Cluster.
To upgrade AEM in a Windows 2012 R2 Cluster

1. Open Failover Cluster Manager on the active cluster node.
2. Stop the Attunity Enterprise Manager service on both nodes.
3. Verify that the AEM Cluster Role status is "Failed".

4. Run the upgrade on Node 1.
5. Move the AEM Role to Node 2.

6. Stop the Attunity Enterprise Manager service on both nodes.
7. Verify that the AEM Cluster Role status is "Failed".

8. Run the upgrade on Node 2.
9. Start the AEM Cluster Role.
The upgrade should now be complete.

Upgrading AEM in a Windows 2008 R2 Cluster

This section explains how to upgrade AEM in a Windows 2008 R2 Cluster.

To upgrade AEM in a Windows 2008 R2 Cluster

1. Open Failover Cluster Manager on the active cluster node.
2. Pause the cluster activity on Node 1.
3. On Node 1, verify that the shared cluster disk is available and then run the upgrade.
4. Verify that the service is not running.
5. Move the AEM clustered service to Node 2.
6. Pause the cluster activity on Node 2.
7. On Node 2, verify that the shared cluster disk is available and then run the upgrade.
8. Resume cluster activity on both nodes.
9. Bring the AEM Cluster Service online.
   The upgrade should now be complete.

Uninstalling AEM from a Windows Cluster

This topic explains how to uninstall Attunity Enterprise Manager from a Windows 2012 R2 cluster and from a Windows 2008 R2 cluster.

To uninstall Attunity Enterprise Manager from a Windows 2012 R2 cluster

1. Open Failover Cluster Manager on the active cluster node.
2. On each of the cluster nodes, open the **Windows Services** console and stop the **Attunity Enterprise Manager** service.
3. Verify in Failover Cluster Manager that the status of the AEM cluster role is "Failed".
4. Go to Node 1 that should be owner to AEM Cluster Role and Cluster Disk. Uninstall the service
5. Move the AEM Role to Node 2.
6. Uninstall AEM on Node 2.
7. Remove the AEM Cluster Role.

To uninstall Attunity Enterprise Manager from a Windows 2008 R2 cluster
1. Open Failover Cluster Manager on the active cluster node.
2. Pause Node 1 (the current AEM cluster service owner).
3. Uninstall AEM from Node 1.

5. Uninstall AEM from Node 2.

6. Remove the AEM Cluster Service.
10 | AEM REST API

The AEM REST API provides an API for performing tasks typically carried out using the AEM web application, such as:

- Viewing a list of tasks for a server
- Viewing details for a particular task
- Stopping a task
- Running a task
- Exporting all definitions from the replication server repository on the selected server
- Importing the JSON definitions provided in the request body into the replication server repository on the selected server
- Reloading a table
- Exporting a task
- Importing a task
- Testing an endpoint’s connectivity and configuration

The AEM REST API allows other systems to interact with AEM, for example to display data about one or more tasks in a user’s dashboard. It also offers a quick and easy way of running batch operations.

Using the API requires basic familiarity with web services, Replicate, and AEM.

In this chapter:

Prerequisites
Standards and Conventions
Authentication and Authorization
Error Handling
Reference of Supported REST Methods
Parameters

Prerequisites

Before using the AEM REST API, make sure that:

- Attunity Enterprise Manager has been installed.
- The AEM service is active.
- The relevant permissions have been granted.
Standards and Conventions

The API is based on the following standards:

- **Names**: Camel Case, such as `GetTaskList`.
- **Date and time format**: ISO 8601 (`YYYY-MM-DD HH:MM:SS`), in UTC (Universal Time Coordinated).
  - Example: `2007-04-05T14:30:25` (implicitly interpreted as UTC without the explicit trailing `Z`).
- **Standard URL format**: `api/v1/URL`.

In addition, this section uses the following conventions:

- **Parameters** in examples appear in curly brackets as `{xx}` and should be replaced with an actual value. An example of a parameter is `{server}`, which should be replaced by the server name or IP address of the machine where Replicate is installed. For a list of parameters, see Parameters.

All examples in this chapter use cURL as the HTTP engine.

In terms of forward and backward compatibility of the AEM REST API, the caller should expect future releases to add new optional request parameters and additional data items in responses.

Authentication and Authorization

The AEM REST API uses the BASIC HTTP authorization scheme to authenticate callers and create a client session. A client session is established using the `AemLogin` method, which returns the special header “EnterpriseManager.APISessionID” with a value (session token) that needs to be sent as a request header in following requests.

A session token expires 5 minutes after the last request. After the session expires, the caller must re-authenticate to establish a new session.

Authorization for performing a specific REST request relies on permission, assigned to the authenticated user either directly or by means of group membership. Each REST request requires a minimum role. The role required is listed as part of the Reference of Supported REST Methods.

Error Handling

When a REST request fails, the HTTP response code is set to an error code. Error messages are returned as part of the payload as error response. An error response has the following structure:

```
{
    "error_code":"code","error_message":"message"
}
```
This section lists the generic messages that apply to most of the API functions. Errors that are specific to a particular API function appear in the section the reference section for the respective API function.

<table>
<thead>
<tr>
<th>HTML Code</th>
<th>AEM Code</th>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>403</td>
<td>UNAUTHORIZED_REQUEST</td>
<td>Unauthorized Request.</td>
<td>The user is not authorized to perform the requested action (e.g. deleting a task).</td>
</tr>
<tr>
<td>404</td>
<td>None (AEM service is down)</td>
<td>The requested resource is not found</td>
<td>The AEM service is down.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_SERVER_NOT_FOUND</td>
<td>Replicate server {server} could not be found</td>
<td>The Replicate server cannot be found.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_SERVER_NOT_MONITORED</td>
<td>Replicate server {server} is not monitored</td>
<td>The Replicate server is not being monitored and thus the information is not accessible.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_SERVER_NOT_CONNECTED</td>
<td>Replicate server {server} is not connected</td>
<td>The Replicate server is not connected and thus the information is not accessible.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_LICENSE_EXPIRED</td>
<td>License for Replicate server {server} expired</td>
<td>The license for the Replicate server has expired.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_SERVER_INVALID_LICENSE</td>
<td>License for Replicate server {server} invalid</td>
<td>The license for the Replicate server is not valid.</td>
</tr>
<tr>
<td>440</td>
<td>INVALID_SESSION_ID</td>
<td>Session expired or invalid.</td>
<td>Session expired or invalid.</td>
</tr>
</tbody>
</table>

Reference of Supported REST Methods

The following REST API methods are currently supported:
- `AemLogin`
- `AemLogout`
- `AemGetServerList`
- `AemGetTaskList`
- `AemGetTaskDetails`
- `AemStopTask`
- `AemRunTask`
- `AemDeleteTask`
» AemExportAll
» AemImportAll
» AemReloadTable
» AemExportTask
» AemImportTask
» AemTestEndpoint
AemLogin

General

<table>
<thead>
<tr>
<th>Title</th>
<th>AemLogin</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>https://{host}/attunityenterprisemanager/api/v1/login</td>
</tr>
<tr>
<td>Description</td>
<td>Authenticates an API caller with AEM and acquires a session token to be used with API method calls. The server requests client authentication.</td>
</tr>
<tr>
<td>HTTP Method</td>
<td>GET</td>
</tr>
<tr>
<td>Required User Role</td>
<td>Viewer</td>
</tr>
</tbody>
</table>

Request Parameters

<table>
<thead>
<tr>
<th>Location</th>
<th>URL Param Name</th>
<th>Required</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>host [string]</td>
<td>Yes</td>
<td>computer.network.net</td>
</tr>
<tr>
<td>Header</td>
<td>user@domain:password converted to base 64 [string]</td>
<td>Yes</td>
<td>c27kc2Rmc27k</td>
</tr>
</tbody>
</table>

Response Header

<table>
<thead>
<tr>
<th>URL Param Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnterpriseManager.APISessionID</td>
<td>Identifier to be used to get authorization to run API functions on AEM</td>
</tr>
</tbody>
</table>

cURL Example

<table>
<thead>
<tr>
<th>Request</th>
<th>curl -i -k -u name@domain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><a href="https://computer.network.net/attunityenterprisemanager/api/v1/login">https://computer.network.net/attunityenterprisemanager/api/v1/login</a></td>
</tr>
<tr>
<td></td>
<td>Enter host password for user name@domain.</td>
</tr>
<tr>
<td>Response</td>
<td>HTTP/1.1 200 OK</td>
</tr>
<tr>
<td></td>
<td>Content-Length: 0</td>
</tr>
<tr>
<td></td>
<td>Content-Type: text/html</td>
</tr>
</tbody>
</table>
Error Response

<table>
<thead>
<tr>
<th>HTTP Code</th>
<th>AEM Code</th>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>401</td>
<td>UNAUTHORIZED_REQUEST</td>
<td>Unauthorized Request</td>
<td>The request was not authorized.</td>
</tr>
</tbody>
</table>

AemLogout

General

<table>
<thead>
<tr>
<th>Title</th>
<th>AemLogout</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>https://{host}/attunityenterprisemanager/api/v1/logout</td>
</tr>
<tr>
<td>Description</td>
<td>End a session</td>
</tr>
<tr>
<td>HTTP Method</td>
<td>GET</td>
</tr>
<tr>
<td>Required User Role</td>
<td>Viewer</td>
</tr>
</tbody>
</table>

Request Parameters

<table>
<thead>
<tr>
<th>Location</th>
<th>URL Param Name</th>
<th>Required</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>host [string]</td>
<td>Yes</td>
<td>computer.network.net</td>
</tr>
<tr>
<td>Header</td>
<td>EnterpriseManager.APISessionID [string]</td>
<td>Yes</td>
<td>wCo0_KvjEUFROvHF5KGrw</td>
</tr>
</tbody>
</table>

cURL Example

Request

```
curl -i -k --header "EnterpriseManager.APISessionID: wCo0_KvjEUFROvHF5KGrw" https://computer.network.net/attunityenterprisemanager/api/v1/logout
```
AemGetServerList

General

<table>
<thead>
<tr>
<th>Title</th>
<th>AemGetServerList</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>https://[host]/attunityenterprisemanager/api/v1/servers</td>
</tr>
<tr>
<td>Description</td>
<td>Retrieves a list of servers under AEM management as well as each server's properties.</td>
</tr>
<tr>
<td>Required permission</td>
<td>Viewer access or above.</td>
</tr>
<tr>
<td>HTTP Method</td>
<td>GET</td>
</tr>
<tr>
<td>Required User Role</td>
<td>Viewer</td>
</tr>
</tbody>
</table>

Request Parameters

<table>
<thead>
<tr>
<th>Location</th>
<th>Name</th>
<th>Required</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>host [string]</td>
<td>Yes</td>
<td>computer.network.net</td>
</tr>
<tr>
<td>Header</td>
<td>EnterpriseManager.APISessionID [string]</td>
<td>Yes</td>
<td>wCo0_KvjEUFROvfHF5KGrw</td>
</tr>
</tbody>
</table>

Response Body

<table>
<thead>
<tr>
<th>Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>{</td>
</tr>
<tr>
<td>&quot;serverList&quot;: [{</td>
</tr>
<tr>
<td>&quot;name&quot;: &quot;{string}&quot; ,</td>
</tr>
<tr>
<td>&quot;description&quot;: &quot;{string}&quot; ,</td>
</tr>
<tr>
<td>&quot;host&quot;: &quot;{string}&quot; ,</td>
</tr>
<tr>
<td>&quot;port&quot;: &quot;{string}&quot; ,</td>
</tr>
<tr>
<td>&quot;state&quot;: &quot;{enum_server_state}&quot; ,</td>
</tr>
<tr>
<td>}</td>
</tr>
<tr>
<td>}</td>
</tr>
</tbody>
</table>
"message": "{string}",
"platform": "{enum_server_platform}",
"version": "{string}",
"last_connection": "{string}"
}
]
}

Response Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>The name of the server.</td>
</tr>
<tr>
<td>description</td>
<td>The description of the server.</td>
</tr>
<tr>
<td>host</td>
<td>The host name or IP address of the server.</td>
</tr>
<tr>
<td>port</td>
<td>The port through which the server is accessed.</td>
</tr>
<tr>
<td>state</td>
<td>The current state of the server.</td>
</tr>
<tr>
<td>message</td>
<td>The error message if AEM fails to connect and monitor the server.</td>
</tr>
<tr>
<td>platform</td>
<td>The operating system on which the server is installed.</td>
</tr>
<tr>
<td>version</td>
<td>The Replicate version of the server.</td>
</tr>
<tr>
<td>last_connection</td>
<td>The date and time of the last successful sync/retrieval of tasks and messages.</td>
</tr>
</tbody>
</table>

cURL Example

Request  
CURL.EXE -i -k --header "EnterpriseManager.APISessionID: wCo0_KvjEUFROvFHP5KGr"  
https://computer.network.net/attunityenterprisemanager/api/v1/servers

Response
Headers:
HTTP/1.1 200 OK
Cache-Control: no-cache, no-store
Content-Length: 1658
Content-Type: application/json; charset=utf-8
Server: Microsoft-HTTPAPI/2.0
Payload:
{
    "serverList": [{
        "name": "RepBS",
        "description": "replicate for business",
        "host": "rep2008r2gs7.qa.int",
        "port": "443",
        "state": "MONITORED",
        "message": "",
        "platform": "WINDOWS",
        "version": "5.2.0.156",
        "last_connection": "2016-12-18T02:23:30",
    },
    {
        "name": "RepDev",
        "description": "replicate for developers",
        "host": "rep2008r2gs8.qa.int",
        "port": "443",
        "state": "NOT_MONITORED",
        "message": "Server changed status to Not Monitored.",
        "platform": "WINDOWS",
        "version": "5.2.0.156",
        "last_connection": "2016-11-16T05:30:00",
    },
    {
        "name": "RepProd",
        "description": "replicate for production",
        "host": "rep2008r2gs9.qa.int",
        "port": "443",
        "state": "ERROR",
        "message": "REPLICATE-E-REPSRVNFND, Replicate server 'Rep 5003' not found. Last Connection: 12:21 PM",
        "platform": "WINDOWS",
        "version": "5.2.0.156",
        "last_connection": "2016-11-16T05:30:00",
    }
}]}
AemGetTaskList

General

<table>
<thead>
<tr>
<th>Title</th>
<th>AemGetTaskList</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>URL</strong></td>
<td>https://{host}/attunityenterprisemanager/api/v1/servers/{ServerName}/tasks</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Receive a list of tasks per selected and authorized server. For each task, the API returns a few parameters.</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>GET</td>
</tr>
<tr>
<td><strong>Required User Role</strong></td>
<td>Viewer</td>
</tr>
</tbody>
</table>

Request Parameters

<table>
<thead>
<tr>
<th>Location</th>
<th>Name</th>
<th>Required</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>host [string]</td>
<td>Yes</td>
<td>computer.network.net</td>
</tr>
<tr>
<td>URL</td>
<td>ServerName [string]</td>
<td>Yes</td>
<td>myrepsrv1</td>
</tr>
<tr>
<td>Header</td>
<td>EnterpriseManager.APISessionID [string]</td>
<td>Yes</td>
<td>wCo0_KvjeUFROvHF5KGrw</td>
</tr>
</tbody>
</table>

Response Body

```json
{  "taskList": [{  "name": "[string]",  "state": "[enum task_state]",  "stop_reason": "[enum stop_reason]"
}, {  "name": "[string]",  "state": "[enum task_state]",  "stop_reason": "[enum stop_reason]"
}, {  "name": "[string]",  "state": "[enum task_state]"
}]```
"stop_reason": "{enum stop_reason } "
]
]
]

Response Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>The name of the task</td>
</tr>
<tr>
<td>state</td>
<td>The current state of the task</td>
</tr>
<tr>
<td>stop_reason</td>
<td>The reason the task has stopped</td>
</tr>
</tbody>
</table>

cURL Example

Request  
curl -i -k --header "EnterpriseManager.APISessionID: wCo0_KvjEUFROvHF5KGrw"
https://computer.network.net/attunityenterprisemanager/api/v1/servers/myrepsrv1/tasks

Response  
Headers:  
HTTP/1.1 200 OK
Cache-Control: no-cache, no-store
Content-Length: 205
Content-Type: application/json; charset=utf-8
Server: Microsoft-HTTPAPI/2.0
Date: Mon, 26 Dec 2016 11:18:53 GMT

Payload:
{
    "taskList": [{
        "name": "Task1",
        "state": "RUNNING",
        "stop_reason": "NONE"
    }, {
        "name": "Task2",
        "state": "STOPPED",
        "stop_reason": "FULL_LOAD_ONLY_FINISHED"
    }, {
        "name": "Task3",
        "state": "STOPPED",
        "stop_reason": "FULL_LOAD_ONLY_FINISHED"
    }]
}
"state": "RUNNING",
"stop_reason": "NONE"
]
]

AemGetTaskDetails

General

Title AemGetTaskDetails
URL https://{host}/attunityenterprisemanager/api/v1/servers/{ServerName}/tasks/{TaskName}
Description Retrieves details about a selected and authorized task. The API returns full monitoring information related to the selected task.

HTTP Method GET

Required User Role Viewer

Request Parameters

<table>
<thead>
<tr>
<th>Location</th>
<th>Name</th>
<th>Required</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>host [string]</td>
<td>Yes</td>
<td>computer.network.net</td>
</tr>
<tr>
<td>URL</td>
<td>ServerName [string]</td>
<td>Yes</td>
<td>myrepsrv1</td>
</tr>
<tr>
<td>URL</td>
<td>TaskName [string]</td>
<td>Yes</td>
<td>SalesDBBackup</td>
</tr>
<tr>
<td>Header</td>
<td>EnterpriseManager.APISessionID [string]</td>
<td>Yes</td>
<td>wCo0_KvJEUFROvHF5KGrw</td>
</tr>
</tbody>
</table>

Response Body

Body {
   "task":{
      "name": "{string}",
      "state": "{enum task_state}",
"state": "RUNNING",
"stop_reason": "NONE"
]
]
"cdc_event_counters":
   {
      "applied_insert_count": "{int64}",
      "applied_update_count": "{int64}",
      "applied_delete_count": "{int64}",
      "applied_ddl_count": "{int64}"}
   ,
   {
      "full_load_counters":
         {
            "tables_completed_count": "{int64}",
            "tables_loading_count": "{int64}",
            "tables_queued_count": "{int64}",
            "tables_with_error_count": "{int64}",
            "records_completed_count": "{int64}",
            "estimated_records_for_all_tables_count": "{int64}"},
         {
            "full_load_completed": "{bool}",
            "full_load_start": "{string}",
            "full_load_end": "{string}"},
      "full_load_throughput":
         {
            "cdc_throughput":
               {
                  "source_throughput_records_count": {
                     "current": "{int32}"},
                  "source_throughput_volume": {
                     "current": "{int32}"}
               },
               {
                  "target_throughput_records_count": {
                     "current": "{int32}"}
               },
               {
                  "target_throughput_volume": {
                     "current": "{int32}"}
               }
         },
         {
            "cdc_throughput":
               {
                  "source_throughput_records_count": "int32",
                  "source_throughput_volume": "int32"}
"target_throughput_records_count": "{int32}",
"target_throughput_volume": "{int32}"
},
"cdc_transactions_counters":{
  "commit_change_records_count": "{int64}",
  "rollback_transaction_count": "{int64}",
  "rollback_change_records_count": "{int64}",
  "rollback_change_volume_mb": "{int64}",
  "applied_transactions_in_progress_count": "{int64}",
  "applied_records_in_progress_count": "{int64}",
  "applied_committed_transaction_count": "{int64}",
  "applied_records_committed_count": "{int64}",
  "applied_volume_committed_mb": "{int64}",
  "incoming_accumulated_changes_in_memory_count": "{int64}",
  "incoming_accumulated_changes_on_disk_count": "{int64}",
  "incoming_applying_changes_in_memory_count": "{int64}",
  "incoming_applying_changes_on_disk_count": "{int64}"
},
"cdc_latency":{
  "source_latency": "{int32}",
  "total_latency": "{int32}"
},
"replicate_profile": "{enum replicate_profile}"
"task_stop_reason": "{enum stop_reason}"
"memory_mb": "{int64}"
"disk_usage_mb": "{int64}"
"data_error_count": "{int64}"
"options": "{full_load_enabled}": "{bool}"", "{apply_changes_enabled}": "{bool}"", "{store_changes_enabled}": "{bool}"", "{audit_changes_enabled}": "{bool}"}

Response Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>The name of the task</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>State</td>
<td>The current state of the task</td>
</tr>
<tr>
<td>cdc_event_counters</td>
<td>All numeric data concerning CDC events</td>
</tr>
<tr>
<td>applied_insert_count</td>
<td>The number of records added in total for all tables</td>
</tr>
<tr>
<td>applied_update_count</td>
<td>The number of records updated in total for all tables</td>
</tr>
<tr>
<td>applied_delete_count</td>
<td>The number of records deleted in total for all tables</td>
</tr>
<tr>
<td>applied_ddl_count</td>
<td>The total number of metadata changes, such as add column</td>
</tr>
<tr>
<td>full_load_counters</td>
<td>All numeric data concerning Full Load events</td>
</tr>
<tr>
<td>tables_completed_count</td>
<td>The number of tables that have been loaded into the target endpoint</td>
</tr>
<tr>
<td>tables_loading_count</td>
<td>The number of tables that are currently being loaded into the target endpoint</td>
</tr>
<tr>
<td>tables_queued_count</td>
<td>The number of tables that are waiting to be loaded due to an error</td>
</tr>
<tr>
<td>tables_with_error_count</td>
<td>The number of tables that could not be loaded due to an error</td>
</tr>
<tr>
<td>records_completed_count</td>
<td>The total number of records that have completed loading into the target endpoint</td>
</tr>
<tr>
<td>estimated_records_for_all_tables_count</td>
<td>The estimated number of records remaining to be loaded into the target endpoint</td>
</tr>
<tr>
<td>full_load_completed</td>
<td>Indicates whether the full load process has ended</td>
</tr>
<tr>
<td>full_load_start</td>
<td>The start time of the full load process</td>
</tr>
<tr>
<td></td>
<td>Format: YYY MM DD</td>
</tr>
<tr>
<td></td>
<td>Timezone: UTC</td>
</tr>
<tr>
<td>full_load_throughput</td>
<td>Indicates how fast the table records are being replicated to the target endpoint (by number or volume of records)</td>
</tr>
<tr>
<td>source_throughput</td>
<td>The current source throughput, in rec/sec</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td><code>records_count</code></td>
<td></td>
</tr>
<tr>
<td><code>source_throughput_volume</code></td>
<td>The current source throughput, in kbyte/sec</td>
</tr>
<tr>
<td><code>target_throughput_records_count</code></td>
<td>The current target throughput, in rec/sec</td>
</tr>
<tr>
<td><code>target_throughput_volume</code></td>
<td>The current target throughput, in kbyte/sec</td>
</tr>
<tr>
<td><code>cdc_throughput</code></td>
<td>Indicates how fast the table records are being replicated to the target endpoint (by number or volume of records). Refers only to the current/last CDC.</td>
</tr>
<tr>
<td><code>source_throughput_records_count</code></td>
<td>The current source throughput, in rec/sec</td>
</tr>
<tr>
<td><code>source_throughput_volume</code></td>
<td>The current source throughput, in kbyte/sec</td>
</tr>
<tr>
<td><code>target_throughput_records_count</code></td>
<td>The current target throughput, in rec/sec</td>
</tr>
<tr>
<td><code>target_throughput_volume</code></td>
<td>The current target throughput, in kbyte/sec</td>
</tr>
<tr>
<td><code>cdc_transaction_counters</code></td>
<td>All numeric data concerning CDC transactions</td>
</tr>
<tr>
<td><code>commit_change_records_count</code></td>
<td>The number of COMMIT change records</td>
</tr>
<tr>
<td><code>rollback_transaction_count</code></td>
<td>The number of ROLLBACK transactions</td>
</tr>
<tr>
<td><code>rollback_change_records_count</code></td>
<td>The number of ROLLBACK change records</td>
</tr>
<tr>
<td><code>rollback_change_volume</code></td>
<td>The volume of ROLLBACK change, in MB</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>mb</td>
<td></td>
</tr>
<tr>
<td>applied_transactions_in_progress_count</td>
<td>The number of transactions in progress</td>
</tr>
<tr>
<td>applied_records_in_progress_count</td>
<td>The sum of all records/events in all In-Progress transactions</td>
</tr>
<tr>
<td>applied_committed_transaction_count</td>
<td>The number of transactions committed</td>
</tr>
<tr>
<td>applied_records_committed_count</td>
<td>The sum of all records/events in all Completed transactions</td>
</tr>
<tr>
<td>applied_volume_committed_mb</td>
<td>The sum of all volume/events in all Completed transactions, in MB</td>
</tr>
<tr>
<td>incoming_accumulated_changes_in_memory_count</td>
<td>The number of changes accumulated in memory until source commit</td>
</tr>
<tr>
<td>incoming_accumulated_changes_on_disk_count</td>
<td>The number of changes accumulated on disk until source commit</td>
</tr>
<tr>
<td>incoming_applying_changes_in_memory_count</td>
<td>The number of changes in memory during apply and until target commit</td>
</tr>
<tr>
<td>incoming_applying_changes_on_disk_count</td>
<td>The number of changes on disk during apply and until target commit</td>
</tr>
<tr>
<td>cdc_latency</td>
<td>CDC latency information</td>
</tr>
<tr>
<td>source_latency</td>
<td>The time gap between the original change in the source endpoint and capturing it, in hh:mm:ss</td>
</tr>
<tr>
<td>total_latency</td>
<td>The overall latency (source latency + target latency + apply latency), in hh:mm:ss</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>replicate_profile</td>
<td>The replication type between endpoints (unidirectional or bidirectional)</td>
</tr>
<tr>
<td>stop_reason</td>
<td>The reason the task stopped</td>
</tr>
<tr>
<td>memory_mb</td>
<td>The current utilization of memory, in MB. A task’s memory utilization is sampled every 10 seconds. When the task is not running, the value is set to zero (0).</td>
</tr>
<tr>
<td>disk_usage_mb</td>
<td>The current utilization of disk space, in MB. A task's disk utilization is sampled every minute.</td>
</tr>
<tr>
<td>data_error_count</td>
<td>The total number of data errors in all tables involved in the task. The count is affected by data errors and the <strong>Reset Data Errors</strong> option available when you drill down to a task.</td>
</tr>
<tr>
<td>full_load_enabled</td>
<td>See <strong>Task Options</strong>.</td>
</tr>
<tr>
<td>apply_changes_enabled</td>
<td>See <strong>Task Options</strong>.</td>
</tr>
<tr>
<td>store_changes_enabled</td>
<td>See <strong>Task Options</strong>.</td>
</tr>
<tr>
<td>audit_changes_enabled</td>
<td>See <strong>Task Options</strong>.</td>
</tr>
</tbody>
</table>

**cURL Example**

**Request**

```bash
CURL.EXE -i -k --header "EnterpriseManager.APISessionID: {SessionID}" https://{host}/attunityservices/api/aem/v1/servers/myrepsrv1/tasks/SalesDBBackup
```

**Response**

- Headers:
  - HTTP/1.1 200 OK
  - Cache-Control: no-cache, no-store
  - Content-Length: 1658
  - Content-Type: application/json; charset=utf-8
  - Server: Microsoft-HTTPAPI/2.0
- Date: Mon, 26 Dec 2016 13:18:27 GMT
- Payload:
  ```json
  {
    "task":{
      "name":"SalesDBBackup",
      "state":"RUNNING",
  }
  ```
"cdc_event_counters":
   {
      "applied_insert_count":0,
      "applied_update_count":0,
      "applied_delete_count":0,
      "applied_ddl_count":0
   },

"full_load_counters":
   {
      "tables_completed_count":3,
      "tables_loading_count":0,
      "tables_queued_count":0,
      "tables_with_error_count":0,
      "records_completed_count":177446,
      "estimated_records_for_all_tables_count":177446,
      "full_load_completed":true,
      "full_load_start":"2016-12-18T02:23:30",
      "full_load_end":"2016-12-18T02:23:35"
   },

"full_load_throughput":
   {
      "source_throughput_records_count":0,
      "source_throughput_volume":0,
      "target_throughput_records_count":0,
      "target_throughput_volume":0
   },

"cdc_throughput":
   {
      "source_throughput_records_count": {
         "current": 0
      },
      "source_throughput_volume": {
         "current": 0
      },
      "target_throughput_records_count": {
         "current": 0
      },
      "target_throughput_volume": {
         "current": 0
      }
   },
"cdc_transactions_counters":{
  "commit_change_records_count":0,
  "rollback_transaction_count":0,
  "rollback_change_records_count":0,
  "rollback_change_volume_mb":0,
  "applied_transactions_in_progress_count":0,
  "applied_records_in_progress_count":0,
  "applied_comitted_transacion_count":0,
  "applied_records_comitted_count":0,
  "applied_volume_comitted_mb":0,
  "incoming_accumulated_changes_in_memory_count":0,
  "incoming_accumulated_changes_on_disk_count":0,
  "incoming_applying_changes_in_memory_count":0,
  "incoming_applying_changes_on_disk_count":0,
},
"cdc_latency":{
  "source_latency":"00:00:00",
  "total_latency":"00:00:00"},
"replicate_profile":"UNIDIRECTIONAL",
"task_stop_reason":"NORMAL",
"memory_mb":57,
"disk_usage_mb":0,
data_error_count":0,
"options":{"full_load_enabled":true,"apply_changes_enabled":true,"store_changes_enabled":false,"audit_changes_enabled":false} 
}

---

Error Response

<table>
<thead>
<tr>
<th>HTTP Code</th>
<th>AEM Code</th>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>AEM_TASK_ NOT_FOUND</td>
<td>Replicate task {task} {server} could not be found.</td>
<td>The task name is unknown to AEM.</td>
</tr>
</tbody>
</table>
AemStopTask

General

<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>AemStopTask</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>URL</strong></td>
<td>https://{host}/attunityenterprisemanager/api/v1/servers/{ServerName}/tasks/{TaskName}/?action=stop&amp;timeout={timeout}</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Stop the selected task</td>
</tr>
<tr>
<td><strong>HTTP Method</strong></td>
<td>POST</td>
</tr>
<tr>
<td><strong>Required User Role</strong></td>
<td>Operator</td>
</tr>
</tbody>
</table>

Request Parameters

<table>
<thead>
<tr>
<th><strong>Location</strong></th>
<th><strong>Name</strong></th>
<th><strong>Required</strong></th>
<th><strong>Example</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>host [string]</td>
<td>Yes</td>
<td>computer.network.net</td>
</tr>
<tr>
<td>URL</td>
<td>ServerName [string]</td>
<td>Yes</td>
<td>myrepsrv1</td>
</tr>
<tr>
<td>URL</td>
<td>TaskName [string]</td>
<td>Yes</td>
<td>SalesDBBackup</td>
</tr>
<tr>
<td>URL</td>
<td>Timeout [int32]</td>
<td>Optional (default is 60 seconds)</td>
<td>60 (seconds)</td>
</tr>
<tr>
<td>Header</td>
<td>EnterpriseManager.APISessionID [string]</td>
<td>Yes</td>
<td>wCo0_KvjEUFROvfHF5KGrw</td>
</tr>
</tbody>
</table>

Response Body

```json
{
    "state":"{enum task_state}",
    "error_message":""
}
```
Response Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>state [enum task_state]</td>
<td>The current state of the task</td>
</tr>
<tr>
<td>error_message</td>
<td>The description of the error</td>
</tr>
</tbody>
</table>

cURL Example

**Request**
curl -i -k -X POST --header "EnterpriseManager.APISessionID: wCo0_KvjEUFROvfHF5KGrw" --header "Content-Length: 0" https://computer.network.net/attunityenterprisemanager/api/v1/servers/myrepsrv1/tasks/SalesDBBackup/?action=stop

**Response**

```
HTTP/1.1 200 OK
Cache-Control: no-cache, no-store
Content-Length: 38
Content-Type: application/json; charset=utf-8
Server: Microsoft-HTTPAPI/2.0
Date: Mon, 26 Dec 2016 16:31:01 GMT

Payload:
{
    "state":"STOPPED",
    "error_message":"
}
```

Error response

<table>
<thead>
<tr>
<th>HTTP Code</th>
<th>AEM Code</th>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>AEM_TASK_ALREADY_STOPPED</td>
<td>Cannot stop a task that is already in Stopped state</td>
<td>Cannot stop a task that is in Stopped state.</td>
</tr>
</tbody>
</table>
AemRunTask

General

<table>
<thead>
<tr>
<th>Title</th>
<th>AemRunTask</th>
</tr>
</thead>
</table>
| URL           | https://{host}/attunityenterprisemanager/api/v1/servers/
|               | {ServerName}/tasks/{TaskName}/?action=run&option=
|               | {option}&timeout={timeout}                      |
| Description   | Run the selected task according to the specified option. |
| HTTP Method   | POST                                            |
| Required User Role | Operator                                |

Request Parameters

<table>
<thead>
<tr>
<th>Location</th>
<th>Name</th>
<th>Required</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>host [string]</td>
<td>Yes</td>
<td>computer.network.net</td>
</tr>
<tr>
<td>URL</td>
<td>ServerName [string]</td>
<td>Yes</td>
<td>myrepsrv1</td>
</tr>
<tr>
<td>URL</td>
<td>TaskName [string]</td>
<td>Yes</td>
<td>SalesDBBackup</td>
</tr>
<tr>
<td>URL</td>
<td>Timeout [int32]</td>
<td>Optional</td>
<td>60 (seconds)</td>
</tr>
</tbody>
</table>

| URL      | option [enum run_options] | Yes      | RELOAD_TARGET                |
| Header   | EnterpriseManager.APISessionID [string] | Yes      | wCo0_KvJEUFROvHF5KGrw       |
| Header   | Content-Type: [Type]      | Yes if the run option = RESUME_PROCESSING_FROM_TIMESTAMP or RECOVER USING CHECKPOINT STORED_ON TARGET | "Content-Type: application/json" |

You can either specify the Content-Type payload inline or by referencing a JSON file. The payload format differs slightly according to whether it is specified inline or by
<table>
<thead>
<tr>
<th>Location</th>
<th>Name</th>
<th>Required</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>referencing a JSON file. For more information, see <strong>Body</strong> below.</td>
<td></td>
</tr>
</tbody>
</table>
| Header   | Content-Length: [Number of bytes in the content body] | Yes if the `option = RESUME_PROCESSING_FROM_TIMESTAMP` or `RECOVER_USING_CHECKPOINT_STORED_ON_TARGET` | "Content-Length: 37"
For example commands, see **Resume Processing from Timestamp Examples**. |
| Body     | cdcposition | Yes if the `option = RESUME_PROCESSING_FROM_TIMESTAMP` or `RECOVER_USING_CHECKPOINT_STORED_ON_TARGET` | The `cdcposition` parameter can either be specified inline or in an external JSON file. The format for both is described in **Request Body Format** below. |

**Request Body Format**

If the task `option` is `RESUME_PROCESSING_FROM_TIMESTAMP`, then the format should be:

**JSON File Format:**

```
{"cdcposition":"timestamp"}
```

**Example:**

```
{"cdcposition":"2017-03-07T11:19:03"}
```

**Inline Format:**

```
{"cdcposition":"timestamp"}
```

**Example:**

```
{"cdcposition":"2017-03-07T11:19:03"}
```
For example commands, see Resume Processing from Timestamp Examples.

If the task option is RECOVER USING CHECKPOINT STORED ON TARGET, then the format should be:

**JSON File Format:**

```
{"cdcposition":"target_checkpoint"}
```

**Example:**

```
{"cdcposition":"Checkpoint:V1#1#timestamp:2017-02-14T12:34:44#0#0#0#0#0"}
```

**Inline Format:**

```
{"cdcposition":"target_checkpoint"}
```

**Example:**

```
{"cdcposition":"Checkpoint:V1#1#timestamp:2017-02-14T12:34:44#0#0#0#0"
```

**Response Body**

```
Body
{
    "state": "{enum task_state}",
    "error_message": ""
}
```

**Response Parameters**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>state</td>
<td>{enum task_state}</td>
</tr>
<tr>
<td>error_message</td>
<td>The description of the error</td>
</tr>
</tbody>
</table>

**cURL Reload Target Example**

```bash
curl -i -k -X POST --header "EnterpriseManager.APISessionID: wCo0_KvjEFROvFHF5KGrw" --header "Content-Length: 0" https://computer.network.net/attunityenterprisemanager/api/v1/server-
```
s/myrepsrv1/tasks/SalesDBBackup/?action=run&option=RELOAD_TARGET

**Response Headers:**

HTTP/1.1 200 OK
Cache-Control: no-cache, no-store
Content-Length: 38
Content-Type: application/json; charset=utf-8
Server: Microsoft-HTTPAPI/2.0
Date: Mon, 26 Dec 2016 16:28:25 GMT

**Payload:**

```json
{
    "state": "RUNNING",
    "error_message": ""
}
```

cURL Resume Processing from Timestamp Examples

**cURL**

When the payload content is in a JSON file:

```bash
curl -i -k -X POST --header "EnterpriseManager.APISessionID: wCo0_KvjEUFR0vFHF5KGrw" --header "Content-Type: application/json" -T @"C:\exports\run.json" --header "Content-Length: 37" https://computer.network.net/attunityenterprisemanager/api/v1/servers/rep2008r2gs7.qa.int/tasks/SalesDBBackup/?action=run&option=RESUME_PROCESSING_FROM_TIMESTAMP"
```

**cURL**

When the payload content is inline.

```bash
curl -i -k -X POST --header "EnterpriseManager.APISessionID: wCo0_KvjEUFR0vFHF5KGrw" --header "Content-Length: 0" -d "{"cdcposition":"2017-03-07T11:19:03"}" https://computer.network.net/attunityenterprisemanager/api/v1/servers/rep2008r2gs7.qa.int/tasks/SalesDBBackup/?action=run&option=RESUME_PROCESSING_FROM_TIMESTAMP"
```

**Response Headers:**

HTTP/1.1 200 OK
Cache-Control: no-cache, no-store
Content-Length: 38
Content-Type: application/json; charset=utf-8
Server: Microsoft-HTTPAPI/2.0
Date: Tue, 07 Mar 2017 16:57:27 GMT

**Payload:**

```json
{"state": "RUNNING", "error_message": ""}
```
Error Response

<table>
<thead>
<tr>
<th>HTTP Code</th>
<th>AEM Code</th>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>AEM_TASK_ALREADY_RUNNING</td>
<td>Replicate task {task} {server} is already running</td>
<td>The task cannot be run because it is already running.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_TASK_IN_RECOVERY</td>
<td>Replicate task {task} {server} is in Recovery mode</td>
<td>The task cannot be run because it is in Recovery state.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_WRONG_OPTION_FOR_CDCPOSITION</td>
<td>Replicate task {task} {server} cannot run with cdc-position {position} and option {option}</td>
<td>When the option <strong>Tables are already loaded. Start processing changes from Timestamp</strong> is selected in the <strong>Advanced Run Options</strong> dialog box for a task, the option sent to the API must be <strong>RESUME_PROCESSING_FROM_TIMESTAMP</strong>.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_CDC_POSITION_ERR_FORMAT</td>
<td>CDC position for Replicate task {task} {server} is not in the correct format ('YYY-MM-DDThh:mm:ssZ')</td>
<td>The cdcPosition parameter must follow this format: YYY-MM-DDThh:mm:ssZ Parameters: task name and server name</td>
</tr>
<tr>
<td>500</td>
<td>AEM_RUN_TASK_TIMEOUT</td>
<td>Replicate task {task} {server}: run task timeout.</td>
<td>The task does not assume a Running state or any other steady state (error or stopped).</td>
</tr>
<tr>
<td>500</td>
<td>AEM_RUN_TASK_INNER_ERR</td>
<td>Replicate task {task} {server}: Error running the task.</td>
<td>Replicate experienced an error/exception when trying to run the task.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_RUN_TASK_NO_SRC_NO_TRG</td>
<td>Replicate task {task} {server} has no source and no target</td>
<td>Task validation revealed that the task is missing a source and a target.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_RUN_</td>
<td>Replicate task {task}</td>
<td>Task validation revealed that the task is</td>
</tr>
<tr>
<td>HTTP Code</td>
<td>AEM Code</td>
<td>Text</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>----------</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>TASK_NO_SRC</td>
<td>{server} has no source</td>
<td>missing a source.</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>AEM_RUN_TASK_TRG</td>
<td>Replicate task {task} {server} has no target</td>
<td>Task validation revealed that the task is missing a target</td>
</tr>
<tr>
<td>500</td>
<td>AEM_RUN_TASK_NO_FL_NOR_CDC</td>
<td>Replicate task {task} {server} cannot be run without at least one of the replication options enabled (Full Load, Apply Changes, or Store Changes).</td>
<td>Task validation of a unidirectional task revealed that the replication option definition for the task is missing (Full Load, Apply Changes, or Store Changes).</td>
</tr>
<tr>
<td>500</td>
<td>AEM_RUN_BIDI_TASK_NO_FL_NOR_CDC</td>
<td>Replicate task {task} {server} cannot be run without at least one of the replication options enabled (Full Load or Apply Changes).</td>
<td>Task validation of a unidirectional task revealed that the replication option definition for the task is missing (Full Load or Apply Changes).</td>
</tr>
</tbody>
</table>

**AemDeleteTask**

**Note** This method requires Replicate 5.5 or above.

**General**

<table>
<thead>
<tr>
<th>Title</th>
<th>AemDeleteTask</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>https[host]/attunityenterprisemanager/api/v1/servers/[server]/tasks/[task]/?action=delete&amp;deletetasklogs=[deletetasklogs]</td>
</tr>
<tr>
<td>Description</td>
<td>Deletes the specified task. The task's logs will be deleted only if deletetasklogs=true is specified in the URL.</td>
</tr>
<tr>
<td>HTTP Method</td>
<td>POST</td>
</tr>
<tr>
<td>Required User Role</td>
<td>Designer</td>
</tr>
</tbody>
</table>
## Request Parameters

<table>
<thead>
<tr>
<th>Location</th>
<th>Name</th>
<th>Required</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>host [string]</td>
<td>Yes</td>
<td>computer.network.net</td>
</tr>
<tr>
<td>URL</td>
<td>ServerName [string]</td>
<td>Yes</td>
<td>myrepsrv1</td>
</tr>
<tr>
<td>URL</td>
<td>TaskName [string]</td>
<td>Yes</td>
<td>SalesDBBackup</td>
</tr>
<tr>
<td>URL</td>
<td>deletetasklogs [bool]</td>
<td>Optional (default is false)</td>
<td>deletetasklogs=true</td>
</tr>
<tr>
<td>Header</td>
<td>EnterpriseManager.APISessionID [string]</td>
<td>Yes</td>
<td>wCo0_KvjEUFROvfHF5KGrw</td>
</tr>
</tbody>
</table>

## Response Body

```json
{
  "error_message":"
}
```

## Response Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>error_message</td>
<td>The description of the error</td>
</tr>
</tbody>
</table>

## cURL Example

**Request**

```bash
curl -i -k -X POST --header "EnterpriseManager.APISessionID: wCo0_KvjEUFROvfHF5KGrw" --header "Content-Length: 0" https://computer.network.net/attunityenterprisemanager/api/v1/servers/myrepsrv1/tasks/SalesDBBackup/?action=delete&deletetasklogs=true
```

**Response**

```text
HTTP/1.1 200 OK
Cache-Control: no-cache, no-store
Content-Length: 38
Content-Type: application/json; charset=utf-8
Server: Microsoft-HTTPAPI/2.0
Date: Mon, 26 Dec 2016 16:31:01 GMT
```
Payload:
{
  "error_message":"
}

Error response

<table>
<thead>
<tr>
<th>HTTP Code</th>
<th>AEM Code</th>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>AEM_TASK_NOT_FOUND</td>
<td>Replicate task {task} {server} could not be found.</td>
<td>The task name is unknown to AEM</td>
</tr>
<tr>
<td>500</td>
<td>AEM_DELETE_TASK_INNER_ERR</td>
<td>Replicate task {task} {server}: Error deleting the task.</td>
<td>Replicate experienced an error/exception when trying to delete the task</td>
</tr>
<tr>
<td>500</td>
<td>AEM_TASK_NOT_STOPPED</td>
<td>Replicate task {task} {server} needs to be stopped in order to be deleted.</td>
<td>The Replicate task must be stopped before it can be deleted.</td>
</tr>
</tbody>
</table>

AemExportAll

General

<table>
<thead>
<tr>
<th>Title</th>
<th>AemExportAll</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>https://{host}/attunityenterprisemanager/api/v1/servers/{ServerName}/?action=export</td>
</tr>
<tr>
<td>Description</td>
<td>Export all definitions from the replication server repository on the selected server (server settings, tasks, endpoints, and so on). The definitions are exported to a JSON file. Supported only with Replicate 5.2 and later.</td>
</tr>
<tr>
<td>HTTP Method</td>
<td>GET</td>
</tr>
</tbody>
</table>
| Required User Role | AEM: Admin  
|                 | Server: Admin  
|                 | All Tasks: Designer  
|                 | All Endpoints: Operator |
### Request Parameters

<table>
<thead>
<tr>
<th>Location</th>
<th>URL Param Name</th>
<th>Required</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>Host [string]</td>
<td>Yes</td>
<td>computer.network.net</td>
</tr>
<tr>
<td>URL</td>
<td>ServerName [string]</td>
<td>Yes</td>
<td>myrepsrv1</td>
</tr>
<tr>
<td>Header</td>
<td>EnterpriseManager.APISessionID [string]</td>
<td>Yes</td>
<td>wCo0_KvjEUFROvfHF5KGrw</td>
</tr>
</tbody>
</table>

### Response

#### JSON File

#### cURL Example

**Request**

```
cURL.EXE -i -k --header "EnterpriseManager.APISessionID: wCo0_KvjEUFROvfHF5KGrw"
computer.network.net/attunityenterprisemanager/api/v1/servers/myrepsrv1/?action=export
```

**Response**

JSON file (stream)

### Error Response

<table>
<thead>
<tr>
<th>HTTP Code</th>
<th>AEM Code</th>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td></td>
<td>AemExportAll is Supported only with Replicate 5.2 and later.</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>AEM_EXPORT_NO_PERMISSION_ON_TASK</td>
<td>Replicate (server '{0}')'s exports inaccessible task '{1}'.</td>
<td>Export all cannot be carried out because the user does not have permissions on one or more tasks.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_EXPORT_NO_PERMISSION_ON_ENDPOINT</td>
<td>Replicate (server '{0}')'s exports inaccessible endpoint.</td>
<td>Export all cannot be carried out because the user does not have permissions on one or more endpoints.</td>
</tr>
</tbody>
</table>
AemImportAll

General

<table>
<thead>
<tr>
<th>Title</th>
<th>AemImportAll</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>https://{Host}/attunityenterprisemanager/api/v1/servers/{ServerName}/?action=import</td>
</tr>
<tr>
<td>Description</td>
<td>Import the JSON definitions provided in the request body into the replication server repository on the selected server. Supported only with Replicate 5.2 and later. The ApiImportAll method uses &quot;merge&quot; semantics. In particular: All valid JSON definitions provided in the request body will be imported. This includes server settings, task settings, endpoints, and other definitions. Items that existed in the target server before the import and have no new JSON definition in the request body will not be modified and in particular will not be removed. This means that ApiImportAll provides no way of removing old definitions that are no longer needed.</td>
</tr>
<tr>
<td>HTTP Method</td>
<td>POST</td>
</tr>
</tbody>
</table>
| Required User Role | » AEM: Admin  
» Server: Admin  
» All Tasks: Designer  
» All Endpoints: Designer |

Request Parameters

<table>
<thead>
<tr>
<th>Location</th>
<th>Name</th>
<th>Required</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>Host [string]</td>
<td>Yes</td>
<td>computer.network.net</td>
</tr>
<tr>
<td>URL</td>
<td>ServerName [string]</td>
<td>Yes</td>
<td>myrepsrv1</td>
</tr>
<tr>
<td>Header</td>
<td>EnterpriseManager.APISessionID [string]</td>
<td>Yes</td>
<td>wCo0_KvjEUFROvF5KGrw</td>
</tr>
<tr>
<td>Body</td>
<td>A JSON document to import [stream]</td>
<td>Yes</td>
<td>localServer1.json</td>
</tr>
</tbody>
</table>

Response

JSON File (stream)
## cURL Example

```bash
cURL.EXE -i -k -X POST --header "EnterpriseManager.APISessionID: wCo0_KvjEURROvfHF5KGrw" --header "Content-Length: 110952" --header "Content-Type: application/json" "computer.network.net/attunityenterprise/api/v1/servers/myrepsrv1/?action=import" -T "C:\exports\localServer1.json"
```

## Response

```
HTTP/1.1 100 Continue
HTTP/1.1 200 OK
Cache-Control: no-cache, no-store
Content-Length: 0
Content-Type: application/json; charset=utf-8
Server: Microsoft-HTTPAPI/2.0
Date: Tue, 28 Feb 2017 19:05:12 GMT
```

## Error Response

<table>
<thead>
<tr>
<th>HTTP Code</th>
<th>AEM Code</th>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td></td>
<td>ApiImportAll is supported only with Replicate 5.2 and later.</td>
<td>Stream cannot be imported because the user does not have the permissions to add tasks.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_IMPORT_NO_PERMISSION_ON_TASK</td>
<td>Replicate {server '{0}'} import stream cannot import task '{1}'. User lacks permission to add tasks.</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>AEM_IMPORT_NO_PERMISSION_ON_ENDPOINT</td>
<td>Replicate {server '{0}'} import stream cannot import endpoint definitions. User lacks permission to insert endpoints.</td>
<td>Stream cannot be imported because the user does not have the permissions to add endpoints.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_IMPORT_CONTENT_EMPTY</td>
<td>Replicate (server '{1}') import stream contains no content.</td>
<td>Stream cannot be imported because it contains no content.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_IMPORT_INVALID_CONTENT</td>
<td>Replicate (server '{1}') import stream contains invalid content.</td>
<td>Stream cannot be imported because it contains invalid content.</td>
</tr>
</tbody>
</table>
AemReloadTable

General

<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>AemReloadTable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>URL</strong></td>
<td>https://{host}/attunityenterprisemanager/api/v1/servers/{server}/tasks/{task}/tables/?action=reload&amp;schema={schema}&amp;table={table}</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Reload a specific table.</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>The method returns with a success status even if the schema or table could not be found.</td>
</tr>
</tbody>
</table>

| **HTTP Method** | POST |
| **Required User Role** | Operator |

Request Parameters

<table>
<thead>
<tr>
<th><strong>Location</strong></th>
<th><strong>Name</strong></th>
<th><strong>Required</strong></th>
<th><strong>Example</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>Host [string]</td>
<td>Yes</td>
<td>computer.network.net</td>
</tr>
<tr>
<td>URL</td>
<td>ServerName [string]</td>
<td>Yes</td>
<td>myrepsrv1</td>
</tr>
<tr>
<td>URL</td>
<td>TaskName [string]</td>
<td>Yes</td>
<td>SalesDBBackup</td>
</tr>
<tr>
<td>URL</td>
<td>Schema [string]</td>
<td>Yes</td>
<td>dbo</td>
</tr>
<tr>
<td>URL</td>
<td>Table [string]</td>
<td>Yes</td>
<td>employeelist</td>
</tr>
<tr>
<td>Header</td>
<td>EnterpriseManager.APISessionID [string]</td>
<td>Yes</td>
<td>wCo0_KvjEUFROvfHF5KGrw</td>
</tr>
</tbody>
</table>

cURL Example

```
cURL.EXE -i -k -X POST --header "EnterpriseManager.APISessionID: wCo0_KvjEUFROvfHF5KGrw" --header "Content-Length: 0" "https://computer.network.net/attunityenterprisemanager/api/v1/servers/myrepsrv1/tasks/SalesDBBackup/tables/?action=reload&schema=dbo&table=employeelist"
```
Error Response

<table>
<thead>
<tr>
<th>HTTP Code</th>
<th>AEM Code</th>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>0</td>
<td>Cannot reload table because Full Load is not enabled for the task.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cannot reload table for remote tasks (with a source database type of File Channel).</td>
<td></td>
</tr>
</tbody>
</table>

AemExportTask

General

<table>
<thead>
<tr>
<th>Title</th>
<th>AemExportTask</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>https://{Host}/attunityenterprisemanager/api/v1/servers/{ServerName} tasks/{TaskName}/?action=export&amp;withendpoints={withendpoints}</td>
</tr>
<tr>
<td>Description</td>
<td>Export definitions from the selected task on the selected server. The definitions always include task settings, tables/table patterns (include/exclude), table settings and global transformations. The endpoint definition is only exported along with the task definition if with endpoints=true is specified in the URL. Supported only from Replicate 5.2 and later.</td>
</tr>
<tr>
<td>HTTP Method</td>
<td>GET</td>
</tr>
<tr>
<td>Required User Role</td>
<td>Designer</td>
</tr>
</tbody>
</table>
Request Parameters

<table>
<thead>
<tr>
<th>Location</th>
<th>Name</th>
<th>Required</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>Host [string]</td>
<td>Yes</td>
<td>computer.network.net</td>
</tr>
<tr>
<td>URL</td>
<td>ServerName [string]</td>
<td>Yes</td>
<td>myrepsrv1</td>
</tr>
<tr>
<td>URL</td>
<td>TaskName [string]</td>
<td>Yes</td>
<td>SalesDBBackup</td>
</tr>
<tr>
<td>URL</td>
<td>withendpoints [bool]</td>
<td>Yes</td>
<td>true/false</td>
</tr>
<tr>
<td>Header</td>
<td>EnterpriseManager.APISessionID [string]</td>
<td>Yes</td>
<td>wCo0_KvjEUFROvfHF5KGrw</td>
</tr>
</tbody>
</table>

Response

JSON File (stream)

cURL Example

**Request**
CURL.EXE -i -k --header "EnterpriseManager.APISessionID: wCo0_KvjEUFROvfHF5KGrw" computer.network.net/attunityenterprisemanager/api/v1/servers/myrepsrv1/tasks/SalesDBBackup/?action=export&withendpoints=true

**Response**
JSON file (stream)

Error Response

<table>
<thead>
<tr>
<th>HTTP Code</th>
<th>AEM Code</th>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td></td>
<td>AemExportAll is Supported only with Replicate 5.2 and later.</td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>AEM_EXPORT_TASK_NO_PERMISSION_ON_ENDPOINT</td>
<td>Replicate (server ' {0}' task '{1}' exports inaccessible endpoint.</td>
<td>Export all cannot be carried out because the user does not have permissions on one or more endpoints.</td>
</tr>
</tbody>
</table>
AemImportTask

General

<table>
<thead>
<tr>
<th>Title</th>
<th>AemImportTask</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>https://{Host}/attunityenterprisemanager/api/v1/servers/{ServerName}task/{task}/?action=import</td>
</tr>
</tbody>
</table>

**Description**
Import a single task's JSON definitions provided in the request body into the replication server repository on the selected server.

The ImportTask method enables importing all valid JSON definitions provided in the request body. This includes task settings, tables/table patterns (include/exclude), table settings and global transformations. Information about endpoints is included if it was included in the JSON file.

When you import a task, Items that existed in the target server before the import and have no new JSON definition in the request body are not modified and not removed. This means that ImportTask provides no way of removing old definitions that are no longer needed.

Supported only with Replicate 5.2 and later.

<table>
<thead>
<tr>
<th>HTTP Method</th>
<th>POST</th>
</tr>
</thead>
</table>
| Required User Role | Designer on relevant task

If endpoint definitions are included in the JSON definition, a user must also be Designer on the relevant endpoints

Request Parameters

<table>
<thead>
<tr>
<th>Location</th>
<th>Name</th>
<th>Required</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>Host [string]</td>
<td>Yes</td>
<td>computer.network.net</td>
</tr>
<tr>
<td>URL</td>
<td>ServerName [string]</td>
<td>Yes</td>
<td>myrepsrv1</td>
</tr>
<tr>
<td>URL</td>
<td>TaskName [string]</td>
<td>Yes</td>
<td>SalesDBBBackup</td>
</tr>
<tr>
<td>Header</td>
<td>EnterpriseManager.APISessionID [string]</td>
<td>Yes</td>
<td>wCo0_KvjEUFROvfHF5KGrw</td>
</tr>
<tr>
<td>Body</td>
<td>A JSON document to import [stream]</td>
<td>Yes</td>
<td>localServer1.json</td>
</tr>
</tbody>
</table>

Response

JSON File
### cURL Example

```bash
cURL.EXE -i -k -X POST --header "EnterpriseManager.APISessionID: wCo0_KvjEUFROvfHF5KGrw" --header "Content-Length: 3986" --header "Content-Type: application/json" "computer.network.net/attunityenterprisemanager/api/v1/servers/myrepsrv1/tasks/SalesDBBackup/?action=import" -T "C:\exports\SalesDBBackup.json"
```

### Response

<table>
<thead>
<tr>
<th>HTTP/1.1 100 Continue</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTTP/1.1 200 OK</td>
</tr>
<tr>
<td>Cache-Control: no-cache, no-store</td>
</tr>
<tr>
<td>Content-Length: 0</td>
</tr>
<tr>
<td>Content-Type: application/json; charset=utf-8</td>
</tr>
<tr>
<td>Server: Microsoft-HTTPAPI/2.0</td>
</tr>
<tr>
<td>Date: Tue, 28 Feb 2017 17:45:41 GMT</td>
</tr>
</tbody>
</table>

### Error Response

<table>
<thead>
<tr>
<th>HTTP Code</th>
<th>AEM Code</th>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>AEM_TASK_IMPORT_NO_PERMISSION_ON_ENDPOINT</td>
<td>ApiImportTask is supported only with Replicate 5.2 and later.</td>
<td>The task cannot be imported because it includes endpoint definitions, and the user does not have permissions to insert endpoints.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_TASK_IMPORT_CONTAIN_ALIEN_ITEMS</td>
<td>Replicate `{server '{0}' import stream cannot import task '{1}' with endpoint definitions. User lacks permission to insert endpoints.</td>
<td>The task cannot be imported because the stream contains items that cannot be imported (such as remote machines).</td>
</tr>
<tr>
<td>500</td>
<td>API_TASK_IMPORT_NAME_DIFFER</td>
<td>Replicate `{server '{1} import stream contains conflicting tasks.</td>
<td>The task cannot be imported because the stream contains conflicting tasks.</td>
</tr>
<tr>
<td>500</td>
<td>AEM_TASK_IMPORT_CONTAINS_MULTIPLE_TASKS</td>
<td>Replicate `{server '{1} import stream contains more than one task. The ImportTask method can only import a single task.</td>
<td>The task cannot be imported since the stream contains multiple tasks, and the method can only import a single task.</td>
</tr>
</tbody>
</table>
AemTestEndpoint

General

<table>
<thead>
<tr>
<th>Title</th>
<th>AemTestEndpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td><code>https://{host}/attunityenterprisemanager/api/v1/servers/{server} endpoints/{endpoint}?action=test&amp;timeout={timeout}</code></td>
</tr>
<tr>
<td>Description</td>
<td>Contact an endpoint to test connectivity and configuration (permissions, CDC configuration).</td>
</tr>
<tr>
<td>HTTP Method</td>
<td>GET</td>
</tr>
<tr>
<td>Required User Role</td>
<td>Operator</td>
</tr>
</tbody>
</table>

Request Parameters

<table>
<thead>
<tr>
<th>Location</th>
<th>Name</th>
<th>Required</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td>Host [string]</td>
<td>Yes</td>
<td><code>computer.network.net</code></td>
</tr>
<tr>
<td>URL</td>
<td>ServerName [string]</td>
<td>Yes</td>
<td><code>myrepsrv1</code></td>
</tr>
<tr>
<td>URL</td>
<td>EndpointName [string]</td>
<td>Yes</td>
<td><code>TargetSQL1</code></td>
</tr>
<tr>
<td>URL</td>
<td>Timeout [int32]</td>
<td>Optional (default is 60 sec)</td>
<td><code>60 (seconds)</code></td>
</tr>
<tr>
<td>Header</td>
<td>EnterpriseManager.APISessionID [string]</td>
<td>Yes</td>
<td><code>wCo0_KvJEUROvHF5KGrw</code></td>
</tr>
</tbody>
</table>

Response Body

```json
{
    "requeststate": "{enum requeststate_state}",
    "message": "",
    "detailed_message": ""
}
```
Response Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>state {enum endpoint_state}</td>
<td>The current state of the endpoint</td>
</tr>
<tr>
<td>message</td>
<td>Short description of the error</td>
</tr>
<tr>
<td>detailed message</td>
<td>Elaborate description of the error</td>
</tr>
</tbody>
</table>

cURL Example

c:\\Tools\curl>CURL.EXE -i -k --header "EnterpriseManager.APISessionID: wCo0_KvJEUFROvfHF5KGrw" "computer.network.net /attunityenterprise/manager/api/v1/servers/myrecsrv1/endpoints/TargetSQL1c/?action=test&timeout=60"

Response

HTTP/1.1 200 OK
Cache-Control: no-cache, no-store
Content-Length: 61
Content-Type: application/json; charset=utf-8
Server: Microsoft-HTTPAPI/2.0
Date: Sun, 19 Feb 2017 16:42:11 GMT

Payload:
{
    "state":"CONNECTED",
    "error_message":"
}

Error Response

<table>
<thead>
<tr>
<th>HTTP Code</th>
<th>AEM Code</th>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>AEM_TEST_ENDPOINT_CONNECTION_TIMEOUT</td>
<td>Replicate task {task} {server} test endpoint connection timeout</td>
<td>Connection was not established within 60 seconds.</td>
</tr>
</tbody>
</table>

Parameters

The following table lists all enum parameters used in the response body, along with their values.
<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Server State</strong></td>
<td>MONITORED</td>
<td>The server is being monitored, the AEM is connected and synchronized successfully.</td>
</tr>
<tr>
<td></td>
<td>ERROR</td>
<td>AEM fails to connect and monitor the server.</td>
</tr>
<tr>
<td></td>
<td>NOT_MONITORED</td>
<td>The server is not being monitored.</td>
</tr>
<tr>
<td><strong>Server Platform</strong></td>
<td>» WINDOWS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>» LINUX</td>
<td></td>
</tr>
<tr>
<td><strong>Task State</strong></td>
<td>RUNNING</td>
<td>The task is running.</td>
</tr>
<tr>
<td></td>
<td>STOPPED</td>
<td>The task has not been run yet or has stopped running at some point during the replication.</td>
</tr>
<tr>
<td></td>
<td>ERROR</td>
<td>The task has stopped due to a fatal error.</td>
</tr>
<tr>
<td></td>
<td>RECOVERING</td>
<td>The task has detected an error and is trying to recover. After a limited number of attempts, the task either recovers and the state returns to RUNNING, or the task fails and the state turns to ERROR.</td>
</tr>
<tr>
<td><strong>Task options</strong></td>
<td>full_load_enabled [bool]</td>
<td>Creates all files or tables at the target endpoint, automatically defines the metadata that is required at the target, and populates the tables with data from the source.</td>
</tr>
<tr>
<td></td>
<td>apply_changes_enabled [bool]</td>
<td>Updates all changes made to files and tables that were created during the full load. Applied changes include inserts, updates, and removal of items.</td>
</tr>
<tr>
<td></td>
<td>store_changes_enabled [bool]</td>
<td>Stores changes in Change tables. This value and the audit_changes_enabled value are mutually exclusive.</td>
</tr>
<tr>
<td></td>
<td>audit_changes_enabled [bool]</td>
<td>Stores changes in a single audit table. This value and the store_changes_enabled_value are mutually exclusive.</td>
</tr>
<tr>
<td><strong>Task Stop reason</strong></td>
<td>NONE</td>
<td>Indicates that a task is running and no Stop reason is prevalent.</td>
</tr>
<tr>
<td>Parameter Name</td>
<td>Value</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>NORMAL</td>
<td>Indicates that the task was stopped by the user.</td>
<td></td>
</tr>
<tr>
<td>RECOVERABLE_ERROR</td>
<td>Indicates that the task is still active, but that there is a temporary problem, such as a missing connection. As soon as the error state is resolved, Replicate restarts the task.</td>
<td></td>
</tr>
<tr>
<td>FATAL_ERROR</td>
<td>Indicates that the task stopped and the error must be resolved manually. The task cannot be started again until the error has been resolved.</td>
<td></td>
</tr>
<tr>
<td>FULL_LOAD_ONLY_FINISHED</td>
<td>Indicates that the task only finished full load.</td>
<td></td>
</tr>
<tr>
<td>STOPPED_AFTER_FULL_LOAD</td>
<td>Indicates that the task stopped after full load. Cached changes may or may not have been applied.</td>
<td></td>
</tr>
<tr>
<td>STOPPED_AFTER_CACHED_EVENTS</td>
<td>Indicates that the task stopped after cached changes were applied.</td>
<td></td>
</tr>
<tr>
<td>EXPRESS_LICENSE_LIMITS_REACHED</td>
<td>The task definition includes actions that are not included with Express license privileges.</td>
<td></td>
</tr>
<tr>
<td>STOPPED_AFTER_DDL_APPLY</td>
<td>Indicates that the task stopped after DDL statements were applied.</td>
<td></td>
</tr>
<tr>
<td>STOPPED_LOW_MEMORY</td>
<td>Indicates that the task stopped due to low memory.</td>
<td></td>
</tr>
<tr>
<td>STOPPED_LOW_DISK</td>
<td>Indicates that the task stopped due to low disk space.</td>
<td></td>
</tr>
<tr>
<td>Replication profile</td>
<td>UNIDIRECTIONAL</td>
<td>Data is replicated from a source to a target.</td>
</tr>
<tr>
<td></td>
<td>BIDIRECTIONAL</td>
<td>Changes to the source are replicated to the target, and vice versa.</td>
</tr>
<tr>
<td>Run options</td>
<td>RESUME_PROCESSING</td>
<td>Resumes task execution from the point that it was stopped.</td>
</tr>
<tr>
<td></td>
<td>RELOAD_TARGET</td>
<td>Re-starts the full-load replication process if the task was previously run.</td>
</tr>
<tr>
<td></td>
<td>RESUME_PROCESSING_FROM_TIMESTAMP</td>
<td>Starts the CDC replication task from a specific point.</td>
</tr>
<tr>
<td></td>
<td>RECOVER_USING</td>
<td>Recover a task using the recovery state stored</td>
</tr>
<tr>
<td>Parameter Name</td>
<td>Value</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Locally stored checkpoint</td>
<td>Locally in the task folder (located under the Data folder).</td>
<td></td>
</tr>
<tr>
<td>• Recover using checkpoint stored on target</td>
<td>Recover a task using the CHECKPOINT value from the attrep.txn_state table (created in the target database).</td>
<td>Note This option is only available if the Store task recovery data in target database option is enabled in the Changes Processing Tuning tab of the Task Settings dialog box.</td>
</tr>
<tr>
<td>Metadata only recreate all tables</td>
<td>Recreates the target tables defined for full load.</td>
<td></td>
</tr>
<tr>
<td>Metadata only create missing tables</td>
<td>Creates missing target tables, including Change Tables.</td>
<td></td>
</tr>
<tr>
<td>Request state</td>
<td>Success</td>
<td>Connection to endpoint is valid</td>
</tr>
<tr>
<td></td>
<td>Failure</td>
<td>Connection to endpoint is not valid</td>
</tr>
</tbody>
</table>