## Arbiter User Manual

Version 4.0

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## Overview

Audit trail collection tool.



### Arbiter is the ultimate tool for audit trail collection and management.

Audit trail is a sum of all information needed to present a histroical view of events related to the saved data and all the systems that collect, process and archive the data.

Audit trails must provide a way to present the time line of events related to any single business process and its data.

Information that audit trails provide must be sufficient to prove the credibility of the saved data. The creation and safekeeping of audit trails is of crucial importance to ensure its credibility and trustfulness.

Arbiter's main characteristics include:

- consolidation of audit trails coming from different applications and databases,
- collecting audit trails at the database level requires **no changes to the applications**,
- keeping track of all actions that happened at any event (logins, DDL, DML, DCL and TCL),
- collection and manageability of audit trail data separated from production data,
- pro-active system of detection and alarming of unauthorized insights and data manipulation,
- ability to answer the most relevant questions about an incident (Who?, What?, When?),
- using simple yet **powerful web GUI**.

## **User Interface**

## Login

Arbiter features web GUI application that users can use to work with Arbiter. Web GUI application can be accessed via web browser by entering the following URL:

```
https://<hostname>:8080/
```

Where <hostname> should be replaced with the hostname or IP address of your Arbiter server. After successfully accessing Arbiter's web application a login form is displayed and user is prompted to enter its credentials and select a database that they want to work with.

+ <b>A</b>	RBITER
Login	
Username	
Password	
Database	arbca
	Login
Support: dba@ Version: 4.0	abakus.si Abaku

Figure 1. Arbiter login form.

After entering all required data **Login** button should be pressed to proceed with login procedure. Correct credentials have to be entered to log in successfully otherwise errors indicating the issue are displayed. One Arbiter GUI can be used to connect to different Arbiter databases. If this is configured **Database** dropdown menu can be used to select which database Arbiter GUI will connect to.

## **User Interface Structure**

After a successful login main part of Arbiter's Graphical User Interface (GUI) is displayed.

Arbiter's GUI consists of multiple parts from top to bottom of the page:

- Title bar with Arbiter logo, navigation and user menu at top of the page.
- Notification area below the part showing general information.
- Main area taking up most of the screen. Through this part of GUI main Arbiter operations are performed.

• Copyright information below the main area.

### Logo and menus



Administration 🔻 rev\_admin@arbca

Figure 2. Title bar.

At the top of each page Arbiter logo is displayed on the left side of the screen. Clicking this logo displays the starting page of Arbiter GUI.



Figure 3. Administration menu.



Figure 4. User menu.

On the right side two dropdown menus are displayed:

- Administration dropdown menu with the following items:
  - Jobs to manage Arbiter's jobs.
  - Users to manage Arbiter's users and user groups.
  - Logs to overview Arbiter's logs.
  - **DB Links** to manage DB Links to databases monitored by Arbiter.
  - Settings to manage various Arbiter settings.
  - **Export** / **Import** exporting and importing preliminary data needed by arbiter to start collecting audit trails for a database.
  - GUI Sessions overview of Arbiter's GUI web sessions history.
- User menu called <username>@<database> (username and database were selected at login) with the following items:
  - My preferences for changing user's password, documentation language and e-main

notifications.

- Logout to log out of Arbiter GUI. Login form is displayed after logging out.
- Administration menu is only displayed if the current user has administrative NOTE privileges.

#### **My Preferences**

This page can be used to set current GUI user's preferences. These preferences are changed by each user separately.

Preierences
My Preferences
E-mail
E-mail warnings? FALSE
Language en 🔽
Language for documentation en
Save My Preferences
Change Password
Current Password *
New Password *
Confirm New Password *
Change My Password

Figure 5. User preferences.

Preferences are split into two parts. Preferences of each part are saved separately by clicking corresponding buttons:

#### • My Preferences:

- E-mail input field. Arbiter is able to send out e-mails to notify users when warnings happen. This input field is used for entering the e-mail address for receiving those e-mail messages.
- E-mail warnings? dropdown menu for enabling/disabling e-mail warning notification.
- Language dropdown menu for setting GUI language.
- Language for documentation dropdown menu for selecting documentation language.
- Save My Preferences button to save all settings of the My Preferences section.

NOTE for GUI and documentation only English language is available.

- Change password section to change current user's password:
  - Current Password input field to enter user's current password (mandatory).

- New Password input field for new password (mandatory).
- **Confirm New Password** input field to reenter new password (mandatory). Has to match **New password**.
- Change My Password button to save all values in Change Password section.

#### Notification area

This area is populated only when at least one notification is present. Notifications can be anything from messages that indicate that something is being done, to warnings and critical faults. Different levels of notifications are represented with different colors:

- Notification: blue.
- Warning: yellow.
- Critical: red.

+ ARBITER	Administration 🔻 rev_admin@arbca 🔻
Databases	
Completed: FRM_SCHEDULER.RUN_JOB	×
Supervisor Findings Run Supervisor Again	

Figure 6. A notification after manually running Supervisor job.

Individual non system notifications can be dismissed by clicking the sign on the right side of each notification bar.

### Main area

This part of GUI is used for most operations that are done with Backup server. By default list of Resources for the current user is displayed in this part of GUI after a successful login. More about user interfaces that are displayed in this part of GUI is explained in the following chapters of this user manual.

### **Copyright information**

At the bottom of every GUI page copyright information is displayed.

Copyright - Abakus Plus d.o.o. All Rights Reserved.

Figure 7. Copyright information.

## Databases

Arbiter keeps audit trails for various databases. This page is Arbiter's GUI homepage where basic information on these databases is displayed.

The page is separated into three sections:

- Supervisor Findings displaying information on status of Arbiter.
- Databases with list and status of databases audited by Arbiter.
- Top Space Consumers basic information on Arbiter disk space consumption.

Sections are described in the following chapters.

### **Supervisor Findings Section**

Supervisor is part of Arbiter monitoring its own health. It does so by running checks to monitor various system parameters. If parameter values exceed threshold values notifications are displayed in this section. The purpose of these notifications is to inform users and support personnel that certain manual actions are required.

Supervisor Findings				
Check Name	Status	Last Run	Message	
arb_scheduler_log	CRITICAL	2017-08-08 02:00:02	[1] job has failed status in their last run.	
arb_user_accounts	WARNING	2017-08-08 02:00:02	Found 4 OPEN user accounts in DBA_USERS, which should not be open because they are not interactive Arbiter users.	
arb_tables_registration	WARNING	2017-08-08 02:00:02	<ul><li>[4] tables have actions pending (register/unregister).</li></ul>	
Run Supervisor Again				

Figure 8. Supervisor Findings section.

Section is comprised of the following elements:

- List of Supervisor notifications in form of a table with the following columns:
  - Check name.
  - Status check severity.
  - $\circ~$  Last run date and time when check has run for the last time.
  - Message additional check information.
- **Run Supervisor Again** button **Run Supervisor Again** to manually starts supervisor job for the Arbiter to refresh Arbiter status information.

### **Databases Section**

Second section is a list of databases that Arbiter is keeping audit trail for. Database are represented in a table where each row stands for one database. Below the table information about Arbiter's disk space availability is displayed.

Databa	ses						
	#Database	Туре	Common Name		Watermark	AUD\$	Status
0	6	EXTERNAL_ORACLE	PROD	Analytics   Explore   Top Space	2017-08-07 11:26:20	N/A	0
0	5001	EXTERNAL_ORACLE	SIOUGC	Analytics   Explore   Top Space	2016-08-03 15:15:00	N/A	0
Space u Space u	sage for +DATA ( sage for +SSD d	diskgroup is at 53% (3928 G iskgroup is at 12% (108 GB)	В)		Re	gister New	Database

Figure 9. Databases section.

List of databases has the following information:

- Expand button •. Pressing this button offers administrative options for each database and only users with administrative privileges can access administrative options. These options are links:
  - **Unregister Database** link to open a dialog window asking for confirmation of database unregistration.
  - **Tables** link which opens a new page with a list of registered tables. More about this can be found in Table Registration chapter.
- **#Database** column with unique number of the database.
- Type of the database (oracle, mssql, ...)
- Common Name column with a friendly name for a database
- **Analytics** link that opens a new page for creating and running **Plan Query Testing** requests. More about this can be found in Analytics chapter.
- **Explore** link that opens a new page for creating and running various audit trail related queries. All audit trail queries, except for **Plan Query Testing** are created and run via this page. More about this can be found in Explore chapter.
- **Top Space** link that opens a new page displaying detailed top space consumers information. More about this can be found in Top Space Consumers Page chapter.
- Watermark column with date and time up until which revision trail has been processed for this database. Clicking this link opens a window called **High-Watermarks** displaying a list of various watermarks. High-watermarks is a list of jobs and their timestamps. These timestamps show to what time a certain job has processed revision trail data.

High-Watermarks		×
Watermark	Timestamp	
READ_ONLY	2014-07-29 00:00:00	
A_MULTILINE	2017-01-17 00:00:00	
A_MIN	2017-07-11 08:30:04	
WRITER	2017-07-11 08:30:04	
D_MINER_THREAD_1	2017-07-11 11:12:11	
D_MINER_LOW_SCN	2017-07-11 11:12:11	
D_MINER_RST_SCN	2017-07-11 11:12:11	

Figure 10. High-Watermarks window.

• AUD\$ with percentage of production database audit table saturation. This is only used and

displayed when Arbiter is directly connected (using database link) with production database to collect its audit trail and metadata.

**NOTE** This number should be low, if it exceeds 50% support personnel should be notified.

• Status icon 🔾 representing database status.

Below Databases table information showing disk space for all disk groups and a button to register a new databases are displayed:

- on the left side there is information showing disk space for all disk groups in the following format: Space usage for <DISKGROUP\_NAME> diskgroup is at <PERCENTAGE>% (<NUMBER\_OF\_GIGABYTES> GB).
- on the right side there is a button called **Register New Database Register New Database**. This button starts the procedure of registering a new database to the Arbiter so it can start collecting its revision trail information. This button is only available to administrators.

### **Top Space Consumers Section**

Because disk space critical Arbiter's resource a large part of home screen is reserved for displaying this information.



Figure 11. Top Space Consumers section.

**Top Space Consumers** section is a graph that shows how much disk space is taken up by a certain partition type each day in a set time period. At the top of the graph there is an input form that can be used to control what is displayed on the graph. The following parameters can be set using this form:

- From Date graph starting point. By default this value is set to one month backwards in time.
- To Date graph ending point. By default this value is set to today.
- **Partition Type** dropdown menu for selecting type of space consumers displayed. The following are available:

- -- All Partition Types -- to display information on all partition types.
- **A\$ (Audit Trail)** audit trail partition type information.
- **D\$ (Data Changes)** data changes (old and new values) partition type information.
- **X\$ (Other)** all other data (meta data).
- **Size Unit** represents units in which data is displayed. A dropdown menu offering: KB, MB, GB and TB.
- Refresh button **Refresh** to redraw the graph with currently set parameters.

Just below the graph information about data growth rate is displayed in the following format: **Growth rate is <SIZE\_1> [X]Bytes/day (<SIZE\_2> [X]Bytes in <NUMBER\_0F\_DAYS> days).** 

- <<u>SIZE\_1</u>> daily data growth rate.
- <<u>SIZE\_2</u>> data growth size during time period selected in input form.
- <NUMBER\_OF\_DAYS> total number of days in the time period selected via input form.
- [X] stands for units selected in the Size Unit dropdown menu.

NOTE

refreshing the homepage or clicking logo at the top of the page resets the values of the input form.

## **Analytics**

Sometimes information is needed whether a certain ID has been accessed in a certain time period and what user accessed it. These kind of queries are called **Plan Query Testing**.

Ana	lytics					
Creat	e					
	#ID	Туре	Name	Status	Created By	Created At
O	183	PLAN	PQT_3	CONFIGURED	REV_ADMIN	2017-07-11 14:02:25
0	182	PLAN	PQT_2	CONFIG_REQUIRED	REV_ADMIN	2017-07-11 14:02:14
0	181	PLAN	PQT_1	RUNNING	REV_ADMIN	2017-07-11 13:47:33

#### *Figure 12. Analytics page.*

This page allows creating and running Plan Query Testing analytics. Because these analytical queries can take a very long time to run and return results this page can also be used for monitoring their progress. Each created analytics job is represented by one row in the table. Each row has the following columns:

- Button to expand database **D**. Pressing this button offers an administrative options to drop the job represented by the row. This is a link called **Drop** pressing it instantly removes the selected job from the list.
- **#ID** unique job identifier.
- Type of job. This is always set to PLAN for analytics jobs.
- Name of job. This text is a link to a page that allows further query configuration or displays query status and results.
- Status of job. It can gave the following values:
  - CONFIGURE REQUIRED job has been created but configuration has not yet been locked.
  - CONFIGURED job's configuration has been locked and can't be changed.
  - RUNNING job has been started and is running.
- Created by username that this job was created by.
- Crated at job creation date and time.

Above the table a button called **Create** is located that can be used to start the procedure of creating a new analytics job.

### Creating a new analytics job

When button **Create** above the list of Analytic jobs is pressed a new window appears that allows new Analytics job creation called Create Analytics Job.

Create An	alytics Job	×
Database	6 PROD	
Туре	Plan Query Test 💌	
Name	PQT_2	
	Create	

Figure 13. Crate Analytics Job window.

The only setting that need to be configured in this step is setting a unique name for a job into the **Name** input field. After entering a name for the job to be created button **Create** has to be clicked and new job appears on the list of analytics jobs with the name entered into **Name** input field.

### Configuring and Running analytics job

When new analytics job is created its status is CONFIG\_REQUIRED meaning that it needs to be configured first. To open job configuration page job name text link has to be clicked on the list of analytics jobs. A new page appears titled **Analytics Job:** <**JOB\_NAME**>. This page allows for analytics job configuration and running.

## Analytics Job: PQT\_2

Overview		
Analytic ID	4	Date Begin
Туре	PLAN	Date Finish
State	CONFIG_REQUIRED	
Name	PQT_2	
	Rename	
Created By	REV_ADMIN	
Created At	2017-07-31 10:34:28	
Configurati	ion (PLAN)	
Table	HRAPP.EMPLOYEES	
Date From	2017-07-01 00:00:00	
Date To	2017-07-10 00:00:00	
Primary	у Кеу	
Save Con	figuration Lock Con	figuration • Results
Progress		
From		So Far %
То		ÊTA
So Far		
Start	Stop	

Figure 14. Analytics job configuration page.

Analytics configuration page is split into three sections:

- **Overview** section containing some basic analytics job information and an option to rename the job. It contains following elements:
  - Analytic ID text field with analytic job ID.
  - **Type** text field showing analytic job type.
  - State text field containing job status as described in Analytics chapter.
  - **Name** input field to set name for analytics job. This is the only value that can be configured in **Overview** section.
  - **Rename** button **Rename** to rename the current analytics job.
  - Created By text field containing username of user that created this analytics job.
  - Created At text field containing date and time when this analytics job was created.

- Date Begin text field containing date and time when this analytics job was started.
- **Date Finish** text field containing date and time when this analytics job has finished.
- Additional Info text field with additional information about this analytics job.
- **Configuration (PLAN)** section where all analytics job query configuration in performed. It contains following elements:
  - **Table** dropdown menu containing a list of tables that analytics jobs can be run on. Analytics job will be run against table selected from this menu.
  - **Date From** text field to set the beginning of the period for which the data will be queried.
  - **Date To** text field to set the end of the period for which the data will be queried.
  - **Primary Key** subsection containing **<PK\_NAME>** input field to enter primary key value that will be queried. **<PK\_NAME>** is primary key column name.
  - **Save Configuration** button **Save Configuration** to save current analytics job configuration. This job's configuration can be changed later.
  - **Save Configuration** button **Lock Configuration** to lock current analytics job configuration. After locking job's configuration it can not be changed any more.
  - **Results** dropdown menu **Results** to display analytics job results in two different fashions which are given as options within dropdown menu:

▼ Results
Detected Users
Reasons for Detection

Figure 15. Results dropdown menu.

- **Detected Users** menu option to display information about which primary keys a specific database user has accessed. After selecting this option **Results** tab of Explore procedure is shown containing results of analytics job. It is a simple list of all database usernames that accessed primary key in selected time period. More about this can be found in Analytics Job Template chapter.
- Reasons for Detection menu option to display information about which queries were run by specific database username accessing primary key. After clicking this button new window called Reasons for User Detection opens. This window features Username input filed to enter database username to query for and Reasons for Detection button Reasons for Detection to show results.

Reasons fo	r User Detection	
Username		
	Reasons for Detection	

Figure 16. Analytics job configuration page.

• **Progress** section which is informational section for running and stopping analytics jobs and displaying their progress. It contains the following items:

- **From** text field with date and time where analytics job started querying data. It can vary from date and time set in **Date From** input field in **Configuration (PLAN)** section.
- **To** text field with date and time up until which analytics job has queried data. It can vary from date and time set in **Date To** input field in **Configuration (PLAN)** section.
- **So Far** text field with date and time up until which analytics job has queried data.
- So Far % text field with information on query progress in percent.
- **ETA** text field with estimated time of analytics job completion.
- Progress bar to represent analytics job's progress graphically.
- **Start** button **Start** to start analytics job.
- **Stop** button **Stop** to stop analytics job.

## Explore

Explore page is used for digging through revision trail data in order to find out answers to certain audit trail related questions. These questions are queries within audit trail databases and their answers are results of this queries. Queries can be constructed and results displayed using Arbiter GUI. When this page is first opened it displays Partitions tab which is used to determine in what partitions and time period a query will run.

Explore			
Partitions	Parameters	Execution	Results
Select Partitions			
← Back			Next →
Partition Type	A: Audit Trail	ф (ф	
Date From			
Date To			
	Find Partition(s)		

Figure 17. Explore page - Partitions tab.

Only **Plan Query Testing** queries are constructed and ran through another interface, namely **Analytics** page, which is explained in Analytics chapter.

The Explore procedure is split into the follworing four steps:

- **Partitions:** in this step revision trail data sources are selected. Queries will be performed on this data.
- **Parameters**: this step is used for setting all revision trails query parameters.
- **Execution**: displays queries that will be performed on partitions and query execution time estimation.
- **Results**: displays revision trail query results.

### **Partitions tab**

First step in revision trail query construction is selecting which data will be used as data set to be queried. **Select Partitions** section offers the following input fields:

- Partition Type dropdown menu with the following items:
  - A: Audit Trail is standard Oracle audit trail data collected by Oracle Databases version 11.
  - **A: Unified Audit Trail** is standard Oracle audit trail data collected by Oracle Databases version 12.
  - D: Data Changes partition type containing information about data changes. Old and new

data values are stored and displayed.

- **SX: Sessions** is partition type that stores data about user sessions.
- **BG: Background Queries** are complex long running queries. This is why Arbiter enables creation of queries that can be ran in the background. Results of such queries are stored and can be accessed at later time via these partitions.
- **SP: Stored Parameters** to load previously stored audit trail query parameters. Arbiter audit trail query parameters can be stored for future use. Selecting this option offers a list of stored parameters to select from. Stored parameters also define which data partitons will be used as source for running revision trail queries. When stored parameters have to be run independedly form data partitions, stored parameters have to be selected in Parameters tab and required **A:**, **D:** or **SX:** partitons have to be selected in Partitons tab.
- Refresh button is only enabled when **BG**: **Background Queries** or **SP**: **Stored Parameters** partition type is selected.
- Date From input field to enter partitions starting date.
- **Date To** input filed to enter partitions ending date.

#### **Selecting partitions**

Different partition types require different parameters to be set to select data sets that queries will be performed on.

#### A: Audit Trail, A: Unified Audit Trail, D: Data Changes and SX: Sessions

These partition types require setting the following parameters: **Date From** and **Date To**. At least **Date From** has to be set to display partition list by clicking **Find Partition(s)** button **Find Partition(s)**. If **Date To** input field is empty the current date will be used.

After clicking **Find Partition(s)** button a list of available partitions is displayed at the bottom of the page.

Name	Date From	Date To	Last Analyzed	Number of Rows	Size in GB
A\$2017_07_01_00	2017-07-01 00:00:00	2017-07-02 00:00:00	2017-07-04 23:00:48	5608821	2.4
A\$2017_07_02_00	2017-07-02 00:00:00	2017-07-03 00:00:00	2017-07-05 23:00:23	5607620	2.43

Figure 18. List of available partitions.

For these partition types table representing list of available partitions shows the following columns:

- Checkbox for selecting partitions. Use title bar checkbox to select all partitions on the list.
- Name of partition.
- Date From starting date of data in this partition.
- Date To ending date of data in this partition.
- **Last Analyzed** showing when partiton has last been analysed. Arbiter has a job analyzing partitions. Time in this field tels when this job has analyzed the partition the last time. Only partitions older than three days are analyzed.
- Number of Rows number of data rows in this partition.

• Size in GB size of partition data in GB.

To select a partition check the checkbox in the first column of the partition list or check the checkbox in the title row to select all partitions on the list. After selecting partitions **Next** button **Next** → should be pressed to continue to the next step of **Explore** procedure.

#### BG: Background Queries and SP: Stored Parameters

These two types of partitions display lists of available partitions right after selecting **Partition Type**. For these two partition types only one partition from the list can be selected. This is why radio buttons are used for selecting desired partitions from the list.

#### When **BG: Background Queries** is selected the following options are available in partitions list:

		ID	Name	Status	Rows	Size GB
•		12	PROD_6.PQT_9_ST	COMPLETED	0	0.0
Drop	Additio	onal Info				
0		11	PROD_6.PQT_8_ST	COMPLETED	0	0.0
0	$\bigcirc$	10	PROD_6.PQT_7_ST	RUNNING	0	0.0

Figure 19. List of available partitions for BG: Background Queries partition type.

- Expand partition button **D** to display additional options:
  - **Drop** link to drop selected stored query results.
  - **Additional Info** link for displaying additional information about a background query that is still running.
- Radio button for selecting a partition.
- ID partition identifier.
- Name of partition.
- Status current partition status.
- Rows number of rows in this partition.
- Size in GB size of data in this partition in GB.

If a job with status COMPLETED is selected from the list and button **Next** is pressed, results for selected job are displayed on the **Results** tab of the **Explore** page.

When SP: Stored Parameters is selected the following options are available in partitions list:

		ID	Title	Created By	Created At
0	$\bigcirc$	21	BGQ_PQT_181_ST	REV_ADMIN	2017-07-11 14:03:43
0		2	BGQ_ivan123	REV_ADMIN	2017-07-07 15:47:22
0	•	1	IVAN	REV_ADMIN	2017-07-07 15:46:10
Drop					
0	$\bigcirc$	41	TEST-ABC123	REV_ADMIN	2017-07-17 13:39:59

Figure 20. Partitions list for SP: Stored Parameters.

- Expand partition button **D** to display additional options:
  - **Drop** link to drop selected stored parameters.
- Radio button for selecting a partition 🦲.
- Title of partition.
- Crated By user that this stored procedure was created by.
- Created At stored procedure creation time.

To select a partition select the radio button  $\bigcirc$  in the second column of the partition list and click **Next** button **Next**  $\rightarrow$  to continue to the next step of **Explore** procedure.

#### **Parameters tab**

Parameters tab is the second stage of Explore procedure. Here parameters for audit trail queries are set. This tab is the same for all partition types. Parts of this tab are different for different partition types.

Parameters	
← Back Load Parameters: ▼ Save Parameters U	Jpdate Parameters Next →
Template Table: PROD_6.D\$2017_07_26_00 Partition Count: 1	
Index Access Display Data Columns	
Index Name I_D\$2017_07_26_00_1  Select *ALL* columns Column Column	Options
NTIMESTAMP# = =	(iii)
Group By EMP_NAME	<b></b>
ONLAW Group Definition Options EMP_SALARY	<b></b>
OG_NAME     =     V     EMPTOTEES       PK_INDEX_1     =     V     Column	1
PK_INDEX_2 =   Function COUNT  Add Column Add Column	
Pre Filter Partitions         Column         ACTION_STR         •	
Add Group Filter Data Columns	
Additional Filter Column Filter	Options
Filter Definition Options Order By ENP_SALARY VALUE_UPDATED	<b></b>
No records found. Order Option No Order (random)	
Column ACTION_STR (STRING)	
Operator = V	
Value Add Column	
Add Filter	

Figure 21. Parameters tab for Data Changes data.

At the top of Parameters tab the following elements can be found:

- Back button Back to return to Partitions tab.
- Load Parameters dropdown menu to load previously stored parameters into Parameters tab

form. When loading Stored Parameters from **Parameters** tab, they are applied to partitions selected in **Partitions** tab. Stored Parameters can be loaded via **Partitons Tab** as well, but in those cases partitons are fixed to what was stored. This way of loading stored parameters is usefull when parameters have to be loaded independedly from source data partitions.

• Save Parameters button **Save Parameters** to store parameters for future use. Stored parameters can be used in the future by selecting them in the **Partitions** tab which is described in Partitions Tab chapter or via **Load Parameters** dropdown menu described above. When this button is pressed a new window called **Save Parameters** is opened. This window has one input field called **Parameters Title** where a friendly name is entered and a **Save Parameters** button **Save Parameters** to store the parameters.

Save Parameters		
Parameters Title		
	Save Parameters	

Figure 22. Save Parameters window.

- Update Parameters button Update Parameters to save parameter changes when stored parameters are used. If Stored Parameters were loaded in Partitons tab and other parameters were loaded via Load Parameters dropdown menu and Update Parameters button was pressed, parameters selected in Parameters tab will get updated.
- **Next** button Next  $\rightarrow$  to continue to the next stage of explore.
- **Template Table:** followed by the name of template table. Template table is one of the selected partition tables that is used to extract list of parameters from.
- Partition Count: followed by the number of selected partitions.

Parameters tab consists of the following sections:

- **Index Access** section to filter partitions that will be queried. This section only filters by indexed columns.
- Additional Filter section to filter partitions that will be queried as well but it only filters by non indexed columns.
- Column Selection section to modify the list of selected columns.
- Group By section for grouping query results.
- Order By section to sort query results.
- **Display Data Columns** section that controls which data columns will be displayed as **D: Data Changes** query results. Only available when **D: Data Changes** partition type is selected.
- Filter Data Columns section to filters data rows of D: Data Changes query results. Only available when D: Data Changes partition type is selected.

Sections are described in the following chapters.

#### **Index Access section**

This section consists of:

- **Index Name** dropdown menu for selecting an index. The default option is **\*\* Full table scan \*\*** meaning that no filtering will be done. When value different from **\*\* Full table scan \*\*** is selected a list of indexed columns is displayed below the dropdown menu. Entering values into the list will filer query results. One or more filters can be entered. Each row of the list contains the following elements:
  - Column name a string representing name of the column to filter by.
  - Operator an operator for creating a where condition. The following are available: =, !=, >,
     >=, <, ←, IS NULL and IS NOT NULL.</li>
  - Value an input field to enter a string to filter by.
- **Pre Filter Partitions** button **Pre Filter Partitions** to filter out the partitions that don't meet the entered filters requirements. This can speed up the final query.



Figure 23. Index Name dropdown menu.

Descriptions of individual partition data columns can be found in **Partition data columns** chapter.

#### **Additional Filter section**

Addition	al Filter	
Filter D	efinition	Options
CLIENT	ID = 11	
Column Operator Value	COMMENT_TEXT (STRING)	
	Add Filter	

Figure 24. Additional Filter section.

This section is the continuation of the previous and can be used to enter additional data filtering conditions, but only on unindexed columns.

This section consists of the following elements:

- List of defined filters
- Column selection dropdown menu

- Operator selection dropdown menu
- Value input field
- Add Filter button Add Filter to add the entered filter condition to the list of defined filters.

Descriptions of individual partition data columns can be found in Partition data columns chapter.

#### **Column Selection section**

Column Selection
✓ Select *ALL* columns

Figure 25. Column Selection section collapsed.

By default all partition data columns are included in query results. To change this setting and display additional options of this section checkbox **Select** \\***ALL** columns\* has to be unchecked. When this checkbox is unchecked, section expands as displayed on the following screenshot:

Column Selection	
Select *ALL* columns	
Only DISTINCT values	
Column	Options
ACTION_STR	
IS_ROLLBACK	<b></b>
СВА	<b>a</b>
Column COMMIT_SCN   Add Column	

Figure 26. Column Selection section expanded.

This section in its expanded form consists of the following elements:

- Select \*ALL\* columns checkbox check it to collapse the section.
- Table with a list of columns to be included in the results. Table has the following columns:
  - Column selected column name.
  - $\circ$  Delete button 💼 to remove the column from the list.
- **Column** dropdown menu containing a list of all partition columns that have not yet been added to the list.
- Add Column button Add Column to add the selected column to the list.

Descriptions of individual partition data columns can be found in Partition data columns chapter.

#### **Group By section**

This section allows grouping of query results to performing some mathematical operations on

partition data.

Group By	
Group Definition	Options
MIN (NTIMESTAMP#)	
COUNT	
Function SUM  Column ACTION_STR	
Add Group Grouping will be slow due to data selection/filter	

Figure 27. Group By section.

Section contains the following elements:

- table containing a list of defined group definitions with the following columns:
  - Group Definition column contains description of group definition
  - Delete button 💼 to remove group definition.
- Function dropdown menu with the following functions:
  - COUNT counts all rows of selected partitions. No column can be selected for this function.
  - SUM calculates sum of all values for selected column.
  - AVG calculates average value for selected column.
  - MIN calculates minimal value for selected column.
  - MAX calculates maximal value for selected column.
- **Column** dorpdown menu to select partition data column that function will be performed on. When function COUNT is selected this dropdown menu is disabled.
- Add Group button Add Group to add the configured group definition to the list.

WARNING	Grouping will be slow due to data selection/filter. Because grouping is costly operation queries that use grouping will run slower.
WARNING	Grouping will override selected ALL column list. When grouping is used and <b>Select ALL columns</b> checked, grouping will override this setting.

Descriptions of individual partition data columns can be found in Partition data columns chapter.

#### Order By section

Query results are returned without any specific order. Result data can be sorted by using options of this section.

Order By	
Order Option	No Order (random)

Figure 28. Order By section.

Section in its default state consists of one dropdown menu called **Order Option** with the following values:

- No Order (random) the default option.
- By Index results will be ordered by the index.
- Custom Order this option allows the creation of custom order configurations. When this option is selected section expands and contains the following additional elements:
  - $\circ~$  Table representing a list of order definitions with the following columns:
    - **Ord** order ID stands for the sequence in which order definitions will be applied.
    - **Order Definition** string representing order definition that is composed from column name and sort direction.
    - **Options** buttons:
      - Move up button 💼 to move order definition to higher position.
      - Move down button 🕢 to move order definition to lower position.
      - Delete button 
         to delete order definition.
  - **Column** dorpdown menu with a list of available partition data columns.
  - Ascending dropdown menu to select sort direction. The following values are available:
    - ASC- results will be sorted in ascending order
    - DSC result will be sorted in descending order
  - Add Order button Add Order to add order definition to the list.

Order By			
Order Optio	n Custom Order		
Ord	Order Definition	Options	
No records found.			
Column	ACTION_STR 🔻		
Ascending	ASC		
	Add Order		

Figure 29. Order By section expanded - when Custom Order is selected.

Descriptions of individual partition data columns can be found in Partition data columns chapter.

#### **Display Data Columns section**

This section can only be used for **D: Data Changes** partitions. Data changes partitions store old and new values of production databases. Consequently containing production data. In this section display of production data in result sets can be controlled. Because tables that are subjects of audit trailing usually contain many attributes, by default no production columns are displayed in query results.

Display Data Columns	
Column	Options
EMP_NAME	
SALARY	
Column Add Column	

Figure 30. Display Data Columns section.

This section contains the following elements:

- Table representing a list of data columns that will be displayed in the results, with the following columns:
  - Column data column name
  - Delete button 💼 to delete display column.
- Column input field data column name should be entered here.
- Add Column button Add Column to add data column to the list.

#### Filter Data Columns section

This section can only be used for **D: Data Changes** partitions. Data changes partitions store old and new values of production databases. Consequently containing production data. In this section display of production data in result sets can be filtered.

Filter Data Columns	
Column Filter Definition	Options
SALARY > 100	
Column Operator =  Value Add Column	

Figure 31. Filter Data Columns section.

This section contains the following elements:

- Table representing a list of data column filters, with the following columns:
  - Column Filter Definition filter definition in the following format: <COLUMN\_NAME> <OPERATOR> <VALUE>
  - Delete button 💼 to delete column filter.
- Column input field data column name should be entered here.
- **Operator** selection dropdown menu. The following operators are available: =, !=, LIKE, NOT LIKE, REGEXP\_LIKE, IS NULL, IS NOT NULL and VALUE\_UPDATED. VALUE\_UPDATED filter shows only revision trail entries for which value of **Column** has changed.
- Value input field to enter the value to be combined with the operator. When IS NULL, IS NOT NULL or VALUE\_UPDATED oprator is selected this input field is disabled.
- Add Column button Add Column to add data column filter to the list.

#### Partition data columns

Partitions that will be queried can be filtered before running audit trail queries on data within them. Audit trail queries often have to dig through large amounts of data causing them to be very time consuming. This is why it is recommended to reduce the data that Arbiter has to search through as much as possible. Arbiter enables this via filtering partitions data. Different partition types have different partition columns. The first table contains a list of columns available for **A: Audit Tail** or **A: Unified Audit Trail** partition types and the second one columns for **D: Data Changes** partition types. Explore procedure results can be modified by selecting result columns, grouping and ordering results. In this operations partition data columns are used as well.

Column name and partition types	Description
ACTION (NUMBER)	Numeric action type code.
ADMIN_OPTION (STRING)	Indicates whether the role or system privilege was granted with the ADMIN option
CLIENT_ID (STRING)	Client identifier in each Oracle session
CLIENT_IP (STRING)	Name of the object affected by the action
CLIENT_PROGRAM (STRING)	Obsolete
COMMENT_TEXT (STRING)	Text comment on the audit trail entry, providing more information about the statement audited. Also indicates how the user was authenticated.
ENTRYID (NUMBER)	Numeric ID for each audit trail entry in the session
GLOBAL_UID (STRING)	Global user identifier for the user, if the user has logged in as an enterprise user
GRANTEE (STRING)	Name of the grantee specified in a GRANT or REVOKE statement
INSTANCE_NUMBER (NUMBER)	Instance number as specified by the INSTANCE_NUMBER initialization parameter
LOB_MARKER (NUMBER)	Obsolete

Table 1. A: Audit Tail or A: Unified Audit Trail partition types data columns table.

Column name and partition types	Description
LOGOFF_TIME (DATE)	Date and time of user log off
MSSQL_CREATED (DATE)	Obsolete
MSSQL_LOGIN (STRING)	Obsolete
NEW_NAME (STRING)	New name of the object after a RENAME or the name of the underlying object
NEW_OWNER (STRING)	Owner of the object named in the NEW_NAME column
NTIMESTAMP# (DATE)	Timestamp of the creation of the audit trail entry (timestamp of user login for entries created by AUDIT SESSION) in UTC (Coordinated Universal Time) time zone (STRING)
OBJ_NAME (STRING)	Name of the object affected by the action
OBJ_PRIVILEGE (STRING)	Object privileges granted or revoked by a GRANT or REVOKE statement
OS_PROCESS (STRING)	Operating System process identifier of the Oracle process
OS_USERNAME (STRING)	Operating system login username of the user whose actions were audited
OWNER (STRING)	Creator of the object affected by the action
PREFIX (STRING)	Obsolete
PRIV_USED (STRING)	System privilege used to execute the action
PROXY_SESSIONID (NUMBER)	Proxy session serial number, if an enterprise user has logged in through the proxy mechanism
RETURNCODE (NUMBER)	Oracle error code generated by the action. Some useful values: 0 - Action succeeded, 2004 - Security violation.
REV_SESSION_ID (NUMBER)	Numeric ID for each Oracle session unique for complete revision trail.
REV_SESSION_TS (DATE)	Session start timestamp.
REV_SOURCE (STRING)	Audit trail log filename that audit trail record is located in.
REV_TRANSACTION_ID (STRING)	Transaction identifier of the transaction in which the object is accessed or modified, unique for complete revision trail.
REV_TRANSACTION_TS (DATE)	Transaction start timestamp.
SCN (NUMBER)	System change number (SCN) of the query
SESSIONID (NUMBER)	Numeric ID for each Oracle session
SES_ACTIONS (STRING)	Session summary (a string of 16 characters, one for each action type in the order ALTER, AUDIT, COMMENT, DELETE, GRANT, INDEX, INSERT, LOCK, RENAME, SELECT, UPDATE, REFERENCES, and EXECUTE. Positions 14, 15, and 16 are reserved for future use. The characters are: None, S - Success, F - Failure, B - Both.
SQL_BIND (STRING)	Bind variable data of the query
SQL_BIND_CLOB (STRING)	Bind variable data of the query when bind string is longer than 2000 characters

Column name and partition types	Description
SQL_BIND_LEN (NUMBER)	SQL_BIND or SQL_BIND_LEN variable length
SQL_TEXT (STRING)	SQL text of the query
SQL_TEXT_CLOB (STRING)	SQL text of the query when string is longer than 2000 characters
SQL_TEXT_LEN (NUMBER)	SQL_TEXT or SQL_TEXT_CLOB length
STATEMENT_ID (NUMBER)	Numeric ID for each statement run
SYS_PRIVILEGE (STRING)	System privileges granted or revoked by a GRANT or REVOKE statement
TERMINAL (STRING)	Identifier of the user's terminal
TRANSACTION_ID (STRING)	Transaction identifier of the transaction in which the object is accessed or modified
USERHOST (STRING)	Client host machine name
USERNAME (STRING)	Name (not ID number) of the user whose actions were audited

Table 2. D: Data Changes partition	type data columns table.
------------------------------------	--------------------------

Column name and partition types	Description
ACTION_STR (STRING)	Numeric action type code.
CBA (NUMBER)	Indicates whether the role or system privilege was granted with the ADMIN option
COMMIT_SCN (NUMBER)	Client identifier in each Oracle session
IS_ROLLBACK (NUMBER)	Name of the object affected by the action
MULTILINE_CONTINUE (NUMBER)	Obsolete
MULTILINE_GROUP (STRING)	Text comment on the audit trail entry, providing more information about the statement audited. Also indicates how the user was authenticated.
MULTILINE_ORDER (NUMBER)	Numeric ID for each audit trail entry in the session
NTIMESTAMP# (DATE)	Timestamp of the creation of the audit trail entry (timestamp of user login for entries created by AUDIT SESSION) in UTC (Coordinated Universal Time) time zone (STRING)
OBJ_NAME (STRING)	Name of the object affected by the action
OPERATION_CODE (NUMBER)	Instance number as specified by the INSTANCE_NUMBER initialization parameter
OWNER (NUMBER)	Creator of the object affected by the action
PK_INDEX_1 (NUMBER)	Date and time of user log off
PK_INDEX_2 (NUMBER)	Obsolete
PREFIX (STRING)	Obsolete

Column name and partition types	Description
RESET_SCN (NUMBER)	New name of the object after a RENAME or the name of the underlying object
REV_SESSION_ID (NUMBER)	Numeric ID for each Oracle session unique for complete revision trail.
REV_SESSION_TS (DATE)	Session start timestamp.
REV_SOURCE (STRING)	Audit trail log filename that audit trail record is located in.
REV_TRANSACTION_ID (STRING)	Transaction identifier of the transaction in which the object is accessed or modified, unique for complete revision trail.
REV_TRANSACTION_TS (DATE)	Transaction start timestamp.
SCN (NUMBER)	System change number (SCN) of the query
SESSIONID (NUMBER)	Numeric ID for each Oracle session
SESSION_INFO (STRING)	Timestamp of the creation of the audit trail entry (timestamp of user login for entries created by AUDIT SESSION) in UTC (Coordinated Universal Time) time zone (STRING)
SQL_REDO (STRING)	Object privileges granted or revoked by a GRANT or REVOKE statement
SQL_REDO_MULTI (STRING)	Operating System process identifier of the Oracle process
TRANSACTION_ID (STRING)	Transaction identifier of the transaction in which the object is accessed or modified
USERNAME (STRING)	Name (not ID number) of the user whose actions were audited

Table 3. SX: Sessions partition type data columns table.

Column name and partition types	Description
COMMENT_TEXT (STRING)	Text comment on the audit trail entry, providing more information about the statement audited. Also indicates how the user was authenticated.
RETURNCODE (NUMBER)	Oracle error code generated by the action. Some useful values: 0 - Action succeeded, 2004 - Security violation.
REV_LOGOFF (DATE)	Date and time of session log off
REV_SESSION_ID (NUMBER)	Numeric ID for each Oracle session unique for complete revision trail.
REV_SESSION_TS (DATE)	Session start date and time.
REV_SOURCE (STRING)	Audit trail log filename that audit trail record is located in.
SESSIONID (NUMBER)	Numeric ID for each Oracle session
USERNAME (STRING)	Name (not ID number) of the user whose actions were audited

## **Execution tab**

This tab displays detailed information about query, how it will run and how results will be displayed.

Execution			
← Back			Background Execution         Download Report         Next →
Partitions Summary Selected 1 partitions holding 0 GB of data (estimated 0 rows).			Template Selection Template D: Old/New Values
SQL Plan Summary			
Cardinality MegaBytes	Cost	Time	SQL Script
4 0	2	1	Copy to Clipboard
SQL Plan Table         Copy to Clipboard         Plan hash value: 782320690         1       1       Operation       Name         1       1       SORT AGGREGATE       Name         1       1       SORT AGGREGATE       Name         2       XPATH EVALUATION       Name       Name         3       SORT AGGREGATE       Name       Name         4       XPATH EVALUATION       Name       Name         7       SORT AGGREGATE       Name       Name         8       TORES KIP SCAN       I Dozol 7.00 mm       Name         1       NDEX SKIP SCAN       I Dozol 7.00 mm       Name         2       filter("P2", "C D15" - SPR NAME")       Name       Name         4       filter("P1", "C D15" - SERN NAME")       Name       Name       Name         10       acccess ("OWHER"=SILON MIN ON DO "OBJ NAME"=	Rows   Bytes   4   1528   1   4   1   528 07.00,1   4   1528 ]:	Cost (%CPU) Time   2 (0) 00:00:01 2 (0) 00:00:01 1 (0) 00:00:01 1 (0) 00:00:01	<pre>SELECT extract(rev_dist, '/200/COL[gename="EPP_NAME"]/OLD/text()').getStringVal() as 0 EVE_NAME; extract(rev_dist, '/200/COL[gename="SALARY"]/OLD/text()').getStringVal() as 0 SALARY, extract(rev_dist, '/200/COL[gename="SALARY"]/OLD/text()').getStringVal() as n_SALARY, ACTION_STR, CBA, CGA, CGA, CGA, CGA, CGA, CGA, CGA, CG</pre>

Figure 32. Execution tab.

Execution tab consists of the following elements:

- Main section called **Execution** that contains control buttons and other sections. At the top of this section the following Explore procedure control buttons are located:
  - Back button + Back to return to Parameters tab.
  - **Background Execution** button **Background Execution** to run query in the background and not interrupt GUI operation. Some queries can take a long time to execute. By default while queries are running Arbiter GUI displays a status window showing query execution progress and no other operations can be done using Arbiter GUI. This is why background execution is available to run comprehensive queries in the background. When this button is pressed a new window called **Background Execution** appears. This window consist of following elements:
    - Input field Background Query Name to enter a name for this background job so it can be identified on the list of running background queries on the Partitions tab of Explore page.
    - Checkbox **Collect Statistics** to select whether statistics are to be collected for this background job.
    - Run Background Query button Run Background Query to run the job in the background, close Background Execution window and return Arbiter GUI to Partitions step of Explore procedure. After a background query is started it is queued up with other background queries and displayed as one of BG: Background Queries partitions as explained in Partitions tab chapter.

Background Execution		×
Background Query Name	bg-job-1	
Collect Statistics	✓	
	Run Background Query	

Figure 33. Background Execution window.

- **Download Report** button **Download Report** to open a window called **Download Report** which allows download of query results to a file. **Download Report** window consists of the following elements:
  - Report Format dropdown menu to select a desired file format.
  - **Download Report** button **Download Report** to initiate download of results file.
- Next button Next → to proceed to the next step of Explore procedure. When this button is pressed query execution begins. During query execution time a new window called Query Execution Progress is displayed. This window automatically closes and Results tab is displayed when query execution finishes.
  - **Partitions Summary** section basic information about the partitions that query will run on.
  - SQL Plan Summary section basic information about query execution plan.
  - SQL Plan Table section SQL query execution plan table.
  - **Template Selection** section for selecting template that will be used to display query results.
  - SQL Script section SQL query that will be run.

#### **Partitions Summary section**



Figure 34. Partitions Summary section.

This section displays basic selected partitions information in a single row in the following format:

Selected **<NUMBER\_OF\_PARTITIONS>** partitions holding **<SIZE\_OF\_DATA>** GB of data (estimated **<NUMBER\_OF\_ROWS>** rows).

Where parameters stand for:

- <NUMBER\_OF\_PARTITIONS> number of partitions to query
- <**SIZE\_OF\_DATA**> size of partition data to be queried
- <NUMBER\_OF\_ROWS> number of rows in partitions to query

#### **SQL Plan Summary section**

SQL Plan Summary					
Cardinality	MegaBytes	Cost	Time		
324	0.08	23	1		

#### Figure 35. SQL Plan Summary section.

Displays summary of SQL execution plan in a table with parameters:

- Cardinality number of predicted rows in result set
- MegaBytes estimation of amount of data to be queried
- Cost Oracle CPU cost estimation
- Time estimated time of query execution in seconds

#### **SQL Plan Table section**

SQL Plan Table							
Copy to Clipboard							
Plan hash value: 782320690							
Id   Operation	Name	Rows	Bytes	Cost (	%CPU)	Time	
0   SELECT STATEMENT     1   SORT AGGREGATE    * 2   XPATH EVALUATION		4	1528   4	2	(0)	00:00:01	
3   SORT AGGREGATE  * 4   XPATH EVALUATION		1	4	   	ļ		
5   SORT AGGREGATE  * 6   XPATH EVALUATION		1	4				
7   SORI AGGREGAIE    * 8   XPATH EVALUATION     9   TABLE ACCESS BY INDEX ROWID	D\$2017 08 07 00	1	4     1528		(0)   (0)	00.00.01	
* 10   INDEX SKIP SCAN	I_D\$2017_08_07_00_1	4	1520	1	(0)	00:00:01	
<pre>Predicate Information (identified by operation id): 2 - filter("P3"."C_01\$"='EMP_NAME') 4 - filter("P2"."C_01\$"='EMP_NAME') 6 - filter("P1"."C_01\$"='SALARY') 8 - filter("P"."C_01\$"='SALARY') 10 - access("OWNER"=:BIND_WH_0 AND "OBJ_NAME"=:BIND_WH_1) filter("OWNER"=:BIND_WH_0 AND "OBJ_NAME"=:BIND_WH_1)</pre>							

Figure 36. SQL Plan Table section.

This section displays Oracle's SQL query execution plan. Plan's text can be copied by clicking on **Copy to clipboard** link at the top of the section.

#### **Template Selection section**



Figure 37. Template Selection section.

Arbiter uses templates to display query results. Templates are usually predefined and fixed based

on selected partition type. In those cases **Template** dropdown menu is disabled and option **Generic** is selected. Only when the following conditions are met, template can be changed:

- partition type **D: Data Changes** is selected
- the following partition data column filters are set in **Parameters** tab: **OWNER** and **OBJ\_NAME**

If above conditions are met, template dropdown menu is enabled and the following options are available:

- D: Old/New Values this template is specially designed to display the selected columns old and new values. D: Data Changes partitions are specifically designed to store data change information and thus need a different template to display these changes. Each partition row holds information about old/new values for all registered columns, but only columns that have been selected in Display Data Columns section of **Parameters** tab will be displayed in results.
- Generic used for all other partition types

Template	D: Old/New Values	•	
	D: Old/New Values		ł
SQL Scrip	Generic		ĺ

Figure 38. Template Selection dropdown menu.

#### **SQL Script section**

This section contains SQL statement constructed through various steps of **Explore** procedure. This SQL query will run against Arbiter's database. SQL script text can be copied by clicking on **Copy to clipboard** link at the top of the section.

SQL Script	
Copy to Clipboard	
SELECT	<pre>extract(rev_data, '/ROW/COL[@name="EMP_NAME"]/OLD/text()').getStringVal() as o_EMP_NAME, extract(rev_data, '/ROW/COL[@name="SALARY"]/NEW/text()').getStringVal() as o_SALARY, extract(rev_data, '/ROW/COL[@name="SALARY"]/NEW/text()').getStringVal() as n_SALARY, ACTION_STR, CBA, COMMIT_SCN, IS ROLEBACK, MULTILINE_CONTINUE, MULTINE_CONTINUE, MULTINE_CONTINE, MULTINE_CONTINE, MULTINE_CONTINE, MULTINE_CONTINE, MULTINE, MULTINE, MULTINE, MULTINE, MULTINE, MULTINE,</pre>
FROM (	PARTITION_SPEC
SEECT	<pre>qa.*, rowidtochar(qa.rowid) rid, 'PROD_6.D\$2017_08_07_00' partition_spec FROM PROD_6.D\$2017_08_07_00 qa WHERE 0WNER = :bind_wh_0 AND OBJ_NAME = :bind_wh_1 ) q</pre>

Figure 39. SQL Script section.

#### **Query Execution Progress window**

When button **Next**  $\rightarrow$  to proceed to the next step of Explore procedure is pressed query execution begins. During this time a new window called **Query Execution Progress** is displayed. This window automatically closes and **Results** tab is displayed when query execution finishes.

Query Execution Progress							
INST_ID	SID, SERIAL#	EVENT					
1	164,46727,@1	SQL*Net message from client					
TARGET	SOFAR / TOTALWORK	PROGRESS					
	/						
** ABORT **							

Figure 40. Query Execution Progress window.

Information displayed in **Query Execution Progress** window:

• INST\_ID - ID of node running the query.

- **SID**, **SERIAL**# Identifier and serial number of the session processing the long-running operation. If multiple sessions are cooperating in the long-running operation, then SID and SERIAL# correspond to the main or master session.
- **EVENT** Resource or event for which the session is waiting. It explains what query is currently doing.
- TARGET Object on which the operation is carried out.
- **SOFAR** / **TOTALWORK** Units of work done so far for the operation specified in the OPNAME column / Total units of work for the operation specified in the OPNAME column.
- **PROGRESS** Audit trail query progress in %.

### **Results tab**

Last step of Explore procedure is presentation of audit query results. At the top of the **Results** main section two buttons are located:

- Back button Back to go to the previous step of Explore procedure.
- Disabled button Next. This button is disabled because this is the last step of Explore procedure.

Explore			
- 0	2	3	4
Partitions	Parameters	Execution	Results
Results			
← Back			Next →

Figure 41. Results tab.

Each different partition type uses different template to display query results. By partition type the following result templates can be displayed:

- A: Audit Trail and A: Unified Audit Trail can use two different templates:
  - A\$ Standard specially designed to display Oracle's audit trail information
  - **Generic** shows more partition data columns and less data query information
- D: Data Changes can use two different templates as explained in Template Selection section chapter:
  - D: Old/New Values template that displays data changes for selected data columns
  - $\circ~$  **Generic** shows partition data columns, without actual data change values
- SX: Sessions template to display database user session information

In the following chapters above mentioned templates are described in more detail.

#### Audit Trail Standard template

Two different templates can be used to display standard Oracle's audit trail query information. By default A\$ Standard template type is selected. This template is recommended for displaying standard audit trail results as it shows more data query details.

2017-08-06 08:15:02	HRAPP	EMPLOYEES	JEFF	oracle				
<pre>select count(*) from employees where emp_name = :v_name</pre>								
Audit Details Bind V	/ariables Download Sta	tement						
2017-08-06 08:15:02	HRAPP	EMPLOYEES	JEFF	oracle				
insert into employees insert into employees	insert into employees (emp_id, emp_name, emp_salary) values (:v_id, :v_name, :v_salary) insert into employees (emp_id, emp_name, emp_salary) values ('6'_id, 'Becky'_name, '7000'_salary)							
Audit Details Bind V	/ariables Download Sta	tement						
2017-08-06 08:15:02	HRAPP	EMPLOYEES	JEFF	oracle				
update employees set en	mp_salary = :v_salary whe	re emp_name like :v_name						
Audit Details Bind Variables Download Statement								
2017-08-06 08:15:02 HRAPP EMPLOYEES JEFF oracle								
<pre>delete from employees where emp_id = :v_id</pre>								
Audit Details Bind V	Audit Details Bind Variables Download Statement							

*Figure 42. A\$ Standard results template.* 

Each row of this template shows information about one audit trail record. Within one row, multiple rows appear displaying the following data:

- Top row consists of the following standard Oracle audit trail columns: NTIMESTAMP#, OWNER OBJ\_NAME, USERNAME, OS\_USERNAME, TERMINAL, CLIENT\_IDENT and their corresponding values. More information on these columns can be found in Partition data columns chapter.
- In the second row SQL query that was run on production database and has generated audit trail is displayed. Query text is a link. When this link is clicked it expands this cell and displays another copy of the same query but with bind variables translated into concrete values.
- at the bottom of the row three button can be found:
  - Audit Details button Audit Details opens a new window showing all standard Oracle audit data column values like show on the screenshot below.
  - **Bind Variables** button **Bind Variables** opens a new window with a list of this SQL statement's bind variables and their concrete values.

Bind Variables					
Position	Length	Content			
1	5	79044			
2	6	794130			

Figure 43. Audit Details window.

• **Download statement** button **Download Statement** - opens a windows to download text file containing SQL statement text.

The following window shows standard Oracle audit trail columns and their values.

udit Details			
Action	2		
Object / Table	EMPLOYEES	J	
Timestamp		#Session	50558
Owner	HRAPP	#Transaction	2543
Username	JEFF	DB Session	32172
OS Username	oracle	DB Transaction	06000700D1020000
Hostname	kastor.abakus.si	SCN	1823555
Terminal		Arbiter Session TS	2017-08-06 10:15:02
OS Process	32334	Arbiter Transaction TS	2017-08-06 10:15:02
Instance Number	0	Table Audit	
New Owner		Table Data	
New Name		Source	/logmnr/PROD/1_1092_95
Return Code	0	Client Identifier	
Session Actions		Proxy Session ID	
Privilege Used		Global UID	
Object Privilege		Entry ID	3
Grantee		Statement ID	17
System Privilege			
Audit Option		)	
Admin Option		1	

Figure 44. Audit Details window.

#### Audit Trail Generic template

Each row of this template shows information about one audit trail record. The results table contains all the standard audit trail columns and their corresponding values. More information on these columns can be found in Partition data columns chapter.

ROWID	OS_USERNAME	USERNAME	USERHOST	TERMINAL	OWNER	OBJ_NAME	ACTION	NEW_OWNER
	jure	REV_LOGMNR	playahorus	unknown			100	
	jure	REV_LOGMNR	playahorus	unknown			101	

Figure 45. Audit trail Generic template.

#### Data Changes Old/New values template

This is default template for **D: Data Changes** partition type. Besides three partition data columns selected production columns new and old values are displayed.

HRAPP.EMPLOYEES EMP_ID		EMP_NAME		EMP_SALARY				
USERNAME	ACTION	NTIMESTAMP	# <del>OLD</del>	NEW	OLD	NEW	OLD	NEW
JEFF	UPDATE	2017-08-07 10:15:03	4		Amanda		2213	2983
JEFF	UPDATE	2017-08-07 10:15:03	5		Amy		2213	2983
JEFF	INSERT	2017-08-07 10:15:03		6		Becky		7000
JEFF	DELETE	2017-08-07 10:15:03	6		Becky		7000	

Figure 46. D: Old/New Values template.

Results table contains the following columns:

- First three columns are partitions data columns: **USERNAME**, **ACTION**, **NTIMESTAMP#**. More information on these columns can be found in Partition data columns chapter.
  - The second column called **ACTION** is a link. When this link is clicked a new window called **Data Details** is displayed. This window contains detailed information about the data change record.
- the continuation of this table are selected production columns. For each selected production column two sub-columns are present representing old and new value of the selected column.

Data Details X									
Data Change Meta									
Partition Spec	PROD_6.D\$2017_08_07_00	)	Original Session ID	32634					
ROWID	AAAR9hAAIAAAA0EAAC		Arbiter Session ID	54046					
Username	JEFF		Original Transaction ID	0800210002030000					
Event Timestamp	2017-08-07 10:15:03		Arbiter Transaction ID	2564					
Owner	HRAPP		Arbiter Session TS	2017-08-07 10:15:03					
Prefix	• ·		Arbiter Transaction TS	2017-08-07 10:15:03					
Table	EMPLOYEES		Session Info						
Is Rollback	0		SCN	1869647					
Is Multiline	0		Commit SCN	1869652					
	Old/New Values								
EMP_ID	4		EMP_NAME	Amanda					
EMP_SALARY	2213	2983	EMP_LAST_NAME						

Figure 47. Data Details window.

#### Data Changes Generic template

Each row of this template shows information about one data changes record. The results table contains all the standard audit trail columns and their corresponding values. More information on these columns can be found in Partition data columns chapter.

ROWID	REV_TRANSACTION_ID	OPERATION_CODE	SYS_NC00004\$	REV_SESSION_ID	USERNAME
	2564	3		54046	JEFF
	2564	3		54046	JEFF
	2564	1		54046	JEFF

Figure 48. Data Changes Generic template.

#### **Sessions Standard template**

This is the most useful template to be used for sessions partition type.

Session ID	DB Username	Logon Time	Logoff Time	Return Code with Comment
16460/20310	JOHN	2017-07-27 14:19:53		0: Authenticated by: DATABASE
16461/20311	JEFF	2017-07-27 14:19:53		0: Authenticated by: DATABASE
16462/20312	JASON	2017-07-27 14:19:53		0: Authenticated by: DATABASE
16642/20327	JOHN	2017-07-27 15:13:52		0: Authenticated by: DATABASE

Figure 49. Sessions S: Sessions template.

Each row of results set represents one database user session. Each row contains the following information:

Text in each row can be clicked to open a new window containing list of database transactions for this session.

#### **Sessions Generic template**

Each row of this template shows information about one data changes record. The results table contains all the standard audit trail columns and their corresponding values. More information on these columns can be found in Partition data columns chapter.

ROWID	REV_SESSION_ID	USERNAME	SESSIONID	REV_SESSION_TS	REV_LOGOFF	REV_SOURCE	RETURNCODE	COMMENT_TEXT
	13637	JOHN	20107	2017-07-26 15:56:16		A	0	Authenticated by: DATABASE
	13638	JEFF	20108	2017-07-26 15:56:16		A	0	Authenticated by: DATABASE
	13639	JASON	20109	2017-07-26 15:56:16	2017-07-26 15:56:23	A	0	Authenticated by: DATABASE
	13640	JOHN	20110	2017-07-26 15:56:41		A	0	Authenticated by: DATABASE
	13641	JEFF	20111	2017-07-26 15:56:42		А	0	Authenticated by: DATABASE
	13642	JASON	20112	2017-07-26 15:56:42	2017-07-26 15:56:44	A	0	Authenticated by: DATABASE
	13643	JOHN	20113	2017-07-26 15:56:45		А	0	Authenticated by: DATABASE
	13644	JEFF	20114	2017-07-26 15:56:45		A	0	Authenticated by: DATABASE
	13645	JASON	20115	2017-07-26 15:56:45	2017-07-26 15:56:52	A	0	Authenticated by: DATABASE

Figure 50. Sessions Generic template.

#### Analytics job template

Missing

## **Top Space Consumers Page**

This page allows for more in detail analysis of Arbiter's space consumption. Basic space consumption information is available on Arbiter's main page.

#### **Top Space Consumers**

op Space Consumers					
rom Date 2017-06-17 ro Date 2017-07-17 Partition Type ** any ** size Unit GB Refresh Tablespaces Partitions T	ables		<ul> <li>Every audit record shoul</li> <li>New tablespace should b</li> <li>New datafiles shold be a <ul> <li>New datafiles are</li> <li>New datafiles can</li> </ul> </li> <li>New partition (table) for</li> <li>New partition (table) for</li> </ul>	d be kept in this database e created every 30 days. Ided to tablespace autom added when there is less grow in size up to 30 GB. audit records (A\$) should data records (D\$) should metadata records (XY\$) s	for at least 10 years. atically. than 10 GB of free space available. be created every 1 days. be created every 1 days. ihould be created every 14 days.
Tablespace Name	Tablespace Status	Data Files	Tablespace [X]Bytes	Date Created	Date Closed
TS_PROGRAM_1_2017_07_10	ONLINE	2	25.44	2017-07-10	
TS_PROGRAM_1_2017_06_09	ONLINE	4	102.92	2017-06-09	
TS_PROGRAM_1_2017_05_09	ONLINE	4	104.38	2017-05-09	
TS_PROGRAM_1_2017_04_08	ONLINE	4	108.00	2017-04-08	2017-07-08
TS PROGRAM 1 2017 03 08	ONLINE	4	108.68	2017-03-08	2017-06-07

Figure 51. Top Space Consumers page.

This page is constructed of a table displaying space consumers information and an input form for filtering this information. Filter input form has the following fields to filter output data:

- From Date date from which the information will be displayed.
- To Date date up to which information will be displayed.
- **Partition Type** partition types that the information will be displayed about. If \*\*\* any \*\*\* is selected all partitions are included. Any other option will display information only about the selected partition type.
- Size Unit units that the information will be displayed in.
- **Refresh** button **Refresh** to filter and display information according to the selected filter parameters.

To the right of the filter input form rules on how space consumers are created is displayed.

Table displaying top space consumers information can be displayed in three modes: **Tablespaces**, **Partitions** and **Tables**. Switching between these modes is done by clicking on according tabs at the top of the table displaying space consumers information. Depending on the selected display mode the following table columns are displayed:

- Tablespaces:
  - Tablespace Name name of the tablespace.
  - Tablespace Status status o a tablespace.
  - Data Files number of datafiles belonging to a tablespace.
  - Tablespace [X]Bytes the size of the tablespace in units selected in the filter input form.
  - Date Created tablespace creation date.

• Date Closed - date when the tablespace was closed.

Partition Timestamp	A\$ [X]Bytes	D\$ [X]Bytes	Meta [X]Bytes	A\$ Rows	D\$ Rows	Meta Rows	Together [X]Bytes
2017-07-03	2.44	0.00	0.00	5661618	0	0	2.44
2017-07-04	2.44	0.00	0.00	5655303	0	0	2.44
2017-07-05	2.44	0.00	0.00	5570864	0	0	2.44
2017-07-06	2.44	0.00	0.00	5646108	0	0	2.44
2017-07-07	2.46	0.00	0.00	5639226	0	0	2.46
2017-07-08	2.44	0.00	0.00	5599556	0	0	2.44
2017-07-09	2.43	0.00	0.00	5620005	0	0	2.43

Figure 52. Top Space Consumers in Tablespaces mode.

#### • Partitions:

- Partition Timestamp date of the information displayed by the row
- **A\$ [X]Bytes** space consumption for A\$ partition type at a certain timestamp in units selected in the filter input form.
- **D\$ [X]Bytes** space consumption for D\$ partition type at a certain timestamp in units selected in the filter input form.
- **Meta [X]Bytes** space consumption for XY\$ (meta) partition type at a certain timestamp in units selected in the filter input form.
- **A\$ Rows** number of rows collected for A\$ partition type at a certain timestamp.
- **D\$ Rows** number of rows collected for D**\$** partition type at a certain timestamp.
- Meta Rows number of rows collected for XY\$ (meta) partition type at a certain timestamp.
- **together [X]Bytes** space consumption of all partition types at a certain timestamp in units selected in the filter input form.

Table Owner	Table Name	Usage Rows	Usage Percent	Usage [X]Bytes
		318	24.67%	.00
HRAPP	EMPLOYEES	205	66.83%	.00
SYS	REV_MANAGETABS_IMPORT_DIR	30	.67%	.00
PROD_5	GA_CONTEXT	8	.17%	.00
PROD_4	GA_CONTEXT	6	.17%	.00
REV_REMOTE	REV_REMOTE	6	.17%	.00
PROD_6	GA_CONTEXT	6	.17%	.00
REV_LOGMNR	GA_DATA_ORACLE_LOGMINER	6	.17%	.00
	REVR_PROD_USER	6	.17%	.00
PROD_4	GA_WRITER_ORACLE	4	.17%	.00
PROD_6	GA_WRITER_ORACLE	4	.17%	.00
PROD_5	GA_AUD_ORACLE\$OS	4	.17%	.00
PROD_4	GA_DATA_ORACLE_ALP	4	.17%	.00
PROD_5	GA_DATA_ORACLE_TRANSFER_API	4	.17%	.00
	PROD_5	4	.17%	.00
PROD_5	GA_DATA_ORACLE_TRANSFER\$DBLINK	4	.17%	.00
PROD_6	GA_DATA_ORACLE_TRANSFER_API	4	.17%	.00
PROD_5	GA_AUD_ORACLE\$UNIFIED	4	.17%	.00
PROD_5	GA_AUD_ORACLE	4	.17%	.00
PROD_5	GA_AUD_ORACLE\$DB	4	.17%	.00
PROD_6	GA_DATA_ORACLE_ALP	1	.33%	.00

Figure 53. Top Space Consumers in Tables mode.

• Tables:

- **Table Owner** table owner username.
- **Table Name** table name.
- **Usage Rows** number of rows collected for table represented by the row.
- **Usage Percent** percentage of total space consumption by the table in the row compared to complete space usage as filtered by the filter input form.
- **Usage [X]Bytes** table space consumption compared to complete space consumption displayed as filtered by the filter input form.

# **Administration Interface**

When logged in with administrator account "Administration" menu is displayed at the top right corner of Arbiter GUI. Basic information about "Administration menu" is available in Logo and Menus chapter.

Administration  rev_a	
✓ Jobs	
🚨 Users	
🗅 Logs	
🔗 DB Links	
差 Settings	
Export / Import	
& GUI Sessions	

Figure 54. Administration menu.

## Jobs

#### Jobs

Admi	Admin Options								
Sta	Start Maintenance								
Datat	ase Jobs								
	Job Name	Repeat Interval	Last Duration	Elapsed	Last Start	Runs	Fails	Retries	State
0	PROD_6_ALP_MINER	<pre>freq=hourly; interval=1; byminute=1</pre>	0d 00:00:04	0d 00:53:08	2017-08-08 11:01:00	292	1	0	<b>\$</b>
0	PROD_6_ALP_MULTILINE	freq=hourly; interval=1; byminute=15	0d 00:00:00	0d 00:07:08	2017-08-08 10:15:00	285	142	0	<b>\$</b>
0	PROD_6_ALP_OSAUD	freq=hourly; interval=1; byminute=45	0d 00:00:00	0d 00:37:09	2017-08-08 10:45:00	285	0	0	<b>\$</b>
0	PROD_6_WA	freq=minutely; interval=30	0d 00:00:00	0d 00:22:08	2017-08-08 11:00:00	569	0	0	<b>\$</b>
0	SIOUGC_5001_ALP_MINER	<pre>freq=hourly; interval=1; byminute=1</pre>	00:00:00 b0	0d 00:53:08	2017-08-08 11:01:00	117	0	0	<b>\$</b>
0	SIOUGC_5001_ALP_MULTILINE	freq=hourly; interval=1; byminute=15	0d 00:00:00	0d 00:07:08	2017-08-08 10:15:00	116	0	0	<b>\$</b>
0	SIOUGC_5001_ALP_OSAUD	freq=hourly; interval=1; byminute=45	0d 00:00:00	0d 00:37:08	2017-08-08 10:45:00	117	0	0	<b>e</b>
0	SIOUGC_5001_WA	freq=minutely; interval=30	00:00:00 b0	0d 00:22:08	2017-08-08 11:00:00	234	0	0	<b>\$</b>
0	REV_GATHERSTATS	freq=daily; byhour=23	0d 00:00:01	0d 11:52:08	2017-08-07 23:00:00	12	0	0	<b>\$</b>
0	REV_NOTIFY	freq=daily; byhour=7	0d 00:00:00	0d 19:52:08	2017-08-08 07:00:00	12	0	0	<b>\$</b>
0	REV_PURGELOG	freq=hourly; interval=3	0d 00:00:00	0d 00:52:08	2017-08-08 09:00:00	95	0	0	
0	REV_SUPERVISE	freq=daily; byhour=2	0d 00:00:01	0d 14:52:08	2017-08-08 02:00:01	13	0	0	<b>\$</b>

Figure 55. Table with a list of Arbiter's jobs.

Here a table with a list of jobs and their statuses running on Arbiter is displayed.

At the top of the page a section called **Admin Options** can be found. This section contains one button called **Start Maintenance Start Maintenance** can be found. When this button is pressed all Arbiter jobs are stopped. This mode is used while maintenance procedures are being done on the Arbiter. While this mode is enabled, Arbiter jobs can't be started. While maintenance mode is active, a warning letting users know about it is displayed at the top of each GUI page like show on the image below. While in maintenance mode is active a button **Stop Maintenance** is shown in **Admin Options** section. Pressing this button restarts all Arbiter jobs and returns Arbiter to normal operation mode.



Figure 56. Maintenance mode warning.

This page is automatically refreshed every 5 seconds. Each row in the table represents one job. For each job the following information is displayed:

• Expand job button •. Pressing this button offers additional options for each job. These options are links and can be enabled or disabled depending on expanded job's current status:



Figure 57. Expanded view of a job.

- Disable link disables expanded job. Disabled jobs don't run on schedule.
- **Start** link starts expanded job. Runs job once, does not enable it if disabled.

• Last Error Log link opens popup window displaying expanded job's last error log.

Last Error Log		×				
Status	FAILED					
Actual Start Date	2017-08-02 12:05:52.8632					
Run Duration	0 0:6:19.0					
Session ID	72,1639					
CPU Used	0 0:0:0.22					
ORA-29273: HTTP request failed ORA-06512: at "SYS.UTL_HTTP", line 1367 ORA-29259: end-of-input reached ORA-06512: at "REV.REV_LOGMNR_ALP_API", line 109 ORA-06512: at "REV.REV_LOGMNR_ALP_API", line 255 ORA-06512: at "PROD_6.GA_DATA_ORACLE_ALP", line 376 ORA-06512: at line 1						

Figure 58. Last Error Log window.

- Job Name
- Repeat Interval job schedule parameters:
  - **freq** how frequently a job is started.
  - interval number of job runs within one interval.
  - **byminute**, **byhour** in what minute in the hour or hour in the day the job is set to run.
- Last Duration how long job ran the last time it ran.
- Elapsed time until the job will run the next time.
- Last Start time when job was last started.
- **Runs** number of job runs. Disabling a job resets this counter to zero.
- Fails number of job fails.
- **Retries** number of job run retires after failure.
- **State** icon representing current state of the job. Hover mouse pointer over the icon to display status information. The following statuses are possible:
  - SCHEDULED job is enabled and scheduled to run
  - O RUNNING job is currently running
  - 🖸 DISABLED job is disabled

## Users

This page is used for Arbiter GUI user and user group configuration.

### Users

sers			
	Username	Created	Is Admin
0	REV_ADMIN	2017-07-24 11:48:59	0
Drop U	ser   Revoke Admin   Privileges		
0	REV_USER	2017-07-31 13:10:17	3

G	Groups						
		Group	Description				
	0	DB1_ADMINS	DB1 Audit Administrators				
	0	BD1_USERS	DB1 Audit Users				
	Delete Group   Assign Users   Privileges						
	Create Group						



Page is split into two sections:

- Users section for user administration.
- Groups section for group administration.

### **Users section**

First part of this section is list of all Arbiter GUI users in a table. With the following columns:

- Expand button **D**. Pressing this button offers additional options for each user. The following options are available:
  - **Drop user** link to drop user.
  - Revoke Admin or Grant Admin links:
    - **Revoke Admin** link is only available when user is administrator and is used to revoke user's administrative privileges
    - **Grant Admin** link is only available when user is not is administrator and is used to grant user administrative privileges
  - **Privileges** link to manage database privileges for users. When this link is clicked new window called **Privileges** with the following options appears:

Privileges		×	
Username REV_ADM	IIN		
Access	Database	Role	
GRANT	PROD	REVR_PROD_USER	
Save Settings		Å	8

Figure 60. User Privileges window.

- Username text filed containing username for the user whose privileges are being managed.
- List of privileges in a form of table where each row represents one database. The following columns are available:
  - $\circ$  Access dropdown menu with <code>GRANT</code> and <code>REVOKE</code> options to grant or revoke access to a database.
  - $\circ~$   ${\bf Database}$  text containing name of database to grant or revoke access to.
  - $\circ~$  Role text representing role to be granted or revoked. Role name is database specific.
- Save Settings Save Settings button to save managed privileges.
  - Username.
  - Created username creation date and time.
  - Is Admin showing whether username has administrative privileges 🜍 or not 🔇.

Beneath the table **Create User** button can be found. This button opens a new window called **New user** and is used for adding new users for Arbiter GUI.

New user		×
Username *		
Password *		
Confirm Password *		
Is Admin		
	Add User	
		//

Figure 61. New user.

New user window consists of the following elements:

- **Username** \* input field to enter username for new user. Username is mandatory and has to be unique.
- **Password** \* input field to enter password for new user. Password complexity requires one number and one non alphanumerical character to be used. **Password** is mandatory and has to match **Confirm Password**.
- **Confirm Password** \* input field to re-enter password for new user. **Confirm Password** is mandatory and has to match **Password**.

- Is Admin checkbox to select whether newly created user will be granted administrative privileges.
- Add User button to complete user creation procedure.

### **Groups section**

First part of this section is list of all Arbiter GUI user groups in a table. With the following columns:

- Expand button **•**. Pressing this button offers additional options for each user. The following options are available:
  - **Delete group** link to delete group.
  - **Assign Users** link to assign users to a group. Clicking this link opens a new window called **Assign Users to Group** with the following elements:
    - **Group** text filed containing name of the selected group.
    - Users not in group list containing list of users that have not yet been assigned to the group being managed.
    - Users in group list containing list of users that are assigned to the group being managed.
    - List management buttons positioned between bots lists to transfer users between the lists:
      - Add button  $\rightarrow$  to add selected users from Users not in group to Users in group list.
      - Add All  $\rightarrow$  button to add all users to Users in group list.
      - **Remove** button to remove selected users from **Users in group** to **Users not in group** list.
      - **Remove All** is button to remove all users from **Users in group** list.
    - Save settings button to save users to group assignment.

Assign Users to Group			×
Group DB1_ADMINS			
Users not in group		Users in group	
REV_ADMIN	TEST		
REV_USER			
Save Settings			
			h

Figure 62. Assign Users to Group window.

- **Privileges** link to manage database privileges for groups. When this link is clicked new window called **Privileges** that is the same as **Privileges** window for users described in Users section chapter. The only change is that the first element in the window is called **Group** instead of **Username**.
  - **Group** column containing group name.
  - **Description** column containing group description.

Beneath the table **Create Group** button **Create Group** is located. This button opens a new window called **New Group** which is used for adding new groups.

New user		×
Group *		
Description *		
	Add Group	
		1

Figure 63. New Group.

New group window consists of the following elements:

- **Group** \* input field to enter new group name. **Group** is mandatory and has to be unique.
- Description \* input field to enter new group description. Description is mandatory.
- Add Group button to complete group creation procedure.

## Logs

Logs page is used to display Arbiter jobs log files.

## Logs

Logs Search	
Refresh Interva	Disabled
Sort By	Timestamp DESC 💌
Log Level	WARNING
Job	
Comment	
Procedure	
	You can use regular expressions like /^[my.regex]/
	Search Purge Log

Figure 64. Logs page.

Page consists of **Logs Search** section. At the top of this section there is a log searching form. By default no logs are shown, they have to be queried. If log search finds any results they are displayed in a table below the search form.

Log search form consists of the following elements:

- **Refresh Interval** dropdown menu to select time interval in seconds to refresh log search results. The following values can be selected **Disabled** (default value), 5, 10, 30, 60.
- **Sort By** dropdown menu to select log results sort order. Values Timestamp DESC and Timestamp ASC are available.
- **Log Level** dropdown menu to select the lowest log severity level to be returned as a result. All logs of selected severity level and above are displayed.
- Job input filed to search logs by job name. Regular expressions can be used.
- **Comment** input filed to search logs by their comment. Regular expressions can be used.
- **Procedure** input filed to search logs by procedure name. Regular expressions can be used.
- **Search** button **Search** to run log search.
- Purge Log button Purge Log to purge log file.

SEQ	Timestamp	Level	User	Job	Procedure	Comment
5092	2017-08-01 12:01:04	INFO	REV		GA_DATA_ORACLE_ALP.RUN_MINER 6	Waiting for new logs on thread [1]
5076	2017-08-01 12:01:00	FINE	REV		GA_DATA_ORACLE_ALP.RUN_DISCOVERY	Running full directory scan
5075	2017-08-01 12:01:00	FINE	REV		GA_DATA_ORACLE_ALP.RUN_DISCOVERY	Initial thread sequence 1 607
5073	2017-08-01 12:00:00	INFO	REV	PROD_6_WA	GA_WRITER.AX_insert_ctx_data	Inserted [0] rows of ctx data into rev_sessions_info. Purged [0] rows from stageing ctx table.
5072	2017-08-01 12:00:00	FINE	REV		rev_log.purge	Purged rev_logs table, keeping [12] days, purged [67] row(s).

Figure 65. Logs search results.

When log search returns results they are displayed in a table below search form with the following

columns:

- **SEQ** log sequence number. Log sequence numbers are not lost after log purge.
- Timestamp date and time of log event.
- Level log severity level.
- User user that log has been created by.
- Job job that created log.
- **Procedure** procedure that crated log.
- **Comment** log additional information.

Each row of the table can be clicked to open a new window called **Log Details** showing detailed information for a selected log entry.

Log Details				×
Level	FINE	SEQ	5076	1
Job		Timestamp	2017-08-01 12:01:00	j
Procedure	GA_DATA_ORACLE_ALP.RU	User	REV	)
Running fu	Il directory scan			
				h

Figure 66. Logs Details window.

Log Details window consists of the following elements:

- Level log severity level.
- Job job that created log.
- Procedure procedure that crated log.
- **SEQ** log sequence number. Log sequence numbers are not lost after log purge.
- Timestamp date and time of log event.
- User user that log has been created by.
- At the bottom of the window additional log information is shown.

## **DB** Links

Arbiter can collect audit trail data via DB links to production databases. This page is used to manage these DB links.

Ora	racle Database Links										
DB	Link	S									
		#Database	Try Order	DB ID	Inst. Description	Database Version	DB Link	Username	Host	Created	Object Count
c		5001: SIOUGC 🔻	1 💌	3478581416	siougc (atlas.abakus.si)		SIOUGP_ATLAS.ABAKUS.SI	REV_SRC_USER	atlas/siougp.abakus.si	2017-08-03 15:23:03	4
D	Drop Link   Change Password										
s	ave	Assignments Create DB	Link Downl	oad create_us	er.sql						

Figure 67. Oracle Database Links page.

A table representing list of DB links is displayed on this page, it consists of the following columns:

- Expand DB Link button **O**. Pressing this button offers additional options for each DB link:
  - Drop Link link to drop DB link represented by the row. Link is deleted instantly!
  - **Change Password** to change DB link password. Clicking this link opens a window called "Change Password". The windows consists of the following items:
    - Link Only checkbox. Check this checkbox to alter database link without touching source database. When this option is selected, **Set random password** checkbox is disabled.
    - Set random password checkbox to randomly generate new password. When this checkbox is selected, New Password and Confirm Password input fields are disabled. When this option is checked Link Only checkbox is disabled.
    - New Password input field for new password.
    - **Confirm Password** input field for confirming new password, this has to match **New Password**.
    - **Old Password** \* input field for existing DB link password.

Change Password	×
Link Only ✔ Alter database link and don't touch source database	
Set random password	
New Password *	
Confirm Password *	
Old Password *	
Change Password	
	h

Figure 68. Change Password window.

• **#Database** dropdown menu to select Arbiter's database to be used by this DB link. Dropdown menu also offers an option to disable individual DB links by selecting link disabled option.

5001: SIOUGC	•
link disabled	
5001: SIOUGC	
6: PROD	

Figure 69. Arbiter database selection.

- **Try order** production database can have more that one instance and Arbiter can connect to all of those instances via multiple DB links. This value sets priority of each of those links where lower value means higher priority.
- **DB ID** production database identifier that was generated during database creation.
- Inst. Description production instance name / production server hostname.
- Database Version displays information on DB software version.
- DB Link name.
- Username DB link username.
- Host hostname of computer hosting database that is the source of audit trail data / service name.
- Created data and time of running create\_user.sql script on production database.
- **Object Count** number of objects residing in production scheme belonging to user created by **create\_user.sql** script.
- Save Assignments button **Save Assignments** to save values of **#Database** and **Try Order** dropdown menus.
- **Create DB Link** button **Create DB Link** button to create new DB link. This button opens a window called **Create DB Link** with the following elements:
  - **DB Link\*** name.
  - Host\* production database server hostname.
  - **Username**\* username to access production database.
  - **Password\*** password to access production database.
  - **Create DB Link** button **Create DB Link** to add new DB link to the list.

Create DB Lini	k	×
DB Link *		
Host *		
Username *		
Password *		
	Create DB Link	

Figure 70. Create new DB link window.

• Download create\_user.sql button Download create\_user.sql . This procedure allows

downloading DB user creation script that can be run on production database. This button opens a window called **Create DB User** containing:

- **Database** dropdown menu with the list of available Arbiter databases.
- Database Version dropdown menu to select database software version.
- **Username** input field to enter username to be created.
- **Password** input field to enter password for the new user.
- **Confirm Password** input field to confirm password fir the new user. This has to match the value of **Password**.
- **Download Script** button **Download Script** to complete the procedure. After clicking this button user is prompted to open user creation script. This script has to be run in production database environment.

Create DB Us	er X
Database	SIOUGC
Database Version	12c 🔻
Username	rev_src_user
Password	
Confirm Password	
	Download Script

Figure 71. Create DB User window.

## Settings

**Settings** page is used to configure various Arbiter settings. Settings are divided into groups of settings that go together. Each groups of settings is displayed on separate tab. The following tabs are available: **Core, Db Specific Settings, Export Import, Jobs, Logging, Password Policy** and **Supervisor**.

### Settings

ore	Db Specific Settings	Expor	t Import	Jobs	Logging	Password Policy	Supervisor
Setti	ng	D	efault Valu	ie		Global Value	
base_archdir			/oradmin/audit_logs/			/logmnr/	
partit	ioning_years	1	10			10	
tmpdi	ir	/t	mp			/tmp	

Figure 72. Core settings page.

Each tab displays all settings available for its group of settings in form of table. Each row represents one individual setting. Setting tables have three or more columns depending on the settings group selected and number of databases registered within Arbiter:

- Setting setting name.
- **Default Value** default setting value.
- Global Value global custom setting value.
- <DB\_COMMON\_NAME> registered database common name as displayed on databases list described in Databases section of Databases chapter. This column holds database specific settings which can be set per Arbiter registered database. There is one <DB\_COMMON\_NAME> column for each registered database. These columns are only displayed in those settings groups that apply to registered databases.
- **Reset Settings** button **Reset Settings** to reset all specific settings in selected settings group to default values.

Default settings can not be changed. Global and database specific settings can be changed by clicking links represented by values of the setting in tables of settings. Clicking these link opens new windows called **Change Setting**. For each individual setting a window opens with the following elements:

- Setting name
- Setting description this manual does not contain in detail settings descriptions because **Change Setting** windows already contain detailed descriptions.
- Setting value domain
- Setting default value
- Some kind of input field to enter setting value. The type of input field depends on setting value

type.

Change Setting	×
export_import_folder: Where to put exported partitions by default	
Constraint STRING Default Value /export/arbiter	
/export/arbiter	
	Save Reset

Figure 73. Change Setting window.

## **Export / Import**

When audit trails have to be stored for long periods of time it is advisable to compress old data and store onto long term storage devices to release Arbiter's data storage capacity. This page is used to export Arbiter's database to an external archive and import previously exported Arbiter data back into Arbiter's database when old data needs to be queried.

## Export / Import

Export	Import	Progress
Database	ID PR	OD 🔹
File Syste	em Path /ex	xport/arbiter
Until	20	07-08-04
	E	xport

Figure 74. Export / Import page.

Page is divided into three tabs:

- Export tab used for exporting Arbiter's data.
- Import tab to import previously exported data.
- **Progress** tab that shows current export / import operation status.

### **Export tab**

Using this tab current Arbiter's data can be exported and archived into files for long term off-site storage.

Tab contains the following elements:

- Database ID dropdown menu to select which database data will be exported.
- File System Path input field to configure where archive files will be created.
- Until date input field to set up until which date audit trail data will be exported into files.
- Export button **Export** to start export procedure.

### Import tab

Using this tab previously exported Arbiter's audit trail data can be imported back into Arbiter's database so it can be queried.

Export	Impor	t Progress
File Syste	m Path	/export/arbiter
File Name		*
		Import

Figure 75. Import tab.

Tab contains the following elements:

- File System Path input field to configure where archive files to be imported are located.
- **Filename** input field to filter which files located on **File System Path** are to be imported (use \* to import all files on **File System Path**).
- **Import** button **Import** to start export procedure.

### **Progress tab**

This tab displays information on current export of import procedure progress.

	import	Progress
Active	NO	
Session	n/a	
Started At		
Completed	At	

Figure 76. Progress tab.

Tab contains the following elements:

- Active indicated whether currently an export or import procedure is active.
- Session
- Started At shows when currently running procedure was started
- Completed At shows when last procedure has finished running.

## **GUI Sessions**

This page shows information about Arbiter GUI sessions. Arbiter can also track logon and logoff events to its own GUI and show those data on this page.

## **GUI Sessions**

GUI Sessio	15		
Logon from	2017-08-02 00:00:00	)	
to	2017-08-29 00:00:00	)	
Username		)	
Sort By	Logon 🔹 DESC	-	
	Search		

Figure 77. GUI Sessions page.

Page consists of **GUI Sessions** section. At the top of this section is a search form. By default no GUI sessions information is shown, data has to be queried first. If search finds any results they are displayed in a table below the search form.

GUI sessions search form consists of the following elements:

- Logon from date and time from which search will start looking for GUI sessions information.
- to date and time up until which search will look for GUI sessions information.
- Username username which to search GUI session information for.
- Sort By input filed to search logs by job name. Regular expressions can be used.
  - Sort column name dropdown menu containing the following options Logon, Logoff, Last action, Username, Remote IP, Remote host.
- Sort direction dropdown menu
- **Search** button **Search** to run log search.

SEQ	Timestamp	Level	User	Job	Procedure	Comment
5092	2017-08-01 12:01:04	INFO	REV		GA_DATA_ORACLE_ALP.RUN_MINER 6	Waiting for new logs on thread [1]
5076	2017-08-01 12:01:00	FINE	REV		GA_DATA_ORACLE_ALP.RUN_DISCOVERY	Running full directory scan
5075	2017-08-01 12:01:00	FINE	REV		GA_DATA_ORACLE_ALP.RUN_DISCOVERY	Initial thread sequence 1 607
5073	2017-08-01 12:00:00	INFO	REV	PROD_6_WA	GA_WRITER.AX_insert_ctx_data	Inserted [0] rows of ctx data into rev_sessions_info. Purged [0] rows from stageing ctx table.
5072	2017-08-01 12:00:00	FINE	REV		rev_log.purge	Purged rev_logs table, keeping [12] days, purged [67] row(s).

Figure 78. Logs search results.

When log search returns results they are displayed in a table below search form with the following columns:

- **SEQ** log sequence number. Log sequence numbers are not lost after log purge.
- Timestamp date and time of log event.
- Level log severity level.

- User user that log has been created by.
- Job job that created log.
- **Procedure** procedure that crated log.
- **Comment** log additional information.