

PUBLIC

Administer and Operate SAP HANA in the Cloud

DAT261

Exercises / Solutions

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BEFORE YOU START

Welcome to the Hands-On Workshop session DAT261 – Administer and Operate SAP HANA in the Cloud!

In this session, we'll introduce you to the different administration and monitoring tools for SAP HANA Cloud and show you how you can get common operational tasks done efficiently using the web-based tool SAP HANA cockpit.

Before You Get Started

This session assumes that you already have an SAP HANA Cloud Trial account. If that's the case, proceed to Chapter 1.

If you do not have an SAP HANA Cloud Trial account, you can register for free at <https://www.sap.com/cmp/td/sap-hana-cloud-trial.html>. Once you have successfully registered and your account is set up, perform the following steps:

1. Enter the "trial" subaccount
2. Enter the "dev" space
3. Click "SAP HANA Cloud" from the left navigation bar
4. Click the button "Create Database" in the top right to invoke the Create Instance wizard
5. Enter "TechEd" for the instance name
6. Enter and confirm your administrator password - please remember it!
7. Click the button "Create Instance" at the bottom

A new SAP HANA Cloud instance will be created - this process will take approx. 25 minutes. You may need to refresh the page to see the instance as "Running" (as opposed to "Creating"). Once that's done, proceed to Chapter 1.

CHAPTER 1 - SAP HANA COCKPIT

Overview

Estimated time: 60 minutes

Objective

In the following exercises you will learn the fundamentals of operating SAP HANA cockpit to perform database administration tasks.

Exercise Description

The SAP HANA cockpit features database management capabilities for a SAP HANA Cloud instance. This chapter offers learning opportunities for:

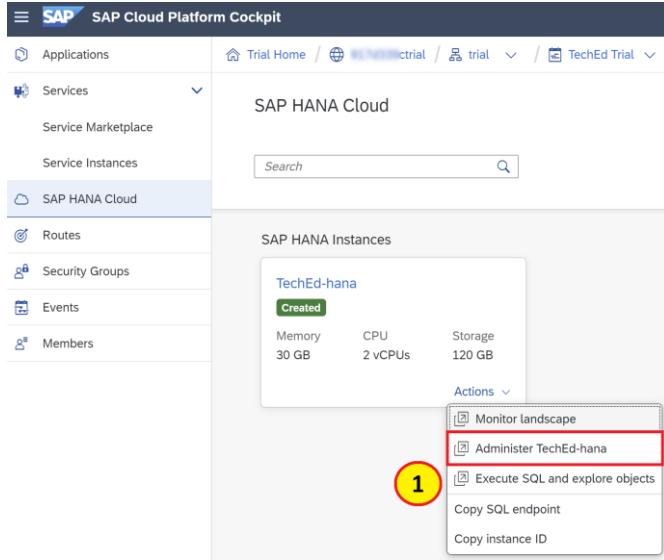
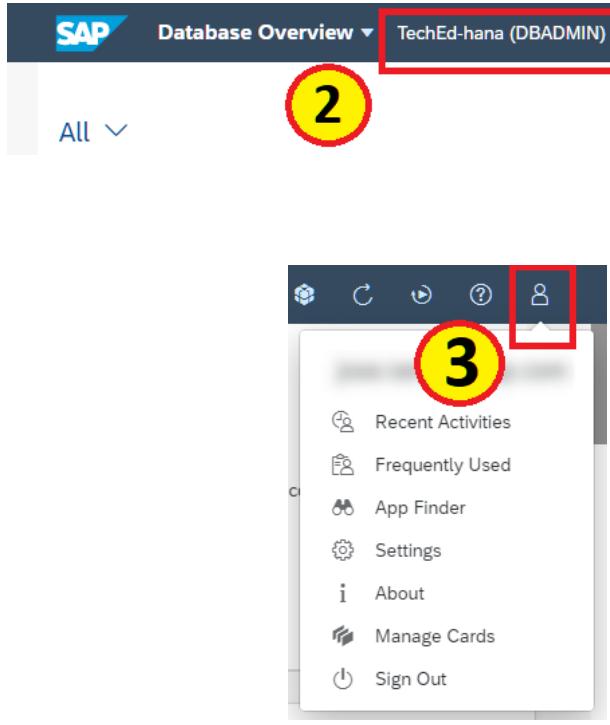
- Monitoring all your SAP HANA databases
- Comparing database configurations
- Configuring and managing individual databases
- Executing performance management tasks
- And much more!

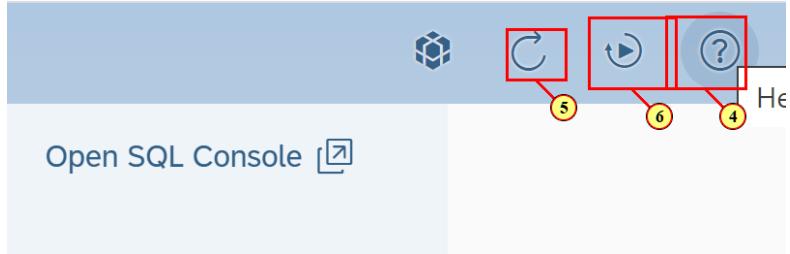
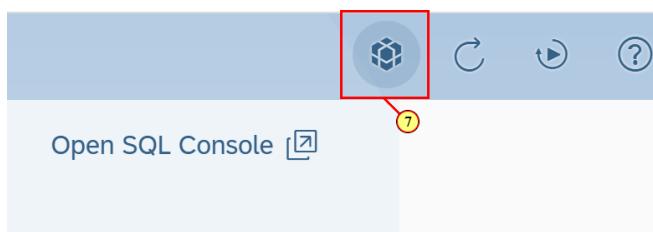
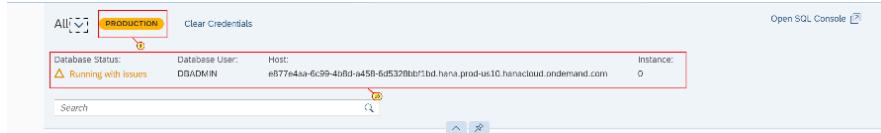
Exercise 1: The Database Overview Page

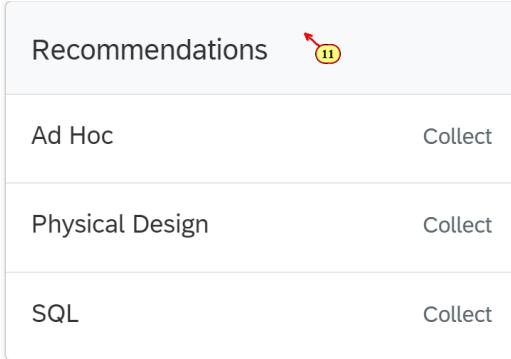
The Database Overview page displays health metrics for an individual SAP HANA Cloud database.

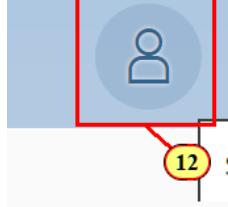
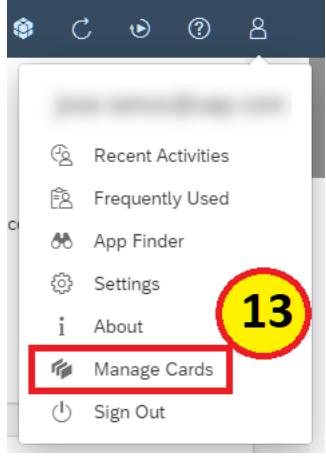
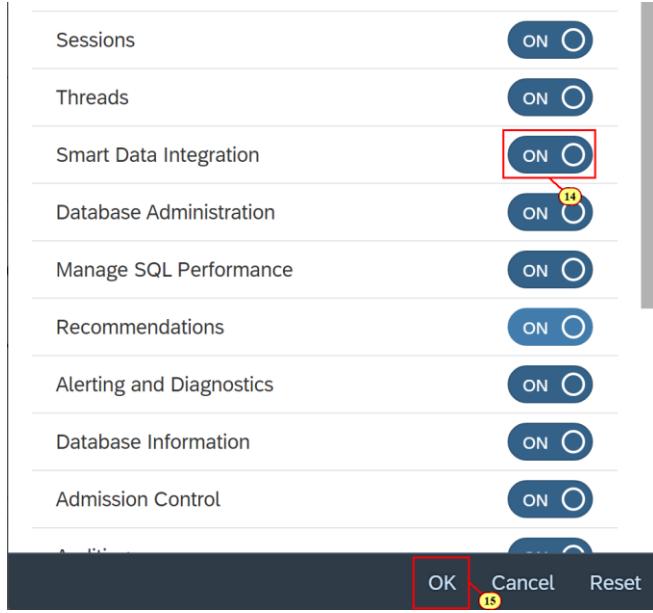
Through the Database Overview page, you can view key health indicators for this specific database, such as database status, alerts, and resource utilization. You also have access to tools that allow you to perform database administrations tasks, such as performance analysis, and executing SQL statements. Different parts of a single card can link to different views or applications. This way, you can see various components in a single view and make the decision whether to further examine issues by drilling down.

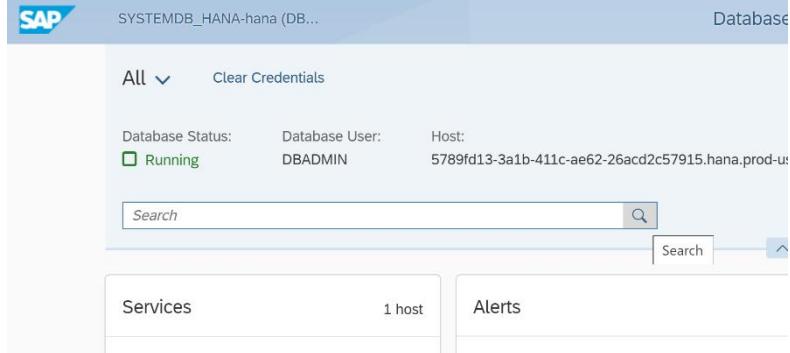
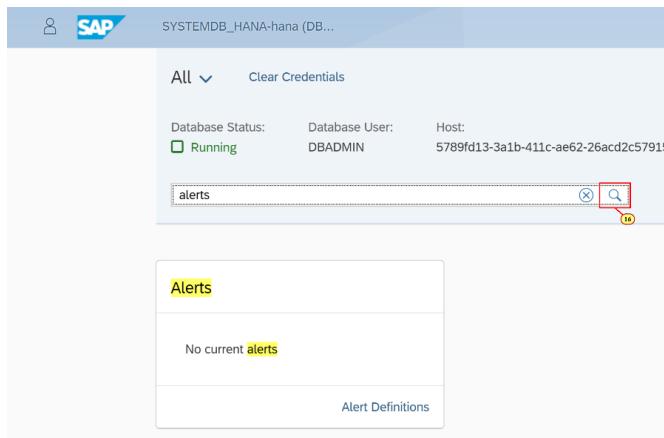
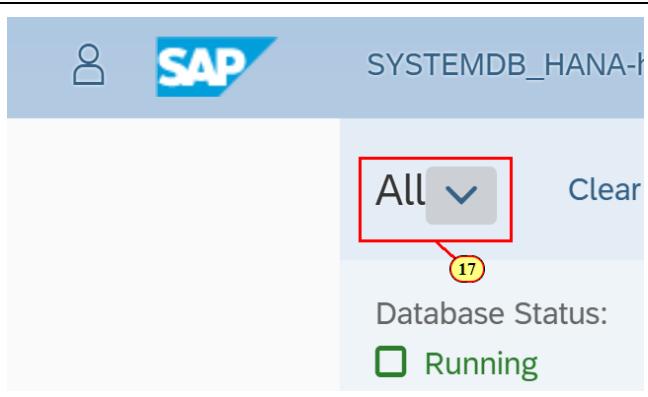
This exercise will teach you the basics of navigating the Database Overview page and how to find the information you need as a database administrator.

Explanation	Screenshot
<p>1. Navigate to your SAP HANA Cloud Trial instance from the SAP Cloud Platform Cockpit ("trial" subaccount and "dev" space). Open the SAP HANA cockpit by clicking on Administer TechEd-hana.</p> <p> If this is the first time you launch the SAP HANA cockpit or SAP HANA Database Explorer, you will be asked to enter your credentials. The default username is DBADMIN and the password is what you entered when creating the instance.</p>	
<p>2. At the top of the Database Overview page, you'll find the toolbar, displaying the name of the currently managed database TechEd-hana and the database username (DBADMIN) you're connecting as to that database.</p> <p>3. The user icon in the top right opens a dropdown menu with user specific settings and options.</p>	

Explanation	Screenshot								
<p>4. The Help button in the top right opens SAP Documents and displays the appropriate topic based on what you're doing.</p> <p>5. You can manually refresh this page here.</p> <p>6. You can set an auto-refresh for every 10 seconds, 20 seconds, 30 seconds, 1 minute, 5 minutes or 10 minutes.</p>	 <p>Open SQL Console []</p>								
<p>7. You can switch between multiple databases or navigate to multiple databases by clicking on this icon. Click on it to see a pop up, where you can select one or multiple databases that you want to navigate to.</p>	 <p>Open SQL Console []</p>								
<p> You can select one or multiple databases from this pop up. Once the databases that we need to be opened is selected from this pop up, if we click on OK, all the selected databases are opened simultaneously on new browser tabs.</p> <p>8. Click on Close to close the pop up.</p>	<p>Open Other Databases</p> <table border="1" data-bbox="578 1185 1433 1269"> <thead> <tr> <th>Organization</th> <th>Space</th> <th>TechEd2020</th> <th>Search</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> Database</td> <td>Space</td> <td>Organization</td> <td>Description</td> </tr> </tbody> </table> <p>There no other databases in this space</p> <p>8</p> <p>OK [] Close []</p>	Organization	Space	TechEd2020	Search	<input type="checkbox"/> Database	Space	Organization	Description
Organization	Space	TechEd2020	Search						
<input type="checkbox"/> Database	Space	Organization	Description						
<p>9. You can see the usage type "Production" displayed as a label alongside the database for easier classification.</p> <p>10. The General information about databases like Database Status, Database Username, Host Name, Instance details are available now in the header bar.</p>	 <p>All [] PRODUCTION [] Clear Credentials [] Open SQL Console []</p> <table border="1" data-bbox="622 1713 1254 1770"> <tr> <td>Database Status: Running with issues</td> <td>Database User: DBADM/N</td> <td>Host: e877e4aa-6c59-40fd-a45b-6d532fbfb1bd.hana.prod.us10.hanacloud.ondemand.com</td> <td>Instance: 0</td> </tr> </table> <p>Search []</p>	Database Status: Running with issues	Database User: DBADM/N	Host: e877e4aa-6c59-40fd-a45b-6d532fbfb1bd.hana.prod.us10.hanacloud.ondemand.com	Instance: 0				
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Explanation	Screenshot								
<p></p> <p>By default, when you first access the Database Overview page you see a quick synopsis of the database status and its alerts, as well as the utilization of memory, CPU and disk.</p> <p>As you scroll down, you see high-level performance metrics in the form of the number of threads, sessions and long-running statements. You also see general information about your SAP HANA database.</p> <p>Down further, you see security settings, such as data volume encryption, auditing status, authentication status, as well as security-related hyperlinks. There are also a number of hyperlinks to launch additional administration and Smart Data Integration applications.</p>									
<p>11. The organization of the cards in your Database Overview page is completely customizable. Click and hold any card and drag it across the screen to change its location.</p>	 <table border="1" data-bbox="584 1200 1095 1559"> <thead> <tr> <th colspan="2">Recommendations</th> </tr> </thead> <tbody> <tr> <td>Ad Hoc</td> <td>Collect</td> </tr> <tr> <td>Physical Design</td> <td>Collect</td> </tr> <tr> <td>SQL</td> <td>Collect</td> </tr> </tbody> </table>	Recommendations		Ad Hoc	Collect	Physical Design	Collect	SQL	Collect
Recommendations									
Ad Hoc	Collect								
Physical Design	Collect								
SQL	Collect								

Explanation	Screenshot
<p> Another personalization feature is the ability to hide cards that you do not wish to see on your Database Overview page.</p> <p>12. Click the User Icon in the top left.</p>	 <p>A screenshot of the Database Overview page. In the top-left corner, there is a blue circular user icon with a white person symbol. A red rectangular box highlights this icon. A yellow circle with the number '12' is positioned at the bottom right of the icon.</p>
<p>13. Click Manage Cards from the drop down menu.</p>	 <p>A screenshot of a user dropdown menu. The menu items are: Recent Activities, Frequently Used, App Finder, Settings, About, Manage Cards (which is highlighted with a red rectangle), and Sign Out. A yellow circle with the number '13' is placed over the 'Manage Cards' option.</p>
<p>14. Click the on/off switches to turn some cards off.</p> <p>15. Click OK.</p>	 <p>A screenshot of the 'Manage Cards' settings screen. It lists several cards with their current status (ON/OFF) indicated by a blue button with a white 'ON' label and a switch icon. The cards are: Sessions (OFF), Threads (OFF), Smart Data Integration (ON), Database Administration (ON), Manage SQL Performance (OFF), Recommendations (OFF), Alerting and Diagnostics (OFF), Database Information (OFF), Admission Control (OFF), and Audit Log (OFF). A red box highlights the 'Smart Data Integration' switch. A yellow circle with the number '14' is placed near the 'Database Administration' switch. At the bottom, there is a dark blue footer bar with three buttons: 'OK' (highlighted with a red rectangle), 'Cancel', and 'Reset'. A yellow circle with the number '15' is placed near the 'OK' button.</p>

Explanation	Screenshot
<p> We will cover the search and highlight feature last in this exercise.</p>	 <p>The screenshot shows the SAP Database Overview page for the database SYSTEMDB_HANA-hana. At the top, it displays the database name and status: "Running". Below the header, there is a search bar with the placeholder "Search" and a magnifying glass icon. The main area shows two tabs: "Services" and "Alerts".</p>
<p>16. At the top right of the Database Overview page, you can search any keyword in the search bar by typing the keyword and then clicking the search icon.</p>	 <p>The screenshot shows the SAP Database Overview page for the database SYSTEMDB_HANA-hana. A red box highlights the search bar at the top right, which contains the word "alerts". To the right of the search bar is a magnifying glass icon with a yellow circle containing the number "16" below it.</p>
<p>17. On the top left corner is a filtering option where the user can filter cards based on the area of interest.</p>	 <p>The screenshot shows the SAP Database Overview page for the database SYSTEMDB_HANA-hana. A red box highlights the "All" dropdown menu at the top left, which has a yellow circle with the number "17" below it. To the right of the dropdown is the word "Clear".</p>

Exercise 2: Configuring Database Properties

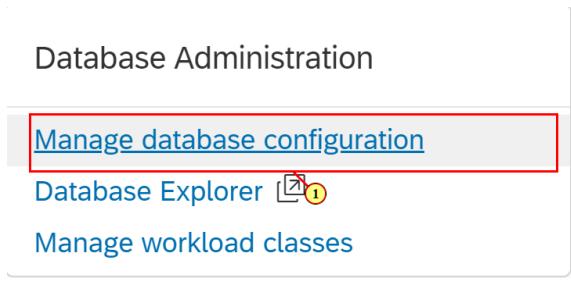
An SAP HANA database has several configuration (*.ini) files that contain properties for configuring the database.

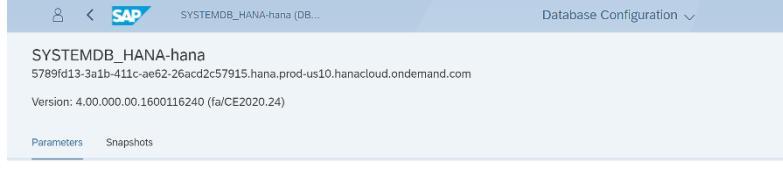
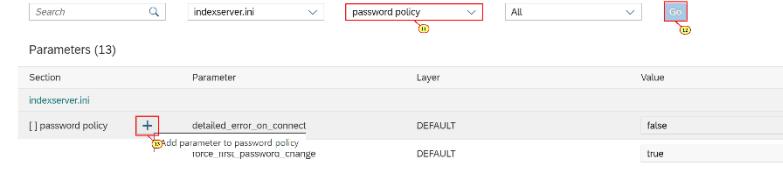
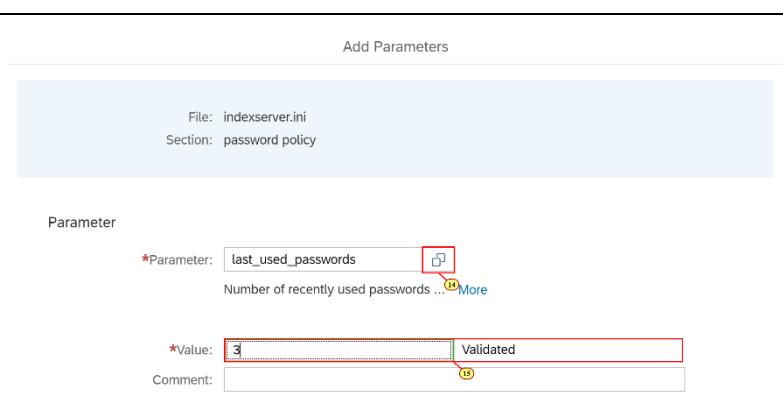
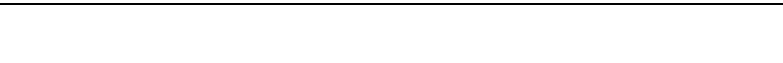
SAP HANA's configuration files contain parameters for global database configuration (global.ini), as well as the configuration of each service in the system (for example, indexserver.ini).

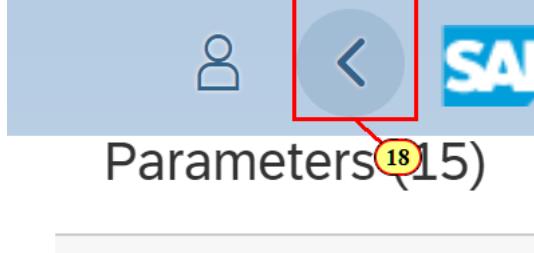
Properties can be configured at different layers, depending on the configuration file:

- DEFAULT: The default value for the property
- DATABASE: The database-specific value for the property

In this exercise, you will change a few properties using the "Configuration of System Properties" GUI application.

Explanation	Screenshot
<p>1. Select Manage Database Configuration at the top of the Database Administration card.</p>	 <p>The screenshot shows the SAP Database Administration card. At the top, there are three main options: "Manage database configuration" (which is highlighted with a red box), "Database Explorer" (with a small info icon), and "Manage workload classes".</p>
<p>2. This application provides a visual way to edit properties by selecting a configuration file and its section.</p>	 <p>The Database Configuration page allows for the user to manage and edit many different properties of their system databases.</p>
<p>3. Properties can also be changed at the HOST layer, if the HANA system is configured as multi-host.</p>	 <p>The screenshot shows the SAP Database Configuration interface. At the top, it displays the system name "SYSTEMDB_HANA-hana" and version "4.00.00.00.1600116240 (aiC2020.2d)". Below this, there are tabs for "Parameters" and "Snapshots". A search bar is present. The "Host" dropdown menu is open, showing "All" selected. The main area lists parameters under sections like "connection" and "host".</p>
<p>4. You can perform a global search for a configuration file, section, specific value or layer type.</p>	
<p>5. You can add a section to a configuration file.</p>	
<p>6. You can compare parameters.</p>	
<p>7. You can take a snapshot with optional notes.</p>	
<p>8. You can view your change history to keep track of your configuration edits.</p>	

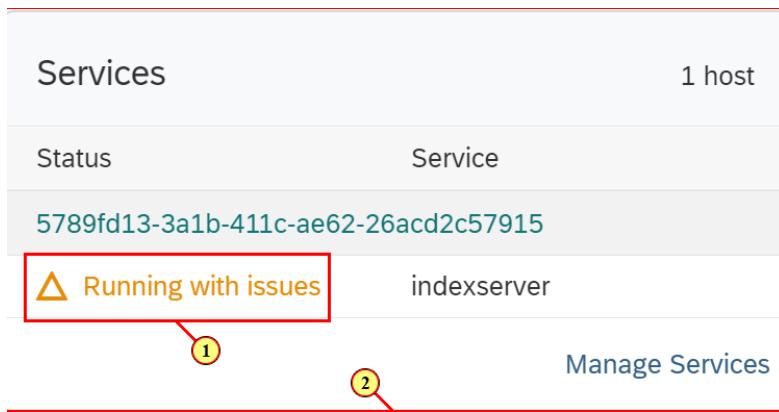
Explanation	Screenshot
9. You can add a parameter to a section by clicking the + button.	
10. Enter indexserver.ini in the Configuration File text field. You can use the drop-down list box to select the configuration file, or you can begin typing its name and the text box will auto fill.	 <p>The screenshot shows the SAP Database Configuration interface for SYSTEMDB_HANA-hana. The 'Configuration File' dropdown is set to 'indexserver.ini'. The 'Section' dropdown is set to 'stat'. The 'Host' dropdown is set to 'All'. A red box highlights the 'indexserver.ini' text in the Configuration File field.</p>
11. Let's change a parameter. Enter password policy in the Section field.	 <p>The screenshot shows the SAP Database Configuration interface for SYSTEMDB_HANA-hana. The 'Configuration File' dropdown is set to 'indexserver.ini'. The 'Section' dropdown is set to 'password policy'. The 'Host' dropdown is set to 'All'. A red box highlights the 'password policy' text in the Section field. Below the search bar, a message says 'Parameters (13)'.</p>
12. Click Go .	
13. Click the + button to add a new parameter.	 <p>The screenshot shows the SAP Database Configuration interface for SYSTEMDB_HANA-hana. The 'File' is 'indexserver.ini' and the 'Section' is 'password policy'. In the 'Add Parameters' dialog, a parameter named 'last_used_passwords' is selected. The 'Value' field contains '3'. A red box highlights the '3' in the Value field. A tooltip 'Number of recently used passwords ...' is shown next to the Value field.</p>
14. Click on the Search button, and a pop up comes up with all possible Parameters that can be added for this section.	
15. Enter 3 in the Value text field.	
16. Click on Save .	<p>The screenshot shows the SAP Database Configuration interface for SYSTEMDB_HANA-hana. The 'Save' button is highlighted with a red box. Other buttons in the dialog are 'Save and Add Another' and 'Cancel'.</p>
17. We've edited this password policy parameter so that the user cannot change their password to be one of the last 3 passwords used (instead of the default last 5 passwords used).	 <p>The screenshot shows the SAP Database Configuration interface for SYSTEMDB_HANA-hana. The table shows three parameters: 'create_error_on_connect' (value: false), 'force_ltu_password_change' (value: true), and 'last_used_passwords' (value: 3). A red box highlights the '3' in the 'Value' column for 'last_used_passwords'.</p>

Explanation	Screenshot
<p>18. Click Back in the top right to return to the Database Overview page.</p>	

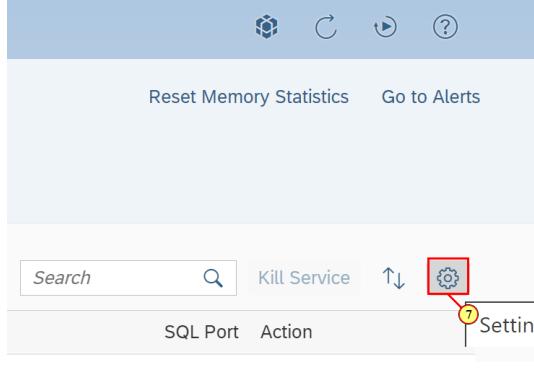
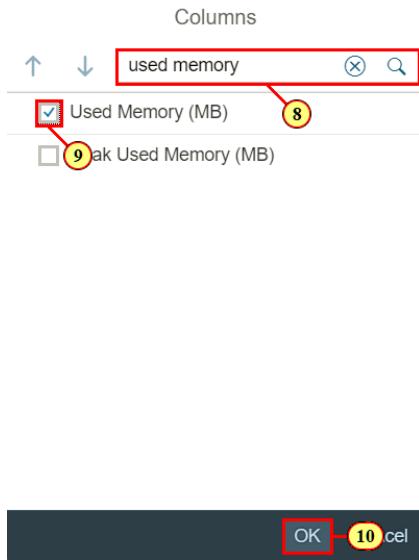
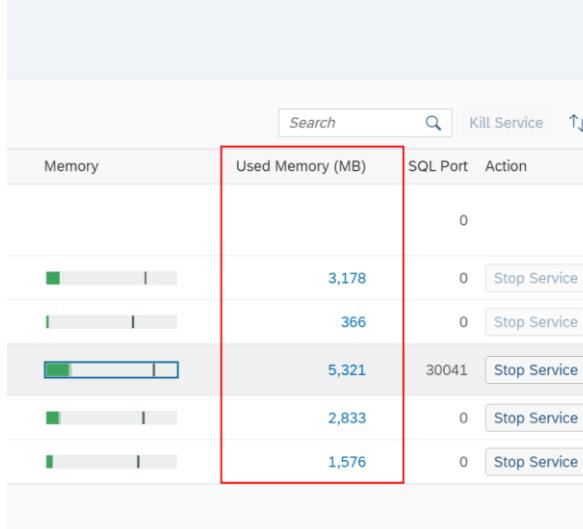
Exercise 3: Managing Services

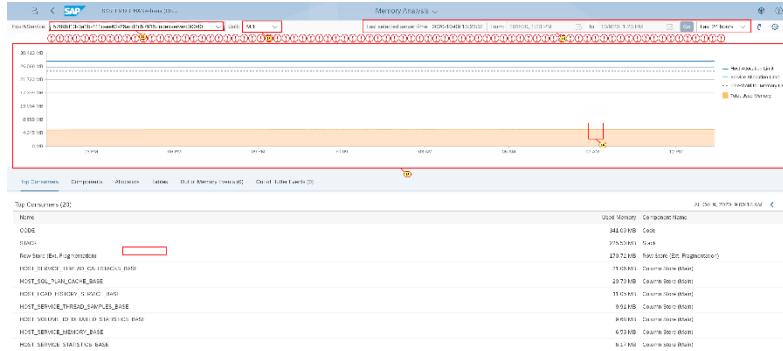
To monitor the health of your SAP HANA database in more detail, for example to troubleshoot performance bottlenecks, you can analyze the status and memory usage of individual database services. The Memory Analysis application is helpful here as it provides a more detailed breakdown of memory usage. It enables you to visualize and explore the memory allocation of every service of a selected host during a specified time range. If you notice an increase in overall memory usage, you can investigate whether it's due to a particular component, subcomponent, or table.

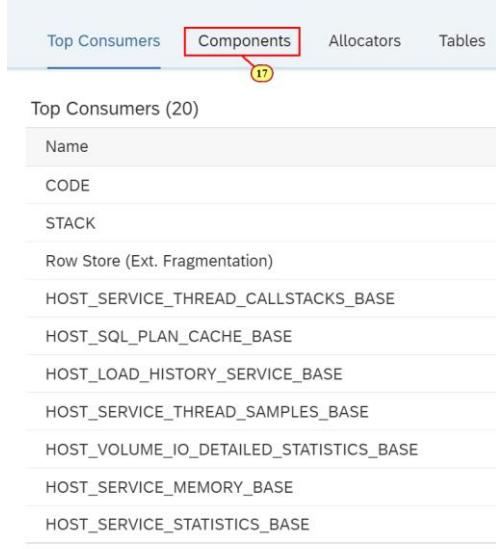
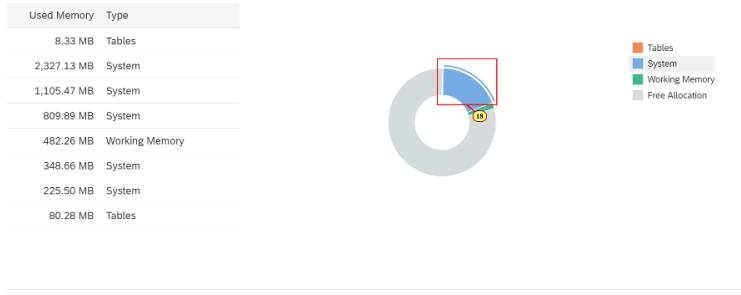
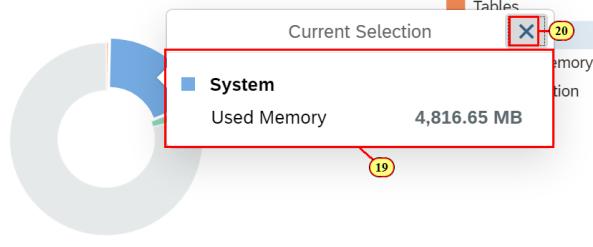
In this exercise, you review the information displayed in the Services card, examine the different database service management operations you have access to, and perform a basic analysis of memory usage.

Explanation	Screenshot										
<p> The "Services" card displays metrics regarding the operational status of the SAP HANA database.</p> <p>1. Here you see the status of the database, "Running with issues" in this case. Other possible values include "Running", "Stopped", "Error", "No SQL Access".</p> <p>2. Click anywhere in the middle of the tile to open the Manage Services application.</p>	 <table border="1" data-bbox="578 1227 1357 1639"> <thead> <tr> <th data-bbox="578 1227 1095 1305">Services</th> <th data-bbox="1095 1227 1357 1305">1 host</th> </tr> </thead> <tbody> <tr> <td data-bbox="578 1354 1095 1390">Status</td> <td data-bbox="1095 1354 1357 1390">Service</td> </tr> <tr> <td data-bbox="578 1428 1095 1464">5789fd13-3a1b-411c-ae62-26acd2c57915</td> <td data-bbox="1095 1428 1357 1464"></td> </tr> <tr> <td data-bbox="578 1491 899 1548">  Running with issues </td> <td data-bbox="899 1491 1357 1548">indexserver</td> </tr> <tr> <td data-bbox="578 1576 1357 1639" style="text-align: right;">(1)</td> <td data-bbox="578 1576 1357 1639" style="text-align: right;">(2) Manage Services</td> </tr> </tbody> </table>	Services	1 host	Status	Service	5789fd13-3a1b-411c-ae62-26acd2c57915		 Running with issues	indexserver	(1)	(2) Manage Services
Services	1 host										
Status	Service										
5789fd13-3a1b-411c-ae62-26acd2c57915											
 Running with issues	indexserver										
(1)	(2) Manage Services										

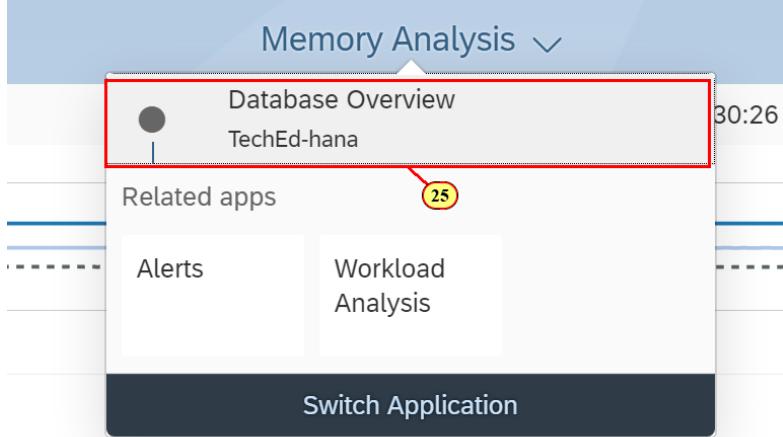
Explanation	Screenshot
<p> The Manage Services app enables you to monitor the health of your SAP HANA database in more detail, for example, to troubleshoot performance bottlenecks, you can analyze the status and resource usage of individual database services.</p>	
<p>If necessary, you can perform follow-up operations, such as stopping a service, or killing a service. You can also reset memory statistics and navigate to Alerts application.</p>	
<p>3. Detailed service information.</p>	
<p>4. CPU usage of the service. Clicking on the mini bar chart redirects you to the Performance Monitor to see more details.</p>	
<p>5. Memory usage of the service, showing used memory (dark green), peak memory (light green), effective allocation limit (grey bar) and physical memory (light grey background).</p>	
<p>6. You can sort the table and add/remove other metrics (e.g. used memory, CPU process %, etc.) and search for specific services.</p>	
<p>You can also perform additional operations, such as start/stop/kill/add/remove services and reset memory statistics.</p>	

Explanation	Screenshot																												
<p>7. Let's add a column to the table. Click Settings (above the table on the right)..</p>																													
<p>8. Enter used memory in the search bar.</p> <p>9. Click Used Memory (MB).</p> <p>10. Click OK.</p>																													
<p>i The column "Used Memory (MB)" is added to the table. As you can see, the indexserver service consumes the most memory. Since we are looking at a tenant database, the main service is indexserver. For a system database the main server would be nameserver.</p>	 <table border="1"> <thead> <tr> <th data-bbox="605 1517 671 1538">Memory</th> <th data-bbox="801 1517 948 1538">Used Memory (MB)</th> <th data-bbox="981 1517 1046 1538">SQL Port</th> <th data-bbox="1079 1517 1128 1538">Action</th> </tr> </thead> <tbody> <tr> <td data-bbox="605 1586 671 1607"> </td> <td data-bbox="883 1586 948 1607">0</td> <td data-bbox="981 1586 1046 1607"> </td> <td data-bbox="1079 1586 1128 1607"> </td> </tr> <tr> <td data-bbox="605 1629 671 1650"> </td> <td data-bbox="883 1629 948 1650">3,178</td> <td data-bbox="981 1629 1046 1650">0</td> <td data-bbox="1079 1629 1161 1650">Stop Service</td> </tr> <tr> <td data-bbox="605 1671 671 1692"> </td> <td data-bbox="883 1671 948 1692">366</td> <td data-bbox="981 1671 1046 1692">0</td> <td data-bbox="1079 1671 1161 1692">Stop Service</td> </tr> <tr> <td data-bbox="605 1713 671 1734"> </td> <td data-bbox="883 1713 948 1734">5,321</td> <td data-bbox="981 1713 1046 1734">30041</td> <td data-bbox="1079 1713 1161 1734">Stop Service</td> </tr> <tr> <td data-bbox="605 1755 671 1777"> </td> <td data-bbox="883 1755 948 1777">2,833</td> <td data-bbox="981 1755 1046 1777">0</td> <td data-bbox="1079 1755 1161 1777">Stop Service</td> </tr> <tr> <td data-bbox="605 1798 671 1819"> </td> <td data-bbox="883 1798 948 1819">1,576</td> <td data-bbox="981 1798 1046 1819">0</td> <td data-bbox="1079 1798 1161 1819">Stop Service</td> </tr> </tbody> </table>	Memory	Used Memory (MB)	SQL Port	Action		0				3,178	0	Stop Service		366	0	Stop Service		5,321	30041	Stop Service		2,833	0	Stop Service		1,576	0	Stop Service
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Explanation	Screenshot
<p>11. Let's examine the memory usage for the indexserver service. Locate it and click memory mini bar chart to launch the Memory Analysis tool.</p>	
<p> The Memory Analysis app enables you to visualize and explore the memory allocation of every service of a selected host during a specified time range. If you notice an increase in overall memory usage, you can investigate whether it's due to a particular component, subcomponent, or table.</p>	
<p>12. You can choose which host and service to examine.</p>	
<p>13. You can change the units for the displayed values (MB, GB, or TB).</p>	
<p>14. You can select a time range to investigate, from the last 24 days to the last 6 weeks, or a custom range.</p>	
<p>15. The upper time chart visualizes the memory statistics. In addition to the total used memory by SAP HANA, you also see the allocation limits for the service and the host.</p>	
<p> When analyzing memory, you typically select the appropriate time range to examine, then click on a specific time in the upper chart. The lower chart is then automatically populated based on that time, allowing you to deepen your analysis.</p>	

Explanation	Screenshot																		
16. Click the upper chart on an area where the used memory is more than 0 MB (look for an orange colored section).																			
17. Click the Components tab.	 <p>The screenshot shows the 'Components' tab selected in a navigation bar. Below it is a table titled 'Top Consumers (20)' listing various system components:</p> <table border="1"> <thead> <tr> <th>Name</th> </tr> </thead> <tbody> <tr><td>CODE</td></tr> <tr><td>STACK</td></tr> <tr><td>Row Store (Ext. Fragmentation)</td></tr> <tr><td>HOST_SERVICE_THREAD_CALLSTACKS_BASE</td></tr> <tr><td>HOST_SQL_PLAN_CACHE_BASE</td></tr> <tr><td>HOST_LOAD_HISTORY_SERVICE_BASE</td></tr> <tr><td>HOST_SERVICE_THREAD_SAMPLES_BASE</td></tr> <tr><td>HOST_VOLUME_IO_DETAILED_STATISTICS_BASE</td></tr> <tr><td>HOST_SERVICE_MEMORY_BASE</td></tr> <tr><td>HOST_SERVICE_STATISTICS_BASE</td></tr> </tbody> </table>	Name	CODE	STACK	Row Store (Ext. Fragmentation)	HOST_SERVICE_THREAD_CALLSTACKS_BASE	HOST_SQL_PLAN_CACHE_BASE	HOST_LOAD_HISTORY_SERVICE_BASE	HOST_SERVICE_THREAD_SAMPLES_BASE	HOST_VOLUME_IO_DETAILED_STATISTICS_BASE	HOST_SERVICE_MEMORY_BASE	HOST_SERVICE_STATISTICS_BASE							
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 <p>The donut chart displays the memory details at that specific point in time.</p>	 <p>The screenshot shows a donut chart with a legend on the right. The legend categories are: Tables (orange), System (blue), Working Memory (green), and Free Allocation (grey). The chart is divided into four segments. A blue segment is highlighted with a red box and a yellow circle containing the number 18, indicating the current selection.</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Used Memory</th> </tr> </thead> <tbody> <tr><td>Tables</td><td>8.33 MB</td></tr> <tr><td>System</td><td>2,327.13 MB</td></tr> <tr><td>System</td><td>1,105.47 MB</td></tr> <tr><td>System</td><td>809.89 MB</td></tr> <tr><td>Working Memory</td><td>482.26 MB</td></tr> <tr><td>System</td><td>348.66 MB</td></tr> <tr><td>System</td><td>225.50 MB</td></tr> <tr><td>Tables</td><td>80.28 MB</td></tr> </tbody> </table>	Type	Used Memory	Tables	8.33 MB	System	2,327.13 MB	System	1,105.47 MB	System	809.89 MB	Working Memory	482.26 MB	System	348.66 MB	System	225.50 MB	Tables	80.28 MB
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<p>18. Click the blue section in the donut chart to see more information about system memory.</p> <p>19. You see the amount of memory taken up by system memory. You can select more components to add their memory amount in this popup.</p> <p>20. Click the X to close the popup.</p>	 <p>The screenshot shows a donut chart with a tooltip overlaid. The tooltip is titled 'Current Selection' and contains the following information:</p> <ul style="list-style-type: none"> System Used Memory: 4,816.65 MB <p>A red box highlights the 'Used Memory' section of the tooltip, and a yellow circle with the number 19 is placed near the bottom right corner of the tooltip. An 'X' button is visible in the top right corner of the tooltip.</p>																		

Explanation	Screenshot
<p>21. Let's investigate a couple of components in more detail. Check System.</p> <p>22. Click Statement Execution & Intermediate Results.</p>	
<p>23. Scroll down and click the arrow at the bottom of the page to expand the Used Memory history chart.</p>	
<p> The history chart shows the memory usage over time for the components you selected.</p>	
<p>24. You can deepen your analysis by looking at the statistics about the memory used by data tables. Click Tables.</p> <p> The top chart shows the breakdown of memory usage of the top 10 highest consuming tables for the specific time you're investigating.</p> <p>The bottom chart shows the memory usage of the top 10 tables with the largest change in consumption for the selected time period.</p>	

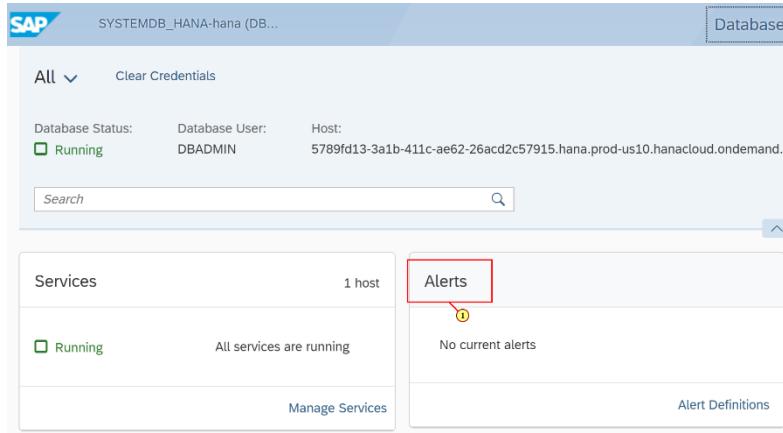
Explanation	Screenshot
<p>25. Select the drop-down menu at the top named Memory Analysis and select Database Overview from the menu to return to the Database Overview page.</p>	

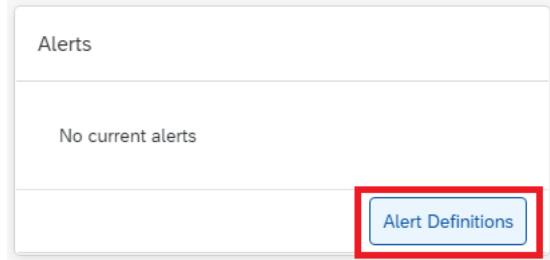
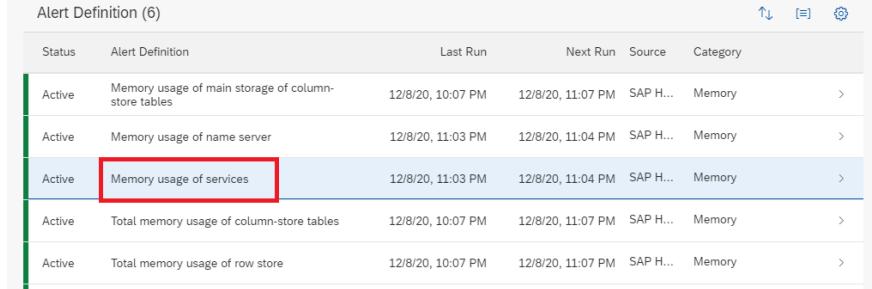
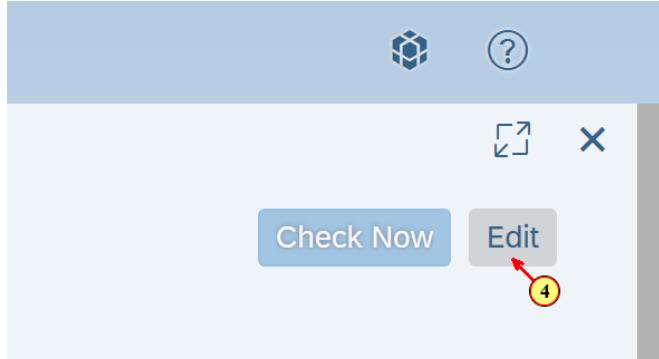
Exercise 4: Managing Alerts

As an administrator, you actively monitor the status of the system, its services, and the consumption of system resources. However, you are also alerted of critical situations, for example: memory utilization is reaching a critical level, or a server has stopped.

The internal monitoring infrastructure of the SAP HANA database is continuously collecting and evaluating information about status, performance, and resource usage from all components of the SAP HANA database. In addition, it performs regular checks on the data in system tables and views and when configurable threshold values are exceeded, issues alerts. In this way, you are warned of potential problems. The priority of the alert indicates the severity of the problem and depends on the nature of the check and configured threshold values.

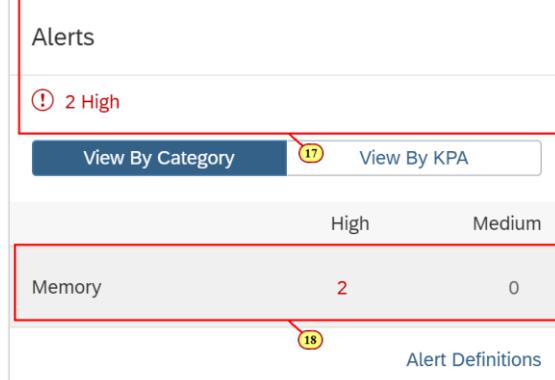
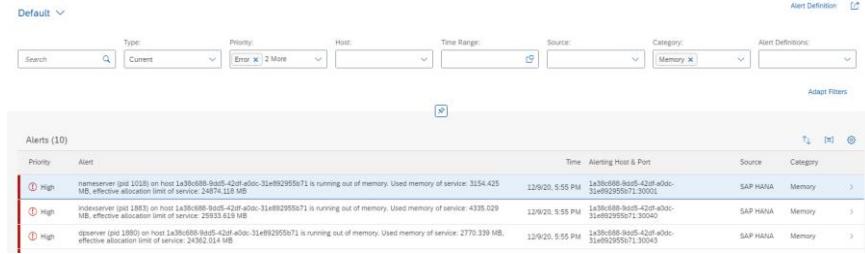
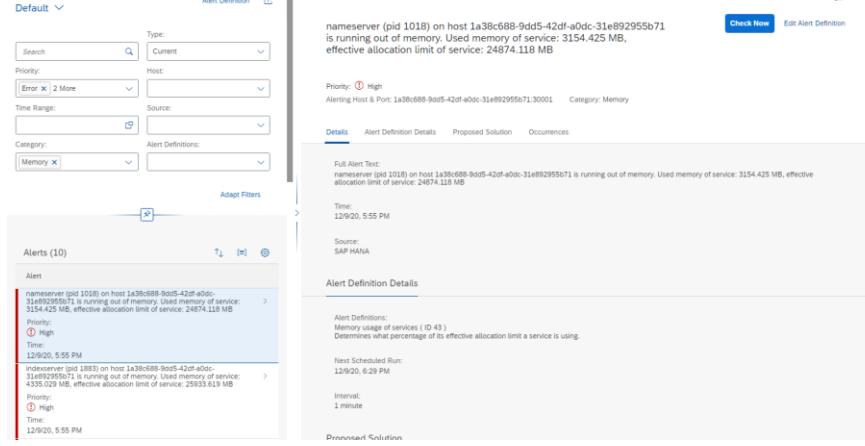
In this exercise, you'll examine the Alerts card, drill-down to obtain more information about raised alerts and configure alert thresholds.

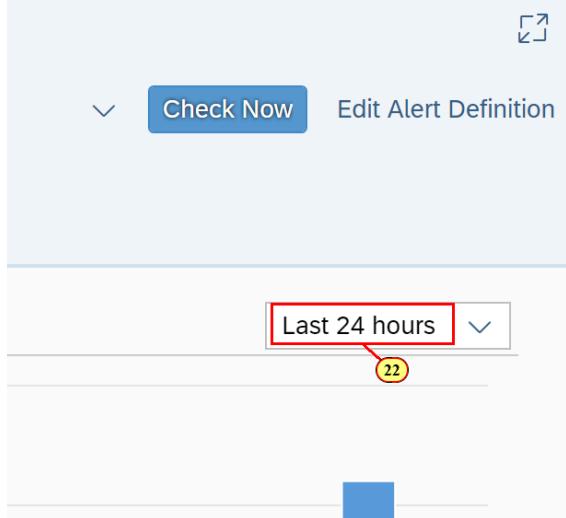
Explanation	Screenshot
<p>1. Locate the Alerts card.</p> <p></p> <p>This card displays the number of high (in red colored font) and medium (in orange colored font) priority alerts in the database, classified into one of the 10 alert categories in SAP HANA. It allows you to quickly identify issues in the database and drill-down to the Alert Details app to analyze</p>	

Explanation	Screenshot
the situation. You can also choose to view alerts by the key performance areas of available, performance and capacity.	
2. Click on Alert Definitions in the Alerts card.	
<p> The Alert Definition screen allows you to choose from many existing alerts, search for them and manage how the different SAP HANA alerts are triggered. On clicking on a particular alert, it displays information about the alert, including its description, category, schedule, threshold values, proposed solution and notifications.</p> <p>3. Locate (or Search) and click on Memory usage of services alert</p>	
4. Click on Edit in the top right corner.	

Explanation	Screenshot
<p>5. Underneath the alert name, you see the last time SAP HANA checked for this alert.</p> <p>6. SAP HANA uses a time interval to check for alerts. You can enable or disable the alert by toggling the schedule button.</p> <p>7. The threshold values are critical to alert management, as they control the priority of the alert (high, medium or low). You can set these for most alerts, according to your needs.</p> <p>8. Let's change the threshold values for the alert we are currently viewing, "Host physical memory usage". Click Edit on the top right corner.</p>	
<p>i The threshold values determine the priority of the alert when it gets triggered. You can change them depending on your environment. For this workshop, we'll change the values to be unnecessarily low so that a high priority alert is triggered (when memory usage is more than 3% total), but under normal circumstances the values would be more reasonable.</p> <p>9. Replace the value in High text field to be 3</p> <p>10. Replace the value in Medium text field to be 2</p> <p>11. Replace the value in Low text field to be 1</p>	

Explanation	Screenshot
<p>12. Set the Schedule Active toggle button to Yes</p> <p>13. Click on Save to accept the changes.</p>	
<p>14. Click Check Now to run the Alert.</p>	
<p>15. When the alert checker finishes running, you get a message with the result. In this case, one alert was issued. Click Close.</p>	
<p>16. Click Back twice to return to Database Overview page.</p>	

Explanation	Screenshot																								
<p>17. Locate the Alerts card.</p> <p> Notice the alert count for Memory increased. Its number depends on the database, but you'll see at least one high and/or medium priority alert.</p>	 <p>The screenshot shows the 'Alerts' card with a red box around the 'Memory' section. It displays '2 High' alerts. Below the count, there are two buttons: 'View By Category' (highlighted with a yellow circle containing '17') and 'View By KPA'. Under the 'Memory' category, there are two boxes: 'High' with a value of '2' and 'Medium' with a value of '0'. At the bottom right, there is a link 'Alert Definitions' with a yellow circle containing '18'.</p>																								
<p>18. Click on Memory bar to open the Alerts application.</p>	 <p>The screenshot shows the SAP Fiori Launchpad with the 'Alerts' application selected for the 'Memory' category. The search bar has 'Memory' typed into it. The results show three alerts, all categorized as 'High'.</p> <table border="1"> <thead> <tr> <th>Priority</th> <th>Alert</th> <th>Time</th> <th>Alerting Host & Port</th> <th>Source</th> <th>Category</th> </tr> </thead> <tbody> <tr> <td>① High</td> <td>nameserver (pid 1018) on host 1a38c688-9dd5-42df-a0dc-31e892955b71 is running out of memory. Used memory of service: 3154.425 MB, effective allocation limit of service: 24874.118 MB</td> <td>12/9/20, 5:55 PM</td> <td>1a38c688-9dd5-42df-a0dc-31e892955b71:30001</td> <td>SAP HANA</td> <td>Memory</td> </tr> <tr> <td>① High</td> <td>indexserver (pid 1083) on host 1a38c688-9dd5-42df-a0dc-31e892955b71 is running out of memory. Used memory of service: 4335.029 MB, effective allocation limit of service: 25933.613 MB</td> <td>12/9/20, 5:55 PM</td> <td>1a38c688-9dd5-42df-a0dc-31e892955b71:3040</td> <td>SAP HANA</td> <td>Memory</td> </tr> <tr> <td>① High</td> <td>opserver (pid 2890) on host 1a38c688-9dd5-42df-a0dc-31e892955b71 is running out of memory. Used memory of service: 2770.339 MB, effective allocation limit of service: 24952.514 MB</td> <td>12/9/20, 5:55 PM</td> <td>1a38c688-9dd5-42df-a0dc-31e892955b71:30043</td> <td>SAP HANA</td> <td>Memory</td> </tr> </tbody> </table>	Priority	Alert	Time	Alerting Host & Port	Source	Category	① High	nameserver (pid 1018) on host 1a38c688-9dd5-42df-a0dc-31e892955b71 is running out of memory. Used memory of service: 3154.425 MB, effective allocation limit of service: 24874.118 MB	12/9/20, 5:55 PM	1a38c688-9dd5-42df-a0dc-31e892955b71:30001	SAP HANA	Memory	① High	indexserver (pid 1083) on host 1a38c688-9dd5-42df-a0dc-31e892955b71 is running out of memory. Used memory of service: 4335.029 MB, effective allocation limit of service: 25933.613 MB	12/9/20, 5:55 PM	1a38c688-9dd5-42df-a0dc-31e892955b71:3040	SAP HANA	Memory	① High	opserver (pid 2890) on host 1a38c688-9dd5-42df-a0dc-31e892955b71 is running out of memory. Used memory of service: 2770.339 MB, effective allocation limit of service: 24952.514 MB	12/9/20, 5:55 PM	1a38c688-9dd5-42df-a0dc-31e892955b71:30043	SAP HANA	Memory
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<p>19. Click on one of the High priority Alerts to get into Alerts Details page.</p> <p>20. You can navigate to the Alert Details screen from different places and filtering is automatically done to see the relevant alerts.</p> <p>21. You see detailed information about the alert, along with a proposed solution.</p>	 <p>The screenshot shows the 'Alert Definition' details for a specific alert. The alert is for a 'nameserver' (pid 1018) running out of memory. The alert definition details include the full alert text, alerting host and port, time, source, and category. The 'Alert Definition Details' tab is selected, showing the alert definition text: 'nameserver (pid 1018) on host 1a38c688-9dd5-42df-a0dc-31e892955b71 is running out of memory. Used memory of service: 3154.425 MB, effective allocation limit of service: 24874.118 MB'. The 'Proposed Solution' tab is also visible.</p>																								

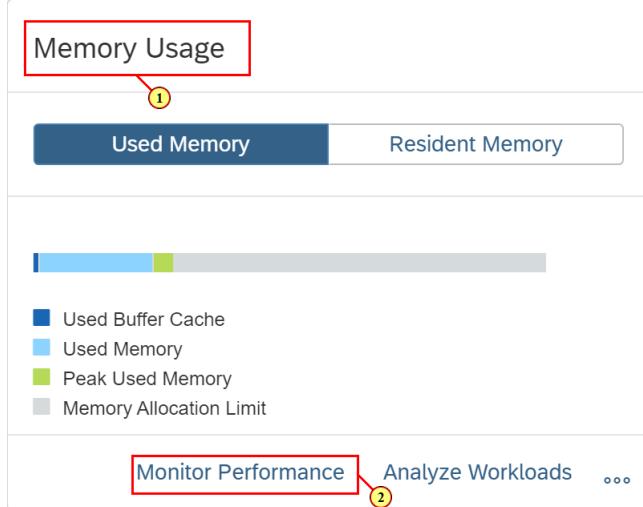
Explanation	Screenshot
22. You can see when this alert occurred, up to the last 30 days. This detail is under the Occurrences tab.	
23. Click the Back button <u>twice</u> to return to Database Overview page.	

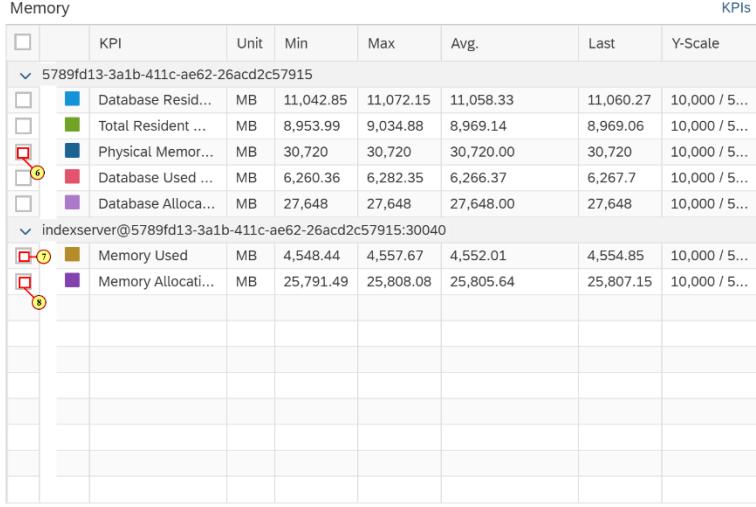
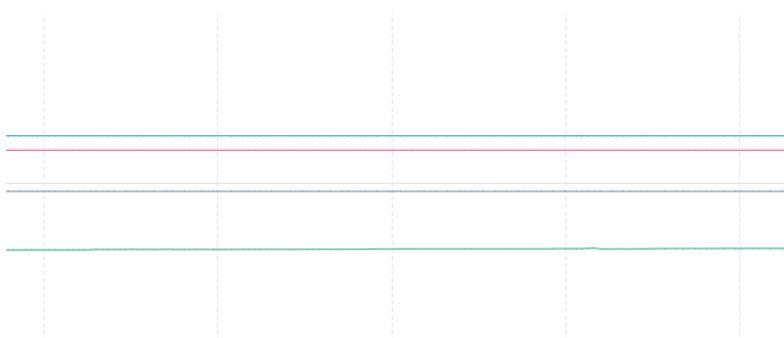
Exercise 5: Monitoring Resources

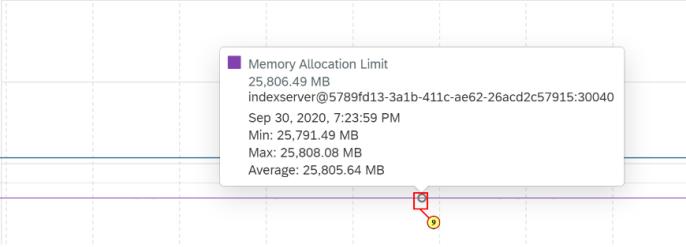
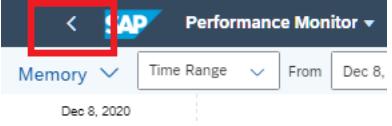
SAP HANA administrators must carefully monitor system computing resources to ensure optimal operation of the database. There are many metrics available to monitor in the SAP HANA cockpit, including memory, CPU and disk usage. You can view precise consumption details for those resources, as well as historical utilization information.

In this exercise, you'll examine the memory utilization of an SAP HANA database and observe the behavior of a few KPIs. You'll also learn to customize the utilization charts to display the information most relevant to your situation.

Explanation	Screenshot
1. Locate the Memory Usage card. It displays how much	

Explanation	Screenshot
<p>memory the host has consumed for the past 2 hours.</p> <p>There are also CPU Usage and Disk Usage cards, showing those metrics for the same time period.</p> <p>2. Let's investigate the memory utilization for this database. Click Monitor Performance.</p>	
<p>3. The Performance Monitor appears, allowing you to see KPIs for memory usage.</p> <p>4. You can change the time range to display.</p> <p>5. You can export a complete snapshot of the performance monitor data into a ZIP file that you can download and send to SAP Support to analyze and diagnose problems with the SAP HANA database.</p> <p>Similarly, you can import performance monitor data from a ZIP file into the SAP HANA cockpit.</p>	

Explanation	Screenshot																																																															
<p>6. Let's examine a few KPIs in more detail. Check Physical Memory Size.</p> <p>7. Click Memory Used.</p> <p>8. Click Memory Allocation Limit.</p>	 <table border="1"> <thead> <tr> <th>KPI</th> <th>Unit</th> <th>Min</th> <th>Max</th> <th>Avg.</th> <th>Last</th> <th>Y-Scale</th> </tr> </thead> <tbody> <tr> <td>Database Residual</td> <td>MB</td> <td>11,042.85</td> <td>11,072.15</td> <td>11,058.33</td> <td>11,060.27</td> <td>10,000 / 5...</td> </tr> <tr> <td>Total Resident</td> <td>MB</td> <td>8,953.99</td> <td>9,034.88</td> <td>8,969.14</td> <td>8,969.06</td> <td>10,000 / 5...</td> </tr> <tr style="outline: 2px solid red;"> <td>Physical Memory</td> <td>MB</td> <td>30,720</td> <td>30,720</td> <td>30,720.00</td> <td>30,720</td> <td>10,000 / 5...</td> </tr> <tr> <td>Database Used</td> <td>MB</td> <td>6,260.36</td> <td>6,282.35</td> <td>6,266.37</td> <td>6,267.7</td> <td>10,000 / 5...</td> </tr> <tr> <td>Database Allocation</td> <td>MB</td> <td>27,648</td> <td>27,648</td> <td>27,648.00</td> <td>27,648</td> <td>10,000 / 5...</td> </tr> <tr> <td colspan="7">indexserver@5789fd13-3a1b-411c-ae62-26acd2c57915:30040</td></tr> <tr> <td>Memory Used</td> <td>MB</td> <td>4,548.44</td> <td>4,557.67</td> <td>4,552.01</td> <td>4,554.85</td> <td>10,000 / 5...</td> </tr> <tr> <td>Memory Allocation</td> <td>MB</td> <td>25,791.49</td> <td>25,808.08</td> <td>25,805.64</td> <td>25,807.15</td> <td>10,000 / 5...</td> </tr> </tbody> </table>	KPI	Unit	Min	Max	Avg.	Last	Y-Scale	Database Residual	MB	11,042.85	11,072.15	11,058.33	11,060.27	10,000 / 5...	Total Resident	MB	8,953.99	9,034.88	8,969.14	8,969.06	10,000 / 5...	Physical Memory	MB	30,720	30,720	30,720.00	30,720	10,000 / 5...	Database Used	MB	6,260.36	6,282.35	6,266.37	6,267.7	10,000 / 5...	Database Allocation	MB	27,648	27,648	27,648.00	27,648	10,000 / 5...	indexserver@5789fd13-3a1b-411c-ae62-26acd2c57915:30040							Memory Used	MB	4,548.44	4,557.67	4,552.01	4,554.85	10,000 / 5...	Memory Allocation	MB	25,791.49	25,808.08	25,805.64	25,807.15	10,000 / 5...
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Memory Used	MB	4,548.44	4,557.67	4,552.01	4,554.85	10,000 / 5...																																																										
Memory Allocation	MB	25,791.49	25,808.08	25,805.64	25,807.15	10,000 / 5...																																																										
<p> The colored lines representing the selected KPIs are highlighted and you can now make a few observations: this host has 32 GB of RAM and the Memory Allocation Limit for this service (indexserver) is slightly below, so there's a bit of memory left in reserve for other processes. The Memory Used for this service is much lower so there's plenty of room to allocate more memory.</p> <p>What you're looking for are situations that may trigger out of memory events and negatively affect performance. For example, when the memory consumption stays constant near the limits for a prolonged period of time and sudden spike of memory usage happens.</p>																																																																

Explanation	Screenshot
<p>9. You can obtain details for a specific point in time by simply hovering the mouse cursor over the line. Mouse over any point along the Memory Allocation Limit line (in Purple).</p>	
<p>10. Click the Back button to return to the Database Overview page.</p>	

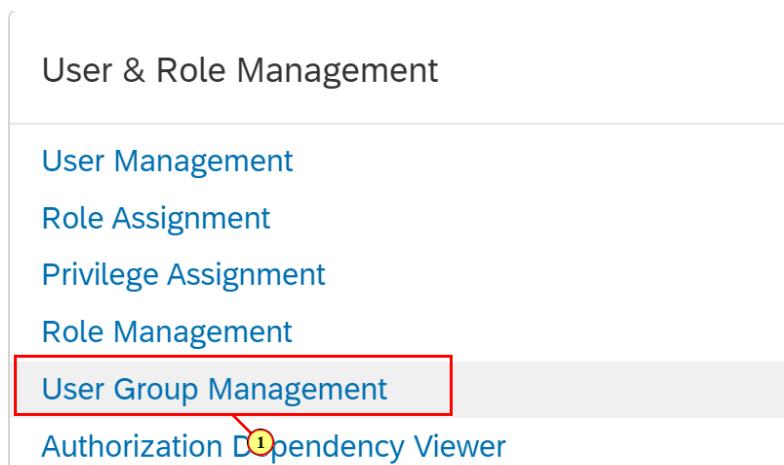
Exercise 6: Security Basics

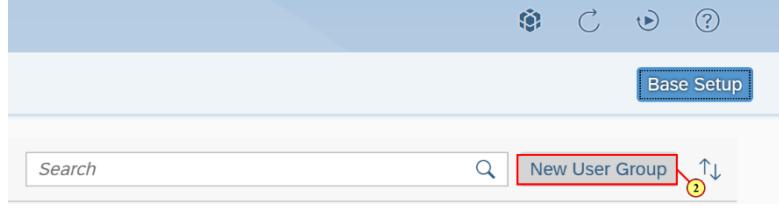
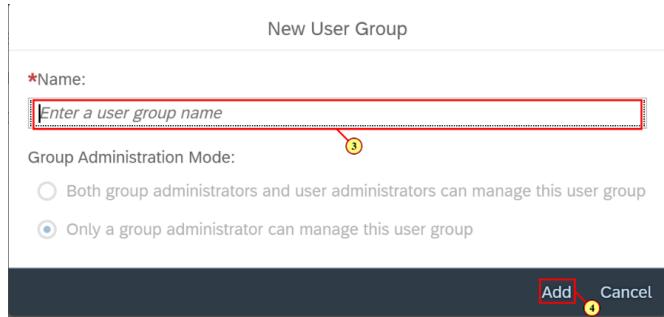
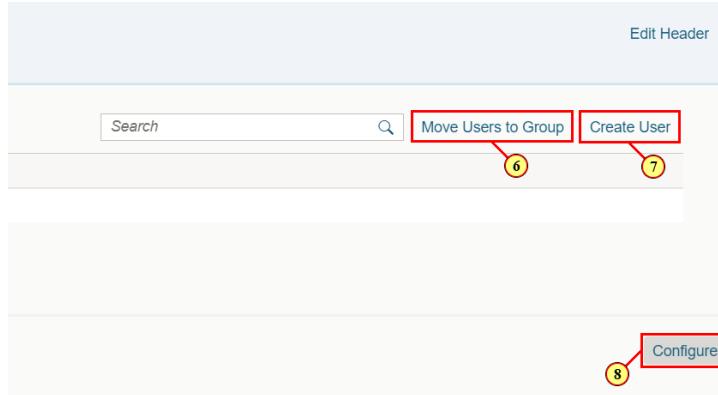
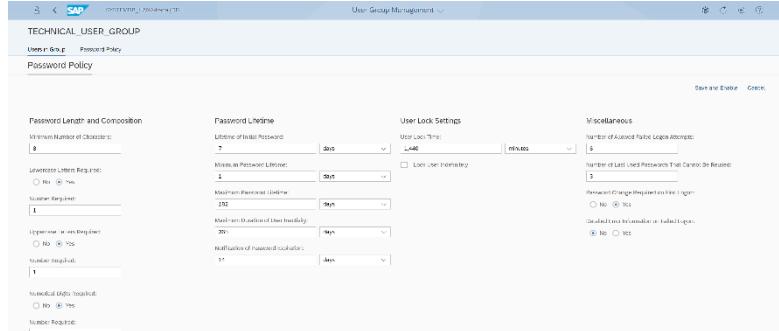
Security administration encompasses a wide range of topics, from monitoring critical security settings, to auditing activity in the SAP HANA database, to managing SAP HANA users and roles.

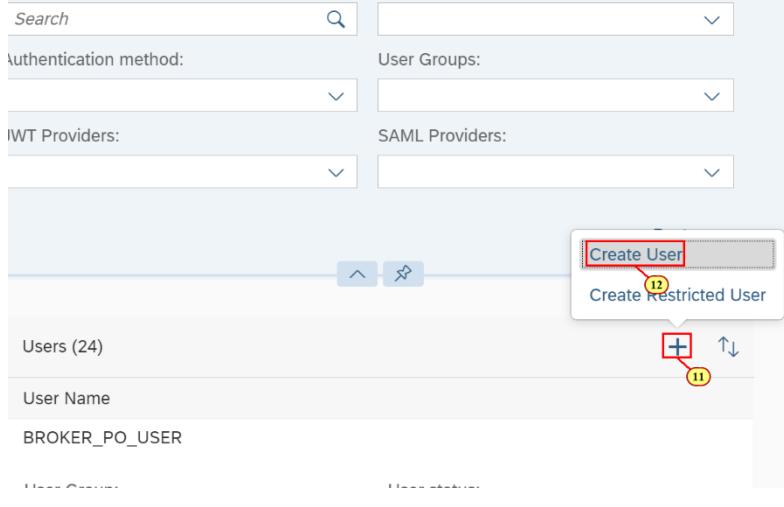
This exercise concentrates on user, role and user group management to provide you with a basic understanding of this important task of database administration.

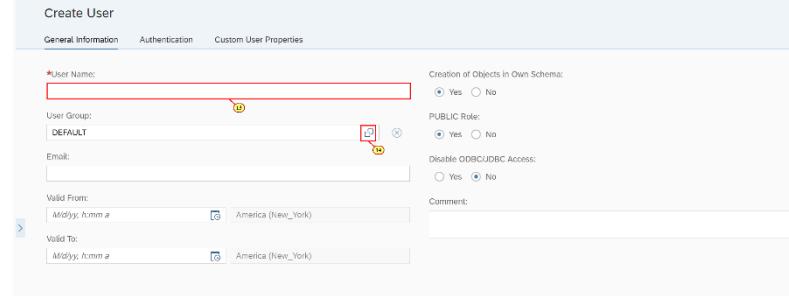
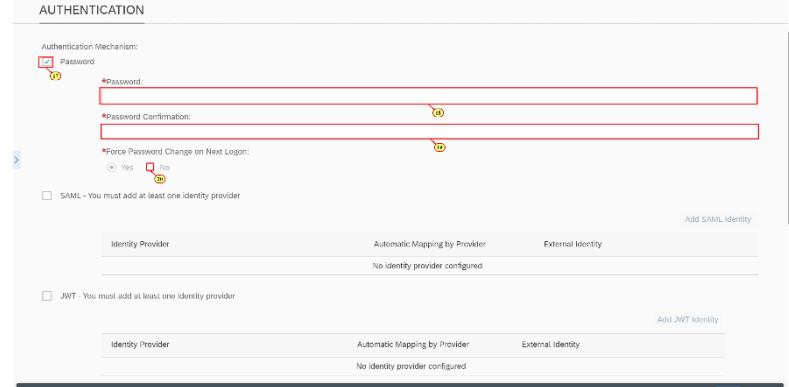
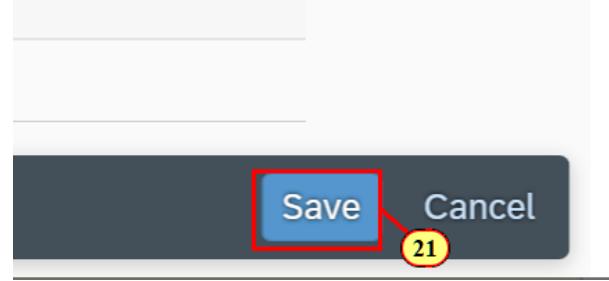
Every user who wants to work with the SAP HANA database must have a database user. As the database administrator, you create and provision the required users, as well as perform other tasks related to user administration. Roles are the standard mechanism of granting privileges to SAP HANA database users. It is recommended that you assign roles to users instead of granting privileges individually. User groups are a mechanism to organize users with similar roles or purposes.

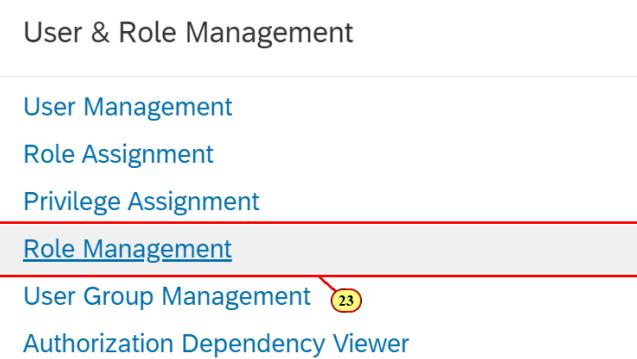
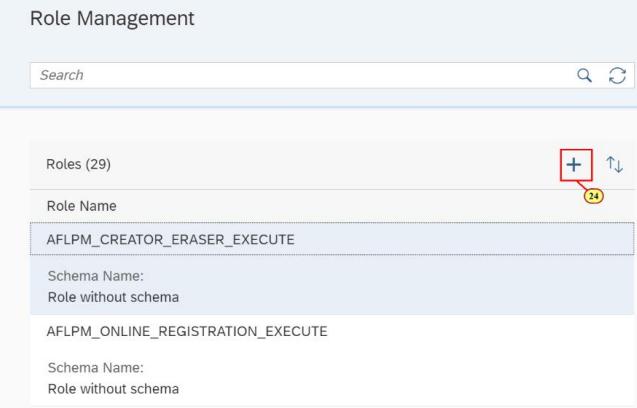
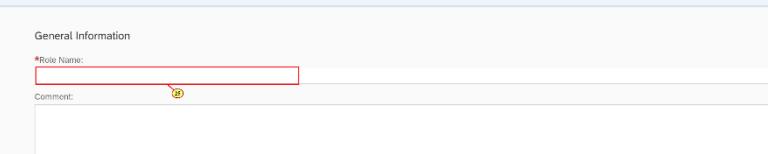
In this exercise, you'll create a new user, a new role and a new user group.

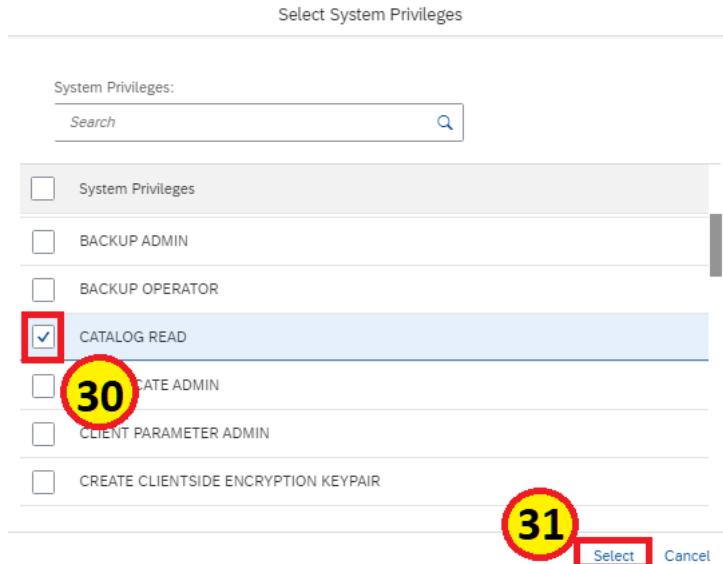
Explanation	Screenshot
<p>1. From the Database Overview page, locate the User & Role Management card. Let's first create a new user group. Click User Group Management.</p>	

Explanation	Screenshot
<p> You can use user groups to group together users with similar roles and to enforce a specific password policy on the group.</p> <p>2. Click New User Group.</p>	
<p>3. Enter TECHNICAL_USER_GROUP in the Name text field.</p> <p>4. Leave the rest of the options in their default settings. Click Add.</p>	
<p>5. Let's explore what we can do with our newly created user group. Click anywhere on the TECHNICAL_USER_GROUP row.</p>	
<p>6. From here you can move existing users to this user group. We haven't created our technical user yet so we won't do this from this page.</p> <p>7. We can also create a new user to assign to this user group.</p> <p>8. To expand the Password Policy configuration, click Configure.</p>	
<p> The password policy can be configured to be different from the database's password policy and will be applied to any users belonging to this user group. From here you can change password policies, such as length requirements, character</p>	

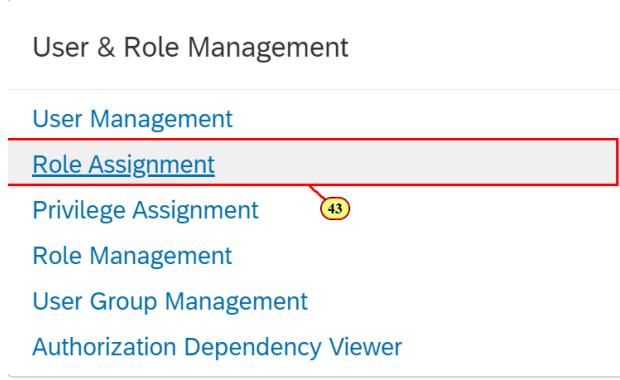
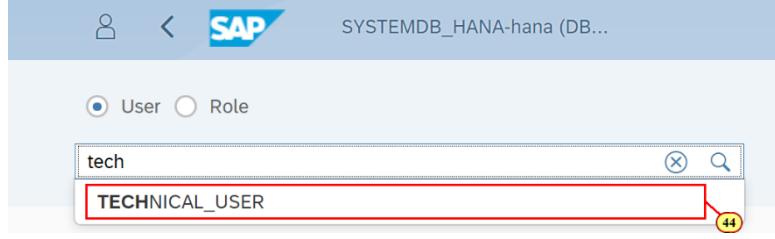
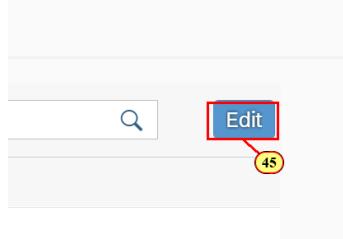
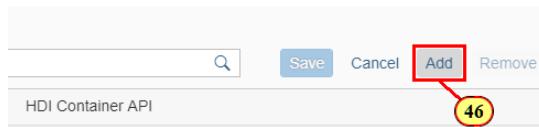
Explanation	Screenshot
requirements, password lifetime, user Lock Settings and expiry, etc.	
9. Click the Back button twice to return to the Database Overview page.	
10. Let's now create a new user. Go back to the User & Role Management card and click on User Management .	
<p>11. Click the plus sign (+) button.</p> <p>12. Click Create User.</p> <p> By default, standard users can create objects in their own schema and read data in system views. Read access to system views is granted by the PUBLIC role, which is granted to every standard user.</p> <p>Restricted users initially have no privileges. They are intended for provisioning users who access SAP HANA through client applications and who are not intended to have full SQL access via an SQL console.</p>	

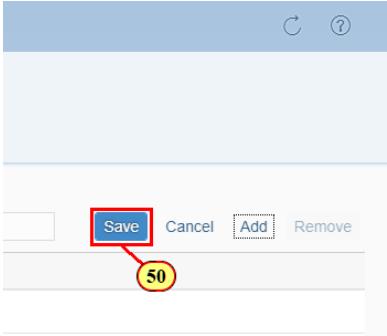
Explanation	Screenshot
<p>13. Enter TECHNICAL_USER in the User Name text field.</p> <p>14. Click the User Group pop-up icon.</p>	
<p>15. Click TECHNICAL_USER_GROUP.</p>	
<p>16. Scroll down to the AUTHENTICATION section.</p> <p>17. Click Password.</p> <p>18. Enter Abcd1234 in the Password text field.</p> <p>19. Enter Abcd1234 in the Password Confirmation text field.</p> <p>20. Select the No radio button on the "Force password change on logon" option.</p>	
<p>21. Click Save in the bottom right corner.</p>	
<p>22. Click the Back button twice to return to the Database Overview page.</p>	

Explanation	Screenshot
<p>23. Let's create a new role. Go back to the User & Role Management card and click Role Management.</p>	 <p>The screenshot shows the User & Role Management interface. A red box highlights the "Role Management" link under the main navigation menu. Other options like User Management, Role Assignment, and Privilege Assignment are also visible.</p>
<p>24. Click the plus sign (+).</p>	 <p>The screenshot shows the "Role Management" screen. A red box highlights the "+" button in the top right corner of the "Roles (29)" list area. Below it, a new role entry is being created with the name "AFLPM_CREATOR_ERASER_EXECUTE".</p>
<p>25. Enter TECHNICAL_USER_ROLE in the Role Name text field.</p>	 <p>The screenshot shows the "Create Role" dialog box. A red box highlights the "Role Name" input field, which contains the value "TECHNICAL_USER_ROLE".</p>
<p>26. Click on Create.</p>	 <p>The screenshot shows the "Create" button in the dialog box, which is highlighted with a red box. A yellow circle with the number "26" is placed near the button.</p>
<p>27. Click System Privileges.</p> <p> The parentheses beside the privilege type shows the number of this type of privilege granted to this role.</p>	 <p>The screenshot shows the "Privileges" tab bar. A red box highlights the "System Privileges (0)" tab, which is currently selected. A yellow circle with the number "27" is placed near the tab.</p>

Explanation	Screenshot
28. Click Edit .	
29. Click Add .	
30. Click CATALOG READ . 31. Click Select .	
32. Click Save . Notice the number in the parentheses besides "System Privileges" is now one.	
33. Click Object Privileges .	
34. Click Edit .	
35. Click Add Object .	

Explanation	Screenshot
<p>36. You can filter based on Object Type. On clicking the dropdown, you can see all Object Types based on which you can filter the Objects. Choose SCHEMA in the Object Type dropdown field.</p> <p>37. You can also filter based on Object Name, Enter _SYS_S in the Object Text field.</p>	<p>The screenshot shows the 'Select Object' dialog. In the 'Object' field, '_SYS_S' is entered. In the 'Object Type' dropdown, 'SCHEMA' is selected. Below the filters, three objects are listed: '_SYS_SECURITY' (SCHEMA), '_SYS_SQL_ANALYZER' (SCHEMA), and '_SYS_STATISTICS' (SCHEMA). A red box highlights the 'Object' input field ('_SYS_S') and the 'Object Type' dropdown ('SCHEMA'). Yellow circles with numbers 37 and 36 point to these respective fields.</p>
<p>38. Choose _SYS_STATISTICS from the filtered results.</p>	<p>The screenshot shows the 'Select Object' dialog with the same filters applied. The list now shows only one item: '_SYS_STATISTICS' (SCHEMA). A red box highlights this row. A yellow circle with number 38 points to the '_SYS_STATISTICS' entry.</p>
<p>39. Scroll down until you see the SELECT privilege. Check SELECT.</p>	<p>The screenshot shows a screen with a 'SELECT' privilege toggle. The 'SELECT' checkbox is checked (indicated by a blue square with a white checkmark) and the 'NO' radio button is unselected (indicated by a grey circle). A yellow circle with number 39 points to the checked 'SELECT' checkbox.</p>
<p>40. Click the SELECT toggle to change it to YES.</p>	<p>The screenshot shows the same privilege selection screen as the previous step, but the 'SELECT' checkbox is now unchecked (blue square with a white square). The 'NO' radio button is selected (grey circle). A red box highlights the 'SELECT' checkbox, and a yellow circle with number 40 points to the 'NO' radio button.</p>
<p>41. Click OK.</p>	<p>The screenshot shows a dark blue rectangular button with the word 'OK' in white. A red box highlights the entire button, and a yellow circle with number 41 points to the center of the button.</p>
<p>42. Click Back.</p>	<p>The screenshot shows a light blue rectangular bar with a back arrow icon and the SAP logo. A red box highlights the back arrow icon, and a yellow circle with number 42 points to the center of the arrow.</p>

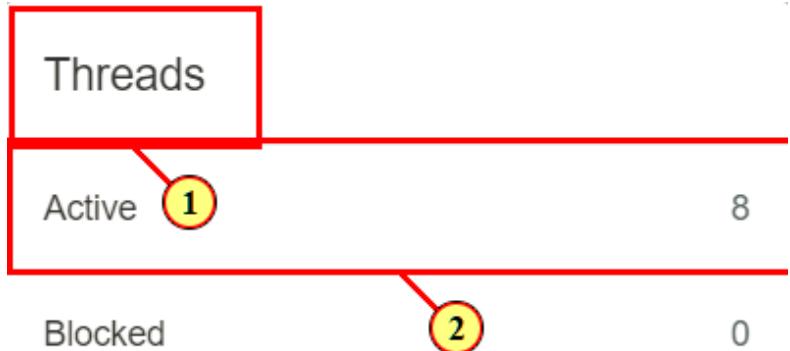
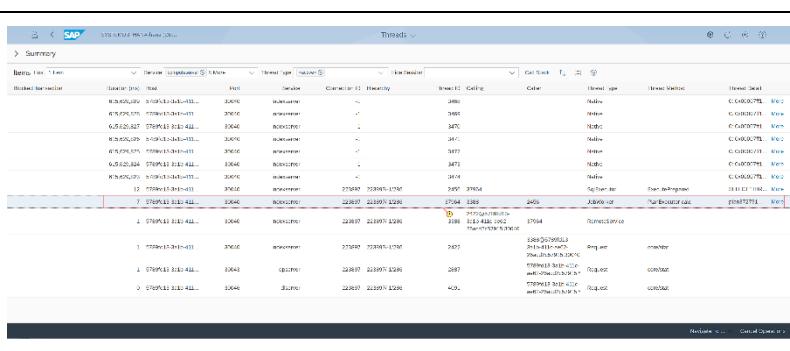
Explanation	Screenshot								
<p>43. Let's now assign the newly created TECHNICAL_USER_ROLE to our user TECHNICAL_USER. Click on Role Assignment.</p>	 <p>User & Role Management</p> <p>User Management</p> <p>Role Assignment 43</p> <p>Privilege Assignment</p> <p>Role Management</p> <p>User Group Management</p> <p>Authorization Dependency Viewer</p>								
<p> On the Role Assignment page, we can search based on either Users or Roles</p> <p>44. Search with keyword 'tech' and all existing User with that keyword show up in the dropdown. Click TECHNICAL_USER from the dropdown.</p>	 <p>SYSTEMDB_HANA-hana (DB...)</p> <p>User Role</p> <p>tech</p> <p>TECHNICAL_USER 44</p>								
<p>45. Click Edit.</p>	 <p>Edit 45</p>								
<p>46. Click Add.</p>	 <p>Add 46</p>								
<p>47. Enter TECHNICAL_USER_ROLE in the Search text field.</p>	 <p>Search 47</p> <p>Select Rules</p> <table border="1"> <tr> <td><input type="checkbox"/> Rule</td> <td><input type="checkbox"/> Service</td> <td><input type="checkbox"/> HDI Container API</td> <td><input type="checkbox"/> Comment</td> </tr> <tr> <td><input type="checkbox"/> AUFUM_SHLADM_HANSA_U_XLCUTL</td> <td></td> <td></td> <td></td> </tr> </table>	<input type="checkbox"/> Rule	<input type="checkbox"/> Service	<input type="checkbox"/> HDI Container API	<input type="checkbox"/> Comment	<input type="checkbox"/> AUFUM_SHLADM_HANSA_U_XLCUTL			
<input type="checkbox"/> Rule	<input type="checkbox"/> Service	<input type="checkbox"/> HDI Container API	<input type="checkbox"/> Comment						
<input type="checkbox"/> AUFUM_SHLADM_HANSA_U_XLCUTL									

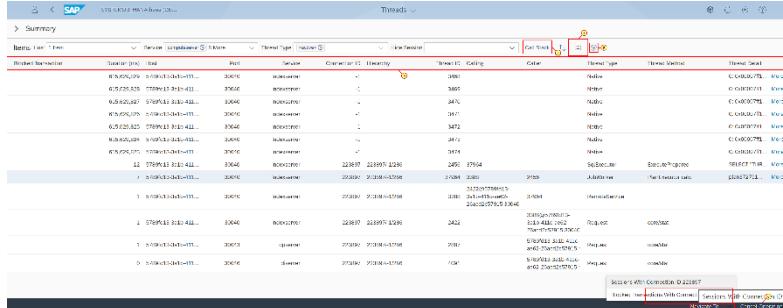
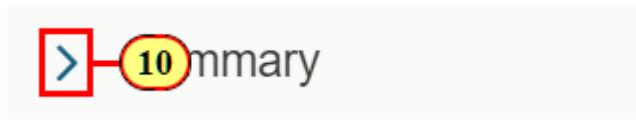
Explanation	Screenshot
48. Click TECHNICAL_USER_ROLE .	
49. Click OK .	
50. Click Save .	
51. Click Back to return to the Database Overview Page.	
52. There is one more link in the User & Role Management card, and that is Privilege Assignment . This application allows you to assign the same privileges that you saw in the Role Assignment application, but this time without having to create a role for the user. This is useful for unique users that require a different combination of privileges than the main reusable roles. We won't cover this because it will mostly be a repeat of what we just saw with the roles portion of this exercise.	<p>User & Role Management</p> <p>User Management</p> <p>Role Assignment</p> <p><u>Privilege Assignment</u></p> <p>Role Management</p> <p>User Group Management</p> <p>Authorization Dependency Viewer</p>

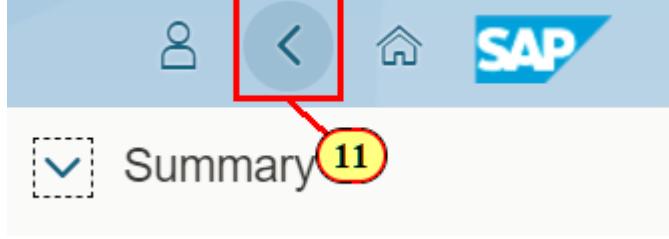
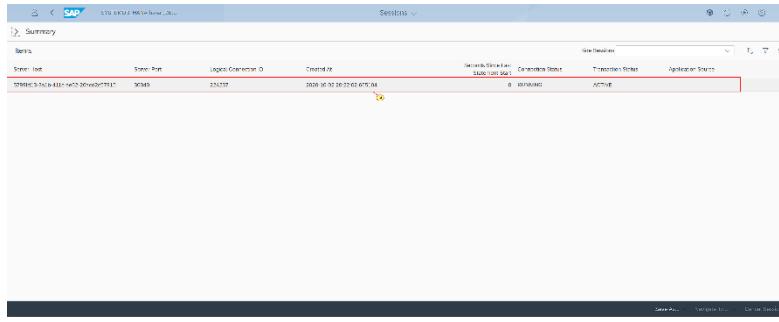
Exercise 7: Performance Management

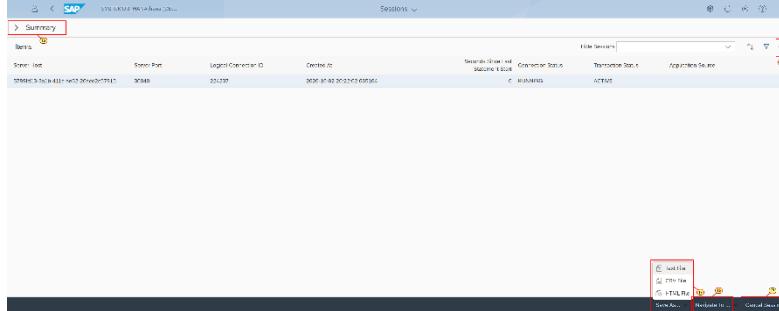
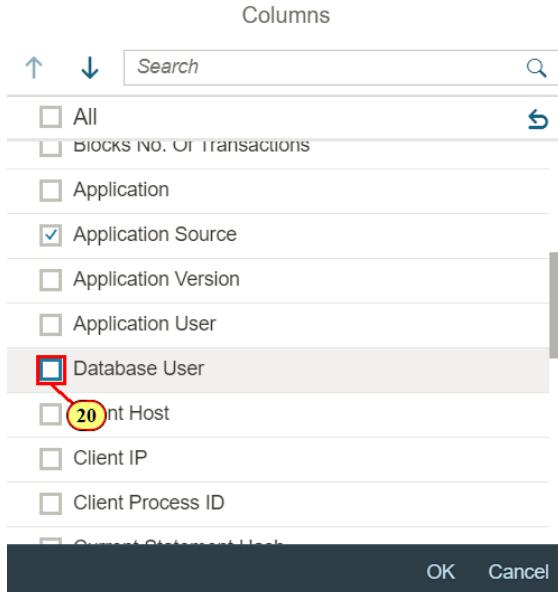
Managing and monitoring past and current information about the performance of the SAP HANA database is important for root-cause analysis and the prevention of future performance issues. We already learned about the Performance Monitor and Memory Analysis applications to visualize and analyze current and historical performance data.

In this exercise, you'll explore the additional performance management tools available in the SAP HANA cockpit.

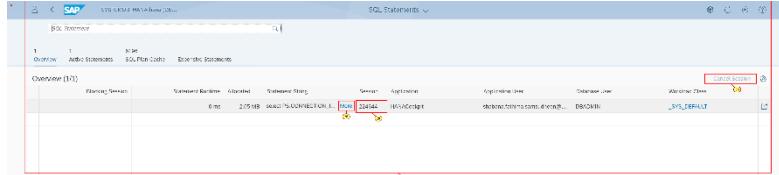
Explanation	Screenshot
<p>1. From the Database Overview page, scroll down until you locate the Threads card.</p>	
<p>This card shows the number of active and blocked threads in the database. Clicking on it takes you to the Threads app, which is used to monitor the longest-running threads active in your system. It may be useful to see, for example, how long a thread is running, or if a thread is blocked for an inexplicable length of time.</p>	
<p>2. Click on the Active threads to launch the Threads application.</p>	
<p>3. Click any row to activate the options in the bottom right corner.</p>	

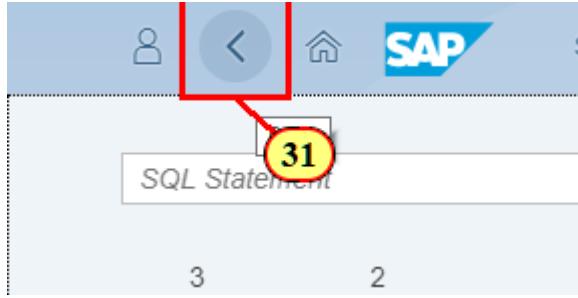
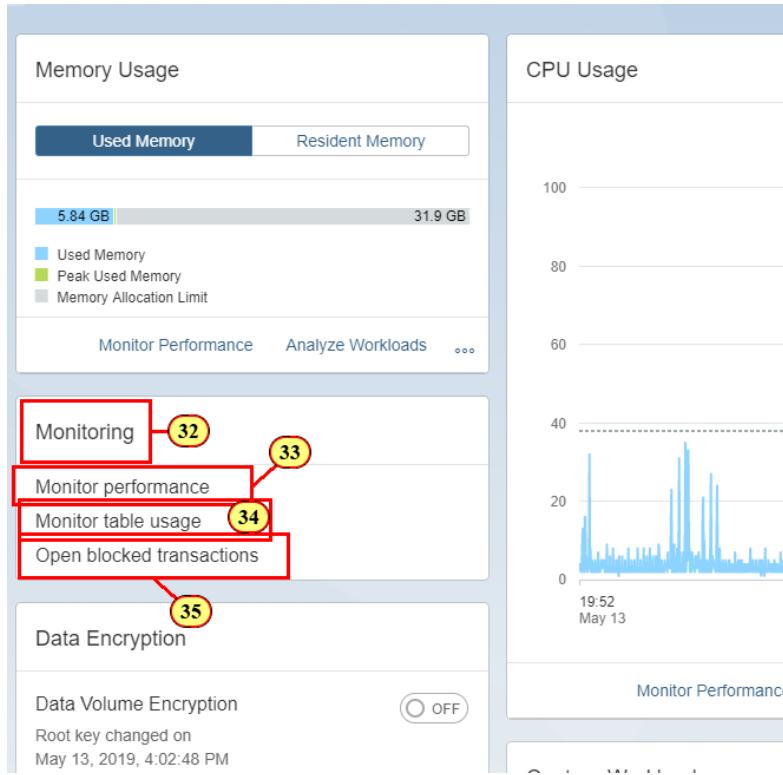
Explanation	Screenshot
<p> When you launch the Threads app, you'll see detailed information for approximately the 1,000 longest-running threads currently active in the database.</p> <p>4. For each statement, you can see the duration, as well as the name of the service that is executing the thread. You can identify the host, the port, and the thread type, whether the statement is related to a blocking transaction, and much more.</p>	
<p>5. Clicking on a thread offers you the option to navigate to the sessions or blocked transactions associated with that connection ID.</p>	
<p>6. If a thread is involved in a blocked transaction or using an excessive amount of memory, you can cancel the operation executing the thread.</p>	
<p>7. You can view the call stack for this thread, although that is typically only useful to SAP Support when analyzing incidents.</p>	
<p>8. The threads can be grouped or sorted using the Group and Sort icon.</p>	
<p>9. You can view much more details on the threads by adding columns to the table via the Settings button.</p>	
<p>10. Click the Summary arrow above the table.</p>	

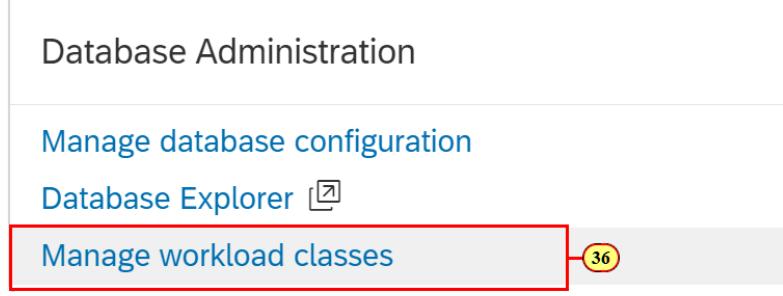
Explanation	Screenshot
<p>In addition to the thread details, you can see a summary of the top 5 application and database users, and information about the total number of threads by status and type.</p> <p>11. Click Back to return to the Database Overview page.</p>	
<p>12. Locate the Sessions card.</p> <p>The Sessions card shows the currently running and total number of sessions in the database.</p> <p>Analyzing the sessions connected to your SAP HANA database can help you identify which applications or which users are currently connected to your system, as well as what they are doing in terms of SQL execution.</p> <p>13. Click on anywhere on the sessions card to launch the Sessions application.</p>	
<p>14. Click any row to activate the options in the bottom right corner.</p>	

Explanation	Screenshot
<p> The Sessions app allows you to monitor all sessions in the database. It can be used to see whether a session is blocked and, if so, which session is blocking it.</p> <p>15. Similar to the Threads app, you can see a summary of the top users, applications and sessions.</p> <p>16. You can navigate to threads and blocked transactions with a specific connection ID.</p> <p>17. You can cancel a session.</p> <p>18. You can save the data sets as a text, CSV or HTML file.</p> <p>19. Click Settings.</p>	
<p>20. Scroll down until you see Database User and check it.</p>	

Explanation	Screenshot								
<p>21. Scroll down further to Number Of Queries and check it.</p> <p>22. Click Average Number Of Records Fetched.</p> <p>23. Click Average Query Time (ms).</p> <p>24. Click OK.</p>	<p>Columns</p> <p>Search</p> <p>All</p> <p>Current Statement</p> <p>Current Operator</p> <p>Last Executed Statement</p> <p><input checked="" type="checkbox"/> 21 Number Of Queries</p> <p><input checked="" type="checkbox"/> 22 Average Number Of Records Fetched</p> <p><input checked="" type="checkbox"/> 23 Average Query Time (ms)</p> <p>Number Of DML Statement</p> <p>Average Time (ms) Per DML Statement</p> <p>Average Wait Time (ms) Per DML Statement</p> <p>OK 24 cancel</p>								
<p></p> <p>You added columns to see the database user, the number of queries in this session, along with its average number of records fetched and query time. By examining these metrics, you can determine whether the queries in this session are returning the expected number of rows and are executing in the expected amount of time.</p>	<table border="1"> <thead> <tr> <th data-bbox="584 1206 747 1263">Database User</th> <th data-bbox="764 1206 943 1263">Number Of Queries</th> <th data-bbox="960 1206 1139 1263">Average Number Of Records Fetched</th> <th data-bbox="1156 1206 1352 1263">Average Query Time (ms)</th> </tr> </thead> <tbody> <tr> <td data-bbox="584 1312 747 1369">SYS_XS_RUNTIME</td> <td data-bbox="764 1312 943 1369">84</td> <td data-bbox="960 1312 1139 1369">106.020000</td> <td data-bbox="1156 1312 1352 1369">0.7</td> </tr> </tbody> </table>	Database User	Number Of Queries	Average Number Of Records Fetched	Average Query Time (ms)	SYS_XS_RUNTIME	84	106.020000	0.7
Database User	Number Of Queries	Average Number Of Records Fetched	Average Query Time (ms)						
SYS_XS_RUNTIME	84	106.020000	0.7						
<p>25. Click Back to return to the Database Overview page.</p>									

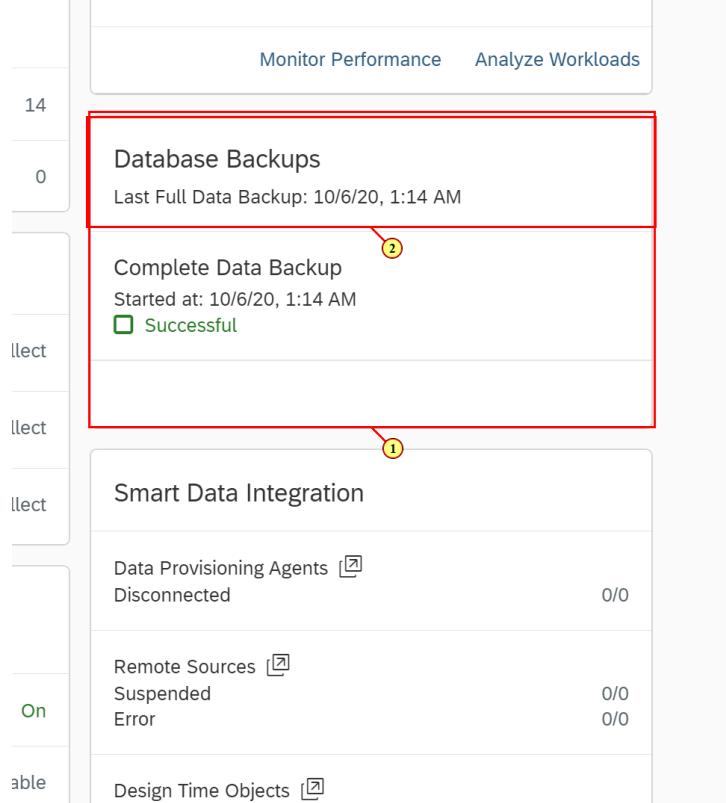
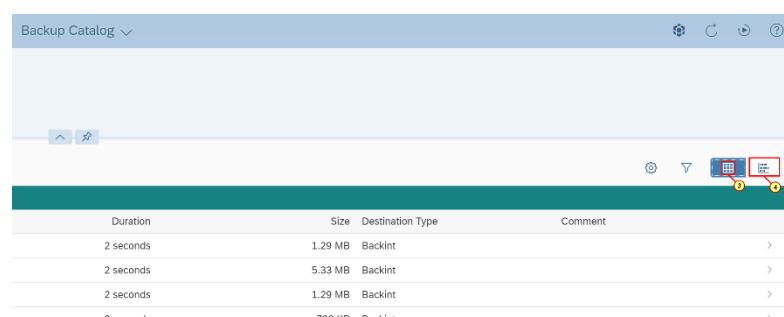
Explanation	Screenshot																		
<p></p> <p>The SQL Statements tile displays the number of long-running statements and the long-running blocking situations currently active in the database. They are ranked based on a combination of the following criteria: (1) Runtime of the current statement execution, (2) Lock wait time of the current statement execution, and (3) Cursor duration of the current statement execution.</p> <p>26. Locate the SQL Statements card and click on the top section.</p>	<p>SQL Statements</p> <pre>select PS.CONNECTION_ID AS "Connection ID", SC1.VALUE... 0 msec</pre> <p>SELECT C.HOST, C.PORT, COUNT(*) AS NUM_TOTAL_SES...</p> <p>View all</p>																		
<p>27. You are now redirected to SQL Statements page, where you can have a look at the Overview, Active Statements, SQL Plan Cache and Expensive statements. These options in details will be discussed in Chapter 3.</p> <p></p> <p>The Monitor Statements app shows the 100 most critical statements currently active in the database. For each statement, you can see the full statement string, as well as the ID of the session in which the statement is running. You can identify the application, the application user and the database user running the statement, and whether the statement is related to a blocking transaction.</p> <p>28. You can see the entire SQL statement by clicking the "More" link.</p>	 <table border="1"> <thead> <tr> <th>Statement ID</th> <th>Statement String</th> <th>Statement Duration</th> <th>Statement Wait</th> <th>Session</th> <th>Optimizer</th> <th>Application User</th> <th>Database User</th> <th>Blocking Status</th> </tr> </thead> <tbody> <tr> <td>26</td> <td>select PS.CONNECTION_ID AS "Connection ID", SC1.VALUE...</td> <td>0 msec</td> <td>2.018 sec</td> <td>20244</td> <td>tk0script</td> <td>stest01</td> <td>stest01</td> <td>Not blocked</td> </tr> </tbody> </table>	Statement ID	Statement String	Statement Duration	Statement Wait	Session	Optimizer	Application User	Database User	Blocking Status	26	select PS.CONNECTION_ID AS "Connection ID", SC1.VALUE...	0 msec	2.018 sec	20244	tk0script	stest01	stest01	Not blocked
Statement ID	Statement String	Statement Duration	Statement Wait	Session	Optimizer	Application User	Database User	Blocking Status											
26	select PS.CONNECTION_ID AS "Connection ID", SC1.VALUE...	0 msec	2.018 sec	20244	tk0script	stest01	stest01	Not blocked											

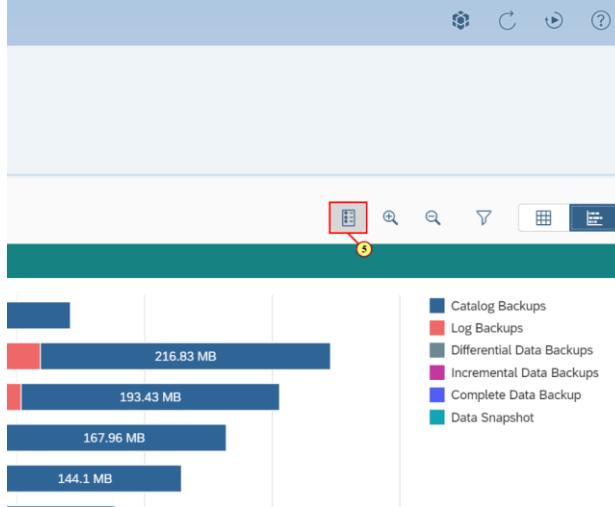
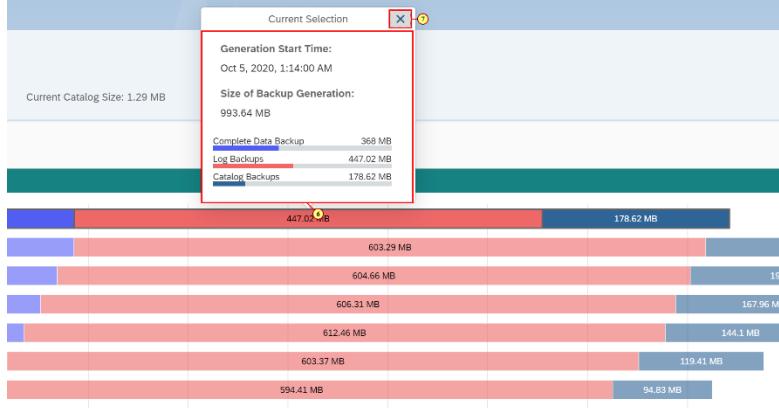
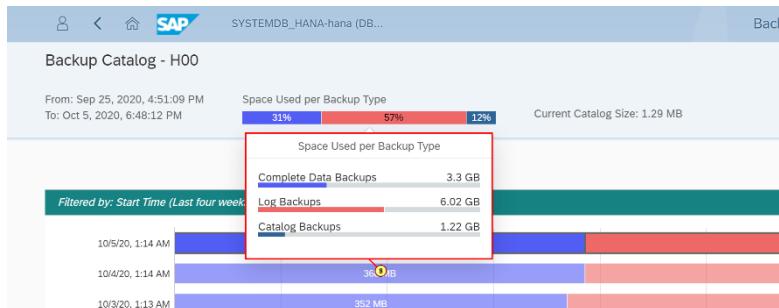
Explanation	Screenshot
<p>29. You can view the session the statement is running in.</p> <p>30. If a statement is involved in a blocked transaction or using an excessive amount of memory, you can cancel the session the statement is running in (or the blocking session).</p>	
<p>31. Click Back to return to the Database Overview page.</p>	
<p>32. Scroll to the Monitoring card. We'll briefly explain the other performance management tools available in SAP HANA cockpit.</p> <p>33. We already examined the Performance Monitor in a previous exercise. It allows you to visually analyze historical performance in the database across a range of related performance indicators.</p> <p>34. Monitoring table usage can help you optimize resource utilization and improve query performance. This link takes you to the Table Usage application, where you can visualize tables by size, explore the usage history of tables, and move tables to warm storage.</p> <p>35. The "Open blocked transactions" link opens the Blocked Transactions</p>	

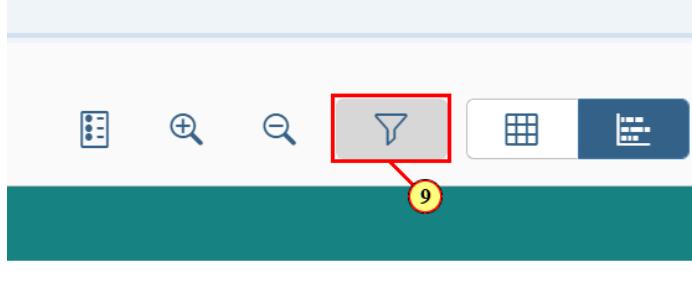
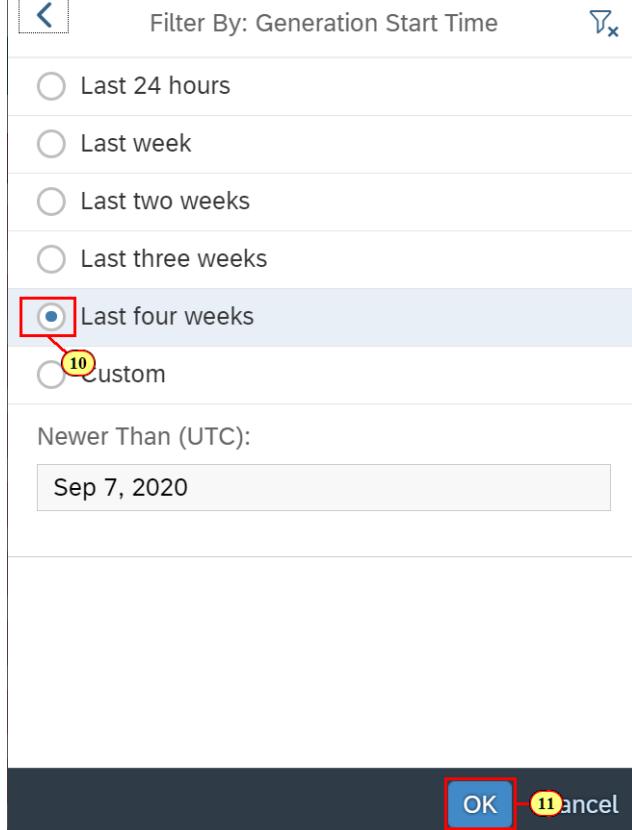
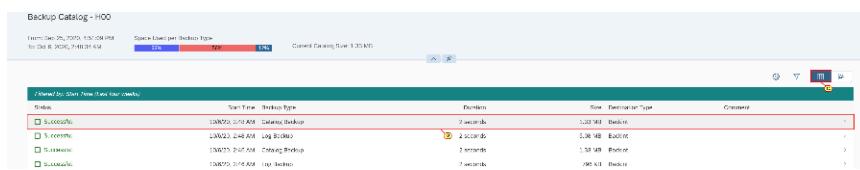
Explanation	Screenshot
<p>application. In this application you can see important details about the currently blocked transactions such as host, service, connection ID, duration, thread details, and more.</p>	
<p>36. A bit further down in the Database Administration card, you'll see the link to launch the Manage workload classes application. Use it to create workload classes and workload class mappings. Workload classes allow SAP HANA to influence dynamic resource consumption on the session or statement level. Workload management allows you to determine how much concurrent work takes place on an SAP HANA system and how that work is prioritized. The goal is to maximize the overall system performance by balancing the demand for resources between the various workloads.</p> <p> Use this application to create workload classes and workload class mappings. Workload classes allow SAP HANA to influence dynamic resource consumption on the session or statement level. Workload management allows you to determine how much concurrent work takes place on an SAP HANA system and how that work is prioritized. The goal is to maximize the overall system performance by balancing the demand for resources between the various workloads.</p>	 <p>The screenshot shows the SAP Fiori Launchpad. A card titled "Database Administration" is open. Inside the card, there are several links: "Manage database configuration" (blue), "Database Explorer" (blue), and "Manage workload classes" (blue). The "Manage workload classes" link is highlighted with a red rectangular box. To the right of this box, there is a small yellow circle with the number "36" inside it, indicating a notification or a step to take.</p>

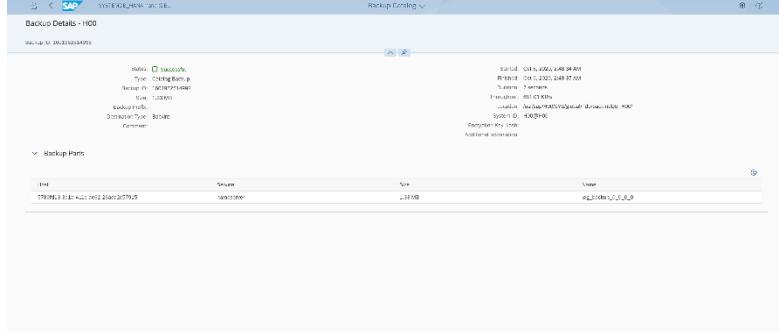
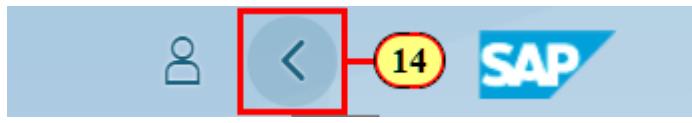
Exercise 8: Database Backup

Database backups are crucial to ensuring data stays safe. In the SAP HANA Cloud service, all backups are created for you, but you can view the backup catalog in the SAP HANA cockpit.

Explanation	Screenshot																
<p>1. Let's now look into the backup of our database. Locate the Database Backups card.</p> <p>2. Click Manage database backups.</p>	 <p>Monitor Performance Analyze Workloads</p> <p>14 0</p> <p>Database Backups Last Full Data Backup: 10/6/20, 1:14 AM</p> <p>Complete Data Backup Started at: 10/6/20, 1:14 AM Successful</p> <p>Smart Data Integration</p> <p>Data Provisioning Agents [?] Disconnected 0/0</p> <p>Remote Sources [?] Suspended 0/0 Error 0/0</p> <p>Design Time Objects [?]</p>																
<p>3. Clicking on this option would display all the backups stored in a table format.</p> <p>4. Clicking on Horizontal stacked chart button would display all the backups stored in a statistical or pictorial format i.e. in form of graphical representation that is easy to interpret.</p>	 <p>Backup Catalog ▾</p> <table border="1"> <thead> <tr> <th data-bbox="671 1586 720 1607">Duration</th> <th data-bbox="899 1586 932 1607">Size</th> <th data-bbox="948 1586 1014 1607">Destination Type</th> <th data-bbox="1128 1586 1177 1607">Comment</th> </tr> </thead> <tbody> <tr> <td data-bbox="671 1618 720 1639">2 seconds</td> <td data-bbox="899 1618 932 1639">1.29 MB</td> <td data-bbox="948 1618 1014 1639">Backint</td> <td data-bbox="1340 1618 1357 1639">></td> </tr> <tr> <td data-bbox="671 1650 720 1671">2 seconds</td> <td data-bbox="899 1650 932 1671">5.33 MB</td> <td data-bbox="948 1650 1014 1671">Backint</td> <td data-bbox="1340 1650 1357 1671">></td> </tr> <tr> <td data-bbox="671 1681 720 1703">2 seconds</td> <td data-bbox="899 1681 932 1703">1.29 MB</td> <td data-bbox="948 1681 1014 1703">Backint</td> <td data-bbox="1340 1681 1357 1703">></td> </tr> </tbody> </table>	Duration	Size	Destination Type	Comment	2 seconds	1.29 MB	Backint	>	2 seconds	5.33 MB	Backint	>	2 seconds	1.29 MB	Backint	>
Duration	Size	Destination Type	Comment														
2 seconds	1.29 MB	Backint	>														
2 seconds	5.33 MB	Backint	>														
2 seconds	1.29 MB	Backint	>														

Explanation	Screenshot
<p>5. Clicking on the Legend button would either display the different types of backups that has been captured. We can either choose to display these types or hide them by click on this button.</p>	
<p>6. On clicking anywhere on the horizontal bar chart, you get details on memory consumed by complete data backup and other backup types. In this screenshot you can notice the amount of memory occupied by Log and Catalog Backups.</p> <p>7. Click Close button to close the pop up.</p>	
<p>8. On clicking the topmost horizontal bar, gives you details on Space Used per Backup Type.</p>	

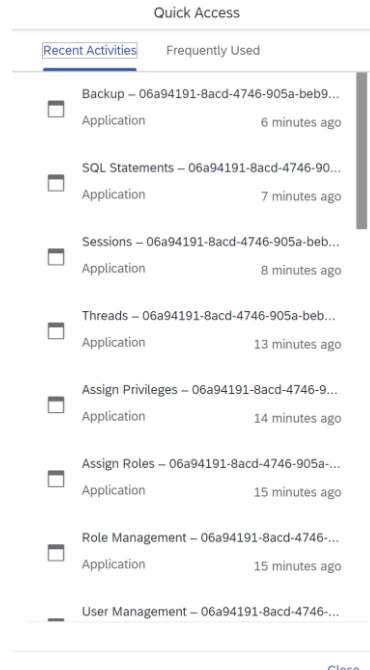
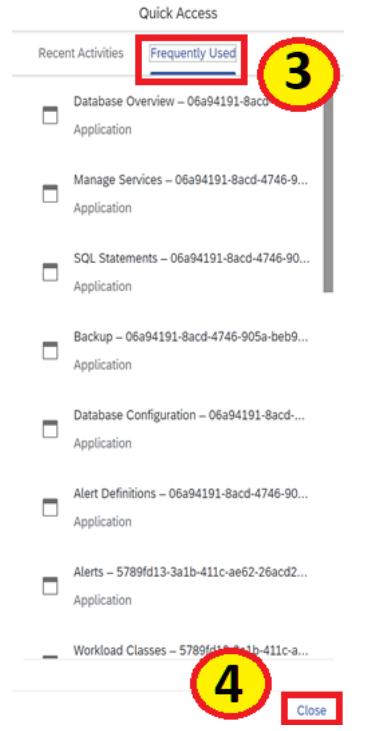
Explanation	Screenshot
<p>9. The filtering button can be used to filter based on the what time frames we would like to see the backups.</p>	
<p>10. Select 'Last Four Weeks' to view the backups taken in last four-week time frame.</p> <p>11. Click on OK to apply the chosen time frame.</p>	
<p>12. Click on Table View button to get back to the Backup details page.</p> <p>13. On clicking on any of the backup record, you will be redirected to Backup details page, that has in detail view of the backup.</p>	

Explanation	Screenshot
	
14. Click Back twice to return to the Database Overview page.	

Exercise 9: Recent Activities and Frequently Used Apps

As the tenant database administrator, you have the option to view your recent activities and most frequently used applications in the Database Overview page of your selected database in order to trace back your activities or view your favorite applications faster.

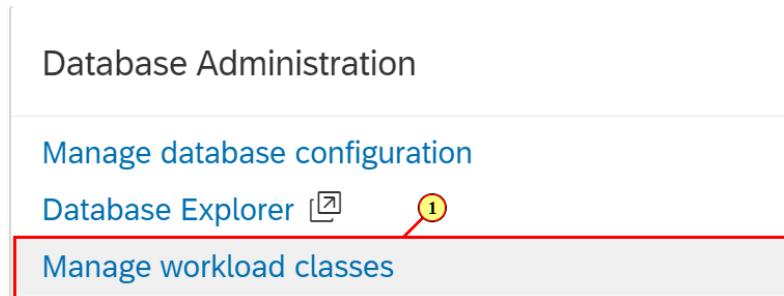
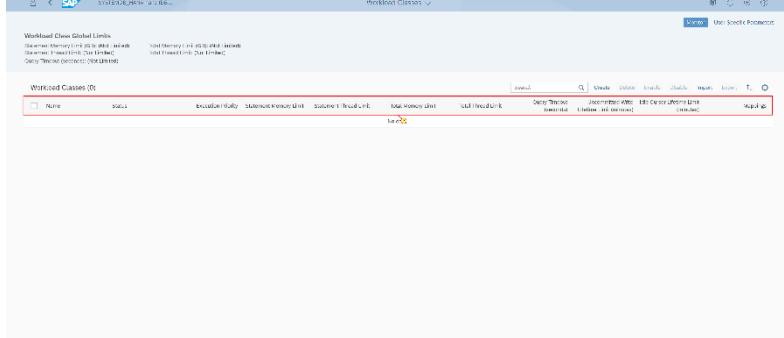
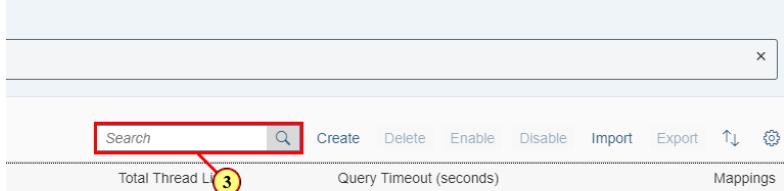
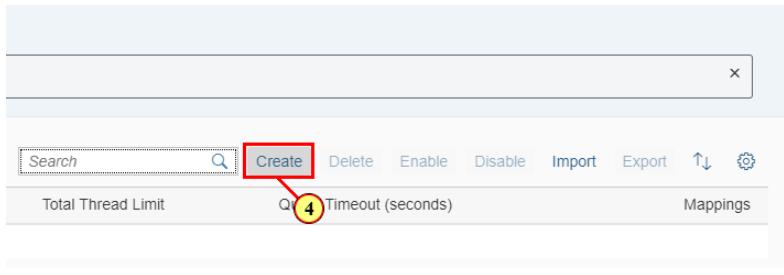
Explanation	Screenshot
1. Click the User Icon at the top right of the Database Overview page.	

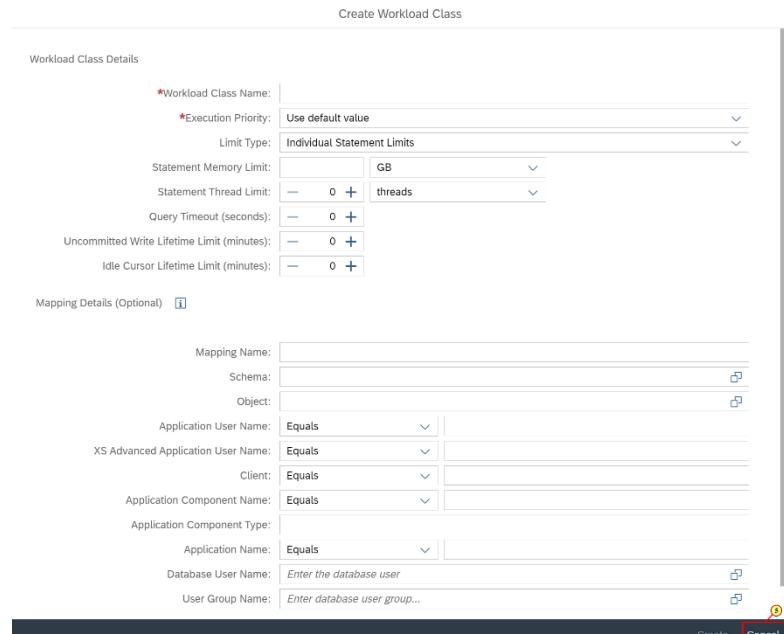
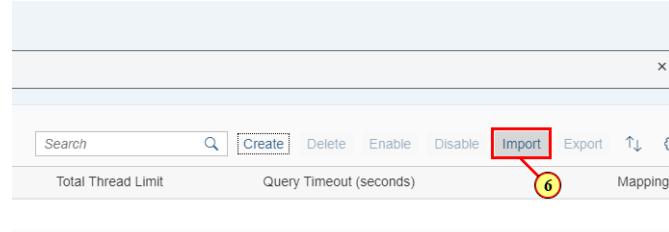
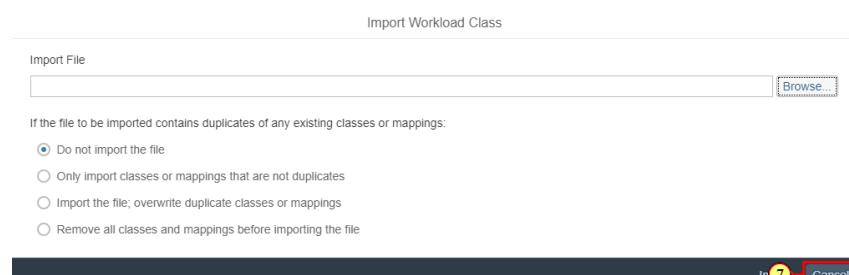
Explanation	Screenshot
<p> Under the Recent Activity you see a list of the applications the user had used. The history can stretch back to several days.</p> <p>2. The Quick Access dialog opens and shows both the Recent Activity list and a tab for the Frequently Used list.</p>	 <p>Recent Activities Frequently Used</p> <ul style="list-style-type: none"> Backup - 06a94191-8acd-4746-905a-beb9... Application 6 minutes ago SQL Statements - 06a94191-8acd-4746-90... Application 7 minutes ago Sessions - 06a94191-8acd-4746-905a-beb... Application 8 minutes ago Threads - 06a94191-8acd-4746-905a-beb... Application 13 minutes ago Assign Privileges - 06a94191-8acd-4746-9... Application 14 minutes ago Assign Roles - 06a94191-8acd-4746-905a-... Application 15 minutes ago Role Management - 06a94191-8acd-4746-... Application 15 minutes ago User Management - 06a94191-8acd-4746-... <p>Close</p>
<p>3. Click the Frequently Used tab to view the list of frequently used applications.</p> <p> The Frequently Used tab in the side bar allows the user to view their most frequently used applications in a list, with the most used application at the top and least used application near the bottom</p> <p>4. Click the Close button to go back to the Database Overview page.</p>	 <p>Recent Activities Frequently Used 3</p> <ul style="list-style-type: none"> Database Overview - 06a94191-8acd-4746-905a-beb9... Application Manage Services - 06a94191-8acd-4746-905a-beb9... Application SQL Statements - 06a94191-8acd-4746-905a-beb9... Application Backup - 06a94191-8acd-4746-905a-beb9... Application Database Configuration - 06a94191-8acd-4746-905a-beb9... Application Alert Definitions - 06a94191-8acd-4746-905a-beb9... Application Alerts - 5789fd13-3a1b-411c-ae62-26acd2... Application Workload Classes - 5789fd13-3a1b-411c-ae62-26acd2... Application <p>4 Close</p>

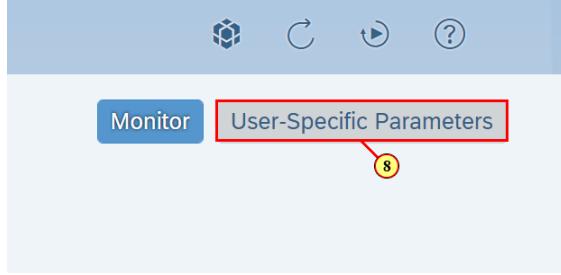
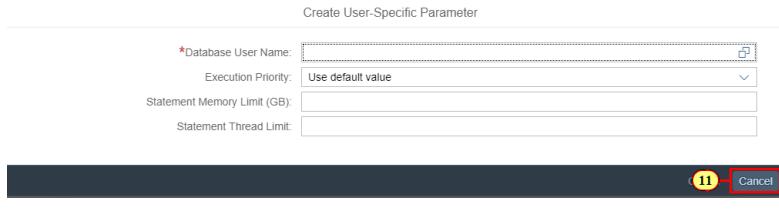
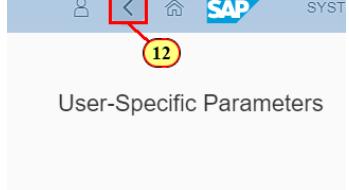
Exercise 10: Managing Workload Classes

We manage workload in SAP HANA by creating workload classes and workload class mappings. Appropriate workload parameters are then dynamically applied to each client session. You can classify workloads based on user and application context information and apply configured resource limitations (for example, a statement memory limit). Workload classes allow SAP HANA to influence dynamic resource consumption on the session or statement level.

In this exercise you will learn on how to create Workload classes and how to monitor them.

Explanation	Screenshot
<p>1. Locate the Data Administration card on the Database Overview page and click Manage workload classes.</p>	
<p>2. The workload classes application displays the parameters for every workload class in the system.</p>	
<p>3. You can search for workload classes using the Search bar.</p>	
<p>4. You can create a new workload class. Click the Create button to view the pop-up page.</p>	

Explanation	Screenshot
<p> You can create a workload class by entering a class name, execution priority, limit type, statement memory limit, and statement thread limit. You also have the option to map workload classes to user groups in the Mapping Details section of the pop-up.</p> <p>5. Click Cancel to return to the workload classes application.</p>	
<p>6. Click Import to import new workload classes into the application.</p>	
<p> You can browse a Workload Class file that you want to be imported using the Browse option. Then, select from one of the four radio options that we have, according to how you want the classes and mappings to be imported and then click on Import. Since we will not be importing any class files for now, let us continue as is.</p> <p>7. Click Cancel to return to the workload classes application.</p>	

Explanation	Screenshot
<p>8. Click User-Specific Parameters to view the user-only values for the workload classes.</p>	
<p>9. Click Create.</p> <p>10. The user-specific parameters for the workload classes include execution priority, statement memory limit, and statement thread limit.</p>	
<p>11. Click Cancel as we will not be creating a new user-specific parameter.</p> <p> Creating a new user-specific parameter will require a database user name. You can optionally add execution priority, statement memory limit, and statement thread limit.</p>	
<p>12. Click Back twice to return to the Database Overview page.</p>	

Summary

You have completed the exercise!

You are now able to:

Monitor and manage individual SAP HANA databases

CHAPTER 2 - DATABASE EXPLORER

Overview

Estimated time: 30 minutes

Objective

The SAP HANA database explorer is a web-based tool for browsing and working with database objects such as tables, views, functions, stored procedures, debugging SQL Script, viewing trace files and executing SQL statements. In the following exercises, you will become familiar with use of the Database Explorer.

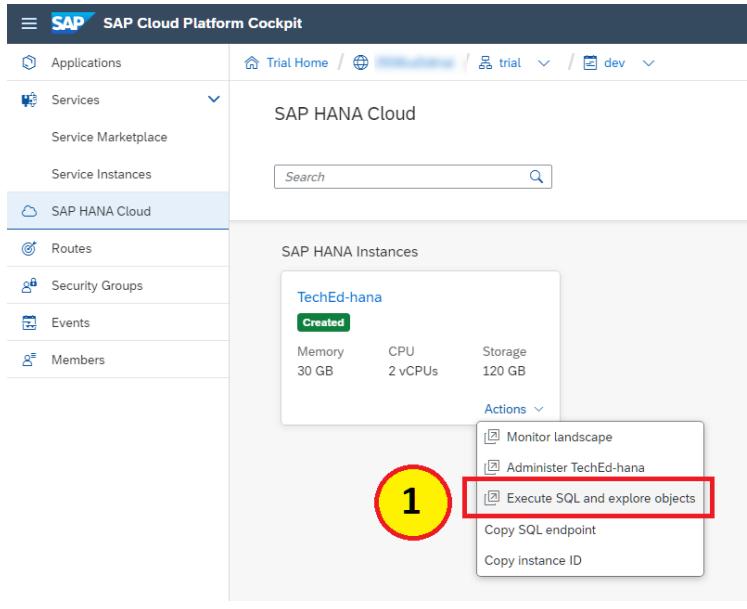
Exercise Description

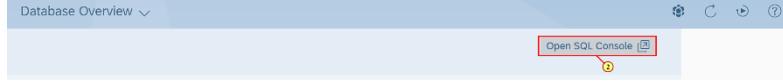
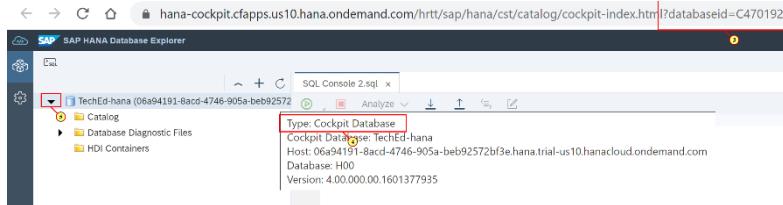
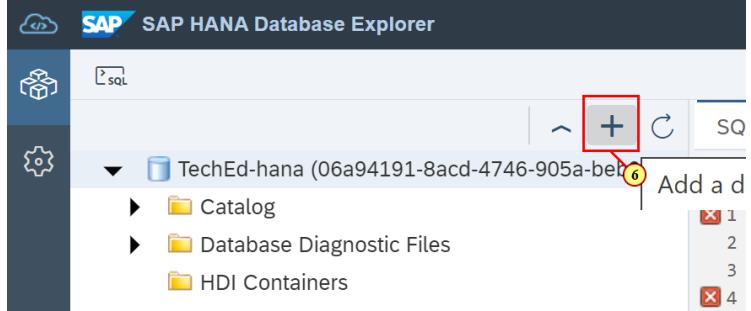
This chapter offers learning opportunities for:

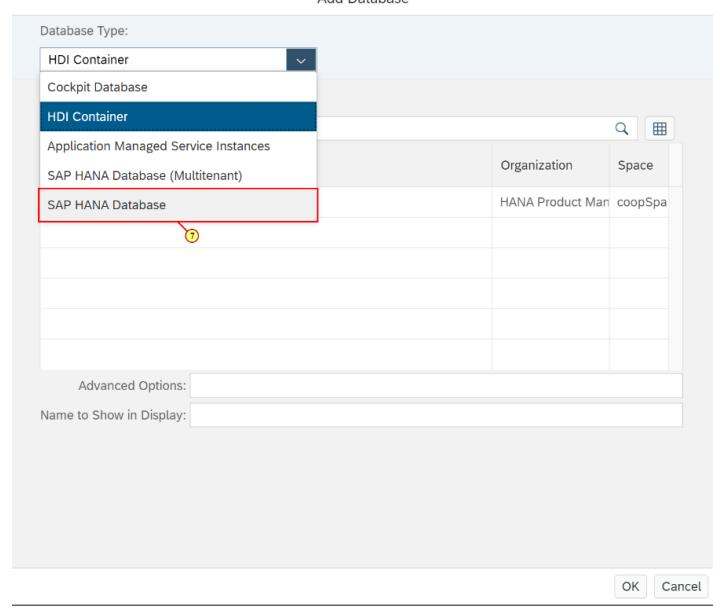
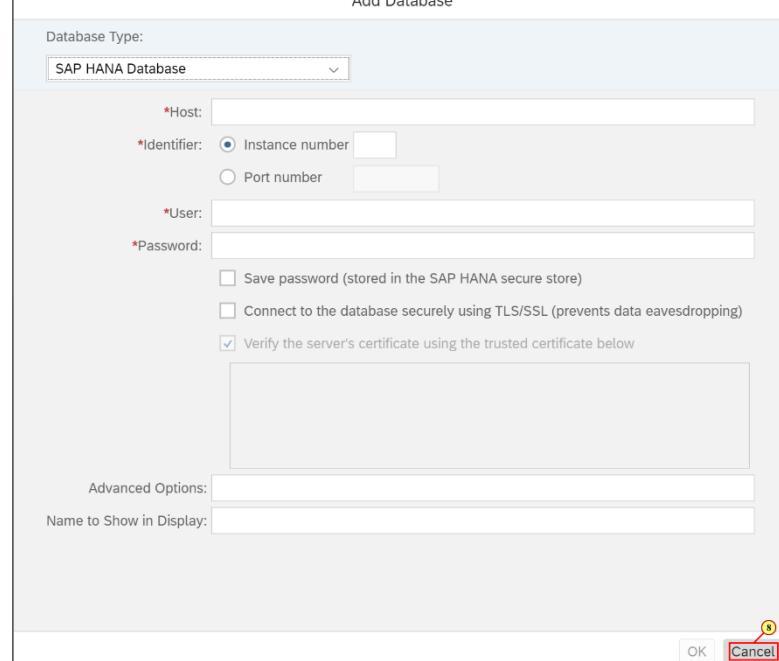
- Starting the Database Explorer and connecting to databases
- Exploring database objects using the Database Explorer
- Using the SQL Console
- Creating, Importing, Exporting and Editing database objects

Exercise 1: Getting Started with Database Explorer

In this exercise, you will launch the Database Explorer from the SAP HANA Cloud instance, and then connect to a database.

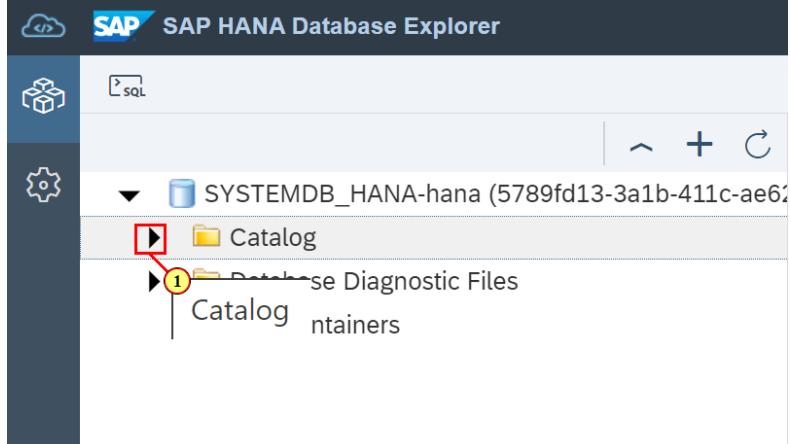
Explanation	Screenshot
<p>1. From the SAP Cloud Platform Cockpit, you can choose to open the SAP HANA Database Explorer by clicking on Execute SQL and explore objects.</p>	 <p>The screenshot shows the SAP Cloud Platform Cockpit interface. On the left, there's a sidebar with 'Services' selected, showing options like Service Marketplace, Service Instances, and SAP HANA Cloud. The SAP HANA Cloud option is highlighted. On the right, under 'SAP HANA Instances', there's a list with one item: 'TechEd-hana' (status: Created). Below it, there are details: Memory 30 GB, CPU 2 vCPUs, Storage 120 GB. To the right of these details is an 'Actions' dropdown menu. The 'Execute SQL and explore objects' option is highlighted with a red box and circled with a yellow circle containing the number '1'.</p>

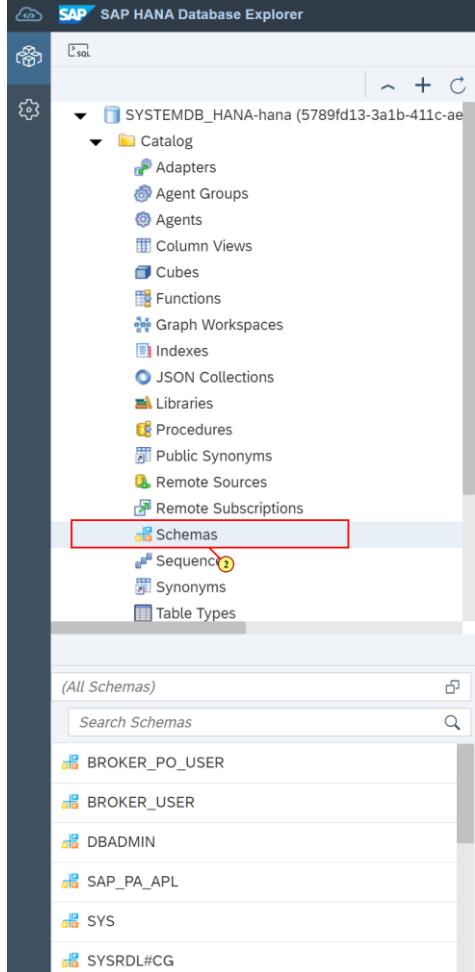
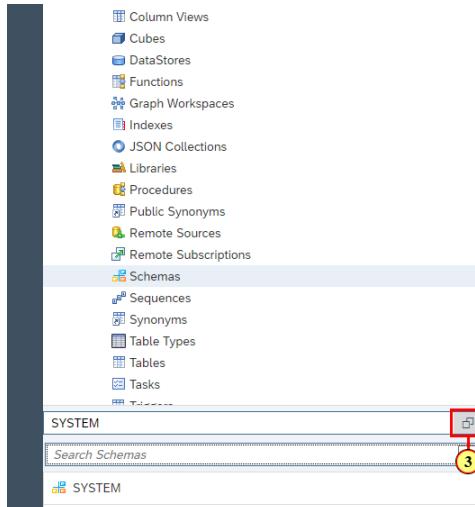
Explanation	Screenshot
<p>2. Or you can also launch the Database Explorer from the SAP HANA Cockpit by clicking on 'Open SQL Console' option on the top right corner.</p>	
<p> You may be prompted to enter database login credentials at this point. Enter the DBADMIN user credentials which were set during the SAP HANA instance setup process.</p>	
<p>3. Notice that the SAP HANA Database Explorer opens and the selected database is the one from the administered database. Also note that the URL contains a "?databaseid=..."</p>	
<p>4. Hover over the database to see a summary and note that the type is Cockpit Database</p>	
<p>5. At the top of the left pane, click the arrow next to the TechEd-hana database icon, to expand the object hierarchy for the database. You will see that it holds catalog objects and database diagnostic files (trace files, or log files)</p>	
<p>6. Click the + button at the top of the left pane to connect to a database that is not already in the treeview on the left pane. You can connect to other resources managed by SAP HANA cockpit, or you can connect to other SAP HANA databases, which are not managed by this SAP HANA cockpit instance.</p>	

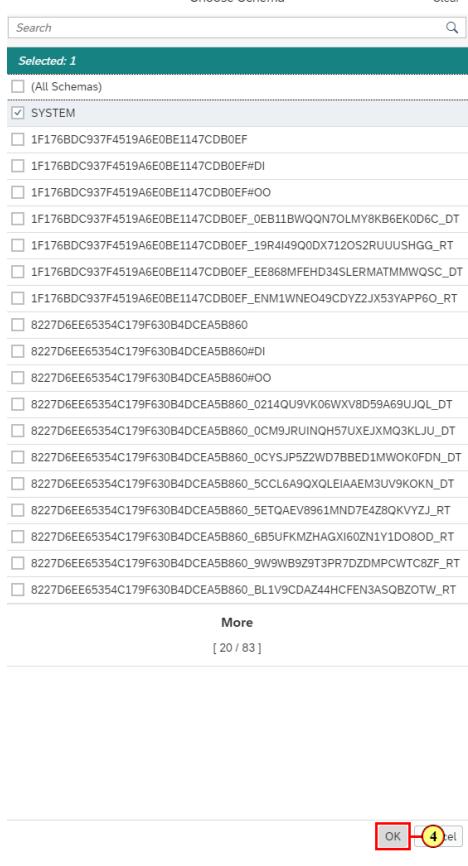
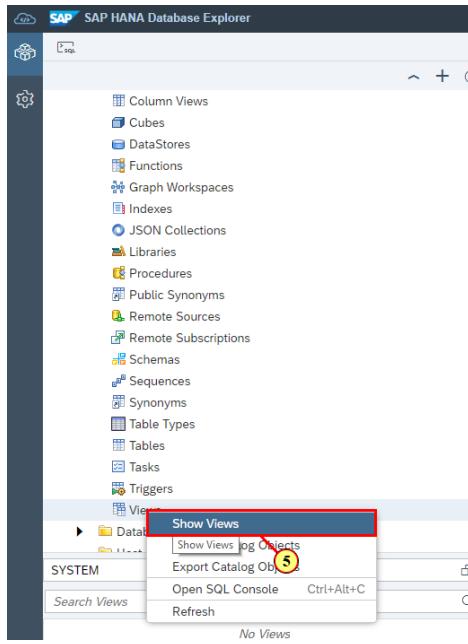
Explanation	Screenshot
<p>7. Choose SAP HANA Database from the dropdown.</p>	
<p> Provide the host, port, user name, password and name to show in display. The host and port values can be copied from the SAP HANA Cloud Platform Cockpit.</p> <p>8. As we are not going to add another database for now in our exercise, continue by clicking on Cancel to close the pop up.</p>	

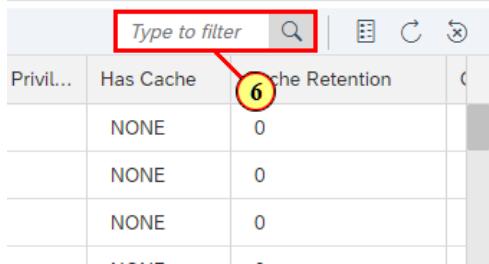
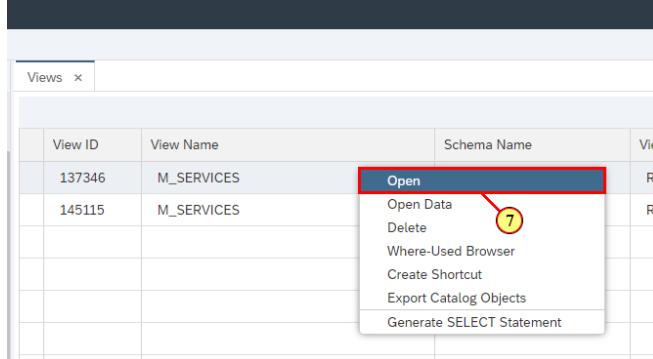
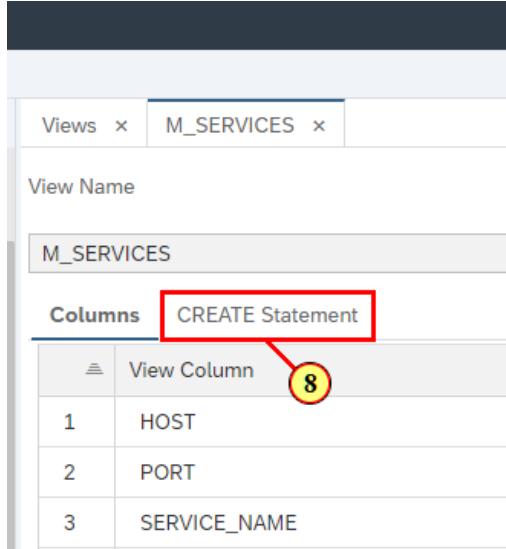
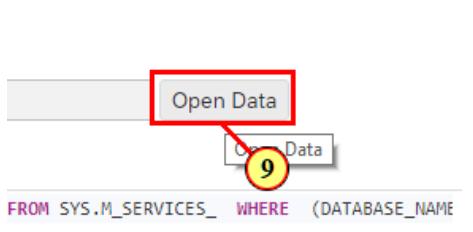
Exercise 2: Browsing the Catalog

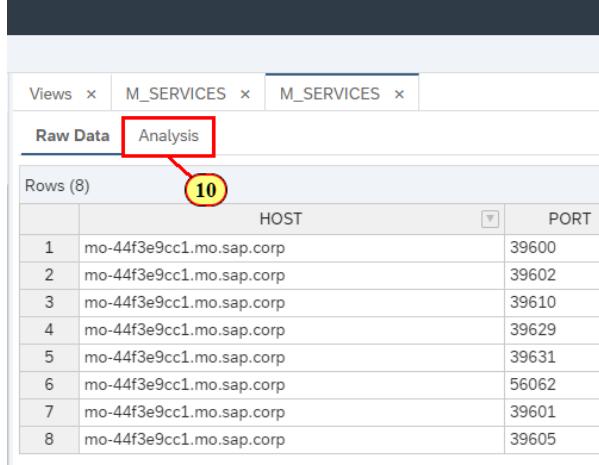
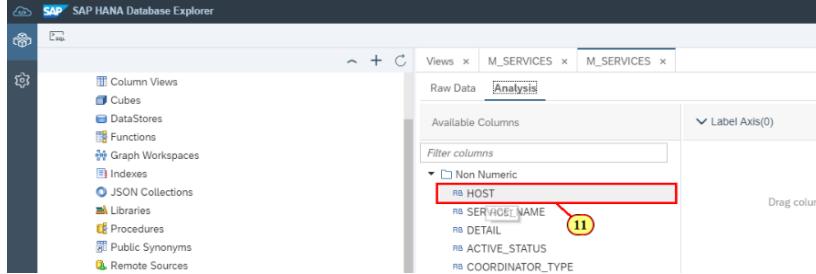
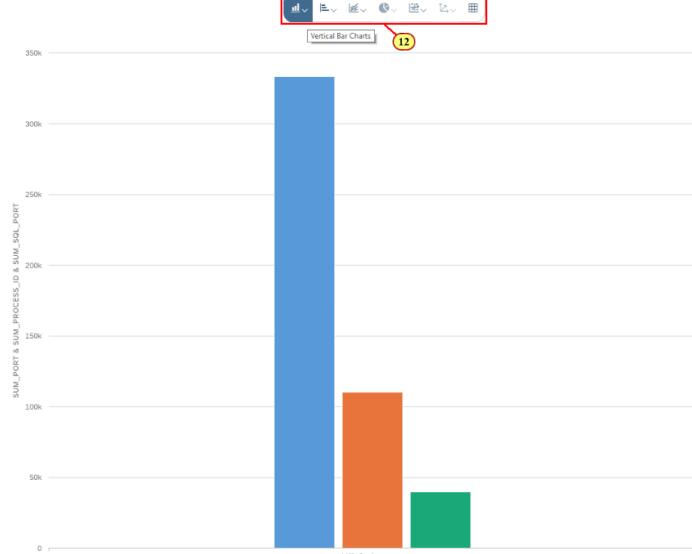
In this exercise we will browse the catalog objects in the database, and explore their properties and data using the Database Explorer. We will use the SYSTEM schema, which exists in every SAP HANA database, as a source of examples.

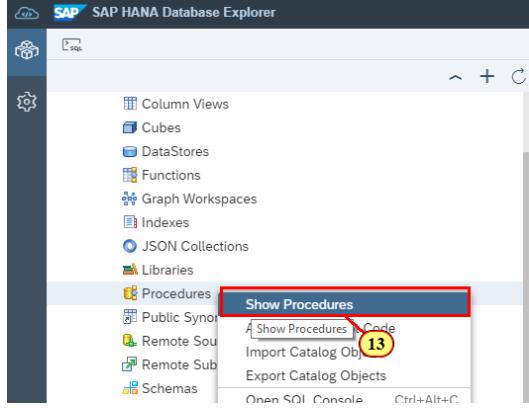
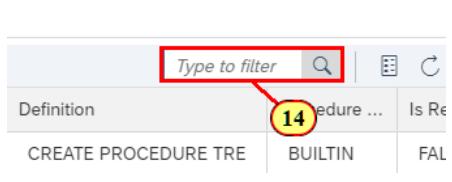
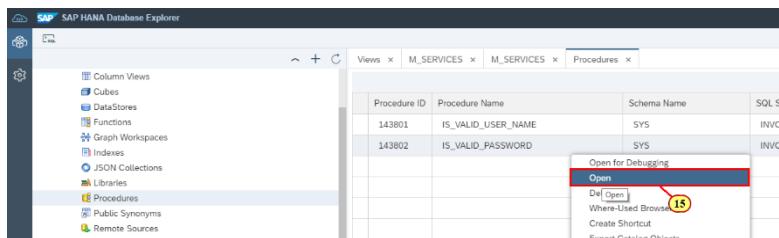
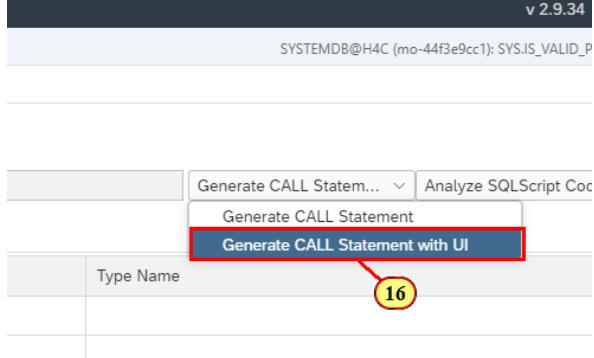
Explanation	Screenshot
<p>1. Click the arrow next to the Catalog folder to expand the catalog hierarchy. It shows a separate container for each schema in the database to which you have access to.</p>	 The screenshot shows the SAP HANA Database Explorer interface. On the left is a sidebar with icons for Cloud, SAP HANA Database, and Settings. The main area has tabs for SQL and Diagram. A tree view shows a database named "SYSTEMDB_HANA-hana" with a "Catalog" folder. An arrow icon is pointing to the "Catalog" folder, and a yellow circle with the number "1" is highlighting the same folder. Other visible nodes include "Diagnostic Files" and "Containers".

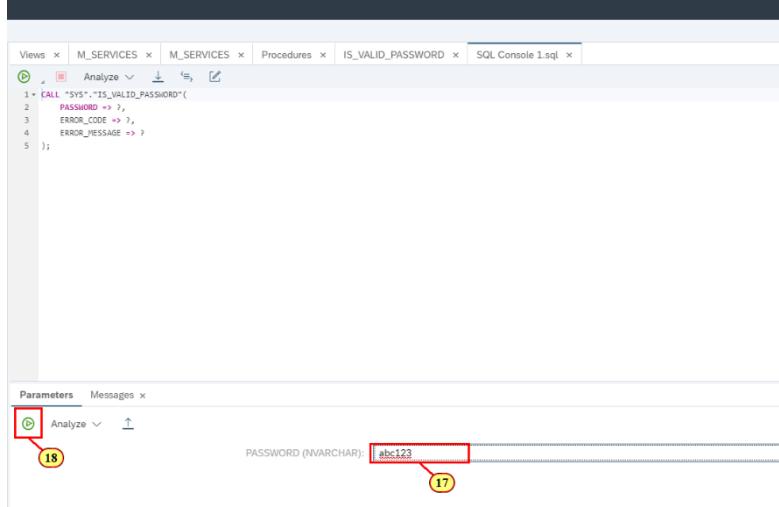
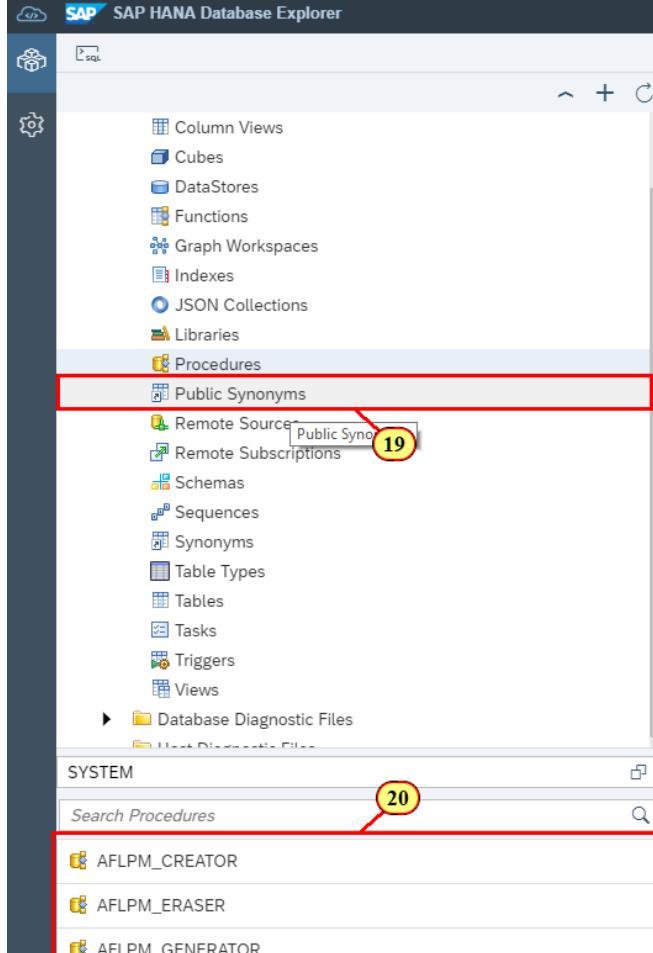
Explanation	Screenshot
<p>2. Click the Schemas button.</p>	 <p>The screenshot shows the SAP HANA Database Explorer interface. On the left, there is a tree view of database objects. The 'Catalog' node is expanded, revealing various object types like Adapters, Agent Groups, Agents, Column Views, Cubes, Functions, Graph Workspaces, Indexes, JSON Collections, Libraries, Procedures, Public Synonyms, Remote Sources, and Remote Subscriptions. Below the Catalog node, the 'Schemas' node is highlighted with a red box and has a small orange circle with the number 2 above it. Other nodes shown include Sequences, Synonyms, and Table Types. To the right of the tree view, there is a search bar labeled '(All Schemas)' and a list of schema names: BROKER_PO_USER, BROKER_USER, DBADMIN, SAP_PA_APL, SYS, and SYSRDL#CG.</p>
<p>3. Click on the Choose Schema icon on the right to open a pop-up with a list of schemas.</p> <p> At the bottom left, you will see SYSTEM schema. As you may know, this schema contains the system catalog as well as a set of other objects for monitoring and providing information about the database, its state and behavior.</p>	 <p>The screenshot shows the SAP HANA Database Explorer interface with the 'Schemas' node selected. The right pane displays a list of schema names: Column Views, Cubes, DataStores, Functions, Graph Workspaces, Indexes, JSON Collections, Libraries, Procedures, Public Synonyms, Remote Sources, Remote Subscriptions, Sequences, Synonyms, Table Types, Tables, and Tasks. The 'SYSTEM' schema is listed at the bottom of the list. A red box highlights the 'Choose Schema' icon (a small square with a plus sign) on the right side of the interface. A red circle with the number 3 is placed at the bottom of the list of schemas.</p>

Explanation	Screenshot
<p> You can now search for objects across multiple schemas.</p> <p>4. Here in the pop-up, many schemas can be chosen from the list. Click OK to close the pop-up.</p>	
<p>5. Right click Views and choose Show Views from the context menu. The right pane displays the views that are in the SYSTEM schema. This is the same list as below the hierarchy, but with more detail about each view.</p> <p>Other objects, such as tables and sequences, can be viewed in the same way and have similar grid displays.</p>	

Explanation	Screenshot
<p>6. Enter M_SERVICES in the search field to the top right of the grid and press Enter. We will use this view as an example of a simple view.</p>	
<p>7. Right-click in the M_SERVICES row and choose Open from the context menu. The columns and datatypes in the M_SERVICES view are shown in a separate tab.</p>	
<p>8. Click CREATE Statement above the grid, to display the SQL statement associated with the view.</p>	
<p>9. Click Open Data at the top right of the window to display the view contents. The contents are shown in a separate tab.</p>	

Explanation	Screenshot																											
<p>10. Click Analysis at the top of the grid, to explore the data graphically. The data for this view is not very suitable for graphical analysis, but for other tables and views this is a useful capability.</p>	 <table border="1"> <thead> <tr> <th></th> <th>HOST</th> <th>PORT</th> </tr> </thead> <tbody> <tr><td>1</td><td>mo-44f3e9cc1.mo.sap.corp</td><td>39600</td></tr> <tr><td>2</td><td>mo-44f3e9cc1.mo.sap.corp</td><td>39602</td></tr> <tr><td>3</td><td>mo-44f3e9cc1.mo.sap.corp</td><td>39610</td></tr> <tr><td>4</td><td>mo-44f3e9cc1.mo.sap.corp</td><td>39629</td></tr> <tr><td>5</td><td>mo-44f3e9cc1.mo.sap.corp</td><td>39631</td></tr> <tr><td>6</td><td>mo-44f3e9cc1.mo.sap.corp</td><td>56062</td></tr> <tr><td>7</td><td>mo-44f3e9cc1.mo.sap.corp</td><td>39601</td></tr> <tr><td>8</td><td>mo-44f3e9cc1.mo.sap.corp</td><td>39605</td></tr> </tbody> </table>		HOST	PORT	1	mo-44f3e9cc1.mo.sap.corp	39600	2	mo-44f3e9cc1.mo.sap.corp	39602	3	mo-44f3e9cc1.mo.sap.corp	39610	4	mo-44f3e9cc1.mo.sap.corp	39629	5	mo-44f3e9cc1.mo.sap.corp	39631	6	mo-44f3e9cc1.mo.sap.corp	56062	7	mo-44f3e9cc1.mo.sap.corp	39601	8	mo-44f3e9cc1.mo.sap.corp	39605
	HOST	PORT																										
1	mo-44f3e9cc1.mo.sap.corp	39600																										
2	mo-44f3e9cc1.mo.sap.corp	39602																										
3	mo-44f3e9cc1.mo.sap.corp	39610																										
4	mo-44f3e9cc1.mo.sap.corp	39629																										
5	mo-44f3e9cc1.mo.sap.corp	39631																										
6	mo-44f3e9cc1.mo.sap.corp	56062																										
7	mo-44f3e9cc1.mo.sap.corp	39601																										
8	mo-44f3e9cc1.mo.sap.corp	39605																										
<p>11. Although this is not a useful table to display graphically, you can learn how the dialog works.</p> <p>Drag the HOST column into the Label Axis area. You can drag numeric columns into the Value Axis area.</p>																												
<p> This is an example of what the graph might look like with HOST on the label axis, and PORT, PROCESS_ID and SQL_PORT on the value axis.</p> <p>12. Click the icons here to change the type of graph that is being displayed.</p> <p>At this stage you may wish to take a few minutes to explore other views in the SYSTEM schema.</p>																												

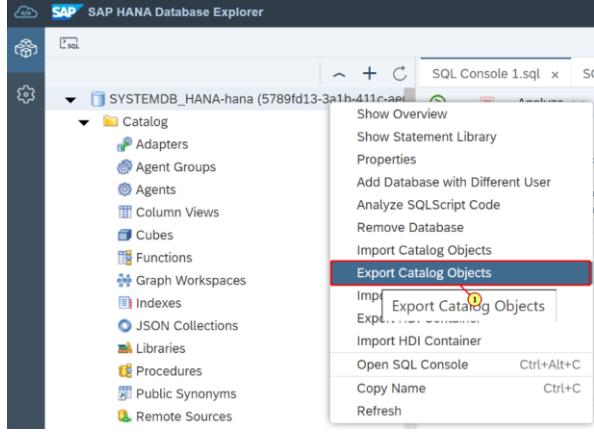
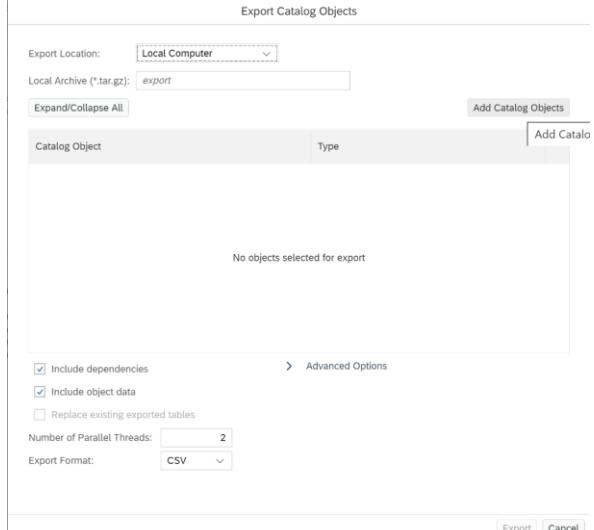
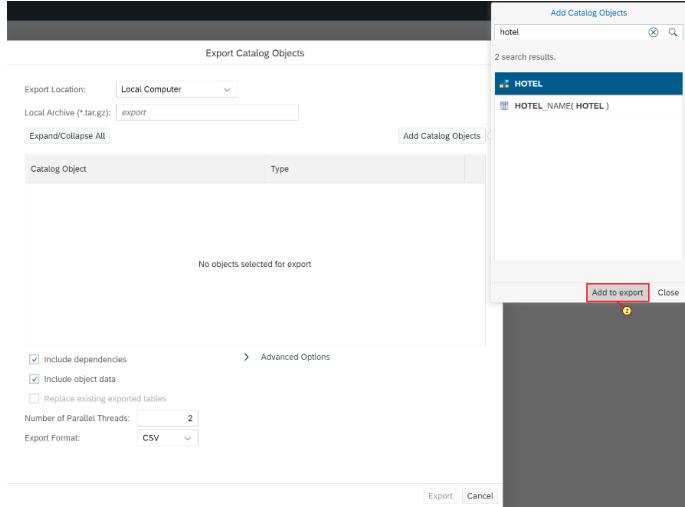
Explanation	Screenshot
<p>13. Now we will explore stored procedures.</p> <p>Right-click on Procedures with the right mouse button and choose Show Procedures from the context menu. A grid of procedures and their properties is displayed in the right pane.</p>	
<p>14. Enter IS_VALID in the search field above the grid.</p>	
<p>15. We are going to use the IS_VALID_PASSWORD procedure as an example.</p> <p>Find the IS_VALID_PASSWORD row, click on the IS_VALID_PASSWORD row with the right mouse button and choose Open from the context menu. A grid is displayed showing the procedure arguments: you can also view the SQL statement for this procedure by selecting the 'CREATE Statement' tab.</p>	
<p>16. We are going to run this procedure, which requires a single argument (the password candidate).</p> <p>Click Generate CALL Statement at the top right of the window and click Generate CALL Statement with UI from the drop-down menu.</p>	

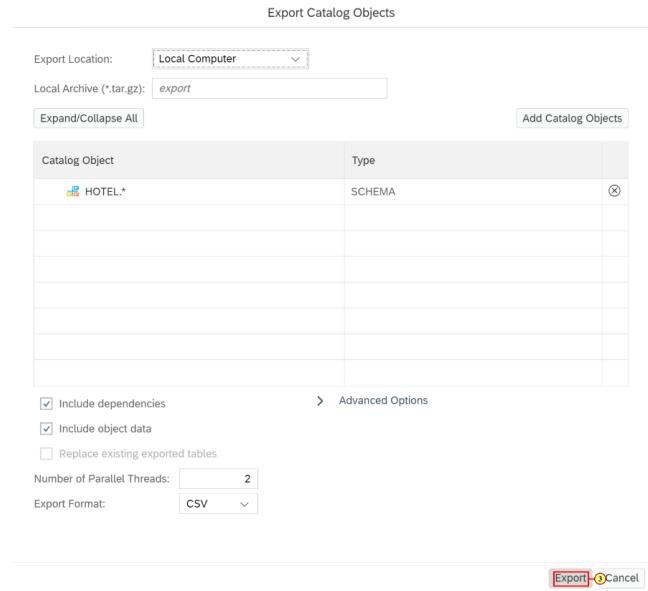
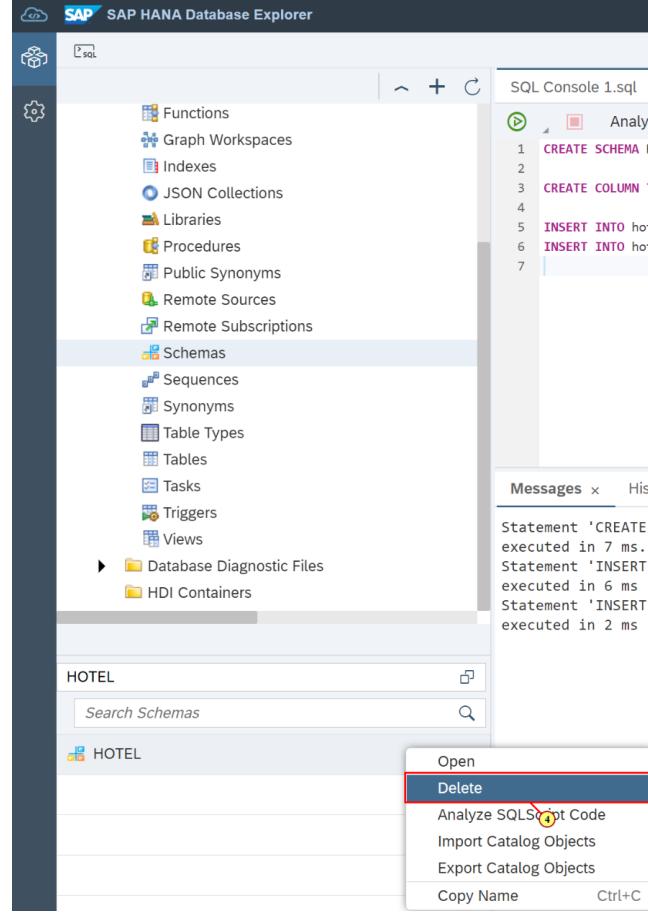
Explanation	Screenshot
<p>17. Enter abc123 in the text field.</p> <p>18. Click the Run button under the Parameters tab to run the procedure. The procedure should display a result with an error code and a statement that the password is too short.</p> <p>Try a more complex password until you get an error code of 0. Password rules are customizable in SAP HANA, but here we are using the default rules.</p>	 <p>The screenshot shows the SAP HANA SQL Console interface. At the top, there are tabs for Views, M_SERVICES, Procedures, and IS_VALID_PASSWORD, with SQL Console 1.sql selected. Below the tabs is a code editor containing the following SQL:</p> <pre>1 CALL "SYS"."IS_VALID_PASSWORD" 2 PASSWORD => ?, 3 ERROR_CODE => ?, 4 ERROR_MESSAGE => ? 5 ;</pre> <p>Below the code editor is a parameters panel. A red box highlights the 'Analyze' button, and a yellow circle labeled '18' is placed over it. To its right, a text input field contains the password 'abc123'. A red box highlights this input field, and a yellow circle labeled '17' is placed over it.</p>
<p>19. As the final example in this exercise, click on Public Synonyms at the top of the catalog hierarchy. The list of public synonyms appears below the catalog hierarchy.</p> <p>20. Search through the synonyms in the list. Click on a synonym to display its metadata in the right pane, including the object to which it refers.</p> <p> This completes the exercise. Take a few minutes to review what you have been doing so that you are comfortable navigating the catalog hierarchy.</p>	 <p>The screenshot shows the SAP HANA Database Explorer interface. The left sidebar lists various database objects: Column Views, Cubes, DataStores, Functions, Graph Workspaces, Indexes, JSON Collections, Libraries, Procedures, Public Synonyms (which is highlighted with a red box and a yellow circle labeled '19'), Remote Sources, Remote Subscriptions, Sequences, Schemas, Synonyms, Table Types, Tables, Tasks, Triggers, and Views. Below this is a 'Database Diagnostic Files' section.</p> <p>The main pane displays a list of public synonyms under the SYSTEM schema. A red box highlights the search bar at the bottom of the list, and a yellow circle labeled '20' is placed over it. The visible synonyms include AFLPM_CREATOR, AFLPM_ERASER, and AFLPM_GENERATOR.</p>

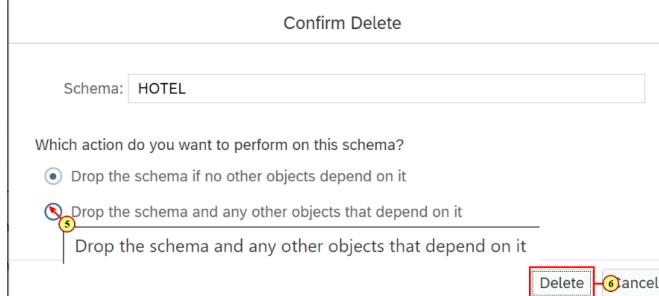
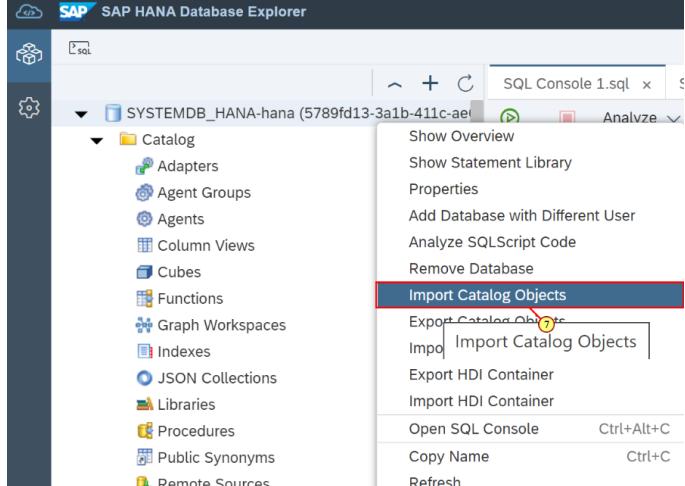
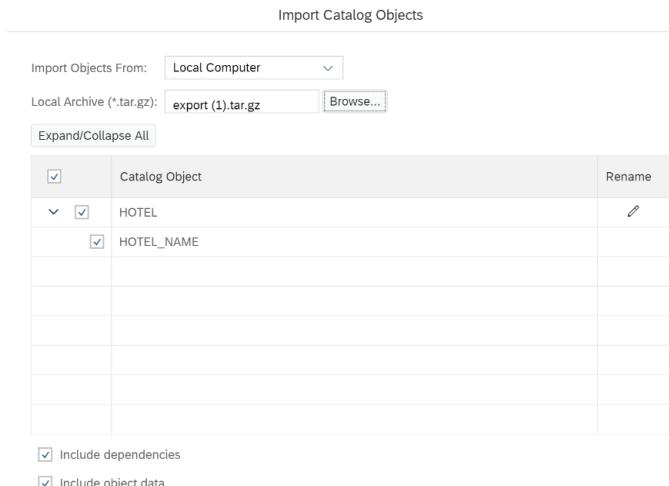
Exercise 3: Create, Import and Export with SAP HANA Database Explorer

In this exercise, we will explore creating schemas, tables and also how to import and export the catalog objects.

Explanation	Screenshot
<p></p> <p>To begin with this exercise, we will have to create a SCHEMA and TABLE as prerequisites. Below SQL statements can be used to create schema HOTEL and a table HOTEL_NAME.</p> <p>SQL to create a schema:</p> <pre data-bbox="164 790 458 819">CREATE SCHEMA HOTEL;</pre> <p>SQL to create a table:</p> <pre data-bbox="164 910 529 1069">CREATE COLUMN TABLE hotel.hotel_name(hno INTEGER PRIMARY KEY, name VARCHAR(50) NOT NULL);</pre> <p>SQL to insert records into table HOTEL_NAME:</p> <pre data-bbox="164 1191 529 1375">INSERT INTO hotel.hotel_name VALUES('10', 'Congress'); INSERT INTO hotel.hotel_name VALUES('11', 'Regency');</pre> <p>On successfully executing the above SQL statements, we have a schema named HOTEL and a table under it HOTEL_NAME with 2 records inserted into it.</p> <p>Now let us explore the Import and Export Catalog Objects functionalities.</p>	 <p>The screenshot shows the SAP HANA Database Explorer interface. In the top-left pane, there are tabs for 'SQL: Conn01 1.sql' and 'SQL: Conn01 2.sql'. The bottom-left pane is titled 'Messages' and shows the execution results of the SQL statements. The results indicate that the schema 'HOTEL' was created and the table 'hotel.hotel_name' was created with primary key 'hno'. Two records were inserted into the table: one with hno 10 and name 'Congress', and another with hno 11 and name 'Regency'. The status bar at the bottom right of the interface shows the connection details: 'Connected to SAP HANA (10.0.0.0:5434) - (DB=HANA21-see22west05475) [see spec-in DB Host for documentation]'. The overall interface is light blue and white, typical of SAP's design.</p>

Explanation	Screenshot
<p> Let us start by exporting the newly created schema HOTEL to our local disk.</p> <p>1. Right-click on a database connected and select Export Catalog Objects Wizard.</p>	
<p> The Export Catalog Objects wizard will open as a new window.</p>	
<p>2. The Add Catalog Objects button opens up a search panel that shows all objects that are available to export. Select the HOTEL schema and choose Add to export.</p>	

Explanation	Screenshot
<p>3. The objects selected for export display. Press the Export button to export the selected objects.</p>	
<p>Info: The inverse operation is to import objects. In this exercise we will explore import operation by first deleting the existing objects in the schema HOTEL and then run the import catalog wizard.</p> <p>4. To do so, right-click on the schema named HOTEL, and select Delete.</p>	

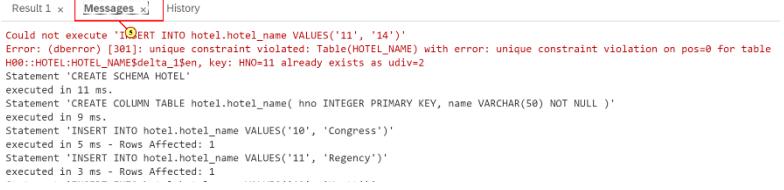
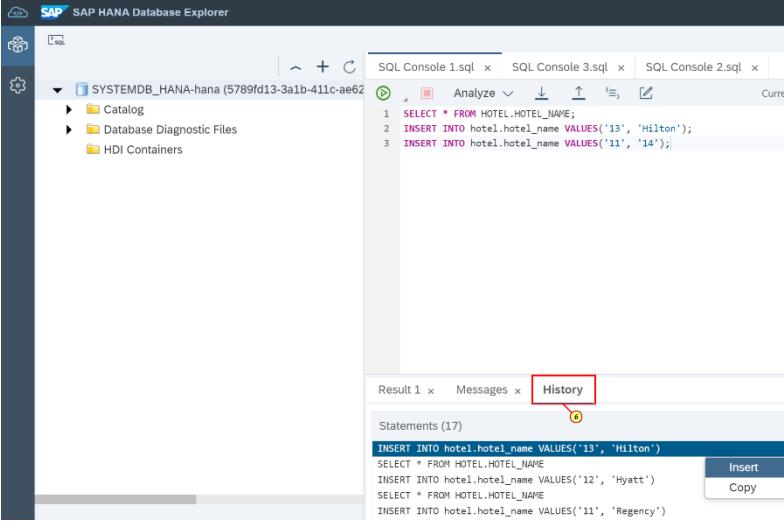
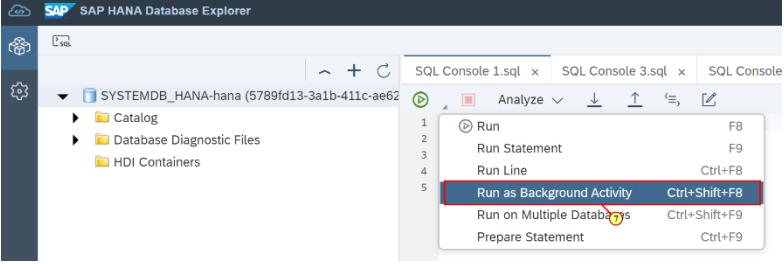
Explanation	Screenshot						
<p>5. Then select Drop the schema and any other objects that depend on it.</p> <p>6. Click on Delete.</p>	 <p>Confirm Delete</p> <p>Schema: HOTEL</p> <p>Which action do you want to perform on this schema?</p> <ul style="list-style-type: none"> <input checked="" type="radio"/> Drop the schema if no other objects depend on it <input type="radio"/> Drop the schema and any other objects that depend on it (S) Drop the schema and any other objects that depend on it <p>Delete Cancel</p>						
<p>7. To import the previously exported objects, right-click on the database connection and select Import Catalog Objects.</p>	 <p>SAP HANA Database Explorer</p> <p>SYSTEMDB_HANA-hana (5789fd13-3a1b-411c-aef...)</p> <p>Catalog</p> <ul style="list-style-type: none"> Adapters Agent Groups Agents Column Views Cubes Functions Graph Workspaces Indexes JSON Collections Libraries Procedures Public Synonyms Remote Sources <p>Show Overview Show Statement Library Properties Add Database with Different User Analyze SQLScript Code Remove Database Import Catalog Objects (I)</p> <p>Export Catalog Objects Import Catalog Objects (I) Export HDI Container Import HDI Container Open SQL Console Ctrl+Alt+C Copy Name Ctrl+C Refresh</p>						
<p>Info: Select Local Computer from the Import Objects From dropdown. Browse to the file that was created during the export steps. All catalog objects and any dependencies are displayed.</p> <p>8. Click on Import</p>	 <p>Import Catalog Objects</p> <p>Import Objects From: Local Computer</p> <p>Local Archive (*.tar.gz): export (1).tar.gz <input type="button" value="Browse..."/></p> <p>Expand/Collapse All</p> <table border="1"> <thead> <tr> <th>Catalog Object</th> <th>Rename</th> </tr> </thead> <tbody> <tr> <td>HOTEL</td> <td><input type="button" value=""/></td> </tr> <tr> <td>HOTEL_NAME</td> <td><input type="button" value=""/></td> </tr> </tbody> </table> <p><input checked="" type="checkbox"/> Include dependencies <input checked="" type="checkbox"/> Include object data <input type="checkbox"/> Replace existing objects <input checked="" type="checkbox"/> Fail import if it contains invalid data</p> <p>Number of Parallel Threads: <input type="text" value="2"/></p> <p>Import Cancel</p>	Catalog Object	Rename	HOTEL	<input type="button" value=""/>	HOTEL_NAME	<input type="button" value=""/>
Catalog Object	Rename						
HOTEL	<input type="button" value=""/>						
HOTEL_NAME	<input type="button" value=""/>						
<p>Info: When complete, a success message will appear. And, the objects in schema HOTEL will again be viewable.</p>							

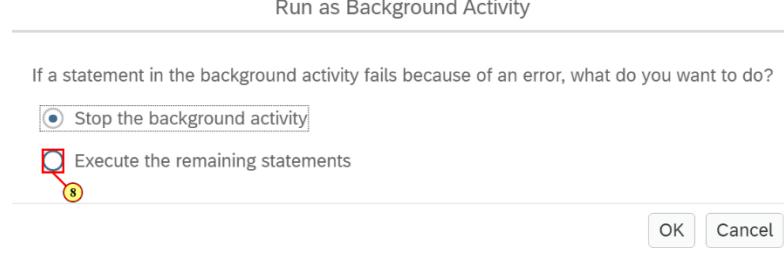
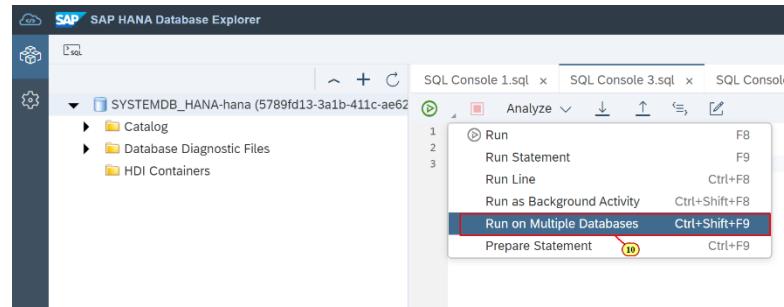
Explanation	Screenshot
<p>9. Copy and run the SQL statement:</p> <pre data-bbox="153 481 414 545">SELECT * FROM HOTEL.HOTEL_NAME;</pre> <p>to view the records under it.</p>	

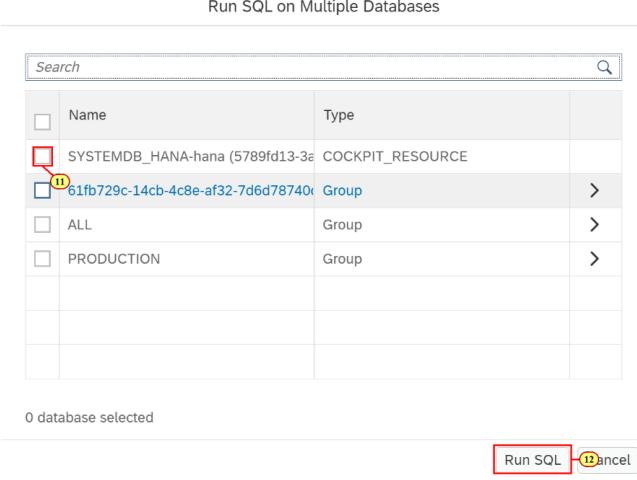
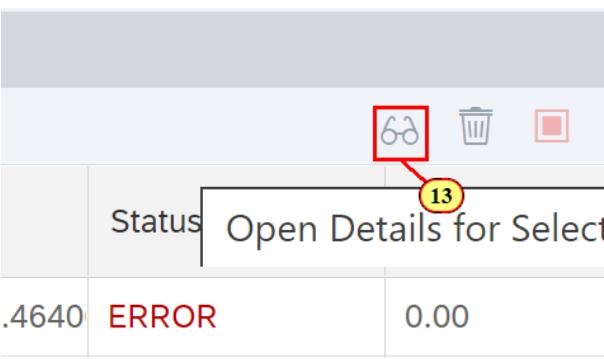
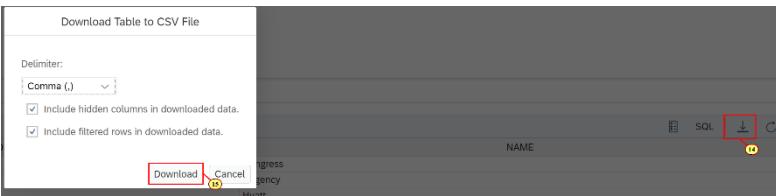
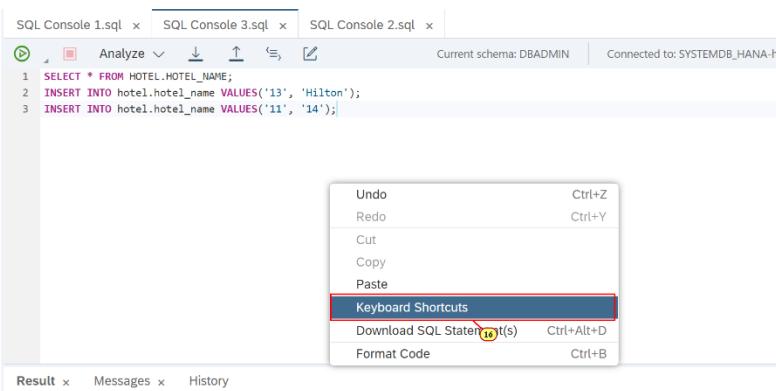
Exercise 4: Using the SQL Console

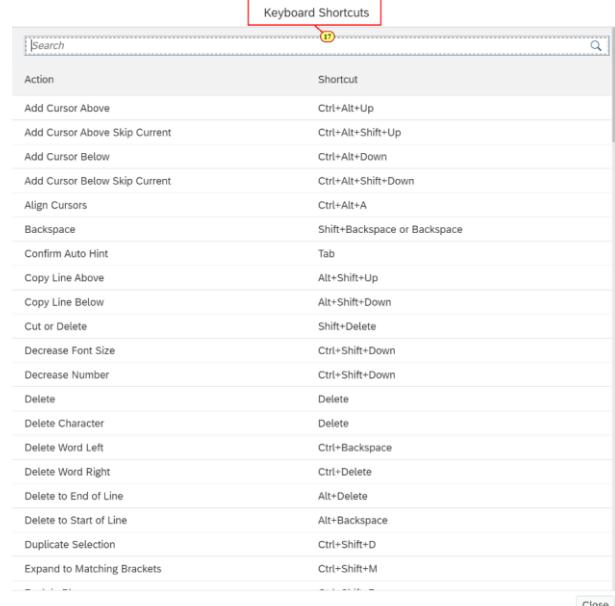
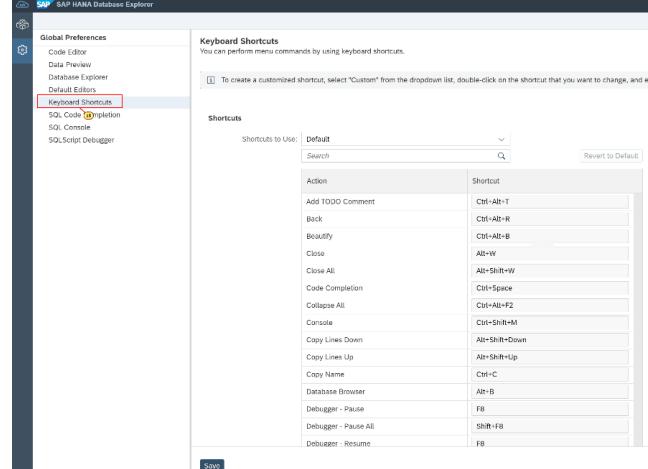
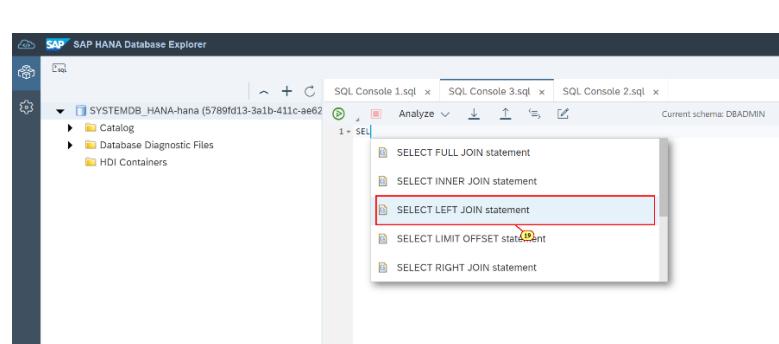
In this exercise, we explore the use of the SQL Console, where you edit and execute SQL statements.

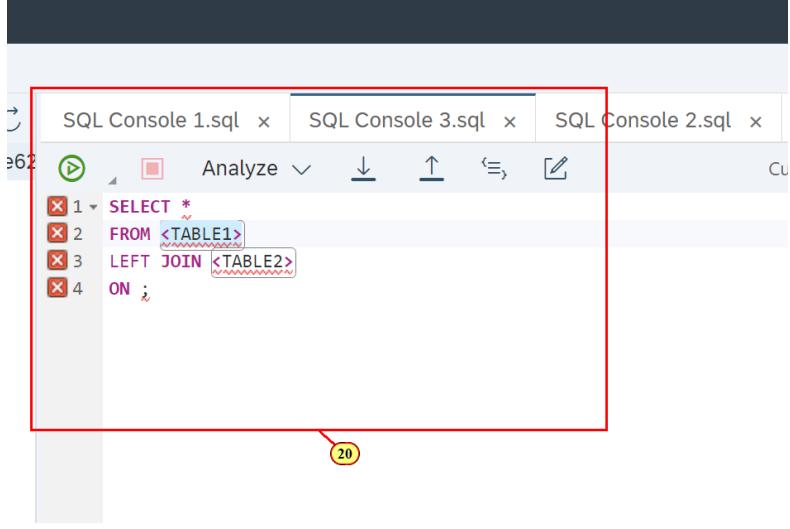
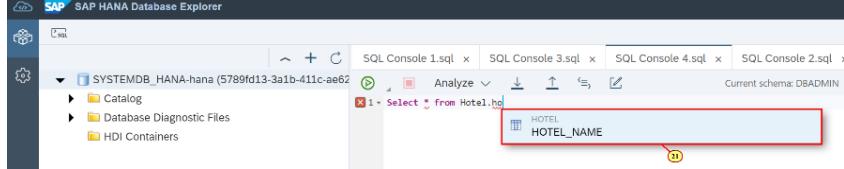
Explanation	Screenshot
<p>1. Select a connection and open the SQL console.</p>	
<p>2. You can notice that the database connection the SQL console is connected to is displayed and in the toolbar there are options to connect, disconnect, or change the connection.</p>	
<p> Enter the below SQL commands in the SQL console:</p> <pre data-bbox="153 1474 502 1715">INSERT INTO hotel.hotel_name VALUES('13', 'Hilton'); INSERT INTO hotel.hotel_name VALUES('11', '14'); SELECT * FROM HOTEL.HOTEL_NAME;</pre> <p>3. On expanding the run drop down, you can notice that there are multiple options and their short cut keys. Choose</p>	

Explanation	Screenshot						
<p>Run to execute the SQL. Or, you can also run the SQL by just clicking on the Run button instead of going into the dropdown.</p> <p>4. The records from the HOTEL table are shown in the results tab.</p>							
<p>5. The Messages tab displays information about the executed queries as well as any errors.</p>	 <pre> Result 1 x Messages x History Could not execute 'INSERT INTO hotel.hotel_name VALUES('11', '14')'. Error: (dberror) [301]: unique constraint violated; Table(HOTEL_NAME) with error: unique constraint violation on pos=0 for table H00::HOTEL::HOTEL_NAMEdelta_35en, key: HNO=11 already exists as udiv+2 Statement 'CREATE SCHEMA HOTEL' executed in 11 ms. Statement 'CREATE COLUMN TABLE hotel.hotel_name(hno INTEGER PRIMARY KEY, name VARCHAR(50) NOT NULL)' executed in 9 ms. Statement 'INSERT INTO hotel.hotel_name VALUES('10', 'Congress)' executed in 5 ms - Rows Affected: 1 Statement 'INSERT INTO hotel.hotel_name VALUES('11', 'Regency)' executed in 3 ms - Rows Affected: 1 </pre>						
<p>6. The History tab displays the last 50 successfully executed queries. A previously executed query can be searched for and recalled.</p>	 <table border="1"> <thead> <tr> <th>Statements (17)</th> </tr> </thead> <tbody> <tr> <td>INSERT INTO hotel.hotel_name VALUES('13', 'Hilton')</td> </tr> <tr> <td>SELECT * FROM HOTEL.HOTEL_NAME</td> </tr> <tr> <td>INSERT INTO hotel.hotel_name VALUES('12', 'Hyatt')</td> </tr> <tr> <td>SELECT * FROM HOTEL.HOTEL_NAME</td> </tr> <tr> <td>INSERT INTO hotel.hotel_name VALUES('11', 'Regency')</td> </tr> </tbody> </table>	Statements (17)	INSERT INTO hotel.hotel_name VALUES('13', 'Hilton')	SELECT * FROM HOTEL.HOTEL_NAME	INSERT INTO hotel.hotel_name VALUES('12', 'Hyatt')	SELECT * FROM HOTEL.HOTEL_NAME	INSERT INTO hotel.hotel_name VALUES('11', 'Regency')
Statements (17)							
INSERT INTO hotel.hotel_name VALUES('13', 'Hilton')							
SELECT * FROM HOTEL.HOTEL_NAME							
INSERT INTO hotel.hotel_name VALUES('12', 'Hyatt')							
SELECT * FROM HOTEL.HOTEL_NAME							
INSERT INTO hotel.hotel_name VALUES('11', 'Regency')							
<p> On reloading the web page, you can notice that when the database explorer re-loads, the SQL console tab and the statements it had last run are shown minus contents of the result, messages and history tab.</p> <p>7. Sometimes you might need to execute a SQL statement that takes a long time to run. In that case, you can run it as a background activity. That</p>	 <p>Run F8 Run Statement F9 Run Line Ctrl+F8 Run as Background Activity Ctrl+Shift+F8 Run on Multiple Databases Ctrl+Shift+F9 Prepare Statement Ctrl+F9</p>						

Explanation	Screenshot
<p>allows you to close your browser window, and come back later to see the results of the statement. For this click on Run as Background Activity under the Run option</p>	
<p>8. You will be displayed a pop up that asks you whether you want to Stop the background activity or Execute the remaining statements as a part of running the SQL as background activity. Choose the options as per your necessity.</p>	
<p>9. To view the results of a query that was run in the background, open the background activities monitor, select the query, and then choose the open details button. A new SQL console will be displayed with the SQL, the results, and any messages from the execution period.</p>	
<p> The SAP HANA database explorer provides the ability to run a query against multiple databases.</p> <p>10. Click on Run on Multiple Databases option in the Run dropdown.</p>	

Explanation	Screenshot
<p>11. This dialog enables multiple databases to be selected. Here, choose the databases across which you want to execute the query.</p> <p>12. Click on Run SQL.</p>	
<p>13. To view the results of a query run on multiple databases, open the background activities monitor, select the query to view the result from and then choose the open details button.</p>	
<p>14. The results of a query can be downloaded by clicking on this Download button.</p> <p>15. Choose your preferences and click on Download option.</p>	
<p>16. Keyboard shortcuts are available to provide alternate methods of completing frequently performed tasks. Right-click in the SQL console and choose Keyboard Shortcuts.</p>	

Explanation	Screenshot
17. This is the list of shortcuts displayed.	 <p>The screenshot shows a 'Keyboard Shortcuts' dialog box. At the top, there's a search bar and a 'Close' button. Below the search bar is a table with two columns: 'Action' and 'Shortcut'. The actions listed include various text editing and navigation functions like 'Add Cursor Above', 'Delete', and 'Select All'. The corresponding shortcuts are shown in the 'Shortcut' column.</p>
18. Shortcuts can be configured in Settings under Keyboard Shortcuts .	 <p>The screenshot shows the SAP HANA Database Explorer settings interface. On the left, there's a sidebar with options like 'Global Preferences', 'Code Editor', 'Data Preview', 'Database Explorer', 'Default Editors', and 'Keyboard Shortcuts'. The 'Keyboard Shortcuts' option is highlighted with a red box. On the right, there's a 'Shortcuts' configuration panel with a search bar and a table of actions and their assigned shortcuts. A 'Save' button is at the bottom.</p>
<p> We will now discuss about the autocomplete functionality, which will ease the process of query writing.</p> <p>19. Once a statement is started, press Ctrl+Space to see a list of possible statements based on what you have typed. Select the LEFT</p>	 <p>The screenshot shows the SAP HANA Database Explorer interface with several open SQL consoles. In the center, a dropdown menu is open, listing various SQL statements such as 'SELECT FULL JOIN statement', 'SELECT INNER JOIN statement', 'SELECT LEFT JOIN statement' (which is highlighted with a red box), 'SELECT LIMIT OFFSET statement', and 'SELECT RIGHT JOIN statement'. The background shows the database structure and schema information.</p>

Explanation	Screenshot
JOIN statement from the displayed dropdown.	
20. By selecting the statement you wish to write from the provided options, the SQL statement will be written into the console. There will be some required information to fill into the generated statement. In the example in screenshot, table names will need to be replaced along with the columns to be used in the on clause.	 <p>SQL Console 1.sql x SQL Console 3.sql x SQL Console 2.sql x</p> <p>1 ~ SELECT *</p> <p>2 FROM <TABLE1></p> <p>3 LEFT JOIN <TABLE2></p> <p>4 ON :</p>
<p></p> <p>Copy the following SQL into the console and then use the autocomplete shortcut to see the available tables:</p> <pre>SELECT * FROM HOTEL.HOTEL_NAME</pre> <p>21. In addition to completing SQL statements, this autocomplete shortcut (ctrl + space) can also be applied to database objects. In this example, autocomplete provides a dropdown of all the available tables matching the first couple of letters provided.</p>	 <p>SAP HANA Database Explorer</p> <p>Current schema: DBADMIN</p> <p>1 ~ Select * From Hotel.ho</p> <p>HOTEL</p> <p>HOTEL_NAME</p>



On the right hand side, there is a statement help panel providing more information about statement syntax, along with any tables, functions, stored procedures or SQL functions that have been referenced.

22. The first section in the help panel is Statement/Syntax. This section looks at the keywords in the current SQL statement and identifies what type of statement is written. It provides information on the proper syntax for that statement.

23. The second section shows tables or views referenced in the SQL statement, the schema it belongs to and the columns in that table/view.

24. The third section shows stored procedures or functions that are referenced in the SQL statement as well any input and output parameters. The final section in the help panel shows any SQL functions that have been included in the SQL. For each SQL function referenced, both input and return parameters are listed.

The screenshot shows the SAP HANA Cloud Statement Help Panel interface. At the top, there are tabs for 'About' and 'Help'. Below the tabs, there are several icons: a magnifying glass, a gear, a hexagon, and a square. A red box highlights the 'Statement/Syntax' section, which contains a dropdown menu and the title 'Statement/Syntax'. A yellow circle with the number '22' is positioned near the title. Below this, the text 'SELECT Statement' is shown, followed by a detailed description of the SELECT statement syntax. Another red box highlights the 'Tables and Views (1)' section, which lists a table named 'HOTEL_NAME' with two columns: 'HNO' (INTEGER) and 'NAME' (NVARCHAR(50)). A yellow circle with the number '23' is near the table name. A third red box highlights the 'Procedures and Functions' and 'SQL Functions' sections, which are currently empty. A yellow circle with the number '24' is near the bottom of the page.

Statement/Syntax

SELECT Statement²²

```
<select_statement> ::= [ <with_clause> ] <subquery> [ <for_update> | FOR SHAR | [ <with_clause> ] ( <subquery> ) [ <for_update> | <{ <subquery> | ( <subquery> ) } INTO { <table_ref>
```

Tables and Views (1)

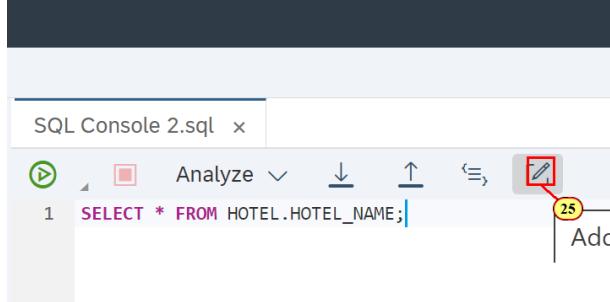
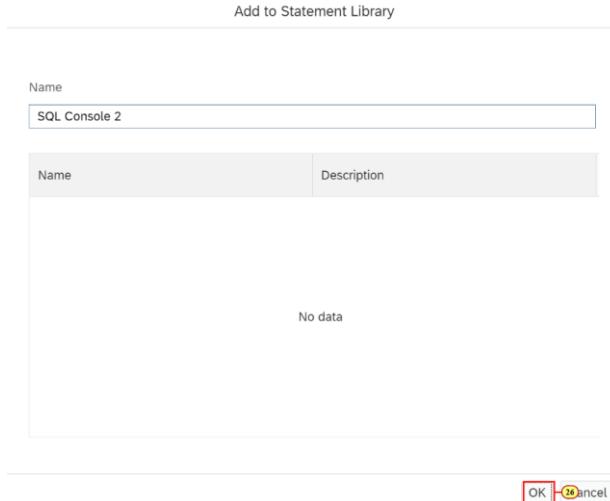
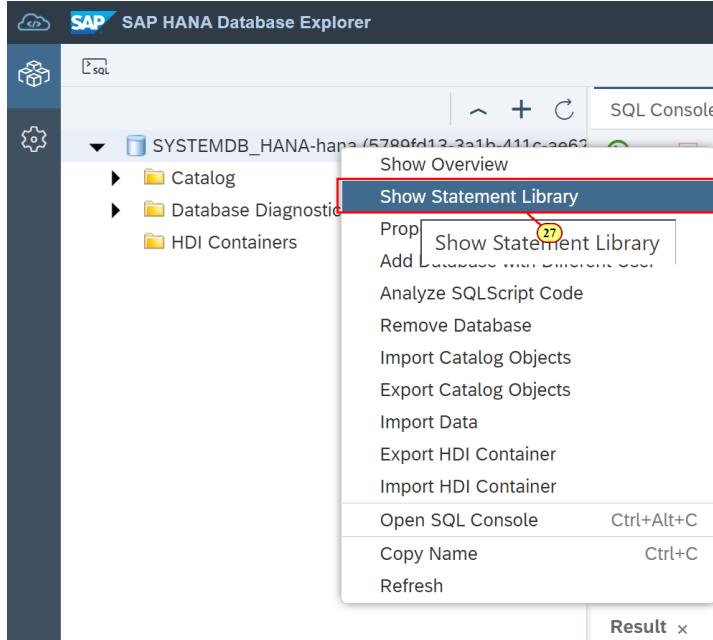
Name: HOTEL_NAME²³

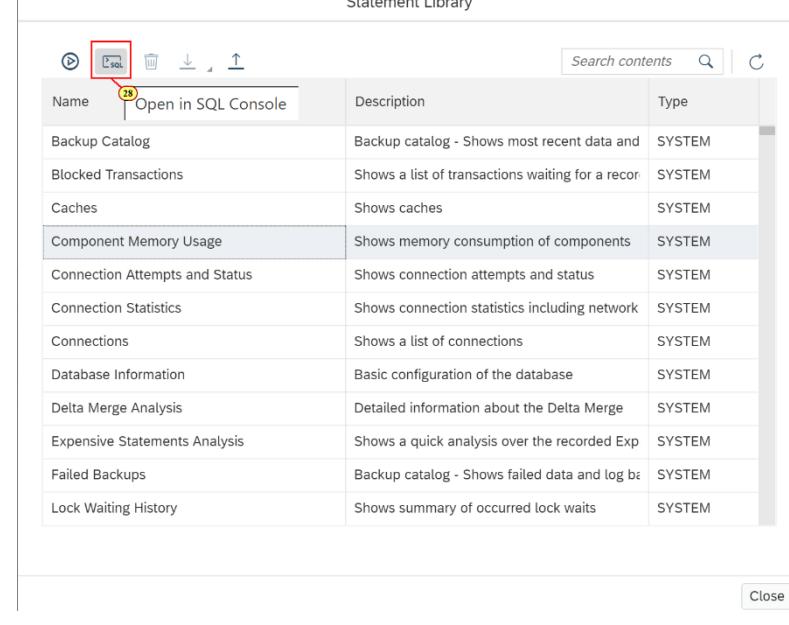
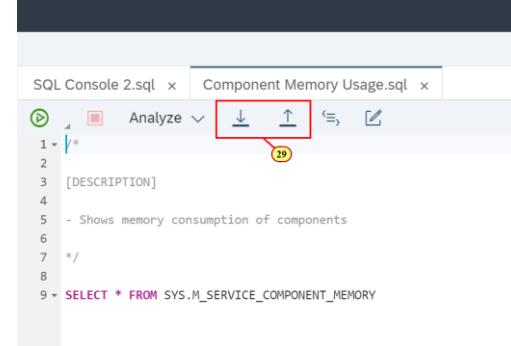
Schema: HOTEL

HNO	INTEGER
NAME	NVARCHAR(50)

Procedures and Functions

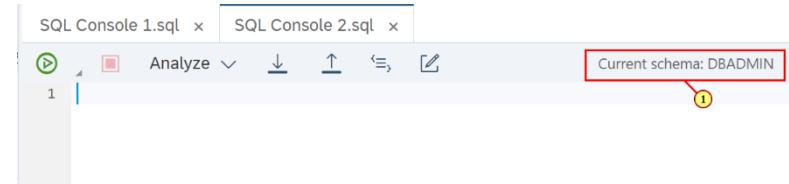
SQL Functions

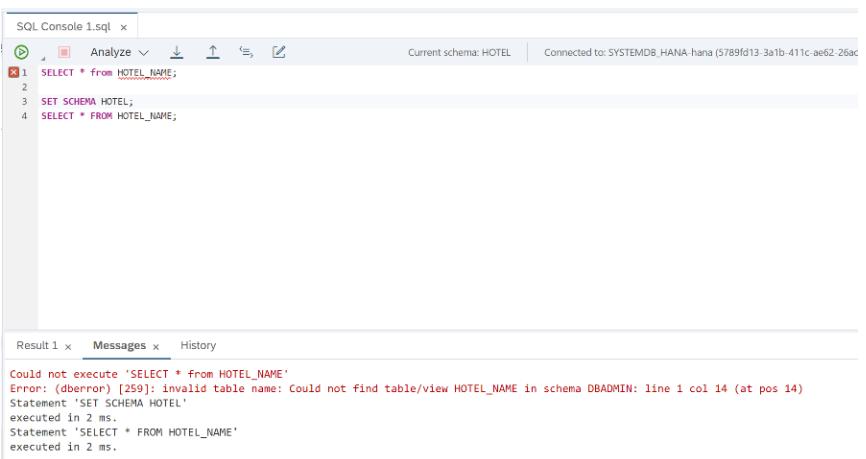
Explanation	Screenshot
<p>25. Frequently used statements can be saved to the statement library for easy access. Enter the below statement into the SQL console and click on the Add to Statement Library button:</p> <pre data-bbox="160 602 409 663">SELECT * FROM HOTEL.HOTEL_NAME;</pre>	
<p>26. You can name the query to be saved and click on OK.</p>	
<p>27. To view the statement library, right click on a database connection and select Show Statement Library.</p>	

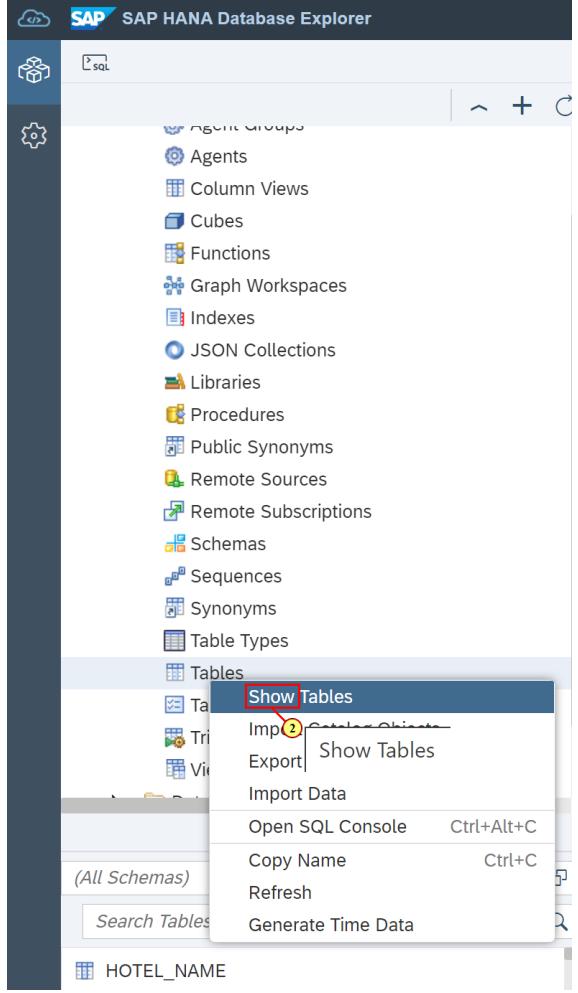
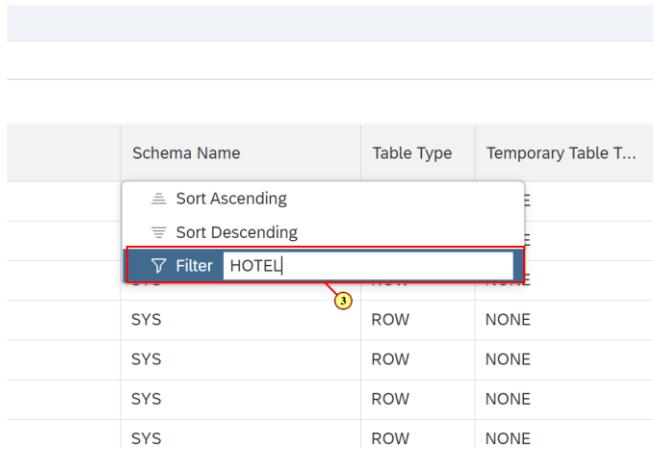
Explanation	Screenshot																																							
<p> In the statement library there are two types of statements: User defined and System. This is reflected in the type column. User defined statements are the ones that you have created and added, like future reservations, while System statements are already created and added to the library. System statements are often used for monitoring and diagnostic purposes.</p> <p>28. To run a statement, select one from the statement library and left-click the Open in SQL Console button.</p>	 <p>The screenshot shows the Statement Library window. At the top, there are buttons for Refresh, Open in SQL Console (highlighted with a red box), Delete, Download, and Upload. Below is a table with columns: Name, Description, and Type. The 'Type' column shows entries like SYSTEM for most rows. A search bar and a close button are at the bottom right.</p> <table border="1"> <thead> <tr> <th>Name</th> <th>Description</th> <th>Type</th> </tr> </thead> <tbody> <tr><td>Backup Catalog</td><td>Backup catalog - Shows most recent data and</td><td>SYSTEM</td></tr> <tr><td>Blocked Transactions</td><td>Shows a list of transactions waiting for a recor</td><td>SYSTEM</td></tr> <tr><td>Caches</td><td>Shows caches</td><td>SYSTEM</td></tr> <tr><td>Component Memory Usage</td><td>Shows memory consumption of components</td><td>SYSTEM</td></tr> <tr><td>Connection Attempts and Status</td><td>Shows connection attempts and status</td><td>SYSTEM</td></tr> <tr><td>Connection Statistics</td><td>Shows connection statistics including network</td><td>SYSTEM</td></tr> <tr><td>Connections</td><td>Shows a list of connections</td><td>SYSTEM</td></tr> <tr><td>Database Information</td><td>Basic configuration of the database</td><td>SYSTEM</td></tr> <tr><td>Delta Merge Analysis</td><td>Detailed information about the Delta Merge</td><td>SYSTEM</td></tr> <tr><td>Expensive Statements Analysis</td><td>Shows a quick analysis over the recorded Exp</td><td>SYSTEM</td></tr> <tr><td>Failed Backups</td><td>Backup catalog - Shows failed data and log b</td><td>SYSTEM</td></tr> <tr><td>Lock Waiting History</td><td>Shows summary of occurred lock waits</td><td>SYSTEM</td></tr> </tbody> </table>	Name	Description	Type	Backup Catalog	Backup catalog - Shows most recent data and	SYSTEM	Blocked Transactions	Shows a list of transactions waiting for a recor	SYSTEM	Caches	Shows caches	SYSTEM	Component Memory Usage	Shows memory consumption of components	SYSTEM	Connection Attempts and Status	Shows connection attempts and status	SYSTEM	Connection Statistics	Shows connection statistics including network	SYSTEM	Connections	Shows a list of connections	SYSTEM	Database Information	Basic configuration of the database	SYSTEM	Delta Merge Analysis	Detailed information about the Delta Merge	SYSTEM	Expensive Statements Analysis	Shows a quick analysis over the recorded Exp	SYSTEM	Failed Backups	Backup catalog - Shows failed data and log b	SYSTEM	Lock Waiting History	Shows summary of occurred lock waits	SYSTEM
Name	Description	Type																																						
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Failed Backups	Backup catalog - Shows failed data and log b	SYSTEM																																						
Lock Waiting History	Shows summary of occurred lock waits	SYSTEM																																						
<p>29. It is also possible to export and import SQL statements directly to/from the file system.</p>	 <p>The screenshot shows the SQL Console interface with two tabs: 'SQL Console 2.sql' and 'Component Memory Usage.sql'. The 'Component Memory Usage.sql' tab is active. At the top, there are buttons for Refresh, Open in SQL Console, Analyze, and a set of export/import buttons (down arrow, up arrow, and a copy/paste icon). The code editor shows a single query:</p> <pre> 1 /* 2 3 [DESCRIPTION] 4 5 - Shows memory consumption of components 6 7 */ 8 9 SELECT * FROM SYS.M_SERVICE_COMPONENT_MEMORY </pre>																																							

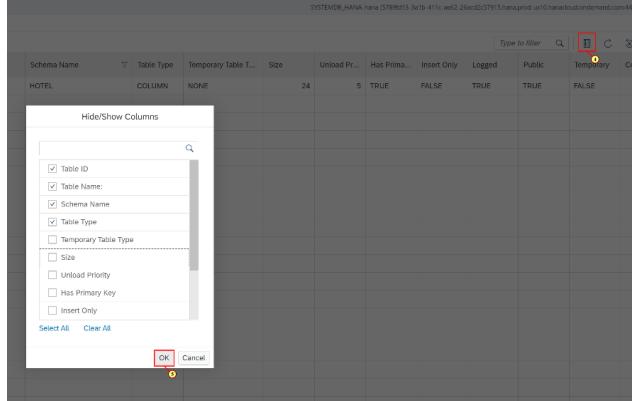
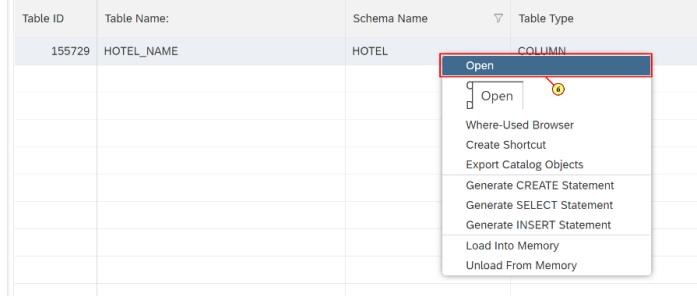
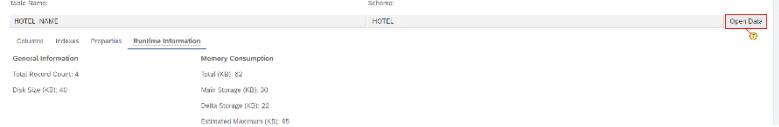
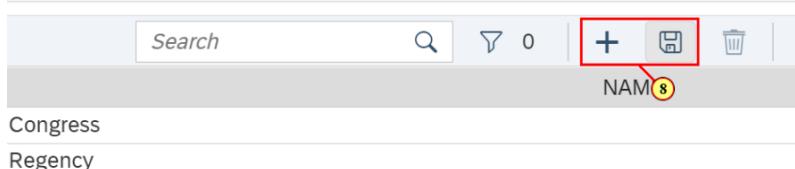
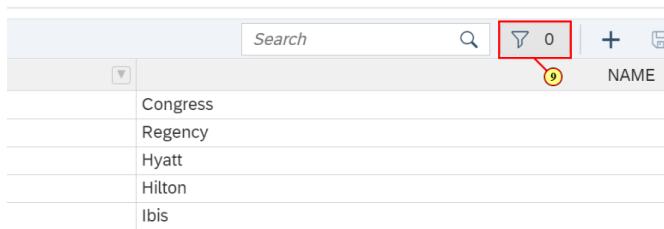
Exercise 5: Browsing across Schemas and Editing Tables

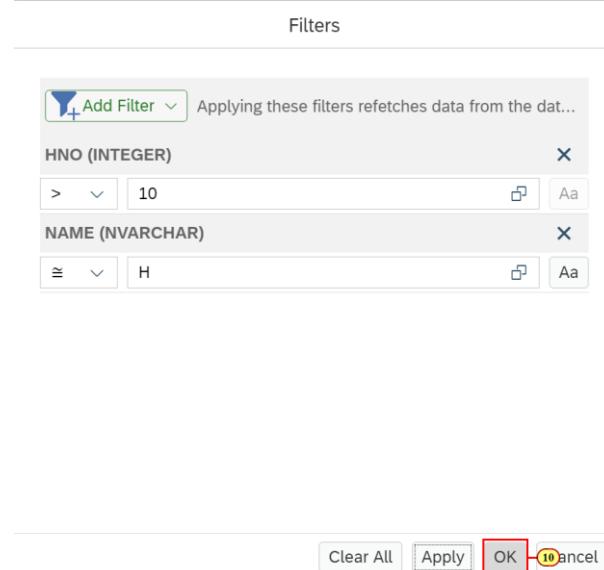
In this exercise, we will discuss on browsing and executing SQL scripts across different schemas and editing an existing table.

Explanation	Screenshot
<p>1. The current schema in the SQL console is shown at the top of the SQL console.</p>	 <p>The screenshot shows the SQL Console interface with two tabs: 'SQL Console 1.sql' and 'SQL Console 2.sql'. The 'SQL Console 2.sql' tab is active. At the top, there are buttons for Refresh, Open in SQL Console, Analyze, and a set of export/import buttons. To the right of the buttons, a message box displays 'Current schema: DBADMIN' with a red box around it and a yellow circle with the number 1 pointing to it.</p>

Explanation	Screenshot
<p></p> <p>Copy and paste the below SQL commands in the console and run them:</p> <pre data-bbox="160 524 535 805">SELECT * FROM HOTEL_NAME; ----- (should fail) SET SCHEMA HOTEL; ----- (sets the schema to HOTEL) SELECT * FROM HOTEL_NAME; ----- (should succeed)</pre> <p>We can notice from the result section that the first SQL query fails as the schema is still set to DBADMIN and HOTEL_NAME table does not exist in that schema. Whereas once the schema is set to HOTEL, the same query succeeds. This can be noticed in the messages section of DBX.</p> <p>The result for the successfully executed SQL query can be seen under the Results tab.</p>	 <p>The screenshot shows the SAP HANA Studio interface with the SQL Console tab open. The console window displays four SQL statements:</p> <pre data-bbox="592 614 1441 720">SQL Console 1.sql x 1 SELECT * from HOTEL_NAME; 2 3 SET SCHEMA HOTEL; 4 SELECT * FROM HOTEL_NAME;</pre> <p>The 'Messages' tab at the bottom of the SQL console shows an error message for the first query:</p> <pre data-bbox="592 931 1392 1052">Result 1 x Messages x History Could not execute 'SELECT * from HOTEL_NAME' Error: (dberror) [259]: invalid table name: Could not find table/view HOTEL_NAME in schema DBADMIN: line 1 col 14 (at pos 14) Statement 'SET SCHEMA HOTEL' executed in 2 ms. Statement 'SELECT * FROM HOTEL_NAME' executed in 2 ms.</pre>

Explanation	Screenshot
<p> Let us now explore the Table Editor feature.</p> <p>2. Right-click on Tables in the catalog tree and choose Show Tables. A list of all of the tables with additional metadata appears.</p>	 <p>The screenshot shows the SAP HANA Database Explorer interface. On the left is a catalog tree with nodes like Agent Groups, Agents, Column Views, Cubes, Functions, Graph Workspaces, Indexes, JSON Collections, Libraries, Procedures, Public Synonyms, Remote Sources, Remote Subscriptions, Schemas, Sequences, Synonyms, Table Types, and Tables. Under Tables, there are sub-nodes for Tables, Triggers, and Views. A context menu is open over the Tables node, with the "Show Tables" option highlighted and a red box around it. Other options in the menu include Import (with a circled '2'), Export, Show Tables, Import Data, Open SQL Console (Ctrl+Alt+C), Copy Name (Ctrl+C), Refresh, and Generate Time Data.</p>
<p>3. You can apply filters to the columns. Here let us filter based on schema name HOTEL.</p>	 <p>The screenshot shows the Table Editor window displaying a list of tables. The header includes columns for Schema Name, Table Type, and Temporary Table T... . There are sorting options for Ascending and Descending, and a "Filter" input field containing "HOTEL". A red box highlights the "Filter" input field. Below the header, four rows of data are shown: SYS, ROW, NONE; SYS, ROW, NONE; SYS, ROW, NONE; and SYS, ROW, NONE.</p>

Explanation	Screenshot
<p>4. The set of columns to be displayed can be set by clicking on this button.</p> <p>5. Select the columns you want to be displayed, and click on OK.</p>	
<p>6. Right-click on the name of a table in the tree and select Open. The editor for the table opens in a new tab.</p>	
<p>7. To see and possibly edit the contents of the table, click on Open Data.</p>	
<p>8. Rows can be edited by selecting a cell and typing in the new value. New rows can be added by selecting the + button. Changes must be saved by pressing the save button in order to commit them to the table.</p>	
<p>9. Filters can also be applied to the table using a set of dropdowns that build up a WHERE clause which can select a subset of the data.</p>	

Explanation	Screenshot
<p>10. In this example in screenshot, the filter is set to find Hotel that starts with letter 'H' and its hotel number is greater than 10. Once the necessary filters are chosen, click on OK.</p>	 <p>The screenshot shows the 'Filters' dialog box. It contains two filter conditions:</p> <ul style="list-style-type: none"> HNO (INTEGER): The value is set to > 10. NAME (NVARCHAR): The value is set to like 'H'. <p>At the bottom of the dialog, there are buttons for Clear All, Apply, OK, and Cancel. The OK button is highlighted with a red box.</p>
<p>11. Click on the SQL button to see the generated query.</p>	 <p>The screenshot shows the SQL Console window with the following query displayed:</p> <pre>SQL Console 2.sql x HOTEL_NAME x Tables x HOTEL_NAME x Raw Data Analysis Rows (2) SELECT TOP 1000 [HNO], [NAME] FROM [HOTEL].[HOTEL_NAME] WHERE ([HNO] > 10) AND (UPPER([NAME]) LIKE UPPER('H'));</pre> <p>The 'SQL' button in the toolbar is highlighted with a red box.</p>

Summary

You have completed the exercise!

You are now able to:

- Navigate the user interface of the Database Explorer
- Use the SQL Console to execute SQL statements
- Navigate the Catalog Browser to find different objects
- Create, Import and Export Catalog Objects
- Browse across Schemas and Editing Tables

CHAPTER 3 - PERFORMANCE MANAGEMENT TOOLS

This chapter covers features related to performance management tasks.

Overview

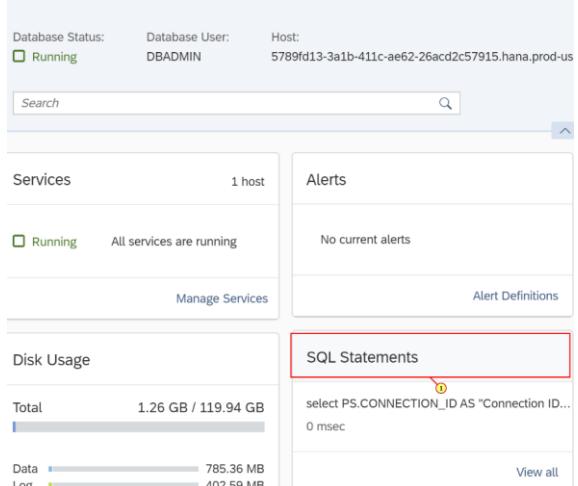
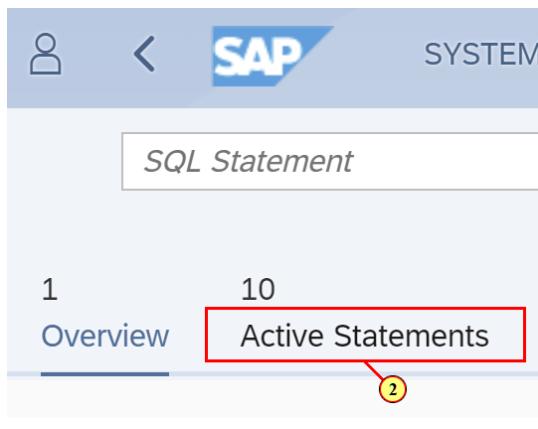
Estimated time: 15 minutes

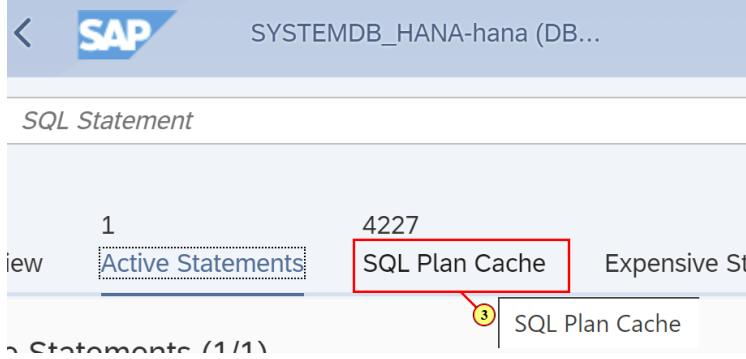
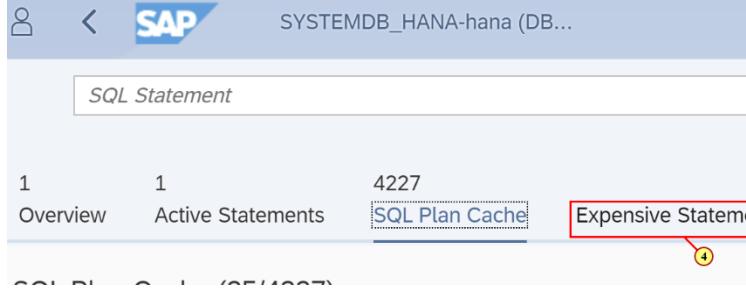
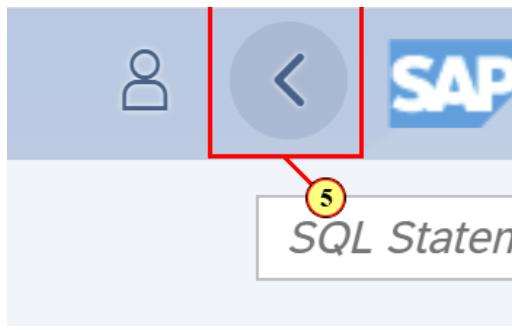
Objective

To explore on Performance Management tools, that allow us to perform various tasks related to the Top SQL commands, Active Statements, Expensive Statements and Data Cache. We will also have a hands-on on Performance Monitoring and Analyzing, Importing and Exporting SQL plans.

Exercise 1: Extra features in Monitor Statements application

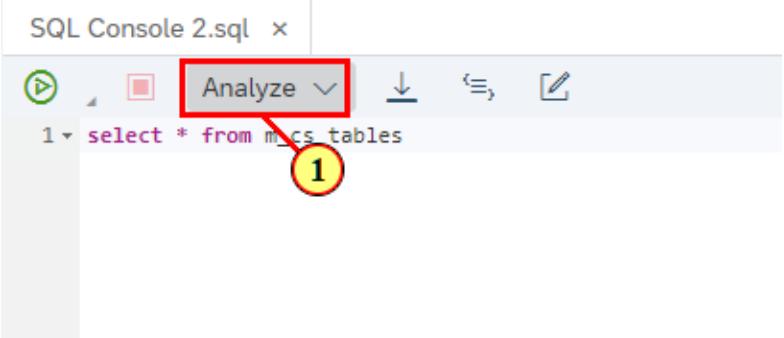
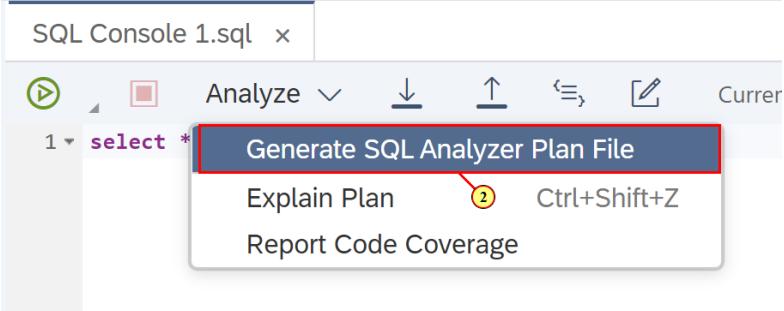
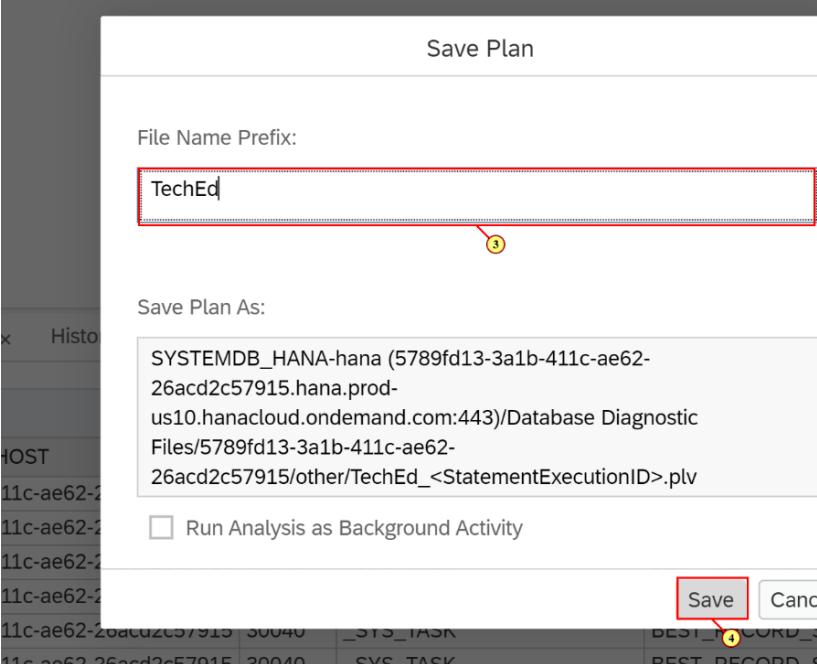
In this exercise, you will explore on the Top SQL Statements like Active Statements, SQL Plan Cache, Expensive Statements

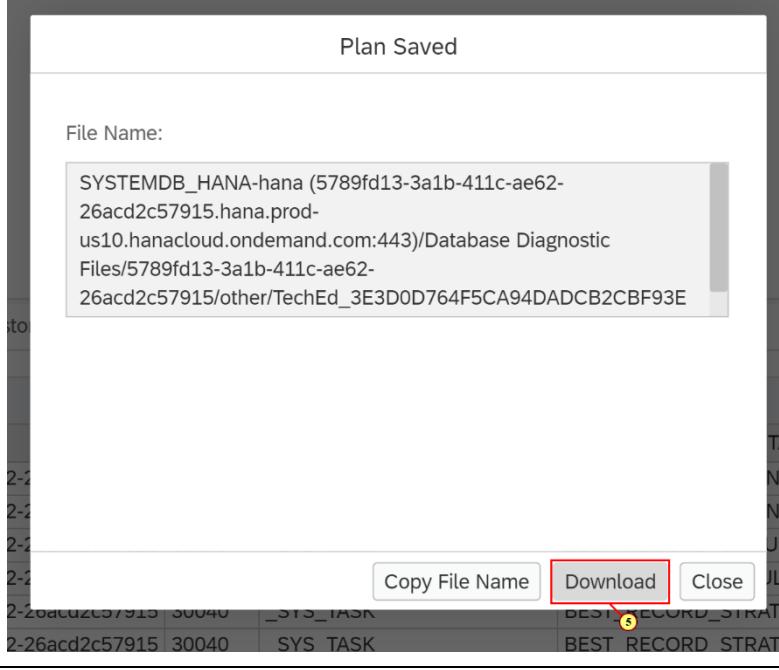
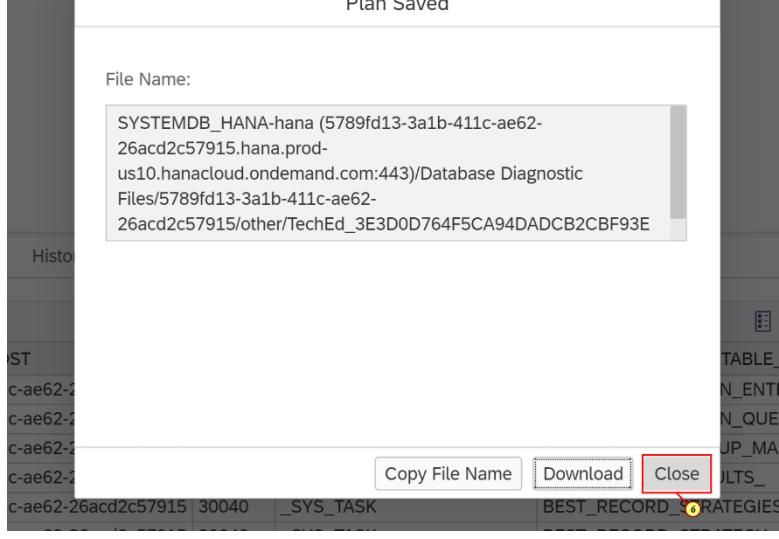
Explanation	Screenshot
<p>1. At the SQL Statements card, click anywhere in the top section.</p>	
<p>The overview page displays an overview of the current active statements and its various parameters. You can even view the entire statement string by clicking More in the Statement String column.</p> <p>2. Click Active Statements at the top left of the Monitor Statements page.</p>	

Explanation	Screenshot
<p></p> <p>The active statements page displays each active SQL statement and its various parameters, such as its status, its statement string and its connection ID.</p> <p>3. Click SQL Plan Cache.</p>	 <p>The screenshot shows the SAP SQL Statement interface for the database SYSTEMDB_HANA-hana. The top navigation bar shows the SAP logo and the database name. Below it, the title "SQL Statement" is displayed. A horizontal menu bar contains four items: "Overview" (with value 1), "Active Statements" (with value 4227, highlighted with a red box and a yellow circle labeled 3), "SQL Plan Cache" (highlighted with a red box), and "Expensive Statements". At the bottom of the menu bar, there is a link "SQL Statement (1/1)".</p>
<p></p> <p>The SQL Plan Cache page displays the SQL plans that have been cached in the server. It displays its host and port number as well as the user name.</p> <p>4. Click Expensive Statements.</p>	 <p>The screenshot shows the SAP SQL Statement interface for the database SYSTEMDB_HANA-hana. The top navigation bar shows the SAP logo and the database name. Below it, the title "SQL Statement" is displayed. A horizontal menu bar contains four items: "Overview" (with value 1), "Active Statements" (with value 4227), "SQL Plan Cache" (highlighted with a red box), and "Expensive Statements" (highlighted with a red box and a yellow circle labeled 4). At the bottom of the menu bar, there is a link "SQL Statement (1/1)".</p>
<p></p> <p>There are currently no expensive statements so there is nothing to display.</p> <p>5. Click the back button at the top left to return to the Database Overview page.</p>	 <p>The screenshot shows the SAP SQL Statement interface for the database SYSTEMDB_HANA-hana. The top navigation bar shows the SAP logo and the database name. Below it, the title "SQL Statement" is displayed. In the top-left corner, there is a blue circular button with a white arrow pointing left, which is highlighted with a red box and a yellow circle labeled 5. This button is used to navigate back to the previous screen.</p>

Exercise 2: Importing and Exporting SQL Plans in the SQL Analyzer

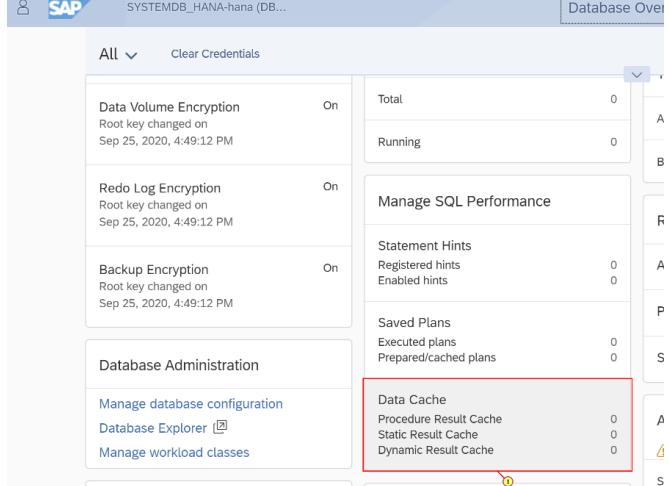
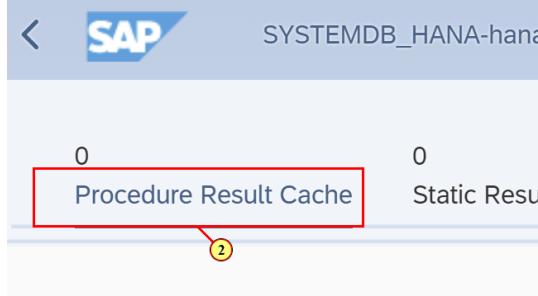
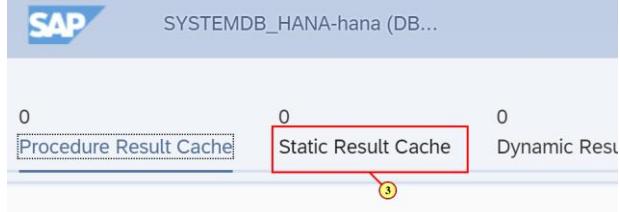
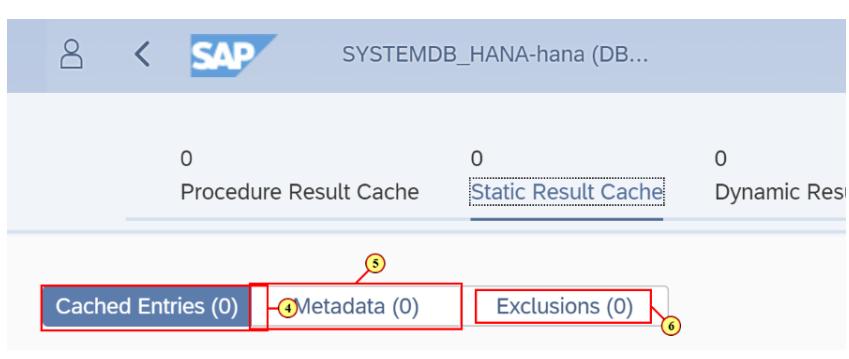
In this exercise, you will have hands-on on how to import, export and analyze the SQL Plans in the SQL Analyzer. For this you will be launching the Database Explorer.

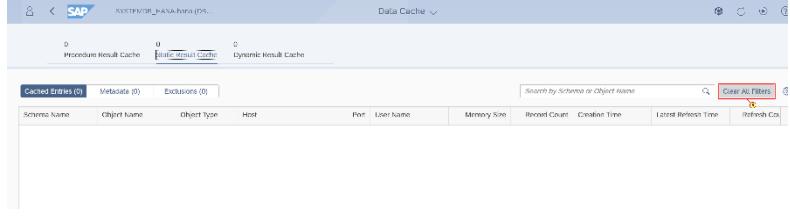
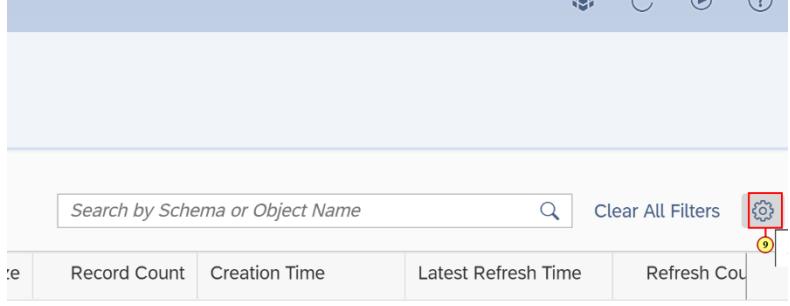
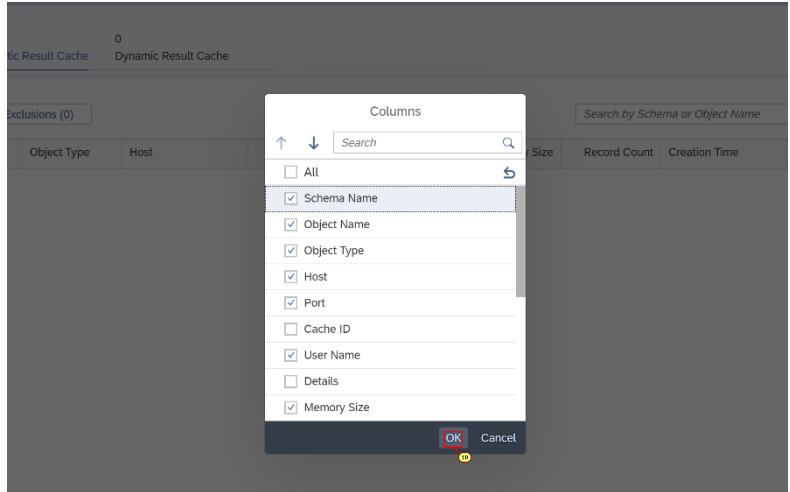
Explanation	Screenshot
1. Select the Analyze drop-down menu to view the analyzer options.	
2. Select Generate SQL Analyzer Plan File from the dropdown menu.	
<p>Info: This feature allows the user to both analyze the SQL query and export the SQL plan to their local directory.</p> <p>3. Enter TechEd in the text box</p> <p>4. Select Save to save the SQL plan.</p>	

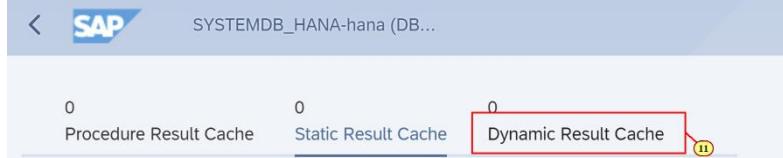
Explanation	Screenshot
<p>5. Click Download to download the SQL plan to your local directory.</p>	 <p>Plan Saved</p> <p>File Name:</p> <pre>SYSTEMDB_HANA-hana (5789fd13-3a1b-411c-ae62-26acd2c57915.hana.prod) us10.hanacloud.ondemand.com:443)/Database Diagnostic Files/5789fd13-3a1b-411c-ae62-26acd2c57915/other/TechEd_3E3D0D764F5CA94DADCB2CBF93E</pre> <p>Copy File Name Download Close</p>
<p>6. Click Close to close the pop-up window and return to the Analyze SQL page in the Database Explorer.</p> <p>i You have completed the exercise! You are now able to:<ul style="list-style-type: none">• View the active statements and monitor the expensive statements• Import and export SQL plans• View cached data entries• Import trace files</p>	 <p>Plan Saved</p> <p>File Name:</p> <pre>SYSTEMDB_HANA-hana (5789fd13-3a1b-411c-ae62-26acd2c57915.hana.prod) us10.hanacloud.ondemand.com:443)/Database Diagnostic Files/5789fd13-3a1b-411c-ae62-26acd2c57915/other/TechEd_3E3D0D764F5CA94DADCB2CBF93E</pre> <p>Copy File Name Download Close</p>

Exercise 3: Data Cache Monitoring Application

In this exercise, you will explore on Data Cache variants such as Procedure Result Cache, Static Result Cache and Dynamic Result Cache. You will also have hands-on on searching cache based on schemas and objects.

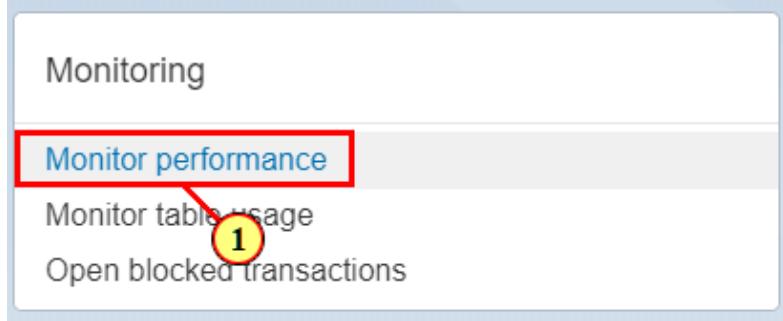
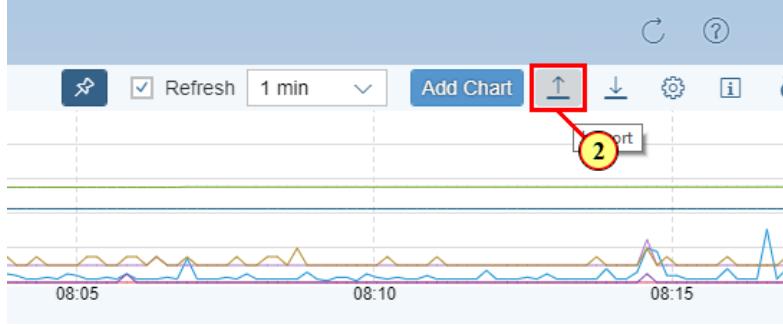
Explanation	Screenshot
<p>1. In the Database Overview page of your selected resource, scroll down to the Manage SQL Performance card and select anywhere on the Data Cache box.</p>	
<p>2. You are currently viewing the Procedure Result Cache entries.</p>	
<p>3. You are currently viewing only the static cache data entries.</p>	
<p>4. You are currently in the Cached Entries tab. Here, you can view all the cached data entries in the table below.</p> <p>5. Clicking the Metadata tab will display schemas and its various object parameters.</p> <p>6. Clicking the Exclusions tab will display the excluded schemas.</p>	

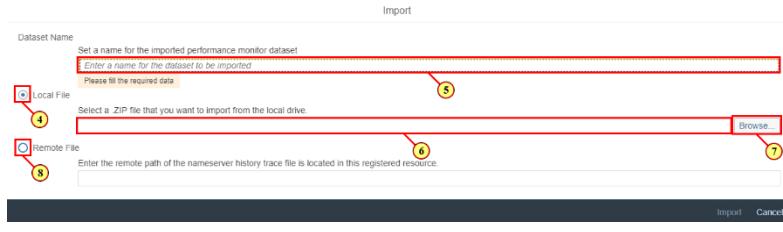
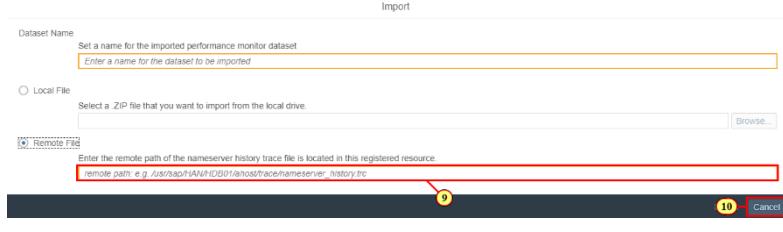
Explanation	Screenshot
7. You can search for the data entries either through schemas or object names.	 <p>The screenshot shows the SAP Data Cache interface. At the top, there are tabs for 'Procedure Result Cache' (0), 'Static Result Cache' (0), and 'Dynamic Result Cache' (0). Below the tabs is a search bar labeled 'Search by Schema or Object Name' with a magnifying glass icon. To the right of the search bar is a button labeled 'Clear All Filters'. The main area has columns for 'Schema Name', 'Object Name', 'Object Type', 'Host', 'Port', 'User Name', 'Memory Size', 'Record Count', 'Creation Time', 'Latest Refresh Time', and 'Refresh Co'. A red box highlights the 'Clear All Filters' button.</p>
8. You can clear all existing filters for filtering data cache entries by clicking Clear All Filters .	 <p>This screenshot is similar to the previous one, but the 'Clear All Filters' button is highlighted with a red box. The rest of the interface and data table are identical.</p>
9. Click on the gear icon.	 <p>The screenshot shows the SAP Data Cache interface with a gear icon highlighted with a red box. The gear icon is located in the top right corner of the main toolbar. The rest of the interface is standard.</p>
The settings pop-up can filter various columns which represent schema and object parameters.	 <p>This screenshot shows a 'Columns' settings pop-up window. It lists various filter options: 'All', 'Schema Name', 'Object Name', 'Object Type', 'Host', 'Port', 'Cache ID', 'User Name', 'Details', and 'Memory Size'. The 'Schema Name' option is selected. At the bottom of the pop-up are 'OK' and 'Cancel' buttons, with 'OK' also highlighted with a red box.</p>

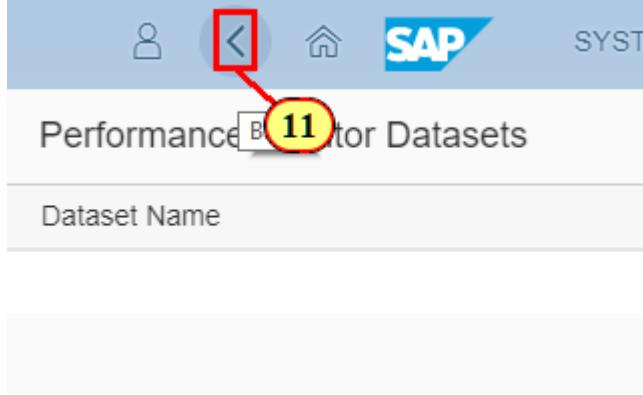
Explanation	Screenshot
<p>11. Clicking Dynamic Result Cache will display all the dynamic data cache entries.</p>	 <p>The screenshot shows the SAP Fiori interface for a database named 'SYSTEMDB_HANA-hana'. At the top, there are three tabs: 'Procedure Result Cache' (0), 'Static Result Cache' (0), and 'Dynamic Result Cache' (0). The 'Dynamic Result Cache' tab is highlighted with a red box and has a yellow circled number '11' next to it. Below the tabs, there is a back button icon and a SAP logo.</p>
<p>12. Click the back button to return to the Database Overview page.</p>	 <p>The screenshot shows the SAP Fiori interface with a back button icon highlighted with a red box and a yellow circled number '12'. Below the button, the text 'Go Back' is visible. The SAP logo is also present.</p>

Exercise 4: Importing NameServer Trace files in the Performance Monitor

In this exercise, you will have hands-on on how to import the NameServer Trace files in the Performance Monitor application.

Explanation	Screenshot
<p>1. Click Monitor Performance to enter the Performance Management application.</p>	 <p>The screenshot shows the 'Monitoring' application. A menu item 'Monitor performance' is highlighted with a red box and a yellow circled number '1'. Other options in the menu include 'Monitor table usage' and 'Open blocked transactions'.</p>
<p>2. Click the Import icon at the top right of the Performance Monitor page.</p>	 <p>The screenshot shows the 'Performance Monitor' page. At the top right, there is a toolbar with various icons. One icon, labeled 'Import' with a circular arrow, is highlighted with a red box and a yellow circled number '2'.</p>

Explanation	Screenshot
<p>3. Click the Import button at the very bottom right of the Performance Monitor Datasets page.</p>	
<p>4. Ensure that the Local File option is selected first.</p> <p>5. You can enter a name for the new dataset that you are about to import, either from your local directory or a remote directory.</p> <p>6. You can enter the path of a .ZIP file that you would like to import.</p> <p>7. You can click Browse to browse your local directory and select a local .ZIP file to import.</p> <p>8. Select the Remote File option under the Local File option.</p>	
<p>9. The search bar for your remote file provides an example for the path of your directory that your remote file may be located in.</p> <p> Notice that for importing a remote file, the remote path for the nameserver history trace file is all you need. The above options can stay empty since they are meant for local file importing.</p> <p>10. We will not be importing any nameserver trace files. Click Cancel to close the pop-up.</p>	

Explanation	Screenshot
11. Click the Back button twice to return to the Database Overview page.	

Summary

You have completed the exercise!

You are now able to:

- Explore extra features in Monitor Statements Application.
- Import and Export SQL Plans.
- Use the Data Cache Monitoring Application.
- Import trace files in Performance Monitor Application.

CONGRATULATIONS! YOU COMPLETED THIS WORKSHOP!

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