

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 Instance" 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:

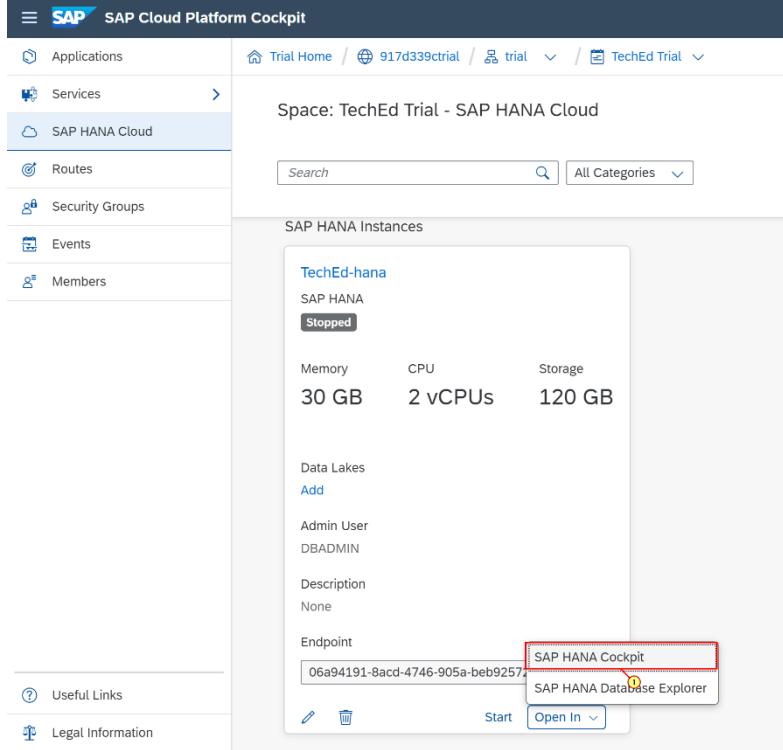
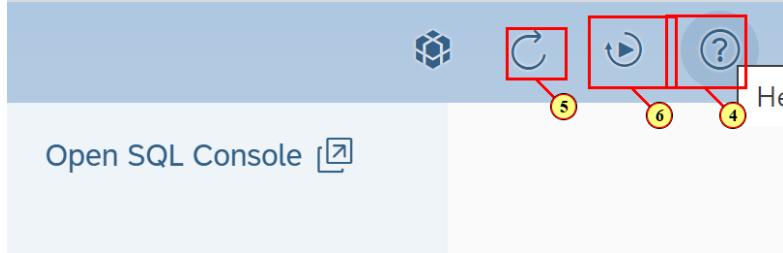
- Monitoring all your SAP HANA databases
- Comparing database configurations
- Configuring and managing individual databases
- Executing performance management tasks
- And much more!

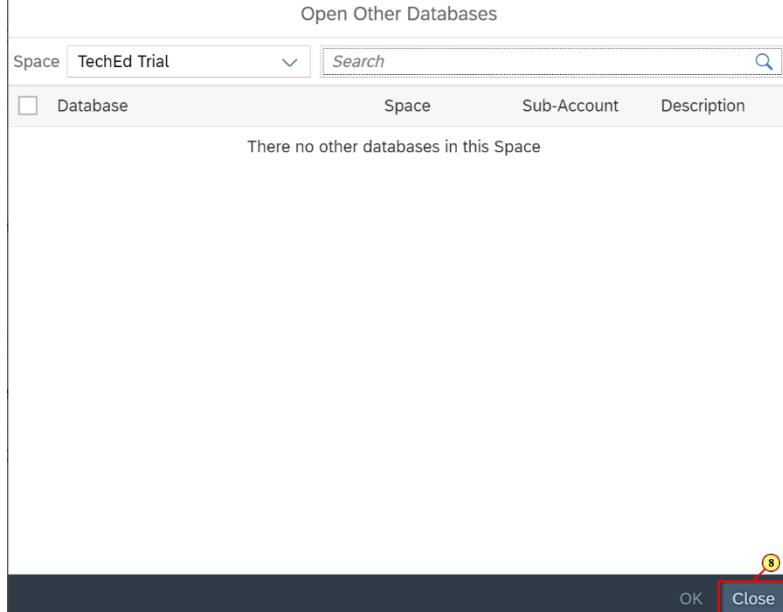
Exercise 1: The Database Overview Page

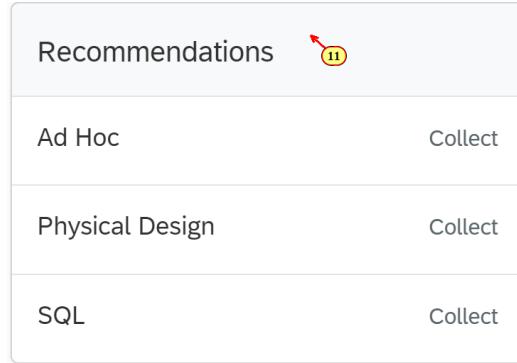
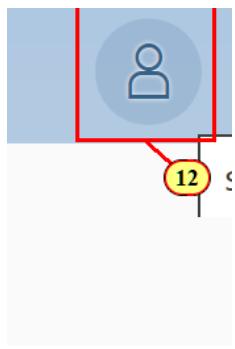
The Database Overview page displays health metrics for an individual SAP HANA Cloud database.

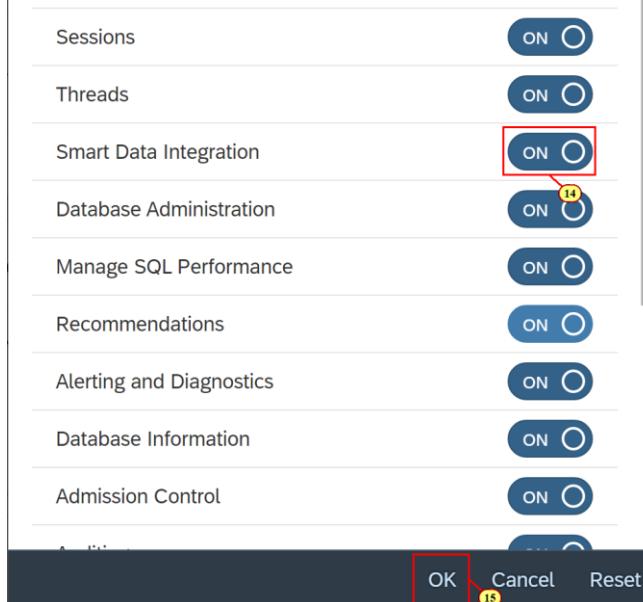
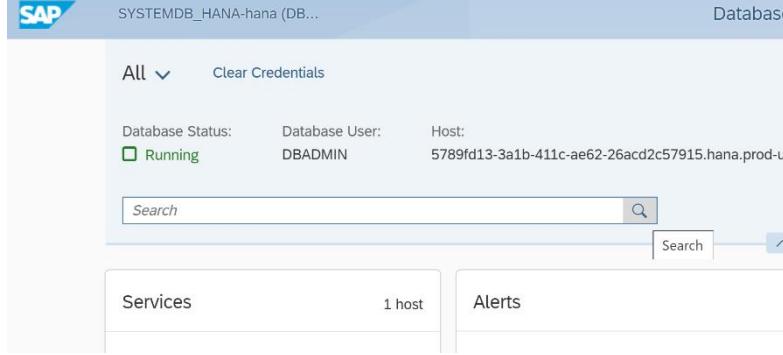
Through the Database Overview page, you can view key health indicators for this specific database, such as database status, alerts, and resource utilization. You also have access to tools that allow you to perform database administrations tasks, such as performance analysis, and executing SQL statements. 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.

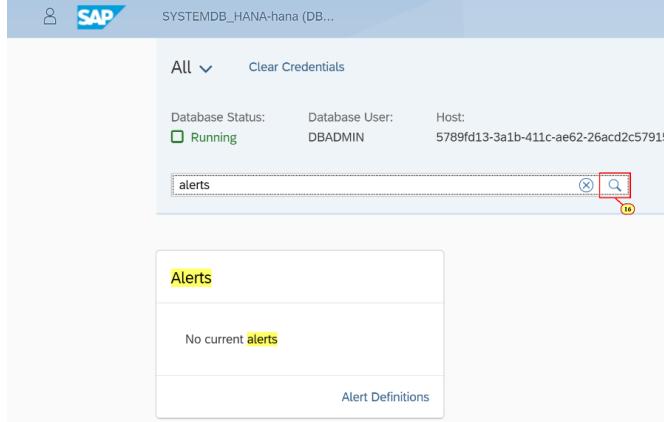
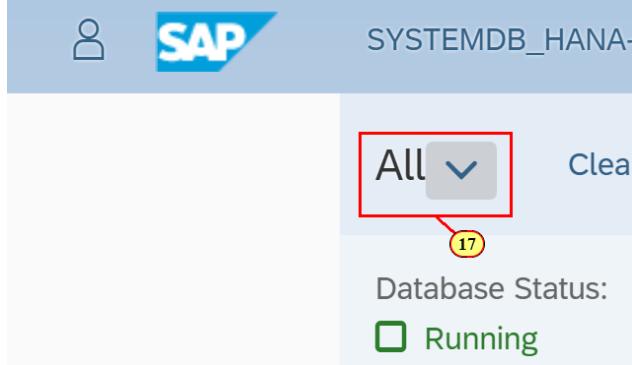
This exercise will teach you the basics of navigating the Database Overview page and how to find the information you need as a database administrator.

Explanation	Screenshot
<p>1. Navigate to your SAP HANA Cloud Trial instance from the SAP Cloud Platform Cockpit ("trial" subaccount and "dev" space). Choose to open the SAP HANA Cockpit.</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 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 left opens a side bar menu with user specific settings.</p>	
<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>	

Explanation	Screenshot
6. You can set an auto-refresh for every 10 seconds, 20 seconds, 30 seconds, 1 minute, 5 minutes or 10 minutes.	
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>Info: 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>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>Info:</p>	

Explanation	Screenshot								
<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="578 1122 1095 1485"> <tbody> <tr> <td>Recommendations</td> <td>11</td> </tr> <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	11	Ad Hoc	Collect	Physical Design	Collect	SQL	Collect
Recommendations	11								
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<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>									

Explanation	Screenshot
13. Click Manage Cards .	
<p>14. Click the on/off switches to turn some cards off.</p> <p>15. Click OK.</p>	
<p> We will cover the search and highlight feature last in this exercise.</p>	

Explanation	Screenshot
<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'. At the top right, there is a search bar containing the word 'alerts'. To the right of the search bar are three icons: a magnifying glass, a red-bordered 'X' for clearing the search, and a small yellow circle with the number '16'.</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. In the top left corner, there is a dropdown menu labeled 'All' with a red box around it. A yellow circle with the number '17' points to the bottom right corner of the 'All' button. To the right of the dropdown are the words 'Clear' and 'Database Status:'. Below the dropdown, there is a status indicator 'Running' with a green checkmark.</p>

Exercise 2: Configuring Database Properties

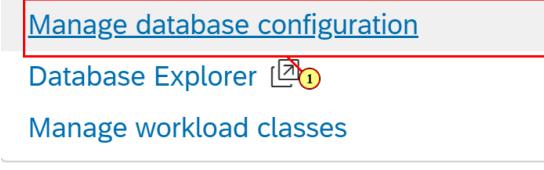
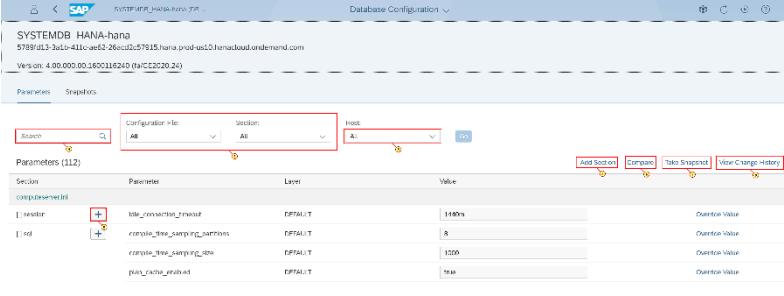
An SAP HANA database has several configuration (*.ini) files that contain properties for configuring the database.

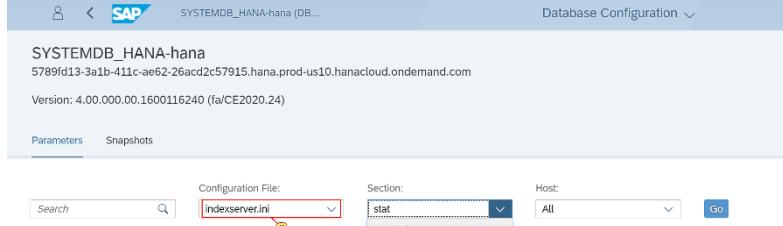
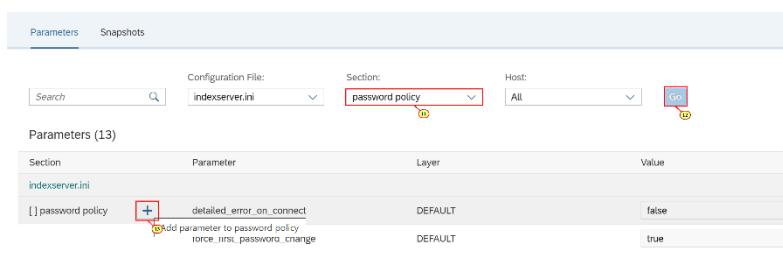
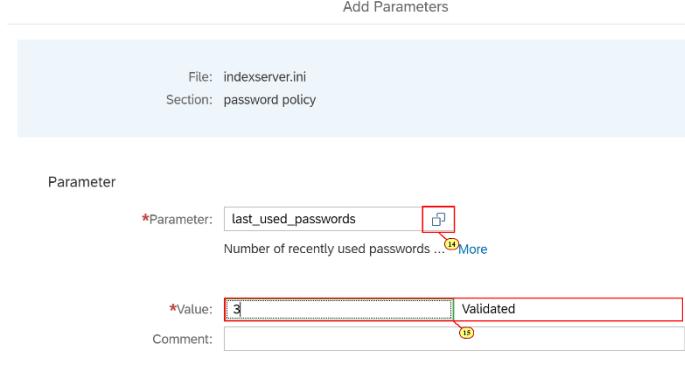
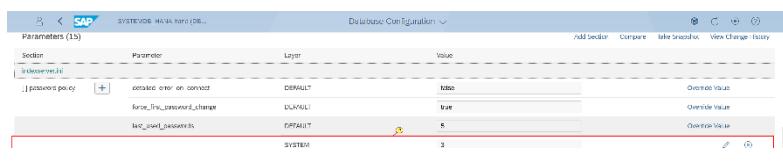
SAP HANA's configuration files contain parameters for global database configuration (global.ini), as well as the configuration of each service in the system (for example, indexserver.ini).

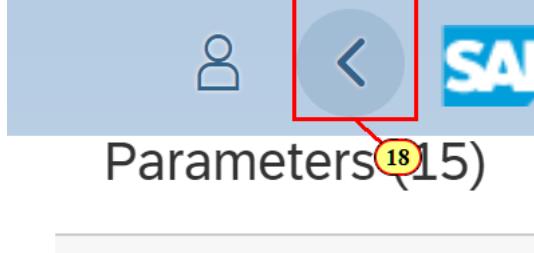
Properties can be configured at different layers, depending on the configuration file:

- **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>Database Administration</p>  <p>Manage database configuration Database Explorer  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>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> <p>9. You can add a parameter to a section by clicking the + button.</p>	 <table border="1"> <thead> <tr> <th>Section</th> <th>Parameter</th> <th>Layer</th> <th>Value</th> <th>Change History</th> </tr> </thead> <tbody> <tr> <td>comparatorfile</td> <td>idle_connection_timeout</td> <td>DEFAULT</td> <td>1440s</td> <td>Overtype Value</td> </tr> <tr> <td>comparator</td> <td>comparator_max_parallelism</td> <td>DEFAULT</td> <td>8</td> <td>Overtype Value</td> </tr> <tr> <td></td> <td>comparator_max_parallelism_low</td> <td>DEFAULT</td> <td>100</td> <td>Overtype Value</td> </tr> <tr> <td></td> <td>plan_cache_size_kb</td> <td>DEFAULT</td> <td>512</td> <td>Overtype Value</td> </tr> </tbody> </table>	Section	Parameter	Layer	Value	Change History	comparatorfile	idle_connection_timeout	DEFAULT	1440s	Overtype Value	comparator	comparator_max_parallelism	DEFAULT	8	Overtype Value		comparator_max_parallelism_low	DEFAULT	100	Overtype Value		plan_cache_size_kb	DEFAULT	512	Overtype Value
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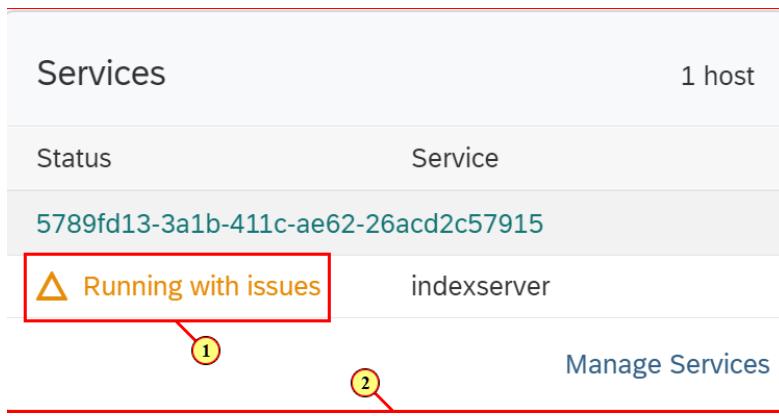
Explanation	Screenshot
<p>10. Enter indexserver.ini in the Configuration File text field. You can use the drop-down list box to select the configuration file, or you can begin typing its name and the text box will auto fill.</p>	
<p>11. Let's change a parameter. Enter password policy in the Section field.</p> <p>12. Click Go.</p> <p>13. Click the + button to add a new parameter.</p>	
<p>14. Click on the Search button, and a pop up comes up with all possible Parameters that can be added for this section.</p> <p>15. Enter 3 in the Value text field.</p> <p>16. Click on Save.</p>	
<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>	

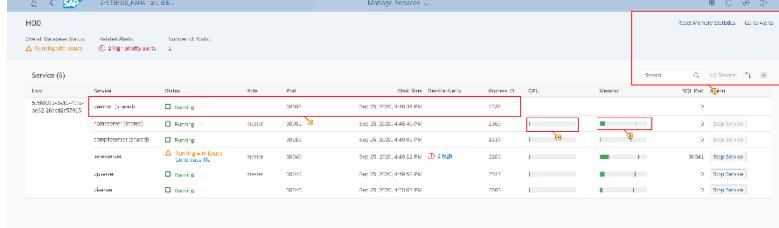
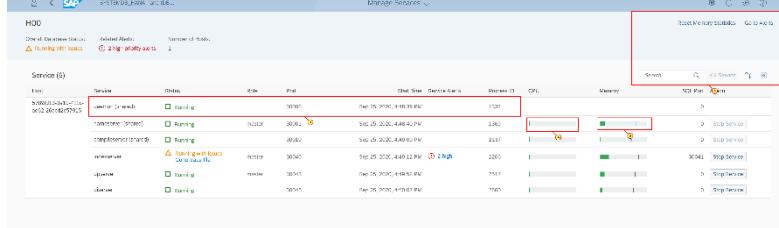
Explanation	Screenshot
<p>18. Click Back in the top right to return to the Database Overview page.</p>	

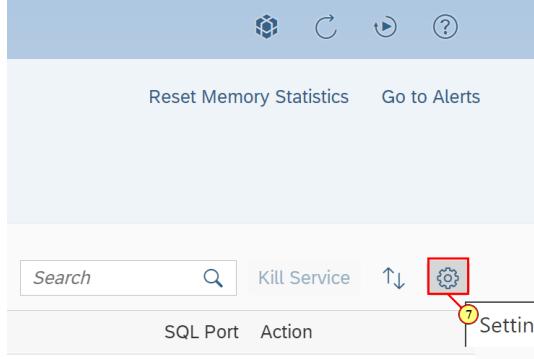
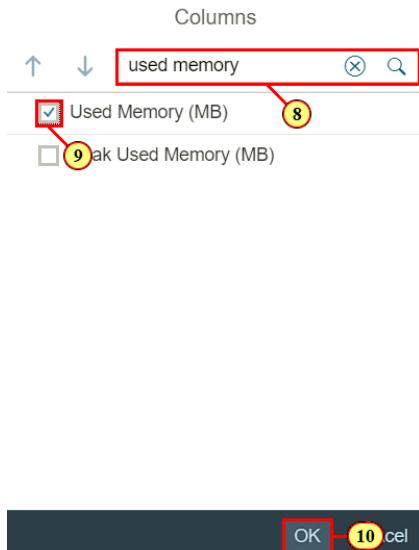
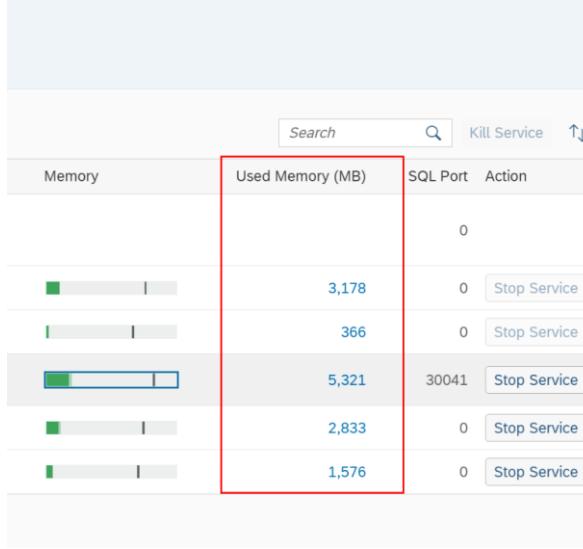
Exercise 3: Managing Services

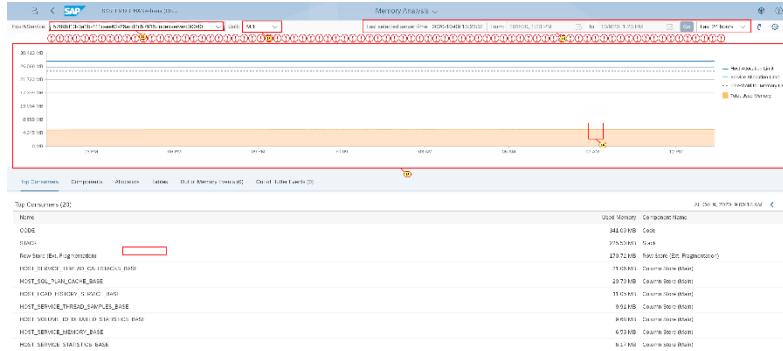
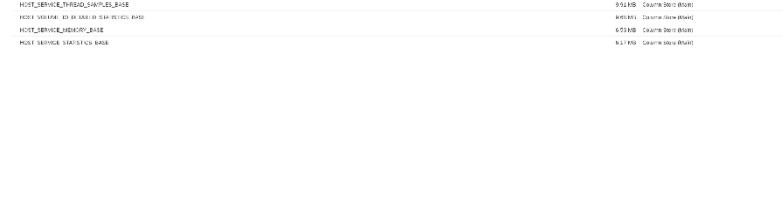
To monitor the health of your SAP HANA database in more detail, for example to troubleshoot performance bottlenecks, you can analyze the status and memory usage of individual database services. The Memory Analysis application is helpful here as it provides a more detailed breakdown of memory usage. It 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.

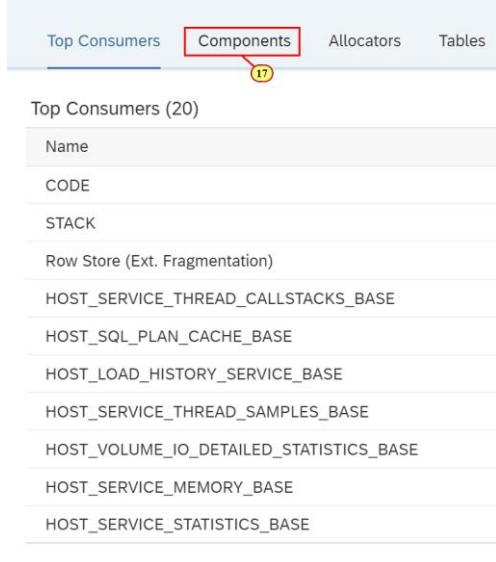
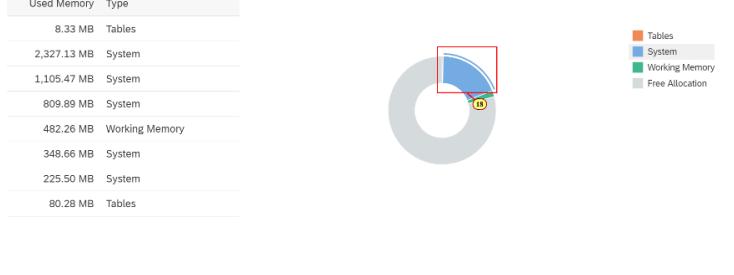
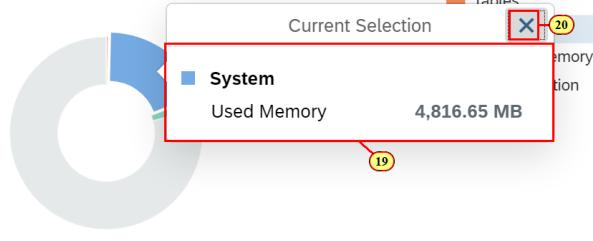
In this exercise, you review the information displayed in the Services card, examine the different database service management operations you have access to, and perform a basic analysis of memory usage.

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 1643"> <thead> <tr> <th colspan="2">Services</th> <th>1 host</th> </tr> <tr> <th>Status</th> <th>Service</th> <th></th> </tr> </thead> <tbody> <tr> <td>5789fd13-3a1b-411c-ae62-26acd2c57915</td> <td> Running with issues</td> <td>indexserver</td> </tr> <tr> <td></td> <td></td> <td>Manage Services</td> </tr> </tbody> </table>	Services		1 host	Status	Service		5789fd13-3a1b-411c-ae62-26acd2c57915	 Running with issues	indexserver			Manage Services
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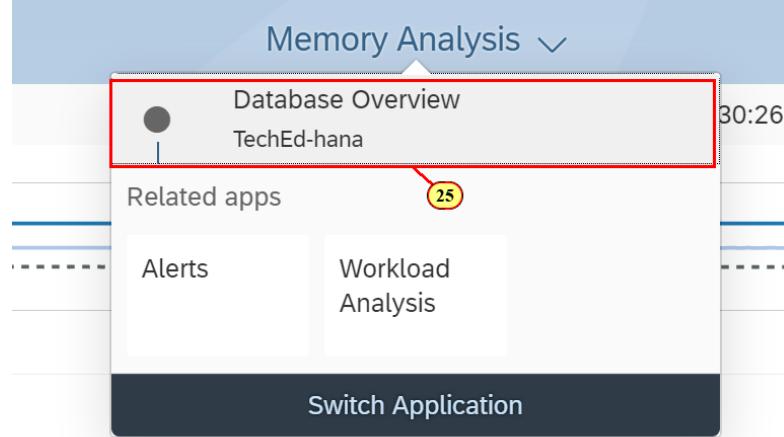
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<p>If necessary, you can perform follow-up operations, such as stopping a service, or killing a service. You can also reset memory statistics and navigate to Alerts application.</p>																																											
<p>3. Detailed service 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>	 <table border="1"> <thead> <tr> <th>Service</th> <th>Status</th> <th>State</th> <th>CPU</th> </tr> </thead> <tbody> <tr> <td>sapdb</td> <td>Running</td> <td>Normal</td> <td>1.00%</td> </tr> <tr> <td>syslog</td> <td>Running</td> <td>Normal</td> <td>0.00%</td> </tr> <tr> <td>compliancecheck</td> <td>Running</td> <td>Normal</td> <td>0.00%</td> </tr> <tr> <td>memservice</td> <td>Starting</td> <td>Normal</td> <td>0.00%</td> </tr> <tr> <td>memservice</td> <td>Starting</td> <td>Normal</td> <td>0.00%</td> </tr> <tr> <td>memservice</td> <td>Starting</td> <td>Normal</td> <td>0.00%</td> </tr> </tbody> </table>	Service	Status	State	CPU	sapdb	Running	Normal	1.00%	syslog	Running	Normal	0.00%	compliancecheck	Running	Normal	0.00%	memservice	Starting	Normal	0.00%	memservice	Starting	Normal	0.00%	memservice	Starting	Normal	0.00%														
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<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>	 <table border="1"> <thead> <tr> <th>Service</th> <th>Status</th> <th>State</th> <th>CPU</th> <th>Memory</th> <th>Process ID</th> </tr> </thead> <tbody> <tr> <td>sapdb</td> <td>Running</td> <td>Normal</td> <td>1.00%</td> <td>Used: 1000, Peak: 1000, Alloc: 1000</td> <td>1234</td> </tr> <tr> <td>syslog</td> <td>Running</td> <td>Normal</td> <td>0.00%</td> <td>Used: 100, Peak: 100, Alloc: 100</td> <td>1235</td> </tr> <tr> <td>compliancecheck</td> <td>Running</td> <td>Normal</td> <td>0.00%</td> <td>Used: 100, Peak: 100, Alloc: 100</td> <td>1236</td> </tr> <tr> <td>memservice</td> <td>Starting</td> <td>Normal</td> <td>0.00%</td> <td>Used: 100, Peak: 100, Alloc: 100</td> <td>1237</td> </tr> <tr> <td>memservice</td> <td>Starting</td> <td>Normal</td> <td>0.00%</td> <td>Used: 100, Peak: 100, Alloc: 100</td> <td>1238</td> </tr> <tr> <td>memservice</td> <td>Starting</td> <td>Normal</td> <td>0.00%</td> <td>Used: 100, Peak: 100, Alloc: 100</td> <td>1239</td> </tr> </tbody> </table>	Service	Status	State	CPU	Memory	Process ID	sapdb	Running	Normal	1.00%	Used: 1000, Peak: 1000, Alloc: 1000	1234	syslog	Running	Normal	0.00%	Used: 100, Peak: 100, Alloc: 100	1235	compliancecheck	Running	Normal	0.00%	Used: 100, Peak: 100, Alloc: 100	1236	memservice	Starting	Normal	0.00%	Used: 100, Peak: 100, Alloc: 100	1237	memservice	Starting	Normal	0.00%	Used: 100, Peak: 100, Alloc: 100	1238	memservice	Starting	Normal	0.00%	Used: 100, Peak: 100, Alloc: 100	1239
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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> 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>	

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).																			
	 <p>Top Consumers (20)</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>17. Click the Components tab.</p> <p></p> <p>The donut chart displays the memory details at that specific point in time.</p>	 <table border="1"> <thead> <tr> <th>Used Memory</th> <th>Type</th> </tr> </thead> <tbody> <tr><td>8.33 MB</td><td>Tables</td></tr> <tr><td>2,327.13 MB</td><td>System</td></tr> <tr><td>1,105.47 MB</td><td>System</td></tr> <tr><td>809.89 MB</td><td>System</td></tr> <tr><td>482.26 MB</td><td>Working Memory</td></tr> <tr><td>348.66 MB</td><td>System</td></tr> <tr><td>225.50 MB</td><td>System</td></tr> <tr><td>80.28 MB</td><td>Tables</td></tr> </tbody> </table>	Used Memory	Type	8.33 MB	Tables	2,327.13 MB	System	1,105.47 MB	System	809.89 MB	System	482.26 MB	Working Memory	348.66 MB	System	225.50 MB	System	80.28 MB	Tables
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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>																			

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>	<table border="1"> <thead> <tr> <th>Component Name</th> <th>Used Memory</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>Row Store Tables</td> <td>8.33 MB</td> <td>Tables</td> </tr> <tr> <td>Code Size</td> <td>2,327.13 MB</td> <td>System</td> </tr> <tr> <td>Caches</td> <td>1,105.47 MB</td> <td>System</td> </tr> <tr> <td>System</td> <td>809.89 MB</td> <td>System</td> </tr> <tr> <td>Statement Execution & Intermediate Results</td> <td>482.26 MB</td> <td>Working Memory</td> </tr> <tr> <td>Monitoring & Statistical Data</td> <td>348.66 MB</td> <td>System</td> </tr> <tr> <td>Stack Size</td> <td>225.50 MB</td> <td>System</td> </tr> <tr> <td>Column Store Tables</td> <td>80.28 MB</td> <td>Tables</td> </tr> </tbody> </table>	Component Name	Used Memory	Type	Row Store Tables	8.33 MB	Tables	Code Size	2,327.13 MB	System	Caches	1,105.47 MB	System	System	809.89 MB	System	Statement Execution & Intermediate Results	482.26 MB	Working Memory	Monitoring & Statistical Data	348.66 MB	System	Stack Size	225.50 MB	System	Column Store Tables	80.28 MB	Tables
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<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>																												

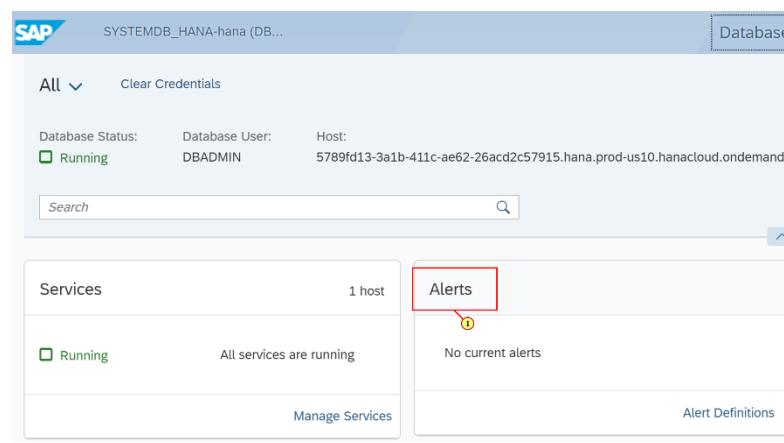
Explanation	Screenshot
<p>25. Select the drop-down menu at the top named Memory Analysis and select Database Overview from the menu to return to the Database Overview page.</p>	

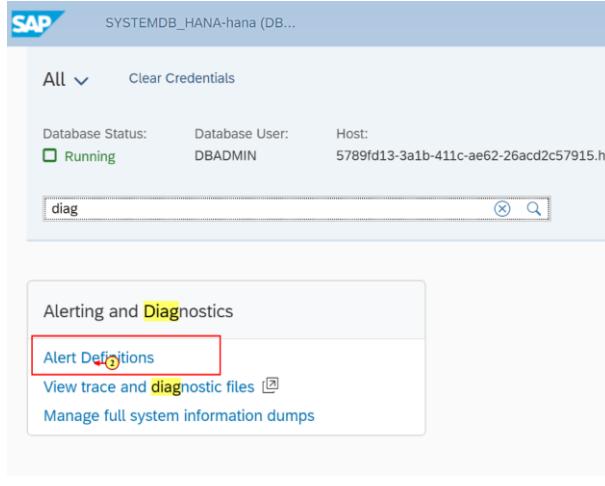
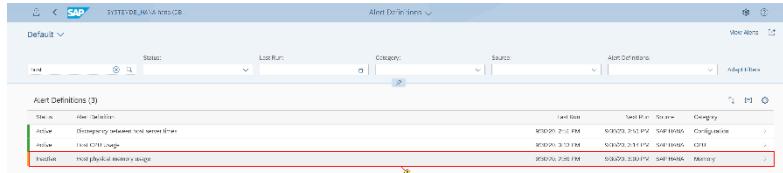
Exercise 4: Managing Alerts

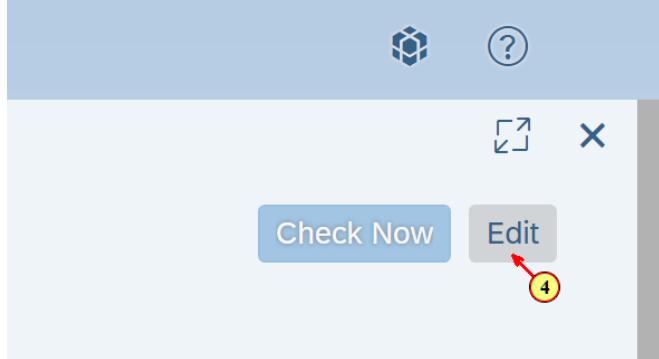
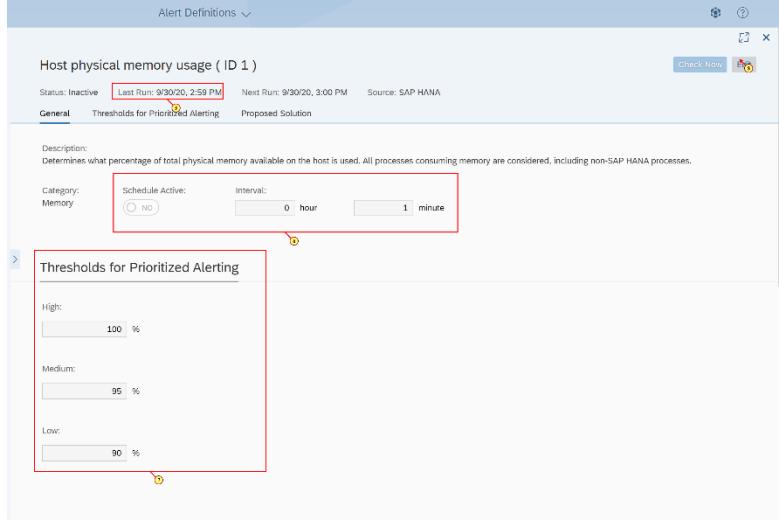
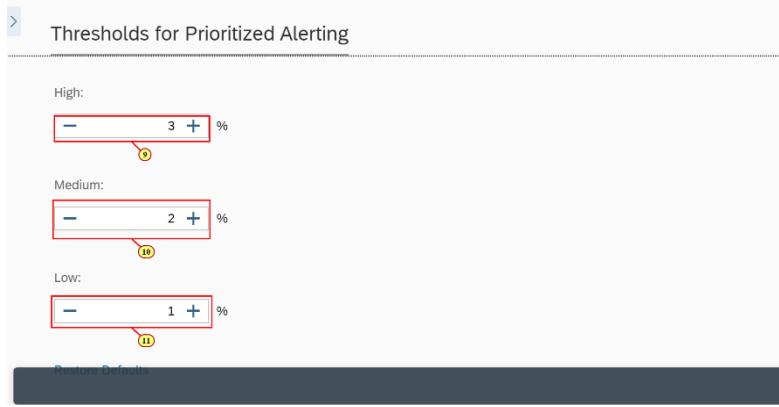
As an administrator, you actively monitor the status of the system, its services, and the consumption of system resources. However, you are also alerted of critical situations, for example: memory utilization is reaching a critical level, or a server has stopped.

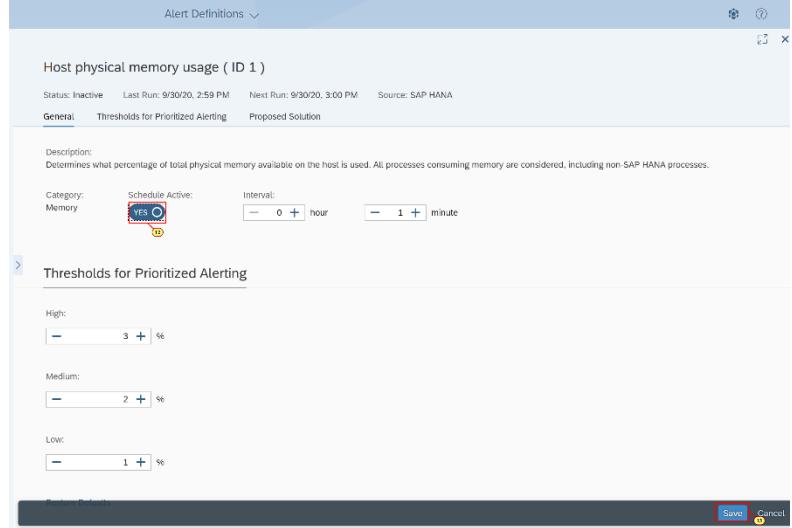
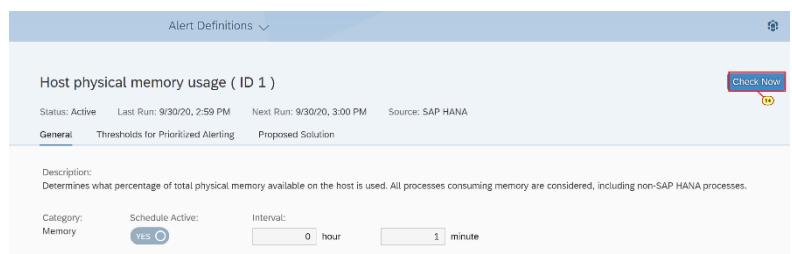
The internal monitoring infrastructure of the SAP HANA database is continuously collecting and evaluating information about status, performance, and resource usage from all components of the SAP HANA database. In addition, it performs regular checks on the data in system tables and views and when configurable 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.

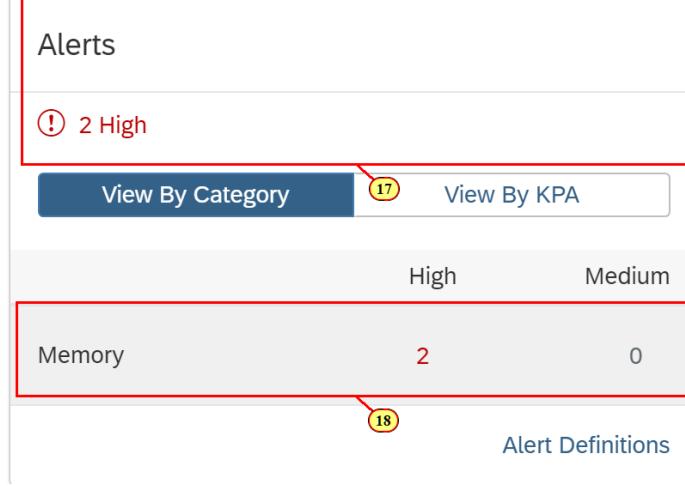
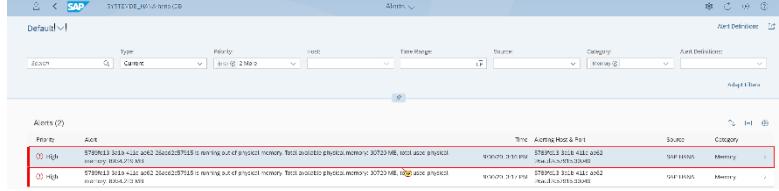
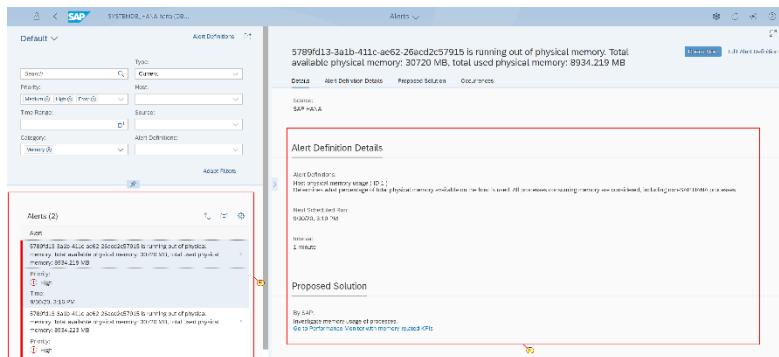
In this exercise, you'll examine the Alerts card, drill-down to obtain more information about raised alerts and configure alert thresholds.

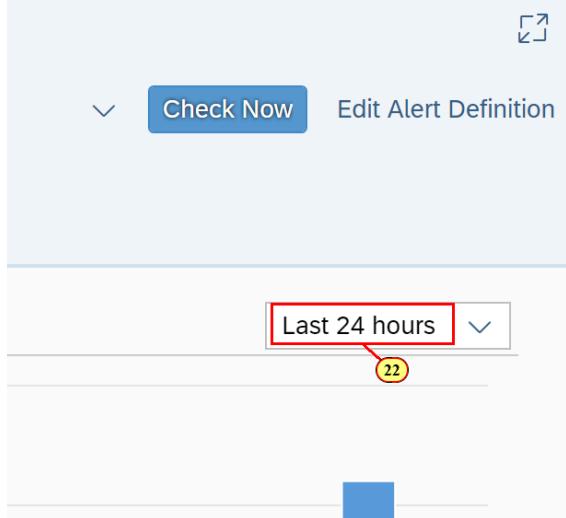
Explanation	Screenshot
<p>1. Locate the Alerts card.</p> <p></p> <p>This card displays the number of high (in red colored font) and medium (in orange colored font) priority alerts in the database, classified into one of the 10 alert categories in SAP HANA. It allows you to quickly identify issues in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

Explanation	Screenshot
<p>the situation. You can also choose to view alerts by the key performance areas of available, performance and capacity.</p>	
<p>2. Click on Alert Definitions.</p>	
<p>i 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 Host physical memory usage alert</p>	

Explanation	Screenshot
4. Click on Edit in the top right corner.	
<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>Info 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</p>	

Explanation	Screenshot
<p>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>	
<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>Check completed</p> <p>The alert checker "Host physical memory usage (ID 1)" has finished running.</p> <p>⚠ One or more alerts were issued.</p> <p>Go to Alerts 15 Close</p>

Explanation	Screenshot
16. Click Back twice to return to Database Overview page.	
<p>17. Locate the Alerts card.</p> <p> Notice the alert count for Memory increased to 2 because an alert was triggered due to low physical memory in the system.</p> <p>18. Click on Memory bar to open the Alerts application.</p>	
19. Click on one of the High priority Alerts to get into Alerts Details page.	
<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>	

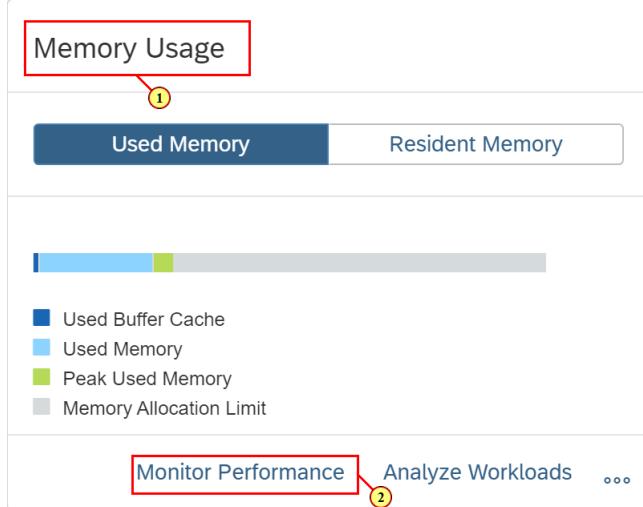
Explanation	Screenshot
22. You can see when this alert occurred, up to the last 30 days. This details are under the Occurrences tab.	
23. Click the Back button twice to return to Database Overview page.	

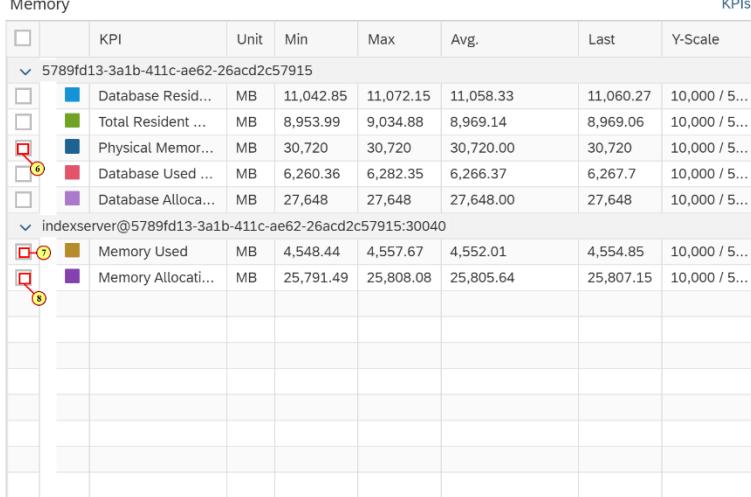
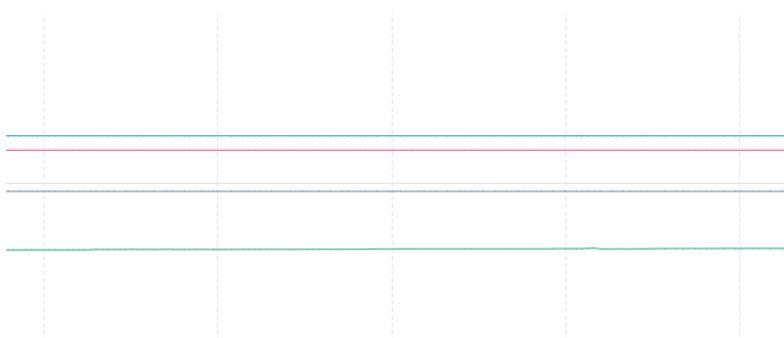
Exercise 5: Monitoring Resources

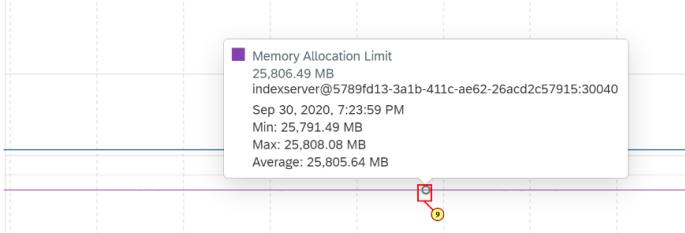
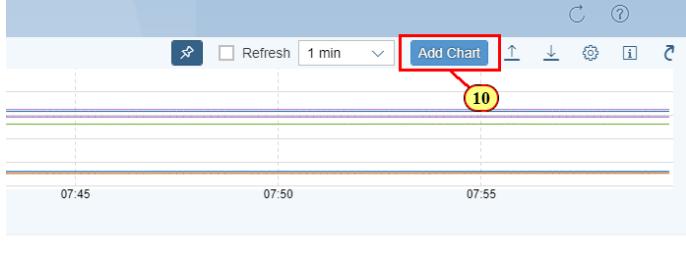
SAP HANA administrators must carefully monitor system computing resources to ensure optimal operation of the database. There are many metrics available to monitor in the SAP HANA cockpit, including memory, CPU and disk usage. You can view precise consumption details for those resources, as well as historical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

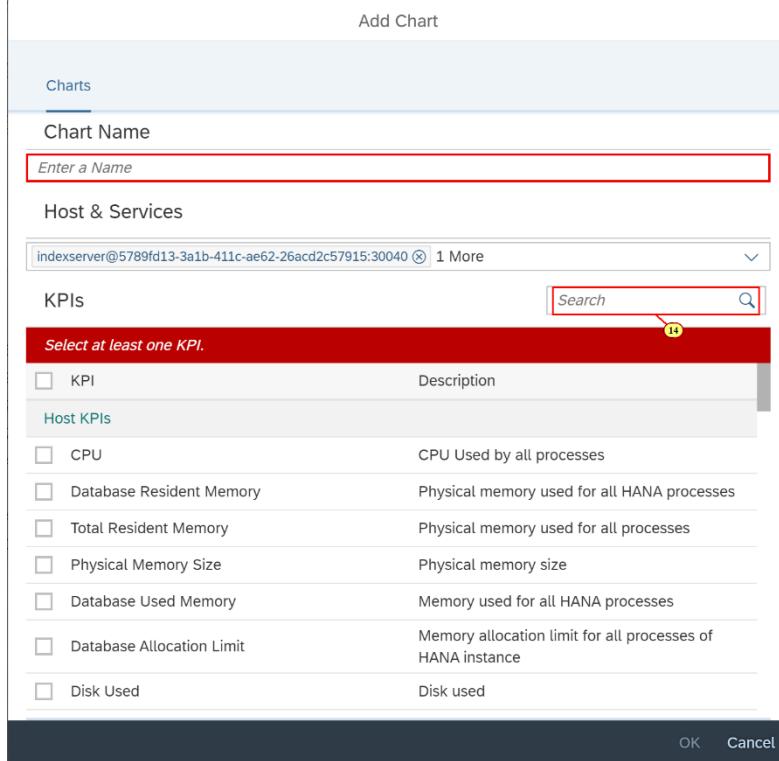
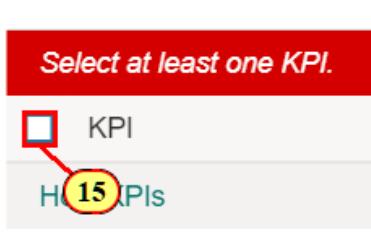
In this exercise, you'll examine the memory utilization of an SAP HANA database and observe the behavior of a few KPIs. You'll also learn to customize the utilization charts to display the information most relevant to your situation.

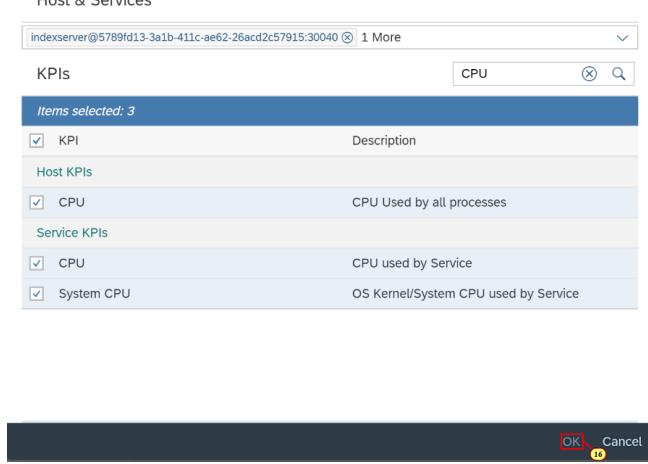
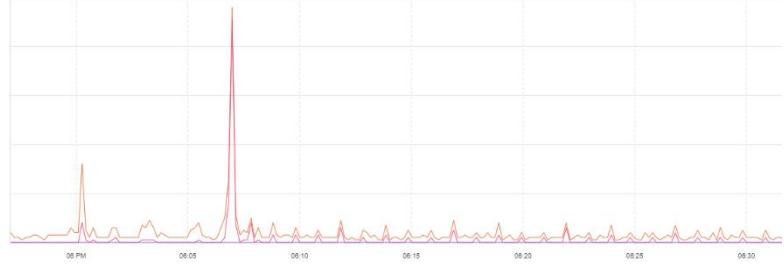
Explanation	Screenshot
1. Locate the Memory Usage card. It displays how much	

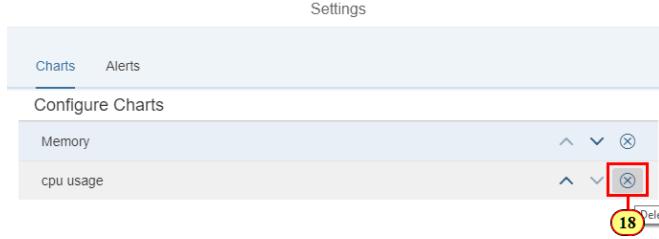
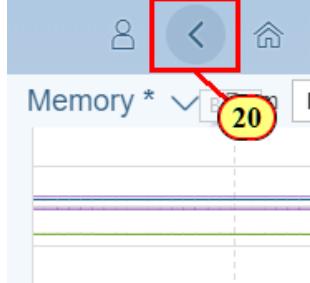
Explanation	Screenshot
<p>memory the host has consumed for the past 2 hours.</p> <p>There are also CPU Usage and Disk Usage cards, showing those metrics for the same time period.</p> <p>2. Let's investigate the memory utilization for this database. Click Monitor Performance.</p>	
<p>3. The Performance 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></th> <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>5789fd13-3a1b-411c-ae62-26acd2c57915</td> <td>Database Resid...</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></td> <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> <td></td> <td>Physical Memor...</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></td> <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></td> <td>Database Allocat...</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>indexserver@5789fd13-3a1b-411c-ae62-26acd2c57915:30040</td> <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></td> <td>Memory Allocati...</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	5789fd13-3a1b-411c-ae62-26acd2c57915	Database Resid...	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 Memor...	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 Allocat...	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 Allocati...	MB	25,791.49	25,808.08	25,805.64	25,807.15	10,000 / 5...
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<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. Let's add a new chart to this screen. Click Add Chart.</p>	
<p>11. Enter CPU Usage in the Chart Name text field.</p>	<p>Chart Name</p> <input data-bbox="596 1024 1347 1067" type="text" value="Enter a Name"/> <input data-bbox="596 1067 1347 1109" type="text" value="Type a name for a chart"/> HOST & SERVICES 11
<p>12. We want a few CPU KPIs, but first we need to uncheck the 7 currently checked KPIs. A quick way to do this is to select them all, unselect them, then check the ones we want.</p> <p>Check KPI to select all KPIs.</p>	<p>KPIs</p> <p>Items selected: 7</p> <p><input type="checkbox"/> KPI</p> <p>12 KPIs 12</p>
<p>13. Now check KPI again to unselect all the items.</p>	<p>KPIs</p> <p>Items selected: 61</p> <p><input checked="" type="checkbox"/> KPI</p> <p>13 KPIs 13</p>

Explanation	Screenshot
<p>14. Enter CPU in the search bar.</p>	 <p>The screenshot shows the 'Add Chart' dialog. In the 'KPIs' section, there is a search bar with the text 'Enter a Name' and a magnifying glass icon. Below the search bar is a list of KPIs under the heading 'Host KPIs'. The 'CPU' option is highlighted with a red box and circled with a yellow marker labeled '14'. Other options include Database Resident Memory, Total Resident Memory, Physical Memory Size, Database Used Memory, Database Allocation Limit, and Disk Used. At the bottom right of the dialog are 'OK' and 'Cancel' buttons.</p>
<p>15. Check KPI to select the 3 CPU KPIs that appear.</p>	 <p>The screenshot shows a list titled 'KPIs' with a red box highlighting the 'KPI' checkbox. Below the list, the text 'Host KPIs' is highlighted with a yellow box and circled with a yellow marker labeled '15'.</p>

Explanation	Screenshot								
16. Click OK .	 <p>Host & Services</p> <p>indexserver@5789fd13-3a1b-411c-ae62-26acd2c57915:30040 1 More</p> <p>KPIs</p> <p>CPU</p> <p>Items selected: 3</p> <table border="1"> <thead> <tr> <th>KPI</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>CPU</td> <td>CPU Used by all processes</td> </tr> <tr> <td>CPU</td> <td>CPU used by Service</td> </tr> <tr> <td>System CPU</td> <td>OS Kernel/System CPU used by Service</td> </tr> </tbody> </table> <p>OK Cancel</p>	KPI	Description	CPU	CPU Used by all processes	CPU	CPU used by Service	System CPU	OS Kernel/System CPU used by Service
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CPU	CPU Used by all processes								
CPU	CPU used by Service								
System CPU	OS Kernel/System CPU used by Service								
 <p>The new chart appears at the bottom of the screen. You can perform the same type of analysis by selecting the KPIs you want to examine and mousing over the lines to see more details.</p>									
17. Let's remove this chart. Click the Manage Configurations button at the top right.									

Explanation	Screenshot																
<p>18. In this dialog, you can change the KPIs for the chart, change its ordering, or remove it from the Performance Monitor.</p> <p>Click Delete Chart.</p> <p>19. Click OK.</p>	 <p>Host & Services</p> <p>mo-44f3e9cc1.mo.sap.corp SYSTEMDB@mo-44f3e9cc1.mo.sap.corp.nameserver:39601</p> <p>KPIs</p> <p>Items selected: 7</p> <table border="1"> <thead> <tr> <th>KPI</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>CPU</td> <td>CPU Used by all processes</td> </tr> <tr> <td>Database Resident Memory</td> <td>Physical memory used for all HANA processes</td> </tr> <tr> <td>Total Resident Memory</td> <td>Physical memory used for all processes</td> </tr> <tr> <td>Physical Memory Size</td> <td>Physical memory size</td> </tr> <tr> <td>Database Used Memory</td> <td>Memory used for all HANA processes</td> </tr> <tr> <td>Database Allocation Limit</td> <td>Memory allocation limit for all processes of HANA instance</td> </tr> <tr> <td>Disk Used</td> <td>Disk used</td> </tr> </tbody> </table> <p>OK 19</p>	KPI	Description	CPU	CPU Used by all processes	Database Resident Memory	Physical memory used for all HANA processes	Total Resident Memory	Physical memory used for all processes	Physical Memory Size	Physical memory size	Database Used Memory	Memory used for all HANA processes	Database Allocation Limit	Memory allocation limit for all processes of HANA instance	Disk Used	Disk used
KPI	Description																
CPU	CPU Used by all processes																
Database Resident Memory	Physical memory used for all HANA processes																
Total Resident Memory	Physical memory used for all processes																
Physical Memory Size	Physical memory size																
Database Used Memory	Memory used for all HANA processes																
Database Allocation Limit	Memory allocation limit for all processes of HANA instance																
Disk Used	Disk used																
<p>20. We are back at the original Performance Monitor screen. Click the Back button to return to the Database Overview page.</p>																	

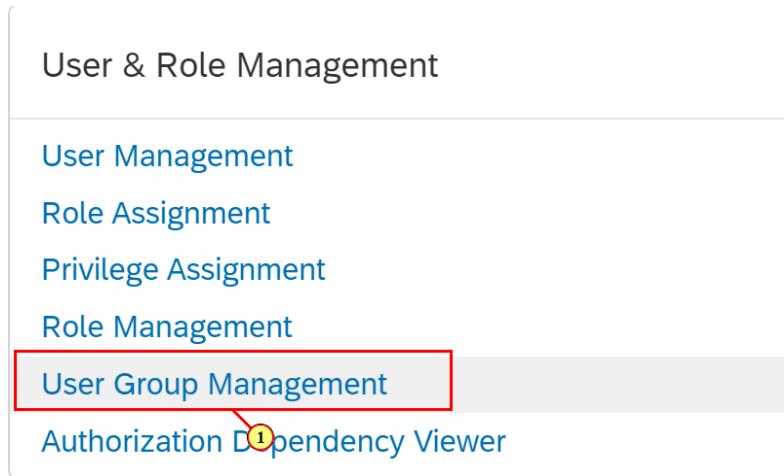
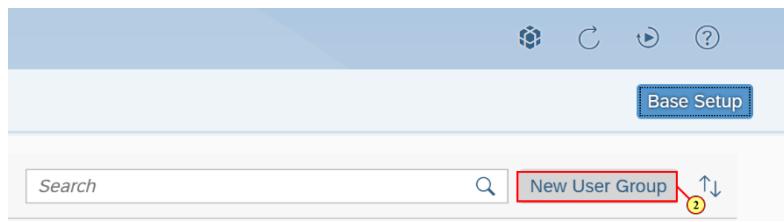
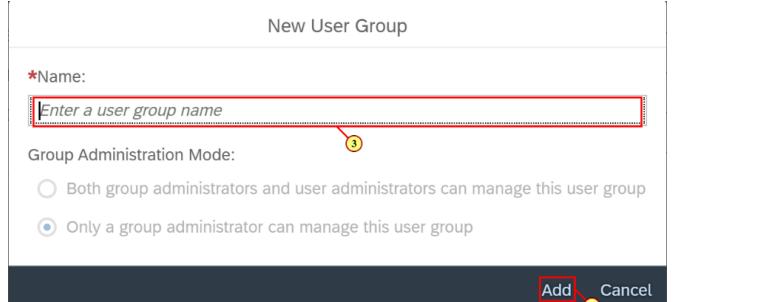
Exercise 6: Security Basics

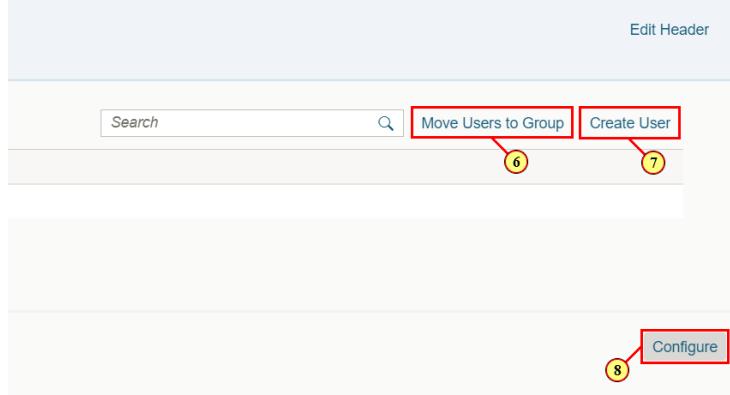
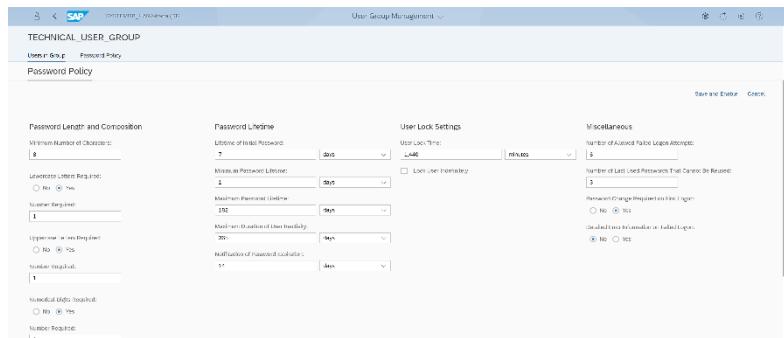
Security administration encompasses a wide range of topics, from monitoring critical security settings, to auditing activity in the SAP HANA database, to managing SAP HANA users and roles.

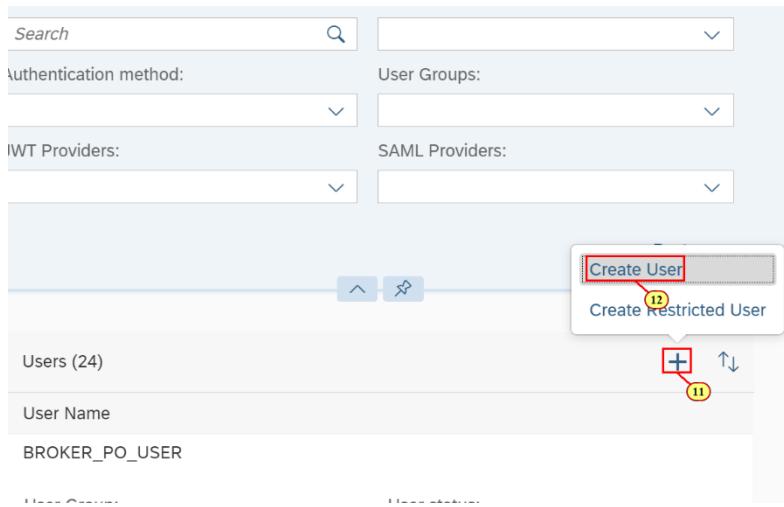
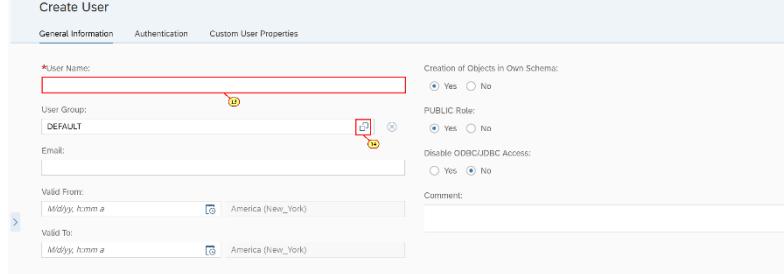
This exercise concentrates on user, role and user group management to provide you with a basic understanding of this important task of database administration.

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.

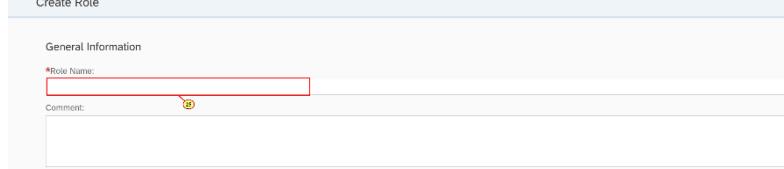
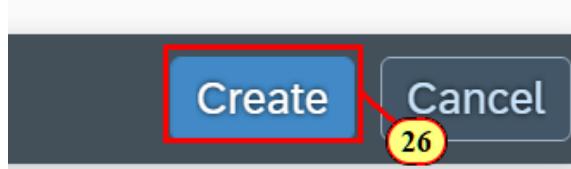
In this exercise, you'll create a new user, a new role and a new user group.

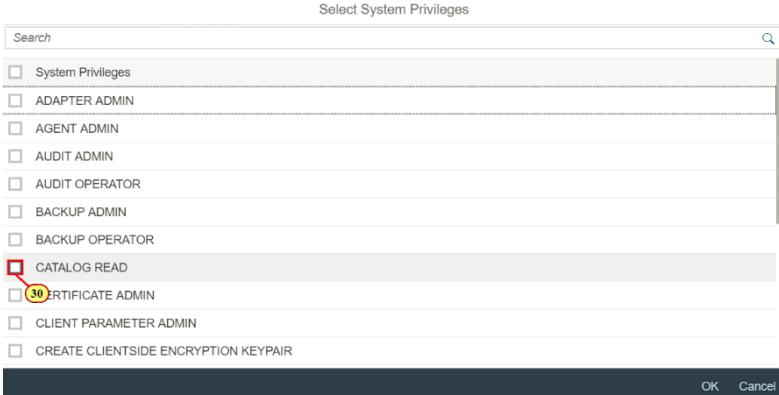
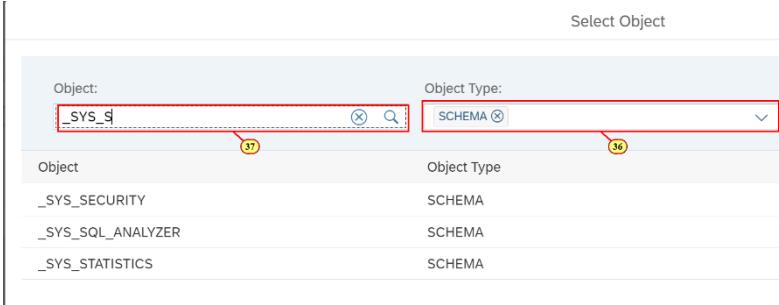
Explanation	Screenshot
<p>1. From the Database Overview page, locate the User & Role Management card. Let's first create a new user group. Click User Group Management.</p>	 <p>The screenshot shows the 'User & Role Management' interface. Under 'User Management', the 'User Group Management' option is highlighted with a red box and a yellow circle containing the number 1, indicating it is the next step. Other options like 'Role Assignment', 'Privilege Assignment', and 'Role Management' are also visible.</p>
<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>The screenshot shows the 'New User Group' dialog box. It has a 'Name:' field with 'Enter a user group name' placeholder text, which is highlighted with a red box and a yellow circle containing the number 2. Below it is a 'Group Administration Mode:' section with two radio button options: 'Both group administrators and user administrators can manage this user group' (unchecked) and 'Only a group administrator can manage this user group' (checked). At the bottom are 'Add' and 'Cancel' buttons, with the 'Add' button highlighted with a red box and a yellow circle containing the number 3.</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>The screenshot shows a list of user groups. The newly created 'TECHNICAL_USER_GROUP' is listed under the 'SYSTEM' category. Other groups like 'SAP_BI_SUITE' and 'SAP_DM_SUITE' are also visible. The 'TECHNICAL_USER_GROUP' row is highlighted with a red box and a yellow circle containing the number 4.</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>	

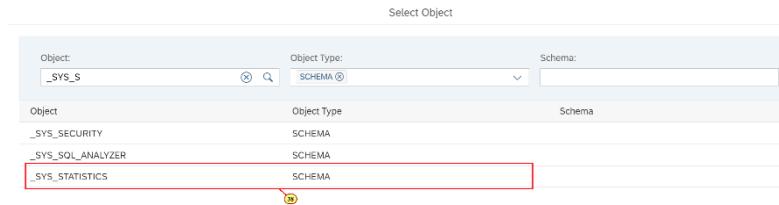
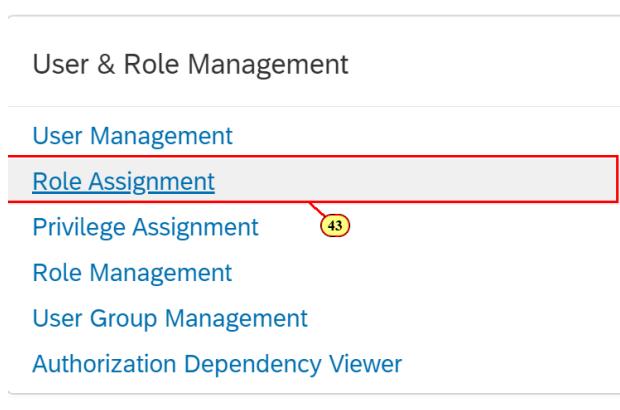
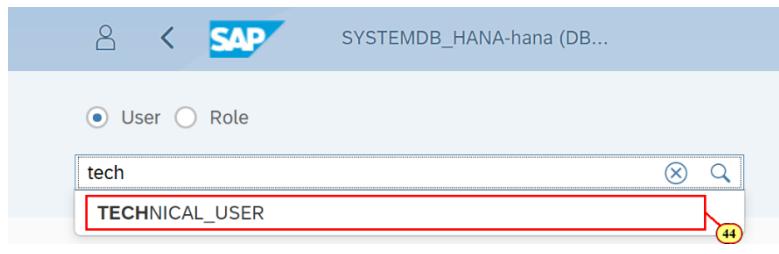
Explanation	Screenshot
<p>6. From here you can move existing users to this user group. We haven't created our technical user yet so we won't do this from this page.</p> <p>7. We can also create a new user to assign to this user group.</p> <p>8. To expand the Password Policy configuration, click Configure.</p>	
<p>Info: 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 requirements, password lifetime, user Lock Settings and expiry, etc.</p>	
<p>9. Click the Back button twice to return to the Database Overview page.</p>	
<p>10. Let's now create a new user. Go back to the User & Role Management card and click on User Management.</p>	

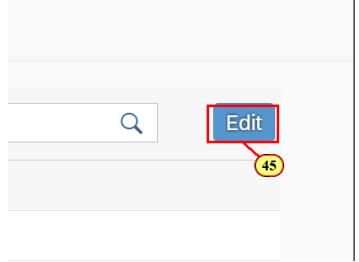
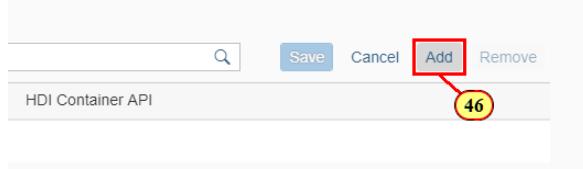
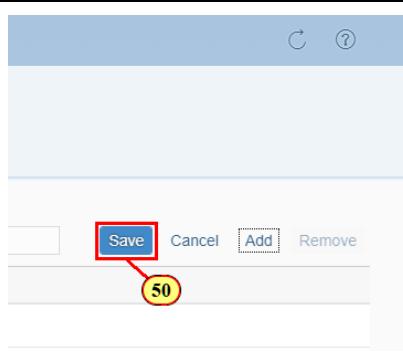
Explanation	Screenshot
<p>11. Click the plus sign (+) button.</p> <p>12. Click Create User.</p> <p> By default, standard users can create objects in their own schema and read data in system views. Read access to system views is granted by the PUBLIC role, which is granted to every standard user.</p> <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>	
<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>	

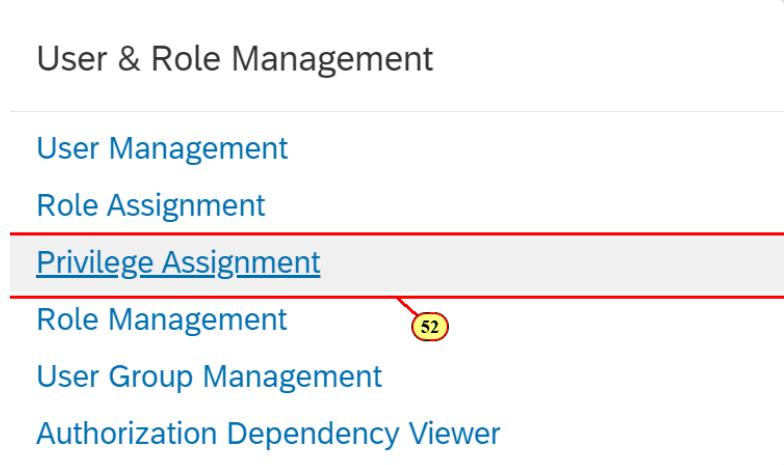
Explanation	Screenshot
<p>16. Scroll down to the AUTHENTICATION section.</p> <p>17. Click Password.</p> <p>18. Enter Abcd1234 in the Password text field.</p> <p>19. Enter Abcd1234 in the Password Confirmation text field.</p> <p>20. Select the No radio button on the "Force password change on logon" option.</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>	
<p>23. Let's create a new role. Go back to the User & Role Management card and click Role Management.</p>	<p>User & Role Management</p> <p>User Management</p> <p>Role Assignment</p> <p>Privilege Assignment</p> <p>Role Management</p> <p>User Group Management</p> <p>Authorization Dependency Viewer</p>

Explanation	Screenshot
24. Click the plus sign (+).	
25. Enter TECHNICAL_USER_ROLE in the Role Name text field.	
26. Click on Create .	
27. Click System Privileges . i The parentheses beside the privilege type shows the number of this type of privilege granted to this role.	
28. Click Edit .	
29. Click Add .	

Explanation	Screenshot								
30. Click CATALOG READ .	 <p>Select System Privileges</p> <p>Search</p> <ul style="list-style-type: none"> <input type="checkbox"/> System Privileges <input type="checkbox"/> ADAPTER ADMIN <input type="checkbox"/> AGENT ADMIN <input type="checkbox"/> AUDIT ADMIN <input type="checkbox"/> AUDIT OPERATOR <input type="checkbox"/> BACKUP ADMIN <input type="checkbox"/> BACKUP OPERATOR <input checked="" type="checkbox"/> CATALOG READ 30 <input type="checkbox"/> CERTIFICATE ADMIN <input type="checkbox"/> CLIENT PARAMETER ADMIN <input type="checkbox"/> CREATE CLIENTSIDE ENCRYPTION KEYPAIR <p>OK Cancel</p>								
31. Click OK .									
32. Click Save . Notice the number in the parentheses besides "System Privileges" is now one.	 <p>Save 32 33 Cancel Add Remove</p>								
33. Click Object Privileges .	 <p>Roles (0) System Privileges 33 Object Privileges (0)</p>								
34. Click Edit .	 <p>Search 34 Edit</p>								
35. Click Add Object .	 <p>Save Cancel Add Object 35 Change Privileges Remove Object</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. 37. You can also filter based on Object Name, Enter _SYS_S in the Object Text field.	 <p>Select Object</p> <p>Object: _SYS_S 37 36 Object Type: SCHEMA</p> <table border="1"> <thead> <tr> <th>Object</th> <th>Object Type</th> </tr> </thead> <tbody> <tr> <td>_SYS_SECURITY</td> <td>SCHEMA</td> </tr> <tr> <td>_SYS_SQL_ANALYZER</td> <td>SCHEMA</td> </tr> <tr> <td>_SYS_STATISTICS</td> <td>SCHEMA</td> </tr> </tbody> </table>	Object	Object Type	_SYS_SECURITY	SCHEMA	_SYS_SQL_ANALYZER	SCHEMA	_SYS_STATISTICS	SCHEMA
Object	Object Type								
_SYS_SECURITY	SCHEMA								
_SYS_SQL_ANALYZER	SCHEMA								
_SYS_STATISTICS	SCHEMA								

Explanation	Screenshot
38. Choose <u>_SYS_STATISTICS</u> from the filtered results.	
39. Scroll down until you see the SELECT privilege. Check SELECT .	
40. Click the SELECT toggle to change it to YES .	
41. Click OK .	
42. Click Back .	
43. Let's now assign the newly created TECHNICAL_USER_ROLE to our user TECHNICAL_USER. Click on Role Assignment .	
On the Role Assignment page, we can search based on either Users or Roles 44. Search with keyword 'tech' and all existing User with that keyword show up in the dropdown. Click TECHNICAL_USER from the dropdown.	

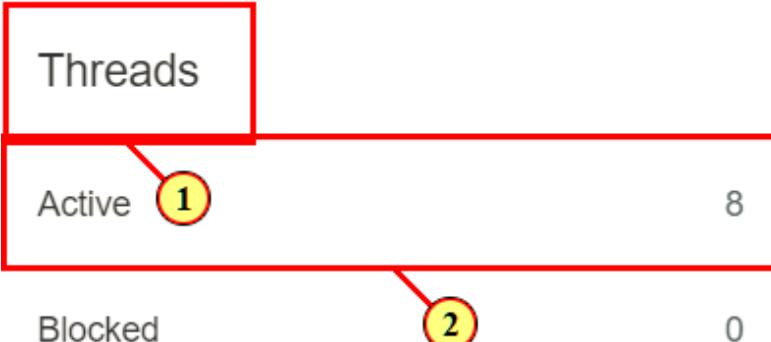
Explanation	Screenshot
45. Click Edit .	
46. Click Add .	
47. Enter TECHNICAL_USER_ROLE in the Search text field.	
48. Click TECHNICAL_USER_ROLE .	
49. Click OK .	
50. Click Save .	
51. Click Back to return to the Database Overview Page.	

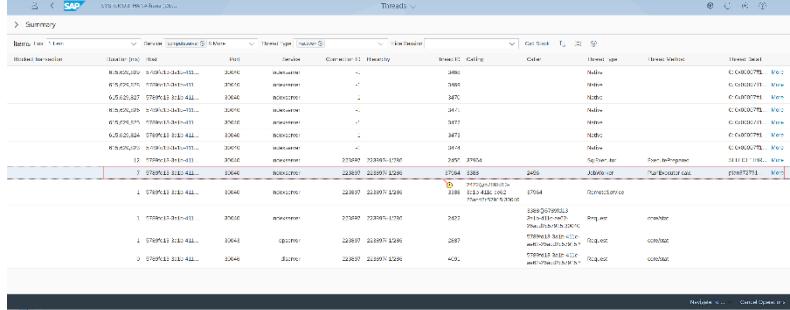
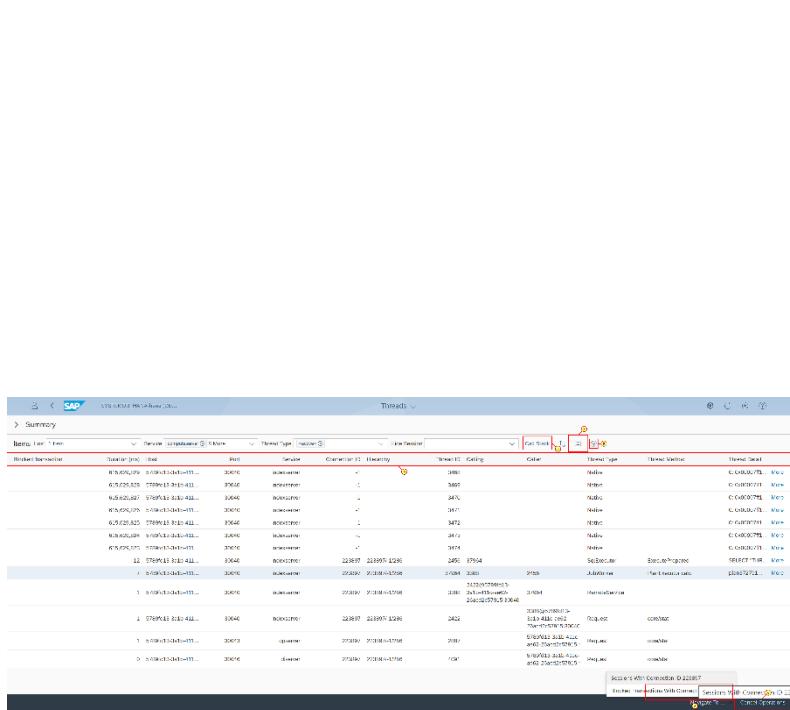
Explanation	Screenshot
<p>52. There is one more link in the User & Role Management card, and that is Privilege Assignment. This application allows you to assign the same privileges that you saw in the Role Assignment application, but this time without having to create a role for the user. This is useful 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>	 <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>

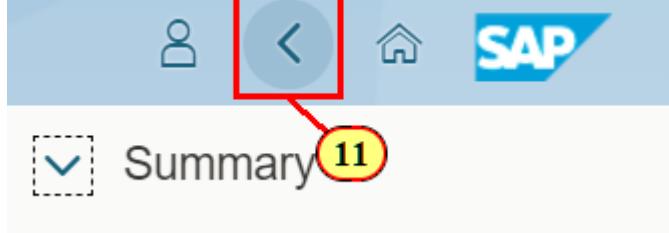
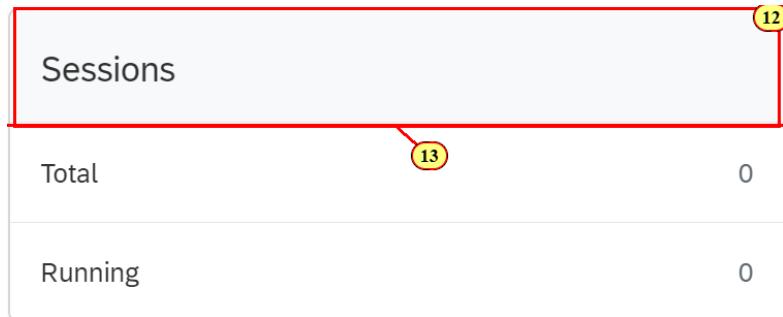
Exercise 7: Performance Management

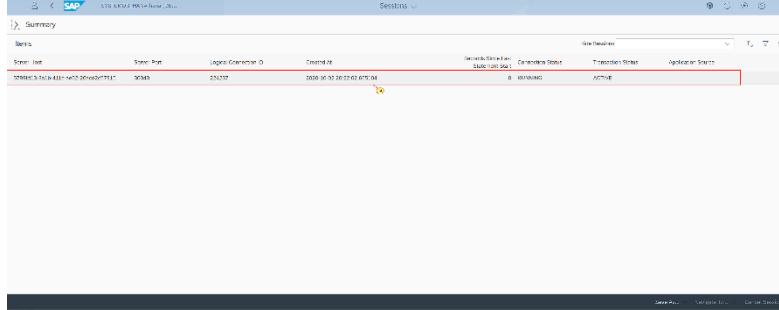
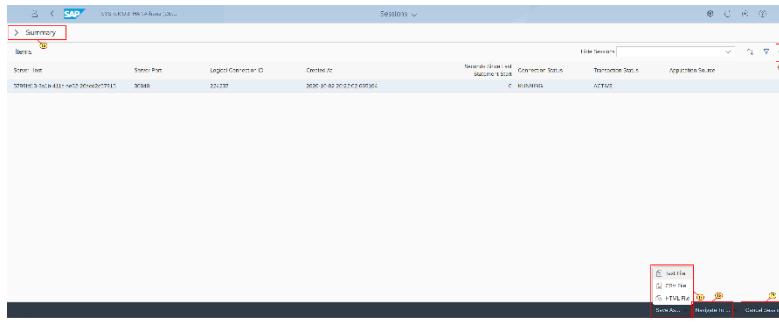
Managing and monitoring past and current information about the performance of the SAP HANA database is important for root-cause analysis and the prevention of future performance issues. We already learned about the Performance Monitor and Memory Analysis applications to visualize and analyze current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

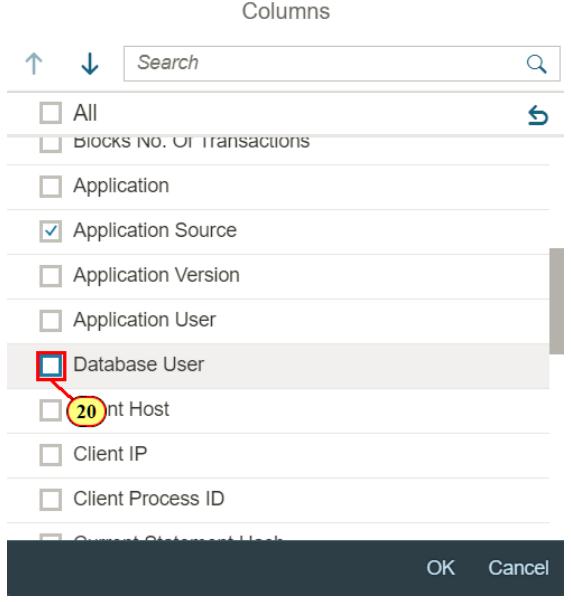
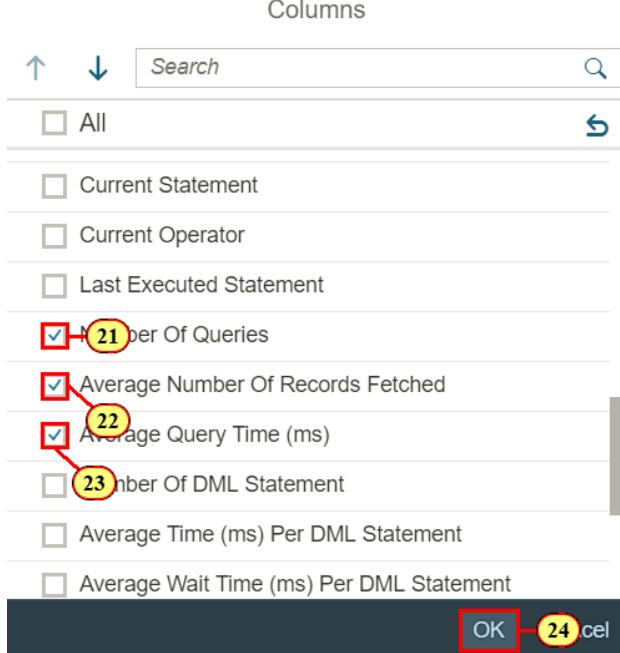
In this exercise, you'll explore the additional performance management tools available in the SAP HANA cockpit.

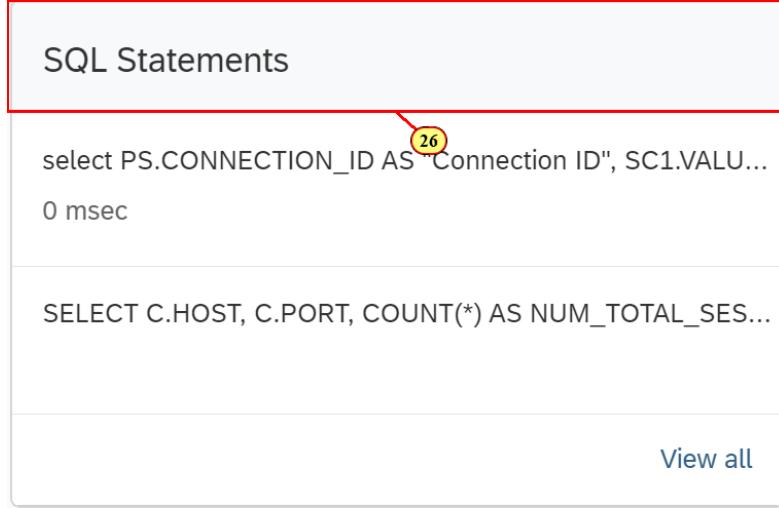
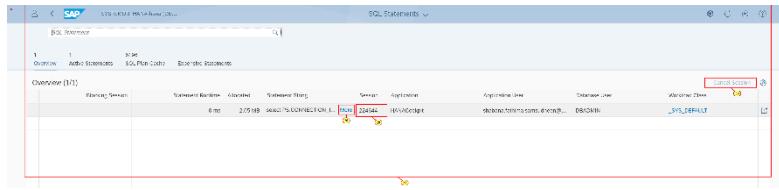
Explanation	Screenshot					
<p>1. From the Database Overview page, scroll down until you locate the Threads card.</p> <p></p> <p>This card shows the number of active and blocked threads in the database. Clicking on it takes you to the Threads app, which is used to monitor the longest-running threads 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>	 <table border="1"> <thead> <tr> <th>Threads</th> </tr> </thead> <tbody> <tr> <td>Active 1</td> <td>8</td> </tr> <tr> <td>Blocked 2</td> <td>0</td> </tr> </tbody> </table>	Threads	Active 1	8	Blocked 2	0
Threads						
Active 1	8					
Blocked 2	0					

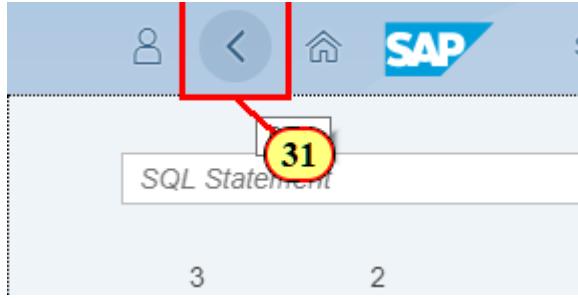
Explanation	Screenshot
<p>3. Click any row to activate the options in the bottom right corner.</p>	
<p>When you launch the Threads app, you'll see detailed information for approximately the 1,000 longest-running threads currently active in the database.</p> <p>4. For each statement, you can see the duration, 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>	

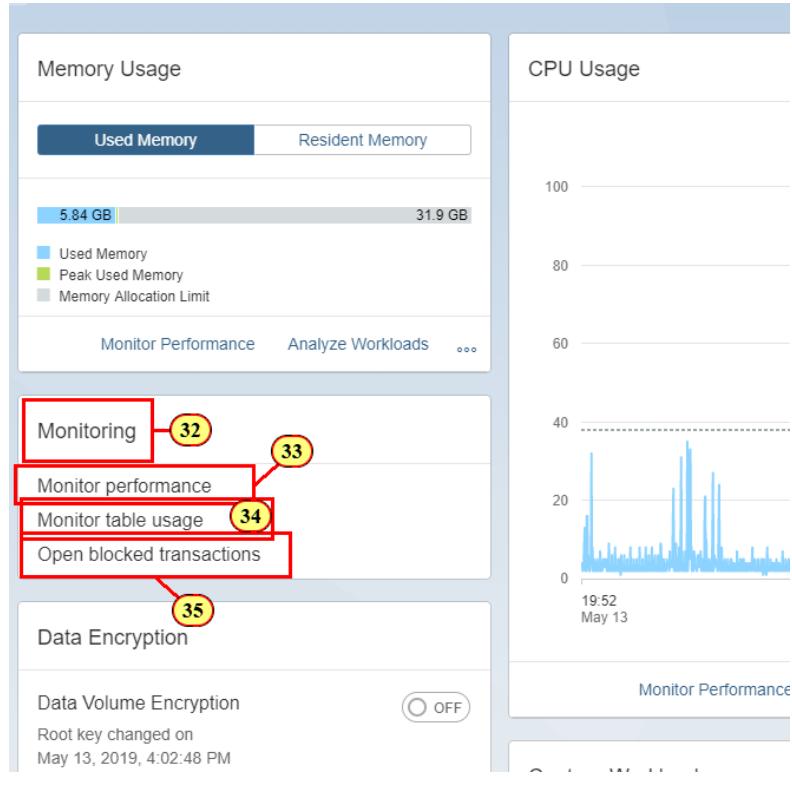
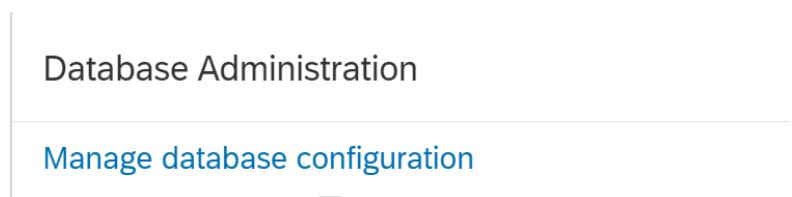
Explanation	Screenshot									
<p>8. The threads can be grouped or sorted using the Group and Sort icon.</p> <p>9. You can view much more details on the threads by adding columns to the table via the Settings button.</p>										
<p>10. Click the Summary arrow above the table.</p>										
<p>i In 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. i 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>	 <table border="1" data-bbox="578 1297 1361 1614"> <thead> <tr> <th colspan="3">Sessions</th> </tr> </thead> <tbody> <tr> <td>Total</td> <td>(13)</td> <td>0</td> </tr> <tr> <td>Running</td> <td></td> <td>0</td> </tr> </tbody> </table>	Sessions			Total	(13)	0	Running		0
Sessions										
Total	(13)	0								
Running		0								

Explanation	Screenshot
<p>14. Click any row to activate the options in the bottom right corner.</p>	
<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>	

Explanation	Screenshot
<p>20. Scroll down until you see Database User and check it.</p>	 <p>Columns</p> <p>Search</p> <p>All BLOCKS NO. OF Transactions Application <input checked="" type="checkbox"/> Application Source Application Version Application User <input checked="" type="checkbox"/> Database User <input checked="" type="checkbox"/> 20 nt Host Client IP Client Process ID Current Statement Lock</p> <p>OK Cancel</p>
<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 Current Statement Current Operator Last Executed Statement <input checked="" type="checkbox"/> 21 Number Of Queries <input checked="" type="checkbox"/> Average Number Of Records Fetched <input checked="" type="checkbox"/> 22 Average Query Time (ms) Number Of DML Statement Average Time (ms) Per DML Statement Average Wait Time (ms) Per DML Statement</p> <p>OK Cancel</p>

Explanation	Screenshot								
<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>Database User</th> <th>Number Of Queries</th> <th>Average Number Of Records Fetched</th> <th>Average Query Time (ms)</th> </tr> </thead> <tbody> <tr> <td>SYS_XS_RUNTIME</td> <td>84</td> <td>106.020000</td> <td>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>									
<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> <p>select PS.CONNECTION_ID AS "Connection ID", SC1.VALU... 0 msec</p> <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>									

Explanation	Screenshot
<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> <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>	

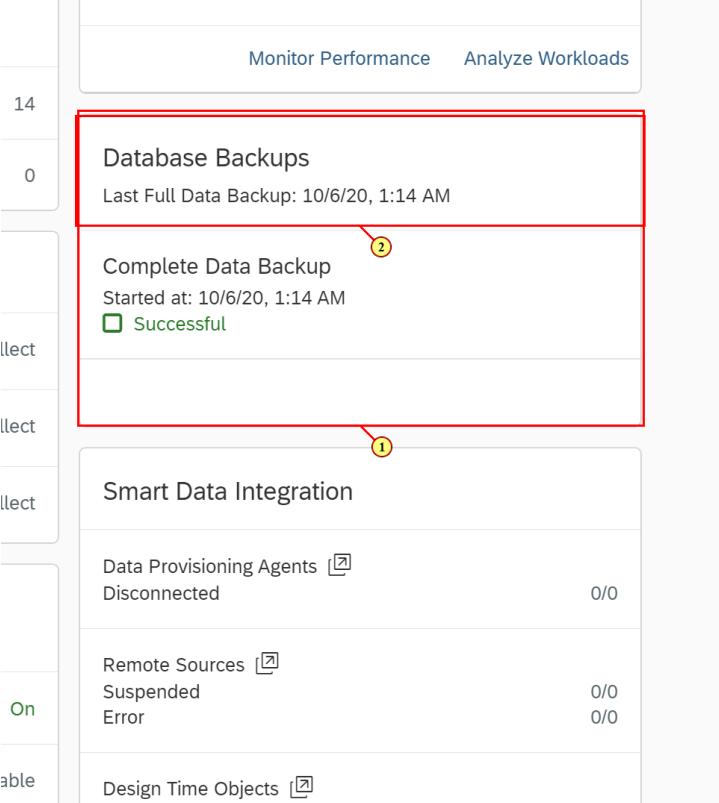
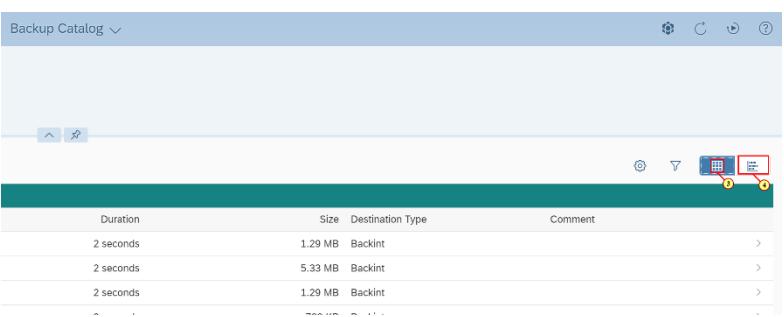
Explanation	Screenshot
<p>32. Scroll to the Monitoring card. We'll briefly explain the other performance management tools available in SAP HANA cockpit.</p>	
<p>33. We already examined the Performance Monitor in a previous exercise. It allows you to visually analyze historical performance in the database 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 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</p>	

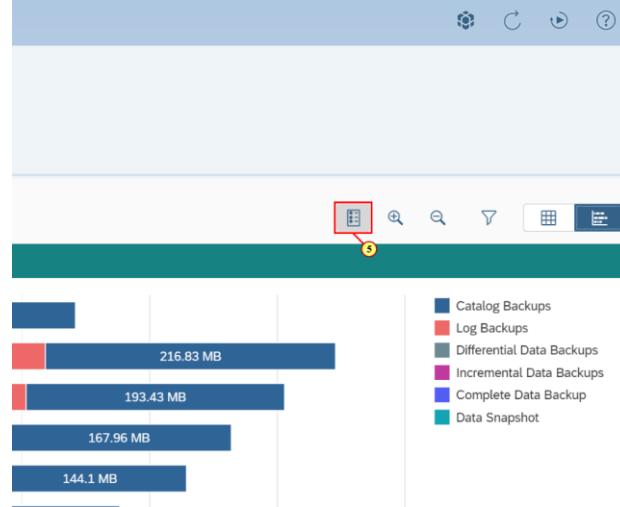
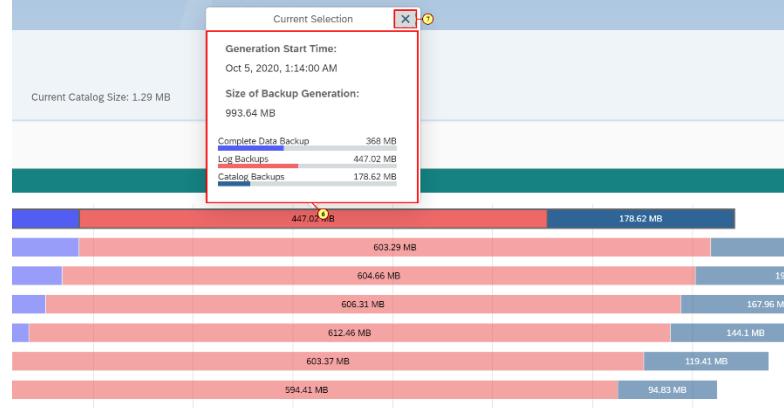
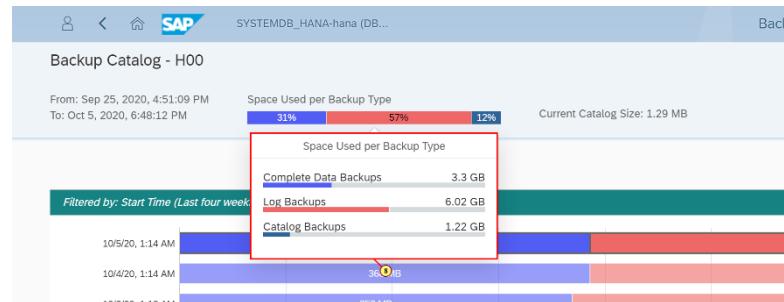
Explanation	Screenshot
<p>on an SAP HANA system and how that work is prioritized. The goal is to maximize the overall system performance by balancing the demand for resources between the various workloads.</p> <p> Use this application to create workload classes and workload class mappings. Workload classes 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>	

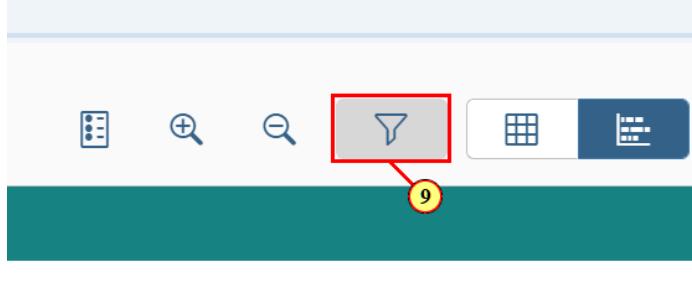
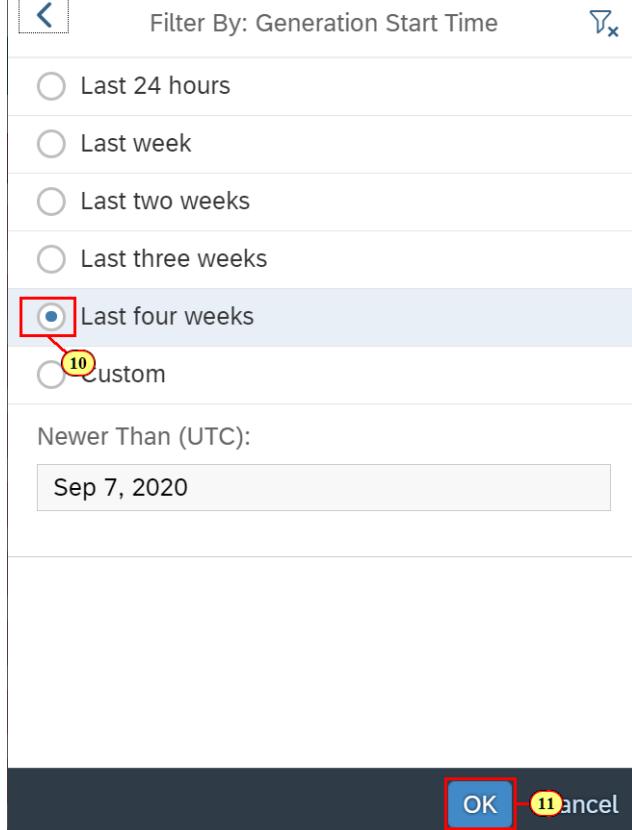
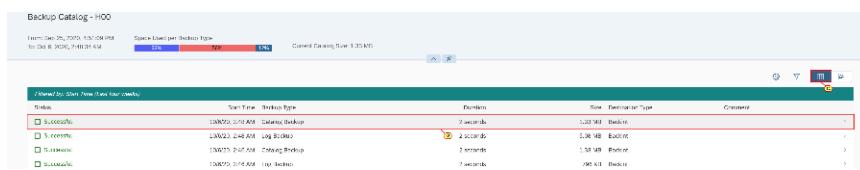
Exercise 8: Database Backup

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.</p>	

Explanation	Screenshot																
<p>Locate the Database Backups card.</p> <p>2. Click Manage database backups.</p>	 <p>The screenshot shows the Azure portal interface with the 'Database Backups' card highlighted by a red box. Within the card, a yellow circle labeled '1' points to the 'Smart Data Integration' section. Another yellow circle labeled '2' points to the 'Complete Data Backup' entry, which includes details like 'Last Full Data Backup: 10/6/20, 1:14 AM' and a 'Successful' status indicator.</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>The screenshot shows the 'Backup Catalog' view with a table of backup logs. A red box highlights the table area. A yellow circle labeled '3' points to the horizontal stacked chart icon located at the top right of the table's header row.</p> <table border="1" data-bbox="584 1417 1368 1523"> <thead> <tr> <th data-bbox="584 1417 734 1438">Duration</th> <th data-bbox="734 1417 898 1438">Size</th> <th data-bbox="898 1417 1061 1438">Destination Type</th> <th data-bbox="1061 1417 1368 1438">Comment</th> </tr> </thead> <tbody> <tr> <td data-bbox="584 1438 734 1460">2 seconds</td> <td data-bbox="734 1438 898 1460">1.29 MB</td> <td data-bbox="898 1438 1061 1460">Backint</td> <td data-bbox="1061 1438 1368 1460">></td> </tr> <tr> <td data-bbox="584 1460 734 1481">2 seconds</td> <td data-bbox="734 1460 898 1481">5.33 MB</td> <td data-bbox="898 1460 1061 1481">Backint</td> <td data-bbox="1061 1460 1368 1481">></td> </tr> <tr> <td data-bbox="584 1481 734 1502">2 seconds</td> <td data-bbox="734 1481 898 1502">1.29 MB</td> <td data-bbox="898 1481 1061 1502">Backint</td> <td data-bbox="1061 1481 1368 1502">></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	>
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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>	 <table border="1"> <thead> <tr> <th>Backup Type</th> <th>Size</th> </tr> </thead> <tbody> <tr> <td>Catalog Backups</td> <td>216.83 MB</td> </tr> <tr> <td>Log Backups</td> <td>193.43 MB</td> </tr> <tr> <td>Differential Data Backups</td> <td>167.96 MB</td> </tr> <tr> <td>Incremental Data Backups</td> <td>144.1 MB</td> </tr> <tr> <td>Complete Data Backup</td> <td>368 MB</td> </tr> <tr> <td>Data Snapshot</td> <td>993.64 MB</td> </tr> </tbody> </table>	Backup Type	Size	Catalog Backups	216.83 MB	Log Backups	193.43 MB	Differential Data Backups	167.96 MB	Incremental Data Backups	144.1 MB	Complete Data Backup	368 MB	Data Snapshot	993.64 MB
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<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>	 <table border="1"> <thead> <tr> <th>Backup Type</th> <th>Size</th> </tr> </thead> <tbody> <tr> <td>Complete Data Backup</td> <td>368 MB</td> </tr> <tr> <td>Log Backups</td> <td>447.02 MB</td> </tr> <tr> <td>Catalog Backups</td> <td>178.62 MB</td> </tr> </tbody> </table>	Backup Type	Size	Complete Data Backup	368 MB	Log Backups	447.02 MB	Catalog Backups	178.62 MB						
Backup Type	Size														
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<p>8. On clicking the topmost horizontal bar, gives you details on Space Used per Backup Type.</p>	 <table border="1"> <thead> <tr> <th>Backup Type</th> <th>Space Used</th> </tr> </thead> <tbody> <tr> <td>Complete Data Backups</td> <td>3.3 GB</td> </tr> <tr> <td>Log Backups</td> <td>6.02 GB</td> </tr> <tr> <td>Catalog Backups</td> <td>1.22 GB</td> </tr> </tbody> </table>	Backup Type	Space Used	Complete Data Backups	3.3 GB	Log Backups	6.02 GB	Catalog Backups	1.22 GB						
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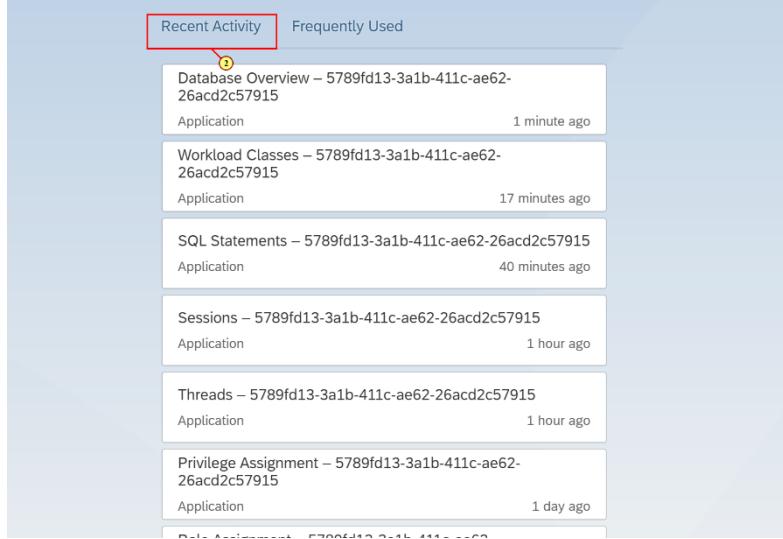
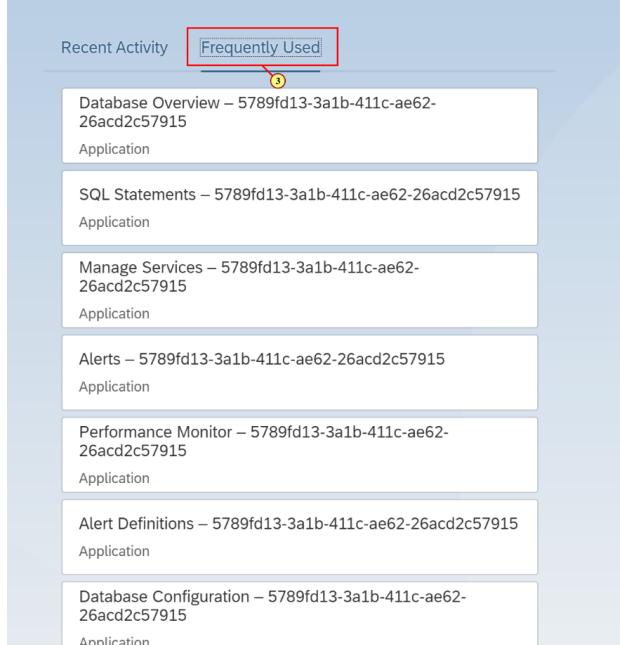
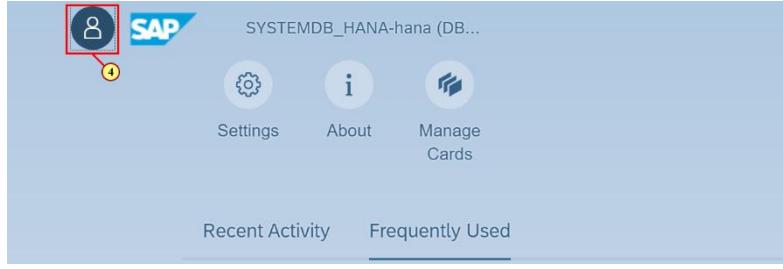
Explanation	Screenshot
<p>9. The filtering button can be used to filter based on the what time frames we would like to see the backups.</p>	
<p>10. Select 'Last Four Weeks' to view the backups taken in last four-week time frame.</p> <p>11. Click on OK to apply the chosen time frame.</p>	
<p>12. Click 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 left of the database overview page.	

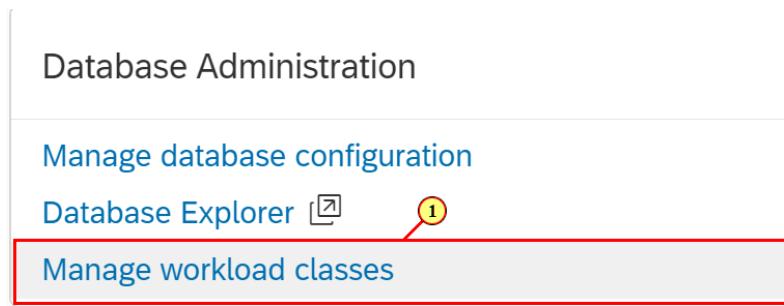
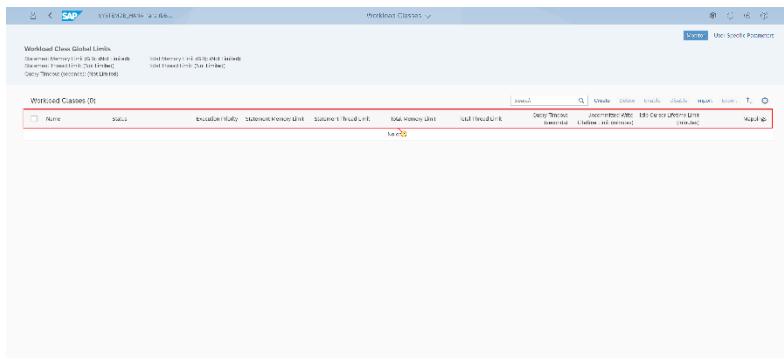
Explanation	Screenshot														
<p> Under the Recent Activity tab in the side bar are a list of the applications the user had used. The history can stretch back to several days.</p> <p>2. When you click the user icon, the side bar menu is displayed and shows both the Recent Activity list and a tab for the Frequently Used list.</p>	 <table border="1"> <thead> <tr> <th>Application</th> <th>Last Used</th> </tr> </thead> <tbody> <tr> <td>Database Overview – 5789fd13-3a1b-411c-ae62-26acd2c57915</td> <td>1 minute ago</td> </tr> <tr> <td>Workload Classes – 5789fd13-3a1b-411c-ae62-26acd2c57915</td> <td>17 minutes ago</td> </tr> <tr> <td>SQL Statements – 5789fd13-3a1b-411c-ae62-26acd2c57915</td> <td>40 minutes ago</td> </tr> <tr> <td>Sessions – 5789fd13-3a1b-411c-ae62-26acd2c57915</td> <td>1 hour ago</td> </tr> <tr> <td>Threads – 5789fd13-3a1b-411c-ae62-26acd2c57915</td> <td>1 hour ago</td> </tr> <tr> <td>Privilege Assignment – 5789fd13-3a1b-411c-ae62-26acd2c57915</td> <td>1 day ago</td> </tr> </tbody> </table>	Application	Last Used	Database Overview – 5789fd13-3a1b-411c-ae62-26acd2c57915	1 minute ago	Workload Classes – 5789fd13-3a1b-411c-ae62-26acd2c57915	17 minutes ago	SQL Statements – 5789fd13-3a1b-411c-ae62-26acd2c57915	40 minutes ago	Sessions – 5789fd13-3a1b-411c-ae62-26acd2c57915	1 hour ago	Threads – 5789fd13-3a1b-411c-ae62-26acd2c57915	1 hour ago	Privilege Assignment – 5789fd13-3a1b-411c-ae62-26acd2c57915	1 day ago
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<p>3. Click the Frequently Used tab to view the list of frequently used applications.</p>	 <table border="1"> <thead> <tr> <th>Application</th> </tr> </thead> <tbody> <tr> <td>Database Overview – 5789fd13-3a1b-411c-ae62-26acd2c57915</td> </tr> <tr> <td>SQL Statements – 5789fd13-3a1b-411c-ae62-26acd2c57915</td> </tr> <tr> <td>Manage Services – 5789fd13-3a1b-411c-ae62-26acd2c57915</td> </tr> <tr> <td>Alerts – 5789fd13-3a1b-411c-ae62-26acd2c57915</td> </tr> <tr> <td>Performance Monitor – 5789fd13-3a1b-411c-ae62-26acd2c57915</td> </tr> <tr> <td>Alert Definitions – 5789fd13-3a1b-411c-ae62-26acd2c57915</td> </tr> <tr> <td>Database Configuration – 5789fd13-3a1b-411c-ae62-26acd2c57915</td> </tr> </tbody> </table>	Application	Database Overview – 5789fd13-3a1b-411c-ae62-26acd2c57915	SQL Statements – 5789fd13-3a1b-411c-ae62-26acd2c57915	Manage Services – 5789fd13-3a1b-411c-ae62-26acd2c57915	Alerts – 5789fd13-3a1b-411c-ae62-26acd2c57915	Performance Monitor – 5789fd13-3a1b-411c-ae62-26acd2c57915	Alert Definitions – 5789fd13-3a1b-411c-ae62-26acd2c57915	Database Configuration – 5789fd13-3a1b-411c-ae62-26acd2c57915						
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<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>	 <table border="1"> <thead> <tr> <th>Recent Activity</th> <th>Frequently Used</th> </tr> </thead> </table>	Recent Activity	Frequently Used												
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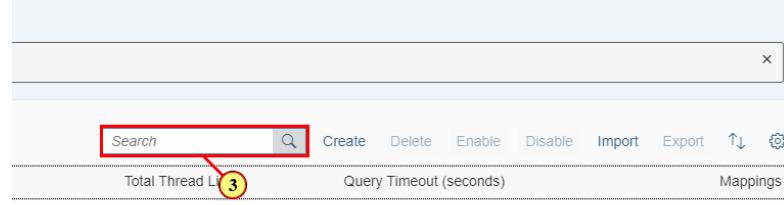
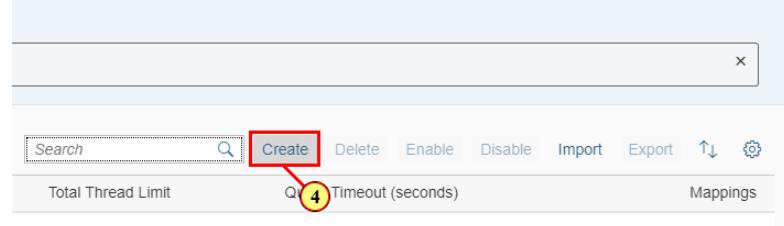
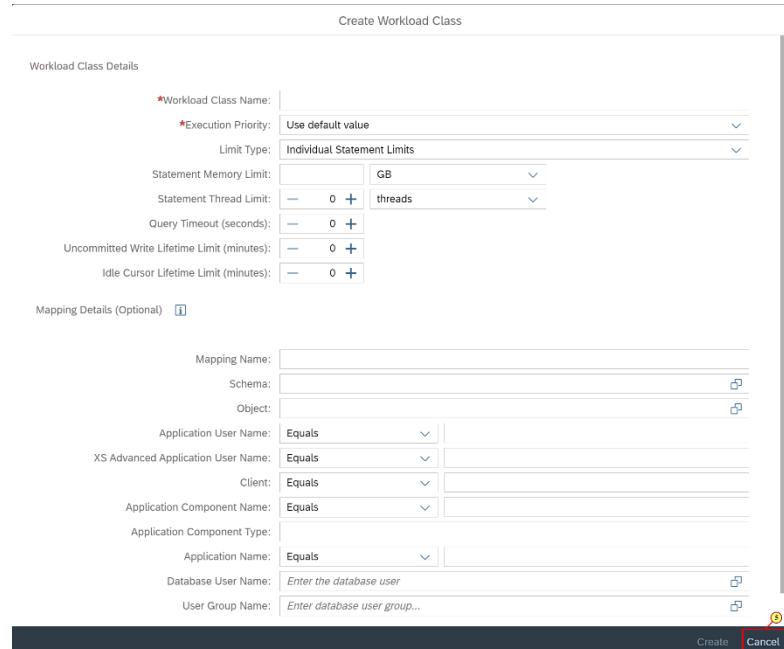
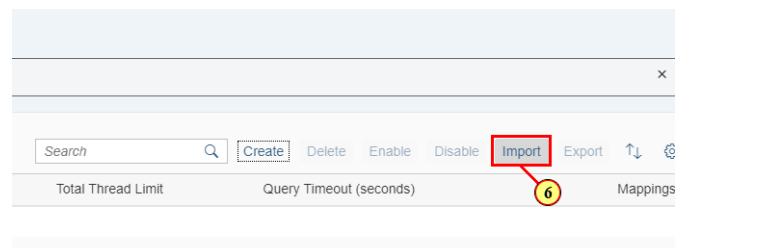
Explanation	Screenshot
<p>4. Select the User Icon at the top left again to close the side bar and to go back to the Database Overview page.</p>	

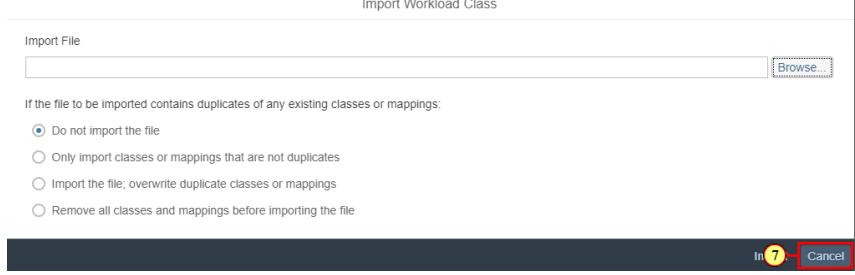
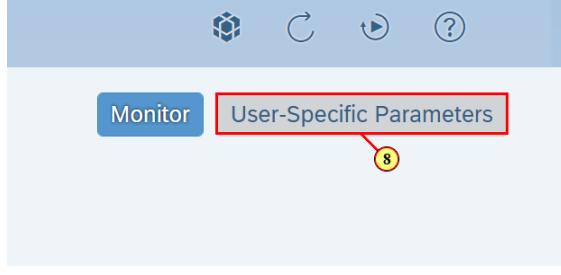
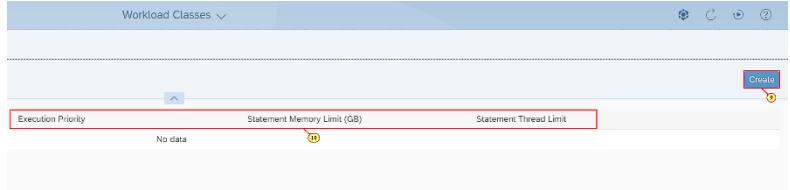
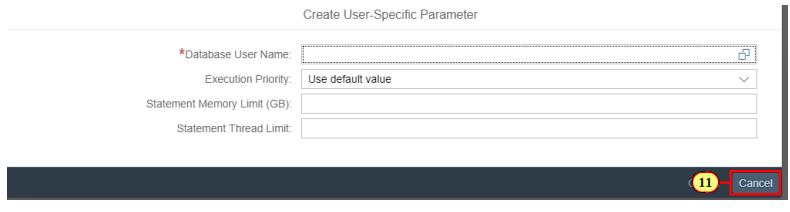
Exercise 10: Managing Workload Classes

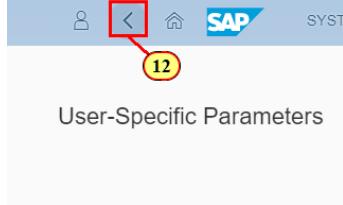
We manage workload in SAP HANA by creating workload classes and workload class mappings. Appropriate workload parameters are then dynamically applied to each client session. You can classify workloads based on user and application context information and apply configured resource limitations (for example, 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>The screenshot shows the SAP Fiori Launchpad with the 'Database Administration' card selected. Below it, the 'Manage database configuration' card is visible. A red box highlights the 'Database Explorer' card, which contains a blue link labeled 'Manage workload classes'. A yellow circle with the number 1 is placed over the 'Manage workload classes' link.</p>
<p>2. The workload classes application displays the parameters for every workload class in the system.</p>	 <p>The screenshot shows the SAP Workload Classes application. The title bar reads 'Workload Classes'. The main area displays a table with columns: Name, Status, Statement Memory Unit, Statement Thread Unit, Total Memory Unit, Total Thread Unit, Deny Thread, Deny Statement, EPC, and User-defined Unit. There are 10 rows listed, each representing a different workload class.</p>

Explanation	Screenshot
<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>	
<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>	

Explanation	Screenshot
<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>	
<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>	

Explanation	Screenshot
12. Click Back twice to return to the Database Overview page.	 A screenshot of an SAP Fiori application interface. The top navigation bar is blue and contains icons for user profile, back (highlighted with a red box), home, SAP logo, and system status. Below the bar, a yellow circle with the number '12' is overlaid on the back arrow icon. The main content area has a light gray background and displays the text 'User-Specific Parameters'.

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

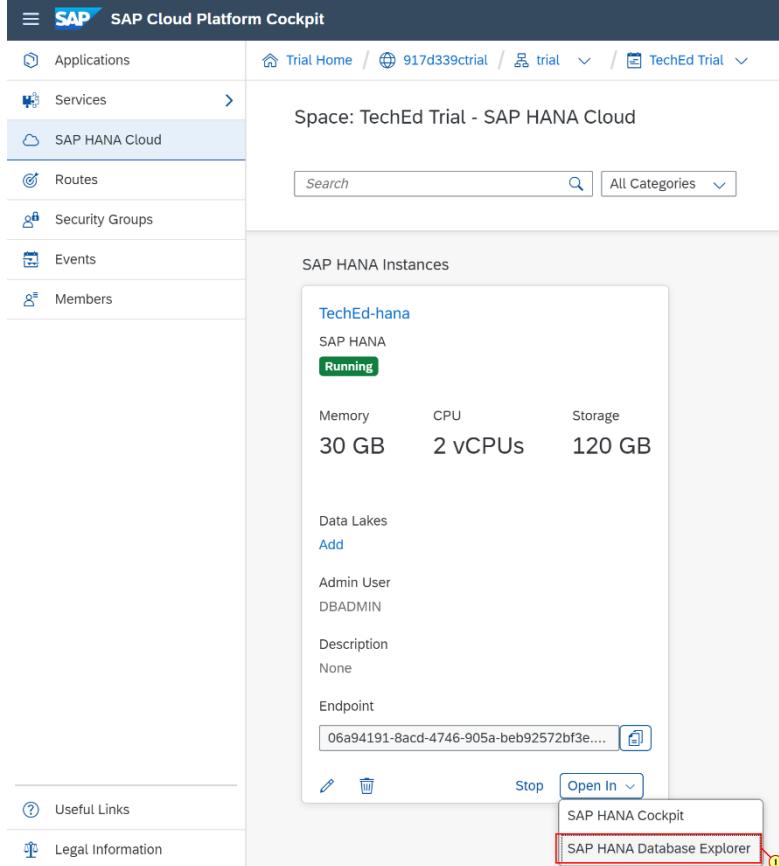
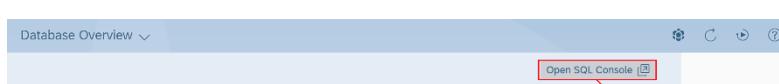
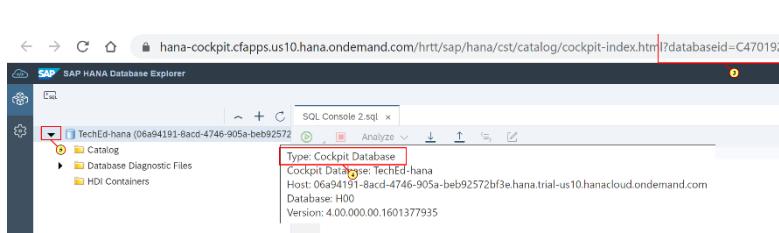
This chapter offers learning opportunities for:

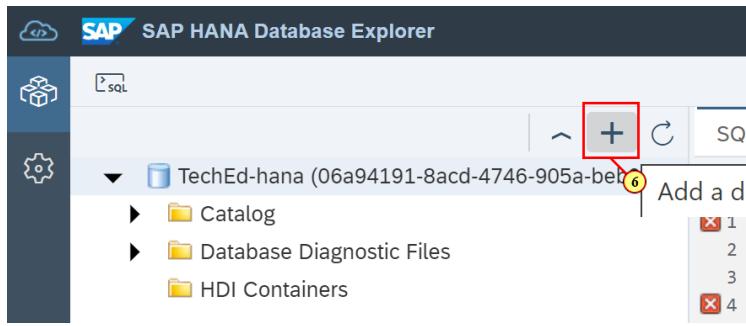
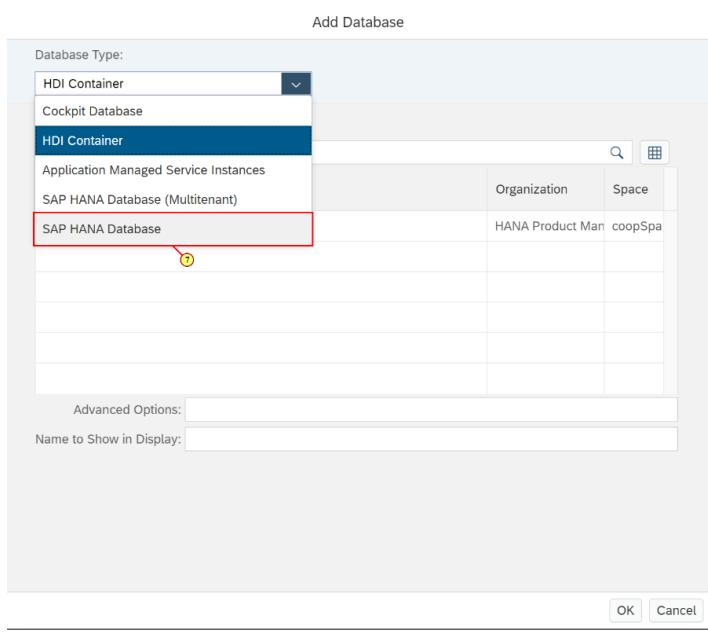
- Starting the Database Explorer and connecting to databases
- Exploring database objects using the Database Explorer
- Using the SQL Console
- Creating, Importing, Exporting and Editing database objects

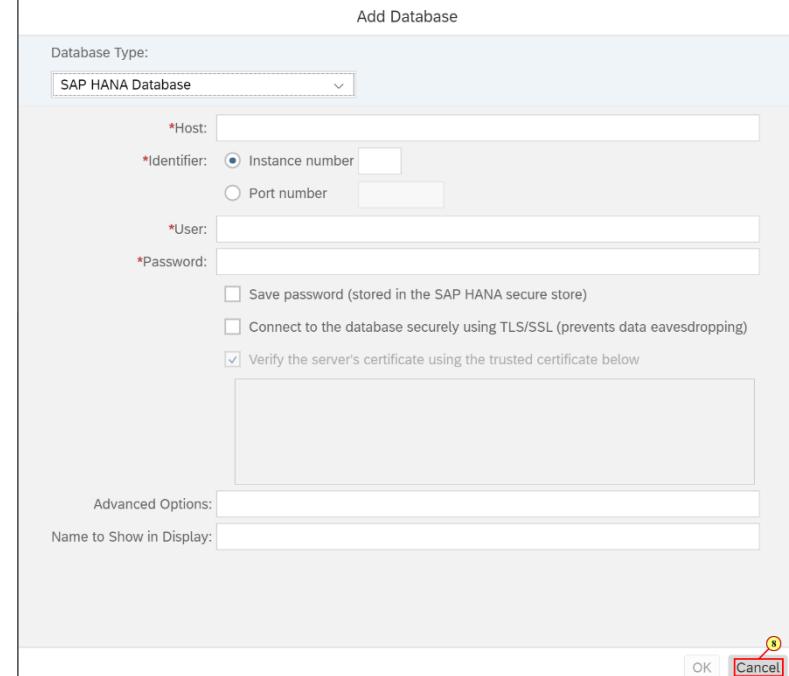
Exercise 1: Getting Started with Database Explorer

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

Explanation	Screenshot
1. From the SAP Cloud Platform, you can choose to	

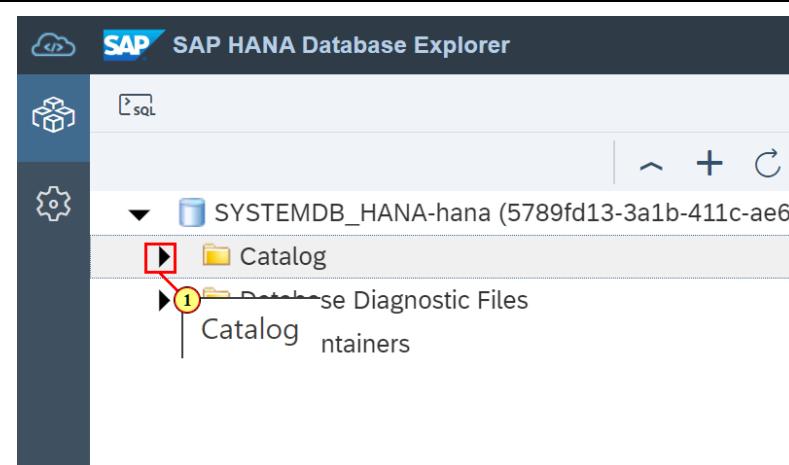
Explanation	Screenshot
<p>open the SAP HANA Database Explorer.</p>	
<p>2. Or you can also launch the Database Explorer from the HANA Cloud Cockpit by clicking on 'Open SQL Console' option on the top right corner.</p>	
<p> You may be prompted to enter database login credentials at this point. Enter the 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</p>	

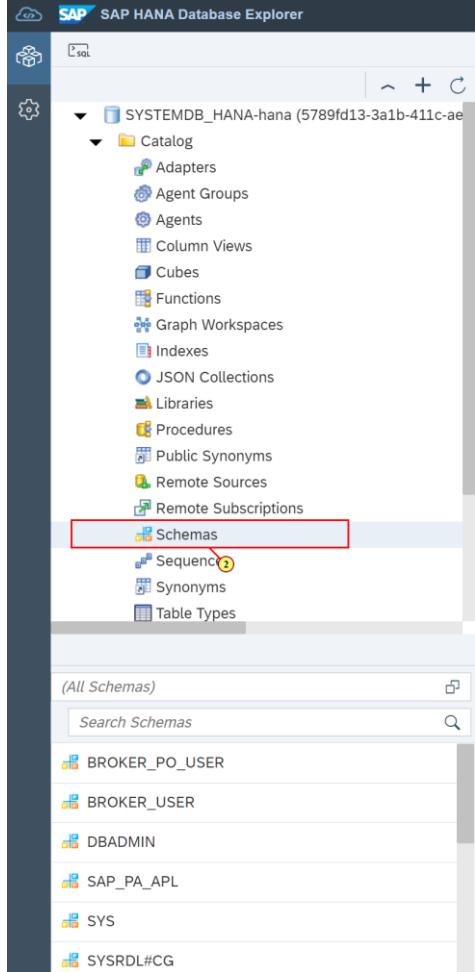
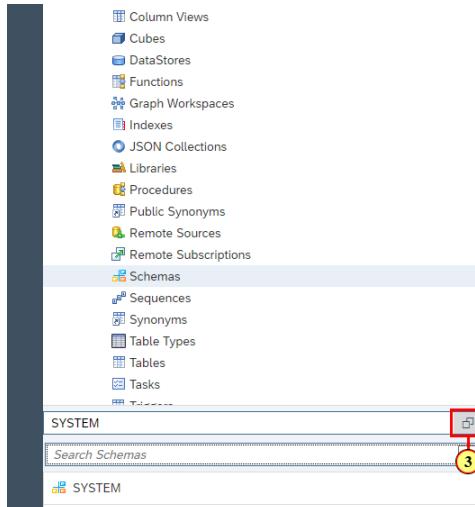
Explanation	Screenshot
<p>URL contains a “?databaseid=”</p> <p>4. Hover over the database to see a summary and note that the type is Cockpit Database</p> <p>5. At the top of the left pane, click the arrow next to the TechEd-hana database icon, to expand the object hierarchy for the database. You will 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>	
<p>7. Choose SAP HANA Database from the dropdown.</p>	

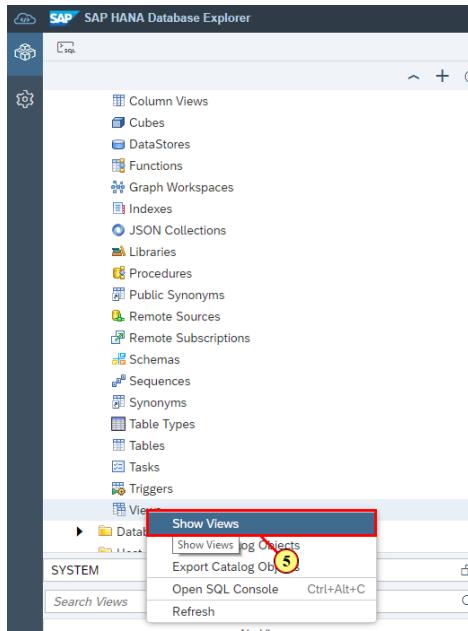
Explanation	Screenshot
<p> Provide the host, port, user name, password and name to show in display. The host and port values can be copied from the SAP HANA Cloud Platform Cockpit.</p> <p>8. As we are not going to add another database for now in our exercise, continue by clicking on Cancel to close the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

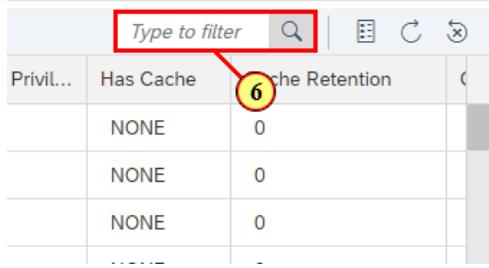
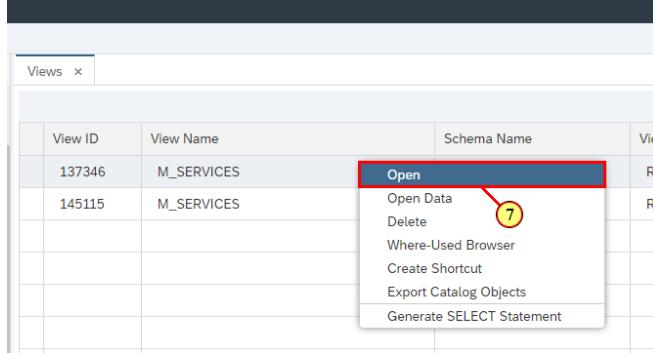
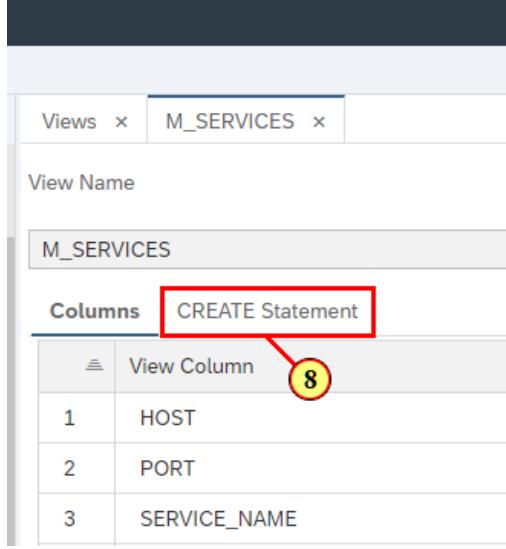
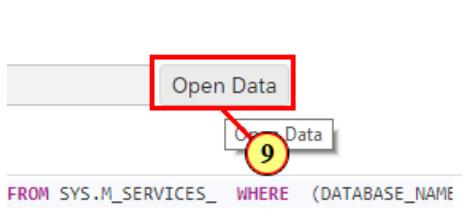
Exercise 2: Browsing the Catalog

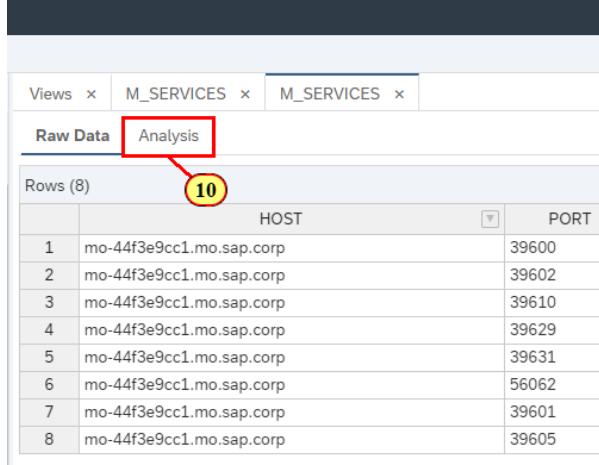
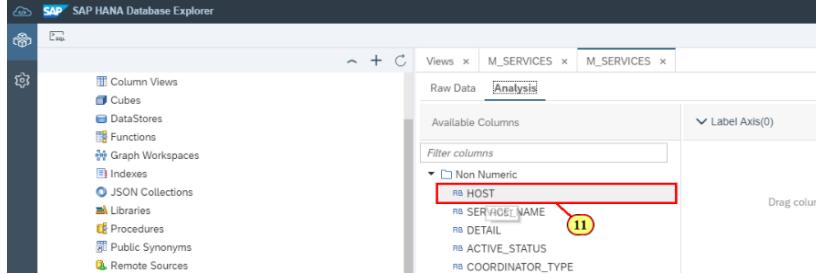
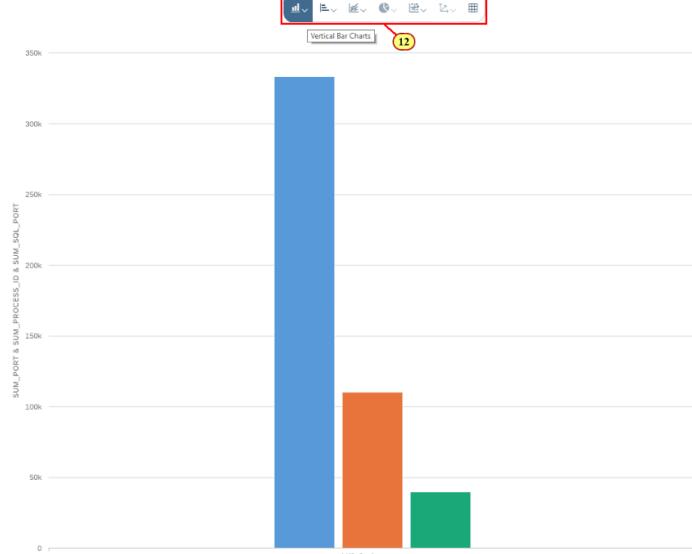
In this exercise we will browse the catalog objects in the database, and explore their properties and data using the Database Explorer. We will use the SYSTEM schema, which exists in every SAP HANA database, as a source of examples.

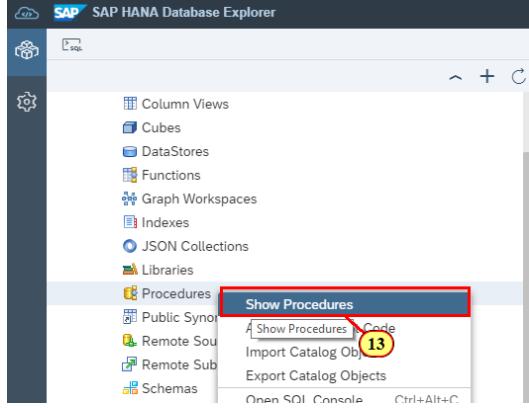
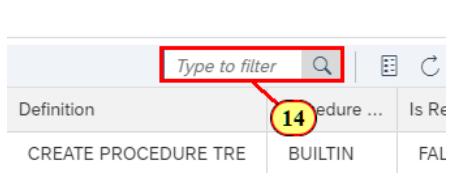
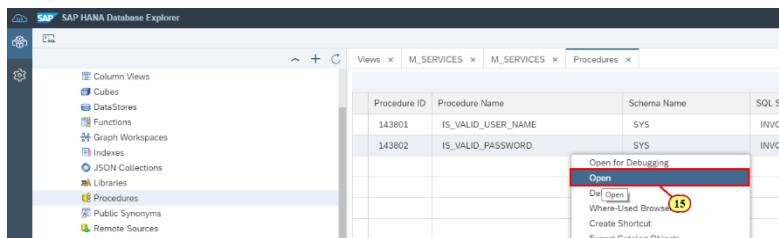
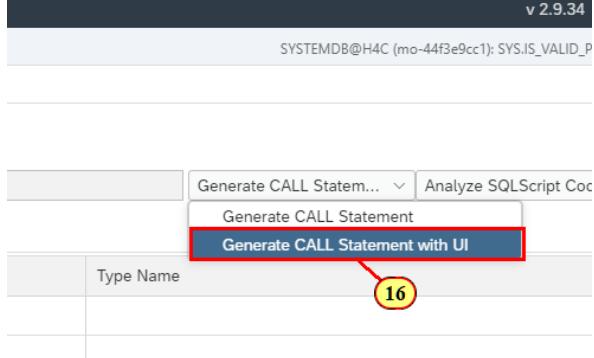
Explanation	Screenshot
<p>1. Click the arrow next to the Catalog folder to expand the catalog hierarchy. It shows a separate container for each schema in the database to which you have access to.</p>	

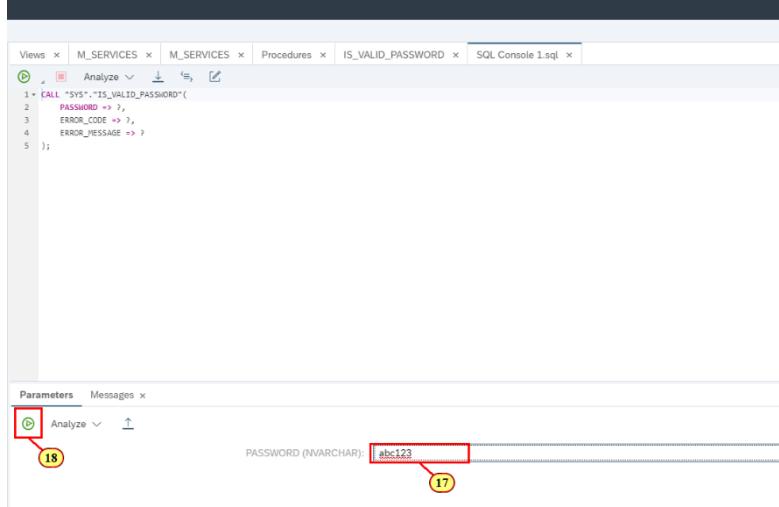
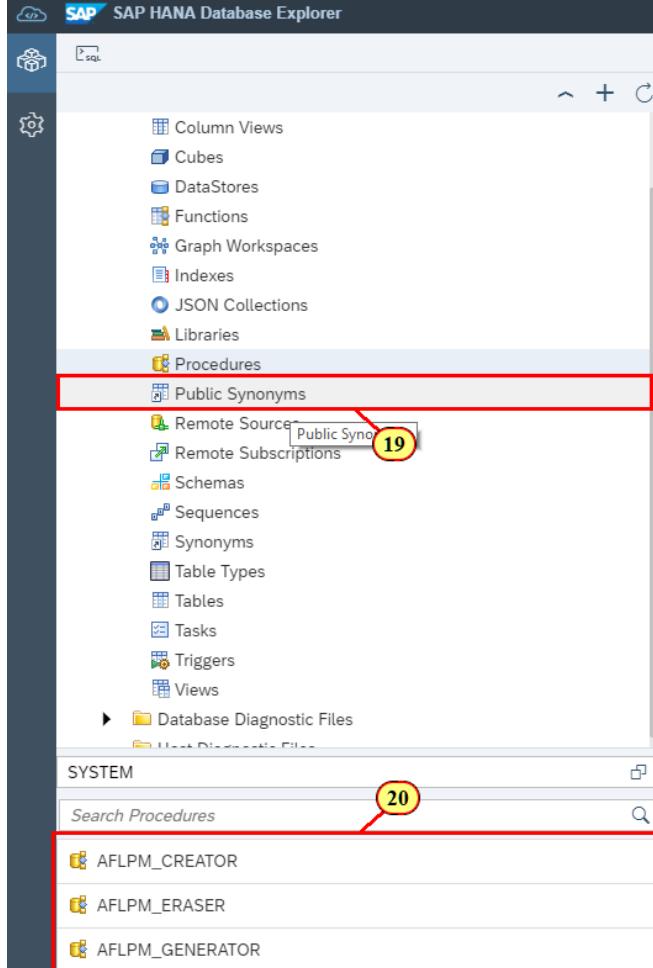
Explanation	Screenshot
<p>2. Click the Schemas button.</p>	
<p>3. Click on the Choose Schema icon on the right to open a pop-up with a list of schemas.</p> <p> At the bottom left, you will see SYSTEM schema. As you may know, this schema contains the system catalog as well as a set of other objects for monitoring and providing information about the database, its state and behavior.</p>	

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>																												

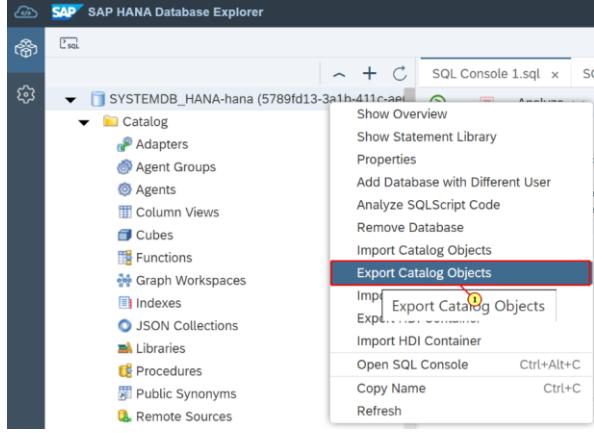
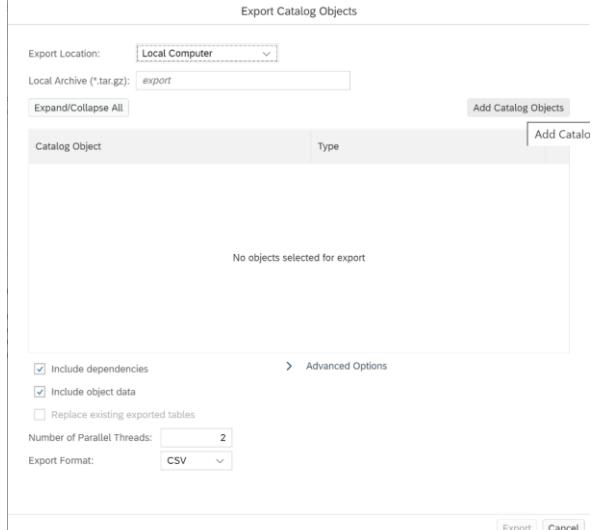
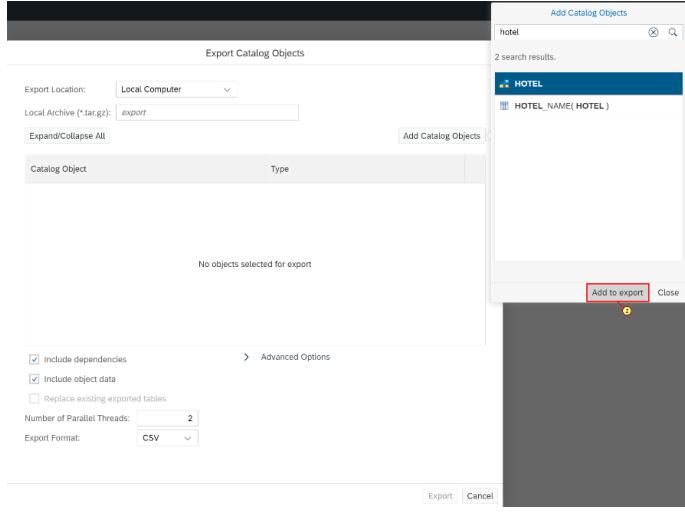
Explanation	Screenshot
<p>13. Now we will explore stored procedures.</p> <p>Right-click on Procedures with the right mouse button and choose Show Procedures from the context menu. A grid of procedures and their properties is displayed in the right pane.</p>	 <p>The screenshot shows the SAP HANA Database Explorer interface. On the left, there's a sidebar with icons for Column Views, Cubes, DataStores, Functions, Graph Workspaces, Indexes, JSON Collections, Libraries, Procedures (which is selected and highlighted in blue), Public Synonyms, Remote Sources, Remote Subscriptions, and Schemas. The main pane displays a context menu for 'Procedures'. The 'Show Procedures' option is highlighted with a red box and a yellow circle containing the number 13. Other options in the menu include 'Show Procedures > Code', 'Import Catalog Obj...', 'Export Catalog Objects', 'Open SQL Console', and 'Ctrl+Alt+C'.</p>
<p>14. Enter IS_VALID in the search field above the grid.</p>	 <p>The screenshot shows the SAP HANA Database Explorer interface with a search bar at the top labeled 'Type to filter' containing 'IS_VALID'. Below the search bar is a grid of procedure definitions. The grid includes columns for 'Definition', 'Procedure ...', 'Is Re...', 'CREATE PROCEDURE TRE', 'BUILTIN', and 'FAL'. A yellow circle containing the number 14 points to the search bar.</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>The screenshot shows the SAP HANA Database Explorer interface with a grid of procedures. The 'IS_VALID_PASSWORD' row is selected. A context menu is open over this row, with the 'Open' option highlighted with a red box and a yellow circle containing the number 15. Other options in the menu include 'Def Open', 'Where-Used Brow...', 'Create Shortcut', and 'Export Catalog Objects'.</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>	 <p>The screenshot shows the SAP HANA Database Explorer interface with a dropdown menu at the top right labeled 'Generate CALL Statement...'. The 'Generate CALL Statement with UI' option is highlighted with a red box and a yellow circle containing the number 16. Other options in the dropdown include 'Generate CALL Statement' and 'Analyze SQLScript Code'.</p>

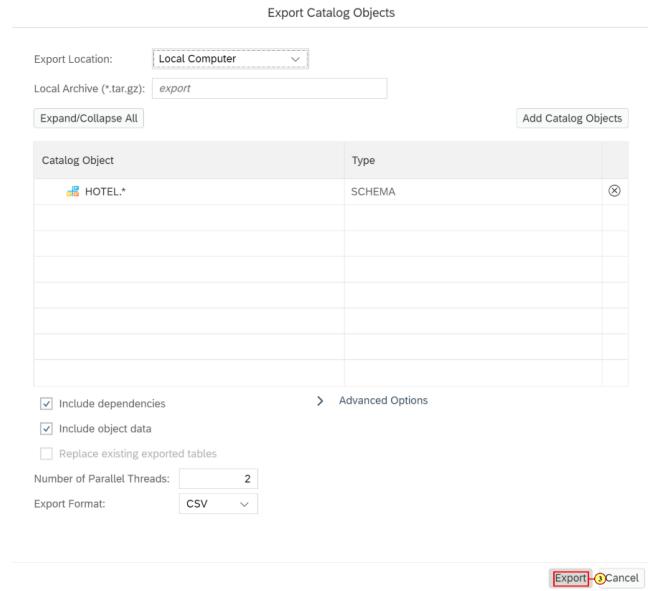
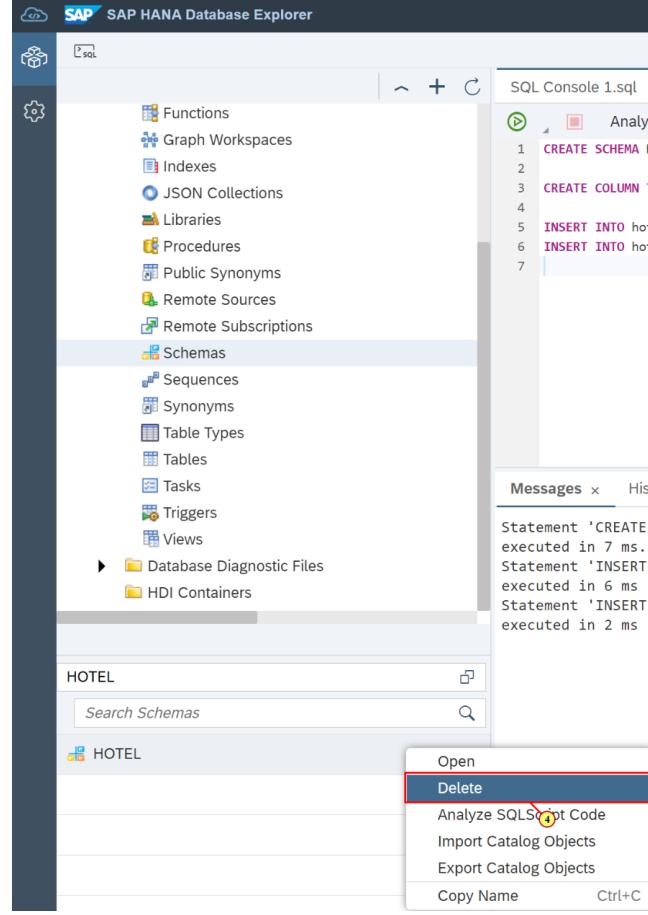
Explanation	Screenshot
<p>17. Enter abc123 in the text field.</p> <p>18. Click the Run button under the Parameters tab to run the procedure. The procedure should display a result with an error code and a statement that the password is too short.</p> <p>Try a more complex password until you get an error 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 window containing the following SQL code:</p> <pre data-bbox="600 431 769 509"> 1 CALL "SYS"."IS_VALID_PASSWORD" 2 PASSWORD => ?, 3 ERROR_CODE => ?, 4 ERROR_MESSAGE => ? 5 ; </pre> <p>Below the code editor is a parameter configuration area. It includes a 'Parameters' tab, an 'Analyze' dropdown, and a 'Messages' tab. A red box highlights the 'Analyze' dropdown, and a yellow circle labeled '18' is placed over it. To its right is a text input field labeled 'PASSWORD (NVARCHAR)' containing the value '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, Remote Sources, Remote Subscriptions, Schemas, Sequences, Synonyms, Table Types, Tables, Tasks, Triggers, and Views. A red box highlights the 'Public Synonyms' item, and a yellow circle labeled '19' is placed over it. In the main content area, a search bar at the bottom has the text 'Search Procedures' and a magnifying glass icon. A red box highlights this search bar, and a yellow circle labeled '20' is placed over it. Below the search bar, three procedure entries are listed: AFLPM_CREATOR, AFLPM_ERASER, and AFLPM_GENERATOR.</p>

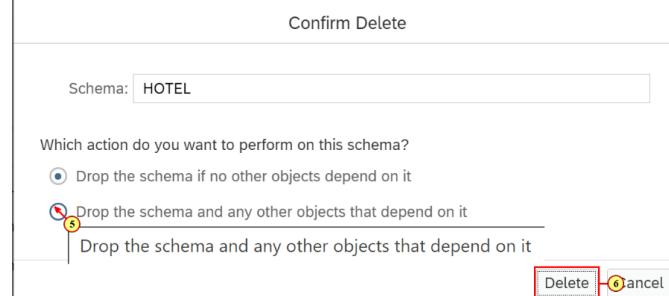
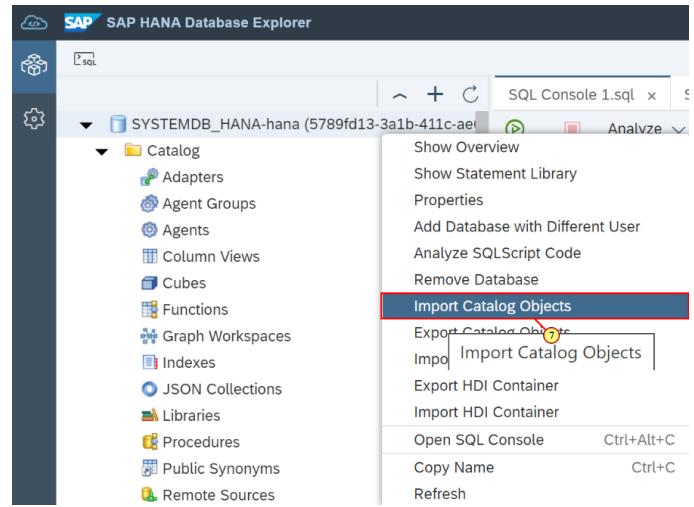
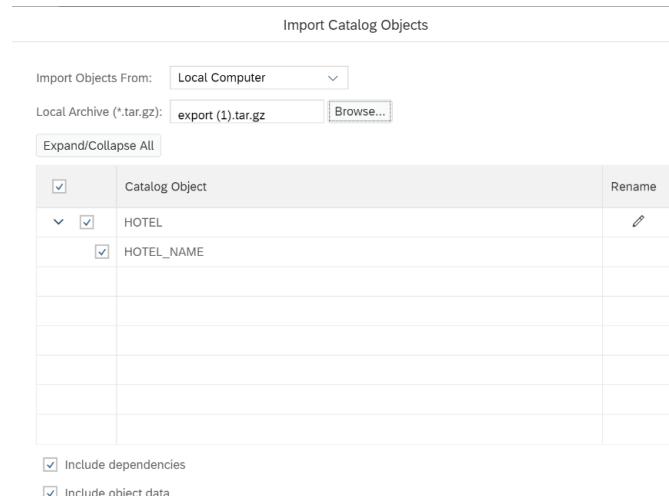
Exercise 3: Create, Import and Export with SAP HANA Database Explorer

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. The left pane displays the SQL editor with the following code:</p> <pre data-bbox="584 946 943 1069">SQL: Conn01.t01.qsp SQL: Conn01.t02.qsp x 1 CREATE SCHEMA HOTEL; 2 3 CREATE COLUMN TABLE hotel.hotel_name(hno INTEGER PRIMARY KEY, name VARCHAR(50) NOT NULL); 4 5 INSERT INTO hotel.hotel_name VALUES('10', 'Congress'); 6 INSERT INTO hotel.hotel_name VALUES('11', 'Regency');</pre> <p>The right pane shows the Messages tab with the following output:</p> <pre data-bbox="584 1136 1009 1233">Statement "CREATE SCHEMA HOTEL;" was executed in 0 ms. Statement "CREATE COLUMN TABLE hotel.hotel_name(hno INTEGER PRIMARY KEY, name VARCHAR(50) NOT NULL)" was executed in 7 ms. Statement "INSERT INTO hotel.hotel_name VALUES('10', 'Congress')" was executed in 0 ms. Statement "INSERT INTO hotel.hotel_name VALUES('11', 'Regency')" was executed in 2 ms - Rows affected: 1</pre>

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>	

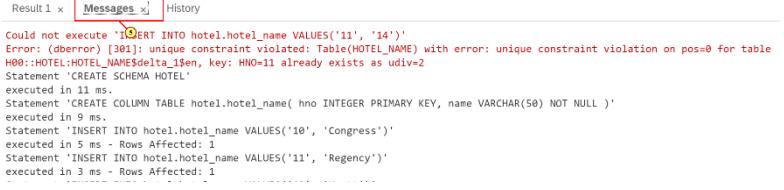
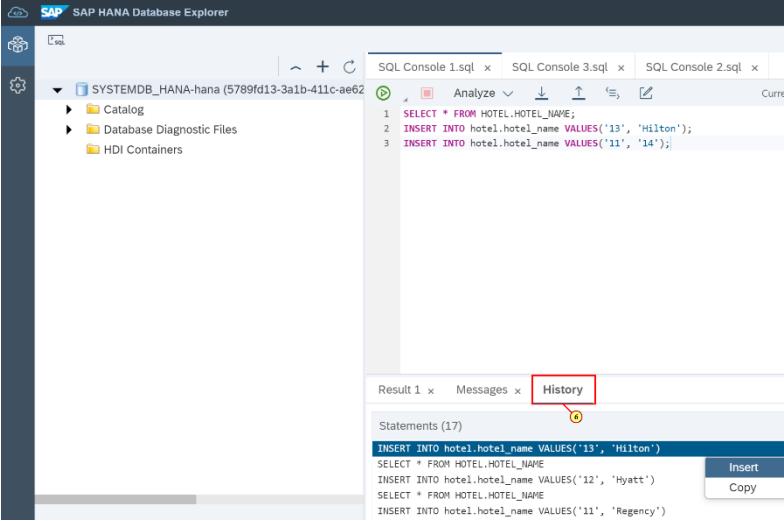
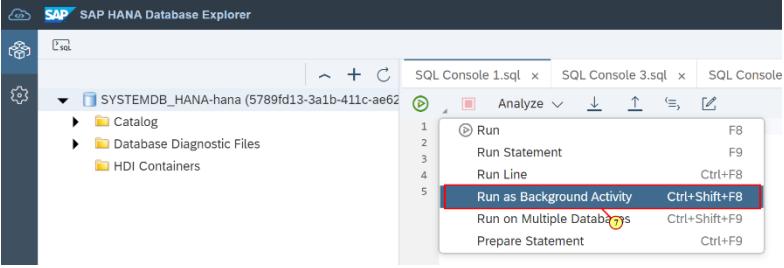
Explanation	Screenshot						
<p>5. Then select Drop the schema and any other objects that depend on it.</p> <p>6. Click on Delete.</p>	 <p>Confirm Delete</p> <p>Schema: HOTEL</p> <p>Which action do you want to perform on this schema?</p> <ul style="list-style-type: none"> <input checked="" type="radio"/> 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>i 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 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=""/>						

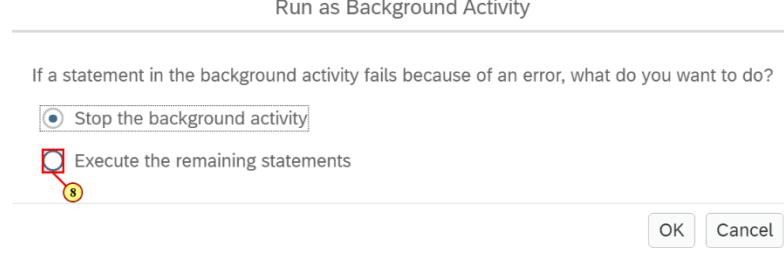
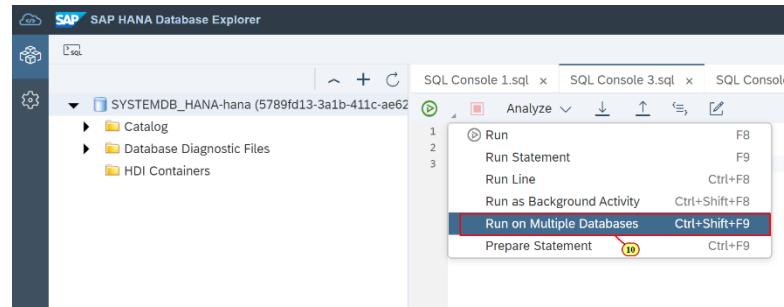
Explanation	Screenshot
<p>9. Copy and run the SQL statement:</p> <pre>SELECT * FROM HOTEL.HOTEL_NAME;</pre> <p>to view the records under it.</p>	

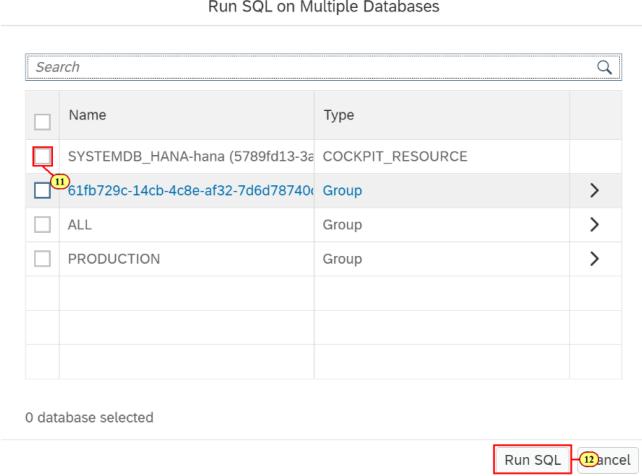
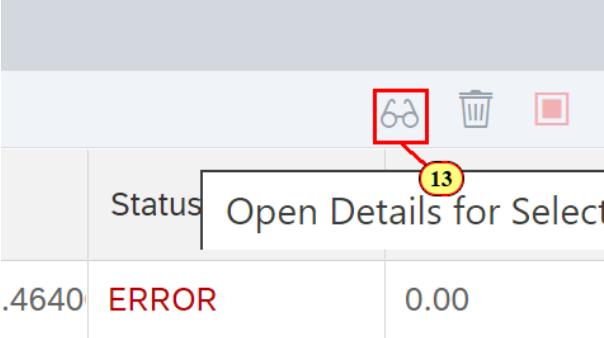
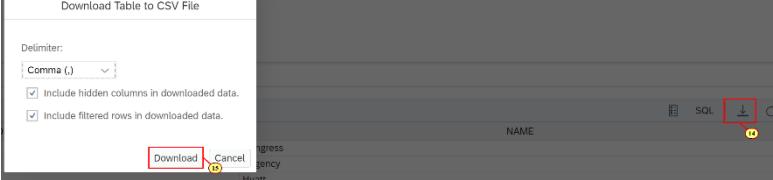
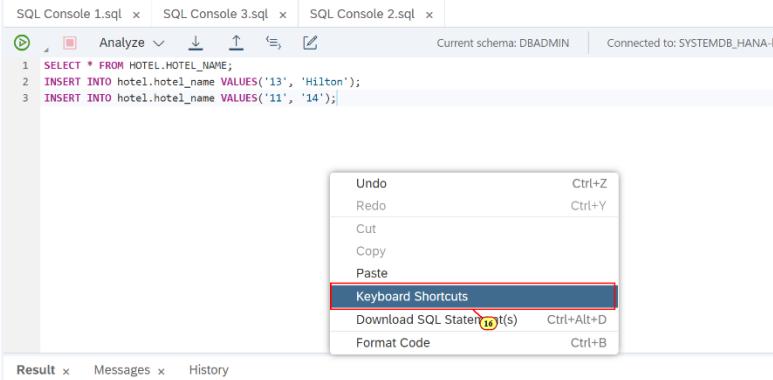
Exercise 4: Using the SQL Console

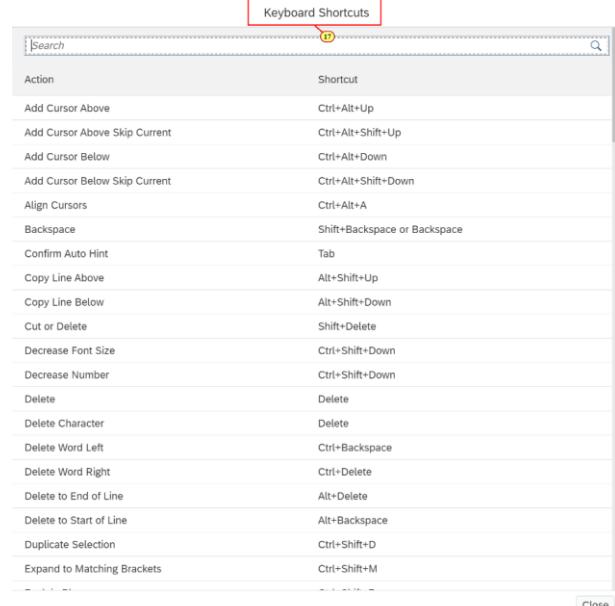
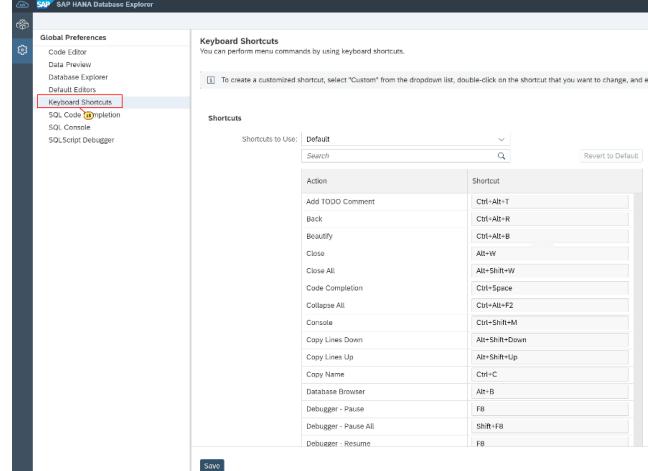
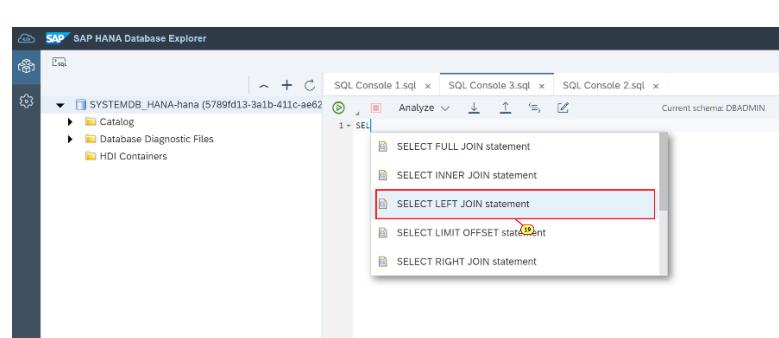
In this exercise, we explore the use of the SQL Console, where you edit and execute SQL statements.

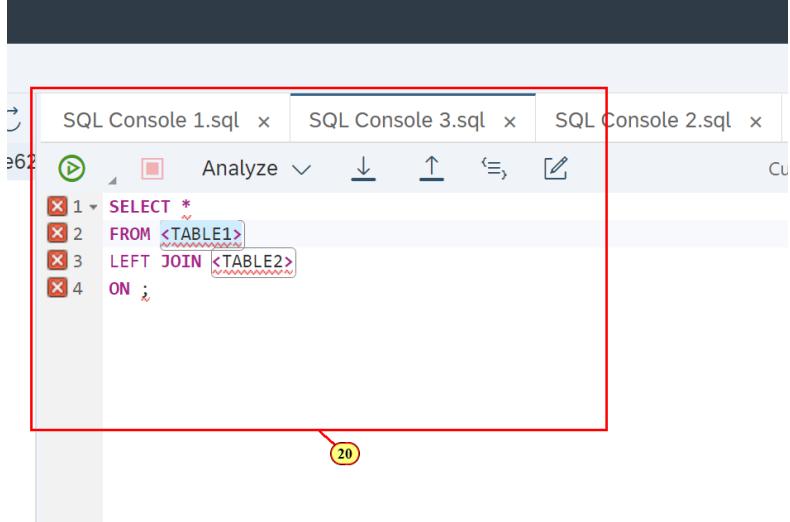
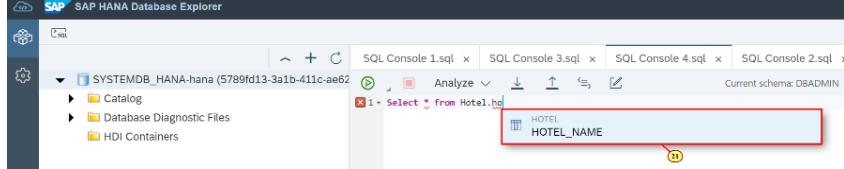
Explanation	Screenshot
<p>1. Select a connection and open the SQL console.</p>	
<p>2. You can notice that the database connection the SQL console is connected to is displayed and in the toolbar there are options to connect, disconnect, or change the connection.</p>	
<p> Enter the below SQL commands in the SQL console:</p> <pre>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"> <tr> <td>1</td> <td>SELECT * FROM HOTEL.HOTEL_NAME;</td> </tr> <tr> <td>2</td> <td>INSERT INTO hotel.hotel_name VALUES('13', 'Hilton');</td> </tr> <tr> <td>3</td> <td>INSERT INTO hotel.hotel_name VALUES('11', '14');</td> </tr> </table> <p>Statements (17)</p> <pre> 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') </pre>	1	SELECT * FROM HOTEL.HOTEL_NAME;	2	INSERT INTO hotel.hotel_name VALUES('13', 'Hilton');	3	INSERT INTO hotel.hotel_name VALUES('11', '14');												
1	SELECT * FROM HOTEL.HOTEL_NAME;																		
2	INSERT INTO hotel.hotel_name VALUES('13', 'Hilton');																		
3	INSERT INTO hotel.hotel_name VALUES('11', '14');																		
<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>	 <table border="1"> <tr> <td>1</td> <td>Run</td> <td>F8</td> </tr> <tr> <td>2</td> <td>Run Statement</td> <td>F9</td> </tr> <tr> <td>3</td> <td>Run Line</td> <td>Ctrl+F8</td> </tr> <tr> <td>4</td> <td>Run as Background Activity</td> <td>Ctrl+Shift+F8</td> </tr> <tr> <td>5</td> <td>Run on Multiple Databases</td> <td>Ctrl+Shift+F9</td> </tr> <tr> <td></td> <td>Prepare Statement</td> <td>Ctrl+F9</td> </tr> </table>	1	Run	F8	2	Run Statement	F9	3	Run Line	Ctrl+F8	4	Run as Background Activity	Ctrl+Shift+F8	5	Run on Multiple Databases	Ctrl+Shift+F9		Prepare Statement	Ctrl+F9
1	Run	F8																	
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4	Run as Background Activity	Ctrl+Shift+F8																	
5	Run on Multiple Databases	Ctrl+Shift+F9																	
	Prepare Statement	Ctrl+F9																	

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 is a search bar and a 'Close' button. Below the search bar is a table listing various actions and their corresponding keyboard shortcuts. Some actions listed include: Add Cursor Above, Add Cursor Above Skip Current, Add Cursor Below, Add Cursor Below Skip Current, Align Cursors, Backspace, Confirm Auto Hint, Copy Line Above, Copy Line Below, Cut or Delete, Decrease Font Size, Decrease Number, Delete, Delete Character, Delete Word Left, Delete Word Right, Delete to End of Line, Delete to Start of Line, Duplicate Selection, and Expand to Matching Brackets. The 'Close' button is located at the bottom right of the dialog.</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 is 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. The main area is titled 'Keyboard Shortcuts' with the sub-instruction 'You can perform menu commands by using keyboard shortcuts.' Below this is a 'Shortcuts' table. The table has two columns: 'Action' and 'Shortcut'. It lists various actions such as Add TODO Comment, Back, Beautify, Close, Close All, Code Completion, Collapse All, Console, Copy Lines Down, Copy Lines Up, Copy Name, Database Browser, Debugger - Pause, Debugger - Pause All, and Debugger - Resume. The 'Save' button is located at the bottom right of the table.</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 three SQL consoles open: 'SQL Console 1.sql', 'SQL Console 3.sql', and 'SQL Console 2.sql'. The current schema is set to 'DBADMIN'. In the center, there is a dropdown menu showing suggestions for the query being typed. The suggestion 'SELECT LEFT JOIN statement' is highlighted with a red box and has a yellow callout arrow pointing to it. Other suggestions include 'SELECT FULL JOIN statement', 'SELECT INNER JOIN statement', 'SELECT LIMIT OFFSET statement', and 'SELECT RIGHT JOIN statement'. The 'Save' button is located at the bottom right of the interface.</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> Copy the following SQL into the console and then use the autocomplete shortcut to see the available tables: SELECT * FROM HOTEL.HOTEL_NAME</p> <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>	



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. The top navigation bar includes 'About' and 'Help'. Below the navigation is a toolbar with icons for search, refresh, and settings. The main content area has a title bar with the URL '0.hanacloud.ondemand.com:443' and several small icons. A red box highlights the 'Statement/Syntax' section, which contains a dropdown menu and a 'SELECT Statement' section with a yellow badge '22'. Below this is a detailed syntax diagram for a SELECT statement. 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 third red box highlights the 'Procedures and Functions' and 'SQL Functions' sections at the bottom of the panel.

Statement/Syntax

SELECT Statement 22

```

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

```

Tables and Views (1)

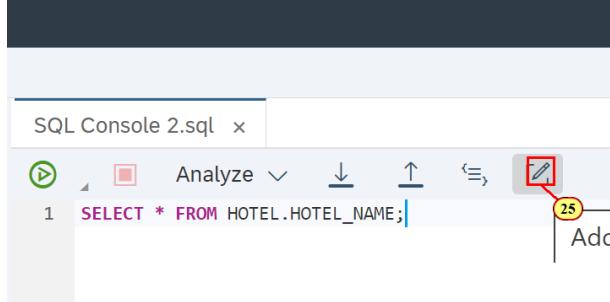
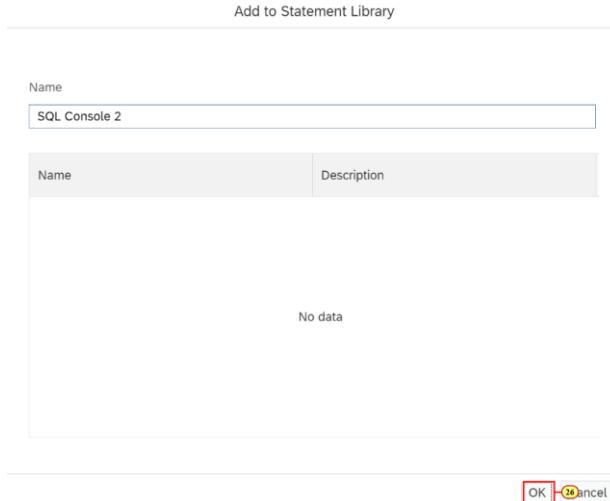
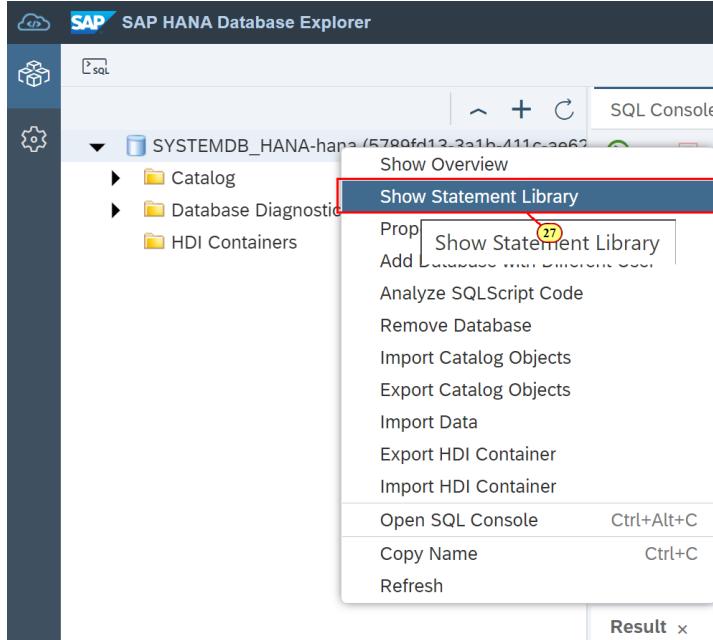
Name: HOTEL_NAME 23

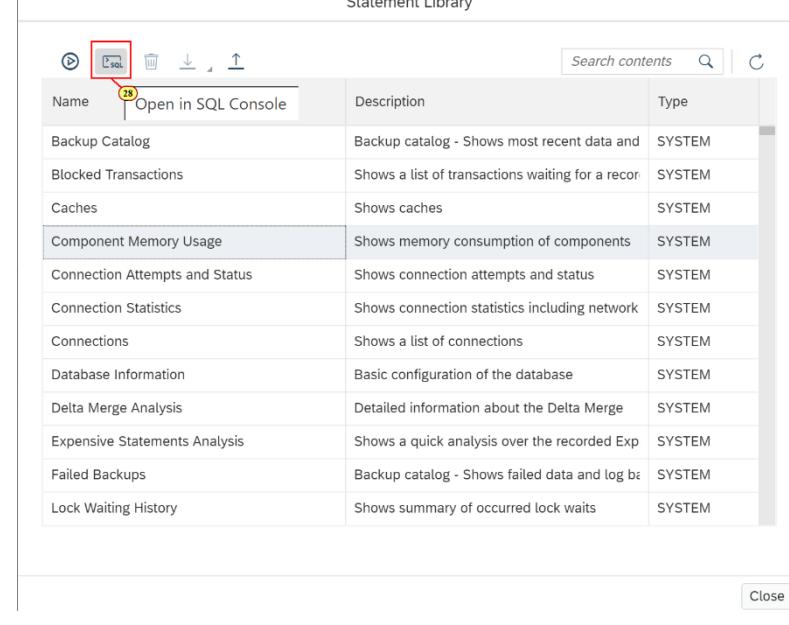
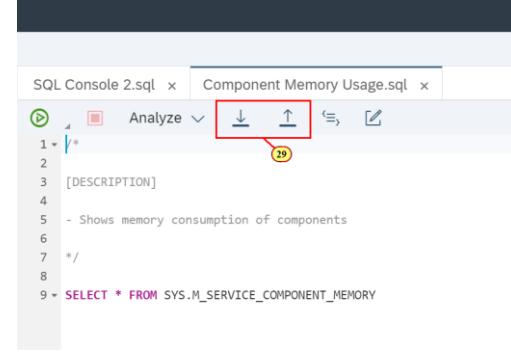
Schema: HOTEL

HNO	INTEGER
NAME	NVARCHAR(50)

> Procedures and Functions

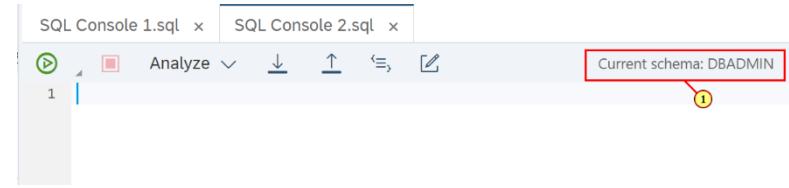
> SQL Functions

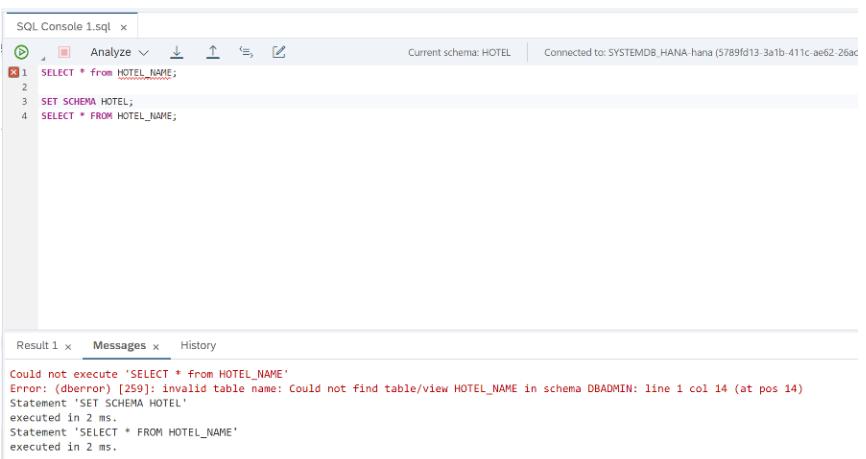
Explanation	Screenshot
<p>25. Frequently used statements can be saved to the statement library for easy access. Enter the below statement into the SQL console and click on the Add to Statement Library button:</p> <pre data-bbox="160 602 409 663">SELECT * FROM HOTEL.HOTEL_NAME;</pre>	
<p>26. You can name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

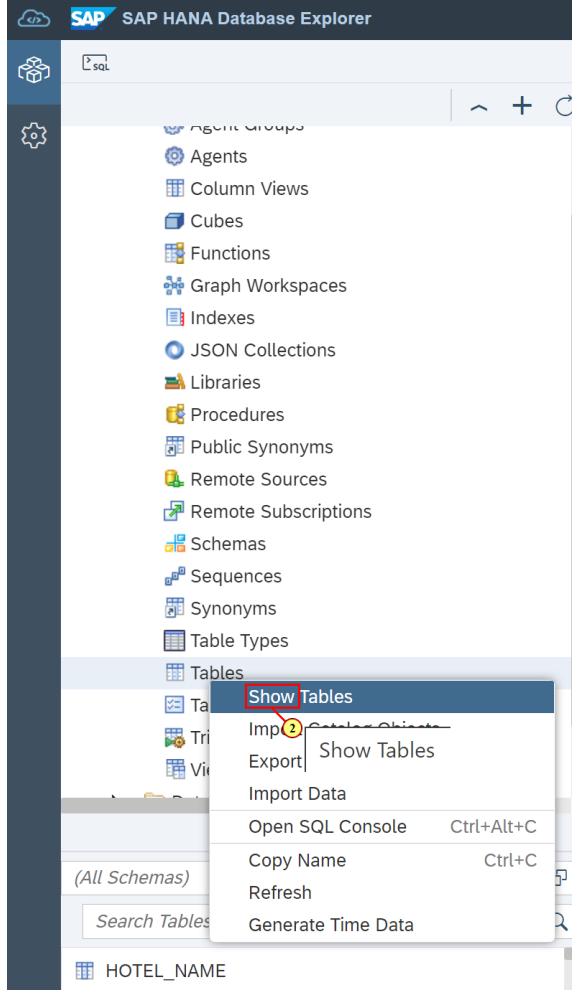
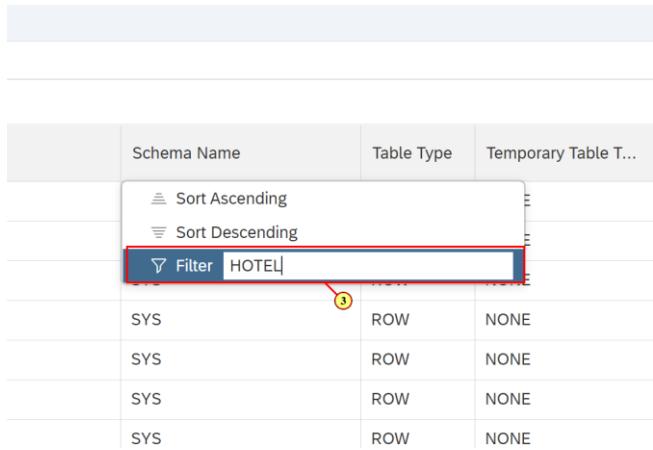
Explanation	Screenshot																																							
<p> In the statement library there are two types of statements: User defined and System. This is reflected in the type column. User defined statements are the ones that you have created and added, like future reservations, while System statements 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 search, refresh, and close. Below is a table with columns: Name, Description, and Type. The 'Type' column indicates whether the statement is SYSTEM or USER. A red box highlights the 'Open in SQL Console' button for the 'Component Memory Usage' row.</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
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<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. At the top, there are tabs for 'SQL Console 2.sql' and 'Component Memory Usage.sql'. Below is a toolbar with buttons for play, stop, analyze, and file operations. A red box highlights the 'Import' and 'Export' buttons. The status bar at the bottom right shows 'Current schema: DBADMIN' with a circled number '1'.</p>																																							

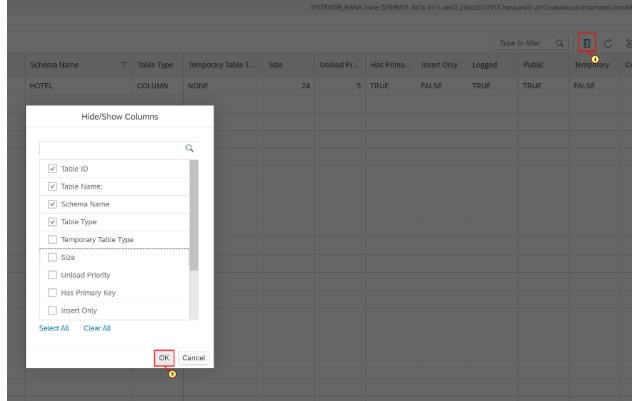
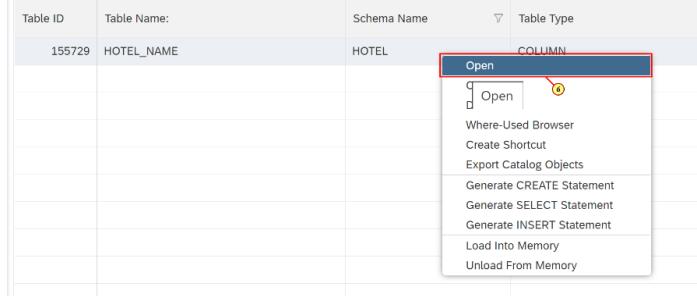
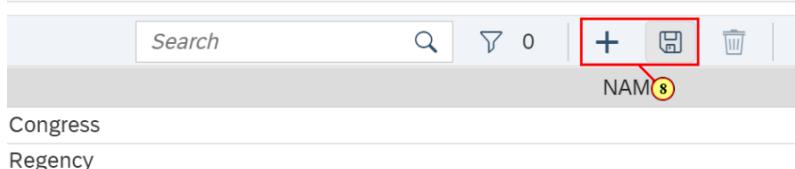
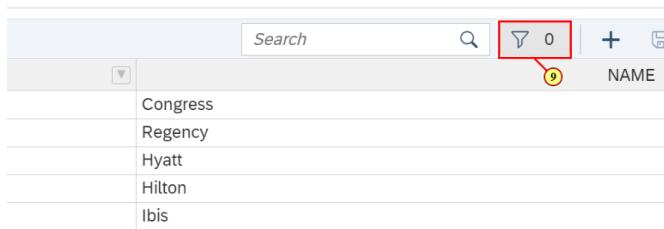
Exercise 5: Browsing across Schemas and Editing Tables

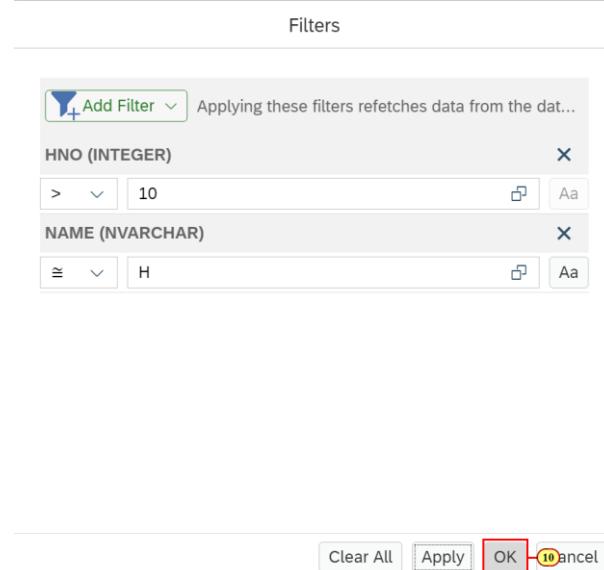
In this exercise, we will discuss on browsing and executing SQL scripts across different schemas and editing an existing table.

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'. Below the tabs is a toolbar with buttons for play, stop, analyze, and file operations. A red box highlights the status bar at the bottom right, which displays 'Current schema: DBADMIN' with a circled number '1'.</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 1037">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 definitions:</p> <ul style="list-style-type: none"> HNO (INTEGER): The value is set to > 10. NAME (NVARCHAR): The value is set to ≥ 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

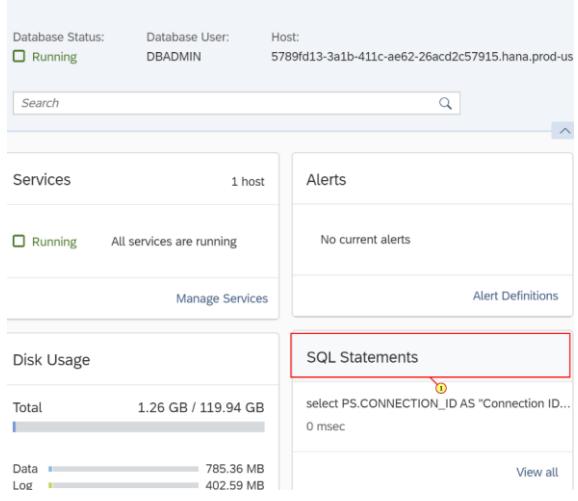
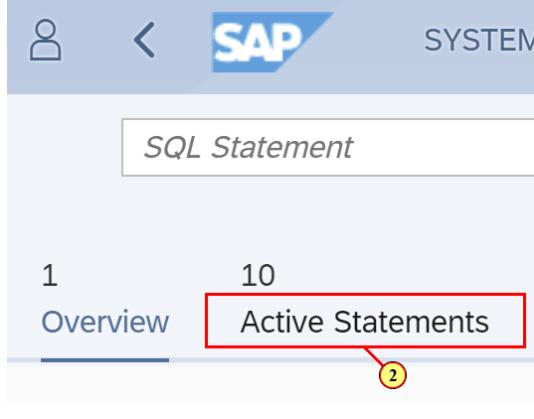
Estimated time: 15 minutes

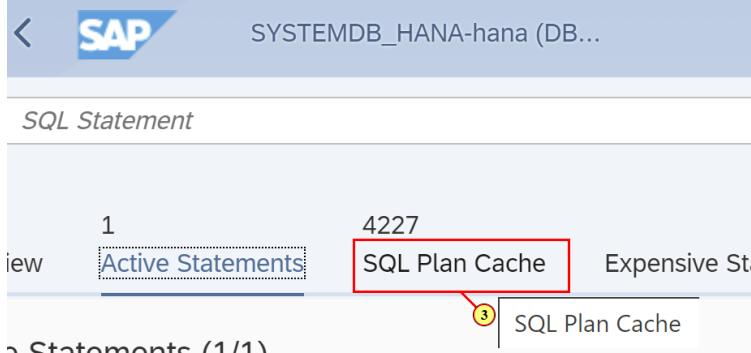
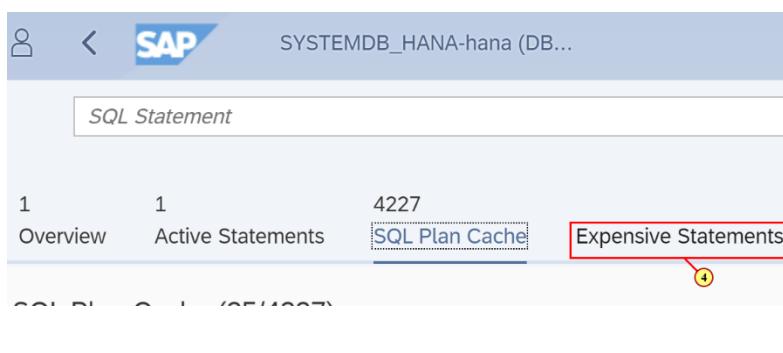
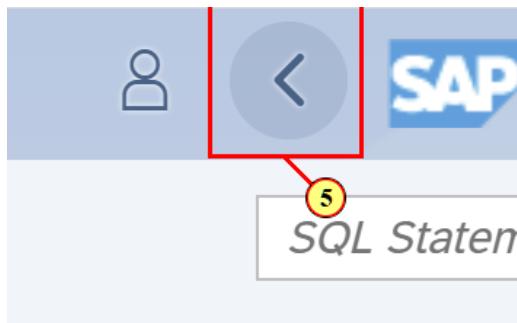
Objective

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

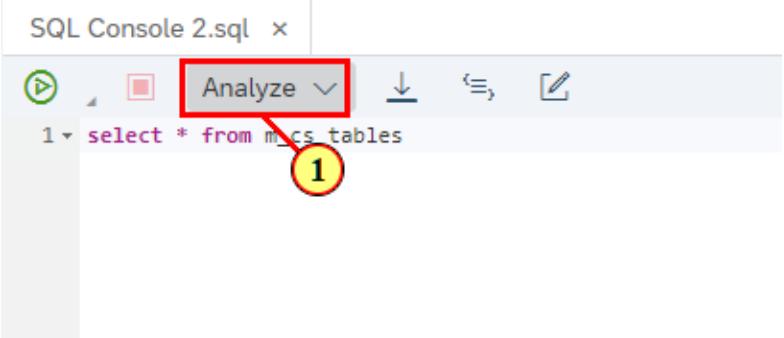
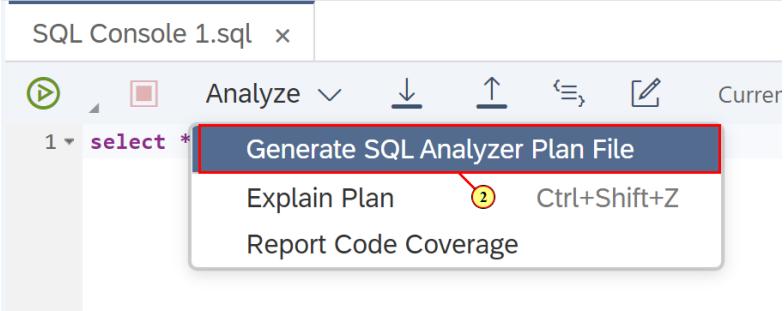
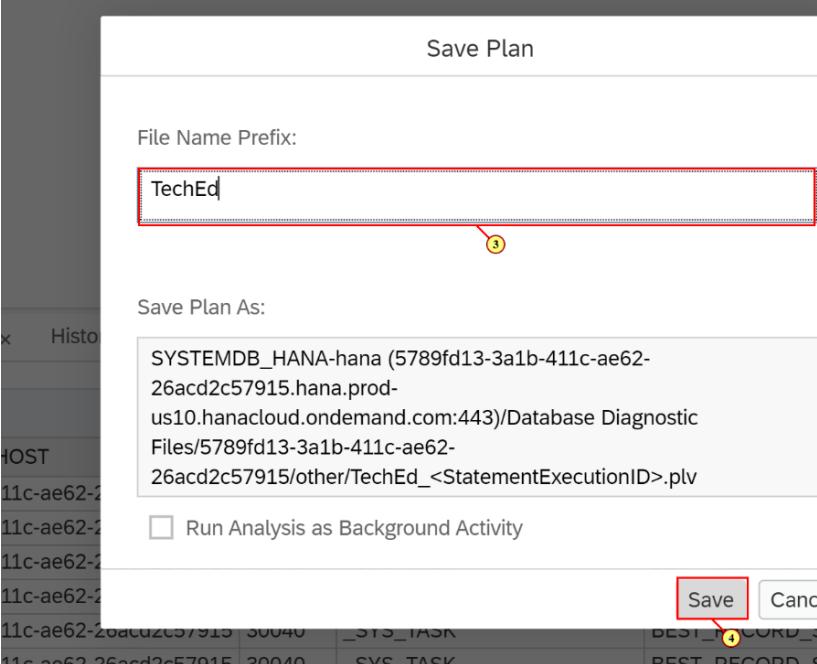
In this exercise, you will explore on the Top SQL Statements like Active Statements, SQL Plan Cache, Expensive Statements

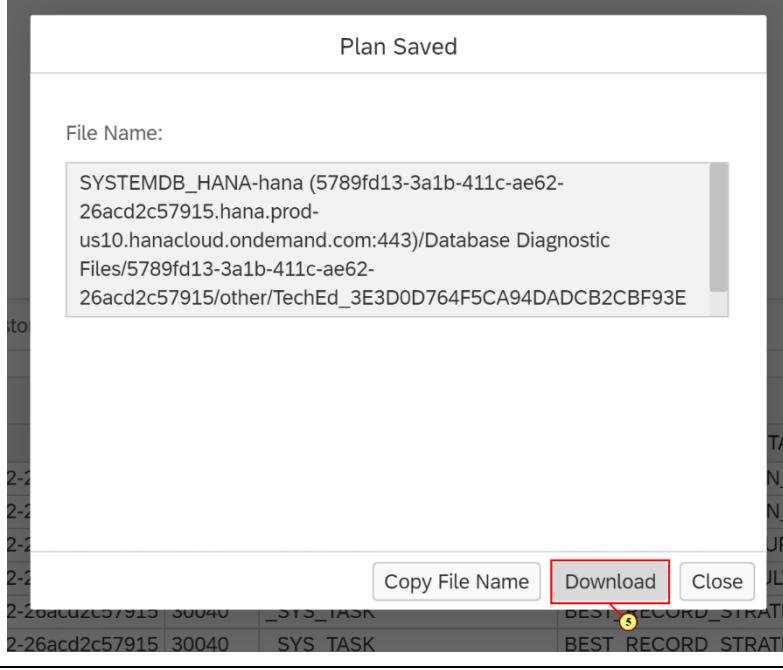
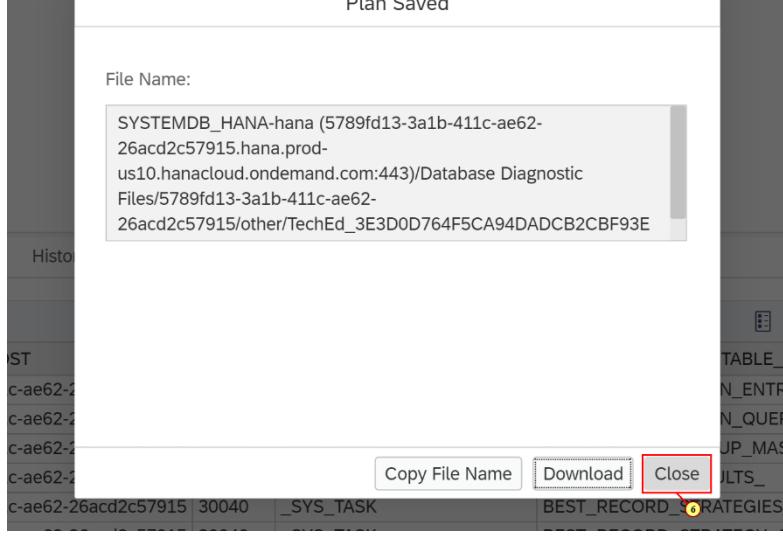
Explanation	Screenshot
<p>1. At the SQL Statements card, click anywhere in the top section.</p>	
<p>The overview page displays an overview of the current active statements and its various parameters. You can even view the entire statement string by clicking More in the Statement String column.</p> <p>2.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

Explanation	Screenshot
<p>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 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>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>	

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

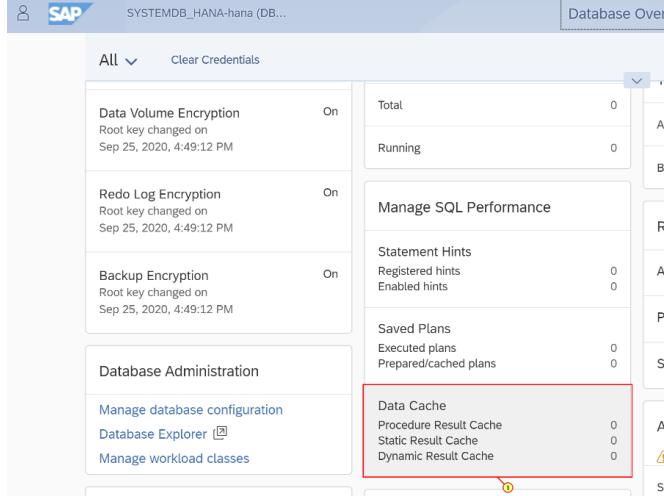
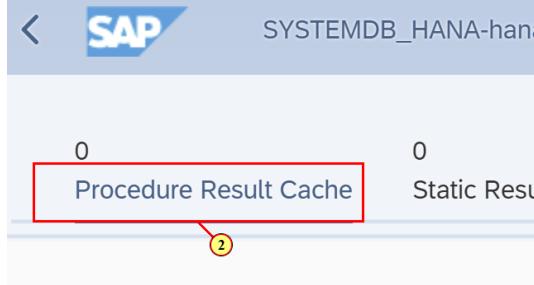
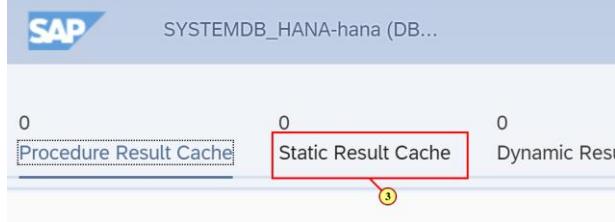
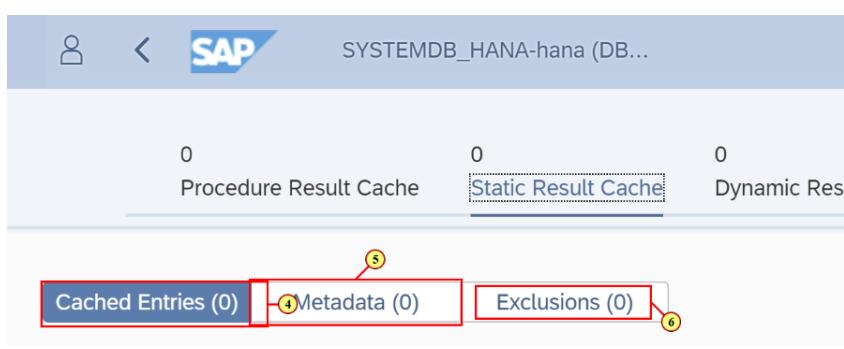
In this exercise, you will have hands-on on how to import, export and analyze the SQL Plans in the SQL Analyzer. For this you will be launching the Database Explorer.

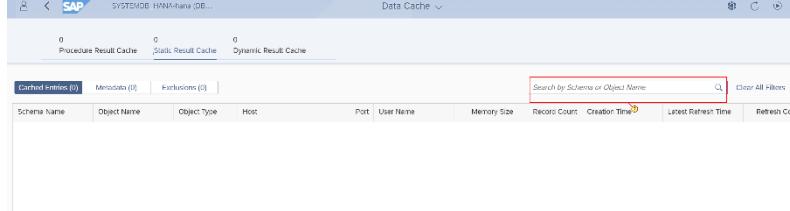
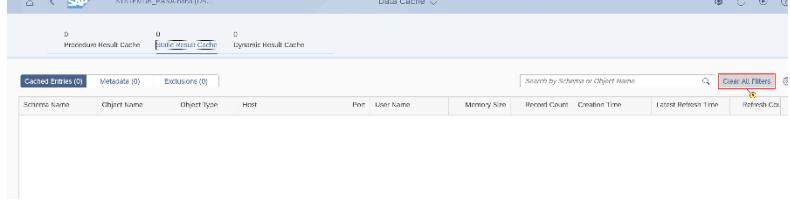
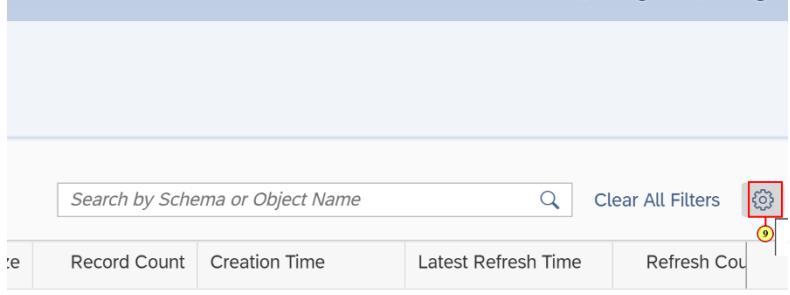
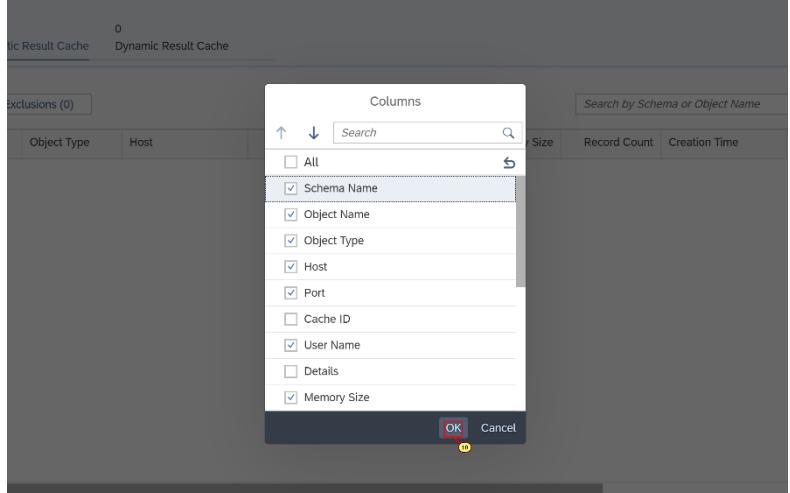
Explanation	Screenshot
1. Select the Analyze drop-down menu to view the analyzer options.	
2. Select Generate SQL Analyzer Plan File from the dropdown menu.	
<p>Info: This feature allows the user to both analyze the SQL query and export the SQL plan to their local directory.</p> <p>3. Enter TechEd in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

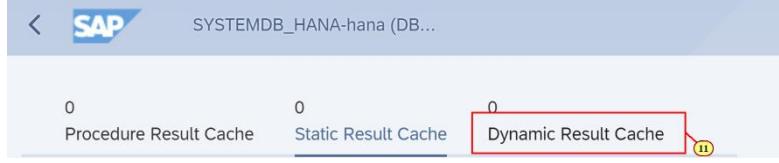
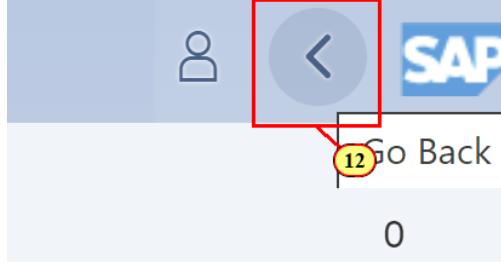
Explanation	Screenshot
<p>5. Click Download to download the SQL plan to your local directory.</p>	
<p>6. Click Close to close the pop-up window and return to the Analyze SQL page in the Database Explorer.</p> <p>Info: You have completed the exercise! You are now able to:<ul style="list-style-type: none">• View the active statements and monitor the expensive statements• Import and export SQL plans• View cached data entries• Import trace files</p>	

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.

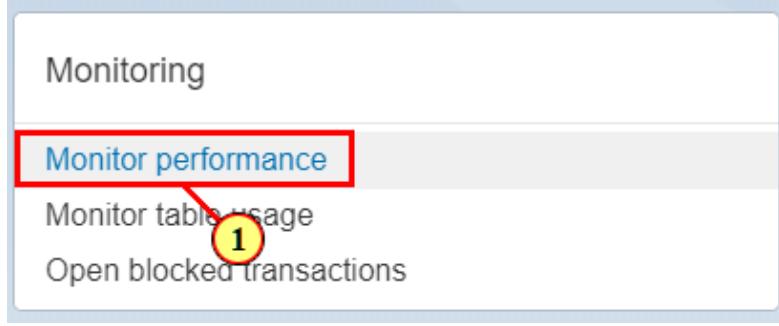
Explanation	Screenshot
<p>1. In the Database Overview page of your selected resource, scroll down to the Manage SQL Performance card and select anywhere on the Data Cache box.</p>	
<p>2. You are currently viewing the Procedure Result Cache entries.</p>	
<p>3. You are currently viewing only the static 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>	

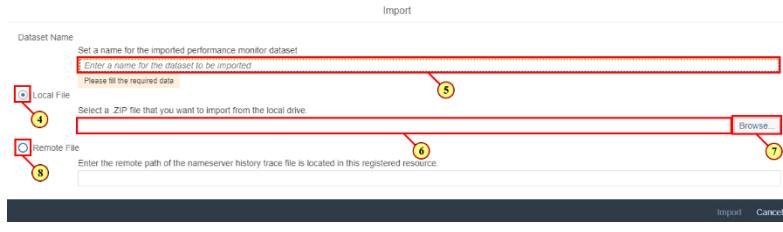
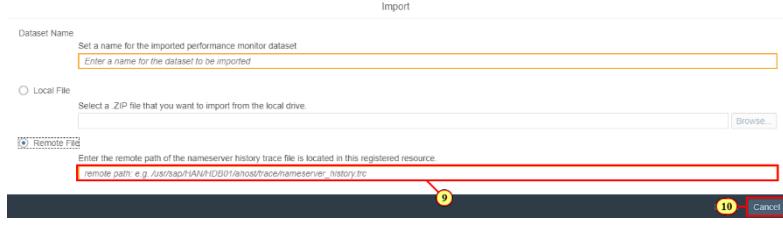
Explanation	Screenshot
<p>7. You can search for the data entries either through schemas or object names.</p>	
<p>8. You can clear all existing filters for filtering data cache entries by clicking Clear All Filters.</p>	
<p>9. Click on the gear icon.</p>	
<p>The settings pop-up can filter various columns which represent schema and object parameters.</p>	

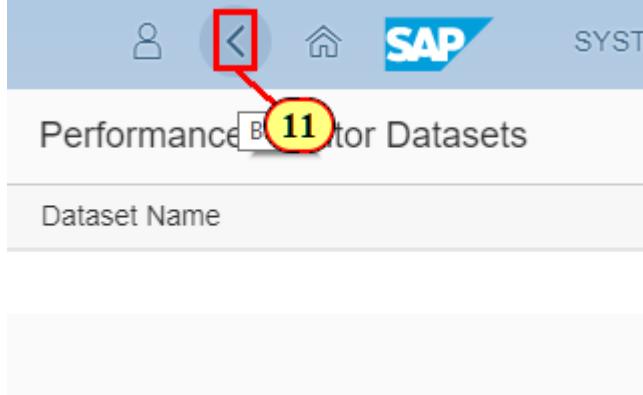
Explanation	Screenshot
<p>11. Clicking Dynamic Result Cache will display all the dynamic data cache entries.</p>	 <p>The screenshot shows the SAP Fiori interface for the Database Overview. At the top, there is a header bar with the SAP logo and the text "SYSTEMDB_HANA-hana (DB...)". Below the header, there are three numerical values: 0 Procedure Result Cache, 0 Static Result Cache, and 0 Dynamic Result Cache. The "Dynamic Result Cache" value is highlighted with a red box and a yellow circle containing the number 11, indicating it is the target for step 11.</p>
<p>12. Click the back button to return to the Database Overview page.</p>	 <p>The screenshot shows a navigation bar with a person icon, a back arrow icon, and the SAP logo. Below the bar, the text "Go Back" is displayed. A red box highlights the back arrow icon, and a yellow circle containing the number 12 points to the "Go Back" text, indicating the target for step 12.</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. It has a menu with three options: "Monitor performance" (highlighted with a red box), "Monitor table usage", and "Open blocked transactions". A yellow circle containing the number 1 points to the "Monitor performance" option.</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 several icons. One of the icons, labeled "Import", is highlighted with a red box and a yellow circle containing the number 2, indicating it is the target for step 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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