In this chapter, we begin by comparing two development tools, SAP HANA Studio and SAP Web IDE for SAP HANA. Then, we’ll show you how to set up a user in SAP HANA XSA. Finally, we’ll walk through the process of setting up SAP Web IDE with the SAP HANA database and create a project in SAP Web IDE using a multitarget application template.
Chapter 3
Data Modeling Tools

In this chapter, we’ll explore the tools you’ll use for data modeling and set them up so that you can follow along with the examples in the rest of the book.

SAP Web IDE for SAP HANA is the tool used for developing SAP HANA database models, calculation views, stored procedures, and more. In this chapter, we’ll take a deep dive into SAP Web IDE for SAP HANA to see how it works. We’ll begin in Section 3.1 by comparing two development tools, SAP HANA Studio and SAP Web IDE for SAP HANA. In Section 3.2, we’ll give an overview of SAP Web IDE, and after we walk you through the basic concepts, we’ll show you how to setup a user in the SAP HANA XSA environment using the SAP HANA XSA administration tool. In Section 3.3.1, we’ll show you how to connect SAP Web IDE to the SAP HANA database and access the application development artifacts stored and managed in the SAP HANA repository. In Section 3.3.2, we’ll turn our attention to the technical aspects of the SAP Web IDE for SAP HANA tool: we’ll create a first project and an SAP HANA database module using a standard template, and then deploy it.

Now, we’ll explore the new SAP Web IDE for SAP HANA, which will be the default tool for SAP HANA modeling, and compare that tool with the traditional SAP HANA modeling tool, SAP HANA Studio.

3.1 Data Modeling with SAP HANA Studio versus SAP Web IDE

In previous versions of SAP HANA, you used SAP HANA Studio for data modeling, but as of SAP HANA SPS 11 (see Chapter 1, Section 1.2 for an overview of the new service layers of the SAP HANA database), SAP recommends following the new SAP HANA deployment infrastructure. That means that going forward all modeling should be done only using the SAP Web IDE for SAP HANA, not SAP HANA Studio.
SAP HANA Studio and SAP Web IDE for SAP HANA are both used for data modeling, and both share very similar features, but there are some fundamental differences between them of which you should be aware:

- In SAP Web IDE, you build runtime objects directly, whereas in SAP HANA Studio you activate the design-time objects to create runtime objects.
- In SAP Web IDE, users access the runtime objects by going into the database explorer, whereas in SAP HANA Studio both runtime and design-time objects are visible in the same panel.
- Design-time objects in SAP Web IDE are in a simple file that can be copied and pasted or can be shared via email, but that's not possible with the design-time objects in SAP HANA Studio.
- Modeling content created with SAP Web IDE for SAP HANA is not compatible with SAP HANA Studio and vice versa. However, you can migrate existing views from SAP HANA Studio to SAP Web IDE with a migration tool that is available in SAP HANA Studio (since SAP HANA SPS 11). We'll show you how to migrate the views in Chapter 8, Section 8.2.

Now that you understand the differences between the SAP HANA Studio and SAP Web IDE tools, next let’s deep-dive into the features of the SAP Web IDE for SAP HANA tool.

### 3.2 Getting Started with SAP Web IDE

SAP Web IDE for SAP HANA provides a comprehensive web-based workflow for all your new SAP HANA deployment infrastructure and SAP HANA XSA–based development. SAP Web IDE for SAP HANA combines capabilities of SAP HANA Studio and the SAP HANA web-based development workbench. From a bird's-eye view, Figure 3.1 shows the position of the SAP Web IDE for SAP HANA architecture in the SAP HANA XSA environment, in which the full modeling functionality is available.

In Chapter 1, Section 1.2, we walked you through the SAP HANA architecture with the new SAP HANA XSA application server. The elements shown in Figure 3.1 are found in the SAP Web IDE architecture in SAP HANA XSA.

SAP Web IDE is where all the development takes place. It offers the same look and feel and ease of use as the standard SAP Web IDE, with sophisticated templates and wizards for quickly creating prototypes, especially for SAP HANA modeling. SAP Web IDE for SAP HANA relieves you from the local management and synchronization of files, and it behaves technically just like an ordinary application because the design-time environment is completely server-based.

SAP HANA XSA embeds a full-featured application server, web server, and development environment within the SAP HANA appliance itself, and this enables developers to develop applications within the SAP HANA server.

It’s important to understand the various levels of security that can be put in place to prevent the unauthorized use of SAP HANA XSA and SAP Web IDE. Just like any other databases or tools, SAP HANA XSA provides features to define and maintain security. There are two levels of security that you need to define before you start working on SAP Web IDE for SAP HANA:

- **SAP HANA XSA Administration tool**
  
  Using this tool in the SAP HANA XSA cockpit, you can provide users access to SAP Web IDE for SAP HANA or create a development space or give a user access to the development space.
To protect important data from unauthorized access and to ensure that the standards and compliance meet the security standards adopted by the company, we define object-level access—that is, restrict access to the tables, views, or procedures—and define data-level security as well using analytic privileges.

3.2.1 Setting Up Access in SAP HANA XSA

In this exercise, we’ll create a new user in the SAP HANA XSA cockpit and assign the SAP HANA XSA developer role to the new user. We’ll show the steps to create a new user, but you can import existing SAP HANA users into SAP HANA XSA as well, as we’ll highlight.

Follow these steps to create a new user in the SAP HANA XSA environment using the SAP HANA XSA Administration tool:

1. Launch the SAP HANA XSA environment with this URL: https://<host>:39030/.

   **Note**
   
   This URL is for the SAP HANA, express edition. Your port number might be different depending on how the SAP HANA landscape is configured.

2. Click XSA-COCKPIT to launch the SAP HANA XSA Administration tool (Figure 3.2).

3. Enter the “XSA_ADMIN” login credentials, then click Log On (Figure 3.3).

4. After you’re logged on, your screen should look like Figure 3.4. Now it’s time to create a new user and assign developer roles. Click User Management, then click New User.

5. In the next screen, you need to fill in the mandatory details about the user (User Name, Email, and Password; see Figure 3.5), then click Create.
You've successfully created a new user. Next, you need to grant access to users so that they can access the SAP HANA XSA tools and features. Follow these steps:

1. After creating a user in the previous steps, you should see the screen shown in Figure 3.6. Assign roles by clicking the under the **Actions** column.

![Figure 3.6 Assign Role](image)

2. Click the **Add** button in the **Assign Role Collections** window (Figure 3.7).

![Figure 3.7 Add Roles](image)

Search for roles starting with XS, then select **XS_CONTROLLER_USER** and **XS_AUTHORIZATION_ADMIN** (see Figure 3.8). The XS_CONTROLLER_USER role will let users read and write within the assigned spaces or organizations, and the XS_AUTHORIZATION_ADMIN role will let users access the SAP HANA XSA Administration tools.

3. Repeat the previous step, but search for and select the **DEVX_DEVELOPER** role.

4. Click **OK** to assign the roles to the user.

5. After you've selected roles, your screen should look like Figure 3.9.

6. Click **Save**.

![Figure 3.8 Search and Assign Roles](image)

![Figure 3.9 Role Collections](image)
You’ve now successfully created a new user and assigned authorizations to the new user to build applications in the SAP HANA XSA environment.

Next, you need to create a dedicated space for the developers within an organization. What is an organization in the SAP HANA XSA world? Organizations enable users to collaborate by sharing resources, services, and applications with other users in the same organization.

### 3.2.2 Organization and Spaces

In every organization, there will be *spaces*; these spaces enable developers to access shared resources that can be used to develop, deploy, and maintain applications. Depending on the type of role you assign the user, he or she will be able to manage the spaces.

Organization and space role management helps you manage authorizations, which enables you to specify the resources that users in your application are allowed to access. Figure 3.10 shows an organization and space role management with a simple example. User A has an *Org Manager* role, so this user can add users to the organization and create, delete, or modify organizations.

![Figure 3.10 Organization and Space Management](image)

Similarly, within every organization, spaces can be managed by the users depending on the type of role the user is assigned to. For example, User 1 has access to manage (administrate) Space 1, and the same user doesn’t have permissions to manage Space 2. However, he will have access to develop applications in and save to Space 2.

The following are the standard roles that are available:
- Space managers are managers or other users who administer a space within an org.
- Space developers are the application developers or other users who manage applications and services in a space.
- Space auditors can view but can’t edit the space.

Within an organization, you can use spaces to group a set of applications, services, and users. Spaces are tied to a specific organization in the SAP HANA XSA cockpit. You can create spaces in an organization based on the delivery lifecycle. For example, you can create a DEV space as a development environment, a TEST space as a testing environment, and a PROD space as a production environment. Then you can give permissions to users to build their applications in and deploy them to the spaces.

By default, an SAP space is created under the SAP HANA, express edition organization. When you install and configure SAP HANA XSA, this SAP space pretty much stores all the applications, services, user authentications, user authorizations, and backend services. SAP recommends creating a separate space for the developers instead of using the default SAP space for the development.

### 3.2.3 Create Organizations and Spaces in SAP HANA XSA

Now that you have a clear understanding of the organizations and spaces management concepts, let’s go ahead and create a space in an organization, and then assign roles to the user. Follow these steps to access organizations:

1. Launch the SAP HANA XSA cockpit, then click **Login** and enter the XSA_ADMIN login credentials. Using the XSA_ADMIN user, you can add orgs and spaces from the **Organizations** page in the cockpit.
2. Click **Organizations**, then select the **HANAExpress** organization (see Figure 3.11).

**Note**

*HANAExpress* in the default organization that comes with the SAP HANA, express edition.
Next, let’s create a space within the default organization in the SAP HANA XSA environment. Because we’ll be deploying all the development objects to this new space, let’s name this new space **DEV**. Complete the following steps to create a DEV space within the organization:

1. Select **Spaces** from the cockpit, and then click **New Space**.

2. Enter a **Space Name**, then select the standard roles **Space Manager** and **Space Developer** (see Figure 3.13).

   **Note**
   
   A user must be assigned at least one of the roles in the space.

3. Click **Save**.

4. Select the DEV space you created in the previous step, then navigate to **Members**.

5. Click **Add Members** (Figure 3.14).

6. Enter the **User ID**, then assign the **Space Developer** role to the user by checking the box (Figure 3.15).

7. Click **OK**.
After you’ve added members to a space, your screen should look like Figure 3.16. You should now see the user added to the DEV space with the space developer role assigned to the user.

Figure 3.15 Assign Roles

After you’ve added members to a space, your screen should look like Figure 3.16. You should now see the user added to the DEV space with the space developer role assigned to the user.

3.2.4 Enabling Spaces

By default, spaces are disabled in an organization. You have to enable spaces so that users can deploy their applications to the space. To enable spaces, complete the following steps:

1. Launch SAP HANA XSA, then click di-space-enablement-ui (Figure 3.17).

   Figure 3.17 Space Enablement

2. Click the Enable button for the space that you want to work with (Figure 3.18).

   Figure 3.18 Enable New Space

3. Make sure the status changes from Not Enabled to Enabled.

   You have successfully set up access to SAP Web IDE for SAP HANA! Next, we’ll launch SAP Web IDE for SAP HANA and take a moment to explore its features.

3.2.5 Launch SAP Web IDE for SAP HANA

In this section, we’ll launch SAP Web IDE for SAP HANA using the new user that we created in the previous section and verify that the user has access to develop objects in SAP Web IDE. Proceed as follows:
1. Launch SAP HANA XSA via https://<host>:39030, then click WebIDE to launch the SAP Web IDE for SAP HANA (Figure 3.19).

![Figure 3.19 Launch SAP Web IDE](image1)

2. Login with the user credentials you created in the previous section. Enter the **User Name** and **Password**, then click **Log On** (Figure 3.20).

![Figure 3.20 SAP Web IDE Login](image2)

3. Change the initial password by entering your username, initial password, and a new password, then click **Change Password** (Figure 3.21).

![Figure 3.21 Change Initial Password](image3)

Now, let’s dive into the various options that are available in SAP Web IDE for SAP HANA. Once you log in, your screen should look something similar to Figure 3.22.

![Figure 3.22 SAP Web IDE for SAP HANA Features](image4)
The menu bar gives access to all the functions and features available in SAP Web IDE. Below the menu bar is the toolbar, which provides access to some of the most commonly used features, such as Save, Delete, Run, and so on. On the left side of the screen are the Development Workspace, Database Explorer, and the User Preferences. When you click the Development Workspace button, you’ll open a screen area next to it, which shows the list of projects and files within a project. You can open a file and see its contents on the right-hand side in the code editor area. If you open several files, then those files will be shown as tabs. On the right side of the screen, you’ll find features such as Search, Git Pane, Git History, Outline, Debugger, and the Test Results pane. On the bottom-right side, you’ll find the Console and the Problems view.

Now, let’s add a connection to the SAP HANA database you will be working with in SAP Web IDE for SAP HANA.

3.3 Projects and Database Models in SAP Web IDE

In SAP Web IDE for SAP HANA, every user will have their own workspace (see Figure 3.22). The source code files that make up your application can be organized into projects within a workspace. In this section, we’ll walk you through the steps to connect the SAP HANA database and SAP Web IDE for SAP HANA. Then we’ll show you how to create a project using a standard multitarget application (MTA) template, and then create an SAP HANA database module.

3.3.1 Connecting SAP Web IDE to the SAP HANA Database

Application development artifacts are stored and managed in the SAP HANA repository, so you need to create a connection in SAP Web IDE for SAP HANA to the SAP HANA database before you can consume tables or load data to or from it.

The following is the list of connection types that are available in the SAP Web IDE for SAP HANA (we’ll cover these different connections in detail in subsequent chapters):

- SAP HANA deployment infrastructure container
- SAP HANA database (multitenant)
- SAP HANA database
- Application managed instance services

In the following exercise, we’ll show you how to connect to the classic SAP HANA database from SAP Web IDE for SAP HANA. As a prerequisite, you need to have a valid user account already created in the SAP HANA database. Proceed as follows:

1. Launch SAP Web IDE for SAP HANA, then click the icon to open the database explorer perspective (see Figure 3.23).

2. Because you’re adding a database for the first time in SAP Web IDE, you’ll see a pop-up message asking if you want to add a database (Figure 3.24). Click Yes.

3. Select SAP HANA Database from the Database Type dropdown list (Figure 3.25).
4. In the database explorer perspective, add the following information (Figure 3.26):
   - In **HOST**, enter the name of the server hosting the SAP HANA database instance, such as HXEHOST.
   - In **Instance Number**, enter the SAP HANA instance number of that SAP HANA server, such as 90.
   - Enter a **User name** and **Password** for the connection.
   - In **Name to Show in the Display**, enter a display name for the system you are adding.

![Figure 3.26 Add Database](image)

5. After adding the database, you will see the connection in the database explorer perspective (see Figure 3.27).

3.3 Projects and Database Models in SAP Web IDE

3.3.2 Creating a Project in SAP Web IDE Using a Template

When you launch SAP Web IDE for the first time, you should see the developer's workspace docked on the left. This is the main point of interaction with your source files. From it, you can create new projects, import files, clone a repository with Git, and so on. You organize your files in terms of workspaces and projects. A project can contain one or more modules representing different applications or different subsystems of a very complex application. A workspace might consist of multiple projects, all of which make up an entire application.

**Multiple Projects**

You can create multiple projects in a workspace, but each project should have a unique name.

It’s now time to put the theory into practice. SAP Web IDE for SAP HANA comes with a standard project template wizard, which makes it easy to create new applications quickly. To conclude this chapter, we’ll build an application using an MTA template that consists of multiple subparts called modules that are developed using different programming paradigms and designed to run on different target runtime environments. In this exercise we’ll focus on the SAP HANA database module, which is a collection of related design-time database artifacts, such as data models, views, or procedures. As a prerequisite, make sure you have set up a user account in SAP HANA XSA (Section 3.2.1) and tested SAP Web IDE for SAP HANA with the new user account (Section 3.2.5). Follow these steps:

1. Launch SAP Web IDE and select the development perspective.
2. Right-click **Workspace**, select **New**, then select **Project from Template** (Figure 3.28).
3. SAP Web IDE comes with one template by default, which is called the multitarget application. Select **Multitarget Application Project** (Figure 3.29), then click **Next**.

4. Enter a **Project Name** (Figure 3.30), then click **Next**.

5. Enter the following details (Figure 3.31), and click **Next**:
   - **Application ID**.
   - **Application Version**.
   - **Description** (optional).
   - **Space**. You will only see the spaces that you have access to. Select the space you created in the previous section.

6. Click **Finish** (Figure 3.32) to create the project in your workspace.
7. Once the project is created, you will see a message in the console: **Workspace Settings Set Successfully** (Figure 3.33).

8. Once the project is created successfully, you will see a project descriptor file called mta.yaml automatically generated under the *Project* folder. This mta.yaml file contains all the settings related to the project.

9. Right-click the project and select **New**, then **SAP HANA Database Module** (Figure 3.34).

You can create the following different types of modules within a project, though we’ll focus only on the SAP HANA database module in this book:
- SAP HANA database module
- Basic HTML5 module

10. Enter a **Module Name** (Figure 3.35), then click **Next**.

11. Select the **SAP HANA Database Version** from the dropdown list (Figure 3.36), then click **Next**.
12. Click Finish to create the module in the project (Figure 3.37).

13. After the module is created, your screen should look similar to Figure 3.38, with the SAP HANA database module and the src folder under the project.

14. Right-click the project, then select Build (Figure 3.39).

15. Once the project is successfully built, you should see a message in the console, something like Build of <Project> Completed Successfully (Figure 3.40).
Congratulations! You have successfully built your first simple project. In coming chapters, you’ll be building all the development objects—tables, information views, script-based views, and so on—under this new project.

3.4 Summary

In this chapter, we introduced SAP Web IDE for SAP HANA and showed you how to set up SAP HANA XSA and SAP Web IDE with the SAP HANA database. At this point, you should understand the different phases of the development process and the options available in SAP Web IDE to develop an SAP HANA database module. You created your first project using the multitarget application standard template and deployed the project. In the next chapter, we’ll introduce the general concepts of information views and the main types of information views.
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