Oracle® Spatial Studio
Guide

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Oracle Spatial Studio Guide, Release 22.3

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Audience

This document is intended for users of the Spatial Studio tool who have one or more of the following responsibilities:

- Administering Spatial Studio. Such users install the tool, and create and manage database users of the tool.
- Using Spatial Studio. Such users are typically data analysts or application developers, or both.

> **Tip:**
>
> If you choose to print the PDF version of this book, and if you do not want to include the licensing details in the printout, print **only pages 1 (title page) through the last page of the last chapter**. (Most of the content of the book consists of license details in Appendix A.)

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Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc.

Access to Oracle Support

Oracle customers that have purchased support have access to electronic support through My Oracle Support. For information, visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info or visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs if you are hearing impaired.

Related Resources

For more information, see these Oracle resources:

- Oracle Technical Resources (formerly called Oracle Technology Network) page: https://www.oracle.com/database/technologies/spatialandgraph.html (and look for Spatial Studio)

- *Oracle Spatial Developer's Guide*

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

Changes in this Release for this Guide

New Features for Oracle Spatial Studio Release 22.3

- Enhanced support for appending custom map regions to an existing target dataset, or adding them to a new target dataset that is automatically created by Spatial Studio.
  See Creating Custom Regions for Visualization for more information.

- Added support to migrate database connections in Spatial Studio between on-premises and Oracle Autonomous Database.
  See Migrating Database Connections for more information.

- Added support for displaying OGC WMS maps as a dataset layer to a map.
  See the following for more information:

  – Creating an OGC WMS Connection

  – Creating an OGC WMS Dataset

  – Visualizing OGC WMS Maps as a Dataset

- Added support for saving pins on a map into a dataset.
  See Saving Pins on a Map Into a Dataset for more information.

- Added support for saving selected features on a map into a dataset.
  See Saving Selected Features on a Map Into a Dataset.

- Enhanced filter analysis that filters on non-spatial attribute columns to allow compound query criteria.
  See Determining the Geometries Filtered By Non-Spatial Attributes for more information.

- Enhanced dataset export to GeoJSON to allow selection of the required geometry column.
  See Exporting a Dataset to GeoJSON for more information.

- Added support for caching the vector tiles, generated for the datasets, to the disk by default.
  See About Cache in Spatial Studio for more information.

- Enhanced support for statistics gathering for spatial analysis and view-based datasets.
  See Updating Statistics for Datasets for more information.

- Added support for applying predefined color codes to map symbols.
  See Applying Predefined Colors to Symbols for more information.

- Added support for an overview map to be displayed in the map visualization.
  See Figure 3-43 for an example.

- Added support to disable or enable the east-west wrap around of the map for visualization.
  See Configuring a Map Visualization for more information.

- Added support for a more flexible and robust layout of multiple visualizations in the project canvas.
  See Multiple Visualizations on a Canvas for an example.

- Date-type table columns can also be used when enabling a Spatiotemporal dataset.
  See Figure 3-51 in Enabling Spatiotemporal for a Dataset.

- Added support to exclude columns that are disabled for a dataset from being visible in the Active Project page.

- Improved performance in GeoRaster virtual mosaic visualization.

- The Quick Start edition of Spatial Studio now shows a *Connection to server is lost* message whenever the server is stopped.

- Oracle Spatial Studio provides REST endpoints that help you to perform various Spatial Studio operations.
  See REST API in Oracle Spatial Studio for more information.

1
Introduction to Oracle Spatial Studio

Oracle Spatial Studio is a visual tool for working with spatial data in Oracle Spatial format.

- **About Oracle Spatial Studio**
  Oracle Spatial Studio, also referred to as Spatial Studio, is a free tool that lets you connect with, visualize, explore, and analyze geospatial data stored in and managed by Oracle Spatial.

- **Spatial Studio Terminology**
  This section introduces the key concepts and domain objects of Oracle Spatial Studio.

- **Spatial Studio Metadata and Connection Management**
  This section provides conceptual information about the metadata schema and the connections object in Spatial Studio.

- **Spatial Studio Best Practices**
  This section describes the best practice recommendations when working with Spatial Studio.

1.1 About Oracle Spatial Studio

Oracle Spatial Studio, also referred to as Spatial Studio, is a free tool that lets you connect with, visualize, explore, and analyze geospatial data stored in and managed by Oracle Spatial.

Spatial Studio is a multiuser Java EE application that can be used as a standalone tool (Quick Start) or deployed to WebLogic Server.

Before you can use Spatial Studio, you must download the kit from Oracle Technical Resources (formerly called Oracle Technology Network), install the software, and perform certain administrative actions like creating database users that are authorized to use the tool, and managing those users.

> **Note:**
>
> Spatial Studio is **not** the Spatial map visualization component (formerly called "MapViewer"), which is not an end-user "tool" but rather a separate and distinct component.
>
> The map visualization component is documented in Spatial Map Visualization Guide.

1.2 Spatial Studio Terminology

This section introduces the key concepts and domain objects of Oracle Spatial Studio.

- **Connection**: Connections are user-created; they provide details so that the Spatial Studio can load user data from an external data source, typically a specific database schema.

- **Dataset**: A dataset is the basic organizational unit of a user's data.

- **Project**: A project is where data visualization and analysis occur. It represents a "workspace" that can be saved and reopened.

- **Published Project**: A published project is a snapshot of the visualizations and analyses that a user has created in a project. It provides an easy way of sharing what users have created within their organization.

- **Analysis**: An analysis is typically one or more (spatial) operations performed on one or more datasets. The operation types and their parameters for an analysis are all stored as part of a *project*. The result of any analysis can be visualized, just like any other dataset.

- **Metadata schema (repository)**: The metadata schema for Spatial Studio is an Oracle Database that contains the repository where all Spatial Studio metadata is centrally managed.

- **User**: Spatial Studio's end users, which are typically business analysts and administrative users. These users are NOT database schema owners; rather they are application users, whose information is typically stored in an LDAP-like directory and whose authentication is carried out by WebLogic Server.

- **Public Dataset**: A public dataset is one with a GeoJSON endpoint that can be accessed without having to log onto the Spatial Studio first. A public dataset is always visible to all the Spatial Studio users and can be used in their projects.

- **Public Published Project (PPP)**: A public published project is a published project where all the datasets involved are public datasets, and the published project itself is also made public. You can embed the visualizations of a public published project in other web applications, or can be viewed standalone in a web browser, without having to log onto Spatial Studio server first.

1.3 Spatial Studio Metadata and Connection Management

This section provides conceptual information about the metadata schema and the connections object in Spatial Studio.

Spatial Studio stores all of its own metadata (such as the definitions of all the datasets and connections created by different users) in a single Oracle Database schema known as the metadata schema, or repository.

This metadata schema is one that Spatial Studio must be able to connect to during initial start up, because all of its essential metadata and states are stored there. This metadata schema can be an Oracle Database devoted solely to Spatial Studio use, or it can be any schema potentially used for other purposes as well, as long as the schema is provisioned for use by Spatial Studio, with the minimum necessary privileges.

The main types of connections are created by Spatial Studio's end users so that they can gain access to a set of data tables stored in potentially several different database schemas, and explore them together in a single project. For each such user-created connection, only its connection details are stored in Spatial Studio's metadata schema, while no actual (raw) data is ever copied or extracted into the metadata schema.

If a schema user name and password are specified when a connection is created in Spatial Studio, this information is securely encrypted before being stored in the metadata schema tables. When a user opens a project that depends on datasets originated from such a connection, then the password is decrypted at that time and a new JDBC connection pool is established. This connection pool is then used by Spatial Studio to run queries against the target table(s) from that connection whenever needed.

By default a connection is **private**, meaning that only the user that created the connection can access it (either in a project or anywhere else). For example, if User A creates a connection, then User B will not be able to see or use that connection or any data from the connection. The only exception is if User B is an admin user, in which case all connections and datasets are fully accessible by User B.

1.4 Spatial Studio Best Practices

This section describes the best practice recommendations when working with Spatial Studio.

Standardize Longitude/Latitude Data on SRID 4326

In Oracle Database, spatial data includes a SRID (spatial reference identifier), which uniquely identifies the coordinate system associated with the data. If you want to perform any spatial analysis operations involving multiple data sets, it is recommended that the data sets have the same SRID.

Many SRIDs can be used for longitude/latitude data, but probably the most widely used is 4326. Oracle recommends that you use SRID 4326 for longitude/latitude geometries unless there is information to indicate otherwise. Also, if you have Oracle tables with longitude/latitude geometries and if the SRID is not consistent across the tables, you are advised to standardize on SRID 4326.

(For detailed information about SRIDs and coordinate system support in Oracle Spatial, see the Coordinate Systems (Spatial Reference Systems) chapter in the Spatial manual.)

The following example transforms geometries that do not use SRID 4326 so that they use SRID 4326. You would need to do these actions for each existing table that does not use SRID 4326. The example assumes a geometry table named TABLE_1 with a geometry column named GEOM. It also drops the existing spatial index named `table_1_idx`, and later re-creates it.

```
-- Drop the existing spatial index.
DROP INDEX table_1_idx FORCE;

-- Update the spatial metadata.
INSERT INTO user_sdo_geom_metadata
  VALUES (
  'TABLE_1',   -- table name
  'GEOM',      -- geometry column name
  SDO_DIM_ARRAY(
    SDO_DIM_ELEMENT('Longitude', -180, 180, 0.05),  -- 0.05 meter tolerance
    SDO_DIM_ELEMENT('Latitude', -90, 90, 0.05)  -- 0.05 meter tolerance
    ),
  4326   -- SRID for 'Longitude / Latitude (WGS 84)' coordinate system
);

-- Update (transform) geometry data to use SRID 4326.
update table_1 set geom = sdo_cs.transform(geom, 4326);
```

```
-- Re-create the spatial index.
CREATE INDEX table_1_idx
ON table_1(geom)
INDEXTYPE IS MDSYS.SPATIAL_INDEX_V2;
```

> **Note:**
>
> In the CREATE INDEX statement, SPATIAL_INDEX_**V2** is recommended if
> the Oracle Database is Release 18 or later. If it is earlier than Release 18,
> specify just SPATIAL_INDEX.

2

Administering Oracle Spatial Studio

Administering Oracle Spatial Studio involves certain actions that must be performed before non-administrative users can work with spatial data. If you are an administrative user of Spatial Studio, you must:

- Download the Oracle Spatial Studio application from Oracle Technical Resources (formerly called Oracle Technology Network) and install it.

- Set up a database schema to be the Spatial Studio schema, that is, to hold metadata for Spatial Studio.
  The Spatial Studio schema can be either an existing database schema in which Spatial Studio metadata will be added, or a newly created schema that will be used only for Spatial Studio.

- Configure the newly installed Spatial Studio application.
  When the installation and configuration actions are completed, users can connect to the database, start Spatial Studio, and use its features.

> **✎ Note:**
>
> The Spatial Studio application can be downloaded in either of the following formats:
>
> - Quick Start: A ready-to-run standalone application packaged in a zip file containing what you need to launch the Spatial Studio web application on your desktop. (You will still need to have JDK 8 64-bit, update 181 or later installed on your desktop, because no Java kit is bundled with this kit.)
>   Quick Start is well suited for personal and development use.
>
> - A WLS-optimized EAR (Enterprise Application aRchive) file. This `.ear` file can be deployed to an existing WebLogic Server domain administered by an organization's WLS or middleware administrator.
>   This is the recommended installation and deployment method if you intend for multiple end users to access the same Spatial Studio web application.

A given person or database user can be *both* an administrative user and a non-administrative user, *or* can be *only* an administrative user or a non-administrative user.

- Prerequisites and Recommendations for Spatial Studio
  This section describes the prerequisites and recommendations that apply for using Spatial Studio.

- Downloading and Installing Spatial Studio
  Spatial Studio must be downloaded and installed before anyone can use it to perform interesting work on spatial data.

- Upgrading Spatial Studio
  You can upgrade your existing Oracle Spatial Studio deployment to a 22.x version.

- Setting Up the Spatial Studio Metadata Schema
  You must set up a database schema to be the Spatial Studio schema, which will
  hold metadata used by the Spatial Studio application.

- Connection Requirements for Database Users of Spatial Studio
  This section describes the connection requirements for database users to work on
  Spatial Studio.

- Changing the Configuration Using the sgtech_config.json File
  This section describes the configuration of important properties in
  `sgtech_config.json` file.

- Recovery from Lost Master Key
  If you accidentally delete or replace the `sgtech_config.json` file, then the master
  key is lost and the Spatial Studio application will throw an error.

- Enabling IDCS as Identity Provider in Spatial Studio
  Starting from Oracle Spatial Studio Release 22.1.0, you can log into your Spatial
  Studio instance using users already managed by your own Oracle Cloud tenancy's
  IDCS identity domain.

2.1 Prerequisites and Recommendations for Spatial Studio

This section describes the prerequisites and recommendations that apply for using
Spatial Studio.

Oracle Spatial must be installed on the database to which any users will connect to
perform actions with Spatial Studio. (It is not sufficient to have only Oracle Locator
installed.)

The following additional requirements and recommendations apply:

- Java versions: Java 8 (64-bit, update 181 or later); or JDK 11 (64-bit).

- Oracle Database 19c or later. This applies both to the Spatial Studio metadata
  schema and to all database connections that will be used by Spatial Studio users.

> **Note:**
>
> Oracle Spatial Studio Releases are backward compatible with supported
> Oracle Database versions.

- Oracle WebLogic Server 12.2.1.3 or later.

- All the privileges listed in section Setting Up the Spatial Studio Metadata Schema
  are required for each database user that works with Spatial Studio.

- Quota on the default tablespace for each database user that works with Spatial
  Studio. ALTER USER statement format: `ALTER USER [username] QUOTA [quota value] ON [default tablespace name];`
  For example, for a user named `test_user` with default tablespace `users`:

  ```
  ALTER USER test_user QUOTA unlimited ON users;
  ```

- The default tablespace for the Spatial Studio repository schema should not use
  compression.

2.2 Downloading and Installing Spatial Studio

Spatial Studio must be downloaded and installed before anyone can use it to perform interesting work on spatial data.

Go to https://www.oracle.com/database/technologies/spatial-studio/get-started.html to see more information for downloading and installing Spatial Studio.

- Installing and Configuring the Spatial Studio Quick Start
  Quick Start is an easy method for getting started, and is well suited for personal and development use.

- Installing Spatial Studio to a WebLogic Server Domain
  Spatial Studio can be deployed to a WebLogic Server domain, the recommended approach if multiple end users will access the same Spatial Studio application.

- Installing Spatial Studio from Oracle Cloud Marketplace
  You can provision Spatial Studio to Oracle Cloud from Oracle Cloud Marketplace.

2.2.1 Installing and Configuring the Spatial Studio Quick Start

Quick Start is an easy method for getting started, and is well suited for personal and development use.

The Quick Start is packaged in a single zip that contains everything you need to start using Spatial Studio, except for Java (64-bit, update 181 or later) and your own database schemas. Before installing the Quick Start, ensure that you meet the following prerequisite requirements:

- You must have Java installed on your system and the `JAVA_HOME` environment variable is pointing to the full JDK installation of Java SE Development Kit. Note that the Quick start installation requires Java 8 (64-bit, update 181 or later) or JDK 11 (64-bit).

- Ports `8080` and `4040` on your system are not being used by any other (web) applications. Port `8080` is used with the `http://` protocol, while port `4040` is for the `https://` protocol. Although you can direct Spatial Studio to use different ports, `8080` and `4040` are the default.
  Note that by default Spatial Studio allows access using `https` only.

You can perform the following steps to install and configure the Spatial Studio Quick Start:

1. Download the Quick Start zip archive `OracleSpatialStudio_qs.zip`.

2. Unzip (extract) the `OracleSpatialStudio_qs.zip` file.

   This results in the `Oracle_Spatial_Studio` directory.

3. Navigate to the `Oracle_Spatial_Studio` directory from a command window (Windows) or terminal (Linux or Mac).

   This directory contains several `.bat` or `.sh` files.

4. Start the Spatial Studio application by running `start.sh` or `start.bat`.

   On Linux or Mac you may need to ensure that the `.sh` files are executable by first running the command: `chmod u+x *.sh`

5. Launch the Spatial Studio web application in your browser using the URL: `https://localhost:4040/spatialstudio`

You can login using the default admin user login credentials - `admin`/`welcome1`. However, it is strongly recommended that you immediately change the password. See the README file in the Quick Start on how to change the (encrypted) password for the admin user.

Also, note the following:

- The default port is 4040. However, you can change the port by editing the `conf/server.json` file in the `Oracle_Spatial_Studio` directory. You must restart the application after you make any change to this file. (The same applies if you change the HTTP port value from the default 8080.)

- The Quick Start provides the following predefined web user login accounts:

  - `admin`: Administrator user account

  - `daustin` and `bruce`: Two regular user accounts

  These predefined users and their login passwords are defined in the `conf/jetty-realm.properties` configuration file. The passwords are all stored in encrypted form. Before you start the application for the first time, it is strongly recommended that you change the password of the default administrator user `admin`. See the README file in the Quick Start on how to change the (encrypted) password for the admin user and other regular Spatial Studio users.

  Also, all other passwords, such as those used to log into the Spatial Studio metadata schema or for any user-created connections to database schemas, are strongly encrypted everywhere.

- The README file also contains information about starting and stopping the web application. To stop the application, the preferred approach is to start a second terminal or command window, then go to the same `Oracle_Spatial_Studio` folder and run the `stop.bat` or `stop.sh` script.

2.2.2 Installing Spatial Studio to a WebLogic Server Domain

Spatial Studio can be deployed to a WebLogic Server domain, the recommended approach if multiple end users will access the same Spatial Studio application.

> **Note:**
>
> A WebLogic Server license is required in order to host Spatial Studio in WebLogic Server for multiple end users.

The general approach for deploying Spatial Studio to WebLogic Server is no different from deploying any other Java EE EAR application. The easiest way to do so is by using the WebLogic Server's Admin console with the following steps. Note that in all or most steps you can accept the default values provided by the WLS Installation Application Wizard.

1. Download the Studio EAR archive from Oracle Technical Resources or eDelivery, and save it to your local system.

2. Log into the target WLS domain's Admin console.

3. Click the **Deployments** link on the left side.

4. Click **Install** button under the Deployments section, as shown in the following figure (note that the exact contents may be different for your instance of WLS).

Figure 2-1   WLS Admin Console for Deploying Spatial Studio
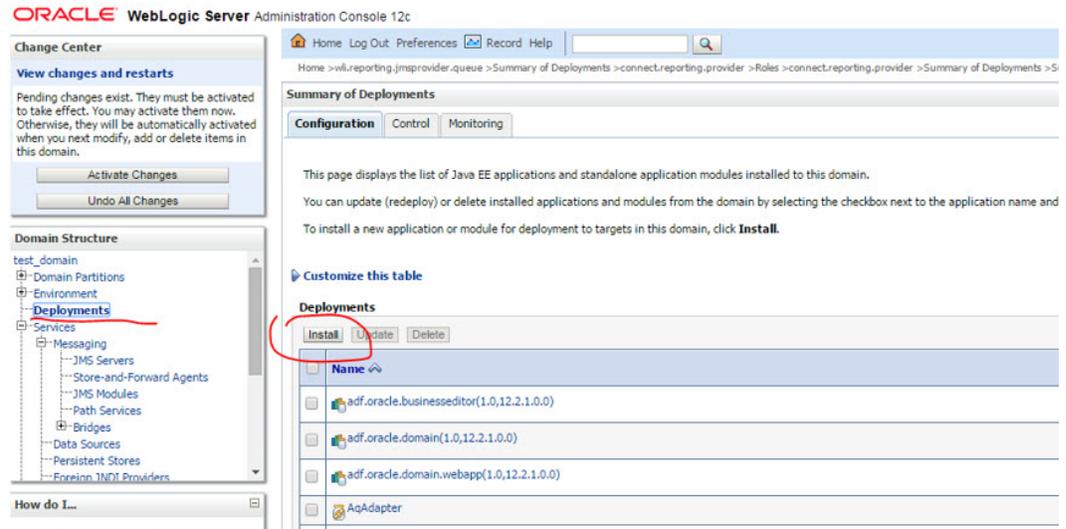
5. On the next page, select the Spatial Studio EAR file downloaded previously, and install it as an application (not as a library).

6. Click through the remaining steps, including selecting the proper target server. You should accept the default options in all cases unless you know exactly what you are doing. Finally, click **Save** to complete the deployment.

7. If your WLS runs in production mode, you may need to activate the changes to ensure the deployment is activated.

8. Make sure the newly deployed Spatial Studio application is marked Active; otherwise, you may need to explicitly start it from the WLS administrative console.

9. Access the Studio application using your managed server's URL with the `/spatialstudio` context root. For example: `http://mycompany.com:7002/spatialstudio`

• Preventing a Spatial Studio Admin User from General WLS Administration
  If you want to prevent a Spatial Studio administrative user from performing other general WebLogic Server administrative operations, follow the instructions in this topic.

2.2.2.1 Preventing a Spatial Studio Admin User from General WLS Administration

If you want to prevent a Spatial Studio administrative user from performing other general WebLogic Server administrative operations, follow the instructions in this topic.

The Spatial Studio application by default allows all WebLogic managed admin users (those who are in WebLogic's **Administrators** group) to log into the Spatial Studio application and assume Admin role inside the Spatial Studio application as well.

However, in some scenarios, your organization may *not* want to provide the WebLogic Server admin account information to the user(s) that will be administering only the Spatial Studio application. In such cases, the WLS system administrator can create a new WLS group with the id value of "**SGTech_SystemAdmin**" in the default WLS security realm. Then, either create a new user or assign an existing non-WLS-admin user to this group. From then on,

this user will assume the admin role of the Spatial Studio whenever logged in, but will not be able to administrate the WLS server in general.

Note that all WLS managed users will be able to log into Spatial Studio by default, but they will be limited to accessing only their own Spatial Studio objects such as connections, datasets, and projects. Administrative users of Spatial Studio will have full access to every Spatial Studio object created by everyone.

2.2.3 Installing Spatial Studio from Oracle Cloud Marketplace

You can provision Spatial Studio to Oracle Cloud from Oracle Cloud Marketplace.

See Deploy Spatial Studio from Cloud Marketplace for more information on deploying Spatial Studio from Cloud Marketplace.

2.3 Upgrading Spatial Studio

You can upgrade your existing Oracle Spatial Studio deployment to a 22.x version.

The following sections explain the steps for upgrading Spatial Studio in an existing host (in-place upgrade) or when deploying to a new host (out-of-place upgrade).

- Prerequisite Tasks for Upgrading Spatial Studio
- In-Place Upgrade
- Out-of-Place Upgrade

2.3.1 Prerequisite Tasks for Upgrading Spatial Studio

Perform the following prerequisite steps to prepare for Spatial Studio upgrade:

1. Stop all running Spatial Studio instances.
2. Take a backup of the following artifacts:
   - Repository database schema
   - Working directory (generally, `~/.sgtech`)
   - **sgtech_config.json** configuration file which is generally located in the working directory
3. Download the required Spatial Studio version and upload it to the host to be upgraded

2.3.2 In-Place Upgrade

Perform the following steps for an in-place Spatial Studio upgrade:

1. Remove all the pre-cached tiles if upgrading from **Spatial Studio 19.x or earlier** to any 22.x version. Otherwise, skip this step.

   To remove all the pre-cached tiles, delete the **cache** subfolder from the application's working-directory. For example:

   ```
   rm -R ~/.sgtech/cache
   ```

2. Redeploy the Spatial Studio application.

- **For Quick Start:** Rename the old Quick Start folder. Expand the newly downloaded ZIP file and run **start.sh** (Linux) or **start.cmd** (Windows).

- **For EAR deployment:** Follow the instructions of your application server to delete the old deployment version. Then, deploy the new version and start the application.

3. Refresh statistics for all datasets if upgrading from **Spatial Studio 20.x or earlier**. Otherwise, skip this step.

   To refresh the dataset statistics, navigate to the **Datasets** page and select **Update statistics** from the action menu for each dataset.

2.3.3 Out-of-Place Upgrade

Perform the following steps for an out-of-place Spatial Studio upgrade:

1. Create the working directory in the new host.

```
mkdir ~/.sgtech
```

2. Copy the `sgtech_config.json` configuration file from the working directory of the old host to the new host.

```
cp old/sgtech_config.json ~/.sgtech
```

   If the **master_seed** entry in the configuration file is lost, all connection passwords will be broken. If this occurs, proceed with the upgrade, then log into the upgraded Spatial Studio instance, edit each connection by re-entering the password, and reconnect.

3. Deploy the Spatial Studio application.

   - **For Quick Start:** Simply expand the newly downloaded ZIP file and run **start.sh** (Linux) or **start.cmd** (Windows).

   - **For EAR deployment:** Follow the instructions of your application server to deploy the new version and start the application.

   When the application is started, the repository database schema will automatically be upgraded.

4. Refresh statistics for all datasets if upgrading from **Spatial Studio 20.x or earlier**. Otherwise, skip this step.

   To refresh the dataset statistics, navigate to the **Datasets** page and select **Update statistics** from the action menu for each dataset.

2.4 Setting Up the Spatial Studio Metadata Schema

You must set up a database schema to be the Spatial Studio schema, which will hold metadata used by the Spatial Studio application.

The Spatial Studio schema can be either an existing database schema in which Spatial Studio metadata will be added, or a newly created schema that will be used only for Spatial Studio. The recommended practice is to create a new database user that will be used only by Spatial Studio. The database user for the Spatial Studio schema must have the following privileges:

- CONNECT

- CREATE PROCEDURE
- CREATE SEQUENCE
- CREATE SESSION
- CREATE SYNONYM
- CREATE TABLE
- CREATE TRIGGER
- CREATE TYPE
- CREATE VIEW

> **Note:**
>
> The CREATE TRIGGER privilege is required only if you intend to store and display GeoRaster data in the schema.

For example, when connected as a user with DBA privileges:

```
SQL> create user SPATIAL_STUDIO identified by <password>;
SQL> grant connect, create procedure, create sequence, create session,
create synonym, create table, create trigger, create type, create view
to SPATIAL_STUDIO;
```

When the Spatial Studio application starts running for the first time, it will generate a configuration file in a folder named **.sgtech** under the current user's operating system home folder. The configuration file is named sgtech_config.json. This is where Spatial Studio application will be obtaining and storing the connection details in its metadata schema.

After the connection to the metadata schema is established, the Spatial Studio application will automatically check if the required tables and other database objects are already present, and if their versions are up to date with the latest Spatial Studio application software. If these tables are not found, or if the tables require migration, the Spatial Studio application will run the necessary SQL scripts to create or migrate them, all without any intervention from the user.

The Spatial Studio schema will contain the following tables and views:

- SGTECH_OBJECT: stores all the domain objects for Spatial Studio.
- SGTECH_SYS_TYPE: defines all the known types of domain objects of Spatial Studio.
- SGTECH_SYS_JSON_SCHEMA: stores JSON data schema.
- SGTECH_TASK_QUEUE: stores long-running jobs of Spatial Studio.
- SGTECH_TASK_BROKER: stores job brokers for Spatial Studio.

> **Note:**
>
> Do **not** add, delete, or edit any of the Spatial Studio tables or views or the data within them. They are automatically maintained by Spatial Studio, and should not be modified by users unless directed by Oracle Support.

Managing Metadata Schema when Running Multiple Instances of Spatial Studio

Spatial Studio prevents you from running multiple application instances each having its own `sgtech_config.json` file from using the same metadata schema. In case you want to run another instance, it is recommended that you copy the `sgtech_config.json` configuration file linked to the initial instance to the system where you want to start the new instance.

Otherwise, any attempt to connect to the same metadata schema from an instance running on a different system is prevented by Spatial Studio with the following warning:

```
The selected repository is already registered to another instance of Spatial
Studio. Check the system logs for more details.
```

2.5 Connection Requirements for Database Users of Spatial Studio

This section describes the connection requirements for database users to work on Spatial Studio.

Each individual user must connect as a database user who is authorized to run Spatial Studio. A Spatial Studio administrator can enable access for the database users.

You can create new database users specifically for Spatial Studio access, or you can modify existing database users to enable Spatial Studio access, or you can do a combination of these approaches.

All database users must have a minimum set of privileges. In addition, each database user that works with Spatial Studio must have quota on its default tablespace. The privilege and quota requirements are explained in Prerequisites and Recommendations for Spatial Studio.

2.6 Changing the Configuration Using the sgtech_config.json File

This section describes the configuration of important properties in `sgtech_config.json` file.

By default, Spatial Studio will create (if it does not already exist) and use a JSON file named `sgtech_config.json` for most of its essential configuration information.

This file is typically found in the operating system user's home directory, in a subfolder named `.sgtech`. This is true whether you deployed the application EAR to a WebLogic domain or you are just using the Quick Start.

> **✎ Note:**
>
> You must safeguard the `sgtech_config.json` file and ensure it has a backup
> on a regular basis. If this file is lost, you will lose the master key that Spatial
> Studio used to encrypt sensitive information, such as the database schema
> password for your data connections. This means that next time you start up
> Spatial Studio, it will no longer be able to decrypt such information, and none
> of your data connections will be usable, as well as all the datasets in them. In
> such a scenario, refer to Recovery from Lost Master Key for more
> information.

The following topics describe some important properties in the configuration file that a
system administrator should be aware of:

- Allow HTTPS-ONLY Access
- Connecting to the Spatial Studio Metadata Schema
- Caching Metadata Objects
- Importing Additional Configuration Files in Spatial Studio
- If the Spatial Studio Repository Schema Password Has Been Changed

2.6.1 Allow HTTPS-ONLY Access

One of the top level properties in the sgtech_config.json config file is **_https_only_**.
When this value is set to **true** (the default), Oracle Spatial Studio will actively monitor
all incoming requests and only allow requests that were made using SSL. Normal
`http://` requests will be denied.

Thus, if you tried to access the Spatial Studio application using an `http://` URL such
as `http://localhost:8080/spatialstudio`, and if the value of `https_only` is set to
`true`, then you will not be able to log in. In fact, you will not even see the login page
itself, because none of the page resources will be accessible by your browser.
Similarly, all RESTful requests will be blocked unless accessed using HTTPS.

If your environment (such as WebLogic Server) supports only `http` access, then you
can change the value of `https_only` to `false`, and make sure to restart the Spatial
Studio application or the JavaEE container where Spatial Studio is deployed.

2.6.2 Connecting to the Spatial Studio Metadata Schema

Spatial Studio must have access to a set of metadata tables, such as
SGTECH_OBJECT. These tables are collectively considered the repository of the
Spatial Studio application. The database schema that hosts these tables is considered
the metadata schema or repository schema of Spatial Studio.

Spatial Studio must be able to establish a connection to this metadata schema as the
first step during startup, when the connection details are found in the
`sgtech_config.json` file in the _metadata_schema_ section.

In an emergency situation, you can also manually edit this section to change or correct
the connection details. However, be careful whenever editing this file, because any
syntax error can cause Spatial Studio to stop working or fail to restart.

When you manually enter the repository schema connection details in the
`sgtech_config.json` file (in the *metadata_schema* section), you must first specify whether
CONTAINER or SPATAL_STUDIO is managing the physical JDBC connections:

```
"metadata_schema" : {
    "connection_manager": "CONTAINER"
}
```

Or

```
"metadata_schema" : {
    "connection_manager": "SPATIAL_STUDIO"
}
```

When `connection_manager` is set to *CONTAINER*, it means the JDBC connections to the
Spatial Studio's repository schema are managed through a Java EE data source already
created in Jetty (for Quick Start) or WebLogic Server. For example, if there is a data source
named `jdbc/studioMetadata` in the WLS domain, and if you want Studio to connect to the
target schema using this data source, the relevant section in `sgtech_config.json` should
look like this:

```
"metadata_schema" {
"connection_manager" : "CONTAINER",
"container_managed":{
        "jndi_datasource_name" : "jdbc/studioMetadata"
}
}
```

> **Note:**
>
> As of Spatial Studio Release 19.2, you cannot enter the container-managed
> connection details in the Spatial Studio application, so manually editing
> `sgtech_config.json` file is the only supported approach.

However, if you want Spatial Studio to manage the physical connections to its metadata
schema, set `connection_manager` to *SPATIAL_STUDIO*, and supply the full set of JDBC
connection details, which vary depending on whether the schema resides in an Oracle
Autonomous database (which requires a database Wallet for establishing connections), or a
regular database on-premises. You can check the inline comments inside the
`sgtech_config.json` file for more details, but it is best if you simply log onto Spatial Studio as
an admin user and then interactively supply the connection details for the repository schema.
Such details will then be automatically saved in `sgtech_config.json` after Spatial Studio
verifies the connection.

2.6.3 Caching Metadata Objects

During run time as users create connections, datasets, and projects, Spatial Studio is
creating, modifying, and storing a large amount of metadata (sometimes called Spatial

Studio's "domain objects"), such as the definition of a dataset and all of its columns, or the definition of a project including the full layout of all of its visualizations.

All the metadata objects are permanently stored in the metadata table SGTECH_OBJECT, but if the database must be accessed frequently (such as every time you open a project or view the properties of a dataset), performance may suffer. If this occurs, the solution is to **cache** frequently accessed copies of such metadata objects in memory.

The *cache* section of the sgtech_config.json file lets you specify whether to enable such an in-memory cache of metadata objects. If the cache is enabled, then you can further specify how many such objects can be cached and for how long. A general rule is that *max_size* (the maximum number of metadata objects to be cached) should be no less than 1000, but probably should not exceed 10000 unless you have a very large amount of memory allocated to Spatial Studio.

2.6.4 Importing Additional Configuration Files in Spatial Studio

Spatial Studio 22.1 allows you to import different configuration files into the main **sgtech_config.json** configuration file.

The following describes the workflow for handling multiple configuration files:

Figure 2-2   Workflow to Handle Multiple Configuration Files
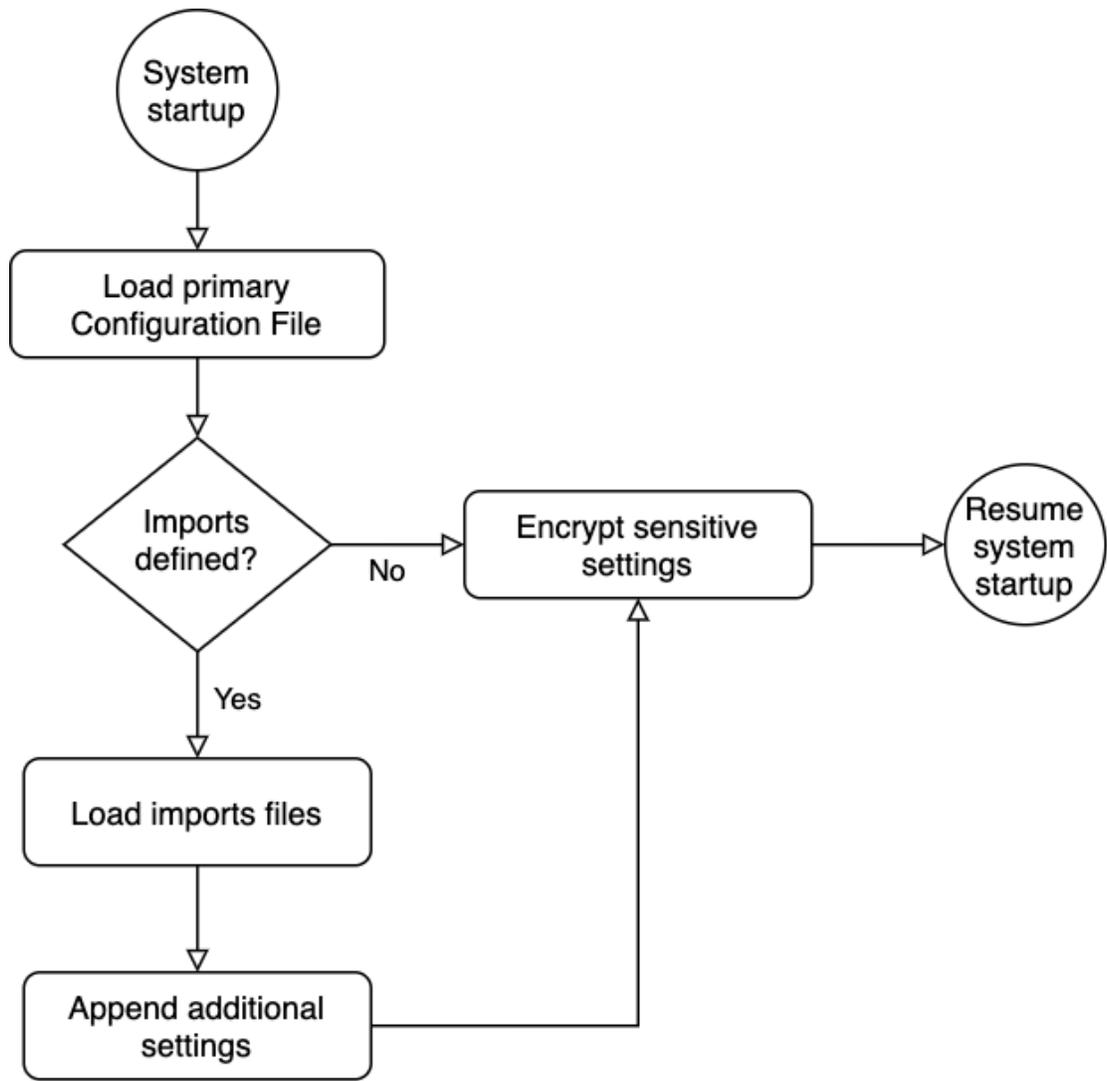
1. At startup, Spatial Studio loads the primary configuration file, `sgtech_config.json`. All the settings defined in `sgtech_config.json` are used as the *base settings*.

2. If the `sgtech_config.json` file contains the `imports` directive, then it loads the import files in the order (top to bottom) in which they are declared.
   For each loaded import file, the system reads and appends the settings to the *base settings*.

3. Once the *base settings* are all read in, the system encrypts any sensitive items and saves them back to their corresponding file.

4. Spatial Studio resumes loading the rest of the system.

Adding `imports` to `sgtech_config.json`

You can edit the `sgtech_config.json` file and add the new top-level `imports` directive as shown:

```
"imports" : {
   "<import_name>" : {
      "module" : "<import_file_path>",
      "description" : "<import_description>"
   }
}
```

In the preceding code:

- **<import_name>**: Name of the import file which must be unique. This is used mainly by Spatial Studio to report errors when loading `imports` files.

- **<import_file_path>**: The file path for the `imports` files must be relative to the containing directory of the main configuration file (*~/.sgtech/ sgtech_config.json*).

- **<import_description>**: To describe the purpose of the import. `description` is an optional parameter for the `imports` property.

For example, configure the `metadata_schema` details as shown in the following code in *sgtech_config.dbsettings.json* file. The file path can be ~/.sgtech/extras/ sgtech_config.dbsettings.json:

```
{
  "metadata_schema" : {
    "connection_manager" : "CONTAINER",
    "container_managed" : {
      ...
    },
  }
}
```

Also, configure the `jobs` details separately in **sgtech_config.jobs.json** following the file path ~/.sgtech/extras/sgtech_config.jobs.json:

```
{
  "jobs" : {
    "init_threads_count" : 45
  }
}
```

You can now include the preceding two configuration files in the `imports` directive in the main `sgtech_config.json` file (*~/.sgtech/sgtech_config.json*) as shown:

```
{
  "version" : "22.1.0",
  "work_dir" : "",
  "https_only" : true,
```

```
      "master_seed" : "<somerandommasterseed>",
      "logging" : {
        "level" : "INFO"
      },
      "imports" : {
        "jobs" : {
          "module" : "extras/sgtech_config.jobs.json"
        },
        "db" : {
          "module" : "extras/sgtech_config.dbsettings.json",
          "description" : "Database settings optimized for clustering"
        }
      }
    }
```

Import Files Requirements

It is important you adhere to the following requirements when handling multiple import files:

- Files for `imports` must be located inside the same directory as the primary `sgtech_config.json` file, or any of its subdirectories.

- Settings included in the `imports` files must not make collision with settings declared already in other configuration files, including the primary `sgtech_config.json` configuration file.

- Since `imports` files can contain sensitive data, only the file owner must have read, write or both access.

- `version`, `work_dir`, `master_seed` and `imports` are settings which are restricted to the primary configuration file, `sgtech_config.json` .

2.6.5 If the Spatial Studio Repository Schema Password Has Been Changed

If the Spatial Studio Repository Schema Password has been changed, you must update the `sgtech_config.json` configuration file, as follows:

1. Make a backup copy of the file. For example, copy `~/.sgtech/sgtech_config.json` to `~/.sgtech/sgtech_config.json_backup`.

2. On the Spatial Studio compute node, edit the file `~/.sgtech/sgtech_config.json`.

3. In the metadata_schema section, update `database_password` to the desired value.

4. Save the file and then restart the Spatial Studio deployment. To restart if you are using the Quick Start kit, see the README file for the Quick Start; to restart if this is a WebLogic Server deployment, use the WebLogic Server console.

5. Open the Spatial Studio application. You should be able to log in.

You will still have all the artifacts you had created, including other (non-repository) connections, which you can edit as needed.

2.7 Recovery from Lost Master Key

If you accidentally delete or replace the `sgtech_config.json` file, then the master key is lost and the Spatial Studio application will throw an error.

The `sgtech_config.json` file includes a `master seed` property which contains the master key value that enables decryption of encrypted items such as database passwords. It is therefore recommended to backup your `sgtech_config.json` file in a safe location.
However, if you lose the `sgtech_config.json` file, then it is possible to recover from a lost master key by performing the following steps:

1. Stop the Spatial Studio instance by running the following command from the application installation directory:

   ```
   ./stop.sh
   ```

   If you installed the application from the Cloud Marketplace, then use the following command:

   ```
   sudo systemctl stop spatialstudio
   ```

2. Run the following command in your Spatial Studio repository using a SQL client (such as Database Actions, SQL Plus or SQL Developer):

   ```
   DELETE
       "SGTECH_OBJECT"
   WHERE
       "TENANTID" = 'GLOBAL'
       AND "ID" IN ('id__sgtech.safe_text.magicword',
   'id__sgtech.key_pair.rsa');

   COMMIT;
   ```

3. Start Spatial Studio by running the following command from the application installation directory:

   ```
   ./start.sh
   ```

   If you installed the application from the Cloud Marketplace, then use the following command:

   ```
   sudo systemctl start spatialstudio
   ```

4. Log into Spatial Studio as the `admin` user.

5. Navigate to the **Connections** page.

6. Right-click on each connection, select **Edit**, and re-enter the password for each connection.

7. Open **Access Tokens** dialog and delete each active token.

8. Navigate to the **Administration** page.

9. Optionally, if you had created a custom basemap with a separate API key, then re-enter the **API Key** by editing the required custom basemap.

   Click **Basemaps** under **Settings** to view and edit your custom basemap.

10. Optionally, if you had created a Cesium basemap with a separate API key, then re-enter the **API Key** by editing the required Cesium basemap.

    Click **Cesium Basemaps** under **Settings** to view and edit your Cesium basemap.

2.8 Enabling IDCS as Identity Provider in Spatial Studio

Starting from Oracle Spatial Studio Release 22.1.0, you can log into your Spatial Studio instance using users already managed by your own Oracle Cloud tenancy's IDCS identity domain.

The workflow to setup IDCS as the identity provider for Spatial Studio involves the following three steps:

1. Adding Spatial Studio roles as Groups in IDCS.
2. Creating an Application in IDCS.
3. Copying IDCS settings into Spatial Studio's configuration file.

Before you begin, see Prerequisite Requirements for Setting Up IDCS with Spatial Studio to ensure that you meet all the prerequisite requirements.

- Prerequisite Requirements for Setting Up IDCS with Spatial Studio
- Adding Spatial Studio Role as a Group in IDCS
  You must add the system administrator role supported in Spatial Studio as a group in IDCS.
- Creating an Application in IDCS
  This section describes the steps to add the Spatial Studio application in IDCS.
- Copying IDCS Settings into Spatial Studio's Configuration File
  To integrate Spatial Studio with IDCS, you must add the IDCS settings into the `sgtech_config.json` configuration file.
- Testing IDCS Login
  After all the setup steps are completed, you can test and verify the IDCS login.

2.8.1 Prerequisite Requirements for Setting Up IDCS with Spatial Studio

To integrate IDCS with Spatial Studio, you must obtain the following details:

- Identify your **IDCS tenant**: See Retrieving IDCS Instance details .
- Identify your **IDCS host**: See Retrieving IDCS Instance details .
- Identify the **Spatial Studio URL**: *https://localhost:4040/spatialstudio/* is the default.
- Setup an **IDCS admin account**: See About Oracle Identity Cloud Service User Accounts and Groups for details.
- Identify **IDCS console URL**: See Determining the IDCS Console URL for more information.

Retrieving IDCS Instance details

You can obtain the IDCS instance details by inspecting any of the IDCS URLs. For instance, you can inspect the IDCS login URL which you receive in the email when you are added as a user in IDCS. For example, consider the following sample IDCS cloud account login URL:

```
https://
idcs-54656e616e742d4578616d706c652121.identity.oraclecloud.com/ui/v1/
signin
```

You can now derive the IDCS instance details from the preceding URL as shown:

- **IDCS tenant**: *idcs-54656e616e742d4578616d706c652121*

- **IDCS host**: *identity.oraclecloud.com*

- Determining the IDCS Console URL
  OCI tenancies include a default IDCS instance and you can obtain the IDCS console URL using the OCI console.

2.8.1.1 Determining the IDCS Console URL

OCI tenancies include a default IDCS instance and you can obtain the IDCS console URL using the OCI console.

Perform the following steps to identify the URL to access IDCS console:

1. Sign in to the OCI console using your Oracle Cloud credentials.

2. Open the navigation menu and select **Identity and Security**.

3. Click **Federation** under **Identity**.

   The Federation page opens as shown:

   Figure 2-3   Default IDCS Instance on the Federation Page
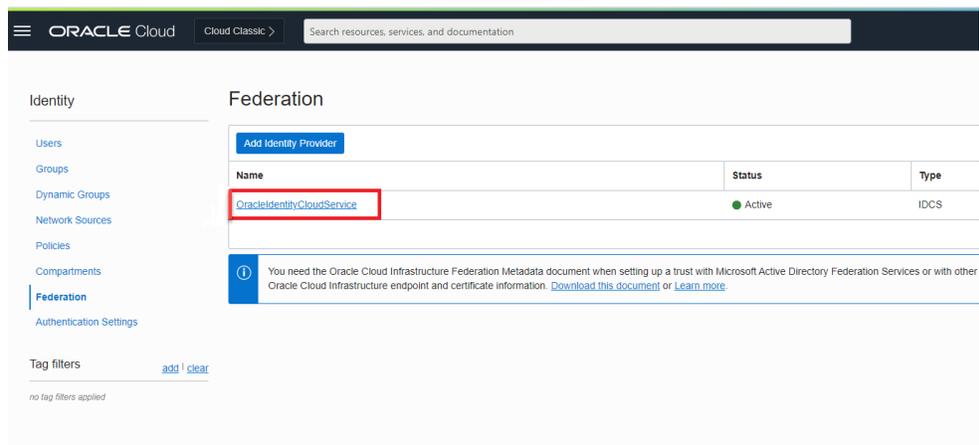
4. Click on the default IDCS instance, shown highlighted in the preceding figure.

   The **Identity Provider Details** page opens.

5. Note the IDCS console URL in the **Oracle Identity Cloud Service Console** field as shown:

Figure 2-4   IDCS Console URL
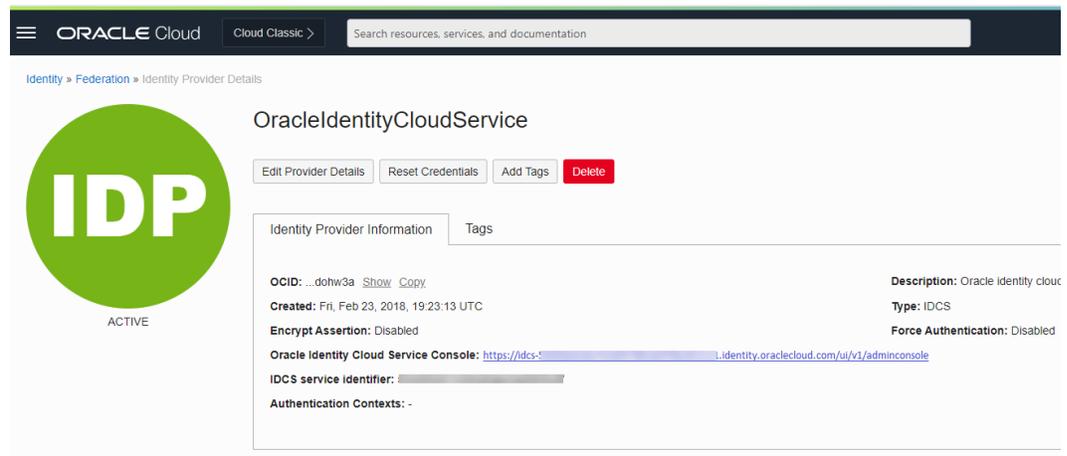
2.8.2 Adding Spatial Studio Role as a Group in IDCS

You must add the system administrator role supported in Spatial Studio as a group in IDCS.

The system administrator role in Spatial Studio is identified by ***SGTech_SystemAdmin***. This implies that the administrator has full access to the entire system.
You need to add this role as an IDCS group. However, the following applies:

- Users assigned to this group will have admin rights in the Spatial Studio instance that is being set up.

- Users who do not belong to this group will have regular access to the Spatial Studio instance when added to the IDCS application.

As a prerequisite, you must obtain the IDCS console URL. See Determining the IDCS Console URL for details.

Perform the following steps to create the groups in IDCS:

1. Open the IDCS login page using the IDCS console URL in your browser.

2. Enter the ADMIN user credentials and sign in as shown:

Figure 2-5   IDCS Login
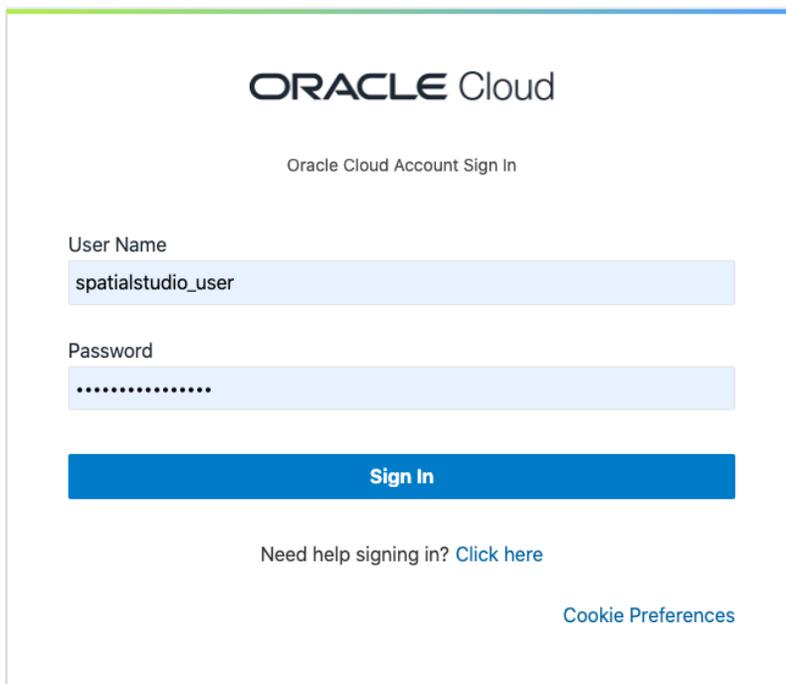
3. Open the navigation menu on top left, select **Groups** and click **Add** to create a new group as shown:

Figure 2-6   Adding an IDCS Group
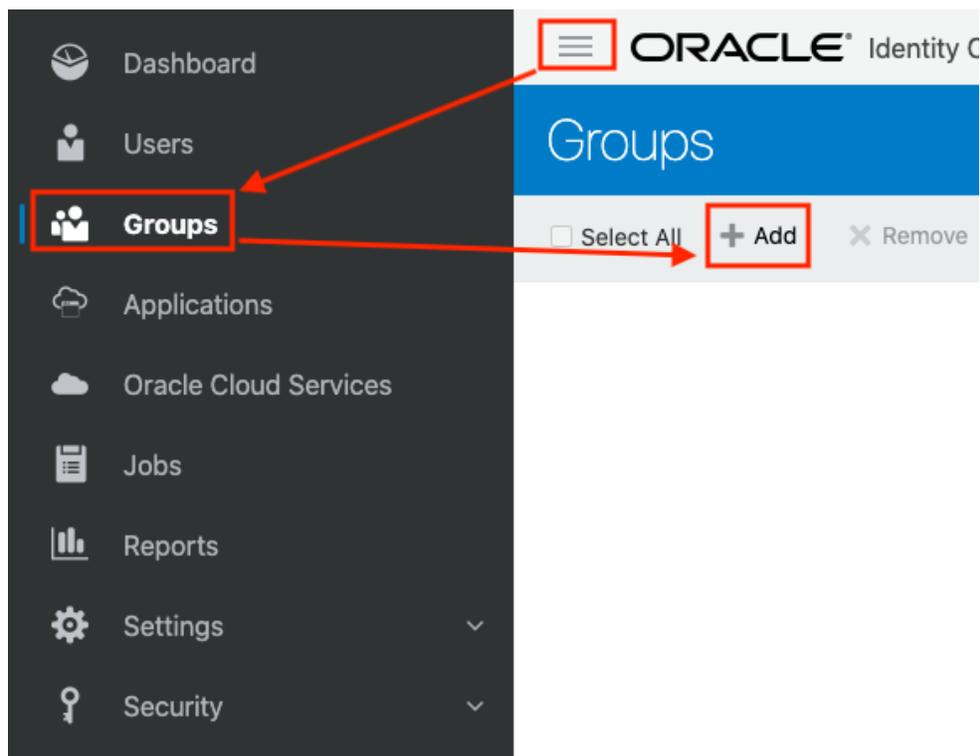
The **Add Group** dialog opens and displays the **Step 1: Group Details** page.

4. Enter **Name** as *SGTech_SystemAdmin*.

   Note that the role name is case sensitive.

5. Optionally, enter a **Description**.

6. Click **Next** as shown:

Figure 2-7   Step-1: Group Details

Step 2: Assign Users to Group (Optional) page opens listing all the existing users.

7. Select the required user and click **Finish**.

   For example, the following figure shows assigning *spatialstudio_user* to the group role *SGTech_SystemAdmin*:

Figure 2-8   Step2: Assign Users to a Group
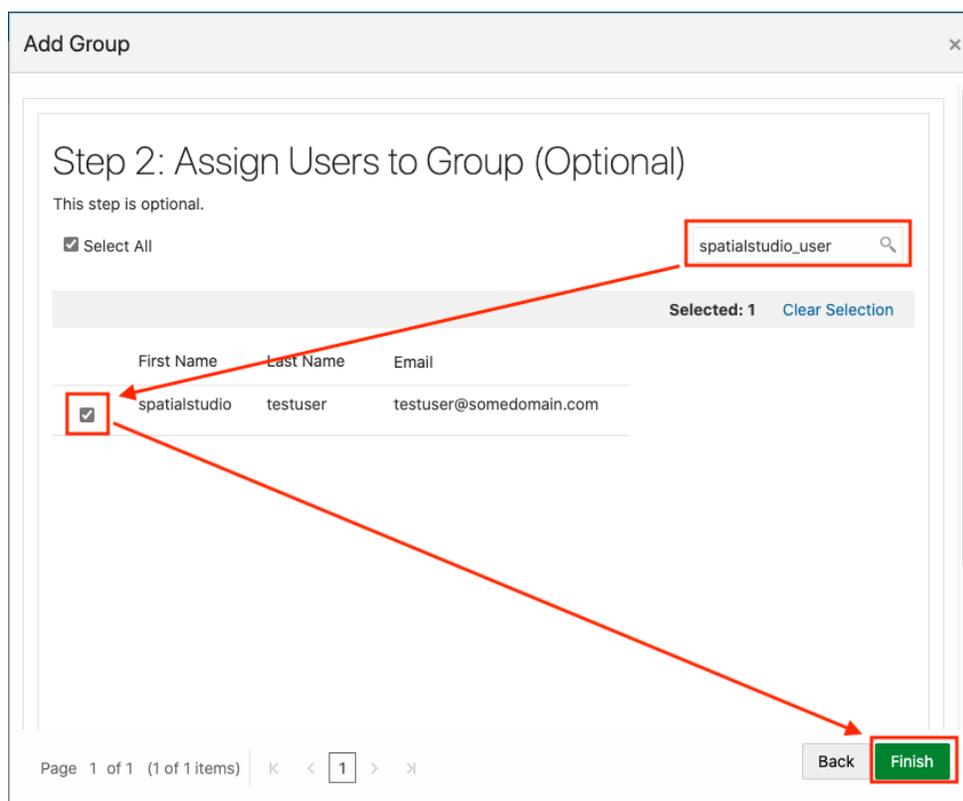
8. Verify that the newly added group is listed on the **Groups** page:

Figure 2-9   List of Groups
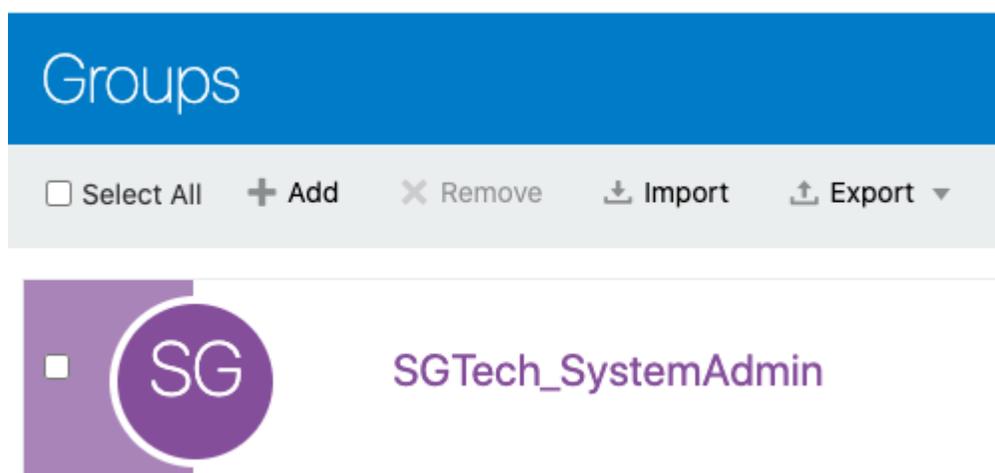
2.8.3 Creating an Application in IDCS

This section describes the steps to add the Spatial Studio application in IDCS.

1. Sign in to IDCS using ADMIN user credentials.

2. Open the navigation menu on top left, select **Applications** and click **Add** to add a new application as shown:

Figure 2-10   Adding an Application
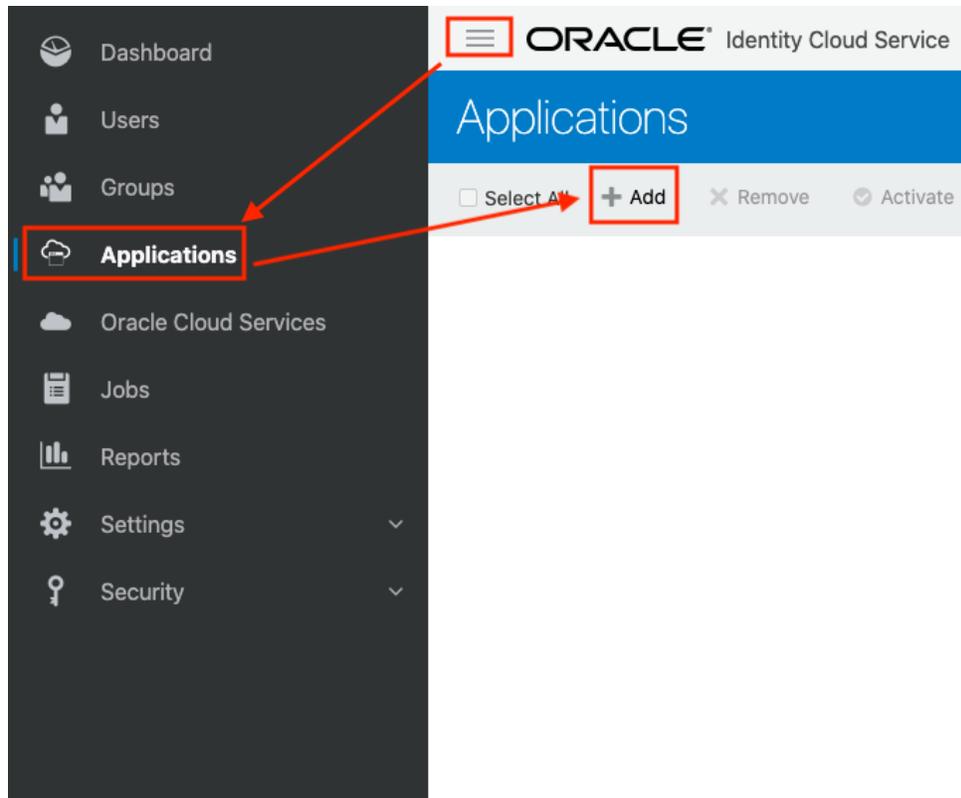
The **Add Application** dialog opens.

3. Select **Confidential Application**.

Figure 2-11   Add Application Dialog
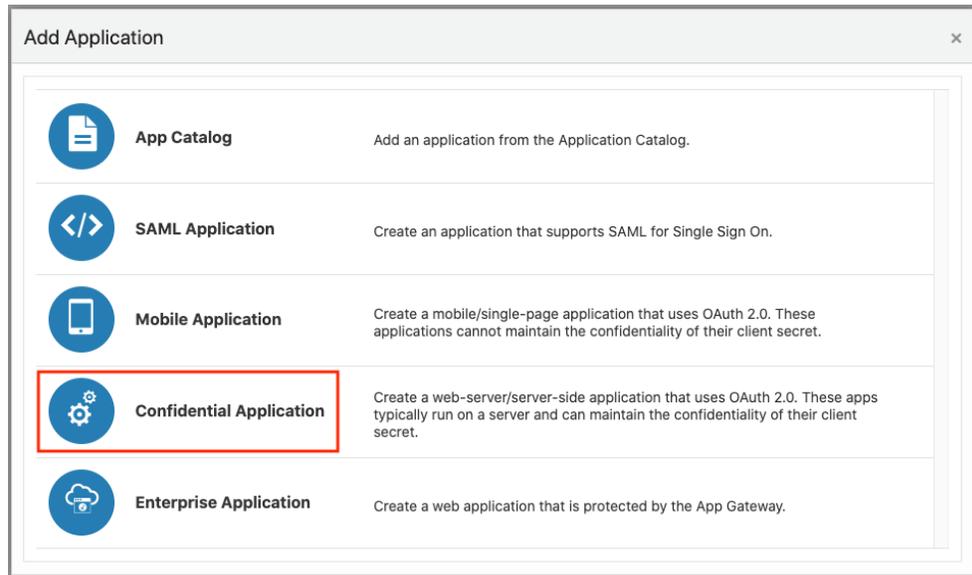
The **Add Confidential Application** wizard opens displaying the **Details** page.

4. Enter the application **Name**.

5. Optionally, add a **Description** and click **Next**.

Figure 2-12   Add Confidential Application: Details Page
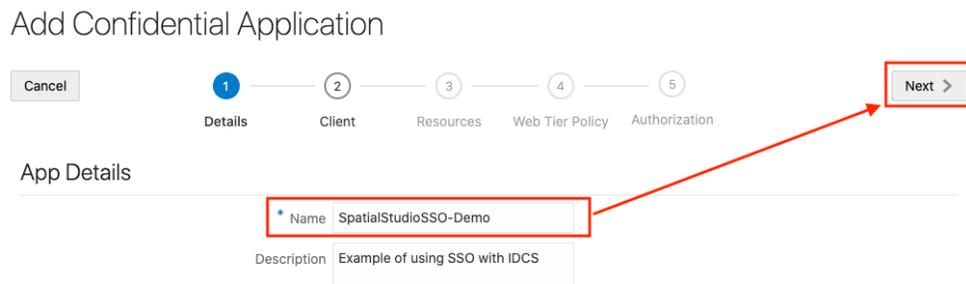
The **Client** page opens.

6. Click **Configure this application as a client now** to configure the authorization information for the new application.

    Perform the following in the **Authorization** section:

    a. Enable **Client Credentials** and **Authorization Code** for **Allowed Grant Types**.

    b. Enter *<spatial_studio_url>/idcscallback* in **Redirect URL**.

    c. Enter *<spatial_studio_url>* in **Post Logout Redirect URL**.

    d. Optionally, for **Security**, you can enable **Trusted Client** to import a custom certificate.

Figure 2-13   Configuring Client Details

Perform the following in the **Token Issuance Policy** section:

a.   Click **Add** under **Grant the client access to Identity Cloud Service Admin APIs** to enable the application to access IDCS APIs.
     The **Add App Role** window opens listing the application roles.

b.   Select *Me* and *Authenticator Client* and click **Add** to assign these application roles to the application as shown:

Figure 2-14   Configuring Token Issuance Policy

    c. Click **Next** on the top right of the page to continue.

7. Skip **Resources** and **Web Tier Policy** by clicking the **Next** button and navigate to the **Authorization** page.

8. Enable the **Enforce Grants as Authorization** option.

9. Click **Finish**.

Figure 2-15   Configuring Authorization
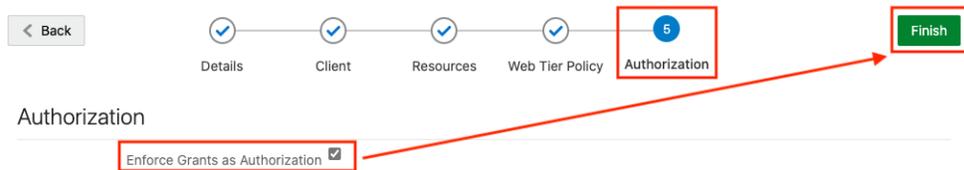
The application is added and the **Application Added** dialog box opens.

Figure 2-16   Confirmation Dialog
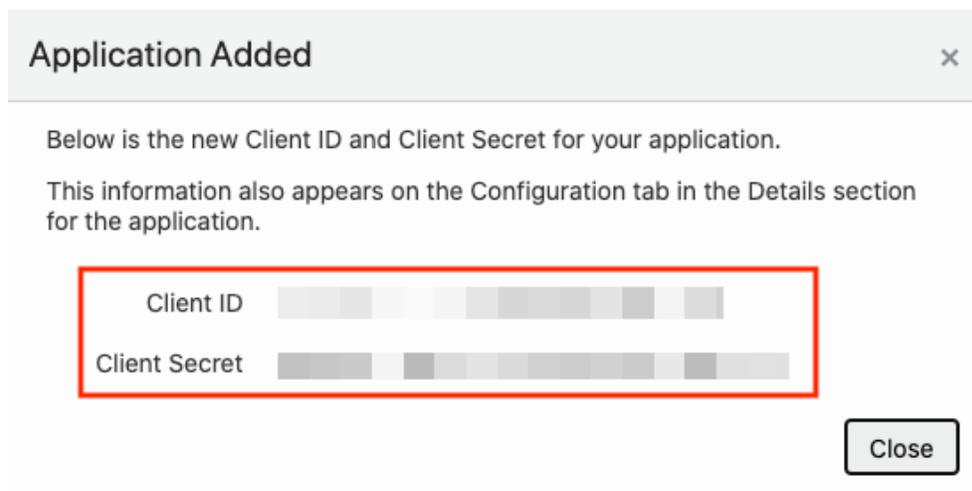
10. Note the **Client ID** and **Client Secret** to be used later to complete the configuration.

> 💡 **Tip:**
>
> You can also obtain the client credentials for the application from the **Configuration** tab in the **General Information** section, once the application is activated.

11. Click **Close**.

The new application's **Details** page is displayed.

12. Click **Activate** to grant users access to the application and confirm the operation on the prompt that follows.

Figure 2-17   Confirmation for Activating Application
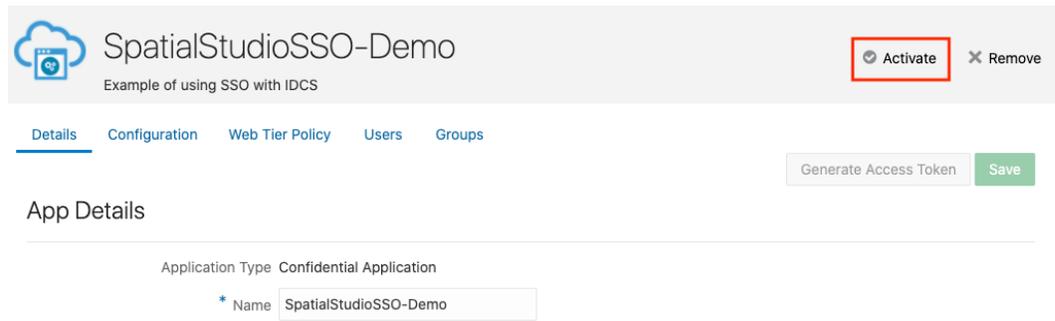
13. Click the **Groups** tab and then click **Assign** to add the group created in Adding Spatial Studio Role as a Group in IDCS as shown:

Figure 2-18   Assigning Groups to an Application
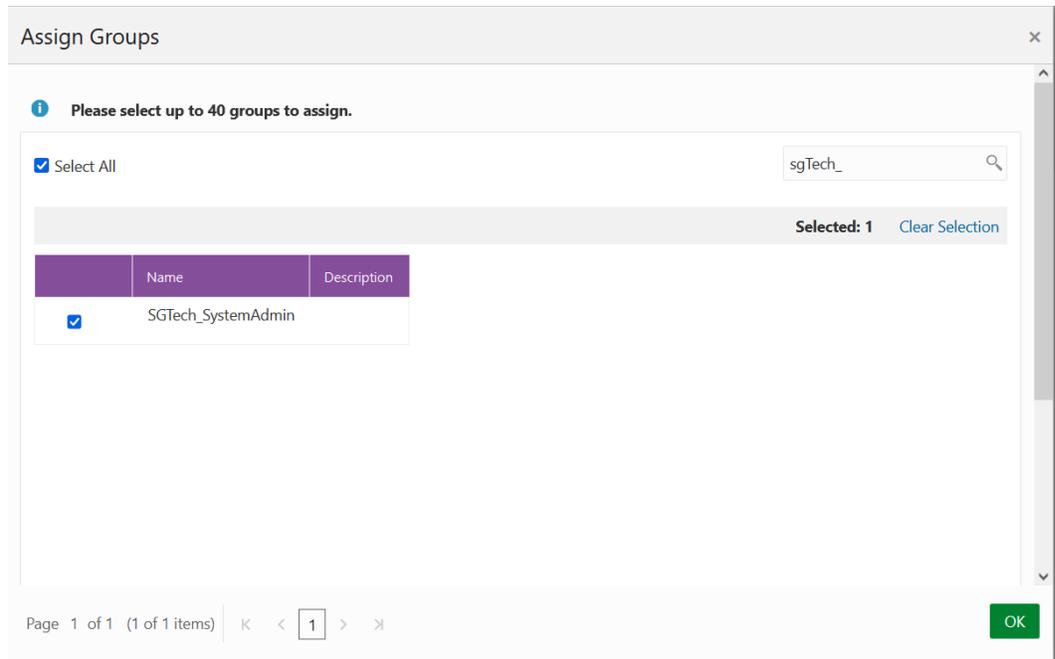
14. Optionally, add non-admin users through the **Users** tab or using other groups.

Figure 2-19   Assigning Non-Admin Users
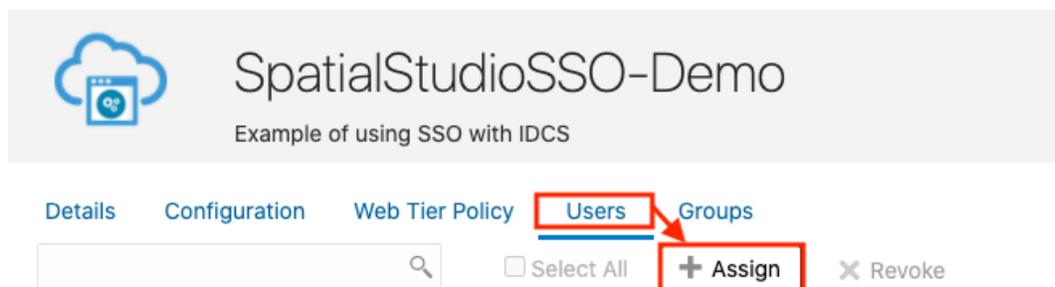
2.8.4 Copying IDCS Settings into Spatial Studio's Configuration File

To integrate Spatial Studio with IDCS, you must add the IDCS settings into the **sgtech_config.json** configuration file.

The configuration file is located at `~/.sgtech/sgtech_config.json` path. You can directly append the IDCS settings into the **sgtech_config.json** file. However, the best practice is to have the IDCS settings in a separate configuration file and then import this file into the main configuration file.

Perform the following steps to create a configuration file for the IDCS settings and to import this configuration in **sgtech_config.json**:

1. Create a new empty JSON configuration file in the `~/.sgtech` directory.

    For example:
    ~/.sgtech/sgtech_config.idcs.json

2. Edit the created file with a file editor of your choice and add the IDCS settings information as shown:

    ```
    {
      "idcs" : {
        "Host" : "identity.oraclecloud.com",
        "ClientTenant" : "<tenant_id>",
        "ClientId" : "<client_id>",
        "ClientSecret" : "<client_secret>",
        "redirectURL" : "https://localhost:4040/spatialstudio/
    idcscallback",
        "postLogoutRedirectURL" : "https://localhost:4040/
    spatialstudio/"
      }
    }
    ```

    In the preceding file:

    *   **Host:** IDCS host.
    *   **Client Tenant:** IDCS tenant.
    *   **ClientId :** Generated when creating the IDCS application.
    *   **ClientSecret :** Generated when creating the IDCS application.
    *   **redirectURL :** Same as the `Redirect URL` used when creating the IDCS application.
    *   **postLogoutRedirectURL :** Same as the `Post Logout Redirect URL` used when creating the IDCS application.

3. Save the **sgtech_config.idcs.json** file.

4. Edit the main **sgtech_config.json** file and add the import configuration as shown:

    ```
    {
      "version" : "22.3.0",
      "work_dir" : "",
      ...
    ```

```
    "jobs" : {
      "init_threads_count" : 15
    },
    "imports" : {
      "idcsclient" : {
        "module" : "sgtech_config.idcs.json"
      }
    }
```

5. Save the `sgtech_config.json` file.

2.8.5 Testing IDCS Login

After all the setup steps are completed, you can test and verify the IDCS login.

1. Ensure you have logged out from IDCS.

2. Ensure all Spatial Studio instances are stopped.

   You can stop a Spatial Studio instance by executing `stop.sh` for Linux and `stop.cmd` for Windows.

3. Run Spatial Studio by executing `start.sh` (Linux) or `start.cmd` (Windows).

4. Open the main URL in your browser, once Spatial Studio is running. For example:

   `https://localhost:4040/spatialstudio/`

   The IDCS login screen as shown in Figure 2-5 opens instead of Spatial Studio's standard login screen.

5. Enter your credentials and click **Sign In**.

   You will be automatically redirected to the Spatial Studio instance. You can verify the logged in user by clicking on the **Avatar** icon as shown:

Figure 2-20   Profile Menu
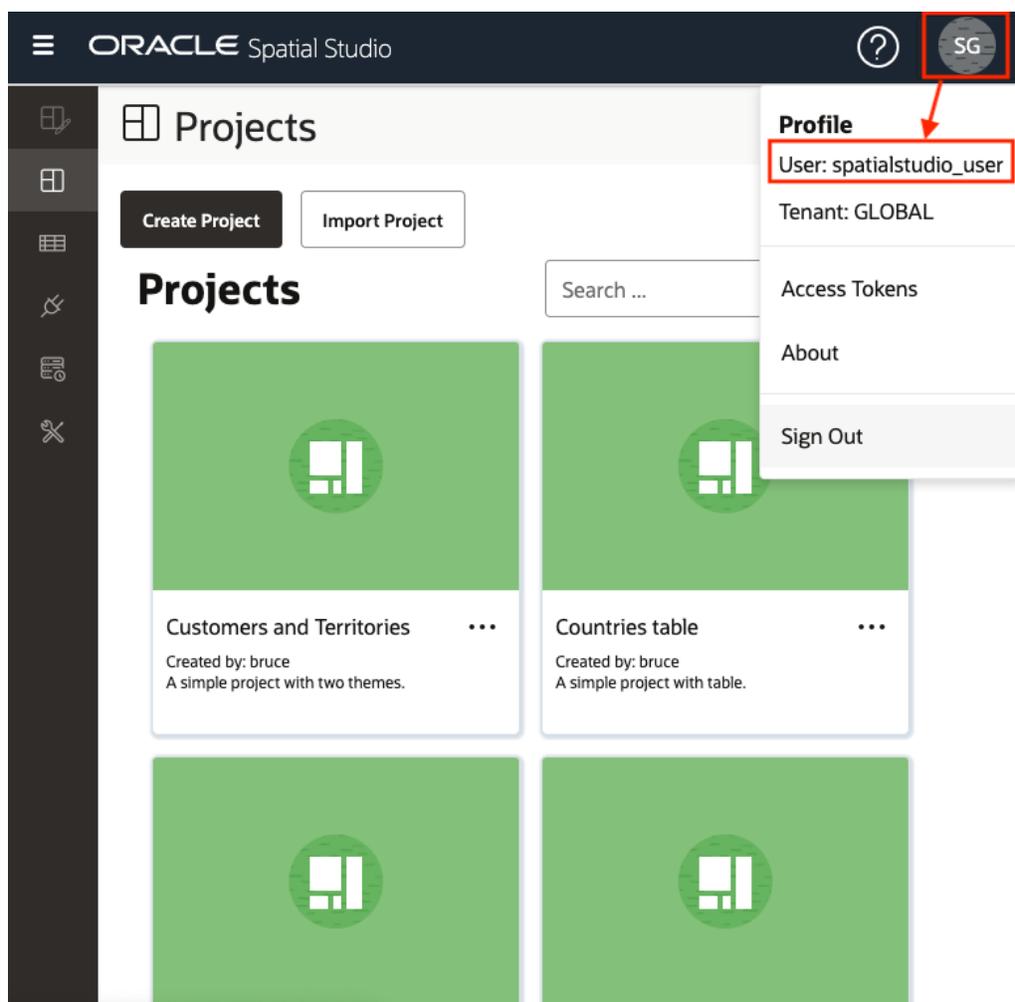
6. Click **Sign out** in the **Profile** menu to logout from Spatial Studio.

    Note, this will also log you out from any other application that is running on IDCS.

3

Using Oracle Spatial Studio

Using Oracle Spatial Studio, you can create one or more projects, each of which can define one or more spatial datasets on which you can perform various spatial operations.

It is important you understand the following terminologies when working on Spatial Studio:

- A **project** contains Spatial Studio objects, such as datasets, that are logically related to some intended usage. For example, a project might be named New England Sales Territories, or Sales Territories and Customers, or Ohio Airports and Counties. When creating a project, you should know the purposes for which you want to identify and analyze spatial data in a geographic area.

- A **dataset** is a collection of spatial features of a specific usage type and geometry type. For example, datasets might include Airports represented by polygon geometries, or Roadways represented by LRS line string geometries, or Accidents represented by point geometries.

- A **connection** specifies information for connecting to an Oracle Database schema where spatial data of interest resides: user name, password, system, port, database name, and so on. (It is similar to a SQL Developer connection.)

> **Note:**
>
> See also Spatial Studio Terminology for more information.

The main landing page for Spatial Studio for a new user is as shown:

Figure 3-1   Spatial Studio Main Page
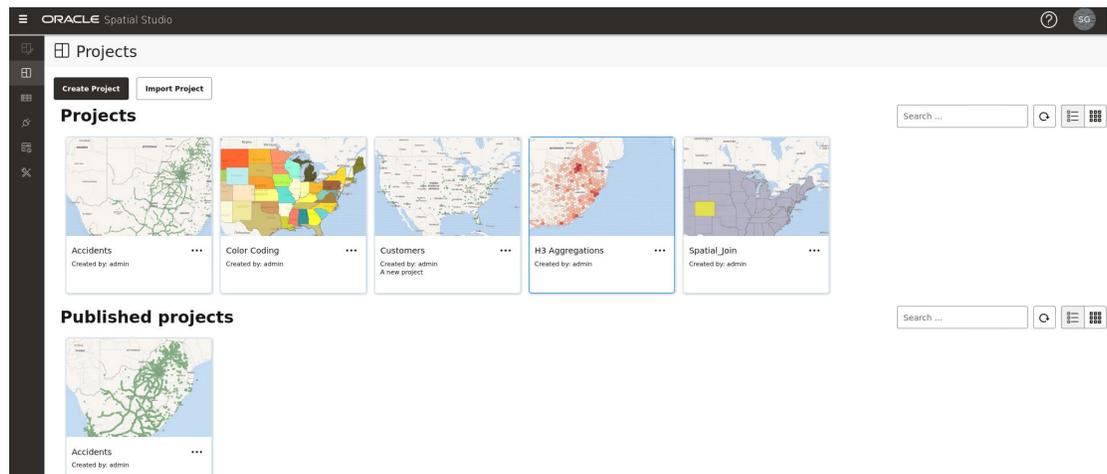
The overall layout of the Spatial Studio user interface comprises of:

- **Header:** The header at the top of the page contains the following buttons:

  - ▤: to display or hide the side navigation menu

  - ⑦ : to help you get started on Spatial Studio by providing an overview of the tool and links to other tutorial resources

  - SG: displays the user profile details

- **Side Navigation Menu:** A navigation panel on the left displays the menu items. You can expand or collapse the navigation drawer.

- **User Workspace:** The page specific details for the selected menu option is displayed on the right.

The navigation menu consists of the following menu options:

- **Active Project:** Directs you to the Active Project page where your recent working project is displayed.

- **Projects:** Directs you to the Projects page where all your existing projects and published projects are listed.

- **Datasets:** Directs you to the Datasets page where all the datasets available to you are listed.

- **Connections:** Directs you to the Connections page where all the existing connections (data sources) available to you are listed.

- **Jobs:** Directs you to the Jobs page where the various background jobs started by Spatial Studio to process various requests are listed.

- **Administration:** Directs you to the Administration page where you can monitor the status and activity of Spatial Studio. It contains tabs for Settings, Maintenance, and Monitoring.

- Logging in to Spatial Studio
  Once you have installed Spatial Studio, either as a standalone tool (Quick Start) or as a Java EE deployment, you can log in to the application.

- Getting Started Using Spatial Studio
  Spatial Studio includes a page with information and links to help you get started using the tool.

- Generating an Access Token
  You can generate an access token to access REST endpoints of Spatial Studio.

- Spatial Studio Active Project Page
  The Active Project page displays your current working project.

- Spatial Studio Projects Page
  The Projects page lists all the projects that have been created, both unpublished and published.

- Spatial Studio Datasets Page
  The Datasets page lets you view and edit existing datasets, and also create new ones.

- Spatial Studio Connections Page
  The Connections page displays all the existing connections and also allows you to create a new connection.

- Spatial Studio Administration Page
  You can monitor the status and activity of Spatial Studio in the Administration Page. You can also view server logs, change global system configurations, manage custom basemaps, and configure safe domains.

- Spatial Studio Jobs Page
  The Jobs page displays details of all the background jobs that run in Spatial Studio.

- Visualization in Oracle Spatial Studio
  You can visualize your spatial data in Oracle Spatial Studio using different modes of visualization.

- Performing Analyses in Spatial Studio
  You can perform various spatial analyses (such as filtering by proximity, nearest neighbor analysis and so on) and visualize the results in Spatial Studio.

3.1 Logging in to Spatial Studio

Once you have installed Spatial Studio, either as a standalone tool (Quick Start) or as a Java EE deployment, you can log in to the application.

To log in to Spatial Studio:

1. Launch Spatial Studio in your browser using the URL provided for your installation.

   - See Installing and Configuring the Spatial Studio Quick Start for the URL to access Spatial Studio as a stand alone tool.

   - See Installing Spatial Studio to a WebLogic Server Domain for the URL details when Spatial Studio is deployed to a WebLogic server.

   For example, if you are using the Quick Start deployment, then open the URL, `https://localhost:4040/spatialstudio`, in your browser.

   Spatial Studio login page appears as shown:

Figure 3-2   Spatial Studio Login Page

2. Enter the **User Name**.

3. Enter the **Password**.

4. Select your preferred language to be used in Spatial Studio from the **Language** drop-down list.

5. Click **Login**.

    You are now logged in to Spatial Studio.

- About Internationalization in Spatial Studio
  Oracle Spatial Studio supports internationalization of its user interface.

3.1.1 About Internationalization in Spatial Studio

Oracle Spatial Studio supports internationalization of its user interface.

You can choose to adapt the Spatial Studio user interface to use one of the following supported languages when logging in to the application:

- `English (default)`

- `German`

- `Spanish`

- `French`

- `Italian`

- `Japanese`

- Korean

- Portuguese-BR

- Simplified Chinese

- Traditional Chinese

Figure 3-3   Internationalization Support in Spatial Studio
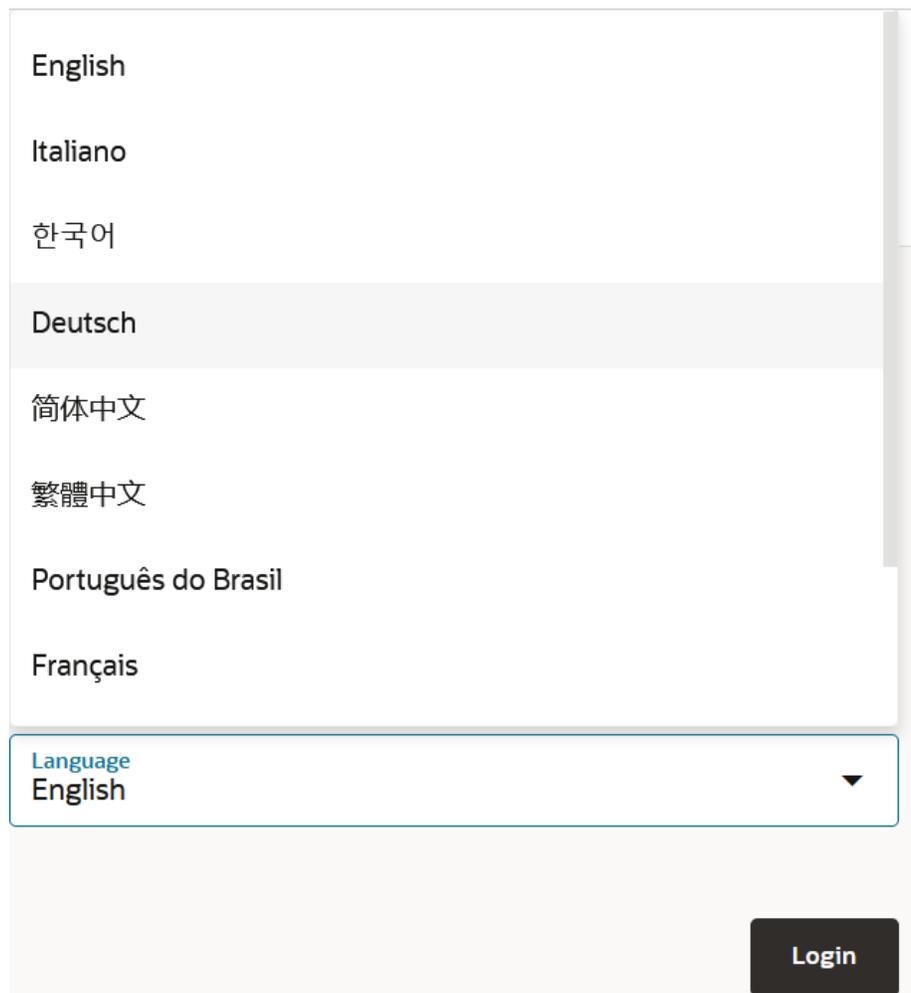
Note, however, any server generated messages or errors will continue to be displayed in English. If you want to switch to a different language after logging in, then you must first log out and select the required language when logging in again.

In case you have configured Spatial Studio to use IDCS as the login provider, then there is no explicit language selector. This is because the login dialog belongs to IDCS. In this case, Spatial Studio will check the locale and language settings in your IDCS profile, and use that to automatically select the best matched language from the list of supported languages. For instance, if your IDCS profile has Canadian French set as the preferred language, then Spatial Studio will use French to display its UI as it does not support Canadian French.

3.2 Getting Started Using Spatial Studio

Spatial Studio includes a page with information and links to help you get started using the tool.

To display this page, click the small question mark icon **(?)** in the top right area of most pages (above the Create button) and click **Getting Started** from the context menu.

The Getting Started page opens as shown:

Figure 3-4   Getting Started Page
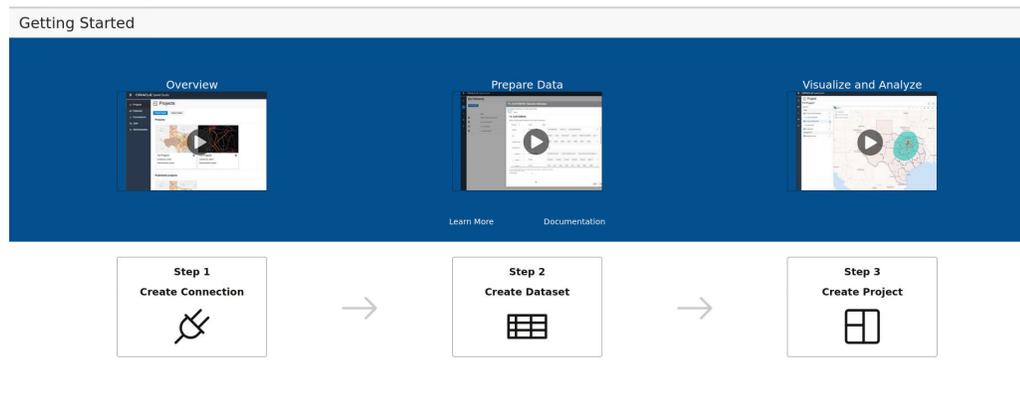
You can learn more about Spatial Studio by clicking one of the following options:

- **Overview**: Watch this video to understand the user interface and see how to perform the available actions.

- **Prepare Data**: Enable your business data for mapping and spatial analysis.

- **Visualize and Analyze**: Explore geographic patterns and relationships in your business data.

- **Learn More**: Visit our video library to learn more about Oracle Spatial Cloud.

- **Documentation**: See *Oracle Spatial Studio Guide* documentation to learn more about administering and using Spatial Studio.

- Get started using Spatial Studio through the following workflow:

    1. **Step1 - Create Connection**: Begin by creating your database connection.

    2. **Step2 - Create Dataset**: Create a Dataset and load spatial data.

    3. **Step3 - Create Project**: Create a Project for visualizing and analyzing the spatial data.

3.3 Generating an Access Token

You can generate an access token to access REST endpoints of Spatial Studio.

Spatial Studio supports two types of tokens:

- **General-purpose token:** Full access to all resources. The token grants read-only or read-write access as required.
- **Streaming-only token:** Access only to REST endpoints related to dataset streaming. Also, the token grants read-only access that be used only with `HTTP GET` methods.

To generate an access token:

1. Click ![SG] on the top right corner of the page.

2. Click **Access Tokens** from the drop-down menu.

   The **Access Tokens** dialog opens and the existing tokens are displayed.

3. Click **Create New Token**.

   Create A New Access Token dialog opens as shown:

   Figure 3-5   Creating a New Access Token

4. Enter the token **Name**.

5. Enter the time **Valid for (minutes)** after which the token expires.

   If you specify `-1`, then Spatial Studio will never expire the token, unless you explicitly revoke it.

6. Select **Resource type**.

7. Optionally, select the **Allowed action** for granting access to a general-purpose token.

8. Click **OK** to create the token.

The token gets created successfully.

3.4 Spatial Studio Active Project Page

The Active Project page displays your current working project.

You can switch to your working project at any time from the other pages when working in Spatial Studio.

The following figure shows a layout of the Active Project page:

Figure 3-6   Active Project Page
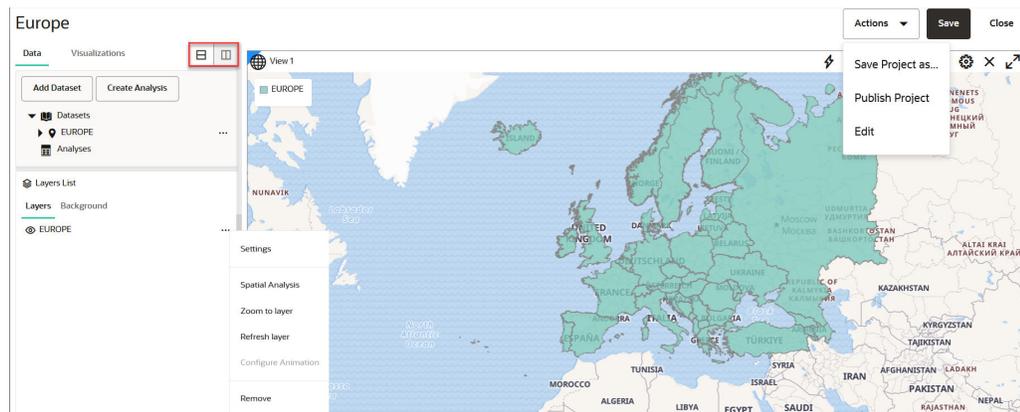
You can perform the following actions on the Active Project page:

• Creating a table or map visualization.

• Adding or removing datasets from your project.

• Adding or removing data from a visualization layer.

• Organizing the **Layers List** panel to be arranged vertically below or to the right of the project **Data** and **Visualizations** panel using the icons shown highlighted in the preceding figure.

• Adjusting the style setting or the zoom resolution for your visualization layer. You can click the menu selector next to the map layer in the **Layers** tab to display the following available options:

  – **Settings**: Shows display options for Style, Filter, Interaction, and Legend.

  – **Spatial Analysis**: Allows you to perform many spatial operations (All, or filtered by type: Filter, Combine, Transform, Measure), such as Add a buffer of a specified distance, Return shapes having spatial relationship to another, and Calculate area.

  – **Zoom to Layer**: Zooms the display (out or in) to fit the entire layer.

- **Refresh Layer**: Refreshes the layer to reflect all user actions.
- **Configure Animation**: Allows you to configure animation settings to visualize a moving object.
- **Remove**: Removes the layer from the project.

- Using the project management options displayed on the top-right area of the Active Project page:
  - **Actions**: The drop-down menu allows you to:
    * **Save Project as**: Creates a new copy of the project.
    * **Publish Project**: Publishes the project.
    * **Edit**: Allows you to edit the project details (such as, Name, Created By and Description).
  - **Save**: Saves your updates to the project.
  - **Close**: Closes the project.

- Using the map tool bar options on the top right of the map visualization pane:
  - ⚡: The **Actions** drop-down menu allows you to:
    * **Create Custom Region**: Creates custom region for the selected polygons.
    * **Save Selections**: Saves selected features on the map layer to a dataset.
    * **Save Pins**: Saves the pins dropped on a map layer to a dataset.
  - 🔍: **Search** based on address, latitude or longitude.
  - 📐: The **Measure Menu** allows you to measure liner or radial distances.
  - ▦: The **Select By Shape** drop-down menu allows you to make a rectangular, circular, or a polygonal selection.
  - ◇: The **Clear Menu** allows you to clear selections, pins, tool drawings, or all.
  - ↻: **Refresh Layers** allows you to refresh the map layers.
  - ⚙: **Settings** allows you to configure your visualization settings.
  - ✕: **Delete** icon allows you to remove the map visualization from the project.

3.5 Spatial Studio Projects Page

The Projects page lists all the projects that have been created, both unpublished and published.

Figure 3-1 shows the layout of the Projects page.

You can perform the following actions on the Projects page:

- You can select a project to work or for viewing the details.
- You can create a new project by clicking **Create Project**.

- You can import a project by clicking **Import** and selecting a project zip file in the **Import Project** dialog.

- You can open, export or delete a project by clicking the ••• icon for any of the listed projects.

- You can alter the display settings to have the projects listed as cards or in a tabular format.

- You can search for both unpublished and published projects.

> **Note:**
>
> For the first two actions, the project will be opened in the **Active Project** page.

3.6 Spatial Studio Datasets Page

The Datasets page lets you view and edit existing datasets, and also create new ones.

The following figure shows the Datasets page:

Figure 3-7   Datasets Page
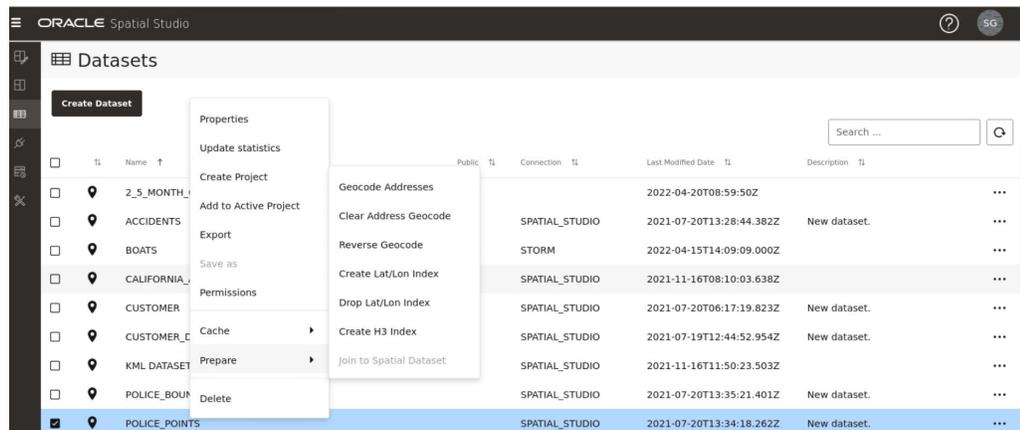
Datasets that are displayed on the **Datasets** page belong to one of the following two categories:

- Manually created by clicking **Create Dataset** or when you perform a **Save as** operation with the **Create Dataset** option enabled. This dataset can then be added to the project for visualization.

- Automatically created when you perform spatial analysis, save selected features, or store pins as a map layer.
  This dataset gets instantly added to the map visualization and also appears listed in the **Datasets** page. Such a dataset is known as a spatial analysis dataset.

You can perform the following actions on the Datasets page:

- You can manually create a new dataset, by clicking **Create Dataset**.

- By clicking **⋯** against any displayed dataset or by right-clicking a dataset row, you can perform the following actions:

  – **Properties:** View or modify properties of the dataset

  – **Update Statistics:** Update the dataset statistics (refer to Updating Statistics for Datasets)

  – **Create Project:** Create a new project using the dataset

  – **Add to Active Project:** Add the dataset to the project in the Active Project page

  – **Export:** Export the dataset (in GeoJSON or CSV file format)

  – **Save as:** Make a new copy of the dataset

  – **Permissions:** Configure dataset sharing and permissions

  – **Cache:** Control map tiles pre-caching activities (refer to About Cache in Spatial Studio)

  – **Prepare:** Prepare a dataset for any of the following options:

    * **Geocode Addresses:** Add geocoded information such as geographic coordinates to the dataset

    * **Clear Address Geocode:** Remove geocoded information from the dataset

    * **Reverse Geocode:** Add address information from a set of geographic coordinates to the dataset

    * **Create Lat/Lon Index:** Create latitude/longitude index

    * **Drop Lat/Lon Index:** Remove latitude/longitude index

    * **Create H3 Index:** Prepare an H3 aggregation dataset

    * **Join to Spatial Dataset:** Prepare a non-spatial dataset for map visualization by joining to a spatial dataset

  – **Delete:** Delete the dataset

- About Creating a Dataset From the Datasets Page
  Spatial Studio allows you to create different types of datasets from the Datasets page.

- About Spatial Analysis Datasets
  Spatial Studio stores the results of a spatial analysis operation in a spatial analysis dataset. Also, storing selected geographic features or pins on a map layer gets saved as a new spatial analysis dataset.

- Datasets with Issues
  All datasets in Spatial Studio must meet certain data requirements in order to be used for map visualization and analysis.

- Geocoding a Dataset
  Geocoding is the process of deriving the latitude and longitude coordinates from location details that are geo address types.

- Reverse Geocoding a Dataset
  Reverse geocoding is the process of deriving the address information from a set of latitude and longitude coordinates.

- **Preparing a Non-Spatial Dataset for Analysis**
  Spatial Studio allows you to prepare a non-spatial dataset for mapping and
  analysis by joining to a spatial dataset.

- **Exporting a Dataset to GeoJSON**
  You can export a dataset from Spatial Studio to GeoJSON.

- **Updating Statistics for Datasets**
  The **Update statistics** feature in Spatial Studio gathers statistics of the dataset
  columns.

- **About Cache in Spatial Studio**
  Starting with Spatial Studio release 22.3, all vector tiles generated for all datasets
  are cached to the file system by default.

3.6.1 About Creating a Dataset From the Datasets Page

Spatial Studio allows you to create different types of datasets from the Datasets page.

The following figure describes the supported options to create a dataset:

Figure 3-8   Creating a Dataset

As seen in the preceding figure, you can create a dataset from the following sources:

- By uploading dataset files with different formats as supported by Spatial Studio

- Oracle Database table or view using a database connection

- By importing 3D Tiles Tileset

- By specifying a GeoJSON URL

- By configuring an OGC Web Map Service

The following sections explain in detail the steps to create a dataset using the supported options:

- Creating a Dataset by Uploading a File
  You can create a dataset by uploading a file in a format supported by Spatial Studio.

- Creating a Dataset from Database Tables or Views
  Using a database connection, you can create a dataset from tables and views in the Oracle Database.

- Creating a GeoRaster Dataset
  Spatial Studio allows you to create Georaster datasets.

- Creating a Dataset from Cesium Datasets
  Spatial Studio supports Cesium map visualization by allowing you to create a dataset from a 3D dataset or a CZML file.

- Creating a GeoJSON URL Dataset
  You can create a dataset by specifying a GeoJSON URL.

- Creating an OGC WMS Dataset
  Starting with Spatial Studio release 22.3, you can define datasets that are based on the `GetMap` responses from any external OGC (Open Geospatial Consortium) WMS (Web Map Service) services.

3.6.1.1 Creating a Dataset by Uploading a File

You can create a dataset by uploading a file in a format supported by Spatial Studio.

The supported file formats are as follows:

- Spreadsheet file

- Shapefile

- GeoJSON file

- CSV file

- KML file

1. Navigate to the **Datasets** page.

2. Click **Create Dataset**.

   The **Create Dataset** window opens.

3. Select the **From file upload** option.

4. Upload any one of the supported file types.

5. Click **Create**.

   The new dataset is added and listed on the Datasets page.

- Uploading a Shapefile

  You can create a dataset by uploading a shapefile.

3.6.1.1.1 Uploading a Shapefile

You can create a dataset by uploading a shapefile.

A shapefile contains the geospatial data which can be referenced in multiple files with specific file extensions. The following lists a few selected files that contribute to shapefile format:

- `.shp` - Stores the geometry data

- `.shx` - Stores the index of the geometry

- `.dbf` - Stores the attribute information of geometry features

- `.prj` - Stores the coordinate system information

- `.cpg` - Specifies the character set to be used

1. Navigate to the **Datasets** page and click **Create Dataset**.

   Create Dataset window opens as shown in Figure 3-8.

2. Select **From file upload**.

3. Click ⬆ to upload the shape file.

   The **File Upload** window opens.

4. Select all the required files from your system.

   > ✎ **Note:**
   >
   > It is mandatory to upload `.shp`, `.shx`, and `.dbf` files.

   The **Create dataset from shapefile** dialog opens as shown:

   Figure 3-9   Create dataset from shapefile
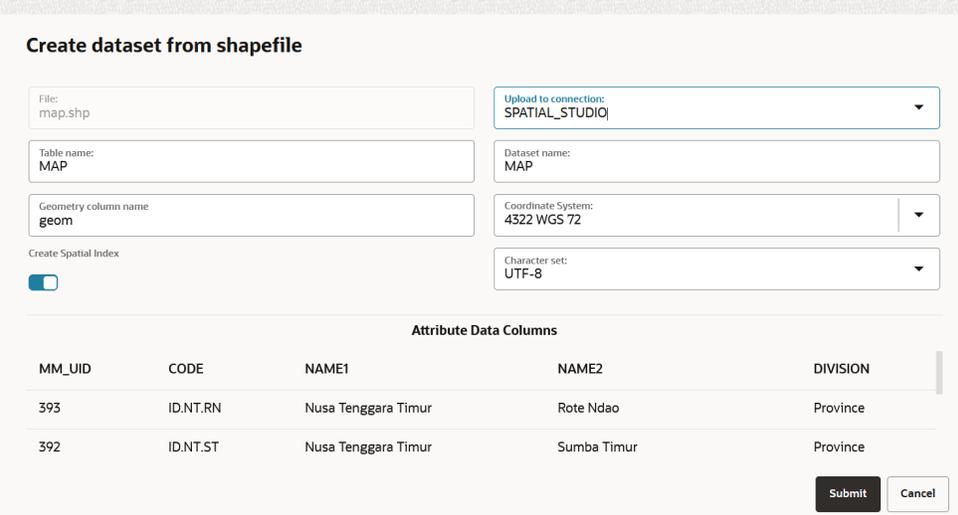
5. Select the connection to upload the shapefile from the **Upload to connection** drop-down list.

6. Optionally, change the **Table name**.

7. Optionally, change the destination **Dataset name**.

8. Optionally, select the **Coordinate System** to be used.

   • If your shapefile includes a `.prj` file referencing a custom Geographic Coordinate System (GEOGCS), then Spatial Studio will assign a best-matched geodetic SRID from the target Spatial database, as shown in the preceding figure.

   • If your shapefile does not contain a `.prj` file, then the system uses the default `EPSG:4326` GEOGCS.

9. Optionally, select the required **Character set**.

   Spatial Studio automatically detects the character set to be used in the following order of priority:

   • Extracts the `charset-name` from a `.cpg` file, if present.

   • Uses the character set specified in the `.dbf` file header.

   • Otherwise, uses the default ISO-8859-1.

   You can preview the file attributes using the detected character set. However, you can still choose to switch to a different **Character set** and preview the refreshed contents.

10. Click **Submit**.

    The dataset gets created from a shapefile.

3.6.1.2 Creating a Dataset from Database Tables or Views

Using a database connection, you can create a dataset from tables and views in the Oracle Database.

Perform the following steps to create a dataset using a database connection:

1. Navigate to the **Datasets** page.

2. Click **Create Dataset**.

   The **Create Dataset** window opens.

3. Select the **From table/view** option.

4. Select a connection from the **Select Connection** drop-down.

5. Click **Create**.

   The **Select items to create datasets** window opens listing all the tables, views and GeoRaster data present in the database.

Figure 3-10   Select the Data Source
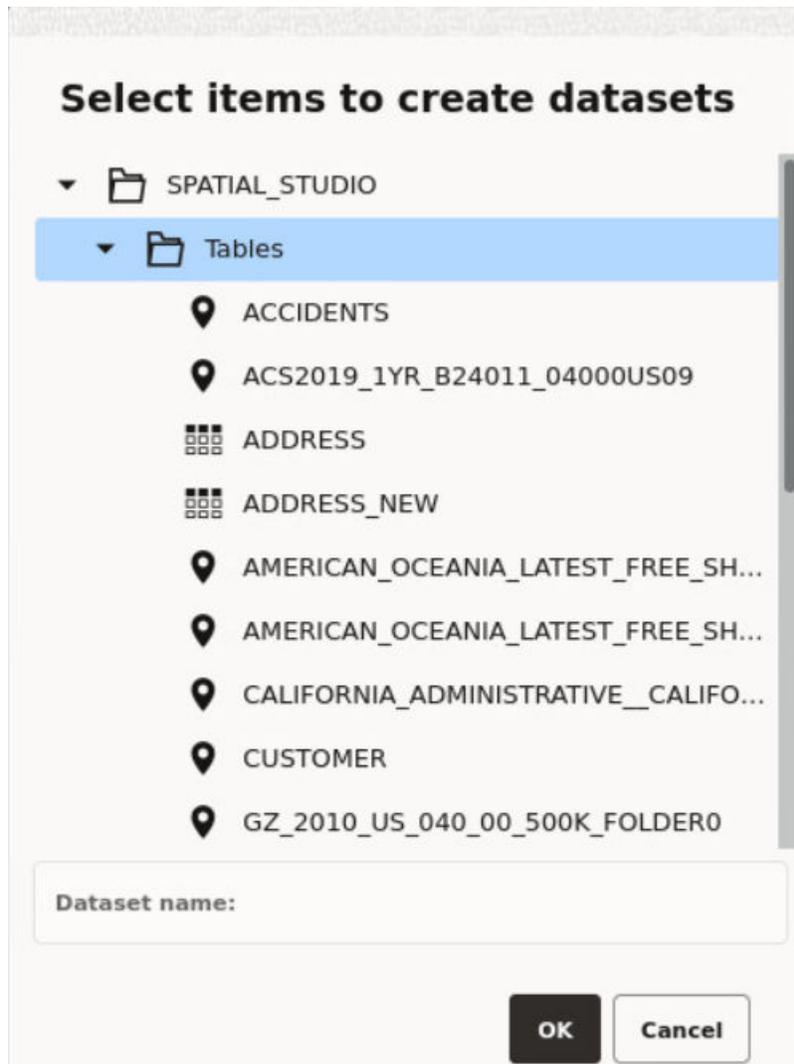
6. Select a database item from the list and click **OK**.

    The new dataset is added and listed on the Datasets page.

3.6.1.3 Creating a GeoRaster Dataset

Spatial Studio allows you to create Georaster datasets.

You can create a GeoRaster dataset using the following steps.

The instructions assume that the GeoRaster data is already existing in your database schema.

1. Navigate to the **Datasets** page and click **Create Dataset**.

2. Click **From table/view**, select a **Connection** and click **Create**.

3. Click **GeoRasters**, select the required **GeoRaster** table and click **OK** as shown:

Figure 3-11   Creating a GeoRaster DataSet
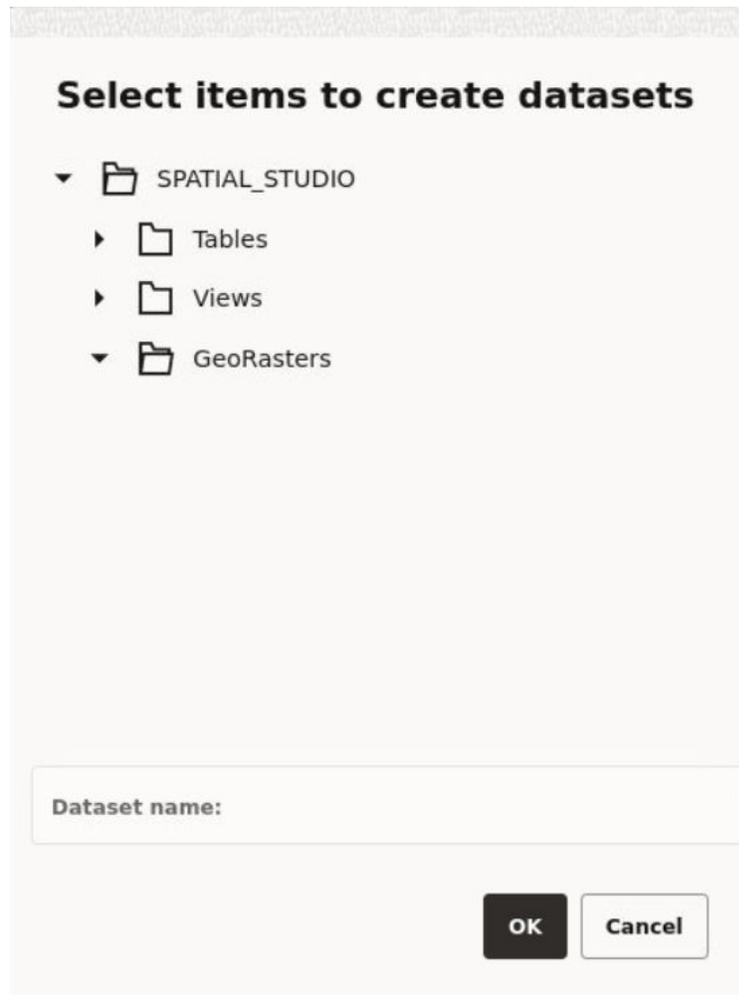
The **Geo-raster Configuration** dialog opens.

4. Choose a **Selection Mode**.

   The values for the selection mode are:

   • Single Raster

   • Virtual Mosaic

5. Select the GeoRaster column for visualization if you have chosen the **Single Raster** mode. Otherwise, you can skip this step.

   > **Note:**
   >
   > If you have chosen the **Virtual Mosaic** mode, all the Georaster columns are included in the visualization.

6. Click **OK**.

The GeoRaster dataset is configured and the newly created GeoRaster dataset is displayed as a row in the Datasets page.

3.6.1.4 Creating a Dataset from Cesium Datasets

Spatial Studio supports Cesium map visualization by allowing you to create a dataset from a 3D dataset or a CZML file.

Perform the following steps to create a dataset from Cesium datasets:

1. Navigate to the **Datasets** page.
2. Click **Create Dataset**.

   The **Create Dataset** window opens.
3. Select the **From Cesium datasets** option.

Figure 3-12   Options for Creating a Cesium Dataset

4. Select a **3D dataset location** option.
   - **Upload czml file:** Upload a `.czml` file.
   - **Upload tileset:** Upload a tileset zip file. The supported formats are:
     - `.b3dm:` Batched
     - `.pnts:` Point Cloud

     > **Tip:**
     >
     > You can increase the default size limit for zip files larger than 50 MB by updating the `dataset_max_size` attribute for the `upload` property defined in `<user_home_folder>/.sgtech/sgtech_config.json` file.

   - **Czml file located on server:** Specify the czml file to be uploaded from the server by entering the **Name** of the `.czml` file and the **Directory** path.
   - **Tileset located on server:** Specify the tileset file to be uploaded from the server by entering the **Name** of the `tileset.json` file and the **Directory** path.

> **Note:**
>
> When uploading a CZML file or a tileset file from the server:
>
> - If the file is not under `<SGTECH_HOME>/cesiumdata` or `<SGTECH_HOME>/3d-tilesets` as it may apply, then you must manually migrate the datasets when migrating Spatial Studio.
>
> - You can update the unzipped file limits in the General tab in the Administration page. The following two advanced settings parameters need to be modified:
>
>   – Maximum unzipped item
>
>   – Maximum unzipped total

5. Click **Create**.

   The new dataset is added and listed on the Datasets page.

3.6.1.5 Creating a GeoJSON URL Dataset

You can create a dataset by specifying a GeoJSON URL.

It is important to note the following prior to creating a GeoJSON URL dataset:

- A GeoJSON URL based dataset accesses its data directly from the source URL. There is no database table managed in Spatial Studio for this dataset.

- A GeoJSON URL based dataset does not support Spatial Analysis.

- A GeoJSON URL based dataset is subject to the same upload size limit, or 100MB, whichever is smaller.

- If a GeoJSON URL does not support CORS (Cross-Origin Resource Sharing), then Spatial Studio will act as a proxy to the browser requesting the GeoJSON URL data.

Perform the following steps to create a GeoJSON URL dataset:

1. Navigate to the **Datasets** page.

2. Click **Create Dataset**.

   The **Create Dataset** window opens.

3. Select the **From GeoJSON URL** option.

4. Specify the **GeoJSON URL** to access GeoJSON data from an external domain for map visualization.

   > **Note:**
   >
   > Ensure you add the external domain used for accessing GeoJSON data to the list of entries in the Safe Domains list.

5. Click **Create**.

   Create dataset from GeoJSON window opens as shown:

Figure 3-13   Creating a Dataset from GeoJSON

6. Optionally, enter a **Dataset name**.

7. Click **Submit**.

    The GeoJSON URL dataset gets created with the warning, `No key column was found`. You must resolve the warning in order to use the dataset as a map layer for visualization. See Datasets with Issues for more details to resolve the warning.

3.6.1.6 Creating an OGC WMS Dataset

Starting with Spatial Studio release 22.3, you can define datasets that are based on the `GetMap` responses from any external OGC (Open Geospatial Consortium) WMS (Web Map Service) services.

Prior to creating a WMS dataset, ensure that the required OGC WMS connection is created in Spatial Studio.

Perform the following steps to create an OGC WMS dataset:

1. Navigate to the **Datasets** page.

2. Click **Create Dataset**.

    The **Create Dataset** window opens.

3. Select **From OGC Web Map Service**.

4. Select the **WMS Connection** to be used from the drop-down list.

5. Explore all the available WMS map layers from the external WMS server and select the required one.

    You can `Shift+Click` to select more than one layer. The external WMS server combines multiple layers into a single image as a response to Spatial Studio's requests for the new WMS dataset.

    For instance, the following figure shows the selection of two WMS map layers, **Image** and **Image Footprints with Time Attributes**, which are used for creating a new dataset.

Figure 3-14   Selecting the WMS Layer to Create a WMS Dataset
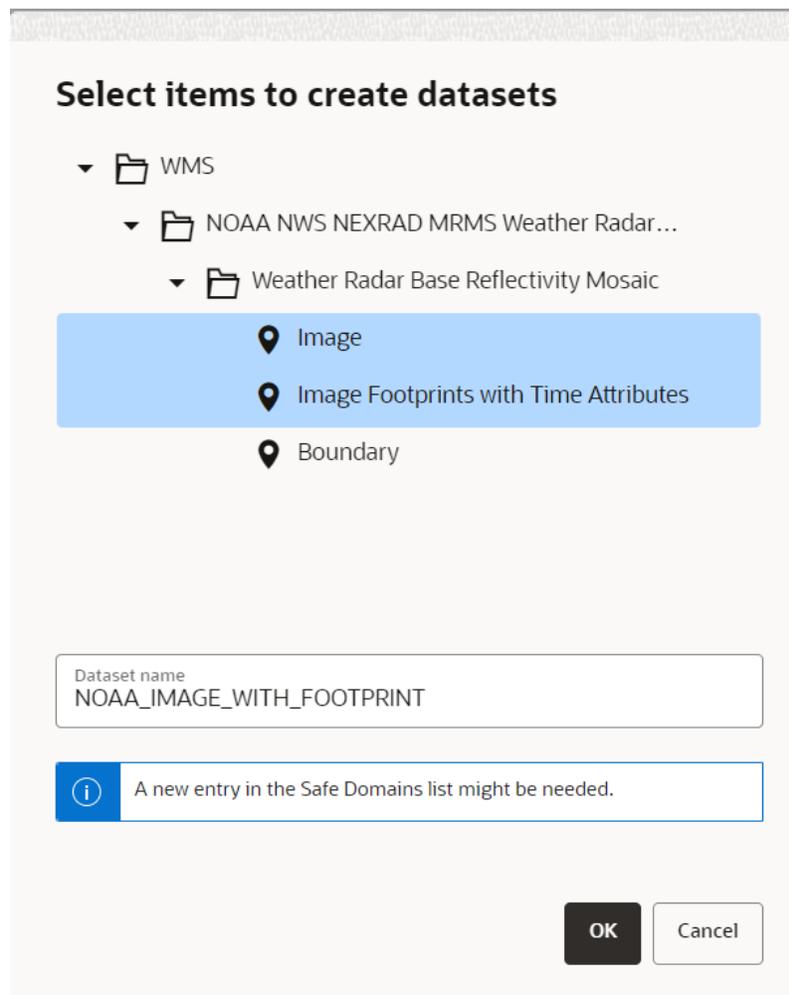
6. Enter the **Dataset name**.

7. Click **OK**.

   The OGC WMS dataset gets created and is displayed on the **Datasets** page.
   When this WMS dataset is displayed on a map visualization, Spatial Studio will obtain and display the images for both the selected layers.

Related Topics

- Creating an OGC WMS Connection
  You can create a new connection to an external OGC (Open Geospatial Consortium) WMS (Web Map Service) service.

- Visualizing OGC WMS Maps as a Dataset
  You can visualize an OGC (Open Geospatial Consortium) WMS (Web Map Service) dataset on a map.

3.6.2 About Spatial Analysis Datasets

Spatial Studio stores the results of a spatial analysis operation in a spatial analysis dataset. Also, storing selected geographic features or pins on a map layer gets saved as a new spatial analysis dataset.

When you perform any new spatial analysis operation (such as filtering, combining, transforming existing datasets, and so on) against a data source in map visualization, the results of the analysis are generated into a spatial analysis dataset. Similarly, when you store selected geographic locations or pins on a map layer, the spatial data gets stored as spatial analysis datasets. These datasets get instantly added to the map visualization project and appear under **Analysis** in the Active Project page. You can also view these datasets on the **Datasets** page.

- Saving Selected Features on a Map Into a Dataset
  You can save selected features on a map layer into a new spatial analysis dataset.

- Saving Pins on a Map Into a Dataset
  You can save all the pins that you dropped on a map layer into a spatial analysis dataset.

Related Topics

- Performing Analyses in Spatial Studio
  You can perform various spatial analyses (such as filtering by proximity, nearest neighbor analysis and so on) and visualize the results in Spatial Studio.

3.6.2.1 Saving Selected Features on a Map Into a Dataset

You can save selected features on a map layer into a new spatial analysis dataset.

The following steps enable you to save selected features on a map layer into a dataset.

The instructions assume that you have a project opened on your Active Project page.

1. Select the required features to be saved to the dataset.

   If you are using a Windows system, you can select multiple features using the keyboard shortcut `Ctrl+Click`.

2. Click the **Actions** icon on the map tool bar.

3. Select **Save Selections** from the drop-down menu.

Figure 3-15   Saving Selections
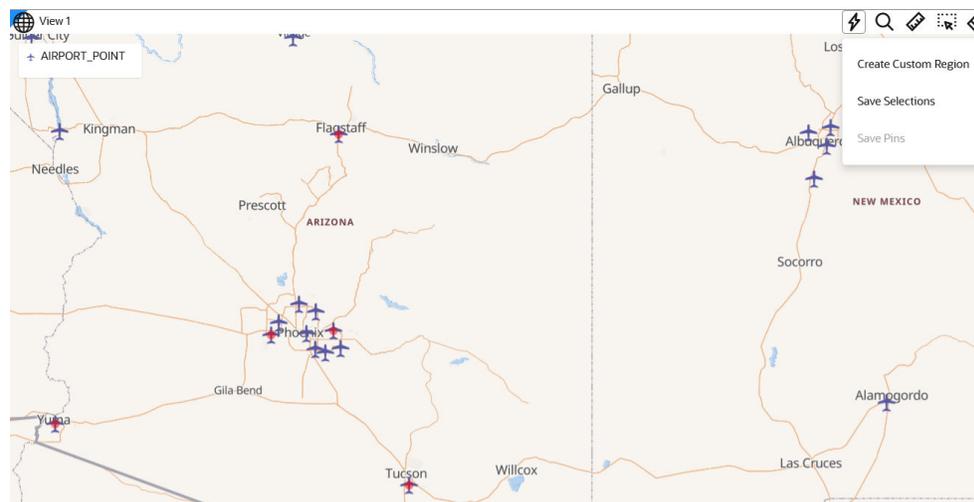
The **Save selections** dialog opens.

4. Enter the **Analysis name**.

5. Select the required columns from the **Save Selections From** drop-down list.

6. Click **Run**.

   The new (analysis) dataset containing the saved selections is created and gets listed under **Analyses** on the left pane in the **Active Project** page. It also appears on the table in the **Datasets** page.

7. Verify the selection, by dragging and dropping the analysis dataset on the map view.

   You can now view only selected features on the map layer:

Figure 3-16   Visualizing Saved Selections
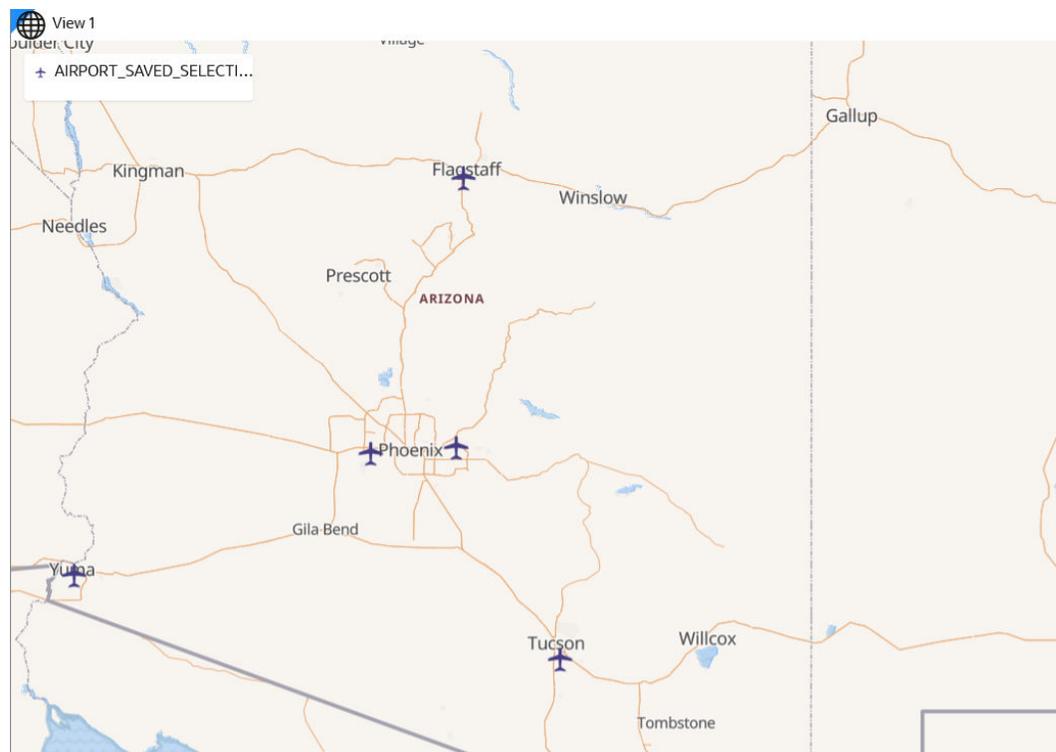
3.6.2.2 Saving Pins on a Map Into a Dataset

You can save all the pins that you dropped on a map layer into a spatial analysis dataset.

This dataset containing the stored pins can later be used in various spatial analyses.

The following steps enable you to save multiple pins on a map layer into a dataset.

The instructions assume that you have a project opened on your Active Project page and the map layer displayed for visualization contains multiple pins.

1. Click the **Actions** icon on the map tool bar.

2. Select **Save Pins** from the drop-down menu.

Figure 3-17   Saving Pins on a Map Layer
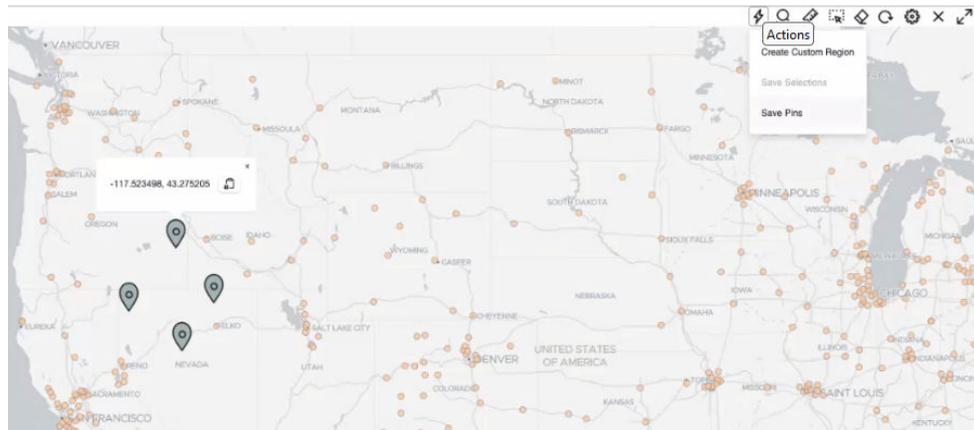
The **Save pinned places** dialog opens.

3. Enter the **Analysis name**.

4. Select the required **Connection** for saving the dataset.

5. Click **Run**.

    The new dataset containing the pins is created and gets listed under **Analyses** on the left pane in the **Active Project** page. It also appears on the table in the **Datasets** page.

6. Verify the saved pins, by dragging and dropping the analysis dataset on the map view.

    The saved pins are displayed as points and not as a pin location on the map layer. This is because the pins get saved to a regular point type dataset. You can now perform various spatial analyses on the map using this dataset layer.

    Related Topics

    •   Adding a Pin on a Map

3.6.3 Datasets with Issues

All datasets in Spatial Studio must meet certain data requirements in order to be used for map visualization and analysis.

Otherwise, Spatial Studio highlights these datasets with a warning on the Datasets page.

You may click on the warning icon to view the issues. You can then click on the resolution link under the issue to prepare the dataset as required for analysis, as shown:

Figure 3-18   Warnings on a Dataset
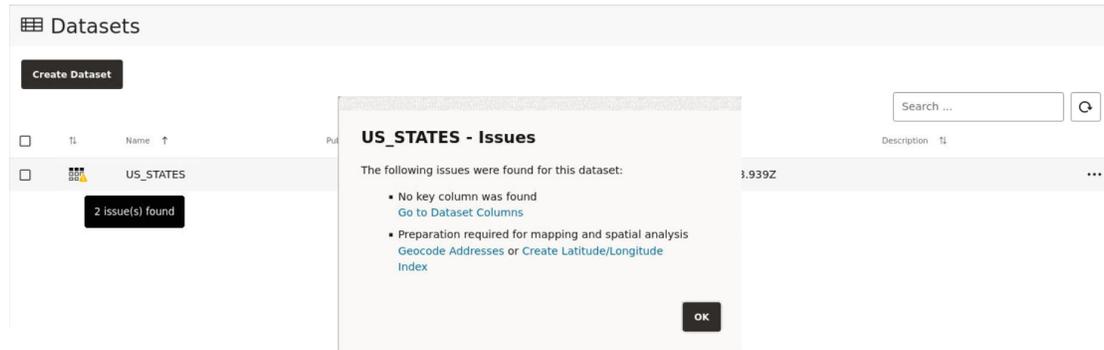
The following table lists a few common issues that are highlighted on a dataset.

Table 3-1   Selected List of Dataset Issues

Issue	Cause	Spatial Studio Resolution
No key column was found	Primary key is missing on the dataset.	• Click **Go to Dataset Columns** to create a dataset key. The **Dataset Properties** configuration window opens. • Select a column containing unique values and switch ON **Use as Key**. • Click **Validate key**. • Click **Apply**.
This dataset needs spatial metadata and index	The geometry column in the dataset does not have the spatial metadata or a spatial index or both.	Click **Create Spatial Metadata and Index** to create the spatial metadata and index for the geometry column.
Preparation Required for mapping and spatial analysis	It can be due to one of the following reasons: • The dataset contains address information but the geographic coordinates are missing. • Latitude and Longitude index are missing for latitude/longitude data in the dataset.	Depending on the cause, you may need to perform one of the following: • Click **Geocode Addresses** • Click **Create Latitude/Longitude Index**

• Enabling Spatial on a View-Based Dataset with Latitude and Longitude Columns

3.6.3.1 Enabling Spatial on a View-Based Dataset with Latitude and Longitude Columns

Spatial Studio allows you to create spatial index on a dataset created from a view containing latitude and longitude columns, thereby enabling you to visualize and analyze views.

The following steps enable you to create latitude/longitude index on a view-based dataset.
The instructions assume:

- You have created a dataset from a view having latitude and longitude columns. See Creating a Dataset from Database Tables or Views for more information on creating a dataset from a view.

- This view-based dataset is listed on the Datasets page with a warning icon since the dataset is not spatially enabled for visualization.

1. Navigate to the **Datasets** page.

2. Click on the warning icon to view the issues on the view-based dataset.

3. Click **Create Latitude/Longitude Index**.

   The **Latitude and Longitude Columns** window opens as shown:

   Figure 3-19   Creating a Latitude/Longitude Index on a View-Based Dataset

4. Select the **Latitude Column**.

5. Select the **Longitude Column**.

6. Select the **Reuse lat/lon index on the base table** checkbox.

   Note that irrespective of whether the spatial index on the latitude and longitude columns exists in the underlying base table (or view) or not, you must always select this checkbox. If there is no spatial index in the underlying base table (or view), Spatial Studio will simply update the dataset's metadata and mark it as ready for spatial visualization. This enables you to perform map visualizations, although it may not be as performant as when there is a spatial index in place.

7. Click **OK**.

   A background task of type **Create lon-lat** index gets executed. A successful completion of this task on the **Jobs** page indicates that the dataset is spatially enabled for visualization.
   You can now use this view-based dataset for visualization on the **Active Project** page.

3.6.4 Geocoding a Dataset

Geocoding is the process of deriving the latitude and longitude coordinates from location details that are geo address types.

You can geocode a dataset in Spatial Studio to store the resulting latitude and longitude information as a `SDO_GEOMETRY` column. Optionally, you can also store them in latitude and longitude numeric columns in the underlying database table referenced by the dataset.

Prior to geocoding a dataset, if the Spatial Studio server is running behind a firewall, then ensure you have the correct **Web Proxy** information configured in the Administration page. This is because the Spatial Studio application uses an external Oracle hosted geocoding service which is on the public internet.

You can perform the following steps to geocode a dataset.

The instructions assume that a dataset containing location columns such as address details is already existing in Spatial Studio.

1. Navigate to the **Datasets** page.

2. Right-click on the **dataset name** on which you want to apply geocoding.

   Ensure that the dataset has a valid key column defined.

3. Select **Geocode Addresses** from the **Prepare** context menu.

   Geocode Addresses dialog opens as shown:

Figure 3-20   Geocode Addresses

4. Click **Setup** tab.

5. Select the **Geo-type** for the geo-attributes to be used for geocoding.

   You must provide sufficient geographic data for successful geocoding. If the address components do not include the country or state attributes, then you must explicitly select either the country or the state in the respective drop-down list shown highlighted in the preceding figure.

6. Optionally, switch ON **Save coordinates in columns** to save the geocoordinates to the dataset and to the underlying database table.

7. Optionally, enter **Latitude column** name and **Longitude column** name, if you switched ON **Save coordinates in columns** in the preceding step.

8. Click **Apply**.

   The geocoding process gets initiated and can be monitored on the **Jobs** page. Also, note the following:

   - The geocoding process is performed in batches and the default batch size is 50. At any time, you can change the default geocoding batch size under the **General** settings in the **Administration** page.

   - If any batch fails, the overall geocoding job will not fail. You will be notified on the failed batch at the end of job completion.

   - At the end of the geocoding process, you can view the results in the **Status** tab as shown:

Figure 3-21   Geocoding Status

- On successful completion of a geocoding job, you can verify that geocoding has been applied by viewing the latitude and longitude columns in the dataset properties and in the input source database table along with the `GC_GEOMETRY` column of data type `SDO_GEOMETRY`.

3.6.5 Reverse Geocoding a Dataset

Reverse geocoding is the process of deriving the address information from a set of latitude and longitude coordinates.

You can reverse geocode a dataset in Spatial Studio to add address information to the dataset's table using the following steps.

> **Note:**
>
> Reverse Geocoding is supported only in point or latitude and longitude datasets.

The instructions assume that a dataset containing the coordinates details is already existing in your database schema.

1. Navigate to the **Datasets** page.

2. Right-click on the **dataset name** on which you want to apply reverse geocoding.

3. Select **Reverse Geocode** from the **Prepare** context menu.

4. Optionally, select and modify the required **Location attributes** as shown in Figure 3-22.

   The Input text fields for Location attributes are the column names to be created in the underlying database table for the target dataset.

5. Select the **Advanced** option as required.

   The default **Reverse geocode to named roads only** option ensures that for all latitude and longitude coordinates that do not match a named road, the closest street or road name will be obtained while geocoding.

6. Click **Apply**.

   You can monitor the **Reverse geocode dataset** background task on the **Jobs** page. A successful completion of the job indicates that reverse geocoding is applied for the data in the dataset.

   You can verify that reverse geocoding has been applied to your dataset by viewing the additional address related columns in the dataset properties.

Figure 3-22   Reverse Geocoding

3.6.6 Preparing a Non-Spatial Dataset for Analysis

Spatial Studio allows you to prepare a non-spatial dataset for mapping and analysis by joining to a spatial dataset.

Note the following highlights about joining two datasets:

- You can only join a non-spatial dataset to a spatial dataset and not conversely.

- It is essential that the non-spatial data in one dataset is linked to the spatial data in the other dataset through a common primary key column.

- You can choose the columns for the newly created joined dataset from the attributes of the datasets associated in the join operation.

The instructions assume that a spatial dataset and a non-spatial dataset having a common primary key data is already existing in your database schema.

1. Navigate to the **Datasets** page.

2. Right-click on the non-spatial **dataset** which you want to join to a spatial dataset.

3. Select **Join to Spatial Dataset** from the **Prepare** context menu.

   The following window opens:

   Figure 3-23   Joining to a Spatial Dataset

4. Optionally, enter a dataset name for **Name of join result dataset**.

5. Select the **Spatial dataset** for the join.

   On selection, the primary key associated with the spatial dataset is validated against the non-spatial dataset key. If the datasets key values are not suitable for a join operation, then the following error is displayed:

   ```
   Dataset key columns to join must be the same data type
   ```

6. Optionally, select the required columns for the joined result dataset from the non-spatial and spatial datasets.

7. Click **OK**.

   The joined dataset is created and it appears as a row on the Datasets Page. This dataset will contain all the column properties selected from both the spatial and non-spatial datasets. You can verify the properties of the joined dataset both in the **Dataset Properties** window on the Datasets page and when using the dataset for map visualization and analysis on the Active Projects page, as shown:

   Figure 3-24   Appended Non-spatial and Spatial Properties
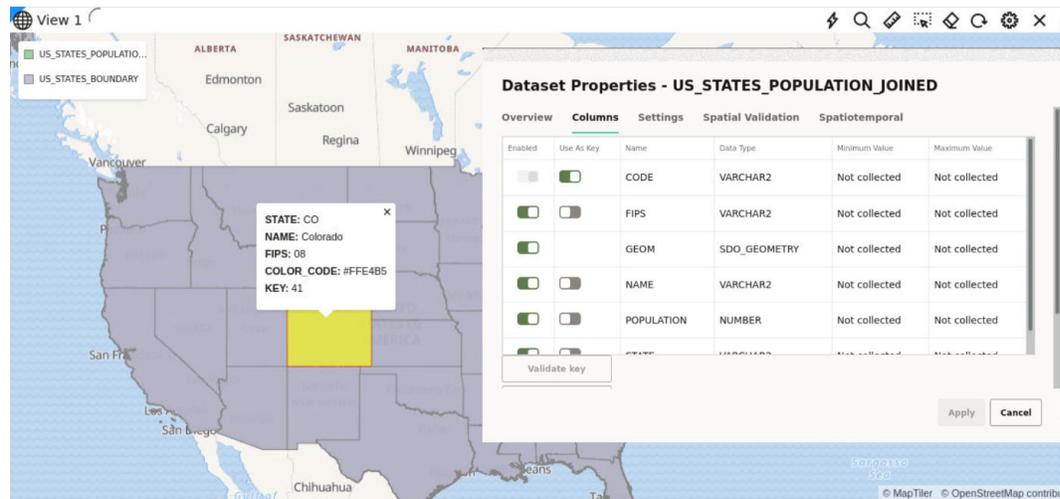
3.6.7 Exporting a Dataset to GeoJSON

You can export a dataset from Spatial Studio to GeoJSON.

It is possible that your dataset can contain multiple geometry columns. In such a case, Spatial Studio allows you to select a specific geometry column for the export operation.

The instructions assume that a dataset containing the coordinates details is already existing in your database schema.

1. Navigate to the **Datasets** page.

2. Right-click on the **dataset name** which you want to export.

3. Select **Export**.

   The dataset **Export** dialog opens as shown:

Figure 3-25   Exporting to GeoJSON

4. Select **GeoJSON** from the **File Format** drop-down list.

5. Optionally, increase or decrease the **Decimal places in coordinates** as required.

6. **Select a geometry column** as required.

7. Select the required columns for the export.

8. Click **OK**.

9. Save the `.zip` file containing the GeoJSON data on your system.

3.6.8 Updating Statistics for Datasets

The **Update statistics** feature in Spatial Studio gathers statistics of the dataset columns.

To gather the dataset statistics, right-click on the dataset and select **Update statistics**. For all datasets (except view-based and spatial analysis datasets), this action triggers a single background job which collects the relevant statistical data. Once the job completes successfully on the Jobs page, you can verify the updated statistical data by viewing the **Dataset Properties**.

However, for view-based and spatial analysis datasets, gathering statistics is a two-step process. It implies that two background jobs are triggered:

1. **Gather dataset statistics [basic]**: This job collects the basic statistics such as **Name** and **DataType** of columns in a dataset. When this job completes successfully, the job in step-2 is triggered.

2. **Gather dataset statistics [full]**: This job collects more detailed statistics such as **Minimum Value**, **Maximum Value**, **Bounding Box**, and unique column values. As long as this job is in the `Processing` status, the view-based dataset may show incomplete information for the **Minimum Value** and **Maximum Value** columns in the **Dataset Properties** dialog:

Figure 3-26   Gathering Statistics In Progress
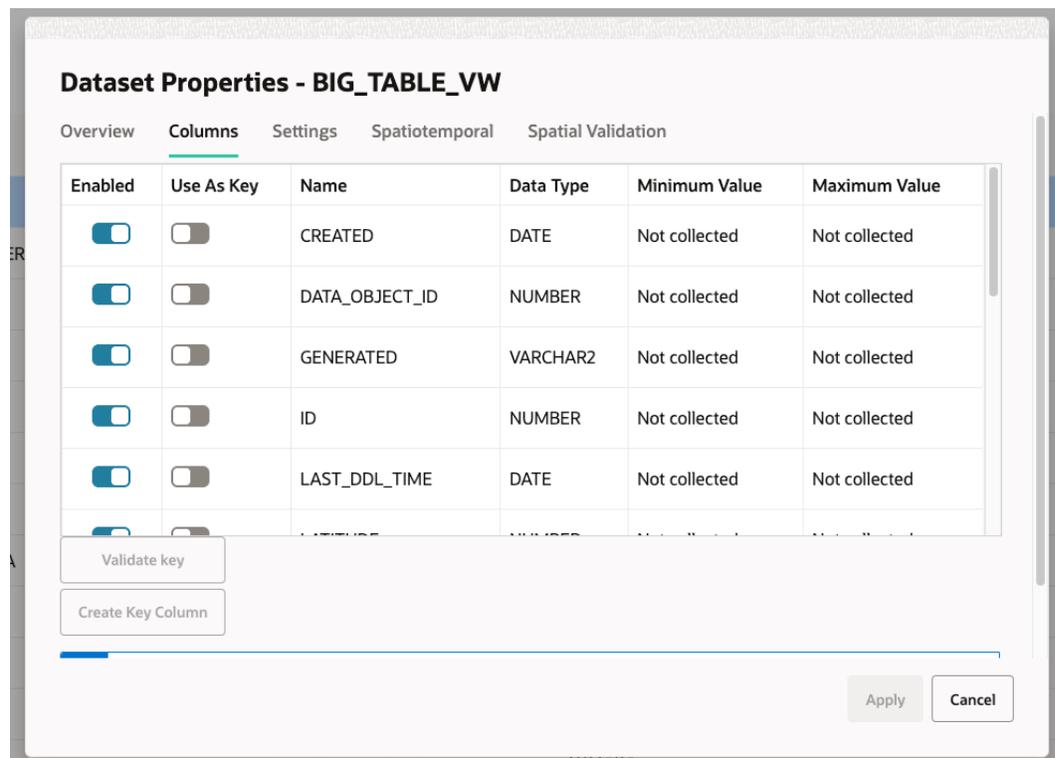
Once the job status is `Done`, the **Dataset Properties** reflects the gathered statistics.

Figure 3-27   Displaying Gathered Statistics

Note that for any type of dataset, you must always ensure that this background job completes successfully before performing advanced styling or visualization of a dataset.

3.6.9 About Cache in Spatial Studio

Starting with Spatial Studio release 22.3, all vector tiles generated for all datasets are cached to the file system by default.

This cache process automatically begins when the you first load a dataset for map visualization and start panning the map or zoom in and out on the map. Therefore, the next time the same dataset is visualized, all the corresponding map layers load faster as the relevant tiles have been already generated and are ready to be loaded. All these generated vector tiles will be saved under:

```
<user_home_folder>/.sgtech/cache/CACHE_<cache_id>
```

The *<cache_id>* which is part of the folder name is an integer value, calculated based on the dataset `id` and the geometry column being encoded in the vector tiles. A metadata file will be saved inside each `cache` folder to provide human-readable information about where the tiles belong to in a `tiles.json` file. A sample structure of the metadata file is as shown:

```
{
  "DatasetName" : "DATASET NAME",
  "DatasetId" : "8da55629d3ca71aa37d859422a847257",
  "GeometryColumn" : "GEOM_COL_NAME"
}
```

Each vector tile will be encoded and saved to a file that follows a name pattern as shown:

`<zoom_level>_<x_axis>_<y_axis>.dat`

All the variables in the preceding name pattern are replaced by an integer and denote the world position where the tile needs to be loaded when looking at a certain viewport of the world map.

The cache options (**Pre-cache** and **Purge cache**) for a dataset can be accessed from the **Datasets** page as shown:

Figure 3-28   Dataset Cache Options
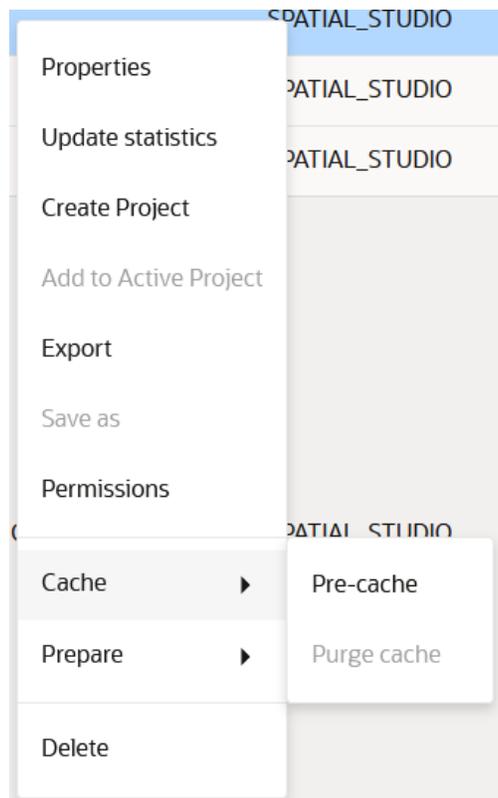
- Pre-Cache
  You can trigger a pre-caching task to start generating vector tiles even before a map is loaded with the dataset for visualization.
- Purge Cache
  You can wipe the cached tiles by calling the **Purge cache** option.

3.6.9.1 Pre-Cache

You can trigger a pre-caching task to start generating vector tiles even before a map is loaded with the dataset for visualization.

See Figure 3-28 to access the **Pre-cache** option.

Pre-caching can infer where the data is located and suggest the data bounds for caching. In case if the information is not available, then you can interactively select the part of the world

that needs to be included in the pre-caching task. Spatial Studio also suggests the zoom levels that are best suited for the data. However, you can always override this and configure your own choice for the **Zoom levels**.

Figure 3-29   Configuring Zoom Levels for Pre-Caching Task
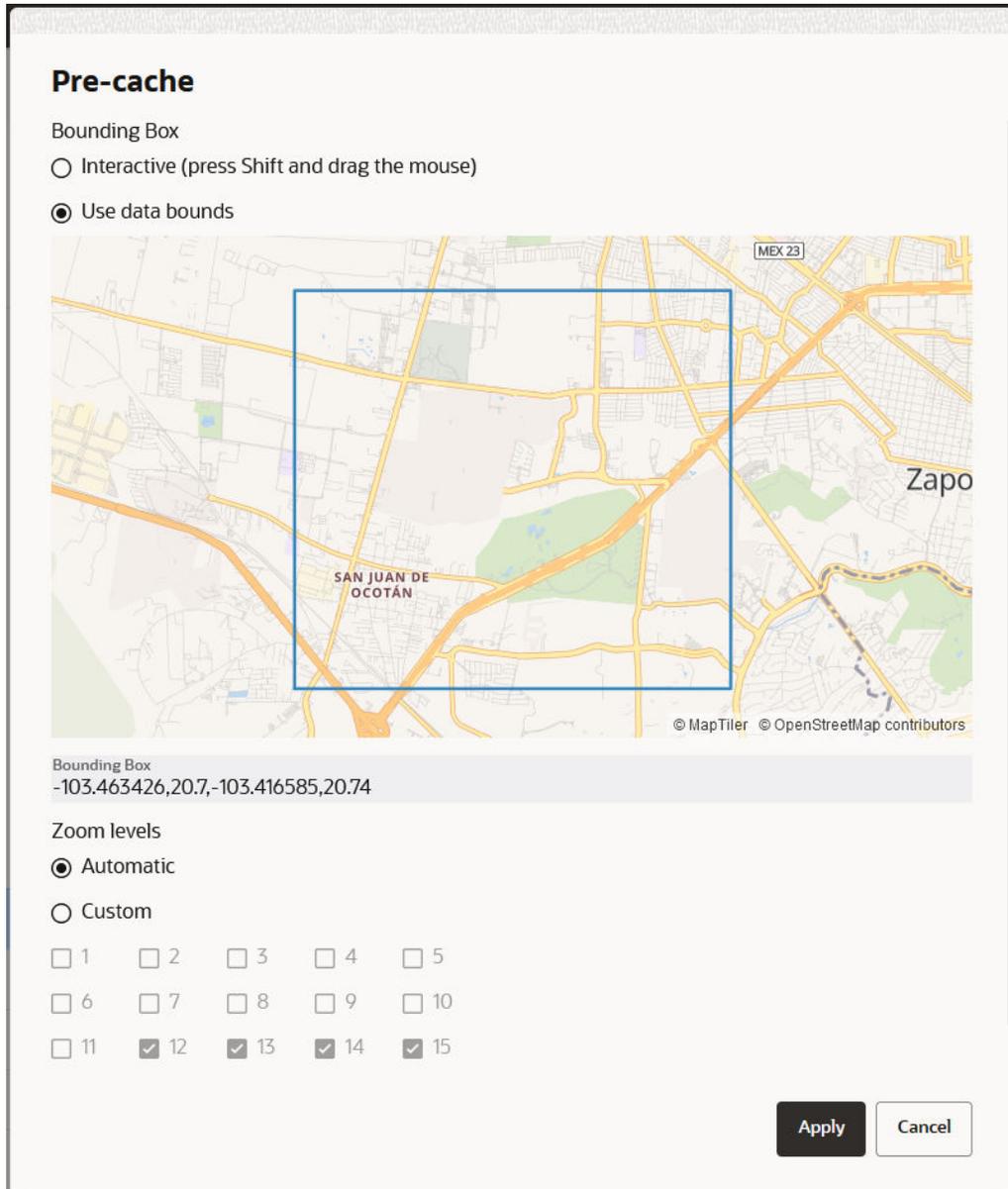
> **Note:**
>
> Based on the complexity of the data and the number of zoom levels to pre-cache, this task could take from a couple of minutes to several hours. Therefore, be cautious on what you opt to include in this process as the database connections and CPU usage could heavily be impacted by this task.

The pre-cached tiles are saved in the file system, following the name pattern discussed in the earlier section. Extra information about the bounding rectangle and zoom levels that were pre-cached are included in the `tiles.json` file as shown:

```
{
  "DatasetName" : "DATASET NAME",
  "DatasetId" : "8da55629d3ca71aa37d859422a847257",
  "GeometryColumn" : "GEOM_COL_NAME",
  "ZoomLevels" : [ 13, 14, 15 ],
  "BoundingBox" : [ -103.455841, 20.708551, -103.421479, 20.73044 ]
}
```

3.6.9.2 Purge Cache

You can wipe the cached tiles by calling the **Purge cache** option.

See Figure 3-28 to access the **Purge cache** option.

This option is helpful whenever the database data changes causing the already generated vector tiles to become stale.

Alternatively, you can also select the **Refresh layer** option for each dataset layer that is added to the map visualization in the **Active Project** page as shown:

Figure 3-30   Refresh Map Data Layer
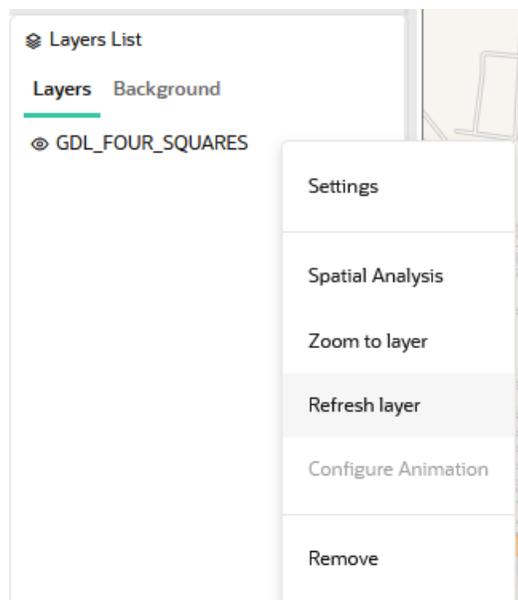
This indirectly triggers a **Purge cache** operation, before generating the vector tiles again.

You must perform a cache purge or layer refresh whenever you apply any of the following changes to a dataset:

- Change the key column of a dataset
- Enable or disable columns of a dataset

- Change the contents of your dataset's source table

Otherwise, you will be viewing stale data on the map and interacting with this data may also result in errors.

3.7 Spatial Studio Connections Page

The Connections page displays all the existing connections and also allows you to create a new connection.

The following figure shows a layout of the Connections page:

Figure 3-31   Connections Page
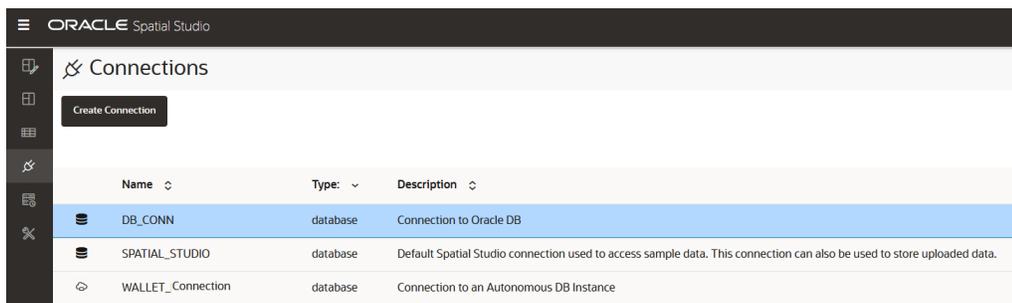
You can perform the following actions on the Connections page:

- You can create a new connection, by clicking **Create Connection**.

Figure 3-32   Create Connection
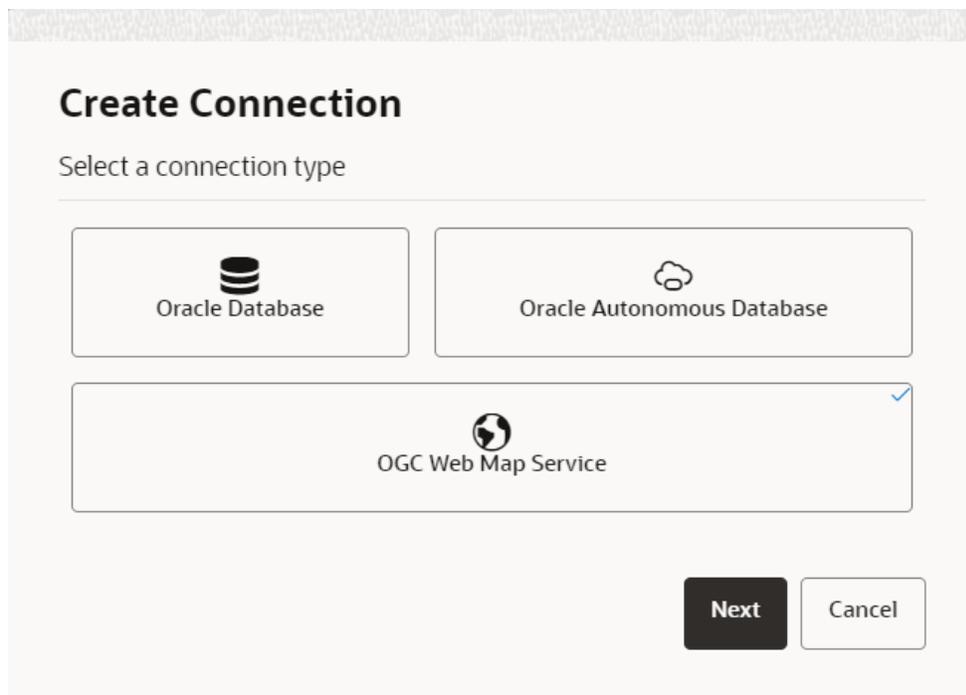
As seen in the preceding figure, you can create a connection to the following sources:

– **Oracle Database:** You must provide the host, port, schema, and other database authentication details.

– **Oracle Autonomous Database:** You must provide the wallet and the connection details.

– **OGC Web Map Service:** You must provide the URL to connect to the WMS service.

• You can also perform the following actions by clicking the hamburger icon against any displayed connection or by right-clicking a connection row:

– **Properties:** To view or modify properties of the connection

– **Edit:** To update the connection details

> **Note:**
>
> You cannot edit the SPATIAL_STUDIO connection on the Connections page. Instead, refer to If the Spatial Studio Repository Schema Password Has Been Changed section.

– **Migrate:** To migrate the connection from one environment to another

– **Test:** To validate the connection

– **Delete:** To delete the connection along with all its datasets

> **Note:**
>
> You cannot delete the SPATIAL_STUDIO connection.

• Creating an Oracle Database Connection
You can create a Spatial Studio connection to any Oracle Database schema.

• Creating a Cloud Connection to an Autonomous Database Instance
You can create a Spatial Studio connection to an Autonomous Database instance.

• Creating an OGC WMS Connection
You can create a new connection to an external OGC (Open Geospatial Consortium) WMS (Web Map Service) service.

• Migrating Database Connections
You can migrate your connections in Spatial Studio between on-premises and cloud database environments.

3.7.1 Creating an Oracle Database Connection

You can create a Spatial Studio connection to any Oracle Database schema.

You can perform the following steps to setup a connection to the database:

1. Navigate to the **Connections** page.

2. Click **Create Connection**.

   The **Create Connection** dialog opens as shown in the Figure 3-32.

3. Select **Oracle Database** as the connection type and click **Next**.

   The **Create Connection** dialog open as shown:

   Figure 3-33   Creating a Connection to the Oracle Database

4. Enter the Spatial Studio connection **Name**.

5. Optionally, enter a **Description**.

6. Select the database **Connection** type.

   The supported types are:

   • **Service**

   • **SID**

7. Enter the **Service/SID** value depending on your connection type.

8. Enter the database **User** name and the **Password** for the user.

9. Enter the **Host** and **Port** details.

10. Click **OK**.

    The Oracle Database connection gets created. This **database** type connection is displayed on the **Connections** page.

3.7.2 Creating a Cloud Connection to an Autonomous Database Instance

You can create a Spatial Studio connection to an Autonomous Database instance.

As a prerequisite, you must download and save the wallet for your Autonomous Database instance from the Oracle Cloud Infrastructure (OCI) console. See Download Client Credentials (Wallets) for more information.

You can perform the following steps to setup a cloud connection to your Autonomous Database instance:

1. Navigate to the **Connections** page.

2. Click **Create Connection**.

    The **Create Connection** dialog opens as shown in the Figure 3-32.

3. Select **Oracle Autonomous Database** as the connection type and click **Next**.

    The **Upload wallet** dialog opens.

4. Drag and drop your saved wallet file or click to upload the wallet from your system.

5. Click **OK**.

    The **Create Connection** dialog opens as shown:

Figure 3-34   Creating a Connection to an Autonomous Database Instance

6. Optionally, change the default Spatial Studio connection **Name**.

7. Optionally, enter a **Description**.

8. Enter the Autonomous Database **User** name and the **Password** for the user.

9. Select the appropriate **Service** from the drop-down list.

10. Optionally, enter the **Proxy Host** and **Proxy Port** details.

11. Click **OK**.

    The connection to the Autonomous Database instance gets created. This **database** type connection is displayed on the **Connections** page.

3.7.3 Creating an OGC WMS Connection

You can create a new connection to an external OGC (Open Geospatial Consortium) WMS (Web Map Service) service.

This enables you to create an OGC WMS dataset which can be used in map visualizations.
Note that a WMS service or server typically offers many individual map layers that can be combined in different orders. The full list of available map layers, as well as many

other important supported functionalities are all advertised by the WMS server through a standard WMS `GetCapabilities` response.

When you create a new WMS connection, Spatial Studio will be querying such capabilities against the external WMS server using the standard `GetCapabilities` call. Based on the result of such a query, you will later be able to choose the required WMS map layers that must be included when creating a new Spatial Studio WMS dataset.

Prior to creating a WMS connection, if the Spatial Studio server is running behind a fire wall, then you must configure the Web Proxy using the **General** panel in the Administration page. This is to enable Spatial Studio to access the WMS server (which can either be running on the same data center or remotely) from the server side.

You can perform the following steps to create an OGC WMS connection:

1. Navigate to the **Connections** page.

2. Click **Create Connection**.

   The **Create Connection** dialog opens as shown in the Figure 3-32.

3. Select **OGC Web Map Service** as the connection type and click **Next**.

   The **Create Connection** dialog open as shown:

Figure 3-35   Creating an OGC WMS Connection
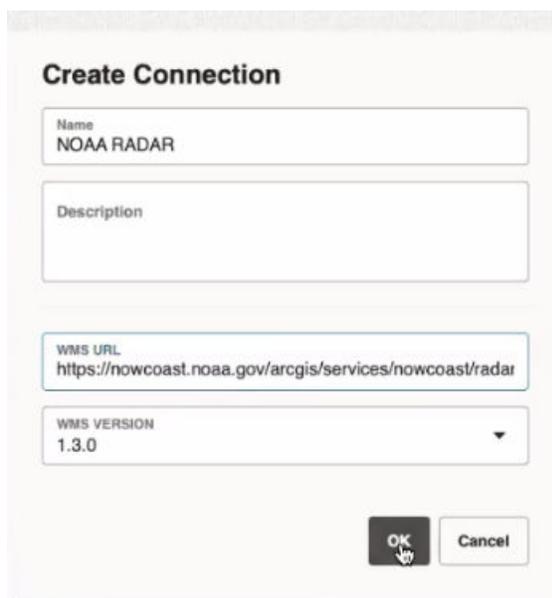
4. Enter the connection **Name**.

5. Optionally, enter a **Description**.

6. Enter the **WMS URL** to connect to the WMS service.

   Note, you can use one of the following two formats for the WMS URL:

   • A complete `GetCapabilities` request, including the version of the WMS specification (1.3.0 is recommended). For instance:
   ```
   https://nowcoast.noaa.gov/arcgis/services/nowcoast/
   radar_meteo_imagery_nexrad_time/MapServer/WmsServer?
   service=WMS&request=GetCapabilities&version=1.3.0
   ```

- The base URL of the WMS server. For instance:
  `https://nowcoast.noaa.gov/arcgis/services/nowcoast/`
  `radar_meteo_imagery_nexrad_time/MapServer/WmsServer`

  However, in general, the first format (a URL for the WMS server's
  `GetCapabilities` request) is recommended.

7. Optionally, select the **WMS VERSION**.

8. Click **OK**.

   The OGC WMS connection gets created. This **wms** type connection is displayed
   on the **Connections** page.
   Also, the new WMS connection stores the names of all the available map layers
   (hosted by the WMS service) and a host of other information based on the
   GetCapabilities response as a part of its metadata.

Related Topics

- Creating an OGC WMS Dataset
  Starting with Spatial Studio release 22.3, you can define datasets that are based
  on the `GetMap` responses from any external OGC (Open Geospatial Consortium)
  WMS (Web Map Service) services.

- Visualizing OGC WMS Maps as a Dataset
  You can visualize an OGC (Open Geospatial Consortium) WMS (Web Map
  Service) dataset on a map.

3.7.4 Migrating Database Connections

You can migrate your connections in Spatial Studio between on-premises and cloud
database environments.

It is possible that you may want to migrate data from your on-premises database to an
Autonomous Database instance or the other way around. In such scenarios, you can
also migrate the Spatial Studio connection related to the data to the new target data
source. Thus, Spatial Studio allows you to continue working with the datasets that
were created using the earlier connection properties, without rendering them invalid.
You can perform the following steps to migrate a database connection.

1. Navigate to the **Connections** page.

2. Right-click on the required connection **Name**.

   The context menu for the database connection appears as shown:

Figure 3-36   Migrate Option for a Database Connection
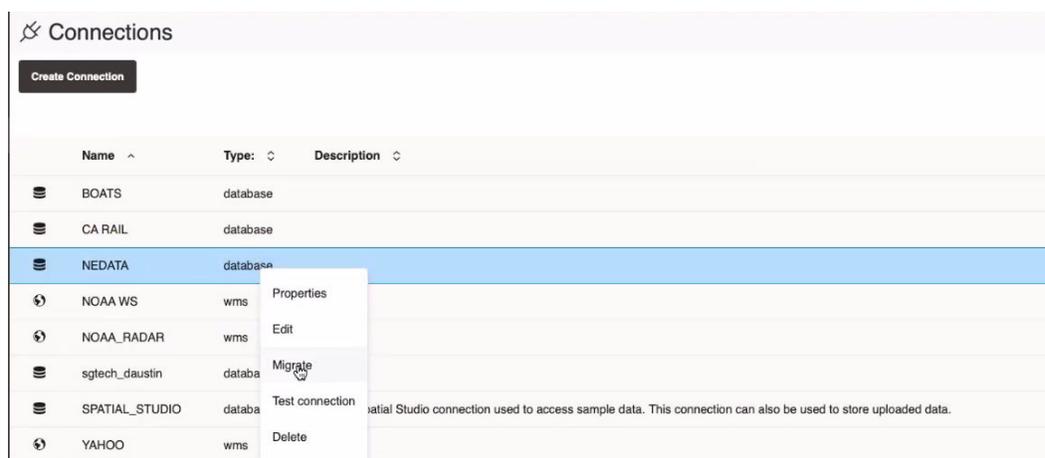
3. Click **Migrate**.

Migrate Database Connection is displayed as shown:

Figure 3-37   Migrate Database Connection
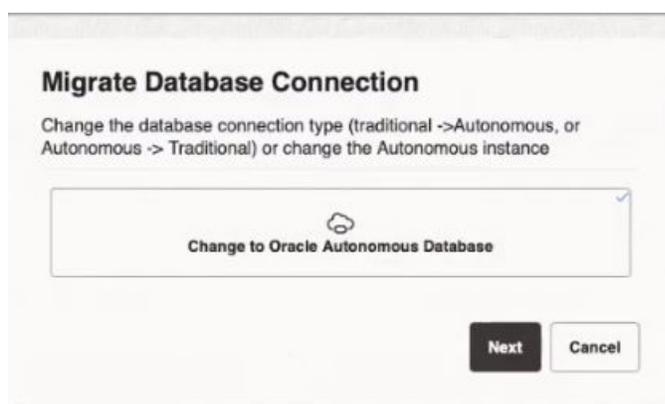
Note that in the preceding image, the target environment for migration may vary depending on the current source of the database connection. You can perform the following steps to configure the target environment that applies to you:

• **Migrating from On-Premises Database to Oracle Autonomous Database**:

   a. Click **Next** and provide the **Upload Wallet** details.

   b. Click **OK** and provide the database connection details.

• **Migrating from Oracle Autonomous Database to On-Premises Database**:

   a. Click **Next** and provide the database connection details.

   b. Click **OK**.

The connection gets updated to the new data source.

3.8 Spatial Studio Administration Page

You can monitor the status and activity of Spatial Studio in the Administration Page. You can also view server logs, change global system configurations, manage custom basemaps, and configure safe domains.

The Administration menu link directs you to the Administration page.

> **✎ Note:**
>
> You must be logged in as an administrator of Spatial Studio to access this menu option.

The layout the Administration page is as shown:

Figure 3-38   Administration Page
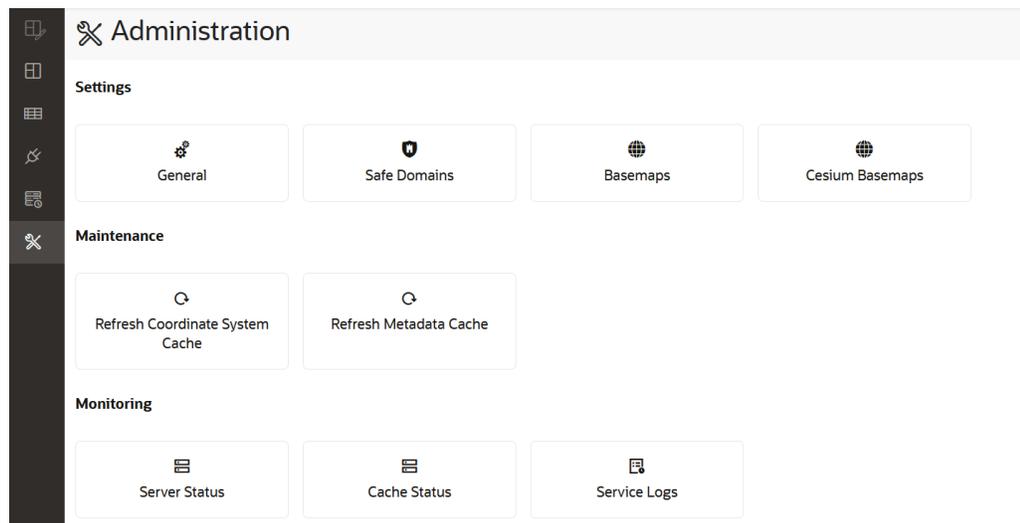
The Studio console page comprises of the following sections:

Settings

*   **General**: This section allows changing the GeoCoding service URL, the geocoding batch size, and the web proxy used by the Studio server. It also allows you to customize the frontend branding area of the application.

*   **Safe Domains**: This section allows the administrator to manage the white listing of the domains (host names or IP addresses) that are considered safe for loading various types of the resources from the Studio application. Typically, it is used to add the domain of a custom basemap to the Content Security Policy directives of the Studio. After making the changes to the safe domains list, you must reload or refresh the browser page to reload the new Content Security Policy.

*   **Basemaps**: This section allows a quick view of the existing custom basemaps, and in adding or editing custom basemaps. Custom basemaps can be made of

either raster or vector tiles, typically hosted on a third party tile server. Additionally, you can also create a custom basemap using a WMS OGC web service.

- **Cesium Basemaps**: This section gives you a quick view of the existing custom basemaps used exclusively for the 3D Cesium Map visualization. It also allows you to add new basemaps to be used by the 3D Map visualizations.

> **Note:**
>
> Each listed host entry for Basemaps and Cesium Basemaps must be present as one of the entries in the Safe Domains list. If the host basemap comes from a domain that is not present in the Safe Domains list, then the basemap may not render correctly when visualizing the map.

Maintenance

- **Refresh Coordinate System cache**: Use this only when needed to rebuild the text index of the repository database schema's supported Spatial Reference Well Known Text (WKText) definitions. For the shapefile upload, this WKText index is used to automatically match the best SRID.

- **Refresh Metadata Cache**: Spatial Studio typically caches all of the frequently used metadata such as the definitions of Datasets, Connections, and Projects. Sometimes it is required to refresh the whole cache in case some cached metadata becomes stale or out of sync in rare events.

Monitoring

- **Server Status**: This section provides read-only information about the general health and system status of the Spatial Studio server.

- **Cache Status**: This section provides the details of the cache maintained by Spatial Studio.

- **Service Logs**: This section allows loading and viewing a desired number of server-side logs. To reduce the clutter, you can filter the result using the desired logging level.

In a cluster deployment, both the preceding options display only the information of the particular Spatial Studio instance to which the current session is connected.

- Adding a Custom Basemap
- Editing a Custom Basemap

3.8.1 Adding a Custom Basemap

The following steps enable you to add a custom basemap.

1. Navigate to the **Administration** page.

2. Click **Basemaps** under Settings.

   The **Basemaps** window listing all the available basemaps opens.

3. Click **Add Basemap** and click on one of the following basemap types:

   - XYZ Raster tiles
   - OGC WMS

- Vector tiles

4. Enter **Name** and **URL** for the selected basemap type.

5. Optionally enter **Attribution** and **API Key**.

> 💡 **Tip:**
>
> Once you have entered all the required fields, you can preview the basemap by clicking **Quick View**.

6. Click **Save** to add the base map.

   For example, the following figure show the **OGC WMS** basemap configuration window:

Figure 3-39   Adding a OGC WMS Map

> **Note:**
>
> It is important to add the domain name to **Safe Domains** in order to enable the Spatial Studio application to access the required service for the basemap.

3.8.2 Editing a Custom Basemap

The following steps enable you to edit a custom basemap.

1. Navigate to the **Administration** page.

2. Click **Basemaps** under Settings.

   The **Basemaps** window listing all the available basemaps opens.

3. Click ✱✱✱ against the required custom basemap and click **Edit** from the context menu.

> **Note:**
>
> **Edit** is disabled for predefined Spatial Studio maps.

The custom basemap configuration details are displayed for editing as shown:

Figure 3-40   Editing a Custom Basemap
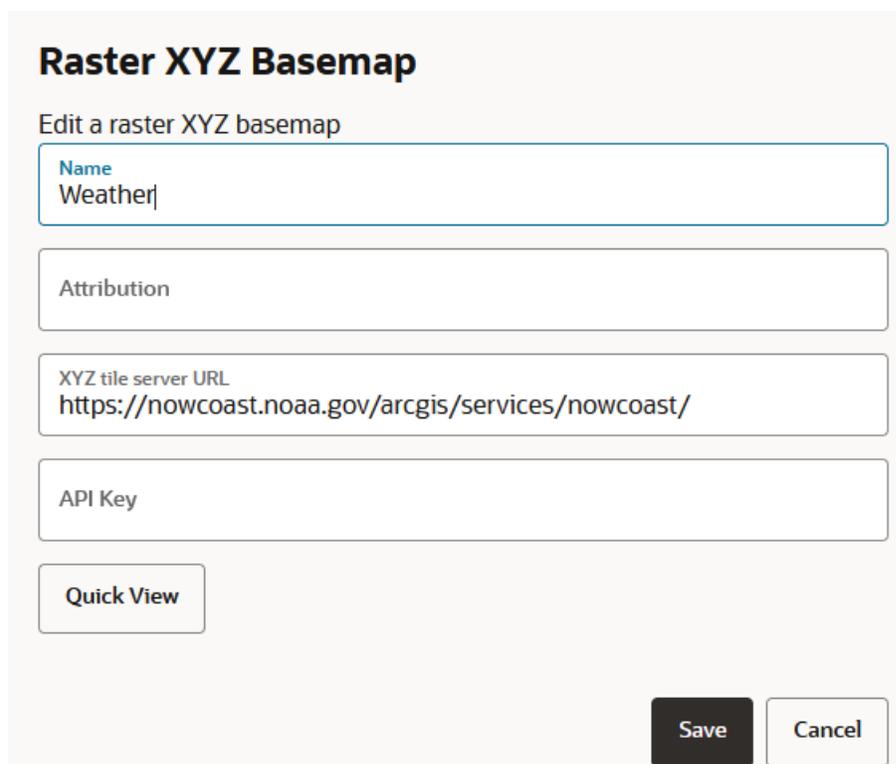
4. Modify the required parameters, such as **Name**, **Attribution**, **URL** or **API Key**.

5. Click **Save**.

The custom basemap details are modified and the updates are shown in the **Basemaps** window.

3.9 Spatial Studio Jobs Page

The Jobs page displays details of all the background jobs that run in Spatial Studio.

The following figure shows a layout of the Jobs page:

Figure 3-41   Jobs Page

You can perform the following actions on the Jobs page:

- Select a job to be displayed in the grid: **Active**, **Past** or **All**.

- Select a refresh interval for the jobs grid.

- View details of a specific job.

- Terminate a job.
  Also, note the following about terminating a job:

  – You can terminate a `Processing` or `Pending` job.

  – You can terminate all job types except `Create lon-lat index` jobs.

  – Upon termination of a job, partial execution results of the job are maintained. You can choose to clear the partial results. For example, you can perform `Clear Address Geocode` after terminating a `Geocode` job.

  – Only jobs related to H3 aggregations such as `Build H3 Index` are completely rolled back when terminated.

The grid table displays the following properties for each job entry row:

- **Type:** The job type, such as "`Geocode`", "`Reverse geocode dataset`" and so on.

- **Object:** The entity being altered by the job, which can be a Dataset, Table, Index or other.

- **Created by:** The user that submitted the job.

> ✏️ **Note:**
>
> System maintenance jobs are created by "`$system`" account

- **Start Time:** The scheduled next run time for jobs with `Pending` status or the actual job start time for any other job status.

- **End Time:** The time at which a job completed.

- **Status:** Indicates the state or progress of a job, which can be:

  - `Pending`

  - `Processing`

  - `Done`

  - `Error`

  - `Terminating`

  - `Terminated`

By clicking `***` against any job row, you can perform the following actions :

- **View Details:** To view extra information, such as the step at which a `Processing` job is currently running or error details for `Error` or `Terminated` jobs. Also, you can terminate a `Processing` job by clicking **Terminate** when viewing the job details.

- **Terminate:** To terminate a `Processing` or `Pending` job directly. It remains disabled for any other job status.

3.10 Visualization in Oracle Spatial Studio

You can visualize your spatial data in Oracle Spatial Studio using different modes of visualization.

Spatial Studio supports the following visualization methods:

- Table

- Map

- Cesium-Map

You can save your visualization as a Project in Spatial Studio. You can rework on a project or publish a project to share the results with other users.

The following sections explain in detail how you can use the various visualization techniques:

- Using a Table Visualization

- Using a Map Visualization

- Using a Cesium Map Visualization

- Styling a Map Layer

- Visualizing Map Data Over Time

- Multiple Visualizations on a Canvas

- Configuring a Map Visualization

3.10.1 Using a Table Visualization

Spatial Studio allows you to visualize your data from the dataset in tables.

To display your data in a tabular view, you must perform the following steps.

The instructions assume that the dataset for visualization is already added to the project in the Active Project page.

1. Click the **Visualizations** tab on the left pane in the Active Project page.

   This lists the various visualization options.

2. Click and drag **Table** from the list to the visualization window on the right to create a table visualization.

   This opens an empty layer in the visualization window.

3. Click the **Data** tab on the left pane in the Active Project page.

   This lists all the **Datasets** that are loaded for the project.

4. Click and drag the desired **dataset** from the list to the empty layer on the right.

> **Note:**
>
> You can view only one dataset in a table view. If you want to view multiple datasets, you must create one table view for each dataset.

This opens the data in tabular format for visualization as shown:

Figure 3-42   Tabular Visualization

You can easily scroll up or down the table to view the data rows as the table supports infinite scrolling.

You can delete the table visualization by clicking the **X** icon on the top-right.

3.10.2 Using a Map Visualization

Spatial Studio supports the following types of map visualizations:

- Geometry Data Visualization:

- Point type
- Line type
- Polygon / Area type
- GeoRaster Data Visualization
- Hexagonal Data Visualization using H3 Aggregations

The following sections describe how to get started on these visualizations:

- Visualizing a Point Map
- About GeoRaster Data Visualization
- About Hexagonal Data Visualization Using H3 Aggregations
- About Custom Map Regions Visualization
- Visualizing a Moving Object
  Starting from Oracle Spatial Studio Release 22.1.0, you can visualize moving objects using a spatiotemporal dataset.
- Visualizing OGC WMS Maps as a Dataset
  You can visualize an OGC (Open Geospatial Consortium) WMS (Web Map Service) dataset on a map.

3.10.2.1 Visualizing a Point Map

Spatial Studio allows you to visualize the location of geographic data as points on maps.

To display your geographic data as maps, you must perform the following steps.

The instructions assume that the dataset for visualization is already added to the project in the Active Project page.

1. Click the **Visualizations** tab on the left pane in the Active Project page.

   This lists the various visualization options.

2. Click and drag **Map** from the list to the visualization window on the right to create a map visualization.

   A default base map is displayed with no data visualization layers.

3. Click the **Data** tab on the left pane in the Active Project page.

   This lists all the **Datasets** that are loaded for the project.

4. Click and drag the desired **dataset** from the list to the map view on the right.

   > 💡 **Tip:**
   >
   > You can drag and drop multiple datasets in a single action to your map view.

   The map layer displays the data points for visualization.

Figure 3-43   Map Visualization
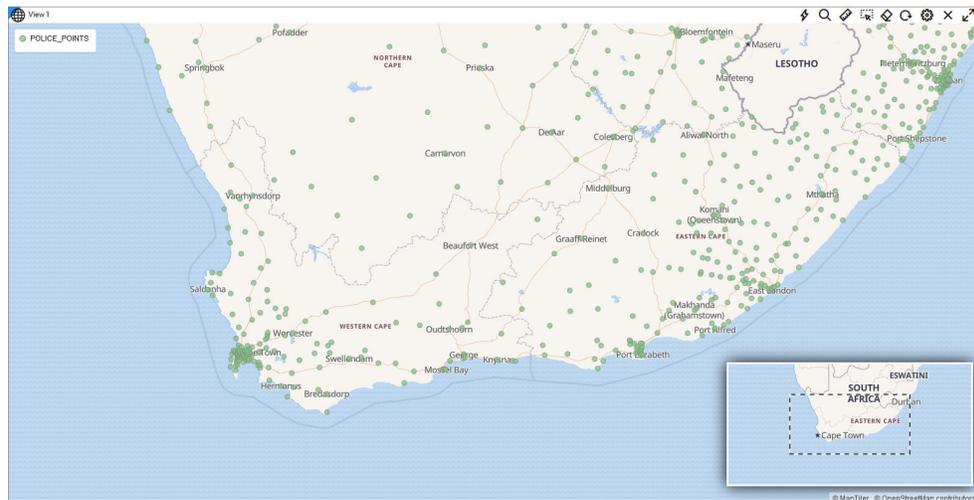
5. Optionally, you can click **Settings** in the map tool bar and enable **Show minimap** in the **Visualization Settings** dialog.

   An inset map showing the overview of the main map is displayed as shown in the preceding figure.

> ✎ **See Also:**
>
> Applying a Render Style For a Point Layer to render your map using different rendering styles.

3.10.2.2 About GeoRaster Data Visualization

Oracle Spatial Studio allows you to visualize GeoRaster data stored in spatial GeoRaster type in Oracle Database.

Geo-referenced raster data, including satellite imagery, aerial photos from drones, and gridded data, is very useful for mapping applications. It can be directly analyzed, or layered with vector data as a background map for additional context. See Spatial GeoRaster Developer's Guide for more information on GeoRaster data.

• Visualizing GeoRaster Data on a Map

3.10.2.2.1 Visualizing GeoRaster Data on a Map

You can visualize georaster data on a map using the following steps.

The instructions assume that the GeoRaster dataset is already added to the project in the Active Project page. To create a GeoRaster dataset, see Creating a GeoRaster Dataset for more information.

1. Click the **Visualizations** tab on the left pane in the Active Project page.

   This lists the various visualization options.

2. Click and drag **Map** from the list to the visualization window on the right to create a map visualization.

A default base map is displayed with no data visualization layers.

3. Click the **Data** tab on the left pane in the Active Project page.

    This lists all the **Datasets** that are loaded for the project.

4. Click and drag the desired **GeoRaster dataset** from the list to the map view on the right.

    A GeoRaster layer is created on the map as shown:

Figure 3-44   GeoRaster Data Visualization

You can delete the map visualization by clicking the X icon on the top right.

> 💡 **Tip:**
>
> You can enhance your visual display by modifying your Layer Settings using the
> **Style** tab and **Raster** tab. See Applying Style for a GeoRaster Layer for more
> information.

3.10.2.3 About Hexagonal Data Visualization Using H3 Aggregations

Oracle Spatial Studio allows you to visualize point-type map data using hexagons with H3
(Hexagonal Hierarchical Spatial Index) aggregations.

Visualizing your map data as hexagons has several advantages:

*   It helps you to identify patterns or clusters in a larger point dataset

- Easier interpretation of data, as in a hexagonal cell, all the points are equidistant from the hexagon center-point
- Hexagonal cells are color coded based on the number of datapoints they hold, which enables you to easily understand data patterns

The following sections describe how you can use H3 aggregations in Spatial Studio:

- Preparing an H3 Aggregation Dataset
- Visualizing Data With H3 Aggregations

3.10.2.3.1 Preparing an H3 Aggregation Dataset

You can prepare an H3 aggregation dataset by performing the following steps.

The instructions assume that a dataset containing geometric data columns is already loaded to Spatial Studio.

1. Navigate to the **Datasets** page.

   All the datasets loaded to Spatial Studio are shown listed on this page.

2. Select the required dataset **name** and right-click to open the context menu.

3. Click **Create H3 Index** on the **Prepare** submenu.

   The **Creating H3 Index** dialog opens as shown:

   Figure 3-45   Creating an H3 Aggregation Dataset

4. Select the **Geometry Column** for H3 aggregations.

5. Click a **Summarize using** option.

   The values for summarizing are:

   - **Count:** buckets the number of datapoints in each hexagon
   - **Sum:** adds up the values for a specific column in the data set, for all the points that fall in a specific hexagon

6. Select the **Column to sum**, if you have chosen **Sum** to summarize your dataset. Otherwise, you can skip this step.

7. Optionally, modify the **H3 Index Name**.

8. Click **OK**.

   An H3 aggregation dataset is created and added as a new row in the Datasets page.

3.10.2.3.2 Visualizing Data With H3 Aggregations

To visualize your map data with H3 aggregations, you must perform the following steps.

The instructions assume that an H3 aggregation dataset is already added to the project in the Active Project page.
To prepare a dataset for H3 aggregation, see Preparing an H3 Aggregation Dataset for more information.

1. Click the **Visualizations** tab on the left pane in the Active Project page.

   This lists the various visualization options.

2. Click and drag **Map** from the list to the visualization window on the right to create a map visualization.

   A default base map is displayed with no data visualization layers.

3. Click the **Data** tab on the left pane in the Active Project page.

   This lists all the **Datasets** that are loaded for the project.

4. Click and drag the desired **H3 Aggregation dataset** from the list to the map view on the right.

   A layer showing the hexagonal binning of the data points is displayed on the map as shown:

Figure 3-46   Map Data Visualization Using Hexagonal Binning
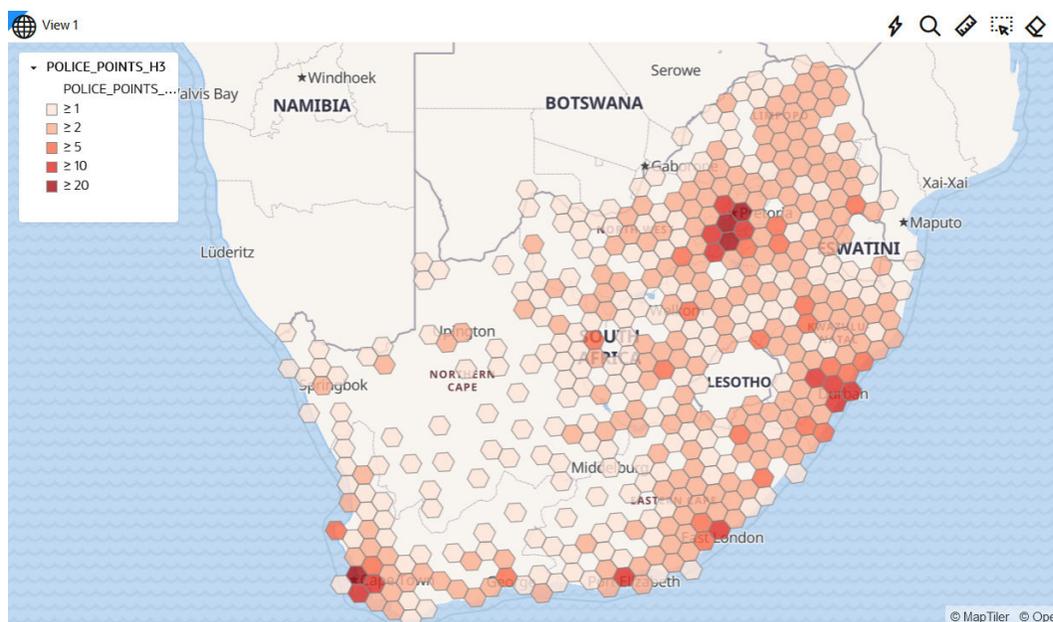
See Applying Data-Driven Style to a Map with H3 Aggregations for more information on applying styling for a H3 map layer.

3.10.2.4 About Custom Map Regions Visualization

Oracle Spatial Studio allows you to create custom map regions on map layers that support polygon type geometry.

You can create a new map region by selecting multiple polygon shapes and combining them with a new key-value. You can then append or insert this new map region with the new key-value into a target dataset containing all of your other custom map regions, or save it as a new dataset.

These newly created custom shapes are persisted on the underlying database table of the target dataset, and therefore can be used for data visualization or reporting just like any other dataset.

The following are the main characteristics for this feature support:

- The source dataset, that is the dataset whose polygon shapes you will be selecting and then combining into a custom map region, must always be based on an Oracle Database table.
  Datasets from Oracle views and Studio's Analyses are not currently supported.

- The new regions may or may not be contiguous.

- The target dataset, that is the dataset on which you want to store the newly created custom map regions, will store them in its geo-reference system.

- The target dataset can be a new dataset or an existing dataset in the current project. For a new dataset, you need to specify the connection, the table name, the dataset name, the key-column name of the table, and provide the key value for the new region.

- Only the key value and new geometry value are inserted into the newly created target table. For inserting the new region into an existing dataset, you may provide values for all of the dataset's attributes, or only the required ones.

- An existing targets dataset must meet the following requirements:

  – The geometry metadata information for the target dataset must be available in the SDO_GEOM_METADATA view.

  – A spatial index must exist on the geometry column. Note that if a spatial index is not created on the geometry column, then the target data layer cannot be dragged on to the map visualization canvas.

> **Note:**
>
> Prior to Release 22.3, these target dataset requirements were implemented using SQL statements. However, from Release 22.3 onwards, if a new dataset is created to store the regions, then Spatial Studio automatically takes care of updating the geometry metadata and creating a spatial index.

- For a new target dataset, once it is created and the first region is inserted, then the dataset can be manually added to the current active project and added as a layer

to the map visualization. For subsequent processing, this new target dataset is treated as an existing target dataset.

- Creating Custom Regions for Visualization
- Creating a Target Dataset

3.10.2.4.1 Creating Custom Regions for Visualization

You can create custom polygon regions on the source dataset that contains polygon type geometries and apply them on a target dataset using the follow steps:

The instructions assume that the source and target datasets are already added to your Project in the ActiveProject page.

1. Click the **Visualizations** tab on the left pane in the Active Project page.

    This lists the various visualization options.

2. Click and drag **Map** from the list to the visualization window on the right to create a map visualization.

    A default base map is displayed with no data visualization layers.

3. Click the **Data** tab on the left pane in the Active Project page.

    This lists all the **Datasets** that are loaded for the project.

4. Click and drag the desired **source dataset** from the list to the map view on the right.

    A map layer with polygon shapes is created.

5. Create the required custom regions by performing the following steps as many times as required:

    a. Select the regions for aggregation using the polygon selection tool in the map tool bar.

Figure 3-47   Creating Custom Map Shapes
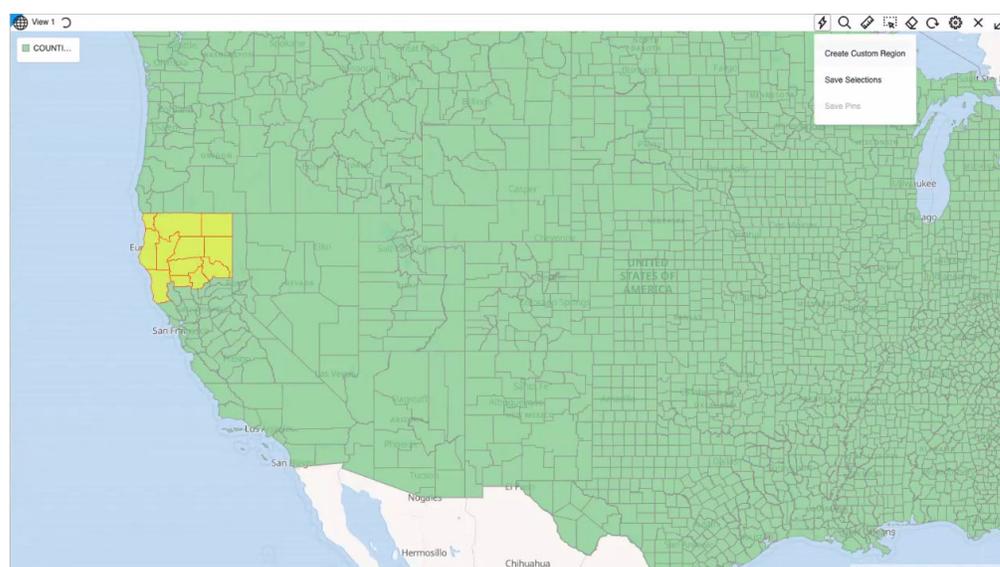
> **Tip:**
>
> Alternatively, you can also select multiple polygons by using the keyboard shortcut `Ctrl + Click` on a Windows system.

b. Click , **Actions** icon on the map tool bar and select **Create Custom Region**.

Combining shape dialog opens as shown:

Figure 3-48   Create a Custom Region
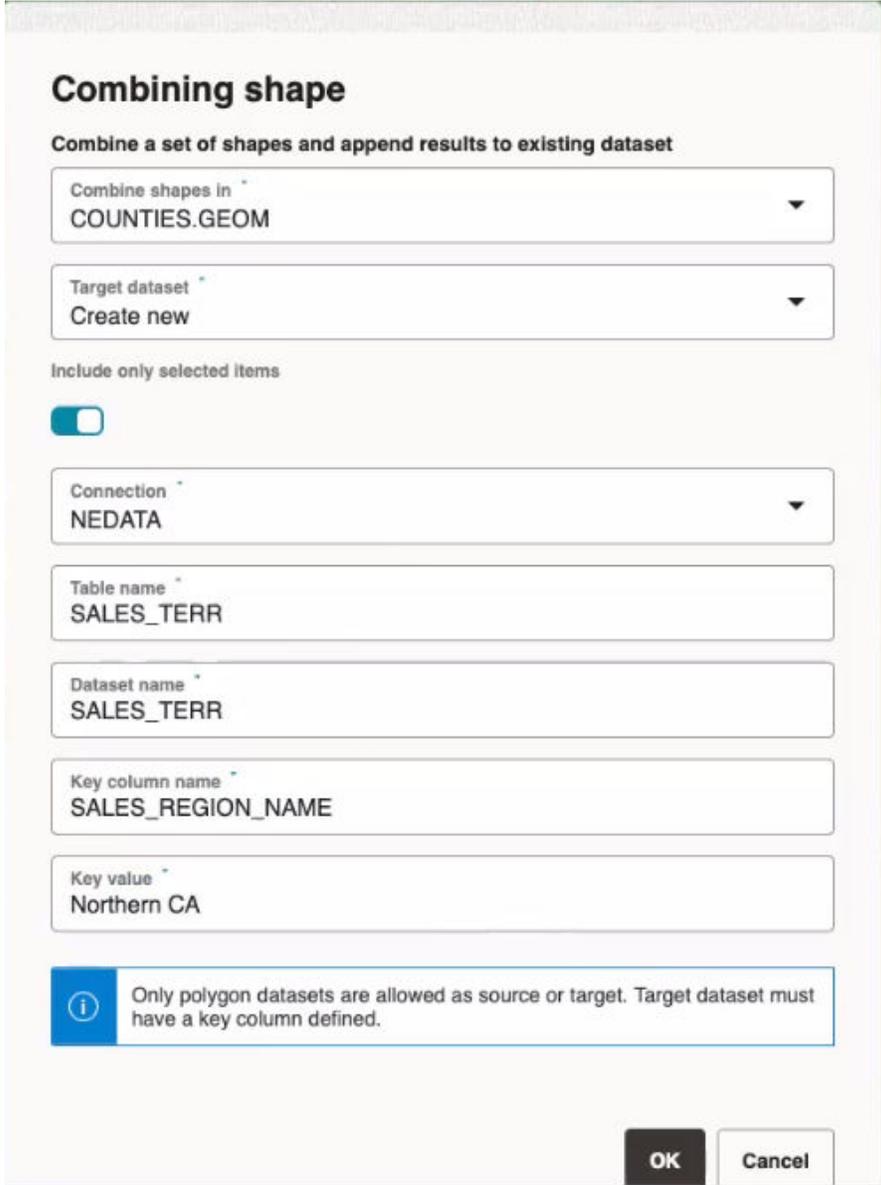
c. Select the source dataset from the **Combine shapes in** drop-down list.

d. Select one of the following desired options for **Target dataset**:

- **Create new:** To create a new target dataset:

    i. Enter **Connection**, **Table name**, and **Dataset name** details for the new target dataset.

    ii. Enter the **Key column name** and the **Key value** that uniquely identifies the custom map region.

- **Append to existing:** To append the custom polygon shapes to an existing target dataset:

    i. Select an existing target dataset from the **Append result to dataset** drop-down list.

    ii. Click **Enter new shape attributes** and enter a unique key value for the **Key column name** of the target dataset.

e. Optionally, switch on or off the **Include only selected items** toggle button:

> ⚠ **Caution:**
>
> The whole source dataset may be aggregated into one region if **Include only selected items** is switched off. In this case the process may run for a long time depending on the number of features in the source dataset. Therefore, use this option only if required.

f. Click **OK** to create the custom map region.

6. Drag and drop the **target dataset** to the map view on the right to view the newly created custom regions.

   The following figure shows the newly defined custom regions that were inserted into the target dataset.

Figure 3-49   Displaying the Custom Shapes on the Target Dataset
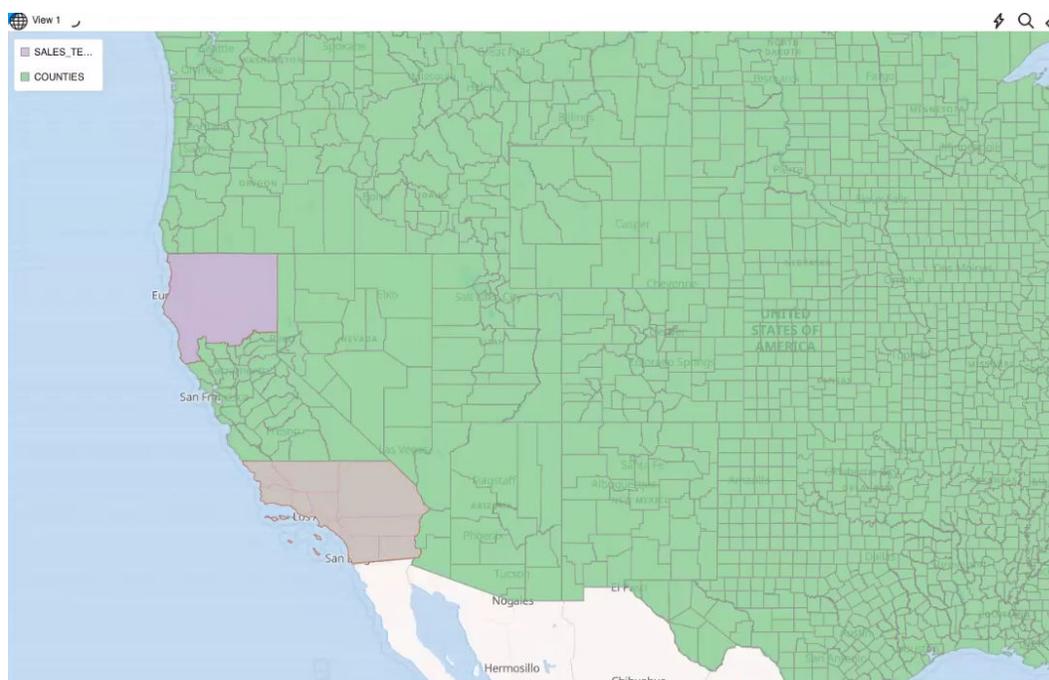
3.10.2.4.2 Creating a Target Dataset

There are two ways to create a target dataset:

- **By Spatial Studio**: Refer to the Create New Target Dataset option in the earlier section. Note that you must specify the key column name for the target dataset as the key values are stored in the key column names for the corresponding geometries (custom map regions).

- **By manual process**: Perform the following steps to create a dataset manually:

1. Connect to an Oracle database schema using SQL Developer or any other tools.

2. Create a spatial table as shown:

```
CREATE TABLE affected_regions (region_id NUMBER PRIMARY KEY, geom
SDO_GEOMETRY);
```

3. Insert the spatial table into USER_SDO_GEOM_METADATA view. For example:

```
INSERT INTO USER_SDO_GEOM_METADATA VALUES (
'affected_regions', -- TABLE_NAME
'geom', -- COLUMN_NAME
SDO_DIM_ARRAY -- DIMINFO attribute for storing dimension bounds,
0.5 m as tolerance
(SDO_DIM_ELEMENT ('LONGITUDE', -180, 180, 0.5 ),
 SDO_DIM_ELEMENT ( 'LATITUDE', -90, 90, 0.5 )),
4326 -- SRID value for specifying a geodetic coordinate system
);
COMMIT;
```

4. Create a spatial index on the SDO_GEOMETRY column.

```
CREATE INDEX affected_regions_sidx ON affected_regions(geom)
INDEXTYPE IS MDSYS.SPATIAL_INDEX_V2;
```

5. Create a dataset in Spatial Studio from the database schema used in the preceding steps.

   The required target dataset is created. You may use this data layer on to which you can apply the newly created custom map regions.

3.10.2.5 Visualizing a Moving Object

Starting from Oracle Spatial Studio Release 22.1.0, you can visualize moving objects using a spatiotemporal dataset.

Figure 3-50   Moving Objects Visualization
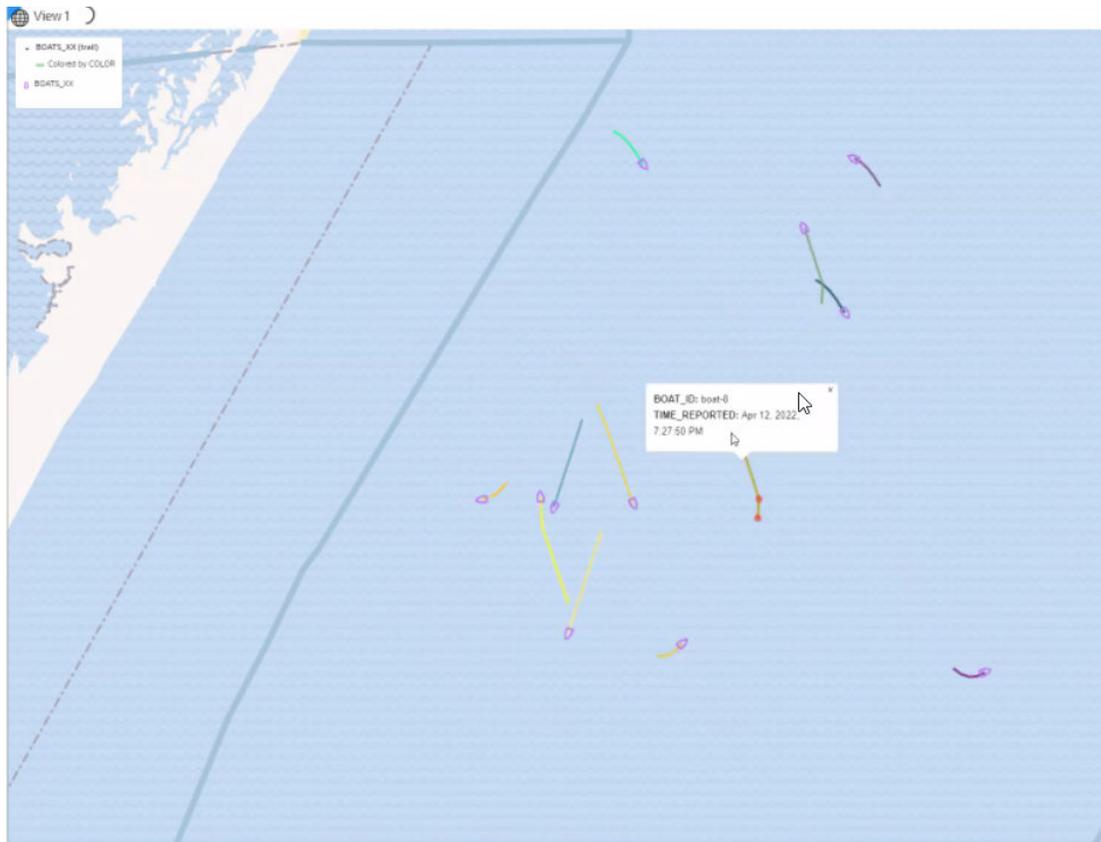
To get started on visualizing moving objects in Spatial Studio, you must:

1. Enable a dataset as a spatiotemporal dataset by defining the essential space, time and entity information.

2. Configure animation settings after adding the spatiotemporal dataset to a map for visualization.

The following sections describe in detail how you can perform the preceding two steps:

* Enabling Spatiotemporal for a Dataset
  In order to visualize and animate moving objects, you must enable **Spatiotemporal** for the dataset containing spatiotemporal data on the Datasets page.

* Configuring Animation for a Moving Object
  To visualize moving objects on a map in Spatial Studio, you must configure the animation settings on the map layer.

* Characteristics of Spatiotemporal Map Layers
  This section describes the distinct characteristics of the spatiotemporal map layers when visualizing a spatiotemporal dataset.

3.10.2.5.1 Enabling Spatiotemporal for a Dataset

In order to visualize and animate moving objects, you must enable **Spatiotemporal** for the dataset containing spatiotemporal data on the Datasets page.

Spatial Studio considers a dataset to contain spatiotemporal data only if it meets the following requirements:

- It must be based on a geometry table or view with a geometry column or pair of latitude/longitude columns.

- There must be one or more "moving objects" or entities uniquely identified by one of the columns.

- There must be a column of the type `TIMESTAMP`, that stores the UTC datetime of the entities as they are being observed and recorded. Alternatively, date-type columns are also supported.

- The dataset's underlying table or view must have ongoing inserts with recently obtained location data of entities being observed or monitored.

You can perform the following steps to enable spatiotemporal for a dataset. The instructions assume that the dataset containing spatiotemporal data is already existing in your database schema.

1. Navigate to the **Datasets** page.

2. Right-click on the spatiotemporal dataset and click **Properties**.

   The **Dataset Properties** dialog opens.

3. Click the **Spatiotemporal** tab.

   The tab display opens as shown:

Figure 3-51   Enabling Spatiotemporal for a Dataset

4. Switch ON **Enable Spatiotemporal**.

5. Select the **Entity_ID Column** that identifies a set of unique entities.

   The **Entity_ID Column** is not a unique column as each entity can have many recordings of its locations in the same table.

6. Select the **Timestamp (or Date) Column**.

   • Both date-type and timestamp-type columns are supported.

   • If using a timestamp-type column, then note that Spatial Studio supports only UTC (Coordinated Universal Time) or GMT (Greenwich Mean Time) time zone for visualizing moving objects.

7. Specify **Data Change Rate** to indicate the approximate frequency of the live feed updates in the table.

8. Optionally, select the **Altitude Column** for Cesium Map Visualization only.

9. Click **Apply**.

Your dataset is now enabled for spatiotemporal data visualization.

3.10.2.5.2 Configuring Animation for a Moving Object

To visualize moving objects on a map in Spatial Studio, you must configure the animation settings on the map layer.

The following instructions assume that you have enabled spatiotemporal for the dataset and the dataset is already added to the project in the Active Project page. See Enabling Spatiotemporal for a Dataset for more information.

1. Click the **Visualizations** tab on the left pane in the Active Project page.

   This lists the various visualization options.

2. Click and drag **Map** from the list to the visualization window on the right to create a map visualization.

   A default base map is displayed with no data visualization layers.

3. Click the **Data** tab on the left pane in the Active Project page.

   This lists all the **Datasets** that are loaded for the project.

4. Click and drag the desired spatiotemporal dataset from the list to the map view on the right. Two map layers are created on the map as shown:

Figure 3-52   Map Visualization Using a Spatiotemporal Dataset
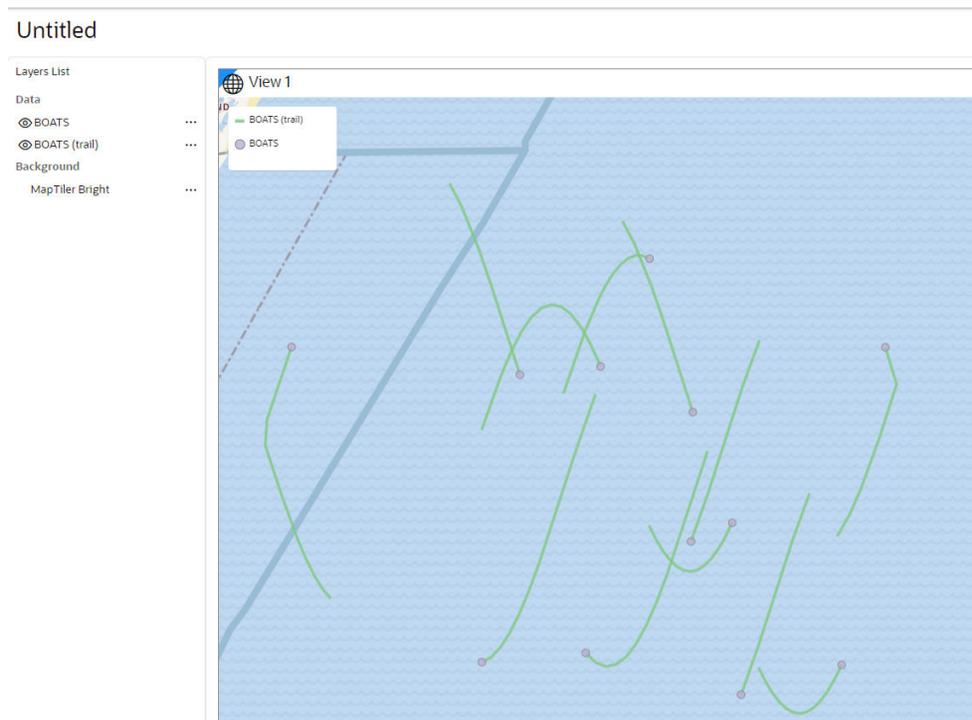
The second layer representing the trails of the moving object is added automatically in Spatial Studio. See Characteristics of Spatiotemporal Map Layers for more information on the two map layers.

5. Perform the following steps to enable animation of the object along the trails:

- Click ••• against the initial layer in the **Data** tab of the **Layers** list.

- Select **Settings** in the context menu and click **Configure Animation**.
  The animation settings for the map layer opens as shown:

Figure 3-53   Configuring Animation Settings
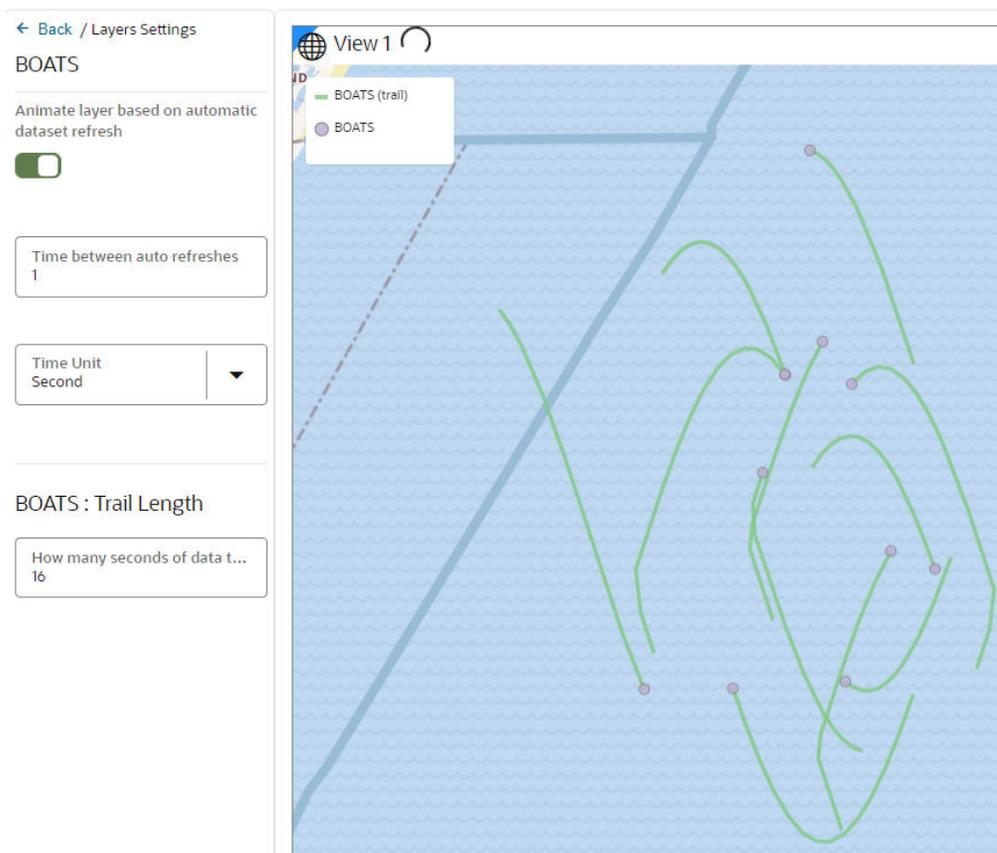
- Switch ON **Animate layer based on automatic dataset refresh**.

- Specify **Time between auto refreshes** to indicate the frequency of data refresh from the backend. This configuration also determines the smoothness and speed of the temporal animation.
  Note that Spatial Studio displays a default frequency value which is same as the **Data Change Rate** value configured on the Spatiotemporal dataset used for the visualization.

- Specify a **Time Unit**.

- Specify the **Trail Length** of your moving object. A trail length value of N indicates that Spatial Studio must fetch the recent N seconds of data of the moving object during every refresh.

> 💡 **Tip:**
>
> If the underlying database table or view contains millions of records, you can limit the map animation to display only the most recent N seconds of data as configured in **Trail Length**.

Note that Spatial Studio displays a default trail length value which is 15 times the **Data Change Rate** value configured on the Spatiotemporal dataset and is rounded to the nearest integer.

The animation settings are configured and you can view the animation of moving objects on the map.

> **✎ Note:**
>
> You can choose a symbol and color for your moving object. However, ensure that the symbol you select adheres to the conditions explained in Characteristics of Spatiotemporal Map Layers.

3.10.2.5.3 Characteristics of Spatiotemporal Map Layers

This section describes the distinct characteristics of the spatiotemporal map layers when visualizing a spatiotemporal dataset.

- The trails map layer is considered the *secondary* layer to the main layer. If you delete the main layer from the map, then the trails map layer is automatically deleted as well.

- The main layer which shares the same name as the dataset is always a Point-type layer, that you can visualize using either as circle or using symbols or icons. When you use symbols, Spatial Studio will also automatically rotate the symbol based on the direction your object is moving.
  Also note, the current release of Spatial Studio supports only those symbols that naturally point North (or point up) or those that do not represent an inherent direction or angle, such as any rounded symbols.

- The main layer will keep its animation even when you toggle the secondary layer invisible. However, if you toggle the main layer invisible, the trail layer will remain static as no new data is fetched from the backend.

- You cannot switch the main layer to Heatmap or Cluster type.

- You cannot use sticky Tooltip or popup as they cannot stick to the moving object when it moves to new locations.

- Spatial Studio drives the animation of moving objects and their trails by constantly refreshing the main layer's data from the backend. This implies that the base table is queried and the last `N` seconds of data is fetched by filtering the records based on the `TIMESTAMP` column.

- If you are working in a multi-user or multi-visualization environment or both, you must take care to avoid overloading the database with many animating layer's data refresh queries. For instance, ensure a layer is not refreshing its data too frequently, or fetching too many seconds of data on each refresh, or both.

3.10.2.6 Visualizing OGC WMS Maps as a Dataset

You can visualize an OGC (Open Geospatial Consortium) WMS (Web Map Service) dataset on a map.

This is in addition to creating a custom basemap that is based on external WMS maps, and switching to such a basemap in your map visualization. The main issue in using basemaps is that a single map visualization can only have one basemap. For instance,

if you are using a basemap based on WMS images, then you can no longer display other background maps, such as OpenStreetMap. Therefore, the geographic context is lost as the WMS images typically do not contain detailed administrative boundaries, or other common features seen on a regular background map.
To overcome this limitation, Spatial Studio allows you to use a regular background map, while adding the WMS map images as a dataset layer on top. As the WMS images are just another dataset, which can be displayed as another layer on the map, you can easily reorder the layers, or toggle the visibility of the WMS images just like with any other map layer.

To visualize an OGC WMS dataset on a map, you must perform the following steps.

As a prerequisite:

• The OGC WMS dataset must be created in Spatial Studio. See Creating an OGC WMS Dataset for more information.

• The required OGC WMS dataset must be added to the project in the Active Project page.

1. Click the **Visualizations** tab on the left pane in the Active Project page.

   This lists the various visualization options.

2. Click and drag **Map** from the list to the visualization window on the right to create a map visualization.

   A default base map is displayed with no data visualization layers.

3. Click the **Data** tab on the left pane in the Active Project page.

   This lists all the **Datasets** that are loaded for the project.

4. Drag and drop the desired **OGC WMS dataset** from the list to the map view on the right.

   The OGC WMS data layer gets displayed on the map. The map will automatically zoom to the area covered by the WMS dataset if it is the very first dataset to be added to your map.

Figure 3-54   Visualizing an OGC WMS Data Layer
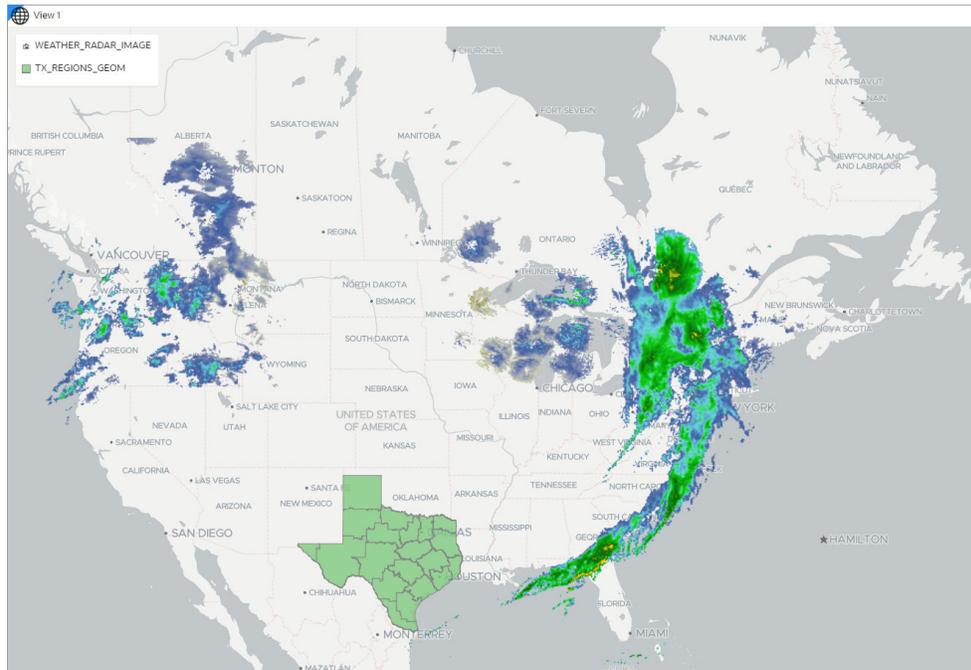
The preceding figure illustrates the weather pattern images (loaded from a WMS service) which are overlaid on top of the OpenStreetMap background. The map also includes another Spatial Studio dataset showing some custom regions in the state of Texas in green color.

> **Note:**
>
> When you display a new WMS dataset for visualization, your browser will be sending the WMS image requests directly to the WMS server. You can always refresh the map layer to reflect the current data from the WMS server.

Related Topics

- Creating an OGC WMS Connection
  You can create a new connection to an external OGC (Open Geospatial Consortium) WMS (Web Map Service) service.

- Creating an OGC WMS Dataset
  Starting with Spatial Studio release 22.3, you can define datasets that are based on the `GetMap` responses from any external OGC (Open Geospatial Consortium) WMS (Web Map Service) services.

3.10.3 Using a Cesium Map Visualization

Spatial Studio uses a CesiumJS plugin to enable you to view 3D visualizations using 3D Tiles or CZML data on a Cesium map.

Cesium map allows you to display your real-world geospatial 3D data in a 3D environment. In order to build interactive 3D visualizations using Cesium maps, you can upload one of the following files to Spatial Studio:

- **3D Tileset:** Supports formats are:

  – Point Cloud (`.pnts`)

  – Batched 3D Model (`.b3dm`)

- **CZML file:** CZML formatted data in `.czml` files

It is important to note the following when using a Cesium map visualization:

- Generating 3D Tiles or CZML formatted data file for your geospatial 3D data must be carried out using any third party software outside of Oracle Spatial Studio.

- 3D Tiles and CZML files are stored in the file system on Spatial Studio's server, not in Oracle Database.

- Currently this feature supports only displaying 3D Tiles and CZML data on maps. It does not support 3D analysis.

- Visualizing a 3D Tileset Using a Cesium Map

- Visualizing CZML Data Using a Cesium Map

3.10.3.1 Visualizing a 3D Tileset Using a Cesium Map

You can visualize your dataset with 3D Tiles on a Cesium map using the following steps.

The instructions assume that the 3D Tiles are uploaded and the dataset is already added to the project in the Active Project page. To create a dataset with 3D Tiles, see Creating a Dataset from Cesium Datasets for more information.

1. Click the **Visualizations** tab on the left pane in the Active Project page.

   This lists the various visualization options.

2. Click and drag **Cesium-Map** from the list to the visualization canvas on the right to create a Cesium map visualization.

   A default Cesium map is displayed.

   > 💡 **Tip:**
   >
   > You can configure new background Cesium maps by adding maps from the following two sources:
   >
   > - URL template
   > - WMTS service

3. Click the **Data** tab on the left pane in the Active Project page.

   This lists all the **Datasets** that are loaded for the project.

4. Click and drag the desired **3D Tiles dataset** from the list to the map view on the right.

   A 3D layer is created on the map as shown:

Figure 3-55   3D Cesium Map Visualization

To interact with the map, click the **?** icon and use either of the following options
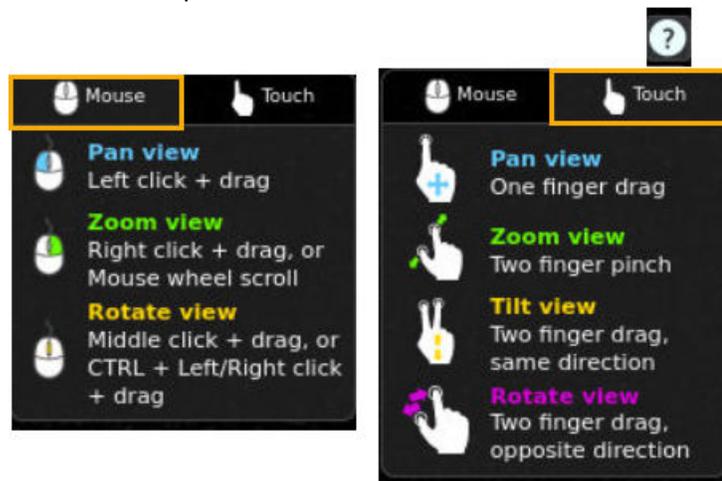
shown:

3.10.3.2 Visualizing CZML Data Using a Cesium Map

You can visualize your CZML dataset on a Cesium map using the following steps.

The instructions assume that the CZML formatted data is uploaded and the CZML dataset is already added to the project in the Active Project page. To create a dataset using `.czml` file, see Creating a Dataset from Cesium Datasets for more information.

1. Click the **Visualizations** tab on the left pane in the Active Project page.

   This lists the various visualization options.

2. Click and drag **Cesium-Map** from the list to the visualization canvas on the right to create a Cesium map visualization.

3. Click the **Data** tab on the left pane in the Active Project page.

   This lists all the **Datasets** that are loaded for the project.

4. Click and drag the desired **CZML dataset** from the list to the map view on the right.

   A 3D layer is created on the map as shown:

Figure 3-56   Cesium Map Visualization Using a CZML Dataset
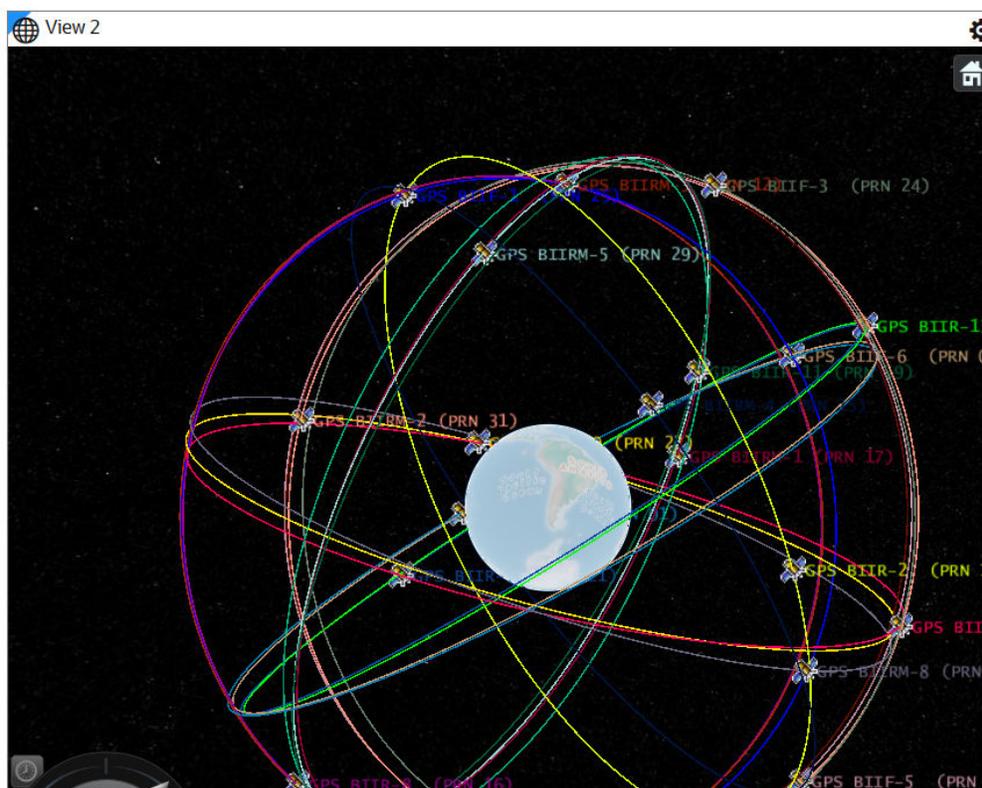
3.10.4 Styling a Map Layer

Spatial Studio allows you to explore different styling options for your map layers, in order to enhance visualization and analysis.

The styling options provided to you may vary depending on the type of data you are mapping.

The following sections describe a few styling techniques for the different data types:

• Applying a Render Style For a Point Layer

• Applying Style for a GeoRaster Layer

• Applying Data-Driven Style to a Map with H3 Aggregations

• Applying Predefined Colors to a Map Layer

• Applying Predefined Symbols to a Map Layer

• Applying Predefined Colors to Symbols

- Setting Selection Tolerance on a Map Layer
- Adding a Pin on a Map
- Applying Map Backgrounds

3.10.4.1 Applying a Render Style For a Point Layer

You can render a point map layer using one of the following render style options:

- Circle (default)
- Symbol
- Heatmap
- Cluster

The following steps enable you to apply your preferred render style option.

The instructions assume that you have point map layer displayed on your Active Project page.

1. Click ••• against the map layer in the **Layers** tab of the **Layers List**.

2. Select **Settings** in the context menu.

3. Configure **Style** and select a **Render Style** option from the drop-down list.

   By default, a point map layer always uses Circle to represent the data points.

   > **Note:**
   >
   > Each render style has its own settings.

- If you select **Cluster** as the render style option, the data points on your map are shown clustered depending on the cluster circle size.

   Figure 3-57   Applying a Cluster Style
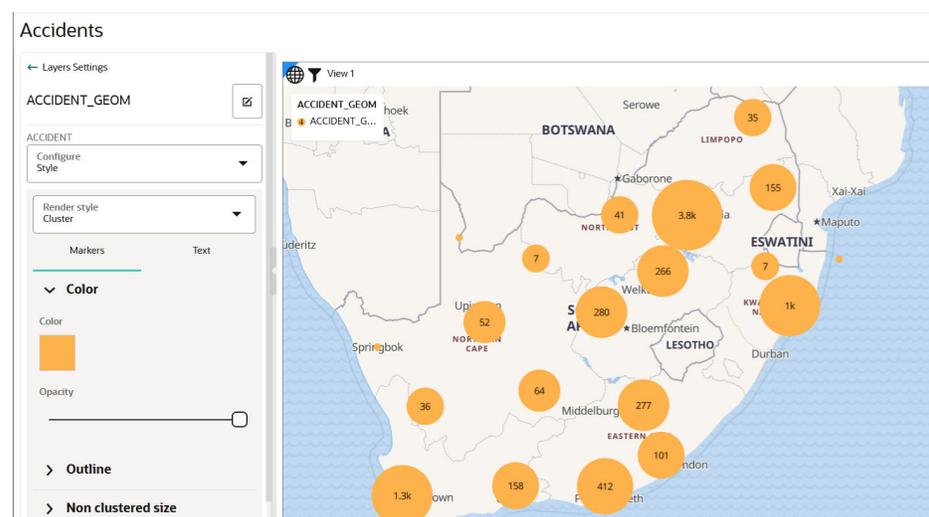
Optionally, you can change the color and the style of the text labels representing the number of points in each cluster.

- If you select **HeatMap** as the render style option, the data points on your map are rendered with continuous colors based on the concentration of points as shown:

> **Note:**
>
> Hot colors represent concentration of points, and cool colors represent sparsity of points.

> **Tip:**
>
> It is recommended that you reduce the default value of the **Radius** parameter to observe a more localized view of point concentrations.

Figure 3-58   Applying a HeatMap Style
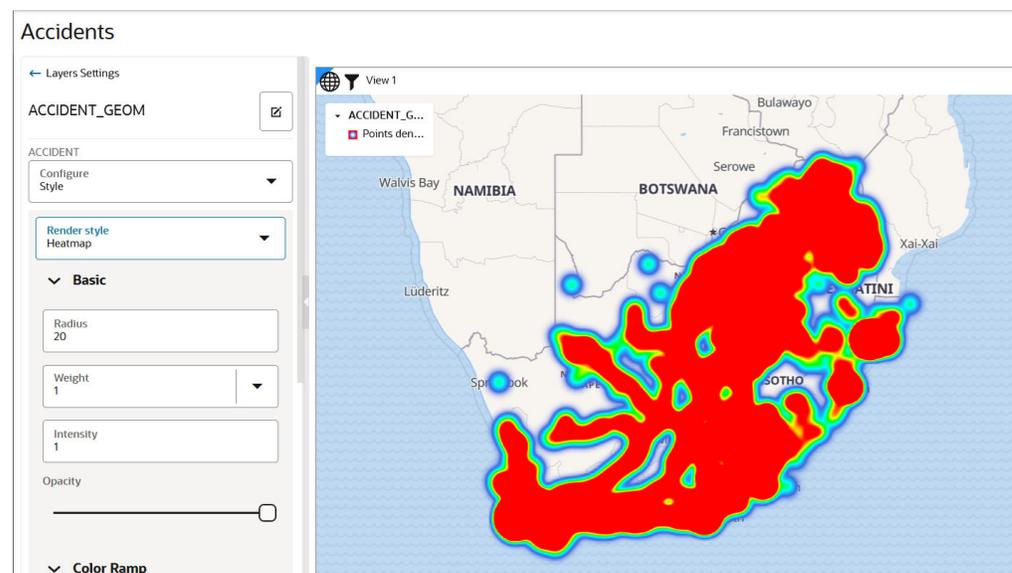
- If you select **Symbol** as the render style option, the data points on your map are rendered with your chosen symbol as shown:

> **Tip:**
>
> You can optionally select a color for your symbol.

Figure 3-59   Applying a Symbol Style
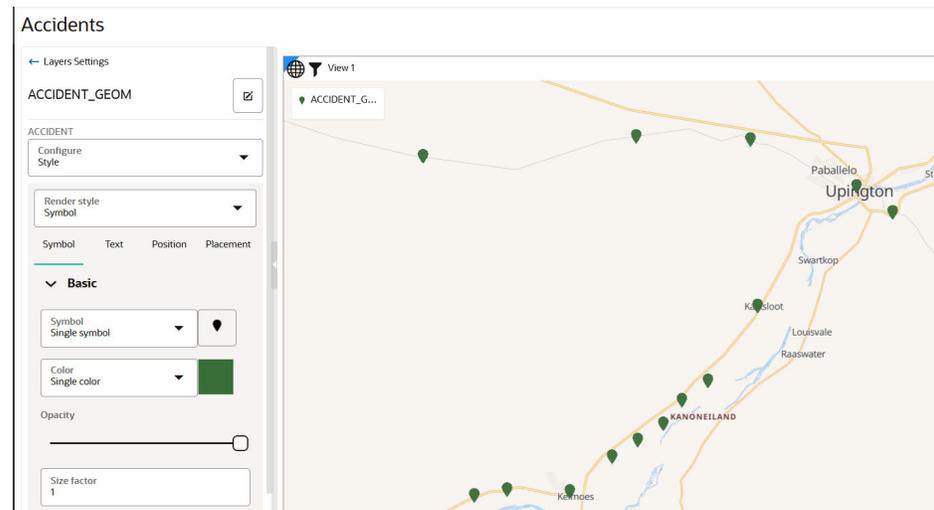
The map layer gets rendered with the appropriate style.

3.10.4.2 Applying Style for a GeoRaster Layer

You can style a GeoRaster map layer using the following steps.

The instructions assume that you have a GeoRaster map layer displayed on your Active Project page.

1. Click ⋯ against the **dataset** in the **Data** tab of the **Layers** list.

2. Select **Settings** in the context menu.

    The **Layer Settings** panel opens.

3. Optionally, modify any of the following options in the **Style**:

    *   **Opacity**

    *   **Maximum Brightness**

    *   **Minimum Brightness**

    *   **Saturation**

    *   **Contrast**

    *   **Hue Rotate**

    *   **Fade Duration**

4. Optionally, modify any of the following rendering options in the **Raster** tab:

    *   **Bands:** Spatial Studio, by default supports the following bands:

        –   Red

        –   Blue

        –   Green

        –   Alpha

    For GeoRaster images that have more than three layers, you can choose which three layers you want to visualize.

- **Reprojection:** represents the interpolation method to be used when transforming an image from one SRS (Spatial Reference System) to another.
- **Image Processing:** represents the subprogram to be used to enhance the visual quality of the images.
- **Rendering Hints:** represents the image interpolation value that determines how each image cell's value on a view port is interpolated using the original image pixels. For example:
  - NEAREST NEIGHBOR: This option has no interpolation by taking the nearest image pixel's value directly.
  - BI-LINEAR: This option will consider 4 neighboring pixels to determine the image cell's value on a view port.

  Additionally, you can also switch on or off the **Transparent NODATA** toggle, which determines if the image cells are to be transparent or not. If the switch is on, then the layers underneath will be visible for areas that have NODATA in the image.

  The GeoRaster map layer is rendered with the updated settings.

3.10.4.3 Applying Data-Driven Style to a Map with H3 Aggregations

You can apply different resolutions to your H3 map layer to enhance your visualization.

In case of an H3 aggregation dataset, the hexagonal cells and the distribution of points in these hexagons automatically change at each resolution level, as you zoom in and out of the map. This implies that the color bins for one level might not be the same as for another level.

Spatial Studio provides an option to automatically calculate color bins as you alter your resolutions. You can also turn this option off if you want to test against a set of specific thresholds.

The following steps enable you to apply a data-driven styling option for your H3 map layer.

The instructions assume that you have a H3 map layer displayed on your Active Project page.

1. Click ••• against the map layer in the **Layers** tab of the **Layers List** list.
2. Select **Settings** in the context menu.
3. Configure **Style**.
4. Select **Based on Data** for the **Color** value under **Fill**.

   The **Style details** panel is displayed.
5. Select the **Column** to control styling.
6. Switch on or off the **Automatically adjust bin values** toggle button.
   - If turned on, the bin values will automatically update as you zoom in or out on the map.
   - If turned off, **Create value bins** option appears.
7. Assign colors to the bins based on data values.

   The following figure shows the Style details panel options:

Figure 3-60   Applying Data-Driven Color Styling for H3 Map Layer
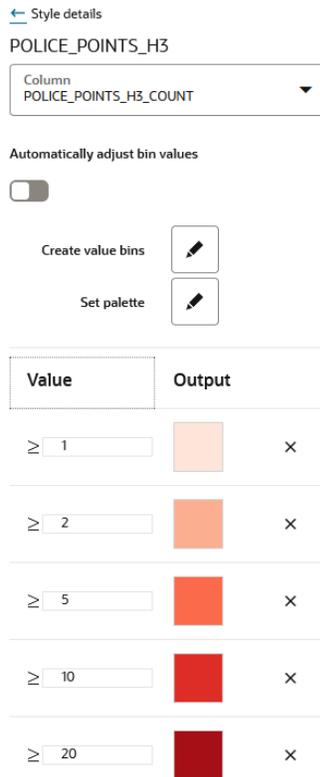
The color bins on the H3 map layer gets rendered appropriately for different resolutions as shown in the preceding figure.

3.10.4.4 Applying Predefined Colors to a Map Layer

Using a column with predefined color codes or values, you can create accurate and consistent choropleth map layers.

You can store a color-coded value in a column of your dataset and then use this column property to color code your map.

The following steps enable you to color code your map layer.

The instructions assume that the map layer displayed on your Active Project page uses a dataset having a column property that contains color-coded values.

1. Click **⋯** against the map layer in the **Layers** tab of the **Layers List**.

2. Select **Settings** in the context menu.

3. Configure **Style** by selecting **Column with color codes** for the **Color** value under **Fill**.

4. Select the **Column** that contains the color value.

   The following figure shows the styling of the map layer using the color variable in the dataset:

Figure 3-61   Color Coding a Map Layer
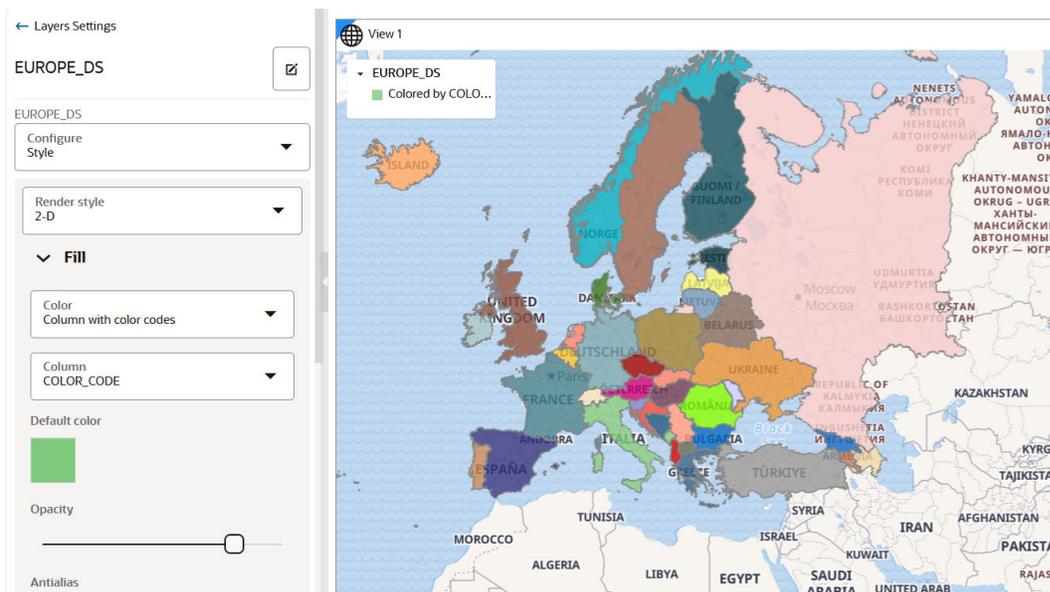
The color code gets applied to the map layer.

3.10.4.5 Applying Predefined Symbols to a Map Layer

Using a column with predefined symbol values, you can apply data-driven symbol styling to your map layer.

However, the symbol must belong to one of the supported symbol sets. Symbols in Spatial Studio are grouped into three sets and each set is identified by a `Symbol set id` as described in the following table:

Table 3-2   Symbol Set

Symbol Set	Symbol set id
Spatial Studio default	`studio`
Oracle Redwood symbols	`oracle-redwood-symbols`
Airfields	`airfields`

You can store a symbol name and the symbol set to which it belongs in a column of your dataset and then use this column property to assign symbols to your map.

For example, assume you want to use the `airport` icon as shown in the following figure:

Figure 3-62   Symbols and Symbol Set
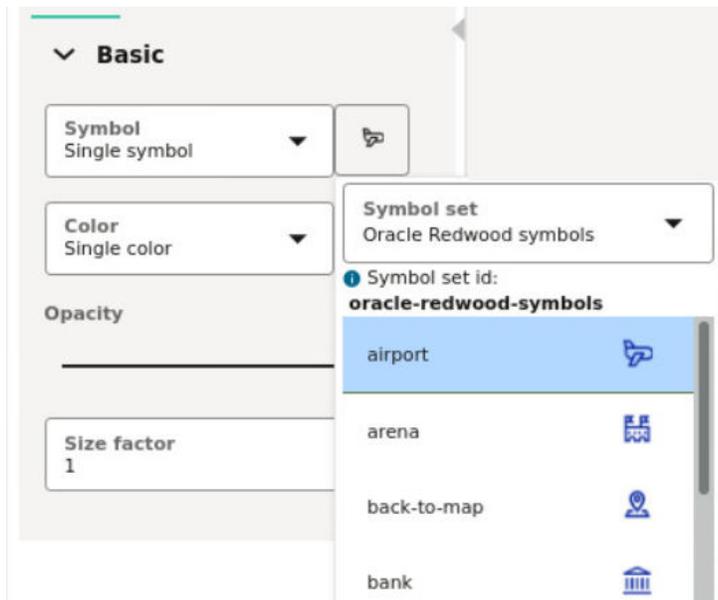
You must then use `oracle-redwood-symbols/airport` as the symbol name in your dataset column. In this case:

- `oracle-redwood-symbols`: is the symbol set id

- `airport`: is the name for the icon to be used on the map layer

The following steps enable you to apply data driven symbol styling for your map layer.

The instructions assume that the map layer displayed on your Active Project page uses a dataset having a column property that contains symbol names following the convention as explained earlier in this section.

1. Click ⋯ against the map layer in the **Layers** tab of the **Layers** list.

2. Select **Settings** in the context menu.

3. Configure **Style** and select **Symbol** as the **Render Style**.

4. Select **Column with symbol names** from the **Symbol** drop-down list in the **Basic** section of the **Symbol** tab.

5. Select the **Column** that contains the symbol name value.

    The following figure shows the styling of the map layer using the symbol name variables in the dataset:

    > **✎ Note:**
    >
    > If incorrect symbol names are present in the dataset column, then for those data points, the **Default symbol** is displayed on the map layer.

Figure 3-63   Custom Symbol Styling in Map Visualization
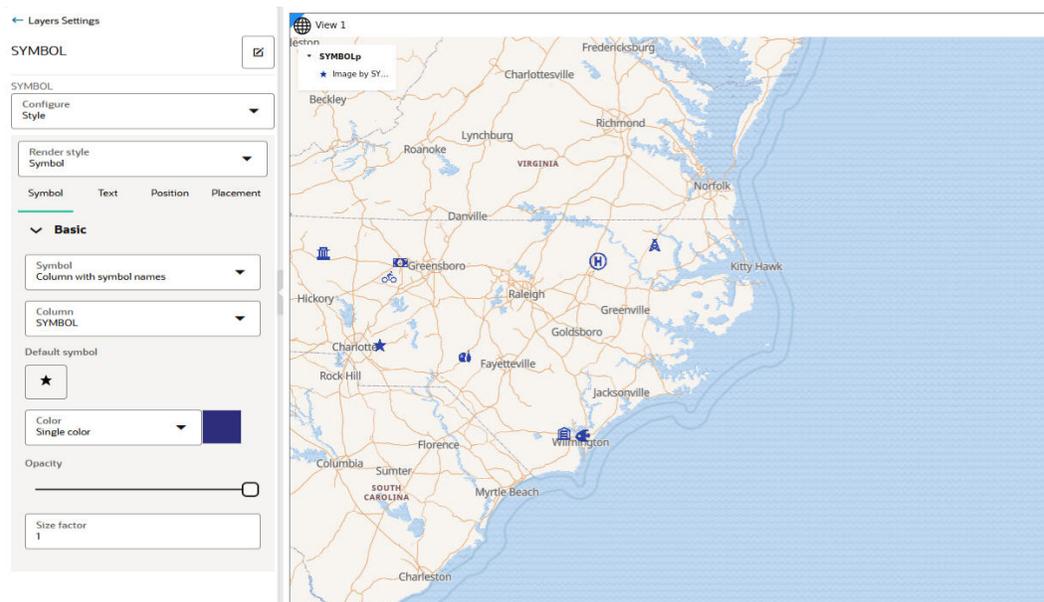
The symbols gets applied to the map layer.

3.10.4.6 Applying Predefined Colors to Symbols

You can color the symbols on a map layer by using an attribute column of the dataset that contains predefined color codes.

The following steps enable you to color code the symbols on a map layer.

The instructions assume that the map layer displayed on your Active Project page uses a dataset having a column property that contains color-coded values.

1. Click ⋯ against the map layer in the **Layers** tab of the **Layers List**.

2. Select **Settings** in the context menu.

3. Configure **Style** by selecting **Column with color codes** for the **Color** value in the **Basic** panel.

4. Select the **Column** that contains the color value.

    Note that the color values in the column must be in `#RGB` notation with the `#` character included.

    The color code gets applied to the symbols on the map layer. The following figure shows the color-coded symbols on the map layer using the color variable in the dataset:

Figure 3-64   Color-Coded Symbols
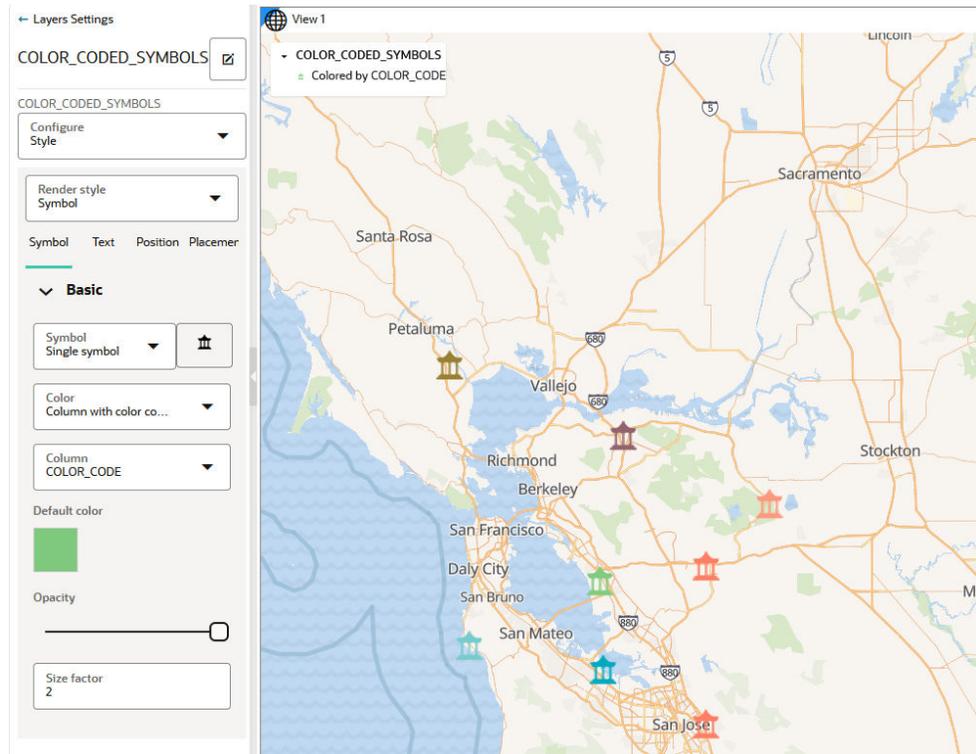
3.10.4.7 Setting Selection Tolerance on a Map Layer

Spatial Studio allows you to increase or decrease the selection tolerance on a map layer, so that selecting small and linear geometry features is easier.

The following steps enable you to adjust and set the selection tolerance on a map.

The instructions assume that a project is open on the Active Project page.

1. Click *** against the **dataset** in the **Data** tab of the **Layers** list.

2. Select **Settings** in the context menu and configure **Interaction**.

3. Switch on the **Allow selection** toggle button.

4. Adjust the **Selection tolerance** slider as required.

   The following figure shows the **Selection** section for setting the tolerance:

Figure 3-65   Setting the Selection Tolerance
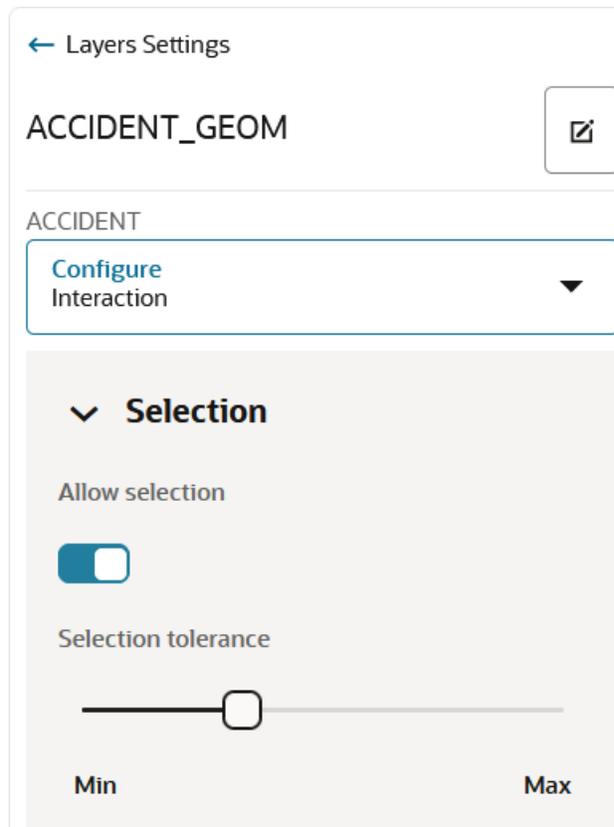
The custom selection tolerance gets applied to the map layer.

3.10.4.8 Adding a Pin on a Map

The following steps enable you to inspect the current mouse pointer's latitude and longitude coordinates and pin a location on the map layer.

The instructions assume that you have a project opened on your Active Project page and the map layer is displayed for visualization.

1. Right-click on any area on the map layer.

   The coordinates for the location gets displayed as shown:

Figure 3-66   Pin a Location on the Map
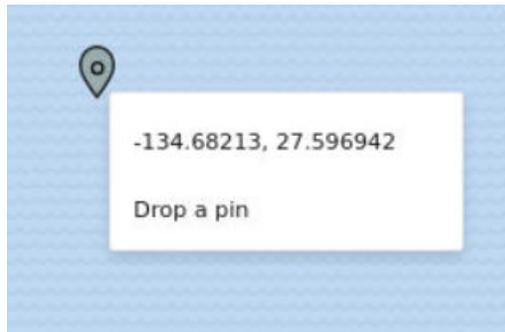
2. Click **Drop a pin** to add a location marker.

    The pin gets displayed on the map. Additionally, you can also copy the coordinates by clicking on the marker and then clicking the **Longitude, Latitude: click to copy** icon.

3.10.4.9 Applying Map Backgrounds

Spatial Studio provides ready-to-use map backgrounds to enhance your visualization.

You can select one of the following map backgrounds for your project visualization:

*   MapTiler Vector Basemaps
*   Oracle Raster Basemaps
*   Blank Basemaps
*   User-defined Basemaps

As an administrator, you can also register custom basemaps and use them in map visualizations. They may be raster or vector tiles that are typically hosted on third party servers, or they be created using a WMS OGC web service. See Spatial Studio Administration Page for more information on adding basemaps.

The following section describes how to apply a specific map background for your project:

*   Changing Map Backgrounds

3.10.4.9.1 Changing Map Backgrounds

The following steps enable you to apply different map backgrounds in your project visualization.

The instructions assume that you have a project opened on your Active Project page.

1. Click ⋯ in the **Background** tab of the **Layers** list.
2. Select **Settings** in the context menu.
3. Click the **Change the Background Map Style** drop-down and select your required background map as shown.

Figure 3-67   Changing a Map Background

All custom basemaps appear under **User-defined Basemaps** in the drop-down list.

The selected map background gets applied to your project visualization.

3.10.5 Visualizing Map Data Over Time

Spatial Studio allows you to perform dynamic map visualizations.
In order to visualize map data over time, your dataset must contain a date column or a time column or both. You can then use the time slider feature to interact with the map.

> **✏ Note:**
>
> The time slider is applicable only for datasets containing event points or simple shapes over time, such as earthquakes or storm paths. It does not apply for datasets containing a fixed set of shapes with attributes varying over time, such as countries with population.

The following steps allow you to configure and use a time slider for your map visualization.

The instructions assume that you have a project linked to a dataset containing date or time data and the project is opened on your Active Project page.

1. Click the **Settings** icon in your map tool bar.

2. Switch on the **Show time slider** toggle button and click **OK**.

    A time slider bar appears at the bottom of the map visualization canvas.

3. Click the **Time slider settings** icon on the time slider bar.

Figure 3-68   Time slider Settings

4. Select the **Date columns** and the **Time unit** to be applied for visualization.

5. Optionally, switch on or off the **Time range** and **Time labels always on** toggle buttons.

6. Optionally, select **Playback speed**.

7. Click **OK**.

   You can now interact with your map using the time slider to view the change of your data over time.

Figure 3-69   Using a Time slider in Map Visualization
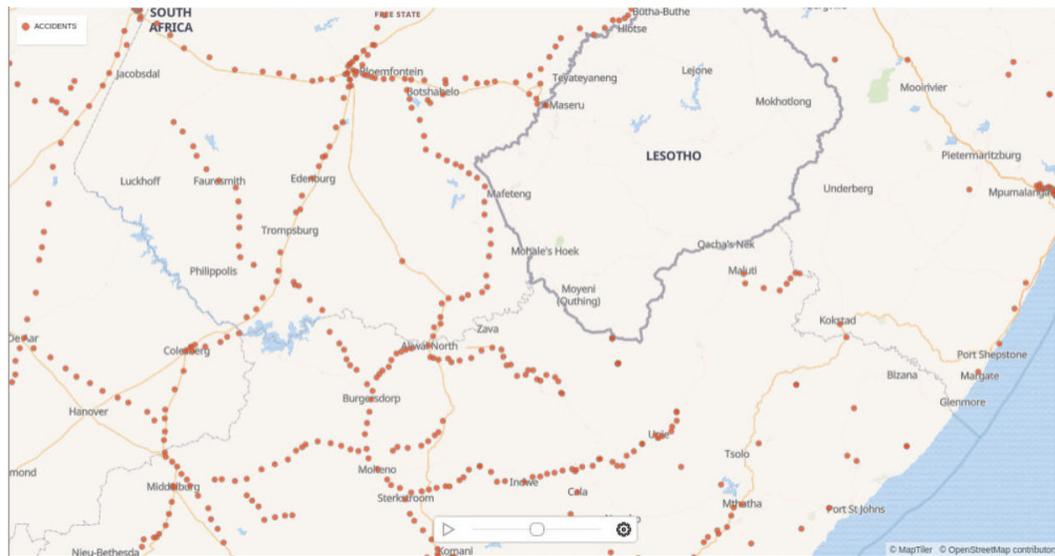
3.10.6 Multiple Visualizations on a Canvas

You can work on multiple visualizations in Spatial Studio.

Figure 3-70   Multiple Map Visualizations
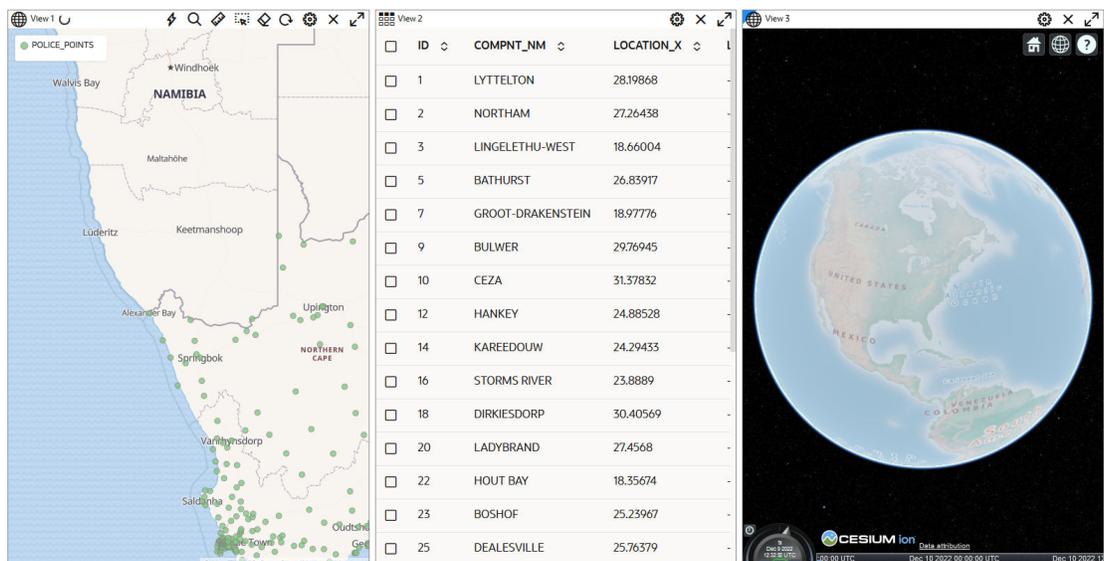
When adding a new visualization to the canvas, if there is already an existing visualization, then you can choose on which adjacent edge of the existing visualization the new one must be placed. This applies even if there are multiple existing visualizations. You can always insert the new visualization to be next to any existing visualization of your choice.

When you drag a new visualization to the canvas with existing visualizations, the border of the existing visualization highlights to indicate where the new visualization will be placed when dropped. The canvas will automatically adjust the layout to make space for the new

visualization in an intuitive way. You can also temporarily maximize any one of the existing visualizations.

3.10.7 Configuring a Map Visualization

You can configure the map visualization settings, by clicking , the **Settings** icon in the map tool bar.

The Visualization Settings dialog opens with the default configuration values as shown as shown:

Figure 3-71   Visualization Settings

Spatial Studio supports the configuration of the following values:

- **Viz label**: You can define the label for your map visualization.

- **Wraparound east-west**: By default, the map is continuous, that is, the map displayed for visualization is east-west wrap around. You can choose to disable this option if you prefer to display the map in a non-repeating mode.

- **Show legend**: The legend displays the map layers that are used in the visualization.
- **Legend Position**: This determines where the legend gets displayed on the map.
- **Navigation Bar**: This displays zoom and compass controls on the map.
- **Show minimap**: You can enable this option if you want to view an overview of the main map as an inset within the main map.
- **Show scale**: You can enable this option if you want to configure a specific scale for the map.
- **Unit of map scale**: Supported scale types are:
  - Imperial
  - Metric
  - Nautical
- **Show time slider**: By enabling the slider, you can display the time slider on the map.

3.11 Performing Analyses in Spatial Studio

You can perform various spatial analyses (such as filtering by proximity, nearest neighbor analysis and so on) and visualize the results in Spatial Studio.

These spatial analyses are grouped under the following categories in Spatial Studio:

- Filter
- Combine
- Transform
- Measure
- Analytics

Figure 3-72   Spatial Analysis Operations
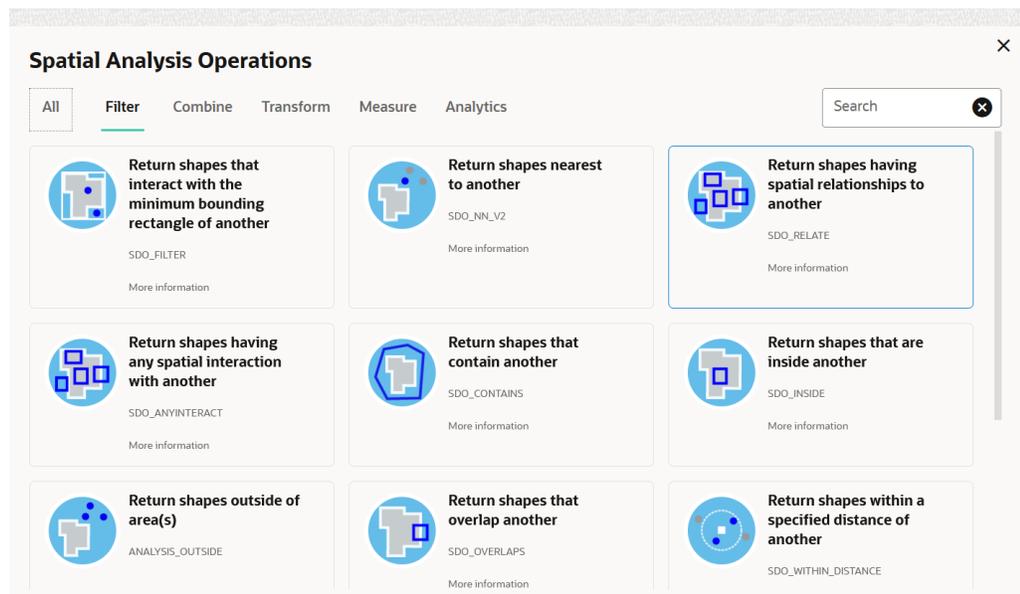
The following topics explore spatial analysis using selected filter operations:

- [Determining the Geometries Within a Specified Distance](#)
- [Determining the N-Nearest Geometries](#)
- [Determining the Geometries Filtered By Non-Spatial Attributes](#)
- [Editing a Spatial Analysis](#)

3.11.1 Determining the Geometries Within a Specified Distance

Using the `SDO_WITHIN_DISTANCE` filter, you can filter coordinates that are within a specific distance from a point on the map layer.

To filter points based on this proximity filter, you must perform the following steps.

The instructions assume that you have the layer to be filtered and the map layer to be used as a filter displayed on your Active Project page.

1. Click ⋯ against the map layer whose coordinates needs to be filtered in the **Layers** tab.

2. Select **Spatial Analysis**.

   The **Spatial Analysis Operations** window opens as shown in Figure 3-72.

3. Click on the **Filter** tab and select **Return shapes within a specific distance of another**.

   Within distance dialog box opens as shown:

Figure 3-73   Spatial Analysis - Within Distance Configuration

4. Enter **Analysis name**.

5. Select the **Layer to be filtered**.

6. Select the **Layer to be used as the filter**.

7. Enter **distance** and **unit**.

8. Click **Run**.

   The Analysis result is listed under **Analyses** in the **Data** elements panel on the left pane of the Active Project page.

9. Drag and drop the analysis result on the map view.

   This creates a new map layer highlighting the filtered coordinates within a specific distance from a point as shown:

Figure 3-74   Spatial Analysis - Within Distance Visualization
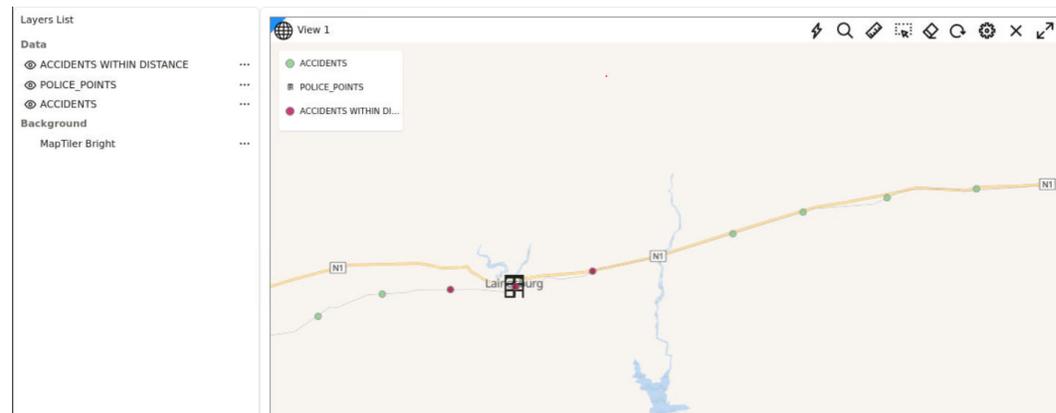
3.11.2 Determining the N-Nearest Geometries

Using the `SDO_NN_V2` filter, you can determine the N-nearest geometries to a geometry.

> **Note:**
>
> The `SDO_NN_V2` filter, introduced in Spatial Studio release 22.2, is an improved form of the `SDO_NN` filter which was used in the prior releases of Oracle Spatial Studio. The old behavior will continue to be supported when you modify analyses that were created using the `SDO_NN` filter. However, when creating a new analysis, the current `SDO_NN_V2` filter will be used.

To find the N-nearest geometries, you must perform the following steps.

The instructions assume that you have the layer to be filtered and the map layer to be used as a filter displayed on your Active Project page.

1. Click ⋯ against the map layer, whose coordinates needs to be filtered, in the **Layers** tab.

2. Select **Spatial Analysis**.

   The **Spatial Analysis Operations** window opens as shown in Figure 3-72.

3. Click on the **Filter** tab and select **Return shapes nearest to another**.

   Nearest neighbors dialog box opens as shown:

Figure 3-75   Nearest Neighbors Analysis

4. Enter **Analysis name**.

5. Select the **Layer to be filtered**.

> **Note:**
>
> Ensure that you have run spatial validations on the map layer to be filtered and the map layer to be used as the filter in order to obtain accurate analysis results.

6. Enter **Number of results**.

7. Click **Run**.

   The Analysis result is listed under **Analyses** in the **Data** elements panel on the left pane of the Active Project page.

8. Drag and drop the analysis result on the map view.

   This creates a new map layer highlighting the N-nearest neighbor geometries for a geometry.

3.11.3 Determining the Geometries Filtered By Non-Spatial Attributes

You can perform non-spatial filter analysis using a compound query.

To run a compound query with non-spatial attributes, you must perform the following steps.

The instructions assume that you have the layer to be filtered displayed on your Active Project page.

1. Click ⋯ against the map layer, whose coordinates needs to be filtered, in the **Layers** tab.

2. Select **Spatial Analysis**.

   The **Spatial Analysis Operations** window opens as shown in Figure 3-72.

3. Click the **Filter** tab and select **Return elements filtered by non-spatial rules**.

   The **Attribute Filter** dialog opens as shown:

Figure 3-76   Non-Spatial Attributes Filter

4. Optionally, change the default **Analysis name**.

5. Select the **Column** name.

6. Select the **Operator to filter by** from the drop-down list.

7. Enter the **Value** to be filtered.

8. Optionally, click **Add Criteria** to repeat from step-5 to step-7 to add as many criteria as required. Also, click the `And` or `Or` operator to form the compound query.

9. Click **Run**.

   The Analysis result is listed under **Analyses** in the **Data** elements panel on the left pane in the Active Project page.

10. Drag and drop the analysis result on the map view.

    This creates a new map layer highlighting the geometry for the filtered attributes.

Figure 3-77   Non-Spatial Filter Analysis
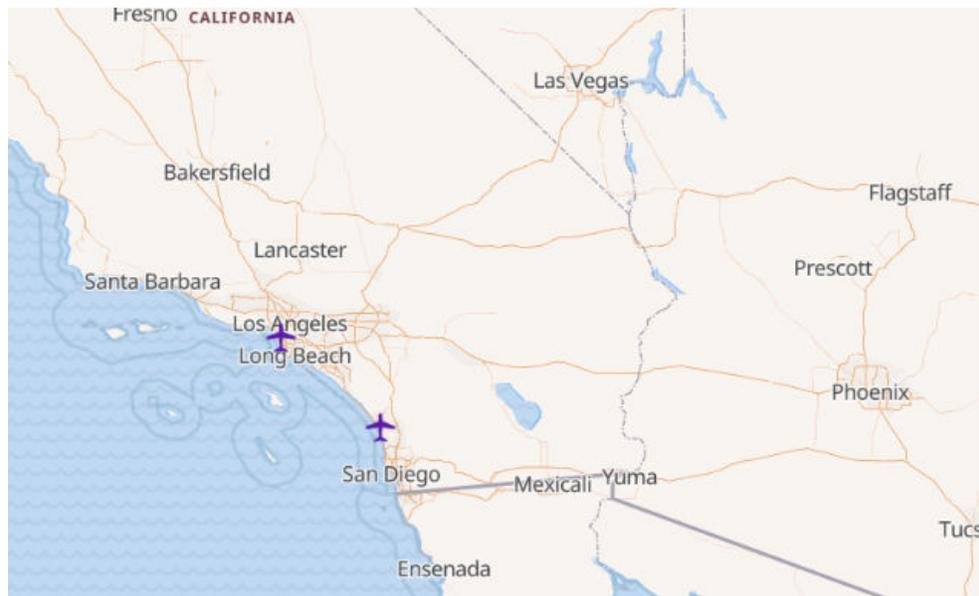
3.11.4 Editing a Spatial Analysis

You can edit an existing spatial analysis to modify certain essential parameters.

However, only the following list of spatial analysis operations allow their parameters to be modified after creation:

Filter

- `SDO_FILTER`
- `SDO_NN_V2`
- `SDO_RELATE`
- `SDO_WITHIN_DISTANCE`

Combine

- Spatial Join

Transform

- `SDO_BUFFER`
- `SDO_MBC`

- `SDO_UTIL.AT_BEARING`

- `SDO_UTIL.SIMPLIFY`

- `SDO_SAM.SIMPLIFY_GEOMETRY`

Measure

- `SDO_GEOM.SDO_AREA`

- `SDO_GEOM.SDO_DIAMETER`

- `SDO_GEOM.SDO_LENGTH`

- `SDO_GEOM.WITHIN_DISTANCE`

- `SDO_GEOM.SDO_MAXDISTANCE`

- `SDO_GEOM.SDO_MAX_MBR_ORDINATE`

- `SDO_GEOM.SDO_MBC_RADIUS`

- `SDO_GEOM.SDO_MIN_MBR_ORDINATE`

Analytics

- Summarize within distance

- Summarize by region

To modify the parameters in a spatial analysis, you must perform the following steps.

The instructions assume that the analysis to be edited is present in the Active Project page.

1. Click ⋯ against the analysis to be edited under **Analyses** tab in the **Data** elements pane of the Active Project page.

2. Select **Modify Parameters** as shown:

> **Note:**
>
> **Modify Parameters** in the context menu will be disabled for spatial analysis operations that cannot be modified.

Figure 3-78   Modify Spatial Analysis Parameters
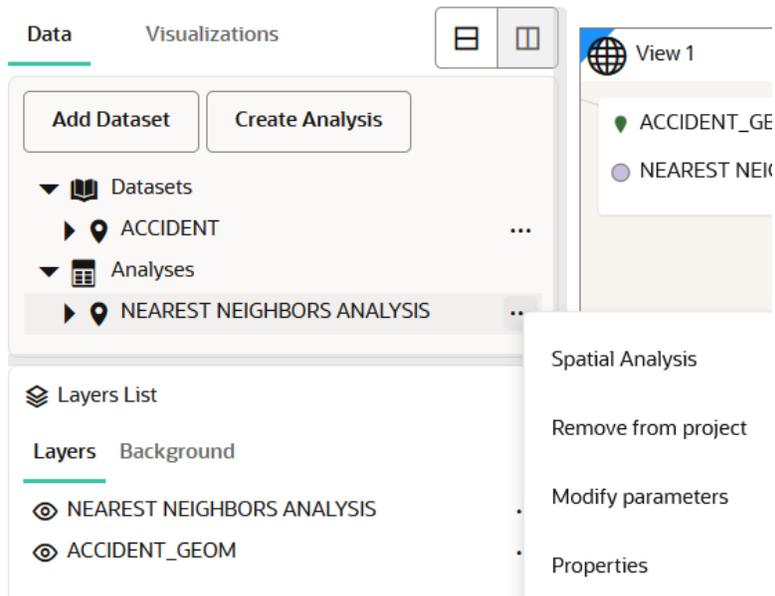
The dialog box displaying the original definition for the specific spatial analysis opens.

3.   Modify the required parameters and click **Run**.

The analysis gets updated and the updates can be visualized in the map view.

4

REST API in Oracle Spatial Studio

Oracle Spatial Studio provides a rich RESTful API that can be accessed not only from its web application user interface (UI), but also from the command line or programmatically from any other server or web applications.

Introduction

When you login to the Spatial Studio web application, the application UI is constantly sending and receiving application data using the REST API endpoints. The URLs to access the endpoints typically start with *<studio-base-URL>/api/v1*. The base URL is the entry point to Spatial Studio, such as `https://localhost:4040/spatialstudio`. When you first login to the Spatial Studio web application, the browser sends several AJAX requests to load various metadata from the server. The REST API endpoints are always in use by the web application when you perform different actions such as listing of the existing projects to which you have access, setting your various preferences, listing running tasks, and so on.

For instance, to get the detailed information about the currently logged in user, the web application sends an HTTP GET request to the URL: `https://localhost:4040/spatialstudio/api/v1/user`. This is provided the base URL is `https://localhost:4040/spatialstudio`. Although the response to such requests is typically in JSON format, there are other requests that return other types of data such as compressed vector tiles (when displaying geometry datasets on a map), or images (when displaying GeoRaster datasets).

The OpenAPI 3.0 specification for all the REST endpoints is available in the form of a YAML specification in Appendix A. Note, however, many of the requests require a (sometimes quite complex) JSON payload, which are currently not part of the automatically generated OpenAPI YAML specification. This will be documented in a future release of Spatial Studio. Detailed description on the JSON request payload for the most common use cases are provided in the subsections of this chapter.

About Access Tokens

Apart from the Spatial Studio UI, almost all of the REST API endpoints can also be accessed from the command line using tools such as cURL, or from an external application programmatically. In both cases, you must first obtain an access token from Spatial Studio, as the token needs to be presented to the server. Also, when accessing the REST endpoints through an access token, the URLs will always start with the pattern `<studio-base-URL>/`**`oauth`**`/v1`. The only difference in the URL is that the path segment `api` is replaced with `oauth`. All other interaction behavior with the REST API endpoints from the Spatial Studio UI, external tools, or other applications remain the same.

An access token always includes the unique identity of the Spatial Studio user who generated the token. This user is considered the owner of the token. The owner identity is always verified when any REST endpoint is accessed through a token. See Generating an Access Token for the different types of access tokens that can be generated in Spatial Studio.

All the examples in the following subsections assume that you have obtained the proper type of access token. It is recommended you obtain the least privileged access token that will meet the requirements. For instance, a `READ ONLY` token is sufficient if you are not required to invoke a state-changing operation (such as deleting an analysis dataset). Similarly, if your

requirement is only to consume and display your datasets in another mapping application, then consider using a **Streaming-only** access token, which cannot be used to query any other information from the server.

Also, the examples in the following sections assume that the Spatial Studio server is running and accessible at the URL `https://localhost:4040/spatialstudio`.

- Using cURL with Spatial Studio REST APIs
  `cURL` is a powerful command line tool available on many platforms for sending and receiving URL requests to a remote server.

- Accessing Spatial Studio REST API Programmatically
  You can programmatically interact with the Spatial Studio REST API endpoints from another application.

4.1 Using cURL with Spatial Studio REST APIs

`cURL` is a powerful command line tool available on many platforms for sending and receiving URL requests to a remote server.

When accessing or invoking a REST endpoint, the curl command follows a specific format.

For example, consider the following request to retrieve the Spatial Studio version:

HTTP GET Request

```
curl -k https://localhost:4040/spatialstudio/oauth/v1/softwareVersion \
 --header "Authorization: Bearer <MY_TOKEN>"
```

The options used in the preceding request are explained as follows:

- `-k`: To indicate that the `cURL` request must accept the self-signed SSL certificate used by a Quick Start Spatial Studio instance.

- `--header`: To set the Spatial Studio access token as a bearer token header in the request.
  Note that the keywords **Authorization:** (including the colon and whitespace) and **Bearer** must be entered as is, with the entire value for the `-- header` option enclosed in double quotes. The variable `<MY_TOKEN>` represents the actual token string which must be provided in one unbroken line.

Note that the URL in the request uses `oauth/v1` as path segments. If you accidentally use `api/v1`, then the response returns the web application login page in HTML.

The following sections explain with a few examples on how to invoke a REST API endpoint using `cURL`:

- Listing Available Datasets
- Example Workflow With the Spatial Studio REST Endpoints

4.1.1 Listing Available Datasets

The following request lists all the datasets available to the user who is "embedded" inside the access token:

HTTP GET Request

```
curl -k https://localhost:4040/spatialstudio/oauth/v1/datasets \
 --header "Authorization: Bearer <MY_TOKEN>"
```

The preceding request will return a JSON document containing all the datasets that are owned or created by the token owner, as well as any dataset that was marked as public (by its owner) which are accessible to any other application user. The JSON response includes a JSON object that describes every aspect of the dataset, such as `id`, `name`, `type`, `source` table name (if applicable), as well as its columns and a host of other metadata.

Note that the access token used in the preceding request must be a **general-purpose** one (either `read-only` or `read-write`, depending on your specific use case), as opposed to a **dataset streaming-only** token. This is because a stream-only access token cannot be used to query any metadata from the Spatial Studio server. As a result, if you pass in a stream-only token in the preceding request, you will not get the desired response.

Alternatively, you can also provide an additional query parameter, **fields**, to filter the data that is returned for each dataset. For instance, if you prefer only the unique `id` and `name` of all the available datasets in the response, then the request is as follows:

Request with Query Parameter:

```
curl -k https://localhost:4040/spatialstudio/oauth/v1/datasets?
fields=id,name \
 --header "Authorization: Bearer <MY_TOKEN>"
```

Response:

```
{"items":[
{
  "id" : "3ee71ae5ba84cc5afd0728643e878f29",
  "name" : "LANDSAT5_IMAGES"
},
{
  "id" : "d06d0b711e10997c1c886b731b1c45b8",
  "name" : "AIRPORT_POINT"
},
{
  "id" : "fd6f55d0773dcda639e07b00e5ba431a",
  "name" : "INTERSTATES"
},
{
  "id" : "5b68bd621ee6f58af0bd0cb20f600a38",
  "name" : "NY_INDIAN_TERRITORIES"
}]
}
```

In the preceding response:

- Each dataset is represented as an element in the **items** array.

- Each item (dataset) contains both the `id` and the `name` of a dataset. The `id` returned in the response is the unique ID of the dataset. Note that Spatial Studio assigns a globally unique `id` to all the objects you create, such as datasets, projects, connections or data

sources, and even columns inside a dataset. In most cases, the REST API uses only these unique `ids` when referencing a user created object such as a dataset or connection.

Related Topics

- Generating an Access Token
  You can generate an access token to access REST endpoints of Spatial Studio.

4.1.2 Example Workflow With the Spatial Studio REST Endpoints

You can perform different workflows with the Spatial Studio REST Endpoints. For example, consider a workflow consisting of the following steps:

1. Create a new Spatial Studio dataset from an existing table containing latitude/longitude coordinates.

2. Instruct Spatial Studio to perform a reverse geocoding task on the underlying database table of the dataset.
   This task will update the table with additional columns representing the nearest address information as a result of the reverse geocoding operation.

3. Verify that the table is updated with the address columns by checking the data in a table row.

You can potentially automate these steps by running the workflow steps in a script. Also, note that the workflows are certainly not limited to this particular scenario. You can also, for instance, automate the process of creating a spatial analysis, obtaining a CSV report of the analysis, and so on.

The following sections enable you to perform the preceding example workflow by interacting with the REST endpoints of Spatial Studio using the `cURL` tool.

- Creating a New Dataset From an Existing Table

- Reading a Single Row of Data From a Dataset

- Performing Reverse Geocoding

- Checking the Reverse Geocoding Task Status

- Verifying the Result of Reverse Geocoding

4.1.2.1 Creating a New Dataset From an Existing Table

The Spatial Studio datasets are created from existing tables, views or models in a database connection.

The following request creates a new Spatial Studio dataset from an existing table.

HTTP POST Request

```
curl -k -X POST https://localhost:4040/spatialstudio/oauth/v1/datasets \
 --header "Authorization: Bearer <MY_TOKEN>" \
 --header "Content-Type: application/json" \
 --data '{
  "objectType": "dataset",
  "name": "MY_LOCATIONS",
  "refId": "<MY_CONN_ID>",
```

```
  "data": {
    "dataSourceId": "$MY_CONN_ID",
    "nodePath": "database://{data}{schema}{<MY_CONN_ID>}/{marker}
{TableMarker}{<MY_CONN_ID>-table}/{dataset}{DatabaseTable}{MY_LOCATIONS}",
    "description": "",
    "dataSourceType": "database",
    "lastModifiedTime": "'$DATE'"
  }
}'
```

The preceding request creates a dataset from *MY_LOCATIONS* table. Also, note the following:

- The `-X POST` option make this a HTTP POST request. This is required when invoking a state-changing action (creating a new dataset on the server). You will also need an access token with the READ and WRITE permissions (changing the server's state is considered a WRITE operation).

- The `--data` option is used to send a JSON payload as part of the REST request. In this example an env variable `$DATE` (`export DATE=date`) is used for the required `lastModifiedTime` field.

- The string *<MY_CONN_ID>* represents the `id` of the data source or connection where the table exists.

- For formatting purposes, the request is shown split into multiple lines. The backslash `\` ensures that all the lines are concatenated and treated as a single unbroken command.

The response includes the new dataset `id`, which is used in subsequent requests.

Response

```
{
  ...
    "id" : "5c3b3a6d98eab545a0f9bd66e3d07886",
  ...
}
```

Although you will receive the JSON response almost instantly, note that there will be additional server-side tasks (for example, statistics gathering) that still continue to run. These background tasks may take a few seconds or more depending on the size of the source table. There are REST endpoints to query and check the status of such tasks. But for the purpose of creating a new dataset, you can safely ignore them.

You can also send a host of other commands that prepare your newly created dataset, such as creating a latitude/longitude index, updating its statistics, setting a key column, and so on.

4.1.2.2 Reading a Single Row of Data From a Dataset

The following request reads a single row of data from a dataset.

HTTP GET Request

```
curl -k "https://localhost:4040/spatialstudio/oauth/v1/datasets/rows/
5c3b3a6d98eab545a0f9bd66e3d07886?limit=1" \
 --header "Authorization: Bearer <MY_TOKEN>"
```

The following response returns a single row of data for the specified dataset (with the given id).

Response

```
{
  ...
    "items" : [
        {
            "LAT" : 35.53222623,
            "LON" : -101.5576172,
            "NAME" : "Amarillo Warehouse"
        }
    ],
    ...
}
```

4.1.2.3 Performing Reverse Geocoding

You can reverse geocode the dataset created in the earlier section using the following request.

HTTP PUT Request

```
curl -k -X PUT "https://localhost:4040/spatialstudio/oauth/v1/
enrichment/reversegeocode/5c3b3a6d98eab545a0f9bd66e3d07886?
datasourceid= <MY_CONN_ID>&roadsonly=true&lat=LAT&lon=LON" \
 --header "Authorization: Bearer <MY_TOKEN>" \
 --header "Content-Type: application/json" \
 --data '{
  "street": "STREET",
  "housenumber": "HOUSE_NUMBER",
  "settlement": "SETTLEMENT",
  "municipality": "MUNICIPALITY",
  "region": "REGION",
  "postalcode": "POSTAL_CODE",
  "country": "COUNTRY"
}'
```

The preceding request uses the coordinate columns (`LAT` and `LON`) and also the `--data` `{key:value, …}` option that specifies which address-related columns must be created and populated. In this sample request, all the attributes are created. `value` determines the resulting column name.

The resulting `task_id` of the reverse-geocoding task running in the background is returned in the response.

Response

```
{
    "task_id" : "a2743564e066153f4a14ac29000727b1"
}
```

4.1.2.4 Checking the Reverse Geocoding Task Status

Using the `task_id` returned in the earlier section, you can obtain the status of the reverse geocoding task.

The following request returns the state or status of a specified task (such as `ONGOING` or `DONE`).

HTTP GET Request

```
curl -k https://localhost:4040/spatialstudio/oauth/v1/tasks/
a2743564e066153f4a14ac29000727b1 \
 --header "Authorization: Bearer <MY_TOKEN>"
```

Response

```
{
 ...
   "state" : "DONE",
 ...
}
```

Once the task returns the state `DONE`, then you can perform Verifying the Result of Reverse Geocoding.

4.1.2.5 Verifying the Result of Reverse Geocoding

Once the reverse geocoding task completes with status `DONE`, then you can use the following request to view a row of data from the dataset table. This is to verify that the table contains additional address-related columns populated by the reverse geocoding operation performed by Spatial Studio in the backend.

HTTP GET Request

```
curl -k "https://localhost:4040/spatialstudio/oauth/v1/datasets/rows/
5c3b3a6d98eab545a0f9bd66e3d07886?limit=1" \
 --header "Authorization: Bearer <MY_TOKEN>"
```

The JSON response contains a single table row with the added columns.

Response

```
{
  ...
  "items": [
    {
      "COUNTRY": "US",
      "HOUSE_NUMBER": "2403",
      "LAT": 35.53222623,
      "LON": -101.5576172,
      "MUNICIPALITY": "Carson",
      "NAME": "Amarillo Warehouse",
```

```
      "POSTAL_CODE": "79068",
      "REGION": "TX",
      "SETTLEMENT": "Panhandle",
      "STREET": "County Road D"
    }
  ],
  ...
}
```

4.2 Accessing Spatial Studio REST API Programmatically

You can programmatically interact with the Spatial Studio REST API endpoints from another application.

A typical use case is to consume a Spatial Studio dataset or analysis, and showing its contents (geometries and attributes) on a map that you are creating either from scratch or in an existing web mapping application (such as a map region inside your Oracle Apex application). To implement this, you must first understand the ways Spatial Studio can serve its datasets for mapping purposes.

Spatial Studio can serve its geometry datasets in two formats - **GeoJSON** and **Vector Tiles**, with each format using its own REST endpoint. The endpoint that applies for GeoRaster datasets, returns its contents as image tiles. Table 4-1 summarizes all the relevant REST endpoints Spatial Studio uses to serve the data of the datasets.

Table 4-1   Dataset Format Specific Endpoint

Format	Endpoint

Vector Tiles
 	
(for table/view/analysis datasets containing geometry or lat/lon indexed columns)
	`https://localhost:4040/spatialstudio/oauth/v1/vt/`
	`<DATASET_ID>/<GEOM_COLUMN_NAME>/{z}/{x}/{y}.mvt`
	Ensure to substitute the string `<DATASET_ID>` with the `id` of the target dataset and `<GEOM_COLUMN_NAME>` with the `name` (not `id`) of the geometry column.

GeoJSON
 	
(for geometry type datasets)
	`https://localhost:4040/spatialstudio/oauth/v1/`
	`jsonstream/<DATASET_ID>?geo=<GEOM_COLUMN_NAME>`
	
	• If the dataset has only one geometry column, then the **geo** query parameter can be omitted.
	• Also, ensure to substitute the string `<DATASET_ID>` with the `id` of the target dataset and `<GEOM_COLUMN_NAME>` with the `name` (not `id`) of the geometry column.

Image Tiles
 	
(for GeoRaster datasets)
	`https://localhost:4040/spatialstudio/oauth/v1/rt/`
	`<COLUMN_ID>/{z}/{x}/{y}.png`
	Note that this requires `<COLUMN_ID>` and not `<DATASET_ID>`. Also, replace `<COLUMN_ID>` with the image column `id` of the GeoRaster dataset. See Displaying a Spatial Studio GeoRaster Dataset as Image Tiles for more information on how to obtain the image column `id` of GeoRaster datasets.
	
	This is different from the REST endpoints for Vector Tiles or GeoJSON data, which require the `id` of the dataset and the `name` of the geometry column.

• Displaying a Spatial Studio Dataset in a Standalone MapLibre JavaScript Map as Vector Tiles

4.2.1 Displaying a Spatial Studio Dataset in a Standalone MapLibre JavaScript Map as Vector Tiles

This section explains how to create a simple one-page HTML page that can display a vector tiles of a dataset in a standalone JavaScript web mapping application written using the open source MapLibre GL JS API library.

Any mapping APIs must meet the following criteria:

- Support displaying vector tiles or GeoJSON data from an external source.

- Support setting a custom HTTP header on its Vector Tile or GeoJSON requests. This is needed in order to pass an access token to Spatial Studio.

The following example displays the public *Submarine Cables* dataset that was loaded into an Oracle database table from which a Spatial Studio dataset was created. The access token was obtained from the same Studio server with the type *Dataset streaming only*. The sample code is as shown:

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="utf-8">
    <title>Display vector dataset from Spatial Studio</title>
    <meta name="viewport" content="initial-scale=1,maximum-scale=1,user-
scalable=no">
    <script src="https://unpkg.com/maplibre-gl@2.1.9/dist/maplibre-gl.js"></
script>
    <link href="https://unpkg.com/maplibre-gl@2.1.9/dist/maplibre-gl.css"
rel="stylesheet">
    <style>
        body { margin: 0; padding: 0; }
        #map { position: absolute; top: 0; bottom: 0; width: 100%; }
    </style>
</head>
<body>
<div id="map"></div>
<script>
    const spatialStudio = {
        // the base URL for accessing Spatial Studio dataset's vector tiles
using an access token
        baseUrl : 'https://localhost:4040/spatialstudio/oauth/v1',
        // a stream-only access token issued by Spatial Studio
        accessToken: 'eyJ0eXAiOiJzZ3R...HV3koQsYF_MkKQ'
    };

    const map = new maplibregl.Map({
        container: 'map',
        // For demo purpose we will simply create a background map based on
the OpenStreetMap from Map Tiler. Note that you must obtain your own API key
from maptiler.com. Any Mapbox style basemap works here.
        style: ' https://api.maptiler.com/maps/openstreetmap/style.json?
```

```
key=YOUR_KEY',
        zoom: 1,
        center: [-122.5, 37.5],

        // This function is used to set the Spatial Studio access
token when requesting the vector tiles of a dataset.
        transformRequest: (url, resourceType) => {
            if (resourceType === 'Tile' &&
url.startsWith(spatialStudio.baseUrl)) {
                return {
                    url: url,
                    headers: {'Authorization': 'Bearer ' +
spatialStudio.accessToken}
                }
            }
        }
    });

    map.on('load', function () {
        // Adds the vector tiles for the Spatial Studio dataset with
the id "c5e166cdf86a1605ff9fbaa9d04b7378" to
        // the MapLibre map as a source object.
        map.addSource('spatial-studio-vector-tiles', {
            'type': 'vector',
            'tiles': [
                spatialStudio.baseUrl + '/vt/
c5e166cdf86a1605ff9fbaa9d04b7378/GEOM/{z}/{x}/{y}.mvt'
            ],
            'minzoom': 0,
            'maxzoom': 10
        });

        // Adds the layer definition for the dataset. Note that vector
tiles generated by Spatial Studio always includes only one dataset,
        // and the layer name is always 'LAYER'.
        map.addLayer(
            {
                'id': 'submarine-cables',
                'type': 'line',
                'source': 'spatial-studio-vector-tiles',
                'source-layer': 'LAYER',
                'layout': {
                    'line-cap': 'round',
                    'line-join': 'round'
                },
                'paint': {
                    'line-opacity': 0.6,
                    'line-color': 'rgb(53, 175, 109)',
                    'line-width': 3
                }
            }
        );
    });

    map.addControl(new maplibregl.NavigationControl());
```

```
    // Adds a simple popup on hover
    var popup = new maplibregl.Popup({
        closeButton: false,
        closeOnClick: false
    });

    // Defines what happens when you mouse over a feature of the dataset.
    map.on('mouseenter', 'submarine-cables', function (e) {
        // Changes the cursor style as a UI indicator.
        map.getCanvas().style.cursor = 'pointer';

        var coordinates = e.features[0].geometry.coordinates.slice();
        if (Array.isArray(coordinates[0])){
            // Uses the first vertex of the linestring feature under hover
as the anchor point for the popup.
            coordinates = coordinates[0];
        }

        // NAME is one of the columns of the dataset. You have access to all
the columns of a dataset here.
        var description = e.features[0].properties.NAME;

        // Ensures that if the map is zoomed out such that multiple
        // copies of the feature are visible, the popup appears
        // over the copy being pointed to.
        while (Math.abs(e.lngLat.lng - coordinates[0]) > 180) {
            coordinates[0] += e.lngLat.lng > coordinates[0] ? 360 : -360;
        }

        // Populates the popup with custom HTML contents and sets its
coordinates
        // based on the feature found under the mouse pointer. Finally the
popup is added to the map.
        popup.setLngLat(coordinates).setHTML(description).addTo(map);
    });

    map.on('mouseleave', 'submarine-cables', function () {
        map.getCanvas().style.cursor = '';
        popup.remove();
    });

</script>

</body>
</html>
```

Note the following related to the preceding code:

- Replace the `baseURL` and `accessToken` as it applies to your installation. Also, the access token should be of the type *Dataset stream only*.

- Similarly, replace the dataset `id` string to your own.

- The access token is set as a request header through MapLibre API's `transformRequest` option when constructing a MapLibre `Map` object. This option provides MapLibre API with

a callback that will be invoked whenever it sends a vector tile request to the Spatial Studio server.

- A MapLibre *vector* type Source object is created and added to its `Map` object. From this source object a map layer is defined and added to the map as well.

- You have full access to all the columns of the dataset once its data are displayed on the map.

- You can always customize the popup behavior and the contents as they are standard MapLibre GL JS API classes.

When you save the code to a web server and open its URL in a browser window, a similar map as shown will be displayed. The green lines on the map are the features of the Spatial Studio dataset containing submarine cables.

Figure 4-1   Displaying Vector Tiles of a Dataset in the MapLibre Application
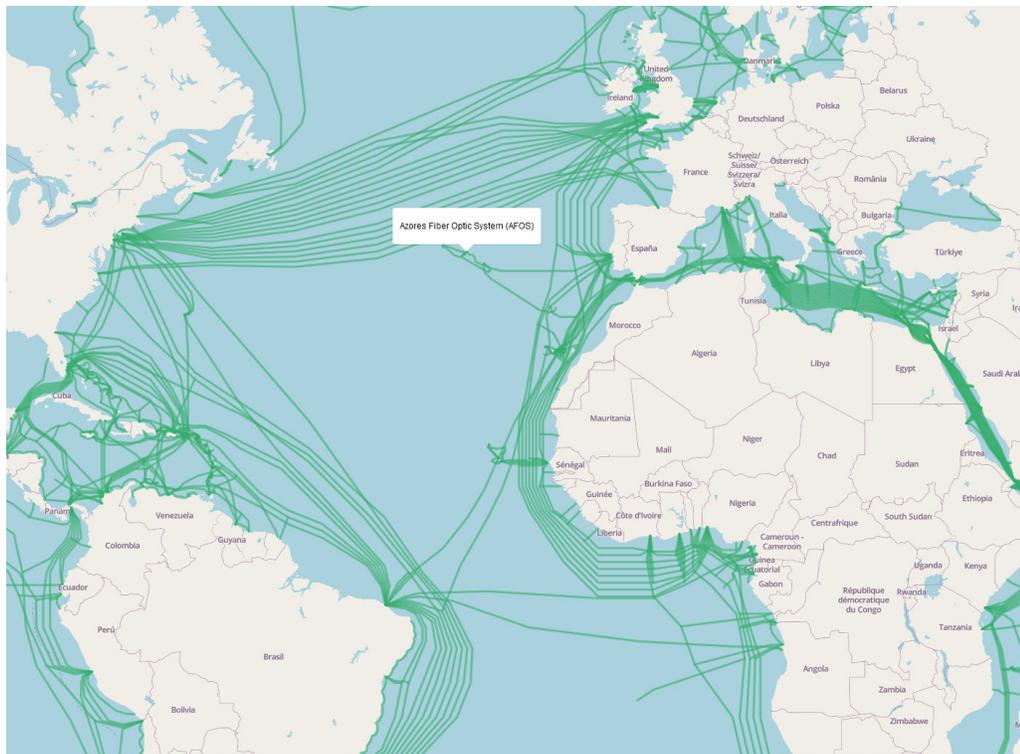
4.2.2 Displaying a Spatial Studio Dataset as GeoJSON

To load the public *Submarine Cables* dataset as GeoJSON from Spatial Studio and display it in the MapLibre application, you must make the following changes to the HTML code shown in Displaying a Spatial Studio Dataset in a Standalone MapLibre JavaScript Map as Vector Tiles:

- When adding the Spatial Studio token, the `transformRequest` function must look for requests of the type *Source* instead of *Tile*.

- The map source and layer definitions must change to use the *geojson* type.

The following show the corresponding changed blocks of code:

```
        transformRequest: (url, resourceType) => {
            if (resourceType === 'Source' &&
url.startsWith(spatialStudio.baseUrl)) {
                return {
                    url: url,
                    headers: {'Authorization': 'Bearer ' +
spatialStudio.accessToken}
                }
            }
        }

        map.addSource('spatial-studio-geojson-data', {
            'type': 'geojson',
            'data': spatialStudio.baseUrl + '/jsonstream/
c5e166cdf86a1605ff9fbaa9d04b7378'
        });

        map.addLayer(
            {
                'id': 'submarine-cables',
                'type': 'line',
                'source': 'spatial-studio-geojson-data',
                'layout': {
                    'line-cap': 'round',
                    'line-join': 'round'
                },
                'paint': {
                    'line-opacity': 0.6,
                    'line-color': 'rgb(53, 175, 109)',
                    'line-width': 3
                }
            }
        );
```

4.2.3 Displaying a Spatial Studio GeoRaster Dataset as Image Tiles

Similar to how the geometry dataset from Spatial Studio can be displayed in a standalone MapLibre map, GeoRaster datasets from Spatial Studio can also be easily added to your MapLibre map. As mentioned in the earlier sections, the REST endpoint for returning the image tiles of a GeoRaster dataset requires the image column's `id` as part of the REST endpoint URL. Unlike easily finding out the `id` of a dataset from its properties dialog, in this case, you must use a `cURL` command to obtain the image column `id`. For example:

```
curl -k "https://localhost:4040/spatialstudio/oauth/v1/datasets/<DATASET_ID>/
columns?datasetFields=georasterColumns&columnFields=id,name" \
 --header "Authorization: Bearer <MY_TOKEN>"
```

The preceding REST endpoint returns the metadata of all the columns in the specified dataset. The query parameters, `datasetFields` and `columnFields` are used to filter the response so that only the fields matching the given names are returned to the client. In this case, the requirement is to obtain the `georasterColumns` field, which indicates the name of

the dataset's GeoRaster image columns (that store raster image data). For the individual columns in that dataset, only the `name` and `id` are required.

The request returns a similar response:

```
{
  "georasterColumns": [
    "IMAGE"
  ],
  "columnDetails": [
    {
      "id": "09b60f1da4c6808d753c57393c6f899f",
      "name": "IMAGE_ID"
    },
    {
      "id": "7223184218fc39ac149c91155a9f9242",
      "name": "MIN_X_RES$"
    },
    {
      "id": "e56426442075b028018175740b64449d",
      "name": "IMAGE"
    },
    {
      "id": "c254f40e6ea6f14f4899c8801b485b24",
      "name": "MAX_X_RES$"
    },
    {
      "id": "5c4d7c6963f7234adc97fafc52c0c04c",
      "name": "DESCRIPTION"
    }
  ]
}
```

In the preceding response, the `id` of the image column is *e56426442075b028018175740b64449d*, which is then used in the following example code to display a Spatial Studio GeoRaster dataset on a standalone MapLibre application.

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="utf-8">
    <title>Display GeoRaster imagery from Spatial Studio</title>
    <meta name="viewport" content="initial-scale=1,maximum-
scale=1,user-scalable=no">
    <script src="https://unpkg.com/maplibre-gl@2.1.9/dist/maplibre-
gl.js"></script>
    <link href="https://unpkg.com/maplibre-gl@2.1.9/dist/maplibre-
gl.css" rel="stylesheet">
    <style>
        body { margin: 0; padding: 0; }

        .container {
            position: absolute;
```

```
            width: 100%;
            height: 100%;
        }
        .control {
            background-color: #a9cce3 ;
            width: 100%;
            height: 100px;
            margin: 5px auto;
        }
        .map_container {
            position: absolute;
            top: 100px;
            bottom: 0;
            width: 100%;
            margin: 5px auto;
        }
    </style>
</head>
<body>

<div class="container">
    <div class="control">
        <form>
          <fieldset>
                <legend>GeoRaster display settings</legend>
                <p>
                    <input type="checkbox" name="nodata_flag"
id="nodata_flag">
                    <label for="nodata_flag">Show NODATA values as
transparent</label>
                </p>
          </fieldset>
        </form>
    </div>

    <div class="map_container" id="map"></div>
</div>


<script>
    // basic information about the remote Spatial Studio instance that is
serving the GeoRaster images.
    const spatialStudio = {
        // the base URL for accessing Spatial Studio dataset's GeoRaster
image tiles using an access token
        baseUrl : 'https://localhost:4040/spatialstudio/oauth/v1',
        rasterTileEndpoint: '/rt/e56426442075b028018175740b64449d/{z}/{x}/
{y}.png',
        // a stream-only access token issued by Spatial Studio
        accessToken: 'eyJ0eXAiOiJzZ3R...qOdHV3koQsYF_MkKQ'
    };

    const sourceId = 'spatial-studio-raster-tiles1';

    const map = new maplibregl.Map({
```

```
      container: 'map',
      // Gets the OpenStreetMap basemap from maptiler.com. You must
change to use your own maptiler API key and agree to their terms of
usage.
      style: 'https://api.maptiler.com/maps/openstreetmap/style.json?
key=YOUR_KEY,
      zoom: 6,
      center: [-90.241936, 33.911399],

      //This option sets a Spatial Studio access token when
requesting the image tiles of a GeoRaster dataset.
      transformRequest: (url, resourceType) => {
          if (resourceType === 'Tile'&&
url.startsWith(spatialStudio.baseUrl)){
              return {
                  url: url,
                  headers: {'Authorization': 'Bearer ' +
spatialStudio.accessToken}
              }
          }
      }
    });

    // Controls the visual appearances of the GeoRaster images
generated by Studio. This is appended to the Studio tile request URLs.
    let geoRasterVisualProperties = {"reprojection":
{"mode":"NN","medianfilter":false},"transpnodata":false,"virtualmosaic"
:
{"resolfilter":true,"nodata":true,"fillgap":true,"commonpointrule":"HIG
H"},"bands":{"red":1,"green":2,"blue":3,"alpha":-1}};

    map.on('load', function () {
      // Adds the image tiles for the Spatial Studio GeoRaster
dataset with the specified column id (not dataset id)
"e56426442075b028018175740b64449d" to
      // the map.
      //
      map.addSource(sourceId, {
          'type': 'raster',
          'tiles' : [
                  spatialStudio.baseUrl +
spatialStudio.rasterTileEndpoint + '?visualProperties=' +
JSON.stringify(geoRasterVisualProperties)
              ],
          'minzoom': 5,
          'maxzoom': 20,
          'tileSize' : 256,
          // this tells MapLibre API that the dataset only has
GeoRaster images within this bounding box
          'bounds': [-90.4895407500805, 32.3190270753724,
-89.9586424931126, 35.2761555998833]
      });

      // Defines and adds a layer from the above Map source.
      map.addLayer(
```

```
                {
                    'id': 'my_georaser_layer',
                    'type': 'raster',
                    'source': sourceId,
                    'paint':  {
                        'raster-opacity': 0.72,
                        'raster-hue-rotate': 0,
                        'raster-brightness-min': 0,
                        'raster-brightness-max': 1,
                        'raster-saturation': 0,
                        'raster-contrast': 0,
                        'raster-fade-duration': 300
                    }
                }
            );
        });

        map.addControl(new maplibregl.NavigationControl());

        // Toggles the display of GeoRaster NODATA values between transparent or
not.
        // This is done by changing the visual properties object's "nodata"
field,
        // then reloading the GeoRaster images from Spatial Studio using the new
properties.
        function toggleNODATA(flag) {
            if (geoRasterVisualProperties.transpnodata === flag) {
                return; // do nothing since we are already using the input value
            }

            geoRasterVisualProperties.transpnodata = flag;

            // update map source so that future tile requests will generate
tiles with the new visual properties.
            const sourceObj = map.getSource(sourceId);
            const newTileUrl = spatialStudio.baseUrl +
spatialStudio.rasterTileEndpoint + '?visualProperties=' +
JSON.stringify(geoRasterVisualProperties);

            sourceObj.tiles = [newTileUrl];
            // Remove all the existing, cached tiles of the GeoRaster source
            map.style.sourceCaches[sourceId].clearTiles();
            // Reloads the GeoRaster image tiles for the current viewport
(map.transform -> viewport)
            map.style.sourceCaches[sourceId].update(map.transform);
            // Force a map repaint
            map.triggerRepaint();
        }

        // add callback to the nodata checkbox
        const nodataCheckbox = document.querySelector('#nodata_flag');

        nodataCheckbox.addEventListener('change', () => {
            if(nodataCheckbox.checked){
                toggleNODATA(true);
```

```
        } else {
            toggleNODATA(false);
        }
    });

</script>

</body>
</html>
```

The following shows the output map with the GeoRaster (high resolution images) overlaid on top of the OpenStreetMap. When you toggle the **Show NODATA values as transparent**, the GeoRaster images will display its *NODATA* area either as black or transparent pixels.

Figure 4-2   Displaying a GeoRaster Dataset in the MapLibre Application
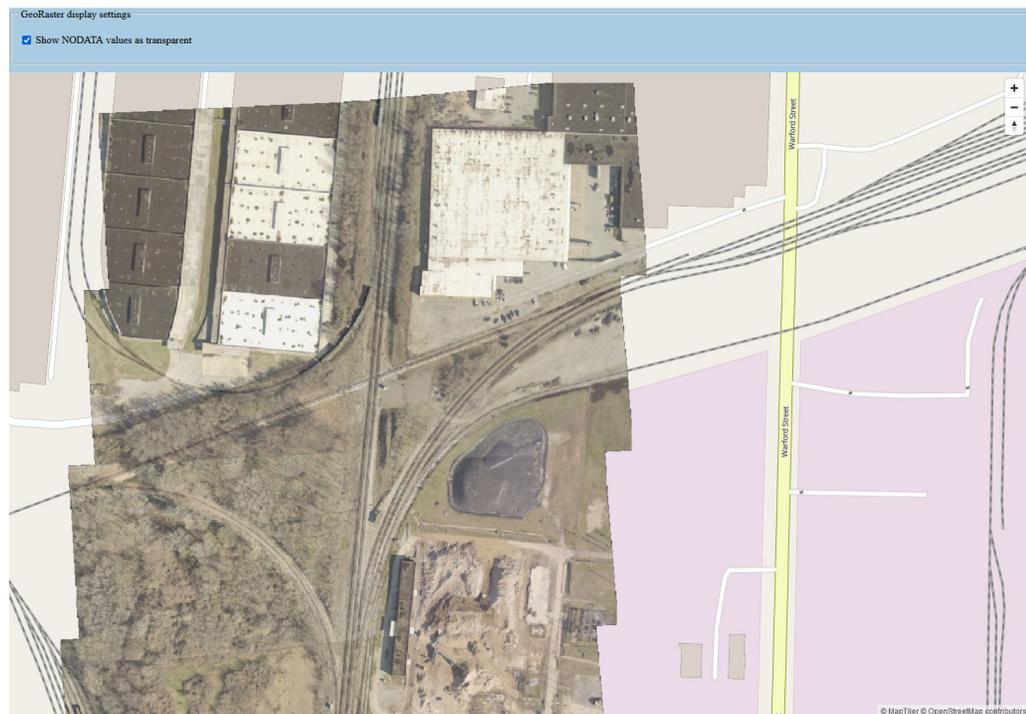
Note the following on the preceding GeoRaster image:

- The overall pattern remains similar to how geometry datasets are displayed. You only need to change the Spatial Studio REST endpoint and how the MapLibre Source and Layer objects are defined.

- You can fine-tune the generated image tiles by supplying a visual properties payload as part of the image tile request.

- Spatial Studio takes care of all the backend processes such as querying the GeoRaster table or virtual mosaic based on the browser's image tile requests, applying the specified visual properties, and sending the result images back to the browser.

5

Spatial Studio Accessibility Information

This topic provides information on the accessibility features for Oracle Spatial Studio.

It includes the following.

- About Oracle Spatial Studio Accessibility
- Oracle Spatial Studio Features that Support Accessibility
- Highly Visual Features of Oracle Spatial Studio

5.1 About Oracle Spatial Studio Accessibility

It is our goal to make Oracle Products, Services, and supporting documentation accessible to the disabled community.

Oracle Spatial Studio is based on the Oracle JET components. For more information about accessibility of Oracle JET components, see the Oracle JET Documentation.

For additional accessibility information for Oracle products, see the Oracle Accessibility Program page at:

http://www.oracle.com/accessibility/

5.2 Oracle Spatial Studio Features that Support Accessibility

Oracle Spatial Studio provides features that are designed to support accessibility.

- Keyboard Access with Spatial Studio
- Screen Reader Readability with Spatial Studio
- Flexibility in Font and Color Choices with Spatial Studio
- No Audio-only Feedback with Spatial Studio
- No Dependency on Blinking Cursor and Animation with Spatial Studio
- Screen Magnifier Usability with Spatial Studio

5.2.1 Keyboard Access with Spatial Studio

Oracle Spatial Studio features support keyboard access to the product's functionality; a summary is provided in this section. The following menu and toolbar functionality is provided through keyboard access:

- Users can navigate to and invoke all menu items.
- All toolbar functions are accessible through menu items.
- All menus and menu items have unique and functioning mnemonic keys.
- All context menus within the navigators and source editor can be invoked.

- Frequently used menu items have unique accelerator keys.

5.2.2 Screen Reader Readability with Spatial Studio

Here is a summary of screen readability in Spatial Studio, when it is used with a screen reader.

When used with menus and toolbars:

- All menus and menu items are read.
- All toolbar items are read.
- The hint text on all toolbar items is read.

5.2.3 Flexibility in Font and Color Choices with Spatial Studio

The user interface in Spatial Studio improves usability for people who are visually impaired by offering flexibility in color and font choices. The following font and color features are included:

- Users can specify both the font and the size in which the font displays for code editors.
- All features of the product have black text on a white or gray background.
- Colored text, underlining, or images are never used as the only method of conveying information.

5.2.4 No Audio-only Feedback with Spatial Studio

In Spatial Studio, there is no situation in which the only feedback a user receives is audible feedback. All audible feedback is accompanied by a visual indicator. For example, a prompt accompanies the bell sound that occurs when an error or illegal action has taken place.

5.2.5 No Dependency on Blinking Cursor and Animation with Spatial Studio

Spatial Studio makes minimal use of a blinking cursor and animation:

- No features in Spatial Studio use blinking indicators, with the exception of the cursor in the source editor.
- No features rely on animated sequences.

5.2.6 Screen Magnifier Usability with Spatial Studio

The Spatial Studio user interface works well with screen magnifiers. All features of the product can be magnified by a screen magnifier.

5.3 Highly Visual Features of Oracle Spatial Studio

Spatial Studio includes features that are highly visual, and these features have equivalent functionality that is available to people who are blind or visually impaired,

except for the generated maps, which are only visual. However, results of an analysis can also be generated as JSON and tables, as an alternative format to the visual map.

All of the functionality is available through REST APIs.

In Spatial Studio, it is possible to create, edit, and generate an analysis result using only keystrokes.

A
Spatial Studio OpenAPI Specification for the REST API Endpoints

This appendix contains the OpenAPI 3.0 YAML documentation of the REST API endpoints for the Spatial Studio. You can invoke these endpoints to perform various Spatial Studio operations programmatically or through a command line tool such as curl using access tokens of the Spatial Studio.

OpenAPI 3.0 YAML Document containing the REST API Endpoints

```
openapi: 3.0.0
info:
  title: Oracle Spatial Studio REST API
  description: This file lists all RESTful API end points of the Oracle
Spatial Studio
    application.
  version: "1.0"
paths:
  /v1/plugins/resource/{pluginId}/{segment}:
    get:
      operationId: getResource
      parameters:
      - name: pluginId
        in: path
        required: true
        schema:
          type: string
      - name: segment
        in: path
        required: true
        schema:
          type: array
          items:
            type: object
            properties:
              path:
                type: string
              matrixParameters:
                type: object
                properties:
                  empty:
                    type: boolean
                additionalProperties:
                  type: array
                  items:
                    type: string
      responses:
        default:
```

```
              description: default response
              content:
                '*/*': {}
/v1/object/{type}/{name}/metadata:
  get:
    operationId: getMetadata
    parameters:
    - name: type
      in: path
      required: true
      schema:
        type: string
    - name: name
      in: path
      required: true
      schema:
        type: string
    - name: scope
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/safe_domains:
  get:
    operationId: getSafeDomains
    parameters:
    - name: reload
      in: query
      schema:
        type: boolean
        default: false
    responses:
      default:
        description: default response
        content:
          application/json: {}
  post:
    operationId: updateSafeDomains
    requestBody:
      content:
        '*/*':
          schema:
            type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/object_body_field/{type}/{id}:
  put:
    operationId: updateBodyField
```

```
        parameters:
        - name: type
          in: path
          required: true
          schema:
            type: string
        - name: id
          in: path
          required: true
          schema:
            type: string
        - name: name
          in: query
          schema:
            type: string
        - name: value
          in: query
          schema:
            type: string
        responses:
          default:
            description: default response
            content:
              '*/*': {}
/v1/logs:
  get:
    operationId: getSystemLogs
    parameters:
    - name: entries
      in: query
      schema:
        type: integer
        format: int32
        default: 30
    - name: entrylength
      in: query
      schema:
        type: integer
        format: int32
        default: 600
    - name: cropentries
      in: query
      schema:
        type: boolean
        default: true
    - name: filterlevel
      in: query
      schema:
        type: string
        default: INFO
    responses:
      default:
        description: default response
        content:
          application/json: {}
```

```
        /v1/systemStatus:
          get:
            operationId: getSystemStatus
            responses:
              default:
                description: default response
                content:
                  application/json: {}
        /v1/softwareVersion:
          get:
            operationId: getVersionAndBuild
            responses:
              default:
                description: default response
                content:
                  application/json: {}
        /v1/ping:
          get:
            operationId: ping
            responses:
              default:
                description: default response
                content:
                  '*/*': {}
        /v1/connections/validate:
          post:
            operationId: isValidConnection
            requestBody:
              content:
                application/json:
                  schema:
                    type: object
                    additionalProperties:
                      type: string
            responses:
              default:
                description: default response
                content:
                  application/json: {}
        /v1/settings/{typeString}:
          get:
            operationId: getSGTechSettings
            parameters:
            - name: typeString
              in: path
              required: true
              schema:
                type: string
            responses:
              default:
                description: default response
                content:
                  application/json: {}
        /v1/requirejsconfig.js:
          get:
```

```
        operationId: getRequireJSConfig
        responses:
          default:
            description: default response
            content:
              text/javascript:
                schema:
                  type: string
/v1/settings/test/elocationurl:
  post:
    operationId: testElocationURL
    parameters:
    - name: url
      in: query
      schema:
        type: string
    requestBody:
      content:
        '*/*':
          schema:
            type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/settings/update/{typeString}:
  put:
    operationId: updateSGTechSettings
    parameters:
    - name: typeString
      in: path
      required: true
      schema:
        type: string
    requestBody:
      content:
        '*/*':
          schema:
            type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/header_fields/{id}:
  put:
    operationId: updateDomainObjectHeaderFields
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    requestBody:
```

```
          content:
            '*/*':
              schema:
                type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
/v1/contextPath:
  get:
    operationId: getApplicationContextPath
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/repository/connect:
  post:
    operationId: connectToMetaDataSchema
    requestBody:
      content:
        application/json:
          schema:
            type: object
            additionalProperties:
              type: object
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/object_body_fields/{type}/{id}/{csf}:
  get:
    operationId: getDomainObjectFields
    parameters:
    - name: type
      in: path
      required: true
      schema:
        type: string
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: csf
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
```

```
              application/json: {}
      /v1/extensionpoints:
        get:
          operationId: getFronendExtensionPoints
          responses:
            default:
              description: default response
              content:
                application/json: {}
      /v1/repository/status:
        get:
          operationId: getMetaDataSchemaStatus
          responses:
            default:
              description: default response
              content:
                application/json: {}
      /v1/extensions:
        get:
          operationId: getFronendExtensions
          responses:
            default:
              description: default response
              content:
                application/json: {}
      /v1/acl/{id}:
        post:
          operationId: addOneAccess
          parameters:
          - name: id
            in: path
            required: true
            schema:
              type: string
          - name: user_id
            in: query
            schema:
              type: string
          - name: actions
            in: query
            schema:
              type: string
          responses:
            default:
              description: default response
              content:
                application/json: {}
        delete:
          operationId: removeACL
          parameters:
          - name: id
            in: path
            required: true
            schema:
              type: string
```

```
        - name: user_id
          in: query
          schema:
            type: string
        - name: actions
          in: query
          schema:
            type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/world_readable/{id}:
    get:
      operationId: isWorldReadable
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
    put:
      operationId: setWorldReadable
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
    delete:
      operationId: removeWorldReadable
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/adhocdatasets/{datasetId}/dbobject:
    post:
```

```
                  operationId: createDBObject
                  parameters:
                  - name: datasetId
                    in: path
                    required: true
                    schema:
                      type: string
                  requestBody:
                    content:
                      application/x-www-form-urlencoded:
                        schema:
                          type: object
                          properties:
                            objectName:
                              type: string
                            objectType:
                              type: string
                              enum:
                              - TABLE
                              - VIEW
                            createDataset:
                              type: boolean
                            datasetName:
                              type: string
                  responses:
                    default:
                      description: default response
                      content:
                        application/json: {}
  /v1/adhocdatasets/{datasetId}:
    patch:
      operationId: editAdhocDataset
      parameters:
      - name: datasetId
        in: path
        required: true
        schema:
          type: string
      requestBody:
        content:
          application/x-www-form-urlencoded:
            schema:
              type: object
              properties:
                query:
                  type: string
                name:
                  type: string
                description:
                  type: string
                  default: ""
                operator:
                  type: string
                parameters:
                  type: string
```

```
              datasetIds:
                type: string
              keyColumn:
                type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
  /v1/adhocdatasets:
    post:
      operationId: createNewAdHocDataset
      requestBody:
        content:
          application/x-www-form-urlencoded:
            schema:
              type: object
              properties:
                query:
                  type: string
                name:
                  type: string
                description:
                  type: string
                  default: ""
                operator:
                  type: string
                parameters:
                  type: string
                datasourceId:
                  type: string
                datasetIds:
                  type: string
                keyColumn:
                  type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
  /v1/admin/cache:
    delete:
      operationId: cacheRebuild
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/uploads/csvs/{uploadToken}/rows:
    get:
      operationId: getCSVRows
      parameters:
      - name: uploadToken
        in: path
        required: true
```

```
          schema:
            type: string
      - name: fromrow
        in: query
        schema:
          type: integer
          format: int32
      - name: torow
        in: query
        schema:
          type: integer
          format: int32
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/cacheStats/roundtrip:
  get:
    operationId: getCoherenceRoundTripStats
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/cacheStats/summary:
  get:
    operationId: getCoherenceStatsSummary
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/cacheStats/details:
  get:
    operationId: getCoherenceStatsDetails
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/cesium/3dtileset/{doid}/{segment}:
  get:
    operationId: do3DTileset
    parameters:
    - name: doid
      in: path
      required: true
      schema:
        type: string
    - name: segment
      in: path
      required: true
      schema:
        type: array
```

```
            items:
              type: object
              properties:
                path:
                  type: string
                matrixParameters:
                  type: object
                  properties:
                    empty:
                      type: boolean
                  additionalProperties:
                    type: array
                    items:
                      type: string
      responses:
        default:
          description: default response
          content:
            application/octet-stream: {}
/v1/cesium/czml/{doid}:
  get:
    operationId: doCZMLRequest
    parameters:
    - name: doid
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/public/cesiummapstyles:
  get:
    operationId: getCesiumMapStyleList
    parameters:
    - name: fields
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/cesiummapstyles:
  post:
    operationId: createCesiumMapStyle
    requestBody:
      content:
        '*/*':
          schema:
            type: string
    responses:
```

```
        default:
          description: default response
          content:
            application/json: {}
/v1/cesiummapstyles/{id}:
  get:
    operationId: getCesiumMapStyleObject
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
  put:
    operationId: updateCesiumMapStyle
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    requestBody:
      content:
        '*/*':
          schema:
            type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
  delete:
    operationId: deleteCesiumMapStyle
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/public/cesiummapstyles/{id}:
  get:
    operationId: getCesiumMapStyle
    parameters:
    - name: id
      in: path
```

```
          required: true
          schema:
            type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
  /v1/public/cesium/czml/{doid}:
    get:
      operationId: doGetCZML
      parameters:
      - name: doid
        in: path
        required: true
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/public/cesium/3dtileset/{doid}/{segment}:
    get:
      operationId: doGetTileset
      parameters:
      - name: doid
        in: path
        required: true
        schema:
          type: string
      - name: segment
        in: path
        required: true
        schema:
          type: array
          items:
            type: object
            properties:
              path:
                type: string
              matrixParameters:
                type: object
                properties:
                  empty:
                    type: boolean
                additionalProperties:
                  type: array
                  items:
                    type: string
      responses:
        default:
          description: default response
          content:
            application/octet-stream: {}
```

```
/v1/dataset_column_values/{datasetId}:
  get:
    operationId: getDatasetColumnValues
    parameters:
    - name: datasetId
      in: path
      required: true
      schema:
        type: string
    - name: columns
      in: query
      schema:
        type: string
    - name: filter
      in: query
      schema:
        type: string
    - name: maxRows
      in: query
      schema:
        type: integer
        format: int32
    - name: distinct
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/public/dataset_column_values/{datasetId}:
  get:
    operationId: getDatasetColumnValuesPublic
    parameters:
    - name: datasetId
      in: path
      required: true
      schema:
        type: string
    - name: columns
      in: query
      schema:
        type: string
    - name: filter
      in: query
      schema:
        type: string
    - name: maxRows
      in: query
      schema:
        type: integer
        format: int32
    - name: distinct
      in: query
```

```
          schema:
            type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
  /v1/datasets/records/{id}:
    post:
      operationId: insertDatasetRow
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      requestBody:
        content:
          '*/*':
            schema:
              type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
    delete:
      operationId: deleteDataSetTableRow
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      requestBody:
        content:
          '*/*':
            schema:
              type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
    patch:
      operationId: patchDatasetRows
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      requestBody:
        content:
          '*/*':
```

```
        schema:
          type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/datasets/same_table_datasets/{id}:
  get:
    operationId: getSameTableDatasets
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/datasets/spatiotemporal/{id}:
  get:
    operationId: getSpatioTemporalDescriptor
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
  post:
    operationId: activateSpatioTemporal
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    requestBody:
      content:
        '*/*':
          schema:
            type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
  delete:
    operationId: deactivateSpatioTemporal
```

```
        parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
/v1/datasets/export/{id}:
  get:
    operationId: downloadExportedDataset
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: client_token
      in: query
      schema:
        type: string
    - name: format
      in: query
      schema:
        type: string
    - name: file_name
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/zip: {}
  post:
    operationId: exportDatasetAsGeoJson
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: format
      in: query
      schema:
        type: string
    - name: simplify_geoms
      in: query
      schema:
        type: string
    - name: coord_precision
      in: query
```

```
          schema:
            type: string
        - name: columns
          in: query
          schema:
            type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/datasets/columns/geom_col_metadata_status/{id}/{geomColumnId}:
  get:
    operationId: checkGeomColOrLLIndexedMetadata
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: geomColumnId
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/datasets/refresh/{id}:
  post:
    operationId: getDatasetLastModified
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: lastModified
      in: query
      schema:
        type: integer
        format: int64
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/datasets/columns/rectifygeometries/{id}:
  put:
    operationId: runSingleGeoColumnRectifyGeomtries
    parameters:
    - name: id
      in: path
```

```
          required: true
          schema:
            type: string
        - name: geoColumnId
          in: query
          schema:
            type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/datasets/columns/geovalidations/{id}:
    get:
      operationId: getGeoColumnsValidationResults
      parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        - name: geoColumnId
          in: query
          schema:
            type: string
        - name: jetResponse
          in: query
          schema:
            type: boolean
      responses:
        default:
          description: default response
          content:
            application/json: {}
    put:
      operationId: runSingleGeoColumnValidations
      parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        - name: geoColumnId
          in: query
          schema:
            type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
    delete:
      operationId: clearSingleGeoColumnValidations
      parameters:
        - name: id
```

```
          in: path
          required: true
          schema:
            type: string
      - name: geoColumnId
          in: query
          schema:
            type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/datasets/unique_constraint/exists/{id}:
  get:
    operationId: existsUniqueConstraint
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: columnNames
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/datasets/unique_constraint/{id}:
  put:
    operationId: createUniqueConstraint
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: newColumnIds
      in: query
      schema:
        type: string
    - name: oldColumnIds
      in: query
      schema:
        type: string
    - name: setNotNullable
      in: query
      schema:
        type: boolean
    responses:
      default:
        description: default response
```

```
              content:
                application/json: {}
/v1/datasets/body_fields/{id}:
    put:
      operationId: updateDatasetOrColumnBodyFields
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      requestBody:
        content:
          '*/*':
            schema:
              type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/datasets/columns_geotags/{id}:
    get:
      operationId: getColumnGeoTags
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
    put:
      operationId: updateColumnGeoTags
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      requestBody:
        content:
          '*/*':
            schema:
              type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/datasets/statistics/{id}:
    get:
```

```
            operationId: getDatasetStatistics
            parameters:
            - name: id
              in: path
              required: true
              schema:
                type: string
            responses:
              default:
                description: default response
                content:
                  application/json: {}
    /v1/datasets/function_based_index/{id}:
      post:
        operationId: createFunctionBasedIndex
        parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        - name: lon
          in: query
          schema:
            type: string
        - name: lat
          in: query
          schema:
            type: string
        - name: reuse_bt_index
          in: query
          schema:
            type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
      delete:
        operationId: deleteFunctionBasedIndex
        parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        - name: lon
          in: query
          schema:
            type: string
        - name: lat
          in: query
          schema:
            type: string
        responses:
```

```
              default:
                description: default response
                content:
                  application/json: {}
      /v1/datasets/cachesettings/{id}:
        get:
          operationId: getDatasetCacheSettings
          parameters:
          - name: id
            in: path
            required: true
            schema:
              type: string
          responses:
            default:
              description: default response
              content:
                application/json: {}
      /v1/datasets/valid_key_columns/{id}:
        get:
          operationId: validateKeyColumnNames
          parameters:
          - name: id
            in: path
            required: true
            schema:
              type: string
          - name: columns
            in: query
            schema:
              type: string
          responses:
            default:
              description: default response
              content:
                application/json: {}
      /v1/datasets/update_statistics/{id}:
        post:
          operationId: updateDataSetStatistics
          parameters:
          - name: id
            in: path
            required: true
            schema:
              type: string
          responses:
            default:
              description: default response
              content:
                application/json: {}
      /v1/datasets/{id}/columns:
        get:
          operationId: getColumns
          parameters:
          - name: id
```

```
        in: path
        required: true
        schema:
          type: string
    - name: datasetFields
      in: query
      schema:
        type: string
    - name: columnFields
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/datasets/geom_metadata/{id}:
  post:
    operationId: createGeometryMetadata
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/datasets/row/{id}:
  delete:
    operationId: deleteDataSetRow
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: row_key
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/datasets/{id}:
  get:
    operationId: getDataset
    parameters:
    - name: id
      in: path
```

```
          required: true
          schema:
            type: string
      - name: fields
        in: query
        schema:
          type: string
      - name: expand
        in: query
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  delete:
    operationId: deleteDataSet
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: deleteDataTable
      in: query
      schema:
        type: boolean
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/datasets:
  get:
    operationId: getDataSets
    parameters:
    - name: fields
      in: query
      schema:
        type: string
    - name: expand
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
  post:
    operationId: createDataSet
    requestBody:
      content:
        application/json:
```

```
          schema:
            type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/datasets/batchdelete:
  delete:
    operationId: deleteDataSetBatch
    requestBody:
      content:
        '*/*':
          schema:
            type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/datasets/size/{id}:
  get:
    operationId: getDatasetSize
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: exactValue
      in: query
      schema:
        type: boolean
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/datasets/urlstatistics:
  get:
    operationId: getGeoJsonUrlStats
    parameters:
    - name: url
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/datasets/page/{id}:
  get:
    operationId: getDatasetRowPage
    parameters:
```

```
              - name: id
                in: path
                required: true
                schema:
                  type: string
              - name: column
                in: query
                schema:
                  type: string
              - name: value
                in: query
                schema:
                  type: string
              - name: pageSize
                in: query
                schema:
                  type: integer
                  format: int32
              - name: sortCriteria
                in: query
                schema:
                  type: string
            responses:
              default:
                description: default response
                content:
                  application/json: {}
  /v1/datasets/{datasetId}/synonym/allowed:
    get:
      operationId: isSynonymAllowed
      parameters:
      - name: datasetId
        in: path
        required: true
        schema:
          type: string
      - name: synonymName
        in: query
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/datasets/distinctvalues/{id}:
    get:
      operationId: getDistinctValues
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      - name: column
```

```
            in: query
            schema:
              type: string
        - name: offset
          in: query
          schema:
            type: integer
            format: int64
        - name: limit
          in: query
          schema:
            type: integer
            format: int64
        - name: totalResults
          in: query
          schema:
            type: boolean
        - name: jetResponse
          in: query
          schema:
            type: boolean
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/datasets/rows/{id}:
    get:
      operationId: getDatasetRows
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      - name: columns
        in: query
        schema:
          type: string
      - name: filter
        in: query
        schema:
          type: string
      - name: orderBy
        in: query
        schema:
          type: string
      - name: offset
        in: query
        schema:
          type: integer
          format: int64
      - name: limit
        in: query
        schema:
```

```
                    type: integer
                    format: int64
              - name: totalResults
                in: query
                schema:
                  type: boolean
              - name: jetResponse
                in: query
                schema:
                  type: boolean
            responses:
              default:
                description: default response
                content:
                  application/json: {}
  /v1/datasets/create_key_column/{datasetId}:
    post:
      operationId: createKeyColumn
      parameters:
      - name: datasetId
        in: path
        required: true
        schema:
          type: string
      - name: columnName
        in: query
        schema:
          type: string
      - name: setAsKey
        in: query
        schema:
          type: boolean
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/datasets/columns/{id}:
    get:
      operationId: getDatasetColumnsContentInASingleRow
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      - name: columns
        in: query
        schema:
          type: string
      - name: offset
        in: query
        schema:
          type: integer
          format: int64
```

```
        - name: limit
          in: query
          schema:
            type: integer
            format: int64
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/datasources/{id}:
    get:
      operationId: getDatasource
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      - name: fields
        in: query
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
    put:
      operationId: updateDataSource
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      requestBody:
        content:
          '*/*':
            schema:
              type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
    delete:
      operationId: deleteDataSource
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      responses:
```

```
            default:
              description: default response
              content:
                application/json: {}
    /v1/datasources:
      get:
        operationId: getDatasources
        parameters:
        - name: fields
          in: query
          schema:
            type: string
        - name: expand
          in: query
          schema:
            type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
      post:
        operationId: createDataSource
        parameters:
        - name: uploadToken
          in: query
          schema:
            type: string
        requestBody:
          content:
            '*/*':
              schema:
                type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
    /v1/datasources/migrate/{id}:
      put:
        operationId: migrateDataSource
        parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        - name: uploadToken
          in: query
          schema:
            type: string
        requestBody:
          content:
            '*/*':
              schema:
```

```
                type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/datasources/validate/{id}:
  post:
    operationId: validateDatasource
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/datasources/wallet/{walletId}/services:
  get:
    operationId: getWalletServices
    parameters:
    - name: walletId
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/enrichment/geocodefailedrows/{id}:
  put:
    operationId: geocodeDataSetFailedRows
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/enrichment/geocode/fix_ambiguous/{id}:
  post:
    operationId: fixSigleAmbiguousMatch
    parameters:
    - name: id
      in: path
      required: true
```

```
              schema:
                type: string
          - name: row_key
            in: query
            schema:
              type: string
          - name: selected_match
            in: query
            schema:
              type: integer
              format: int32
        requestBody:
          content:
            '*/*':
              schema:
                type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
  /v1/enrichment/reversegeocode/{id}:
    put:
      operationId: reverseGeocodeDataSet
      parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        - name: datasourceid
          in: query
          schema:
            type: string
        - name: roadsonly
          in: query
          schema:
            type: boolean
        - name: geometrypoint
          in: query
          schema:
            type: string
        - name: latlonindex
          in: query
          schema:
            type: string
        - name: lat
          in: query
          schema:
            type: string
        - name: lon
          in: query
          schema:
            type: string
      requestBody:
```

```
              content:
                '*/*':
                  schema:
                    type: string
          responses:
            default:
              description: default response
              content:
                application/json: {}
    delete:
      operationId: clearReverseGeocoding
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/enrichment/{id}/tasks:
    get:
      operationId: getGeocodingTasksIds
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      - name: taskStates
        in: query
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/enrichment/geocode/temptable/{id}:
    delete:
      operationId: removeTempTable
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/enrichment/geocode/{id}:
```

```
        put:
          operationId: geocodeDataSet
          parameters:
          - name: id
            in: path
            required: true
            schema:
              type: string
          requestBody:
            content:
              '*/*':
                schema:
                  type: string
          responses:
            default:
              description: default response
              content:
                application/json: {}
      delete:
        operationId: clearGeocoding
        parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
/v1/enrichment/geocode/result/{id}:
  get:
    operationId: getGeocodedResults
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: resultType
      in: query
      schema:
        type: string
    - name: orderby
      in: query
      schema:
        type: string
    - name: offset
      in: query
      schema:
        type: integer
        format: int32
    - name: limit
      in: query
```

```
      schema:
        type: integer
        format: int32
    - name: totalResults
      in: query
      schema:
        type: boolean
    - name: jetResponse
      in: query
      schema:
        type: boolean
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/enrichment/geocode/fix/{id}:
  post:
    operationId: geocodeSingleItem
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: row_key
      in: query
      schema:
        type: string
    requestBody:
      content:
        '*/*':
          schema:
            type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/uploads/geojsons/{uploadToken}/rows:
  get:
    operationId: getGeoJsonRows
    parameters:
    - name: uploadToken
      in: path
      required: true
      schema:
        type: string
    - name: fromrow
      in: query
      schema:
        type: integer
        format: int32
    - name: torow
      in: query
```

```
        schema:
          type: integer
          format: int32
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/rt/{id}/{z}/{x}/{y}.png:
  get:
    operationId: streamRasterTile
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: z
      in: path
      required: true
      schema:
        type: integer
        format: int32
    - name: x
      in: path
      required: true
      schema:
        type: integer
        format: int32
    - name: "y"
      in: path
      required: true
      schema:
        type: integer
        format: int32
    - name: visualProperties
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          image/png: {}
/v1/it/{id}/{z}/{x}/{y}.png:
  get:
    operationId: streamDatasetAsImageTile
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: z
      in: path
```

```
                          required: true
                          schema:
                            type: integer
                            format: int32
                    - name: x
                      in: path
                      required: true
                      schema:
                        type: integer
                        format: int32
                    - name: "y"
                      in: path
                      required: true
                      schema:
                        type: integer
                        format: int32
                  responses:
                    default:
                      description: default response
                      content:
                        image/png: {}
    /v1/public/jsonstream/{id}:
      get:
        operationId: streamDatasetAsGeoJsonPublic
        parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        - name: geo
          in: query
          schema:
            type: string
        - name: p
          in: query
          schema:
            type: string
        - name: filter
          in: query
          schema:
            type: string
        - name: vizType
          in: query
          schema:
            type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
      post:
        operationId: streamDatasetAsGeoJsonPublic2
        parameters:
        - name: id
```

```
            in: path
            required: true
            schema:
              type: string
          - name: geo
            in: query
            schema:
              type: string
          - name: p
            in: query
            schema:
              type: string
          - name: vizType
            in: query
            schema:
              type: string
          requestBody:
            content:
              application/json:
                schema:
                  type: string
          responses:
            default:
              description: default response
              content:
                application/json: {}
      /v1/jsonstream/{id}:
        get:
          operationId: streamDatasetAsGeoJson
          parameters:
          - name: id
            in: path
            required: true
            schema:
              type: string
          - name: geo
            in: query
            schema:
              type: string
          - name: p
            in: query
            schema:
              type: string
          - name: filter
            in: query
            schema:
              type: string
          - name: vizType
            in: query
            schema:
              type: string
          responses:
            default:
              description: default response
              content:
```

```
                    application/json: {}
              post:
                operationId: streamDatasetAsGeoJson2
                parameters:
                - name: id
                  in: path
                  required: true
                  schema:
                    type: string
                - name: geo
                  in: query
                  schema:
                    type: string
                - name: p
                  in: query
                  schema:
                    type: string
                - name: vizType
                  in: query
                  schema:
                    type: string
                requestBody:
                  content:
                    application/json:
                      schema:
                        type: string
                responses:
                  default:
                    description: default response
                    content:
                      application/json: {}
/v1/public/vt/{id}/{geo}/{z}/{x}/{y}.mvt:
    get:
      operationId: streamDatasetAsVectorTilePublic
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      - name: geo
        in: path
        required: true
        schema:
          type: string
      - name: z
        in: path
        required: true
        schema:
          type: integer
          format: int32
      - name: x
        in: path
        required: true
        schema:
```

```
             type: integer
             format: int32
       - name: "y"
         in: path
         required: true
         schema:
           type: integer
           format: int32
     responses:
       default:
         description: default response
         content:
           application/vnd.mapbox-vector-tile: {}
/v1/vt/{id}/{geo}/{z}/{x}/{y}.mvt:
  get:
    operationId: streamDatasetAsVectorTile
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: geo
      in: path
      required: true
      schema:
        type: string
    - name: z
      in: path
      required: true
      schema:
        type: integer
        format: int32
    - name: x
      in: path
      required: true
      schema:
        type: integer
        format: int32
    - name: "y"
      in: path
      required: true
      schema:
        type: integer
        format: int32
    responses:
      default:
        description: default response
        content:
          application/vnd.mapbox-vector-tile: {}
/v1/enrichment/geotag/datasets:
  get:
    operationId: getGeonameTagDatasets
    parameters:
    - name: query
```

```
        in: query
        schema:
          type: string
          default: "{}"
      - name: simpleResponse
        in: query
        schema:
          type: boolean
          default: false
      - name: matchThreshold
        in: query
        schema:
          type: number
          format: float
          default: 10
    responses:
      default:
        description: default response
        content:
          application/json:
            schema:
              type: string
  post:
    operationId: postGeonameTagDatasets
    requestBody:
      content:
        application/x-www-form-urlencoded:
          schema:
            type: object
            properties:
              query:
                type: string
                default: "{}"
              simpleResponse:
                type: boolean
                default: false
              matchThreshold:
                type: number
                format: float
                default: 10
    responses:
      default:
        description: default response
        content:
          application/json:
            schema:
              type: string
/v1/enrichment/geotag/attributes:
  get:
    operationId: getGenFormAttributes
    parameters:
    - name: type
      in: query
      schema:
        type: string
```

```
            default: ""
        responses:
          default:
            description: default response
            content:
              application/json: {}
  /v1/enrichment/geotag:
    get:
      operationId: getGeonameTag
      parameters:
      - name: query
        in: query
        schema:
          type: string
          default: "{}"
      - name: simpleResponse
        in: query
        schema:
          type: boolean
          default: false
      - name: matchThreshold
        in: query
        schema:
          type: number
          format: float
          default: 10
      responses:
        default:
          description: default response
          content:
            application/json:
              schema:
                type: string
    post:
      operationId: postGeonameTag
      requestBody:
        content:
          application/x-www-form-urlencoded:
            schema:
              type: object
              properties:
                query:
                  type: string
                  default: "{}"
                simpleResponse:
                  type: boolean
                  default: false
                matchThreshold:
                  type: number
                  format: float
                  default: 10
      responses:
        default:
          description: default response
          content:
```

```
                  application/json:
                    schema:
                      type: string
/v1/h3/{id}/{geo}/{name}:
  post:
    operationId: createHexAnalysis
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: geo
      in: path
      required: true
      schema:
        type: string
    - name: name
      in: path
      required: true
      schema:
        type: string
    - name: col
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/uploads/kmls/{uploadToken}/rows:
  get:
    operationId: getKMLRows
    parameters:
    - name: uploadToken
      in: path
      required: true
      schema:
        type: string
    - name: fromrow
      in: query
      schema:
        type: integer
        format: int32
    - name: torow
      in: query
      schema:
        type: integer
        format: int32
    responses:
      default:
        description: default response
        content:
          application/json: {}
```

```
    /v1/mvsuggest:
      get:
        operationId: getRequest
        responses:
          default:
            description: default response
            content:
              application/json: {}
      post:
        operationId: postRequest
        responses:
          default:
            description: default response
            content:
              application/json: {}
    /v1/public/mapstyles/{id}:
      get:
        operationId: getMapStyle
        parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
    /v1/mapstyles/{id}:
      get:
        operationId: getMapStyleObject
        parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
      put:
        operationId: updateMapStyle
        parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        requestBody:
          content:
            '*/*':
              schema:
```

```
              type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
    delete:
      operationId: deleteMapStyle
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/mapstyles:
  post:
    operationId: createMapStyle
    requestBody:
      content:
        '*/*':
          schema:
            type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/public/mapstyles:
  get:
    operationId: getMapStyleList
    parameters:
    - name: fields
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/oauth2/authorize:
  get:
    operationId: doAuthorize
    parameters:
    - name: response_type
      in: query
      schema:
        type: string
    - name: client_id
      in: query
```

```
        schema:
          type: string
      - name: scope
        in: query
        schema:
          type: string
      - name: state
        in: query
        schema:
          type: string
      - name: redirect_uri
        in: query
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/oauth2/token:
  post:
    operationId: doToken
    parameters:
    - name: Authorization
      in: header
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/ordsToken/{datasource}:
  get:
    operationId: getOrdsToken
    parameters:
    - name: datasource
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json:
            schema:
              type: string
/v1/datasets/polygon_operations:
  post:
    operationId: mergeSourcePolygonsAndInsertIntoTargetDataset
    parameters:
    - name: action
      in: query
      schema:
```

```
              type: string
        requestBody:
          content:
            '*/*':
              schema:
                type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
  /v1/datasets/polygon_operations/columns_nullable/{datasetId}:
    get:
      operationId: getDatasetColumnNullableStatus
      parameters:
      - name: datasetId
        in: path
        required: true
        schema:
          type: string
      - name: tgtDSrcId
        in: query
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/datasets/polygon_operations/validate/{key}:
    get:
      operationId: validateNewDatasetKey
      parameters:
      - name: key
        in: path
        required: true
        schema:
          type: string
      - name: tgtDSrcId
        in: query
        schema:
          type: string
      - name: tgtDsetId
        in: query
        schema:
          type: string
      - name: tgtKeyColId
        in: query
        schema:
          type: string
      - name: tgtGeomColId
        in: query
        schema:
          type: string
      responses:
```

```
            default:
              description: default response
              content:
                application/json: {}
    /v1/datasets/polygon_operations/validatenewtable:
      get:
        operationId: validateNewTable
        parameters:
        - name: targetConnId
          in: query
          schema:
            type: string
        - name: newTableName
          in: query
          schema:
            type: string
        - name: newKeyColName
          in: query
          schema:
            type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
    /v1/cache/precache/{id}:
      put:
        operationId: updateDatasetOrColumnBodyFields_1
        parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        requestBody:
          content:
            '*/*':
              schema:
                type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
    /v1/cache/purge/{id}:
      delete:
        operationId: purgeVectorTileCache
        parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        responses:
          default:
```

```
          description: default response
          content:
            application/json: {}
/v1/cache/zoomLevels/{x1}/{y1}/{x2}/{y2}:
  get:
    operationId: calculateZoomLevelsForBounds
    parameters:
    - name: x1
      in: path
      required: true
      schema:
        type: number
        format: double
    - name: y1
      in: path
      required: true
      schema:
        type: number
        format: double
    - name: x2
      in: path
      required: true
      schema:
        type: number
        format: double
    - name: y2
      in: path
      required: true
      schema:
        type: number
        format: double
    - name: maxTiles
      in: query
      schema:
        type: integer
        format: int32
        default: 25000
    - name: maxZoomLevel
      in: query
      schema:
        type: integer
        format: int32
        default: 15
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/projects/{id}:
  get:
    operationId: getProject
    parameters:
    - name: id
      in: path
      required: true
```

```
            schema:
              type: string
          - name: fields
            in: query
            schema:
              type: string
          - name: expand
            in: query
            schema:
              type: string
          responses:
            default:
              description: default response
              content:
                application/json: {}
      put:
        operationId: updateProject
        parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        requestBody:
          content:
            '*/*':
              schema:
                type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
      delete:
        operationId: deleteProject
        parameters:
        - name: id
          in: path
          required: true
          schema:
            type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
  /v1/projects:
    get:
      operationId: getProjects
      parameters:
      - name: fields
        in: query
        schema:
          type: string
      - name: expand
```

```
          in: query
          schema:
            type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  post:
    operationId: createProject
    requestBody:
      content:
        '*/*':
          schema:
            type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/projects/export/{id}:
  get:
    operationId: downloadExportedProject
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: client_token
      in: query
      schema:
        type: string
    - name: file_name
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/zip: {}
  post:
    operationId: createExportedProject
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
```

```
/v1/projects/analyze/{file_type}:
  get:
    operationId: analyzeUploadedProject
    parameters:
    - name: file_type
      in: path
      required: true
      schema:
        type: string
    - name: file_name
      in: query
      schema:
        type: string
    - name: upload_token
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/projects/import/{file_type}:
  post:
    operationId: importProject
    parameters:
    - name: file_type
      in: path
      required: true
      schema:
        type: string
    requestBody:
      content:
        '*/*':
          schema:
            type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/public/datasets/rows/{id}:
  get:
    operationId: getDatasetRows_1
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    - name: columns
      in: query
      schema:
        type: string
    - name: filter
```

```
        in: query
        schema:
          type: string
    - name: orderBy
        in: query
        schema:
          type: string
    - name: offset
        in: query
        schema:
          type: integer
          format: int64
    - name: limit
        in: query
        schema:
          type: integer
          format: int64
    - name: totalResults
        in: query
        schema:
          type: boolean
    - name: jetResponse
        in: query
        schema:
          type: boolean
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/publishedprojects/{id}:
  get:
      operationId: getPublishedProject
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      - name: fields
        in: query
        schema:
          type: string
      - name: expand
        in: query
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  put:
      operationId: refreshProject
      parameters:
```

```
        - name: id
          in: path
          required: true
          schema:
            type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/publishedprojects:
  get:
    operationId: getPublishedProjects
    parameters:
    - name: fields
      in: query
      schema:
        type: string
    - name: expand
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
  post:
    operationId: createPublishedProject
    requestBody:
      content:
        '*/*':
          schema:
            type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/publishedprojects{id}:
  delete:
    operationId: deleteProject_1
    parameters:
    - name: id
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/public/publishedprojects/{id}:
  get:
```

```
              operationId: getPublicProject
              parameters:
              - name: id
                in: path
                required: true
                schema:
                  type: string
              - name: fields
                in: query
                schema:
                  type: string
              - name: expand
                in: query
                schema:
                  type: string
              responses:
                default:
                  description: default response
                  content:
                    application/json: {}
    /v1/uploads/shapefiles/wktext/srids:
      get:
        operationId: getWKTextMatchingSRIDs
        parameters:
        - name: wkText
          in: query
          schema:
            type: string
        - name: maxResults
          in: query
          schema:
            type: integer
            format: int32
            default: 10
        responses:
          default:
            description: default response
            content:
              application/json: {}
    /v1/uploads/shapefiles/wktext/search:
      get:
        operationId: queryWKTextMatchingSRIDs
        parameters:
        - name: query
          in: query
          schema:
            type: string
        - name: maxResults
          in: query
          schema:
            type: integer
            format: int32
            default: 10
        responses:
          default:
```

```
          description: default response
          content:
            application/json: {}
/v1/uploads/shapefiles/{uploadToken}/srids:
  get:
    operationId: getShapefileMatchingSRIDs
    parameters:
    - name: uploadToken
      in: path
      required: true
      schema:
        type: string
    - name: maxResults
      in: query
      schema:
        type: integer
        format: int32
        default: 10
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/uploads/shapefiles/{uploadToken}/charsets:
  get:
    operationId: getShapefileEncodingCharsets
    parameters:
    - name: uploadToken
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/uploads/shapefiles/wktext/rebuild:
  post:
    operationId: rebuildWKTextIndex
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/uploads/shapefiles/{uploadToken}/rows:
  get:
    operationId: getShapefileRows
    parameters:
    - name: uploadToken
      in: path
      required: true
      schema:
        type: string
    - name: fromrow
```

```
          in: query
          schema:
            type: integer
            format: int32
      - name: torow
        in: query
        schema:
          type: integer
          format: int32
      - name: charset
        in: query
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/uploads/spreadsheets/{uploadToken}/headersRow:
  get:
    operationId: getSpreadsheetHeaders
    parameters:
    - name: uploadToken
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/uploads/spreadsheets/{uploadToken}/rows:
  get:
    operationId: getSpreadsheetRows
    parameters:
    - name: uploadToken
      in: path
      required: true
      schema:
        type: string
    - name: fromrow
      in: query
      schema:
        type: integer
        format: int32
    - name: torow
      in: query
      schema:
        type: integer
        format: int32
    responses:
      default:
        description: default response
        content:
```

```
              application/json: {}
    /v1/settings/system/unzipper/{settingName}:
      get:
        operationId: getZipUtilsSetting
        parameters:
        - name: settingName
          in: path
          required: true
          schema:
            type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
      put:
        operationId: setZipUtilsSetting
        parameters:
        - name: settingName
          in: path
          required: true
          schema:
            type: string
        requestBody:
          content:
            '*/*':
              schema:
                type: object
                additionalProperties:
                  type: string
        responses:
          default:
            description: default response
            content:
              application/json: {}
    /v1/tables/rows:
      get:
        operationId: getRows
        parameters:
        - name: datasource
          in: query
          schema:
            type: string
        - name: table
          in: query
          schema:
            type: string
        - name: columns
          in: query
          schema:
            type: string
        - name: filter
          in: query
          schema:
            type: string
```

```
            - name: orderby
              in: query
              schema:
                type: string
            - name: offset
              in: query
              schema:
                type: integer
                format: int64
            - name: limit
              in: query
              schema:
                type: integer
                format: int64
            - name: totalResults
              in: query
              schema:
                type: boolean
            - name: jetResponse
              in: query
              schema:
                type: boolean
          responses:
            default:
              description: default response
              content:
                application/json: {}
  /v1/tables/{table}:
    get:
      operationId: getTableColumnNamesAndTypes
      parameters:
      - name: table
        in: path
        required: true
        schema:
          type: string
      - name: datasource
        in: query
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/tables/exist:
    get:
      operationId: tableExists
      parameters:
      - name: datasource
        in: query
        schema:
          type: string
      - name: table
        in: query
```

```
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/tables/delete:
  delete:
    operationId: deleteTable
    parameters:
    - name: datasourceId
      in: query
      schema:
        type: string
    - name: tableName
      in: query
      schema:
        type: string
    - name: tableType
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/tables:
  get:
    operationId: getTableNames
    parameters:
    - name: datasource
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/tasks:
  get:
    operationId: getTasks
    parameters:
    - name: status
      in: query
      schema:
        type: string
    - name: maxAge
      in: query
      schema:
        type: integer
        format: int32
    - name: maxTasks
```

```
          in: query
          schema:
            type: integer
            format: int32
      - name: includeSystem
        in: query
        schema:
          type: boolean
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/tasks/{taskId}:
  get:
    operationId: getTaskById
    parameters:
    - name: taskId
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
  delete:
    operationId: abortTaskById
    parameters:
    - name: taskId
      in: path
      required: true
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/uploads/store:
  post:
    operationId: storeUploadedFileInDB
    requestBody:
      content:
        '*/*':
          schema:
            type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/uploads/cesiumtileset/{uploadToken}/stats:
  get:
```

```
        operationId: get3DTilesetStats
        parameters:
        - name: uploadToken
          in: path
          required: true
          schema:
            type: string
        - name: filename
          in: query
          schema:
            type: string
        - name: setTilesetJsonDir
          in: query
          schema:
            type: boolean
        responses:
          default:
            description: default response
            content:
              application/json: {}
  /v1/uploads/czml/{uploadToken}/stats:
    get:
      operationId: getCZMLDataStats
      parameters:
      - name: uploadToken
        in: path
        required: true
        schema:
          type: string
      - name: filename
        in: query
        schema:
          type: string
      - name: setCZMLDir
        in: query
        schema:
          type: boolean
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/uploads/{uploadToken}/stats:
    get:
      operationId: getStats
      parameters:
      - name: uploadToken
        in: path
        required: true
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
```

```
              application/json: {}
      /v1/user/preferences:
        get:
          operationId: getUserPreferences
          responses:
            default:
              description: default response
              content:
                application/json: {}
        put:
          operationId: updateUserPreferences
          requestBody:
            content:
              application/json:
                schema:
                  type: object
                  additionalProperties:
                    type: string
          responses:
            default:
              description: default response
              content:
                application/json: {}
      /v1/user/token:
        get:
          operationId: getUserTokens
          parameters:
          - name: fields
            in: query
            schema:
              type: string
          responses:
            default:
              description: default response
              content:
                application/json: {}
        post:
          operationId: createAccessToken
          parameters:
          - name: name
            in: query
            schema:
              type: string
          - name: validTime
            in: query
            schema:
              type: integer
              format: int64
          - name: scope
            in: query
            schema:
              type: string
          responses:
            default:
              description: default response
```

```
          content:
            application/json: {}
  /v1/user/token/{id}:
    delete:
      operationId: deleteAccessToken
      parameters:
      - name: id
        in: path
        required: true
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/user:
    get:
      operationId: getCurrentUser
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/user/invalidateSession:
    get:
      operationId: invalidateSession
      parameters:
      - name: redirectURL
        in: query
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/user/logout:
    post:
      operationId: logout
      responses:
        default:
          description: default response
          content:
            application/json: {}
  /v1/views/{view}:
    get:
      operationId: getViewColumnNamesAndTypes
      parameters:
      - name: view
        in: path
        required: true
        schema:
          type: string
      - name: datasource
```

```
        in: query
        schema:
          type: string
      responses:
        default:
          description: default response
          content:
            application/json: {}
/v1/views:
  get:
    operationId: getViewNames
    parameters:
    - name: datasource
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/oac/datasets:
  get:
    operationId: getOACDatasetsNames
    parameters:
    - name: dataSourceId
      in: query
      schema:
        type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
  post:
    operationId: storeUploadedFileInDB_1
    requestBody:
      content:
        '*/*':
          schema:
            type: string
    responses:
      default:
        description: default response
        content:
          application/json: {}
/v1/oac/datasets/{dataset}/stats:
  get:
    operationId: getOACDataset
    parameters:
    - name: dataset
      in: path
      required: true
      schema:
        type: string
```

```
    - name: dataSourceId
      in: query
      schema:
        type: string
    - name: offset
      in: query
      schema:
        type: integer
        format: int64
    - name: limit
      in: query
      schema:
        type: integer
        format: int64
    - name: importMode
      in: query
      schema:
        type: string
  responses:
    default:
      description: default response
      content:
        application/json: {}
```

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Vendor: The Apache Software Foundation

Version: 8.11.1

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were
automatically generated with the moman/finenight FSA library, created by
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The snowball stemmers in
  analysis/common/src/java/net/sf/snowball
were developed by Martin Porter and Richard Boulton.
The snowball stopword lists in
  analysis/common/src/resources/org/apache/lucene/analysis/snowball
were developed by Martin Porter and Richard Boulton.
The full snowball package is available from
  http://snowball.tartarus.org/

The KStem stemmer in
  analysis/common/src/org/apache/lucene/analysis/en
was developed by Bob Krovetz and Sergio Guzman-Lara (CIIR-UMass Amherst)
under the BSD-license.

The Arabic,Persian,Romanian,Bulgarian, Hindi and Bengali analyzers (common) come
with a default
stopword list that is BSD-licensed created by Jacques Savoy. These files reside
in:
analysis/common/src/resources/org/apache/lucene/analysis/ar/stopwords.txt,
analysis/common/src/resources/org/apache/lucene/analysis/fa/stopwords.txt,
analysis/common/src/resources/org/apache/lucene/analysis/ro/stopwords.txt,
analysis/common/src/resources/org/apache/lucene/analysis/bg/stopwords.txt,
analysis/common/src/resources/org/apache/lucene/analysis/hi/stopwords.txt,
analysis/common/src/resources/org/apache/lucene/analysis/bn/stopwords.txt
See http://members.unine.ch/jacques.savoy/clef/index.html.

The German,Spanish,Finnish,French,Hungarian,Italian,Portuguese,Russian and
Swedish light stemmers
(common) are based on BSD-licensed reference implementations created by Jacques
Savoy and
Ljiljana Dolamic. These files reside in:
analysis/common/src/java/org/apache/lucene/analysis/de/GermanLightStemmer.java
analysis/common/src/java/org/apache/lucene/analysis/de/GermanMinimalStemmer.java
analysis/common/src/java/org/apache/lucene/analysis/es/SpanishLightStemmer.java
analysis/common/src/java/org/apache/lucene/analysis/fi/FinnishLightStemmer.java
analysis/common/src/java/org/apache/lucene/analysis/fr/FrenchLightStemmer.java
analysis/common/src/java/org/apache/lucene/analysis/fr/FrenchMinimalStemmer.java
analysis/common/src/java/org/apache/lucene/analysis/hu/HungarianLightStemmer.java
analysis/common/src/java/org/apache/lucene/analysis/it/ItalianLightStemmer.java
analysis/common/src/java/org/apache/lucene/analysis/pt/
PortugueseLightStemmer.java
analysis/common/src/java/org/apache/lucene/analysis/ru/RussianLightStemmer.java

analysis/common/src/java/org/apache/lucene/analysis/sv/SwedishLightStemmer.java

The Morfologik analyzer (morfologik) includes BSD-licensed software
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Protocol Buffers (aka Google protobuf)

Vendor: Google

Version: 3.19.6

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OAuth 2.0 SDK with OpenID Connect extensions

Vendor: Nimbus DS

Version: 9.9.1

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jackson-annotations

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jackson-core

Vendor: FasterXML, LLC

Version: 2.13.4

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# Jackson JSON processor


Jackson is a high-performance, Free/Open Source JSON processing library.
It was originally written by Tatu Saloranta (tatu.saloranta@iki.fi), and has
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It is currently developed by a community of developers.


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jackson-databind

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JavaScript Extension Toolkit (JET) 6.0.0

Oracle JET

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The initial code for shuffling an array (originally in class
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a method in class "org.apache.commons.math3.util.MathArrays") was
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"Algorithms", by Ian Craw and John Pulham (University of Aberdeen 1999).
The textbook (containing a proof that the shuffle is uniformly random) is
available here:
  http://citeseerx.ist.psu.edu/viewdoc/download;?
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when.js

https://github.com/cujojs/when

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zip.js

https://github.com/gildas-lormeau/zip.js

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Autolinker.js

https://github.com/gregjacobs/Autolinker.js

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ReverseSyntax, Nathan, Alex Wilson, kenneth, Bayron Guevara, Adam Wallner (http://
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https://github.com/BinomialLLC/crunch

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HttpComponents HttpClient 4.5.12

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Supercluster 3.0.2

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ajv 6.5.3

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analysis/common/src/java/org/apache/lucene/analysis/fr/FrenchMinimalStemmer.java
analysis/common/src/java/org/apache/lucene/analysis/hu/HungarianLightStemmer.java
analysis/common/src/java/org/apache/lucene/analysis/it/ItalianLightStemmer.java
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