



SA Studio Community Edition

User Guide

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Version information

SASCE v4.9.4

User Guide v1.0

Introduction

SA Studio is a streaming analytics and AI platform designed for edge devices from industrial PCs to micro processing units; and also microcontrollers for our enterprise customers. It is an end-to-end platform enabling efficient development, training, deployment, and orchestration of analytics, computational, and AI models. SA Studio Community Edition (SASCE) is free to use for non-commercial applications.

SA Studio Community Edition provides a convenient way of trying out analytics on edge devices. It is an online application that you access through a regular browser on your workstation. From SA Studio you can access and control any device that runs SA Engine (see **Figure 1**).

SA Engine is a streaming analytics engine which operates on data streams and facilitate transformation of streams using computational and AI models (SA Studio also runs an instance of SA Engine). SA Engine can be installed on many different devices, such as microcontrollers, Raspberry Pis and PCs.



Figure 1. Users access SA Studio in the cloud and can control edge devices with SA Engine installed.

SA Studio has a versatile IDE in which the user can develop computational models, read documentation, connect edges to servers, etc.

From SA Studio the user can also:

- Visualize data streams from edge devices.
- Deploy models to edge devices.
- Interactively update models on edge devices.

And all this while the edge devices are running. There is no need to turn off or restart an edge device between deployments or model updates.

For model development, deployment and orchestration SA Engine uses a powerful query language called OSQL (Object Stream Query Language). It provides an experience that best can be described as a combination of SQL and Matlab. Once you get familiar with the syntax and capabilities of the language, developing and deploying computational models is easy and low effort compared to more traditional languages such as Python and C.

SA Engine also supports a variety of third-party technologies such as MQTT and Kafka, for sending data as messages to external systems, and TensorFlow Lite for inference with artificial neural networks.

Accessing SA Studio Community Edition

You can access SA Studio Community Edition by going to <https://studio.streamanalyze.com/>. You need to register a user account by providing your email address. Once you have signed up you can start SA Studio from the same page.

SA Studio

When you launch SA Studio you end up at the landing page on the OSQL tab (see **Figure 2**). It contains a short introduction video for the OSQL tab.

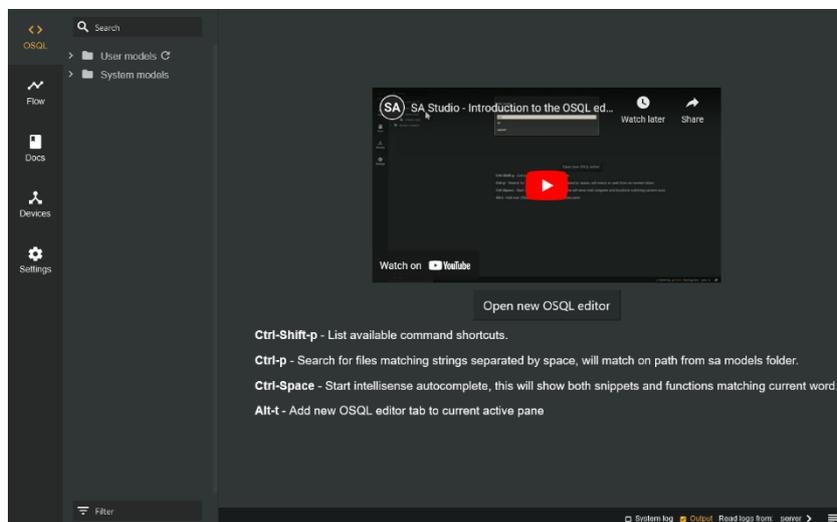


Figure 2. The SA Studio landing page.

CONNECTING EDGE DEVICES

To be able to monitor sensor streams and deploy models to a device you first need to connect the device to the server. Connecting an edge device is generally comprised of three steps.

1. Download and install the SA Engine edge client on the device.
2. Start SA Engine on the device.
3. Execute a connect query on the device.

There are instructions for how to connect edges in SA Studio under “Get started” on the Devices tab (see **Figure 3**). There you can select the platform you want to connect, and you get step-by-step instructions on how to connect your device to the server.

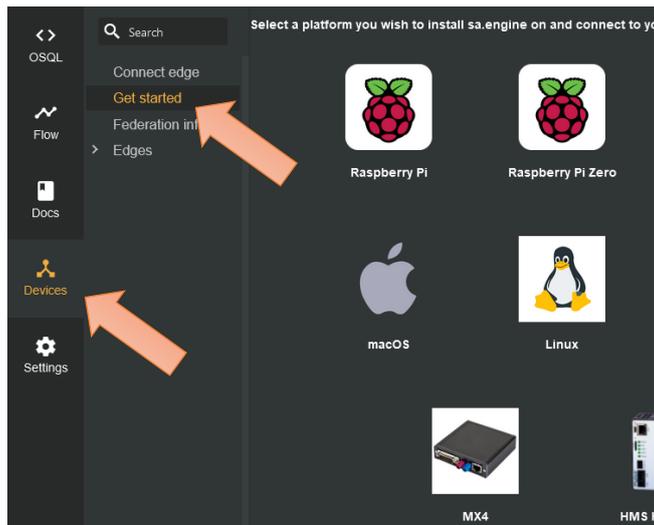


Figure 3. Instructions on how to connect a device is available for different platforms under "Get started" on the Devices tab.

You can also get connection instructions for a specific platform by following one of the getting started guides found in the documentation on the Docs tab. We will talk more about the Docs tab below in the **Documentation** section.

If you follow the instructions under "Get started" on the Devices tab or one of the getting started guides in the documentation, then you can skip the rest of this section and jump straight to **Working with queries and models**.

Getting SA Engine onto the edge device

SA Engine edge clients are available for download on the download page <https://studio.streamanalyze.com/download>. You must be signed in to access the download page. There you can find clients for all supported platforms.

Some platforms have dedicated tabs on the download page with instructions on how to install the client for that specific platform. All other clients can be found on the "All" tab. Each client file has a copy button (📄) next to its name. Clicking the button will copy a curl command for downloading the file to the clipboard. This makes it convenient to download the file directly to the device by executing the curl command on the device.

Starting the client

How the client is started differs between platforms. For Android it is enough to install the app, but on most other platforms you will have to run the `sa.engine` CLI command.

Connecting the client

To connect the client to the server you must follow the instructions under "Connect edge" in the Devices tab of SA Studio (see **Figure 4**). For Android this consists of scanning a QR code with the app, but on most other platforms you must run a `connect_using_config_blob` query inside the SA Engine CLI.

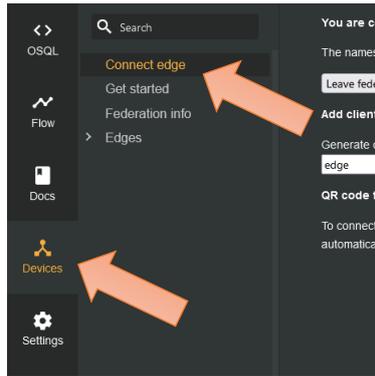


Figure 4. Edges are connected under "Connect edge" on the Devices tab.

Once your edge device is connected to the server it will end up in the list of connected edges under "Edges" in the Devices tab.

WORKING WITH QUERIES AND MODELS

You build models and interact with edges by running OSQL queries on the OSQL tab (see Figure 5).

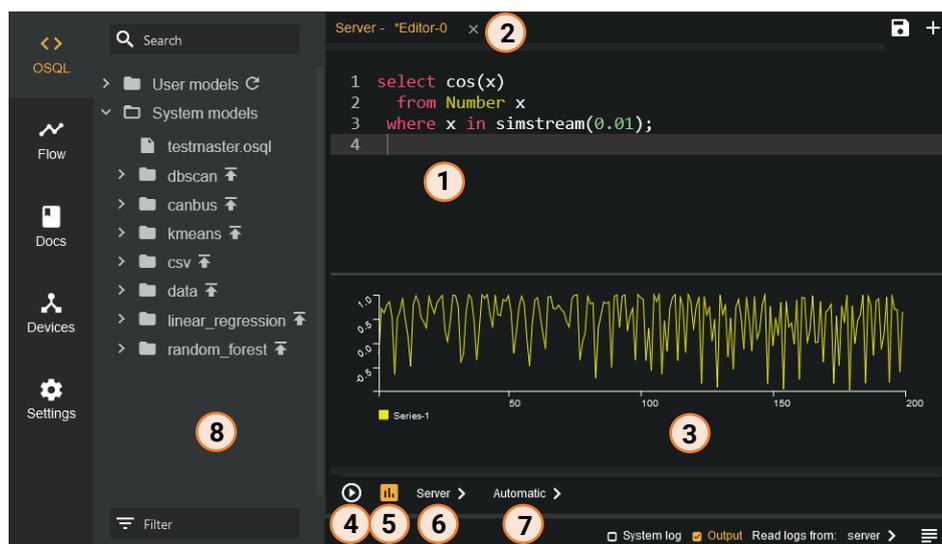


Figure 5. The OSQL tab with model index, query editor and output window.

- 1: OSQL queries are written in OSQL query editor windows.
- 2: Each editor window has a tab showing which device the query is run on, the name of the OSQL file, and if there are any unsaved changes (*).
- 3: The output of the query is shown in the output window.
- 4: The play button runs all queries in the query window.
- 5: The output window button toggles visibility of the output window.
- 6: The device selector specifies which device the query runs on.
- 7: The output selector determines how the output is visualized.
- 8: The model index lists all system and user models.

Queries are written in query editor windows (1). You can open multiple windows and navigate between them by using the window tabs (2). Each editor window can be saved as an OSQL file by using the save file icon in the top right corner. Saved files will end up as separate entries in the model index (8).

To run all queries in an editor window you press the play button (4). If you only want to run a specific query and not all queries in a window you can put the cursor on a query and press F2. Or you can select the query and press Ctrl+Return.

Important: When pressing the play button (4) you run ALL queries in the active editor window. If there are many and/or complex queries, this can put a considerable load on the device and result in SA Studio feeling unresponsive. In situations like this it is best to wait until all queries are done before continuing to operate SA Studio. When working with large code buffers it is recommended practice to do one of the following:

1. Distribute the code across multiple buffers. For example, put all queries for system setup in one buffer and queries that require repeated evaluation in a separate buffer.
2. Run the queries one at a time (using F2 or selecting a query and pressing Ctrl-Return).
3. Save the buffer as a `master.osql` file in a new model and deploy the model to run the file.

Running a query generally generates some output in the output window (3). Whenever you stop a continuous query the output window closes. You can press the output window button (5) to toggle the visibility of the output window.

To select which device you want to run the query on, you pick a device from the device list (6) (see **Figure 6**). To run queries on the server you select "Server", and to run queries on your edge device you select the name you gave it when you connected it to the server. "Local" should only be used in SA Studio Desktop, which is run locally on workstations, and is not part of SA Studio Community Edition.

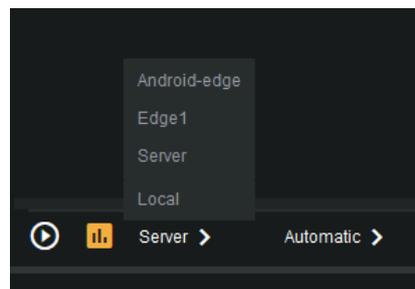


Figure 6. Device selector.

You select the output format the same way by picking a format from the list of output types (7) (see **Figure 7**).

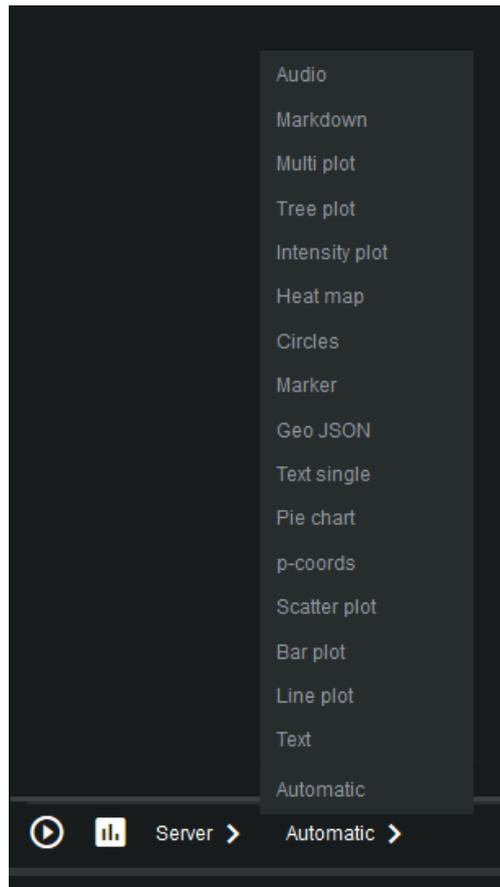


Figure 7. Output type selector.

The OSQL tab also has a model index (8) which works like a file tree. The model index contains system models - such as k-means, DBSCAN, and CAN bus -- and user models that you either create yourself or import from file.

New models can be created by right-clicking "User models" and selecting "Create new model" (see **Figure 8**). This will add a new folder to the model index under "user models" with a `master.osql` file and an auto-generated documentation file `docs.md`. In the `master.osql` file is where you write your model code.

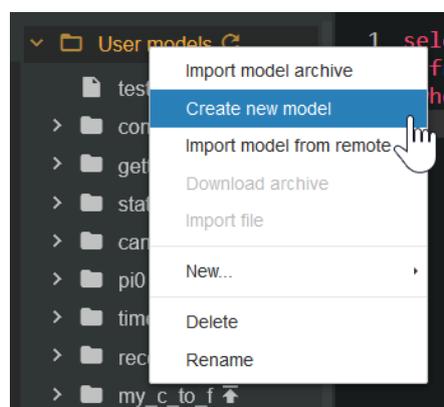


Figure 8. Create a new model.

Models can be deployed on any device by using the “deploy” button (up arrow) next to the model’s name. This will load and run `master.osql` on the device. It will also load any documentation provided with the model onto the device.

Note: All documentation guides loaded from external sources are models and will end up in the model index.

DOCUMENTATION

SA Studio comes with extensive documentation consisting of various tutorials, guides and reference documentation. One significant feature is that much of the documentation is interactive and many examples can be executed directly inside the code blocks.

The documentation is located on the Docs tab and is divided into four pages: Docs, Topics, Loaded models, and Available Online (SA Official) (see **Figure 9**).

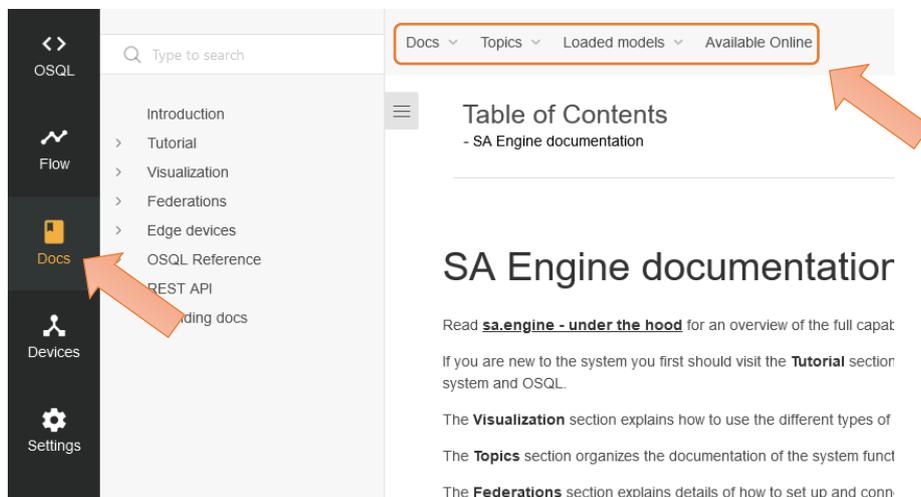


Figure 9. Documentation inside SA Studio.

Docs contains of a Tutorial section, with several interactive tutorials that cover the system and OSQL, a Visualization section, that explains how to use the different type of visualizations in SA Studio, an OSQL reference guide, and various other concepts.

Topics lists all the function signatures with doc strings categorized by topic.

Loaded models contains documentation for all loaded models. A model can be loaded either from the model file tree on the OSQL tab or from the Available online page on the Docs tab.

Available online (SA Official) is a collection of installable guides (and tutorials) for various concepts. When you select a guide on this page, it will be loaded onto the “Loaded models” page (all guides are in fact models). Many guides are useful for beginners, such as the getting started guides or working with recorded data, while other guides cover more niche subjects, such as the serial communications guide (Sensor data over RS232) or the CAN bus guide.

Note: The documentation is also available online at <https://docs.streamanalyze.com>. But it is recommended to read the documentation in SA Studio to take advantage of the interactive examples.

Running documentation code

Most code examples in the documentation can be run interactively when viewed in SA Studio. The example code blocks are just small OSQL editor windows populated with code snippets. To run the code, you can simply select which device you want to run it on with the device button, select output type, and press the play button (see **Figure 10**).



Figure 10. Example code block from the documentation.

How to learn

It is recommended to start with one or more of the “getting started” tutorials on the “Available online (SA Official)” page (see **Figure 9**). This will show you some of the capabilities of the system and demonstrate how to work with edge clients.

When you have finished at least one of the getting started guides it is recommended to work through the Tutorial section on the “Docs” page, and maybe also the Visualization and OSQL reference sections, to become more familiar with SA Engine and the OSQL language. Once you start feeling comfortable with OSQL you should dig deeper into the rest of the guides on the “Available online (SA Official)” page.

Additional resources

There is a developer forum at <https://github.com/streamanalyze/streamanalyze.github.io/discussions> where you can ask questions about the product or any related problem you might have encountered. The forum is monitored by Stream Analyze experts and they are there to respond to questions and help you resolve any issues you might have related to the product.

About Stream Analyze

Stream Analyze provides a groundbreaking software engine that enables an interactive deployment of AI and local smartness on any device. It becomes a tool in the hands of people in the whole organization, allowing them to change the way they do business, forever.

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