CGI Studio Professional Edition

This book describes the differences of the Professional Edition to the Enterprise Edition and its specific features.

- Overview
- Python-based Data Binding
- Predefined Data Bindings
- Blood Pressure Sample
- Target Setup Guide

Overview

The Professional Edition provides ease of use for creating embedded HMI projects, by reducing the platform-related engineering know-how required by designers.

The Professional Edition was introduced with CGI Studio Version 3.15. Up to version 3.14, all CGI Studio release were the Enterprise Edition.

For details about the CGI Studio versions, go to this page: CGI Studio Editions

Notes

> Some of the bundled samples are designed for the Enterprise Edition of CGI Studio and contain a not compatible data binding definition. In that case the sample would not run on the target. Please have a look at the Bloodpressure Sample, as it is specifically designed for the Professional Edition.

Python-based Data Binding

The Player Connector Library is a simple library written in Python and c++ that provides functionality to start and load scene composer binary assets and interact with a predefined set of data binding items (Variant) through Python scripting.

Player Connector Library Package

The main functionality of the library is contained in two files, **`CanderaAppConnector.py`** [1] and **`BindingSourceEnum.py`** [2]. These files contain three classes.

- `CanderaAppConnector`: This is the main class to be used to play assets and interact with them using data binding
- `BindingSourceEnum`: A Python enum generated by the build pipeline that contains the enum keys to be used when setting and getting data binding items. The keys underlay the nomenclature "SOURCE<*sourceIndex*>ITEM<*itemIndex*>". Source - and item index start at one and go to ten, as we currently have ten predefined binding sources and ten items per source.
- `Logger`: Logger class that my be used to generate logs with compliant format and logging levels

The sources and types listed above are contained in a file system Python package that can be installed with pip.

```
pip install path/to/python/library/root/folder
```

> It is suggested to install the library to a virtual environment and not to the global Python installation. For an exemplary usage refer to the Blood Pressure Sample documentation and source code.

[1]: */bin/ProfessionalEdition/Python/CanderaAppConnector/CanderaAppConnector.py*
[2]: */bin/ProfessionalEdition/Python/Generated/BindingSourceEnum.py*

Workflow

The general workflow using the Player Connector Library package consists of:

1. Constructing the library with the Player Connector Library binary contained in the delivered package (PlayerConnectorLibrary)
2. Initializing the library with the asset binary
3. Optionally register data binding callbacks
4. Continuously calling step to invoke the render loop and internal message delivery
5. Interact with data bindings. Note that internally, changes to the data bindings are reflected on the view when step is called
6. Shutdown library and gracefully exit program

Documentation

Constructor

Creates and instance of this class. Expects and absolute or relative path to the Player Connector Library binary as parameter.

Parameters	1. `BinaryLibraryPath`: Absolute or relative path to the Player Connector Library binary

Init

Initializes the player with the provided asset path. Expects an absolute or relative path to the asset binary as parameter. Must be called before every other method. Returns a bool value whether the operation was successful.

Parameters	1. `AssetPath`: Absolute or relative path to the asset binary
Returns	The bool value

Step

Invokes the internal message processing and render loop execution. Needs to be called continuously. Databinding updates are reflected internally during the invocation of this method. Returns a bool value whether the operation was successful.

Parameters	None
Returns	The bool value

SetIntValue

Sets an integer value to a predefined databinding source item.

Parameters	1. `BindingSourceItem`: Enum that specifies the binding source item. Enum is defined in *Generated/BindingSourceEnum.py* 2. `Value`: The integer value
Returns	The bool value

SetBoolValue

Sets a bool value to a predefined databinding source item.

Parameters	1. `BindingSourceItem`: Enum that specifies the binding source item. Enum is defined in *Generated/BindingSourceEnum.py* 2. `Value`: The bool value
Returns	The bool value

SetStringValue

Sets a string to a predefined databinding source item.

Parameters	1. `BindingSourceItem`: Enum that specifies the binding source item. Enum is defined in *Generated/BindingSourceEnum.py* 2. `Value`: The string
Returns	The bool value

SetFloatValue

Sets a float value to a predefined databinding source item.

Parameters	1. `BindingSourceItem`: Enum that specifies the binding source item. Enum is defined in *Generated/BindingSourceEnum.py* 2. `Value`: The float value
Returns	The bool value

GetIntValue

Gets an int value from a predefined databinding source item.

Parameters	1. `BindingSourceItem`: Enum that specifies the binding source item. Enum is defined in *Generated/BindingSourceEnum.py*
Returns	The integer value

GetBoolValue

Gets a bool value from a predefined databinding source item.

Parameters	1. `BindingSourceItem`: Enum that specifies the binding source item. Enum is defined in *Generated/BindingSourceEnum.py*
Returns	The bool value

GetStringValue

Gets a string from a predefined databinding source item.

Parameters	1. `BindingSourceItem`: Enum that specifies the binding source item. Enum is defined in *Generated/BindingSourceEnum.py*
Returns	The string

GetFloatValue

Gets a float value from a predefined databinding source item.

Parameters	1. `BindingSourceItem`: Enum that specifies the binding source item. Enum is defined in *Generated/BindingSourceEnum.py*
Returns	The float value

RegisterCallback

Registers a callback method. Multiple methods can be registered. Passed method must have two parameters. First param is BindingSourceItem and second parameter is value.

Parameters	1. `CallbackFn`: Callable type with two parameters

Returns	The bool value

ShutDown

Shuts down the asset player and frees up allocated resources.

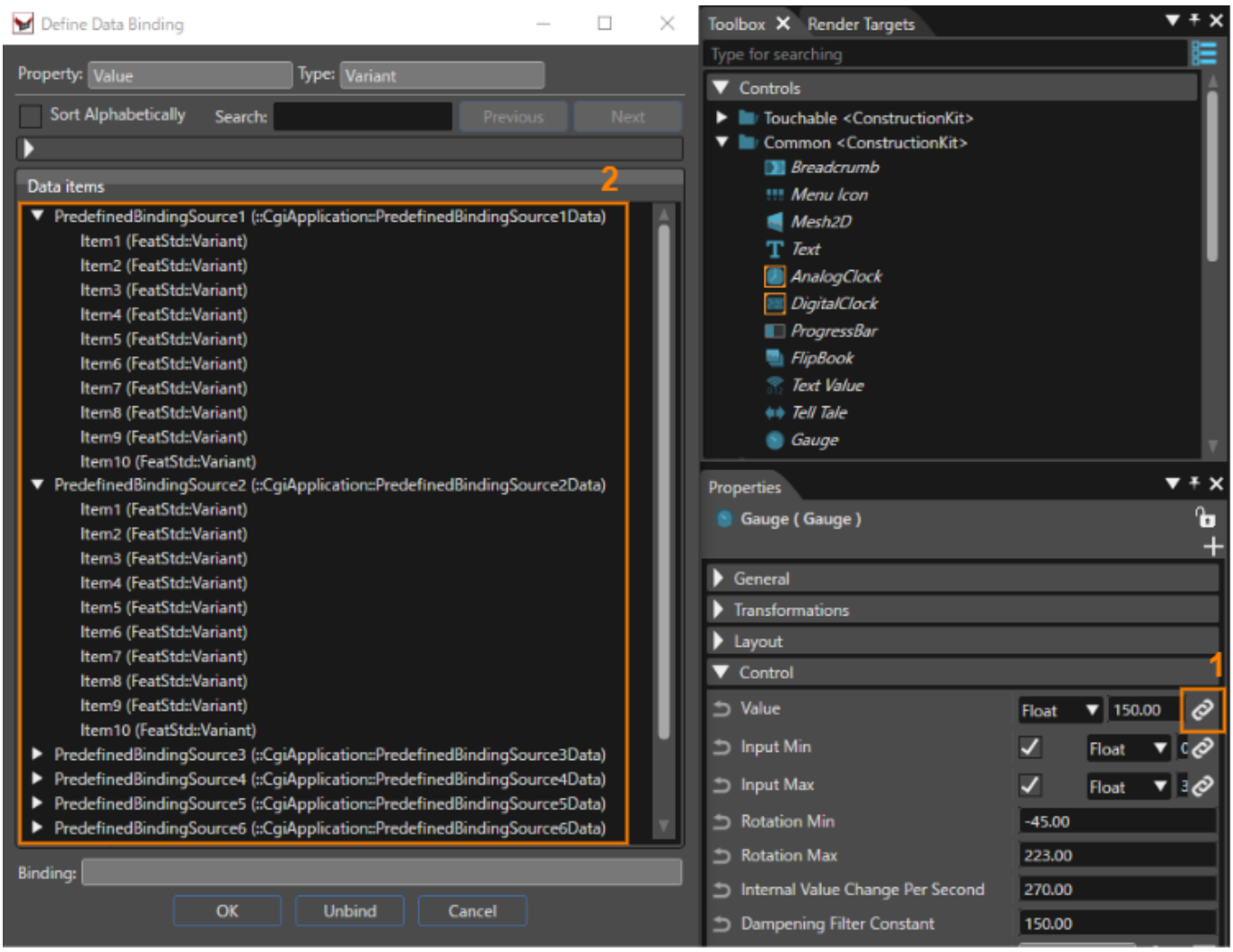
Parameters	None
Returns	The bool value

Predefined Data Bindings

The CGI Studio Professional Edition comes with a predefined set of data bindings. This set consists of ten data binding sources with ten data binding items each. They are all of type FeatStd::Variant and can be bound to any bindable property in the scene composer with standard data binding. The data binding sources are prefixed with *PredefinedBindingSource*[n] and the items of each source is prefixed with *Item*[n].

To select and use the predefined set of data bindings follow the steps in the image below

1. Click on the chain icon near a bindable property in the properties panel.
2. Select a predefined binding item from the list in the modal window that follows the nomenclature described above.



There are two methods how to set values to the binding items and observe changes in the player.

- During solution development in the Scene Composer, values can be set and simulated through the player panel, as described here.
- By exporting the solution as asset and setting the values with the Player Connector Library, as described here.

Blood Pressure Sample

The blood pressure device sample is a Scene Composer sample that demonstrates a blood pressure measurement device with exemplary scenes and animations. For the professional edition, the sample was extended with a voice activation feature and a data binding sample programmed in Python. The Python part of the sample relies on the Python-Based Player Data Binding Library to interact with the data bindings of the scene.

General information on this sample can be found in the Blood Pressure Solution documentation. This book goes over the sample Python extension, namely the voice activation feature and the integrated data binding.

The Python code for the blood pressure device sample can be found under: *\bin\ProfessionalEdition\Python\Samples\BloodPressureDevice*.

> The voice activation feature only works if the sample is started from Python using the Player Connector Library with the provided Python sample program. The feature doesn't work if the sample is started from the scene composer or directly with the player. Also, for enterprise edition users, if the Player Connector Library binary is built from source, it must be built with CMake flag `CGIAPP_SAMPLE_SOUNDHOUND_ENABLED` set to `ON`.

Python Environment Setup

To play the sample, a minimal Python setup is required. Verify that Python 3.x is installed on the system and either the `py` or the `python` command is on the path. Afterwards, create a virtual environment like below.

1. Navigate to *\bin\ProfessionalEdition\Python\Samples\BloodPressureDevice*
2. Create a virtual environment in that location with `py -m venv .`
3. Activate the virtual environment by running `.\Scripts\activate`
4. Install the dependencies from `requirements.txt` with `pip install -r .\requirements.txt`

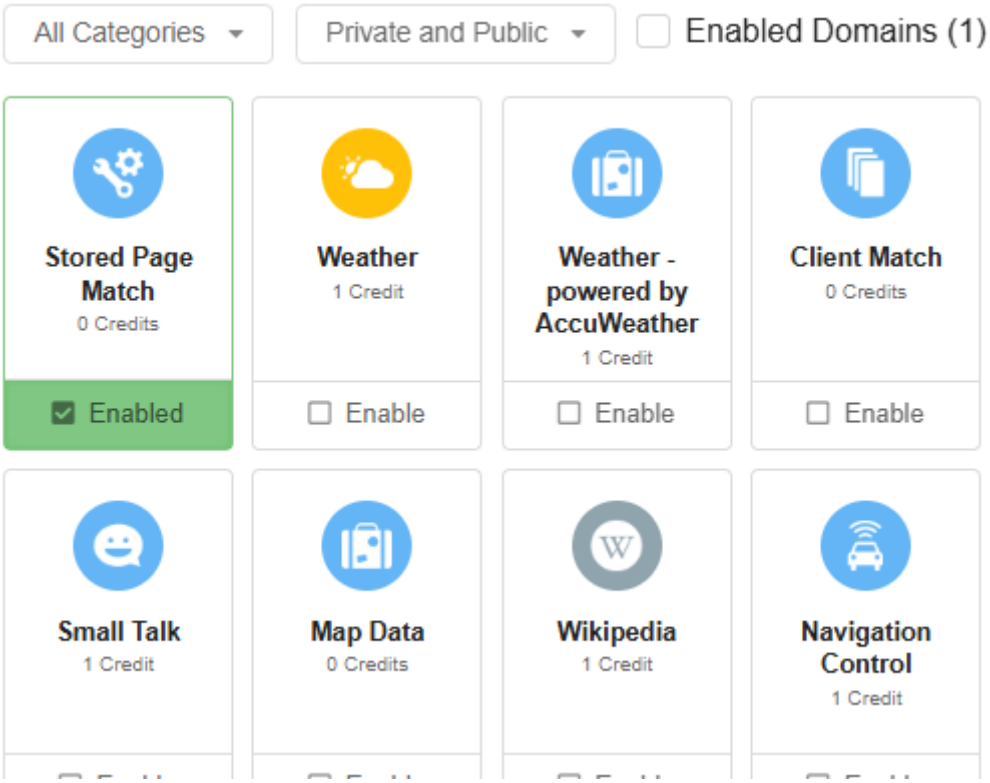
> The `CanderaAppConnector` and other required types are an installable Python package under *\bin\Player\PlayerConnector*. Although, the package is listed in `requirements.txt` and installed by default. For more information refer to the Python-based Data Binding documentation.

Soundhound API Setup

The voice to text/command transcription is realized with Soundhound. To use the Soundhound Api in the blood pressure sample, a free account must be created under

https://www.houndify.com/login. Afterwards, a new client must created in the dashboard. In this client, all domains may be deactivated, apart from the "Stored Page Match" domain.

> As custom commands on Soundhound are only available in English language, the voice activation feature only support English language.



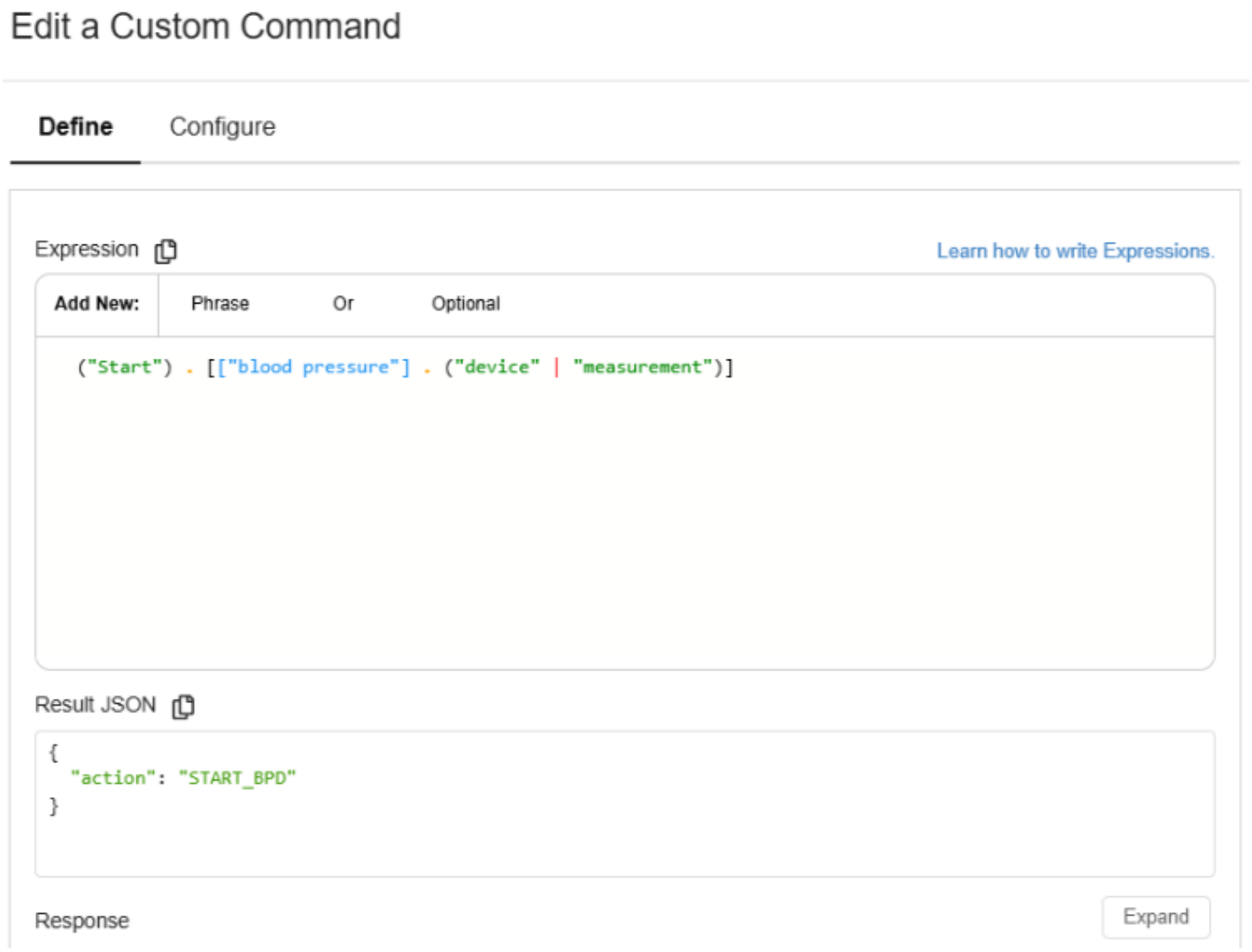
Now, a new custom can be created by navigating to the section "Custom Commands" in the menu on the left side. Enable the custom commands and click "New Page". After entering an arbitrary name for the command like "BloodPressureDevice", a modal window for configuring the command, opens. In der "Expression" input field enter the string

```
("Start") . [["blood pressure"] . ("device" | "measurement")]
```

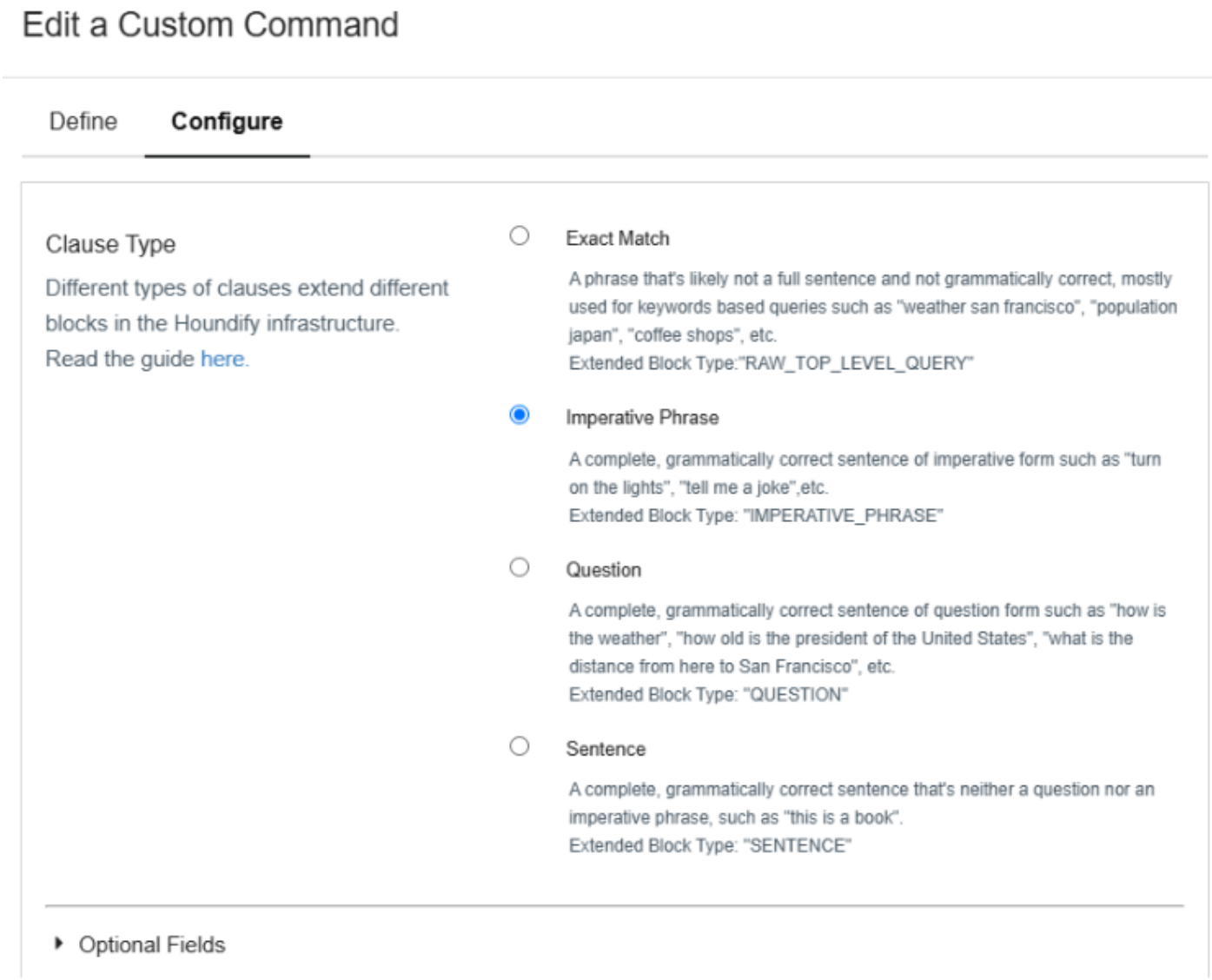
and in the "Result JSON" input field the JSON

```
{
  "action": "START_BPD"
}
```

like in the image below



In the header/tab "Configure", select the "Imperative Phrase" radio button



The Soundhound service is now configured and the client credentials must be copied to the Python source files. Navigate to "Overview & API Key" and copy the credentials to the corresponding fields in the Python source file under:
\bin\Player\PlayerConnector\Samples\BloodPressureDevice\SoundhoundCommandClient.py

```python
import houndify
import pyaudio
import webrtcvad
import threading
import socket
import json
import struct
from collections import deque
import time
from CanderaAppConnector import Logger

class SoundhoundCommandClient(houndify.HoundListener):

    __SOUNDHOUND_ENDPOINT = "https://api.houndify.com/v1/audio"
    __SOUNDHOUND_CLIENT_ID = ""
    __SOUNDHOUND_CLIENT_KEY = ""
    __SOUNDHOUND_REQUEST_USER = ""
    __SOUNDHOUND_REQUEST_INFO = {
        "Polaris": {
            "ConfidenceAdjust": 0.01,
            "EnglishMinProb":0.01,
            "RespLangMinProb":0.95,
            "PolarisOnly": True
        }
    }
```

Note: The field __SOUNDHOUND_REQUEST_USER may be an arbitrary string value

Creating and running the asset

The binary asset can be created by opening the scene composer and opening the blood pressure device sample from the sample list. Save the solution on your file system and generate the asset by clicking on the "Generate Asset" button in the toolbar of the Scene Composer. Afterwards save the asset to the file system.

The sample can be started by executing the python blood pressure device sample program (*\bin\ProfessionalEdition\Python\Samples\BloodPressureDevice\BloodPressureDevice.py*) with the Python interpreter of the virtual environment. Note that the Python interpreter of the virtual environment is automatically used when the environment is activated. If the environment is activated, the terminal should have "`(BloodPressureDevice)`" written near the command input area.

```
py BloodPressureDevice.py -lbp "path/to/the/connector/library/binary" -abp
"path/to/the/asset/binary"
```

- "-lbp" is the path to the Player Connector Library binary. Either under *\bin\ProfessionalEdition\<device>_Simulation\PlayerConnector\PlayerConnectorLibrary*.dll*

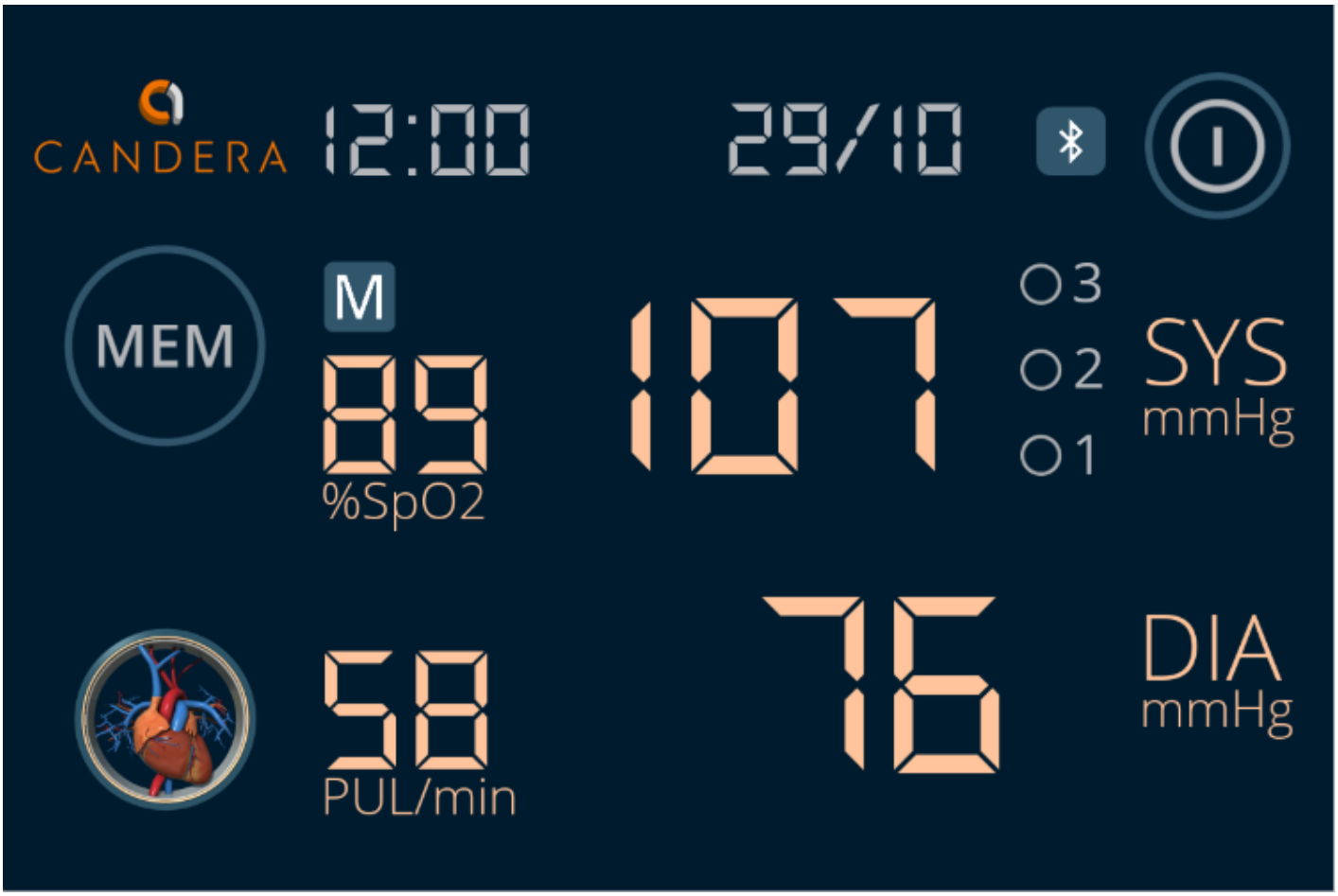
or where it was built
- "-abp" is the path to the asset binary

Blood Pressure Device Sample

When the sample starts, it plays an intro animation and activates the menu scene. The menu scene is active util an according voice command like "Start", "Start measurement", "Start blood pressure device", ... was recorded. A live transcription of the voice input is displayed in the menu scene.



When the according voice command was received or the start button was pressed, the sample transitions to the blood pressure measurement scene. The measurement scene animates measurement values like oxygen saturation or heart rate gradually. An exemplary MEM button demonstrates a potential saving function of last measurements.



The values that can be seen in the above picture are set via Python by using the data binding library. A timer defined in the global state machine transitions back to the menu scene after 20 seconds.

Target Setup Guide

Please refer to below for setup guides for each target device supported by CGI Studio Professional Edition.

- **STM32MP157**
- **RASPBERRYPI**