Science and Technology Facilities Council

ISIS Neutron and Muon Source

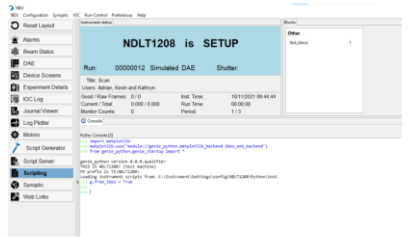
isis.stfc.ac.uk

TUPV049

The IBEX Script Generator

James King, Jack Harper, Thomas Löhnert, Aaron Long, Dominic Oram, (STFC/RAL/ISIS, Chilton, Didcot, Oxon)

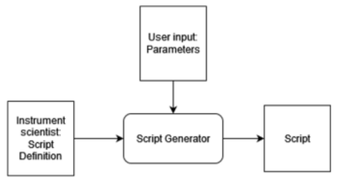
IBEX Scripting



- IBEX is used for beamline control at ISIS
- Users can control experiments with Python scripts
- Scripting is error prone
- Learning to write scripts is a steep learning curve
- Script generator reuses common code
- Users are note required to write code

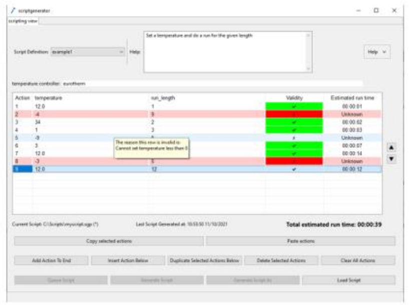
Script Generator Basic Behaviour

- Experiments at ISIS often execute common actions
- Script definitions are Python classes that define these actions
- The script definition defines the parameters an action takes
- The script definition also defines how to run, validate and estimate the time for an action
- The execution code is reused, so it can be well tested
- The validation code can be written to avoid common errors



Script Generator Behaviour

- Script definitions are selected from a drop down
- Actions can be inserted, appended, duplicated, copied and pasted and deleted
- Actions can also be reordered and have their parameter values set



- Actions are validated in real time and validity is displayed to the user
- Run time of the actions and script is estimated in real time

- Action parameters are set specifically for an action
- Global parameters are set for the entire script
- For example, a global parameter could define a temperature controller to use and an action a temperature to set using this temperature controller

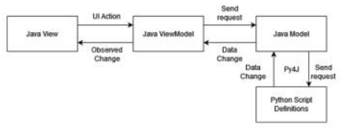
- The script that is currently being edited is tracked and displayed

- A script definition defined help string is displayed to the user

- Scripts can be generated for valid tables or queued in the script server
- Generated scripts can be run in the IBEX scripting console
- Script parameters from saved scripts can be reloaded into the table

Architecture

- The script generator needs to be included in the IBEX client
- Uses the same tech stack: Java and Eclipse RCP
- Uses the same Model-View-ViewModel design pattern as the client.



- The Java and Python sides talk via Py4J
- Py4J use is run in a CompletableFuture to avoid hanging the GUI thread
- A chain of listeners passes the returned data back the View for display
- A strategy pattern is used to enable the extensibility to add new actions

Quality Assurance

- 2 forms of automated testing: unit and system UI
- JUnit for Java and unittest for Python
- The Squish GUI tester's BDD tools have been leveraged for system UI testing
- Application behaviour is defined using Gherkin
- Gherkin steps are linked to test code
- Regressions and deviations in behaviour have been caught prior to release on multiple occasions

```
Scenario: Setting global parameters to empty causes validation error
    Given I am on the test_global_params script definition
     When I add 1 actions
     Then global parameter number 0 is valid
      And the generate script button is enabled
     When I delete the text in global parameter number 0
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```
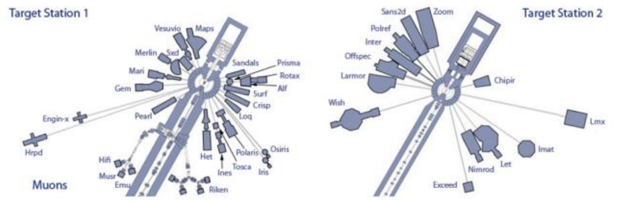

- All script generator code is subject to code reviews
- Checkstyle is used to identify programming flaws and style inconsistency

Future of The IBEX Script Generator

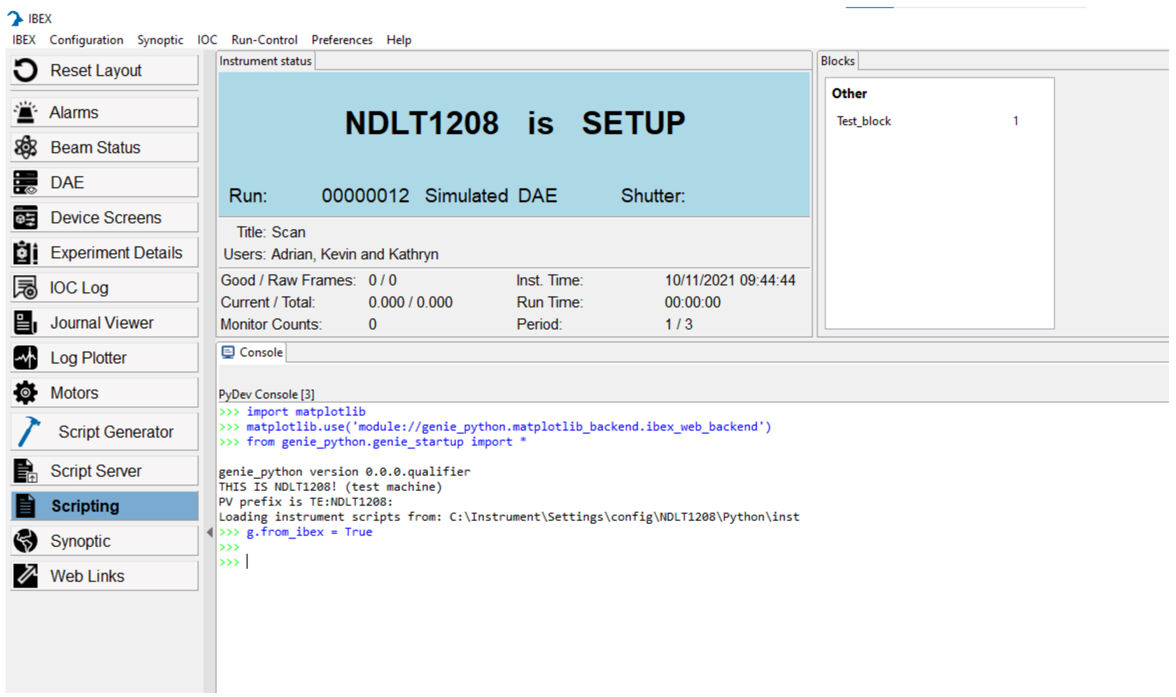


- Currently the script generator is only deployed for EMU and MuSR
- The functionality is being expanded to make it useful to other instruments
- Dynamic scripting will enable users to control the execution and values of actions whilst the script is running in the script server
- Dry runs will give the users the ability to test run their scripts without affecting hardware or data collection
- Different types of actions will be available for use within the same script

- Usability will be improved through:

- A UI redesign
- Improving the readability of generated scripts
- The development of a type system, which will enable us to customise the display of action parameters
- For example, drop down boxes for enumerated types

IBEX Scripting



NDLT1208 is SETUP

Run: 00000012 Simulated DAE Shutter:

Title: Scan
Users: Adrian, Kevin and Kathryn

Good / Raw Frames:	0 / 0	Inst. Time:	10/11/2021 09:44:44
Current / Total:	0.000 / 0.000	Run Time:	00:00:00
Monitor Counts:	0	Period:	1 / 3

Other
Test_block 1

PyDev Console [3]

```
>>> import matplotlib
>>> matplotlib.use('module://genie_python.matplotlib_backend.ibex_web_backend')
>>> from genie_python.genie_startup import *

genie_python version 0.0.0.qualifier
THIS IS NDLT1208! (test machine)
PV prefix is TE:NDLT1208:
Loading instrument scripts from: C:\Instrument\Settings\config\NDLT1208\Python\inst
>>> g.from_ibex = True
>>>
>>> |
```

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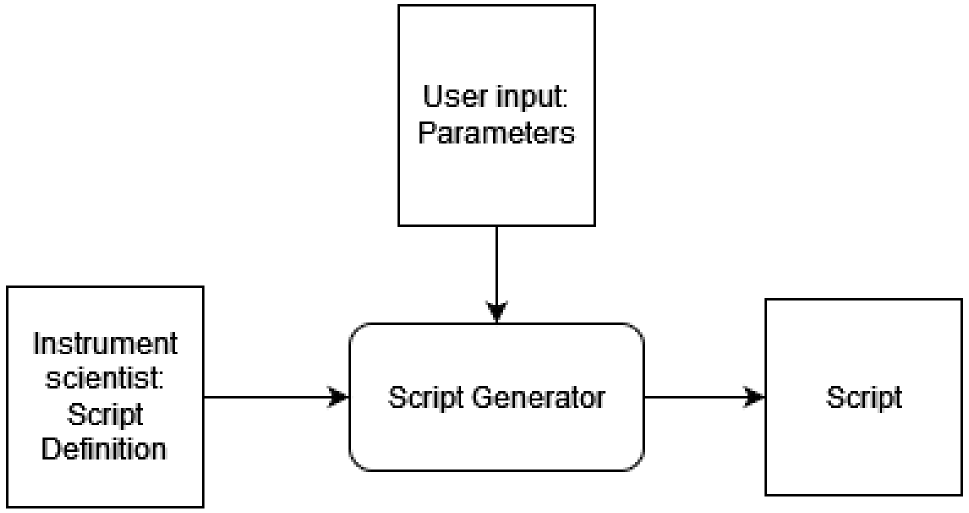

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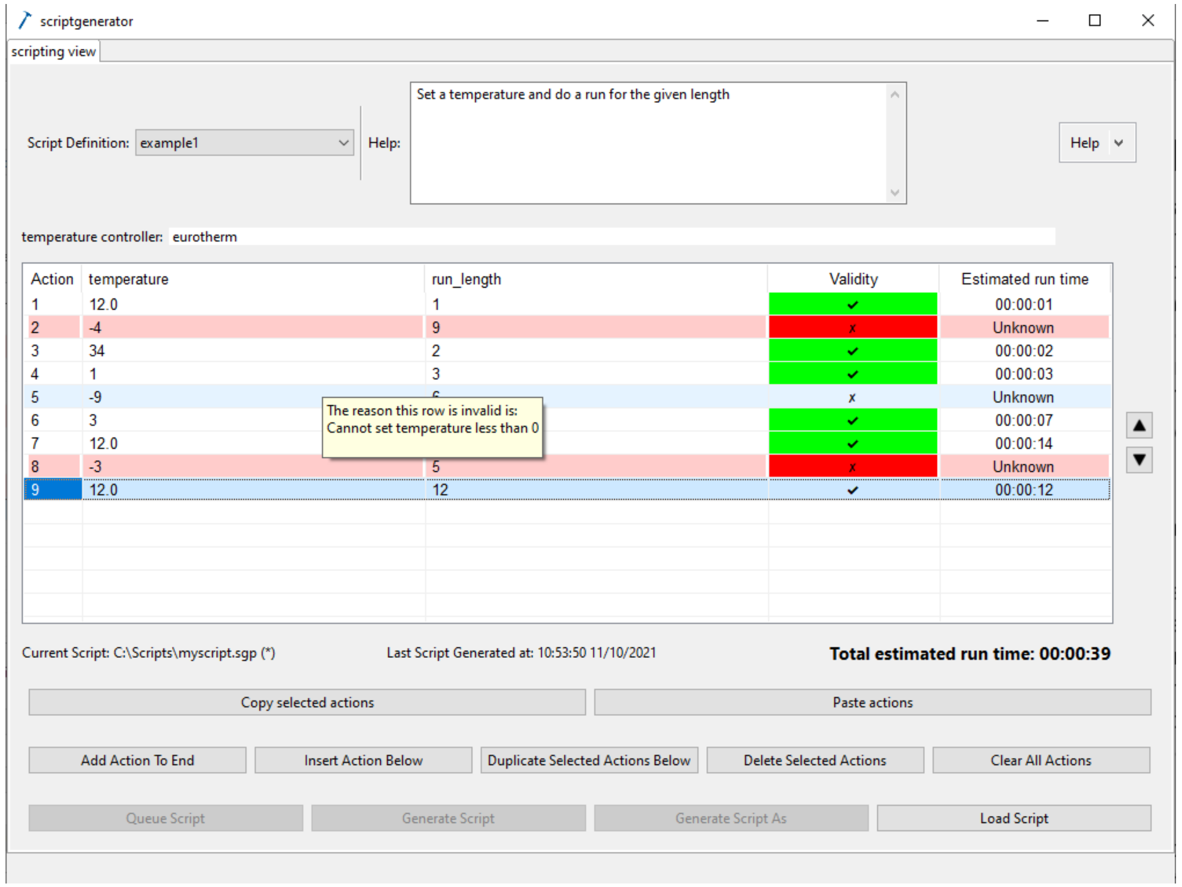

scriptgenerator

scripting view

Script Definition: example1

Help: Set a temperature and do a run for the given length

temperature controller: eurotherm

Action	temperature	run_length	Validity	Estimated run time
1	12.0	1	✓	00:00:01
2	-4	9	✗	Unknown
3	34	2	✓	00:00:02
4	1	3	✓	00:00:03
5	-9	6	✗	Unknown
6	3		✓	00:00:07
7	12.0		✓	00:00:14
8	-3	5	✗	Unknown
9	12.0	12	✓	00:00:12

The reason this row is invalid is:
Cannot set temperature less than 0

Current Script: C:\Scripts\myscript.sgp (*)

Last Script Generated at: 10:53:50 11/10/2021

Total estimated run time: 00:00:39

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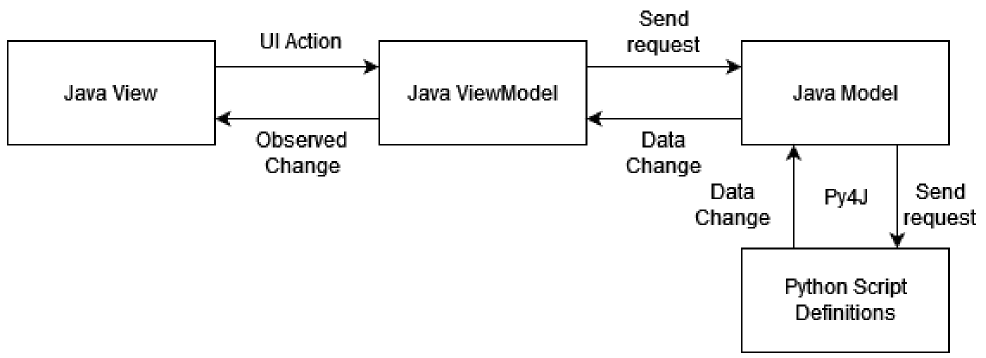

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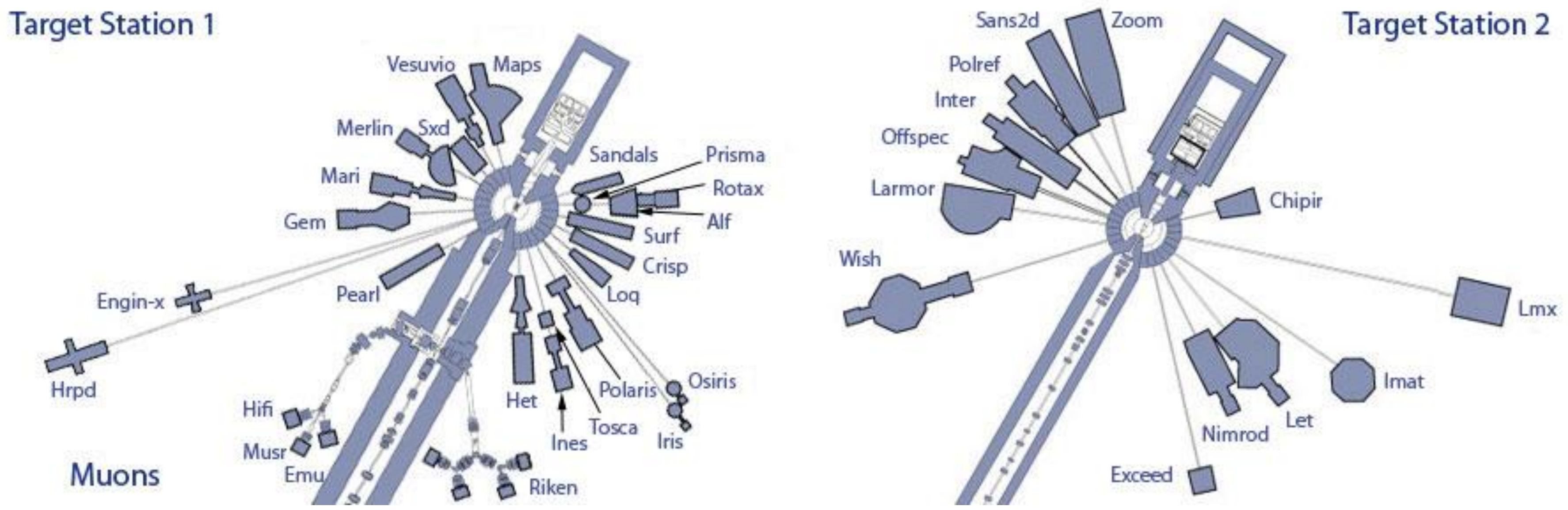

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