



Hailo Integration Tool

User Guide

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Documentation Control

History Table

Version	Date	Description
V1.0.0	August 31, 2021	First Hailo Integration Tool release

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1. Overview

The Hailo Integration tool is supplied as part of Hailo platform package. It can be used by the user for characterization, validation or approving his system compatibility with Hailo modules or chips.

The integration tool supports several tests, with different goals, given in detail in section 3.

Note: The tool supports PCIe interface only.

2. Installation

2.1. System requirements

System requirements are identical to the HailoRT installation requirements.

2.2. Pre-requisites

Installed HailoRT v4.0.0 environment is mandatory

2.3. Installation

The Integration Tool package includes a wheel – `integration_tool-1.0.0-py3-none-any.whl`

From the HailoRT virtual environment run the following command to install the Integration tool:

```
$ pip install integration_tool-1.0.0-py3-none-any.whl
```

2.4. Version's compatibility

This Hailo Integration Tool matches the following:

- HailoRT v4.0.0

3. Integration Tool's Tests

3.1. General

- The tests will run on all the Hailo boards connected. User can use the command: `$ lspci | grep Hailo` to verify which boards are currently connected.
- Log files
 - In case of a test failure, the list of errors can be view in the .integration_tool.log file or the hailort.log file.
 - All measurements are logged into a data.csv log file

```
timestamp, device, power (W), avg. temp (C)
2021-08-31 15:11:54,879,<0000:03:00.0>, 0.91, 26.06
2021-08-31 15:11:57,897,<0000:03:00.0>, 0.94, 26.49
2021-08-31 15:12:00,915,<0000:03:00.0>, 0.94, 26.77
2021-08-31 15:12:03,934,<0000:03:00.0>, 0.95, 26.87
2021-08-31 15:12:06,952,<0000:03:00.0>, 0.95, 27.10
2021-08-31 15:12:09,970,<0000:03:00.0>, 0.95, 27.22
2021-08-31 15:12:12,988,<0000:03:00.0>, 0.95, 27.30
2021-08-31 15:12:16,006,<0000:03:00.0>, 0.95, 27.35
2021-08-31 15:12:19,024,<0000:03:00.0>, 0.95, 27.40
2021-08-31 15:12:22,042,<0000:03:00.0>, 0.95, 27.53
2021-08-31 15:12:25,061,<0000:03:00.0>, 0.95, 27.58
```

3.2. Thermal test

3.2.1. Overview

- Goal: map the thermal operating envelope of a Hailo-8 device or a Hailo module, for a given heat dissipation solution and ambient temperature, and provide feedback for customers so they can adjust the thermal design as needed.
- Input: The user inputs the required power consumption range.
- Output: The tool confirm that the user's thermal solution is sufficient for the given required power consumption range and ambient temperature, or otherwise exit with an error.
- Method:
 - The tool uses pre-compiled networks, each with expected empirical power consumption, for a 'power consumption sweep'.
 - Per pre-compiled network, thermal stabilization is confirmed if the

- temperature maintains stable 'dtemp' for 'dsamples' consecutive temperature sensor readouts polls.
 - In addition to power consumption, each of the pre-compiled networks has its expected fps.
- Pass criteria: The thermal solution is confirmed if the Hailo-8's internal temperature has managed to stabilize for the given input power consumption range.
- In addition to thermal stabilization, the tool will exit with error code if:
 - The inference doesn't reach the required FPS.
 - The inference is stopped due to an overcurrent event. (if applicable).
 - The inference is stopped due to an overheat event.

3.2.2. Test execution

Command line: `$ hailo-int thermal [--show] [--dsample] [--dtemp] [--sampling-interval] MIN_POWER MAX_POWER`

- Parameters:

Parameter name	Description	Notes
MIN_POWER	Mandatory non-integer parameter, in Watts unit. Indicating the required lower bound of the tested power consumption range.	Lowest supported value is 1W As the tool uses pre-compiled networks with estimated power consumption, it will start the power consumption sweep with the closest (but lower) available power consumption network.
MAX_POWER	Mandatory non-integer parameter, in Watts unit. Indicating the required upper bound of the tested power consumption range.	Maximal supported value is 9W As the tool uses pre-compiled networks with estimated power consumption, it will start the power consumption sweep with the closest (but higher) available power consumption network.
Show	Optional flag. In case used, the tool will show the results graph of the temperature vs power after	

	completion.	
Dsample	Optional flag. Default value = 10 Indicating the required number of consecutives stable temperature sensor readout pollings.	
Dtemp	Optional flag. Default value = 0.3 [C] Indicating the temperature stability criteria.	Thermal stabilization is confirmed if the temperature maintains stable 'dtemp' for 'dsamples' consecutive temperature sensor readouts pollings
sampling-interval	Optional flag. Default value = 3 [seconds] Indicating the duration between two consecutive temperature measurements.	

- Console logs

During the test execution, the tool will indicate the current running network, temperature and power measurements:

```

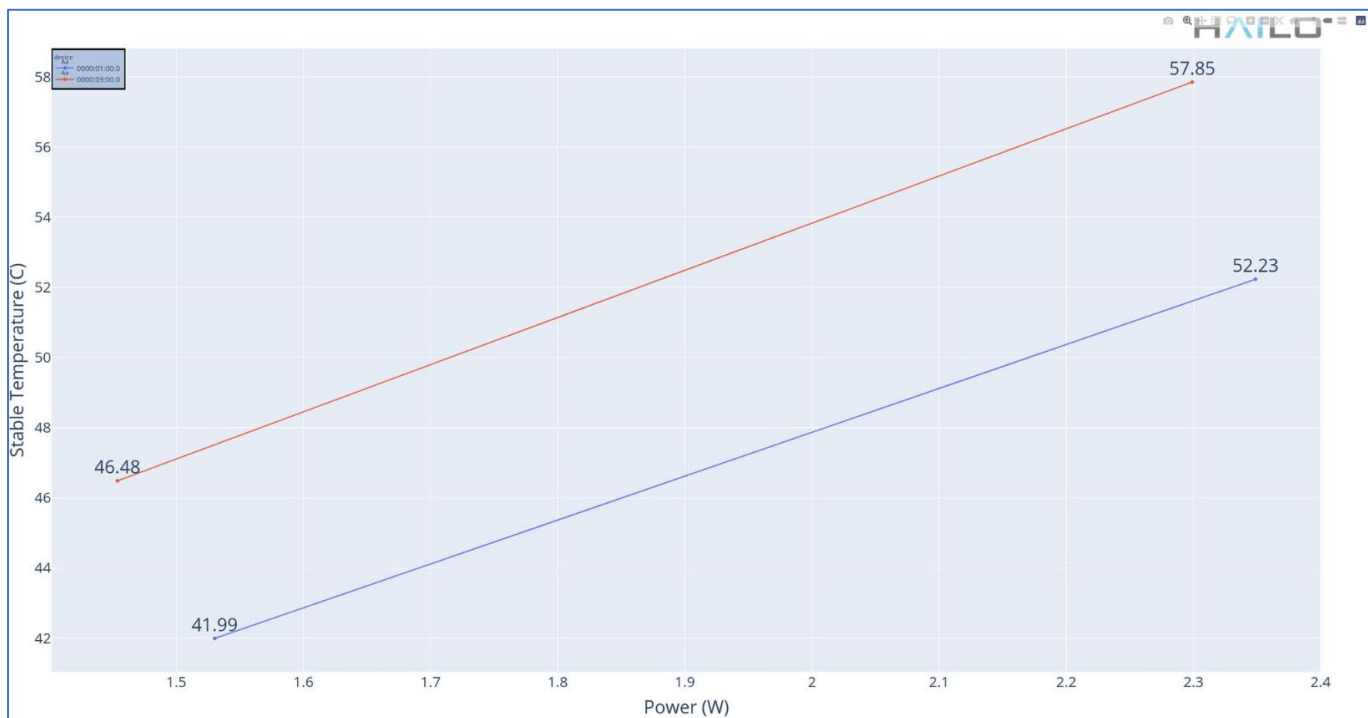
15:01:15 :: running thermal test
0%|
15:01:33 :: <0000:03:00.0>: Temperature: [sensor #0: 29.37 (C), sensor #1: 29.12 (C), average: 29.25 (C)]. Power: 0.96 (W)

15:01:58 :: running thermal test
100%|
15:01:58 :: thermal test passed
+-----+-----+-----+-----+-----+-----+-----+-----+
| status | fps | device | device_type | Power (W) | Stable Temperature (C) |
+-----+-----+-----+-----+-----+-----+-----+
| 0 | 0 | 41.26 | 0000:03:00.0 | HAILO-8 AI ACCELERATOR M.2 M KEY MODULE | 0.96 | 29.61 |
+-----+-----+-----+-----+-----+-----+-----+

```

- Graph output

In case the --show flag was set, the tool will output the graph of stabilized temperature per consumed power:



3.3. Stress test

3.3.1. Overview

- It is suggested to run the stress test after the thermal solution was validated by executing the thermal test (see section 3.1).
- Goal: Validate that the full **system** is managed to run error-less for tested duration of time.
- Input: The user inputs the required tested power consumption and the required duration of the stress test.
- Output: The tool outputs a pass/fail message, indicating if the Hailo-8 has noticed any error during the stress test.
- Method: The tool uses pre-compiled networks, each with expected empirical power consumption, to reach the required power consumption as inputted by the user and infer for the inputted required duration.
- Pass criteria: The test completed running for the required duration without any errors.

3.3.2. Test execution

- Command line:

```
$ hailo-int stress TEST_POWER DURATION
```

- Parameters:

Parameter name	Description	Notes
TEST_POWER	Mandatory non-integer parameter, in Watts units. Indicating the required upper bound of the tested power consumption range.	Maximal supported value is 9.0W As the tool uses pre-compiled networks with estimated power consumption, it will use a network with closest (but higher) expected power consumption available.
DURATION	Mandatory integer parameter, in seconds units. Indicating the required duration of the stress test.	

- Console logs

During the test execution, the tool will indicate the current temperature and power measurements.

```
15:11:54 :: running stress test
15:12:06 :: <0000:03:00.0>: Temperature: [sensor #0: 27.30 (C), sensor #1: 26.90 (C), average: 27.10 (C)]. Power: 0.95 (W)

15:11:54 :: running stress test
15:12:28 :: stress test passed
```

	status	fps	device	device_type	Power (W)	Stable Temperature (C)
0	0	41.26	0000:03:00.0	HAILO-8 AI ACCELERATOR M.2 M KEY MODULE	0.95	27.58

4. Version Changelog

4.1. Version 1.0.0

- Initial release