

Lanner

Embedded Computing Platform

Hardware Platforms for Intelligent Edge Computing

Falcon-H8 User Manual

Version: 1.4

Date of Release: 2023-10-25

About this Document

This manual describes the overview of the various functionalities of this product, and the information you need to get it ready for operation. It is intended for those who are:

- responsible for installing, administering and troubleshooting this system or Information Technology professionals.
- assumed to be qualified in the servicing of computer equipment, such as professional system integrators, or service personnel and technicians.

Icon Descriptions

The icons are used in the manual to serve as an indication of interest topics or important messages. Below is a description of these icons:



Note or Information: This mark indicates that there is a note of interest and is something that you should pay special attention to while using the product.



Warning or Important: This mark indicates that there is a caution or warning and it is something that could damage your property or product.

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Safety Guidelines

Follow these guidelines to ensure general safety:

- ▶ Keep the chassis area clear and dust-free during and after installation.
- ▶ Do not wear loose clothing or jewelry that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.
- ▶ Wear safety glasses if you are working under any conditions that might be hazardous to your eyes.
- ▶ Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- ▶ Disconnect all power by turning off the power and unplugging the power cord before installing or removing a chassis or working near power supplies
- ▶ Do not work alone if potentially hazardous conditions exist.
- ▶ Never assume that power is disconnected from a circuit; always check the circuit.

Consignes de sécurité

Suivez ces consignes pour assurer la sécurité générale :

- ▶ Laissez la zone du châssis propre et sans poussière pendant et après l'installation.
- ▶ Ne portez pas de vêtements amples ou de bijoux qui pourraient être pris dans le châssis. Attachez votre cravate ou écharpe et remontez vos manches.
- ▶ Portez des lunettes de sécurité pour protéger vos yeux.
- ▶ N'effectuez aucune action qui pourrait créer un danger pour d'autres ou rendre l'équipement dangereux.
- ▶ Coupez complètement l'alimentation en éteignant l'alimentation et en débranchant le cordon d'alimentation avant d'installer ou de retirer un châssis ou de travailler à proximité de sources d'alimentation.
- ▶ Ne travaillez pas seul si des conditions dangereuses sont présentes.
- ▶ Ne considérez jamais que l'alimentation est coupée d'un circuit, vérifiez toujours le circuit. Cet appareil génère, utilise et émet une énergie radiofréquence et, s'il n'est pas installé et utilisé conformément aux instructions des fournisseurs de composants sans fil, il risque de provoquer des interférences dans les communications radio.

Operating Safety

- ▶ Electrical equipment generates heat. Ambient air temperature may not be adequate to cool equipment to acceptable operating temperatures without adequate circulation. Be sure that the room in which you choose to operate your system has adequate air circulation.
- ▶ Ensure that the chassis cover is secure. The chassis design allows cooling air to circulate effectively. An open chassis permits air leaks, which may interrupt and redirect the flow of cooling air from internal components.
- ▶ Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. ESD damage occurs when electronic components are improperly handled and can result in complete or intermittent failures. Be sure to follow ESD-prevention procedures when removing and replacing components to avoid these problems.
- ▶ Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. If no wrist strap is available, ground yourself by touching the metal part of the chassis.
- ▶ Periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms (Mohms).

Sécurité de fonctionnement

- ▶ L'équipement électrique génère de la chaleur. La température ambiante peut ne pas être adéquate pour refroidir l'équipement à une température de fonctionnement acceptable sans circulation adaptée. Vérifiez

que votre site propose une circulation d'air adéquate.

- ▶ Vérifiez que le couvercle du châssis est bien fixé. La conception du châssis permet à l'air de refroidissement de bien circuler. Un châssis ouvert laisse l'air s'échapper, ce qui peut interrompre et rediriger le flux d'air frais destiné aux composants internes.
- ▶ Les décharges électrostatiques (ESD) peuvent endommager l'équipement et gêner les circuits électriques. Des dégâts d'ESD surviennent lorsque des composants électroniques sont mal manipulés et peuvent causer des pannes totales ou intermittentes. Suivez les procédures de prévention d'ESD lors du retrait et du remplacement de composants.
- ▶ Portez un bracelet anti-ESD et veillez à ce qu'il soit bien au contact de la peau. Si aucun bracelet n'est disponible, reliez votre corps à la terre en touchant la partie métallique du châssis.
- ▶ Vérifiez régulièrement la valeur de résistance du bracelet antistatique, qui doit être comprise entre 1 et 10 mégohms (Mohms).

Mounting Installation Precaution

The following should be put into consideration for rackmount or similar mounting installations:

- ▶ Do not install and/or operate this unit in any place that flammable objects are stored or used in.
- ▶ The installation of this product must be performed by trained specialists; otherwise, a non-specialist might create the risk of the system's falling to the ground or other damages.
- ▶ Lanner Electronics Inc. shall not be held liable for any losses resulting from insufficient strength for supporting the system or use of inappropriate installation components.
- ▶ Elevated Operating Ambient - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (T_{ma}) specified by the manufacturer.
- ▶ Reduced Air Flow - Installation of the equipment in a rack should be such that the amount of airflow required for safe operation of the equipment is not compromised.
- ▶ Mechanical Loading - Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- ▶ Circuit Overloading - Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- ▶ Reliable Grounding - Reliable grounding of rack mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).

Electrical Safety Instructions

Before turning on the device, ground the grounding cable of the equipment. Proper grounding (grounding) is very important to protect the equipment against the harmful effects of external noise and to reduce the risk of electrocution in the event of a lightning strike. To uninstall the equipment, disconnect the ground wire after turning off the power. A ground wire is required and the part connecting the conductor must be greater than 4 mm² or 10 AWG.

Consignes de sécurité électrique

- ▶ Avant d'allumer l'appareil, reliez le câble de mise à la terre de l'équipement à la terre.
- ▶ Une bonne mise à la terre (connexion à la terre) est très importante pour protéger l'équipement contre les effets néfastes du bruit externe et réduire les risques d'électrocution en cas de foudre.
- ▶ Pour désinstaller l'équipement, débranchez le câble de mise à la terre après avoir éteint l'appareil.
- ▶ Un câble de mise à la terre est requis et la zone reliant les sections du conducteur doit faire plus de 4 mm² ou 10 AWG.

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CHAPTER 1: PRODUCT OVERVIEW

Lanner’s Falcon H8 modular, PCIe form factor provides an easily deployable solution for engineers looking to offload CPU loading for low-latency deep learning inference. With high-density AI processors, the Falcon H8 accommodates 4, 5, or 6 Hailo-8™ AI processors, offering a modular, cost-effective Edge AI solution with high processing capabilities and power efficiency. Through a standard PCIe interface, the Falcon H8 AI Accelerator Card enables legacy devices such as NVRs, Edge AI boxes, Industrial PCs and robots to run video-intensive, mission-critical Edge AI applications such as video analytics, traffic management, access control, and beyond.

Key Features

- ▶ Best-in-class Performance and Cost-efficiency
- ▶ Scalable, Supports 4, 5, or 6 Hailo-8™ AI Processors
- ▶ High Power Efficiency, Low Power Consumption
- ▶ Commercial and Industrial Grade Support
- ▶ Enablement Software Package with Advanced Deep Learning Models and AI Reference Applications
- ▶ Hailo-8™ Software Development Tools Significantly Reduces Time-to-Market of AI Applications.

Package Content

Your package contains the following items:

- ▶ 1x Falcon H8 modular



Ordering Information

Model No.	Description
FALCON-H8A	IEE-AI0001A, Commercial Grade, Onboard 6x Hailo-8™ AI Processor
FALCON-H8B	IEE-AI0001B, Commercial Grade, Onboard 5x Hailo-8™ AI Processor
FALCON-H8C	IEE-AI0001C, Commercial Grade, Onboard 4x Hailo-8™ AI Processor
FALCON-H8D	IEE-AI0001D, Industrial Grade, Onboard 6x Hailo-8™ AI Processor
FALCON-H8E	IEE-AI0001E, Industrial Grade, Onboard 5x Hailo-8™ AI Processor
FALCON-H8F	IEE-AI0001F, Industrial Grade, Onboard 4x Hailo-8™ AI Processor

System Specifications

AI Performance		Up to 156 TOPs 8000 FPS of ResNet-50, 1300 FPS of YOLOv5m
AI Processors		4-6x Hailo-8™ AI Processors with Hailo Patented Structure Defined Dataflow Architecture
AI Frameworks Support		Hailo AI Dataflow Compiler with Profiler and Emulator Supports TensorFlow, ONNX and PyTorch Frameworks
PCIexpress Interface		PCI Express x16 Compliant with PCI Express Specification v3.0
System Compatibility		Intel x86 or ARM Devices, Linux OS e.g., Ubuntu. Yocto Lanner Network and Edge AI Appliances
Power Consumption		Typical: 45W
Environment	Operating Temperature	0~70°C (Commercial Grade); -40~85°C (Industrial Grade)
	Storage Temperature	-40~85°C
	Humidity	5% ~ 90% RH, Non-condensing
Dimension		Standard PCIe Single Slot Form-Factor; 167.65mm x 111mm without Bracket
Certification		CE Class A, FCC Class A

System Requirements

Hardware:

Host system CPU Architecture

- ▶ x86 or ARM
- ▶ 16+ GB RAM (32+ GB recommended)

Software:

Pre-requisite

- ▶ Access to Hailo Developer Zone
- ▶ Ubuntu 18.04/20.04, 64 bit

CHAPTER 2: HARDWARE SETUP

To reduce the risk of personal injury, electric shock, or damage to the unit, please remove all power connections to completely shut down the device, and wear ESD protection gloves when conducting the steps in this chapter.

Installing Falcon-H8 AI Accelerator Card

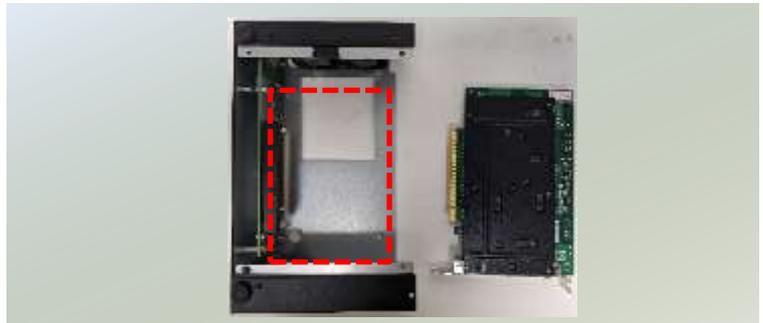
Falcon-Hailo-8™ AI Accelerator card can easily be installed in many appliances, including Lanner's LEC-2290H. The assembly must be handled with care, make sure you have acquired the necessary knowledge and comply with the requirements. The images below are for illustrative purpose only.

1. The AI Accelerator Card Kit will include:

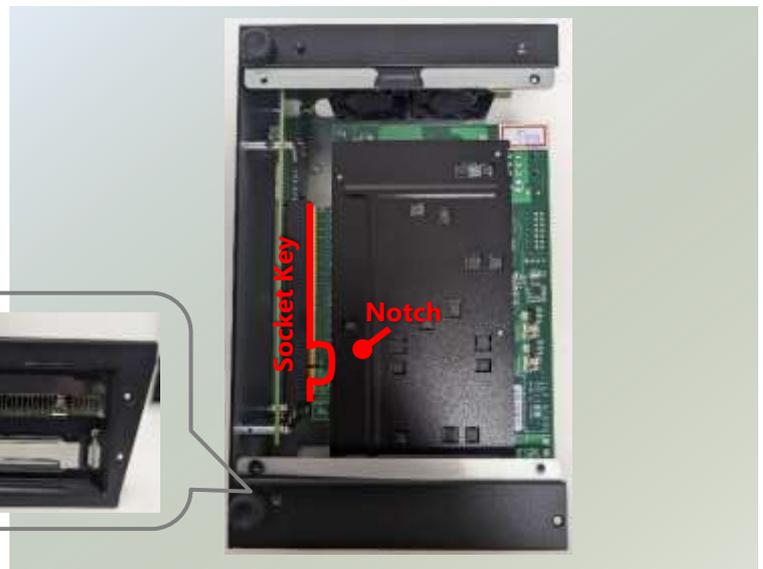
- ▶ 1x Falcon-H8 module card
- ▶ Screw pack



2. Power off the system and open the chassis cover. Locate the PCIe slot for the module.



3. Install the Falcon-H8 AI accelerator module. Align the notch of the module with the socket key in the pin slot. Make sure the side bar slides in properly (as pictured below).



4. Gently insert the module pins into the socket until it is fully seated.



5. Secure with one (1) screw on the side.



6. The module installation is complete. Make sure to cover the system with the chassis and secure in place with screws.

Falcon-H8 PCIe Card Enumeration Verification

After successfully installing Falcon-H8 Module into the network appliance, please follow the steps below to complete Falcon-H8 PCIe enumeration verification process.

Step 1: Power ON the host system and log on to Linux.

Step 2: Verify that the Hailio-H8 processor is detected on the PCIe bus. From a Linux terminal, type:

Commands

A. Check that your board is recognized by the host by running:

```
lspci | grep Co-processor
```

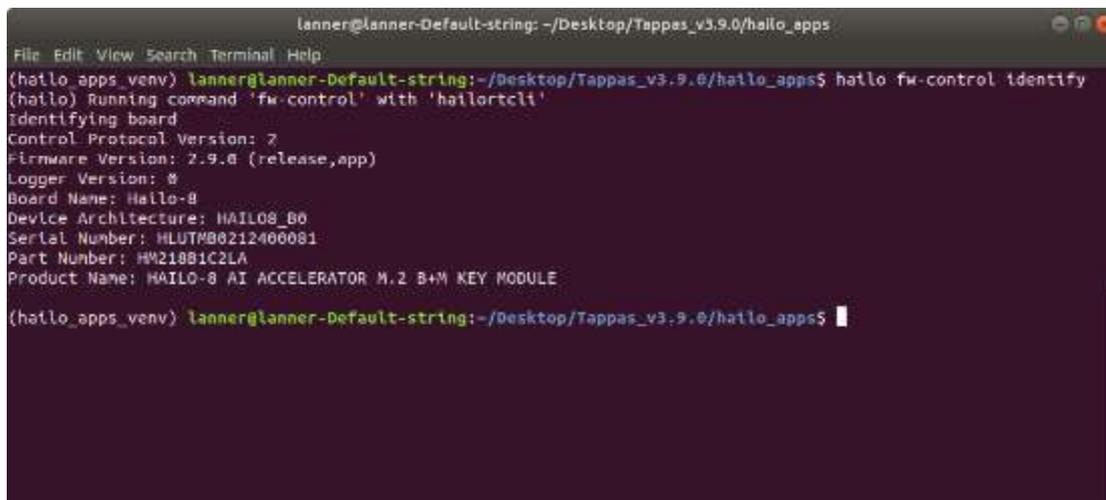
B. Find Hailo virtual environment:

```
source hailo_platform_venv/bin/activate
```

C. Verify (while in Hailo environment):

```
hailo fw-control identify
```

Output Example:



```
lanner@lanner-Default-string: ~/Desktop/Tappas_v3.9.0/hailo_apps
File Edit View Search Terminal Help
(hailo_apps_venv) lanner@lanner-Default-string:~/Desktop/Tappas_v3.9.0/hailo_apps$ hailo fw-control identify
(hailo) Running command 'fw-control' with 'hailortcli'
Identifying board
Control Protocol Version: 2
Firmware Version: 2.9.0 (release,app)
Logger Version: 8
Board Name: Hailo-8
Device Architecture: HAILO8_B0
Serial Number: HLUTM00212400081
Part Number: HW21081C2LA
Product Name: HAILO-8 AI ACCELERATOR M.2 B+M KEY MODULE
(hailo_apps_venv) lanner@lanner-Default-string:~/Desktop/Tappas_v3.9.0/hailo_apps$
```

CHAPTER 3: HAILO SOFTWARE SUITE OVERVIEW

Hailo Toolchain and Developer Tools – Getting Started

Hailo SW products are set of frameworks and tools that enable you to compile, run and evaluate neural networks on Hailo devices. Although you can install each product separately, Hailo releases a quarterly software suite in which all the product versions are aligned. Therefore, using Hailo SW Suites ensures the best compatibility.

The suites include four packages:

1. Dataflow Compiler (Model conversion and compilation to Hailo binary format)
2. HailoRT (Runtime environment and driver for running networks and interacting with Hailo devices)
3. Model Zoo (Pre-trained models to run and evaluate on Hailo devices)
4. TAPPAS (Various demo applications using GStreamer framework)

For the most updated versions, please visit [Hailo developer site](#) for the latest installation manuals and software installation packages.

Hailo Driver, HailoRT, and Hailo TAPPAS source code and license disclaimer can be found in the links below (Installation manuals can be downloaded from [Hailo developer site](#)):

- a.) [Hailo Driver](#)
- b.) [Hailo RT/Hailo Library](#)
- c.) [Hailo TAPPAS](#)

Suite Overview

Hailo SW components are used in this manner:

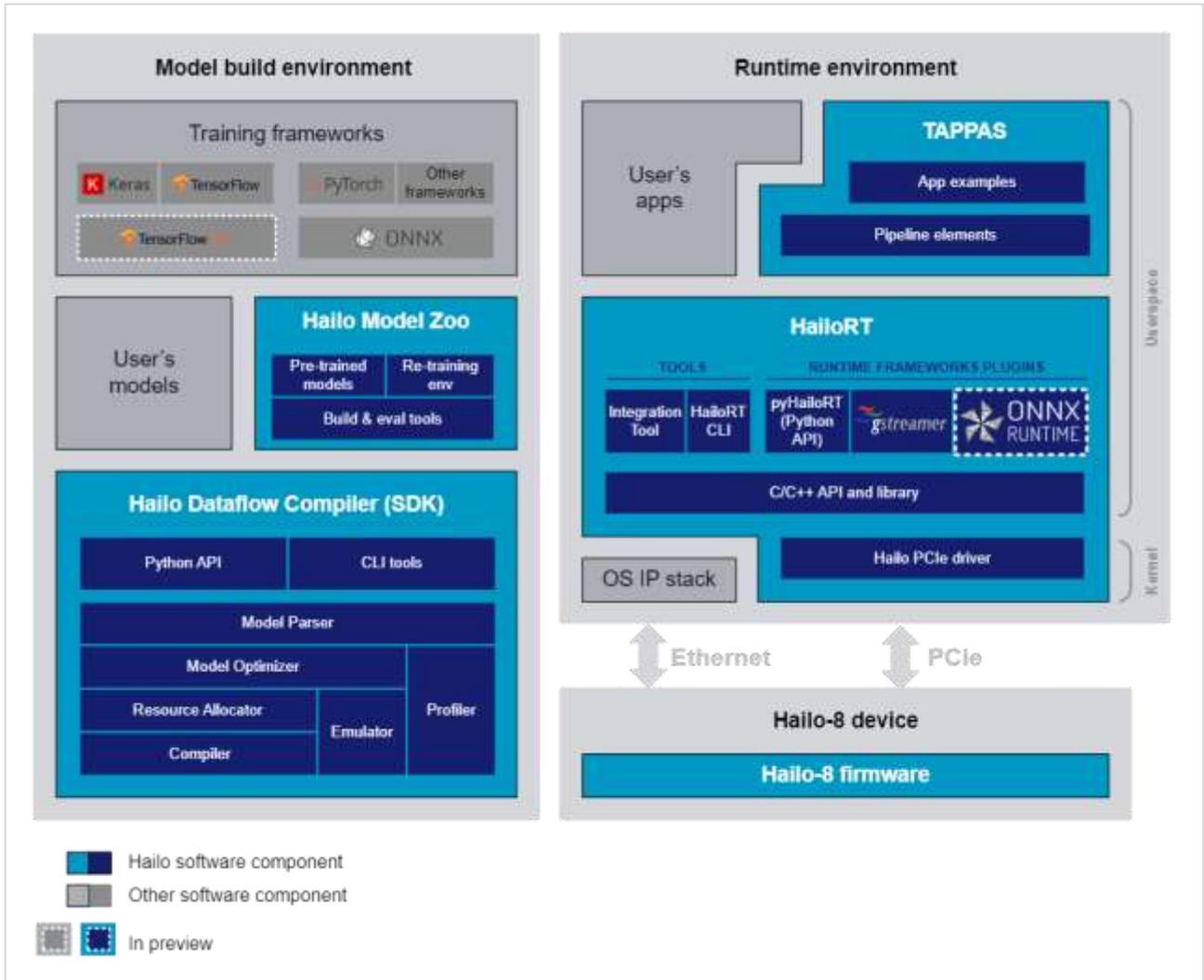
On the Model build environment:

- ▶ Hailo Dataflow Compiler is used to compile a trained model to run on Hailo devices.
- ▶ Hailo Model Zoo contains a large database of pre-trained models that are validated to work with best performance on Hailo devices.

It also contains a retraining environment.

On the Runtime environment:

- ▶ HailoRT is used to load the compiled model to Hailo device and interact with it (using the PCIe driver).
- ▶ TAPPAS includes complete examples and demos of using HailoRT to create full pipelines on top of Hailo devices.



1.1 Detailed block diagram of Hailo software packages

Hailo Suite Components

Dataflow Compiler

The Dataflow Compiler API is used for compiling models to Hailo binaries. The input of the Dataflow Compiler is a trained Deep Learning model. The output is a binary file which is loaded to the Hailo device.

HailoRT

The HailoRT API is used for deploying the built model on the target device. This library is used by the runtime applications.

It implements a userspace C/C++ API that is called from the user's applications. It allows both to control the Hailo device and to send and receive data from it. It supports both the PCIe interface and the Ethernet interface.

The HailoRT Python package wraps the C/C++ API and exposes a Python interface that allows to load models to the device and send and receive data from it.

It also includes a PCIe driver is required when working via the PCIe interface. It links the HailoRT library and the device. It also loads the device's firmware when working through this interface.

Finally, Hailo's Yocto layer allows the user to integrate Hailo's software into an existing Yocto environment. It includes recipes for the HailoRT library, Python package and the PCIe driver.

Hailo Model Zoo

Hailo Model Zoo provides pre-trained models for high-performance deep learning applications.

Using the Hailo Model Zoo you can measure the full precision accuracy of each model, the optimized accuracy using the Hailo Emulator and measure the accuracy on the Hailo-8 device.

Finally, you will be able to generate the Hailo Executable Format (HEF) binary file to speed-up development and generate high quality applications accelerated with Hailo-8.

The models are optimized for high accuracy on public datasets and can be used to benchmark the Hailo model optimization scheme.

TAPPAS

TAPPAS is a framework for optimized execution of video-processing pipelines in systems with the Hailo-8 accelerator. Hailo-8 accelerates NN inference, TAPPAS optimizes the rest of the data path running on the host.

The core of TAPPAS is a library of non-neural video-processing elements. These elements include:

- ▶ Hailo abstraction - elements to send/receive data from the Hailo accelerator.
- ▶ Glue-logic (e.g. format conversion YUV->RGB)
- ▶ Decision logic (e.g.rule-based filtering; branching; conditional invocation etc.)
- ▶ Data flow regulation elements (e.g. buffering; throttling; muxing/de-muxing)
- ▶ Functional elements (e.g. NMS, Tracking, Tiling, etc.)

TAPPAS comes packaged with a rich set of example applications built on top of TAPPAS. These examples demonstrate common use-cases and showcase performance.

CHAPTER 4: HAILO SW SUITE INSTALLATION GUIDE

System Software Requirements

The following requirements are needed for the installation:

1. Python 3.6/3.7/3.8, including `pip` and `virtualenv`
2. `python3.6-dev` / `python3.7-dev` / `python3.8-dev` (accordingly), `python3-tk`, `graphviz`, and `libgraphviz-dev` packages
3. build-essential package (needed to compile the PCIe driver)
4. For TAPPAS: `ffmpeg`, `x11-utils`, `python-gi-dev`, `libgirepository1.0-dev`, `libzmq3-dev`, `gcc-9` and `g++-9` apt packages, `git`, `OpenCV4`, `Gstreamer`, `pygobject`, `opencv_flann`, `calib3d` and `features2d`
5. (Optional) bison, flex, libelf-dev and dkms packages (needed to register the PCIe driver using DKMS)
6. (Optional) cmake (needed to compile the HailoRT examples)

To install TAPPAS apt packages simply run the following:

```
sudo apt-get install -y ffmpeg x11-utils libgstreamer-plugins-base1.0-dev python-gi-dev libgirepository1.0-dev libzmq3-dev gcc-9 g++-9
```

To install OpenCV:

```
# Download Opencv and unzip
wget https://github.com/opencv/opencv/archive/4.5.2.zip
unzip 4.5.2.zip

# cd and make build dir
cd opencv-4.5.2
mkdir build
cd build

# Make and install
cmake -DOPENCV_GENERATE_PKGCONFIG=ON \
  -DBUILD_LIST=core,imgproc,imgcodecs,calib3d,features2d,flann \
  -DCMAKE_BUILD_TYPE=RELEASE \
  -DWITH_PROTOBUF=OFF -DWITH_QUIRC=OFF \
  -DWITH_WEBP=OFF -DWITH_OPENJPEG=OFF \
  -DWITH_GSTREAMER=OFF -DWITH_GTK=OFF \
  -DOPENCV_DNN_OPENCL=OFF -DBUILD_opencv_python2=OFF \
  -DINSTALL_C_EXAMPLES=ON \
  -DINSTALL_PYTHON_EXAMPLES=ON \
  -DCMAKE_INSTALL_PREFIX=/usr/local ..
```

```
make -j4
sudo make install

# Update the linker
sudo ldconfig
```

To install Gstreamer:

```
sudo apt-get install -y libcairo2-dev libgirepository1.0-dev libgstreamer1.0-dev \
libgstreamer-plugins-base1.0-dev libgstreamer-plugins-bad1.0-dev gstreamer1.0-plugins-base \
gstreamer1.0-plugins-good gstreamer1.0-plugins-bad gstreamer1.0-plugins-ugly gstreamer1.0-libav \
gstreamer1.0-doc gstreamer1.0-tools gstreamer1.0-x gstreamer1.0-alsa gstreamer1.0-gi \
gstreamer1.0-gtk3 gstreamer1.0-qt5 gstreamer1.0-vaapi gstreamer1.0-pulseaudio \
gcc-9 g++-9 python-gi-dev
```

For further information, please refer to Gstreamer [installation guide](#)

To install pygobject:

```
sudo apt install python3-gi python3-gi-cairo gir1.2-gtk-3.0
```

For further details, please refer to pygobject [installation guide](#)

The following additional requirements are needed for GPU based hardware emulation:

1. Nvidia's Pascal/Turing/Ampere GPU architecture (such as Titan X Pascal, GTX 1080 Ti, RTX 2080 Ti, or RTX A4000)
2. GPU driver version 470
3. CUDA 11.2
4. CUDNN 8.1
5. (Recommended for TensorFlow) AVX instructions support on CPU

System Software Installation

The executable is an archive that contains all required Hailo SW and an embedded installation script. The file will be named according to the following convention:

```
hailo_sw_suite_<version>.run
```

For example:

```
hailo_sw_suite_2022-10.run
```

After the executable is launched, the following will be present on the system:

- ▶ A new virtual environment named "hailo_venv" will be created and will contain the following:

1. HailoRT Python package and it's dependencies
 2. DFC Python package and it's dependencies
 3. ModelZoo Python package and it's dependencies
 4. All Python packages specified in the included requirements.txt file
 5. A target directory will be created containing all suite contents
- ▶ Hailo docs will be present in the directory from which the executable was launched.
 - ▶ Hailo PCIe driver installed

Usage:

First, make sure the file is executable by running `ls -l`. If not, turn it into an executable with:

```
sudo chmod 770 hailo_sw_suite_<version>.run
```

The following command will extract the archive contents to `hailo_sw_suite` directory and will install Hailo SW suite:

```
./hailo_sw_suite_<version>.run
```

Example:

```
./hailo_sw-suite_2022-10.run
```

For those who wish only to extract and keep archive contents:

```
./hailo_sw_suite_<version>.run --noexec
```

To run an internal validation hook after the installation is completed:

```
./hailo_sw_suite_<version>.run -- validate-installation
```

To install TAPPAS, specify the `Install-tappas` flag at the end of the command:

```
./hailo_sw_suite_<version>.run -- install-tappas
```

After the installation is complete, activate the newly created virtual environment:

```
source hailo_sw_suite/hailo_venv/bin/activate
```

For the most updated versions, please visit [Hailo developer site](#) for the latest installation manuals and software installation packages.

Other Installation Methods including Docker & Manual Installation can be found in the links below (must have access to Hailo Developer Zone):

- 1.) [Docker Installation](#)
- 2.) [Manual Installation](#)

CHAPTER 5: RUN REFERENCE APPLICATION WITH HAILO TAPPAS

Detection Pipeline

Overview

detection.sh demonstrates detection on one video file source and verifies Hailo's configuration. This is done by running a single-stream object detection pipeline on top of GStreamer using the Hailo-8 device.

Options

```
./detection.sh [--input FILL-ME]
```

- ▶ `--network` is an optional flag that sets which network to use. Choose from [yolov3, yolov4, yolov5, mobilenet_ssd], default is yolov5. This will set which hef file to use, the corresponding hailofilter function, and the scaling of the frame to match the width/height input dimensions of the network.
- ▶ `--input` is an optional flag, a path to the video displayed (default is detection.mp4).
- ▶ `--show-fps` is an optional flag that enables printing FPS on screen.
- ▶ `--print-gst-launch` is a flag that prints the ready gst-launch command without running it.
- ▶ `--print-device-stats` Print the power and temperature measured on the Hailo device.

Configuration

In case the selected network is yolo, the app post process parameters can be configured by a json file located in `$TAPPAS_WORKSPACE/apps/gstreamer/general/detection/resources/configs`

Supported Networks

- ▶ ['yolov5m wo spp 60p'](#)
- ▶ ['yolov4 leaky'](#)
- ▶ ['yolov3 gluon'](#)
- ▶ ['mobilenet_ssd'](#)
- ▶ ['nanodet repvgg'](#)

Run

```
cd $TAPPAS_WORKSPACE/apps/gstreamer/general/detection
./detection.sh
```


▶ **yolov4**

- [Retraining docker](#)

*For best compatibility and performance with TAPPAS, use for compilation the corresponding YAML file from above.

-TAPPAS changes to replace model:

*Update HEF_PATH on the .sh file

*Update resources/configs/yolov4.json with your new post-processing parameters (NMS)

▶ **yolov3**

- [Retraining docker](#)

* For best compatibility and performance with TAPPAS, use for compilation the corresponding YAML file from above.

- TAPPAS changes to replace model:

*Update HEF_PATH on the .sh file

*Update resources/configs/yolov3.json with your new post-processing parameters (NMS)

▶ **mobilenet_ssd**

- [Retraining docker](#)

* For best compatibility and performance with TAPPAS, use for compilation the corresponding YAML file from above.

- TAPPAS changes to replace model:

*Update HEF_PATH on the .sh file

*Update mobilenet_ssd.cpp with your new post-processing parameters, then recompile to create l1bmobilenet_ssd_post.so

▶ **nanodet_repvgg**

- [Retraining docker](#)

* For best compatibility and performance with TAPPAS, use for compilation the corresponding YAML file from above.

- TAPPAS changes to replace model:

*Update HEF_PATH on the .sh file

*Update nanodet.cpp with your new post-processing parameters, then recompile to create l1bnanodet_post.so

APPENDIX A: TERMS AND CONDITIONS

Warranty Policy

1. All products are under warranty against defects in materials and workmanship for a period of one year from the date of purchase.
2. The buyer will bear the return freight charges for goods returned for repair within the warranty period; whereas the manufacturer will bear the after service freight charges for goods returned to the user.
3. The buyer will pay for the repair (for replaced components plus service time) and transportation charges (both ways) for items after the expiration of the warranty period.
4. If the RMA Service Request Form does not meet the stated requirement as listed on "RMA Service," RMA goods will be returned at customer's expense.
5. The following conditions are excluded from this warranty:
 - ▶ Improper or inadequate maintenance by the customer
 - ▶ Unauthorized modification, misuse, or reversed engineering of the product
 - ▶ Operation outside of the environmental specifications for the product.

RMA Service

Requesting an RMA#

1. To obtain an RMA number, simply fill out and fax the "RMA Request Form" to your supplier.
2. The customer is required to fill out the problem code as listed. If your problem is not among the codes listed, please write the symptom description in the remarks box.
3. Ship the defective unit(s) on freight prepaid terms. Use the original packing materials when possible.
4. Mark the RMA# clearly on the box.

Note: Customer is responsible for shipping damage(s) resulting from inadequate/loose packing of the defective unit(s). All RMA# are valid for 30 days only; RMA goods received after the effective RMA# period will be rejected.

RMA Service Request Form

When requesting RMA service, please fill out the following form. Without this form enclosed, your RMA cannot be processed.

RMA No.:		Reasons to Return: <input type="checkbox"/> Repair(Please include failure details)	
		<input type="checkbox"/> Testing Purpose	
Company:		Contact Person:	
Phone No.		Purchased Date:	
Fax No.:		Applied Date:	
Return Shipping Address: _____			
Shipping by: <input type="checkbox"/> Air Freight <input type="checkbox"/> Sea <input type="checkbox"/> Express_____			
<input type="checkbox"/> Others:_____			
Item	Model Name	Serial Number	Configuration

Item	Problem Code	Failure Status

- *Problem Code:**
- | | | | |
|------------------------|------------------------------|--------------------|--------------------------|
| 01: D.O.A. | 07: BIOS Problem | 13: SCSI | 19: DIO |
| 02: Second Time R.M.A. | 08: Keyboard Controller Fail | 14: LPT Port | 20: Buzzer |
| 03: CMOS Data Lost | 09: Cache RMA Problem | 15: PS2 | 21: Shut Down |
| 04: FDC Fail | 10: Memory Socket Bad | 16: LAN | 22: Panel Fail |
| 05: HDC Fail | 11: Hang Up Software | 17: COM Port | 23: CRT Fail |
| 06: Bad Slot | 12: Out Look Damage | 18: Watchdog Timer | 24: Others (Pls specify) |

Request Party

Confirmed By Supplier

Authorized Signature / Date

Authorized Signature / Date