Application Note

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All VART Examples from Xilinx Vitis AI 2.0 for Trenz Electronic board TE0808 SoM + TEBF0808 Carrier

Zdeněk Pohl, Lukáš Kohout, Jiří Kadlec
zdenek.pohl@utia.cas.cz, kohoutl@utia.cas.cz, kadlec@utia.cas.cz

Revision history

Rev.	Date	Author	Description
01	8.12.2022	Z.P.	document creation
02	30.12.2022	Z.P.	fixed error in petalinux configuration

Contents

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1 Description

This document provides tutorial how to setup and run all VART demos present in Vitis AI library 2.0 on Trenz TE0808 SoM attached to TEBF0808 carrier board.

2 Requirements

1. Hardware:
    a. Trenz TE0808 SoM installed on TEBF0808 and power source.
    b. Display Port Cable.
    c. Display port monitor with FHD support.
    d. USB webcam with USB cable, tested with See3CAM_CU30 - 3.4 Mpix Low Light USB Camera (Color).
    e. Ethernet UTP cable.
    f. 16GB SD card
2. Software:
    a. Finished “Test 3: Vitis-AI Demo” [1] example from TE0808 StarterKit Vitis AI Tutorial, i.e. it is possible to run dpu_trd (resnet50) demo.
    b. SD Card image created in “Test 3: Vitis-AI Demo” have to be re-generated as described in this application note.

3 How to Build VART Examples and Install Models

1. First the SD Card image used in “Test 3: Vitis-AI Demo” must be extended by additional gstreamer plugins as the VART demos are mostly running on video sources. Steps to add gstreamer plugins:
    a. Go back to place where petalinux was compiled in Trenz Vitis-AI Tutorial and add to ~/work/TE0808_24_240/StarterKit/os/petalinux/project-spec/meta-user/conf/user-rootfsconfig
    following line:

```
CONFIG_packagegroup-petalinux-gstreamer
```

    b. At the same folder open file “petalinuxbsp.conf” and add lines:

```
LICENSE_FLAGS_WHITELIST_append = “ commercial”
IMAGE_INSTALL_append = “ gstreamer1.0-plugins-ugly”
IMAGE_INSTALL_append = “ gstreamer1.0-libav”
```

    c. Setup petalinux environment.
    d. Run:

```
petalinux-config -c rootfs
```

    e. Make sure that in “user packages” submenu is **packagegroup-petalinux-gstreamer** is checked.
    f. Rebuild petalinux:

```
petalinux-build
```

    g. Open Vitis workspace used to generate **dpu_trd** project.
    h. Build the **dpu_trd** project. New rootfs.ext4 file built in previous steps will be added to **sd_card.img**

i. Write **sd_card.img** file to 16GB SD Card.
j. Boot the board with new image and resize partition as learned in Trenz Vitis AI Tutorial.

2. Get scripts **init_VART.sh** and **VART_build_all.sh**
3. Edit **init_VART.sh** script and set correct paths to:
    a. Vitis AI github repository path (see Vitis AI Starterkit Tutorial, the path should be ~/vitis_ai_2_0):

```
VITIS_AI_DIR=~/vitis_ai_2_0/
```

    b. Path to installed platform SYSROOT (see Vitis AI Starterkit Tutorial, the path should be ~/work/te0808_24_240/StarterKit_pfm):

```
PLATFORM_SYSROOTS_DIR=~/work/te0808_24_240/StarterKit_pfm
```

4. Start downloading support files and building all examples:

```
./VART_build_all.sh all
```

5. Connect UTP and power cable to TE0808+TEBF0808. Power on the board.
6. Connect your PC to TE0808 using SFTP.
7. Copy 'VART' folder content to board using SFTP:

Copy all content of:

```
~/vitis_ai_2_0/demo/VART
```

to target board TE0808 folder:

```
/home/root
```

8. In PC open folder ~/vitis_ai_2_0/models/AI-Model-Zoo/ and use script to get all available precompiled models from Xilinx, call:

```
python3 downloader.py
```

when asked for input fill: "all", then enter "0" for all and enter "2" for zcu102 & zcu104 & kv260. Wait until all models in form of tar.gz archives are downloaded.

IMPORTANT: Vitis AI library 2.0 has an error in one of 'yaml' metafiles. Before download process is started it is needed to fix it:
In folder model-list/pt_pointpainting_nuscenes_2.0
Open 'model.yaml' file for editing and replace complete line:

```
download link: download link
```

With line

```
download link:
https://www.xilinx.com/bin/public/openDownload?filename=pointpainting_nuscenes_40000_64_0_pt-zcu102_zcu104_kv260-r2.0.0.tar.gz
```

9. Connect to target board TE0808 and create folder for models:

```
/usr/share/vitis_ai_library/models
```

10. Copy all downloaded *.tar.gz files to TE0808 board using SFTP to folder:

```
/usr/share/vitis_ai_library/models
```

11. Open ssh terminal to TE0808 board and continue on target board.
12. (Optional step) Set correct date and time:

```
date -s "2 OCT 2006 18:00:00"
hwclock --systohc
```

13. Go to `/usr/share/vitis_ai_library/models` and extract all:

```
cat *.tar.gz | tar xvzf - -i
```

14. (Optional step) Remove archives to save space on SD card:

```
rm *.tar.gz
```

15. Set environment variables:

```
export XLNX_VART_FIRMWARE=/mnt/sd-mmcblk1p1/dpu.xclbin
```

DISPLAY must be set only when X11 forwarding is NOT used:

```
export DISPLAY=:0.0
```

16. (recommended step) Test on one example - resnet50:
    a. Open readme file located in VART folder, and find command to execute resnet50 demo:

```
./resnet50 /usr/share/vitis_ai_library/models/resnet50/resnet50.xmodel
```

    b. Run example demo (using command found in previous step):

```
cd /home/root/VART/resnet50
./resnet50 /usr/share/vitis_ai_library/models/resnet50/resnet50.xmodel
```

See result in terminal.

4 Tested Demos

Commands needed to execute individual demos can be found in VART/README.md

Following sections will show example results of execution each demo.

4.1 Demo: adas_detection

Command:

./adas_detection video/adas.webm /usr/share/vitis_ai_library/models/yolov3_adas_pruned_0_9/yolov3_adas_pruned_0_9.xmodel

or

./adas_detection video/adas.avi /usr/share/vitis_ai_library/models/yolov3_adas_pruned_0_9/yolov3_adas_pruned_0_9.xmodel

Input:
AVI or webm video
Output:

Summary:
Adas detection running on provided small resolution dashboard cam video.

4.2 Demo: inception_v1_mt_py

Command:

python3 inception_v1.py 1 /usr/share/vitis_ai_library/models/inception_v1_tf/inception_v1_tf.xmodel

Input:

-

Output:

In terminal

Summary:

Inception implemented in python.

4.3 Demo: pose_detection

Command:

./pose_detection video/pose.webm /usr/share/vitis_ai_library/models/sp_net/sp_net.xmodel /usr/share/vitis_ai_library/models/ssd_pedestrian_pruned_0_97/ssd_pedestrian_pruned_0_97.xmodel

Or

./pose_detection video/pose.mp4 /usr/share/vitis_ai_library/models/sp_net/sp_net.xmodel /usr/share/vitis_ai_library/models/ssd_pedestrian_pruned_0_97/ssd_pedestrian_pruned_0_97.xmodel

Input:

mp4 or webm video file

Output:

Summary:

Demo shows pose detection of pre recoded fitness video. Persons in mirror are also detected.

4.4 Demo: resnet50

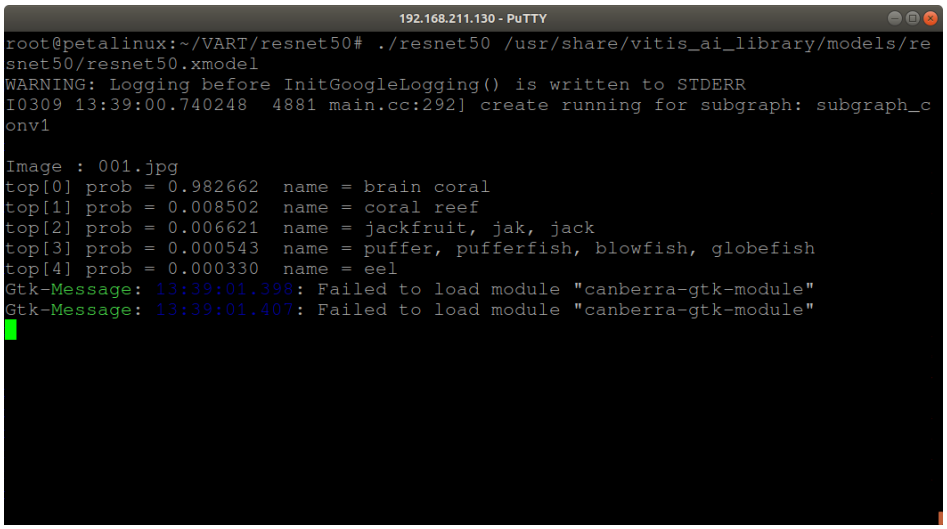
Command:

./resnet50 /usr/share/vitis_ai_library/models/resnet50/resnet50.xmodel

Input:

Automatically uses image: images/001.jpg

Output:



Summary:

Demo takes file images/001.jpg and does classification. Output can be found in terminal. Path to input file seems to be fixed (no path to image in command)

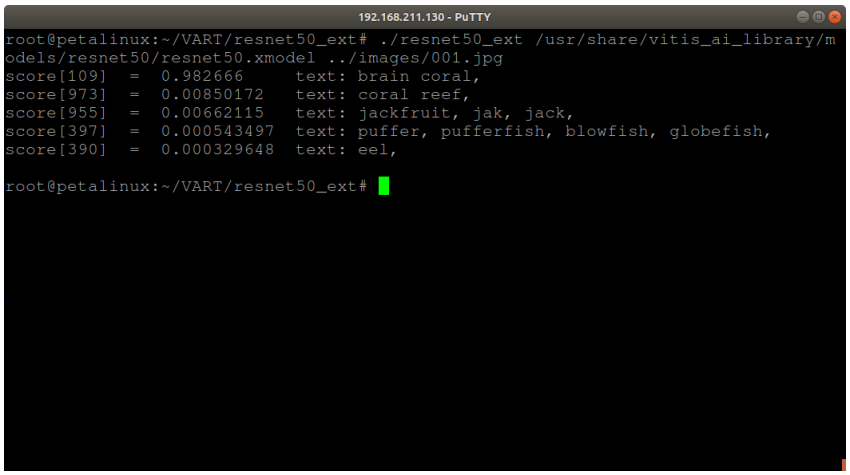
4.5 Demo: resnet50_ext

Command:

./resnet50_ext /usr/share/vitis_ai_library/models/resnet50/resnet50.xmodel ../images/001.jpg

Input:

Output:



Summary:

Like resnet50 but now there is possible to add input file(s) in command line.

4.6 Demo: resnet50_mt_py

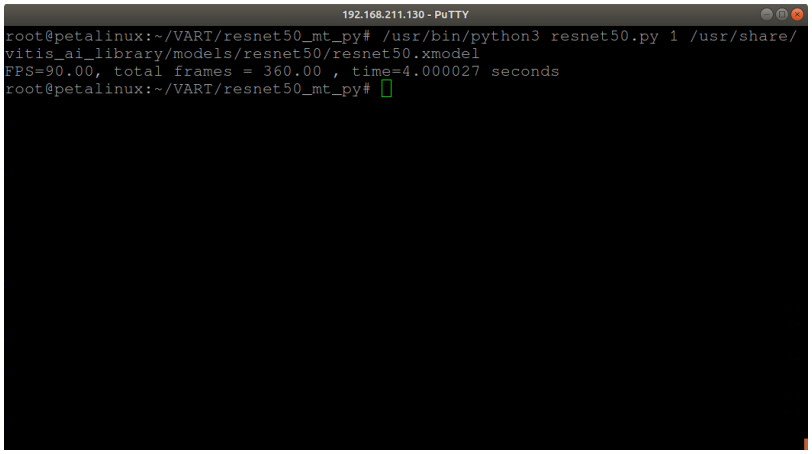
Command:

python3 resnet50.py 1 /usr/share/vitis_ai_library/models/resnet50/resnet50.xmodel

Input:

-

Output:



Summary:

resnet50 in python. It is not clear where is input file defined and where is output.

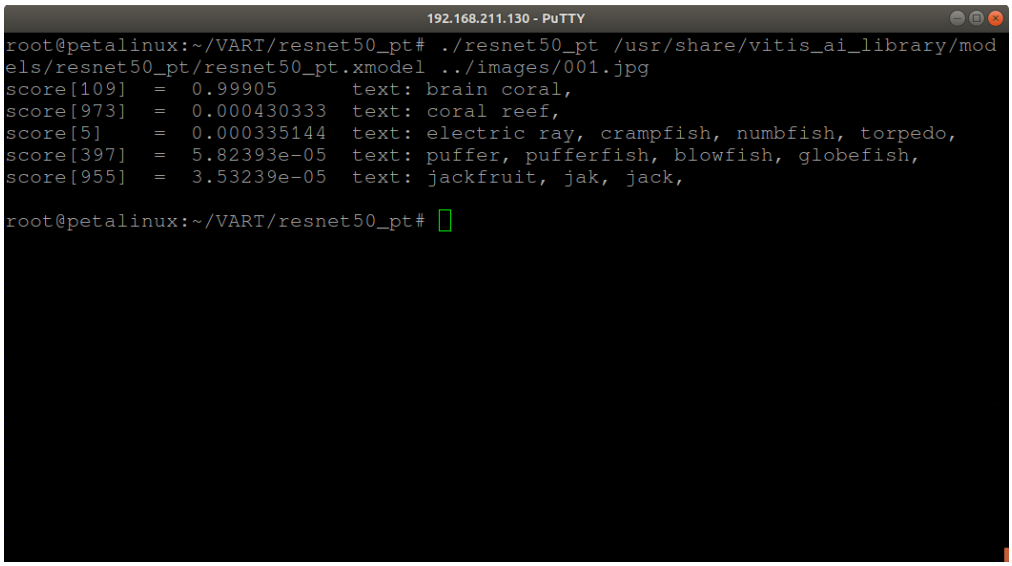
4.7 Demo: resnet50_pt

Command:

./resnet50_pt /usr/share/vitis_ai_library/models/resnet50_pt/resnet50_pt.xmodel ../images/001.jpg

Input:

Output:



Summary:

Another implementation of resnet50. It is not clear what exactly are differences between resnet50_* demos in VART.

4.8 Demo: segmentation

Command:

./segmentation video/traffic.webm /usr/share/vitis_ai_library/models/fpn/fpn.xmodel

Input:

mp4 or webm video

Output:

Summary:

ADAS segmentation on pre-recorded dashboard video.

4.9 Demo: squeezenet_pytorch

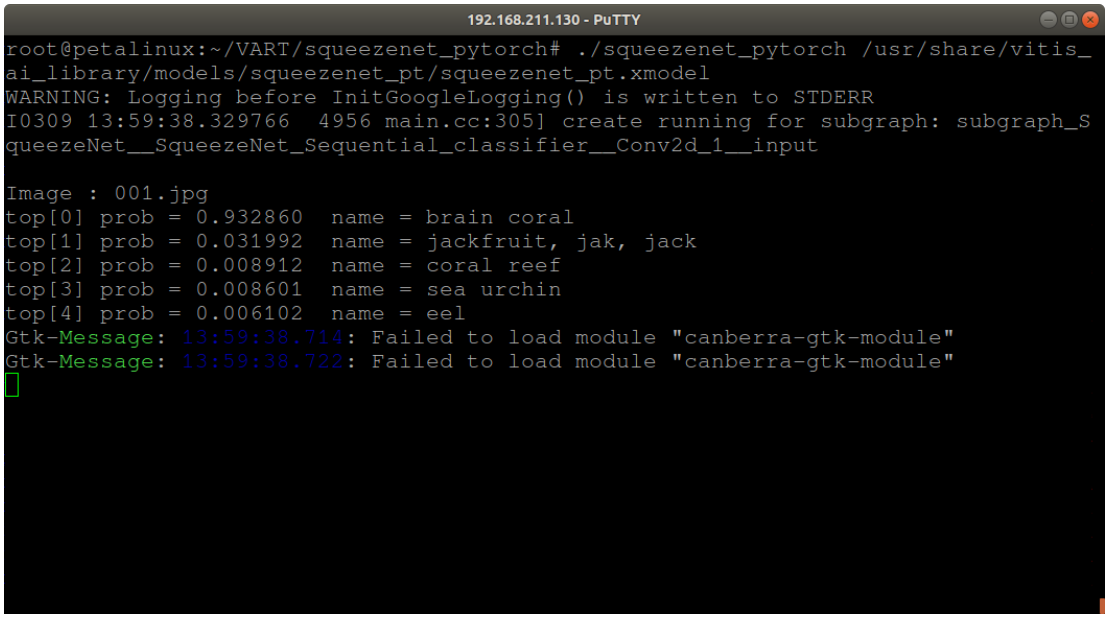
Command:

./squeezenet_pytorch /usr/share/vitis_ai_library/models/squeezenet_pt/squeezenet_pt.xmodel

Input:

Fixed input image

Output:



Summary:

Classification of image by squeezenet.

4.10 Demo: video_analysis

Command:

./video_analysis video/structure.webm /usr/share/vitis_ai_library/models/ssd_traffic_pruned_0_9/ssd_traffic_pruned_0_9.xmodel

Input:

webm or mp4 video

Output:

Summary:

Traffic surveillance analysis from pre-recorded video.

5 References

[1] TE0808 Starterkit Vitis AI Tutorial, Trenz Electronic Wiki: https://wiki.trenz-electronic.de/display/PD/TE0808+Starterkit+Vitis+AI+Tutorial