Alpha Presentation
SmartSat™ AI Acceleration in Space
The Capstone Experience
Team Lockheed Martin Space
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Project Overview

• Develop a benchmark script to test different machine learning models
• Collect data by using previous semester’s XRT manager
• Deploy scripts remotely using Tinker application
• Configure ZCU102 to run scripts on boot automatically
• Display results onto a dashboard
System Architecture
Dashboard
PetaLinux Boot Terminal

Starting Network Name Resolution...
- [ OK ] Started Network Name Resolution.
- [ OK ] Reached target Network.
- [ OK ] Reached target Host and Network Name Lookups.
- [ OK ] Started NFS status monitor for NFSv2/3 locking..
  Starting Permit User Sessions...
  Starting Target Communication Framework agent...
- [ OK ] Started Xinetd A Powerful Replacement For Inetd.
- [ OK ] Finished Permit User Sessions.
- [ OK ] Started Getty on tty1.
- [ OK ] Started Serial Getty on ttyPS0.
- [ OK ] Reached target Login Prompts.
- [ OK ] Started Target Communication Framework agent.
- [ OK ] Started dpu-auto-config.service.
- [ OK ] Reached target Multi-User System.
- [ OK ] Reached target Graphical Interface.
  Starting Record Runlevel Change in UTMP...
- [ OK ] Finished Record Runlevel Change in UTMP.

PetaLinux 2022.2_release_S10071807 xilinx-zcu102-20222 ttyPS0

xilinx-zcu102-20222 login: root (automatic login)

root@xilinx-zcu102-20222:~#
Board
Script Execution

```
images script.py  script2.py  testingImages
root@xilinx-zcu102-20222:~/kellen_test# python3 script2.py
(name: 'quantize_eval_model', op_num: 190, attrs: {'libs_info': {'xcompiler.3.5.0': 'be7bc16b73939070b4526571bd251757bf0e57', 'xcompiler.3.5.0 : target-factor y.3.5.0': '947d287c09dadab682bealc60ae5ed21fbcbe64', 'xcompiler.3.5.0 : xir.3.5.0': 'ea490ee80414766b6b7f74622ca6b50ea57b6d8'}, 'files_md5sum': {'/tmp/resnet50_tfdpuCZDXg8GISA1B4096_oge.xmodel': '2999d5e6493adc3bf084c781a76eea91', '/workspacetf_resnetv1_50_imagenet_224_224_6.97G_3.0/quantized/quantize_eval_model.pb': 'c855eb51ac404197e0766d33ef513ed6'}, 'origin': 'tensorflow'}
input size = (1, 224, 224, 3)
/home/root/kellen_test/testingImages/images/2.jpeg
/home/root/kellen_test/testingImages/images/4.jpeg
/home/root/kellen_test/testingImages/images/1.jpeg
/home/root/kellen_test/testingImages/images/3.jpeg
/home/root/kellen_test/testingImages/images/0.jpeg

corkscrew, bottle screw
marimba, xylophone
lycaenid, lycaenid butterfly
badger
folding chair
Total Runtime: 5.86 seconds
Average Latency: 0.01 seconds
Throughput: 85.27 inferences/second
root@xilinx-zcu102-20222:~/kellen_test#
```
What’s left to do?

• Develop benchmarks using Lockheed Martin given models
• Jetson TX2 GPU passthrough
• Integrate XRT with our scripts
• Write script that runs automatic benchmarking
• Install packages on ZCU102 on root pre boot
Questions?