Alpha Presentation
SmartSat™ Heterogeneous Computing in Space

The Capstone Experience
Team Lockheed Martin Space

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Project Overview

- Enable data to be processed faster by distributing algorithms across dissimilar and workload optimized processing devices.
- Minimize processing delays by determining which hardware component to use based on status of the satellite and resource utilization.
- Reduce hardware knowledge required to develop with XRT
System Architecture
Connecting Accelerator Manager

**Accelerator Manager**

Server Connection Successful
Server listening on port 12345...
Waiting for command...
Received command: 1: Add Accelerator #1
Adding Accelerator #1
Waiting for command...
Received command: 2: Add Accelerator #2
Adding Accelerator #2
Waiting for command...
Received command: 6: Close Connection

**System User Interface**

Select a command to send:
1: Add Accelerator #1
2: Add Accelerator #2
3: Remove Accelerator #1
4: Remove Accelerator #2
5: Show Accelerator Status
6: Stop Connection

Command Selection: 1
Server response: Successfully started Accelerator #1
Select a command to send:
1: Add Accelerator #1
2: Add Accelerator #2
3: Remove Accelerator #1
4: Remove Accelerator #2
5: Show Accelerator Status
6: Stop Connection

Command Selection: 2
Server response: Successfully started Accelerator #2
Select a command to send:
1: Add Accelerator #1
2: Add Accelerator #2
3: Remove Accelerator #1
4: Remove Accelerator #2
5: Show Accelerator Status
6: Stop Connection

Command Selection: 6
Server response: Closed Connection
Error Handling with Accelerator Manager

Accelerator Manager

```
Server Connection Successful  
Server listening on port 12345...  
Wating for command...  
Received command: 1: Add Accelerator #1:  
Adding Accelerator #1  
Wating for command...  
Received command: 1: Add Accelerator #1:  
Adding Accelerator #1  
Wating for command...  
Received command: 5: Show Accelerator Status:  
Wating for command...  
Received command: 4: Remove Accelerator #2:  
Wating for command...  
```

System User Interface

```
Select a command to send  
1: Add Accelerator #1  
2: Add Accelerator #2  
3: Remove Accelerator #1  
4: Remove Accelerator #2  
5: Show Accelerator Status  
6: Stop Connection  

Server response: Successfully added Accelerator #1  
Select a command to send  
1: Add Accelerator #1  
2: Add Accelerator #2  
3: Remove Accelerator #1  
4: Remove Accelerator #2  
5: Show Accelerator Status  
6: Stop Connection  

Server response: Successfully added Accelerator #1  
Select a command to send  
1: Add Accelerator #1  
2: Add Accelerator #2  
3: Remove Accelerator #1  
4: Remove Accelerator #2  
5: Show Accelerator Status  
6: Stop Connection  

Server response: Accelerator : Status  
#0 xGFX-200 : idle  
#1 xGFX-200 : idle  
Select a command to send:  
1: Add Accelerator #1  
2: Add Accelerator #2  
3: Remove Accelerator #1  
4: Remove Accelerator #2  
5: Show Accelerator Status  
6: Stop Connection  

Server response: Failed to remove accelerator(AMD Radeon RX 7700) accelerator does not exist or could not be found  
Select a command to send:  
1: Add Accelerator #1  
2: Add Accelerator #2  
3: Remove Accelerator #1  
4: Remove Accelerator #2  
5: Show Accelerator Status  
6: Stop Connection  
```
Vitis Accelerator with XRT Output

Terminal Output Continued

```
zynqmp-common-20231:/mnt# ./jacobKernel
argc = 2
argv[0] = ./jacobKernelTest
argv[1] = binary_container_1.xclbin
Initializing Device
Opening Device
Loading Binary File
Bitstream load successful
Loading User-hosted kernel
Allocate Buffer in Global Memory
```

loaded the data
synchronize input buffer data to device global memory
INFO: Setting IP Data
Setting Register A (Input Address)
Setting Register B (Input Address)
INFO: IP Start
INFO: IP Done
Get the output data from the device
Shawn's TEST PASSED
zynqmp-common-20231:/mnt#
Vitis Accelerator with Image Processing
What’s left to do?

- Include additional base functions to the XRTLibrary
- Advanced AdaptiveCpp Accelerator
- SmartSat SDK Integration
- Advanced Vitis Accelerator
- Ability to display Vitis Accelerator properties outside of the XRTLibrary
Questions?