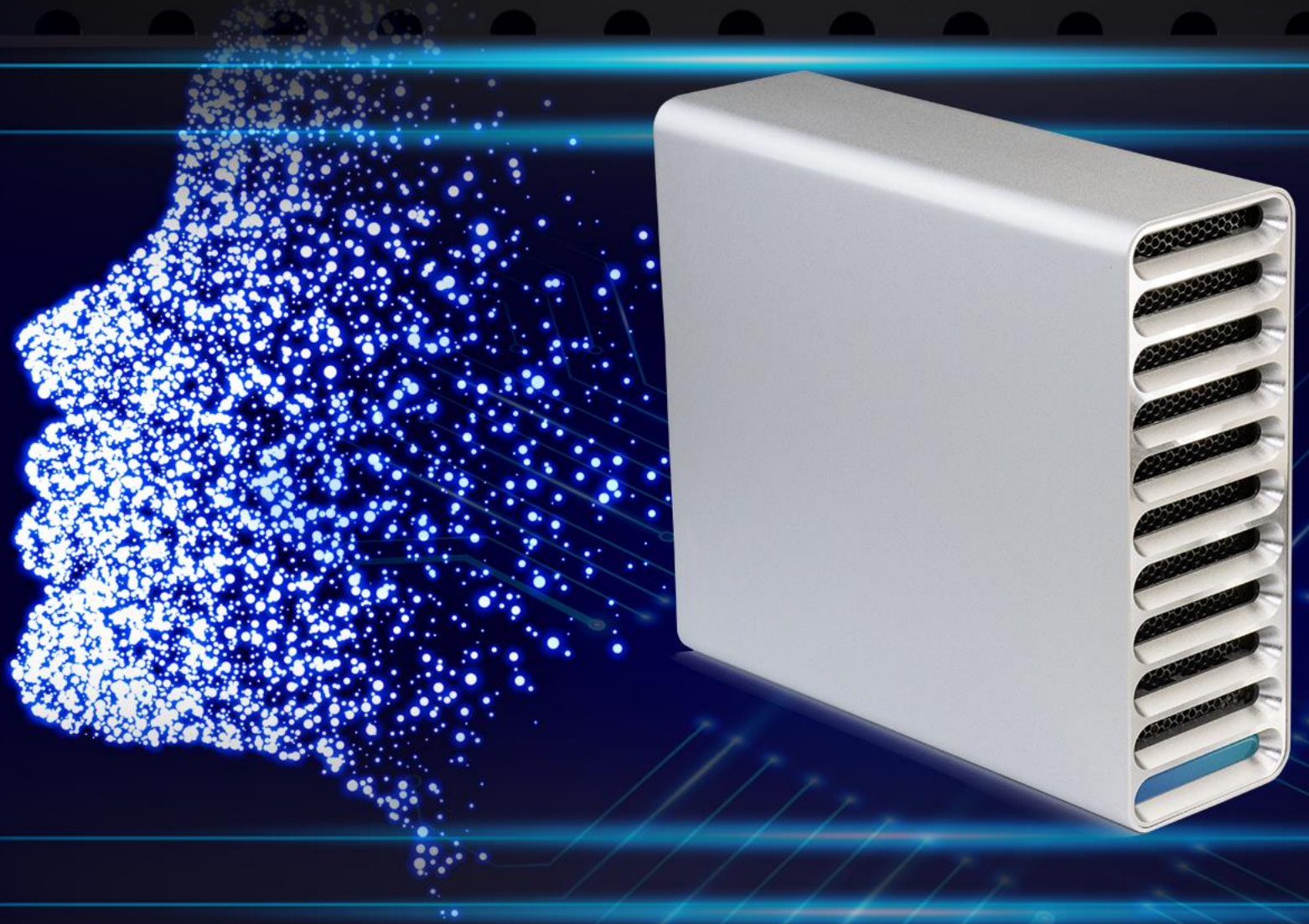
intel FPGA

terasIC
www.terasic.com



# FLIK

**World's First Portable Accelerator for Your Laptop!**

# Terasic Overview

## World Leading FPGA-Based Product Designer & Manufacturer

Terasic is the leading developer and provider for FPGA-based hardware & complex system solution. With twenty years of experience in developing high-end solutions for the industrial and FPGA system markets, our team provides the first-class design-to-order services for high speed boards and custom rugged system solutions to help our customers achieve their demanding applications in High Performance Computing, High Frequency Trading, network processing, radar detection, instrumentation, etc.

Headquartered in Hsinchu, Taiwan, the silicon valley of Asia and the cradle of invention and creativity, Terasic boasts an extensive product portfolio from COTS of PCIe boards, high speed boards, FMC & HSMC daughter cards for networking & video processing to cost-friendly educational & development kits widely used by today's college education and worldwide research institutes.

Our technical coverage:

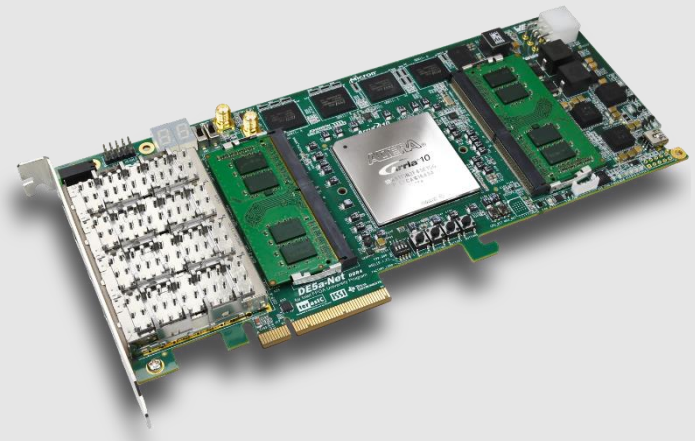
- FPGA board design & layout
- Firmware & Drivers
- Signal integrity analysis
- SoC application
- OpenCL BSP porting & support
- OpenVINO and OPAE Support

# Terasic is Intel's official global service provider for OpenCL™ BSP Service


**As Intel certified service provider for OpenCL-related services & development, Terasic also provides customized service to meet the exact needs of our client.**

- Support OpenCL™ HPC, SoC, and Networking BSPs.
- Customize FPGA Board and OpenCL BSP.
- Terasic FPGA Board integrate Customized IPs.
- Upgrade OpenCL BSP to the latest version.
- Modify hardware of Terasic FPGA Board, example: Memory Size

# Terasic platforms support Intel FPGA Acceleration Hub


| | |
|---|---|
| Dynamically Allocate Intel® FPGAs for Workload Optimization | **Rack-Level Solutions** |
| Enhanced End-User Experience | **User Applications** |
| Focus on System Architecture | **Industry Standard Software Frameworks** |
| Fast-Track Your Performance | **Acceleration Libraries** |
| Workload Optimization with Less Effort | **Intel® Developer Tools** (Intel Quartus® Prime, Intel FPGA SDK for OpenCL™, Intel Parallel Studio XE) |
| Common Developer Interface for Intel® FPGA Data Center Products | **Acceleration Environment** (Intel Acceleration Engine with OPAE Technology, FPGA Interface Manager (FIM)) |
| Decrease server TCO, simplify management | **OS & Virtualization Environment** |




**Intel® Hardware**

# Terasic platforms support Intel OpenVINO™ Toolkit

*OpenVINO 2020 R1 version is now available on Terasic Stratix 10, and Arria 10 boards and Starter Platform for OpenVINO™ toolkit.*

**Demonstrations:**

- Face Detection
- Emotion Recognition
- Age and Gender Recognition
- Head Pose Estimation
- Object Detection
- Object Segmentation
- Person Re-identification
- Vehicle Detection

FLIK Pro

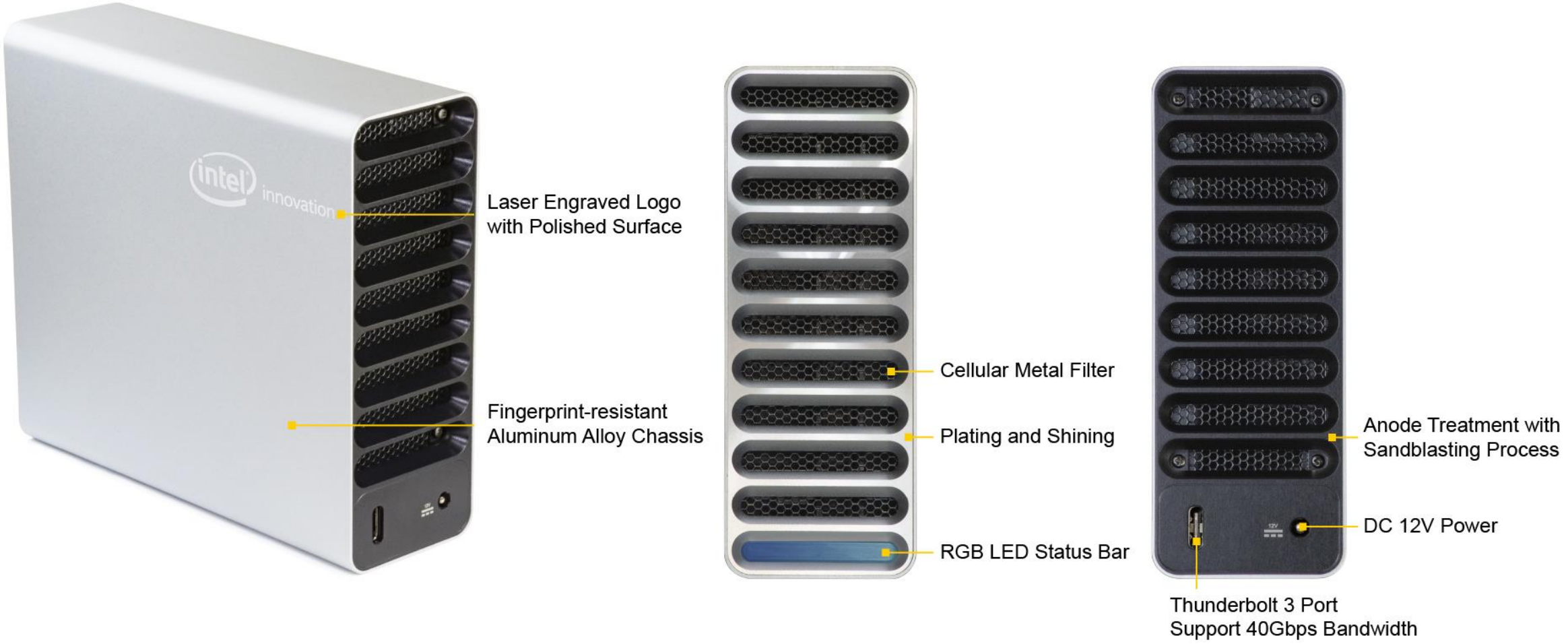
# Product Features

# FLIK – FPGA Client Innovation Kit

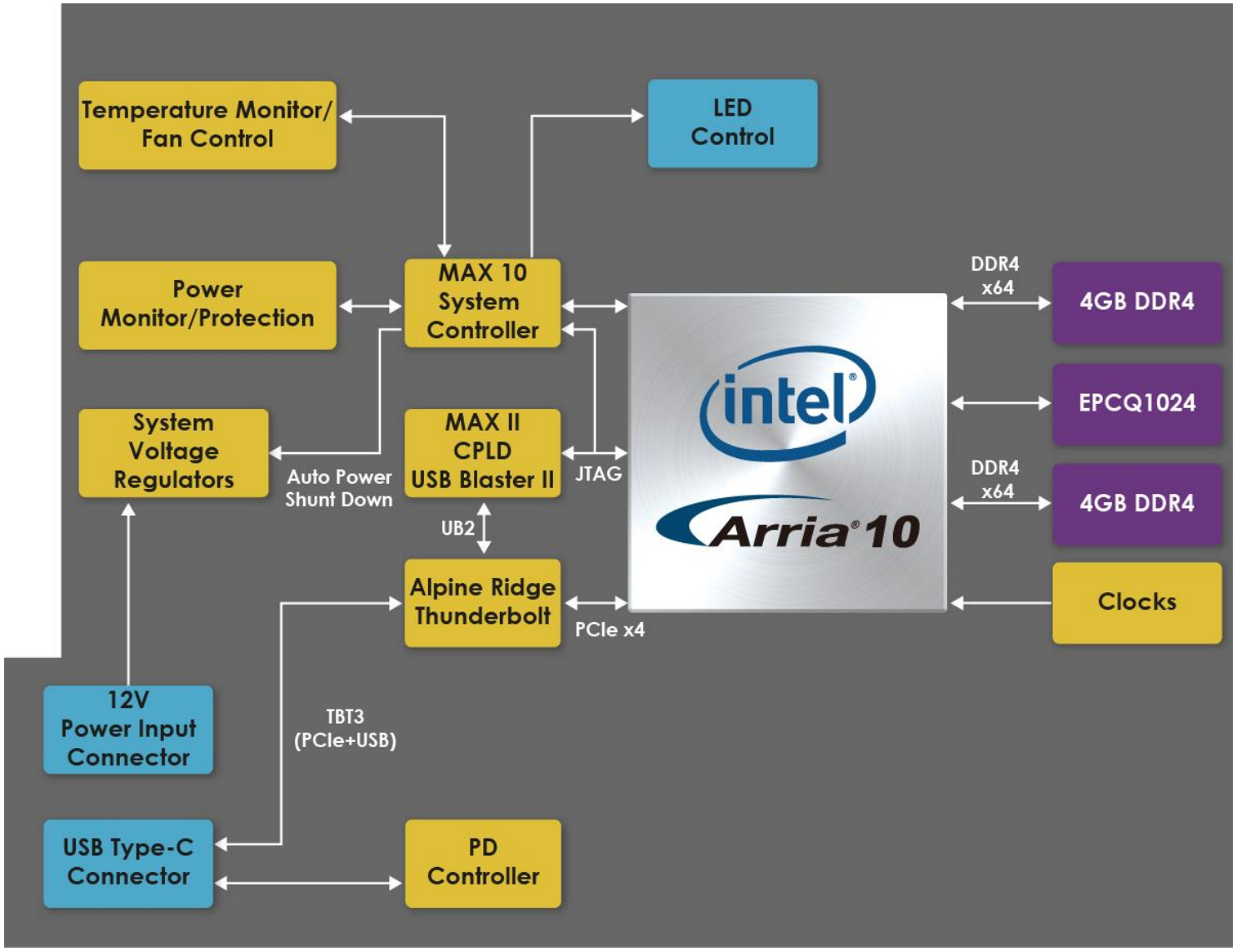

## Major Specs and Interfaces

- Arria 10 FPGA Board with Thunderbolt 3 connection
- Kit Features:
  - Arria 10 GX 1150K
  - Two DDR4 x64 Data Bus for 8GB total
  - PCIe Gen 3 x4 via Type-C Thunderbolt 3 interface
  - Board Management Controller includes Power, Temperature, Fan, and LED Control

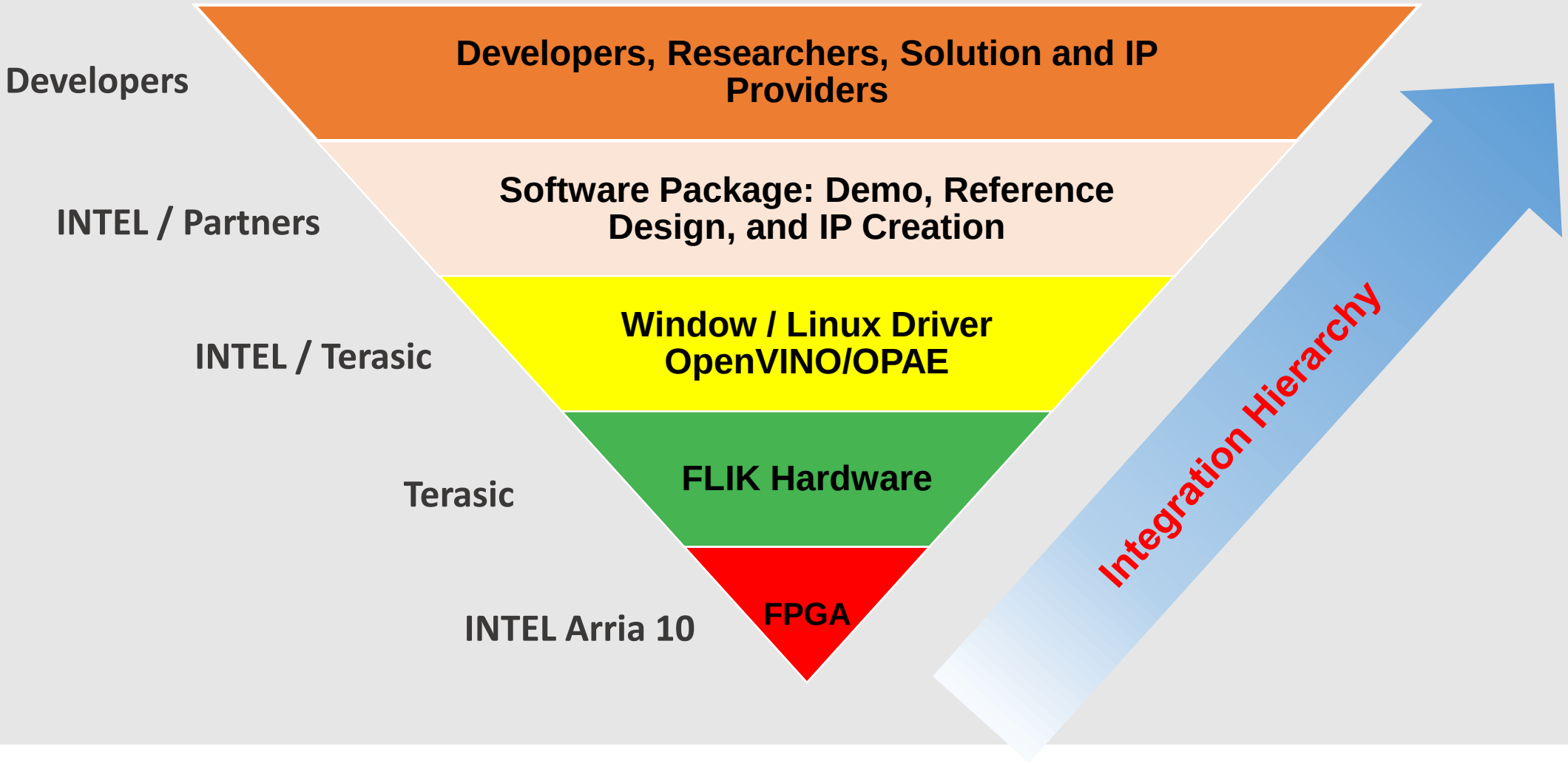
# FLIK Layout


intel
innovation
Laser Engraved Logo
with Polished Surface
Fingerprint-resistant
Aluminum Alloy Chassis
Cellular Metal Filter
Plating and Shining
RGB LED Status Bar
Anode Treatment with
Sandblasting Process
DC 12V Power
Thunderbolt 3 Port
Support 40Gbps Bandwidth

# Block Diagram



# Goal of FLIK: An integrated System for Global Developers for AI and FPGA Acceleration



# Hardware Package Preparation

## Chassis and ID Look

Thickness increased from 0.5mm to 0.8mm – Done by Intel and Terasic

## Board Manufacture

Design circuitry has been validated and verified – Done by Terasic

## Accessories

Includes power supply and Thunderbolt cable – Done by Terasic

## Package Design

Package / Box Design – Done by Terasic and approved by INTEL

# Software

# Contents

1. Pre-programmed Power-on Self-test Suite
2. OpenVINO Toolkit Demos
3. OPAE Enablement with Examples (working in progress)
4. OpenCL for Windows 10
5. Adobe Premiere Pro Plugin

# 1. Pre-programmed Power-on Self-test Suite

- FPGA Boot from EPCQL1024 to see the board is powered up correctly
- Thunderbolt Link Status to check if a Thunderbolt cable is connected or disconnected
- DMA Access between Host PC and DDR4 on FLIK via PCIe Gen3 x4 up to 32Gbps
- Read/Write Data Transfer between FPGA and Two Bank 4GB DDR4@2133 MT/S (1066MHz)
- Power and Temperature Monitor to keep tracking power consumption and the temperature of FPGA and hotspots such as power modules

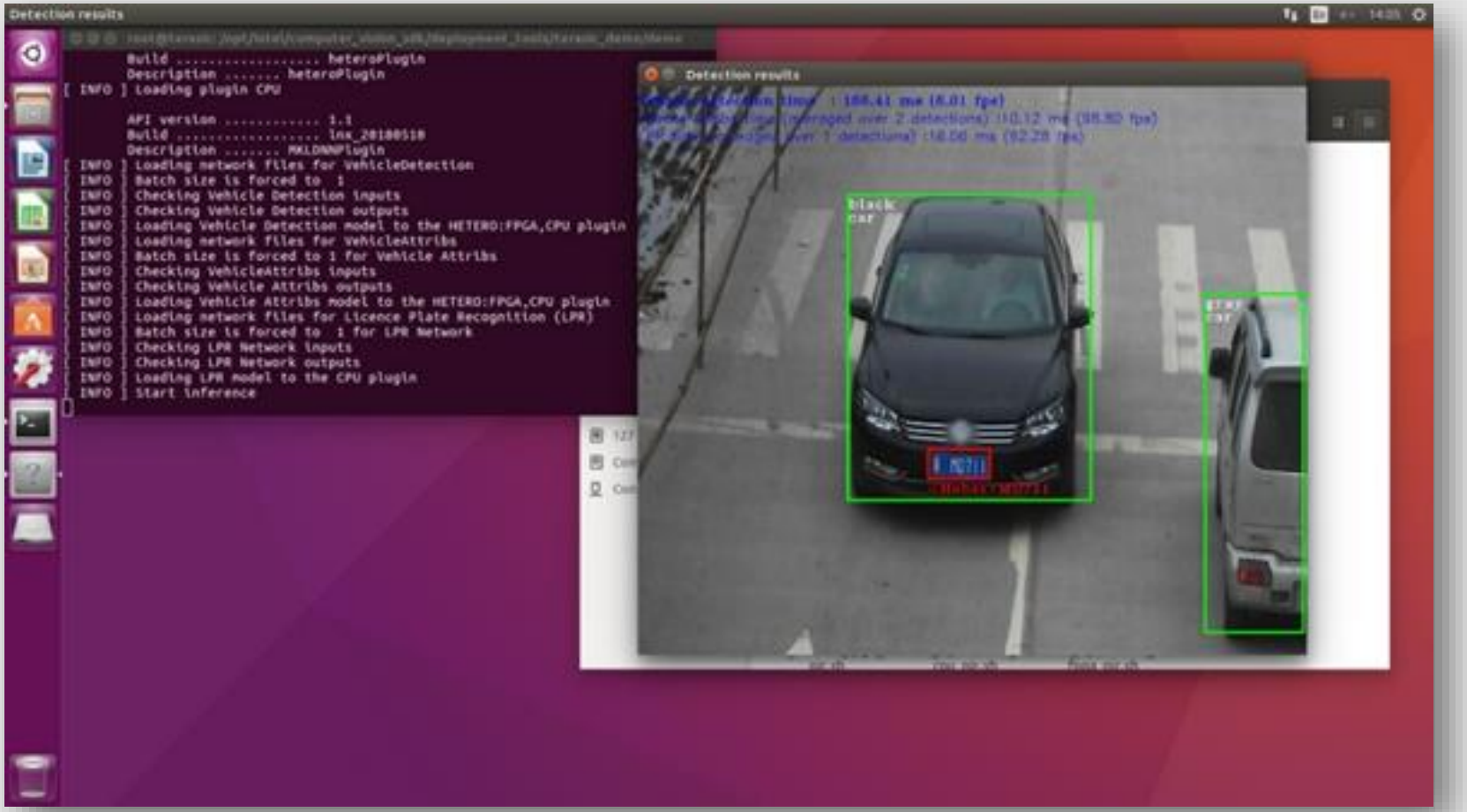
# Performance between FLIK and CPU

## OpenVINO Benchmark Application Demo

| | Arria 10 FPGA | 6th Gen i7 series CPU |
|---|---|---|
| Latency | 2.00 ms | 6.82 ms |
| Throughput | 647.23 FPS | 243.09 FPS |

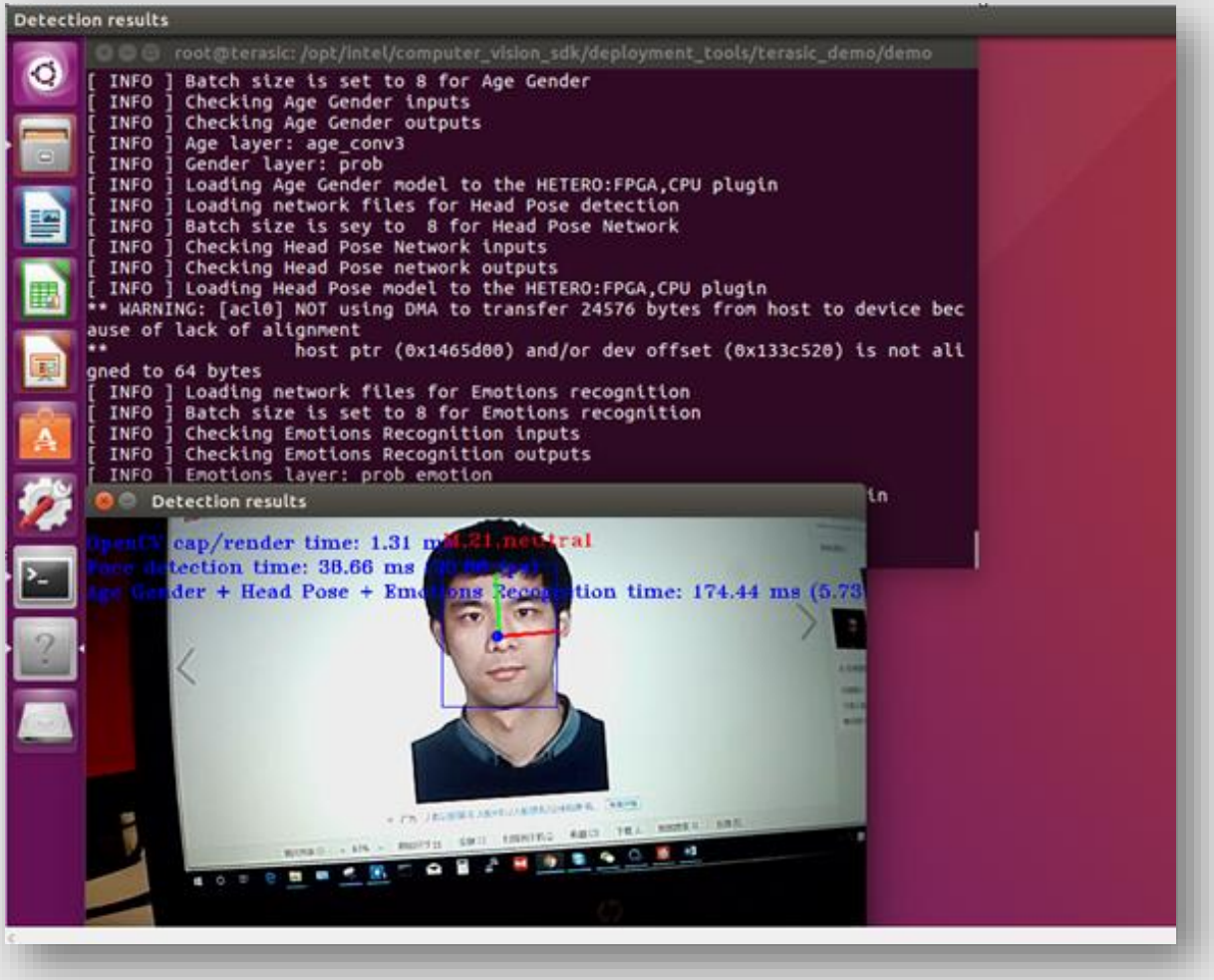
# 2. Demos for OpenVINO™ ToolKit on FLIK (1/3)

- Security Barrier – This demo can recognize the car, car license number and its location by using the three models.



# 2. OpenVINO™ ToolKit Demos on FLIK (2/3)

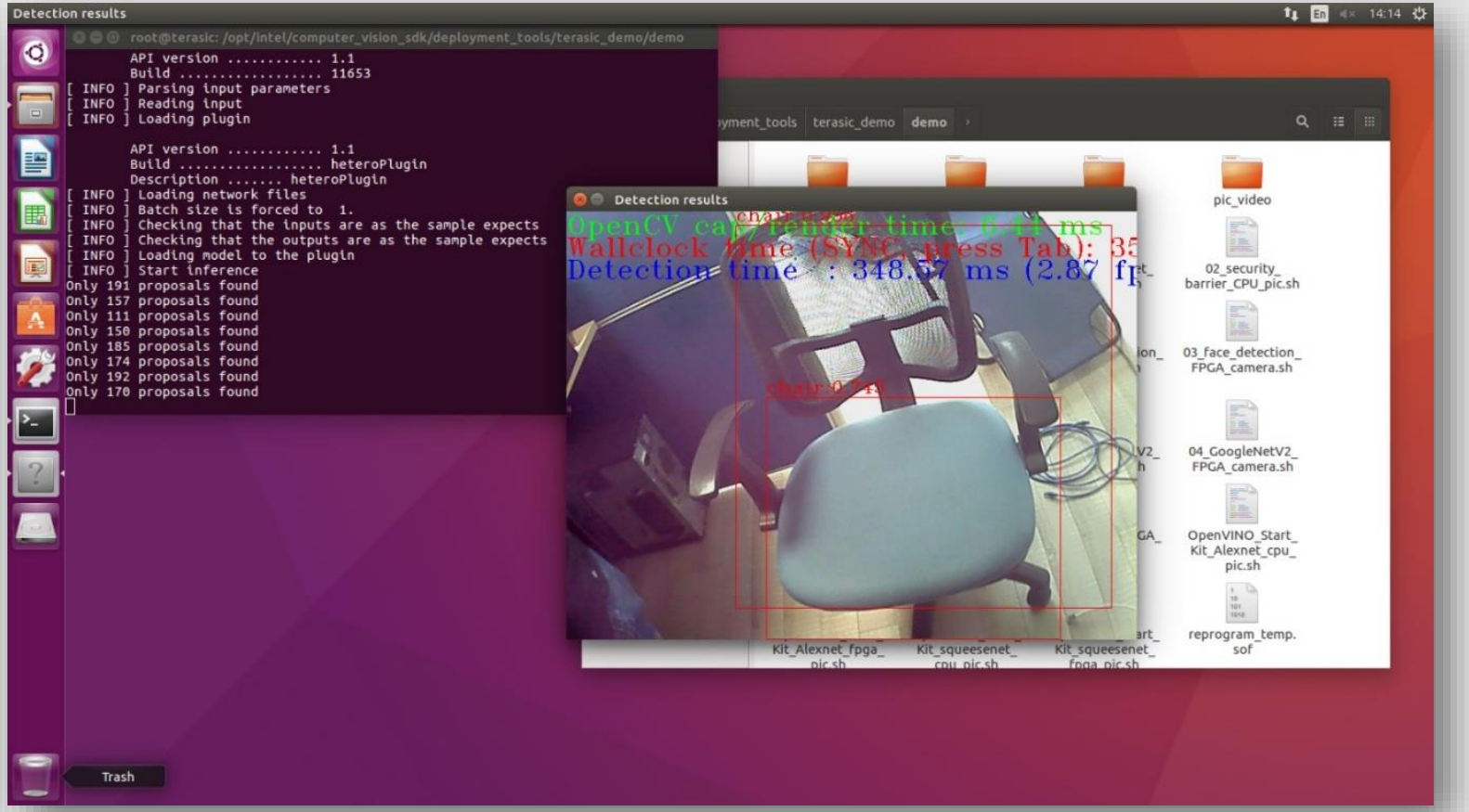
- Face detection - This demo used four models and it can recognize human face position in the figure. It can also judge the human gender, age, expression, and head gesture according to the human face.



# 2. OpenVINO™ ToolKit Demos on FLIK (3/3)

- GoogleNet – This demo can recognize the target object by using GoogleNetV2, the object tags are shown in figure below:

```
1  aeroplane
2  bicycle
3  bird
4  boat
5  bottle
6  bus
7  car
8  cat
9  chair
10 cow
11 diningtable
12 dog
13 horse
14 motorbike
15 person
16 pottedplant
17 sheep
18 sofa
19 train
20 tvmonitor
```



# 3. OPAE Enablement with Examples for Intel Acceleration Stack

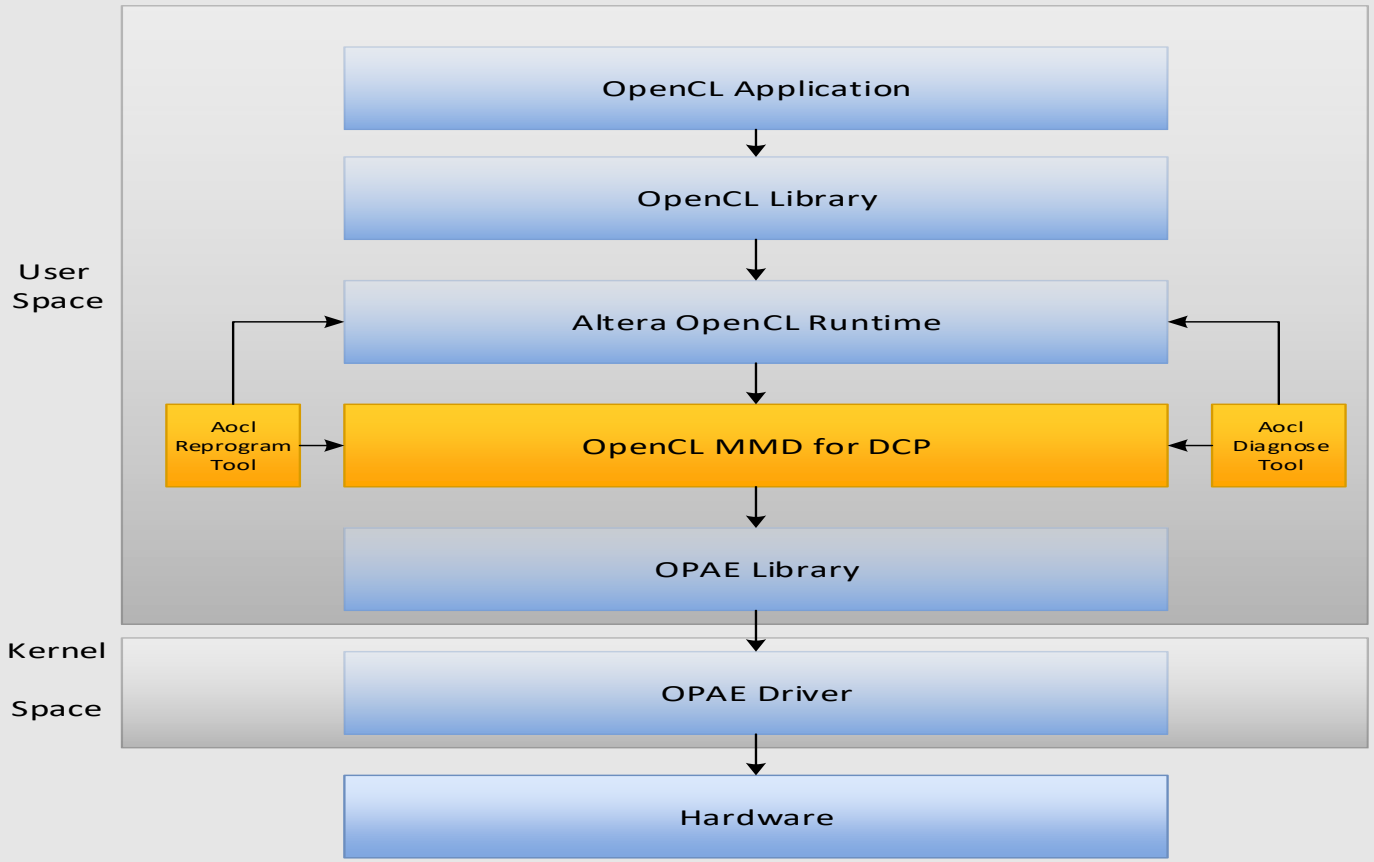
- The direct memory access (DMA) AFU test transfers data from host memory to FPGA-attached local memory (**dma_afu)**
- **hello_intr_afu** demonstrates the user interrupt feature in ASE
- **hello_mem_afu** demonstrates an AFU that builds a simple state machine to access memory
- **nlb_mode_0_stp** is a CCI-P system demonstrating the memory copy test.
- **nlb_mode_3** is a native loopback (NLB) test implements a loopback from TX to RX

# 4. OpenCL for Windows 10

One of the expectations for FLIK is for application developers to use SDK APIs and libraries to communicate with the FPGA OpenCL based IP.

Additional SDK can be built on top of OpenCL for FPGA development. For examples,

- Deep Learning SDK implementing CNNs,
- Intel's Computer Vision SDK (CVSDK),
- Microsoft's Machine Learning (ML) SDK.



# 5. FLIK’s benchmark for Adobe Encoder

Terasic is working closely with IBEX. The goal is to productize Adobe Premiere Pro Plugin on FLIK.

## Current Performance:

The Adobe Premiere Pro plugin can accelerate different codecs in the FPGA. This IP gives over 3X performance improvement when encoding video with FPGA (FLIK) vs a 12 core Xeon CPU.

# The End