



Adaptive
Computing
Partner

SELECT



LogicTronix

Offering Vision-AI Solutions on Edge!

**FPGA Design + Machine Learning
Acceleration Company**

www.LogicTronix.com

LogicTronix

We are

✓ FPGA Design & Machine Learning Acceleration Company

Expertise (Design Service) & IP Cores:

- ❖ 10+ Years of experience and expertise in Xilinx FPGA families, for sensor data acquisition, embedded product design with 7 series & MPSOC FPGAs and Versal for high end applications.
- ❖ FPGA based development for Computer Vision, Sensor Fusion, Embedded Solutions, etc.

- ❖ Machine Learning Acceleration with FPGA for Surveillance/Security, Automotive (ADAS), Industrial, Medical and Smart City Applications.
- ❖ Offering IP Cores in Machine Learning Computer Vision, Cryptographic-hashing, etc.

Solutions:

- ❖ Smart City and Smart Parking Solutions: **TVAS and ANPR Solution** (AI in edge solution with FPGA)
- ❖ Sensor Fusion + Machine Learning Acceleration with FPGAs for Automotive Application
- ❖ Event Camera based Machine Learning for Smart Traffic System and Surveillance.

Mission and Vision:

❖ Mission:

- Accelerating Real World Vision Solutions with AI and Machine Learning.
- Offering Automotive Grade of Sensor Fusion and ML Solution (ADAS 2.0).
- Providing optimized and user-friendly **Vision Edge AI Solutions**.

❖ Vision:

- Being the top-notch “**Vision Edge AI - Company**”

We are:

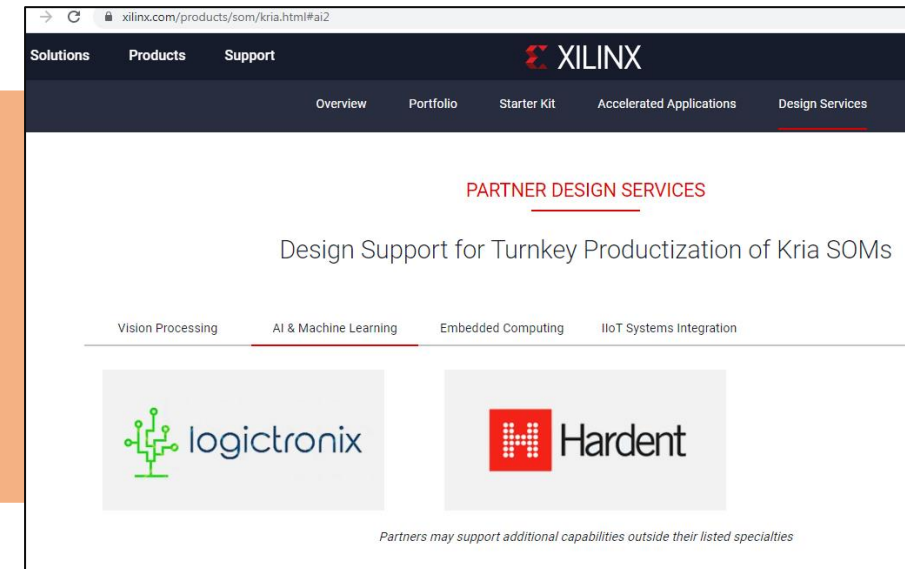
❖ AMD-Xilinx ACP Partner



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❖ Design Service Partner for
Machine Learning for Xilinx Kria SoM FPGAs



We have:

❖ Xilinx Certified Engineering Teams with expertise on:

- ✓ FPGA Design with Xilinx Tools (RTL and IP Designs)
- ✓ Embedded Linux Application Development
- ✓ Machine Learning Acceleration with AI/ML Tools

❖ Availability of Xilinx based Resources , Hardware's (FPGAs) and Tools:

- ✓ Number of Xilinx based FPGA devices
- ✓ Number of Xilinx Licensed Tools
- ✓ Analyzers, Measurement tools and Instruments

❖ Xilinx Early Access and Support

- ✓ As a Xilinx Partner we have early access to Xilinx upcoming releases, upcoming tools, platforms and methodologies. These resources gives us advantage while selecting proper platform and solution for customers.

LogicTronix Automotive Experience:

Some of Automotive Experience of LogicTronix:

1. Worked on Multi Camera , LiDAR and Ultrasonic sensor integration and fusion in Xilinx FPGA for ADAS.
2. ECU test system development with Xilinx MPSoC FPGA.
3. Work experience with GMSL2, FPD link III , Automotive Ethernet and few more Automotive interfaces.
4. LogicTronix Offers AXI CAN (FD + Classical) IP Core for Automotive Application.
5. LogicTronix Offers AXI DSI3 IP core for Automotive application.
6. And, few more IP Cores and Design experiences.

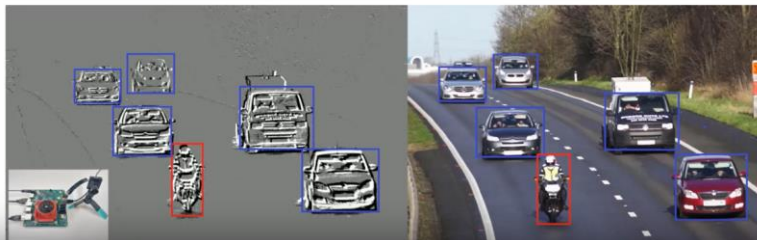
LogicTronix Solutions:

1. ANPR - License Plate Recognition System
2. TVAS - Traffic Video Analytics System
3. Passenger Counting Solution
4. AI Solution for Construction sites
5. Traffic Analysis with Event Based Vision and Machine Learning



Kria-Prophesee-Event-VitisAI

Running event based Yolov7 model in Kria KV260



PPE [Safety Gear Detection] with Xilinx Kria SoM (KV260) & Machine Learning

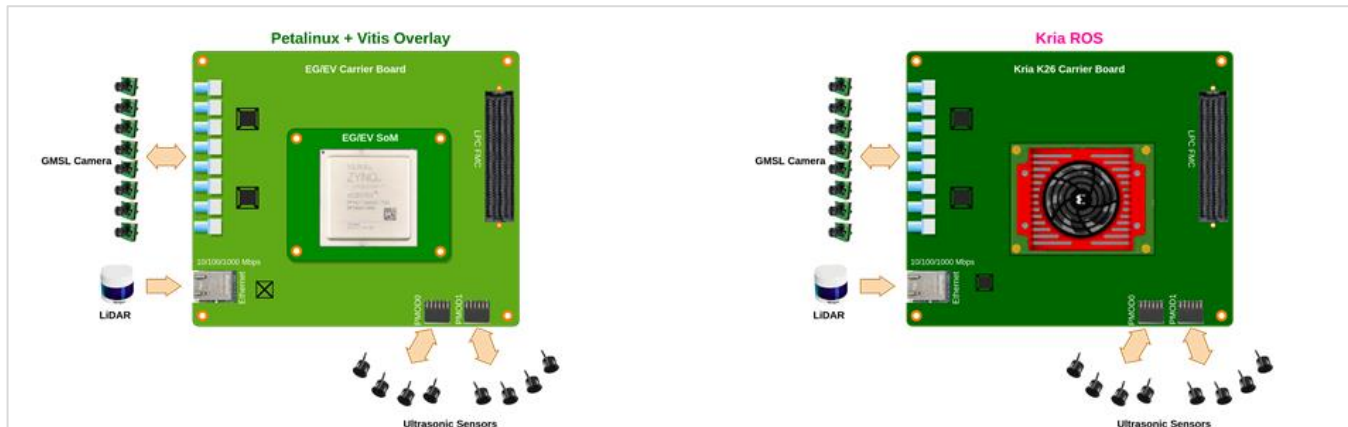
-Helmet, Shoes, Vest, Gloves, etc



LogicTronix Solutions:

- 6. MultiChannel + MultiModel ML in Xilinx Platform
- 7. Retail Analytics Solution for Shopping Marts
- 8. ADAS Sensor Fusion – System Development
- 9. Thermal Vision Solution with AI feature
- 10. High Speed Object Counting for Industrial Application

ADAS Sensor Fusion Platform






ANPR & 8-Channel + 8-ML Model Kria App Installation and Demo Guide for Kria-KV260



DPU Overlay with 8 Channel Pipeline-Platform

8 Channel Video Streams

GUI Over SSH

ANPR along with ML Model + File Source - Selection with GUI

4K Monitor - HDMI/DP

Kria-App developed by: LogicTronix Technologies
 Design Service Partner for Xilinx Kria SoM for AI/ML
 For support and inquiry on Kria SoM: info@logictronix.com



ANPR & 8-Channel + 8-ML Model Demo -Reference Manual [LRM032]


LogicTronix-Xilinx Webinar on Kria-AI/ML

pages.xilinx.com/EN-WB-2022-03-03-Logictronix_LP-Registration.html

AMD
XILINX

Kria SOM - KV260 Development and Machine Learning Acceleration

Webinar



Summary

Presented in collaboration with Xilinx Kria SOM partner Logictronix, this webinar will focus on the methodologies about Machine Learning Acceleration, developing ML based solution on Xilinx Kria KV260 Vision AI Starter Kit, creating custom Accelerated Applications for Kria SOMs. During the webinar, we will also discuss how to use Petalinux or Yocto layers for creating customization on real world solutions and creating Vitis Video Analytics SDK based pipelines for ML inference.

WATCH ON-DEMAND

bit.ly/KriaSoM_Webinar

LogicTronix's Machine Vision solution with Xilinx FPGAs

❖ Machine Vision with High Speed Camera and Machine Learning

- Targeted to industrial customers
- For LVDS Stream Processing with FPGA is prototyped with Xilinx 7 Series FPGA then we will migrate it into Kria SoM.



Processing High-Speed Camera Stream in FPGA [LVDS into FPGA]




LogicTronix
FPGA Design and ML Acceleration Company
Email: info@logictronix.com



Our Reference Design on LVDS-FPGA Processing

- FPGA SoM Based LVDS-FPGA Processing Design
- Features of our design
 - 4K@60 FPS processing capabilities,
 - Vivado 2018.1 and above,
 - References design only consumes 30% of chip area of Kintex-7
 - Enough spaces left for extra high-speed processing with Vivado
 - AI inferencing capabilities,
 - Can produce preferable output stream (HDMI, DP, MIPI, 10G Ethernet)
 - Design and Technical Support.



High Speed Camera-FPGA: Applications

The FPGA processing of high-speed camera has wide application in several fields.

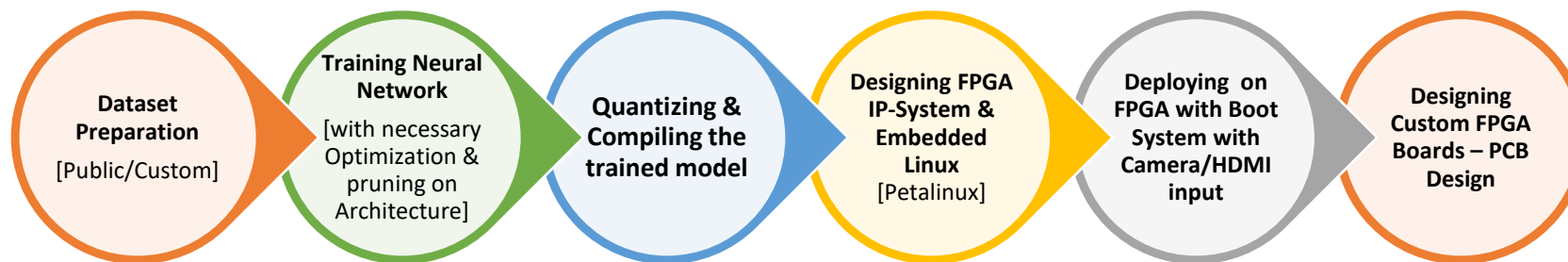
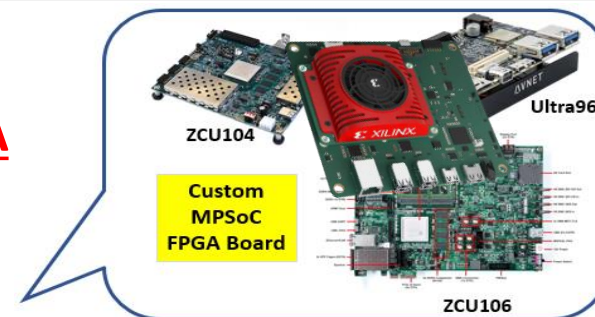
- ❖ Industrial Inspection
- ❖ Machine Vision
- ❖ Bio-Medical Imaging
- ❖ Defense and Aerospace
- ❖ Surveillance
- ❖ Automotive Driving
- ❖ Video Conferencing
- ❖ Commercial film production
- ❖ Television and Studio Production



ML Acceleration Flow: for our Edge based AI-Solutions



Machine Learning Acceleration flow on FPGA



ANPR
Solution-Demo on
Xilinx Kria-KV260 / MPSoC FPGA



Solution Developed by
LogicTronix

Accelerating Yolo V2 for
Object detection on Image on VCU1252



Multi-Stream + Multi-Model based ML Inferencing

-Running Multiple Neural Network model on multiple streams of video on single device-Xilinx Kria KV260



Kria-NLP SmartVision Demo

Keyword based ML Model Switching on Xilinx Kria SoM-KV260 Board **30 FPS**



Kria KV260- Defect Detection Demo

Running Defect-Detect application with AR0144-Sensor/USB-Camera-Stream



Yolo-V3-Tiny for Object Detection with DPU-DNNDK 3.0 [AI SDK]
-Demo with Ultra96 FPGA



LogicTronix IP Portfolio on

1. HFT
2. Crypto Hashing
3. Machine Learning
4. Computer Vision



LogicTronix IP Portfolio

Offering 25+ IP Cores for Customers

Computer Vision

1. Non-Uniform Correction (NUC)
2. Auto Contrast Enhancement (ACE)
3. Bayer to RGB (ByrRGB)
4. Thermal Color Profile (ThCP)
5. Alpha Blending (ABLND)
6. Edge Enhancement (EDGEN)
7. Gamma Correction (GMC)
8. Sharp Enhancement (SEN)

High Frequency Trading (HFT)

1. OrderBook
2. Protocol Engine IP Cores

Crypto-hashing

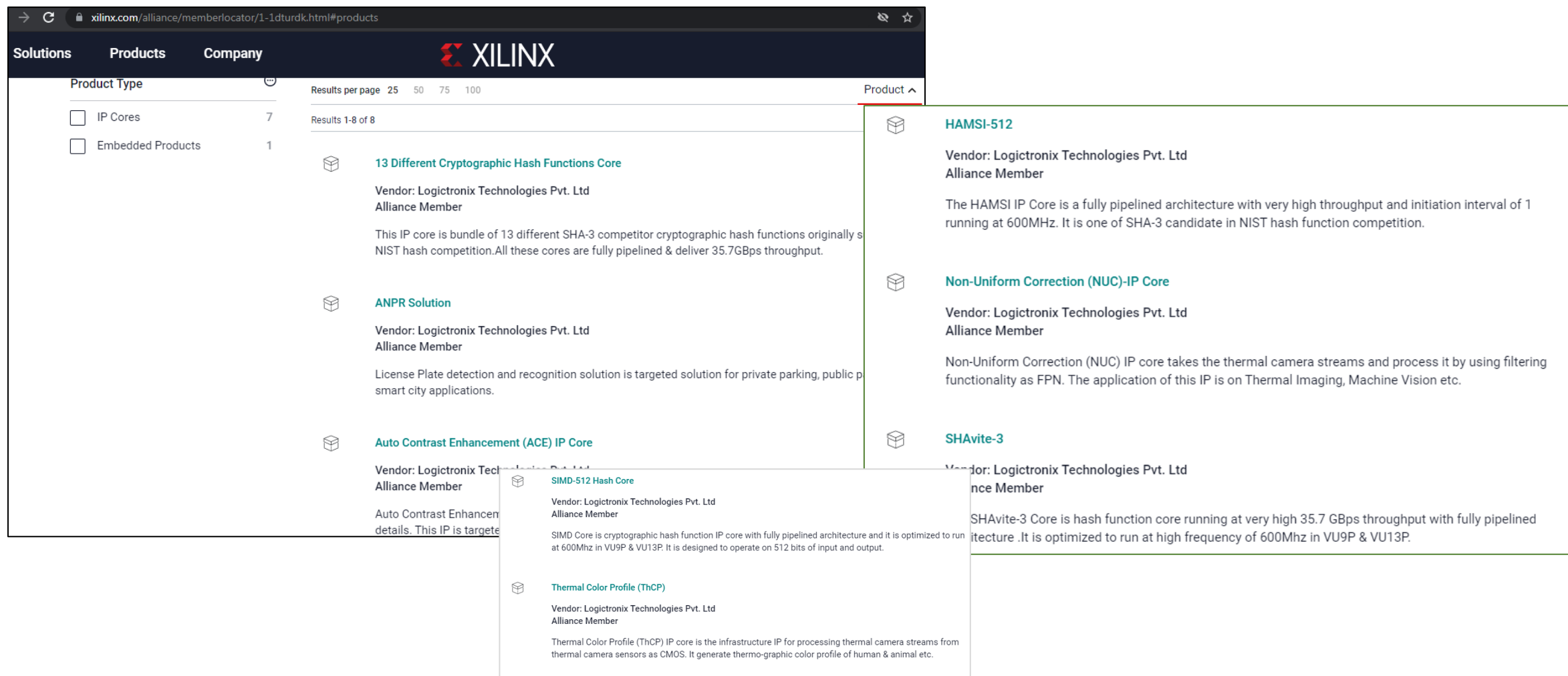
1. 13 Crypto Hash Function Cores
2. SIMD-512
3. HAMSI-512
4. SHAvite-3

LogicTronix IP Core- Features

- Highly Resource and Performance Optimized
- Verified and Hardware-FPGA Tested
- Cost Optimized

For IP Cores: ip-sales@logictronix.com

Our IP Portfolio: 25+ IP cores available for customers



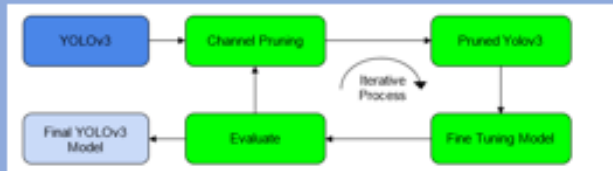
The screenshot shows the Xilinx Alliance member locator interface. The main navigation includes Solutions, Products, and Company. The XILINX logo is prominently displayed. A sidebar on the left allows filtering by Product Type, with 'IP Cores' selected (7 results) and 'Embedded Products' (1 result). The main content area displays a list of IP cores, with detailed descriptions for the following:

- 13 Different Cryptographic Hash Functions Core**
 Vendor: Logictronix Technologies Pvt. Ltd Alliance Member
 This IP core is bundle of 13 different SHA-3 competitor cryptographic hash functions originally s NIST hash competition.All these cores are fully pipelined & deliver 35.7GBps throughput.
- ANPR Solution**
 Vendor: Logictronix Technologies Pvt. Ltd Alliance Member
 License Plate detection and recognition solution is targeted solution for private parking, public p smart city applications.
- Auto Contrast Enhancement (ACE) IP Core**
 Vendor: Logictronix Tech Alliance Member
 Auto Contrast Enhancem details. This IP is targete
- SIMD-512 Hash Core**
 Vendor: Logictronix Technologies Pvt. Ltd Alliance Member
 SIMD Core is cryptographic hash function IP core with fully pipelined architecture and it is optimized to run at 600Mhz in VU9P & VU13P. It is designed to operate on 512 bits of input and output.
- Thermal Color Profile (ThCP)**
 Vendor: Logictronix Technologies Pvt. Ltd Alliance Member
 Thermal Color Profile (ThCP) IP core is the infrastructure IP for processing thermal camera streams from thermal camera sensors as CMOS. It generate thermo-graphic color profile of human & animal etc.
- HAMSI-512**
 Vendor: Logictronix Technologies Pvt. Ltd Alliance Member
 The HAMSI IP Core is a fully pipelined architecture with very high throughput and initiation interval of 1 running at 600MHz. It is one of SHA-3 candidate in NIST hash function competition.
- Non-Uniform Correction (NUC)-IP Core**
 Vendor: Logictronix Technologies Pvt. Ltd Alliance Member
 Non-Uniform Correction (NUC) IP core takes the thermal camera streams and process it by using filtering functionality as FPN. The application of this IP is on Thermal Imaging, Machine Vision etc.
- SHAvite-3**
 Vendor: Logictronix Technologies Pvt. Ltd Alliance Member
 SHAvite-3 Core is hash function core running at very high 35.7 GBps throughput with fully pipelined itecture .It is optimized to run at high frequency of 600Mhz in VU9P & VU13P.

Our White Paper and Resources

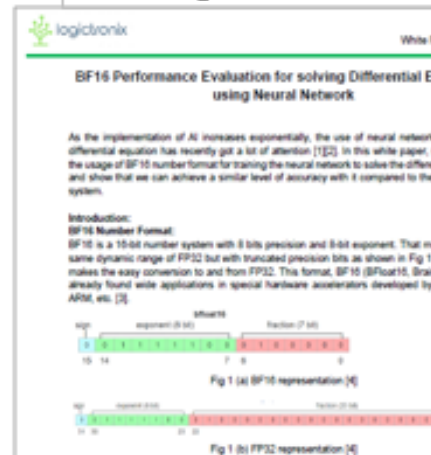
Some of Our White-Paper's

WPL053 on "Pruning Neural Network models



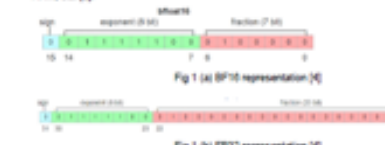
| Model | Global threshold (Pruning ratio) | Input Size | GFL | BDD Model Original YOLOv3 | 512*512 | 99 | 42.96 | 245.5 MB |
|--|----------------------------------|------------|------|--|---------|---------|-------|----------|
| License Plate Original YOLOv3 | - | 512*512 | 99.1 | - | 640*640 | 154.687 | 45.97 | |
| | | 640*640 | 154 | | 960*960 | 348.086 | 42.43 | |
| | | 960*960 | 347 | | | | | |
| License Plate Pruned Model 1st Iteration | 0.5 | 512*512 | 25.1 | BDD Pruned Model 1st Iteration | 512*512 | 39.464 | 42.83 | 112.5 MB |
| | | 640*640 | 39.1 | | 640*640 | 61.662 | 46.61 | |
| | | 960*960 | 88.1 | | 960*960 | 138.739 | 44.93 | |
| License Plate Pruned Model 2nd Iteration | 0.5 | 512*512 | 11.1 | Face+Person Original YOLOv3 | 512*512 | 96.912 | 77.61 | 246.3 |
| | | 640*640 | 17.1 | | 640*640 | 154.549 | 76.96 | |
| | | 960*960 | 39.1 | | 960*960 | 347.736 | 62.26 | |
| License Plate Pruned Model 2nd Iteration | 0.5 | 512*512 | 11.1 | Face+Person Pruned Model 1st Iteration | 512*512 | 40.801 | 70.12 | 113.8 |
| | | 640*640 | 17.1 | | 640*640 | 62.502 | 74.93 | |
| | | 960*960 | 39.1 | | 960*960 | 140.629 | 63.88 | |
| License Plate Pruned Model 2nd Iteration | 0.5 | 512*512 | 11.1 | Face+Person Pruned Model 2nd Iteration | 512*512 | 58.294 | 76.26 | 50.1 |
| | | 640*640 | 17.1 | | 640*640 | 28.522 | 73.11 | |
| | | 960*960 | 39.1 | | 960*960 | 64.174 | 90.16 | |

WPL061: BF16 Performance Evaluation for solving Differential Equations using Neural Network



As the implementation of AI increases exponentially, the use of neural networks to solve differential equations has recently got a lot of attention [1][2]. In this white paper, we show the usage of BF16 number format for training the neural network to solve the differential equations and show that we can achieve a similar level of accuracy with it compared to the FP32 system.

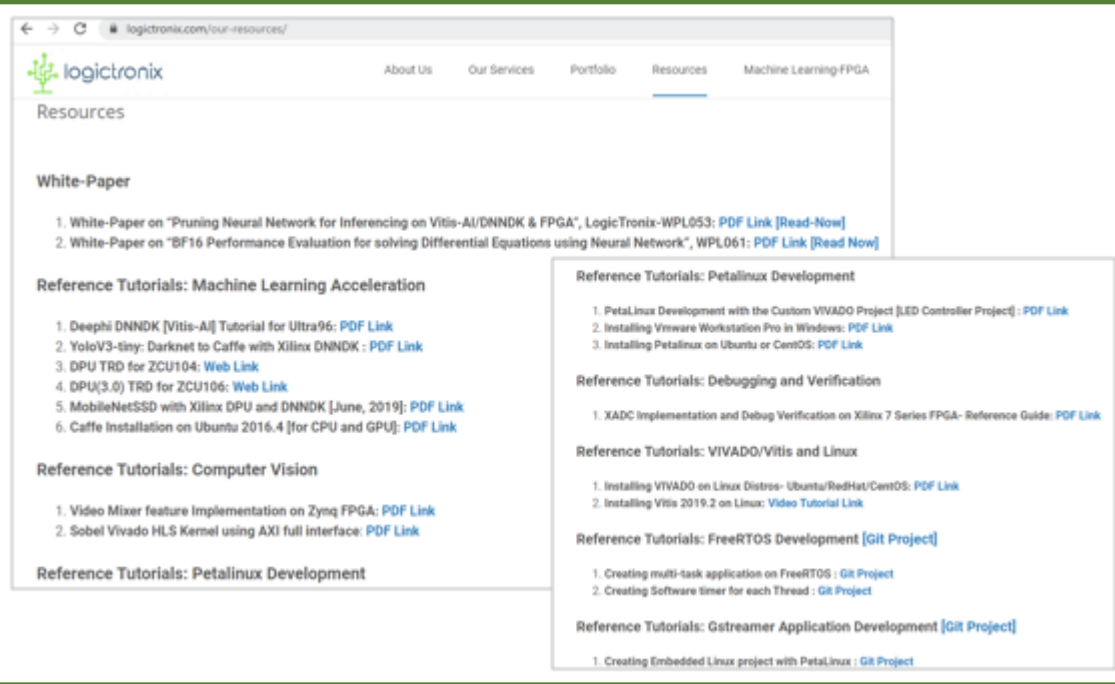
Introduction:
BF16 is a 16-bit number system with 8 bits precision and 8-bit exponent. That makes the same dynamic range of FP32 but with truncated precision bits as shown in Fig 1 (a) makes the easy conversion to and from FP32. This format, BF16 (Brain Floating Point), has already found wide applications in special hardware accelerators developed by Google, etc. [3].



Harnessing GPU Tensor Cores for Fast FP16 White Paper-WPL063

Introduction:

In order to test the performance of FP16 compared to FP32 and FP64 in the area of solving linear equations, we experimented with different combinations with precision. The test was performed in NVIDIA RTX 2070 Super GPU which consists of 320 tensor cores. One of our main targets was to get compare the performance accuracy of mixed precision including fp64 and without including fp64. For that we used mixed precision library available in magma where FP-16 TC (Tensor Core Version) was used together with fp64 arithmetic. They used fp64 for solving linear and fp64 for solving the residual in each step. We used the



Resources

White-Paper

- White-Paper on "Pruning Neural Network for Inference on Vitis-AI/DNNDK & FPGA", LogicTronix-WPL053: [PDF Link \[Read-Now\]](#)
- White-Paper on "BF16 Performance Evaluation for solving Differential Equations using Neural Network", WPL061: [PDF Link \[Read Now\]](#)

Reference Tutorials: Machine Learning Acceleration

- DeepHi DNNDK [Vitis-AI] Tutorial for Ultra96: [PDF Link](#)
- YoloV3-tiny: Darknet to Caffe with Xilinx DNNDK : [PDF Link](#)
- DPU TRD for ZCU104: [Web Link](#)
- DPU(3.0) TRD for ZCU106: [Web Link](#)
- MobileNetSSD with Xilinx DPU and DNNDK [June, 2019]: [PDF Link](#)
- Caffe Installation on Ubuntu 2016.4 [for CPU and GPU]: [PDF Link](#)

Reference Tutorials: Petalinux Development

- PetaLinux Development with the Custom VIVADO Project [LED Controller Project]: [PDF Link](#)
- Installing Vmware Workstation Pro in Windows: [PDF Link](#)
- Installing Petalinux on Ubuntu or CentOS: [PDF Link](#)

Reference Tutorials: Debugging and Verification

- XADC Implementation and Debug Verification on Xilinx 7 Series FPGA- Reference Guide: [PDF Link](#)

Reference Tutorials: VIVADO/Vitis and Linux

- Installing VIVADO on Linux Distros- Ubuntu/RedHat/CentOS: [PDF Link](#)
- Installing Vitis 2019.2 on Linux: [Video Tutorial Link](#)

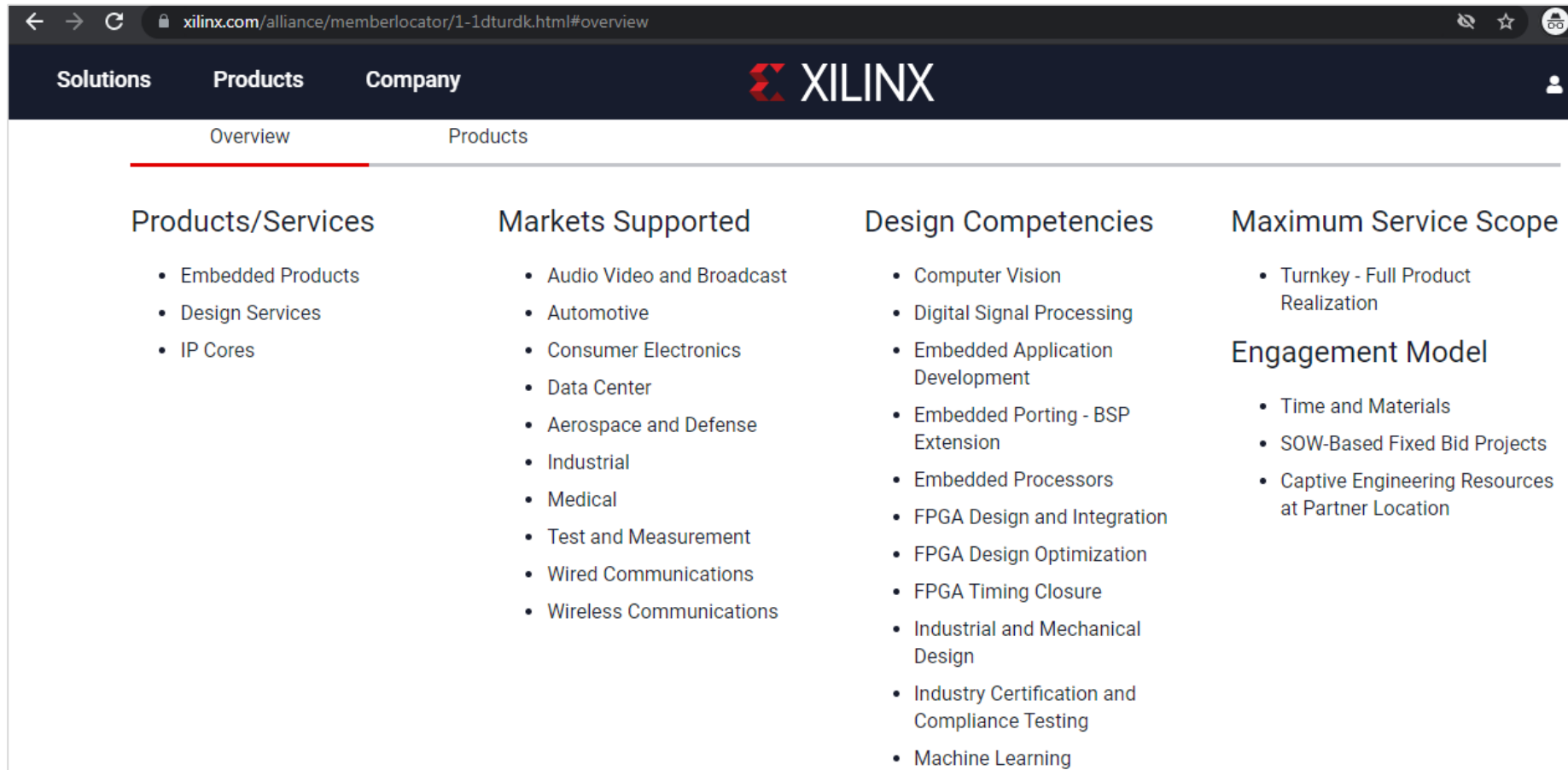
Reference Tutorials: FreeRTOS Development [Git Project]

- Creating multi-task application on FreeRTOS : [Git Project](#)
- Creating Software timer for each Thread : [Git Project](#)

Reference Tutorials: Gstreamer Application Development [Git Project]

- Creating Embedded Linux project with PetaLinux : [Git Project](#)

Our Design Services:



The screenshot shows a web browser window with the URL [xilinx.com/alliance/memberlocator/1-1dturdk.html#overview](https://www.xilinx.com/alliance/memberlocator/1-1dturdk.html#overview). The page features a dark navigation bar with 'Solutions', 'Products', and 'Company' menus, and the XILINX logo. Below the navigation, there are two tabs: 'Overview' (selected) and 'Products'. The main content area is divided into four columns:

| Products/Services | Markets Supported | Design Competencies | Maximum Service Scope |
|--|--|--|--|
| <ul style="list-style-type: none">• Embedded Products• Design Services• IP Cores | <ul style="list-style-type: none">• Audio Video and Broadcast• Automotive• Consumer Electronics• Data Center• Aerospace and Defense• Industrial• Medical• Test and Measurement• Wired Communications• Wireless Communications | <ul style="list-style-type: none">• Computer Vision• Digital Signal Processing• Embedded Application Development• Embedded Porting - BSP Extension• Embedded Processors• FPGA Design and Integration• FPGA Design Optimization• FPGA Timing Closure• Industrial and Mechanical Design• Industry Certification and Compliance Testing• Machine Learning | <ul style="list-style-type: none">• Turnkey - Full Product Realization <h3>Engagement Model</h3> <ul style="list-style-type: none">• Time and Materials• SOW-Based Fixed Bid Projects• Captive Engineering Resources at Partner Location |

Thank you!

For any queries, please write us at: info@logictronix.com