

An aerial night view of a city, likely Hong Kong, with a dense grid of buildings. The streets are illuminated with bright red light trails, creating a striking contrast against the dark sky and the grey silhouettes of the urban landscape. The perspective is from a high angle, looking down on the city's intricate layout.

Your Innovation Powered by Xilinx

Victor Peng | CEO

Developers Like You





Strategy



**Accelerate Core
Markets**



**Data Center
First**



**Drive Adaptive
Computing**

Major Growth Drivers



Data Center



5G



Automotive

Major Growth Drivers



Data Center



5G



Automotive



SAMSUNG

Wonil Roh, Ph.D.

VP, Head of Product Strategy, Networks Business,
Samsung Electronics

5G is Being Deployed Faster than Many Expected

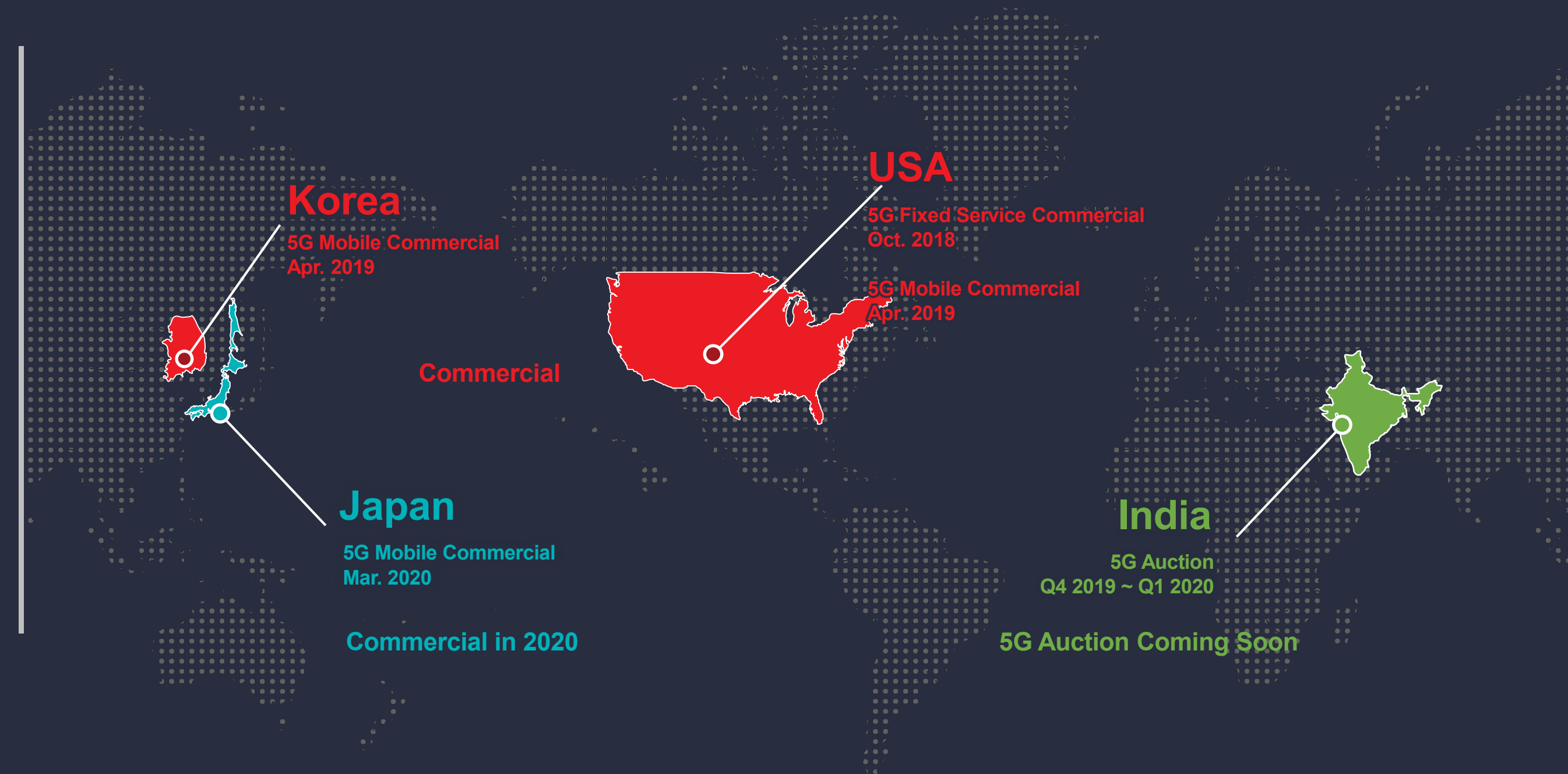


56 in **32**
Operators Countries

**Have Activated One or More 5G Sites
within Their Live Commercial Networks**

(Source : Evolution from LTE to 5G, GSA, as of Aug. 2019)

USA & Korea Leading the Pack



USA, a Pioneer in 5G

Oct. 2018

**5G Fixed Broadband
Commercial**

mmWave

Apr. 2019

**5G Mobile
Commercial**

mmWave

Jun. 2019

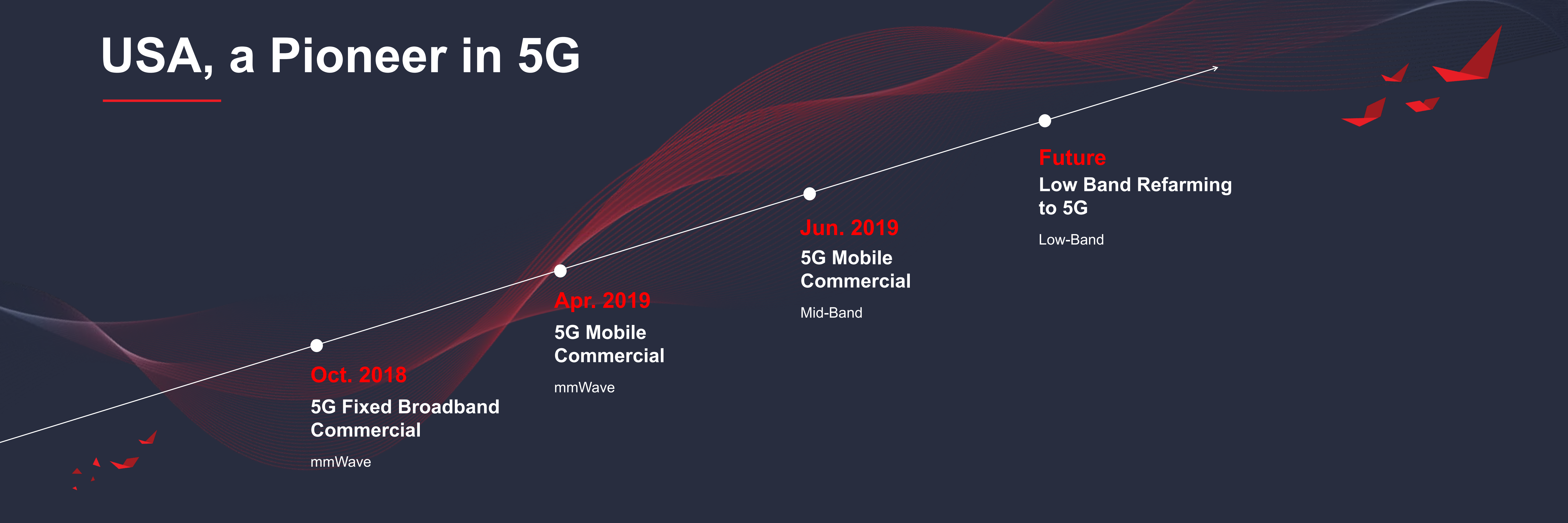
**5G Mobile
Commercial**

Mid-Band

Future

**Low Band Refarming
to 5G**

Low-Band



Samsung, Leading USA into 5G Commercialization

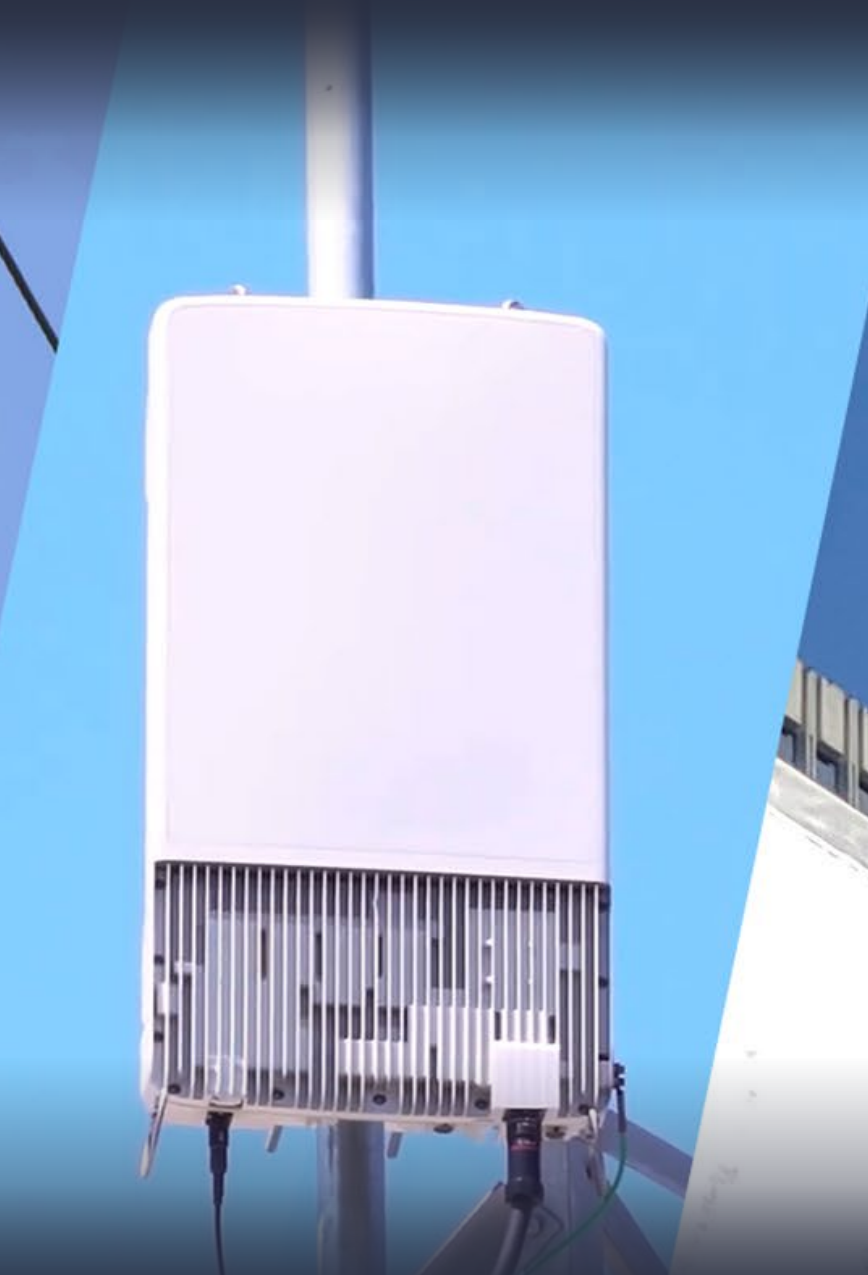
Through Cooperation with Three USA Carriers



mmWave



mmWave

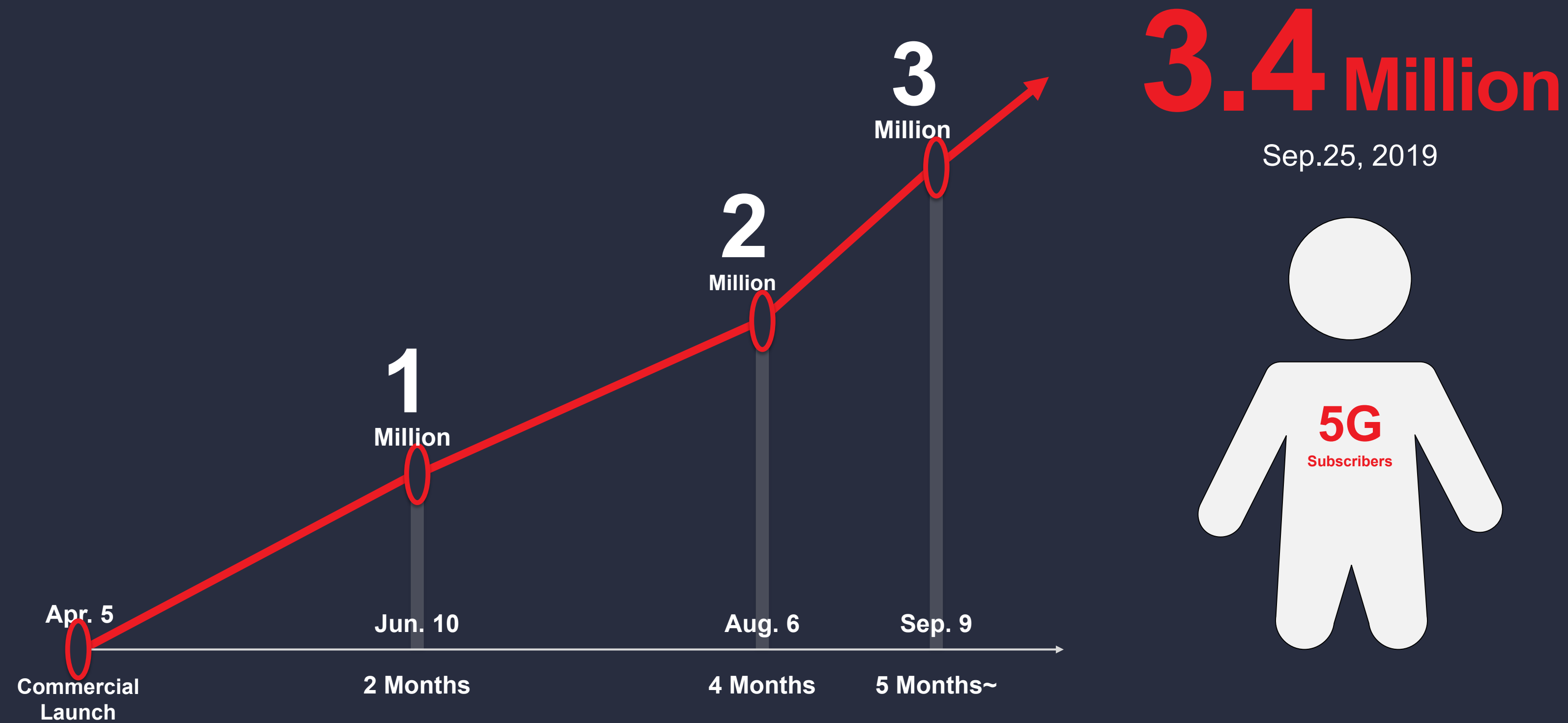


Mid-Band



mmWave

Korea, Skyrocketing 5G Subscribers



(Source : Ministry of Science and ICT, Korea)

Korea, The World's Most Extensive 5G Rollout



(Source : Ministry of Science and ICT, Korea, Samsung Market Intelligence)

Samsung, Largest Share of 5G Network Solutions in Korea

By Meeting Customers Requirements and Speedy Delivery of 5G RAN & Core



5G Radios



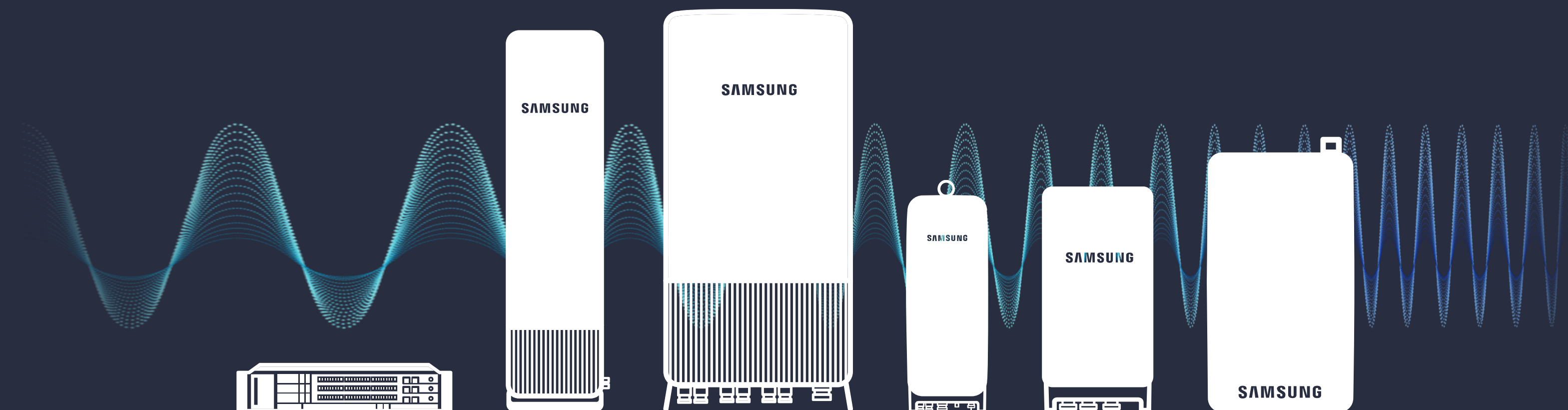
5G Core

5G Collaboration to Success

For New Bands, New Types of Products

Low/Mid-band

mmWave



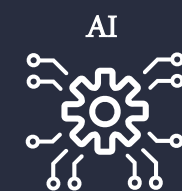
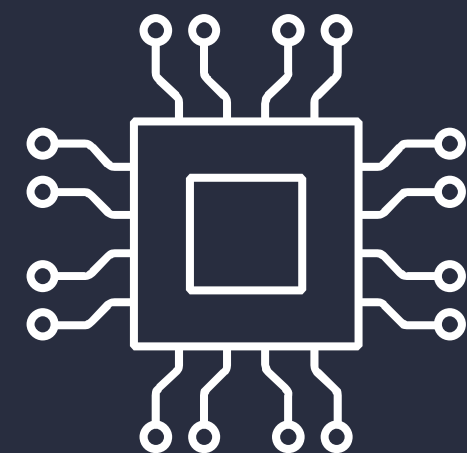
FPGA Commercial Development Since September 2017

A State-of-the-Art 5G Through Close Collaboration

Future Cooperation with Versal ACAP

 XILINX

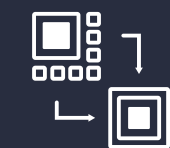
State-of-the-art Xilinx Products



Adaptable
Intelligent Engine



Low Latency &
High Throughput



Highly
Integrated SoC

SAMSUNG

Best-in-class 5G Products



Compact & Light



High Performance

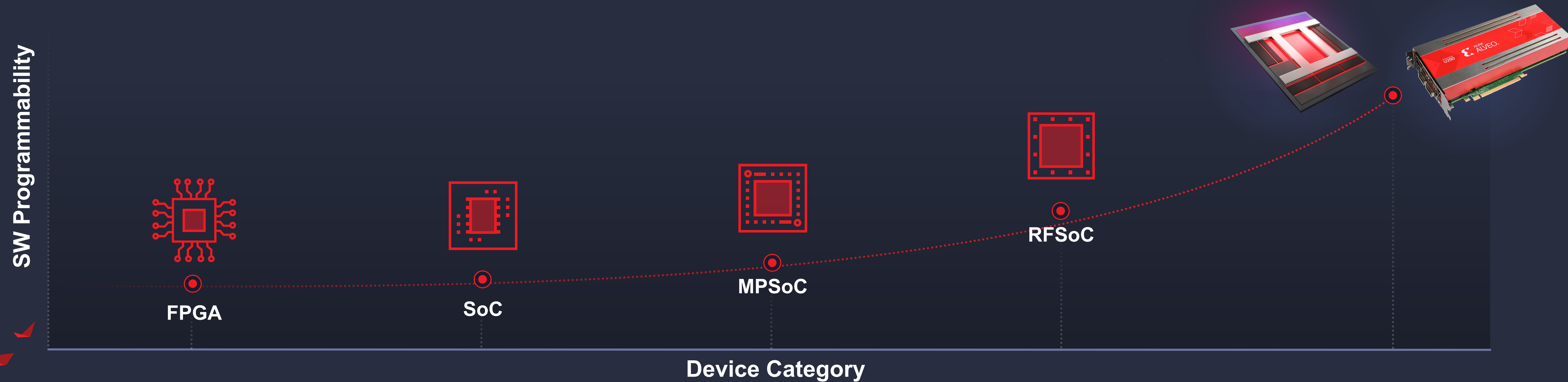


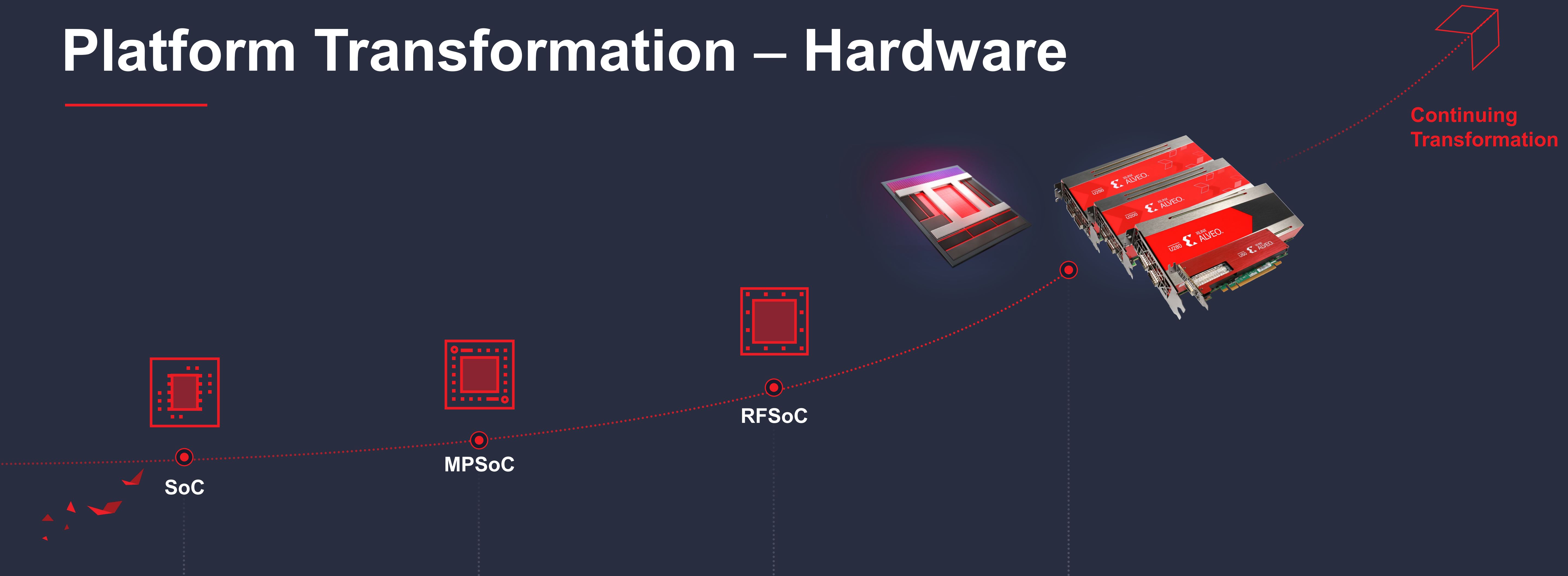
Low Power

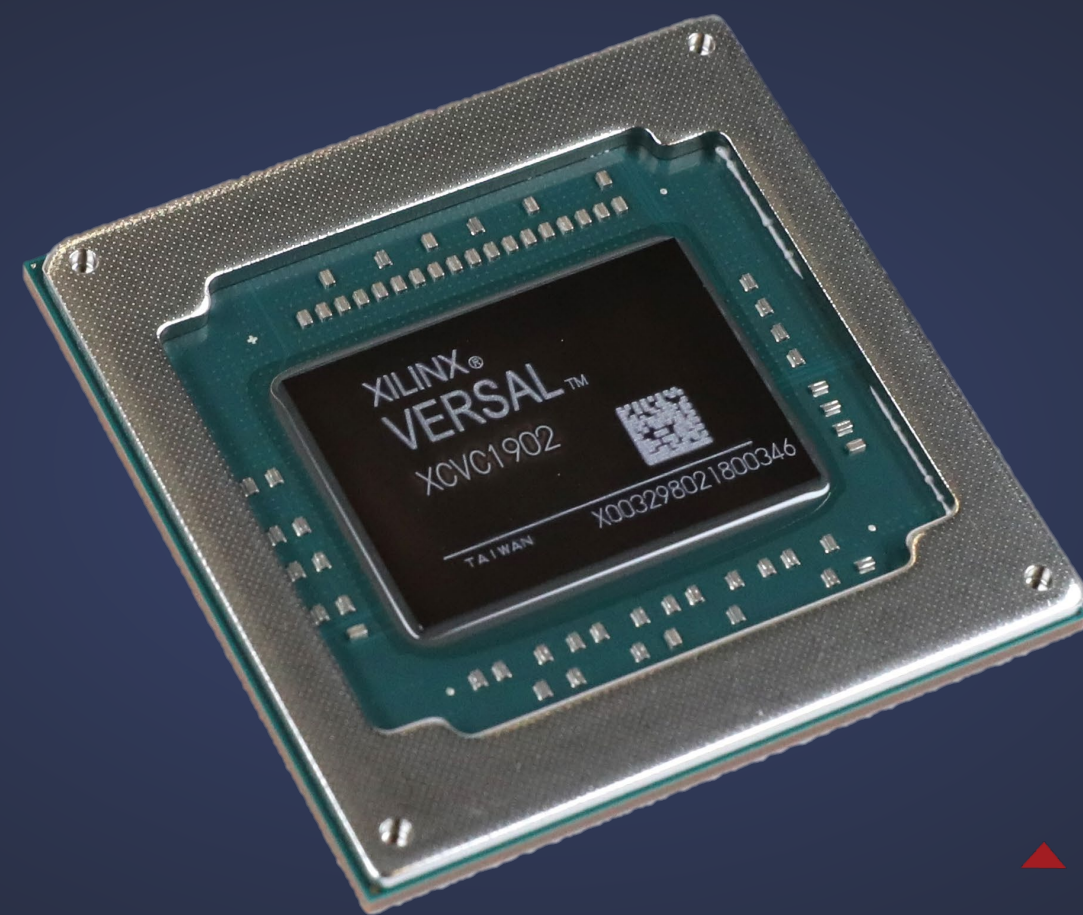
Thank You



Platform Transformation – Hardware







XILINX®
VERSAL™



Major Growth Drivers



Data Center

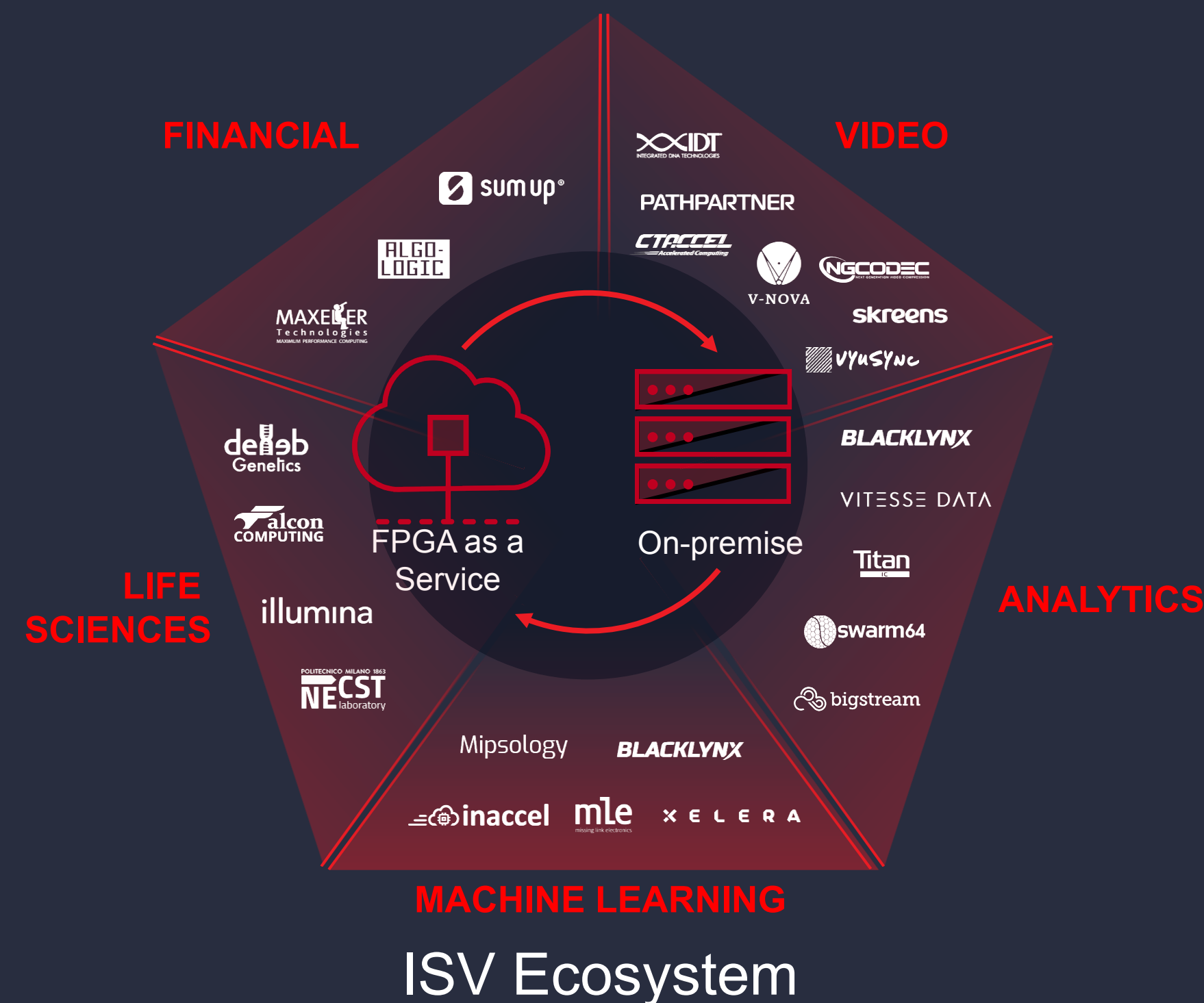
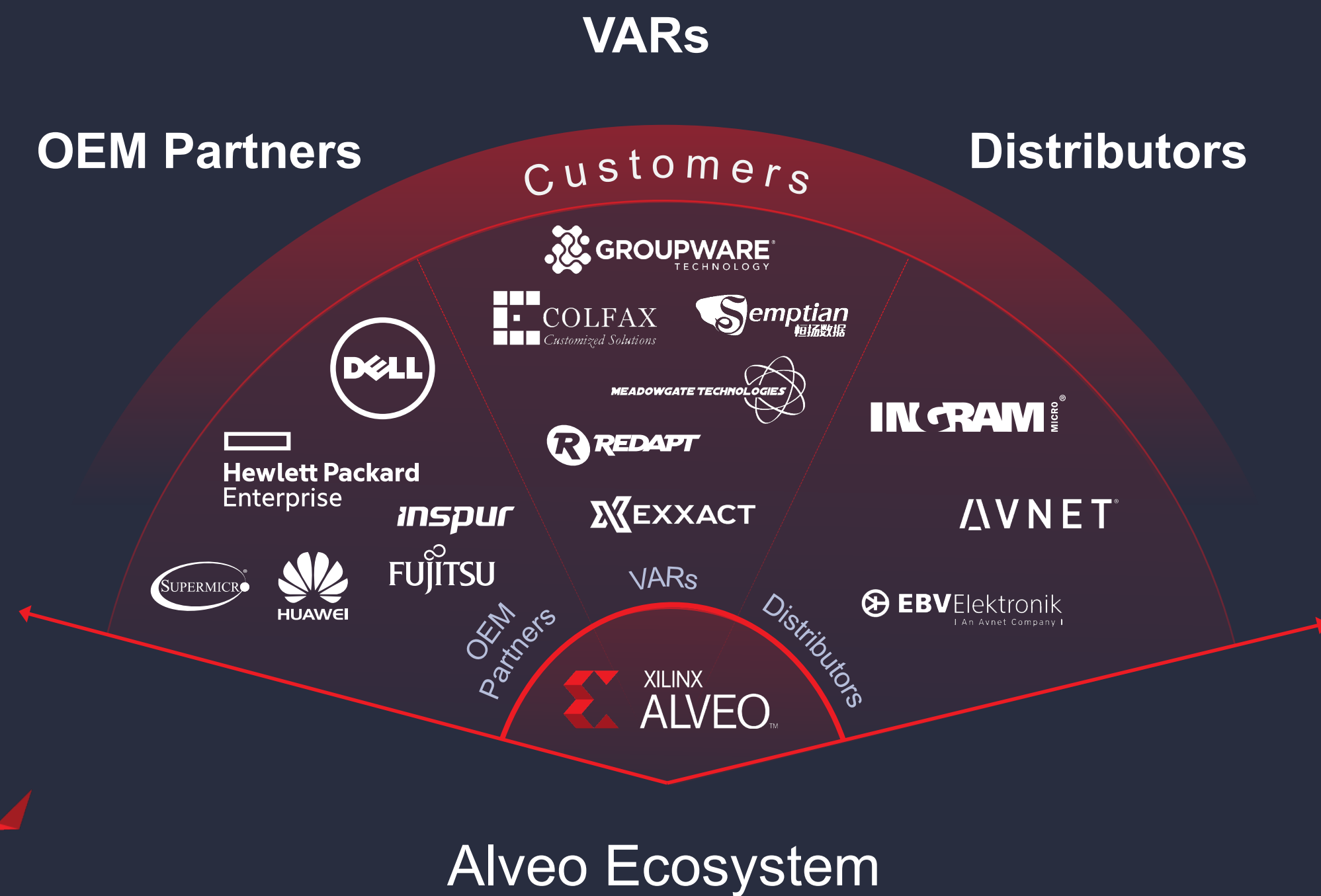


5G



Automotive

Data Center Ecosystem Growth



5815

Companies and Academia

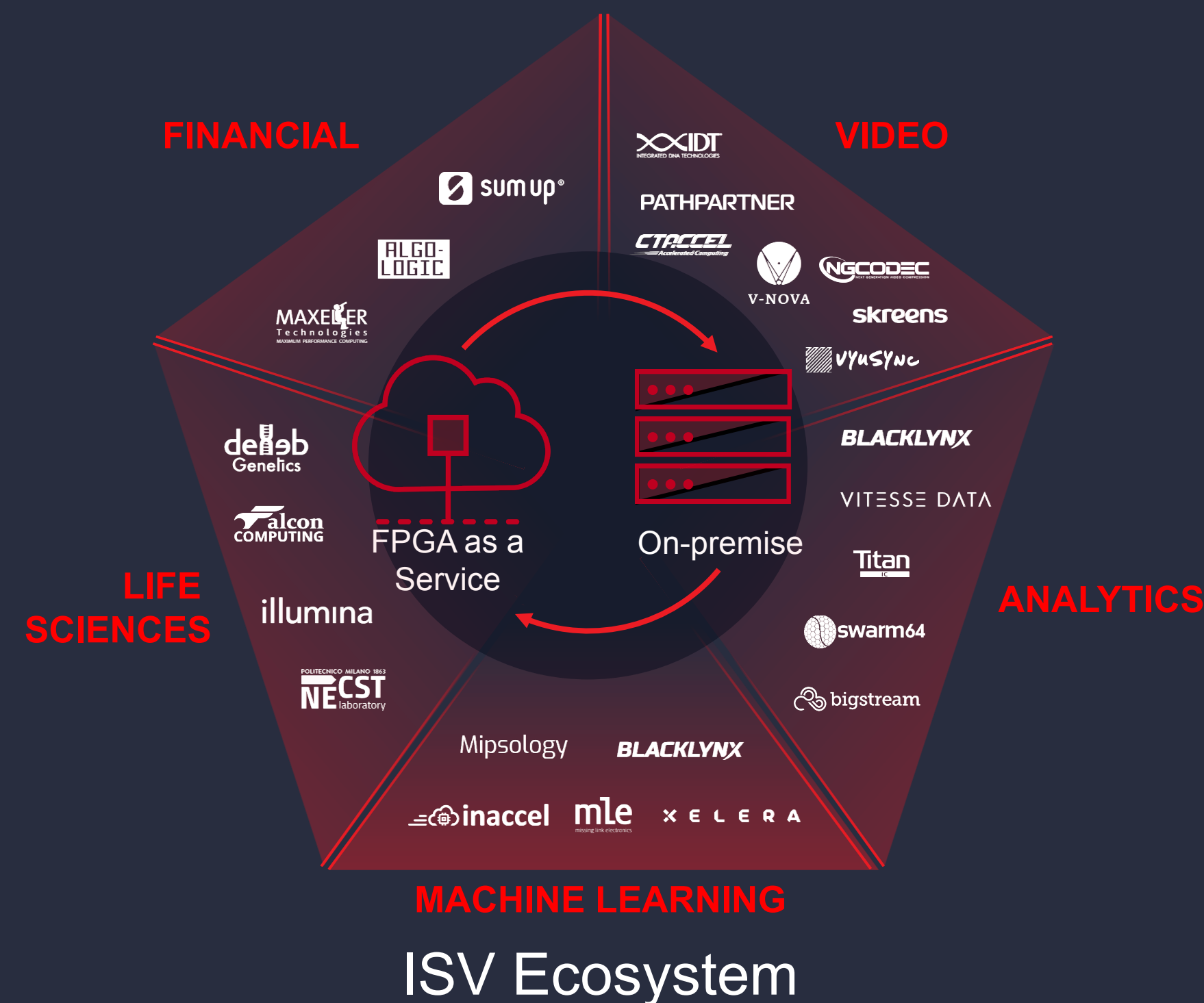
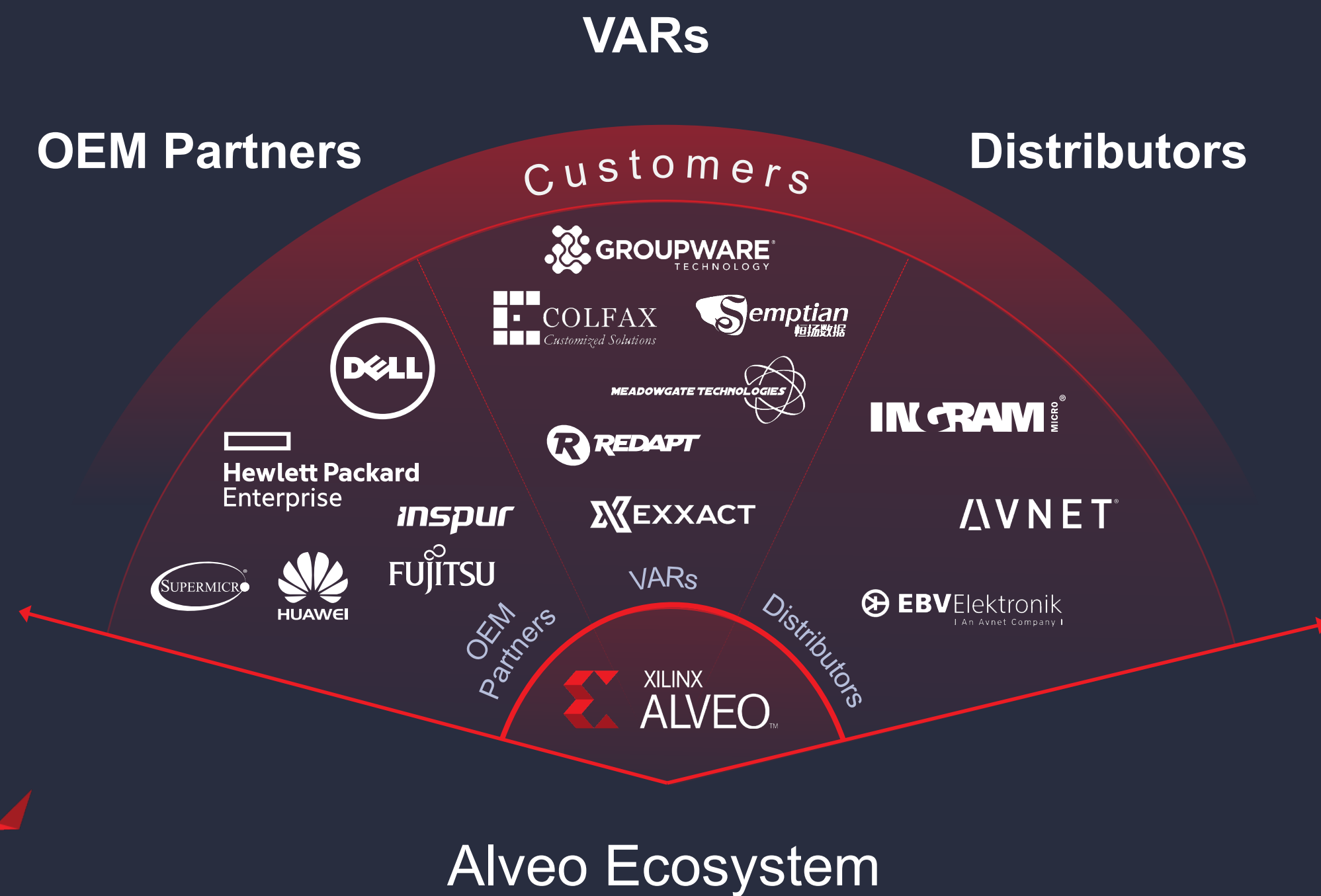
725

Accelerator Program

85

Published Apps

Data Center Ecosystem Growth



5815

Companies and Academia

725

Accelerator Program

85

Published Apps



Gadi Hutt

Senior Director,
Amazon Web Services

Vin Sharma

Head of Engineering,
Amazon Web Services

AWS Recognized as a Cloud Leader for the 9th Consecutive Year

Gartner Magic Quadrant for Cloud Infrastructure as a Service, Worldwide

AWS FPGAs at a Global Scale



**EC2 F1 is Available in Canada
(Central) AWS Region**

AstraZeneca are Raising the Bar Running Their Genome Sequencing Pipeline on AWS

AstraZeneca 

100,000 Genomes in 100 hours
2 Million Genomes planned

Amazon EC2 F1

Virtual FPGA instances
in the cloud

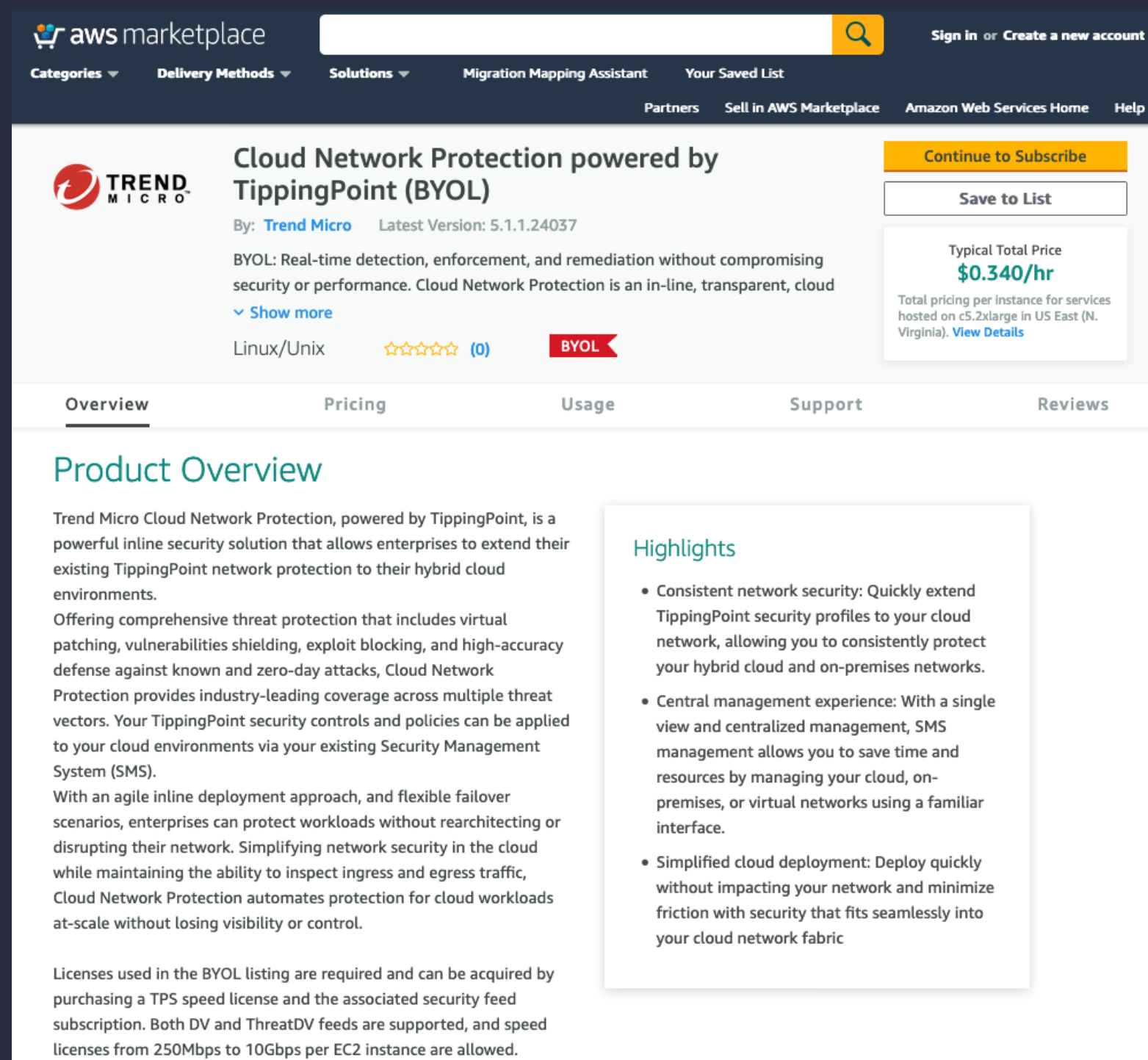
AWS Batch

Scale your HPC
workloads to thousands
of compute nodes

Amazon S3

Low cost, highly scalable
cloud object storage
with 99.999999999%
durability

Trend Micro Network Security Powered by EC2 F1



aws marketplace Sign in or Create a new account

Categories ▾ Delivery Methods ▾ Solutions ▾ Migration Mapping Assistant Your Saved List

Partners Sell in AWS Marketplace Amazon Web Services Home Help

TREND MICRO Cloud Network Protection powered by TippingPoint (BYOL)

By: [Trend Micro](#) Latest Version: 5.1.1.24037

BYOL: Real-time detection, enforcement, and remediation without compromising security or performance. Cloud Network Protection is an in-line, transparent, cloud

[Show more](#)

Linux/Unix ★★★★★ (0) **BYOL**

[Continue to Subscribe](#)

[Save to List](#)

Typical Total Price
\$0.340/hr

Total pricing per instance for services hosted on c5.2xlarge in US East (N. Virginia). [View Details](#)

Overview Pricing Usage Support Reviews

Product Overview

Trend Micro Cloud Network Protection, powered by TippingPoint, is a powerful inline security solution that allows enterprises to extend their existing TippingPoint network protection to their hybrid cloud environments.

Offering comprehensive threat protection that includes virtual patching, vulnerabilities shielding, exploit blocking, and high-accuracy defense against known and zero-day attacks, Cloud Network Protection provides industry-leading coverage across multiple threat vectors. Your TippingPoint security controls and policies can be applied to your cloud environments via your existing Security Management System (SMS).

With an agile inline deployment approach, and flexible failover scenarios, enterprises can protect workloads without rearchitecting or disrupting their network. Simplifying network security in the cloud while maintaining the ability to inspect ingress and egress traffic, Cloud Network Protection automates protection for cloud workloads at-scale without losing visibility or control.

Licenses used in the BYOL listing are required and can be acquired by purchasing a TPS speed license and the associated security feed subscription. Both DV and ThreatDV feeds are supported, and speed licenses from 250Mbps to 10Gbps per EC2 instance are allowed.

Highlights

- **Consistent network security:** Quickly extend TippingPoint security profiles to your cloud network, allowing you to consistently protect your hybrid cloud and on-premises networks.
- **Central management experience:** With a single view and centralized management, SMS management allows you to save time and resources by managing your cloud, on-premises, or virtual networks using a familiar interface.
- **Simplified cloud deployment:** Deploy quickly without impacting your network and minimize friction with security that fits seamlessly into your cloud network fabric

EC2 F1 Enables Consistent Network Security

Predictable Network & Application Performance

Unparalleled Efficiency & Operational Simplicity

AWS Hosts the Largest Amount Of FPGA Apps in the Cloud

HPC

Video & Imaging

Data Analytics

Fintech

Security



Tools & Services



Tens of Thousands of Customers

More Machine Learning Happens on AWS Than Anywhere Else



81% of deep learning in the cloud runs on AWS

85% of TensorFlow projects in the cloud run on AWS



Amazon SageMaker

Build, Train, & Deploy ML Models at Scale

**Pre-Built
Notebooks
for Common
Problems**

**Collect and
prepare training
data**

**Built-In, High
Performance
Algorithms**

**Choose and
optimize
your ML
algorithm**

**One-Click
Training on the
Highest
Performing
Infrastructure**

**Set up and
manage
environments for
training**

**Model
Optimization**

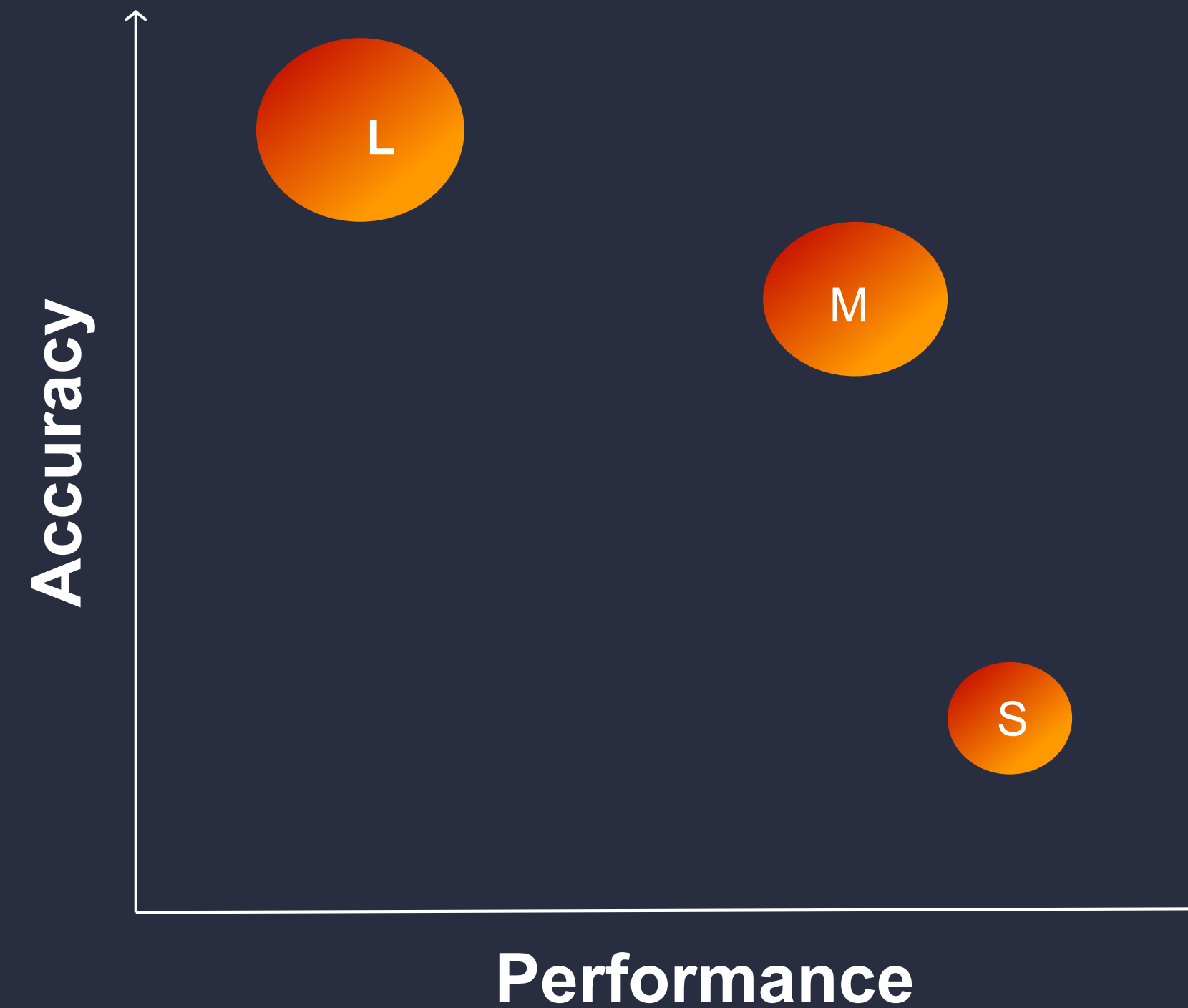
**Train and
Tune ML Models**



**Deploy models
in production**



Problem: Not All Models are Skinny

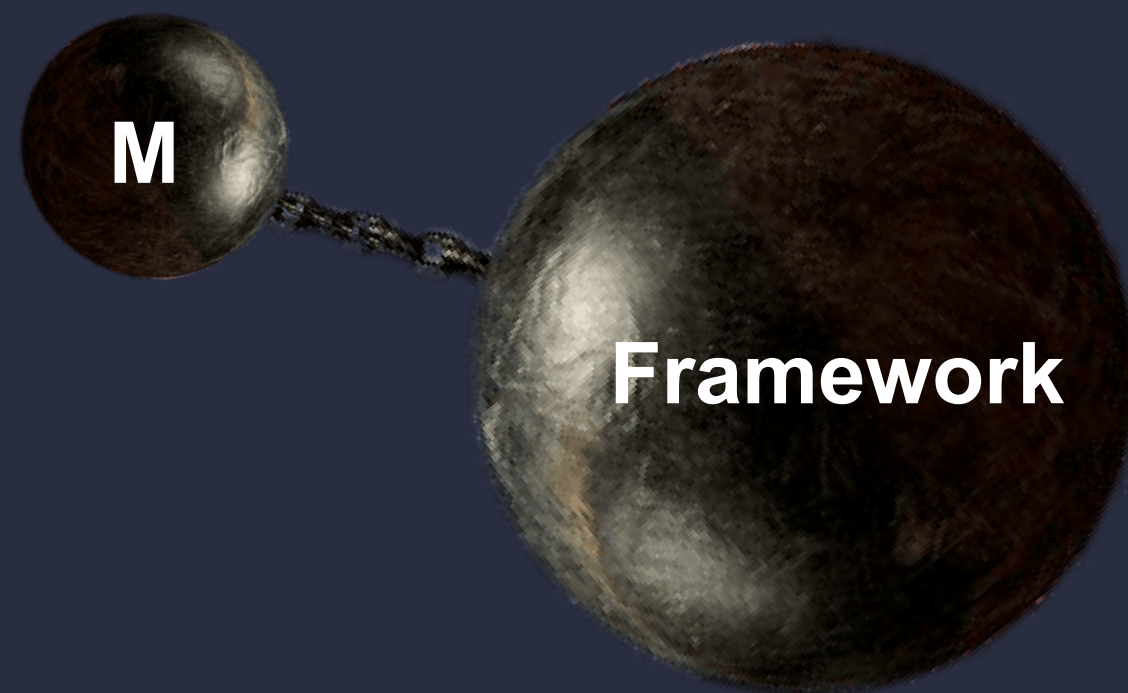


Models that are Accurate
Tend to be Big and Slow



Problem: Not All Models are Liberated

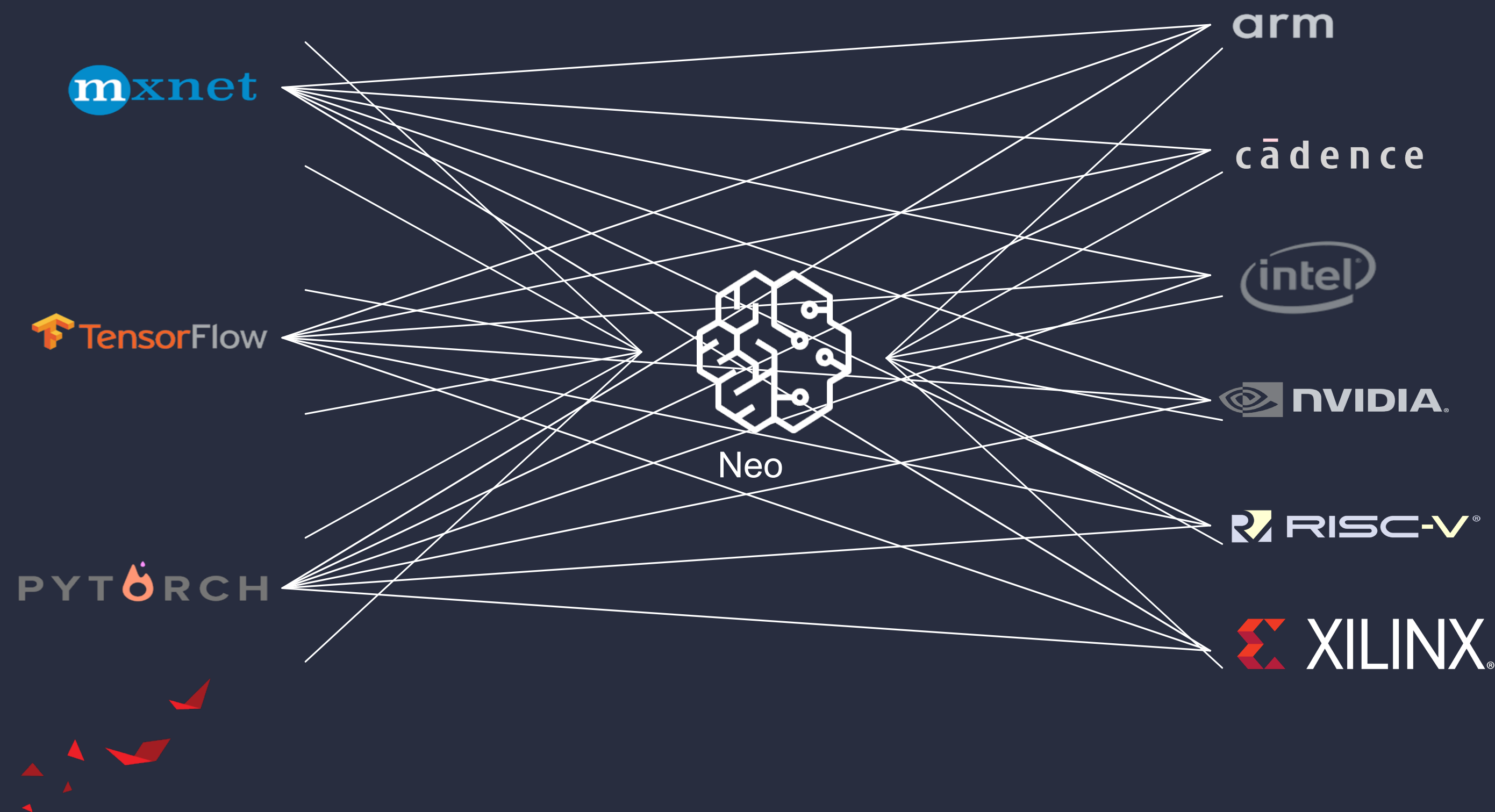
Build, Train, & Deploy ML Models at Scale



Models are chained to
the framework in which
they were trained

Framework	Size
MXNet	450 MB
TensorFlow	660 MB
PyTorch	1000 MB

Problem: Not Every Path is a Catwalk



Neo Provides

Model Optimization as a Service

Parses
Model

Optimizes
Graph

Optimizes
Tensors

Generates
Code

Compact Runtime

Dispatches
Model

Partitions
Graph

Problem: Not Every Path is a Catwalk

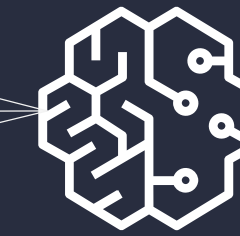
A smart city is a safe and efficient city, that empowers and informs citizens

Kutleng Engineering Technologies delivers a new line of security cameras with AWS IoT Greengrass and Amazon SageMaker Neo on Xilinx

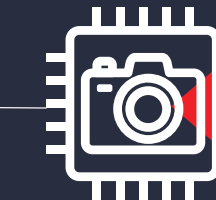
mxnet

TensorFlow

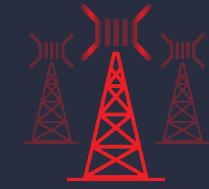
PYTORCH



Amazon SageMaker Neo



Security Camera
XILINX



Infrastructure Monitoring



License Plate Recognition



Traffic Monitoring



Crime Prevention



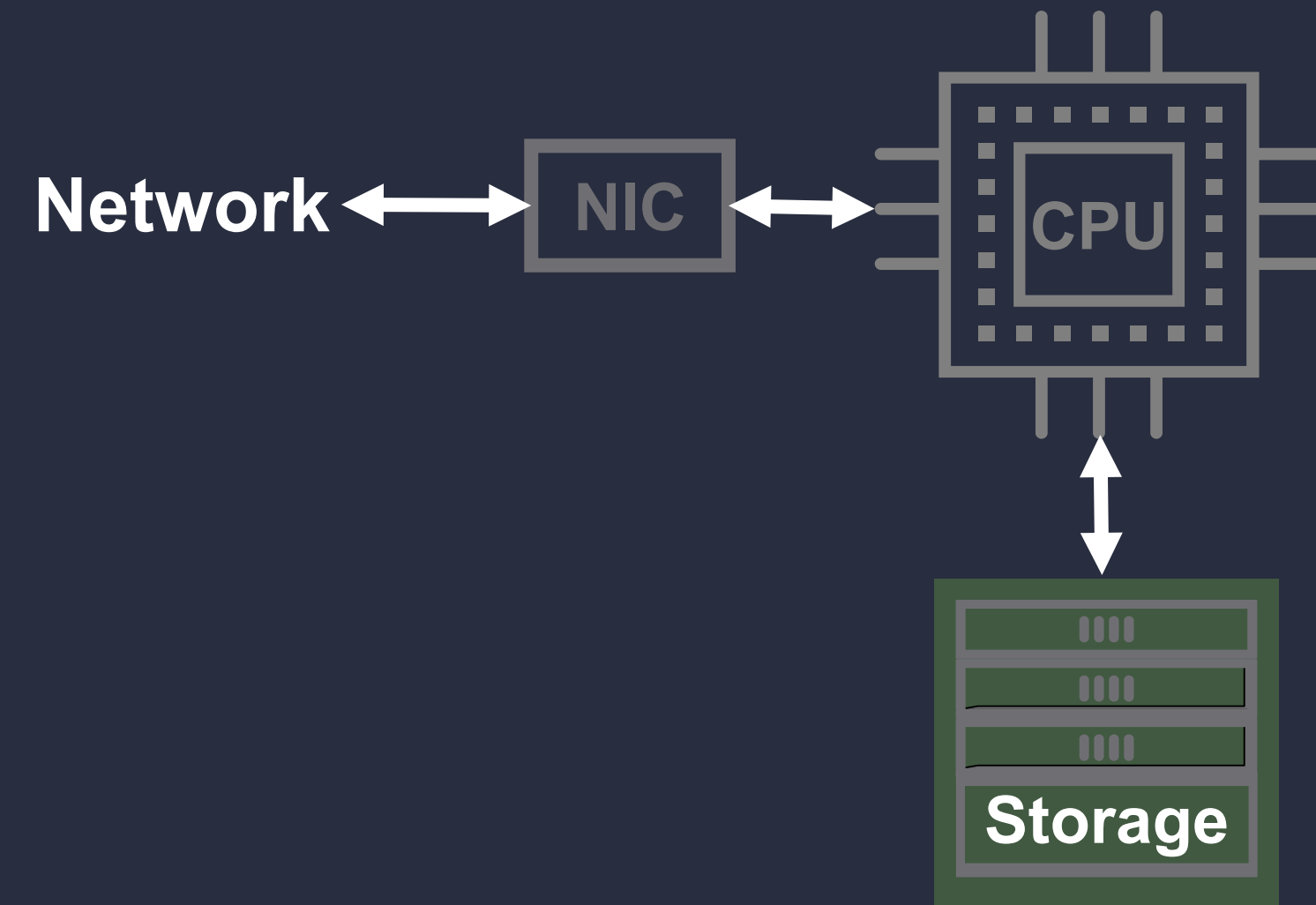
Retail Analytics

Thank You

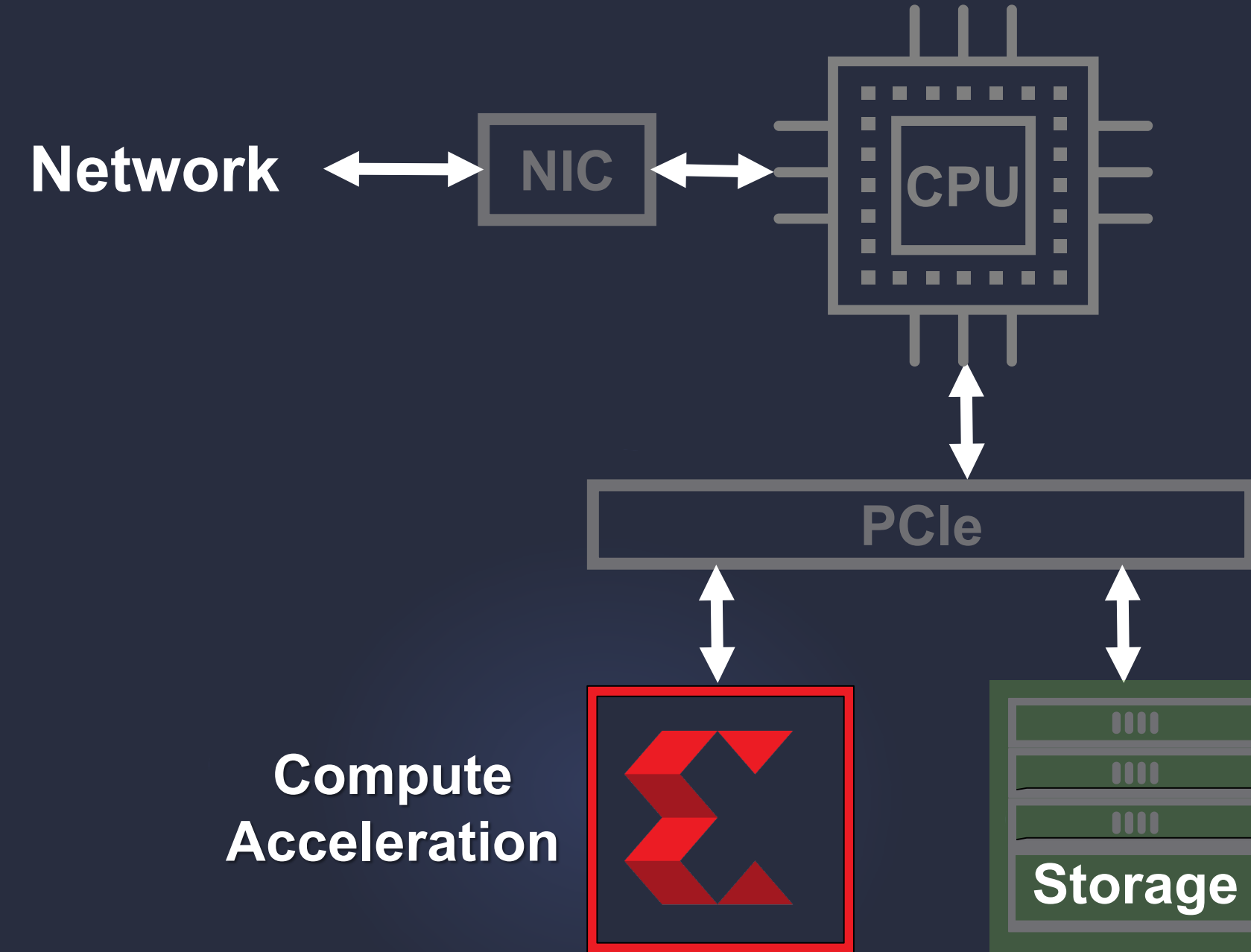


Xilinx in Compute Acceleration

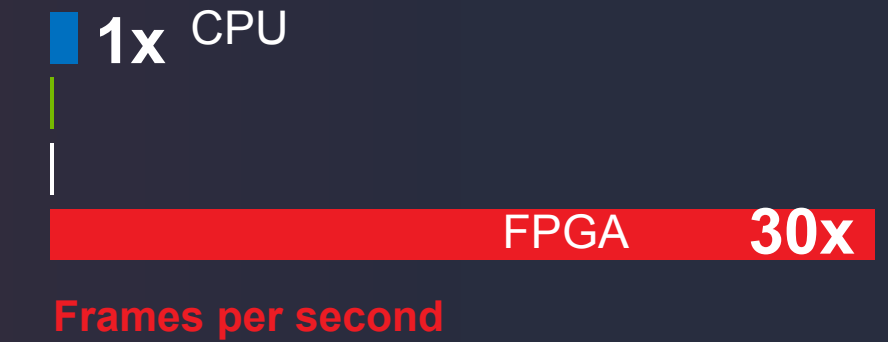
Traditional Computing



Xilinx Accelerated Computing



twitch Video Transcoding for VP9 Live Stream



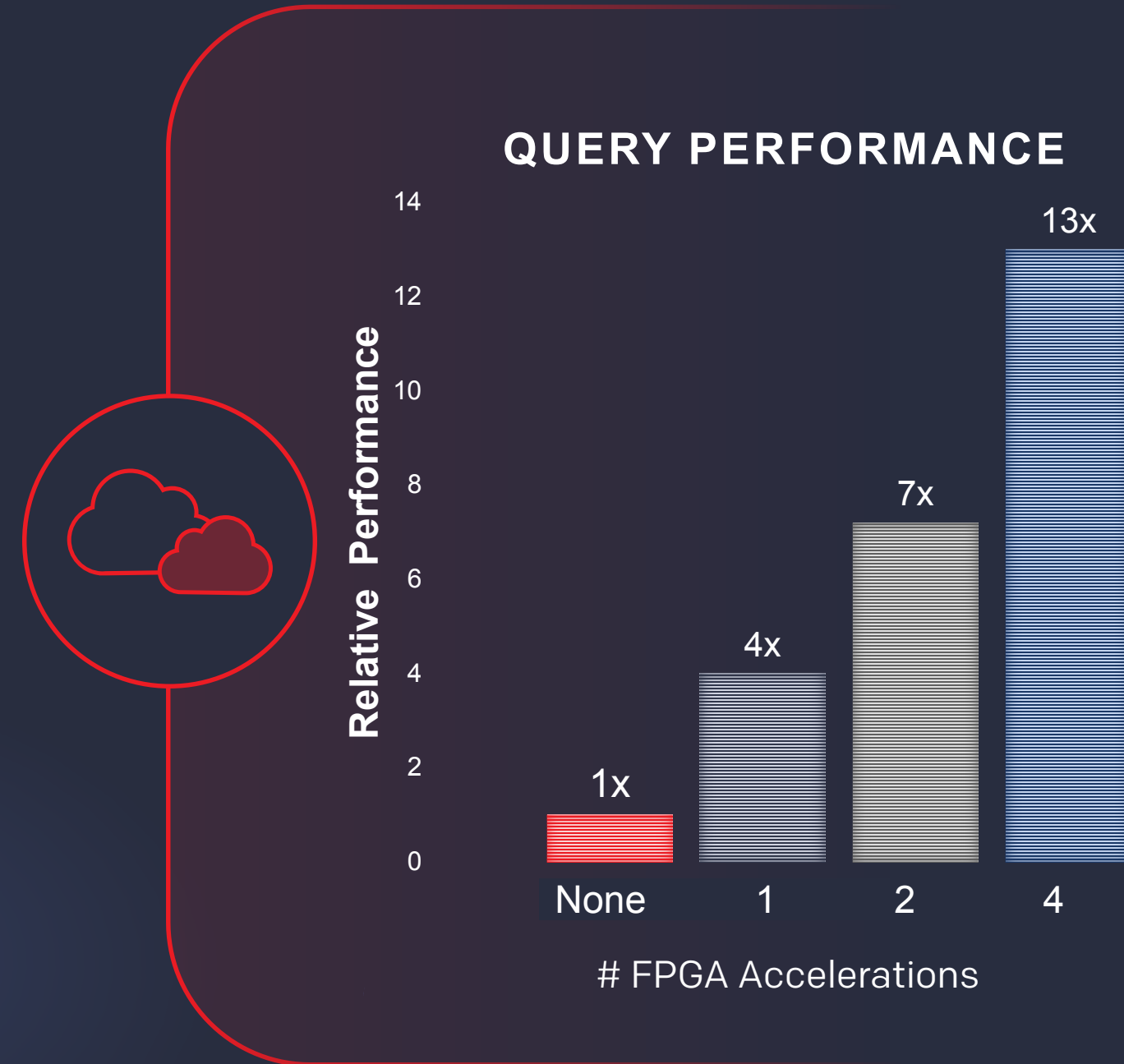
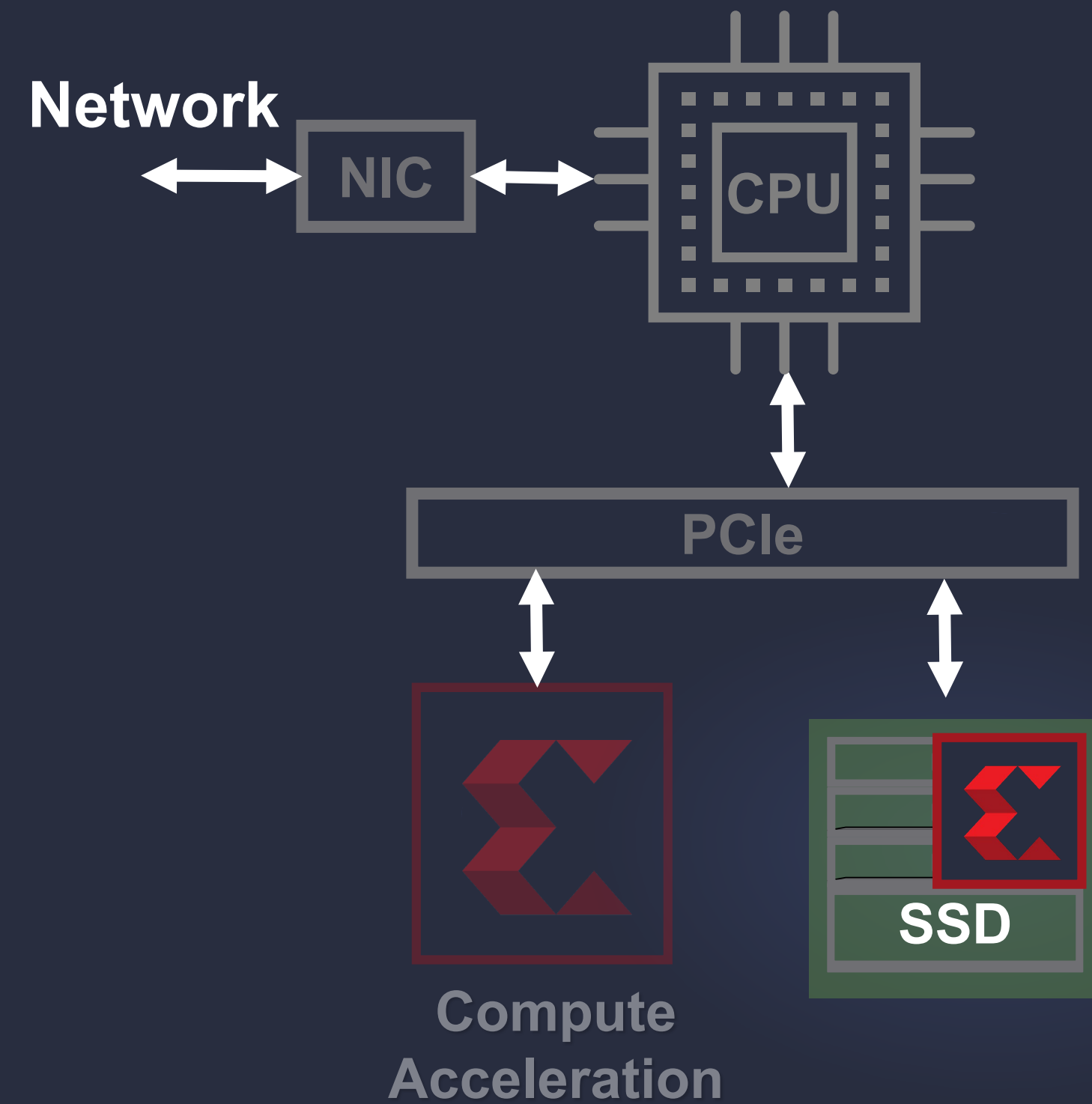
illumina Genomic Data Analytics



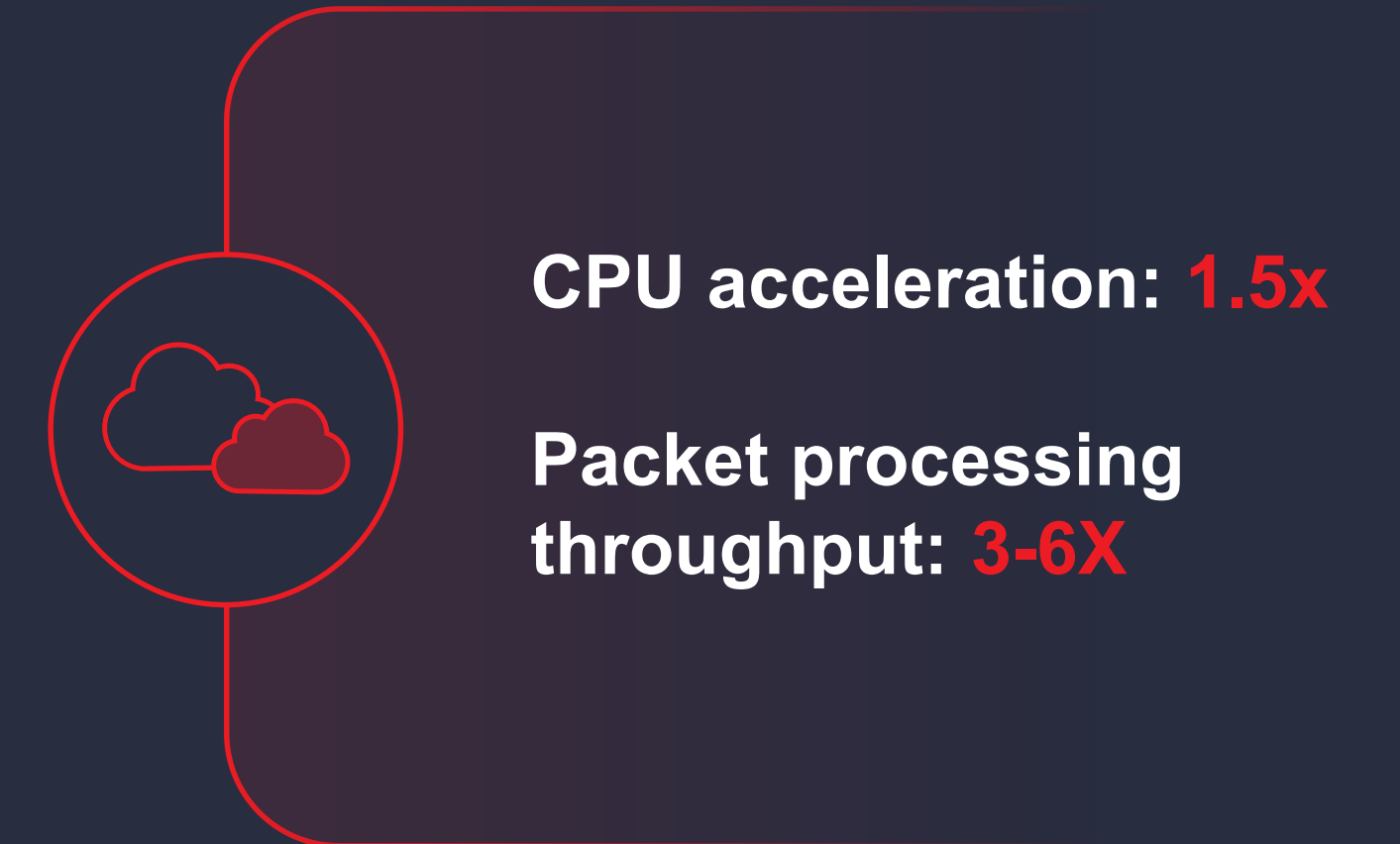
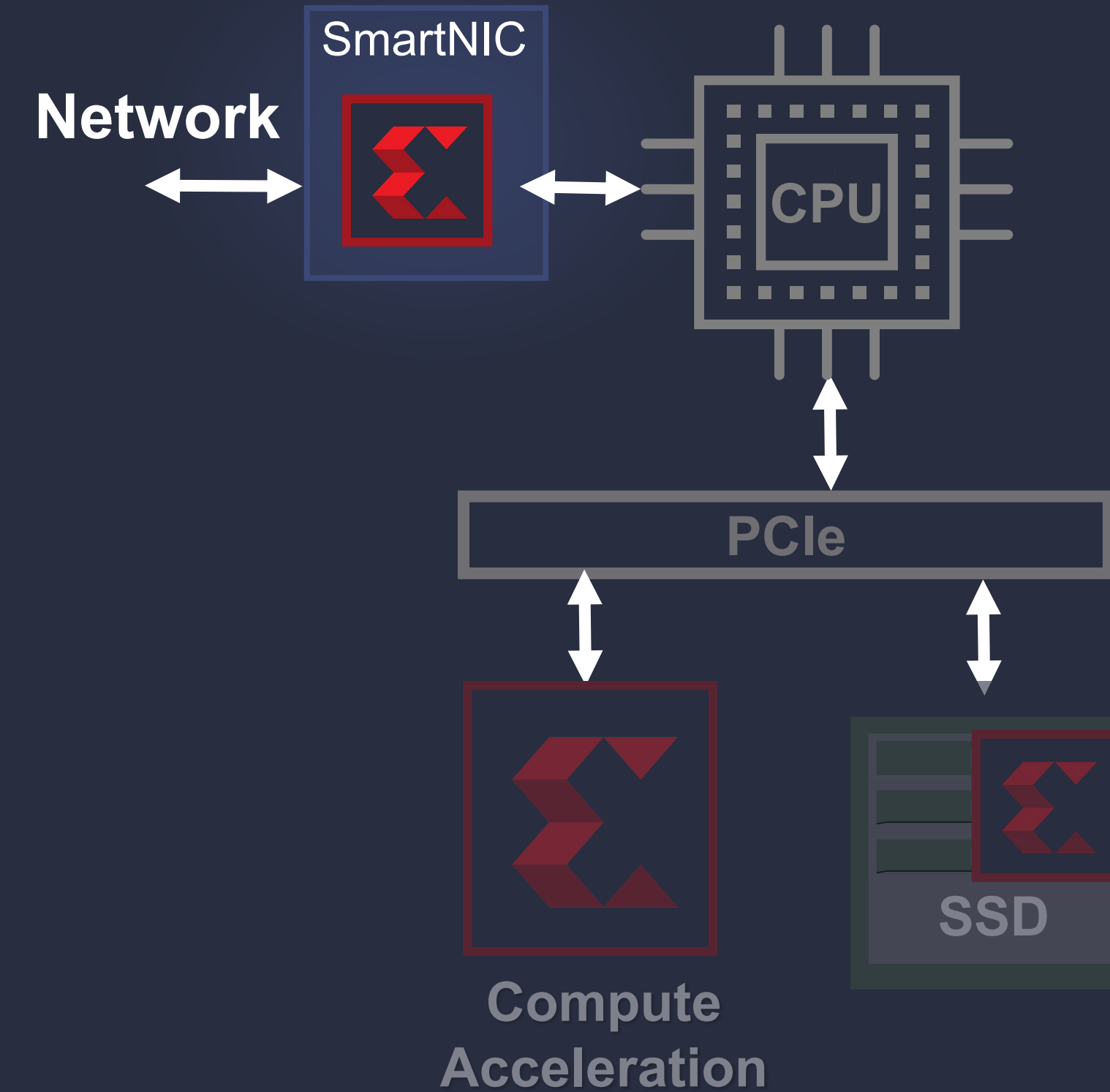
tend Real-time ML Inference



Xilinx Storage & Network Acceleration



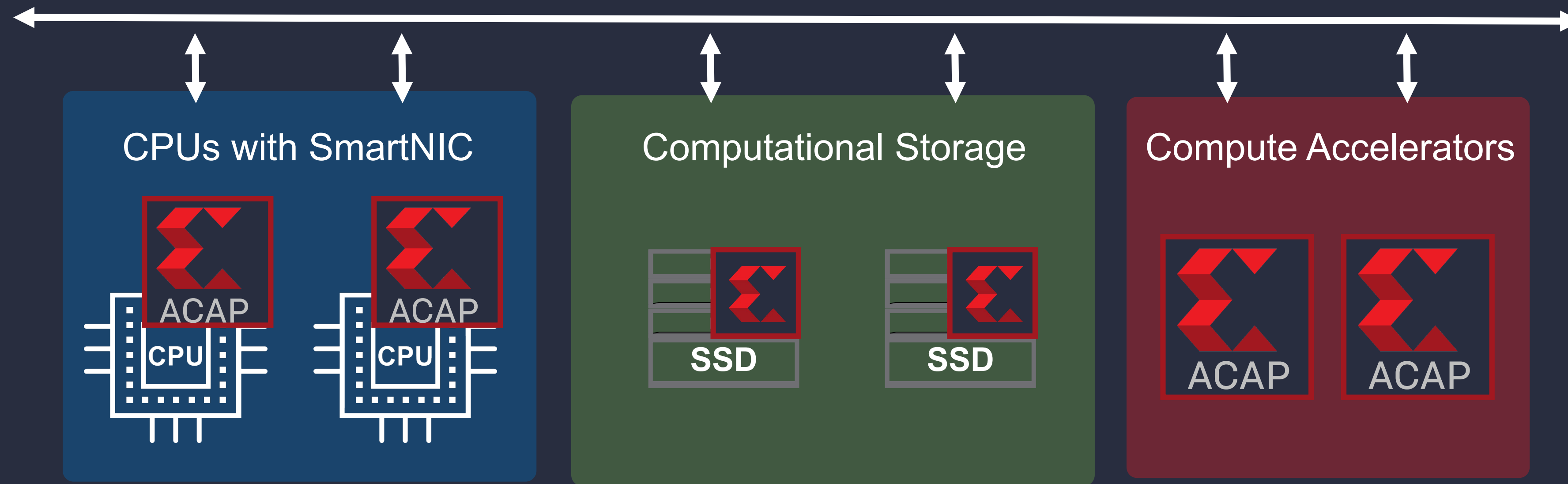
Server: Dual Socket Xeon E5-2697 (24 Cores)
- Data-Plane: ~20 Mpps
- # Cores Used: 10



Server + FPGA (VU9P)
- Data-Plane: ~100 Mpps
- # Cores Used: 2

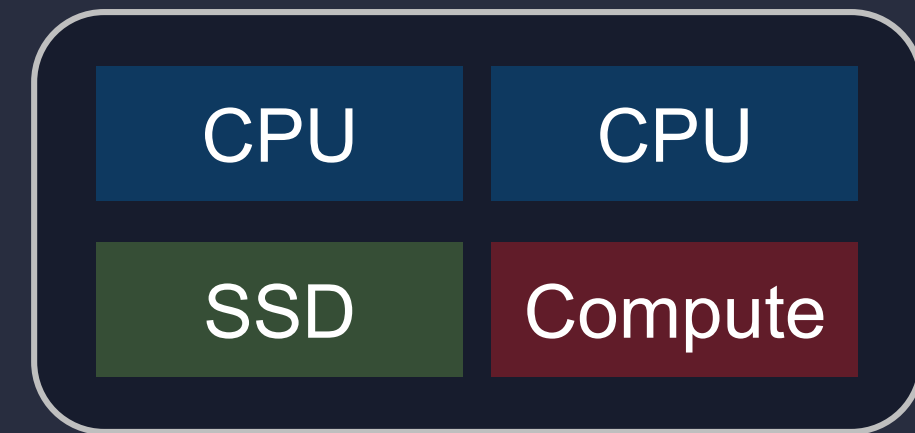
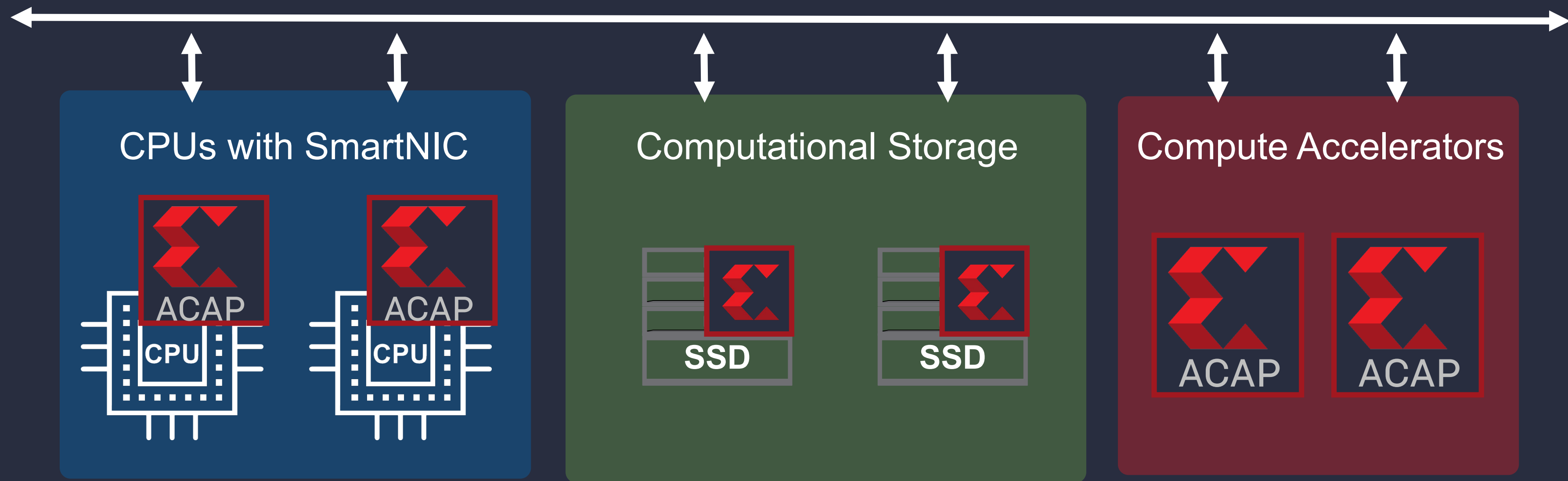
Future of Data Center: Distributed Adaptive Computing

Disaggregated & Composable

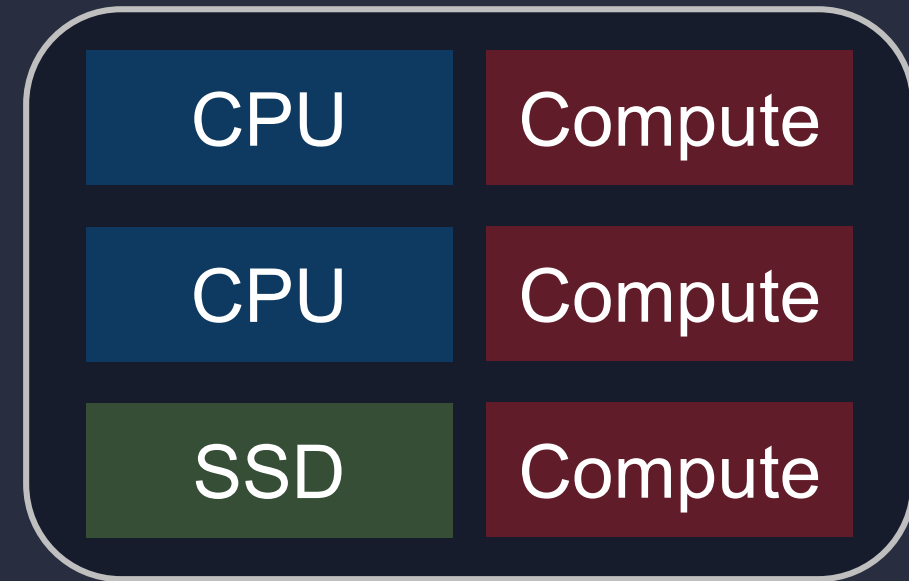


Future of Data Center: Distributed Adaptive Computing

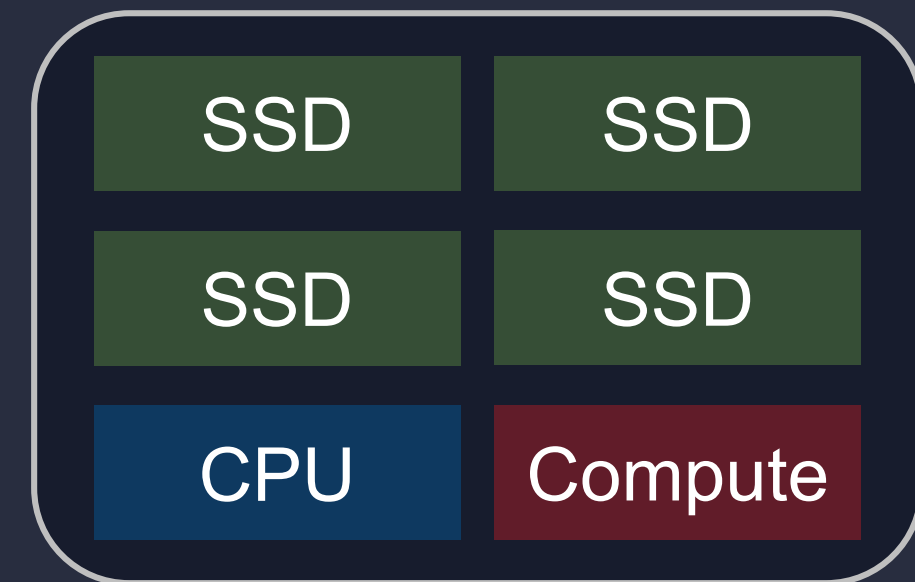
Disaggregated & Composable



Workload 1



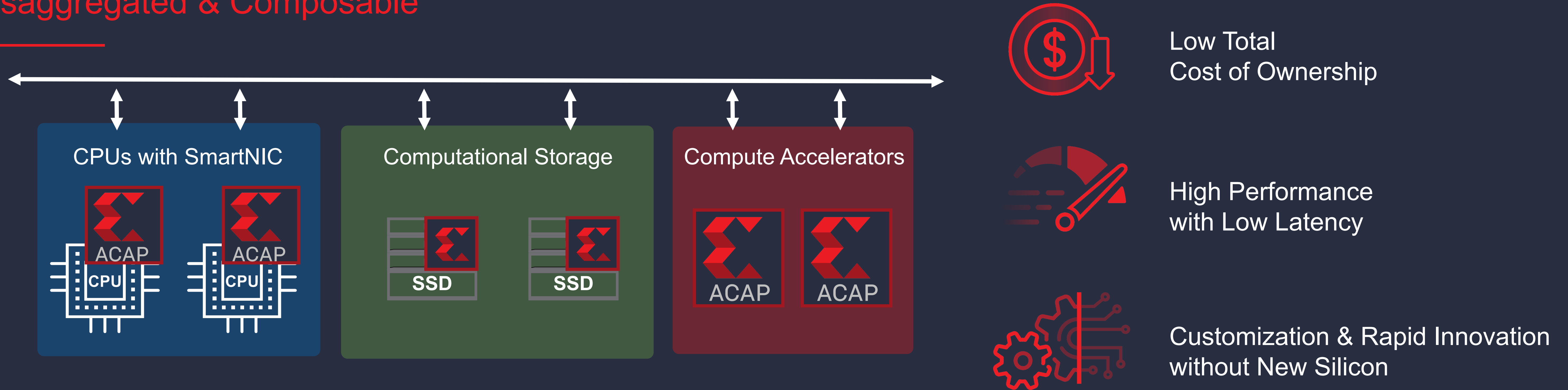
Workload 2



Workload 3

Future of Data Center: Distributed Adaptive Computing

Disaggregated & Composable





Melur Raghuraman

Distinguished Engineer,
Microsoft Azure

Microsoft Azure

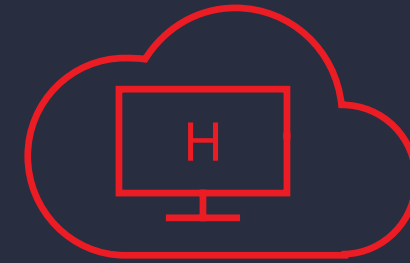
2.0

Million Miles
of Fiber

-  Data Center
-  CDN Locations
-  Edge Node
-  Internet Exchange
-  Terrestrial Network
-  Subsea Network



Azure Specialized Infrastructure



High-performance VMs
Tightly Coupled
Parallel Jobs with Infiniband



Accelerator-Enabled VMs
NV—Graphic-based applications
NC—GPU Accelerated Compute
ND—Deep Learning
NP—General Purpose FPGA



Cray in Azure
Managed, Custom Bare-metal
HPC or Supercomputing
On the Azure Network



>80,000 IOPs
Premium Storage
Low Latency, High
Throughput Apps

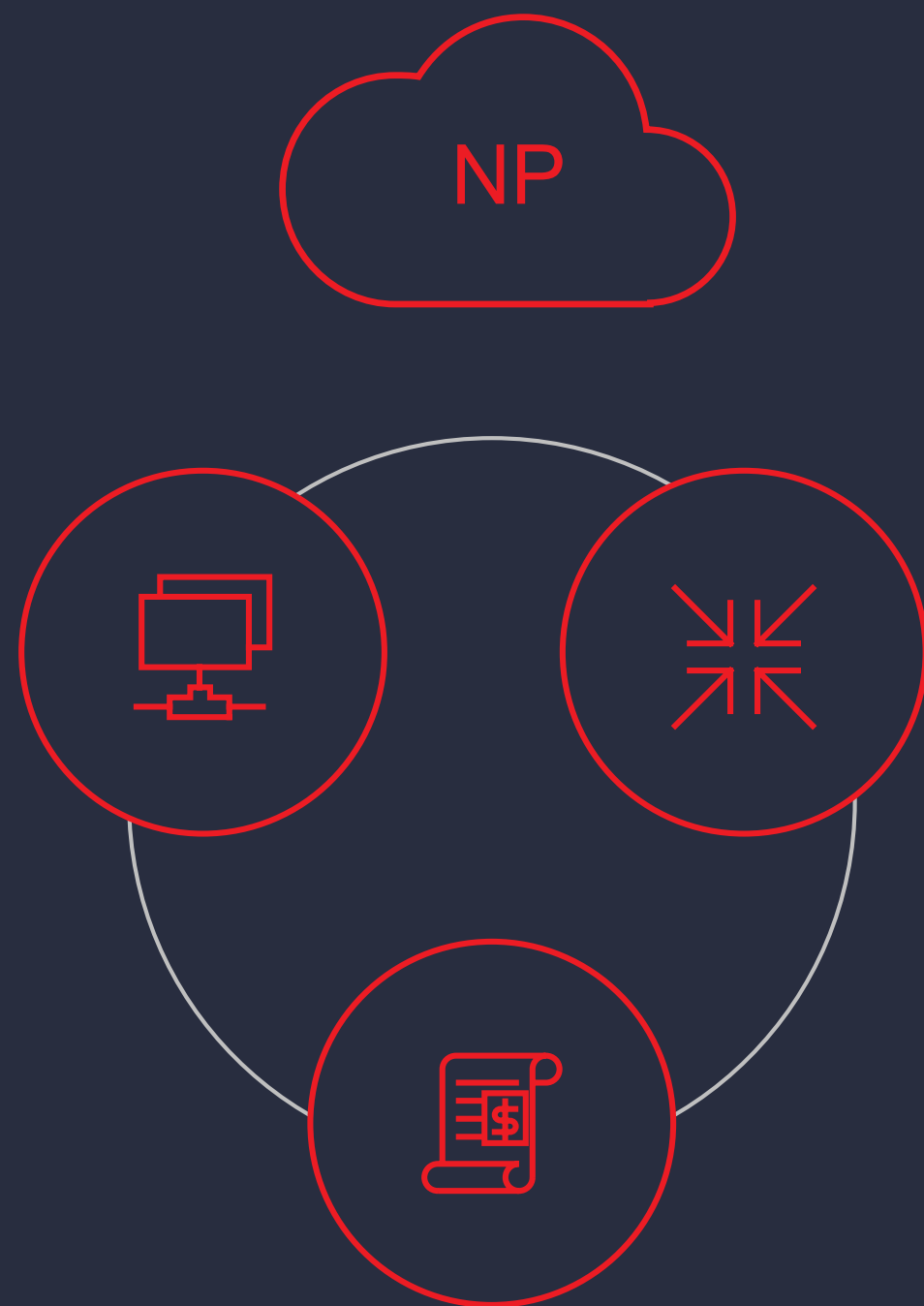


Compute-Optimized VMs
Batch Processing, Monte
Carlo Simulations



Large Memory VMs
Large Databases

Azure NP VM Family

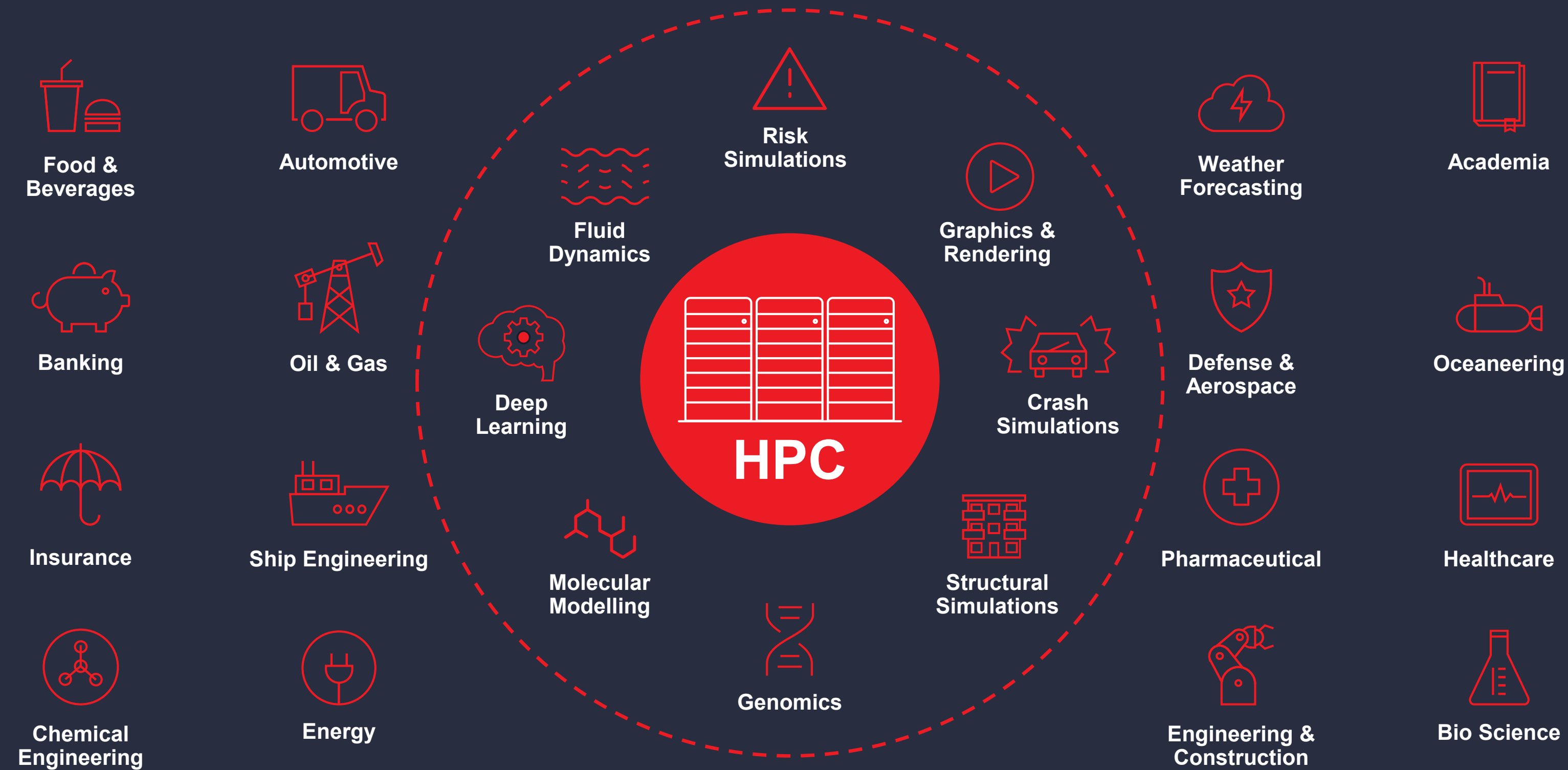


Alveo U250 FPGA-Accelerated VMs coming soon to East US, West US, Southeast Asia, and Western Europe.

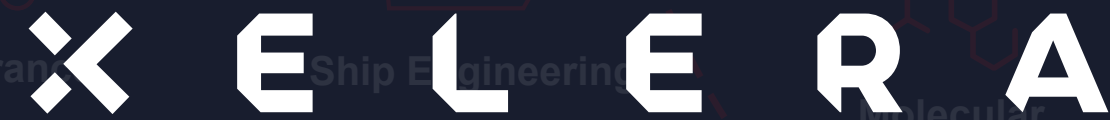
Host VM Specifications	NP10	NP20	NP40
CPU Cores	10	20	40
Local SSD Temp. Storage	0.7 TB	1.4 TB	2.8 TB
Host RAM	168 GB	336 GB	672 GB
Accelerators (U250s)	1	2	4



The Wide Reach of Accelerated Applications in Azure



Today's Alveo U250-Ready Products Are Tomorrow's Azure-Ready Solutions

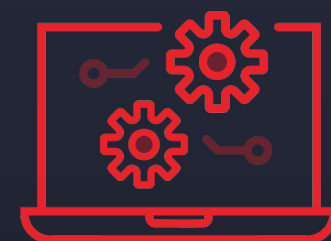


Thank You



Platform Transformation - Software

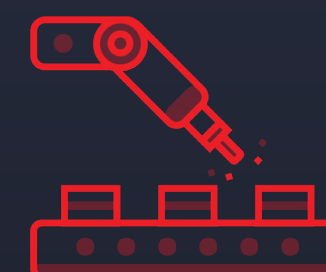
SW Programmability



Vivado



OS & Firmware
SDK



SDSoC, Embedded
Applications



SDAccel, Data
Center Platform
(FaaS, Alveo)

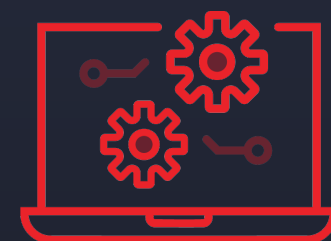


AI Inference
Acceleration

Device Category

Platform Transformation - Software

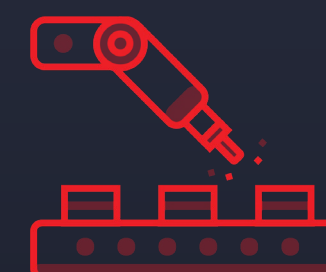
SW Programmability



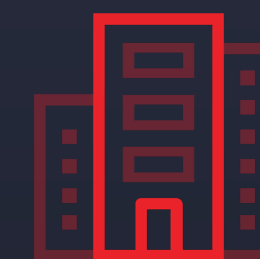
Vivado



OS & Firmware
SDK



SDSoC, Embedded
Applications



SDAccel, Data
Center Platform
(FaaS, Alveo)



AI Inference
Acceleration

Device Category

Introducing Vitis Unified Software Platform

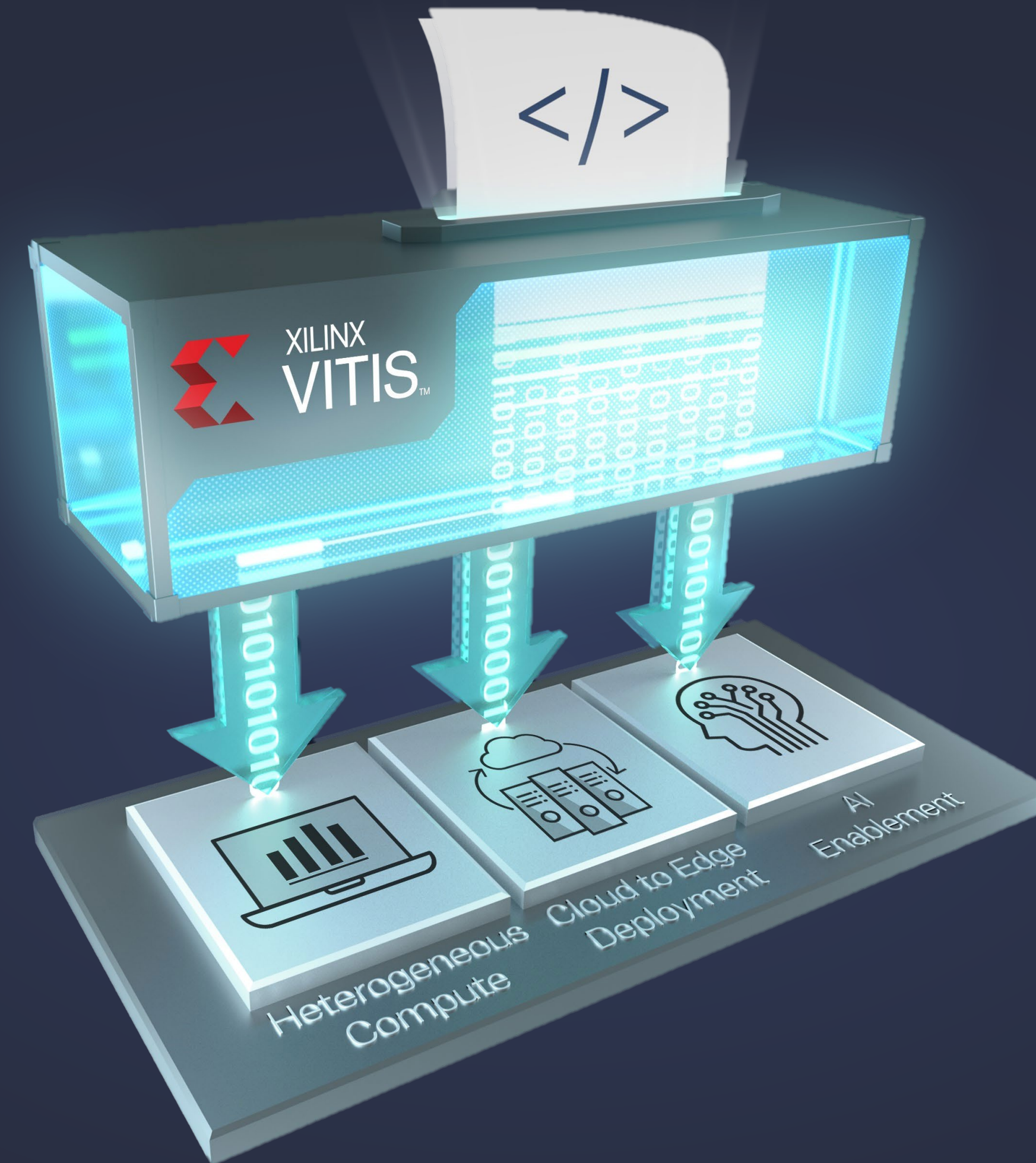


Unified Software Platform

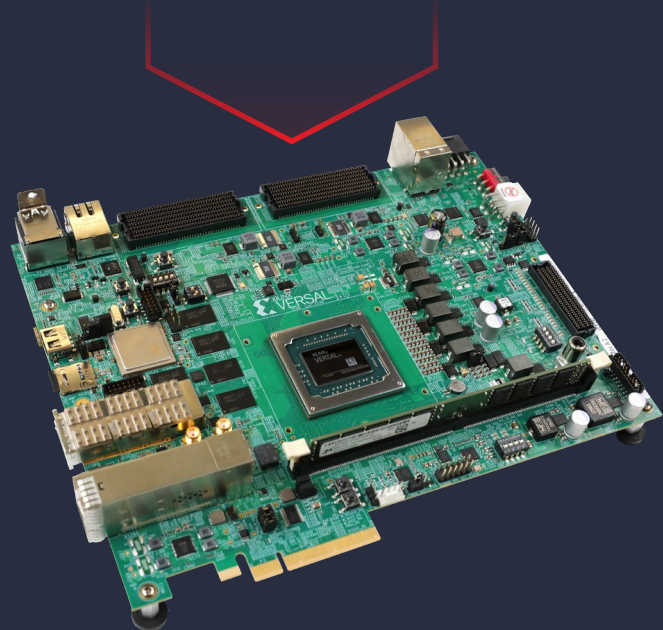
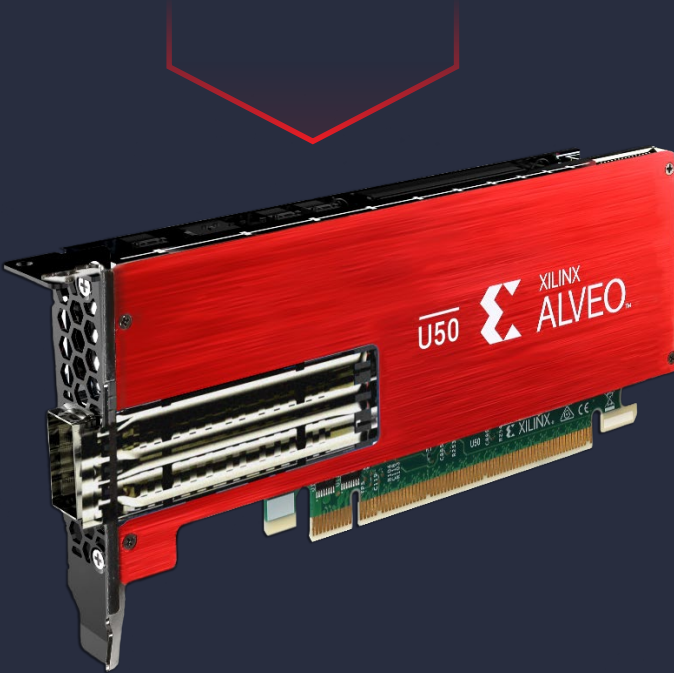
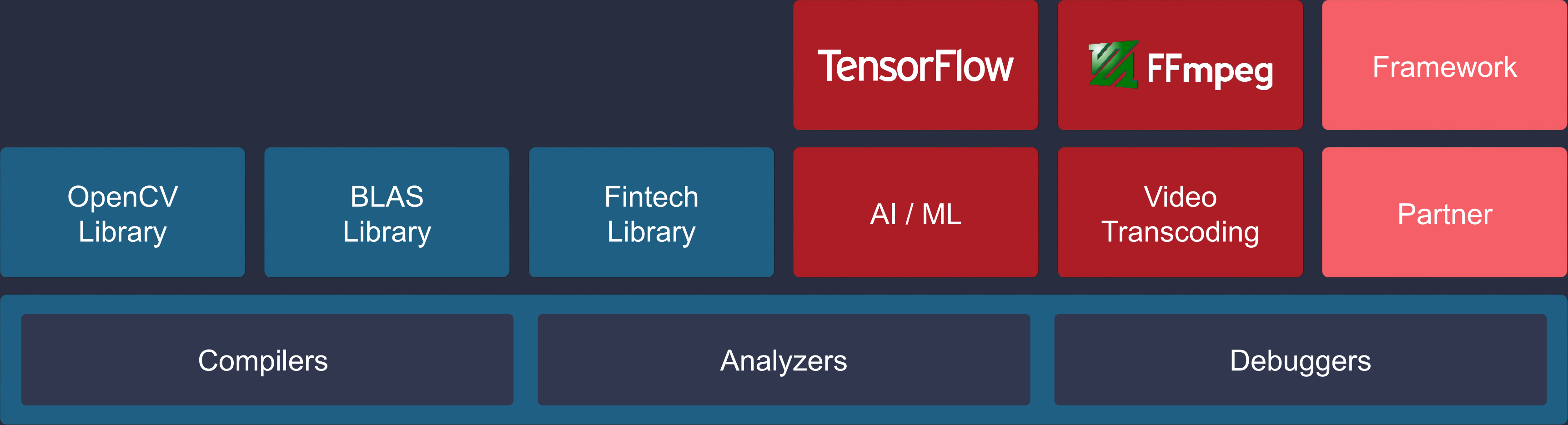
| Heterogeneous

| Edge to Cloud

| Software & AI



Vitis: Unified Software Platform

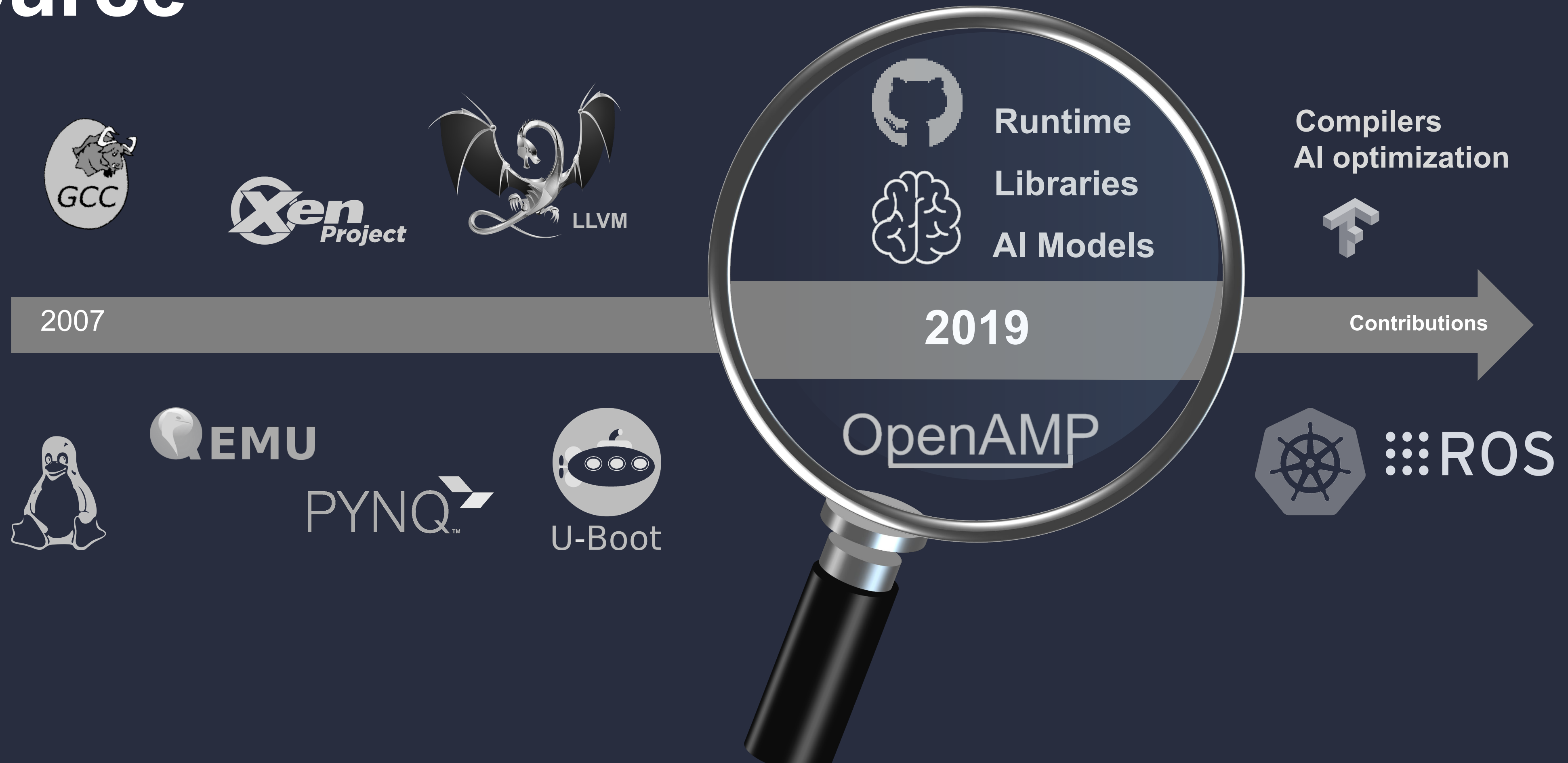


FREE



Committed to Open Source

- | User Since 2001
- | Contributor Since 2007
- | Now Core to Xilinx Strategy



Major Growth Drivers



Data Center



5G



Automotive

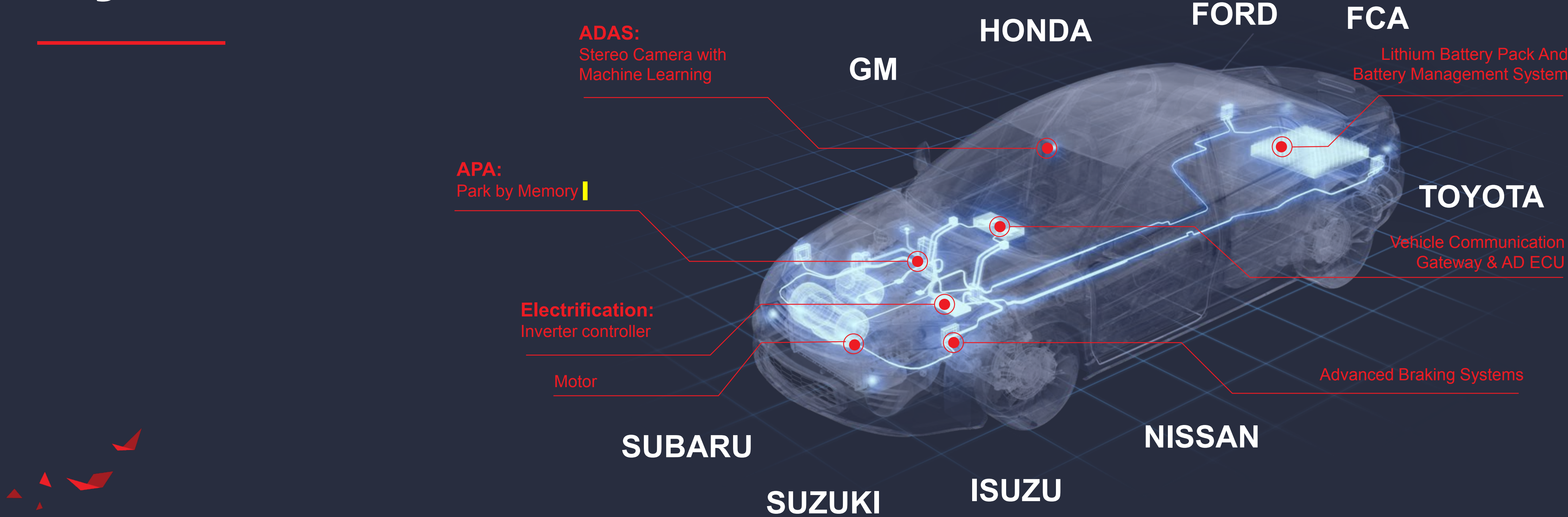
The Hitachi logo is displayed in white, bold, sans-serif capital letters. It is positioned on the left side of the image, which has a red background with a geometric, low-poly pattern. A diagonal line separates this red area from a dark blue area on the right.

HITACHI

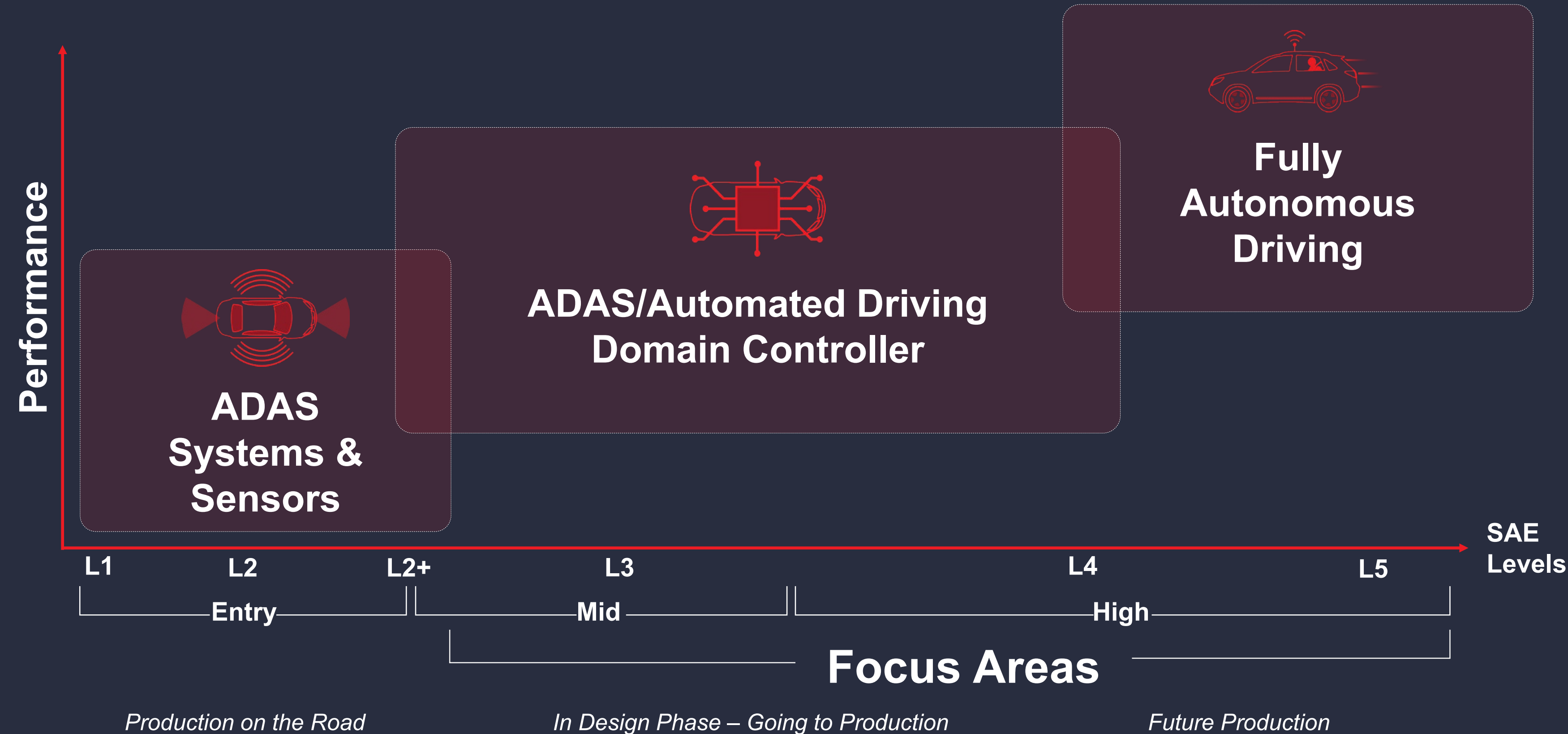
A series of stylized red paper planes are arranged in two diagonal lines, one in the upper right and one in the lower left, pointing towards the center of the image. They are set against a dark blue background.

Hiroki Uchiyama
Vice President,
Hitachi Automotive Systems of the Americas

Hitachi Products Widely Used By Automotive OEMs



Innovation for Next Generation ADAS / AD Systems



Versal ACAP is the Key to L2+ ADAS

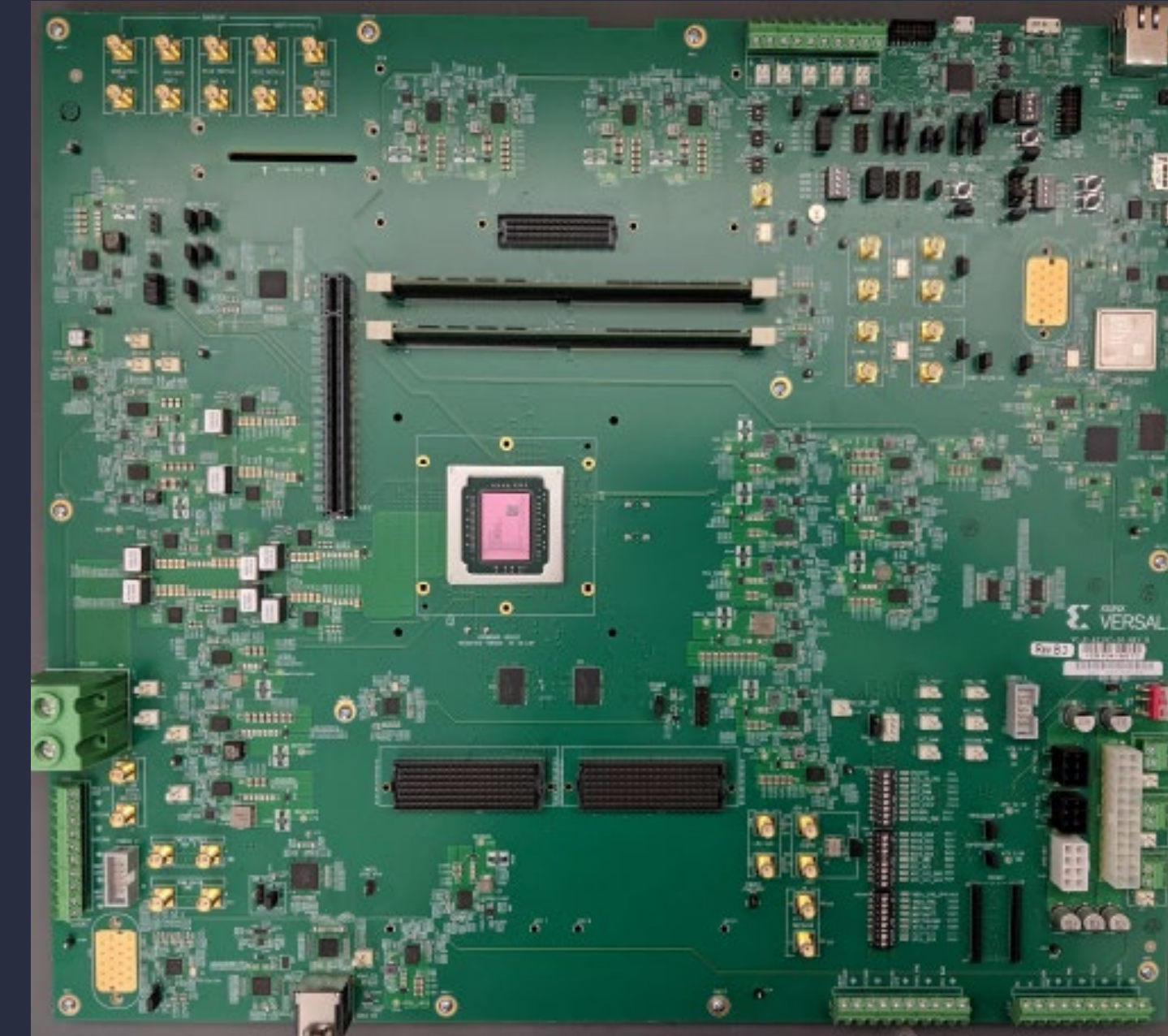
| Tens of TOPS of AI Inference

| Proven Functional Safety

| Adaptable Engine + AI Engine

- Low Latency End-to-End Processing

| ...and We Received the World's First Versal Development Board!



We Used Vitis... and Here's the Demo

MIPI Camera Input

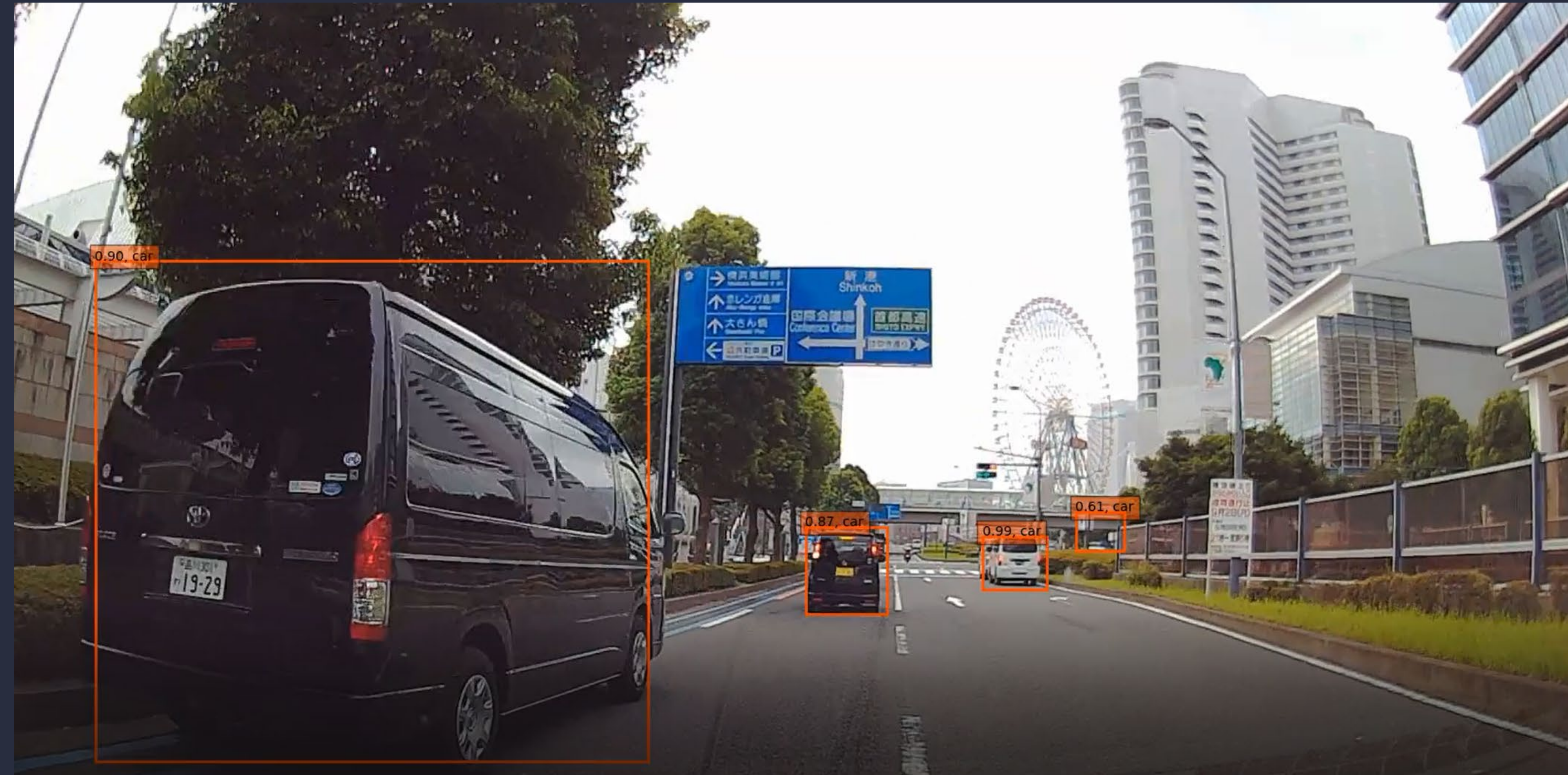
ISP

Scalar

Deep Learning: SSD-500

Visual Overlay

HDMI Display



Thank You



Empowering AI Scientists with Vitis AI



Frameworks

TensorFlow

Caffe

PyTorch

Vitis AI
Models



Vitis AI
Development Kit

AI Optimizer

AI Quantizer

AI Compiler

AI Profiler

Runtime Library

DSA

CNN

LSTM

MLP





James Peng

Co-Founder & CEO,
Pony.ai



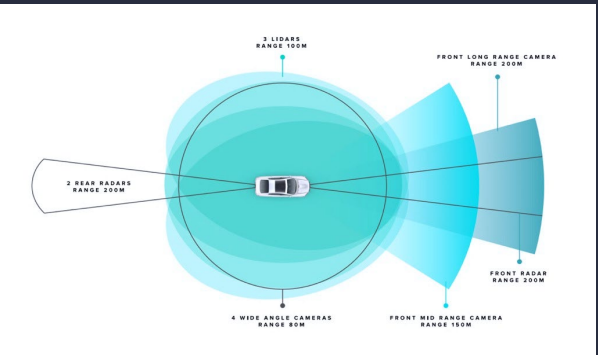
Pony.ai – A Leading Autonomous Driving (AD) Technology Company



Leading AD technology



Most diverse urban scenarios



Ecosystem



Partnerships with OEMs, Tier 1s, & suppliers



Product-ready



Multiple robo-taxis operations in US & China



US
CHINA



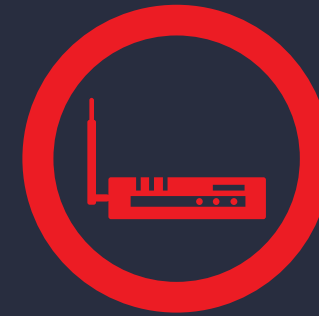
<play video>

Compute Platform Plays a Major Role in AD Performance

AD compute requirements are not your
average compute requirements...

...because an AD vehicle generates
massive amounts of data

Generating up to **4TB** of
data per day per vehicle



Processing over **100
million pixels** / second...

...and **over 1 million
points** of lidar point
cloud per second



Minimal to no latency



High performance +
power efficient



Using Xilinx FPGA has Improved our Compute Efficiency

	CPU + GPU Solution	FPGA Solution
Latency improvement	-	12x improvement
Power consumption	250 W	30 W
Real-time accuracy	X Not real-time X Unpredictable latencies varying from hundreds to millions cycles	✓ Cycle accurate pipeline ✓ Deterministic latency at fixed 73 cycles
Computing task adaptability	X Poor cache hit rate ~60% X Computing core utilization rate <10%	✓ Customized memory architecture – 100% cache hit rate ✓ Fully utilized computing core 100%



Case Study: Sensor Fusion Architecture

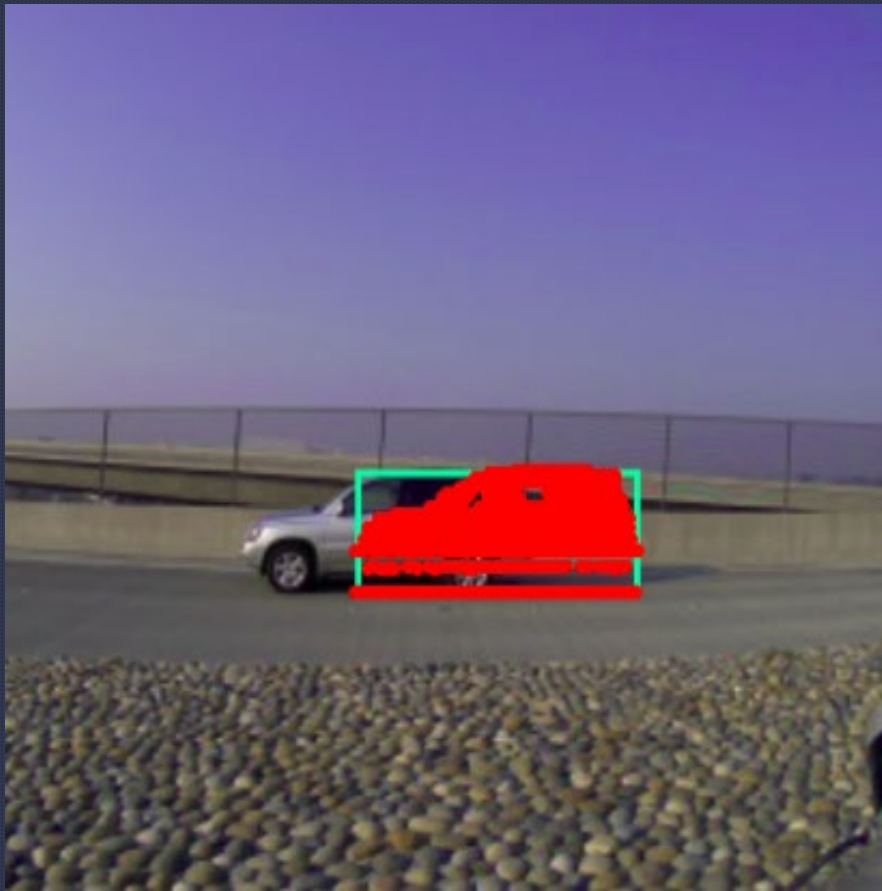
Before vs. After Introduction of FPGA Solution



Without FPGA Sensor Fusion

Side view of a vehicle
moving in the
opposite direction

Relative speed: ~30 m/s

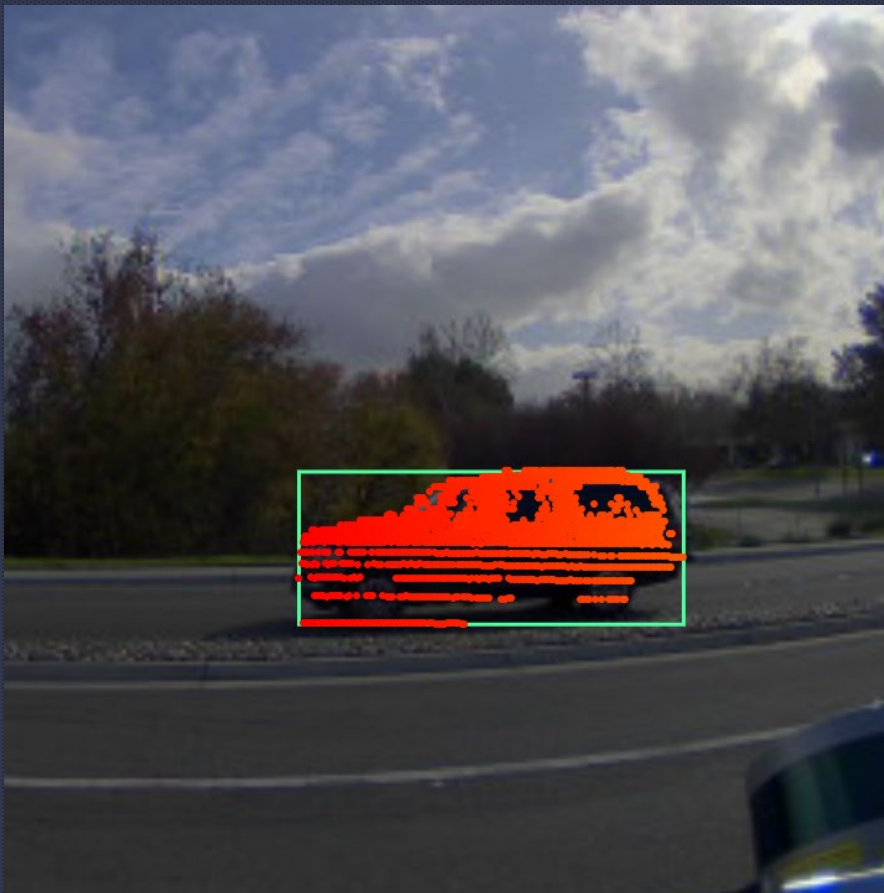


X Sensor Fusion Output Discrepancy by Nearly 1/2 Car Length

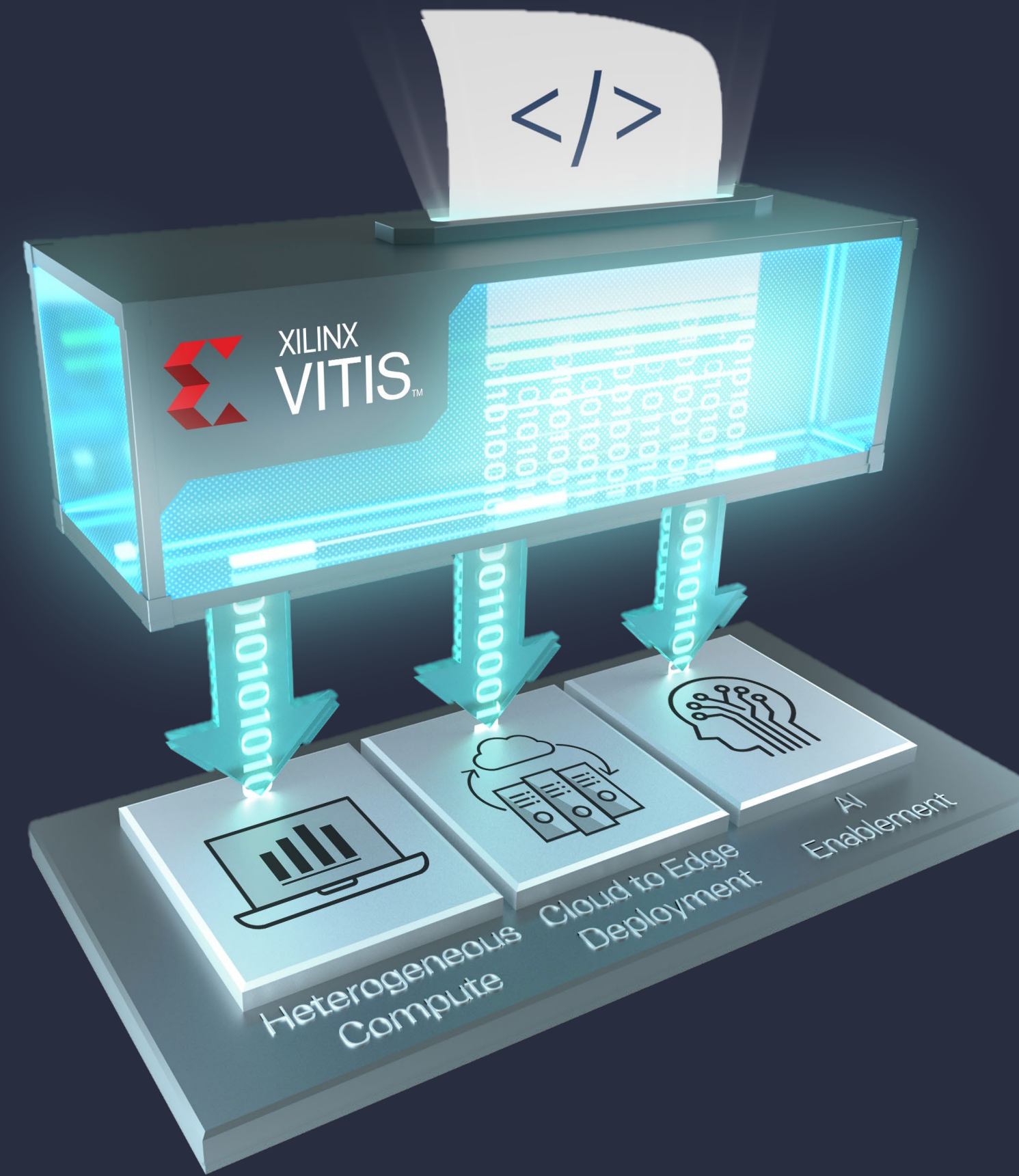
With **Xilinx FPGA** Sensor Fusion

Side view of a vehicle
moving in the
opposite direction

Relative speed: ~30 m/s



✓ No Discrepancy in Sensor Fusion Output

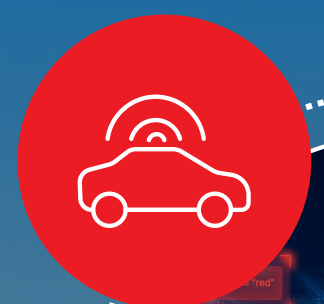


Using Xilinx Adaptive Compute Technology, Vitis AI will help accelerate our AI deployment

Thank You



Empowering the Future





Building the Adaptable, Intelligent World

