INTEL® XEON® D-1700/2700 PROCESSORS INDUSTRIAL GOLD DECK

FOR MORE INFORMATION ON CHECK HERE.

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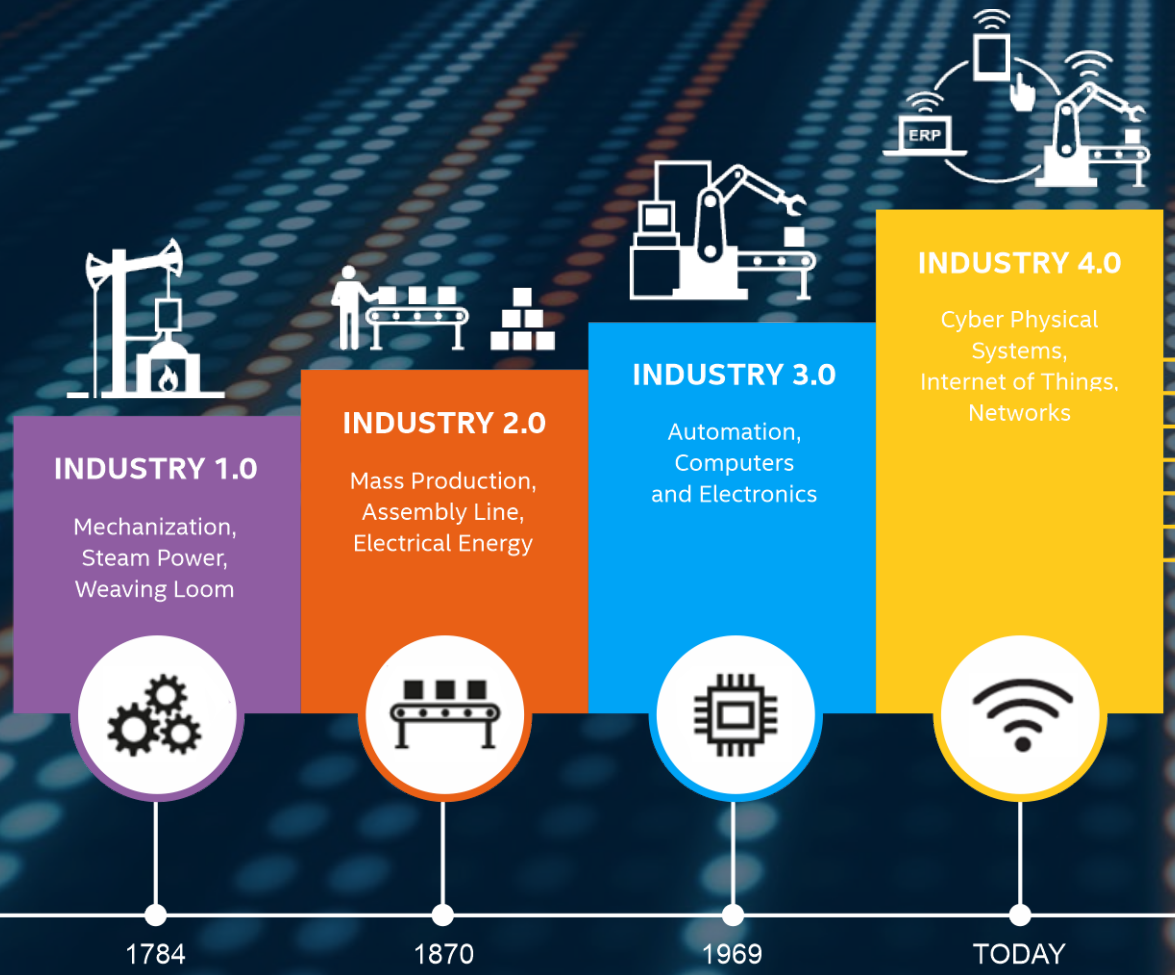
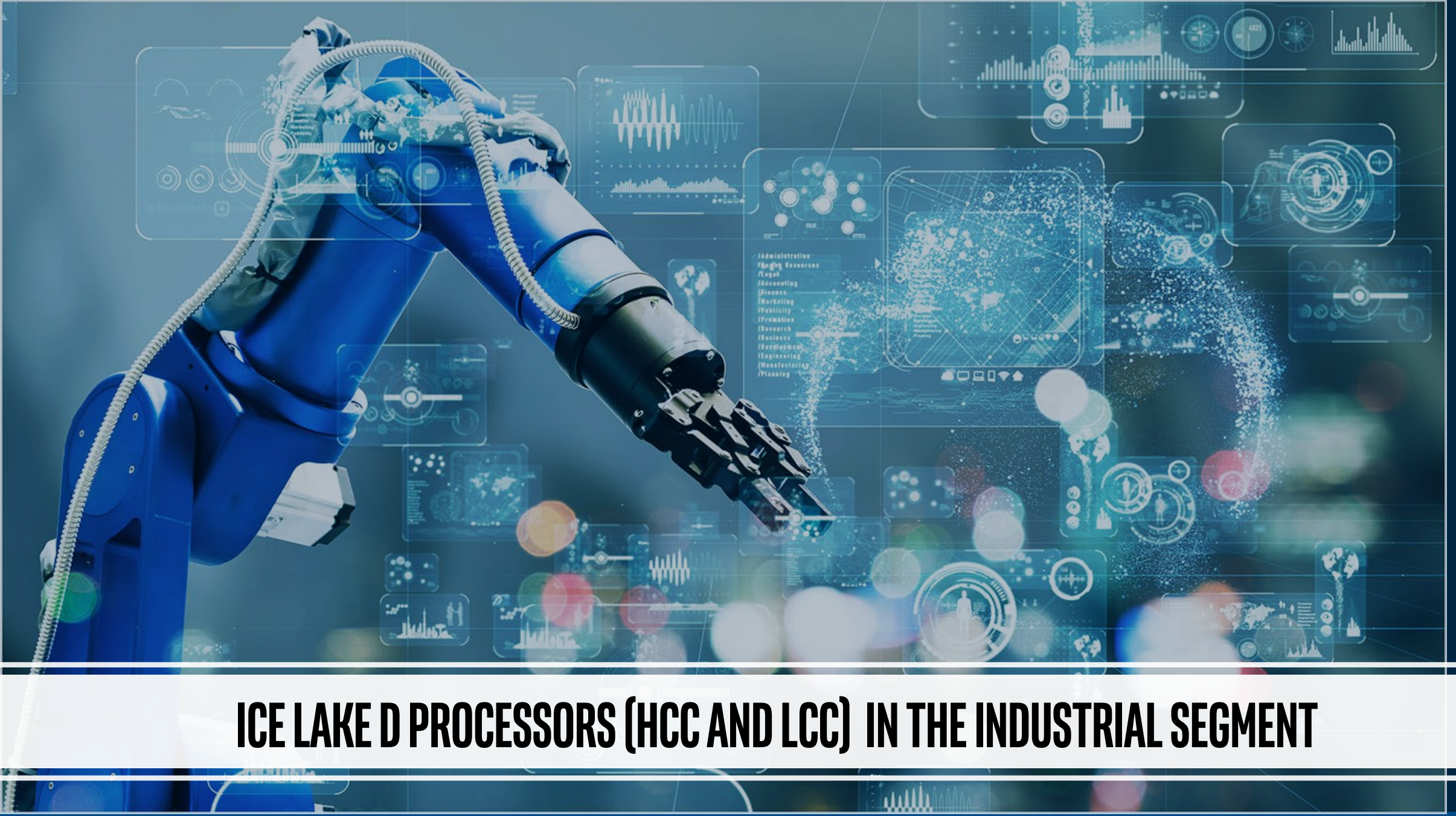
INDUSTRY 4.0



- AI
- Real time
- Functional safety
- **MORE** Reliability, security & manageability
- Connectivity
- Common & seamless developer experience
- Support for legacy systems & protocols



ICE LAKE D PROCESSORS (HCC AND LCC) IN THE INDUSTRIAL SEGMENT

ICE LAKE D OVERVIEW

High Performance Edge Computing

- Intel® Deep Learning Boost, AVX-512, VBMI
- New Hardware-Enhanced Security
- Enhanced Crypto Processing
- Intel® Software Guard Extensions
- Intel® Total Memory Encryption
- Fast and Flexible I/Os
- Increased Memory Capacity & Bandwidth

Ruggedized Solution

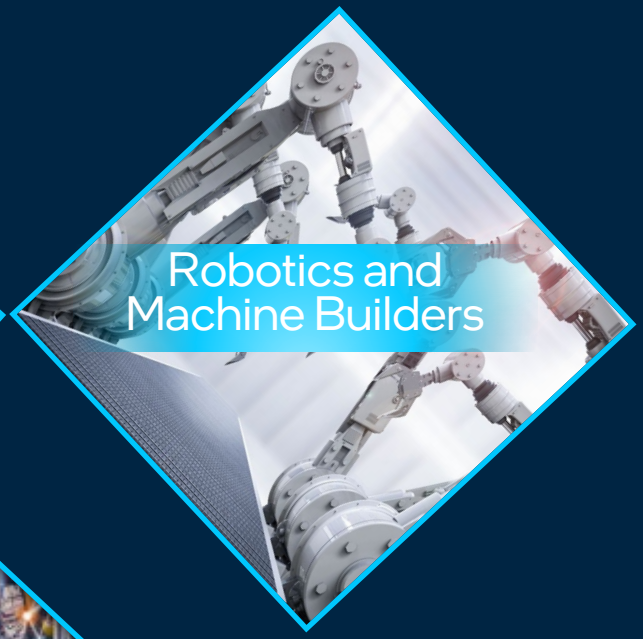
- Extended Temp supporting fanless designs
- Industrial use condition (24X7, 10-year reliability)
- High performance SoC in BGA packaging optimized for IoT applications
- Memory down solution

Industrial Technologies

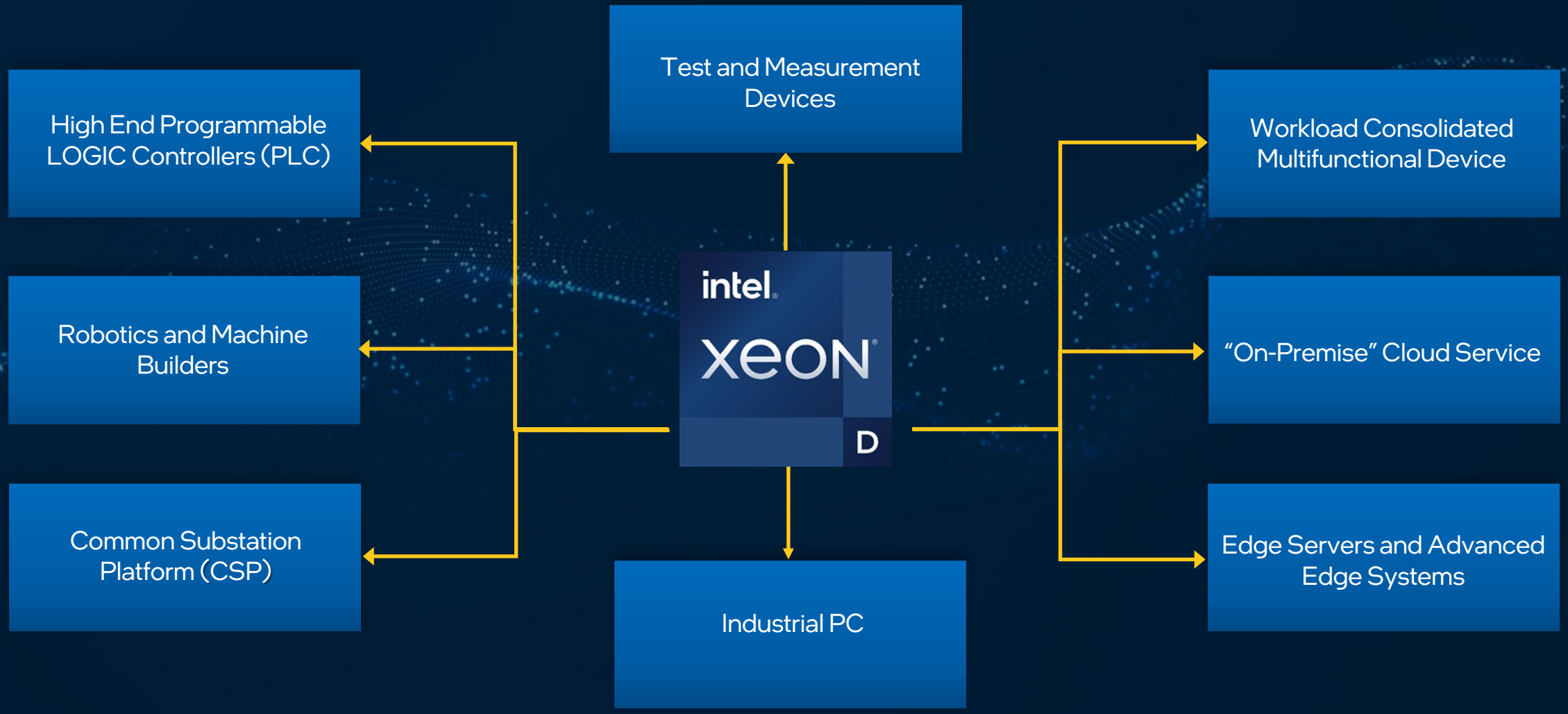
- ECC Memory Support
- Real time capabilities
- Intel® Resource Director
- Intel® Virtualization Technologies

VBMI= Vector Bit Manipulation Instruction

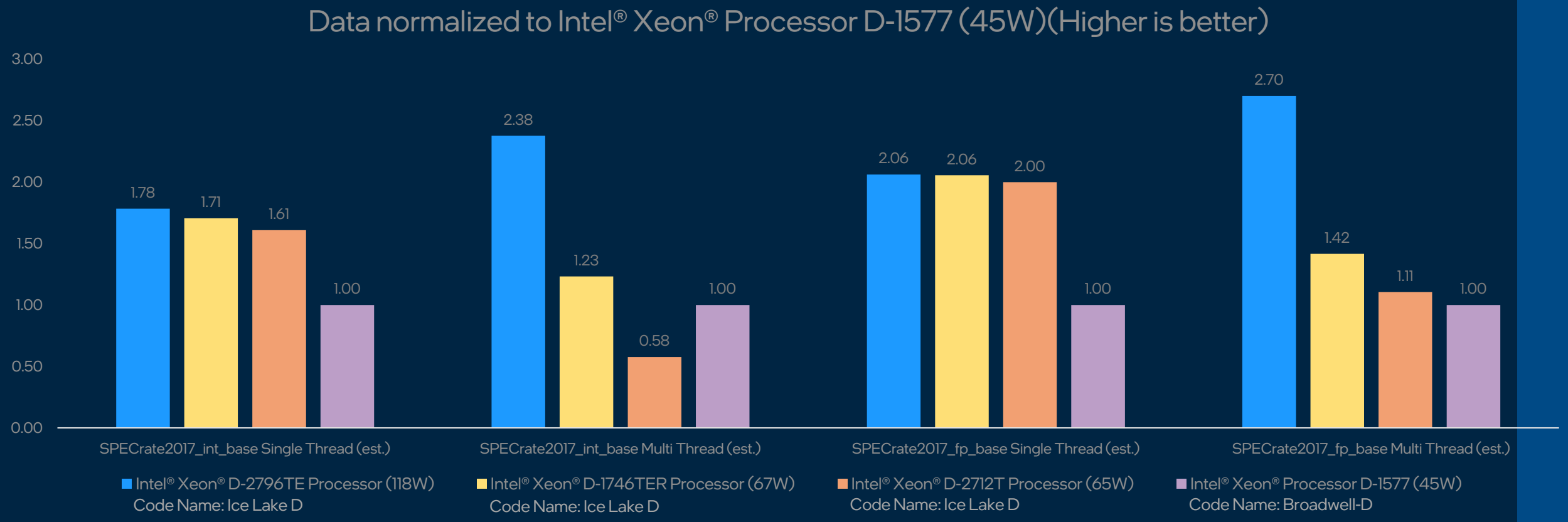
ICE LAKE D FOR INDUSTRIAL MARKET



INDUSTRIAL CLASSES OF DEVICES WITH ICE LAKE D PROCESSORS



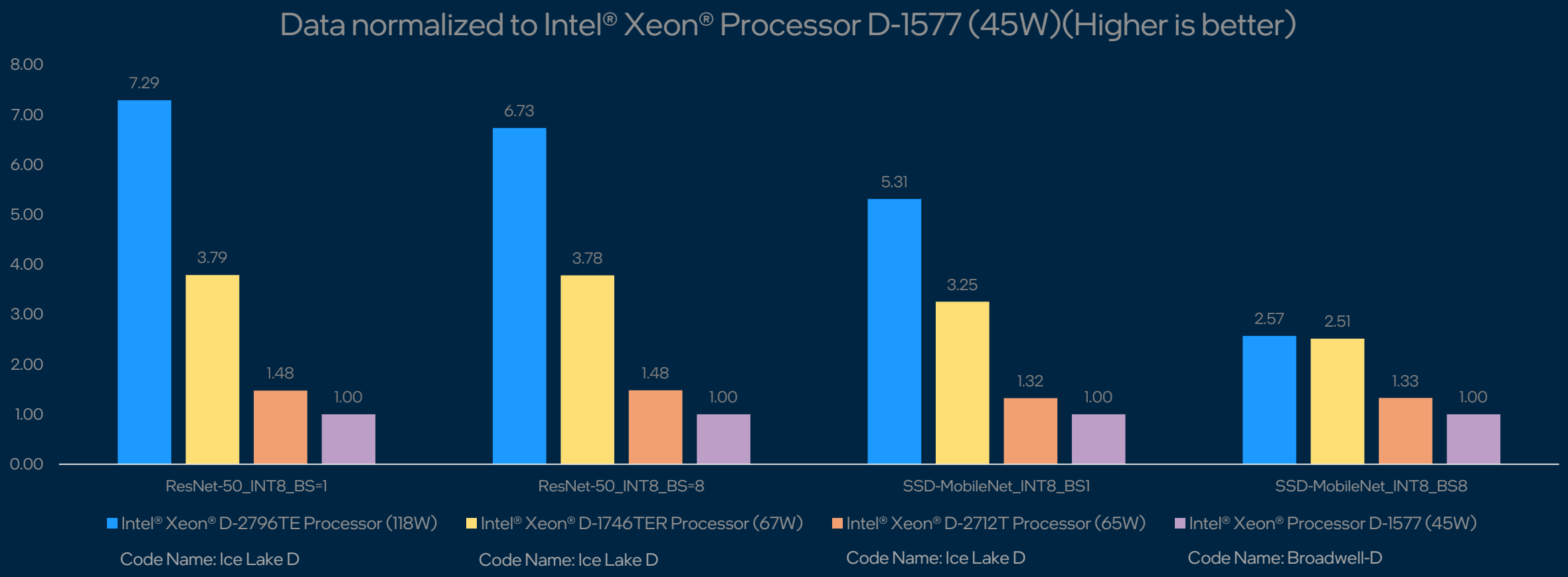
INTEL® XEON® D SERIES CPU PERFORMANCE



Performance varies by use, configuration and other factors. Learn more at www.Intel.com/PerformanceIndex. Configurations see Appendix.

Intel Top Bin Ice Lake-D SKUs shows up to 2.7x better CPU performance when compared against Broadwell-D Top bin SKU.

INTEL® XEON® D SERIES AI INFERENCE PERFORMANCE



Performance varies by use, configuration and other factors. Learn more at www.Intel.com/PerformanceIndex. Configurations see Appendix.

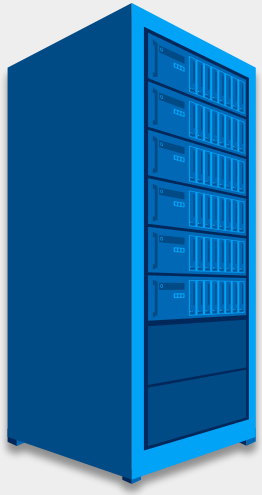
Intel Top Bin Ice Lake-D SKUs shows up to 7.29x better AI inference performance when compared against Broadwell-D Top bin SKU.

ICE LAKE D USE CASES

INDUSTRIAL RACK SERVER AND INDUSTRIAL PC

INDUSTRIAL RACK SERVER

SUPPORTS INTENSIVE WORKLOADS. RUGGEDIZED DESIGN. SHOCK RESISTANCE. ENHANCED RELIABILITY. LOW LATENCY AND DETERMINISTIC CAPABILITY

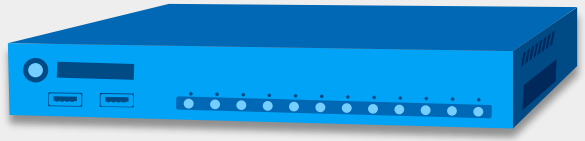


ICE LAKE D ENABLES A RUGGEDIZED DESIGN WITH ITS INDUSTRIAL USE CONDITION SUPPORT. THE BUILT IN AI CAPABILITY, DEEP LEARNING BOOST ® AND HIGH SPEED ETHERNET SUPPORT A NUMBER OF WORKLOADS SUCH AS DATABASE ANALYTICS, AI/ML TRAINING AND INFERENCING, HIGH DENSITY VIRTUALIZATION, ETC..

INDUSTRIAL PC

SUITABLE FOR FACTORY ENVIRONMENT. WIDE OPERATING TEMPERATURE. HIGH RELIABILITY (10 YEARS UP TO 100% ACTIVE)

SOC WITH BGA PACKAGING WITH SCALABLE PERFORMANCE, ECC CAPABILITIES AND THE ABILITY TO PERFORM IN EXTENDED TEMPERATURE WHILE SUPPORTING FAN LESS DESIGN SUPPORTS VERSATILE HIGH PERFORMANCE USE CASES



ROBOTICS AND MACHINE CONTROLLERS

Smart Manufacturing Applications that need high compute power and neural networks to process large data sets thru AI/ML

- For Robotics & Manufacturing: Aligning the sensors and actuators using Time Sensitive Networking helps increase the computational efficiency and reliability aimed at increasing throughput and cost savings

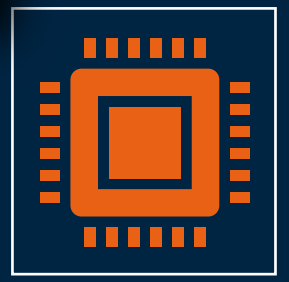
WORKLOAD CONSOLIDATION

Virtualization and Orchestration

- ACRN and KVM support.
- Performance tuning and management enhanced on
- NFVI networks.
- Intel® RDT as a solution for specific hardware resource contention.

Reduced latency , increased bandwidth needs

Low latency determinism with Time Coordinated Computing



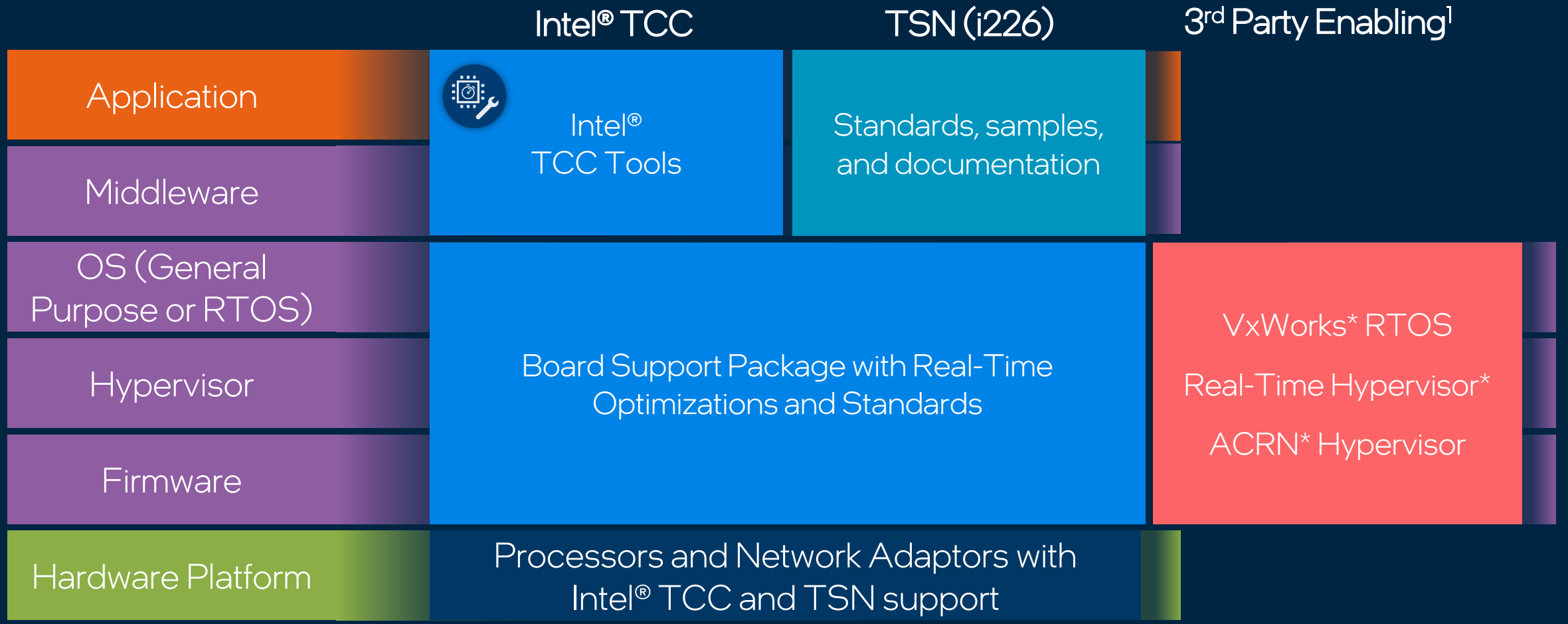
More workloads (new and legacy) on fewer devices with smaller footprint and less system complexity.

- Core acceleration through VNNI , Vector AES and VBMI for database workloads.
- TCC and TSN supporting Real time workloads.
- Networking workloads supported through RDMA

TCC AND DISCRETE TSN

INTEL® REAL-TIME WITH ICE LAKE D (HCC , LCC)

Optimized for real-time performance with a consistent user and developer experience



1 Select platforms only

For Real-Time Gold Deck Click Here.

RTOS = REAL TIME OPERATING SYSTEM

*OTHER NAMES AND BRANDS MAY BE CLAIMED AS THE PROPERTY OF OTHERS.

INTEL® TCC

FOR MORE INFORMATION ON CHECK HERE.

Enhanced performance for latency-sensitive applications at system level

Simplify the complex

Enhanced out-of-box real-time performance and no need to learn intricate low-level concepts

Doing more with the same system

Maximum efficiencies by aggregating real-time and non-real-time applications on a single system

Future-proofing designs

Scale between Intel Atom®, Intel® Core™ and Intel® Xeon® processors and across processor generations

Accelerating development

Ultra fast time to market thanks to unified and consistent developer experience

For Real-Time Gold Deck Click Here.

TSN WITH INTEL

FOR MORE INFORMATION ON CHECK HERE.

Ice Lake D supports discrete TSN (i226*). TSN is an open standards-based design that helps improve real-time performance between systems

Intel gives you choice

Build your system based on integrated or **discrete TSN Ethernet**

Timely and reliable data delivery

Reliably meet your latency SLA between devices at gigabit speeds

Converged networks

Save operating costs by running time-sensitive workloads over a single network converging IT and OT traffic

Future proof your design

Open, standards-based design simplifies system configuration and ongoing operations while supporting increased interoperability

* Intel® i226 2.5 Gbps Ethernet NIC with TSN

SPEED SELECT TECHNOLOGY

INTEL® SPEED SELECT TECHNOLOGY

FOR MORE INFORMATION ON CHECK HERE.

Intel® Speed Select Technology is an umbrella term for a collection of features that provide more granular control over CPU to help improve overall performance*. (The first time supported on Xeon-D SKU)

Intel® SST offers more active, nuanced and flexible control over CPU performance.

High Utilization

Advanced server utilization through SKU consolidation

Flexibility to select frequency and core combination

Optimized Performance

Configure CPU to run at three distinct operating points

Monitor and change core and frequency settings per workload

Lower TCO

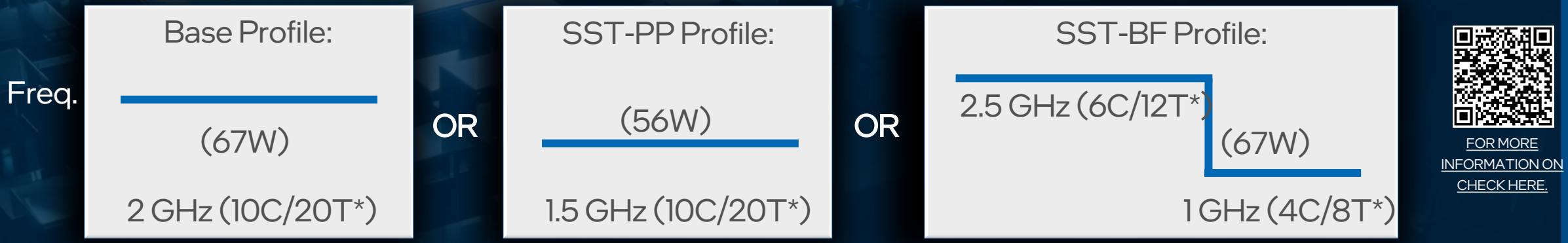
Added versatility means fewer servers to maintain

Agility and efficiency keep costs low

*http://www.intel.com/PerformanceIndex. Results may vary.

INTEL® SPEED SELECT TECHNOLOGY

- 3 SST profiles supported on Xeon-D **1746TER SKU**: Base, Performance Profile (PP), Base Frequency (BF)
- Base Frequency Profile: Ability to increase base frequency on certain cores (High Priority cores) in exchange for lowering the base frequency on the other cores (Low Priority cores)
  - Intel® SST-BF can be activated/deactivated at boot or runtime
- Perf. Profile: Allows workload capacity within one server to be reconfigured for efficient utilization



FOR MORE INFORMATION ON CHECK HERE.

* Hyper threading will be disabled during RT (Real Time) mode

One SKU. Three Profiles: Flexibility for different use cases, TDP or Performance Need

SOFTWARE

ENABLED BY VARIOUS OS AND HYPERVISORS

FROM COMMUNITY AND ECOSYSTEM PARTNERS

OS Type	Operating System (Targeted for Support)	Support	Distribution
Linux	Red Hat* Enterprise Linux 7.6 or latest[1]	Red Hat	
	SUSE* Linux Enterprise Server 12 SP4 or latest[1] SUSE* Linux Enterprise Server 15 SP2 or latest[1]	SUSE, Open Source	SUSE
	Ubuntu* 19.04 or latest[1]	Canonical, Open Source	Canonical
	Wind River Linux*	Wind River	Wind River
	Yocto Project* BSP tool-based embedded Linux (64-bit)	Intel, Open Source	Yocto Project*
Windows*	Microsoft Windows* 10 IoT Enterprise LTSC[2] Microsoft Windows Server 19H1, 19H2, 20H1	Intel, Microsoft	Microsoft
RTOS	Wind River VxWorks*	Wind River	Wind River
VMM	Linux KVM*	Open Source	
	ACRN*	Open Source	
	VMware* ESXi	VMware*, Open Source	
	Microsoft Windows* Hyper-V: Windows Server 19H1 Microsoft Windows* Hyper-V: Windows Server 19H2 Microsoft Windows* Hyper-V: Windows Server 20H1	Microsoft	
	Microsoft Azure*	Microsoft	

INTEL® EDGE INSIGHTS FOR INDUSTRIAL

Robotic Controllers

- Robotic pick and place
- Robotic motion control with integrated analytics

Predictive Maintenance

Predicting future outcomes based on historical data

- Predict product quality
- Predict equipment maintenance

Video Analytics

- Vision use cases around quality assurance, identification, positioning and guidance
- Video Data Ingestion, Analytics and Storage

Process Automation

Asset monitoring and control

- Control processes with soft real time capabilities
- Optimize process efficiency

FOR MORE INFORMATION ON EII CHECK HERE.

Edge Insights for Industrial is Intel's reference software for industrial edge inference IoT that is validated on Ice Lake -D. It is a modular software that aggregates and processes time series, image/video & audio1 data at the edge to provide useful insights via edge data analytics.

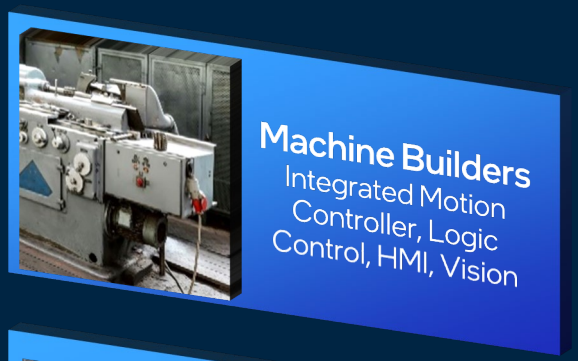
Structured Data | Time series | Image | Video | Text | Audio

INTEL® EDGE CONTROLS FOR INDUSTRIAL

Edge Node Management	StarlingX	Intel Orchestration Service Extensions	3rd Party DMS Integration				
	Orchestration Containers & VM	Platform Management	Protocol Bridge	Onboarding	Performance Benchmarking Tools	3rd Party SoftPLC	Time Series Database stack
	Sample OPC UA Application	EtherCAT Master	Real-Time Tools	Trusted Edge Platform	Robotics OS	FuSa Capable Software *EA Only*	Middleware/ Tools
OS	Yocto built Linux – PREEMT RT Host and Guest OS	MS Windows as Guest OS	RTOS				
	ACRN	Realtime Systems	Linux KVM				Hypervisors
Firmware	Standard UEFI	Slim boot Loader					
Supported HW	Intel® FPGA	Intel® Atom®	Intel® Core™	Intel® Xeon®			
Physical Platforms	Wide range of validated COTS IPC	Intel's DCN HW Reference*					

Intel Developed | Open Source | Intel + Open Source

3rd party Developed | Intel/Open Source/ 3rd Party



Machine Builders
Integrated Motion Controller, Logic Control, HMI, Vision

Discrete Automation
(Automotive) Cell Controllers, Robotic Controllers

Process Automation
(Oil & Gas, Grid Substations)

FOR MORE INFORMATION SCAN THE QR CODE

Intel® Edge Controls for Industrial uses a range of IT-style technologies—like containerization, virtualization, and orchestration—while meeting industrial-grade requirements for determinism and high levels of operational availability.

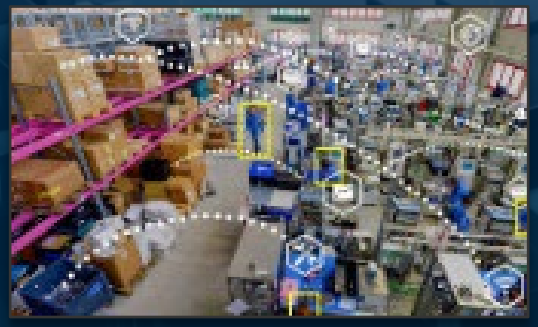
INTEL® DISTRIBUTION OF OPENVINO™ TOOLKIT

What is it?

The toolkit enables a write-once, deploy anywhere approach to deep learning deployments on Intel platforms, including CPU, integrated GPU, Intel Movidius VPU, and FPGAs.

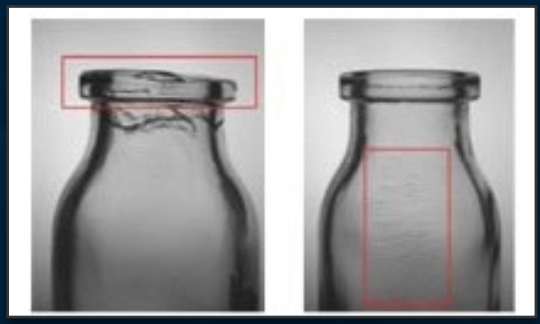
Write Once, Deploy Anywhere

Examples of using Xeon with Intel® Distribution of OpenVINO™ Toolkit



Optimize factory operation to higher throughput?

Predicting failure and downtime



Bring AI to find product deficiency

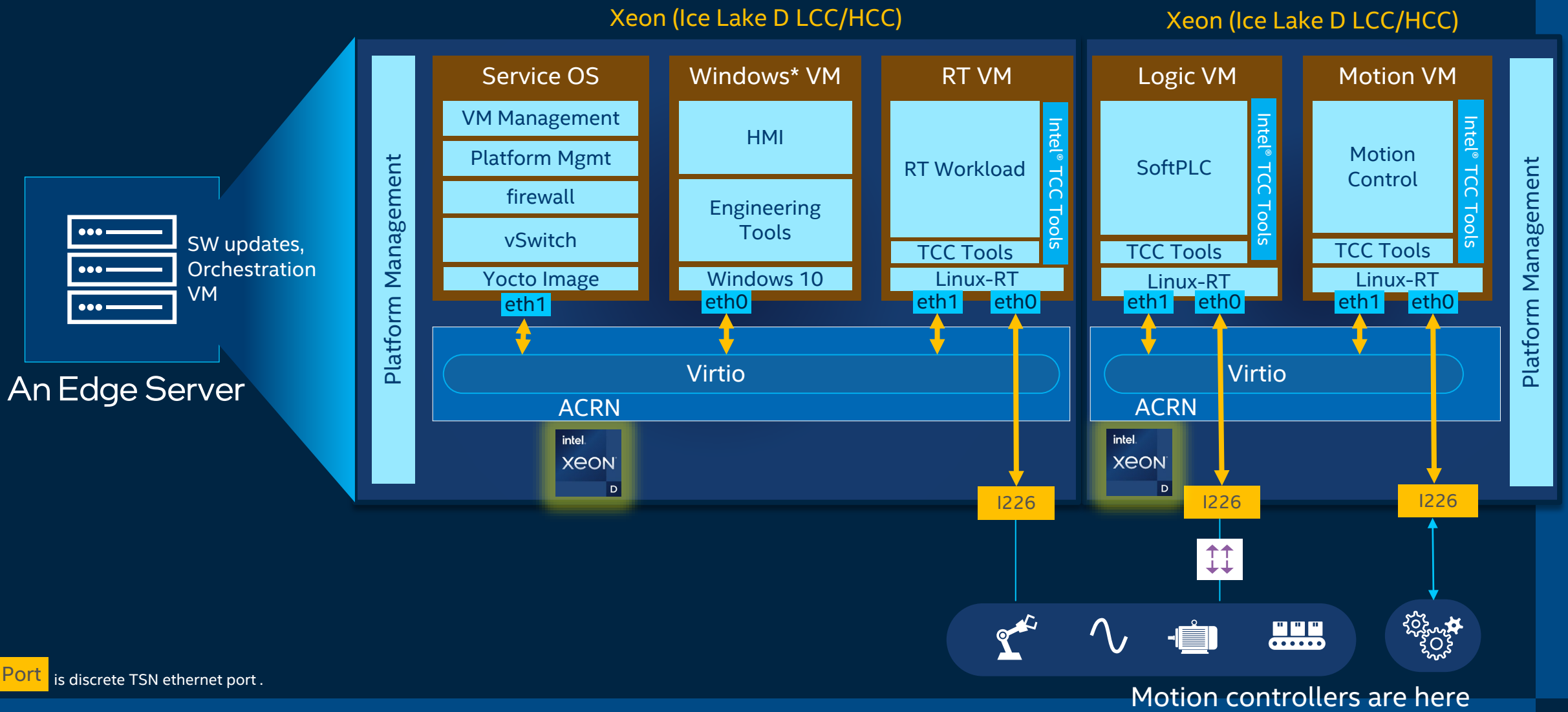
FOR MORE INFORMATION ON OPENVINO CHECK HERE.

The Intel® Distribution of OpenVINO™ Toolkit enables industrial customers to **optimize**, **tune**, and **run** comprehensive AI inference using the included **model optimizer** and **runtime** and **development tools**.

Note: OpenVino is integrated with TensorFlow

DISCRETE AUTOMATION: CONSOLIDATED CELL CONTROLLER

ECI + TSN + TCC (interoperability and more)

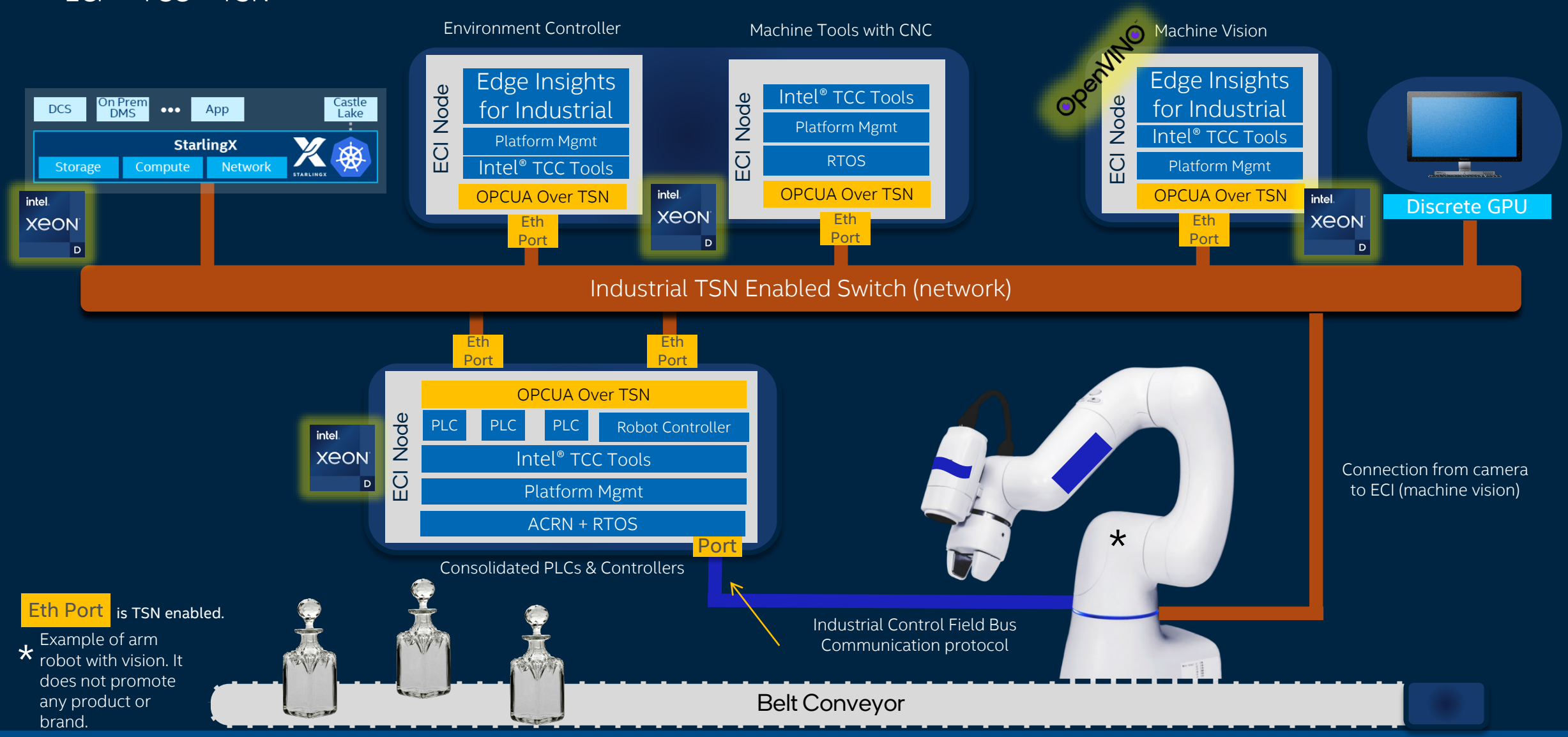


Eth Port is discrete TSN ethernet port .

- Ice Lake-D with it's high-performance cores & TCC, along with discrete TSN make it an excellent platform for industrial real time, and edge server use cases.
- The support for TCC and discrete TSN makes Ice Lake-D a great platform for real-time workload consolidation.
- ECI software platform, facilitates the consolidation of multiple discrete automation workloads with real-time requirements on Ice Lake-D platform.

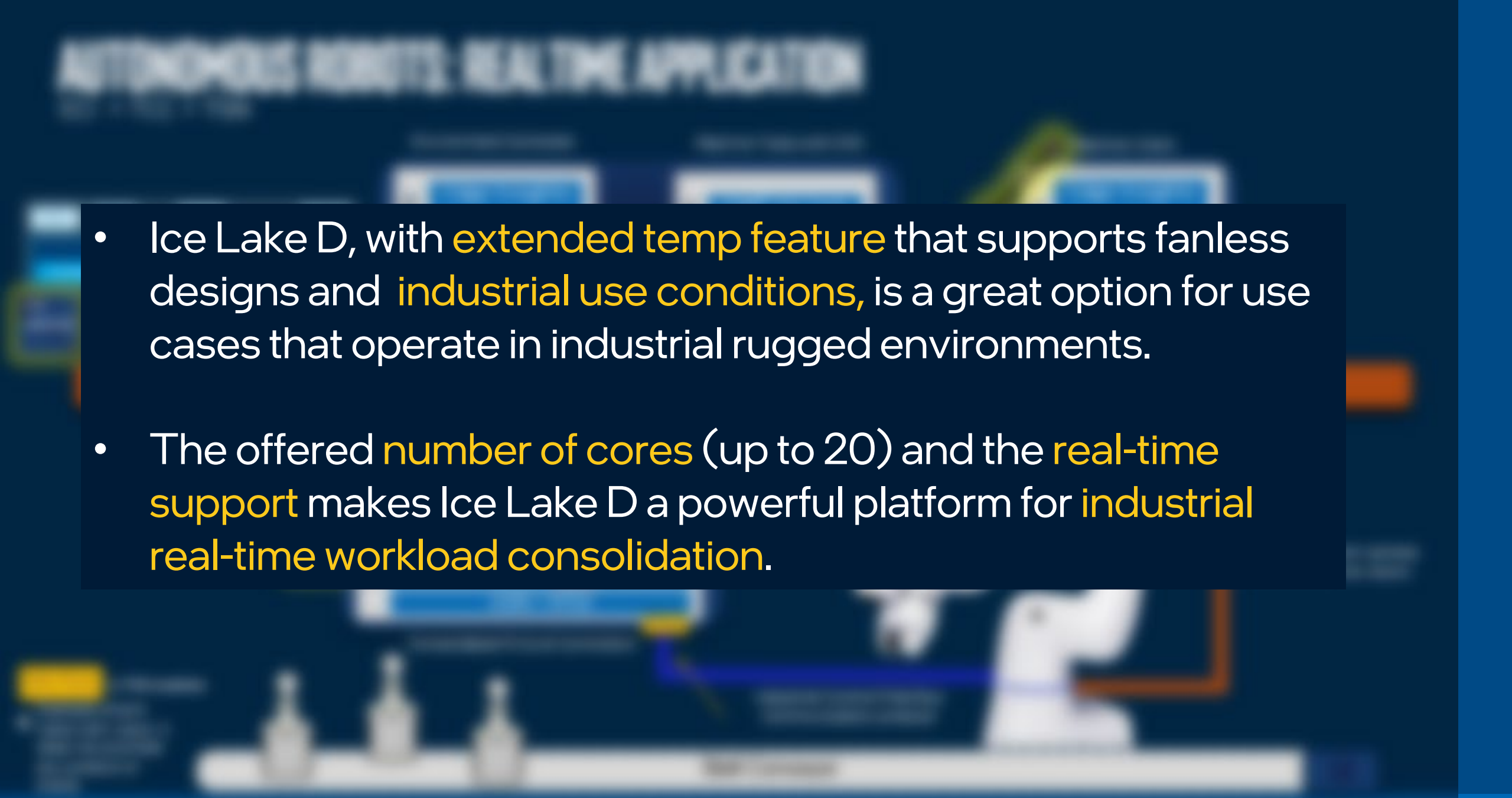
AUTONOMOUS ROBOTS: REALTIME APPLICATION

ECI + TCC + TSN



Eth Port is TSN enabled.

* Example of arm robot with vision. It does not promote any product or brand.



- Ice Lake D, with extended temp feature that supports fanless designs and industrial use conditions, is a great option for use cases that operate in industrial rugged environments.

- The offered number of cores (up to 20) and the real-time support makes Ice Lake D a powerful platform for industrial real-time workload consolidation.

INTEL® FDO (FIDO DEVICE ONBOARD)

Drop ship device to installation location

Power-up & connect to Network

Auto-provisions to target platform or Cloud

Value Proposition[1]

- **Zero touch onboarding** – integrates readily with existing zero touch solutions
- **Fast & more secure**[1] – ~1 minute
- **Hardware flexibility** – any hardware
- **Any cloud** – internet & on-premise
- **Late binding** - of device to cloud greatly reduces number of SKUs vs. other zero touch offerings
- **Open** - LF-Edge SDO project up and running, SDO code now on GitHub

Use cases for Industrial devices: Gateways, servers, sensors, actuators, control systems

IT-OT Convergence - Intel® FDO enables remote configuration & manageability of industrial devices on factory floor, helps in volume deployment

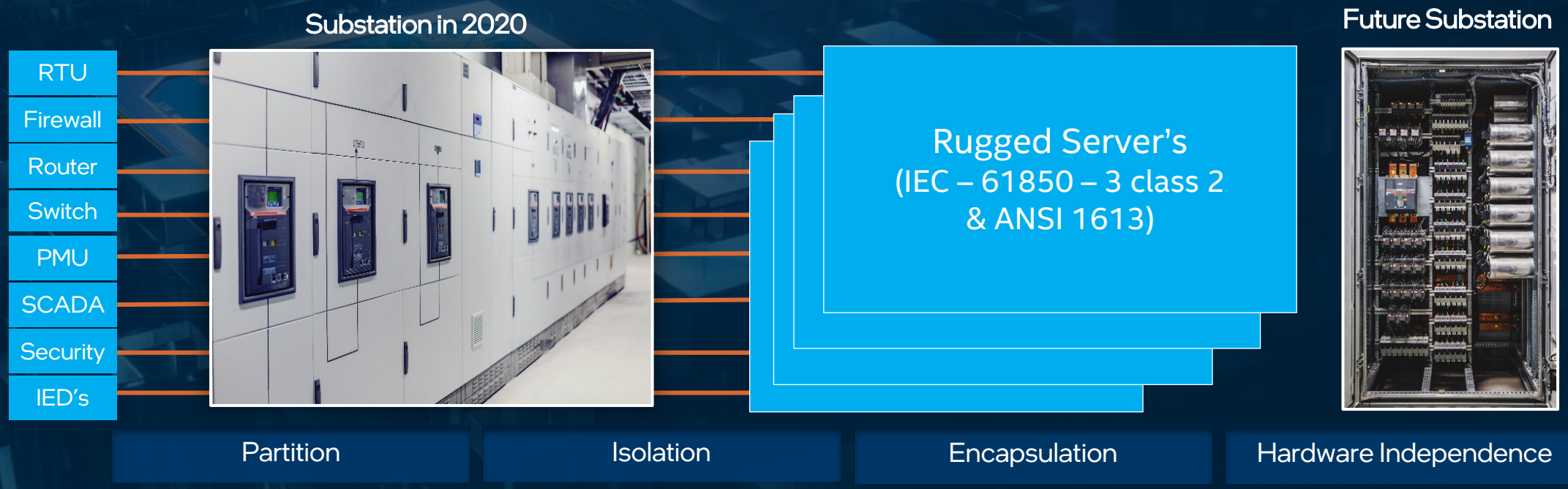
FOR MORE INFORMATION SCAN THE QR CODE

1. No product or component can be absolutely secure

Ice Lake D on Substation: Multi- RTVM Enabled Ruggedized Server

Development with ECI 3.0 Multi-RTVM

Enhance Reliability, SAFETY, Security, manageability and Edge Analytics



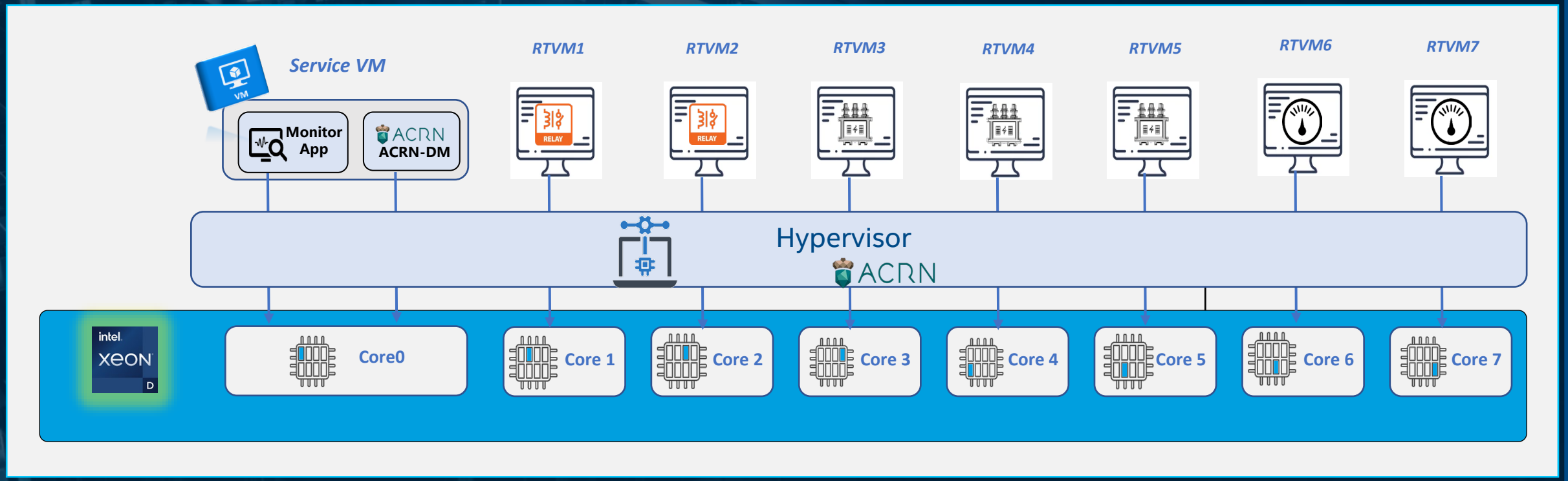
Standardize Hardware Platform	Help improve Reliability, Safety and Security	Reduce Capital Investment	Reduce Operation and Maintenance Cost
50% Reduction in Devices*, **		76% Reduction in O&M Cost*, **	

*https://gridwise.org/wp-content/uploads/2021/09/Power-of-Infrastructure-Modernization-Ebook.pdf

** Data Source: Salt River project. Intel does not control or audit third-party data. You should consult other sources to evaluate accuracy.

Ice Lake D on Substation: Multi- RTVM Enabled Ruggedized Server

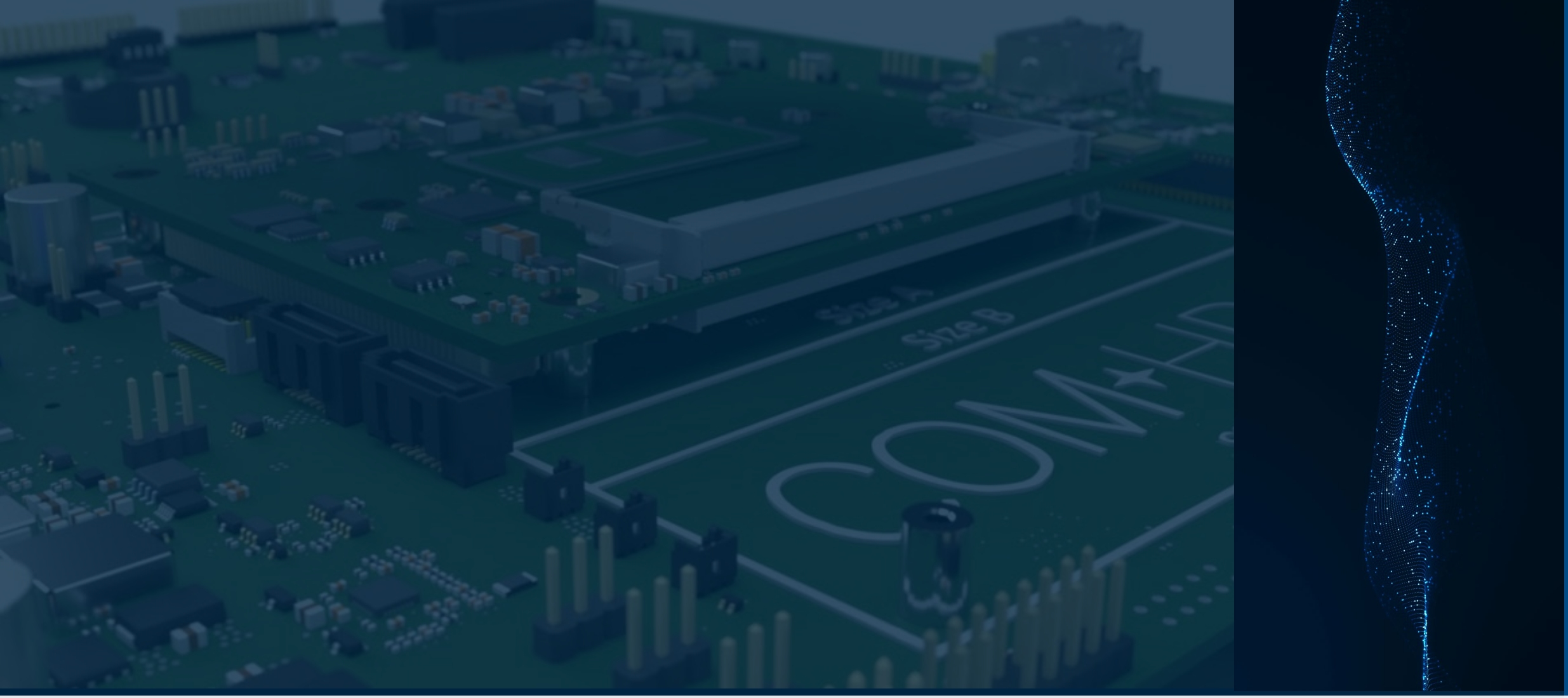
Development with ECI 3.0 Multi-RTVM



Ice Lake D Values (vs. Xeon SP):

- Lower core counts
- A fanless option for a small substation
- RT control/AI/5G WLC at the substation edge

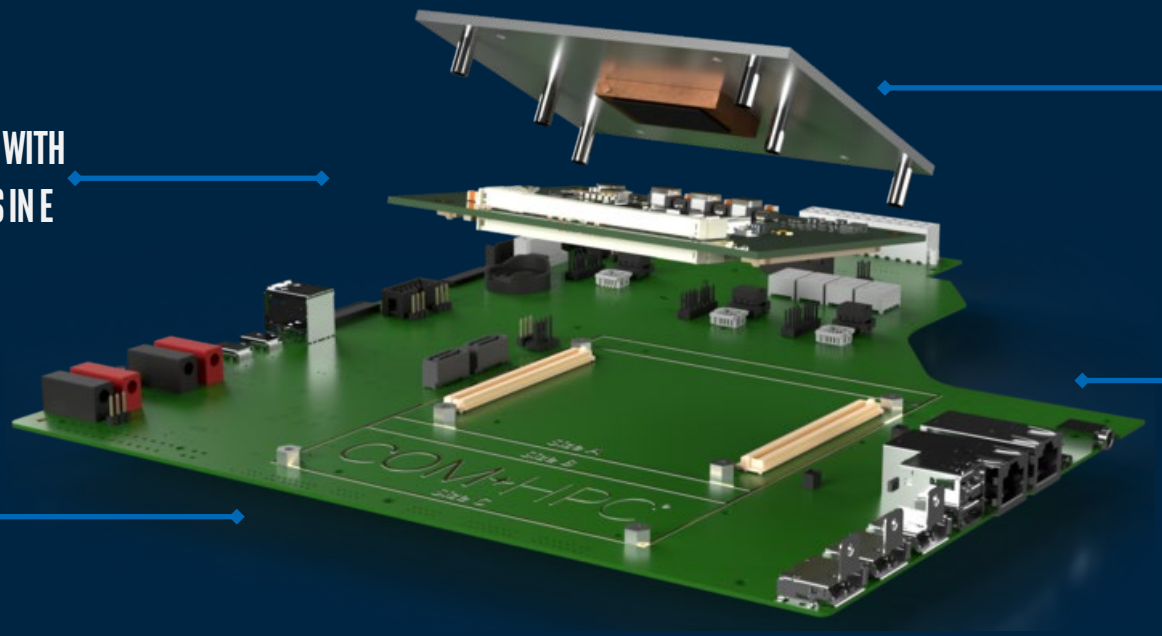
In this use case:
8 cores Ice Lake D running 7 RTVMs, RTVM/core



COM-HPC

COM-HPC SERVER MODULE HIGHLIGHTS

ENHANCED MEMORY PERFORMANCE WITH
SPACE FOR UP TO 8X DIMM SOCKETS IN E



2 DIFFERENT MODULE SIZES FOR SERVER
D (160X160MM) & E (200X160MM)

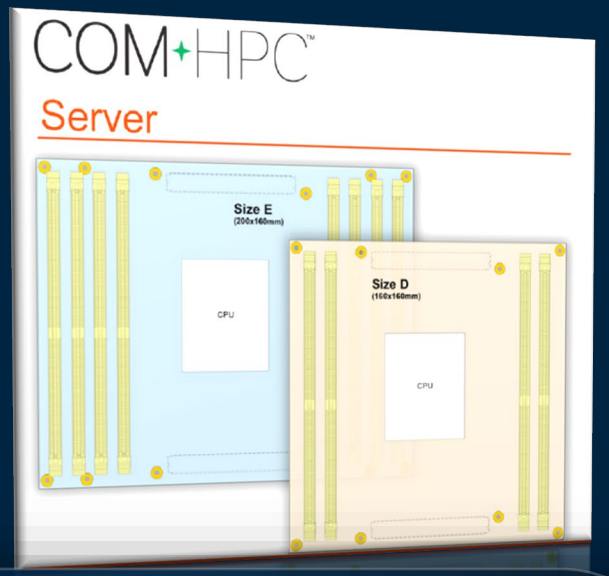
2X400 PIN HIGH PERFORMANCE
CONNECTOR

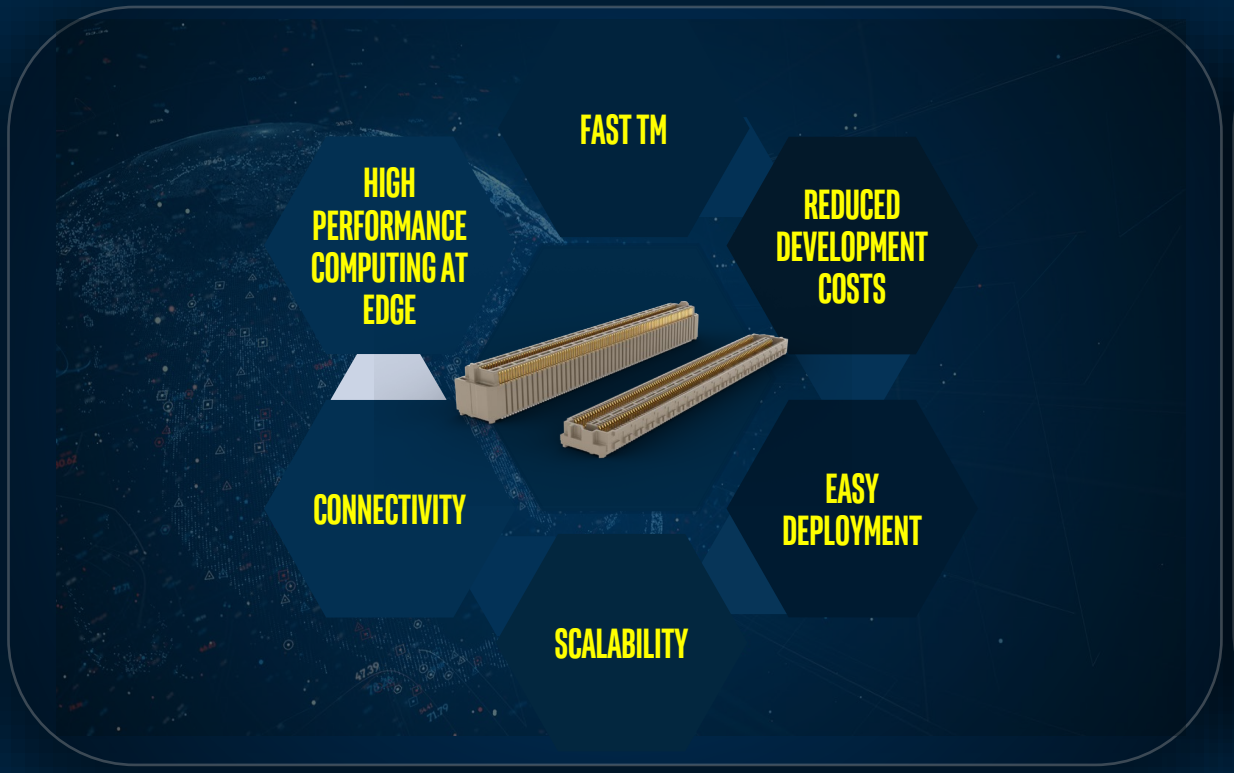
LARGE NUMBER OF HIGH-SPEED IO
65X PCIE GEN 5, 8X25 GBE KR
MIX OF OTHER MID-LOW IOS

OPTIMIZED SERVER GRADE BOARD
MANAGEMENT

FIXED 12V, UP TO 358W INPUT POWER

COM – HPC SERVER MODULE AND ICE LAKE D

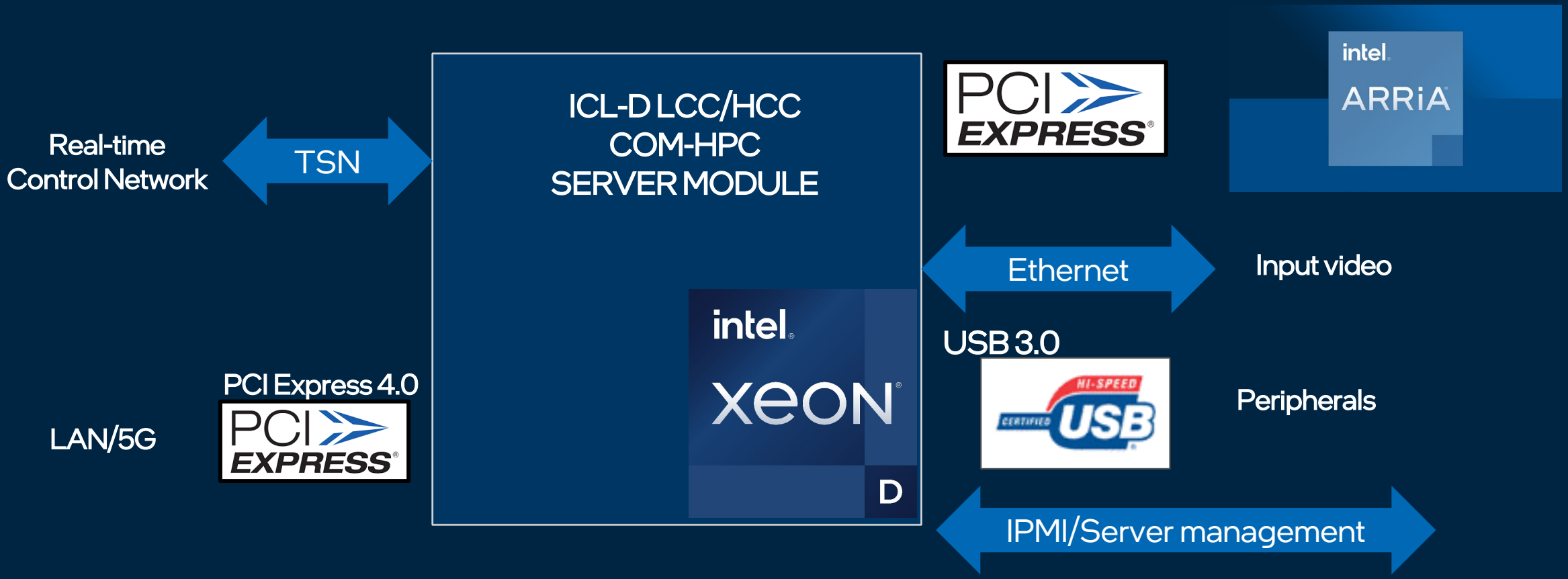




Synergy between Ice Lake D and COM-HPC

- COM-HPC supports more cores and higher performance of Ice Lake D (HCC, LCC)
- Support for PCIe Gen4, USB4 and 25GbE matching ICL-D enhanced IO capabilities
- Larger number of IOs to support the wide range of requirements and peripherals for edge computing and workload consolidation
- Enhanced memory performances
- Fit sizes D (160x160mm) & E (200x160mm) of COM-HPC server

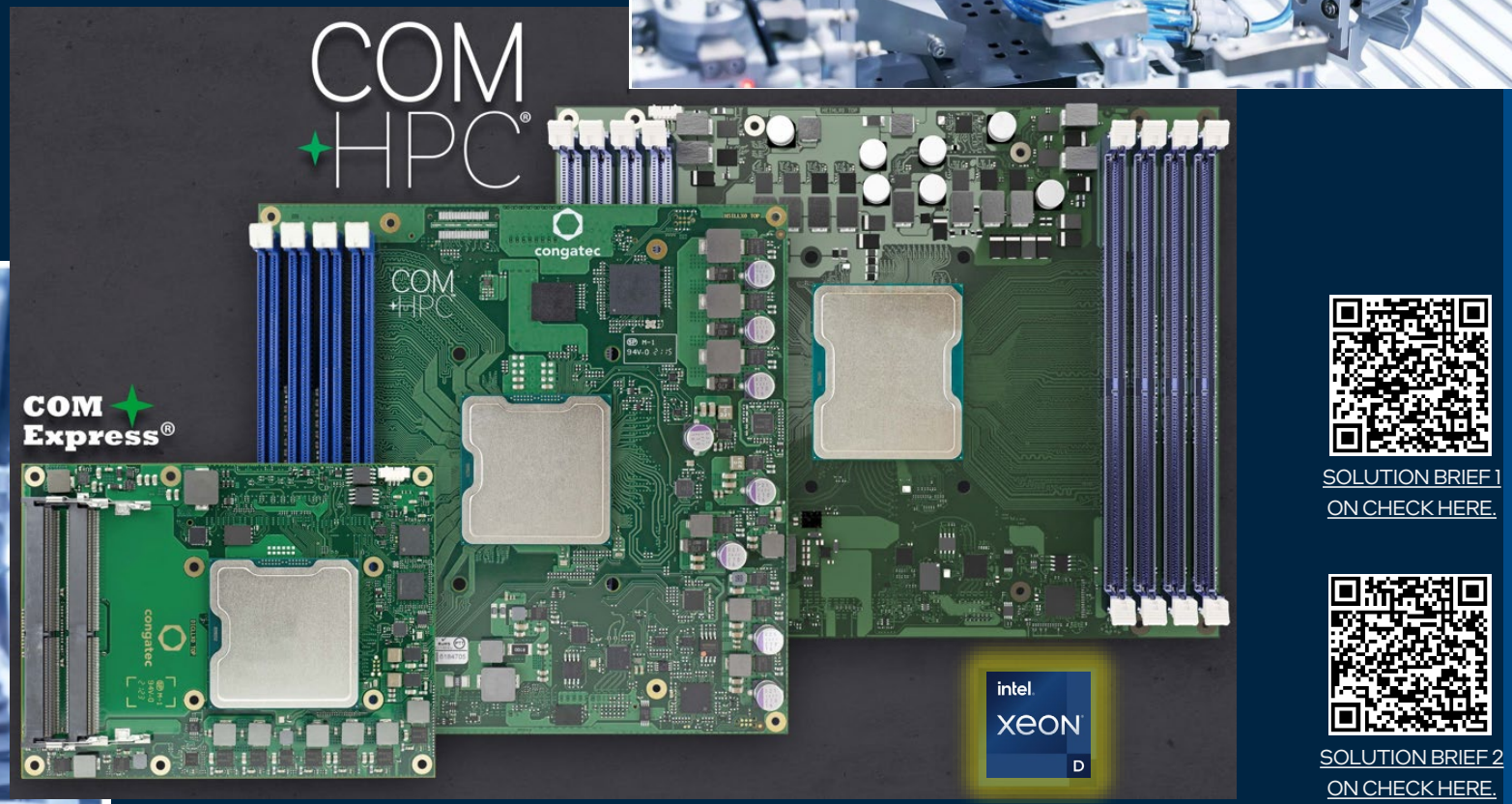
COM-HPC FOR WORKLOAD CONSOLIDATION



COM-HPC FOR TEST & MEASUREMENT

Benefits:

- Fast time to market and fast reaction to market trends
- Low development costs and inventory costs
- Scalable across multiple CPU speeds and generations
- Customers can focus on system features



SOLUTION BRIEF 1
ON CHECK HERE.

SOLUTION BRIEF 2
ON CHECK HERE.

KEY TAKEAWAYS

FURTHER INFORMATION

More details about Ice Lake D and its supporting hardware and software features, roadmap and schedule can be found at Intel Resource & Design Center:

Idaville LCC Collateral Technical Library

Idaville HCC Collateral Technical Library

Discover the latest in Intel® Industrial IoT at:
https://www.intel.com/content/www/us/en/internet-of-things/industrial-iot/overview.html

SUMMARY

Ice Lake D aims to offer amazing improvements and upgrades to cater the new generation of IOT Industrial Applications, while maintaining the small form factor. Ice Lake D also offers low to high power SKUs benefitting various, ever evolving IOT needs, enabling processing at the edge.

APPENDIX: WORKLOAD DESCRIPTIONS & CONFIGURATIONS

SYSTEM CONFIGURATION (ICX-D, BDW-D)

Hardware spec		ICX D			BWD D
	Hardware spec	2796TE (QYP5)	D-1746TER (QYQ7)	D-2712T (QYP4)	1577
	Processor Cores	20	10	4	16
	Cores per socket	2	2	2	1
	Number of Threads	40	20	8	32
	Core MAX Turbo Freq GHz	3.1GHz	3.1GHz	3.0GHz	2.10GHz
	Core Base Freq GHz	2.0GHz	2.0GHz	1.9GHz	1.30GHz
	TDP (W)	118	67	65	45
	Graphics Max Freq GHz	Nil	Nil	Nil	Nil
	Graphics Processor	Nil	Nil	Nil	Nil
	Number of Execution Units (EUs)	Nil	Nil	Nil	Nil
	Max Memory Speed (MHz)	DDR4-2400 MHz	DDR4-2400 MHz	DDR4-2400 MHz	DDR4-2133MHz
	Intel Smart Cache (L3)	30MB	15MB	15MB	24MB
	RAM size	128GB DDR4-2400 MHz	64GB DDR4-2400 MHz	64GB DDR4-2400 MHz	64GB DDR4-2133 MHz
	Storage	SSD 500GB	SSD 500GB	SSD 500GB	SSD 500GB
	Platform/motherboard	Brighton City RVP (Rerefence validation Platform)			TBD

SYSTEM CONFIGURATION (ICX-D, BDW-D)

		ICX D (2796TE, 1746TER, 2712T)			BWD D (1577)		
System Config	Bios	IDVLCRB1.86B.0021.D41.2112031014	IDVLCRB1.86B.0021.D40.2112020610	IDVLCRB1.86B.0021.D41.2112031014	TBD		
	CPU ISA feature	AVX512			AVX2		
	Turbo Mode	Enabled			Enabled		
	Hyper Threading	Enabled			Enabled		
	DL Boost	Enabled			NA		
	OS	Ubuntu Desktop 20.04 Intel IoTg, 64 bit					
	Kernel	5.13.0-1010-intel					
	CPU Frequnecy Governor	Performance					
	Power and Perf Policy	Performance					
	Microcode	0x1000150	0x1000150	0x1000150	-	0x700001b	TBD
	NUMA Nodes	Enabled					

SYSTEM CONFIGURATION (ICX-D, BDW-D)

		ICX D (2796TE, 1746TER, 2712T)	BWD D (1577)
Workload Config	Synthetics workload config		
	Spec2017 1.1.5		
	Support-tier	Tier-1	
	Compiler version	C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux	
	Binary version	IC2021.1	
	Config scenario	intrate	
		fprate	
	Measurement	1-copy	
		n-copy (n = max threads)	
	Result	score (the higher the better)	
	AI Workload config		
	OpenVINO 2022.1		
	Support-tier	Tier2	
	AI Model	resnet-50-tf v1.5 [224x224]	
		SSD-resnet34-1200-onnx [1200x1200]	
		ssd_mobilenet_v1-coco [300x300]	
	Batch Size	1,4,8,16	
	Precision	FP16-Int8	
	Devices (CPU/dGPU/iGPU)	CPU	
	nstreams	max number of threads	
	Result	TPT (the higher the better)	
		Latency (the lower the better)	

WORKLOAD DESCRIPTION

SPEC* CPU2017 is a benchmark from the SPEC consortium (www.spec.org) that measures computer performance and throughput using compute intensive application subtests.

MLPerf v1.1 Inference Edge/ Mobile with Offline Scenario using OpenVINO 2021.4.1 framework is a benchmark suite for measuring how fast systems can process inputs and produce results using a trained model on Intel® UHD graphics. Result not verified by MLPerf. MLPerf name and logo are trademarks. See www.mlperf.org for more information.

HandBrake is a High Definition Experience & Performance Ratings Test, is a benchmark from Principled Technologies* that measures Windows* media editing performance.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