

oneAPI Workshop

“Using Intel® oneAPI Toolkits with FPGAs Virtual Workshop”

15th December 2021



intel[®]

Introduction to Innovator Program

(<https://devmesh.intel.com>-> member Programs)

TOP TIER EXPERTS WHO INNOVATE & LIKE TO SHARE WORK GO UNDER NDA

ACCESS TO INTEL HARDWARE & INTEL EXPERTISE

EARLY EXPERIMENTS, PROTOTYPES, TESTING & RESEARCH

SPOTLIGHT

SPEAKERSHIPS & DEMOS AT MAJOR CONFERENCES AND PUBLIC EVENTS



Shared Projects - Mesh

Technical Articles

Media Articles

Event Demos

Devs Trained

Product Feedback



Intel® oneAPI Technology Partners

Companies endorsed by Intel who provide services based on their Intel® oneAPI technical expertise to meet the business and technical needs of customers and the local developer community.

Connecting with an Intel® oneAPI Technology Partner:

- 19 companies in 10 countries
- Certified on various programming models for HPC and AI using Intel oneAPI
- Find your local expert here:
 - software.intel.com/content/dam/develop/external/us/en/documents/pdf/intel-oneapi-tech-partners-v-1-0.pdf

PARTNER QUALIFICATIONS:

1. Expertise in parallel programming for CPU & GPU
2. Provide consulting & services such as porting applications, coding, tuning, code-modernization, etc.
3. Successful completion of training portal and technical assessments

Intel® Certified Instructors for oneAPI

Intel® Certified Instructors are endorsed by Intel to teach oneAPI topics creating a global network of oneAPI experts.

Instructors come from consulting companies & solution providers in the Intel® oneAPI Technology Partner Program, academia and the Software Innovator program.

Connecting with an Intel® Certified Instructor:

- 64 instructors certified to teach Data Parallel C++ across 10 countries
- Find your local expert here:
 - software.intel.com/oneAPI/training/certified-instructors

INSTRUCTOR QUALIFICATIONS:

1. Technical expertise and mastery of DPC++ language
2. Demonstrated teaching ability
3. Ability to use Intel® DevCloud as a teaching tool
4. Successful completion of our hands-on workshops and assessments

What's next.....

Try your code on Intel® DevCloud

Develop, run, and optimize your oneAPI project on the Intel® DevCloud, a free development sandbox with access to the latest hardware and software from Intel. No software downloads. No configuration steps. No installations. Get started in minutes.



[Get started in minutes](#)



Continue your self-paced learning

Work step-by-step through code examples to that will help you optimize your Intel® oneAPI solution in the Intel® DevCloud and enhance your understanding of DPC++.

[Start Trainings](#)

Innovate, Collaborate & Share on DevMesh:

Submit your project to showcase your work and get feedback and support from experts and Intel. See how others are leveraging Intel® oneAPI Products.



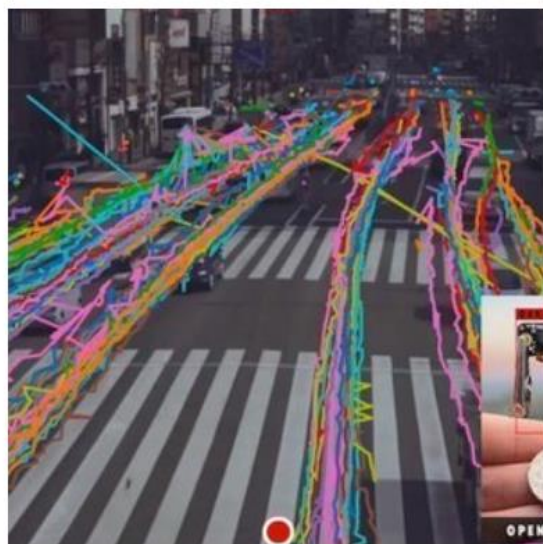
[Share on DevMesh](#)

INTEL DEVMESH PROJECTS

<https://devmesh.intel.com>



with



idVR Intelligent Digital Video Recording



Alessandro de Oliveira Faria



Created: 04/02/2021



oneOLIGO



Eugenio Marinelli



Created: 03/24/2021

- Intel's community portal for developers and creators who want to share their work and best practices to the community while building a professional profile of amazing work and activities.
 - Find Amazing Research and Projects. [Go to Project](#)
 - Developer Profiles [Go to People](#)
 - Developer Blogs [Go to Blogs](#)
 - Project Groups [Go to Groups](#)
 - Become A Developer Leader [Go To Members Programs](#)

Agenda

- Industry Trends: Heterogeneous computing
 - Cloud, Edge, Network Transformation
- Intel FPGA Roadmap
- oneAPI Ecosystem and Success Story
- Using FPGAs with the Intel® oneAPI Toolkits
 - Introduction to oneAPI
 - What are FPGAs and Why Should I Care About Programming Them?
 - Development Flow for Using FPGAs with the Intel® oneAPI Toolkits
 - Lab: Practice the FPGA Development Flow
- Optimizing Your Code for FPGAs
 - Introduction to Optimizing FPGAs with the Intel oneAPI Toolkits
 - Lab: Optimizing the Hough Transform Kernel

INCREASING WORKLOAD DIVERSITY



CONSUMER

HEALTH

FINANCE

RETAIL

GOVERNMENT

ENERGY

TRANSPORT

INDUSTRIAL

INFRA

Smart Assistants
Chatbots
Search
Personalization
Augmented Reality
Robots

Enhanced Diagnostics
Drug Discovery
Patient Care
Research
Sensory Aids

Algorithmic Trading
Fraud Detection
Research
Personal Finance
Risk Mitigation

Support Experience
Marketing
Merchandising
Loyalty
Supply Chain
Security

Defense
Data Insights
Safety & Security
Resident Engagement
Smarter Cities

Oil & Gas Exploration
Smart Grid
Operational Improvement
Conservation

In-Vehicle Experience
Automated Driving
Aerospace
Shipping
Search & Rescue

Factory Automation
Predictive Maintenance
Precision Agriculture
Field Automation

Smart Networking
Tiered Storage
Security
Compression
Manageability
Wireless

Source: Intel forecast

POWERED BY AIDEPLOYMENTS SPANNING CLOUD, ENTERPRISE, HPC, IOT

WAREHOUSE SCALE COMPUTING

FACILITIES NETWORKING HARDWARE SOFTWARE OPERATIONS



FEATURE ATTRIBUTES

- Virtualization & Containerization
- Quality of Service
- RAS (Reliability, Availability, Serviceability)
- Security
- Power Management

DATACENTER IS THE COMPUTER

EDGE IS THE EPICENTER OF INNOVATION

DEVICES | THINGS

EDGE NODE REGIONAL DC

CORE

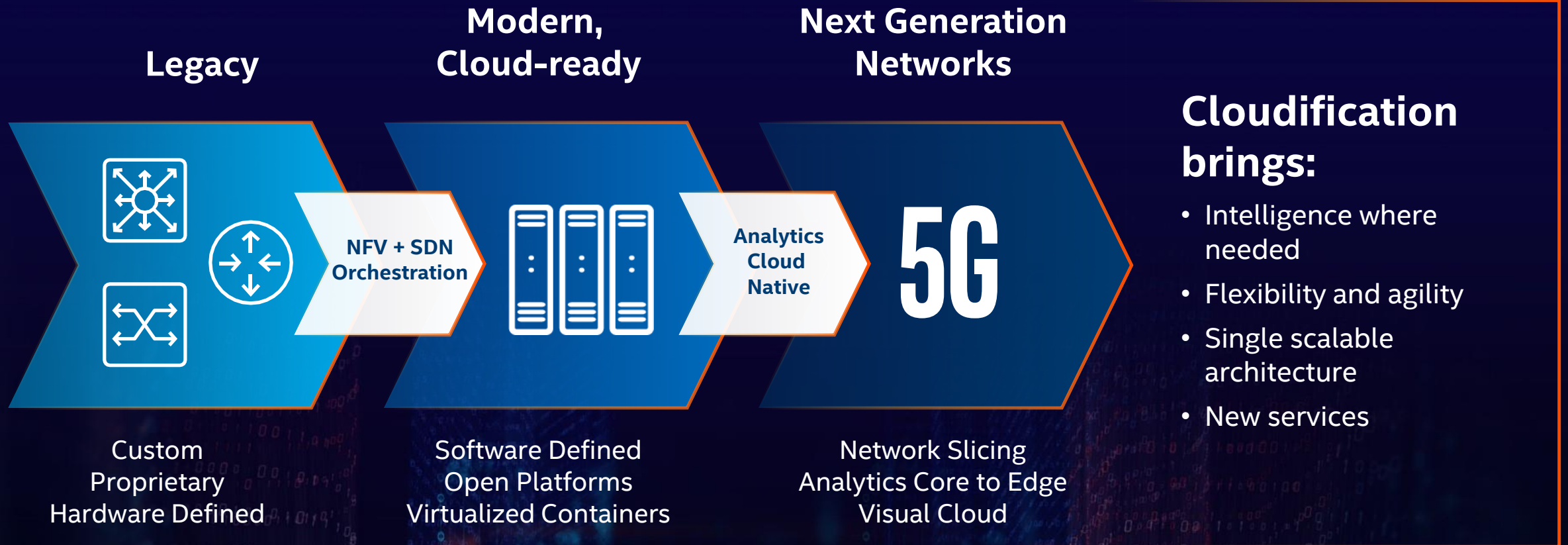
DATA CENTER CLOUD



By 2022, **45%** Of Data Will Be Stored, Analyzed, And Acted On At The Edge

ORCHESTRATION ACROSS EDGE & CLOUD TO DELIVER USECASE METRICS

NETWORK TRANSFORMATION: 5G FUNDAMENTAL



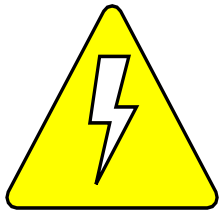
Advantages of Heterogeneous Computing

Multiple Architectures

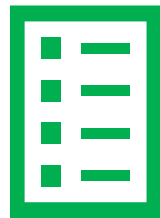
Developers can optimize specialized inline and offload workloads to meet business needs.

- Strengths of individual xPUs (CPU, GPU, FPGAs, etc.) can be combined for the benefit of the overall system.

Performance/Watt



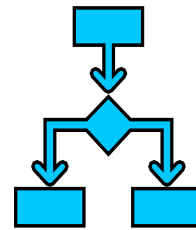
Throughput



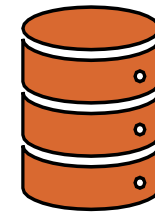
Latency



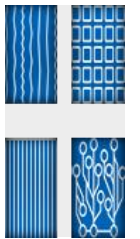
IO Flexibility



Memory Bandwidth

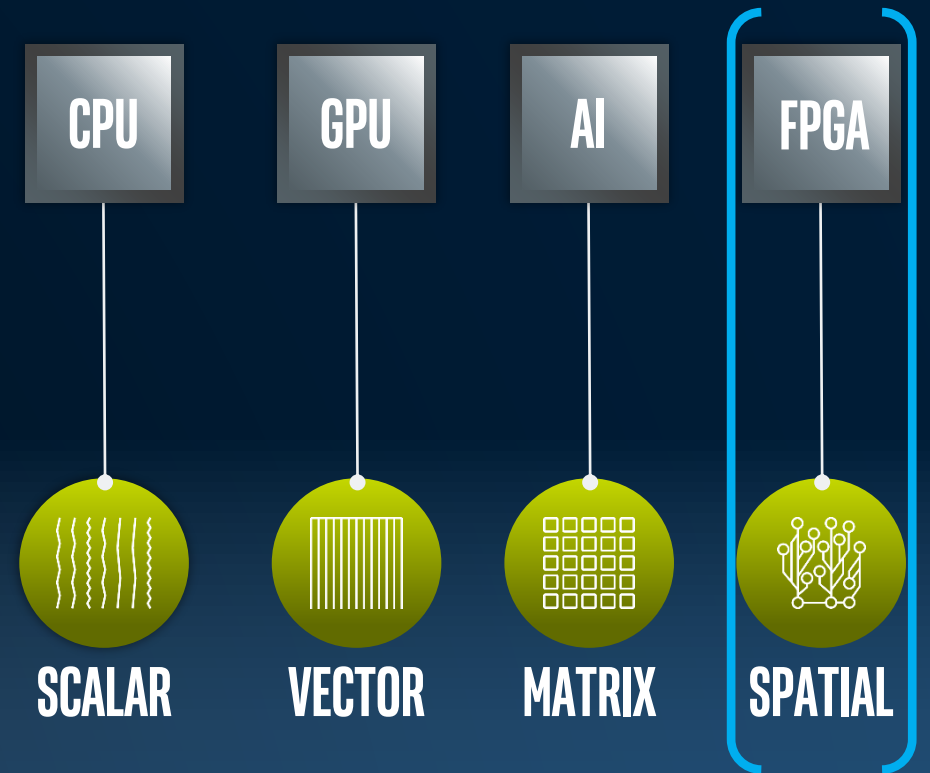


Architecture



DIVERSE WORKLOADS REQUIRE DIVERSE ARCHITECTURES

The future is a **diverse** mix of scalar, vector, matrix, and spatial architectures deployed in CPU, GPU, AI, **FPGA** and other accelerators



FPGA Roadmap

EMIB to Co-EMIB to Foveros

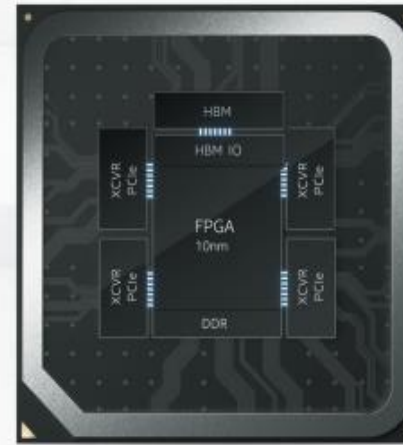
Arria®10
Production



Stratix®10
Production



Agilex™
Sampling



Next Gen FPGAs

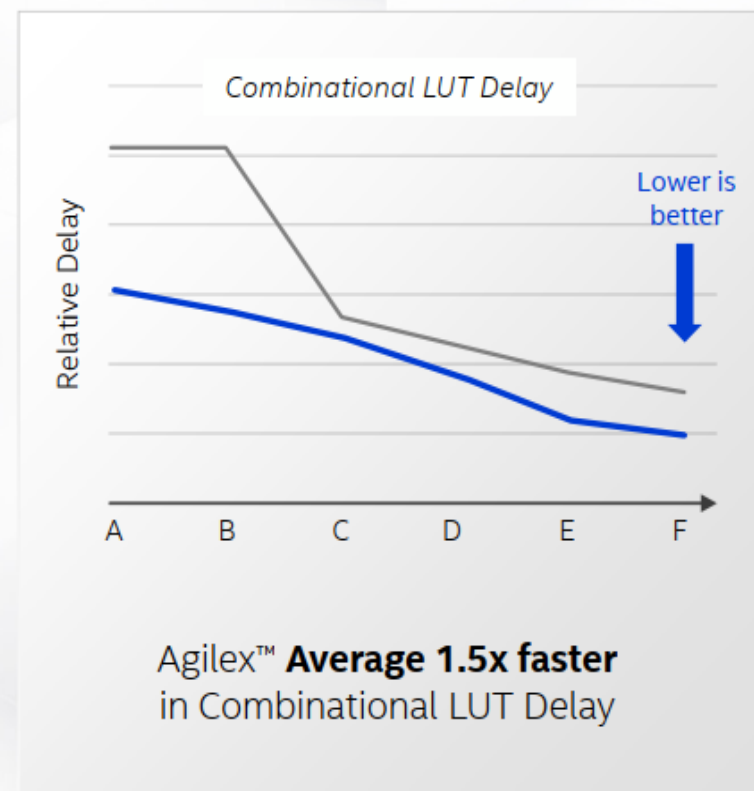
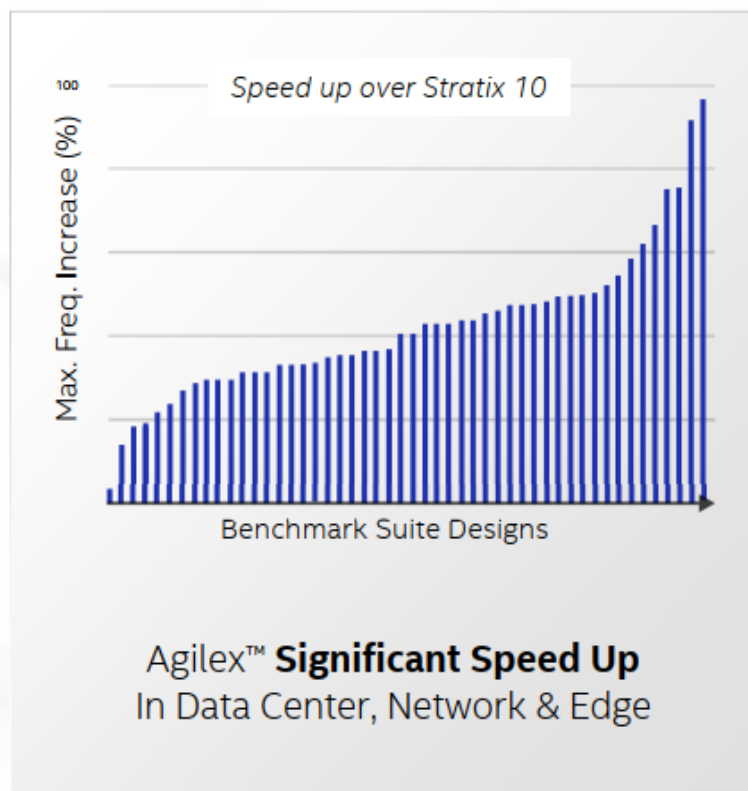
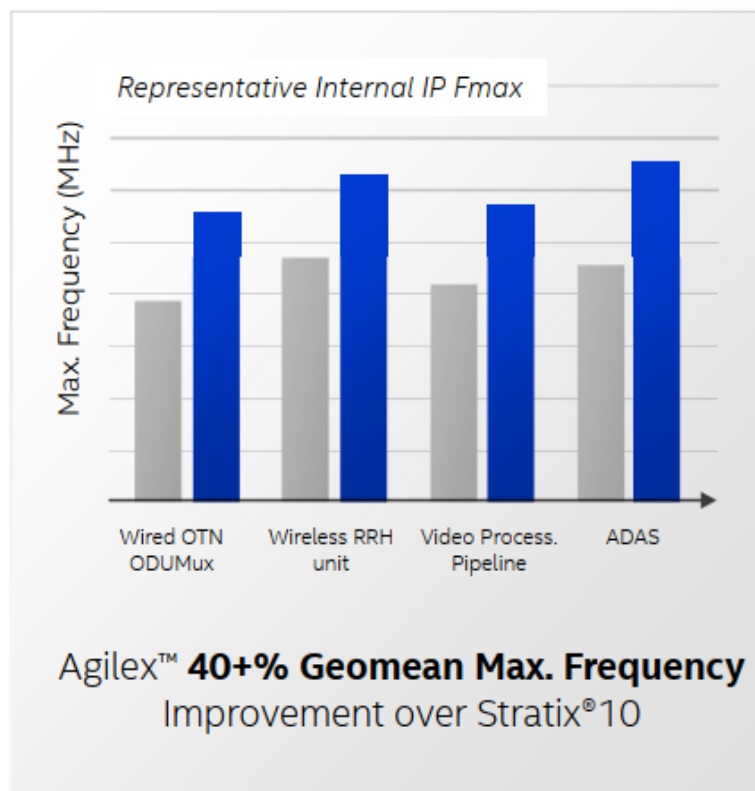


Packaging Technology

Monolithic	●			
EMIB (2.5D)		●	● 2 nd Gen	
Co-EMIB / Foveros (3D)				●

Agilex™ Performance/Power

Based on Intel® 10nm Process



Intel® Agilex™ FPGAs Deliver Significantly Better Performance/Watt

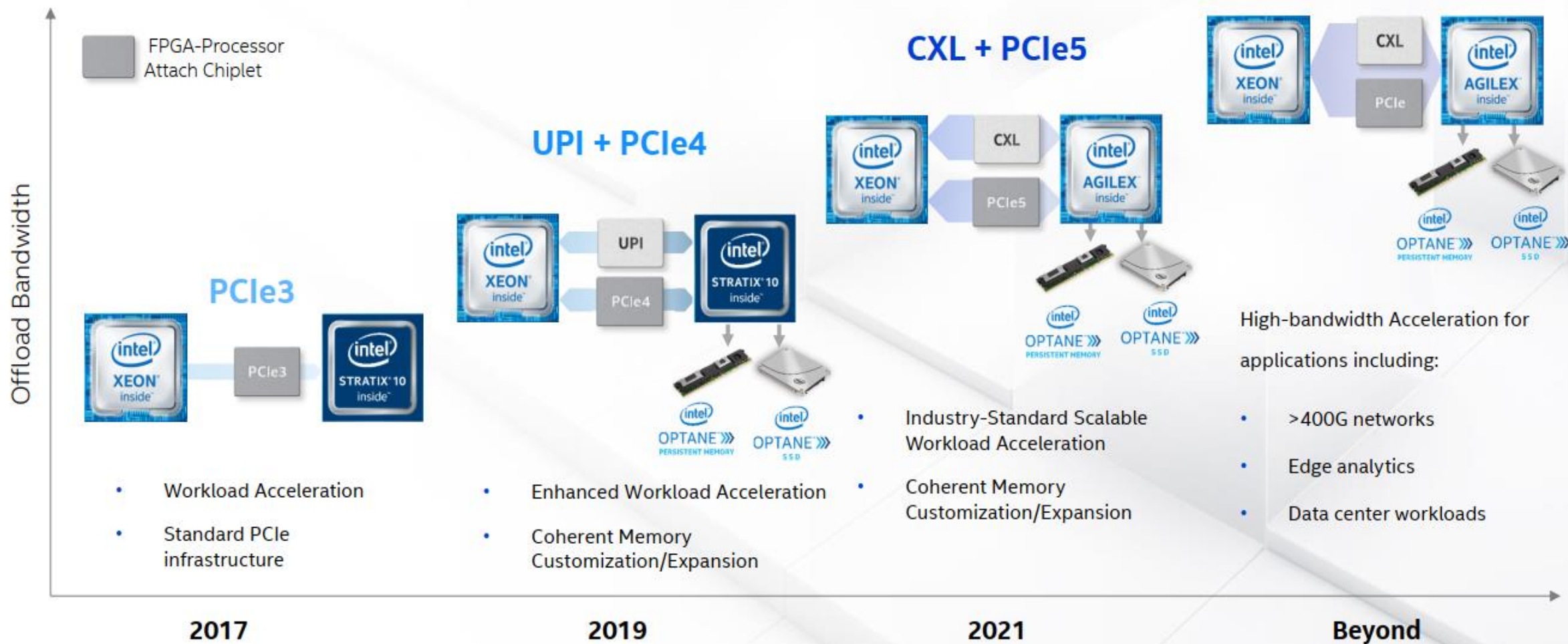
Refer to software.intel.com/articles/optimization-notice for more information regarding performance & optimization choices in Intel software products.

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*Other names and brands may be claimed as the property of others.

FPGA-Processor Attach Chiplets

Acceleration & Efficient Processing of Diverse Workloads



Intel® Stratix® 10 NX FPGA

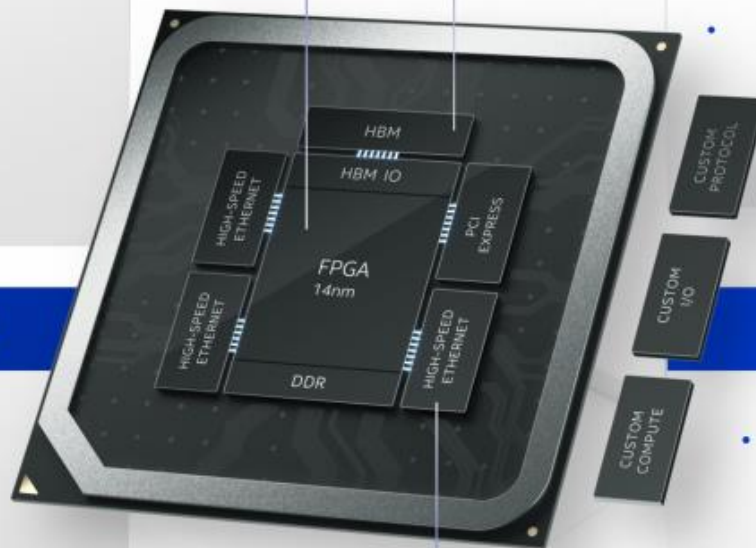
Intel's first AI-optimized FPGA

HIGH PERFORMANCE AI MATRIX BLOCKS

- Up to 15X more INT8 compute performance than today's Stratix 10 MX for AI workloads
- Hardware programmable for AI with customized workloads

HIGH BANDWIDTH NETWORKING

- Up to 57.8G PAM4 transceivers and hard Intel Ethernet blocks for high efficiency
- Flexible and customizable interconnect to scale across multiple nodes



ABUNDANT NEAR-COMPUTE MEMORY

- Embedded and customizable memory hierarchy for model persistence
- Integrated HBM for high memory bandwidth

EXTENSIBLE

- Chiplets enable easier interface customization and ASIC extensions

Matrix Compute, Memory & Networking delivers high performance HW optimized for AI

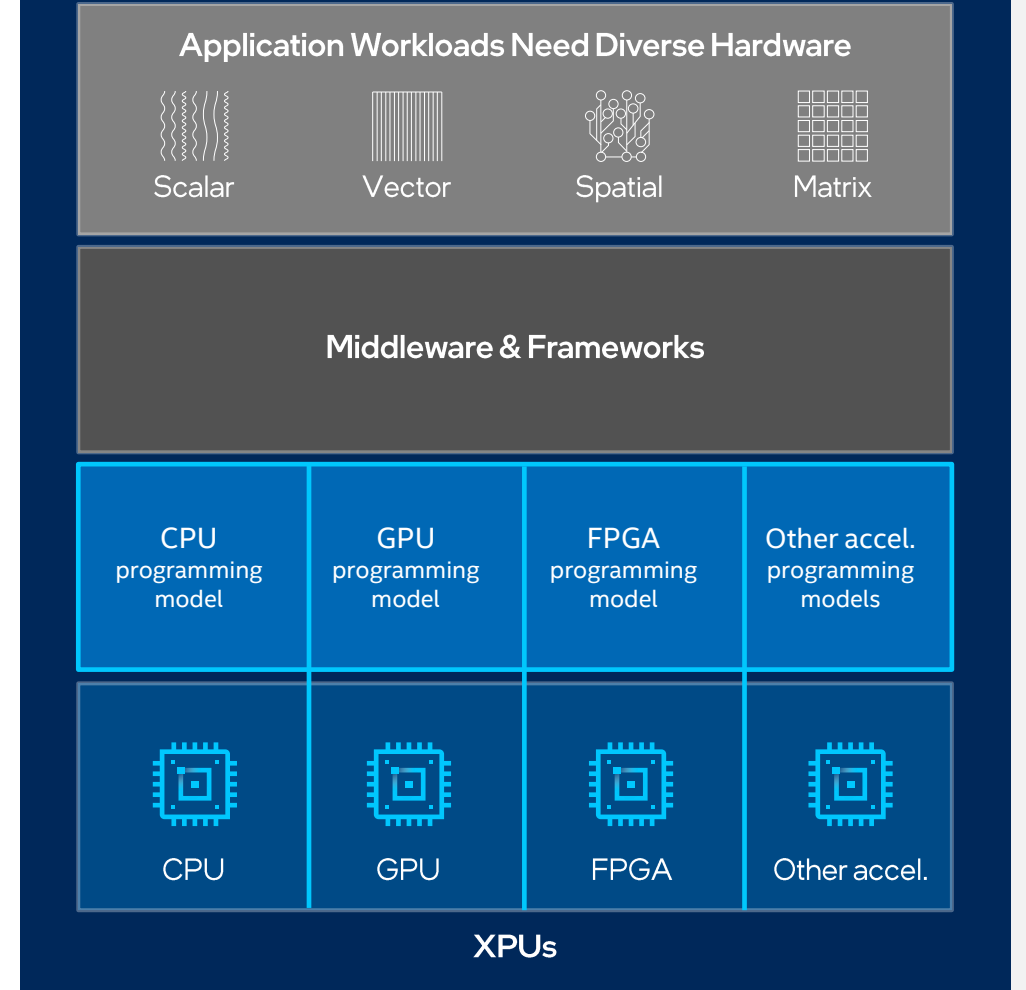
Programming Challenges for Multiple Architectures

Growth in specialized workloads

Variety of data-centric hardware required

Separate programming models and toolchains for each architecture are required today

Software development complexity limits freedom of architectural choice



oneAPI

One Programming Model for Multiple Architectures and Vendors

Freedom to Make Your Best Choice

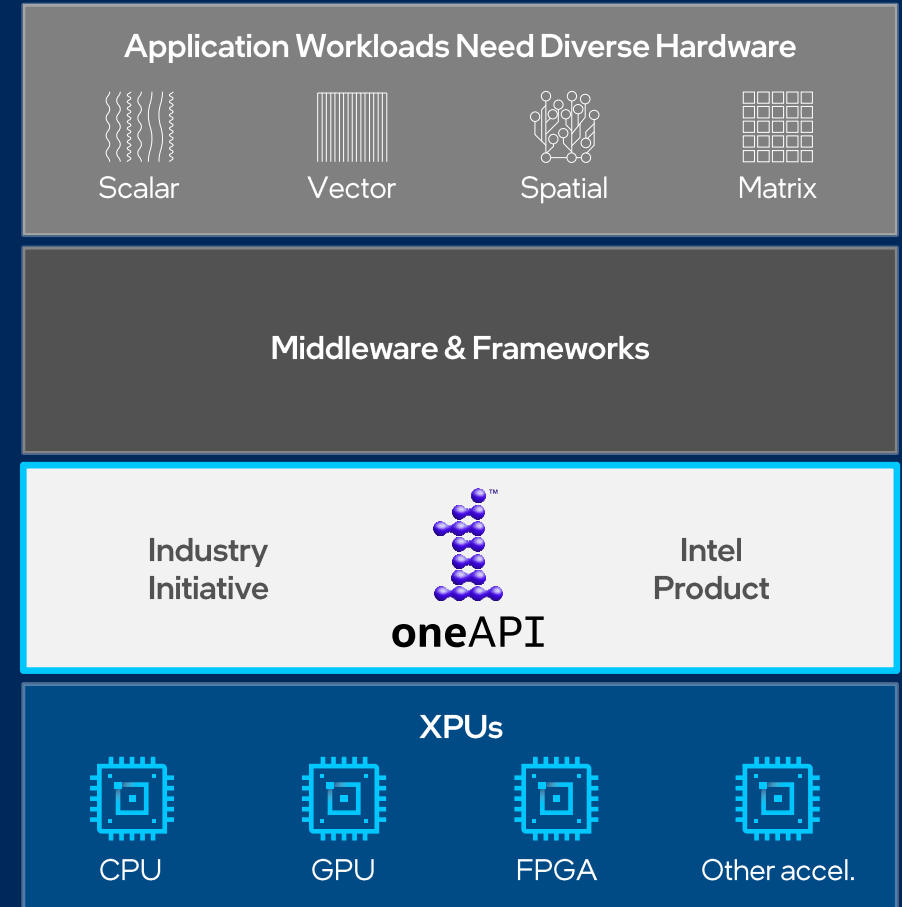
- Choose the best accelerated technology the software doesn't decide for you

Realize all the Hardware Value

- Performance across CPU, GPUs, FPGAs, and other accelerators

Develop & Deploy Software with Peace of Mind

- Open industry standards provide a safe, clear path to the future
- Compatible with existing languages and programming models including C++, Python, SYCL, OpenMP, Fortran, and MPI

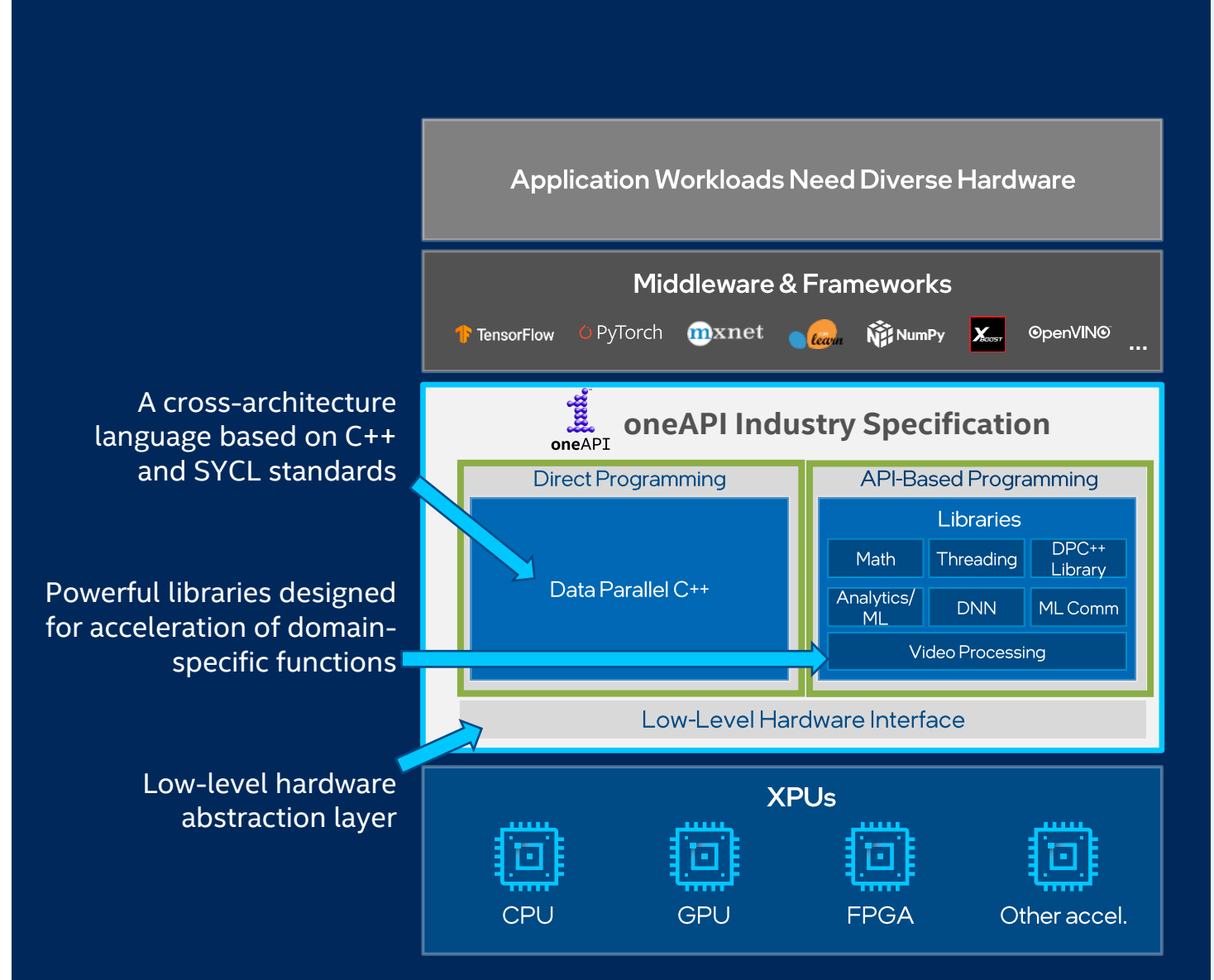


oneAPI Industry Initiative

Break the Chains of Proprietary Lock-in

Open to promote community and industry collaboration

Enables code reuse across architectures and vendors



The productive, smart path to freedom for accelerated computing from the economic and technical burdens of proprietary programming models

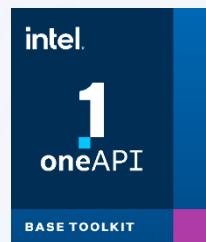
Intel® oneAPI Toolkits

A complete set of proven developer tools expanded from CPU to XPU



Intel® oneAPI Base Toolkit

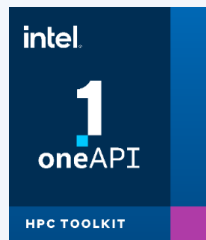
Native Code Developers



A core set of high-performance tools for building C++, Data Parallel C++ applications & oneAPI library-based applications

Add-on Domain-specific Toolkits

Specialized Workloads



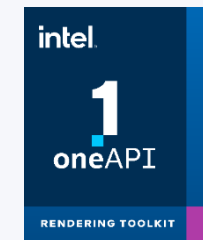
Intel® oneAPI Tools for HPC

Deliver fast Fortran, OpenMP & MPI applications that scale



Intel® oneAPI Tools for IoT

Build efficient, reliable solutions that run at network's edge



Intel® oneAPI Rendering Toolkit

Create performant, high-fidelity visualization applications

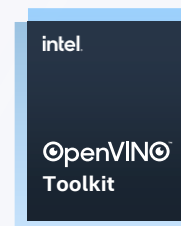
Toolkits powered by oneAPI

Data Scientists & AI Developers



Intel® AI Analytics Toolkit

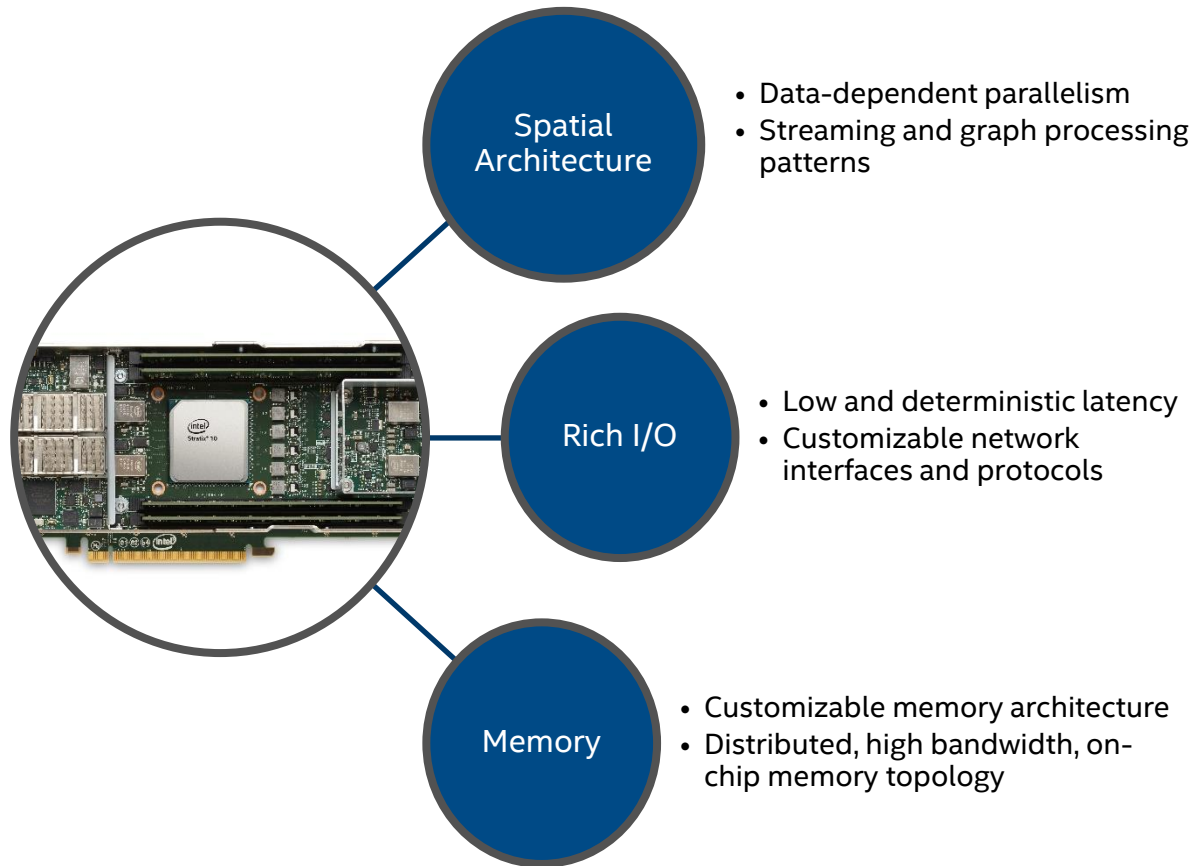
Accelerate machine learning & data science pipelines with optimized DL frameworks & high-performing Python libraries



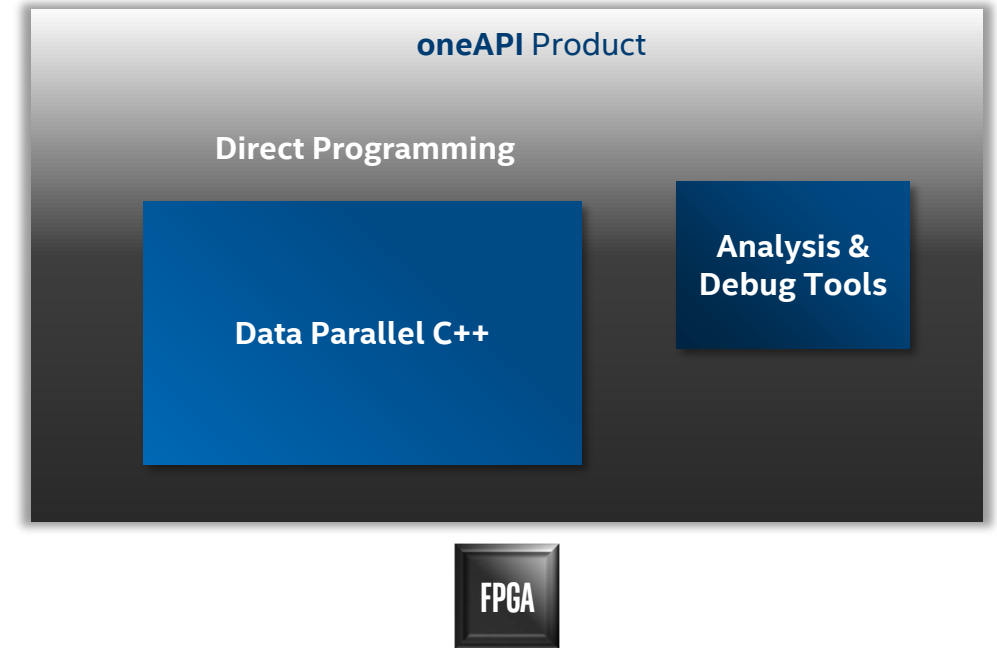
Intel® Distribution of OpenVINO™ Toolkit

Deploy high performance inference & applications from edge to cloud

Intel® FPGAs + Intel® oneAPI Toolkits



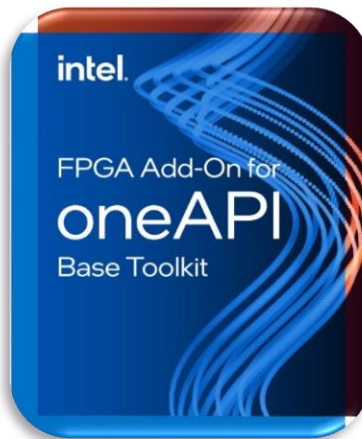
+



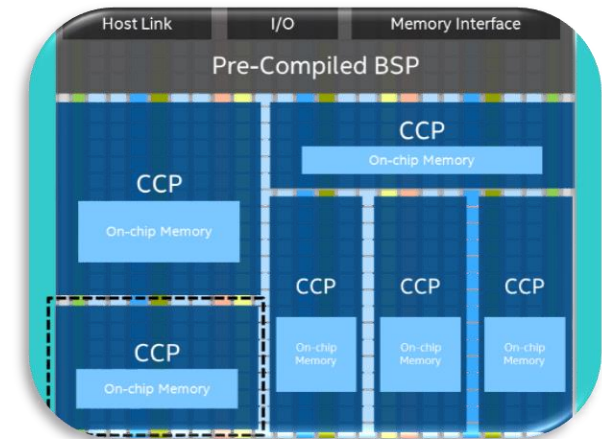
Getting Started with oneAPI on an FPGA



Intel® oneAPI Base Toolkit



Intel® FPGA Add-on for oneAPI Base Toolkit

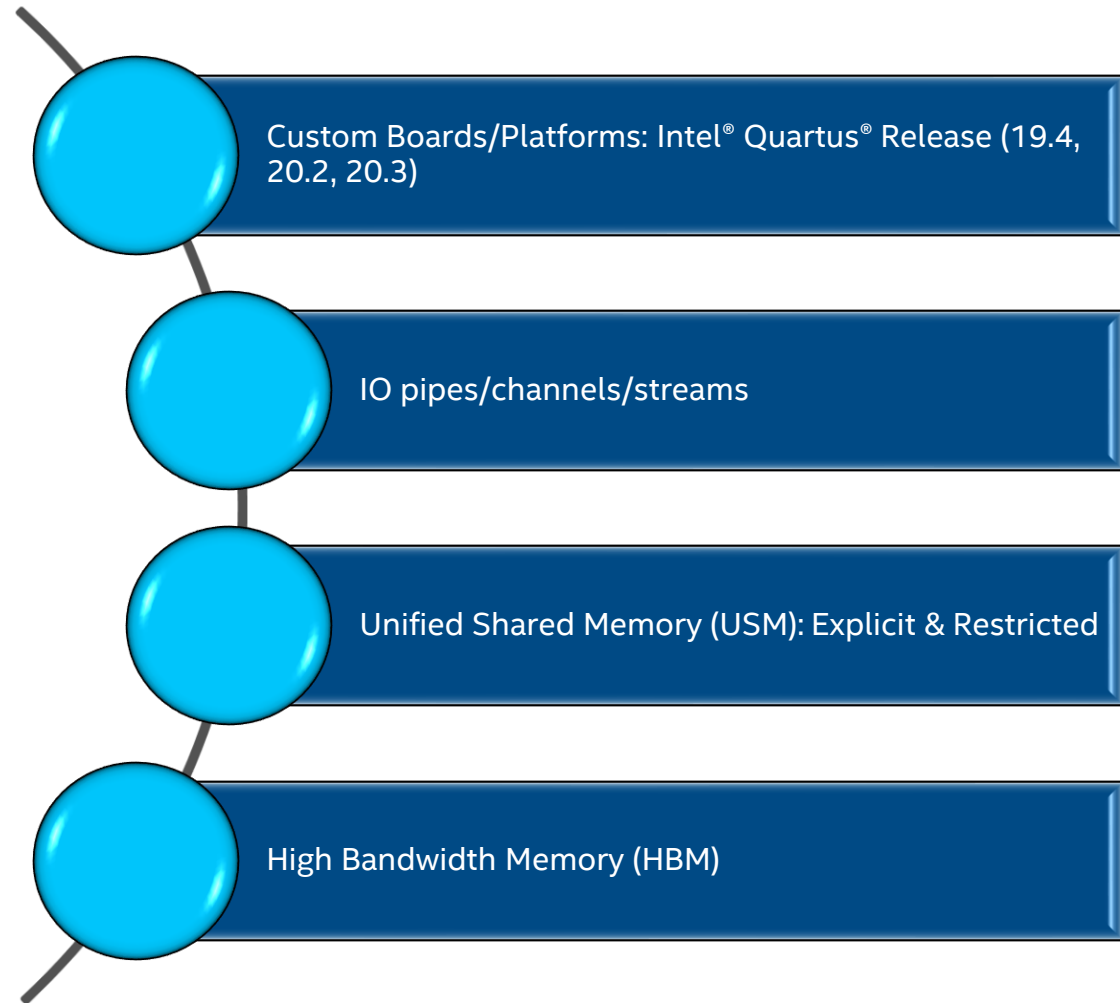


Board Support Package (BSP)

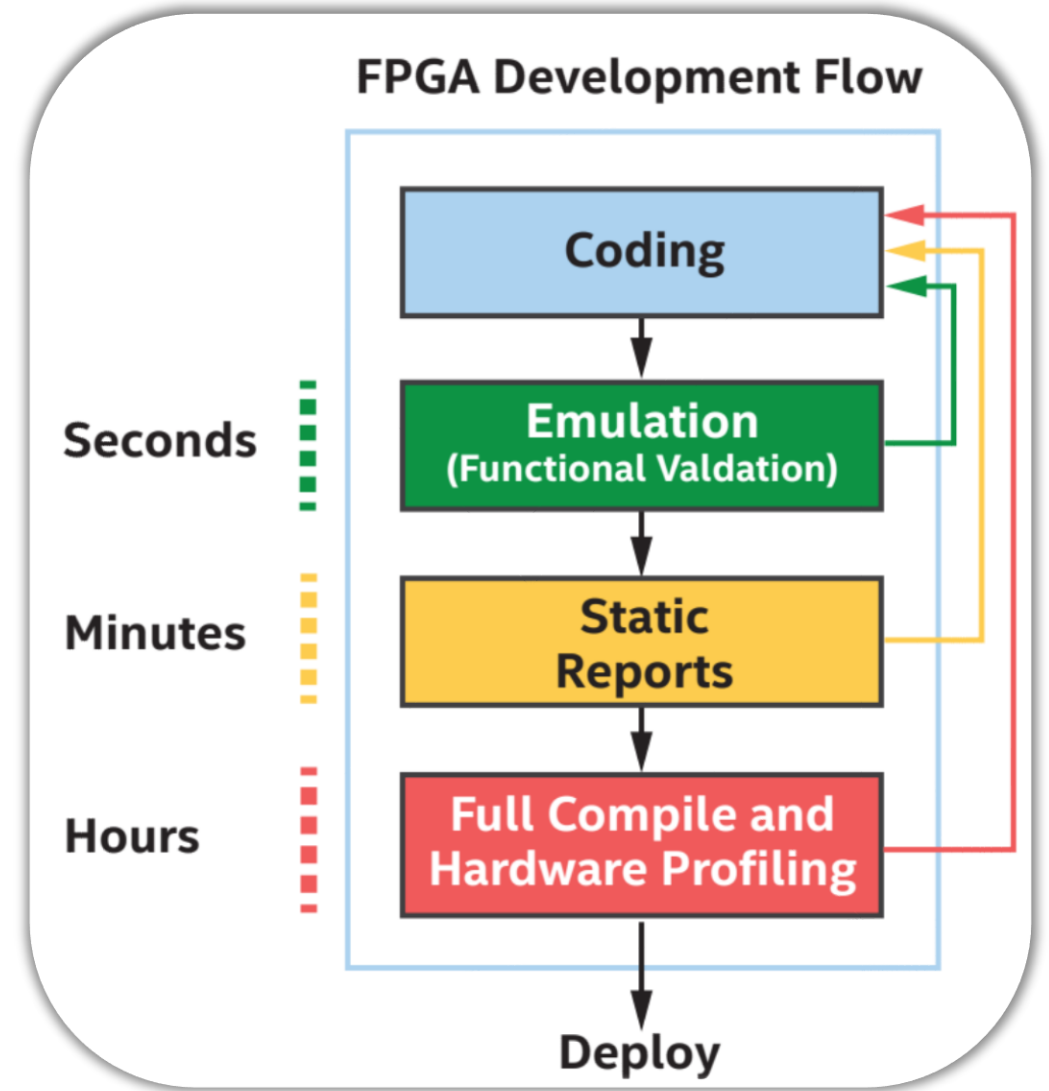
Note: Developers using custom platforms should [download](#) the Intel® FPGA Add-on for Intel® Custom Platforms with the respective Intel® Quartus® version and obtain a BSP from their 3rd part platform vendor.

Intel oneAPI/DPC++ Feature Update

- 100% Performance parity with OpenCL



FPGA Development Flow for oneAPI Projects



Intel® oneAPI Toolkits Free Availability

Get Started Quickly

Code Samples, Quick-start Guides, Webinars, Training

software.intel.com/oneapi



Run the tools locally

- Downloads
- Repositories
- Containers

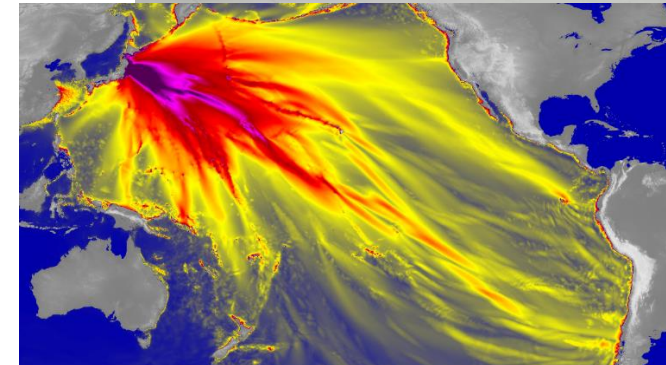
Run the tools in the Cloud

intel DevCloud

Intel® oneAPI Toolkits – Proven Performance

Top Takeaways & Proof Points

- **HPC Cross-architecture** – [Argonne National Labs](#) is running Exascale-class applications efficiently on current and future generations of Intel CPUs and GPUs
- **HPC Cross-architecture** – [Zuse Institute Berlin \(ZIB\)](#) ported the tsunami simulation *easyWave* application from CUDA to Data Parallel C++ delivering performance across multiple architectures from multiple vendors
- **HPC & AI** – [CERN](#) uses Intel® DL Boost and oneAPI to speed simulations with inference acceleration by nearly **2x** without accuracy loss*
- **Hyper-real Visualization & AI Using Advanced Ray Tracing** – [Bentley Motors Limited's AI-based car configurator](#) processes **1.7M+** images with up to **10B** possible configurations per model*
- **IoT** – [Samsung Medison](#) accelerates ultrasound image processing at the edge on multiple Intel® architectures for improved accuracy and fast diagnosis
- **Major CSPs & Framework endorse oneAPI** – Microsoft Azure, Google Cloud, TensorFlow
- **FPGA** – Using oneAPI, [Bittware](#) had its application running **in days** vs. what typically would take several weeks using Verilog or VHDL*
- And more... 250+ applications developed with oneAPI tools > view [catalog](#)



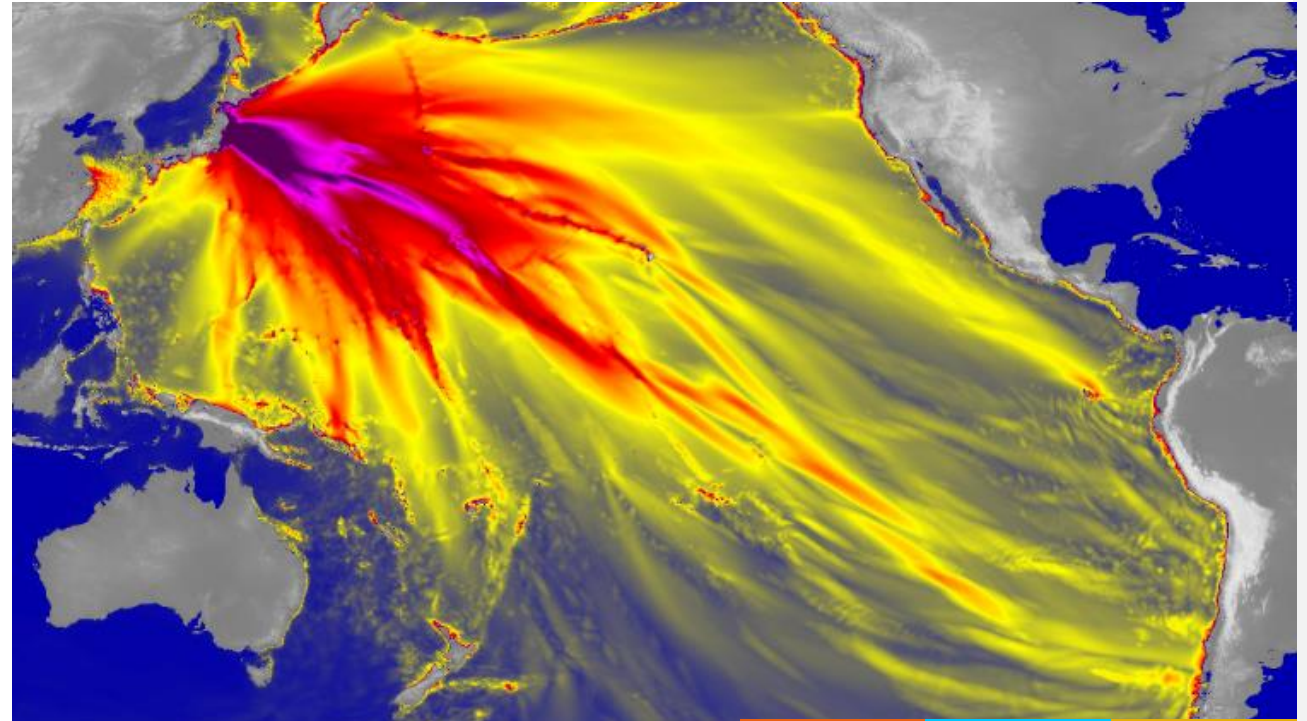
Innovation Leaders Using Intel Cross-architecture Tools [Video \[3:45\]](#)

*Detailed slides per customer are later in deck. Intel does not control or audit third-party data. You should consult other sources to evaluate accuracy. See [Notices & Disclaimers](#) for more details.

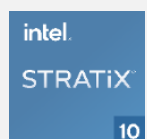
oneAPI Development Example

ZIB ported *EasyWave* application from CUDA to DPC++ delivering performance across multi-architectures

- Ported EasyWave written in CUDA to Data Parallel C++ efficiently using the Intel® DPC++ Compatibility Tool
- Achieved strong performance across Intel CPU, GPU and FPGA architectures, and within 5% of CUDA performance on Nvidia P100



CUDA Code Migration to DPC++ for Single Source Code | Intel Multi-architecture Deployments (CPU, GPU, FPGA) | Cross-vendor Multi-architecture Deployments | Used Multiple tools in Intel® oneAPI Toolkits



Intel® oneAPI
Base Toolkit +
FPGA Add-on

Visualization of *easyWave* tsunami simulation application -Courtesy Zuse Institute Berlin (ZIB)

Bittware

<https://www.youtube.com/watch?v=8dNrStoJMwE>



<https://news.yahoo.com/bittware-launches-ia-840f-intel-133000364.html>

yahoo!news



CISION

BittWare Launches IA-840F with Intel® Agilex™ FPGA and Support for oneAPI™ Unified Software Programming Environment



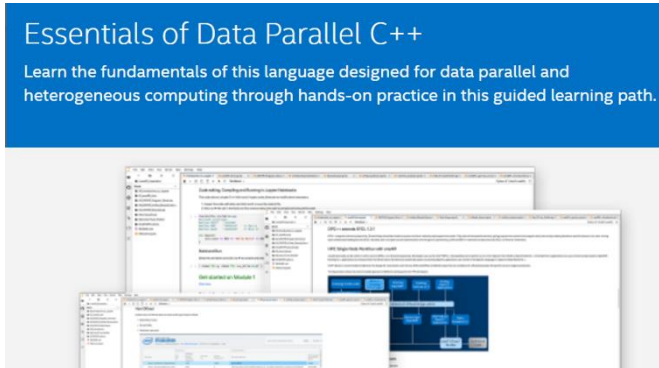
November 17, 2020



CONCORD, N.H., Nov. 17, 2020 /PRNewswire/ -- BittWare, a Molex company, today unveiled the IA-840F, the company's first Intel® Agilex™-based FPGA card designed to deliver significant performance-per-watt improvements for next-generation data center, networking and edge compute workloads. Agilex FPGAs deliver up to 40% higher performance or up to 40% lower power, depending on application requirements. BittWare maximized I/O features using the Agilex chip's unique tiling architecture with dual QSFP-DDs (4x 100G), PCIe Gen4 x16, and three MCIO expansion ports for diverse applications. BittWare also announced support for Intel

Ecosystem Adoption & Support

Training



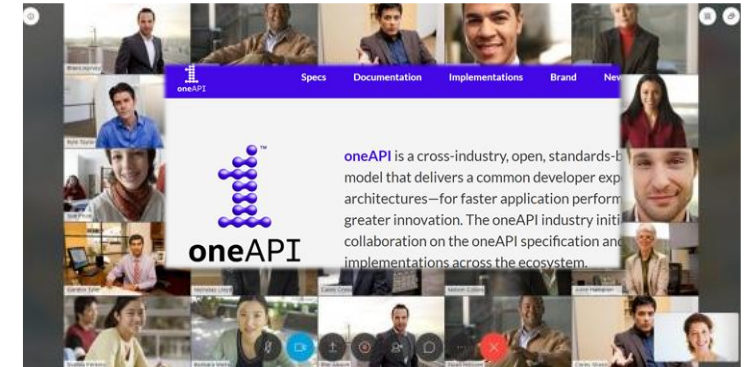
Online [webinars](#) & courses, developer guides, sample code

Academia



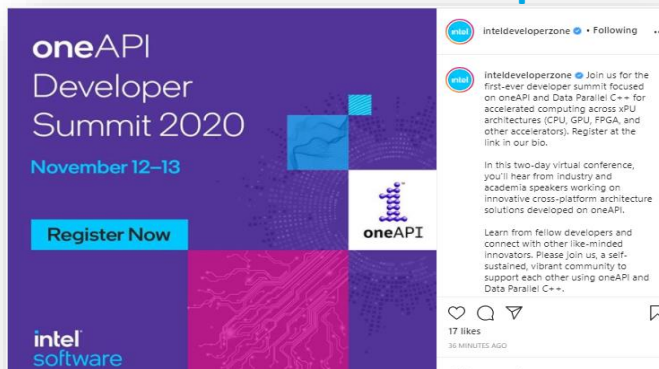
oneAPI Centers of Excellence: research, enabling code, curriculum, teaching

Community



oneAPI open specification, DevMesh innovators, community support forums

Summits & Workshops



Live & on-demand virtual workshops, community-led sessions

Industry Experts



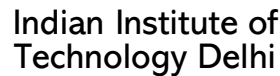
Training by leading technical training companies worldwide

Intel® DevCloud



State-of-the-art software and hardware
Intel® oneAPI Toolkits + latest Intel® Xeon® processors, GPUs (integrated & discrete), FPGAs

ONEAPI INITIATIVE – ECOSYSTEM SUPPORT



These organizations support the oneAPI initiative 'concept' for a single, unified programming model for cross-architecture development. It does not indicate any agreement to purchase or use of Intel's products.
*Other names and brands may be claimed as the property of others.

INTEL EVENT CODE- DEVCLOUD ACCESS
[HTTPS://INTEL.LY/3H1GGFV](https://intel.ly/3H1GGFV)

Devcloud Access code:
oneAPI15DEC

Workshop sign-up process – Step 1 of 9

<https://intel.ly/3H1GGfv>

Enrollment Form
DevCloud for oneAPI

Step 1: Sign in or Register
To get an Intel® DevCloud account, you must first create a Basic Intel® Account

[Sign in](#) [Register](#)

Step 2: Activate Intel® DevCloud for oneAPI
To get free access, tell us a bit more about yourself and how you would like to use the Intel DevCloud.

Workshop sign-up process – Step 2 of 9

<https://intel.ly/3H1GGfv>

Register for Intel® Developer Zone

Sign up for access to tools, code, and support communities with Intel experts and industry peers. Discover new opportunities to help you develop, market, and sell your software.

[Already have an account?](#)

Personal Information

First Name kavita	Last Name aroor	
Business Email Address kavita.aroor1@gmail.com	Username kavita.aroor1@gmail.com	
<input checked="" type="checkbox"/> Use my email as username		
Password	Confirm Password	
<ul style="list-style-type: none">✓ Must include a letter✓ Must include a number✓ Must include a special character✓ Must be between 8 and 15 characters in length		
Country/Region India		
Country/Region Code ▼	Phone (optional) 09096754225	Extension (optional)

Next Step

Workshop sign-up process – Step 3 of 9

Enrollment Questions

Company Information

Company Name/University
Test

Company/University URL (optional)

Company Type (optional)

Communication Subscriptions

Subscribe to email updates from Intel (optional).

Software Developer Product Insights

Intel Software Developer Zone Newsletter

Edge Software Hub Product Communication

Yes, I would like to subscribe to stay connected to the latest Intel technologies and industry trends by email and telephone. I can unsubscribe at any time.

Next Step

intel PRODUCTS SUPPORT SOLUTIONS DEVELOPERS PARTNERS

Thank you for registering for the Intel® Developer Zone

If this is the first time you are creating an Intel account, a verification email has been sent to you. Please check your inbox and follow the link to complete your registration. The link will expire in 5 days.

Didn't receive the verification email for Intel® Developer Zone? Check your spam or junk folder, or click on Resend Email below.

Before you can proceed with the resending of email, please complete the captcha below.

I'm not a robot

reCAPTCHA Privacy - Terms

Do not close the Browser, verify your email!

Resend email

Existing Intel.com users and new users who have completed the email verification step can proceed to [My Intel](#) and access the Intel® Developer zone Program tools and resources.

Aroor, Kavita
To Aroor, Kavita

Retention Policy Mail Cloud - Inbox (60 days)

Verify your e-mail

Action Required

Welcome - we have added a profile for you as a result of your interest in Intel® Developers Zone.

Please retain this e-mail for future reference.

Login ID: [Redacted]

E-mail Address: [Redacted]

What you need to do

Please verify your e-mail address by clicking this [link](#) or by copying the URL into your browser.

Your password should be protected as confidential. Your use of the password and Intel's websites are governed by Intel's Terms and Conditions of Use linked from the bottom of each respective site's web pages.

Click on the link to verify your email, this should refresh the Browser and lead you to the Sign in page.. Sign up with your credentials and you will be directed to the DevCloud registration page.

Workshop sign-up process – Step 4 of 9

Step 2: Activate Intel® DevCloud for oneAPI

To get free access, tell us a bit more about yourself and how you want to use the Intel® DevCloud.

Required Fields(*)

* First Name Kavita	* Country Please select a country/region
* Last Name Aror	* Company or University Company or Academic Institution
* Email Address kavita.aror@intel.com	* What type of developer are you? -Select-

* Which hardware and accelerator architecture are you developing for?(Select all that apply)

- ASICs (application-specific integrated circuits)
- CPU
- FPGA (field-programmable gate array)
- GPGPU (general-purpose GPU)
- GPU
- Integrated Graphics
- IPU (image processing unit)
- NNPU (neural network processing unit)
- VPU (vision processing unit)
- Other

*I have read and accept the [Intel® DevCloud Agreement](#)

By submitting this form, you are confirming you are an adult 18 years or older and you agree to share your personal information with Intel to use for this business request. You also agree to subscribe to stay connected to the latest Intel technologies and industry trends by email and telephone. You may unsubscribe at any time. Intel's websites and communications are subject to our [Privacy Notice](#) and [Terms of Use](#).

Submit

Do you have an event code provided by Intel? (Optional)
oneAPI19May
oneAPI15DEC

Pls. fill in the form and don't miss to add the Event code in the highlight section.

oneAPI15DEC

As you register you should receive the email..

"We are excited you chose Intel® DevCloud for oneAPI where you can develop, test, and run your workloads across a range of Intel® CPUs, GPUs, and FPGAs using oneAPI software.

Free access. No downloads. No installations. No maintenance. Get Started-
https://devcloud.intel.com/oneapi/get_started/

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Workshop sign-up process – Step 5 of 9

WELCOME

Intel® DevCloud is preinstalled with the latest Intel® hardware, frameworks, tools, and libraries.

Read and Accept Terms and Conditions

By accessing this site and the cloud computing services that it provides, you acknowledge and accept the following:

- [Intel DevCloud Access and Software License Agreement](#)
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I, kavita aroor, accept these terms.

Submit

Workshop sign-up process – Step 6 of 9

https://devcloud.intel.com/oneapi/get_started/

Scroll down the page to connect with JupyterLab*

Connect with Jupyter* Lab



Connect with Jupyter* Notebook

Use Jupyter Notebook to learn about how oneAPI can solve the challenges of programming in a heterogeneous world and understand the Data Parallel C++ (DPC++) language and programming model.

[Launch JupyterLab*](#)

Training Resources

DevCloud Commands

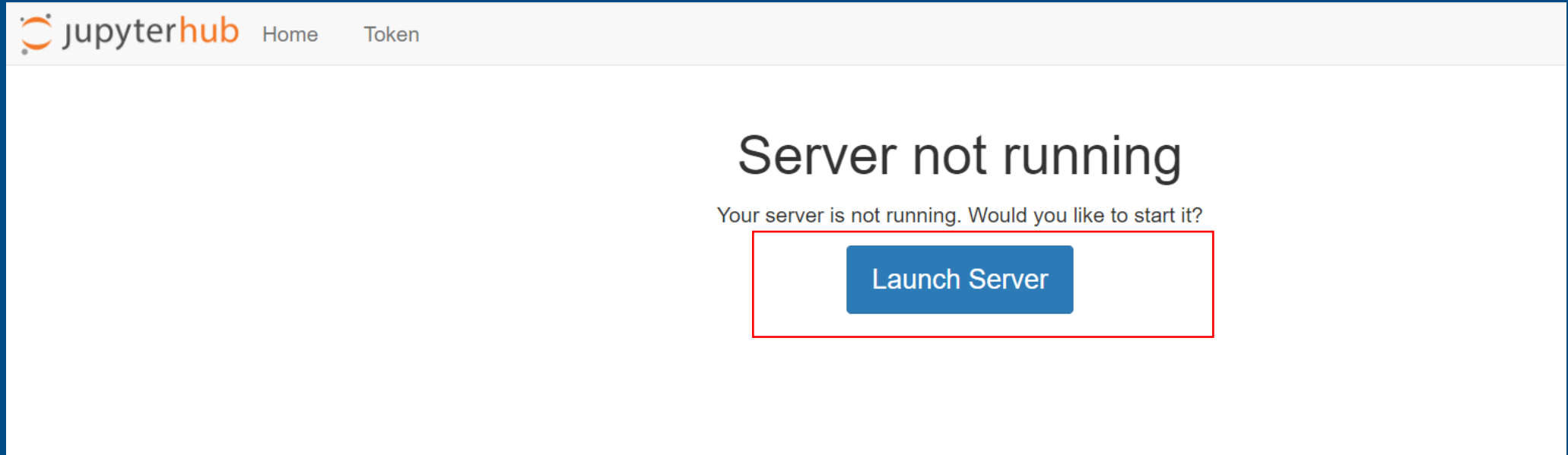
Learn about the features of the compute nodes, data management, and how to submit, query, and delete your jobs.

Introduction to oneAPI and Essentials of Data Parallel C++

Use Jupyter Notebook* to learn about how oneAPI can solve the challenges of programming in a heterogeneous world and understand the Data Parallel C++ (DPC++) language and programming model.

Workshop sign-up process – Step 7 of 9

Launch Server



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Workshop sign-up process – Step 8 of 9

The screenshot shows a Jupyter Notebook interface with a file browser on the left and a notebook window titled 'Welcome.ipynb'. The notebook content includes a title, introductory text, and a diagram of the DevCloud architecture.

Welcome to Jupyter Notebooks on the Intel DevCloud for oneAPI Projects!

This document covers the basics of the JupyterLab access to the Intel DevCloud for oneAPI Projects. It is not a tutorial on the JupyterLab itself. Rather, we will run through a few examples of how to use the computational resources available on the DevCloud *beyond* the notebook.

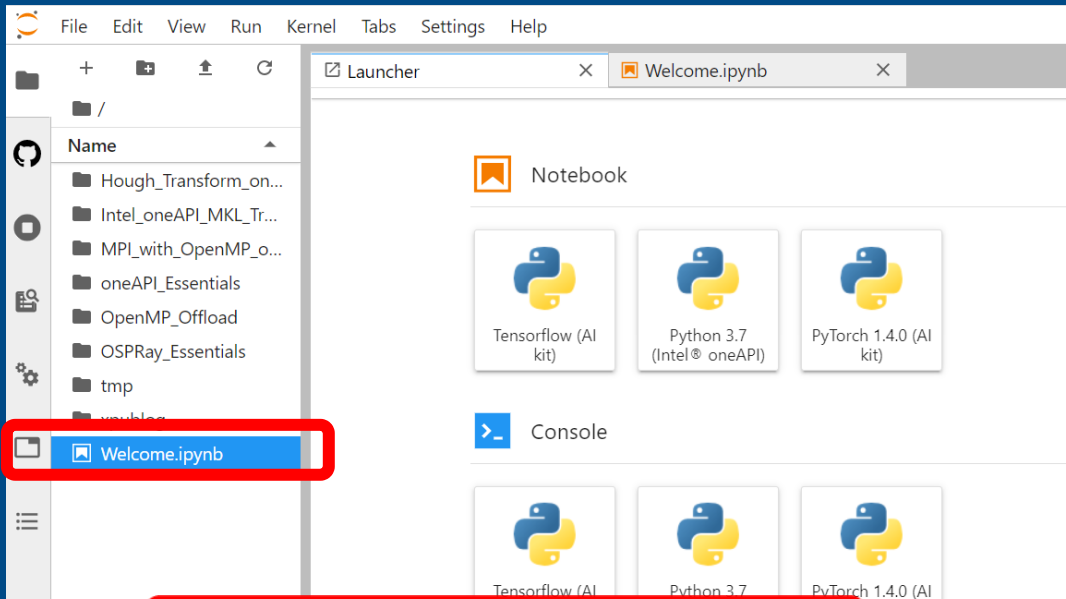
The diagram below illustrates the high-level organization of the DevCloud. This tutorial explains how to navigate this organization.

The diagram illustrates the high-level organization of the DevCloud. It shows the following components and their interactions:

- Web Browsers (Firefox, Safari, Chrome, ...)**: Access the system via **HTTPS** through the **Internet**.
- Linux (Terminal), OS X (Terminal), Windows (PuTTY), WinSCP, FileZilla...**: Access the system via **SSH** through the **Internet**.
- Internet**: The central communication hub.
- Login Node**: Receives connections from the Internet and provides **NFS** access to **Storage Servers**.
- Storage Servers: /home, /glob**: Provide storage for the system.
- Job Queue**: Manages the execution of jobs, receiving requests via **qsub** and distributing them to servers.
- Cloud**: A collection of servers (server #1 to server #n) that execute jobs. Some servers are running **Notebook** instances, while others are **Available for Jobs** or running **Computational Jobs**.

Workshop sign-up process – Step 9 of 9

Jupyter notebooks – Introduction



```
u42034@s001-n0000:~$ /data/oneapi_workshop/get_jupyter_notebooks.sh
## u42034 is copying jupyter-notebooks...
sending incremental file list
jupyter-notebooks.tar.gz
 37.57M 100% 271.22MB/s   0:00:00 (xfr#1, to-chk=0/1)

sent 37.58M bytes received 35 bytes 25.05M bytes/sec
total size is 37.57M speedup is 1.00
jupyter-notebooks/
jupyter-notebooks/00_Introduction_to_Jupyter/
jupyter-notebooks/00_Introduction_to_Jupyter/.ipynb_checkpoints/
jupyter-notebooks/00_Introduction_to_Jupyter/.ipynb_checkpoints/Introduction_to_Jupyter-checkpoint.ipynb
jupyter-notebooks/00_Introduction_to_Jupyter/Introduction_to_Jupyter.ipynb
jupyter-notebooks/00_Introduction_to_Jupyter/q
```

Name	Last Modified
folder jupyter-notebooks	7 days ago
folder oneapi-evangelist-workshop	3 months ago
folder tmp	4 minutes ago

Name	Last Modified
folder / jupyter-notebooks / 00_Introduction_to_Jupyter	3 minutes ago
folder 01_oneAPI_Intro	7 days ago
folder 02_DPCPP_Program_Struct...	7 days ago

Name	Last Modified
folder / jupyter-notebooks / 00_Introduction_to_Jupyter / src	4 minutes ago
file Introduction_to_Jupyter.ipynb	5 minutes ago
file q	7 days ago

*This path would be updated during the workshop

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