Easily speed up Deep Learning inference – Write once deploy anywhere!

Vladimir Kilyazov

AI Software Solutions Engineer

OpenVINO™

oneAPI

Powered by oneAPI

Notices and Disclaimers

- Performance varies by use, configuration and other factors. Learn more at www.Intel.com/PerformanceIndex
- Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. No product or component can be absolutely secure.
- You may not use or facilitate the use of this document in connection with any infringement or other legal analysis concerning Intel products described herein. You agree to grant Intel a non-exclusive, royalty-free license to any patent claim thereafter drafted which includes subject matter disclosed herein.
- The products described may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.
- No license (express or implied, by estoppel or otherwise) to any intellectual property rights is granted by this document, with the sole exception that a) you may publish an unmodified copy and b) code included in this document is licensed subject to the Zero-Clause BSD open source license (0BSD), https://opensource.org/licenses/0BSD. You may create software implementations based on this document and in compliance with the foregoing that are intended to execute on the Intel product(s) referenced in this document. No rights are granted to create modifications or derivatives of this document.
- No license (express or implied, by estoppel or otherwise) to any intellectual property rights is granted by this document, with the sole exception that code included in this document is licensed subject to the Zero-Clause BSD open source license (OBSD), http://opensource.org/licenses/0BSD.
- No license (express or implied, by estoppel or otherwise) to any intellectual property rights is granted by this document.
- Code names are used by Intel to identify products, technologies, or services that are in development and not publicly available. These are not "commercial" names and not intended to function as trademarks.
-

System configuration

System board	Intel prototype, TGL U DDR4 SODIMM RVP	ASUSTek COMPUTER INC./Prime z370-a
CPU	11th Gen Intel® Core™ i5-1145G7 @ 2.6 GHz	8th Gen Intel ® Core™ i5-8500t @ 3.0 GHz
Sockets/physical cores	1/4	1/6
Hyperthreading/turbo setting	Enabled/On	NA/On
Memory	2 x 8198 MB 3200 MT/s DDR4	2 x 16384 MB 2667 MT/s DDR4
OS	Ubuntu 18.04 LTS	Ubuntu 18.04 LTS
Kernel	5.8.0-050800-generic	5.3.0-24-generic
Software	Intel® Distribution of OpenVINO™ toolkit 2021.1.075	Intel Distribution of OpenVINO toolkit 2021.1.075
BIOS	Intel TGLIFUI1.R00.3243.A04.2006302148	AMI, version 2401
BIOS release date	June 30, 2020	July 12, 2019
BIOS setting	Load default settings	Load default settings, set XMP to 2667
Test date	September 9, 2020	September 9, 2020
Precision and batch size	CPU: int8, GPU: FP16-int8, batch size: 1	CPU: int8, GPU: FP16-int8, batch size: 1
Number of inference requests	4	6
Number of execution streams	4	6
Power (TDP link)	28W	35W
Price (USD) link on 02/25/2022 Prices may vary	USD 312	USD 192

1) Memory is installed such that all primary memory slots are populated.
2) Testing by Intel as of September 9, 2020.

Compounding effect of hardware and software configuration

See the compounding effect

System board	1) Purley E63448-400, Intel® Internal Reference System	2) Intel® Server Board S2600STB	3) Intel Server Board S2600STB	4) Intel® Internal Reference System
CPU	Intel® Xeon® Silver 4116 @ 2.1 GHz	Intel® Xeon® Silver 4216 CPU @ 2.10 GHz	Intel® Xeon® Silver 4216R CPU @ 2.20 GHz	Intel® Xeon® Silver 4316 CPU @ 2.30 GHz
Sockets, physical cores/socket	2, 12	2, 16	2, 16	2, 20
Hyperthreading/turbo setting	Enabled/On	Enabled/On	Enabled/On	Enabled/On
Memory	12x 16 GB DDR4 2400 MHz	12x 64 GB DDR4 2400 MHz	12x 32GB DDR4 2666 MHz	16 x32GB DDR4 2666 MHz
OS	UB-16.04.3 LTS	UB-18.04 LTS	UB-18.04 LTS	UB-20.04 LTS
Kernel	4.4.0-210-generic	4.15.0-96-generic	5.3.0-24-generic	5.13.0-rc5-intel-next+
Software	Intel® Distribution of OpenVINO™ toolkit R5 2018	Intel® Distribution of OpenVINO™ toolkit R3 2019	Intel® Distribution of OpenVINO™ toolkit 2021.2	Intel® Distribution of OpenVINO™ toolkit 2021.4.1
BIOS	PLYXCRB1.86B.0616.D08.2109180410	—	Intel Corporation SE5C620.86B.02.01. 0009.092820190230	WLYDCRB1.SYS.0020.P93.2103190412
BIOS release date	September 18, 2021	—	September 28, 2019	March 19, 2021
BIOS setting	Select optimized default settings, save, and exit	Select optimized default settings, save, and exit	Select optimized default settings, change power policy to "performance," save, and exit	Select optimized default settings, change power policy to "performance," save, and exit
Test date	October 8, 2021	September 27, 2019	December 24, 2020	September 6, 2021
Precision and batch size	FP32/Batch 1	int8/Batch 1	int8/Batch 1	int8/Batch 1
Workload: model/image size	MobileNet-SSD/300x300	MobileNet-SSD/300x300	MobileNet-SSD/300x300	MobileNet-SSD/300x300
Number of inference requests	24	32	32	10
Number of execution streams	24	32	32	10
Power (TDP link)	170W	200W	250W	300W
Price (USD) link on 02/25/2022 Prices may vary	USD 2,024	USD 1,926	USD 2,004	USD 2,166

AI is changing industries

Emergency response

Real-time emergency and crime response

Energy

Maximize production and uptime

Education

Transform the learning experience

Cities

Enhance safety, research, and more

Finance

Turn data into valuable intelligence

Health

Revolutionize patient outcomes

Industrial

Empower truly intelligent Industry 4.0

Media

Create thrilling experiences

Retail

Transform stores and inventory

Smart homes

Enable homes that see, hear, and respond

Telecom

Drive network and operational efficiency

Smart cities

Efficient and robust traffic systems

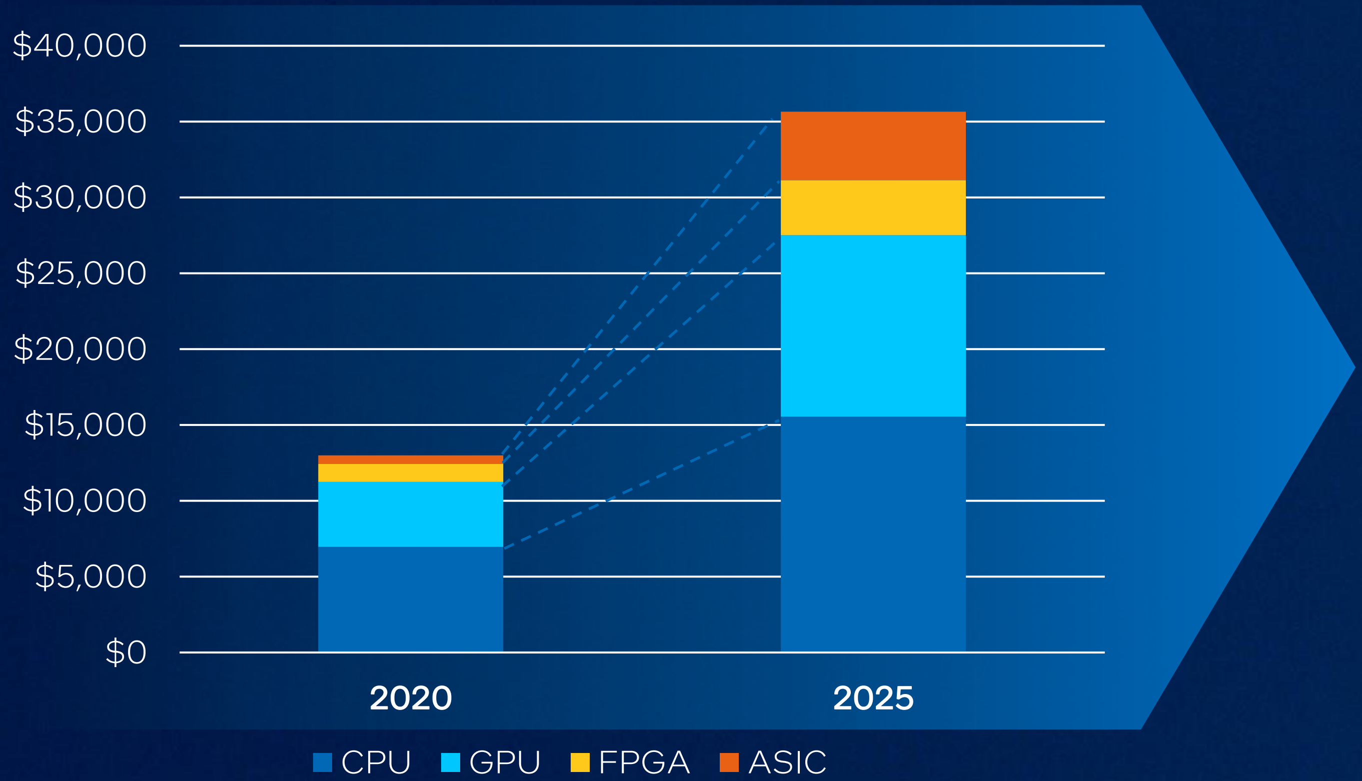
Why deep learning

There is tremendous opportunity in the global growth in chipset revenue driven by AI inference

$51.9B

by 2025

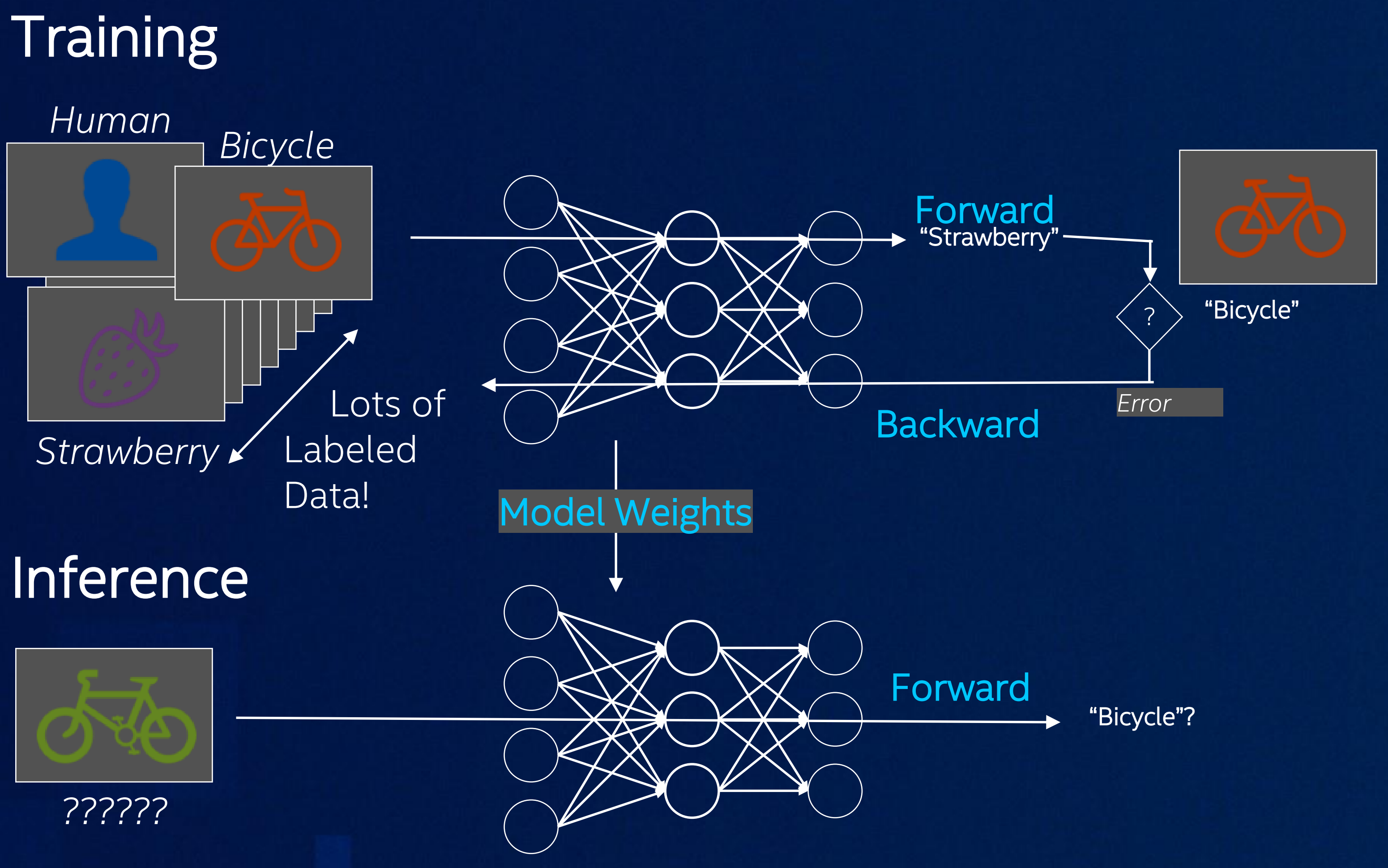
Inference TAM by Chipset



Driven by AI inference

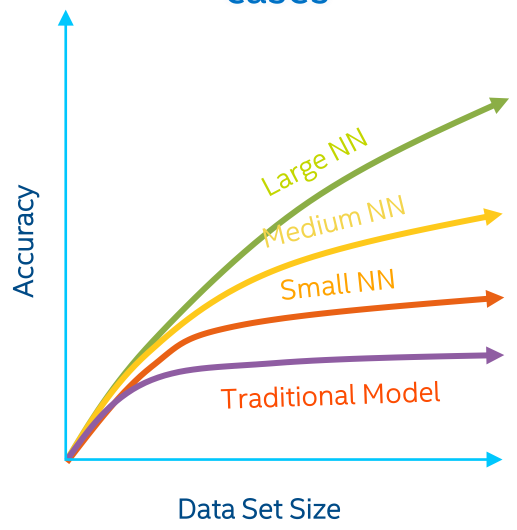
Source: Intel AI Market Model/Omdia Q2'20 AI Chipsets Report.
All figures are in US Dollars.

Deep Learning: Training vs. Inference



Did You Know?

Training requires a very large data set and deep neural network (many layers) to achieve the highest accuracy in most cases



Challenges in deep learning

Development and deployment challenges in deep learning

Unique inference needs

Gap in performance and accuracy between trained and deployed models

Low-performing, lower-accuracy models deployed

Integration challenges

No way to streamline end-to-end development workflow

Slow time to solution and time to market

No one size fits all

Diverse requirements for myriad use cases require unique approaches

Inability to meet use-case-specific requirements

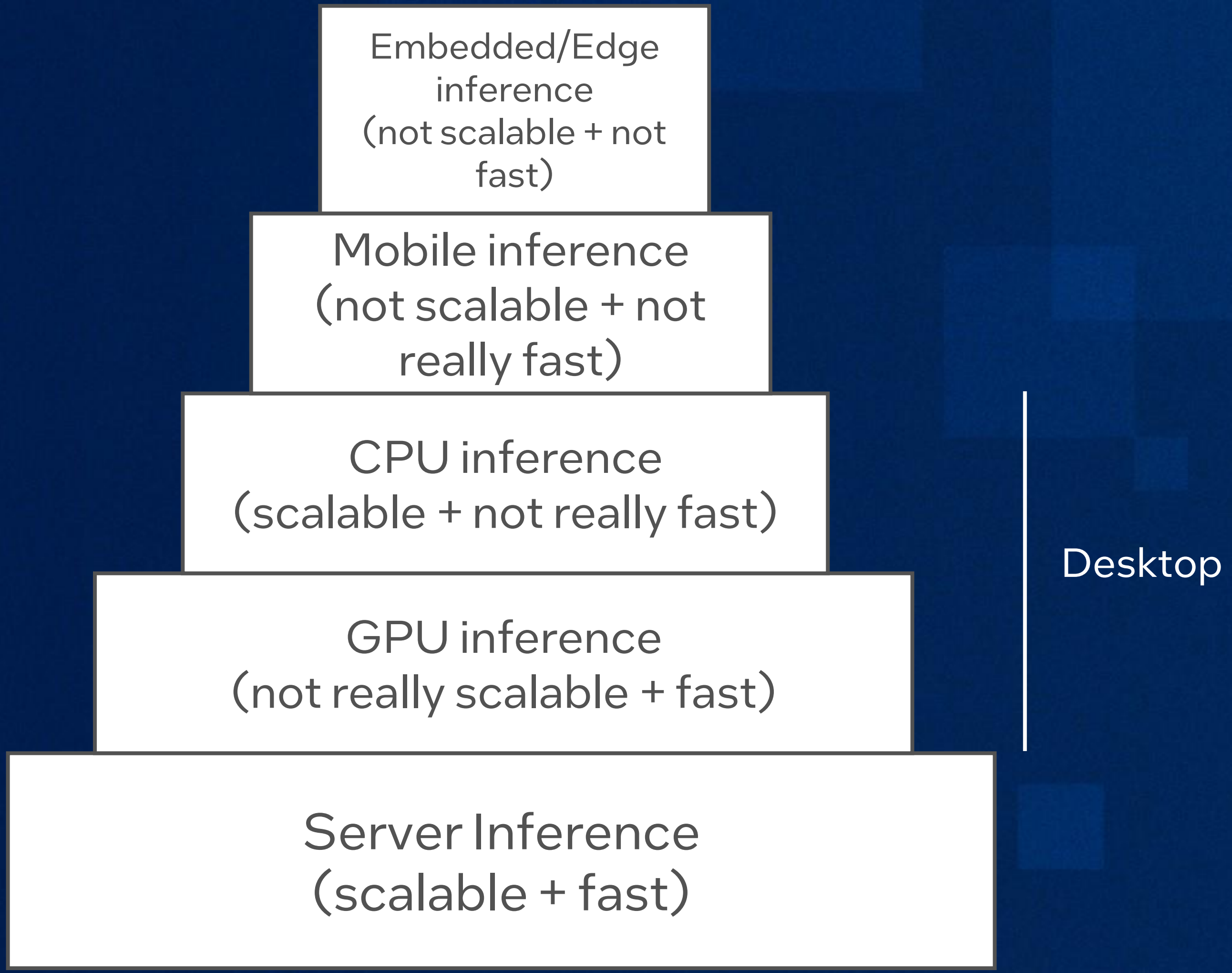
AI Inference target devices

Determinants of configuration selection:

- Performance
- Power consumption
- Price
- Size
- Location (availability and quality of Internet channel)
- Location conditions (temperature, dust and moisture protection)

Server focus

Edge focus



Embedded/Edge inference (not scalable + not fast)

Mobile inference (not scalable + not really fast)

CPU inference (scalable + not really fast)

GPU inference (not really scalable + fast)

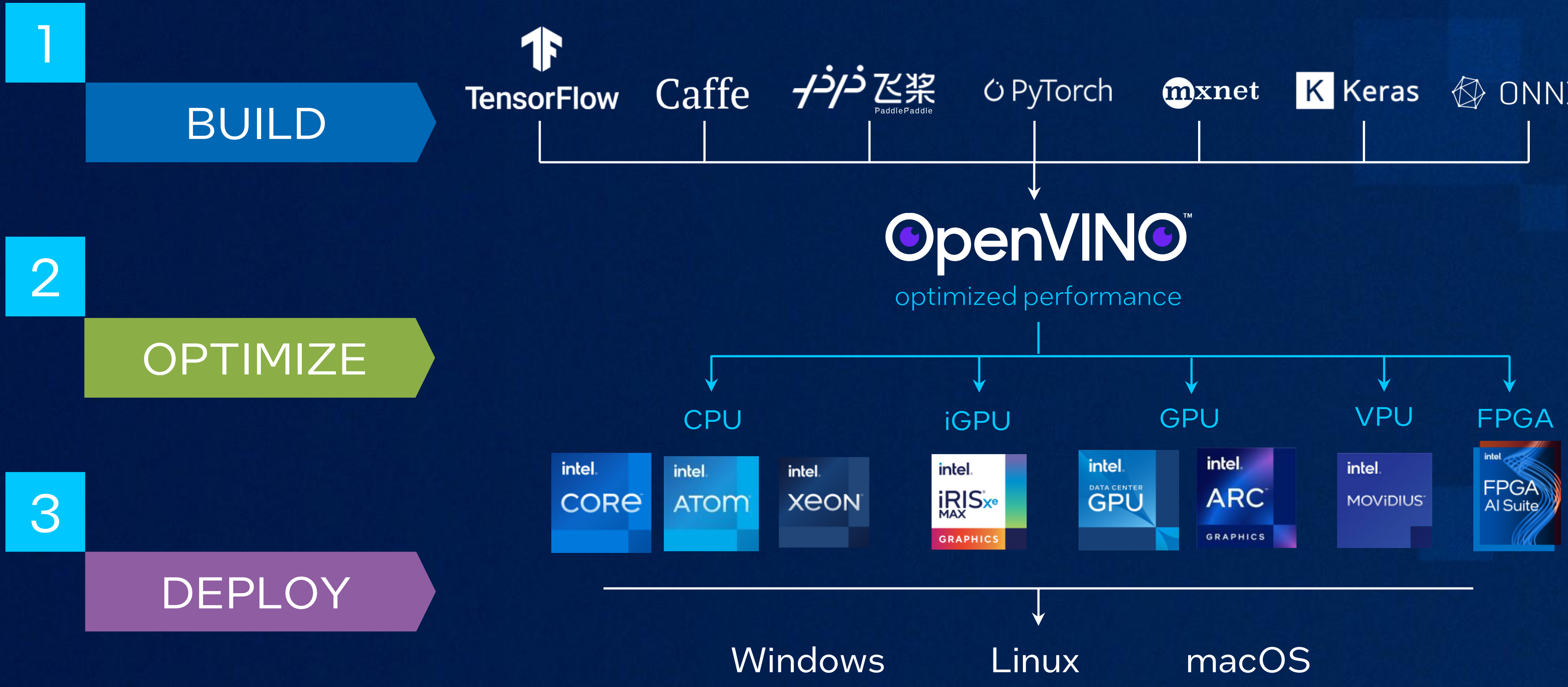
Server Inference (scalable + fast)

Desktop

Why Intel® Distribution of OpenVINO™ Toolkit

Fast, accurate real-world results with high-performance, deep learning inference

Convert and optimize models, deploy across a mix Intel hardware and environments, on-premise and on-device, in the browser or in the cloud

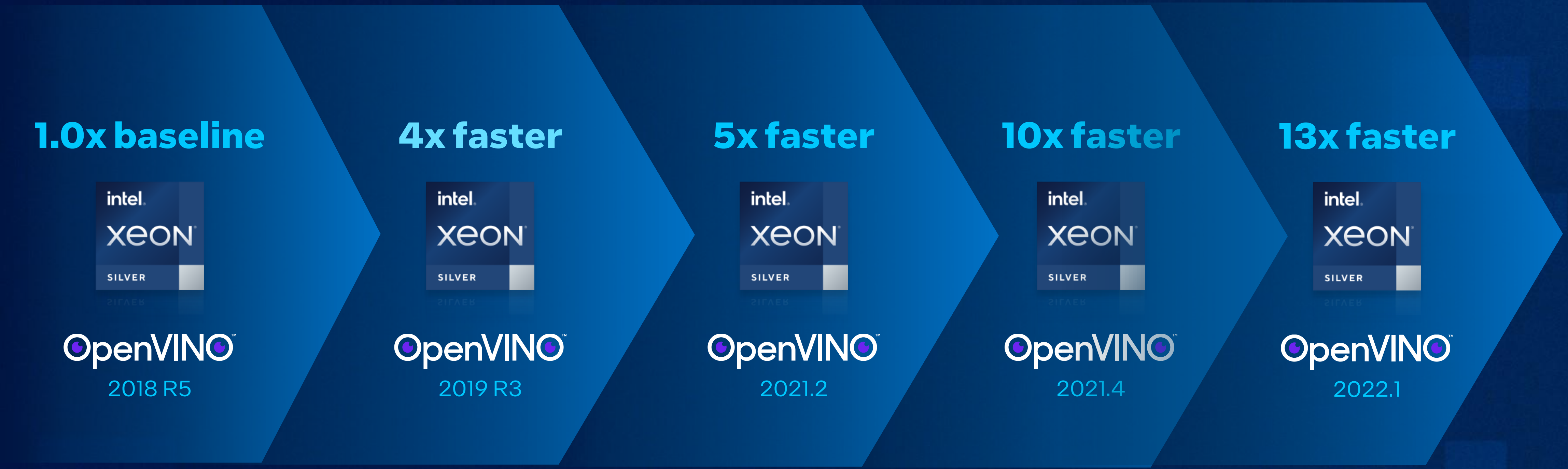


1 oneAPI

Powered by oneAPI
The productive, smart path to freedom for accelerated computing from the economic and technical burdens of proprietary alternatives.

Object Detection + Intel® Xeon®: Compelling SW+HW AI Inference Performance Increases Over Time

Improvements mean exponential performance increase



1.0x baseline

OpenVINO™ 2018 R5

4116 1st Gen Intel® Xeon® Scalable processor with FP32

4x faster

OpenVINO™ 2019 R3

4216 2nd Gen Intel® Xeon® Scalable processor with Intel® Deep Learning Boost (INT8 VNNI)

5x faster

OpenVINO™ 2021.2

4216R 2nd Gen Intel® Xeon® Scalable processor with Intel® Deep Learning Boost (INT8 VNNI)

10x faster

OpenVINO™ 2021.4

4316 3rd Gen Intel® Xeon® Scalable processor with Intel® Deep Learning Boost (INT8 VNNI)

13x faster

OpenVINO™ 2022.1

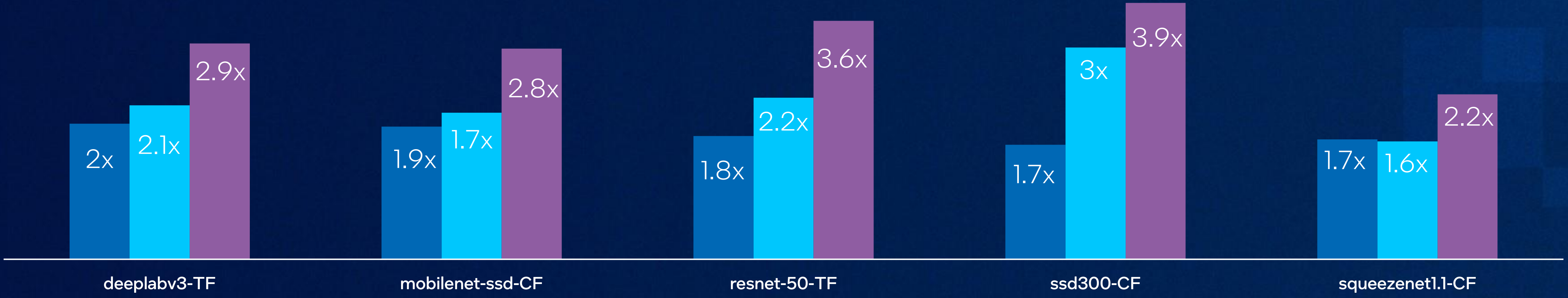
4316 3rd Gen Intel® Xeon® Scalable processor with Intel® Deep Learning Boost (INT8 VNNI)

See here for workloads and configurations. Results may vary.
2018 R5 obtained on system configuration 1
2019 R3 obtained on system configuration 2
OV-2021.2 obtained on system configuration 3
OV-2021.4.1 and OV-2022.1 obtained on system configuration 4

Compounding effect of hardware and software

Use Intel® Iris® X^e graphics + CPU combined for maximum inferencing

Tiger Lake + Intel® Distribution of OpenVINO™ toolkit vs. Coffee Lake CPU

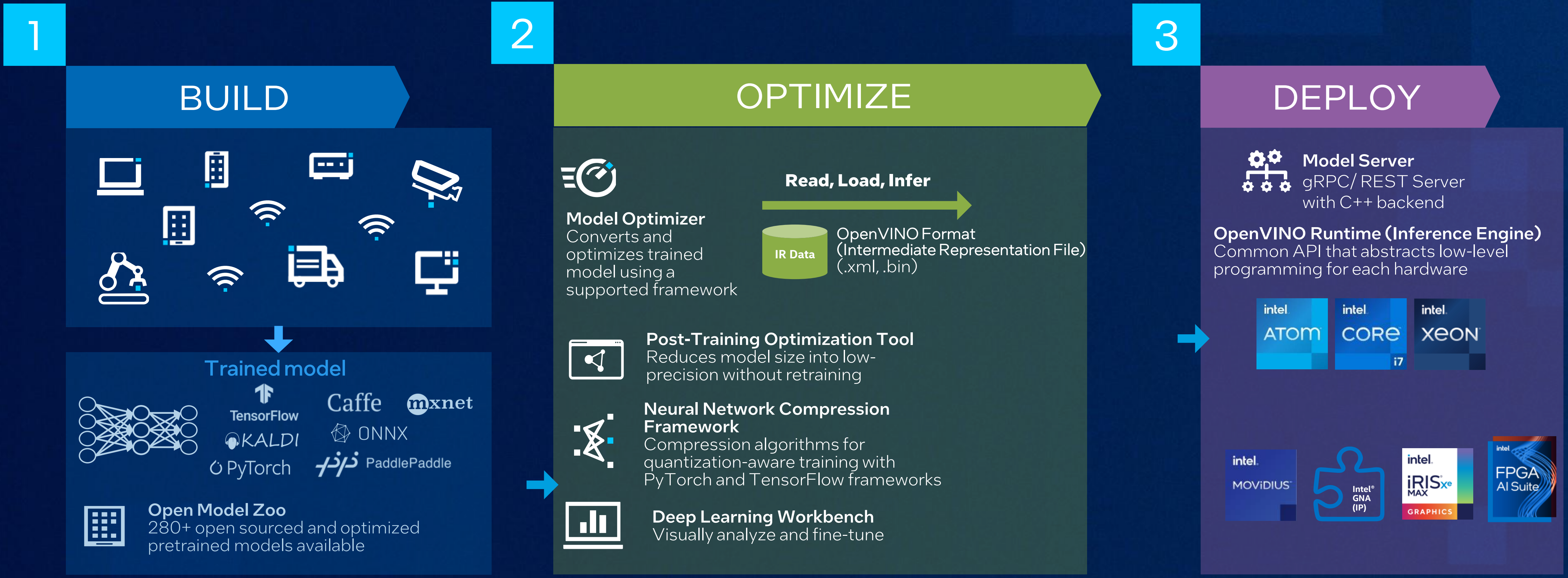


■ Core i5-1145G7, CPU (FPS) ■ Core i5-1145G7, GPU (FPS) ■ Core i5-1145G7, GPU+CPU (FPS)

11th Gen Intel® Core™ i5-1145G7 (Tiger Lake) relative inference FPS compared to Intel® Core™ i5-8500 (Coffee Lake).

The above is preliminary performance data based on preproduction components. For more complete information about performance and benchmark results, visit intel.com/benchmarks. See backup for configuration details.

OpenVINO™ Toolkit Developer Journey



1 BUILD

Trained model

Open Model Zoo
280+ open sourced and optimized pretrained models available

2 OPTIMIZE

Model Optimizer
Converts and optimizes trained model using a supported framework

Read, Load, Infer

IR Data

OpenVINO Format
(Intermediate Representation File)
(.xml, .bin)

Post-Training Optimization Tool
Reduces model size into low-precision without retraining

Neural Network Compression Framework
Compression algorithms for quantization-aware training with PyTorch and TensorFlow frameworks

Deep Learning Workbench
Visually analyze and fine-tune

3 DEPLOY

Model Server
gRPC/ REST Server
with C++ backend

OpenVINO Runtime (Inference Engine)
Common API that abstracts low-level programming for each hardware

1 oneAPI

Powered by oneAPI
The productive, smart path to freedom for accelerated computing from the economic and technical burdens of proprietary alternatives.

OpenVINO™ Developer journey

1 BUILD

2 OPTIMIZE

3 DEPLOY

Open Model Zoo

Pretrained models

TensorFlow

ONNX

KALDI

mxnet

Caffe

飞桨 PaddlePaddle

Supported frameworks and formats ▸ https://docs.openvino.ai/latest/openvino_docs_MO_DG_prepare_model_Supported_Frameworks_Layers.html#doxid-openvino-docs-m-o-d-g-prepare-model-supported-frameworks-layers

Convert model with Model Optimizer ▸ https://docs.openvino.ai/latest/openvino_docs_MO_DG_Deep_Learning_Model_Optimizer_DevGuide.html

OpenVINO™ Developer journey

1 BUILD

2 OPTIMIZE

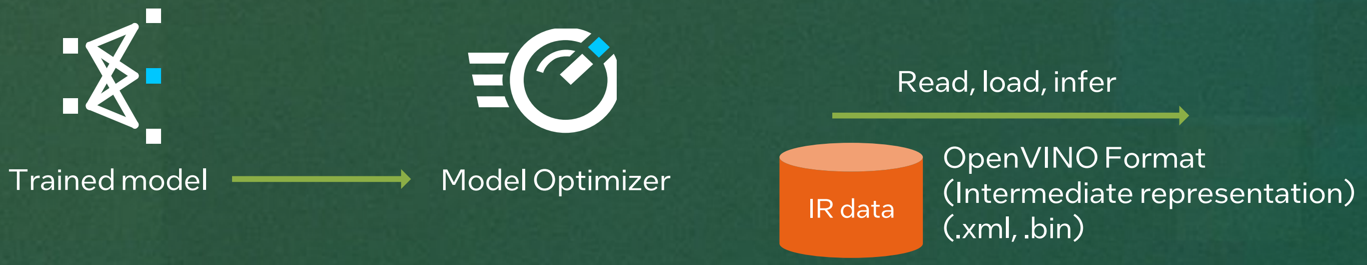
3 DEPLOY

300+ pretrained and optimized models

- Object detection
- Object recognition
- Gesture recognition
- Machine translation
- Text recognition
- Semantic segmentation
- Question answering
- Human pose estimation
- Compressed models
- Action recognition
- Image processing
- Instance segmentation
- Text detection
- Text spotting
- Image retrieval

Model Optimizer

- A Python-based tool to import trained models and convert them to intermediate representation (IR)
- Optimizes for performance or space with conservative topology transformations
- Hardware-agnostic optimizations



.xml – Describes the network topology
.bin – Describes the weights and biases binary data

Optimization techniques available are:

- Linear operation fusing
- Stride optimizations
- Group convolutions fusing

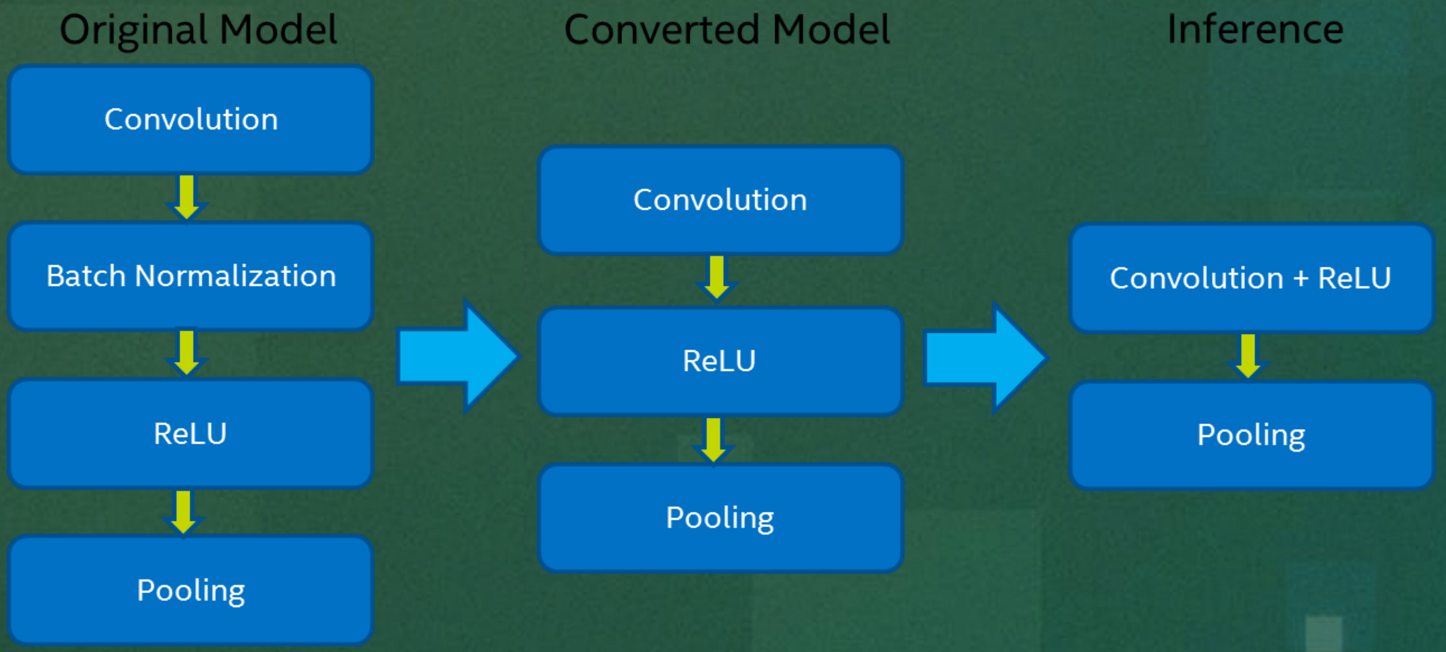
Note: Except for ONNX (.onnx model formats), all models have to be converted to an IR format to use as input to the Inference Engine.

Development guide ▸ https://docs.openvino.ai/latest/openvino_docs_MO_DG_Deep_Learning_Model_Optimizer_DevGuide.html

Model Optimizer: Linear Operation Fusing

- Example

1. Remove Batch normalization stage.
2. Recalculate the weights to 'include' the operation.
3. Merge Convolution and ReLU into one optimized kernel.



Development guide ▸ https://docs.openvino.ai/latest/openvino_docs_MO_DG_Deep_Learning_Model_Optimizer_DevGuide.html

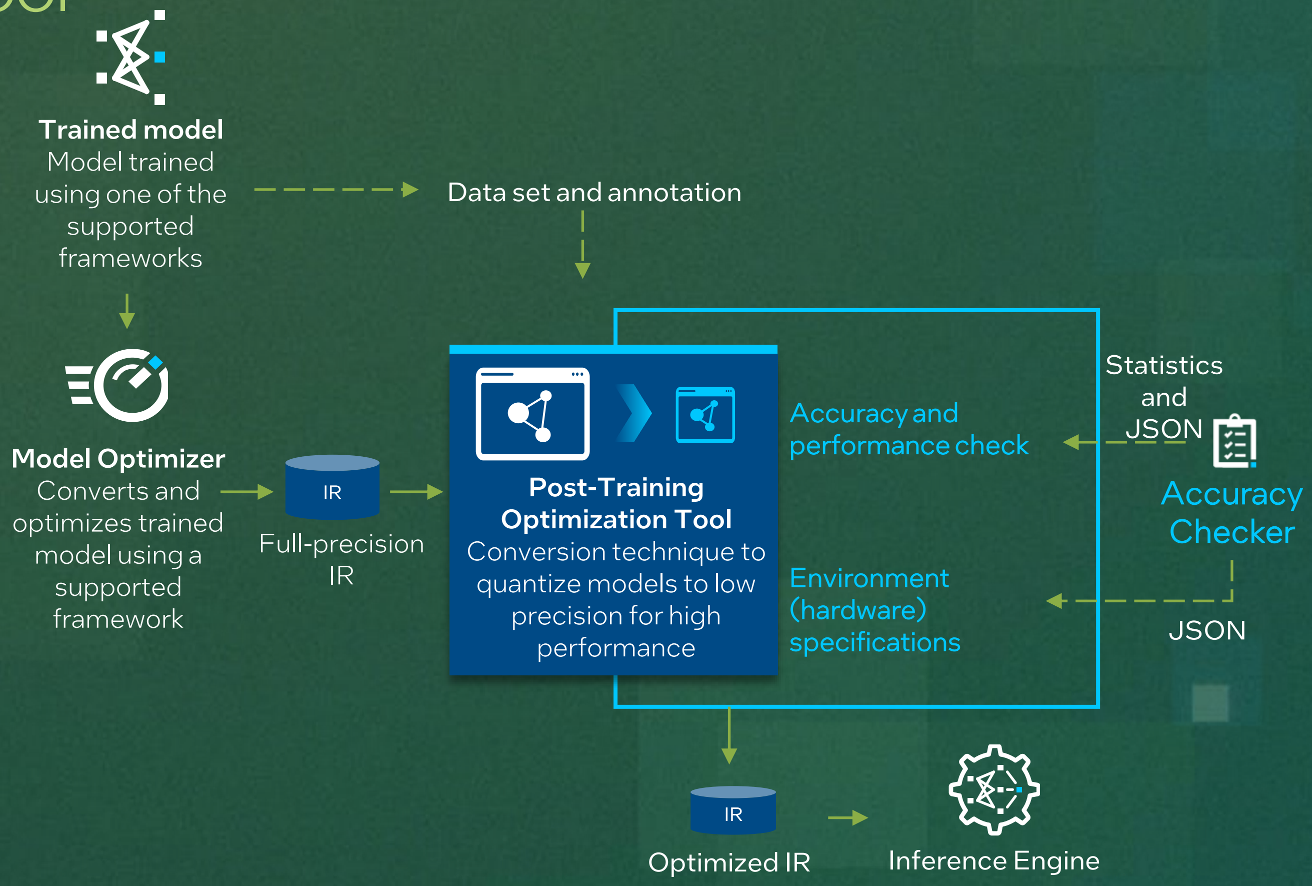
Post-Training Optimization Tool

Conversion technique that reduces model size into low precision without retraining

Reduces model size while also improving latency, with little degradation in model accuracy and without model retraining.

Different optimization approaches are supported: quantization algorithms, etc.

Available as a command line tool and API and inside Deep Learning Workbench.



Trained model
Model trained using one of the supported frameworks

Data set and annotation

Model Optimizer
Converts and optimizes trained model using a supported framework

Post-Training Optimization Tool
Conversion technique to quantize models to low precision for high performance

Accuracy and performance check

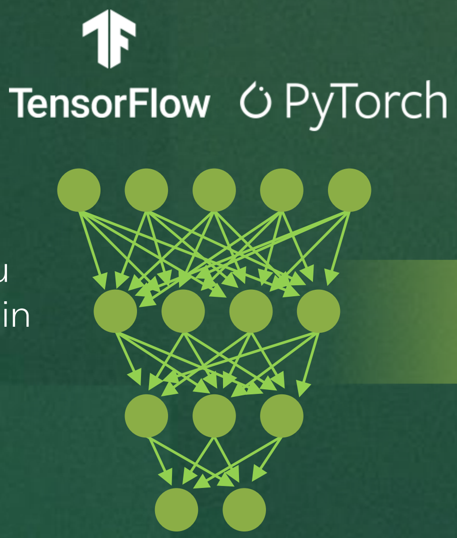
Environment (hardware) specifications

Neural Network Compression Framework (NNCF)

Do you need more optimization?

No problem. This is what Neural Network Compression Framework was created for.

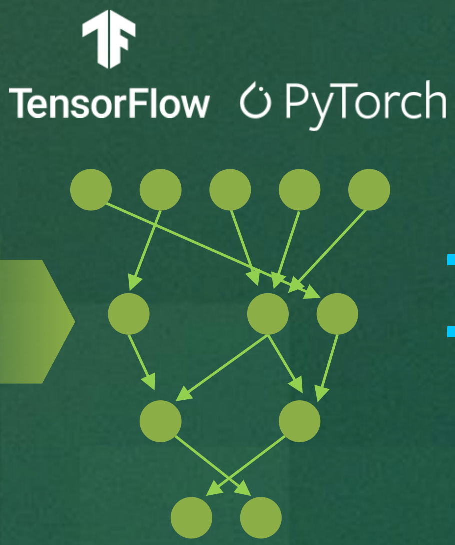
Let's assume you have your model in TensorFlow or PyTorch.



Neural Network Compression Framework

- Quantization-aware training
- Mixed-precision quantization
- Filter pruning

Use any of these algorithms to quantize or prune networks.



- Smaller
- No experts needed

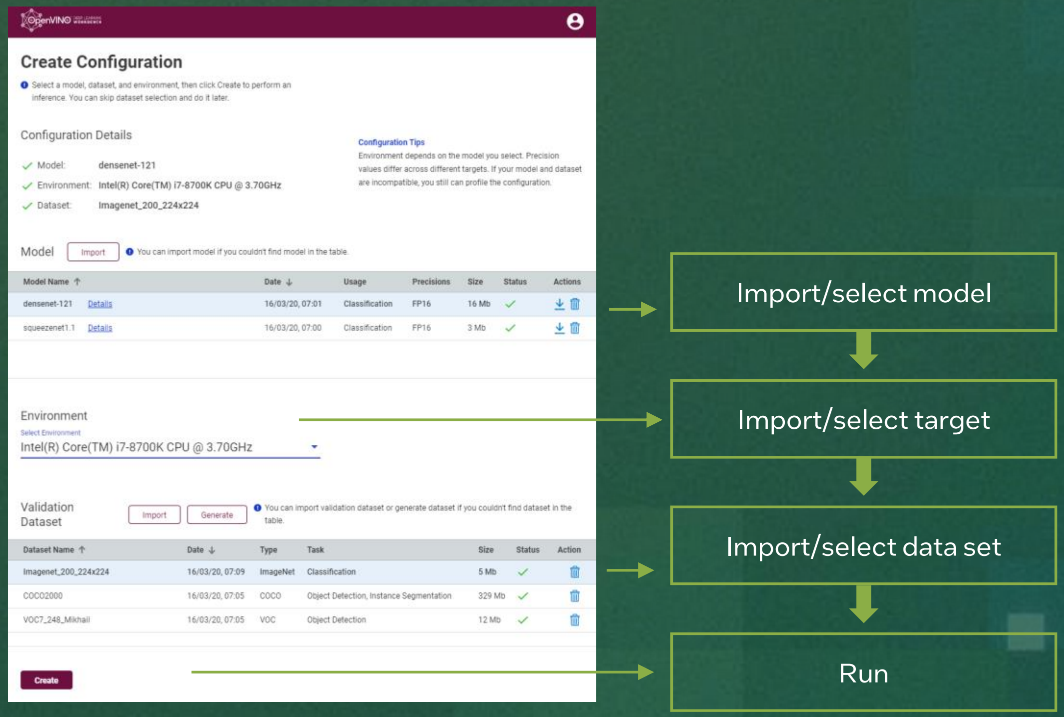
OpenVINO™
Developer journey

1 BUILD | 2 OPTIMIZE | 3 DEPLOY

Deep Learning Workbench

Web-based UI extension tool for model analyses and graphical measurements

- Visualize performance data for topologies and layers to aid in model analysis
- Automate analysis for optimal performance configuration (streams, batches, latency)
- Experiment with int8 or Winograd calibration for optimal tuning using the Post-Training Optimization Tool
- Provide accuracy information through Accuracy Checker
- Direct access to models from public set of Open Model Zoo
- Enable remote profiling, allowing the collection of performance data from multiple machines without any additional setup



Create Configuration

Select a model, dataset, and environment, then click Create to perform an inference. You can skip dataset selection and do it later.

Configuration Details

✓ Model: densenet-121
✓ Environment: Intel(R) Core(TM) i7-8700K CPU @ 3.70GHz
✓ Dataset: Imagenet_200_224x224

Configuration Tips
Environment depends on the model you select. Precision values differ across different targets. If your model and dataset are incompatible, you still can profile the configuration.

Model You can import model if you couldn't find model in the table.

Model Name ↑		Date ↓	Usage	Precisions	Size	Status	Actions
densenet-121	Details	16/03/20, 07:01	Classification	FP16	16 Mb	✓	
squeezenet1.1	Details	16/03/20, 07:00	Classification	FP16	3 Mb	✓	

Environment
Select Environment
Intel(R) Core(TM) i7-8700K CPU @ 3.70GHz

Validation Dataset You can import validation dataset or generate dataset if you couldn't find dataset in the table.

Dataset Name ↑	Date ↓	Type	Task	Size	Status	Action
Imagenet_200_224x224	16/03/20, 07:09	ImageNet	Classification	5 Mb	✓	
COCO2000	16/03/20, 07:05	COCO	Object Detection, Instance Segmentation	329 Mb	✓	
VOC7_248_Mikhail	16/03/20, 07:05	VOC	Object Detection	12 Mb	✓	

Runtime

- High-level C, C++, and Python inference runtime API
- Interface is implemented as dynamically loaded plugins for each hardware type
- Delivers superior performance for each type without requiring users to implement and maintain multiple code pathways

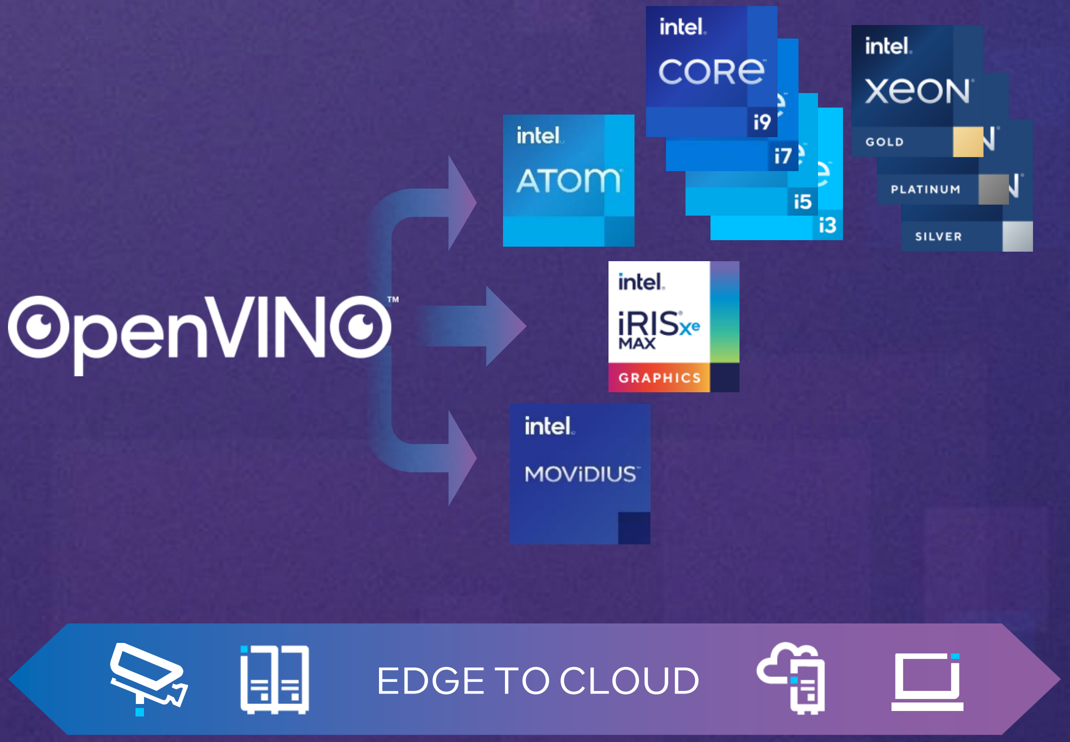
Development guide ▸ https://docs.openvino.ai/latest/openvino_docs_OV_UG_OV_Runtime_User_Guide.html#

Write once, deploy anywhere

Common high-level inference runtime for cross-platform flexibility

Write once, deploy across different platforms with the same API and framework-independent execution.

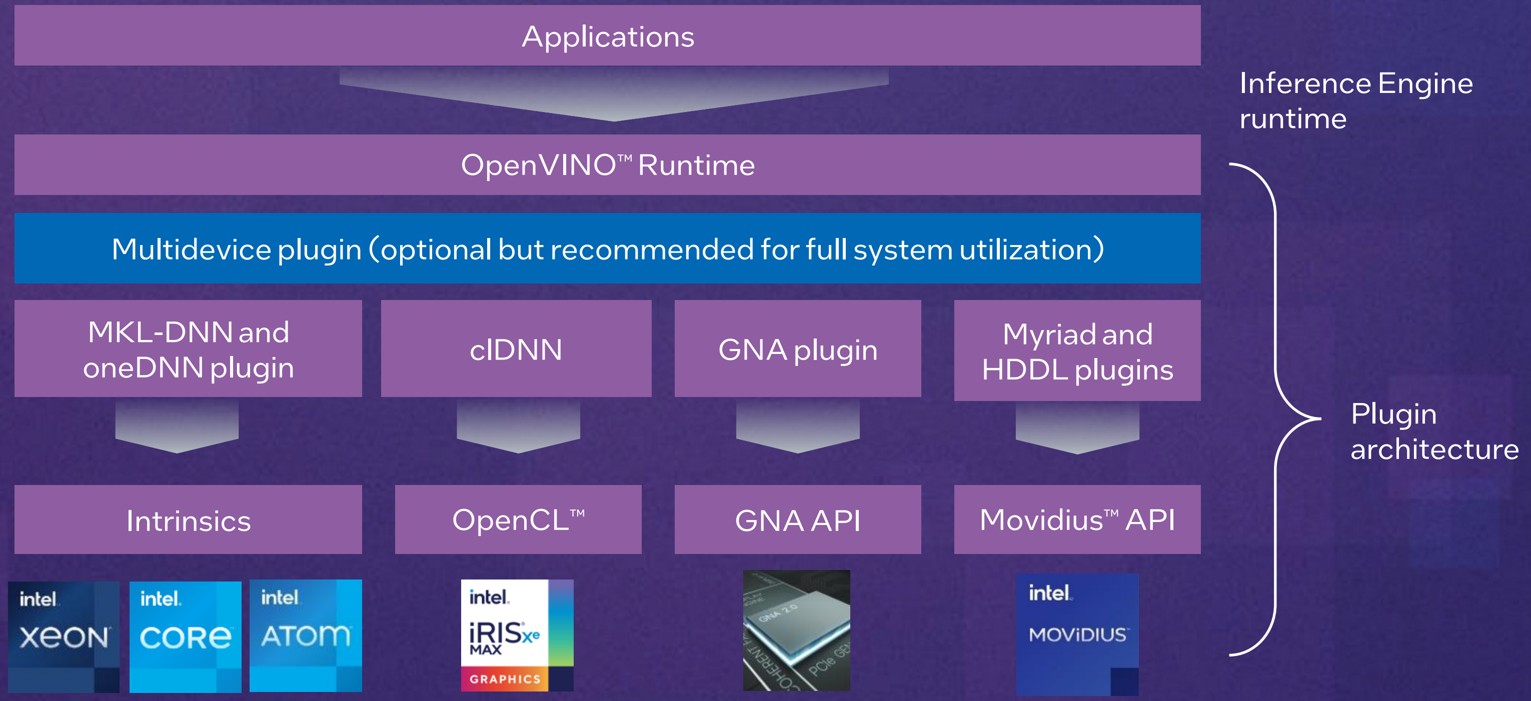
Full environment utilization, or multidevice plugin, across available hardware for superior performance results.



For more details on supported platforms see system requirements ▸ https://www.intel.com/content/www/us/en/developer/tools/openvino-toolkit/system-requirements.html

Write once, deploy anywhere

Common high-level inference runtime for cross-platform flexibility



Applications

OpenVINO™ Runtime

Multidevice plugin (optional but recommended for full system utilization)

MKL-DNN and oneDNN plugin

clDNN

GNA plugin

Myriad and HDDL plugins

Intrinsics

OpenCL™

GNA API

Movidius™ API

Inference Engine runtime

Plugin architecture

Additional tools and add-ons

Streamlined development experience and ease of use

Model Downloader

- Provides an easy way of accessing a number of public models as well as a set of pretrained Intel models

Deployment Manager

- Generate an optimal, minimized runtime package for deployment
- Deploy with smaller footprint compared to development package

Benchmark App

- Measure performance (throughput, latency) of a model
- Get performance metrics per layer and on overall basis

Accuracy Checker

- Check model accuracy pre- and post-conversion using a known data set

Computer Vision Annotation Tool
This web-based tool helps annotate videos and images before training a model

Deep Learning Streamer
Streaming analytics framework to create and deploy complex media analytics pipelines

OpenVINO™ Model Server
Scalable inference server for serving optimized models over gRPC or REST API endpoints

Dataset Management Framework
Use this add-on to build, transform, and analyze data sets

Neural Network Compression Framework
Suite of compression algorithms for quantization-aware training with PyTorch and TensorFlow frameworks

Training Extensions
Trainable deep learning models for action recognition, segmentation, image classification, object detection, and text spotting

What's New with OpenVINO™ Toolkit 2022.1 Release

Updated, Cleaner API

The 2022.1 release aligns with TensorFlow conventions, streamlines optimization, and improves conversion. performance.

- Performance has been significantly improved for model conversion on Open Neural Network Exchange (ONNX*) models
- Model Optimizer parameters have been reduced to minimize complexity

Broader Model Support

Tackle more applications including natural language processing (NLP), PaddlePaddle models, and anomaly detection.

- OpenVINO 2022.1 adds Dynamic Input Shapes, more NLP models for training speech denoising and updates on speech recognition and speech synthesis
- Support for select PaddlePaddle* models
- Pretrained models for Anomaly Detection including anomaly segmentation for industrial inspection

Portability and Performance

The new AUTO plugin discovers available devices and runs inference workloads dynamically across CPU, GPU, and XPUs

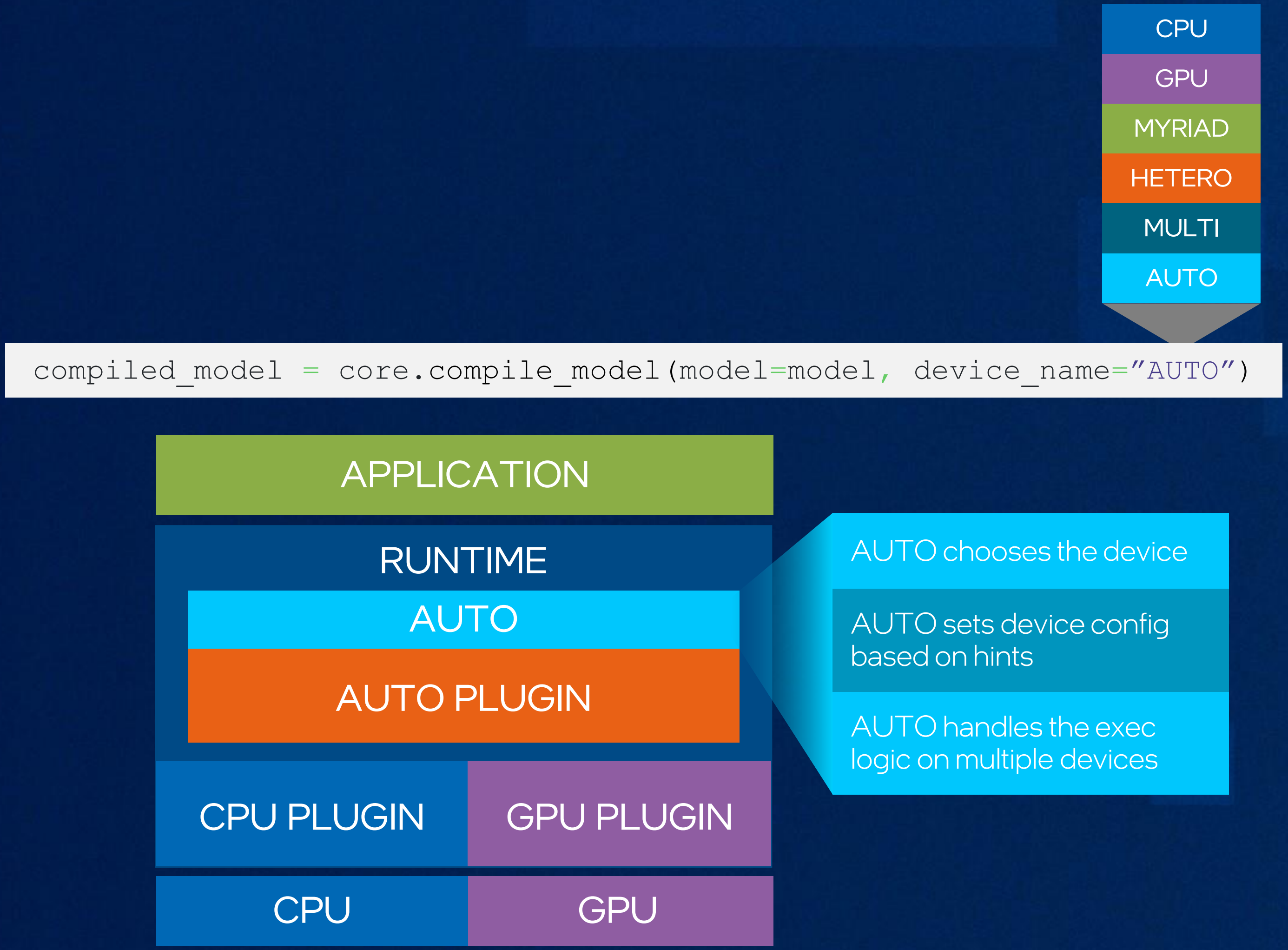
- The AUTO feature uses performance hints to define latency, throughput, and batching requirements—device and runtime logic configure themselves
- AUTO maximizes hybrid architectures for high performance inferencing on platforms with CPUs and integrated GPUs like 12th Gen Intel® Core™ processors (aka Alder Lake)

New feature in 2022.1: AUTO plugin

The AUTO plugin automatically detects processing resources and maximizes inference performance, which is ideal for hybrid architectures and container-based applications that land on unknown devices.

The AUTO plugin uses performance hints to select devices and configure workload logic. Performance hints reverse the direction of configuration by expressing a target scenario—for example, latency and throughput targets—with a single config key that then lets the device configure itself in response.

Learn more doc.openvino.ai



```
compiled_model = core.compile_model(model=model, device_name="AUTO")
```

AUTO chooses the device

AUTO sets device config based on hints

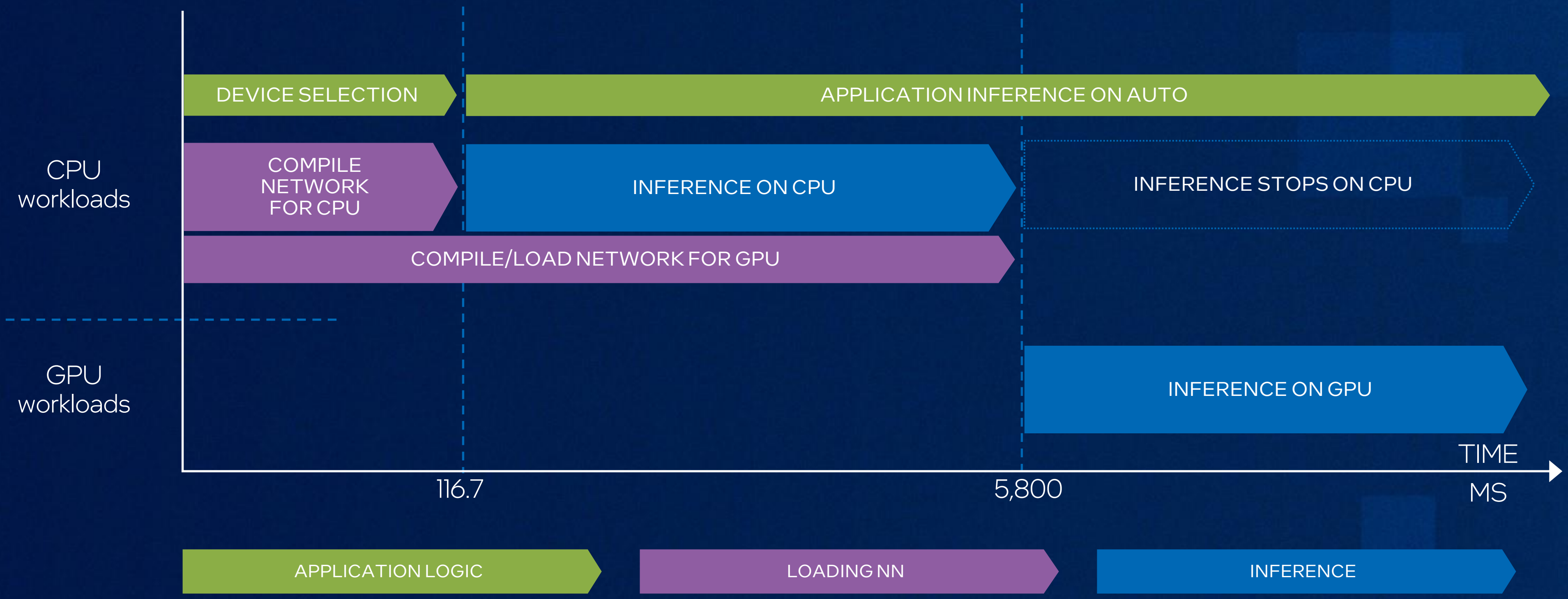
AUTO handles the exec logic on multiple devices

New feature in 2022.1: AUTO plugin—how it works

The AUTO plugin shifts workloads throughout runtime to maximize performance.

For example, the GPU may be the best device, but GPU initialization takes longer than the CPU because of the time it takes to compile the OpenCL™ kernel.

The AUTO plugin starts inference on the CPU while it loads and compiles for the GPU. When the GPU is ready, the AUTO plugin switches the device to the GPU and releases resources from the CPU.



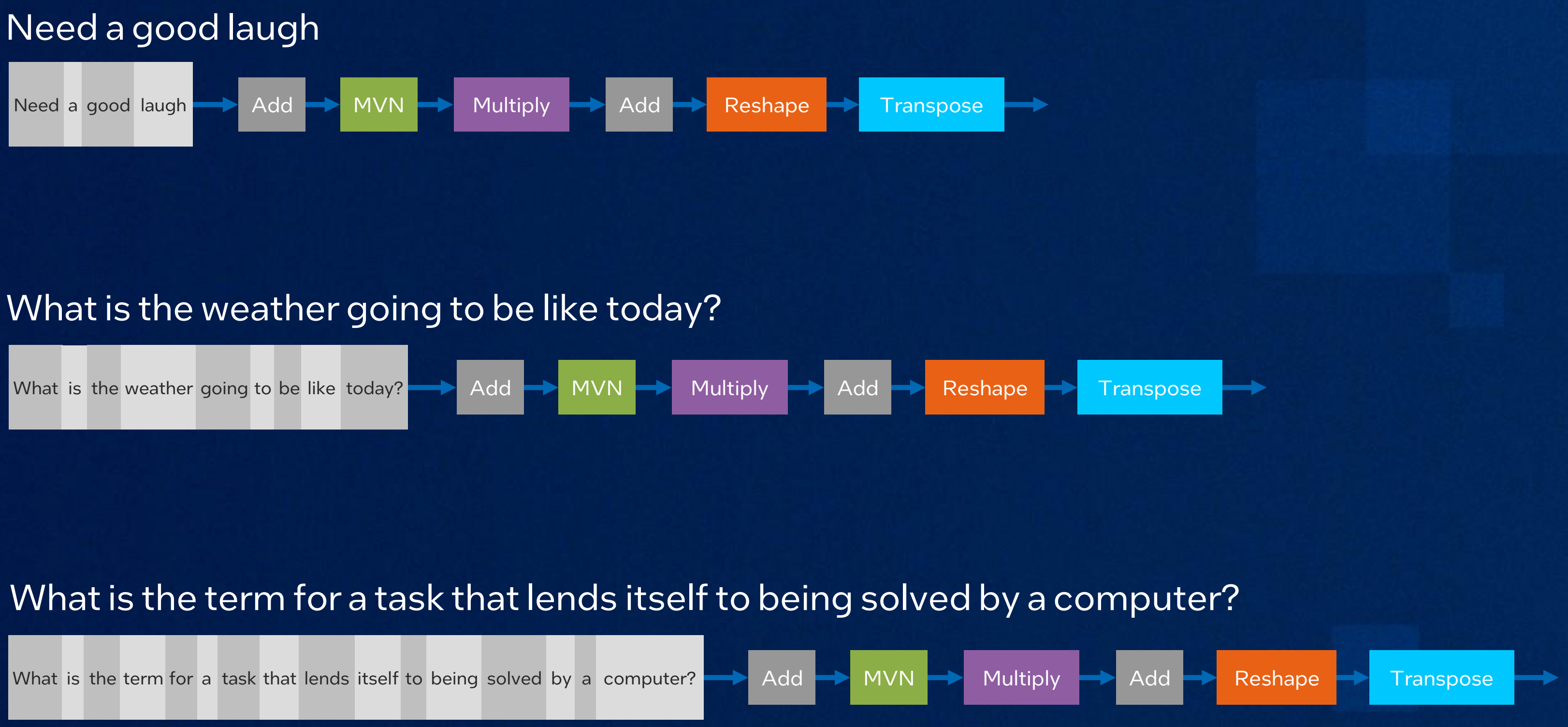
New feature in 2022.1: Dynamic Input Shapes on CPU

Words, phrases, and sentences come in many lengths, which means every input shape varies from sample to sample.

Dynamic Input Shapes reads and reshapes the model's network for each input automatically.

This allows sequence processing models, like BERT-based NLP models, to ingest, inference, and output results of varying lengths more efficiently.

In OpenVINO™ 2022.1, Dynamic Input Shapes run on CPUs only. Extending Dynamic Input Shapes to GPUs and VPUs is on the road map for a future dot release.


Need a good laugh
Need a good laugh
Add
MVN
Multiply
Add
Reshape
Transpose
What is the weather going to be like today?
What is the weather going to be like today?
Add
MVN
Multiply
Add
Reshape
Transpose
What is the term for a task that lends itself to being solved by a computer?
What is the term for a task that lends itself to being solved by a computer?
Add
MVN
Multiply
Add
Reshape
Transpose

Edge Intelligence Solution =
Video AI Box + AI Algo + Business App

Edge Intelligence Solution

- Unmanned parking
- FR payment
- Smart community
- Smart bank
- Industrial defect detection
- Forest vision fire alarm
- Smart farming

And more….

=

Video AI Box

- Intel CPU
- Intel CPU with iGPU
- Intel CPU + 3rd Party Accelerator
- Validated Video AI Box from Intel partners

+

AI Algo

- Object detection
- Feature recognition
- Feature detection
- People counting
- Fire detection
- Classification
- Semantic segmentation

+

Business App

- VMS
- CRM System
- ERP System
- Customer UI
- Cloud Synergy
- Device Gateway
- Device Management
- Security

Intel® Video AI Box

"General Compute + Media + AI" Capability to Meet Diverse Requirements

	CPU		+	GPU	+	
i7	4C/8T	12MB		2 VDBox		96 EU
i5	4C/8T	8MB		2 VDBox		80 EU
i3	2C/4T	6MB		1 VDBox		48 EU
Celeron	2C/2T	4MB		1 VDBox		48 EU
	General Workloads			High Density Codec		AI Inference

11th Gen Intel® Core™ (Tiger Lake – UP3)
General Workloads + Codec + AI in one SoC

Intel® Video AI Box Platform

CPU+ iGPU platform to ease the development, improve the efficiency, lower the solution cost and reduce the operation efforts

Media and AI workloads on Integrated GPU with OpenVINO™ to accelerate the AI inference

OS, Business app and other general workloads consolidated on high performance X86 CPU

New Intel® Iris® Xe graphics

Powerful AI and Media Capability at Low Power

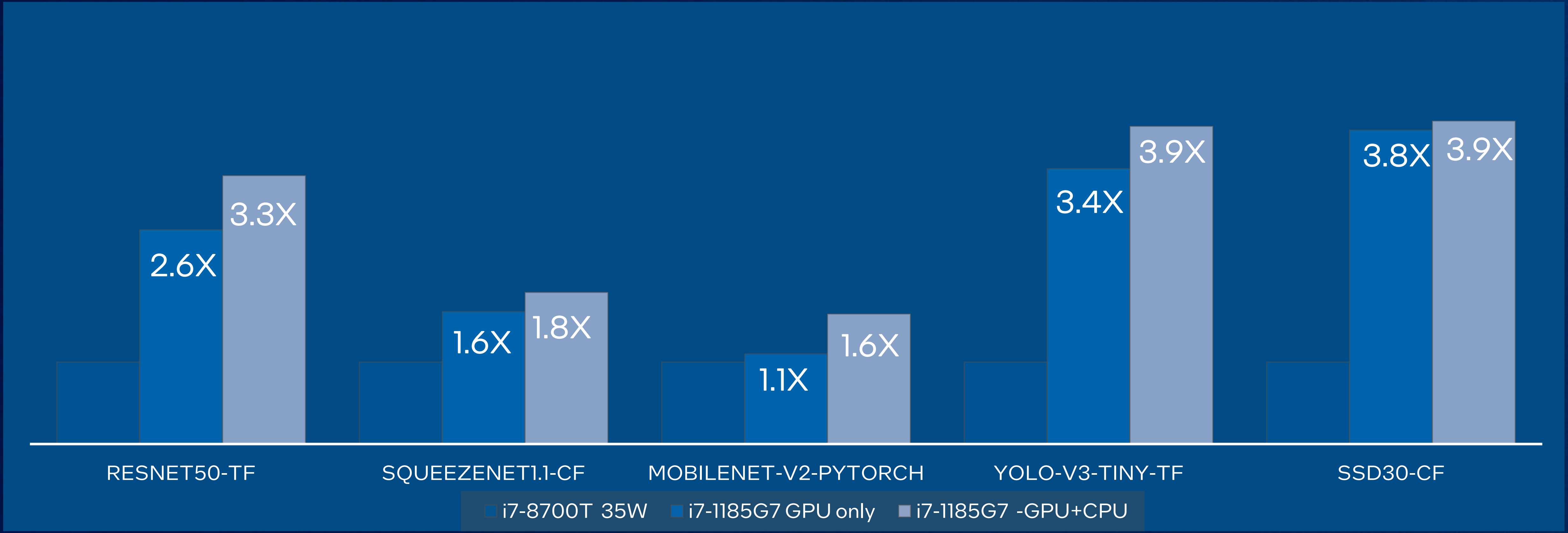
- Up to 96 execution units providing 2.95x graphic performance improvement[1] and powerful AI computing capability
- Up to 2 VDBox to high-density video decoding offloading EU and CPU resources
- Intel® Deep Learning Boost to achieve accelerated INT8 AI inference via VNNI on CPU and DP4a instructions on iGPU
- Leverage iGPU powerful media and AI capability to avoid additional discrete accelerator, reducing the cost for solutions and future maintenance

1. For more information and configuration, please visit intel.com/tigerlake-up3. Workloads and configurations. Results may vary.

Intel® Video AI Box

11th Gen Intel® Core™ Processor Performance

Tiger Lake-UP3 + Intel® Distribution of OpenVINO™ toolkit vs Coffee Lake CPU



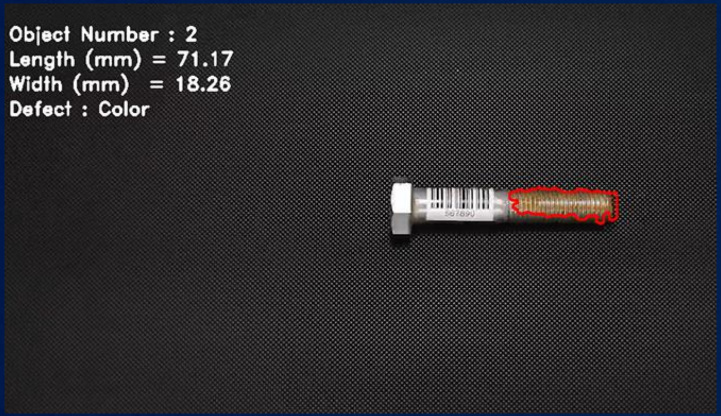
* For detailed configuration and AI inference benchmark results on more neutral networks, please visit Intel® Distribution of OpenVINO™ toolkit Benchmark Results . Performance varies by use, configuration and other factors. Learn more at www.intel.com/PerformanceIndex.Your costs and results may vary.

Demos and reference implementations

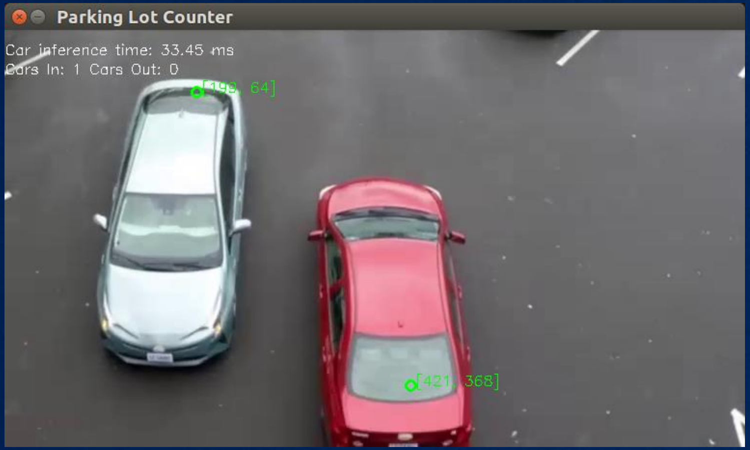
AI inferencing one-stop shop

Take advantage of prebuilt, open-source example implementations with step-by-step guidance and required components list

- Intruder Detector – C++
- Machine Operator Monitor –C++
- Motor Defect Detector – Python
- Object Flaw Detector – C++
- Object Size Detector – C++
- Parking Lot Counter – C++
- People Counter – C++
- Shopper Gaze Monitor – C++
- Store Aisle Monitor – C++
- Store Traffic Monitor – C++
- Store Traffic Monitor – Python



```
Object Number : 2
Length (mm) = 71.17
Width (mm)  = 18.26
Defect : Color
```



Parking Lot Counter

```
Car inference time: 33.45 ms
Cars In: 1 Cars Out: 0
```

New OpenVINO™ notebooks, demos and support for additional public models

OpenVINO™ notebook:

Ready-to-run Jupyter Notebooks with tutorials for converting TensorFlow and PyTorch models, image classification, segmentation, depth estimation, post-training quantization and more

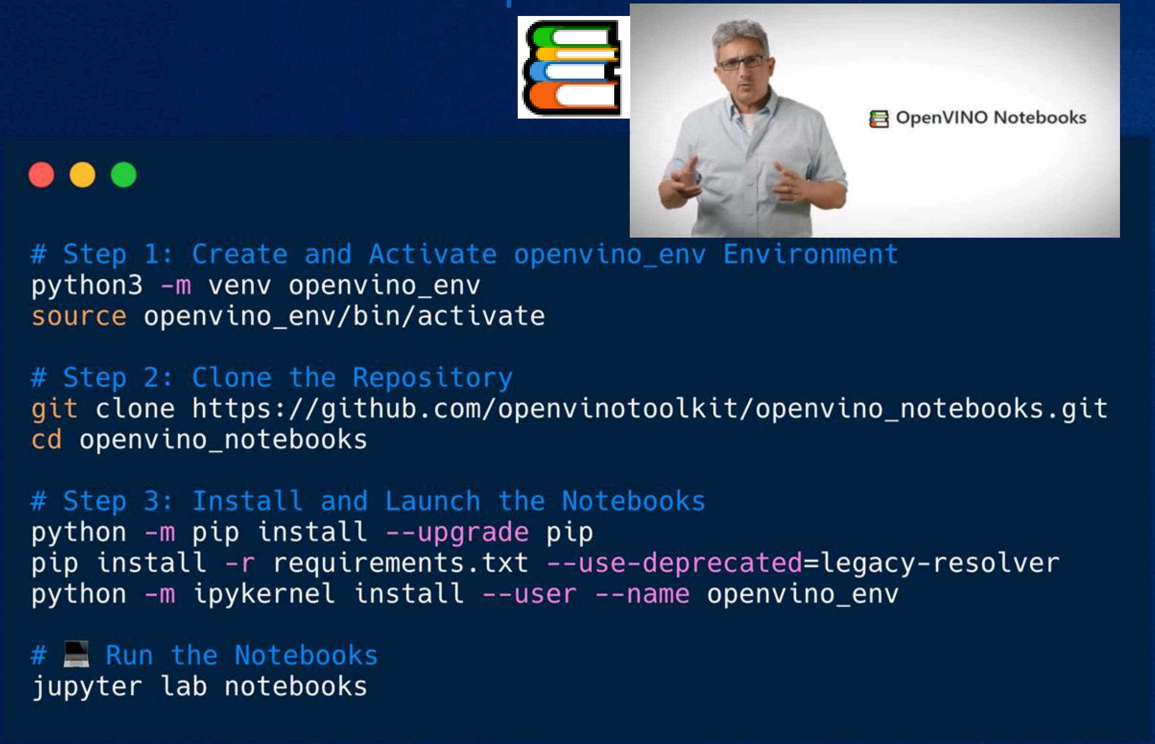
Demos:

- Audio Noise Suppression & Time Series Forecasting demos

Additional Public Models:

- RCAN and IseeBetter (image super-resolution)
- Attention OCR (image text prediction)
- Tacotron 2 (text-to-speech)
- ModNet (portrait/image matting)

Launch an OpenVINO ™ notebook



```
# Step 1: Create and Activate openvino_env Environment
python3 -m venv openvino_env
source openvino_env/bin/activate

# Step 2: Clone the Repository
git clone https://github.com/openvinotoolkit/openvino_notebooks.git
cd openvino_notebooks

# Step 3: Install and Launch the Notebooks
python -m pip install --upgrade pip
pip install -r requirements.txt --use-deprecated=legacy-resolver
python -m ipykernel install --user --name openvino_env

# 💻 Run the Notebooks
jupyter lab notebooks
```

OpenVINO™ notebooks: https://github.com/openvinotoolkit/openvino_notebooks
OpenVINO™ notebooks video: https://youtu.be/JtRcFmXMdbg

Ready to get started?

Download free directly from Intel

Intel® Distribution of OpenVINO™ toolkit

Also available from these sources:

Intel® DevCloud for the Edge | PIP
Docker Hub | Dockerfile
Anaconda Cloud | YUM | APT

Build from source:

GitHub | Gitee (for China)

Demo