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# INTEL INTERNET OF THINGS GROUP

**Tom Lantzsch**  
SVP and GM  
Internet of Things Group  
Intel Corporation



# IOT FUELS INTEL'S DATA-CENTRIC TRANSFORMATION



**INTEL TAM**  
**>\$300B**

**IOT TAM**  
**~\$30B**  
**2022**

**AUTONOMOUS THINGS – EDGE – NETWORK – CLOUD**



# INTEL'S INTERNET OF THINGS GROUP

## HIGH PERFORMANCE COMPUTE SOLUTIONS FOR TARGETED VERTICALS ALONG WITH HISTORIC EMBEDDED APPLICATIONS



Atom™ Core™ Xeon®

Revenue

\$4,000  
\$3,500  
\$3,000  
\$2,500  
\$2,000  
\$1,500  
\$1,000  
\$500  
\$-

YoY Growth

25%  
20%  
15%  
10%  
5%  
0%

2013 2014 2015 2016 2017 2018

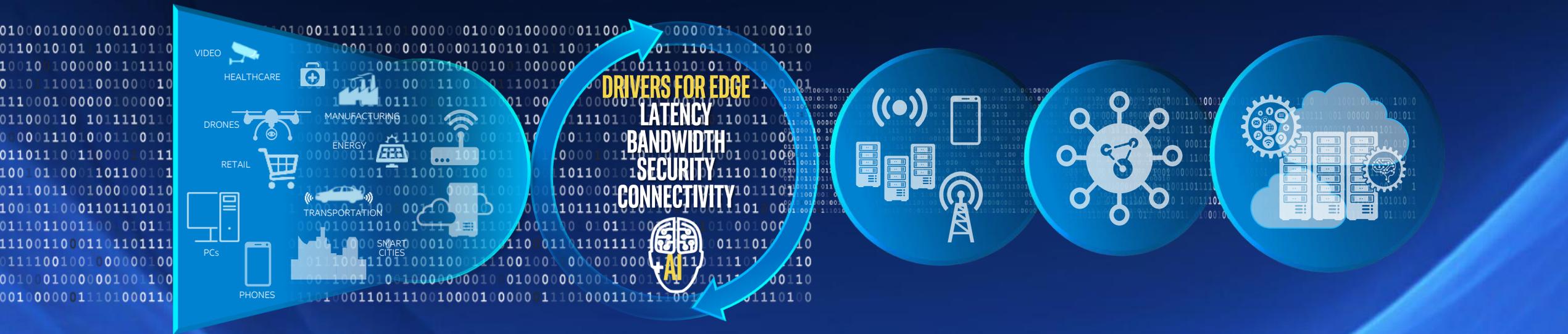
Revenue from Wind River

1st Half 2019 without Wind River

Note: Based on reported revenues for 2013-2019, the ASP and Product Mix based on 2018 CPU revenue



# OUR FUTURE IS EDGE COMPUTING



DEVICES / THINGS

EDGE COMPUTE NODE

NETWORK HUB OR REGIONAL DATA CENTER

CORE NETWORK

CLOUD DATA CENTER

# OUR STRATEGY

**HIGH PERFORMANCE COMPUTE**



**AGGREGATION AT THE EDGE  
APPLICATIONS & DATA**



**VISION (VIDEO) INFERENCE**



**COMMON AND SEAMLESS DEVELOPER EXPERIENCE + SOFTWARE**

**SCALING THE ECOSYSTEM TO DELIVER MARKET-READY SOLUTIONS**



# VERTICAL BUSINESS MODEL

**SOLVE KEY VERTICAL  
MARKET CHALLENGES**

**PARTNER WITH MARKET LEADERS  
IN VERTICAL SEGMENTS**

**DIFFERENTIATE WITH SILICON, SYSTEM  
DESIGN AND DEVELOPER EXPERIENCE**

**RETAIL**



**INDUSTRIAL**



**SMART CITIES/VIDEO**



**TRANSPORTATION**



**PUBLIC SECTOR**



**EDUCATION**



**HEALTHCARE**



**FINANCIAL SERVICES**



**AUTOMOTIVE**



# SCALE OUR STRATEGY WITH DEVELOPER COMMUNITIES

	<b>COMPUTER VISION</b> 
	<b>NETWORK</b>  <small>OPEN NETWORK EDGE SERVICES SOFTWARE</small>
	<b>FUNCTIONAL SAFETY</b>
	<b>REAL-TIME CONTROL</b>
	<b>MANAGEABILITY</b>
	<b>SECURITY</b>



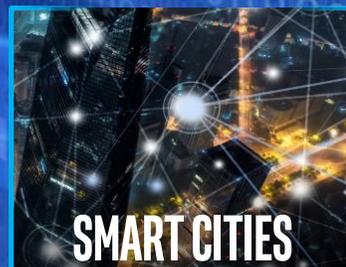
# ACCELERATE VISUAL INFERENCE AT THE EDGE

## OpenVINO™



DEVELOP ONCE, DEPLOY ON INTEL CPU, GPU, VPU & FPGA

IMPROVE PERFORMANCE EXPONENTIALLY



# PERFORMANCE BOOST WITH OPENVINO™

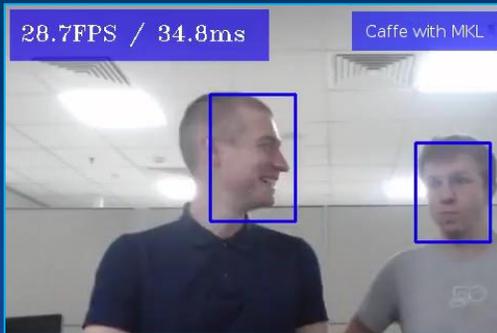


## SAME HARDWARE, BETTER SOFTWARE

## SCALE WITH ACCELERATOR



### CORE i7+CAFFE\*+MKL



**1 STREAM AT 28FPS**

### CORE i7+OPENVINO™



**16 STREAMS AT 20FPS**

### CORE i7+iGPU+OPENVINO™



**16 STREAMS AT 28FPS**

### CORE i7+iGPU+HDDL R8+OPENVINO™



**49 STREAMS AT 25FPS**

FPS = Frames per Seconds

STREAMS = Cameras

For more complete information about performance and benchmark results, visit [www.intel.com/benchmarks](http://www.intel.com/benchmarks). Performance results are based on testing as of August 07<sup>th</sup>, 2019 and may not reflect all publicly available security updates. See configuration disclosure for detail end of the presentation. No product can be absolutely secure.

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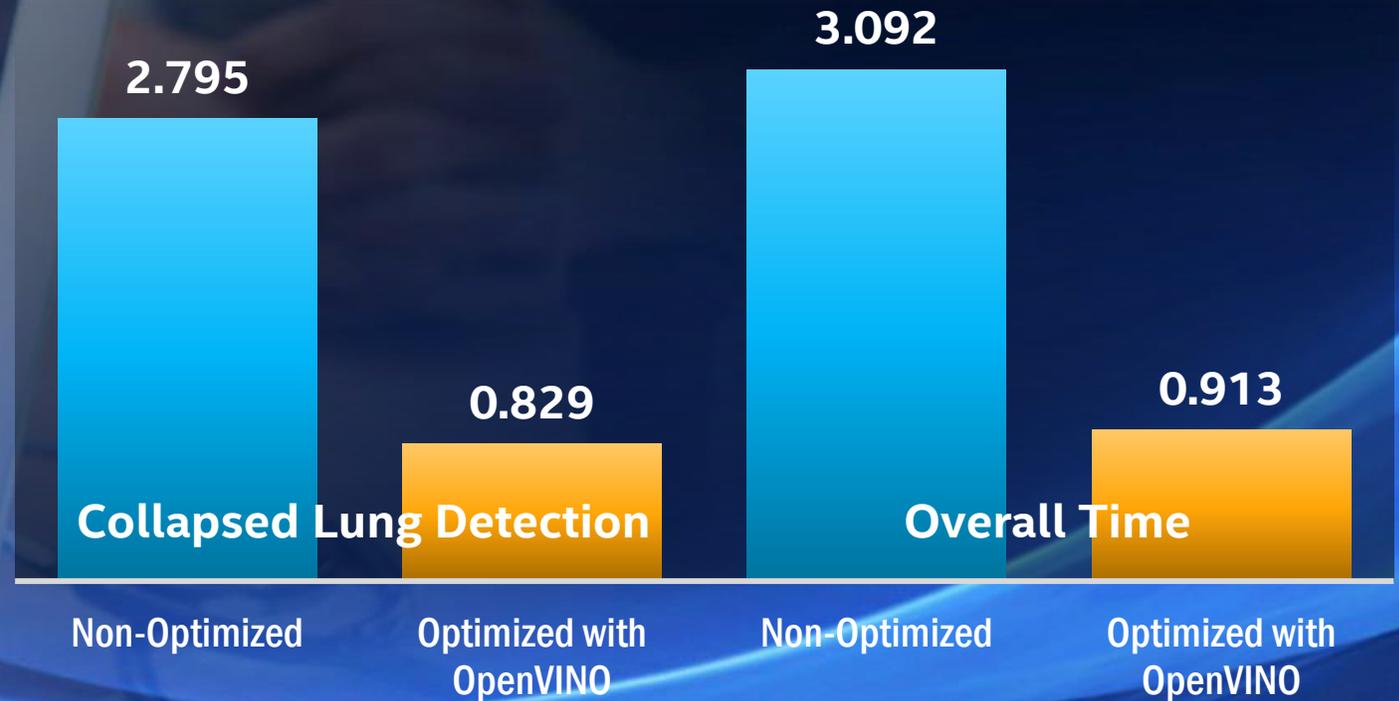


# OPENVINO™ AT WORK

## RESULTS OF COLLAPSED-LUNG INFERENCE MODEL



Time to Completion (Seconds)



OpenVINO™



**3.3X FASTER FOR < 1 SECOND RESULT**

For more complete information about performance and benchmark results, visit <https://newsroom.intel.com/news/new-intel-based-artificial-intelligence-imaging-solution-accelerate-critical-patient-diagnoses/#gs.upprt4>. Performance results are based on testing as of September, 2018 and may not reflect all publicly available security updates. See configuration disclosure for detail end of the presentation. No product can be absolutely secure.

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# WINNING TOGETHER WITH OUR ECOSYSTEM

HW & SW ENABLING

PLATFORM INTEGRATION

SOLUTION DELIVERY & SCALE

## EQUIPMENT MAKERS



## CLOUD PLATFORMS



**70+**  
INTEL® RFP READY KITS  
**150+ DEPLOYMENTS**

**150+**  
INTEL® MARKET READY SOLUTIONS  
**2900+ DEPLOYMENTS**

## TECHNOLOGY PROVIDERS



## VERTICAL OEM'S



## SYSTEM INTEGRATORS



## IoT SOLUTION AGGREGATORS



**1000+** IoT Solutions Alliance

As of August 2019

Other names and brands may be claimed as the property of others.,  
Brands depicted are partners delivering Intel® Market Ready Solutions & Intel® RFP Ready Kits, Intel® IoT Solution Aggregators, and/or members of Intel® IoT Solutions Alliance

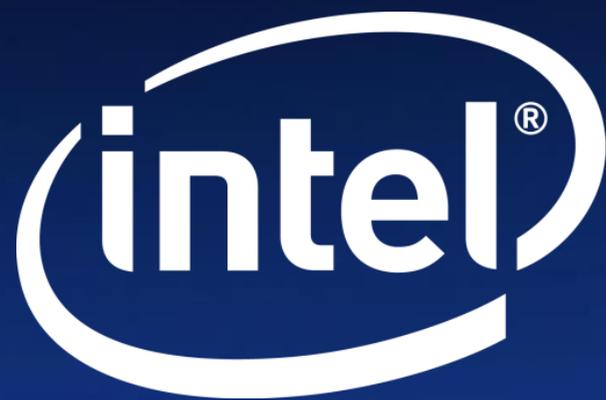


2022  
IOT TAM  
~\$30B



Source: TAM – 2022F SI TAM is based on amalgamation of analyst data and Intel analysis





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**No computer system can be absolutely secure.**

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Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit <http://www.intel.com/benchmarks>.

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The benchmark results may need to be revised as additional testing is conducted. The results depend on the specific platform configurations and workloads utilized in the testing, and may not be applicable to any particular user's components, computer system or workloads. The results are not necessarily representative of other benchmarks and other benchmark results may show greater or lesser impact from mitigations.

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# SYSTEM CONFIGURATION FOR SLIDE 9

*Testing by Intel as of August, 7<sup>th</sup>, 2019*

## **Core™i7: (for all scenarios)**

Platform: Intel(R) Core(TM) i7-8700T CPU @ 2.40GHz / 6 cores x 2 Threads, HT ON, Turbo ON, Total Memory 64GB DDR4-2400MHz. Model Name: Z370M-DS3H-CF. BIOS Version: F11. Ubuntu 16.04.6 LTS with kernel 4.15.0-55-generic.

## **Caffe\* with MKL**

Public distribution of Caffe with Intel® MKL optimizations enabled, for more information visit <http://caffe.berkeleyvision.org>

MKL - Math Library for Intel®-Based Systems for more information: <https://software.intel.com/en-us/mkl>

## **OpenVINO (Scenarios Core™i7 + OpenVINO™)**

Intel® Open Visual Inference & Neural Network Optimization software toolkit. For more information: <https://software.intel.com/en-us/openvino-toolkit>

OpenVINO™ Toolkit R2'2019 for Linux. Topology: face-detection-retail-0004/INT8. Scenarios (Core™i7+OpenVINO™, Core™i7+iGPU+OpenVINO™) Precision: mixed FP32+INT8. Scenario (Core™i7+iGPU+HDDL R8+OpenVINO™) Precision: FP16.

## **HDDL R8 (Scenarios Core™i7 + HDDL R8 + OpenVINO™)**

Intel® Vision Accelerator Design with Intel® Movidius™ VPU PCIe card (HDDL-R8).



# SYSTEM CONFIGURATION FOR SLIDE 10

*Testing by GE Healthcare as of September, 2018*

## **System Test Configuration Details:**

Intel® Core™ i5-4590S CPU @ 3.00GHZ, x86\_64, VT-x enabled, 16GB memory, OS: Linux magic x86\_64 GNU/Linux, Ubuntu 16.04 inferencing service docker container. Test compares TensorFlow model total inferencing time of 3.092 seconds to the same model optimized by Intel® Distribution of OpenVINO™ Toolkit optimized TF model resulting in a total inferencing time of 0.913 seconds for 338% performance speedup.

## **OpenVINO™**

Intel® Open Visual Inference & Neural Network Optimization software toolkit. For more information: <https://software.intel.com/en-us/opencvino-toolkit>

System test configuration: Testing done by GE Healthcare, September 2018.

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For published case study, visit: <https://www.intel.ai/solutions/gehc/#gs.uqkdbp>

