EMPOWERING IOT DEPLOYMENT SCENARIOS

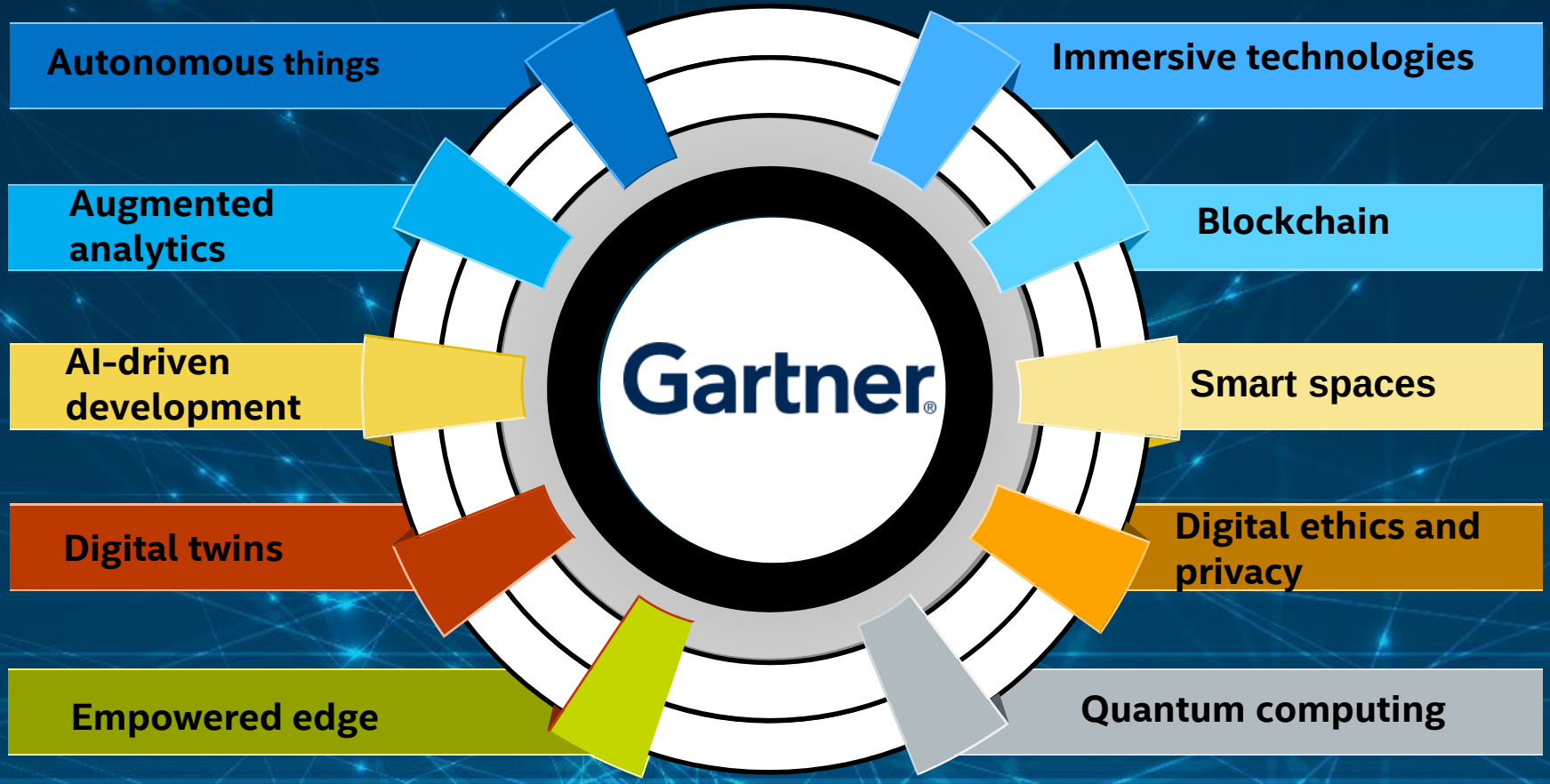
4th ITU Annual Forum on "IoT, Big Data, Smart Cities and Societies" for Arab region
Dubai, UAE, 28-29 August 2019

Eslam Kandiel, Technology Director,
Middle East, Turkey and Africa.

Intel Confidential – Do Not Forward

GARTNER TOP 10 STRATEGIC TECHNOLOGY TRENDS FOR 2019

IT IS ALL ABOUT THE DATA PROCESSING



EDGE IOT AND AI ARE MAJOR TECHNOLOGY TRENDS

https://www.gartner.com/smarterwithgartner/gartner-top-10-strategic-technology-trends-for-2019/

IOT IS AT THE CENTER OF OUR CHANGING WORLD

200% growth of information-based products & services by 2020 compared with traditional products & services[1]

79.4 Zettabytes (ZB) of data in 2025 generated by 41.6 billion connected IoT devices or things[2]

62% of developers deem IoT 'very important' to digital strategies[1]

>55% percentage of all data forecast to be generated by IoT in 2025[3]

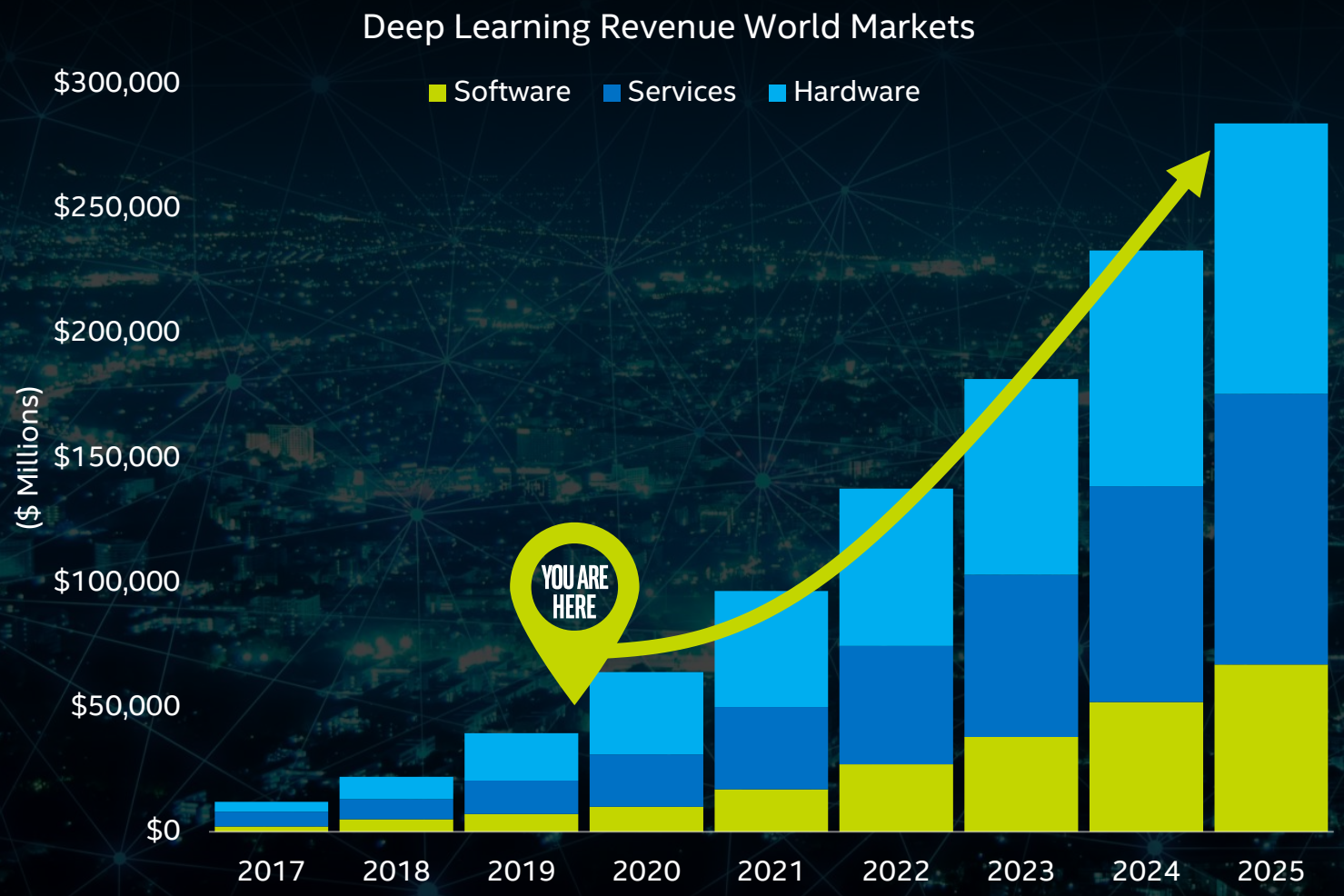
50% of data will created and processed outside the data center or cloud by 2022[4]

43% share of AI tasks taking place on edge devices (vs. cloud) in 2023[5]

>$300B annual B2B IoT revenue[6]

1. IDC Worldwide Digital Transformation Predictions, November 2015, (link); 2. IDC Forecast, June 2019, (link); 3. DataAge 2025, November 2018, (link); 4. Gartner, December 2018 (link); 5. ABI Research, May 2018 (link); 6. Forbes, December 10, 2017 (link)

THE AI COMPUTING ERA OFFERS GROWING OPPORTUNITY



AI to create

$13 TRILLION

additional economic activity by 2030[1]

Machines to impact jobs—in a good way

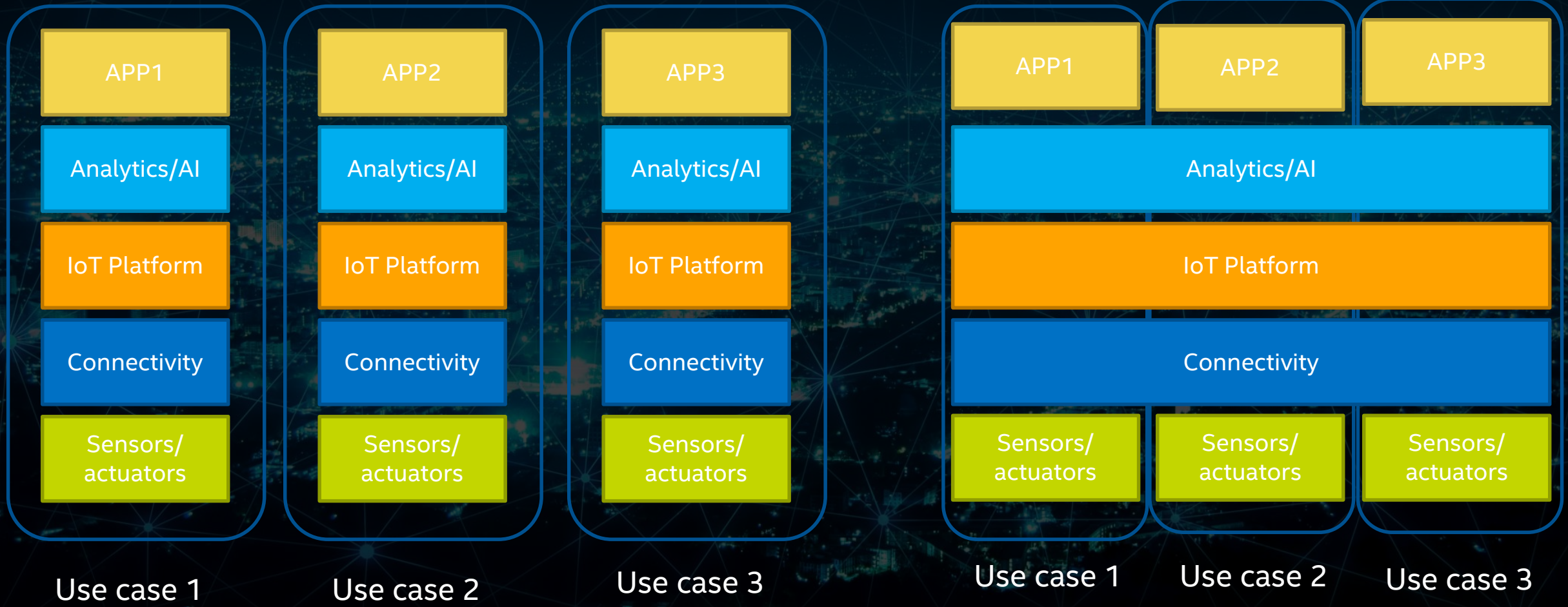
58M NEW JOBS

by 2022[2]

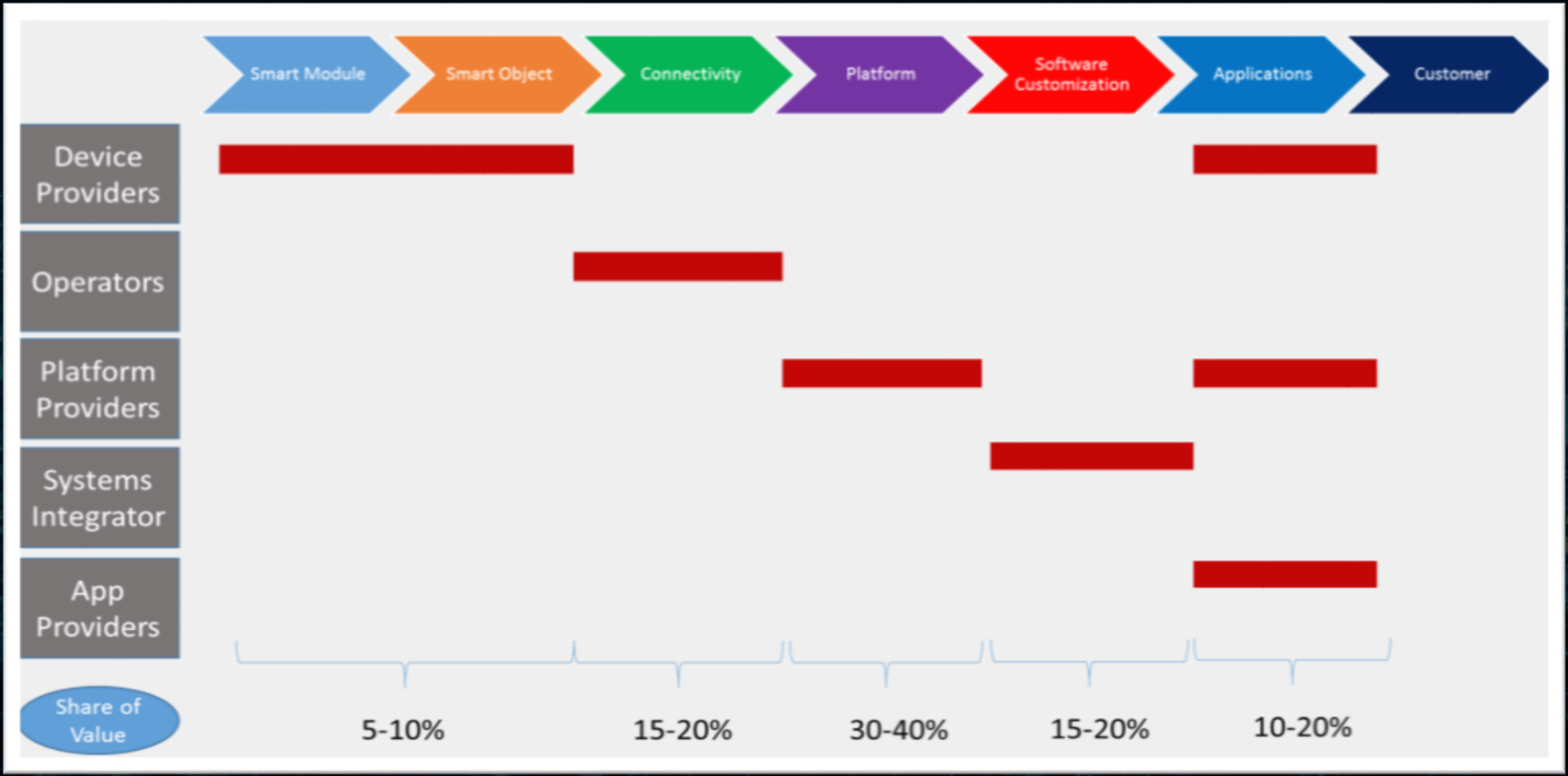
Chart Source: Source: Tractica

1. https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-AI-frontier-modeling-the-impact-of-ai-on-the-world-economy
2. https://www.forbes.com/sites/amitchowdhry/2018/09/18/artificial-intelligence-to-create-58-million-new-jobs-by-2022-says-report/#710234644d4b

VERTICAL VS HORIZONTAL DEPLOYMENT OPTIONS



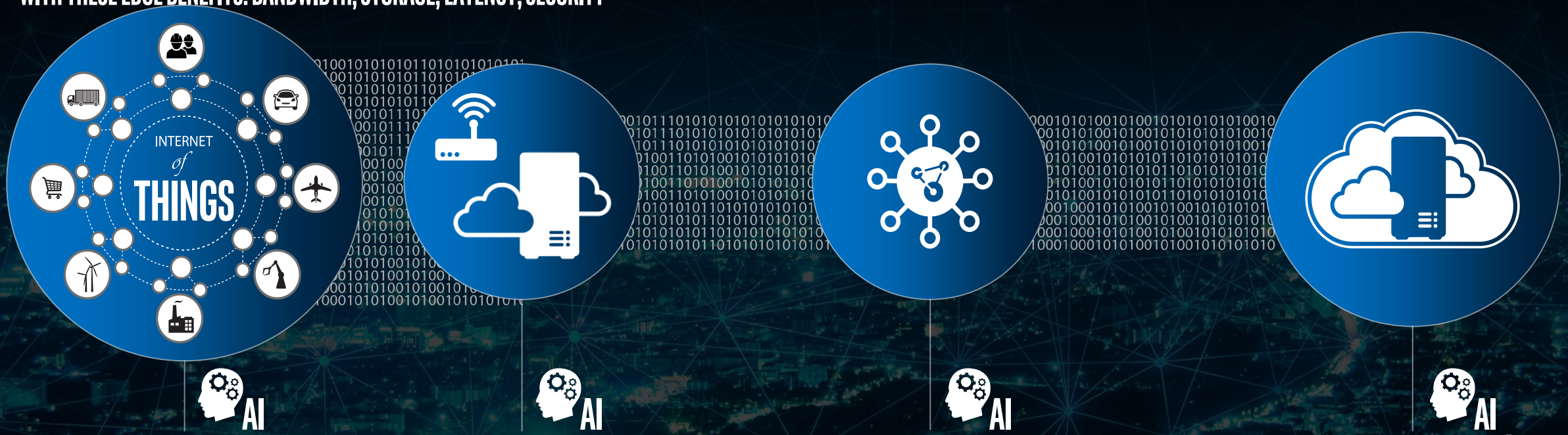
VALUE CHAIN IMPACTS THE DEPLOYMENT OPTIONS



http://www.telecomcircle.com/2016/05/internet-of-things-business-models/

INTEL OFFERS DISTRIBUTED AI COMPUTE FROM DEVICE TO CLOUD

WITH THESE EDGE BENEFITS: BANDWIDTH, STORAGE, LATENCY, SECURITY



45% of data will be stored, analyzed, and acted on at the edge by 2019[1]

43% share of AI tasks taking place on edge devices (vs. cloud) in 2023[2]

15X growth in devices with edge AI capabilities by 2023[2]

1. Source: IDC FutureScape: Worldwide Internet of Things 2017 Predictions; 2. ABI Research

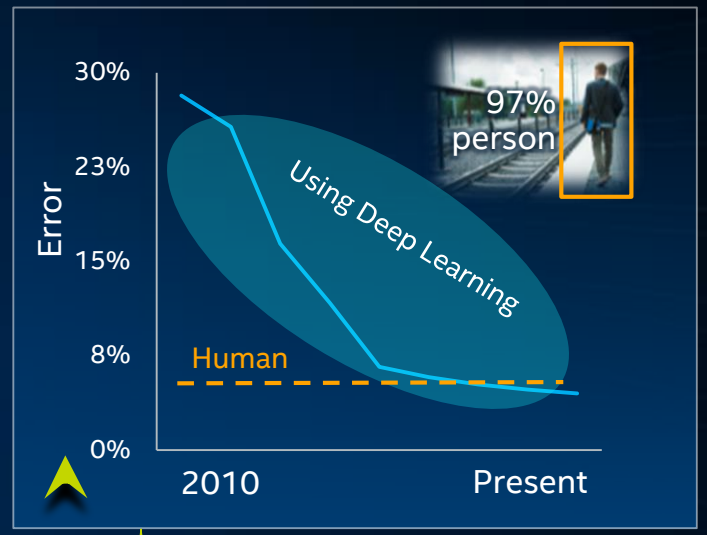
VISION AND AI AT THE EDGE BECOMING VIABLE

TRADITIONAL ANALYTICS

Vision algorithms were only 60% accurate;
Not good enough for commercial deployment

Development took too long,
and was too use-case specific

NOW WITH DEEP LEARNING

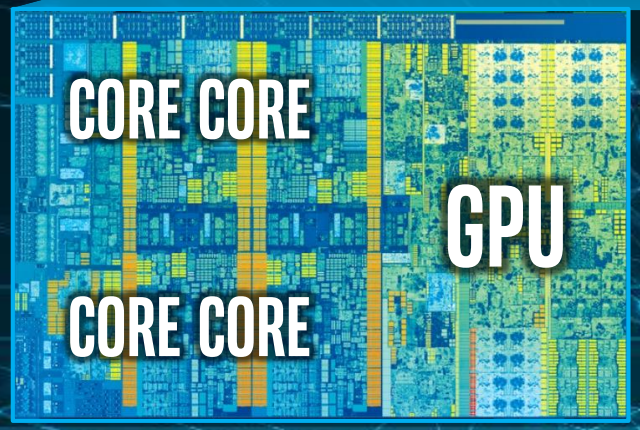


Heuristic Algorithms → AI / Deep Learning
Human Engineered → Real-time, Higher Accuracy
Server Based → Edge Based

BREADTH OF INTEL PRODUCTS
UNLEASHING AI AT THE EDGE

OpenVINO™ VISUAL INFERENCE & NEURAL NETWORK OPTIMIZATION

MAXIMIZE PERFORMANCE • DEPLOY TO CPU, GPU, FPGA & VPU ACCELERATORS • LEVERAGE COMMON ALGORITHMS



+

VPU

intel MOVIDIUS inside

FPGA

intel ARRIA 10 inside

INTEL COMPUTE

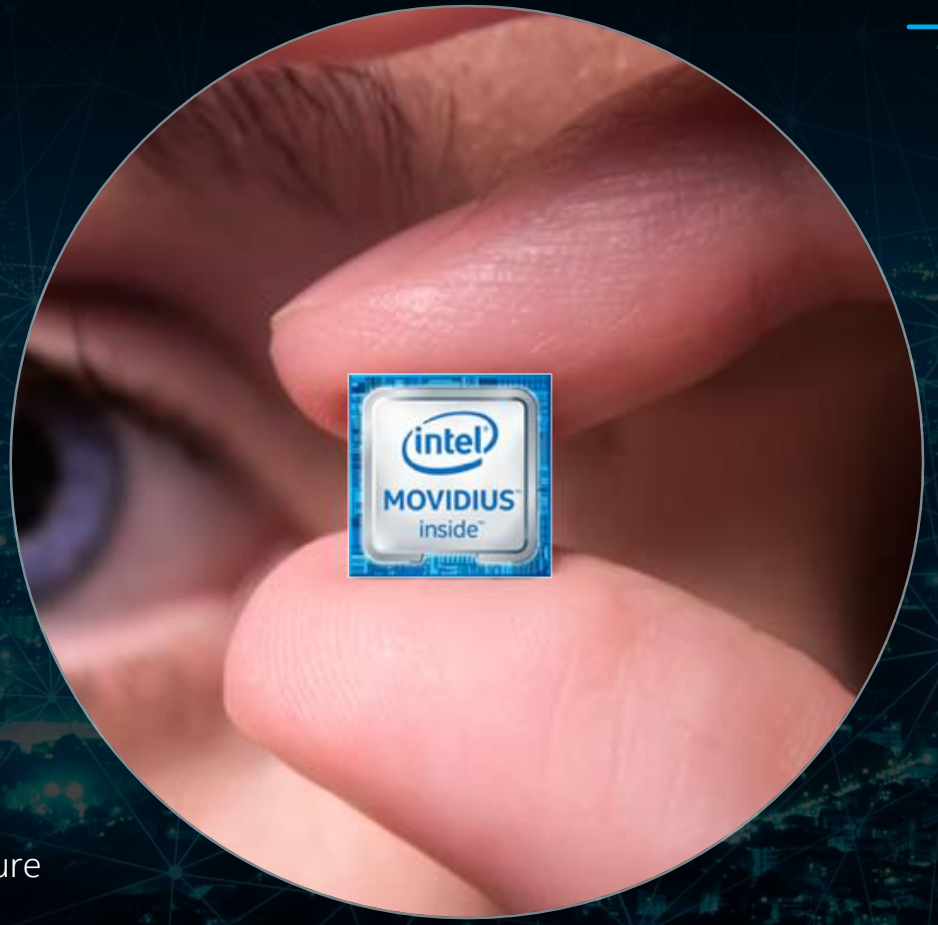
INTEL VISION ACCELERATORS

INTEL® MOVIDIUS™ VISION PROCESSING UNIT (VPU)

SERVICE ROBOTS
- Navigation
- 3D Vol. mapping
- Multimodal sensing

SURVEILLANCE
- Detection/classification
- Identification
- Multi-nodal systems
- Multimodal sensing
- Video, image capture

WEARABLES
- Detection, tracking
- Recognition
- Video, image, session capture



DRONES
- Sense and avoid
- GPS denied hovering
- Pixel labeling
- Video, image capture

AR-VR HMD
- 6DOF pose, position, mapping
- Gaze, eye tracking
- Gesture tracking, recognition
- See-through camera

SMART HOME
- Detection, tracking
- Perimeter, presence monitoring
- Recognition, classification
- Multi-nodal systems
- Multimodal sensing
- Video, image capture

POWER-EFFICIENT IMAGE PROCESSING, COMPUTER VISION & DEEP LEARNING FOR DEVICES

All products, computer systems, dates, and figures are preliminary based on current expectations, and are subject to change without notice.

INTEL® VISION SUPPORTS AI ACROSS ENDPOINT, EDGE, CLOUD

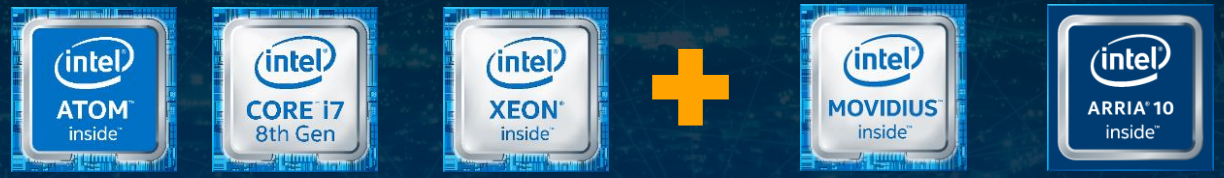
END POINT
IOT SENSORS

Vision & Inference

Low Latency, Privacy

EDGE
GATEWAYS

Intel® Vision Accelerators



Basic Inference, Media & Vision

NVR's Up to 36Ch

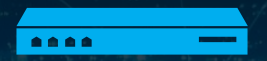
Video Storage, Analytics, DL Servers

High-end NVRs

Best Efficiency, Lowest Power Mid/Small Memory Footprint

High Perf, Large/Mid Memory Custom/New HW Architecture

DATA CENTER
SERVERS & APPLIANCES



NNP-L / NNP-I Most Intensive Use Cases

Most Use Cases

Flexible & Memory Bandwidth-Bound Use Cases

OpenVINO™ Toolkit
Deploy across Intel® CPU, GPU, VPU, FPGA; Leverage common algorithms

OPENVINO TOOLKIT BRINGS FLEXIBILITY TO THE EDGE

USING THE INTEL® DISTRIBUTION OF OPENVINO™ TOOLKIT ADVANCED CAPABILITIES TO STREAMLINE DEEP LEARNING DEPLOYMENT

1. BUILD

Models and Frameworks

- Intel-optimized models
- Customer models
- Open source models

ONNX
Caffe
mxnet
TensorFlow
KALDI

Traditional Computer Vision Tools

2. OPTIMIZE

Developer Tools

OpenVX*
Samples
OpenCV*

Model Optimizer
Convert and optimize

IR file

or

Open Model Zoo
(30+ pre-trained models)
existing IR files

IR file

IR file = Intermediate Representation file

3. DEPLOY

Deployment Environment
(Target Platform)

Intel® Media SDK open source version

OpenCL™ Drivers and Runtimes

Inference Engine

- CPU Plugin* — Extend via C++
- GPU Plugin** — Extend via OpenCL™
- GNA Plugin
- Myriad Plugin — NCS & NCS2
- HDDL Plugin — Intel® Vision Accelerator Design (VAD) Products
- FGPA Plugin

FPGA RunTime Environment
(from Intel® FPGA SDK for OpenCL™)

Bitstreams

Some deep learning functions support CPU or CPU/GPU only

OpenVINO™

- AI in Production Solutions
- Intel/Partner Developer Kits

IT TAKES AN ECOSYSTEM

INTEL® AI: IN PRODUCTION

DEVELOP

TRAINING & WORKSHOPS

FUNCTION-AS-A-SERVICE CODE SAMPLES

INTEL® IOT MARKET READY SOLUTIONS & INTEL® IOT RFP READY KITS OFFER CO-CREATION

INTEL® VISION ACCELERATOR DESIGN PRODUCTS

INTEL® DISTRIBUTION OF OPENVINO™ TOOLKIT

INTEL® NEURAL COMPUTE STICK 2

SCALE

INTEL® IOT MARKET READY SOLUTIONS FOR AI

INTEL® IOT RFP READY KITS FOR AI

INTEL® IOT SOLUTIONS ALLIANCE

INTEL® IOT SOLUTIONS ALLIANCE VIDEO SPECIALIST

INDUSTRY EVENT PARTICIPATION

PARTNER & SOLUTION MATCHMAKING

LAUNCH PARTNER, SOLUTION BRIEF, LOGO SHOWCASE

AAEON, ADLINK, ADVANTECH, AGENT, AllGoVision, Arrow, axxonsoft, camio, 云从科技 CLOUDWALK, alhua, deepomatic, DT42, GeoVision, Getac, Gorilla, Hewlett Packard Enterprise, HIKVISION, iEi, inNODE, iOmniScient, JWIPC, KAGA ELECTRONICS CO.,LTD., KLAS TELECOM, Matroid, Mindtree, Mobiliya, ncs, NEXCOM, outdu, uniview, uzei, SYNNEX, Touch Cloud, tinyGO, Uncanny Vision, VIDEONETICS, wpg

INTEL® NEURAL COMPUTE STICK 2
AI IN ACTION

Machine Learning and Mammography
Detecting invasive ductal carcinoma with convolutional neural networks showing how existing deep learning technologies can be utilized to train artificial intelligence (AI) to be able to detect invasive ductal carcinoma (IDC)[1] (breast cancer) in unlabeled histology images.

AI Assists with Skin Cancer Screening
Doctor Hazel, a skin cancer screening service powered by AI that operates in real time, relies on an extensive library of images to distinguish between skin cancer and benign lesions, making it easier for people to seek professional medical advice.

AI Helps Detect Bacteria in Water
Offline analysis is accomplished with a digital microscope connected to a laptop running Ubuntu* and the Intel® Movidius™ Neural Compute Stick. After analysis, contamination sites are marked on a map in real time

Shark Detection to Save Lives
Intel® Movidius™ Neural Compute Stick was used with Australia's Little Ripper Lifesaver UAV to monitor the New South Wales coastline for sharks.

CORaiL: Coral Reef Restoration and Research
Prototype a fully functional modular AI-powered underwater camera unit that continuously counts the number of visible fauna, and, as possible, assign a taxonomy to help protect endangered coral reefs.

AI has the power to make a difference and change lives. What will you make?
Get Started Today ▸ intel.com/ncs

FOR EXTERNAL USE

intel
experience
what's inside™