

# AN EDGE FRAMEWORK FOR FACIAL RECOGNITION

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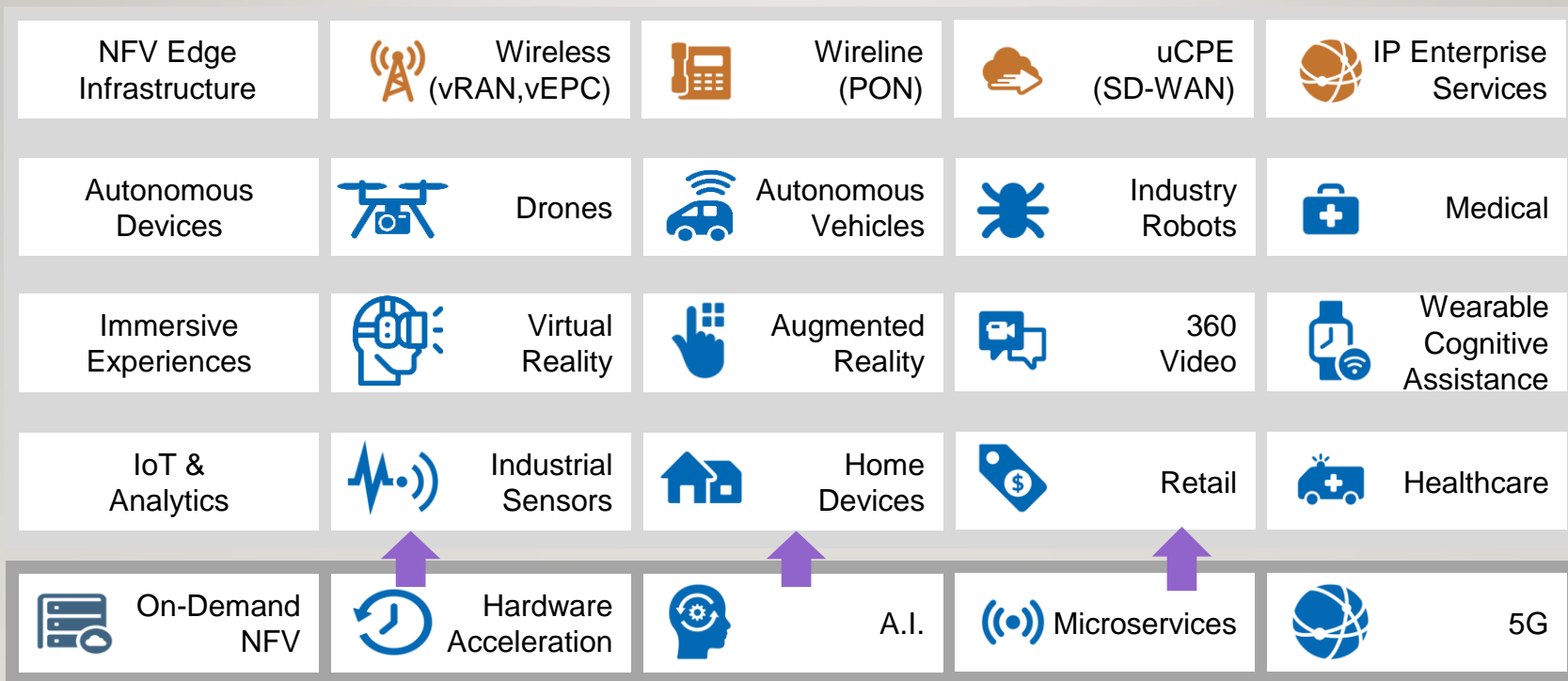
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INTEL

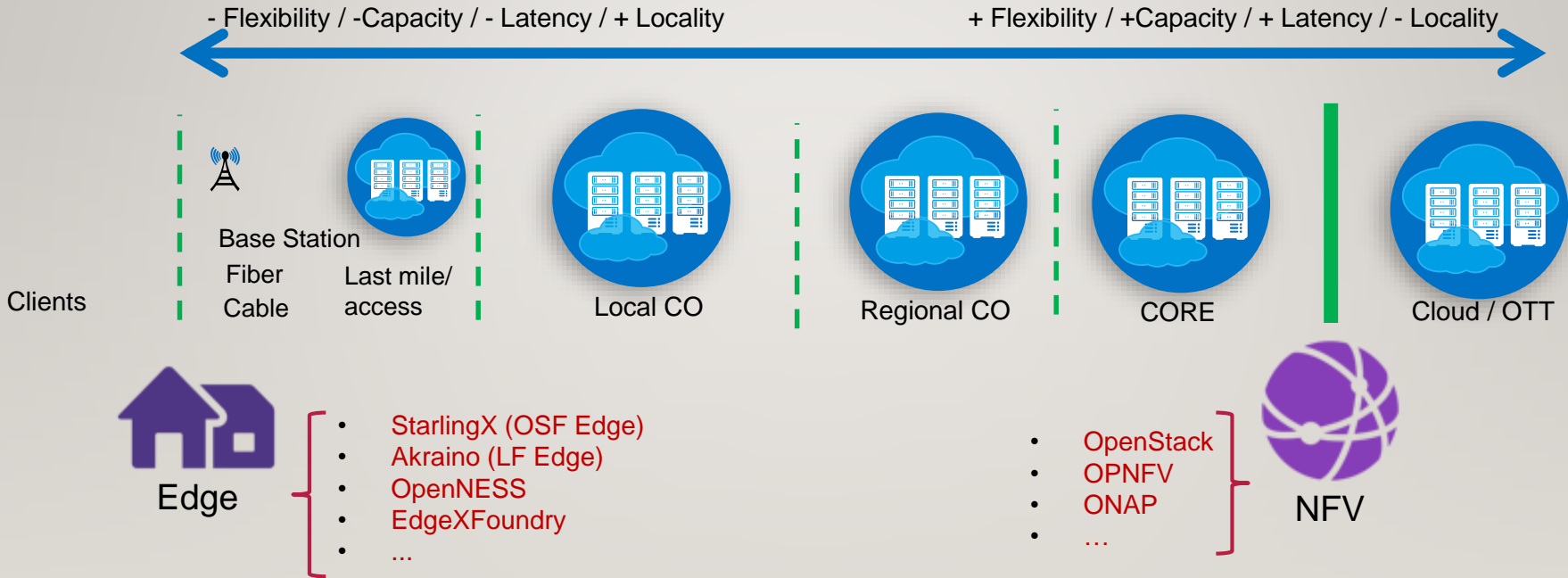
# AGENDA

- Why and what is Edge Computing
- One Use Scenario
- Framework for Cloud Stack and Edge Stack
- Summary

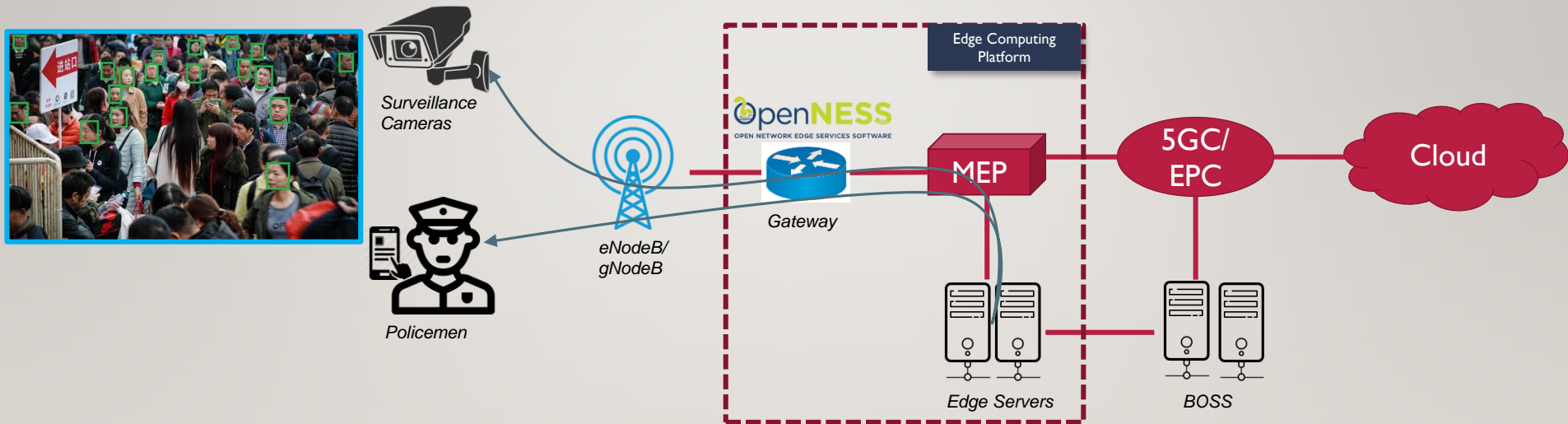
# EDGE COMPUTING



# FROM CLOUD TO EDGE



# ONE USE SCENARIO



- Leveraging 5G Core network, the system separates and forwards surveillance data to edge computing platform, and then adopt AI technology for facial recognition and ID confirmation, after training personal data on the cloud.
- The solution on edge and 5G could adopt at the spots like airports, railway stations, ferries, tourist attractions, etc. for public safety, rescue, onsite checking and commanding, people density warning, etc., and reduce staff workloads.

# CLOUD STACK: OPENSTACK AND KUBERNETES

Edge Stack

## APPLICATIONS AND SERVICES

Facial Recognition

Smart City

Smart Transportation

Intelligent Community

Automated Industry

### DEEP LEARNING (INFERENCE)

**OpenVINO™** †

Open Visual Inference & Neural Network Optimization toolkit for inference deployment on CPU/GPU/FPGA for TensorFlow\*, Caffe\* & MXNet\*

**Intel® Movidius™ SDK**

Optimized inference deployment on Intel VPUs for TensorFlow\* & Caffe\*

### REASONING

**Intel® Saffron™ AI**

Cognitive solutions on CPU for anti-money laundering, predictive maintenance, more

### DEEP LEARNING

**Intel® Deep Learning Studio†**

Open-source tool to compress deep learning development cycle

VM CONTAINER

### CLOUD SOFTWARE

OpenStack Kubernetes



openstack. kubernetes

### VIRTUALIZATION/CONTAINER RUN TIME

KVM Docker



### OPERATING SYSTEM

Linux



### IA BASED PLATFORM

Server Silicon Network Silicon Storage Silicon

### MACHINE LEARNING LIBRARIES

**Python R Distributed**

- Scikit-learn
- Pandas
- NumPy
- Cart
- RandomF
- orest
- e1071
- MLlib (on Spark)
- Mahout

### DEEP LEARNING FRAMEWORKS

Now optimized for CPU

Optimizing



TensorFlow\* MXNet\* Caffe\* BigDL (Spark)\* Caffe2\* PyTorch\* CNTK\* PaddlePaddle\*

### ANALYTICS, MACHINE & DEEP LEARNING PRIMITIVES

**Python**

Intel distribution optimized for machine learning

**DAAL**

Intel® Data Analytics Acceleration Library (incl machine learning)

**MKL-DNN**

Open-source deep neural network functions for CPU / integrated graphics

**clDNN**

### DEEP LEARNING GRAPH COMPILER

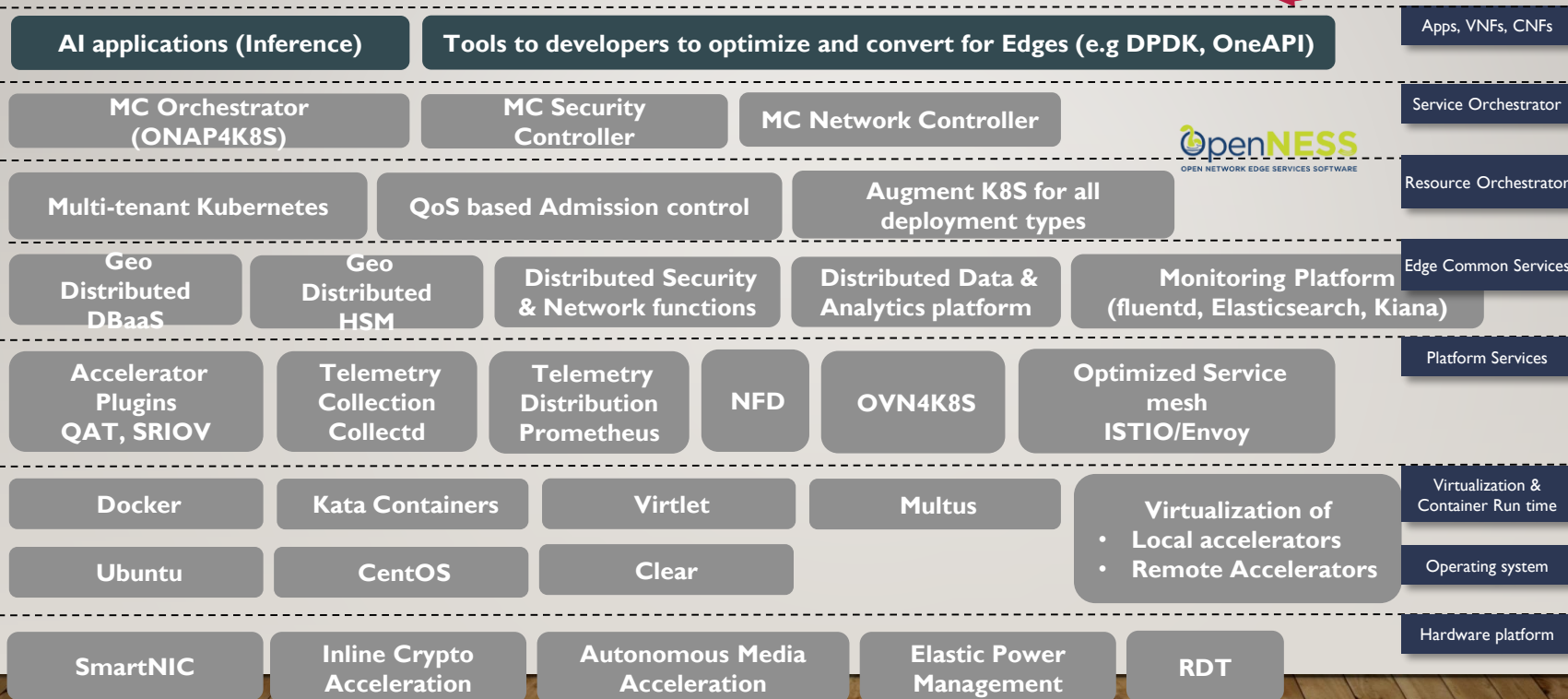
**Intel® nGraph™ Compiler**

Open-sourced compiler for deep learning model computations optimized for multiple devices from multiple frameworks



# EDGE STACK: INTEGRATED CLOUD NATIVE

Cloud Stack



# SUMMARY

- Edge computing will widely adopted for many new use scenarios, such as facial recognition, autonomous vehicles etc. as AI is adopted and 5G emerges.
- We propose an edge framework with the edge stack running on Integrated Cloud Native (ICN) and OpenNESS, and the cloud stack running on OpenStack or Kubernetes, where AI workloads run in VMs and containers.
- Edge and AI workloads are fully optimized on Intel platforms with acceleration technologies, e.g., SR-IOV, TSN, DPDK, GPU, FPGA and others.



# Thanks for Listening



# BACKUP

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# OPENVINO TOOLKIT

Cross-Platform Tool to Accelerate Computer Vision & Deep Learning Inference Performance

