Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)

VEL TECH
TECHNOLOGY INCUBATOR

Two Days Hands on Training

Computer Vision at the Edge with Jetson Nano

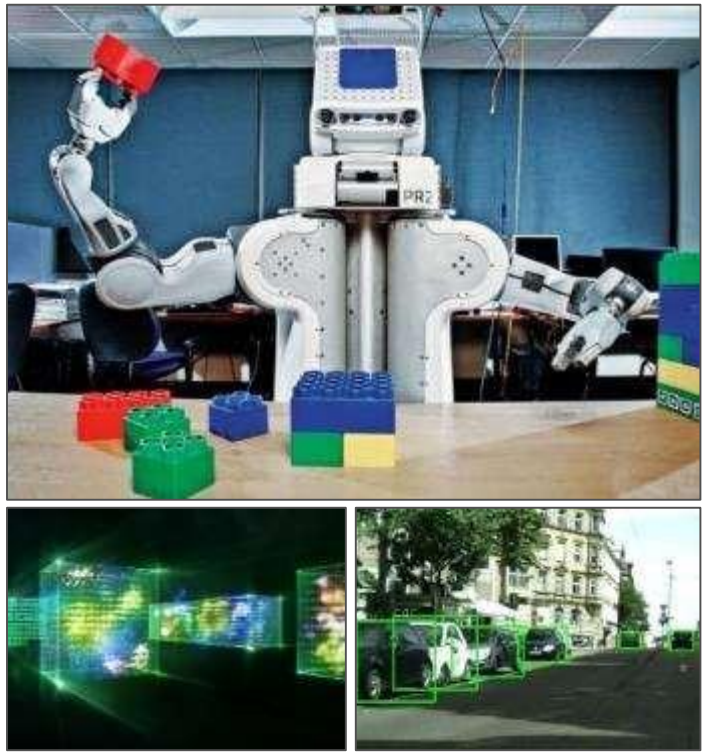
5th & 6th of Nov 2020 from 4.00 PM till 6.00 PM

Arun Pandian J

NVIDIA: THE AI COMPUTING COMPANY

GPU Computing

Visual Computing



Artificial Intelligence

AMAZING ACHIEVEMENTS IN AI

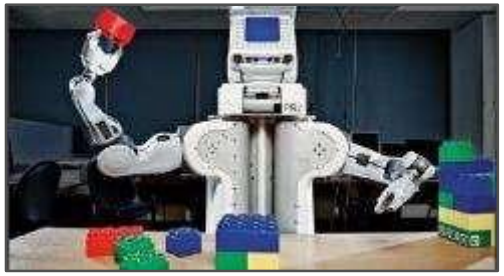
Play Go

Play Doom

Learn Paint Style

Synthesize Voice

Write Captions

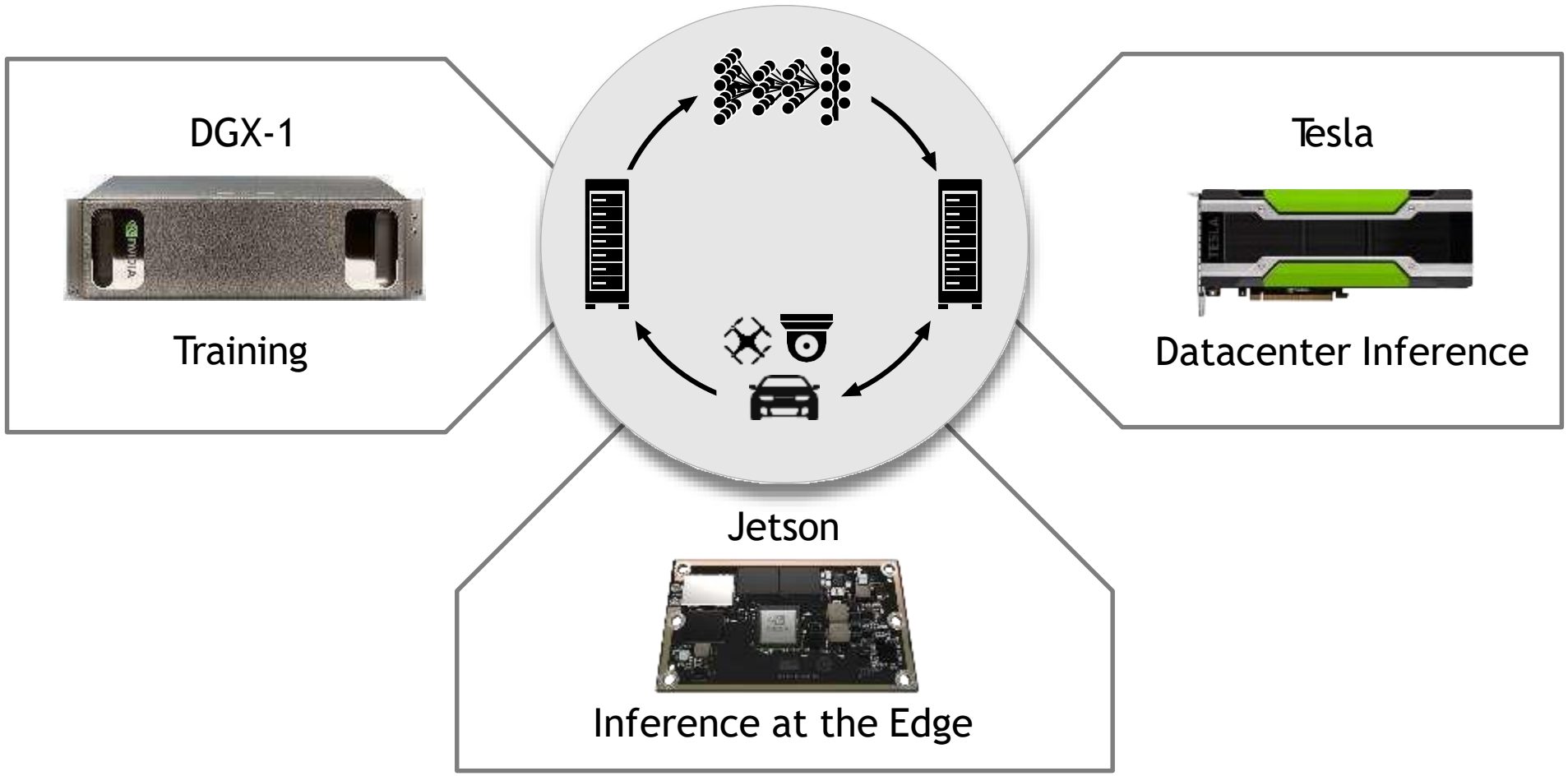


Learn Motor Skills

Learn to Walk

Drive

GPU DEEP LEARNING IS A NEW COMPUTING MODEL



WHY AI AT THE EDGE MATTERS

Bandwidth

1 billion cameras WW (2020)

30B Inference/Second

Latency

30 images per second

200ms latency

Availability

50% of world at less than 8mbps

Only 73% 3G/4G availability WW

"Billions of intelligent devices will take advantage of DNNs to provide personalization and localization as GPUs become faster and faster over the next several years." – Tractica

AI: THE NEW INDUSTRIAL REVOLUTION

Mining

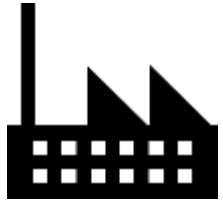
Equipment automation

Operational safety

Logistics

Autopilot/self-driving trucks

Robot/drone delivery and support



Intelligent Factory

Pick and place

Complex/custom tasks

Visual inspection

Task consolidation

Dynamic reconfiguration

Collaborative robotics

Efficiency optimization

Factory simulation

Intelligent Warehouse

Inventory management

Bin picking

Pallet movement

Smart Operations

Infrastructure inspection

Predictive maintenance

Physical security

SMART FACTORY EXAMPLE

Challenge

AOI
- Autonomous Optical Inspection

Operational efficiency
- Energy efficiency
- Improved Uptime
- Predictive Maintenance
- Make one of many
- Make many of one
- Picking-placing
- Screwing/fastening/riveting

Man-Machine Co-existence
- Collaborative Human-Robot

Traceability

Solution

- Inspection/Quality assurance
- DL-Picking and placing
- Cobot applications (Deep Learning)
- Big Data analytics
- Real time analysis of data from sensors

AI FOR INDUSTRIAL AND COMMERCIAL UAVS

Logistics

Warehouse automation

Package delivery

Inspection

Wind turbines

Bridges

Oil rigs

Pipelines

High-voltage power lines

Cell towers

Precision Agriculture

Planting

Spraying

Emergency Response

First Responder

Search and Rescue

Security

Enterprise security

Ad hoc security systems

AERIALTRONICS
REMOTELY PILOTED AIRCRAFT SYSTEMS

Problem

Aerial inspection is

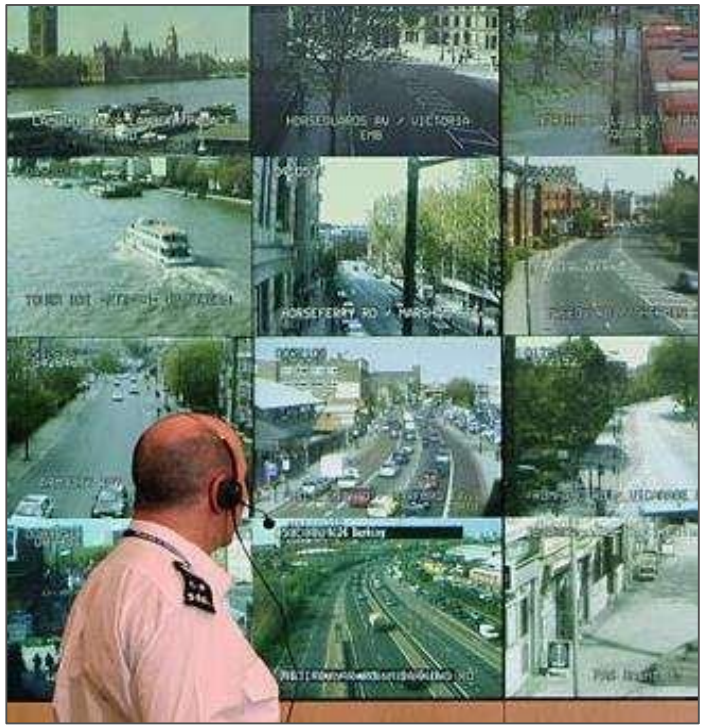
- Imprecise: often needs multiple flights
- Time consuming: manual review of footage
- Dangerous: drone crashes into subject or operator

Solution

Automate the process

- Vision-enabled navigation
- On-board verification
- On-board fault classification

AI CITY — 1B CAMERAS BY 2020



~1 billion cameras worldwide by 2020

⇒ 30 billion inferences/sec

Tesla P40: 2,500 inferences/sec @ 720P

⇒ AI City needs ~10M P40 servers

DATA: 1B cameras, IHS "Video Surveillance Intelligence Service, Aug. 2016"

END TO END SOLUTION
ONE ARCHITECTURE FOR ALL

EDGE COMPUTING

JETSON

HYPERSCALE HPC

TESLA

VISUALIZATION

QUADRO

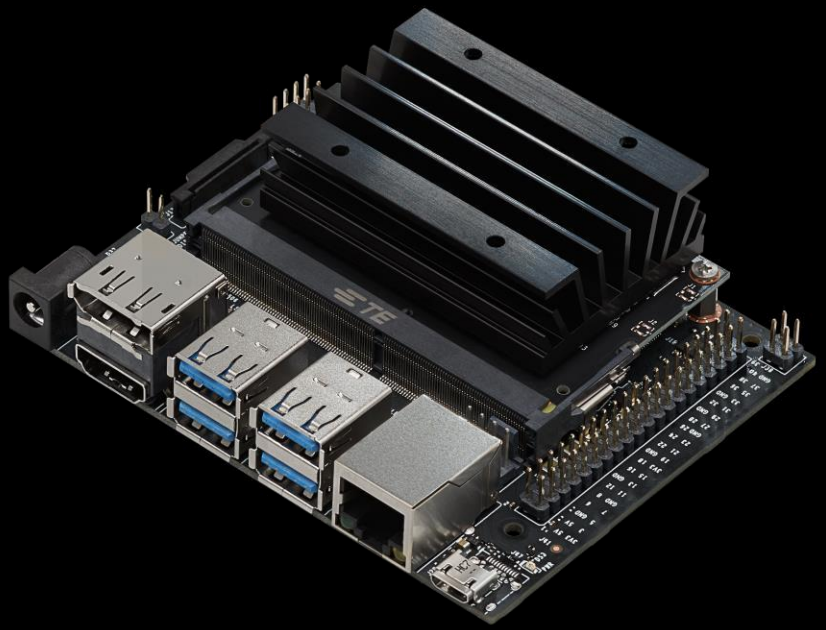
RESEARCHERS/ EARLY ADOPTERS

DGX-1

JETSON NANO DEVELOPER KIT

128 CUDA Cores
4 Core CPU

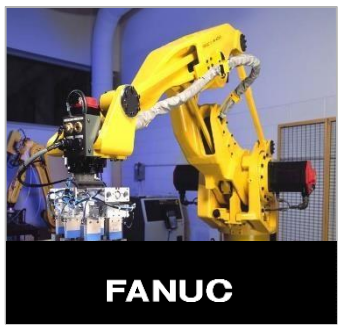
472 GFLOPs
5W
10W

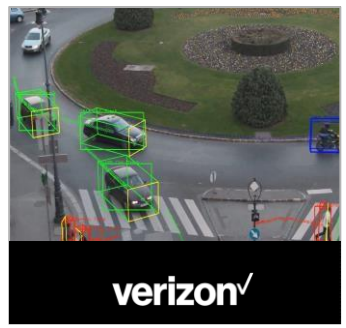


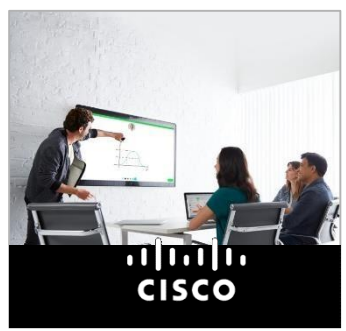
Available now at GTC
nvidia.com and distributors worldwide

Also: Jetson AGX Xavier $899
Jetson TX2 $299

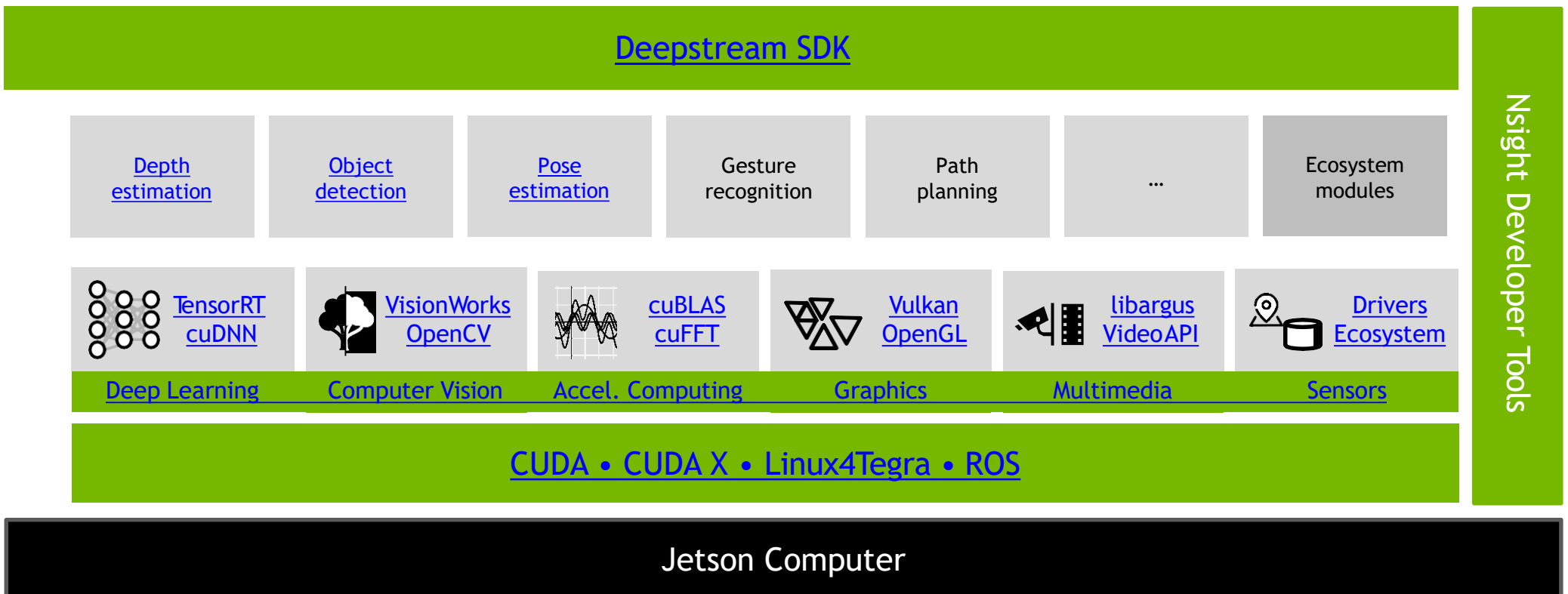
JETSON POWERS AI ACROSS INDUSTRIES







JETSON NANO SOFTWARE



developer.nvidia.com/jetson

CONTINUOUS SOFTWARE INVESTMENT

Jetpack 2.1/2.2
Jetson TX1
CUDA 7.0
cuDNN 4.0
Ubuntu 14.04
Kernel 3.10

Jetpack 2.3.x
CUDA 8.0
cuDNN 5.1
TensorRT 1.0

Jetpack 3.0/3.1
+ Jetson TX2
2x inference perf
cuDNN 6.0
TensorRT 2.1
Ubuntu 16.04
Kernel 4.4

Jetpack 3.2/3.3
Deepstream 1.5
TensorFlow
CUDA 9.0
cuDNN 7.0
TensorRT 4.0

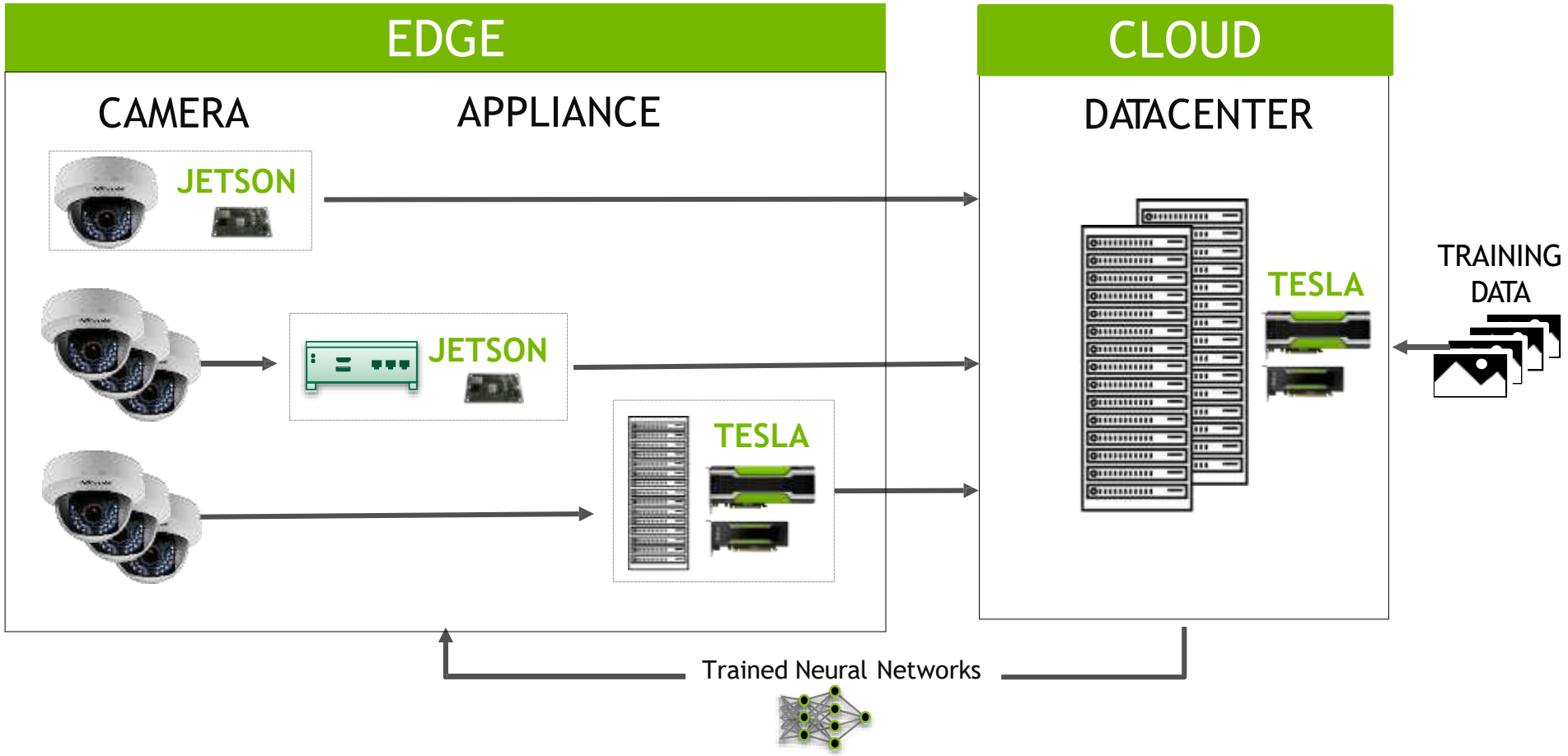
Jetpack 4.0/4.1
Deepstream 3.0
+ Jetson Xavier
CUDA 10
TensorRT 5.0
Ubuntu 18.04
Kernel 4.9

Jetpack 4.2
Deepstream 3.0
+Jetson Nano

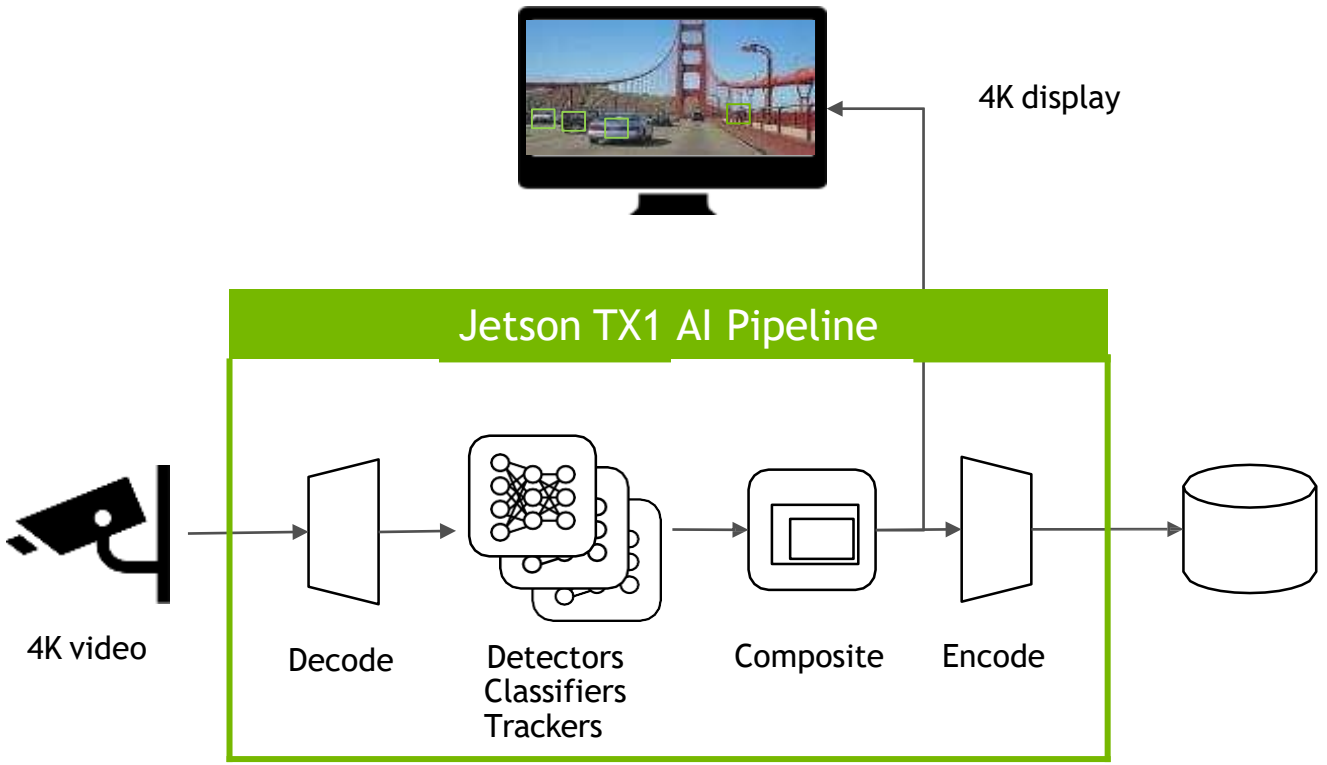



MAR 2016 | SEPT 2016 | MAR 2017 | MAR 2018 | DEC 2018 | MAR 2019

FROM CAMERA TO CLOUD



JETSON FOR AI AT THE EDGE



JETSON TX1

3 DNNs

Object tracking

4K30 video decode

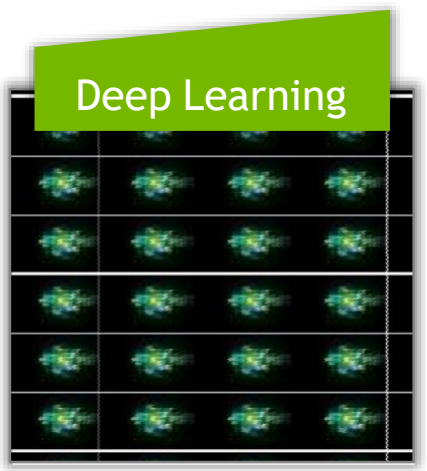
Video compositing

4K HDMI output

H.265 video encode

NVIDIA JETPACK 2.3

SDK for embedded AI computing



TensorRT
cuDNN
DIGITS Workflow

VisionWorks
OpenCV

CUDA
CUDA Libs

ISP Support
Camera Imaging
Video CODEC

Also includes ROS compatibility, OpenGL, advanced developer tools, and much more

DEEP LEARNING END-TO-END

Train

NVIDIA DGX-1: Train your model with NVIDIA DIGITS Software on DGX-1, this highest performance training solution for DNNs

Optimize

TensorRT

TensorRT: Dramatically speed up and reduce memory usage for your model on Jetson TX1

Deploy

Jetson TX1: Deploy your model to your fleet of **Jetson TX1**-enabled products. Jetson TX1 is the highest performance inference solution under 10W

RESOURCES

Jetson (corp): www.nvidia.com/object/embedded-systems.html

Jetson (dev): developer.nvidia.com/embedded-computing

Embedded Country selector: www.nvidia.com/embedded

Jetpack (under develop/tools): https://developer.nvidia.com/embedded/develop/tools

Jetpack is a one click installer that will perform BSP installation, plus all relevant SDK (CUDA, cuDNN, TensorRT, VisionWorks)

Success Stories: developer.nvidia.com/embedded/learn/success-stories

Partners and Ecosystem: developer.nvidia.com/embedded/community

Deep Learning Institute: www.nvidia.com/object/deep-learning-institute.html

Two Days To A Demo: developer.nvidia.com/embedded/twodaystoademo

Inception Program: www.nvidia.com/inception