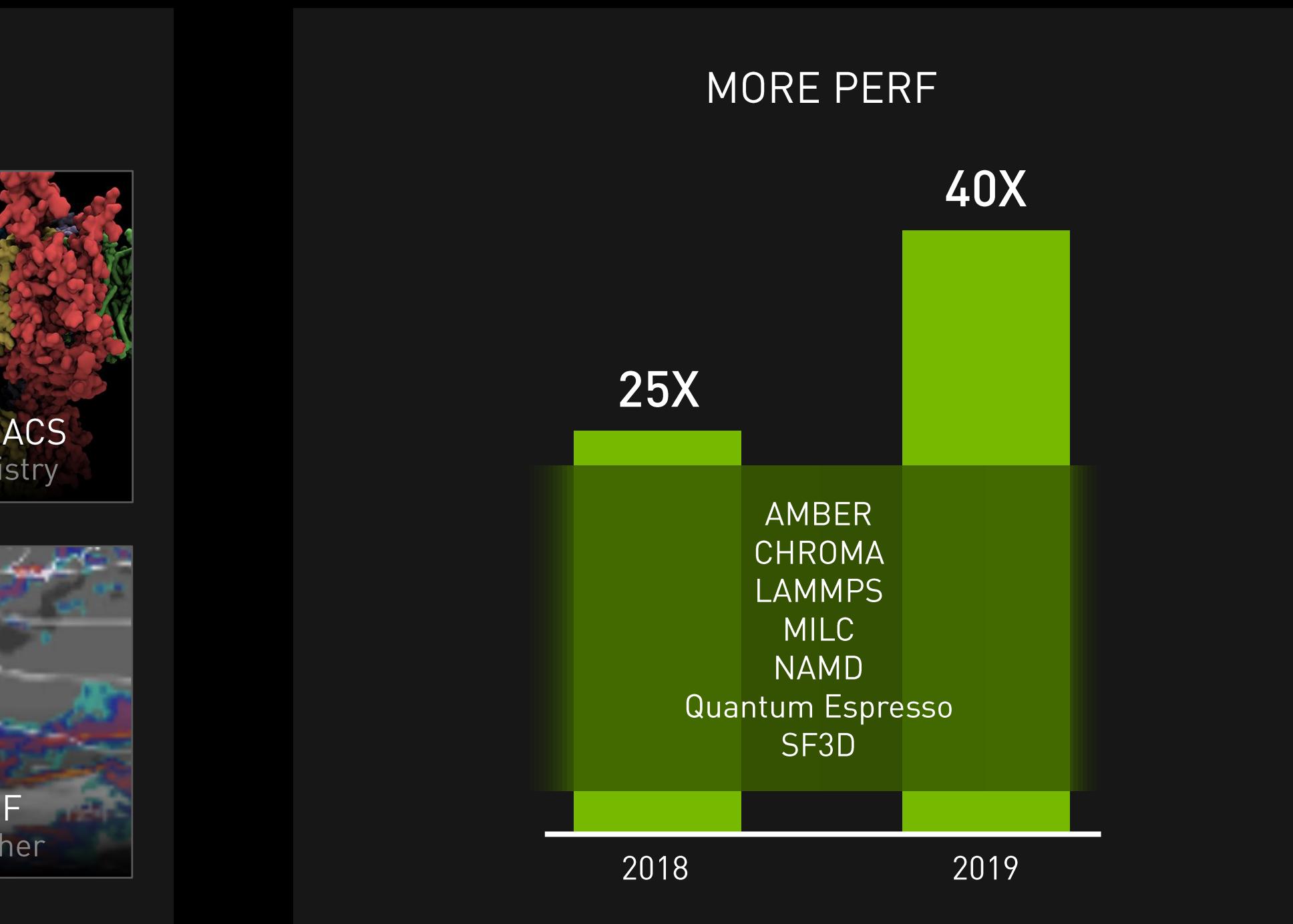
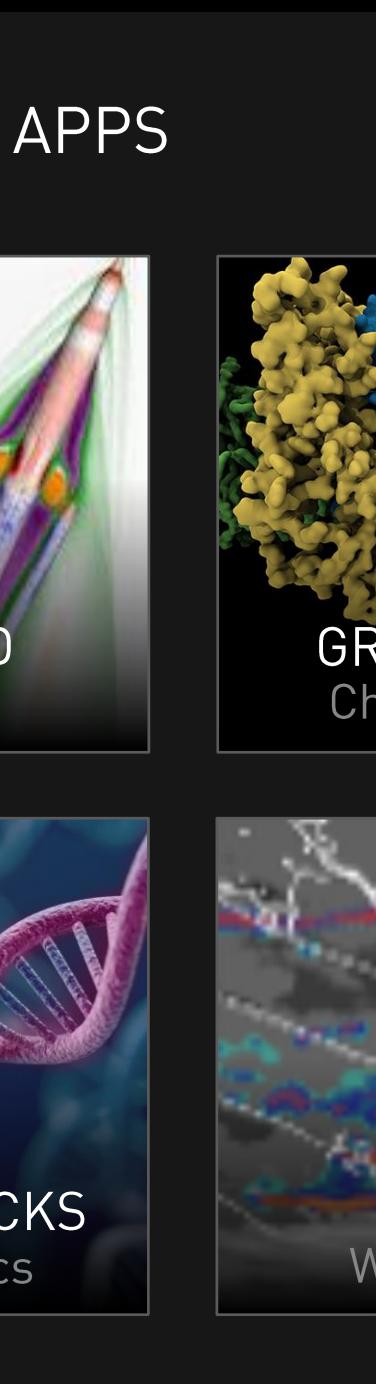
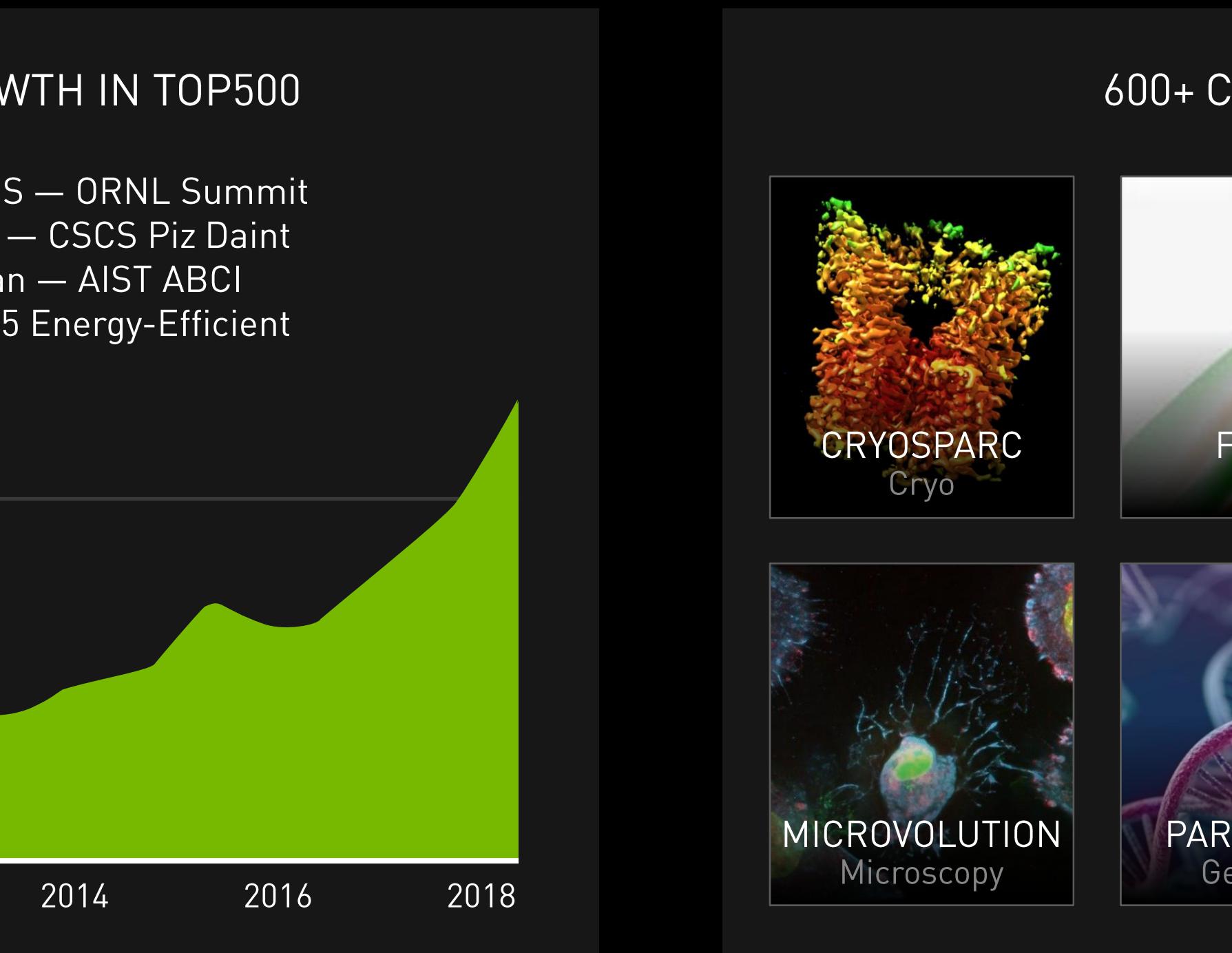
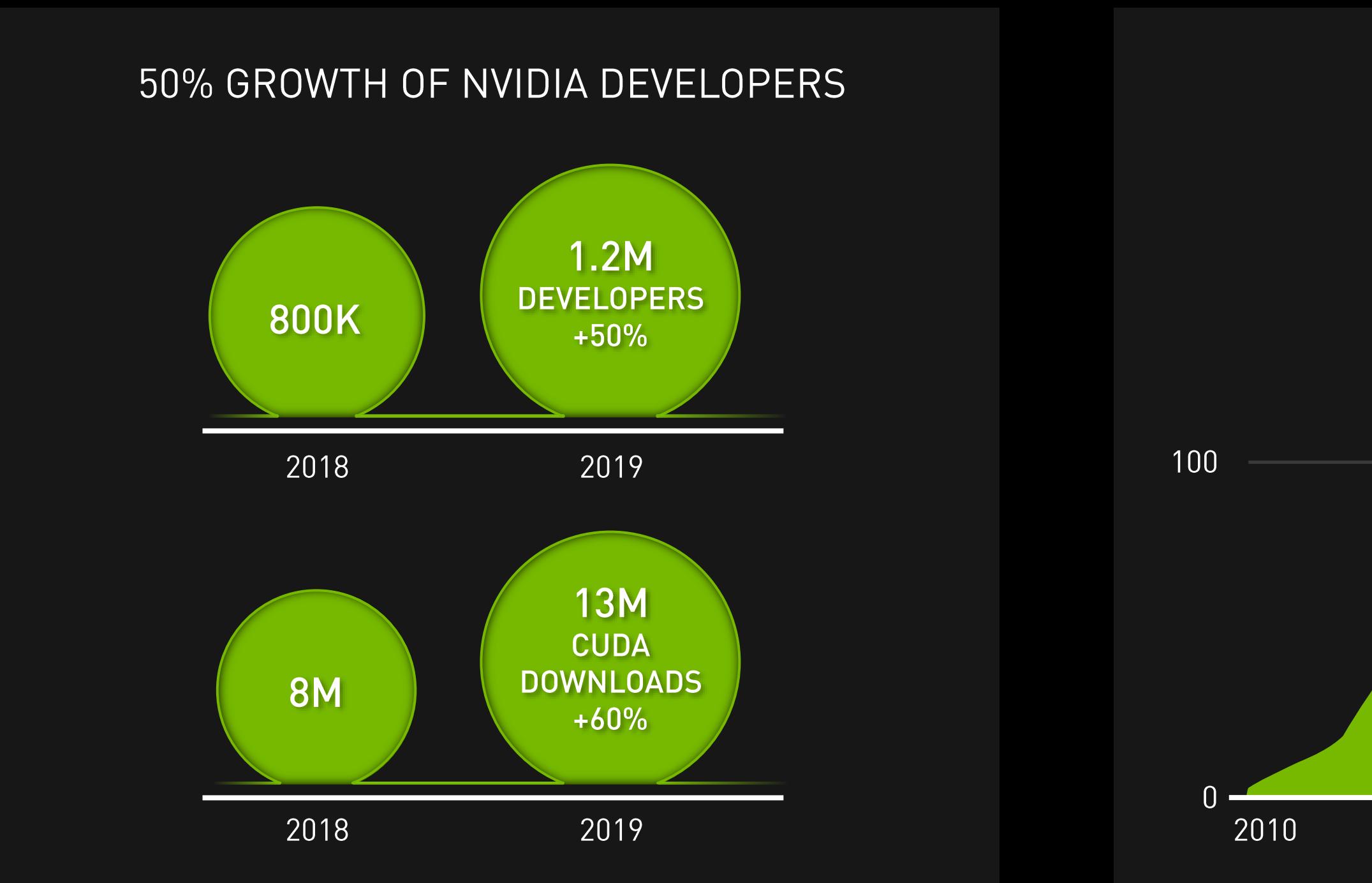
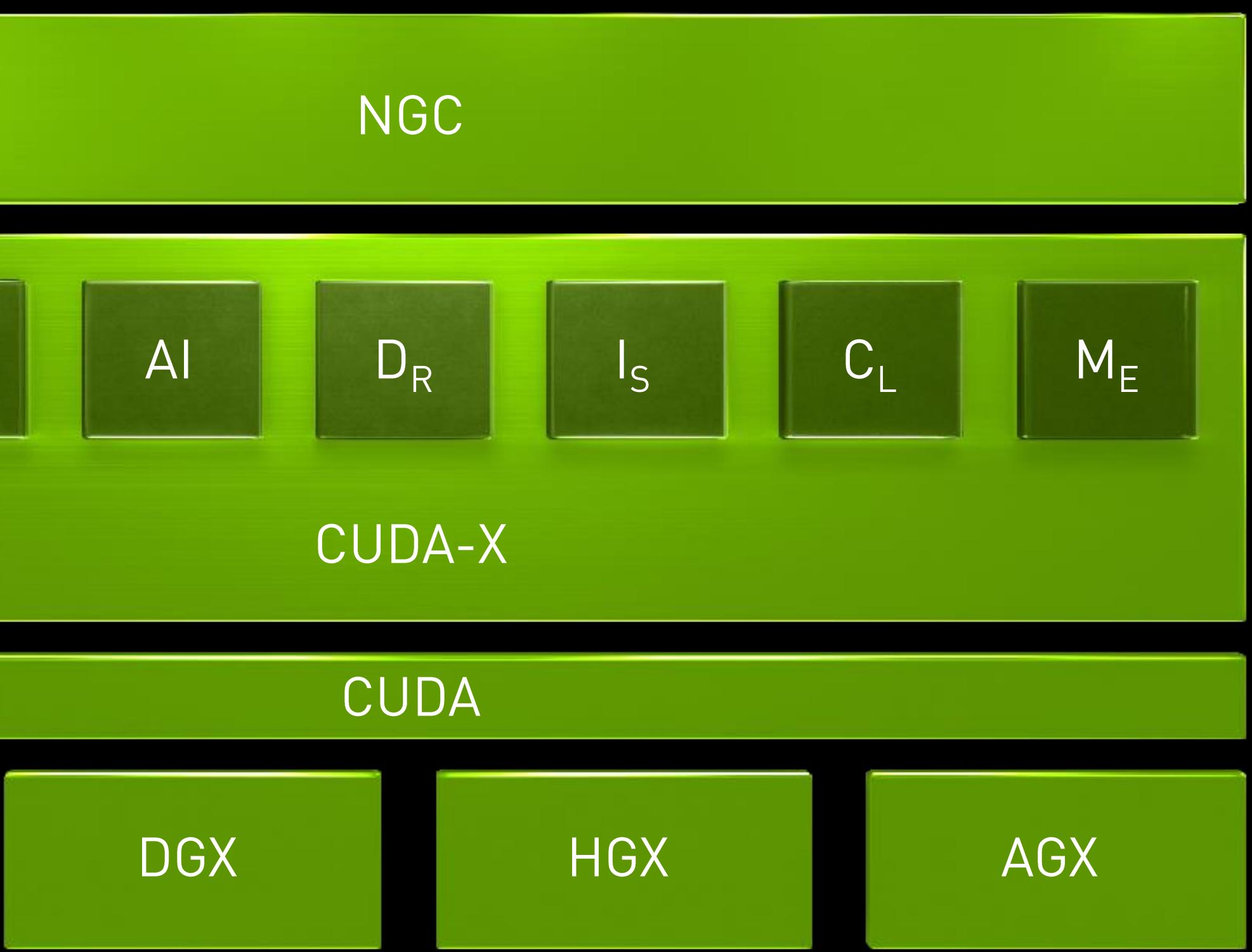




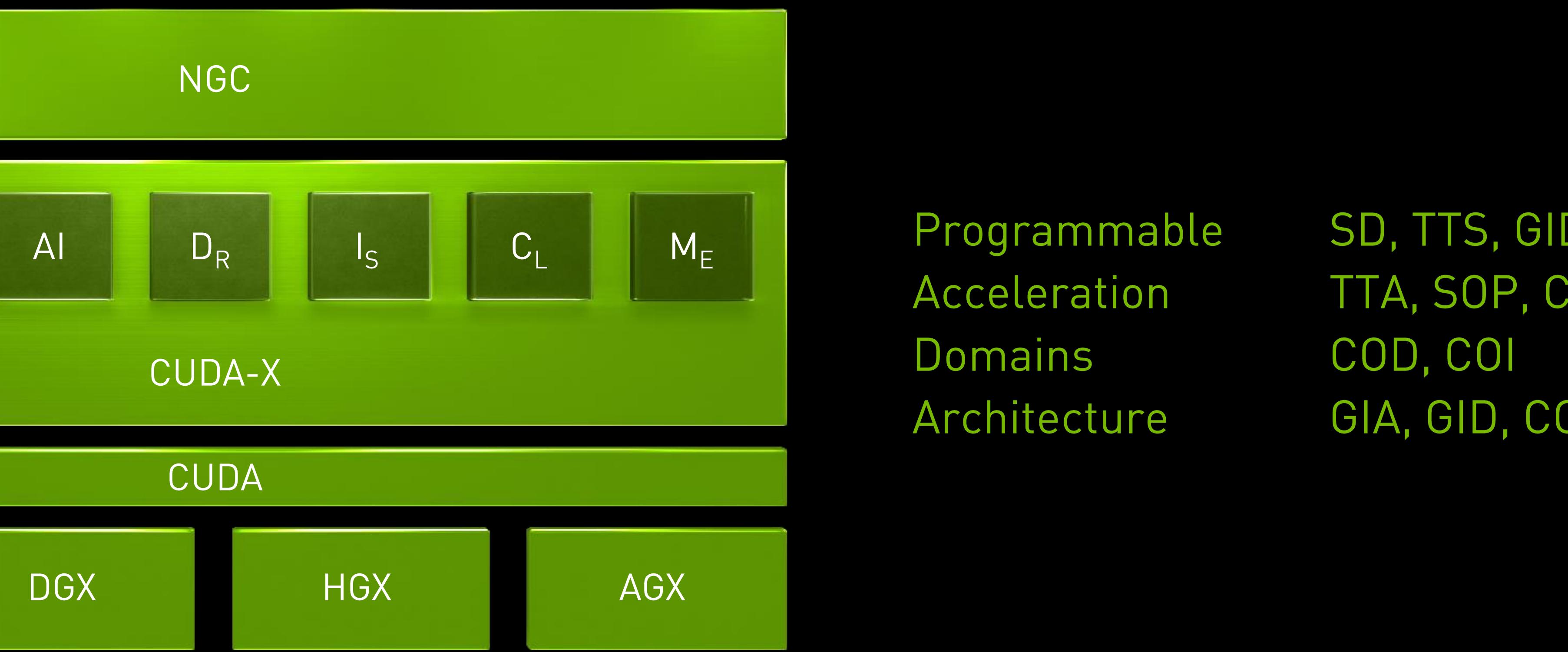
# NVIDIA ACCELERATED COMPUTING GROWTH



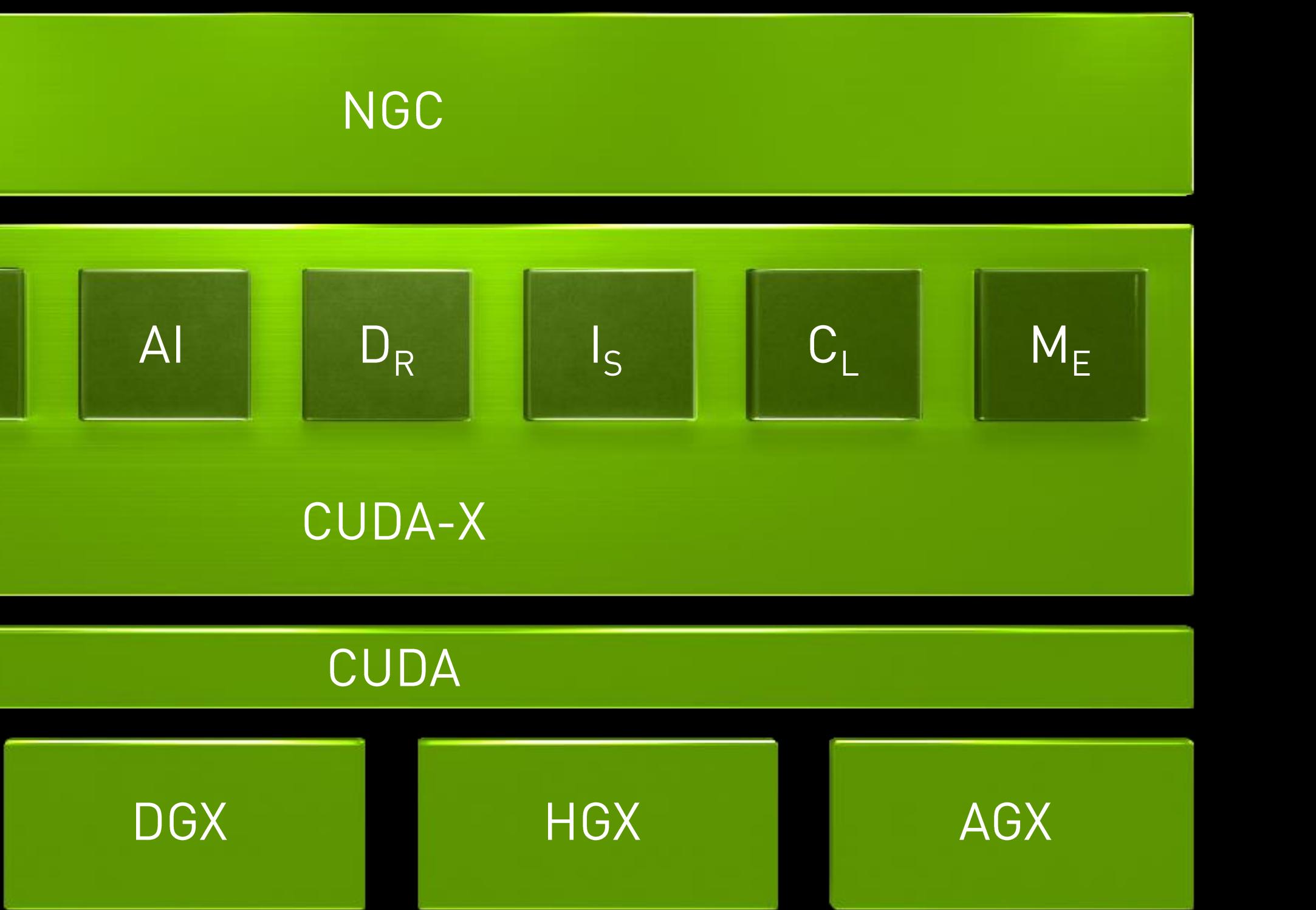
# NVIDIA CUDA-X GPU-ACCELERATED COMPUTING LIBRARIES



# NVIDIA CUDA-X GPU-ACCELERATED COMPUTING LIBRARIES



# NVIDIA CUDA-X GPU-ACCELERATED COMPUTING LIBRARIES



PRogrammable  
Acceleration  
Domains  
Architecture

# CHAPTER 1: GRAPHICS





Rendered in real-time with Unity



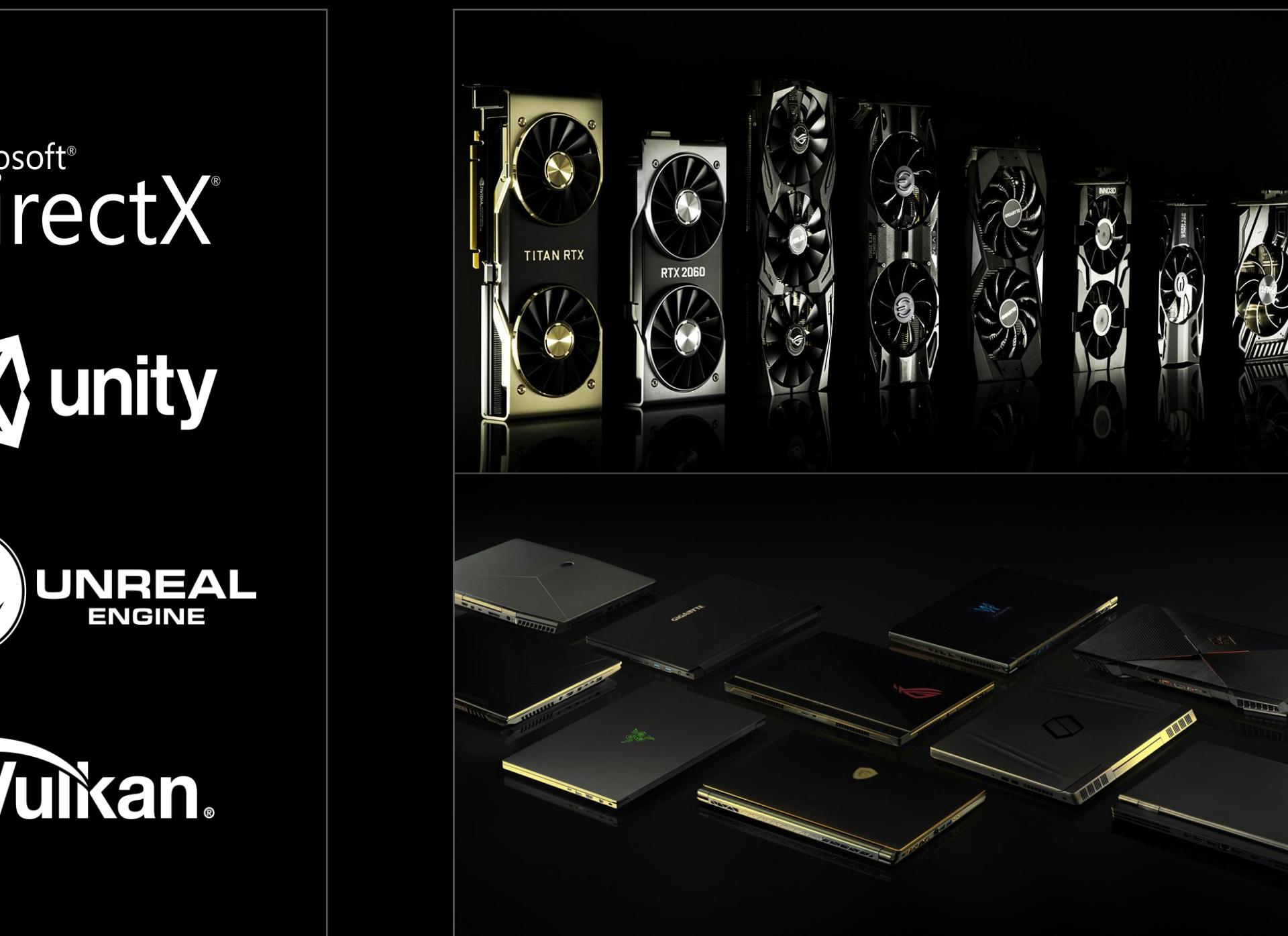
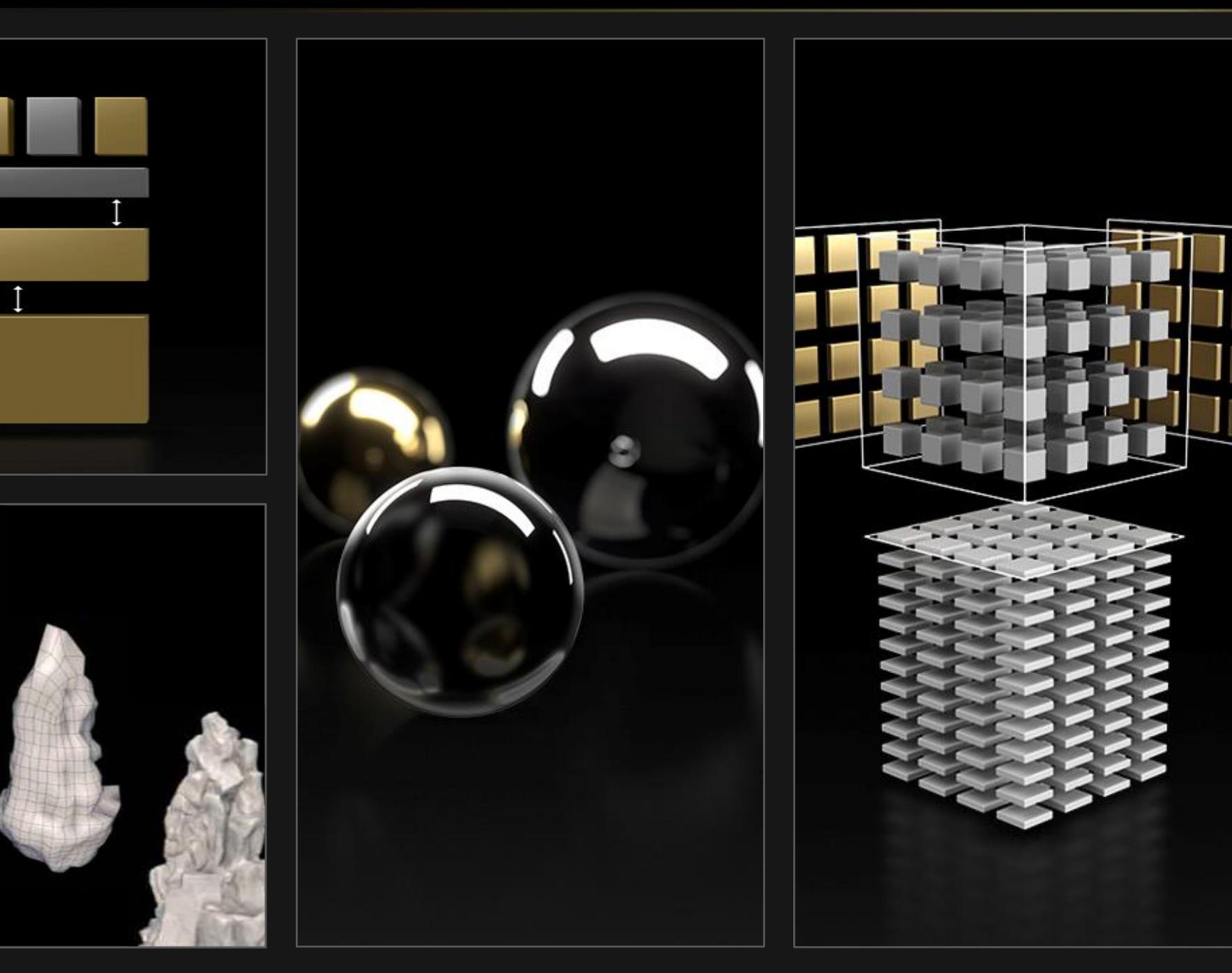
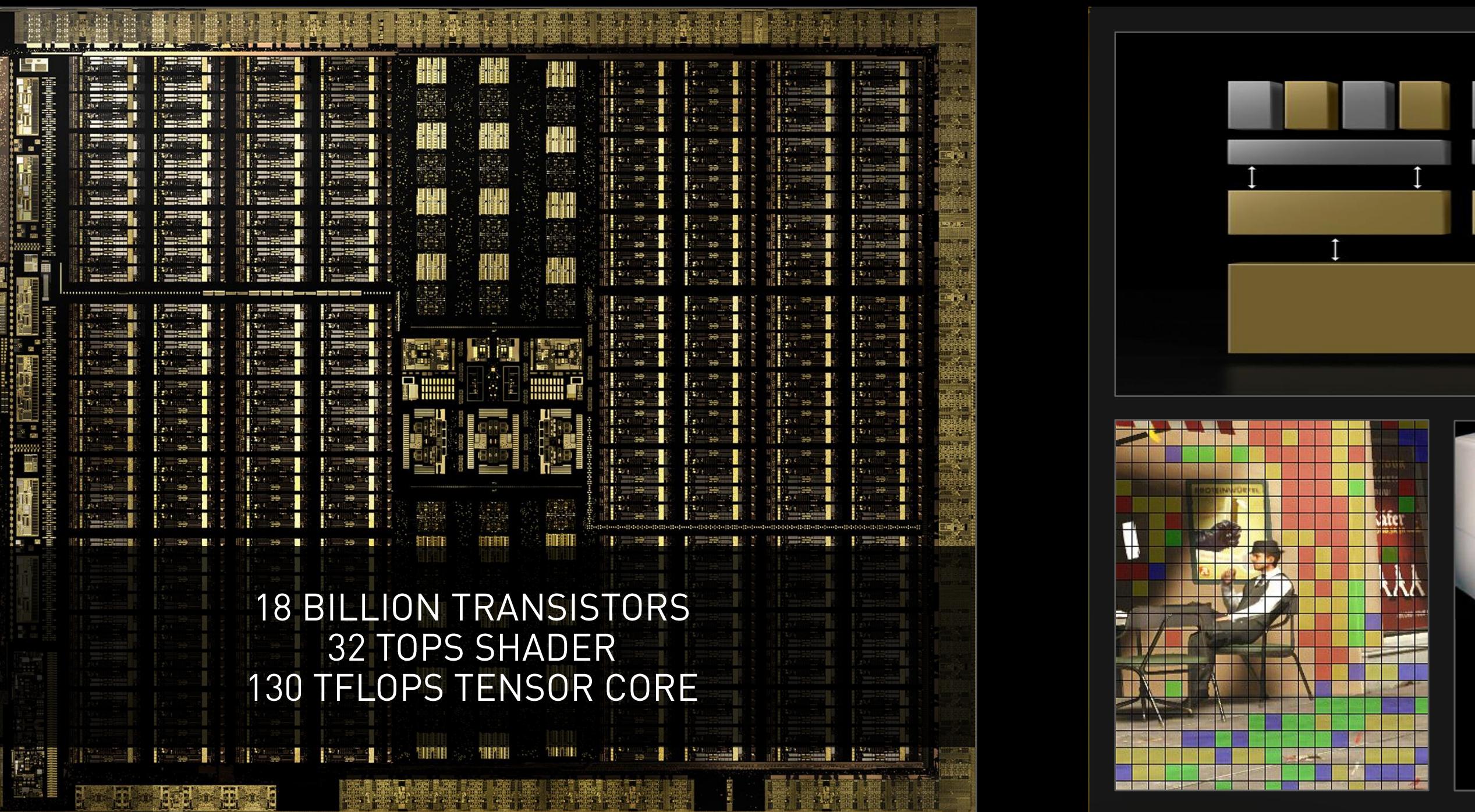






RTX  
ON

# NVIDIA TURING RTX







100

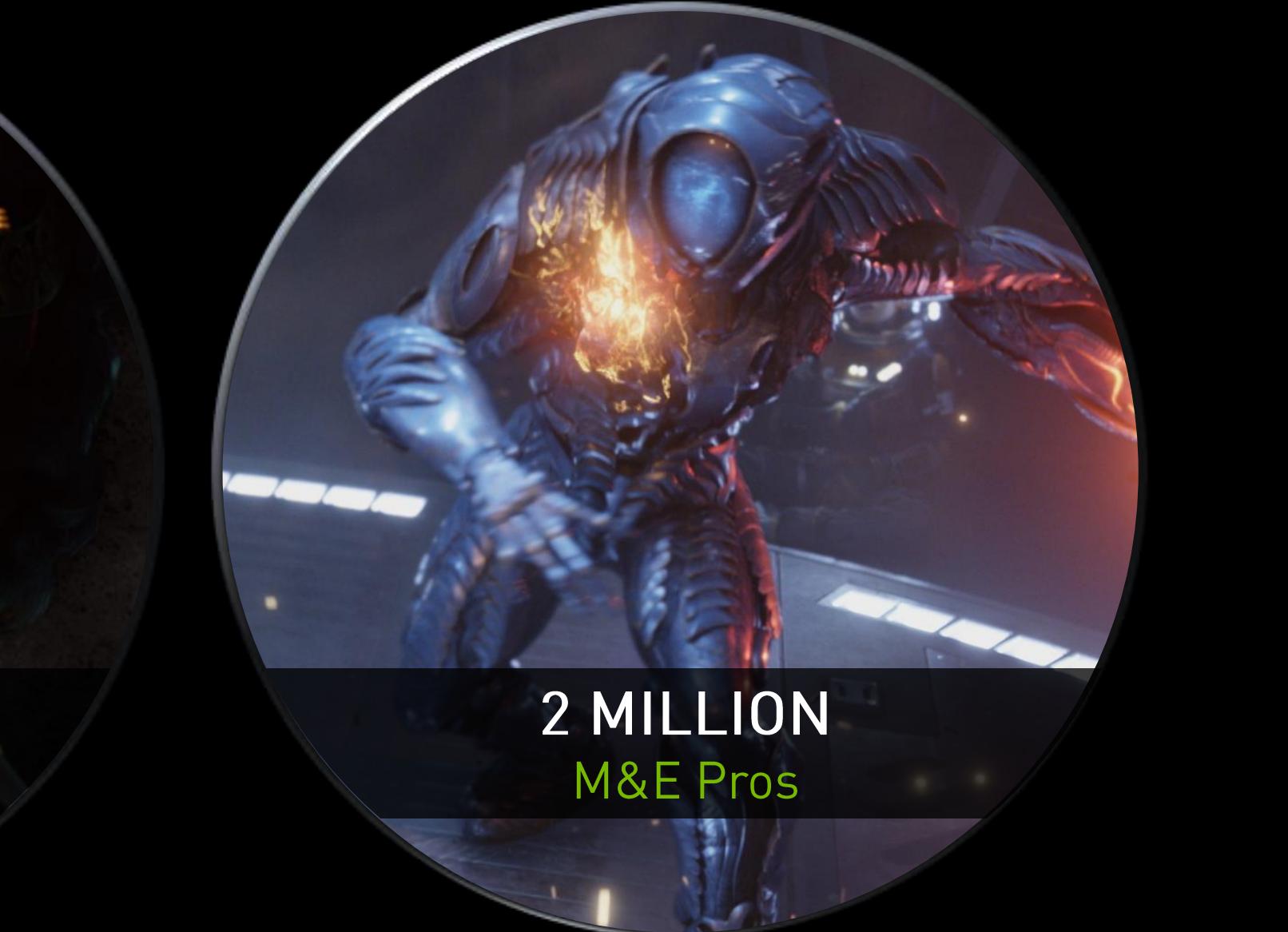
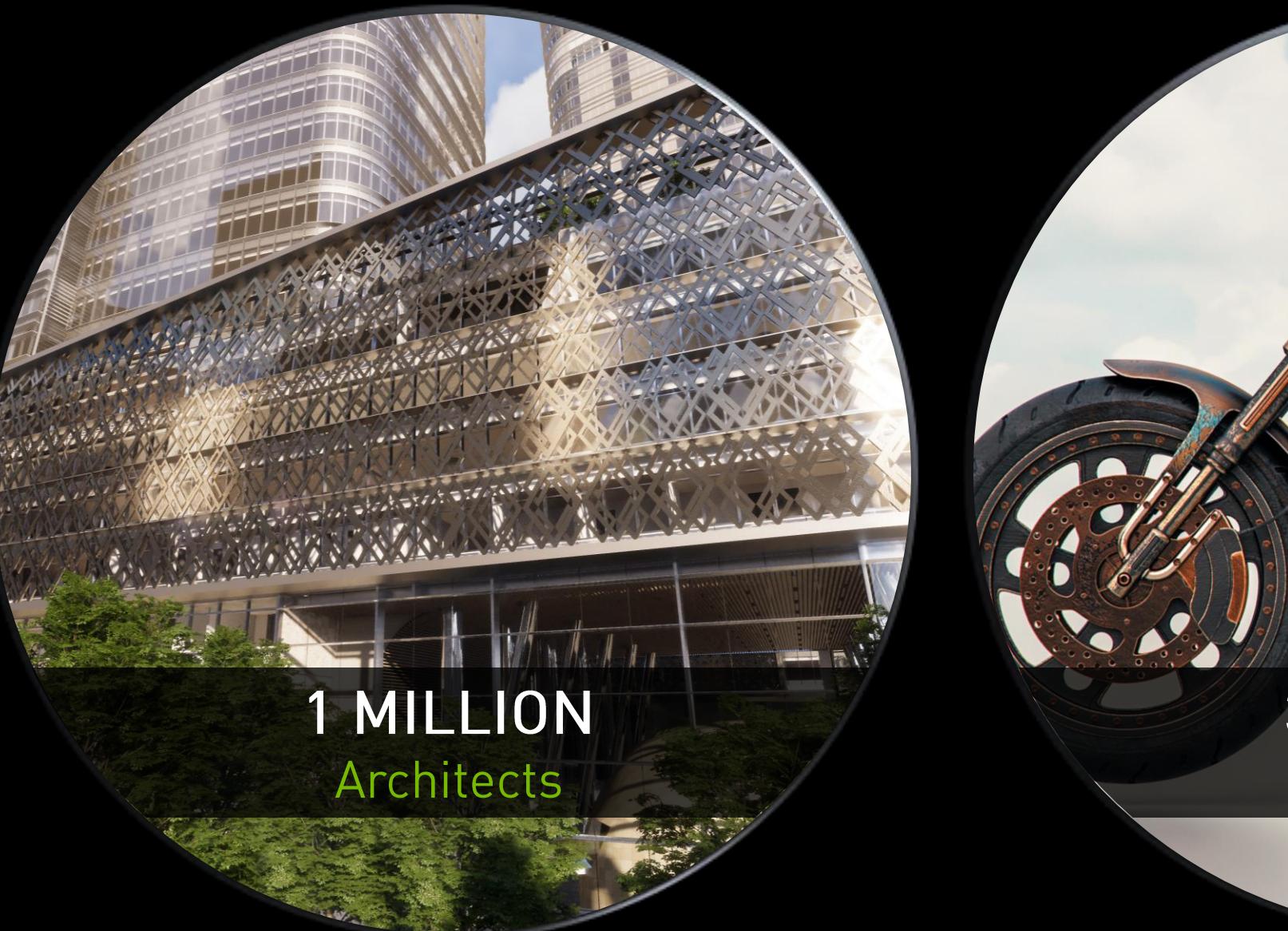


G4



# BROAD SUPPORT FOR NVIDIA RTX

RTX COMES TO 9M 3D CREATORS IN 2019



AUTODESK

CHAOSGROUP



ENSCAPE™

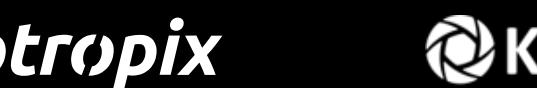


get it right®

THE  
FOUNDRY.



isotropix



MPC Film



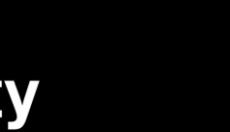
PIXAR



RENDERMAN.



unity



weta  
DIGITAL



**image engine.**  
VISUAL EFFECTS + ANIMATION



RenderMan XPU R&D test on assets from *Incredibles 2* © Disney/Pixar

	# of Nodes	Total Render Time	Cost of Power (5 yrs)	Total Cost
CPU - Dual Skylake	25	38 Hours	\$70k	\$250k
RTX Server - 4x RTX 8000	1	6 Hours	\$10k	\$30k

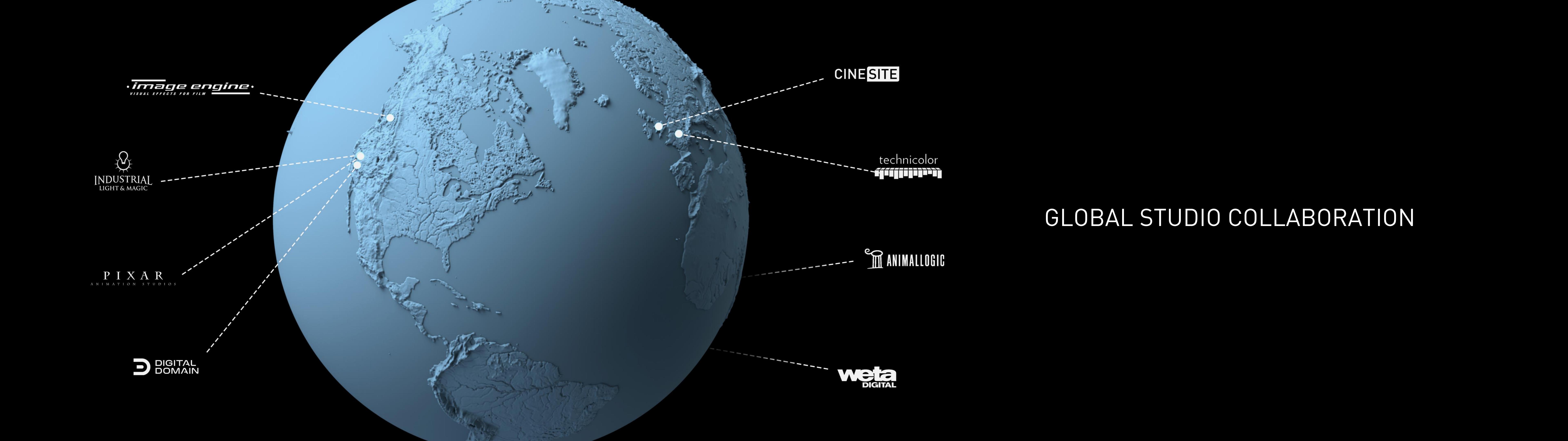
“ Pixar artists already rely on NVIDIA ray tracing, and RTX more than doubles the performance they will see. We’re excited to use RTX on our upcoming films.”

– STEVE MAY, CTO, Pixar



## COMPLEX RENDERING PIPELINE

CONCEPT | MODELING | TEXTURE | RIGGING  
ANIMATION | LIGHTING | RENDER



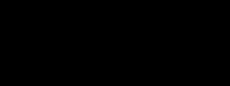
**image engine**  
VISUAL EFFECTS FOR FILM

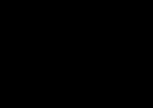
 INDUSTRIAL  
LIGHT & MAGIC

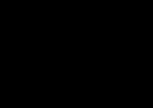
**PIXAR**  
ANIMATION STUDIOS

 DIGITAL  
DOMAIN

**CINESITE**

 technicolor

 ANIMALLOGIC

 weta  
DIGITAL

GLOBAL STUDIO COLLABORATION



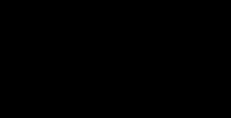
**image engine**  
VISUAL EFFECTS FOR FILM

 INDUSTRIAL  
LIGHT & MAGIC

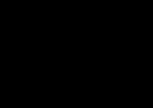
**PIXAR**  
ANIMATION STUDIOS

 DIGITAL  
DOMAIN

**CINESITE**

 technicolor

 ANIMALLOGIC

 weta  
DIGITAL

# ANNOUNCING NVIDIA OMNIVERSE

OPEN COLLABORATION PLATFORM TO SIMPLIFY STUDIO  
WORKFLOWS FOR REAL-TIME GRAPHICS





## ANNOUNCING NVIDIA OMNIVERSE

Early Access at [developer.nvidia.com/nvidia-omniverse](https://developer.nvidia.com/nvidia-omniverse)

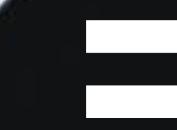




GeForce NOW  
500+ Games



15 Datacenters  
300K Players  
1M on Waiting List



SoftBank

LG U+

Announcing  
GFN Alliance

# ANNOUNCING RTX SERVER

## Datacenter Graphics Server Design

40 Turing GPUs in 8U

Virtualize graphics apps up to 320 CCU

Optimized end-to-end stack for rendering,  
remote workstation, and cloud gaming



# ANNOUNCING RTX SERVER POD

**Modular Designs for Enterprise & Cloud Edge Datacenters**

Pods scale to 32 RTX servers

1,280 GPUs in 10 racks

High-speed storage connected with MLNX IB

Up to 10,000 concurrent users per RTX Pod



# NVIDIA RTX SERVER

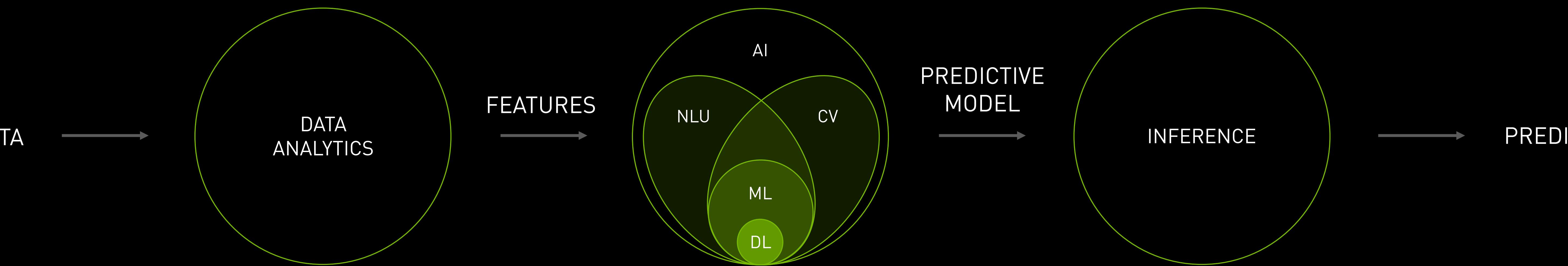




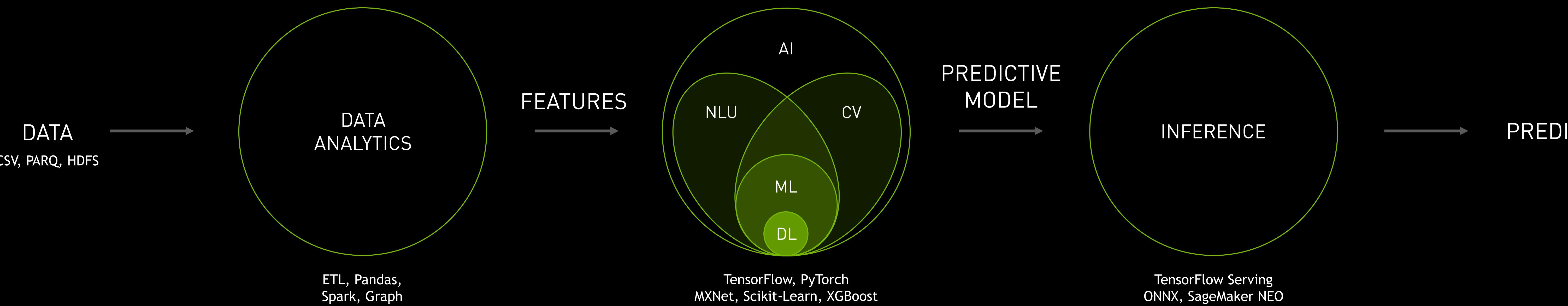
## CHAPTER 2: AI & HPC



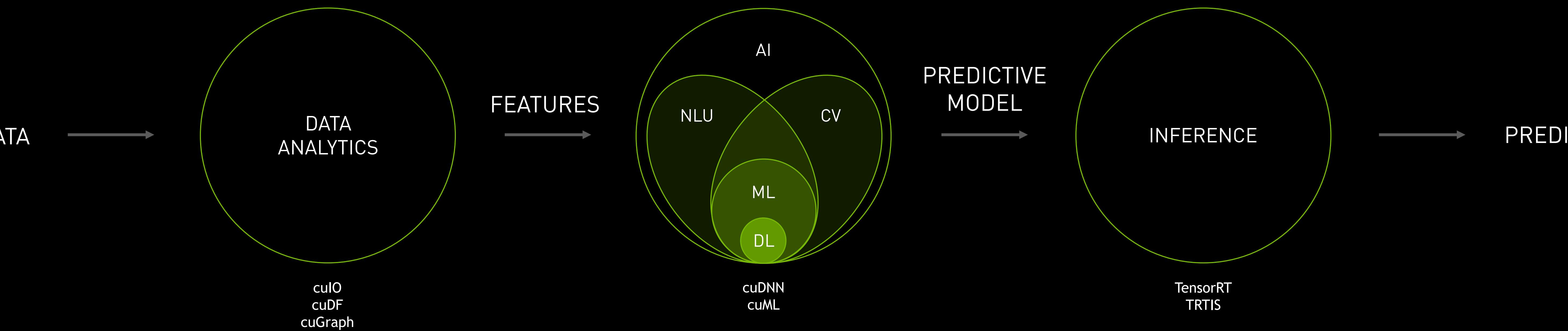
# DATA SCIENCE – A NEW PILLAR OF DISCOVERY



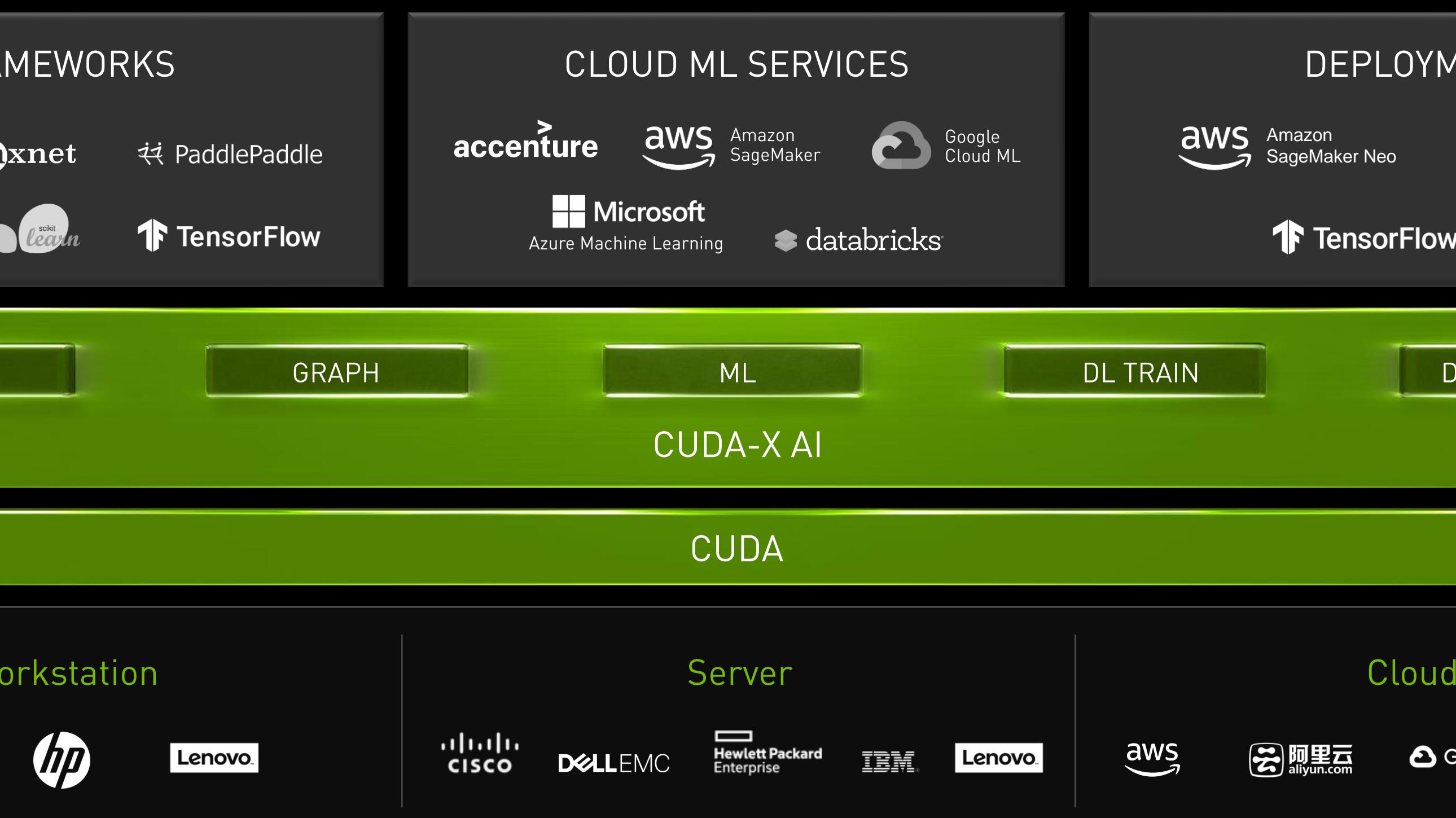
# DATA SCIENCE – A NEW PILLAR OF DISCOVERY



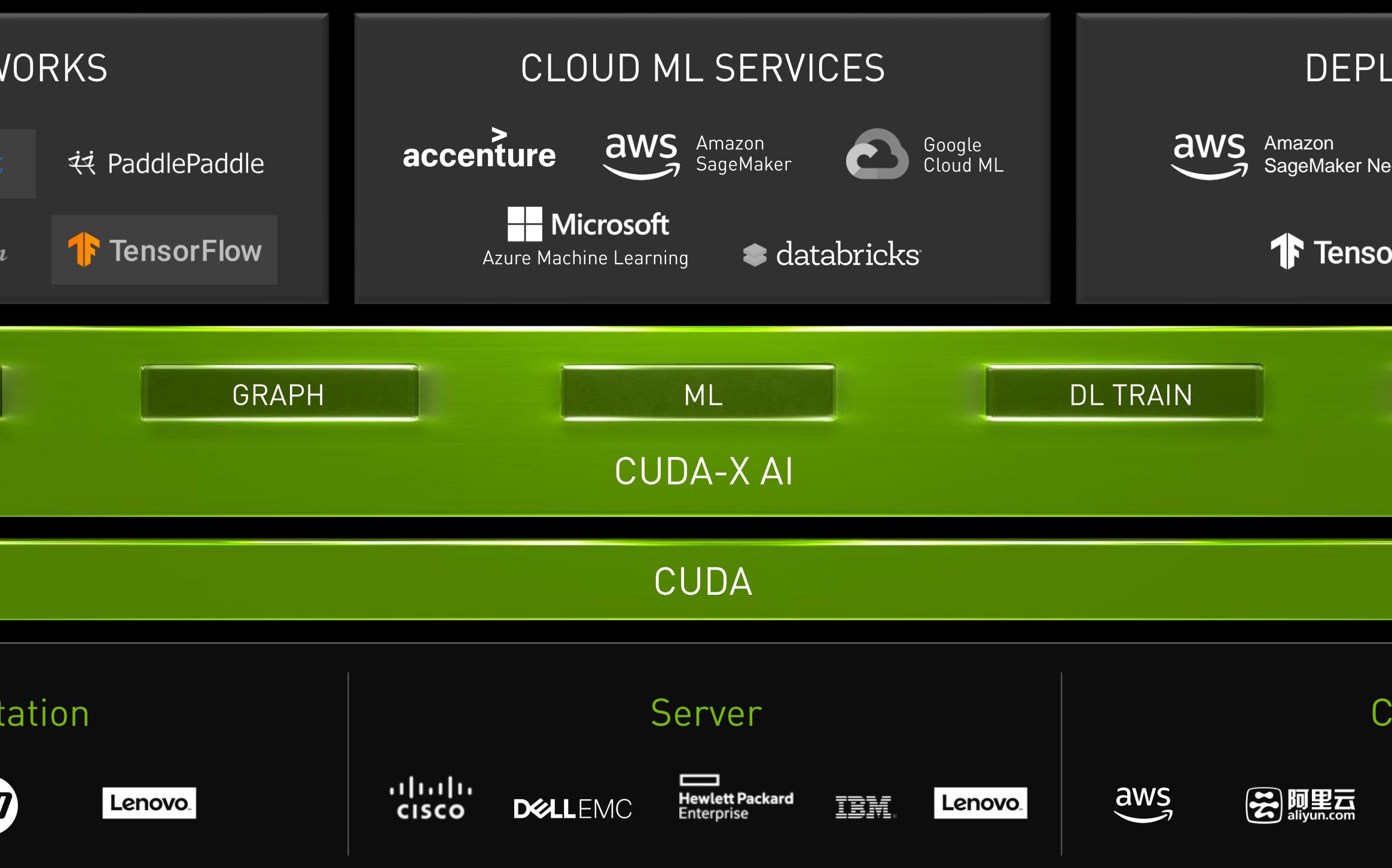
# DATA SCIENCE – A NEW PILLAR OF DISCOVERY



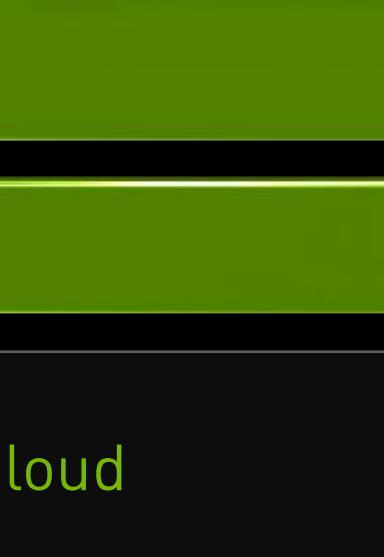
# NVIDIA CUDA-X AI ECOSYSTEM



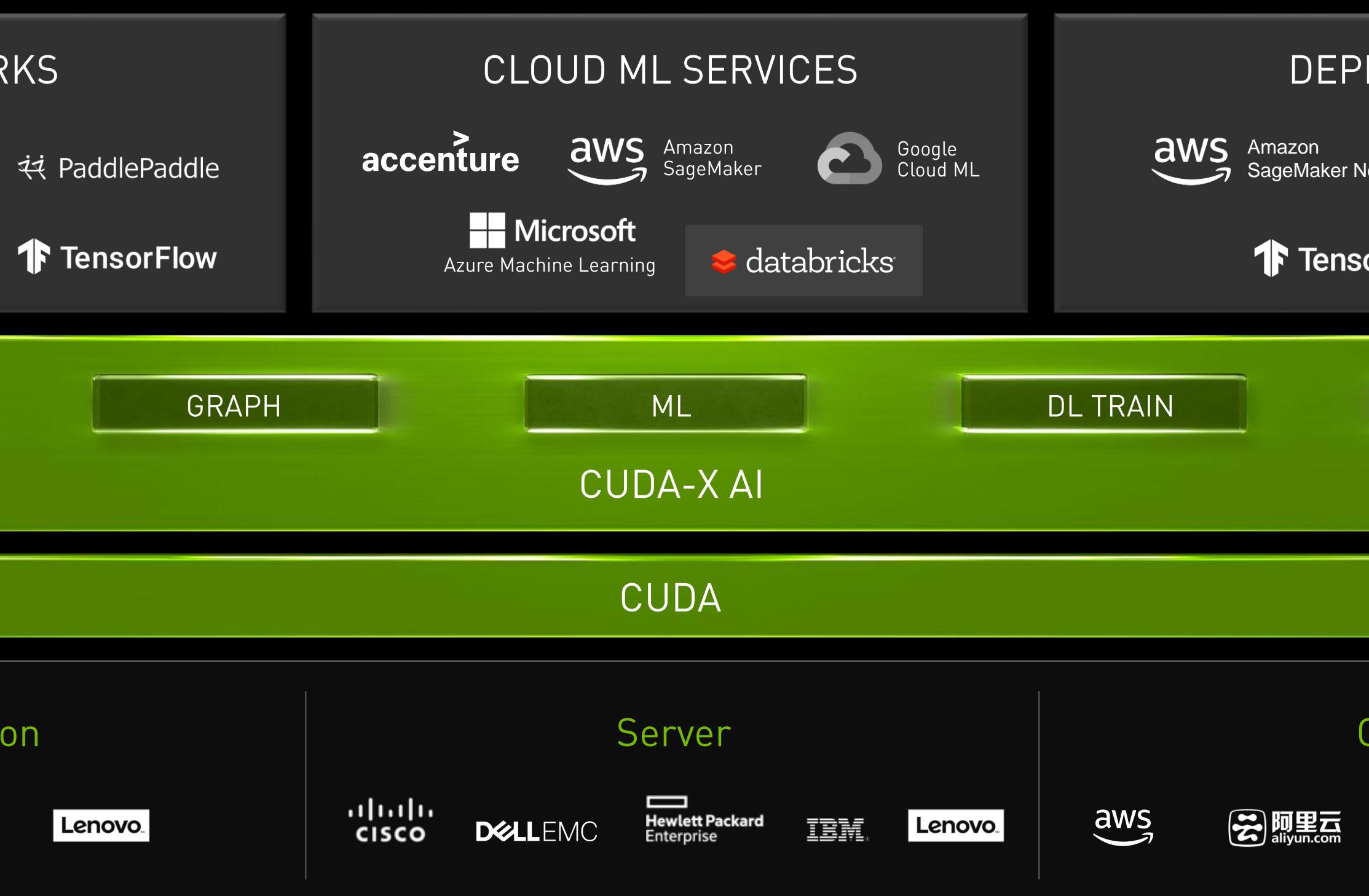
# NVIDIA CUDA-X AI ECOSYSTEM



Announcing Tensor Core Mixed-Precision  
Automatically Supported in TensorFlow, PyTorch, MXNet



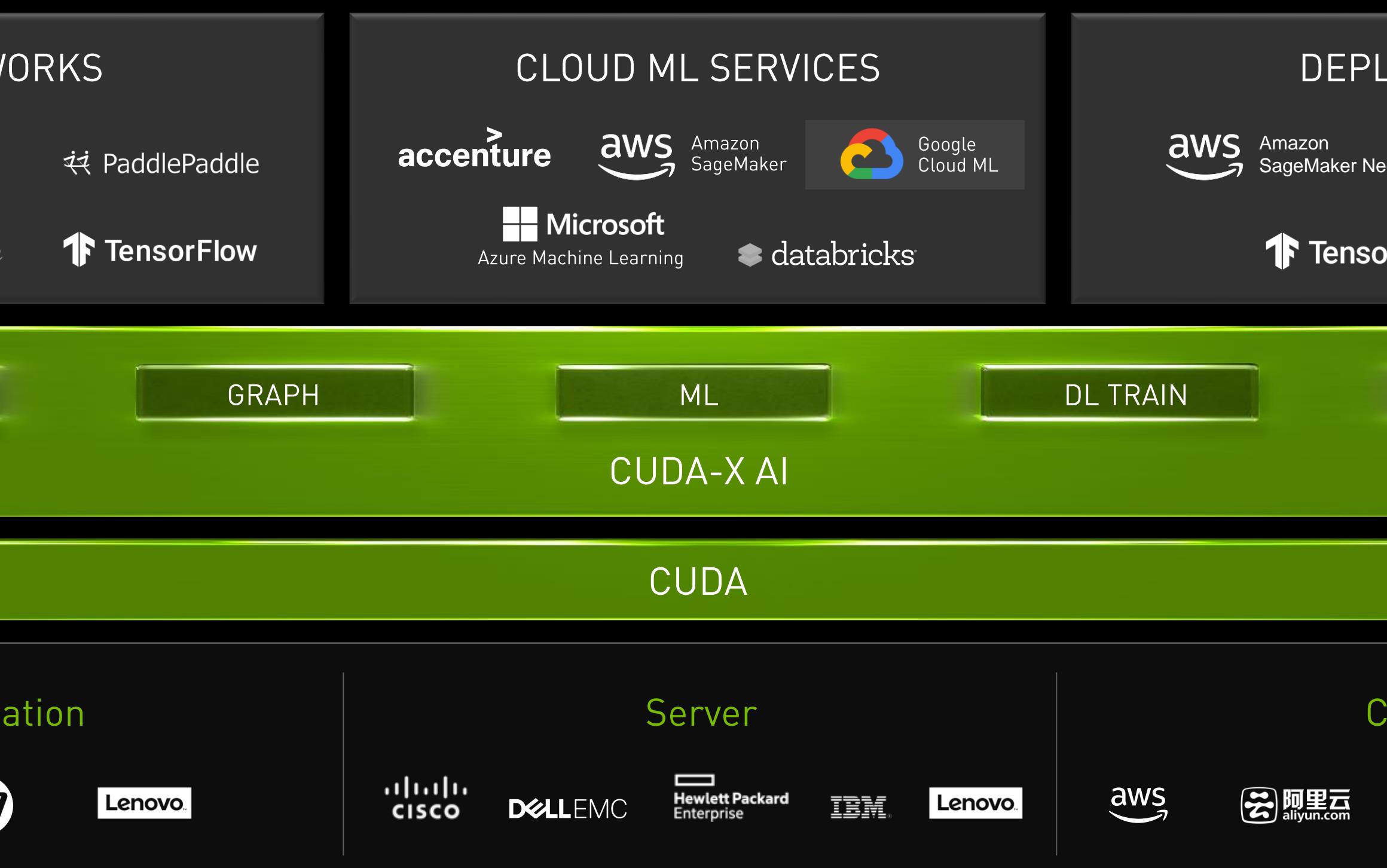
# NVIDIA CUDA-X AI ECOSYSTEM



Announcing RAPIDS Now Integrated  
with Databricks Unified Analytics Platform

**databricks**<sup>®</sup>

# NVIDIA CUDA-X AI ECOSYSTEM

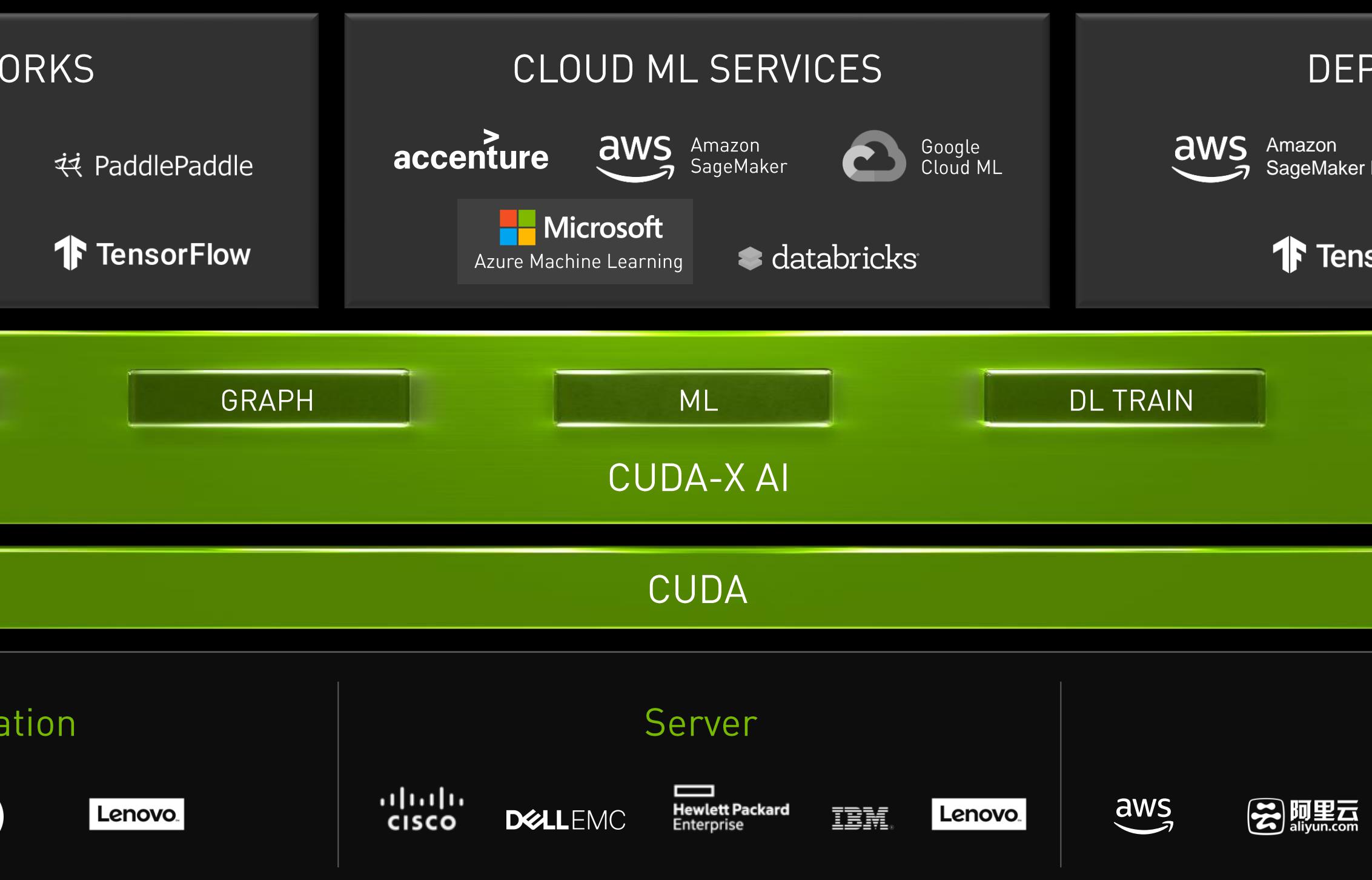


Announcing RAPIDS with  
GCP VM Images and Kubeflow



Google Cloud

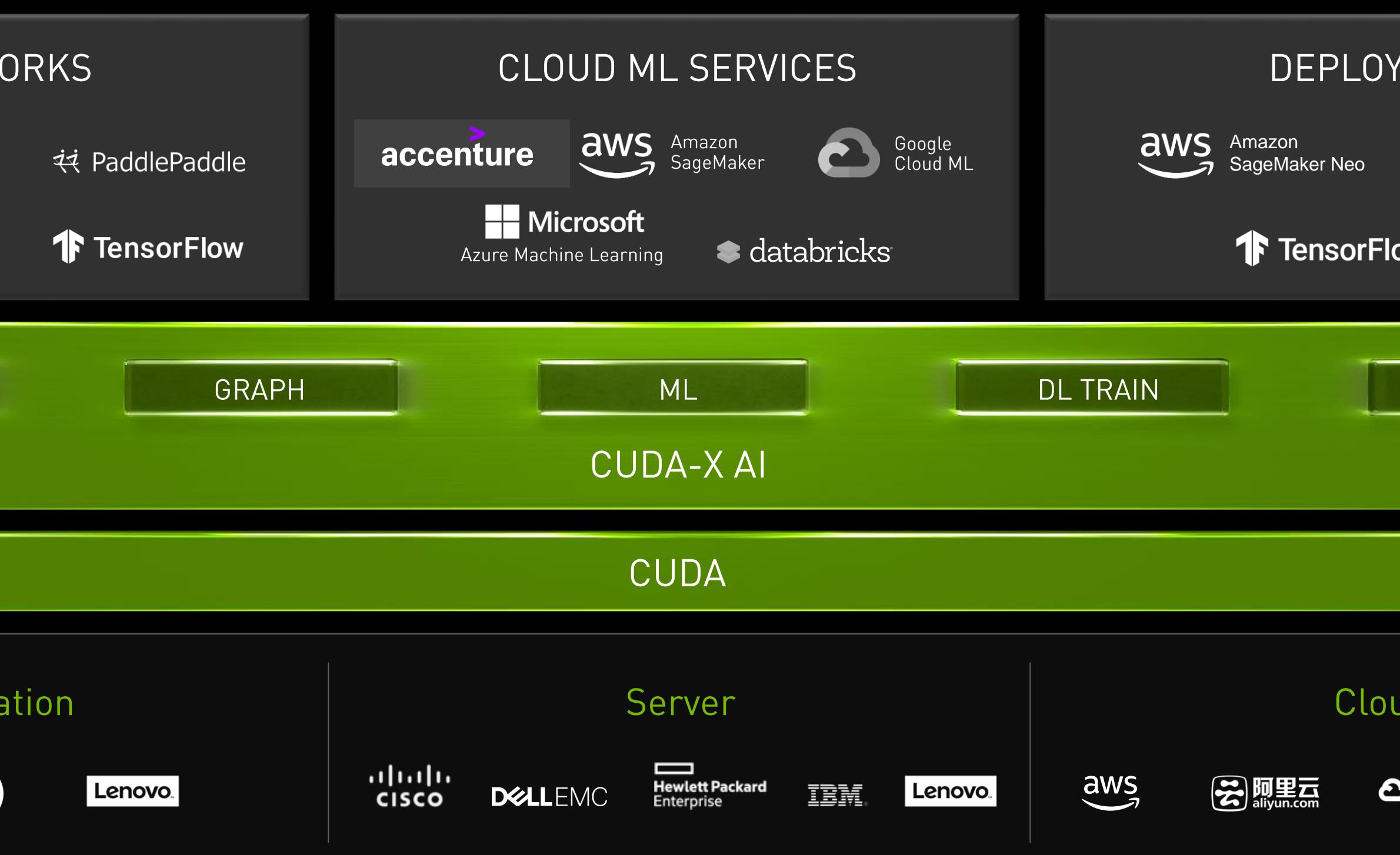
# NVIDIA CUDA-X AI ECOSYSTEM



Announcing RAPIDS Integrated  
into Azure Machine Learning Service



# NVIDIA CUDA-X AI ECOSYSTEM

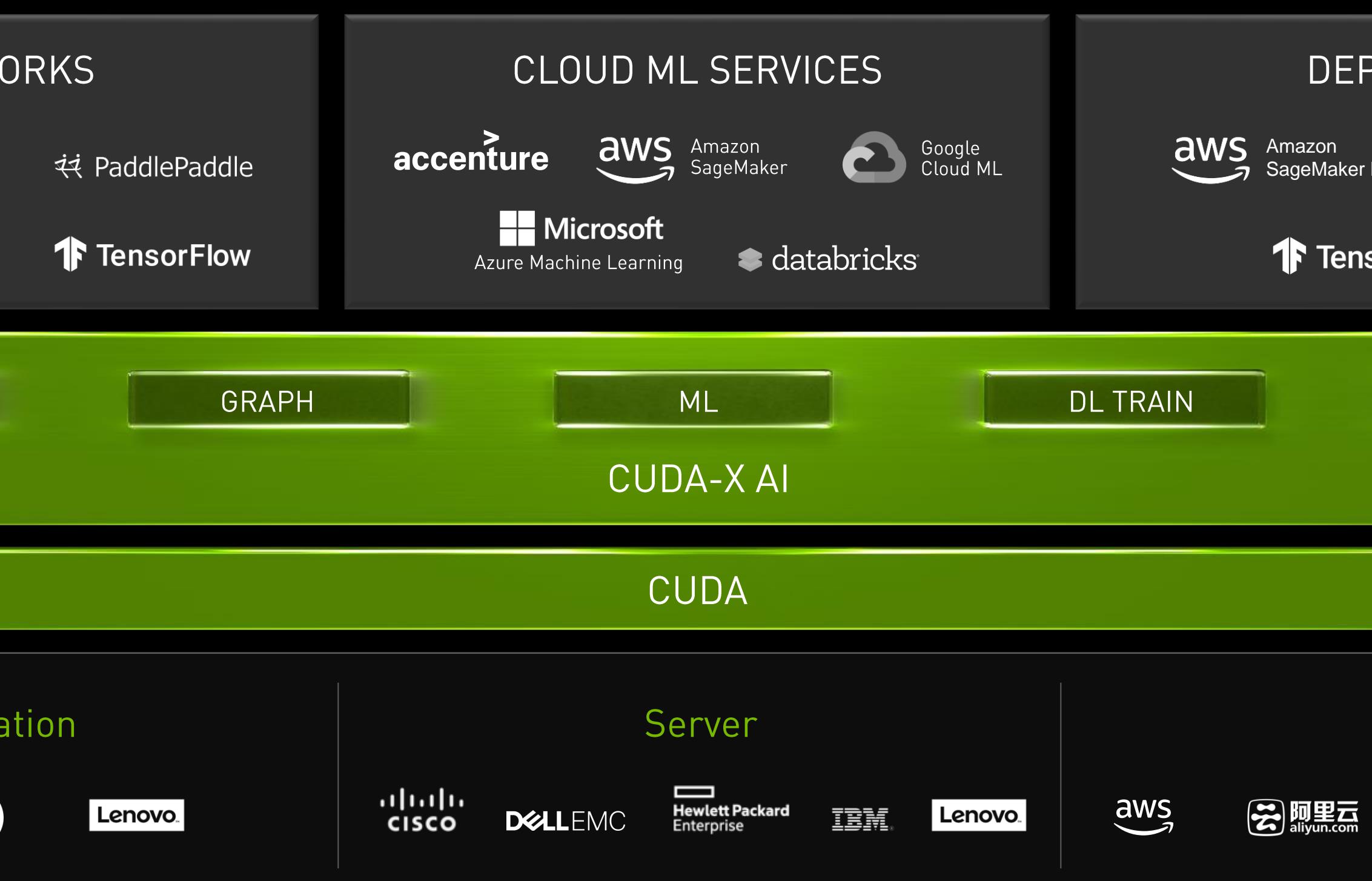


"We are excited to announce that we are partnering with NVIDIA to bring RAPIDS to Accenture's new Applied Intelligence Platform enabling our joint venture with Kansai Electric Power, K4Digital, to transform business process and create new opportunities."

- MIKE SUTCLIFF, Group Chief Executive, Accenture Digital

**accenture**

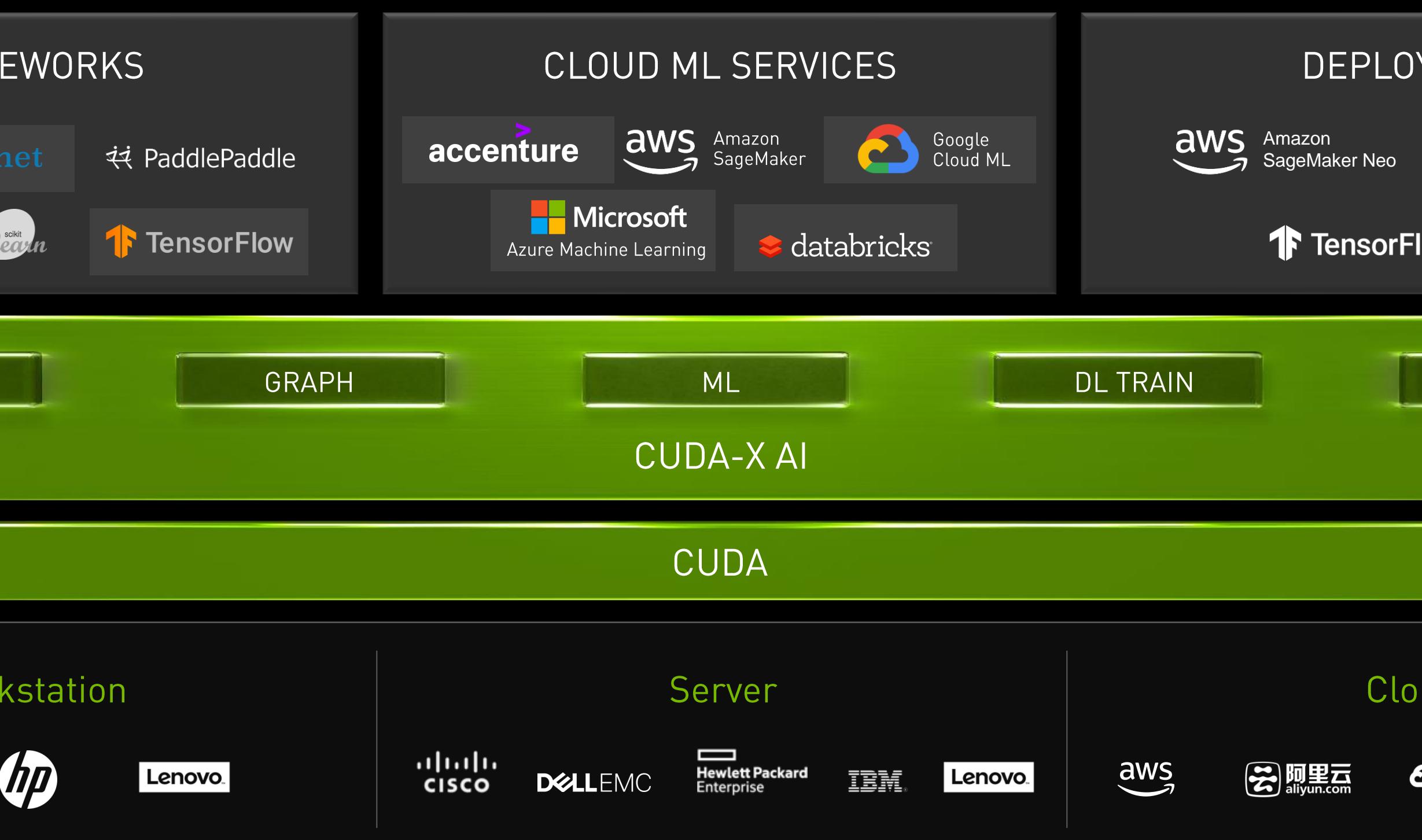
# NVIDIA CUDA-X AI ECOSYSTEM



Announcing NVIDIA TensorRT  
Integrated into Microsoft ONNX Runtime



# NVIDIA CUDA-X AI ECOSYSTEM



# AI CONVERSATIONAL SEARCH

20-30 containers end-to-end

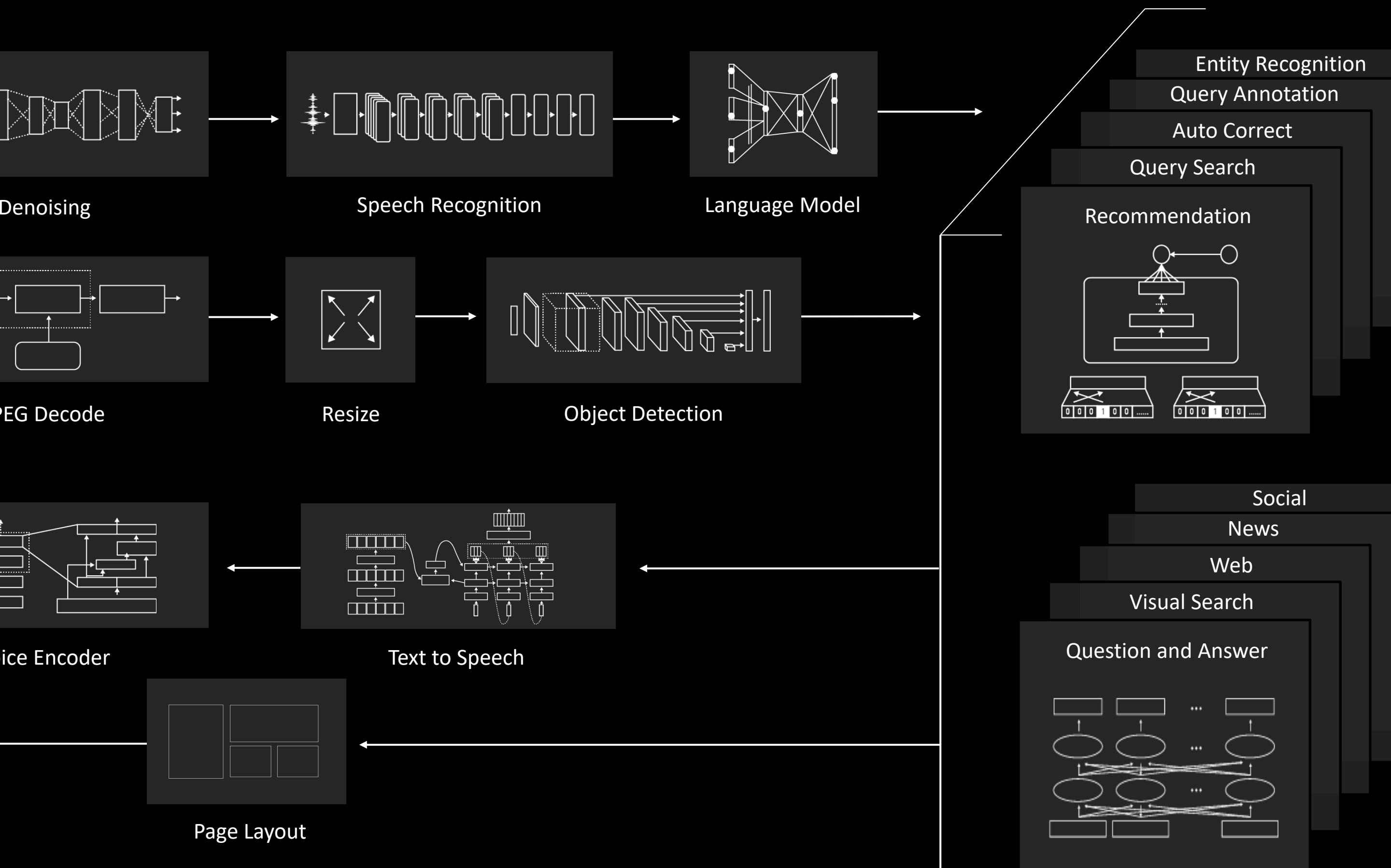
RNN, CNN, MLP in INT8, FP16, FP32

Latency <300ms



What are different types of lighting for a living room?

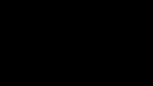
Ambient, task and accent





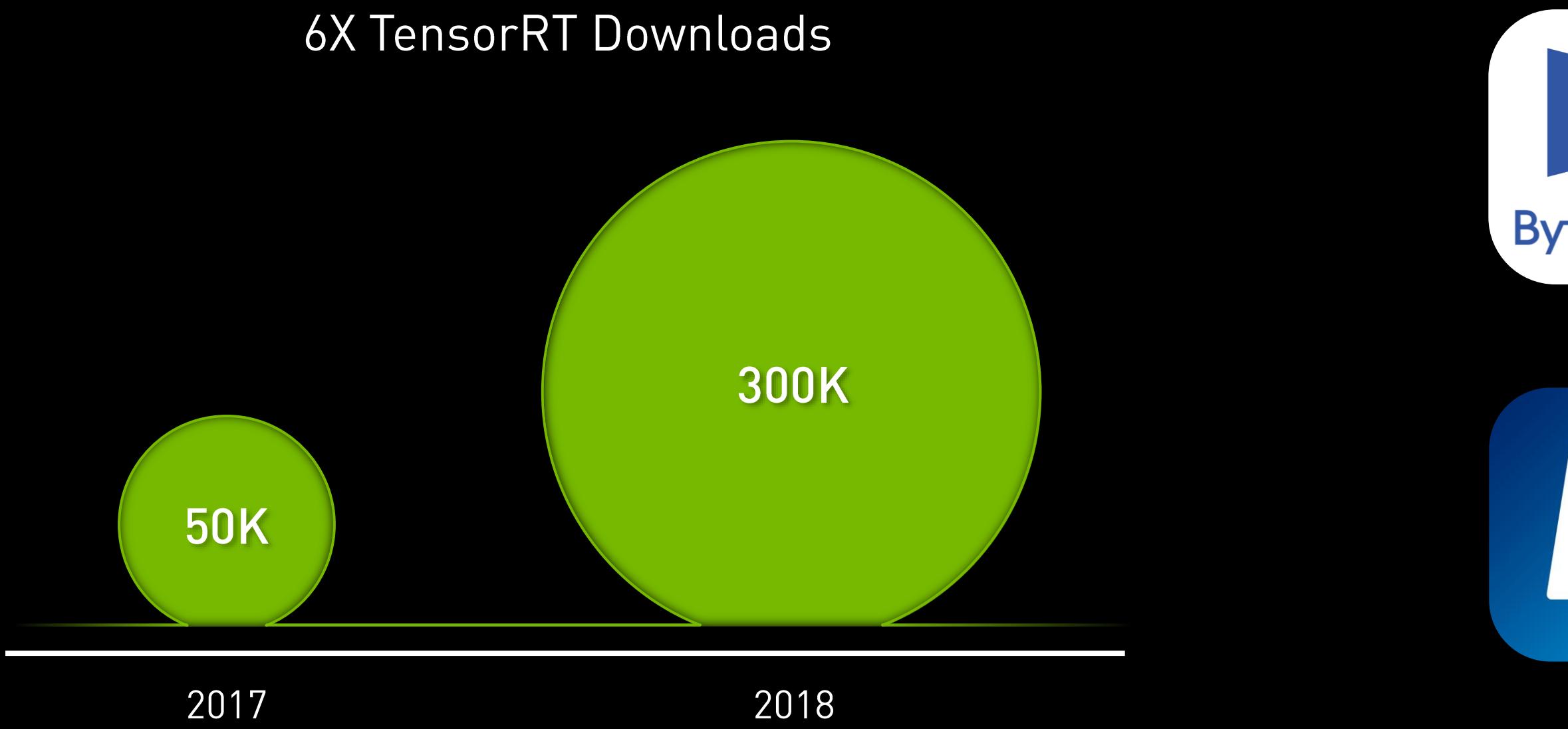
# Microsoft

I'm listening



<https://bing.app.link/gtc>

# ANNOUNCING WORLD'S LEADING TECH COMPANIES ADOPT CUDA-X AI TO ACCELERATE MODEL DEPLOYMENT



Voice Search

Image Search

Recommendations

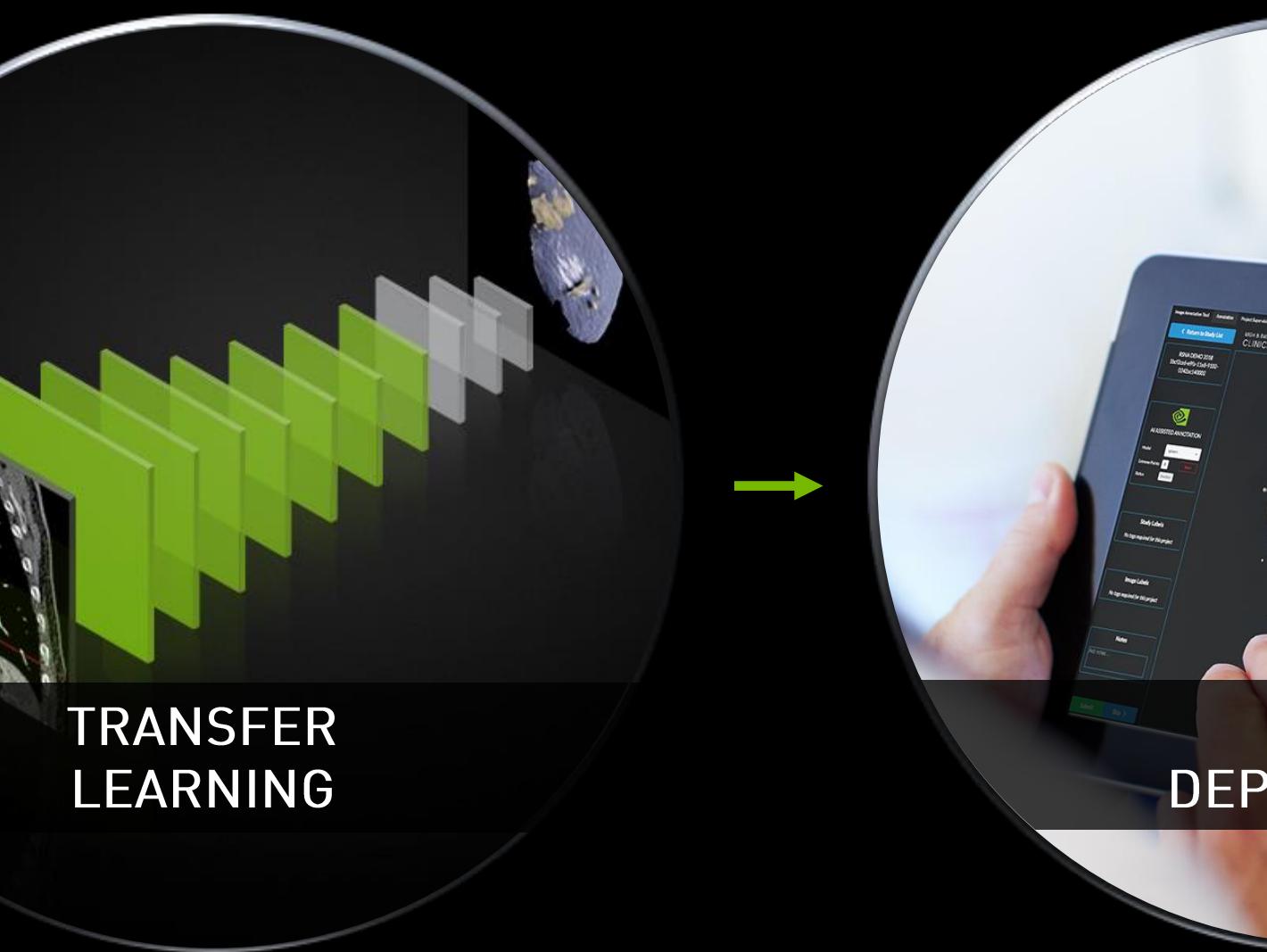
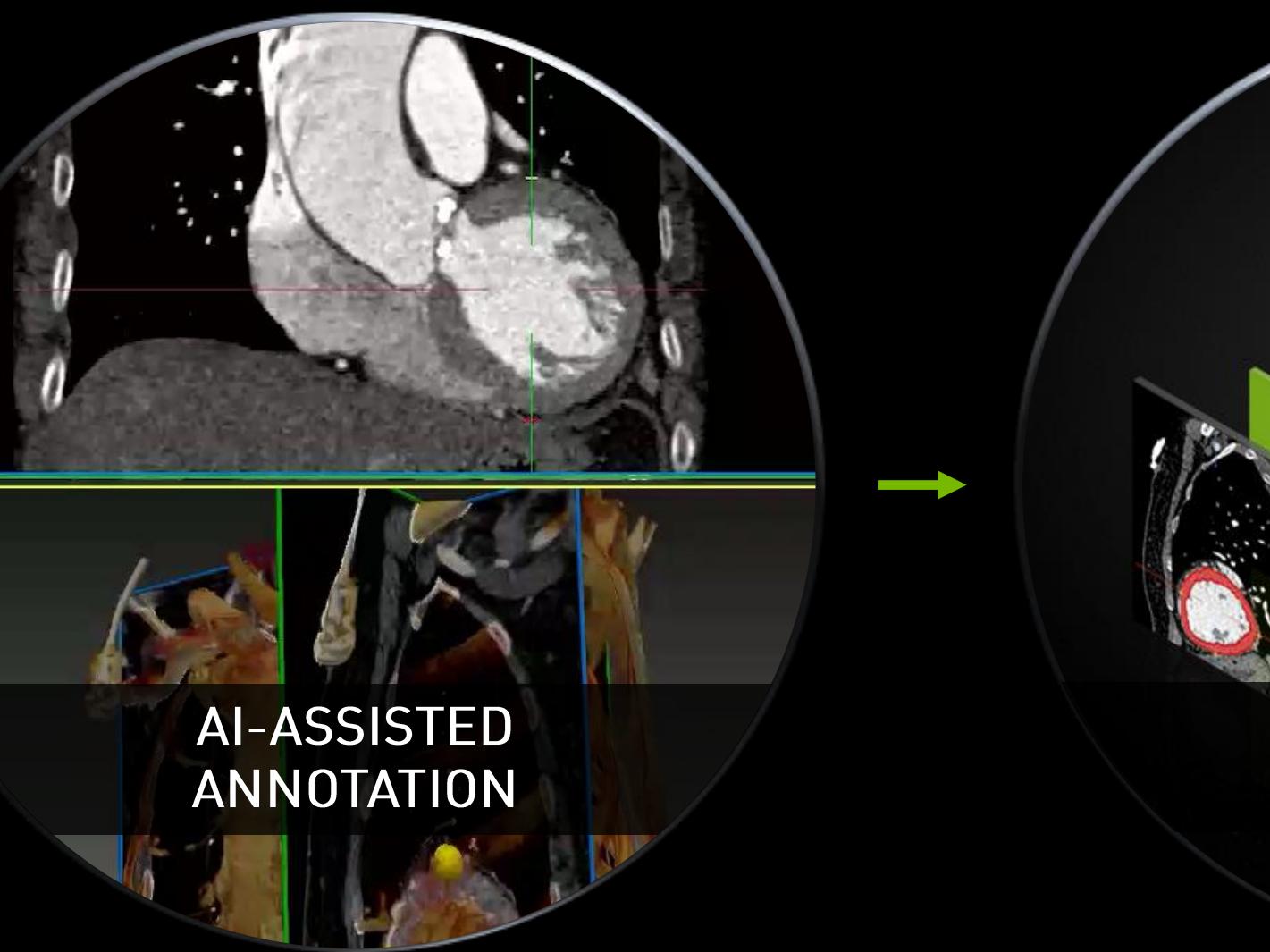
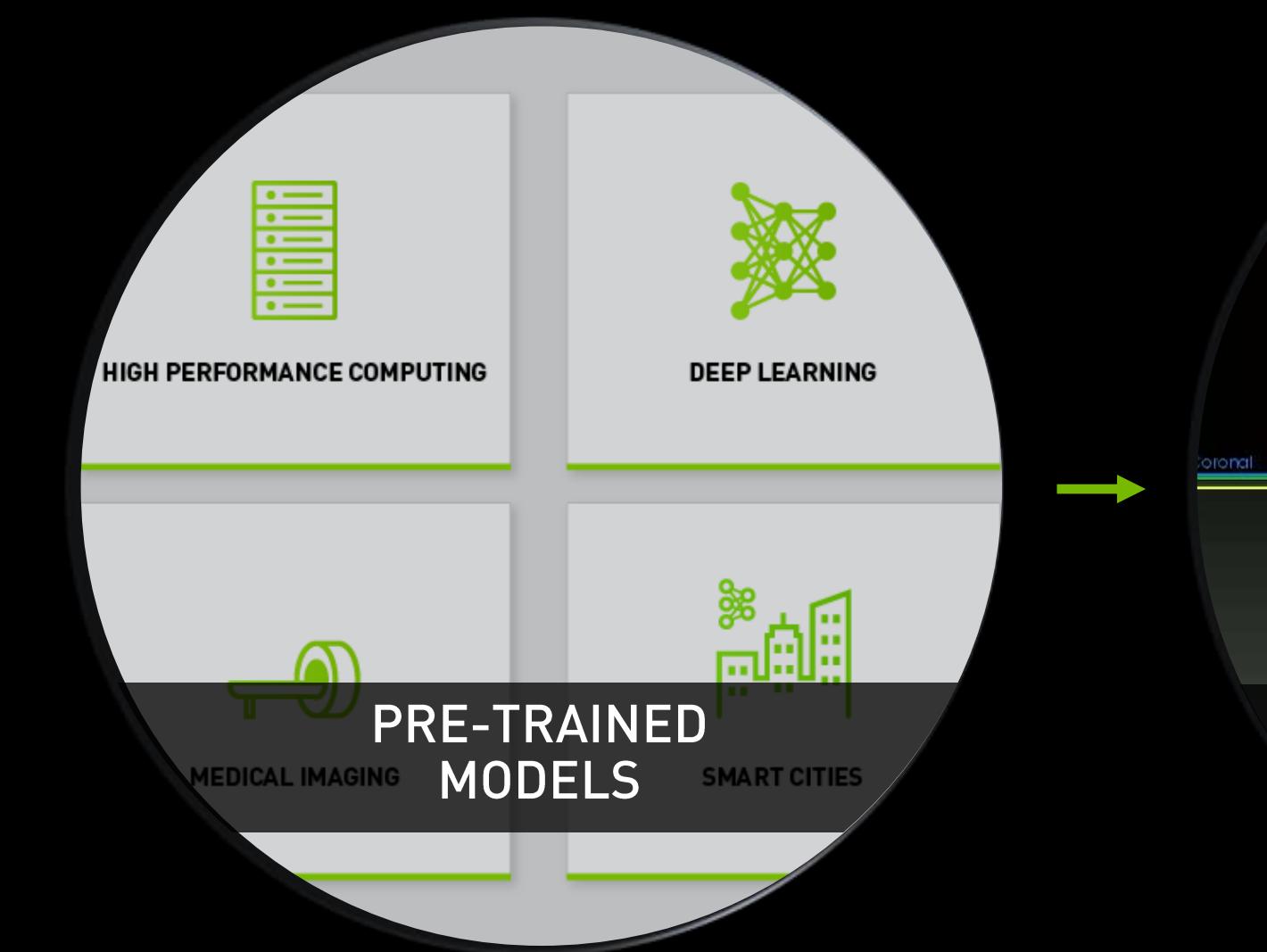
Home Assistant

News Feed

Translation

eCommerce

# ANNOUNCING CLARA AI TOOLKIT

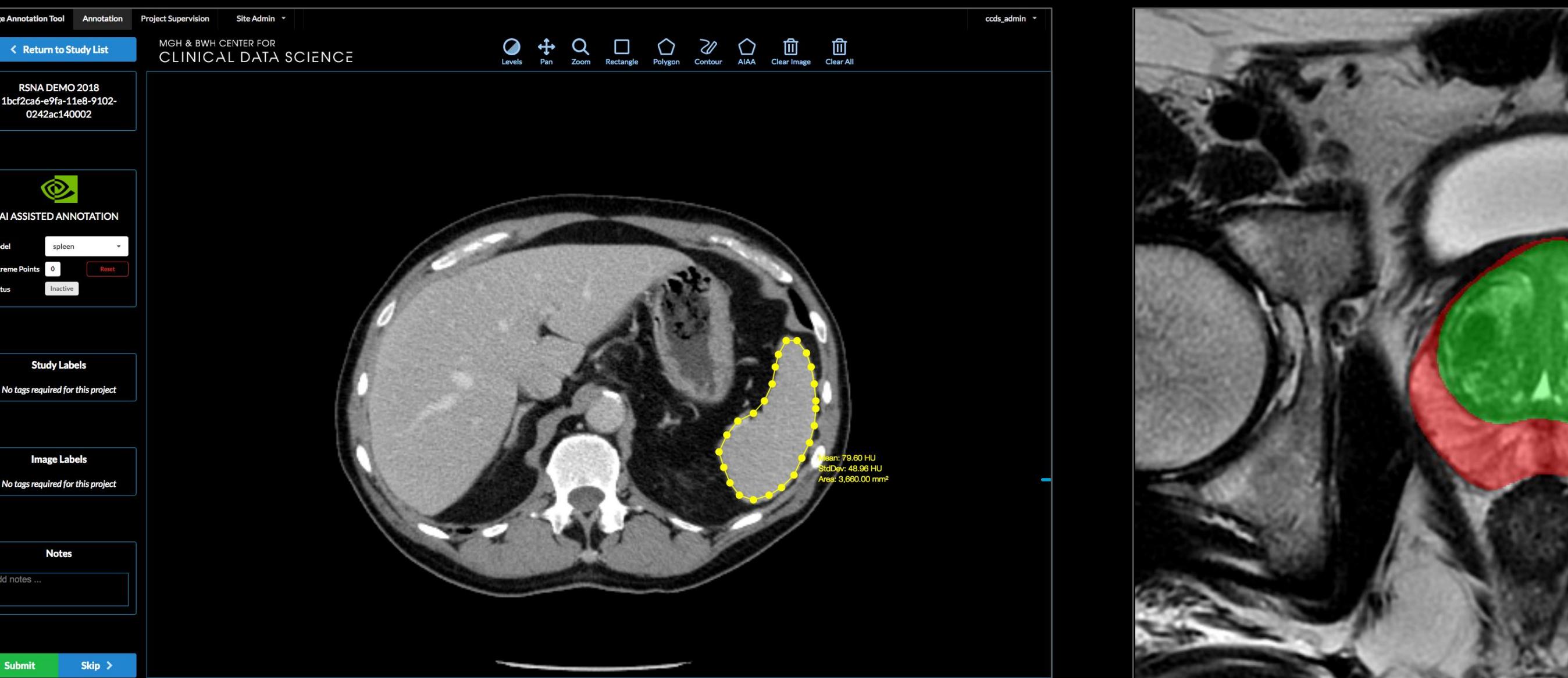


## BUILD, MANAGE AND DEPLOY AI APPLICATIONS FOR RADIOLOGY

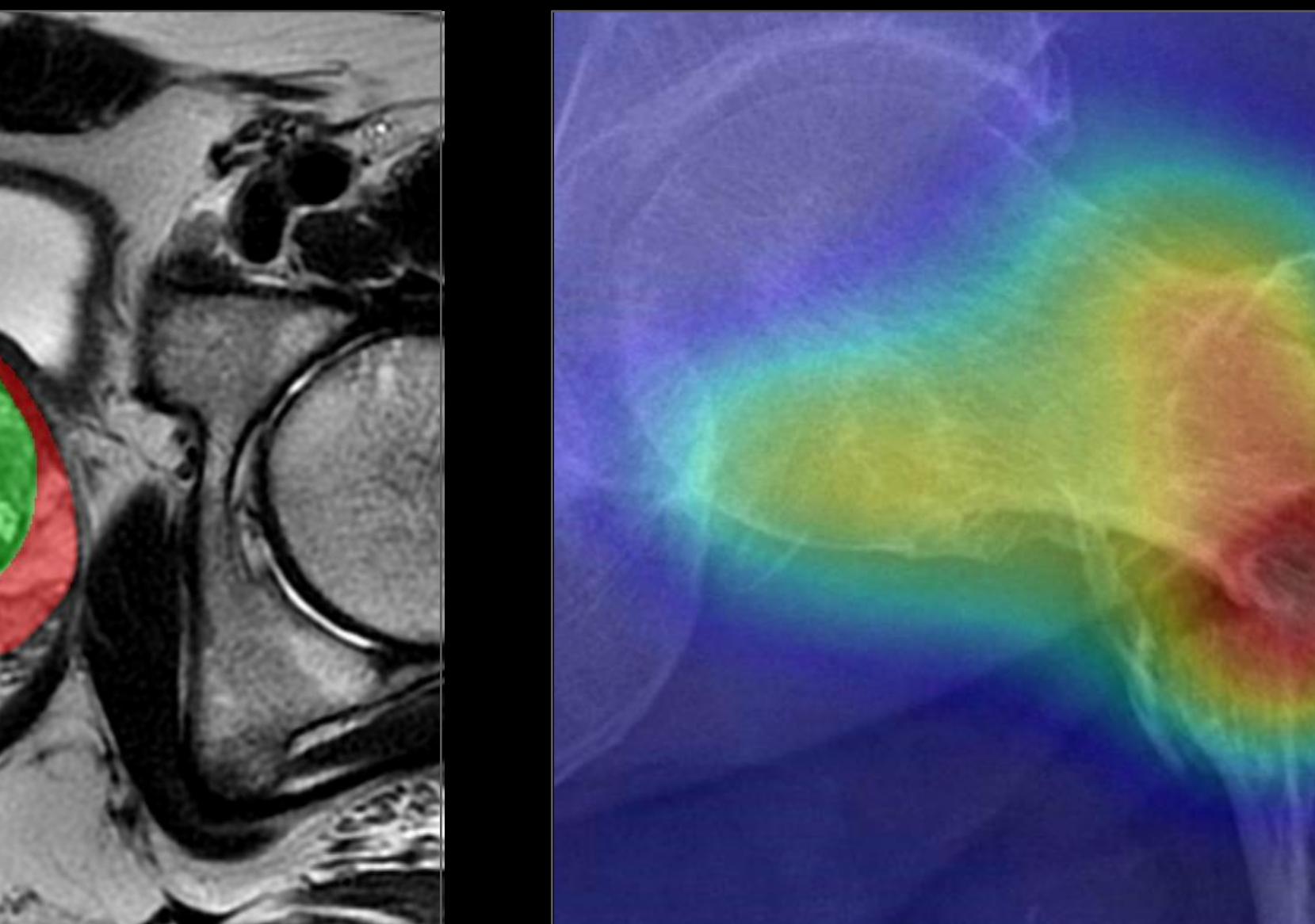
- AI-Assisted Annotation – Hours to Minutes
- 10x Less Training Data Needed
- 13 Pre-Trained Models
- Reference Training and Deployment Pipelines

Available at [developer.nvidia.com/clara](https://developer.nvidia.com/clara)

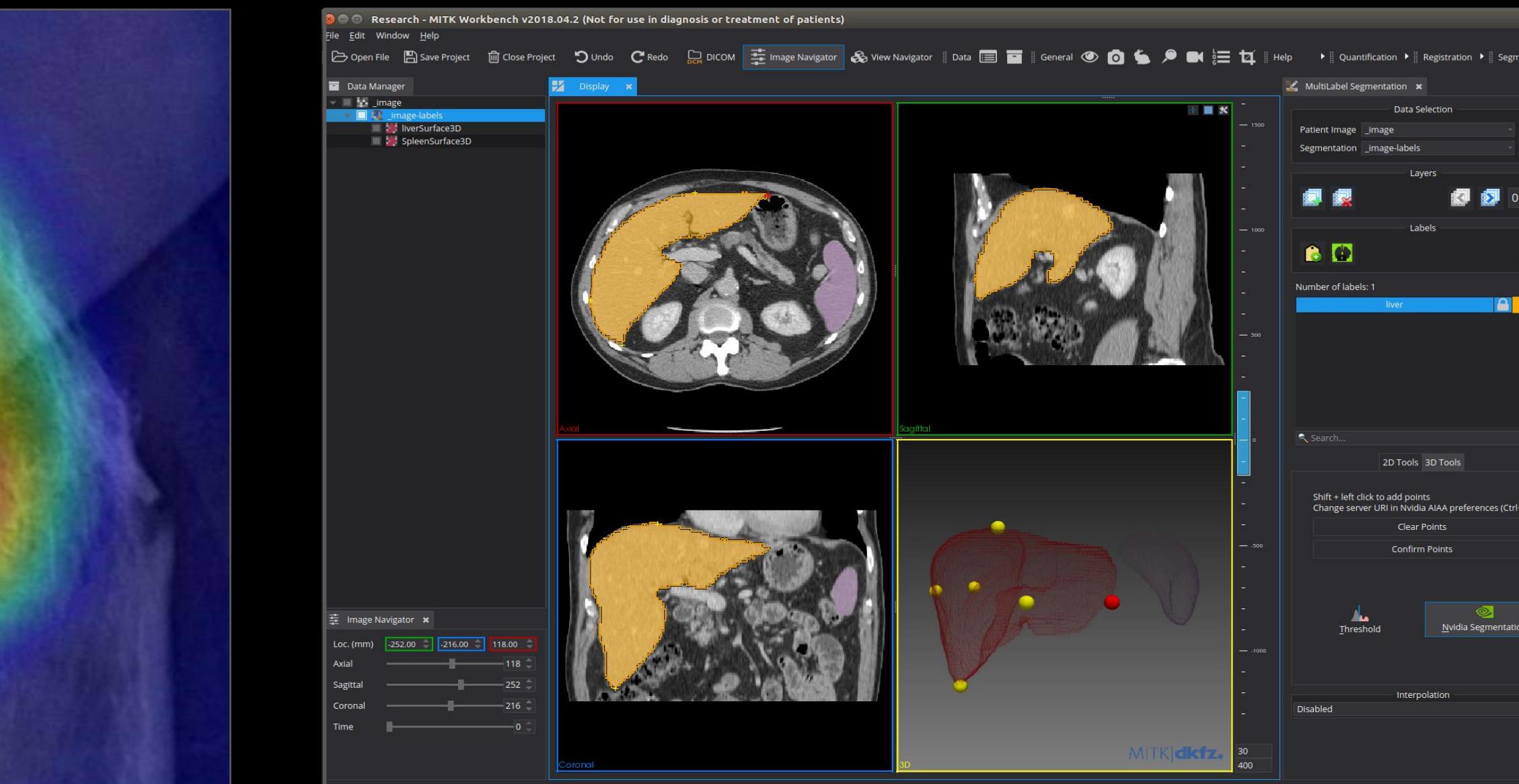
# CLARA AI – BUILT FOR RADIOLOGY



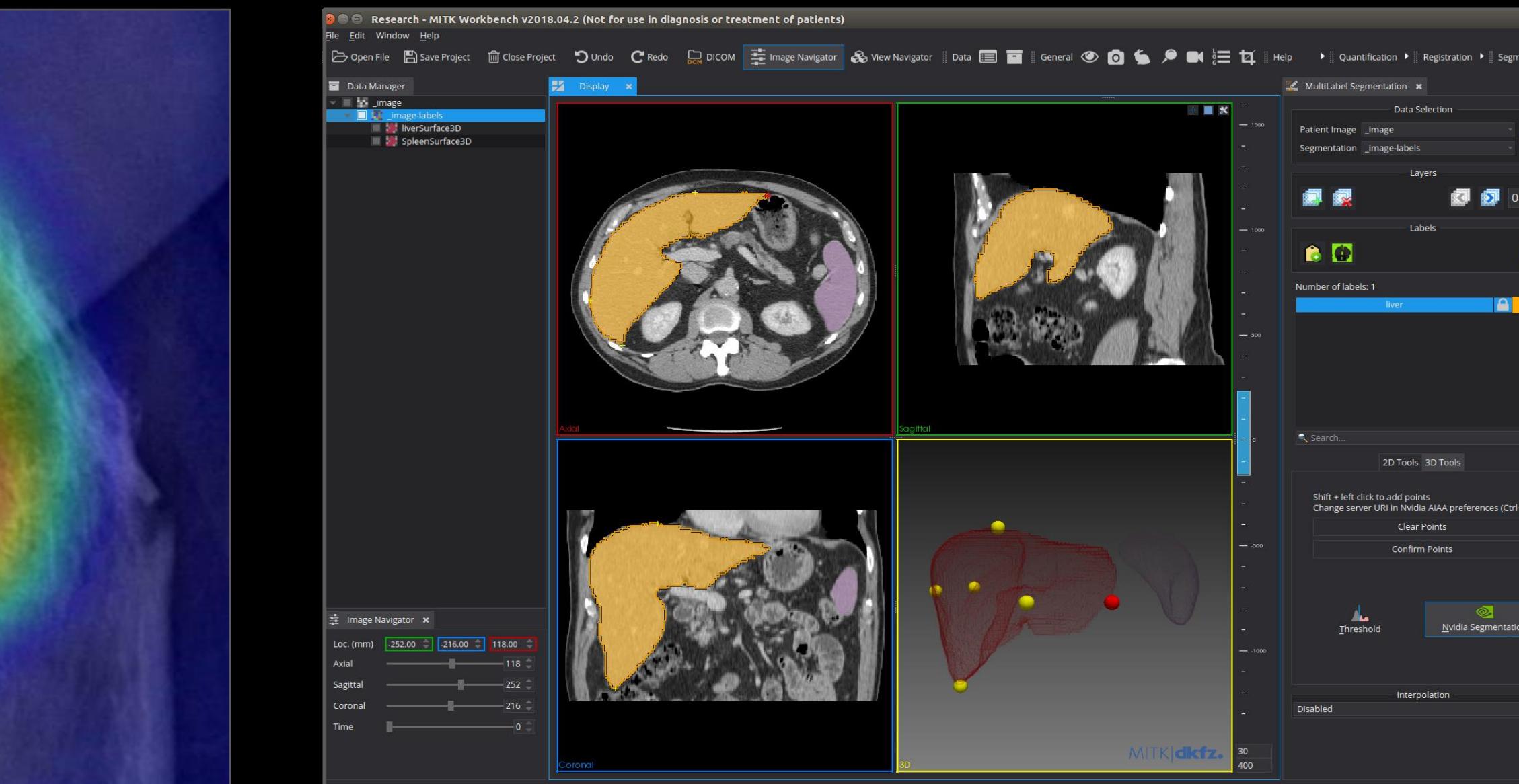
**MGH**  
3D Annotation from Hours to Minutes



**NIH**  
Trained State-of-the-Art Model in Weeks

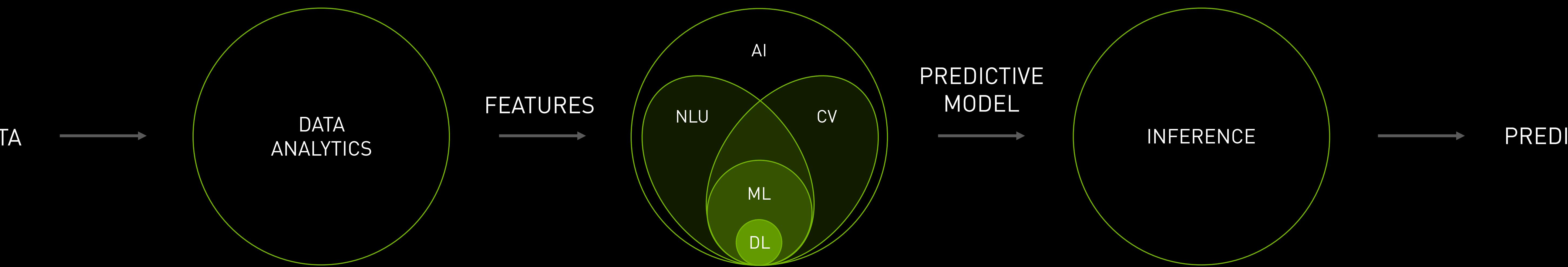


**OSU**  
Clinical Model Deployment in Less Than 24 hours



**DKFZ**  
Clara AI Annotation Integrated in MITK Open Source Viewer

# DATA SCIENCE IS THE NEW HPC CHALLENGE





25 million customers in 40+ states in US



500K access points  
1TB | day

DATALOGUE

o m n i • s c i RAPIDS TRACE3

## WiFi Access Points - Feb 2019 - Historical

aaa\_acct2 · 18,820,845 of 546,722,025



REFRESH



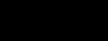
SAVE



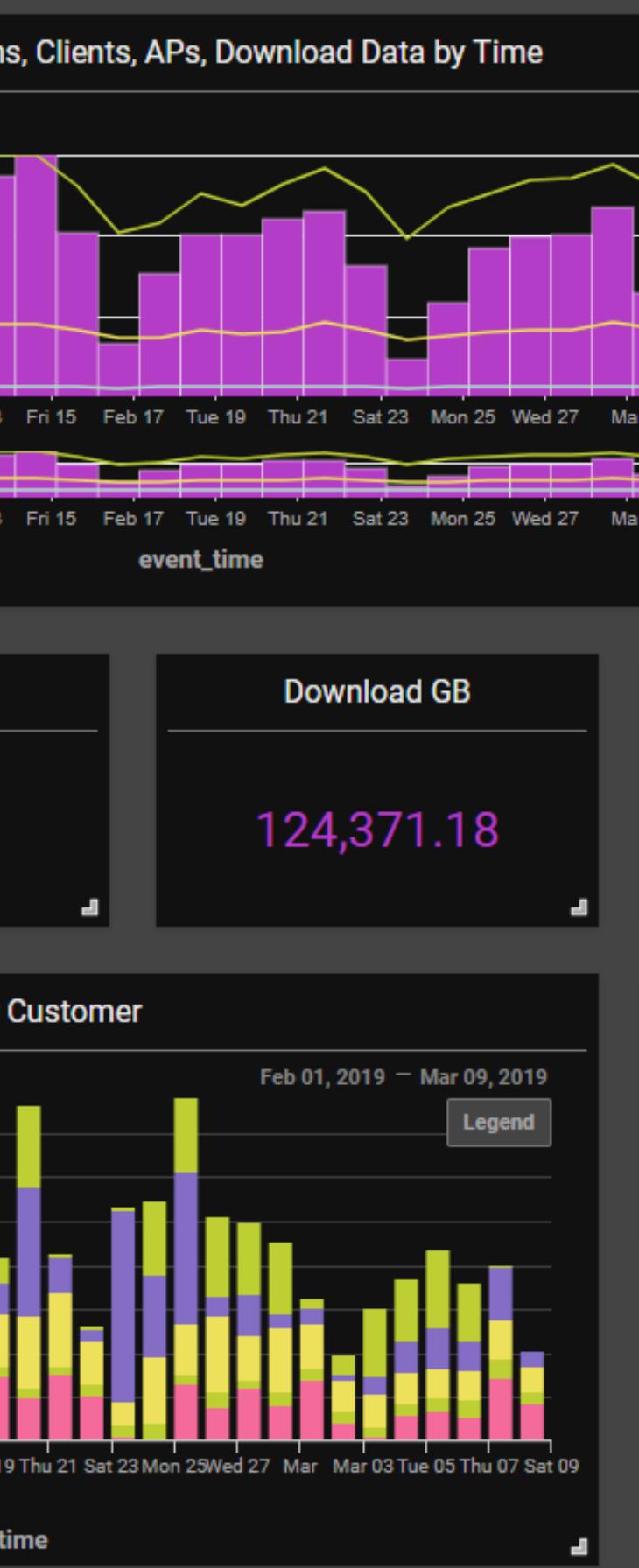
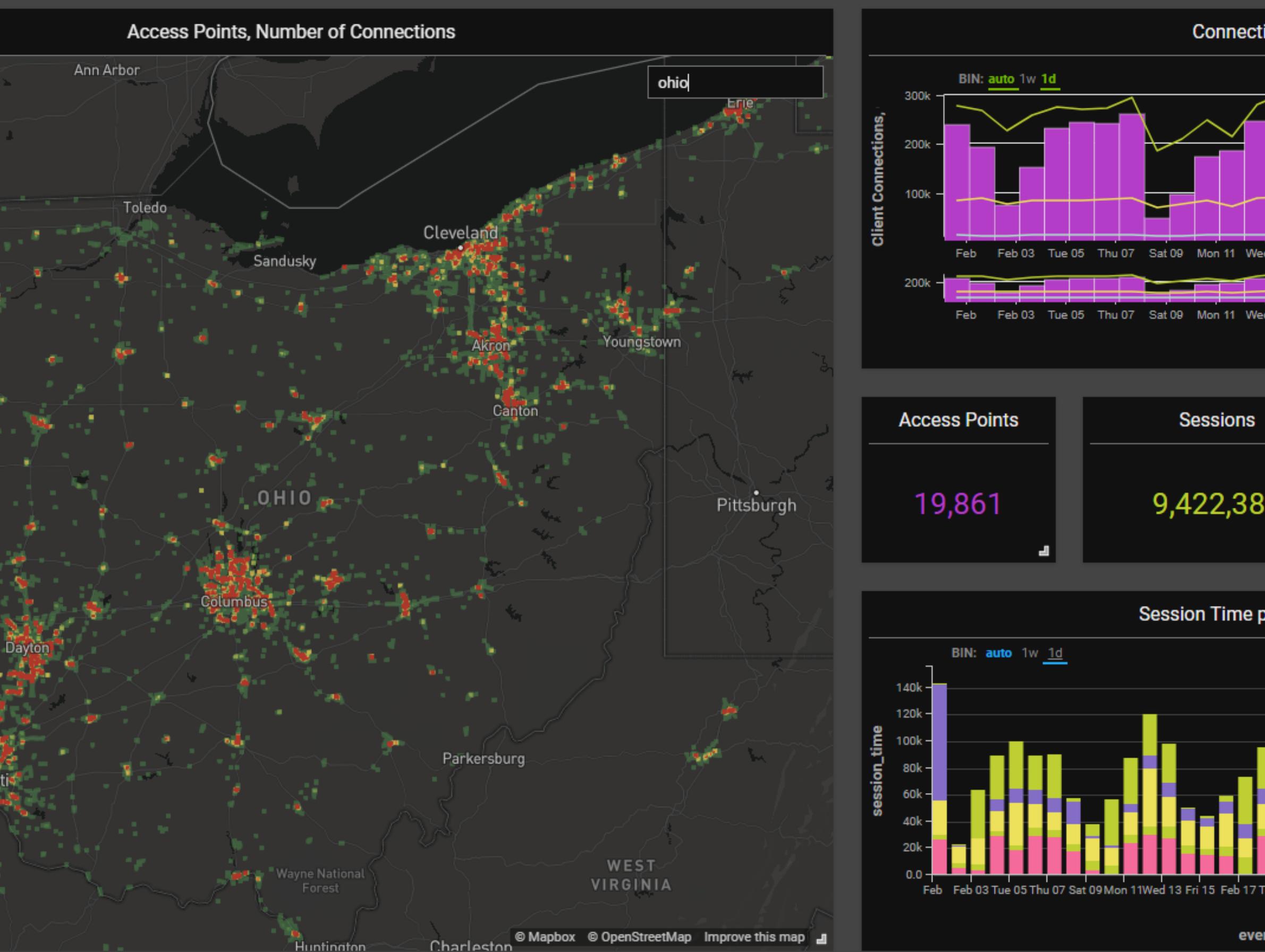
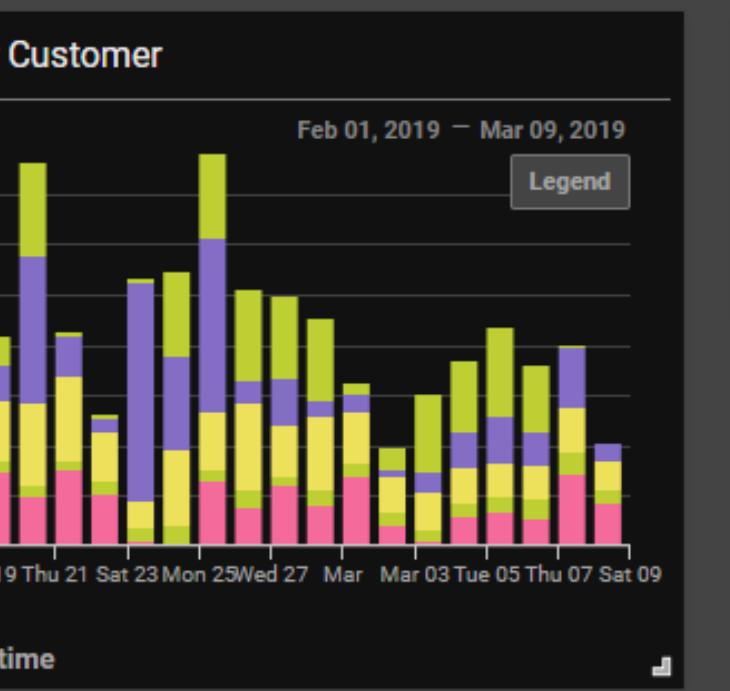
SHARE



DUPLICATE



Add Chart

**Access Points**  
19,861**Sessions**  
9,422,386**Download GB**  
124,371.18**Users**  
333,772

Total Session Time (min)

13,906,376,891

# A WORKSTATION FOR DATA SCIENTISTS



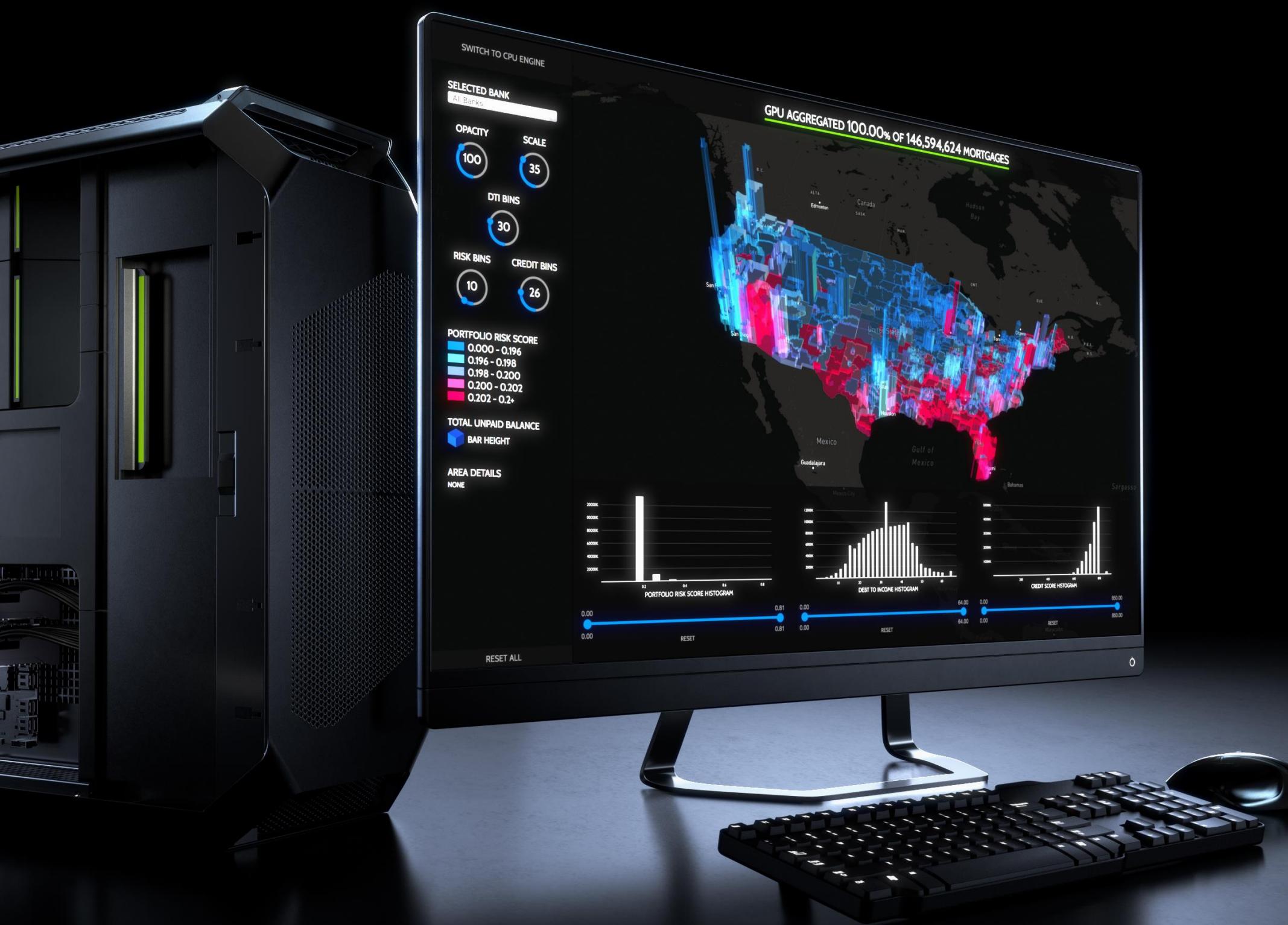
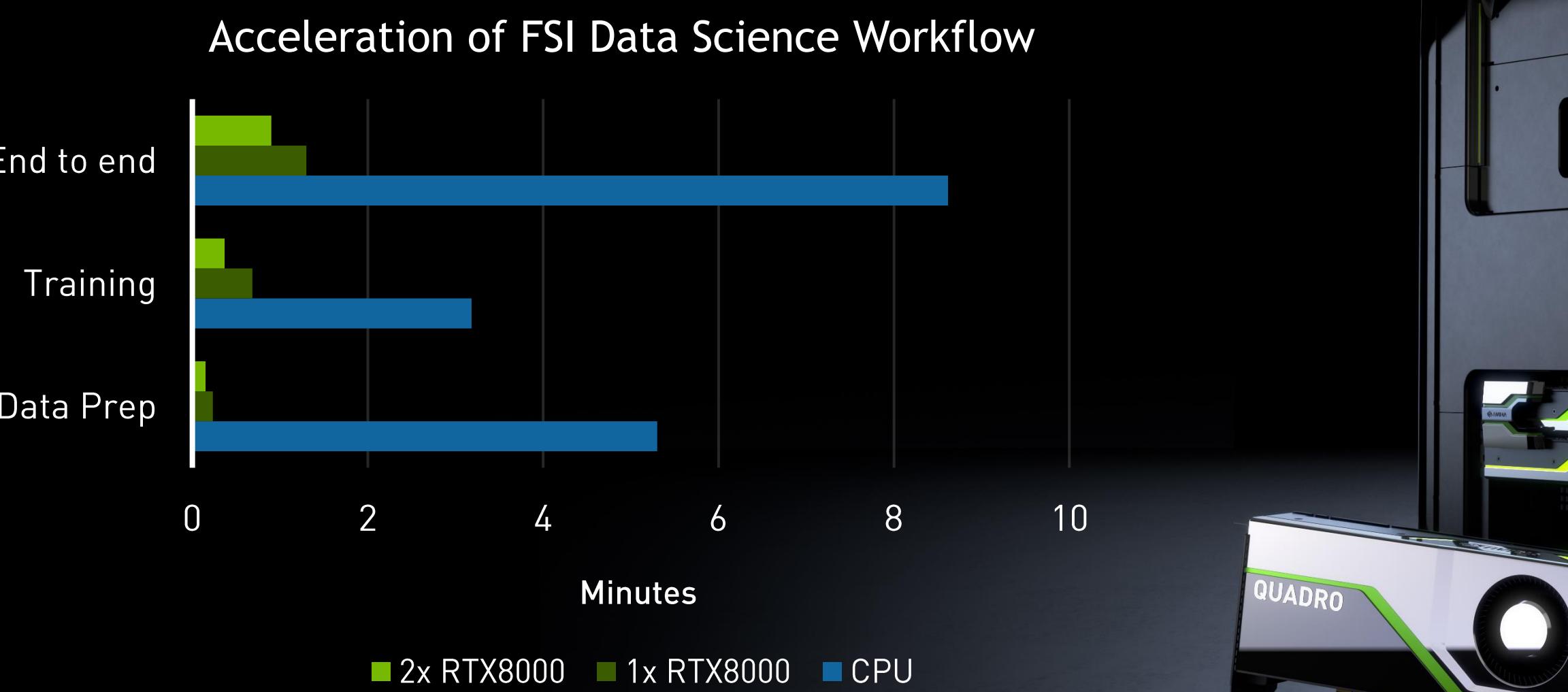
POWERED BY NVIDIA GPU AND CUDA-X AI

Dual Quadro RTX 8000 with 96 GB Memory

Pre-installed for CUDA-X Accelerated Data Science —  
RAPIDS, TensorFlow, PyTorch, Caffe, Anaconda Distribution

10X Faster

# A WORKSTATION FOR DATA SCIENTISTS



POWERED BY NVIDIA GPU AND CUDA-X AI

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RAPIDS, TensorFlow, PyTorch, Caffe, Anaconda Distribution

10X Faster

# ANNOUNCING WORLD'S TOP COMPUTER MAKERS OFFER WORKSTATIONS OPTIMIZED FOR DATA SCIENCE



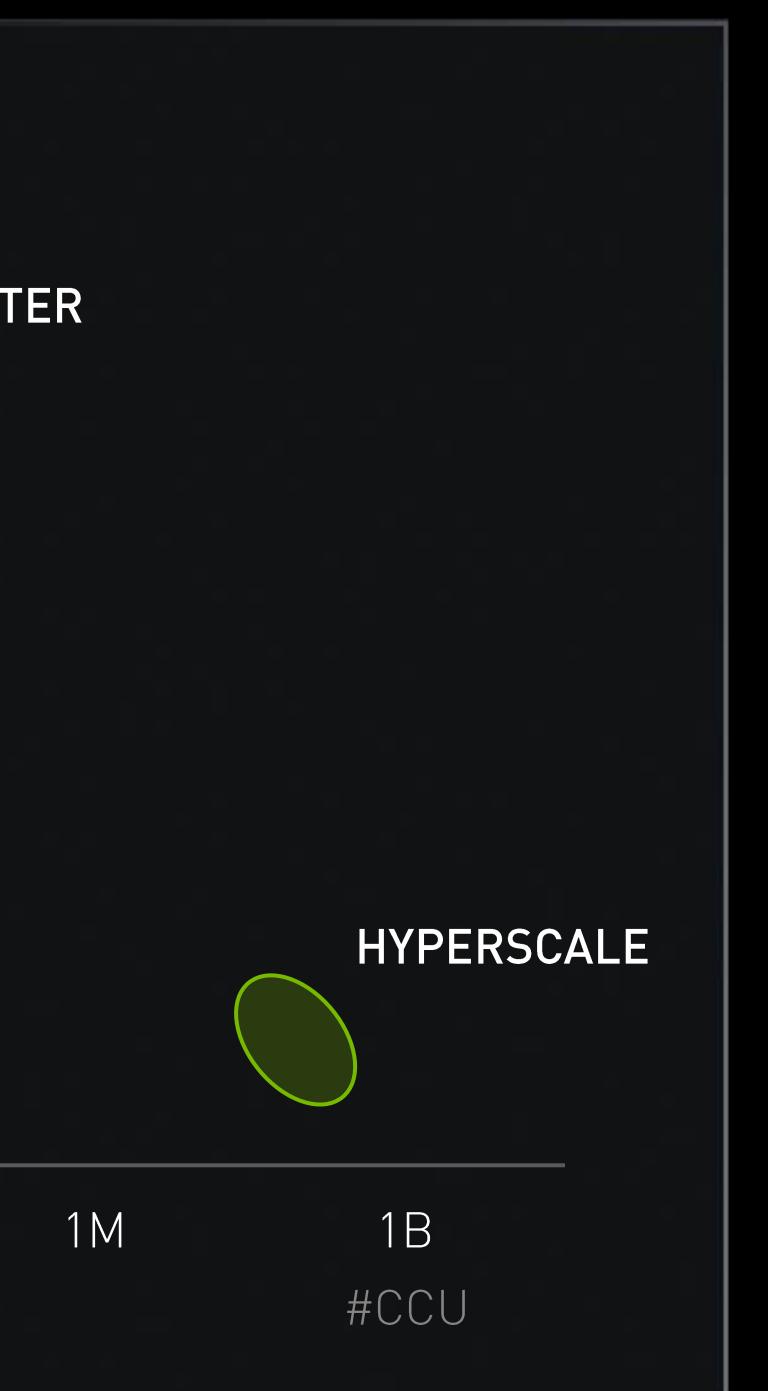
POWERED BY NVIDIA GPU AND CUDA-X AI

Dual Quadro RTX 8000 with 96 GB Memory

Pre-installed for CUDA-X Accelerated Data Science —  
RAPIDS, TensorFlow, PyTorch, Caffe, Anaconda Distribution

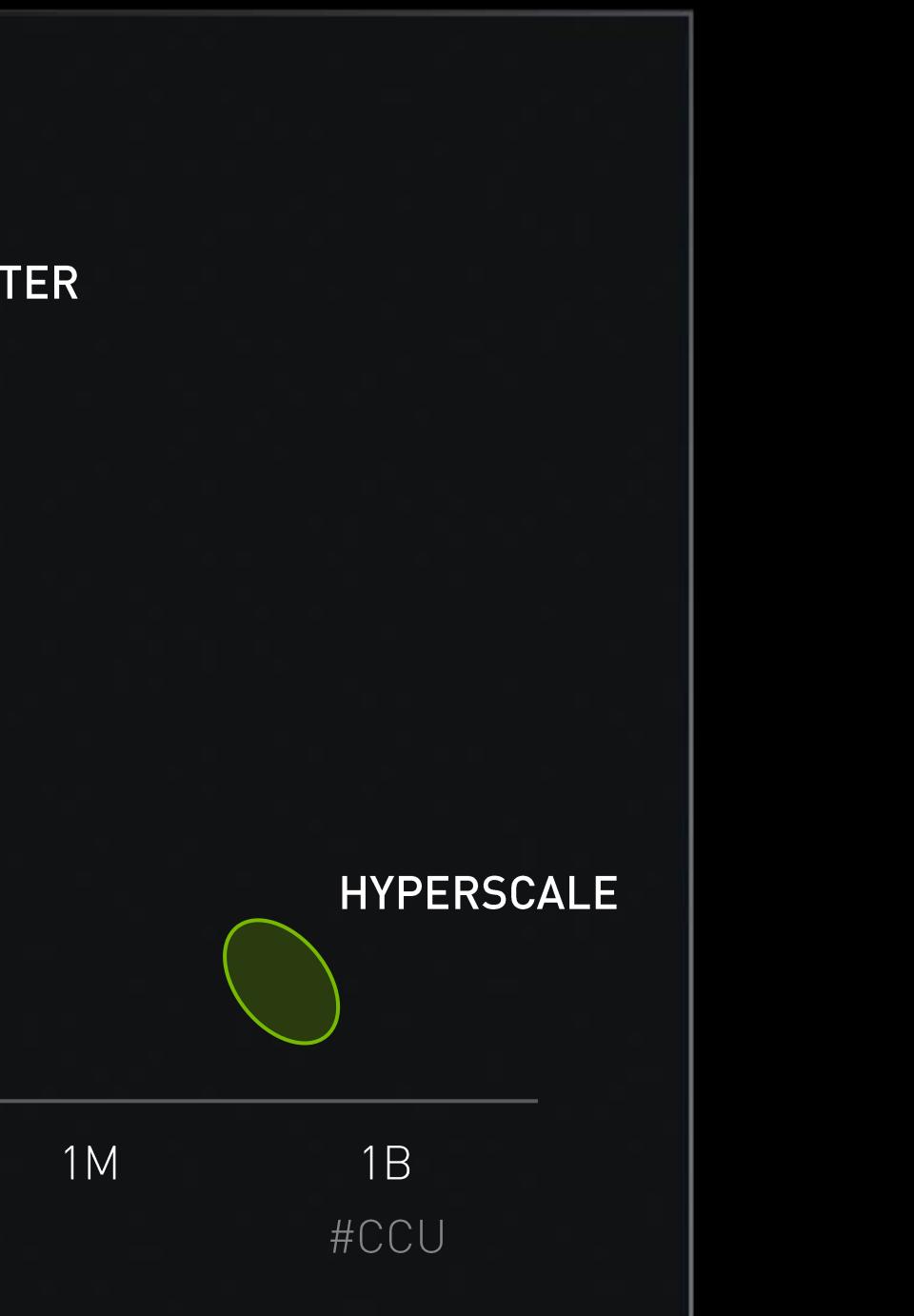
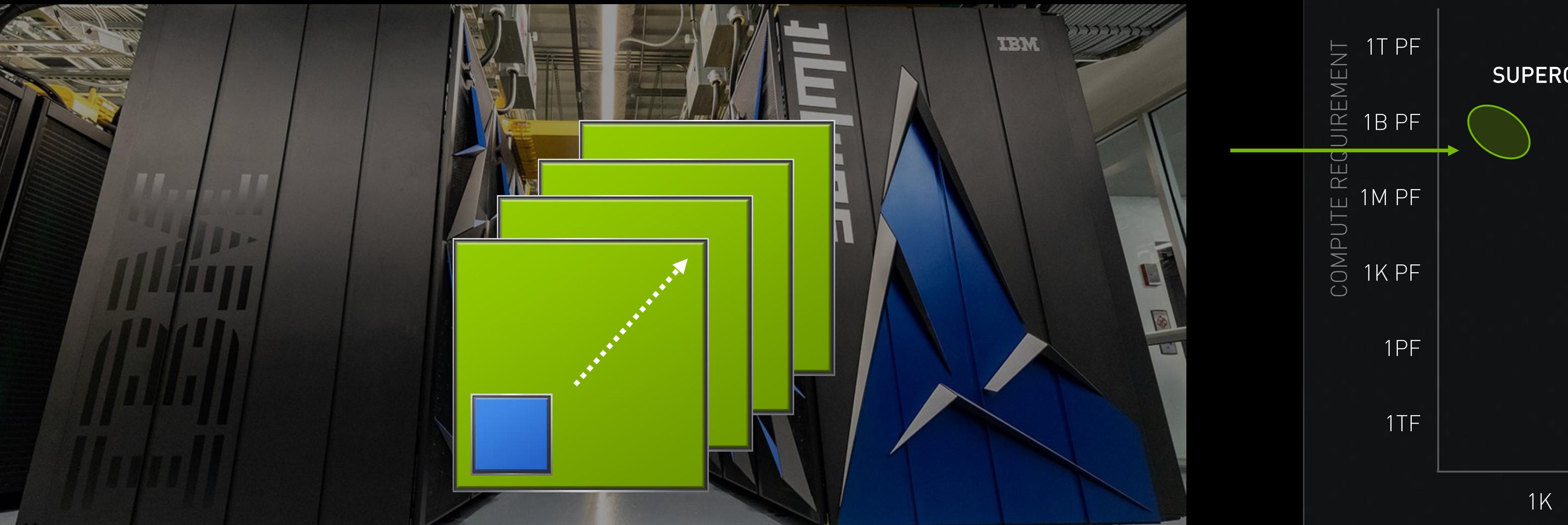
10X Faster

# SUPERCOMPUTER vs. HYPERSCALE



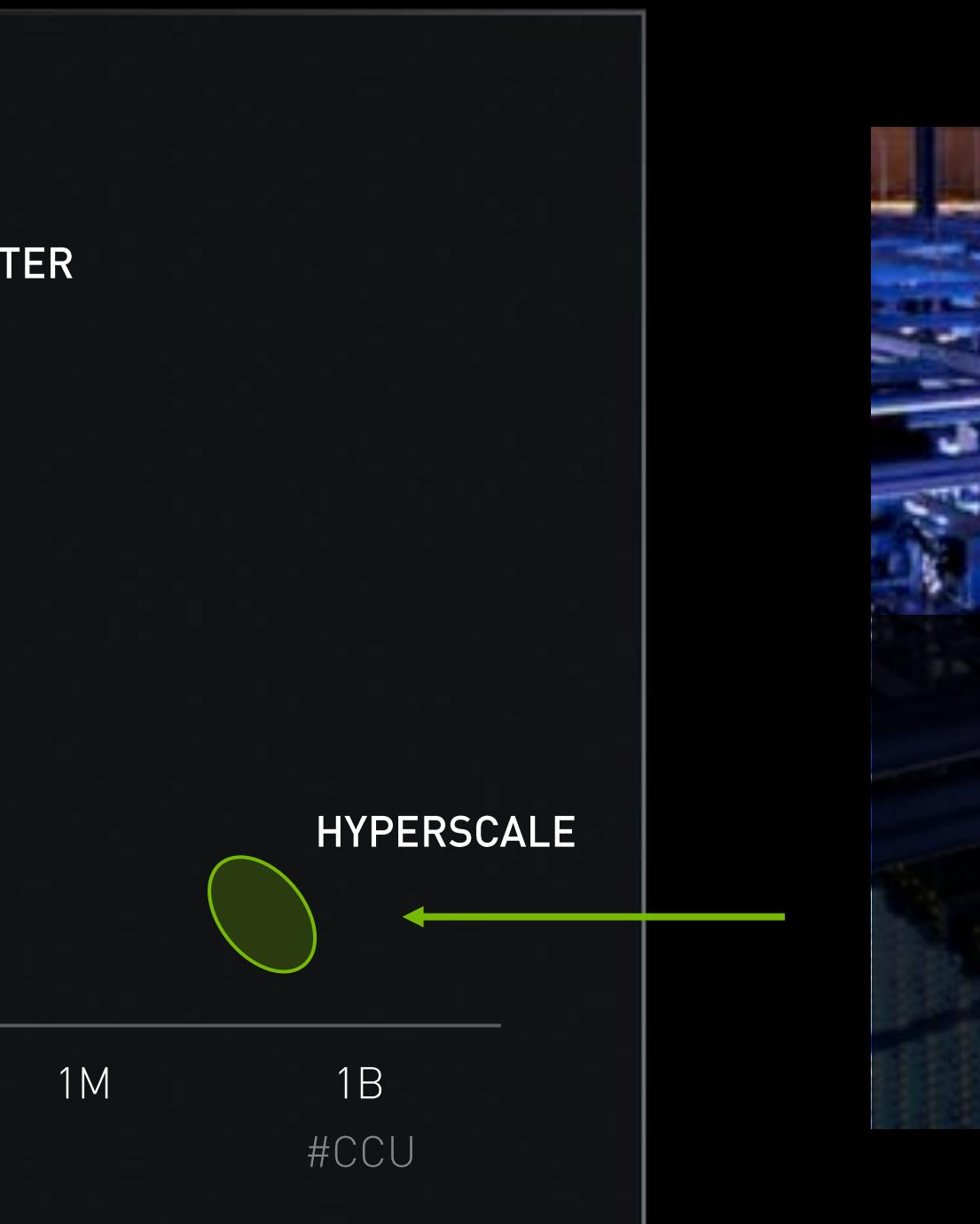
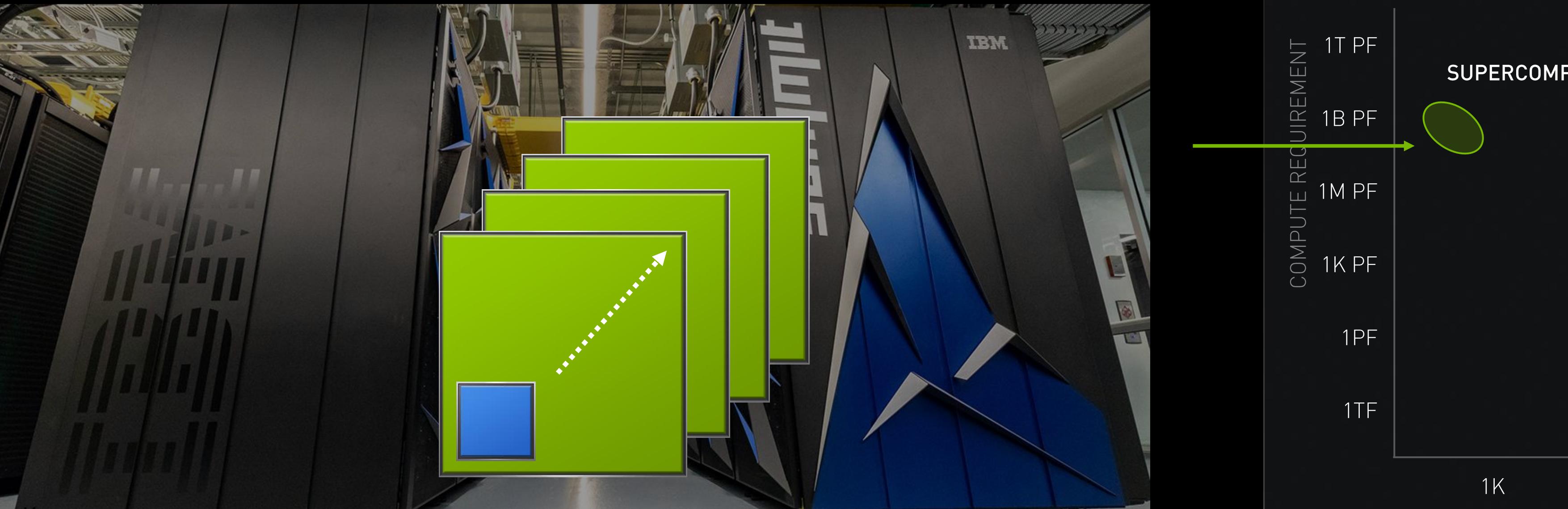
# SUPERCOMPUTER vs. HYPERSCALE

Supercomputer | Capability Machine | Scale-up Architecture

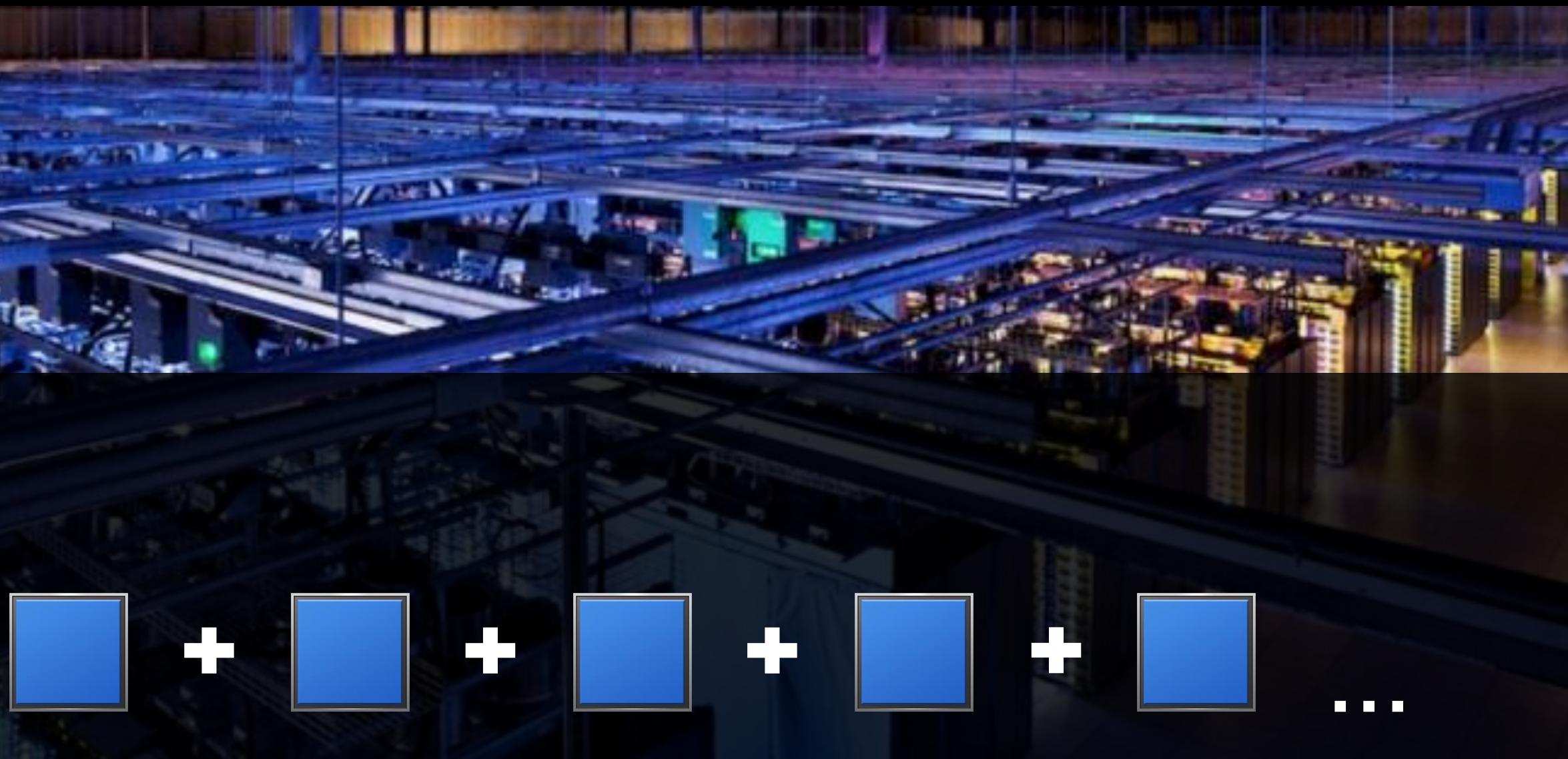


# SUPERCOMPUTER vs. HYPERSCALE

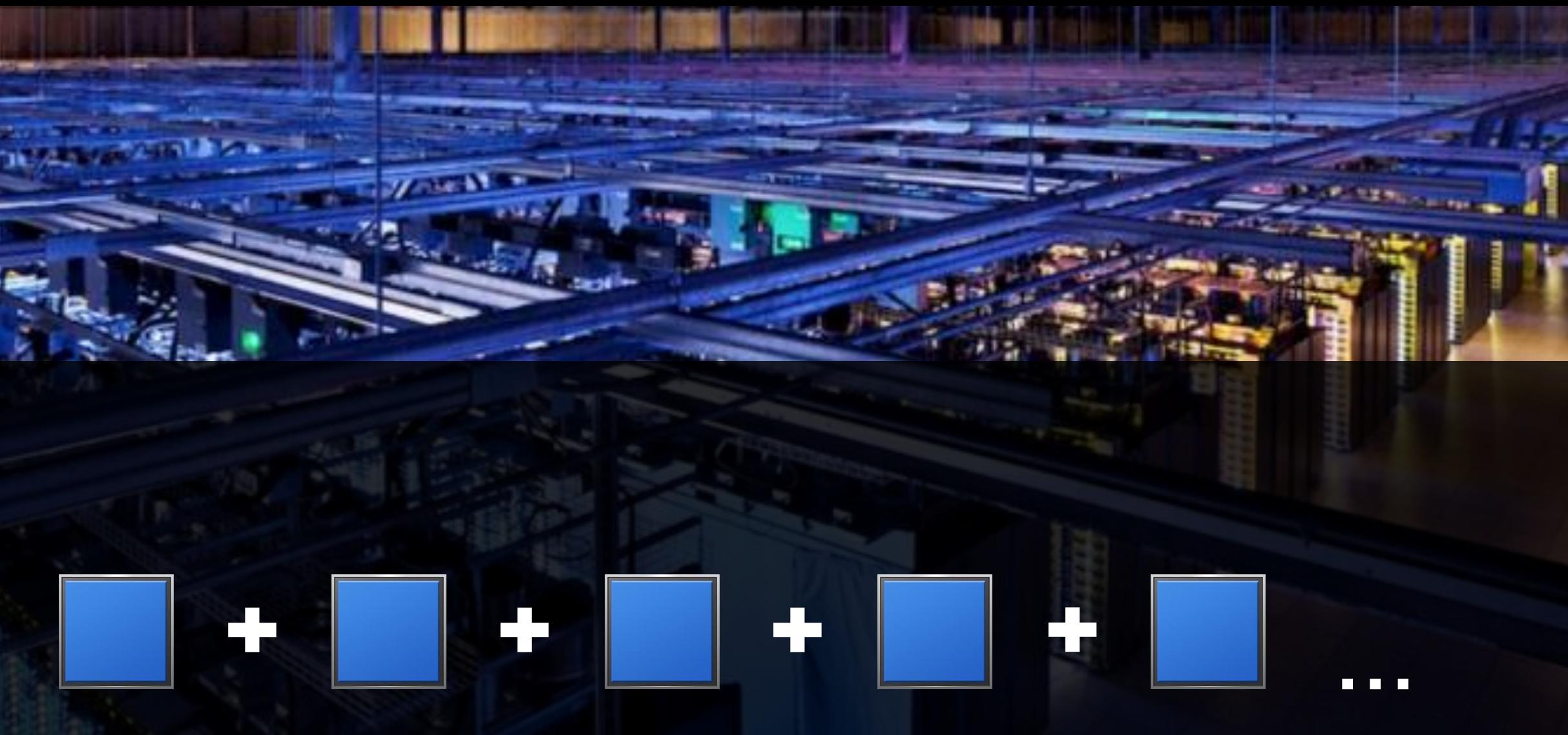
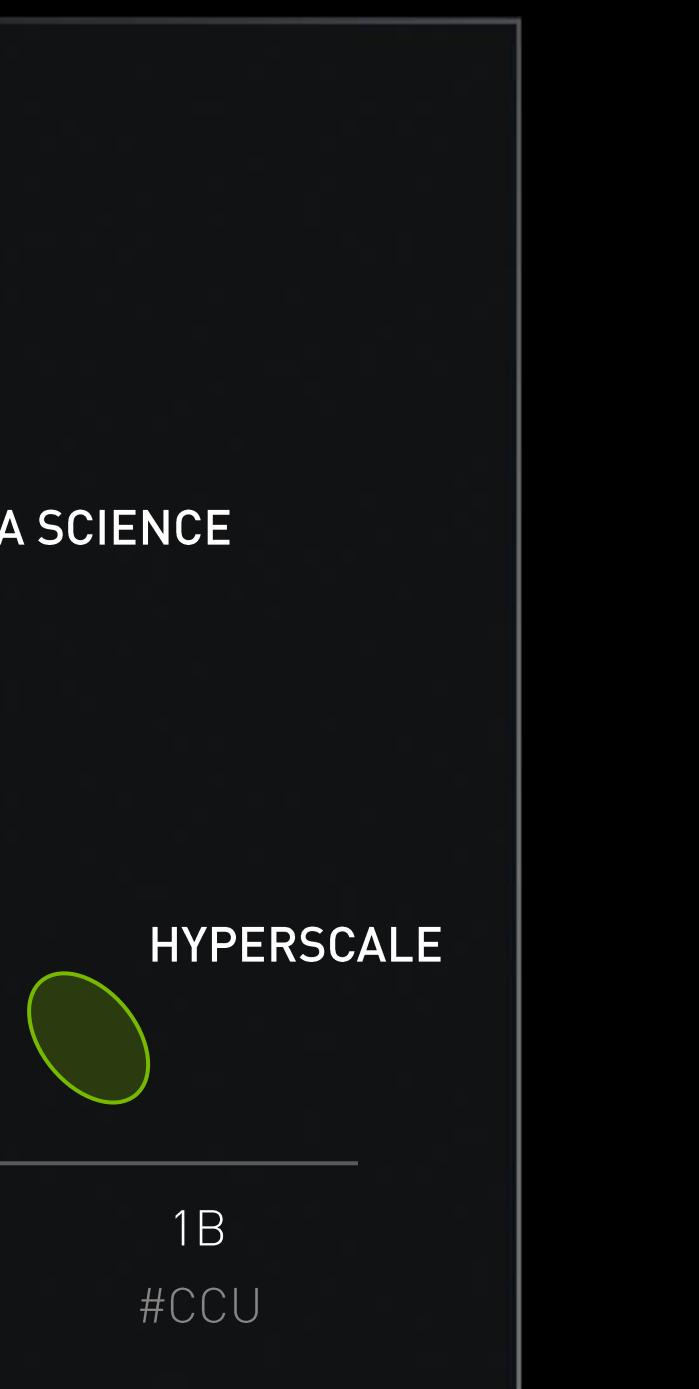
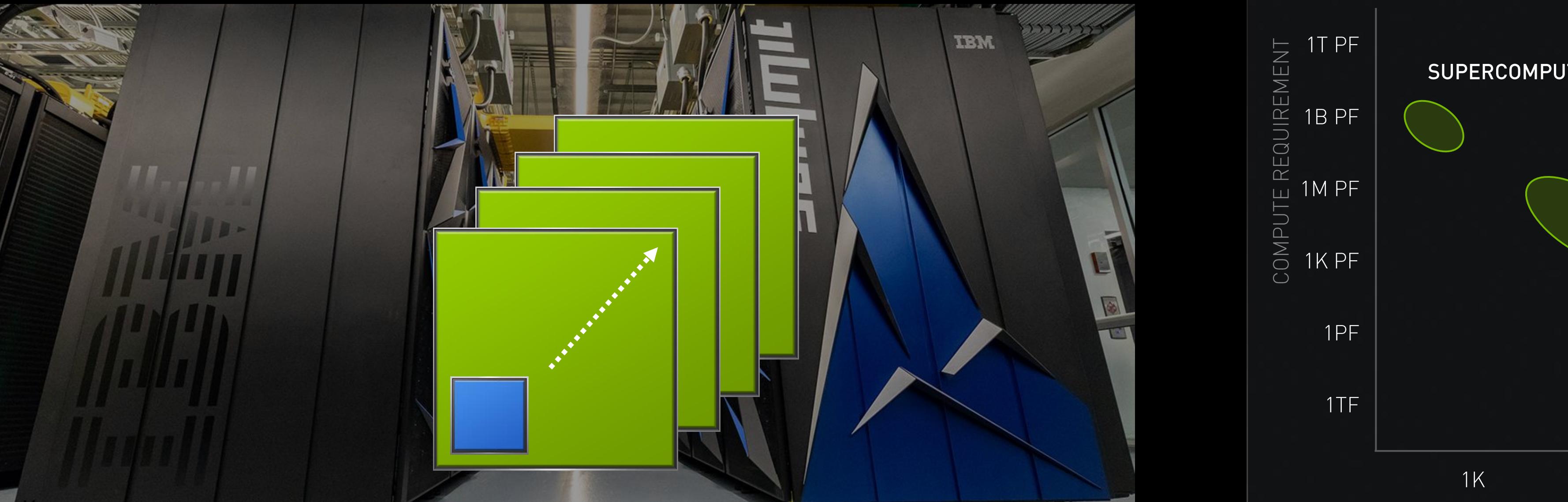
Supercomputer | Capability Machine | Scale-up Architecture



Hyscale | Capacity Machine | Scale-out Architecture



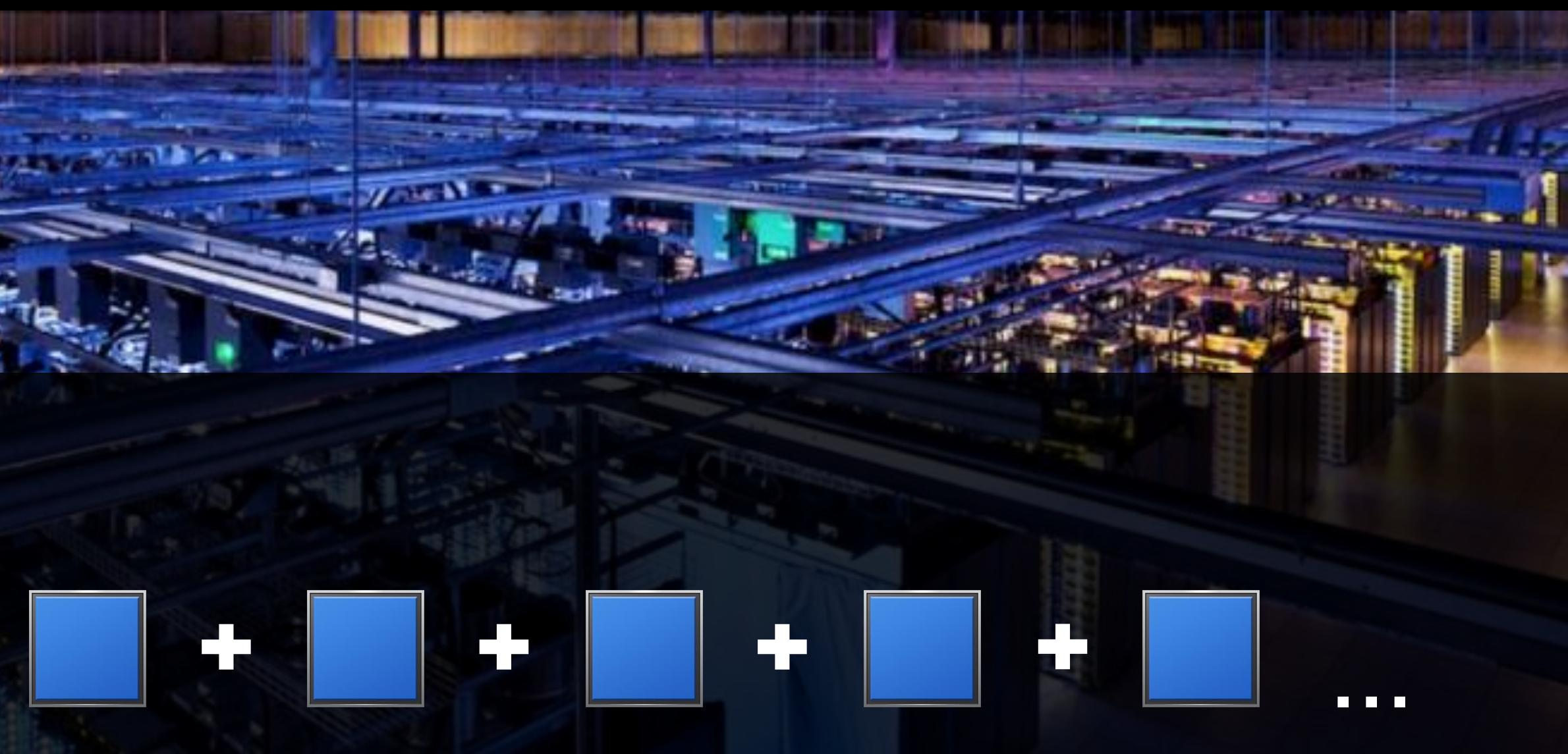
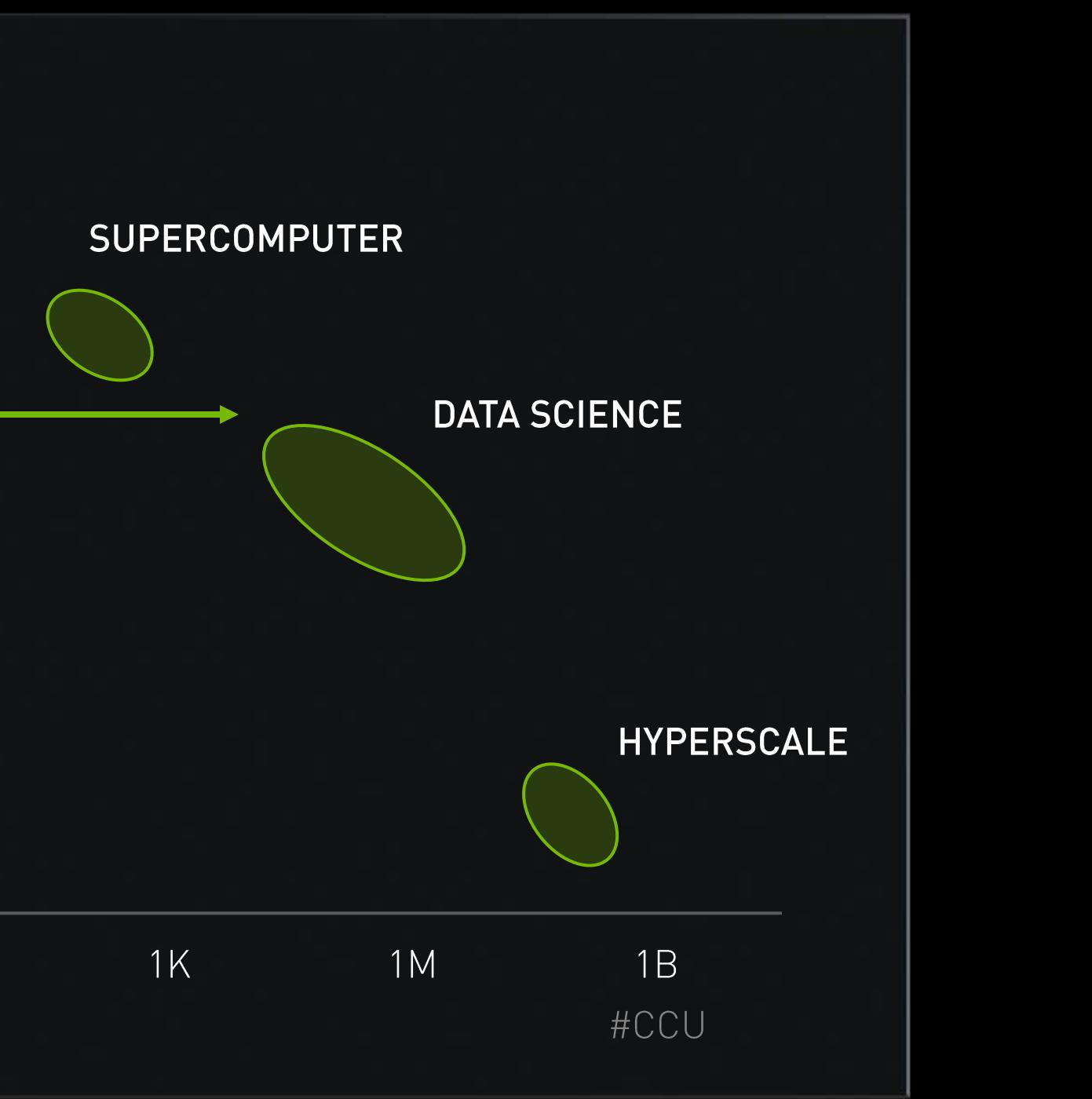
# DATA SCIENCE – THE NEW HPC CHALLENGE



# DATA SCIENCE – THE NEW HPC CHALLENGE



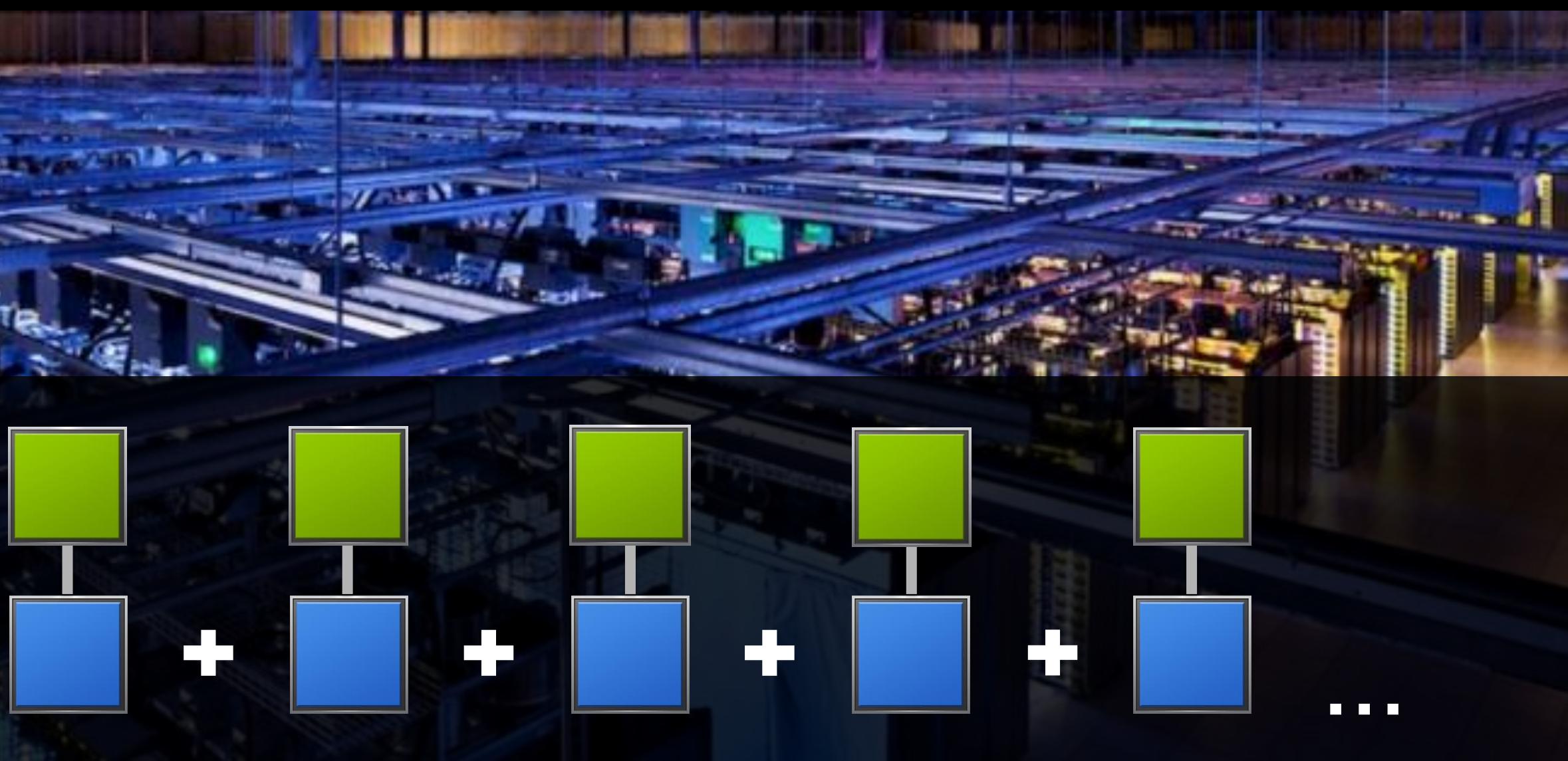
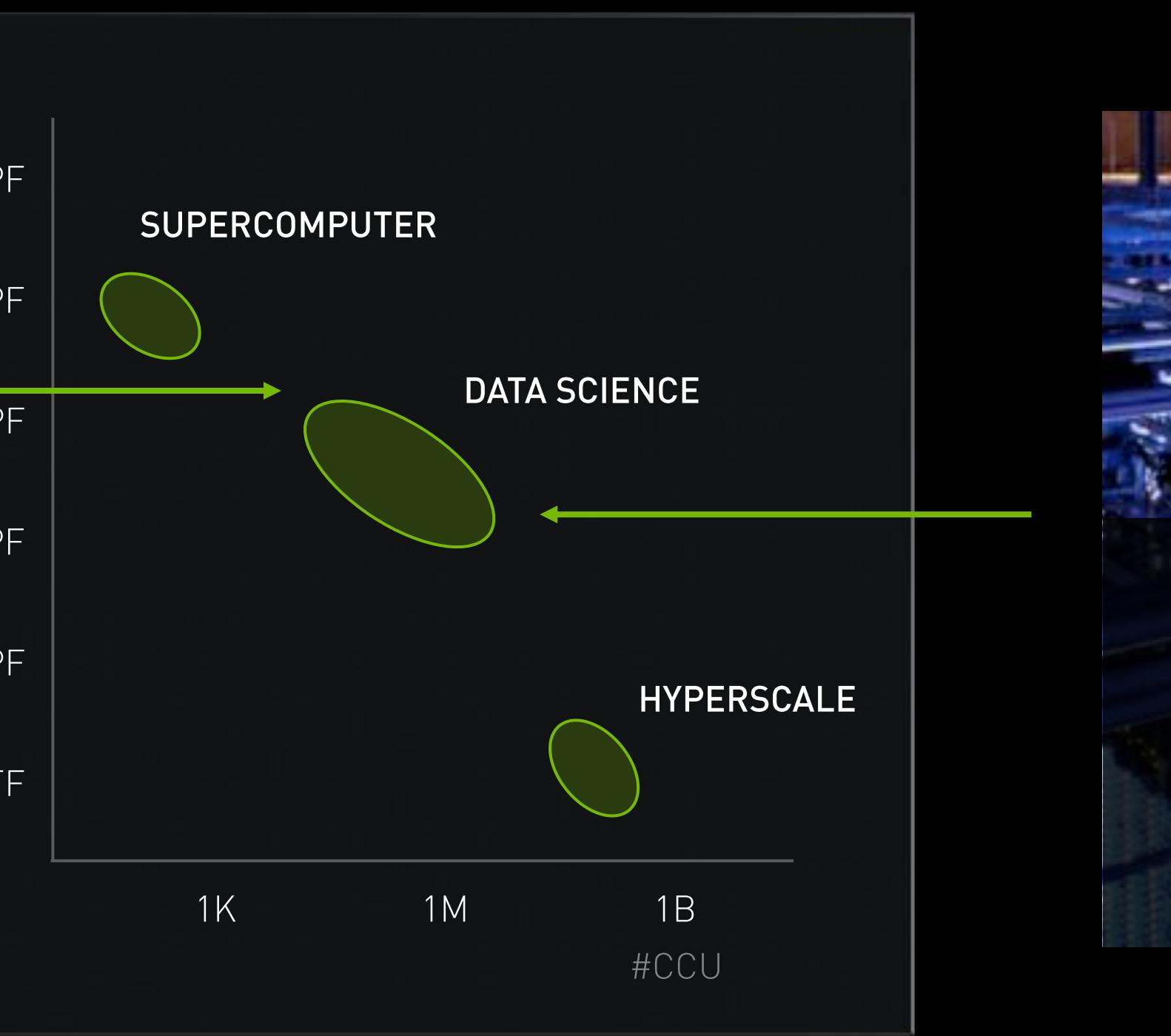
NVIDIA DGX-2  
AI Supercomputer Appliance  
16x V100 | 2 PF | 512GB HBM2  
8x MLNX IB



# DATA SCIENCE – THE NEW HPC CHALLENGE



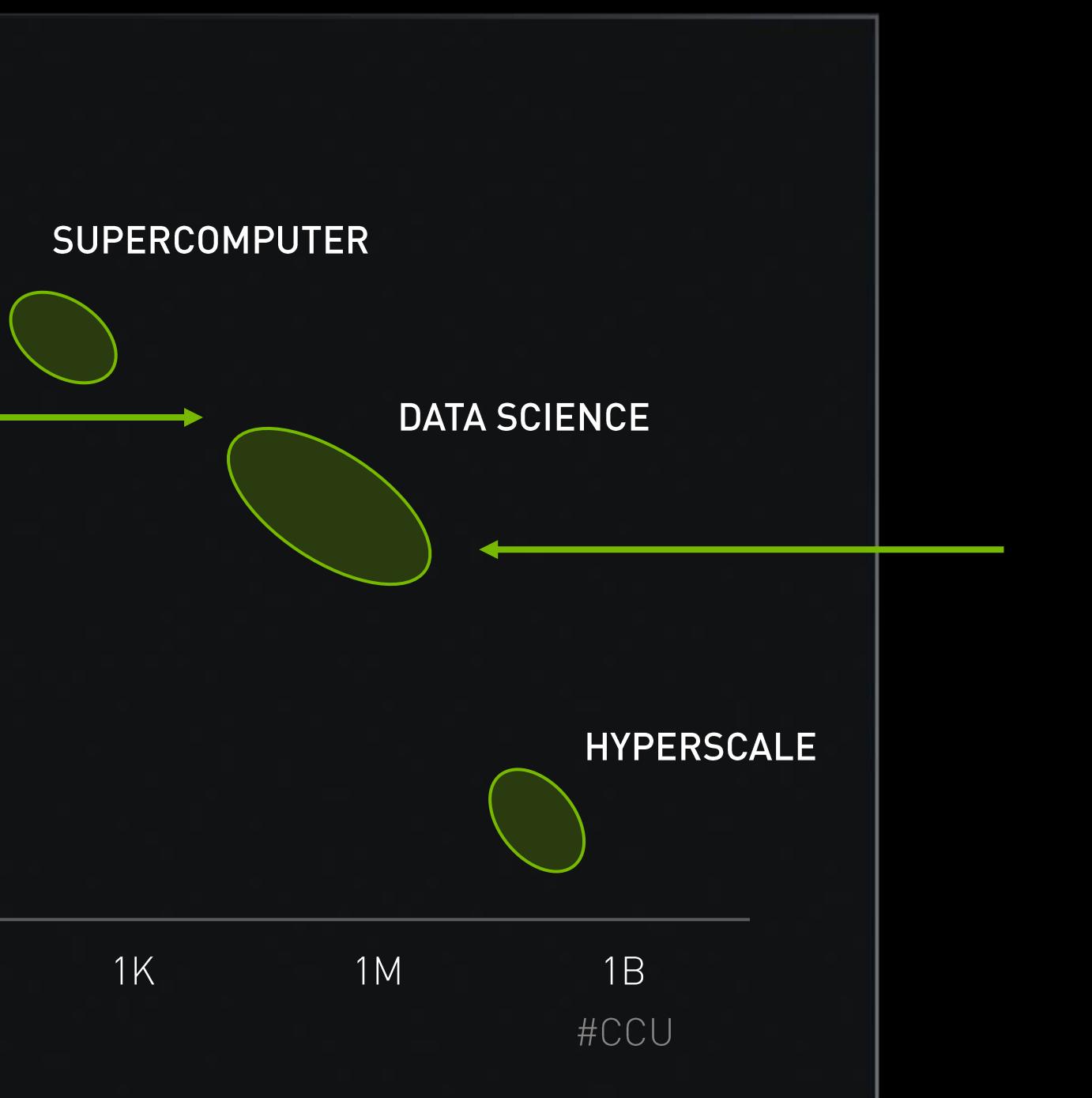
NVIDIA DGX-2  
AI Supercomputer Appliance  
16x V100 | 2 PF | 512GB HBM2  
8x MLNX IB



# DATA SCIENCE – THE NEW HPC CHALLENGE

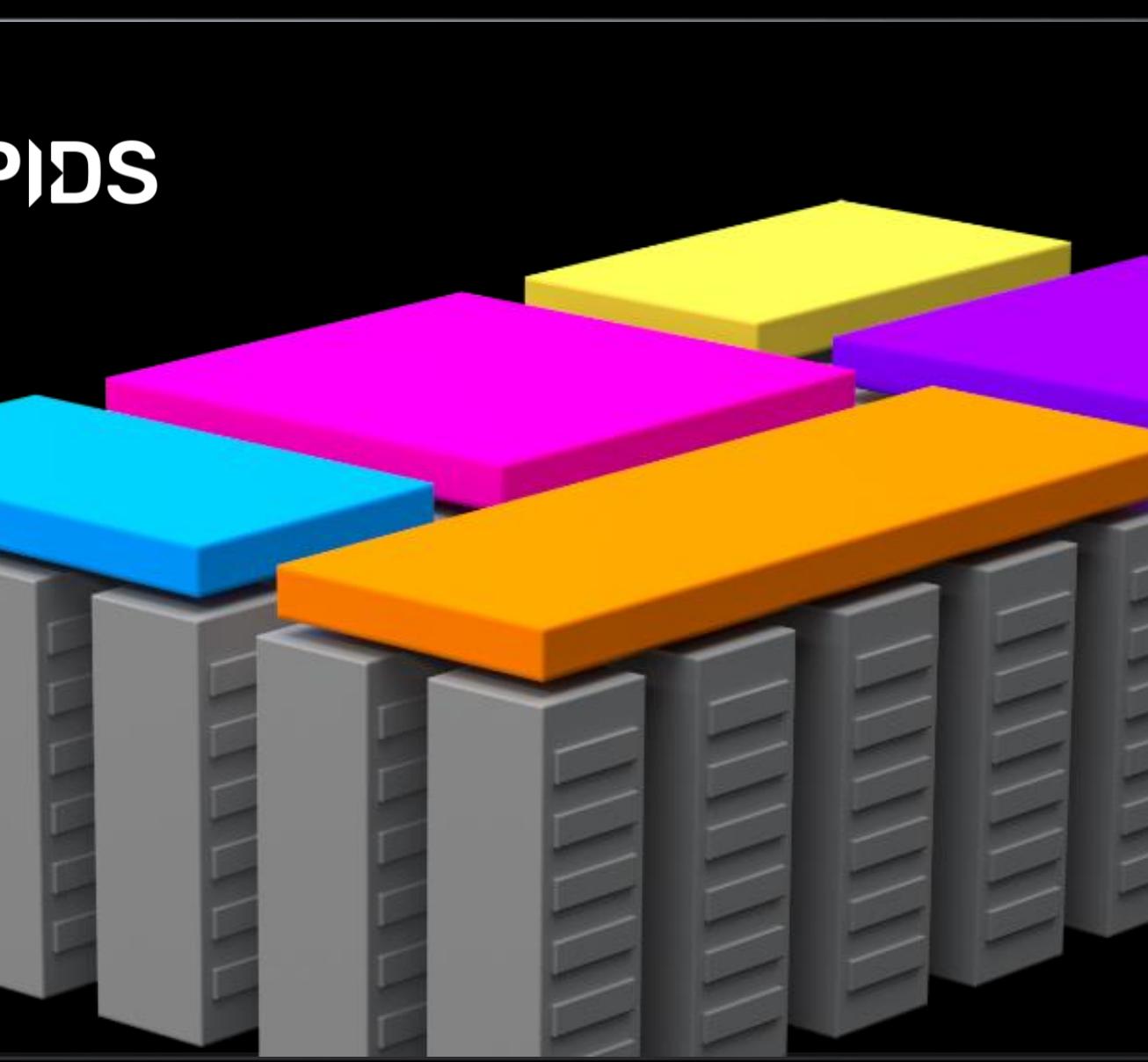
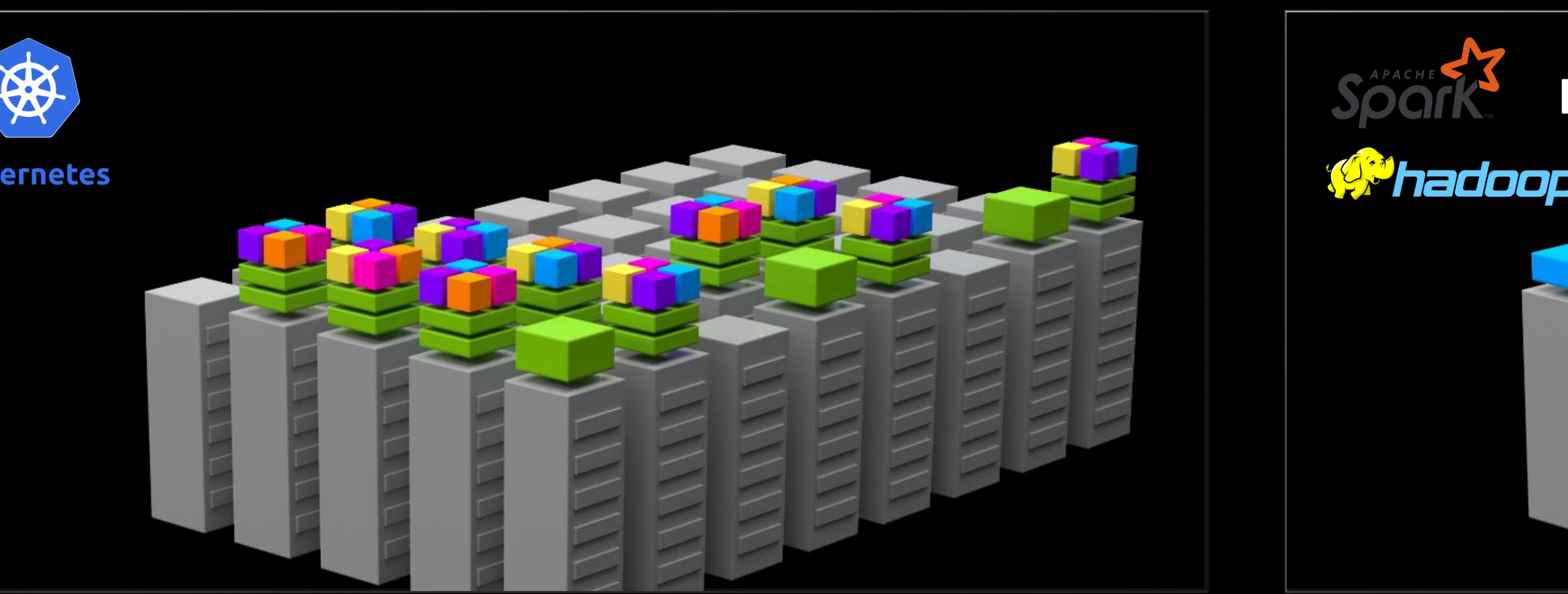


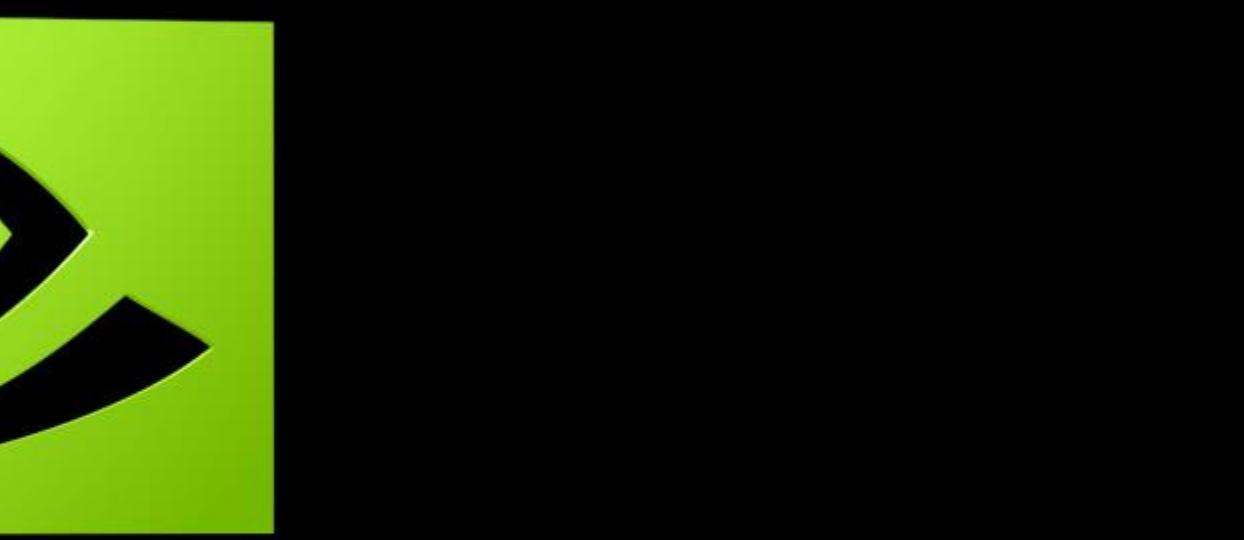
NVIDIA DGX-2  
AI Supercomputer Appliance  
16x V100 | 2 PF | 512GB HBM2  
8x MLNX IB



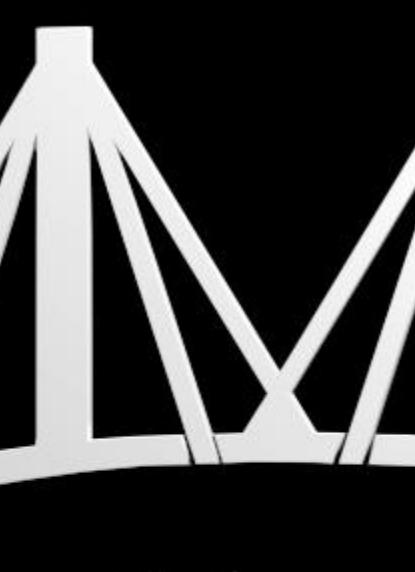
Data Science Server  
4x T4 | 260 TF FP16 | 64GB GDDR6  
MLNX or BRCM EN

# DATACENTER BECOMES A COMPUTE ENGINE

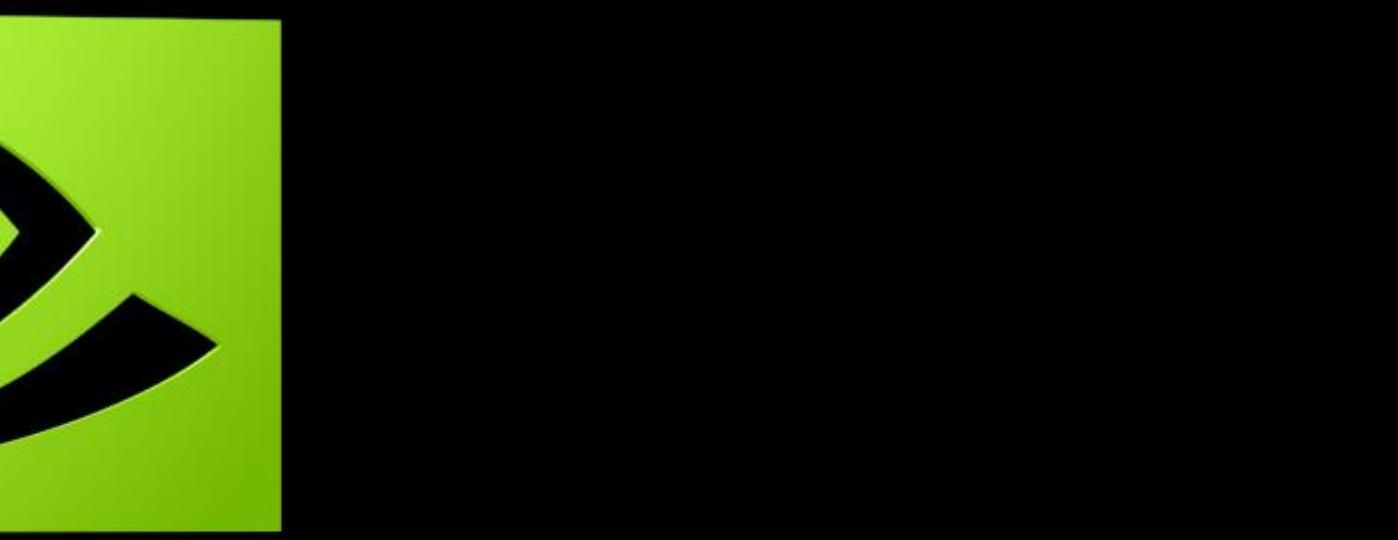




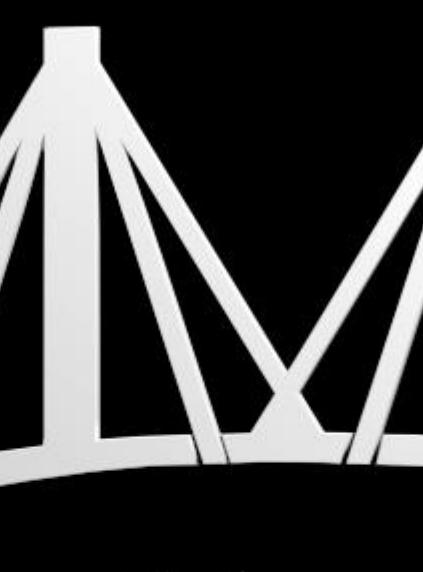
NVIDIA®



Mellanox®  
TECHNOLOGIES



NVIDIA®

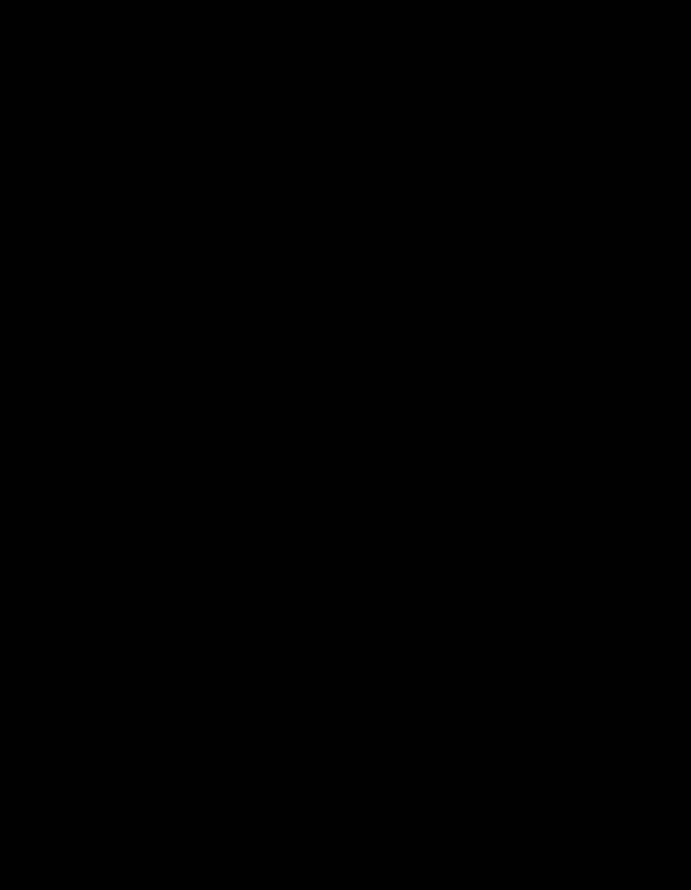
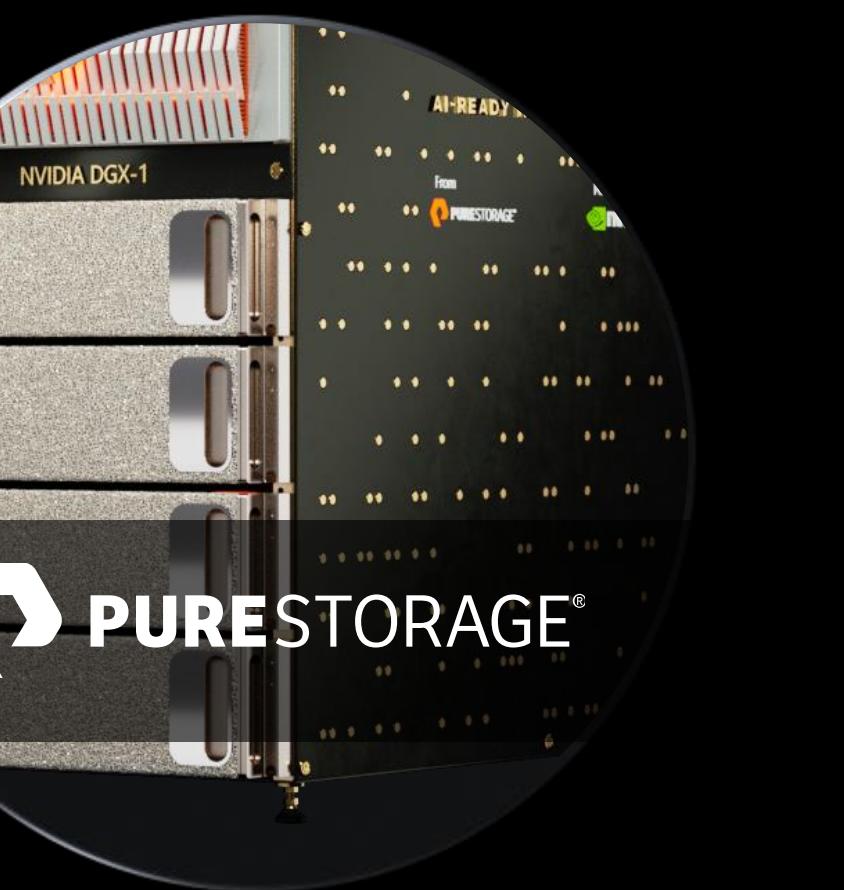
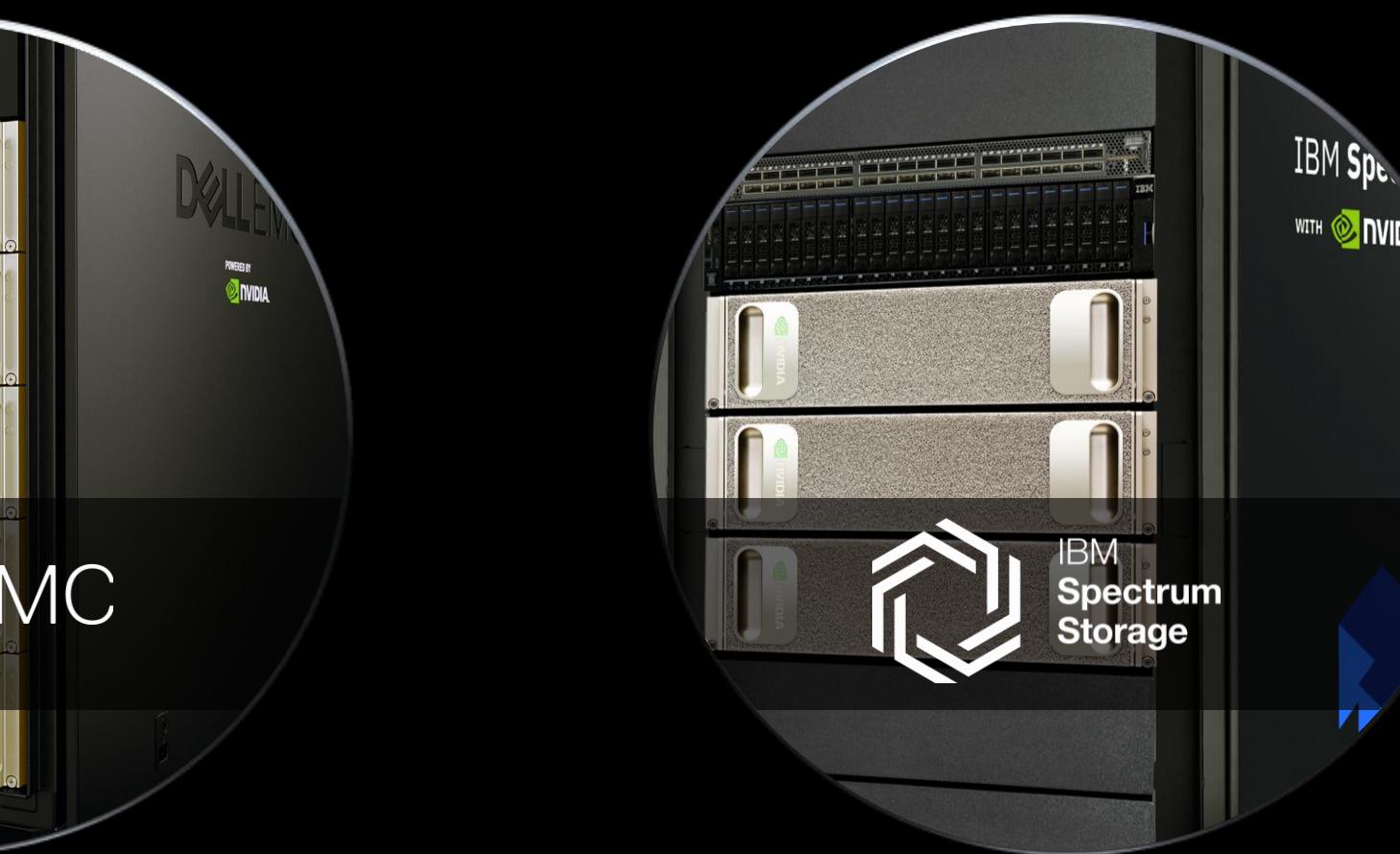
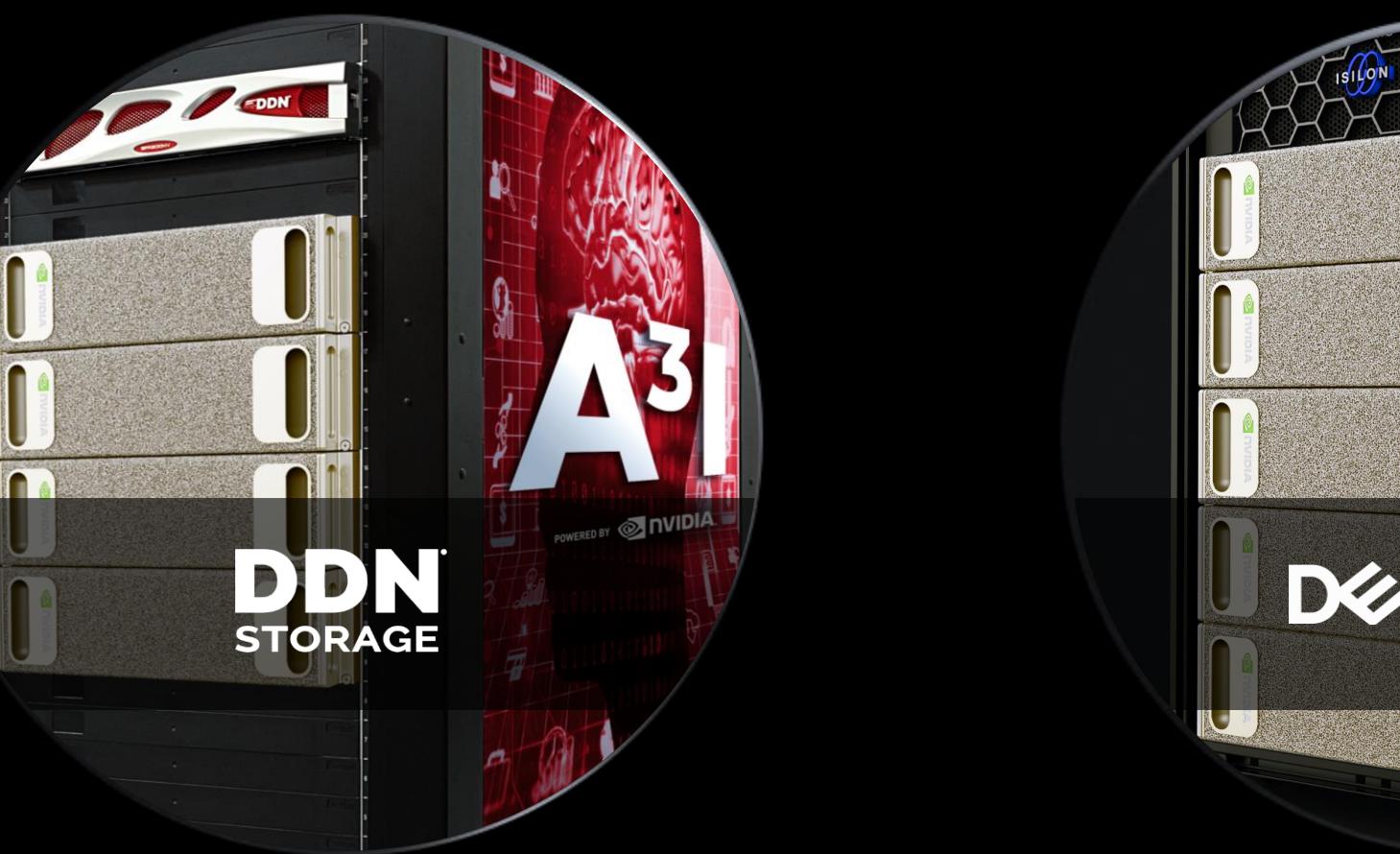


Mellanox®  
TECHNOLOGIES

EYAL WALDMAN

CEO, Mellanox

# NVIDIA DGX POD – ZERO TO DATA SCIENCE IN 1 DAY



ARISTA

CISCO

Mellanox<sup>®</sup>

# ANNOUNCING WORLD'S MOST POPULAR ENTERPRISE SERVERS OPTIMIZED FOR DATA SCIENCE

Powered by NVIDIA T4 and New CUDA-X AI  
NGC Certified



cisco™

DELL EMC



Hewlett Packard  
Enterprise

*inspur*

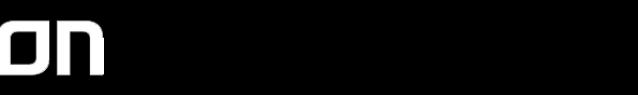
Lenovo™

Sugon

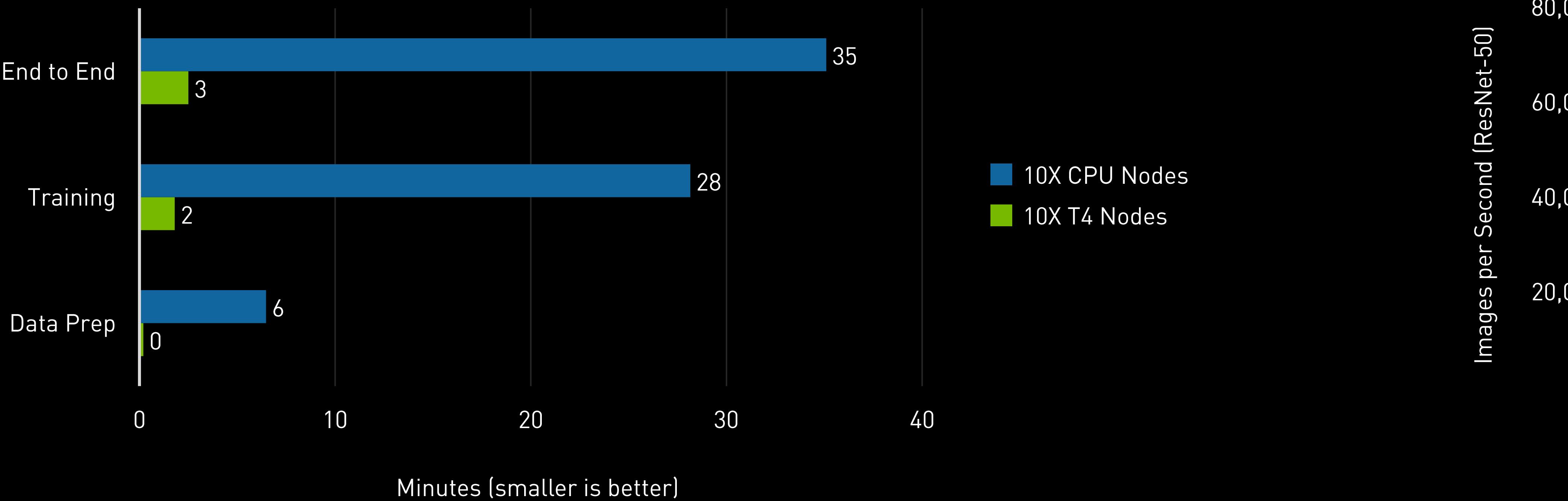


# ANNOUNCING WORLD'S MOST POPULAR ENTERPRISE SERVERS OPTIMIZED FOR DATA SCIENCE

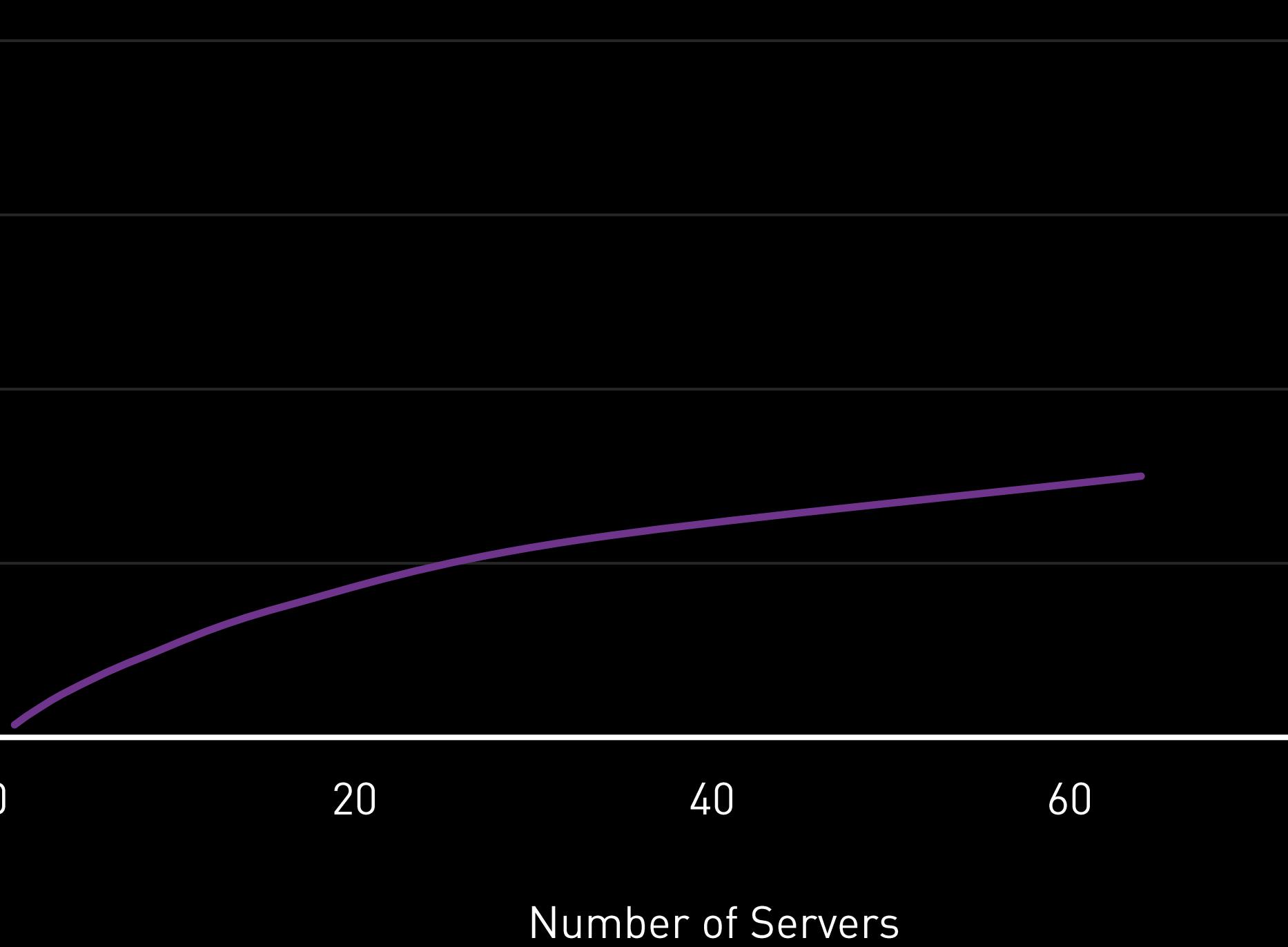
Powered by NVIDIA T4 and New CUDA-X AI  
NGC Certified



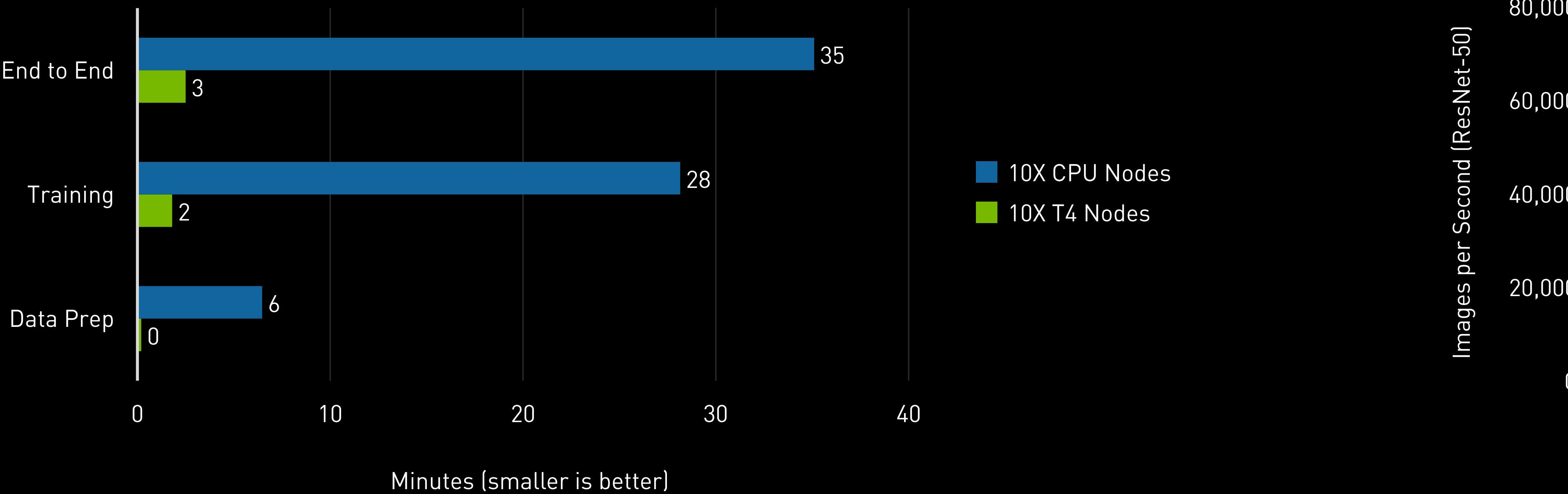
## Acceleration of Data Science Clusters



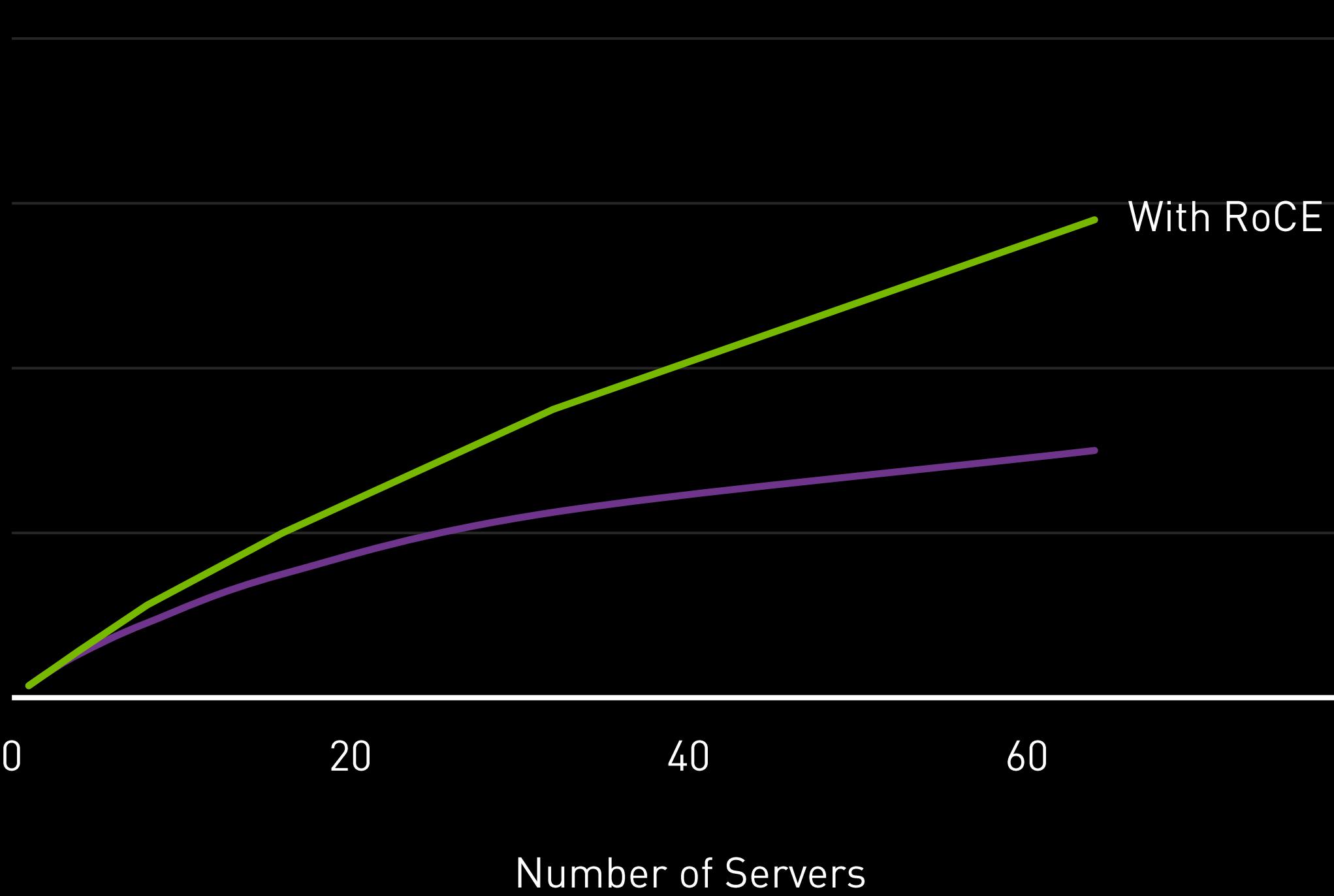
## Deep Learning Scaling



## Acceleration of Data Science Clusters



## Deep Learning Scaling





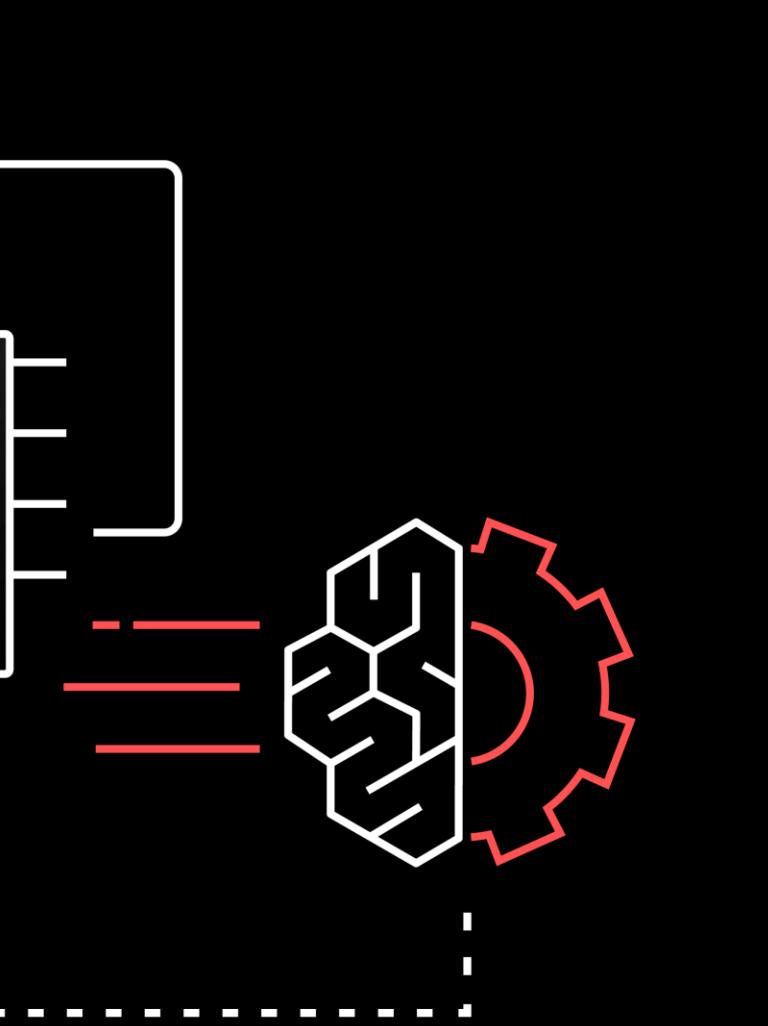
MATT GARMAN

Vice President of Compute Services  
Amazon Web Services

THE WORLD'S LEADING BRANDS USE AMAZON EC2 P3 INSTANCES WITH NVIDIA V100 GPUS

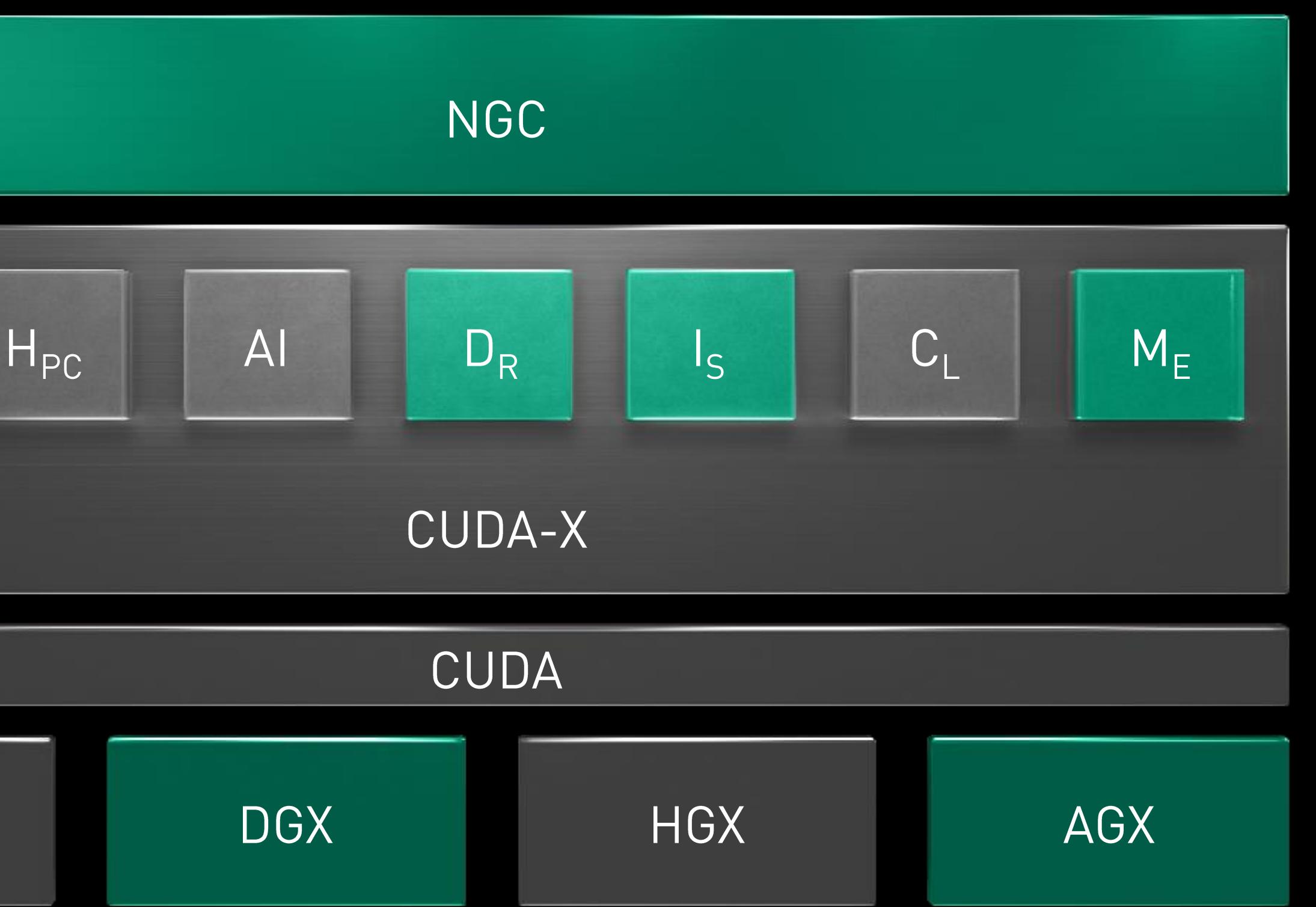


# INTRODUCING AMAZON EC2 G4 INSTANCES WITH NVIDIA T4 TENSOR CORE GPUS



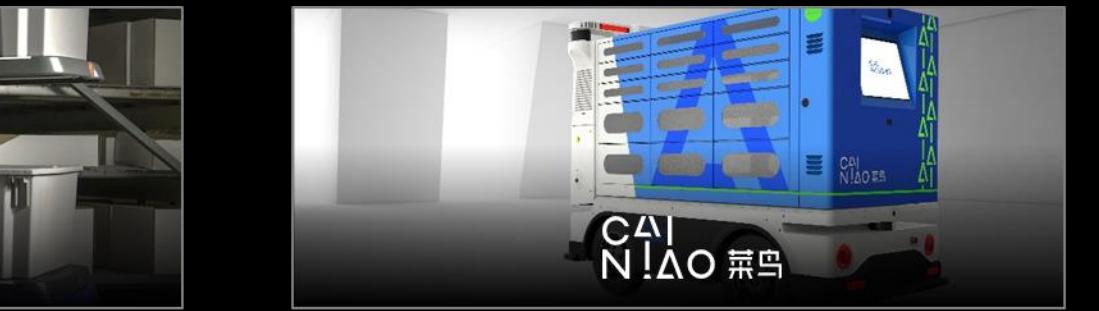
MACHINE LEARNING INFERENCE  
GRAPHICS INTENSIVE APPLICATIONS  
VIDEO TRANSCODING

## CHAPTER 3: ROBOTICS



# JETSON POWERING AUTONOMOUS MACHINES

WAREHOUSE



DELIVERY



AGRICULTURE



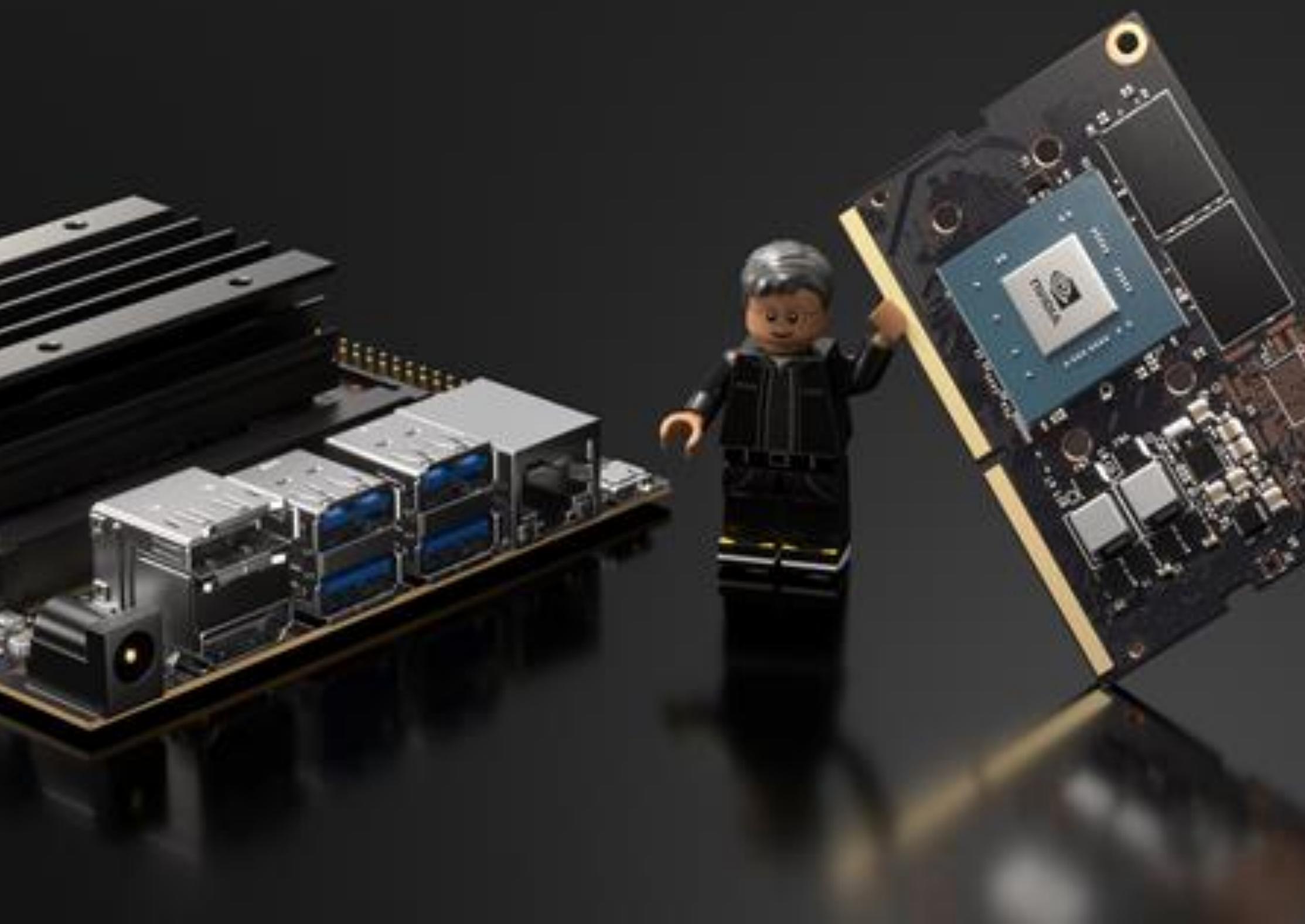
RETAIL



INDUSTRIAL



# ANNOUNCING JETSON NANO



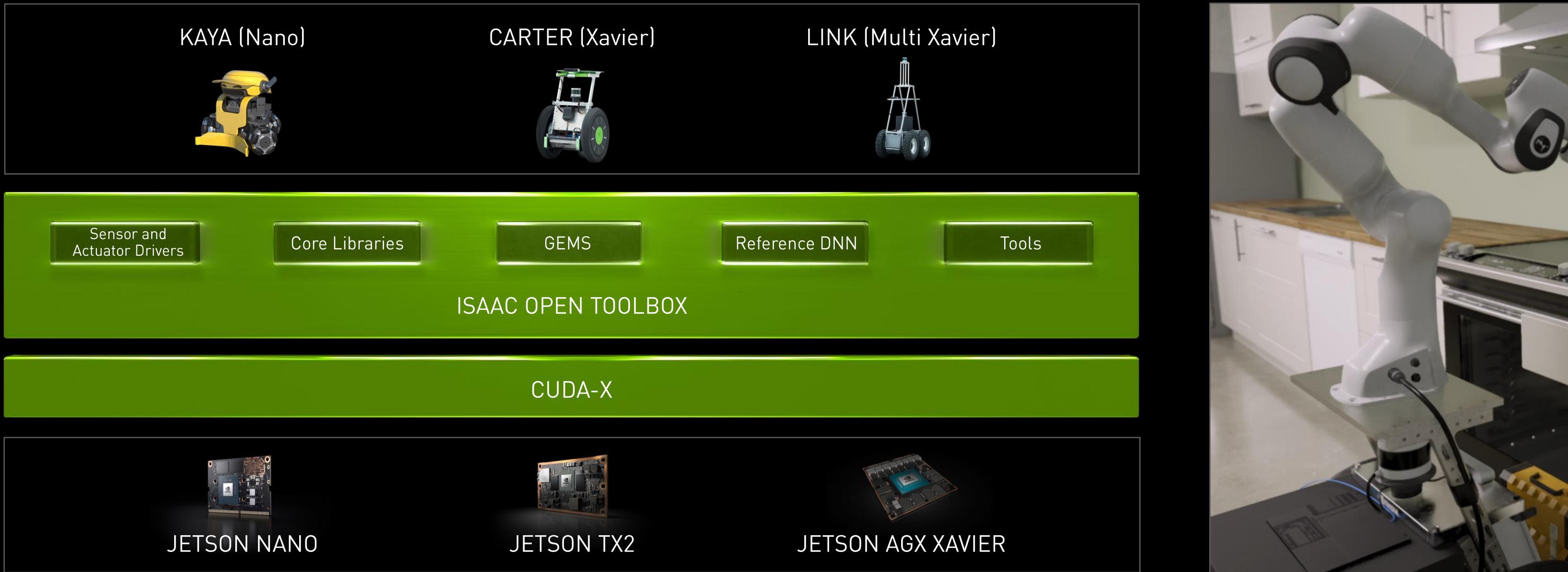
\$99 NVIDIA CUDA-X AI COMPUTER

CUDA-X acceleration stack

High-resolution sensor support

Runs all CUDA-X AI models

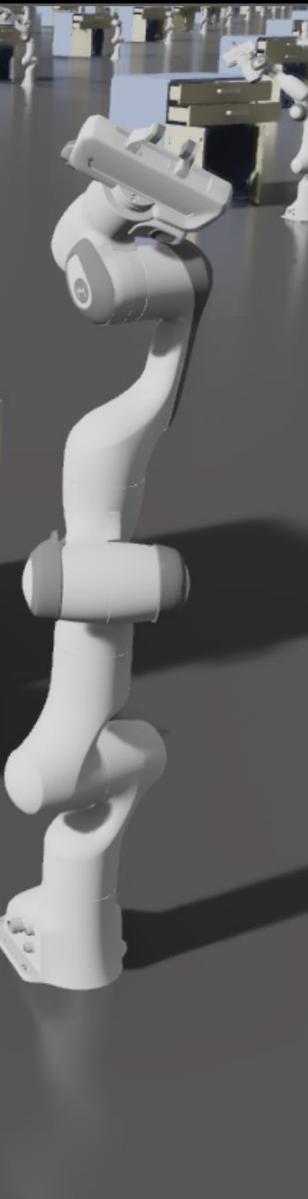
# ANNOUNCING ISAAC OPEN SDK



Isaac Robot Engine



Isaac Sim



Isaac Gym



Isaac Robot Engine – Modular robot framework  
Isaac Sim - Virtual robotics laboratory  
Isaac Gym – Reinforcement learning simulator  
Isaac Robot Apps – Kaya, Carter and Link

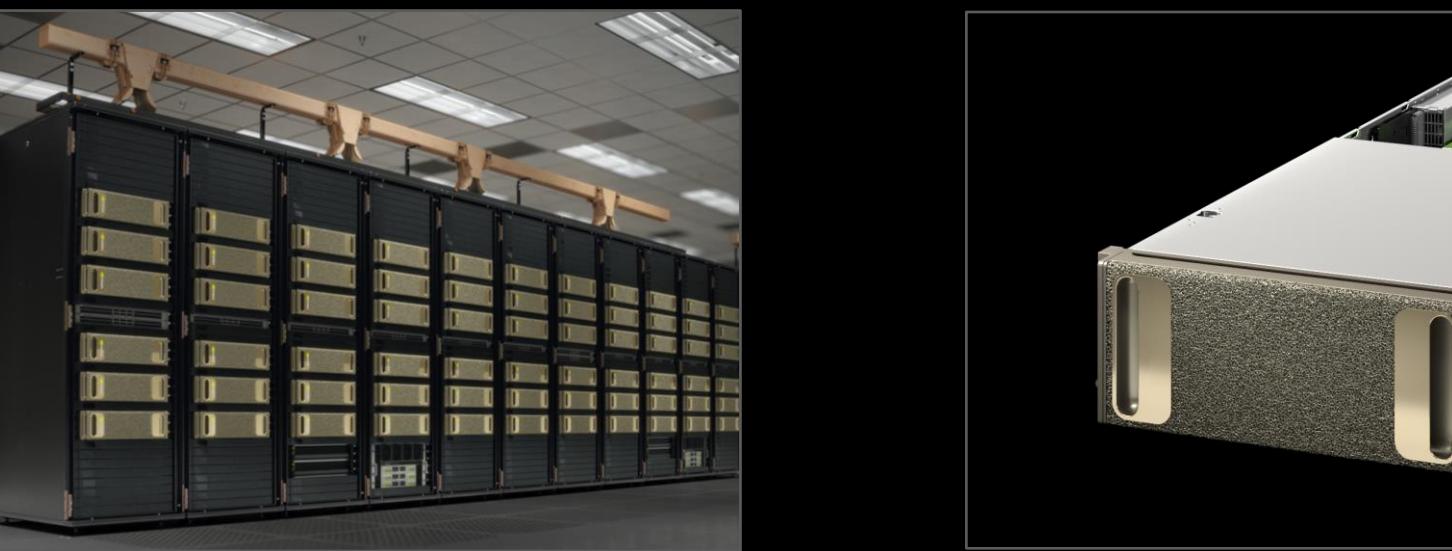
Available at [developer.nvidia.com/isaac-sdk](https://developer.nvidia.com/isaac-sdk)



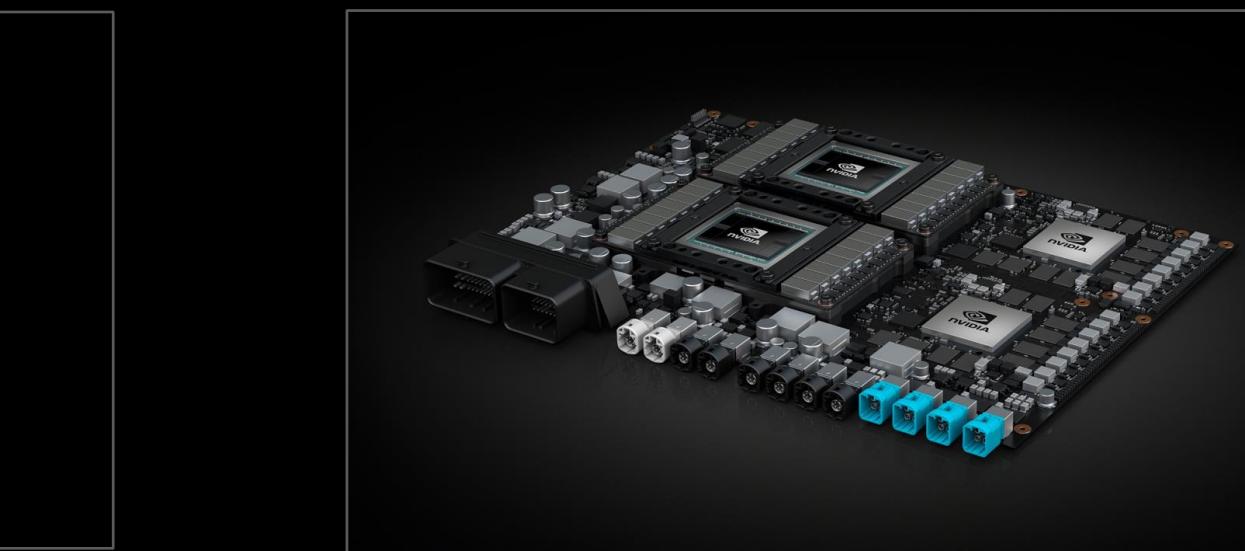
Kaya

# THE DRIVE INITIATIVE

DGX Saturn V



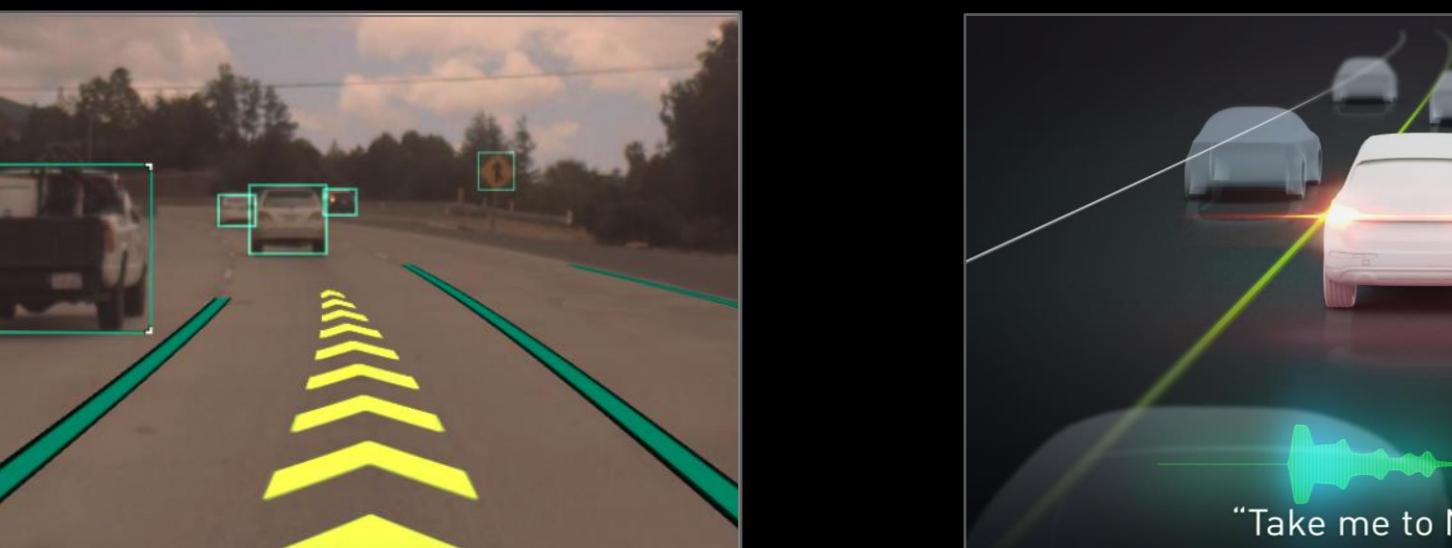
Constellation



Xavier



DRIVE AV



DRIVE IX



KITT Resim



# DRIVE OPEN PLATFORM ECOSYSTEM

CARS



TOYOTA

TRUCKS



Peterbilt

MOBILITY SERVICES



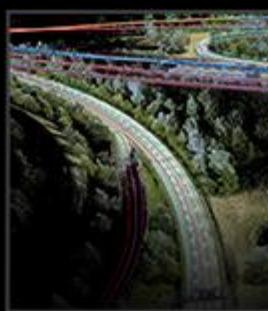
UBER

TIER 1s



BOSCH

AI ISVs



SoundHound Inc.

MAPPING



here



cognata

SIMULATION



TOMTOM

SENSORS



SONY



Velodyne



VOLVO



tuSimple



NURO



ZF



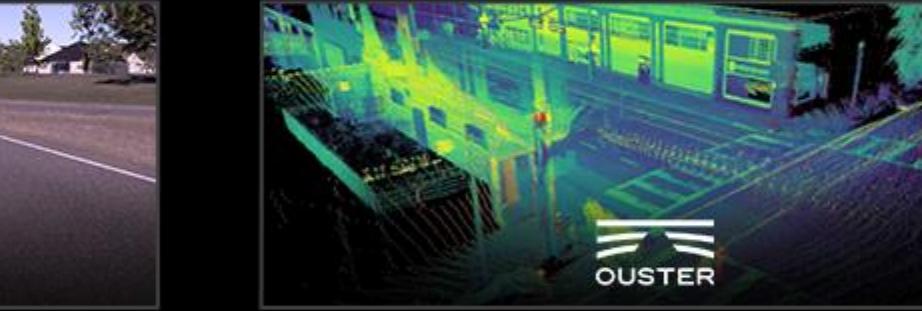
GUARDIAN



Baidu



ON



Ouster



NIO



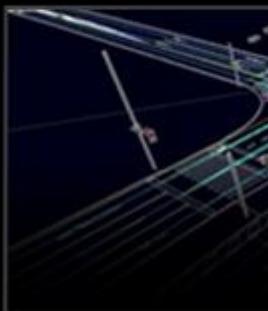
GIGA



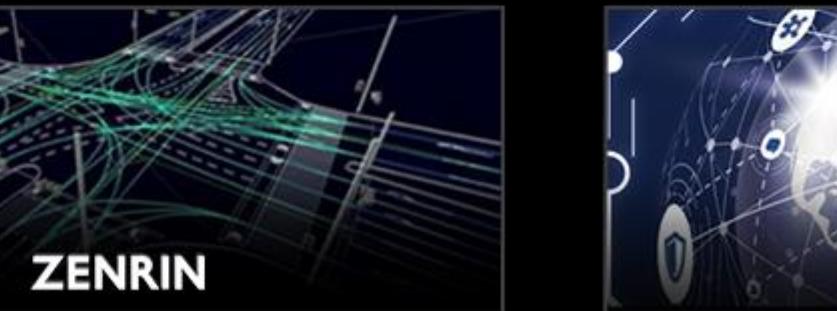
Deutsche Post  
DHL Group



veoneer



JUNGO



ZENRIN

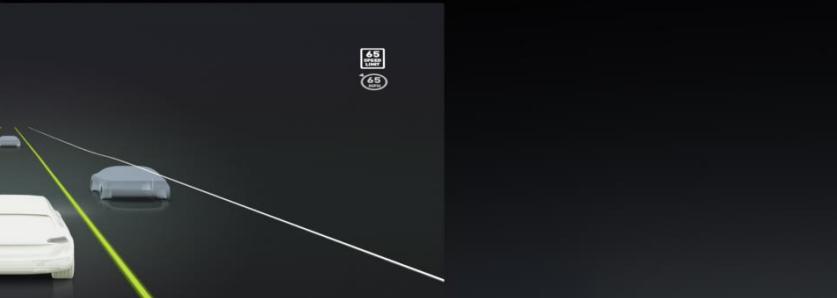


TUM



FLIR

# ANNOUNCING DRIVE AP2X RELEASE 9.0



## HIGH FUNCTION L2+ AUTOPILOT SYSTEM

On-ramp to off-ramp

Surround perception for auto lane-change

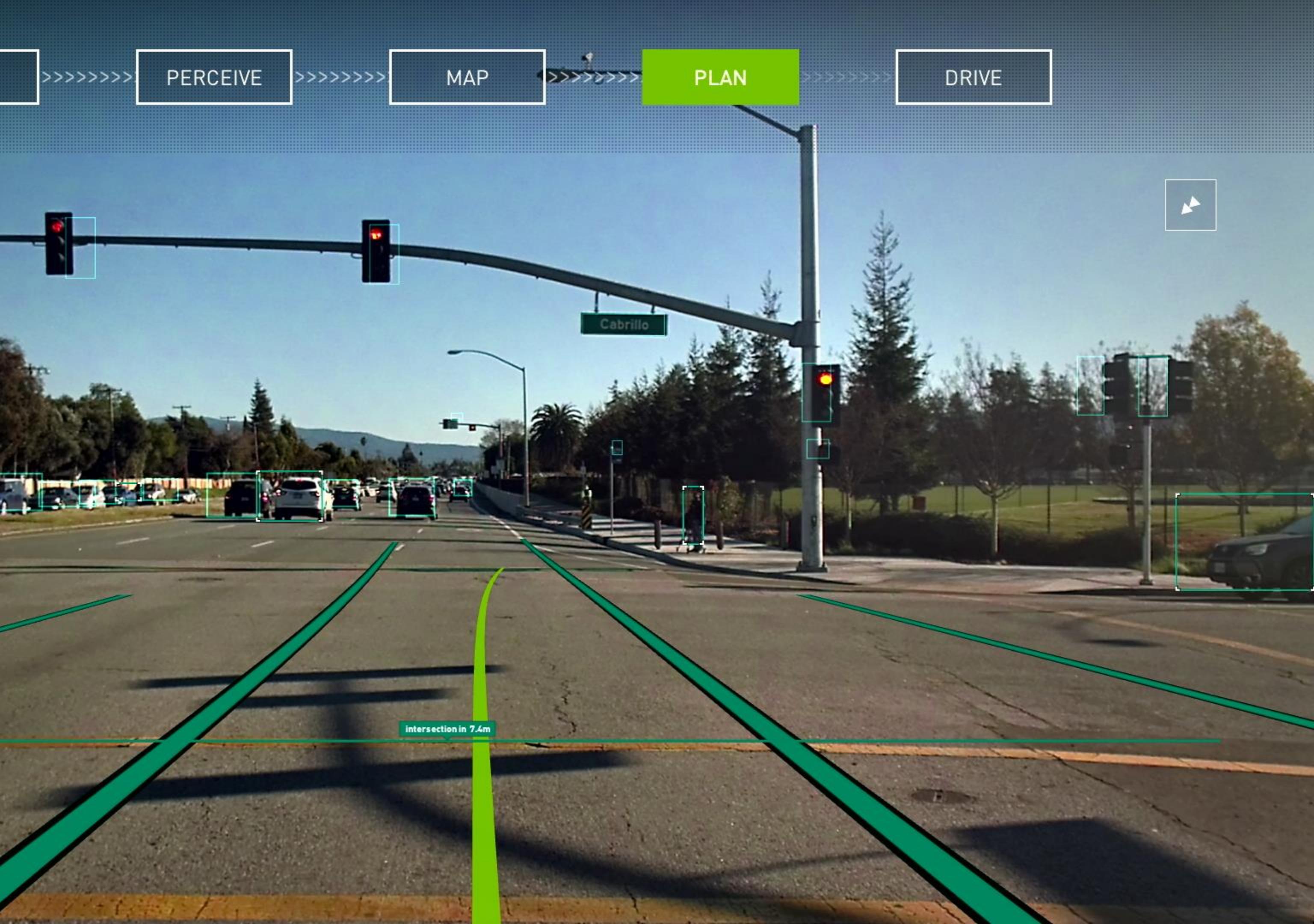
Localization to all major HD maps

Real-time mapping with camera and radar

Integrated AR and VR confidence visualization

Integrated DM and voice command

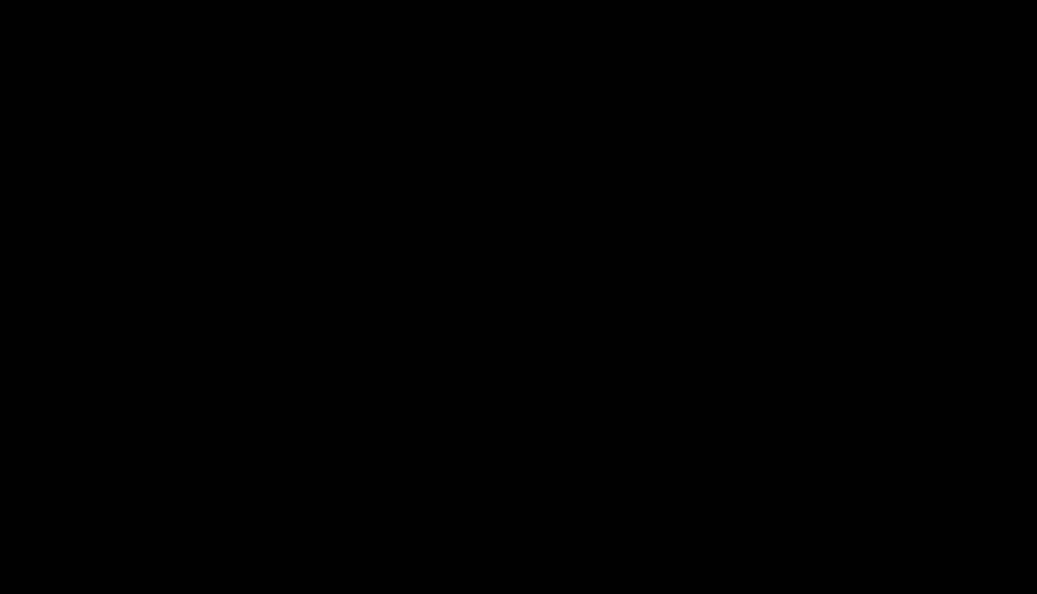




# DRIVE AV – PERCEPTION



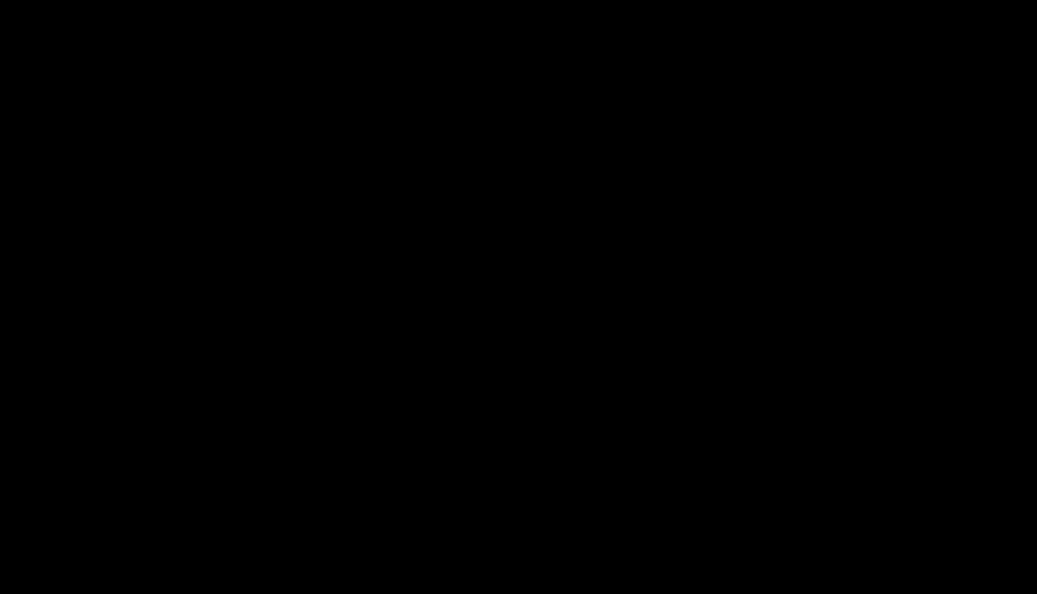
Objects



Free Space



Lanes & Road Markings

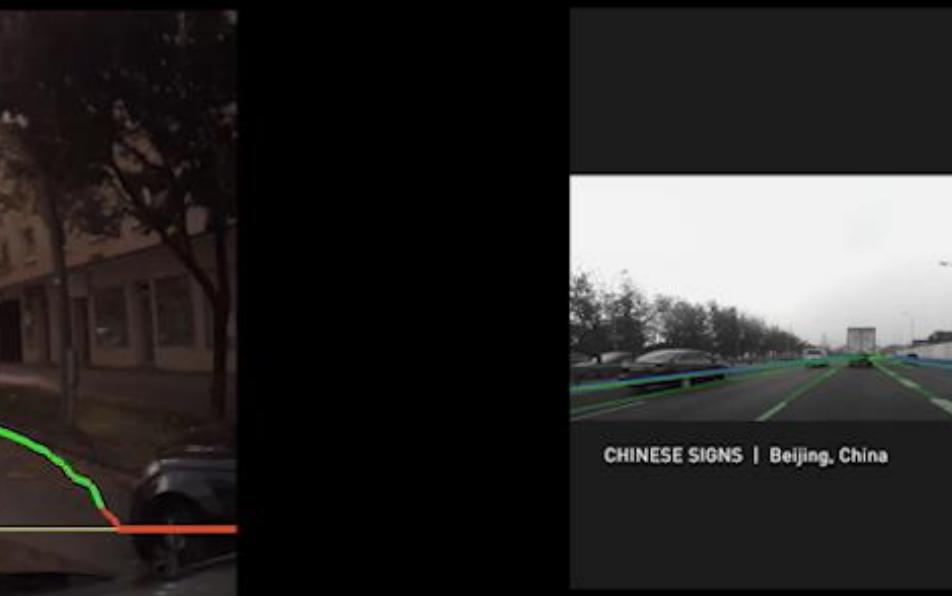


Distance

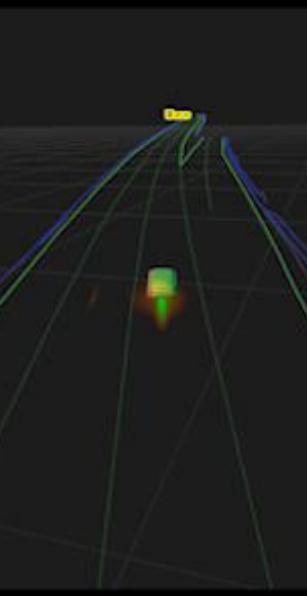
## DRIVE AV – PERCEPTION



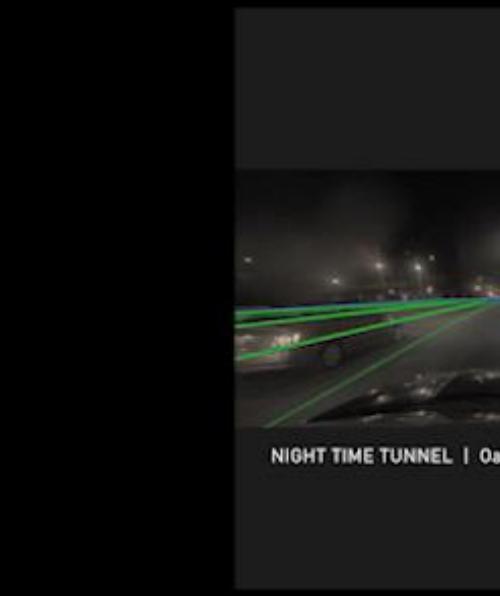
Objects



Free Space



Baidu – Beijing, China



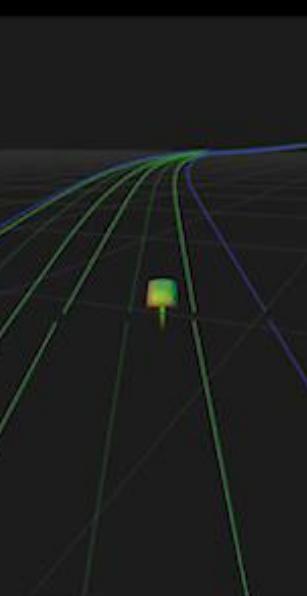
HERE – Oakland, USA



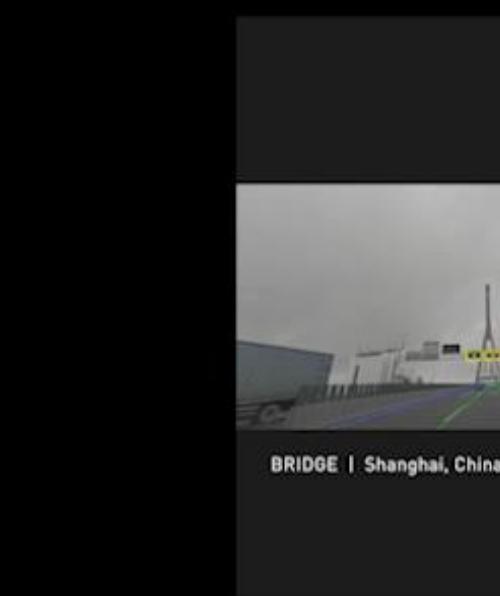
Lanes & Road Markings



Distance



TomTom – Barcelona, Spain



Navinfo – Shanghai, China

## DRIVE AV – LOCALIZATION & MAPPING

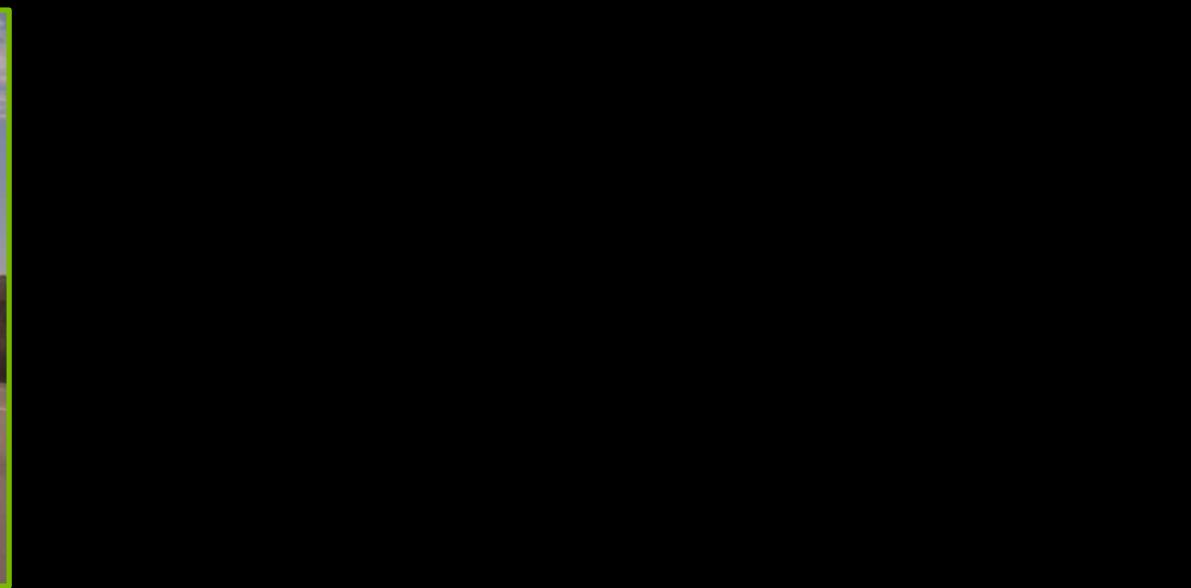
# ANNOUNCING DRIVE AV — PATH PLANNING WITH SAFETY FORCE FIELD

Path Planning + Prediction + Safety Force Field

Designed for AV safety and drive comfort

Mathematically verifiable, validated in simulation

Open platform



PATH PERCEPTION &  
PLANNING

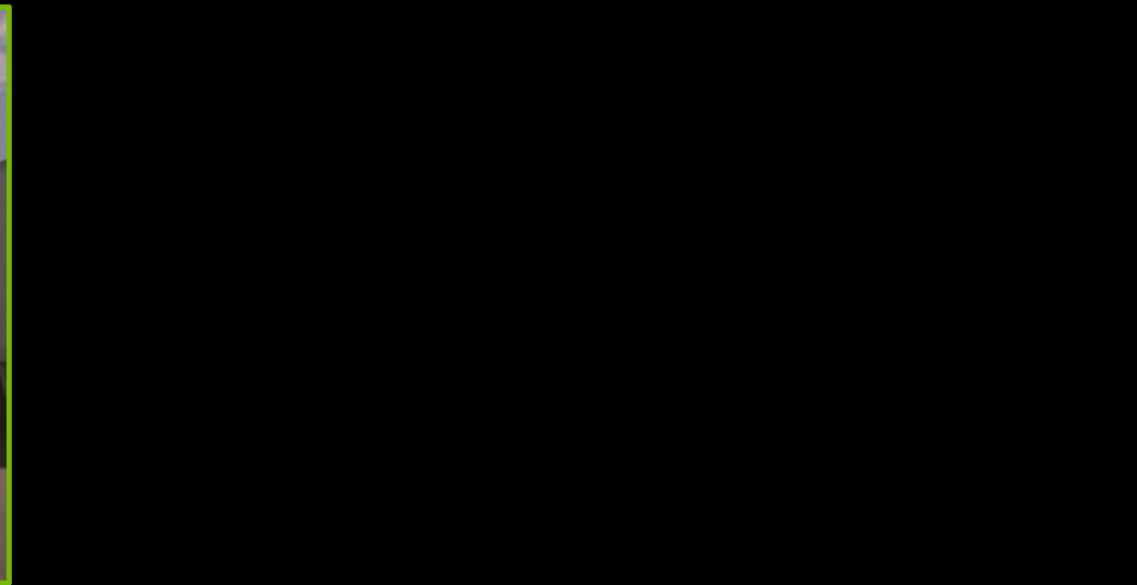
# ANNOUNCING DRIVE AV — PATH PLANNING WITH SAFETY FORCE FIELD

Path Planning + Prediction + Safety Force Field

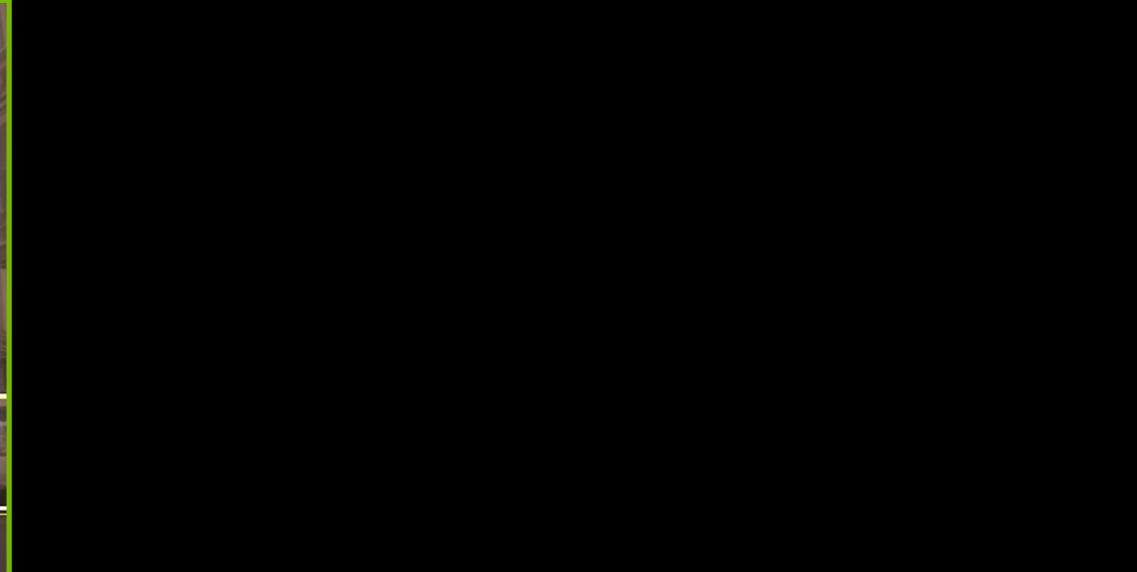
Designed for AV safety and drive comfort

Mathematically verifiable, validated in simulation

Open platform



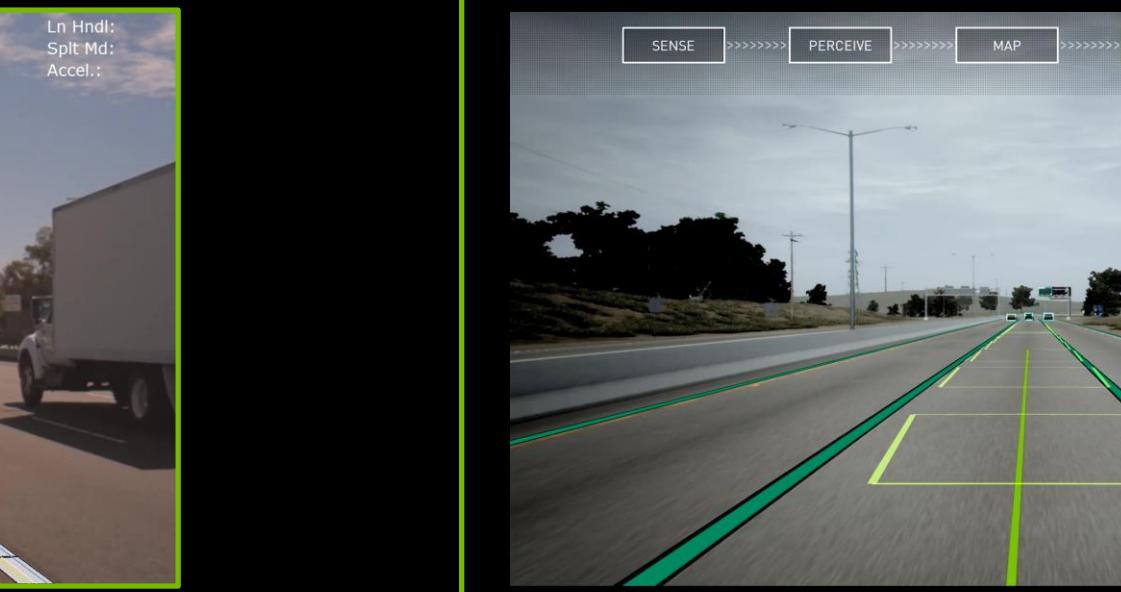
PATH PERCEPTION &  
PLANNING



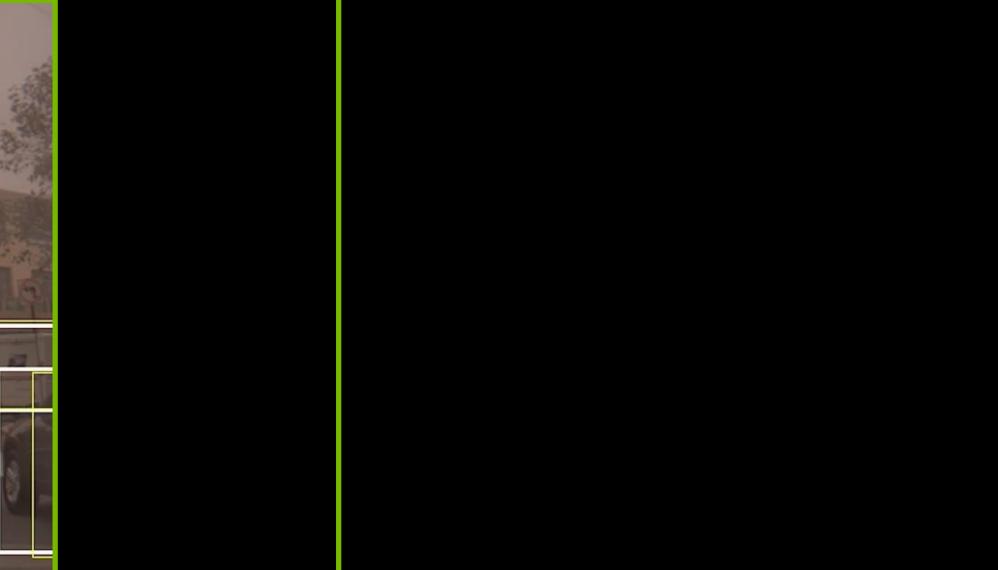
PREDICTION

# ANNOUNCING DRIVE AV — PATH PLANNING WITH SAFETY FORCE FIELD

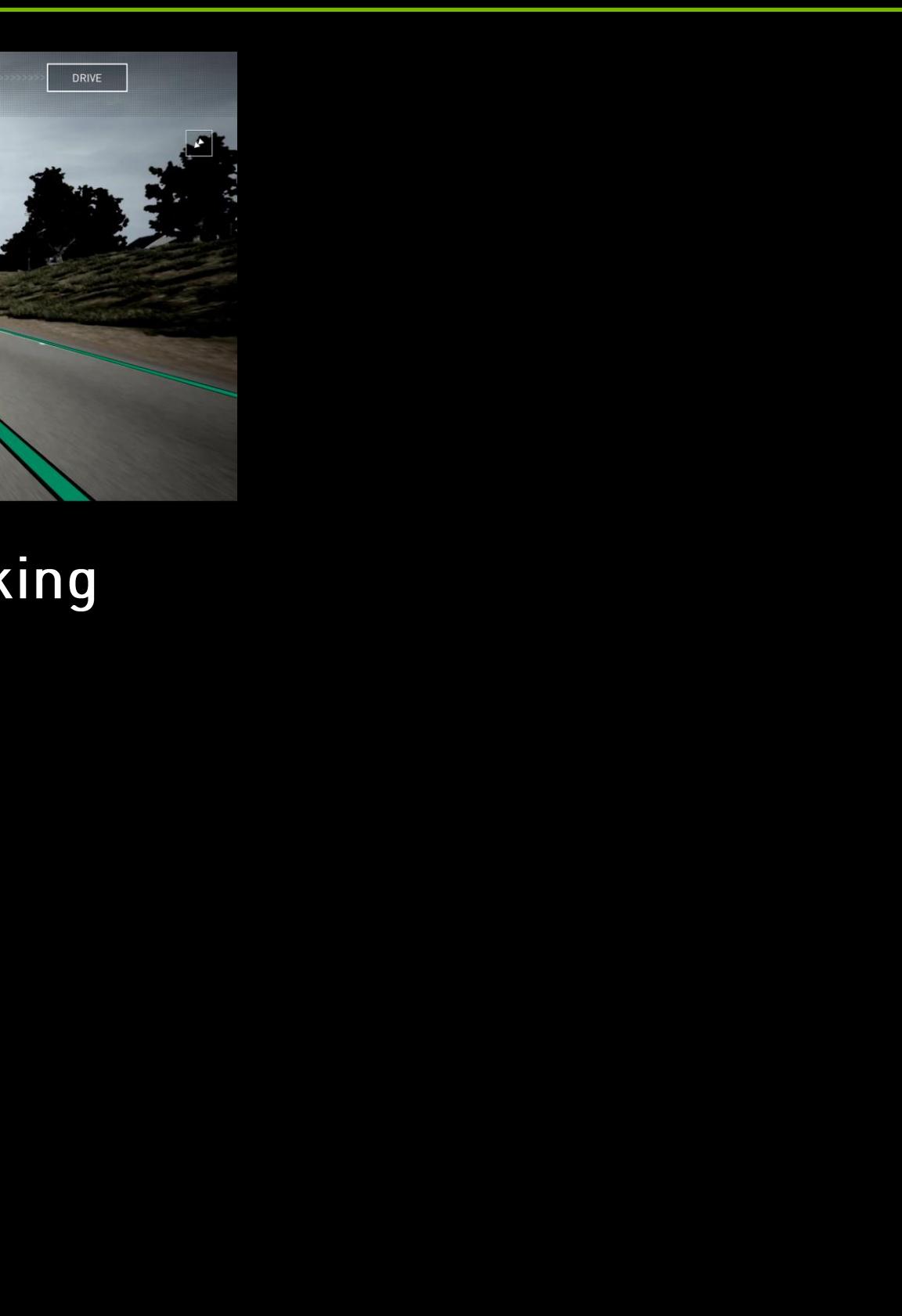
Path Planning + Prediction + Safety Force Field  
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Mathematically verifiable, validated in simulation  
Open platform



PATH PERCEPTION & PLANNING



PREDICTION

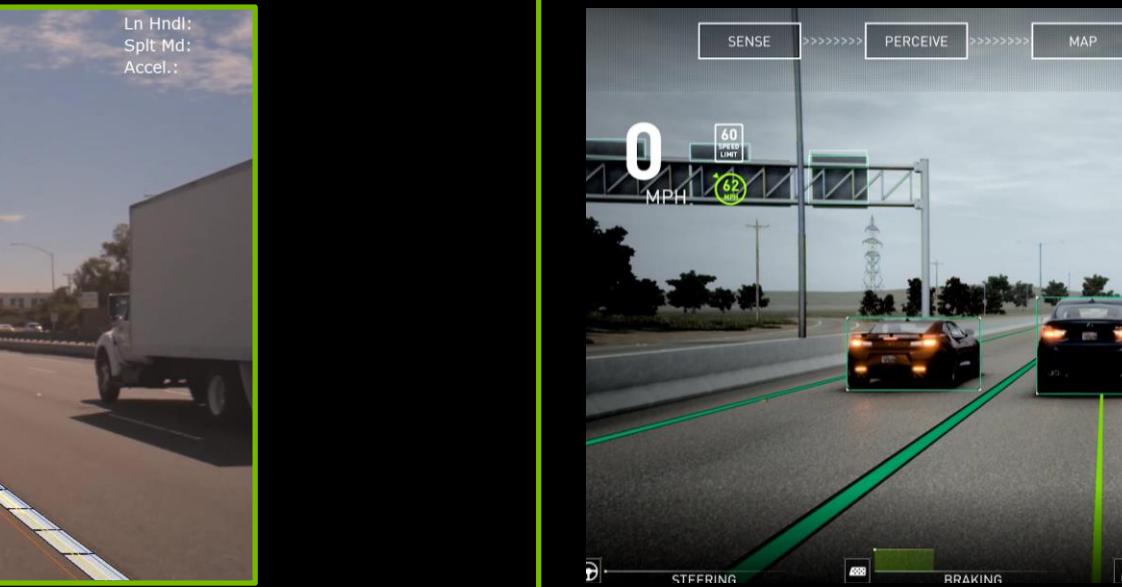


Emergency Braking

SAFETY FORCE FIELD

# ANNOUNCING DRIVE AV — PATH PLANNING WITH SAFETY FORCE FIELD

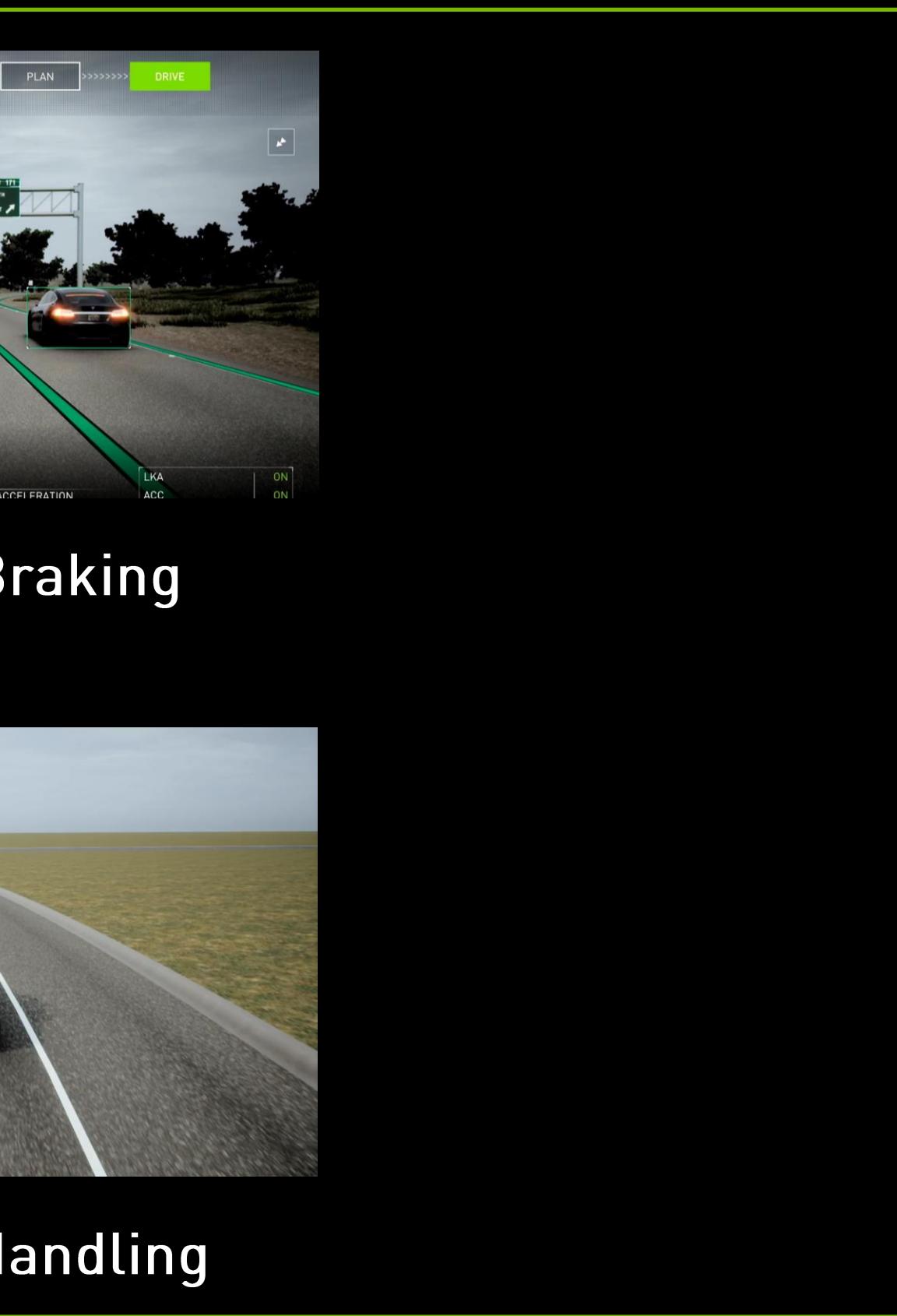
Path Planning + Prediction + Safety Force Field  
Designed for AV safety and drive comfort  
Mathematically verifiable, validated in simulation  
Open platform



PATH PERCEPTION & PLANNING



PREDICTION



Emergency Braking



Intersection Handling

SAFETY FORCE FIELD

# ANNOUNCING DRIVE AV — PATH PLANNING WITH SAFETY FORCE FIELD

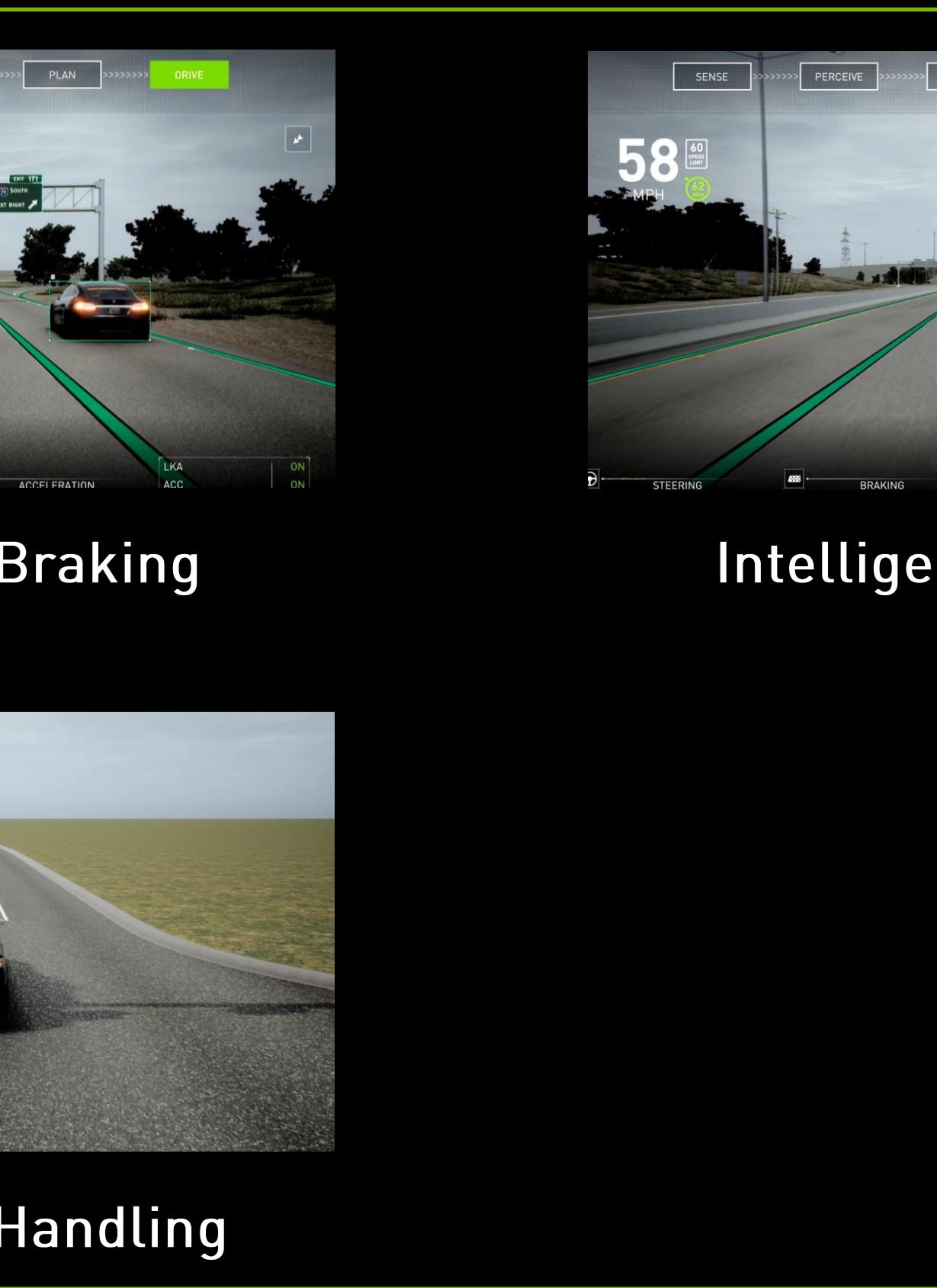
Path Planning + Prediction + Safety Force Field  
Designed for AV safety and drive comfort  
Mathematically verifiable, validated in simulation  
Open platform



PATH PERCEPTION & PLANNING

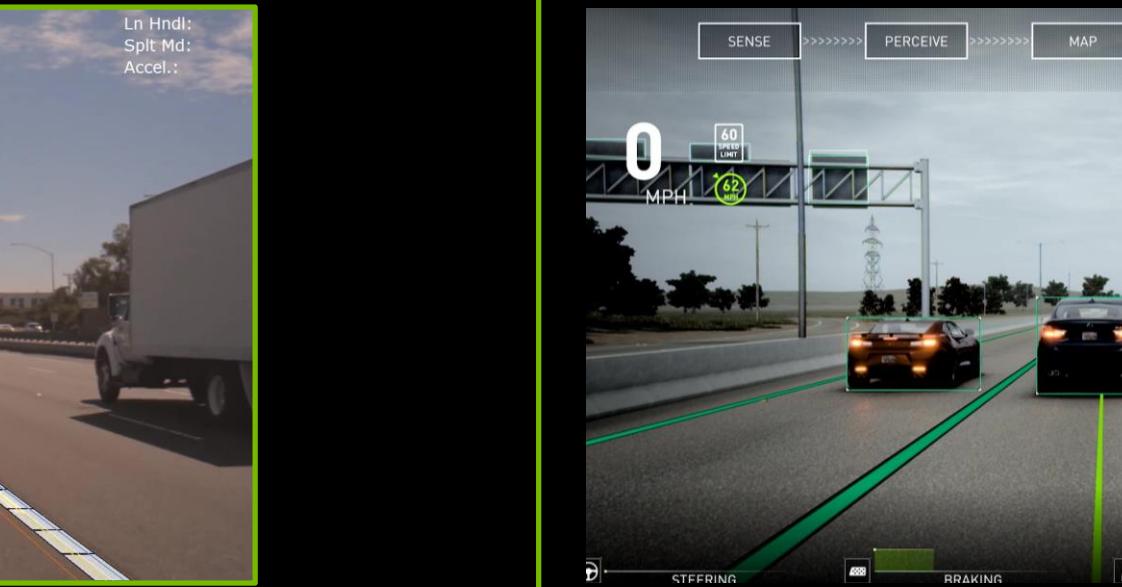


PREDICTION



# ANNOUNCING DRIVE AV — PATH PLANNING WITH SAFETY FORCE FIELD

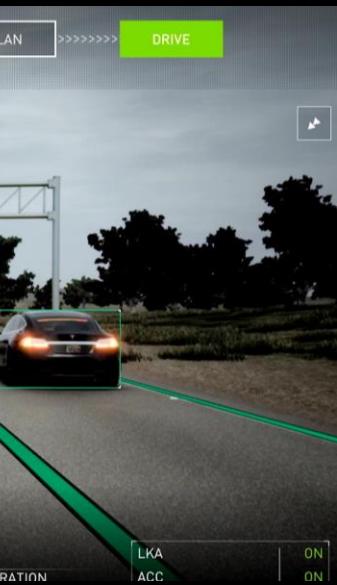
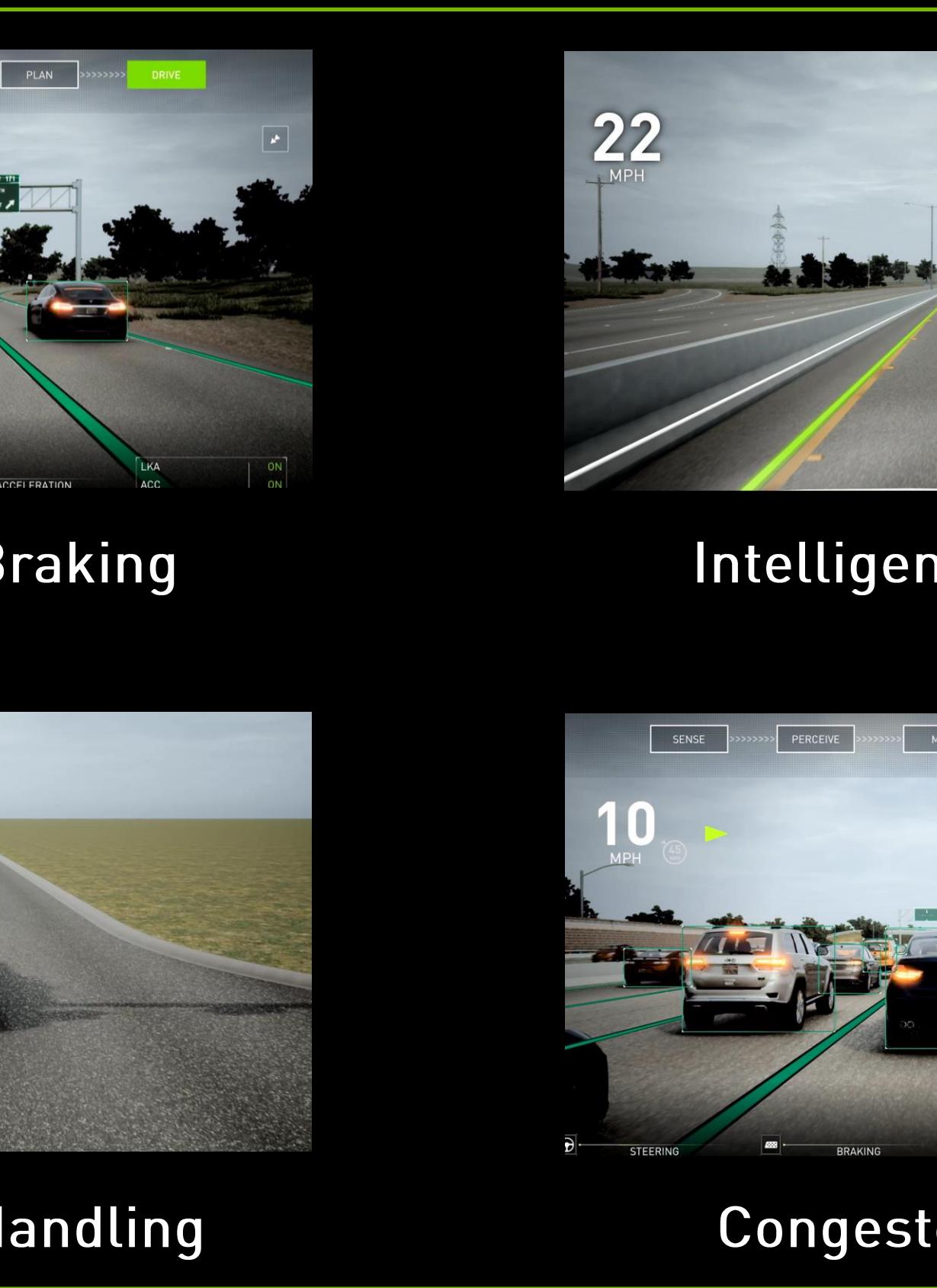
Path Planning + Prediction + Safety Force Field  
Designed for AV safety and drive comfort  
Mathematically verifiable, validated in simulation  
Open platform



PATH PERCEPTION & PLANNING



PREDICTION



Emergency Braking



Intelligent Steering



Intersection Handling



Congested Traffic

SAFETY FORCE FIELD

# ANNOUNCING DRIVE CONSTELLATION AVAILABLE NOW

## Virtual AV Test Fleet

Bit-accurate, hardware-in-the-loop simulator

Test corner and rare conditions

Simulate previous failure scenarios

Cloud-based workflow

Open platform

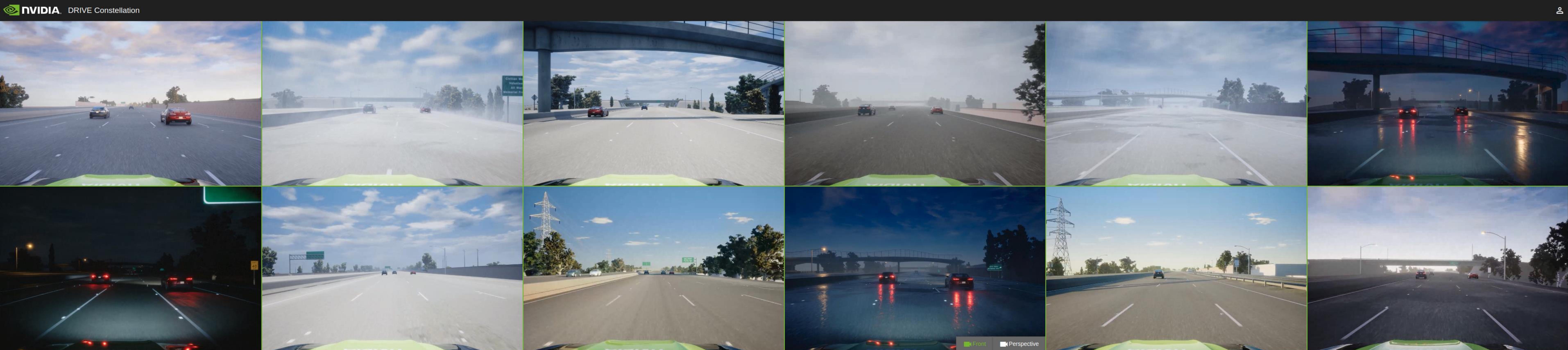


# ANNOUNCING DRIVE CONSTELLATION AVAILABLE NOW

## Virtual AV Test Fleet

- Bit-accurate, hardware-in-the-loop simulator
- Test corner and rare conditions
- Simulate previous failure scenarios
- Cloud-based workflow
- Open platform







# ANNOUNCING DRIVE CONSTELLATION AVAILABLE NOW

## Virtual AV Test Fleet

Bit-accurate, hardware-in-the-loop simulator

Test corner and rare conditions

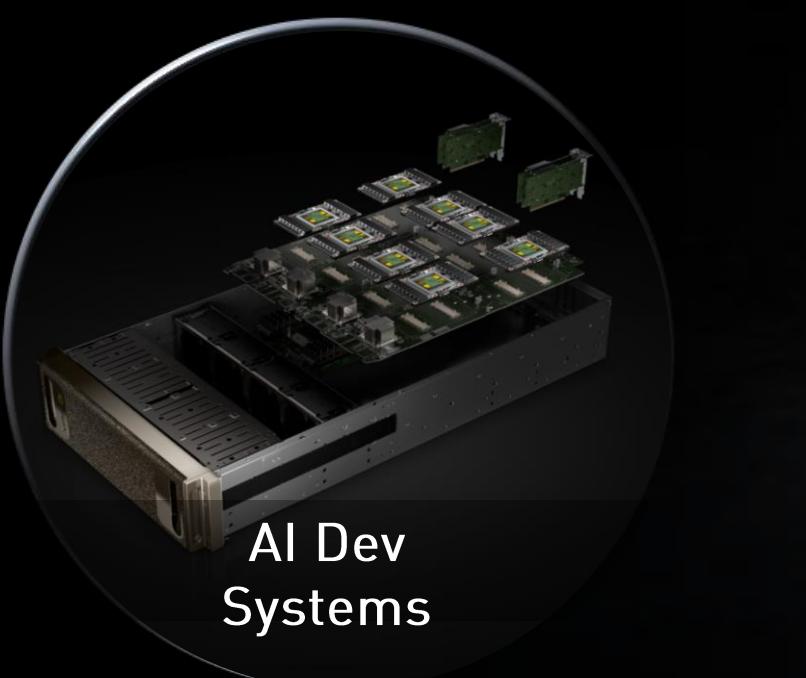
Simulate previous failure scenarios

Cloud-based workflow

Open platform



# ANNOUNCING NVIDIA AND TRI-AD PARTNER TO CREATE FUTURE OF AUTONOMOUS VEHICLES



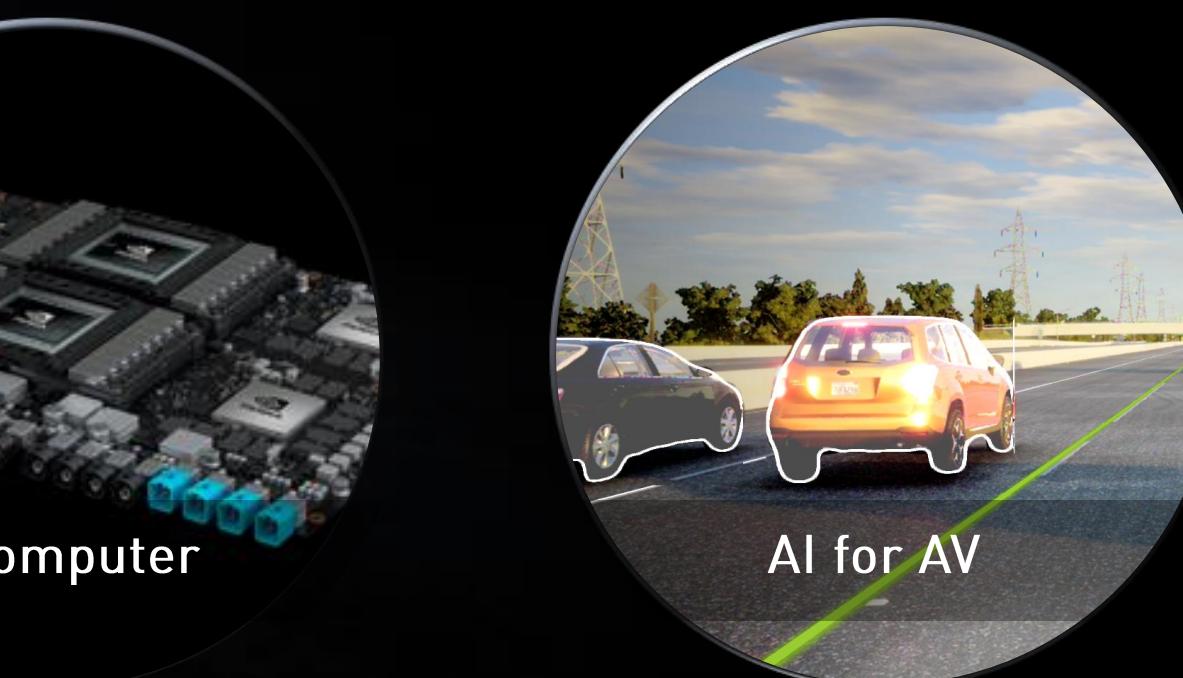
AI Dev  
Systems



Driving  
Simulation



AV Computer

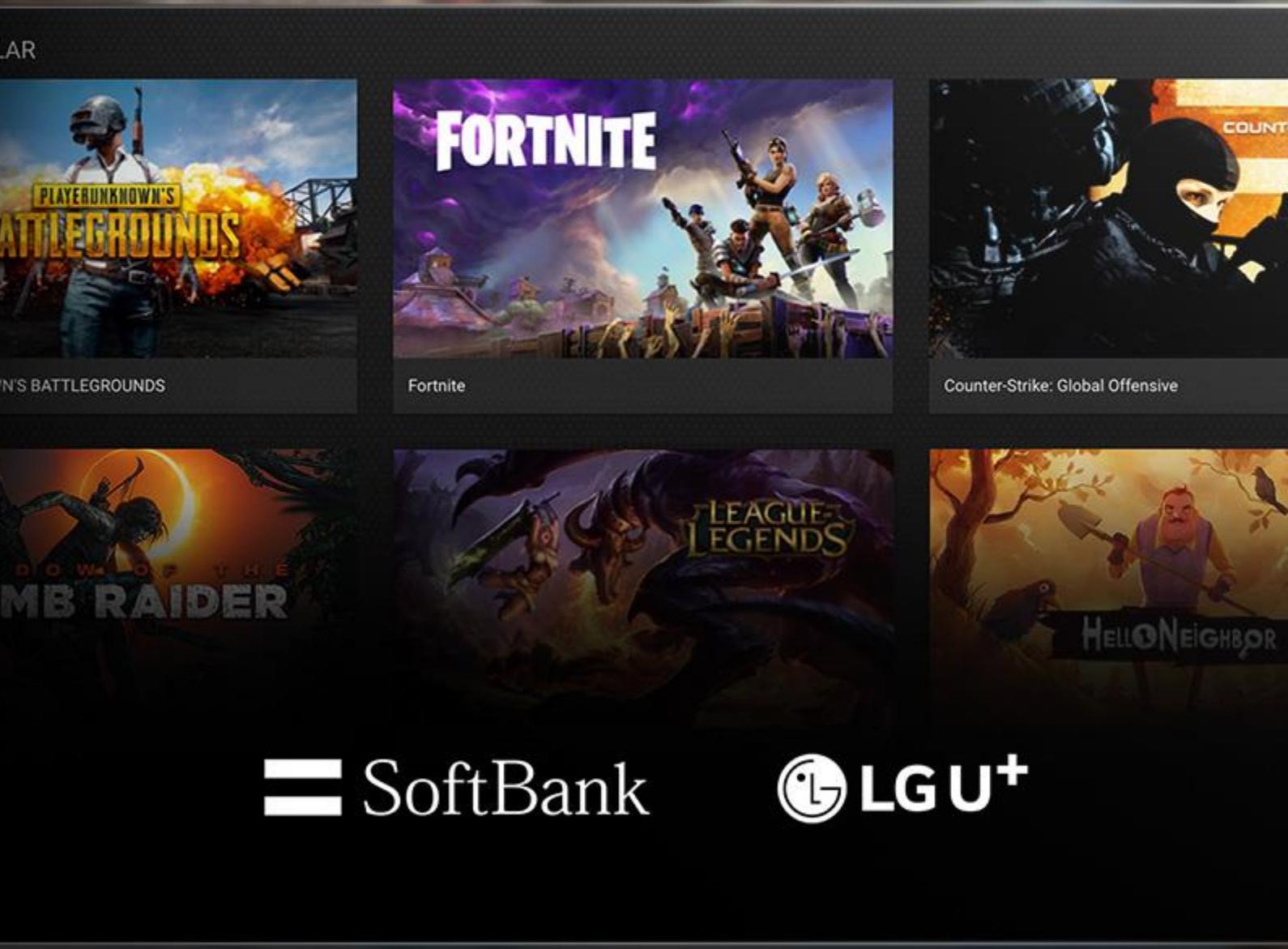
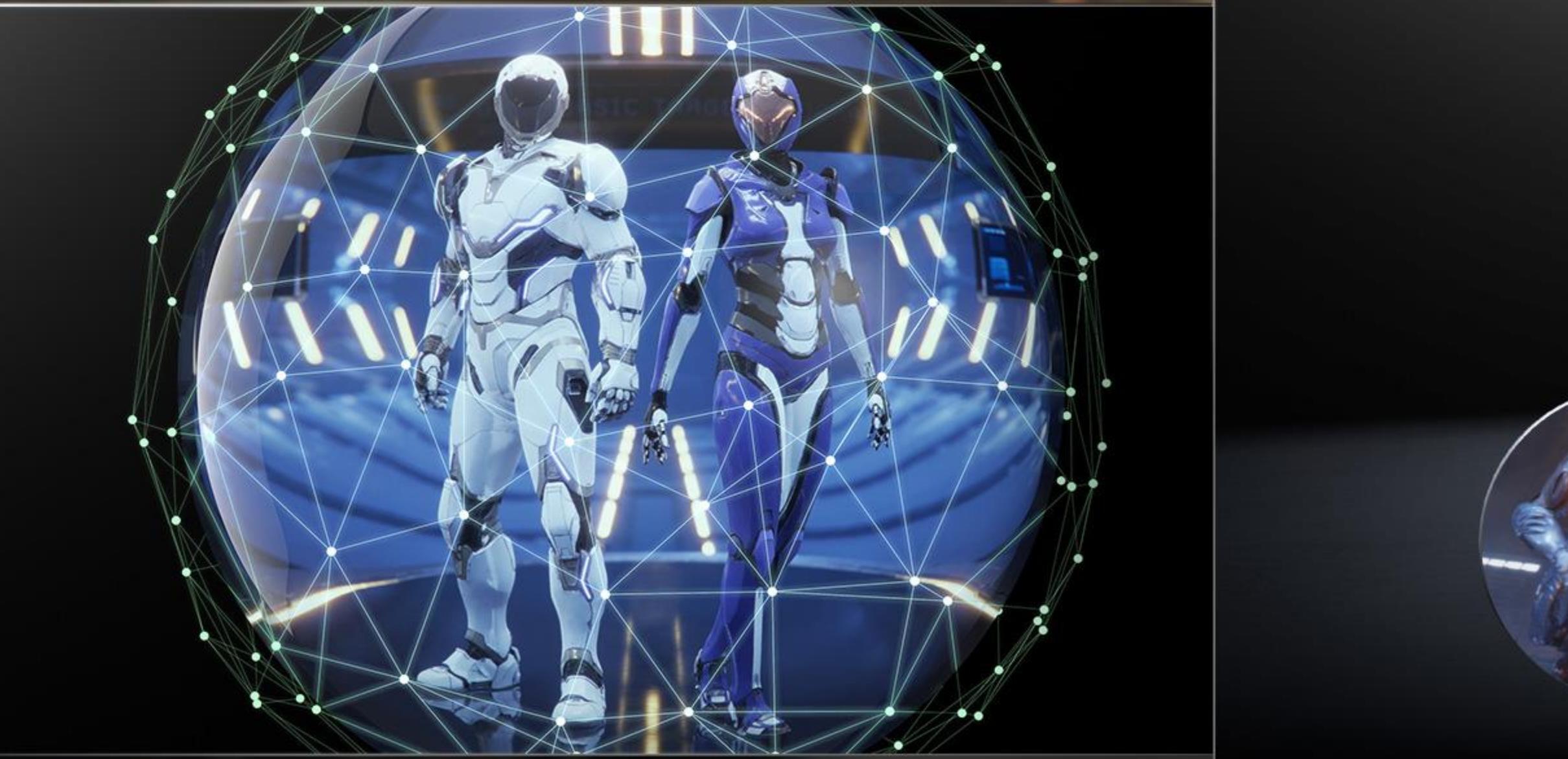


AI for AV

# ACCELERATED COMPUTING – THE PATH FORWARD “PRADA”



# RTX | OMNIVERSE | 5G GFN ALLIANCES



# DATA SCIENCE – THE NEW HPC | CUDA-X ECOSYSTEM



# JETSON NANO | ISAAC | CONSTELLATION | TOYOTA

