



BY Developers FOR Developers

Storage Developer Conference
September 22-23, 2020

Computational Storage **Edge Applications**

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VP Marketing, **NGD Systems**

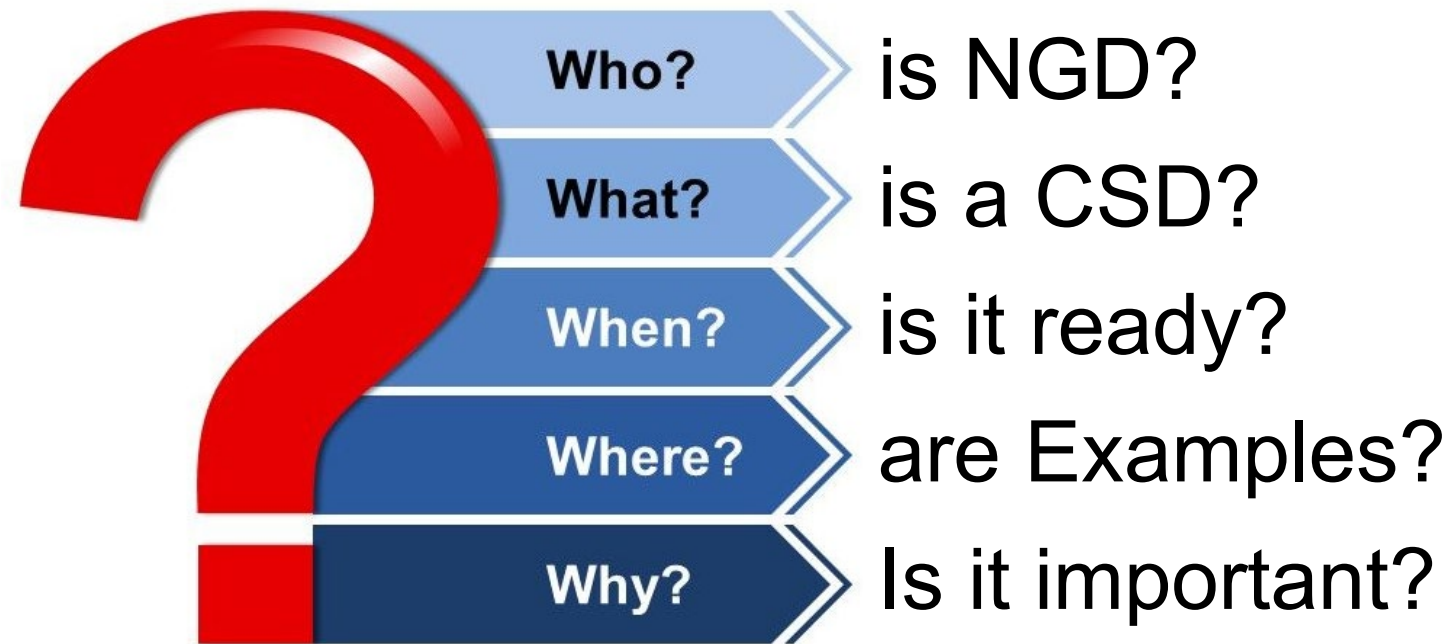
Director, Board of Directors, SNIA

Co-Chair, Computational Storage TWG, SNIA

Co-Chair, Communications Steering Committee, SNIA



Edge Agenda - Computational Storage



Who is NGD Systems?

- **Founded in 2013 to develop NVMe Computational Storage technology**
 - Rethinking Storage for the Next Generation of Data Growth
- **Shipping Worldwide since 2018**
 - Largest Capacity, Lowest Power NVMe Solutions on the Market
- **We solve THE problems for Storage Intensive deployments:**
 - **Data movement**
 - **Energy efficiency**
 - **Capacity footprint**

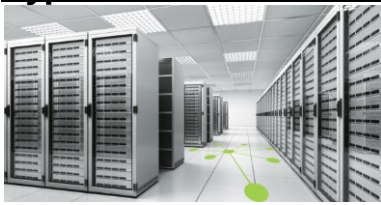


Who NGD Systems Supports.

Key Markets and Applications

The Newport platform brings sizable advantages to those markets where high capacity SSD storage, low power, and parallel processing are all part of the application space. These markets include but are not limited to:

Hyperscale / Data Center



By utilizing CSDs for these workloads, hyperscale data centers reduce CapEx, OpEx, power/cooling, and physical footprint.

Content Delivery Networks



CSDs allows access control to occur at the point of storage, reducing TCO and improving quality and number of concurrent streams

AI / Edge Compute

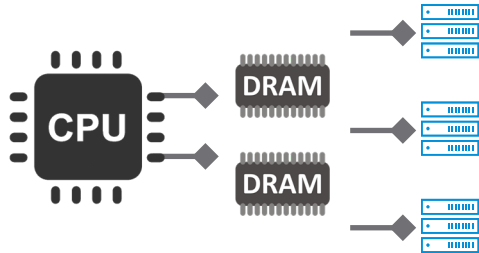


With a growing need to store and analyze data at the edge, a more cost effective and offload need to CSDs exists.

What is the Driver for a CSD?

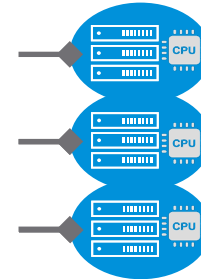
Pain Points - Before

- ✗ Physical Space
- ✗ Available Power
- ✗ Scaling Mismatch
- ✗ Bottleneck Shuffle



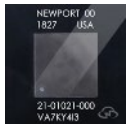
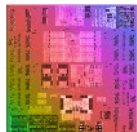
Value Add - After

- ✓ Smaller Footprint
- ✓ Lower Power
- ✓ Distributed Processing
- ✓ Faster Results



What is a CSD from NGD Systems?

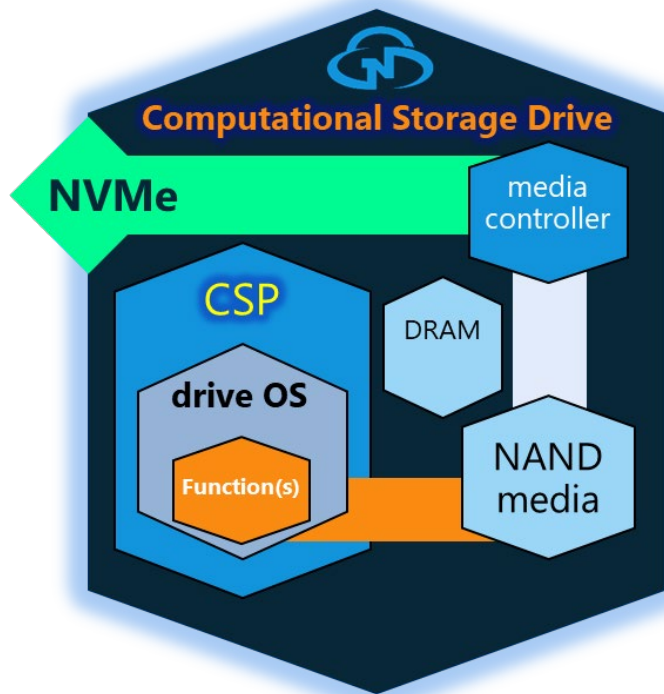
ASIC-Based Controller



Management Firmware

Modular firmware

Flash Vendor & Type agnostic
SLC/MLC/TLC/QLC



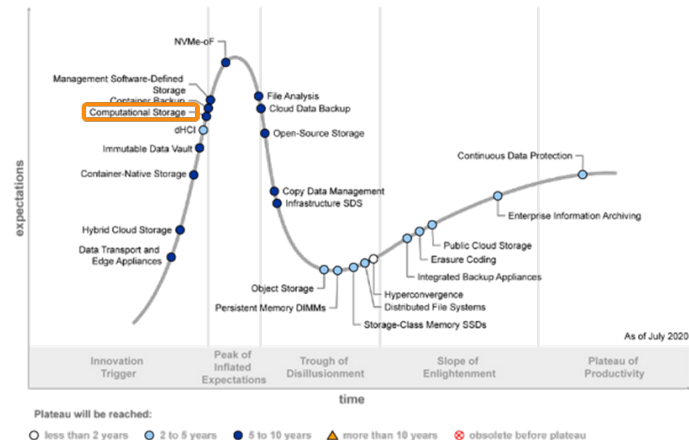
In-Situ Processing

- ✓ Full fledged on drive OS
- ✓ Quad-core 64-bit app processor
- ✓ Hardware acceleration

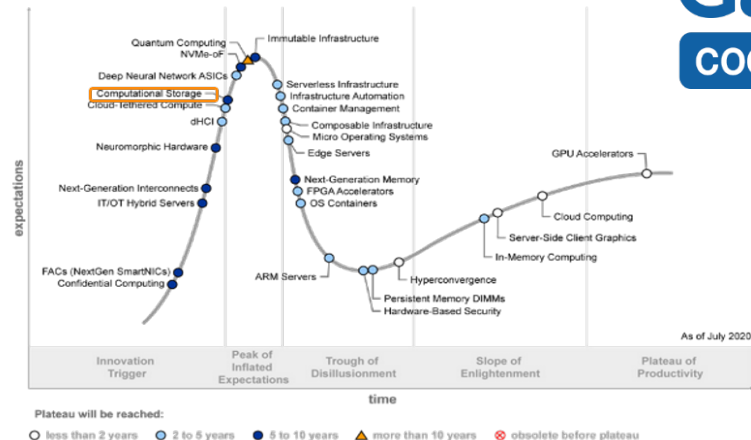
Designed & Manufactured in USA

When is 'the Industry' Ready?

Hype Cycle for Storage and Data Protection Technologies, 2020



Hype Cycle for Compute Infrastructure, 2020



Gartner®
COOL VENDOR

“Business Impact Areas (per Hype Cycle):

There is both a cost and time factor involved in shuffling terabytes of data around. CS can provide **material performance benefits** to data-intensive applications, *especially in edge computing*. Combined with its low power footprint, **CS increases the performance-per-watt ratio**, therein **decreasing power consumption costs for applications at the edge.**” – Jeff Vogel, Julia Palmer – Gartner Research

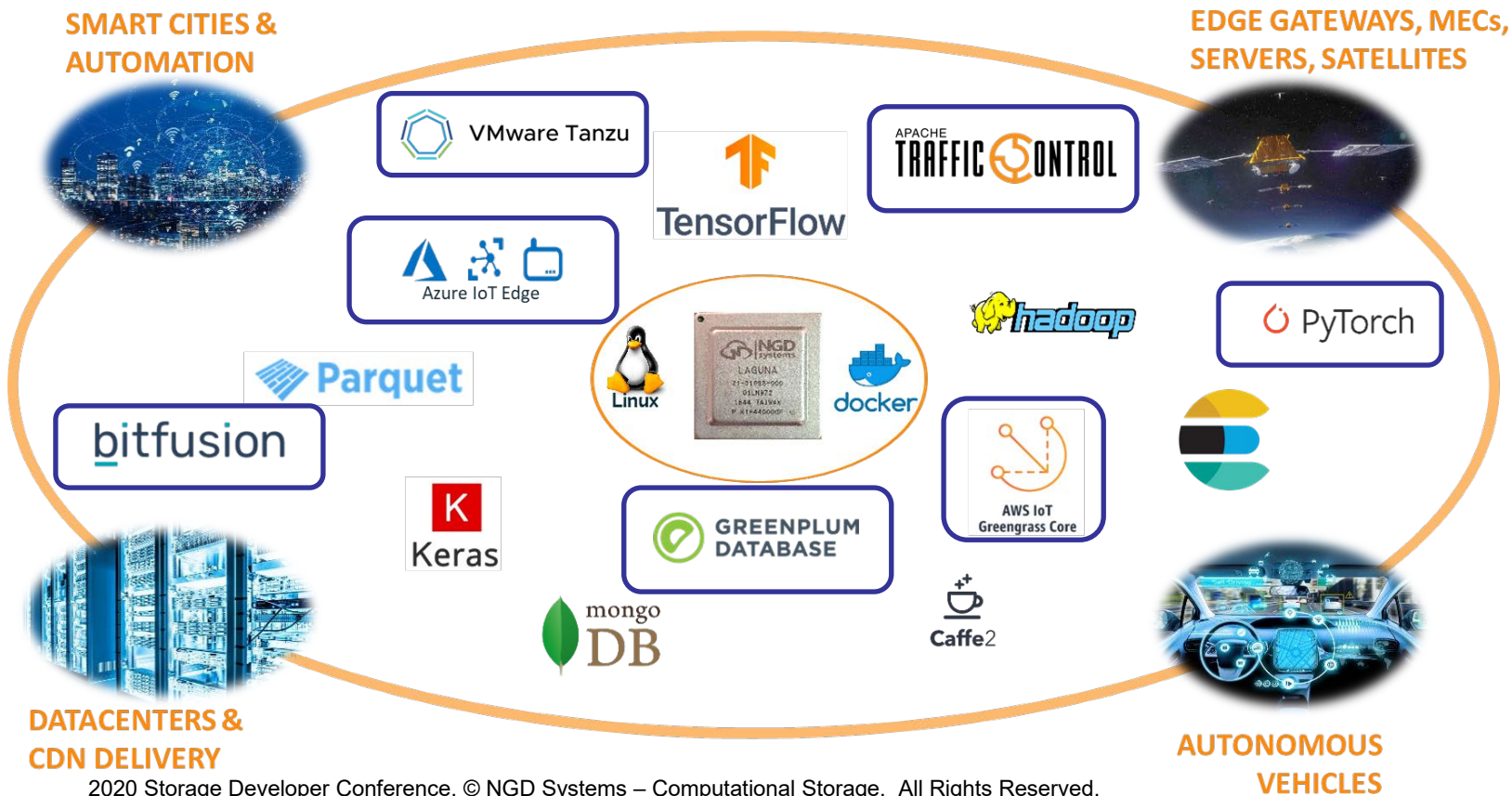
When is 'NGD' Ready? – NOW!!

- ✓ Breadth of **SSD** solutions and capacity options
- ✓ Leading **W/TB** Energy Efficiency
- ✓ Industry's **First** 16-Channel M.2
- ✓ **Largest** capacity NVMe U.2
- ✓ Computational Solutions **Built-In**

Form Factor	Availability	Raw Capacity TLC (TB)	Max Raw Capacity QLC (TB)
M.2 22110	NOW	up to 8	12
U.2 15mm	NOW	up to 32	48
EDSFF E1.S	NOW	up to 12	16



Where are the Examples? – Right Here!



How about real EDGE Workloads!

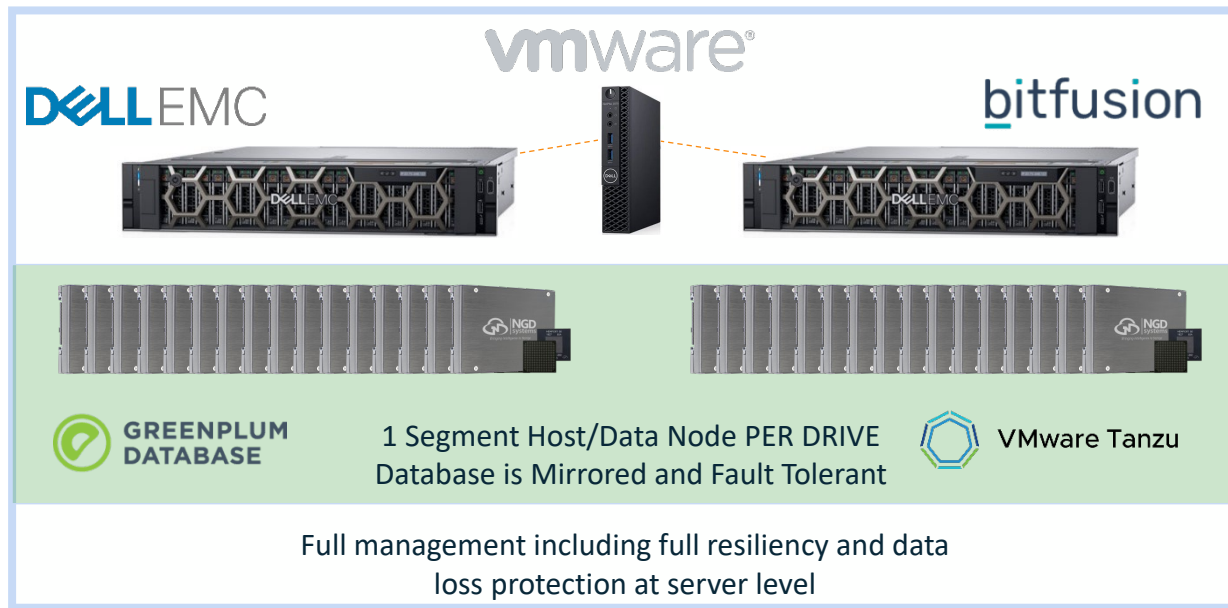
- EDGE DB Acceleration - VMware
- EDGE CDN – Customer Results
- EDGE AI - Inferencing - WiSARD
- EDGE AI - Machine Learning - Stannis
- EDGE IoT – Microsoft Azure IoT Edge



EDGE Analytics – VMware - GreenplumDB

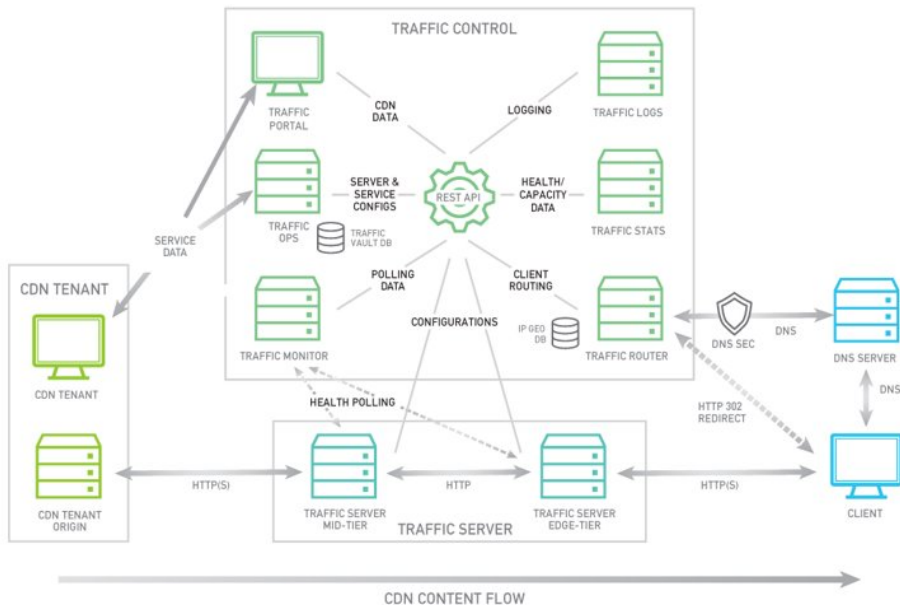
Computational Storage allows it to be drive level.

Reducing Footprint, server cost and still offering full fault tolerance



Showcased at Vmworld 2020 - Session ID [OCTO478] –
Computational Storage, Tanzu Greenplum, vSphere Bitfusion

EDGE CDN Solution – One of Many



Problem Statement

- Open source CDN – Traffic Control
- Focus on Time to First Frame (TtFf)
- Complex System to be pulled apart to find single step for impact

Process

- Identified a Single Storage Instance
- Allocated Storage and processing to NGD Computational Storage
- Performance impact to whole system
 - **50% faster step performance**
 - **10% overall system improvement**



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Proving Value to Open Source CDN – Better TtFf.

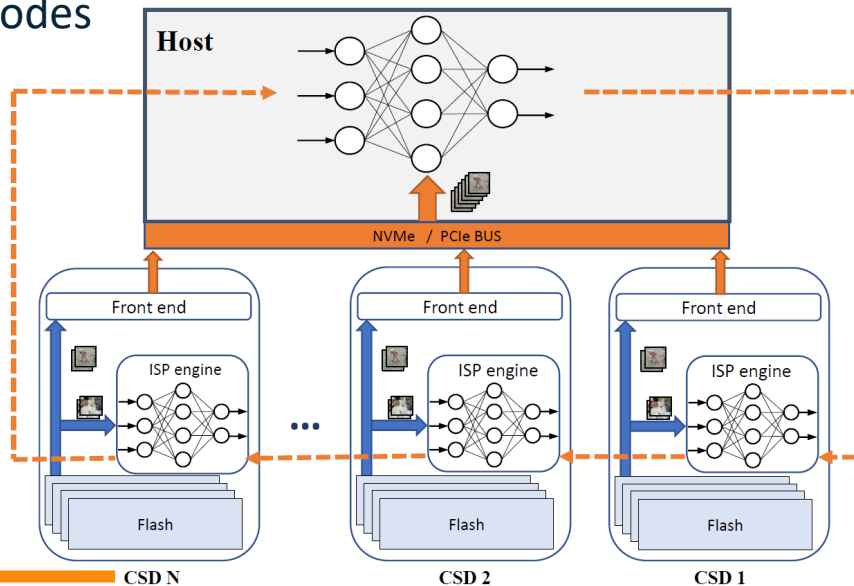


By Addressing just one step:
>50% performance improvement of this step
>10% OVERALL CDN Efficiency

These results were achieved with
Only a few drives shows scalability

Machine Learning Using the STANNIS Framework

- System for Training of Neural Networks In Storage
- Matches the processing workload of all nodes
- Determines batch size on each node
- Load balancing on size of input data



Machine Learning At Scale – Not Just One Way

- Four neural networks Evaluated

- MobileNetV2
- NASNet
- SqueezeNet
- InceptionV3Quad-core

- Tested with 24 CSDs

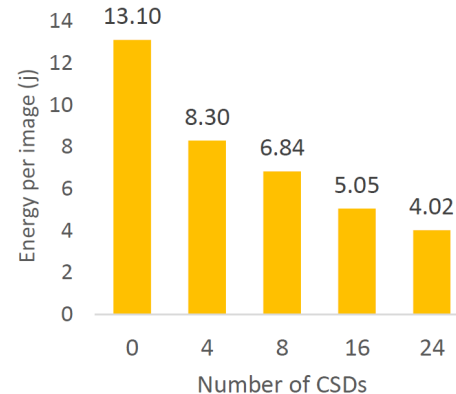
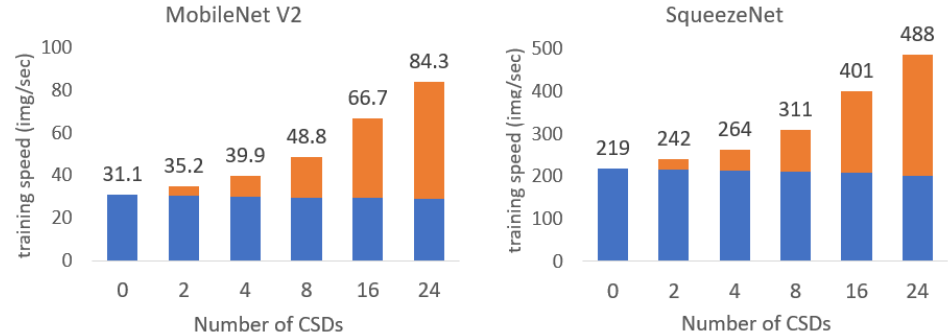
- 32TB capacity each
- Quad-core ARM A53 processor
- 4x NEON SIMD engines
- 8GB DRAM

- Training data stored on CSDs

- 72k public images
- 12k private images

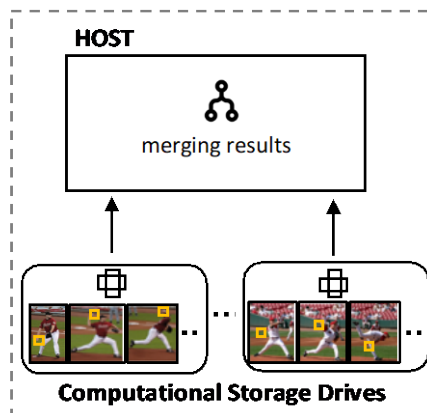
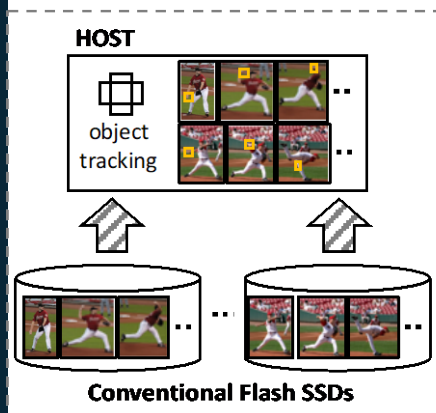
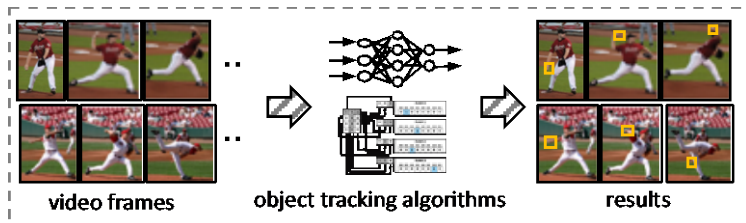
- Using an AIC 2U-FB201-LX server

- Intel® Xeon® Silver 4108 CPU
- 32GB DRAM

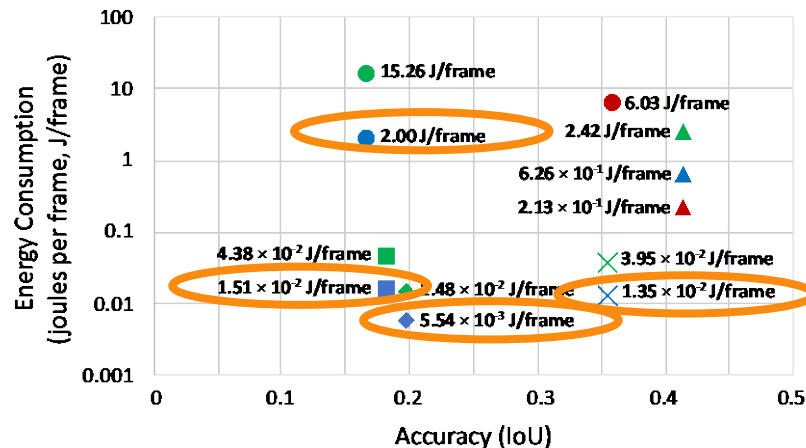
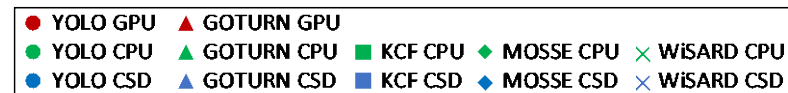


Inference at the Edge – Low Power, Big Results.

Definitive AI Support at the Edge



- Scalable solution
- Energy efficiency gains (~10x)



CSD Results Are equal in accuracy with Less Power

Azure IoT Deployment on Computational Storage

- **Computer Vision Running on NGD Computational Storage**
- **Directly Connected to Azure IoT Edge**
- **Microsoft Developer Sponsored Content**

NGD's Computational Storage device is powered by Azure IoT Edge



<https://www.youtube.com/watch?v=D7Ab8zli3kw>

Azure IoT Edge





The **ONLY** Edge-Ready
Computational Storage Drive on the Market
Learn More Here: www.NGDSystems.com