Simplifying Deep Learning Infrastructure with Dell EMC

Boni Bruno, CISSP, CISM, CGEIT
Chief Solutions Architect

D✕LLEMC

TRADITIONAL CLUSTER

Workload Profile:

Financial Services Company

192TB data set

16 years, 68 quarters

34.7 Million Customers

1.85 Billion performance records

XGBoost training set: 50 features

300 Servers | $3M | 180 kW

Dell EMC Solution

1/6 the Cost

1/14 the Space

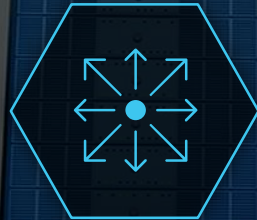1/9 the Power

Why Dell EMC Isilon for AI?

High Performance

Flexibility

Extreme Scale

Enterprise Data Governance

ALL THIS WITH JUST STANDARD ACCESS PROTOCOLS
NO OS MODIFICATION or SPECIAL DRIVERS NEEDED

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Dell EMC Isilon Deep Learning Solution Portfolio

Only vender to offer flexibility & informed choice with NVIDIA, the leader in AI

Augment existing Isilon with
F800 All-Flash

Ready Solution for AI:
Deep Learning with NVIDIA

Extreme Deep Learning
Isilon with NVIDIA DGX-1

Dell EMC PowerEdge servers accelerated with NVIDIA GPUs

↑↓ Massively Parallel IO ↑↓

All-Flash

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Isilon with NVIDIA GPUs Benchmark

Image detection with Tensorflow and 22 TB dataset

ResNet-50 (Training)

Chart axes: IMAGES/SEC (0 to 60000) vs GPU (8 to 72)

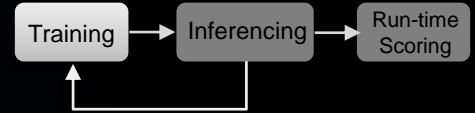Legend:
- Isilon w/ DGX-1
- Isilon w/ Ready Solution
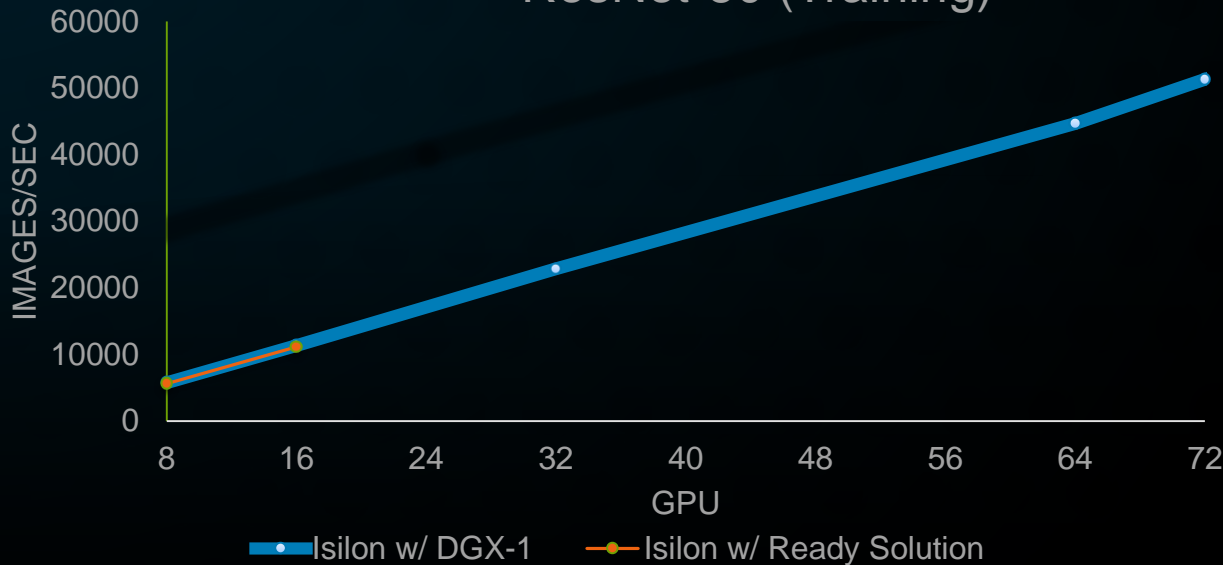
Highlights

- **Record performance:** 96% or more of theoretical max

- **Linear Scaling:** From 8 to 72 GPUs
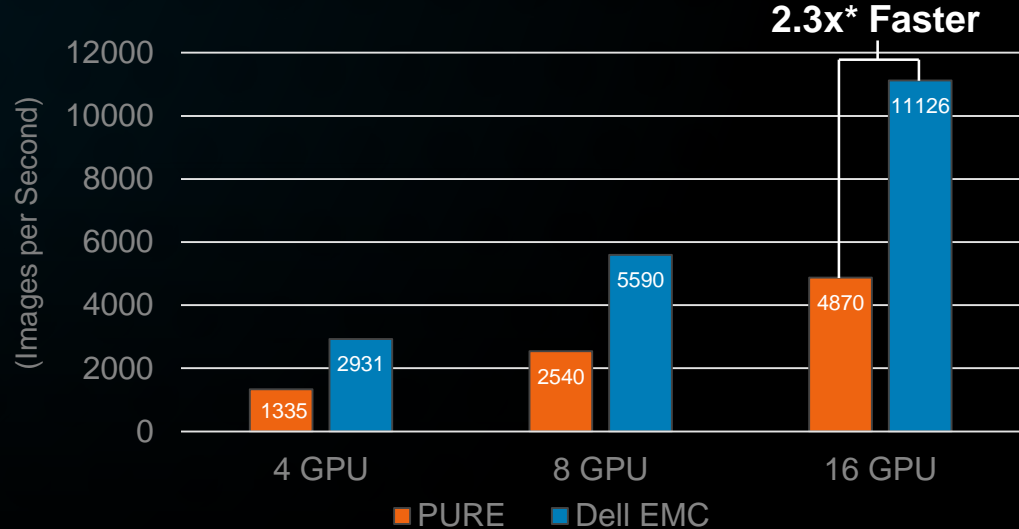
- Only vender to publish above 32 GPUs

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Ready Solution for Deep Learning: Benchmark results

Training: Image Classification with TensorFlow and ImageNet Data Set

Training → Inferencing → Run-time Scoring

ResNet-50 Results

2.3x* Faster

(Images per Second)

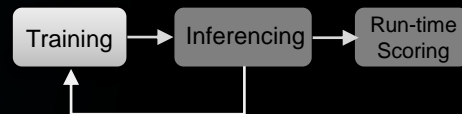|	4 GPU	8 GPU	16 GPU
PURE	1335	2540	4870
Dell EMC	2931	5590	11126

■ PURE ■ Dell EMC

*Based on an Enterprise Strategy Group Technical Review "Accelerating the Artificial Intelligence Journey with Dell EMC Ready Solutions for AI", August 2018 AD# G18000181

Not STAC Benchmarks

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Ready Solution for Deep Learning: Benchmark results

Training: Image Classification with TensorFlow and ImageNet Data Set

Training → Inferencing → Run-time Scoring

AlexNet Results

(Images per Second)

2.9x* Faster

	4 GPU	8 GPU	16 GPU
NetApp	4243	4929	NetApp N/A — 0
Dell EMC	7691	14259	27375

■ NetApp   ■ Dell EMC

*Based on an Enterprise Strategy Group Technical Review "Accelerating the Artificial Intelligence Journey with Dell EMC Ready Solutions for AI", August 2018 AD# G18000181
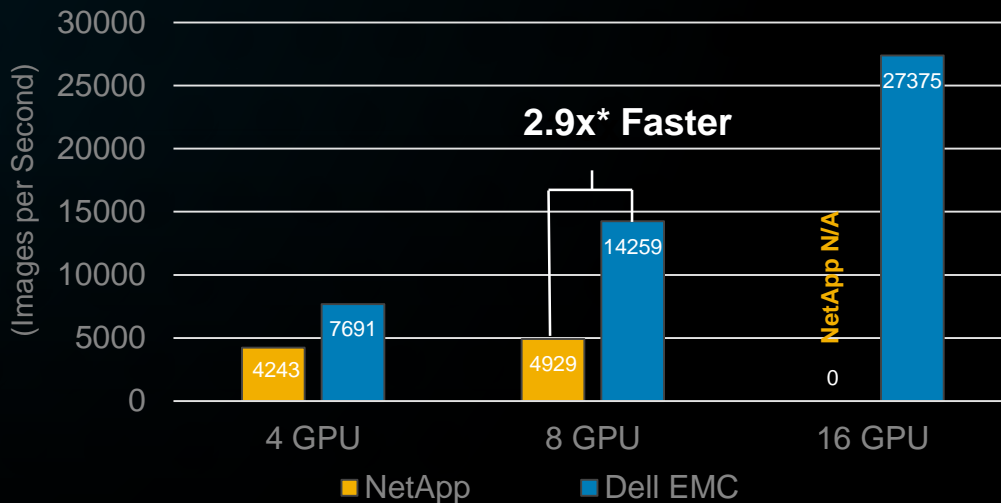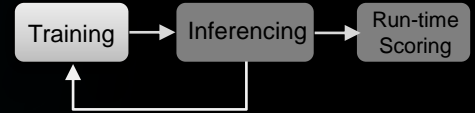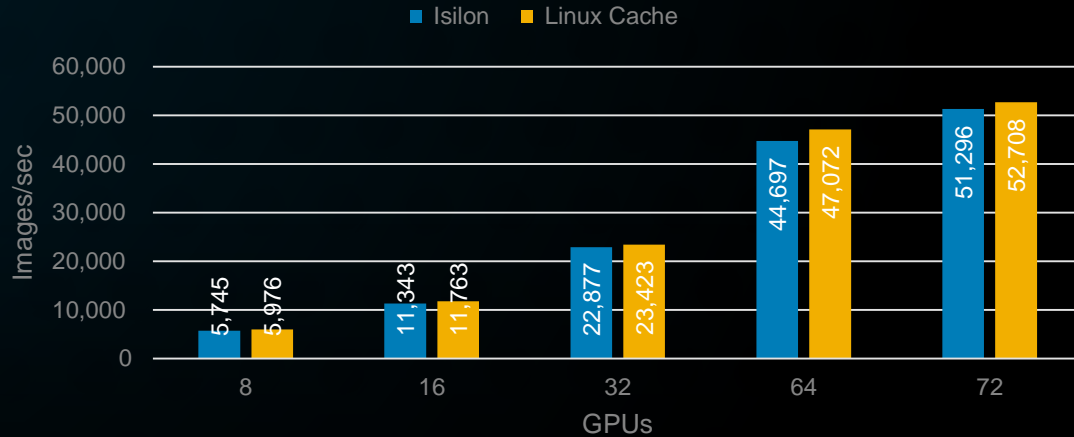
Not STAC Benchmarks

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Isilon with DGX-1: Benchmark Results

Training: Image Classification with TensorFlow and ImageNet Data Set

Training → Inferencing → Run-time Scoring

ResNet-50

■ Isilon   ■ Linux Cache

GPUs	Isilon	Linux Cache
8	5,745	5,976
16	11,343	11,763
32	22,877	23,423
64	44,697	47,072
72	51,296	52,708

Images/sec (y-axis: 0 to 60,000)

Training

- 97% GPU utilization or higher

- 96% of local memory throughput with Isilon

- Linear Scaling from 8 to 32 to 72 GPUs

Not STAC Benchmarks
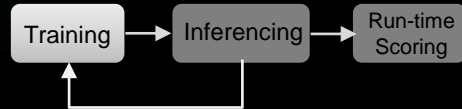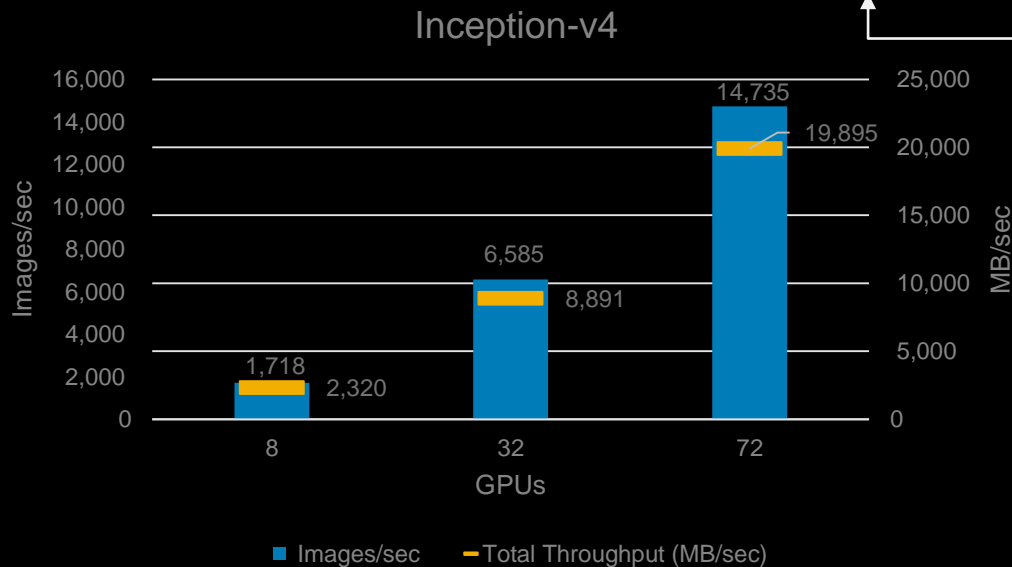
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Isilon with DGX-1: Benchmark Results

Training: Large Image Classification with TensorFlow and ImageNet

Inception-v4

Chart — Images/sec (left axis) and MB/sec (right axis) vs GPUs:

GPUs	Images/sec	Total Throughput (MB/sec)
8	1,718	2,320
32	6,585	8,891
72	14,735	19,895

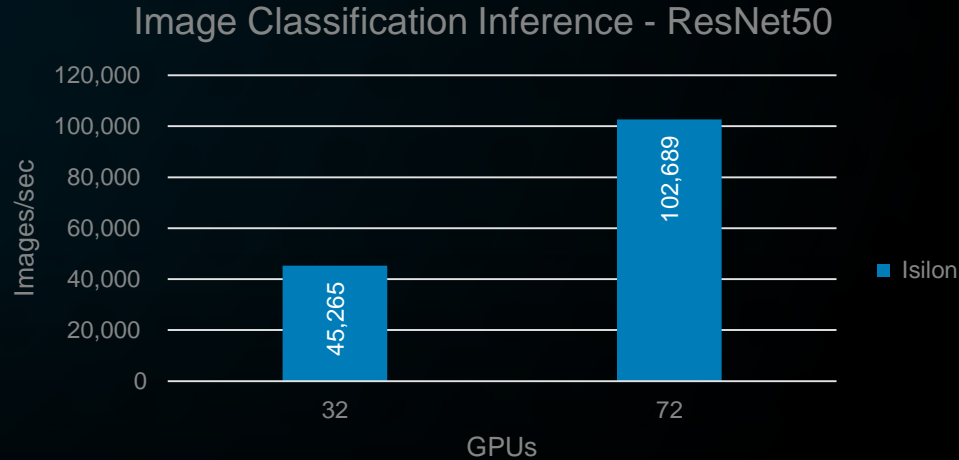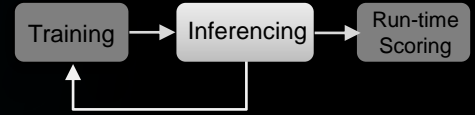Legend: ■ Images/sec — Total Throughput (MB/sec)

Training

- 98% GPU utilization
- Linear Scaling from 8 to 32 to 72 GPUs
- 19.9 GB/s throughput with 72 GPUs

Not STAC Benchmarks

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Isilon with DGX-1: Benchmark results

Inferencing: Image Classification with TensorFlow and ImageNet Data Set

Training → Inferencing → Run-time Scoring

Image Classification Inference - ResNet50

Images/sec

- 120,000
- 100,000
- 80,000
- 60,000
- 40,000
- 20,000
- 0

45,265 (32 GPUs)

102,689 (72 GPUs)

GPUs

■ Isilon

Inferencing

- 100% of local memory throughput with Isilon
- Linear Scaling from 32 to 72 GPUs

Not STAC Benchmarks

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Isilon eliminates the I/O bottleneck for AI at any scale

All Flash

Ultra Dense
72TBs up to 924TBs in 4U

Seamless Scale to Over 58PBs
In a Single File System

No Special Storage Drivers Needed
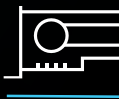Simply use NFS for data access

Faster training and validation of AI models

Higher model accuracy

Improve data science productivity

Maximize ROI of compute investments

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Additional Reading Material…

- [Tick Data Analytics – Scaling Concurrency and I/O Performance](#)

- [Deep Learning with Dell EMC Isilon](#)

- [Digital Banking](#)

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Thank You

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