

# JUMPSTART YOUR AI INITIATIVE

10 OBSERVATIONS & LEARNINGS FROM THE FINANCIAL SERVICES FRONT LINE

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## 1) DON'T UNDERSTIMATE THE INFOSEC CHALLENGE

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- **Getting access to the internal data you need is difficult**
- **Putting it in the public cloud even more so**
- **Plan for data sourcing to take 2-3X longer than anyone says**

## 2) TOOLING & FRAMEWORKS ARE EVOLVING QUICKLY

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- **Don't get religious about tools**
- **You “don't want to be right for 6 months and wrong forever”**
- **Key architectural principle – build upon open standards and avoid vendor lock in – so you can swap in/out tools as appropriate**

## 3) IS YOUR INITIATIVE STRATEGIC OR TACTICAL?

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- **If tactical that's fine, but recognize that when it becomes strategic your infrastructure may require a complete re-design**
- **Document upfront at what point the solution should be considered strategic so you do not continue to invest in something that may never be fit for purpose**
- **In our experience this often means discarding "tactical" infrastructure investments and starting all over again (requirements definition, design, approvals, funding sign off, procurement, build, optimization processes etc.)**
- **Think about how long this takes in your organization?**
- **And the implications of this if your competitors have a 6-12-18 month competitive advantage in that area?**
- **Discuss this upfront with your customers/stakeholders! It may drive a different thought process!**



**"IT WAS NEVER MEANT TO BE A  
STRATEGIC SOLUTION"**

**"WE DID THE BEST WE COULD"**

## 3) IS YOUR INITIATIVE STRATEGIC OR TACTICAL?

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- **If it is strategic then treat it as such, invest and build on firm, proven foundations that allow you to scale simply, linearly and non-disruptively**

## 4) AI IS OFTEN CHALLENGING TO POC

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- **SCALE**

- At small scale (single GPU) AI experiments can be serviced by pretty much any hardware. But this changes quickly as your sophistication and scale increase!
- POC data sets may work fine on DAS – but production size data sets?
- Lab environments often lack the performance and scale to really simulate large scale AI workload
- At scale legacy storage technologies are not able to meet the supercomputer levels of performance that GPU's require today
- Real world test wherever possible (vs synthetic)
- Test the hard stuff – try and break it - don't waste time on the easy stuff

## 4) AI IS OFTEN CHALLENGING TO POC

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- **DATA**

- Real data is often difficult to source in POC timescales
- Particularly in meaningful volumes
- “Toy” datasets yield “toy” results

## SCALE OF REAL-WORLD DATA

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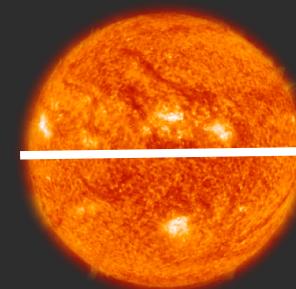
143 GB

ImageNet



20+ PB

Autonomous vehicles



## 5) DOCUMENT YOUR CRITICAL CAPABILITIES

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### Proven INFRA with ability to:

- **Scale from 100's TB's to PB's**
- **Scale from X GPU to Y GPU**
- **Scale in cost effective increments**
- **Scale 100% non disruptively**
- **Deliver linear scale/performance**
  - A model that takes 4 hours to run on 1 GPU
  - Takes 1 hour to run on 4 GPU's
  - **NOTE:** Sounds easy but in practice is anything but!

## 6) INFRASTRUCTURES KEY PRIORITIES

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- **Keep the GPU's busy**
- **Keep the Data Scientists busy (doing data science!)**
  - Not systems integration
  - Not system optimization and tuning
- **Able to handle the chaos factor**
  - Random adhoc concurrent workloads
  - Able to cope with changing business requirements and priorities
  - Tuned for everything – able to cope with multiple different data types concurrently (e.g. voice, market data, alternate data sets, videos, images etc.)

## 7) RECOGNISE THE COST OF DATA SCIENCE

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- **You do not want these people unproductive!**
- **Average cost of Data Scientist in NYC according to indeed.com is \$150K per year**
- **Yet there remains a sense in some FS organizations that development (non-production) work is a second class citizen and that developers/data scientists “can wait for data”. Infrastructure investments are often skimped on to save a few \$’s. “Penny wise pound foolish”.**
- **If we buy into “software eating the world”, data being “the worlds most valuable resource” (Economist) and AI being the “4<sup>th</sup> industrial revolution” then lets act and invest accordingly.**

## 8) AI IS A PIPELINE – NOT JUST TRAINING

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- **Between 60-80% of AI work is data preparation (only 20-40% training)**
- **Yet the vast majority of focus when it comes to infrastructure is on training**
- **Henry Ford didn't just automate and industrialize the final stage of car assembly - Nor should AI teams!**
- **At the start of an AI initiative we have a great opportunity to reduce duplication and bottlenecks and build something that's efficient and effective end to end. Far harder to address down the line.**
- **Take the opportunity to do it right and build an end to end industrial strength solution for the whole AI data pipeline**
- **In FS in particular you need to be rigorous in your execution (MLOps) as "track-ability" and "reproducibility" are critical for production algorithms.**

# TRADITIONAL SILOED APPROACH

## INGEST

From sensors, machines,  
& user generated



## CLEAN & TRANSFORM

Label, anomaly detection,  
ETL, prep, stage



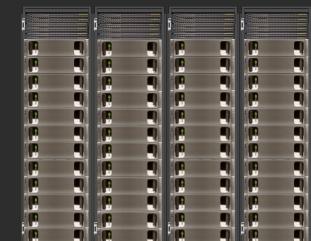
## EXPLORE

Quickly iterate to  
converge on models



## TRAIN

Run for hours to days in  
production cluster

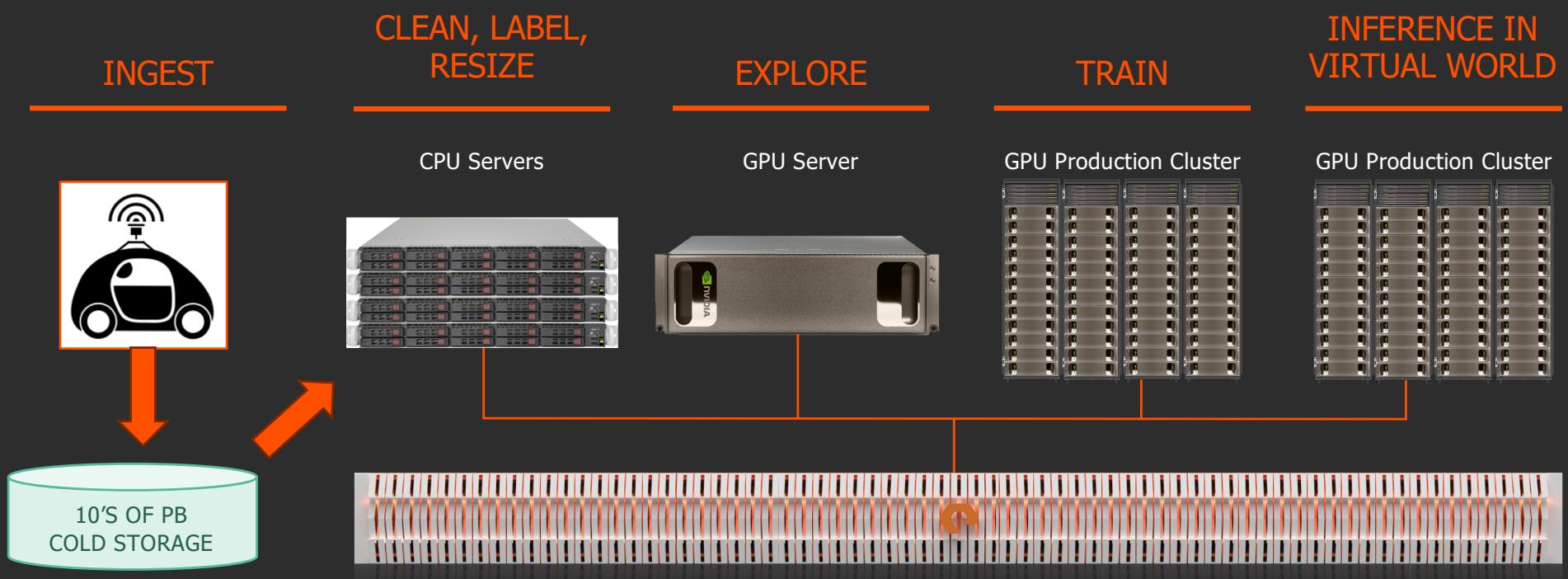


**COPY &  
TRANSFORM**

**COPY &  
TRANSFORM**

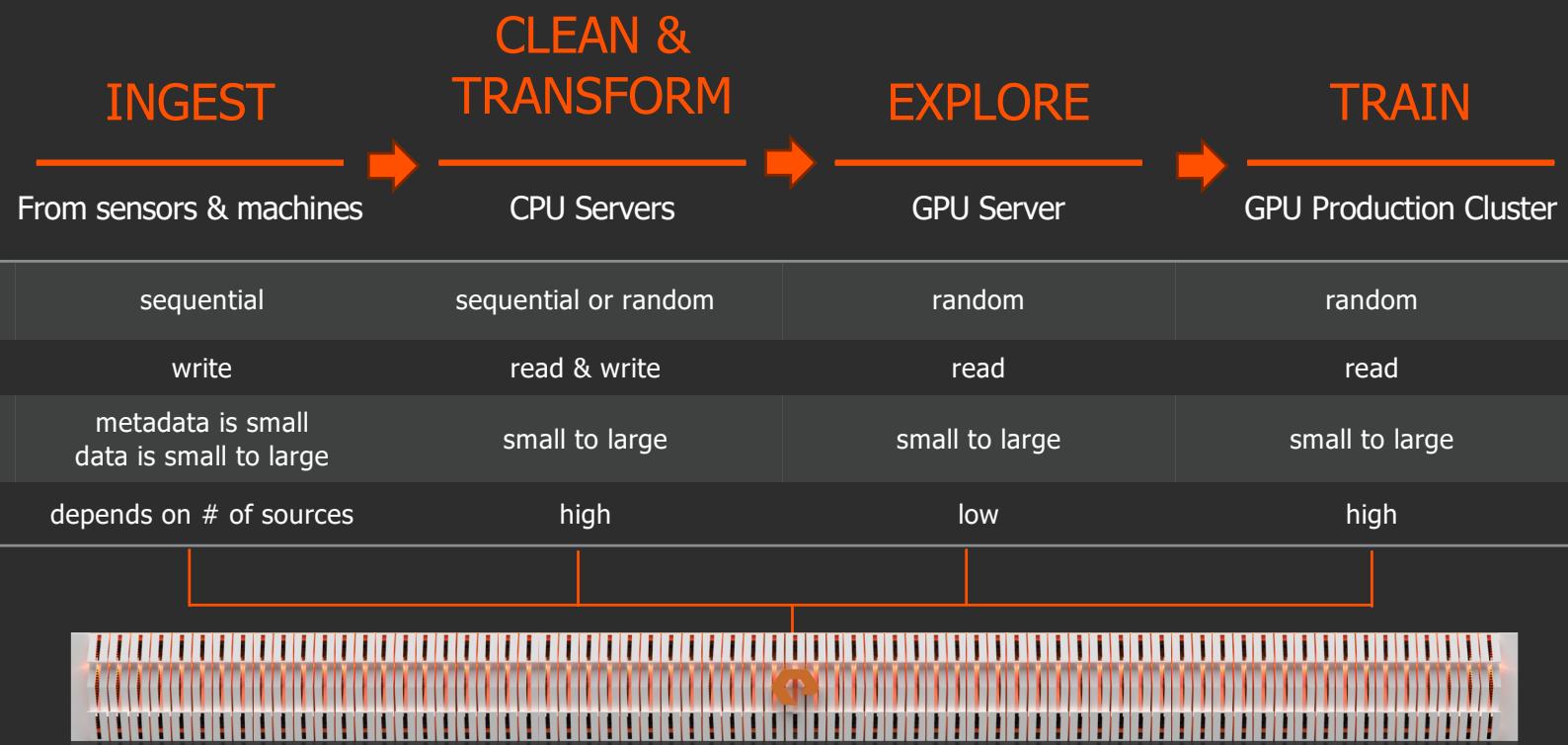
**COPY &  
TRANSFORM**

# CONSOLIDATED, EFFICIENT & EFFECTIVE



# WIDE RANGE OF NEEDS IN AI PIPELINE

SIGNIFICANT CHALLENGE TO LEGACY STORAGE, NOT FOR FLASHBLADE



## 9) FEW PEOPLE UNDERSTAND THE E2E SOLUTION

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- **Data Scientists understand the tools / frameworks**
- **Infrastructure people understand their part of the infrastructure**
- **But its important to recognize that:**
  - Delivering an integrated system that is able to deliver supercomputer levels of performance is not “standard IT”
  - The software tools and frameworks are new and immature
  - It’s likely no-one understands the impact of the tens/hundreds of software tuneables on the infrastructure

# SMALL SET OF CONFIGURABLES

```
--eval_interval_secs    --forward_only    --print_training_accuracy    --batch_size    --batch_group_size    --num_batches  
--num_epochs    --num_warmup_batches    --autotune_threshold    --num_gpus    --hierarchical_copy    --display_every  
--data_dir    --data_name    --resize_method    --distortions    --use_datasets    --gpu_thread_mode    --  
per_gpu_thread_count    --cache_data    --agg_small_grads_max_group    --local_parameter_device    --device    --  
data_format    --num_intra_threads    --num_inter_threads    --trace_file    --use_chrome_trace_format    --  
graph_rewriter    --optimize    --learning_rate    --piecewise_learning_rate_schedule    --num_epochs_per_decay    --  
learning_rate_decay_factor    --minimum_learning_rate    --momentum    --rmsprop_decay    --rmsprop_momentum    --  
rmsprop_epsilon    --gradient_clip    --weight_decay    --mkl    --gpu_memory_trac_for_testing    --use_tf_layers    --  
tf_random_seed    --debugger    --use_python32_barrier    --use_fp16    --winograd_nonfused    --sync_on_finish    --  
staged_vars    --force_gpu_compatible    --fuse_decode_and_crop    --job_name    --distort_color_in_yiq    --  
enable_layout_optimizer    --kmp_blocktime    --kmp_affinity    --kmp_settings    --rewriter_config    --  
loss_type_to_report    --single_l2_loss_op    --fp16_loss_scale    --fp16_vars    --variable_update    --all_reduce_spec  
--fp16_enable_auto_loss_scale    --fp16_inc_loss_scale_every_n    --variable_update    --all_reduce_spec    --
```

## 10) IN BIG ORGANISATIONS THIS BECOMES INCREASINGLY CHALLENGING

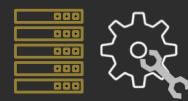
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- **Building a successful AI infrastructure for AI at scale will require close collaboration between multiple specialists from the following fields:**
- **Compute, Storage, Network, Data Scientists, Kubernetes / Docker**
- **Yet the monolithic silos of technical specialization in most large organizations do not typically lend themselves to the level of close collaboration required to build a successful, strategic, integrated, linearly scalable AI infrastructure**

## DO IT YOURSELF THE TRADITIONAL APPROACH



Never-ending cycles of compiling and tuning open source software



Months of system building and tuning, constant maintenance



Legacy solutions full of data bottlenecks, from storage to GPU to apps



# THERE IS HOWEVER AN ALTERNATIVE



AI-READY INFRASTRUCTURE

From  
**PURESTORAGE**

Powered by  
**NVIDIA**





# THE INDUSTRY'S FIRST COMPLETE AI-READY INFRASTRUCTURE

## HARDWARE

**NVIDIA® DGX-1™** | 4x DGX-1 Systems | 4 PFLOPS of DL Performance

**PURE FLASHBLADE™** | 15x 17TB Blades | 1.5M IOPS

**ARISTA or CISCO** | 2x 100Gb Ethernet Switches with RDMA

## SOFTWARE

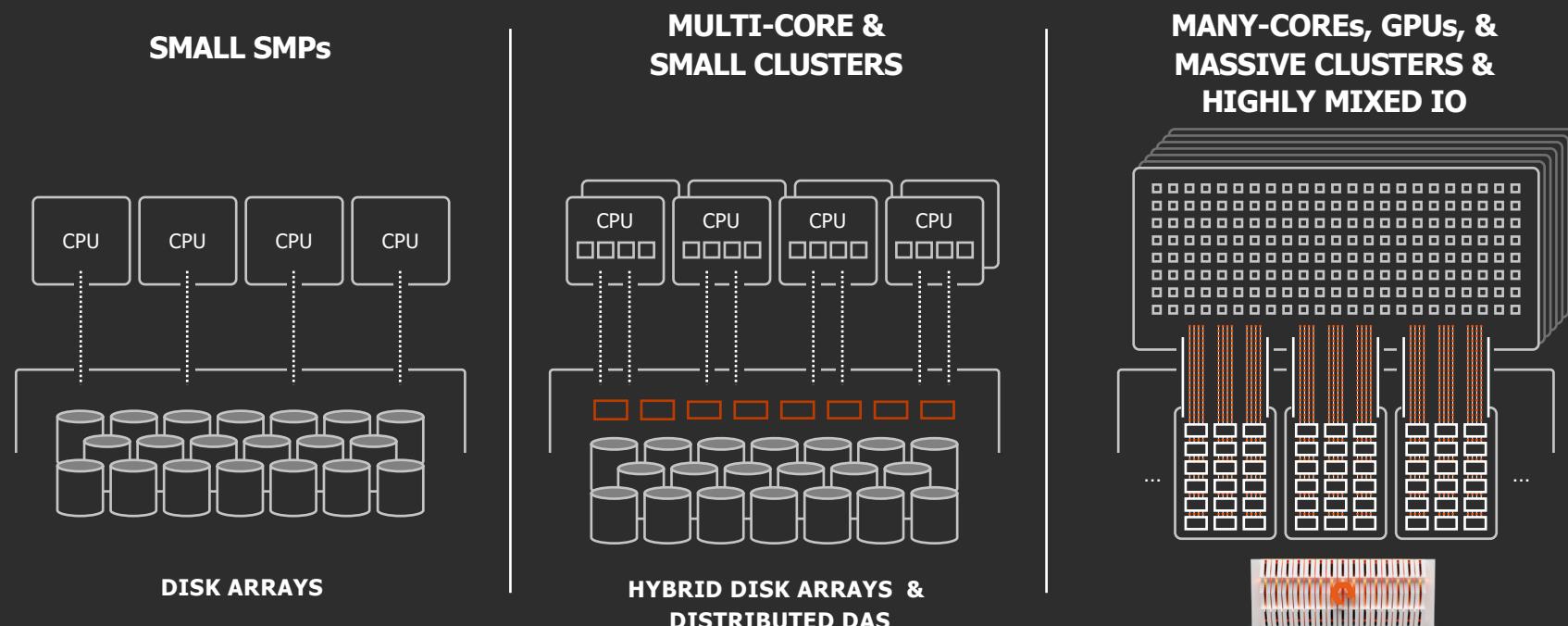
**NVIDIA GPU CLOUD DEEP LEARNING STACK** | NVIDIA Optimized Frameworks

**AIRI SCALING TOOLKIT** | Multi-node Training Made Simple



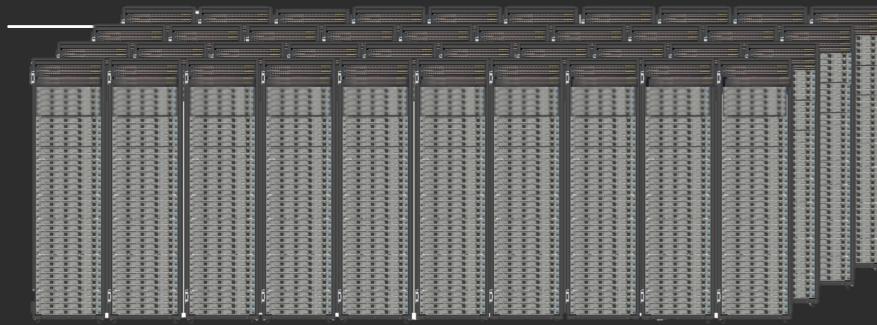
# 20+ YEAR TREND: MASSIVE PARALLELISM

FLASHBLADE BRINGS PARALLELISM THROUGH TO STORAGE

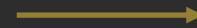


# MASSIVE EFFICIENCY - 50 RACKS UNDER 50 INCHES

PERFORMANCE OF ENTIRE DATA CENTER FOR EACH DATA TEAM IN AN ORGANIZATION



**NVIDIA® DGX-1™**  
Delivering performance  
of 40 racks of CPUs

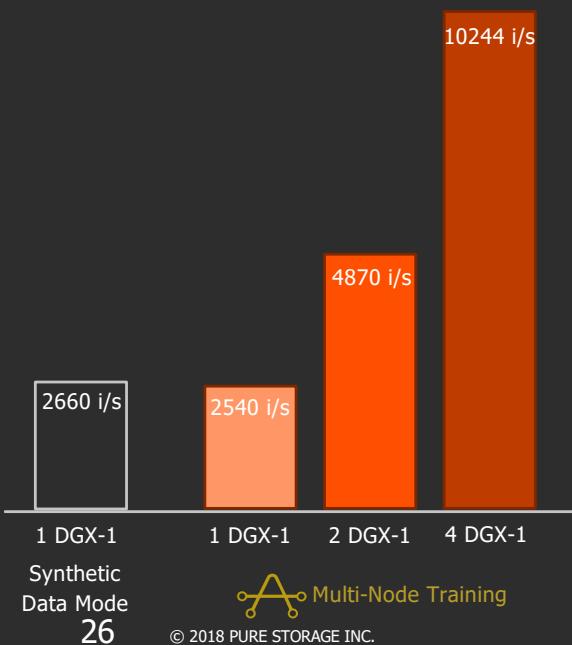


**PURE FLASHBLADE™**  
Delivering performance  
of 10 racks of Disk

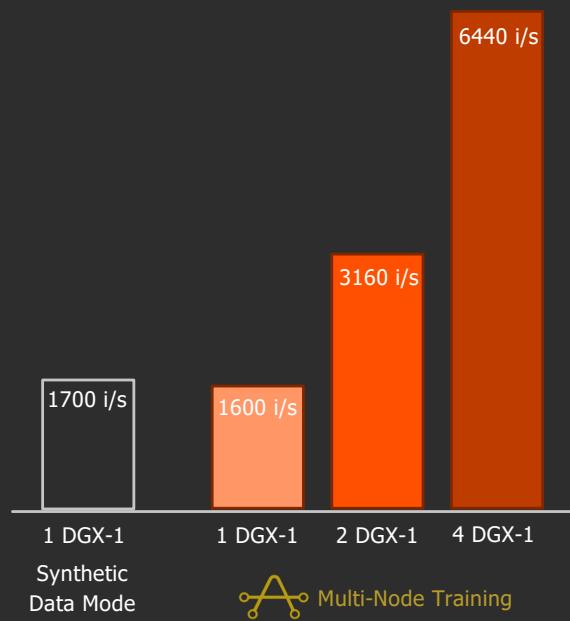
# LINEAR PERFORMANCE SCALING

*Keeping GPUs Busy with TensorFlow & 100Gb Ethernet with RDMA*

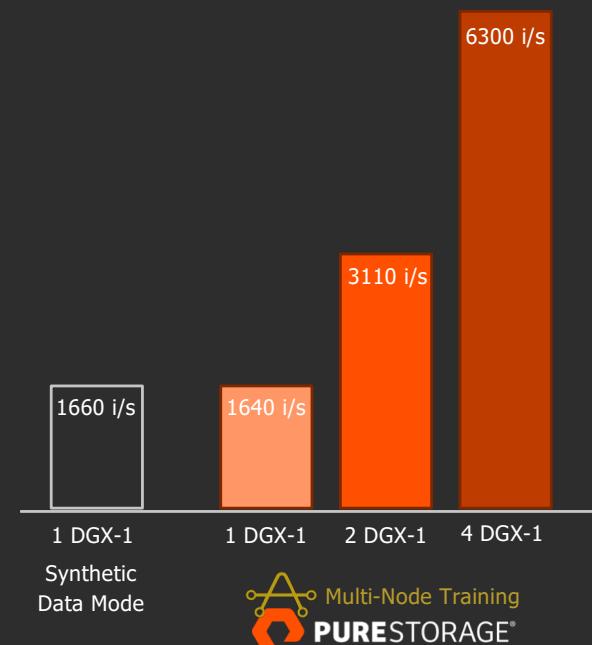
RESNET-50



INCEPTION3



VGG16





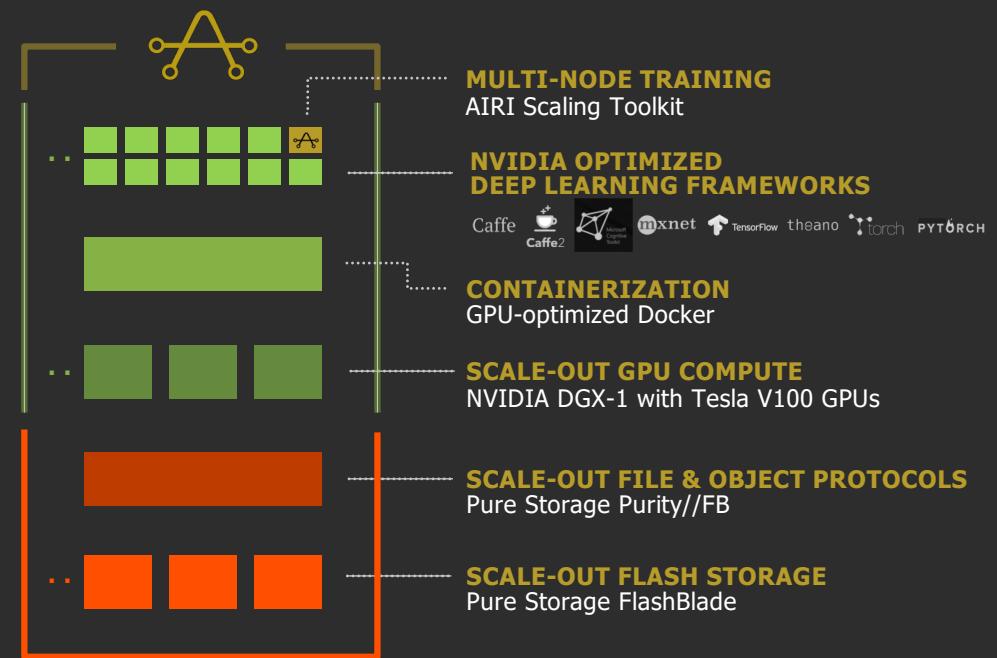
# AIRI

## TECHNOLOGY STACK

AI-AT-SCALE MADE SIMPLE

### AIRI TECHNOLOGY STACK

INCLUDES NVIDIA GPU CLOUD DL STACK & SCALING TOOLKIT



# ELEMENT<sup>AI</sup>

“AIRI represents an exciting breakthrough for AI adoption in the enterprise, shattering the barrier of infrastructure complexities and clearing the path to jumpstart any organization’s AI initiative.

AIRI is built with the same core solutions ElementAI uses extensively both internally and with its customers- the NVIDIA DGX-1 and Pure Storage FlashBlade.”

*Jeremy Barnes  
Chief Architect, ElementAI*





“ While we wanted to move quickly, infrastructure for AI was slowing us down because it is very complex to deploy. To truly operationalize AI at scale, we needed to build a simple foundation powerful enough to support the entire organization. ”

AIRI is that foundation. All of the question marks and complexities associated with AI are solved, with a solution that integrates state-of-the-art software and hardware to enable our teams to get up and running in hours, not weeks or months. ”

*Stephen Shooster  
Co-CEO, Global Response*



# 10X FASTER SPARK FOR SYSTEMATIC TRADING

“ Our quants want to test a model, get the results, and then test another one- all day long. So an **10-20X improvement in performance is a game-changer** when it comes to creating a time-to-market advantage for us.

We double our storage needs about every 18 months. And that's a scary prospect. One of Pure's competitors required 4x the rack space of FlashBlade, without the ability to add capacity. **FlashBlade significantly improved productivity for the team and accelerated time-to-market for new trading ideas.** ”

Gary Collier, co-CTO, Man AHL

# THANK YOU!

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