

HPC/HPDA/AI/ML/DL: Many Acronyms, One Future

Earl J. Dodd

Global Technical Solutions Architect – HPC / Supercomputing

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Presentation Abstract

Many organizations are struggling to understand just what big data is and how to best harness it. Data is exploding at an exponential rate, and data sources are increasingly complex and varied, including a massive influx of data generated by mobile devices, social media, clickstreams, machines, applications, and a lot more means to collect data. Tightly-coupled, data-driven modeling and simulation is a relatively new field. In the past, most enterprises did not have access to high-speed networks and advanced computing. But then this data revolution happened, and we have a lot more data to transform into actionable information.

Now having more access to on-demand HPC and supercomputing capabilities, we can couple this horsepower with our big data analytics platforms and learning tools. The ability to get real intelligence on the edge of our networks gives us more intelligence to inform our models in real-time. Edge and real-time curation of data combined with Artificial Intelligence (e.g., machine learning, deep learning) and computational physics enable us to build sustainable models.

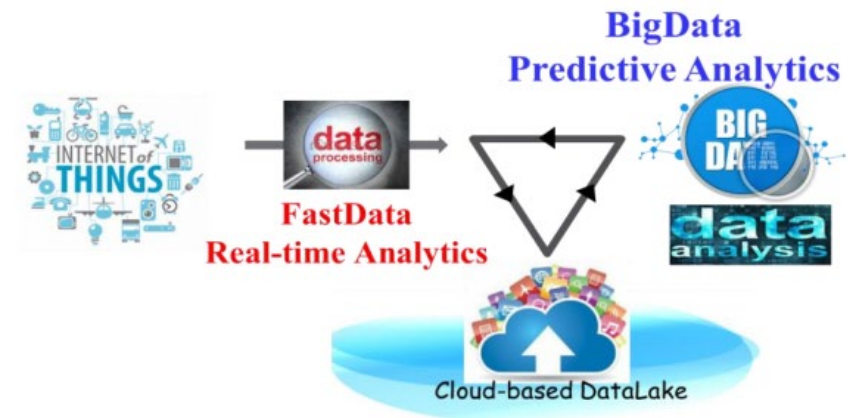
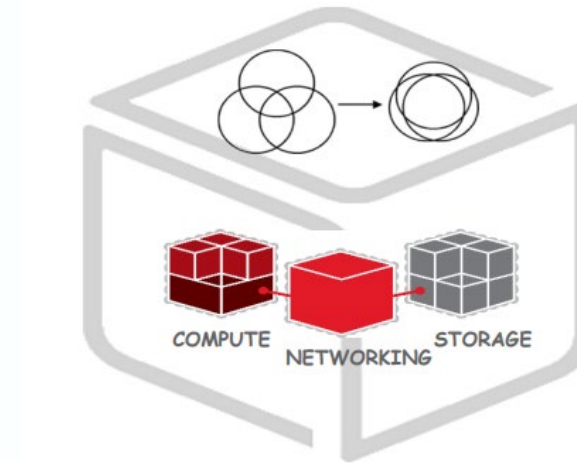
How does the HPC infrastructure support and globally optimize the growing demands of Artificial Intelligence (AI) and big data analytics processing needs? Now, as large-scale machine learning and streaming start to play a larger role in the enterprise, the big data systems need more computational capabilities. Tools and frameworks are making streaming and machine learning algorithms more powerful.

This presentation outlines the disruption of bringing the elements of HPC and AI/ML/DL with Big Data together. Although we have many crucial components represented by a pool of acronyms coupled together, the seamlessly integration creates the capability needed for complex data and computational physics problems that range from the core data center through the multiple tiers of the network (a.k.a. fog computing) and up to the network edge.



Agenda

- About WWT
- Vocabulary Leveling
- Market Drivers
- Convergence
- Architecture
- Announcement
- Next Steps
- Q&A
- Contact Information.



About WWT



My Responsibilities @ WWT: Stand-up the HPC Business Practice



Vocabulary Leveling



What is HPC?



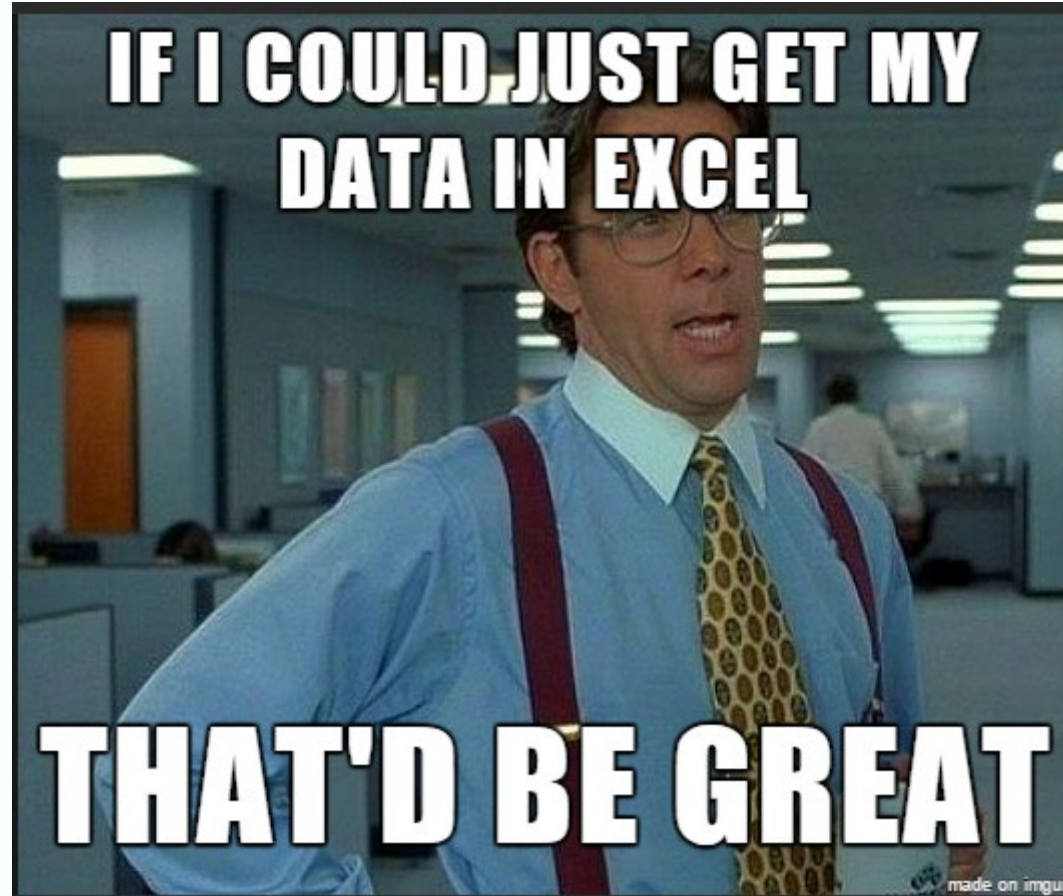
WARANDPEAS.COM



What is AI?



What is HPDA?



What is HPDA?

High Performance Data Analytics (HPDA) unites HPC with big data and analytics.

The process leverages HPC's use of parallel processing to run powerful analytic software at extreme speeds. Through this approach, it is possible to quickly examine large data sets, drawing conclusions about the information they contain.

Some analytics workloads do better with HPC rather than standard compute infrastructure. While some “big data” tasks are intended to be executed on commodity hardware in a “scale out” architecture, there are certain situations where ultra-fast, high-capacity HPC “scale up” approaches are preferred. This is the domain of HPDA.



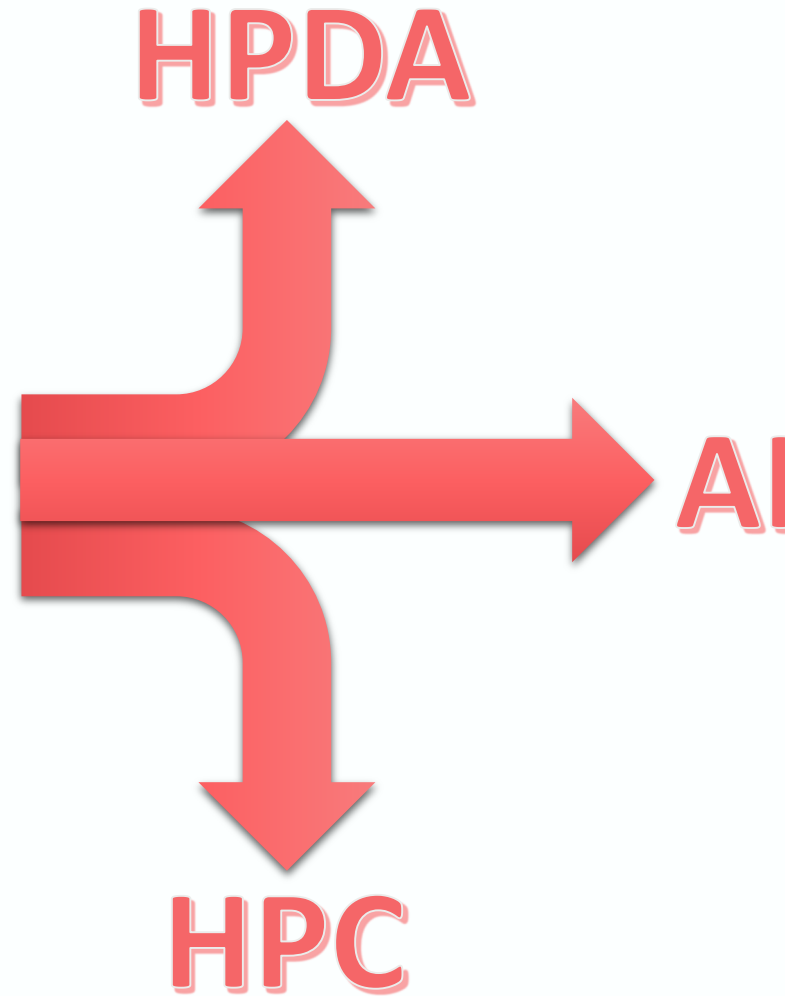
HPDA Factoid

- The Financial Services Industry (FSI) was the first commercial market to adopt supercomputers for advanced data analytics and HPDA.
- In the 1980s, large investment banks began hiring particle physicists from Los Alamos National Laboratory and the Santa Fe Institute to employ HPC systems for daunting analytics tasks, such as optimizing portfolios of mortgage-backed securities, pricing exotic financial instruments, and managing firm-wide, global risk.
- This practice continues: e.g., FSI poaches scientists away from the Large Hadron Collider work at CERN.



What's With All these Acronyms?

- BD
- AI
- ML/DL
- CNN/LNN
- CV/HR/NLP
- VR/AR
- SRM/AMM
- M2M
- and many more!



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Same Coin



***Advanced
Computing***

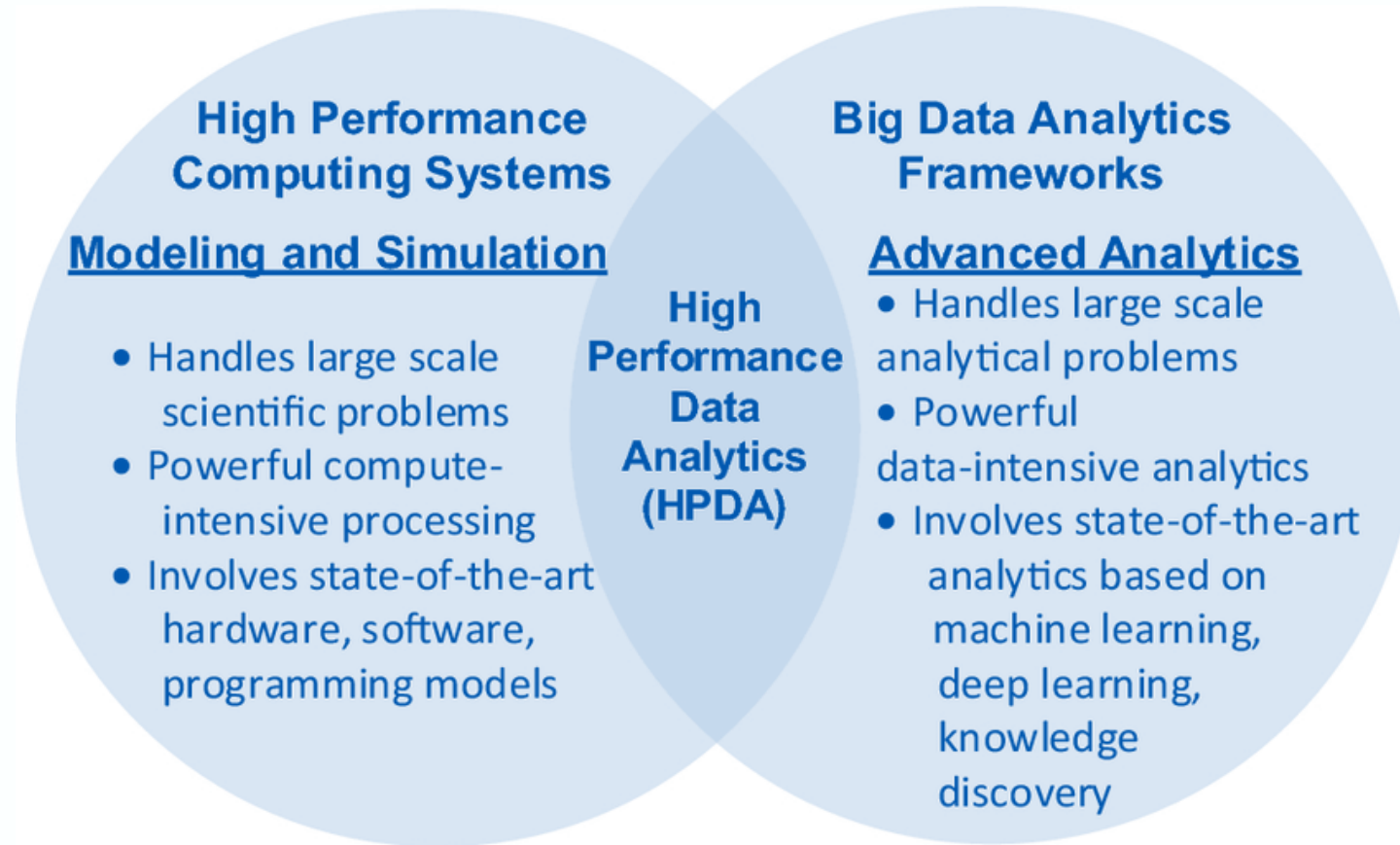
Different Sides



Building the Story



HPDA: Modeling & Simulations Meets Big Data & AI



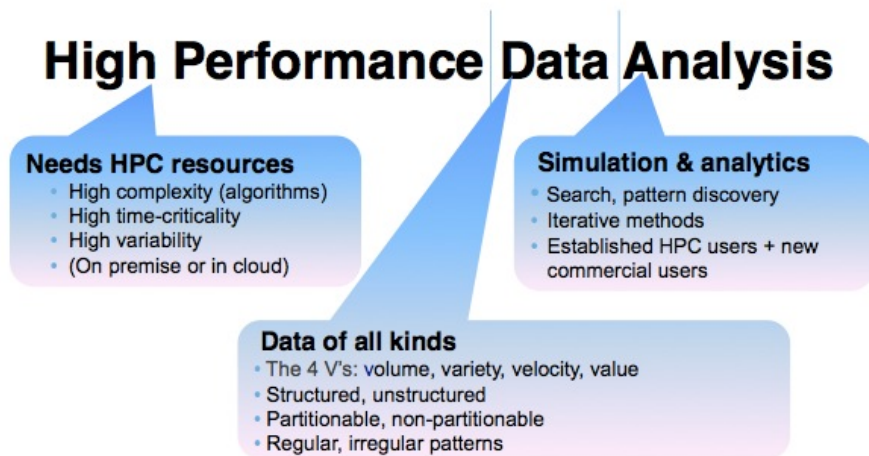
What Is Driving Demand? New Market Segments

- Fraud and Anomaly Detection
 - Government (intelligence, cyber security)
 - Industry (credit card fraud, cyber security)
- Affinity Marketing
 - Discern potential customers' demographics, buying preferences, and habits
 - Position goods or services in exchange for access to a new market
- Business Intelligence
 - Identify opportunities to advance market positioning and competitiveness
 - Robotic mapping and odometry for virtual reality or augmented reality, simultaneous localization and mapping (SLAM)
- Precision Medicine
 - Personalized approached to improve outcomes
 - Improve and control costs



Market Drivers

HPDA is evolutionary and a revolutionary. The data explosion fueling the growth of high performance data analysis stems from a mix of long-standing and newer factors.

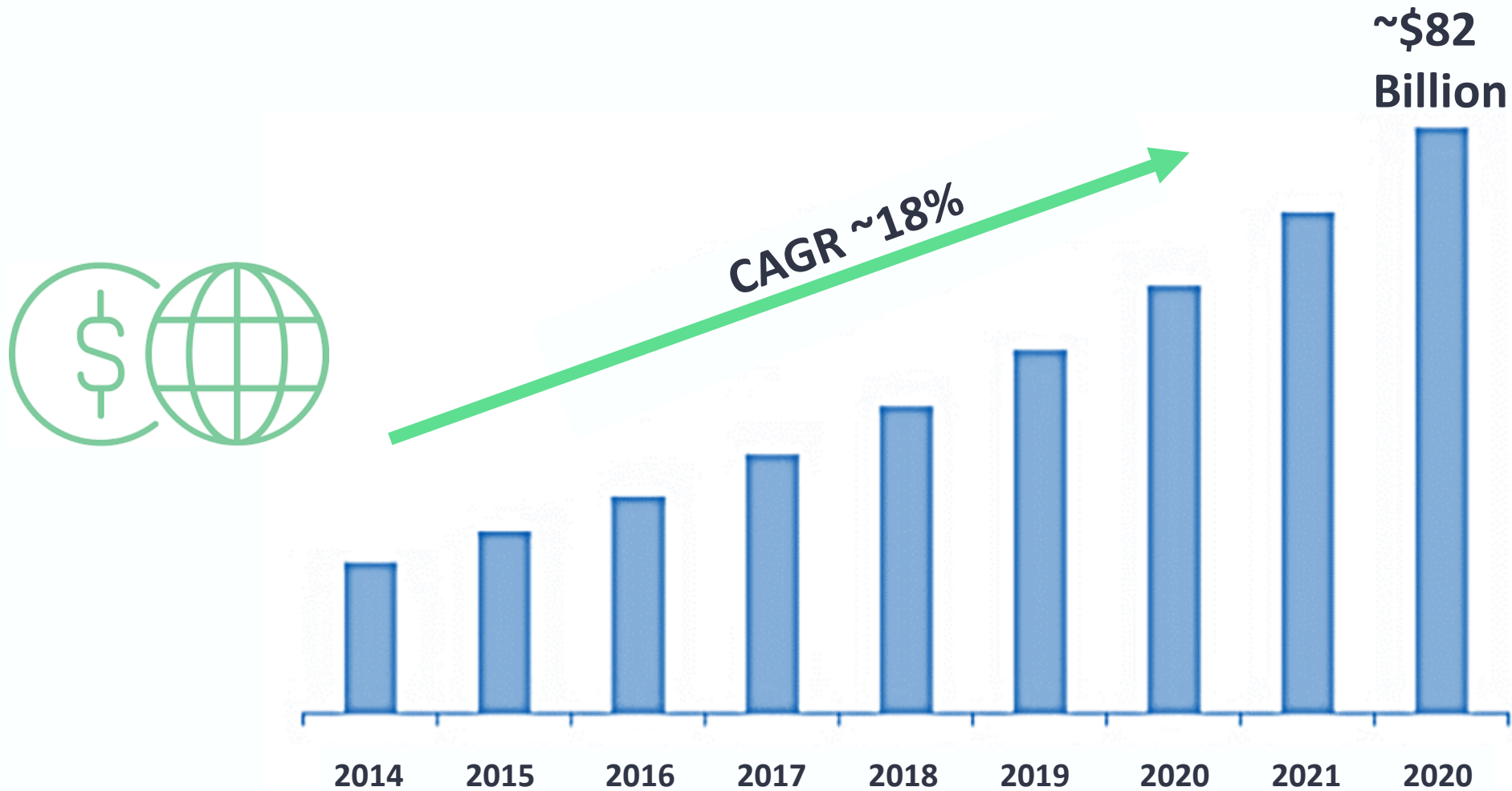


- More Input Data (**Ingest**)
 - More scientific and laboratory instruments and sensor networks
 - More transactions and higher security (fraud, terrorism)
- More Output Data for Integration/Analysis (**Digest**)
 - More powerful systems and computers
 - More realism
 - More iterations per time slot available
- More Intelligent Questions and Answers (**Suggest**)
 - “Smarter” models and algorithms
- Less Time Available (**Gest**)
 - (Near) Real-time requirements

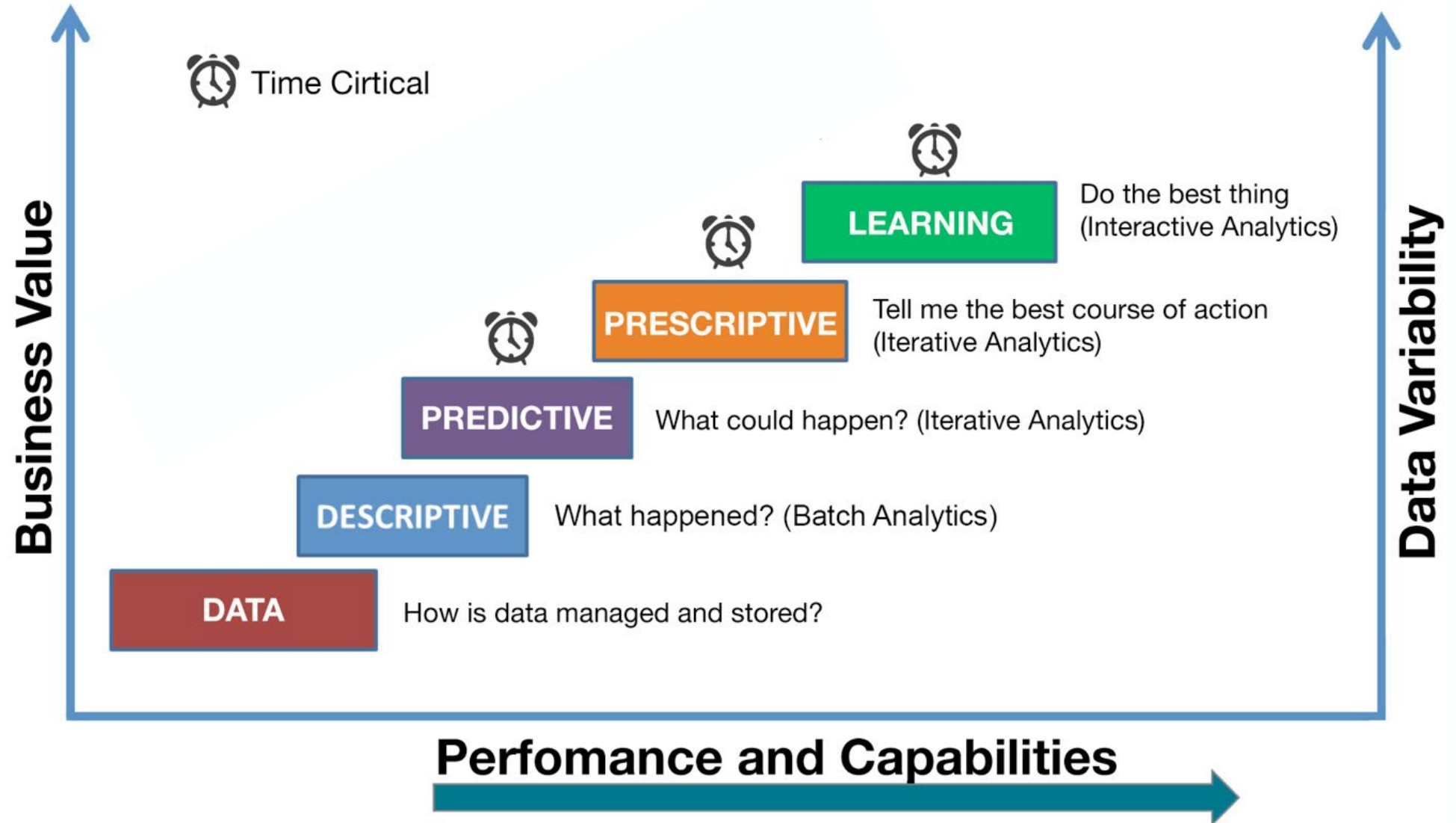


Global HPDA Market (2016-2022)

Market Research Future Report, ID: MRFR/ICT/1296-HCRR, May 2019



The Business Journey



Advanced Computing



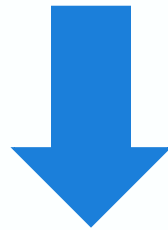
Convergence of Compute, Storage, Interconnects, Management

Metric	The Old Way	The New Wave
Compute Performance	Petaflops	Exaflops
Network Performance	GB/sec	TB/sec
Storage Capacity	Petabytes	Zettabytes
Storage Tier	Disk	Memory
Capacity Tier	Tape	Optical + Tape
Architecture	Homogeneous, Clusters	Heterogeneous, Hybrid
Management	People-, Role-focused	Autonomous, B2B-focused



Key Messages about Advanced Computing

- Focus on **Workflow** Optimization (not workloads)
- **HPDA Workflows** will expand to include more computation, larger data analysis, and real-time visualization
- **HPDA Workflows** are about optimizing the movement and acceleration of data

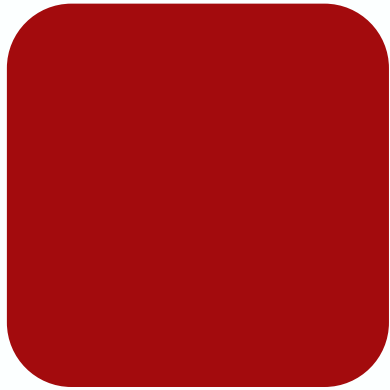


***Advanced
Computing***

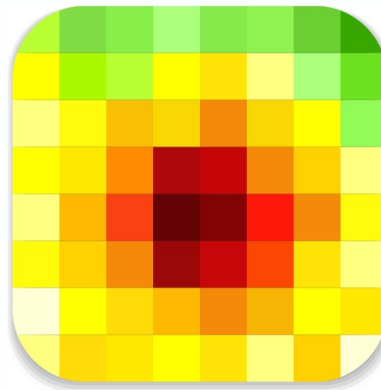


Architecture Direction (1)

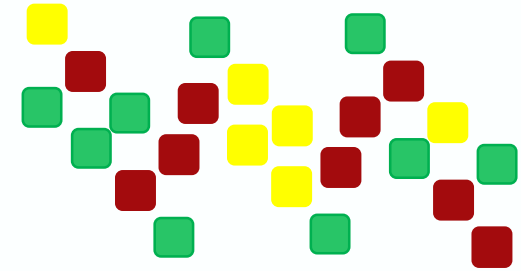
Capability
Computing



Capacity
Computing



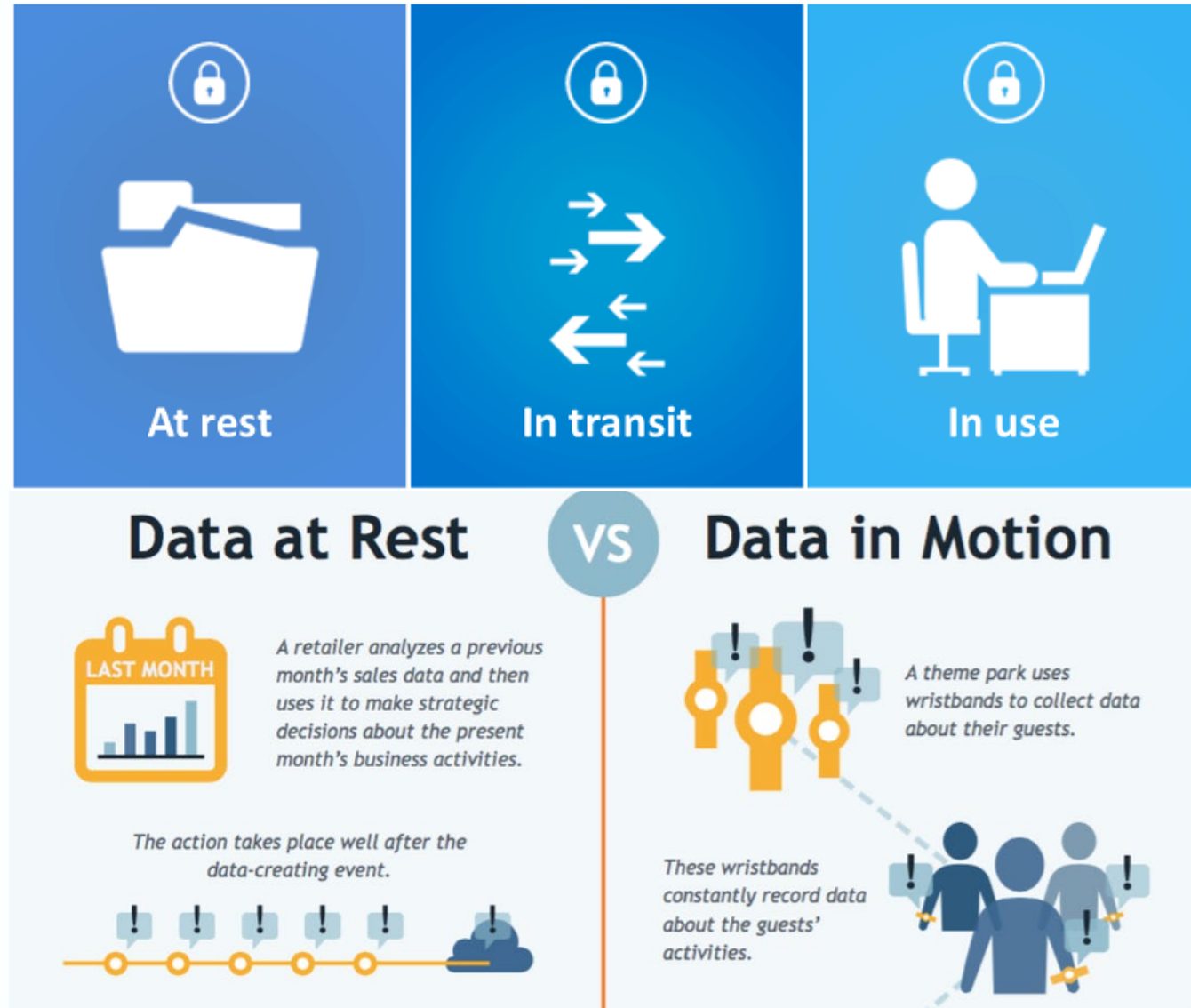
Edge
Computing



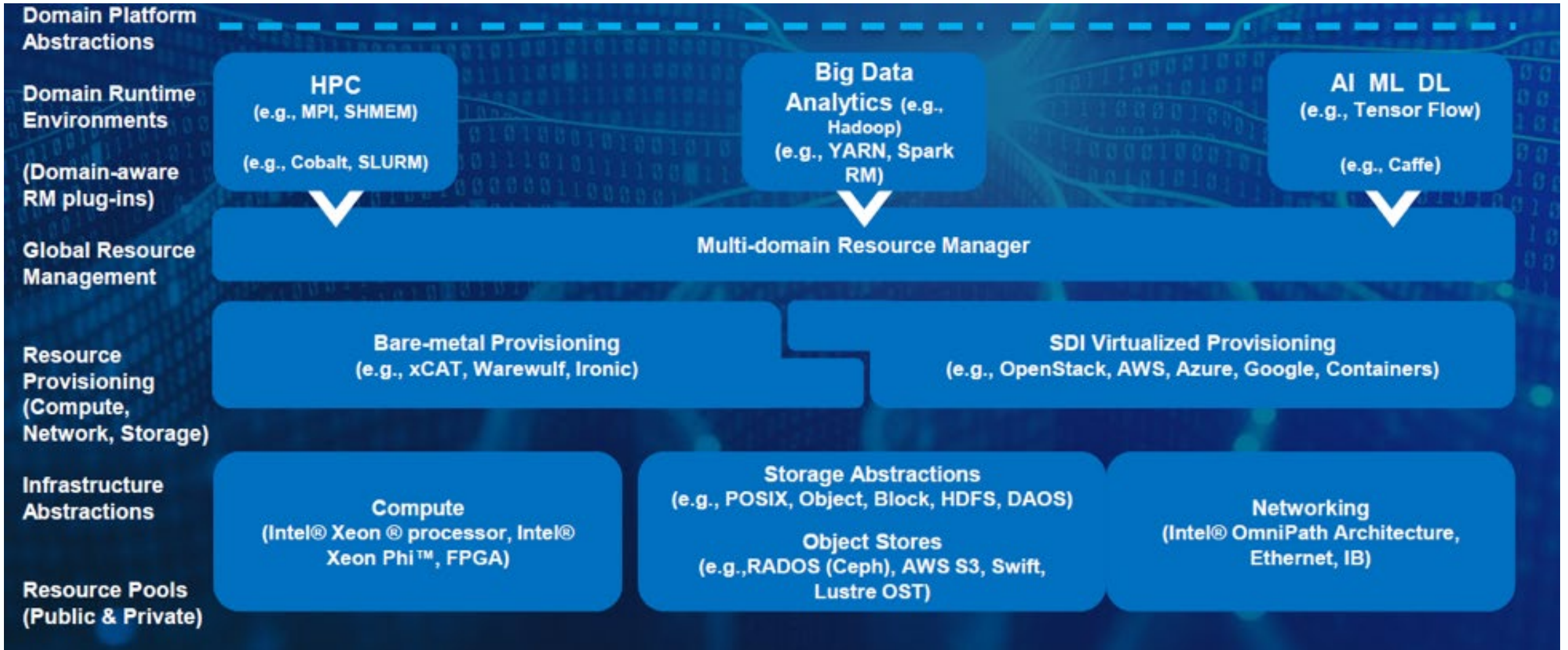
Traditional HPC & Big Data

Converged HPC, HPDA & AI

Architecture Direction (2)



At the Intersection of HPC, HPDA & AI



The convergence of HPC, HPDA, and AI requires a unified software stack and resource management capabilities, along with robust platform technologies and a consistent architecture. Reference: Patricia Damkroger, Intel Corporation.



Advanced Computing & Where to Focus

- Similar Architecture—HPC is HPDA & AI at greater scale & performance
- Key Solution Requirements—heart of the enterprise
- “AARP” Workflow Approach
 - Workflow Acceleration
 - Workflow Automation
 - Workflow Resiliency
 - Workflow Performance
- Converged Architecture: Compute, Storage, Interconnects, Management

HPDA + Data-Intensive Computing +
Heterogenous HPC Infrastructure



Converged Computing

“

**The Next-Generation Workflows at
the Intersection of HPC, HPDA & AI
Will Drive Tomorrow's Breakthroughs**

”

Partnership Announcement

Details Pending

Experience Silicon Valley in St. Louis

WWT brings today's leading technologies together in a physical and virtual environment, accessible from anywhere in the world.



Connect with our experts



Access our research



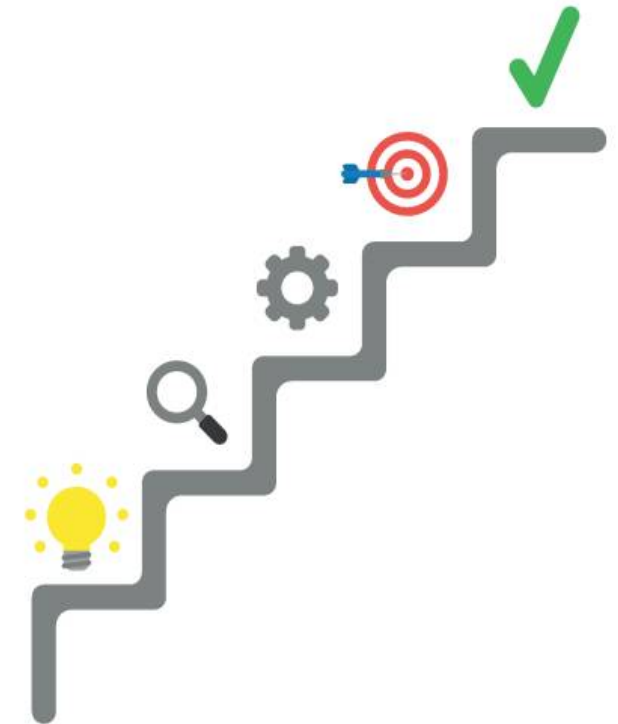
Explore our labs



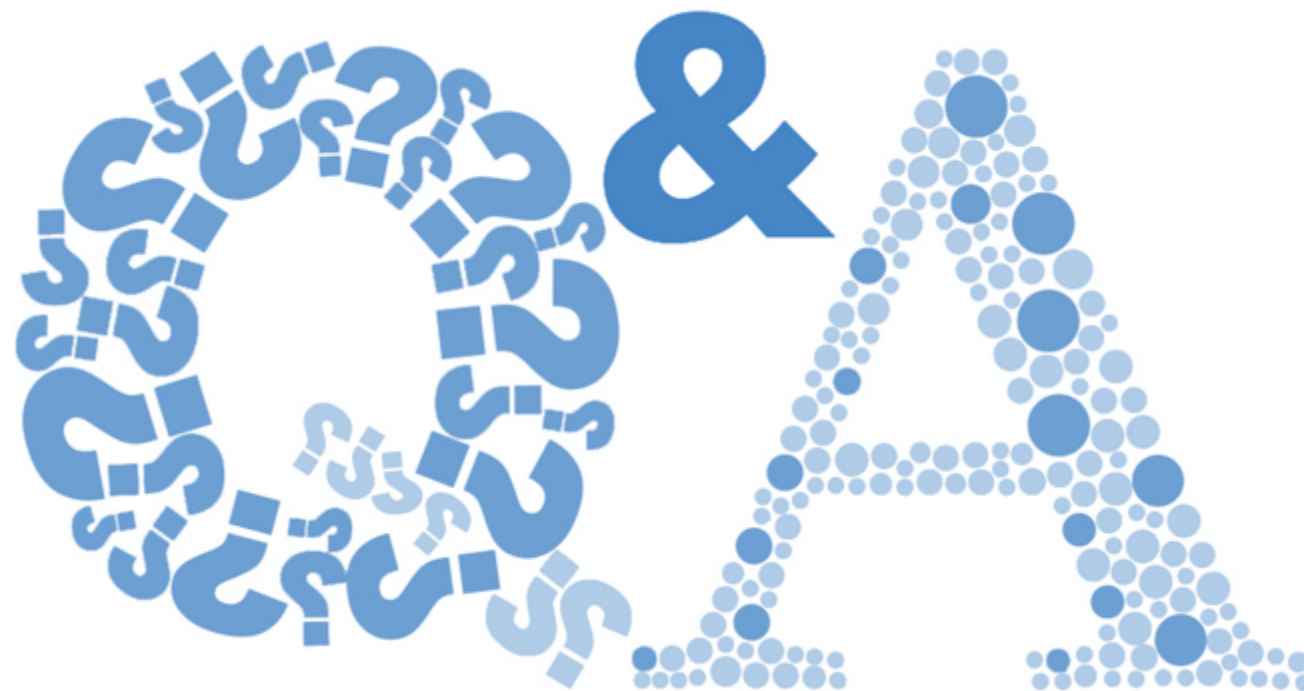
<https://www.wwt.com/atc>

Next Steps

- Leverage the strength and agility through our partnership ([WWT + SHPCP](#))
- We follow a prescriptive, proven process to develop the HPDA/HPC solution that meets your customer needs.
 - [Assess](#): Work to understand the unique environment and what workflows are needed to realize the converged solution.
 - [Design](#): Define, architect, and design a converged solution that is future proof.
 - [Build](#): Together, we build and benchmark the new solution.
 - [Manage](#): Decide the right level of services needed to manage the new solution.
- Engage the Advanced Technology Center ([ATC](#)).







Contact Information



Earl J. Dodd

**Global Technical Solutions Architect
HPC / Supercomputing**

World Wide Technology

1 World Wide Way, St. Louis, MO 63146 USA

+1-713-446-4963 Mobile

+1-281-379-5553 Fax

Earl.Dodd@WWT.com

*Moving from Driving with Technology to Thriving with Technology
Transforming High Performance Computing to High Value Computing
Showcasing future customers workflows today with HPC, AI & Big Data*

