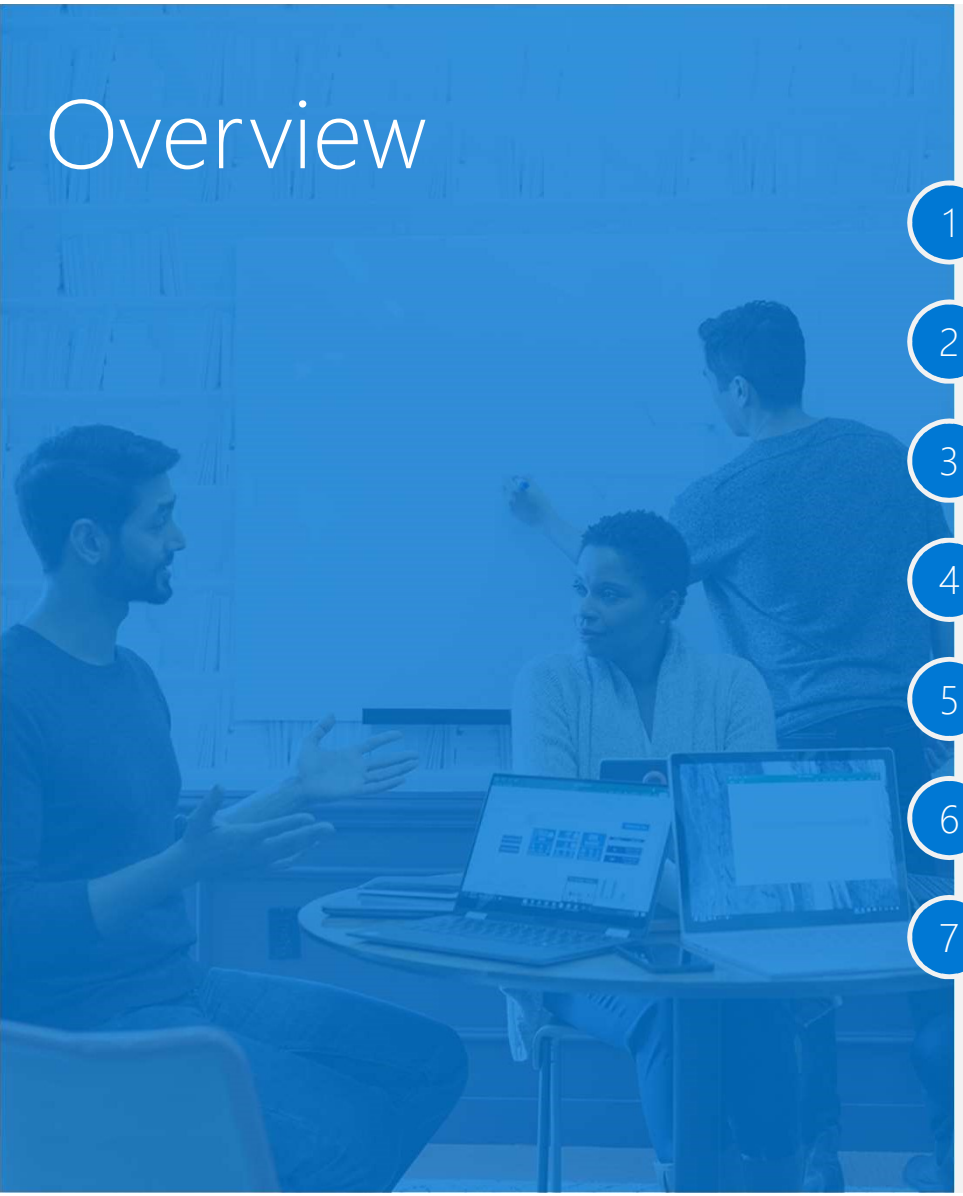
Microsoft

Big Compute Meets Big Data in the Cloud

Gabriel Sallah
EMEA HPC GBB

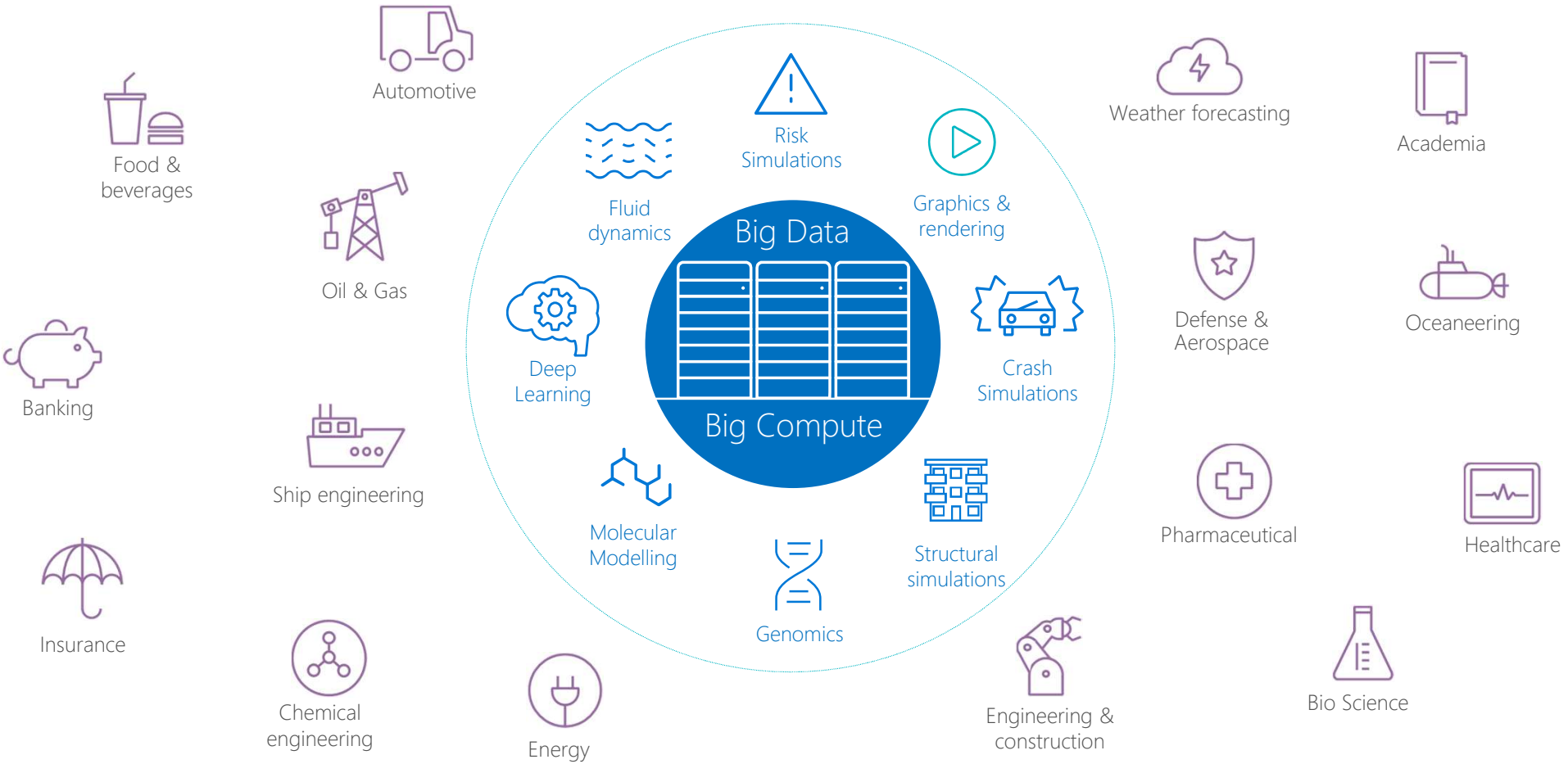
Azure

Overview



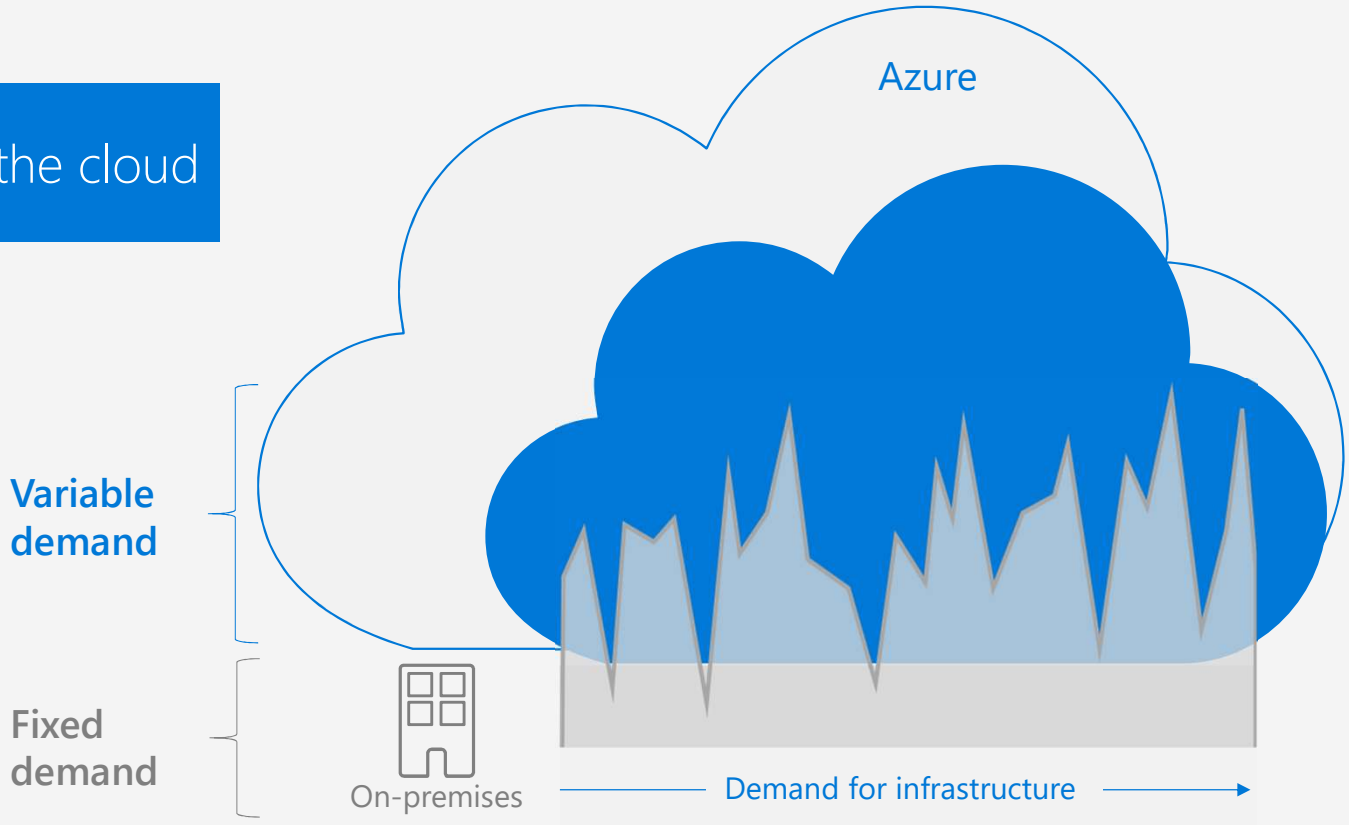
1. Challenge of modern computing
2. Azure value for Big Compute and Big data
3. Most performant infrastructure
4. Open and integrated
5. Cost control and governance
6. Industry specifics
7. Next steps

Where is Big Compute and Big Data



The new Big Compute opportunity

Expand your environment to the cloud



Azure for every Big Compute workload

Existing apps

Clone to cloud

Start using cloud without rewriting applications

Hybrid workflows

Simple to optimize infrastructure

Cloud workflows

End-to-end workflows in the cloud

Cloud-native apps

Create new services and modernize apps that matter

Making Big Compute and Big Data a reality

Big Compute& Big Data challenges	Azure solves these
Getting your workload into the cloud	Simple, managed access to Big Compute and Big data
Supporting hybrid use cases	Azure CycleCloud for burst, including big data and executables
Moving big data and apps	Fast, repeatable, scalable deployment,
Managing bandwidth, security, users	Cost, user, and access controls
Accessing the technology needed	Leading high-performance technologies running in the cloud
Building cloud-native applications	Azure Batch for resource provisioning and job scheduling

Most performant infrastructure

Specialized infrastructure for Big Compute

Cray in Azure

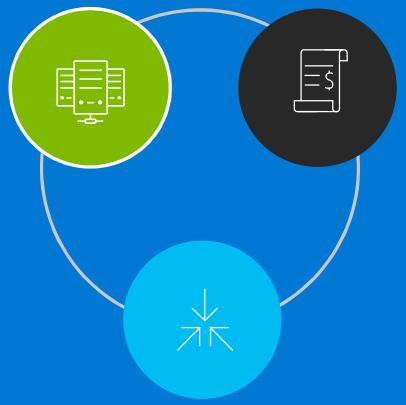
Performant hybrid storage with Avere

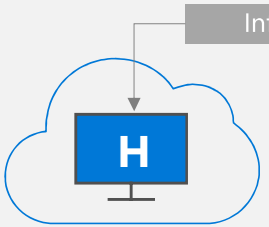
Open and integrated

Granular cost control and governance

Big Compute management with Batch & Azure CycleCloud

Specialized infrastructure for Big Compute





High-performance VMs

Tightly coupled parallel jobs

GPU-enabled VMs

NV—Graphic-based applications

NC—Advanced simulation

ND—Artificial Intelligence

Cray in Azure

IB Connected CPU/GPU/Storage available in cloud

>80,000 IOPs Premium Storage

Low latency, high throughput apps

FPGA

PGA Microservices—AI/Edge

Compute-optimized VMs

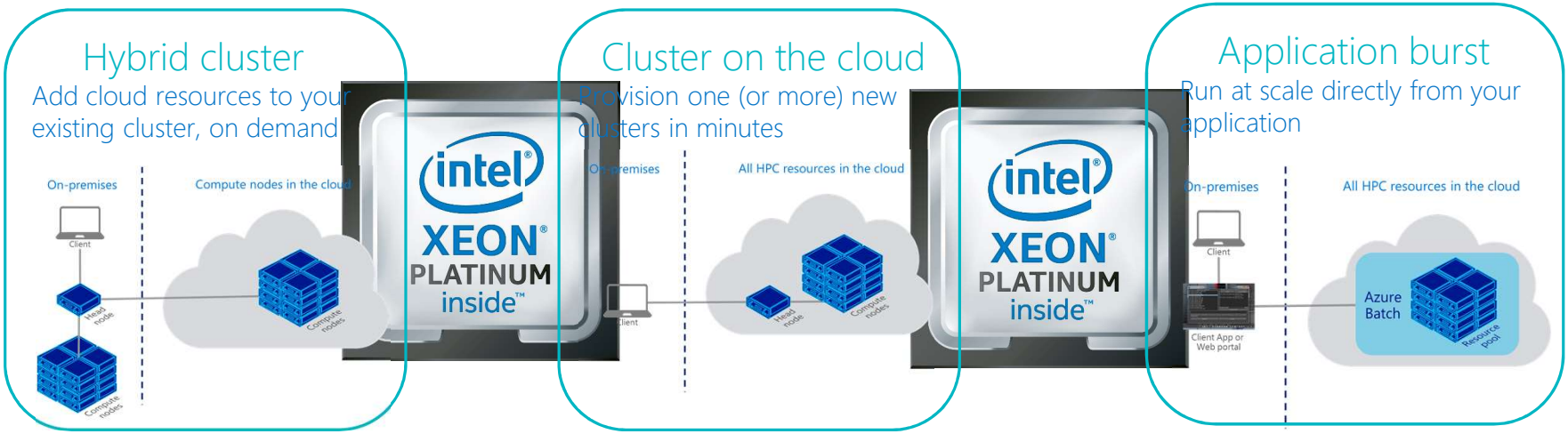
Batch processing, Monte Carlo simulations

Large memory VMs

Large databases

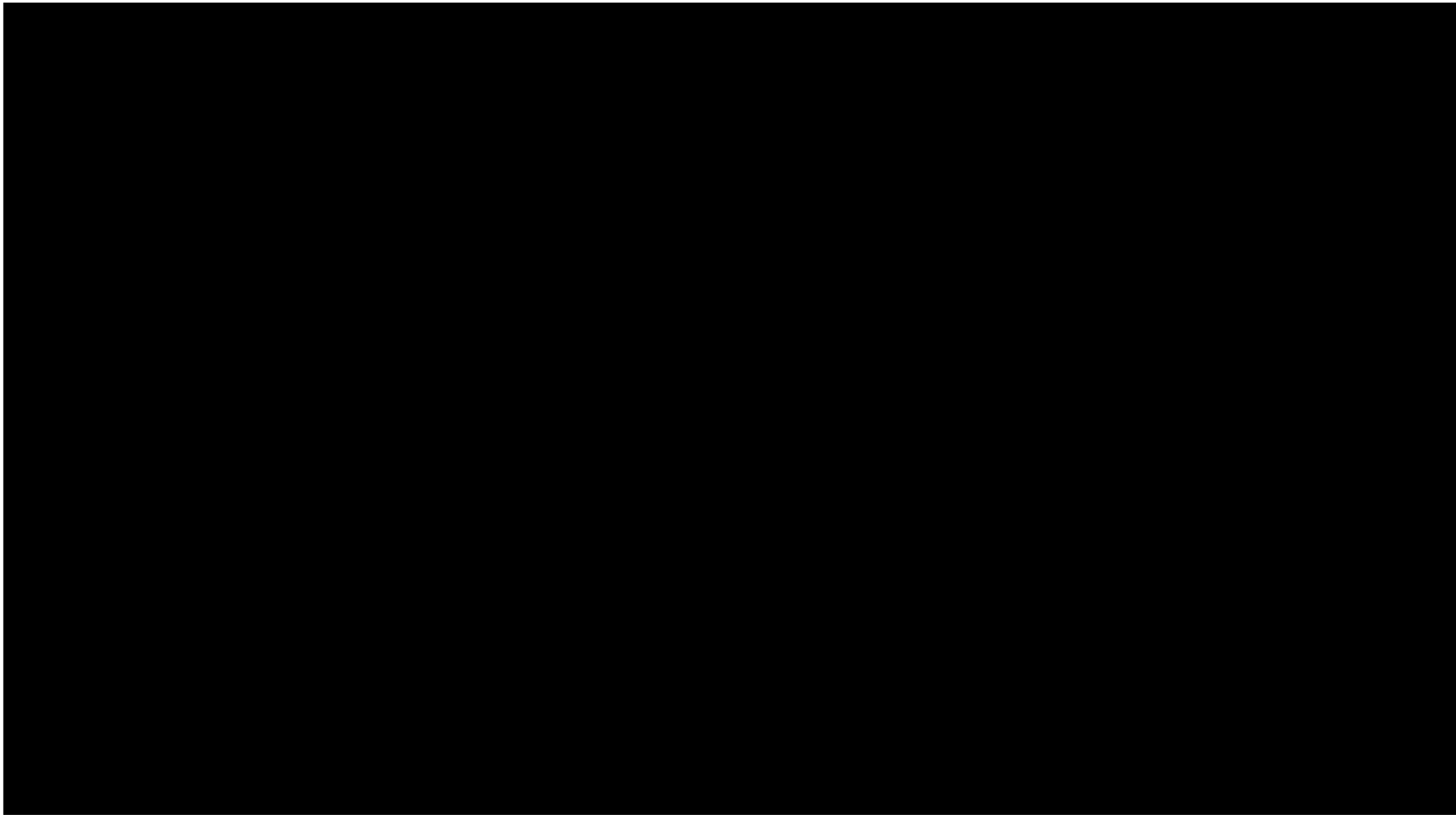
The Intel® Xeon® scalable processor : On Azure for big compute

Fv2 , *Hv2 with Skylake on AZURE Instances

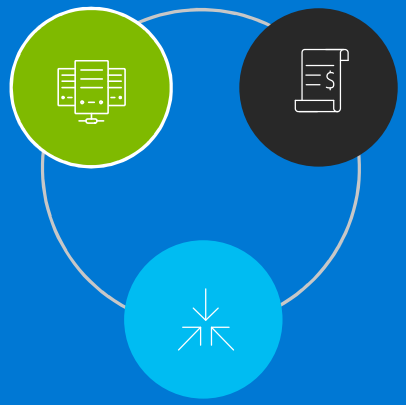


***Hv2-Series / FV2 Series**

* Coming soon



Cray in Azure



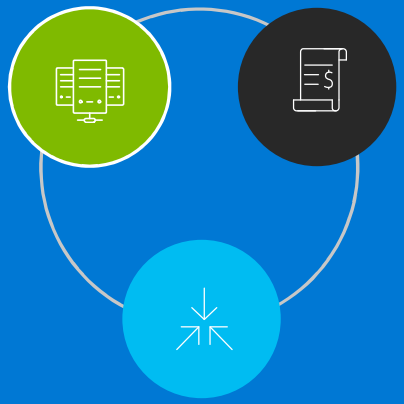
Your Cray supercomputer running in Azure, close to your Azure services.

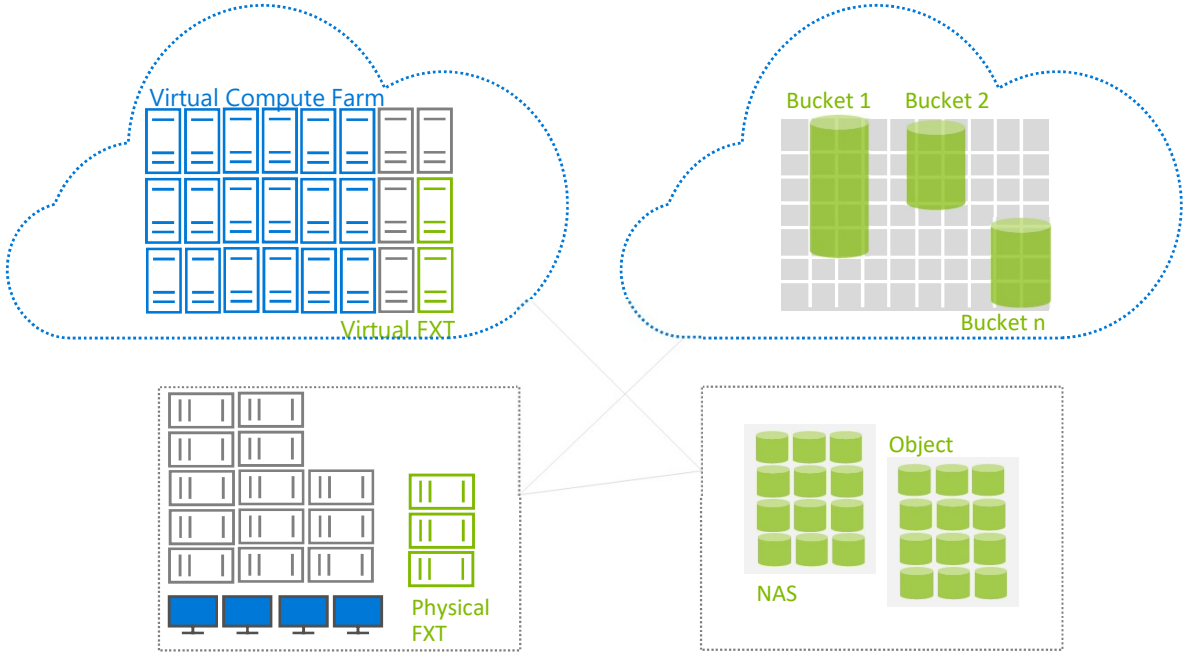
Rely on a dedicated, built-to-spec Cray XC or SC supercomputer for your most demanding workloads.

Connect to the broad range of Azure services on your Azure Virtual Network.

Access the Cray as a managed service in the cloud as OpEx, instead of maintaining specialized infrastructure with high up-front costs.

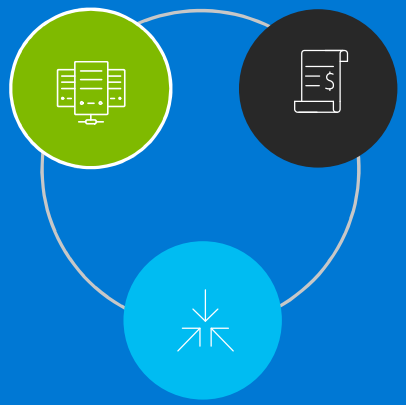
Performant hybrid storage with Avere



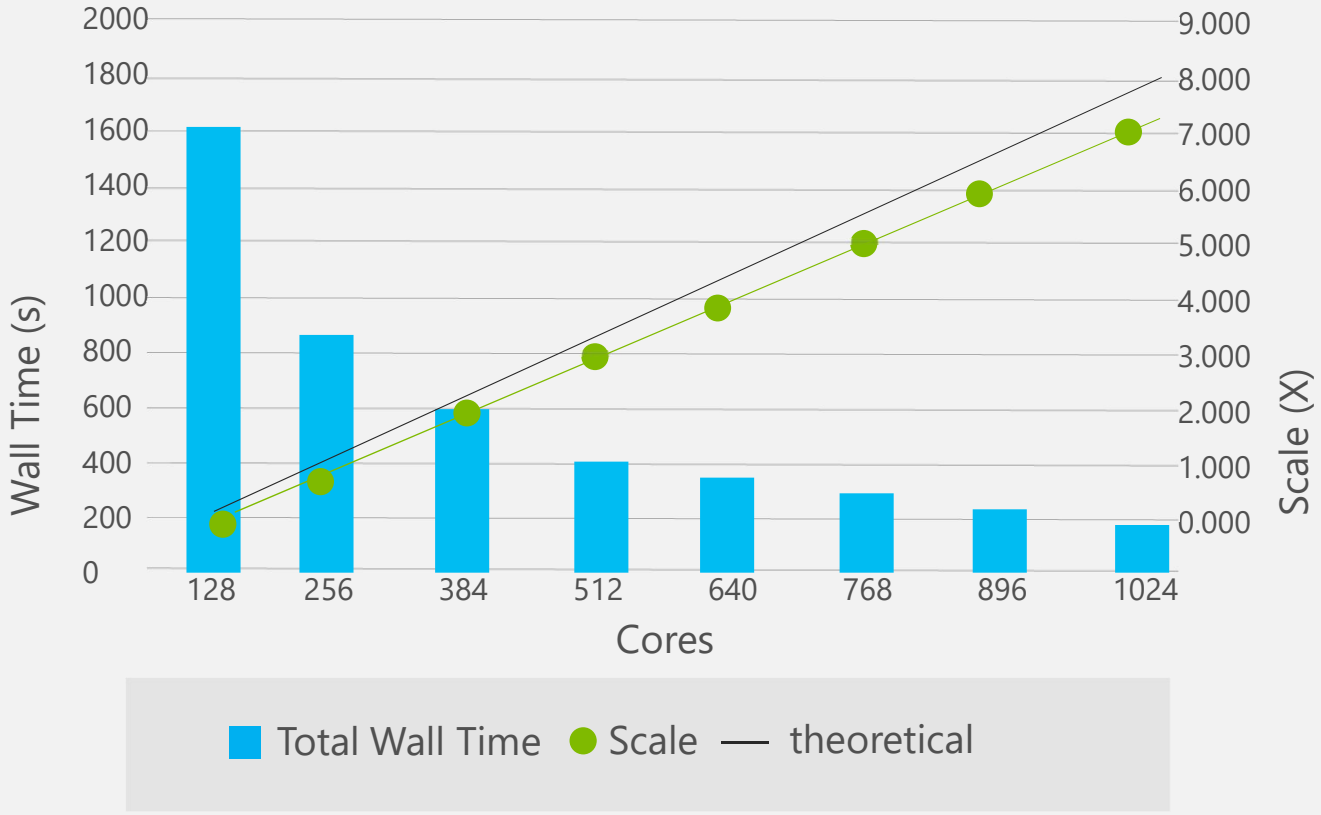


Customer needs	Avere delivers
Low-latency file access	Edge-Core architecture
Scalable performance and HA	Scale-out clustering (3 to 24 nodes per cluster)
Familiar NFS and SMB interfaces	FlashCloud file system for object storage
Manage as a single pool of storage	Global namespace (GNS), FlashMove
Data protection	Cloud snapshots, FlashMirror
High security	AES-256 encryption (FIPS 140-2 compliant), KMIP
Efficiency	LZ4 compression

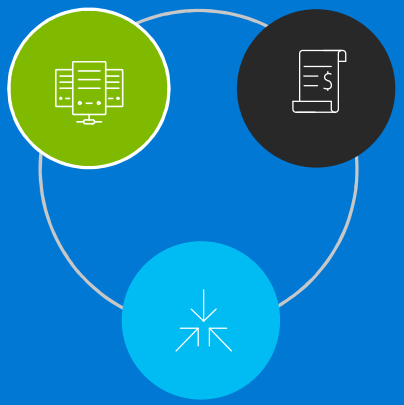
Most performant infrastructure



Fluent 280M Cell Open Race Car Model Benchmark Scaling on Microsoft Azure



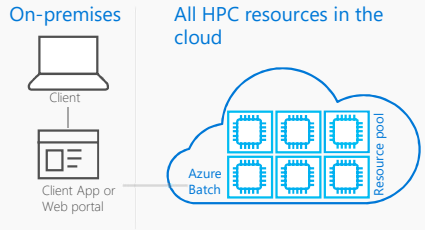
Big Compute management



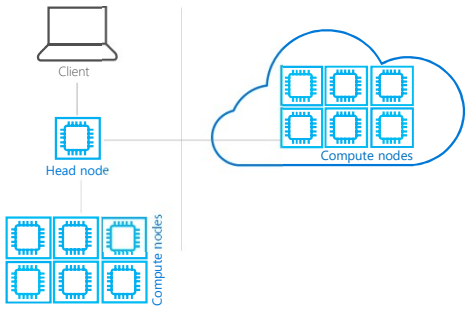
Azure Batch
Running jobs

Azure CycleCloud
Running clusters

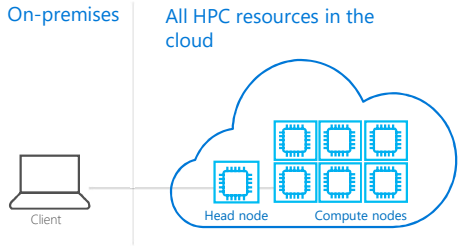
HPC as a Service



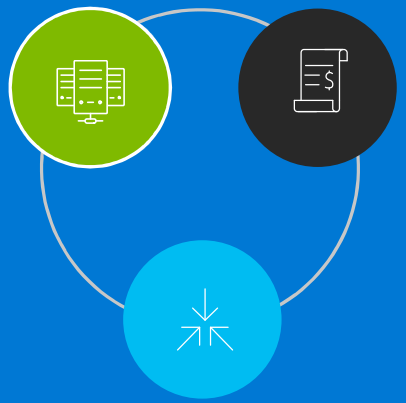
Hybrid/burst



Cluster in Azure



Azure Batch



Service / Solution

Get and manage VMs

Install task applications

Manage and authenticate users

Start the tasks

Azure Batch
VM management & job scheduling

Task failure? Task frozen?

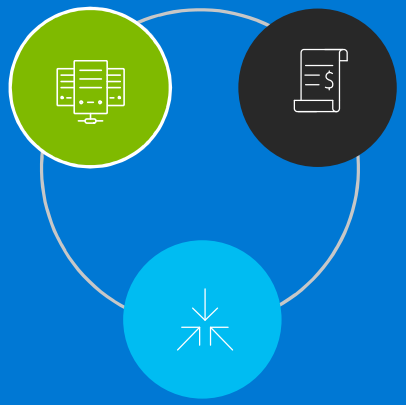
Scale up and down

PaaS
Cloud Services

IaaS
VM / VMSS

Hardware

Azure Batch



Batch pools

Configure and create VMs to cater for any scale: tens to thousands.

Automatically scale the number of VMs to maximize utilization.

Choose the VM size most suited to your application.

Batch jobs and tasks

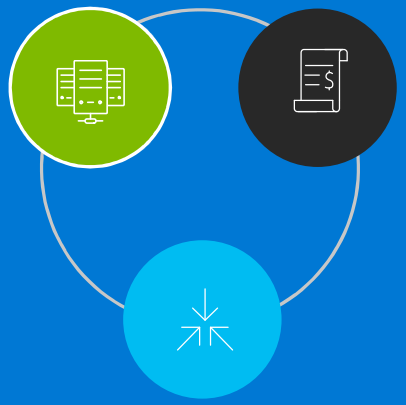
Task is a unit of execution; task = application command line (EXE, BAT, CMD, PS1, etc.).

Jobs created and tasks submitted to a pool; tasks are queued, then assigned to VMs.

Any application, any execution time; run applications unchanged.

Automatic detection and retry of frozen or failing tasks.

Azure CycleCloud



User empowerment

Able to cloud-enable existing workflows.

Enable instant access to resources.

Provide auto-scaling, error handling.

IT management

Link workflows for internal and external clouds.

Use Active Directory for authentication and authorization.

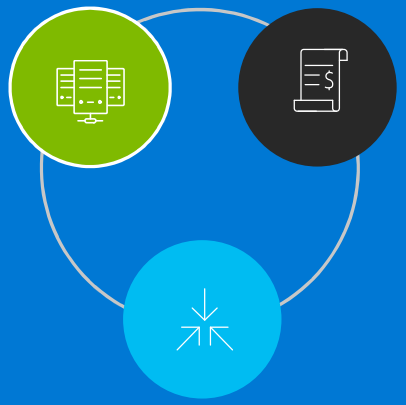
Provide secure, consistent access.

Business management

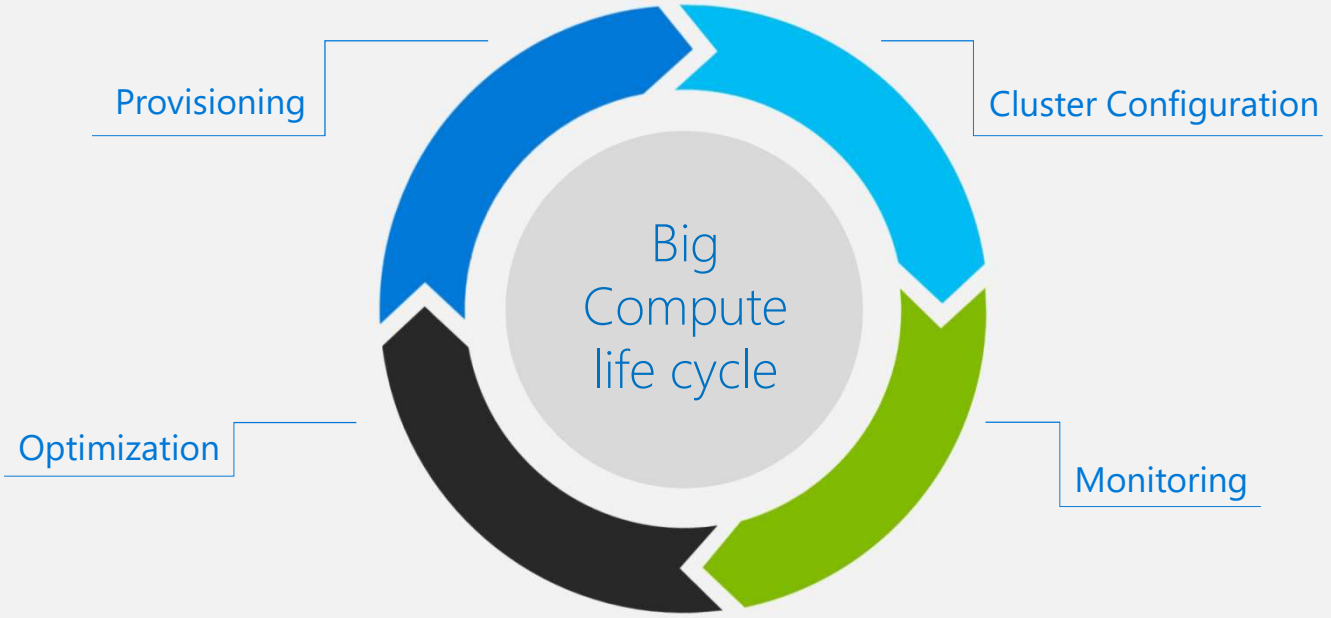
Able to link usage to spend.

Provide tools to manage, control costs.

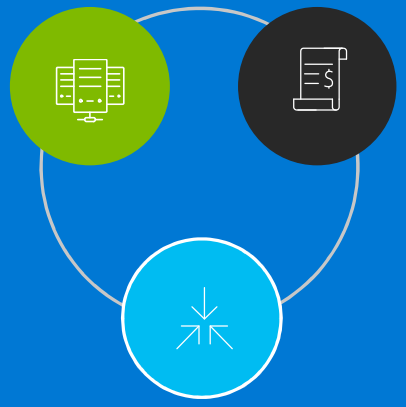
Azure CycleCloud



Hybrid/Clustered Big Compute life cycle



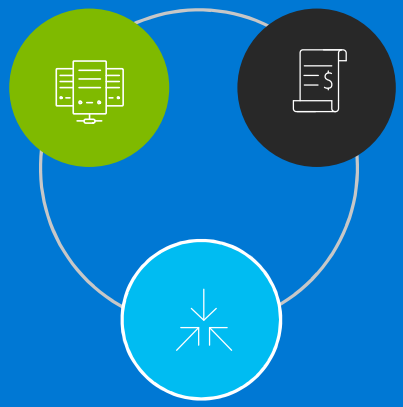
Open and integrated



Robust partner ecosystem

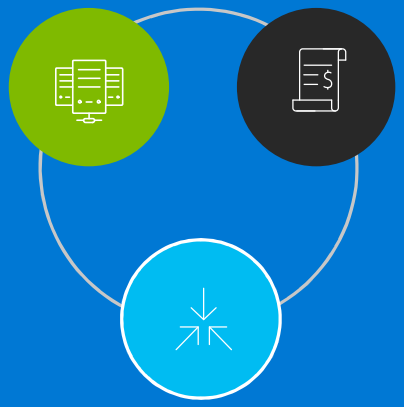
Support for Microsoft and open source software

Robust partner ecosystem



Bright Computing
BizData
teradici
Workspot
rescale
Willis Towers Watson
kinetica
Milliman
excelian
LUXOFT FINANCIAL SERVICES
Uber Cloud
IHS Markit
ACTIVEVIAM
Analysing data. Empowering the future.
Altair
d3View
CD-adapco
www.cd-adapco.com
ANSYS
PBS Works
MSC Software
DASSAULT SYSTEMES
LSTC
Livermore Software Technology Corp.
HALLIBURTON
Landmark
Schlumberger
SIMULIA
JSOL Corporation
esi
SIEMENS
CRAY
intel
Mellanox
TECHNOLOGIES
NVIDIA

Support for Microsoft and open source software



redhat

CentOS

Windows Server

FreeBSD

ubuntu

SUSE

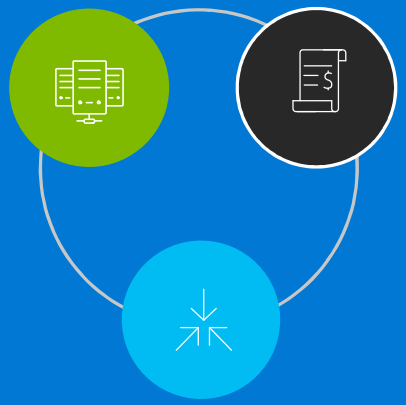
R

python

Java

.NET

Cost control & governance



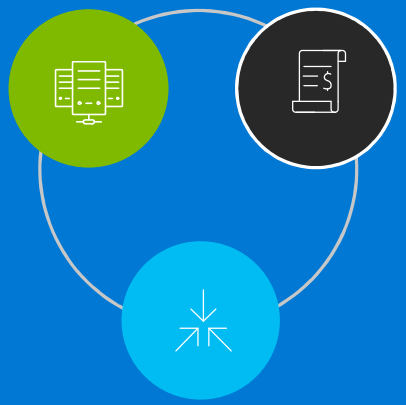
Azure Cost Management

Provides monitoring

Includes cost-saving features

Offers the largest global footprint and compliance portfolio of any cloud

Azure Cost Management



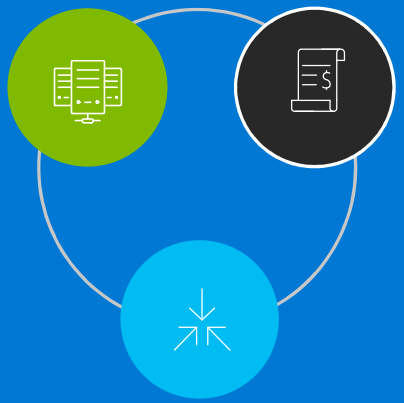
Monitor cloud spend

- Visualize data in consolidated and custom views.
- Track usage and cost trends.
- Detect spend anomalies and usage inefficiencies.
- Forecast future spend based on historical data.

Drive organizational accountability

- Allocate usage and costs using resource tags.
- Produce chargeback and showback reports.
- Allow teams to access data insights with Role-Based Access Control.
- Alert stakeholders automatically for spend anomalies and overspending.
- Eliminate idle resources.

Cost savings



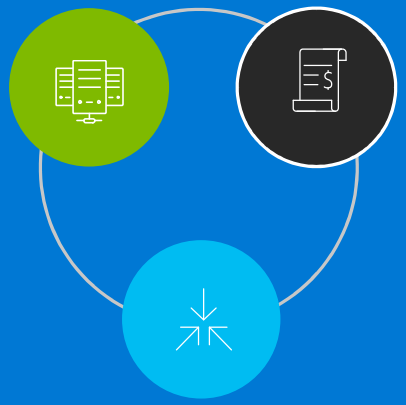
Azure services

Offer flexible consumption and cost savings with low-priority VMs.

Provide per-second billing for VMs.

Ensure Reserved Instances for persistent infrastructure.

The largest compliance portfolio in the industry



PCI
CSA cloud security alliance
ISO
CDSA Content Protection & Security Program
SHARED ASSESSMENTS
FedRAMP
FIPS 140-2 CRYPTOGRAPHY
ISO 27001 Certified
AICPA SOC Formerly SAS 70 Reports
AICPA SOC Formerly SAS 70 Reports
DEPARTMENT OF DEFENSE
CRIMINAL JUSTICE INFORMATION SYSTEMS CJIS
TREASURY INTERNAL REVENUE SERVICE
DEPARTMENT OF STATE
FIEC
enisa
HIPAA
FDA
DEPARTMENT OF EDUCATION
ESI
CPP 云计算发展与政策论坛
iDA INFOCOMM DEVELOPMENT AUTHORITY OF SINGAPORE
irap
European Commission
US-EU SAFEHARBOR U.S. DEPARTMENT OF COMMERCE
GOV.UK

Azure value for Oil & Gas

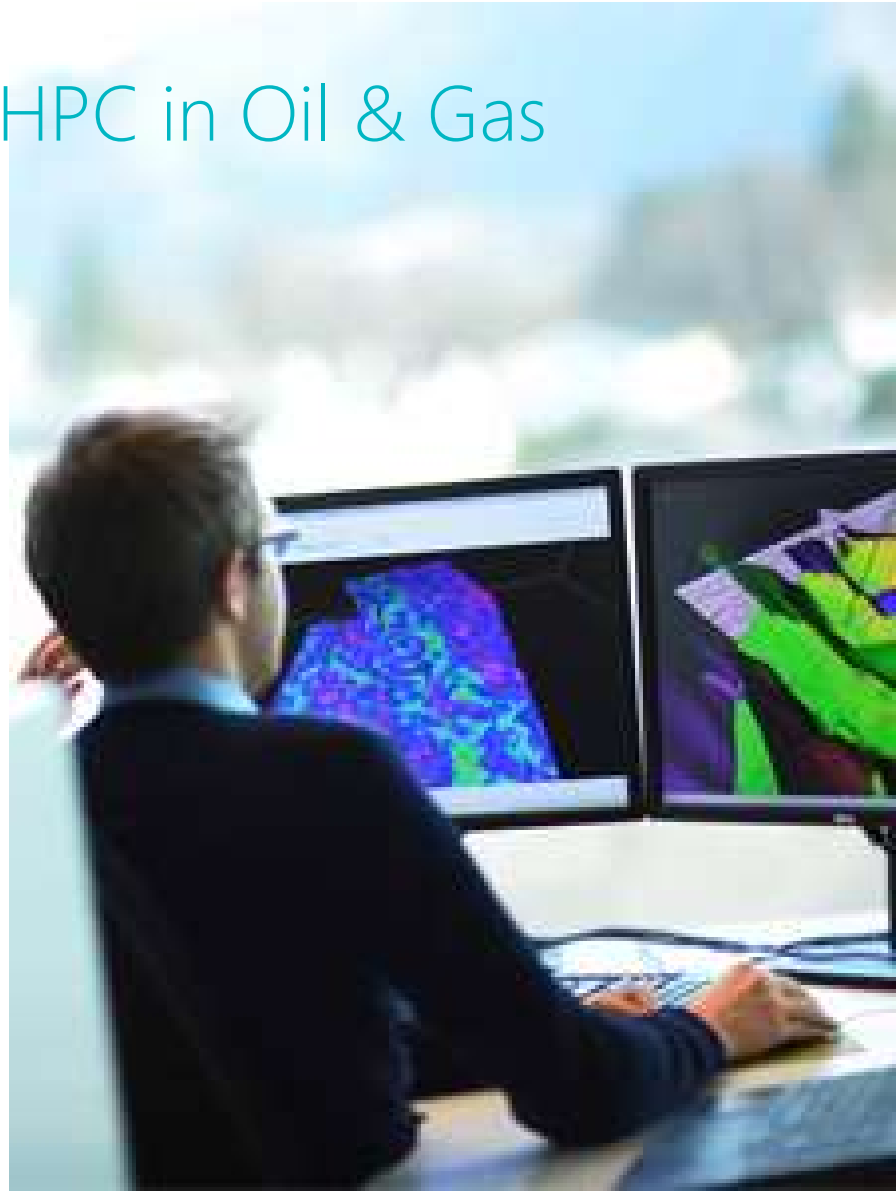
Workloads

Key partnerships

How our Customers are using Azure HPC in Oil & Gas

IOC & NOCs use Azure today for:

- Reservoir modeling/simulation
- Control Simulation
- Structural Simulation
- Computation Fluid Dynamics
- Molecular Dynamics Simulations
- Remote visualization
- Holo-lens AR-3D visualization
- IOT for data ingestion
- Seismic processing



Oil & Gas workloads

Seismic processing

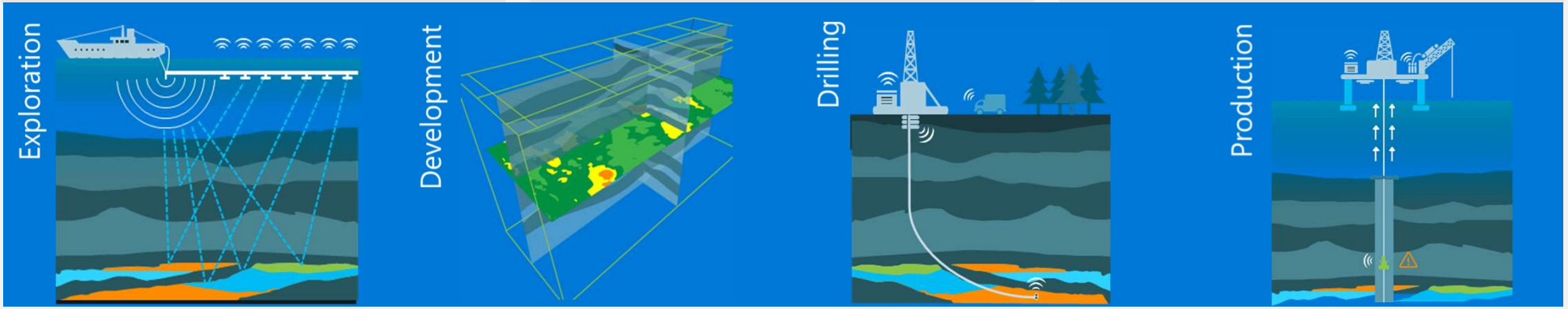
- Process raw seismic data.
- Perform bulk upload of seismic data.
- Use in-house or commercial applications to process seismic data.

Reservoir simulations

- Help provide development of new oil fields.
- Ensure simulation helps predict oil production and productivity.
- Use commercial tools like Nexus or Intersect to run Reservoir simulation in Azure.

Remote Viz and AI

- Accelerate onboarding and knowledge transfer.
- Increase collaboration and productivity of field workers.
- Create more accurate reservoir models, optimize drilling, and identify risks.



Key Oil & Gas partnerships

CRAY

NVIDIA

Schlumberger

HALLIBURTON
Landmark Software & Services

Paradigm™

Azure value for Media & Entertainment

Workloads

Key partnerships

Media & Entertainment workloads

Rendering

- Hybrid/burst for peak demand.
- Large-scale cloud-native workflows with Batch.

Remote visualization

Shared workstations for collaboration.

Scenarios & workloads to look for

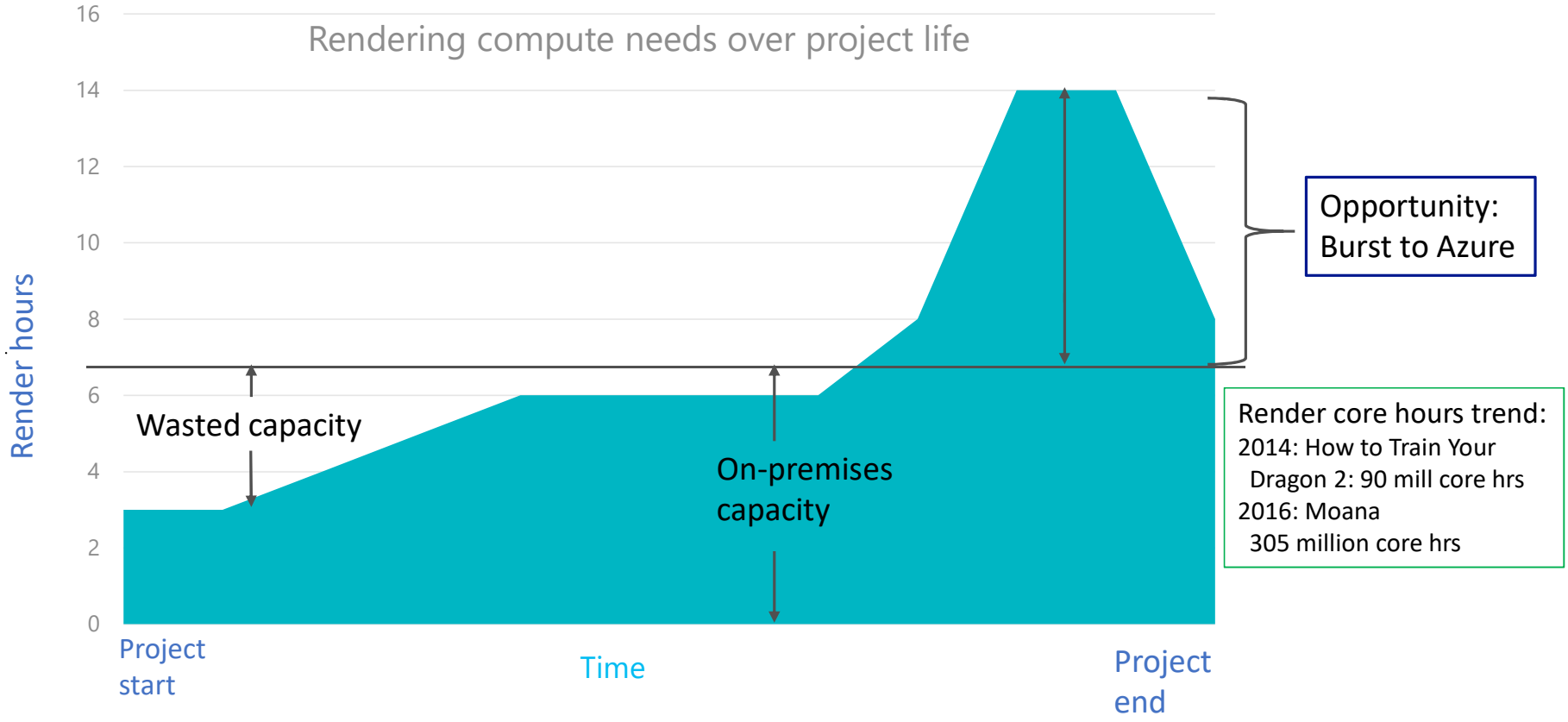
Common Use cases for HPC

- Rendering- process of generating an image from a 2D or 3D model (or models in what is called a scene file)
- Virtual Desktops – access your high end workstation (CPU/GPU) from any device from anywhere
- Encoding- converting digital assets into desired format(s)

Rendering Overview

- Definition: Generating an image from a 2D or 3D model; the "in data structure" contains geometry, viewpoint, texture, lighting, shading.
- Rendering is the most complex and compute intensive part of a production (90% of overall compute cycles)
- Big market opportunity in verticals such as Advertising, Architecture, Manufacturing, Automotive, Aerospace, Oil & Gas and Media
- Typical project includes multiple ISV applications and last anywhere from months to years
- Large amount of compute power often required for short time periods

Typical Project-Render Requirements



Key Media & Entertainment partners

Azure value for Financial Services

Workloads

Key partnerships

Financial Services workloads

Risk analytics

- Monte Carlo simulations

Regulatory reporting

- CCAR
- FRTB

Batch processing

- Scripts at scale

Regression testing

- Code analysis
- Unit testing

Key Financial Services partners

Mitsubishi Securities UK

Supporting risk computations and regulatory compliance at a lower cost

Objectives Mitsubishi Securities needed to reduce CAPEX expenses, reduce time to delivery, meet time to market demands for regulatory testing, and align costs to their business strategy

Tactics Microsoft Services implemented an approach that worked in-tandem with on-premise data centers to enable cloud-based HPC bursting scenarios and moved more than 5,000 cores per day to the cloud

Results

- Maximized flexibility
- Increased control of data and models
- Improved ability to map business usage to provide exact costs
- Boosted agility in regulatory risk reporting
- Drove innovation where it would have previously been impossible

MUFG Bank of Tokyo-Mitsubishi UFJ

"I can now manage 750 machines in Azure on weekdays, and a thousand on weekends. Plus an extra 300 production machines on-prem. And that's all done by one person."

— **Dr. Robert K. Griffiths**
Head of High Performance Computing, MUFG

Axioma
Managing risk through Azure

Objectives Axioma needed better modeling capacity and data storage capabilities to cater to the huge demands from their risk and quant teams

Tactics Microsoft's cloud risk computation engine gave Axioma additional elasticity, lowered their overhead, and enabled them to focus on what's core to their business

Results

- Gained unlimited compute capacity
- Reduced costs during non-peak hours
- Improved ability to meet customer requirements
- Enabled team to focus more on intellectual property and company growth

Axioma
Flexible is better.®

"Leveraging an evergreen cloud platform gives us agility in our development cycle and ultimately improves time to market. As a result, our solutions are able to innovate in sync with our client needs."

— **Fabien Couderc**
Head of Enterprise Development, Axioma

UBS
Powering business-critical technology

Objectives UBS wanted to reduce dependency on legacy technology, find new ways to leverage digital channels, and rethink how its business and people worked

Tactics UBS implemented an Azure-based approach to powering its risk management platform

Results

- Sped up calculation times by 100%
- Reduced infrastructure costs by 40%
- Gained nearly infinite scale within minutes
- Increased working capital on-hand
- Improved employees' abilities to make quicker, more informed decisions for clients

UBS

"Increasing the agility and scalability of our technology infrastructure is crucial to the bank's strategy. With Microsoft Azure, we are building on the industry's leading cloud platform in terms of innovation, technology, security and regulatory compliance, which is very important as a Swiss financial institution."

Paul McEwen
Group Head of Technology Services, UBS

Société Générale

Supporting business growth in a rapidly changing economy

Objectives Société Générale needed a secure, modular, scalable, and resilient application in a very short timeframe

Tactics Partner Qarnot Computing leveraged Service Fabric to deliver an innovative, high quality approach

Results

- Implemented a new financial simulation platform in a short time frame
- Enabled teams to focus on integrating new types of simulations and scaling the platform to handle them
- Provided clients with a platform that scales to the computational capacities they need

SOCIETE GENERALE

"With Service Fabric, developers can focus on business needs and rely on the platform for resiliency, load balancing, and scalability. We can deliver better software, and do it faster."

— **Stephane Bonniez**
Project manager, Société Générale

MetLife®

Achieved consistent experience in Azure on-premises with familiar tools and processes.

Gained cost savings of up to 55% and year-over-year infrastructure savings by scaling down unused compute.

Improved customer service with quicker data processing and faster results.

Azure value for Automotive

Workloads

Key partnerships

Azure Big Compute for Automotive

HPC/Simulation

- Finite Element Analysis (FEA)
- Computational Fluid Dynamics (CFD)
- Multibody Dynamics (MBD)
- Simulation Program with Integrated Circuit Emphasis (SPICE) analysis
- Optimization

Rendering

- Concept vehicle styling
- Digital concept vehicle
  - Replace clay models
- Marketing campaign
  - Web, media, print
- Engineering
  - E.g., windshield cockpit glare

Visualization

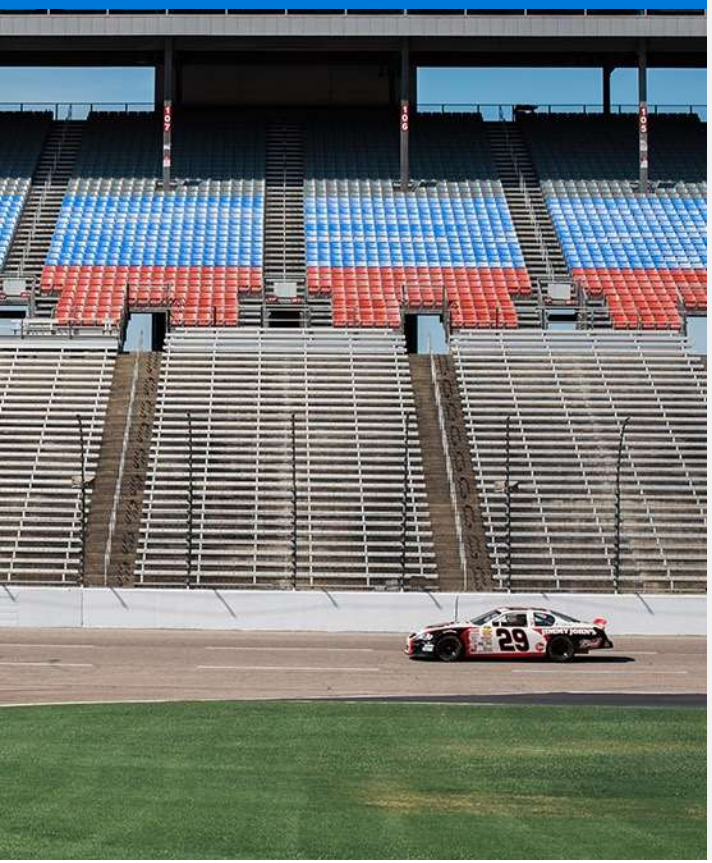
- Cloud-based engineering (cloud VDI)
- Cloud-based post visualization of simulations

Deep Learning/AI

- Autonomous driving
- Advanced Driver Assistance Systems (ADAS)
- Adaptive cruise control
- Auto parking
- Navigation systems
- Collision avoidance/warning
- Lane departure warning

Key Automotive partners

Hendrick MOTORSPORTS



Stay ahead of the competition by accessing powerful infrastructure for real-time race simulations.

Ensure significant cost savings versus building an on-premises HPC environment.

Provide rapid decision making using Azure Machine Learning and intelligent services.

Azure value for Manufacturing

Workloads

Key partnerships

Manufacturing workloads

HPC/Simulation

- Finite Element Analysis (FEA)
- Computational Fluid Dynamics (CFD)
- Multibody Dynamics (MBD)
- Simulation Program with Integrated Circuit Emphasis (SPICE) analysis
- Optimization

Rendering

- Digital concept product
  - Physical models
- Marketing campaign
  - Web, media, print
- Engineering
  - E.g., windshield cockpit glare

Visualization

- Cloud-based engineering (cloud VDI)
- Cloud-based post visualization of simulations

Deep Learning/AI

- Image recognition for quality assurance

Key Manufacturing partners