Microsoft Azure in Autonomous Driving

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Partner Outcome

Understand Microsoft's capabilities and how you can leverage them to build autonomous development toolchain solutions for your customers

Customer Opportunity

From massive data ingest, storage, train, simulate, build and validate; the immense range of capabilities and sophistication of tools required build an autonomous vehicle are staggering. See how Microsoft and its partners are leading this with big compute, AI and other solutions

The Automotive Industry is at a Transformational Moment

The industry is being transformed by a combination of **key technology and business model trends:**

By 2030…

		As a result, **automakers need to:**
1. Connectivity	**~100%** of new cars projected to be connected, up from ~25% today	**Transform into mobility service providers** with a suite of integrated and intelligent connected car services
1. Autonomous Driving	**~10-15%** of new cars projected to be fully autonomous	**Own AV technology** to provide mobility services and preserve their market position
3. Vehicle Sharing	**~32%** of miles driven on new cars will be in shared rides	**Invest in vehicle sharing and fleet management services** to prepare for a world with fully autonomous vehicles
4. Electric	**~25%** WW by 2025 **and100%** of passenger vehicles in China and India will be electric by 2030	**Own EV technology and avail charging services** to enable customer demand

C o A te S E

utonomous

hared mobility

lectric

Accelerate your Transformation with Microsoft

Our approach to automotive

- Complements OEMs and suppliers – not compete
- Ensures your data is always under your control
- Guarantees the brand and customer experience belongs to you

Our focus areas

Connected Vehicle

Autonomous Development

Smart Mobility

Marketing, Sales, Service

Connected Factory

Emerging

Automotive Priority Solution Areas

Our focus areas

Connected Vehicle

- Telematics and predictive services
- Location based services
- Infotainment

Autonomous Development

- Massive Data Ingestion
- Simulation
- Data Mgmt. and Training Components
- AD Toolchain on Azure

Smart mobility

- Data Marketplace
- Fleet management
- Urban Mobility

Marketing, Sales, Service

- Customer 360
- Digital marketing
- CRM
- Contact Center
- Dealer Management Services

Connected factory

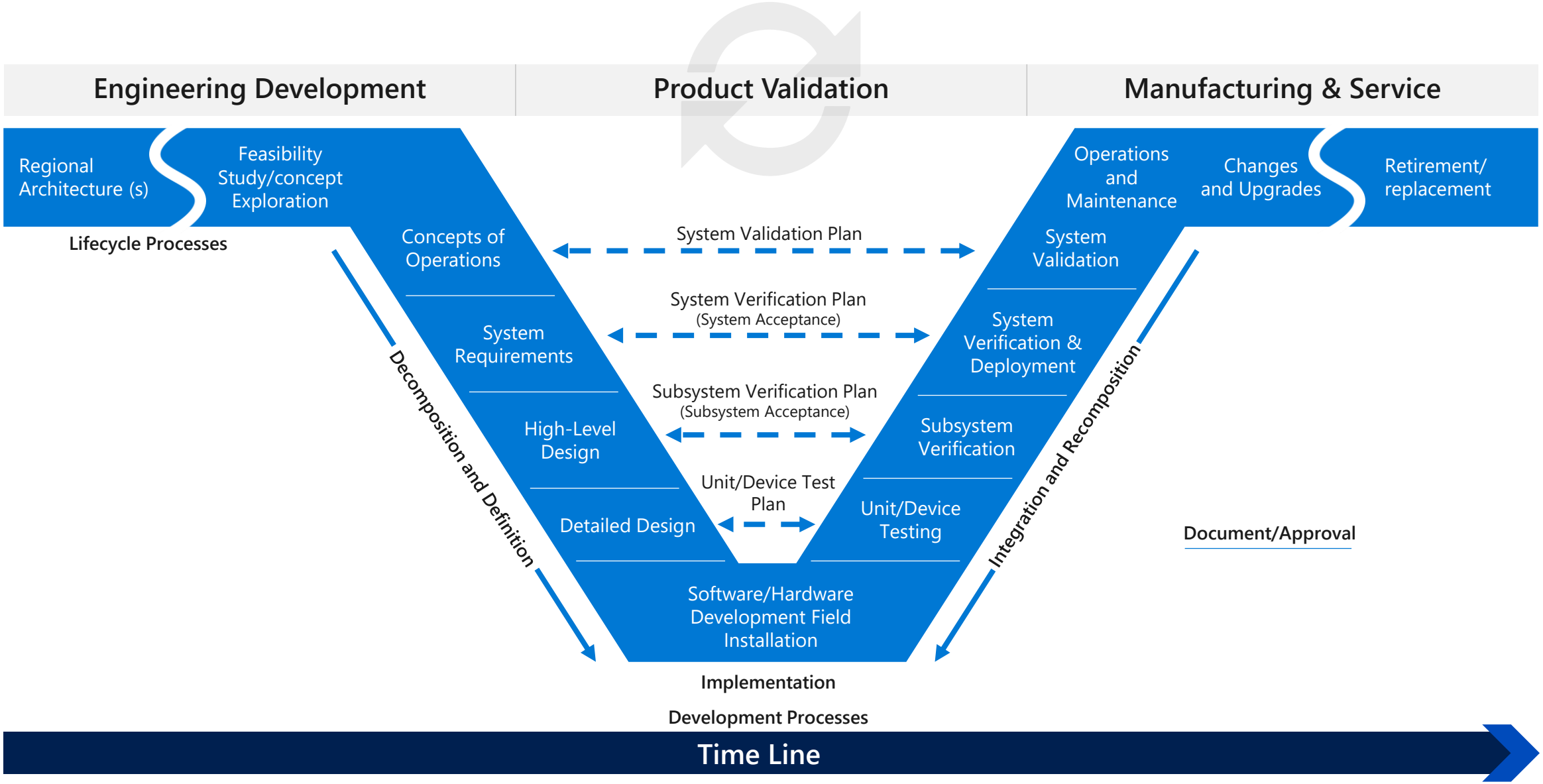
- Smart Factory
- Intelligent Supply Chain and Logistics

Emerging

- Blockchain
- Azure Kinect
- Quantum Computing

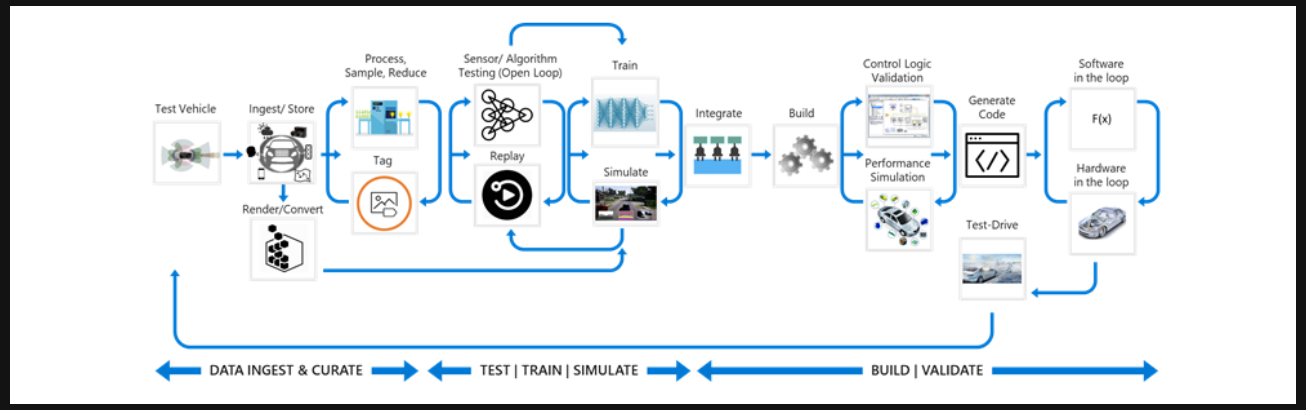

Autonomous Driving
Accelerating the dev/test workflow with Intelligent Edge and Cloud

OEM System Engineering Process

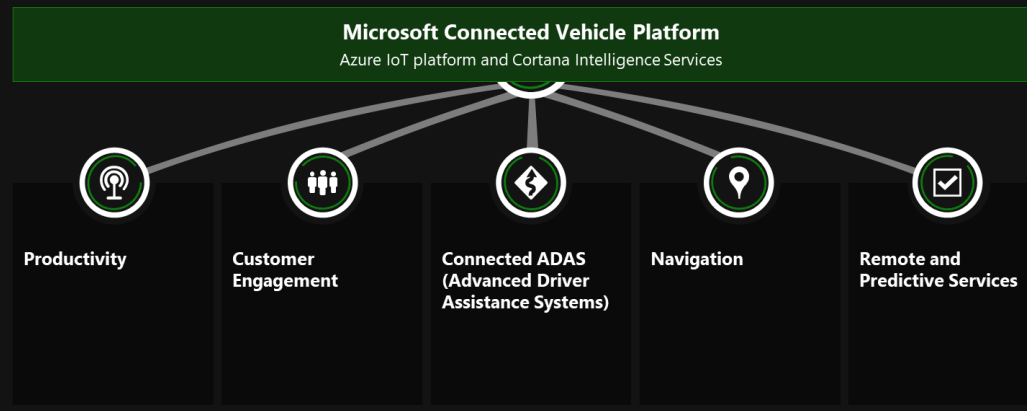


OEM Product and Services Lifecycle

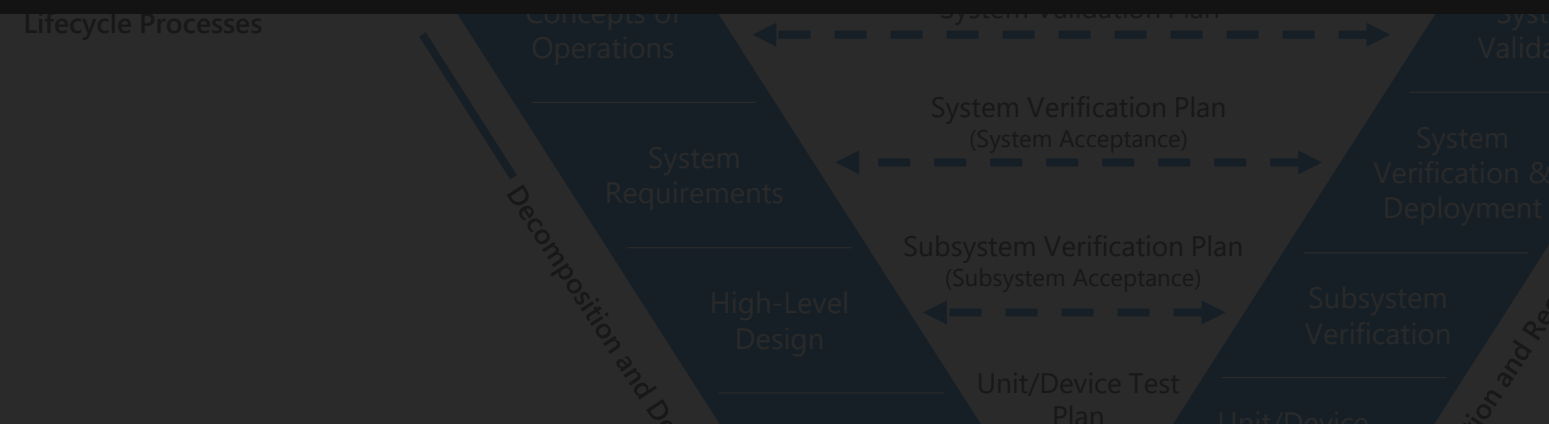
Autonomous Driving Development



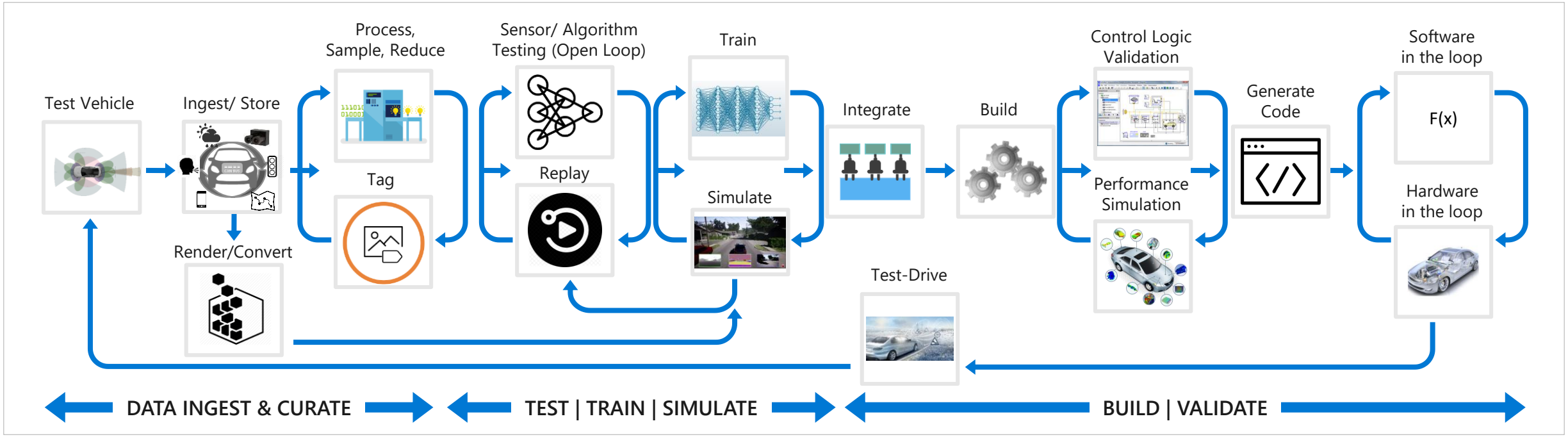
Connected Vehicle



AD Development → Test → Validation → Production → Ownership Lifecycle



AD Dev/Test: E2E Workflow & Partner Ecosystem



AKKA TECHNOLOGIES · MathWorks · ROS · unity · Spark ML · Preferred Networks · AV SIMULATION · carSIM MECHANICAL SIMULATION · CORETEK Services · Altair · Siemens PLM Software SIEMENS · intel · esi

DXC.technology · LG CNS · UNREAL ENGINE · Baidu 百度 · aspera an IBM company · EB · cognata · arasoft corp · SIGNIANT · DASSAULT SYSTEMES · T-Systems · EQUINIX · ANSYS

- Azure Express Route
- Azure Storage, Data Lake Gen2
- Azure Data Box
- Azure Compute
- Azure Batch AI
- Cycle Cloud
- Databricks & HDInsight
- Azure Machine Learning
- Cognitive Services
- Azure IoT Edge
- Kubernetes
- Azure Key Vault, AAD

Key Industry Ecosystem Engagements

American Center for Mobility
CONNECTED. AUTOMATED. VALIDATED.

- Cloud and Analytics partner for ACM, an autonomous and smart mobility test facility
- Leveraged by all OEMs, tier ones and technology start ups
- Engaged with ACM to influence standards

TESTING

STANDARDS

SAE INTERNATIONAL

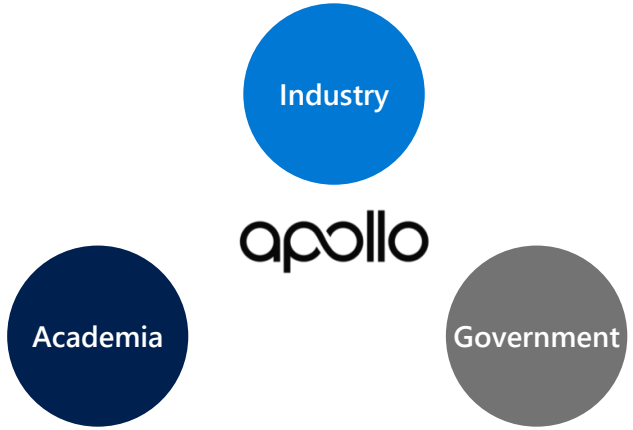
ITE

IEEE

EDUCATION

Baidu 百度 apollo

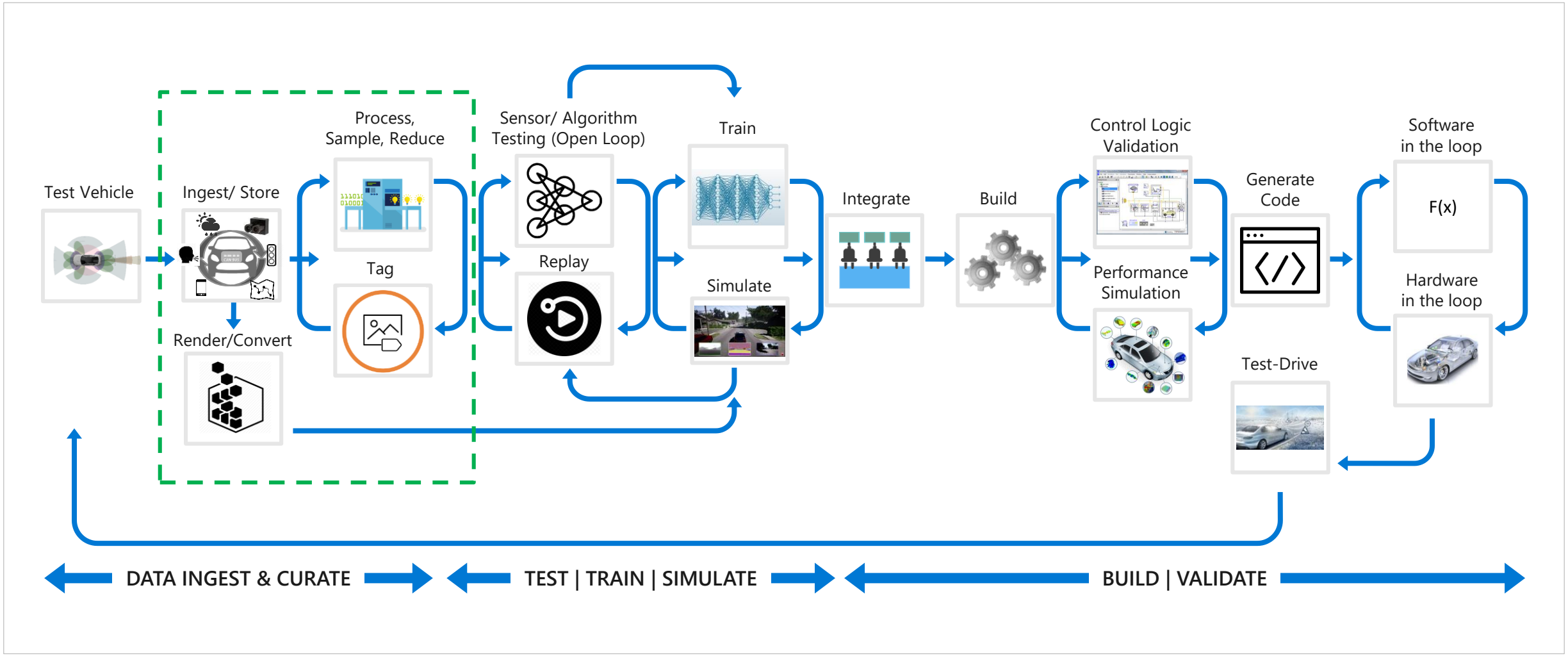
- Open source AD Platform
- 200+ Member Consortium
- Microsoft is the cloud provider for Project Apollo worldwide with the exception of China



BOSCH

- OpenADx
- Interoperable Eclipse Framework

AD Dev/Test: End-to-End Workflow



Data Ingest

Express Route

- Private, secure, predictable connections
- 100+ carrier partners
- 10 Gbps+

Devices


Disk Import


Data Box Disk


Data Box

Azure Edge

- IoT Edge
- AI Toolkit
- Databox Edge

Multiple options to filter and ingest PBs daily, regardless of fleet type or location

Partner-based solutions

- In-car data storage
- Express Route partner
- Data delivery partner
- Garages/drop-off hubs
- Network acceleration

Data Storage

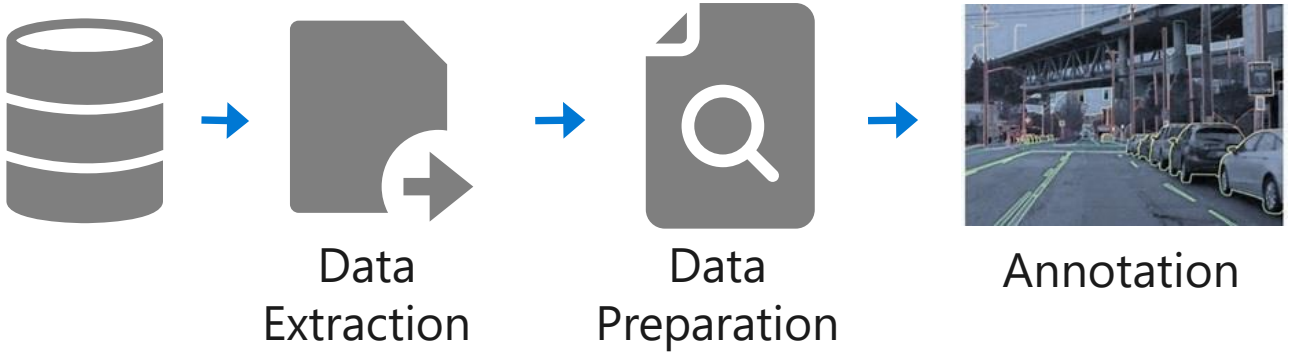
Scalable	• Foundational service for Microsoft • >40 million transactions per second • Multi-PB accounts
Performant	• 50+Gbps account throughput • Continued enhancements under development
Secure & Compliant	• Client & Service Encryption • AAD Integration + ACLs • Broad & deep compliance portfolio
Durable	• Multiple redundancy options • Strong consistency, data integrity • Policy: Versioning & WORM locks
Cost Effective	• Integrated storage tiers • Lifecycle management • Rich metrics

Massively scalable object storage for unstructured data

Partner-based Solutions

- Data management
- Lifecycle management policies
- Unique policy/regulatory requirements
- Hybrid services: Data replication and tiering, protocol support

Data Curation



Microsoft Services

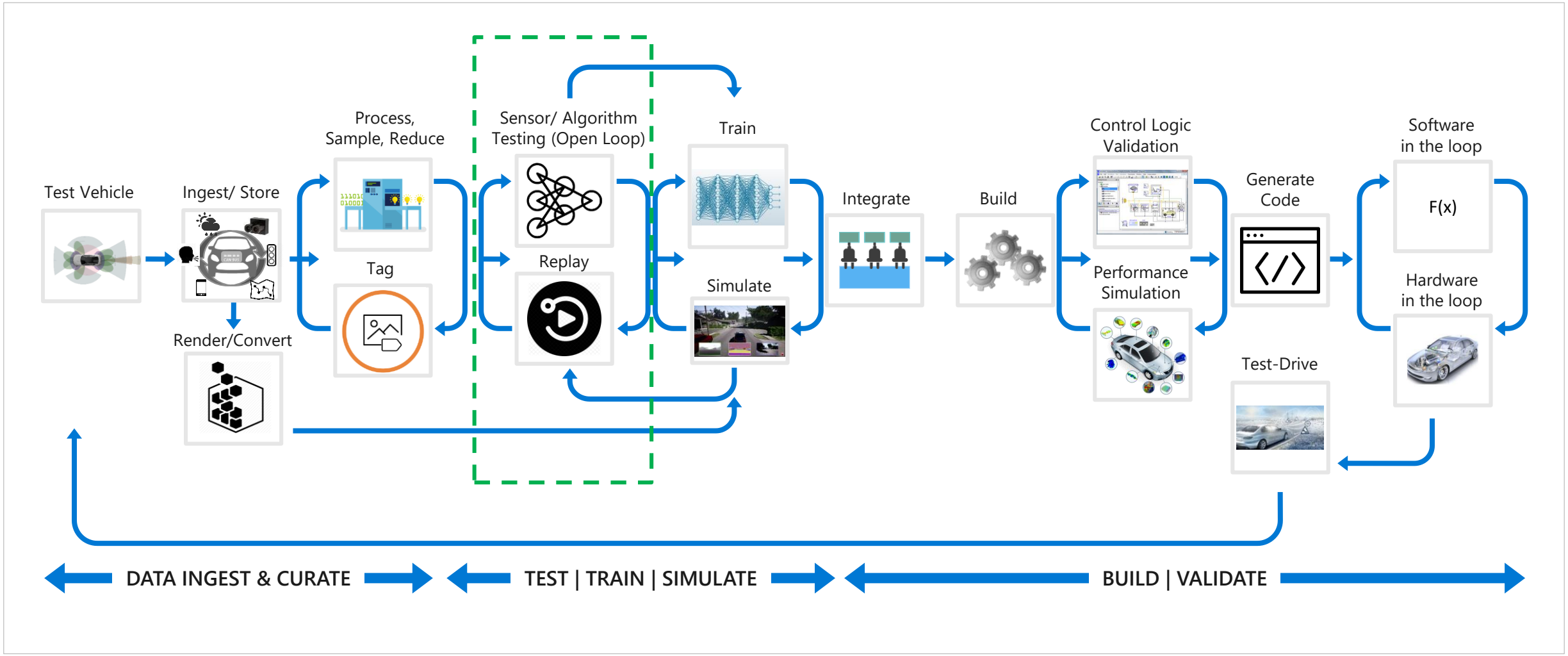
Blob | Cognitive Services | Services Logic | Apps Functions | HDInsight | Search | Databricks | Cosmos | DB Batch

Data selection and transformation, PII data redaction, annotation and training data preparation

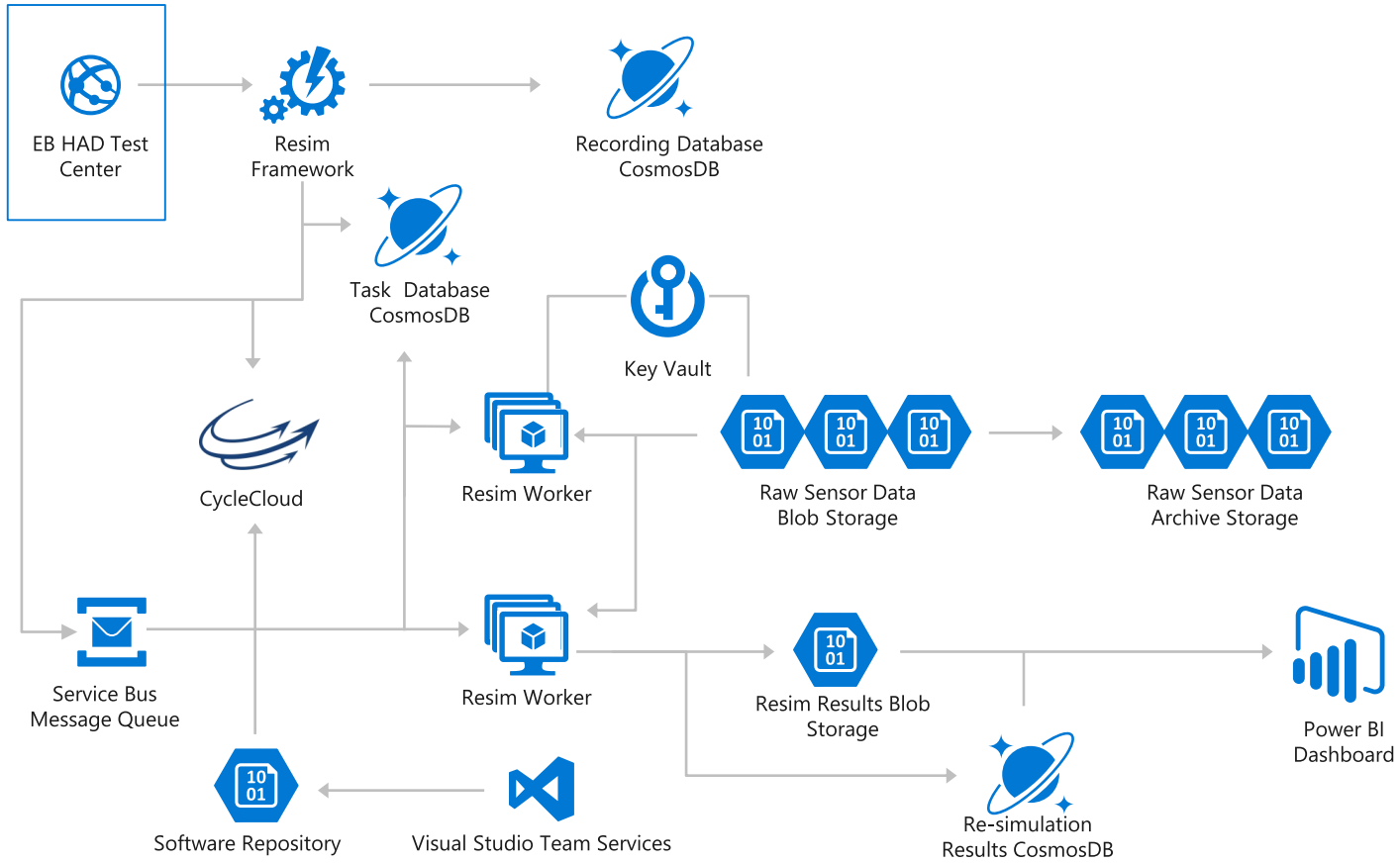
Partner-based Solutions

- Sensor data fusion tools
- Data extraction
- Labeling and annotation
- Data analysis
- Data anonymization
- Workflow orchestration and managed services

AD Dev/Test: End-to-End Workflow



Algorithm Validation (Open Loop Testing w/ ADTF)

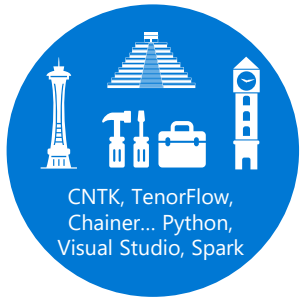


Verification and validation of training algorithms and sensors via open loop testing

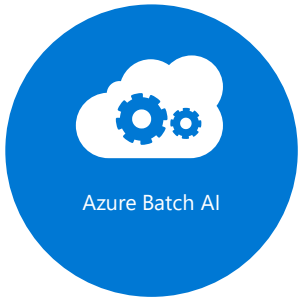
Partner-based Solutions

- Open loop testing tools (ex. ADTF)
- Simulation tools for sensor and algorithm validation
- Comprehensive test management framework
- Workflow management services

Training



Your Data with Any AI Tools

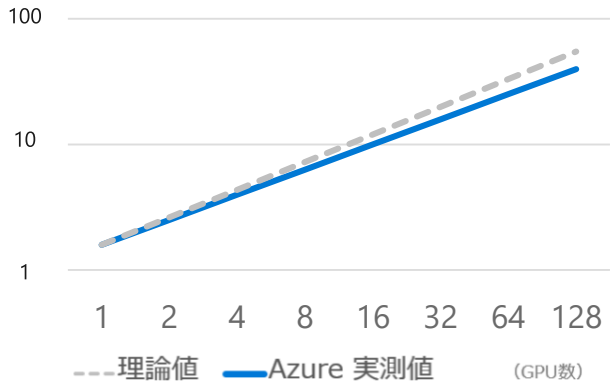


Training with Scale-Out GPU Clusters on Demand

Intelligence In your Apps and Data Services

Reduce Training Job Run-time with ChainerMN on Azure

Chainer MN



With InfiniBand, Scaled to 128 GPUs – job run-time shrunk by a factor of >100x

Partnership Opportunities

- Custom AI model development using TensorFlow, Chainer, PyTorch, CNTK, and other major frameworks
- Compute PaaS training service for custom pipelines, tool integration, & services
- Rich job monitoring and control experience, hyper-parameter tuning, batch testing & scoring

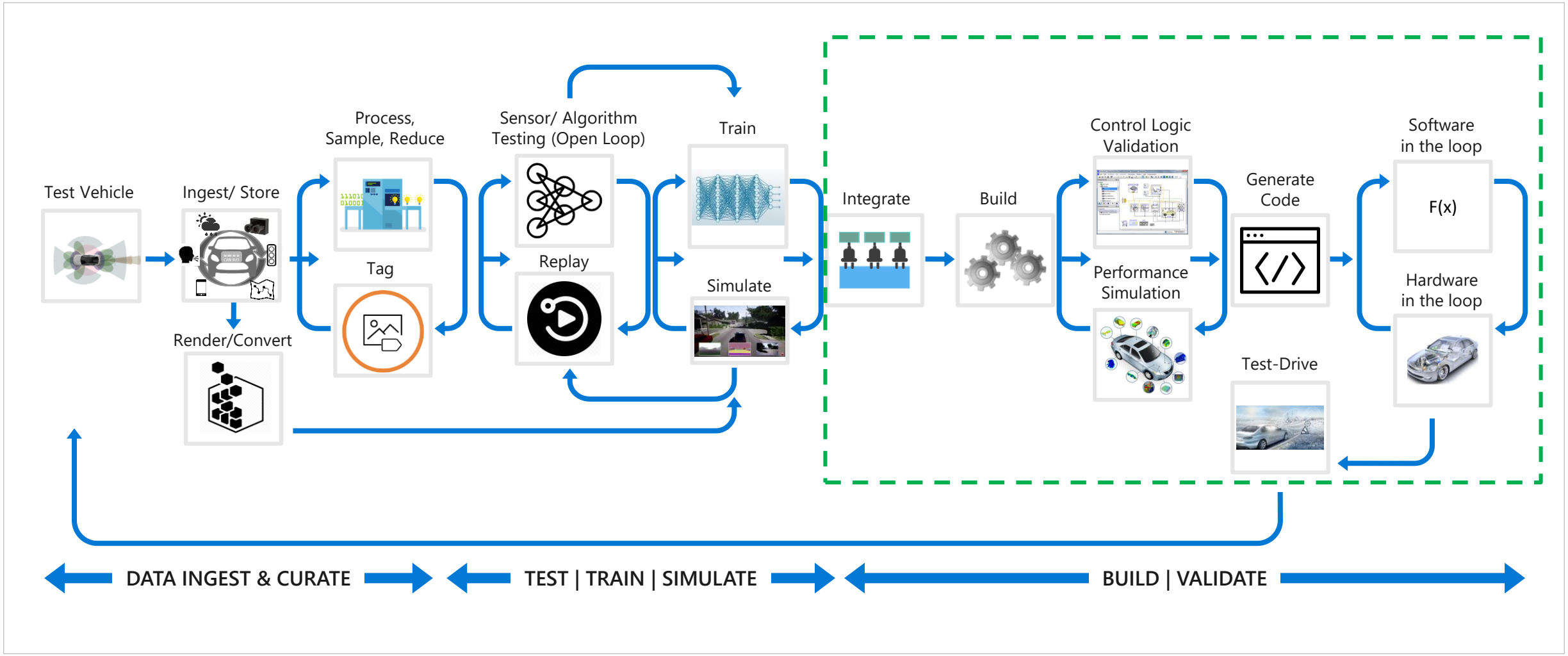
Simulation

Billions of miles required: Only possible via simulation, run at scale

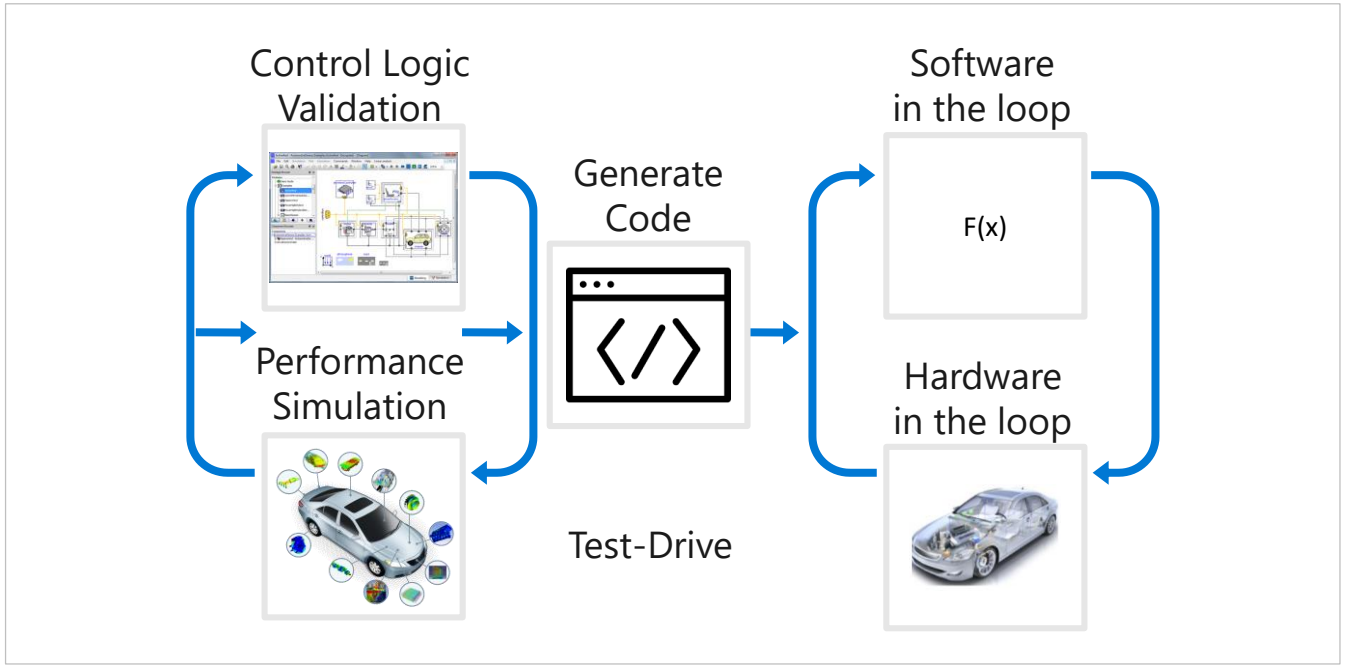
Partnership Opportunities

- Simulation as a managed service
  - Photo realistic Sensor Simulation
  - Object level Scenario Simulation
- Customer specific customizations
  - Support latest and accurate sensor models
  - Parametric control of environment
  - Integration of vehicle dynamics
  - Deriving scenarios from real world data

AD Dev/Test: End-to-End Workflow



HIL and SIL Validation



Microsoft Services

Blob storage | Batch | GPU VM | Active Directory | Container service

Embedded system validation via hardware-in-loop and software-in-loop

Partner-based Solutions

- Comprehensive test management framework
- HIL solutions
- System validation tools
- Workflow management services
- Managed services

EB HAD Test Center

Azure

Automated Driving Test Data Platform

Database

Raw Data

Label Ground Truth

Scenarios

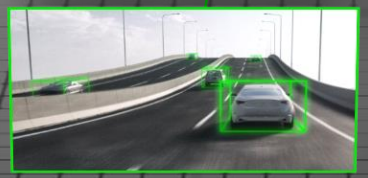
Test Cases

Archive

Test drive recording

Scenario generation

Data Enhancement

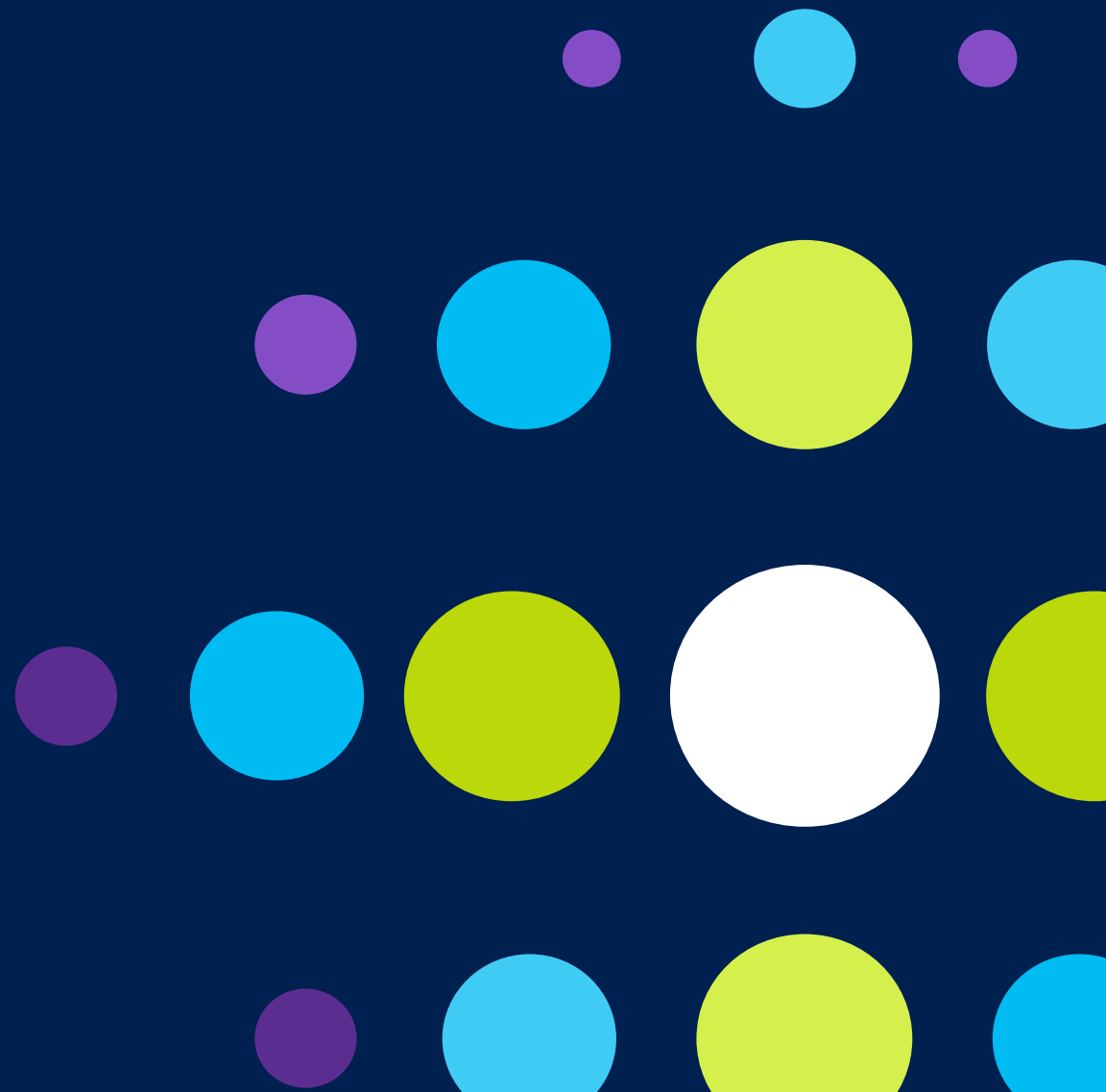


Test Case Management

Test Execution

Test Post-processing

Q & A



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