DXC accelerates Autonomous Driving development

High Performance D3 platform of BMW Group

Powered by Openshift

Discuss and derive the learnings for your industry data driven AI ecosystem!

DXC.technology

Thrive on Change

DXC Technology is the world's leading independent, end-to-end IT services company. We guide clients on their **digital** transformation journeys, **multiply** their capabilities, and help them harness the power of innovation to **thrive on change**.

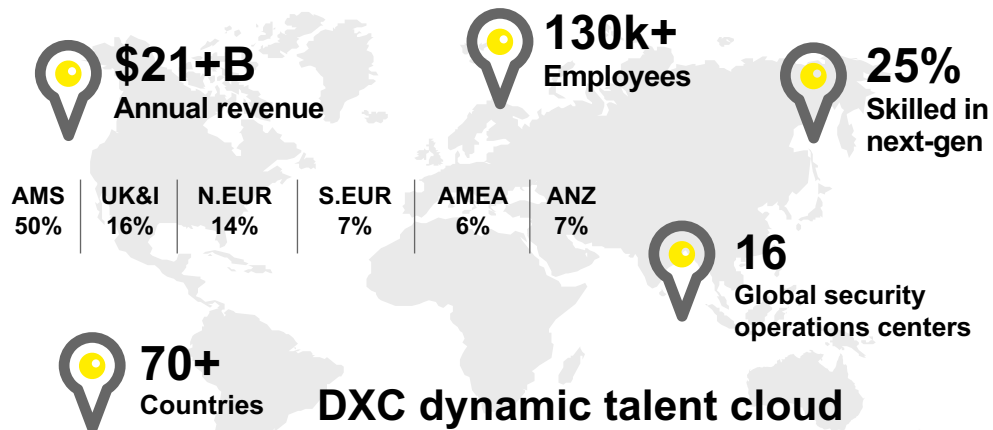| **Bringing innovation to clients for 60+ years** | Serving **nearly 6,000 private and public sector enterprises across 70 countries** | Our clients benefit from our **technology independence, global talent, expertise and extensive partner network** | We are **uniquely positioned to lead digital transformations,** creating greater value for our people, clients and partners |

DXC was created to lead the digital disruption cycle

Scale & skills

$21+B
Annual revenue

130k+
Employees

25%
Skilled in next-gen

AMS 50%	UK&I 16%	N.EUR 14%	S.EUR 7%	AMEA 6%	ANZ 7%

16
Global security operations centers

70+
Countries

DXC dynamic talent cloud

Agility & cost efficiency

Integrated delivery model

55% low-cost center mix for delivery

21 in-country low-cost centers
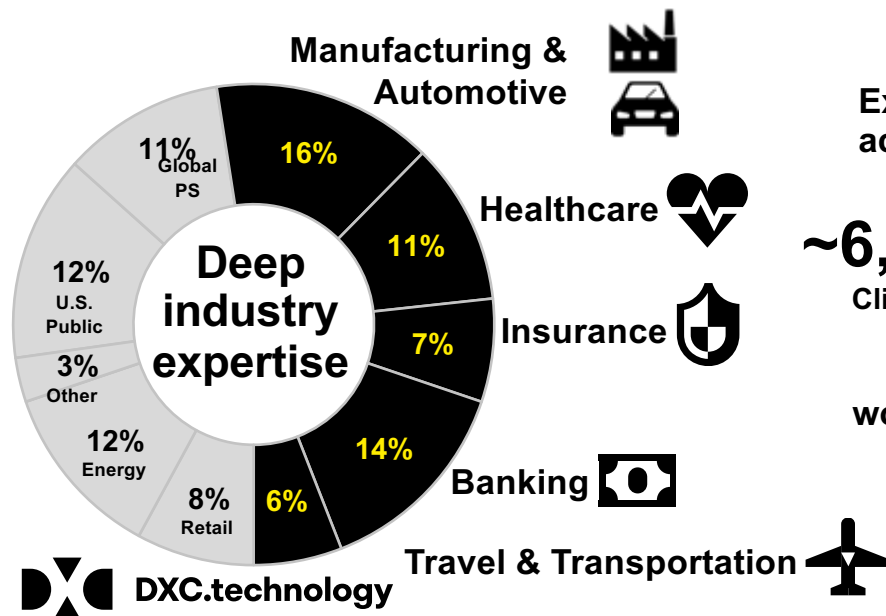
8 global delivery centers

Operational data mining

Connect · Analyze · Optimize

50% incident volume reduction potential through ODM

Automation targets

80% priority service requests auto-resolved

50% tickets auto-processed

Customer intimacy

Manufacturing & Automotive

11% Global PS
12% U.S. Public
3% Other
12% Energy
8% Retail
16%
11%
7%
14%
6%

Deep industry expertise

Healthcare

Insurance

Banking

Travel & Transportation

Excellent client coverage across the globe …

~6,000 Clients

200+ F500 clients

36 NPS

… enhanced through world-class partner network

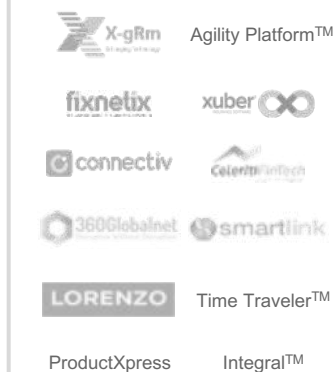## Technology-driven innovation

$4B
Digital revenue

11
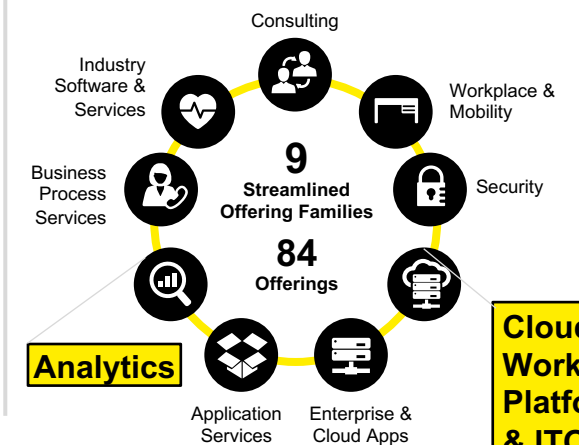largest offerings rated as differentiated leader

250+
global partners

14 strategic co-investing partners

Differentiated IP

X-gRm — Agility Platform™
fixnetix — xuber
connectiv — CelerityFintech
360Globalnet — smartlink
LORENZO — Time Traveler™
ProductXpress — Integral™

Streamlined offerings

Consulting
Workplace & Mobility
Industry Software & Services
Security
Business Process Services
9 Streamlined Offering Families
84 Offerings
Analytics
Application Services
Enterprise & Cloud Apps

Cloud, Workload, Platforms & ITO

DXC.technology

DXC Robotic Drive to accelerate Autonomous Driving development

DXC.technology

September 17, 2019

PD_1335a-19

Watch Robotic Drive at

Robotic Drive Video

DXC.technology

September 17, 2019

R&D in Automotive Industry – Capabilities are Changing

Machine Learning

Information Technology

Software Engineering

Electronic Engineering

Mechanic Engineering

DXC.technology

"Outside in" change to build next gen car

Reuse series car invest

Artificial Intelligence

Software Engineering

Information Technology

Electronic Engineering

Mechanic Engineering
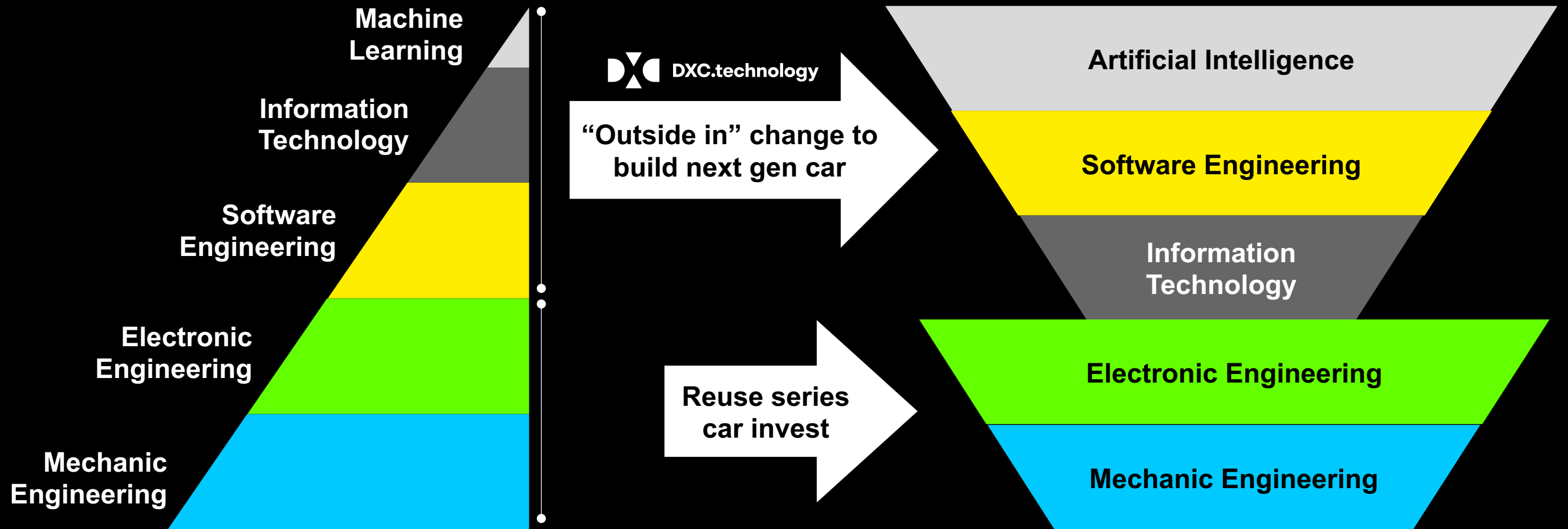
Extend & reuse current mechanic engineering capability combined with artificial intelligence, software building and IT is important to survive

PD_1335a-19

Partnering setup to master this innovation leap

System-integration

Automotive manufacturer with strong own IT

Next-gen IT partner

DXC.technology

Innovation to enable machine learning & data management

System & subsystem innovation

Lead automotive system supplier

Next-gen technology supplier

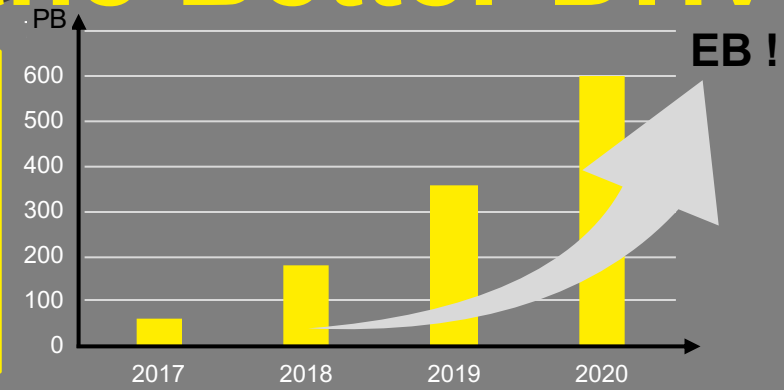Best of Breed HW and SW Technology for AD

DXC.technology

PD_1335a-19
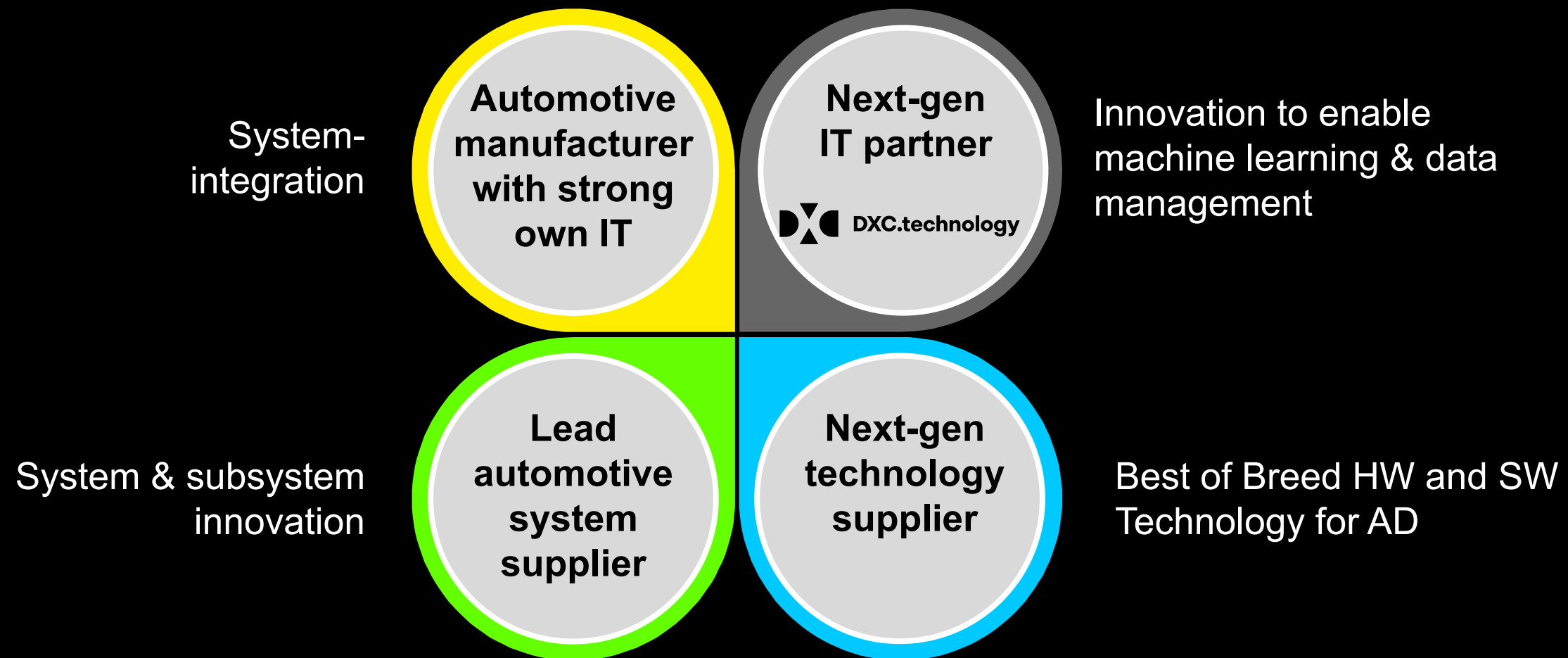
Key Autonomous Driving Goal & Challenges
Storage Workloads on Exabyte Scale
Compute Workloads requires tens of thousands of GPU (SP) Tflops

360°

Build the Better Driver
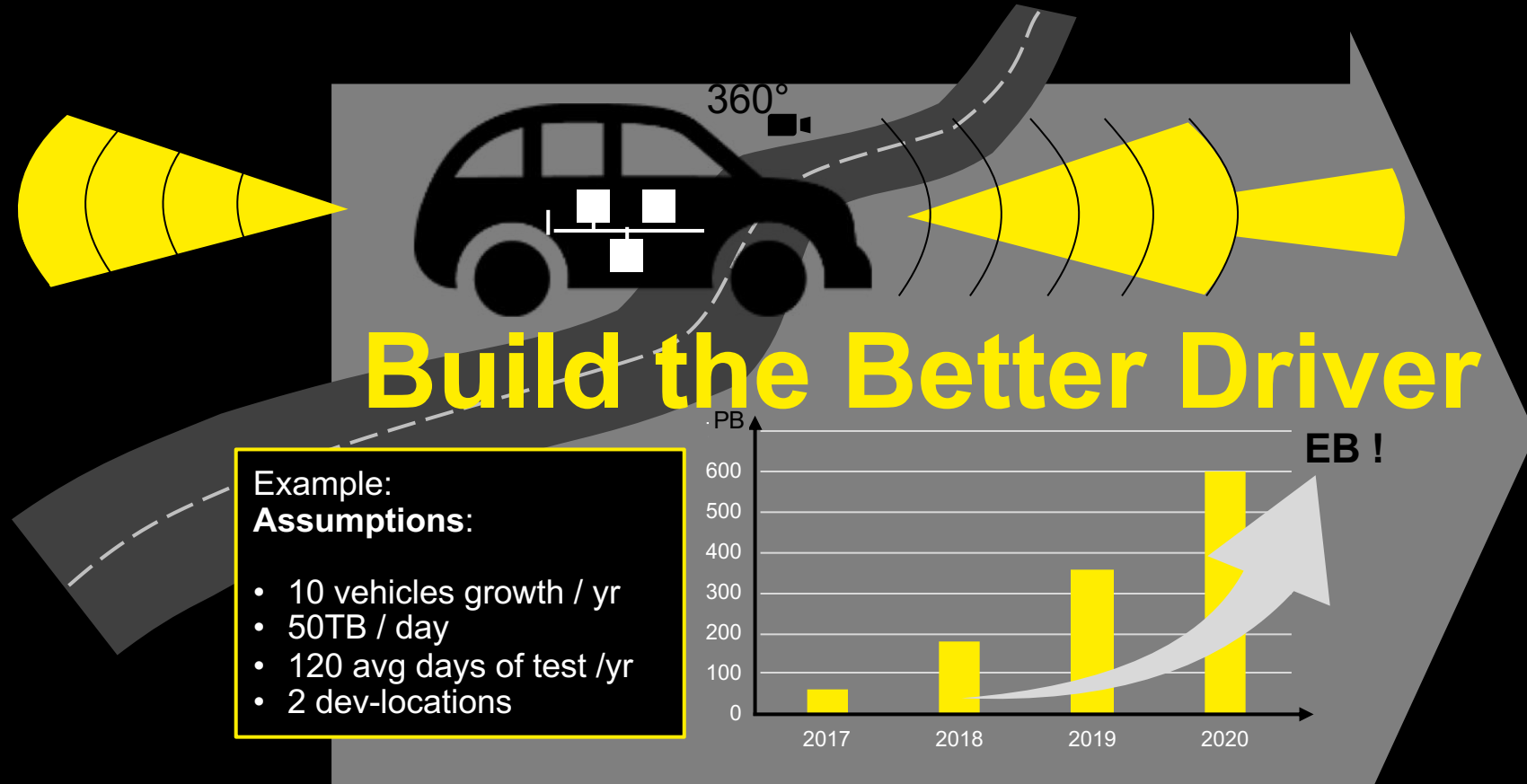
Example:
Assumptions:

- 10 vehicles growth / yr
- 50TB / day
- 120 avg days of test /yr
- 2 dev-locations

PB

EB !

600
500
400
300
200
100
0

2017   2018   2019   2020

- **The legal road approval is** far away or even **impossible by using the deterministic approach** based on business rules

- **Product development** on this level is **very hard or even impossible to achieve** with current approach

1 Amount of test data to train the neuronal networks — 22 mil. km → 120 exabyte Data

2 Effort to label the data for feature recognition — 1 mil. Person Years per simple capability → More than 10 complex capabilities needed

4 **Object recognition**   **Drive strategy**
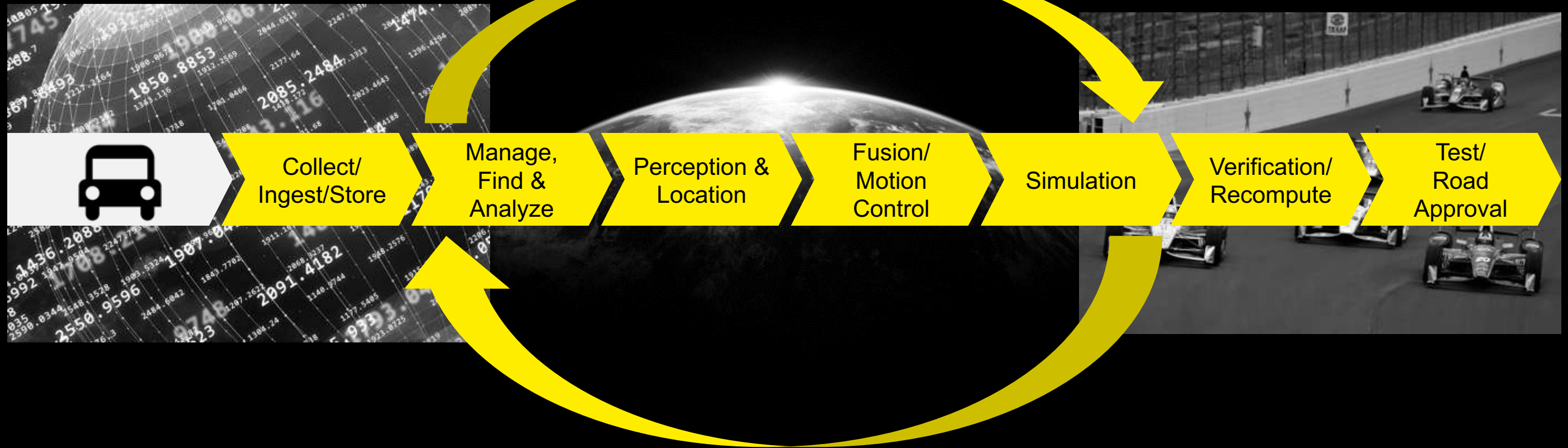
Situation analytics

Pictures: Spiegel Online

DXC.technology

September 17, 2019   **9**

PD_1335a-19

Requires an end-to-end data and AI capability ecosystem for AD development

**Geographically distributed
R&D teams**

AD data & models

Need for speed

Collect/
Ingest/Store → Manage, Find & Analyze → Perception & Location → Fusion/ Motion Control → Simulation → Verification/ Recompute → Test/ Road Approval

PD_1335a-19

DXC Robotic Drive Solution
Basic Features

Data Centers — Building blocks in car — Cluster

1	RD Geographic Distributed Data Lake
2	RD Analyzer
3	RD Containerized Compute Cluster
4	RD Managed Machine Learning

5 RD Ingestor

6 RD Optimizer

7 RD Instant Access

R&D Engineers
Data Analysts
Data Scientists
Annotation Teams
Remote Work Platform

Car
OEMs
Suppliers
Consumers

PD_1006a-19
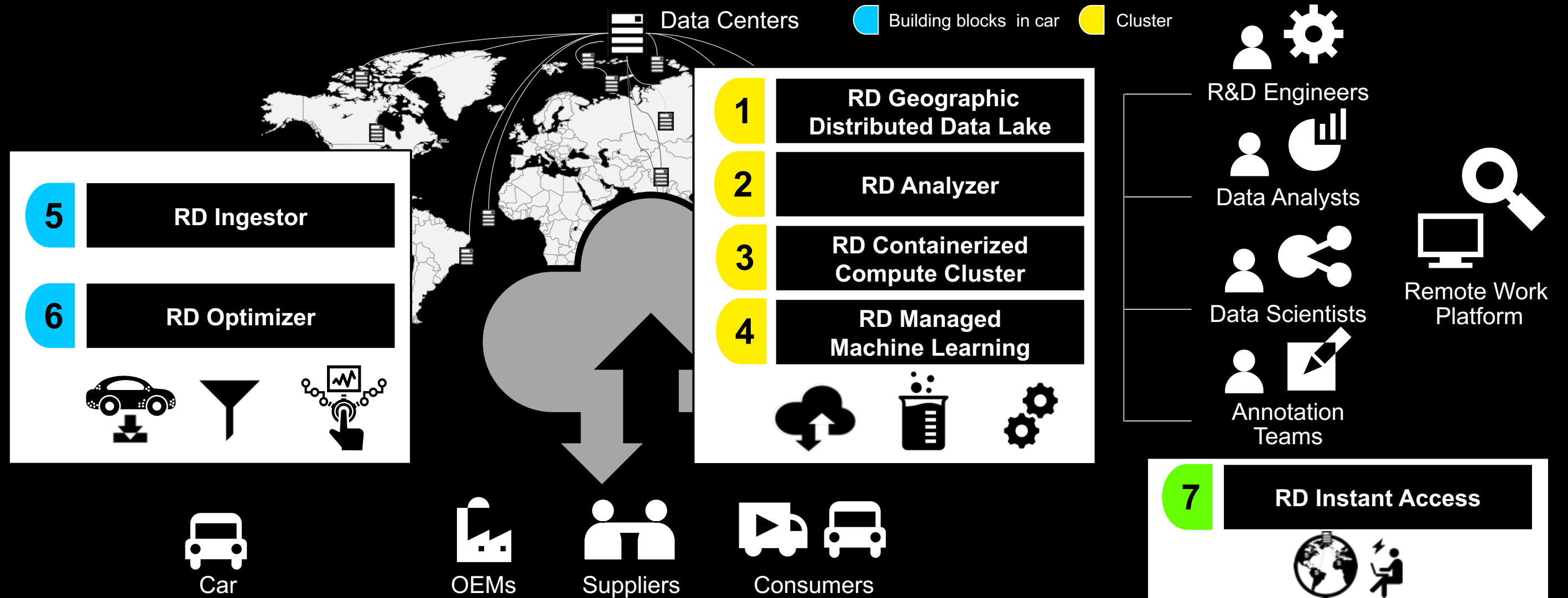
Digital Ecosystem: Big Data + Compute + AI
DXC Robotic Drive Autonomous Drive Development Eco System

Globally located ingestion stations equipped with **Robotic Drive ingestor**

Converged AD Platform hosting distributed data storage (MS), processing (DP), computation (CP) on Hadoop based Data Lake

Kubernetes, Docker based (fully automated) data computation platform equipped with **Robotic Drive analyzer, trainer**

Self Service UI (notebooks, containerized apps, ingest monitor etc.)

Recommend: Add **Dev & Test Environments & use 100 GBit Net** architecture

Cloud data back up

Ingestion Cluster

Ingestion Cluster

Ingestion Cluster

Ingestion Cluster

GPU

Node

Node

Containerized Computing & AI Platform

RED HAT OPENSHIFT

Converge Data Platform (Centralized Data Lake)

redhat.

Unified Security

Fully managed DevOps

MDM, Governance

High Density Mass Storage Platform

GPU

Ingestion Cluster

Ingestion Cluster

Ingestion Cluster

Ingestion Cluster

On-Premise Managed Infrastructure

AD Platform Solution for Robotic Drive Geo Distributed Data Lake

DXC Robotic Drive enables autonomous driving development and testing

DXC Robotic Drive Toolkit

DXC Robotic Drive Accelerators

DXC Robotic Drive Platform

Build Solution

CLIENT AUTONOMOUS DRIVING PROGRAM

DXC.technology

PD_1006a-19

DXC Technology is partner for the new BMW Group High Performance D3 platform

Autonomous driving is at the heart of BMW Group's 'NUMBER ONE > NEXT' strategy," said Alejandro Vukotich, senior vice president, Autonomous Driving and Driver Assistance at BMW Group. "DXC will greatly support our commitment to maximizing innovation, which will benefit our customers. With the managed services, we are able to ramp up the solution to support the next stage of the future of BMW Group's autonomous drive platform."
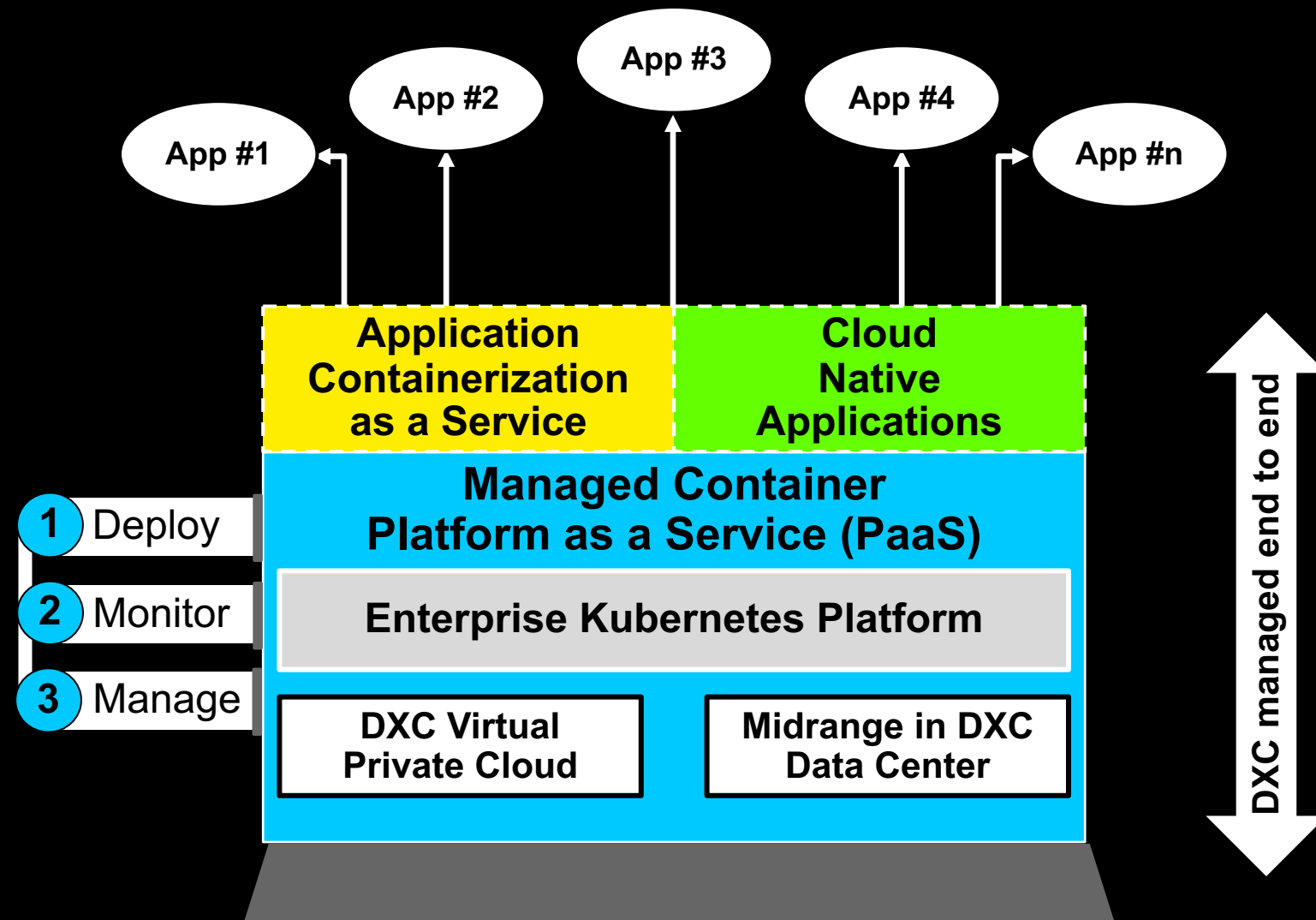
September 17, 2019

BMW GROUP HIGH PERFORMANCE D^3 PLATFORM.
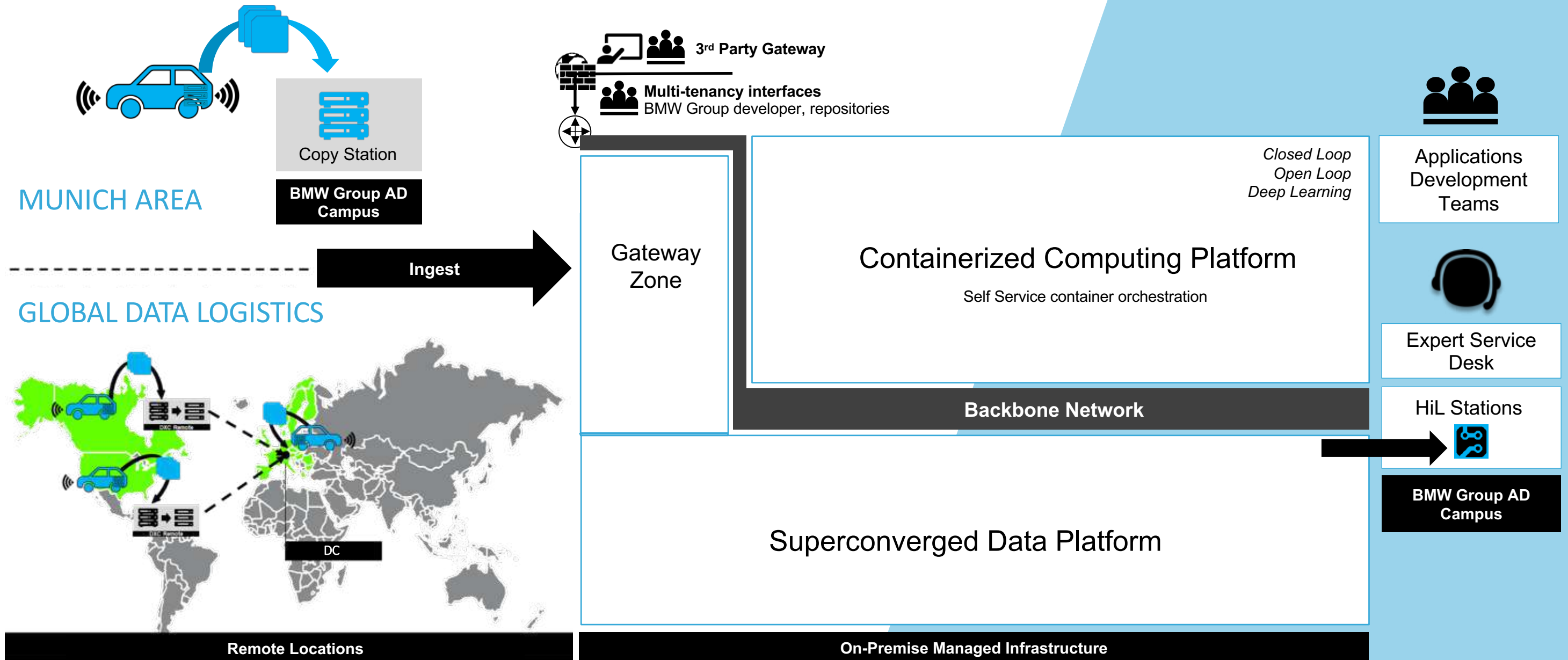
Deep Dive in DXC Managed Container Platform as part of Robotic Drive

June 2019

DXC.technology

Containerized Compute Platform
DXC Managed Container Platform as a Service powered by Red Hat OpenShift

App #1 App #2 App #3 App #4 App #n

Application Containerization as a Service

Cloud Native Applications

Managed Container Platform as a Service (PaaS)

Enterprise Kubernetes Platform

DXC Virtual Private Cloud

Midrange in DXC Data Center

1 Deploy
2 Monitor
3 Manage

DXC managed end to end

Managed Container PaaS

1 A fully managed Kubernetes platform unites apps/ops teams on a single platform, driving shorter development cycles and lower operating costs

2 Move legacy and cloud native applications between hybrid and disparate clouds, retaining full application functionality and avoiding cloud lock-in
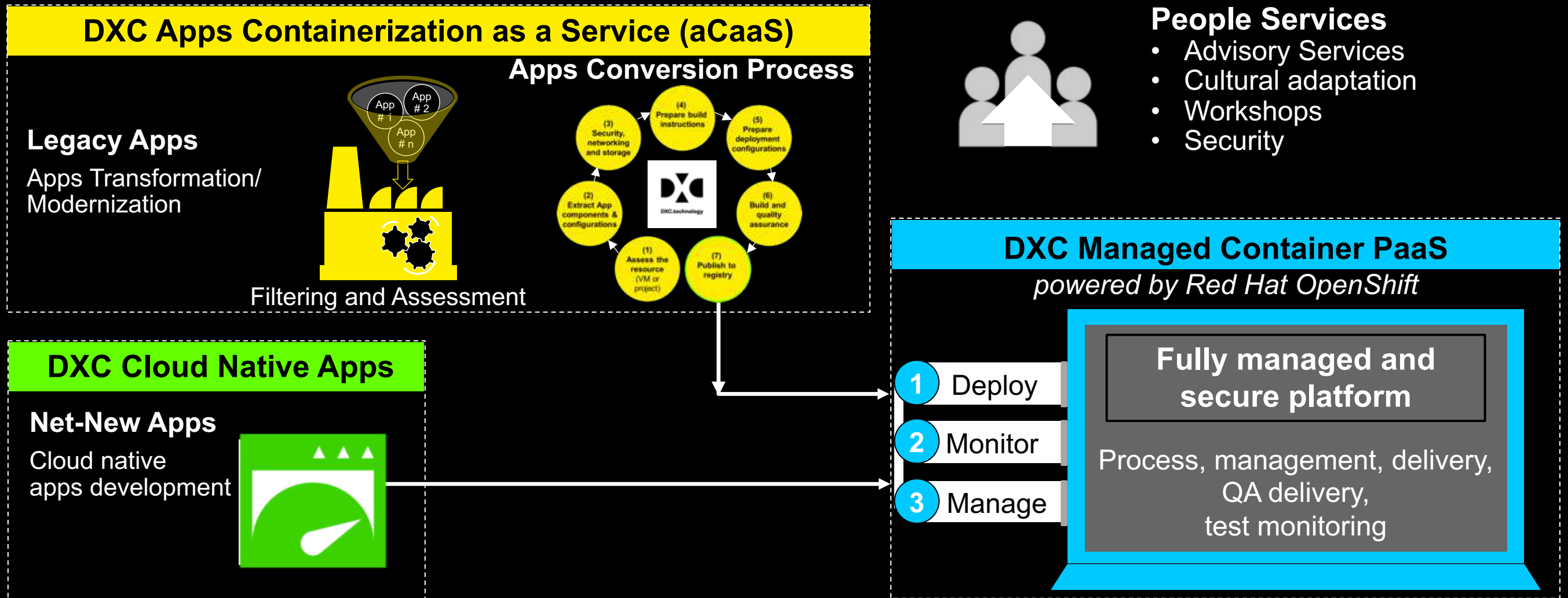
3 DXC best-in-class support and industry-leading automation provides the capability to quickly support changing business needs.

4 Currently delivered in a managed service in traditional and private cloud, with the addition of hosting on public cloud coming soon

PD_1006a-19

Full scope of DXC Containerized services
DXC Managed Container Platform as a Service powered by Red Hat OpenShift

DXC Apps Containerization as a Service (aCaaS)

Apps Conversion Process

App # 1
App # 2
App # n

Legacy Apps

Apps Transformation/ Modernization

(4) Prepare build instructions

(3) Security, networking and storage

(5) Prepare deployment configurations

(2) Extract App components & configurations

DXC.technology

(6) Build and quality assurance

(1) Assess the resource (VM or project)

(7) Publish to registry

Filtering and Assessment

People Services
- Advisory Services
- Cultural adaptation
- Workshops
- Security

DXC Managed Container PaaS
powered by Red Hat OpenShift

DXC Cloud Native Apps

Net-New Apps

Cloud native apps development

1 Deploy

2 Monitor

3 Manage

Fully managed and secure platform

Process, management, delivery, QA delivery, test monitoring

In summary: Why DXC Technology?
Accelerate autonomous driving development

DXC Analytics has demonstrated that **augmented agile thinking and approach** is needed in such complex digital deals

We understand AD development

DXC has experience managing AD research and development projects and provide proven components to manage the size and technical complexity

Vendor-agnostic and cloud-ready AD development platform

DXC's technology independence allows us to deploy and deliver the best solutions with scale, speed, and agility

We solve complex AD challenges, end to end

DXC helps AD R&D engineers ingest files from test vehicles, eliminate data conversion, avoid duplication, enable AI training, and more
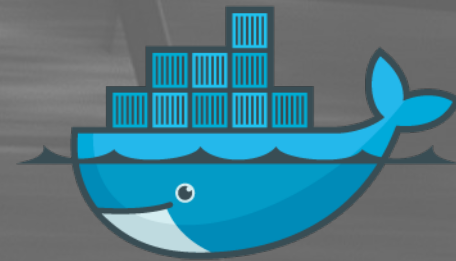
We understand AD development on a global scale

DXC provides an established global network of automotive centers of excellence for collaboration and innovation

Fast, cost-effective, innovative

DXC helps accelerate AD development by reducing time spent analyzing data, lowering costs by eliminating complexity, and promoting innovation with faster development cycles

Agility Flexibility Scalability

DXC enables engineers and IT professionals to work collaboratively with a standard development accelerator and platform and flexible deployment for hybrid or full cloud
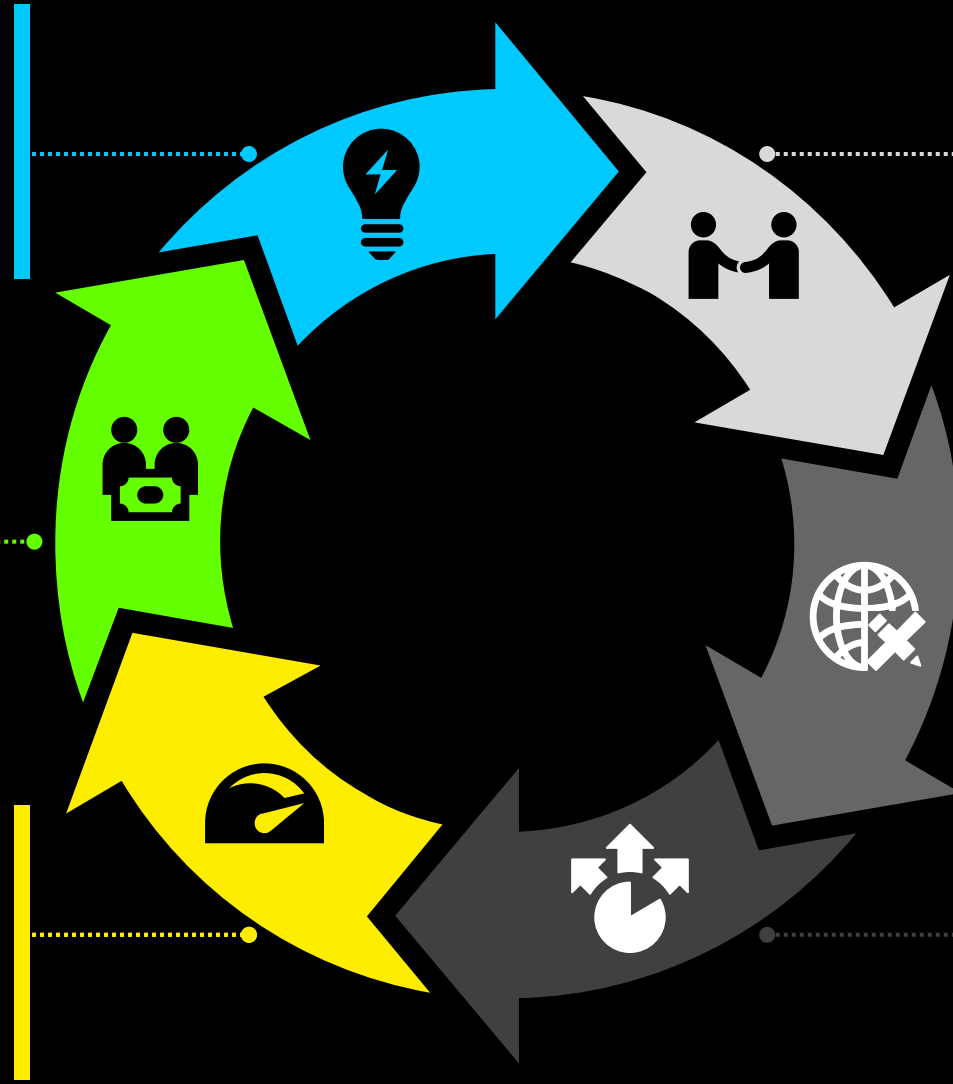
PD_1335a-19

Thank you

Start your AI Journey with DXC

Günter Koch – Global Solution Lead Robotic Drive

gkoch@dxc.com

Andrea Ubbiali - …..

aubbiali@redhat.com

DXC.technology