CLOUD NATIVE@BMW GROUP
TECHNOLOGY FOR THE AGILE TRANSITION.

Jens Eckert (BMW Group, Cloud Platforms)

BMW GROUP

THE NEXT 100 YEARS

126.013

employees worldwide

2.367.603

sold vehicles worldwide in 2016

ENSURING OUR POSITION AS TECHNOLOGY LEADER.

Technology and innovation leader

Future focus:
Powertrain technologies

Future focus:
Digitalization

Efficient Dynamics NEXT

Hydrogen

Connectivity

Artificial Intelligence

Autonomous driving

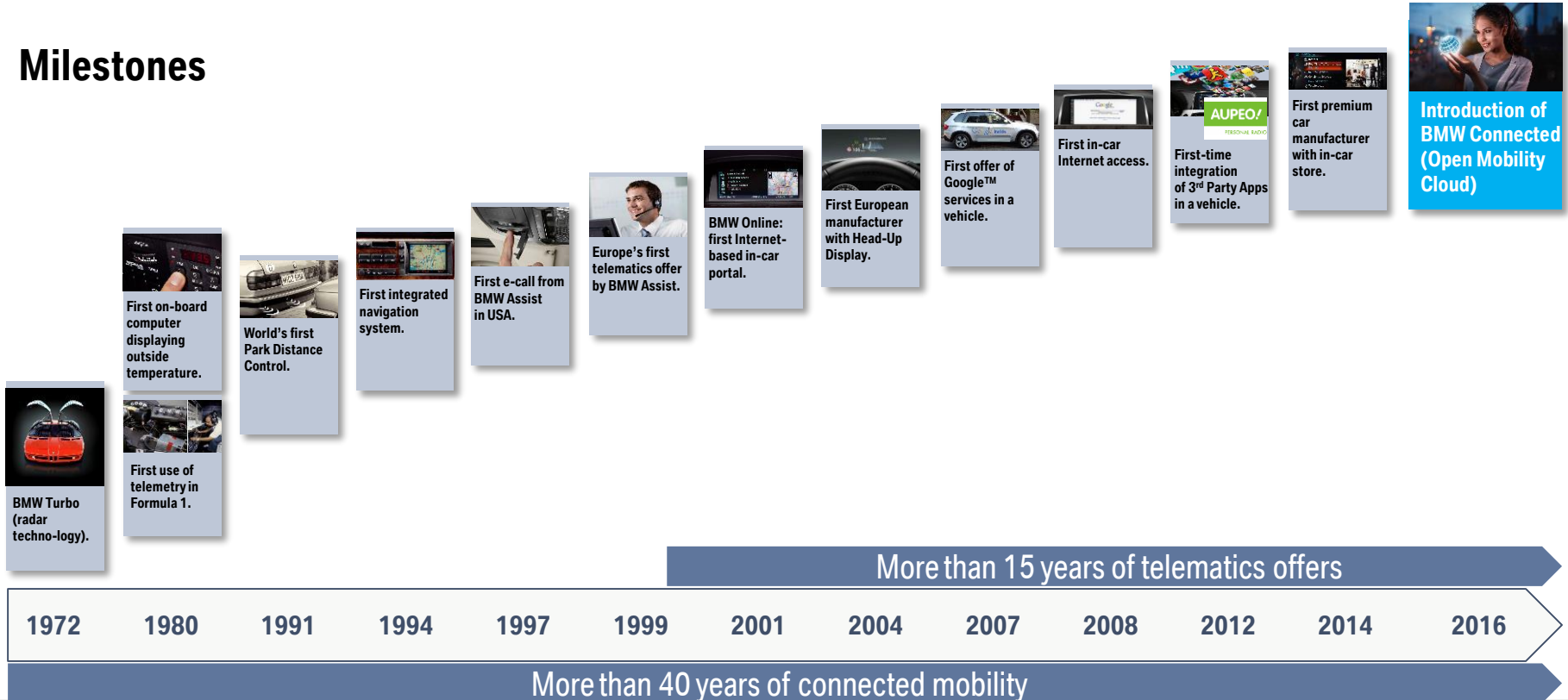# THE IMPLEMENTATION OF THE STRATEGY NUMBER ONE > NEXT LEADS TO A TRANSFORMATION PROCESS TOWARDS A TECH COMPANY.

Today

Tomorrow

Products

Mobility & Services

„Die Wertschöpfung verschiebt sich von der Hardware in Richtung Software und Services."
Harald Krüger, 16.03.2016
BMW Group Bilanzpressekonferenz

Products

Mobility & Services

Software & Services (Tech)

Effect on:
- Customer Experience
- Shareholder/ Analysts
- Stakeholder / Partner
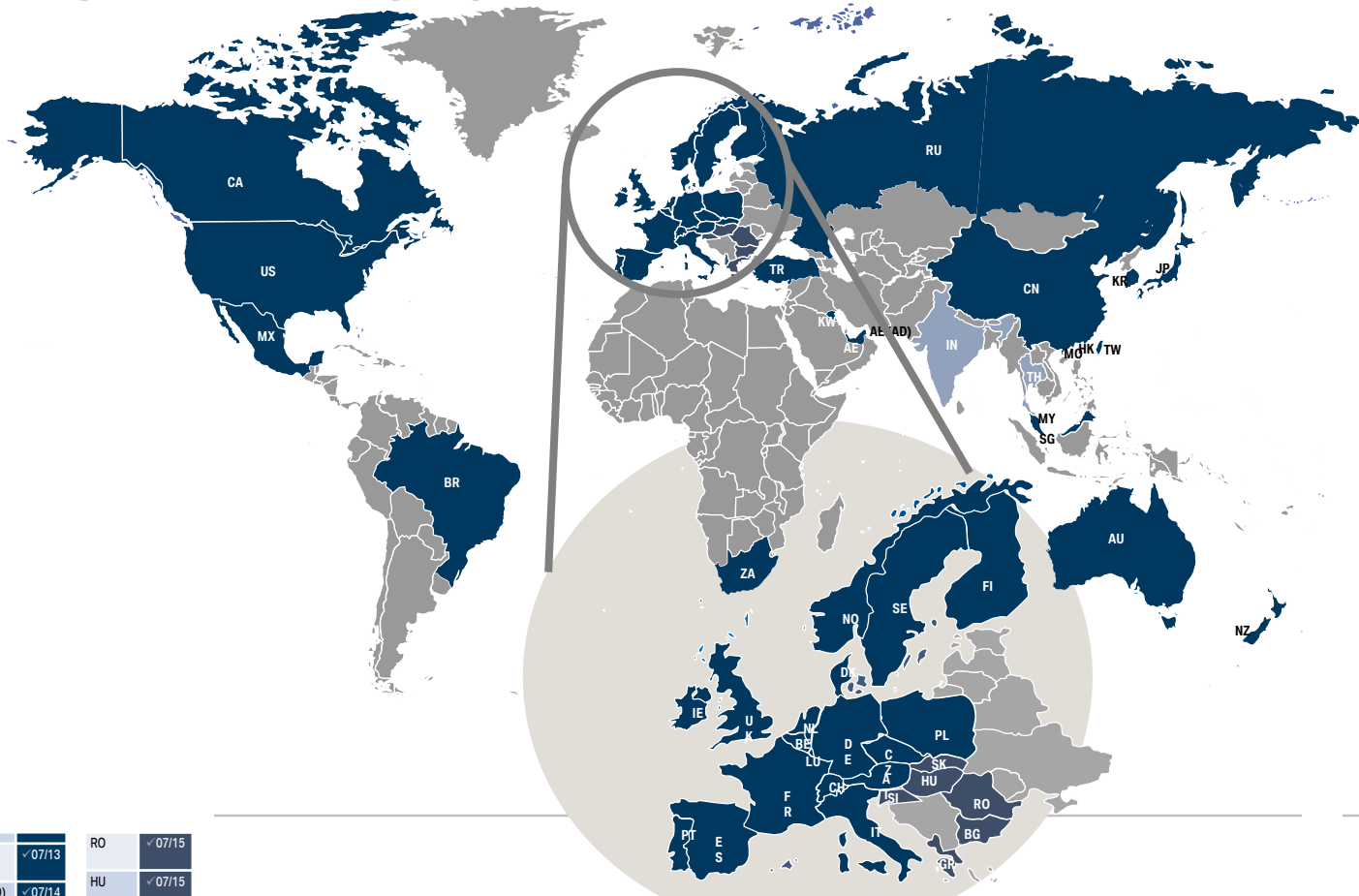- Employees / Attractiveness

Digital customer experience, connected and automated driving and digitalized business processes lead to a transformation of the BMW Group towards software and services (Tech).

BMW CONNECTED DRIVE HISTORY.
MORE THAN 40 YEARS OF EXPERIENCE.

Milestones

Introduction of BMW Connected (Open Mobility Cloud)

First premium car manufacturer with in-car store.

First-time integration of 3rd Party Apps in a vehicle.

First in-car Internet access.

First offer of Google™ services in a vehicle.

First European manufacturer with Head-Up Display.

BMW Online: first Internet-based in-car portal.

Europe's first telematics offer by BMW Assist.

First e-call from BMW Assist in USA.

First integrated navigation system.

World's first Park Distance Control.

First on-board computer displaying outside temperature.

First use of telemetry in Formula 1.

BMW Turbo (radar techno-logy).

More than 15 years of telematics offers

1972	1980	1991	1994	1997	1999	2001	2004	2007	2008	2012	2014	2016

More than 40 years of connected mobility

BMW CONNECTED DRIVE.
44 ESTABLISHED MARKETS WORLDWIDE.

US	✓03/13	MO	✓07/13	RO	✓07/15
CA	✓03/13			HU	✓07/15
		AE (AD)	✓07/14		

BMW CONNECTED DRIVE.
CONSISTING OF "SOFTWARE" AND "HARDWARE".

BMW
ConnectedDrive

BMW CONNECTED DRIVE DIGITAL SERVICES

BMW CONNECTED DRIVE DRIVER ASSISTANCE

"SOFTWARE"

"HARDWARE"

Update and upgrade capable "software"

Prefitted "hardware" and sensor technology

SELECTED USE CASES.

Electric Cars

Service Calls

Real-Time Traffic

Driving Assistance

Autonomous Driving

DriveNow

ParkNow
You found your place.

ChargeNow

FACTS AND NUMBERS.

15
Years

4 Mio.
Lines of Code (Backend)

8 Mio.
ConnectedDrive Cars

30 %
Yearly Growth

1100
Jenkins Jobs

300
Microservices (Planned)

CHALLENGES AND SOLUTIONS FOR CONNECTED CARS.

More Cars are sold

More Features in each car

Conway's Law

Standardization

Growth **Enterprise**

Time to Market **Cars**

Traditional Development Cycles

Traditional Service Delivery

> 10 years of support

Changeing (old) cars is hard

Planning ahead
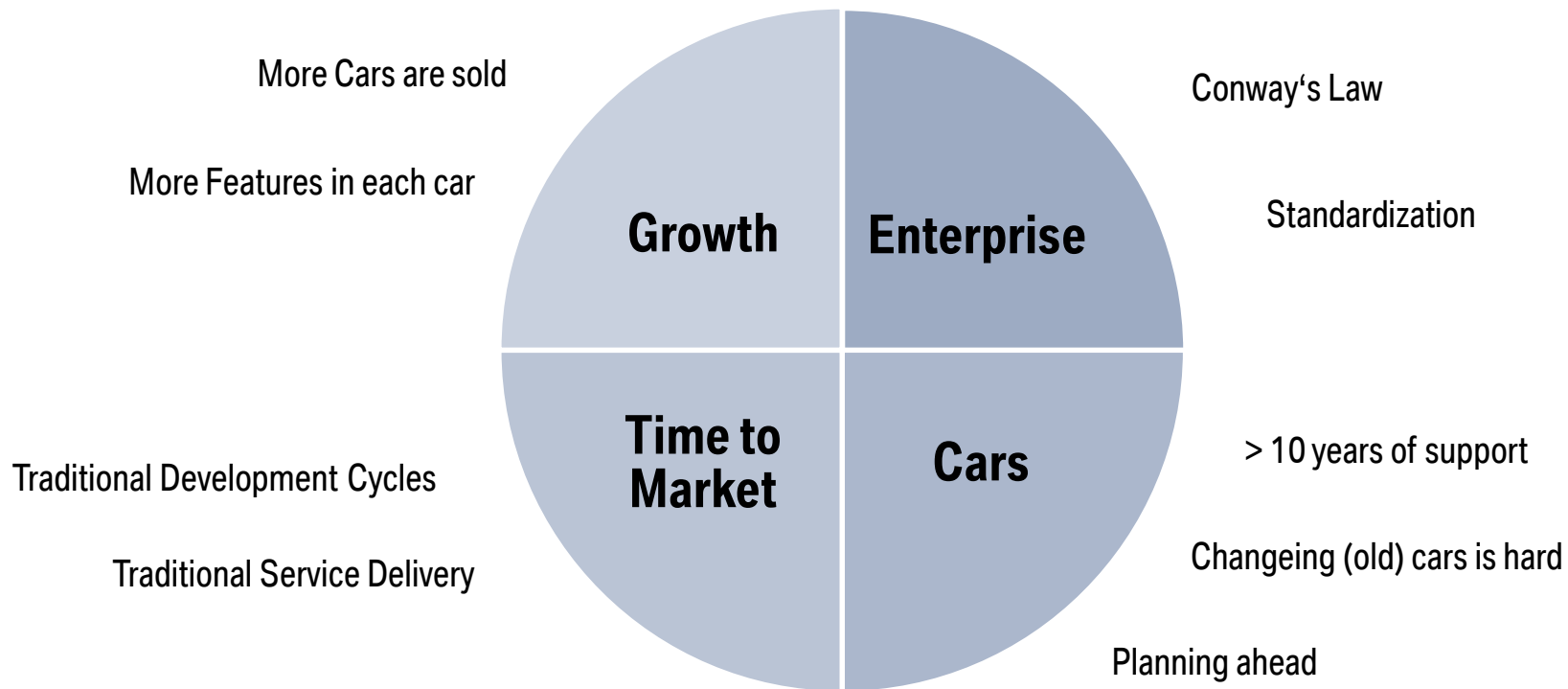
CLOUD NATIVE.
SERVICE DELIVERY IN THE PAST.
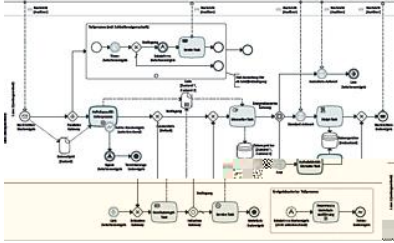
Manual Processes
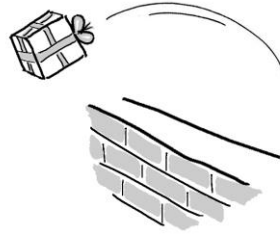
Silos

Long Processes

We need to gain agility back

WHICH ELEMENTS REGARDING ARCHITECTURE AND TECHNOLOGY ARE MOST RELEVANT WHILE MOVING INTO AN AGILE WORLD?

Requirements

> If the rate of change outside exceeds the rate of change inside, the end is in sight...
>
> JACK WELCH

Requirements:

- Short Time to Market
- Short Cycle Times
- Continuous Delivery
- Maintainability
- Stable Operations

- Integration and adaption of modern technologies
- Durability and fast reaction times
- Long term cost efficiencies

Innovation:

- Rapid integration of market available services (e.g. IoT, AI)
- Integration of Cloud based services (e.g. Robotics Predictive Maintenance)

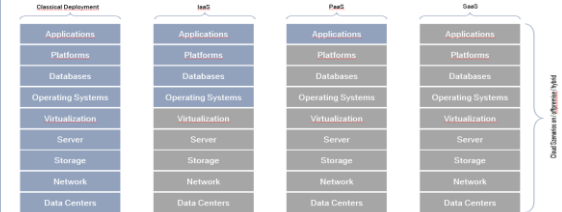## Micro Service Architecture

http://microservices.io
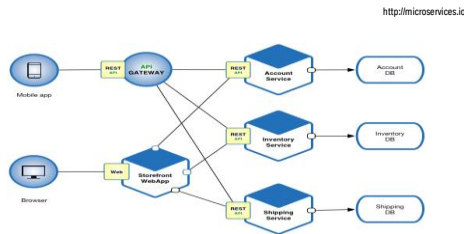
Fast, flexible and independent realization of requirements with a Micro Service Architecture.

Continuous Integration

Early detection of integration issues and a constant availability of a "current" build with continuous integration.
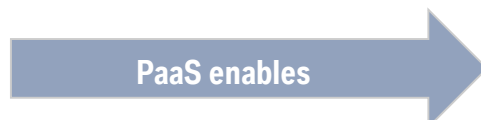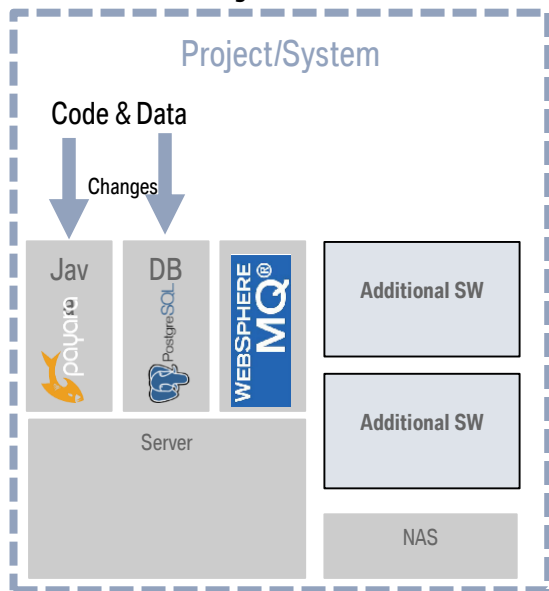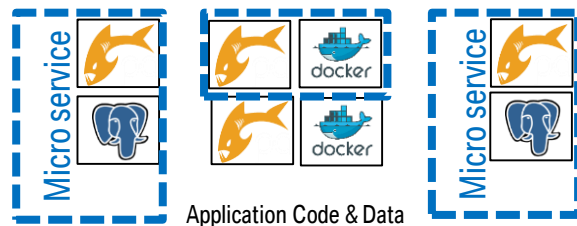
Cloud

Easy access to innovations and global deployment with cloud based services.
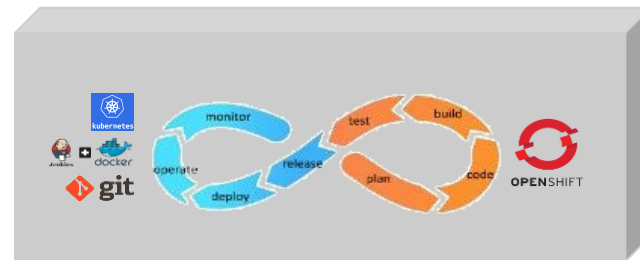
MODERN SOFTWARE ARCHITECTURES BASED ON MICRO SERVICES.

Monolithic/ Layered

Project/System

Code & Data

Changes

Jav

DB

WEBSPHERE MQ®

Additional SW

Server

Additional SW

NAS

PaaS enables

PaaS requires

Micro Services

Micro service

Micro service

Application Code & Data

Cloud Native Application Platform

CLOUD NATIVE.
CLOUD BASED SERVICE DELIVERY.

Technology Stack

Cloud Native Plattform

OPENSHIFT BUNDLES BEST PRACTICE CONTAINER TECHNOLOGY.

Enterprise PaaS

- **Continuous Integration**: Source code based deployment, automatic builds/deployments, staging
- **Tool completeness**: user management, multi tenancy support, monitoring, log-file access, operational tools
- **Security**: removes docker security risks: no root execution, project isolation (vLANs), authorization for docker registry and log-access

Cluster Management for Containers

- **Powerful Technology**: Google Kubernetes is derived from Google's cluster management tool BORG and brings cluster management for Docker containers.
- **Features**: HA-Scheduling, namespace separation, auto-scaling, rolling-updates, self-healing
- **Flexibility**: Can span a cluster across nodes in mixed infrastuctures (local servers, public clouds, multiple locations)

Container Virtualization

- **Standards**: De facto standard for container virtualization, packaging standard for applications, tools, infrastructure
- **Run anywhere**: Applications packaged in Docker Containers run everywhere (OpenShift, Linux, Amazon, Azure, ….)
- **Extendability**: Docker Hub provides thousands of docker packaged PaaS components

SOME TAKEAWAYS.

Scale Architecture first but don't forget the Infrastructure!

Shift of responsibilities to developers: DevOps!

Share, communicate, educate!

Change is normal, still be ready to stick with your decisions!

Training of: developers, architects, operators required!

Shift from instance operations to platform operations!

Don't forget pricing!

Capacity Management!

THANK YOU.