CLOUD NATIVE@BMW GROUP

TECHNOLOGY FOR THE AGILE TRANSITION.

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Jens Eckert (BMW Group, Cloud Platforms)
Wolfram Richter (Redhat)

BMW GROUP THE NEXT 100 YEARS

BMW GROUP – OVERVIEW 2016.

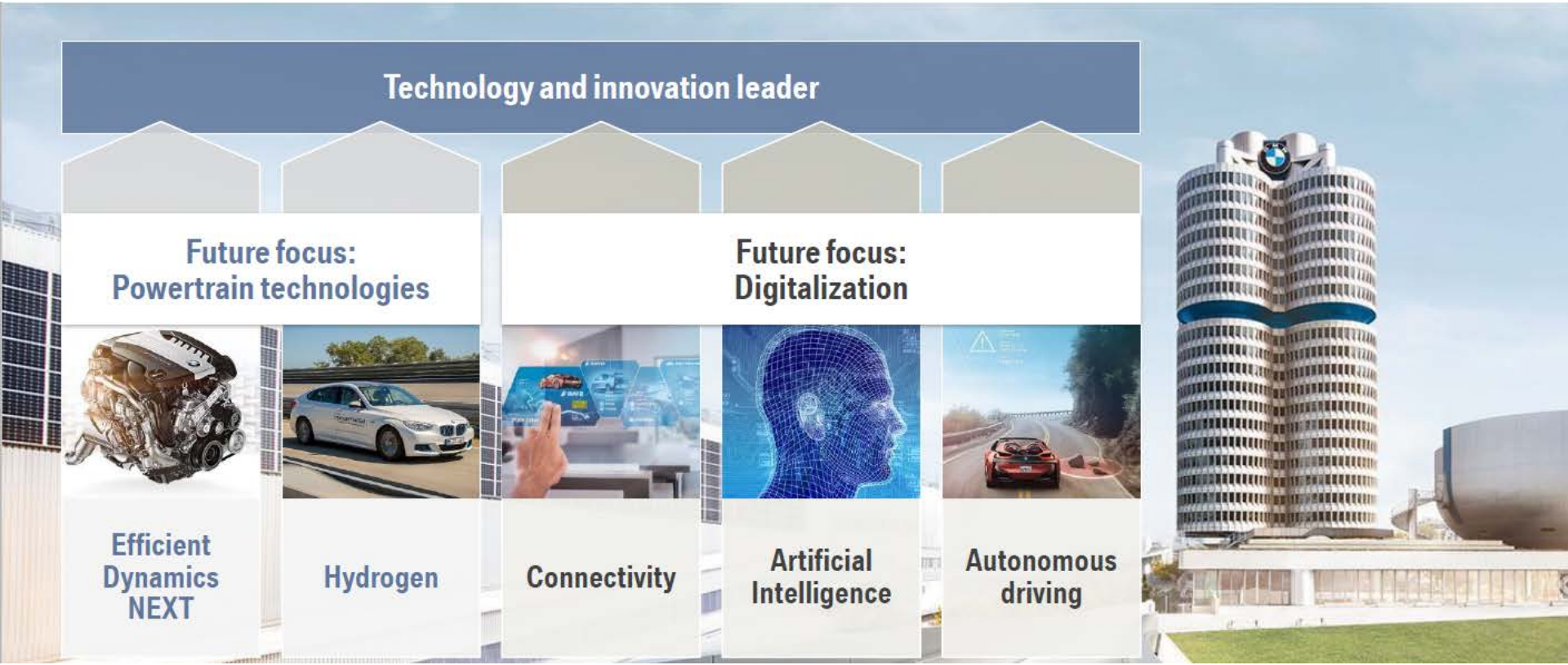
126.013

employees worldwide

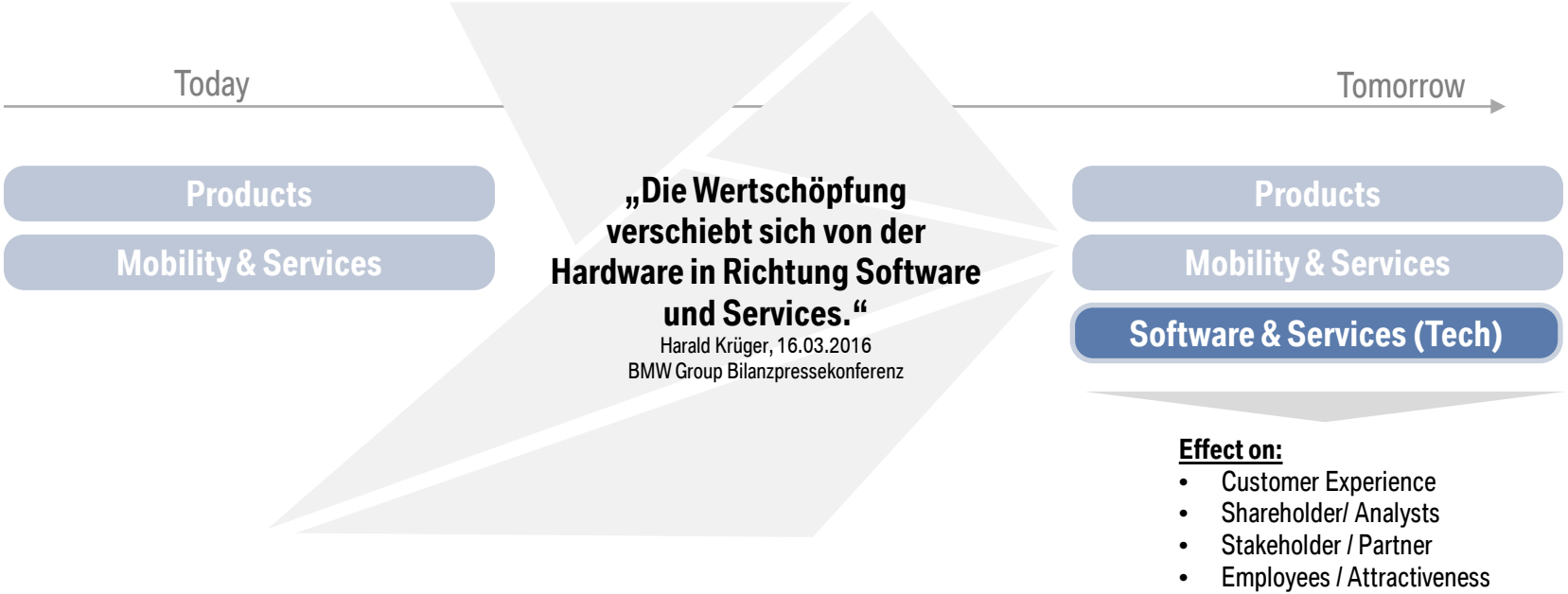
2.367.603

sold vehicles worldwide in 2016

ENSURING OUR POSITION AS TECHNOLOGY LEADER.



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



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

1972 BMW Turbo (radar techno-logy).

1980 First use of telemetry in Formula 1.

1980 First on-board computer displaying outside temperature.

1991 World's first Park Distance Control.

1994 First integrated navigation system.

1997 First e-call from BMW Assist in USA.

1999 Europe's first telematics offer by BMW Assist.

2001 BMW Online: first Internet-based in-car portal.

2004 First European manufacturer with Head-Up Display.

2007 First offer of Google™ services in a vehicle.

2008 First in-car Internet access.

2012 First-time integration of 3rd Party Apps in a vehicle.

2014 First premium car manufacturer with in-car store.

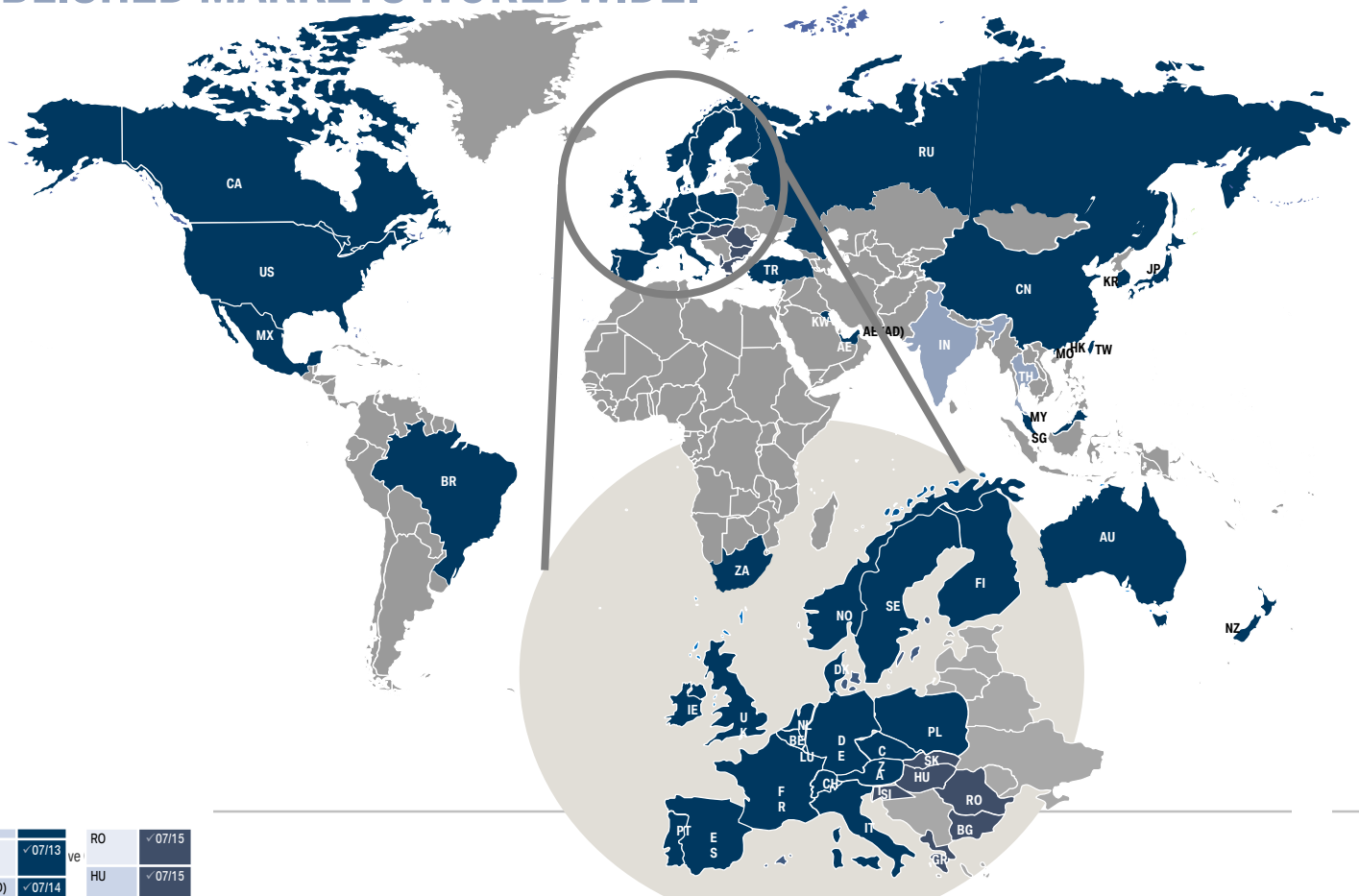
2016 Introduction of BMW Connected (Open Mobility Cloud)

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	AE (AD)	✓07/14	HU	✓07/15

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

8 Mio.
ConnectedDrive Cars

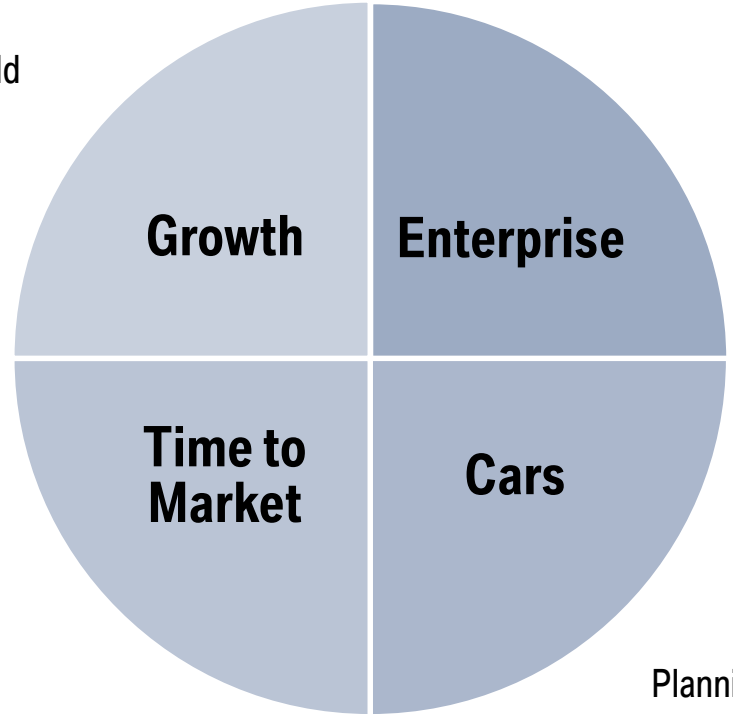
4 Mio.
Lines of Code (Backend)

300
Microservices (Planned)

30 %
Yearly Growth

1100
Jenkins Jobs

CHALLENGES AND SOLUTIONS FOR CONNECTED CARS.



More Cars are sold

More Features in each car

Conway‘s Law

Standardization

Traditional Development Cycles

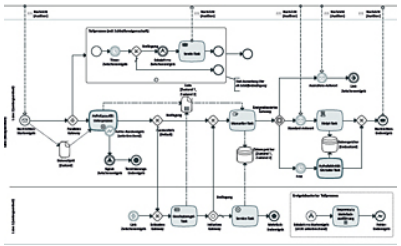
Traditional Service Delivery

> 10 years of support

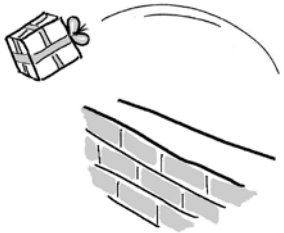
Changeing (old) cars is hard

Planning ahead

CLOUD NATIVE.
SERVICE DELIVERY IN THE PAST.



Manual Processes



Silos

Long Processes

We need to gain agility back

Picture Source: https://www.johner-institut.de/blog/wp-content/uploads/2015/01/BPMN-zum-Beschreiben-von-Prozessen-Workflows.png, https://slides.com/brampatelski/javaone/embed

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

Requirements

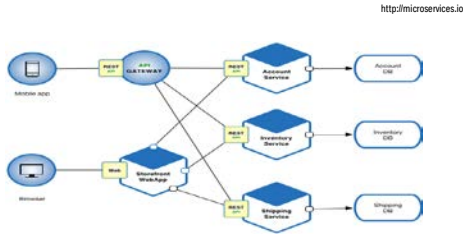
Requirements:

- 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

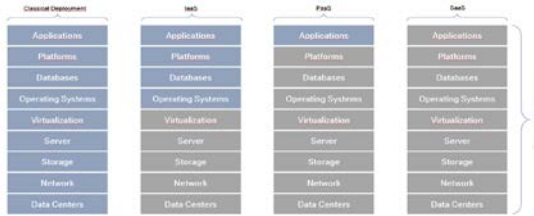


Fast, flexible and independent realization of requirements with a Micro Service Architecture.

Continuous Integration

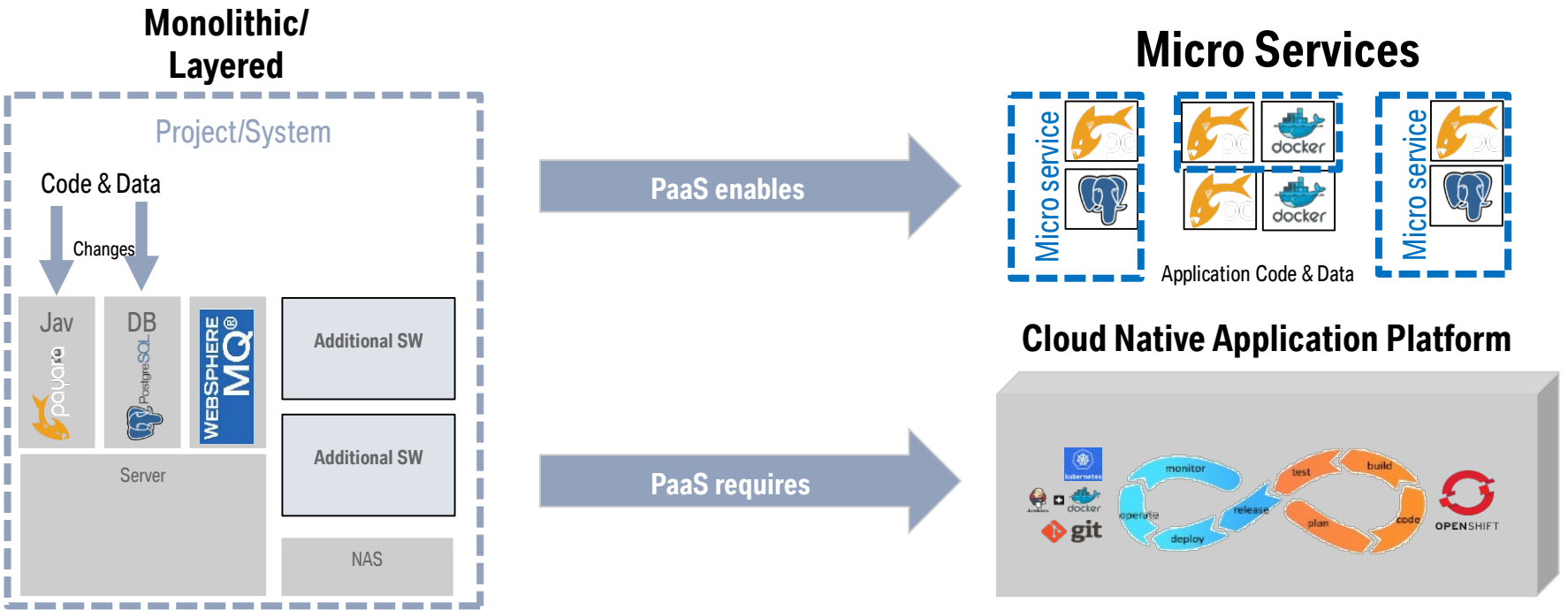
Early detection of integration issues and a constant availability of a "current" build with continuous integration.

Cloud

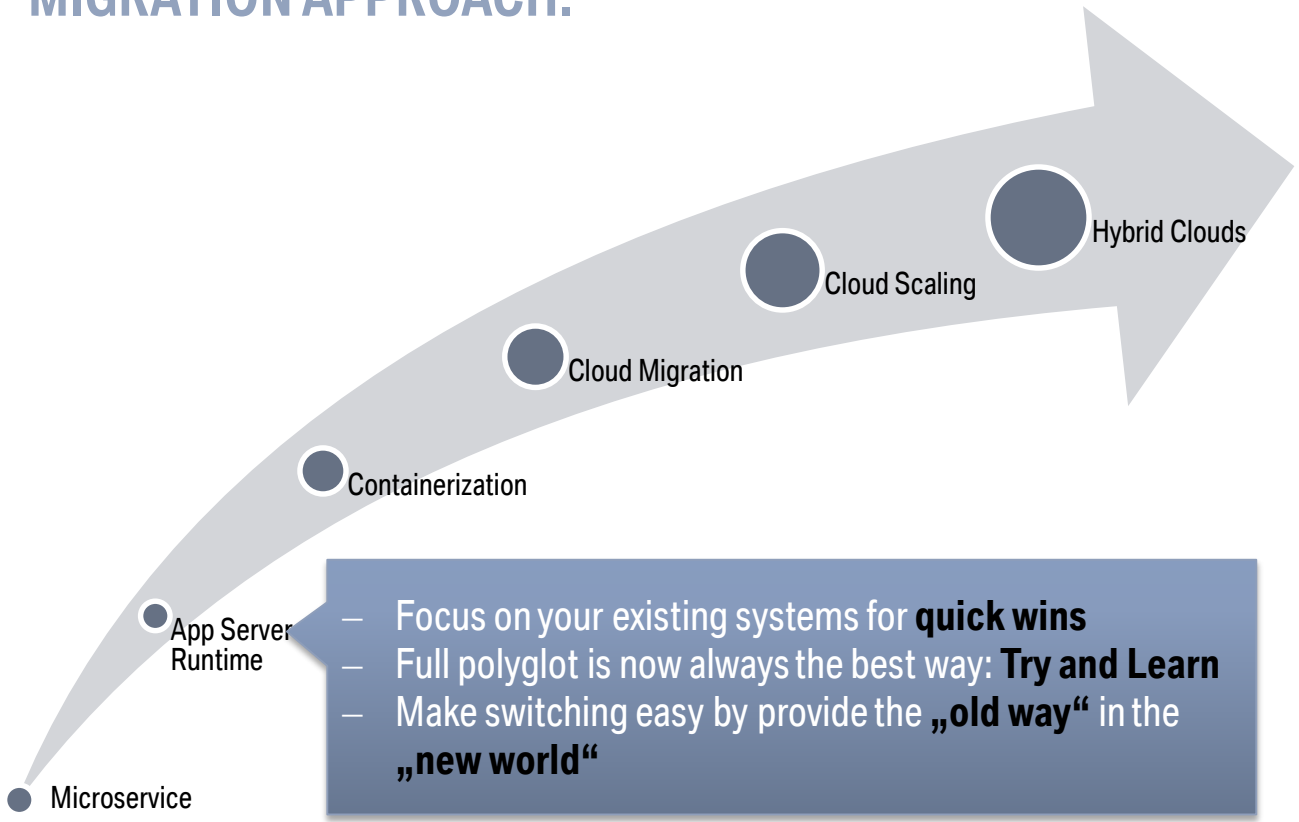


Easy access to innovations and global deployment with cloud based services.

MODERN SOFTWARE ARCHITECTURES BASED ON MICRO SERVICES.

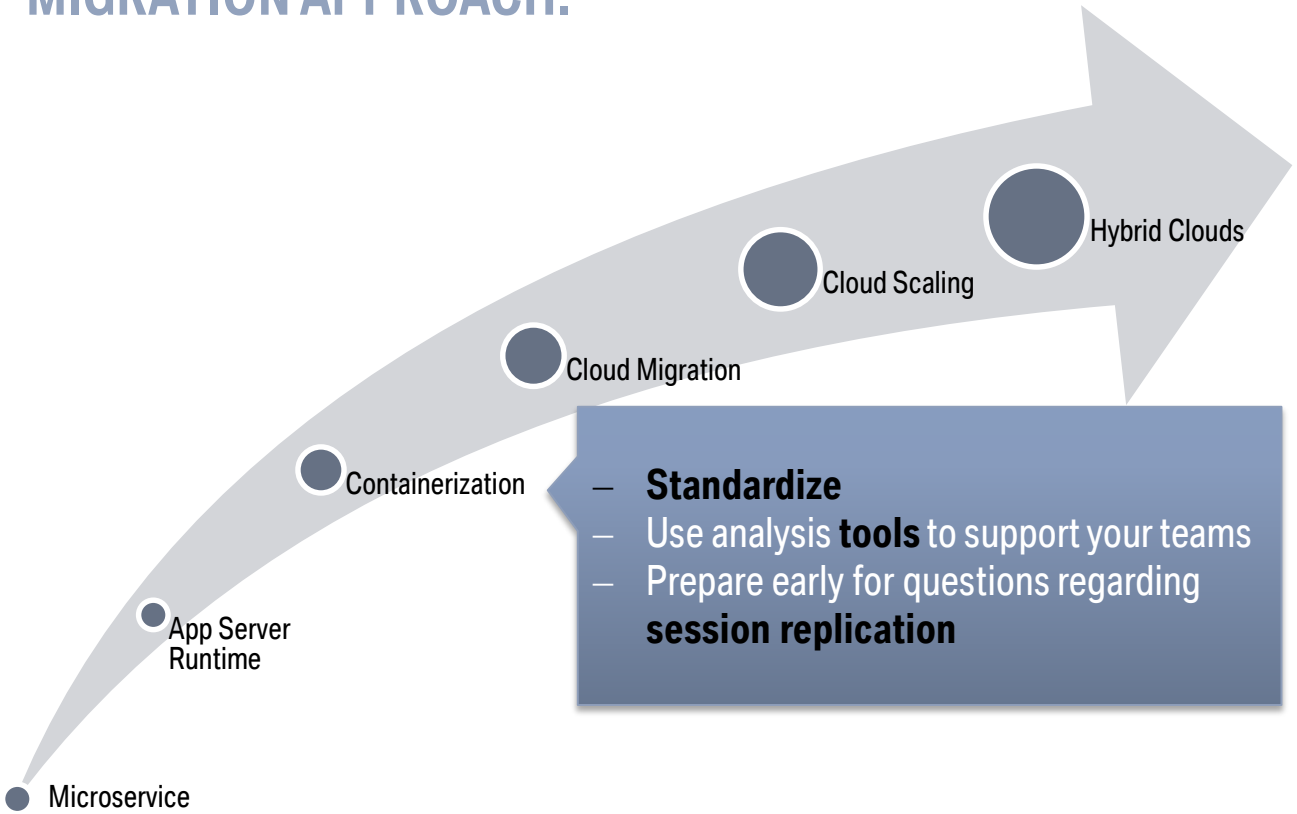


CLOUD NATIVE.
MIGRATION APPROACH.



- Focus on your existing systems for **quick wins**
- Full polyglot is now always the best way: **Try and Learn**
- Make switching easy by provide the **„old way“** in the **„new world“**

CLOUD NATIVE.
MIGRATION APPROACH.



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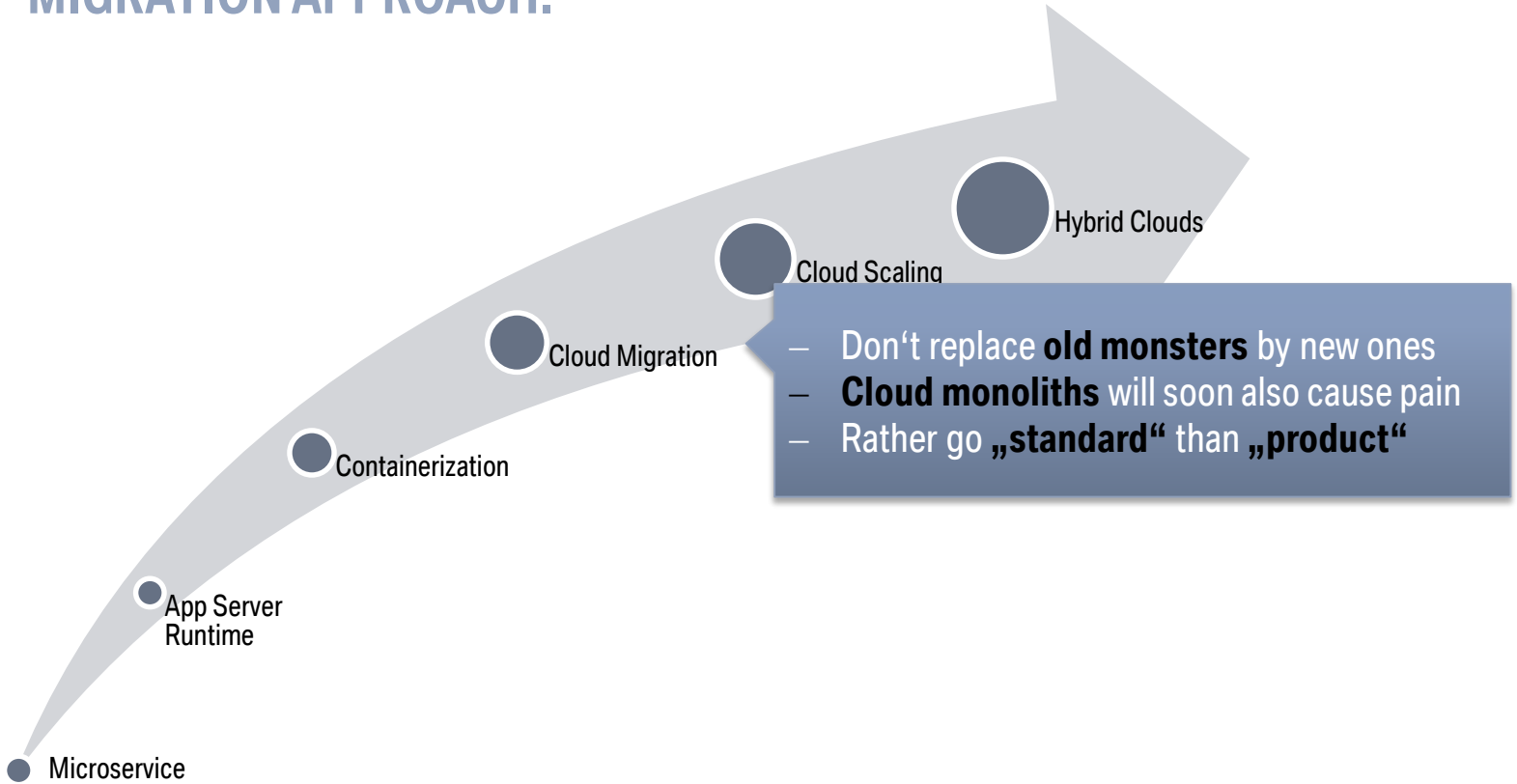

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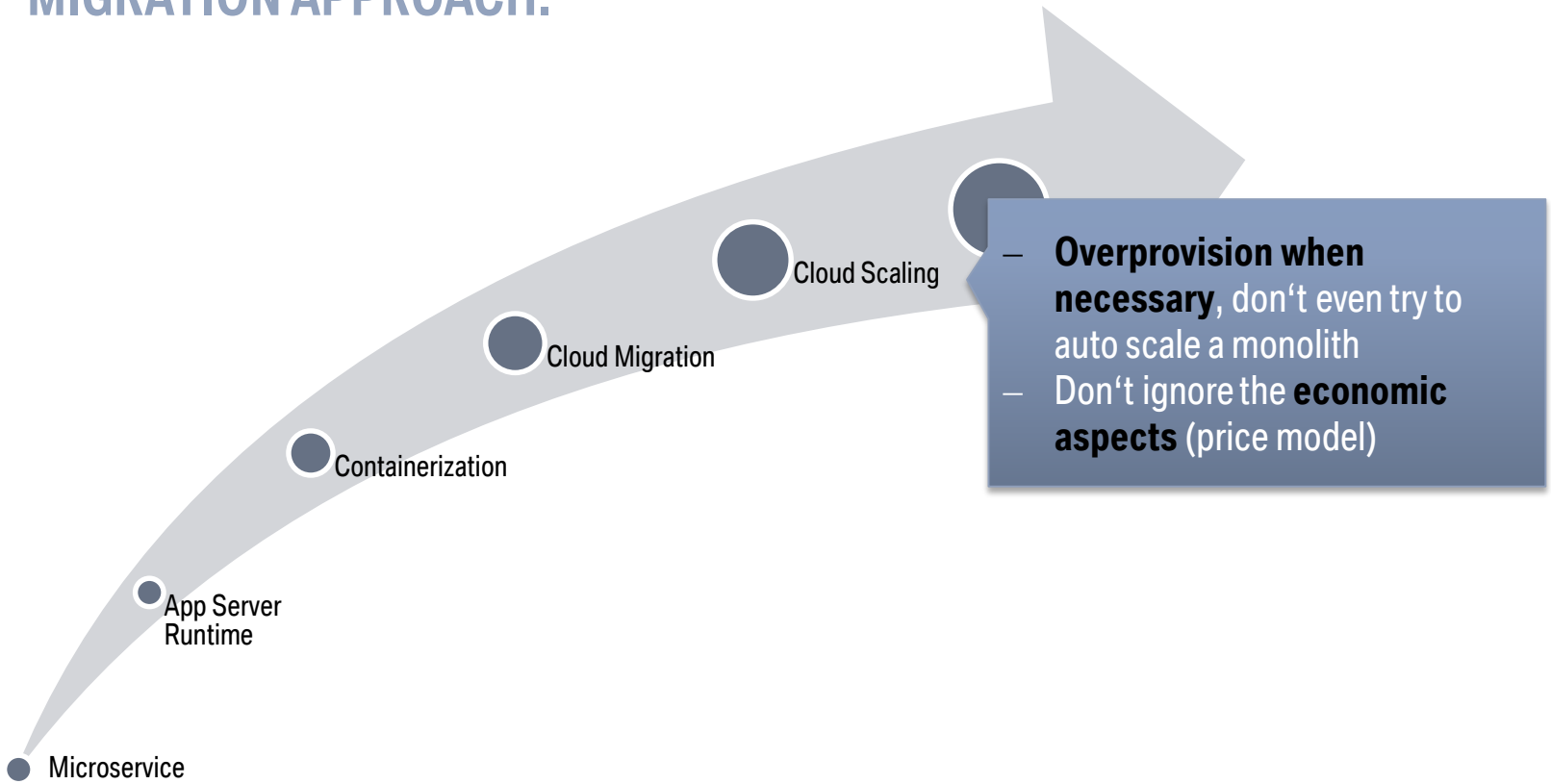

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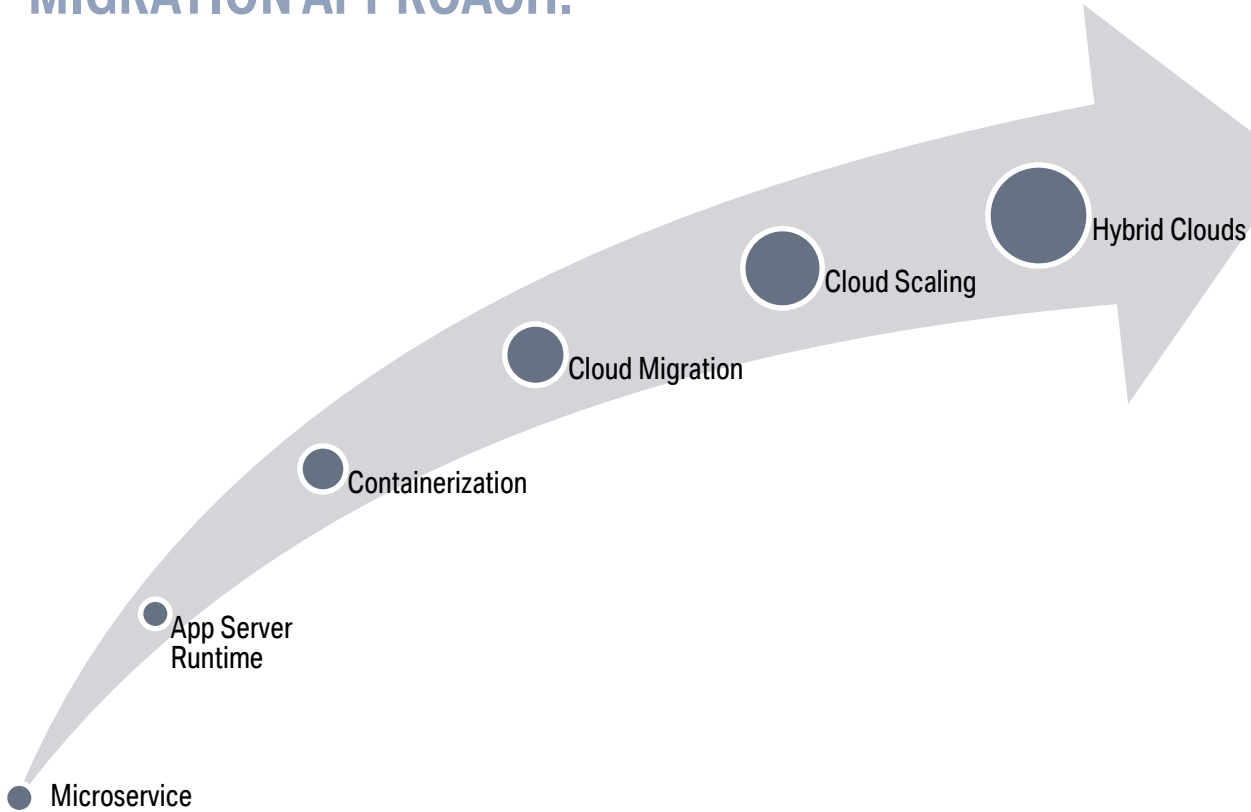
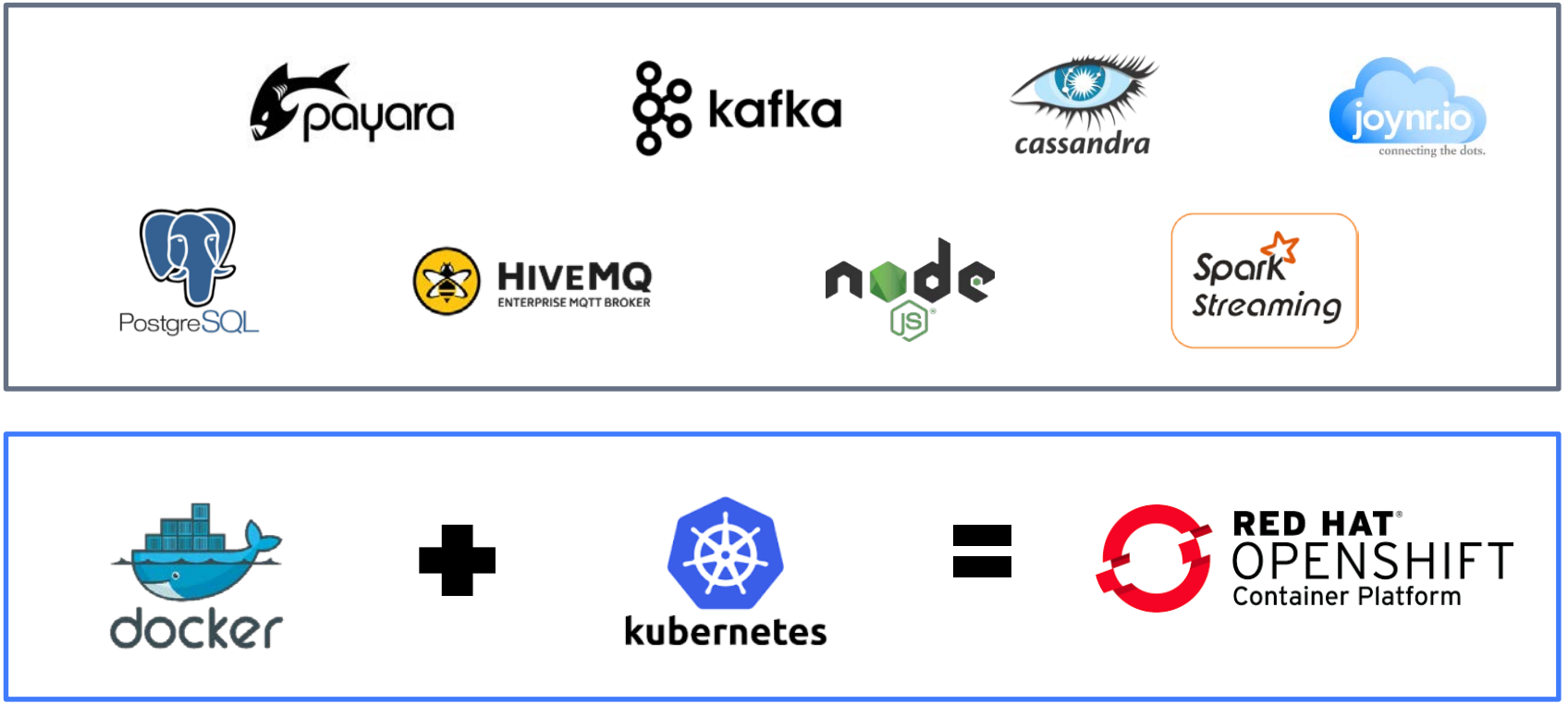


- Hybrid means **outsourcing**
- Same code / containers inside and outside
- There‘s always a better offer, **be ready to switch**, and then stay
- **Compilance, Privacy, Security**

CLOUD NATIVE.
CLOUD BASED SERVICE DELIVERY.



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

BMW CLUSTER BLUEPRINT. HA-SETUP.
MINIMUM CONFIGURATION: 15 BARE METAL SERVERS

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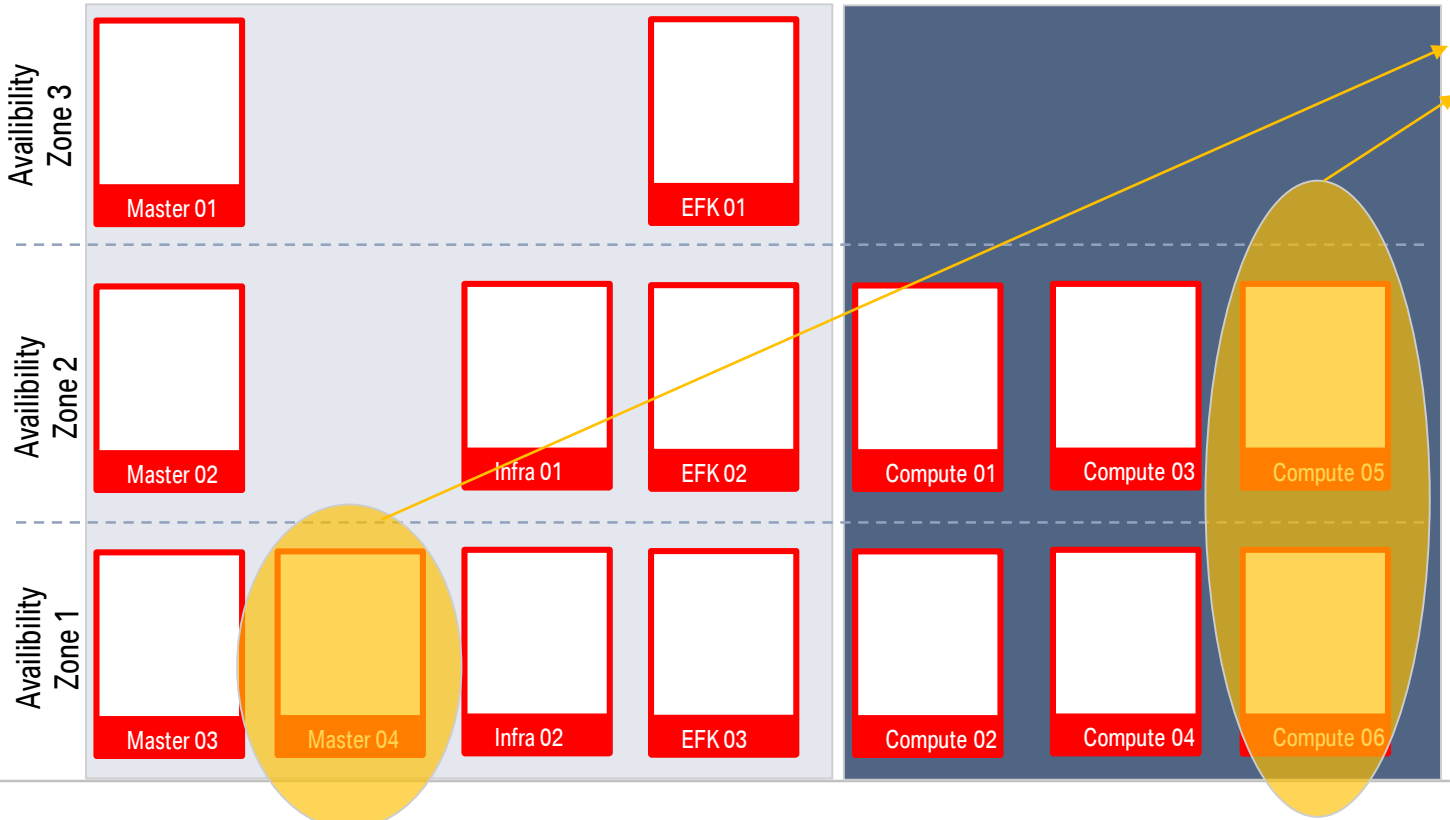


- Spare servers for compute and master/infra
- Covers risk of hw damage
- Not part of „sold“ capacity

BMW CNAP CLUSTER BLUEPRINT. STORAGE USE.

Compute:

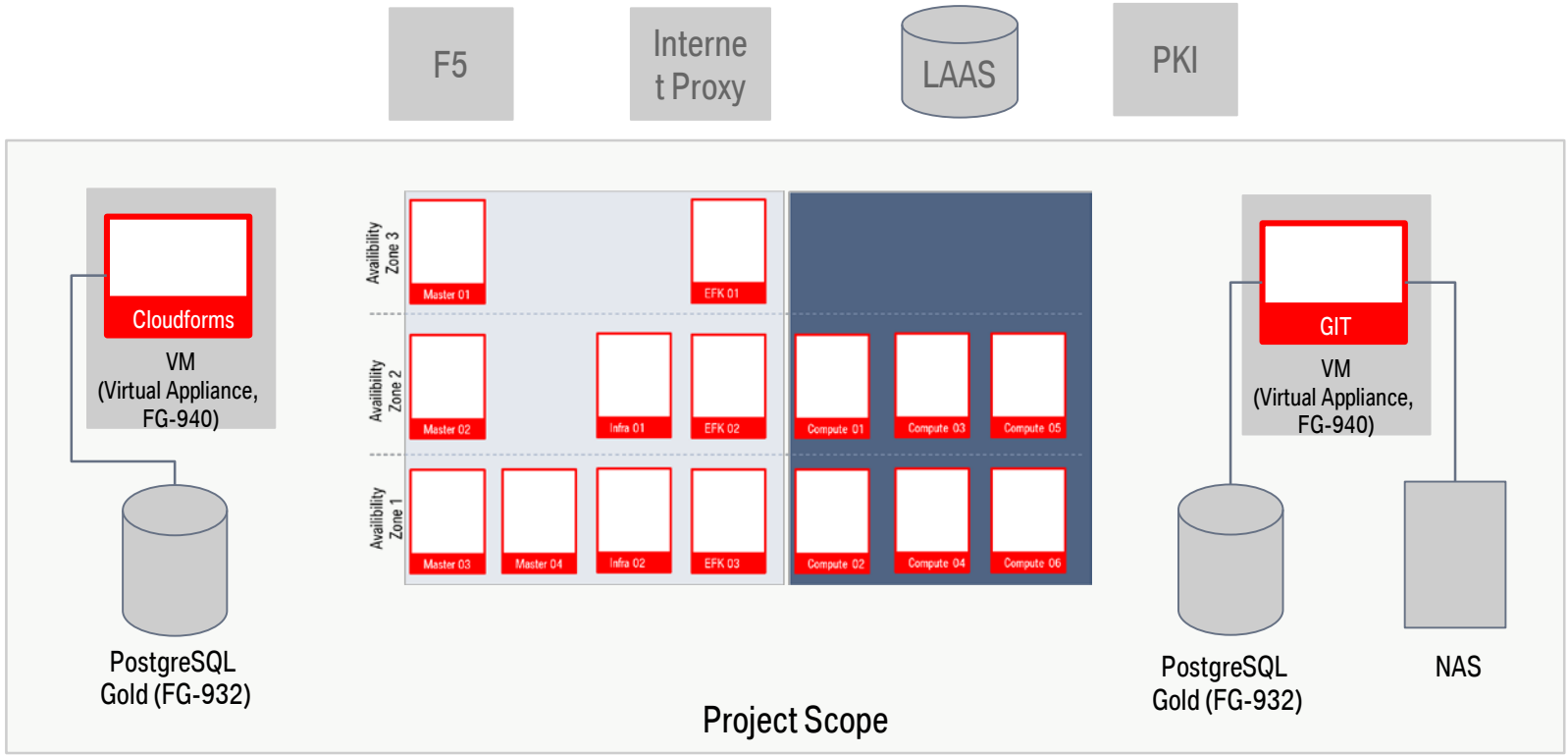
- Launch scope: only NAS
- Object storage

Masters use local disk for etcd

Infra uses NAS for Metrics (Casandra) DB and Docker Registry

EFK requires SAN for elastic search

BMW CNAP CLUSTER BLUEPRINT.
SUPPORTING SERVICES AND INTERFACES.



SOME TAKEAWAYS.

Scale Architecture first but don‘t forget the Infrastructure!

Share, communicate, educate!

Shift of responsibilities to developers: DevOps!

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

Training of: developers, architects, operators required!

Shift from instance operations to platform operations!

Capacity Management!

Don‘t forget pricing!