



# Using Microsoft Azure Cloud for CAE Simulations

Easy Step-by-Step Guide and Live CAE Demonstration

Reha Senturk, The UberCloud  
June 5, 2018



# Agenda

- ❑ Summary of UberCloud
- ❑ Summary of Microsoft Azure
- ❑ Benefits and Challenges of Cloud Computing for CAE
- ❑ UberCloud CAE Container Solutions in the Azure Cloud
- ❑ Easy Steps to 'On-Board' Your CAE Application to the Cloud
- ❑ Live Demo of ANSYS Mechanical in the Cloud



# The UberCloud



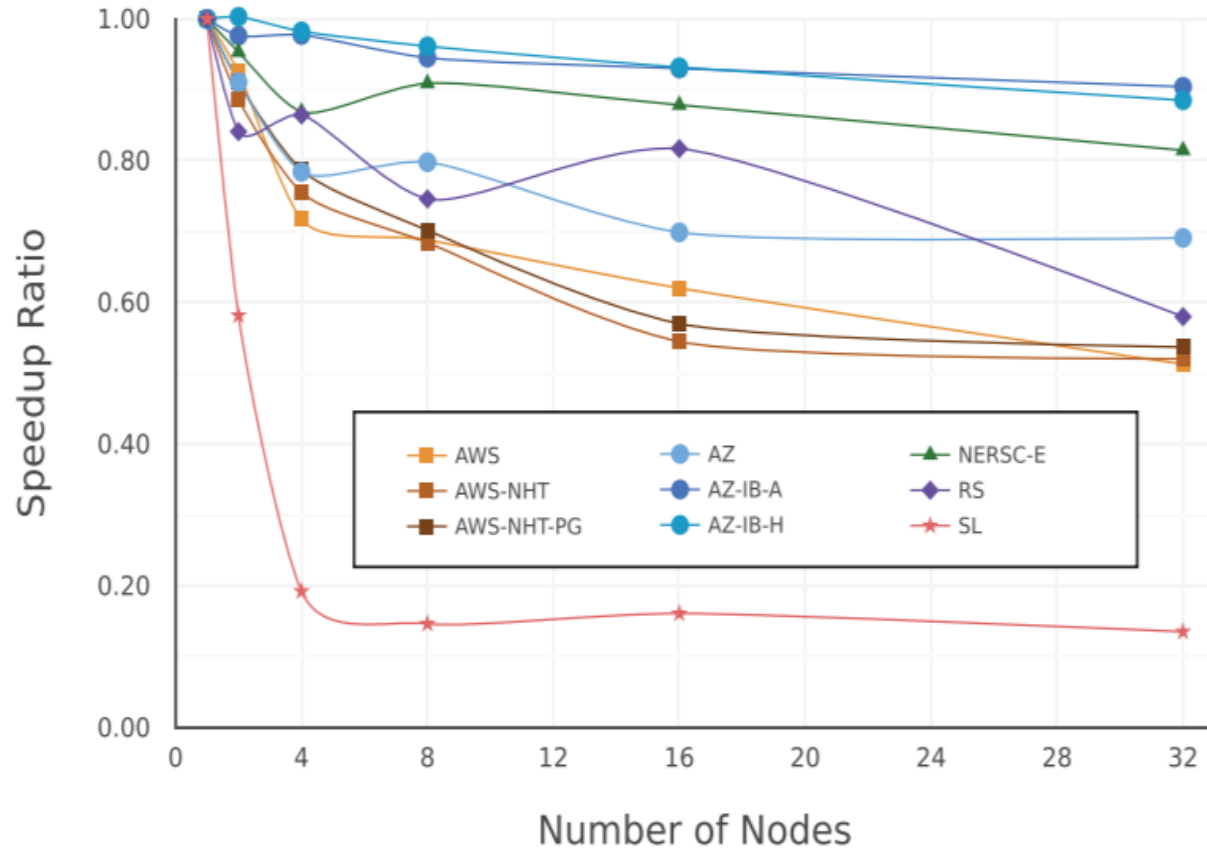
- 2012: UberCloud experiments (200+)
- 2013: Docker container technology for technical computing
- 2014: UberCloud online marketplace with 45+ stores
- 2015: Strategic collaboration with Microsoft Azure
- 2017: Tech Awards from Intel, HPCwire, IDC/Hyperion
- Today: 50+ CAE and Bio containers, e.g. ANSYS, COMSOL, Dassault, Matlab, Numeca, Siemens, Transvalor, . . .



# Azure in Cloud HPC

Benchmarking cloud vendors with High Performance Linpack\*

## Azure leading the pack



- Azure, AWS, IBM, Rackspace, NERSC
- Azure HPC scalability is comparable to an HPC Cluster at scale
- AWS still the first Public Cloud provider people think of, but in HPC it is not
- Other public clouds struggle in HPC (e.g. IBM Softlayer)

Mohammad Mohammadi, Timur Bazhirov, Exabyte, 2017

\*Solver for large algebraic equation systems



## Recap: Benefits of HPC servers

- ❑ More compute power and memory
  - ❑ Higher quality design and products
  - ❑ Reduce product failures early
  - ❑ Shorten time to market
- => Strengthen your company's competitiveness.

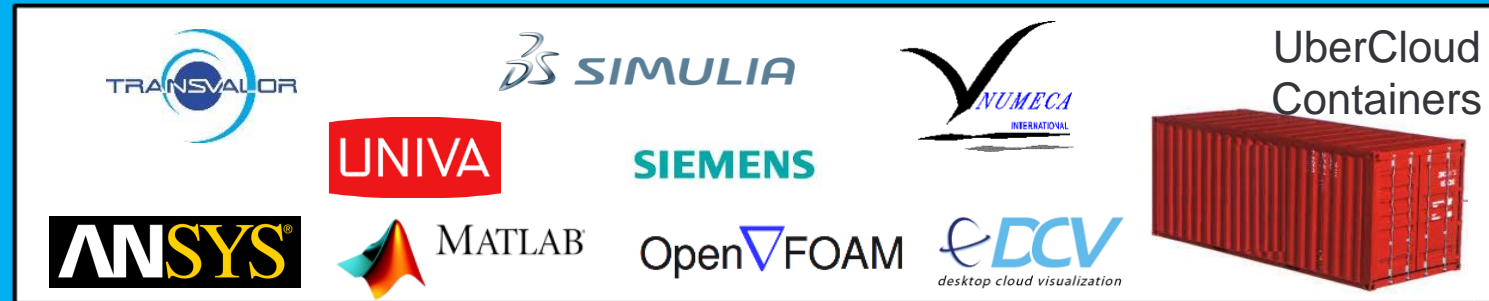
# Benefits of public clouds

In addition to the benefits of HPC servers

- ❑ On demand, pay per use
- ❑ Scaling resources dynamically, up and down
- ❑ Always the latest hardware and software
- ❑ No long procurement, nor acquisition cost, nor high TCO
- ❑ No need for expensive in-house infrastructure & experts
- ❑ Resulting in: better, faster, cheaper.

# The Fully Integrated Azure UberCloud Solution

UberCloud's software packaging technology makes CAE software available on Azure



Azure High Performance  
Enterprise Cloud Platform

H-Series  
N-Series  
InfiniBand & GPU



Microsoft's focus is the High Performance Enterprise Cloud Platform – Azure

# UberCloud Container Technology



- Based on Docker, **enhanced** for engineering & scientific app software
- Application software is **pre-installed**, configured, tested by UberCloud and the software provider (ISV)
- Includes **all tools** an engineer needs such as MPI and remote visualization
- On the **Azure** Marketplace (self service) or as a Fully Managed Service



# There are huge benefits for Engineers



CONFIDENCE IN YOUR ANALYSIS



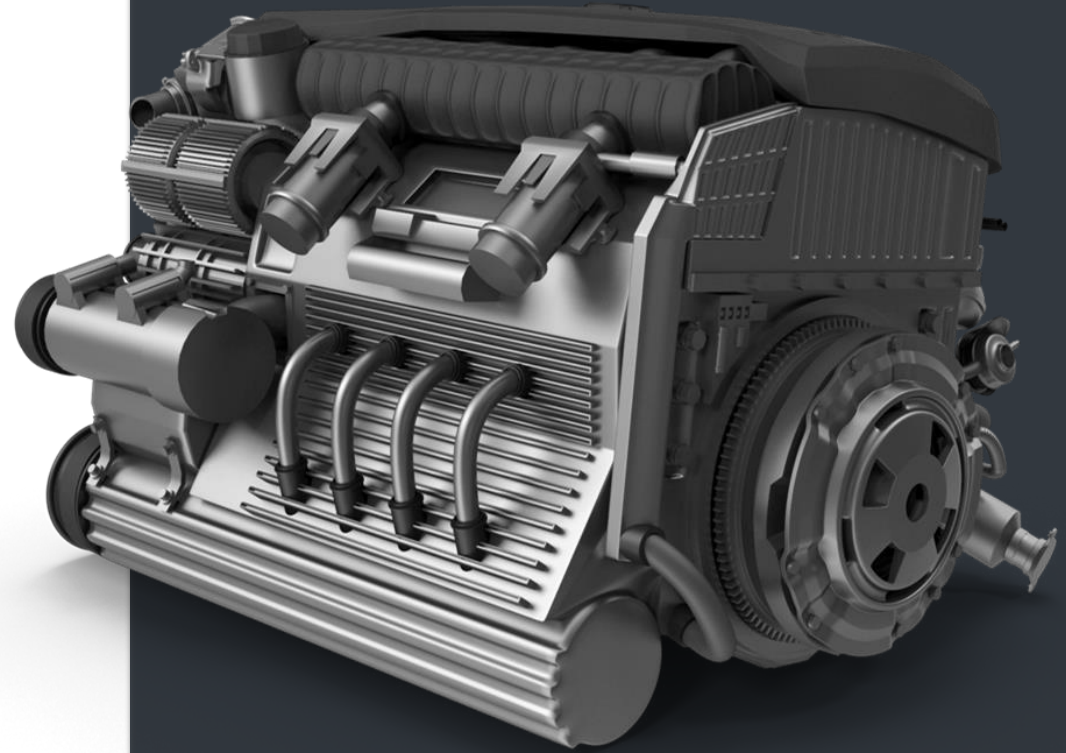
FASTER TIME TO MARKET



GLOBAL ACCESSIBILITY



UNLOCK NEW CAPABILITIES

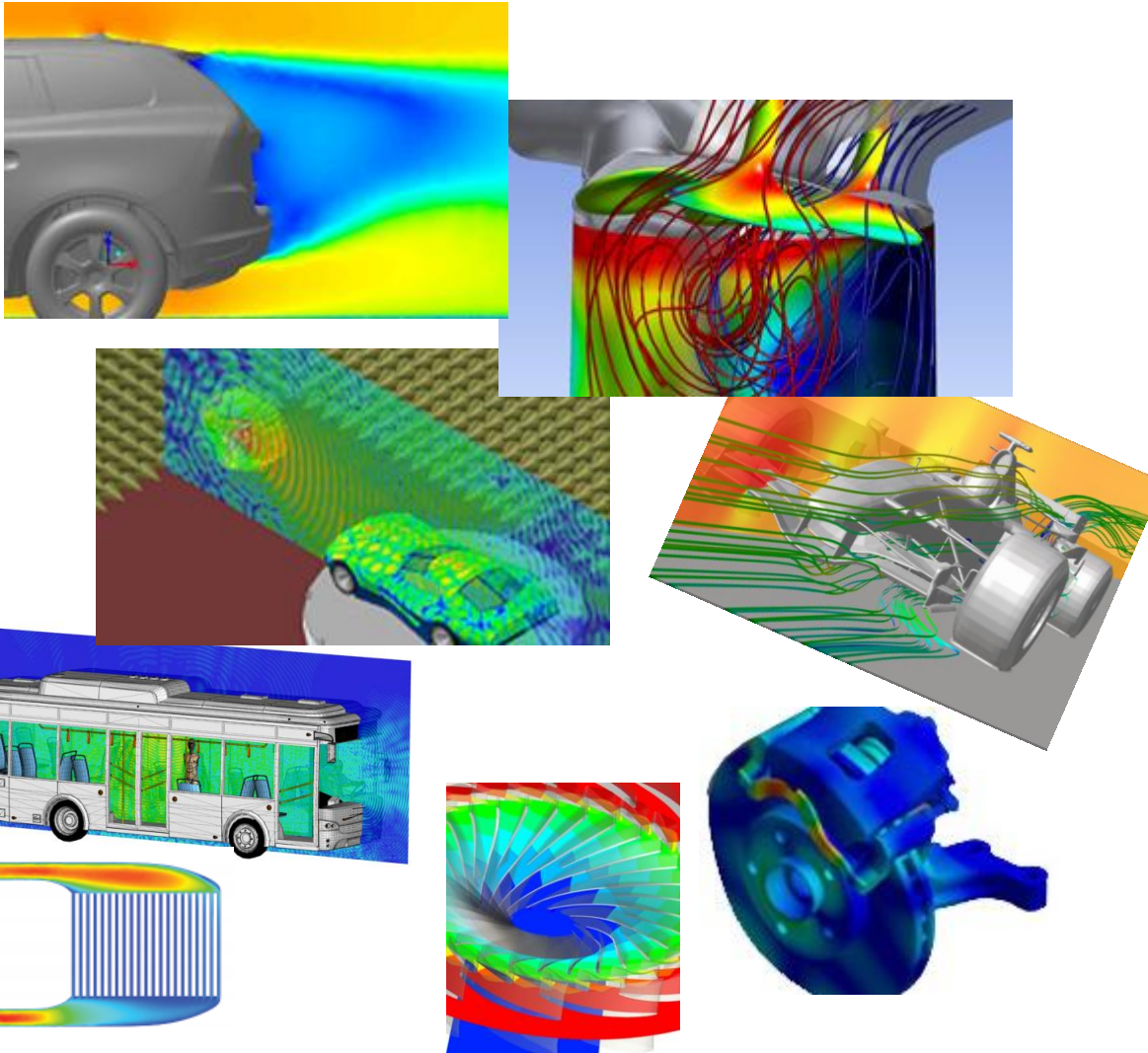


# Example: ANSYS in the Azure UberCloud



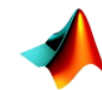
- ☐ Access ANSYS in your account on Azure
- ☐ Microsoft Enterprise Agreement ?
- ☐ Use of the ANSYS for a given amount of time
- ☐ Cluster set-up with CycleCloud provisioning, fully automated
- ☐ Demo, trial, experiment, proof of concept
- ☐ One bill: ANSYS license, Azure hardware, UberCloud services & full support

# Simulation in Automotive Industry



Aerodynamics, Fuel efficiency, Powertrain and exhaust systems, Engine Design, Brake Life, Electric car battery design, ADAS, Autonomous driving, Crash test, High-speed wireless communications systems, Safety systems analysis, Human-Machine Interface, Antenna and sensor design, Electronics and hardware, Electromagnetic simulation, and more...

**ANSYS**



MATLAB

OpenFOAM

**SIEMENS**

**SIMULIA**





# Access to your CAE Tools

*Your Cloud Desktop*

HPC Performance  
with Desktop “Look and Feel”



**Full Desktop  
User Interface**



**Pre and post-  
processing in Cloud**



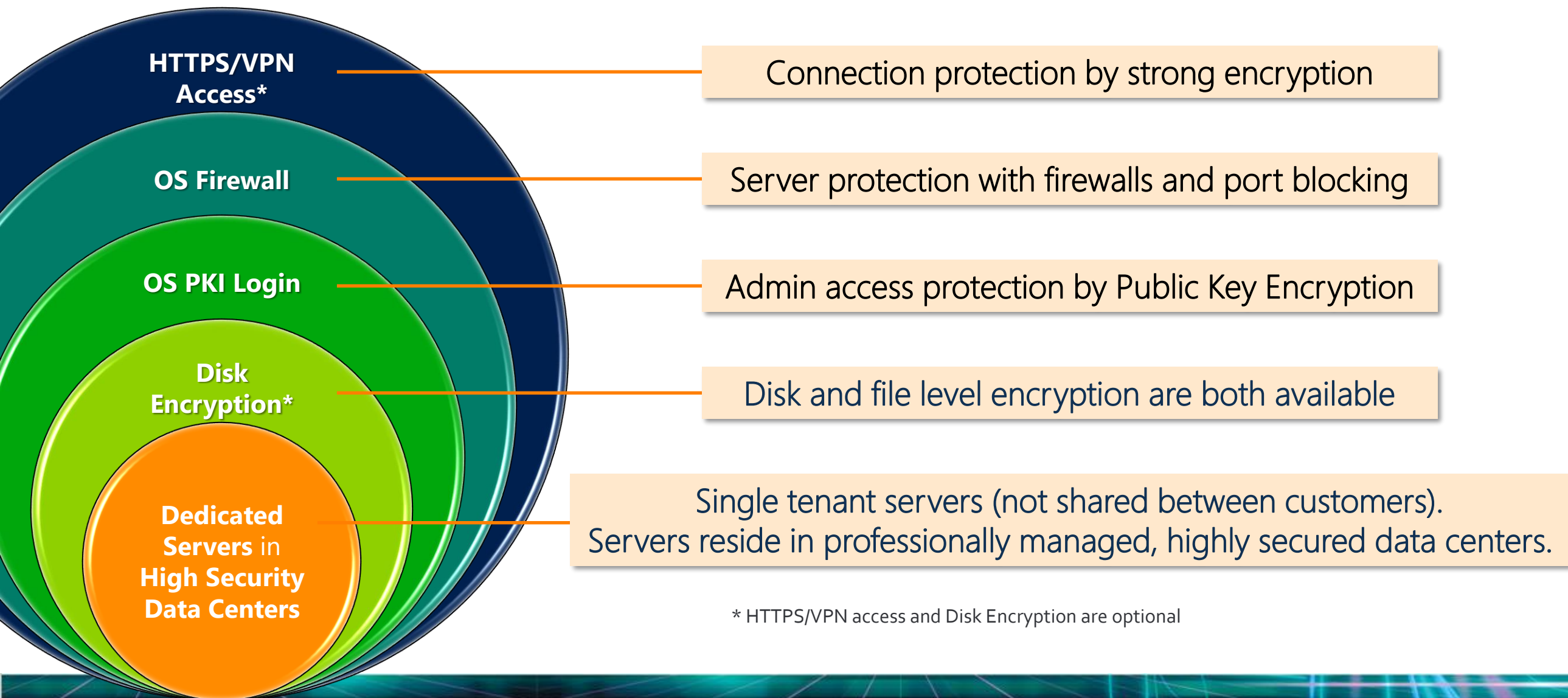
**Flexible Cluster  
Sizing**



**Flexible  
Licensing**



# Cloud Container Security Layers



For first time user: (We) contact your ISV

## Software Licensing

***"Licensing concerns rank on the top of the list."***



BYOL – Bring Your Own License, use it on premise OR in cloud



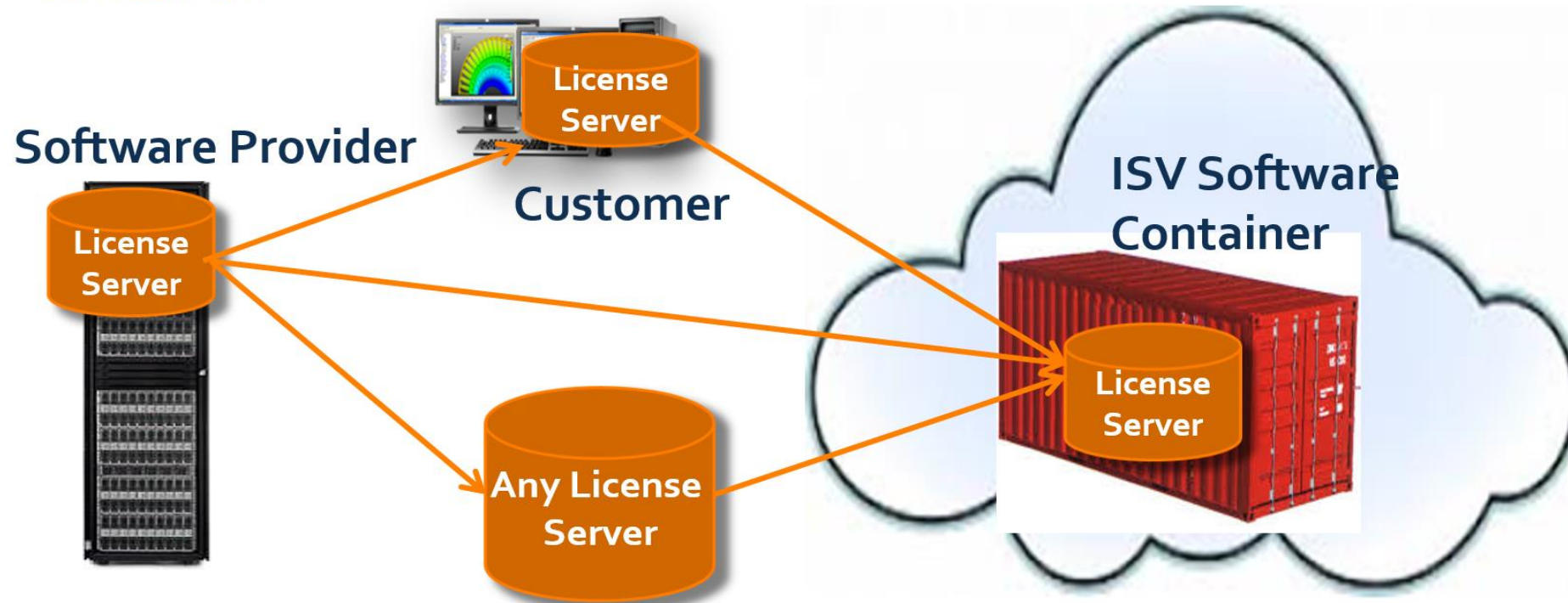
BYOT – Bring Your Own Tokens, paid on the ISV's website



PPU – Pay Per Use, one price bundling hardware, software, and services

# Solving software licensing issues, with containers

- + 200+ experiments led to an excellent network of ISV relationships with 120+ ISVs
- + Solution: UberCloud including a license server into every container



# Your 7 Easy Steps to the Azure Cloud

1. Enter your / your company's Azure account
2. Go to the Azure/UberCloud Marketplace
3. Select your software container, e.g. ANSYS
4. Select your compute instance, e.g. H16r
5. Receive "Welcome Email" with container login
6. Enter ANSYS container
7. Select ANSYS Workbench / Mechanical and go!

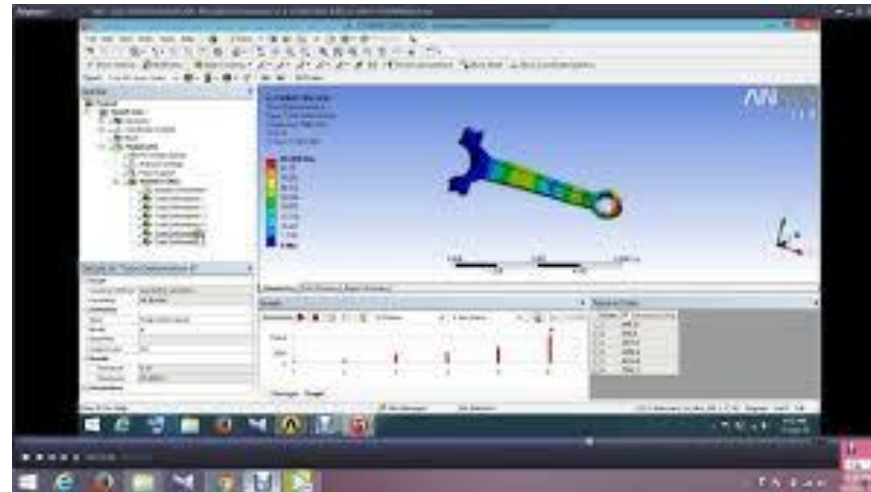




# Live Demo



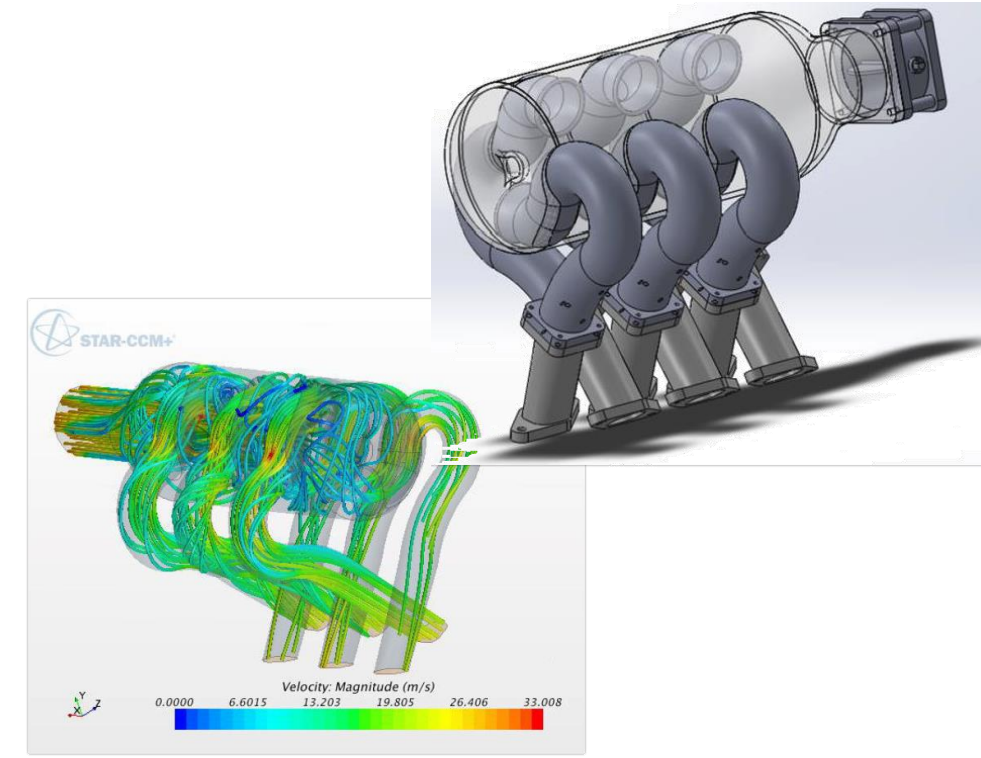
ANSYS Mechanical



Open  FOAM

# Case Study: CFD Analysis of a V6 intake manifold

- Pressure drop directly relates to the engine efficiency
- Design optimization: uniform flow rate across each branch of the intake duct
- STAR-CCM+ on 10 node cluster (128 cores, 1TB RAM, Infiniband)
- Excellent performance for pre-, post-processing and solving

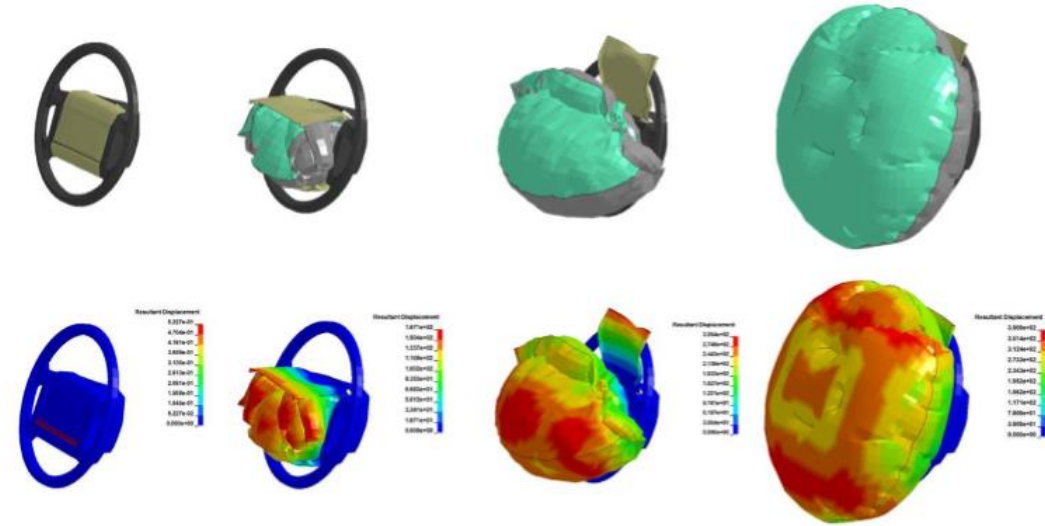


*"Excellent performance of the STAR-CCM+ container eliminates the need to have all software in-house. HPC Cloud provides the packaged software ready to go for faster analysis. This gives the confidence to work on more complex problems with higher cell counts in shorter time."*

*Krishnan Nayanar, Project Manager, CAE Technology Inc.*

# Case Study: Airbag simulation

- Air bag inflation behaviour under dynamic conditions and the stresses on the air bag material
- ANSYS LS-DYNA on 32 core node
- Parallel computing for fast results



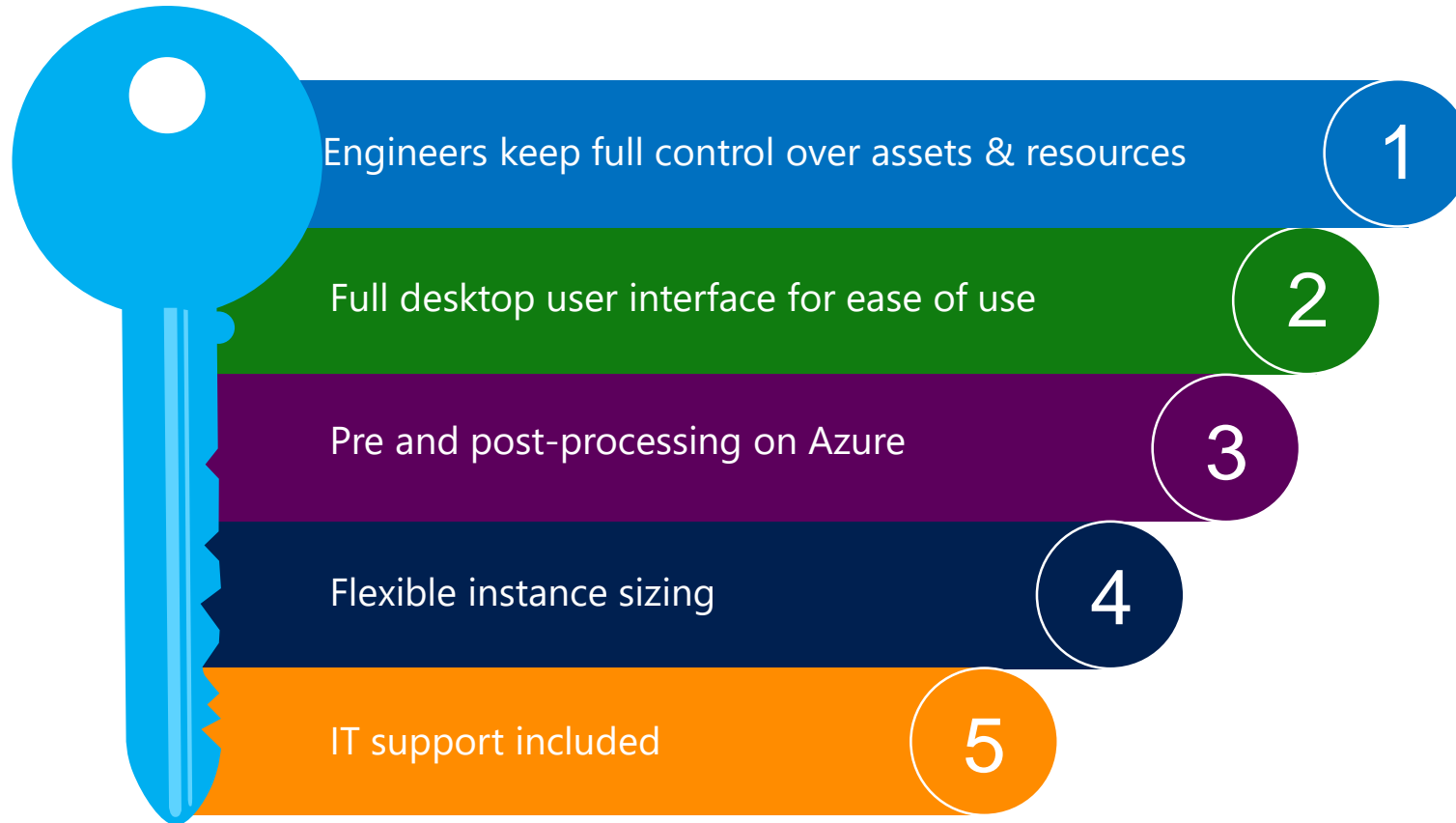
*"Microsoft Azure resources with UberCloud Containers and ANSYS LS-DYNA provide an excellent platform to develop and run accurate simulation models that involve complex impact physics."*

*Praveen Bhat, Technology Consultant, INDIA*



# Summary of Key Benefits

Azure UberCloud Service: Looks & works like your desktop only much faster



## Usability – Flexibility – Performance

- No-learning-needed interface
- Secured and isolated
- All software installed & ready to use
- Pre/post processing, meshing, solvers
- Flexible sizing based on requirements
- Shared storage sized based on needs
- GPU, RDMA, InfiniBand & SSD

# Thank you!

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