
Hewlett Packard
Enterprise
September 21, 2016
The Living Heart Project:
Going Beyond Traditional ModSim Use Cases
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ONWARD UPWARD

# Growing Number of HPC Use Cases

## Traditional HPC

- Modeling & Simulation
- More iterative methods (stochastic, parametric, ensemble)
- More SMEs

## High Performance Data Analytics

- Today: Knowledge Discovery, BI/BA, Anomaly Detection, Marketing
- Emerging: Precision Medicine, Cognitive, AI, IoT

## HPC Anywhere

- On-Premise
- Cloud (Public, Private, Hybrid)
- Private Hosted



IDC Report: Market Analysis Perspective: Worldwide Technical Computing, 2016 New Forces at Play in the High-Performance Computing and High-Performance Data Analysis Sectors

# HPC Alliance defined - Three (3) key components

## 1 Intel® Innovation
Intel® Scalable System Framework

- **Intel® Xeon Phi™** coprocessors

- **Intel® Lustre** Software
- **Intel® SSD Data Center Family** for NVMe

- **Intel® Xeon®** processors
- **Intel® Omni-Path** Architecture

Value

- Scalability and resiliency
- Power efficiency
- Price and performance

## 2 HPE Innovation
Industry Solutions Framework

**Solution design**

- Purpose built and optimized for HPC workloads
- End-to-end Integration to simplify deployment and management
- Uniquely designed for Density, Energy Efficiency, and Performance

**ISVs**

ANSYS · SIMULIA · BIOVIA · SYNOPSYS · HALLIBURTON · Gaussian · Paradigm · Schlumberger

**Industry expertise**

## 3 Customer Experience
HPC Center of Excellence (CoE)

- Code modernization
- Performance optimization
- Engineering

- Business outcomes
- Rapid deployment
- Expert community

- Benchmarking / POC
- TS Consulting Service Engagement
- Resource utilization

Customer value

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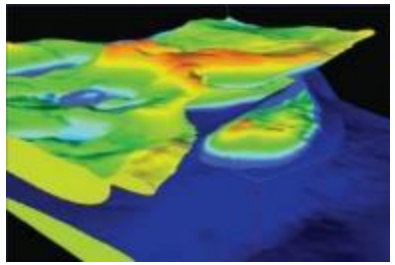
# Our journey towards a robust HPE Industry Solutions Portfolio

## Why Industry Solutions

- Expand market reach
  - Go beyond infrastructure to **higher layers of the solution stack**
- Achieve higher margins
  - Deliver **higher business value**, solve business challenges
- Create clear differentiation in market
  - Unique and differentiated solution features, **avoid hardware commoditization**
- Stronger partner ecosystem
  - **Include ISV partners** in our solution stack

## Priority Industries

- **Financial Services**
  - TAM $2.43B by 2019
  - CAGR 19.9% (HPC), 23% (Big Data)
- **Energy (Oil and Gas)**
  - TAM $1.1B (HPC), $204M (Big Data) by 2019
  - CAGR 9.1% (HPC), 20.4% (Big Data)
- **Health and Life Sciences**
  - TAM $1.38B (HPC) by 2019
  - CAGR 4% (HPC)



From the well-established to the wild-West

TAM/CAGR Data: IDC Market Analysis Aug 2016, Frost & Sullivan 2015, and HPE Extrapolations

# Maximize Performance and Agility for High Frequency Trading

Trade and Match Server Solution Highlights

## Key Differentiators

- Overclocking capability: tune and optimize for improved frequency — **save time**
- Optimized for applications that perform better at high frequency and with lower core count — **save costs**
- Workstation processor as opposed to competitive offerings using consumer processors — **Reliability** including ECC memory
- Solution offerings optimized for easy co-location data center deployments — **ease of deployment**

## Proven Benefits

| E5-1680v3 Specs | |
|---|---|
| # of Cores | 8 |
| # of Threads | 16 |
| Base Frequency | 3.2 GHz |
| All Core Max Turbo Freq. | 3.5 GHz |
| Overclock Frequency | **Up to 4.6 GHz** |
| Overclock Frequency Ratio | +21-37% |
| Black Scholes Speedup | +17-26% |
| Monte Carlo Speedup | +11-28% |

**Best in Class Speed with Leadership Reliability**

** Based on HPE internal lab testing

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# UberCloud
# Community, Marketplace, Container Technology

Engineers & scientists discover, try, buy computing on demand, in the cloud

- 200+ engineering cloud experiments
- 70+ engineering cloud case studies
- 50+ cloud resource providers
- 120+ engineering software providers (ISVs)

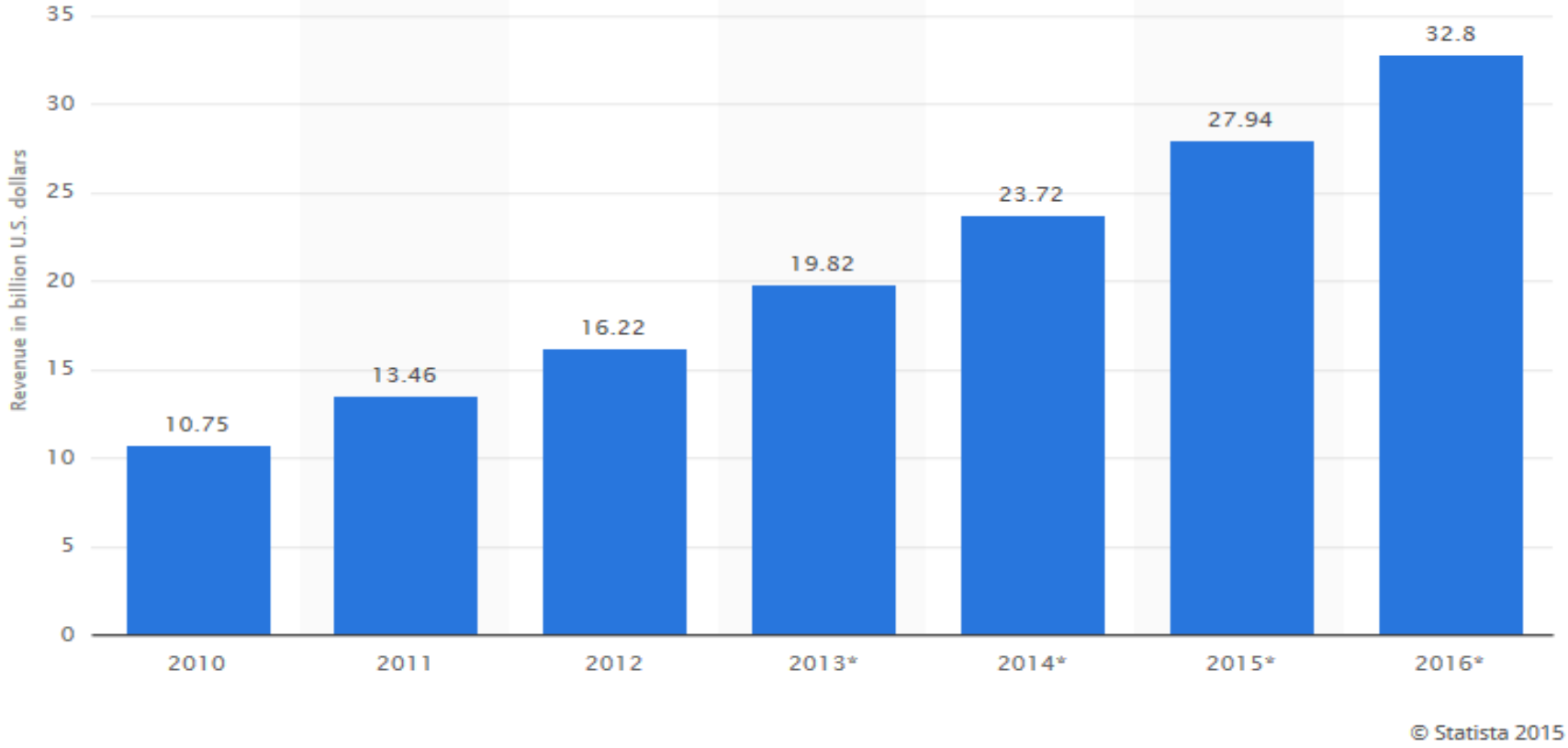

- Application **Software Containers** for ANSYS, CD-adapco, CFD Support, CFturbo, COMSOL, Dacolt, Flow Science, Friendship Systems, LS-Dyna, NICE DCV, Numeca, OpenFOAM, Red Cedar, Simulia, …
- **Cloud Resources:** Advania, AWS, Azure, CPU 24/7, Google, Ozen,…

# The market for HPC computing services

- **20+million engineers, scientists and their service providers in a very fragmented market:**
  - CAE, Biotech, Pharma, Oil & Gas, Finance, Chemistry, Environment, Big Data Analytics, Government, Research
  - But, all have one thing in common: they need computing
- **Tomorrow: plus 30+ million 'makers' (3D printing), plus big data analytics, plus digital natives, plus MOOC, . . .**

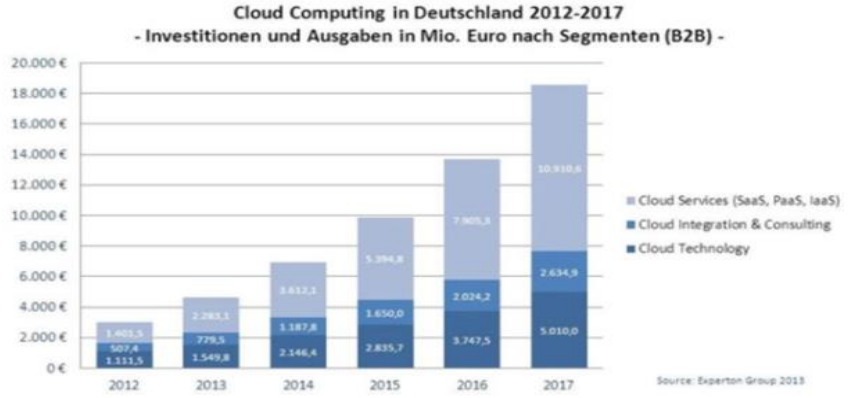
# SaaS – Software as a Service

## SaaS Market Growth for Enterprise Applications



# Key HPC Cloud Market Drivers

- **Enterprise use of cloud** drives R&D use of Cloud
- Engineers' growing **awareness** about **benefits**
- Engineers' experience with **consumer** cloud = "work imitates life" *)
- Tier 1 manufacturers expect **suppliers** to do better, faster, cheaper



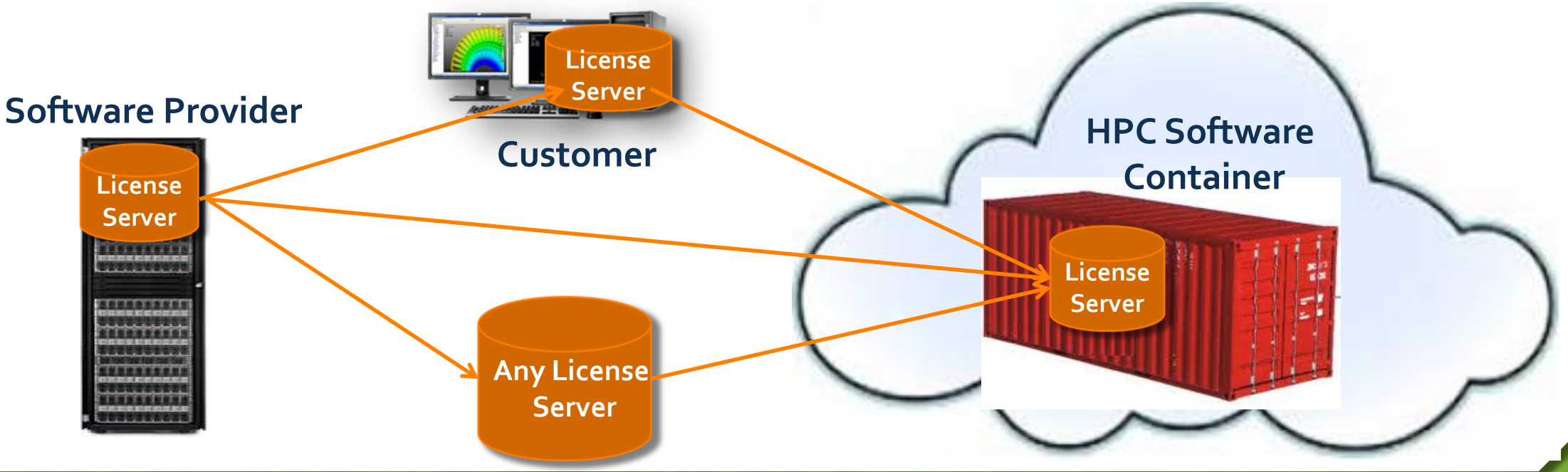

*) CDW 2013 State of the Cloud

# Challenges to move to the HPC Cloud

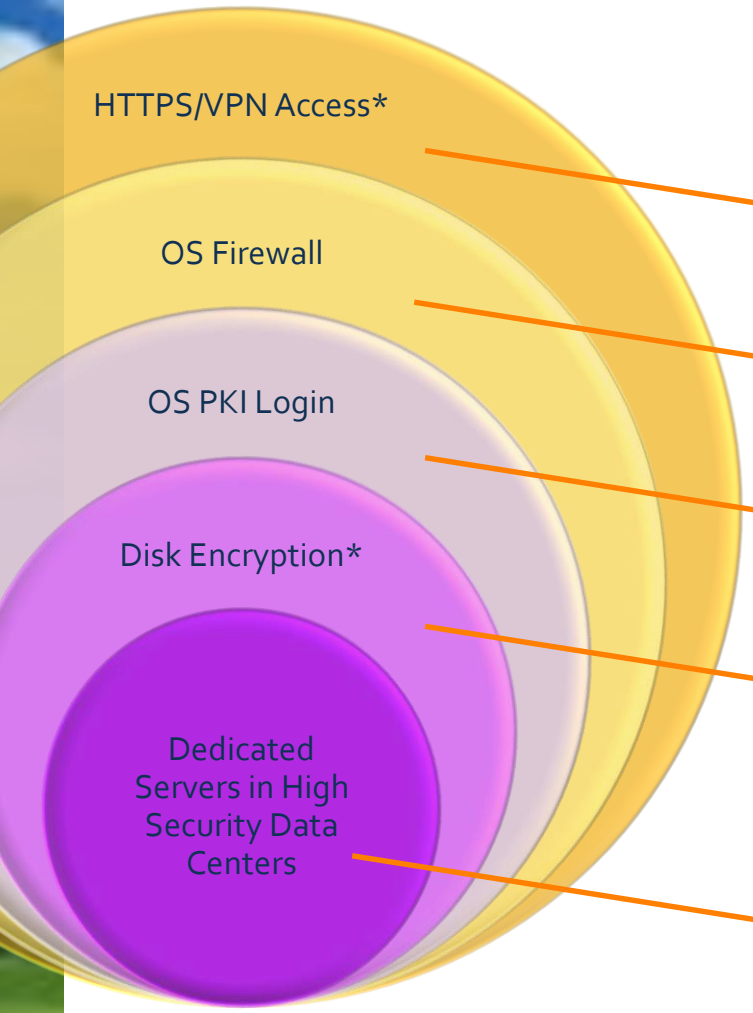
- **The end-user:** engineers & scientists are reluctant to use cloud
- **The software provider:** concern to disrupt their traditional licensing model
- **The cloud resource provider:** HPC apps are architecture dependent
- **The HPC market:** 16 verticals with very different requirements
- **Roadblocks: real:** data transfer, licensing, no standards, cloud access, cloud lock-in/portability, losing control
- **Roadblocks: perceived:** security, compliance, cost, cloud expertise
- **Solution: HPC Containers**

# How does UberCloud resolve software licensing issue

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



# UberCloud Security Layers




Connection to our servers are protected by strong encryption techniques such as HTTPS and VPN

Our servers are protected with firewalls. Only necessary ports are turned on to reduce attacks

Admin access to our servers are protected by PKI
Public Key Encryption (vs passwords, which can be guessed)

Data at rest can be encrypted. Disk and file level encryption are both available (optional, may degrade performance)

We deploy on single tenant servers (not shared between customers). These servers reside in professionally managed, highly secured data centers.

* HTTPS/VPN access and Disk Encryption are optional

# UberCloud Containers – The last 9 months

- NICE DCV in container with GPU acceleration for Remote Desktop with HD quality
- Encrypted connections for data transmissions
- OpenHPC compatible
- Resource Manager (Grid Engine) capabilities for complex, multi-host deployments
- Multi-host networking over low latency networking stacks (IB and RDMA)
- Support for multiple OS distributions
- Support for multiple MPI distributions
- Dozens of ISV codes supported
- Complex workflows such as optimization supported
- Integrated into Cloud Marketplaces like Azure

# OpenFOAM Test: Bare Metal vs Docker

| Simple Average of the 3 runs and comparison between Bare Metal and Container | | | |
|---|---|---|---|
| | **Serial (1 Host x 1 CPU) = 1 Core Total** | **1 Host Parallel (4 Host x 1 CPU) = 4 Core Total** | **2 Host Parallel (2 Host x 2 CPU) = 4 Core total** |
| Bare Metal | 10,847 | 2,040 | 1,842 |
| Container | 10,869 | 1,851 | 1,852 |
| **Overhead** | **0.20%** | **-9.30%** | **0.51%** |

OpenFOAM with 1.4 million cells on bare metal and in UberCloud Docker container

Containers remove Portability & Standard related challenges.
By integrating 3rd party tools we tackle the following:

| CAE Cloud Challenges | UberCloud |
|---|---|
| Security | √ |
| Portability | √ |
| Compliance | √ |
| Data Transfer | √ |
| Standardization | √ |
| Software Licenses | √ |
| Resource Availability | √ |
| Transparency of Market | √ |
| Cost & ROI Transparency | √ |
| No Cloud Expertise Needed | √ |

# Next Steps

- Run several UberCloud Experiments with the Living Heart Project solution
  - First in India on HPE's pilot HPCaaS platform in Bangalore
  - Five more around the world, aligning HPE, Simulia, UberCloud, and Advania
  - Publish resulting case studies throughout the next 2-3 UberCloud Compendium releases through 2017
- Expand use cases beyond the LHP in additional verticals, such as FSI and Energy, plus additional use cases in Life Sciences

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# Thank you