Enterprise Cloud for CAE
LS-DYNA User Forum - Bamberg, Germany - Oct 2018
JJ Jones - Software Partner Manager, Rescale

What is required to get the most out of your simulation environment?

- Highly specialized hardware

- Software that takes advantage and often requires specialized hardware for optimal performance

- The availability and scalability of both of the above

High Performance Computing

Cray T3E MPP
1995

Standard Processors
2048 nodes
1 TeraFlop

Equivalent to about 2
Iphone 7s

High Performance Computing
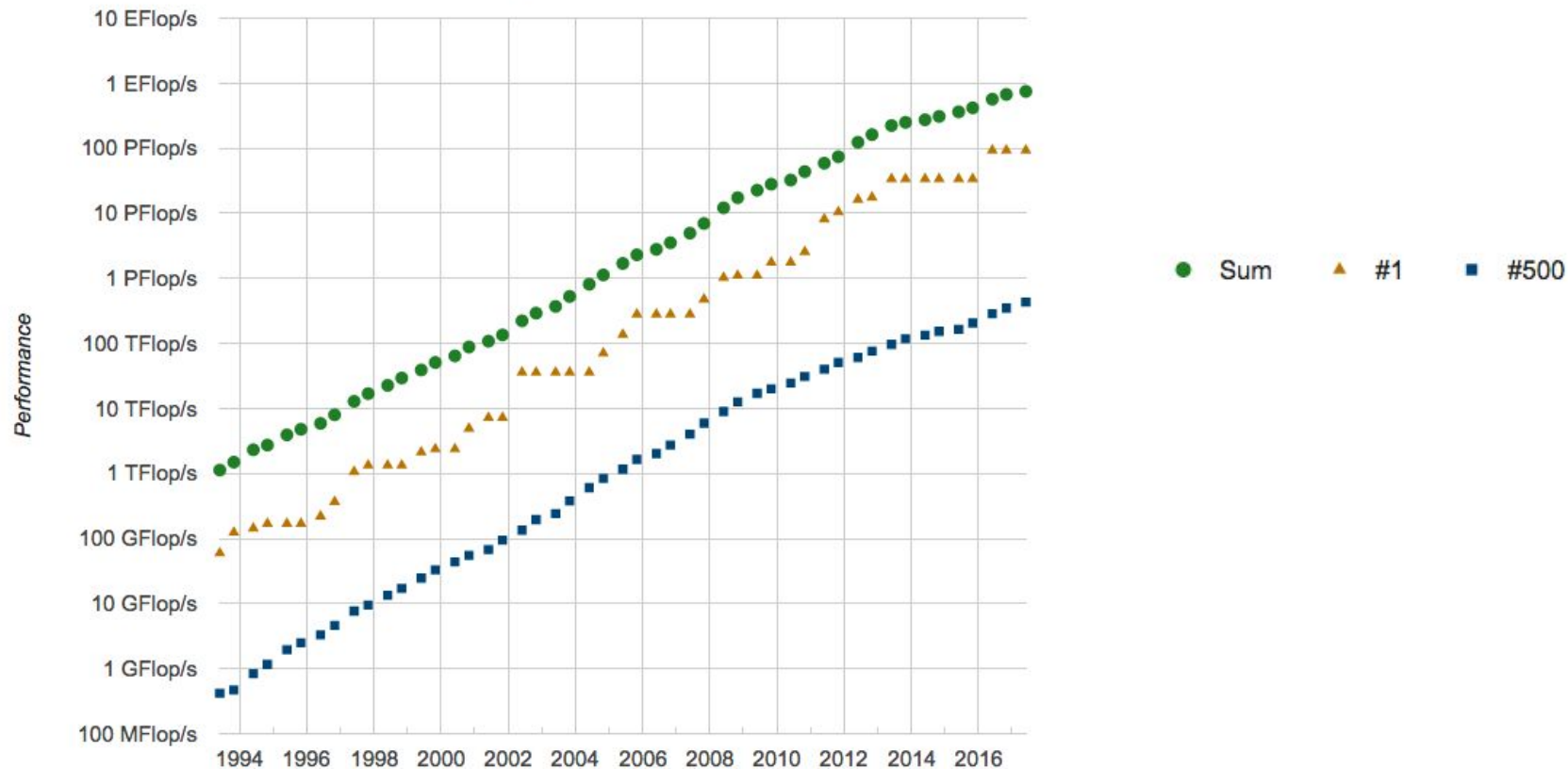
IBM Summit
Oak Ridge NL
2018

2.2M Power9 Cores
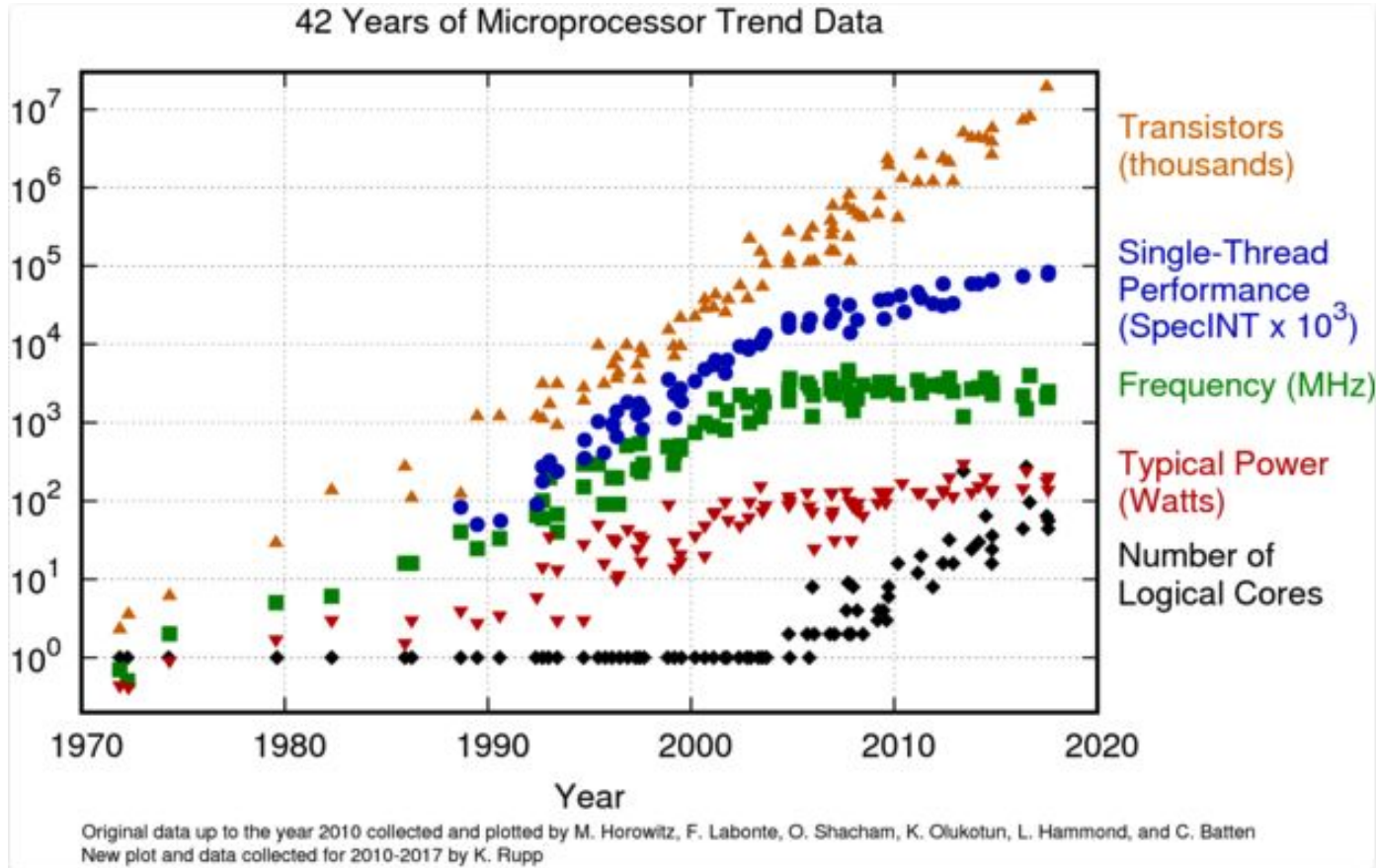2.1M GV100 Cores

122 Petaflops

122,000 x T3E

Supercomputing Performance

Data from top500.com

Processor Performance is Reaching a Plateau

42 Years of Microprocessor Trend Data

Transistors (thousands)

Single-Thread Performance (SpecINT x 10^3)

Frequency (MHz)

Typical Power (Watts)

Number of Logical Cores

Original data up to the year 2010 collected and plotted by M. Horowitz, F. Labonte, O. Shacham, K. Olukotun, L. Hammond, and C. Batten
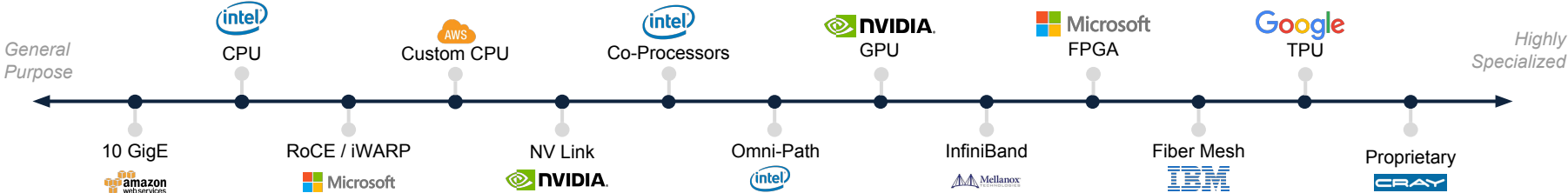New plot and data collected for 2010-2017 by K. Rupp

The Move to Multiple Architectures

- Single thread plateauing

- Increasing server specialization

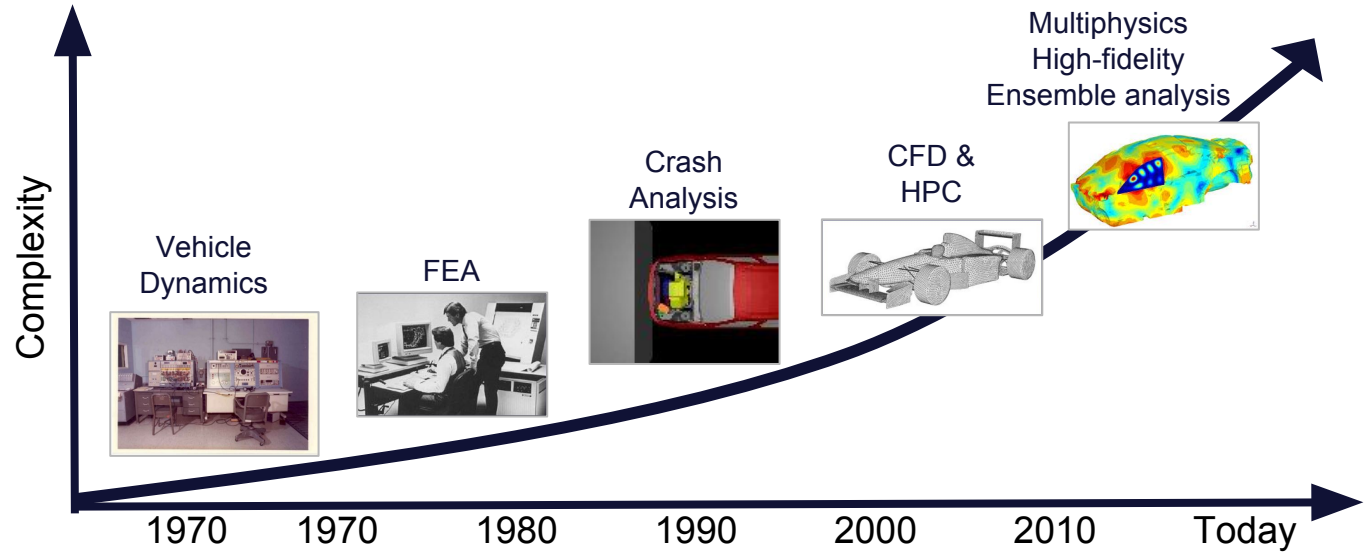- Workload-centric stack important for optimal performance

General Purpose

Highly Specialized

CPU

Custom CPU

Co-Processors

GPU

FPGA

TPU

10 GigE

RoCE / iWARP

NV Link

Omni-Path

InfiniBand

Fiber Mesh

Proprietary

Evolution of Simulation: Increasing Compute Requirements

Progression Towards Increasing Compute Requirements →

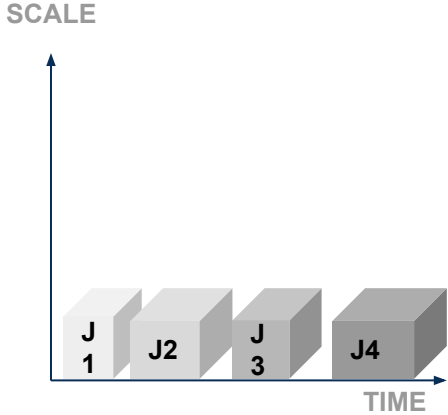| Design complexity increasing | > | Multidiscipline simulation | > | Optimization, MDO, DOE, Monte Carlo | > | Elastic big compute resources needed on-demand |

Automotive Example: Evolution of Simulation and Move Toward Cloud HPC

Complexity

Multiphysics
High-fidelity
Ensemble analysis

CFD & HPC

Crash Analysis

Vehicle Dynamics

FEA

| 1970 | 1970 | 1980 | 1990 | 2000 | 2010 | Today |

Scalability: faster results, shorter turnaround time

Rescale Confidential
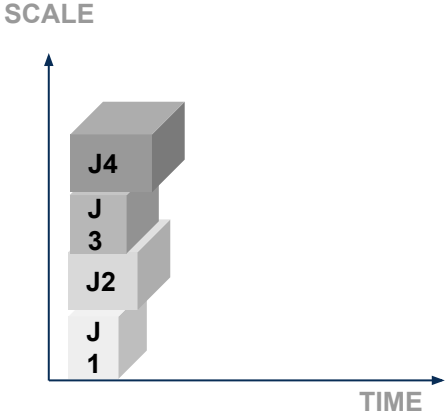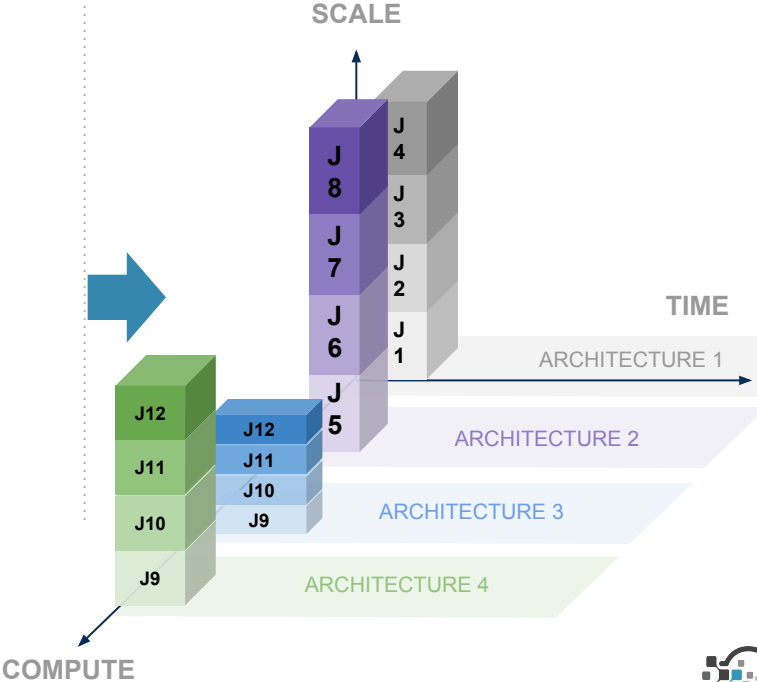
Specialization of compute servers for optimal performance
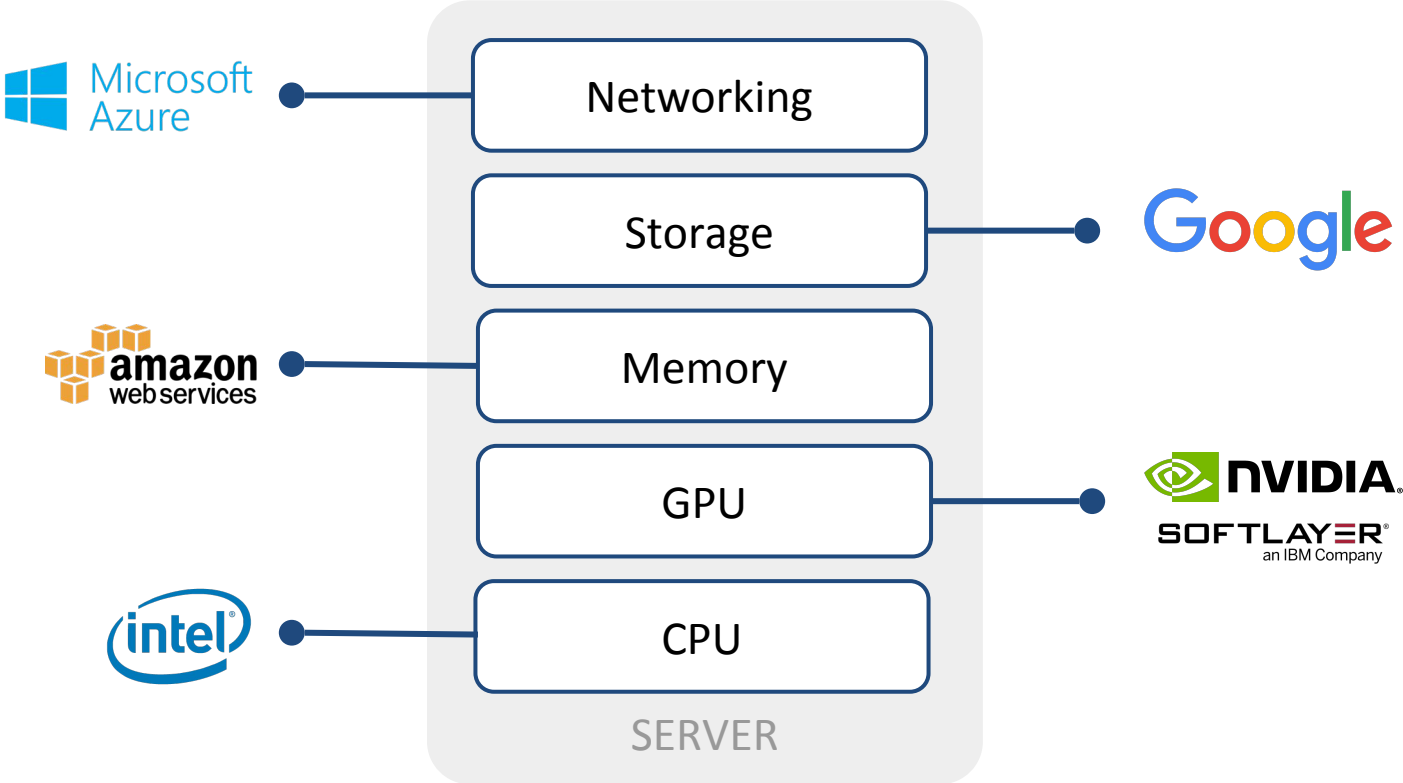
Growth and differentiated strategies of IaaS providers
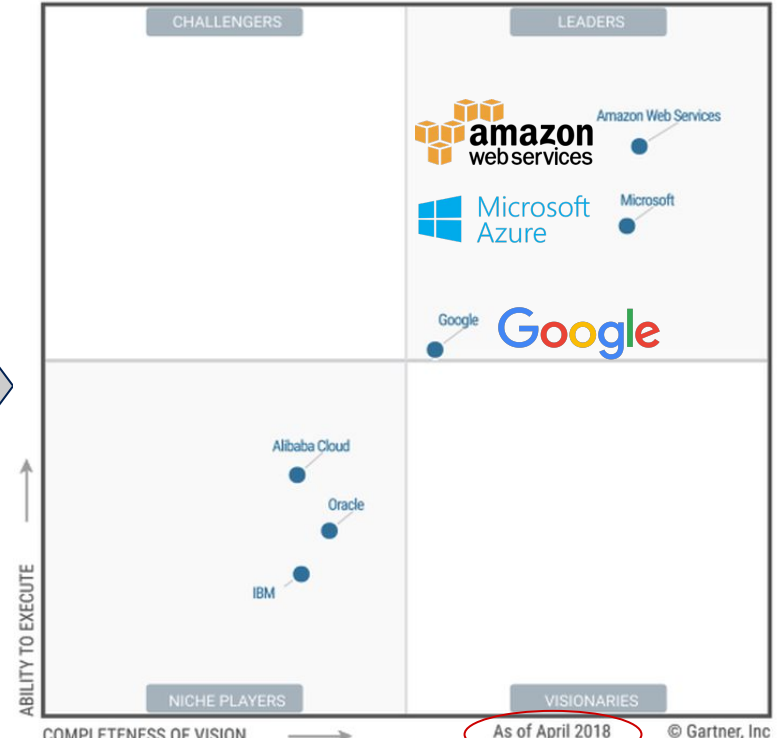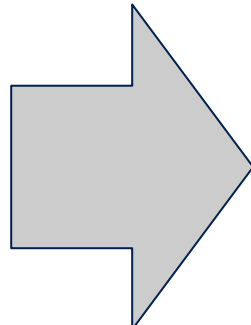
The New Big 3

Industrial Economy

Digital Economy

The Rescale HPC Platform Experience

LS-DYNA + 300

FULLY INTEGRATED STACK OF ENTERPRISE DEPLOYMENT TOOLS

rescale PLATFORM

Input → Software → Post Processing → Output ▼ Filters

Hardware Settings

Rescale ScaleX Platform

- Enterprise big compute
- Innovation acceleration
- User-first platform
- Security and admin controls

aws | Azure | IBM | DELL | Hewlett Packard Enterprise +

Easy to Use, Intuitive SaaS Interface

1 SaaS Access

2 Specify input file — Input → Software → Post Processing → Output · Filters

Hardware Settings

6 Run job — Submit

3 Select LS-Dyna SW

Configure Software Settings · + Add Software
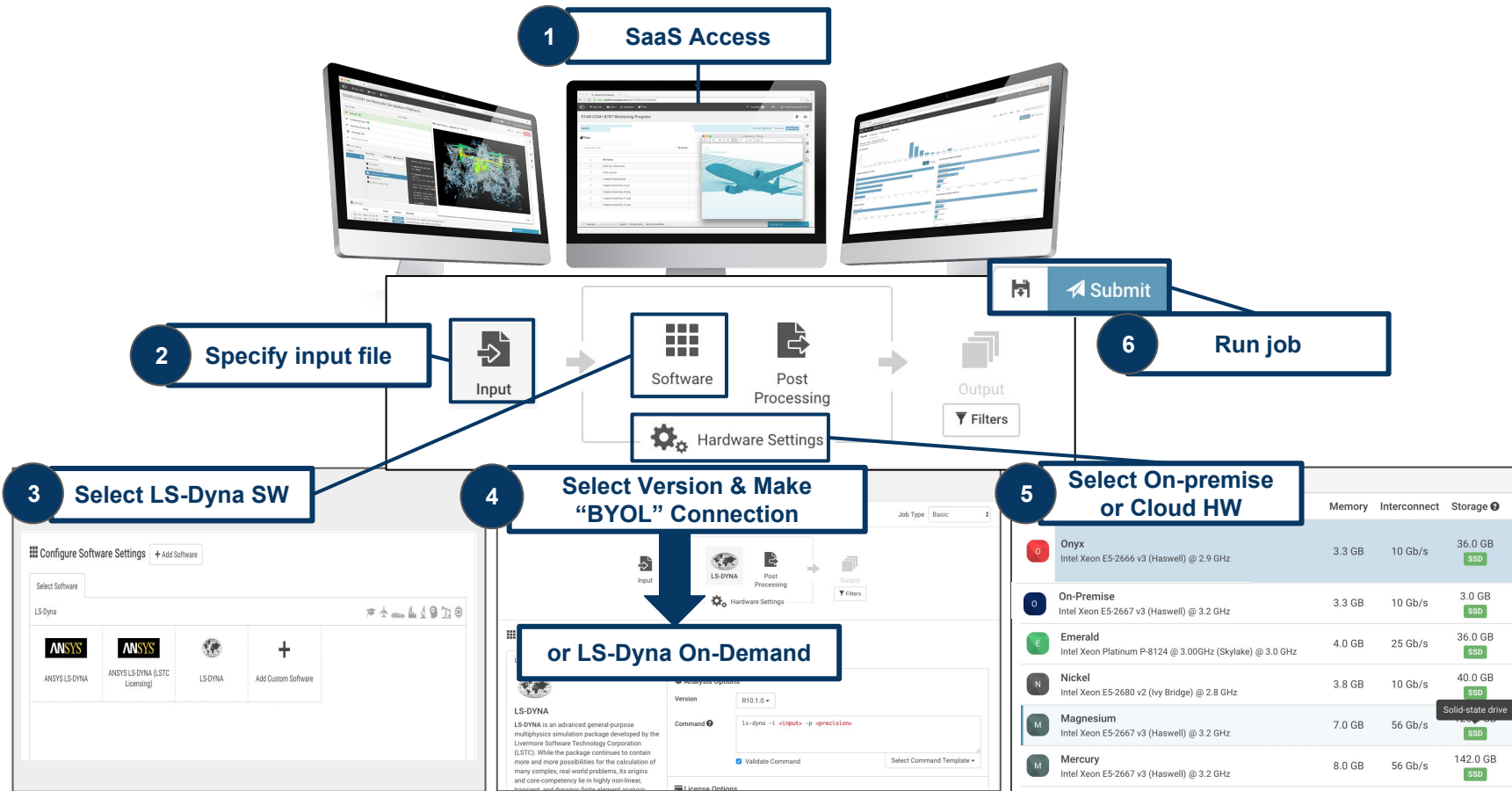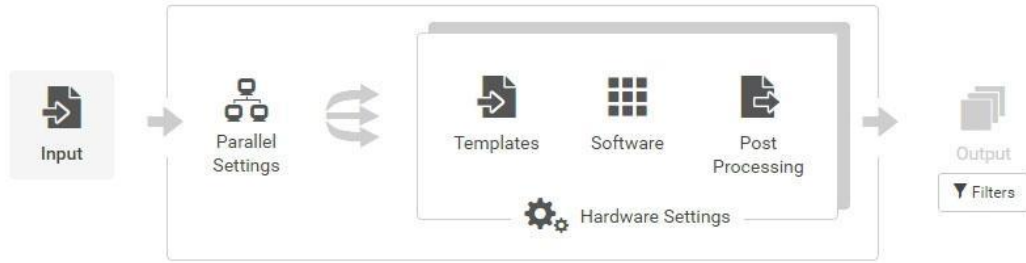Select Software
LS-Dyna
ANSYS LS-DYNA | ANSYS LS-DYNA (LSTC Licensing) | LS-DYNA | Add Custom Software

4 Select Version & Make "BYOL" Connection

Input · LS-DYNA · Post Processing · Output · Filters
Hardware Settings

or LS-Dyna On-Demand

LS-DYNA

LS-DYNA is an advanced general-purpose multiphysics simulation package developed by the Livermore Software Technology Corporation (LSTC). While the package continues to contain more and more possibilities for the calculation of many complex, real world problems, its origins and core-competency lie in highly non-linear, transient and dynamic finite element analysis.

Job Type: Basic

Analysis Options
Version: R10.1.0
Command: ls-dyna -i <input> -p <precision>
☑ Validate Command   Select Command Template
License Options

5 Select On-premise or Cloud HW

		Memory	Interconnect	Storage
O	**Onyx** Intel Xeon E5-2666 v3 (Haswell) @ 2.9 GHz	3.3 GB	10 Gb/s	36.0 GB SSD
O	**On-Premise** Intel Xeon E5-2667 v3 (Haswell) @ 3.2 GHz	3.3 GB	10 Gb/s	3.0 GB SSD
E	**Emerald** Intel Xeon Platinum P-8124 @ 3.00GHz (Skylake) @ 3.0 GHz	4.0 GB	25 Gb/s	36.0 GB SSD
N	**Nickel** Intel Xeon E5-2680 v2 (Ivy Bridge) @ 2.8 GHz	3.8 GB	10 Gb/s	40.0 GB SSD
M	**Magnesium** Intel Xeon E5-2667 v3 (Haswell) @ 3.2 GHz	7.0 GB	56 Gb/s	Solid-state drive SSD
M	**Mercury** Intel Xeon E5-2667 v3 (Haswell) @ 3.2 GHz	8.0 GB	56 Gb/s	142.0 GB SSD

Configurable workflow reduces the need to develop and maintain custom scripts for each system

*Transformative Benefits – Full CLI/Scripting Flexibility for Power Users*


```
#!/bin/bash
#RESCALE_NAME="ANSYS job"
#RESCALE_ANALYSIS=LS_Dyna
#RESCALE_CORE_TYPE=Onyx
#RESCALE_CORES=2
#RESCALE_WALLTIME=1
#USE_RESCALE_LICENSE
dyna.exe -n
$RESCALE_CORES_PER_SLOT -i
neon.refined.rev01.k -p single
```

GUI for simple Workflow definition

Submission scripts for powerful access

Rescale is accessed the same way when submitting jobs that can run on cloud providers, supercomputing centers, or on premises

Global Turnkey IT Administration
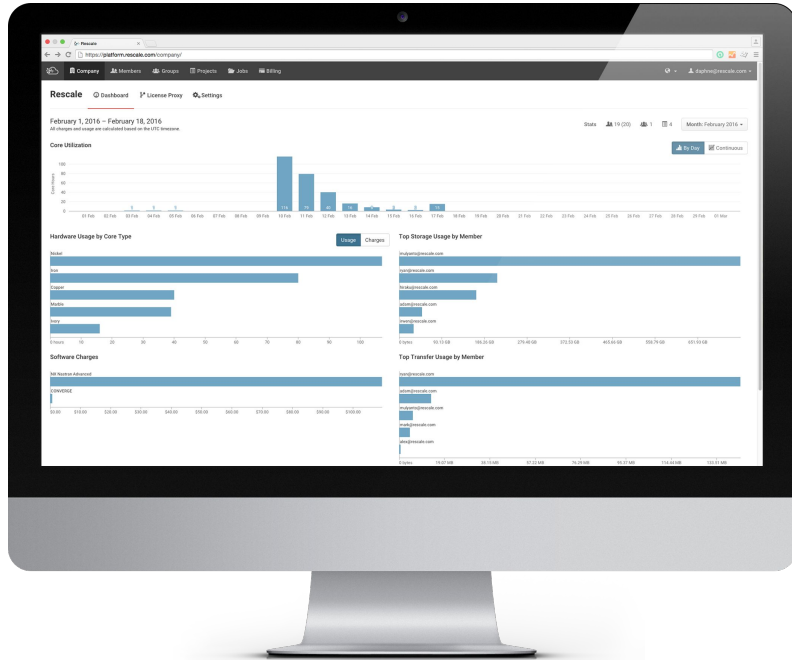
Easy-to-use SaaS interface for IT & engineering managers

Key Enterprise Features

Role-based Access	Manage users Manage roles Manage groups Manage projects
Platform	HW access, regions, and pricing SW access, licenses, and pricing Platform features access Data retention and sharing settings
Security	Restricted access by IP address range Password complexity rules Multi-factor authentication (MFA) User audit logs & notification rules
Cost Management	Budget by level Reports by application type Payment methods and history License usage optimizer
Connect	On-premise compute and storage PDM/SLM integration VPN Single sign-on (SSO)

Rescale Platform implementation strategies

Choose what is right for you, right now

Cloud Native

- Elastic scaling on demand
- Turnkey
- Zero IT footprint

On-premise HPC

- Submit jobs on-premise
- Administration portal
- Analysis and reporting

Hybrid: Cloud & On-premise

- Extend to cloud on demand
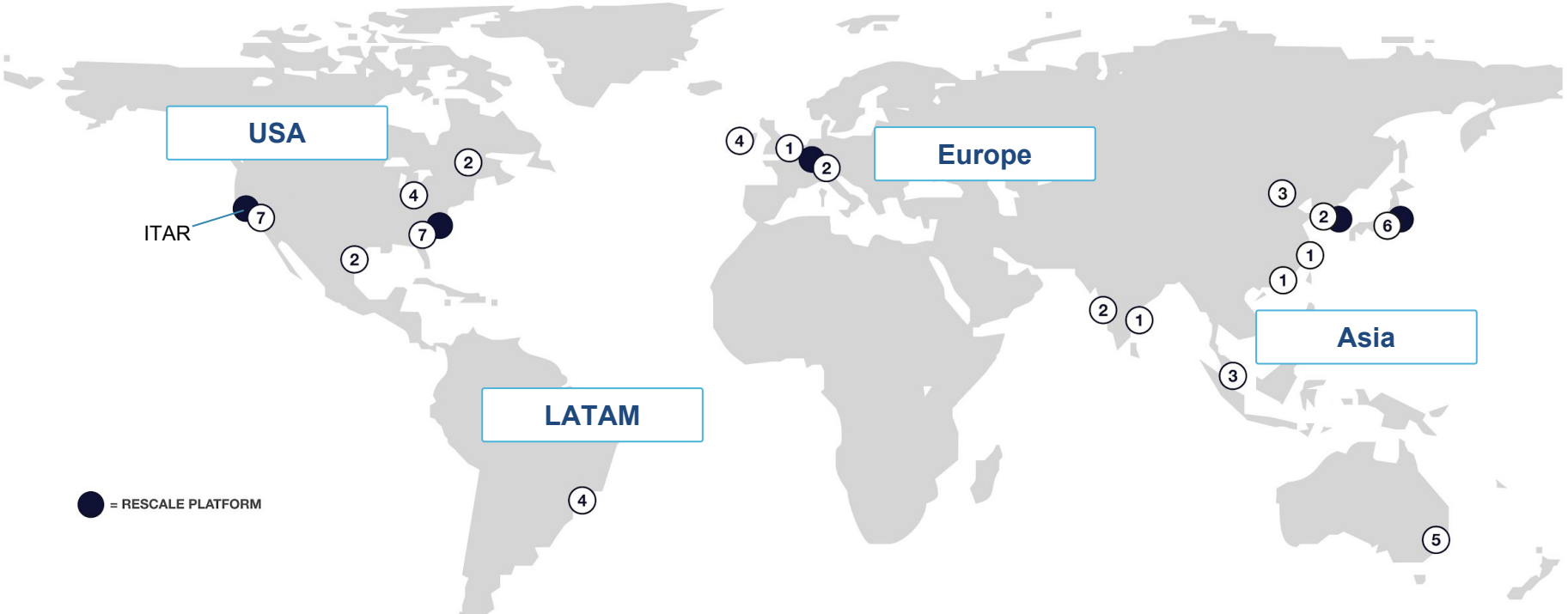- Seamless transitioning between architectures
- Disaster recovery

+

Advantages of both

Rescale's global HPC infrastructure network

Over 100 data centers worldwide

USA

ITAR

Europe

Asia

LATAM

= RESCALE PLATFORM

**Turnkey deployment to the fastest local HPC infrastructure**

Absolute enterprise security, delivered end-to-end

Rescale delivers best-in-class security layer across entire platform

Rescale is compliant with the strictest industry security standards

- Full administrative management and IT dashboard provide comprehensive controls and visibility

- Software defined security policy implementation tools to enforce proper IP handling

- Encryption in transfer with high-grade TLS and multi-layered encryption at rest with 256-bit AES
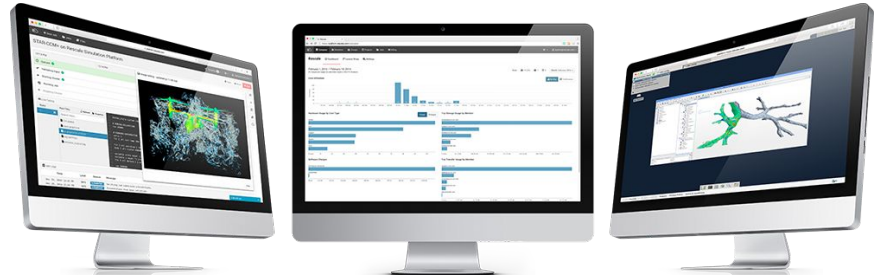
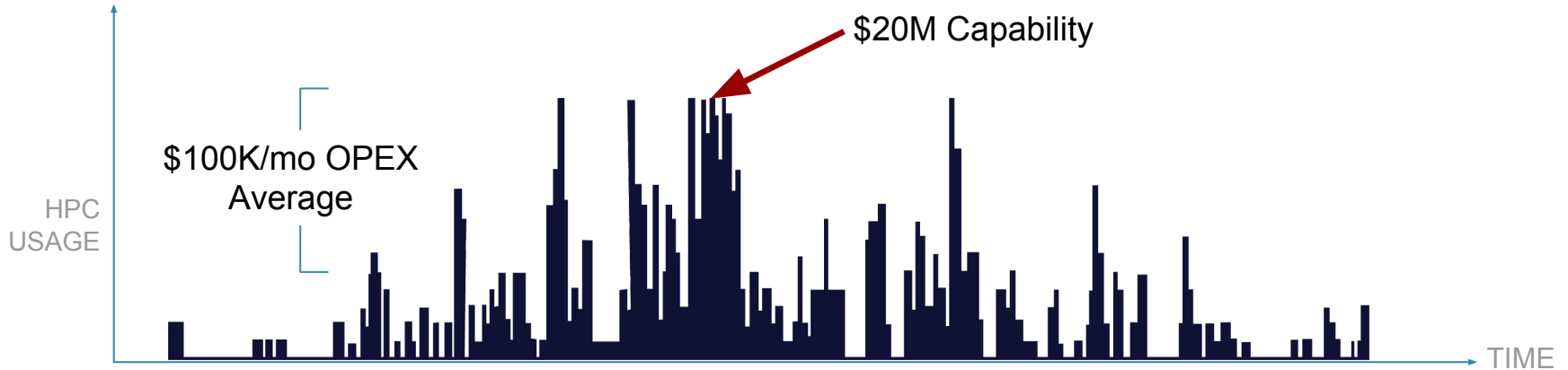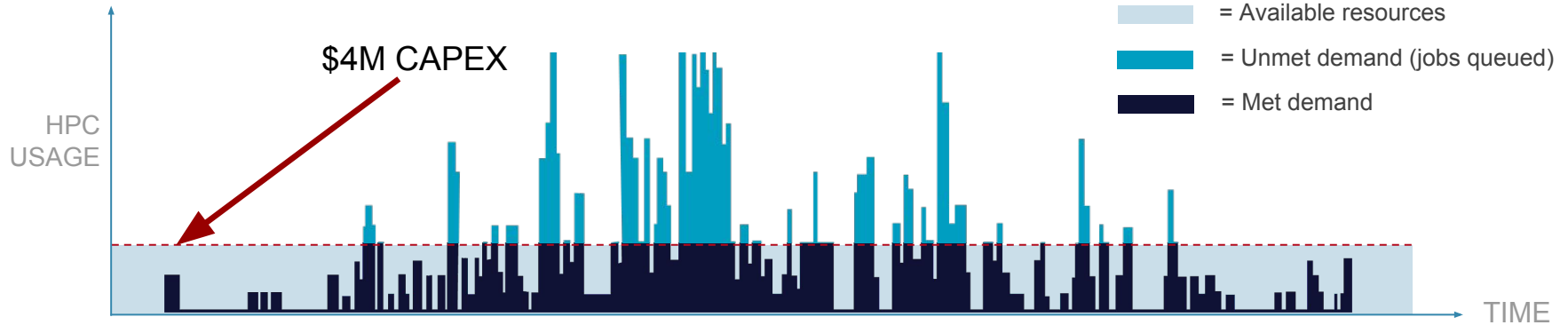SOC 2 Type 2 Attested   CSA Registered   ITAR Compliant *   HIPAA Certified *   FedRAMP (pending)

* Not available in all geographical regions.   Rescale Confidential

Tier 1 automotive: HPC usage versus demand

CAPEX replaced with lower monthly OPEX while increasing compute capacity and flexibility

Legend:
- = Available resources
- = Unmet demand (jobs queued)
- = Met demand

$4M CAPEX

HPC USAGE

TIME

$20M Capability

$100K/mo OPEX Average

HPC USAGE

TIME

HPC in the Cloud

- *Take advantage of the fragmented hardware environment*

- *Find the right architecture for each software workflow without compromise*

- *Pursue a Multi-Cloud solution to get the best of all worlds*

- *Combine your existing HPC in a single platform*

- *Ensure you have access to highly scalable and available assets when and where you need them*

Contact us for a free Technical Review
Get up to 50,000 core hours for a POC