LS-DYNA Forum
October 2016

Agenda

- Introduction to Rescale
- Market View: HPC, Cloud and Simulation
- Rescale Solution

Rescale Overview

Global Footprint

Founded in 2011, San Francisco HQ

Tokyo office, in-progress EMEA expansion

Technology

Cloud-based HPC and simulation platform

Global HPC compute, 180+ turn-key software solutions

Industry Sectors

100+ Global 2000 enterprises

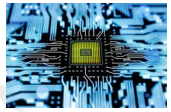

Aerospace


Oil & Gas


Automotive


Life Sciences


Industrials


Semiconductor

Investors


Jeff Bezos


Richard Branson


Peter Thiel

TRANSLINK CAPITAL

Microsoft

TRG

ITV ITOCHU TECHNOLOGY VENTURES

JumpCapital

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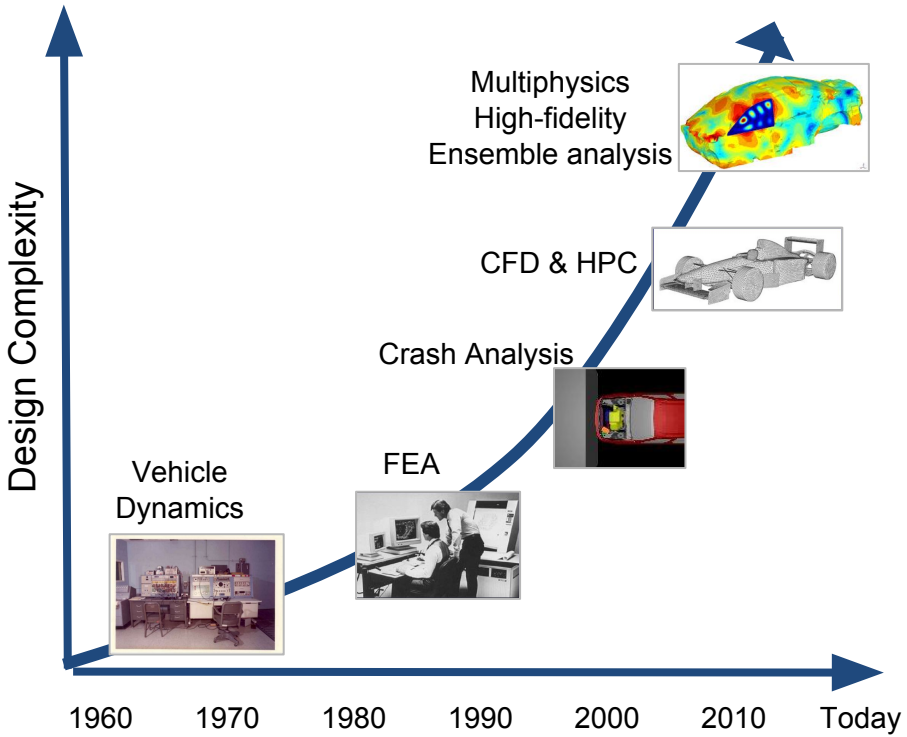
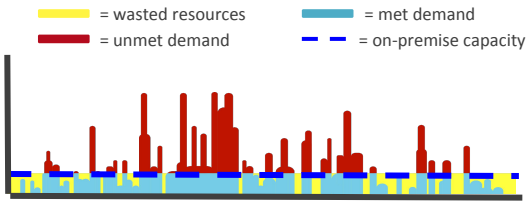
HPC Market Dynamics

Increasing Demand for HPC



Enterprise Challenges in HPC

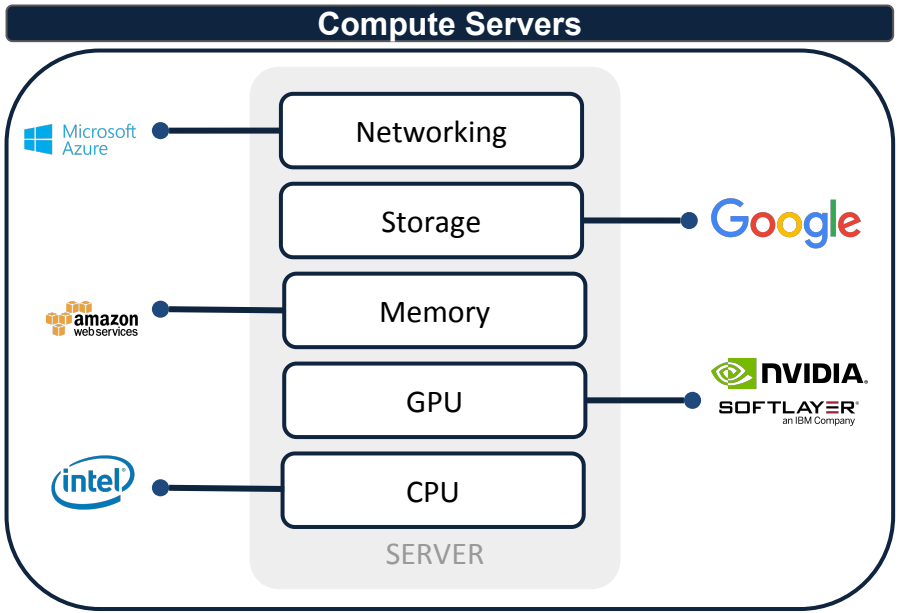
IT Environment

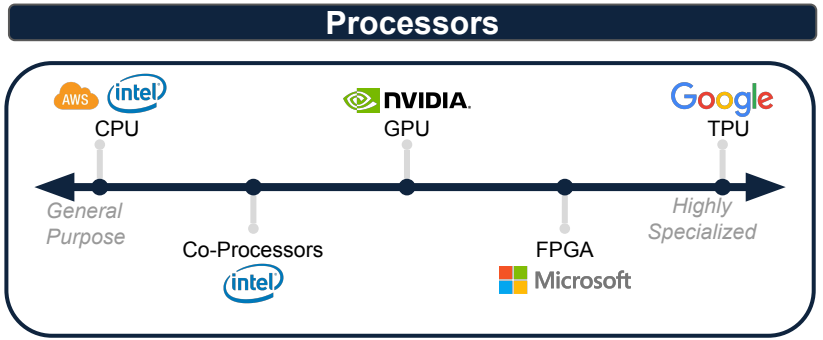


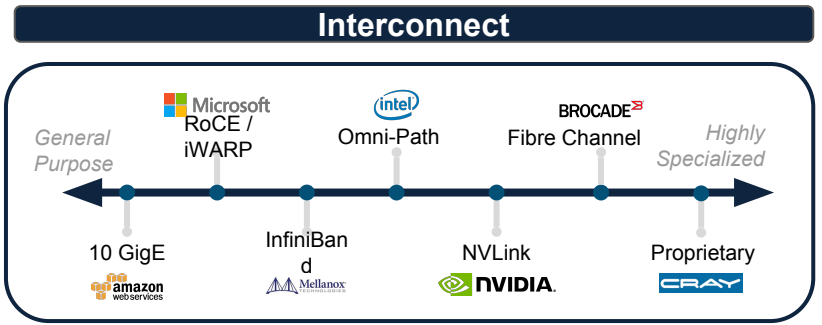
Accessibility

Total Cost of Ownership

Increasing fragmentation and specialization

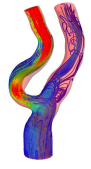


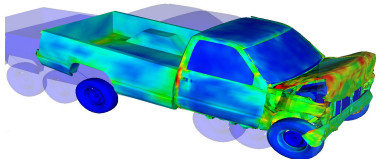




Software Match to Hardware

- Fluids -> Compute, Interconnect
- Structural -> Compute, Memory
- Electromagnetic -> Memory
- Molecular Dynamics -> GPUs
- Deep Learning -> GPUs





LS-DYNA - Broad Capabilities

HW selection depends on what solver is used

- Full 2D & 3D capabilities
- Nonlinear dynamics
- Rigid body dynamics
- Quasi-static simulations
- Normal modes
- Linear statics
- Thermal analysis
- Fluid analysis
- Eulerian capabilities
- ALE (Arbitrary Lagrangian-Eulerian)
- FSI (Fluid-Structure Interaction)
- Navier-Stokes fluids
- Radiation transport
- Compressible fluid solver, CESE
- FEM-rigid multi-body dynamics coupling (MADYMO, Cal3D)
- Underwater shock
- Failure analysis
- Crack propagation
- Real-time acoustics
- Implicit springback
- Multi-physics coupling
- Structural-thermal coupling
- Adaptive remeshing
- SPH (Smoothed Particle Hydrodynamics)
- EFG (Element Free Galerkin)
- EM (Electromagnetism

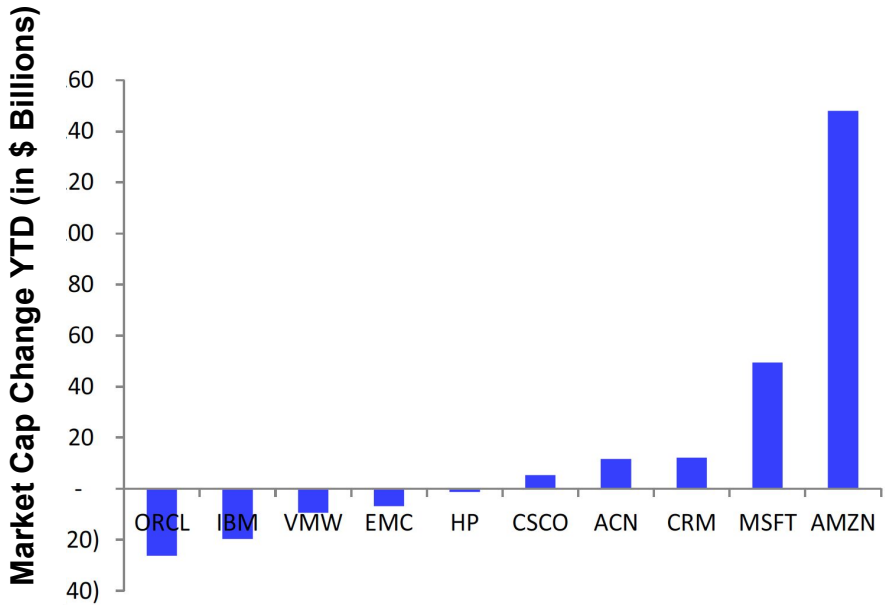
HW Variety Enables Alignment with Customer Value

There is hardware in the cloud for every HPC workload

JOB TYPE		Most Advanced Hardware (Best Hardware, Cost Higher, Higher Demand)	High Throughput (Capable and High Availabilty Systems)	Best Value (Low Price, Capabilty, High Availabilty)
PURE INTERCONNECT	CFD, Explicit Structural	Bronze* Copper Ivory	Iron Ivory	Copper Low Priority Ivory
GENERAL PERFORMANCE	Large CFD, Large Explicit Structural	Onyx Titanium	Onyx Titanium Nickel	Nickel Low Priority Onyx Low Priority
MULTINODE MEMORY	Implicit Structural	Bronze* Copper Ivory	Topaz* Pearl Gold	Gold Low Priority Ivory Iron
SINGLE NODE MEMORY	Accoustics, EM	Topaz* Mercury Pearl	Topaz* Pearl Gold	Gold Low Priority Nickel Low Priority
MULTINODE GPU	MD, Small Implicit Structural	Emerald** Tungsten Platinum+	Emerald**	Tungsten Platinum+
SINGLE NODE GPU	MD, Rendering	Emerald** Jade	Emerald** Jade	Jade Low Priority
DISK / IO	Implicit Structural, Docking	Quartz	Quartz	Quartz

Cloud is Transforming HPC Market Dynamics

$1T+ Enterprise IT Shift from On-prem to Cloud



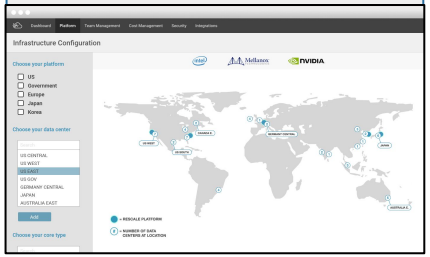
Source: Deutsche Bank, Thomson Reuters

Democratizing HPC

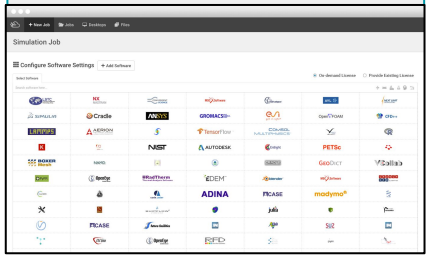
Easy to use

Cost Alignment

Global



Easy SW Consumption



$10B Simulation Software market shifting to cloud

*NOT EXHAUSTIVE

Simulation drives innovation in the largest industries

Aerospace

SPACEX

Oil & Gas

ارامكو السعودية
Saudi Aramco

Automotive

TESLA

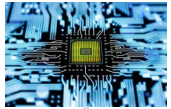
Life Sciences

GILEAD

Industrials

SIEMENS

Semiconductor

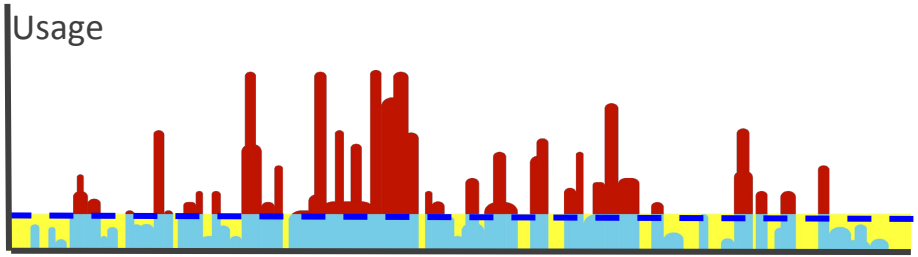


ARM

Migration to Cloud HPC Simulation

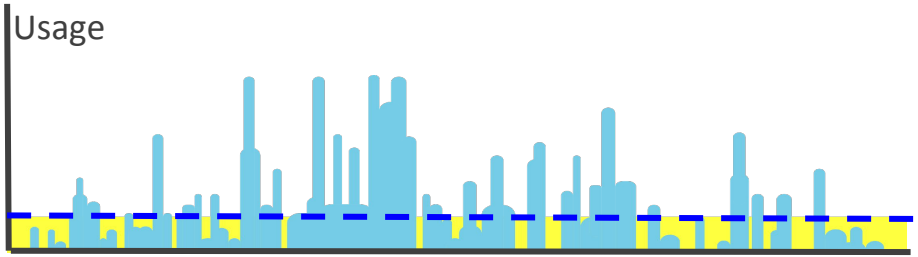
= wasted resources
= unmet demand
= met demand
= on-premise capacity

Phase 1: Today - On-Premise



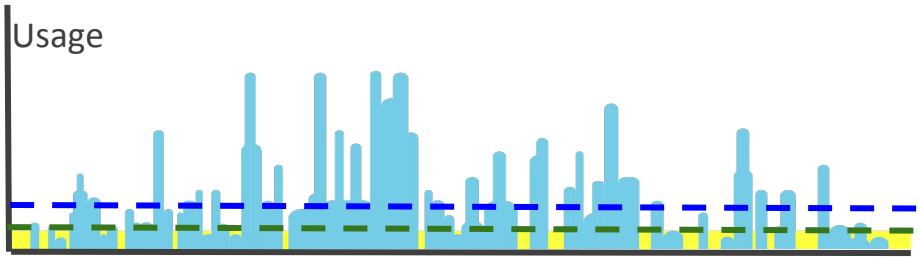
Shortened product development time and a faster time-to-market, reduce capital expenditure

Phase 2: Immediate-term - "Bursting"



Shortened product development time and a faster time-to-market, reduce capital expenditure

Phase 3: Near-term - Hybrid



One transparency control for administration and management. Leveraging existing assets, improved security, better experience for your engineers

Phase 4: Medium/Long-term - Full Cloud

Cost-efficient infrastructure that has minimal capital expenses, eliminated operating expenses

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Rescale's Turn-key Cloud HPC Solution

Rescale SaaS
Purpose built portals, intuitive workflows

Engineers / Scientists | Enterprise IT | Partners

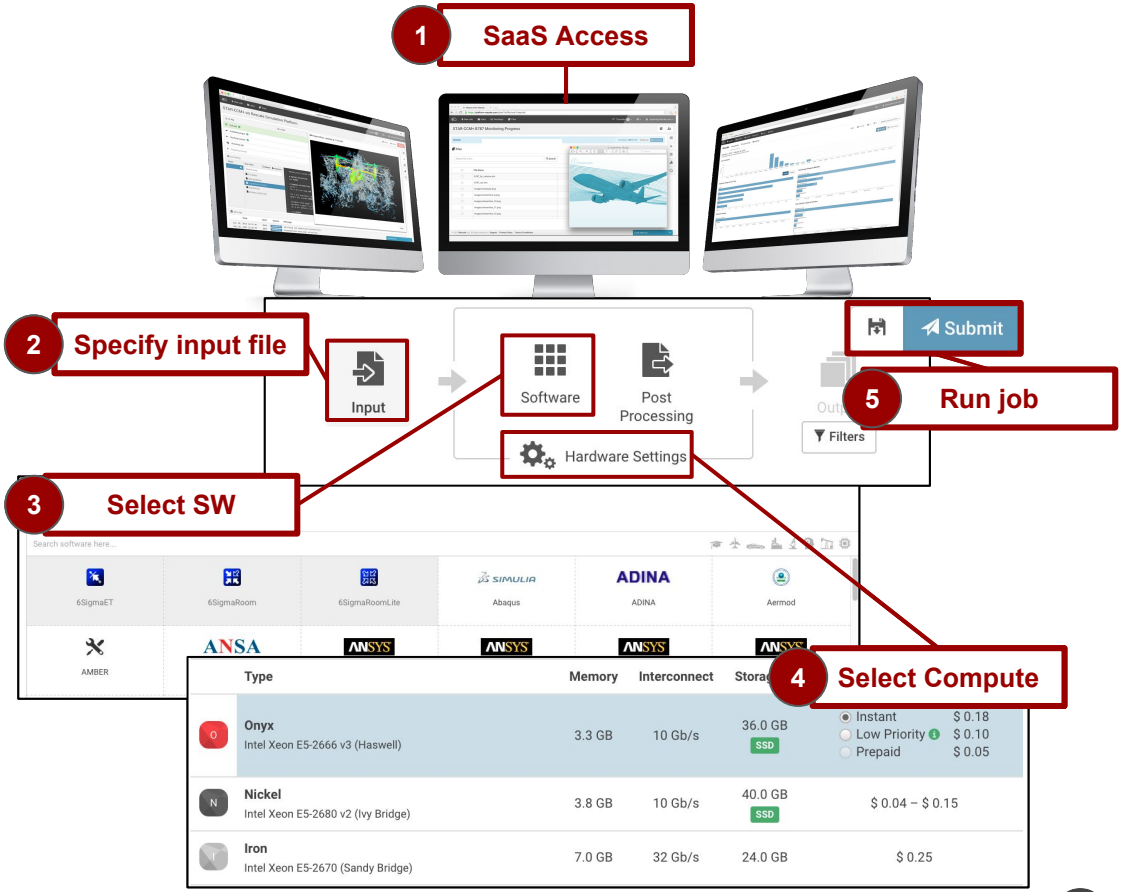
Rescale SW Library
+180 Turn-key SW Solutions

Open Source | Third Party | In-house Apps

Rescale Platform
Automated HPC IT Deployment
Seamless Hybrid, Multi-Cloud Environment

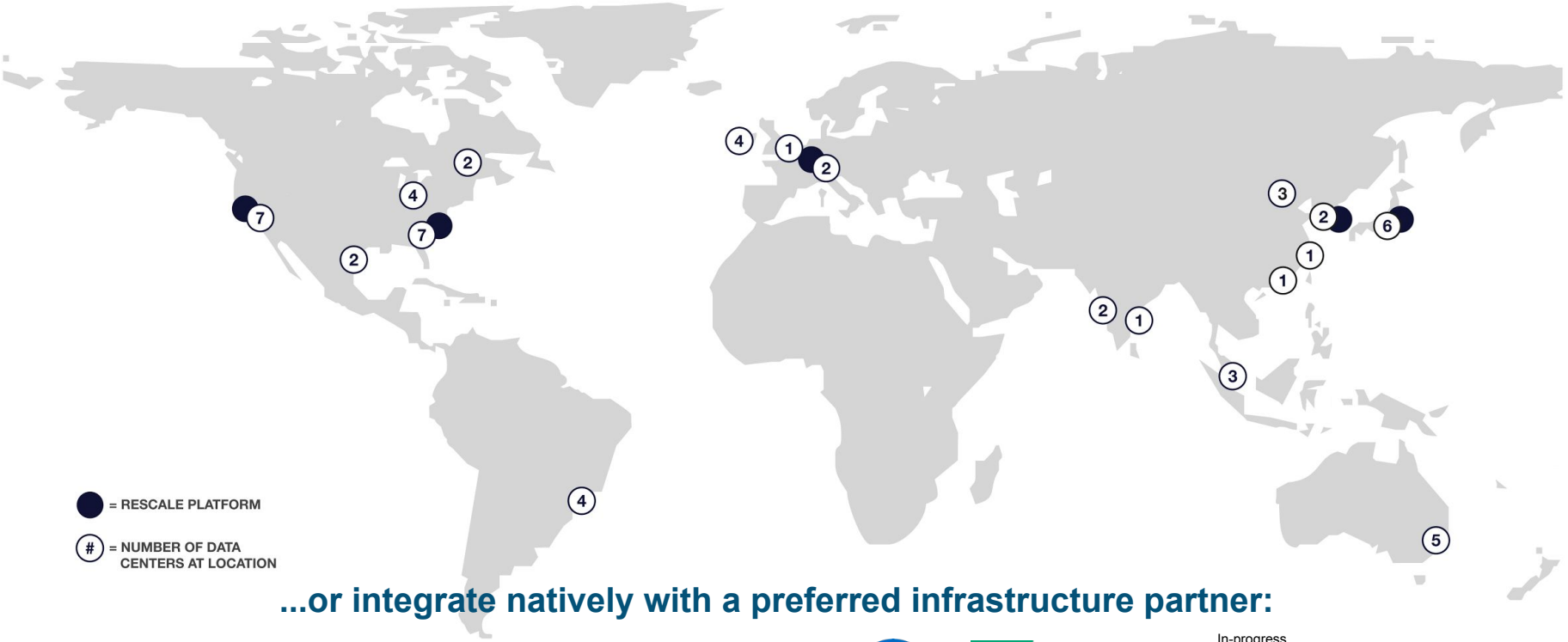
Rescale Global HPC Compute
57+ Data centers, 23+ locations

On Premise | Private Cloud | Public Cloud



Rescale Global HPC Compute

57+ Data Centers, 23+ Locations



...or integrate natively with a preferred infrastructure partner:

amazon web services

Microsoft Azure

SOFTLAYER an IBM Company

DELL

Hewlett Packard Enterprise

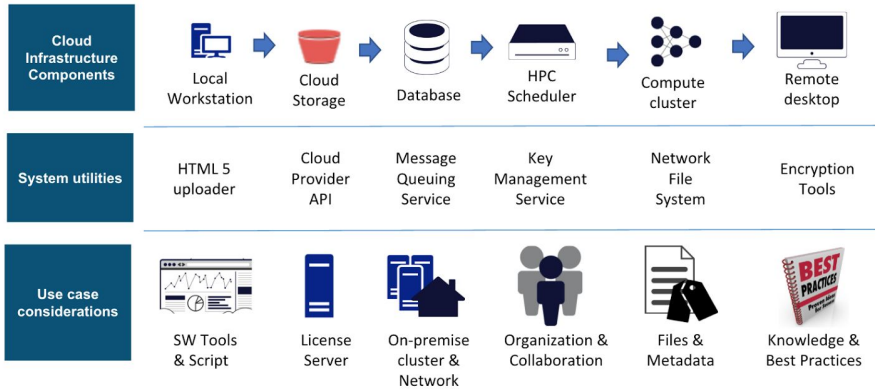
In-progress

Google Cloud Platform

Rescale Platform: A Seamless Deployment Experience

Automation of services & tools required in HPC IaaS deployment

Time consuming HPC IaaS deployment and expensive consulting services…



…transformed into one seamless, automated SaaS enterprise deployment

Rescale SW Library: One Platform, All Codes

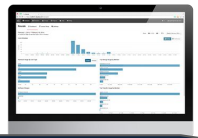
Out-of-the box integration and configuration with 3rd party and with in-house codes

Key Features Overview

Licensing
- BYOL +/- on-demand
- Customer, Rescale or ISV Partner hosted

SW and Support
- Continuous version updates
- Integrated support
- Simulation and DL expertise

Workflow
- Pre & post processing workflows
- View results online via GUI app



Unified view into entire application portfolio

Native integration with 180+ 3rd party codes...

Commercial

CD-adapco, ANSYS, SIEMENS, AVL, Dassault Systèmes, MSC Software, Altair, Convergent Science, LS-DYNA, EnSight, Autodesk, LSTC, esi get it right, COMSOL, Exa, GT Gamma Technologies, CRUNCH CFD by CRAFT Tech, MathWorks, R

OSS / Community

TensorFlow, LAMMPS, blender, cardiosolv, Cradle, GPAW!, ParaView, GEODICT, code_aster, HMMER

...and In-house Apps

Existing

Existing App 1, Existing App 2, Existing App 3, Existing App ..

ScaleX Developer

PaaS

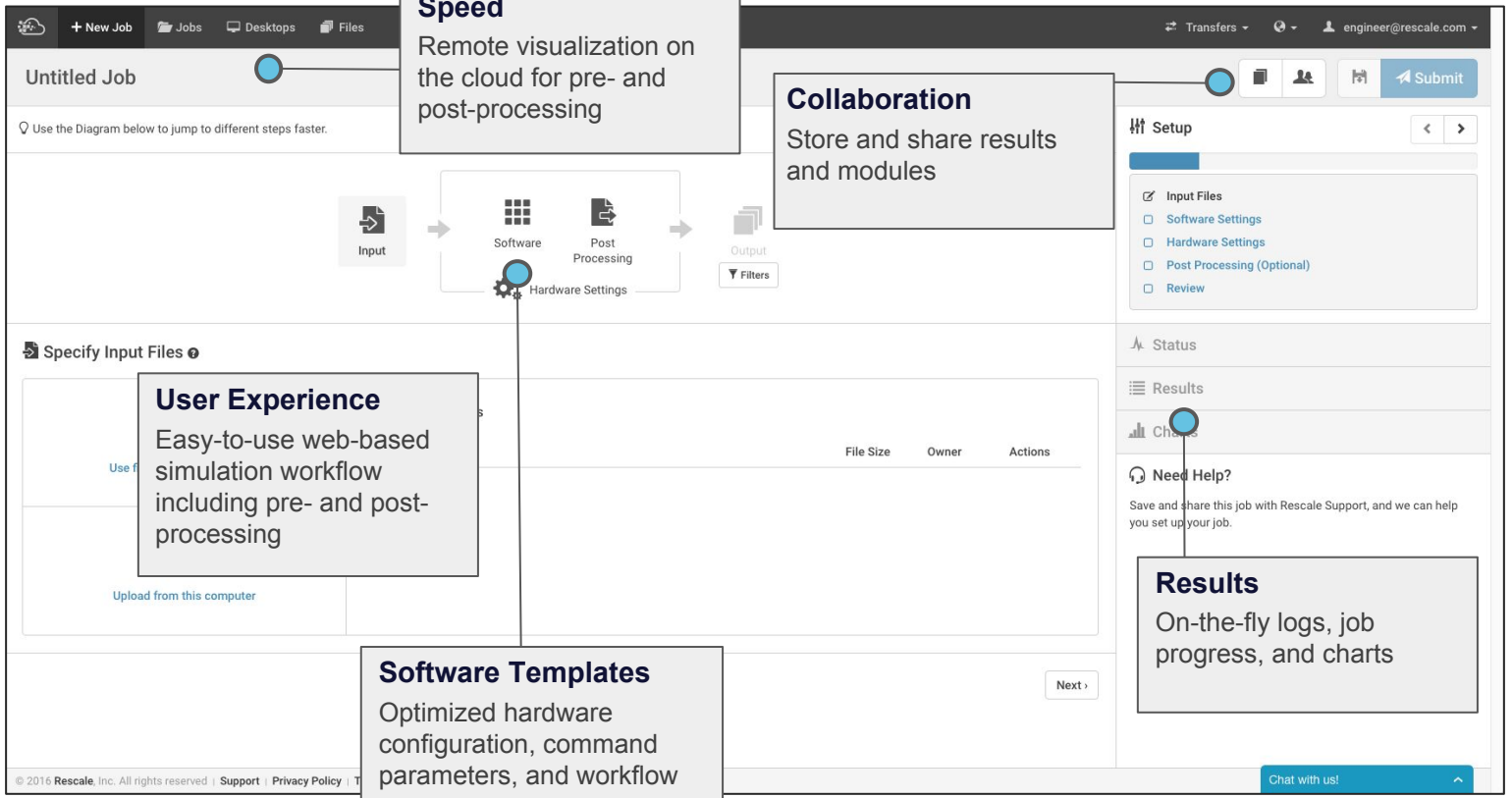
New App 1, New App 2, New App ..

Rescale Platform

Rescale Global HPC Compute

Rescale SaaS: Turnkey Platform for End-users

Zero IT footprint, intuitive and easy-to-use interface



Speed
Remote visualization on the cloud for pre- and post-processing

Collaboration
Store and share results and modules

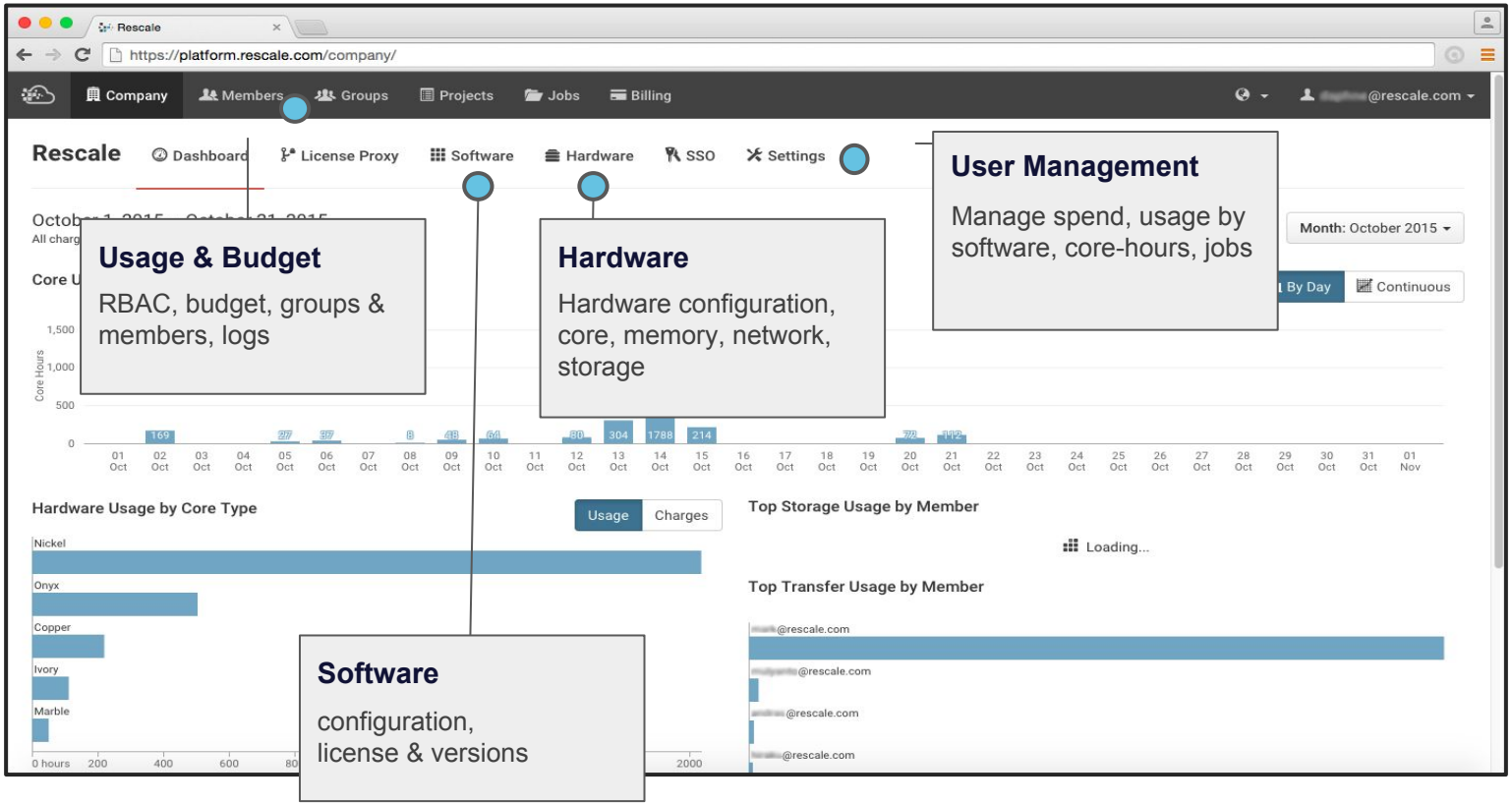
User Experience
Easy-to-use web-based simulation workflow including pre- and post-processing

Results
On-the-fly logs, job progress, and charts

Software Templates
Optimized hardware configuration, command parameters, and workflow

Rescale SaaS: Purpose-built IT portal

Increased transparency, controls and functionality for administrators

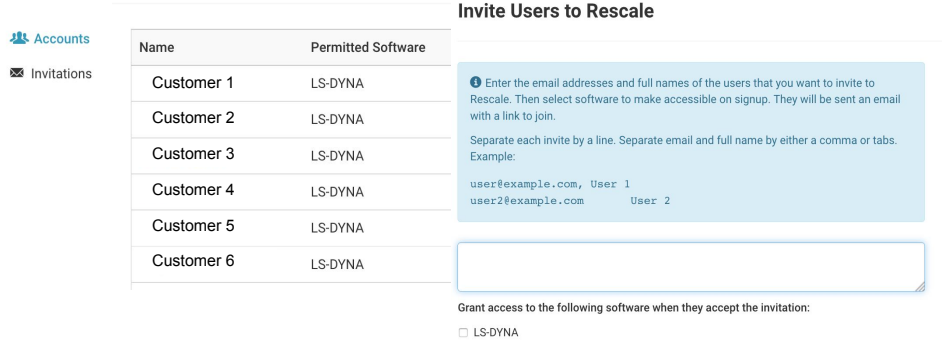


Rescale SaaS: Dedicated Partner Portal

Overview

- Separate portal for strategic partners with branded Rescale platform
- Easy-to-use SaaS interface and workflows
- Rich features and functionality enable increased transparency and usage controls

User Management

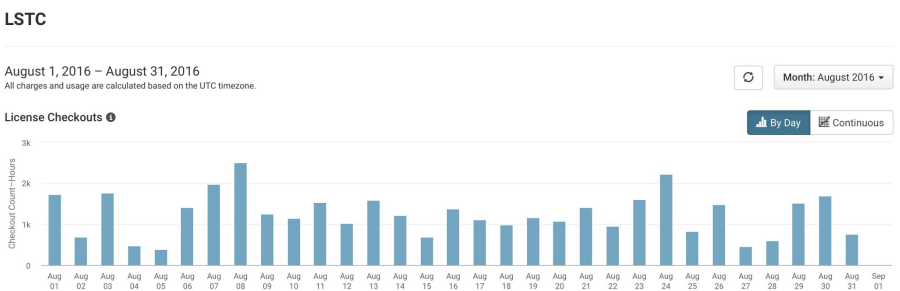


Software Management

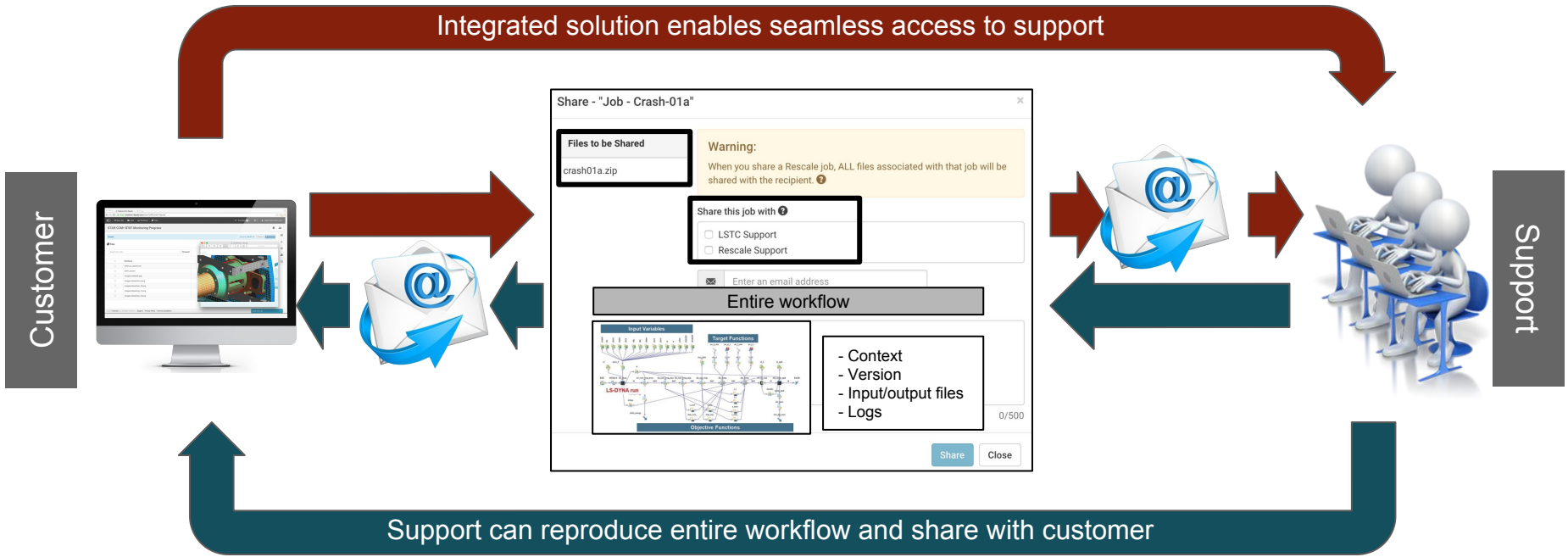
Software Name	Versions	Description	Logo
LS-DYNA	R9.0.0, R9.0.0 (AVX2), R8.1.0, R8.1.0 (AVX2), R8.0.0, R8.0.0 (AVX2), R7.1.2, R7.1.2 (AVX2), R6.1.2 (OpenMPI), R6.1.2, R4.2.1 (OpenMPI), R4.2.1, Custom Version/Revision	LS-DYNA is an advanced general-purpose multiphysics simulation package developed by the 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 (FEA) using explicit time integration.	

Public	Visible on the Platform and selectable by all users.
Requestable	Visible on the Platform but not selectable unless access is granted. Access may be requested.
Private	Hidden on the Platform unless access is granted.

Dashboarding & Usage Visibility



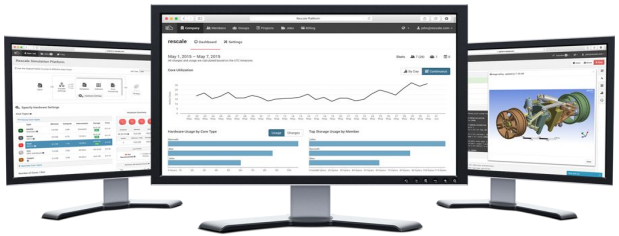
Rescale Partner Support



Best-in-class Security Deployed Across Entire Platform

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



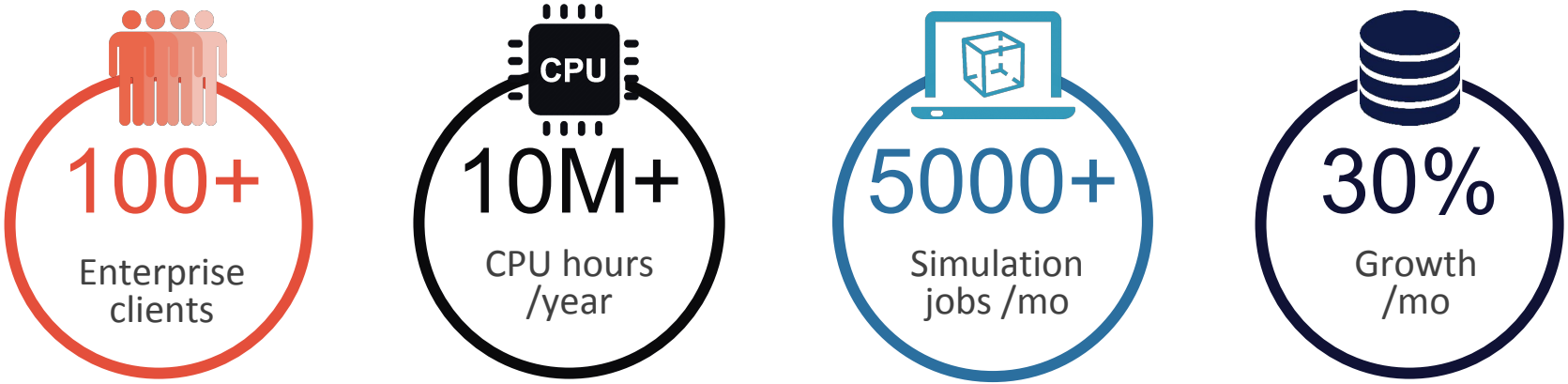
SOC 2 Type 2 Certified

ISO 27001 Certified

CSA Certified

ITAR Compliant

Trusted and Deployed at Leading Global Enterprises



SIEMENS ABB Formula 1 SPACEX Sikorsky A United Technologies Company

TREK MAGNA Capstone Turbine Corporation ISUZU autoneum

RICARDO TOYOTA boom MANOR RACING bosal

Cloud HPC underpins innovation.
Build a better world with us.