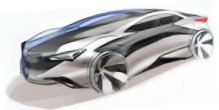
1
CAPTURE MARKET SHIFTS
2
OPERATIONAL EXCELLENCE
3
DIGITALIZATION
4
GEOGRAPHIC REACH
rescale
Automotive Industry Best Practice

Pre-Program ◄ Market Validation ► **Operation**



CONCEPT

System Design ◄ Design for Manufacturing ► **Production**

PRODUCTION

MATERIALS

CLASS A SURFACING

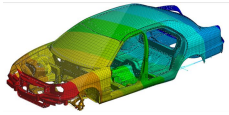
Virtual Validation ◄ Verification ► **Physical Test**

SUPPLY CHAIN

DELIVERY & SALES

ENERGY

BODY IN WHITE



SIMULATION

Detailed Design

NVH

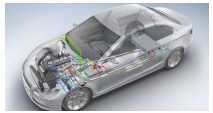
MFG ENGINEERING

MAINTENANCE & PARTS

CRASH

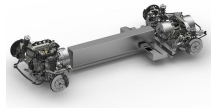
INTERIOR & TRIM

FATIGUE



ELECTRONICS

VEHICLE TEST



POWERTRAIN

SAFETY VALIDATION

Legend

- RESCALE CORE
- RESCALE INTEGRATED
- RESCALE UNADDRESSED

KEY RESCALE VALUES

1. **Product Quality**
2. **Time to Market**
3. **Lower Cost**

INDUSTRY LEADER INITIATIVES	AUTOMOTIVE DOMAINS	PRIMARY DRIVERS	KEY RESCALE VALUES
Capture Market Shifts *ADAS, Electrification, fuel cell*	**New Technology**	ENGINEER • Apply recommendation engine to leverage industry benchmarks • Drive design decisions with better traceability • Increase simulation per labor hour and throughput • Quicker handoff across groups • Faster turnaround time to reach informed decisions • Minimize engineer waste & rework • Holistic engineering process	**Improve product, performance, and quality**
Operation Excellence	**Product Development**		**Increase development efficiency**
Digitalization	**Test & Validation**	IT • Automation of business processes to increase agility • Optimize processes through data insights • Support and foster new business models • Fulfill IT requirements at the best cost/value ratio	**Shorten time to market**
Geographic Reach	**Manufacturing**		**Leverage industry-leading best practices**
	Operation		

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Pre-Program

Market Validation

Operation

CONCEPT

System Design

Design for Manufacturing

Production

PRODUCTION

MATERIALS

CLASS A SURFACING

Virtual Validation

Verification

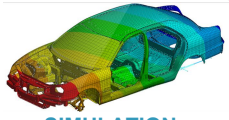
Physical Test

SUPPLY CHAIN

DELIVERY & SALES

ENERGY

BODY IN WHITE



SIMULATION

Detailed Design

NVH

MFG ENGINEERING

MAINTENANCE & PARTS

Real-time informed design decisions with surrogate-based analysis

Global and multi-disciplinary simulation collaboration

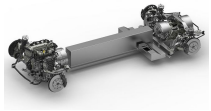
INTERIOR & TRIM

FATIGUE

ELECTRONICS

VEHICLE TEST

Accelerate design optimization across vehicle attributes with CAE and machine learning



POWERTRAIN

SAFETY VALIDATION

PRODUCT DEFINITION & CREATION

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INDUSTRIALIZATION

Pre-Program

Market Validation

Operation

CONCEPT

Enable Digital Twin workflows

Fine tune Digital Twins with test data correlation

Model Based System Engineering CAE enablement

PRODUCTION

MATERIALS

CLASS A SURFACING

Virtual Validation

Verification

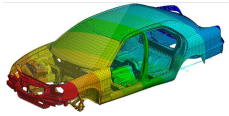
Physical Test

SUPPLY CHAIN

DELIVERY & SALES

ENERGY

BODY IN WHITE



SIMULATION

Detailed Design

NVH

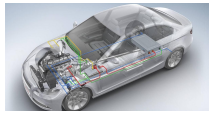
MFG ENGINEERING

MAINTENANCE & PARTS

CRASH

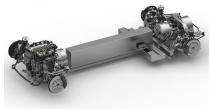
INTERIOR & TRIM

FATIGUE



ELECTRONICS

VEHICLE TEST



POWERTRAIN

SAFETY VALIDATION

Legend

RESCALE CORE

RESCALE INTEGRATED

RESCALE UNADDRESSED

PRODUCT DEFINITION & CREATION

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INDUSTRIALIZATION

PROGRAM MANAGEMENT

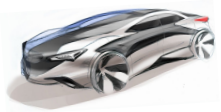
VEHICLE CONFIGURATION & BOM

COST CONTROLS AND GOVERNANCE

NEXT GEN INNOVATION DEVELOPMENT

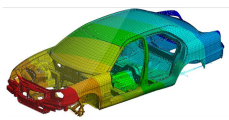
MARKETING & CUSTOMER EXPERIENCE

Pre-Program | **Design** | **Validation** | **Detailed Design** | **Physical Test** | **Production** | **Operations**



CONCEPT

CHASSIS ENG



SIMULATION

INTERIOR & TRIM

NVH

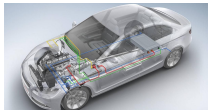
SUPPLY CHAIN

PRODUCTION

MATERIALS

STYLING - CLASS A SURFACING

CRASH



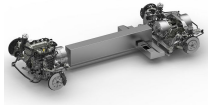
ELECTRONICS

FATIGUE

MFG ENGINEERING

DELIVERY & SALES

ENERGY



POWERTRAIN

VEHICLE TEST

SAFETY VALIDATION

MAINTENANCE & PARTS

Legend

RESCALE CORE

RESCALE INTEGRATED

RESCALE UNADDRESSED

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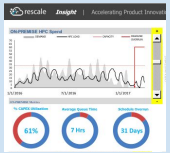
Executive

Operation Excellence

Geographic Reach



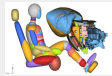
Innovation

Electrification

Autonomous

Industry 4.0

Engineering Lifecycle



Production Design	Test & Validation	Manufacturing & Operations	Next Generation Technology
Accelerate Design optimization across vehicle attributes with CAE and machine learning	Enable Digital Twin workflows	Facilitate Design for Manufacturing with process simulation	On-Demand Multiscale and Multiphysics for advanced analysis
Real-time informed design decision with surrogate based analysis	Fine tune Digital Twins with test data correlation	Digital Twin execution for Predictive Maintenance	System, subsystem and sensor simulation
Global & multidisciplinary simulation collaboration	Model-Based System Engineering CAE enablement	Support Blockchain decentralized traceability	Efficiently train and execute deep learning algorithms

IT

User & App Support	System Architecture	Compliance & IP Protection
Turnkey application deployment & maintenance	HPC-Centric Disaster Recovery	Turnkey ITAR, GDPR in the cloud
Agile implementation of new engineering methods	Maximize utilization by consolidating resources	Data export control
End-to-end simulation traceability with PLM integration	Internal cost management with ERP integration	Extend private networking to cloud

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IDEAL WORLD

LOW UTILIZATION, HIGH COST

1

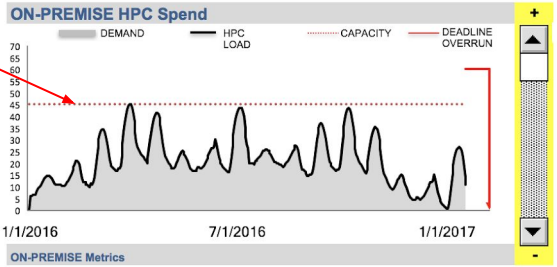
In an ideal world, compute capacity would always exceed demand

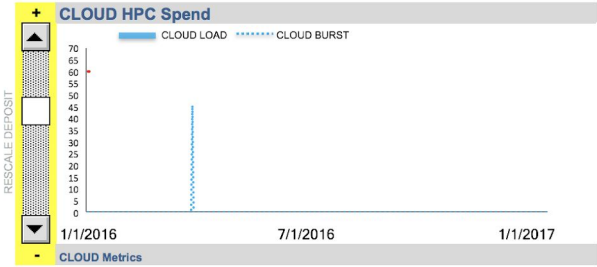
2

Product teams would suffer no resource shortage and deliver on-time

3

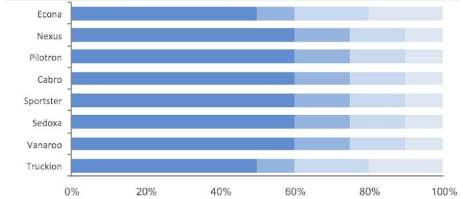
However, utilization would be low (46%), and fixed cost would be high ($45M+)

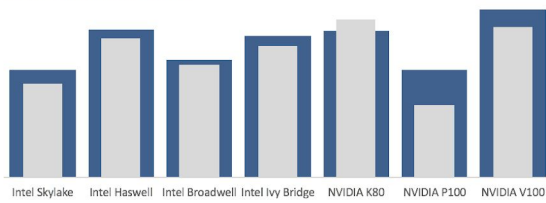


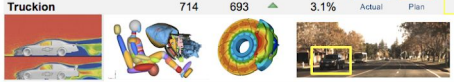


Product Lines	Budget	Spend		ROI
Econa	856	796	▲	7.6%
Nexus	189	185	–	2.4%
Pilotron	482	476	–	1.3%
Cabro	1,260	1,213	▲	3.8%
Sportster	1,084	1,093	▼	(0.8%)
Sedoxa	242	237	–	2.4%
Vanaroo	820	798	–	2.8%
Truckion	714	693	▲	3.1%

Projected Revenue (Actual, Plan) · Select







Use Cases	Actual	Ideal	Var	Sensitivity to Cloud
Design of Experiments	864	853	☆	(1.4%)
Single Physics	514	499	☆	(3.0%)
Co-simulation FMI	631	604	☆	(4.5%)
Multidisciplinary Optimizatior	684	676	☆	(1.3%)
Reverse engineering / ML	790	768	☆	(2.9%)
Design Analysis	637	610	☆	(4.4%)
Predictive Maintenance	1,177	1,118	☆	(5.3%)
Integrated sensor feedback	706	710	★	0.6%
OEM supplier data sync	790	768	☆	(2.9%)

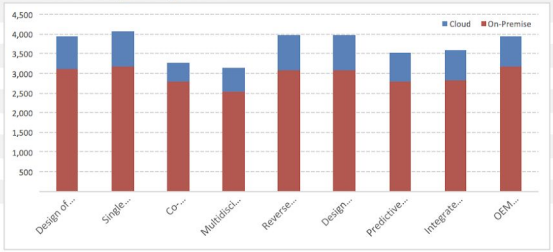
Overall Simulation Level (% of Industry Standard) 90 %

On-Premise ⟷ Cloud

Volume	Select	
100 %		0 %
100 %		0 %
100 %		0 %
100 %		0 %
100 %		0 %
100 %		0 %
100 %		0 %
100 %		0 %
100 %		0 %
100 %		0 %

All On-premise | 10% | 20% | 30% | Mixed | 100% Cloud

Defaults | Save



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REAL WORLD

LIMITED RESOURCES, SLOW TO MARKET

4

Typical IT organizations limit resources to less fixed capacity than the demand

5

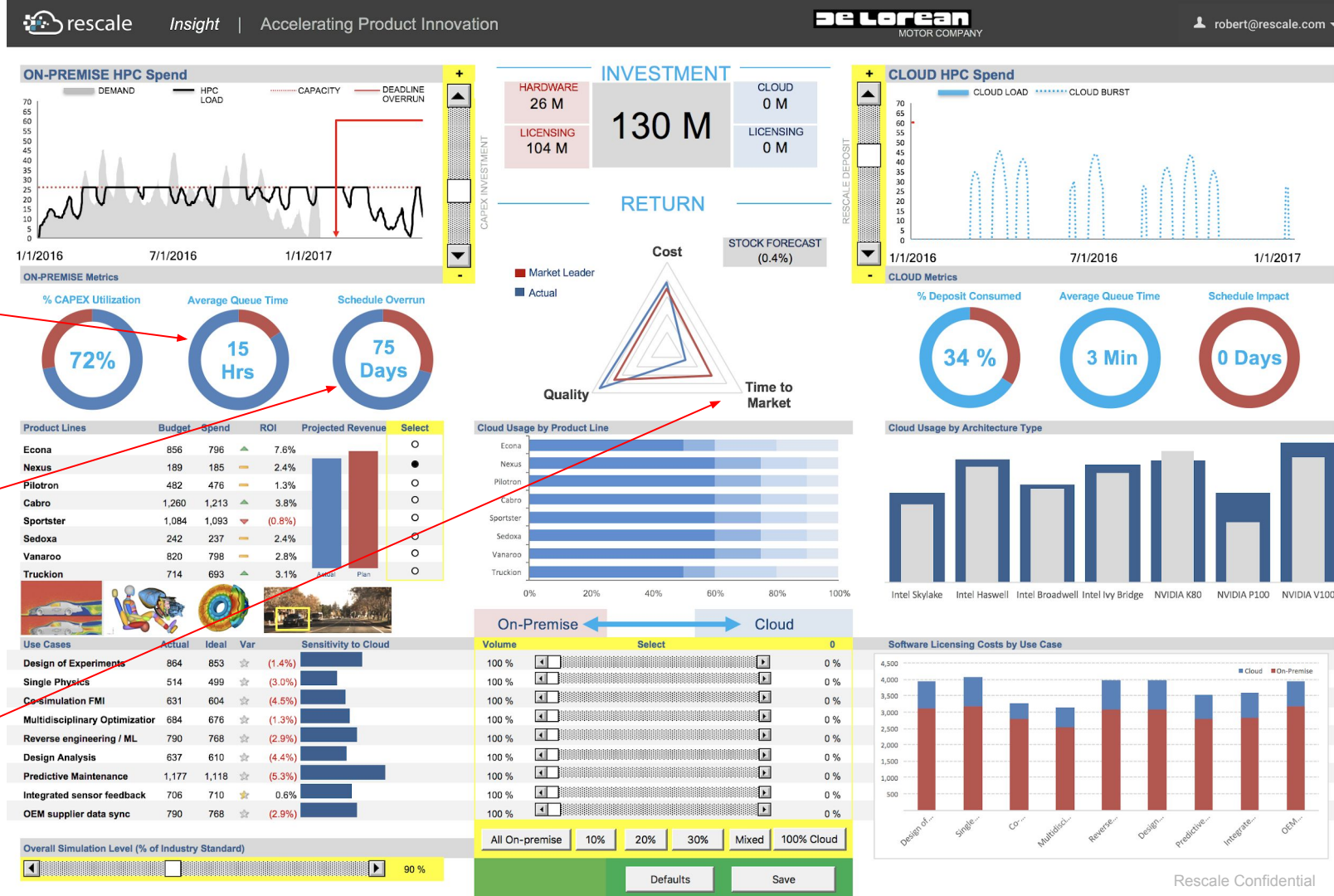
This forces engineers to submit jobs in a queue, with a 15 hour wait to begin processing

6

IT Utilization (72%) and fixed cost ($26M) are improved, but programs are now 75 days behind schedule

7

This time-to-market setback rolls up to a decline in company performance



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CLOUD-ENABLED

BEST OF BOTH WORLDS

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8

Innovative organizations enable cloud, and shift key use cases to the cloud

9

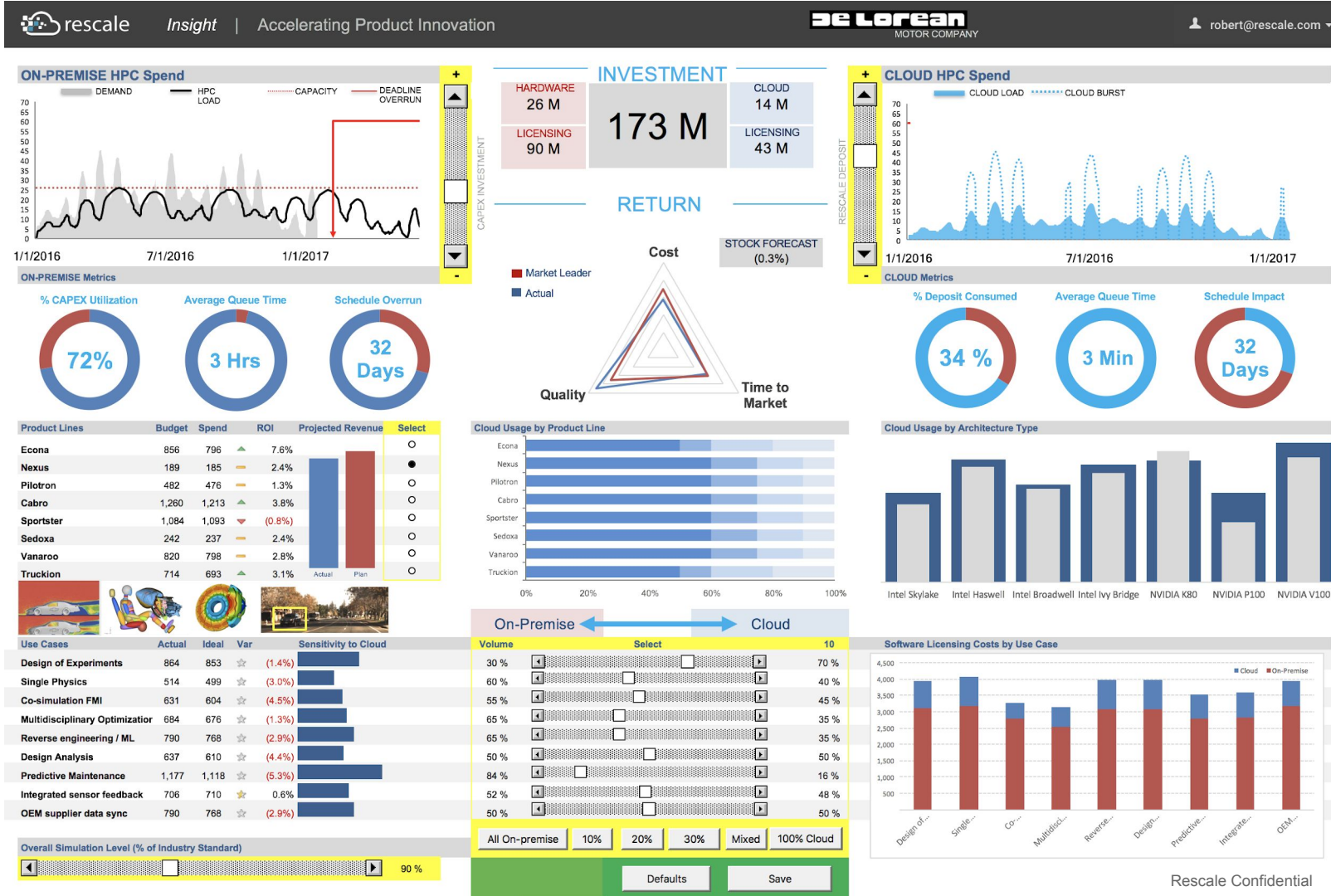
Engineers now wait less, and half of the schedule overrun is returned: (75 - 32) = 37 Days

10

The entire organization is now more agile and able to cope with unforeseen setbacks

11

With unlimited resources available on demand, engineers can now accelerate innovation



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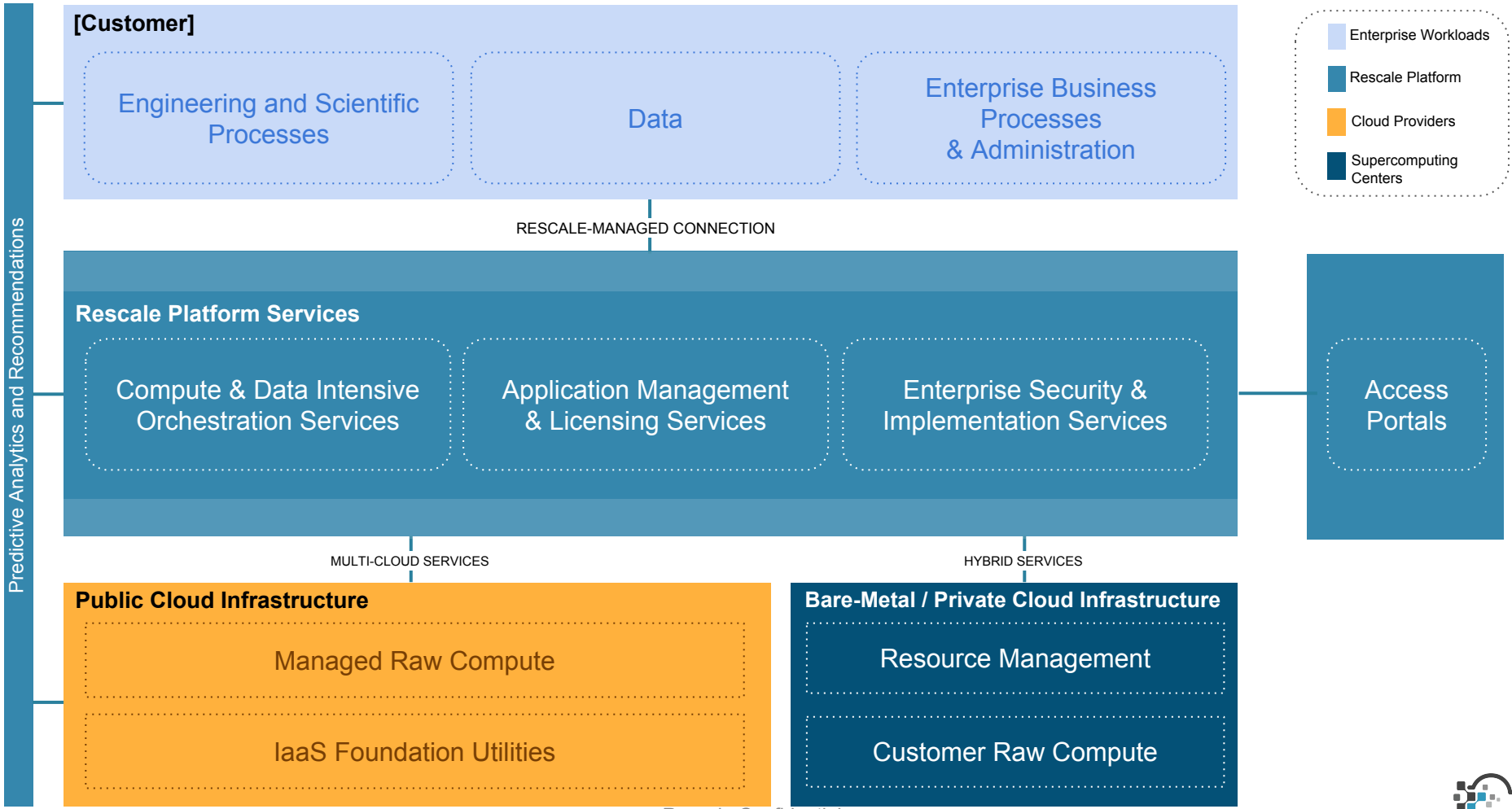
Rescale Reference Architecture - Level 1



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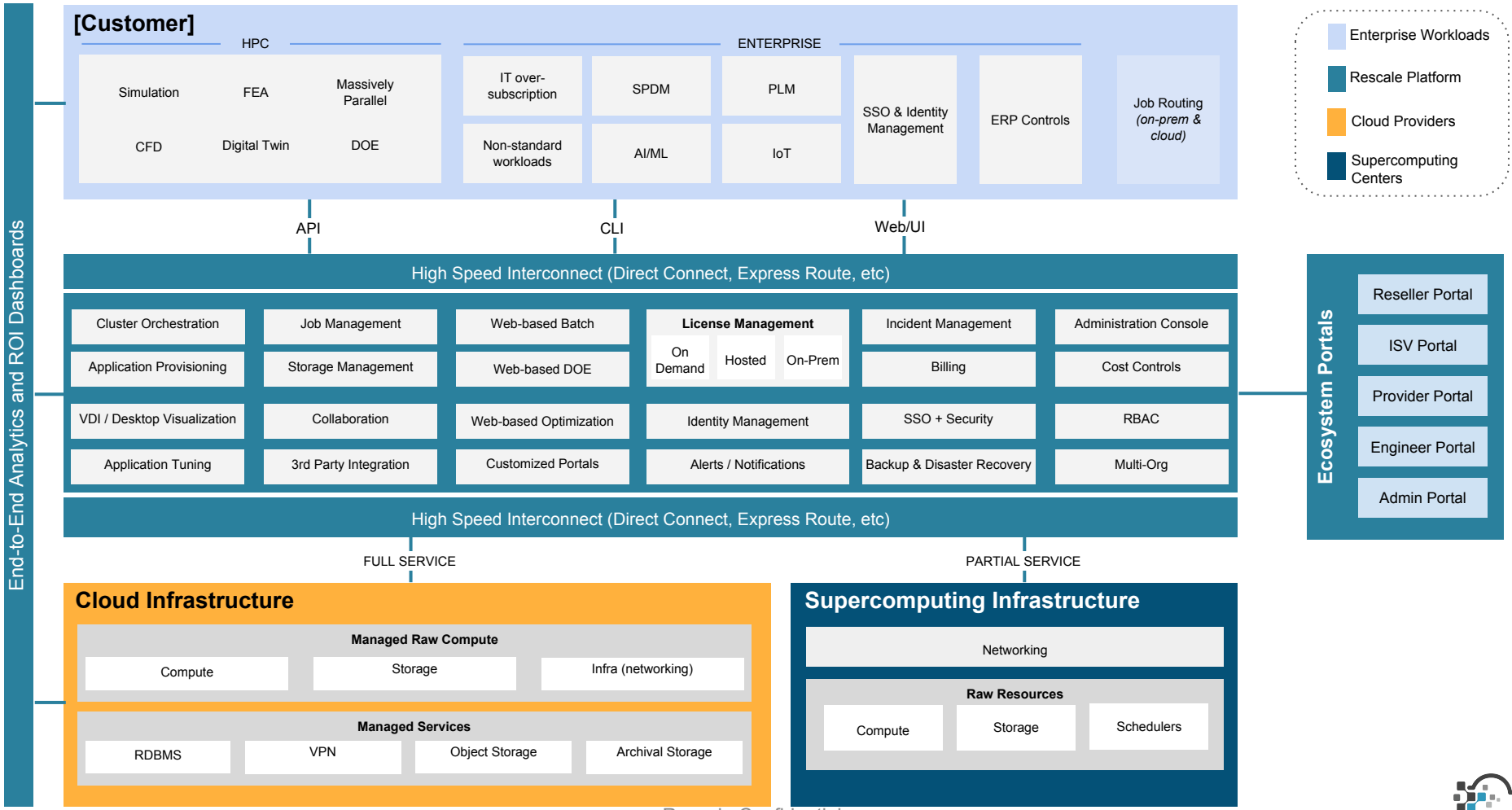
Rescale Reference Architecture - Level 2



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