

Hewlett Packard
Enterprise

SOLUCIÓN DE HPC

COMUNIDAD DE MADRID – EUROPEAN DIGITAL INNOVATION HUB

Febrero 2023

CONFIDENTIAL | AUTHORIZED

RESUMEN DE ELEMENTOS



Management Nodes

HPE Proliant DL385 Gen10 Plus v2



Login Nodes

HPE Proliant DL385 Gen10 Plus v2



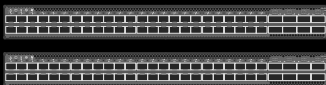
Login Storage

HPE MSA1060 Gen6



Infiniband 200Gbps Network

Mellanox InfiniBand HDR 40-port QSFP56



Ethernet 25GbE Network

HPE SN2410M



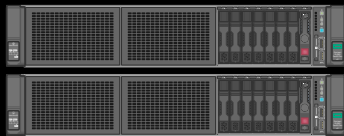
iLO 1GbE Network

HPE Aruba 2930F



Compute Nodes

HPE Apollo n2600 Gen10 Plus chassis with
10x HPE XL225n Gen10+



GPU Nodes

HPE Proliant DL385 Gen10 Plus v2



HPC/AI Storage

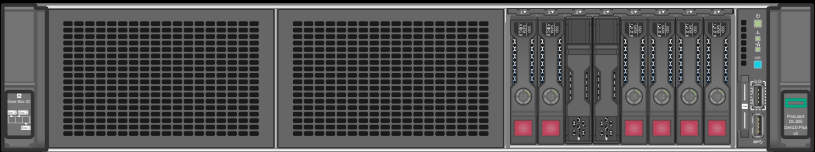
HPE Parallel File System



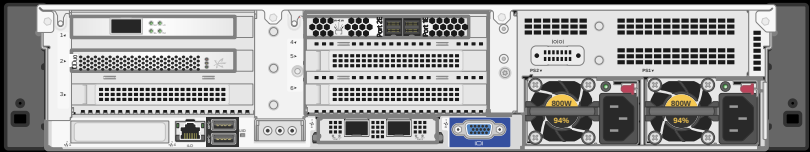
LOGIN NODES (1)

EDIH contará con dos (2) Login Nodes, cada uno de ellos con la siguiente configuración:

Tecnología	HPE Proliant DL385 Gen10 Plus v2
CPU	2x AMD EPYC 7343 3.2GHz 16-core 190W Processor
Memoria	16x HPE 32GB Dual Rank x4 DDR4-3200 CAS-22-22-22 (512GB)
Conectividad	1x HPE InfiniBand MCX653105A-HDAT HDR/Ethernet 200Gb 1-port QSFP56 PCIe4 x16 1x Mellanox MCX562A-ACAI Ethernet 10/25Gb 2-port SFP28 OCP3
Almacenamiento	1x Broadcom MegaRAID MR416i-a x16 Lanes 4GB Cache NVMe/SAS 12G Controller 2x HPE 480GB SATA 6G Read Intensive SFF BC SSD 4x HPE 1.92TB SATA 6G Mixed Use SFF BC SSD 1x HPE Smart Array E208e-p SR Gen10 (8 External Lanes/No Cache) 12G SAS PCIe Plug-in Controller
Fuentes de alimentación	2x HPE 800W Flex Slot Platinum Hot Plug Low Halogen Power Supply Kit
Licencias	1x HPE iLO5 Advanced 1x Red Hat Enterprise Linux for HPC Head Node 3yr Subscription 1x Red Hat High Availability 2 Sockets or 2 Guests 3 Year Subscription E-LTU 1x HPE Performance Cluster Manager 1 Node 3yr 24x7 Support Perpetual



HPE Proliant DL385 Gen10 Plus v2 (Front)



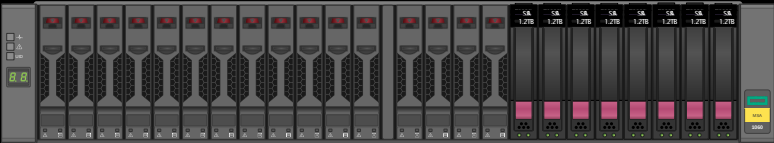
HPE Proliant DL385 Gen10 Plus v2 (Rear)



LOGIN NODES (II)

Los dos Management Nodes se conectarán a una (1) HPE MSA 1060 Gen6, que tendrá la siguiente configuración

Tecnología	HPE MSA 1060 Gen6 SAS
Discos	8x HPE MSA 1.2TB SAS 12G Enterprise 10K SFF (2.5in) HDD
Capacidad	5,46TiB netos RAID6 1 disco Hot Spare
Controladora	Dual-controller cada una con: 2x SAS 12Gb port (Front end port) 1x SAS 12Gb port (expansion drives port)
Escalabilidad	Hasta 96 discos SFF ó Hasta 24 discos SFF + 36 discos LFF



HPE MSA 1060 Gen6 (Front)



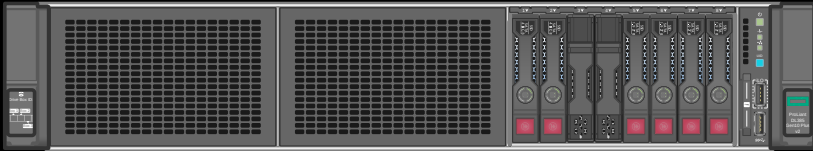
HPE MSA 1060 Gen6 (Rear)



MANAGEMENT NODES

EDIH contará con tres (3) Management Nodes, cada uno de ellos con la siguiente configuración:

Tecnología	HPE Proliant DL385 Gen10 Plus v2
CPU	2x AMD EPYC 7343 3.2GHz 16-core 190W Processor
Memoria	16x HPE 32GB Dual Rank x4 DDR4-3200 CAS-22-22-22 (512GB)
Conectividad	1x HPE InfiniBand MCX653105A-HDAT HDR/Ethernet 200Gb 1-port QSFP56 PCIe4 x16 1x Mellanox MCX562A-ACAI Ethernet 10/25Gb 2-port SFP28 OCP3
Almacenamiento	1x Broadcom MegaRAID MR416i-a x16 Lanes 4GB Cache NVMe/SAS 12G Controller 2x HPE 480GB SATA 6G Read Intensive SFF BC SSD 4x HPE 1.92TB SATA 6G Mixed Use SFF BC SSD
Fuentes de alimentación	2x HPE 800W Flex Slot Platinum Hot Plug Low Halogen Power Supply Kit
Licencias	1x HPE iLO5 Advanced 1x Red Hat Enterprise Linux Server 2 Sockets or 2 Guests 3 Year Subscription 24x7 Support E-LTU 1x Red Hat High Availability 2 Sockets or 2 Guests 3 Year Subscription E-LTU



HPE Proliant DL385 Gen10 Plus v2 (Front)



HPE Proliant DL385 Gen10 Plus v2 (Rear)



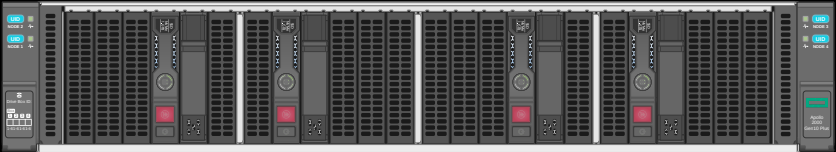
COMPUTE NODES

Inicialmente EDIH contará con **tres (3) chasis** para alojar los nodos de cómputo, cada uno de ellos con la siguiente configuración:

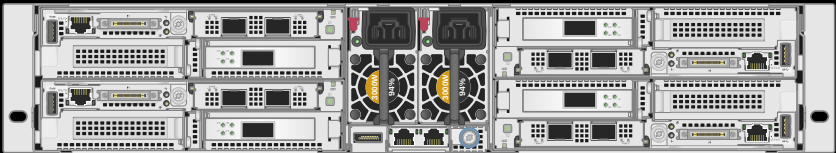
Tecnología	HPE Apollo n2600 Gen10 Plus Chassis
Capacidad	Hasta 4x HPE ProLiant XL225n Gen10 Plus
Fuentes de alimentación	2x HPE 3000W 200-277VAC Platinum Hot Plug Power Supply

En esos 3 chasis se tendrán **diez (10) Compute Nodes**, cada uno de ellos con la siguiente configuración:

Tecnología	HPE ProLiant XL225n Gen10 Plus
CPU	2x AMD EPYC 73F3 3.5GHz 16-core 240W
Memoria	16x HPE 16GB Dual Rank x8 DDR4-3200 CAS-22-22-22 (256GB)
Conectividad	1x HPE InfiniBand MCX653105A-HDAT HDR/Ethernet 200Gb 1-port QSFP56 PCIe4 x16 1x Mellanox MCX562A-ACAI Ethernet 10/25Gb 2-port SFP28 OCP3
Almacenamiento	1x HPE 1.6TB NVMe Gen4 High Performance Mixed Use SFF SC U.3 PM1735a SSD
Licencias	1x HPE iLO5 Advanced 1x Red Hat Enterprise Linux for HPC Compute Node 3yr Subscription 1x HPE Performance Cluster Manager 1 Node 3yr 24x7 Support Perpetual



HPE Apollo n2600 Gen10 Plus Chassis (Front)



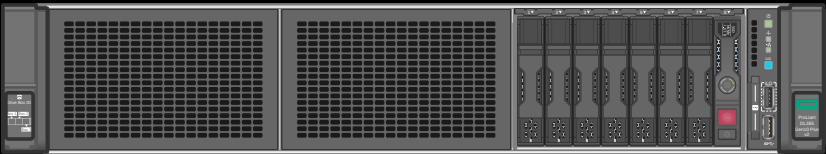
HPE Apollo n2600 Gen10 Plus Chassis (Rear)
Configuración con 4x HPE ProLiant XL225n Gen10 Plus



GPU NODES

Inicialmente EDIH contará con dos (2) GPU Nodes, cada uno de ellos con la siguiente configuración:

Tecnología	HPE Proliant DL385 Gen10 Plus v2
CPU	2x AMD EPYC 7543 2.8GHz 32-core 225W Processor
Memoria	16x HPE 32GB Dual Rank x4 DDR4-3200 CAS-22-22-22 (512GB)
Conectividad	- HPE InfiniBand MCX653105A-HDAT HDR/Ethernet 200Gb 1-port QSFP56 PCIe4 x16 - Mellanox MCX562A-ACAI Ethernet 10/25Gb 2-port SFP28 OCP3
Almacenamiento	1x HPE 1.6TB NVMe Gen4 High Performance Mixed Use SFF SC U.3 PM1735a SSD
GPU	2x NVIDIA L40S 48GB PCIe Non-CEC Accelerator
Fuentes de alimentación	2x HPE 1600W Flex Slot Platinum Hot Plug Low Halogen Power Supply Kit
Licencias	- HPE iLO5 Advanced - Red Hat Enterprise Linux for HPC Compute Node 3yr Subscription - HPE Performance Cluster Manager 1 Node 3yr 24x7 Support Perpetual



HPE Proliant DL385 Gen10 Plus v2 (Front)



HPE Proliant DL385 Gen10 Plus v2 (Rear)



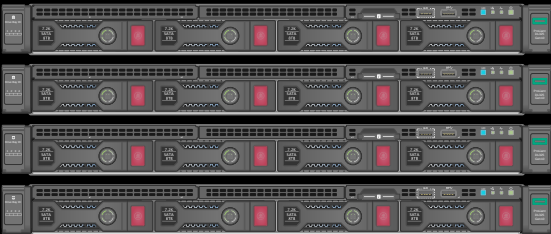
HPC/AI STORAGE

HPE Parallel File System

El cluster de HPC/AI estará conectado a un sistema de almacenamiento basado en la tecnología HPE Parallel File System:

SKU	Description	Order Qty
R7R35A	HPE Parallel File System 8Disk Bay Svr	4
R7R42A	HPE PFS 8TB SAS 7.2K LFF LP HDD	32
R7R45A	HPE PFS IB HDR 200Gb 1p QSFP56 Adptr	4
R7R37A	HPE 1.6TB NVMe MU HH PM1735 SSD	4

Parameters	Disk Tier
PFSS Node Count	4
PFSS Node Type	Disk8
Drive Type / TB	8
Drives per Node (qty)	8
Total Drives (qty)	32
Erasure Code	4+3p
Distributed Spares per Cluster	3
Failure Tolerance	1 Node + 1 Device
Raw Capacity in TB	256
Usable Capacity in TB	130.6
Read BW GB/s	2.6
Write BW GB/s	1.4
Estimate Read IOPS	4,160
Estimate Write IOPS	549
Network Data Rate Gbs	100
Network Ports configured (per Node)	2
Network Ports configured (total)	8



4 Disc Nodes
~130 TB

Infiniband Connectivity

1x InfiniBand HDR 200Gb 1-port QSFP56 per node

Ethernet Connectivity

4x 1GbE for Administration Network

4x 1GbE port for iLO

RED INFINIBAND

Mellanox InfiniBand HDR 200Gbps

- El cluster de HPC/AI usará un (1) switch Mellanox InfiniBand HDR 40-port QSFP56 Managed para interconectar todos los componentes en una red de alta velocidad y baja latencia.
- Además la propuesta incluye veintiún (21) HPE InfiniBand HDR 200Gb QSFP56 to QSFP56 2m Direct Attach Copper Cable para cubrir la conectividad de:
 - GPU nodes: 2 HDR cables
 - Compute nodes: 10 HDR cables
 - Management nodes: 2 HDR cables
 - Login nodes: 3 HDR cables
 - PFS storage: 4 HDR cables
- Software: Mellanox Unified Fabric Manager 24x7 3yr



Mellanox InfiniBand HDR 40-port QSFP56 Managed Switch

RED ETHERNET

HPE SN2410M

- El cluster de HPC/AI usará dos (2) switch HPE SN2410M 25GbE para interconectar todos los componentes a través de protocolo Ethernet. Cada uno de estos switch dispondrá de:
 - 48 puertos 25GbE SFP+/SFP28
 - 8 puertos 100GbE QSFP+/QSFP28
- Además la propuesta incluye cableado para cubrir la conectividad de:
 - GPU nodes: 4x HPE 25Gb SFP28 to SFP28 3m DAC Cable
 - Compute nodes: 20x HPE 25Gb SFP28 to SFP28 3m DAC Cable
 - Management nodes: 4x HPE 25Gb SFP28 to SFP28 3m DAC Cable
 - Login nodes: 6x HPE 25Gb SFP28 to SFP28 3m DAC Cable
 - MLAG: 2x HPE 100Gb QSFP28 to QSFP28 3m DAC Cable
- También se incluye conectividad que permitirá conectar al core de EDIH:
 - 4x HPE BLc 40G QSFP+ MPO SR4 100m XCVR
 - 4x HPE Premier Flex MPO/MPO OM4 8f 10m Cbl



HPE SN2410M 25GbE Switch



RED ILO

HPE Aruba 2930F 24G 4SFP+ Switch

Para conectar todos los elementos de la solución a la red de gestión, la propuesta incluye un (1) switch HPE Aruba 2930F 24G 4SFP+

- Además la propuesta se incluye el cableado Ethernet Cat6 para cubrir la conectividad a la red iLO de:
 - GPU nodes: 2x cat6 cables
 - Compute nodes: 10x cat6 cables
 - Management nodes: 2x cat6 cables
 - Login nodes: 3x cat6 cables
 - PFS storage: 4x cat6 cables



HPE Aruba 2930F 24G 4SFP+

RACK

- La propuesta incluye un (1) rack HPE 42U 800mmx1075mm G2 Enterprise Rack para desplegar toda la solución inicial.
- Se incluyen cuatro (4) HPE G2 Basic Modular 3Ph 22kVA/60309 5-wire 32A/230V Outlets (6) C19/1U Horizontal INTL PDU



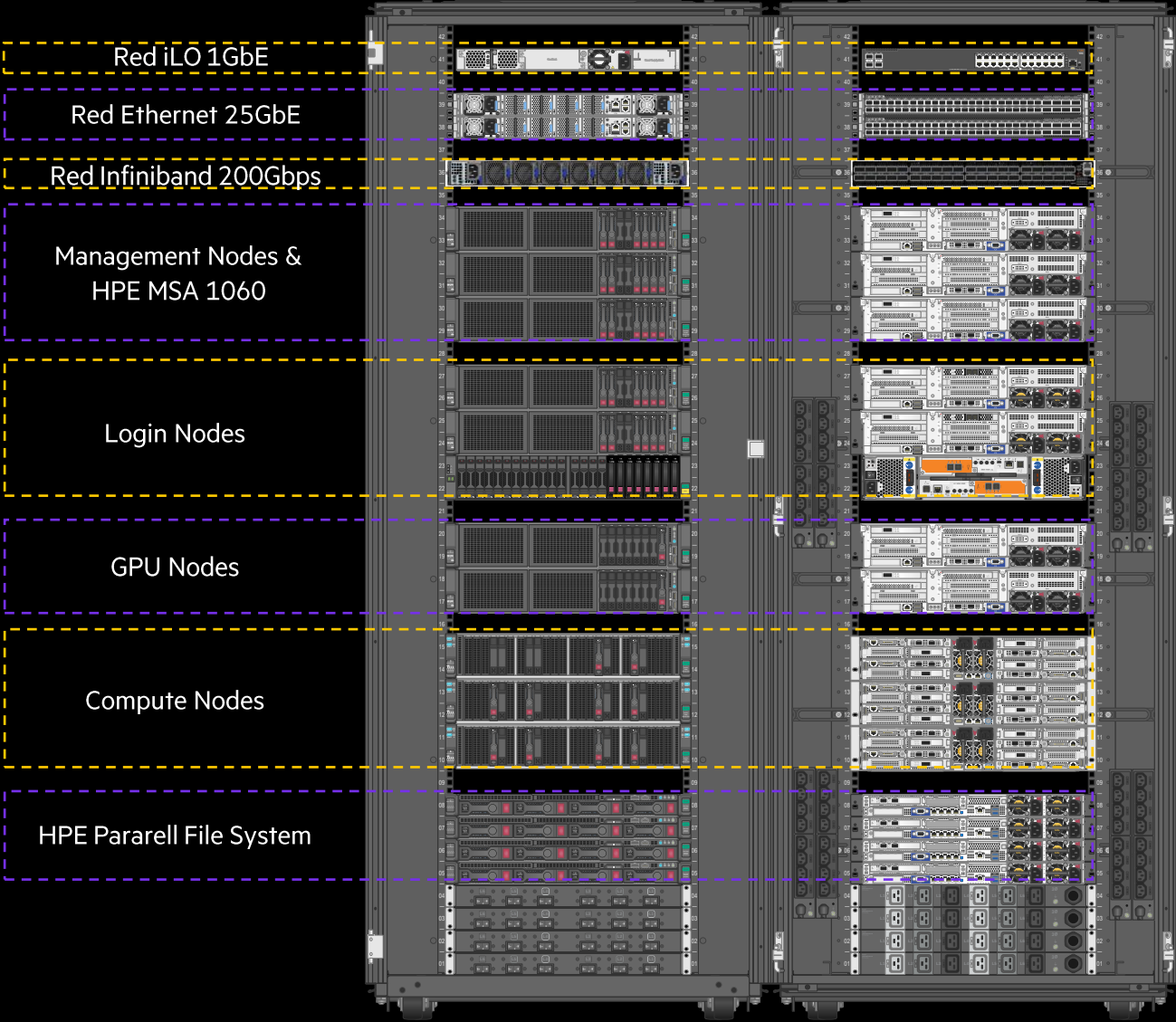
- Para conectar todos los elementos se incluyen ocho (8) Extension Bar como las que se muestran a continuación:



- A cada una de las PDUs se conectarán 2 extension bar, así se repartirá la carga de alimentación entre las PDUs.



RACK ELEVATION



VISTA DELANTERA

VISTA TRASERA

ESTIMACIÓN DE CONSUMO

- El **Utilization Power** es el valor de consumo con la solución propuesta al **60% de carga**
- **Max Load Input Power** es el valor con la solución al **100% de carga**.

Configuration Summary	
Total U's	42
U's Used	35
U's Available	7
Total Weight	587.06 Kg /1294.23 lbs
Power Summary	
System VA Rating	14947.18 VA
System BTU HR	50647.27 BTU
Input System Current	64.96 A
Utilization Power	14852.52 W
Idle Input Power	6086.51 W
Max Load Input Power	20689.19 W
Data Center Summary	
Total System VA Rating	14947.18 VA
Total Input System Current	64.96 A
Total System BTU/HR	50647.27 BTU
Total Utilization Power	14852.52 W

HPE HPC Verticals and Target Workloads

FSI



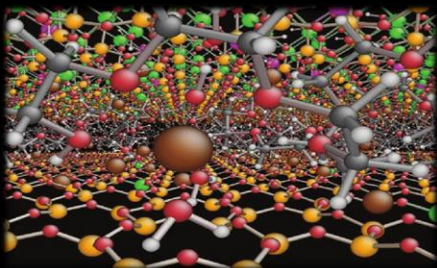
Customer Requirements

- High Performance
- Full Predictability
- Manageability
- Latest Technology

Workloads

- Portfolio Management
- Stock & Economic Forecasting
- Global Risk Management

Bio-Sciences



Customer Requirements

- Management of Data Over Time (Automated, Tiered Storage)
- Accelerated Time to Insights
- Burst Capabilities

Workloads

- Pharmaceutical Research
- Bioinformatics
- Drug Discovery
- Agricultural Research

AI inferencing



Customer Requirements

- Near line Big Data availability
- Zero Trust Architecture
- Quickly process
- Cooling infrastructure
- Longevity

Workloads

- Robotics
- IoT and Sensor Data
- Recommender Systems
- Autonomous Vehicles

Academic and Scientific Research



Customer Requirements

- High Computational Performance
- Diverse Software Support
- Security and Data Privacy

Workloads

- Physics and Chemistry Research
- Material Science
- Astronomy and Astrophysics



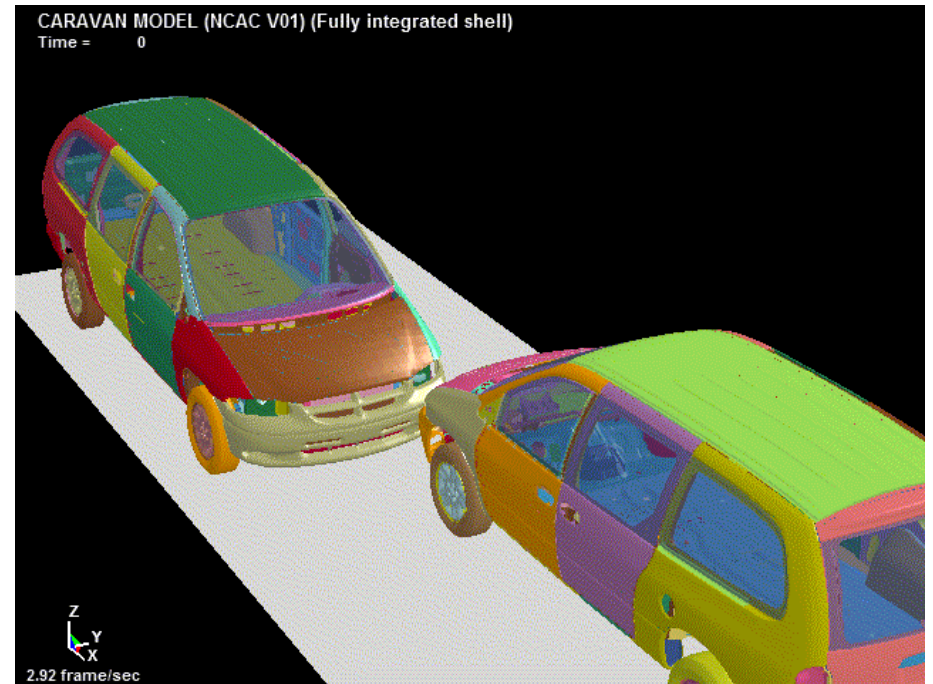
WHY IS CAE SO IMPORTANT TO CUSTOMERS?

- Fundamentally, CAE allows customers to design and test ideas for new products without having to build physical prototypes. Virtual prototypes, of course, are far cheaper and quicker to make than physical ones. So, CAE typically translates to substantial cost reductions and workflow speedups. CAE also allows companies to focus on only those designs that have the best potential for success. It reduces corporate risk by finding issues early in the design cycle before they go to manufacturing. Other “downstream” effects include reduction of warranty costs and potential litigation if a product failure causes an injury.
- A strategic investment in a new, additional or upgraded HPC CAE infrastructure can save the customer hundreds of thousands to millions of dollars in design, manufacturing, warranty, and corporate risk costs. It also can provide additional effects of creating more competitive products, happier customers, and increased revenue for the customer.



Sales tip

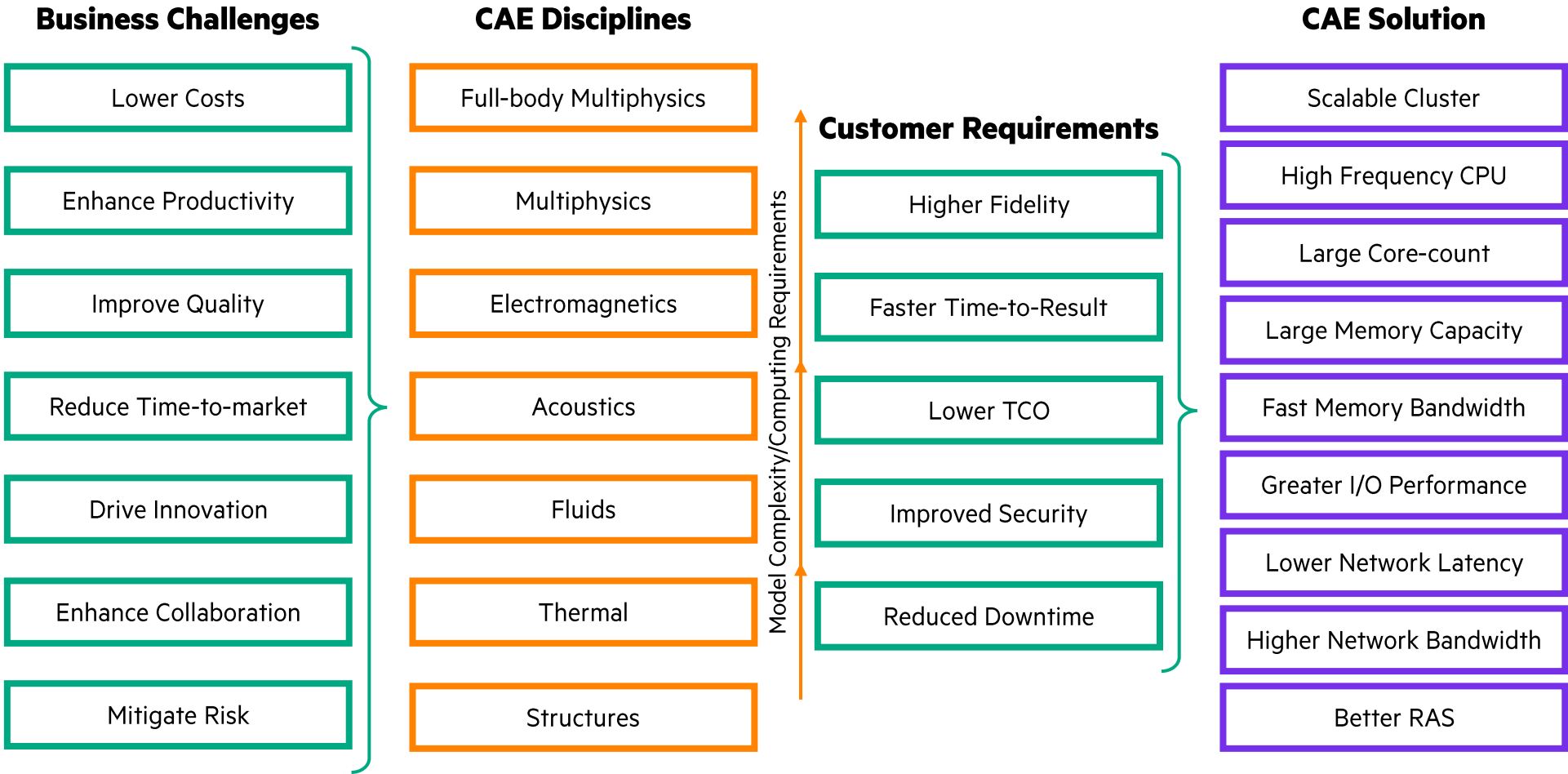
Understand how CAE adds value to your customers. Helps you communicate the value to your clients at every level—from executives to end-users



MANUFACTURING INDUSTRY BUSINESS REQUIREMENTS AND CAE SOLUTIONS

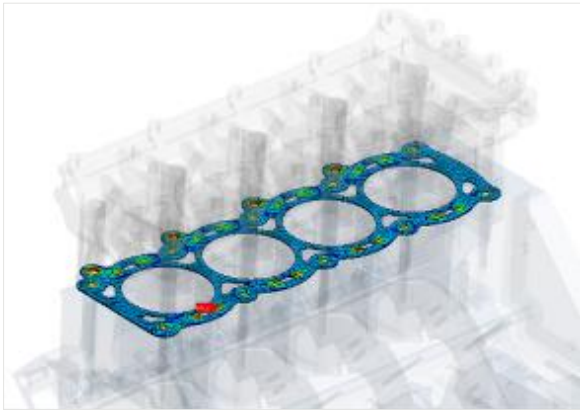
**Sales tip**

Connecting the dots from business challenges to CAE solutions helps build credibility with prospects at every level from executives to engineers.



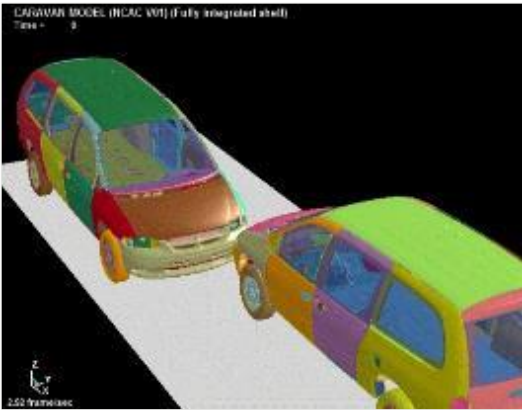
WHAT CAE SOLUTIONS DO CUSTOMERS BUY—APPLICATIONS CATEGORIES

HPC applications generally attempt to model real-world processes or physical systems. In the real world, the process or physical system being observed is often too slow, too fast, too big, too small, or too expensive to observe or prototype empirically. So CAE on HPC exposes these heretofore inaccessible worlds to the engineer. CAE solutions cover a wide range of disciplines, but broadly they span these four application categories:



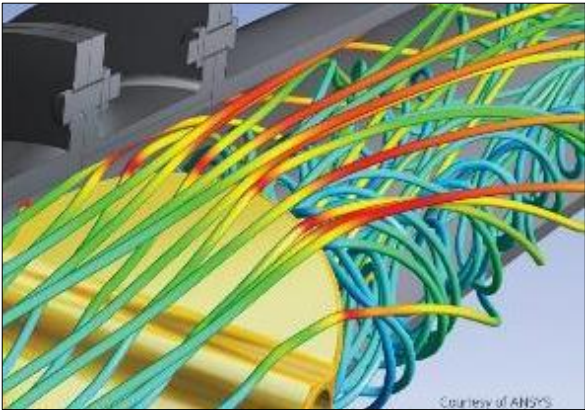
**Computational Structural
Mechanics (CSM)
For Implicit FEA**

Simulate the strength and vibration characteristics of product.



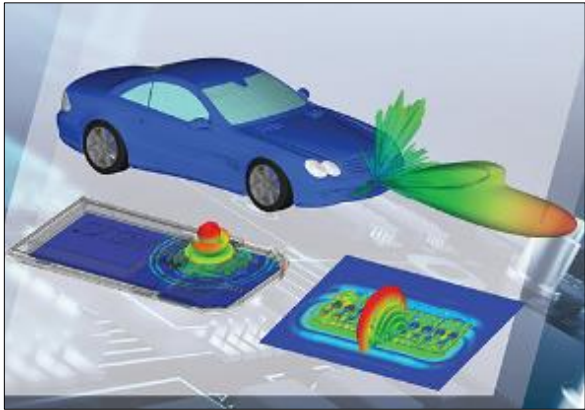
**Computational Structural
Mechanics (CSM)
For Explicit FEA**

Simulate the shock impact of products over short duration.



**Computational
Fluid Dynamics
(CFD)**

Simulate Aerodynamics; cooling; mixing of fluids such as air, water and chemicals.



**Computational
Electromagnetics
(CEM)**

Simulate radar signature/scattering to assess/prevent detection and identification; Antenna performance, ASIC package simulations.



Sales tip

Having a high-level understanding of these CAE workloads will make you more credible when speaking with clients.

GRACIAS



CONFIDENTIAL | AUTHORIZED