The Dell HPC System for Manufacturing is designed specifically for digital manufacturing workloads. It bridges the technology gap between workstations and full scale HPC clusters/data centers.

This system combines compute, storage and networking into a single, easy-to-manage solution, easily configured to fit your specific manufacturing requirements through a core set of powerful and flexible building blocks:

• Explicit Solver Building Block
• Implicit Solver Building Block
• Implicit Solver GP/GPU Building Block
• VDI Building Block

Powering the next industrial revolution

Technology has been the driving force behind industrial revolutions for more than two hundred years. The latest wave of transformation is built on developments in electronics and information technology. The largest automotive, aerospace and heavy industrial manufacturers have been using high performance computing (HPC) and digital manufacturing technologies for decades. These technologies are fundamental to their business model and their ability to compete.

Small-to-medium manufacturers have not been so fortunate when it comes to accessing this critical technology. Many have tight budgets and limited people resources. Adding HPC and digital manufacturing capabilities to their existing manufacturing processes can be a risky proposition.

Barrier to manufacturing innovation

Many of these small-to-medium manufacturers are interested in exploring the benefits of high performance computing, but only if they can do so with minimal risk and expense. Physical prototype testing is a very expensive and time-consuming process. Many are interested in using virtual simulations and modeling that are reliable and accurate and will help reduce design cycle time and errors.

However, introducing complex and expensive HPC-based technology is a challenge that many small-to-medium manufacturers can’t do on their own.
The biggest barriers to adopting High Performance Computing are cost and uncertainty.

- Costs include hardware; software with its tangled and expensive licensing requirements; finding trained staff; maintenance, data center power, cooling and floor space costs — the list goes on.
- HPC has been traditionally a custom-built, non-standardized technology. It can be very difficult to measure the appropriate return on investment and payback period, as well as manage risks, creating uncertainty about investing in this technology.

**Accelerating adoption and mitigating risk through a proven technology and support model**

For companies to get over the hurdles inherent in the adoption of high performance computing, the search is on for partners and programs that mitigate risk and help defray costs, so that they can make the investments required to improve their competitiveness technologically.

**Dell addresses HPC manufacturing challenges through a proven, time-tested framework of open standards-based technology, services, expert guidance and collaboration.**

Most small company IT managers are reluctant to go into a new area of technology where they have little to no experience. Dell provides domain-specific, pre-sales and architectural expertise to help you determine the right configuration based on your manufacturing requirements.

Dell engineering optimizes and validates superior configurations to help our manufacturing customers achieve faster deployment and productivity for specific simulation workloads:

- Tuned configuration for manufacturing with focus on ISV license optimization
- Tested with ISV software applications, including SIMULIA® Abaqus®, ANSYS® Mechanical™ & Fluent®, CD-adapco® STAR-CCM+® and LSTC LS-DYNA®

- Simplified management using Dell iDRAC with Lifecycle Controller to update, monitor and maintain PowerEdge™ servers

Dell’s single source of support for consistent, predictable and reliable IT services helps eliminate deployment and production bottlenecks and mitigate risks associated with integrating high performance computing into your manufacturing environment.

Dell can also provide secure remote system monitoring, management and support, reducing your need for expensive full-time HPC IT support staff, while increasing your system utilization and uptime. Our Remote Cluster Management (RCM) Service lets customers with little HPC resources or experience to gain the benefits of HPC, allowing customers to focus on their core engineering or research.

**Contact your Dell HPC Specialist to learn how you can accelerate your manufacturing workloads, reduce time to production and lower your system costs with a Dell HPC System for Manufacturing.**

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**Solution details**

- Flexible design to scale from 4 to 32 nodes per system
- Multiple options for solution specific workloads using building blocks
  - Explicit Solver Building Block
  - Implicit Solver Building block
  - Remote Desktop (VDI) Building Block
- Options available for storage using NFS for persistent storage (up to 480TB per namespace)
- Options for Software integration using Bright Cluster Manager 7.2, Red Hat® Enterprise Linux® 7.2

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**ISV Applications**

<p>| Dell Pro Support, Pro Support Plus, Deployment Services |
| Bright Cluster Manager |
| HPC Storage Offerings |
| HPC Networking Offerings |
| Explicit Solver Building Block |
| Implicit Solver Building Block |
| Implicit Solver GPU Building Block |
| VDI Server Building Block |</p>
<table>
<thead>
<tr>
<th>Dell HPC System for Manufacturing</th>
<th>Explicit Solver Building Block</th>
<th>Implicit Solver Builder Block</th>
<th>Implicit Solver GP/GPU Building Block</th>
<th>Management Building Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical ISV application workloads</td>
<td>CFD: ANSYS Fluent, CFX™, STAR-CD™, STAR-CCM+, OpenFOAM®, PowerFLOW® Explicit Structures: SIMULIA Abaqus/Explicit, LS-DYNA, PAM-CRASH®, RADIOSS™</td>
<td>ANSYS-Mechanical, SIMULIA Abaqus/Standard, MSC, Nastran™, NX.Nastran™, Optistruct®</td>
<td>ANSYS-Mechanical, SIMULIA Abaqus/Standard, MSC.Nastran, NX.Nastran, Optistruct</td>
<td>N/A</td>
</tr>
<tr>
<td>Typical simulation types</td>
<td>Crash, stamping, safety, Impact analysis, fluid flow, pump design, combustion, aerodynamics, acoustics</td>
<td>Noise Vibration Harshness (NVH), structural integrity (linear and nonlinear), assembly</td>
<td>Noise Vibration Harshness (NVH), structural integrity(linear and nonlinear), assembly</td>
<td>N/A</td>
</tr>
</tbody>
</table>
| Typical run environment          | • MPI parallel jobs run across 4-12 nodes  
• Typically run on a cluster with a high-speed InfiniBand or 10GE network  
• Minimal I/O to local disks during job | • Most jobs run on a single node  
• Jobs tend to require large memory to improve overall performance  
• Scratch I/O to array of local disks typically preferred over shared file system | • Most jobs run on a single node GP/GPUs  
• May help specific workload cases but not in general  
• Jobs tend to require large memory to improve overall performance  
• Scratch I/O to array of local disks typically preferred over shared file system | N/A |

| Hardware Components              | PowerEdge C6320  
• Intel E5-2697Av4  
• 128GB 2400MHz DDR4 memory  
• 2x600GB 10Krpm SAS HDDs | PowerEdge R630  
• Intel E5-2667v4  
• 512GB 2400MHz DDR4 memory  
• 8x300GB 15Krpm SAS HDDs | PowerEdge R730  
• Intel E5-2680v4  
• NVIDIA K80 GPU, NVIDIA GRID K2  
• 256GB 2400MHz DDR4 memory  
• 8x300GB 15Krpm SAS HDDs | PowerEdge R630  
• Intel E5-2680v4  
• 128GB RAM 2400MHz DDR4 memory 2x600GB  
• 10Krpm SAS HDDs |
| Management Software              | N/A | N/A | N/A | The Dell HPC System for Manufacturing is configured to work with all industry leading IPMI-based cluster management tools, but is tuned to work best with Bright system software. |
| Management server building blockers | N/A | N/A | N/A | Cluster management — Typically one for modest clusters, two for larger clusters  
Cluster administration (queues, etc.) — Typically one or two for each specific task  
Login — Typically one for each 30-100 users |

Contact your Dell representative or visit Dell.com/hpc for more information.

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