A digital twin is a highly virtual model that is an exact representation, or "twin", of a physical object or business process. Digital twins can be the virtual mirror of entire buildings, factories, distribution centers, cities, or even the whole planet.

Designing and conducting simulations within a digital twin delivers optimized business processes and improved results to companies that deploy them. The Accenture Technology Trends 2022 report forecasts the worldwide market for digital twin platforms to grow from $3.2 billion in 2020 to $184.5 billion by 2030. This shows the competitive disadvantage to companies not taking this crucial next step in their Intelligent Transformation.

Before you can deploy any new device or autonomous agent in a real-world environment, organizations need to understand how they will behave in the physical world. This can be achieved through first simulating the change in a digital twin. Digital twins must be physically accurate representations of their real-world counterparts. True-to-life simulations require precision timing, ensuring synchronization across the physical and digital worlds with interactions occurring within the same real-time space for all actors in the simulation.

Figure 1. The relation of the digital twin to the physical world
Creating an industrial-scale digital twin simulation also involves capturing and modeling data from large numbers of machines, robots, sensors, autonomous vehicles, people, and processes. Building these sophisticated environments and accurately processing and modeling the data generated by the multitude of interactions of these components requires powerful computing solutions.

**NVIDIA OVX** is purpose-built to power large-scale industrial digital twins from the data center to create and operate massively complex models and true-to-reality simulation environments in real time leveraging the Omniverse Enterprise platform.

### The “Power of 2” removing OVX complexity for Lenovo customers

Through the “Power of 2” collaboration, Lenovo partners with NVIDIA to bring our joint customers innovative solutions and infrastructures to support their Intelligent Transformations with smarter technology for all. This means equipping businesses across industries with the instruments to make data-driven decisions and gain faster insight from the edge to the core, achieving a competitive advantage.

Lenovo Everyscale OVX is a result of that deep partnership providing an architecture that is optimized to deliver extreme performance, scalability, and low latency to meet the demands of digital twins within the NVIDIA Omniverse. Lenovo’s integrated solution approach removes the complexity in design, procurement, and testing of various infrastructure components providing predictable performance and solution-level interoperability support.

**Lenovo Scalable Infrastructure** is the solution-framework Lenovo Everyscale OVX is built upon. Through solution-level interoperability testing Lenovo can warrant a fully end-to-end supported environment based on proven best practices while still tailoring it exactly to the customer’s needs. That means that the infrastructure is not just supported on a component break and fix or “box”-level, but with a holistic perspective including software, firmware and even firmware-settings.

In addition to the interoperability solution support, Lenovo Scalable Infrastructure is being deployed fully pre-integrated, pre-cabled, pre-loaded with the latest firmware “best recipe” to ensure a fast and reliable delivery and installation resulting in best-in-class time to solution.

Lenovo Services and NVIDIA Services provide the necessary experience to bring your Digital Twin environment to life partnering with your business lines and potential business consulting partners to fully incorporate the NVIDIA Omniverse into your business-verse.

### OVX digital twin example use cases

The application of a digital twin is only limited by the reality it represents. The following two use cases give an idea of the power and value that an Omniverse digital twin can drive. Other real-life examples can be found on the NVIDIA Digital Twins page.
Reducing planned and unplanned downtime for plant maintenance

Whether it is a turnaround in a refinery or a maintenance event in a power production plant (hydroelectric, nuclear, etc.) any interruption of production is extremely expensive. Leveraging a digital twin for planned and unplanned downtimes can massively reduce downtime duration resulting in $ millions savings for the operator. An Omniverse digital twin could operate as a safe cowork space for engineers, contractors, and operators alike allowing lifts to be planned, measurements to be taken, and equipment to be designed.

Evolve and optimize manufacturing and supply chain

Operating a manufacturing environment does not end at the walls of the factory floor but requires a seamless engine from supply coming in over product being built to shipping out. A digital twin can realize the whole process from digital humans and trucks as well as autonomous robots that obey the laws of physics, it can create a perfect replication of reality. Through that digital twin the warehouse design and flow can be optimized, the intelligent robots can be trained, and overall productivity can be improved.

OVX Software platform

NVIDIA Omniverse Software

NVIDIA Omniverse™ Enterprise is an end-to-end collaboration and simulation platform that fundamentally transforms complex design workflows, creating a more harmonious environment for creative teams. It consists of three software components:

- **NVIDIA Omniverse Enterprise Nucleus**
  Collaboration service which enables a variety of Omniverse Enterprise-enabled client applications (Apps, Connectors, and others) to share and modify authoritative representations of virtual worlds. Omniverse Nucleus is the database and collaboration engine of Omniverse and built for collaboration across multiple users.

- **NVIDIA Omniverse Enterprise Creator**
  App for accelerated advanced scene composition and world building. Creator enables scene composition, simulation, and rendering on workstations and virtual workstations.

- **NVIDIA Omniverse Enterprise Reviewer**
  App designed to visualize projects in stunning, physically accurate photorealism and enable minor editing and comment permissions. Reviewer enables review and approval for workstations and virtual workstations.

NVIDIA Omniverse Enterprise Nucleus is licensed on a per named user basis while NVIDIA Omniverse Enterprise Creator and Reviewer are licensed on a Concurrent User basis. The NVIDIA Omniverse Enterprise software licenses can be configured and ordered together with the Lenovo EveryScale OVX solution.
The Lenovo EveryScale OVX solution is a purpose-built NVIDIA Omniverse computing offering based on Lenovo Scalable Infrastructure integrating Lenovo ThinkSystem servers and designed to meet the demands of large-scale digital twins.

Lenovo Scalable Infrastructure is a framework for designing, manufacturing, integrating and delivering data center solutions, with a focus on High Performance Computing (HPC), Technical Computing, and Artificial Intelligence (AI) environments.

The Lenovo EveryScale OVX computing solutions architecture is designed to scale leveraging NVIDIA Spectrum Ethernet switches and, when combined with NVIDIA Omniverse Enterprise, delivers a fully integrated solution that transforms workflows for digital twins.

As a result, despite the scale and complexity of an NVIDIA Omniverse digital twin solution, customers can focus their efforts on maximizing their business value, instead of consuming valuable resources to design, optimize, install, and support the infrastructure. Again, this is all thanks to Lenovo Scalable Infrastructure and the engineering partnership between Lenovo and NVIDIA.

### OVX Infrastructure solution

Lenovo EveryScale OVX solution also leverages RedHat Enterprise Linux as Operating System and Lenovo XClarity family to simplify and automate the deployment and management of the solution.

To run the Lenovo EveryScale OVX solution as a fully virtualized environment Lenovo and NVIDIA partner with VMware leveraging vSphere.

<table>
<thead>
<tr>
<th>Part No</th>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7S02002MWW</td>
<td>S82A</td>
<td>NVIDIA Omniverse Enterprise Nucleus Subscription per Named User, 1 Year</td>
</tr>
<tr>
<td>7S02002NW</td>
<td>S82B</td>
<td>NVIDIA Omniverse Enterprise Nucleus Subscription per Named User, 3 Years</td>
</tr>
<tr>
<td>7S02002PW</td>
<td>S82C</td>
<td>NVIDIA Omniverse Enterprise Nucleus Subscription per Named User, 4 Years</td>
</tr>
<tr>
<td>7S02002QWW</td>
<td>S82D</td>
<td>NVIDIA Omniverse Enterprise Nucleus Subscription per Named User, 5 Years</td>
</tr>
<tr>
<td>7S02002VWW</td>
<td>S82J</td>
<td>NVIDIA Omniverse Enterprise Creator Subscription per CCU, 1 Year</td>
</tr>
<tr>
<td>7S02002WWW</td>
<td>S82K</td>
<td>NVIDIA Omniverse Enterprise Creator Subscription per CCU, 3 Years</td>
</tr>
<tr>
<td>7S02002XWW</td>
<td>S82L</td>
<td>NVIDIA Omniverse Enterprise Creator Subscription per CCU, 4 Years</td>
</tr>
<tr>
<td>7S02002YWW</td>
<td>S82M</td>
<td>NVIDIA Omniverse Enterprise Creator Subscription per CCU, 5 Years</td>
</tr>
<tr>
<td>7S020033WW</td>
<td>S82S</td>
<td>NVIDIA Omniverse Enterprise Reviewer Subscription per CCU, 1 Year</td>
</tr>
<tr>
<td>7S020034WW</td>
<td>S82T</td>
<td>NVIDIA Omniverse Enterprise Reviewer Subscription per CCU, 3 Years</td>
</tr>
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<td>7S020035WW</td>
<td>S82U</td>
<td>NVIDIA Omniverse Enterprise Reviewer Subscription per CCU, 4 Years</td>
</tr>
<tr>
<td>7S020036WW</td>
<td>S82V</td>
<td>NVIDIA Omniverse Enterprise Reviewer Subscription per CCU, 5 Years</td>
</tr>
</tbody>
</table>
Scalable Performance

The Lenovo EveryScale OVX solution is designed for multi-node scalability with NVIDIA Spectrum Ethernet switch fabric. All POD and SuperPOD configurations are integrated with an optimized combination of network fabric, storage, and enterprise-grade software which combine to deliver unprecedented performance for the most demanding workloads. The OVX POD based architecture enables the deployment of one or more Scalable Units, providing the compute, low-latency networking, bandwidth, and performance required for massively complex simulations and real-time digital twins at the factory, city, or planetary-scale.

Table 2. Lenovo EveryScale OVX Size definitions

<table>
<thead>
<tr>
<th>Lenovo Everyscale OVX Solution</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenovo Everyscale OVX Node</td>
<td>The foundational building block of the Lenovo EveryScale OVX solution. A Lenovo SR670 V2 configured as listed in the OVX Server platform section.</td>
</tr>
<tr>
<td></td>
<td>Capable of Initial POC.</td>
</tr>
<tr>
<td></td>
<td>Can be used for single-node Omniverse Enterprise Workloads.</td>
</tr>
<tr>
<td>Lenovo Everyscale OVX POD</td>
<td>Lenovo EveryScale Omniverse Enterprise PODs start at 4 node configurations and can scale up to 32 nodes.</td>
</tr>
<tr>
<td></td>
<td>Typical configurations include the Base-POD containing 4 Omniverse Enterprise nodes and the Quad-POD containing 16 Omniverse Enterprise nodes.</td>
</tr>
<tr>
<td></td>
<td>Customers can start with Base-POD and scale as needed.</td>
</tr>
<tr>
<td></td>
<td>Spectrum 2 or Spectrum 3 network fabric.</td>
</tr>
</tbody>
</table>
Lenovo EveryScale OVX SuperPODs consist of at least 1 scalable unit (SU) of 32 Lenovo Everyscale OVX nodes.

- Optimized infrastructure for large-scale, digital twin simulations.
- Spectrum3 network fabric, storage, and orchestration software.

**Figure 3. Lenovo EveryScale OVX scalable POD and SuperPOD rack view examples**

---

**Lenovo Everyscale OVX node**

The building block of the Lenovo Everyscale OVX Solution, the Lenovo ThinkSystem SR670 V2 server provides best-in-class cooling for the accelerators positioned in the front and allows both for front and rear IO connectivity for maximum graphic performance and IO throughput.

The Everyscale OVX node configuration combines eight **NVIDIA A40** GPUs, top-of-line Intel Xeon 3rd Generation Scalable Processors, super-fast NVMe storage, and leading-edge NVIDIA ConnectX-6 Dx network adapters with enterprise-grade management and orchestration software.
For more information regarding the Lenovo ThinkSystem SR670 V2 in general, see the SR670 V2 product guide.

Below you find the detailed configuration of the Lenovo Everyscale OVX node:

**Table 3. Lenovo Everyscale OVX Node Configuration**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server</td>
<td>ThinkSystem SR670 V2</td>
</tr>
<tr>
<td>Processor</td>
<td>2x Intel Xeon Platinum 8362 32C 265W 2.8GHz Processor</td>
</tr>
<tr>
<td>Memory</td>
<td>32x 32GB TruDDR4 3200 MHz (2Rx4 1.2V) RDIMMs</td>
</tr>
<tr>
<td>OS SSD</td>
<td>2x M.2 PM983 960GB NVMe PCIe 3.0 x4 Non-Hot Swap SSD</td>
</tr>
<tr>
<td>Data SSD</td>
<td>6x E1.S P4511 4.0TB Read Intensive NVMe PCIe 3.0 x4 HS SSD</td>
</tr>
<tr>
<td>Network Interface</td>
<td>4x Mellanox ConnectX-6 Dx 1-port 200GbE PCIe Adapter</td>
</tr>
<tr>
<td>GPU</td>
<td>8x NVIDIA A40 48GB PCIe Gen4 Passive GPU</td>
</tr>
<tr>
<td>Power</td>
<td>4x 2400W (230V) Platinum Hot-Swap Power Supply</td>
</tr>
</tbody>
</table>
Nucleus is the collaborative user environment of NVIDIA Omniverse providing persistent data and scalable core microservices. Depending on the number of users in the Omniverse Environment the Nucleus Server configuration must fit those needs.

The Lenovo ThinkSystem SR630 V2 has been designed to combine highest performance and flexibility. It allows to support up to 500 users without live editing and be scaled out as requirements grow.

For more information regarding the Lenovo ThinkSystem SR630 V2 in general, [SR630 V2 product guide](#).
Below you can find the detailed example configuration of the Lenovo Nucleus node:

**Table 4. Lenovo Nucleus node configuration**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server</td>
<td>ThinkSystem SR630 V2</td>
</tr>
<tr>
<td>Processor</td>
<td>2x Intel Xeon Gold 6346 16C 205W 3.1GHz Processor</td>
</tr>
<tr>
<td>Memory</td>
<td>16x 16GB TruDDR4 3200 MHz (2Rx4 1.2V) RDIMM</td>
</tr>
<tr>
<td>OS SSD</td>
<td>2x M.2 PM983 960GB NVMe PCIe 3.0 x4 Non-Hot Swap SSD</td>
</tr>
<tr>
<td>Data SSD</td>
<td>2x 2.5” U.2 P5600 1.6TB Mixed Use NVMe PCIe 4.0 x4 HS SSD</td>
</tr>
<tr>
<td>Network Interface</td>
<td>2x Mellanox ConnectX-6 VPI 1-port 200GbE PCIe Adapter</td>
</tr>
<tr>
<td>Power</td>
<td>2x ThinkSystem 1100W (230V/115V) v2 Platinum Hot-Swap Power Supply</td>
</tr>
</tbody>
</table>

Depending on concurrent users and targeted capabilities like live editing the optimal configuration choice can vary. A customer POC is recommended to optimize further for each unique deployment.

**Everyscale OVX Network platform**

Digital twin simulations involve multiple autonomous systems interacting in the same space-time. To unlock the benefits of a digital twin and enable advanced visualization and simulation at scale, the architecture must be able to accurately simulate interactions with precise time synchronization across digital and physical worlds.

The Lenovo EveryScale OVX solution includes advanced networking technologies that enable that precise simulation of space and time. The NVIDIA Spectrum Ethernet Switch fabric and ConnectX-6 Dx Smart NICs deliver the necessary bandwidth, low latency, and precision timing to enable real-time accuracy and network synchronization, enhancing simulation capabilities.

**NVIDIA Spectrum Ethernet Switches**

The NVIDIA Spectrum-2 SN3700 Ethernet switch offers 32 ports of 200GbE in a compact 1U form factor. It enables connectivity to endpoints at different speeds and carries a throughput of 12.8Tb/s, with an 8.33Bpps processing capacity and only 425ns latency. It is best used in small to medium sized Everyscale OVX POD configurations.
The NVIDIA ConnectX-6 Dx SmartNIC is the industry’s most secure and advanced datacenter network interface card to accelerate mission-critical applications, such as security, virtualization, SDN/NFV, big data, machine learning, and storage.

Its Advanced Timing and Synchronization capabilities with PTP hardware clock, PTP-based packet pacing, and nanosecond-level accuracy make it the ideal choice for OVX real-time accurate Digital Twin simulation. The ConnectX-6 Dx 1-port 200GbE PCIe Adapter provides a single-port of 200Gb/s Ethernet connectivity.

**ConnectX-6 Dx Network Adapter**

The NVIDIA ConnectX-6 Dx SmartNIC is the industry’s most secure and advanced datacenter network interface card to accelerate mission-critical applications, such as security, virtualization, SDN/NFV, big data, machine learning, and storage.

Its Advanced Timing and Synchronization capabilities with PTP hardware clock, PTP-based packet pacing, and nanosecond-level accuracy make it the ideal choice for OVX real-time accurate Digital Twin simulation. The ConnectX-6 Dx 1-port 200GbE PCIe Adapter provides a single-port of 200Gb/s Ethernet connectivity.
NVIDIA Everyscale OVX solutions are operating mostly with local storage on the OVX nodes. They do require a high performance and high reliable network file system though to read the initial data from and optionally execute for example continuous snapshots or backups to.

Lenovo Distributed Storage Solution for IBM Spectrum Scale (DSS-G) is the recommended Storage environment for the Lenovo EveryScale OVX solution. It is a software-defined storage (SDS) solution for dense scalable file and object storage suitable for high-performance and data-intensive environments. DSS-G combines the performance of Lenovo ThinkSystem servers, Lenovo storage enclosures, and industry leading IBM Spectrum Scale software, to offer a high performance, scalable building block approach to modern storage needs. IBM Spectrum Scale, based on IBM General Parallel File System (GPFS) technology, is a high-performance and highly scalable parallel file system with an extensive suite of enterprise class data management features.

Lenovo is a strategic alliance partner of IBM, and combines IBM Spectrum Scale software with Lenovo servers, storage and networking components for integrated and customized solutions.

IBM Spectrum Scale offers access to a single file system or set of filesystems in a global namespace with shared file system access among IBM Spectrum Scale clusters, simultaneous file access from multiple nodes, high recoverability and data availability through replication, the ability to make changes while a file system is mounted, and simplified administration even in large environments.

Everyscale OVX Customer Journey

The following steps are the OVX customer journey:

<table>
<thead>
<tr>
<th>Table 5. Customer Journey</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step One – Proof Of Concept</strong></td>
</tr>
<tr>
<td>Engage with Lenovo and NVIDIA on early-stage opportunities to qualify use cases and develop sizing recommendations:</td>
</tr>
<tr>
<td>• Initial POC on a single node.</td>
</tr>
<tr>
<td>• Virtual Machine or Bare-Metal.</td>
</tr>
<tr>
<td>• Single-node Omniverse Enterprise Workloads.</td>
</tr>
</tbody>
</table>

Contact your Lenovo or NVIDIA sales representative to get started.
For More Information

To learn more about the Lenovo EveryScale OVX Solutions for NVIDIA Omniverse, contact your Lenovo Sales Representative or Business Partner.

Products related to this document are the following:

- Lenovo Scalable Infrastructure (LeSI)
- Lenovo ThinkSystem SR670 V2
- Lenovo ThinkSystem SR630 V2
- Lenovo Distributed Storage Solution for IBM Spectrum Scale (DSS-G)
- Lenovo High Performance Computing
- Lenovo TruScale Infrastructure Services

More information on NVIDIA Omniverse and related product families:

- NVIDIA Omniverse
- NVIDIA Omniverse Documentation
- NVIDIA A40
- NVIDIA ConnectX-6 Dx
- NVIDIA Spectrum 3000 Series
- NVIDIA Spectrum 4000 Series

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Solution brief
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Solution brief
Lenovo is a leading provider of data center infrastructure solutions and a premier NVIDIA OVX partner. The Lenovo EveryScale OVX solution is co-designed with NVIDIA. Lenovo will work with you and NVIDIA to identify, design, install and support the solution that best ensures your organization's needs.

Lenovo complements a portfolio of leading x86 infrastructure with a full range of storage, software, and comprehensive services that provides excellent performance, reliability, and security for your IT environment from the edge to the cloud.

- **Integrated Software & Hardware**

  Optimized to power the most demanding workloads, Lenovo EveryScale OVX solution for NVIDIA Omniverse™ Enterprise provides an end-to-end collaboration and true-to-reality simulation platform that transforms complex digital twin workflows at any scale.

- **Enterprise Level Support**

  Lenovo EveryScale OVX solutions are based on Lenovo and NVIDIA-Certified Systems™, tested and validated to provide the necessary performance, manageability, security, and scalability. Comprehensive enterprise-grade support for Lenovo EveryScale OVX solutions will be provided by Lenovo and Omniverse software support will be provided directly by NVIDIA.

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