

# ORACLE DATABASE APPLIANCE

## X9-2S / X9-2L

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# Oracle Database Appliance

## X9-2S / X9-2L



**Oracle Database Appliance**  
X9-2S / X9-2L

Oracle Database Appliance is an Oracle Engineered System that saves time and money by simplifying deployment, management, and support of database solutions for organizations of every size.

Optimized for the world's most popular database—Oracle Database—it integrates software, compute, storage, and network resources to deliver database services for a wide range of custom and packaged online transaction processing (OLTP), in-memory database, and data warehousing applications. All hardware and software components are engineered and supported by Oracle, offering customers a reliable and secure system with built-in automation and best practices. In addition to accelerating the time to value when deploying database solutions, Oracle Database Appliance offers flexible Oracle Database licensing options and reduces operational expenses associated with maintenance and support.

### Fully Integrated System Optimized for Oracle Database

Oracle Database Appliance X9-2S and Oracle Database Appliance X9-2L are engineered as single 2U rack-mountable servers that provide the performance benefits associated with Intel® Xeon® Scalable Processor CPUs and NVM Express (NVMe) flash storage. Oracle Database Appliance X9-2S is powered by one 16-core Intel® Xeon® S4314 processor and 256 GB of main memory, expandable to 512 GB. Oracle Database Appliance X9-2L increases the processor and memory resources by offering two 16-core Intel® Xeon® S4314 processors and 512 GB of main memory, expandable to 1.0 TB. Both systems come configured with 13.6 TB of high-bandwidth NVMe flash for data storage and Oracle Database Appliance X9-2L offers the option to expand the raw storage capacity up to 81.6 TB of NVMe flash. Both systems offer a choice of either a dual-port 25-Gigabit Ethernet (GbE) SFP28 or a quad-port 10GBase-T PCIe network adapter for external networking connectivity with the option to add up to two additional dual-port 25GbE SFP28 or quad-port 10GBase-T PCIe network adapters.

Oracle Database Appliance X9-2S and Oracle Database Appliance X9-2L have Oracle best practices built-in and are optimized for Oracle databases. The number of processor cores, amount of main memory, and NVMe flash storage capacity in each fully integrated system is balanced to provide optimal database performance for a wide range of enterprise applications. Oracle Database sizing templates ensure that the system resources are properly allocated for database

### Key Features

- Fully integrated and complete database appliance
- Single-instance Oracle databases
- Oracle Database Enterprise Edition and Standard Edition
- Oracle ASM and ACFS
- Oracle Appliance Manager
- Command Line Interface (CLI) and Browser User Interface (BUI)
- Software Development Kit (SDK) and REST API
- Integrated Backup and Data Guard
- Oracle Cloud Integration
- Hybrid Columnar Compression often delivers 10X-15X compression ratios
- Oracle Linux and Oracle Linux KVM
- NVM Express (NVMe) solid-state drives
- Persistent Memory (PMEM) option (X9-2L only)

workloads running on each system. Oracle Database Appliance X9-2S and Oracle Database Appliance X9-2L also incorporate NVMe flash storage to increase database performance and system reliability. Database workloads can realize a significant improvement in input/output operations per second (IOPS) and bandwidth while achieving extremely low latency and CPU overhead with NVMe flash storage over similar systems configured with conventional SAS solid-state drives.

### **Persistent Memory (PMem) for ODA X9-2L**

Persistent memory is a modern silicon technology, adding a distinct storage tier of performance, capacity, and price between DRAM and Flash. As the persistent memory is physically present on the memory bus of the storage server, reads perform at memory speed, much faster than flash. Persistent Memory (PMem) provides access to more data in memory enabling customers to process large amounts of data faster and at a lower cost. PMem is available as an option only for the Oracle Database Appliance X9-2L.

### **Ease of Deployment, Management, and Support**

To help customers deploy and manage their databases, Oracle Database Appliance features Appliance Manager software to simplify the administration and diagnosis of the system. The Appliance Manager feature greatly simplifies the deployment process and ensures that the system and database configuration adhere to Oracle's best practices. The browser user interface quickly gathers all the configuration parameters to streamline both system and database provisioning with a few easy steps. The Appliance Manager also drastically simplifies maintenance by patching the entire appliance, including all firmware and software, using an Oracle-tested patch bundle engineered specifically for the appliance. Simply select the appropriate patch bundle in the browser user interface to validate it and update the entire system. Database backup and recovery is integrated into the Appliance Manager with the option to backup locally, to external storage, or to the Oracle Cloud directly through the browser user interface. Oracle Data Guard is also integrated with the appliance to simplify the configuration of standby databases for disaster recovery. The Appliance Manager tracks system and database information and displays the information in the browser user interface. Built-in diagnostics continually monitor the appliance and detect component failures, configuration issues, and deviations from best practices. In addition, Oracle Database Appliance Auto Service Request (ASR) feature can automatically log service requests with Oracle Support to help speed resolution of issues.

### **Flexible Oracle Database Software Licensing**

Oracle Database Appliance X9-2S and Oracle Database Appliance X9-2L support both Oracle Database Enterprise Edition and Standard Edition. Enterprise deployments that require the enhanced feature set of Oracle Database Enterprise Edition can take advantage of a unique capacity-on-demand database software licensing model to quickly scale utilized processor cores without any hardware upgrades. Customers can deploy the system and license as few as 2 processor cores in the appliance, and incrementally scale up to the

#### **Key Benefits**

- Oracle Engineered Systems for every organization
- World's #1 database
- Simple, optimized, and affordable
- Integrated hardware and software
- Built-in automation and best practices
- Ease of deployment, patching, management, and diagnostics
- Simplified backup and disaster recovery
- All flash NVMe storage to accelerate database performance
- Capacity-on-demand licensing
- Rapid provisioning of test and development environments with database snapshots
- Single-vendor support

maximum physical processor cores in each system. This enables customers to deliver the performance and reliability that enterprise business users demand, and align software spend with business growth. Small enterprises, line-of-business departments, and branch office deployments that don't require enterprise class features can license Oracle Database Standard Edition, allowing them to realize the benefits of Oracle Database Appliance to reduce costs and improve productivity.

## **Integrated Virtualization Support**

Virtualization provides IT cost savings and better resource utilization through consolidation of multiple physical servers as Virtual Machines in an Oracle Database Appliance. It helps reduce space, power, and cooling for data centers and provides isolation for workloads to improve service quality for applications and databases. Oracle Database Appliance supports two types of Kernel-based Virtual Machines (KVM) that can be quickly deployed using built-in user interfaces: Application KVM and Database KVM (a.k.a. database system). In an application KVM, customers manage the installation and maintenance of the application, while in the Database KVM, the Oracle Database Appliance manages the installation and maintenance of the Oracle Database.

KVM database systems enable hard partitioning for Oracle Database licensing, where each KVM database system can have its own CPU pool that is automatically assigned during KVM database system creation, or share a CPU pool. Oracle Database Appliance simplifies the management of KVM database systems with built-in user interfaces.

## **Solution-In-A-Box Through Virtualization**

Oracle Database Appliance X9-2S and Oracle Database Appliance X9-2L enable customers and ISVs to quickly deploy database and application workloads on a single Oracle Database Appliance. Support for virtualization adds additional flexibility to the already complete and fully integrated database solution by providing isolation between database and application instances.

Customers and ISVs benefit from a complete solution that efficiently utilizes resources and takes advantage of capacity-on-demand licensing for multiple workloads by leveraging Oracle KVM hard partitioning.

## **Conclusion**

For customers seeking a simple, optimized, and affordable database solution, the Oracle Database Appliance X9 model family offers optimized purpose-built hardware and software choices for every organization. The Oracle Database Appliance is engineered across every technology stack level, resulting in easier deployment and upgrades and more efficient management. With the Oracle Database Appliance X9 model family, customers can quickly bring new services to the market while improving their service levels – adding business value to their company.

To learn more about the Oracle Database Appliance X9 model family, visit: [www.oracle.com/oda](http://www.oracle.com/oda)

## Oracle Database Appliance X9-2L Specifications

ARCHITECTURE	
<b>System</b>	<ul style="list-style-type: none"> <li>One 2U X9-2L server per system</li> </ul>
<b>Processor</b>	<ul style="list-style-type: none"> <li>One Intel® Xeon® processor for Oracle Database Appliance X9-2S                             <ul style="list-style-type: none"> <li>Intel® Xeon® S4314 2.4 GHz, 16 cores, 135 watts, 24 MB L3 cache</li> </ul> </li> <li>Two Intel® Xeon® processors for Oracle Database Appliance X9-2L                             <ul style="list-style-type: none"> <li>Intel® Xeon® S4314 2.4 GHz, 16 cores, 135 watts, 24 MB L3 cache</li> </ul> </li> </ul>
<b>Cache</b>	<ul style="list-style-type: none"> <li>Level 1: 32 KB instruction and 32 KB data L1 cache per core</li> <li>Level 2: 1 MB shared data and instruction L2 cache per core</li> <li>Level 3: Up to 1.375 MB shared inclusive L3 cache per core</li> </ul>
<b>Main Memory</b>	<ul style="list-style-type: none"> <li>256 GB (8 x 32 GB) for Oracle Database Appliance X9-2S                             <ul style="list-style-type: none"> <li>Optional memory expansion to 512 GB (16 x 32 GB)</li> </ul> </li> <li>512 GB (16 x 32 GB) for Oracle Database Appliance X9-2L                             <ul style="list-style-type: none"> <li>Optional memory expansion to 1.0 TB (32 x 32 GB)</li> </ul> </li> </ul>
<b>Server Storage</b>	<ul style="list-style-type: none"> <li>Two internal 240 GB M.2 SSDs (mirrored) per server, for Operating System and Oracle Database software</li> </ul>

STORAGE				
<ul style="list-style-type: none"> <li>Oracle Database Appliance X9-2S / X9-2L                             <ul style="list-style-type: none"> <li>Two NVMe SSDs (6.8 TB per drive) for data storage</li> </ul> </li> <li>Oracle Database Appliance X9-2L Only                             <ul style="list-style-type: none"> <li>Optional expansion up to twelve total NVMe SSDs (6.8 TB per drive) for data storage</li> </ul> </li> </ul>				
Data Storage	Quantity	Raw Capacity	Usable Capacity (Double Mirroring)	Usable Capacity (Triple Mirroring)
Base System	2 x 6.8 TB NVMe	13.6 TB	6.2 TB	N/A
Plus 2 NVMe SSDs	4 x 6.8 TB NVMe	27.2 TB	10.5 TB	7.0 TB
Plus 2 NVMe SSDs	6 x 6.8 TB NVMe	40.8 TB	15.8 TB	10.5 TB
Plus 2 NVMe SSDs	8 x 6.8 TB NVMe	54.4 TB	21.0 TB	14.0 TB
Plus 2 NVMe SSDs	10 x 6.8 TB NVMe	68.0 TB	26.3 TB	17.5 TB
Full System	12 x 6.8 TB NVMe	81.6 TB	31.5 TB	21.0 TB
<ul style="list-style-type: none"> <li>The raw storage capacity is based on storage industry conventions where 1 TB equals 1,000<sup>4</sup> bytes.</li> <li>The usable storage capacity is based on operating system conventions where 1 TB equals 1,024<sup>4</sup> bytes and accounts for 15% reserved space required to rebuild full redundancy in case of disk failure (not applicable to the two-drive configuration).</li> </ul>				

INTERFACES	
<b>Standard I/O</b>	<ul style="list-style-type: none"> <li>One GbE port and one serial RJ45 port (management ports)</li> <li>One USB 3.0 ports (one rear)</li> <li><b>Oracle Database Appliance X9-2S:</b> <ul style="list-style-type: none"> <li>PCIe slot 6: Choice of quad-port 10GBase-T card or dual-port 10/25 GbE (SFP28) card</li> <li>PCIe slot 7: Choice of quad-port 10GBase-T card or dual-port 10/25 GbE (SFP28) card (Optional)</li> <li>PCIe slot 8: Choice of quad-port 10GBase-T card or dual-port 10/25 GbE (SFP28) card (Optional)</li> </ul> </li> <li><b>Oracle Database Appliance X9-2L:</b> <ul style="list-style-type: none"> <li>PCIe slot 4: Choice of quad-port 10GBase-T card or dual-port 10/25 GbE (SFP28) card (Optional)</li> <li>PCIe slot 6: Choice of quad-port 10GBase-T card or dual-port 10/25 GbE (SFP28) card</li> <li>PCIe slot 8: Choice of quad-port 10GBase-T card or dual-port 10/25 GbE (SFP28) card (Optional)</li> <li>PCIe slot 10: Retimer card (required for NVMe drives in slots 8 to 11)</li> </ul> </li> </ul> <p>Note: No additional PCIe cards can be added in the non-mentioned slots</p>

SYSTEMS MANAGEMENT	
<b>Service Processor</b>	<p>Oracle Integrated Lights Out Manager (Oracle ILOM) provides:</p> <ul style="list-style-type: none"> <li>▪ Remote keyboard, video, and mouse redirection</li> <li>▪ Full remote management through command-line, IPMI, and browser interfaces</li> <li>▪ Remote media capability (USB, DVD, CD, and ISO image)</li> <li>▪ Advanced power management and monitoring</li> <li>▪ Active Directory, LDAP, and RADIUS support</li> <li>▪ Dual Oracle ILOM flash</li> <li>▪ Direct virtual media redirection</li> </ul>
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>▪ Comprehensive fault detection and notification</li> <li>▪ In-band, out-of-band, and side-band SNMP monitoring v3</li> <li>▪ Syslog and SMTP alerts</li> <li>▪ Automatic creation of a service request for key hardware faults with Oracle auto service request (ASR)</li> </ul>

SOFTWARE	
<b>Oracle Software</b>	<ul style="list-style-type: none"> <li>▪ Oracle Linux (Pre-Installed)</li> <li>▪ Oracle Linux KVM (Pre-Installed and optional to use)</li> <li>▪ Appliance Manager (Pre-Installed)</li> </ul>
<b>Oracle Database Software (Licensed Separately)</b>	<ul style="list-style-type: none"> <li>▪ Choice of Oracle Database software, depending on the desired level of availability: <ul style="list-style-type: none"> <li>– Oracle Database 19c Enterprise Edition, Standard Edition 2</li> <li>– Oracle Database 12c Enterprise Edition Release 1, Release 2, Standard Edition 2</li> </ul> </li> <li>▪ Support for: <ul style="list-style-type: none"> <li>– Oracle Database options</li> <li>– Oracle Enterprise Manager Management Packs for Oracle Database Enterprise Edition</li> </ul> </li> </ul>
<b>Capacity-On-Demand Software Licensing for Oracle Database Enterprise Edition</b>	<ul style="list-style-type: none"> <li>▪ Enable and license 2, 4, 6, 8, 10, 12, or 16 cores per ODA X9-2S</li> <li>▪ Enable and license 2, 4, 6, 8, 10, 12, 16, 20, 24, 28, or 32 cores per ODA X9-2L</li> </ul>

ORACLE DATABASE APPLIANCE SOFTWARE FEATURES	
MANAGEABILITY	
<b>Appliance Manager</b>	The software interface for the Oracle Database Appliance simplifies the deployment, management, and support of your Oracle Database Appliance.
<b>Management Interfaces</b>	Command Line interface (CLI), Web Browser Interface (BUI), and REST/API.
<b>Database Templates</b>	Pre-defined (based on Oracle best practices database parameters) database templates sized for best performance to satisfy various workloads for OLTP, DSS, and In-Memory.
<b>Capacity-on-Demand Licensing</b>	A database licensing capability to enable only the processor cores (two minimum) required and to easily scale to a higher number as business needs change.
<b>Single Patch for Entire Stack</b>	Provides a single patch for the entire stack that includes the latest Oracle Database RU, Oracle GI, Oracle Linux, Hardware firmware updates, etc. Applying Out-of-Cycle Database Patches is also supported.
<b>Integrated KVM Virtualization</b>	Linux kernel-based virtual machine (KVM) enables virtualization for Oracle Database or Applications. Supports Hard Partitioning for Oracle Database licensing.
<b>CPU Pools</b>	Enable management of CPU resources, providing QoS (Quality of Service) by guaranteeing dedicated CPU resources for Databases and VMs. (note: <i>CPU pools cannot be used for Oracle Database licensing</i> )
<b>Automated Serviceability</b>	Through Oracle Auto Service Request (ASR), problems are resolved faster with ASR, which automatically opens service requests for your Oracle Database Appliance when specific faults occur.
<b>Automated Monitoring</b>	The ODA Hardware Monitoring Tool displays the status of different hardware components in Oracle Database Appliance server. It reports information only for the node on which you run the command.
<b>Automated Diagnostics</b>	Oracle Database Appliance uses Oracle Autonomous Health Framework, which collects and analyzes diagnostic data, and proactively identifies issues before they affect the health of your system.
<b>ODA Software Development Kit (SDK)</b>	The ODA SDK publicly exposes the ODA REST and Java API to invoke ODA database services programmatically.



<b>Oracle Enterprise Manager (OEM) Plug-In</b>	The ODA EM Plug-In supports detailed monitoring of one or multiple Oracle Database Appliances and provides actionable component level analytics across an ODA group
<b>DATA PROTECTION</b>	
<b>Automated Database Backup (including to Cloud)</b>	Integrated RMAN for simple backup operation of Oracle Databases to Oracle Cloud Infrastructure Object Storage or Internal FRA/ External FRA. Restore can be done to different levels (latest, PITR, SCN, etc.)
<b>Integrated Data Guard Configuration</b>	Oracle Database Appliance provides client interface through ODACLI commands for easy configuration and management of Oracle Data Guard for high availability, data protection, and disaster recovery.
<b>Integrated Database Security Assessment Tool (DBSAT)</b>	Run DBSAT reports directly from the Browser User Interface (BUI). The Oracle Database Security Assessment Tool (DBSAT) helps identify areas where your database configuration, operation, or implementation introduces risks and recommends changes and controls to mitigate those risks.
<b>System Configuration Backup</b>	Use Oracle Database Appliance Backup and Recovery (ODABR) to back up the system disks to ensure easy restore if the patching operation fails. ODABR restores the system disk to pre-patching state.
<b>Other Data Protection Features</b>	<ul style="list-style-type: none"> <li>• Prioritize Recovery of Critical Database Files</li> <li>• Automatic Repair of Corrupt Disk Data</li> </ul>
<b>DATA MANAGEMENT</b>	
<b>Built-in Storage Management</b>	Integrated ASM for simplified storage management, where the user only selects a few options, and the Appliance Manager automatically configures ASM
<b>Integrated Database Clones</b>	Rapid and efficient database copies using integrated ACFS Snapshots to provision database environments for development and testing of applications
<b>Hybrid Columnar Compression (HCC) Support</b>	Enables the highest levels of data compression possible with Oracle databases, often delivering 10X-15X compression ratios. It provides substantial cost-savings and performance improvements due to reduced I/O, especially for analytic workloads. <i>(Requires ODA SW 18.8 or higher, and Oracle EE license)</i>
<b>SECURITY AND COMPLIANCE</b>	
<b>Hardening</b>	<ul style="list-style-type: none"> <li>• Installed packages are trimmed to a minimum, so that unnecessary packages are not installed</li> <li>• Only essential services are enabled on the Oracle Database Appliance nodes</li> <li>• Operating system users are audited</li> <li>• Secure configurations for NTP, SSH, and other services</li> </ul>
<b>Security Capabilities</b>	<ul style="list-style-type: none"> <li>• Isolation policies</li> <li>• Controlled access to data</li> <li>• Cryptographic services</li> <li>• Monitoring and auditing</li> <li>• Unified Auditing for Oracle database</li> <li>• Oracle Integrated Lights Out Manager (ILOM) for secure management</li> </ul>
<b>Encryption</b>	Integrated TDE support for database lifecycle management, including backup and iRestore <i>(Oracle Database Transparent Data Encryption [TDE] requires Advanced Security Option license)</i>
<b>Multi-User Access</b>	Create multiple users with different roles that restrict them from accessing resources created by other users and restrict the set of operations they can perform.
<b>Compliance</b>	<ul style="list-style-type: none"> <li>• FIPS 140-2 Level one compliant</li> <li>• STIG (Security Technical Guide) security audit script</li> <li>• Secure erase drives</li> <li>• Integrated Database Security Assessment Tool (DBSAT)</li> </ul>
<b>Adaptive Classification and Redaction (ACR)</b>	Enables the sanitization of sensitive diagnostic data, such as Host names, IP and MAC addresses, Oracle Database names, tablespace names, user data (personal information) that may leak into redo and block dumps in trace files, etc.
<p><i>Some features are specific to Oracle Database Enterprise Edition (Data Guard, TDE, etc.) and need to be licensed appropriately. Others are included with either the Oracle Database Enterprise Edition (i.e., HCC) or Standard Edition (i.e., SEHA) licensing. Talk to your Oracle Database sales representative for details.</i></p>	

## ENVIRONMENTAL

### Environmental Temperature, Humidity, Altitude

- Operating temperature: 5°C to 35°C (41°F to 95°F)
- Nonoperating temperature: -40°C to 70°C (-40°F to 158°F)
- Operating relative humidity: 10% to 90%, noncondensing
- Nonoperating relative humidity: Up to 93%, noncondensing
- Operating altitude: Maximum ambient operating temperature is derated by 1°C per 300 m of elevation beyond 900 m, up to a maximum altitude of 3000 m (except in China where regulations may limit installations to a maximum altitude of 6,560 feet or 2,000 m)
- Nonoperating altitude: up to 39,370 feet (12,000 m)
- Acoustic noise:
  - Maximum condition: 7.1 Bels A weighted
  - Idle condition: 7.0 Bels A weighted

## POWER AND THERMAL

### Power

- **Two 1,200 watt hot-swappable and redundant power supplies, rated 96% efficiency**
  - Voltage (nominal) 100 to 127 VAC; 200 to 240 VAC
  - Input current (maximum) 100 to 127 VAC 10.0 A; and 200 to 240 VAC 7.0 A
  - Frequency (nominal) 50/60 Hz (47 to 63 Hz range)

For more information on power consumption, go to: [Oracle Server X9-2L Power Calculator](#)

### X9-2S (Max Memory, 512 GB)

- Maximum power usage: 515W, 1,757 BTU/Hr
- Active Idle power usage: 204W, 696 BTU/Hr

### X9-2L (Max Memory, 1 TB)

- Maximum power usage: 820W, 2,798 BTU/Hr
- Typical power usage: 270W, 921 BTU/Hr

## PHYSICAL SPECIFICATIONS

### Dimensions and Weight

- Height: 86.9 mm (3.4 in.)
- Width: 445.0 mm (17.5 in.)
- Depth: 759.4 mm (29.9 in.)
- Weight: 28.6 kg (63 lb.), fully populated

### Included Installation Kits

- Rack-mount Slide Rail Kit
- Cable Management Arm

## REGULATIONS AND CERTIFICATIONS

### CERTIFICATIONS<sup>1</sup>

- NRTL (North America Safety)
- CE (European Union)
- International CB Scheme
- BIS (India)
- BSMI (Taiwan)
- CCC (PRC)
- EAC (EAEU including Russia)
- KC (Korea)
- RCM (Australia)
- VCCI (Japan)
- UKCA (United Kingdom)

<sup>1</sup> All standards and certifications referenced are to the latest official version. For additional detail, please contact your sales representative. Other country regulations/certifications may apply.

For regulatory compliance information, please consult the "Safety and Compliance Guide" available in the product's documentation library at <https://docs.oracle.com>.



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