InteleOrchestrator

System Requirements Guide

intelerad

Intelerad.com

COPYRIGHT

TRADEMARKS

THIRD-PARTY TRADEMARKS

Intelerad Medical Systems Incorporated
800, boul. De Maisonneuve East, 14th floor
Montreal (Quebec)
H2L 4L8 Canada

Title:	InteleOrchestrator System Requirements Guide
Document version:	1.0 (Multiple Patient Multiple Use)
Date:	2025-01-10
Part number:	IOSENRG-O Issue 002

DISCLAIMER

Intelerad is a software company. As such, Intelerad’s approval of the hardware does not constitute a guarantee that the hardware configuration provided by the hardware vendor is functional. Intelerad relies on the hardware vendor to ensure compatibility of all its internal and external components, as well as the operating system. Hardware requirements mostly concern the components significant for performance and reliability. Minor components like cables, connectors, power cords and rack mounting rails might be required even though they are not explicitly listed in the minimum requirements. The purchase of these components should follow the hardware vendor's recommendations.

Some of Intelerad's products are classified as medical devices under various regulations and must meet medical device safety and effectiveness requirements imposed by national authorities (https://www.intelerad.com/en/legal/regulatory-compliance/) . If your product is classified as a medical device and is not accessible to Intelerad's Support Team, Intelerad will not provide maintenance, including remote monitoring, remote diagnostics, and updates. Using a medical device product without access from Intelerad’s Support Team might put the health and safety of patients at risk, as you may not be advised of software patches, bug fixes, updates, or Field Safety Notices, Medical Device Recalls, or Advisory Notices. Furthermore, Intelerad will not be in a position to access your systems to implement corrections to prevent patient safety issues. Any use of the Licensed Software beyond Intelerad’s standard support practices is at your own risk.

TABLE OF CONTENTS

Disclaimer **3**

Document Revisions **8**

Document Conventions **9**

About this Guide **11**

Download the Latest Version 11

Server Requirements **12**

Physical Server Hardware 13

Server Chassis 13

CPU 13

RAM 14

Network Controllers 14

RAID Controllers 14

Internal Storage 14

External Storage 15

Remote Consoles 15

Power Supplies 16

Fax Controllers 16
Virtual Servers 17
Supported Hypervisors 17
Warnings 17
Virtual Resources Allocations 17
Virtual CPU Configuration and Allocation 18
Storage 19
Disk Types and Format 19
Provisioning 19
Storage Mapping and Layout 19
Snapshots 20
Host Affinity 20
Hardware Compatibility 20
Hypervisor Console Access 21
Power Saving 21
Hyper-Threading 21
Shared Storage 22
Supported Shared Storage 22
Notes on shared storage for physical servers 22
Performance Requirements 22
Important storage performance characteristics 23
How shared storage performance differs from local storage on a server 23
How Intelerad calculates input/output operations per second (IOPS) 25
Reliability, Confidentiality, Availability, and Integrity Considerations 26
Operating Systems Requirements 28
Supported Versions 29
Supported Windows and SQL Versions by InteleOrchestrator Version 29

Windows and Server Installation 29
Database Servers 30
Web Servers 31
Services & HL7 Servers 31
Test Server 31
Operating System and Required Software Maintenance 32
Antivirus & Antimalware Software 32
Third-Party Software 32
Network Requirements **33**
Introduction 34
High Availability and Load Balancers 34
Network Port Details 34
Connectivity Requirements **39**
Support and Access 40
Remote Desktop Support 40
Software Updates 40
Monitoring and Alerts 40
Resiliency Requirements **41**
High Availability 42
Business Continuity 42
Disaster Recovery 43
Server Approval and Software Installation Process **44**
Windows Servers 45
Appendix A: Server Specification Code and Alias **46**
Introduction 47
Server Specification Formats 47
Server Specification Codes 47

Server Specification Alias 48
Server Specification Elements 49
Prefix 49
Alias ID 50
Compute 50
Storage 51
Accessories 52
Viewing the Documentation **53**
Comments and questions 53
Obtaining Printed Documentation 53
Contacting Intelerad Technical Support **54**

DOCUMENT REVISIONS

Issue	Document Release Date	Document Version
001	December 12, 2024	1.0
002	December 23, 2024	1.0

DOCUMENT CONVENTIONS

Several conventions are used throughout this document. A list of these and examples of their use are provided below.

Convention	Example
Text that you enter in a field, or on a command line are in `courier font`.	In the Date field, enter `2003/04/04`.
Keyboard commands are in **SMALL CAPS AND BOLD**.	Press **CTRL+C** to copy text.
New terminology or concepts are *italicized*.	The process of automatically distributing the images is referred to as *autorouting*.
Interface elements, such as menus, buttons, options, and preferences are **bold**.	From the **Font** list, choose the desired font.
Menu selections are separated by vertical lines.	Choose **File** | **Print** to print this page.
Information that is important for a user to know when performing a task, such as prerequisite information or restrictions, is represented with a note icon .	To view reports, you must have the Report privilege enabled in your user account.

Convention	Example
Information that is helpful to a user, such as when describing an alternate or simpler way to perform a task, is represented with a tip icon .	You can also use the **CTRL+T** keyboard shortcut to show or hide thumbnail images.
Information that warns users to potential problems in the outcome of what they are doing, such as data loss or data breach, is represented with a warning icon ⚠.	⚠ Image measurements are saved for the current application session only. If you exit the application, all measurements are lost.

ABOUT THIS GUIDE

This System Requirements Guide for InteleOrchestrator provides essential details for deploying the software in healthcare environments. It covers the hardware and software specifications for both physical and virtual servers, shared storage, and network configurations, including required open network ports. Additionally, it outlines operating system requirements and connectivity needs for system monitoring, support, and ongoing maintenance.

The guide also addresses resiliency requirements, focusing on high availability, business continuity, and disaster recovery to ensure uninterrupted system performance. The final section offers a high-level overview of the server approval and software installation process; and the appendix provides further information on hardware specification codes. This guide serves as a practical resource for IT teams, system administrators, and project managers involved in the deployment and ongoing support for InteleOrchestrator.

Download the Latest Version

This guide is subject to frequent updates. Before referencing this guide, Intelerad highly recommends that you visit the Knowledge section of the Intelerad Service Portal.

1 SERVER REQUIREMENTS

This chapter describes Intelerad's requirements and recommendations for physical server hardware, virtualization, and shared storage.

In this chapter:

Physical Server Hardware 13

Virtual Servers 17

Shared Storage 22

Physical Server Hardware

This section describes the physical hardware that you can purchase to meet the requirements of Intelerad Server Specification Codes.

All hardware and accessories installed on the physical servers must be supported by the server vendor. Please consult with your server vendor to confirm compatibility and supportability.

Intelerad Server Specification Codes that do not contain the letter V in the code Prefix refer to physical hardware. This is true for servers, storage, and accessories. For more information, see the Server Specification Code and Alias Section.

Server Chassis

Intelerad supports Dell and HP hardware. Dell PowerEdge and HP ProLiant server lines are officially supported.

Choosing a specific chassis is largely a function of form factor and how many drives need to be accommodated. Other factors include number of CPU sockets, number of RAM slots, and room for expansion cards.

The server will need to be compatible with the supported Linux / Windows OS version. To check which operating systems are currently supported, see the Operating System Requirements Section.

To confirm server / OS compatibility, refer to the hardware vendors website for the appropriate certification matrix of your Linux or Windows server.

CPU

Intelerad supports only 64-bit Intel Xeon and AMD EPYC processors of current generations. At this time, AMD Opteron and other x86 processors are not supported. The minimum core clock speed and minimum number of physical cores are encoded in the compute element of the Server Specification Codes.

The required number of physical cores can be achieved using either a single processor or multiple processors. Configurations with dual processors may enhance performance for memory-intensive or I/O-heavy workloads by providing additional memory channels and PCIe lanes, while a single processor can offer lower inter-core latency.

RAM

Use ECC RDIMMs at the highest speed supported by the CPU and motherboard to ensure stability, data integrity, and optimal performance. Populate all memory channels evenly with identical DIMMs to maximize memory bandwidth and prevent bottlenecks. ECC RDIMMs help prevent data corruption, making them ideal for enterprise workloads.

Network Controllers

Network controllers are often built into the servers and are sometimes add-on cards. Regardless of the physical configuration of the network controller, use a minimum of two redundant network ports, ideally 10 GbE or faster, for improved throughput and reliability in high-bandwidth applications. Multipath network configuration is permitted but not required.

RAID Controllers

Attach all drives to RAID controllers with non-volatile Write-Back Cache (e.g., battery, capacitor, or flash-based) to protect data and enhance performance under heavy I/O workloads.

The maximum amount of cache per RAID controller is required (this is typically 8 GB per controller).

When using all HDD devices, one RAID controller must be used for OS+DB arrays, and one or more additional RAID controllers are required for data arrays. When using a mix of SSD and HDD devices, one RAID controller must be used for SSD arrays (typically OS+DB), and one or more additional RAID controllers are required for HDD arrays (typically data arrays). When using all SSD devices, a single RAID controller may be used.

Internal Storage

Internal storage must use SSD or HDD drives of either SFF 2.5 inches or LFF 3.5 inches, depending on the required disk capacity and performance. Disk arrays that are used for operating system and database partitions must always be configured as internal storage when possible.

HDD specifications

Internal HDD drives that are used for operating system and database partitions must be enterprise drives with the highest rotational speed available in the required individual disk

size (typically 15K RPM or 10K RPM). The required individual disk size is calculated using the formulae in the Storage Performance mapping table. For more information see the Storage Section.

SDD specifications

Select SSDs with a minimum endurance rating of 3 DWPD for high-write workloads, such as operating system and database partitions. For bulk data storage, like image storage bins, 1 DWPD endurance SSDs are acceptable, balancing durability with cost-effectiveness for large-scale storage needs.

External Storage

SAN storage

It is uncommon for physical servers to make use of SAN storage. However, for physical servers that require SAN-hosted bulk data storage, ensure that the SAN meets specified performance requirements and connects via Fibre Channel (FC) or iSCSI. For more information, see the Shared Storage Section.

Storage enclosures (Direct-Attached Storage)

External storage arrays are typically used for storing large amounts of data that are accessed relatively infrequently (compared to databases, for example). External storage arrays follow the same general guidelines as internal storage, except that HDD disks do not have to be of the highest performance; instead, external arrays have a minimum rotational speed requirement of 10K RPM (7200 RPM is permitted for enclosures using larger than 1.5 TB drives).When choosing a storage enclosure, work with our hardware vendor to choose the appropriate Direct-Attached Storage (DAS).

Remote Consoles

Intelerad recommends setting up the remote console for your servers so that you can access your servers remotely in case access to your servers is required for support and troubleshooting.

Although not mandatory, the remote console access can be shared with Intelerad to assist with troubleshooting. While you remain responsible for the support and maintenance of the servers, having access to the server may help Intelerad identify the root cause of issues more quickly during troubleshooting sessions.

Power Supplies

All servers must be configured with redundant power supplies and must be connected to different power sources.

To prevent a potentially damaging unexpected power loss, all Intelerad servers must be provided with guaranteed power, such as in most co-location facilities, or must be on an uninterruptible power supply (UPS). When choosing a UPS, it needs to be supported by appropriate software for monitoring and to ensure a graceful shutdown of all Intelerad servers protected by it.

The selected UPS needs to provide sufficient power for a clean shutdown of all servers it protects. Confirm with your server vendor the power requirements of your servers and consult with your UPS vendor to select a product that will provide sufficient capacity.

Fax Controllers

Intelerad no longer supports physical Fax Controllers.

For solutions that require the ability to send fax, Intelerad relies on eFax providers. Your Pre-Sales Architect will provide details for the supported eFax vendor according to your solution.

Virtual Servers

This section provides guidelines for setting up virtual infrastructure for use with Intelerad software.

Supported Hypervisors

VMware is the only virtual infrastructure ecosystem currently supported by Intelerad. If you have a strong case for using a different virtual environment, please request a copy of our *Intelerad Guide for Unsupported Virtual Infrastructure*.

In all cases, Intelerad recommends using a mature hypervisor with a good track record for stability, performance and supportability. In addition, the client needs to have access to the required expertise to support and maintain the virtual ecosystem as the client is responsible for any task or issue at the infrastructure, server and operating system layers, including installation, maintenance, monitoring and troubleshooting.

The selected hypervisor should always be on a supported version, patched and upgraded regularly as per the vendor's recommendations.

Warnings

- The most common struggles experienced when using a virtual infrastructure are about compute resources contention and storage performance. These struggles occur most frequently when clients or hardware/storage vendors misinterpret the project requirements, or when there is complete disregard for the guidance provided by Intelerad.
- Some hypervisor features (for example, VMware Fault Tolerance) have limitations that may not be compatible with the Intelerad server requirements. Before implementing a hypervisor feature, make sure the limitations don't conflict with the Intelerad server requirements.

Virtual Resources Allocations

- Avoid oversubscription to host processors (see detailed guidance in Virtual CPU Configuration and Allocation section).
- Fully reserve memory allocation so that the hypervisor does not use ballooning to evict data from the filesystem cache. The "unused" memory is used by the filesystem cache to drastically reduce read demand on the storage subsystem to improve performance.

- The resources allocated to a virtual machine may need to be changed over time to ensure appropriate performance and compliance with newer versions of this document. This allows Intelerad to recommend virtual hardware with less spare capacity than would be necessary in physical configurations that are expected to last until they are evergreened.
- To facilitate the troubleshooting of performance-related issues of a virtual machine, it might be necessary to temporarily isolate the problematic guest. This requires your virtual infrastructure to provide sufficient compute resources to isolate the largest of your virtual Intelerad servers to a host that is not running any other virtual machine for the duration of the troubleshooting process. Since a typical virtual infrastructure has sufficient hosts to accommodate failure of one or more physical machines, no special consideration to extra hardware is typically required.
- The storage controller must be set to use the paravirtual SCSI controller.
- The network controller must be set to use the paravirtual Ethernet adapter.
- Synchronize guest OS time using NTP. Disable the hypervisor's host-based time synchronization (you may need to go in advanced settings to specifically disable time sync for specific actions like snapshots, disk shrink, etc.).
- Your Pre-Sales Architect will provide the specific resource and storage requirements for each of your servers.

Virtual CPU Configuration and Allocation

Configure one vCPU per virtual socket to enhance CPU scheduling efficiency by the hypervisor. This setup is generally recommended unless software licensing constraints are based on socket counts. Note that Intelerad software is not licensed by core or socket counts.

Intelerad solutions are typically business-critical, necessitating careful management of CPU resources to avoid oversubscription. Oversubscription can lead to performance degradation during peak periods due to increased CPU stolen/ready time. For most Intelerad workloads, it's advisable to allocate up to 90% of the logical processors (HTs) available on the host. For instance, on a host with 32 physical cores and 64 logical processors, allocate up to 58 vCPUs across all guests. For heavily CPU-bound Intelerad workloads, allocate up to 90% of the physical cores, such as up to 28 vCPUs on a host with 32 physical cores.

Since performance becomes increasingly unpredictable when oversubscribing to the host processors, Intelerad may request that problematic guests be moved to a host without oversubscription before diagnosing performance complaints.

Typically, using CPU reservations is not advised. On a host with appropriately allocated CPUs, CPU reservations are unnecessary; on a host with CPU oversubscription, CPU reservations are likely to cause performance problems for other guests.

Storage

Disk Types and Format

Use virtual disks for all virtual storage. Do not use raw device mappings (RDM), as virtual disks offer better portability and management within the virtual environment.

Provisioning

Intelerad recommends thick-provisioned (with eager zeroed if available) virtual disks for all partitions, unless your storage array can provide near wire-speed performance with thin-provisioned virtual disks. On some arrays, thin provisioning results in almost zero decreased performance, while on other arrays it results in a 50% decrease in performance. If you are unsure, please confirm the impact of thin provisioning with your storage vendor.

It is acceptable to use thin-provisioned virtual disks for image storage partitions even when performance is not as good as thick-provisioned ones since the performance requirements for image storage are not as high as for operating system and database partitions. Since image storage is expected to grow over time, Intelerad recommends using thick-provisioned virtual disks for image storage to prevent running out of space with overprovisioning.

Storage Mapping and Layout

For SQL servers, create four PVSCSI controllers and assign them as follows:

Drive Letter	Drive Description	PVSCSI Controller
C:	Operating System	PVSCSI #1
D:	SQL Server Application and Files	PVSCSI #2
E:	SQL System Databases	PVSCSI #2
F:	SQL Application Databases	PVSCSI #3
L:	SQL Transaction Logs	PVSCSI #2
T:	SQL Temp Databases	PVSCSI #4
P:	OS Page File	PVSCSI #2
S:	SQL Backups	PVSCSI #4

For other server types, a single PVSCSI controller is sufficient.

Your Pre-Sales Architect will provide the partitioning details for each of your Intelerad servers.

Snapshots

As part of the upgrade process for certain products, Intelerad may ask you to make snapshots of your virtual servers. In all cases when taking snapshots of servers running an Intelerad product, Intelerad strongly recommends stopping the services on those servers first. Stopping services may require Intelerad Support team's involvement.

In general, Intelerad advises against taking snapshots of active servers. Given that data changes very frequently on Intelerad servers, the link between what is stored on the database and what has been committed to storage can be lost during a snapshot. This can lead to orphan records in the database and inaccessible data, which in turn will likely cause a recovery attempt to be slower than via another recovery method. At worst, the snapshot may simply be unusable. If snapshots of active production servers are still desired, active snapshots should not be kept running for more than 72 hours to not impact performance.

Due to the reasons mentioned above, Intelerad adopted a different strategy than taking snapshots for the business continuity and disaster recovery of its products. The Intelerad products include redundancy at the software level and your Pre-Sales Architect will recommend clustering servers of the same type together. You can refer to the *Business Continuity and Disaster Recovery (BCDR) Guide* for your product(s) available on the Intelerad Service Portal to learn more.

Host Affinity

Intelerad servers that provide redundant services must not run on the same host. Use host affinity rules to ensure that redundant virtual machines are not inadvertently moved to the same physical hosts. Please ask your Pre-Sales Architect if you are unsure about which virtual servers must be on separate physical hosts.

Hardware Compatibility

- Intelerad supports only 64-bit Intel Xeon and AMD EPYC processors of current generations. At this time, AMD Opteron and other x86 processors are not supported.
- All physical hardware must be compatible for use with your hypervisor. Please consult with your hardware and hypervisor vendors to confirm compatibility.

Hypervisor Console Access

Intelerad does not require direct console access to the hypervisor or guest VMs. The client is responsible for their virtual infrastructure. In case of issues, Intelerad expects the client or their representative responsible for the server infrastructure to investigate, troubleshoot and fix problems that could be at the operating system, server or infrastructure layers.

Power Saving

Power saving settings can cause major performance issues for virtual machines. Power saving should be disabled on hosts running Intelerad virtual machines to ensure optimal performance. If power saving is essential, set your power management to 'OS Managed' and configure Intelerad virtual machines with the High Performance policy to minimize potential performance impacts.

Hyper-Threading

Intelerad does not mandate specific rules on enabling or disabling Hyper-Threading (HT) in the BIOS for your hypervisor hosts. When HT is enabled, the hypervisor has access to twice as many logical processors as there are physical processors. HT can improve performance under many conditions, but under extreme CPU demand, HT can degrade performance. The decision should be based on the workload characteristics and the composition of the virtual machines on the host. Refer to the “Virtual CPU Configuration and Allocation” section to understand how many vCPUs should be allocated on a host based on the number of physical (core) or logical (HT) processors available on the host.

Shared Storage

Virtual machines and their virtual disks are typically stored on shared storage within a storage area network (SAN) or network-attached storage (NAS). In this guide, 'shared storage' refers to storage that is remote to the server and mounted as a network resource using protocols like Fibre Channel (FC), iSCSI, or NFS. Direct-attached storage (DAS), connected to a single server via SAS or SATA, is considered host-only storage and is not classified as shared storage.

Supported Shared Storage

With virtualization, the underlying storage infrastructure is abstracted from the virtual machines and is not visible to Intelerad. To Intelerad servers, the storage appears only as a collection of virtual disks, with no information about specific storage hardware (e.g., HP, EMC, Dell). Due to the variety of storage vendors and configurations, Intelerad does not recommend specific storage vendors or models, as even identical models can perform differently based on configuration and firmware.

Intelerad's shared storage requirements are as follows:

- Shared storage must meet the performance specifications provided for each server, which Intelerad may test before software deployment.
- The storage hardware must support high reliability, data integrity, and availability to ensure uptime, prevent data corruption, and allow recovery from hardware faults (e.g., failed disks or controllers) without downtime.
- For environments with redundant servers, host each redundant server on a separate storage system to avoid single points of failure within the storage infrastructure.

Notes on shared storage for physical servers

With physical servers, shared storage is generally used only with servers that have a requirement to store large amounts of image data, and only for the image storage partitions. In most cases, mount points and filesystems must use local disks that are connected to a RAID card with battery-backed write-back caching.

Performance Requirements

Prior to deployment of a virtual server, or a physical server using shared storage, Intelerad specifies minimum input/output operations per second (IOPS) requirements for each mount point. Prior to deploying some products, Intelerad may run multiple tests to

validate that the storage meets the necessary performance requirements to ensure that the Intelerad server is able to reliably perform at the client's given data volumes. As some Intelerad products are certified medical devices, it is necessary for Intelerad to validate performance as part of our ISO 13485 (Quality Management System - Medical Devices) certification.

Important storage performance characteristics

Databases are typically the most performance-sensitive components of Intelerad products, and sub-optimal database performance can significantly impact software functionality and the end-user experience. Intelerad product databases rely heavily on random, synchronous small-block writes, a workload that is particularly challenging for shared storage solutions. Although read performance also matters, critical reads are often served from the database or filesystem cache, while other reads tend to be more sequential and can tolerate higher I/O latency. As read operations are generally less taxing on storage systems, our performance evaluations emphasize write latency—the time it takes for the software to perform a write and receive hardware confirmation of completion.

How shared storage performance differs from local storage on a server

With a physical server utilizing local storage, much less abstraction occurs, and there are fewer steps involved in each write. Most importantly, all physical servers that Intelerad supports utilize a RAID card with battery- or capacitor-backed non-volatile random-access memory (NVRAM) to provide write-back caching. Using NVRAM for write-back caching is critical to ensure adequate performance as this is much faster than other types of storage, such as spinning disks and SSDs.

The following table details the operation sequence when a synchronous write operation is issued on a physical server.

Sequence	Operation
1	The operating system sends the write operation via the PCI Express bus to the RAID card.
2	The RAID card stores the write on the NVRAM and immediately returns a write acknowledgment to the operating system.
3	Once the application receives the write acknowledgement from the operating system, the application immediately proceeds with the next write operation. The RAID card flushes writes to permanent disks at set intervals. However, it is not necessary for the application to wait for

	the RAID card to flush writes before proceeding with the next write operation. As long as the flush is performed in a timely enough manner to prevent the overflowing of the write cache buffer.

A synchronous write operation that is issued by a virtual machine to shared storage involves many more layers, and usually occurs over a longer physical distance. The following table details the operation sequence when a synchronous write operation is issued by a virtual machine.

Sequence	Operation
1	The operating system issues the write operation to the paravirtual SCSI (PVSCSI) adapter.
2	The hypervisor sends the write operation to the virtual disk.
3	The write operation then goes via the physical host bus adapter across the network, Ethernet or Fibre Channel, to a switch, where it is switched and then sent to the storage array's network interface.
4	The storage array assesses the data, possibly compresses, encrypts or deduplicates it, writes it to its write-back cache, and then mirrors the write to a secondary controller to ensure redundancy. Some arrays do not use fast NVRAM write-back caching, but instead, write it to slower SSDs, which increases the response time.
5	The array sends the write acknowledgment back through the enter path until it finally reaches the operating system on the virtual machine.

The write process that is issued by a virtual machine is significantly longer, more complex and involves many additional abstraction layers. There are many more "moving parts" involved in this process, with each step and layer contributing to latency in the overall operation.

Write latency is the time that it takes for a write operation to complete. Given the additional complexity involved in using shared storage, the write latency for a single synchronous write operation to a shared storage array is almost always much greater than a write operation performed on a physical server with local storage with write-back caching.

For example, while a complete write operation might take 25 microseconds on a physical server, the same write operation might take 250 microseconds to shared storage. Though 250 microseconds does not seem like a substantial amount of time, the time difference becomes significant when performing thousands of write operations per second.

The added latency involved in shared storage does not necessarily make shared storage bad nor unusable, as shared storage has many benefits. One benefit is that shared storage performs well in parallel. Unlike physical servers, shared storage supports multiple, simultaneous read and write operations from multiple servers without performance loss. Therefore, while a synchronous write operation to a shared storage array can be up to 10 times slower than to a physical server, the shared storage array handles hundreds of these requests in parallel at the same time, while the same load on a physical server with local storage can cause performance to drop to unbearable levels. By adding the throughput of all the hundreds of write operations, the cumulative throughput that a shared storage array can handle is far greater than local storage. This makes shared storage well suited for large multi-server environments running many virtual machines.

However, this added latency for sequential synchronous write operations is why Intelerad may perform additional tests on shared storage to ensure that it can perform adequately.

How Intelerad calculates input/output operations per second (IOPS)

There is an inherent relationship between write latency and the IOPS requirements provided by your Pre-Sales Architect. Intelerad uses the following calculation to determine IOPS.

For a physical server with 25 microsecond latency:

- Average write operation time = 25 microseconds = 0.000025 seconds
- 1 / 0.000025 = 40,000 IOPS

For shared storage with a 250 microsecond latency:

- Average write operation time = 250 microseconds = 0.00025 seconds
- 1 / 0.00025 = 4,000 IOPS

Not all mount points have the same IOPS requirements. Databases typically require higher IOPS for optimal performance, while bulk storage can function with lower IOPS. Performance requirements vary by product, server role, and expected workload, typically ranging from 500 to 3,000 IOPS. Your Pre-Sales Architect will provide exact IOPS requirements tailored to your server based on study volume, product features, workflow, and other factors.

Reliability, Confidentiality, Availability, and Integrity Considerations

When using shared storage as the underlying storage infrastructure for virtual machine storage, it is important that the array provides a highly resilient and reliable service that tolerates faults and does so without causing data corruption or loss. Often, the shared storage array is the single point of failure within the infrastructure, and if the storage fails, all VMs are unavailable and Intelerad software cannot function. It is therefore critical that your storage array has the appropriate high availability features and redundancy.

In addition to meeting the performance requirements described in this guide, when you are evaluating a storage array for use with Intelerad solutions, Intelerad recommends that you consider the following to ensure a stable and reliable storage environment:

- Good enterprise-quality storage arrays should be certified to at least 99.999% (five nines) of availability. Intelerad advises that you exercise extreme caution with a vendor that cannot provide this certification. Many storage arrays can provide greater than 99.9999% (six nines) of availability.
- The storage array should contain redundant controllers, fans, power sources, and so on, to ensure continued operation in the event of part failure.
- Work with your storage vendor to ensure that an appropriate RAID configuration is used and that hot spare disks are allocated to ensure sufficient redundancy at the disk level. For example, many vendors no longer support using RAID 5 with large disks, for good reason.
- Ensure that appropriate network redundancy exists between the servers and storage for both management and data, including Fibre Channel.
- Have an active service contract in place with your vendor that includes adequate part replacement and support response times. Also, be sure to keep up to date with firmware and software updates on your storage array.
- Storage arrays must be compatible for use with your hypervisor. Consult your hardware and hypervisor vendors. Your vendors should provide you with any required plugins and drivers.
- Make use of multiple switches and multipathing to ensure that you have redundant storage network paths from your servers to the array. Consult your vendor to determine if they provide a specific multipathing driver or solution for your hypervisor.
- Some vendors can provide encryption at rest, which may be a consideration for some clients.

- As Fibre Channel separates the storage network from the data (Ethernet) network, it typically provides consistent and lower-latency performance and is recommended for large deployments.
- While iSCSI can provide excellent performance, when misconfigured or non-optimized, it may cause problems on the network, and other network problems may cause storage problems. If you are not experienced with iSCSI, consult an expert to ensure that your network is configured appropriately to avoid such issues. You may need to purchase separate, high-performance switches with optimizations specifically designed to improve iSCSI performance.

Being storage agnostic, Intelerad does not provide official recommendations or endorsements for particular vendors or models. However, we are happy to provide you with models that we have seen perform well and reliably in the field with real Intelerad production workloads.

2
OPERATING SYSTEMS REQUIREMENTS

This chapter details the operating system and server setup requirements for Intelerad servers.

In this chapter:

Supported Versions 29

Windows and Server Installation 29

Operating System and Required Software Maintenance 32

Antivirus & Antimalware Software 32

Third-Party Software 32

Supported Versions

Supported Windows and SQL Versions by InteleOrchestrator Version

Supported Microsoft Windows Server Versions

InteleOrchestrator Version	MS Windows Server 2012	MS Windows Server 2016	MS Windows Server 2019	MS Windows Server 2022
3.x				
4.x				

Supported Microsoft SQL Server Versions

InteleOrchestrator Version	MS SQL Server 2012	MS SQL Server 2014	MS SQL Server 2016	MS SQL Server 2017	MS SQL Server 2019	MS SQL Server 2022
3.x						
4.x						

Important notes:

- Green cells represent the required version for server additions and evergreens.
- Orange cells represent a supported version for existing servers.
- Microsoft SQL Server edition must be Standard or Enterprise.

Windows and Server Installation

The following is a list of requirements and notes regarding Windows and server installation:

- It is the client's responsibility to install the operating system.
- You must use the server hostnames that are prescribed by Intelerad.
- Ensure that the server is configured according to the vendor's recommendations for low latency and/or high-performance computing.
- The server IP addresses must be statically assigned.

- Intelerad requires an account with administrator access to the operating system on the InteleOrchestrator servers.
- All servers using Microsoft Windows Server must be properly licensed with Microsoft and have access to Microsoft update servers.
- Client is responsible for complying with Operating System vendor EULA terms.
- All servers must be configured to use the filesystem(s) specified by the Server Specifications provided by Intelerad.
- All server partitions must be configured and assigned the drive letters as per the Server Specifications provided by Intelerad.
- Use a standard install for the operating system with GUI and default roles and services.
- Enable write-back caching on RAID controllers that are equipped with a battery- or flash-backed cache.
- All firmware pertaining to RAID controllers and arrays and remote access consoles should be verified and, if required, upgraded to the current revision from the hardware manufacturer.

Database Servers

For InteleOrchestrator database servers, the following softwares must be installed after the operating system has been installed:

- Microsoft SQL Server (Standard or Enterprise) with Full Text Indexing feature installed.
- SA Account for SQL: Add InteleOrchestrator user account to SQL with SysAdmin level access.
- SQL Server Management Studio (SSMS)

For practices with no maintenance windows, 24x7 SQL Enterprise is recommended. We support the use of high availability SQL Clusters managed by the customer.

If you are already managing a SQL environment, you may build the InteleOrchestrator databases in that environment. InteleOrchestrator will access the database(s) using an instance of SQL Server Management Studio (SSMS) installed on the Services Server (outlined below). InteleOrchestrator will require the appropriate database connection string along with a user account that has “owner” access to the InteleOrchestrator database(s).

If storing database backups on a network share rather than a local drive, please ensure the InteleOrchestrator user accounts have access to the path, for support related tasks.

Web Servers

For InteleOrchestrator web servers, the following software must be installed after the operating system has been installed:

- Microsoft Internet Information Server (IIS), with Feature Application Development > CGI.
- SSL Certificate for the InteleOrchestrator URL. Wildcard or specific, in PFX format.
    - SSL Server Certificate should be imported into IIS > Server Certificates.
    - Intelerad will bind the certificate to the webpage during the installation.

Services & HL7 Servers

For InteleOrchestrator Services and HL7 servers, the following softwares must be installed after the operating system has been installed:

- Microsoft .NET 3.5, 4.8 & 7

Test Server

Intelerad requires that a SQL instance be deployed on the test server so it can fully stand alone.

For InteleOrchestrator Test server, the following software must be installed after the operating system has been installed:

- Microsoft SQL Server (Standard or Enterprise) with Full Text Indexing feature installed.
- SA Account for SQL: Add InteleOrchestrator user account to SQL with SysAdmin level access.
- SQL Server Management Studio (SSMS)
- Microsoft Internet Information Server (IIS), with Feature Application Development > CGI.
- Microsoft .NET 3.5, 4.8 & 7
- SSL Certificate for the InteleOrchestrator URL. Wildcard or specific, in PFX format.
    - SSL Server Certificate should be imported into IIS > Server Certificates.
    - Intelerad will bind the certificate to the webpage during the installation.

Operating System and Required Software Maintenance

It is the client's responsibility to apply operating system, required software and hardware/firmware updates, critical patches, and Common Vulnerabilities and Exposures (CVE) security updates. Required software include Microsoft SQL Server, Microsoft Internet Information Server (IIS), Microsoft .NET and any other software Intelerad may require to be installed by the client. You must notify Intelerad before performing an operation that requires a server reboot, such as OS updates, software updates, firmware updates, and hardware maintenance.

The test system should be patched first prior to deploying the same patches in the production environment, to allow validating that product functionality has not been negatively impacted. Intelerad recommends following Microsoft's best practices regarding updates and security patches.

Intelerad recommends applying operating system updates and rebooting the servers at least once per month.

Antivirus & Antimalware Software

Intelerad encourages its clients to install antivirus/antimalware software on its InteleOrchestrator servers to protect them. Clients should follow their company's own policy when selecting and configuring such software.

In order not to impact the performance of the InteleOrchestrator software, please follow the guidelines provided by Microsoft for SQL Server.

Third-Party Software

Intelerad server software must run in a controlled environment. It is not uncommon for software to impede other software from operating as intended. As such, the only third-party software permitted on InteleOrchestrator servers are the required Microsoft software listed above, antivirus/antimalware software and backup agents.

3 NETWORK REQUIREMENTS

This chapter details the network requirements for InteleOrchestrator.

In this chapter:

Introduction 34

High Availability and Load Balancers 34

Network Port Details 34

Introduction

Servers hosting Intelerad software at each installation site must comply with the networking requirements that are described in this document in order to function properly and to guarantee service and support from Intelerad. When possible, all servers hosting Intelerad software should have unrestricted access to all other servers hosting Intelerad software. All Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) ports, as well as all Internet Control Message Protocol (ICMP) packets, require unrestricted access between servers. Each server must be identified by a single hostname and IP address pair across the system. Network address translation between servers is not supported.

The InteleOrchestrator web servers can be placed in a DMZ to meet the organization's security requirements.

High Availability and Load Balancers

For requirements on High Availability and Load Balancers, see the Resiliency Requirements Chapter.

Network Port Details

This section describes the network traffic for Intelerad software. Generally, Intelerad expects inter-server traffic to be unrestricted. As a result, the information provided in this section is subject to change. However, this information can be useful in the case where a firewall partitions the network.

This section does not include network traffic for Microsoft Availability Groups and Always On. For the specific network configurations for those features, please refer to the Microsoft documentation.

Network connectivity between InteleOrchestrator servers, and between end-users and servers, must be at least 100 Mbps in full-duplex. Latency between data centers should be reasonable. If you anticipate greater than 25 ms of latency between data centers, be sure to communicate this to your Project Manager or Solution Architect early in the process.

If Quality of Service (QoS) is being used on the network, Intelerad recommends prioritizing network traffic as follows: 1) database and server-to-server traffic; 2) HL7 traffic; 3) user connections and web traffic; 4) DICOM traffic.

Between InteleOrchestrator Servers and the Internet

This table describes the network communication requirements between InteleOrchestrator servers and the Internet. Normally, opening up outgoing ports is not a problem for our clients because people do not operate InteleOrchestrator servers. Consequently, restricting outgoing web access, such as to ports 80 and 443, is typically not a security concern.

Port(s)	Protocol	Service	Source	Destination
	Description URL**			
80,443	TCP	BeyondTrust	All servers	Internet
	Interactive support access. The BeyondTrust (aka Bomgar) session is initiated by the client from the server. remote.intelerad.com			
443	TCP	Web	All servers	Internet
	This is used to retrieve Python and OpenVPN software packages at initial installation and during updates/upgrades. pypi.org pythonhosted.org chocolatey.org			
443	TCP	Web	Database servers	Internet
	This port is required for accounting and business analytics. These modules are in Amazon Web Services (AWS). intelerad-billing-production-bucket.s3.amazonaws.com datalake-config-production.analytics.intelerad.com datalake-quicksight-production.analytics.intelerad.com kinesis.us-east-1.amazonaws.com			
443, 1194	TCP/UDP	Client Link VPN	All servers	Intelerad's subnetworks
	Software-based VPN required on all servers. Used for pro-active monitoring and for pushing software updates. Intelerad's subnetworks (104.156.67.64/26, 15.156.172.183, 3.99.5.199)			
3389	TCP	RDP	Intelerad's subnetworks	All Servers

Port(s)	Protocol	Service	Source	Destination
	Description URL**			
	Remote Desktop for interactive support access when BeyondTrust is not used. Intelerad's subnetworks (104.156.67.64/26, 15.157.167.0/28, 72.15.232.128/25)			
**If necessary, the remote address range can be limited to the listed URL(s).				

Between InteleOrchestrator Servers

Normally, all network ports are open between all InteleOrchestrator servers. If the network is fully open between all InteleOrchestrator servers, then this section is not relevant. If you must filter the network internally between InteleOrchestrator servers, this table describes the network communication requirements between InteleOrchestrator servers.

Port(s)	Protocol	Service	Source	Destination
	Description			
1433	TCP	SQL	Web and Services servers	Database servers
	Used for database connection strings			
9090	TCP	Prometheus	All servers	All servers
	Monitoring			
ICMP	ICMP	Ping	All servers	All servers
	Monitoring			

Between InteleOrchestrator Web Servers in the DMZ and Internal InteleOrchestrator Servers

This table describes the network communication requirements for the InteleOrchestrator web servers residing in a DMZ. The ports detailed in this table are required to establish connections from the InteleOrchestrator web servers in the DMZ to the InteleOrchestrator servers on the internal network, and from Internet users to web servers in the DMZ.

Port (s)	Protocol	Service	Source	Destination
	Description			
443	TCP	HTTPS	Web servers	Services servers
	Server-to-server web applications.			
443	TCP	HTTPS	Services servers	Web servers in DMZ
	Web services calls to web server.			
443	TCP	HTTPS	Internet	Web servers in DMZ
	Web applications. The blocking of unknown/foreign IPs is permitted.			
1433	TCP	SQL	Web servers	Database Servers
	Used for database connection strings.			
3000	TCP	WebSocket	Internet	Web servers
	Typically, websocket is installed on the Web servers. If opening port 3000 is not an option, a dedicated Websocket server can be installed in the DMZ to use port 443.			

Between InteleOrchestrator Workstations and InteleOrchestrator Servers

This table describes the network communication requirements between workstations and InteleOrchestrator servers. All InteleOrchestrator user applications connect using HTTPS. If your user base connects from known networks, restrict access to those networks instead of allowing access from all Internet addresses. If access from the internet is permitted, we recommend putting the Web server in a DMZ.

Port (s)	Protocol	Service	Source	Destination
	Description			
443	TCP	Web Applications	Web Browser	Web server
	InteleOrchestrator user applications.			
3000	TCP	Web Socket	zvExtender Application	Designated severs
	The zvExtender allows for 3rd-party desktop integrations. The websocket service is typically installed on the Web or Service servers, but can also be installed on a dedicated server in the DMZ.			

External Interfaces to InteleOrchestrator Servers

This table describes the network communication requirements between 3rd-party systems and the InteleOrchestrator servers for HL7, DICOM, LDAP and email notification services.

Port (s)	Protocol	Service	Source	Destination
	Description			
104*, 5000	TCP	DICOM	Services servers	PACS servers
	Used by InteleOrchestrator Odyssey to issue DICOM C-MOVE requests to intelligently route images from PACS to the AI servers. *Depending on what port the PACS servers are listening on. Port 104 is often the default port for PACS. IntelePACS listens on port 5000.			
389	TCP	LDAP	Web & Services servers	Domain Controller server
	Authentication with Domain Controller.			
443	TCP	Web	AI servers	Services server
	Used by InteleOrchestrator Odyssey to receive results through a RESTful API from AI vendor.			
465, 587	TCP	TLS/SMTP	All servers	Email relay server
	Optional: Used for outbound email alerting.			
636	TCP	LDAPS	Web & Services servers	Domain Controller server
	Authentication with Domain Controller.			
5005	TCP	HL7	Services server	RIS/EMR/PACS
	HL7 messaging to a RIS/EMR/PACS. This is the default port that Intelerad recommends, but can be modified if required.			
5005, 5008	TCP	HL7	RIS/EMR/PACS	Services server
	HL7 messaging from a RIS/EMR/PACS. These are the default ports that Intelerad recommends, but can be modified if required.			

4
CONNECTIVITY REQUIREMENTS

This chapter details the connectivity requirements for InteleOrchestrator for support and monitoring.

In this chapter:

Support and Access 40

Monitoring and Alerts 40

Support and Access

Remote Desktop Support

BeyondTrust Secure Remote Access (formerly Bomgar) is used by the Intelerad Support team to remotely connect to clients InteleOrchestrator system when providing support. BeyondTrust is a third-party product that ensures secure connections. For more information, please visit the BeyondTrust website.

- Intelerad strongly recommends having BeyondTrust pro-actively setup on the InteleOrchestrator system. Intelerad will provide the installer packages for BeyondTrust, and this is often done during the initial installation of the system.
- The Intelerad Support team requires Windows credentials to login to the system when providing support. Please ensure that Windows credentials are provided to the Intelerad Support team for future access.

Software Updates

Software updates are managed through BeyondTrust, see the Remote Desktop Support section above for more details on the requirements.

Monitoring and Alerts

Intelerad does not directly monitor client hosted servers. If Intelerad customers want to monitor their servers, they should follow their infrastructure vendors' and their own internal best practices.

5
RESILIENCY REQUIREMENTS

This chapter details the resiliency requirements for InteleOrchestrator. Resiliency is addressed for InteleOrchestrator by different mechanisms of high availability, business continuity and disaster recovery.

In this chapter:

High Availability 42

Business Continuity 42

Disaster Recovery 43

High Availability

High Availability (HA) ensures that a system remains operational and accessible with minimal downtime. The many services and components of the Intelerad solutions are designed to be redundant wherever possible. At the server level, all InteleOrchestrator production servers are deployed in redundant pairs. The recommended mechanisms to achieve high availability are the Microsoft Failover Clusters and SQL Always On features.

The following is required to achieve high availability for InteleOrchestrator:

- For any installation not hosted by Intelerad, the client is responsible for providing the optional network load balancers, and for providing, configuring, managing and supporting the Microsoft Failover Clusters and SQL Always On Availability Groups.
- The client is responsible for making sure the Microsoft SQL Always On Availability Groups and Failover Clusters configurations meet the Microsoft requirements.
- Configure clusters by server type (i.e. Database, Services and Web).
- All servers in a cluster must be on the same subnet.
- Virtual IPs are needed for all servers.
- A low-latency network.
- A stable network and stable hardware.
- A network load balancer can also be used in front of the web servers for user connections. When used, load balancers must have session persistence for both user sessions and the WebSocket service.

Business Continuity

Intelerad considers business continuity (BC) as a collection of steps and procedures required to quickly restore essential system functions when faced with a disruptive failure. It focuses on minimizing impacts to business operations. Intelerad designs its solutions with business continuity in mind at the software and at the architecture levels.

There are no specific requirements for InteleOrchestrator business continuity. Intelerad strongly advises including InteleOrchestrator in your business continuity and disaster recovery plan. For more information, please consult our *InteleOrchestrator Business Continuity and Disaster Recovery (BCDR) Guide* available on the Intelerad Service Portal.

Disaster Recovery

Disaster recovery (DR) are the steps taken to recover from an adverse event to restore the system or component to its original designed state. Most failures allow business operations to continue using HA and BC strategies. The work to restore the system to its original state is considered disaster recovery, even though the system remains operational. Some failures could be more disruptive and require DR work before functionality is restored, for instance losing all redundant components providing the same functionality. The Intelerad solutions include features to help with disaster recovery, such as storing data in multiple copies across multiple servers.

The two important pieces of data to back up on a regular basis are the databases (found on the Database server) and the configuration files (found on the Web, Services and HL7 servers). For the list of files to backup per server type, see the Appendix in the *InteleOrchestrator Business Continuity and Disaster Recovery (BCDR) Guide* available on the Intelerad Service Portal.

- Follow Microsoft requirements and best practices for setting up SQL database backups.
- Follow your organization's best practices and policies for the configuration file backups, ensuring third-party software does not impact server performance.
- The backups should be stored separately from the production environment, and ideally in a different geographical location.

Intelerad strongly advises including InteleOrchestrator disaster recovery in your business continuity and disaster recovery plan. For more information, please consult our *InteleOrchestrator Business Continuity and Disaster Recovery (BCDR) Guide* available on the Intelerad Service Portal.

6
SERVER APPROVAL AND SOFTWARE INSTALLATION PROCESS

This chapter provides an overview of the Intelerad approval and installation process for projects that require new hardware for use with Intelerad software. Such projects include new server installations, server replacements, and server additions.

In this chapter:

Windows Servers 45

Windows Servers

The Intelerad hardware approval and installation process for Windows servers is as follows:

1. **Intelerad provides you with server specifications.**

   At the beginning of a hardware installation project, the Intelerad Pre-Sales team sends you a Server Specification workbook by email that lists all the servers that are required for your project with detailed compute and storage resources for each.

2. **You install the servers (physical or virtual), operating systems, and a remote access tool.**

   The server requirements provided by the Intelerad Pre-Sales team also include requirements on how to configure the disk layout. If you are using virtual servers, it is important that your servers meet the minimum requirements to identify any potential issues and prevent unexpected delays during Intelerad software installation.

   In addition, for new installations, install a remote access tool (Intelerad recommends Bomgar/BeyondTrust). Intelerad uses this remote application tool to manage the lifecycle of your Intelerad solution and provide technical support.

3. **Intelerad verifies the server configurations and installs the Intelerad software.**

   An Intelerad Deployment Specialist validates the servers that you provisioned and configured against the initial requirements and verifies that you installed the right operating system in the required configuration. This includes the use of the prescribed hostname, virtual machine performance, and virtual resource reservations. If there is a discrepancy between the approved and delivered system, the Deployment Specialist will recommend you to correct the situation to avoid potential performance issues with the Intelerad software.

APPENDIX A: SERVER SPECIFICATION CODE AND ALIAS

This appendix describes the Intelerad Server Specification Code formats, and details how to decode the code elements.

In this Appendix:

Introduction 47

Server Specification Formats 47

Server Specification Elements 49

Introduction

This appendix describes how Intelerad communicates server requirements using Intelerad Server Specification Codes and Server Specification Aliases; and provides information on how to understand and decode these Server Specification Codes and Aliases.

If the Intelerad Server Specification Code or Alias provided to you is not accompanied by detailed resource requirements (i.e. you have a Server Specification Code or Alias without any other information), then you can use our web tool to interpret and decode it.

Follow this link: https://decoder.sre.intelerad.com to see an overview of what the tool can do.

To decode a Server Specification Code or Alias, add it to the end of this link:

- https://decoder.sre.intelerad.com/?action=getServerSpecsTxt&code=
- e.g. https://decoder.sre.intelerad.com/?action=getServerSpecsTxt&code=1PV-EJ-GVA-Z16VC-KVB-OVK-IVL-DVM

Server Specification Formats

Intelerad Server Specifications are expressed in one of two possible formats:

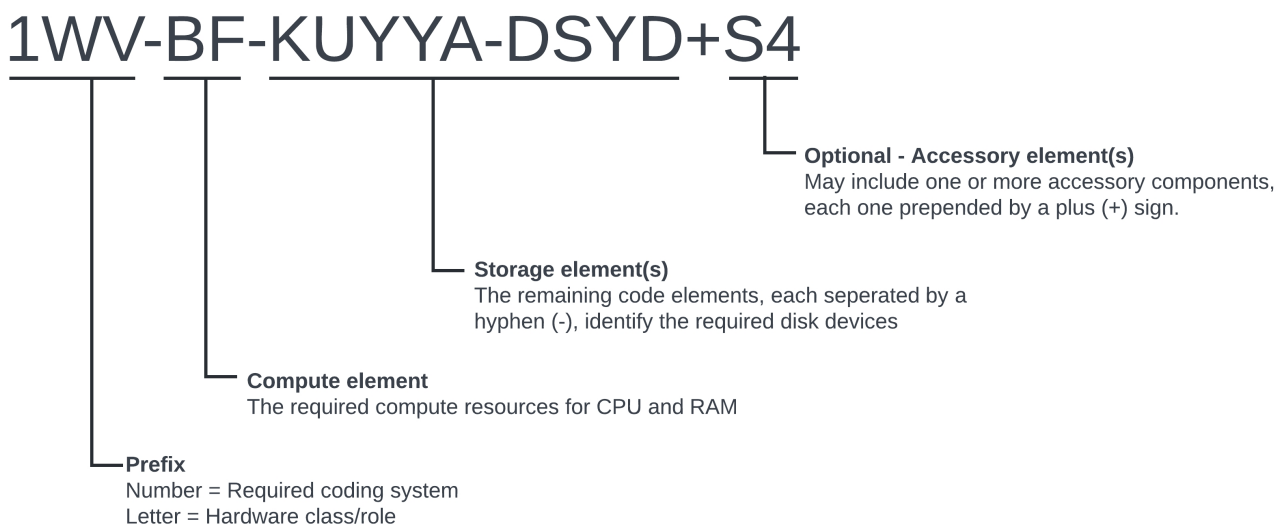
- Server Specification Code, also referred to as “Code” for the purposes of this appendix.
- Server Specification Alias, also referred to as “Alias” for the purposes of this appendix.

The two formats are detailed in the corresponding sections of this document.

Server Specification Codes

Server Specification Codes describe the hardware requirements for a given server. If a suitable Alias exists, Intelerad provides the Alias instead of the Code.

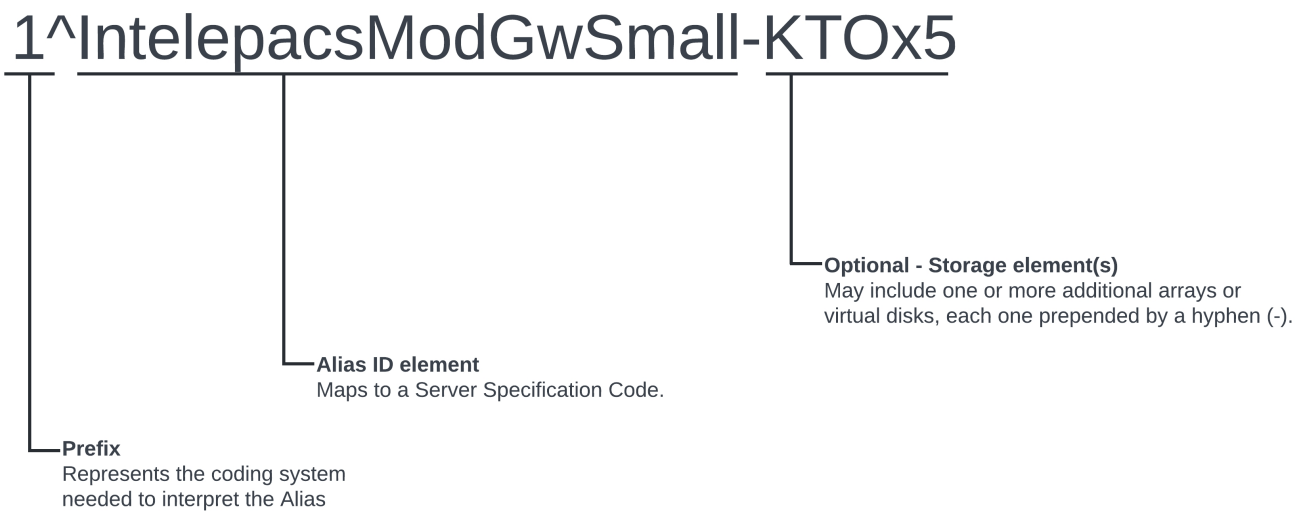
For detailed information on how to decode the Code elements, see Server Specification Elements.



Server Specification Alias

Server Specification Aliases are used to refer to common server configurations through the use of an Alias ID. An Alias ID maps to a specific Server Specification Code and is meant to be easy to read and remember. Therefore, Intelerad provides server hardware requirements using Aliases where possible.

For detailed information on how to decode the Alias elements, see Server Specification Elements.



Server Specification Elements

This section describes the elements that appear in Server Specification Codes and Aliases.

Letter-based code elements range from A to X. Letters Y and Z have the following special uses:

- The letter Y acts as a “shift bit” so that additional A through X values can be referenced in a given table.
- The letter Z acts as a custom value and is followed by a number to indicate the required value.
- Letters Y and Z can be combined in some cases, such as for CPU specifications. For example, a CPU code of YYZ1 would be a single core running at 1.6 GHz.

Prefix

The prefix is always the first element in a Code / Alias. It precedes the carat (^) in an Alias and precedes the first hyphen in a Code. The prefix includes a number only for Aliases, and a number with letters for Codes.

There is a guarantee that each Alias/Code will keep the same meaning over time. It is important to understand that the prefix is required to interpret the Alias/Code as such e.g. 1^AAGW is different from 2^AAGW.

- **Number**: The prefix always begins with a number. This number denotes the major version of the coding system used by the Server Specification Codes / Aliases and is required to properly interpret the Code/Alias. Currently, only version 1 of the coding system exists.
- **Letter**: Only Server Specification Codes will have one or two letters, denoting the hardware class/role. These letters can be interpreted as shown in this table: https://decoder.sre.intelerad.com/showPrefix
- Code Prefix examples:
    - **1PV** = Coding system version 1.x; IntelePACS virtual server running a Linux operating system
    - **3W** = Coding system version 3.x; Physical server running a Windows operating system

- **5WV** = Coding system version 5.x; Virtual server running a Windows operating system

Alias ID

The Alias ID is only used for Aliases.

The Alias ID element appears after the Prefix and maps to commonly used Server Specification Codes. However, full specifications are provided alongside the Aliases every time Intelerad provides server specifications (typically in spreadsheet format).

To access the full catalogue of Aliases, see:
https://decoder.sre.intelerad.com/showAliases

Compute

The compute element is only used for Codes and appears after the first hyphen (-) in the code.

The compute element comprises two letters from A to X:

- First letter = the number of CPU cores
- Second letter = the amount of required RAM

The required CPU clock speed is based on the presence of zero, one or two “Y” characters at the beginning of the compute element.

Custom values are specified by using the letter Z followed by the number of cores or amount of RAM.

For storage-only Server Specification Codes, the compute values will display as custom values of zero for both CPU and RAM. For example, 1S-Z0Z0-GSOx5.

For the full list of compute codes, see:

- CPU cores: https://decoder.sre.intelerad.com/showCpu
- RAM size: https://decoder.sre.intelerad.com/showRam

Compute element examples:

- **DH** = 8 cores at 2.2 GHz or higher (D) and 32 GB of RAM (H)
- **YDH** = 8 cores at 3.0 GHz or higher (YD) and 32 GB of RAM (H)

- **YYDH** = 8 cores at 1.6 GHz or higher (YYD) and 32 GB of RAM (H)
- **JZ320** = 64 cores at 2.2 GHz or higher (J) and 320GB of RAM (Z320)
- **YZ10F** = 10 cores at 3.0 GHz or higher (YZ10) and 16GB of RAM (F)

Storage

The storage element is used in Aliases and Codes.

Multiple compute elements can appear in a server specification, with each instance of the element preceded by a hyphen (-).

The storage element comprises three letters:

- First letter = storage capacity
- Second letter = storage performance (number of drives and RAID configuration, or IOPS)
- Third letter = storage partitioning scheme

Storage capacity (first letter)

For physical servers, determining the individual disk size is a function of the required usable capacity and the number of disks that are required in the array in order to meet performance requirements.

For the full list of storage capacity codes, see:
https://decoder.sre.intelerad.com/showDiskSize

Storage performance (second letter)

The Storage Performance maps letter codes to the RAID configuration that is used for physical servers, or required IOPS per partition for virtual machines or shared storage.

For the full list of storage performance codes, see:
https://decoder.sre.intelerad.com/showDiskPerf

Storage partitioning (third letter)

For the full list of storage performance codes, see:
https://decoder.sre.intelerad.com/showDiskPart

Accessories

The accessories element may appear at the end of a Server Specification Code or a Server Specification Alias Code. The accessories element is preceded by a plus sign (+).

Accessory Codes

For the full list of accessory codes, see:
https://decoder.sre.intelerad.com/showAccessory

VIEWING THE DOCUMENTATION

You can view this guide online or print it for later. You can also access this documentation and more in the Intelerad Service Portal:

https://serviceportal.intelerad.com/csm

The guide is provided as an Adobe Portable Document Format (PDF) file. You can open it with Adobe Reader, a free application for viewing and printing PDF files.

If you do not have Adobe Reader installed on your system, go to:

http://www.adobe.com

Comments and questions

At Intelerad, we strive to create accurate and intuitive documentation that provides you with effective product training and troubleshooting support. To better help us develop documentation products that meet your needs, we encourage you to send your comments and questions to:

documentation@intelerad.com.

Obtaining Printed Documentation

Additional printed and bound copies of this manual and other Intelerad product documentation can be obtained for a small fee.

For information, send an e-mail to: documentation@intelerad.com

CONTACTING INTELERAD TECHNICAL SUPPORT

Your system administrator can assist you with any issues you may encounter. If you require additional assistance, you can contact Intelerad Technical Support, 24 hours a day, seven days a week.

To contact us:	Use:
On the Internet	https://serviceportal.intelerad.com/csm
By telephone	Toll-free North America: 1-866-951-6222 Sans frais Amérique du Nord (français): 1 844-467-7227 Toll-free Australia: 1-800-286-418 Toll-free New Zealand: 0800-467-723 United Kingdom: 0113-360-2615 Other: +1-514-931-7127

These coordinates and a wealth of other information are also available on the Intelerad Service Portal.

https://serviceportal.intelerad.com/csm

You should regularly check the Intelerad knowledge base for the latest version of the documentation, as well as other product-specific resources such as TechNotes, downloads, and videos.