



SPECTRALIS[®], HEP on HEYEX 2 Platform

Heidelberg Engineering

IT Requirements

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Mind all safety instructions in this document while operating the software.

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1 Preface

HEYEX 2 is a software module for ophthalmic image management and device integration. It is an integrated part of Heidelberg Engineering products.

1.1 Purpose of this Document and Audience

This document is written for IT and system administrators who are responsible for the overall imaging network and system integration.

1.2 Applicable Documents

If you have any further questions, please refer to the following applicable documents:

Applicable documents

Article No.	Revision	Document	Content
306038	002 et seq.	HEYEX 2 Administrator Manual	In this document you will find all information on data, user, and license management, import and export, backup and archiving, and further configuration options of HEYEX 2.
306020	003 et seq.	Heidelberg Engineering Software Installation Manual on HEYEX 2 Platform	In this document you will find all information on installing the software.
306017	005 et seq.	HEYEX 2 Migration Guide	In this document you will find all information on how to migrate data from HEYEX to HEYEX 2.
306019	004 et seq.	HEYEX 2 User Manual	In this document you will find all information on the use of HEYEX 2.

1.3 Symbols Used in this Document

This chapter describes the definition, formatting, and symbols used in this document.

Cross-references Cross-references are identified by parentheses and a black arrow (→), for example: (→ “Cross-references”, p. 7).

Elements of the graphical user interface Elements of the graphical user interface such as buttons, window names, or file names are identified by quoted *“italic”* font, for example *“Next”*.

Lists Lists are used for structuring information and are marked by red squares:

- List entry
- List entry

Procedures Procedures are used for supporting the reader in completing a task and are marked by red triangles:

- ▶ Step 1.
- ▶ Step 2.

Safety messages Safety messages are indicated by symbols in this document. They are marked by a signal word and a safety alert symbol indicating the category of the hazard.



This symbol indicates helpful hints for using the device and software.

URL Information available on websites is identified by underlined text, for example <http://www.heidelbergengineering.com>. Click on the URL to open the corresponding website.

FW Whenever you see **FW** in this document, this information applies only to SPECTRALIS devices with FireWire interface.

TB Whenever you see **TB** in this document, this information applies only to SPECTRALIS devices with Thunderbolt interface.

1.4 Terms and Definitions

This chapter defines the abbreviations and terms used in this document.

Acquisition module An acquisition module is used for performing examinations and is installed on an acquisition station.

AQM Acquisition module

Acquisition station An acquisition station consists of a Heidelberg Engineering device and a PC. On this PC, an acquisition module and one or more viewing modules are installed.

Cache server A cache server is a dedicated server that stores remote content locally to increase the data access speed at a remote location.

CIFS Common Internet File System
CIFS is used for providing shared access to files, printers, and serial ports, and miscellaneous communication between nodes on a network.

EHR Electronic Health Record

EMR	Electronic Medical Record
FIPS	Federal Information Processing Standard These standards aim to ensure computer security and interoperability.
HITECH Act	Health Information Technology for Economic and Clinical Health Act
HEP	Heidelberg Edge Perimeter
HEYEX 2	Heidelberg Eye Explorer 2 HEYEX 2 is the next generation Heidelberg Eye Explorer platform which provides centralized management of image data in ophthalmology.
HIPAA	Health Insurance Portability and Accountability Act
HL7	Health Level 7 A set of international standards for transfer of clinical and administrative data between software applications used by various healthcare providers.
ImagePool	The “ <i>ImagePool</i> ” directory is the storage location for image data with accompanying patient data saved in DICOM format. Multiple “ <i>ImagePool</i> ” directories can be configured on local and network server directories.
I/O	Input/Output
LUN	Logical Unit Number
NAS	Network attached storage
PCI DSS	Payment Card Industry Data Security Standard
RAID	Redundant Array of Independent Disks A RAID is a data storage virtualization technology that combines multiple physical disk drive components into a single logical unit for the purposes of data redundancy, performance improvement, or both. Depending on the required level of redundancy and performance, the data can be distributed across the drives following a defined scheme.

RDM	Raw Device Mapping An option in the VMware server virtualization environment.
SAN	Storage area network
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
UPS	Uninterruptible Power Supply
UVO Tool	Tool for editing or updating examination data or patient master data.
VHD	Virtual Hard Disk; Synonym: VMDK
Viewing module	A viewing module allows the review of examinations from any PC in your practice. Viewing modules provide access to examinations acquired by Heidelberg Engineering devices and allow for examination review and image manipulation.
Viewing station	A viewing station is a PC that is used for examination review and image manipulation. On this PC, one or more viewing modules are installed.
VMDK	Virtual Machine Disk; Synonym: VHD
VPN	Virtual Private Network
VWM	Viewing module; also referred to as analysis window
WAN	Wide area network
WORM	Write once read many

1.5 General Safety Messages

Review the following points before working with the software:

- Carefully read the user manual.
- Keep the user manual within easy access.
- The inappropriate use of this software could damage the device and/or cause severe injuries.
- Mind all safety instructions in the user manual.
- Follow all precautions listed in the user manual.

A thorough understanding of how to properly use the software will reduce examination time, increase patient comfort, and allow for the best examination quality.

 **CAUTION**

If the HEYEX database and the archived data are saved on the same drive, both the HEYEX database and the archived data might be lost if the drive is damaged.

- ▶ **Do not archive the data on the same drive as the HEYEX database.**

Lost data might not be restored.

i

Do not install HEYEX 2 on a Domain Controller or a Backup Domain Controller.

For system performance and security reasons, it is required that the HEYEX 2 components are installed on a dedicated server instance.

i

No third-party software should be installed on the dedicated HEYEX 2 server.

2 Information about the Setup of Networks Incorporating HEYEX 2

Purpose of the network connectivity

The purpose of the network is to ensure access to diagnostic data from all workstations. The diagnostic data are typically images acquired and analyzed by devices from Heidelberg Engineering. As an option, there is the possibility to import additional diagnostic data into the database and assign them to patients.

Possible risks of network breakdown

- In case of a network breakdown, saved diagnostic data can only be accessed from the workstation where the data directory is locally stored. This might lead to a delay in a patient's diagnosis.
- In case of a network breakdown, it is not possible to save new data in the database. This might lead to a delay in a patient's diagnosis.
- In case of a network breakdown during image acquisition, acquired images might be lost. A re-examination of the patient may be necessary.

Obligations of the responsible organization

The connection of HEYEX 2 to a network that includes other equipment could result in previously unidentified risks to patients, operators or third parties. As the responsible organization, you should identify, analyze, evaluate and control these risks. Changes to the network could introduce new risks and require additional analysis.

Changes to the network include:

- Changing the network configuration.
- Connecting additional items to the network.
- Disconnecting items from the network.
- Updating equipment connected to the network.
- Upgrading equipment connected to the network.

3 IT System Architecture

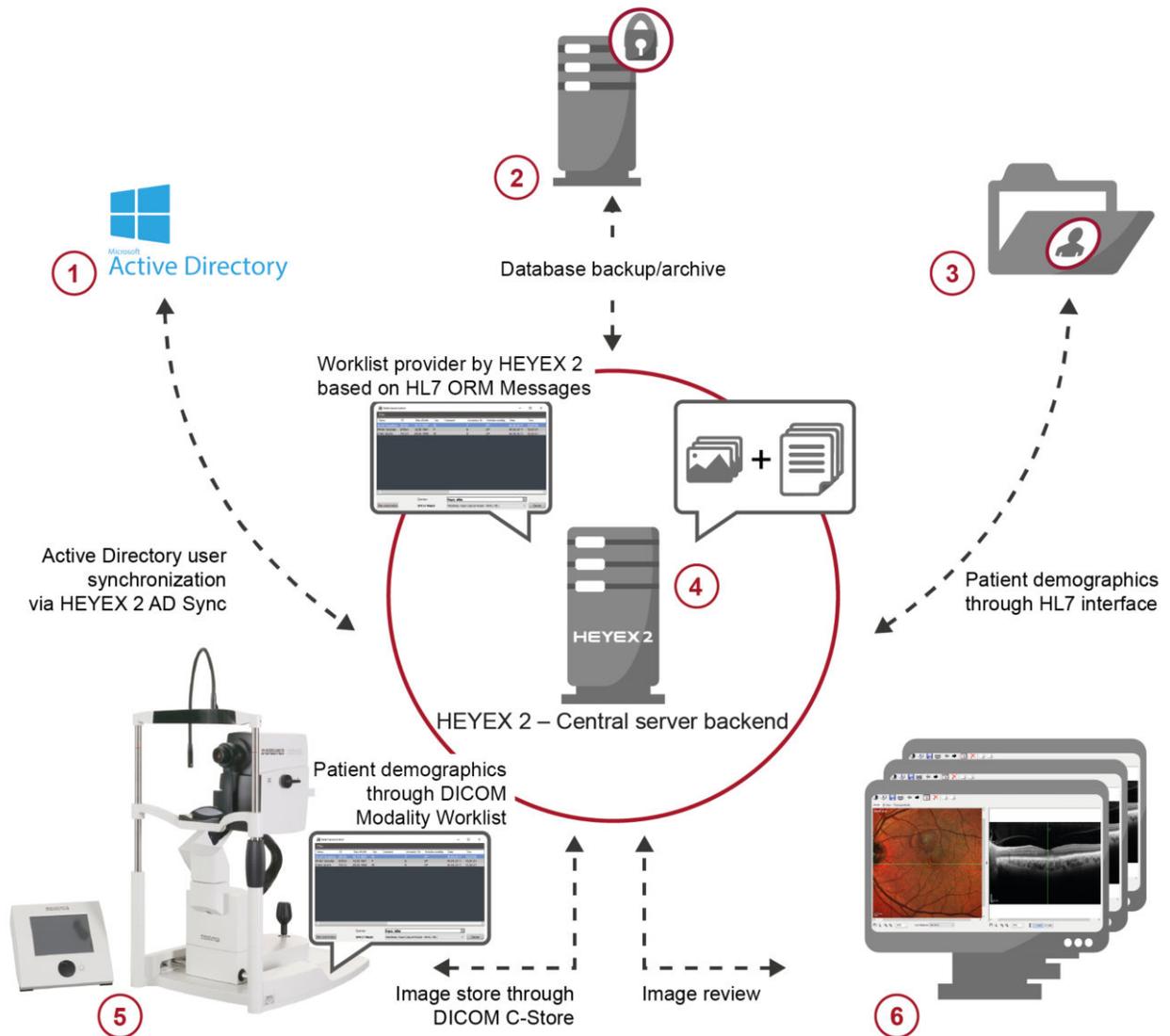


Fig. 1: IT system architecture

- ① Active Directory
- ② Database backup and archive
- ③ EHR/EMR integration
- ④ HEYEX 2 server with image management, database, HL7 interfaces, DICOM interfaces, image archiving, import server, postprocessing
- ⑤ Heidelberg Engineering devices
- ⑥ Viewing stations

4 Compatibility with Operating Systems

The software was tested and validated for the following operating systems. Please note that operating systems not listed in the table below are not supported.

i Heidelberg Engineering recommends using Windows 10 (64-bit) with HEYEX 2. However, not all acquisition modules support Windows 10. Please refer to the table below to determine if your device supports Windows 10.

i The minimum requirement for Windows 10 is the update version 1607.

- .NET Framework version 4.7.2 is installed together with HEYEX 2 version 2.4.
- .NET Framework version 4.7.2 requires Windows 10 update version 1607 to operate correctly.

i The minimum requirement for Windows Server 2016 is the update version 1709.

Acquisition or viewing station PC with HEYEX 2

	Windows 7 (32-bit)	Windows 7 (64-bit)	Windows 10 (32-bit) Minimum requirement: version 1607	Windows 10 (64-bit) Minimum requirement: version 1607
HEP AQM 3.1 See (→ "HEP AQM and HEYEX 2", p. 14).	✓	–	–	–
HEP VWM 3.2 or higher	✓	✓	✓	✓
Image Capture Module 1.2 or higher	✓	✓	✓	✓
SPECTRALIS AQM 6.10 FW or higher	✓	✓	✓	✓
SPECTRALIS AQM 6.10 TB or higher	–	✓	–	✓
SPECTRALIS VWM 6.10 or higher	✓	✓	✓	✓
HEYEX 2 version 2.4 or higher, client or server setup	✓	✓	✓	✓

HEP AQM and HEYEX 2

i Operating HEP AQM with HEYEX 2.

- Before installing HEYEX 2, ensure that the HEP device is running with Windows 7.
- HEYEX 2 can only be operated on HEP acquisition station PCs with at least 3 GB RAM.
- The HEP device can only be operated as a client connecting with a server in a network.

Microsoft Terminal Server / Citrix XenApp and XenDesktop

	Windows Server 2012 R2 (64-bit)	Windows Server 2016 (64-bit) Minimum requirement: version 1709
HEP VWM 3.2 or higher	✓	✓
SPECTRALIS VWM 6.10 or higher	✓	✓
HEYEX 2 version 2.4 or higher, client or server setup	✓	✓

Dedicated server with HEYEX 2

	Windows Server 2012 R2 Standard (64-bit)	Windows Server 2012 R2 Datacenter (64-bit)	Windows Server 2016 Standard (64-bit) Minimum requirement: version 1709	Windows Server 2016 Datacenter (64-bit) Minimum requirement: version 1709
HEYEX 2 version 2.4 or higher, server setup	✓	✓	✓	✓

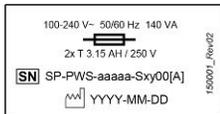
5 Hardware Requirements

5.1 Prerequisites

- Server components must meet applicable standards and the current state of technology.
- Heidelberg Engineering strongly recommends using Intel-based systems.
- Heidelberg Engineering recommends using multiprocessor systems.
- Heidelberg Engineering does not recommend using systems with a single processor that has Hyper-Threading enabled as these systems do not have the required peak performance.

5.2 Requirements for Acquisition Station PCs

5.2.1 SPECTRALIS Devices with FireWire **FW**



You can easily see the configuration of your device by checking the label on the power supply (Fig. 2).

Fig. 2: Power supply label **FW**

Acquisition station PC for SPECTRALIS with FireWire FW	
Processor	Intel Xeon E5-1630 v3 or higher
Chip set	Intel C612 or higher
RAM	8 GB or higher
Graphics board	AMD FirePro W2100 2 GB RAM or higher
Audio interface	Audio interface and internal or external speaker required
FireWire FW interface	For all SPECTRALIS devices: 1 PCI or PCI Express Card IEEE-1394a Additionally for SPECTRALIS HRA+OCT/OCT/OCT ^{Plus} : 1 PCI Express Card IEEE-1394b (FireWire 800)
Permanent storage	256 GB SSD or higher Additional storage may be necessary if the workstation is also used for image data storage.
Patient data storage	Requirements vary according to the amount of data and the amount of examinations per day.
Archive data storage	Requirements vary according to the amount of data and the amount of examinations per day.
Display*	Size: 24 inches Resolution: 1920x1200 Scaling: 125% dpi
Network	1x network adapter 1 GBit/s
Heidelberg Engineering recommends using an HP Z4 G4 Workstation.	

*Full HD displays that have a resolution of only 1920x1080 are not sufficient for the SPECTRALIS software.

*When using an ultra high definition monitor, please refer to (→ 6.6 “Adjusting a High Definition Monitor”, p. 28).



Special requirements may be valid for additional features or modules.

5.2.2 SPECTRALIS Devices with Thunderbolt Interface **TB**



You can determine the configuration of your device by checking the label on the power supply (Fig. 3).

Fig. 3: Power supply label **TB**



Make sure that the main board supports a Thunderbolt interface.

Acquisition station PC for SPECTRALIS with Thunderbolt TB	
Processor	Intel Xeon E5-1630 v4 or higher
Chip set	Intel C612
RAM	32 GB DDR4-2400 MHz (4 x 8 GB Modules)
Graphics board	AMD FirePro W2100 2 GB RAM
Audio interface	Audio interface and internal or external speaker required
Thunderbolt TB interfaces	Thunderbolt 2 or Thunderbolt 3 (including adapter)
Permanent storage	256 GB SSD or higher
	Additional storage may be necessary if the workstation is also used for image data storage.
Patient data storage	Requirements vary according to the amount of data and the amount of examinations per day.
Archive data storage	Requirements vary according to the amount of data and the amount of examinations per day.
Display*	Size: 24 inches Resolution: 1920x1200 Scaling: 125% dpi
Network	1x network adapter 1 GBit/s
Heidelberg Engineering recommends using an HP Z4 G4 Workstation.	

*Full HD displays that have a resolution of only 1920x1080 are not sufficient for the SPECTRALIS software.

*When using an ultra high definition monitor, please refer to (→ 6.6 “Adjusting a High Definition Monitor”, p. 28).



Special requirements may be valid for additional features or modules.

5.3 Requirements for Viewing Station PCs

Viewing station PC	
Processor	Intel Xeon E5-1630 v4
RAM	8 GB DDR4-2133 MHz (2 x 4 GB Modules)
Graphics board	AMD FirePro W2100 2 GB RAM
Permanent storage	256 GB SSD or higher
	Additional storage may be necessary if the workstation is also used for image data storage.
Display*	Size: 24 inches Resolution: 1920x1200
Network	1x network adapter 1 GBit/s
Heidelberg Engineering recommends using an HP Z4 G4 or an HP Z2 Mini G4 Workstation.	

*Full HD displays that have a resolution of only 1920x1080 are not sufficient for the SPECTRALIS software.

*When using an ultra high definition monitor, please refer to (→ 6.6 “Adjusting a High Definition Monitor”, p. 28).

Special requirements may be valid for additional features or modules.

5.4 Server Requirements



Configuring disks for the operating system, the databases, and the “ImagePool”.

Heidelberg Engineering recommends using different structures such as hard disks, RAID, etc. for the operating system and databases. The configuration should be RAID 1, 1+0 or 6. For best data protection, “ImagePool” drives should be RAID 6. Heidelberg Engineering does not recommend implementing software RAID.



I/O performance of the disks.

The database requires a higher I/O performance with regard to small data quantities, whereas images require a higher reading performance for bigger data quantities. As such, Heidelberg Engineering recommends running databases and images separately on different disk configurations.



Firmware update.

Prior to the operation of HEYEX 2, ensure that the firmware of the installed components is up-to-date.



Consider side effects prior to updating the firmware of the installed components.

It might not be possible to downgrade to the previously-used firmware version.

5.4.1 Dedicated Server

	Class 1	Class 2	Class 3
Max. number of devices	2-4	3-6	5-16
Max. number of concurrent users	3	5-10	10-40
Processor	Intel Xeon E3-1220 v6 or higher	Intel Xeon E5-1650 v4 or higher	Intel Xeon E5-2640 v4 or higher
RAM	32 GB or higher		64 GB or higher
Graphics board	Any		
Fast storage (operating system/ database)	512 GB SSD	300 GB 15k SAS HDD in RAID 10	600 GB 15k SAS HDD in RAID 10
Data volume storage (image data)	Requirements vary according to the amount of data and the amount of examinations per day. For best data protection, configure your ImagePool as a RAID 6.		
Archive data storage	Connection to external storage, for example NAS/SAN		
Display	Size: 17 inches Resolution: 1280x1024		
Network	1x network adapter 1 GBit/s, plus 1x for redundancy		
CD-R/DVD	Optional		
Power supply	1x, plus 1x for redundancy		
Uninterruptible power supply	Recommended		
Recommended	HP ProLiant ML30	HP ProLiant ML350 or DL120	HP ProLiant ML350 or DL380

5.5 Storage Requirements for Migration Projects

	Minimum	Recommended
Processor	Intel Core i3-4150	Intel Core i5-4590 or higher
RAM	4 GB	8 GB
Network	1 network adapter 1 Gbit/s CIFS share on NAS storage must be accessible from the data source system and target storage with read and write permissions.	
Drive bays	The actual number of drives determines the available storage volume and I/O load. Heidelberg Engineering recommends a minimum of 4 drives.	
Storage	RAID 5	
Heidelberg Engineering recommends using the QNAP NAS TVS-x71 series or equivalent.		

For further information on migration projects, please refer to the *Software Installation Manual* and the *Migration Guide* (→ 1.2 “Applicable Documents”, p. 7).

6 Preparations

6.1 Requirements for Environment and Infrastructure

6.1.1 Server Rack Cabinet and Server Use

Heidelberg Engineering strongly recommends using enclosed 19" server rack cabinets.

The servers must be used exclusively for HEYEX 2 applications.

6.1.2 Cooling Capacity

The servers must be operated in a sufficiently cooled environment. The cooling capacity must be adequate to dissipate the heat generated by the installed systems. Heidelberg Engineering can provide the respective technical specifications for the components delivered by Heidelberg Engineering. However, it rests with the customer to calculate the overall thermal load.



Please note that viewing stations, systems for clinical demonstration, and equivalent systems also must be operated under the required conditions. Rooms with elevated ambient temperature are not suitable for clinical demonstrations, as they could result in an increased fan speed and a reduced durability of the components.

6.1.3 Partitioning

Heidelberg Engineering recommends the following partitioning:

Partitioning example, real size and location depending on data volume

Assignment	Location	Size	Storage type
Windows + HEYEX 2 + page file See (→ 6.1.3.1 "Page File Size", p. 21).	C:\	150 GB (minimum) See (→ 6.1.3.1 "Page File Size", p. 21).	Fast storage
Database	D:\	350 GB See (→ 6.1.3.3 "Database Size", p. 21).	Fast storage
TransactionLogs	E:\	50 GB	Fast storage
MainImport	F:\	200 GB	Fast storage
UVOBackup	G:\	500 GB	Fast storage
ImagePool	H:\ + I:\ See (→ 6.1.3.2 "Mounted Folders for "ImagePool" Directories", p. 21).	2 x 2 TB	Data volume storage

For further information on software configuration regarding the partitioning, please contact your Heidelberg Engineering partner for assistance.

6.1.3.1 Page File Size

The minimum size of the page file must be equivalent to the RAM size.

If, for example, the RAM size of the server is 64 GB, the same 64 GB should be allocated for the page file on the local system drive. This is preferably the drive where the operating system is located.

The page file must be configured manually. It should not be automatically set by the operating system.

The required size of C:\ depends on the page file size.

6.1.3.2 Mounted Folders for “ImagePool” Directories

For the “ImagePool” directories, Heidelberg Engineering recommends assigning a mount point folder path to a drive instead of a static drive letter to each partition.

6.1.3.3 Database Size

The requirements for the database partition depend on the number of patients and images acquired. Each installation may need an individual database size. The size of the database partition in this document is an average partition size.

For further information on an actual calculation of the requested database size, please contact your Heidelberg Engineering partner for assistance.

6.1.4 System Stability

6.1.4.1 Redundancy

Heidelberg Engineering recommends setting up fans, power supply units, and network adapters of the installed servers redundantly. The same applies to the controller boards of the installed RAID systems.

6.1.4.2 Uninterruptible Power Supply

Heidelberg Engineering recommends equipping the server components with a UPS, so that operation is guaranteed in case of a power outage. This applies to all server components. The UPS must be able to shut down the server and the connected systems in case of a persistent power outage. Software must be installed to control the UPS and the shutdown of the system.

6.1.5 Network Infrastructure

6.1.5.1 Bandwidth and Latency

Bandwidth

The dimension of the network's bandwidth must be sufficient. The server must be connected to the network with an uplink data transmission rate of at least 1 GBit. The acquisition stations must be connected to the network with an uplink data transmission rate of at least 100 MBit, preferably 1 GBit. An adequate switch must be used to allow for connection to multiple network adapters.



The effective data throughput depends on several factors:

- CPU
- RAM
- Storage controller
- Storage device
- Network switches
- Workstation configuration

Latency

For optimum performance, Heidelberg Engineering recommends a latency of $\leq 3\text{ms}$.

In high latency environments, such as WAN or VPN, Heidelberg Engineering recommends using a HEYEX 2 cache server.

6.1.5.2 HEYEX 2 Cache Server

When HEYEX 2 is operated in a WAN environment, Heidelberg Engineering recommends the use of a HEYEX 2 cache server. This keeps your system operational even if the connection to the database server is interrupted. Additionally, the use of cache servers reduces the data access time.

6.1.5.3 Link Aggregation

Heidelberg Engineering recommends using link aggregation methods like teaming and trunking for increased data throughput and maximized system stability.

Please note that your network structure, especially the switch, must support link aggregation methods.

6.1.5.4 Online Storage

HEYEX 2 can manage an unlimited number of *"ImagePool"* directories.

6.2 System User Overview

Some Windows user accounts are created automatically during the installation of HEYEX 2.

All passwords of automatically-created users are assigned during the installation of HEYEX 2.

NOTICE

Do not change the password of any Windows user account created automatically during HEYEX 2 installation. Changing a Windows user account's password may cause a malfunction of the system.

NOTICE

Do not delete any Windows user account created automatically during HEYEX 2 installation. Deleting a Windows user account may cause a malfunction of the system.

Windows operating system user overview

User	User account	Function	Permanent password	Administrative rights
User	"ASHVINSLOC"	Intra-system user. This user is created automatically and suppressed for login.	Yes	No
User	"HEArchive"	User with access rights to the archive medium. This user is created by the customer's IT department if necessary.	Yes	No
User	"HEUpdate"	User with administrative rights to distribute software updates. This user is created by the customer's IT department if necessary.	Yes	Yes
User	"HEYEXUSER"	Standard user. This user is created automatically.	No	No
User	"IMAGEPOOLUSER"	Intra-system user. This user is created automatically for server installations only and suppressed for login.	Yes	No
User	"MCSERVICE"	User for HEYEX 2 maintenance and system analysis. This user is created automatically during the server setup.	Yes	Yes
User	"MCSYSTEM"	HEYEX 2 background services as well as the database server are executed with this user account. This user account is created automatically. It is not possible to log in to Windows using this user account.	Yes	Yes
Group	"HE_Remote_Users"	User group. This user group is created by the customer's IT department if necessary, and administrated, e.g., in Active Directory.	No	No

- i** Domain user account with administrator rights.
- On client PCs, the “*MCSERVICE*” user is not created automatically during the client setup.
 - For service purposes, your Heidelberg Engineering partner needs a comparable access to the clients. Please ensure that a domain user account with administrator rights is available on every client PC.
 - For the silent setup mode, you can set the parameter “*MCSERVICE*” in the configuration file to TRUE to automatically create the user account on the client PCs.

6.3 Access Rights

6.3.1 Access Control Lists

The access rights concept of HEYEX 2 is based on Access Control Lists (ACLs). The ACLs are displayed in the HEYEX 2 database.

6.3.2 Control Mechanisms

Within HEYEX 2, the following control mechanisms are available:

- Equipment access control
Unauthorized persons do not have access to the system.
- Data media control
The unauthorized reading, copying, modification or removal of data media is prevented.
- Storage control
The unauthorized input of data and the unauthorized inspection, modification, or deletion of stored data is prevented.
- User control
The use of the system by unauthorized persons using data communication equipment is prevented.
- Data access control
Persons authorized to use the system only have access to the data covered by their access authorization.
- Communication control
The system provides means to verify and establish to which communication partners data may be transmitted using data communication equipment.
- Input control
The system provides means to verify and establish which data has been input into the system and when and by whom the data was input.
- Order control
Data that is processed by order is only processed under instruction of the client.
- Transport control
The system prevents the unauthorized reading, copying, modifying or deleting of data in transfer.
- Organizational control
The internal authorizations and organization are designed in such a way that they meet the special data protection requirements.

6.3.3 Emergency Login

In case of an emergency, even if a user does not have the necessary user rights to access a patient's examination, the emergency login can be used to obtain access. Please note that all activity is logged when using the emergency login.

6.4 Antivirus and Firewall Software

6.4.1 Prerequisites

Heidelberg Engineering recommends using an antivirus software for scanning the HEYEX 2 server.

Please follow the instructions outlined in (→ 6.4.2 “Configuring the Antivirus Software”, p. 26) in order to avoid any conflicts.

NOTICE

HEYEX 2 and the image data archive must not be interrupted by antivirus software.

- ▶ **Configure the antivirus software so that HEYEX 2 and the image data archive are not scanned.**

The entire work of your practice might be endangered by massive performance losses.

6.4.2 Configuring the Antivirus Software



Always keep your antivirus software updated. An updated antivirus software detects and removes even new viruses and ensures that the antivirus software is regularly updated with the latest security patches.



Always exclude the recommended folders and files from the real-time scan process. Using antivirus software without excluding files from the real-time scan process may lead to performance problems in your IT environment. Heidelberg Engineering recommends proceeding as described in (→ “Excluding folders and files from the real-time scan process”, p. 27).



Do not perform routine full antivirus scans during business hours. To avoid a significantly reduced performance of your operating system, schedule routine full scans accordingly.

- Excluding folders and files from the real-time scan process**
- ▶ When installing the antivirus software per the manufacturer's recommendations, configure it so that the following folders and files with file extensions are excluded from the real-time scan process:
 - C:\HEYEX
The HEYEX installation directory configured during setup. If a different installation directory has been configured on the server and/or the clients, each directory has to be excluded separately.
 - C:\Program Files (x86)\Sybase16\Bin64
 - .dcm
 - .bmp
 - .tcl
 - .inf
 - .bin
 - .jpeg
 - .jpg
 - .db
 - .log
 - .e2e
 - .edb
 - .pdb
 - .sdb
 - .mdb
 - ▶ Ensure that the shared image data archives are excluded from the real-time scan process by both the server and the clients.
- i** Set the exclusions for the complete system. Depending on the system configuration, it may be necessary to exclude all *“ImagePool”* directories. For further information on the *“ImagePool”* directories, please refer to the *Administrator Manual* (→ 1.2 *“Applicable Documents”*, p. 7).
- i** Always disable behavior-based monitoring. Even though the folder and file exclusions have been configured, some antivirus systems, such as Trend Micro, may enable a behavior mode to continue their real-time scanning process. Ensure that the behavior mode is disabled.

6.4.3 Communication

To configure firewalls, the ports and services used for communication between the server and HEYEX 2 clients, follow the instructions in the chapters below.

6.4.3.1 HEYEX 2 Server

- ▶ Make the following ports available for incoming and outgoing traffic and ensure a functioning DNS server:

Application/Protocol	Port
DICOM	104; 105
DNS	23
CIFS	445
Sybase	2638
Worklist	5550
HL7	5678; 5679; 5680; 5681
WEB	80; 443 Binary data is also exchanged through these ports.

6.4.3.2 HEYEX 2 Clients

- ▶ Make the following ports available for outgoing traffic:

Application	Port
DICOM	104; 105
DNS	23
CIFS	445
Sybase	2638
WEB	80; 443 Binary data is also exchanged through these ports.

Depending on the configuration of modalities, additional ports may be needed for DICOM queries.

6.5 Windows Updates

Your IT policy should cover the handling of Windows updates. Heidelberg Engineering recommends regularly updating your systems with all relevant security patches from Microsoft. While there are no restrictions regarding these updates, Heidelberg Engineering recommends waiting a short time after the release before installing these updates on your systems.

With the HEYEX 2 setup, .NET framework 4.7 is included. By preparing all applicable systems with .NET framework 4.7 through Windows Updates prior to rollout, installation times can be reduced significantly.

6.6 Adjusting a High Definition Monitor

When using a monitor with an ultra high definition, the user interface may be distorted.

- ▶ Right-click the *“HEYEX”* desktop icon.
- ▶ Select *“Properties ▶ Compatibility ▶ Change high DPI Settings”*.
- ▶ Click *“Override high DPI scaling behavior. Scaling performed by:”* and select *“System”* in the drop-down list.
- ▶ Click *“OK”* to save the settings.

7 Remote Support

Heidelberg Engineering uses the Bomgar software for secure remote support.

The Bomgar remote support solution uses 256-bit Advanced Encryption Standard SSL to encrypt all application communications. The security features include role-based access control. The appliance is designed to use a demilitarized zone with firewall protection.

Session access and data never pass through a third-party server. Thus, your organization remains compliant with respective regulations, including the HITECH Act and HIPAA.

Bomgar complies with FIPS 140-2 Level 2 and PCI DSS.

The Bomgar software is hosted by Heidelberg Engineering.

For further information, please visit <https://www.bomgar.com>.

To guarantee the best support, please note the following:

- Only qualified, trained Heidelberg Engineering support personnel will conduct the remote support sessions. They will not disclose information covered by the obligation of professional confidentiality.
 - Please note that the remote support sessions are initiated by Heidelberg Engineering. On client systems, you will be asked to confirm a remote access inquiry to grant access to your system.
 - Heidelberg Engineering recommends granting 24/7 access to your server systems for assistance purposes during the installation and migration period.
 - Heidelberg Engineering recommends granting administrative rights to the user during the remote support session in order to ensure complete support.
 - To improve the quality of our services, the remote support sessions are recorded and stored.
 - Please note that an up-to-date internet connection facilitates the remote support service.
- ▶ Make the following ports available for incoming and outgoing traffic on the remote system:

Application	Port
WEB	80; 443



The instructions on port availability apply for a typical network setup. For further information, please refer to the software manufacturer's instructions.

Excluding files from the real-time scan process ▶ Allow the following executables to communicate through your firewall and antivirus software:

- bomgar-scc-{uid}.exe
- bomgar-scc.exe
- bomgar-pac-{uid}.exe
- bomgar-pac.exe
- bomgar-pec-{uid}.exe
- bomgar-pec.exe

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{uid} is a unique identifier consisting of letters and numbers.

If you encounter problems concerning the communication through the firewall or any other problems when establishing a connection, please contact your Heidelberg Engineering partner for assistance.

8 Configuring the Storage Device

8.1 Configuring a Storage Area Network

The configuration of a SAN for optimal performance depends on various parameters.

A SAN can be divided into various RAID groups. Thus, the I/O load is shared and data corruption is limited in case of outages. Multiple *"ImagePool"* directories can be assigned to a respective RAID group. This enhances the system performance and facilitates recovery after a system outage.

For extended data volumes and simultaneous access of multiple workstations, Heidelberg Engineering recommends using multiple servers in order to split the I/O load. Each of the servers is connected to the SAN.

For further information on how to configure a SAN, please contact your Heidelberg Engineering partner for assistance.

8.2 Long-term Archiving

Heidelberg Engineering recommends using Fast LTA Silent Cubes for long-term archiving.

Fast LTA Silent Cube is a certified, revision-safe archive storage medium with WORM-protection. HEYEX 2 allows for the configuration of the storage medium for scheduled archivings/backups.

For further information, please visit <https://www.fast-lta.com>.



Heidelberg Engineering supports backup/archiving on NAS/SAN systems. Please note that NAS/SAN or similar storage media do not provide revision-safe archiving.

9 Operation in a Virtualized Environment

9.1 Requirements

The requirements for the virtualized environment are equivalent to the requirements for the dedicated server, classes 1 to 3 (→ 5.4.1 “Dedicated Server”, p. 19).

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Storage medium for image data.

Heidelberg Engineering recommends configuring the storage medium for image data as RDM depending on the data volume. The storage medium is connected to a virtual machine in a virtualization environment.

Best practices for the deployment of virtualization technology

- ▶ Use Intel-based systems.
- ▶ Disable Hyper-Threading Technology for the respective host system.
- ▶ Install “*VMware tools*” in VMware vSphere or the “*Integration Services*” in Microsoft Hyper-V, respectively.
- ▶ Configure Service Console and VM on separate network adapters.
- ▶ Remove or deactivate hardware which is not needed, e.g. COM ports, LPT ports, USB controller if not required for license dongle, floppy and CD/DVD drives.

For further information on the hardware requirements, please refer to (→ 5 “Hardware Requirements”, p. 16).

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