



BridgeHead

Warranted Environment Specification

Healthcare Data Management Solution

BH-DEP-WES02

STORE | PROTECT | SHARE

Warranted Environment Specification

Document Purpose

This document specifies the environment required to install, and run, BridgeHead software. The Healthcare Data Management solution is both application and hardware vendor agnostic and supports many configurations. This document covers the more common configurations, other options are available.

Statement of Confidentiality

To be agreed

Document Control

Project:	Healthcare Data Management solution
Document Type:	Warranted Environment Specification
Document Name:	HDM Warranted Environment Specification
Document Number:	BH-DEP-WES02
Version:	1
BIP Reference:	
Document Author:	Shaun Smale – Solutions Consultant
Document Owner:	Jamie Clifton

Revision History

Date	Version	Author	Summary of Changes
10/01/2014	0.00	Shaun Smale	1st Draft
15/01/2014	0.002	Shaun Smale	Approved for release

Review History

Date	Version	Reviewer	Comments
15/01/2014	Draft	JC,GB,DL,PG,NB	Review cycle complete , changes made

Approval History

Date	Version	Comments	Status
15/01/2014	01	Final review	Approved

Review/Approvers.

Name	Title	Role
Graham Belcher	Services Manager	Approver
Jamie Clifton	VP Product Management and Solutions	Approver
Gareth Griffiths	Chief Technical Officer	Review
Pradeep Gurav	Product Manager	Review
David Lane	Software Engineering Manager	Review
Neil Brown	Sales Engineer	Review
Brendan O'Leary	Training development manger	

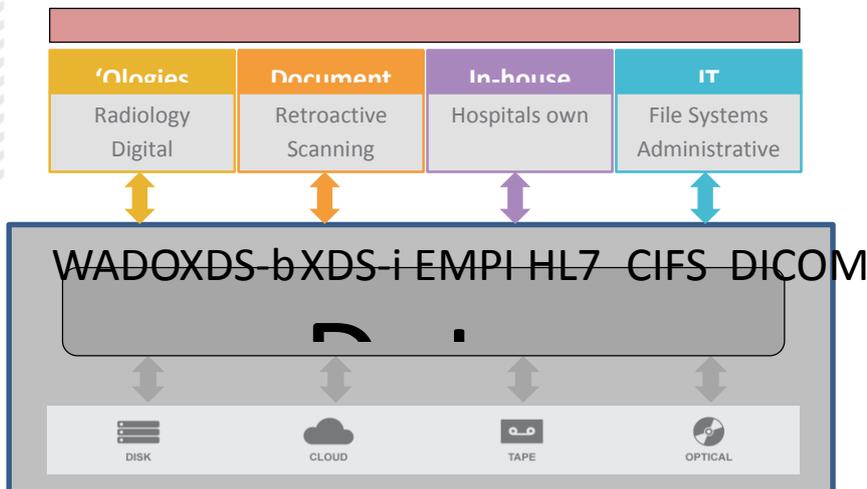
Table of Contents

1	SOLUTION OVERVIEW	4
1.1	HEALTHCARE DATA MANAGEMENT PLATFORM.....	4
1.2	STORAGE.....	4
1.3	AGENTS	5
1.4	INTERFACES	5
1.5	HDM ARCHITECTURE	5
1.6	OVERVIEW OF DICOM MIGRATION	6
2	HARDWARE SPECIFICATION	7
2.1	SERVER ROOM ENVIRONMENT	7
2.2	SERVER SPECIFICATIONS	7
2.3	TYPICAL SERVER REQUIREMENT FOR A PACS ARCHIVE	8
2.4	REQUIRED SERVER INFORMATION.....	9
2.5	SQL SERVER.....	9
2.6	BACKUP	10
3	ARCHIVE STORAGE.....	11
3.1	STORAGE VOLUME	11
3.2	STORAGE REQUIREMENT FOR FUTURE STUDIES	11
3.3	STORAGE TYPE.....	11
4	CONNECTIVITY	12
4.1	HL7	12
4.2	DICOM.....	12
4.3	STATIONS.....	12
4.4	SOURCE DICOM APPLICATIONS.....	12
4.5	E-MAIL NOTIFICATION.....	13
5	IMPLEMENTATION AND SUPPORT	14
5.1	INFORMATION REQUIRED FOR SIZING AND LICENCES	14
5.2	SOFTWARE DOWNLOAD	14
5.3	REMOTE ACCESS TO THE SOFTWARE AND SERVERS VIA N3 OR VPN.....	14
5.4	TRAINING REQUIREMENTS	15
5.5	ON-SITE TRAINING	15
5.6	REMOTE TRAINING	15
 Appendix		
APPENDIX A -	LOCALISATION OF DATA FROM BT MIA.....	16
APPENDIX B -	GLOSSARY	17

1 Solution Overview

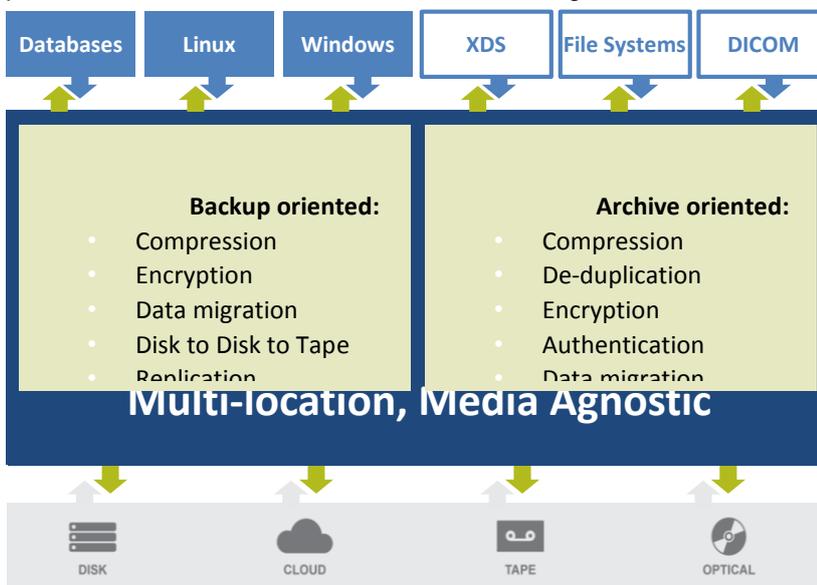
BridgeHead's Healthcare Data Management solution is designed to store, protect and share all healthcare data, whether they are databases, files, VMs, or a complex mixture.

BridgeHead's Healthcare Data Management solution abstracts the data from the application that creates it, and from the hardware that it is stored on. Data is managed in its native form. This use of standards based file format and exchange protocols facilitates exchange of that data with other applications. The underlying storage is managed independently to the application that created and/or uses it. Hardware can be replaced or augmented transparently to the application.



1.1 Healthcare Data Management Platform

The HDM uses a combined approach of back-up and archive to efficiently manage any data source. This maximises performance and reduces the total cost of storage.



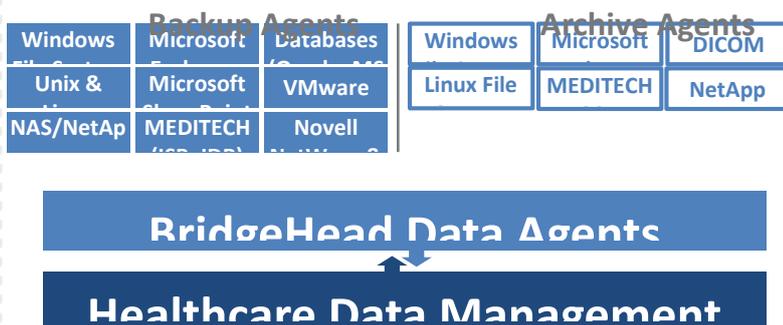
1.2 Storage

THE HDM platform is hardware agnostic and is able to write up to four copies of the files to any accessible storage location including cloud. With the use of its Information Lifecycle Management capability, the HDM solution is able to spread copies over a mixture of hardware platforms from a range of different vendors, maximising performance and reducing cost.

The majority of healthcare data becomes inactive after a short time but must be kept for varying length of time in accordance with legislative and best practice guide lines. By intelligently managing this data, inactive data can be moved to lower cost media, transparently to the application.

1.3 Agents

Agents are used to manage source data. Agents are specifically tailored to the type, environment and function of the data.



For a full list of agents and variants please see xxxxx

1.3.1 FileStore and DICOMStore

FileStore is the target for all non-DICOM file data. FileStore stores native files, such as the compressed proprietary files used within a PACS environment, as well as standards-based files such as jpeg, dcm, and pdf that can be exchanged with other applications.

The proposed solution provides an archive for native files using FileStore, and DICOM PACS data using the DICOMStore agent.

Back up agents are available to backup RIS/PACS databases in to the same archive

1.4 Interfaces

The solution requires the following interfaces to the Trust environment:

- UNC file paths to share, or mount, window files systems
- Access to a SMTP server for reports and alerts
- DICOM for storage and retrieval using the DICOM protocol, including IOCM
- XDS – The HDM is a XDS repository (optional)
- HL7 to provide update events to maintain the metadata

1.5 HDM Architecture

1.5.1 Standard configuration

A typical configuration to store radiology and other data in both native file and DICOM consist of 2 servers:

- Primary server for the HDM software – (with access to the storage hardware, PACS, and the Trust enterprise SQL server.)
- Server for the DICOM migration software, and later on to act as the DICOM gateway between the VNA and other DICOM applications (if required).

If resilience is required, a failover server will also be required at a remote location.

1.5.2 High availability clustering

A common configuration to provide additional resilience is a two node Active-Active Cluster of the Archive Server and SQL Server with SAN based storage. This configuration allows high availability because if the primary server fails, the failover server will pick up the entire load.

1.6 Overview of DICOM Migration

Out of scope

1.6.1 New PACS data

During the migration the PACS will be producing new data. This can be archived as file data and moved later or sent to the DICOM VNA.

Where the data is from a second DICOM application such as a replacement PACS, a DICOM integration will be required to facilitate the new application storing new data and retrieving prior data..

1.6.2 Maintaining metadata

In order to keep the metadata in the VNA up to date two feeds are required.

HL7

Patient update and patient merges should be sent from the HIS/PAS using HL7. This is usually via the Trust Interface engine (TIE) and consist of two messages A08 and A40.

IOCM

Information about changes made to studies in PACS must also be sent to the DICOM archive; most importantly images that are rejected after being sent to the archive. This is done using the DICOM Image Object Change Management protocol.

2 Hardware specification

2.1 Server room environment

The server room should comply with best practice for security and fire protection. The BridgeHead server should be protected by an uninterrupted power supply.

2.2 Server specifications

The HDM software can be installed on physical or Virtual servers.

What servers do BridgeHead need? That of course depends what you want to do! The beauty of the BridgeHead architecture is that it is very scalable. Therefore there is no simple answer. BridgeHead is not 'a one size fits all' solution, but this short guide shows how to determine your requirements.

To answer the question we'll split the system into Backup and Archiving components, but for a very small site you might be able to combine servers. BridgeHead applications by their nature tend to be input/output bound rather than processor intensive. That is, the limiting factor is how quickly the system can read or write data rather than how fast the CPU is. A clustered large HDM installation may have three (or more) servers.

- Management and Backup Server (If the backup volume is very large there may be multiple backup servers).
- Archiving server (FileStore, DICOMStore, Data repository)
- SQL Server – a SQL server or the Trust enterprise SQL Server

What we can say is that generally BridgeHead recommend physical servers where there are high I/O loads associated with large back-up solutions. The high I/O could affect other guests in a VM environment. In fact the BridgeHead servers are often specifically offloading the backup load from a VMware environment. If there will be a high restore rate from archiving for many concurrent users consider more memory on the SQL Server system.

Smaller sites may be able to combine servers, larger backup sites will need additional backup servers, and very large sites might split the Control and Media Management onto separate servers. For simplicity we will start with a standard BridgeHead system for a medium to large PACS archive will sufficient capacity to accept other DICOM and files data from other departments. The solution can be reviewed and scaled at a later date to include mail archives, and large back up task.

The recommend server arrangement for a typical PACS archive (files and DICOM) is a prime (hardware or Virtual) server with the BridgeHead software for FileStore and DICOMStore, with a second fail-over server at a remote location. The solution would utilise the Trust's enterprise SQL server. A temporary third server is required for DICOM migration. This server will be re-used to host the DICOM gateway software to map non-conformant DICOM data from the PACS if required. Details specifications are shown below:

2.3 Typical server requirement for a PACS archive

The same minimum specification apply for both physical and Virtual servers for a typical PACS archive to host the HDM software (FilesStore and DICOMStore. This SQL server will be on a separate physical device or will use the Trust's own enterprise SQL server.

A typical environment will have two identical servers, the second an active-passive fail-over server. Other combinations and clustering is supported.

CPU Cores:	Core 2 Duo
RAM:	16 GB
Operating System	Windows Server 2008 R2
Local storage	RAIDed 1TB
Partitions	
C: Operating system	100GB
D: HDM Software and agents/ Service Node journals	200GB
E: Landing area/share/Mount point	600GB
Network connections	
Ethernet	Minimum of 2 Teamed 1GB ports
HBA Fibre channel	may be required depending on storage infrastructure
VLAN	Access to PACS VLAN
Software	
Anti-virus	Trust's own enterprise solution
.NET Framework	Microsoft .NET Framework 3.5 SP1
USER accounts	
Bridgehead Admin account	Domain account 'htservice'
PACS Service user account	

A third server is required for the DICOM migration and as a gateway between the DICOM VNA and DICOM applications to address differences in the application of the DICOM standard. (tag morphing).

The DICOM Migration tool utilizes several components that must be installed for it to work.

CPU Core	2 core
Operating System	Windows Server 2008 R2
RAM	8GB
Local storage	RAIDed 1TB
Partitions	
C: Operating system	100 GB
D: HDM Software	500GB
Additional software	
Anti-virus	Trust's own enterprise solution
.NET Framework	Microsoft .NET Framework 3.5 SP1
.SQL server	Microsoft SQL Server 2005 Express or Microsoft SQL Server 2005

2.4 Required server Information

To assist the implementation of the BridgeHead server the following information will be required from the Trust

Host servers

Primary Data Centre location	
Hostname:	
IP Address	
PACS user account name	

Other servers

PACS user account name	
PACS server IP	
PACS server AET and DICOM Port	
Network domain name	

2.5 SQL server

There will be two databases – one recording the DICOM information and the other for FileStore

2.5.1 Standalone SQL server requirements

The SQL server can be standalone or the HDM solution can use an existing Trust enterprise SQL server. The minimum requirements for a standalone server are:

CPU Cores:	Core 2 Duo
RAM:	16 GB increase with size of database
Operating System	Windows Server 2008 R2
Local storage	RAIDed 1TB
Partitions	
C: Operating system	100GB
S: Database/data-files	See section 2.5.2 below
L: log and transactions	See section 2.5.2 below
Network connections	
Ethernet	Min. 2 Teamed 1GB ports
HBA Fibre channel	may be required depending on storage infrastructure
Software	
Anti-virus	Trust's own enterprise solution
USER accounts	
Bridgehead Admin account	Domain account 'htservice'

2.5.2 SQL disk requirements

FileStore

FileStore requires approximately 1.5K per file in the SQL database. (The exact size depends on the length of file names and how much single instancing occurs). So allow 1.5GB per million files.

- Default 50 million files
- Datafile size = 15 GB per 10 million files
- Transaction log size = 10 GB per 10 million files

DICOMStore:

DICOMStore requires approximately 1K per image stored. (The exact size depends on numbers of images per series, series per study and studies per patient) so BridgeHead recommend allowing 1GB per Million Images. In addition, because DICOMStore uses FileStore, each Image is also a file in FileStore. Therefore also allow FileStore 1.5K per file and allow for the Data Repository storage.

- Default 2 million studies
- Assume 100 images per study
- Datafile size = 100 GB per 1 million studies
- Transaction log size = 50 GB per 1 million studies

SQL Server transaction logs.

BridgeHead recommends a minimum of 30 GB assuming the transaction logs are backed up and truncated daily. The transaction log space required is governed by the amount of activity between backups. Initially there is usually a heavy ingest period, 30 GB is normally adequate if a suitable backup regime is in place.

Total

Putting that together for a three copy Data Repository:

For each million Files or Images

- 1GB Archiving server storage
- plus 1.5 GB SQL server storage,
- plus 1 GB per image for the DICOM specific SQL.

Or 3.5GB per million files or images

2.6 Backup

BridgeHead's solution can provide back-up for all its own systems and any healthcare system and their data.

Requirements:

Target for the backed-up metadata – typically the remote HDM server

3 Archive Storage

3.1 Storage volume

The total storage volume will depend upon the number of copies to be made, the volume of data to be migrated into the VNA (both Files and DICOM), the allowance for growth, and the allowance for other data sources.

3.2 Storage requirement for future studies

The number of studies added to PACS each year has increased at a little over 10% per year across the UK. New modalities and specialities may cause a significant jump. The average files size has dramatically increased in recent years with the introduction of multi-slice CT. As a result, the ratio between number of studies and storage volume has changed, making it difficult to estimate the requirement for future growth. The BridgeHead solution allows replacement and augmentation of the storage. This replacement or augmentation is completely transparent to application.

BridgeHead can provide a calculator to help estimate the future storage requirement.

The storage volume requirements will be defined in the quote

3.3 Storage type

Archived data can be stored on a variety of storage types. The different copies can be stored on different storage types. This allows you to choose a combination that best meets your speed, security and cost constraints.

NAS

It is simplest to present NAS as a single CIFS share

SAN

If the archive storage is going to be provided from a SAN there are a variety of options. One of the simplest approaches with SAN storage is to have a small F: drive and have the storage carved into (say) 200 GB LUNs each configured as mount points on the F: drive.

Cloud

Cloud support is available

Tape

Copies can also be written to tape

4 Connectivity

4.1 HL7

DICOMStore requires a feed from the HIS/PAS usually via the Trust Interface engine. Only two messages are required.

See HL7 interface specification for full details

Details to be provided by the Trust are:

- Port
- Support messages
- Example A08 message
- Example A40 message

4.1.1 NHS number

Only validated NHS number to be provided

4.2 DICOM

See DICOM Interface specification for full details

C-Find, C-Store, C-Move, Storage commit, IOCM

4.3 Stations

Two stations must be configured on the PACS to support DICOM migration and for storage and retrieval of new data.

Existing PACS

DICOMStore	
AET:	DICOMSTORE
Port:	104
IP Address:	to be provided by Trust

DicomStore	
AET:	EXODUS
Port:	104
IP Address:	to be provided by Trust

Configure the stations to allow

- Query Retrieve
- Retrieve off-line studies
- Enable multi-frame studies

4.4 Source DICOM applications

Whether the PACS is being retained or replaced both PACS can be configured to write DICOM data to the VNA and retrieve data from it. The details of the PACS should be provided to support integration.

Existing PACS

AET:	
Port:	104
Host Name:	
IP Address:	

New PACS

AET:	
Port:	104
Host Name:	
IP Address:	

4.5 E-mail notification

Connection to the Trust's SMTP server is required. This is required to:

- Support e-mail notification of error and warning messages
- Send reports

Messages and reports are generally sent to both a nominated distribution list within the Trust and to nominated BridgeHead staff. SMTP mail forwarding is critical where BridgeHead are responsible for monitoring as part of a fully managed service. Note: Some SMTP server may not be able to send to external addresses.

To support e-mail notification of error and sending of reports to BridgeHead the details of the Trust SMTP server and the ability to use the server to send these e-mails.

- Host Name/IP address/Port of SMTP server
- Account name (BridgeHead use)
- BridgeHead Mail box account (e-mail alias – to and from address)

5 Implementation and support

5.1 Information required for sizing and licences

The following information is required:

Total number of studies to be moved	
Forecast for number of studies	
Total volume in TB of existing archive (usually compressed)	
Forecast for future study volume	See BridgeHead's sizing calculator

To forecast the volume of future DICOM data, it is necessary to make certain assumptions about the average study sizes by modality type for the Trust. This average is multiplied out by the forecasted number of study for each type. A specialist department with a multi-slice CT scanner may acquire significantly more images per study than a general department. Failure to take this into account may lead to an undersized archive. The HDM solution is easily scalable and additional storage can be added completely transparently to the application.

5.2 Software download

The HDM software and licence is specifically cut for the Trust. This must be downloaded to the Trust servers ready for BridgeHead staff to install. Since the software is too big to send by e-mail the Trust will need to pull the files from BridgeHead's FTP server.

Suitable FTP software and external network access is required to log in to the BridgeHead FTP server.

Site:	TBA
User name	TBA
Password	TBA
Mode:	Passive

Future release may also be delivered this way.

5.3 Remote access to the software and servers via N3 or VPN

The trust is to provide details to BridgeHead so that they may remotely access the servers

This includes (but not limited to)

Service desk contact details	
Name	
Phone number(s)	
Alternative contact	

VPN connection details (via service desk)	
address:	. .nhs.uk
Group:	
username:	
password:	

Where possible a token would be desired, so as to allow 24/7 service support.

VPN connection details (Token)	
address:	. .nhs.uk
Group:	
Username/PIN	
User guide/ access instructions	

5.4 Training Requirements

Training can be provided on-site or via web-ex; in both cases a training room away from the working environment is recommend to reduce interruptions

5.5 On-site training

For on-site training the following will be required

- Network connectivity to HDM software

5.6 Remote training

For web-ex training the following will be required

- Laptop or PC configured to run the web-ex software (may need admin right to download and install software)

Appendix A - Localisation of data from BT MIA

Data will be localised by Sectra via the PACS to the Sectra OPEN Archive as part of the LSP contract. The data can be moved from the SOA using DICOM

Appendix B - Glossary

Term	Description
LSP	Local Service Provider
N3	New National Network, established to provide a robust network to support the required capacity for national electronic projects
NPfIT	National Programme for IT
PACS	Picture Archiving & Communication System
PAS	Patient Administration System
PDS	Patient Demographics Service will provide basic patient information, e.g. name, address, date of birth
PRINCE2	Projects In a Controlled Environment. Prince is a project management methodology.
RIS	Radiology Information System