

Synapse Release Version 3.2.1
Product Data

Server Modules and Interfaces

Application

Synapse Server Software is a collection of software modules built on the Microsoft® Windows® Server platform, which together, provide the core software functionality for Synapse - Fujifilm's Next Generation PACS.

Synapse Server Software's communication with the workstation is entirely web-based and uses Microsoft Internet Information Server (IIS) to provide image access to client workstations. Server modules provide foundation technologies and help communicate with other imaging and informatics systems including the Synapse Database, Web Server (and CodeBase Server), Storage Server, DICOM Server, HIIS, Recollection, PreCache Server and, when required, Hierarchical Storage Manager (HSM).

All Synapse server components can run on standard Windows servers or can be installed on clustered servers to provide high availability. Because all data traffic is over standard TCP/IP ports, Web and DICOM communication can also be routed through content switches to provide greater system scalability and reliability.

Server Modules

Database Server

The Synapse Database operationally tracks all aspects of the PACS. The database supports the system folder structure, which organizes the patients and studies. All workstations communicate with the database through Hyper Text Transfer

Protocol (HTTP) communication.

Synapse uses Oracle 10g as its database foundation.

At least one logical copy of the database exists in the PACS. For enterprise deployments requiring separate physical databases, multiple logical databases can be deployed and coexist. A user's system access and privileges are all controlled by assignment of database access rights.

For high availability requirements, the Synapse Database can be clustered on multiple servers using Oracle Fail-safe software and Windows Clustering.

Web Server

Synapse uses Windows Internet Information Server (IIS) as its core web server. Synapse is a truly web-based system – all data going to and from the Synapse workstation goes through the web server(s). All images, information and user authentication is sent over standard web ports – port 80 for standard communication and port 8080 for SSL are typical in most installations.

A special web server called the CodeBase server provides installation files and automatic code update notifications for the Synapse workstation. For enterprise distribution of MultiView and CommonView datasources, the CodeBase server can publish settings for other available datasources and settings.

The web server can run on one multi-function server or on multiple servers depending on image volume, available bandwidth and desired functionality.

Storage Server

Synapse Storage servers are Windows servers that are used for the storage and distribution of images, documents and other Synapse file objects. Storage directories are then presented as UNC paths to the web servers which wrap the file content for web-based distribution to the Synapse workstation.

DICOMServer

Synapse DICOMServer Software receives studies directly from DICOM modalities without the need for modality interface gateways or interface units. All modalities are direct TCP/IP connections to the network. Synapse DICOMServer Software also provides direct, brokerless DICOM Modality Worklist Management (DMWL) to any modality supporting this functionality and responds to all Query/Retrieve, Modality Performed Procedure Step and Storage Commitment requests.

DICOMServer writes images to standard NTFS file locations and inserts an entry for each image into the Synapse Database as a Uniform Resource Locator (URL). From there, the Synapse Database maintains the image locations for on-demand delivery to workstations. When images are requested, they are streamed directly from the storage system.

Upon receipt of images from a modality, a technology called AON™ (Access Over Network) Engine enables DICOMServer Software to generate multiple image versions at varying levels of compression. The AON Engine can write JPEG Lossless and Fujifilm Wavelet Lossy image files at user selectable levels of compression based on body part, modality type or a modality's specific AE-Title.

DICOMServer can run on one multi-function server or on multiple servers depending on image volume, available bandwidth and desired functionality.

HIIS Server

The HIIS (Hospital Information Interface) Synapse RIS/HIS Interface Software is integrated as an HL-7 interface engine, which provides direct brokerless connections to any HL-7 information system. It supports patient, order and report related information. Admit/Discharge/Transfer (ADT) related information could originate from the RIS or HIS.

As with most Synapse components, the Synapse RIS/HIS Interface Software can run on a single multi-function server system or on one server in a multi-server system.

A bi-directional version of HIIS supports study and image notification back to the HIS/RIS and EMR systems for better coordinated enterprise workflow and information sharing.

Recollection Server

Recollection Server is a Synapse specific implementation of Microsoft ISA (Internet Security and Acceleration) Server. The Recollection Server provides a central cache for remote locations connecting to a centrally hosted Synapse system. DICOMServer works directly with ISA to put images in the ISA cache during image storage to Synapse. Multiple Recollection Servers can be deployed throughout the enterprise at various remote locations.

PreCache Server

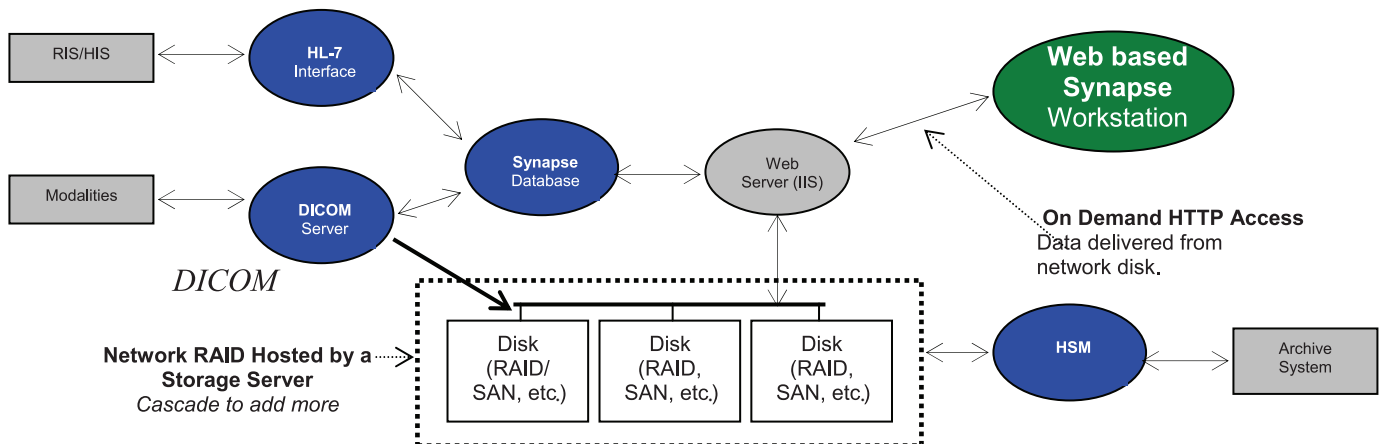
PreCache Server is a Windows service that listens for scheduled exams and retrieves comparison images for the scheduled patient from the archive. The service opens the image files which would trigger the HSM to bring the files back to primary storage if the file has migrated off to an archive device. It can be configured to retrieve a defined number of historical studies and can be set to run on a specified schedule.

HSM (Hierarchical Storage Manager)

Synapse reads from and writes images to spinning disk media. HSM is then responsible for image archival, copies and backups to multiple tiers of storage. The Synapse HSM monitors the storage levels of any disk on the Synapse network. It scans the disks for new data and writes or migrates the data to the archive device and creates a redundant archive copy for complete archive backup and disaster recovery.

Synapse uses commercially available HSM products for its PACS specific application. Synapse is archive device independent and can utilize any archive device (spinning disk, SAN, NAS, CAS, tape, DVD, UDO, etc.) that is validated to the HSM.

Synapse Server Software Logical Flow



Interfaces

Inbound HL-7 Interface

This is the standard HL-7 interface into Synapse and supports a large amount of ADT, order and report transactions into Synapse. When a capturable event occurs in your HIS or RIS system an HL-7 transaction is generally created. The Synapse HIIS Server accepts the transaction, parses it and inserts or updates it into the Synapse Database.

The following HL-7 message types are supported:

- General Acknowledgement (ACK)
- Admit/Discharge/Transfer (ADT)
- Master File Notification (MFN)
- Order Message (ORM)
- Report Message (ORU)

The following HL-7 event types are supported:

- Admit/Visit Notification (A01)
- Patient Transfer (A02)
- Patient Discharge (A03)
- Patient Registration (A04)
- Patient Information Update (A08)
- Patient Merge (A18)
- Patient Merge – patient ID only (A34)
- Patient Merge – account number only (A35)
- Patient Internal ID Change (A47)
- Order Message (O01)
- Report Message (R01)

Many event types not listed above are supported by mapping them to higher level event types.

Typical examples:

- A05 → A04
- A05, A06 → A02
- A09, A10 → A08
- A11 → A03
- A13 → A01

Bi-directional Outbound HL-7 Interface

(upgrade to standard HIIS)

A bi-directional HIIS interface enables Synapse to send study status to a third party system via an outbound HL-7 based order message (ORM). Synapse can be configured to trigger an outbound message anytime a study's status changes to:

- Started
- Sent
- Completed
- Dictated

Note: Not all status changes have to trigger an outbound message – trigger activation is site configurable.

Along with the expected standard demographic and study information, the outbound ORM message can send PACS specific information that may be useful for third portal, HER, EMR, RIS and other systems.

Information includes:

- Internal Study Instance EUID
- AE title for the study
- Study date/time
- Image Count
- Study URL

Note: Additional details on the inbound and outbound HL-7 capabilities of Synapse can be found in the Synapse RIS Interface Specification document.

DICOM Interface

Supported SCP (Service Class Providers)

Classes:

- Standard Storage
- Multiframe Image Storage
- Fujifilm Private CR Storage
- Modality Worklist C-FIND
- Patient Root Q/R-FIND
- Study Root Q/R-FIND
- Patient/Study Q/R-FIND
- Patient Root Q/R-MOVE
- Study Root Q/R-MOVE
- Patient/Study Q/R-MOVE
- Storage commitment push
- Modality Performed Procedure Step

Supported SCU (Service Class User)

Classes:

- Basic Grayscale Print Management Meta SOP Class
- Basic Film Session SOP Class
- Basic Film Box SOP Class
- Basic Grayscale Image Box SOP Class
- Printer SOP Class
- Print Job SOP Class
- Study Root Q/R-Find SCU
- Study Root Q/R-Move SCU
- Verification SCU

Please reference the Synapse v3.2.1 DICOM Conformance Statement for greater detail.

Server Operating System Support

Operating System	Vendor	Browser	Additional
Windows 2000 (Standard) with SP4	Microsoft	Internet Explorer 6.0 SP1+ Internet Explorer 7.0	<ul style="list-style-type: none"> • Microsoft MSMQ version 2.0[†] • Oracle 10g V10.2.0.1 Server* • Oracle 10g V10.2.0.3 Server* • Oracle 10g V10.2.0.1 Client[‡]
Windows 2003 (Standard) with SP2	Microsoft	Internet Explorer 6.0 SP1+ Internet Explorer 7.0	<ul style="list-style-type: none"> • Microsoft MSMQ version 2.0[†] • Oracle 10g V10.2.0.1 Server* • Oracle 10g V10.2.0.3 Server* • Oracle 10g V10.2.0.1 Client[‡]
Windows 2003 R2 with SP2	Microsoft	Internet Explorer 6.0 SP1+ Internet Explorer 7.0	<ul style="list-style-type: none"> • Microsoft MSMQ version 2.0[†] • Oracle 10g V10.2.0.1 Server* • Oracle 10g V10.2.0.3 Server* • Oracle 10g V10.2.0.1 Client[‡]
Windows 2000 Advanced Server + SP4	Microsoft	Internet Explorer 6.0 SP1+ Internet Explorer 7.0	<ul style="list-style-type: none"> • Oracle 10g V10.2.0.1 Server* • Oracle 10g V10.2.0.3 Server* • Oracle 10g V10.2.0.1 Client[‡] • Oracle FailSafe3.3.4
Windows 2003 Server (Enterprise) SP2a	Microsoft	Internet Explorer 6.0 SP1+ Internet Explorer 7.0	<ul style="list-style-type: none"> • Oracle 10g V10.2.0.1 Server* • Oracle 10g V10.2.0.3 Server* • Oracle 10g V10.2.0.1 Client[‡] • Oracle FailSafe3.3.4

[†] MSMQ is necessary for servers hosting HIIS Server

* Oracle 10g Server is only installed on the Database Server or Cluster

[‡] Oracle 10g Client is for the Storage, Web (incl. CodeBase), DICOMServer, HIIS, Recollection (ISA) Server & PreCache Servers

CPU Requirement

Synapse server components can be installed on any server with an Intel Pentium III (or higher Intel) or AMD Opteron. Synapse server software is evaluated for use on Single and Dual CPU with Intel Pentium III, Pentium IV, Pentium IV Xeon, Pentium D, and on the AMD Opteron platforms during software release testing.

Memory Requirement

A minimum of 2 GB of RAM is required and 4 GB is recommended.

Supported IHE Profiles

Profile	Actors
Scheduled Workflow	Image Manager
	Image Display
	Perform Procedure Step Manager
Patient Information Reconciliation	Image Manager
	Perform Procedure Step Manager
Access to Radiology Information	Image Manager
	Image Display
	Report Reader
Simple Image and Numeric Report	Report Reader
Consistent Time	Time Client
Teaching File and Clinical Trial Export	Export Selector
Mammography Image	Image Manager
PDI	Portable Media Creator

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