

1. Introduction

1.1. Purpose of the Document

This document is the DICOM Conformance Statement for Fluoroscans InSight mini C-Arms, version 6.0. It describes its DICOM capabilities and how it conforms to the DICOM 3.0 standard.

1.2. References

1. American College of Radiology - National Electrical Manufacturers Association (ACR-NEMA) Digital Imaging and Communications in Medicine V3.0-2000.

1.3. Definitions

This section provides the definitions of terms, acronyms, and abbreviations that are used throughout the document.

DICOM	Digital Imaging and Communication in Medicine, a standard on image communications in medical applications
HIS	Hospital Information System
RIS	Radiology Information System
AE	Application Entity
SCU	Service Class User
SCP	Service Class Provider
SOP	Service-Object Pair, a definition of an information object (like an image) and of service (like storage) that can be performed for the object
VR	Value Representation, a data encoding method in DICOM
VM	Value Multiplicity, number of values in a DICOM attribute
UID	Unique Identifier
DIMSE	DICOM Message Service Element
TCP/IP	Transmission Control Protocol / Internet Protocol, a widely used computer networking protocol
UI	Application's User Interface
GUI	Graphical User Interface

2. Implementation Model

2.1. Application Data Flow Diagram

There are six Real-World Activities that occur in the InSight: Storage, Storage Commitment, Modality Worklist, Modality Performed Procedure Step, Print, and Verification. The Application Data Flow Diagram shown on Figure 1 represents the Application Entity of the InSight application, and graphically depicts the relationship of the AE's use of DICOM to Real-World Activities.

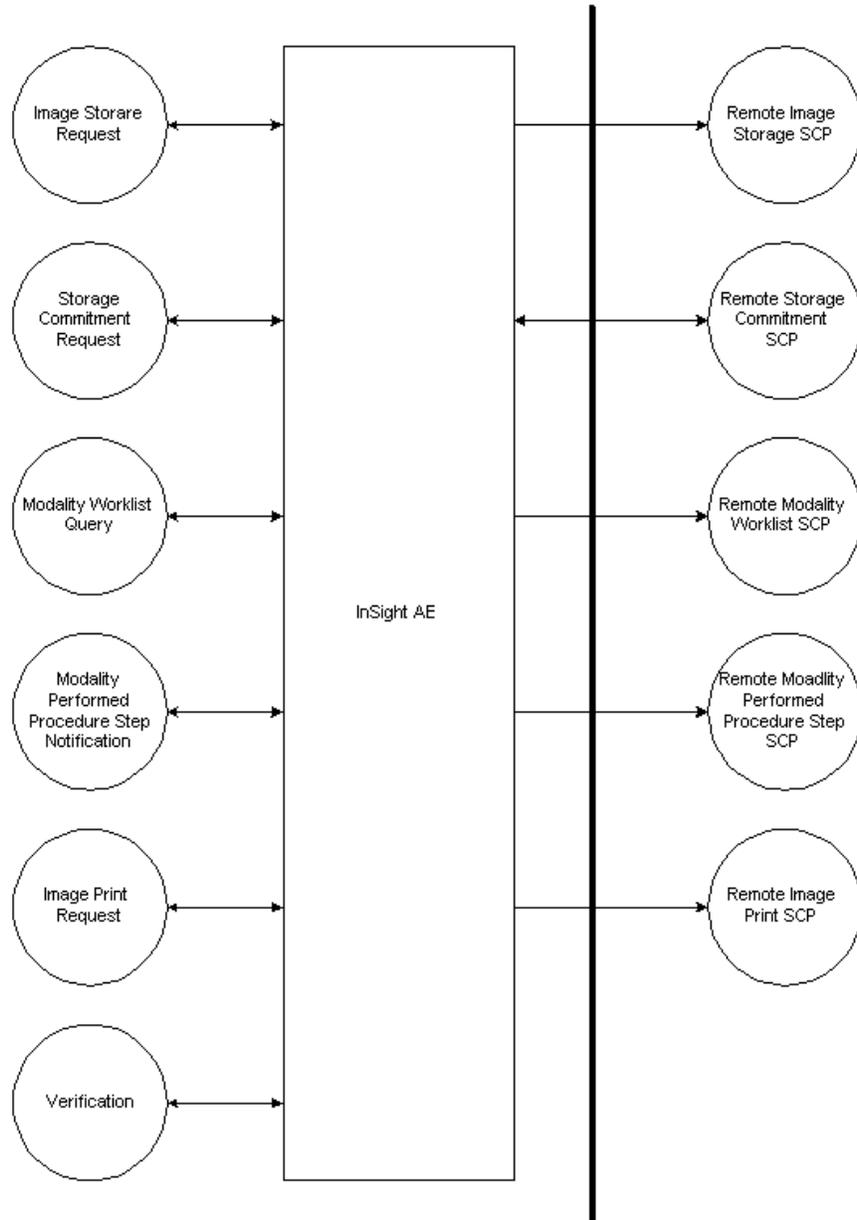


Figure 1. Application Data Flow Diagram

2.1.1. Storage

1. The InSight application generates DICOM files and stores them locally.
2. The InSight application initiates an association with remote Storage SCP.
3. The InSight application pushes files to the remote Storage SCP using C-STORE command, and then closes the association.

2.1.2. Storage Commitment

1. The InSight application initiates an association with remote Storage Commitment SCP.
2. The InSight application sends a Storage Commitment request to remote Storage Commitment SCP using the N-ACTION command.
3. The InSight application waits for the N-EVENT-REPORT command from remote Storage Commitment SCP with a notification about Storage Commitment results, and then closes the association.
4. If remote Storage Commitment SCP has not sent the N-EVENT-REPORT command in the same association, it initiates an association with the InSight application and uses the N-EVENT-REPORT command to send a notification about Storage Commitment results, and then closes the association.

2.1.3. Modality Worklist

1. The InSight application initiates an association with remote Modality Worklist SCP.
2. The InSight application queries the Modality Worklist SCP to obtain Modality Worklist information using the C-FIND command, and then closes the association.

2.1.4. Modality Performed Procedure Step

1. The InSight application initiates an association with remote Modality Performed Procedure Step SCP.
2. The InSight application notifies the MPPS SCP about started procedure using the N-CREATE command, and then closes the association.
3. The InSight application initiates an association with remote MPPS SCP.
4. The InSight application notifies the MPPS SCP about a completed procedure using the N-SET command, and then closes the association.

2.1.5. Image Print

1. The InSight application initiates an association with remote Print SCP.
2. The InSight application queries the remote printer status using the N-GET command.
3. The InSight application sends images for printing using a series of N-CREATE commands and an N-ACTION command, and then closes the association.

2.1.6. Verification

1. The InSight application initiates an association with remote SCP.
2. The InSight application verifies the remote SCP status by using the C-ECHO command, and then closes the association.

2.2. Functional Definitions of AE

2.2.1. Image Storage

The InSight application provides a UI to select images to store. It then generates DICOM files for the selected images, stores them into a designated local queue directory, and performs an attempt to send the files immediately. It opens associations with remote SCPs, and pushes the images using the C-STORE command. In case of failure, the application keeps the files for further retry attempts.

A background process runs according to a configured time interval, reads the files present in the queue directory, opens associations with remote SCPs, and pushes the images using the C-STORE command.

In case of successful status received from SCP, the InSight application deletes the corresponding DICOM file. In case of failure status, the application keeps the file and retries to store the image when the queue is next processed.

2.2.2. Storage Commitment

Upon successfully sending an image to a remote archive device, the InSight application issues a Storage Commitment request to the SCP using the N-ACTION command, in the same association. It waits for the N-EVENT-REPORT notification from the SCP for a specified time interval and then closes the association.

If the N-EVENT-REPORT notification has not been received during the same association as Image Storage, then the InSight application waits for an incoming association request from the Storage Commitment SCP.

The InSight application does not delete a DICOM file corresponding to the image until it receives a notification from the SCP with status indicating successful storage commitment.

2.2.3. Modality Worklist

Worklist query may start either by user request or automatically according to the configured schedule. In either case, the InSight application opens an association with the Worklist SCP, queries for the Worklist using the C-FIND command, stores the Worklist data locally, and closes the association.

2.2.4. Modality Performed Procedure Step

The InSight application maintains the MPPS queue. Upon starting an image acquisition session, the application puts a procedure-started entry into the queue. Upon ending the session, the application puts a corresponding entry into the queue.

A background process runs according to a configured time interval and reads the queue entries. It initiates associations with the MPPS SCPs and sends N-CREATE requests for the queue entries corresponding to procedure status “In Progress”, and N-SET requests for the queue entries corresponding to procedure status “Completed”.

2.2.5. Image Print

The InSight application provides a UI to select images for DICOM Print. It initiates an association with a remote Image Print SCP and queries for a printer status using the N-GET command.

Upon receiving the N-GET response indicating that the printer is ready, it creates an instance of Basic Film Session SOP class using the N-CREATE command.

The InSight application then calculates the number of films, dividing total number of selected images by the number of images per film, and creates the corresponding number of instances of Basic Film Box SOP class using the N-CREATE command.

For each film box, the InSight application creates a set of instances of Basic Grayscale Image Box SOP class, one for each image, using the N-CREATE command.

The InSight application then prints the images using the N-ACTION command on each film box. Film boxes are printed one at a time (i.e., the application creates one film box and then prints it). It then creates and prints the second one and so on.

After sending the N-ACTION request for the last selected image, the application closes the association with the SCP.

2.2.6. Verification

The InSight application initiates an association with a corresponding remote SCP when the user requests to verify the DICOM connection.

The InSight application uses the C-ECHO command to verify the connection with the SCP.

2.3. Sequencing of Real World Activities

2.3.1. Storage Commitment

A Storage Commitment Request for a specific study and SCP may be sent only after the successful completion of a Storage Request for the same study and SCP.

2.3.2. Modality Performed Procedure Step

MPPS notifications for a specific procedure will be sent only if the procedure was previously retrieved using the Modality Worklist service (i.e. not entered manually).

3. AE Specifications

The InSight application provides Standard Conformance for the following DICOM V3.0 SOP Classes as an SCU:

SOP Class Name	SOP Class UID
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2
Storage Commitment Push Model	1.2.840.10008.1.20.1
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3

Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Verification	1.2.840.10008.1.1

3.1. Association Establishment Policies

3.1.1. General

The maximum PDU length is 28,672 bytes.
 The SOP Class Extended Negotiation is not supported.

3.1.2. Number of Associations

The InSight application initiates only one association at a time for each SOP class.

3.1.3. Asynchronous Nature

The InSight application does not support asynchronous communications.

3.1.4. Implementation Identifying Information

The InSight provides an implementation class UID of 1.2.840.113830.

3.2. Association Initiation by Real-World Activity

3.2.1. Real World-Activity - Image Storage

3.2.1.1. Associated Real-World Activity

The InSight application initiates an association with a Storage SCP and sends DICOM images using the C-STORE command.

3.2.1.2. Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1 .12.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

Grayscale Softcopy Presentation State Storage	1.2.840.10008.5.1.4.1.1.11.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.2.1.3. SOP Specific Conformance

3.2.1.3.1. Image file

Module	Attribute Name	Type	Value	Tag	VR
Patient	Patient's Name	2		0010, 0010	PN
	Patient ID	2		0010, 0020	LO
	Patient's Birth Date	2		0010, 0030	DA
	Patient's Sex	2		0010, 0040	CS
General Study	Study Instance UID	1	Note 1	0020, 000D	UI
	Study ID	2		0020, 0010	SH
	Study Date	2		0008, 0020	DA
	Study Time	2		0008, 0030	TM
	Referring Physician	2	Note 6	0008, 0090	PN
	Accession Number	2	Note 5	0008, 0050	SH
	Study Description	3		0008, 1030	LO
	General Series	Modality	1	Note 16	0008, 0060
	Series Instance UID	1	Note 2	0020, 000E	UI
	Series Number	2	"1"	0020, 0011	IS
	Protocol Name	3	Note 6	0018,1030	LO
	Performing Physician's Name	3		0008,1050	PN
	Request Attribute Sequence	3	Note 6	0040,0275	SQ
	>Requested Procedure ID	1C	Note 6	0040,1001	SH
	>Scheduled Procedure Step ID	1C	Note 6	0040,0009	SH
	Scheduled Procedure Step Description	3	Note 6	0040,0007	LO
	Performed Procedure Step ID	3	Note 7	0040,0253	SH
	Performed Procedure	3		0040,0244	DA

	Step Start Date				
	Performed Procedure Step Start Time	3		0040,0245	TM
	Performed Procedure Step Description	3		0040,0254	LO
	Referenced Study Component Sequence	3		0008,1111	SQ
	>Referenced SOP Class UID	1C	Note 8	0008,1150	UI
	>Referenced SOP Instance UID	1C	Note 9	0008,1155	UI
General Equip.	Manufacturer	2	“Hologic”	0008, 0070	LO
	Institution Name	3		0008, 0080	LO
	Station Name	3	Note 6	0008, 1010	SH
	Manfr’s Model Name	3	“InSight”	0008, 1090	LO
	Device S/N	3		0018, 1000	LO
	S/W Versions	3		0018, 1020	LO
General Image	Image Number	2	Note 18	0020, 0013	IS
Image Pixel	Samples per pixel	1	“1”	0028, 0002	US
	Photometric Interpretation	1	MONOCHROME2	0028, 0004	CS
	Rows	1		0028, 0010	US
	Columns	1		0028, 0011	US
	Bits Allocated	1	8	0028, 0100	US
	Bits Stored	1	8	0028, 0101	US
	High Bit	1	7	0028, 0102	US
	Pixel Representation	1	0	0028, 0103	US
	Window Level	3	128	0028, 1050	DS
	Window Width	3	256	0028, 1051	DS
	Pixel Data	1		7FE0, 0010	OB
X-Ray Image Module	Image Type	1	Note 10	0008,0008	CS
	Pixel Intensity Relationship	1	“DISP”	0028,1040	CS
	KVP	2		0018,0060	DS
X-Ray Acquisition Module	Radiation Setting	1	“SC”	0018,1155	CS
	Exposure Time	2C	Time (ms)	0018, 1150	IS
	X-Ray Tube Current	2C	Note 21	0018, 1151	IS
Multi-Frame Module (Note 14)	Number of Frames	1	Actual	0028, 0008	IS
	Frame Increment Pointer	1	0018\1063	0028, 0009	AT

	Frame Time	1C	40	0018, 1063	DS
SOP Common	SOP Class UID	1	Note 4	0008, 0016	UI
	SOP Instance UID	1	Note 3	0008, 0018	UI
	Instance Number	1		0020, 0013	IS
Overlay Plane Module (Note 15)	Overlay Rows	1		60xx, 0010	US
	Overlay Columns	1		60xx, 0011	US
	Overlay Type	1	“G”	60xx, 0040	CS
	Overlay Origin	1	1\1	60xx, 0050	SS
	Overlay Bits Allocated	1	1	60xx, 0100	US
	Overlay Bit Position	1	0	60xx, 0102	US
	Overlay Data	1		60xx, 3000	OB
Private Study Information Group	Private Creator Data Element		“Hologic”	0035, 0010	LO
	Scheduled Station AE Title		Note 6	0035,1000	AE
	Scheduled Procedure Start Date		Note 6	0035,1001	DA
	Scheduled Procedure Start Time		Note 6	0035,1002	TM
	Scheduled Procedure Location		Note 6	0035,1003	SH
	Scheduled Performing Physician		Note 6	0035,1004	PN
	Scheduled Procedure Code		Note 6	0035,1005	SH
	Scheduled Procedure Coding Scheme		Note 6	0035,1006	SH
	Scheduled Procedure Code Meaning		Note 6	0035,1007	LO
	Requested Procedure Comments		Note 6	0035,1008	LT
	Requested Procedure Description		Note 6	0035,1009	LO
	Requested Procedure Code		Note 6	0035,100a	SH
	Requested Procedure Coding Scheme		Note 6	0035,100b	SH
	Requested Procedure Code Meaning		Note 6	0035,100c	LO
	Names Of Intended Recipients of Results		Note 6	0035,100d	PN

	Imaging Service Request Comments		Note 6	0035,100e	LT
	Requesting Physician		Note 6	0035,100f	PN
	Requesting Service		Note 6	0035,1010	LO
	Current Patient Location		Note 6	0035,1011	LO
	Other Patient Ids		Note 6	0035,1012	LO
	Ethnicity		Note 6	0035,1013	SH
	Patient Comment		Note 6	0035,1014	LT
	Pregnancy Status		Note 6	0035,1015	SH
	Medical Alerts		Note 6	0035,1016	LO
	Additional Patient History		Note 6	0035,1017	LT
	X-ray KV			0035,1018	FL
	X-ray MA			0035,1019	FL
	X-ray Dose			0035,1020	FL
	X-ray Time			0035,1021	UL
	Collimator			0035,1022	UL
	Legacy flag		Note 11	0035,1023	CS
	X-ray DAP			0035,1024	FL
	Noise Suppression			0035,1025	SH
	Auto Accession		Note 13	0035,1026	SH
Private Image Information Group	Private Creator Data Element		“Hologic”	0071,0010	LO
	Horizontal Flip			0071,1000	CS
	Image Rotation			0071,1001	US
	Presentation LUT Shape			0071,1002	CS
	Edge Enhancement			0071,1003	CS
	AOI Rows			0071,1004	US
	AOI Columns			0071,1005	US
	AOI Origin X			0071,1006	US
	AOI Origin Y			0071,1007	US
	Dark Fluoro Threshold			0071,1008	US
	Use Dark Fluoro			0071,1009	CS
	Rotation Offset			0071,1010	US
	Image Brightness			0071, 1011	US
	Image Contrast			0071, 1012	US
	Raw Image Rows			0071,1080	US
	Raw Image Columns			0071,1081	US
	Raw Bits Allocated		16	0071,1082	US
	Raw Bits Stored		12	0071,1083	US

	Raw High Bit		11	0071,1084	US
	Raw Image Data		Note 12	0071,1099	OW
Private Annotations Group	Private Creator Data Element		“Hologic”	9001,0010	LO
	Annotations			9001,1000	LT

3.2.1.3.2.Presentation State file

Module	Attribute Name	Type	Value	Tag	VR
Patient	Patient’s Name	2		0010, 0010	PN
	Patient ID	2		0010, 0020	LO
	Patient’s Birth Date	2		0010, 0030	DA
	Patient’s Sex	2		0010, 0040	CS
General Study	Study Instance UID	1	Note 1	0020, 000D	UI
	Study ID	2		0020, 0010	SH
	Study Date	2		0008, 0020	DA
	Study Time	2		0008, 0030	TM
	Referring Physician	2	Note 6	0008, 0090	PN
	Accession Number	2	Note 5	0008, 0050	SH
General Series	Modality	1	“PR”	0008, 0060	CS
	Series Instance UID	1	Note 2	0020, 000E	UI
	Series Number	2	1	0020, 0011	IS
General Equip.	Manufacturer	2	“Hologic”	0008, 0070	LO
	S/W Versions	3		0018, 1020	LO
SOP Common	SOP Class UID	1	Note 4	0008, 0016	UI
	SOP Instance UID	1	Note 3	0008, 0018	UI
Presentation State Identification	Instance Number	1		0020, 0013	IS
	Content Label	1	“HOLOGIC”	0070, 0080	CS
	Content Description	2	"Fluoroscans InSight Display Flags"	0070, 0081	LO
	Presentation Creation Date	1		0070, 0082	DA
	Presentation Creation Time	1		0070, 0083	TM
	Content Creator’s Name	2	“HOLOGIC”	0070, 0084	PN
Presentation State Relationship Macro Attribute	Referenced Series Sequence	1		0008, 1115	SQ
	>Series Instance UID	1		0020, 000E	UI
	>References Image Sequence	1		0008, 1140	SQ
	>>SOP Class UID	1	Note 4	0008, 1150	UI

	>>SOP Instance UID	1		0008, 1155	UI
Graphic Annotation	Graphic Annotation Sequence	1		0070, 0001	SQ
	>Graphic Layer	1	“1”	0070, 0002	CS
	>Text Object Sequence	1C		0070, 0008	SQ
	>>Anchor Point Annotation Units	1C	“PIXEL”	0070, 0004	CS
	>>Unformatted Text Value	1		0070, 0006	ST
	>>Anchor Point	1C		0070, 0014	FL
	>>Anchor Visibility	1C	“N”	0070, 0015	CS
Graphic Layer	Graphic Layer Sequence	1		0070, 0060	SQ
	>Graphic Layer	1	“1”	0070, 0002	CS
	>Graphic Layer Order	1	“1”	0070, 0062	IS
Displayed Area	Displayed Area Selection Sequence	1		0070, 005A	SQ
	>Presentation Size Mode	1	"SCALE TO FIT"	0070, 0100	CS
	>Presentation Pixel Aspect Ratio	1C	"1\1"	0070, 0102	IS
Softcopy Presentation LUT	Presentation LUT Shape	1C	“IDENTITY”		

3.2.1.3.3.DAP Report File

Module	Attribute Name	Type	Value	Tag	VR
Patient	Patient's Name	2		0010, 0010	PN
	Patient ID	2		0010, 0020	LO
	Patient's Birth Date	2		0010, 0030	DA
	Patient's Sex	2		0010, 0040	CS
General Study	Study Instance UID	1	Note 1	0020, 000D	UI
	Study ID	2		0020, 0010	SH
	Study Date	2		0008, 0020	DA
	Study Time	2		0008, 0030	TM
	Referring Physician	2	Note 17	0008, 0090	PN
	Accession Number	2	Note 17	0008, 0050	SH
General Series	Modality	1	Note 17	0008, 0060	CS
	Series Instance UID	1	Note 2	0020, 000E	UI
	Series Number	2	1	0020, 0011	IS
SC Equipment	Conversion Type	1	“DV”	0008, 0064	CS
Image Pixel	Samples per pixel	1	“1”	0028, 0002	US
	Photometric	1	MONOCHROME	0028, 0004	CS

	Interpretation		2		
	Rows	1		0028, 0010	US
	Columns	1		0028, 0011	US
	Bits Allocated	1	8	0028, 0100	US
	Bits Stored	1	8	0028, 0101	US
	High Bit	1	7	0028, 0102	US
	Pixel Representation	1	0	0028, 0103	US
	Pixel Data	1		7FE0, 0010	OB
SOP Common	SOP Class UID	1	Note 19	0008, 0016	UI
	SOP Instance UID	1	Note 3	0008, 0018	UI
	Instance Number	1		0020, 0013	IS

Note 1. If the Study Instance UID is obtained from Modality Worklist, this value is used. Otherwise, the Study Instance UID consists of the UID Root 1.2.840.113830, followed by the unique part generated using InSight serial number, patient ID, and accession number as an input.

Once generated, the Study Instance UID does not change in case of modifying the input parameters.

GSPS and DAP Report files use the same Study Instance UID as DICOM image files.

Note 2. The Series Instance UID for image file consists of the UID Root 1.2.840.113830, followed by the unique part generated using Study Instance UID as an input.

All images acquired during one acquisition session belong to the same series.

The Series Instance UIDs for GSPS and DAP Report files are generated using the Series Instance UID of the image file as an input, but are different for each of these two file types. Once generated, the Series Instance UID does not change.

Note 3. The SOP Instance UID for image file consists of the UID Root 1.2.840.113830, followed by the unique part generated using Series Instance UID and current time as an input.

The SOP Instance UID for GSPS file is generated using the SOP Instance UID of the source image file.

The SOP Instance UID for DAP Report file is generated using the Series Instance UID of the DAP Report file and current time.

The SOP Instance UIDs are updated each time when any underlying data changes.

Note 4. SOP Class UID for the X-Ray Radiofluoroscopic Image Storage SOP Class is 1.2.840.10008.5.1.4.1.1.12.2, and for the Grayscale Softcopy Presentation State Storage SOP Class is 1.2.840.10008.5.1.4.1.1.11.1.

Note 5. If an Accession Number is not supplied from Modality Worklist and not entered by the user, the current date and time in UNIX format will be used. In this case, the same accession number is used for all images within one acquisition session.

Note 6. The value is always obtained from Modality Worklist. If a procedure is not obtained from the Worklist, the field will be blank.

Note 7. Has the same value as Scheduled Procedure Step ID field.

Note 8. Has the same value as SOP Class UID field.

Note 9. Has the same value as Study Instance UID field.

Note 10. Multivalue attribute: “ORIGINAL”/“PRIMARY”/“SINGLE PLANE”.

Note 11. If the image has been acquired with one of the previous versions of Fluoroscans mini C-arm devices and then imported to the InSight, then the value of this field is “Y”, otherwise “N”.

Note 12. The field contains raw unprocessed image data.

Note 13. Accession number is generated automatically if the user does not specify one, using a current system time in Unix format.

Note 14. Multi-Frame Module is included only for Cine Loop images when performing DICOM Send operation or export in DICOM format.

Note 15. Overlay Plane Module contains annotations. It is included only when exporting/sending images with a selected option to include annotations as overlay.

Note 16. Based on the configuration settings, modality is either set from Modality Worklist, or “RF”.

Note 17. The value is the same as for a corresponding study.

Note 18. Image Number matches the ordinal number of the InSight image. Once saved, it does not change.

Note 19. The SOP Class UID is for a Secondary Capture Image Storage SOP Class: 1.2.840.10008.5.1.4.1.1.7

Note 20. The SOP Instance UID has format “1.2.840.113830.[Unique Part]”. The unique part is generated by applying the RSA Data Security, Inc. MD5 Message-Digest Algorithm to a Series Instance UID. Each character of the MD5 output will be converted into its hexadecimal numeric representation, and leading ‘0’ characters will be removed from the resulting string.

Note 21. The X-ray tube current is expressed in mA, but the InSight tube current is measured in μA and is lower than 1 mA, The attribute’s VR is IS, it does not allow fractional values. Therefore the value will be always blank.

3.2.2. Real-World Activity – Storage Commitment

3.2.2.1. Associated Real-World Activity

The InSight application initiates an association with a Storage Commitment SCP and sends a Storage Commitment request using N-ACTION command.

3.2.2.2. Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.2.2.3. SOP Specific Conformance

Attribute Name	Attribute Tag
Transaction UID	0008,1195
Retrieve AE Title	0008,0054
Referenced SOP Sequence	0008,1199
>Referenced SOP Class UID	0008,1150
>Referenced SOP Instance UID	0008,1155

3.2.3. Real-World Activity – Modality Worklist

3.2.3.1. Associated Real-World Activity

The InSight application initiates an association with a Modality Worklist SCP and sends a Worklist query using C-FIND command.

3.2.3.2. Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Worklist Find	1.2.840.10008.5.1.4.3 1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.2.3.3. SOP Specific Conformance

Matching keys:

Matching Key Attribute	Tag	Matching Type
Scheduled Procedure Step Start Date	0040, 0002	Wild Card
Modality	0008, 0060	One of enumerated values
Scheduled Station AE Title	0040, 0001	Wild Card
Accession Number	0008,0050	Single Value
Requested Procedure ID	0040,1001	Single Value

Return Keys:

Attribute Name	Tag	Type
Scheduled Procedure Step		
Scheduled Procedure Step Sequence	0040,0010	1
>Scheduled Station AE Title	0040,0001	1
>Scheduled Procedure Step Start Date	0040,0002	1
>Scheduled Procedure Step Start Time	0040,0003	1
>Scheduled Procedure Step Location	0040,0011	2
>Modality	0008,0060	1
>Scheduled Performing Physician's Name	0040,0006	2
>Scheduled Procedure Step Description	0040,0007	1C
>Scheduled Procedure Step ID	0040,0009	1
>Scheduled Protocol Code Sequence	0040,0008	3
>>Code Value	0008,0100	1C
>>Coding Scheme Designator	0008,0102	1C
>>Code Meaning	0008,0104	3
Requested Procedure		
Requested Procedure Description	0032,1060	1C

Requested Procedure ID	0040,1001	1
Requested Procedure Comments	0040,1400	3
Requested Procedure Code Sequence	0032,1064	1C
>Code Value	0008,0100	1C
>Coding Scheme Designator	0008,0102	1C
>Code Meaning	0008,0104	3
Study Instance UID	0020,000D	1
Names of Intended Recipients of Results	0040,1010	3
Imaging Service Request		
Imaging Service Request Comments	0040,2400	3
Accession Number	0008,0050	2
Requesting Physician	0032,1032	2
Requesting Service	0032,1033	3
Referring Physician's Name	0008,0090	2
Visit Status		
Current Patient Location	0038,0300	2
Patient Identification		
Patient's Name	0010,0010	1
Patient ID	0010,0020	1
Other Patient ID's	0010,1000	3
Patient Demographic		
Patients Birth Date	0010,0030	2
Patient's Sex	0010,0040	2
Ethnic Group	0010,2160	3
Patient Comment	0010,4000	3
Patient Medical		
Pregnancy Status	0010,21C0	2
Medical Alerts	0010,2000	2
Additional Patient History	0010,21B0	3

3.2.3.4. Status Codes

The following table describes the InSight behavior dependent on Status Codes of messages received from the Worklist SCP.

Status	Status Code	Meaning	QDR Behavior
Success	0000	Matching is complete – No final Identifier is supplied	Completes retrieving of matches
Pending	FF00	Matches are continuing – Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	Receiving of matches continues
Pending (No	FF01	Matches are continuing – Warning that	Receiving of

Optional Key Support)		one or more Optional Keys were not supported for existence for this Identifier	matches continues without any warnings or errors
Other	Other	All other Status Codes	Terminates receiving of matches and logs a failure message. The matches received prior to this code are handled normally.

3.2.4. Real-World Activity – Modality Performed Procedure Step

3.2.4.1. Associated Real-World Activity

The InSight application initiates an association with the Modality Performed Procedure Step SCP and sends reports about started procedure using N-CREATE command, or about completed or discontinued procedure with N-SET command.

3.2.4.2. Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.2.4.3. SOP Specific Conformance

Following attributes are included in N-CREATE request:

Attribute Name	Tag	Type	Value
Scheduled Step Attribute Sequence	0040,0270	1	
>Study Instance UID	0020,000D	1	From Worklist
>Referenced Study Sequence	0008,1110	2	NULL

>Accession Number	0008,0050	2	From Worklist
>Requested Procedure ID	0040,1001	2	NULL
>Requested Procedure Description	0032,1060	2	NULL
>Scheduled Procedure Step ID	0040,0009	2	NULL
>Scheduled Procedure Step Description	0040,0007	2	NULL
>Scheduled Action Item Code Sequence	0040,0008	2	NULL
Patient's Name	0010,0010	2	From Worklist
Patient ID	0010,0020	2	From Worklist
Patient's Birth Date	0010,0030	2	NULL
Patient's Sex	0010,0040	2	NULL
Referenced Patient Sequence	0008,1120	2	NULL
Performed Procedure Step ID	0040,0253	1	From Worklist – Scheduled Procedure Step ID
Performed Station AE Title	0040,0241	1	InSight AE Title
Performed Station Name	0040,0242	2	NULL
Performed Location	0040,0243	2	NULL
Performed Procedure Step Start Date	0040,0244	1	Actual Start Date
Performed Procedure Step Start Time	0040,0245	1	Actual Start Time
Performed Procedure Step Status	0040,0252	1	IN PROGRESS
Performed Procedure Step Description	0040,0254	2	NULL
Performed Procedure Type Description	0040,0255	2	NULL
Procedure Code Sequence	0008,1032	2	NULL
Performed Procedure Step End Date	0040,0250	2	NULL
Performed Procedure Step End Time	0040,0251	2	NULL
Modality	0008,0060	1	Configured InSight Modality
Study ID	0020,0010	2	NULL
Performed Action Item Code Sequence	0040,0260	2	NULL
Performed Series Sequence	0040,0340	2	NULL
Image Area Dose Product	0018,115E	3	NULL
Total Number of Exposures	0040,0301	3	NULL
Exposure Dose Sequence	0040,030E	3	NULL

Following attributes are included in N-SET request:

Attribute Name	Tag	Type	Value
Performed Procedure Step End Date	0040,0250	1	Actual Start Date
Performed Procedure Step End Time	0040,0251	1	Actual Start Time
Performed Procedure Step Status	0040,0252	1	COMPLETED
Image Area Dose Product	0018,115E	3	Image DAP
Total Number of Exposures	0040,0301	3	Number of acquired images (both saved and not saved)
Exposure Dose Sequence	0040,030E	3	

>Radiation Mode	0018,115A	3	CONTINUOUS
>KVp	0018,0060	3	Image KVp
>X-Ray Tube Current in uA	0018,8151	3	Image Current in uA
>Exposure Time	0018,1150	3	Exposure Time in msec
Performed Series Sequence	0040,0340	1	
>Performing Physician's Name	0008,1050	2	NULL
>Protocol Name	0018,1030	1	"NA"
>Operators' Name	0008,1070	2	NULL
>Series Instance UID	0020,000E	1	Generated
>Series Description	0008,103E	2	NULL
>Retrieve AE Title	0008,0054	2	NULL
>Reference Image Sequence	0008,1140	2	NULL
>Reference Non-Image Composite SOP Instance Sequence	0040,0220	2	NULL

3.2.5. Real-World Activity – Image Print

3.2.5.1. Associated Real-World Activity

The InSight application will request that an image be printed on a remote DICOM printer.

3.2.5.2. Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.2.5.3. SOP Specific Conformance

The Basic Grayscale Print Management Meta SOP Class is defined by the following set of supported SOP classes.

SOP Class Name	SOP Class UID
----------------	---------------

Basic Film Session SOP Class	1.2.840.10008.5.1.1.1
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4
Printer SOP Class	1.2.840.10008.5.1.1.16

3.2.5.3.1. Basic Film Session SOP Class

For Basic Film Session SOP Class, InSight supports the N-CREATE command.

Supported attributes:

Attribute Name	Tag	Attribute Description
Number of Copies	2000,0010	Number of copies to be printed for each film of the film session. User configurable.
Print Priority	2000,0020	Medium (“MED”)
Medium Type	2000,0030	Medium type. User configurable.

Status Codes:

Service Status	Status Code	Meaning	Application Behavior
Success	0x0000	Film session successfully created	Continue
Warning	0xB600	Memory allocation is not supported	Write error log and continue
	0xB605	Requested Min or Max Density out of range	
	0x0116	Attribute Value Out of Range	
	0x0107	Attribute List Error	
All other status codes		Warning or Failure	Stop and report an error.

3.2.5.3.2. Basic Film Box SOP Class

For Basic Film Box SOP Class, InSight supports both the N-CREATE and N-ACTION commands.

Supported Attributes:

Attribute Name	Tag	Attribute Description
Image Display Format	2010,0010	STANDARD\C,R. C and R are user configurable.
Film Orientation	2010,0040	PORTRAIT /LANDSCAPE, user configurable
Film Size ID	2010,0050	User configurable

Status Codes:

Service Status	Status Code	Meaning	Application Behavior
Success	0x0000	Film box successfully created	Continue
Warning	0xB600	Memory allocation is not supported	Write error log and continue
	0xB605	Requested Min or Max Density out of range	
	0x0116	Attribute Value Out of Range	
	0x0107	Attribute List Error	
All other status codes		Warning or Failure	Stop and report an error.

3.2.5.4. Basic Grayscale Image Box SOP Class

For Basic Grayscale Image Box SOP Class, InSight supports the N-SET command.

Supported attributes:

Attribute Name	Tag	Attribute Description
Image Position	2020,0010	The position of the image on the film
Requested Image Size	2020,0030	Used to prevent the image from being magnified.
Requested Decimate/Crop Behavior	2020,0040	DECIMATE/CROP, user configurable
Basic Grayscale Image Sequence	2020,0110	A sequence which provides the content of the image pixel data to be printed.
>Samples Per Pixel	0028,0002	1
>Photometric Interpretation	0028,0004	MONOCHROME2
>Rows	0028,0010	Number of pixel rows
>Columns	0028,0011	Number of pixel columns
>Pixel Aspect Ratio	0028,0034	1/1
>Bits Allocated	0028,0100	8
>Bits Stored	0028,0101	8
>High Bit	0028,0102	7
>Pixel Representation	0028,0103	0
>Pixel Data	7FE0,0010	Actual image pixels

Status Codes:

Service Status	Status Code	Meaning	Application Behavior
Success	0000	Image successfully stored in Image Box	Continue
Warning	0xB600	Memory allocation is not supported	Write error log and

	0xB605	Requested Min or Max Density out of range	continue
	0xB609	Image Cropped To Fit	
	0xB60A	Image Decimated To Fit	
	0x0116	Attribute Value Out of Range	
	0x0107	Attribute List Error	
All other status codes	Warning or Failure	Stop and report an error.	

3.2.5.5. Printer SOP Class

For Printer SOP Class, InSight supports the N-GET command.

Supported Attributes:

Attribute Name	Tag	Attribute Description
Printer Status	2110,0010	Printer status returned by the Printer. NORMAL, WARNING, or FAILURE.
Printer Status Info	2110,0020	Info about the problem in case of warning or failure.

In case of Printer Status NORMAL, the InSight will continue the printing flow.

In case of Printer Status WARNING, the InSight will write a log record concerning the problem and continue the flow.

In case of Printer Status FAILURE, the InSight will write a log record concerning the problem and stop the printing flow.

Status Codes

Service Status	Status Code	Meaning	Application Behavior
Success	0x0000	Film box successfully created	Continue
Warning	0x0001	Optional attribute is not supported	Write error log and continue
	0x0107	Attribute List Error	
All other status codes	Warning or Failure	Stop and report an error.	

3.2.6. Real-World Activity – Verification

3.2.6.1. Associated Real-World Activity

The InSight application initiates an association with a SCP and sends a verification request using the C-ECHO command.

3.2.6.2. Proposed Presentation Contexts

Abstract Syntax	Transfer Syntax	Role	Extended
-----------------	-----------------	------	----------

Name	UID	Name List	UID List		Negotiation
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.3. Association Acceptance Policy

3.3.1. Storage Commitment

3.3.1.1. Associated Real-World Activity

The InSight application waits for a N-EVENT-REPORT request messages from the SCP. Upon receiving such a request, it accepts the association and sends back a N-EVENT-REPORT response message.

3.3.1.2. Proposed Presentation Contexts

Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

3.3.1.3. SOP Specific Conformance

Attribute Name	Attribute Tag
----------------	---------------

Transaction UID	0008,1195
Retrieve AE Title	0008,0054
Referenced SOP Sequence	0008, 1199
>Referenced SOP Class UID	0008,1150
>Referenced SOP Instance UID	0008,1155
Failed SOP Sequence	0008,1198
>Referenced SOP Class UID	0008,1150
>Referenced SOP Instance UID	0008,1155

4. Communication Profiles

4.1. Supported Communication Stacks

DICOM Upper Layer (PS 3.8.) is supported using TCP/IP.

4.2. TCP/IP Stack

The TCP/IP stack is inherited from the operating system on which it is running.

5. Configuration

5.1. AE Title / Presentation Address Mapping

The AE Title is configurable via the User Interface.

5.2. Configurable Parameters

5.2.1. Network Parameters

The following parameters are required and are configurable for each InSight DICOM service:

1. Called Application Entity Title
2. Called Application Entity Port
3. Called Application Entity IP address

5.2.2. Image Storage

The user may configure the options:

1. Whether and how to include annotations with images:
 - a. send a presentation state file along with an image file
 - b. include as Overlay Plane Module (group 60xx)
 - c. embed into the image
 - d. do not include
2. Whether to include the raw image data into the image file

5.2.3. Storage Commitment

The user may select one or more existing Image Storage SCPs to serve as a Storage Commitment SCP.

5.2.4. Modality Worklist

5.2.4.1. Worklist Query Parameters

The user may configure the Worklist query parameters:

1. Scheduled Procedure Step Start Date
2. Modality
3. Scheduled Station AE Title
4. Accession Number
5. Requested Procedure ID

5.2.4.2. Worklist Maintenance

The user may configure the automatic Worklist query schedule and the maximum number of hits per query.

5.2.4.3. Attribute Mapping

The user may map the following InSight data fields to Worklist attributes:

1. Patient Name
2. Patient ID
3. Patient Sex
4. Procedure ID
5. Study Name
6. Start Date
7. Study Description

5.2.4.4. Worklist Sets Modality

The user may configure to use Modality from Worklist when acquiring images. If this setting is off, the default modality RF is used.

5.2.5. Modality Performed Procedure Step

The user may turn the Performed Procedure Step service on and off.

5.2.6. Image Print

The user may configure following print parameters:

1. Number of copies
2. Image display format
3. Orientation
4. Film size
5. Medium type
6. Decimate/crop behavior

5.2.7. Verification

There are no configurable parameters.

6. Support of Extended Character Set

No Extended Character sets are supported.