DICOM

Conformance Statement
 Xperius 2.0.1
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PHILIPS

0.1   Revision History

Document Version	Date of Issue	Authors	Description
A	18 April 2019	ML, GB	Initial Release

1   CONFORMANCE STATEMENT OVERVIEW

The Philips Xperius Ultrasound systems implement the necessary DICOM® services to download worklists from an information system, save acquired US Images to a network storage device and inform the information system about the work actually done.

Table 1 provides an overview of the supported network services.

Table 1
NETWORK SERVICES

Networking SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Ultrasound Image Storage	Yes	No
Ultrasound Multiframe Image Storage	Yes	No
Workflow Management		
Modality Worklist	Yes	No

Table 2 below specifies the Media Storage Application Profiles supported.

Table 2
MEDIA SERVICES

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
USB Devices		
STD-GEN-USB-JPEG for Ultrasound images	Yes / Yes	No

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3 INTRODUCTION

3.1 AUDIENCE
This document is intended for hospital staff, health care system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

3.2 REMARKS
DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication between the Philips Healthcare Xperius ultrasound systems and other vendors' Medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [DICOM]. However, by itself it is not guaranteed to ensure the desired interoperability and successful interconnectivity.

The user should be aware of the following important issues:

— The comparison of different conformance statements is the first step towards assessing interconnectivity between Philips Healthcare and non - Philips Healthcare equipment.
— Test procedures should be defined to validate the desired level of connectivity.
— The DICOM standard will evolve to meet the users' future requirements. Philips Healthcare is actively involved in developing the standard further and therefore reserves the right to make changes to its products or to discontinue its delivery.

Note: The Implementation Class UID and Implementation Version Name attribute contents may differ from the information in this document when a sustaining software release is done that does NOT change the DICOM features or functionality.

3.3 Important Note to the Reader
Interoperability

Interoperability refers to the ability of application functions, distributed over two or more systems, to work successfully together. The integration of medical devices into an IT environment may require application functions that are not specified within the scope of DICOM. Consequently, using only the information provided by this Conformance Statement does not guarantee interoperability of Philips equipment with non-Philips equipment. It is the user's responsibility to analyze thoroughly the application requirements and to specify a solution that integrates Philips equipment with non-Philips equipment.

Validation

Philips equipment has been carefully tested to assure that the actual implementation of the DICOM interface corresponds with this Conformance Statement. Where Philips equipment is linked to non-Philips equipment, the first step is to compare the relevant Conformance Statements. If the Conformance Statements indicate that successful information exchange should be possible, additional validation tests will be necessary to ensure the functionality, performance, accuracy and stability of image and image related data. It is the responsibility of the user (or user's agent) to specify the appropriate test suite and to carry out the additional validation tests.

New versions of the DICOM Standard

The DICOM Standard will evolve in future to meet the user's growing requirements and to incorporate new features and technologies. Philips is actively involved in this evolution and plans to adapt its equipment to future versions of the DICOM Standard. In order to do so, Philips reserves the right to make changes to its products or to discontinue its delivery. The user should ensure that any non-Philips provider linking to Philips equipment also adapts to future versions of the DICOM Standard. If not, the incorporation of DICOM enhancements into Philips equipment may lead to loss of connectivity (in case of networking) and incompatibility (in case of media).

3.4   DEFINITIONS, TERMS AND ABBREVIATIONS
Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard.

Abbreviations and terms are as follows:

AE	DICOM Application Entity
AET	Application Entity Title
DICOM	Digital Imaging and Communications in Medicine
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
GSDF	Grayscale Standard Display Function
IOD	(DICOM) Information Object Definition
ISO	International Standard Organization
MWL	Modality Worklist
R	Required Key Attribute for Modality Worklist Query Matching
O	Optional Key Attribute for Modality Worklist Query Matching
PDU	DICOM Protocol Data Unit
PDE	Patient Data Entry
SCP	DICOM Service Class Provider (DICOM server)
SCU	DICOM Service Class User (DICOM client)
SOP	DICOM Service-Object Pair
U	Unique Key Attribute for Modality Worklist Query Matching, or Optional Attribute
US	Ultrasound

3.5   REFERENCES
DICOM]   Digital Imaging and Communications in Medicine, Parts 1 - 20 (NEMA PS 3.1- PS 3.20), National Electrical Manufacturers Association (NEMA)
Publication Sales 1300 N. 17th Street, Suite 1752 Rosslyn, Virginia. 22209, United States of America
Internet: http://medical.nema.org/

Note that at any point in time the official standard consists of the most recent yearly edition of the base standard (currently 2017) plus all the supplements and correction items that have been approved as Final Text.

4   NETWORKING

4.1   IMPLEMENTATION MODEL

4.1.1   Application Data Flow
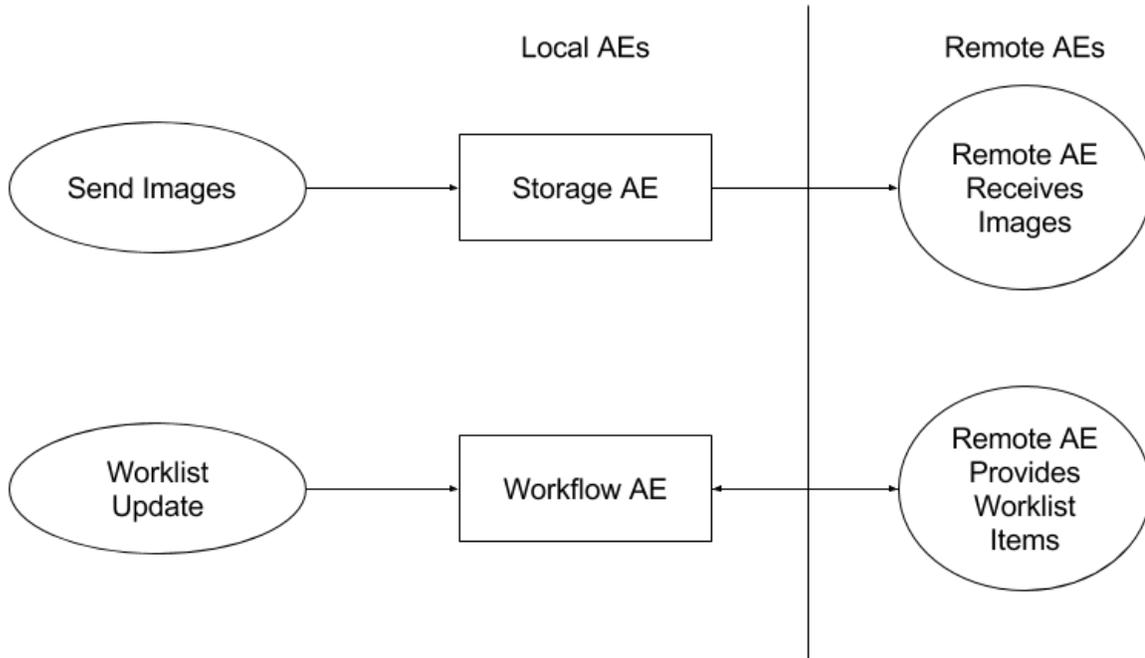
Figure 1
APPLICATION DATA FLOW DIAGRAM

— The **Storage Application Entity** sends **Images** to a single remote AE by user selection of the exam from "Review".
— The **Workflow Application Entity** receives Worklist information remote AEs. It is associated with the local real-world activities "Refresh." When the "Refresh" is performed, the Workflow Application Entity queries a remote AE for worklist items that provides the set of worklist items matching the query request. The system will only perform updates based on the setting of the update interval. No manual update is available.

4.1.2   Functional Definition of AEs

4.1.2.1   Functional Definition of Storage Application Entity
A Network Store queue with associated network destination will activate the Storage AE. An association request is sent to the destination AE and upon successful negotiation of a Presentation Context the image transfer is started. If the association cannot be opened, the related queue's Status is set to "Stopped" as displayed in the Job Manager, Settings> System> Diagnostics> Job Queue> Jobs... The user may select "Retry Job" to attempt re-send. After the automatic retries have failed, the job is set to "ERROR." The user may select "Delete Job" and re-send manually. Deleting a job does not remove the data, as it is still present on the system. Only the request to transfer the data is removed. Once any communication issues have been resolved, "Retry Job" may be selected or if the jobs were deleted, they may be queued again from the Review directory.

4.1.2.2   Functional Definition of Workflow Application Entity
"Refresh" attempts to download a Modality Worklist from a Modality Worklist server with studies matching the search criteria by sending a C-Find Request. Query parameters are stored in the "Set Modality Worklist Query" Dialog.

Settings that may be customized are:

- o Start Date (Today, ±24 hours of today, "yesterday today and tomorrow" and past 30 days plus next 7 days)
- o AE Title (This system, Any)
- o Modality (Ultrasound or All Modalities)

When the Workflow AE establishes an association to a remote AE, a MWL C-Find-Rq message is sent to the MWL server. The server will transfer all matching worklist items via the open association. The results of a successful Worklist Update will overwrite the data in the Worklist display.

There is no queue management for Worklist.

4.1.3   Sequencing of Real-World Activities
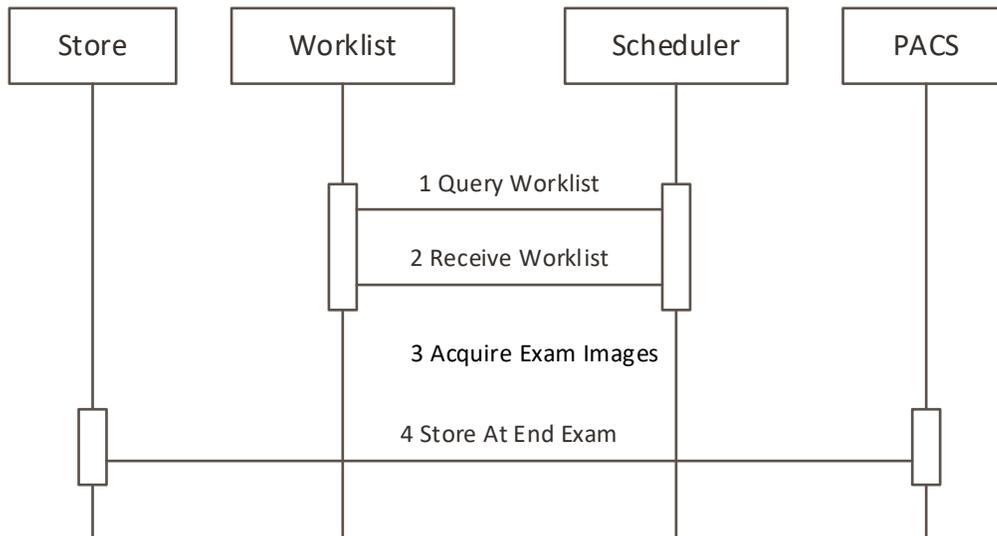
Figure 2
Sequencing Constraints

4.2   AE SPECIFICATIONS

4.2.1   Storage Application Entity Specification

4.2.1.1   SOP Classes

Table 1
SOP CLASSES FOR AE STORAGE

SOP Class Name	SOP Class UID	SCU	SCP
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Yes	No
US Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Yes	No

4.2.1.2   Association Establishment Policy

4.2.1.2.1   General
The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 2
DICOM APPLICATION CONTEXT FOR AE STORAGE

Application Context Name	1.2.840.10008.3.1.1.1

The PDU size is configurable with a minimum size of 100 and a maximum size of 16,000. The default PDU size is 16,000.

4.2.1.2.2   Number of Associations
Xperius initiates one Association at a time for each destination to which a transfer request is being processed in the active job queue list.

Table 3
NUMBER OF ASSOCIATIONS INITIATED FOR AE STORAGE

Maximum number of simultaneous Associations	1

4.2.1.2.3   Asynchronous Nature
Xperius does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 4
ASYNCHRONOUS NATURE AS A SCU FOR AE STORAGE

Maximum number of outstanding asynchronous transactions	1

4.2.1.2.4   Implementation Identifying Information
The implementation information for this Application Entity is:

Table 5
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE STORAGE

Implementation Class UID	1.3.46.670589.14.8200.201
Implementation Version Name	XPERIUS_2.0.1

4.2.1.3 Association Initiation Policy

4.2.1.3.1 Activity – Store Images and Loops

4.2.1.3.1.1 Description and Sequencing of Activities

Selected studies may be sent from the Review directory. This is associated with the configuration setting, "Manual". The system supports automatic export when pressing "End Exam" using the "Batch mode" transfer selection or sending images as they are acquired using "Send as you go" selection in Advanced settings for the selected "Primary Storage SCP"

If the C-STORE response from the remote application contains a status other than Success or Warning, the association is retried until switched to a failed state.

The sequencing of messaging for each of the storage configurations is shown in the following drawings.
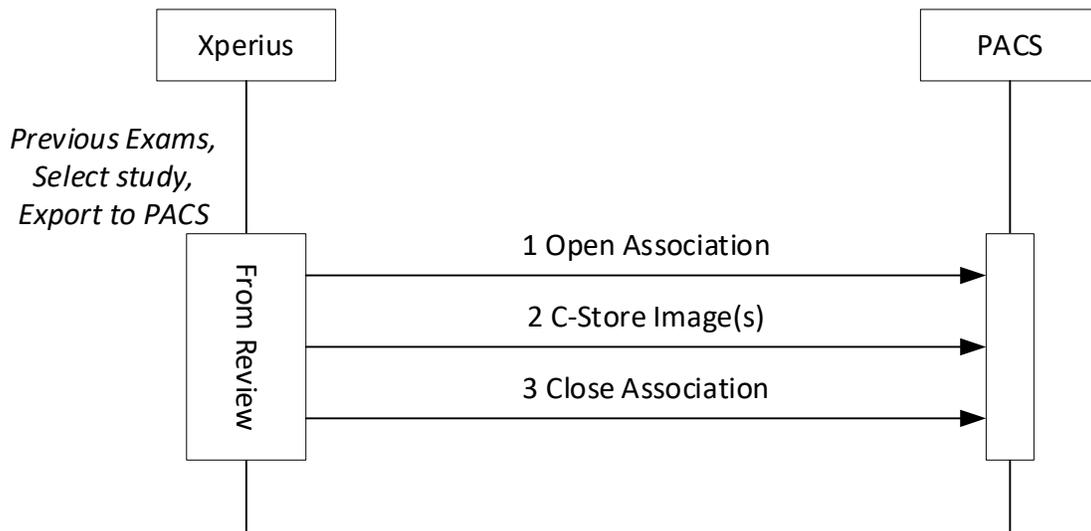
Figure 3
SEQUENCING OF ACTIVITY – SEND FROM REVIEW
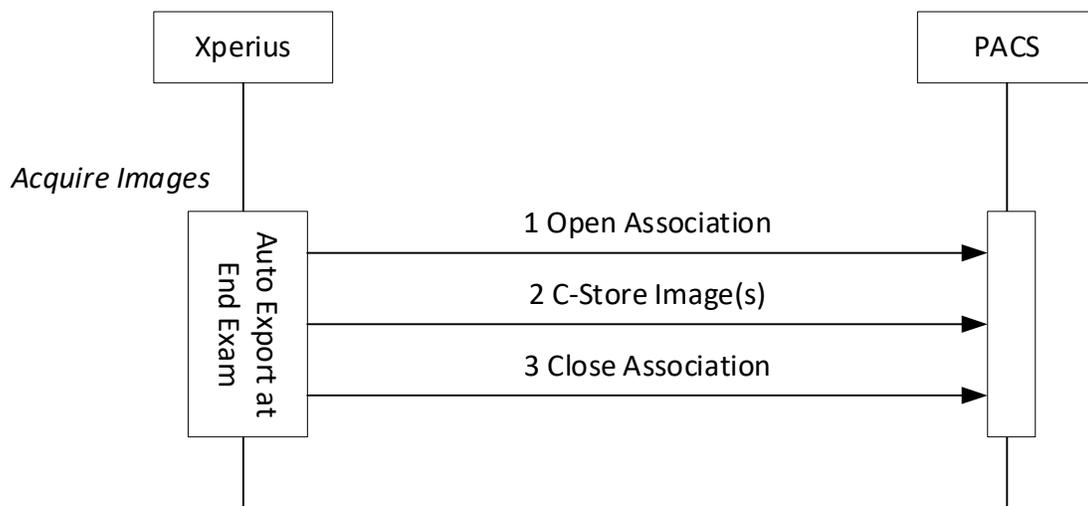
Figure 4
SEQUENCING OF ACTIVITY – SEND AT END OF EXAM
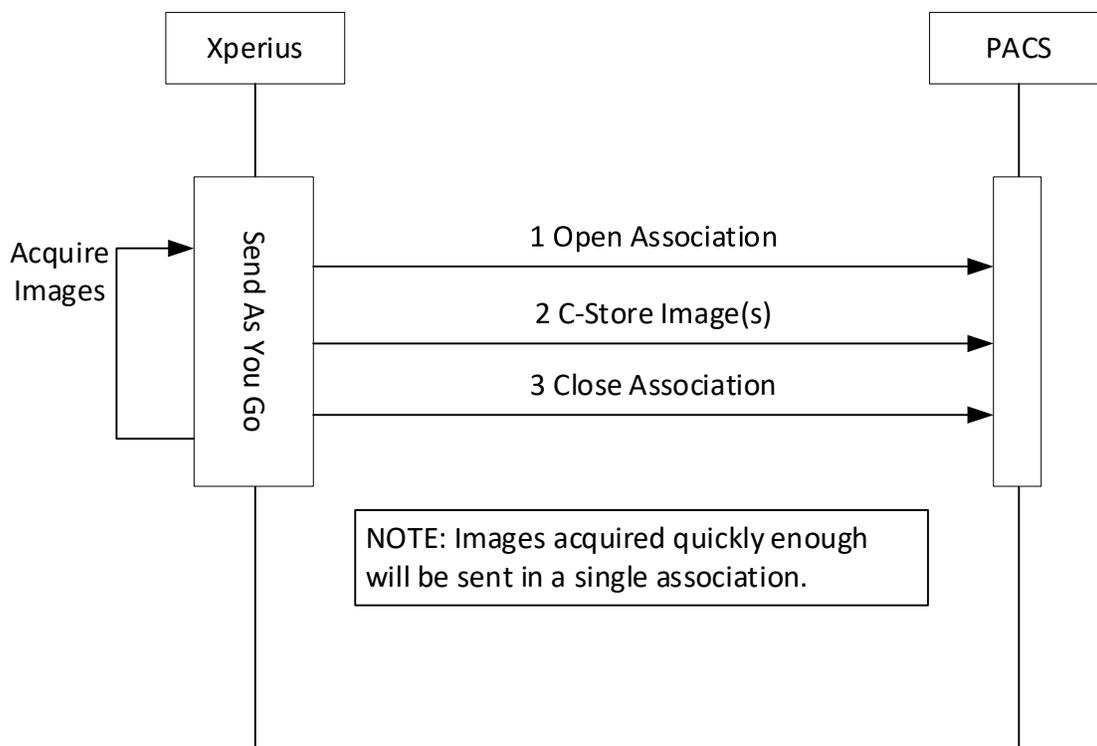
Figure 5
SEQUENCING OF ACTIVITY – SEND AS YOU GO

Proposed Presentation Contexts

Xperius is capable of proposing the Presentation Contexts shown in the following table:

Table 6
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY SEND IMAGES

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**			
Name	**UID**	**Name List**	**UID List**	**Role**	**Ext. Neg.**
US Image Storage*	1.2.840.10008.5.1.4.1.1.6.1	Implicit Little Endian JPEG Lossy Baseline	1.2.840.10008.1.2 1.2.840.10008.1.2.4.50	SCU	None
US Multiframe Image Storage*	1.2.840.10008.5.1.4.1.1.3.1	Implicit Little Endian JPEG Lossy Baseline	1.2.840.10008.1.2 1.2.840.10008.1.2.4.50	SCU	None

*The following applies to both US Image and US Multiframe Images
JPEG Lossy used if image Photometric Interpretation is
   YBR_FULL_422
Implicit Little Endian (ILE) transfer Syntax is used when:
   Palette Color,
   RGB,
   MONOCHROME2

4.2.1.3.1.2 SOP Specific Conformance for Image SOP Classes

All SOP Classes supported by the Storage AE exhibit the same behavior, except where stated, and are described together in this section.

Table 7 describes C-Store response behavior.

The following Default Settings and Ranges may be used where applicable in Table 7:

Setting	Default
Connect Timeout	30 sec
Read Timeout	300 sec
Retry Interval	120 sec
Maximum Retries	20

Establishing the Association with Default settings

Table 7
STORAGE C-STORE RESPONSE STATUS HANDLING BEHAVIOR

Condition (After C-Store)	Status Codes (C-Store-RSP)	Response
Could not establish the association within 30-second time window (Connect Timeout) due to NO RESPONSE from the Storage Server	Not Applicable	The association attempt is aborted, and after 2-minutes a new association is attempted. Xperius will make twenty attempts to open an association with the configured Storage SCP before aborting the storage request and placing the job in an error state. The user can then manually restart the job at some later date. The 2-minute timeout and the number of retries are configurable by the user from the DICOM Setup screens. The 2-minute timeout is mapped to the 'Retry Interval' input control on the DICOM Setup screen and the number of retries is mapped to 'Maximum Retries' on the DICOM Setup screen.
Refused	A7xx	If the Storage SCP server refuses the association, then the association attempt is aborted. Xperius will wait 2-minutes and then reattempt the association. Xperius will make twenty attempts to establish the association before aborting the storage request and placing the job in an error state. The user can then manually restart the job at some later date. The failure is logged to the DICOM log file as an error. As an example, the association would be refused if the storage server employs a high security mechanism whereby it only accepts association requests from DICOM Servers that it knows about and the Xperius's AE Title was not in the PACS database. See the timeout and retry settings above.

During Image Transfer

Table 8

Service Status	Error Code	Behavior
After association has been accepted, there is no response to a request within 5-minute time window (Read Timeout).	Not Applicable	If the association is lost during active image transfer to the Storage SCP server, Xperius will initiate a new association after 2 minutes, and attempt to store all the images. If during transfer, the association is again lost, Xperius will wait another minutes and try again. Xperius will make twenty attempts to send all the images before aborting the storage request and placing the job in an error state. The user can then manually restart the job at some later date.

Service Status	Error Code	Behavior
		See the timeout and retry settings above.
Error	A9xx, Cxxx, 0122, Other	Xperius will treat all errors as failure of Storage request (also called as Job). A failed job is automatically retried after 2 minutes. If the job fails even after twenty attempts, Xperius will abort this request and place the job in an Error state. The user can then manually restart the job at some later date.
Warning	D000, B000, B006, B007	If the Storage SCP issues a warning on a particular image (perhaps it had to use coercion), Xperius logs the warning to the DICOM log file as an informational event and continues on as if the image was successfully stored to the PACS (see row below).
Success	0000	When an image is successfully stored to the Storage SCP (PACS), Xperius will keep a record of the successful storage. If all the images in the job are successfully stored, Xperius will notify the user (through an icon on the list of studies), and the job will be removed from the job manager.

The behavior of Storage AE during communication failure is summarized in Table 8.

Table 9
STORAGE COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	Same as Service Status timeouts in Table 8 above.
Association aborted by the SCP or network layers	Same as Service Status in Table 8 above.

The contents of US Image and US Multiframe Storage SOP Instances conform to the DICOM IOD definitions described in Section 8.1.

4.2.2 Workflow Application Entity Specification

4.2.2.1 SOP Classes
Xperius provides Standard Conformance to the following SOP Classes:

Table 10
SOP CLASSES FOR AE WORKFLOW

SOP Class Name	SOP Class UID	SCU	SCP
MWL Information Model – FIND	1.2.840.10008.5.1.4.31	Yes	No

4.2.2.2 Association Establishment Policy

4.2.2.2.1 General
The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 11
DICOM APPLICATION CONTEXT FOR AE WORKFLOW

Application Context Name	1.2.840.10008.3.1.1.1

4.2.2.2.2 Number of Associations
Xperius initiates one Association at a time for a Worklist request.

Table 12
NUMBER OF ASSOCIATIONS INITIATED FOR AE WORKFLOW

Maximum number of simultaneous Associations	1

4.2.2.2.3 Asynchronous Nature
Xperius does not support asynchronous communication.

Table 13
ASYNCHRONOUS NATURE AS A SCU FOR AE WORKFLOW

Maximum number of outstanding asynchronous transactions	1

4.2.2.2.4 Implementation Identifying Information
The implementation information for this Application Entity is:

Table 14
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE WORKFLOW

Implementation Class UID	1.3.46.670589.14.8200.201
Implementation Version Name	XPERIUS_2.0.1

4.2.2.3 Association Initiation Policy

4.2.2.3.1 Activity – Worklist Update

4.2.2.3.1.1 Description and Sequencing of Activities
Worklist queries for Modality (US) or All Modalities only at specified interval. No manual refresh.

A possible sequence of interactions between the Workflow AE and a Departmental Scheduler (e.g. a device such as a RIS or HIS which supports the MWL SOP Class as an SCP) is illustrated in Figure .
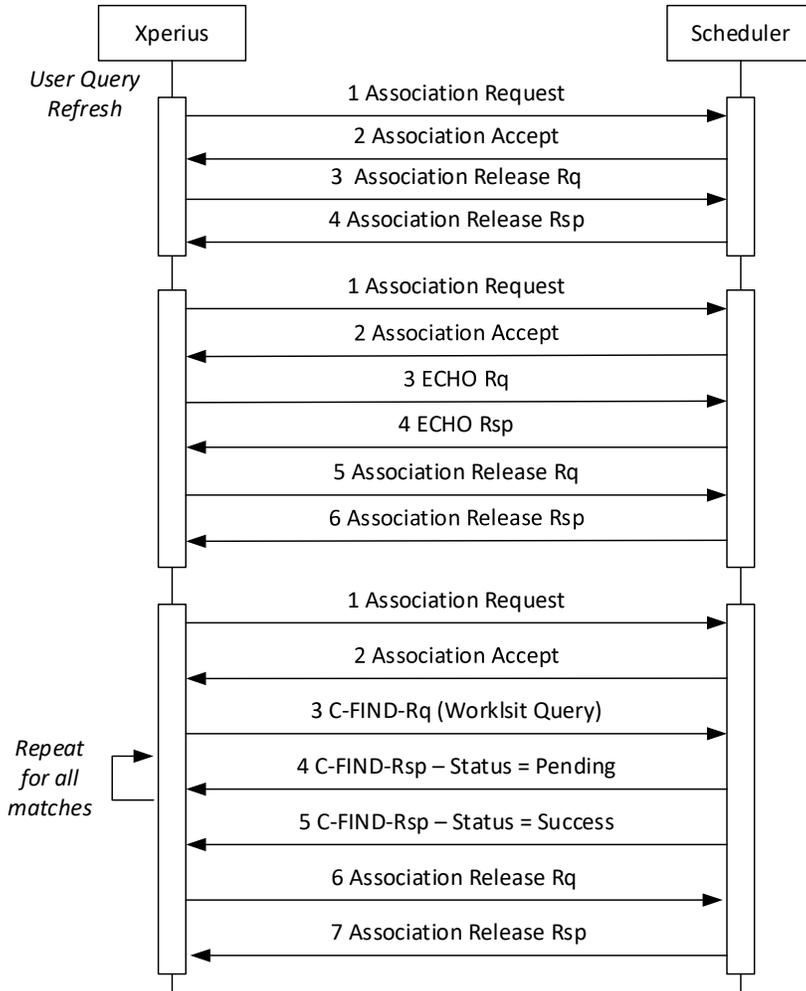
Figure 6
SEQUENCING OF ACTIVITY – WORKLIST UPDATE

4.2.2.3.1.2 Proposed Presentation Contexts
Xperius will propose Presentation Contexts as shown in the following table:

Table 15
PROPOSED PRESENTATION CONTEXTS FOR ACTIVITY WORKLIST UPDATE

Presentation Context Table					
Abstract Syntax		Transfer Syntax			Ext. Neg.
Name	UID	Name List	UID List	Role	
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Explicit VR Little Endian* Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2	SCU	None

*Note: If the worklist server accepts Explicit VR Little Endian and Implicit VR Little Endian then Xperius will use Explicit VR Little Endian Transfer Syntax.

4.2.2.3.1.3 SOP Specific Conformance for Modality Worklist

Table 16 summarizes the behavior of Xperius when encountering status codes in a MWL C-FIND response.

A message "query failed" will appear on the user interface if Xperius receives any other SCP response status than "Success" or "Pending."

Table 16
MODALITY WORKLIST C-FIND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Matching is complete	0000	The system replaced the worklist from the response.
Refused	Out of Resources	A700	The Association is aborted using A-ABORT. The worklist is not replaced.
Failed	Identifier does not match SOP Class	A900	Same as "Refused" above.
Failed	Unable to Process	C000 – CFFF	Same as "Refused" above.
Cancel	Matching terminated due to Cancel request	FE00	The user is notified that a partial list was retrieved. The retrieved items can be displayed by user request.
Pending	Matches are continuing	FF00	Continue.
Pending	Matches are continuing – Warning that one or more Optional Keys were not supported	FF01	Continue.
*	*	Any other status code.	Same as "Refused" above.

Table 17 summarizes the behavior of Xperius during communication failure.

Table 17
MODALITY WORKLIST COMMUNICATION FAILURE BEHAVIOR

Exception	Behavior
Timeout	Same as Service Status "Refused" in the table above.
Association aborted by the SCP or network layers	Same as Service Status "Refused" in the table above.

Table 18 describes the Xperius Worklist Matching Keys and requested attributes. Unexpected attributes returned in a C-FIND response are ignored.

Non-matching responses returned by the SCP due to unsupported optional matching keys are ignored.

Table 18
WORKLIST MATCHING KEYS

Module Name Attribute Name	Tag	VR	B	R	D	IOD
Scheduled Procedure Step						
Scheduled Procedure Step Sequence	(0040,0100)	SQ				
> Scheduled Station AE Title	(0040,0001)	AE	S*	x		
> Scheduled Procedure Step Start Date	(0040,0002)	DA	S	x	x	
> Scheduled Procedure Step Start Time	(0040,0003)	TM		x	x	
> Modality	(0008,0060)	CS	S	x		x
>Scheduled Performing Physician's Name[1]	(0040,0006)	PN		x	x	x
>Scheduled Procedure Step Description	(0040,0007)	LO		x		
Requested Procedure						
Requested Procedure Description[2]	(0032,1060)	LO		x	x	
Study Instance UID	(0020,000D)	UI		x		x
Imaging Service Request						
Accession Number	(0008,0050)	SH		x	x	x
Patient Identification						
Patient's Name	(0010,0010)	PN		x	x	x
Patient ID	(0010,0020)	LO		x	x	x
Patient Demographic						
Patient's Birth Date	(0010,0030)	DA		x	x	
Patient's Sex	(0010,0040)	CS		x	x	x
Patient Size	(0010,1020)	DS		x		x
Patient's Weight	(0010,1030)	DS		x		x

The above table should be read as follows:

    Module Name: The name of the associated module for supported worklist attributes.

    Attribute Name: Attributes supported to build an Xperius Worklist Request Identifier.

    Tag: DICOM tag for this attribute.

    VR: DICOM VR for this attribute.

    B: Matching keys for <u>B</u>road Worklist Update. An "S" indicates that Xperius supplies an attribute value for Single Value Matching; S* if configured in MWL SCP Advanced Settings

R:	Return keys. An "x" indicates that Xperius supplies this attribute as a Return Key with zero length for Universal Matching. NOTE: This table only includes the return keys present in the Request that are used in either the display or IOD.
D:	Displayed keys. An "x" indicates that this worklist attribute is displayed to the user in the Patient Data Entry screen or Worklist Directory.
IOD:	An "x" indicates that this Worklist attribute's data is included into applicable Image Object Instances created during performance of the related Procedure Step.

Notes:

1   Scheduled Performing Physician's Name sets the "Physician" field in Patient Data Entry Screen and is mapped into Performing Physician Name and Operator's Name in Image IODs

2   Requested Procedure Description is only displayed in the Patient Worklist page in "Study Description" when the procedure step is selected.

4.2.3   Verification Application Entity specification

4.2.3.1   SOP Class

Xperius provides Standard Conformance to the following SOP Class:

Table 19
SOP CLASSES FOR AE VERIFICATION

SOP Class Name	SOP Class UID	SCU	SCP
Verification	1.2.840.10008.1.1	Yes	No

4.2.3.2   Association Establishment Policy

4.2.3.2.1   General

The DICOM standard application context name for DICOM 3.0 is always proposed:

Table 20
DICOM APPLICATION CONTEXT FOR AE VERIFICATION

Application Context Name	1.2.840.10008.3.1.1.1

4.2.3.2.2   Number of Associations

Xperius initiates one Association at a time for a Verification request.

Table 21
NUMBER OF ASSOCIATIONS INITIATED FOR AE VERIFICATION

Maximum number of simultaneous Associations	1

4.2.3.2.3   Asynchronous Nature

Xperius does not support asynchronous communication (multiple outstanding transactions over a single Association).

Table 22
ASYNCHRONOUS NATURE AS A SCU FOR AE VERIFICATION

Maximum number of outstanding asynchronous transactions	1

4.2.3.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

Table 23
DICOM IMPLEMENTATION CLASS AND VERSION FOR AE VERIFICATION

Implementation Class UID	1.3.46.670589.14.8200.201
Implementation Version Name	XPERIUS_2.0.1

4.2.3.3 Association Initiation Policy

4.2.3.3.1 Activity – Verify as SCU

4.2.3.3.1.1 Description and Sequencing of Activities

SCU: The user can verify the existence of a DICOM server on the hospitals network, through the "Ping" button on the DICOM Node's Setup Dialog. When the user presses this button, Xperius will initiate the association.

Only one association is established for each verification attempt.
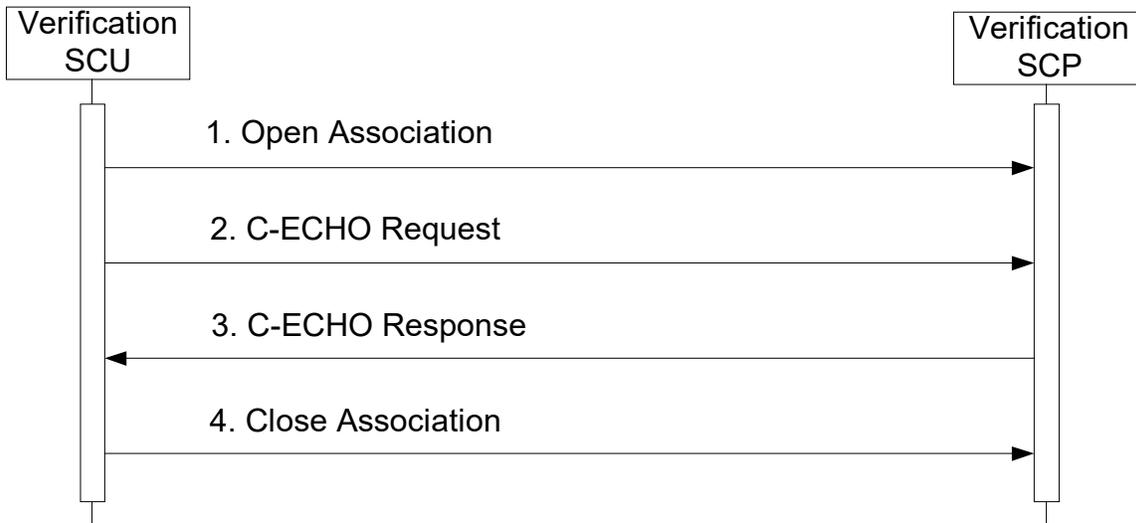
Figure 7
SEQUENCING OF ACTIVITY – ISSUE VERIFY

4.2.3.3.1.2 Proposed Presentation Contexts

Table 24
Proposed Presentation Contexts for Activity Verify As Scu

Presentation Context Table					
Abstract Syntax		**Transfer Syntax**		**Role**	**Ext. Neg.**
Name	**UID**	**Name List**	**UID List**		
Verification	1.2.840.10008.1.1	Implicit VR Little Endian JPEG Lossy Baseline*	1.2.840.10008.1.2 1.2.840.10008.1.2.4.50	SCU	None

*Note: Only present during verification command. Implicit Little Endian is used for all image transfers.

4.2.3.3.1.3 SOP Specific Conformance for Verification
No SOP Specific behavior

4.2.3.4 Association Acceptance Policy

4.2.3.4.1 Verification
Table 25 summarizes the behavior of Xperius when receiving status codes in a C-ECHO response.

A message will appear on the user interface if Xperius receives any other SCP response status than "Success."

Table 25
VERIFICATION C-ECHO RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success		0000	Device Status is set to: Verified
Refused	Out of Resources	A700	Device Status is set to: Not Verified
Failed	Unable to Process	C000 – CFFF	Same as "Refused" above.
*	*	Any other status code.	Same as "Refused" above.

4.3   PHYSICAL NETWORK INTERFACES

4.3.1   Supported Communication Stacks

4.3.1.1   TCP/IP Stack
The system provides only DICOM V3.0 TCP/IP Network Communication Support as defined in PS 3.8 of the standard.

The TCP/IP Stack, as supported by the underlying Operating System, is the only protocol stack supported.

4.3.2   Physical Network Interface
The Xperius 2.0.1 DCS system supports one network interface at a time. The following physical network interfaces are available:.

Table 26
SUPPORTED PHYSICAL NETWORK INTERFACE

1)   802.11 a/b/g/n/ac Wireless
2)   Ethernet 10/100/1000 BaseT, RJ-45, AutoDetect Speed, Full or Half Duplex

4.3.3   Additional Protocols
Not Applicable

4.3.4   IPv4 and IPv6 Support
IPv4 and IPv6 are supported.

4.4   CONFIGURATION
Any implementation's DICOM conformance may be dependent upon configuration, which takes place at the time of installation. Issues concerning configuration are addressed in this section.

4.4.1   AE Title/Presentation Address Mapping
An important installation issue is the translation from AE title to presentation address. How this is to be performed is described here.

The DICOM setup screen allows the user to configure a significant number of options including (but not limited to):

- For the Xperius system, its AE Title, IP Address and Port number, and wired or wireless connection.

- For DICOM servers, their AE Title, Port number, IP address.

- For Storage SCP's and for media storage; the image format.

  Advanced settings (including Photometric Interpretation settings: MONOCHROME2, RGB, Palette color and YBR_FULL_422).

- For a MWL server, the query parameters: Scheduled Procedure Start Date range, Modality, AE Title and update interval.

The Devices Configuration section allows configuration of the following device types:

Device Type	Supported SOPs
Primary Storage SCP	Ultrasound Store Ultrasound Multiframe Store
MWL SCP	Modality Worklist

To configure a server that supports image store, a "Server" entry must be configured under "Settings>DICOM…>Change Settings >Servers and Roles>Servers". Enter a Name (an 'alias' used in the system UI only), the appropriate AE Title, IP Address, Port number and timeout values. "Ping" sends an ICMP ping message to the address and a DICOM Verification Association message to the IP, Port and AE Title. A success message is displayed if all is configured correctly at this level. If not, an error message dialog is displayed indicating possible reasons and suggested corrective actions. Once successful, Hit "Done" to continue to Role definition.

Once the server data is defined, then its role and options are configured. For each role, as in Primary Storage SCP or MWL, select the server's alias name from the list. If "Advanced" options are available, select the "Advanced" button to access them.

When Role configuration is completed and "Done" is selected under "Roles", then another set of Verification messages are sent to each server confirming network connectivity and DICOM role support. A dialog box updates as the tasks are in progress. No error messages indicates successful configuration.

4.4.1.1   Secure DICOM Configuration Option

DICOM Setup supports the ability to make secure connections between the ultrasound system and DICOM servers. The "DICOM Setup" page includes the "This System" tab that includes a "Secure DICOM" button. Select that button to open the "Secure DICOM Configuration" dialog and select the "Modify" button. Select the "Use Transport Layer Security (Use TLS) checkbox and optionally the "Use TLS Encryption" box.

With a USB device connected to the system containing the certificates, select "Manage Certificates" to enter certificates. Detailed instructions are available in Help on the system.

After entering the certificates into the system, make the selection for "* This System's Certificate:"

Similarly, with the certificates imported into the system, when configuring remote servers to connect with under the "Systems and Roles" tab, the correct certificate may be selected in the "Servers" side's "Secure DICOM" button.

Note: If the system is set for Secure DICOM, it will only communicate with secure devices, and the system's default listening port will change from 104 to 2762.

4.4.1.2   Local AE Title

All local AEs use the same AE Title and TCP/IP Port configured via the Settings>DICOM…>Change Settings >This System screen. The system listens on the configured Port only for Verification requests. The system supports Static Addressing or DHCP to receive its IP Address, Subnet Mask and Default Gateway address.

4.4.1.3   Remote AE Title/Presentation Address Mapping

The AE Titles, IP Addresses and Port numbers of remote applications are manually configured using the Settings>DICOM…>Change Settings >Servers and Roles. The remote system's IP Address may be entered manually if known or the Host Name of the remote device may be entered and resolved by the DNS if the network includes this service.

4.4.2   Workflow

DICOM Setup is used to set the AE Title, Port number and IP Address the remote MWL SCP. Multiple MWL SCPs may be defined, but only a single remote MWL SCP can be selected at a time.

The default MWL query uses Modality = "US". This may be changed in the "Set Modality Worklist Query Customizable Queries" definition page. Alternately, "All Modalities" may be selected.

"AE Title" may be selected as the system's or a custom query value may be defined for "ANY".

The Start Date defaults to "Today" but or a Date range of ±24 hours, yesterday, today and tomorrow, and past 30 days plus next 7 days.

The Update (automated polling) interval range for sending MWL queries is between 1 and 32,767 minutes, defaulting to 30 minutes.

5   MEDIA STORAGE

5.1   IMPLEMENTATION MODEL

5.1.1   Application Data Flow
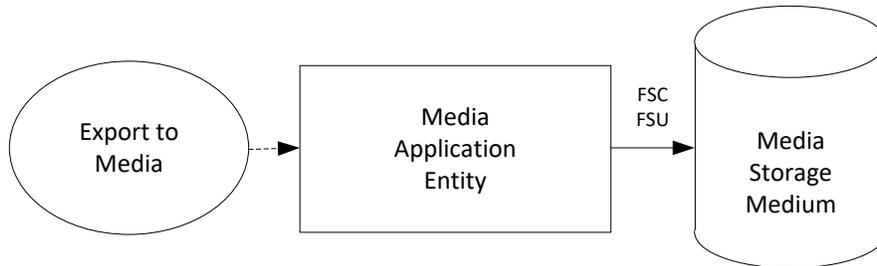
Figure 8
APPLICATION DATA FLOW DIAGRAM FOR MEDIA STORAGE

— The Media Application Entity exports Images to a removable storage medium. It is associated with the local real-world activity "Export" using the configured export selection parameters for selected patients' data.

XPERIUS will support the use of USB devices.

An export to new media will include the following:

1 Format the media, creating a new Volume Label	4 Create a folder for each patient
2 Will export the "QVue" DICOM viewer	5 Write a DICOMDIR file.
3 Write an "Index.html" file to the media	6 If a DICOMDIR already exists, the system will update.

5.1.2   Functional Definition of AEs

5.1.2.1   Functional Definition of Media Application Entity
Using "Export" will pass the currently selected patients' exams or individually selected images to the Media Application Entity. The contents of each export job will be written to the selected media destination. The size of the selected media is used to determine and display the number of media required for the export. When a device is filled to capacity, the system will prompt the user for addition media and continue.

5.1.3   Sequencing of Real-World Activities
At least one image must exist and be selected before the Media Application Entity can be invoked. The operator can insert new media at any time. The Media Application Entity will wait indefinitely for media to be inserted before starting to write to the device.

5.1.4   File Meta Information Options
The implementation information written to the File Meta Header in each file is:

Table 27
DICOM IMPLEMENTATION CLASS AND VERSION FOR MEDIA STORAGE

Implementation Class UID	1.3.46.670589.14.8200.201
Implementation Version Name	XPERIUS_2.0.1

5.2   AE SPECIFICATIONS

5.2.1   Media Application Entity Specification
The Media Application Entity provides standard conformance to the DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed in

Table 28
APPLICATION PROFILES, ACTIVITIES AND ROLES FOR OFFLINE-MEDIA

Application Profiles Supported	Real World Activity	Role	SC Option
STD-GEN-USB-JPEG	Send to….Media	FSC / FSU	Interchange

Transfer Syntax and Photometric Interpretation options for removable media

Transfer Syntax	Photometric Interpretation
RLE (Lossless) Compression	Palette Color

5.2.1.1   File Meta Information for the Application Entity
The File-Set Identifier included in the File Meta Header is "".

5.2.1.2   Real-World Activities

5.2.1.2.1   Activity – Send to Media – "Export"
The Media Application Entity acts as an FSC using the interchange option when requested to export SOP Instances from the local database to media.

The contents of the export job will be written together with a corresponding DICOMDIR to media. The user can cancel an export job in the job queue.

5.2.1.2.2   Activity – Update to Media – "Export"
The Media Application Entity acts as an FSU using the interchange option when requested to export SOP Instances from the local database to media upon which DICOM data already resides.

The system user selects exams from the system's directory for transfer to media that already contains data. The DICOMDIR is updated allowing access to original and new data.

5.2.1.2.2.1   Media Storage Application Profiles
See Table 28 for supported Application Profiles.

5.2.1.2.2.2   Options
The Media Application Entity supports the SOP Classes and Transfer Syntaxes listed in Table 29.

Table 29
IODS, SOP CLASSES AND TRANSFER SYNTAXES FOR OFFLINE MEDIA

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Media Storage Directory Storage	1.2.840.10008.1.3.10	Implicit VR Little Endian	1.2.840.10008.1.2
US Image Storage	1.2.840.10008.5.1.4.1.1.6.1	RLE Lossless	1.2.840.10008.1.2.5

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
US Multiframe Image Storage	1.2.840.10008.5.1.4.1.1.3.1	RLE Lossless	1.2.840.10008.1.2.5

Directory Information Module

All data elements are used as described in DICOM 3.0 Part 3 for Basic Directory Object Definitions. As stated in the Ultrasound Application Profile, "The (DICOMDIR) Directory shall include Directory Records of PATIENT, STUDY, SERIES, and IMAGE corresponding to the information object files in the File-set". These are present when writing media.

Xperius ignores directory Record Types other than those above.

Xperius also ignores the "File-set consistency Flag" (0004,1212).

Patient Directory Record

Attribute Name	Tag	Type	Usage
Specific Character Set	(0008,0005)	1C	The default DICOM character set and optional set ISO-IR 100 (Latin 1) are supported. See Section 6 for details.
Patient Name	(0010,0010)	2	Displayed to help the user identify the patient folder in which to place the studies for this patient.
Patient ID	(0010,0020)	1	Displayed to help the user identify the patient folder in which to place the studies for this patient.

Study Directory Record

Attribute Name	Tag	Type	Usage
Specific Character Set	(0008,0005)	1C	The default DICOM character set and optional set ISO-IR 100 (Latin 1) are supported. See Section 6 for details.
Study Date	(0008,0020)	1	Used in displaying list of studies to user
Study Time	(0008,0030)	1	Used in displaying list of studies to user
Accession Number	(0008,0050)	2	Stored in the system database
Study Description	(0008,1030)	2	If available
Study Instance UID	(0020,000D)	1C	Stored in the system database
Study ID	(0020,0010)	1	Stored in the system database

Series Directory Record

Attribute Name	Tag	Type	Usage

Specific Character Set	(0008,0005)	1C	The default DICOM character set and optional set ISO-IR 100 (Latin 1) are supported. See Section 6 for details.
Modality	(0008,0060)	1	Only US is supported. Other modalities are ignored.
Series Instance UID	(0020,000E)	1	Stored, when available
Series Number	(0020,0011)	1	Stored

Image Directory Record

Attribute Name	Tag	Type	Usage
Specific Character Set	(0008,0005)	1C	The default DICOM character set and optional set ISO-IR 100 (Latin 1) are supported. See Section 6 for details.
Instance Number	(0020,0013)	1	Used
Referenced File ID	(0004,1500)	1C	Used
Referenced SOP Class UID in File	(0004,1510)	1C	Used
Referenced SOP Inst UID in File	(0004,1511)	1C	Used
Referenced Transfer Syntax UID in File	(0004,1512)	1C	Used
Content Date	(0008,0023)	3	Used for ordering the thumbnail display. On Export, comes from the image.
Content Time	(0008,0033)	3	Used for ordering the thumbnail display. On Export, comes from the image.
Image Comments	(0020,4000)	3	If available

6   SUPPORT OF CHARACTER SETS

Table 30
Supported Character Sets

Character Set Description	Defined Term	ESC Sequence	ISO Registration Number	Code Element	Character Set
Unicode as UTF-8	ISO_IR 192	-	ISO-IR 192	N/A	ISO 10646-1, 10646-2, and their associated supplements and extensions
		-	ISO-IR 6	G0	ISO 646

7   SECURITY

7.1   General Security

Xperius incorporates an internal firewall that only accepts incoming traffic on the designated listening port, configured in Settings >DICOM>Change Settings>This System >System port number. The port is only opened if a server is defined.

7.2   Supported DICOM Security Profiles

7.2.1 TLS Secure Transport Connection Profiles

Basic TLS Secure Transport Connection Profile and the AES TLS Secure Transport Connection Profile are supported using Transport Layer Security Version 1.2 protocol with the following features:

Supported TLS Feature	Mechanism
Entity Authentication	RSA based certificates
Exchange of Master Secrets	RSA
Data Integrity	SHA-1 or SHA-2 based certificates
Privacy (Cyphersuite Options)	TLS_RSA_WITH_AES_128_CBC_SHA (preferred)
	TLS_RSA_WITH_3DES_EDE_CBC_SHA

TLS authentication may be used with or without TLS encryption – default is with TLS encryption.

For outgoing TLS requests where Xperius acts as a TLS Client, the received server RSA certificate is validated by verifying its digital signature against a certificate in the local Trusted Certificate Authorities store whose Subject matches the Issuer of the received certificate. If requested by the TLS Server, Xperius will then send the certificate configured for "This System" from the local Personal store.

For incoming TLS connection requests where Xperius acts as a TLS Server, the certificate configured for "This System" is sent from the Personal store to the client as specified in the TLS protocol. Xperius always requests a client certificate from the TLS Client.

Certificates are locally managed. The site administrator may import certificates from media to the Trusted Certificate Authority store for verifying incoming certificates; these may be either CA certificates or self-signed end-entity certificates. The site administrator may also import certificates from media to the Personal store along with the certificates private key for certificates representing 'This System'. A wide variety of certificate file formats are supported, including

Base 64 Text: PEM format (.pem, .crt), usually unencrypted but may be encrypted. If encrypted, the encryption password must be provided when importing.

ASN.1 Binary: BER, DER, CER formats (.der, .cer, .crt)

PKCS#12: Encrypted Container for certificates with private keys (.pfx, .p12). This format is used primarily for the "This System" certificate with corresponding private key. The encryption password must be provided when importing.

PKCS#7: Container for multiple certificates. If there is only one certificate in the container, then the certificate is saved to the user-specified store name. If there are multiple certificates in the container, then the Issuer and Subject names of each certificate are compared; if the names are the same, the certificate is stored in the Trusted Certificate Authority store, else in the Intermediate Certificate Authority store.

The site administrator may also remove previously-imported certificates.

The incoming TCP port defaults to port 2762 when TLS security is enabled; this port may be changed by the user if desired.

8   ANNEXES

8.1   CREATED IOD INSTANCES

Table 31 specifies the attributes of an Ultrasound Image transmitted by the Xperius storage application.

The following tables use a number of abbreviations. The abbreviations used in the "Presence of …" column are:

VNAP	Value Not Always Present (attribute sent zero length if no value is present)
ANAP	Attribute Not Always Present
ALWAYS	Always Present
EMPTY	Attribute is sent without a value

The abbreviations used in the "Source" column:

MWL	the attribute value source Modality Worklist
	Unless otherwise noted, values returned from worklist may be overridden by User input.
USER	the attribute value source is from User input
AUTO	the attribute value is generated automatically
CONFIG	the attribute value source is a configurable parameter

8.1.1   US or US Multiframe Image IOD

Table 31
IOD of created US or US Multiframe SOP Instances

IE	Module	Reference	Presence of Module
Patient	Patient	Table 2	ALWAYS
Study	General Study	Table 33	ALWAYS
	Patient Study	Table 4	ALWAYS
Series	General Series	Table 3	ALWAYS
Equipment	General Equipment	Table 36	ALWAYS
Image	General Image	Table 37	ALWAYS
	Image Pixel	Table 38	ALWAYS
	Cine	Table 39	Only if Multi-frame
	Multi-frame	Table 40	Only if Multi-frame
	US Region Calibration	Table 41	ANAP*
	US Image	Table 42	ALWAYS
	SOP Common	Table 43	ALWAYS

* the US Region Calibration module is not present in US Multiframe images where a calibration change occurs, i.e. the loop contained a depth or zoom change.

8.1.2 Common Modules

Table 32
PATIENT MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient's Name	(0010,0010)	PN	Same attribute of MWL or PDE input	ALWAYS	MWL/ USER/ AUTO
Patient ID	(0010,0020)	LO	From MWL, user input or system generated.	ALWAYS	MWL/ USER/ AUTO
Patient's Birth Date	(0010,0030)	DA	Same attribute of MWL or PDE input	VNAP	MWL/ USER
Patient's Sex	(0010,0040)	CS	Same attribute of MWL or PDE input	ANAP	MWL/ USER

Table 33
GENERAL STUDY MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020,000D)	UI	Same value as in MWL or auto generated	ALWAYS	MWL/ AUTO
Study Date	(0008,0020)	DA	Study's Start Date	ALWAYS	AUTO
Study Time	(0008,0030)	TM	Study's Start Time	ALWAYS	AUTO
Accession Number	(0008,0050)	SH	Same attribute of MWL	VNAP	MWL

Table 34
PATIENT STUDY MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient Size	(0010,1020)	DS	Same value as MWL attribute.	ANAP	MWL
Patient's Weight	(0010,1030)	DS	Same value as MWL attribute.	ANAP	MWL

Table 35
GENERAL SERIES MODULE OF CREATED IMAGE SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008,0060)	CS	"US"	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Auto generated.	ALWAYS	AUTO
Series Number	(0020,0011)	IS	A number unique within the Study	ALWAYS	AUTO
Performing Physician's Name	(0008,1050)	PN	MWL Scheduled Performing Physician's Name (0040,0006) or PDE input, 'Physician'.	ANAP	MWL/ USER
Operator's Name	(0008,1070)	PN	MWL Scheduled Performing Physician's Name (0040,0006) or PDE input, 'Physician'.	ANAP	MWL/ USER

Table 36
GENERAL EQUIPMENT MODULE OF CREATED SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	Philips	ALWAYS	AUTO
Institution Name	(0008,0080)		User entry or default, "B|Braun Philips"	ALWAYS	USER/ AUTO
Station Name	(0008,1010)	SH	The AE Title of Xperius system on which the image is acquired. The user can configure the AE Title of the system through 'Settings'.	VNAP	CONFIG
Software Version(s)	(0018,1020)	LO	This is a multi-valued tag which contains the following components: SW Part number, Version number, and SW build date	ALWAYS	AUTO
Manufacturer's Model Name	(0008,1090)	LO	"XPERIUS"	ALWAYS	AUTO

8.1.3 US or Multiframe Image Modules

Table 37
GENERAL IMAGE MODULE OF CREATED US SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Instance Number	(0020,0013)	IS	Generated by device, increments from "1" in each series. Gaps in values may exist if images are deleted on the system prior to export.	ALWAYS	AUTO
Patient Orientation	(0020,0020)	CS	The system sends the tag empty	VNAP	AUTO
Content Date	(0008,0023)	DA	<yyyymmdd>	ALWAYS	AUTO
Content Time	(0008,0033)	TM	<hhmmss.ffffff>	ALWAYS	AUTO
Image Type	(0008,0008)	CS	ORIGINAL or DERIVED\PRIMARY\<Clinical application>; e.g.: MUSCULOSKELETAL	ALWAYS	AUTO
Acquisition Date	(0008,0022)	DT	The system uses the same value as the Content Date, tag 0008,0023.	ALWAYS	AUTO
Acquisition Time	(0008,0032)	TM	The system uses the same value as the Content time, tag 0008,0033.	ALWAYS	AUTO
Acquisition Datetime	(0008,002A)	DT	The system generates this as a combination of Acquisition Date and Acquisition Time. The format is yyyymmddhhmmss.ffffff	ALWAYS	AUTO
Lossy Image Compression	(0028,2110)	CS	"00"	ALWAYS	AUTO

Table 38
IMAGE PIXEL MODULE OF CREATED US OR US MULTIFRAME SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples per Pixel	(0028,0002)	US	1 for PALETTE COLOR	ALWAYS	CONFIG
Photometric Interpretation	(0028,0004)	CS	PALETTE COLOR MONOCHROME2	ALWAYS	CONFIG
Rows	(0028,0010)	US	600	ALWAYS	CONFIG
Columns	(0028,0011)	US	800	ALWAYS	CONFIG
Bits Allocated	(0028,0100)	US	2D B&W: 8 bits 2D Color: 16 bits	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	Always the same numbers as Bits Allocated.	ALWAYS	AUTO
High Bit	(0028,0102)	US	The High Bit is always (Bits Allocated -1).	ALWAYS	AUTO
Pixel Representation	(0028,0103)	US	"0" pixels are Unsigned integers	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Pixel Data	(7FE0,0010)	OW / OB		ALWAYS	AUTO
Red Palette Color Lookup Table Descriptor	(0028,1101)	US	Specifies the format of the Red Palette Color Lookup Table Data (0028,1201).	ALWAYS	AUTO
Green Palette Color Lookup Table Descriptor	(0028,1102)	US	Specifies the format of the Green Palette Color Lookup Table Data (0028,1201).	ALWAYS	AUTO
Blue Palette Color Lookup Table Descriptor	(0028,1103)	US	Specifies the format of the Blue Palette Color Lookup Table Data (0028,1201).	ALWAYS	AUTO
Red Palette Color Lookup Table Data	(0028,1201)	OW	The Red Palette Color Lookup Table Data.	ALWAYS	AUTO
Green Palette Color Lookup Table Data	(0028,1202)	OW	The Green Palette Color Lookup Table Data.	ALWAYS	AUTO
Blue Palette Color Lookup Table Data	(0028,1203)	OW	The Blue Palette Color Lookup Table Data.	ALWAYS	AUTO

Table 39
CINE MODULE OF CREATED US MULTIFRAME SOP

Attribute Name	Tag	VR	Value	Presence of Value	Source
Recommended Display Frame Rate	(0008,2144)	IS	Used for Multiframe	ALWAYS	AUTO
Cine Rate	(0018,0040)	IS	Used for Multiframe	ALWAYS	AUTO
Effective Duration	(0018,0072)	DS	Used for Multiframe	ALWAYS	AUTO
Frame Time Vector	(0018,1065)	DS	An array that contains the real time increments (in msec) between frames for a Multi-frame image. Present if Frame Increment Pointer (0028,0009) points to Frame Time Vector.	ALWAYS	AUTO

Table 40
MULTI-FRAME MODULE OF CREATED US MULTIFRAME SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Number of Frames	(0028,0008)	IS	# of frames in object	ALWAYS	AUTO
Frame Increment Pointer	(0028,0009)	AT	(0018,1065) Frame Time Vector	ALWAYS	AUTO

Table 41
US Region Calibration Module of created US IMAGE or US Multiframe IMAGE SOP Instances

Attribute Name	Tag	VR	Value	Presence of Value	Source
Sequence of Ultrasound Regions	(0018,6011)	SQ	A sequence is present for each region on the system display	ANAP	AUTO
>Region Location Min x_0	(0018,6018)	UL	Top Left position of region.	ANAP	AUTO
>Region Location Min y_0	(0018,601A)	UL	Top Left position of region	ANAP	AUTO
>Region Location Max x_1	(0018,601C)	UL	Bottom Right position of region	ANAP	AUTO
>Region Location Max y_1	(0018,601E)	UL	Bottom Right position of region	ANAP	AUTO

>Physical Units X Direction	(0018,6024)	US	Enumerated Value.
			  2D Image = 0003H = CM
			  ECG Region = 0004H = Seconds
				ANAP	AUTO

>Physical Units Y Direction	(0018,6026)	US	Enumerated Value.
			  2D Image = 0003H = CM
			  ECG Region = 0000H = None
				ANAP	AUTO

>Physical Delta X	(0018,602C)	FD	The physical value per pixel increment	ANAP	AUTO
>Physical Delta Y	(0018,602E)	FD	The physical value per pixel increment	ANAP	AUTO
>Reference Pixel X0	(0018,6020)	SL	The X pixel value of baseline	ANAP	AUTO
>Reference Pixel Y0	(0018,6022)	SL	The Y pixel value of baseline	ANAP	AUTO
>Reference Pixel Physical Value X	(0018,6028)	FD	For each region, the X coordinate of the reference point for measurements within that region.	ANAP	AUTO
>Reference Pixel Physical Value Y	(0018,602A)	FD	For each region, the Y coordinate of the reference point for measurements within that region.	ANAP	AUTO

>Region Spatial Format	(0018,6012)	US	Enumerated Value.
			  2D (tissue or flow) = 0001H
			  Wave form = 0004H
				ANAP	AUTO

>Region Data Type	(0018,6014)	US	Enumerated Value.
			  Tissue = 0001H
			  ECG Trace = 000AH
				ANAP	AUTO

>Region Flags	(0018,6016)	UL	Always set to 3.	ANAP	AUTO

Table 42
US IMAGE MODULE OF CREATED US IMAGE OR US MULTIFRAME IMAGE SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
Samples Per Pixel	(0028,0002)	US	See 'Image Pixel Module'	ALWAYS	AUTO
Photometric Interpretation	(0028,0004)	CS	See 'Image Pixel Module'	ALWAYS	CONFIG
Bits Allocated	(0028,0100)	US	See 'Image Pixel Module'	ALWAYS	AUTO
Bits Stored	(0028,0101)	US	See 'Image Pixel Module'	ALWAYS	AUTO
High Bit	(0028,0102)	US	See 'Image Pixel Module'	ALWAYS	AUTO
Planar Configuration	(0028,0006)	US	See 'Image Pixel Module'	ANAP	AUTO
Pixel Representation	(0028,0103)	US	"0" Pixels are Unsigned integers	ALWAYS	AUTO
Frame Increment Pointer	(0028,0009)	AT	(0018,1065) Frame Time Vector	ALWAYS	AUTO
Image Type	(0008,0008)	CS	See 'General Image Module'	ALWAYS	CONFIG
Lossy Image Compression	(0028,2110)	CS	"00"	ALWAYS	AUTO
Ultrasound Color Data Present	(0028,0014)	US	0 or 1	ALWAYS	AUTO
Acquisition Datetime	(0008,002A)	DT	The date and time that the acquisition of data that resulted in this image started.	ALWAYS	AUTO
Transducer Data	(0018,5010)	LO	Transducer name. VM = 3, the last two fields are written as "UNUSED".	ALWAYS	AUTO
Transducer Type	(0018,6031)	LO	LINEAR, CURVED LINEAR	ANAP	AUTO
Processing Function	(0018,5020)	LO	The factory-defined exam/preset that was active when the image was acquired even if a user-defined preset.	ALWAYS	AUTO

Table 43
SOP COMMON MODULE OF CREATED US IMAGE OR US MULTIFRAME IMAGE SOP INSTANCES

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	1.2.840.10008.5.1.4.1.1.6.1 for US Image 1.2.840.10008.5.1.4.1.1.3.1 for US Multiframe Image	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Auto Generated	ALWAYS	AUTO
Specific Character Set	(0008,0005)	CS	ISO_IR 192 used for UTF-8 unicode characters, otherwise, ISO_IR 100	ALWAYS	AUTO

8.1.4 USED FIELDS IN RECEIVED IOD BY APPLICATION
Not Applicable

8.2 ATTRIBUTE MAPPING
Table 44 summarizes the relationships between attributes received via MWL, stored in acquired images. The format and conventions used in Table 44 are the same as the corresponding table in DICOM Part 4, Annex M.6

Table 44
ATTRIBUTE MAPPING BETWEEN MODALITY WORKLIST, IMAGE

Modality Worklist	Image IOD
Patient's Name	Patient's Name
Patient ID	Patient ID
Patient's Birth Date	Patient's Birth Date
Patient's Sex	Patient's Sex
Patient's Weight	Patient's Weight
Study Instance UID	Study Instance UID
Accession Number	Accession Number

8.3 CONTROLLED TERMINOLOGY
Not applicable.

8.4 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS
Not applicable.