Technical Publications

Direction DOC2652554
Revision 3

Vivid E95
Vivid E90
Vivid E80
Vivid S70N
Vivid S60N
Vivid iq
Vivid T8
Vivid T9
EchoPAC Software Only
EchoPAC Plug-in

Version 206

CONFORMANCE STATEMENT for DICOM

GE HealthCare

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CONFORMANCE STATEMENT OVERVIEW

The Vivid is an Ultrasound scanner acting as an acquisition modality in a DICOM network. EchoPAC Software Only application is an Ultrasound review software acting as an image display in a DICOM network. The EchoPAC Plug-in also acts as an image display, however it does not provide network or media services.

Table 0.1 provides an overview of the network services supported by Vivid scanner and EchoPAC Software Only application.

TABLE 0.1 NETWORK SERVICES

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Transfer		
Ultrasound Multi-frame Image Storage	Yes	Yes
Ultrasound Image Storage	Yes	Yes
Ultrasound Multi-frame Image Storage (Retired)	Yes	Yes
Ultrasound Image Storage (Retired)	Yes	Yes
Secondary Capture Image Storage	Yes	Yes
Comprehensive SR	Yes	No
CT Image Storage *	No	Yes
Enhanced CT Image Storage *	No	Yes
Query/Retrieve		
Study Root Query/Retrieve Information Model – FIND	Yes	No
Study Root Query/Retrieve Information Model – MOVE	Yes	No
Print Management		
Basic Grayscale Print Management Meta SOP Class	Yes	No
Basic Color Print Management Meta SOP Class	Yes	No
Workflow Management		
Storage Commitment Push Model SOP Class	Yes	No
Modality Performed Procedure Step SOP Class	Yes	No
Modality Worklist Information Model – FIND SOP Class	Yes	No

Option*: This means that this service can be purchased separately and may be available only on certain models.

Table 0.2 provides an overview of the Media Storage Application Profiles supported by the Vivid scanner and EchoPAC Software Only application.

TABLE 0.2 MEDIA SERVICES

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disk – Recordable		
US Spatial Calibration Single Frame CD-R (augmented, see 3.3.1)	Yes	Yes
US Spatial Calibration Multi-frame CD-R (augmented, see 3.3.1)	Yes	Yes
DVD		
US Spatial Calibration Single Frame DVD (augmented, see 3.3.1)	Yes	Yes
US Spatial Calibration Multi-frame DVD (augmented, see 3.3.1)	Yes	Yes
USB		
General Purpose USB Media Interchange (augmented, see 3.3.1)	Yes	Yes

TABLE OF CONTENTS

1. INTRODUCTION

1.1 OVERVIEW

This DICOM Conformance Statement is divided into Sections as described below:

Section 1 (Introduction), which describes the overall structure, intent, and references for this Conformance Statement

Section 2 (Network Conformance Statement), which specifies the GEHC equipment compliance to the DICOM requirements for the implementation of Networking features.

Section 3 (Media Storage Conformance Statement), which specifies the GEHC equipment compliance to the DICOM requirements for the implementation of Media Storage features.

Section 4 (Ultrasound Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of an Ultrasound Medicine Information Object.

Section 5 (Ultrasound Multi-Frame Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of an Ultrasound Multi-Frame Information.

Section 6 (SC Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a Secondary Capture Information Object.

Section 7 (SR Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a Comprehensive Structured Reporting Information Object**.**

Section 8 (Basic Directory Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of a Basic Directory Information Object**.**

Section 9 (Modality Worklist Information Model), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of the Modality Worklist service.

Section 10 (Modality Performed Procedure Step SOP Class Definition), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of Modality Performed Procedure Step Service.

Section 11 (Storage Commitment Push Model SOP Class Definition), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of the Storage Commitment Push Model Service.

Section 12 (Basic Print Meta SOP Class Information Object Implementation), which specifies the GEHC equipment compliance to DICOM requirements for the implementation of Basic Print Meta SOP Classes (Gray and Color).

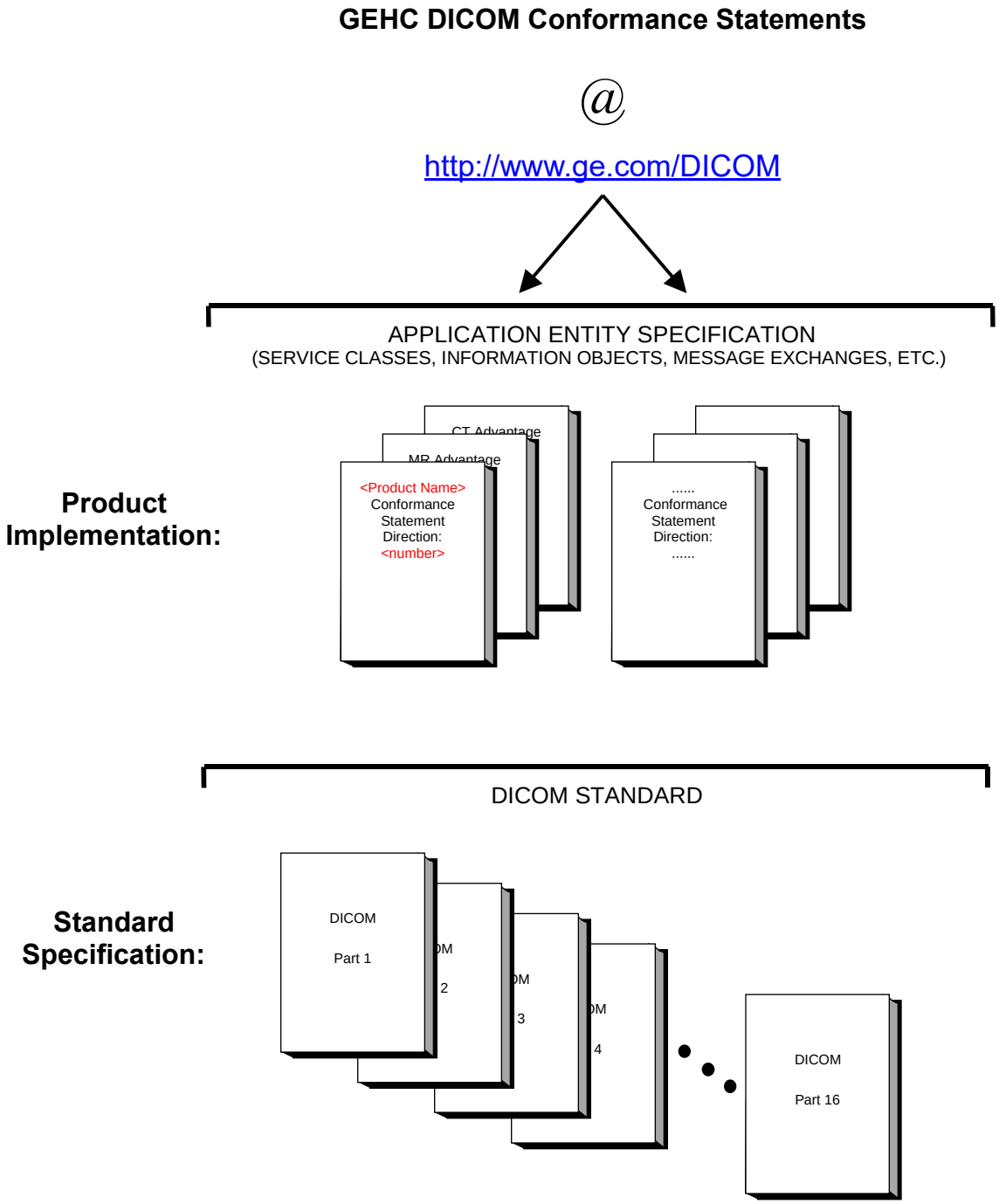
Section 13 (Study Root Query/Retrieve Information Model), which specifies the GEHC equipment compliance to DICOM requirements for the Study Root Query/Retrieve Information Model.

Section 14 (Echocardiography procedure report), which specifies how measurements are mapped to Adult Echocardiography or Pediatric Procedure Report (TID 5200 and TID 5220 respectively) DICOM SR, .

Section 15 (Vascular Ultrasound procedure report), which specifies how measurements are mapped to Vascular Ultrasound Procedure Report (TID 5100) DICOM SR.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

The Documentation Structure of the GEHC Conformance Statements and their relationship with the DICOM Conformance Statements is shown in the Illustration below.



This document specifies the DICOM implementation. It is entitled:

Vivid and EchoPAC version 206
Conformance Statement for DICOM
Direction DOC2652554

This DICOM Conformance Statement documents the DICOM Conformance Statement and Technical Specification required to interoperate with the GEHC network interface.

The GEHC Conformance Statement, contained in this document, also specifies the Lower Layer communications which it supports (e.g., TCP/IP). However, the Technical Specifications are defined in the DICOM Part 8 standard.

For more information regarding DICOM, copies of the Standard may be obtained on the Internet at https://www.dicomstandard.org/.

Comments on the Standard may be addressed to:

DICOM Secretariat
NEMA
1300 N. 17th Street, Suite 1752
Rosslyn, VA 22209
USA
Phone: +1.703.841.3200

1.3 INTENDED AUDIENCE

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the DICOM Standard and with the terminology and concepts which are used in that Standard.

1.4 SCOPE AND FIELD OF APPLICATION

It is the intent of this document to provide an unambiguous specification for GEHC implementations. This specification, called a Conformance Statement, includes a DICOM Conformance Statement and is necessary to ensure proper processing and interpretation of GEHC medical data exchanged using DICOM. The GEHC Conformance Statements are available to the public.

The reader of this DICOM Conformance Statement should be aware that different GEHC devices are capable of using different Information Object Definitions. For example, a GEHC CT Scanner may send images using the CT Information Object, MR Information Object, Secondary Capture Object, etc. Included in this DICOM Conformance Statement are the Module Definitions which define all data elements used by this GEHC implementation. If the user encounters unspecified private data elements while parsing a GEHC Data Set, the user is well advised to ignore those data elements (per the DICOM standard). Unspecified private data element information is subject to change without notice. If, however, the device is acting as a "full fidelity storage device", it should retain and re-transmit all of the private data elements which are sent by GEHC devices.

1.5 IMPORTANT REMARKS

The use of these DICOM Conformance Statements, in conjunction with the DICOM Standards, is intended to facilitate communication with GE imaging equipment. However, **by itself, it is not sufficient to ensure that inter-operation will be successful**. The **user (or user's agent)** needs to proceed with caution and address at least four issues:

- **Integration** – The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM v3.0), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The

responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non-GE systems is the **user's** responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.

- **Validation** – Testing the complete range of possible interactions between any GE device and non-GE devices, before the connection is declared operational, should not be overlooked. Therefore, the **user** should ensure that any non-GE provider accepts full responsibility for all validation required for their connection with GE devices. This includes the accuracy of the image data once it has crossed the interface between the GE imaging equipment and the non-GE device and the stability of the image data for the intended applications. Such a validation is required before any clinical use (diagnosis and/or treatment) is performed. It applies when images acquired on GE imaging equipment are processed/displayed on a non-GE device, as well as when images acquired on non-GE equipment is processed/displayed on a GE console or workstation.

- **Future Evolution** – GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM Standard. DICOM will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEHC protocol is based on DICOM as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices, which have implemented DICOM. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these DICOM Conformance Statements**. The **user** should ensure that any non-GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.

- **Interaction** – It is the sole responsibility of the **non-GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

1.6 REFERENCES

NEMA PS3Digital Imaging and Communications in Medicine (DICOM) Standard, available free at https://www.dicomstandard.org/
DICOM Conformance Statements for the Vivid models, EchoPAC applications and other DICOM implementations, are available at
https://www.gehealthcare.com/en/products/interoperability/dicom/ultrasound-dicom-conformance-statements. They are identified for the version and model of Ultrasound unit.

1.7 DEFINITIONS

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.
Abstract Syntax – the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information Model Find SOP Class, and Computed Radiography Image Storage SOP Class.

Application Entity (AE) – an end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.
Application Entity Title – the externally known name of an *Application Entity*, used to identify a DICOM application to other DICOM applications on the network.
Application Context – the specification of the type of communication used between *Application Entities*. Example: DICOM network protocol.
Association – a network communication channel set up between *Application Entities*.
Attribute – a unit of information in an object definition; a data element identified by a *tag*. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).
Information Object Definition (IOD) – the specified set of *Attributes* that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The *Attributes* may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.
Joint Photographic Experts Group (JPEG) – a set of standardized image compression techniques, available for use by DICOM applications.
Media Application Profile – the specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs)
Module – a set of *Attributes* within an *Information Object Definition* that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.
Negotiation – first phase of *Association* establishment that allows *Application Entities* to agree on the types of data to be exchanged and how that data will be encoded.
Presentation Context – the set of DICOM network services used over an *Association*, as negotiated between *Application Entities*; includes *Abstract Syntaxes* and *Transfer Syntaxes*.
Protocol Data Unit (PDU) – a packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.
Security Profile – a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an *Application Entity* to ensure confidentiality, integrity, and/or availability of exchanged DICOM data
Service Class Provider (SCP) – role of an *Application Entity* that provides a DICOM network service; typically, a server that performs operations requested by another *Application Entity* (*Service Class User*). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).
Service Class User (SCU) – role of an *Application Entity* that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)
Service/Object Pair (SOP) Class – the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.
Service/Object Pair (SOP) Instance – an information object; a specific occurrence of information exchanged in a *SOP Class*. Examples: a specific x-ray image.
Tag – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the "group" and the "element". If the "group" number is odd, the tag is for a private (manufacturer-specific)

data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]

Transfer Syntax – the encoding used for exchange of DICOM information objects and messages. Examples: *JPEG* compressed (images), little endian explicit value representation.

Unique Identifier (UID) – a globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – the format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

1.8 SYMBOLS AND ABBREVIATIONS

AE	Application Entity
AET	Application Entity Title
CD-R	Compact Disk Recordable
CT	Computed Tomography
DHCP	Dynamic Host Configuration Protocol
DICOM	Digital Imaging and Communications in Medicine
DNS	Domain Name System
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
HIS	Hospital Information System
HL7	Health Level 7 Standard
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
Ipv4	Internet Protocol version 4
Ipv6	Internet Protocol version 6
ISO	International Organization for Standards
JPEG	Joint Photographic Experts Group
LUT	Look-up Table
MPPS	Modality Performed Procedure Step
MSPS	Modality Scheduled Procedure Step
MTU	Maximum Transmission Unit (IP)
MWL	Modality Worklist

- Optional (Key Attribute)

OSI	Open Systems Interconnection
PACS	Picture Archiving and Communication System
PDU	Protocol Data Unit
R	Required (Key Attribute)
RIS	Radiology Information System
SC	Secondary Capture
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair

SPS	Scheduled Procedure Step
SR	Structured Reporting
TCP/IP	Transmission Control Protocol/Internet Protocol
U	Unique (Key Attribute)
UL	Upper Layer
US	Ultrasound
VR	Value Representation

2. NETWORK CONFORMANCE STATEMENT

2.1 INTRODUCTION

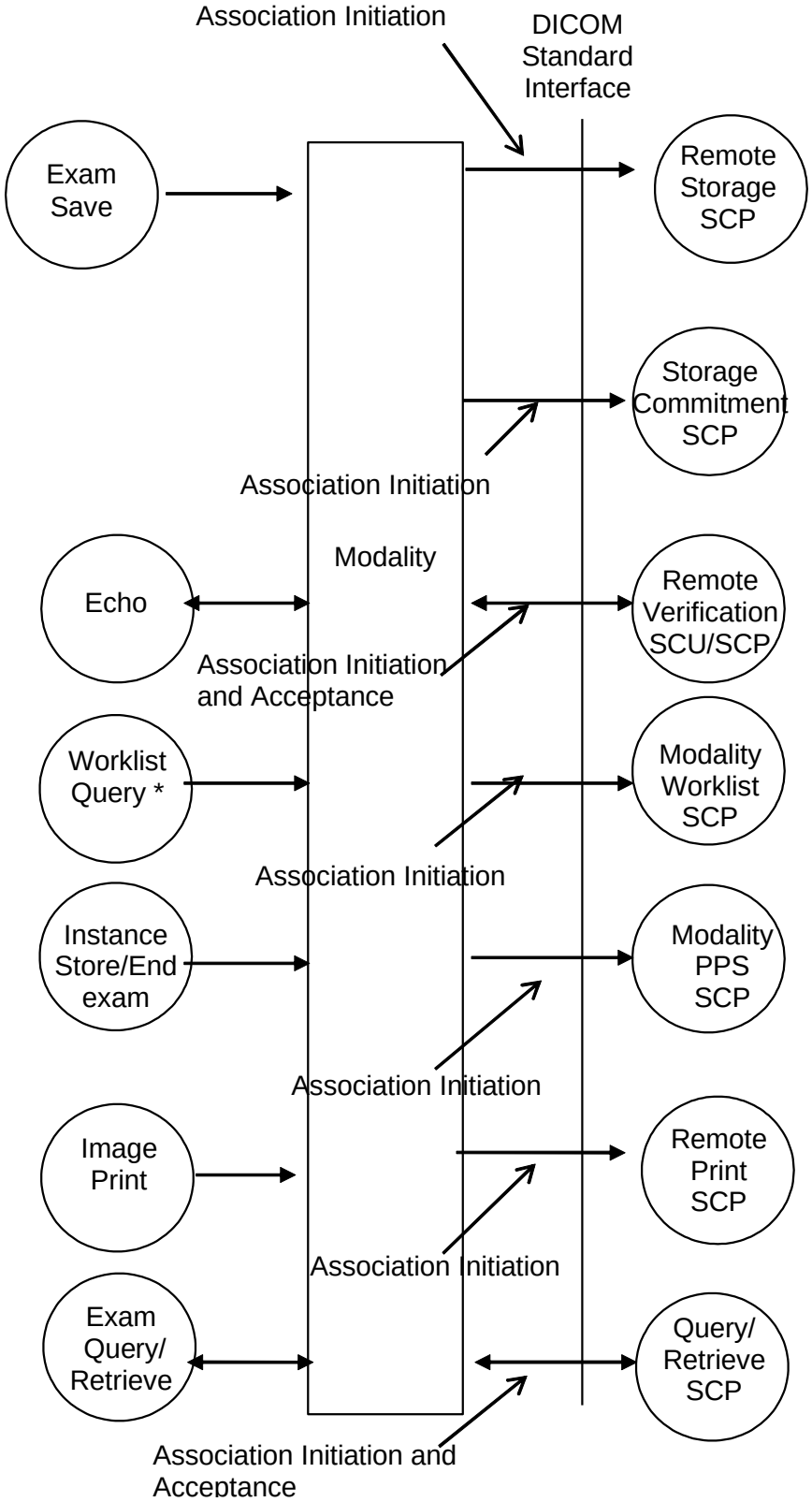
This section of the DICOM Conformance Statement specifies the compliance to DICOM conformance requirements for the relevant **Networking** features for Vivid and EchoPAC Software Only version 206. Note that the format of this section strictly follows the format defined in DICOM Standard PS 3.2 (Conformance). Please refer to that part of the standard while reading this section. As mentioned previously, the EchoPAC Plug-in does not provide DICOM network functionality.
The Vivid is an Ultrasound scanner running on a commercial computer. The EchoPAC Software Only application is software running on a commercial computer.
The Vivid system allows for the following DICOM functionality:
Sending and receiving Echo messages to and from DICOM Verification SCP and client.
Exporting DICOM images and results to a DICOM SCP or saving the DICOM images and results to DICOM media format.
Browsing and viewing DICOM images on DICOM media format.
Querying and retrieving DICOM Modality Worklist from a Worklist SCP.
Sending start and end of examination to a DICOM Modality Performed Procedure Step SCP.
Sending storage commitment requests (and receiving replies) to a DICOM Storage Commitment SCP.
Printing images to a DICOM Printer.
Querying and retrieving examinations from a DICOM Query/Retrieve SCP.
The EchoPAC Software Only application allows for the following DICOM functionality:

- Sending and receiving Echo messages to and from DICOM Verification SCP and client.
- Exporting DICOM images and results to a DICOM SCP or saving the DICOM images and results to DICOM media format.
- Browsing and viewing DICOM images on DICOM media format.
- Sending storage commitment requests (and receiving replies) to a DICOM Storage Commitment SCP.
- Printing images to a DICOM Printer.
- Querying and retrieving examinations from a DICOM Query/Retrieve SCP.

2.2 IMPLEMENTATION MODEL

2.2.1 Application Data Flow Diagram

The Basic and Specific Application models for the Vivid and EchoPAC Software Only are shown in the following illustration:



Option * : The Worklist service is not supported by the EchoPAC Software Only application.

There are six local real-world activities that occur in Vivid v206 – **Exam Save, Echo, Worklist Query, Image Store/End Exam, Image Print** and **Exam Query/Retrieve**
There are five local real-world activities that occur in EchoPAC Software Only v206 – **Exam Save, Echo, Image Store/End Exam, Image Print** and **Exam Query/Retrieve**
Exam save initiates a connection with the DICOM SCP and transmits images and results to the DICOM SCP. If Storage Commitment is configured a commitment request will be sent for the images and results.
Echo initiates a connection with the DICOM SCP, posts a Verification request and closes the connection. It also responds to incoming Verification requests (for service use).
Worklist Query initiates a connection with the DICOM SCP, performs a query and retrieves the matching entries to the product.
Image Store/End exam: If Modality Performed Procedure Step is configured N-CREATE and N-SET messages will be sent for the exam.
Image Print will send images to a DICOM Print SCP.
Exam Query/Retrieve initiates a connection with the DICOM SCP, performs a query and retrieves selected examination.

2.2.2 Functional Definition of AE's

Application Entity Vivid v206 supports the following functions:

- Initiates a DICOM association to send images and results.
- Transmits DICOM images and results to the DICOM Storage SCP.
- Initiates a DICOM verification to assist in network diagnostics.
- Responds to DICOM verification requests from other devices.
- Initiates a DICOM worklist query to receive worklist information.
- Initiates a DICOM association to notify start of examination.
- Initiates a DICOM association to notify end of examination.
- Initiates a DICOM association to request storage commitment of images.
- Responds to replies for storage commitment requests of images.
- Initiates a DICOM association to print images.
- Initiates a DICOM association to query for and retrieve examinations.
- Responds to storage requests triggered by examination retrieve requests.

Application Entity EchoPAC Software Only v206 supports the following functions:

- Initiates a DICOM association to send images and results.
- Transmits DICOM images and results to the DICOM Storage SCP.
- Initiates a DICOM verification to assist in network diagnostics.
- Responds to DICOM verification requests from other devices.
- Initiates a DICOM association to notify start of examination.
- Initiates a DICOM association to notify end of examination.
- Initiates a DICOM association to request storage commitment of images.
- Responds to replies for storage commitment requests of images.
- Initiates a DICOM association to print images.
- Initiates a DICOM association to query for and retrieve examinations.
- Responds to storage requests triggered by examination retrieve requests.

2.2.3 Sequencing of Real-World Activities

Not applicable.

2.3 AE SPECIFICATIONS

2.3.1 Vivid and EchoPAC Software Only v206 AE Specification

This Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCU**:

SOP Class Name	SOP Class UID
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1
Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Verification SOP Class	1.2.840.10008.1.1
Modality Worklist Information Model – FIND (*)	1.2.840.10008.5.1.4.31
Modality Performed Procedure Step SOP Class	1.2.840.10008.3.1.2.3.3
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2
Comprehensive Structured Report Storage	1.2.840.10008.5.1.4.1.1.88.33

Option *: The DICOM Worklist network service is not available within the EchoPAC Software Only application.

This Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCP**:

SOP Class Name	SOP Class UID
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1
Ultrasound Multi-frame Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.3
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1

Ultrasound Image Storage (Retired)	1.2.840.10008.5.1.4.1.1.6
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
CT Image Storage	1.2.840.10008.5.1.4.1.1.2
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1
Verification SOP Class	1.2.840.10008.1.1

2.3.1.1 Association Establishment Policies

2.3.1.1.1 General

The DICOM Application Context Name (ACN), which is always proposed, is:

Application Context Name	**1.2.840.10008.3.1.1.1**

The Maximum Length PDU negotiation is included in all association establishment requests. The maximum length PDU for an association initiated by Vivid and EchoPAC Software Only v206 is (not configurable):

Maximum Length PDU	**32768**

The SOP Class Extended Negotiation is not supported.
The user information Items sent by this product are:

- Maximum PDU Length
- Implementation UID
- Implementation Version Name

2.3.1.1.2 Number of Associations

The Vivid and EchoPAC Software Only v206 AE will initiate multiple DICOM associations. Maximum number of simultaneous associations is 2.

2.3.1.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

2.3.1.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

Vivid E95 Implementation UID	**1.2.840.113619.6.391**
Vivid E90 Implementation UID	**1.2.840.113619.6.390**
Vivid E80 Implementation UID	**1.2.840.113619.6.392**
Vivid S70N Implementation UID	**1.2.840.113619.6.394**
Vivid S60N Implementation UID	**1.2.840.113619.6.393**
Vivid iq Implementation UID	**1.2.840.113619.6.435**

Vivid T8 Implementation UID	**1.2.840.113619.6.400**
Vivid T9 Implementation UID	**1.2.840.113619.6.460**
EchoPAC Software Only UID	**1.2.840.113619.6.118**
EchoPAC Plugin UID	**1.2.840.113619.6.118**

The Implementation Version Name for this DICOM Implementation is:

Vivid E95 Implementation Version Name	**VIVIDE95_206**
Vivid E90 Implementation Version Name	**VIVIDE90_206**
Vivid E80 Implementation Version Name	**VIVIDE80_206**
Vivid S70N Implementation Version Name	**VIVIDS70_206**
Vivid S60N Implementation Version Name	**VIVIDS60_206**
Vivid iq Implementation Version Name	**VIVIDIQ_206**
Vivid T8 Implementation Version Name	**VIVIDT8_206**
Vivid T9 Implementation Version Name	**VIVIDT9_206**
EchoPAC Software Only Implementation Version Name	**EchoPAC_206**
EchoPAC Plug-in Implementation Version Name	**EchoPAC_206**

Note: The Implementation Version Name may change in the future without modification of this document.

2.3.1.2 Association Initiation Policy

The Vivid and EchoPAC Software Only v206 AE attempts to establish a new association with a remote device due to six Real-World Activities:

- Exam save initiated by the operator for images and results and sending request for Storage Commitment.
- Verification, which verifies application level communication between peer DICOM AE's for service purposes.
- Worklist initiated by the operator for receiving worklist information. (*)
- Image Store/End Exam sending messages to Modality Performed Procedure Step.
- Print initiated by the operator for a specific image or group of images.
- Exam Query/Retrieve initiated by the operator for receiving examination information and selecting examination to retrieve.

Option (*) – DICOM Worklist Network service is not available within the EchoPAC Software Only application.

2.3.1.2.1 Real-World Activity A ('Exam save' Operation)

Associated Real-World Activity:

Upon a request by the operator (manual or automatic), images will be sent to a DICOM Storage SCP.

Proposed Presentation Context Tables:

The Proposed Presentation Context Table depends on compression (configurable) according to the following table:

Presentation Context Table – Proposed					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Presentation Context Table: Compression set to None					
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Ultrasound Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Ultrasound Multi-frame Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Presentation Context Table: Compression set to RLE					
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Run Length Encoding, RLE Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.5 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Run Length Encoding, RLE Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.5 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Run Length Encoding, RLE Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.5 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Ultrasound Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	Run Length Encoding, RLE Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.5 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Ultrasound Multi-frame Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	Run Length Encoding, RLE Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.5 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Presentation Context Table: Compression set to JPEG					
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	JPEG Baseline coding Process 1	1.2.840.10008.1.2.4.50	SCU	None
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	JPEG Baseline coding Process 1	1.2.840.10008.1.2.4.50	SCU	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	JPEG Baseline coding Process 1	1.2.840.10008.1.2.4.50	SCU	None
Ultrasound Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	JPEG Baseline coding Process 1	1.2.840.10008.1.2.4.50	SCU	None

Ultrasound Multi-frame Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	JPEG Baseline coding Process 1	1.2.840.10008.1.2.4.50	SCU	None
Presentation Context Table for Structured Reports					
Comprehensive Structured Report	1.2.840.10008.5.1.4.1.1.88.33	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

This operation also sends a Storage Commitment Request, with the following proposed presentation context. The result from the SCP is expected on another association for the Storage Commitment result.

Presentation Context Table – Proposed					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

SOP Specific DICOM Conformance Statement for all Storage and Storage Commitment SOP Classes:

For these SOP classes (Storage and Storage Commitment), all status codes with status Refused or Error are treated as failures and terminate the association and operation. On a failure, the request will be put in a holding queue for the user to manually retry the request. All status codes with status Warning or Success are treated as successes.

2.3.1.2.2 Real-World Activity B ('Echo' Operation)

Associated Real-World Activity:

The user may initiate a DICOM Verification Request in the Config screen.
Associations will be released upon the receipt of each C-ECHO confirmation.
In the event that the SCP does not respond, the operation will time out, close the association and inform the user.

Proposed Presentation Context Table:

Presentation Context Table – Proposed					
Abstract Syntax		**Transfer Syntax**		Role	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification SOP Class	1.2.840.10008.1.1	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

2.3.1.2.3 Real-World Activity C ('Worklist Query' Operation)

Associated Real-World Activity:

The user may initiate a DICOM Worklist Query in Search screen, which will send a C-FIND-RQ to the Worklist SCP.
Associations will be released upon the receipt of C-FIND-RSP confirmation.

Proposed Presentation Context Tables:

Presentation Context Table – Proposed					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

SOP Specific DICOM Conformance Statement for Worklist SOP Classes:

All status codes with status Refused or Error are treated as failures and terminate the association and operation. On a failure, the user will be informed, and the last successful query will be used as Worklist. All status codes with status Warning or Success are treated as successes.

See **Error! Reference source not found.** for the list of Matching keys used for Worklist.

2.3.1.2.4 Real-World Activity D ('Image Store/End exam' Operation)

Associated Real-World Activity:

The Modality Performed Procedure Step messages are sent when the first image or result is made for an exam and when the exam is ended (for the case where there are no images or results, the N-CREATE is sent when the exam is ended). For an exam with saved images or results, the N-SET will be sent with status COMPLETED. For an exam without saved images or results, the N-SET will be sent with status DISCONTINUED.

Proposed Presentation Context Table:

Presentation Context Table – Proposed					
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	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

SOP Specific DICOM Conformance Statement for Modality Performed Procedure Step Class:

For this SOP class, all status codes with status Refused or Error are treated as failures and terminate the association and operation. All status codes with status Warning or Success are treated as successes.

The Vivid and EchoPAC Software Only v206 AE includes attributes in the Modality Performed Procedure Step N-CREATE and N-SET as described in Section **Error! Reference source not found.**.

The mapping from Worklist attributes is described in Section **Error! Reference source not found.**.

2.3.1.2.5 Real-World Activity E ('Image Print' Operation)

Associated Real-World Activity:

Upon a request by the operator, print jobs will be sent to a DICOM Print SCP. If an error occurs during the transmission, the current association is released and a new association initiated. The maximum number of retries is configurable.

Proposed Presentation Context Tables:

The following table is used:

Presentation Context Table – Proposed					
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	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Basic Color Print Management Meta SOP Class	1.2.840.10008.5.1.1.18	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

SOP Specific DICOM Conformance Statement for all Print Management SOP Classes:

All status codes with status Refused or Error are treated as failures and terminate the association and operation. All status codes with status Warning or Success are treated as successes.

2.3.1.2.6 Real-World Activity F ('Exam Query/Retrieve' Operation)

Associated Real-World Activity:

The user may initiate a DICOM Exam Query in Search screen, which will send a C-FIND-RQ to the Query/Retrieve SCP.

Associations will be released upon the receipt of C-FIND-RSP confirmation.

The user may then select an examination to be retrieved, using the C-MOVE-RQ command to the Query/Retrieve SCP. The result from the SCP is expected on another association for the retrieved examinations.

Proposed Presentation Context Tables:

Presentation Context Table – Proposed					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

SOP Specific DICOM Conformance Statement for Study Root Query/Retrieve Information Model – FIND SOP Classes:

All status codes with status Refused or Error are treated as failures and terminate the association and operation. All status codes with status Warning or Success are treated as successes.

Vivid and EchoPAC Software Only v206 will only support hierarchical query.

SOP Specific DICOM Conformance Statement for Study Root Query/Retrieve Information Model – MOVE SOP Classes:

All status codes with status Refused or Error are treated as failures and terminate the association and operation. All status codes with status Warning or Success are treated as successes.

2.3.1.3 Association Acceptance Policy

The AE accepts an association when Vivid and EchoPAC Software Only v206 receives an N-EVENT-REPORT from a Storage Commitment request, a Verification Request from another network device or a C-STORE request as part of a Query/Retrieve operation.

2.3.1.3.1 Real-World Activity A – ('Exam Save' operation)

Associated Real-World Activity:

An incoming N-EVENT-REPORT will cause the AE to accept the association (using SCP/SCU Role Negotiation) and update the internal Storage Commitment statuses.

Accepted Presentation Context Table:

Presentation Context Table Accepted					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Storage Commitment Push Model SOP Class	1.2.840.10008.1.20.1	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

SOP Specific DICOM Conformance Statement for Storage Commitment SOP Class:

The AE provides standard conformance to the Storage Commitment SOP Class as an SCP for the N-EVENT-REPORT. The default port number is 104.

Presentation Context Acceptance Criterion:

No criterion.

Transfer Syntax Selection Policies:

The selected transfer syntax is based on the proposed transfer syntax list. The priority order is Explicit VR Little Endian, Explicit VR Big Endian and Implicit VR Little Endian.

2.3.1.3.2 Real-World Activity B – ('Echo' operation)

Associated Real-World Activity:

An incoming Verification Request will cause the AE to accept the association and respond with a Verification Response.

Accepted Presentation Context Table:

Presentation Context Table – Accepted					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Verification SOP Class	1.2.840.10008.1.1	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None

SOP Specific DICOM Conformance Statement for Verify SOP Class:

The AE provides standard conformance to the Verification SOP Class as an SCP. The default port number is 104.

Presentation Context Acceptance Criterion:

No criterion.

Transfer Syntax Selection Policies:

The selected transfer syntax is based on the proposed transfer syntax list. The priority order is Explicit VR Little Endian, Explicit VR Big Endian and Implicit VR Little Endian.

2.3.1.3.3 Real-World Activity F ('Exam Query/Retrieve' Operation)

Associated Real-World Activity:

If the user has initiated a retrieve by a C-MOVE-RQ, the AE will accept associations for C-STORE-RQs. The images will be stored locally.

Accepted Presentation Context Table:

Presentation Context Table – Accepted					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	JPEG Baseline coding Process 1 Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian Run Length Encoding, RLE	1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2 1.2.840.10008.1.2.5	SCP	None
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	JPEG Baseline coding Process 1 Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian Run Length Encoding, RLE	1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2 1.2.840.10008.1.2.5	SCP	None
Ultrasound Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	JPEG Baseline coding Process 1 Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian Run Length Encoding, RLE	1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2 1.2.840.10008.1.2.5	SCP	None
Ultrasound Multi-frame Image Storage (retired)	1.2.840.10008.5.1.4.1.1.3	JPEG Baseline coding Process 1 Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian Run Length Encoding, RLE	1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2 1.2.840.10008.1.2.5	SCP	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	JPEG Baseline coding Process 1 Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian Run Length Encoding, RLE	1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2 1.2.840.10008.1.2.5	SCP	None
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	Implicit VR Little Endian Explicit VR Little Endian JPEG Lossless First Order	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.4.70	SCP	None
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCP	None

SOP Specific DICOM Conformance Statement for Storage SOP Classes:

The AE provides standard conformance to the Storage SOP Classes as an SCP. The default port number is 104.

Presentation Context Acceptance Criterion:

No criterion.

Transfer Syntax Selection Policies:

The selected transfer syntax is based on the proposed transfer syntax list. The priority order is JPEG Baseline, Run Length Encoding RLE, Explicit VR Little Endian, Explicit VR Big Endian and Implicit VR Little Endian.

2.4 COMMUNICATION PROFILES

2.4.1 Supported Communication Stacks (PS 3.8, PS 3.9)

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

2.4.2 TCP/IP Stack

The TCP/IP stack is inherited from the product's operating system. Please refer to product documentation for more information.

2.4.2.1 API

Not applicable to this product.

2.4.3 Additional Protocols

The ability to enable and use DHCP as a client is inherited from the product's operating system. Please refer to product documentation for more information.
The ability to enable and use DNS as a client is inherited from the product's operating system. Please refer to product documentation for more information. Note: The product does not support configuration of the SCP only by hostname. The SCP must be specified by AE Title, IP address (together with an associated name) and port number (see 2.6).

2.4.4 IPv4 and IPv6 Support

The product does only support IPv4.

2.5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

Please see the definition of private modules in Table A.1.2.

2.6 CONFIGURATION

2.6.1 AE Title/Presentation Address Mapping

The Local AE title is configurable through the Config screen, see below.

2.6.2 Configurable Parameters

Network:

- Local IP address
- Local port number (default 104)
- Local IP netmask
- Local routing table information
- Network Certificates (via Windows MMC)

Local:

- Local AE Title

Verification:

- The AE Title, IP address and port number of the SCP
- Max retries, Retry interval, Timeout

Modality Worklist:

- The AE Title, IP address and port number of the SCP
- Max retries, Retry interval, Timeout
- Disabling/enabling and setting constant values for query fields
- Maximum number of downloaded entries

Storage:

- The AE Title, IP address and port number of the SCP
- Max retries, Retry interval, Timeout
- Enable/disable raw data
- Frame rate reduction
- Enable/disable multi-frame
- Compression selections
- Color support
- Association strategies: one association per image or one association per exam
- Enable/disable results (SR).
- Enable/disable private data elements in results (SR).
- Enable/disable “Signed Doppler Velocities” in results (SR).
- Enable/disable “Use older SR version”.
- Selection of SR version (when “Use older SR version” is enabled).

Modality Performed Procedure Step:

- The AE Title, IP address and port number of the SCP
- Max retries, Retry interval, Timeout

Storage Commitment:

- The AE Title, IP address and port number of the SCP
- Max retries, Retry interval, Timeout

Print:

- The AE Title, IP address and port number of the SCP
- Max retries, Retry interval, Timeout
- Configuration for each job according to attribute description in Section 12 of this document.

Query/Retrieve:

- The AE Title, IP address and port number of the SCP
- Max retries, Retry interval, Timeout
- Disabling/enabling and setting constant values for query fields
- Maximum number of downloaded entries

2.7 SUPPORT OF EXTENDED CHARACTER SETS

In addition to the default character repertoire, the value for Specific Character Set (0008,0005) listed in Table 2.7.1 is supported.

TABLE 2.7.1
SUPPORTED SPECIFIC CHARACTER SETS

Defined Term	Character Set Description
ISO_IR 100	Latin alphabet No. 1

An incoming object that is encoded using another extended character set may not be processed or displayed.

2.8 CODES AND CONTROLLED TERMINOLOGY

2.8.1 Fixed Coded Terminology

The product uses the fixed (non-configurable, non-extensible) coded terminology in SR Document attributes, as described in Section 7 SR INFORMATION OBJECT IMPLEMENTATION.

3. MEDIA STORAGE CONFORMANCE STATEMENT

3.1 INTRODUCTION

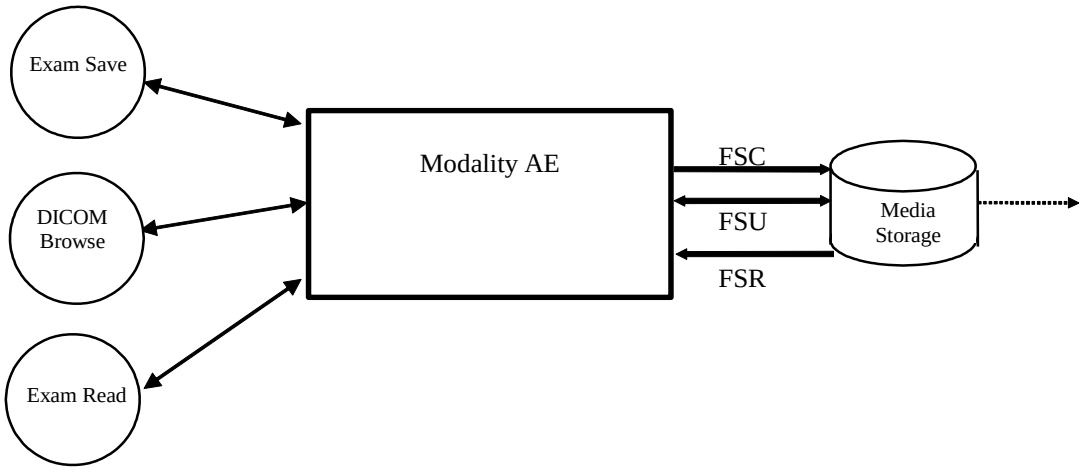
This section of the conformance statement (CS) specifies the Vivid and EchoPAC Software Only v206 compliance to DICOM Media Interchange. It details the DICOM Media Storage Application Profiles and roles, which are supported by this product.
Vivid and EchoPAC Software Only v206 are able to export images and results to DICOM media, browse DICOM media or read images from DICOM media.

3.2 IMPLEMENTATION MODEL

3.2.1 Application Data Flow Diagram

The Basic and Specific Application models for this device are shown in the following Illustration:

ILLUSTRATION 3.2.1
SPECIFIC AE APPLICATION MODEL



Vivid and EchoPAC Software Only v206 can initialize Media by acting as an FSC to create a new DICOM File-set on Media as stated in 3.3.1. The SOP instances written to media must be one of the instances supported by Vivid and EchoPAC Software Only v206. A pre-existing File-set will be updated with the information in DICOM files copied to media.

3.2.2 Functional Definition of AE's

Vivid and EchoPAC Software Only v206 can perform these functions:

- Create a new DICOM File-set on media
- Update DICOM File-set by adding new SOP instances to the File-set
- Read information and images from the existing File-set

3.2.3 Sequencing Requirements

Not applicable.

3.2.4 File Meta Information Options (See PS3.10)

The File Meta-Information for the v206 implementations are:

File Meta-Information Version	1
Vivid E95 Implementation UID	1.2.840.113619.6.391
Vivid E90 Implementation UID	1.2.840.113619.6.390
Vivid E80 Implementation UID	1.2.840.113619.6.392
Vivid S70N Implementation UID	1.2.840.113619.6.394
Vivid S60N Implementation UID	1.2.840.113619.6.393
Vivid iq Implementation UID	1.2.840.113619.6.435
Vivid T8 Implementation UID	1.2.840.113619.6.400
Vivid T9 Implementation UID	1.2.840.113619.6.460
EchoPAC Software Only Implementation UID	1.2.840.113619.6.118
EchoPAC Plug-in Implementation UID	1.2.840.113619.6.118
Implementation Version Name	
Vivid E95 Implementation Version Name	VIVIDE95_206
Vivid E90 Implementation Version Name	VIVIDE90_206
Vivid E80 Implementation Version Name	VIVIDE80_206
Vivid S70N Implementation Version Name	VIVIDS70_206
Vivid S60N Implementation Version Name	VIVIDS60_206
Vivid iq Implementation Version Name	VIVIDIQ_206
Vivid T8 Implementation Version Name	VIVIDT8_206
Vivid T9 Implementation Version Name	VIVIDT9_206
EchoPAC Software Only Implementation Name	EchoPAC_206
EchoPAC Plug-in Implementation Name	EchoPAC_206

Note: The Implementation Version Name and may change in the future without modification of this document.

3.3 AE SPECIFICATIONS

3.3.1 Vivid and EchoPAC Software Only v206 AE Specification

The Vivid and EchoPAC Software Only v206 Application Entity provides standard conformance to DICOM Interchange Option of the Media Storage Service Class. The Application Profiles and roles are listed below; the standard profiles are augmented with Secondary Capture images and SRs. Note that in one case (see 4.5.7.1 US Region Calibration Module), the multi-frame image will be sent without region calibration (i.e., AUG-US-ID-MF-XXX).

Supported Application Profile	Real World Activity	Role	Description
AUG-US-SC-SF-CDR, AUG-US-SC-MF-CDR, AUG-US-SC-SF-DVD, AUG-US-SC-MF-DVD	Exam save	FSR/ FSC	Interchange
	Browse	FSR	Interchange
	Exam Read	FSR	Interchange

3.3.1.1 File Meta Information for the Vivid and EchoPAC v206 Application Entity

The Source Application Entity is set from the Vivid and EchoPAC v206 local AE title. The local AE is configurable.

Following are the default values set in the File Meta Information for the AE Title for each Vivid model:

Vivid E95 Source Application Entity Title	**VIVIDE95_206**
Vivid E90 Source Application Entity Title	**VIVIDE90_206**
Vivid E80 Source Application Entity Title	**VIVIDE80_206**
Vivid S70N Source Application Entity Title	**VIVIDS70_206**
Vivid S60N Source Application Entity Title	**VIVIDS60_206**
Vivid iq Source Application Entity Title	**VIVIDIQ_206**
Vivid T8 Source Application Entity Title	**VIVIDT8_206**
Vivid T9 Source Application Entity Title	**VIVIDT9_206**

The default value set in the File Meta Information for the AE Title is the hostname for the system:

EchoPAC Software Only Source Application Entity Title	*** Default is Hostname EchoPAC_206**

EchoPAC Plug-in Source Application Entity Title	**EchoPAC**

The AE titles for most Vivid models will start with the model's name.
For example, a Vivid E95 system with system ID 123456 will have the following default AE title:
VIVIDE95-123456
Please note that some models will vary, such as the Vivid IQ will have an AE title for system ID 123456WX0 of:
VIQ-123456WX7 or something similar.
These values are configurable and should be verified at each implementation to confirm connection settings.

3.3.1.2 Real-World Activities for the Vivid and EchoPAC Software Only v206 Application Entity

3.3.1.2.1 Real-World Activity "Exam save"

"Exam save" saves a DICOM SOP instance to media and updates DICOM File Set.

Media Storage Application Profile for the Real-World Activity "Exam save":

For the list of Application Profiles that invoke this AE for "Exam save" Real-World Activity, see Table 3.3.1.

Options:

Following are the SOP Classes supported by the Real-World Activity "Exam save":

TABLE 3.3.1
EXAM SAVE – SUPPORTED SOP CLASSES AND TRANSFER SYNTAXES

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
DICOM Media Storage Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian Run Length Encoding, RLE JPEG Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.5 1.2.840.10008.1.2.4.50
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian Run Length Encoding, RLE JPEG Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.5 1.2.840.10008.1.2.4.50
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian Run Length Encoding, RLE JPEG Baseline	1.2.840.10008.1.2.1 1.2.840.10008.1.2.5 1.2.840.10008.1.2.4.50
Comprehensive Structured Report	1.2.840.10008.5.1.4.1.1.88.33	Explicit VR Little Endian	1.2.840.10008.1.2.1

3.3.1.2.2 Real-World Activity "DICOM Browse"

DICOM Browse is activated when the user searches for an exam in Search screen.

Media Storage Application Profile for the Real-World Activity "DICOM Browse":

For the list of Application Profiles that invoke this AE for "DICOM Browse" Real-World Activity, see Table 3.3.2.

Options:

Following are the SOP Classes supported by the Real-World Activity DICOM Browse:

TABLE 3.3.2
DICOM BROWSE – SUPPORTED SOP CLASSES AND TRANSFER SYNTAXES

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
DICOM Media Storage Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		Implicit VR Little Endian	1.2.840.10008.1.2
		Run Length Encoding, RLE	1.2.840.10008.1.2.5
		JPEG Baseline	1.2.840.10008.1.2.4 .50
Ultrasound Multi-frame Image Storage(retired)	1.2.840.10008.5.1.4.1.1.3	Explicit VR Little Endian	1.2.840.10008.1.2.1
		Implicit VR Little Endian	1.2.840.10008.1.2
		Run Length Encoding, RLE	1.2.840.10008.1.2.5
		JPEG Baseline	1.2.840.10008.1.2.4 .50
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		Implicit VR Little Endian	1.2.840.10008.1.2
		Run Length Encoding, RLE	1.2.840.10008.1.2.5
		JPEG Baseline	1.2.840.10008.1.2.4 .50
Ultrasound Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	Explicit VR Little Endian	1.2.840.10008.1.2.1
		Implicit VR Little Endian	1.2.840.10008.1.2
		Run Length Encoding, RLE	1.2.840.10008.1.2.5
		JPEG Baseline	1.2.840.10008.1.2.4 .50
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1
		Implicit VR Little Endian	1.2.840.10008.1.2
		Run Length Encoding, RLE	1.2.840.10008.1.2.5
		JPEG Baseline	1.2.840.10008.1.2.4 .50

Note: As shown in the table Implicit VR Little Endian Transfer Syntax is supported in addition to Transfer Syntaxes defined in Application Profiles.

3.3.1.2.3 Real-World Activity "Exam read"

"Exam read" reads and displays a DICOM SOP instance from media.

Media Storage Application Profile for the Real-World Activity "Exam read":

For the list of Application Profiles that invoke this AE for "Exam read" Real-World Activity, see Table 3.3.3.

Options:

Following are the SOP Classes supported by the Exam read Real-World Activity:

TABLE 3.3.3
EXAM READ – SUPPORTED SOP CLASSES AND TRANSFER SYNTAXES

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
DICOM Media Storage Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian	1.2.840.10008.1.2.1
Ultrasound Multi-frame Image Storage	1.2.840.10008.5.1.4.1.1.3.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		Implicit VR Little Endian	1.2.840.10008.1.2
		Run Length Encoding, RLE	1.2.840.10008.1.2.5
		JPEG Baseline	1.2.840.10008.1.2.4.50
Ultrasound Multi-frame Image Storage(retired)	1.2.840.10008.5.1.4.1.1.3	Explicit VR Little Endian	1.2.840.10008.1.2.1
		Implicit VR Little Endian	1.2.840.10008.1.2
		Run Length Encoding, RLE	1.2.840.10008.1.2.5
		JPEG Baseline	1.2.840.10008.1.2.4.50
Ultrasound Image Storage	1.2.840.10008.5.1.4.1.1.6.1	Explicit VR Little Endian	1.2.840.10008.1.2.1
		Implicit VR Little Endian	1.2.840.10008.1.2
		Run Length Encoding, RLE	1.2.840.10008.1.2.5
		JPEG Baseline	1.2.840.10008.1.2.4.50
Ultrasound Image Storage (retired)	1.2.840.10008.5.1.4.1.1.6	Explicit VR Little Endian	1.2.840.10008.1.2.1
		Implicit VR Little Endian	1.2.840.10008.1.2
		Run Length Encoding, RLE	1.2.840.10008.1.2.5
		JPEG Baseline	1.2.840.10008.1.2.4.50
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Explicit VR Little Endian	1.2.840.10008.1.2.1

		Implicit VR Little Endian	1.2.840.10008.1.2
		Run Length Encoding, RLE	1.2.840.10008.1.2.5
		JPEG Baseline	1.2.840.10008.1.2.4.50

Note: As shown in the table Implicit VR Little Endian Transfer Syntax is supported in addition to Transfer Syntaxes defined in Application Profiles.

3.4 AUGMENTED AND PRIVATE APPLICATION PROFILES

Vivid and EchoPAC v206 creates Secondary Capture Image and SR Objects in addition to the objects defined in the application profiles.

3.5 EXTENSIONS, SPECIALIZATIONS, PRIVATIZATIONS OF SOP CLASSES AND TRANSFER SYNTAXES

Please see the definition of private modules in Table A.1.2.
DICOMDIR has also been extended with Standard Extended elements.

3.6 CONFIGURATION

The following parameters are configurable:

- Location of DICOMDIR
- Read or Read/Write
- Enable/disable raw data
- Frame rate reduction
- Enable/disable multi-frame
- Compression selections
- Enable/disable results (SR).
- Enable/disable private data elements in results (SR).
- Enable/disable “Signed Doppler Velocities” in results (SR).
- Enable/disable “Use older SR version”.
- Selection of SR version (when “Use older SR version” is enabled).

3.7 SUPPORT OF EXTENDED CHARACTER SETS

Vivid and EchoPAC v206 will support only the ISO_IR 100 (ISO 8859-1:1987 Latin alphabet N 1. supplementary set) as extended character sets. Any incoming SOP instance that is encoded using another extended character set will not be read.

4. ULTRASOUND (US) INFORMATION OBJECT IMPLEMENTATION

4.1 INTRODUCTION

This section specifies the use of the DICOM US Image IOD to represent the information included in US images produced by this implementation. Corresponding attributes are conveyed using the module construct. The contents of this section are:
4.2 - IOD Implementation

4.3 - IOD Entity-Relationship Model

4.4 - IOD Module Table

4.5 - IOD Module Definition

In this section, supported means that tag is sent with value.

4.2 US IOD IMPLEMENTATION

This section defines the implementation of US image information object.

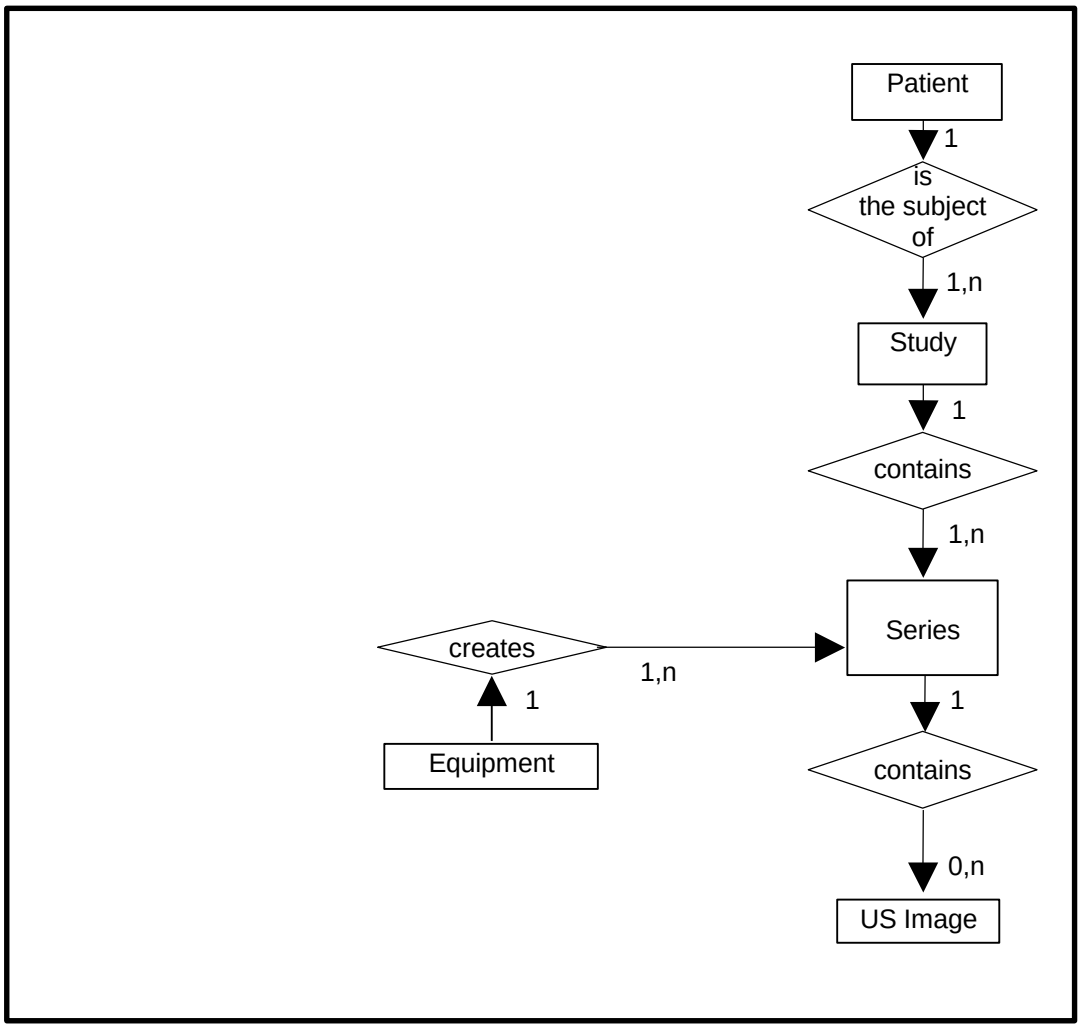
4.3 US ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the US Image interoperability schema is shown in Illustration 4.3.1**.** In this figure, the following diagrammatic convention is established to represent the information organization:

- each entity is represented by a rectangular box
- each relationship is represented by a diamond shaped box.
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Series and Image can have up to n Images per Series, but the Patient to Study relationship has 1 Patient for each Study (a Patient can have more than one Study on the system; however each Study will contain all of the information pertaining to that Patient).

ILLUSTRATION 4.3.1
US IMAGE ENTITY RELATIONSHIP DIAGRAM



4.3.1 Entity Descriptions

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities contained within the US Information Object.

4.3.2 Vivid and EchoPAC v206 Mapping of DICOM Entities

TABLE 4.3.1
MAPPING OF DICOM ENTITIES TO VIVID V206 ENTITIES

DICOM	Vivid and EchoPAC v206 Entity
Patient	Patient
Study	Exam
Series	Exam
Frame of Reference	Not used
Equipment	Equipment

Image	Image

4.4 IOD MODULE TABLE

Within an entity of the DICOM US IOD, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into data sets.
Table A.2.1 identifies the defined modules within the entities, which comprise the DICOM US IOD. Modules are identified by Module Name.
See DICOM Part 3 for a complete definition of the entities, modules, and attributes.
Only the single frame US Image IOD is described here.

4.5 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities and modules contained within the US Information Object.
The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions).

4.5.1 Common Patient Entity Modules

4.5.1.1 Patient Module

Section “Patient” in Table A.1.1 specifies the Attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains Attributes of the patient that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

4.5.2 Common Study Entity Modules

The following Study IE Modules are common to all Composite Image IODs, which reference the Study IE. These modules contain Attributes of the patient and study that are needed for diagnostic interpretation of the image.

4.5.2.1 General Study Module

Section “General Study” in Table A.1.1 specifies the attributes that describe and identify the Study performed upon the Patient.

4.5.2.2 Patient Study Module

Section “Patient Study” in Table A.1.1 defines attributes that provide information about the Patient at the time that the Study was performed.

4.5.3 Common Series Entity Modules

The following Series IE Modules are common to all Composite Image IODs, which reference the Series IE.

4.5.3.1 General Series Module

Section “General Series” in Table A.1.1 specifies the attributes that identify and describe general information about the Series within a Study.

4.5.4 Common Equipment Entity Modules

The following Equipment IE Module is common to all Composite Image IODs, which reference the Equipment IE.

4.5.4.1 General Equipment Module

Section “General Equipment” in Table A.1.1 specifies the attributes that identify and describe the piece of equipment, which produced a Series of Images.

4.5.5 Common Image Entity Modules

The following Image IE Modules are common to all Composite Image IODs, which reference the Image IE.

4.5.5.1 General Image Module

Section “General Image” in **Error! Reference source not found.** specifies the attributes that identify and describe an image within a particular series.

4.5.5.2 Image Pixel Module

Section “Image Pixel” in **Error! Reference source not found.** specified the attributes that describe the pixel data of the image.

4.5.5.3 Contrast/Bolus Module

Section “Contrast/Bolus” in **Error! Reference source not found.** specifies the attributes that describe the contrast /bolus used in the acquisition of the Image.

4.5.5.4 Palette Color Lookup Table Module

Section “Palette Color Lookup Table” in **Error! Reference source not found.** specifies the attributes that describe the Lookup table data for images with Palette Color photometric interpretation.

4.5.5.5 VOI LUT Module

Section “VOI LUT” in **Error! Reference source not found.** specifies the attributes that identify and describe the VOI LUT Module.

4.5.6 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

4.5.6.1 SOP Common Module

Section “SOP Common” in **Error! Reference source not found.** defines the attributes that are required for proper functioning and identification of the associated SOP Instances. They do not specify any semantics about the Real-World Object represented by the IOD.

4.5.7 US Modules

This section describes US Series, Equipment, and Image Modules. These Modules contain attributes that are specific to US Image IOD.

4.5.7.1 US Region Calibration Module

Section “US Region Calibration” in **Error! Reference source not found.** specifies the supported attributes. US Region Calibration Module is used to describe multiple regions. Note: if a multi-frame image has been acquired with different calibration, the US Region Calibration Module will not be used.

4.5.7.2 US Image Module

Section “US Image” in **Error! Reference source not found.** specifies the supported attributes.

5. ULTRASOUND MULTIFRAME (US MF) INFORMATION OBJECT IMPLEMENTATION

5.1 INTRODUCTION

This section specifies the use of the DICOM US Multi-frame Image IOD to represent the information included in US images produced by this implementation. Corresponding attributes are conveyed using the module construct. The contents of this section are:

5.2 - IOD Implementation

5.3 - IOD Entity-Relationship Model

5.4 - IOD Module Table

5.5 - IOD Module Definition

5.2 US MF IOD IMPLEMENTATION

This section defines the implementation of US Multi-Frame image information object.

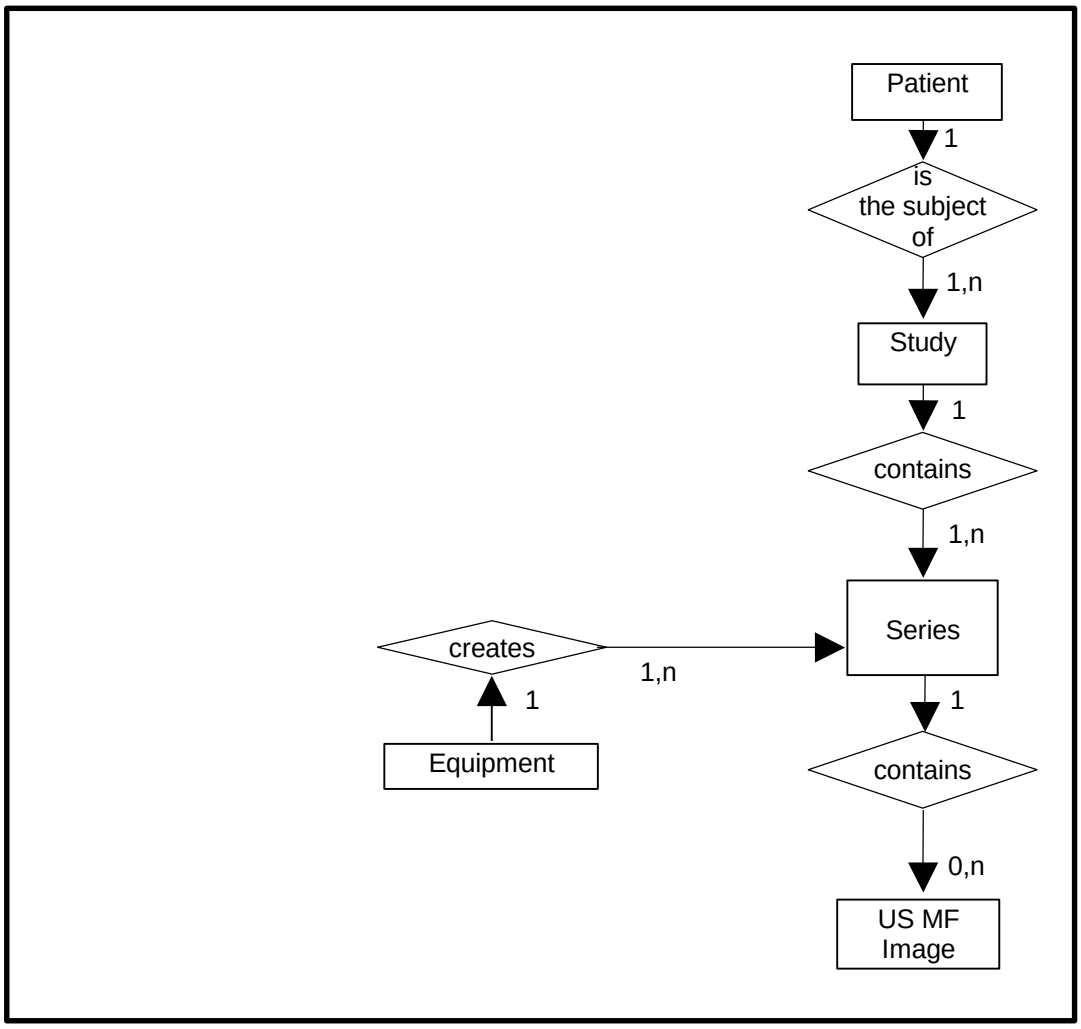
5.3 US MF ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the US MF Image interoperability schema is shown in Illustration 5.3.1. In this figure, the following diagrammatic convention is established to represent the information organization:

- each entity is represented by a rectangular box
- each relationship is represented by a diamond shaped box.
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Series and Image can have up to n Images per Series, but the Patient to Study relationship has 1 Study for each Patient (a Patient can have more than one Study on the system, however each Study will contain all of the information pertaining to that Patient).

ILLUSTRATION 5.3.1
US MULTIFRAME IMAGE ENTITY RELATIONSHIP DIAGRAM



5.3.1 Entity Descriptions

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities contained within the US Multi-Frame Information Object.

5.3.2 Vivid and EchoPAC v206 Mapping of DICOM entities

TABLE 5.3.1
MAPPING OF DICOM ENTITIES TO VIVID V206 ENTITIES

DICOM	Vivid and EchoPAC v206 Entity
Patient	Patient
Study	Exam
Series	Exam
Frame of Reference	Not used
Equipment	Equipment

Image	Image

5.4 IOD MODULE TABLE

Within an entity of the DICOM US Multi-Frame IOD, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.
Table A.3.1 identifies the defined modules within the entities, which comprise the DICOM US Multi-Frame IOD. Modules are identified by Module Name.
See DICOM Part 3 for a complete definition of the entities, modules, and attributes.

5.5 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities and modules contained within the US Multi-Frame Information Object.
The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions).

5.5.1 Common Image Modules

The following Image IE Modules are common to all Composite Image IODs which reference the Image IE.

5.5.1.1 Cine Module

Section “Cine” in Table A.3.2 specifies the implemented attributes.

5.5.1.2 Multi-frame Module

Section “Multi-frame” in Table A.3.2 specifies the implemented attributes.

6. SC INFORMATION OBJECT IMPLEMENTATION

6.1 INTRODUCTION

This section specifies the use of the DICOM SC Image IOD to represent the information included in SC images produced by this implementation. Corresponding attributes are conveyed using the module construct. The contents of this section are:

6.2 - IOD Implementation

6.3 - IOD Entity-Relationship Model

6.4 - IOD Module Table

6.5 - IOD Module Definition

6.2 SC IOD IMPLEMENTATION

This section defines the implementation of SC image information object.

6.3 SC ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the SC Image interoperability schema is shown in Illustration 6.3.1**.** In this figure, the following diagrammatic convention is established to represent the information organization:

- each entity is represented by a rectangular box
- each relationship is represented by a diamond shaped box.
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

The relationships are fully defined with the maximum number of possible entities in the relationship shown. In other words, the relationship between Series and Image can have up to n Images per Series, but the Patient to Study relationship has 1 Patient for each Study (a Patient can have more than one Study on the system; however each Study will contain all of the information pertaining to that Patient).