

# DICOM CONFORMANCE STATEMENT

## PRODUCT DETAILS

Product Type:  
Data Management Software

Product Name:  
TOMTEC-ARENA TTA2 (2.40)

## MANUFACTURER

TOMTEC IMAGING SYSTEMS  
Edisonstrasse 6  
85716 Unterschleissheim

## USED STANDARDS

Digital Imaging and Communications in Medicine (DICOM), DICOM V3.0

We declare under sole responsibility that the product listed above is in compliance with DICOM Version 3.0

Unterschleissheim, 2020-05-06

A handwritten signature in black ink, appearing to read 'R. Baumann'.

**ROLF BAUMANN**  
CTO

# 1 Conformance Statement Overview

The TOMTEC-ARENA is a self-contained networked computer system used for archiving and reviewing diagnostic medical images. It allows external systems to send images to it for permanent storage. It also supports querying a remote system for a list of DICOM objects that may then be retrieved to the local system.

| SOP Class                                                            | SCU | SCP | Display |
|----------------------------------------------------------------------|-----|-----|---------|
| <b>Other</b>                                                         |     |     |         |
| Verification SOP Class                                               | Yes | Yes | N/A     |
| <b>Query/Retrieve</b>                                                |     |     |         |
| Patient Root Query/Retrieve Information Model - FIND                 | Yes | No  | N/A     |
| Patient Root Query/Retrieve Information Model - MOVE                 | Yes | No  | N/A     |
| Study Root Query/Retrieve Information Model - FIND                   | Yes | Yes | N/A     |
| Study Root Query/Retrieve Information Model - MOVE                   | Yes | Yes | N/A     |
| Patient/Study Only Query/Retrieve Information Model - FIND (Retired) | Yes | No  | N/A     |
| Patient/Study Only Query/Retrieve Information Model - MOVE (Retired) | Yes | No  | N/A     |
| <b>Transfer</b>                                                      |     |     |         |
| Ultrasound Multi-frame Image Storage (Retired)                       | Yes | Yes | Yes     |
| Ultrasound Multi-frame Image Storage                                 | Yes | Yes | Yes     |
| Ultrasound Image Storage (Retired)                                   | Yes | Yes | Yes     |
| Ultrasound Image Storage                                             | Yes | Yes | Yes     |
| Secondary Capture Image Storage                                      | Yes | Yes | Yes     |
| Multi-frame Single Bit Secondary Capture Image Storage               | Yes | Yes | Yes     |
| Multi-frame Grayscale Byte Secondary Capture Image Storage           | Yes | Yes | Yes     |
| Multi-frame Grayscale Word Secondary Capture Image Storage           | Yes | Yes | Yes     |
| Multi-frame True Color Secondary Capture Image Storage               | Yes | Yes | Yes     |
| X-Ray Angiographic Image Storage                                     | Yes | Yes | Yes     |
| Enhanced XA Image Storage                                            | Yes | Yes | Yes     |
| IVOCT Image Storage - For Presentation                               | Yes | Yes | Yes     |
| IVOCT Image Storage - For Processing                                 | Yes | Yes | Yes     |
| Nuclear Medicine Image Storage                                       | Yes | Yes | Yes     |
| Raw Data Storage                                                     | Yes | Yes | Yes     |
| Text SR Storage - Trial (Retired)                                    | Yes | Yes | N/A     |
| Audio SR Storage - Trial (Retired)                                   | Yes | Yes | N/A     |
| Detail SR Storage - Trial (Retired)                                  | Yes | Yes | N/A     |
| Comprehensive SR Storage - Trial (Retired)                           | Yes | Yes | N/A     |
| Basic Text SR Storage                                                | Yes | Yes | Yes     |

| SOP Class                               | SCU | SCP | Display |
|-----------------------------------------|-----|-----|---------|
| Enhanced SR Storage                     | Yes | Yes | Yes     |
| Comprehensive SR Storage                | Yes | Yes | Yes     |
| Encapsulated PDF Storage                | Yes | Yes | Yes     |
| Toshiba US Private Data Storage         | Yes | Yes | N/A     |
| Hitachi Line Data 103                   | Yes | Yes | N/A     |
| Hitachi Line Data 105                   | Yes | Yes | N/A     |
| Hitachi Line Data 110                   | Yes | Yes | N/A     |
| Private HP Live 3D 01                   | Yes | Yes | N/A     |
| Private HP Live 3D 02                   | Yes | Yes | N/A     |
| Private Philips 3D Sub Page Store       | Yes | Yes | N/A     |
| <b>Workflow</b>                         |     |     |         |
| Storage Commitment Push Model SOP Class | Yes | No  | N/A     |

Table 1.1: Network Services

The SOP Classes are categorized as follows:

| UID Value                      | UID Name                                                             | Category       |
|--------------------------------|----------------------------------------------------------------------|----------------|
| 1.2.840.10008.1.1              | Verification SOP Class                                               | Other          |
| 1.2.840.10008.5.1.4.1.2.2.2    | Study Root Query/Retrieve Information Model - MOVE                   | Query/Retrieve |
| 1.2.840.10008.5.1.4.1.2.3.1    | Patient/Study Only Query/Retrieve Information Model - FIND (Retired) | Query/Retrieve |
| 1.2.840.10008.5.1.4.1.2.3.2    | Patient/Study Only Query/Retrieve Information Model - MOVE (Retired) | Query/Retrieve |
| 1.2.840.10008.5.1.4.1.2.2.1    | Study Root Query/Retrieve Information Model - FIND                   | Query/Retrieve |
| 1.2.840.10008.5.1.4.1.2.1.2    | Patient Root Query/Retrieve Information Model - MOVE                 | Query/Retrieve |
| 1.2.840.10008.5.1.4.1.2.1.1    | Patient Root Query/Retrieve Information Model - FIND                 | Query/Retrieve |
| 1.2.840.10008.5.1.4.1.1.88.3   | Detail SR Storage - Trial (Retired)                                  | Transfer       |
| 1.2.840.10008.5.1.4.1.1.7.2    | Multi-frame Grayscale Byte Secondary Capture Image Storage           | Transfer       |
| 1.2.840.10008.5.1.4.1.1.7.3    | Multi-frame Grayscale Word Secondary Capture Image Storage           | Transfer       |
| 1.2.840.10008.5.1.4.1.1.7.4    | Multi-frame True Color Secondary Capture Image Storage               | Transfer       |
| 1.2.840.10008.5.1.4.1.1.12.1   | X-Ray Angiographic Image Storage                                     | Transfer       |
| 1.2.840.10008.5.1.4.1.1.12.1.1 | Enhanced XA Image Storage                                            | Transfer       |
| 1.2.840.10008.5.1.4.1.1.14.1   | IVOCT Image Storage - For Presentation                               | Transfer       |

| UID Value                     | UID Name                                               | Category            |
|-------------------------------|--------------------------------------------------------|---------------------|
| 1.2.840.10008.5.1.4.1.1.14.2  | IVOCT Image Storage - For Processing                   | Transfer            |
| 1.2.840.10008.5.1.4.1.1.20    | Nuclear Medicine Image Storage                         | Transfer            |
| 1.2.840.10008.5.1.4.1.1.66    | Raw Data Storage                                       | Transfer            |
| 1.2.840.10008.5.1.4.1.1.88.1  | Text SR Storage - Trial (Retired)                      | Transfer            |
| 1.2.840.10008.5.1.4.1.1.88.2  | Audio SR Storage - Trial (Retired)                     | Transfer            |
| 1.2.840.10008.5.1.4.1.1.7.1   | Multi-frame Single Bit Secondary Capture Image Storage | Transfer            |
| 1.2.840.10008.5.1.4.1.1.88.4  | Comprehensive SR Storage - Trial (Retired)             | Transfer            |
| 1.2.840.10008.5.1.4.1.1.88.11 | Basic Text SR Storage                                  | Transfer            |
| 1.2.840.10008.5.1.4.1.1.88.22 | Enhanced SR Storage                                    | Transfer            |
| 1.2.840.113543.6.6.1.3.10002  | Private HP Live 3D 02                                  | Transfer            |
| 1.2.840.10008.5.1.4.1.1.104.1 | Encapsulated PDF Storage                               | Transfer            |
| 1.2.840.10008.5.1.4.1.1.7     | Secondary Capture Image Storage                        | Transfer            |
| 1.2.840.10008.5.1.4.1.1.6.1   | Ultrasound Image Storage                               | Transfer            |
| 1.2.840.10008.5.1.4.1.1.6     | Ultrasound Image Storage (Retired)                     | Transfer            |
| 1.2.840.10008.5.1.4.1.1.3.1   | Ultrasound Multi-frame Image Storage                   | Transfer            |
| 1.2.840.10008.5.1.4.1.1.3     | Ultrasound Multi-frame Image Storage (Retired)         | Transfer            |
| 1.3.46.670589.2.5.1.1         | Private Philips 3D Sub Page Store                      | Transfer            |
| 1.2.392.200036.9116.7.8.1.1.1 | Toshiba US Private Data Storage                        | Transfer            |
| 1.2.392.200039.103.9.2        | Hitachi Line Data 103                                  | Transfer            |
| 1.2.392.200039.105.9.2        | Hitachi Line Data 105                                  | Transfer            |
| 1.2.392.200039.110.9.2        | Hitachi Line Data 110                                  | Transfer            |
| 1.2.840.113543.6.6.1.3.10001  | Private HP Live 3D 01                                  | Transfer            |
| 1.2.840.10008.5.1.4.1.1.88.33 | Comprehensive SR Storage                               | Transfer            |
| 1.2.840.10008.1.20.1          | Storage Commitment Push Model SOP Class                | Workflow Management |

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## 3 Introduction

### 3.1 Audience

This document is written for the people that need to understand how TOMTEC-ARENA will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product.

This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

### 3.2 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between TOMTEC-ARENA and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

- The comparison of different Conformance Statements is the first step towards assessing interconnectivity between TOMTEC-ARENA and other DICOM conformant equipment.
- Test procedures should be defined to validate the desired level of connectivity.

### 3.3 Definitions, Terms and Abbreviations



|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Abstract Syntax                         | The information agreed to be exchanged between applications, generally equivalent to aService/Object Pair (SOP) Class. Examples: Verification SOP Class, Modality Worklist Information-Model Find SOP Class, 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 (AET)          | 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 (Type2), 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 ApplicationEntities; 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 anApplication 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/retrieveSCP), 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 Class (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 StorageService, Basic Grayscale Print Management.                                                                                              |
| Service/Object Pair Instance (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) [PixelData], (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 ImplicitVR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

### 3.4 References

[DICOM]

NEMA PS3.1 2014c / ISO 12052, Digital Imaging and Communications in Medicine (DICOM) Standard, National Electrical Manufacturers Association, Rosslyn, VA, USA (available free at <http://medical.nema.org/>)

## 4 Networking

### 4.1 Implementation Model

#### 4.1.1 Application Data Flow

The division of TOMTEC-ARENA into the separate DICOM Application Entities represents a somewhat arbitrary partitioning of functionality.

For the purpose of this document they are organized in this manner so as to detail their independent logical functionality.

By default TOMTEC-ARENA is configured so that the

- STORAGE-SCP AE
- STORAGE-SCU AE
- QUERY-RETRIEVE-SCU AE
- QUERY-RETRIEVE-SCP AE

share the same Application Entity Title (by default TTASRV).

The STORAGE-SCP AE can receive incoming DICOM images and add them to the TOMTEC-ARENA database. It can respond to external C-ECHO requests.

The STORAGE-SCP AE can receive Composite SOP Instances.

The STORAGE-SCU AE can send Composite SOP Instances.

It can send Storage and Verification Requests to a Remote AE to get confirmation of ownership and responsibility for a specific Composite SOP Instance.

The STORAGE-SCU AE functions as a C-STORE SCU and a user can request that images are sent to a Remote AE.

The QUERY-RETRIEVE-SCU AE can send C-FIND and C-MOVE requests. It handles queries for Patient, Study, Series, and Image data, and also sends Image retrieval requests to a Remote AE.

The QUERY-RETRIEVE-SCU AE functions as a C-FIND SCU and a C-MOVE SCU and a user can send queries and retrieval requests to a Remote AE.

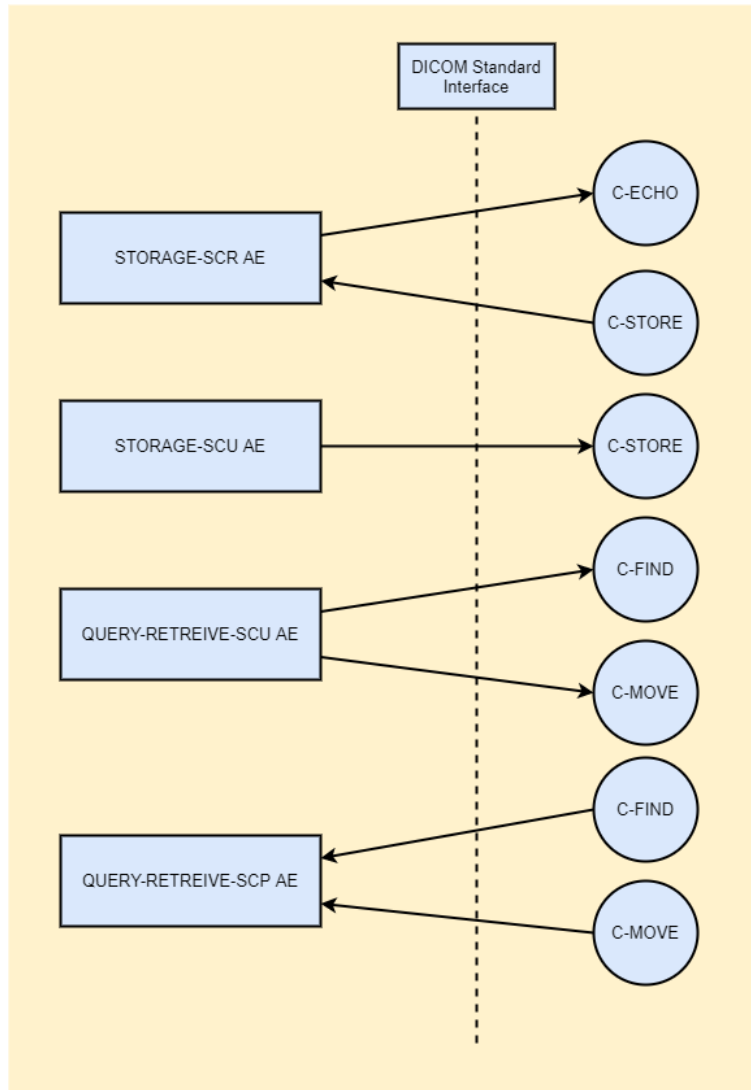


Figure 4.1: Application Data Flow

The QUERY-RETRIEVE-SCP AE can handle incoming query and retrieve requests.

The QUERY-RETRIEVE-SCP AE handles retrieval requests by issuing a command to the STORAGE-SCU AE to send the requested Images to the destination specified by the Remote AE. The QUERY-RETRIEVE-SCP AE functions as an SCP for C-FIND and C-MOVE requests.

## **4.1.2 Functional Definition of AEs**

### **4.1.2.1 Functional Definition of STORAGE-SCP AE Specification**

The STORAGE-SCP AE waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the STORAGE-SCP AE expects it to be a DICOM application.

The STORAGE-SCP AE will accept Associations with Presentation Contexts for SOP Classes of the Verification and Storage Service Classes. Any images received on such Presentation Contexts will be added to the TOMTEC-ARENA database.

### **4.1.2.2 Functional Definition of STORAGE-SCU AE Specification**

The STORAGE-SCU AE is activated through the user interface when a user selects instances from the local database or the currently displayed instance, and requests that they be sent to a remote AE (selected from a pre-configured list).

Additionally the STORAGE-SCU AE is used to transfer instances to remote AEs automatically.

Depending on the configuration the STORAGE-SCU AE will request a N-EVENT-REPORT notification to confirm the ownership and responsibility of the sent instances from the remote AE.

### **4.1.2.3 Functional Definition of QUERY-RETRIEVE-SCP AE Specification**

The QUERY-RETRIEVE-SCP AE waits for another application to connect at the presentation address configured for its Application Entity Title. When another application connects, the QUERY-RETRIEVE-SCP AE expects it to be a DICOM application. The QUERY-RETRIEVE-SCP AE will accept Associations with Presentation Contexts for SOP Classes of the Verification and Query/Retrieve Service Classes.

Once received a Retrieve (Move) request, Query/Retrieve Server AE will initiate a new association and send the requested instances to the Move Destination AE.

#### 4.1.2.4 Functional Definition of QUERY-RETRIEVE-SCU AE Specification

The QUERY-RETRIEVE-SCU is activated through the user interface when a user selects a remote AE to query (from a pre-configured list), then initiates a query. The AE uses hierarchical queries and the extended negotiation is not supported. Queries are performed recursively from the study through the series and instance levels until all matching instances have been listed.

Additionally the user can send a C-MOVE request to request the transfer of selected instances from the remote AE to the STORAGE-SCP AE.

## 4.2 AE Specification

### 4.2.1 STORAGE-SCP AE Specification

#### 4.2.1.1 SOP Classes

The STORAGE-SCP AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

| SOP Class Name                                             | SOP Class UID                  | SCU |
|------------------------------------------------------------|--------------------------------|-----|
| Ultrasound Multi-frame Image Storage (Retired)             | 1.2.840.10008.5.1.4.1.1.3      | Yes |
| Ultrasound Multi-frame Image Storage                       | 1.2.840.10008.5.1.4.1.1.3.1    | Yes |
| Ultrasound Image Storage (Retired)                         | 1.2.840.10008.5.1.4.1.1.6      | Yes |
| Ultrasound Image Storage                                   | 1.2.840.10008.5.1.4.1.1.6.1    | Yes |
| Secondary Capture Image Storage                            | 1.2.840.10008.5.1.4.1.1.7      | Yes |
| Multi-frame Single Bit Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.1    | Yes |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2    | Yes |
| Multi-frame Grayscale Word Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.3    | Yes |
| Multi-frame True Color Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.4    | Yes |
| X-Ray Angiographic Image Storage                           | 1.2.840.10008.5.1.4.1.1.12.1   | Yes |
| Enhanced XA Image Storage                                  | 1.2.840.10008.5.1.4.1.1.12.1.1 | Yes |
| IVOCT Image Storage - For Presentation                     | 1.2.840.10008.5.1.4.1.1.14.1   | Yes |
| IVOCT Image Storage - For Processing                       | 1.2.840.10008.5.1.4.1.1.14.2   | Yes |
| Nuclear Medicine Image Storage                             | 1.2.840.10008.5.1.4.1.1.20     | Yes |
| Raw Data Storage                                           | 1.2.840.10008.5.1.4.1.1.66     | Yes |
| Text SR Storage - Trial (Retired)                          | 1.2.840.10008.5.1.4.1.1.88.1   | Yes |

| SOP Class Name                             | SOP Class UID                 | SCU |
|--------------------------------------------|-------------------------------|-----|
| Audio SR Storage - Trial (Retired)         | 1.2.840.10008.5.1.4.1.1.88.2  | Yes |
| Detail SR Storage - Trial (Retired)        | 1.2.840.10008.5.1.4.1.1.88.3  | Yes |
| Comprehensive SR Storage - Trial (Retired) | 1.2.840.10008.5.1.4.1.1.88.4  | Yes |
| Basic Text SR Storage                      | 1.2.840.10008.5.1.4.1.1.88.11 | Yes |
| Enhanced SR Storage                        | 1.2.840.10008.5.1.4.1.1.88.22 | Yes |
| Comprehensive SR Storage                   | 1.2.840.10008.5.1.4.1.1.88.33 | Yes |
| Encapsulated PDF Storage                   | 1.2.840.10008.5.1.4.1.1.104.1 | Yes |
| Toshiba US Private Data Storage            | 1.2.392.200036.9116.7.8.1.1.1 | Yes |
| Hitachi Line Data 103                      | 1.2.392.200039.103.9.2        | Yes |
| Hitachi Line Data 105                      | 1.2.392.200039.105.9.2        | Yes |
| Hitachi Line Data 110                      | 1.2.392.200039.110.9.2        | Yes |
| Private HP Live 3D 01                      | 1.2.840.113543.6.6.1.3.10001  | Yes |
| Private HP Live 3D 02                      | 1.2.840.113543.6.6.1.3.10002  | Yes |
| Private Philips 3D Sub Page Store          | 1.3.46.670589.2.5.1.1         | Yes |

Table 4.1: SOP Classes for STORAGE-SCP AE

These are the Transfer Syntaxes supported.

| Name                           | UID                     |
|--------------------------------|-------------------------|
| JPEGLossless                   | 1.2.840.10008.1.2.4.70  |
| JPEGLosslessNonHierarchical14  | 1.2.840.10008.1.2.4.57  |
| JPEG2000LosslessOnly           | 1.2.840.10008.1.2.4.90  |
| DeflatedExplicitVRLittleEndian | 1.2.840.10008.1.2.1.99  |
| RLELossless                    | 1.2.840.10008.1.2.5     |
| JPEGBaseline1                  | 1.2.840.10008.1.2.4.50  |
| JPEGExtended24                 | 1.2.840.10008.1.2.4.51  |
| JPEG2000                       | 1.2.840.10008.1.2.4.91  |
| MPEG2                          | 1.2.840.10008.1.2.4.100 |

Table 4.2: Transfer Syntaxes for STORAGE-SCP AE



In addition the following transfer syntaxes are supported for the C-ECHO SCP included in this AE.

| Name                       | UID                 |
|----------------------------|---------------------|
| ExplicitVRLittleEndian     | 1.2.840.10008.1.2.1 |
| ExplicitVRBigEndianRetired | 1.2.840.10008.1.2.2 |
| ImplicitVRLittleEndian     | 1.2.840.10008.1.2   |

Table 4.3: Transfer Syntaxes for ECHO-SCP AE

By altering the configuration it is possible to support additional or fewer SOP Classes and Transfer Syntaxes

#### 4.2.1.2 Association Establishment Policies

##### 4.2.1.2.1 General

The STORAGE-SCP AE can both accept and propose Association Requests.

The DICOM standard Application Context Name for DICOM 3.0 is always accepted and proposed:

|                          |                       |
|--------------------------|-----------------------|
| Application Context Name | 1.2.840.10008.3.1.1.1 |
|--------------------------|-----------------------|

Table 4.4: DICOM Application Context for STORAGE-SCP AE

##### 4.2.1.2.2 Number of Associations

The STORAGE-SCP AE can support multiple simultaneous Associations requests. Each time the STORAGE-SCP AE receives an Association, a thread will be spawned to process the Verification or Storage requests.

|                                             |                    |
|---------------------------------------------|--------------------|
| Maximum number of simultaneous Associations | 100 (Configurable) |
|---------------------------------------------|--------------------|

Table 4.5: DICOM Application Context for STORAGE-SCP AE

##### 4.2.1.2.3 Asynchronous Nature

The STORAGE-SCU AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

All Association requests must be completed and acknowledged before a new operation can be initiated.

|                                                         |   |
|---------------------------------------------------------|---|
| Maximum number of outstanding asynchronous transactions | 1 |
|---------------------------------------------------------|---|

Table 4.6: Asynchronous Nature as a SCP for STORAGE-SCP AE

#### 4.2.1.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

|                             |                      |
|-----------------------------|----------------------|
| Implementation Class UID    | 1.2.276.0.48.20000.2 |
| Implementation Version Name | TomTecArena v2       |

Table 4.7: DICOM Implementation Class and Version for STORAGE-SCP AE

Note that the TOMTEC-ARENA AEs use the same Implementation Version Name and the same Implementation Class UID. The Version Name is updated with each new release of the product software, as the different AE versions are never released independently.

## 4.2.2 STORAGE-SCU AE Specification

### 4.2.2.1 SOP Classes

The STORAGE-SCP AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

| SOP Class Name                                             | SOP Class UID                | SCU |
|------------------------------------------------------------|------------------------------|-----|
| Ultrasound Multi-frame Image Storage (Retired)             | 1.2.840.10008.5.1.4.1.1.3    | Yes |
| Ultrasound Multi-frame Image Storage                       | 1.2.840.10008.5.1.4.1.1.3.1  | Yes |
| Ultrasound Image Storage (Retired)                         | 1.2.840.10008.5.1.4.1.1.6    | Yes |
| Ultrasound Image Storage                                   | 1.2.840.10008.5.1.4.1.1.6.1  | Yes |
| Secondary Capture Image Storage                            | 1.2.840.10008.5.1.4.1.1.7    | Yes |
| Multi-frame Single Bit Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.1  | Yes |
| Multi-frame Grayscale Byte Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.2  | Yes |
| Multi-frame Grayscale Word Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.3  | Yes |
| Multi-frame True Color Secondary Capture Image Storage     | 1.2.840.10008.5.1.4.1.1.7.4  | Yes |
| X-Ray Angiographic Image Storage                           | 1.2.840.10008.5.1.4.1.1.12.1 | Yes |

| SOP Class Name                             | SOP Class UID                  | SCU |
|--------------------------------------------|--------------------------------|-----|
| Enhanced XA Image Storage                  | 1.2.840.10008.5.1.4.1.1.12.1.1 | Yes |
| IVOCT Image Storage - For Presentation     | 1.2.840.10008.5.1.4.1.1.14.1   | Yes |
| IVOCT Image Storage - For Processing       | 1.2.840.10008.5.1.4.1.1.14.2   | Yes |
| Nuclear Medicine Image Storage             | 1.2.840.10008.5.1.4.1.1.20     | Yes |
| Raw Data Storage                           | 1.2.840.10008.5.1.4.1.1.66     | Yes |
| Text SR Storage - Trial (Retired)          | 1.2.840.10008.5.1.4.1.1.88.1   | Yes |
| Audio SR Storage - Trial (Retired)         | 1.2.840.10008.5.1.4.1.1.88.2   | Yes |
| Detail SR Storage - Trial (Retired)        | 1.2.840.10008.5.1.4.1.1.88.3   | Yes |
| Comprehensive SR Storage - Trial (Retired) | 1.2.840.10008.5.1.4.1.1.88.4   | Yes |
| Basic Text SR Storage                      | 1.2.840.10008.5.1.4.1.1.88.11  | Yes |
| Enhanced SR Storage                        | 1.2.840.10008.5.1.4.1.1.88.22  | Yes |
| Comprehensive SR Storage                   | 1.2.840.10008.5.1.4.1.1.88.33  | Yes |
| Encapsulated PDF Storage                   | 1.2.840.10008.5.1.4.1.1.104.1  | Yes |
| Toshiba US Private Data Storage            | 1.2.392.200036.9116.7.8.1.1.1  | Yes |
| Hitachi Line Data 103                      | 1.2.392.200039.103.9.2         | Yes |
| Hitachi Line Data 105                      | 1.2.392.200039.105.9.2         | Yes |
| Hitachi Line Data 110                      | 1.2.392.200039.110.9.2         | Yes |
| Private HP Live 3D 01                      | 1.2.840.113543.6.6.1.3.10001   | Yes |
| Private HP Live 3D 02                      | 1.2.840.113543.6.6.1.3.10002   | Yes |
| Private Philips 3D Sub Page Store          | 1.3.46.670589.2.5.1.1          | Yes |

Table 4.8: SOP Classes for STORAGE-SCU AE

These are the default Transfer Syntaxes supported.

| Name                           | UID                     |
|--------------------------------|-------------------------|
| JPEGLossless                   | 1.2.840.10008.1.2.4.70  |
| JPEGLosslessNonHierarchical14  | 1.2.840.10008.1.2.4.57  |
| JPEG2000LosslessOnly           | 1.2.840.10008.1.2.4.90  |
| DeflatedExplicitVRLittleEndian | 1.2.840.10008.1.2.1.99  |
| RLELossless                    | 1.2.840.10008.1.2.5     |
| JPEGBaseline1                  | 1.2.840.10008.1.2.4.50  |
| JPEGExtended24                 | 1.2.840.10008.1.2.4.51  |
| JPEG2000                       | 1.2.840.10008.1.2.4.91  |
| MPEG2                          | 1.2.840.10008.1.2.4.100 |

Table 4.9: Transfer Syntaxes for STORAGE-SCU AE

By altering the configuration it is possible to support additional or fewer SOP Classes and Transfer Syntaxes.

#### 4.2.2.2 Association Establishment Policies

##### 4.2.2.2.1 General

The STORAGE-SCP AE can both accept and propose Association Requests.

The DICOM standard Application Context Name for DICOM 3.0 is always accepted and proposed is the same as for the STORAGE-SCP AE. See table 4.4

##### 4.2.2.2.2 Number of Associations

The STORAGE-SCP AE can support multiple simultaneous Associations requested by peer AEs. Each time the STORAGE-SCP AE receives an Association, a thread will be spawned to process the Verification or Storage requests.

Configuration is the same as for the STORAGE-SCP AE. See table 4.5

##### 4.2.2.2.3 Asynchronous Nature

The STORAGE-SCU AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Configuration is the same as for the STORAGE-SCP AE. See table 4.6

#### 4.2.2.2.4 Implementation Identifying Information

The implementation information for this Application Entity is the same as for the STORAGE-SCP AE. See table 4.7

### 4.2.3 QUERY-RETRIEVE-SCU AE Specification

#### 4.2.3.1 SOP Classes

The QUERY-RETRIEVE-SCU AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

| SOP Class Name                                                       | SOP Class UID               | SCU |
|----------------------------------------------------------------------|-----------------------------|-----|
| Patient Root Query/Retrieve Information Model - FIND                 | 1.2.840.10008.5.1.4.1.2.1.1 | Yes |
| Patient Root Query/Retrieve Information Model - MOVE                 | 1.2.840.10008.5.1.4.1.2.1.2 | Yes |
| Study Root Query/Retrieve Information Model - FIND                   | 1.2.840.10008.5.1.4.1.2.2.1 | Yes |
| Study Root Query/Retrieve Information Model - MOVE                   | 1.2.840.10008.5.1.4.1.2.2.2 | Yes |
| Patient/Study Only Query/Retrieve Information Model - FIND (Retired) | 1.2.840.10008.5.1.4.1.2.3.1 | Yes |
| Patient/Study Only Query/Retrieve Information Model - MOVE (Retired) | 1.2.840.10008.5.1.4.1.2.3.2 | Yes |

Table 4.10: SOP Classes for QUERY-RETRIEVE-SCU AE

These are the default Transfer Syntaxes supported.

| Name                       | UID                 |
|----------------------------|---------------------|
| ExplicitVRLittleEndian     | 1.2.840.10008.1.2.1 |
| ExplicitVRBigEndianRetired | 1.2.840.10008.1.2.2 |
| ImplicitVRLittleEndian     | 1.2.840.10008.1.2   |

Table 4.11: Transfer Syntaxes for QUERY-RETRIEVE-SCU AE

By altering the configuration it is possible to support additional or fewer SOP Classes and Transfer Syntaxes

## 4.2.3.2 Association Establishment Policies

### 4.2.3.2.1 General

The QUERY-RETRIEVE-SCU AE can both accept and propose Association Requests.

The DICOM standard Application Context Name for DICOM 3.0 is always accepted and proposed is the same as for the STORAGE-SCP AE. See table 4.4

### 4.2.3.2.2 Number of Associations

The QUERY-RETRIEVE-SCU AE can support multiple simultaneous Associations requested by peer AEs. Each time the QUERY-RETRIEVE-SCU AE receives an Association, a thread will be spawned to process the Verification or Storage requests

Configuration is the same as for the STORAGE-SCP AE. See table 4.5

### 4.2.3.2.3 Asynchronous Nature

The STORAGE-SCU AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Configuration is the same as for the STORAGE-SCP AE. See table 4.6

### 4.2.3.2.4 Implementation Identifying Information

The implementation information for this Application Entity is the same as for the STORAGE-SCP AE. See table 4.7

## 4.2.4 QUERY-RETRIEVE-SCP AE Specification

### 4.2.4.1 SOP Classes

The QUERY-RETRIEVE-SCP AE provides Standard Conformance to the following DICOM V3.0 SOP Classes:

| SOP Class Name                                       | SOP Class UID               | SCP |
|------------------------------------------------------|-----------------------------|-----|
| Patient Root Query/Retrieve Information Model - FIND | 1.2.840.10008.5.1.4.1.2.1.1 | No  |
| Patient Root Query/Retrieve Information Model - MOVE | 1.2.840.10008.5.1.4.1.2.1.2 | No  |

| SOP Class Name                                                       | SOP Class UID               | SCP |
|----------------------------------------------------------------------|-----------------------------|-----|
| Study Root Query/Retrieve Information Model - FIND                   | 1.2.840.10008.5.1.4.1.2.2.1 | Yes |
| Study Root Query/Retrieve Information Model - MOVE                   | 1.2.840.10008.5.1.4.1.2.2.2 | Yes |
| Patient/Study Only Query/Retrieve Information Model - FIND (Retired) | 1.2.840.10008.5.1.4.1.2.3.1 | No  |
| Patient/Study Only Query/Retrieve Information Model - MOVE (Retired) | 1.2.840.10008.5.1.4.1.2.3.2 | No  |

Table 4.12: SOP Classes for QUERY-RETRIEVE-SCP AE

These are the default Transfer Syntaxes supported.

| Name                       | UID                 |
|----------------------------|---------------------|
| ExplicitVRLittleEndian     | 1.2.840.10008.1.2.1 |
| ExplicitVRBigEndianRetired | 1.2.840.10008.1.2.2 |
| ImplicitVRLittleEndian     | 1.2.840.10008.1.2   |

Table 4.13: Transfer Syntaxes for QUERY-RETRIEVE-SCP AE

By altering the configuration it is possible to support additional or fewer SOP Classes and Transfer Syntaxes

#### 4.2.4.2 Association Establishment Policies

##### 4.2.4.2.1 General

The QUERY-RETRIEVE-SCP AE can both accept and propose Association Requests.

The DICOM standard Application Context Name for DICOM 3.0 is always accepted and proposed is the same as for the STORAGE-SCP AE. See table 4.4

##### 4.2.4.2.2 Number of Associations

The QUERY-RETRIEVE-SCP AE can support multiple simultaneous Associations requested by peer AEs. Each time the QUERY-RETRIEVE-SCP AE receives an Association, a thread will be spawned to process the Verification or Storage requests

Configuration is the same as for the STORAGE-SCP AE. See table 4.5

#### **4.2.4.2.3 Asynchronous Nature**

The STORAGE-SCP AE does not support asynchronous communication (multiple outstanding transactions over a single Association).

Configuration is the same as for the STORAGE-SCP AE. See table 4.6

#### **4.2.4.2.4 Implementation Identifying Information**

The implementation information for this Application Entity is the same as for the STORAGE-SCP AE. See table 4.7

### **4.3 Network Interface**

#### **4.3.1 Physical Network Interface**

TOMTEC-ARENA is indifferent to the physical medium over which TCP/IP executes. It inherits this from the Java Runtime Environment provided with the installation.

#### **4.3.2 Additional Protocols**

DNS can be used for address resolution. If a DNS server is not used all addresses have to be specified as IPv4/IPv6 addresses.

##### **4.3.2.1 IPv4 and IPv6 Support**

The TOMTEC-ARENA supports both IPv4 and IPv6. It does not utilize any of the optional configuration identification or security features of IPv6.

### **4.4 Configuration**

#### **4.4.1 AE Title/Presentation Address Mapping**

##### **4.4.1.1 Local AE Titles**

The mapping from AE Title to TCP/IP addresses and ports is configurable and set at the time of installation by Installation Personnel.



| Application Entity    | Role | Default AE Title | Default TCP/IP Port |
|-----------------------|------|------------------|---------------------|
| STORAGE-SCU AE        | SCU  | TTASRV           | 50145               |
| STORAGE-SCP AE        | SCP  | TTASRV           | 50145               |
| QUERY-RETRIEVE-SCP AE | SCP  | TTASRV           | 50145               |
| QUERY-RETRIEVE-SCU AE | SCU  | TTASRV           | 50145               |

Table 4.14: Default Application Entity Characteristics

- AE title.
- Hostname or IP address (or both). Use "localhost" (127.0.0.1) for the complete local system. If the AE should only be associated with a specific network adapter, don't specify the host name and use the IP address of this network adapter.
- Port number.

#### 4.4.1.2 Remote AE Title/Presentation Address Mapping

The mapping of external AE Titles to TCP/IP addresses and ports is configurable and set at the time of installation by installation personnel.

One or more remote AE's may be configured. The following AE specific information must be available to configure a remote AE:

- AE title.
- Hostname or IP address (or both).
- Port number.

#### 4.4.2 Parameters

| Parameter                               | Configurable | Default Value                                                |
|-----------------------------------------|--------------|--------------------------------------------------------------|
| <b>General Parameters</b>               |              |                                                              |
| PDU Size                                | No           | 16kB                                                         |
| Connection Timeout                      | Yes          | none                                                         |
| Request Timeout                         | Yes          | none                                                         |
| Accept Timeout                          | Yes          | none                                                         |
| Release Timeout                         | Yes          | none                                                         |
| Response Timeout                        | Yes          | none                                                         |
| Retrieve Timeout                        | Yes          | none                                                         |
| Idle Timeout                            | Yes          | none                                                         |
| <b>AE Specific Parameters (all AEs)</b> |              |                                                              |
| SOP Class support                       | No           | All supported SOP Classes always proposed and accepted       |
| Transfer Syntax support                 | No           | All supported Transfer Syntaxes always proposed and accepted |

Table 4.16: Configuration Parameters Table

## 5 Media Interchange

### 5.1 Implementation Model

The implementation model identifies the DICOM Application Entities for Media in specific implementation and relates the Application Entities to Real-World Activities.

#### 5.1.1 Application Data Flow Diagram

The TOMTEC-ARENA is capable of importing/exporting studies to/from DICOM media.

#### 5.1.2 Functional Definition of AEs

The TOMTEC-ARENA implements the following functions for DICOM media.

- Write a DICOM file-set onto the medium and create a DICOMDIR.
- Read a DICOMDIR from the medium.
- Read selected images from the medium

##### 5.1.2.1 Media Import - FSR

The Media Import application entity reads a user-selected PS 3.10 compliant DICOM file (generally a DICOMDIR) from the local file system or from PS 3.12 compliant DICOM media.

##### 5.1.2.2 Media Export - FSC

The Media Export application entity is able to create a new DICOMDIR. Furthermore, DICOM image or structured report instances can also be stored to media on user interaction.

#### 5.1.3 Sequencing of Real World Activities

Not applicable.

## 5.2 AE Specifications

All FSR activities are sequentially initiated in the user interface, and another activity may not be initiated until the prior activity has completed.

### 5.2.1 Media Import

The Media Import application entity provides standard conformance to the DICOM Interchange Option of the Media Storage Service Class.

#### 5.2.1.1 Activity: Read DICOMDIR from DICOM Media

Studies can be imported from DICOM Media import locations by user interaction using the import functionality. The list of studies contained in the DICOMDIR is read and displayed. The user can then select one or more studies to be imported into the TOMTEC-ARENA database.

### 5.2.2 Media Export

The Media Export AE implements the Interchange Option of the DICOM Media Storage functionality. It does not support the Directory Information Module. It can play the following roles at handling with file sets:

- File Set Creator (FSC) role,

The Media Export functionality provides Standard Conformance to the DICOM Media Storage Service (PS.3.10). It generates a File-Set under the STD-US class of Application Profiles (PS.3.11). It provides standard conformance to the SOP Classes listed in the DICOM V3.0 Standard (PS.3.3) in Table 5.2-6. The specific character set and encoding used by TOMTEC Arena when exporting is UTF-8 (ISO\_IR 192).

#### 5.2.2.1 File Meta Information for the Application Entity

#### 5.2.2.2 Real-World Activities

Activity: Export Study or some Study Components to DICOM Media

Studies can be exported by selecting the study and choosing the Export option in the study selection dialog.

## 6 Transformation of DICOM to CDA

Not applicable for TOMTEC-ARENA .

## 7 Support of Character Sets

TOMTEC-ARENA supports a couple of extended character sets defined in the DICOM 3.0 standard, including singlebyte and multi-byte character sets as well as code extension techniques using ISO 2022 escapes.

Support extends to correctly decoding and displaying the correct symbol for all names and strings found in the DICOMDIR, in storage instances from media and received over the network, and in the local database. No specific support for sorting of strings other than in the default character set is provided in the browsers.

## 7.1 Character Sets

| Character Set Description | Defined Term    |
|---------------------------|-----------------|
| Latin alphabet No. 1      | ISO_IR 100      |
| Latin alphabet No. 2      | ISO_IR 101      |
| Latin alphabet No. 3      | ISO_IR 109      |
| Latin alphabet No. 4      | ISO_IR 110      |
| Latin alphabet No. 5      | ISO_IR 148      |
| ASCII                     | ISO_IR 6        |
| UTF-8                     | ISO_IR 192      |
| Cyrillic                  | ISO_IR 144      |
| Arabic                    | ISO_IR 127      |
| Greek                     | ISO_IR 126      |
| Hebrew                    | ISO_IR 138      |
| Chinese                   | GB18030         |
| Default repertoire        | ISO 2022 IR 6   |
| Japanese                  | ISO 2022 IR 13  |
| Japanese                  | ISO 2022 IR 87  |
| Japanese                  | ISO 2022 IR 149 |
| Japanese                  | ISO 2022 IR 159 |

Table 7.2: Supported DICOM Character Sets

## 8 Security

TOMTEC-ARENA does not support any specific security measures.

- Application level security: not supported.
- Association level security: any Calling AE Titles and/or IP addresses may open an Association for Verification.

Only AE Titles that own a license and are known to TOMTEC-ARENA will be allowed to open an association for storage purposes.



## 9 Annexes

### 9.1 IOD Contents

#### 9.1.1 Created SOP Instance(s)

This section specifies each IOD created by this application.

This section specifies each IOD created (including Private IOD's). It should specify the Attribute Name, tag, VR, and Value. The Value should specify the range and source (e.g. User input, Modality Worklist, automatically generated, etc.). For content items in templates, the range and source of the concept name and concept values should be specified. Whether the value is always present or not shall be specified.

Abbreviations used for the tables are:

**VNAP** Value Not Always Present (attribute sent zero length if no value is present)

**ANAP** Attribute Not Always Present

**ALWAYS** Always Present with a value

**EMPTY** Attribute is sent without a value

Abbreviations used for the source of the data values in the tables are:

**USER** the attribute value source is from user input.

**AUTO** the attribute value is generated automatically.

**COPY** the attribute value is copied from the values of the original DICOM file.

**CONFIG** the attribute value source is a configurable parameter.

##### 9.1.1.1 List of created SOP Classes

| SOP Class Name                                         | SOP Class UID                 | Modality |
|--------------------------------------------------------|-------------------------------|----------|
| Secondary Capture Image Storage                        | 1.2.840.10008.5.1.4.1.1.7     | OT       |
| Multi-frame True Color Secondary Capture Image Storage | 1.2.840.10008.5.1.4.1.1.7.4   | OT       |
| Comprehensive SR Storage                               | 1.2.840.10008.5.1.4.1.1.88.33 | SR       |

| SOP Class Name           | SOP Class UID                 | Modality |
|--------------------------|-------------------------------|----------|
| Encapsulated PDF Storage | 1.2.840.10008.5.1.4.1.1.104.1 | DOC      |

Table 9.1: List of created SOP Classes

### 9.1.1.2 Secondary Capture IOD

| Information Entity | Module            | Reference  | Presence of Module |
|--------------------|-------------------|------------|--------------------|
| Patient            | Patient           | Table 9.6  | ALWAYS             |
| Study              | General Study     | Table 9.8  | ALWAYS             |
| Study              | Patient Study     | Table 9.7  | ALWAYS             |
| Series             | General Series    | Table 9.9  | ALWAYS             |
| Equipment          | General Equipment | Table 9.10 | ALWAYS             |
| Equipment          | SC Equipment      | Table 9.10 | ALWAYS             |
| Image              | General Image     | Table 9.11 | ALWAYS             |
| Image              | Image Pixel       | Table 9.11 | ALWAYS             |
| Image              | US Image          | Table 9.11 | ALWAYS             |
| Image              | SOP Common        | Table 9.11 | ALWAYS             |

Table 9.2: IOD of Created Secondary Capture SOP Instance

### 9.1.1.3 Multi-Frame true Color Secondary Capture IOD

| Information Entity | Module            | Reference  | Presence of Module |
|--------------------|-------------------|------------|--------------------|
| Patient            | Patient           | Table 9.6  | ALWAYS             |
| Study              | General Study     | Table 9.8  | ALWAYS             |
| Study              | Patient Study     | Table 9.7  | ALWAYS             |
| Series             | General Series    | Table 9.9  | ALWAYS             |
| Equipment          | General Equipment | Table 9.10 | ALWAYS             |
| Equipment          | SC Equipment      | Table 9.10 | ALWAYS             |

| Information Entity | Module        | Reference  | Presence of Module |
|--------------------|---------------|------------|--------------------|
| Image              | General Image | Table 9.11 | ALWAYS             |
| Image              | Image Pixel   | Table 9.11 | ALWAYS             |
| Image              | Cine          | Table 9.11 | ALWAYS             |
| Image              | Multiframe    | Table 9.11 | ALWAYS             |
| Image              | US Image      | Table 9.11 | ALWAYS             |
| Image              | SOP Common    | Table 9.11 | ALWAYS             |

Table 9.3: IOD of Created Multi-Frame Color secondary Capture SOP Instance

#### 9.1.1.4 Comprehensive Structured Report IOD

| Information Entity | Module            | Reference  | Presence of Module |
|--------------------|-------------------|------------|--------------------|
| Patient            | Patient           | Table 9.6  | ALWAYS             |
| Study              | General Study     | Table 9.8  | ALWAYS             |
| Study              | Patient Study     | Table 9.7  | ALWAYS             |
| Series             | General Series    | Table 9.9  | ALWAYS             |
| Equipment          | General Equipment | Table 9.10 | ALWAYS             |
| Equipment          | SC Equipment      | Table 9.10 | ALWAYS             |

Table 9.4: IOD of Created Comprehensive Structured Report SOP Instance

#### 9.1.1.5 Encapsulated PDF IOD

| Information Entity | Module                       | Reference  | Presence of Module |
|--------------------|------------------------------|------------|--------------------|
| Patient            | Patient                      | Table 9.6  | ALWAYS             |
| Study              | General Study                | Table 9.8  | ALWAYS             |
| Study              | Patient Study                | Table 9.7  | ANAP               |
| Series             | Encapsulated Document Series | Table 9.9  | ALWAYS             |
| Equipment          | General Equipment            | Table 9.10 | ALWAYS             |

| Information Entity    | Module                | Reference  | Presence of Module |
|-----------------------|-----------------------|------------|--------------------|
| Equipment             | SC Equipment          | Table 9.10 | ALWAYS             |
| Encapsulated Document | Encapsulated Document | Table 9.13 | ALWAYS             |
| Encapsulated Document | SOP Common            | Table 9.13 | ALWAYS             |

Table 9.5: IOD of created Encapsulated PDF SOP Instance

### 9.1.1.6 Attribute Content by Module

| Attribute Name       | Tag         | Value | Presence of Value |
|----------------------|-------------|-------|-------------------|
| Patient's Name       | (0010,0010) | COPY  | VNAP              |
| Patient ID           | (0010,0020) | COPY  | VNAP              |
| Issuer of Patient ID | (0010,0021) | COPY  | VNAP              |
| Patient's Birth Date | (0010,0030) | COPY  | VNAP              |
| Patient's Sex        | (0010,0040) | COPY  | VNAP              |
| Patient's Birth Time | (0010,0032) | COPY  | VNAP              |
| Other Patient IDs    | (0010,1000) | COPY  | VNAP              |
| Other Patient Names  | (0010,1001) | COPY  | VNAP              |
| Patient Comments     | (0010,4000) | COPY  | VNAP              |

Table 9.6: Patient Module of created SOP Instance

| Attribute Name   | Tag         | Value | Presence of Value |
|------------------|-------------|-------|-------------------|
| Patient's Age    | (0010,1010) | COPY  | ANAP              |
| Patient's Size   | (0010,1020) | COPY  | ANAP              |
| Patient's Weight | (0010,1030) | COPY  | ANAP              |

Table 9.7: Patient Study Module of created SOP Instances

| Attribute Name                     | Tag         | Value | Presence of Value |
|------------------------------------|-------------|-------|-------------------|
| Study Instance UID                 | (0020,000D) | COPY  | ALWAYS            |
| Study Date                         | (0008,0020) | COPY  | ALWAYS            |
| Study Time                         | (0008,0030) | COPY  | ALWAYS            |
| Referring Physician's Name         | (0008,0090) | COPY  | VNAP              |
| Study ID                           | (0020,0010) | COPY  | VNAP              |
| Accession Number                   | (0008,0050) | COPY  | VNAP              |
| Admission ID                       | (0038,0010) | COPY  | VNAP              |
| Study Description                  | (0008,1030) | COPY  | VNAP              |
| Name of Physician(s) Reading Study | (0008,1060) | COPY  | VNAP              |

Table 9.8: Study Module of created SOP Instance

| Attribute Name      | Tag         | Value                                   | Presence of Value |
|---------------------|-------------|-----------------------------------------|-------------------|
| Modality            | (0008,0060) | Table 9.1                               | ALWAYS            |
| Series Instance UID | (0020,000E) | AUTO using<br>1.2.276.0.48 as<br>prefix | ALWAYS            |
| Series Number       | (0020,0011) | AUTO                                    | ALWAYS            |
| Series Date         | (0008,0021) | AUTO                                    | ALWAYS            |
| Series Time         | (0008,0031) | AUTO                                    | ALWAYS            |

Table 9.9: Series Module of created SOP Instance

| Attribute Name   | Tag         | Value                                               | Presence of Value |
|------------------|-------------|-----------------------------------------------------|-------------------|
| Manufacturer     | (0008,0070) | TOMTEC (for TIMS<br>DLL: TomTec Imaging<br>Systems) | ALWAYS            |
| Institution Name | (0008,0080) | CONFIG (Hospital<br>Name)                           | ANAP              |
| Station Name     | (0008,1010) | TTA                                                 | ANAP              |

| Attribute Name                | Tag         | Value                                                 | Presence of Value |
|-------------------------------|-------------|-------------------------------------------------------|-------------------|
| Institutional Department Name | (0008,1040) | CONFIG (Department)                                   | ANAP              |
| Manufacturer's Model Name     | (0008,1090) | TTA2LOT30.01 (For TIMS DLL: TIMS)                     | ALWAYS            |
| Software Versions             | (0018,1020) | TTA2.31.00:123456 (For TIMS DLL: 1.0.0.464706/TTSR/1) | ALWAYS            |
| Conversion Type               | (0008,0064) | WSD                                                   | ALWAYS            |

Table 9.10: Equipment Module for created SOP Instance

| Attribute Name                  | Tag         | Value             | Presence of Value |
|---------------------------------|-------------|-------------------|-------------------|
| Content Date                    | (0008,0023) | Generated         | ALWAYS            |
| Content Time                    | (0008,0033) | Generated         | ALWAYS            |
| Photometric Interpretation      | (0028,0004) | RGB, YBR_FULL_422 | ALWAYS            |
| Private Creator                 | (7FDF,0050) | TomTec            | VNAP              |
| Bookmark Information VR:OB VM:1 | (7FDF,5050) | proprietary data  | VNAP              |
| Bookmark Content VR:OB VM:1     | (7FDF,5051) | proprietary data  | VNAP              |

Table 9.11: Image Module for created SOP Instance

| Attribute Name         | Tag         | Value                             | Presence of Value |
|------------------------|-------------|-----------------------------------|-------------------|
| Specific Character Set | (0008,0005) | ISO_IR 100, ISO_IR 192            | ALWAYS            |
| SOP Class UID          | (0008,0016) | Table 9.1                         | ALWAYS            |
| SOP Instance UID       | (0008,0018) | AUTO using 1.2.276.0.48 as prefix | ALWAYS            |
| Instance Creation Date | (0008,0012) | Generated                         | ALWAYS            |
| Instance Creation Time | (0008,0013) | Generated                         | ALWAYS            |

| Attribute Name | Tag | Value | Presence of Value |
|----------------|-----|-------|-------------------|
|----------------|-----|-------|-------------------|

Table 9.12: Common Module for created SOP Instance

| Attribute Name                     | Tag         | Value                         | Presence of Value |
|------------------------------------|-------------|-------------------------------|-------------------|
| Instance Number                    | (0020,0013) | AUTO                          | ALWAYS            |
| Content Date                       | (0008,0023) | AUTO                          | ALWAYS            |
| Content Time                       | (0008,0033) | AUTO                          | ALWAYS            |
| Acquisition DateTime               | (0008,002A) | AUTO                          | ALWAYS            |
| Burned In Annotation               | (0028,0301) | YES                           | ALWAYS            |
| Document Title                     | (0042,0010) | Title of Report               | VNAP              |
| Concept Name Code Sequence         | (0040,A043) | Coded Representation of Title | ALWAYS            |
| >Code Value                        | (0008,0100) | REPORT                        | ALWAYS            |
| >Coding Scheme Designator          | (0008,0102) | 99TOMTEC                      | ALWAYS            |
| >Code Meaning                      | (0008,0104) | TOMTEC Report                 | ALWAYS            |
| Source Instance Sequence           | (0042,0013) |                               | VNAP              |
| >Referenced SOP Class UID          | (0008,1150) | AUTO                          | VNAP              |
| >Referenced SOP Instance UID       | (0008,1155) | AUTO                          | VNAP              |
| Verification Flag                  | (0040,A493) | VERIFIED / UNVERIFIED         | ALWAYS            |
| MIME Type of Encapsulated Document | (0042,0012) | application/pdf               | ALWAYS            |
| Encapsulated Document              | (0042,0011) | Encapsulated Document Stream  | ALWAYS            |
| Private Creator                    | (7FDF,0040) | TomTec_Rep                    | VNAP              |
| Report Data Information VR:OB VM:1 | (7FDF,4050) | proprietary data              | VNAP              |
| Report Data Content VR:OB VM:1     | (7FDF,4051) | proprietary data              | VNAP              |

Table 9.13: Encapsulated Document Module for created SOP Instance

## 9.2 Data Dictionary of Private Attributes

| Attribute Name                     | Tag         | Value            |
|------------------------------------|-------------|------------------|
| Private Creator                    | (7FDF,0050) | TomTec           |
| Bookmark Information VR:OB VM:1    | (7FDF,5050) | proprietary data |
| Bookmark Content VR:OB VM:1        | (7FDF,5051) | proprietary data |
| Private Creator                    | (7FDF,0040) | TomTec_Rep       |
| Report Data Information VR:OB VM:1 | (7FDF,4050) | proprietary data |
| Report Data Content VR:OB VM:1     | (7FDF,4051) | proprietary data |

Table 9.14: Data Dictionary of Private Attributes

## 9.3 Coded Terminology and Templates

TOMTEC-ARENA does not use any codes or controlled terminology.

## 9.4 Grayscale Image Consistency

TOMTEC-ARENA does not make use of the DICOM Greyscale Standard Display Function.

## 9.5 Standard Extended/Specialized/Private SOP Classes

Not applicable to TOMTEC-ARENA .

## 9.6 Private Transfer Syntaxes

TOMTEC-ARENA does not use any private transfer syntaxes.



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