Basic Dental Workflow (BDW)

Version 2

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Introduction

This is an internal VDDS working document. It is not an official document within the IHE initiative. Its structure follows an IHE supplement.

The Basic Dental Workflow Profile defines how central Use Cases of the established VDDS media standards can be implemented based on DICOM services. The document follows the structure of an IHE supplement and also adopts essential elements from the IHE. The BDW profile is based, in particular, on the IHE profile "Scheduled Workflow (SWF)" from the "Radiology" domain.

Volume 1 – Dental profiles

1 Basic Dental Workflow (BDW) profile

This profile describes the implementation of the VDDS media standards using known and established IHE profiles. For this purpose, the corresponding standards are specified in detail or amended. In particular, the established and already widely used DICOM services (Part 7 - Message Exchange and Part 8 - Network Communication Support for Message Exchange) are used. Other transport routes (e.g., Part 18 - Web Services) may be used in further development stages.

1.1 BDW Actors and Transactions

This section defines the actors belonging to the profile and their transactions. To implement a Use Case, an application program must implement the necessary roles (actors) and their functions (transactions). The assignment of actors to VDDS roles depends on the Use Case and is defined per Use Case. One actor may be implemented by several application programs (e.g., there are several worklists). It is possible and sometimes necessary that one application program implements several actors.

All actors used in the profile, not only new ones, are listed here for better legibility.

Table 1.1-1: Actors used in the BDW

Actor	IHE definition
Department System Scheduler/Order Filler (see SWF)	A department-based information system (for instance, Radiology or Laboratory) that provides functions related to the management of orders received from external systems or through the department system's user interface. Upon a defined workflow action, makes procedures available for charge posting. The action/event that actually causes charges to post is defined by the actor.
Acquisition modality (see SWF)	A system that acquires and creates medical images while a patient is present, e.g., a Computed Tomography scanner or Nuclear Medicine camera. A modality may also create other evidence objects such as Grayscale Softcopy Presentation States for the consistent viewing of images or Evidence Documents containing measurements. A modality may also create and store Dose SRs.
Image display (see SWF)	A part of a system that can access imaging evidence objects (images, Presentation States, Key Image Notes, Evidence Documents) through network query/retrieve or reading interchange media and allow the user to view these objects.
Image archive (see SWF)	A system that provides long term storage of evidence objects such as images, presentation states, Key Image Notes, Evidence Documents and Dose SR.

Table 1.1-2: Examples of actors in dentistry

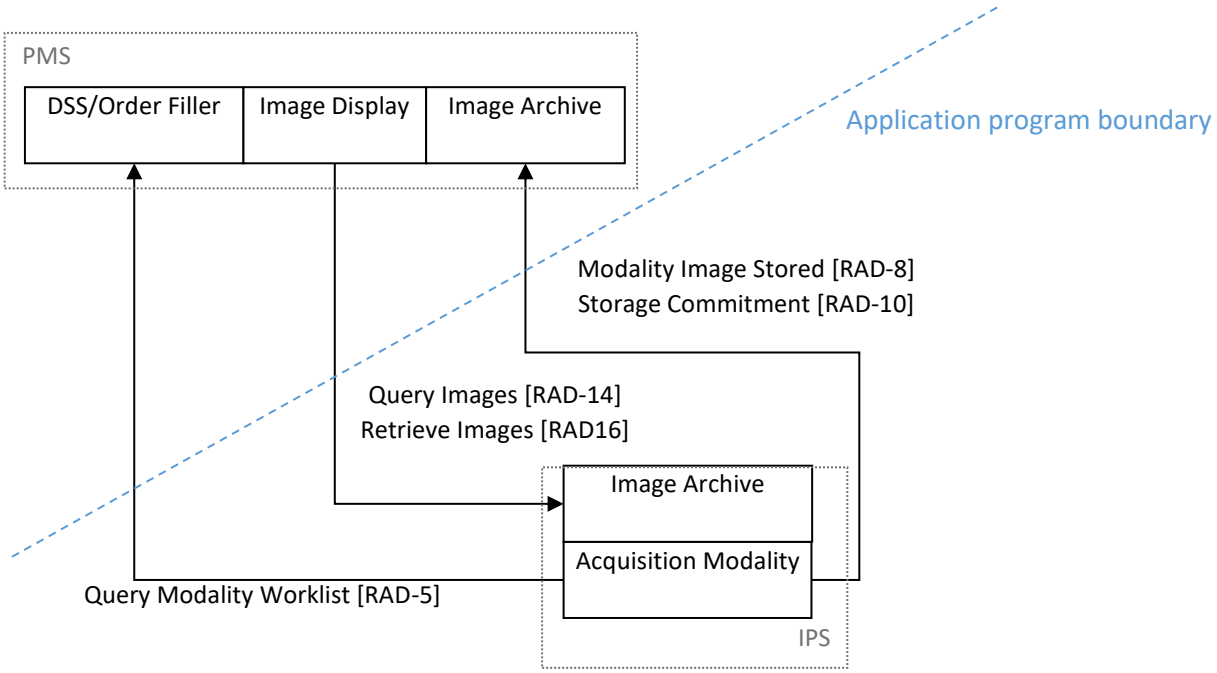
Actor	Example
Department System Scheduler/Order Filler (see SWF)	Practice Management System (PMS; German: PVS) that creates and provides X-ray jobs with patient information.
Acquisition Modality (see SWF)	X-ray device (or a general data acquisition device)
Image Display (see SWF)	Practice Management System (PMS) that stores image information and displays images, if necessary. Image Processing System (IPS; German: BVS) that serves to view X-ray images.
Image Archive (see SWF)	X-ray software, Image Processing System (IPS), or an image archive that stores images long-term and makes them available to other systems via interfaces. Practice Management System (PMS) that retrieves images and image information for the patient record. (In this case, the data may not be stored permanently)

All transactions used, not only new ones, are listed here for better legibility.

Table 1.1-3: Transactions used in the BDW

Transaction	Definition
Query Modality Worklist [RAD-5]	(see SWF)
Query Images [RAD-14]	(see SWF)
Retrieve Images [RAD-16]	(see SWF)
Modality Image Stored [RAD-8]	(see SWF)
Storage Commitment [RAD-10]	(see SWF)
Store Dose Information [RAD-62]	(see REM)

IHE actors can be assigned to the classic VDDS roles. For example, the actor "DSS/Order Filler" can be implemented by a PMS.



145 **Figure 1.1-1: BDW Actor Diagram**

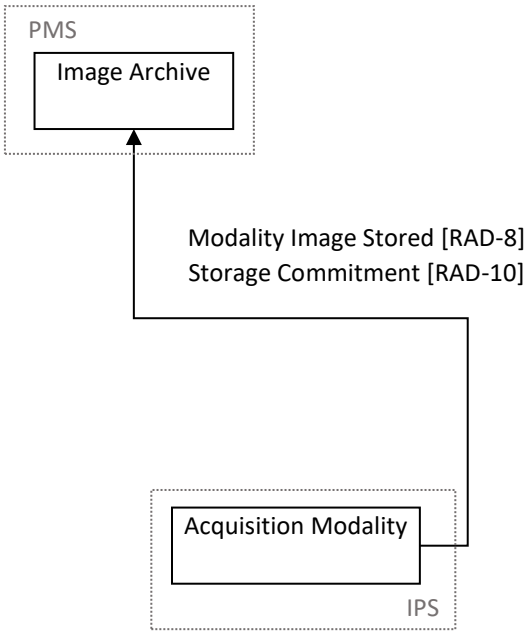


Figure 1.1-2: BDW Actor Diagram - possible instance

Table 1.1-1 lists all transactions of the BDW actors. For BDW compliance, all mandatory transactions (marked with "R") must be supported. All optional transactions can be supported (marked with "O"). Which of the transactions are necessary to implement a particular VDDS Use Case is described in the notes to Table 1.1-1.

Table 1.1-1: BDW – Actors and Transactions for PMS

Actors	Transactions	Optionality	Reference
DSS/Order Filler	Query Modality Worklist [RAD-5] (SCP)	R (Note 1)	
Image Display	Query Images [RAD-14] (SCU)	O (Note 3)	
	Retrieve Images [RAD-16] (SCU)	O (Note 4 and 5)	
Image Archive	Modality Image Stored [RAD-8] (SCP)	O (Note 4 and 6)	
	Storage Commitment [RAD-10] (SCP)	O	
Dose Information Consumer	Store Dose Information [RAD-62] (SCP)	O	

Note 1: Required for: Use Case U1 transfer of patient data (VDDS media level 1)

Note 3: Required for: Use Case U3 retrieving image information (VDDS media level 2 / VDDS media level 3)

Note 4: Required for: Use Case U4 retrieving images (VDDS media level 4)

Note 5: Required for: Use Case U5 sending images for display (VDDS media level 5)

Note 6: Required for: Use Case U6 automatic image import (VDDS media level 5)

Table 1.1-2: BDW – Actors and Transactions for IPS

Actors	Transactions	Optionality	Reference
Acquisition Modality	Query Modality Worklist [RAD-5] (SCU)	R (Note 1)	
	Modality Image Stored [RAD-8] (SCU)	O (Note 4 and 6)	
Image Archive	Query Images [RAD-14] (SCP)	O (Note 3)	
	Retrieve Images [RAD-16] (SCP)	O (Note 4 und 5)	
Image Display	Retrieve Images [RAD-16] (SCU)	O (Note 5)	
Dose Information Consumer	Store Dose Information [RAD-62] (SCU)	O	

Note 1: Required for: Use Case U1 transfer of patient data (VDDS media level 1)

Note 3: Required for: Use Case U3 retrieving image information (VDDS media level 2 / VDDS media level 3)

Note 4: Required for: Use Case U4 retrieving images (VDDS media level 4)

Note 5: Required for: Use case U5 sending images for display (VDDS media level 5). In this case, RAD-16 for image display includes the information that the image display actor has a store SCP to receive the images.

Note 6: Required for: Use Case U6 automatic image import (VDDS media level 5)

1.1.1 Tenants

Tenant separation makes it possible to keep several separate data sets on one system. The separation allows working with one tenant without seeing or modifying the data of another tenant.

1.1.1.1 Multi-Tenancy option

If an order or a query is to apply to several tenants at the same time, the Multi-Tenancy option must be supported.

With this option, all the entries in Patient ID (0010,0020) / Issuer of Patient Id (0010,0021) and the entries in the Other Patient IDs Sequence (0010,1002) are equivalent.

- One order applies to all these tenants

- One query searches in all these tenants

Using that option requires that all communication partners support the option.

Table Multi-Tenancy option 1.1.1.1-1: Multi-Tenancy

Actor	Standard	With Multi-Tenancy
DSS/Order Filler	Patient ID (0010,0020) / Issuer of Patient ID (0010,0021) (one tenant)	Specification of Patient ID (0010,0020) / Issuer of Patient ID (0010,0021) and Other Patient IDs Sequence (0010,1002) (multiple tenants)
Acquisition Modality	Assignment of a job to a tenant	Assignment of a job to several tenants
Image Display	Queries for exactly one tenant	Queries across several tenants
Image Archive	Responses to exactly one tenant	Responses across multiple tenants

1.1.1.2 Tenant separation for orders

To make it clear that an MWL order belongs to a specific tenant, the field Issuer of Patient ID (0010,0021) must be used. One tenant is assigned to a specific Issuer of Patient ID (0010,0021). This assignment must be known to the system processing the order.

If several Issuers of Patient IDs (0010,0021) are specified for a patient in an order (via Other Patients IDs Sequence (0010,1002)), the order-processing system decides to which issuer/tenant the order is assigned.

The Issuer of Patient ID (0010,0021) is required for the query of images and must therefore be transferred into the image header. All patient numbers from the Other Patients IDs Sequence (0010,0021) must also be transferred to the image header.

A visible identification of the tenant in the pixel data is not required by the BDW.

In addition, institution information (which can be tenant-specific) can be transferred within the order.

The tenant separation is done via the Issuer of Patient ID (0010,0021). MWL worklists separated by tenant-specific AE titles must not be used for tenant separation. However, AE titles can be used to distinguish between devices/rooms.

1.1.1.3 Tenant separation for queries

In a DICOM query, the field Issuer of Patient ID (0010,0021) must also be queried and must be used for tenant assignment. How queries without Issuer of Patient ID (0010,0021) are handled is up to the queried system and must be documented in the conformance statement (see 2.5 Non-compliant systems).

1.1.1.4 Authentication / data protection

Specifications for the authentication of jobs or specifications for rights to query for certain tenants are not part of the BDW.

Restrictions and compulsory specifications for image queries ensure that queries only refer to data of one tenant.

1.1.2 MWL information model

For the BDW profile, Table K.6-1. "Attributes for the Modality Worklist Information Model" of DICOM Standard Part 4 is supplemented as described in Table 1.1.2-1.

Comment:

Matching Type regulates with which attributes search queries may be made by the SCU.

Return Types govern what must be provided by the SCP in response to a request (see DICOM, K.2 Worklist Information Model Definition).

The SCU does not need to use all *Required Matching Key Types* in one request. However, the SCP must fill all attributes in the response that are Required Return Types (type 1, 1C and 2). For type 2, the response may be empty (zero length). The SCP must answer the attributes if they are requested by the SCU and are known.[1]

Table 1.1.2-1: BDW – extension of the MWL information model

Description / Module	Tag	Matching Key Type	Return Key Type	Remark / Matching Type	Notes / VDDS (Table 3)
Specific Character Set	(0008,0005)	R	1	ISO_IR 100	

[1] https://groups.google.com/forum/#!topic/comp.protocols.dicom/0nZzaSggpKY

Description / Module	Tag	Matching Key Type	Return Key Type	Remark / Matching Type	Notes / VDDS (Table 3)
Scheduled Procedure Step					
Scheduled Procedure Step Sequence	(0040,0100)	R	1	The Attributes of the Scheduled Procedure Step shall only be retrieved with Sequence Matching. The Scheduled Procedure Step Sequence shall contain only a single Item.	
>Scheduled Station AE Title	(0040,0001)	R	1	Scheduled Station AE Title shall be retrieved with Single Value Matching only.	Specification of multiple AETs is possible. Separated by \ (see multivalue) BVS=
>Scheduled Procedure Step Start Date	(0040,0002)	R	1	Scheduled Step Start Date shall be retrieved with Single Value Matching or Range Matching. See remark under Scheduled Procedure Step Start Time (0040,0003).	<planned date of examination> (filter option)
>Scheduled Procedure Step Start Time	(0040,0003)	R	1	Scheduled Step Start Time shall be retrieved with Single Value Matching or Range Matching. Scheduled Step Start Date and Scheduled Step Start Time are subject to Range Matching. If both keys are specified for Range Matching, e.g., the date range July 5 to July 7 and the time range 10am to 6pm specifies the time period starting on July 5, 10am until July 7, 6pm. Note If the Information System does not provide scheduling for individual Procedure Steps, it may use the closest scheduling information it possesses (e.g., Procedures are subject to	<scheduled time of examination> (filter option)

Description / Module	Tag	Matching Key Type	Return Key Type	Remark / Matching Type	Notes / VDDS (Table 3)
				scheduling instead of Procedure Steps).	
>Modality	(0008,0060)	R	1	The Modality shall be retrieved with Single Value Matching.	The modality (if known) or OT (Other Modality)
>Scheduled Performing Physician's Name	(0040,0006)	R	2	Scheduled Performing Physician's Name shall be retrieved with Single Value Matching or Wild Card Matching.	see DIN 6862-2 „Für Untersuchung verantwortlicher Arzt“ / ggf. leer
>Scheduled Procedure Step Description	(0040,0007)	R	1	Scheduled Protocol Code Sequence (0040,0008) may be used additionally	
>Include 'General Anatomy Optional Macro' Table 10-7		O	3	In the case of CID 4016 “Anatomic Region for Intra-oral Radiography”, the Defined CID for the Anatomic Region Modifier Sequence (0008,2220) shall be CID 4017 “Anatomic Region Modifier for Intra-oral Radiography”CID 4017 “Anatomic Region Modifier for Intra-oral Radiography”, if present, and the Defined CID for the Primary Anatomic Structure Sequence (0008,2228) shall be CID 4026 “Primary Anatomic Structure for Intra-oral and Craniofacial Radiography - Teeth”CID 4026 “Primary Anatomic Structure for Intra-oral and Craniofacial Radiography - Teeth”, if present.[2] May base on other CIDs than CID 4016 “Anatomic Region for Intra-oral Radiography”CID 4016 “Anatomic Region for Intra-oral Radiography”.	In DIN 6862-2 "Körperregion"
>Scheduled Procedure Step ID	(0040,0009)	O	1		<Transfer ID to be generated by PMS>

[2] ftp://dicom.nema.org/MEDICAL/dicom/current/output/chtml/part03/sect_A.54.4.html

Description / Module	Tag	Matching Key Type	Return Key Type	Remark / Matching Type	Notes / VDDS (Table 3)
Requested Procedure					
Requested Procedure ID	(0040,1001)	O	1		<Transfer ID to be generated by PMS>
Reason for the Requested Procedure	(0040,1002)	O	2		In DIN 8682-2 “Rechtfertigende Indikation“
Reason for Requested Procedure Code Sequence	(0040,100A)	O	3		In DIN 8682-2 “Rechtfertigende Indikation“
>Include Table 8.8-1 “Code Sequence Macro Attributes”		*O*	*3*		*In DIN 8682-2 “Rechtfertigende Indikation“*
Requested Procedure Description	(0032,1060)	R	1	Requested Procedure Code Sequence (0032,1064) may be used additionally	
Study Instance UID	(0020,000D)	O	1		UID of the study assigned by PMS (based on own OID or OID assigned by VDDS).
Referenced Study Sequence	(0008,1110)	O	2		<usually left blank>
Requested Procedure Priority	(0040,1003)	O	2		<may be left blank>
Patient Transport Arrangements	(0040,1004)	O	2		<may be left blank>
Imaging Service Request					
Accession Number	(0008,0050)	O	2		in DIN 6862-2 “Verwaltungsnummer (Untersuchung)“

Description / Module	Tag	Matching Key Type	Return Key Type	Remark / Matching Type	Notes / VDDS (Table 3)
Requesting Physician	(0032,1032)	O	2		In DIN 6862-2 „Rechtfertigende Indikation stellender Arzt“
Referring Physician's Name	(0008,0090)	O	2		In DIN6862-2 „Anfordernder Arzt“
Visit Identification					
Admission ID	(0038,0010)	O	2	Identification number of the visit as assigned by the healthcare provider	<may be left blank>
Institution Name	(0008,0080)	O	3		In DIN 6862-2 "Institution" Useful with multiple tenants
Institution Address	(0008,0081)	O	3		In DIN6862-2 "Anschrift der Institution" Useful with multiple tenants
Institutional Department Name	(0008,1040)	O	3		In DIN6862-2 "Abteilungsname" Useful with multiple tenants
Visit Status					
Current Patient Location	(0038,0300)	O	2		<may be left blank>
Visit Relationship					
Referenced Patient Sequence	(0008,1120)	O	2		<may be left blank>
Visit Admission					

Description / Module	Tag	Matching Key Type	Return Key Type	Remark / Matching Type	Notes / VDDS (Table 3)
Consulting Physician's Name	(0008,009C)	O	3	Consulting physician(s) for this patient visit.	DOCTOR=
Patient Relationship					
Patient Identification					
Patient's Name	(0010,0010)	R	1	Patient Name shall be retrieved with Single Value Matching or Wild Card Matching.	LASTNAME ^ FIRSTNAME ^ MIDDLENAME + NAMEADDON ^ TITLE + NAMEPREFIX
Patient ID	(0010,0020)	R	1	Patient ID shall be retrieved with Single Value Matching.	PATID
Issuer of Patient ID	(0010,0021)	R	1		PRXNR (required to map tenants)
Issuer of Patient ID Qualifiers Sequence	(0010,0024)	O	3		
Other Patient IDs Sequence	(0010,1002)	O	3		Lifetime EGK (Electronic Health-Card) No. Show No. In DIN 6862-2
All other Attributes of the Patient Identification Module		*O*	*3*		
Patient Comments	(0010,4000)	O	3		in DIN 6862-2 "Kommentare zu Patientendaten"
Patient Demographic					
Patients Birth Date	(0010,0030)	O	2		BIRTHDAY

Description / Module	Tag	Matching Key Type	Return Key Type	Remark / Matching Type	Notes / VDDS (Table 3)
Patient's Sex	(0010,0040)	O	2	Enumerated Values: M - male F - female O - other	SEX
Other Patient Names	(0010,1001)	O	3	Other names used to identify the patient.	in DIN 6862-2 "Andere Patientennamen"
Patient's Weight	(0010,1030)	O	2	Weight of the patient in kilograms	<blank> in DIN 6862-2 "Gewicht"
Confidentiality constraint on patient data	(0040,3001)	O	2		<may be left blank>
All other Attributes of the Patient Demographic ModulePatient Demographic Module		O	3		
Occupation	(0010,2180)	O	3	Occupation of the Patient.	PROFESSION
Patient's Insurance Plan Code Sequence	(0010,0050)	O	3	A sequence that conveys the patient's insurance plan. Zero or more Items shall be included in this Sequence.	
Patient's Address	(0010,1040)	O	3	Legal address of the named patient	STREET ZIP CITY
Country of Residence	(0010,2150)	O	3	Country in which patient currently resides	COUNTRY
Patient's Telephone Numbers	(0010,2154)	O	3	Telephone numbers at which the patient can be reached	
Patient's Telecom Information	(0010,2155)	O	3	The patient's personal telecommunication contact information, including telephone, email, or other telecom addresses. It is recommended that this attribute be treated as equivalent to HL7v2 fields PID-13 and PID-14, or PID-40 (v2.7 and later), and be formatted in accordance with the HL7v2	HOMEPHONE WORKPHONE CELLULAR EMAIL

Description / Module	Tag	Matching Key Type	Return Key Type	Remark / Matching Type	Notes / VDDS (Table 3)
				XTN data type (without escapes for HL7 message structure reserved characters). [3]	
Patient Medical					
Patient State	(0038,0500)	O	2		<may be left blank>
Pregnancy Status	(0010,21C0)	O	2		<may be left blank>
Medical Alerts	(0010,2000)	O	2		<may be left blank>
Allergies	(0010,2110)	O	2		<may be left blank>
Special Needs	(0038,0050)	O	2		<may be left blank>

1.1.3 Patient data transfer

In addition to the communication of an X-ray job, the BDW profile can also be used for transmitting pure patient data without a job, e.g., if the target system is not an X-ray system.

For patient data transmission, an MWL job is only filled with patient data. An MWL SCP must, therefore, offer the possibility of specifying for certain recipient AETs that only patient data and no complete MWL jobs are sent to them.

For patient data transport, order fields must be filled with return Key Type 1. Since the fields have no function in the context of patient data transfer, they must be filled with the following default values.

Table 1.1.3-1: Patient data transmission, field contents

Tag	Value
Scheduled Procedure Step Description (0040,0007)	PATIENTDATAEXCHANGE
Scheduled Procedure Step ID (0040,0009)	0 or Scheduled Procedure Step ID

[3] http://www.hl7.eu/refactored/dtXTN.html

Tag	Value
Requested Procedure ID (0040,1001)	0 or Requested Procedure ID
Requested Procedure Description (0032,1060)	PATIENTDATAEXCHANGE
Study Instance UID (0020,000D)	assigned individually

The SCP can offer two worklists for the job and patient data.

1.1.4 Query/Retrieve

1.1.4.1 DICOM SOP classes involved

The SOP classes used for Query/Retrieve are:

Name	SOP Class UID
Study Root QR Information Model – FIND SOP Class	1.2.840.10008.5.1.4.1.2.2.1

The SCU uses one or more "matching keys" as a search criterion to obtain the list of relevant information in the SCP according to the selected level (Patient/Study/Series/Image).

Based on this returned information, the SCU can deduce whether images are present in the SCP or use this information to retrieve the images from the AWS (see Use Case 4).

No Patient Root Information Model is provided to guarantee that Issuer of Patient ID is specified in each level.

1.1.4.2 DICOM attributes for Study Root Information Model-FIND

Only attributes that are either mandatory or optional and only defined in the context of this SOP class (such as "Number of Study Related Instances") are listed here.

Optionally, all DICOM attributes of the corresponding entity level (Study/Series/Image) can be used.

Table 1.1.4.2-1: Query Keys

Name	Tag	Matching Keys		Return Keys		Notes
		SCU	SCP	SCU	SCP	
Study Level						

Query / Retrieve Level	0008,0052			R	R	STUDY
Study Date	0008,0020	R	R	R	R	
Study Time	0008,0030	R	R	R	R	
Accession Number	0008,0050	R	R	R	R	
Retrieve AE Title	0008,0054				R	
Modalities in Study	0008,0061			O	O	
Study Description	0008,1030			R+	R+	
Patient Name	0010,0010	R	R	R	R	
Patient ID	0010,0020	R	R	R	R	
Issuer of Patient ID	0010,0021	R++	R++	R++	R++	Single Value Matching
Patient's Birth Date	0010,0030	O	O	R+	R+	
Patient Sex	0010,0040	O	O	R+	R+	
Study Instance UID	0020,000D	U	U	U	U	
Study ID	0020,0010	R	R	R	R	
Number of Study Related Series	0020,1206			O	O	
Number of Study Related Instances	0020,1208			O	O	
All other Attributes at Study Level				O	O	
Series Level						
Query / Retrieve Level	0008,0052			R	R	SERIES
Modality	0008,0060	R	R	R	R	
Series Number	0020,0011	O	O	R	R	

Series Instance UID	0020,000E	U	U	U	U	
Number of Series Related Instances	0020,1209			O	O	
All other Attributes at Series Level				O	O	
Composite Object Instance Level (Image Level)						
Query / Retrieve Level	0008,0052			R	R	IMAGE
Instance Number	0020,0013	O	O	R	R	
SOP Instance UID	0008,0018	U	U	U	U	
SOP Class UID	0020,000E	O	O	R+	R+	
All other Attributes at Instance Level				O	O	

O: Optional

R : Mandatory attributes per DICOM standard

R+: Optional in DICOM, mandatory in VDDS context (largely implemented in the real world).

R++: Mandatory in the VDDS context as type 1, see the next two chapters.

U: Same as R; a unique UID

1.1.4.3 Special requirements for an SCU

To enable multi-tenant capability, the SCU must enter a value in the 'Issuer of Patient ID' attribute (0010,0021) for each Study Level Query.

Therefore, this value must not have the length 0 or contain a wildcard.

As described in the DICOM standard, C-FIND operations on lower levels (i.e., Series/Image) must include the respective UID of the higher level.

With appropriate implementation in the applications, it is thus ruled out that an SCU can access the image (and thus patient) information of another tenant.

Behaviour of the SCU for Matching Keys

O The SCU can specify the attribute in a request, but does not need to. (This also applies to all attributes not listed in the table)

R/R+/R++	The SCU must specify the attribute in a request and must provide a (user) option to define this attribute, if applicable.

Behaviour of the SCU for Return Keys:

O	The SCU can process the attribute from a response, but does not need to. (This also applies to all attributes not listed in the table)
R/R+	The SCU must be able to process/display this attribute from a response.
R++	The SCU must be able to process/display this attribute from a response and require it to be present.

1.1.4.4 Special requirements for an SCP

At the study, Series and Image Level, the SCP must prevent access to data from other tenants.

For example, the SCP may not return data at study level if the attribute 'Issuer of Patient ID' (0010,0021) is missing, empty, or contains a wildcard.

The SCP must insist on a "single value matching" value of the UID of the higher level at Series and Image Level.

Behaviour of the SCP for Matching Keys:

O	The SCP can process the attribute from a request, but does not require it to be there. (This also applies to all attributes not listed in the table)
R/R+	The SCP must be able to process this attribute from a request, but does not require it to be there.
R++	The SCP must be able to process this attribute from a request and demand that it is present.

Behaviour of the SCP for Return Keys:

O	The SCP can return the attribute in one response. (This also applies to all attributes not listed in the table)
R/R+/R++	The SCP must return this attribute in one response.

1.1.4.5 Use of C-MOVE for transmitting images

For the transmission of image data, DICOM C-MOVE must be supported on the Study, Series and Image level.

1.1.5 Supported SOP classes

305 The following SOP classes should be used. The manufacturer's declaration of BDW conformity shows the user which SOP classes are used and which applications are compatible.

Table 1.1.5-1: SOP classes

SOP Class Name	SOP Class UID	BDW level	VDDS-TYPENR (informative)
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	from 2	1,2,3,4,5,19,20,29,30,31,32
Digital X-Ray Image Storage-For Presentation	1.2.840.10008.5.1.4.1.1.1.1	from 2	1,2,3,4,5,19,20,29,30,31,32
Digital X-Ray Image Storage-For Processing	1.2.840.10008.5.1.4.1.1.1.1.1	from 2	1,2,3,4,5,19,20,29,30,31,32
Digital Intra-Oral X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.3	from 2	1,2,5,19
Digital Intra-Oral X-Ray Image Storage - For Processing	1.2.840.10008.5.1.4.1.1.1.3.1	from 2	1,2,5,19
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	from 4	31
Enhanced CT Image Storage	1.2.840.10008.5.1.4.1.1.2.1	from 4	31
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	from 2	10,11,12,13,14,15,16,17,21,22,23,25, 26,27,28
VL Microscopic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.2	from 2	7,8,9,18
VL Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4	from 2	7,8,9,18
Encapsulated STL Storage	1.2.840.10008.5.1.4.1.1.104.3	3D Model	33, 34
Encapsulated OBJ Storage	1.2.840.10008.5.1.4.1.1.104.4	Textured 3D Model	33, 34
Encapsulated MTL Storage	1.2.840.10008.5.1.4.1.1.104.5	Textured 3D Model	33, 34
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Documents Option	24, 25, 26, 27, 28
Video Photographic Image Storage	1.2.840.10008.5.1.4.1.1.77.1.4.1	Option Videos	6

For VDDS types No. 0, 24, 35, 36, 37 other suitable SOP classes must be used. The AETs of the communication partners must be known in advance (see service availability).

310 The transfer syntax offered must be at least 1.2.840.10008.1.2 Implicit VR Little Endian.

The bit depth of the resulting image can be up to 16 bits according to the DICOM standard.

1.1.5.1 VDDS object types

If it is necessary to additionally transmit VDDS object types for workflows, one or more VDDS object types can be specified as code in the following attributes:

- In the job, the *(0032,1064) Requested Procedure Code Sequence* in the *Requested Procedure Module* can be used.
- For a data object, the *(0040,0260) Performed Protocol Code Sequence* in the *General Series Module* can be used.

For a VDDS object type specification, only the codes from table 1.1.5.1-1 may be used.

Table 1.1.5.1-1: VDDS object type codes

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
99VDDSBDW	VDDSMEDIA_TNR1	Small X-ray
99VDDSBDW	VDDSMEDIA_TNR2	Bite-wing
99VDDSBDW	VDDSMEDIA_TNR3	PAN (panoramic X-ray)
99VDDSBDW	VDDSMEDIA_TNR4	Lateral X-ray
99VDDSBDW	VDDSMEDIA_TNR5	Status
99VDDSBDW	VDDSMEDIA_TNR6	Video
99VDDSBDW	VDDSMEDIA_TNR7	Photo
99VDDSBDW	VDDSMEDIA_TNR8	Intraoral X-ray
99VDDSBDW	VDDSMEDIA_TNR9	Video image
99VDDSBDW	VDDSMEDIA_TNR10	Form (sick note, prescription, or similar)
99VDDSBDW	VDDSMEDIA_TNR11	Assessment
99VDDSBDW	VDDSMEDIA_TNR12	Invoice
99VDDSBDW	VDDSMEDIA_TNR13	Correspondence with the patient
99VDDSBDW	VDDSMEDIA_TNR14	Treatment and cost plan
99VDDSBDW	VDDSMEDIA_TNR15	In-house lab invoice
99VDDSBDW	VDDSMEDIA_TNR16	External lab invoice
99VDDSBDW	VDDSMEDIA_TNR17	Material document
99VDDSBDW	VDDSMEDIA_TNR18	Model photo
99VDDSBDW	VDDSMEDIA_TNR19	PA X-ray
99VDDSBDW	VDDSMEDIA_TNR20	Hand-held X-ray
99VDDSBDW	VDDSMEDIA_TNR21	Analysis result
99VDDSBDW	VDDSMEDIA_TNR22	Precision
99VDDSBDW	VDDSMEDIA_TNR23	Miscellaneous
99VDDSBDW	VDDSMEDIA_TNR24	Unknown (for documents that are already used on a proprietary basis)
99VDDSBDW	VDDSMEDIA_TNR25	In-house lab invoice (health insurance fund)
99VDDSBDW	VDDSMEDIA_TNR26	In-house lab invoice (private insurance)
99VDDSBDW	VDDSMEDIA_TNR27	External lab invoice (health insurance fund)

99VDDSBDW	VDDSMEDIA_TNR28	Third-party laboratory invoice (private insurance)
99VDDSBDW	VDDSMEDIA_TNR29	Frontal X-ray
99VDDSBDW	VDDSMEDIA_TNR30	X-ray of temporomandibular joint
99VDDSBDW	VDDSMEDIA_TNR31	DICOM series
99VDDSBDW	VDDSMEDIA_TNR32	SMV X-ray
99VDDSBDW	VDDSMEDIA_TNR33	3D model scan
99VDDSBDW	VDDSMEDIA_TNR34	3D skull scan
99VDDSBDW	VDDSMEDIA_TNR35	3D findings report
99VDDSBDW	VDDSMEDIA_TNR36	3D therapy planning report
99VDDSBDW	VDDSMEDIA_TNR37	Therapy planning information

1.1.6 Job list processing

The BDW profile does not specify how jobs are deleted from the MWL job lists or marked as processed. Based on the BDW, however, it is possible to use the mechanisms provided for this purpose, such as DICOM MPPS, or to develop individual solutions (Study Instance UID, Accession No. in the image).

Provided that both communication partners have at least level 2 (see 1.4 Requirements for conformity with the VDDS DICOM seal), an automatic (return) transmission of the recording to the Store-SCP of the ordering system is possible. This return information can be used for the consolidation of the job list.

1.1.7 Service Availability

The possibility given in the classic VDDS media to see all available services of other application programmes in the VDDS_MMI.ini was a great advantage for the configuration of a workstation and will be implemented again in VDDS DICOM. It should be noted that in future not every service will be available locally on every workstation. Services will be operated centrally instead (e.g., a central DICOM store service).

1.1.7.1 Configuration information

The configuration file is a system's self-disclosure of its configuration. It provides the services of an application in a clear, human- and machine-readable manner. The configuration file allows easy access to all necessary configuration information of an application, e.g., to a technician setting up an X-ray system.

The configuration file should be automatically stored in a directory known to the user/technician and displayed/called up from the software. In case of configuration changes, the file must be updated by the generating application. The configuration information file is identical on all workstations and always contains all services. The configuration information file can be used to automatically derive authorisations for establishing connections.

The configuration information is to be generated on each workstation/tenant by each BDW-compliant application to access it on all workstations/tenants.

Furthermore, all BDW-compliant applications should, if possible, use a common directory to store the configuration file. The "VDDS_BDW" subdirectory in %PROGRAMDATA% (C:\ProgramData\VDDS_BDW\ or /var/lib/VDDS_BDW under Linux/Unix/MacOS) should be used. The file names of the configuration file can be freely selected and should have the .cfg extension. The configuration information file shall be encoded in UTF-8. The directory must be readable for all applications.

The file structure is such that it could be read not only by technicians but also by applications (e.g., a PMS) to get the configuration information of other BDW applications. When automatically importing the configuration information file, pay special attention to the version (*BDWConfigurationFileVersion)*. The information in the configuration file is partly taken from the Application Configuration Management (DICOM PS3.15 - Security and System Management Profiles).

1.1.7.1.1 Structure of a configuration information

All information is mandatory unless otherwise stated.

The configuration file has one or more comment lines at the beginning that refer to its function within the BDW. The content can be freely structured.

The first section [General Information] contains information about the product to which the configuration file belongs.

- *Manufacturer* (0008,0070)
- *Manufacturer Model Name* (0008,1090)

The next section [Configuration File] contains information about the configuration file itself.

- *BDWConfigurationFileVersion*: Configuration file format version
- *ConfigurationFileCreationDate*: Date of file creation as Value Representation DA (Date).

Then follows the optional section [Migration].

- *MigrationExporter*: specifies the path to an executable file which gets a folder path transferred as a parameter, in which migration index files can subsequently be created (see 1.3.4). This is a simplification of the manual procedure. A migration process started in this way, usually once, does not necessarily need to be accepted by the PMS or be successful. The return value is not equal to 0 in the event of an error. Path is specified without quotation marks and may contain spaces. (optional specification)

This is followed by a section [ServiceX] for each service offered, where X is a natural number greater than or equal to 1.

- *ServiceType* for SCP: STORE_SCP, QR_SCP, MWL_SCP
- *ServiceType* for SCU: STORE_SCU, QR_SCU, MWL_SCU
- *ServiceName*: is not assigned and serves the purpose of clarification
- *AETitle*: AE title of the service; as value representation AE (Application Entity)

- *Host name*: Name/IP address of the service (optional specification for SCU)
- *Port*: Port of the service (optional specification for SCU)
- *OptionSystemStart*: indicates whether the System Start Option is supported by the service (1) or not (0)
- *OptionPostProcessingPassThrough*: indicates whether the Post Processing Pass Through Option is supported by the service (1) or not (0)
- *OptionMultiTenancy*: indicates whether the Multi-Tenancy option is supported by the service (1) or not (0)
- *OptionDocument*: indicates whether the Document Option is supported by the service (1) or not (0)
- *Option3DModel*: indicates whether the 3D Model Option is supported by the service (1) or not (0)
- *Option3DModelTextured*: indicates whether the 3D Model Textured Option is supported by the service (1) or not (0)
- *OptionVideo*: indicates whether the Video Option is supported by the service (1) or not (0)
- *OptionStorageCommitment*: indicates whether the Storage Commitment Option is supported by the service (1) or not (0)
- *OnlyPatientData*: indicates whether an MWL-SCP provides patient data or job data; 1 for mere patient data or 0 for complete job data

1.1.7.1.2 Example of configuration information

```
;Configuration Information File - Basic Dental Workflow - Example

[General Information]
Manufacturer = SuperRay
ManufacturerModelName = SuperModel1

[Configuration File]
BDWConfigurationFileVersion = 2
ConfigurationFileCreationDate = 20180211
```

```
[Migration]
MigrationExporter =
C:\Users\MyUser\AppData\Local\Temp\MyBVS_MiExp.exe

[Service1]
ServiceType = STORE_SCP
ServiceName = SuperApplication Viewer
AETitle = SA_ST_V
Hostname = 192.168.1.15
Port = 11112
OptionSystemStart = 1
OptionPostProcessingPassThrough = 0
OptionMultiTenancy = 0
OptionStorageCommitment = 0

[Service2]
ServiceType = STORE_SCP
ServiceName = SuperApplication Store
AETitle = SA_ST
Hostname = 192.168.1.15
Port = 11112
OptionSystemStart = 0
OptionPostProcessingPassThrough = 0
OptionMultiTenancy = 0
OptionStorageCommitment = 0

[Service3]
ServiceType = MWL_SCU
ServiceName = SuperApplication WLU
AETitle = SA_WLU
```

```
OptionMultiTenancy = 0
...
```

1.2 Basic Dental Workflow Use Cases

1.2.1 Concept

The Use Cases of VDDS media can each be implemented by a specific combination of transactions. PMS or IPS take on the role belonging to the respective transaction. Table 1.1-1 shows which transaction is used to implement the individual Use Cases.

1.2.2 Use Cases and implementation notes

1.2.2.1 Use Case U1: Transfer of patient data

Steps:

The user transfers patient information and job information from a PMS to a IPS so that they won't need to re-enter patient master data. The IPS starts automatically and can take an X-ray image for the patient afterwards if needed.

Implementation:

The transfer of patient data is based on the "Query Modality Worklist [RAD-5]" transaction, which is specified below.

The PMS provides patient information and, if necessary, job data for one or more IPS via its MWL service so that patient master data do not need to be re-entered there. The MWL Information Model is used for both patient data transmission and job transmission.

Modality Performed Procedure Step (MPPS) can be used if it is supported by the systems involved.

See also: 1.1.2 MWL information model and 2.4 Assignment VDDS Table 3 according to DICOM

1.2.2.1.1 Example of patient data exchange

The example corresponds to the minimum data that a PMS must provide.

```
(0008,0005) CS [ISO_IR 100]
#####Scheduled Procedure Step
(0040,0100) SQ #Scheduled Procedure Step Sequence
 (fffe,e000) -
  (0040,0001) AE  SupiDent #Scheduled Station AE Title
  (0040,0002) DA  19951015 #Scheduled Procedure Step Start Date
  (0040,0003) TM  085607 #Scheduled Procedure Step Start Time
  (0008,0060) CS  OT #Modality
  (0040,0006) PN  Doe^John#Scheduled Performing Physician's Name
  (0040,0007) LO  #Scheduled Procedure Step Description
  (0040,0009) SH  #Scheduled Procedure Step ID
 (fffe,e00d) -
```

```
(fffe,e0dd) # End of Scheduled Procedure Step Sequence
(0040,1001) SH  #Requested Procedure ID
(0040,1002) LO # Reason for the Requested Procedure
(0032,1060) LO  #Requested Procedure Description
(0020,000d) UI  #Study Instance UID
(0008,1110) SQ #Referenced StudySequence
 #leer
(fffe,e0dd) -
(0040,1003) SH #Requested Procedure Priority
(0040,1004) LO #Patient Transport Arrangements
#####Imaging Service Request
(0008,0050) SH #Accession Number
(0032,1032) PN #Requesting Physician
(0008,0090) PN #Referring Physician's Name
#####Visit Identification
(0038,0010) LO #Admission ID
#####Visit Status
(0038,0300) LO #Current Patient Location
#####Visit Relationship
(0008,1120) SQ #Referenced Patient Sequence
 #leer
(fffe,e0dd) -
#####Visit Admission
(0008,009C) PN Schulz^Max #Consulting Physician's Name
#####Patient Relationship
#####Patient Identification
(0010,0010) PN Glücklich^Ulrike #Patient's Name
(0010,0020) LO M4000 #Patient ID
(0010,0021) LO ADT01 #Issuer of Patient ID
#####Patient Demographic
(0010,0030) DA 19940731 #Patient's Birth Date
(0010,0040) CS F #Patient's Sex
(0010,1030) DS #Patient's Weight
(0040,3001) LO #Confidentiality Constraint on Patient Data Description
#####Patient Medical
(0038,0500) LO #Patient State
(0010,21C0) US #Pregnancy Status
(0010,2000) LO #Medical Alerts
(0010,2110) LO #Allergies
(0038,0050) LO #Special Needs
```

1.2.2.1.2 Example of an X-ray job

```
(0008,0005) CS [ISO_IR 100]
#####Scheduled Procedure Step
(0040,0100) SQ #Scheduled Procedure Step Sequence
 (fffe,e000) -
  (0040,0001) AE  SupiDent #Scheduled Station AE Title
  (0040,0002) DA  19951015 #Scheduled Procedure Step Start Date
  (0040,0003) TM  085607 #Scheduled Procedure Step Start Time
  (0008,0060) CS  DX #Modality
  (0040,0006) PN  Doe^John#Scheduled Performing Physician's Name
  (0040,0007) LO  Orthopantomography #Scheduled Procedure Step Description
  (0008,2218) SQ #Anatomic Region Sequence
    (fffe,e000) -
    (0008,0100) SH T-11170 #Code Value
    (0008,0102) SH SRT #Coding Scheme Designator
    (0008,0104) LO Maxilla #Code Meaning
    (0008,2220) SQ #Anatomic Region Modifier Sequence
      (fffe,e000) -
        (0008,0100)SH R-FB322 #Code Value
        (0008,0102) SH SRT #Coding Scheme Designator
        (0008,0104) LO Central incisor region #Code Meaning
        (fffe,e00d) -
      (fffe,e0dd) #End of Anatomic Region Modifier Sequence
      (fffe,e00d) -
    (fffe,e0dd) #End of Anatomic Region Sequence
  (0008,2228) SQ #Primary Anatomic Structure Sequence
    (fffe,e000) -
```

```
      (0008,0100) SH T-54290 #Code Value
      (0008,0102) SH SRT #Coding Scheme Designator
      (0008,0104) LO Maxillary left central incisor tooth #Code Meaning
    (fffe,e00d) -
  (fffe,e0dd) #End of Primary Anatomic Structure Sequence
 (0040,0009) SH  42 #Scheduled Procedure Step ID
 (fffe,e00d) -
(fffe,e0dd) # End of Scheduled Procedure Step Sequence
(0040,1002) LO # Reason for the Requested Procedure
(0040,1001) SH  42 #Requested Procedure ID
(0032,1060) LO  X-Ray #Requested Procedure Description
(0020,000d) UI  1.2.276.0.7230010.9999 #Study Instance UID
(0008,1110) SQ #Referenced StudySequence
 #leer
(fffe,e0dd) -
(0040,1003) SH #Requested Procedure Priority
(0040,1004) LO #Patient Transport Arrangements
#####Imaging Service Request
(0008,0050) SH 12345#Accession Number
(0032,1032) PN Maier^Max #Requesting Physician
(0008,0090) PN Müller^Max #Referring Physician's Name
#####Visit Identification
(0038,0010) LO #Admission ID
#####Visit Status
(0038,0300) LO #Current Patient Location
#####Visit Relationship
(0008,1120) SQ #Referenced Patient Sequence
 #leer
(fffe,e0dd) -
#####Visit Admission
(0008,009C) PN Schulz^Max #Consulting Physician's Name
#####Patient Relationship
#####Patient Identification
(0010,0010) PN Glücklich^Ulrike #Patient's Name
(0010,0020) LO M4000 #Patient ID
(0010,0021) LO ADT01 #Issuer of Patient ID
(0010,1002) SQ #Other Patient IDs Sequence
 (fffe,e000)
  (0010,0020) LO 4711 #Patient ID
  (0010,0021) LO BVS_XY #Issuer of Patient ID
 (fffe,e00d) -
(fffe,e0dd) -
#####Patient Demographic
(0010,0030) DA 19940731 #Patient's Birth Date
(0010,0040) CS F #Patient's Sex
(0010,1030) DS 75 #Patient's Weight
(0040,3001) LO #Confidentiality Constraint on Patient Data Description
(0010,2180) SH #Occupation
(0010,0050) SQ #Patient's Insurance Plan Code Sequence
 #leer
(fffe,e0dd) -
(0010,1040) LO Oppenheimstraße 16, 50668 Köln #Patient's Address
(0010,2150) LO Germany #Country of Residence
(0010,2154) SH #Patient's Telephone Numbers
(0010,2155) LT ^PRN^PH^^49^221^88848140^^^^^221-88848140#Patient's Telecom Information
#####Patient Medical
(0038,0500) LO #Patient State
(0010,21C0) US 0001 #Pregnancy Status
(0010,2000) LO #Medical Alerts
(0010,2110) LO #Allergies
(0038,0050) LO #Special Needs
```

1.2.2.2 Use Case U2: Continuous transmission of patient data

This Use Case should not be pursued for data protection reasons, among others.

1.2.2.3 Use Case U3: Query of image information (VDDS media level 2 / VDDS media level 3)

Steps:

The user checks whether images/data are available in a IPS for a specific patient (in the PMS). The user gets the list of available data as a result of their request.

Implementation:

The transfer of patient data is based on the "Query Images [RAD-14]" transaction which is specified below.

IPS provides a service for searching and retrieving meta-information of images, which is addressed by PMS.

1.2.2.3.1 Using the Query functionality to retrieve image information

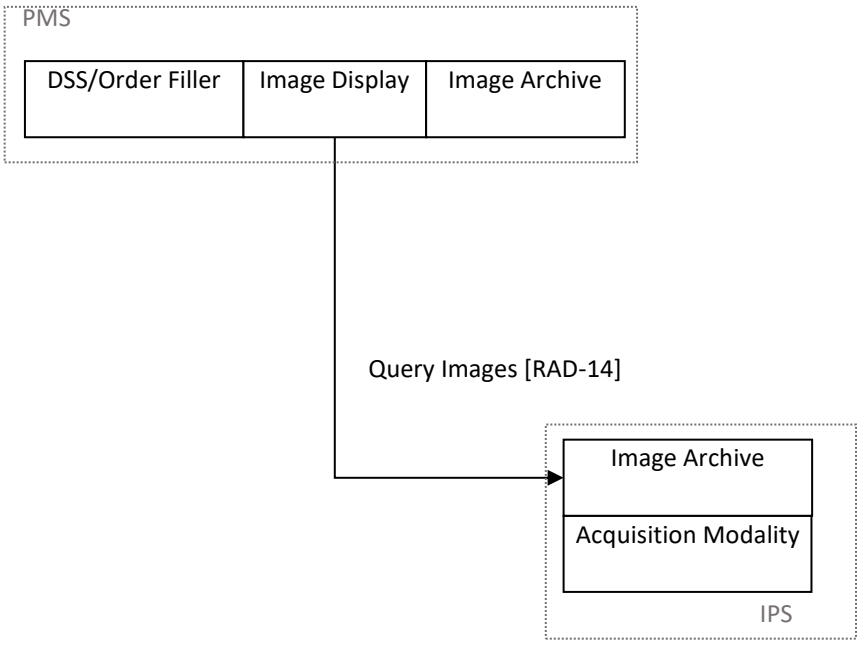


Figure 1.2.2.3.1-1: Actor diagram

The retrieval of images is based on the "Query Images [RAD-14]" transaction, which is specified in the BDW. When querying image information, DICOM C-FIND operations are used to determine the availability of images in an Image Archive. For the available metadata see chapter 1.1.4.2 DICOM attributes for Study Root Information Model-FIND. The query must be formulated by specifying metadata. The Query can contain further attributes, which are then

filled in and returned by the server in the response. Which metadata can be used and which metadata can be obtained via a Query (without retrieving an image completely), depends on the manufacturer of the server (within the framework of the DICOM specifications).

With the Query functionality, only metadata is returned, no image data.

See 1.1.4 Query/Retrieve

1.2.2.4 Use Case U4: Querying images (VDDS media level 4)

Steps:

The PMS requests the IPS to transfer a certain image to it.

e.g., transferring X-ray images from the software of the X-ray unit for further processing

This Use Case is only interesting for programmes that want to process the images further (measurement, rendering). The function is not needed for most PMS.

Implementation:

A PMS is able to retrieve a specific image (for which the metadata is available) from the IPS. Retrieving images is based on the "Retrieve Images [RAD-16]" transaction, which is specified in 1.1.4.5 Use of C-MOVE for transmitting images.

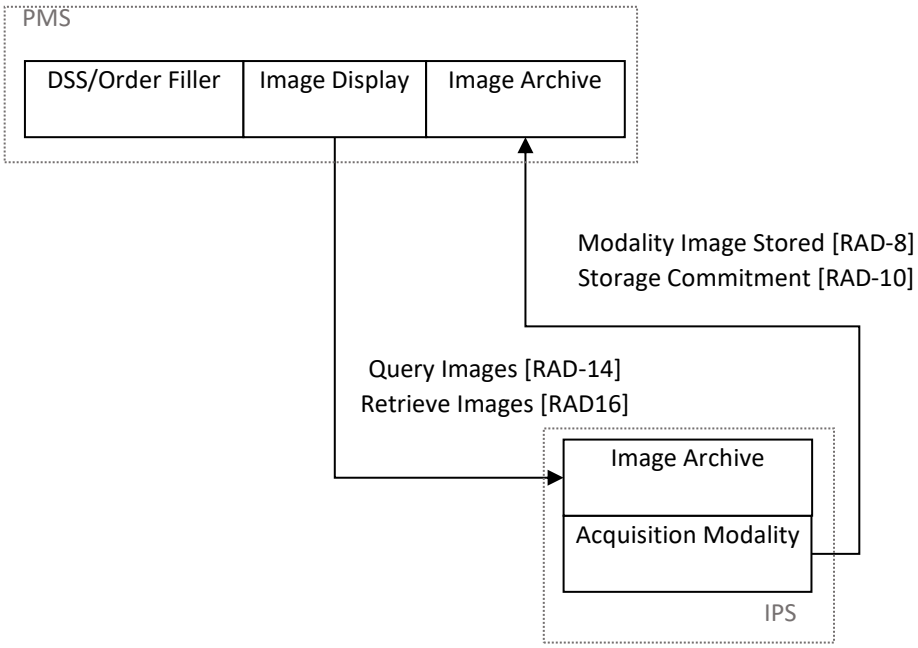


Figure 1.2.2.4-1: Actor diagram

1.2.2.4.1 Dose data

The dose data in the images must be transferred via one of the two attributes:

- Acquired Image Area Dose Product (0018,9473) in dGy*cm² (preferred)
- Image Area Dose Product (0018,115e) in dGy*cm²

or the attribute

- Exposure (0018,1152) (alternatively: Exposure in µAs (0018,115 3))

or via the three attributes

- Exposure Time (0018,1150)
  (alternatively: Exposure Time in µs (0018,8150))
- X-ray Tube Current (0018,1151)
  (alternatively: X-ray Tube Current in µAs (0018,8151))
- KVP (0018,0060)

.

Independently of this, the transmission of dose data can be based on the Store Dose Information [RAD-62] transaction.

1.2.2.5 Use Case U5: Opening an image/data set (VDDS media level 5)

The user can display a specific image/data set from the PMS in the IPS.

Typical Use Case:

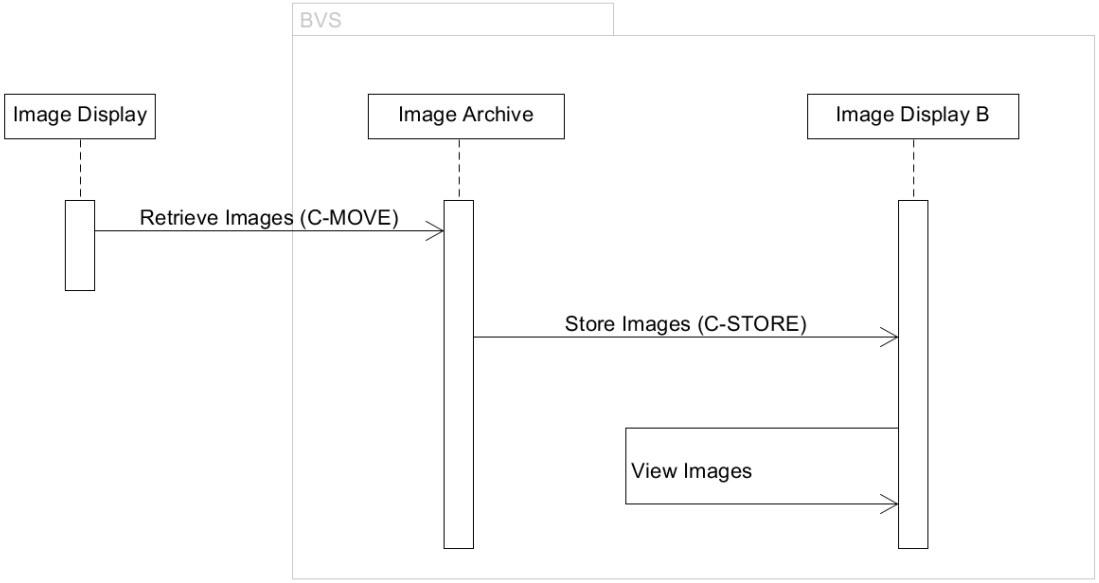
Displaying an X-ray image in the viewer of an X-ray software.

Implementation

The display of images and other DICOM objects is based on the "Retrieve Images [RAD-16]" transaction, which is specified in the following.

For the implementation, the viewer must set the System Start Option for its image display component (see 1.3.2 System Start).

The triggering application (Image Display) must use "Retrieve Images [RAD-16]" in such a way that the C-MOVE statement does not contain its own destination AET but that of the viewer (Move Destination (0000,0600)).



690 **Figure 1.2.2.5-1: Sequence diagram**

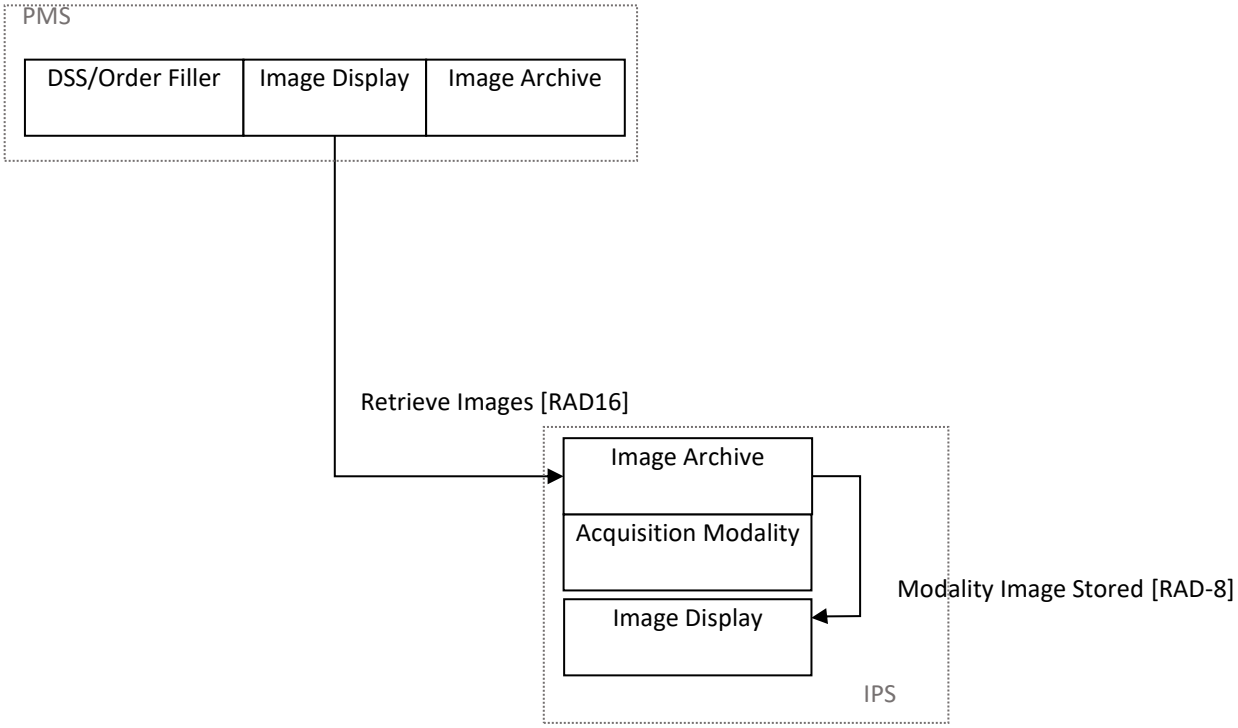


Figure 1.3.2.5-2: Actor diagram

1.2.2.6 Use Case U6: Automatic image import (VDDS media level 5)

Workflow

The IPS can send images/data sets directly to the PMS.

Typical Use Case:

Individual images are sent from IPS to other software for measurement.

Implementation

Storing images is based on the "Modality Images Stored [RAD-8]" transaction, which is 1.1.5 Supported SOP classes below.

1.2.2.6.1 Using the Store functionality for transferring images

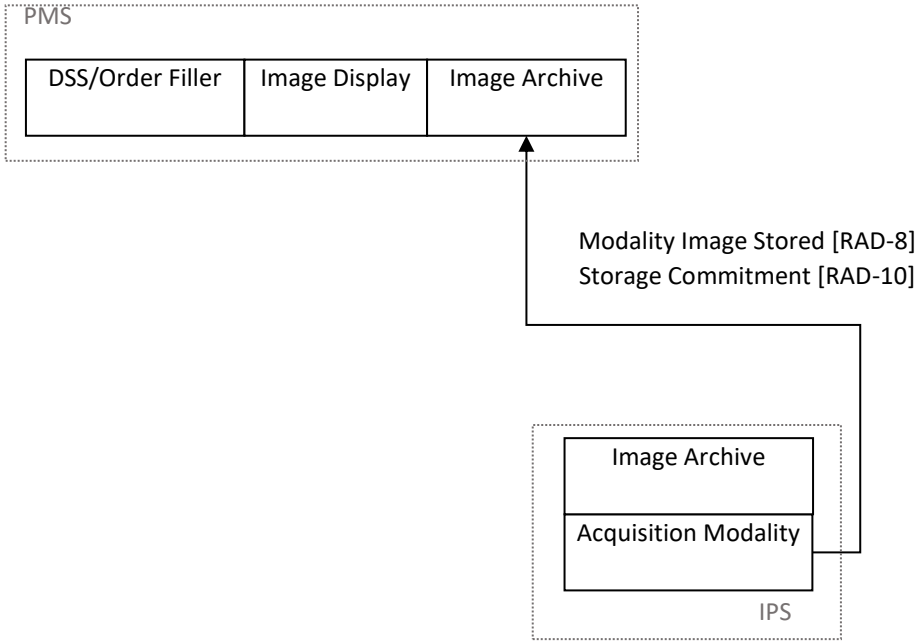


Figure 1.2.2.6.1-1: Actor diagram

1.2.2.7 Use Case U7: Prompt X-ray image

Steps:

The user (doctor) wants to X-ray the patient and then view the image. For this purpose, a PMS transfers job data to an X-ray programme (IPS 1) on another workstation (in the X-ray room), where an X-ray image is taken based on the patient and order data (by another employee of the practice). The image is then transferred (automatically) to a viewer (IPS 2), so that the user can view it promptly.

Implementation:

The Use Case can be implemented on the basis of the other Use Cases defined in the BDW.

The job data is transferred from the PMS to the IPS1 via the MWL worklist. This provides the staff in the X-ray room with all the necessary information for carrying out the imaging (see also chapter 2.2 Case studies).

Once the X-ray has been taken, there are two possibilities:

a) The PMS coordinates the workflow:

- The PMS checks whether the image is available (e.g., Query for Accession Number)
- When the image is available, it is sent via MOVE to the IPS2, which supports the "System Start" option and displays the image.

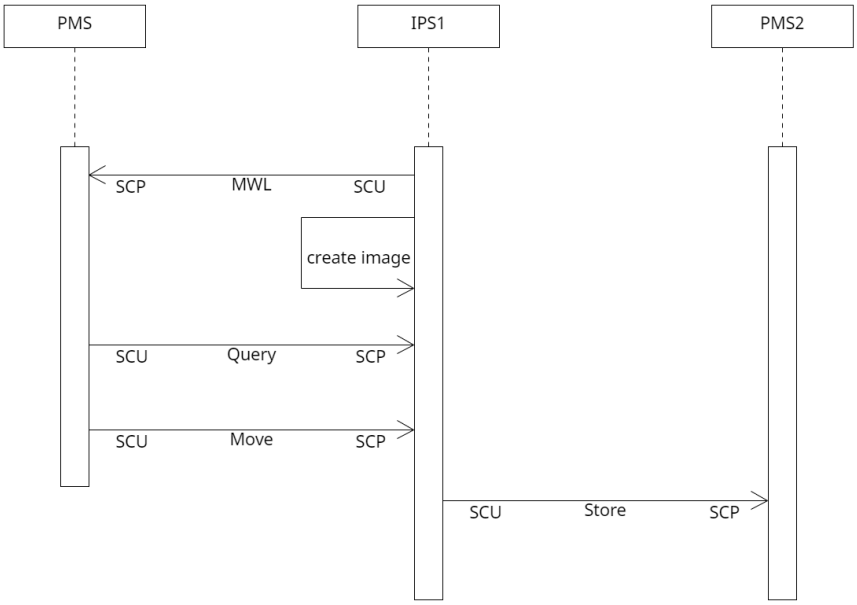


Figure 1.2.2.7-1: Sequence diagram a)

b) IPS 1 coordinates the workflow:

- The IPS1 is configured to automatically send the image (copy) directly to the IPS2, which supports the "System Start" Multi-Tenancy and displays the image

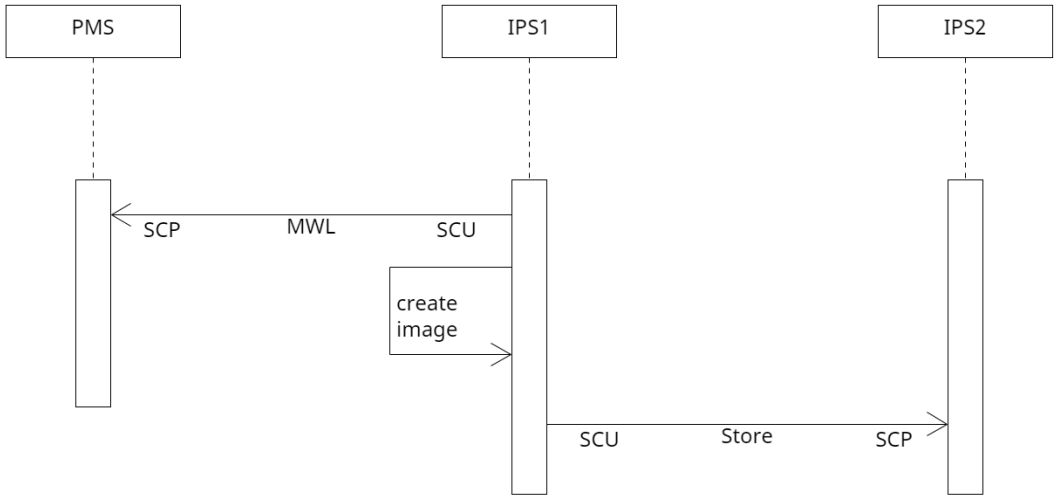


Figure 1.2.2.7-2: Sequence diagram b)

730 ### 1.2.2.7.1 Use of MWL/store functionality for timely X-rays

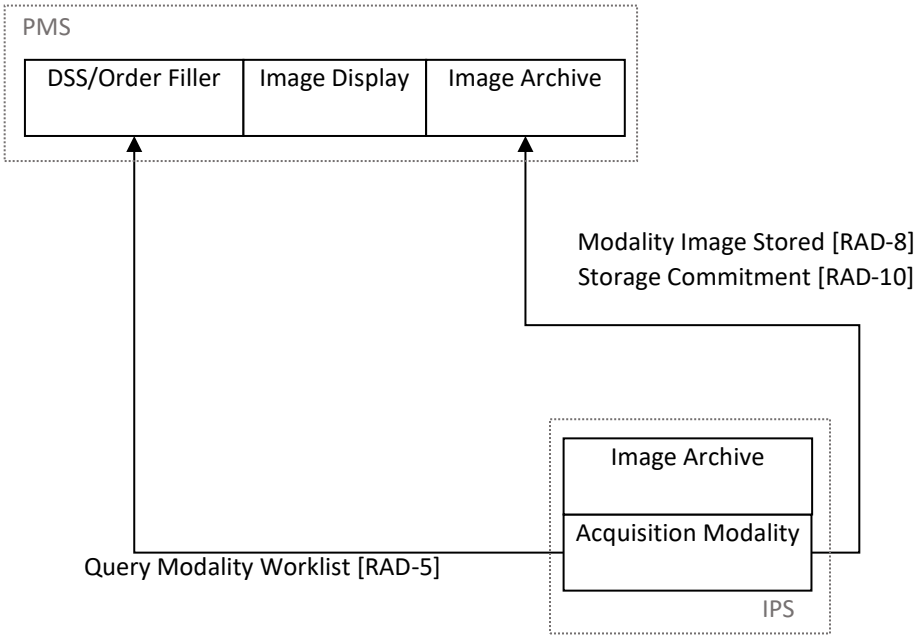


Figure 1.2.2.7.1-1: Actor diagram

1.3 Options

1.3.1 Overview of BDW options for actors

If there are options for actors, they are listed in Table 1.3.1-1.

Table 1.3.1-1: BDW - Actors and Options

Actor	Option Name	Reference
DSS/Order Filler	System Start	See chapter 1.3.2 of the BDW
	Multi-Tenancy	See chapter 1.1.1.1 of the BDW
Acquisition Modality	System Start	See chapter 1.3.2 of the BDW
	Multi-Tenancy	See chapter 1.1.1.1 of the BDW
	3D Model	See chapter 1.3.5 of the BDW
	3D Model Textured	See chapter 1.3.6 of the BDW
	Document	See chapter 1.3.7 of the BDW
	Video	See chapter 1.3.8 of the BDW
Image Display	System Start	See chapter 1.3.2 of the BDW
	Multi-Tenancy	See chapter 1.1.1.1 of the BDW
	Post Processing Pass-Through	See chapter 1.3.3 of the BDW
Image Archive	System Start	See chapter 1.3.2 of the BDW
	Multi-Tenancy	See chapter 1.1.1.1 of the BDW
	Post Processing Pass-Through	See chapter 1.3.3 of the BDW
	3D Model	See chapter 1.3.5 of the BDW
	3D Model Textured	See chapter 1.3.6 of the BDW
	Document	See chapter 1.3.7 of the BDW
	Video	See chapter 1.3.8 of the BDW
	Migration	See chapter 1.3.4 of the BDW

1.3.2 System Start

This option should make it possible to influence the system behaviour. It must be noted that the VDDS-DICOM communication is not limited to one computer as in the classic VDDS media. In addition to the action itself, it is therefore also necessary to determine the associated workstation. In a broader sense, Use Case 5 is also a type of remote control (something is to be displayed in another application).

In BDW, the system behaviour is a setting of the target system and not a specification of the third-party system.

1.3.2.1 Acquisition Modality

In order to enable the automatic start of a IPS when a "job is received", the MWL-SCU should be configurable in such a way that it continuously queries a worklist for jobs and, as soon as it receives a job, changes to a ready-to-accept state (e.g., application in the foreground, possibly

patient selected). The triggering of the examination (in the sense of the Medical Devices Act) is not automatic and is controlled by the IPS.

The start-up behaviour is to be bound to the SCP-AE Title scheduled station (0040,0001). In order to control the start behaviour via a job, the MWL-SCU must react to several AETs. One AET that triggers the start option and one AET that does not.

Moreover, the start behaviour must not be linked to other conditions, such as Requested Procedure.

1.3.2.2 Image Display/Image Archive

In order to enable the automatic start of a IPS/PMS on "image input", the Storage SCP should be configurable in such a way that it displays an image when it is received.

The start-up behaviour is to be bound to the AET. To control the start behaviour via a job, the Storage SCP must react to several AETs. One AET that triggers the start option and one AET that does not.

Moreover, the start behaviour must not be linked to other conditions, such as Requested Procedure.

1.3.3 Post Processing Pass-Through

The aim of this option is to make it possible to change an image in the source system (e.g., filter) and to make this change effective for requesting systems (changed image is transmitted). This should especially be the case if an image has been changed/filtered subsequently (after creation). The option must not have any influence on an original image.

1.3.3.1 Image Archive

Images are always returned in the last changed version with Q/R of a known Instance UID. Q/R at different times can therefore result in changed images. The original image must be retrievable from the Image Archive. It should be possible to de-/activate the option for individual AETs.

1.3.3.2 Image Display

The querying system must be able to handle changed image pixel data with the same Instance UID and perform updates if necessary (e.g., thumbnails). The images must not be passed on to systems without a Post-Processing Pass-Through Option (especially outside the institution) or stored only temporarily.

1.3.4 Migration

Many installations that will use the BDW in the future currently work on the basis of VDDS media. Therefore, this chapter deals with the conversion from VDDS media to DICOM.

The BDW does not specify to what extent a migration should or must be carried out. Switching an application between VDDS media and BDW interface is possible, but should be avoided.

Parallel operation complicates the identification of images (SOP Instance UID/ MMOID) and can result in the migration process having to be carried out several times.

DICOM Query/Retrieve of images is also possible on the basis of meta-information about an image that may be known in addition to the MMOID (patient information, image date). Retrieving images solely on the basis of the MMOID is not possible in the BDW.

However, the BDW defines a way in which data migration can be standardised between different application systems.

1.3.4.1 Exchanging identifiers

In VDDS media, MMOIDs are communicated in the communication (between IPS and PMS) for the unique identification of image data. With the conversion to DICOM, image data must be identified by DICOM identification numbers (e.g., SOP Instance UID). See also specifications for UIDs in DICOM.

In order to achieve data migration, the necessary DICOM attributes (e.g., B. SOP Instance UID) for finding and requesting must be generated by IPS in one transaction for all VDDS inventory data and reconciled across all systems involved.

Whether the IPS inserts the information mentioned here "on-the-fly" into images or performs a complete conversion of the inventory data to DICOM during the migration remains deliberately unspecified. As long as the interfaces required in the BDW are also correctly supported for inventory data, this decision lies with the manufacturer of the IPS.

If there are images in several IPS systems, several migrations must also be performed. If several IPS systems contain the same images (same MMOID), the IPS systems should exchange the newly assigned DICOM identifiers. This can be done by importing each other's migration index file.

1.3.4.2 Use case

The interfaces of a practice are converted to DICOM. This means that the inventory data are initially no longer accessible. The inventory data must be provided with new DICOM identification numbers in order to keep them accessible via DICOM Query/Retrieve. The DICOM identification numbers must be entered in all systems involved (PMS, IPS, archive, if applicable).

1.3.4.3 Workflow

The IPS generates corresponding DICOM identification numbers for each image of the inventory data and exports a corresponding index file listing the DICOM identification numbers for each MMOID. This index file is imported to the systems involved (i.e., those that retrieve/call up image data from the IPS). Thus, the DICOM identification numbers are known for all VDDS media objects.

The export/import can be triggered automatically by IPS if a MigrationExporter has been specified in the configuration file.

1.3.4.4 Index file format

The index file is saved in CSV format (UTF-8). The attribute separator is the semicolon, the line separator is the CR/LF combination. All attribute values are transmitted in double apostrophes.

The index file contains exactly one line per image object in the data stock of the exporting system. There can be several index files for several tenants (especially with the Multi-Tenancy option). This includes the following information:

Table 1.3.4.4-1: Index file

Column	Attribute	Notes	Data type
1	IPS identifier	VDDS equivalent: IPS	String
2	PRXNR	PRXNR under which the image is available. blank if PRXNR is disregarded by IPS	Int
3	MMOID	Object ID	200 alpha-numeric characters
4	Patient ID	Patient ID used by the system	DICOM-LO – Long String
5	Issuer of Patient ID	Tenant identifier	DICOM-LO – Long String
6	Study Instance UID	Newly generated by IPS	DICOM-UI
7	Series Instance UID	Newly generated by IPS	DICOM-UI
8	SOP Class UID	According to image type (CT, X-ray)	DICOM-UI
9	SOP Instance UID	Unique number generated by IPS	DICOM-UI
10	Issuer of Patient ID in the PMS	Optional entry of the PMS when importing and processing the migration file (see 1.3.4.5)	DICOM-LO – Long String
11	Patient ID in the PMS	Optional entry of the PMS when importing and processing the migration file (see 1.3.4.5)	DICOM-LO – Long String

Notes:

- Study and Series Instance UID are needed to fulfil the requirements of the DICOM standards regarding hierarchical search. Even with an IMAGE level call, the identifying information of the higher levels (here: Series and Study) are included.
- Even though the SOP Class UID can be dispensed with from the point of view of unique identification, images in DICOM are always identified by the tuple SOP Class and Instance UID.
- Each SOP Instance UID may only be used for exactly one assignment (i.e., it may only appear once in the transfer file).

1.3.4.5 Matching the tenant/patient number

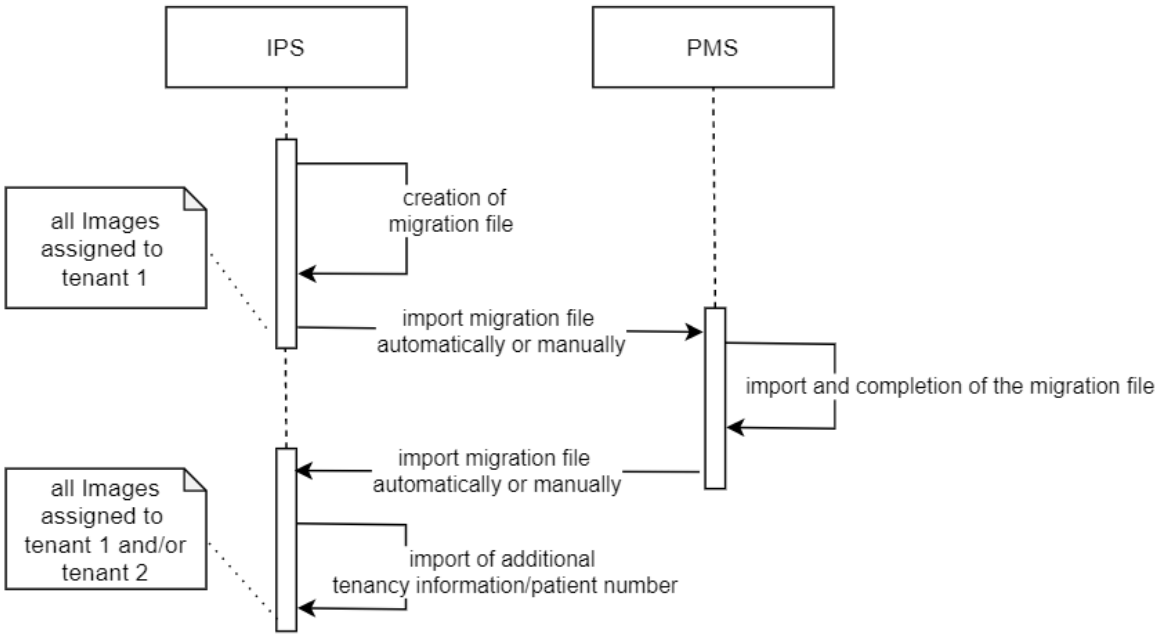
Since multi-tenant capability was never enforced by VDDS media for VDDS media, it is possible that IPS datasets exist that have none or incorrect tenant identifiers or even incorrect or deviating patient numbers. It is possible to correct this on the basis of MMOID migration.

If the PMS reads the migration file to adjust the MMOID, it can add one or two fields to the migration file in the same process.

- Issuer of Patient ID in the PMS
- Patient ID in the PMS

The tenant identifier and the real patient number are entered in the fields. Therefore, after finishing the PMS import run, there is a possibility to update the incorrect/missing information in the IPS. The IPS can now also import the migration list and update the incorrect/missing data.

Figure 1.3.4.5-1: Alignment of tenant information and patient numbers



1.3.5 3D Model

This option allows exchanging 3D model data in STL format. All SOPs mentioned for this option in chapter 1.1.5 (Supported SOP classes) must be supported by the storage SOP or it must be possible to generate them.

1.3.6 Textured 3D model

This option allows exchanging 3D model data in STL format and OBJ format. All SOPs mentioned for this option in chapter 1.1.5 (Supported SOP classes) must be supported by the storage SOP or it must be possible to generate them.

1.3.7 Document

This option allows exchanging documents in PDF format. All SOPs mentioned for this option in chapter 1.1.5 (Supported SOP classes) must be supported by the storage SOP or it must be possible to generate them.

1.3.8 Video

This option makes it possible to share videos.

For videos, the following transfer syntaxes are allowed and must be supported by the storage SCP:

- 8.2.7. MPEG-4 AVC/H.264 High Profile / Level 4.1 Video Compression
- 8.2.8. MPEG-4 AVC/H.264 High Profile / Level 4.2 Video Compression
- 8.2.10. HEVC/H.265 Main Profile / Level 5.1 Video Compression
- 8.2.11. HEVC/H.265 Main 10 Profile / Level 5.1 Video Compression

For videos, the SOP class Video Photographic Image Storage 1.2.840.10008.5.1.4.1.77.1.4.1 shall be used.

1.4 Requirements for conformity with the VDDS DICOM seal

The VDDS DICOM seal defines several levels for which the seal can be awarded. These levels also distinguish between IPS and PMS. If a system appears as both a PMS and a IPS, all corresponding requirements must be met.

The basis is a DICOM Conformance Statement. It also describes the behaviour of a software with regards to all relevant aspects.

The information on conformance with the BDW should be available in the DICOM Conformance Statement in the chapter "Overview".

For the seal, one of the 4 levels must be met.

Level 1 (MWL)

Objective: Exchange of patient/job data

- PMS: Query Modality Worklist [RAD-5] (SCP)
- IPS: Query Modality Worklist [RAD-5] (SCU)

- Mandatory for IPS and PMS: Service Availability

Level 2 (2D Push)

Objective: Exchanging patient/job data; sending the generated image to the PMS (see 1.1.5 Supported SOP classes)

- PMS:
  - All requirements of level 1
  - Modality Image Stored [RAD-8] (SCP)
    - Receives the images generated or sent automatically by the IPS
- IPS:
  - All requirements of level 1
  - Modality Image Stored [RAD-8] (SCU)
    - The created images can be sent automatically
- Mandatory for IPS and PMS: Service Availability

Level 3 (2D Query)

Objective: Exchange of patient/job data and 2D images (see 1.1.5 Supported SOP classes)

- PMS:
  - All requirements of level 2
  - Query Images [RAD-14] (SCU)
  - Retrieve Images [RAD-16] (SCU)
  - Modality Image Stored [RAD-8] (SCP)
- IPS:
  - All requirements of level 2
    - Modality Image Stored [RAD-8] (SCU)
  - Query Images [RAD-14] (SCP)
  - Retrieve Images [RAD-16] (SCP)
- Mandatory for IPS and PMS: Service Availability

Level 4 (3D Query)

Objective: Exchange of patient/job data and 2D images and 3D data (see 1.1.5 Supported SOP classes)

- PMS: All level 3 requirements for all level 4 SOPs
- IPS: All level 3 requirements for the generated level 4 SOPs

- Mandatory for IPS and PMS: Service Availability

Options

The supported options must be identified (see 1.3 Options):

- Migration
- System Start
- Post Processing Pass-Through
- Multi-Tenancy
- Document
- 3D Model
- Textured 3D Model
- Video

Sample text in a Conformance Statement:

> The product <Product name> conforms to the requirements of BDW Level <x> for <practice management systems and/or image processing systems>. Further information can be found on the VDDS homepage (www.vdds.de/).

Supported BDW-Option	Note
Migration	
System Start	
Post Processing Pass-Through	
Multi-Tenancy	
…	

For its part, the VDDS publishes a list of products that have received the VDDS seal on its homepage.

Referenced standards

- VDDS media version 1.4
- IHE IT Infrastructure Technical Framework – Revision 17.0
- IHE Radiology Technical Framework – Revision 19.0
- DICOM 2020e

Glossary

Glossary Term	Definition
IPS / BVS	Image Processing System / German: Bildverarbeitungssystem
PMS / PVS	Practice Management System / German: Praxisverwaltungssystem
IoPID	Issuer of Patient ID (0010,0021)

2 Informative part

2.1 Architecture variants

2.1.1 Centralised and distributed architecture with VDDS

The VDDS media standard 1.4 provides for both a distributed and a centralised architecture for the storage of image data.

However, the BDW profile is strongly based on the DICOM standard, which is primarily designed for a centralised architecture. Nevertheless, the BDW profile allows for both distributed and centralised structures.

Figure 2.1.1-1: Example of a classic VDDS media architecture (distributed)

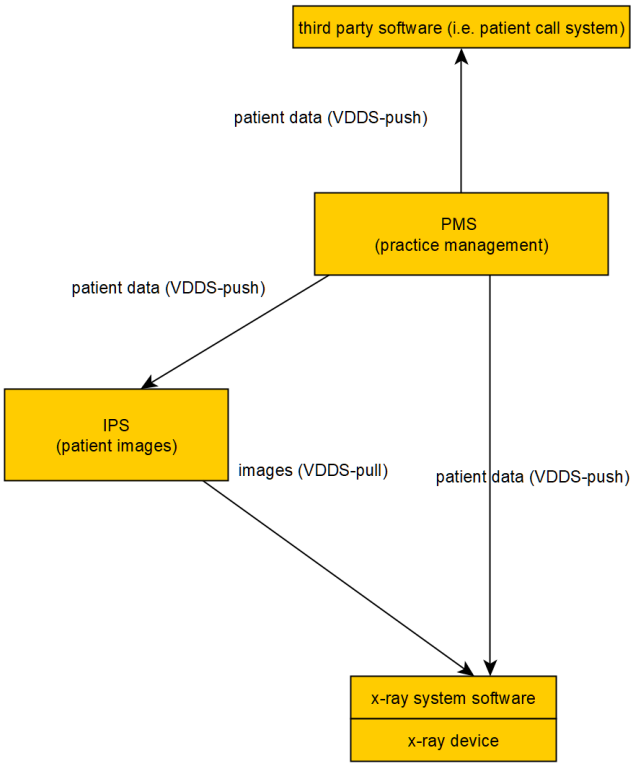
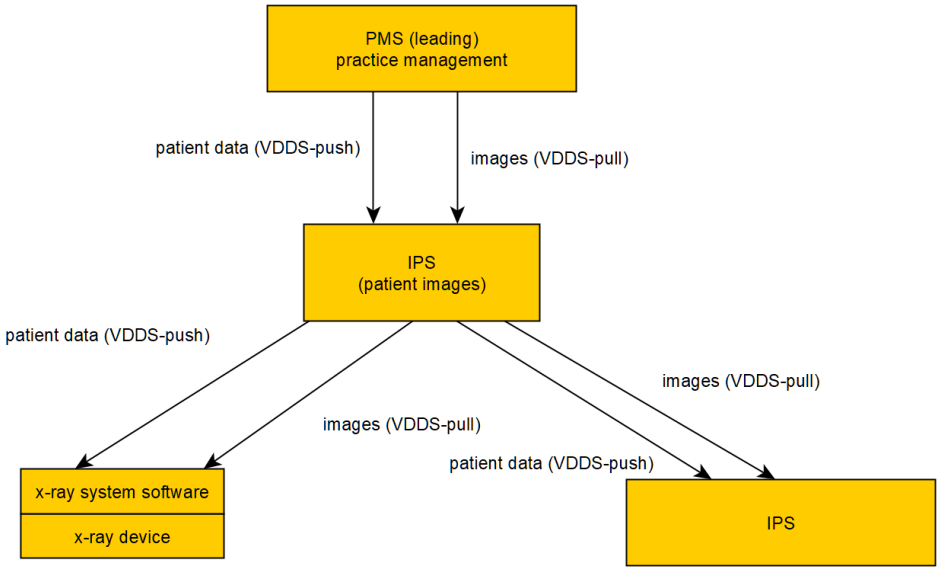


Figure 2.1.1-2: Example of a centralised VDDS media architecture

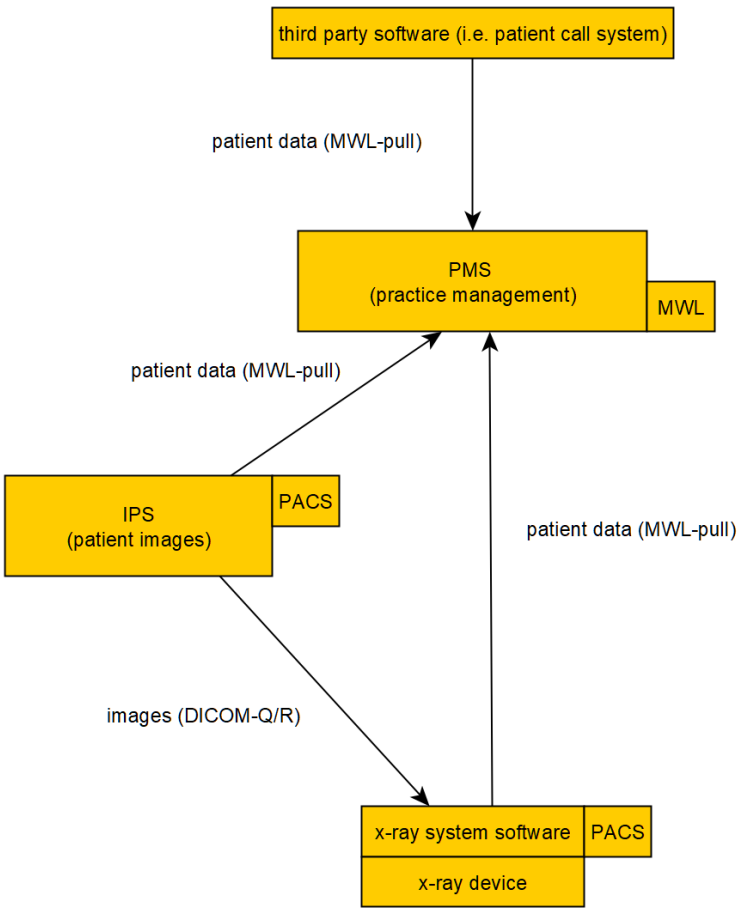


In a centralised VDDS architecture, all components must communicate via the archive (which serves as an intermediate point).

2.1.2 Distributed architecture with BDW

In the distributed BDW architecture, the DICOM services replace the respective VDDS interfaces. The communication direction changes only for the transmission of patient data/X-ray jobs (push to pull). The architecture remains the same. There are several small PACSs and possibly several MWL servers.

Figure 2.1.2-1: Example of a distributed BDW architecture



2.1.3 Centralised architecture with BDW

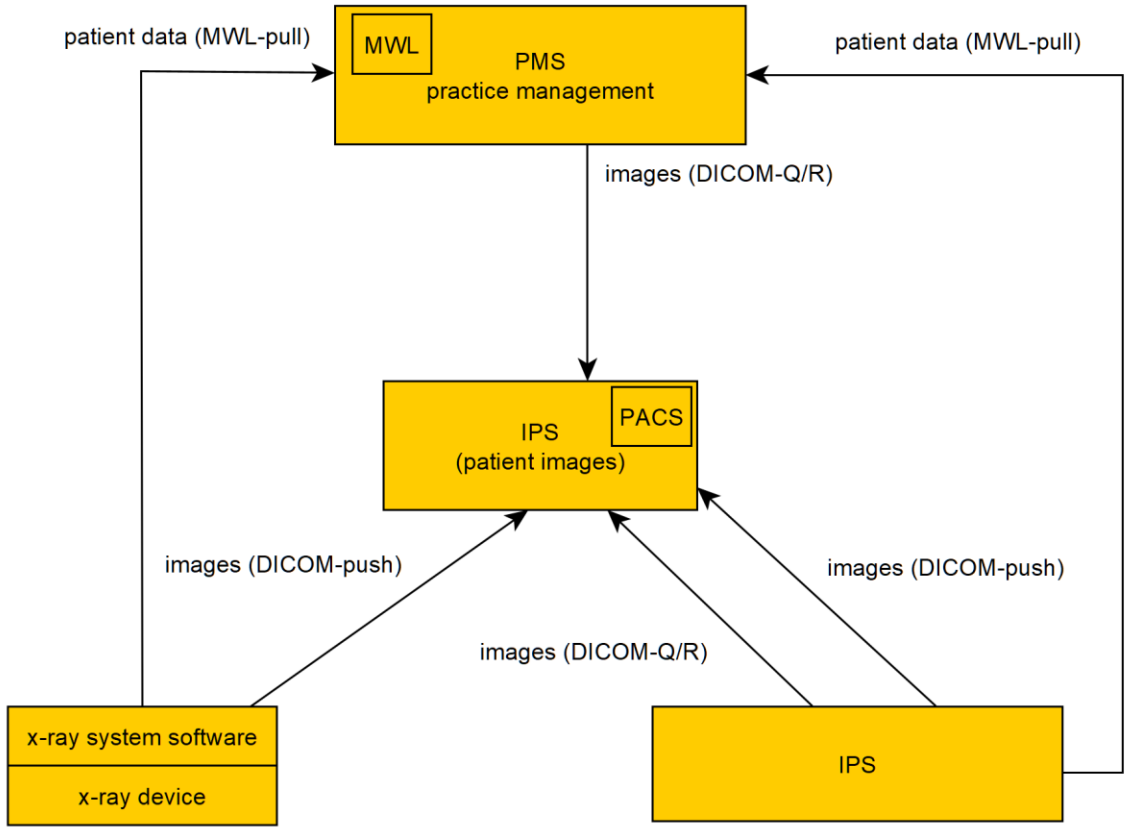
In a centralised architecture, the server components would each need to be available only once in the system. In BDW, these are the two server components, the store functionality and the worklist functionality.

The store functionality can be maintained by IPS analogous to the central VDDS media scenario. All tenants would be able to query images from this IPS and send images to this IPS.

The worklist functionality should be located at the leading PMS system, as the current patient data is available there. All tenants would be able to retrieve patient data/job data from this PMS.

If the worklist server is located elsewhere, other interfaces (HL7) would need to be used to transmit the patient data. These interfaces are not covered by the BDW but by other IHE profiles (SWF).

Figure 2.1.3-1: Example of a centralised BDW architecture



2.2 Case studies

Here, we will show by way of example how the standard procedure based on the BDW is implemented.

2.2.1 Case study: X-ray job with delayed image retrieval

2.2.1.1 Process description from the perspective of the practice staff

The dentist decides that a patient should be x-rayed. They select the patient in the PMS and create an X-ray job. The dental assistant then accompanies the patient to the X-ray room. There, the X-ray system shows the assistant which jobs are pending. The assistant selects the order for this patient. The image is created according to the specifications from the job. The dentist now has the possibility to view the image in the X-ray system (outside the BDW). Later, the dentist wants to call up the image in their PMS (e.g., to show it to the patient). To do this, they select the patient in their PMS and then start a query for images for this patient. The images available in the X-ray system are displayed. The dentist selects the relevant image and displays it in the PMS.

2.2.1.2 Implementation in the BDW

The PMS must support the Query Modality Worklist [RAD-5] transaction as SCP according to Use Case 1. The PMS creates an MWL order from the patient's data and the physician's data and adds it to the worklist.

In the X-ray room, the X-ray system (IPS) supports the Query Modality Worklist [RAD-5] transaction as SCU and thus fetches the pending jobs.

Once the image is created, it is stored by the X-ray system.

According to Use Case 3, the X-ray system supports the Query Images [RAD-14] transaction as SCP to enable search for images. This allows the IPS to send the Query Images [RAD-14] transaction as SCU requests for images to the X-ray system according to Use Case 3. Since the PMS knows information of the job (e.g., the Accession Number (0008,0050) generated by the PMS), the search can be narrowed down very precisely. If an image was found/selected, it can be retrieved from the PMS according to Use Case 4 with transaction "Retrieve Images [RAD-16]" as SCU (retrieve image = have image sent to yourself). For this, the PMS must implement Use Case 6 with transaction "modality images stored [RAD-16]" as SCP to receive the image and the IPS must implement Use Case 4 with transaction "retrieve images [RAD-16]" as SCP to send the image.

Once the image has arrived in the store service in the PMS, the image can be shown to the user.

2.2.2 Case study: X-ray job with immediate image retrieval

2.2.2.1 Process description from the perspective of the practice staff

The dentist decides that a patient should be X-rayed immediately (in the treatment room/chair). They select the patient in the PMS and create an X-ray job. The X-ray System Starts on their computer and automatically selects the patient. The image is created according to the specifications from the job. It is then automatically displayed in the PMS.

2.2.2.2 Implementation in BDW (Polling)

The PMS must support the Query Modality Worklist [RAD-5] transaction as SCP according to Use Case 1. The PMS creates a MWL order from the patient's data and the physician's data and adds it to the worklist. The AE title of the X-ray system, which identifies the X-ray system located in the treatment room, is stored in the PMS. The X-ray system recognises the job assigned to it (not yet processed) on the basis of the AE title. The X-ray system constantly checks whether there is a job in the worklist. It also implements the System Start Option (see1.3.2) and, therefore, starts the X-ray application with the job information when a new job is requested (retrieval according to Use Case 1 with the Query Modality Worklist [RAD-5] transaction as SCU).

Once the order has been transmitted, the PMS checks whether the created image is already available by searching for it.

According to Use Case 3, the X-ray system supports the Query Images [RAD-14] transaction as SCP to enable search for images. This allows the IPS to send the Query Images [RAD-14] transaction as SCU requests for images to the X-ray system according to Use Case 3. Since the PMS knows information of the job (e.g., the Accession Number (0008,0050) generated by the PMS), the search can be narrowed down very precisely. If an image was found/selected, it can be retrieved from the PMS according to Use Case 4 with transaction "Retrieve Images [RAD-16]" as SCU (retrieve image = have image sent to yourself). For this, the PMS must implement Use Case 6 with transaction "modality images stored [RAD-16]" as SCP to receive the image and the IPS must implement Use Case 4 with transaction "retrieve images [RAD-16]" as SCP to send the image.

Once the image has arrived in the store service in the PMS, the image can be shown to the user.

2.2.2.3 Implementation in BDW (without Polling)

The PMS must support the Query Modality Worklist [RAD-5] transaction as SCP according to Use Case 1. The PMS creates a MWL order from the patient's data and the physician's data and adds it to the worklist. The AE title of the X-ray system, which identifies the X-ray system located in the treatment room, is stored in the PMS. The X-ray system recognises the job assigned to it (not yet processed) on the basis of the AE title. The X-ray system constantly checks whether there is a job in the worklist. It also implements the System Start Option (see 1.3.2) and, therefore, starts the X-ray application with the job information when a new job is requested (retrieval according to Use Case 1 with the Query Modality Worklist [RAD-5] transaction as SCU).

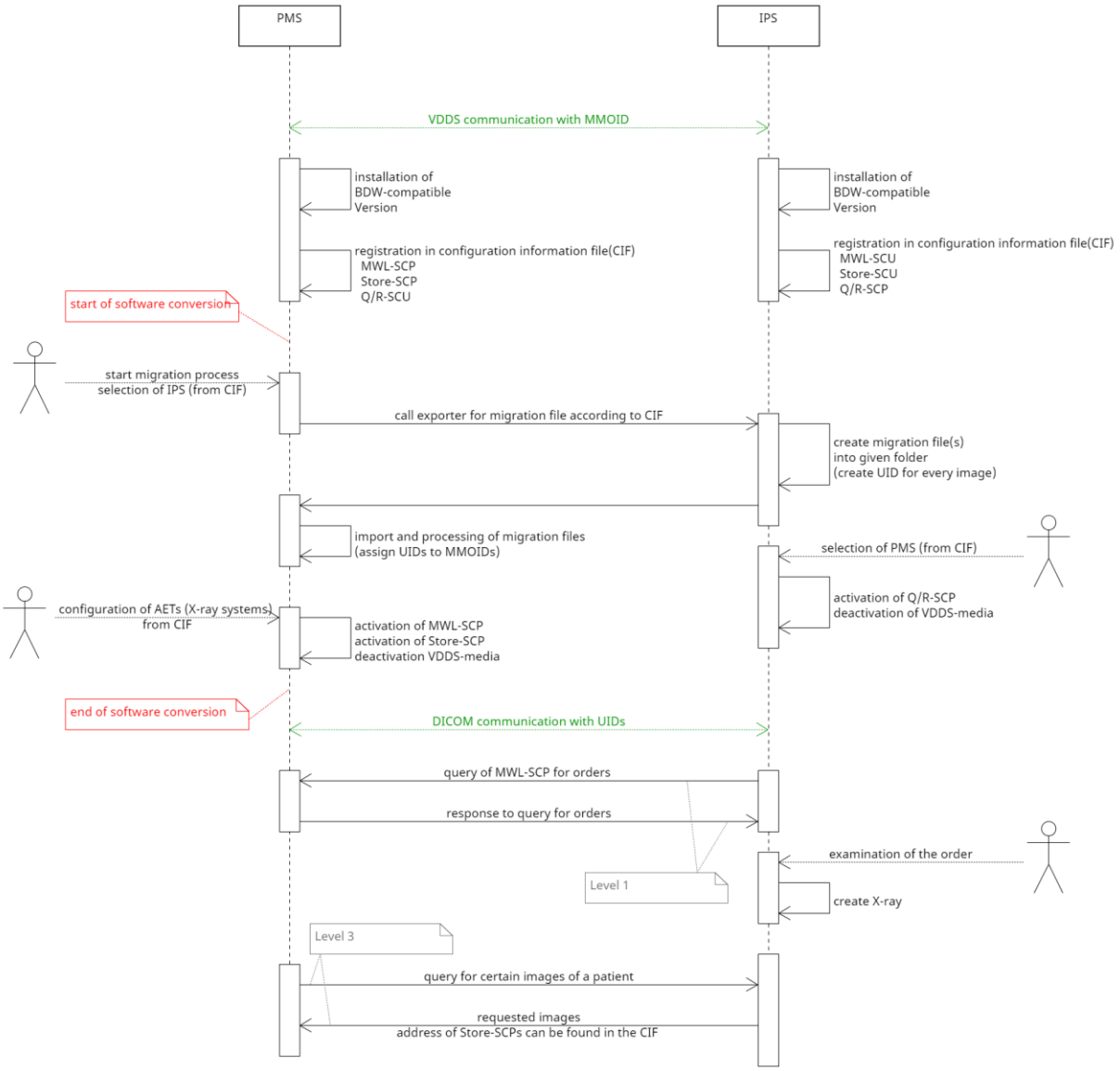
The PMS receives the image once it has been created. For this, the PMS must implement Use Case 6 with transaction "modality images stored [RAD-16]" as SCP to receive the image and the IPS must implement Use Case 4 with transaction "retrieve images [RAD-16]" as SCP to send the image. The IPS sends the image immediately after creation. Since the PMS knows information of the job (e.g., the Accession Number (0008,0050) generated by the PMS), it can assign the image to the job.

In this context, it must be clear whether the X-ray images are also held in the X-ray system or other software in addition to the PMS, or whether IPS thus becomes the owner of the "original".

2.3 Migration procedure

The following is an example of the migration procedure. One of several possible variants is shown. For example, it is not absolutely necessary that the migration file is automatically generated by calling the exporter; it can also be exported manually. The times for activating DICOM services can be freely selected. However, the sequence shown demonstrates how manual and automatic phases of the migration interlock.

Figure 2.3-1: Sample migration



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2.4 Assignment VDDS Table 3 according to DICOM

Table 1.3.2.1.3-1: VDDS attributes

VDDS attribute	Description	DICOM attribute
PVS=	Section name of the PMS sending the data (as registered in VDDS_MMI.INI)	

BVS=	Section name of the IPS that is to receive the data (as registered in VDDS_MMI.INI) (required for the archive and the direct return of image information; the PMS must also save the name of the IPS for each image information set taken over to request the image later)	Scheduled Station AE Title (0040,0001)
FROMPVS=	Section name of the PMS managing the patient if it differs from the entry PMS= (use of the ID server); in this special case the field is mandatory	
PRXNR=	Tenant number if several practices or tenants participate in the communication. In this case, the PRXNR number must be adjustable in the PMS. A IPS must always support PRXNR.	Issuer of Patient ID (0010,0021)
PATID=	Patient identification number, alphanumeric, maximum 12 digits	Patient ID (0010,0020)
INSURANCEID=	Insured person ID according to eGK (*2) If the data in the PMS come from an eGK, then mandatory field	
PATSHOWNR=	If the number offered to the practice for selecting the patient differs from the identification number, the number offered for the selection can be indicated here	Other Patient IDs Sequence
MODELLNR=	Support of the model number common in orthodontics	
DOCTOR=	Name of the main practitioner/doctor	Consulting Physician's Name (0008,009C)
LASTNAME=	Patient last name (*1)	Patient's Name (0010,0010)
FIRSTNAME=	Patient first name (*1)	Patient's Name (0010,0010)
TITLE=	Academic title of the patient (e.g., prof., dr.) (*1)	Patient's Name (0010,0010)
NAMEADDON=	Suffix (e.g., von, zu) (*1)	Patient's Name (0010,0010)
NAMEPREFIX=	Prefix (e.g., Freiherr, Baron) (*2)	Patient's Name (0010,0010)
MIDDLENAME=	This specification was included for integrating software from the Anglo-Saxon area.	Patient's Name (0010,0010)
PREFERREDNAME=	This specification was included for integrating software from the Anglo-Saxon area.	
BIRTHDAY=	Date of birth written as CCYYMMDD (*1)	Patients Birth Date (0010,0030)
SEX=	Sex: M-male, F-female (*2)	Patient's Sex (0010,0040)
SALUTATION=	Form of address: 1=Mr, 2=Mrs, 3=Miss	

STREET=	Street and building number (*1)	Patient's Address (0010,1040)
CITY=	Location (*1)	Patient's Address (0010,1040)
ZIP=	Zip code (*1)	Patient's Address (0010,1040)
COUNTRY	Country (according to the EU standard) (*2)	Country of Residence (0010,2150)
ADDRADDON=	Additional line (*2)	
EMPLOYER=	Employer	
PROFESSION=	Occupation	Occupation (0010,2180)
HOMEPHONE=	Private phone number	Patient's Telecom Information (0010,2155)
WORKPHONE=	Work phone	Patient's Telecom Information (0010,2155)
CELLULAR=	Mobile phone	Patient's Telecom Information (0010,2155)
EMAIL=	Email address	Patient's Telecom Information (0010,2155)
INSURANCESTATUS=	Insurance status: M=member, F=family insurance, R=retired, P=private	
INSURANCE=	Name of the health insurance fund	
INSURANCENUMBER=	Number of the health insurance fund	
POLICYNUMBER=	Patient's health insurance fund membership number	
MAKEMMOS=	With MAKEMMOS=1, the PMS requests the IPS to return the available image information (see PVSIMP)	
DATE=	The specification is only required if MAKEMMOS=1 and the information of the returned images is to be specified. Empty - transmit data of all images CCYYMMDD - transmit data of all images from this date SELECT - let image be selected in the IPS NEW - create new image in the IPS SELECT and NEW are only	

	possible if the IPS allows them (see VDDS_MMI.INI). For both specifications, PVSIMP=1 should always be set, since the operation of the IPS can take longer and the interface then runs into a timeout. If INFO=1, the SELECT and NEW specifications are forbidden.	
NEWTYPE=	If DATE=NEW is specified and the IPS supports the inclusion of several different image types (see SUPPORTNEWTYPE= in Table 2), then the PMS must implement the selection of the type and transmit the result of the selection here.	
PVSIMP=	The specification is only needed if MAKEMMOS=1 and the information of the returned images should run via the import module of the PMS. If this entry is not present or has the value PVSIMP=0, the IPS writes the information according to Table 6/7 directly into the file that is transferred during the call (output INI file). If PVSIMP=1, prepare a new INI file for calling the PMS image information import module according to Table 5 and then terminate the output INI file with READY=1. After that, the image information according to table 6/7 has to be written into the new INI file, and the PMS image information import module (MMOINFIMPORT in the VDDS_MMI.INI) has to be called. With PVSIMP=1, the following section must be written to the output INI file before setting READY=1: [MMOS] COUNT=0	
THUMBNAILS=	The specification is only required if MAKEMMOS=1 and thumbnails are desired. The PMS must take into account whether the IPS supports this function (SUPPORTTHUMBNAILS=1 in the IPS section). The PMS is responsible for deleting the thumbnails.	
THUMBNAILSX=	Desired maximum width of thumbnails. If not specified, the value is left to IPS.	
THUMBNAILSY=	Desired maximum height of thumbnails. If not specified, the value is left to IPS. If width and height are limited, the IPS must ensure that the height/aspect ratio of the respective image is preserved and the more limiting value is applied to the reduction.	
INFO=	If INFO=1, the IPS only takes over the data and reports back image information if requested, without activating the IPS. Otherwise, start the IPS or bring its window to the foreground and select the transferred patient.	
PROCEDURE=	The possible procedures are assigned by the IPS in the VDDS_MMI.INI (see the following) If PROCEDURE is specified, INFO=0 is required (or it can be omitted). The response to a procedure is always asynchronous via the MMO importer of the PMS or the archive (PVSIMP=1).	
PROCEDURE_MMOID=	MMOID to which the procedure refers if the procedure requires MMO data. The IPS can then retrieve this data from the corresponding IPS or from the archive.	
PROCEDURE_MMOID_BVS=	IPS that holds the image data	

	Required for the retrieval.	

2.5 Non-compliant systems

BDW is based on DICOM, but makes heavy use of the Issuer of Patient Id (0010,0021), which is optional in the DICOM standard. Since not all DICOM-compliant systems will also be BDW-compliant, it will happen that BDW-compliant applications should or must communicate with non-compliant applications. It is up to the respective applications how exactly they react in such situations. For reference, the following two graphics illustrate possible behaviours and their conformity with the BDW.

Figure 2.5-1: Possible communication during a worklist retrieval of a non-BDW-compliant IPS

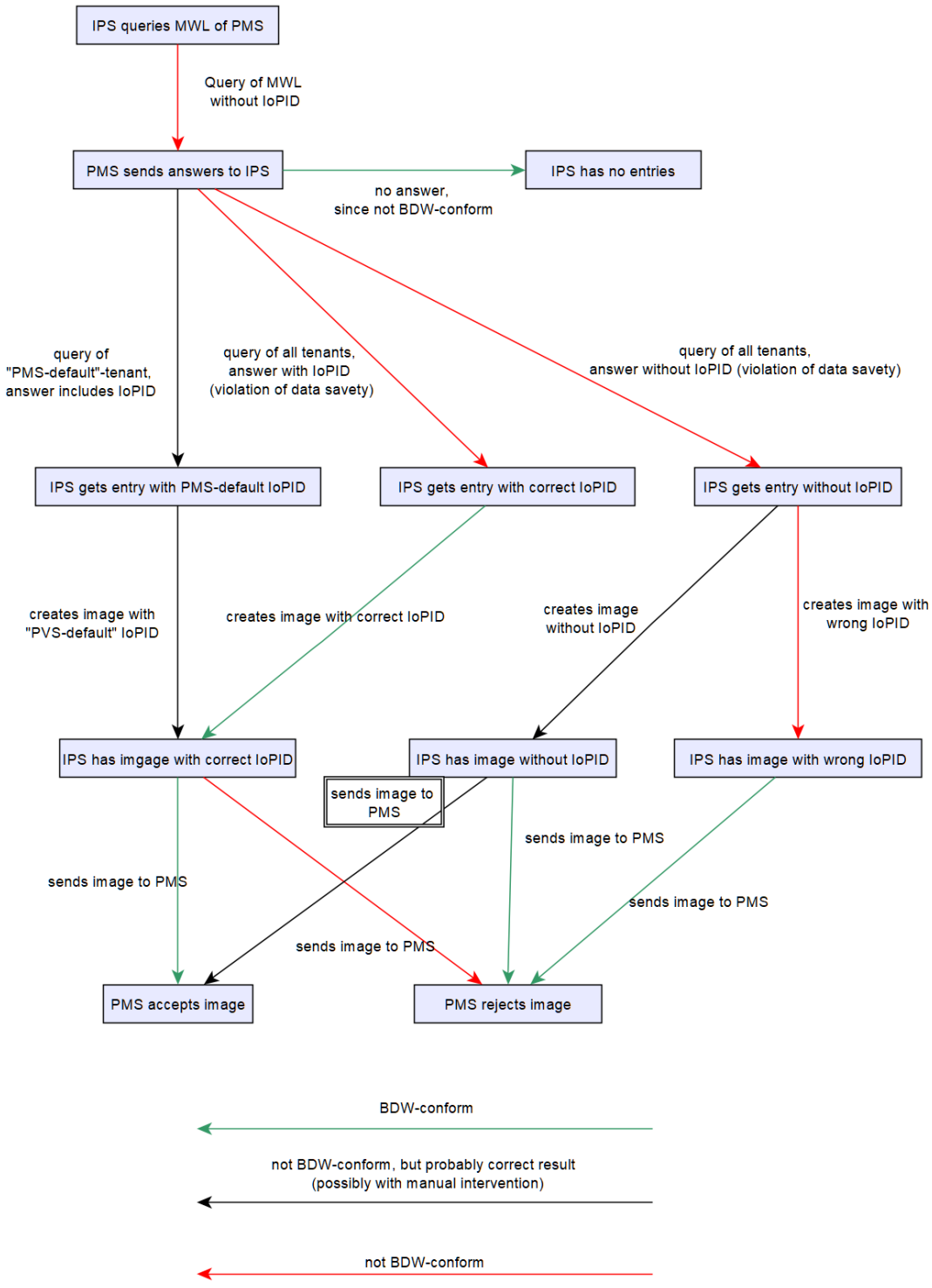

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Figure 2.5-2: Possible communication during an image retrieval of a non-BDW-compliant IPS

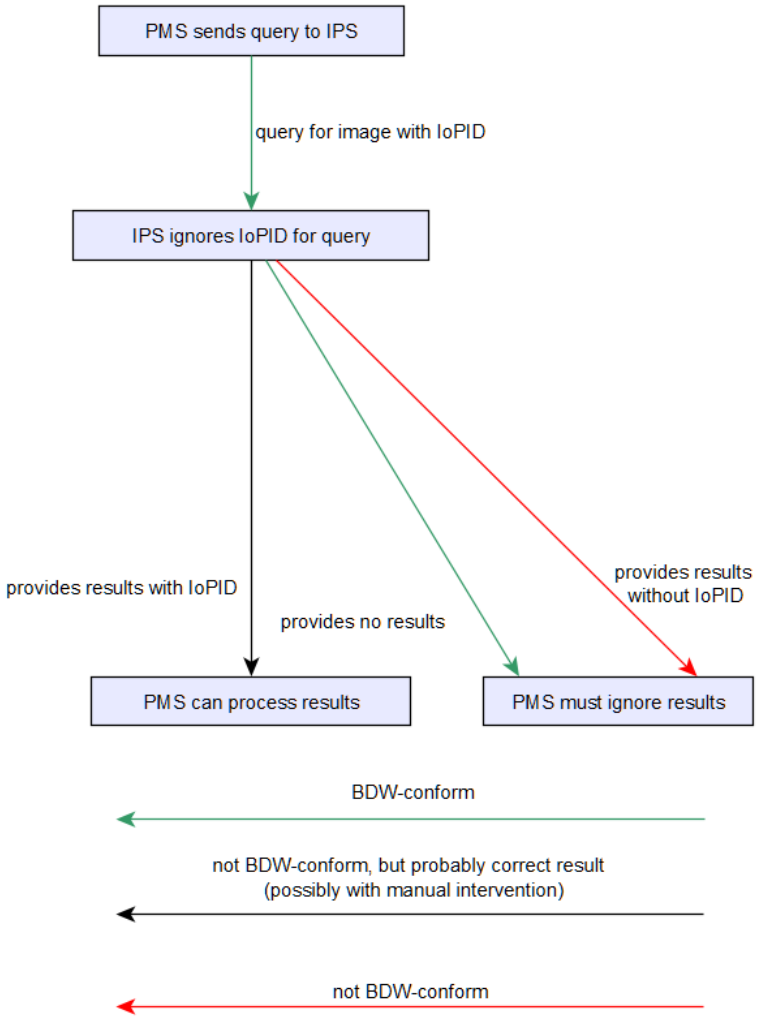

Figure 2.5-3: Possible communication during an MWL retrieval of a non-BDW-compliant IPS