

syngo.via
VA20A

SY

HL7 Conformance Statement

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1 Introduction

1.1 Purpose

This document gives a compact view to the HL7 interface provided by *syngo.via*. The HL7 interface of *syngo.via* is based on the requirements and suggestions of the IHE Framework [1], in regard to supported message types.

Hint: Messages, that do not 100% comply to the definition of IHE, but contain the minimum required information as per definition of *syngo.via*, are nevertheless processed. Please refer to Chapter 5 “Required attributes” for the list of mandatory information.

1.2 Audience

This document is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader has a working understanding of HL7 and IHE.

1.3 Definitions, Terms and Abbreviations

1.3.1 Abbreviations

HL7	Health Level Seven
IHE	Integrating the Healthcare Enterprise
ISR	Imaging Service Request
OEM	Original Equipment Manufacturer
RIS	Radiology Information System
RP	Requested Procedure
SPS	Scheduled Procedure Step

1.3.2 Definition and Terms

HL7	HL7 is a standard for information exchange between medical applications. It is an abbreviation of "Health Level Seven", 7th OSI layer protocol for the health environment. (OSI = Open Systems Interconnect, a model to describe defined layers in a network operating system). The HL7 protocol defines the format and the content of the messages that applications have to pass to one another under various conditions (e.g. to pass the message between applications / systems that a patient has been admitted in a hospital).
IHE	Integrating the Healthcare Enterprise is an initiative designed to stimulate the integration of the information systems that support modern healthcare institutions.
ISR	An Imaging Service Request includes pertinent specific and general information. Each instance of an Imaging Service Request carries the information common to one or

more Requested Procedures requested at the same moment. For further information please refer to [3].

- RP A Requested Procedure is an instance of a Procedure of a given Procedure Type. An instance of a Requested Procedure includes all of the items of information that are specified by an instance of a Procedure Plan that is selected for the Requested Procedure by the imaging service provider. For further information please refer to [3].
- SPS A Modality Scheduled Procedure Step is an arbitrarily defined scheduled unit of service, that is specified by the Procedure Plan for a Requested Procedure. A Modality Scheduled Procedure Step prescribes the Protocol which may be identified by one or more protocol codes. A Modality Scheduled Procedure Step involves equipment (e.g. imaging Modality equipment, anesthesia equipment, surgical equipment, transportation equipment), human resources, consumable supplies, location, and time (e.g. start time, stop time, duration). For further information please refer to [3].

1.4 References

- [1] IHE Radiology Framework, Vol. I – IV
- [2] HL7 Standard, chapter 2 “Control”
- [3] DICOM Standard, 2011

1.5 General information

Siemens offers advanced RIS, PACS, and Processing features for all imaging needs in radiology and cardiology:

- *syngo* Workflow drives the radiological workflow from order entry to image and report distribution.
- *syngo* Dynamics is a multi-modality, dynamic image review, diagnosis and archiving system for cardiology, general imaging and OB/GYN.
- *syngo* Imaging XS is a scalable solution that gives access to the world of digital image management.
- *syngo* Imaging is a modular, scalable PACS solution for highest customer demands with focus on workflow, speed and usability.
- *syngo.via* enables advanced visualization for routine reading, combines modalities while reading and stays ahead with lowest TCO.

syngo.via, on which this Conformance Statement focuses, provides a set of interfaces for tight integration with radiology information systems.

- An OEM interface is used to realize frontend integration (remote image callup).
- For backend communication there is a bi-directional interface available, where the HL7 interface comprises the RIS to *syngo.via* communication parts. Furthermore *syngo.via* is informed about new procedures via DICOM Modality Worklist service.

For a detailed description of RIS / PACS – *syngo.via* integration please refer to the Interoperability Database.

2 Overview

syngo.via supports the following features in regards to the HL7 communication:

- Patient Update / Merge (ADT^A08, ADT^A40 or ADT^A34)
- Report Import (ORU^R01) for the option *syngo.via* WebReport

For the definition of these interfaces, IHE was used as a basis, therefore *syngo.via* expects the Patient Update or Merge messages from the Information System to be compliant to IHE semantics. The structure of the Report Import message is aligned with the SINR profile, but other forms are also supported.

For an overview about all supported IHE actors/profiles, please have a look at the IHE Integration Statement published at www.siemens.com/ihe.

2.1 Supported Messages

The table below provides an overview about all HL7 messages that are supported by *syngo.via* as receiving application.

Message	Description	Segment Decomposition
Supported inbound messages		
ADT^A08	Patient Update	MSH, EVN, PID, [MRG], [PV1]
ADT^A40	Patient Merge	MSH, EVN, PID, [MRG], [PV1]
ADT^A34	Patient Merge – Patient ID only	MSH, EVN, PID, [MRG], [PV1]
ORU^R01	Unsolicited Transmission of an observation to be transferred to <i>syngo.via</i> WebReport	MSH, PID, OBR, {OBX}, [PV1]

Table 1: Overview of supported messages

2.2 ACK / NACK behavior

If a message is sent to *syngo.via* which is not supported (e.g. ORU) or a mandatory attribute is missing (e.g. Patient Name), *syngo.via* nevertheless replies with an HL7 ACK in order to avoid blocking the connection. The message is stored within the backlog of the HL7 gateway. (see *Table 10* for a list of required attributes which are expected by *syngo.via*)

3 Implementation Details

3.1 HL7 Version

Generally *syngo.via* will expect HL7 version 2.3.1 as this version is required by IHE Radiology Framework. But messages based on version 2.4 and 2.5 will also be processed.

3.2 Configuration

3.2.1 Minimal Layer Protocol (MLP)

The *syngo.via* HL7/XML interface uses HL7's Minimal Layer Protocol (MLP) protocol over TCP/IP to receive and send messages. Briefly, message body is encoded using transaction framing with 0xB start and 0x1C+0xD end.

TXS	TX Body											TXE	
0xB	A	B	C	D	E	...						0x1C	0xD

Figure 1: Encoding message using MLP

Such encoded transactions are then sent to (or received from) a TCP/IP port at the *syngo.via* HL7/XML interface.

3.2.2 Sending HL7 Messages to *syngo.via*

MLP encoded HL7 messages have to be sent to the port 9973 at the *syngo.via* HL7/XML interface. No additional configuration needs to be done on the *syngo.via* HL7/XML interface if the port is 9973. Note that the TCP/IP connection is permanent and the interface port is blocked as long as the IS is connected to it (dedicated connection).

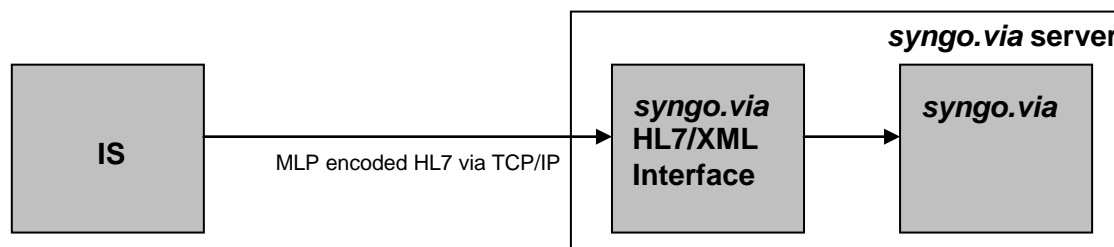


Figure 2: Sending HL7 to *syngo.via* HL7/XML interface

3.2.3 Sending HL7 Messages out of syngo.via

MLP encoded HL7 messages are sent to the receiving port of the Information System. This port needs to be configured within the *syngo.via* HL7/XML interface. Additionally to the Port configuration the IP address of the receiving system needs to be set on the *syngo.via* HL7/XML interface. Note that the TCP/IP connection is permanent and the interface port is blocked as long as the IS is connected to it (dedicated connection).

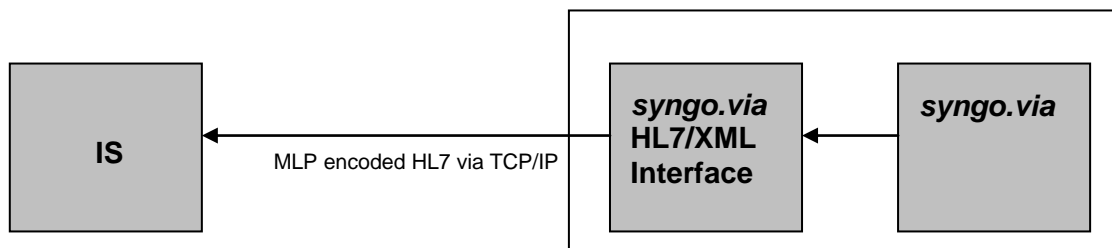


Figure 3: Sending HL7 out of *syngo.via*

3.3 Restrictions

Exactly one IS instance can connect to the HL7 interface provided by *syngo.via*.

3.4 Finding matches

If objects are either created or updated at the RIS, *syngo.via* tries to find a matching existing patient and Requested Procedure (RP). If it finds either of that, it performs an update rather than creating a new record.

To match a patient, a configurable combination of the following fields is used.

- Patient ID (PID-3.1) (*mandatory*)
- Assigning Authority (PID-3.4)
- Patient Name (PID-5)
- Patient Date of Birth (PID-7)

The patient is by default identified through Patient ID and Assigning Authority/Issuer of Patient ID. If the latter is not set and no default value is set for Assigning Authority/Issuer of Patient ID the above mentioned configuration is applied for patient identification.

4 Inbound

4.1 Patient Update / Merge

The Patient information Update and Patient Merge messages trigger changes to patient information, including demographics, patient identification, patient location/class changes, and patient merges. These changes may occur at any time for a patient record. These messages are used for both inpatients (i.e., those who are assigned a bed at the facility) and outpatients (i.e., those who are not assigned a bed at the facility) if the patient has been previously registered.

4.1.1 Patient Information Update – ADT^A08

Changes to patient demographics and account information (e.g. change in patient name, patient address, etc.) shall trigger an ADT^A08 Update Patient message.

The table below indicates the message semantics of the ADT^A08 message:

ADT^A08	Patient Administration Message	Chapter in HL7 v2.3.1
MSH	Message Header	2
EVN	Event Type	3
PID	Patient Identification	3
PV1	Patient Visit	3
[[OBX]]	Observation/results	7
[[AL1]]	Allergy	3

Table 2: Message semantics of ADT^A08 according to IHE

syngo.via tries to find the patient and

- erases values of attributes where the message contains a null value (two adjacent quotation marks "")
- ignores empty attributes
- updates the below specified attributes (with a non-null value)

Attribute	DICOM Tag Number	Part of DICOM Module	DICOM Value Representation	HL7
Patients Name*	(0010,0010)	Patient Identification / Patient	PN	ADT PID:5
Patients Sex	(0010,0040)		CS	ADT PID:8
Patients BirthDate	(0010,0030)		DA	ADT PID:7
Patients BirthTime	(0010,0032)		TM	ADT PID:7
Other Patient Names	(0010,1001)		PN (VM 1-n)	ADT PID:9
Ethnic Group	(0010,2160)		SH	ADT PID:10
Allergies	(0010,2110)	Patient Medical	LO	ADT AL1:3

Table 3: attributes to be updated by a received ADT^A08 message

* Patient Name is expected in DICOM format.

If the patient is not found, syngo.via stores the update information. Imaging data which enters the system afterwards and match the patient demographics within the update message, gets updated while receiving/importing.

Note: this patient update message can be used to update only non-key attributes. To change a key attribute, a "Patient Merge – ADT^A40" or a "Patient Merge (Patient ID Only) – ADT^A34" message has to be issued by the sending application.

4.1.2 Patient Merge – ADT^A40

A Patient Merge triggered by an ADT^A40 message indicates that a merge has been done at the internal identifier level. That is, PID-3-patient ID identifier has been merged with MRG-1 Patient ID.

Note: Be aware that the RIS has to send all the attributes which are configured in syngo.via to identify a patient in order to merge the patient.

The table below indicates the message semantics of the ADT^A40 message:

ADT^A40	Patient Administration Message	Chapter in HL7 v2.3.1
MSH	Message Header	2
EVN	Event Type	3
PID	Patient Identification	3
MRG	Merge Information	3
[PV1]	Patient Visit	3

Table 4: Message semantics of ADT^A40 according to IHE

There are two use cases for the patient merge message:

1. **Merging of two patient object branches into a single one**

In this case the PID and MRG segments represent two existing patients in the database. After finding the target patient and merge patient (MRG segment), all RPs from the merge patient are moved to the target patient. See *Table 6* for an explanation which attributes are changed in this case.

2. **Update patient's key attributes**

the target patient (PID segment) is not found. Only the merge patient (MRG segment) exists. A new patient is created with the key attributes from PID segment and all other fields are populated from the existing merge patient in database. All RPs from the merge patient are moved to the new patient. See *Table 5* for an explanation which Patient's key attributes are changed in this case.

Patients get identified by a configurable combination of fields. The MRG segment only provides the patient name and patient id. Therefore, the *syngo.via* can only process the message in case the merge patient gets identified unambiguously using these fields.

If the patient with the correct patient identification does not exist, *syngo.via* modifies only the patient identification attributes:

Attribute	Tag Number	Part of DICOM Module	Value Representation	HL7
Patients Name	(0010,0010)	Patient Identification / Patient	PN	ADT PID:5
Patient ID	(0010,0020)		LO	ADT PID:3
Issuer Of Patient ID	(0010,0021)		LO	ADT PID:3

Table 5: attributes which get updated based on Patient Merge

If the patient with the correct patient identification already exists, *syngo.via* copies the following attributes from that patient:

Attribute	DICOM Tag Number	Part of DICOM Module	DICOM Value Representation	HL7
Patients Name	(0010,0010)	Patient Identification / Patient	PN	ADT PID:5
Patient ID	(0010,0020)		LO	ADT PID:3
Issuer Of Patient ID	(0010,0021)		LO	ADT PID:3
Other Patient IDs	(0010,1000)		LO (VM 1-n)	ADT PID:3
Other Patient Names	(0010,1001)		PN (VM 1-n)	ADT PID:9
Patients Birth Date	(0010,0030)		DA	ADT PID:7

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Patients Birth Time	(0010,0032)	TM	ADT PID:7
Patients Sex	(0010,0040)	CS	ADT PID:8
Ethnic Group	(0010,2160)	SH	ADT PID:10

Table 6: attributes which get updated during Patient Merge

4.1.3 Patient Merge (Patient ID Only) – ADT^A34

Although IHE specifies, that the ADT^A40 message shall be used for Patient Merge messages, several older systems still use the ADT^A34 ("Merge patient information - patient ID only") message for this purpose.

The difference between the ADT^A40 and the older ADT^A34 is, that the A40 deals with the Patient Identifier List, whereas the ADT^A34 only supports the Patient ID.

syngo.via also supports the ADT^A34 message in order to enhance the interoperability to older RIS as those systems more often support the retired ADT^A34 and do not support the ADT^A40.

The table below indicates the message semantics of the ADT^A34 message:

ADT^A34	ADT Message	Chapter
MSH	Message Header	2
EVN	Event Type	3
PID	Patient Identification	3
[PD1]	Patient Additional Demographic	3
MRG	Merge Information	3

Table 7: Message semantics of ADT^A34

Hint: syngo.via treats and analyzes the ADT^A34 in the same way as the ADT1^A40.

4.2 Report Import

The ORU message is used for receiving results from other systems and forwarding these results to syngo.via WebReport. With the OBX and the OBR segments, one can construct almost any clinical report as a three-level hierarchy, with the Patient Context within the PID segment at the upper level, an order record within the OBR segment at the next level and one or more observation records within the OBX at the bottom.

4.2.1 Unsolicited Report – ORU^R01

ORU^R01	Unsolicited Observation Message	Segment used within syngo.via ORU msg	Chapter
MSH	Message Header	Yes	2
{ [PID	Patient Identification	Yes	3
[PD1]	Additional Demographics	No	3
[[NK1]]	Next of Kin/Associated Parties	No	3
[[NTE]]	Notes and Comments	No	2
[PV1	Patient Visit	No	3
[PV2]]]	Patient Visit - Additional Info	No	3
{[ORC]	Order common	No	4
OBR	Observations Report ID	Yes	7
{[NTE]}	Notes and comments	No	2
[CTD]	Contact Data	No	11
{ [OBX]	Observation/Result	Yes	7
{[NTE]}}	Notes and comments	No	2
[[FT1]]	Financial Transaction	No	6
{[CTI]}}	Clinical Trial Identification	No	7
[DSC]	Continuation Pointer	No	2

Table 8: General message semantics of ORU^R01

4.2.1.1 Identifying Information

The table below indicates the message semantics of the ORU^R01 message:

Attribute	DICOM Tag Number	Part of DICOM Module	DICOM Value Representation	HL7
Patients Name*	(0010,0010)	Patient Identification / Patient	PN	ORU PID:5
Patient ID	(0010,0020)		LO	ORU PID:3
Patients BirthDate	(0010,0030)		DA	ORU PID:7
Patients Sex	(0010,0040)		CS	ORU PID:8
Accession Number	(0008,0050)	Imaging Service Request	SH	ORU OBR:3
Procedure Description	(0032,1060)	Requested Procedure Module	LO	ORU OBR:4

Table 9: attributes used to identify the patient the report belongs to by a received ORU^R01 message

4.2.1.1.1 Result Status

The result status (OBR-25) attribute is aggregated across all available OBX-11 segments. In case multiple OBX-11 segments are available, all of those need to be filled with

- F (meaning: "Final: The report has been finalized in the IS)

in order for the report to be treated as finalized by *syngo.via* WebReport.

4.2.1.1.2 Report Content

The report in plain text format is conveyed within the OBX2-5 Observation Value.

Information about the observation date will be read from OBR-7 Observation Date/Time. It is assumed that this value correlates with the DICOM Study Date (0008,0020). The report date will be read from OBR-22 Results rpt/status chng - date/time. The reason for study will be read from OBR-31.2 and the reading radiologist will be taken from OBR-32 Principal Result Interpreter.

4.2.1.1.3 Example Report

MSH|^~\&|RAD|BMH|||301203140327||ORU^R01|RMS|P|2.3.1|<x0D>
PID|1||000999888777|001010126512|LASTNAME1 MIDDLENAM^FIRST^^^|<x0D>
OBR||00003^001|36494140|ULT4476814 ^OB LIMITED FOR VIABL SNGL OR MUL||2
01003150319|||||||^^^ |067900^DOCTORLN1^FIRSTNM^^^^MD|||||3012031403
27||F|1^^^^^S^^STAT||||^OB US TO RULE IN PREGNANCY|000000&UNASSIGNED&
DOCTOR&&&&|<x0D>

OBX|5|TX|36494140&BODY||***** FINAL *****~REASON FOR EXAM: OB US TO
RULE IN PREGNANCY~DIAGNOSIS: . .~COMMENTS: OB US TO RULE IN PREGNANCY
~ACC#: 12341234~PROCEDURE: ULT 9876- OB LIMITED FOR VIABL SNGL OR MUL - Jul
11 2009 ~*** Anywhere Memorial Hospital ~1234 South Sealevel Blvd., Whitest
Beach, TX 12345 Phone: (123) 456-7890 ~Ext 9999 ~-----
-----~Pat. Name: LASTNAME1 MIDDLENAM, FIRST Study Date: 07/11/2009
3:21am~Pat. No: 999888777 Referring MD: DOCTORLN1, FIRS
TNM~LMP: Unknown Sonographer: SMITHY~NA by US: 08.9 weeks
DOB, Age: 05/05/1990, 19~ GA Selected: 08.9 weeks ~(Sonographic)~
EDD: 10/18/2010~-----
~MEASUREMENTS \T\ FETAL AGE FETAL GROWTH
EVALUATION~Measurement GA Range Source % for 08.9 Ratios~-----
-----~Sac 3.6 cm 08.7 wk (07.8-09.6) Hellman Sac 38%~CRL
2.5 cm 09.2 wk (08.5-09.9) Hadlock CRL 65%~GA for sonogram 08.9 wk (08
.1-09.8)~based on (Sac,CRL) Avg ~-----
-----~CLINICAL SUMMARY~Fetus Number:single~Fetal Heart Rate: 170 bpm~Yolk Sac
seen:yes~Ovaries: wnl~Fibroid seen:NONE~IMPRESSION:~ RADIOLOGIST DICTATED
REPORT: \E\ ~DOCTOR UNASSIGNED~~~Report Dictated by DOCTOR UNASSIGNED on: Jul
11 2009 3:23A~Transcribed by: on Jul 11 2009 3:23A~|||||F|<x0D>

Report in plain text

5 Required attributes

Following fields are required by *syngo.via*.

The attributes marked as required are checked when ADT or ORU messages enter the system and if not present or exceeding the acceptable length, they are stored within the backlog of the HL7/XML interface of *syngo.via*.

5.1 ADT

HL7	Meaning	Required
MSH-07	Date/Time Of Message	
MSH-09	Message Type	Yes
MSH-10	Message Control ID	
MSH-12	Version ID	Yes
PID-03.01	Patient Identifier List / ID	Yes (max. 64 char)
PID-04	Alternate Patient ID	
PID-05	Patient Name	Yes (max. 64 char)
PID-07	Date Of Birth	
PID-08	Administrative Sex	
PID-09	Patient Alias	
PID-18.01	Patient Account Number / ID	
PID-18.04	Patient Account Number / Assigning Authority	
MRG-01.01	Prior Patient Identifier List	Yes (max. 64 char)
MRG-04.01	Prior Patient ID	
MRG-07	Prior Patient Name	
PV1-02	Patient Class	
PV1-03	Assigned Patient Location	
PV1-06	Prior Patient Location	
PV1-08	Referring Doctor	
PV1-15	Ambulatory Status	
PV1-19	Visit Number	
PV1-21	Charge Price Indicator	
PV1-44	Admit Date and Time	
PV1-45	Discharge Date and Time	

Table 10: required fields of ADT messages

5.2 ORU

HL7	Meaning	Required
MSH-07	Date/Time Of Message	
MSH-09	Message Type	Yes
MSH-10	Message Control ID	
MSH-12	Version ID	Yes
PID-03.01	Patient Identifier List / ID	Yes (max. 64 char)
PID-04	Alternate Patient ID	
PID-05	Patient Name	Yes (max. 64 char)
PID-07	Date Of Birth	
PID-08	Administrative Sex	
OBR-03.01	Filler Order Number	Yes (max. 16 char)
OBR-04	Universal Service ID	
OBR-07	Observation Date/Time	Strongly Recommended
OBR-22	Results rpt/status chng - date/time	Strongly Recommended
OBR-25	Result Status	Yes
OBR-31.2	Reason For Study	Strongly Recommended
OBR-32	Principal Result Interpreter	Strongly Recommended
OBX-02	Value Type	Yes
OBX-05	Observation Value	Yes (max. 655236* ¹)
OBX-11	Observation Result Status	Yes

Table 11: required fields of ORU (Report Import) messages

¹ The length of the observation value field is variable, depending upon value type. See *OBX-2-value type*.

6 Open Issues

N/A