



# Cleome HL7 Interface Specification

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Version 13.5 SP1

**Synaptive Medical  
MaRS Discovery District  
101 College Street, Suite 200  
Toronto, ON M5G 1L7  
Canada**

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## Interface Specification Overview

### Overview

The ClearCanvas Cleome is a Picture Archiving and Communication system used in medical imaging. It is composed of the following components:

- ClearCanvas ImageServer: A DICOM image management server
- ClearCanvas Workstation: A diagnostic medical imaging workstation
- ClearCanvas IntegrationServer: A server for processing HL7 messages and distributing them to other components
- ClearCanvas WebPortal: A referring physician's portal
- ClearCanvas CleomeCast: An HTML5 medical imaging viewer

The IntegrationServer processes HL7 messages, and relays actions to Cleome components. This document details the HL7 messages processed by the IntegrationServer and how it integrates with the other Cleome components.

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## Introduction

### Revision History

Document Version	Date of Issue	Author	Description
1.0	January 11, 2014	Steve Wranovsky	Initial version for Cleome 11.0.
2.0	July 30, 2014	Steve Wranovsky	Updated to include order processing in Cleome 13.0.
3.0	May 1, 2015	Steve Wranovsky	Updated to include changes in Cleome 13.5.
3.1	July 3, 2015	Jasper Yeh	Updated for Version 13.5 SP1

### Audience

This document is intended for people who need to integrate Cleome into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as those who need to have a detailed understanding of the HL7 features of the product. It is assumed that readers have a working knowledge of HL7.

### Remarks

This document is the HL7 Interface Specification for Cleome. This document should be read and understood in conjunction with the HL7 standard. Readers thus need a working knowledge of HL7. Note that HL7, by itself, does not guarantee interoperability. However, this Interface Specification facilitates a first level validation for interoperability between different applications supporting the same HL7 functionality.

### Communication Interface

The HL7 Standard recommends the Minimal Lower Layer Protocol (MLLP) for communication between HL7 systems. For this purpose, the HL7 Interface of Cleome provides unidirectional TCP/IP socket interface. The Lower Layer Protocol defined by the HL7 Standard is implemented as follows:

- Message Start Character: 0x0B
- Segment End Character: 0x0D
- Message Stop Characters: 0x1C and 0x0D
- Character Encoding: UTF-8

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## Functional Overview

### General

#### IntegrationServer

The IntegrationServer supplies a mechanism for processing HL7 message that is shared by the Cleome components. The functionality includes:

- Reception of incoming HL7 messages
- Queuing and processing of HL7 messages including error handling during processing.
- Trigger actions in other Cleome components based on the received HL7 messages.
- The ability to reprocess received messages.

#### Patient Information Reconciliation

Cleome will process incoming patient update and merge messages. The patient reconciliation functionality includes:

- Updating ImageServer studies and orders with new patient demographics based on a matching Patient ID.
- Merging patients by updating the Patient ID of matching DICOM studies and orders to a new Patient ID.

#### Incoming Reports

Cleome can accept, store, and display reports that match specific studies. The reports functionality includes:

- Reception of incoming HL7 ORU^R01 message containing reports
- Matching reports to existing studies.
- Creating a DICOM Encapsulated PDF version of the report and storing on the ImageServer which can be viewed in the ClearCanvas Webstation and ClearCanvas Workstation.

#### Order Management

Cleome can accept and update orders. The order management functionality includes:

- Reception of incoming HL7 ORM^001 order messages.
- Storing orders on the ImageServer and updating the status of the orders.
- Matching incoming orders to existing studies stored on the ImageServer.

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## Message Descriptions

### Overview

Cleome is able to handle a subset of ADT messages for performing patient updates and merges. Additionally, ORU messages containing reports are processed and imported.

### Supported HL7 Versions

The Cleome HL7 interface has been primarily tested with HL7 Version 2.5.1. It will also accept messages encoded as:

- HL7 Version 2.5.1
- HL7 Version 2.4
- HL7 Version 2.3.1

### Supported HL7 Messages

The Cleome HL7 interface supports the reception and processing of several message types:

- ADT^A08 – Update Patient Information
- ADT^A40 – Merge Patient
- ORU^R01 – Observation report – unsolicited
- ORM^O01 – Order Message

Note that Cleome IntegrationServer will accept other HL7 message types and acknowledge them, but will ignore them.

## ADT Messages

### General Purpose ADT Processing

The Cleome IntegrationServer will only process ADT^A08 and ADT^A40 messages. Any other ADT messages it will return an error status when received.

### ADT^A08 – Update Patient Information

This message type is used to update demographic information for a specific patient. The Cleome IntegrationServer will send a command to the ImageServer to have it update the Patient's Name, Patient Sex, and Patient's Birth Date field for all studies that match based on the Patient ID.

### Segment Specification

The following table lists the expected segments within the ADT^A08 message processed by Cleome. All other segments listed in the HL7 Standard for ADT^A08 messages are ignored by Cleome.

<b>ADT A08</b>	<b>Patient Administration Message</b>
<b>MSH</b>	Message Header
<b>PID</b>	Patient Identification

The following sections describe the fields within each of the segments that are accessed by Cleome to perform the patient update.

**MSH – Message Header Segment**

SEQ	LEN	DT	OPT	Element Name	Description
1	1	ST	R	Field Separator	' ' is the expected value
2	4	ST	R	Encoding Characters	'^~\&' is the expected value
3	227	HD	0	Sending Application	Used in acknowledgement message
4	227	HD	0	Sending Facility	Used in acknowledgement message
5	227	HD	0	Receiving Application	Used in acknowledgement message
6	227	HD	0	Receiving Facility	Used in acknowledgement message
7	26	TS	R	Date/Time of Message	Used in acknowledgement message
8	40	ST	0	Security	Used in acknowledgement message
9	15	MSG	R	Message Type	'ADT^A08^ADT_A01' is the required value
10	20	ST	R	Message Control ID	Used in acknowledgement message
11	3	PT	R	Processing ID	Used in acknowledgement message
12	60	VID	R	Version ID	Expecting '2.5.1'

**PID – Patient Identification Segment**

SEQ	LEN	DT	OPT	Element Name	Description
1	4	SI	0	Set ID – PID	
2	20	CX	B	Patient ID	
3	250	CX	R	Patient Identifier List	The Patient ID to identify the patient to update. The Assigning Authority is also



					<p>accessed from this field.          Expecting a value such as '1234^HOS' where 1234 is the patient identifier and HOS is the assigning authority for the identifier.          Note: If this field contains more than one identifier, only the first one is used.</p>
5	250	XPN	R	Patient Name	Patient's Name to update to.
7	26	TS	0	Date/Time of Birth	Patient's Birthdate to update to.
8	1	IS	0	Administrative Sex	The Patient Sex

### ADT^A40 – Merge Patient Information

An A40 event is used to signal a merge of records for a patient that was incorrectly filed under two different identifiers. The Cleome IntegrationServer will send a command to the ImageServer to have it update any studies or order for the Prior Patient ID to the new Patient ID.

#### Segment Specification

The following table lists the expected segments within the ADT^A40 message processed by Cleome. All other segments listed in the HL7 Standard for ADT^A40 messages are ignored by Cleome.

ADT A40	Merge Patient Information
<b>MSH</b>	Message Header
<b>PID</b>	Patient Identification
<b>MRG</b>	Merge Information

The following sections describe the fields within each of the segments that are accessed by Cleome to perform the patient merge.

#### MSH – Message Header Segment

SEQ	LEN	DT	OPT	Element Name	Description
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1	1	ST	R	Field Separator	' ' is the expected value
2	4	ST	R	Encoding Characters	'^~\&' is the expected value
3	227	HD	O	Sending Application	Used in acknowledgement message
4	227	HD	O	Sending Facility	Used in acknowledgement message
5	227	HD	O	Receiving Application	Used in acknowledgement message
6	227	HD	O	Receiving Facility	Used in acknowledgement message
7	26	TS	R	Date/Time of Message	Used in acknowledgement message
8	40	ST	O	Security	Used in acknowledgement message
9	15	MSG	R	Message Type	'ADT^A40^ADT_A39' is the required value
10	20	ST	R	Message Control ID	Used in acknowledgement message
11	3	PT	R	Processing ID	Used in acknowledgement message
12	60	VID	R	Version ID	Expecting '2.5.1'
13	15	NM	O	Sequence Number	Sequence of messages

**PID – Patient Identification Segment**

SEQ	LEN	DT	OPT	Element Name	Description
1	4	SI	O	Set ID – PID	
3	250	CX	R	Patient Identifier List	The Patient ID to update matching studies to. The Assigning Authority is also accessed from this field and is used as the Issuer of Patient Id field. Note: If this field contains more than one identifier, only the first one is used.

**MRG – Merge Patient Information Segment**

SEQ	LEN	DT	OPT	Element Name	Description
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1	250	CX	R	Prior Patient Identifier List	The Prior Patient ID to merge the patient from. Matching studies are searched for based on this Patient ID on the ImageServer. The Assigning Authority is also read from this field and passed to the ImageServer.
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## ORU Messages

### ORU^R01

The HL7 ORU message is for transmitting an observational report for a specific study to other systems.

#### Segment Specification

The following table lists the expected segments within the ORU^R01 message processed by Cleome. All other segments listed in the HL7 Standard for ORU^R01 messages are ignored by Cleome.

ORU R01	Merge Patient Information
<b>MSH</b>	Message Header
<b>PID</b>	Patient Identification
<b>PV1</b>	Patient Visit Information
<b>OBR</b>	Observation Request
<b>OBX</b>	Observation related to OBR
<b>ZDS</b>	Z Segment

The following sections describe the fields within each of the segments that are accessed by Cleome to create the report.

#### MSH – Message Header Segment

SEQ	LEN	DT	OPT	Element Name	Description
1	1	ST	R	Field Separator	' ' is the expected value
2	4	ST	R	Encoding Characters	'^~\&' is the expected value
3	227	HD	O	Sending Application	Used in acknowledgement

					message
4	227	HD	O	Sending Facility	Used in acknowledgement message
5	227	HD	O	Receiving Application	Used in acknowledgement message
6	227	HD	O	Receiving Facility	Used in acknowledgement message
7	26	TS	R	Date/Time of Message	Used in acknowledgement message
8	40	ST	O	Security	Used in acknowledgement message
9	15	MSG	R	Message Type	'ORU^R01' is the expected value
10	20	ST	R	Message Control ID	Used in acknowledgement message
11	3	PT	R	Processing ID	Used in acknowledgement message
12	60	VID	R	Version ID	'2.5.1' is the expected value

**PID – Patient Identification Segment**

SEQ	LEN	DT	OPT	Element Name	Description
3	250	CX	R	Patient Identifier List	The Patient ID to identify the patient. The Assigning Authority is also accessed from this field. Note: If this field contains more than one identifier, only the first one is used.
5	250	XPN	R	Patient Name	Patient's Name
11	250	XAD	O	Patient Address	When present, the patient address can be accessed in the report template.

**PV1 – Patient Visit Segment**

SEQ	LEN	DT	OPT	Element Name	Description
8	250	XCN	O	Referring Doctor	Maps to the DICOM Referring Physician's Name, used in the report

template.
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**OBR – Observations Request Segment**

SEQ	LEN	DT	OPT	Element Name	Description
1	4	SI	O	Set ID – OBR	
2	22	EI	C	Placer Order Number	Available for use in the report template.
3	22	EI	C	Filler Order Number	Checked for matches with the DICOM Accession Number.
4	250	CE	R	Universal Service Identifier	The Requested Procedure associated with the report.
7	26	TS	C	Observation Date/Time	The Date/Time of the report.
16	250	XCN	O	Ordering Provider	Ordering Physician’s Name
18	60	ST	O	Placer Field 1	Checked for matches with the DICOM Accession Number.
31	250	CE	O	Reason for Study	
32	200	NDL	O	Principal Result Interpreter	

**OBX – Observation related to OBR Segment**

SEQ	LEN	DT	OPT	Element Name	Description
2	2	ID	C	Value Type	Specifies the formatting of the Observation Value field.
3	250	CE	R	Observation Identifier	
5	99999	Varies	C	Observation Value	Repeating segments are supported.
11	1	ID	R	Observation Result Status	

**ZDS – Z Segment**

SEQ	LEN	DT	OPT	Element Name	Description
1	64		O	Study Instance UID	

**IPC – Imaging Procedure Control Segment**

SEQ	LEN	DT	OPT	Element Name	Description
3	64	EI	0	Study Instance UID	

**Notes**

When processing a report, the Cleome IntegrationServer will perform a number of queries against the ImageServer until it finds a matching study. The first queries will be done by attempting to find a matching Study Instance UID. Subsequent queries will be done attempting to find a matching Accession Number. The following fields are used in the ORU^R01 message to search the ImageServer for a matching study based on Study Instance UID:

- Study Instance UID (ZDS Segment, Field 1-1)
- Study Instance UID (IPC Segment, Field 3-1)

Note that both of these fields are not defined in HL7 for a standard ORU^R01. These fields are at least checked for in the message, however, to find a match.

The following fields are then searched in the ImageServer for a match to an existing Accession Number on a study:

- Placer field 1 (OBR Segment Field 18-1)
- Placer Order Number (OBR Segment, Field 2-1)
- Filler Order Number (OBR Segment, Field 3-1)

If a matching study is found, a message is sent to the ImageServer to create a report associated with the study. If a match is not found, the action of the IntegrationServer is configuration dependent. It may fail or mark as processed the ORU message.

**ORM Messages**

**ORM^O01**

The HL7 ORM message is for transmitting order information.

**Segment Specification**

The following table lists the expected segments within the ORM^O01 message processed by Cleome. All other segments listed in the HL7 Standard for ORM^O01 messages are ignored by Cleome.

<b>ORM 001</b>	<b>Order Message</b>
<b>MSH</b>	Message Header
<b>PID</b>	Patient Identification

<b>PV1</b>	Patient Visit Information
<b>ORC</b>	Order Common
<b>OBR</b>	Observation Request

The following sections describe the fields within each of the segments that are accessed by Cleome when processing the order.

**MSH – Message Header Segment**

SEQ	LEN	DT	OPT	Element Name	Description
1	1	ST	R	Field Separator	' ' is the expected value
2	4	ST	R	Encoding Characters	'^~\&' is the expected value
3	227	HD	O	Sending Application	Used in acknowledgement message
4	227	HD	O	Sending Facility	Used in acknowledgement message
5	227	HD	O	Receiving Application	Used in acknowledgement message
6	227	HD	O	Receiving Facility	Used in acknowledgement message
7	26	TS	R	Date/Time of Message	Used in acknowledgement message
8	40	ST	O	Security	Used in acknowledgement message
9	15	MSG	R	Message Type	'ORM^001' is the required value
10	20	ST	R	Message Control ID	Used in acknowledgement message
11	3	PT	R	Processing ID	Used in acknowledgement message
12	60	VID	R	Version ID	Expecting '2.5.1'
13	15	NM	O	Sequence Number	Sequence of messages

**PID – Patient Identification Segment**

SEQ	LEN	DT	OPT	Element Name	Description
3	250	CX	R	Patient Identifier List	The Patient ID to identify the patient (3-1). The Assigning Authority (3-2) is also accessed from this

					field. Note: If this field contains more than one identifier, only the first one is used.
5	250	XPN	R	Patient Name	Patient's Name. Family, Given, and Middle name are read from this field.
11	250	XAD	O	Patient Address	Address values are parsed, but they are not used at this point

**PV1 – Patient Visit Segment**

SEQ	LEN	DT	OPT	Element Name	Description
2	1	IS	R	Patient Class	Parsed and passed to the ImageServer.
3	80	PL	O	Assigned Patient Location	Point of care is taken from PV1-3-1, Room is taken from PV1-3-2, and Bed is taken from PV1-3-3
8	250	XCN	O	Referring Doctor	Maps to the DICOM Referring Physician's Name, associated with the order. The value is optional.

**ORC – Common Order Segment**

SEQ	LEN	DT	OPT	Element Name	Description
1	2	ID	R	Set ID – OBR	Order Control values of NW, SN, SC, CA, OC, and DC expected. If one of these status values is not used and Order Status has no value, the Order Control is defaulted to "NW".
2	22	EI	C	Placer Order Number	
3	22	EI	C	Filler Order Number	Used to match with the DICOM Accession Number for studies on the



					ImageServer
5	2	ID	O	Order Status	Order status of CM, DC, or IP expected when the Order Control value is SC. When no value is included for Order Control, this value is also checked for a value of CM, DC, or IP.
7	200	TQ	B	Quality/Timing	Priority of the order is taken from ORC-7-6.
10	250	XCN	O	Entered By	Saved as the Entered By Staff.

**OBR – Observations Request Segment**

SEQ	LEN	DT	OPT	Element Name	Description
1	4	SI	O	Set ID – OBR	
4	250	CE	R	Universal Service identifier	Treated as the Requested Procedure Code. OBR-4-2-1 is used to look for matching values for studies that are intended for Quality Control (QC).
7	26	TS	C	Observation Date/Time	The Date/Time of the report.
16	250	XCN	O	Ordering Provider	Ordering Physician’s Name
27	200	TQ	B	Quality/Timing	Priority for the Order is taken from OBR-27-6-1.
31	250	CE	O	Reason for Study	Reason for the study
36	26	TS	O	Scheduled Date / Time	The scheduled date/time for the order.

**Notes**

When processing an order, the Cleome IntegrationServer will forward all orders received to the Cleome ImageServer. The ImageServer will match orders to studies based on the following fields:

- Patient Identifier (PID Segment, field 3-1))
- Accession Number (ORC Segment, field 3-1)

Note that the Accession Number is the Filler Order Number.

The Cleome ImageServer can tag orders that are intended for Quality Control (QC). Orders intended for QC are determined by the value of the field:

- Universal Service Identifier (OBR Segment, Field 4-2)

A series of text strings can be configured in a setting that is used to look for matches to the procedure.