18821 Bardeen Ave. Irvine, CA 92612
Phone: 800.800.8600 Fax: 949.752.7317

Candelis, Inc.

ImageGrid HL7 Conformance Statement

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INTRODUCTION

ImageGrid System and the HL7 Standard

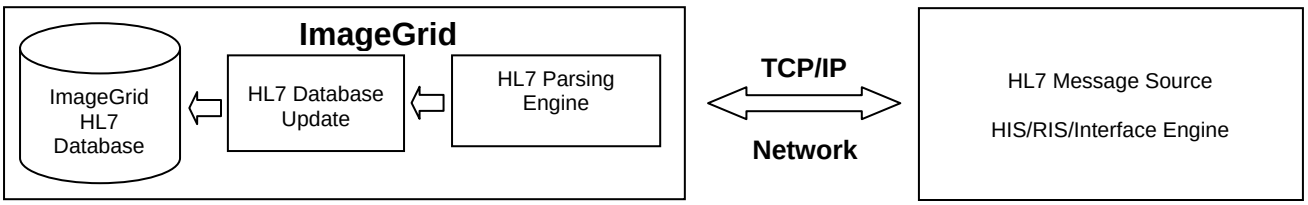
The ImageGrid is a medical image and information distribution product designed for integration into a medical institution's existing healthcare Information Systems (IS) structure. The product utilizes the medical industry standard HL7 2.3.1 messaging protocol to exchange information with other HL7 compliant applications such as Hospital Information Systems (HIS) and Radiology Information Systems (RIS) on the IS network. The primary use of the HL7 protocol in this setting is to import patient demographics, visits, orders, and transcribed results into the ImageGrid product.

1. Implementation Model

The IMAGEGRID system consists of the server and its client components. With respect to HL7 the server receives HL7 inbound messages from external sources such as HIS's and RIS's and performs rules-based insertion of data into the ImageGrid database. The stored data are later used in the ImageGrid product to reconcile differences that may occur between HIS/RIS derived data and modality derived data. The model ImageGrid implementation uses the TCP/IP communications protocol inbound; ImageGrid database insertion is accomplished using proprietary object method calls. An integration application on the ImageGrid server performs the HL7 to method calls, returns HL7 acknowledgements, and logs all transactions and error messages.

1.1 Application Data Flow Diagram

After the ImageGrid server platform has been properly installed, configured, and launched a port is opened to "listen" for source HL7 messages. At the same time the HL7 message logging, parsing, and ImageGrid database insertion processes are initialized.



The ImageGrid server process and its integration component operate as linux Daemons, therefore when operating system has been started, the ImageGrid HL7 integration component and connections activate automatically. There are no user serviceable configurations. ImageGrid Customer Care personnel will perform HL7 changes that are required for message control characters, IP address, port, and custom data mappings (if needed).

1.2 Sequencing of Real-World Activities

It is assumed that patient demographics and visit information will be transported via HL7 ADT events. Order and result information will be imported via HL7 ORM and ORU events respectively. It is assumed that the general sequence of HL7 events for patients will be ADT, ORM, and ORU. However, the ImageGrid interface accommodates overlapping or redundant functions within messages. For example, order messages can establish new patients, visits, and providers in the ImageGrid clinical database as well as add an order. Patient demographics are established by the first HL7 message that is received and updated with subsequent ADT messages.

2. Message Specifications

The ImageGrid HL7 message processing facility supports the message types, trigger events, segments, and fields shown in the tables below and the requirements for each. In addition, information about mapped ImageGrid and corresponding DICOM data elements is included.

2.1 Code Tables

2.1.1 Code Table Notes

The following code tables show abbreviations that are unique to this document as well as HL7 or proprietary codes that are likely to appear or are required in messages.

Code Type	Sub-Type	Code	Description	Meaning/Comment
Patient Status		C	Clinic	
Patient Status		D	Discharged	
Patient Status		E	Emergency	
Patient Status		I	Inpatient	
Patient Status		O	Outpatient	

Code Type	Sub-Type	Code	Description	Meaning/Comment
Exam Status		S	Scheduled	An exam has been scheduled but not yet begun. This is the default code when none is received in an order (ORM) message.
Exam Status		I	In Progress	The exam is in progress; the patient has arrived and the exam has begun.
Exam Status		C	Completed	The exam is complete and is pending a diagnostic report.
Exam Status		D	Dictated	A report has been dictated for the exam through a dictation system; but has not been transcribed.
Exam Status		P	Preliminary	The diagnostic report hs been transcribed for the exam. This is the default code when none is received in a results (ORU) message.
Exam Status		F	Finalized	The diagnostic report has been signed
Exam Status		A	Addendum	An addendum has been received and the report needs to be finalized again.

Code Type	Sub-Type	Code	Description	Meaning/Comment
Data Requirement		R	Required for ImageGrid	Element or attribute must be present; data must be provided in this position
Data Requirement		C	Conditional for ImageGrid	Element or attribute must be present under

Code Type	Sub-Type	Code	Description	Meaning/Comment
				Some circumstances; data must be provided to enable specified software functions.
Data Requirement		O	Optional for ImageGrid	Supported but not required; data will be imported to ImageGrid if provided in the message.

Code Type	Sub-Type	Code	Description	Meaning/Comment
Sex		M	Male	
Sex		F	Female	
Sex		U	Unknown	

Code Type	Sub-Type	Code	Description	Meaning/Comment
Message Encapsulation- Start Character		<11>	Hex 0b; Vertical Tab	The ImageGrid interface can read this character when presented as shown or as a non- printable character..
Segment End Character		<13>	Hex 0d; Carriage Return	The ImageGrid interface can read this character when presented as shown or as a non- printable character..
Message Encapsulation- End Character		<28><13>	Hex 1c; File Separator and Hex 0d; Carriage Return	The ImageGrid interface can read this character when presented as shown or as a non-printable character.. Also note that the final set of characters in a message would be <13><28><13> as a result of terminating the last segment as well as terminating the message.

2.2 MESSAGE TYPES/EVENTS SUPPORTED

ImageGrid Server supports the following HL7 message types and events. When unrecognized message types/events are sent the message will be logged by the ImageGrid message processing facility and a simple Ack will be returned. HL7 messages are recognized by the combination of supported message start and termination characters, and a valid MSH segment.

Message Type Trigger		Definition	Comments
ADT_A01		Admit a patient.	This event can be used to record a new visit; not limited to inpatients. May be used for inpatients or outpatients. See Patient Status codes and segment PVI-2
ADT_A02		Transfer a patient	
ADT_A08		Update patient	
ORM_O01		Order message	Order control codes NW, SC, and OC
ORU_R01		Unsolicited result	Results are sent to the target application without a query or request (unsolicited).

2.3 SEGMENTS SUPPORTED

Note: Unsupported segments will be ignored. Not all SEQ's/fields are supported for segments below. Please see segment tables.

Segment	Req			Comments
MSH	R			
MSA	C			Returned by ImageGrid in all Ack messages
PID	R			
PV1	C			Required for ADT messages
PV2	O			
PD1	O			
OBR	C			Required for all ORM (orders) and all ORU (results)
ORC	C			Required for all ORM (orders)
OBX	C			Required for all ORU (results)

2.3.1 SEGMENT: MSH (Message Header Segment)

SEQ	Len	Rep	Req	Element Name	ImageGrid Name	Comments
1	1	N	R	Field Separator	Field Separator	|
2	4	N	R	Encoding Characters	Encoding characters	Values are: ^~/&. These characters cannot appear as data in any part of the message.
3	180	N	R	Sending Application	Sending Application	Returned in Ack
4	180	N	R	Sending Facility	Sending Facility	Returned in Ack
7	26	N	R	Date/Time of Message	Date/Time of Message	Returned in Ack
9	7	N	R	Message Type	Message Type	Required to identify message; returned in
10	20	N	R	Message Control ID	Message Control ID	Returned in Ack

2.3.2 SEGMENT: MSA (Message Acknowledgement Segment)

Note: This is not a customer requirement; statement of ImageGrid functionality

SEQ	Len	Rep	Req	Element Name	ImageGrid Name	Comments
1			R	Acknowledgment Code	Acknowledgment Code	'AA' is returned in the Ack messages.
2			R	Message Control ID	Message Control ID	Taken from MSH-10
3				Text Message	Text Message	Null: customer can request a note
4				Expected Sequence Number	Expected Sequence Number	Null
5				Delayed Acknowledgment Type	Delayed Acknowledgment Type	Null
6				Error Condition	Error Condition	Null

2.3.3 SEGMENT: PID (Patient Identification Segment)

SEQ	Len	Rep	Req	Element Name	ImageGrid Name	Comments
2	20	N	O	Patient ID	MPI Number	Equates to DICOM (0010, 0021)
3^1	20	N	R	Patient Identifier List	MRN	Used for primary patient matching. Equates to DICOM (0010, 0020)
3^6	10	N	O		Organization Code; /Visit Organization	Or ImageGrid if null;
4	20	N	O	Alternate Patient ID	Department Number	Used for secondary patient matching
5^1	35	N	R	Patient Name	Last Name	Used for secondary patient matching. Equates to DICOM (0010, 0010)
5^2	35	N	R		First Name	Used for secondary patient matching. Equates to DICOM (0010, 0010)
5^3	35	N	O		Middle Name	Used for secondary matching. Equates to DICOM (0010, 0010)
5^4	5	N	O		Suffix Name	
5^5	5	N	O		Prefix Name	

SEQ	Len	Rep	Req	Element Name	ImageGrid Name	Comments
5^6	20	N	O		Title Name	
6	35	N	O	Mother's Maiden Name	Mother's Maiden Name	
7		N	R	Date/Time of Birth		CCYYMMDDHHMMSS. Used for secondary patient matching. Equates to DICOM (0010,
8	1	N	R	Sex		Values: M, F, U. Used for secondary patient matching. Equates to DICOM (0010, 0040)
9^1	35	N	O	Patient Alias	Alias Last Name	
9^2	35	N	O		Alias First Name	
9^3	35	N	O		Alias Middle Name	
9^4	5	N	O		Alias Suffix Name	
9^5	5	N	O		Alias Prefix Name	
9^6	20	N	O		Alias Title	
11^1	50	N	O	Patient Address	Address Line 1	
11^2	50	N	O		Address Line 2	
11^3	35	N	O		City	
11^4	2	N	O		State	
11^5	10	N	O		Postal Code	
11^6	10	N	O		Country	
13	30	N	O	Phone Number-Home	Phone Area, Exchange, and Last	Format: (xxx) xxx-xxx.
14	30	N	O	Phone Number-Business	Work Phone Area, Exchange, Last 4, and extension	Format: (xxx) xxx-xxx.
18	20	N	C	Patient Account Number	Visit Number	Needed to update patient location and status. Equates to DICOM (0038, 0010)
19	11	N	O	SSN Number-Patient	SSN Number	Used for secondary matching
23	35	N	O	Birth Place	Place of Birth	

2.3.4 SEGMENT: PV1 (Patient Visit Segment)

SEQ	Len	Rep	Req	Element Name	ImageGrid Name	Comments
2	1	N	R	Patient Class	Patient Status Patient Type	I, E, O, C, D as per Patient Status code table.
3^2	10	N	O	Assigned Patient Location	Patient Location	Room Number component. Equates to DICOM (0038, 0300)
4		N	R	Admission Type	Is Pregnant Flag	Allowable values are 'Y', 'N', and 'U'. 'U' is inserted when no value is provided or value is unrecognized. Pregnancy status equates to DICOM (0010, 21C0)
7^1	20	N	O	Attending Doctor	Attending ID	
7^2	35	N	C		Attending Last Name	Last and First Names are required when ID is present.
7^3	35	N	C		Attending First Name	Last and First Names are required when ID is present
7^4	35	N	O		Attending Middle Name	
44		O	O	Admit Date/Time	Admit Date and Time	CCYYMMDDHHMMSS
45		O	O	Discharge Date/Time	Discharge Date and Time	CCYYMMDDHHMMSS

2.3.5 SEGMENT: PV2 (Patient Visit-Additional Information Segment)

SEQ	Len	Rep	Req	Element Name	ImageGrid Name	Comments
3	255	N	O	Admit Reason	Signs and Symptoms	

2.3.6 SEGMENT: PD1 (Patient Demographics Segment)

SEQ	Len	Rep	Req	Element Name	ImageGrid Name	Comments
4^1	20	N	O	Patient Primary Care Provider Name and ID	PCP ID	
4^2	35	N	C		PCP Last Name	Last and First Names are required when ID is present

SEQ	Len	Rep	Req	Element Name	ImageGrid Name	Comments
4^3	35	N	C		PCP First Name	Last and First Names are required when ID is present
4^4	35	N	O		PCP Middle Name	
4^5	5	N	O		PCP Suffix Name	
4^6	20	N	O		PCP Title Name	

2.3.7 SEGMENT: ORC (Common Order Segment)

SEQ	Len	Rep	Req	Element Name	ImageGrid Name	Comments
1	2	N	R	Order Control		Supported values (applies to ORM messages only): NW, CA, OC, SC
10^1			C	Entered By ID	Entered By	Required for Order Cancel Messages (ORM: ORC-1 ='CA' or 'OC'). Customer may elect to use Ordering Provider (OBR-16 or ORC-12) for this value or default to a fixed value such as
10^2			C	Entered by Last Name	Provider Last Name	Last and First Names are required when ID is present
10^3			C	Entered by First Name	Provider First Name	Last and First Names are required when ID is present
16	10	N	C	Order Control Code Reason	Cancel Reason	Interface inserts the value 'DEFAULT' but customer may elect to map to a defined set of values presented in messages. Required for order cancel messages (ORM: ORC-1='CA' or 'OC').

2.3.8 SEGMENT: OBR (Observation Request Segment)

SEQ	Len	Rep	Req	Element Name	ImageGrid Name	Comments
1				Set ID - OBR		No processing
3	20	N	R	Filler Order Number	Accession number	Note: this is usually provided by the RIS. Accession numbers must be unique. Messages that update orders (status changes, cancels, and results) must contain a match for the original accession and MRN. Equates to DICOM (0008, 0050)
4^1	10	N	R	Universal Service ID	Exam Code	Equates to DICOM Requested Procedure ID (0040,
4^2	255	N	R		Exam Description, Exam Mod 1 Code, Exam Mod	Note: Exam Mod codes are delimited by '/' by default; this should be reviewed at each site. Equates to DICOM Requested Procedure Description (0032, 1060)
7		N	O	Observation Date/Time	Exam Date/Time	Note: Customer should verify meaning of the data that is provided. Expected to be Acquisition Time. Note that this value is overwritten by the DICOM Study Date/Time when exception resolution occurs.
13	255	N	O	Relevant Clinical Info	Diagnosis	Free text entry. Equates to DICOM Medical Alerts (0010, 2000)
16^1	20	N	R	Ordering Provider	Ordering Number	Equates to DICOM Requesting Physician Requesting Physician (0032, 1032)
16^2	35	N	R		Ordering Last Name	Last and First Names are required when ID is present. Equates to DICOM Requesting
16^3	35	N	R		Ordering First Name	Last and First Names are required when ID is present. Equates to DICOM Requesting
16^4	35	N	O		Ordering Middle Name	Last and First Names are required when ID is present. Equates to DICOM Requesting Physician (0032, 1032)
24	10	N	R	Diagnostic Service Section	Performing Resource	Describes the Performing Resource that will be used such as a room or area.
25	10	N	R	Result Status	Exam Status	If OBR-25='F' then NOW used for Final Date/Time. For Exam Status: see Exam status code table for allowable
27^4		N	R	Quantity/Timing	Scheduled Date/Time	Date and Time that Image Acquisition is expected to be performed. CCYYMMDDHHMMSS.
27^6		N	O		Stat Codes-Priority	ConnectR translation to Stat='Y' or Stat='N'.
31	255	N	O	Reason For Study	History	Equates to DICOM Reason for Imaging Service Request (0040, 2001)

SEQ	Len	Rep	Req	Element Name	ImageGrid Name	Comments
32^1	20	N	C	Principal Result Interpreter	Interp 1 Number; Signing 1 Provider Number if OBR-	Required if OBR-25='F'.
32^2					Interp 1 Last Name	Last and First Names are required when ID is present
32^3					Interp 1 First Name	Last and First Names are required when ID is present
32^4					Interp 1 Middle Name	
33^1	20	Y-1	O	Assistant Result Interpreter	Interpreting 2 Provider Number for first occurrence; Interpreting 3 Provider Number for second occurrence; Signing 2 Provider Number if OBR-25='F' on first occurrence; Signing 3 Provider Number if	
33^2					Interp 2 or 3 Last Name	Last and First Names are required when ID is present
33^3					Interp 2 or 3 First Name	Last and First Names are required when ID is present
33^4					Interp 2 or 3 Middle Name	

2.3.9 SEGMENT: OBX (Observation/Result Segment)

SEQ	Len	Rep	Req	Element Name	ImageGrid Name	Comments
1		N	R	Set ID - OBX		Used to identify the correct placement of lines of transcribed text
5	No limit	Y	R	Observation value	Report Text	Transcribed result text can be presented as one line of text per OBX segment or as a single OBX segment with repetition separators (~).

3 COMMUNICATION PROFILES

3.1 TCP/IP STACK

The Candelis Technology ImageGrid server inherits its TCP/IP stack from Linux operating system.

4 EXTENDED CHARACTER SET SUPPORT

Current implementation of the Candelis Technology ImageGrid server has only been tested for compatibility with the standard ANSI (ASCII) character set.