Integrating the Healthcare Enterprise

IHE

IHE Devices
Technical Framework Supplement

PCD Program
Medical Equipment Management
Location Services
(MEMLS)

Rev. 1.4 – Trial Implementation

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Foreword

This is a supplement to the IHE Devices Technical Framework. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

30 This supplement is published on April 7, 2023 for trial implementation and may be available for testing at subsequent IHE Connectathons. The supplement may be amended based on the results of testing. Following successful testing it will be incorporated into the Devices Technical Framework. Comments are invited and can be submitted at https://www.ihe.net/DEV_Public_Comments.

35 This supplement describes changes to the existing technical framework documents.

"Boxed" instructions like the sample below indicate to the Volume Editor how to integrate the relevant section(s) into the relevant Technical Framework volume.

Amend Section X.X by the following:

Where the amendment adds text, make the added text **bold underline**. Where the amendment
40 removes text, make the removed text **bold strikethrough**. When entire new sections are added, introduce with editor's instructions to "add new text" or similar, which for readability are not bolded or underlined.

General information about IHE can be found at IHE.net.

45 Information about the IHE Devices domain can be found at IHE Domains.

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at Profiles and IHE Processes.

The current version of the IHE Devices Technical Framework can be found at Devices Technical Framework.

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CONTENTS

Introduction to this Supplement

This supplement affects volumes 1 and 2 of the Devices Technical Framework. The supplement adds a new profile, new actors, new triggers, and a new transaction. This supplement defines a profile for the communication of equipment and people location information in the absence of patient observations, alerts, or event notifications.

The IHE Working Group (WG) that created and maintains this profile (PCD MEMLS WG) is aware of IEEE WG P1847 Location-Based Services (LBS) for Healthcare. The results of ongoing interactions with this IEEE WG are expected to impact this profile from time to time. Additionally, some content from this profile should be assumed to be available for utilization in the deliverables of the IEEE WG.

Open Issues and Questions

Staff location tracking is about more than the technology which can accomplish it. This effort will focus predominately on equipment location, but will provide a means of communicating location information of people. Enumerating all that can be accomplished with that information and all of the issues around those accomplishments is outside the scope of this effort.

Identification of some observation identifications (MDC & REFID) are not be currently defined in Rosetta Terminology Mapping (RTM) or in IEEE 11073-10101 Nomenclature and so a submission will be required. After values are assigned they are likely to appear in the Rosetta Terminology Mapping Management System (RTMMS) prior to being balloted for an update to the standard. Once assigned official values implementations shall use the assigned values.

A unique to this profile HL7 v2 message trigger has been requested from HL7 v2 Orders and Observations to replace current use of trigger value R01. This profile utilizes unsolicited observations and therefore MSH-9-1 Message Code shall remain ORU. Once confirmed by HL7 that assigned trigger value shall replace R01 in the MSH-9 Message Type field in both MSH-9-2 Trigger and MSH-9-3 Message Structure components at which time examples and references within this document shall be updated accordingly. By that point in time commercial deployments of this profile are likely to already exist. This trigger change will allow transactions of this profile to utilize a message structure unique to this profile which will permit discontinuance of use of the message structure associated with R01. This change will allow transactions of this profile to exclude the R01 structure required HL7 message segments associated with electronic patient healthcare information (ePHI) contained in the PID Patient Identification and PV1 Patient Visit segments. Observation producer and consumer actors associated with this profile do not make use of and do not administer ePHI. Removal of ePHI message content which is not required by this profile assures patient confidentiality and avoids transaction consuming actors from requiring a HIPAA (Health Insurance Portability and Accountability Act of 1996) Business Associate agreement.

When copying OBX instances from consumed transactions of this profile to reporter transactions of other profiles, such as DEC, IPEC, ACM, etc., the dotted notation values in OBX-4 should

155 bear scrutiny for hierarchical conflicts with OBX-4 values of OBX instances associated with the base reporter content into which the OBX instances of this profile are being copied.

Closed Issues

Communication of the same information that this profile communicates as observations in conjunction with the data, alert, and event use cases associated with existing PCD profiles can be

160 accomplished using the observation documentation found in this profile as additional observations to existing transactions in association with existing actors without the requirement for vendor adoption of this new profile. The justification for this additional profile is the definition of a new actor type (LS) which is distinct from existing actors as well as the trigger condition which is unrelated to any device associated patient.

165 Other methods for communication of location information exist in the operating environment (SNMP, vendor proprietary SOAP/XML, etc.) today, are expected to continue to exist, but are not expected to integrate with medical device data communication.

History of Document Changes

This section provides a brief summary of changes and additions to this document.

170

Date	Document Revision	Change Summary
2023-04-07	1.4	Updated for approved CPs, housekeeping corrections, and replacing MDCXs with allocated MDCs and REFIDs. The following CPs were integrated. <table><tr><td>CP #</td><td>CP Approval Date</td><td>CP Title</td></tr><tr><td>112</td><td>2015-02-26</td><td>Move equipment name from OBX-18 to OBX-5</td></tr><tr><td>120</td><td>2015-03-06</td><td>Clarification of Observation Result Status OBX-11 as F</td></tr><tr><td>160</td><td>2022-01-07</td><td>MEM LS Multiple Location Observations, PL Clarity</td></tr></table>
2017-11-09	1.3	Updated for approved CPs, housekeeping corrections, and explanation that MDCs and REFIDs need to be standardized and that they will appear first in RTMMS.
2015-10-14	1.2	Updated for approved CPs and housekeeping corrections.

IHE Technical Frameworks General Introduction

The [IHE Technical Frameworks General Introduction](#) is shared by all of the IHE domain technical frameworks. Each technical framework volume contains links to this document where appropriate.

9 Copyright Licenses

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IHE technical documents refer to, and make use of, a number of standards developed and published by several standards development organizations. Please refer to the IHE Technical Frameworks General Introduction, [Section 9 - Copyright Licenses](#) for copyright license information for frequently referenced base standards. Information pertaining to the use of IHE International copyrighted materials is also available there.

180

10 Trademark

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IHE Technical Frameworks General Introduction Appendices

The IHE Technical Framework General Introduction Appendices are components shared by all of the IHE domain technical frameworks. Each technical framework volume contains links to these documents where appropriate.

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> *Update the following appendices to the General Introduction as indicated below. Note that these are **not** appendices to this domain's Technical Framework (TF-1, TF-2, TF-3 or TF-4) but rather, they are appendices to the IHE Technical Frameworks General Introduction located* *here.*

195

> ***NEW: REQUIRED APPROVAL OF ACTORS, TRANSACTIONS and TERMS -** To avoid duplication and ensure consistency across domains, all **new or modified** actors, transactions and glossary terms need approval by IHE's Domain Coordination Committee (DCC) before they are published in a trial implementation supplement. Please see this Wiki page for additional*
200 > *guidance and links to the forms for approval submission.*

> *Add the following **new or modified** actors to the IHE Technical Frameworks General*
205 > *Introduction Appendix A:*

The Location Observation Reporter (LOR) produces observations.

The Location Observation Consumer (LOC) consumes observations.

Actor	Definition
Location Observation Reporter (LOR)	The profile actor that sends Location Services observations of location for devices or people and data from Location Services tags
Location Observation Consumer (LOC)	The profile actor that receives Location Services observations

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The Location Observation Reporter (LOR) is a new and distinct observation source actor and is likely to be a Location Services system (LS) also recognized by the underlying technology used for equipment and people tracking, such as Radio Frequency Identification (RFID) or Real Time Location Services (RTLS). But it may also be an actor in a different profile (DEC DOR, ACM
215 AR, IPEC DOR), assuming the location tracking and reporting capability is embedded into the

medical device or the location observation is merged with the medical device data in a gateway system prior to it being sent to the observation consumer. The Location Observation Consumer (LOC) may also be an actor in a different profile (DEC DOC, ACM AM, IPEC DOC).

220   **Appendix B** – Transactions

*Add the following **new or modified** transactions to the IHE Technical Frameworks General Introduction Appendix B:*

225   Report Location Observation (RLO) (from LOR to LOC)

New (or modified) Transaction Name and Number	Definition
Report Location Observation [PCD-16]	If the location observation information is sourced from an external to device tag and reporting system, then the device to which it is attached has the potential of being unaware of its presence and would likely not contain device associated patient information. Then, the observation will be sourced by the LS and not the medical device. This transactions contains an observation of the location of a device or person or information about the Location Services tag, such as environmental (temperature, humidity, gases, etc.) or operator interactions (buttons, pulls, accelerometers, etc.).

Appendix D – Glossary

230   *Add the following **new or modified** glossary terms to the IHE Technical Frameworks General Introduction Appendix D:*

New (or modified) Glossary Term	Definition	Synonyms	Acronym/ Abbreviation
Computerized Maintenance Management System	This is the system which the hospital makes use of to maintain its inventory of medical devices, their identification, their status, their software, firmware, and hardware versioning information and history. This is a system for which reception of device location observation is well suited as a means of identifying the last known location of equipment in need of servicing, repairs, or version upgrades.		CMMS

New (or modified) Glossary Term	Definition	Synonyms	Acronym/ Abbreviation
Global Positioning System	This is the system of orbiting satellites that are constantly broadcasting extremely high accuracy time information, combined with ubiquitous receivers and software associated with the receivers that upon correlation of the received data can identify with reasonably high accuracy the location of the receiver in 3D space by latitude, longitude, and altitude.		GPS
Health Insurance Portability and Accountability Act of 1996	The Health Insurance Portability and Accountability Act of 1996 (HIPAA) is a federal law that required the creation of national standards to protect sensitive patient health information from being disclosed without the patient's consent or knowledge. The US Department of Health and Human Services (HHS) issued the HIPAA Privacy Rule to implement the requirements of HIPAA. The HIPAA Security Rule protects a subset of information covered by the Privacy Rule. See https://www.cdc.gov/phlp/publications/topic/hipaa.html.		HIPAA
Location Services	This is a collection of software applications and services which utilize tag tracking information to provide the last known location of the tags as well as any environmental or operator interactions with the tags.		LS
National Marine Electronics Association	This is a worldwide, self-sustaining organization with the commitment to enhance the technology and safety of electronics used in marine applications.		NMEA
Radio Frequency Identification	This is the technology whereby tags will transmit their unique identification either periodically (active) or when energized by an energy field (passive). This identification transmission can be correlated by multiple receives to identify the location of the tag.		RFID
Real Time Location Services	This is an aspect of Location Services whereby the last known location of devices or people can be communicated to other systems.		RTLS

Volume 1 – Profiles

235

Copyright Licenses

Add the following to the IHE Technical Frameworks General Introduction Copyright section:

NA

Domain-specific additions

240   None

Add Section X

X Medical Equipment Management Location Services (MEMLS) Profile

245   Existing profile transaction observation information does not include detailed device and people location identification which can be sourced by embedded location sensing components or through location sensing tags external to equipment and these tags can also provide additional information such as button presses and environmental information such as temperature and humidity. Additionally, there are no defined actors or transactions for providing location

250   information from other than medical devices to other than an EMR or an alert manager.

Specific triggers, transactions, and source actors in existing profiles do not exist for the sole purpose of communication of location information in the absence of patient observations, alerts, or event notifications. The absence of the communication of this information outside of patient observations, alerts, or event notifications reduces the effectiveness of Location Services (LS)

255   solutions and impacts the effectiveness of people interactions with equipment and systems by not providing for location information or location specific events.

This profile is a combination of profile types as it defines workflow through use case specification and transport through its described use of the HL7 and IEEE 11073 standards for information communication.

260   ### X.1 MEMLS Actors, Transactions, and Content Modules

This section defines the actors, transactions, and/or content modules in this profile. General definitions of actors are given in the Technical Frameworks General Introduction Appendix A. IHE Transactions can be found in the Technical Frameworks General Introduction Appendix B. Both appendices are located at https://profiles.ihe.net/GeneralIntro/index.html.

265   Figure X.1-1 shows the actors directly involved in the MEMLS Profile and the relevant transactions between them. If needed for context, other actors that may be indirectly involved

due to their participation in other related profiles are shown in dotted lines. Actors which have a mandatory grouping are shown in conjoined boxes.

```
        ┌──────────────────┐
        │       LOR        │
        └──────────────────┘
                 │
        RLO      │
      [PCD-16] ↓ │
                 │
        ┌──────────────────┐
        │       LOC        │
        └──────────────────┘
```
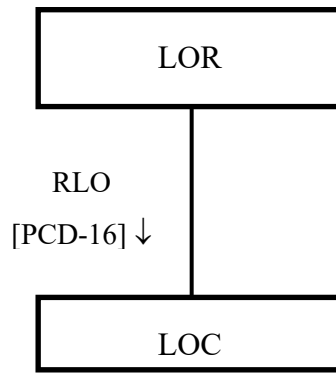
270 **Figure X.1-1: MEMLS Actor Diagram**

Table X.1-1 lists the transactions for each actor directly involved in the MEMLS Profile. To claim compliance with this profile, an actor shall support all required transactions (labeled "R") and may support the optional transactions (labeled "O").

Table X.1-1: MEMLS Profile - Actors and Transactions

Actors	Transactions	Optionality	Reference
LOR	RLO [PCD-16]	R	PCD TF-2: 3.16
LOC	RLO [PCD-16]	R	PCD TF-2: 3.16

275

X.1.1 Actor Descriptions and Actor Profile Requirements

Most requirements are documented in Transactions (Volume 2) and Content Modules (Volume 3). This section documents any additional requirements on profile's actors.

X.1.1.1 Location Observation Reporter (LOR)

280 The Location Observation Reporter (LOR) may also be an observation transaction sending actor in other IHE Devices profiles, such as a DEC DOR, an ACM AR, an IPEC DOR, or a MEMDMC DMIR. This could be the case if the location tracking tag is either embedded in the sending actor or if the tag is external and a gateway system is being used to merge the location information with observations associated with other IHE profiles. If the tag is external the

285 medical device may have no awareness of its presence or if the observations are unique to location services and are not associated with patients. The location services specific nature of the

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observations produced by the Location Observation Reporter is the justification for this unique profile.

X.1.1.2 Location Observation Consumer (LOC)

290 It is highly likely that the Location Observation Consumer may also be an observation transaction receiving actor in other IHE Devices profiles. If the observation is simply to be recorded it is likely to be a DEC DOC or IPEC DOC Actor. If the observation is to be acted upon, it is likely to be an ACM AM Actor. If the location observation is to be used for equipment management, the LOC Actor is likely to be a MEMDMC DMIC Actor (a CMMS).

295 ## X.2 MEMLS Actor Options

Options that may be selected for each actor in this profile, if any, are listed in the Table X.2-1. Dependencies between options when applicable are specified in notes.

Table X.2-1: MEMLS - Actors and Options

Actor	Option Name	Reference
LOR	No options defined	--
LOC	No options defined	--

300 ## X.3 MEMLS Required Actor Groupings

There are no required actor groupings.

X.4 MEMLS Overview

MEM LS is focused on getting location tracking or tag related observations into medical records and into equipment management systems.

305 ### X.4.1 Concepts

Location information is pertinent to medical device observations as it provides a means of locating the patient currently associated with that equipment. This can be additional observation information added to existing transactions without the use of this profile. This profile focuses on those uses of location tracking information or tag associated information independent of any

310 patient currently associated with the equipment, such as for equipment management, and tag auxiliary information such as button presses or environmental observations like temperature and humidity.

If the end result of receipt of such information is the generation of Report Alert [PCD-04] transactions in association with the ACM Profile then the sending system is considered to be an

315 AR with additional types of alerts and observations.

X.4.2 Use Cases

X.4.2.1 Use Case #1: Communication of location observations in conjunction with other non-location related transactions

This is the addition of location observations in the same transaction with non-location related transactions, such as DEC [PCD-01], ACM [PCD-04], IPEC [PCD-10], and MEMDMC [PCD-15].

X.4.2.1.1 Location Added to Other Observations Use Case Description

This presumes that the reporting piece of equipment or system is location aware and so has the location information to include in with its other observations. This can be accomplished either by embedding the location tracking capability into the equipment or by using a gateway external to the device and to the location tracking system to merge the information into a single device observation plus location observation message.

X.4.2.1.2 Location Added to Other Observations Process Flow

A producer (DEC DOR or IPEC DOR or ACM AR or MEMDMC DMIR) is producing an observation (evidentiary data, alert, or event) and is location aware and includes location as an observation in with the rest of the observations. The device or system is made location aware either through an embedded location tag or by querying an external system that is aware of the location of a tag physically external to the device or system producing the observation. Such transactions are outside the scope of this profile and are addressed by the existing DEC, ACM, IPEC, and MEMDMC Profiles.
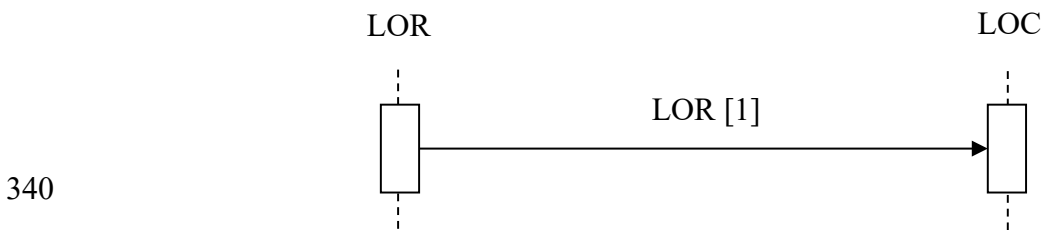

Figure X.4.2.1.2-1: Basic Process Flow in MEMLS Profile

Main Flow:

An observation, alert, or event has occurred and a device or system will be producing a profile related transaction [(PCD-01], [PCD-04], [PCD-10], or [PCD-15]). The device or system is location aware and will include location as an additional observation in the transaction.

X.4.2.2 Use Case #2: Communication of location observations in conjunction with LS specific events

350 This is the addition of location observations in the same transactions with location related transactions, such as DEC [PCD-01] and ACM [PCD-04]. These are LS specific and not patient specific.

X.4.2.2.1 Location Event Observations Use Case Description

This presumes that the reporting piece of equipment or system is location aware and so has the location information to include in with its other observations.

355 ### X.4.2.2.2 Location Event Observations Process Flow

A producer (DEC DOR or ACM AR or IPEC DOR or MEMDMC DMIR) is producing an LS specific observation (evidentiary data, alert, or event) and is location aware and includes location as an observation in with the rest of the observations. The device or system is made location aware either through an embedded location tag or by querying an external system that is aware of 360 the location of a tag physically external to the device or system producing the observation.

For backward compatibility with existing applications that only look for and process a single device single location observation per MEM LS Report Location Observation (RLO) [PCD-16] transaction, if multiple location observations for the same device are communicated in a single Report Location Observation (RLO) [PCD-16] transaction the first observation shall be the most 365 fully resolved, meaning having the most non-empty components of the Person Location (PL) datatype, with lesser resolved location observations following it in order of decreasing completeness of resolution. See the note within the PL datatype definition in HL7 version 2.6 chapter 2A Control (DataTypes) page 53 which spells out PL component ordering.

Figure X.4.2.2.2-1: Basic Process Flow in MEMLS Profile

370 # X.5 MEMLS Security Considerations

During the Profile development there were no unusual security or privacy concerns identified. There are no mandatory security controls but the implementer is encouraged to use the underlying security and privacy profiles from ITI that are appropriate to the transports such as the Audit Trail and Node Authentication (ATNA) Profile. The operational environment risk

375 assessment, following ISO 80001, will determine the actual security and safety controls employed.

X.6 MEMLS Cross Profile Considerations

An LOR is likely to also be a DEC DOR, an IPEC DOR, an ACM AR, or MEMDMC DIOR. There is no grouping required.

380 An LOC is likely to also be a DEC DOC, an IPEC DOC, an ACM AM, or MEMDMC DIOC. There is no grouping required.

Volume 2 – Transactions

385

Add Section 3.16

3.16 Report Location Observation (RLO) [PCD-16]

3.16.1 Scope

This transaction is used to report location observations for equipment or people.

390 ### 3.16.2 Actor Roles

The LOR sends the RLO to the LOC.
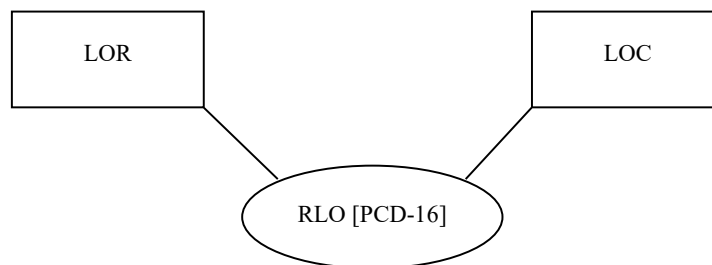
Figure 3.16.2-1: Use Case Diagram

395 The roles in this transaction are defined in the following table and may be played by the actors shown here:

Table 3.16.2-1: Actor Roles

Role:	Producer
Actor(s):	The following actors may play the role of Producer: Location Observation Reporter (LOR)
Role:	Consumer
Actor(s):	The following actors may play the role of Consumer: Location Observation Consumer (LOC)

3.16.3 Referenced Standards

400 HL7 v2.6, Chapter 7 Observations and v2.7, Chapter 7 Observations for the PRT segment

IEEE 11073-10101 with additional MDC/REFID values not yet in the standard (as identified by MDCX indicated value of zero and the interim REFID values).

Identification of some observation identifications (MDC & REFID) might not be currently defined in Rosetta Terminology Mapping (RTM) or in IEEE 11073-10101 Nomenclature in

405 which case a submission will be required. These are maintained external to this profile and thus have a low probability of new change proposals to this profile. After values are assigned, they appear in the current version of Rosetta Terminology Mapping Management System (RTMMS) prior to being balloted for an update to the standard. Once assigned, official values implementations shall use the assigned values.

410 Below is a mapping table with an indication as to whether or not the REFID string changed from the trial to the allocated values. To reduce transcription errors, table content has been kept to a minimum. For additional details, such as value descriptions, units of measure, partition codes, and enumerations, refer to the IEEE 11073-10101 standard (normative and balloted versions) or RTMMS.

415 **Table 3.16.3-1: IEEE Nomenclature Mapping from preliminary to assigned**

Trial Values	Allocated Values	Changed
0^MDCX_EVT_LS_DEVICE	203776^MDC_EVT_LS_DEVICE^MDC	N
0^MDCX_EVT_LS_PERSON	203778^MDC_EVT_LS_PERSON^MDC	N
0^MDCX_LS_ATTR_NAME^MDC	68512^MDC_ATTR_LS_NAME^MDC	Y
0^MDCX_LS_ATTR_LOCATION^MDC	68513^MDC_ ATTR_LS_LOCATION^MDC	Y
0^MDCX_LS_ATTR_ADDRESS^MDC	68514^MDC_ATTR_LS_ADDRESS^MDC	Y
none	68515^MDC_ATTR_LS_PHASE^MDC	N
0^MDCX_LS_ATTR_REF_NAME^MDC	68517^MDC_ATTR_LS_REF_NAME^MDC	Y
none	68518^MDC_ATTR_LS_REF_GPS^MDC	N
none	68519^MDC_ATTR_LS_REF_GPS_LAT^MDC	N
none	68520^MDC_ATTR_LS_REF_GPS_LON^MDC	N
none	68521^MDC_ATTR_LS_REF_GPS_ALT^MDC	N
none	68522^MDC_ATTR_LS_REF_GPS_BEARING^MDC	N
none	68523^MDC_ATTR_LS_REF LIMITS^MDC	N
none	68524^MDC_ATTR_LS_COORD_XYZ^MDC	N
0^MDCX_LS_ATTR_COORD_X^MDC	68525^MDC_ATTR_LS_COORD_X^MDC	Y
0^MDCX_LS_ATTR_COORD_Y^MDC	68526^MDC_ATTR_LS_COORD_Y^MDC	Y
0^MDCX_LS_ATTR_COORD_Z^MDC	68527^MDC_ATTR_LS_COORD_Z^MDC	Y
none	68528^MDC_ATTR_LS_COORD_XYZ_ACCY^MDC	N
0^MDCX_LS_ATTR_COORD_X_ACCURACY^MDC	68529^MDC_ATTR_LS_COORD_X_ACCY^MDC	Y
0^MDCX_LS_ATTR_COORD_Y_ACCURACY^MDC	68530^MDC_ATTR_LS_COORD_Y_ACCY^MDC	Y

Trial Values	Allocated Values	Changed
0^MDCX_LS_ATTR_COORD_Z_ACCURACY^MDC	68531^MDC_ATTR_LS_COORD_Z_ACCY^MDC	Y
none	68532^MDC_ATTR_GPS_COORDINATES	N
0^MDCX_GPS_ATTR_LATITUDE^MDC	68533^MDC_ATTR_GPS_LAT^MDC	Y
0^MDCX_GPS_ATTR_LONGITUDE^MDC	68534^MDC_ATTR_GPS_LON^MDC	Y
0^MDCX_GPS_ATTR_ACCURACY	68535^MDC_ATTR_GPS_COORD_ACCY^MDC	N
none	68536^MDC_ATTR_GPS_LAT_ACCY^MDC	N
none	68537^MDC_ATTR_GPS_LON_ACCY^MDC	N
0^MDCX_GPS_ATTR_ALTITUDE^MDC	68538^MDC_ATTR_GPS_ALT^MDC	Y
none	68539^MDC_ATTR_GPS_ALT_ACCY^MDC	N
0^MDCX_GPS_ATTR_HEADING^MDC	68540^MDC_ATTR_GPS_HEADING^MDC	Y
0^MDCX_GPS_ATTR_PITCH^MDC	68541^MDC_ATTR_GPS_PITCH^MDC	Y
0^MDCX_GPS_ATTR_SPEED^MDC	68542^MDC_ATTR_GPS_SPEED^MDC	Y
none	69135^MDC_OBS_MEM^MDC	N
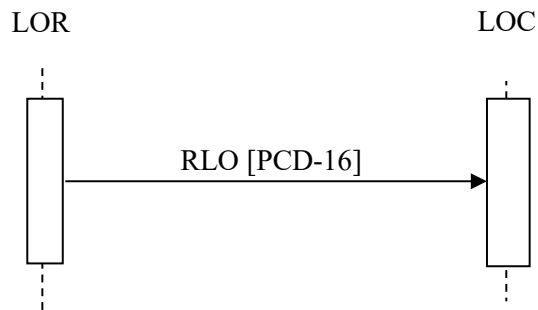
Figure 3.16.4-1: Interaction Diagram

3.16.4 Messages

3.16.4.1 Report Location Observation (RLO) [PCD-16]

420   The observations are mapped to OBX (equipment) and PRT (people or equipment) segments and contained under the OBX segment which identifies the observation type (person or equipment).

A single transaction should report about one piece of equipment or one person.

More than one sending actor instance can send to the same receiving actor instance.

For backward compatibility with existing applications that only look for and process a single
425   device single location observation per MEM LS Report Location Observation (RLO) [PCD-16] transaction, if multiple location observations for the same device are communicated in a single

Report Location Observation (RLO) [PCD-16] transaction the first observation shall be the most fully resolved.

3.16.4.1.1 LS Observation Types

430 Location observations can be reported in one or more types.

- Named Location (hospital named hierarchical location or simple name string)

- Base + (X/Y/Z) offset plus accuracy indications

- GNSS/GPS plus accuracy indications

Named locations are preferred for communication of a location to a person. Base + offset is used
435 to communicate location to another LS system for moving pushpins on active maps or floor layouts. GNSS/GPS is good for absolute location retrospective analysis or for locations outside structures.

The Base reference for base + offset location observations is typically a mutually agreed base map, such as an electronic architectural diagram file for an area within a building, such as a care
440 unit on a floor within a hospital building.

For backward compatibility with existing applications that only look for and process a single device single location observation per MEM LS Report Location Observation (RLO) [PCD-16] transaction, if multiple location observations for the same device are communicated in a single Report Location Observation (RLO) [PCD-16] transaction the first observation shall be the most
445 fully resolved, meaning having the most non-empty components of the Person Location (PL) datatype, with lesser resolved location observations following it in order of decreasing completeness of resolution. See the note within the PL datatype definition in HL7 version 2.6 chapter 2A Control (DataTypes) page 53 which spells out PL component ordering.

3.16.4.1.2 HL7 Conformance Statement

450 The conformance statement for this interaction described below is adapted from HL7 version 2.6 with use of the Participation Information (PRT) segment from HL7 version 2.7.

Table 3.16.4.1.2-1: Report Location Observation [PCD-16] Transaction Conformance

Publication ID:	R01
Type:	Unsolicited
Publication Name:	IHEPCD-16ReportLocationObservation
Trigger:	See Section 3.16.4.1.4 Trigger Events
Mode:	Immediate
Response:	ORU^R01^ORU_R01
Characteristics:	Sends defined location observation data
Purpose:	Report Location Observation from LOR to LOC
Based on Segment Pattern:	R01

3.16.4.1.3 Report Location Observation [PCD-16] (ORU^R01^ORU_R01) Static Definition

455

The Report Location Observation [PCD-16] message is used to communicate location observation data from a Location Observation Reporter (LOR) to a Location Observation Consumer (LOC).

Common HL7 segments are defined in DEV TF-2: Appendix B. Sections below discuss
460　considerations specific to [PCD-16].
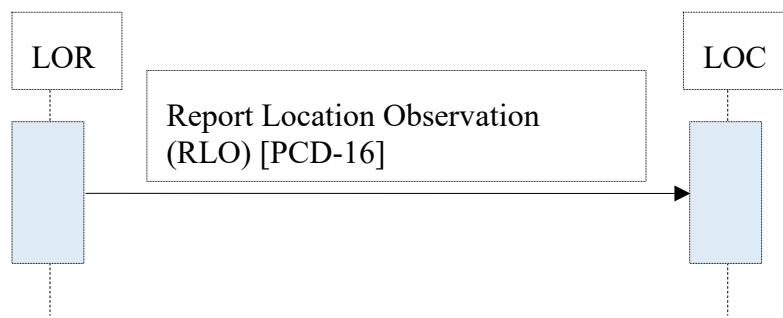
Figure 3.16.4.1.3-1: Basic Process Flow for MEMLS Profile (reference)

Table 3.16.4.1.3-1: ORU^R01^ORU_R01 HL7 Attribute Table

Segment	ORU Message	Usage	Card.	HL7 Ref
MSH	Message Header Segment	R	[1..1]	2.15.9
PID	Patient Identification Segment	CE	[0..1]	3.4.2
PV1	Patient Visit Segment	CE	[0..1]	3.4.3
OBR	Observation Request Segment	R	[1..n]	7.4.1
OBX	Observation Result Segment	R	[1..n]	7.4.2
[PRT]	Participation Information Segment	O	[0..n] Note 1	7.4.4 (V2.7)

465　Note 1: Use of PRT is required for communicating the location of people. If operating in a backward compatible manner for equipment location observations this can be accomplished using OBX-18 Equipment Instance Identifier instead of the PRT segment.

Table 3.16.4.1.3-2: ORU^R01^ORU_R01 Static Definition

ORU^R01^ORU_R01	Device Management Information Observation Message
MSH	Message Header
[{SFT}]	Software Segment
{	--- REPORT LOCATION OBSERVATION begin
[	--- PATIENT begin
PID	Patient Identification
[	--- ASSIGNED PATIENT LOCATION begin
PV1	Assigned Patient Location
]	--- ASSIGNED PATIENT LOCATION end
]	--- PATIENT end
{	--- LOCATION_OBSERVATION begin
OBR	Location Observation Identification
[{	--- OBSERVATION begin
{OBX}	Location observations relative to OBR
[PRT]	Participation identifies person or equipment
}]	--- OBSERVATION end
}	--- LOCATION_OBSERVATION end
}	--- REPORT LOCATION OBSERVATION end

3.16.4.1.4 Trigger Events

470 The HL7 trigger event is currently an ORU^R01^ORU_R01. This is expected to change once HL7 v2 Orders and Observations allocates and assigns the requested trigger unique to this profile at which time MEMLS actor implementations shall utilize the standardized value.

Trigger identifications in the OBR used by the MEMLS Profile are not yet in the IEEE 11073-10101 standard. These will be submitted for inclusion in the first available update to the
475 standard. In the interim, MDC will be identified as MDCX, codes values will be zero, and interim REFID strings will be utilized. Once the standard has been updated to include the identifications, MEMLS actor implementations shall utilize the standardized MDC/REFID values.

More sophisticated location services events can be derived from the above defined events using
480 the observation attributes associated with the event message. For example a Mother-Baby mismatch, equipment collocation implying a patient to equipment binding, or arrival of a clinician to a room location which results in a change to a nurse call dome light. It is not within the scope of this profile to define the algorithms by which such sophisticated events are determined to have occurred or the actions which would result from such an occurrence.

485   Typical application purposes for deployment of LS solutions are achievable using the above set of triggers. Additional triggers typically aren't required. The triggering event is the underlying event that is the foundation for the application purposes. The table below offers some suggestions.

Table 3.16.4.1.4-2: Application Purposes Mapped to Available Triggers

#	Application Purpose	Based Upon Available Triggers
1	Mother-Baby mismatch detection	Colocation
2	Infant abduction	Boundary or Colocation
3	Patient – equipment binding	Colocation
4	Clinician entering room or being near patient affecting equipment	Boundary or Colocation
5	Privacy/security, authentications and violations	Colocation or Boundary
6	Positive Patient Identification/Device Association	Colocation
7	Specimen tracking	Location observation, Movement, Boundary
8	Staff tracking (other than clinical)	Location Observation
9	Staff needing assistance	Dwell, Interaction, Tamper
10	Refrigerator/freezer monitoring	Environment
11	Violation of controlled environment	Environment
12	Infection prevention and control	Colocation (of staff to wash station)
13	Human resources log in/out for payroll	Colocation, Boundary
14	Communication device asset management	Location observation, Boundary
15	Delivery arrivals (pharmacy, supplies)	Location observation, Boundary
16	Closed Loop Medication Administration	Location observation, Colocation
17	Code/Nurse Calls	Location observation, Colocation
18	Food services workflow	Location observation, Boundary, Colocation
19	Automated/guided vehicle arrival/departure	Colocation
20	Supplies tracking	Location observation, Colocation
21	Transfer center workflow	Location observation, Colocation, Boundary

490

3.16.4.1.5 Message Semantics

The message is an HL7 observation. The content of the message is governed by HL7, IHE DEV Technical Framework and this profile. The objects for which the observations are being reported are governed by IHEE 11073.

495   The MDS, VMD, CHAN, and METRICs are to be reported per the IHE PCD Technical Framework.

The HL7 version 2.7 Participation Information (PRT) segment is required as a child of the location type identifying OBX segment to identify the person in person associated location

observations. For backwards compatibility if the location observation is equipment associated then the PRT segment need not be used and OBX segment field Equipment Instance Identifier OBX-18 can be used to identify the unique instance of the equipment. As of HL7 version 2.7 use of Equipment Instance Identifier OBX-18 is retained for backward compatibility and equipment identification has been moved to the PRT segment. Therefore use of the PRT segment for equipment location observations is considered forward looking. This applies to both MEMLS use cases (LS observations in other profiles, such as DEC, ACM, and IPEC and LS observations in the MEMLS Profile).

Indicating Observation Result Status (OBX-11) as a value of R (Results entered – not verified) establishes an expectation that someone will manually verify the value of the observation. Review and verification of MEMLS Profile specific observations is not expected as they change over time and requiring someone to review and certify them is a workload with little return for the effort. Therefore MEMLS observations shall indicate a value of F (Final) in Observation Result Status (OBX-11).

3.16.4.1.5.1 Proposed additions to IEEE 11073-10101

There are a number of location services associated observation identifications used by the MEMLS Profile which are not yet in the IEEE 11073-10101 standard. These will be submitted for inclusion in the first available update to the standard. In the interim MDC will be identified as MDCX, codes values will be zero, and interim REFID strings will be utilized. Identification of some observation identifications (MDC & REFID) are not be currently defined in Rosetta Terminology Mapping (RTM) or in IEEE 11073-10101 Nomenclature and so a submission will be required. After values are assigned they are likely to appear in the Rosetta Terminology Mapping Management System (RTMMS) prior to being balloted for an update to the standard. Once the standard has been updated to include the identifications MEMLS actor implementations shall utilize the standardized MDC/REFID values.

Communication of the location of a person or piece of equipment by structured location as in, building, floor, point of care, room, bed, etc. is communicated using a separate instance of an OBX segment with OBX-3 Observation Identifier containing 68513^MDC_ATTR_LS_LOCATION^MDC and OBX-5 Observation Value containing the observed location in the format defined by the HL7 Person Location (PL) Data Type (see HL7 version 2.6 Chapter 2A Section 2.A.53 PL - Person Location) and indicating PL in OBX-2 Value Type.

For backward compatibility with existing applications that only look for and process a single device single location observation per MEM LS Report Location Observation (RLO) [PCD-16] transaction, if multiple location observations for the same device are communicated in a single Report Location Observation (RLO) [PCD-16] transaction the first observation shall be the most fully resolved, meaning having the most non-empty components of the Person Location (PL) datatype, with lesser resolved location observations following it in order of decreasing completeness of resolution. See the note within the PL datatype definition in HL7 version 2.6 chapter 2A Control (DataTypes) page 53 which spells out PL component ordering.

540 The Point of Care component of the Person Location (PL) datatype is meant to refer to the
architecturally or business unit defined within the floor of a building, as in Recovery,
Emergency, Radiology, etc. It is not meant to refer to a site on the body of a patient where care is
administered. For patient body site indications, see HL7 2.6 Chapter 7 Observation Reporting
section 7.4.2 Observation/Result Segment (OBX) Observation Site field (OBX-20).

545 To indicate building structural compass ordinal wings in a location observation when using the
Person Location (PL) datatype a common practice is to suffix the Point of Care (sequence 1)
component with the compass ordinal indication, either abbreviated to reduce the length of the
name string, i.e., ICU-W for ICU West or the full ordinal name. Continued use of site currently
deployed structural identification strings, as used by the patient Admit/Discharge/Transfer
(ADT) system, are likely to take precedence over changes to the strings. See the IHE Information
550 Technology (ITI) domain profiles.

Common areas, such as waiting rooms or hallways, are also likely to need encoding into the
Person Location (PL) datatype. A common practice is to establish a reusable point of care unique
Room component string value, such as Waiting, as used in ER^Waiting or OR^Waiting or ICU-
W^Hall.

555 Shared areas between two defined Room values, as in a bathroom shared by multiple rooms, are
typically arbitrarily indicated by the healthcare institution as being associated with one of the
Room name strings so as to more concisely direct a responding individual to the shared area.

As it is defined in the HL7 standard an uncoded string the Location Description component (seq
9) of the Person Location (PL) datatype shall be avoided for communicating a hierarchical
560 named location. It shall be reserved for optional additional information for improved human
recognition, as in OR^Waiting^^^^^^blue walls.

HL7 Component Table – PL – Person Location

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	SEC. REF.
1	20	IS	O	0302	Point of Care	2.A.36
2	20	IS	O	0303	Room	2.A.36
3	20	IS	O	0304	Bed	2.A.36
4	227	HD	O		Facility	2.A.33
5	20	IS	O	0306	Location Status	2.A.36
6	20	IS	C	0305	Person Location Type	2.A.36
7	20	IS	O	0307	Building	2.A.36
8	20	IS	O	0308	Floor	2.A.36
9	199	ST	O		Location Description	2.A.74
10	427	EI	O		Comprehensive Location Identifier	2.A.25
11	227	HD	O		Assigning Authority for Location	2.A.33

For definitive works always refer back to the originating version of the standard to make sure you're using up to date information.

Communication of equipment name shall be in a separate OBX segment occurrence with an observation containment identifying MDC/REFID in OBX-3 68512^MDC_ATTR_LS_NAME^MDC shall be used with the equipment name as the observation value in OBX-5 Observation Value.

3.16.4.1.6 Expected Actions

In response to the receipt of the message the receiver will generate an HL7 acknowledgement to advise the sending of the status of the receipt of the message that was sent.

As a result of receiving the observation the receiver can store the information for later retrieval or the information can be used to trigger the production of transactions in other IHE profiles, such the generation of an ACM alert.

For backward compatibility with existing applications that only look for and process a single device single location observation per MEM LS Report Location Observation (RLO) [PCD-16] transaction, if multiple location observations for the same device are communicated in a single Report Location Observation (RLO) [PCD-16] transaction the first observation shall be the most fully resolved, meaning having the most non-empty components of the Person Location (PL) datatype, with lesser resolved location observations following it in order of decreasing completeness of resolution. See the note within the PL datatype definition in HL7 version 2.6 chapter 2A Control (DataTypes) page 53 which spells out PL component ordering.

3.16.5 Security Considerations

During the Profile development there were no unusual security or privacy concerns identified. There are no mandatory security controls but the implementer is encouraged to use the underlying security and privacy profiles from ITI that are appropriate to the transports such as the Audit Trail and Node Authentication (ATNA) Profile. The operational environment risk assessment, following ISO 80001, will determine the actual security and safety controls employed.

Volume 2 Namespace Additions

Add the following terms to the IHE General Introduction Appendix G:

The following OIDs have been allocated to the MEMLS Profile.

Specific IHE-PCD Transactions: 1.3.6.1.4.1.19376.1.6.16.9 / 1.3.6.1.4.1.19376.1.6.1.16.1 [PCD-16].

The 1.3.6.1.4.1.19376.1.6.1.16.1 will appear in MSH-21 to identify the [PCD-16] transaction.

Specific IHE-PCD Conformance Profiles: 1.3.6.1.4.1.19376.1.6.6.16.1 [PCD-16]

Appendices

600 ## Appendix A – Transaction Examples

These are the transaction examples for this profile.

A.1 Report Location Observation for equipment

The Report Location Observation (RLO) for equipment is the report of an observation of the location of a piece of equipment and the reason for the report. As this observation transaction is 605 associated with Use Case #2 of this profile there would be no patient specific information contained in the PID or PV1 segments.

MSH|^~\&|Argus RFID System^00095F56787^EUI-64|Guard RFID Solutions|HEMS|EQ2|20140213165004.434-0800||ORU^R01^ORU_R01|132449|P|2.6|||||||| IHE_PCD_MEMLS_001^IHE PCD^1.3.6.1.4.1.19376.1.6.1.16.1^ISO

610 PID|1|||||||||||||||||||||||||||||N

PV1|1|N

OBR|1|||203776^MDC_EVT_LS_ DEVICE ^MDC|||20140213165004.434-0800

OBX|1|PL|68513^MDC_ATTR_LS_LOCATION ^MDC|<PCD data source dot notation>|^^^Fraser Health^^^South BuildingS^Floor 1^Emergency 615 Department||||||F|||20140215181304.697-0500||||10006^THNAME^^~112212000001^TAGNO^^

OBX|2|ST|68512^MDC_ATTR_LS_NAME^MDC|LOC|IV Pump 2012078||||||F|||20150127110822.229-0800

OBX|3|NM|68525^MDC_ATTR_LS_COORD_X^MDC ||5350|263441^MDC_DIM_CENTI_M^MDC|||F|||20140215181304.697- 620 0500|||||10006^THNAME^^~112212000001^TAGNO

OBX|4|NM|68526^MDC_ATTR_LS_COORD_Y^MDC ||16430|263441^MDC_DIM_CENTI_M^MDC|||F|||20140215181304.697- 0500|||||10006^THNAME^^~112212000001^TAGNO

OBX|5|NM|68527^MDC_ATTR_LS_COORD_Z^MDC 625 ||0|263441^MDC_DIM_CENTI_M^MDC|||F|||20140215181304.697- 0500|||||10006^THNAME^^~112212000001^TAGNO

OBX|6|ST|68517^MDC_ATTR_LS_ REF_NAME^MDC|Fraser ED||||||F

OBX|7|NM|68519^MDC_ATTR_LS_REF_GPS_LAT^MDC|26.0795|262880^MDC_DIM_AN G_DEG|||||F

630 OBX|8|NM|68520^MDC_ATTR_LS_REF_LON^MDC|80.2287|262880^MDC_DIM_ANG_DE G |||||F

OBX|9|NM|68521^MDC_ATTR_LS_REF_ALT^MDC||263424^MDC_DIM_X_M |||||F

OBX|10|NM|68535^MDC_ATTR_GPS_COORD_ACCY^MDC||262880^MDC_DIM_ANG_DEG |||||F

635 OBX|11|NM|68539^MDC_ATTR_GPS_ALT_ACCY^MDC||263424^MDC_DIM_X_M |||||F

OBX|12|NM|68540^MDC_ATTR_GPS_HEADING^MDC|NaN|262880^MDC_DIM_ANG_DEG |||||F

OBX|13|NM|68541^MDC_ATTR_GPS_SPEED^MDC|0|264960^MDC_DIM_X_M_PER_SEC| ||||F

640 The base referenced latitude and longitude can be agreed between systems in advance in which case the full lat/lon information is optional in the individual location observations so as to reduce the volume of data communicated over time.

If lat/lon are passed and the additional attributes are not known they are also optional, particularly if the lat/lon is of a stationary location, such as a reference point for X/Y/Z
645 coordinates in an LS system.

The X/Y/Z coordinates are a new data type and so some definition is in order.

> X starts at zero at the left and progresses to the right
> Y starts at the bottom and progresses upwards
> Z starts at the bottom and progresses upwards

650 The units of measure are specified in the observed value.

If the Z coordinate is not supported it is optional and need not be sent with each observation.

The base point reference name 68517^MDC_ATTR_LS_REF_NAME ("Fraser ED" in this example) defines an agreement between systems that is external to the communication of individual location observations. This agreement would also likely include a graphical image file
655 representing the structural area of the building and the format of the file. It would be wasteful of communication bandwidth and processing power to communicate this on every location observation.

While this message contains many OBX segments relating to X, Y, Z, and baseline offsets as well as GPS coordinates most messages making use of an OBX using the PL data type to
660 indicate a named location is sufficient and the additional OBX segments are optional.

A.2 Report Location Observation for people

The Report Location Observation (RLO) for equipment is the report of an observation of the location of a person and the reason for the report. This would be similar to the previous example except that it would additionally include a Participation Information (PRT) segment beneath the
665 OBX segment as the means of communication of the person location. As this observation transaction is associated with Use Case #2 of this profile there would be no patient specific information in the PID and PV1 segments.

670

MSH|^~\&|Argus RFID System^00095F56787^EUI-64|Guard RFID Solutions|HEMS|EQ2|20140213165004.434-0800||ORU^R01^ORU_R01|132449|P|2.6||||||||| IHE_PCD_MEMLS_001^IHE PCD^1.3.6.1.4.1.19376.1.6.1.16.1^ISO

PID|1|||||||||||||||||||||||||||||N

PV1|1|N

OBR|1|||203778^MDC_EVT_LS_ PERSON ^MDC|||20140213165004.434-0800

675

OBX|1|PL|68513^MDC_ATTR_LS_LOCATION ^MDC|<PCD data source dot notation>|^^^Fraser Health^^^South BuildingS^Floor 1^Emergency Department ||||||F|||20140215181304.697-0500||||10006^THNAME^^~112212000001^TAGNO^^

PRT|1|AD||RO|^Smith^John|Patient|1|Fraser_Health|^^^Fraser_Health^^^North_Building^Floor _1^LnD|^^112204006564^GuardRFID|20160204143332.4658-0800

680

The value in PRT-2 Action Code is AD indicating ADD. The value in PRT-4 Participation is RO indicating Responsible Observer.

Volume 3 – Content Modules

None

685

5 Namespaces and Vocabularies

Add to Section 5 Namespaces and Vocabularies

None

690

6 Content Modules

Not applicable. CDA is not being produced.

Volume 3 Namespace Additions

Add the following terms to the IHE Namespace:

695

None

700

Volume 4 – National Extensions

Add appropriate Country section

4 National Extensions

705   None at this time