



Integrating
the Healthcare
Enterprise

Inside IHE: Patient Care Device Webinar Series 2017

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Practical Health Interoperability, LLC
IHE PCD Planning Committee Co-Chair

Patient Care Device (PCD) Domain

Formed in 2005 to address Point-of-Care Medical Device integration issues

To enable “Out of the Box”, Reliable, “Functionally Interoperable” solutions

Utilizing IHE and PCD open Processes and open Standards

Technical Underpinnings

HL7 version 2.6 baseline, with profile specific drawing upon 2.7, 2.8, and 2.8.2

IEEE 11073 Standards

- 10101 – Standardized Nomenclature

- 10201 – Standardized Information Model

Wireless Communication Transfer Protocol (WCTP) version 1.3

IHE ITI domain Consistent Time (CT) profile – Network Time Protocol (NTP)

IHE PCD Co-sponsors



Patient Care Device (PCD) Domain

Focuses on devices associated with patients, including...

Patient monitors, vital signs monitors, pulse oximetry, ventilators, Infusion pumps, syringe pumps, PCA pumps, etc.

Collecting and reporting data from devices for immediate access and for retrospective storage and retrieval (EMR)

Harmonizing terminology – nomenclature, enumerations, units of measure

Getting alerts (alarms & advisories) to staff (clinicians, physicians, clinical engineers, IT, etc.) on local wireless, mobile, and desktop devices

Improving infusion order safety

Patient Care Device (PCD) Domain

Implantable Cardiac Device Observations

Waveform support in observations and alerts

Medical Equipment Management (MEM)

Medical Device Management Communication (DMC)

Point of Care Identity Management (PCIM)

Location Services (LS, RTLS)

System, Device, and Usage Cyber Security

For more information http://www.ihe.net/Patient_Care_Devices

Patient Care Device (PCD) Domain

Device to Enterprise Communication (DEC) profile

Alert Communication Management (ACM) profile

Point of care Infusion Verification (PIV) profile

Infusion Pump Event Communications (IPEC) profile

Implantable Device – Cardiac Observation (IDCO) profile

Retrospective Data Query (RDQ) profile

Medical Equipment Management (MEM)

 Device Management Communication (MEMDMC) profile

 Location Services (MEMLS) profile

Rosetta Terminology Management (RTM)

Waveform Content Module (WCM)

Optimized Message Syntax (OMS)

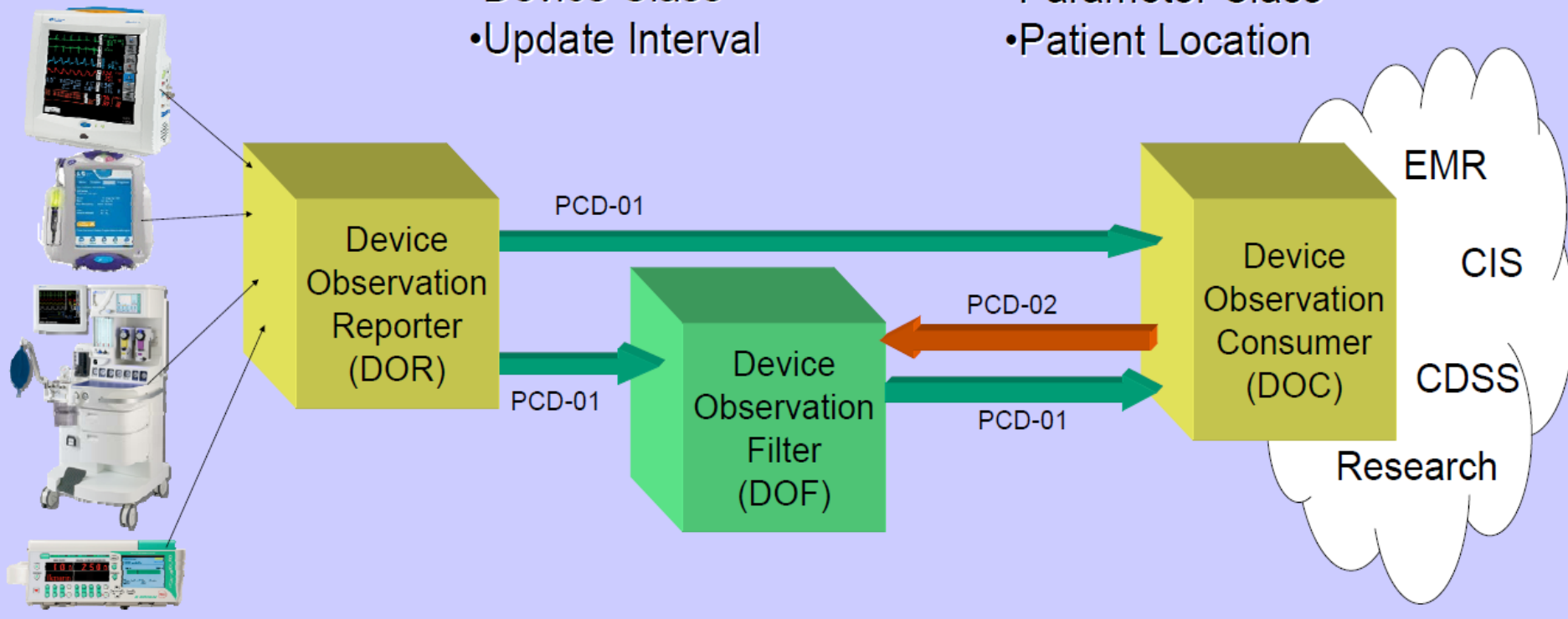
NIST Testing Tools

Device to Enterprise Communication (DEC)

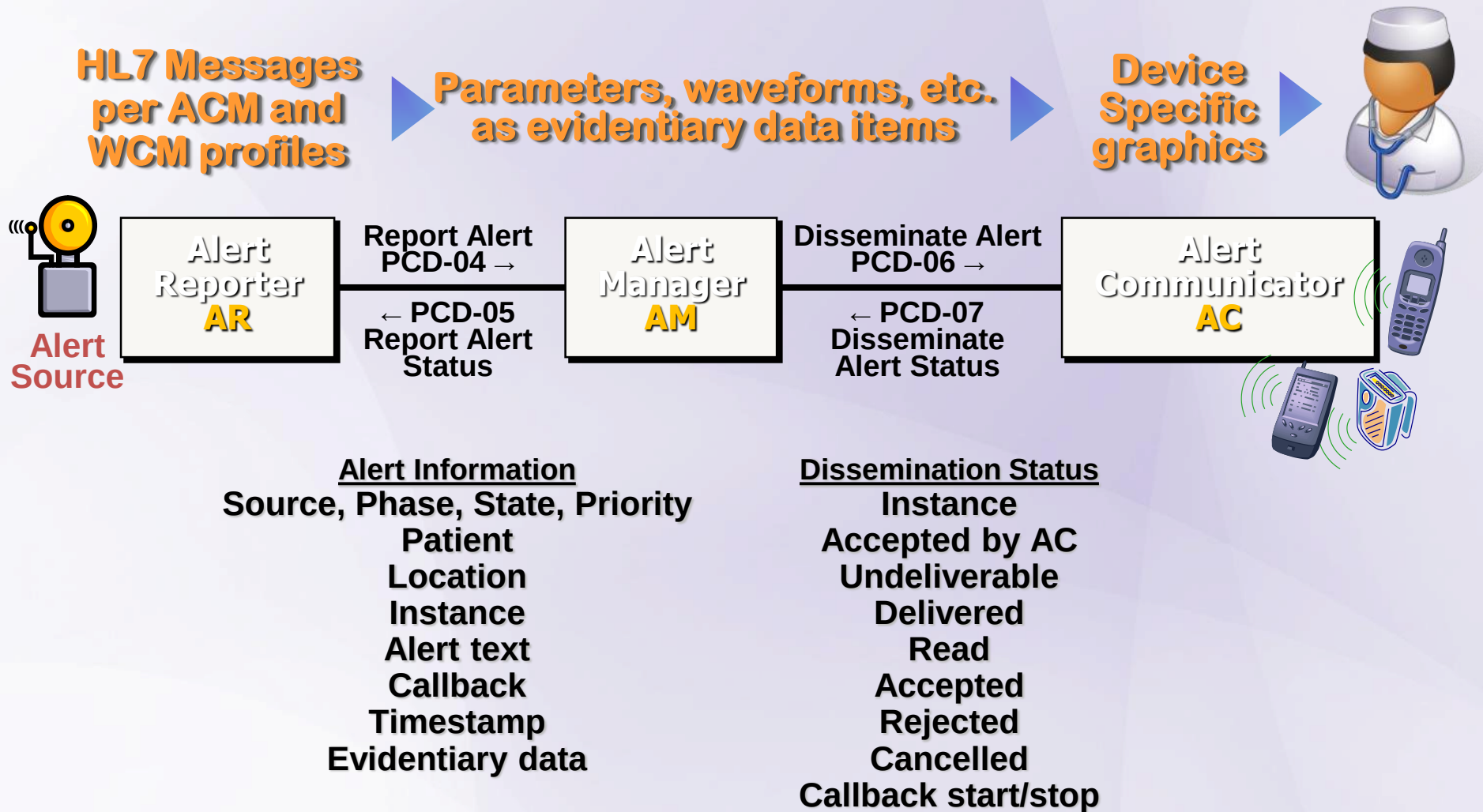
The DEC profile allows a consuming system (DOC) to receive patient clinical information including vitals, demographics, settings, and location from a reporting device/system (DOR).

The Subscribe to Patient Data (SPD) option allows the consumer to filter the data by:

- Medical Record #
- Device Class
- Update Interval
- Start & End Times
- Parameter Class
- Patient Location



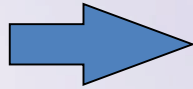
Alert Communication Management (ACM)



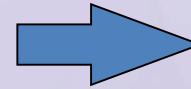
Point of care Infusion Verification (PIV)



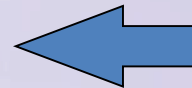
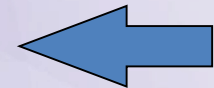
Physician's
Order



Nurse
Review



Pharmacist
Review



Medication
Administered



Nurse confirms 6 Rights:

- Right Patient
- Right Medication
- Right Dose
- Right Time
- Right Route
- Right Device

Infusion Pumps

BCMA to
Pump
(PCD-03)

Pump
may
provide
data to
EMR
(PCD-01)

Infusion Pump Event Communication (IPEC)

Infusion Pump Event Communication enables reporting of clinical and operational events from an infusion pump to a Bedside Computer-assisted Medication Administration (BCMA) system or EMR. Clinicians can then view and validate this information for infusion documentation.

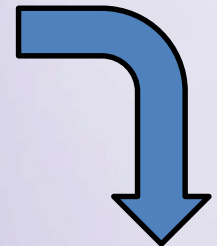
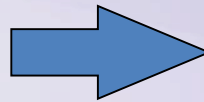
BCMA/EMR

Prior to medication administration, nurse confirms the 6 Rights of administration using BCMA/EMR:

- Right Patient
- Right Medication
- Right Dose
- Right Time
- Right Route
- Right Device

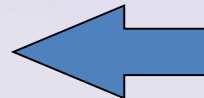
Infusion-related events are displayed, validated, and/or recorded by the clinician using the BCMA/EMR

Infusion order sent from BCMA/EMR to Pump (PCD-03)



Pump provides information on infusion-related events to BCMA/EMR (PCD-10) such as:

- Delivery Start
- Delivery Stop
- Delivery Complete



Implantable Device – Cardiac Observation (IDCO)

Device Implant Procedure



IDCO profile defines sending of pacemaker and Implantable Cardiology Defibrillator data

Collect device data from:

- Device implant
- In-clinic visits
- Remote transmissions from patient's home

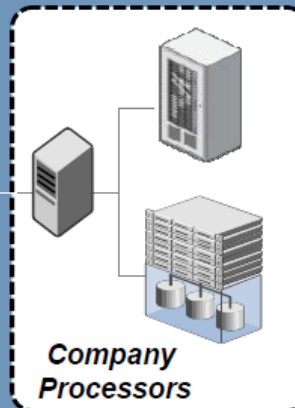
Includes data for:

- Current device state
- Event/episode information
- Device-collected electrocardiograms

In-clinic Follow-up



*Company
Proprietary Formats*



Patient Home Monitoring



Forward raw data to company data processor systems

Collect raw Implanted Device data

IDCO data transfer to EHR

Process/convert data into XML format & PDF reports

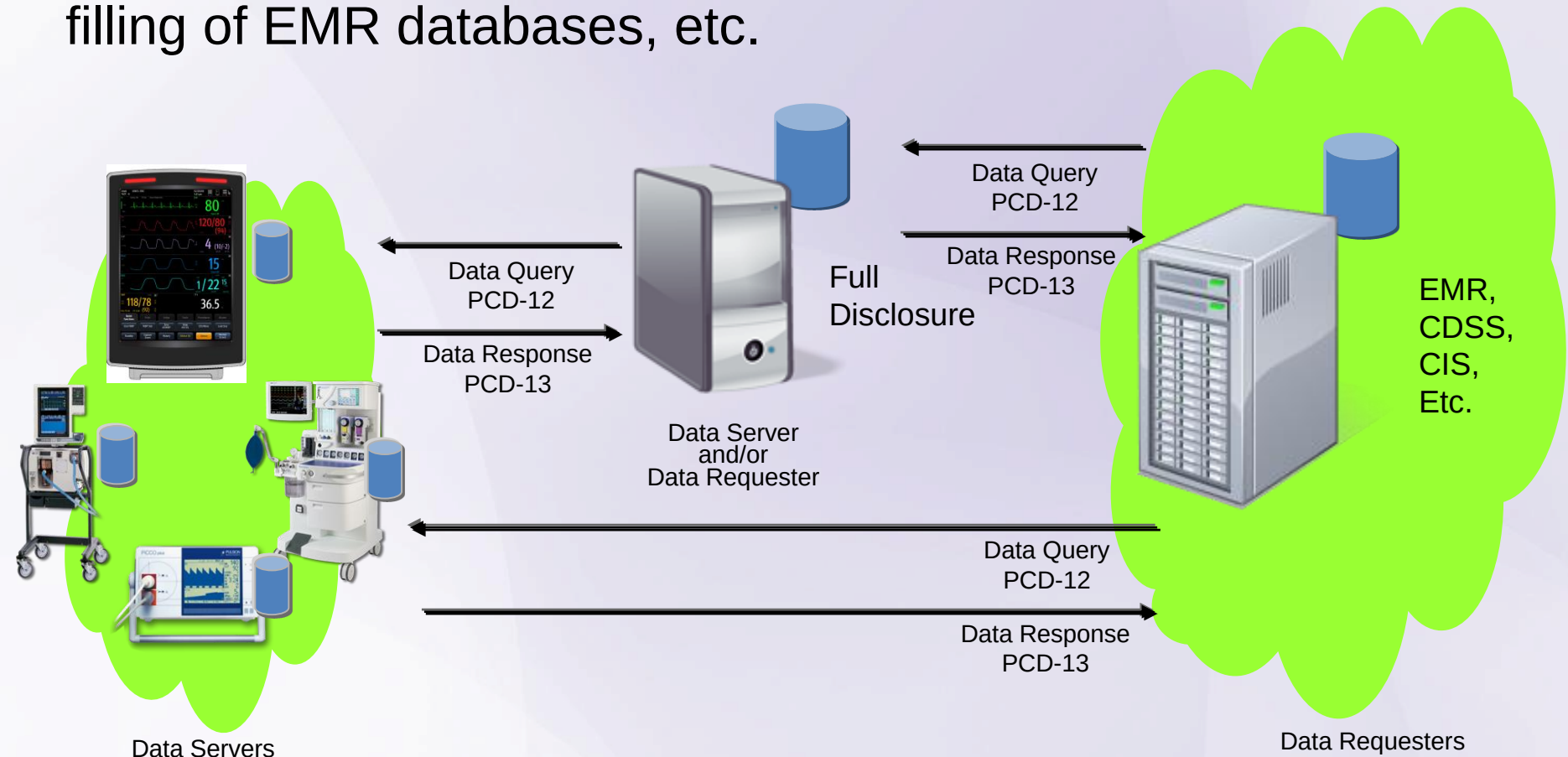
Hospital, Other EHRs

Clinician views data in EHR



Retrospective Data Query (RDQ)

Supports retrospective query of PCD data from databases.
Supports Use Cases such as Clinical Decision Support, back-filling of EMR databases, etc.



Device Management (MEMDMC) & Location Services (MEMLS)

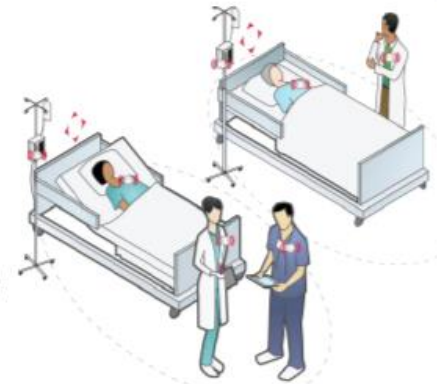
Profile based messages relay IV pump status including:

- Infusing
- Stopped



RTLS uses location to interpret asset status:

- Biomed (PM / Repair)
- CS (Cleaning)
- Clean Utility
- Patient Room (In Use)
- Dirty Utility

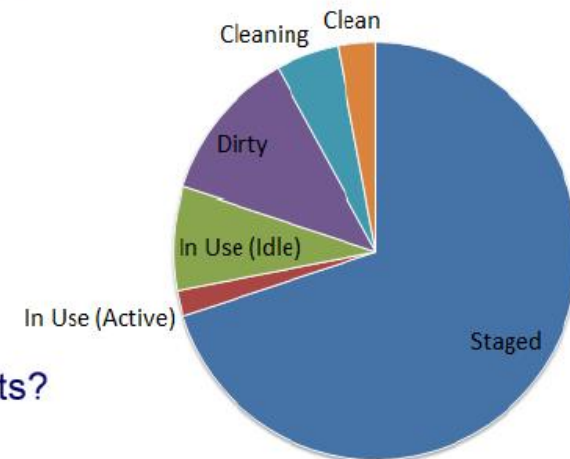


Combined data generates asset state:

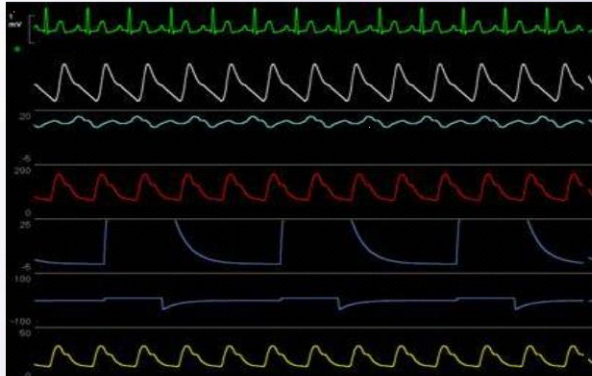
- Available
- In Active Use
- Unavailable but Idle
- Unavailable (PM / Technical Assessment): *Future* based on CMMS Data

Drives workflow and analytics:

- Where can I find idle pumps to return to circulation and meet requests?
- How often are pumps sitting idle in patient rooms?
- What is my true utilization?
- Is the pump leaving the building running (with a patient) or idle (possible theft)?
- Do I have more inventory than I need? (And what is related maintenance cost? Replacement cost?)



Waveform Content Module (WCM)



Continuous Waveform Data



Alarm Evidentiary Data

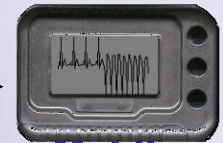
PCD-01

WCM encoded waveform

PCD-04



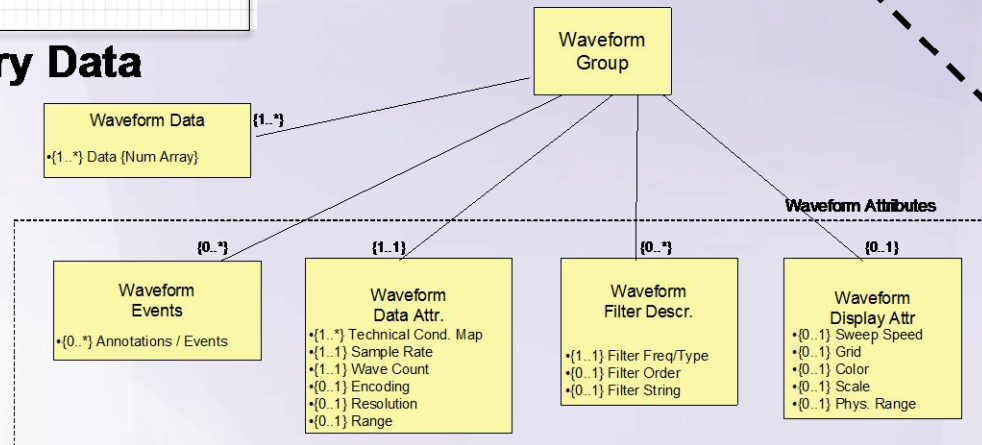
In-Hospital Access



Mobile Access

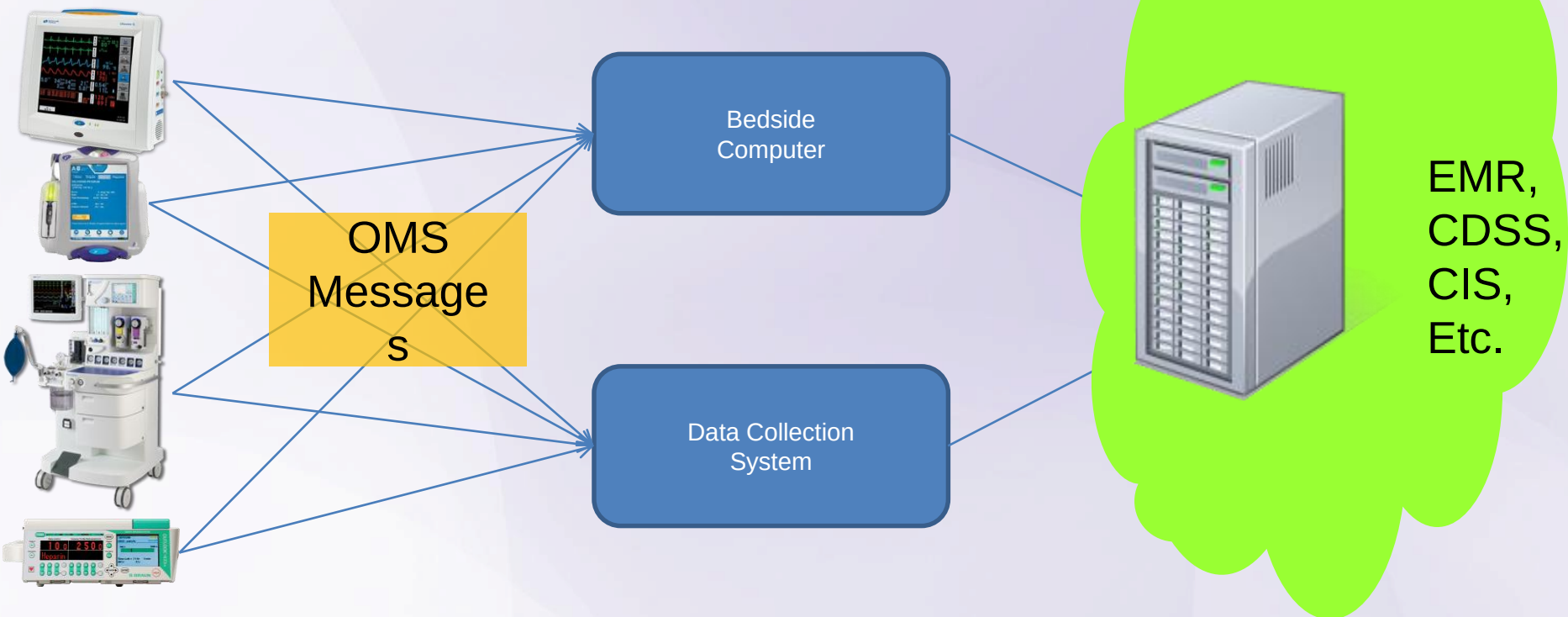


Remote Access

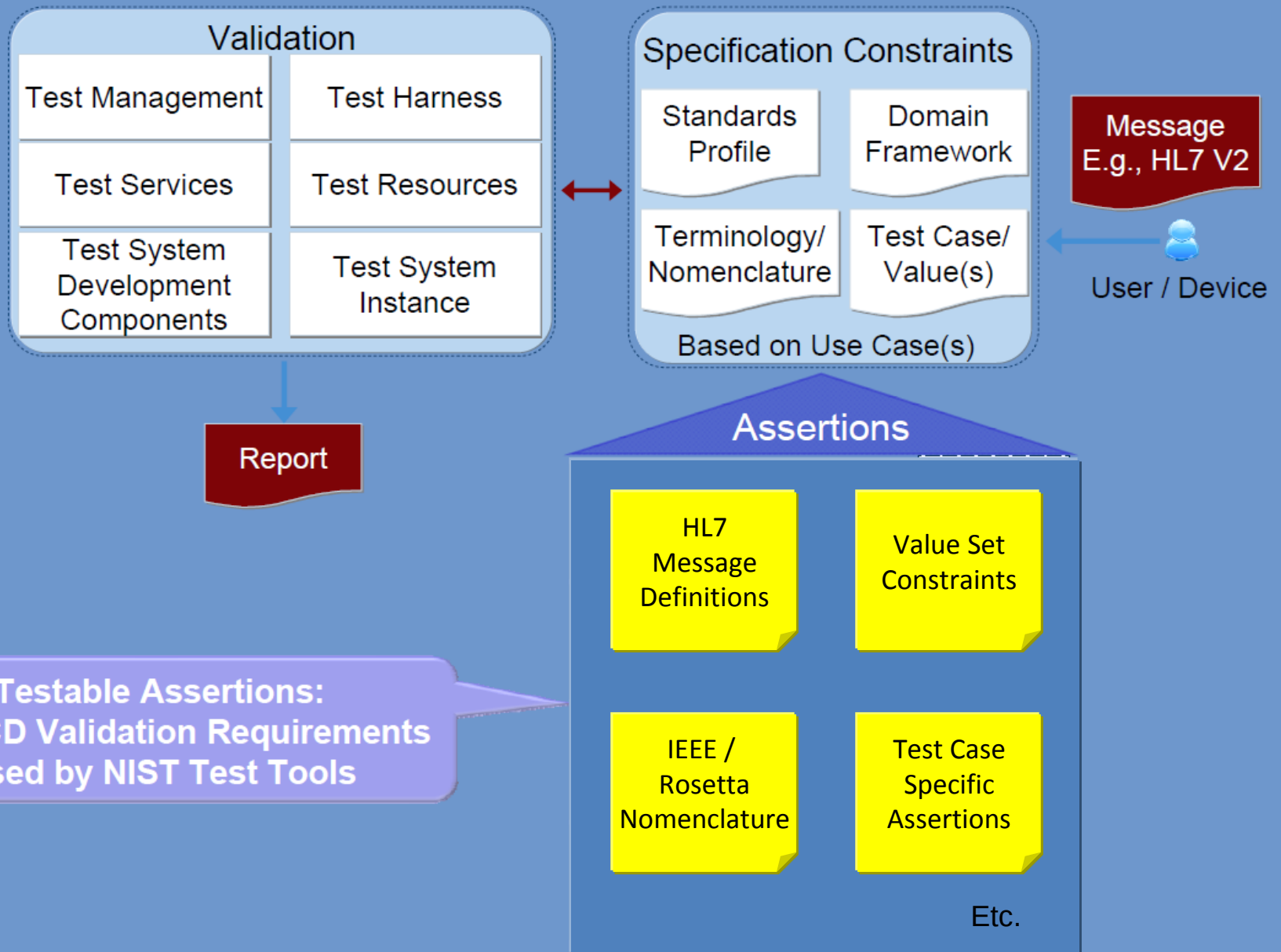


Optimized Message Syntax (OMS)

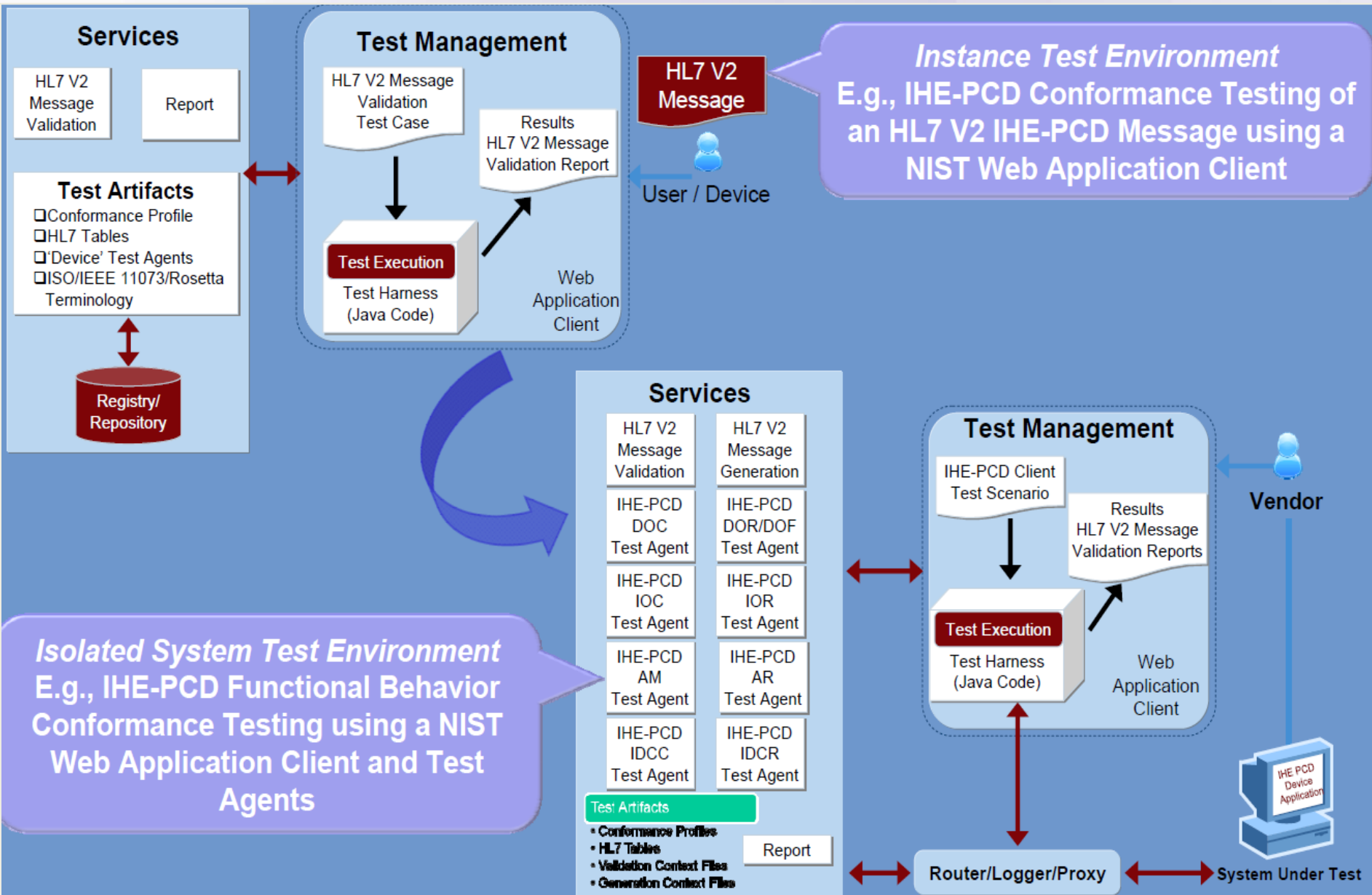
Optimized Message Syntax is an effort to adapt IHE PCD profiles for devices that have slow legacy RS-232 serial ports. OMS will optimize the PCD messages to reduce their size but still maintain consistency with mainstream PCD messages.



NIST Testing Tools



NIST Testing Tools



2017 Update

Document housekeeping and Change Proposals (CP) for several profiles

Update of PCD Technical Framework (PCDTF) for profiles at Final Text status

Publish of updated versions of some profiles at Trial Implementation status

Work with IEEE P1847 Working Group – Location Services for Healthcare

Point of Care Identity Management (PCIM) Whitepaper & Trial Implementation

Medical Equipment Management Remote Device Control (MEMRDC)

Whitepaper

IEEE 11073 new version -10101(b) to include nomenclature for

MEMDMC, MEMLS, alarms/alerts/events

Medical Equipment Management Remote Device Control (MEMRDC)

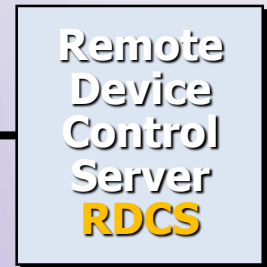
**Requestor
Initiates
Request**

**Communicate Identification,
Credentials, Request**

**Server
Validates Request
Performs Request**



Remote Device Control Request (RDCRQ) PCD-17 →
← PCD-18 Remote Device Control Response (RDCRS)



**Confirm Received,
Validated, Performed**

Focus

Device Security, Patient Safety

Data

Identification/Credentials (Requestor, Destination, Command)

Acknowledgements, Responses

Closed Loop (delivery confirmation, verification, completion)

Integration

Identify contextual data to implement ease of use of human interfaces

Initial Feasibility Demonstration

Focus on limited set of non-controversial use cases

Pause alert audio, Reset displayed infusion thus far, Unlock device panel

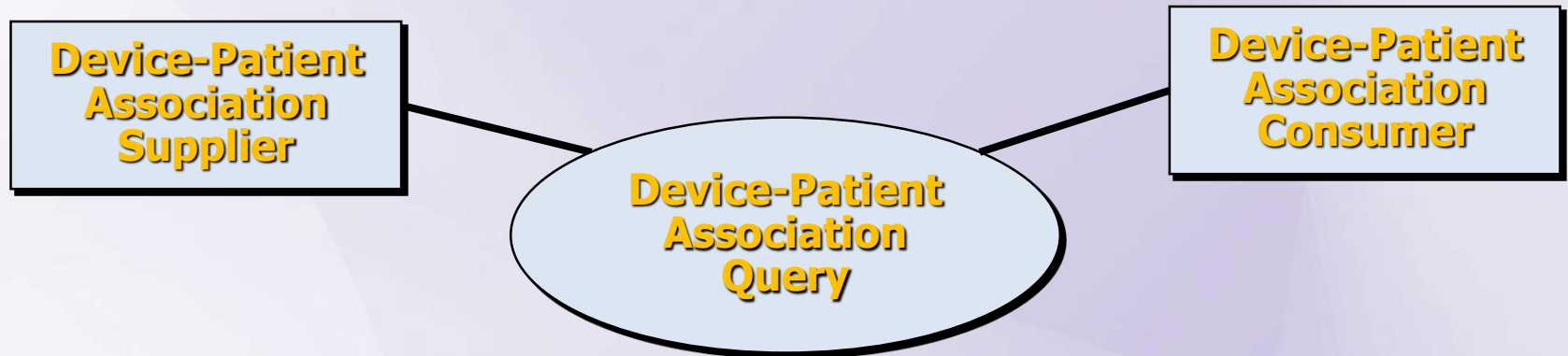
Point of Care Identity Management (PCIM)

Right Patient, Right Devices, Right Time

Every measurement to the right chart Every measurement to a chart

Every patient affecting device command sent to the correct device

Purpose of PCIM Working Group is to discuss additional use cases, and means for recording events of devices becoming associated with patients, and means for systems to receive notifications of such events, as well as to query the state of patient-device associations.



Device-Patient Associations have a beginning and an end

Discusses Device-Patient Association workflows

Discusses barcodes or RFID to assist in identifications of patients, devices, and staff

Supports fixed (ADT), mobile, and transient (spot-check) device associations

Utilizes HL7 v2.7 plus Participate (PRT) segment US FDA UDI extensions from v2.8.2

Utilizes ITI profiles Patient Administration Management (PAM) & Patient Encounter Management (PEM)

Single authoritative source for device-patient associations (Device-Patient Association Manager)

recording associations from other systems (Device-Patient Association Reporters) and responding to association queries from other systems (Device-Patient Association Consumers)

Identifies the Device Registrant as system, device, or person identifying that a device may participate in an association

Identifies a Patient Registration System as a system that identifies patients that may participate in associations



Integrating
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Enterprise

Role of Device Vendors

Support the Mission of IHE PCD

- Become an IHE member

- Participate in PCD efforts

 - Increased consistency and conformance – listen and be heard

Plant the Seed

- Support IHE PCD Profile based Interoperability

- Encourage active IHE participation by vendors

Request customers purchase IHE PCD compliant products

- Provide IHE Integration Statements

- Participate in Connectathons

- Promote browsing of Connectathon Results and Product Registry sites

- Participate in Interoperability Demonstrations (HIMSS and AAMI)

Role of Device Users

Support the Mission of IHE PCD

- Become an IHE member

- Participate in PCD efforts

 - Increased consistency and conformance – listen and be heard

- Plant the Seed

 - Encourage active IHE participation by users

- Purchase IHE PCD compliant products

 - Expect IHE Integration Statements from vendors

 - Expect vendor participation in Connectathons as external verification

 - Look for products in Connectathon Results and Product Registry sites

 - Visit Live Interoperability Demonstrations (HIMSS and AAMI)

 - Purchase commercially available PCD profile interoperable products

Commercially Available Devices and Systems

The IHE PCD domain maintains a listing of commercially available devices and systems which have passed IHE Connectathons for PCD profiles. The list is cooperatively maintained by IHE PCD, contributing vendors, and comments from end users. This is an ever changing list that is too long to be easily presented here in its entirety.

The most recent version can be found at

[ftp://ftp.ihe.net/Patient_Care_Devices/Deployment/Commercially Available PCD Systems/](ftp://ftp.ihe.net/Patient_Care_Devices/Deployment/Commercially_Available_PCD_Systems/)

Additional Resources

IHE PCD web site

www.ihe.net/pcd/index.cfm

IHE PCD Wiki

[wiki.ihe.net/index.php?title=Patient Care Devices](http://wiki.ihe.net/index.php?title=Patient_Care_Devices)

Tool web sites

PCD Pre-Connectathon

<http://ihe-pcd-precon.nist.gov/PCD-HL7WebPreCon/>

PCD Connectathon

<http://ihe-pcd-con.nist.gov/PCD-HL7WebCon/#home.htm>

Rosetta Terminology

<https://rtmms.nist.gov/rtmms/index.htm>

Contacts

- **IHE PCD Planning Committee Co-Chairs**
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 - Kurt Elliason – Smiths Medical
- **IHE PCD Technical Committee Co-Chairs**
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- **IHE – www.ihe.net**
- **IHE PCD – www.ihe.net/Patient_Care_Devices**
- **Connectathon Results – <http://connectathon-results.ihe.net>**
- **IHE PCD list of Commercially Available Devices and Systems**
ftp://ftp.ihe.net/Patient_Care_Devices/Deployment/Commercially_Available_PCD_Systems/