Health Information Exchange Architecture Building Blocks

Overview and Glossary

HISO 10040.0

To be used in conjunction with
HISO 10040.1 Health Information Exchange CDR Utility Services
HISO 10040.2 Health Information Exchange Content Model
HISO 10040.3 Health Information Exchange Structured Documents

Health Information Exchange Architecture Building Blocks

This document provides an introduction to a suite of three specifications that define the Interoperability Standard for the New Zealand health and disability sector.

Each of these specifications defines a key ingredient of our recipe for interoperability. These *architecture building blocks*, as we call them, collectively describe an overall architecture for information exchange that is centred on regional clinical data repositories.

The *Health Information Exchange (HIE)* is defined as a standards-based fabric across which participant systems (of all kinds) will interact with regional and national repositories. HIEs will be regional to begin with, but will interconnect to provide national coverage and the necessary support for shared care records.

The three building blocks embody the essentials of a larger piece of work called the *Interoperability Reference Architecture.*

National Health IT Plan

All of the above is in direct support of the National Health IT Plan, which sets out to realise an e-health vision of shared care records, teams and processes. R-CDRs are given as foundational in this.

There was a clear need to describe how R-CDRs would actually work, what the required standards should be, and so on – hence the work on interoperability.
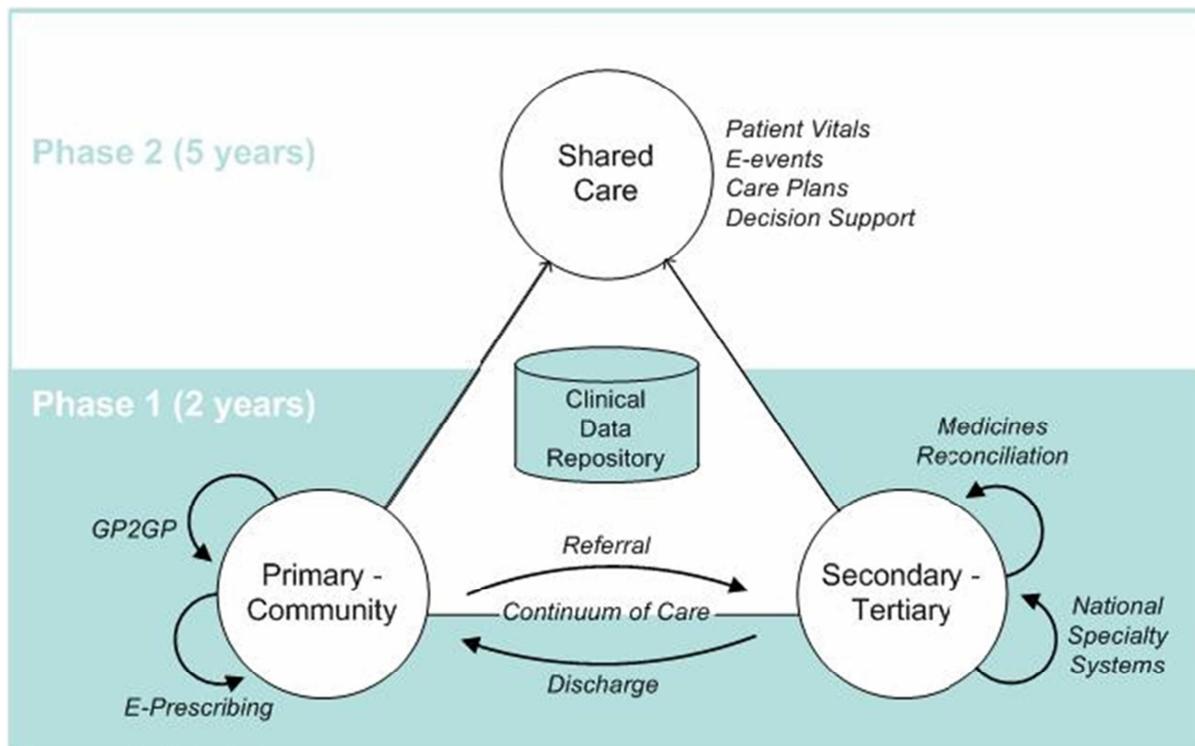
Figure 1: Enabling an Integrated Healthcare Model

Interoperability Reference Architecture

The overall objective of the Interoperability Reference Architecture is to enable *functional, semantic and process interoperability,* wherever distributed transactions involving different systems and actors occur.

- *Functional Interoperability* exists when information exchange conforms to agreed transport protocols and message formats
- *Semantic Interoperability* exists when information exchange involves commonly understood data structures and terminologies
- *Process Interoperability* exists when business processes are supported across multiple information systems

An information system can be called interoperable when it implements the standards to interoperate with others in these ways.

Architecture Building Blocks

There are three key building blocks that we are proposing as being essential for interoperability.

1. *HISO 10040.1 HIE CDR Utility Services*, specifying a style of information exchange based on the registry-repository model of the *IHE Cross Enterprise Document Sharing (XDS)* integration profile
2. *HISO 10040.3 HIE Structured Documents*, specifying *HL7 Clinical Document Architecture (CDA)* structured documents as the common currency of information exchange
3. *HISO 10040.2 HIE Content Model*, specifying a common shared content model, with the *ASTM Continuity of Care Record (CCR)* as the basis for core health information, extensible per clinical specialty

To use an everyday analogy, the first of these is to define the postal system, then the second defines the envelope, and the third the contents of the envelope.

Specifications

Each building block is formulated as a separate document. They combine to make a coherent whole, but are individually more or less discrete and independent.

They are technical specifications. They comprise architectural principles and requirements, and reference standards. They are reasonably terse, going into detail only where necessary to avoid ambiguity.

They are future state documents. They define a future state that can be achieved using the standards and technology of today, but without undue deference to today's systems and their limitations.

They are pragmatic documents. The future state they describe is readily achievable. They are designed for uptake and not to place unreasonable demands on software vendors and implementers.

They are evolutionary specifications. Interoperability is a moving target as the industry gains experience. The specifications can be expected to change in their detail, although not their essence.
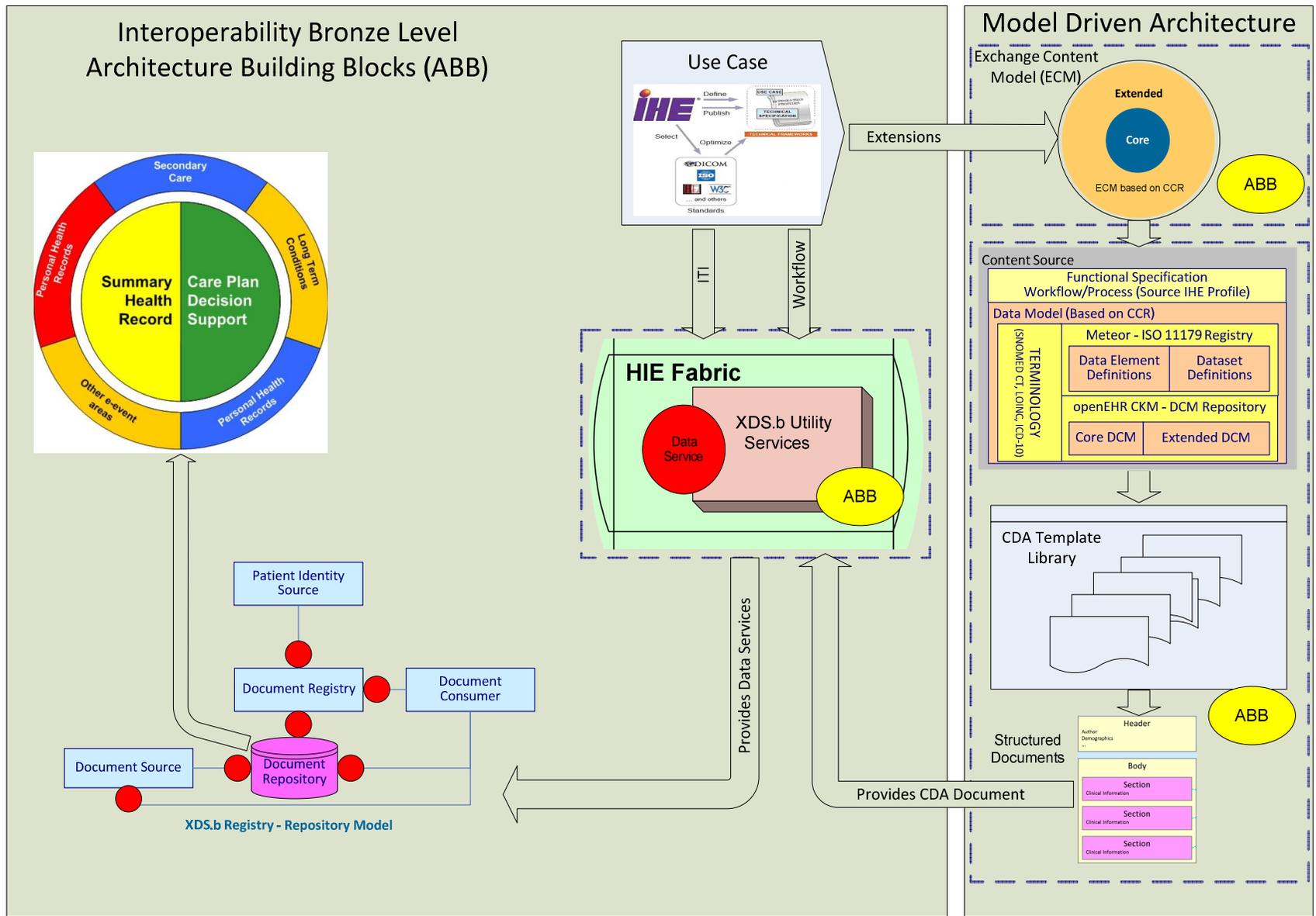
Figure 2: Interoperability Reference Architecture

Stakeholders

There are a number of stakeholders to this work.

Regional Information Systems Groups are key stakeholders. In turn, so too are their customers, the health workers and organisations around the country.

Software vendors are key stakeholders. They are being asked to support the new standards in their products.

Some upcoming projects will be affected. This includes R-CDR projects, the Auckland Region eReferral Project, the Health Identity Project, and the National View of Cancer Project. All people working on these projects should ensure they have necessary familiarity with the specifications.

Solution architects are the primary audience for the specifications. The building blocks are theirs to use in creating new solutions.

The building blocks do not directly affect consumers. Any connection is via the National Health IT Plan and Regional Information Systems Plans, for which the building blocks provide some of the technical substance.

Information governance work is underway as a separate although related exercise to define how information should be used, collected, etc in business terms.

Australia's Personally Controlled Electronic Health Record (PCEHR) project is well aligned to this work.

Related HISO Standards

Certain HISO standards are impacted by this work and will require review or at least the overall fit needs to be worked out.

The building blocks note in some detail where overlaps and conflicts occur.

In summary, there is some impact to the following in particular:

- HISO 10014.1 Data Concept Repository
- HISO 10014.2 Online Forms Architecture Technical Specification
- HISO 10011 Referrals, Status and Discharge
- HISO 10038 National Specialist Cancer Core Data Standards
- HISO 10039 National Specialist Palliative Care Data Standards

Glossary

Abbreviation	Term	Definition	Reference
	Actor	Participant people or systems engaged in some transaction; actor is a UML term used in modelling solutions	http://www.uml-diagrams.org/use-case-diagrams.html
ADK	Additional Decryption Key	Standard encryption technique	http://www.symantec.com/business/support/index?page=content&id=TECH149500
AES	Advanced Encryption Standard	Standard encryption technique	http://csrc.nist.gov/publications/fips/fips197/fips-197.pdf
ADR	Adverse Drug Reaction		
	Archetype	ISO 13606/openEHR archetypes are constraint-based formal models representing clinical concepts; encoded using Archetype Definition Language; templates collect and further constrain archetypes for specific needs	http://www.openehr.org/wiki/display/stds/openEHR+Archetypes+for+HL7+CDA+Documents
ADL 1.4	Archetype Definition Language 1.4	The normative language used to express archetypes	http://www.openehr.org/releases/1.0.2/architecture/am/adl2.pdf
ABB	Architecture Building Block	Discrete unit of architecture specification; comprises architectural principles, constraints and requirements for some purpose; may be composed with others to create solution architectures; typically collected under reference architectures	http://www.opengroup.org/togaf/
ABB	Architecture Building Block	These are discrete units of architecture specification which, collectively, will make up the interoperability reference architecture	http://www.ithealthboard.health.nz/content/sector-architects-group
	ASTM International	SDO and creator of the CCR specification	http://www.astm.org/
ATNA	Audit Trail and Node Authentication	IHE integration profile defining security aspects of the related XDS integration profile; sets requirements for authentication, access control and audit in relation to document sharing	http://wiki.ihe.net/index.php?title=Audit_Trail_and_Node_Authentication

Abbreviation	Term	Definition	Reference
AIHW	Australian Institute of Health and Welfare	Creator of the METeOR online metadata registry tool	http://www.aihw.gov.au/
CDA R2	CDA Release 2	Current release of CDA	http://www.hl7.org/implement/standards/cda.cfm
CDR	Clinical Data Repository	Database that brings together clinical information from many sources for the purpose of sharing it among care teams	
CDA	Clinical Document Architecture	HL7 RIM-based specification and XML schema for structured documents	http://www.hl7.org/implement/standards/cda.cfm
CKM	Clinical Knowledge Manager	openEHR Clinical Knowledge Manager is a web-based tool for creating ISO 13606/openEHR archetypes	http://www.openehr.org/wiki/display/healthmod/Clinical+Knowledge+Manager
CTS2	Common Terminology Services 2	HL7/OMG specification for terminology services, e.g. ICD-to-SNOMED CT translation	http://hssp.wikispaces.com/cts2
	Containment	The term containment is used when a standard is not the current standard. The standard in containment can only be used for specific and specified circumstances; hence the standard is contained for a certain usage.	http://www.opengroup.org/togaf/
CCR	Continuity of Care Record	Widely used international specification that describes summary health status information including problems, medications, alerts, care plan, etc.	http://www.ccrstandard.com/ http://www.astm.org/Standards/E2369.htm
	Core Health Information	A term used for important patient information, previously referred to as Patient Vitals	
XCA	Cross Community Access	IHE integration profile that enables the interconnection of XDS affinity domains	http://wiki.ihe.net/index.php?title=Cross-Community_Access
XDW	Cross Enterprise Document Workflow	The Cross-Enterprise Document Workflow (XDW) profile enables participants in a multi-organisational environment to manage and track the tasks related to patient-centric workflows as the systems hosting workflow management applications coordinate their activities for the health professionals and patients they	http://wiki.ihe.net/index.php?title=Cross_Enterprise_Workflow

Abbreviation	Term	Definition	Reference
		support.	
		XDW builds upon the sharing of health documents provided by other IHE profiles such as XDS, adding the means to associate documents conveying clinical facts to a patient-specific workflow. XDW provides a common interoperability infrastructure upon which a wide range of specific workflow definitions may be supported. It is designed to support the complexity of health services delivery with flexibility to adapt as workflows evolve.	
XDS	Cross Enterprise Document Sharing	IHE integration profile for document-oriented health information exchange, based on ebXML	http://wiki.ihe.net/index.php?title=Cross-Enterprise_Document_Sharing
XDS.b	Cross Enterprise Document Sharing-b	Latest edition of the XDS specification	http://wiki.ihe.net/index.php?title=Cross-Enterprise_Document_Sharing-b_(XDS.b)
	Custodianship	A data custodian is responsible for data management, including transport, storage, security and access.	
	Data Service	A service that provides interfaces to the capabilities and data of one or more data resources	
DCM	Detailed Clinical Model	Conceptual-level specification of the structure and semantics of context-specific clinical information, e.g. adverse reactions, medications	http://www.detailedclinicalmodels.nl/dcm-en
DICOM KOS	DICOM Key Object Selection	Part of the DICOM standard – describes an image manifest file format	http://medical.nema.org/
DICOM	Digital Imaging and Communications in Medicine	International standard for communication of medical images	http://medical.nema.org/
DSG	Document Digital Signature	IHE integration profile for digital signatures	http://wiki.ihe.net/index.php?title=Document_Digital_Signature
ebXML	Electronic Business Extensible Markup	Standard from Oasis and the United Nations Centre for Trade Facilitation and Electronic Business	http://www.ebxml.org/

Abbreviation	Term	Definition	Reference
	Language	(UN/CEFACT) for e-business based on XML document exchange; ebXML specifies an infrastructure that allows enterprises to find services, products, business processes and documents in a standard way	
XML	Extensible Markup Language	Markup language commonly used to convey structured information	http://www.w3schools.com/xml/
XSLT	Extensible Stylesheet Language	XML-based language used to process XML documents, e.g. to create a human readable HTML version of an XML document	http://www.w3schools.com/xsl/
	Functional Interoperability	An aspect of interoperability, functional interoperability exists when information exchange conforms to agreed transport protocols and message formats	
GUID	Globally Unique Identifier	Systematically created, practically unique identifiers in computer software, based on the Universally Unique Identifiers (UUID) standard	http://www.itu.int/ITU-T/asn1/uuid.html
GP2GP	GP2GP	General practice patient notes transfer solution; based on CDA messages and point-to-point messaging	http://www.ithealthboard.health.nz/content/gp2gp
GIF	Graphics Interchange Format	Bitmap image file format	http://www.w3.org/Graphics/
HIE	Health Information Exchange	Application-level communication medium with standardised content and transport, across which participants exchange health information	
HL7	Health Level 7	May refer to either Health Level Seven International, the organisation, or its published standards, HL7 v2 and HL7 v3	http://www.hl7.org/ http://www.ithealthboard.health.nz/endorsed
HL7 International	Health Level Seven International	International SDO and creator of the HL7 sets of standards	http://www.hl7.org/ http://www.hl7.org.nz/
HPI	Health Practitioner Index	National index of all health practitioners and provider	http://www.ithealthboard.health.nz/hpi

Abbreviation	Term	Definition	Reference
		organisations, services and facilities operating in New Zealand	
HPD	Health Provider Directory	IHE integration profile for the management of and access to shared health provider information	http://www.ihe.net/Technical_Framework/upload/IHE_ITI_Suppl_HPD_Rev1-1_TI_2010-08-10.pdf
	HealthBase	Based on TOGAF is an enterprise architecture for the New Zealand health and disability sector	
	HIE Adapter	Software component providing interfacing support to systems that do not natively use the communication protocols of the HIE	
HL7 v2.x	HL7 Version 2.x	Widely used health messaging standard, referring to the various iterations under version2 s	http://www.hl7.org/implement/standards/v2messages.cfm
HL7 v3	HL7 Version 3	The successor standard to HL7 v2; encompasses HL7 v3 Reference Information Model, HL7 v3 Messaging, CDA and other related specifications	http://www.hl7.org/implement/standards/v3messages.cfm
HTML	Hypertext Markup Language	The markup language used to create web pages	http://www.w3schools.com/html/default.asp
	IHE Integration Profile	Standards-based specification that describes the actors and transaction types that enable some aspect of interoperability There are foundational integration profiles that are common across clinical domains, and then there are integration profiles specific to particular clinical domains	http://wiki.ihe.net/index.php?title=Profiles
IHE IT	IHE IT Infrastructure Technical Framework	Set of foundational integration profiles, independent of clinical domain	http://wiki.ihe.net/index.php?title=Profiles - IHE_IT_Infrastructure_Profiles
ITI-xx	IHE-xx	IHE Transaction type	
IHE	Integrating the Healthcare Enterprise	International organisation promoting and providing implementation guidelines for standards-based interoperability	http://www.ihe.net/

Abbreviation	Term	Definition	Reference
ICD O	International Classification of Diseases for Oncology	Used principally in tumour or cancer registries for coding the site (topography) and the histology (morphology) from a pathology report	http://www.who.int/classifications/icd/adaptations/oncology/en/
ICD 10 AM	International Classification of Diseases, Australian Modification	Widely used international classification system for disease identification	http://www.who.int/classifications/icd/en/
IHTSDO	International Health Terminology SDO	SDO that develops SNOMED CT	http://www.ihtsdo.org/
	Interoperability	Interoperability of health information systems, or the ability to exchange information; encompasses functional, semantic and process interoperability	
	Interoperability Reference Architecture	Is the reference architecture required for health information interoperability within the NZ health and disability sector . It has been developed to support the National Health IT Plan.	http://www.ithealthboard.health.nz/content/sector-architects-group
	ISO 13606	Five-part international standard for Health Informatics – Electronic Health Record Communication	http://en13606.webs.upv.es/web13606/index.php/the-ceniso-en13606-standard
	ISO 13606/openEHR Reference Model (RM)	Set of technical building blocks which archetypes bind and constrain to express a particular clinical concept; the reference model consists of a set of UML classes	http://www.openehr.org/
LOINC	Logical Observation Identifiers Names and Codes	Coding system for identifying laboratory test and clinical observations The coding system NZPOCS is based upon	http://loinc.org/ http://www.ithealthboard.health.nz/endorsed
	Medico legal	The term medico legal documentation refers to medical records created systematically by healthcare practitioners as authoritative documentation of episodes of care.	
MTOM/XOP	Message Transmission Optimisation Mechanism /	MTOM is a method of including binary data in calls to	http://www.w3.org/TR/soap12-mtom/

Abbreviation	Term	Definition	Reference
	XML-binary Optimised Packaging	SOAP web services XOP is a means for including binary data within XML documents MTOM/XOP is use of the two together	http://www.w3.org/TR/xop10/
METeOR	METeOR	Online metadata registration tool, conforming to ISO/IEC 11179; provided by AIHW and licenced for use in New Zealand	http://meteor.aihw.gov.au/content/index.phtml/itemId/181162
MIME	Multipurpose Internet Mail Extensions	Internet content type family; formats for the transmission of text, images, audio, video, etc.	http://www.w3.org/Protocols/rfc1341/7_2_Multipart.html
NHI	National Health Index	New Zealand's national master patient index; an NHI number identifies every health consumer in the country	http://www.nzhis.govt.nz/moh.nsf/pagesns/266?Open
NTP	Network Time Protocol	Protocol used to synchronise clocks over the Internet	http://www.ntp.org/
NZMT	New Zealand Medicines Terminology	SNOMED CT Reference Set for medicines used in New Zealand	http://www.nzulm.org.nz/
NZPOCS	New Zealand Pathology Observation Code Sets	New Zealand specific code sets for ordering and reporting laboratory tests, based on LOINC	http://www.ithealthboard.health.nz/nzpocs
OID	Object Identifier	Hierarchically generated persistent object identifier	http://www.oid-info.com/ - oid
OMG	Object Management Group	An IT industry SDO	http://www.omg.org/
PAS	Patient Administration System	Hospital information system, responsible for booking and scheduling patients and resources	
PDQV3	Patient Demographic Query V3	IHE integration profile, using HL7 v3 message formats and SOAP web services transport, for distributed access to patient demographic data from an authoritative source	http://www.ihe.net/Technical_Framework/upload/IHE_ITI_Suppl_PIX_PDQ_HL7v3_Rev2-1_TI_2010-08-10.pdf
PIXV3	Patient Identity Cross Reference V3	IHE integration profile, using HL7 v3 message formats and SOAP web services transport, for distributed access to patient identity feeds from an authoritative source	http://www.ihe.net/Technical_Framework/upload/IHE_ITI_Suppl_PIX_PDQ_HL7v3_Rev2-1_TI_2010-08-10.pdf

Abbreviation	Term	Definition	Reference
PACS	Picture Archiving and Communication System	Class of system for storing and providing access to medical images, particularly DICOM images	
PoC PoS	Point of Care Point of Service	Point-of-care or, more generally, point-of-service systems are those used proximate to the patient receiving care	
PDF	Portable Document Format	Standard file format for unstructured document exchange	http://www.adobe.com/products/acrobat/adobepdf.html
PNG	Portable Network Graphics	Lossless, portable bitmap image file format	http://www.w3.org/Graphics/
PMS	Practice Management System	General practice, primary care or departmental practice or patient management system, with both administrative and clinical functions	
	Process Interoperability	An aspect of interoperability, process interoperability exists when business processes are supported across multiple information systems	
RLS	Record Locator Service	Index-based tool provided by the Health Information Exchange enabling participant applications to find patient records distributed across multiple repositories	http://healthinformatics.wikispaces.com/Record+Locator+Service+(RLS)
RA	Reference Architecture	Collection of related architecture building blocks in some domain, a guide and template for solution architectures in that aspect	http://www.opengroup.org/togaf/
RIM	Reference Information Model	HL7 v3 RIM is a health meta-model for the development (by constraint) of domain-specific models and message formats RIM sometimes also refers to similar non-HL7 models	http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.145.4676&rep=rep1&type=pdf
R-CDR	Regional - Clinical Data Repository	R-CDR are described by the National Health IT Plan as the regional collection points for objective health information, including laboratory test results, medication records, etc. – to facilitate information sharing. R-CDR will be made up of multiple repositories holding clinical	

Abbreviation	Term	Definition	Reference
		information for a Region	
R-CDR	Regional CDR	R-CDRs are described by the National Health IT Plan as the regional collection points for objective health information, including laboratory test results, medication records, etc. – to facilitate information sharing	http://www.ithealthboard.health.nz/content/national-health-it-plan
	Registry-Repository Model	Information sharing architecture in which a central registry serves as an index to documents stored in multiple distributed repositories	
REST	Representational State Transfer	Style of web services based on native use of HTTP; alternative to and simpler than SOAP web services	https://www.ibm.com/developerworks/webservices/library/ws-restful/
	Schematron	XPath-based assertion language for validating XML documents	http://www.schematron.com/
	Semantic Interoperability	An aspect of interoperability, semantic interoperability exists when information exchange involves commonly understood data structures and terminologies	
	Service Adapters	Service adapters are software components that attach to legacy applications in order to make web services accessible to them	
SOA	Service Oriented Architecture	Architectural philosophy or style for delivery of functionality as sets of discrete, interoperable components	
SOAP	Simple Object Access Protocol	Method of invoking web services based on remote procedure calls and structured XML payloads	
	SNOMED CT Reference Set	Collection of related SNOMED CT concepts and terms pertaining to some domain, e.g. New Zealand Medicines Terminology	http://www.ihtsdo.org/fileadmin/user_upload/Docs_01/Technical_Docs/reference_sets.pdf
SDO	Standards Development Organisation (SDO)	Usually non-profit body that exists to create standards – e.g. in health informatics, HL7, IHTSDO; in the IT	

Abbreviation	Term	Definition	Reference
		industry, Oasis, OMG	
	Stewardship	A data steward is responsible as the source of data and metadata, including content, quality and compliance with standards	
SNOMED CT	Systematised Nomenclature of Medicine Clinical Terms	Universal medical terminology system	http://www.ihtsdo.org/ http://www.ithealthboard.health.nz/endorsed
TOGAF	The Open Group Architecture Framework	Industry standard architecture framework,	http://www.opengroup.org/togaf/
TLS	Transport Layer Security	Cryptographic protocol that enables secure channels of communication over the Internet	http://www.ietf.org/rfc/rfc2246.txt
UCUM	Unified Code for Units of Measure	Universal coding system for units of measure	http://unitsofmeasure.org/
UML	Unified Modelling Language	Standard business process and information modelling language developed by OMG	http://www.omg.org/technology/readingroom/UML.htm
UUID	Universally Unique Identifiers	International standard for OIDs	http://www.itu.int/ITU-T/asn1/uuid.html
	Utility Services	SOA term that refers to services encapsulating common, reusable crosscutting (business process-independent) functionality	
WADO	Web Access to DICOM Persistent Objects	HTTP-based protocol for retrieval of DICOM objects (e.g. stored in PACS), either in native form or as a rendered image	ftp://medical.nema.org/medical/dicom/2009/09_18pu.pdf
WS-I	Web Services Interoperability Basic Profile	Set of consistent web services specifications, collected and profiled for use in interoperability	http://ws-i.org/Profiles/BasicProfile-2.0-2010-11-09.html
XDS	XDS Affinity Domain	Group of healthcare enterprises that have agreed to	http://wiki.ihe.net/index.php?title=Cross_Enterprise_

Abbreviation	Term	Definition	Reference
		share health information under a common set of policies and with common infrastructure; a concept of the XDS integration profile	Document_Sharing
XSD	XML Schema	XML-based language for defining XML document structure	http://www.w3schools.com/schema/default.asp
	XPath	XML-based language for querying XML documents	http://www.w3schools.com/xpath/default.asp