



# **VA HITSAC HIE Technology Topics**

**John Quinn**

**HITSAC Meeting**

**September 17, 2009**





# Agenda / Topics

- **HL7 & Version 3 *(presented August 20, 2009)***
- **HIE Architecture Choices**
- **Medicaid Information Technology Architecture (MITA) and the Nationwide Health Information Network (NHIN)**
- **Healthcare inter-organizational examples today both inside and outside the US.**
- **HITSP & Federal Health Architecture**



# HL7 & Version 3



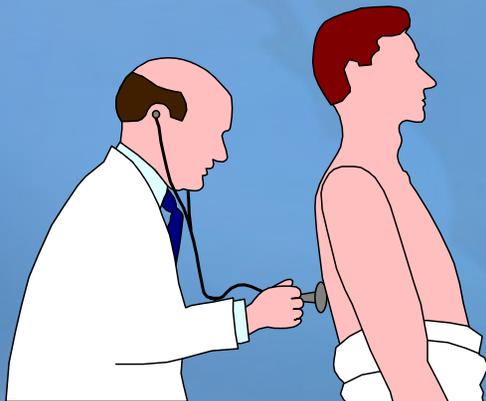


# Health Level Seven (HL7)

HL7 is an ANSI accredited standards organization (ASO) for clinical & operational EDI.

*ISO's Open Systems Interconnect (OSI) model: Application Level" – level 7*

**Members include:** user (hospital, physicians practices, physician group practices, academic faculty practice plans, health maintenance organizations (HMO), preferred provider organizations (PPO), independent practice affiliations (IPA), utilization review (UR) companies, fiscal intermediaries, third-party administrators (TPA), peer review organizations (PRO), insurers and payers, manufacturers (pharmaceuticals, medical devices, etc.), professional associations and societies, industry consortia, regulators, and Provider Enforcer Organizations (PEOs) (government agencies (e.g., NHS, Canada Health Infoway, NICTZ The Netherlands, etc.).



*There are also now 34 countries that participate in HL7*

Argentina, Austria, Australia, Brazil, Canada, Chili, China, Columbia, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, India, Ireland, Italy, Japan, Korea, Mexico, New Zealand, Romania, Russia, Singapore, Spain, Sweden, Switzerland, Taiwan, The Netherlands, Turkey, UK, United States, Uruguay

# 34 HL7 Affiliates / Countries



Argentina



Australia



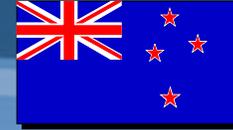
Singapore  
South Korea



Russia



Rumania



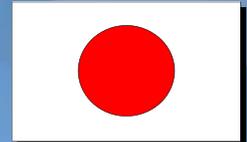
New Zealand



Mexico



Austria



Japan



Brazil



Uruguay



Italy

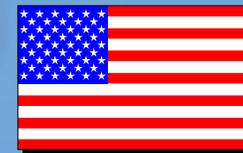


Spain



*And growing*

United States



Ireland



Canada



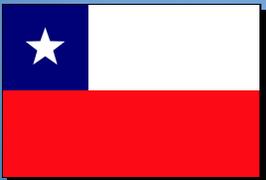
Sweden



United Kingdom



India



Chile



Switzerland

The Netherlands



Turkey



Greece



China

Taiwan



Croatia



Czech Republic



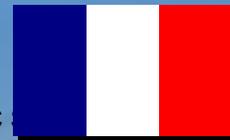
Denmark



Finland



France



Germany



Columbia



# What is HL7?

- Health Level Seven is one of several American National Standards Institute (ANSI) -accredited Standards Developing Organizations (SDOs) operating in the healthcare arena.
- Most SDOs produce standards (sometimes called specifications or protocols) for a particular healthcare domain such as pharmacy, medical devices, imaging or insurance (claims processing) transactions. Health Level Seven's domain is clinical and administrative data.

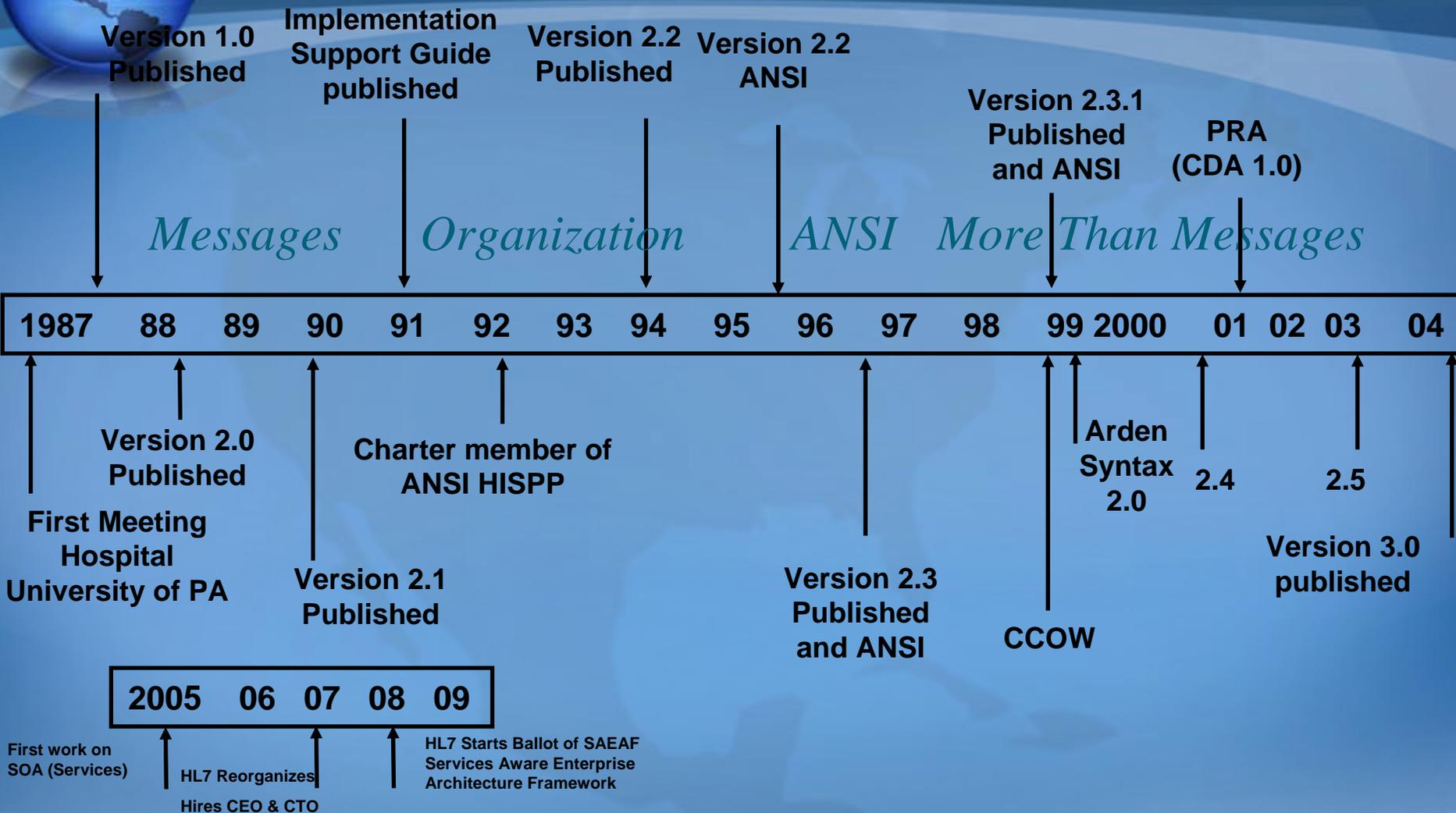


# Where & Who is HL7?

- Headquartered in Ann Arbor, MI, Health Level Seven is like many other SDOs in that it is a not-for-profit volunteer organization.
- Its members—*providers, vendors, payers, consultants, government groups and others who have an interest in the development and advancement of clinical and administrative standards for healthcare*—develop the standards.

# History of HL7

(Through 2009)

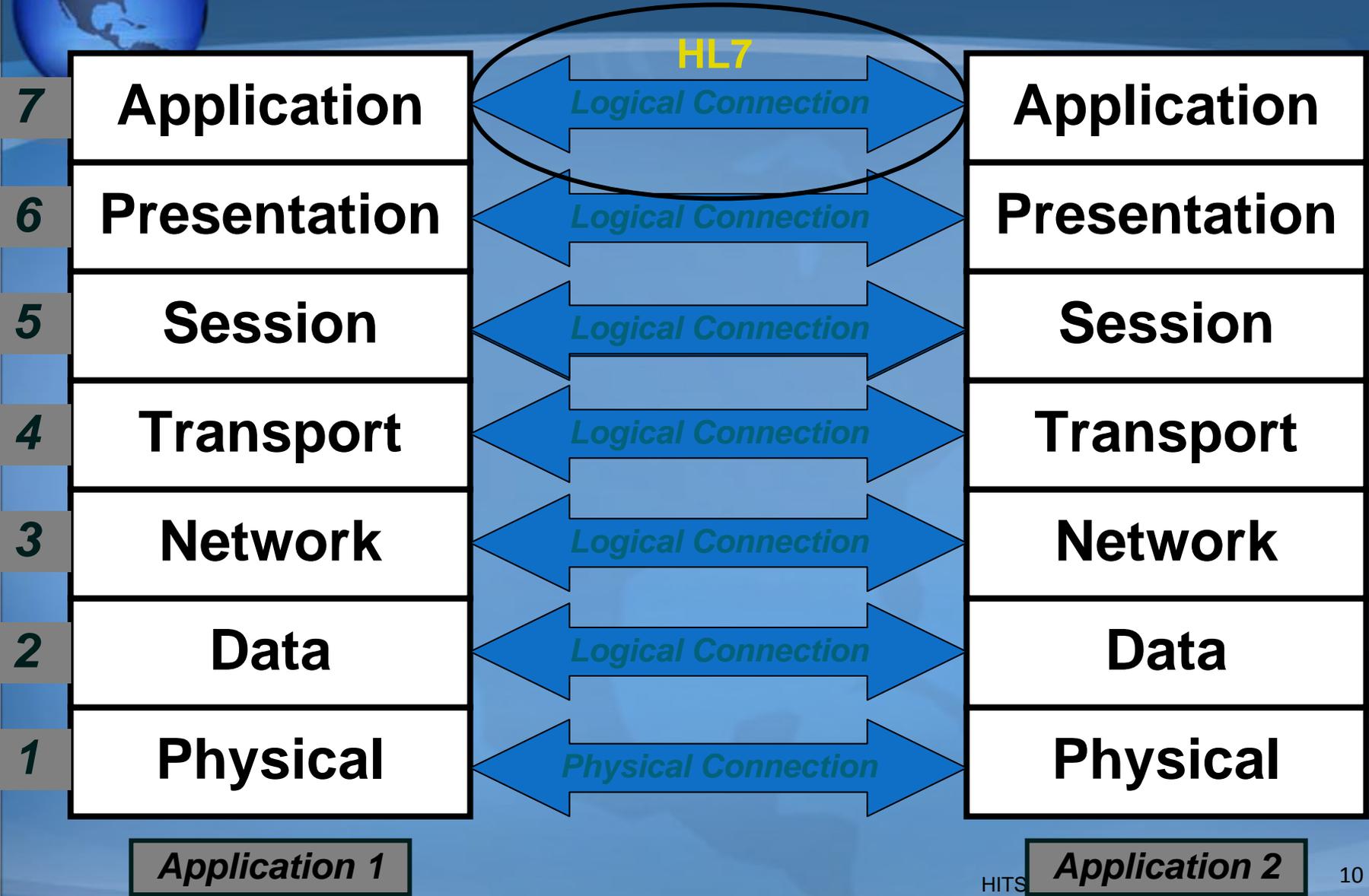




# What Does the Name HL7 Mean?

"Level Seven" refers to the highest level of the International Standards Organization (ISO) communications model for Open Systems Interconnection (OSI)—the Application Layer.

# The OSI Model





# HL7 Work Groups

## HL7 Work Groups:

- **Affiliates Council**
- **Anatomic Pathology**
- **Architecture Review Board**
- **Arden Syntax**
- **Attachments**
- **Child Health**
- **Clinical Context Object Workgroup (CCOW)**
- **Clinical Decision Support**
- **Clinical Genomics**
- **Clinical Interoperability Council**
- **Clinical Statement**
- **Common Message Element Types**
- **Community Based Collaborative Care**
- **Domain Experts Steering Division**
- **Dynamic Model**
- **Education**
- **Electronic Health Record**
- **Electronic Services**

- **Emergency Services**
- **Financial Management Foundation & Technology Steering Division**
- **Generation of Anesthesia Standards**
- **Governance and Operations**
- **Government Projects**
- **Health Care Devices**
- **Imaging Integration**
- **Implementable Technology Specifications**
- **Implementation / Conformance**
- **Infrastructure and Messaging**
- **International Mentoring**
- **Laboratory**
- **Marketing**
- **Modeling and Methodology**
- **Orders and Observations**
- **Outreach Committee for Clinical Research**
- **Patient Administration**

- **Patient Care**
- **Patient Safety Pharmacy**
- **Process Improvement Committee**
- **Project Services**
- **Public Health and Emergency Response**
- **Publishing**
- **Regulated Clinical Research Information Management (RCRIM)**
- **RIMBAA**
- **Scheduling and Logistics**
- **Security**
- **Services Oriented Architecture**
- **Structure and Semantic Design Steering Division**
- **Structured Documents**
- **Technical and Support Services Steering Division**
- **Technical Steering Committee**
- **Templates**
- **Terminfo Project**
- **Tooling**
- **Vocabulary**

# U.S. Health Messaging Standards Development Efforts

## HL7

*(Health Level 7)*

## ACR/NEMA (DICOM)

*(American College of Radiologists / National  
Electrical Manufacturers Association)  
(Digital Image Communications)*

## X12 (X12N)

## ASTM (E31)

*ASTM International  
(was American Society of Testing Materials)*

## IEEE

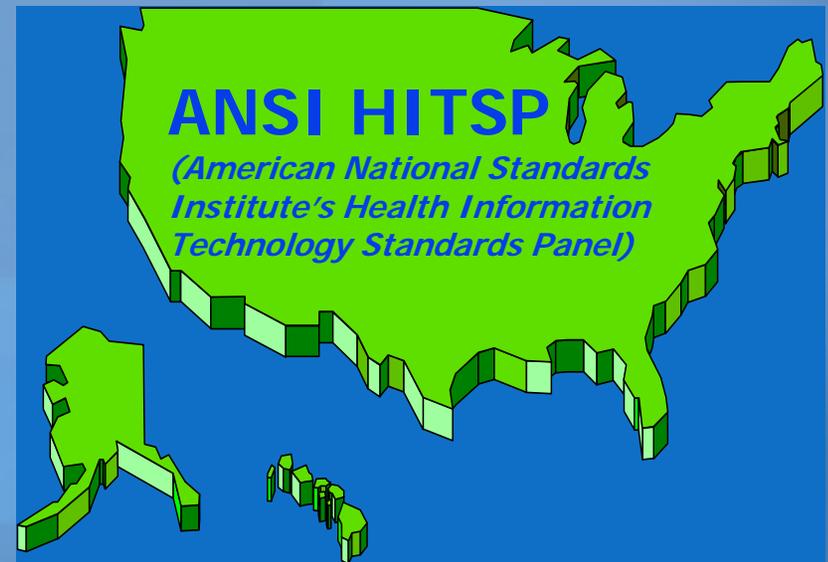
*(Institute of Electrical and Electronic Engineers)*

## NCPDP

*(National Council of Prescription Drug  
Producers)*

## ADA

*(American Dental Association)*



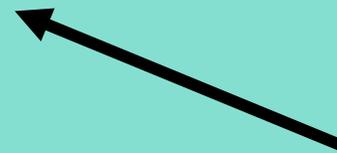
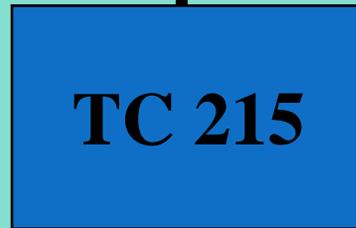
ORGANISATION  
INTERNATIONALE DE  
NORMALISATION



INTERNATIONAL  
ORGANIZATION FOR  
STANDARDIZATION



UN/EDIFACT



TC 251



# HL7 Diversifies ...

- HL7 Started with and is traditionally thought of as “messaging”. For most of its life, however, HL7 has also produced more than messaging standards.
  - Electronic Data Exchange in Healthcare Environments (*i.e. “messaging”*)
    - Version 2 & Version 3
  - Arden Syntax
  - GELLO
  - Visual / Context Integration (*CCOW*)
  - Version 2.x XML (*XML encoding of HL7 messages*)
  - Clinical Document Architecture (*CDA*)
    - *Clinical Context Document Implementation Guide (CCD)*
  - Electronic Health Record System (EHR) Functional Model
  - Personal Health Record System (PHRS) Functional Model
  - Services (*i.e., Services as related to a Services Oriented Architecture*)



# HL7 V2 & V3

- **Version 1.0 was a research document published by HL7 in late 1987 about six months after it formed.**
- **Version 2.0 was informally balloted and used in the first HL7 HIMSS demo in 1988 .**
- **Version 2.1 was the first generally usable and adopted standard published in late 1989. Version 2.1 interfaces are still in use today.**



## V2 & V3

- **V2.x continues to evolve to this day adding new requested scope and depth of functionality to the same EDI-styled/delimited/position dependent/not tagged style interface standard.**
- **Work began on defining a “Reference Information Model (RIM)” in or about 1993 during a meeting at the Mayo Clinic.**



# V2 & V3

- **Developing the RIM of Healthcare proved very difficult.**
  - **The object based modeling methodologies did not support the complexity of clinical data**
  - **The modeling tools available at the time “broke” whenever we tried to create a true-to-life set of entities and the relationships that existed.**
  - **HL7 began to build its own tools to support the modeling efforts**



## V2 & V3

- **By the mid-'90s we had modeling working and decided to embark on applying the RIM to an HL7 Standard that was based on Model-Driven Architecture approach to design.**
- **This RIM-based MDA effort became what we now call HL7 Version 3**



# V3

- **HL7 Version 3 was never advertised nor expected to be “backwards-compatible” with any HL7 V2.x specification.**
- **The methodology for creating and not growing and publishing HL7 V3 was all “new work” for HL7.**
- **Some new concepts discovered in HL7 V3 development have been put into HL7 V2.x.**



# V3

- **HL7 V3 follows a cycle of yearly publication.**
- **This year's version will be the 2009 HL7 V3 Normative Edition.**
- **Specifications are created via a tools-based methodology that uses:**
  - **The RIM,**
  - **A definition of the process the interaction is supporting and**
  - **A set of terminology bindings.**



# V3

- **V3 implementations are expressed in XML.**
- **Complex data types that contain both the rich contextual relationships of clinical data, definitions of terminology bindings and mappings and also support international variations are the basis of the XML schemas used by V3**



# V3

- **HL7 V3 now includes three mechanisms/modes for interactions that each today have their own place:**
  - Traditional messages supporting a discrete interaction;
  - Clinical Documents based on the RIM and using HL7 V3 XML artifacts (e.g., HITSP's C32 (CCD));
  - HL7 V3 Services based on HL7's RM-ODP (Reference-Model of Open Distributed Processing) based Services Aware Enterprise Architecture Framework (SAEAF).
    - SAEAF is the basis of the SOA architecture being used by the NCI as they are now rolling out the implementation of their cancer Bio-Informatics Grid (caBIG).



# Computable Semantic Interoperability

- We speak of “syntactical” interoperability as what HL7 V2.x is good at supporting today.
- We speak of “Computable Semantic Interoperability (CSI)” as a formally defined process for defining specific structures containing *data, defined actions and fully specified terminology mappings* to be exchanged between machines, i.e. a data exchange (i.e., message), electronic document or services specification.

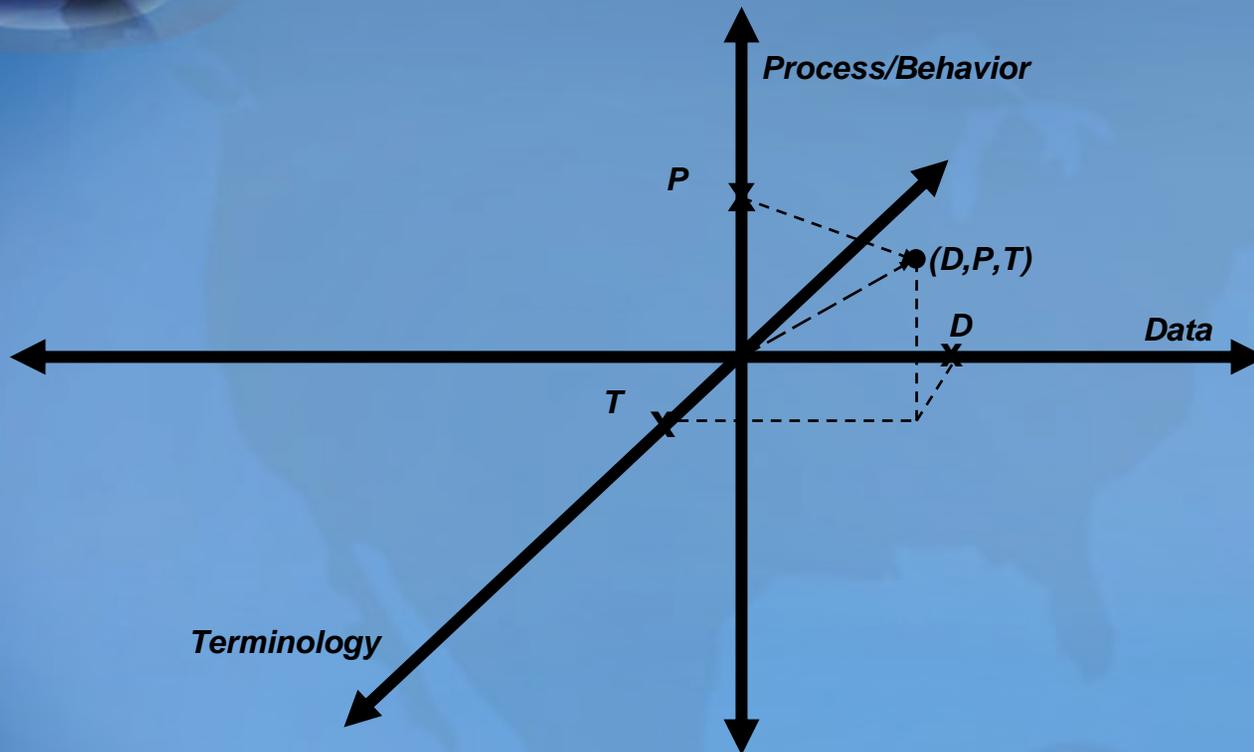


# Computable Semantic Interoperability

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- **Semantic Interoperability that supports the exchange of clinical information requires:**
  - **Common static models across all domains-of-interest including**
    - **Information model (not just Data model)**
    - **The semantics of common structures**
    - **Model grounded on robust data type specification**
  - **A mutually understood behavioral (or dynamic) model that enables sufficient (as defined by the problem space) understanding of the “use context” of the creation of the data by the producer and its intended use by the consumer.**
  - **A Methodology for binding to concept-based ontologies that support**
    - **Domain-specific semantics**
    - **Country, regional or use-domain selection of appropriate ontologies**

# The Dimensions of Clinical Interoperability





# Terminologies/Ontologies

- **Ontology: definition of concepts and related notions that are variously referred to as “codes”, “vocabulary”, “terminology”, “ontology”, and/or “semantic webs”**
  - **Structured data is “tied-to” or “mapped” to standard reference terminologies**
  - ***We Do Not have a way to support alerts, Computer-based Physician Order Entry (CPOE), or retrospective Public Health and Quality Measurements without terminologies.***



# HL7 Today V2

- Almost every hospital and ambulatory facility that is able to electronically order pathology testing and retrieve the resulting observations, use HL7 V2.x today.
- This is true in most countries around the world.
- These interfaces are individually “mapped” and “fitted” to/from “vendor-specific” reference V2.x specifications.
- **Once built, there are never updated!**



# HL7 Today V3

- **In the US there is significant specification and/or use of HL7 V3 in the “new” domain of electronic documents (Clinical Document Architecture). In addition to HITSP’s use in C32:**
  - **Government: ONC, NIH, CDC, FDA, FHA, SSA, and the DOD**
  - **Academia: Harvard, Mayo Clinic\*, University of Utah**
  - **Vendor community: EHR Association, Siemens, Epic**
  - **Research bodies: NCI caBIG**
  - **Standards Development Organizations: CDISC, ISO**
  - **Clinical Decision Support consortia: CDSC (Harvard Partners), Morningside Consortium (DOD)**
  - **Professional Societies: American College of Physicians, American College of Cardiology**
  - **Integrated Healthcare Delivery Systems: Kaiser Health\***

\* Both Mayo and Kaiser produce and use several thousands of CDA documents per day.

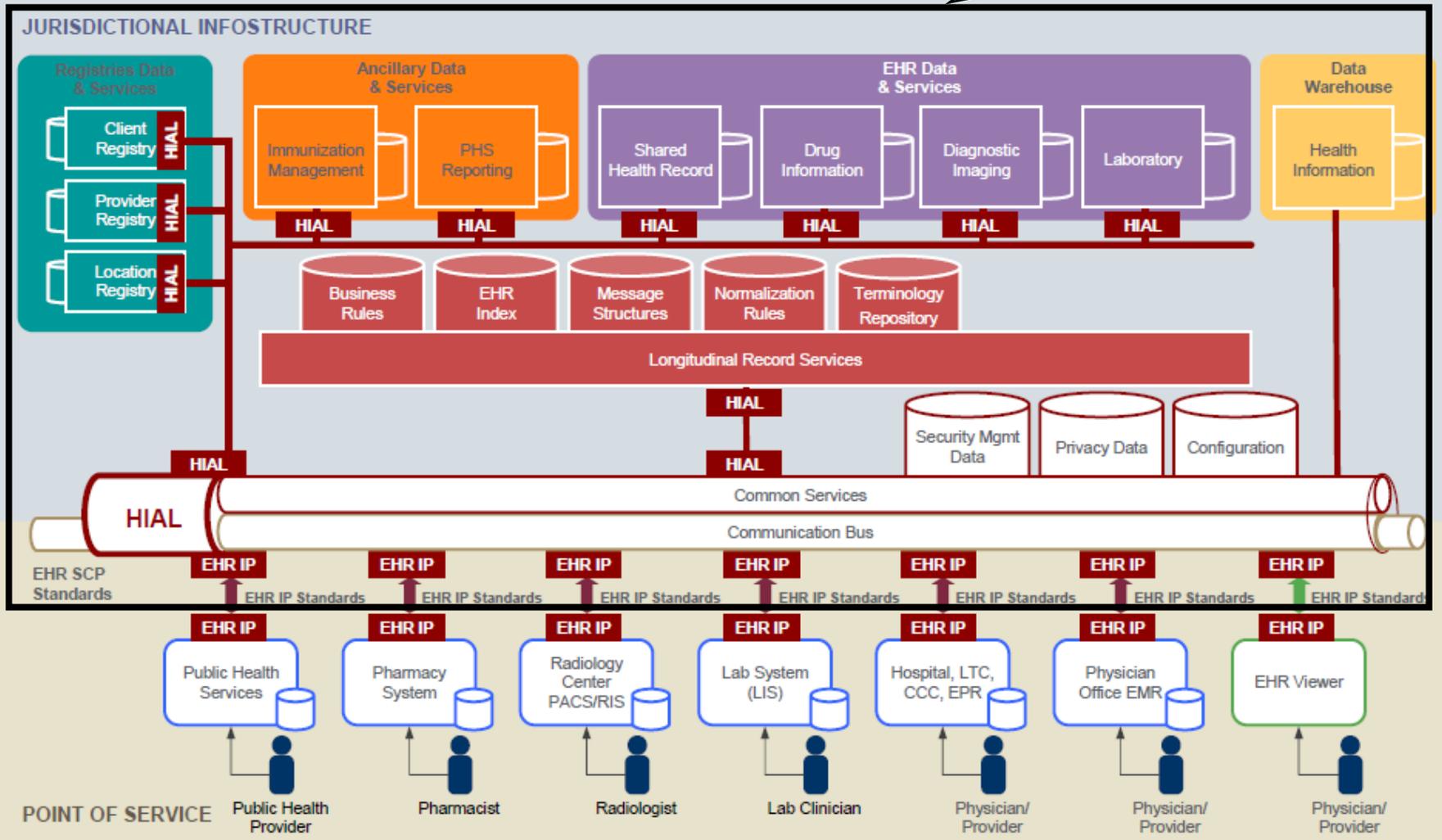


# HL7 V3 Today

- Clearly “Green Field” new applications of HL7 are the most popular application of V3.
- Inter-organizational interactions have no strong base in either V2 or V3. HITSP has chosen (at this point) a combination of V2 and V3.
- Canada, UK (England), Netherlands and several tens of other countries have chosen to use HL7 V3 for some or all of their inter-organizational interoperation requirements.

# EHR Infostructure: Standards Based Connectivity

All Interactions inside box are HL7 V3 Services



Canada Health Infoway "Blueprint" 5/2008



# Where is HL7 Lacking

- **Clear user-level documentation, methodology and tooling to use the methodology is a significant challenge.**
- **Available funding for these is HL7's biggest current constraint.**
- **A balance of professional staff to work with the domain expert volunteers. This would expedite the production process and overall progress.**



# How Dynamic is HIT Interoperability Standards?

- Traditionally, the need for change has been rather slow.
- However, 20+ countries have now decided that national initiatives for interoperable EHRs are a priority.
- Every country has a different approach and set of requirements for the HIT interoperability standards. Hence the demand for changes and new features is high even in areas where the standards are otherwise well defined.
- The number of qualified experts to assist is now far less than the demand (and growing).



# How Dynamic is HIT Interoperability Standards?

- **HIT Standards, just like HIT systems, is not a business that you can start overnight and the learning curves are steep and long.**
- **Nevertheless, the “smell of money” has created a long line of otherwise very smart people who are claiming that they can do all of these with a lot less effort, complexity and risk.**



# HIE Architectures

*(Start September 17, 2009)*





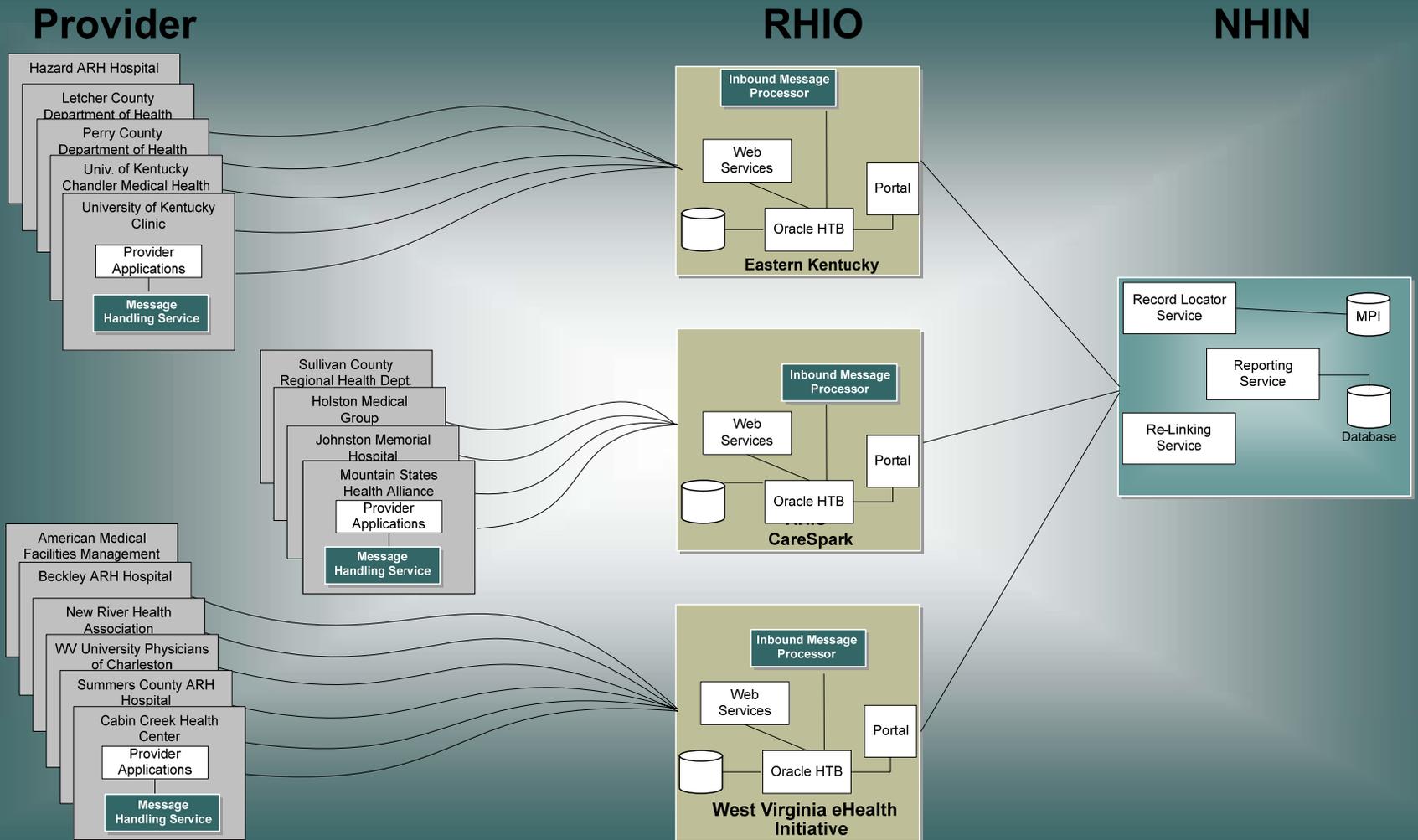
# Three Basic Architectures

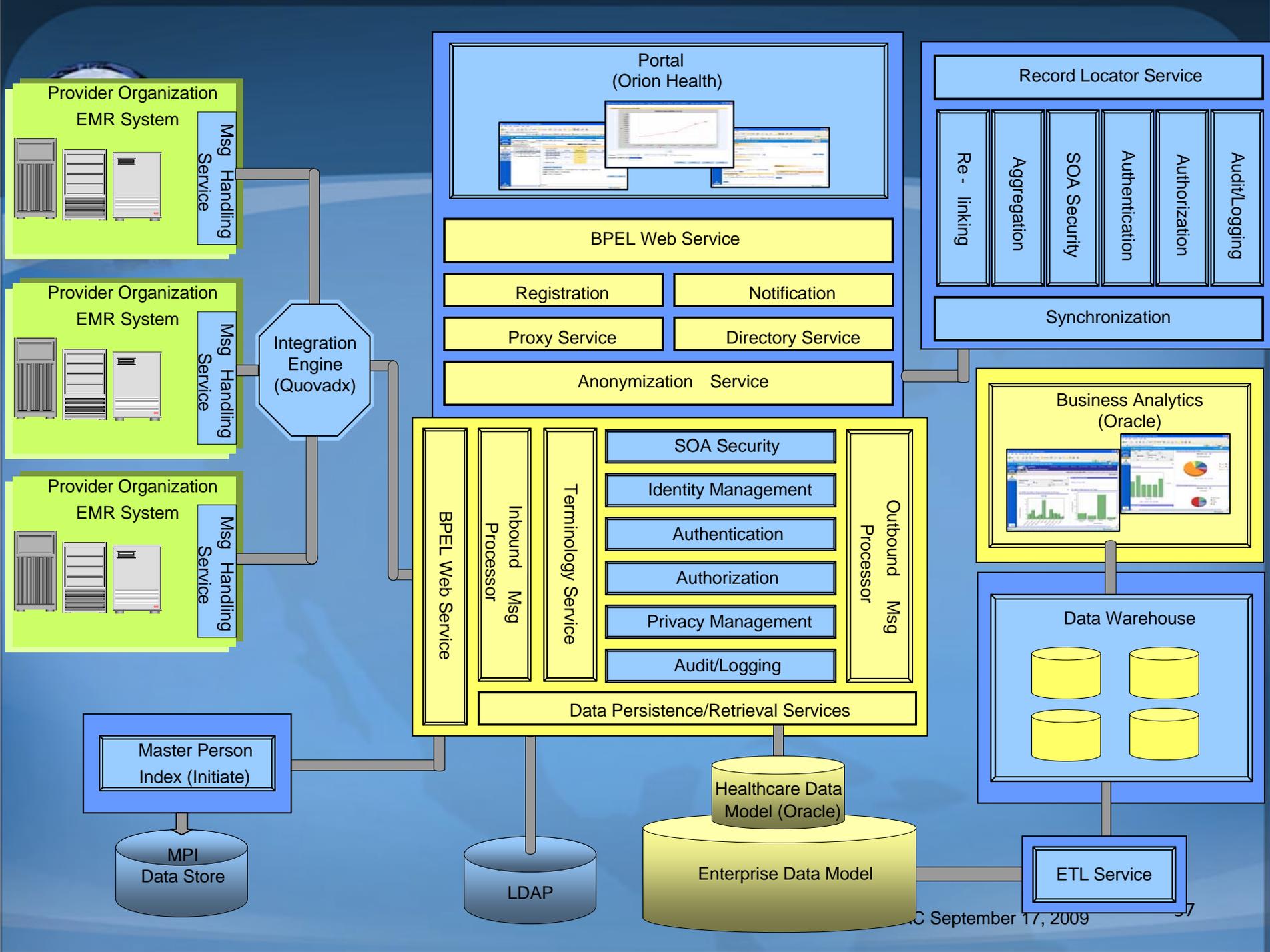
- Federated
- Hybrid
- Centralized
- *(With slight variations demonstrated on all three)*



# Basis for Discussion

## Accenture's Solution Overview







# Federated

- **Generally, the federated model leaves patient data on the source systems and does not duplicate in the HIE infrastructure.**
- **Requestor of data must:**
  - Identify the patient (MPI)
  - Query the HIE for location of records (RLS)
  - Query the source systems for data on the patient
  - Assemble the returned information for display
- **Patient data privacy protection is strongly retained as a source system responsibility but collecting communicating and validating users identity and role becomes a complex shared activity between source systems and HIE.**



# Hybrid

- **HIE provides MPI and RLS services as in the Federated Model.**
- **Patient data is staged within the HIE infrastructure and/or within the source organization's IT environment but on a dedicated (to the HIE) database hosted on an "edge" server.**
- **Patient data privacy protection is a shared HIE/Source/User responsibility.**



# Centralized

- **MPI services are in the HIE, but RLS is not explicitly necessary within the HIE**
- **All patient data accessible to the HIE is hosted on HIE databases. Source data is fed to the HIE on a transactional basis as created keeping the HIE database reasonably up to date.**
- **Privacy and role-based access become is the responsibility of the HIE.**



# Challenges

- **There are several characteristics that have clearly been problematic (to varying degrees) across all three models in both prototype and production environments:**
  - **Privacy and Security is strongest in the Federated Model and the most difficult to assure in the Centralized model because primary responsibility for maintaining the patient's privacy trust sits with the source system.**



# Challenges

- **Performance:** HIE systems have been demonstrated have adoption rates that are inversely proportional to response time. In all demonstrated uses of HIE prototypes and production systems that I have discussed with the principals involved performance is a significant issue and particularly problematic in the Federated Model.
- **Vendor Source Systems:** As currently designed and deployed source system vendor's systems are not designed to support HIEs. Furthermore, provider organizations have not implemented these systems with a performance capacity that anticipated the needs of HIEs.



# Challenges

- **Patient Identification:** Unlike most other countries that are implementing interoperable EHRs, the US does not have (and will not likely have in the foreseeable future) patient identifiers. MPI services augment this deficiency with a cost and complexity that is less reliable than the same MPI service with a patient identifier. This leads to two undesirable outcomes:
  - False Negative matches—this leaves out possibly vital information (e.g., current medicines or allergies) from the patient’s record while indicating that all available data has been retrieved.
  - False Positives—this creates an even more undesirable condition where two or more patient’s data is effectively “intermixed” when presented to the HIE using physician.



# MPIs

- **Master Patient Indices are IT applications. HIT vendors of clinical and administrative systems have internal proprietary MPIs that are usually difficult or impossible to use outside of the vendors solution space (i.e., in an HIE). MPIs are also available from some vendors as independent stand-alone applications or as part of some HIE packaged solutions.**



# MPIs

- **MPIs take specific demographic data about a patient and create an internal temporary identity of the patient from that data.**
  - **Demographic data used may include: date & place of birth, mother's maiden name, patient's phone number, address, etc.**
- **Vendor proprietary algorithms are run against the gathered data to create a internal identity match.**
- **Financial services companies have become a large user of MPIs for marketing and risk research.**



# Existing Clinical HIT Systems

- **An often overlooked concern is the existing clinical HIT systems that must produce the data needed by HIEs and simultaneously also appear as a consumer of HIE data and services.**
- **In general, no existing HIT system implemented today was designed to support HIEs**



# Existing Clinical HIT Systems

- **Problems Include:**
  - **No mechanisms to support services for ad-hoc queries for patient lists, provider lists, record inventory. No ability to support externally generated privacy and role-based access services. Finally, when functionality does exist to support HIEs, the performance of the system provides impractical response times.**
  - **Even if a vendor now supports HIE specific requirements, the local provider organization must still plan and budget upgrades to their systems and then implement the HIE functions.**



# Existing HIEs

- **There are several existing HIEs in the US today.**
- **Most of these are prototypes that have participated in one or more of the ONC managed and funded NHIN projects from 2006 to 2008.**
- **The notable exception that existed well before the NHIN projects and runs at scale is Indiana Health Information Exchange (IHIE) run by Regenstrief Institute at Indiana University in Indianapolis.**



# Example HIEs

- **MedVirginia**
- **North Carolina Health Information & Communications Alliance (NCHICA)**
- **New England Healthcare EDI Network (NEHEN)**
- **Indiana Health Information Exchange (IHIE)**



# MedVirginia *Solution*<sup>®</sup> Health Information Exchange (HIE)\*

- Operational January 2006
- Focuses on Central Virginia providers
- Enrollment stats:
  - 6 hospitals,
  - 1100+ users
- In over 110 physician offices
- Master Patient Index of 600,000+ patients
- Over 1 million messages processed each month



*\*As Presented in April 2009 HITSP Webinar*



# MedVirginia Scope

## MedVirginia



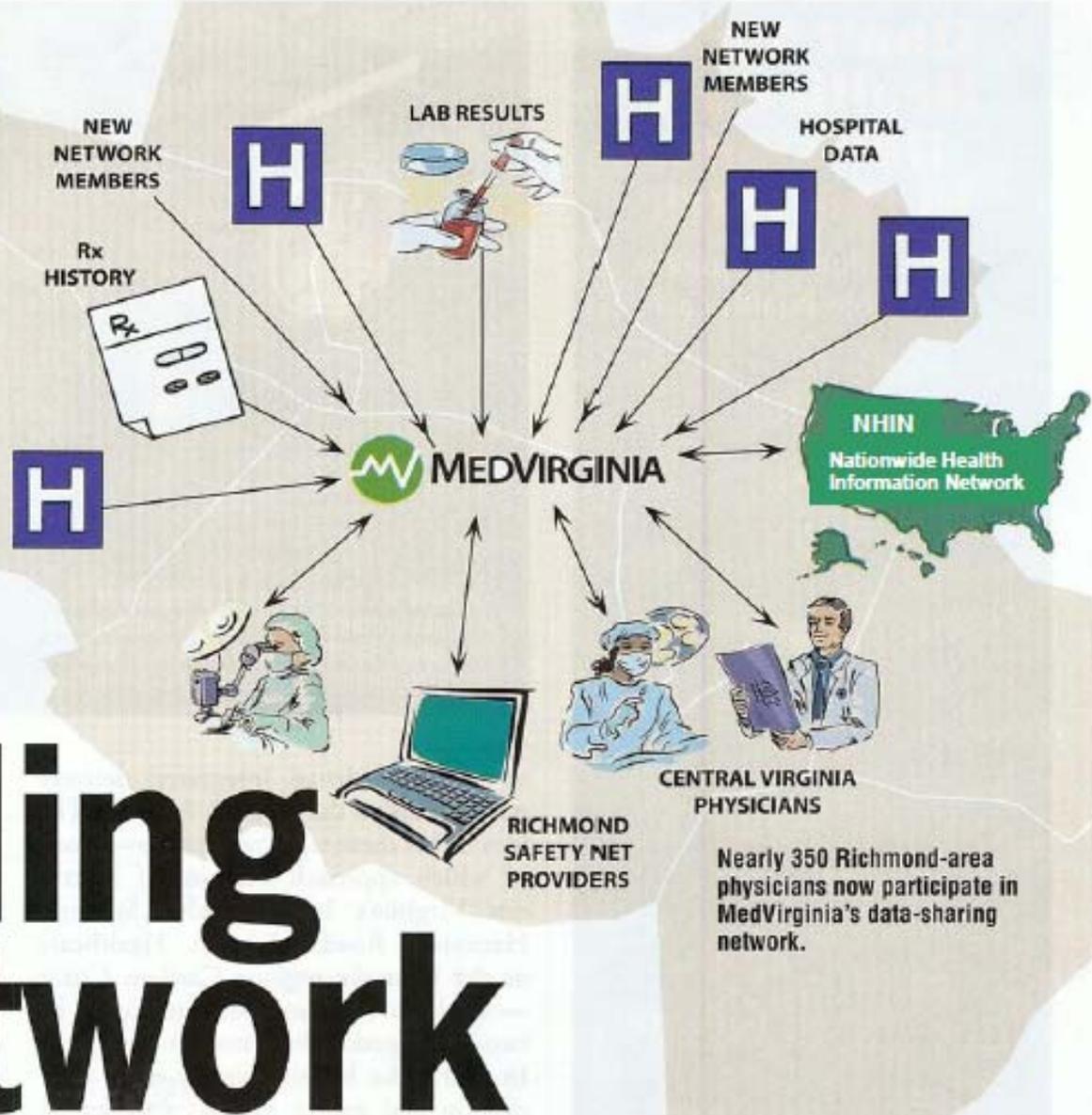
**IS 01**

**Electronic Health Record (EHR)  
Laboratory Results Reporting**



**IS 07**

**Medication Management**



# Building a network

Nearly 350 Richmond-area physicians now participate in MedVirginia's data-sharing network.



# Existing HIEs

- **Indiana Health Information Exchange has been characterized as a “centralized” model. Even though it has been constructed with dedicated “edge” servers holding the data for each institution, those servers are housed and controlled by IHIE. IHIE is connected to most acute care provider institutions in the state of Indiana and has recently announced an expansion to include the greater Cincinnati area.**
- **IHIE was originally built with research grant monies from the Federal Government over the last 20+ years.**



# Existing HIEs

- **Many other HIEs exist but are not running at “scale” for their served region. Many of these HIEs are applying for ARRA funds earmarked for state HIE initiatives in order to expand their existing prototype architectures and services to more widely offer services to provider organizations across their states or smaller regions of interest.**



# Medicaid Information Technology Architecture (MITA) & the Nationwide Health Information Network





# MITA & NHIN

- **These are two major technology initiatives that have both originated in DHHS at about the same time.**
- **They both serve somewhat different purposes and different customers.**
  - **MITA CMS and the state Medicaid Agencies**
  - **NHIN ONC/FHA and the future “cloud” of HIEs that will eventually be built in this country to connect qualified EMR systems**



# MITA

- **MITA's goals include:**
  - **A patient-centric view not constrained by organizational barriers**
  - **Common standards with, but not limited to, Medicare**
  - **Interoperability between state Medicaid organizations within and across states, as well as with other agencies involved in healthcare**
  - **Web-based access and integration**
  - **Software reusability**
  - **Use of commercial off-the-shelf (COTS) software**
  - **Integration of Public Health Data**



# MITA's Mission

- *Establish a national framework of enabling technologies and processes that support improved program administration for the Medicaid enterprise and stakeholders dedicated to improving healthcare outcomes and administrative procedures for Medicaid Beneficiaries.*



# MITA

- **MITA's customers are state Medicaid agencies and the payer organizations that they use.**
- **Looking at a few of MITA's objectives, we see common threads between MITA and NHIN:**
  - **Adopt data and industry standards**
  - **Promote secure data exchange**
  - **Promote reusable components through modularity**
  - **Promote efficient and effective data sharing to meet stakeholders' needs**
  - **Provide a beneficiary-centric focus**
  - **Support interoperability and integration using open architecture standards**



# MITA & NHIN

- **It is likely that both DHHS programs will learn from each other and adopt what makes sense to adopt between them**
- **MITA has been running longer and is better funded and organized than NHIN (at least up to this point).**
- **CMS's MITA architecture group has been reaching out to HL7.**



# Existing HIEs

- **IHIE has been characterized as a “centralized” model. Even though it has been constructed with dedicated servers holding the data for each institution, those servers are housed and controlled by IHIE. IHIE is connected to most acute care provider institutions in the state of Indiana.**
- **IHIE was originally built with research grant monies from the Federal Government over the last 20+ years.**



# Existing HIEs

- **Many other HIEs exist but are not running at “scale” for their served region. Many of these HIEs are applying for ARRA funds earmarked for state HIE initiatives in order to expand their existing prototype architectures and services to more widely offer services to provider organizations across their states or smaller regions of interest.**



# Outside the US

- **The most advanced efforts that I have direct experience include:**
  - **UK: (NHS England)**
  - **Canada Health Infoway (Ontario, British Columbia)**
  - **Australia National E-health Transition Authority**
  - **The Netherlands NICTIZ**



# Common Threads

- **Adoption by Physicians is the only meaningful measurement of success**
- **Every country has discovered “holes” in IT deployments making source data hard to obtain**
- **Everyone has challenges in selecting, implementing and maintaining country-wide terminologies**



# Common Threads

- **The privacy laws and penalties in most countries are more stringent than the US**
- **The organization of healthcare payment and delivery is different in the US and creates some complications not experienced elsewhere**
- **Politics has at one time or another become and obstacle to progress everywhere**



# Health Information Technology Standards Panel (HITSP) Federal Health Architecture (FHA)





# HITSP

- Organization “re-formed” shortly after David Brailer MD assumed control of National Health Information Infrastructure (NHII) (July 2004) and renamed it Office of the National Coordinator for Health Information Technology (ONCHIT or just ONC).
- Predecessors to HITSP include HISPP and HISP
- HITSP is an ANSI sponsored organization contracted to ONC to develop the specifications necessary to interconnect HIT systems.
- HIMSS is the HITSP secretariat.
- <http://www.hitsp.org>



# HITSP\*

- **HITSP is a cooperative partnership between the public and private sectors for the purpose of achieving a widely accepted set of healthcare interoperability standards.**
- **HITSP is a volunteer-driven, consensus-based organization that is funded through a contract from the Department of Health and Human Services**
- **HITSP develops Interoperability Specifications (IS) – documents that harmonize and recommend the technical standards that are necessary to assure the interoperability of electronic health records**

\*HITSP



# HITSP

Healthcare Information Technology Standards Panel

**Status:  
Interoperability  
Specifications**

**Released**

**Accepted**

**Recognized**

Panel approved for  
submission to HHS

Secretary of HHS has  
accepted for a period  
of testing

Secretary of HHS has  
recognized the IS for  
immediate  
implementation



**Federal projects must use  
HITSP recognized standards  
Per *Executive Order 13410***



# HITSP

Healthcare Information Technology Standards Panel

## HITSP Interoperability Specifications (IS)

Recognized  
Accepted



**IS 01** **Electronic Health Record (EHR) Laboratory Results Reporting**



**IS 02** **Biosurveillance**



**IS 03** **Consumer Empowerment**



**IS 04** **Emergency Responder Electronic Health Record (ER-EHR)**



**IS 05** **Consumer Empowerment and Access to Clinical Information via Media**



**IS 06** **Quality**



**IS 07** **Medication Management**



# HITSP

Healthcare Information Technology Standards Panel

## HITSP Interoperability Specifications (IS)

Accepted
Released / Panel Approved



**IS 08** Personalized Healthcare



**IS 09** Consultations and Transfers of Care



**IS 10** Immunizations and Response Management



**IS 11** Public Health Case Reporting



**IS 12** Patient – Provider Secure Messaging

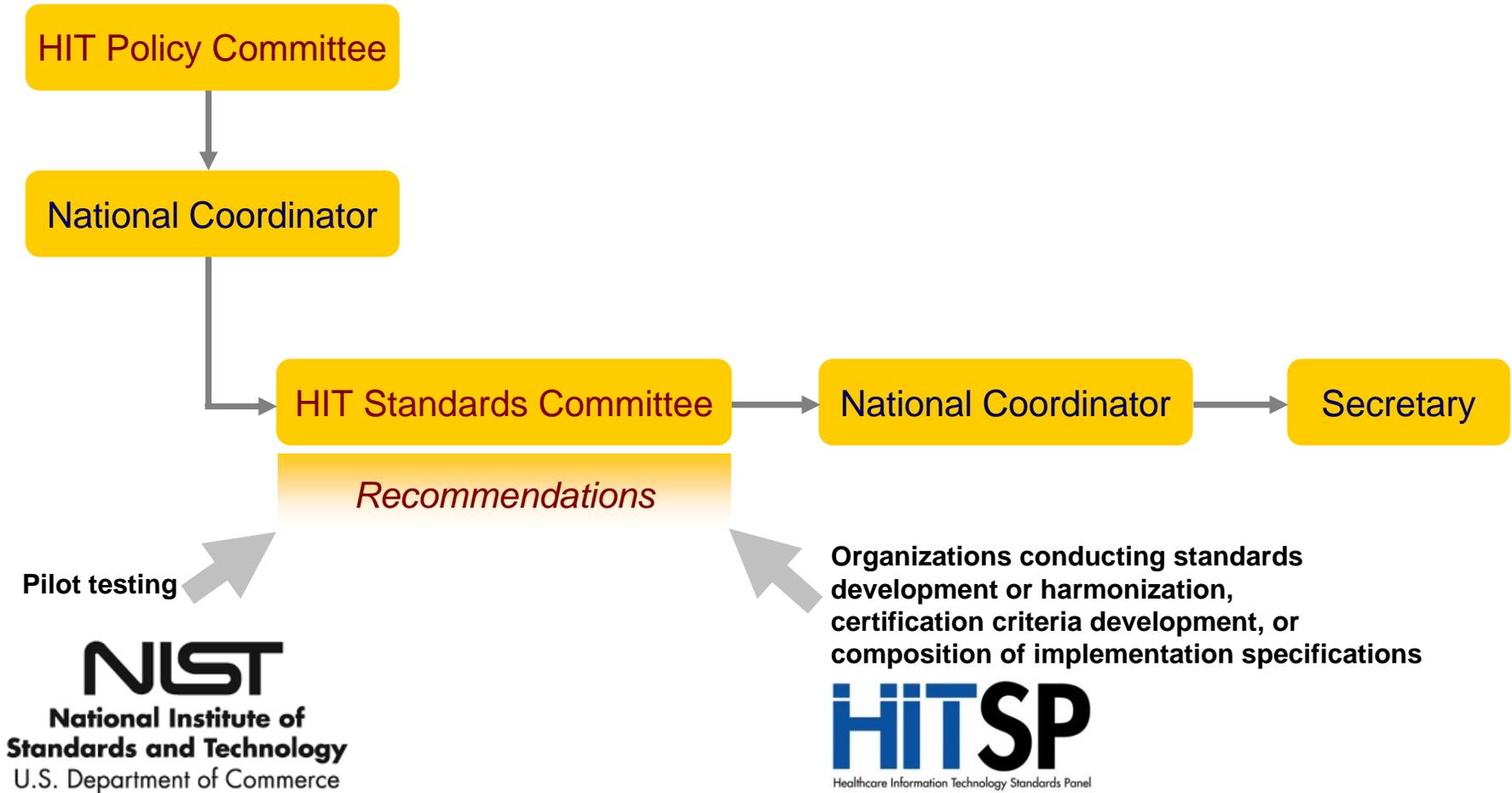


**IS 77** Remote Monitoring



**IS 107** EHR Centric

# Work Flow: A High-Level View

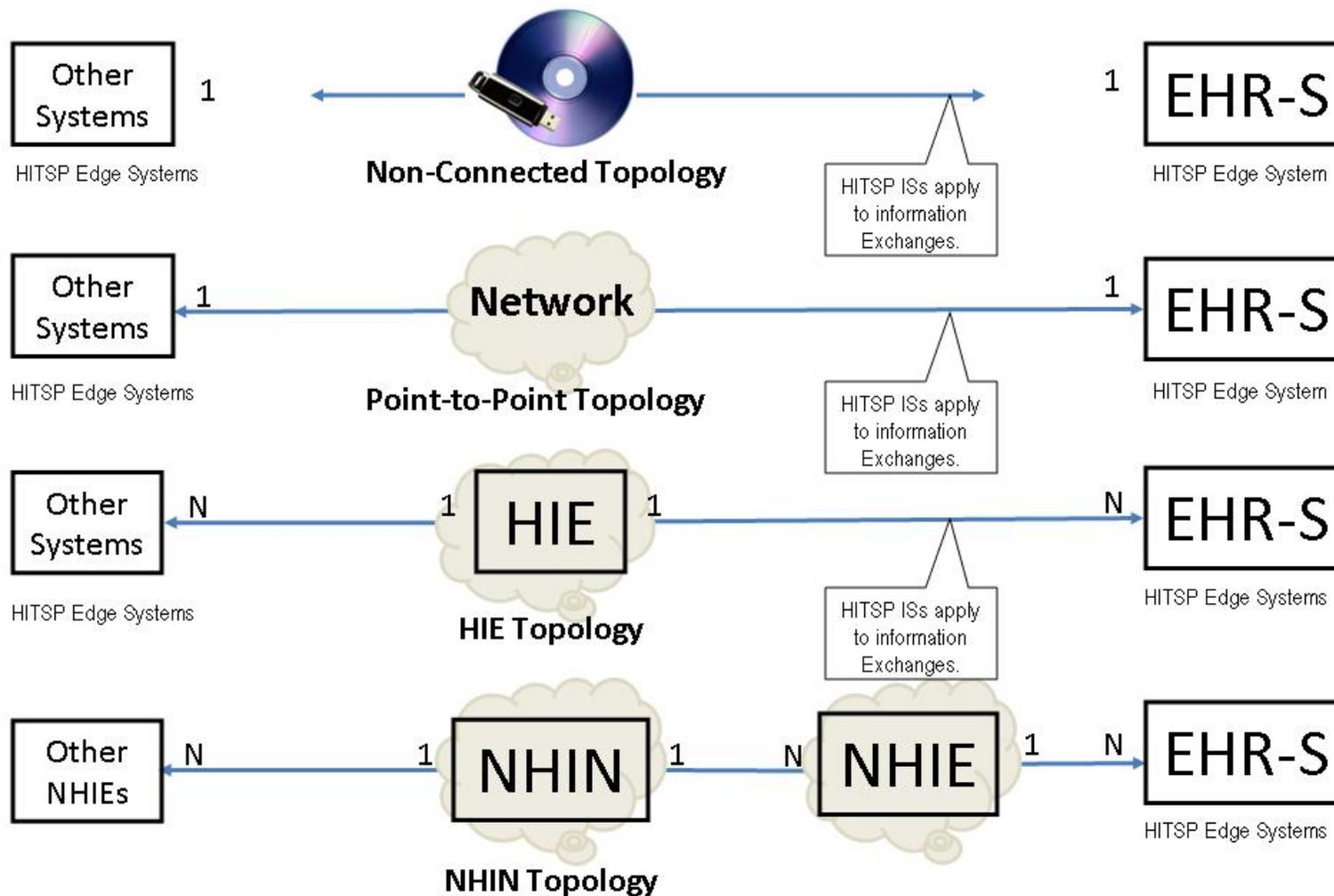




# Scope of HITSP Specifications

- In general, HITSP specifications will apply to interconnections between organizations. However, it is the responsibility of any connected Healthcare IT to conform to all aspects of (i.e., data (including terminology mappings) through transaction formats) the requirements of HITSP Specifications.
- HITSP privacy and security requirements as they relate to HIT content and behavior, however, may well apply inside the connected organization.

# What We Mean by Exchange Architecture



**NOTE:** HITSP Interoperability Specifications apply across business boundaries. An associated business agreement defines the business boundaries of EHRs, HIEs and the NHIN. Nationwide Health Information Exchange (**NHIE**) is the mechanism of connecting HIEs to the NHIN.



# Federal Health Architecture

- **The Health Insurance Portability and Accountability Act (HIPAA) in 1996 specified a number of responsibilities to DHHS's National Committee on Vital and Health Statistics (NCVHS).**
  - **Among those responsibilities NCVHS was called upon to "study the issues related to the adoption of uniform data standards for patient medical record information [PMRI] and the electronic exchange of such information."**
  - **Through 2006 NCVHS produced a series of reports, evaluations and recommendations on healthcare messaging and terminology standards.**



# Consolidated Health Informatics

- **CHI was formed in 2004:\***
  - **One of the 24 Quicksilver eGovernment Initiatives of the President’s Management Agenda**
  - **Goal: To adopt existing clinical vocabulary & messaging standards to enable interoperability in the federal health care enterprise.**
  - **Federal agencies will incorporate adopted standards into individual IT architectures within new systems and major system upgrades**
  - **“Tipping point” for industry—industry seeking federal lead**
  - **Coordinated with the NCVHS**
  - **Complementary to HIPAA**
- **CHI adopted the NCVHS PMRI reports**

\* From CHI Overview HIPAA Summit March 2004



# Federal Health Architecture

- In the 2007 budget President Bush requested funds from Congress to form a Federal Health Architecture.
- FHA is a program in the Office of the National Coordinator of Health Information Technology. Vish Sankaran is its director.
- FHA adopted the CHI/NCVHS recommendations on messaging and terminology standards.



# FHA

- **From the very beginning the FHA was given the role of insuring that recommended standards were formally published and that all federal agencies that could make use of them would.**
- **The thinking was: ...if federal provider organizations ignore and do not adopt the use HIT standards then we can't be surprised that private industry also ignores them...**



# FHA Standards

## Messaging

- **These are the core standards that HITSP references when it creates its implementation specifications (ISs):**
- **The Messaging Standards Include:**
  - **HL7 V2 and V3 (messaging & electronic documents)**
  - **NCPDP (retail pharmacy)**
  - **IEEE 1073 (messaging for medical device connectivity)**
  - **DICOM (messaging for sharing image data)**



# FHA Standards

## Core Terminologies

- **SNOMED CT (as licensed by the National Library of Medicine)**
- **Logical Observation Identifiers Names and Codes (LOINC) (laboratory subset)**
- **Federal Drug Terminologies:**
  - RxNorm;
  - The representations of the mechanism of action and physiologic effect of drugs from NDF-RT; and ingredient name, manufactured dosage form and package type from the FDA



# FHA Standards

## Important Mapped Terminologies

- **Priority 1: Terminologies previously designated as HIPAA medical code sets:**
  - CPT-4 (Current Procedural Terminology)
  - CDT (Current Dental Terminology)
  - Level II HCPCS (Healthcare Common Procedure Coding System)
  - ICD-9-CM (International Classification of Diseases – Clinical Modification)
  - NDC (National Drug Codes)



# FHA Standards

## Important Mapped Terminologies

- **Priority 2: Terminologies in common use as enablers of important healthcare functions.**
  - These terminologies include but are not necessarily limited to:
    - DSM-IV (diagnosis codes for mental disorders)
    - Terminologies in private sector drug information databases (e.g., FirstDatabank NDDF Plus, Medi-Span, Micromedex, Multum Lexicon)
    - ISBT 128 (coding system for describing blood products and tissues)
    - Medcin (codes for structured entry of clinical notes)
    - MedDRA (international code set for use by drug regulatory agencies)
    - Nursing terminologies not otherwise included in SNOMED CT



# Unified Medical Language System

## UMLS\*

- The purpose of NLM's Unified Medical Language System (UMLS<sup>®</sup>) is to facilitate the development of computer systems that behave as if they "understand" the meaning of the language of biomedicine and health.
- To that end, NLM produces and distributes the UMLS Knowledge Sources (databases) and associated software tools (programs) for use by system developers in building or enhancing electronic information systems that create, process, retrieve, integrate, and/or aggregate biomedical and health data and information, as well as in informatics research.

\* From NLM website: <http://www.nlm.nih.gov/pubs/factsheets/umls.html>



# Unified Medical Language System

## UMLS\*

- UMLS is developed and maintained by the National Library of Medicine
- There are three UMLS Knowledge Sources: the Metathesaurus<sup>®</sup>, the Semantic Network, and the SPECIALIST Lexicon.
- They are distributed with flexible lexical tools and the MetamorphoSys install and customization program.

\* From NLM website: <http://www.nlm.nih.gov/pubs/factsheets/uMLS.html>



# UMLS Purpose

- **To develop a very large, multi-purpose, and multi-lingual vocabulary database that contains information about biomedical and health-related concepts**
- **To link alternative names and views of the same concept together and to identify useful relationships between different concepts.**
- **Scope is determined by the combined scope of its source vocabularies**



# UMLS

*(as of 2007)*

- Metathesaurus Includes
- >1 Million concepts
- 5.6 Million Term Names
- >100 Source Vocabularies  
(<http://www.nlm.nih.gov/research/umls/metaa1.html>)
- 65% Of Concepts Have **No** Intellectual Property Restrictions (free for use)



# UMLS Metathesaurus

- **Incorporates MeSH (Medical Subject Heading) parts of ICD, CPT, SNOMED**
  - main concepts
  - synonyms
  - lexical variants
  - related/associated terms
    - 54 Semantic Relationships
  - hierarchical association
- **Links to the “Semantic Network”**



# Appendices

Acronyms

Glossary



# Some Acronyms\*

- 
- **ADA** American Dental Association
  - **ACR** American College of Radiology
  - **AHA** American Hospital Association
  - **AHIC** American Health Information Community (an advisory board within DHHS)
  - **AHIMA** American Healthcare Information Management Association
  - **AHRQ** Agency for Health Research and Quality
  - **AMA** American Medical Association
  - **AMIA** American Medical Informatics Association
  - **ANA** American Nursing Association
  - **ANSI** American National Standards Institute
  - **ASC X12** Accredited Standards Committee X12 – for business transactions
  - **ASC X12N** Accredited Standards Committee X12N – for insurance and reimbursement data interchange
  - **ASC Z80** Accredited Standards Committee Z80 – for Optometry
  - **ASN.1** Abstract Syntax Notation One
  - **ASTM** American Society for Testing and Machinery—A US based SDO

\* Courtesy of Ed Hammond, PhD 1999, with some updates from John Quinn, 2007

# Some Acronyms\*

- 
- **CAP** College of American Pathologists
  - **CCHIT** Certification Commission for Health Information Technology
  - **CCOW** HL7 Clinical Context Object Workgroup (now Clinical Context Management)
  - **CDC** Centers for Disease Control and Prevention
  - **CEN** Comité Européen de Normalisation (EU Standards Body)
  - **CENELEC** European ` for Electrotechnical Standardization
  - **CHIA** Canadian Health Informatics Association
  - **CIHI** Canadian Institution for Health Information
  - **CMA** Context Management Architecture
  - **CMET** HL7 Common Message Element Type—reusable message components such as data types
  - **CMS** DHHS Centers for Medicare and Medicaid Services (was HCFA)
  - **COM** Component Object Model
  - **CORBA** Common Object Request Broker Architecture
  - **CorbaMed** OMG group working on health related projects
  - **CPRI** Computer-based Patient Record Institute
  - **CPT** Common Procedural Terminology. A systematic listing and coding of procedures and services performed by physicians. A five-digit code with modifiers, used for billing. Owned & maintained by AMA.
  - **CTS** HL7 Common Terminology Services

\* Courtesy of Ed Hammond, PhD 1999, with some updates from John Quinn, 2007

# Some Acronyms\*

- 
- **DCOM** Distributed Component Object Model
  - **DES** Data Encryption Standard
  - **DHHS** Department of Health and Human Services
  - **DICOM** Digital Imaging and Communications in Medicine. Standard for transferring images. Owned by ACR
  - **DIM** Domain Information Model
  - **DIN** German standards organization
  - **DISA** Data Interchange Standards Organization. The secretariat for ASC X12.
  - **DMIM** Domain Message Information Model
  - **DOD** Department of Defense
  - **DRG** Diagnostic Related Group
  - **DSM-IV** Diagnostic and Statistical Manual of Mental Disorders. American Psychiatric Association.
  - **EPA** Environmental Protection Agency. Has data registry.
  - **EU** European Union
  - **EWG** UN/EDIFACT Working Group
  - **FDA** Food and Drug Administration
  - **FDIS** ISO Final Draft International Standard
  - **GEHR** Good European Health Record

\* Courtesy of Ed Hammond, PhD 1999, with some updates from John Quinn, 2007

# Some Acronyms\*

- 
- **HCFA** Health Care Financing Administration (now CMS)
  - **HCPCS** HCFA Procedure Coding System
  - **HDF** HL7 Development Framework
  - **HEDIS** Health Employers Data and Information Set
  - **HHCC** Home Health Care Classification. Virginia Saba's code set for home care.
  - **HHS** Health and Human Services (sometimes used instead of DHHS)
  - **HIBCC** Health Industry Business Communications Council
  - **HIMA** Health Industry Manufacturers Association
  - **HIMSS** Healthcare Information and Management Systems Society (a trade group)
  - **HIPAA** Health Insurance Portability and Accountability Act of 1996
  - **HIT** Health Information Technology
  - **HITSP** Healthcare Information Technology Standards Panel (owned and organized under ANSI)
  - **HL7** Health Level Seven
  - **HMD** HL7 Hierarchical Message Definition
  - **HMO** Health Maintenance Organization
  - **HOST** Healthcare Open Systems and Trials
  - **HPCC** High Performance Communications and Computing
  - **HTML** Hyper-Text Markup Language

\* Courtesy of Ed Hammond, PhD 1999, with some updates from John Quinn, 2007

# Some Acronyms\*

- 
- **ICD** International Classification of Disease
  - **ICD9** Diagnostic and procedure codes, current version in the US is ICD9-CM
  - **ICD9-CM** ICD9 with Clinical Modification
  - **ICD10** Latest version of ICD implemented in most countries
  - **IDL** Interface Definition Language
  - **ICNP** International Classification for Nursing Practice
  - **IEC** International Electrotechnical Commission
  - **IEEE** Institute of Electronic and Electrical Engineers
  - **IETF** Internet Engineering Task Force
  - **IHS** Indian Health Service
  - **IMIA** International Medical Informatics Association
  - **IOM** Institute of Medicine
  - **ISSB** Information Systems Standards Board
  - **ISO** International Standards Organization (part of the UN in Geneva Switzerland)
  - **ITSEC** Information Technology Security Evaluation Criteria
  - **ITU** International Telecommunication Union

\* Courtesy of Ed Hammond, PhD 1999, with some updates from John Quinn, 2007

# Some Acronyms\*

- 
- **JAHIS** Japanese Association for Medical Informatics
  - **JCAHO** Joint Commission on Accreditation of Healthcare Organizations
  - **JIRA** Japan Industries Association of Radiation Apparatus
  - **LOINC** Logical Observations, Identifiers, Names and Codes
  - **MDF** Message Development Framework
  - **MEDCIN** Nomenclature for healthcare. Produced by Medicomp.
  - **MEDINFO** World Medical Informatics Conference; every 3 years; sponsored by IMIA.
  - **MEDIX** Medical Data Interchange Standard (IEEE)[P1157]
  - **MEDRA** Medical Dictionary for Drug Regulatory Affairs
  - **MeSH** Medical Subject Heading
  - **MGMA** Medical Group Management Association
  - **MIB** Medical Informatics Bus (IEEE)
  - **MOU** Memorandum Of Understanding
  - **MPI** Master Patient Index or Master Person Index
  - **MPL** Master Patient (Person) Locator
  - **MSHUG** Microsoft Healthcare User Group

\* Courtesy of Ed Hammond, PhD 1999, with some updates from John Quinn, 2007

# Some Acronyms\*

- 
- **NANDA** North American Nursing Diagnoses Association
  - **NCHS** National Center for Health Statistics
  - **NCCLS** National Committee for Clinical Laboratory Standards
  - **NCPDP** National Council for Prescription Drug Programs
  - **NCVHS** National Committee for Vital and Health Statistics
  - **NDC** National Drug Codes. Produced by the FDA.
  - **NEMA** National Electrical Manufacturers Association
  - **NHS** National Health Service – UK
  - **NHS CT** National Health Service Clinical Terms (formerly Read Codes)
  - **NIC** Nursing Intervention Classification
  - **NILT** Nursing Intervention Lexicon and Taxonomy
  - **NIST** National Institute of Standards and Technology
  - **NLM** National Library of Medicine
  - **NOC** Nursing Outcomes Classification
  - **NPRM** Notice of Proposed Rule Making
  - **NUBC** National Uniform Billing Committee
  - **NUCC** National Uniform Claims Committee

\* Courtesy of Ed Hammond, PhD 1999, with some updates from John Quinn, 2007

# Some Acronyms\*

- 
- OMAHA System Nursing Codes
  - **OMG**            **Object Management Group**
  - **ORB**            **Object Request Broker**
  - **PACS**           **Picture Archiving and Communication System**
  - **PCDS**           **Patient Care Data Set. Judy Ozbolt, Vanderbilt.**
  - **PHS**            **Public Health Service**
  - **PRA**            **Patient Record Architecture**
  - **PSRO**           **Professional Standards Review Organization**
  - **READ Classification System:**  
    **Clinical codes with a bias for primary care. Now part of NHS SNOMED CT.**
  - **RIM**            **Reference Information Model**
  - **RMIM**           **Refined Message Information Model**
  - **RSA**            **Algorithm for encrypting / decrypting data. Developed by Ronald Rivest, Adi Shamir, and Leonard Adleman**
  - **RSNA**           **Radiological Society of North America**
  - **SCAR**           **Society for Computer Applications in Radiology**
  - **SDO**            **Standards Development Organization**
  - **SGML**           **Standard Generalized Markup Language**

\* Courtesy of Ed Hammond, PhD 1999, with some updates from John Quinn, 2007

# Some Acronyms\*

- 
- **SCAR** Society for Computer Applications in Radiology
  - **SDO** Standards Development Organization
  - **SGML** Structured Graphical Markup Language
  - **SNOMED RT** Systematized Nomenclature of Medicine Reference Terminology
  - **SNOP** Systematized Nomenclature of Pathology
  - **SQL** Structured Query Language
  - **TC 215** ISO Technical Committee 215 – Healthcare Information
  - **TC 215 WG1** Working Group 1: Modeling Coordination and Health Records
  - **TC 215 WG2** Working Group 2: Messaging and Communications
  - **TC 215 WG3** Working Group 3: Health Concept Representation
  - **TC 215 WG4** Working Group 4: Security
  - **TC 215 WG5** Working Group 5: Health Cards

\* Courtesy of Ed Hammond, PhD 1999, with some updates from John Quinn, 2007

# Some Acronyms\*

- 
- **TC 251** CEN Technical Committee for Medical Informatics
  - **TC 251 WG1** Healthcare Information Modeling and Medical Records
  - **TC 251 WG2** Healthcare Terminology, Semantics and Knowledge Bases
  - **TC 251 WG3** Healthcare Communications and Messages
  - **TC 251 WG4** Medical Imaging and Multimedia
  - **TC 251 WG5** Communication with Medical Devices
  - **TC 251 WG6** Healthcare Security, Privacy, Quality and Safety
  - **TC 251 WG8** Intermittently Connected Devices (including Cards)
  - **TCP/IP** Transmission Control Protocol/Internet Protocol
  - **Terminfo** An HL7 General Approach to resolving issues related to the interface between HL7 Information Model and terminologies or code systems
  - **TR** ISO Technical Report
  - **TS** ISO Technical Specification
  - **UCC** Uniform Code Council
  - **UCDS** Uniform Clinical Data System
  - **UMDNS** Universal Medical Device Nomenclature System
  - **UML** Unified Modeling Language
  - **UMLS** Unified Medical Language System

\* Courtesy of Ed Hammond, PhD 1999, with some updates from John Quinn, 2007

# Some Acronyms\*

- 
- **UN/EDIFACT** United Nations Electronic Data Interchange For Administration, Commerce and Transport
  - **UNIX** Open Systems Operating system
  - **UPC** Universal Product Code. From UCC.
  - **URL** Universal Resource Locator (e.g., <http://www.hl7.org>)
  - **USHIK** US Health Information Knowledgebase; Data Registry
  - **US/TAG** United States Technical Advisory Committee
  - **VA** Veterans Administration
  - **WEDI** Workgroup on Electronic Data Interchange
  - **WHO** World Health Organization
  - **WS-I** Web Services Interoperability Organization
  - **www** World Wide Web
  - **W3C** World Wide Web Consortium. Definers of HTML & XML among other things
  - **XML** Extensible Markup Language

\* Courtesy of Ed Hammond, PhD 1999, with some updates from John Quinn, 2007

# HL7 V 2.6 Glossary

## D. Glossary

Editor: Karen Van Hentenryck  
Health Level Seven, Inc.

### A

<b>Abstract Message</b>	The basic level of definition within HL7 is that of the abstract message associated with a particular trigger event. The abstract message definition includes the data fields that will be sent within a message, the valid response messages, and the treatment of application level errors or the failure of the underlying communications system. An HL7 abstract message is defined in terms of HL7 segments and fields, as described in Section 2.4.8.
<b>Abstract Syntax Notation One (ASN.1)</b>	ASN.1 is a data definition language that allows formal definitions of information structures to be expressed in a manner that is independent of any implementation constraints. It may be used to create complex hierarchical structures from basic primitive types.
<b>ACK</b>	General Acknowledgment message. The ACK message is used to respond to a message where there has been an error that precludes application processing or where the application does not define a special message type for the response.
<b>Acknowledgment - Accept Level</b>	The receiving system commits the message to safe storage in a manner that releases the sending system from any obligation to resend the message. A response is returned to the initiator indicating successful receipt and secure storage of the information.
<b>Acknowledgment - Application Level</b>	The appropriate application on the receiving system receives the transaction and processes it successfully. The receiving system returns an application-dependent response to the initiator.
<b>ACR/NEMA</b>	American College of Radiology and the National Electrical Manufacturers Association. The American College of Radiology formed a relationship with the National Electronic Manufacturers' Association in 1982 to develop a standard for Digital Imaging and Communications in Medicine (DICOM). The purpose of the standard was to promote a generic digital image communication format; facilitate the development and expansion of picturing archiving and communication systems (PACS); allow the creation of diagnostic information databases for remote access; and help assure the usability of new equipment with existing systems. The current standard (Version 3.0) defines image data as well as patient, study and visit

### **Links to HITSP acronyms and glossary:**

Acronyms List: [http://www.hitsp.org/ConstructSet\\_Details.aspx?&PrefixAlpha=7&PrefixNumeric=04](http://www.hitsp.org/ConstructSet_Details.aspx?&PrefixAlpha=7&PrefixNumeric=04)

Glossary: [http://www.hitsp.org/ConstructSet\\_Details.aspx?&PrefixAlpha=7&PrefixNumeric=06](http://www.hitsp.org/ConstructSet_Details.aspx?&PrefixAlpha=7&PrefixNumeric=06)