

39th VistA Community Meeting
October 22, 2021

Immunization Calculation Engine (ICE) Project



Goal of the ICE Project

Objective	Achievement
Supports routinely administered vaccine groups	<ul style="list-style-type: none">• Supports 16 vaccine groups from birth through adulthood
Promotes clinical best practices	<ul style="list-style-type: none">• Follows ACIP recommendations• Informed by CDC's CDSi project
Adapts to changing requirements	<ul style="list-style-type: none">• Tools for self-administration if practical• Automated testing tool• Engineered for high performance & scalability
Easily integrates with IIS and other health systems	<ul style="list-style-type: none">• Standards-based architecture and APIs• Variety of deployment options
Software and knowledge base freely available	<ul style="list-style-type: none">• Standard, permissive open-source license (LGPL v3)• Downloadable from public website

Project Principles

- ❖ Changes to the Open Source software should be available to all users.
- ❖ A base set of rules developed by consensus should be maintained and be freely available to all users.
- ❖ Alternate rule sets may or may not be freely available at the discretion of the organizations that create them or sponsor their creation.
- ❖ Resources and activities should be leveraged across participants as much as possible.
- ❖ Anyone may create products with “enhanced features” that must comply with the Open Source license but might not be freely available.



Original ICE Collaborators

- ❖ New York City Citywide Immunization Registry
- ❖ HLN Consulting, LLC
- ❖ Alabama Dept of Public Health
- ❖ OpenCDS Team
 - ❑ Software platform and toolkit
 - ❑ Open source
 - ❑ Standards-based
 - ❑ Web Service interface
 - ❑ Collaborative project: Dr. Kensaku Kawamoto at University of Utah

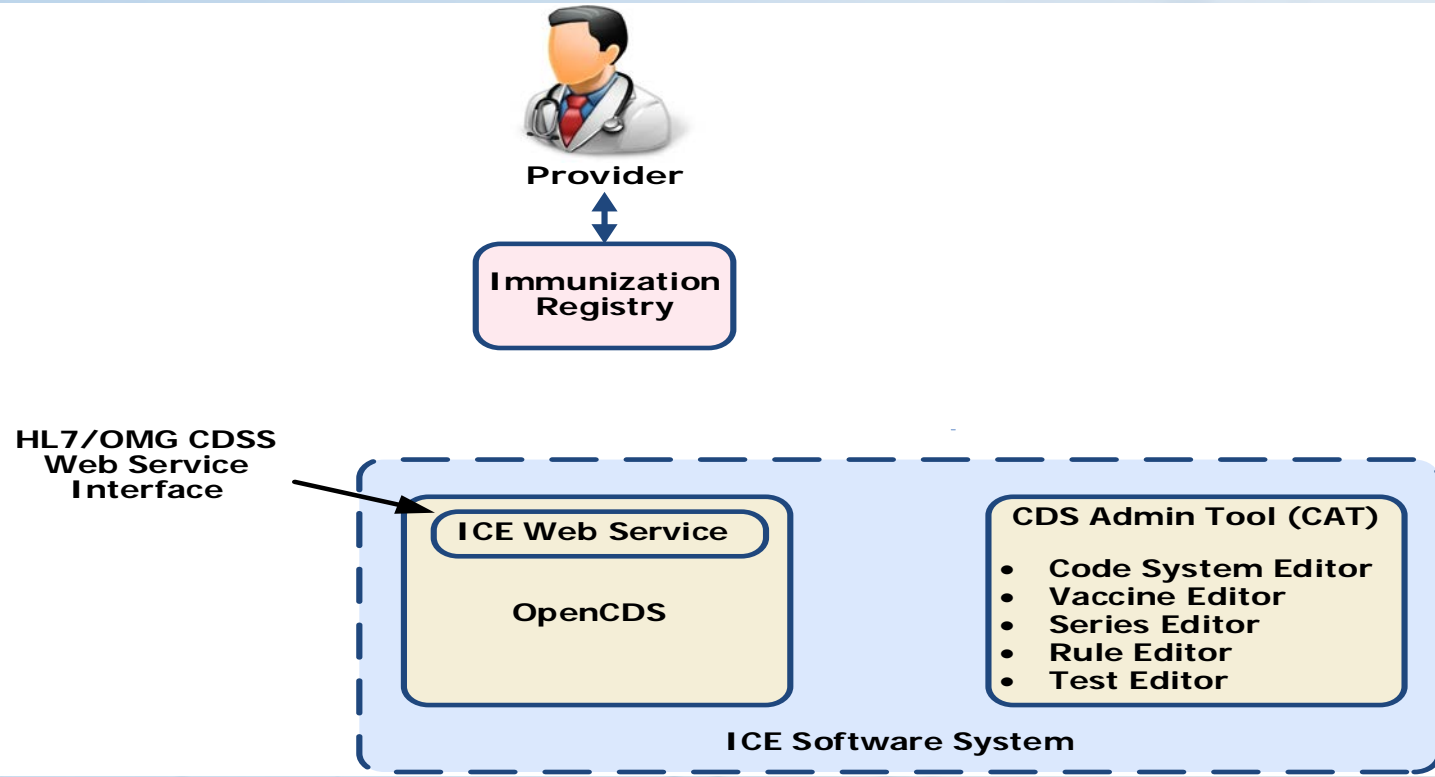


ICE: “5 Rights” of CDS

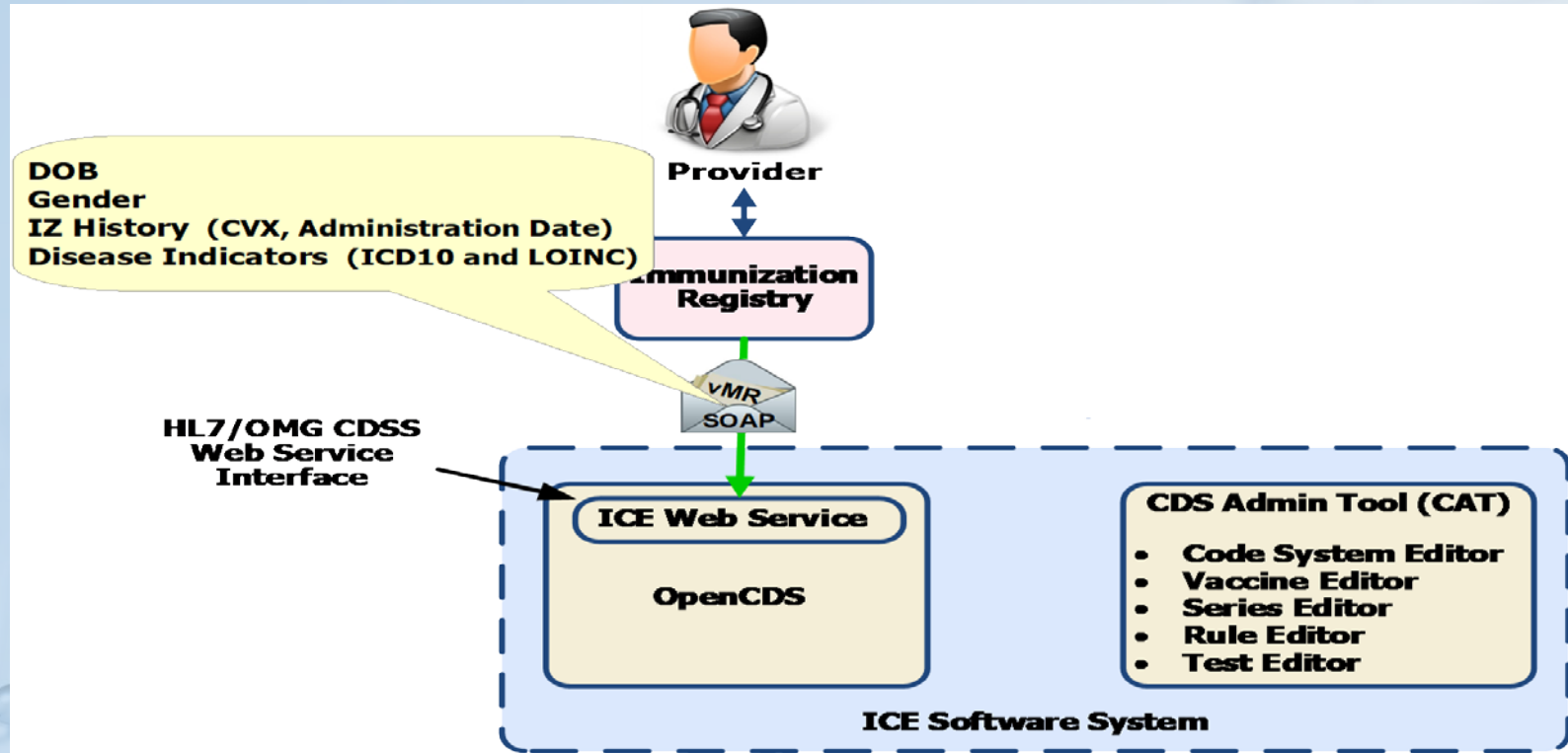
The right information	The architecture delivers a clear determination, based on the clinical data provided about whether the patient’s past immunizations are valid, and based on that determination, what immunizations may be due now or in the future..
To the right person(s)	The determination of whether the patient requires immunizations is delivered directly to the provider or his/her designee, as well as directly to the patient if desired..
Using the right intervention format	Once the clinical decision support is activated - locally or centrally - EHRs should be able to display immunizations due as alerts, on reports, or through practice-level or population-level reminder/ recall processes.
In the right channel	EHRs and registries should be able to display immunizations due within their user interface.
At the right time during workflow	EHRs can decide how and if the clinician is alerted within the workflow. This can be done before a patient is seen or at the point of service.

Campbell, Robert James. "The Five Rights of Clinical Decision Support: CDS Tools Helpful for Meeting Meaningful Use" Journal of AHIMA 84, no.10 (October 2013): 42-47 (web version updated February 2016).

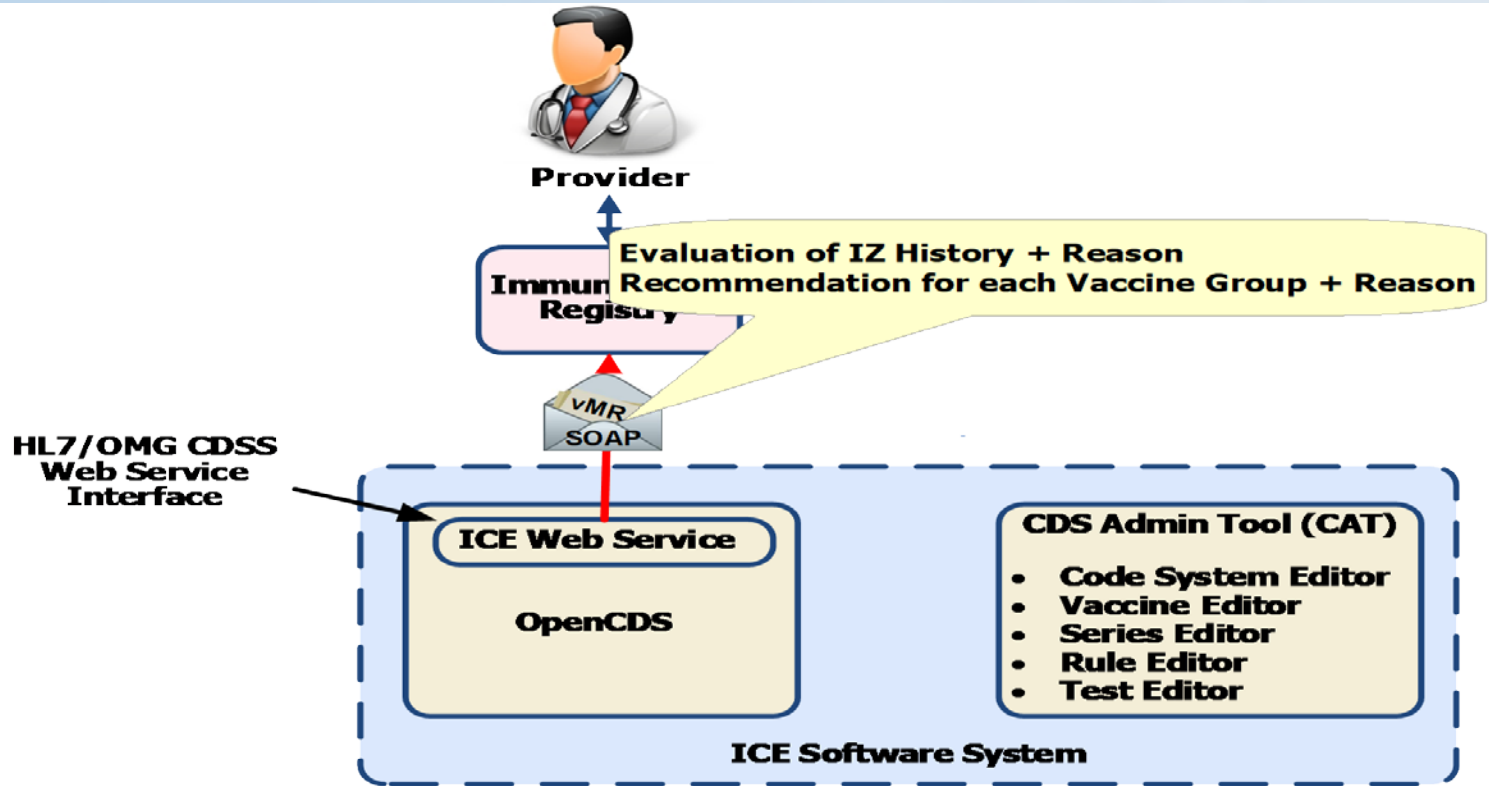
How Does ICE Work?



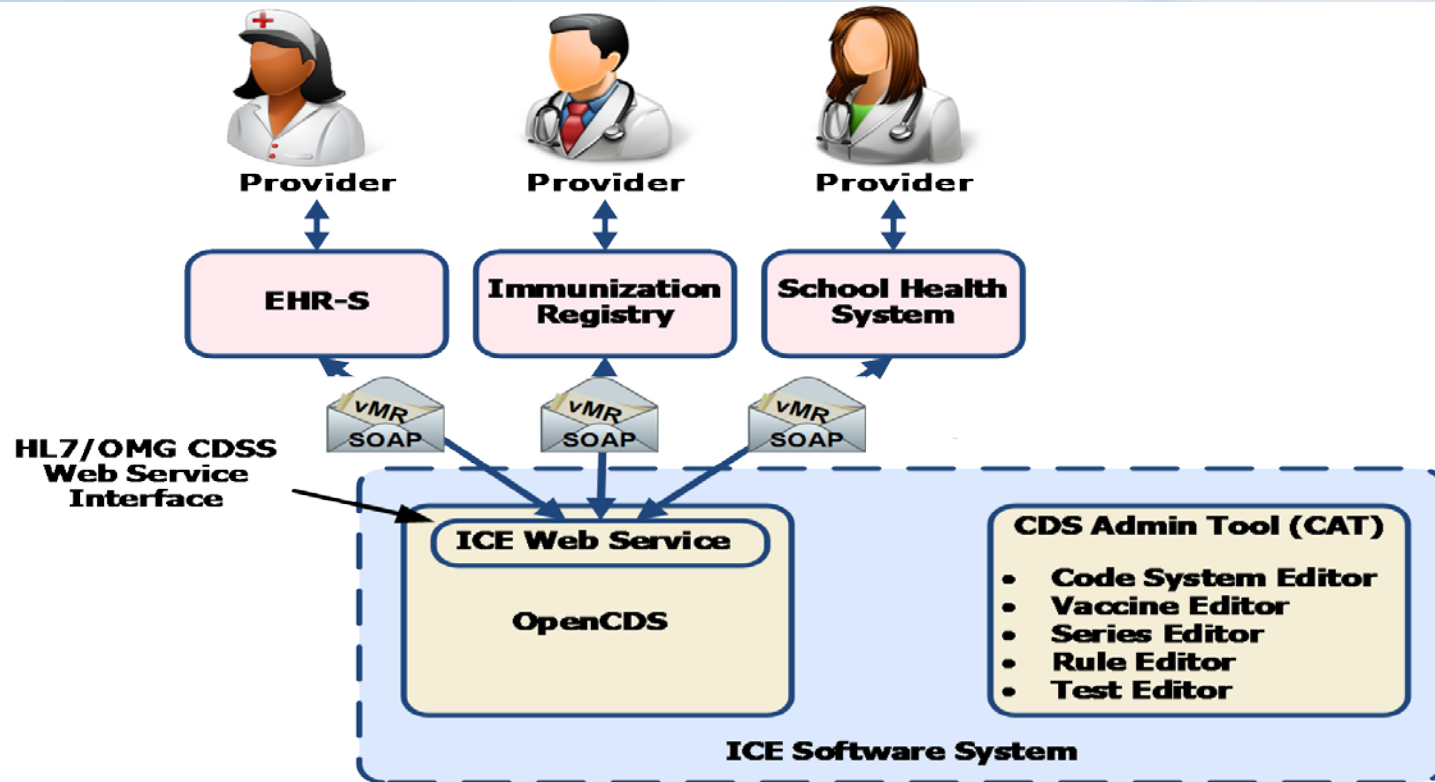
How Does ICE Work?



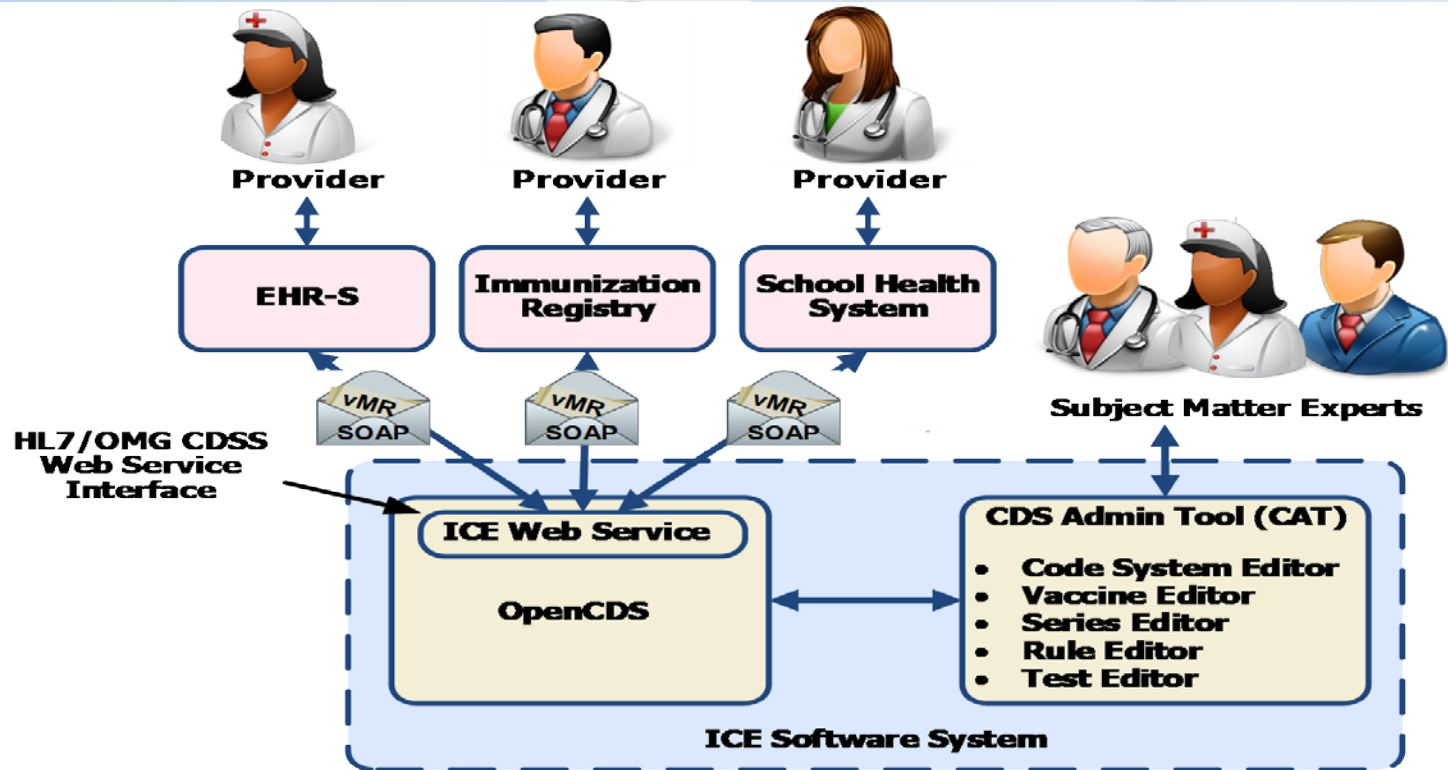
How Does ICE Work?



How Does ICE Work?



How Does ICE Work?



Easy to Adopt and Integrate

- ❖ Open source (GNU LGPL v3)
- ❖ Java-based system runs on a wide variety of server platforms
- ❖ Can be deployed in a variety of ways
- ❖ Standards-based Web Service interface
- ❖ Comprehensive Documentation
 - ❑ Public Wiki – www.cdsframework.org
 - ❑ Implementation Guide for Integrating with ICE
 - ❑ ICE Default Immunization Schedule
 - ❑ Binary Releases
 - ❑ Source Code

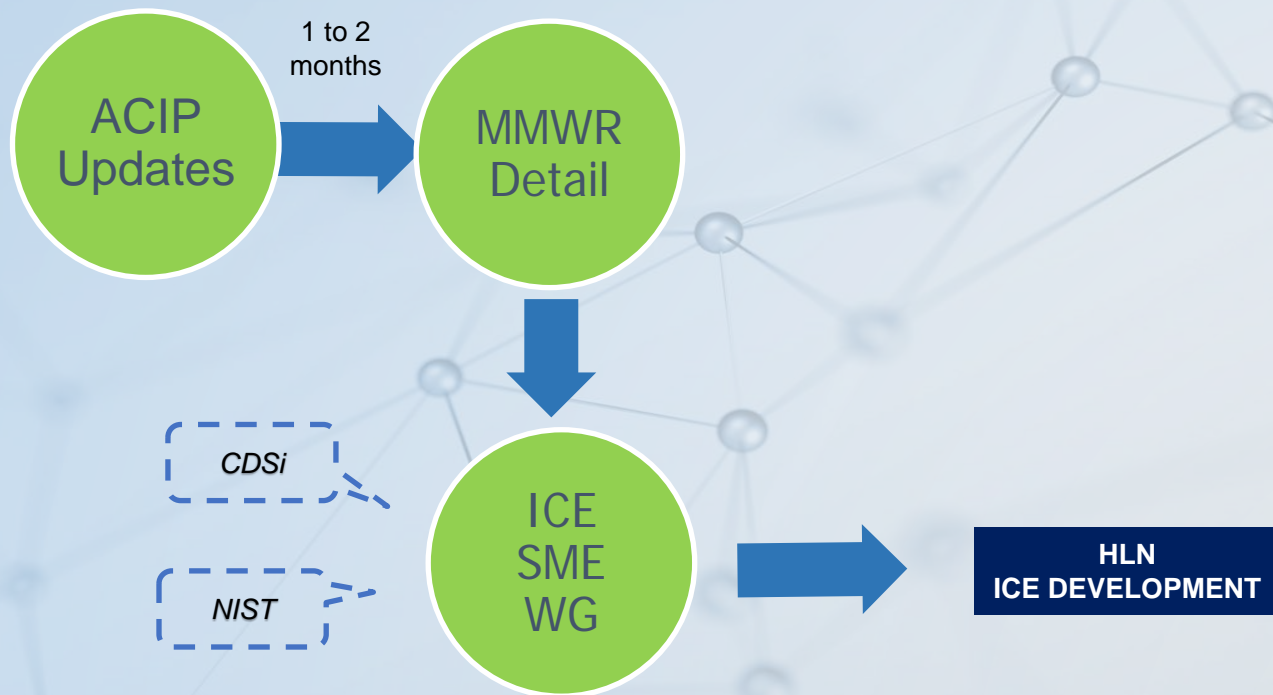
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Software Architecture

❖ OpenCDS CDS Service

- ❑ Java Servlet Container (Tomcat 7/8/9)
- ❑ JBoss Drools Rules Engine
- ❑ HL7/OMG Decision Support Service “DSS” (web service interface)
- ❑ HL7 Virtual Medical Record “vMR” (data model)
- ❑ Working to support CQL evaluation via CDS Hooks interface (as additional rules language and interface option)
- ❑ Working to support FHIR compatibility for ICE Service

Update Process Flow & Advisory Structure



Support Services

❖ Technical Support

- ❑ Provide web conference/telephone/email support to an organization's IT staff
- ❑ Create additional technical documentation
- ❑ Work with an organization's IT staff to integrate ICE with their healthcare systems
- ❑ Enhance or customize the ICE software features (e.g., CDS Manager) to meet the custom needs or workflow of an organization

❖ Configuration Services

- ❑ Develop middleware to interface with standard ICE API
- ❑ Customize and/or maintain an immunization schedule on behalf of organizations (ICE configurations are portable and can be exported/imported/shared as XML files)


❖ Hosted ICE Service

- ❑ Host an instance of the ICE web service that healthcare systems could securely connect to over the internet

Known Users of ICE

- ❖ Massachusetts Department of Public Health (August 2021)
- ❖ WebChart (December 2020)
- ❖ empower systems (September 2020)
- ❖ Virginia Department of Health – Web Vision Public Health EHR (September 2020)
- ❖ New York City Department of Health and Mental Hygiene – Citywide Immunization Registry (Summer 2020, in final testing)
- ❖ athenaPractice EHR (Summer 2020)
- ❖ Vermont Department of Health – Statewide Immunization Information System (July 2020)
- ❖ Indian Health Service – RPMS EHR (May 2020)
- ❖ Rhode Island Department of Health – Statewide Immunization Information System (April 2020)
- ❖ AZOVA Vaxigo Clinical System (January 2020)
- ❖ Michigan Department of Health and Human Services – Statewide Immunization Information System (phasing in since December 2018)
- ❖ GE Centricity/Health 1 Technologies EHR (May 2018)
- ❖ New Jersey Department of Health – Statewide Immunization Information System (January 2018)
- ❖ New York-Presbyterian Hospital/Columbia University Medical Center (June 2017)
- ❖ CareDox PHR (November 2014)
- ❖ eClinicalWorks EHR (December 2013)

IHS RPMS: Immunization History

Source: **Immunization Record**  Source: **RPMS + AZ** **AZ: No state data found** **Refresh State** **State Immunization Profile** **No Query Response on file for TEST_NEWBABY (Click to Remove)**

Forecast

DTaP NOS	past due
POLIO NOS	past due
HEP B NOS	past due
MMR	past due

Contraindications **Add** **Delete**

Immunization History

Print Record **Due Letter** **Profile** **Case Data** **Add** **Edit** **Delete**

Registry	Vaccine	Visit Date	Age@Visit	Location	Reaction	Volume	Inj. Site	Lot	Manufacturer	VIS Date
RPMS ONLY	DTaP	11/14/2002	3 mths	2017 DEMO CLINIC CHIT				DTAP455A2		07/30/200
RPMS ONLY	DTaP	01/13/2003	5 mths	2017 DEMO CLINIC CHIT				dtpa575a2		07/30/200
RPMS ONLY	DTaP	03/11/2003	7 mths	2017 DEMO CLINIC CHIT						
RPMS ONLY	DTaP	09/18/2003	13 mths	2017 DEMO CLINIC CHIT						07/30/200
RPMS ONLY	DTaP	09/21/2006	49 mths	2017 DEMO CLINIC CHIT		0.5	Right Thigh IM	U1891CA	SANOFI PASTEUR	07/30/200
RPMS ONLY	FLU NOS	10/17/2003	14 mths	2017 DEMO CLINIC CHIT						
RPMS+AZ	FLU-IV3pf	05/08/2020	1	Tuba City Regional Health Care						
RPMS+AZ	FLU-IV4	10/21/2015	1	St. Joseph's Indian School						
RPMS+AZ	FLU-IV4	10/17/2016	1	St. Joe's						
RPMS ONLY	FLU-LAIV3	11/12/2008	6 yrs	2017 DEMO CLINIC CHIT		0.2	Intranasal	500559P	MEDIMMUNE	07/24/200
RPMS+AZ	FLU-LAIV3	09/11/2012	1	St. Joe's		0				
RPMS+AZ	FLU-LAIV4	10/04/2013	1	St. Joe's						
RPMS+AZ	FLU-LAIV4	10/02/2014	1	St. Joe's						

IHS RPMS: Immunization Forecasting

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Patient: TEST,DONNA    DOB: 17-Feb-1979 (42 yrs)
HLN ICE Forecaster v1.29.1 for: 10/18/2021  (run: 10/18/2021 @ 14:14)

-- IMM HISTORY EVALUATION -----

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Date	CVX	Vaccine (combo)	Status - Reason
04/18/1979	20	DTaP	VALID
06/18/1979	20	DTaP	VALID
08/19/1979	20	DTaP	VALID
05/18/1980	20	DTaP	VALID
02/19/1984	20	DTaP	VALID
08/03/2021	20	DTaP	VALID
02/17/2018	115	Tdap	VALID
07/09/2020	144	FLU-DERMAL	VALID
08/03/2021	158	FLU-TIV4	VALID
01/17/2019	133	PCV-13	ACCEPTED: This immunization was administered outside of the series.
07/09/2020	165	HPV-9v	VALID
08/16/2021	207	COVID,Mod	VALID
09/05/2021	207	COVID,Mod	VALID
10/06/2021	207	COVID,Mod	ACCEPTED: The vaccine administered is an extra dose.

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-- FORECAST -----
DUE:
| Vaccine      Status      Earliest      Recommended      Overdue
| -----
| MMR          * Series assumed completed.
| HPV,NOS      Due now      08/06/2020    08/06/2020      10/28/2020

FUTURE:
| Vaccine      Status      Earliest      Recommended      Overdue
| -----
| Td,NOS       Due in future 08/03/2026    08/03/2031      08/30/2031
| FLU,NOS      * Contraindicated due to patient history.
| PNEUMO-PS    Due in future 02/17/2044    02/17/2044      NO DATE
| ZOS-Shgrx    Due in future 02/17/2029    02/17/2029      NO DATE

COMPLETE:
| Vaccine      Status
| -----
| COVID,NOS     Complete

HIGH RISK:
| Vaccine      Status
| -----
| None

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Learn More About ICE Through...

- ❖ HLN's ICE Webpage (www.hln.com/ice)
- ❖ ICE Wiki (cdsframework.org)
- ❖ Sample ICE Client (cds.hln.com/iceweb/#about)
- ❖ Executable software distribution and source code (cdsframework.atlassian.net/wiki/spaces/ICE/pages/18972704/Downloads)
- ❖ *OpenHealthNews* article (www.openhealthnews.com/articles/2019/anatomy-public-health-open-source-project-hlns-immunization-calculation-engine-ice)
- ❖ HLN-hosted test instance

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