39th VistA Community Meeting
October 22, 2021
Immunization Calculation Engine (ICE) Project

Goal of the ICE Project

Objective	Achievement
Supports routinely administered vaccine groups	• Supports 16 vaccine groups from birth through adulthood
Promotes clinical best practices	• Follows ACIP recommendations • Informed by CDC's CDSi project
Adapts to changing requirements	• Tools for self-administration if practical • Automated testing tool • Engineered for high performance & scalability
Easily integrates with IIS and other health systems	• Standards-based architecture and APIs • Variety of deployment options
Software and knowledge base freely available	• 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.

UpShot Awards Program
2017 WINNER
For work optimizing the vaccine and immunization system
NVPO   hhs.gov/nvpo/awards

HLN Consulting

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.

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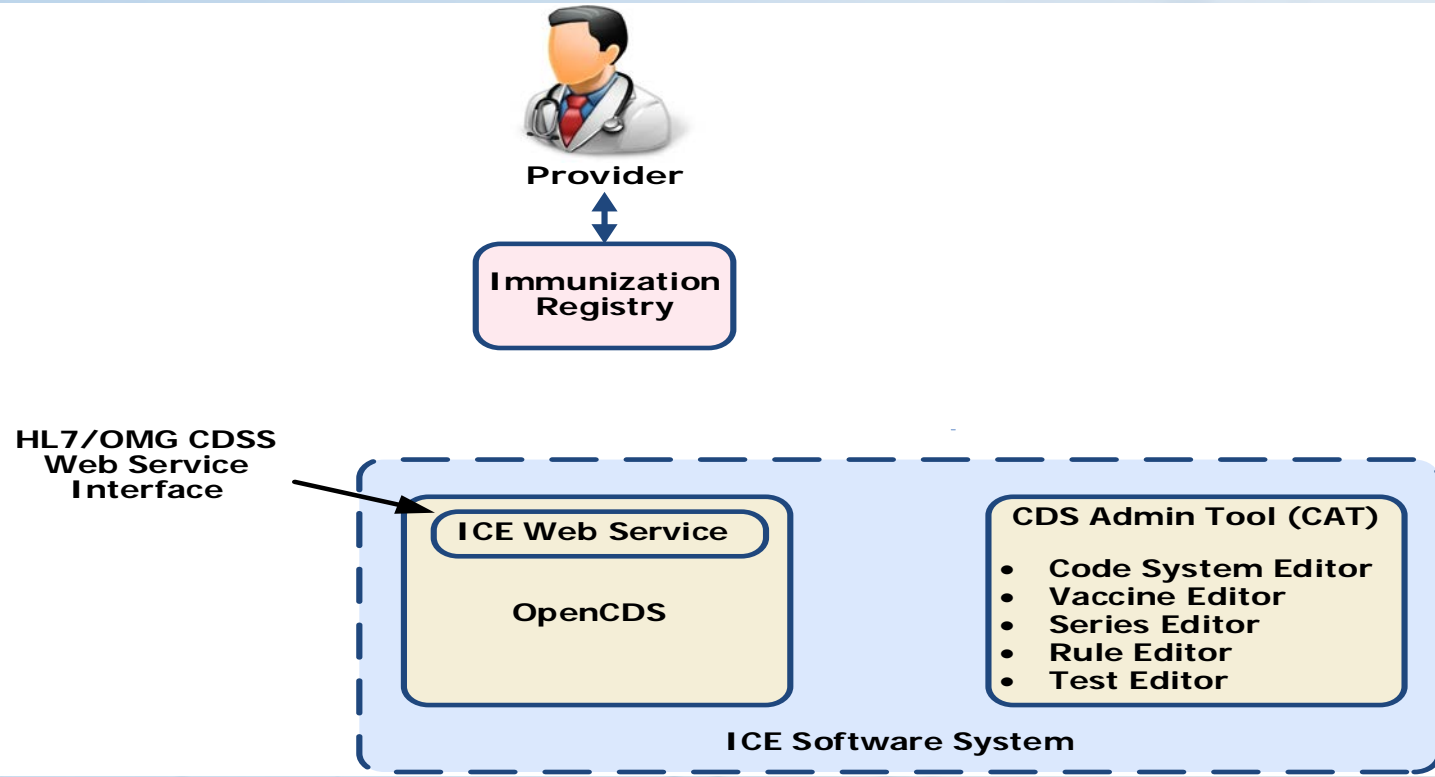
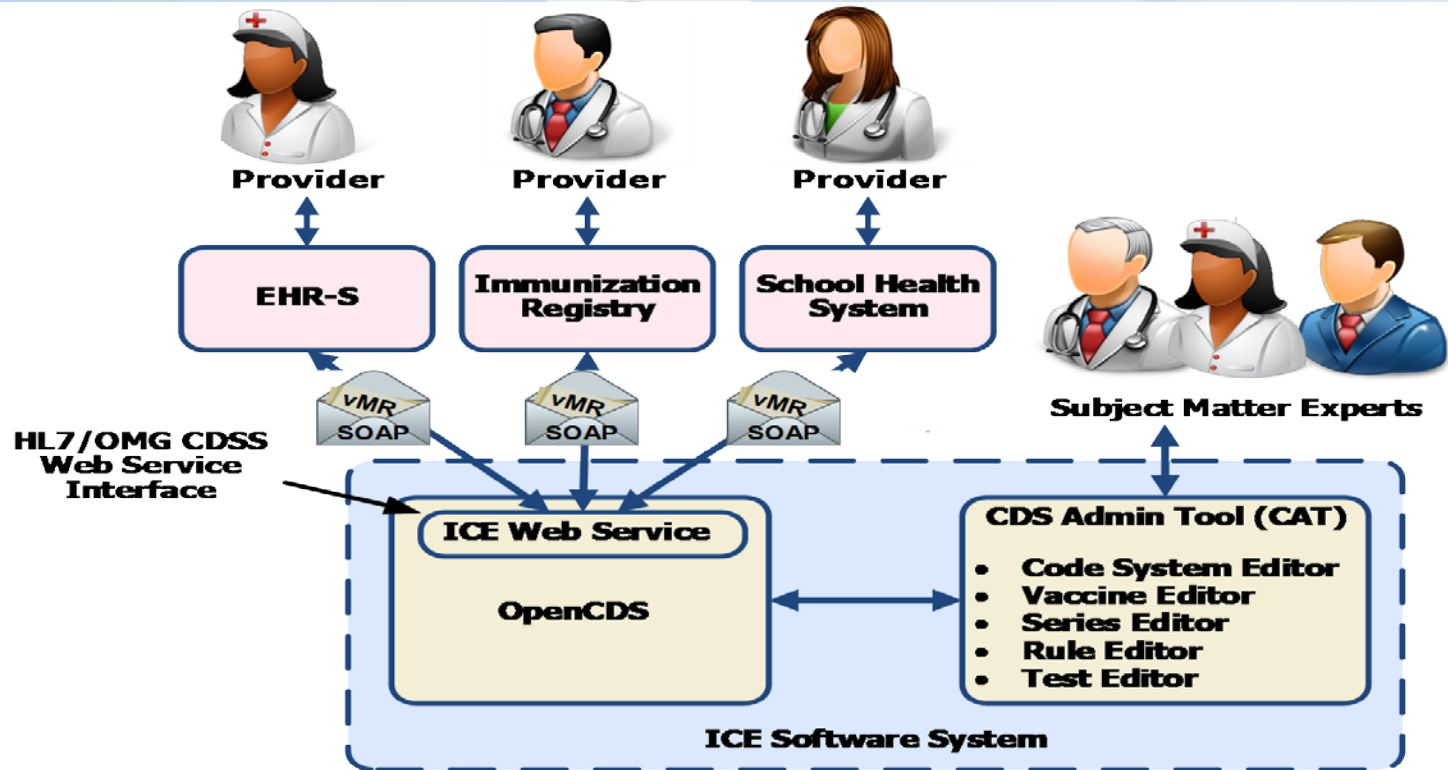# How Does ICE Work?
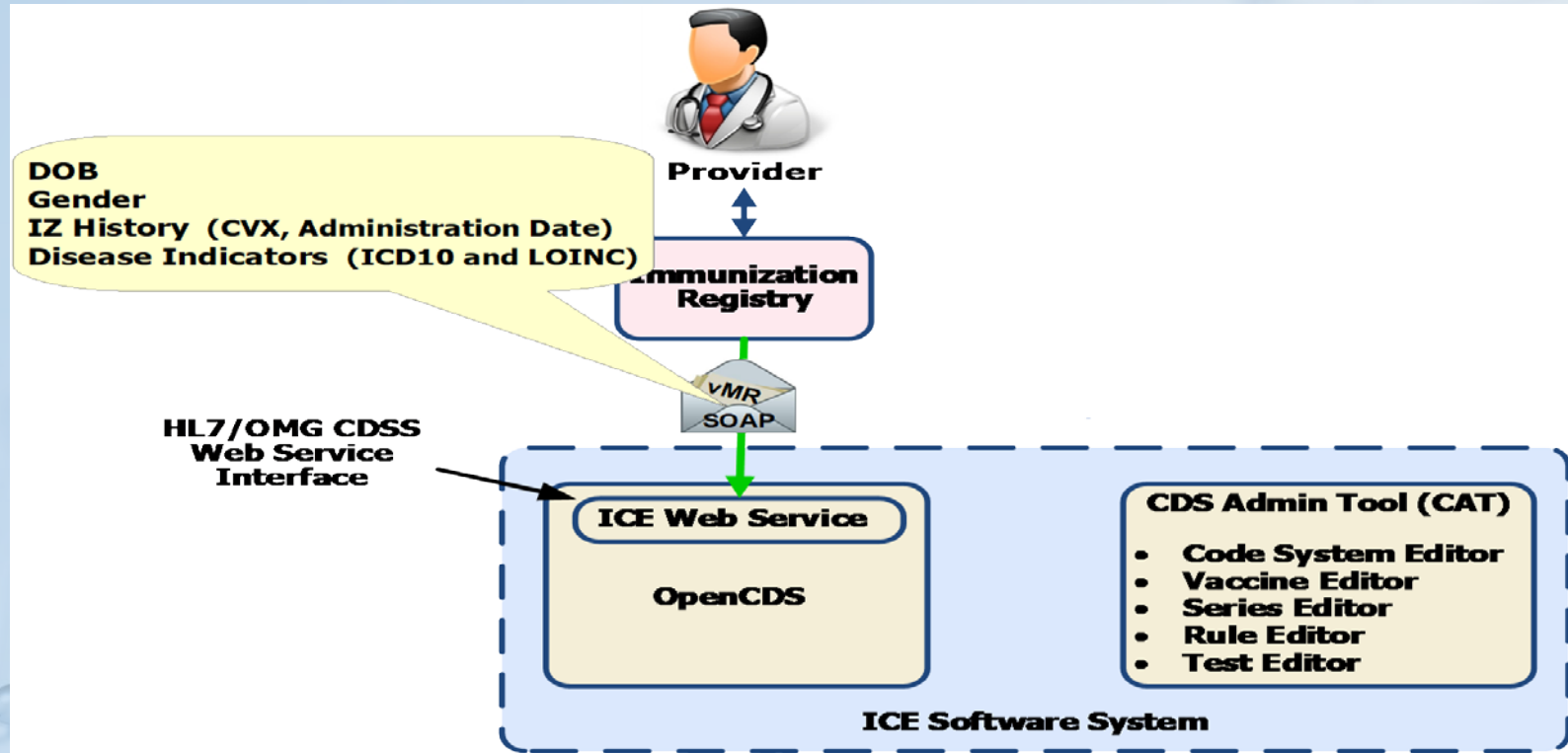
How Does ICE Work?
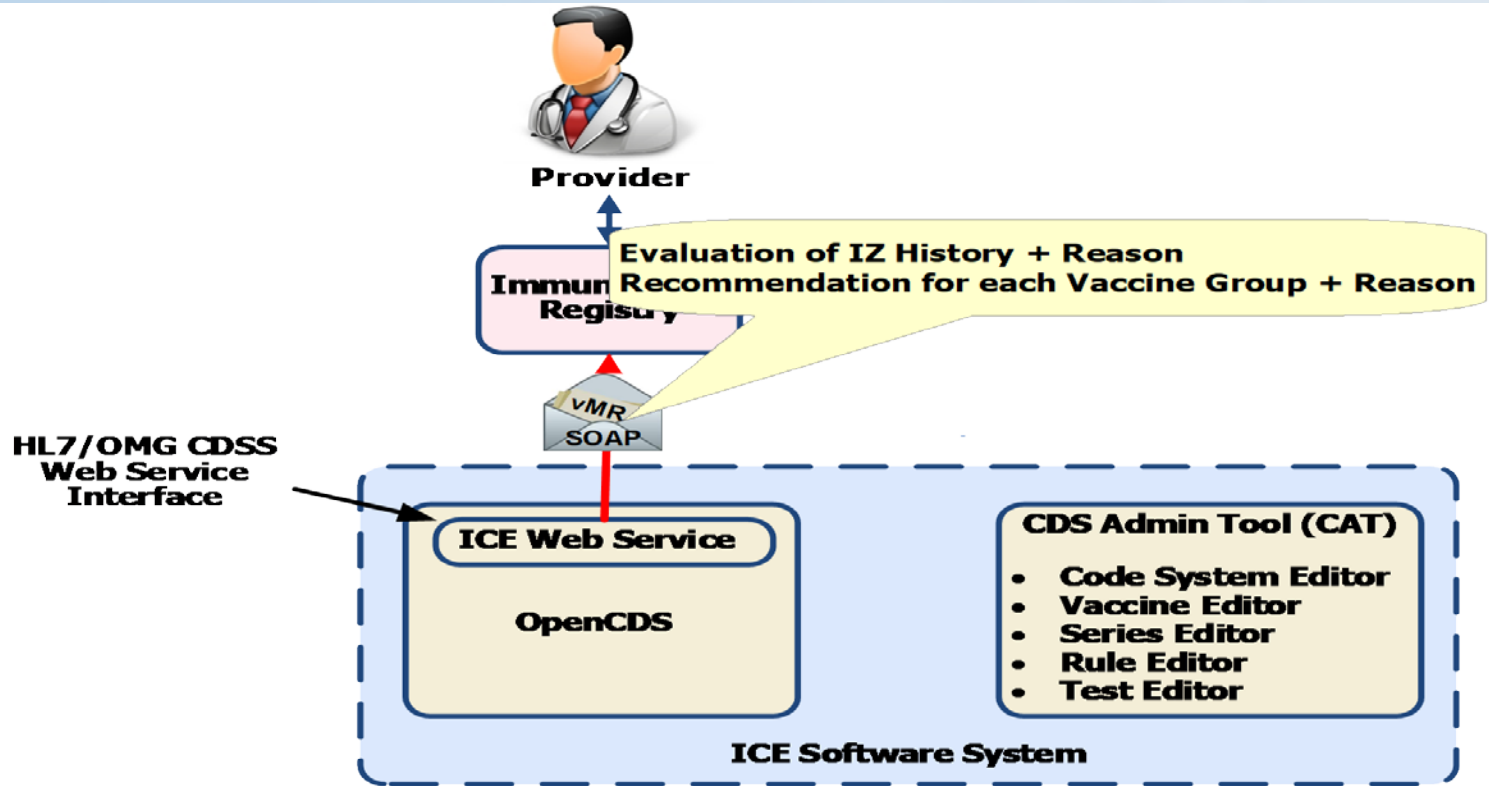
How Does ICE Work?
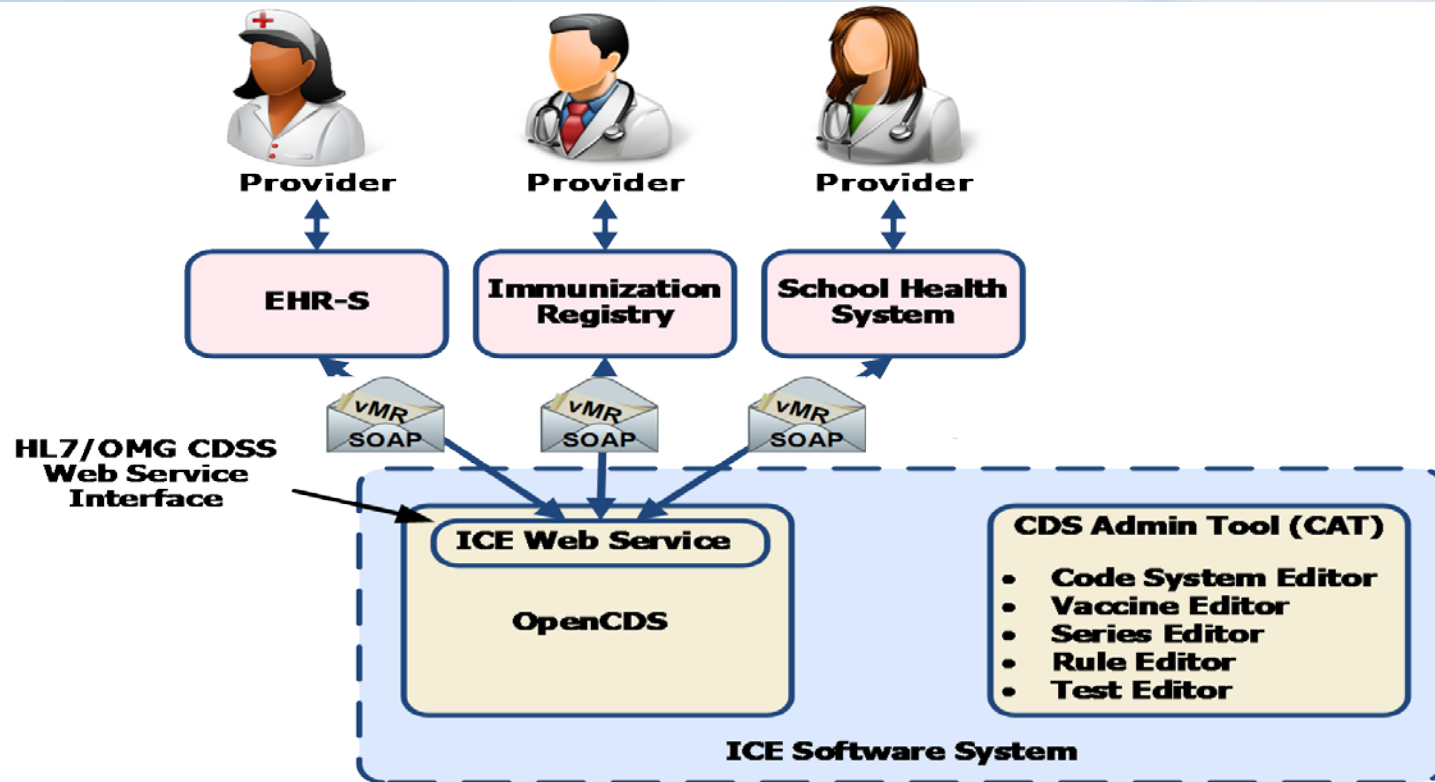
How Does ICE Work?

How Does ICE Work?

Easy to Adopt and Integrate

- ❖ Open source (GNU LGPL v3)
- ❖ Java-based system runs on a wide variety of sever 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
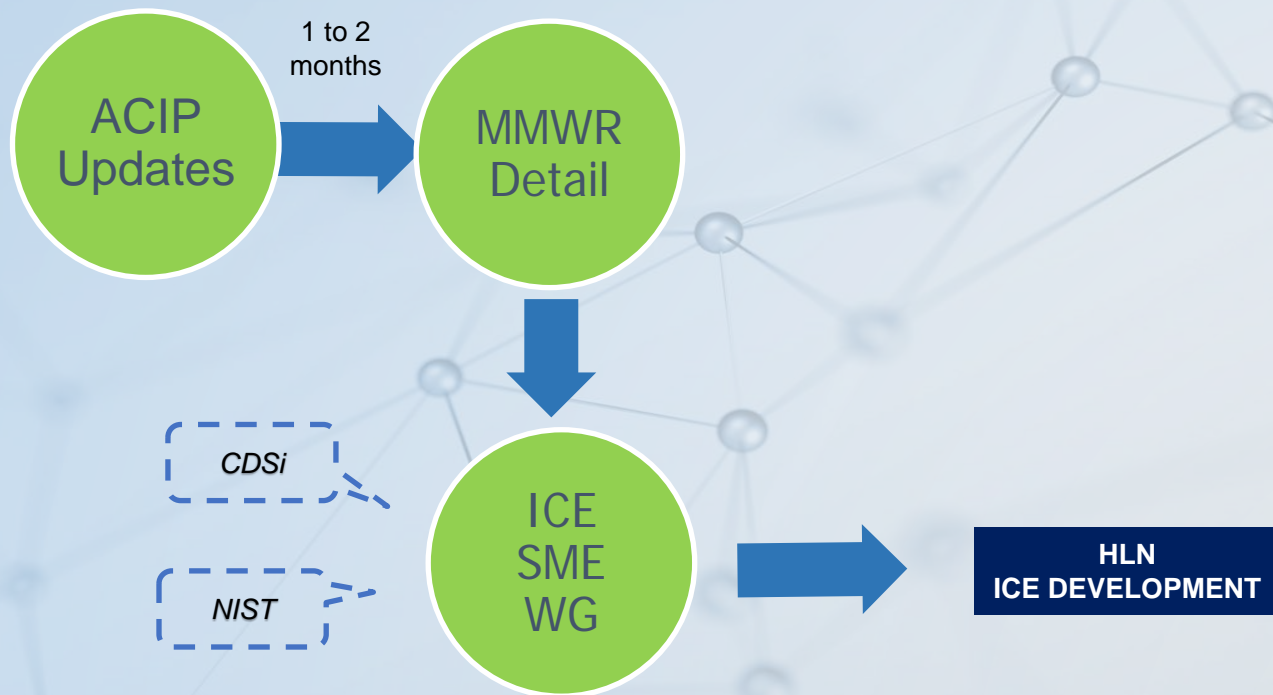 - ❑ Binary Releases
  - ❑ Source Code

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

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Update Process Flow & Advisory Structure

ACIP Updates

1 to 2 months

MMWR Detail

CDSi

NIST

ICE SME WG

HLN ICE DEVELOPMENT

*

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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

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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

IHS RPMS: Immunization Forecasting


```
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 -------------------------------------------------

   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-IIV4                 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.


-- 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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