



Immunization Calculation Engine (ICE): An Open Source Option for Immunization Forecasting

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Agenda

1. ICE Deployments
2. Three Interesting Real World Uses of ICE
3. ICE Releases - (where we have been)
4. ICE Roadmap - (where we are going)
5. ICE Governance - (how we are getting there)



1. ICE Deployments



Why Use ICE?

- ACIP-compliant
- Rigorously developed and tested
- Standards-based
- Scalable
- Rich configuration and testing tools
- Open source software – no vendor lock-in
- Flexible deployment options



ICE Deployments

IIS

- Production
 - New Jersey (Jan 2018)
- Transitioning
 - New York City (Dec 2018)
 - Rhode Island (Dec 2018)
 - Michigan

EHRs and Others

- eClinicalWorks (Dec. 2013)
- CareDox (November 2014)
- Denver Public Health (July 2016)
- Health 1 Technologies / GE Centricity (May 2018)
- Major academic medical center research project
- And more...



2. Three Stories of Interesting Real World Uses of ICE



ICE Story #1:

Responding to a Vaccine Refrigeration Incident

- Large pediatric practice
- Temperature excursion affected 5,000 patients
- Provider, manufacturers, and health department identified which doses were nonviable due to excursion
- Goal: Use ICE to calculate dates of necessary re-vaccinations and all future doses (assuming patient stays on schedule)



ICE Story #1: (cont.)

Responding to a Vaccine Refrigerator Incident

- Created special ICE client
 - Imports EHR data via spreadsheet
 - Repeatedly calls ICE for each patient
 - Calculates dates for **all** future recommended doses in series
 - Exports results to spreadsheet and PDF



ICE Story #2:

Generating Population Vaccine Coverage Estimates

- Denver Public Health periodically imports patients and IZs from Colorado Immunization Information System (CIIS)
- DPH selects cohort of interest (age range, as of a specific day)
- Uses ICE to batch process evaluations and forecasts for that specific past date, for all patients in cohort.



ICE Story #2: (cont.)

Generating Population Vaccine Coverage Estimates

- Large batches
 - > 1M patients
 - > 18M immunizations
- Produce population reports and histograms that display # of valid doses
 - by Vaccine Group, Age, Gender, and County
- Produce facility-specific report cards for providers



ICE Story #3: Integration with GE Centricity

- Health 1 Technologies – GE Centricity vendor
- Customers wanted immunization forecasting ASAP, but:
 - Unable to incorporate ICE client into Centricity
 - FHIR capability (SMART-on-FHIR, CDS Hooks) not yet in Centricity



ICE Story #3: (cont.)

Integration with GE Centricity

- Deployed simple filesystem-based API using open source ICE Python client
 - <https://bitbucket.org/cdsframework/pyiceclient>
- From zero to production in three months with first 150 providers



3. ICE Releases



9 Releases of ICE over the Past Year

Release Date	Version #
August 1, 2017	1.8.1
August 2, 2017	1.8.2
October 6, 2017	1.9.1
November 20, 2017	1.9.2
December 19, 2017	1.10.1
March 9, 2018	1.11.1
April 13, 2018	1.12.1
June 17, 2018	1.13.1
August 11, 2018	1.14.1



Highlights of ICE Releases over the Past Year

- Feature Enhancements
 - Added support for Earliest Date & Overdue Date
- Routine Maintenance
 - Added support for Meningococcal B vaccine group
 - Combined PCV & PPSV vaccine groups into a single Pneumococcal vaccine group



Highlights of ICE Releases over the Past Year

- Routine Maintenance (cont.)
 - Added support for several new vaccines (Shingrix, etc)
 - Adjustments to a variety of rules
- Other
 - Released Python client



4. ICE Roadmap



The “ICE Vision”

- **ACIP:** Adherence to appropriate clinical guidelines (ACIP)
- **Standards:** Standards-based technical architecture and application programming interface (API)
- **Easy Integration:** Support for a growing range of relevant APIs for invoking and receiving responses from the ICE service, making it easy to integrate ICE with a wide variety of other systems
- **Performance:** High performance and high scalability



The “ICE Vision” (cont.)

- **Knowledge Base:** Published knowledge base, including complete documentation of the ICE immunization schedule, ICE installation process, and ICE API(s)
- **Open Source:** Available under a standard permissive Open Source license.
- **Variety of Sectors:** Use within both public sector and private sector systems
- **Self-Administration:** Tools that allow self-administration where practical



ICE Product Roadmap

Target Release	Category	Modification
Ongoing	ACIP Updates	Ongoing ACIP Updates Ongoing CDSi Comparison and Analysis
August 2018	Feature Enhancement / Addition	Completion of Earliest / Past Due Date for Remaining Vaccine Groups
September 2018	ACIP Updates	Full Support for HEPLISAV-B
October 2018	Product	Survey of ICE enhancement priorities
TBD based on HL7 Ballot Approval	Product	FHIR Compatibility for ICE Service
TBD 2019	Product	CAT Authoring Tool



5. ICE Governance



Governance Principles

- **Availability:** Changes to the Open Source software should be available to all users.
- **Consensus-Based:** A base set of rules developed by consensus should be maintained and be freely available to all users.
- **Protecting Knowledge Generation:** Alternate rule sets may or may not be freely available at the discretion of the organizations that create them or sponsor their creation.
- **Leveraging Resources:** Resources and activities should be leveraged across participants as much as possible.
- **Encouraging Innovation:** Any organization may create products with “enhanced features” that must comply with the Open Source license but which might not be freely available to everyone.

ICE Review Board: Current Members

Name	Title / Organization	Location
Nancy Anthracite, MD	President, CMO, and Director, WorldVista	DC
Noam H. Arzt, PhD	President, HLN Consulting, LLC <i>Ex Officio</i>	CA
Bill Brand	Director, Public Health Informatics Science, Public Health Informatics Institute (PHII)	MN
Mary Beth Kurilo	Policy and Planning Director, American Immunization Registry Association (AIRA)	OR
Amy Metroka, DrPH, MSW	Director, Citywide Immunization Registry, New York City Department of Health and Mental Hygiene	NY
Fred Pytlak	Chief Client Officer, Office Practicum	PA
Robert Silverman, PharmD	Pharmacist, Veterans Health Administration, Department of Veterans Affairs	IL
Bob Swanson, MPH	Director, Division of Immunization, Michigan Department of Health and Human Services	MI
Stuart Weinberg, MD	Associate Professor, Vanderbilt University Medical Center	TN

ICE SME Workgroup: Current Members

Name	Title / Organization	Location
Denise Benkel, MD	Medical Specialist, Citywide Immunization Registry, New York City Department of Health and Mental Hygiene	NYC
Kathleen Blaney	Research Scientist, Citywide Immunization Registry, New York City Department of Health and Mental Hygiene	NYC
Bonnie Davis	Registry Branch Director, Alabama Department of Public Health Immunization Division	AL
Elzbieta Kopec-Schrader, MD	Research Scientist, Citywide Immunization Registry, New York City Department of Health and Mental Hygiene	NYC
Deepali Rastogi	Technical Analysts/Consultants, Alabama Department of Public Health	AL
Mark Sawyer, MD	Pediatrician, University of California, San Diego	CA
Hari Siva	Technical Analysts/Consultants, Alabama Department of Public Health	AL



Quarterly ICE Review Board Meetings

- Review Roadmap
 - New ICE Features
 - ACIP Rules Changes by the ICE SME WG
 - Technical Interfaces to ICE (APIs)
- Discuss Special Topics, such as...
 - ICE at FHIR Connectathon (Germany, May 2018)
 - Fuzzy Dates
 - Use of ICE for the Vaccine Refrigerator Incident
- Quarterly Meetings, started in November 2017
- Next Meeting: September 2018



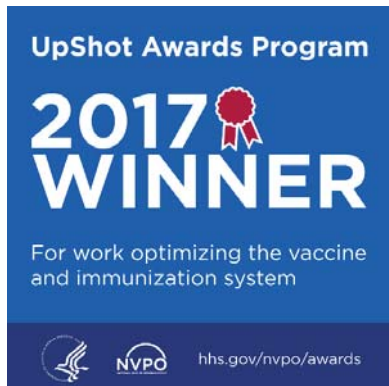
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