



# SAGE Guideline Modeling: Motivations and Methodology

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# Outline

- **SAGE: Standards-Based Active Guideline Environment**
- Deployment-Driven Guideline Modeling
- Compliance with Standards
- SAGE Decision-Support System Architecture
- Results and Conclusions

# SAGE: Standards-Based Active Guideline Environment

- 3-year US NIST Advanced Technology Program grant
- IDX leads R&D consortium that includes as partners:
  - Apelon, Inc.
  - Stanford Medical Informatics (SMI)
  - Intermountain Healthcare (IHC)
  - University of Nebraska Medical Center (UNMC)
  - Mayo Clinic
- Ultimate goal: An **infrastructure** that will allow execution of **standards-based** clinical practice guidelines across **heterogeneous clinical information systems** (CIS)
- Focus is on the goal of **deployment** of guideline knowledge **within the workflow** of clinical information systems

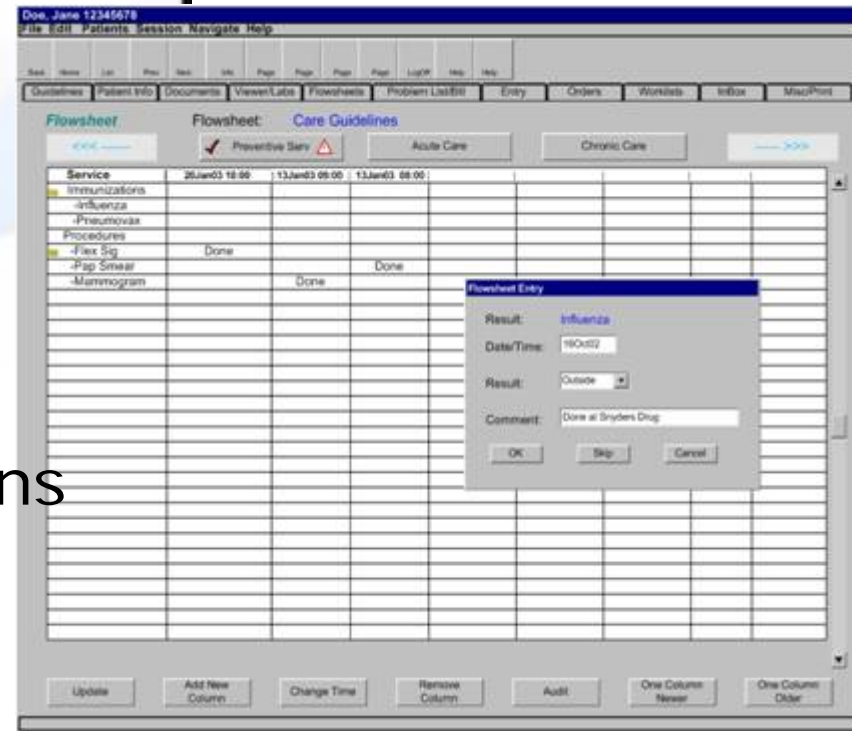
# Deployment-Driven Guideline Modeling

- Assumption: Guideline DSS is reactive
  - Not in control of clinical workflow
  - Respond to external events (including passage of time)
- Methodology
  - Empirically define points in care processes where guideline DSS may provide services
  - Discover characteristics of human-computer interactions that enhances prospect of acceptance
- Method
  - Create scenarios that walk-through care process
  - Create prototype GUI to validate in usability lab

# Scenario Summary

- Clinical scenario: Patient arrives for visit with primary physician. At **check-in**, SAGE checks for immunizations that are due and prints consents and information sheets. Nurse then reviews any other shots received, **updates the record**, and SAGE pre-order immunizations to be given that day

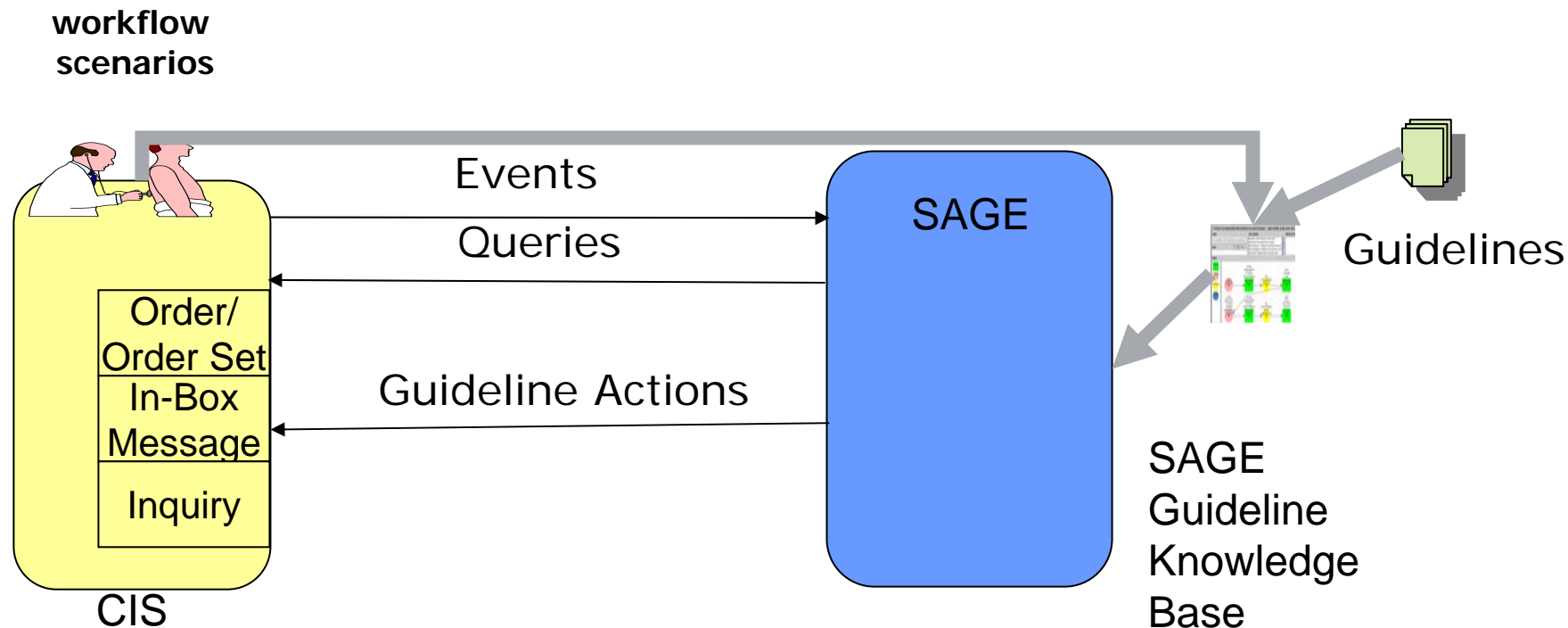
# Mayo Usability Lab



- Prototypes tested by clinicians in Mayo usability lab

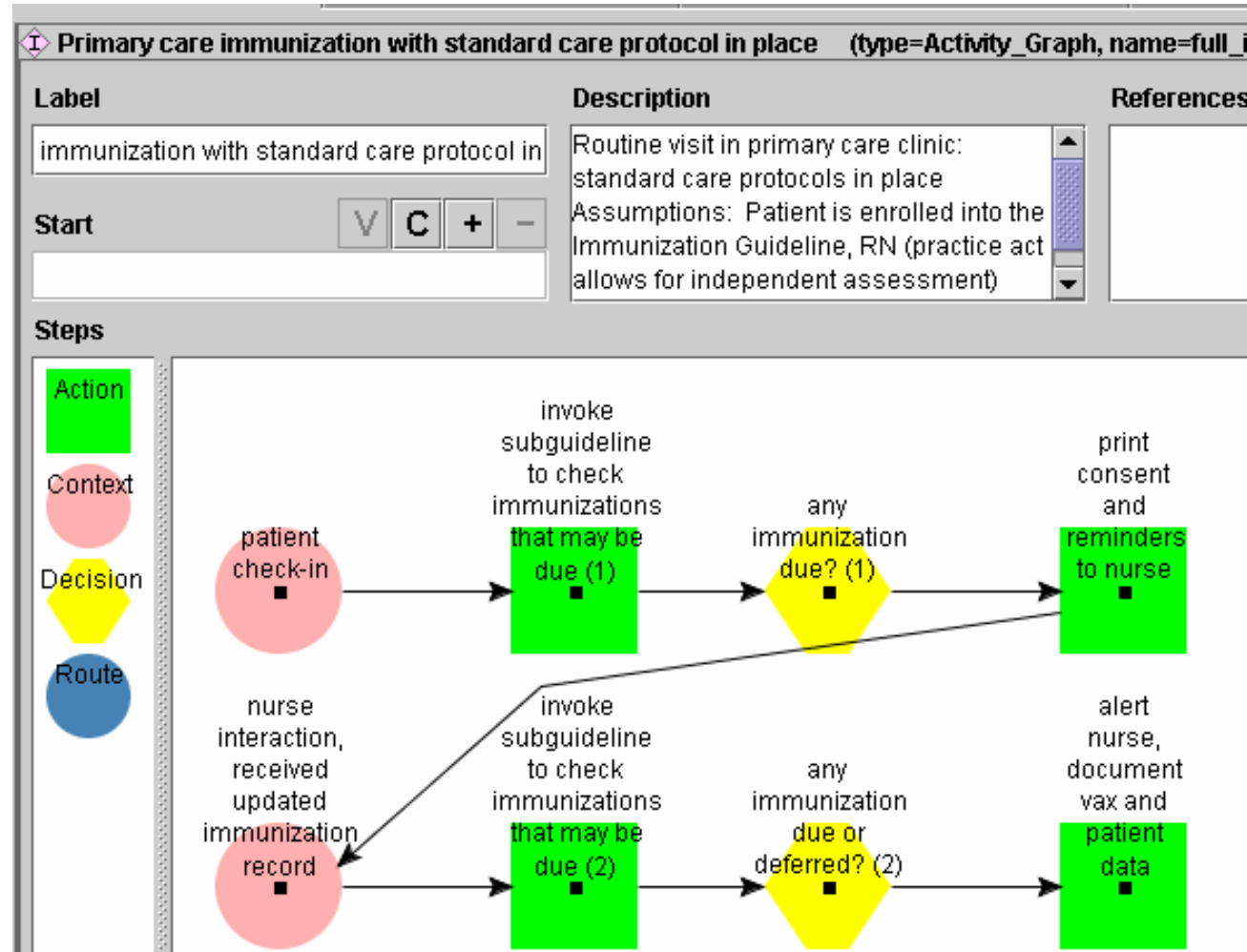
# Results of Scenario Development

- Scenario development defines events and actions that SAGE must respond to and generate. Scenarios help to define what guideline knowledge must be encoded and what data must be queried.



# Top-Level Workflow-Aware Process

- Top-level process description in encoded guideline reflect expected reactions to events in clinical workflow

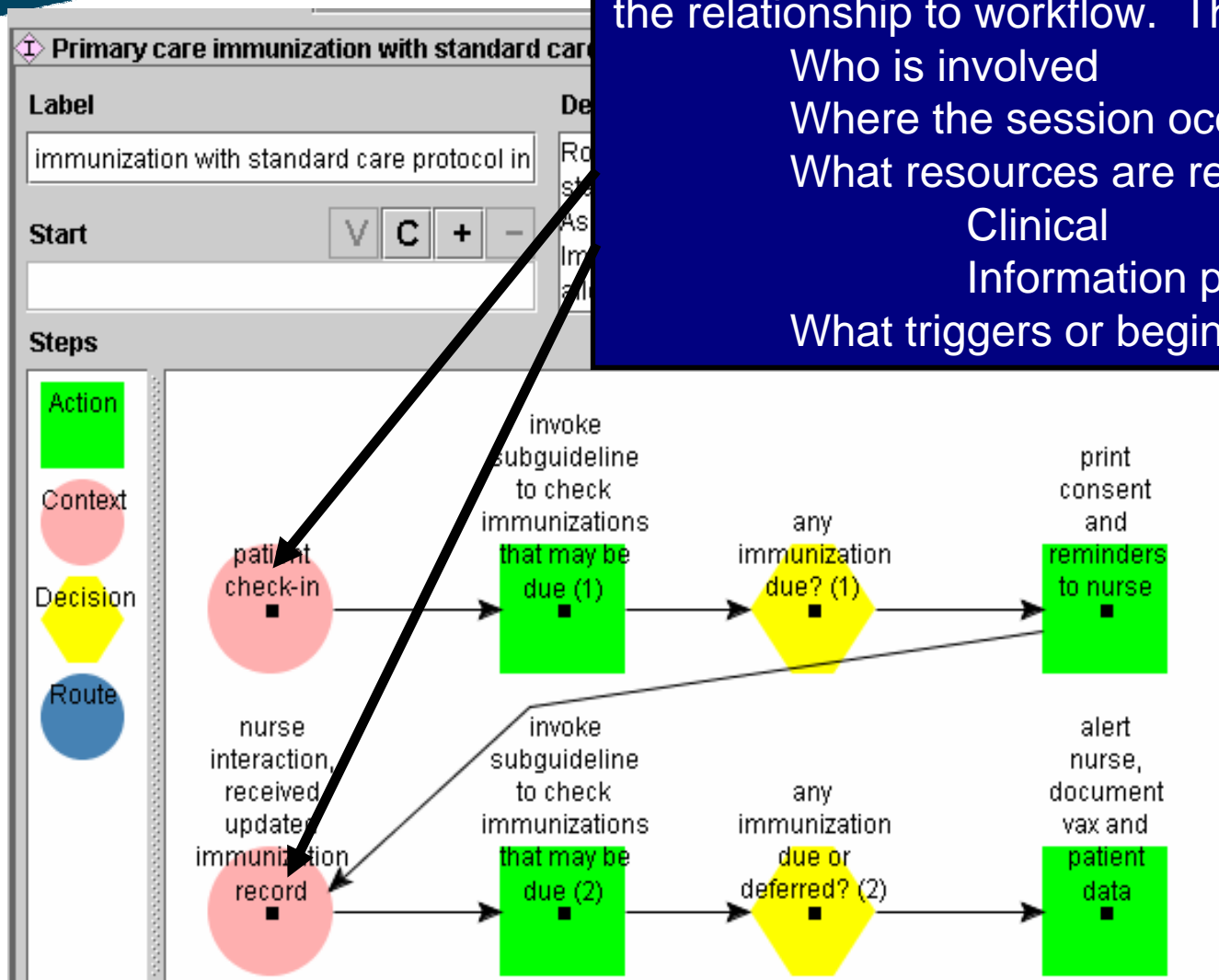




# SAGE Context Model

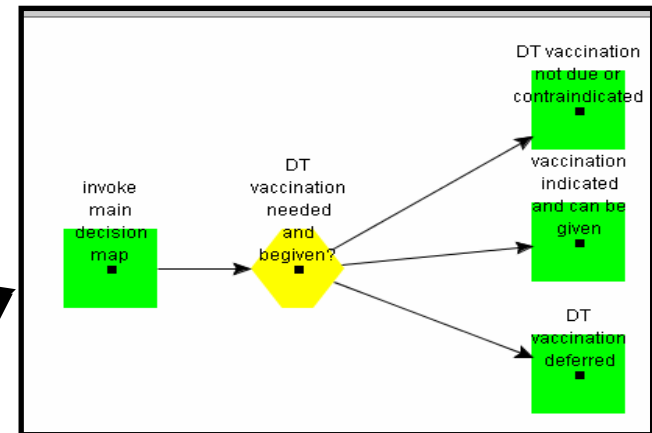
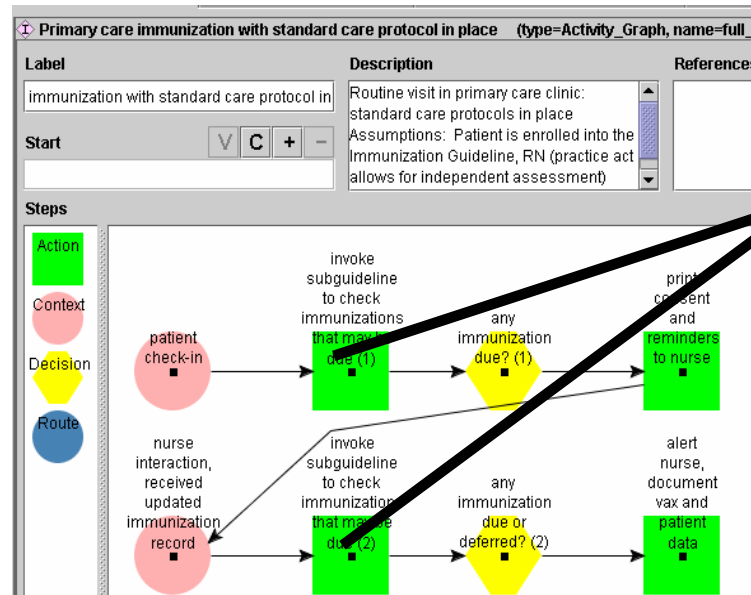
Context nodes organize and specify the relationship to workflow. They record:

- Who is involved
- Where the session occurs
- What resources are required
- Clinical
- Information processing
- What triggers or begins session



# Sub-guidelines

Can be thought of as reusable subsets of guideline logic (much like subroutines) for repeated use within a recommendation set



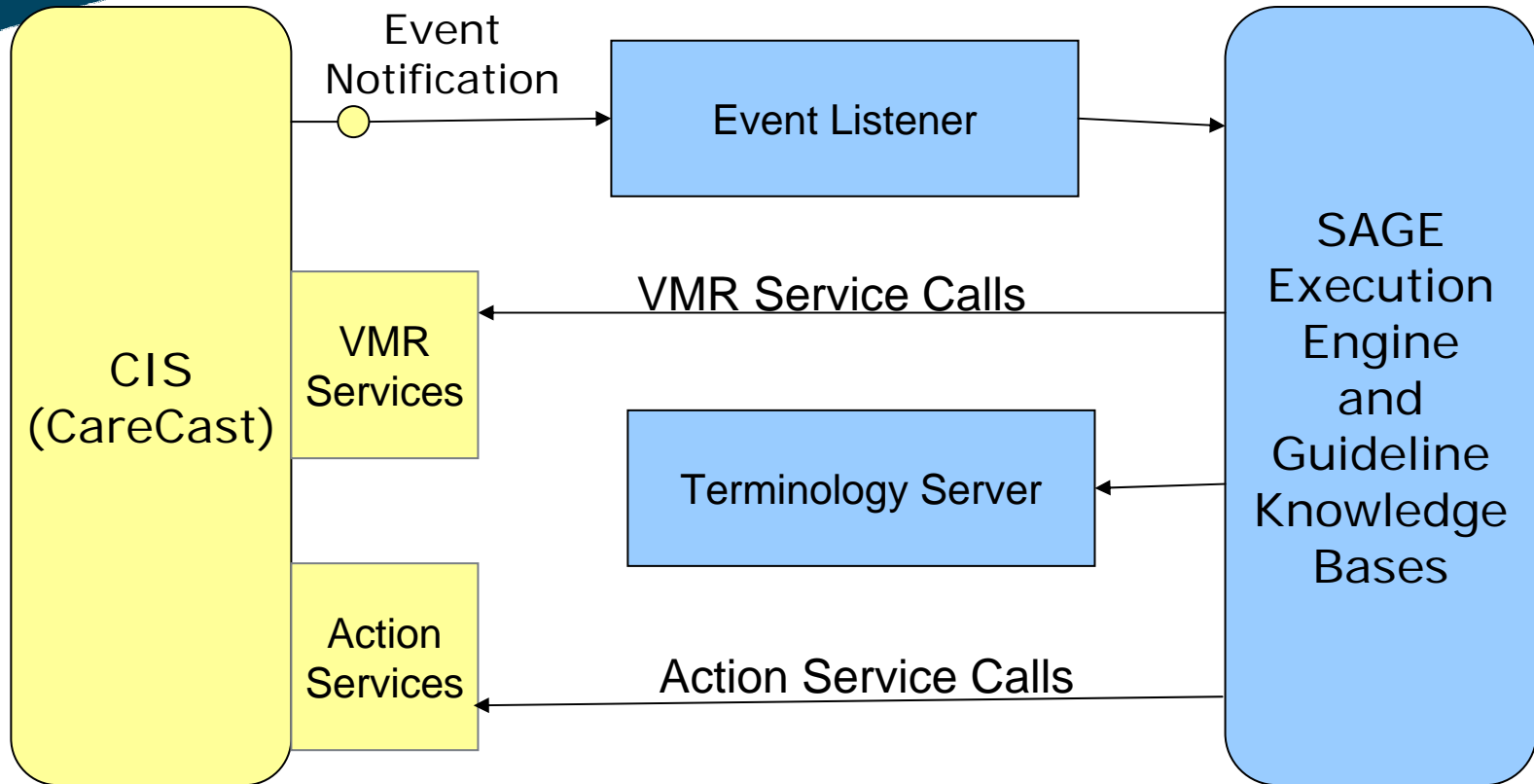
# Compliance with Standard....

- Take existing components whenever possible
  - Data types: HL7 version 3 data types
  - Reference terminology: SNOMED CT, LOINC, NDF-RT
  - Patient data model: “virtual medical record” being defined by HL7 Clinical Decision Work TC
  - Expression language: GELLO
- Difficulties
  - Moving targets: e.g. GELLO not well specified until 2004/03
  - Mismatches
    - e.g. between guideline concepts and terminology concepts

# Specifying a Decision Criterion: Presence of Chronic Pulmonary Disease (excl asthma)

- GELLO
  - Collection->exists(attribute.equals(value))
- Virtual Medical Record
  - **Problem**-> exists(**code**.equals(Factory.**CodedValue**(...)))
- Terminology
  - CodedValue
    - display\_name: Chronic pulmonary disease (excl asthma)
    - terminology SAGE
    - code 434343
  - Concept expression
    - (SNOMED 128272009) AND (SNOMED 128272009) AND (NOT (SNOMED 195967001))
    - Chronic respiratory disease AND Disease of lower respiratory system AND (NOT Asthma)

# Integration of SAGE Decision-Support System with Clinical Information System



# Results and Conclusions

- Prototype specification and implementation
- Working cycles of scenario development, guideline encoding, and simulation in CIS environment for exemplar guidelines:
  - Immunization, Diabetes
  - Community-acquired pneumonia, Hip replacements
- Good understanding of components of infrastructure required to integrate standard-based guideline DSS with CIS
- Involvement with standard organization (Health Level 7) to reconcile SAGE project results with emerging version 3 standards