The Implementer's Workbench: Incorporating Site-Specific Factors into Clinical Decision Support Rules Using an ArdenML Framework

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Introduction

- Clinical Decision Support (CDS) technologies have demonstrated their ability to favorably impact healthcare. However, efforts to make CDS components widely available in the medical workplace have not resulted in broad adoption. A key challenge is support to customize existing knowledge or to transfer proven medical logic from one institution to another.
- An important part of this challenge derives from the desire, on the part of institutions seeking to reuse medical logic modules (MLMs) from other institutions, to configure parts of these MLMs to fit local conditions. These local conditions may derive from various sources:
  - Difference in threshold values for a logical comparison.
  - Added restrictions that are thought important to maintain local applicability.
  - Differing logic triggering mechanisms.
  - Other site-specific refinements.
- We refer to these as **"Site-Specific Factors (SSFs)"**.
- The portability of computable medical knowledge has been an Informatics goal for two decades. It is the focus of numerous research efforts and of the HL7 standard known as the Arden Syntax for Medical Logic Modules.
- As a part of continuing efforts to reduce the barriers to CDS portability, we are developing an MLM authoring and editing tool with a focus on **SSFs**. We call it the "Implementer's Workbench."

Goals:

- Develop a knowledge authoring environment where **SSFs** can be readily incorporated into developing MLMs
- Author MLMs in an XML-based representation language capable of transformation into other forms for review and execution.
- Support MLM logic testing, transformation for display and execution, and authoring using alternate representation languages of varying complexity.
- Integrate authoring system with ontologies. Use these to define data models and to detail functional characteristics of logical operators.

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Approach

The MLM development and refinement environment supported by the Implementer's Workbench is designed to support incorporation of triggering, workflow, and environmental specifications and refinement of logic to reflect local needs. We have chosen as our target representation, medical logic modules expressed in the XML-based version of the Arden syntax known as ArdenML. Logic expressed in ArdenML is directly convertible to Arden syntax, allowing it to inherit the readability of this standard. To support a model of stepwise refinement by incorporation of site-specific factors, we use ontologies of **SSFs**, managed within the Protégé ontology-management system. Through these we can represent data objects used in the MLMs.

Target System Architecture

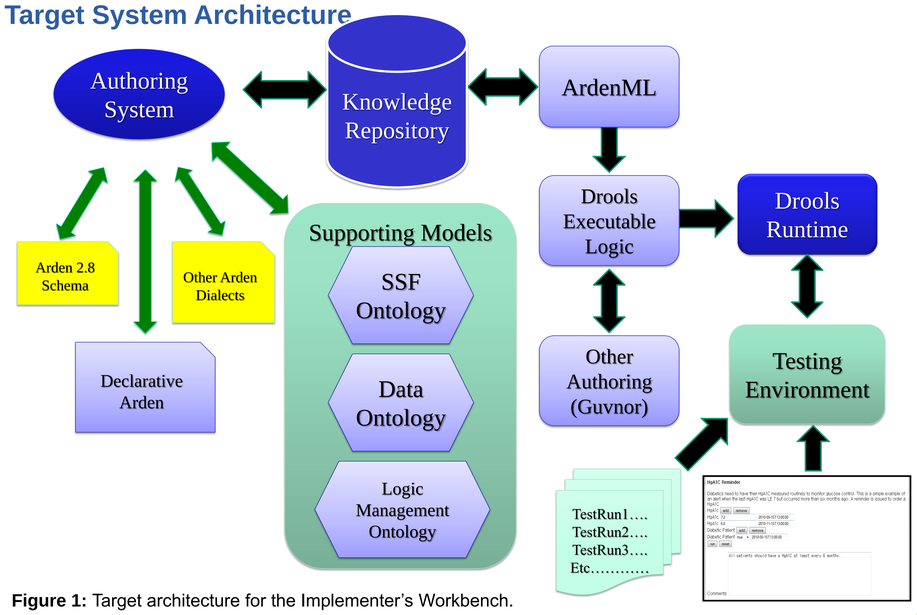

Figure 1: Target architecture for the Implementer's Workbench.

Results:

- A proof-of-concept version of the Implementer's Workbench has been developed.
- This system supports MLM authoring using ArdenML supported by ontologies.
- XML Transforms support display of MLMs in multiple syntaxes (figure 2).
  - Native XML.
  - Native Arden Syntax.
  - An exploding structure-based view with forms capability.
  - A Java-like Drools compatible form.
- Interfaces to Ontologies support specification of logical behavior, data models, and site-specific factors.
- A simple testing environment has been implemented using a Drools runtime.
- Portions of this environment will be used in a test bed for the Healthy Decisions Standard.

References

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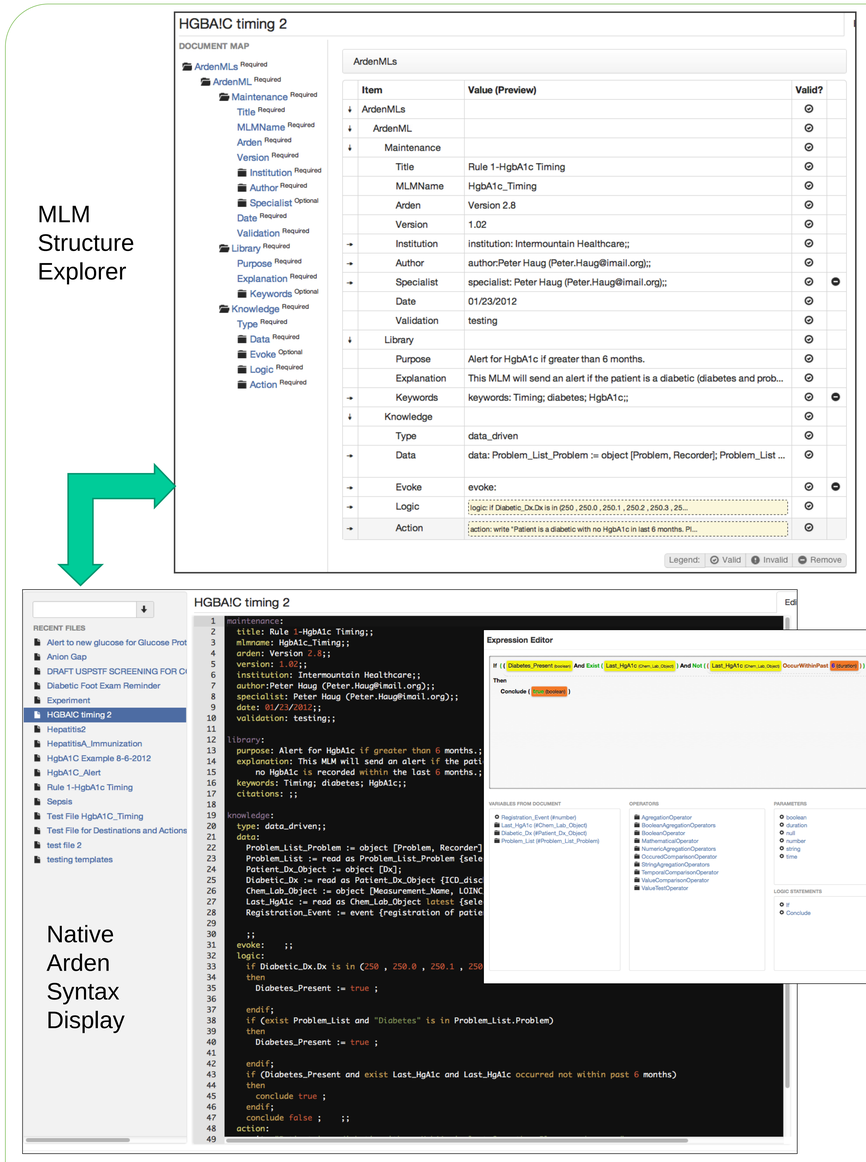

Figure 2: The authoring environment provides alternative views into CDS logic and the rule editing tools. Shown are the structure-based and native Arden Syntax views. A specialized, expression editor is also presented.

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