The Repository for Model Driven Development (ReMoDD) Project

Robert B. France
Dept. of Computer Science
Colorado State University
USA
france@cs.colostate.edu
What is Model-Driven Engineering (MDE)?
Coping with the evolving nature of software complexity
If software developers built pyramids ...
“Model-Driven Engineering” (MDE) is concerned with …

- reducing accidental complexities associated with bridging wide problem-solution abstraction gaps
- through use of technologies that support rigorous transformation of abstractions to software implementations

MDE is concerned with developing software tools to support the work of software engineers
Role of modeling in software development

- Development involves analyzing problems and synthesizing solutions.

- Software modeling is concerned with imposing structure on problems and solutions to facilitate rigorous analysis and synthesis of implementations
  - Purpose-driven modeling
  - Provide requirements and design feedback through model animation/testing/static analysis
Early focus of MDE

- Models as documentation/communication artifacts
  - Early work on CASE technologies laid the foundation

- Models as artifacts for generating implementation and deployment artifacts
  - OMG’s UML and MDA
  - Software development viewed as a transformative process
    - Model transformations as key enablers of MDA
Evolution of MDE

- Breathing life into models
  - Models as analyzable artifacts
  - Foundation provided by work on formal specification techniques

- Supporting exploratory development through compositional modeling
  - Making agile development rigorous

- Models as artifacts for managing and evolving runtime behavior
  - models@run.time

- Supporting domain-specific software development
Why is modeling challenging?
Or why modeling seems to add accidental complexity

- Lack of good tool support
  - Many existing modeling tools do introduce significant accidental complexity

- Learning how to abstract is difficult
  - Current software development methods provide little or no abstraction guidelines

- Few facilities for gathering, evaluating and sharing of quality experience
  - Peer reviewed publications valuable, but more is needed
A MDE vision of software development

- Meeting the challenge of evolving software complexity
  - Need to incorporate domain-specific knowledge into the languages and tools we use to develop software

- The vision
  - A MDE framework provides concepts and tools that developers can use to build domain-specific development environments
    - Support creation and evolution of domain-specific languages and tools
    - Support multi-modeling and multiple models of computations
    - Support compositional development and analysis
Realizing the MDE vision

- Requires deep understanding of what abstractions can best serve specific modeling purposes
  - Understanding can only be gained through development of solutions, experimentation, and systematic accumulation and examination of modeling and software development practices and experience

- Need to share MDE experience and research results to build MDE knowledge base
ReMoDD: What, Why, When

Is it here yet?
What is ReMoDD?

- An NSF-funded research infrastructure project
  - PIs: Robert France, Jim Bieman (Colorado State University); Betty Cheng (Michigan State University)

- Community resource for gathering, evaluating and sharing MDE research and education artifacts

- Planned contents:
  - Documented MDE case studies.
  - Examples of “good” and “poor” models.
  - Modeling exercises suitable for classroom assignments and projects.
Perceived ReMoDD Benefits

- Sharing of MDD-related research and teaching experience
- Community-based evolution of MDE knowledge
- Documented “lessons learned”
- Support for empirical studies of modeling phenomena
- Learning resource for MDE students
Timeline

- **2006-2008**
  - Prototype developed by MSU students

- **2009**
  - Funding for full-blown development provided by the NSF
  - Prototype demonstrated at MODELS’09

- **2011**
  - Early limited release evaluated at Barbados AOM workshop
  - Planned release of ReMoDD v1 at MODELS 2011
Current ReMoDD Advisory Board

Industry Members:
- Susan Wong, Microsoft.
- Brian Berenbach, Siemens.
- Frank Weil, Heng Software.
- Pascal Roques, Valtech.
- Richard Soley, OMG.
- Clay Williams, IBM.
- Bran Selic, Malina Software
- William Milam, Ford

Academic Members:
- Don Batory, U. Texas.
- Jean Bezivin, U. Nantes, France.
- Lionel Briand, Carleton U., Canada.
- Doris Carver, Louisiana State U.
- Alexander Egyed, U. Linz, Austria
- David Garlan, Carnegie Mellon U.
- Jeff Gray, U. Alabama.
- Mark Harman, Kings College, UK.
- Jean-Marc Jezequel, IRISA/INRIA France.
- Kevin Lano, Kings College, UK.
- Robin Lutz, Iowa State U.
- Atif Memon, U. Maryland.
- Spencer Rugaber, Georgia Tech.
- Bernhard Rumpe, U. Aarhus, Germany.
- Doug Schmidt, Vanderbilt Univ./SEI
- Perdita Stevens, U. Edinburgh, UK.
- Steffen Strecker, U. Essen-Dusiberg, Germany
ReMoDD Challenges

- Populating ReMoDD
  - How can we encourage researchers and practitioners to submit useful artifacts?
  - What artifacts can be usefully shared?

- Developing ReMoDD storage infrastructure
  - What formats will be supported?
  - How will the artifacts be organized?

- Accessing artifacts
  - What interfaces are needed to support easy access to ReMoDD artifacts?
  - How can we interface with other related repositories?

- Managing ReMoDD
  - How do we manage users?
  - What mechanisms are needed to ensure provision of useful services to the MDE community?
Populating ReMoDD

- First generation of ReMODD artifacts
  - Examples of end-to-end MDD products (business to requirements to design to implementation models)
  - Examples of good and poor modeling practices
  - Other educational resources: modeling projects, specialized lecture materials by experts

- Targeted sources
  - Academia: Artifacts from modeling workshops and research projects, exemplar models used in classroom, student projects
  - Standards organizations (e.g., OMG): models used in standards work

- Encouraging submissions
  - Provide facilities for citing accepted submissions
  - Recognition of submissions with earned distinctions (e.g., highest rating, most downloaded)
Population Issues

- Legal sharing of artifacts from industry
  - Non-Disclosure Agreements (tiers of users)
  - Serve as a broker for a P2P (peer-to-peer exchange)
    - Broadcast industry needs
  - Sanitized data
- Submission quality control
  - New submissions will be reviewed for utility
  - Users will be able to provide constructive comment on published artifacts
  - User will be able to rate artifacts
Storage Infrastructure Issues

- **Supported formats**
  - Providing artifact previews: Submissions must include artifacts in pdf format
  - Other formats can be submitted, but viewers will not be provided within ReMoDD

- **Artifact organization**
  - Multi-faceted classification
  - Support for user-defined facets and system-defined facets

- **Artifact revision**
  - Users can revise artifacts after they are published
  - But, currently no support for versioning
Accessing ReMoDD

- Web-based access
  - ReMoDD implemented as a Drupal installation

- Search/browse capability:
  - By modeling language
  - By submitter
  - By model types (e.g., class, state, sequence, etc.)
  - By application domain
  - By other facets
  - ...
Managing ReMoDD

- Managing users
  - Users must register and be approved before they can access or submit artifacts
  - Once registered users can freely submit, post comments, form and manage groups
  - Users are required to respect the code of behavior
    - Abusive users will be “de-registered”

- Supporting community activities
  - Users can form open or closed groups within ReMoDD
  - Files can be shared among group members
Obvious usage scenarios

- ReMoDD as a source of artifacts for empirical studies
- ReMoDD as a source of instructional resources
- ReMoDD as a vehicle for disseminating research results
Other usage scenarios

- Provide supplemental publication material
  - Conferences can form groups in which authors can post supplemental information that cannot be presented in submitted papers because of page limit
  - Supplemental information for published papers can be disseminated via ReMoDD

- Crowd sourcing of MDE problems
  - Modeling challenges/competitions

- Supporting pre- and post-workshop activities
But is it here yet?
Phase I: Prototype Development

- Establishment of ReMoDD user community
- Elicitation of ReMoDD requirements
- Development of ReMoDD Prototype
- Demonstration of ReMoDD use with sample artifacts
Phase 2: Development of ReMoDD v1

- Development platform: Drupal
- Implementation of basic features
  - Submit single-file artifacts
    - Supported formats: pdf, compressed files
  - Browse/Search
  - Support for community interaction
    - Forums
    - Groups
Phase 3: Evaluation

- April 2011: Evaluation at AOM workshop
- Summer 2011: Evaluation by advisory board and other interested parties
- October 2011: Public release (MODELS 2011)
Phase 4: Development of ReMoDD v2

- Provide support for
  - Uploading multi-file models

- Also considering
  - support for versioning
  - support for specifying relationships across submissions
  - Richer forms of queries (e.g., queries on model relationships and types)
Accessing ReMoDD

- To contribute models, access ReMoDD via
  - http://www.cs.colostate.edu/remodd/prod-v1

- Contact information:
  - remodd-project@cs.colostate.edu

- Demo