# MICIS - A Model-Integrated Clinical Information System

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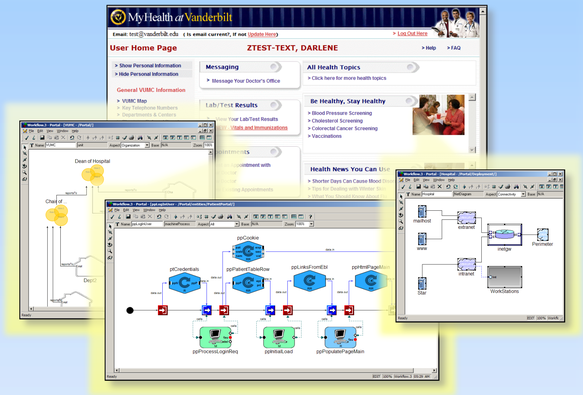
## Goal

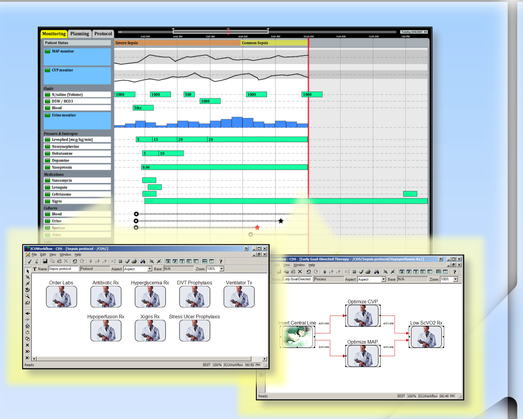
*Develop a Modeling and Simulation Platform for Health Information Systems*

**Platform is suitable for**

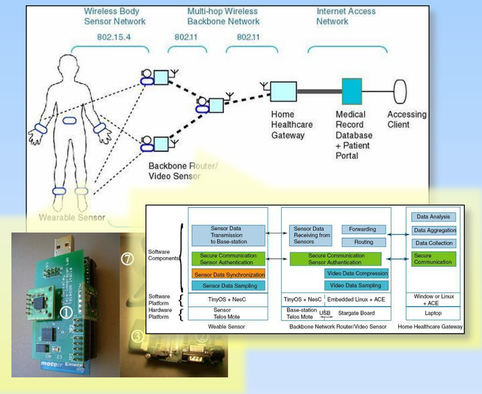
- Modeling and model-based integration of Health Information Systems (HIS) - including Patient Portals (PP) - providing access to Electronic Medical Records (EMR)
- Performing security and privacy analysis using model verification and simulation-based testing
- Providing mapping and deployment to standard SOA execution platforms




*Patient Portal*



*Sepsis Treatment Controller*



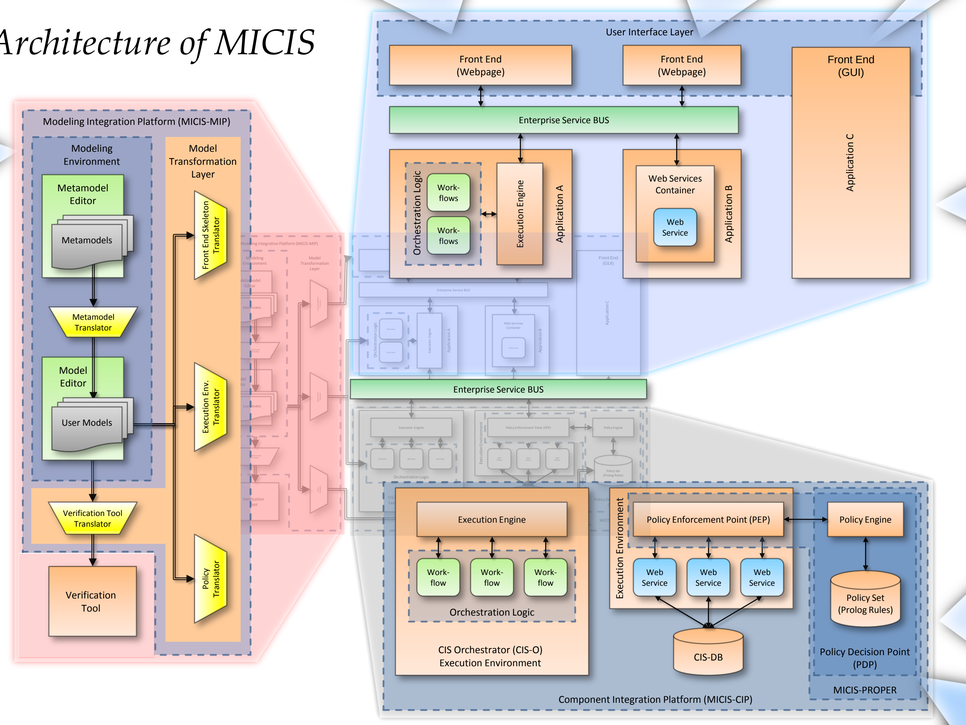

*In-home Patient Monitoring*

## Approach

1) Development of abstractions in Domain-Specific Modeling Languages (DSMLs)
2) Construction of the models: capturing the key elements of operation
3) Translation (interpretation) of models
4) Execution and simulation of models

*Refining the level of abstraction in iterations*

## Architecture of MICIS




## Applications Layer

- Integration of medical applications that use sensitive medical information
- Applications communicate by using web services standards (OASIS, WC3)
- Utilization of already available services is possible

## Deployment Architecture

| SOA Execution (A) | | SOA Execution (B) |
|---|---|---|
| Apache ODE v1.1 (or higher)<br>Axis2 v1.3 (or higher)<br>Tomcat Apache v5.5 (or higher) | | Oracle BPEL Process Manager v10g |
| **Policy Enforcement (A.1)**<br>SWI-Prolog<br>Axis2 handler | **Policy Enforcement (A.2)**<br>SunXACML<br>Axis2 handler | **Policy Enforcement**<br>none |
| **Operating System**<br>Windows XP (or higher) or Linux (e.g. Fedora Core 8 / RHEL5) | | |
| **Hardware**<br>Regular desktop PC | | |

## Results

- Built a testbed for Health Information Systems, which includes a SOA-based execution environment, and is extended with policy evaluation and enforcement capabilities using an embedded PROLOG engine.
- Developed and evaluated experimental modeling languages for three different CIS applications.
- Developed model translators for translating architecture models into PROLOG clauses to enable context dependent evaluation of privacy and security policies.
- Built a component library of web services for prototyping experimental HISs.

## Policies

*Policy representation, decision and enforcement*

- Modular Policy Enforcement Point integrated into a Web Service container
- PEP supports XACML and Prolog based Policy Decision Points
- Policies and policy descriptions generated from the models
- Support of past events using stored facts
- Support of future events using obligation mechanism