

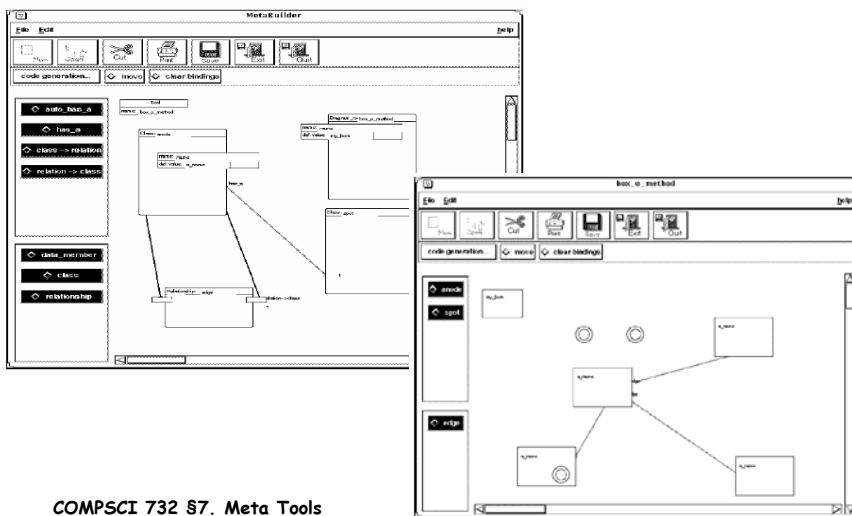
Other Meta Tools

- **Aim of section:**
 - Examine other meta tools compare and contrast to Pounamu
- **Contents**
 - MetaBuilder
 - MetaEdit+
 - GME
 - Dome
 - IPSEN
 - Comparison

MetaBuilder

- Ferguson et al, U of Sunderland (now @ Strathclyde)
- Visual constructor tool for the MetaMOOSE framework
- Metamodel tool
 - Classes, with data and function members
 - Function members provide behaviour (using Itcl)
 - Relations
 - Source, sink, cardinality constraints
 - Has-a for aggregation, Inheritance
 - CF Pounamu Entities and relationships
- Symbol editor
 - Widgets of various sorts, implemented in Itcl

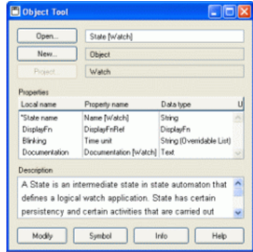
MetaBuilder



MetaEdit+

- Commercial system from MetaCASE (cost E11,500) www.metacase.com
 - (ex MetaEdit from U Jyväskylä Finland)
- Variety of text/form based tools to specify meta model
 - Objects
 - Properties (attributes)
 - Relationships and Roles (endpoints)
 - Ports (constraints on connection points)
 - Graph (like Pounamu view tool)
- Symbol and Dialog Box Editors
- Reports and generators (walk data structures to generate reports, code)
- External interfaces
- Model editors include diagrams, matrices, tables, browsers

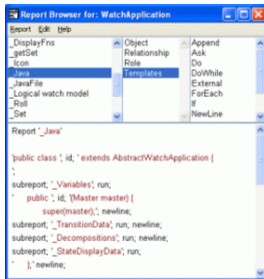
MetaEdit+



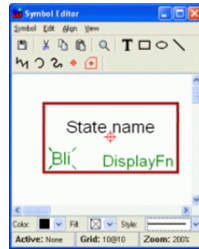
Object Tool



Constraints

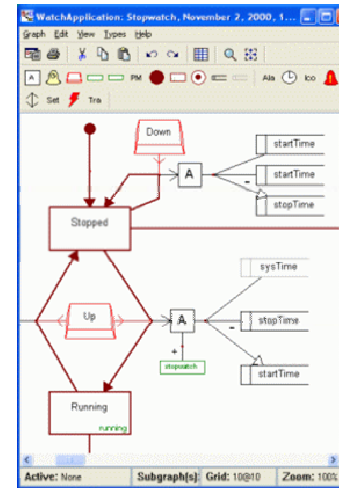


Symbol editor



Generator

MetaEdit+ Generated System



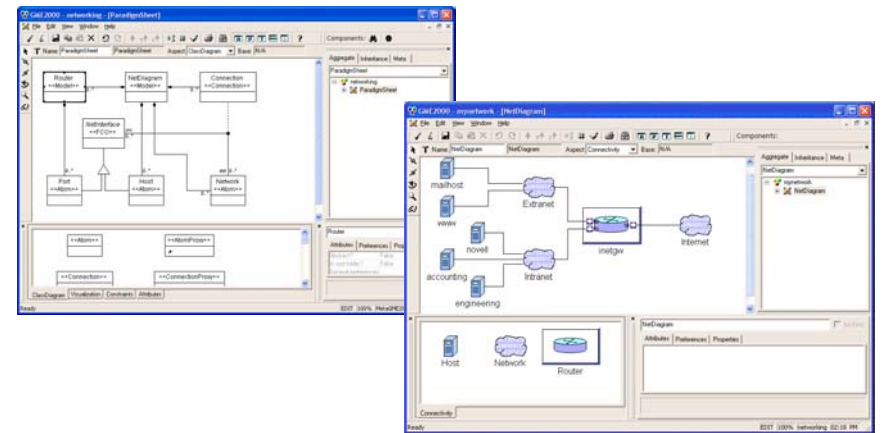
```
public Stopwatch(Master master) {
    super(master);
    addTransition("Start [Watch]", "", 0, "Stopped");
    addTransition("Running", "Up", +22, 718, "Stopped");
    addTransition("Stopped", "Mode", 0, "Stop [Watch]");
    addTransition("Stopped", "Up", +22, 1077, "Running");
    addTransition("Running", "Mode", 0, "Stop [Watch]");
}
```

startTime	Variable	Variable that stores the start time of the running stopwatch.
stopTime	Variable	Variable that stores the current stop time; how many seconds had elapsed when the stopwatch was stopped.

GME

- **Generic Modelling Environment**, Ledeczi et al, Vanderbilt
- <http://www.isis.vanderbilt.edu/Projects/gme/default.html>
- **Visual MetaModel** composed of several parts
 - **Class diagram** with stereotypes representing metatype
 - Metatypes defined by MetaGME meta model
 - Atoms, connections, models
 - **Attributes, constraints**
 - Constraints represented using OCL (see UML later)
 - **Visualization**
 - Like Pounamu view definer - defines aspects
 - Symbols from simple built-in symbols or bitmaps + code for more complex symbols
- **Extensibility** via COM interfaces and XML import/export

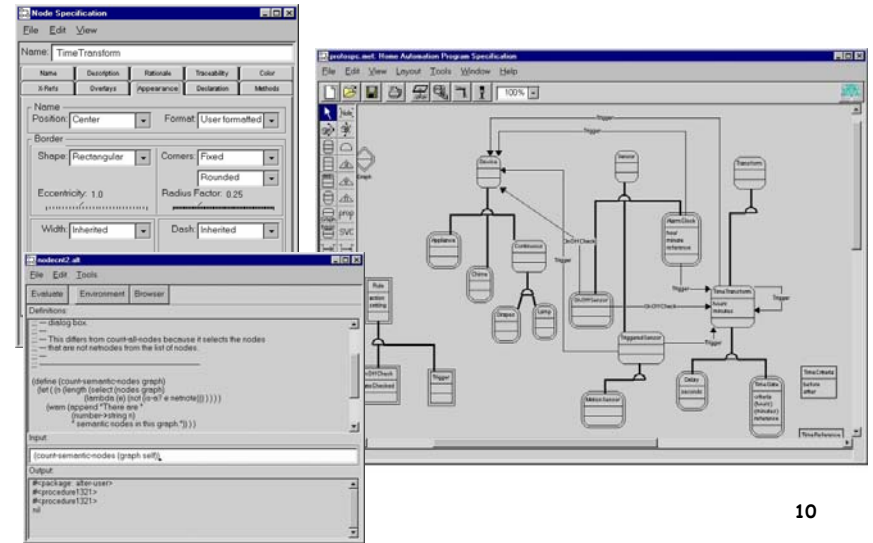
GME Example



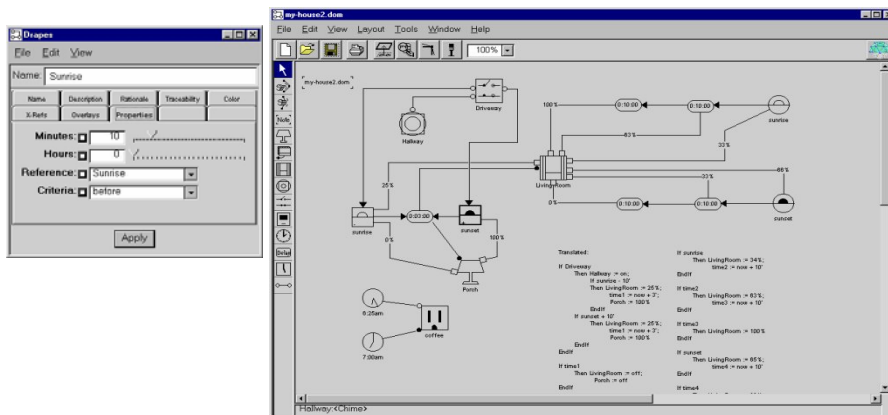
DOME

- Notations defined by filling in properties on an object model using the DOME Tool Specification Language.
 - Includes object class, property and relationship definitions, connector types, dynamic object appearances, tool buttons, menus, annotations, and semantic relationships.
 - Graphical languages can also include textual, numeric, and symbolic annotations.
- Graphical meta-modeling capability ProtoDOME
 - allows specn of new notations and running them in an interpreted mode.
- Projector and Alter are DOME's code and document generation tools:
 - Projector, is a visual dataflow language;
 - Alter, a functional textual language
 - Both provide functionality to write complex model transformations.
- <http://www.htc.honeywell.com/dome>

DOME - Tool Specn



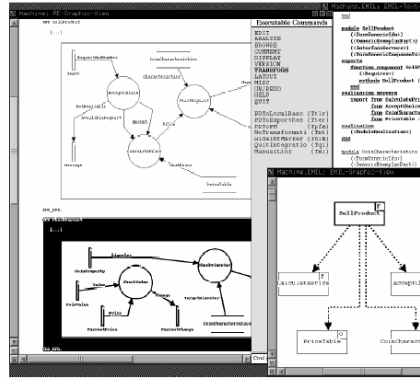
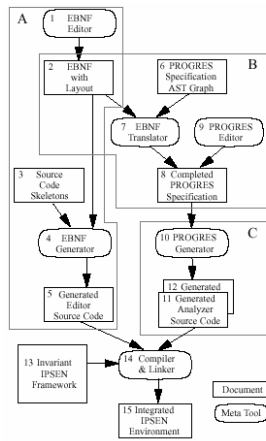
DOME Model Instantiation



IPSEN

- Klein and Schurr, Aachen (Schurr now @ Darmstadt)
 - See SEE'97 paper
- Quite different approach to the other tools
 - Context free grammars used to specify syntax and layout of languages
 - Graph rewriting rules (PROGRESS) used for specifying semantics
 - Both mechanisms use textual specification to generate syntax directed visual editor

IPSEN



Comparison

Tool	MetaModel Paradigm	Meta Model Specn	Visual Elmt Specfn	Behaviour Specfn
MetaEdit+	Unkown (MetaEdit was MOF)	Tabular/ Form based	Symbol Editor	Constraints
Meta Builder	EER/OO based on MOOSE	Visual Editor	Primitives, bitmaps, code	Code
GME	OO based on MetaGME	Visual - several editors	Bitmaps, simple shapes	OCL constraints
IPSEN	EBNF and graph grammars	Text	EBNF	Graph Grammars
DOME	Object Model	ProtoDome	ProtoDome	Visual & textual scripting
Pounamu	Entity Relationship	Visual (currently limited)	Shape & Connector tools	Event handlers

Comparison

Tool	Storage	Code gen support	Integration API	Multi paradigm
MetaEdit+	Custom DB	Custom scripting language	SOAP	Partially
Meta Builder	OODB	Unknown	Unknown	Unclear
GME	Variety - customisable	Model interpreters	COM interfaces	Yes, aspects
IPSEN	Graph based database	Graph grammars	Unknown	No
DOME	Custom	Extensive	Custom - has plug ins	Yes
Pounamu	XML files	XML tools	SOAP, RMI	Yes, view definer

Comparison

Tool	Multuser tools	Liveness	Portability	Thin client support	Cost
MetaEdit+	Yes	Yes	Multi-platform	No	High
Meta Builder	No	No compile Cycle	No	No	Academic
GME	Unclear	Versioning support	Java based	No	Free
IPSEN	No	No-compile cycle	No	No	Free
DOME	No	Yes, good support	Multi-platform	No	Free GNU
Pounamu	Yes for generated tools	Yes, some bugs!	Java based	Yes	Free for ac use

Exercise

- Consider how easy it would be to construct your Assignment 2 tool using the other five systems
 - Strengths in each case
 - Weaknesses
- Will need to explore websites/papers to get a good feel for capabilities of the other tools.