

# Support of Modeling Process by Structured Modeling Technology

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Structured Modeling Technology Framework



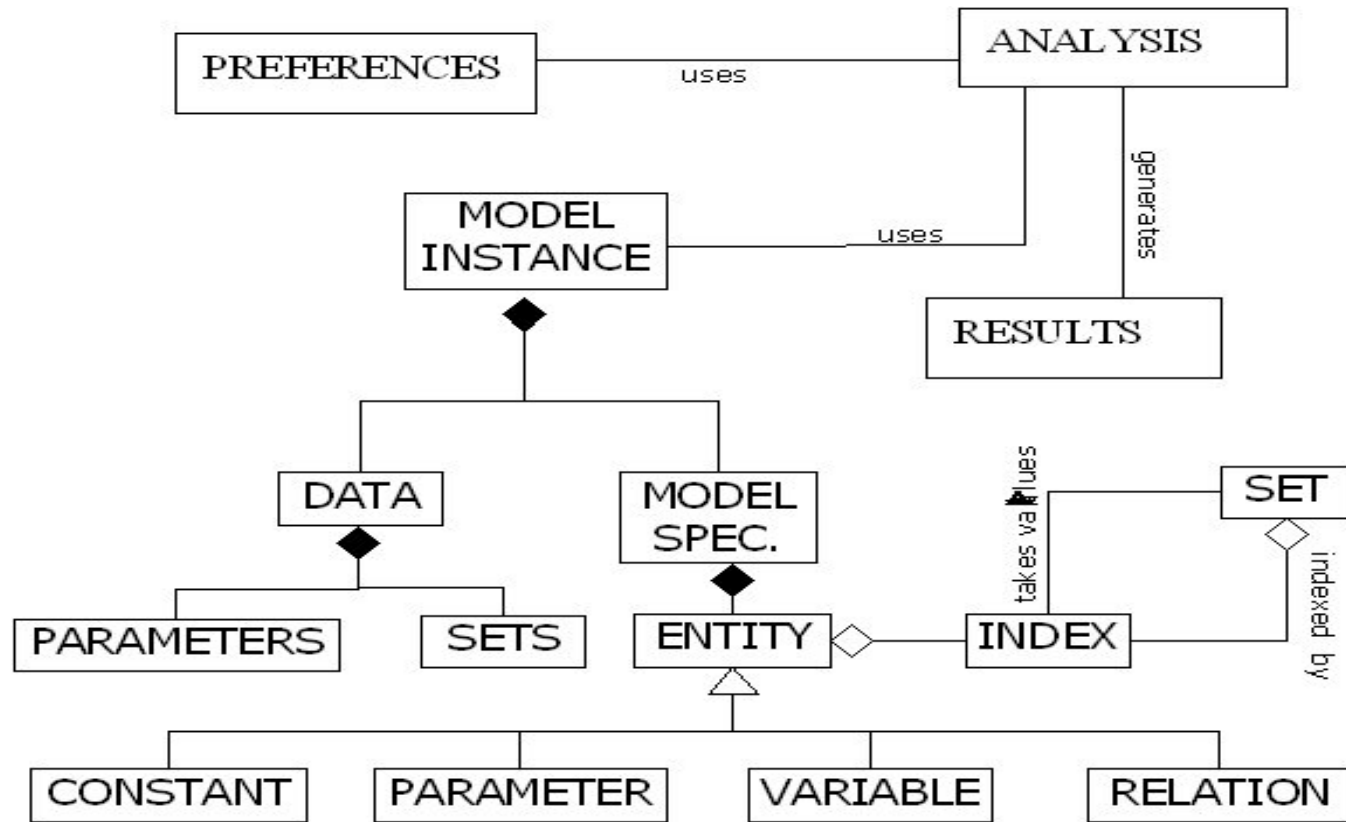
# Modeling process in SMT



- *Domain analysis*
- Symbolic model specification
- Data
- Instance (substantive model)
- Model analysis
- Documentation



# SMT objects



$$em_{ipa} = \sum_{t \in T_{pa}} e_{ipat} x_{ipat} \quad i \in I, p \in P, a \in A_i$$

# Model Specification



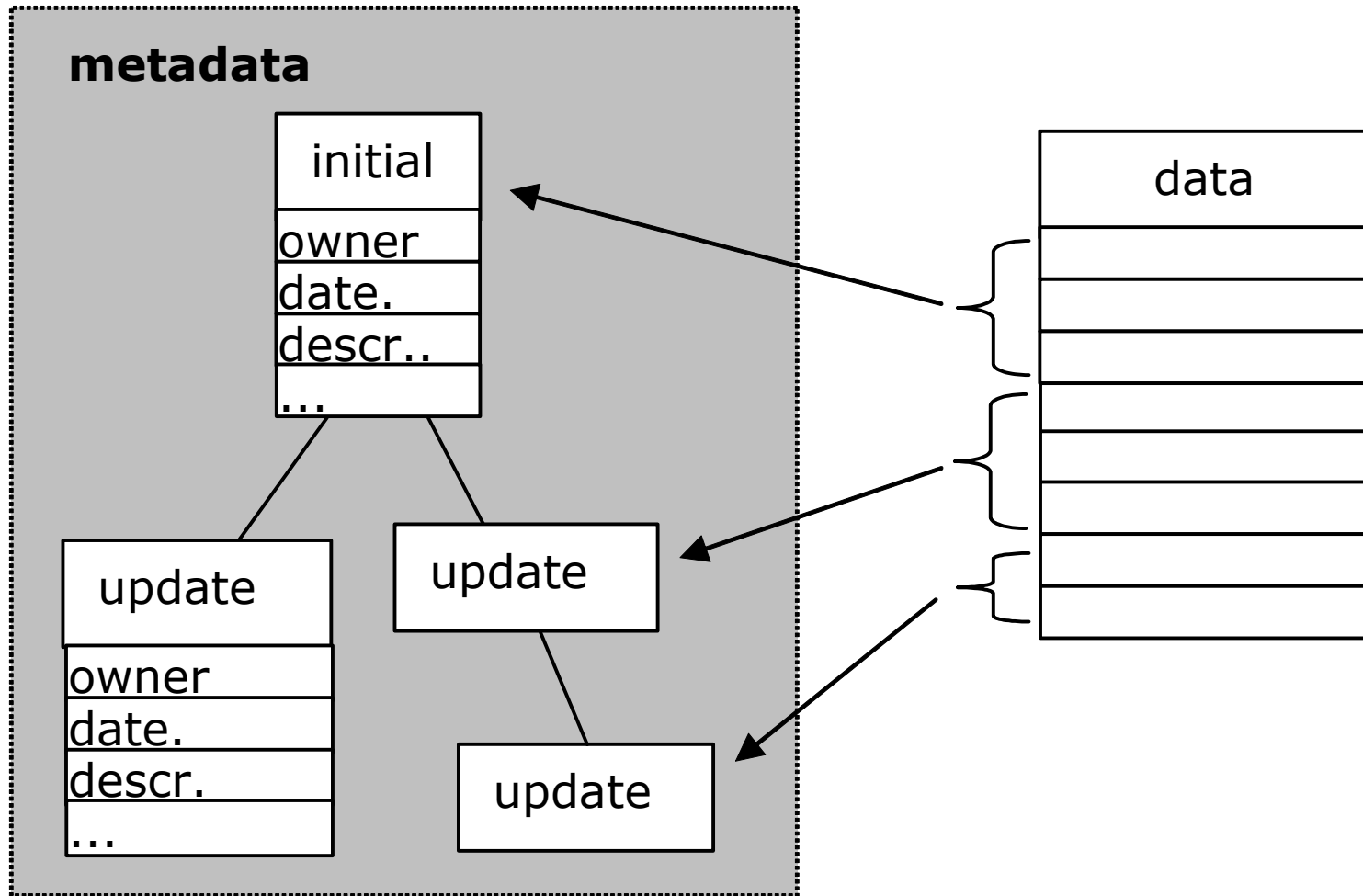
- **Entities**
  - Roles: Parameters, Constants, Variables, Relations
  - Types: Binary, Integer, Real, Categorical
- **Indices**
  - Collection (enumeration of elements)
  - Sequence (start, end, step)
- **Sets**
  - Default
  - Optional: indexed, not indexed
- **Relations**
  - Assignments, Constraints
  - Expressions of LaTeX syntax

# Data warehouse

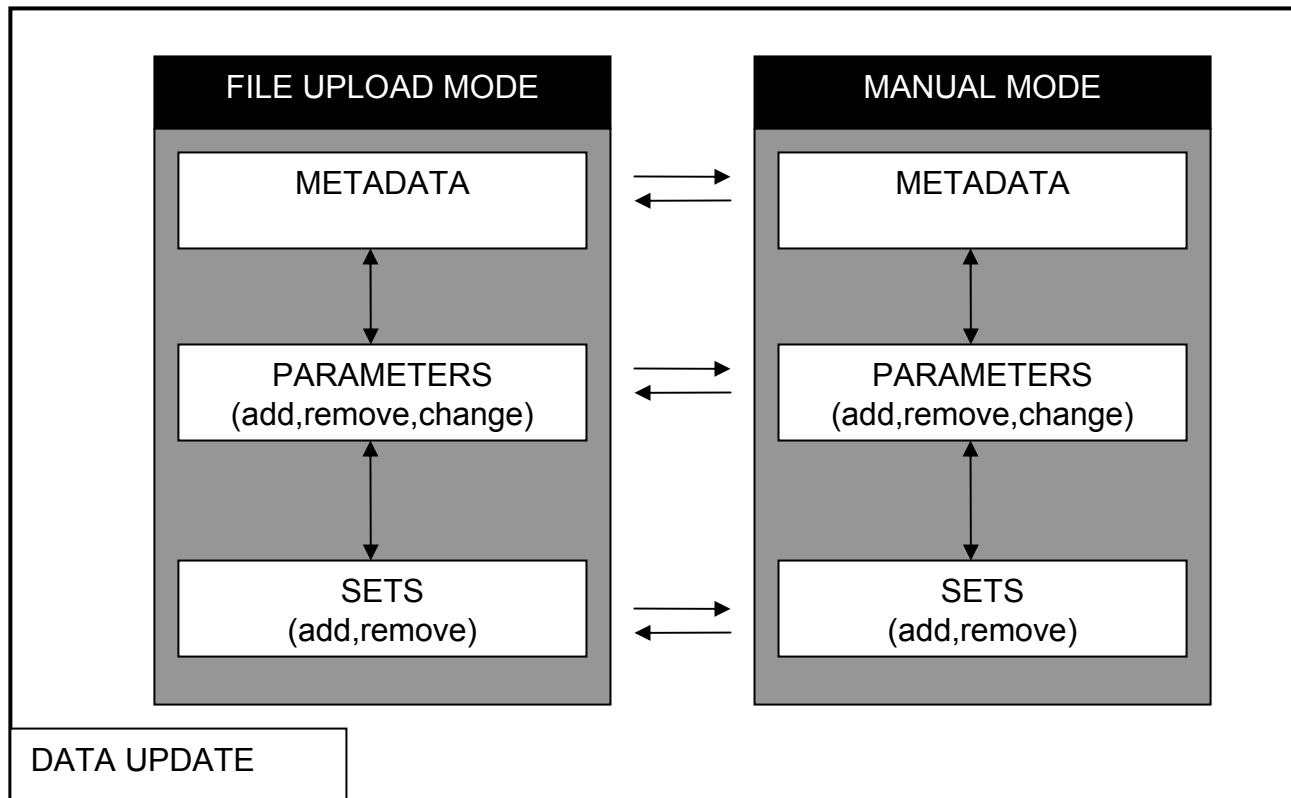


- Generated from specification
- Stores:
  - Sets' enumerations
  - Values of parameters
  - Results of analysis

# Data updates



# Data Update



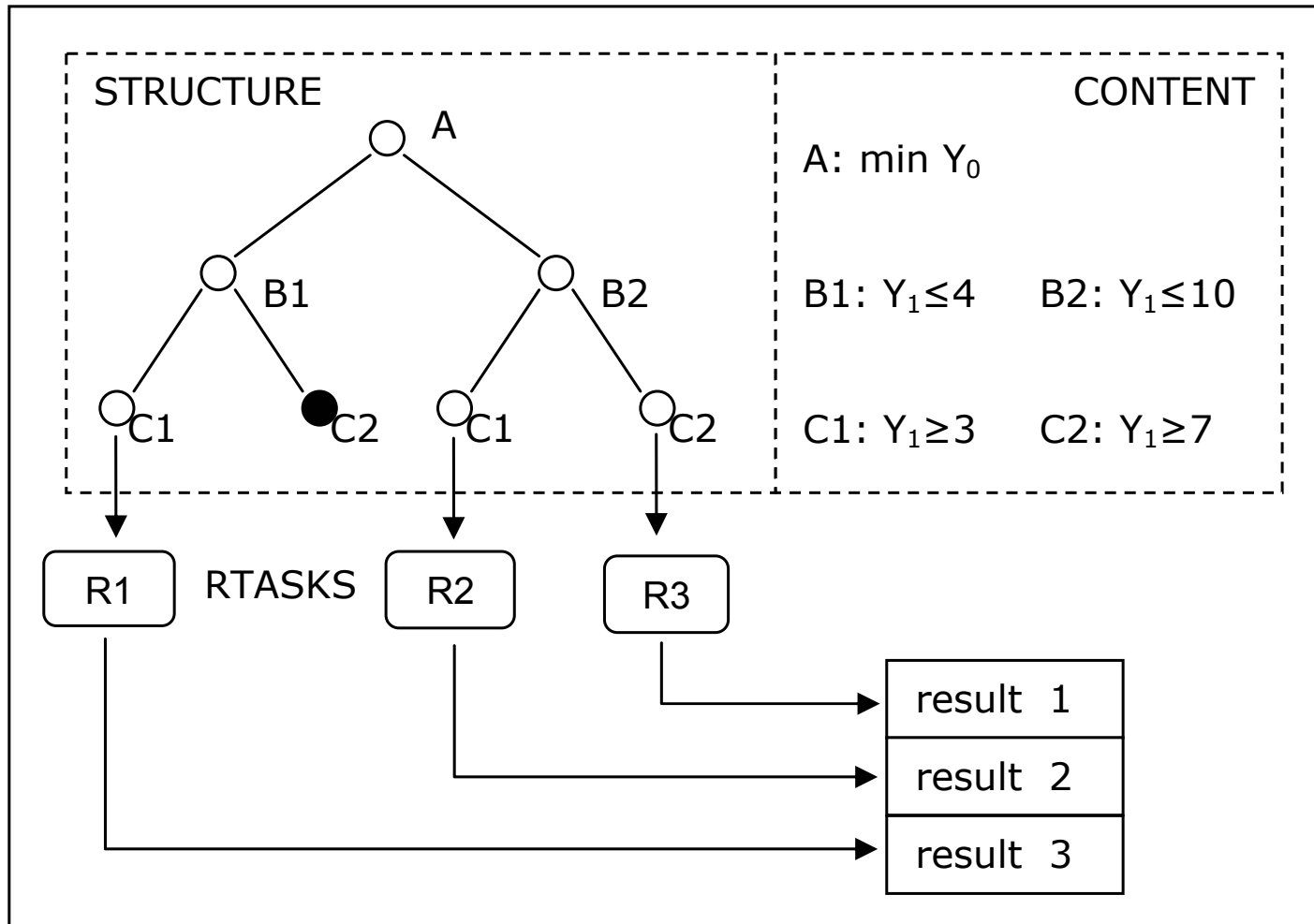


# Preference item

- Tripple ( $Var, R, Val$ )
- Variable
  - decision
  - outcome
- Role
  - bound
  - goal
  - fixed
- Value (optional)



# Analysis - overview



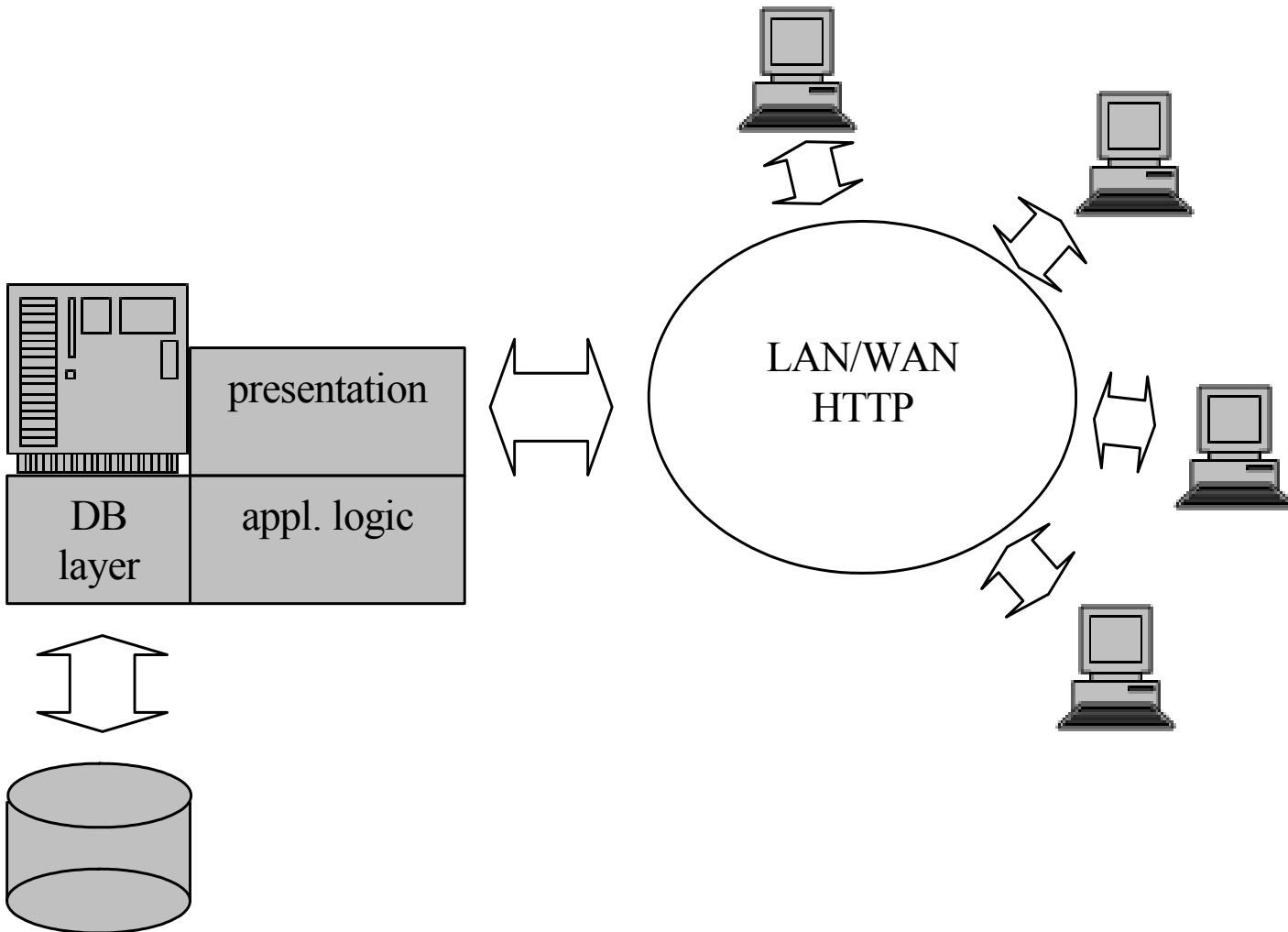
# Decision rules in SMT



## Beyond algebraic models:

- categorical entity type
- entity role
  - conditional attribute
  - decision attribute
- data structure for decision rules

# Architecture



# Technology



- RDBMS for storing all components
- XML for documentation
- WWW for user interface
  - Web Application Server
  - Java Programming Language (J2EE)
  - DB layer/application logic/presentation layer
  - Distributed environment



# Tour (1) - entities

Structured Modeling Technology Framework

Home

Model Specification

Model Description

Indices

Sets

Constants

**Entities**

Relations

Data Warehouse

Generation

Data Import

Data Update

Model Instance

Definition

Analysis

Solutions

Documentation

Specification

Data

Instances

Analysis

**Entities**

Label: lowBnd type: REAL

role: PARAMETER unit: UNITLESS

Lower bnd: -infy Upper bnd: uppBnd

Zero Tol.: tol6

Indices:  i  j  p  q  s  r

Description: lower bounds for decision variables

SAVE CLEAR NEW

label	operations		
c	X	↓	↑
lowBnd	X	↓	↑
uppBnd	X	↓	↑
x	X	↓	↑
cost	X	↓	↑
costD	X	↓	↑
lhs	X	↓	↑
rhs	X	↓	↑
a	X	↓	↑
constr	X	↓	↑
p1	X	↓	↑
p2	X	↓	↑
e	X	↓	↑
em	X	↓	↑
totEm	X	↓	↑
emD	X	↓	↑
totEmD	X	↓	↑

USERNAME: smt MODEL: ax6 STATUS: edit

HELP COMMENT DATABASE LOGOUT



# Tour (2) - relations

**Relations**

**Assignments**

costD :  
cost  $\sum_{j \in J} c_j * x_j$

=

sets:

emD :  
em  $e_{\{p\}} * x_j$

=

sets: j: J p: P

totEmD :  
totEm  $\sum_{j \in J} em_{\{j\}}$

=

sets: p: P

**Constraints**

constr :  $\sum_{j \in J} a_{\{j\}} * x_j + p1 * p2$

sets: i: J

SAVE CLEAR VERIFY



# Tour (3) - analysis

Name	Type	Instance	Author	Created at	Description	Operations					
Reguly 1	Decision rules generation	First rule	smt	2004-08-23 14:15:12.0	Reguly decyzyjne - take 1.		DELETE	COPY			RTASKS GENERATOR
an1	Optimization (simple/parametric)	cctest	smt	2004-08-23 17:55:53.0	analysis 1	LOCKED	DELETE	COPY	TREE	VIEW	RTASKS GENERATOR
pros6	Decision rules generation	prost6l	smt	2004-08-24 00:00:00.0			DELETE	COPY			RTASKS GENERATOR
DR - LEM Daily	Decision rules generation	DR	smt	2004-08-24 12:12:12.0	Daily generation from LEM2 algorithm.		DELETE	COPY			RTASKS GENERATOR
update2	Optimization (simple/parametric)	update2	marek	2004-08-27 22:09:46.0	yet another attempt	LOCKED	DELETE	COPY	TREE	VIEW	RTASKS GENERATOR

NEW

# One step ahead



- Huge amount of information
- Automatic data analysis (DM)
  - Understanding
  - Experiments planning
- Visualization techniques