REQUIREMENTS OF RUN-TIME MODELS

DIFFERENCE BETWEEN DESIGN TIME AND RUN-TIME MODELS

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Contents of Run-time Model

• Environmental conditions
  – Design time info (e.g., plant model)
  – Run-time info (e.g., [more abstract] plant model with values)

• System conditions
  – Design time info
    • Traditional system models (e.g., class, state, etc.)
  – Run-time info
    • Present information (e.g., current task, service, attribs, processing node)
    • Traceability information to design-time info
Purpose of Run-Time Models (for adaptive systems)

• Monitoring (collect system and env. State)
  – Domain model with current evalues
  – Trace data
  – Feature, service, component models

• Decision-Making (process data to adapt, validate, simulate)
  – State-based (e.g., state, petri-nets); simulation
  – Machine learning/search-based; rule-based
  – Descriptive (constraints, contracts, etc.)

• Adaptation (mode change; reconfiguration)
  – Structure
    • Add information (active/inactive)
    • Abstract away irrelevant information (e.g., parts that are not adaptive)
  – Behavior
    • Current state;
    • History
    • Preservation of data from one config to another config
Findings

• Need a means to represent information about
  – environment
  – system

• Purpose of run-time models and how to change
  – Monitoring
    • Model + Monitoring Functionality
  – Decision Making
    • Model + Decision Algorithms
  – Adaptation
    • Model + Representation of the current state
    • Model + Reconfiguration Rules
Recommendations

• Move towards multiple run-time models, rather than a monolithic run-time model

• The kinds of run-time models strongly depend on what we want to do with the system
  – Performance analysis; fault tolerance, diagnosis; adaptive; safety

• We should look into possible purposes of run-time models and find additional ones
  – Change existing model types
  – Develop new ones