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