The Policy Decade: Has it Delivered?
An Autonomic Computing Perspective

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“Have we delivered on what we promised?”

“Did we make the right promises?”

Or, equivalently

“Are we solving the right problems?”
We’re missing something important

- Role-based access control, policy-based network management, etc. are all worthy things to work on…

- … but autonomic computing is focused primarily on higher-level policies
  - “Computing systems that manage themselves in accordance with high-level objectives from humans.”

- From an AC point of view, the policy community should focus less on what we want a system to do …

- … and more on what we want it to accomplish
Action Policy

{ON (Event)} IF(Condition) THEN (Action)

- **Event/Condition** specifies
  - Current state or set of states S
  - Action a that should be taken from state S

- Nothing is said about the state σ that will result from taking action a from state S

- Presumably, the rule author had an idea of what state σ would result, but there is no slot in the policy to hold such information

- There is no way to check and see whether the action resulted in the desired state
  - Let us hope that the rule author was highly knowledgeable and very careful
  - Let us hope that nothing unanticipated happened to interfere with the state or action

**Advantage**: Policy fully specifies what action to take.

**Disadvantage**: This seems inherently dangerous and brittle!
Goal Policy

- Specifies desired resulting state $\sigma$
  - Or properties that define a set of desired states, any of which are acceptable

- System computes action (or action sequence) that reaches $\sigma$ from S

- This computation requires
  - A system model $\sigma(S, a)$
  - Planning technologies (engine, etc.)

**Advantage**: Higher level; more flexible.

**Disadvantage**: Requires sophisticated modeling and planning technologies.
Utility-function Policy

- Like Goal, focus on the states you want to be in
- Assign to each state $\sigma$ a real value $U(\sigma)$
- Compute state $\sigma^*$ for which $U(\sigma^*)$ is maximized
- Compute action to reach $\sigma^*$

This computation requires
- A system model $\sigma(S, a)$
- Optimization/Planning technologies

**Advantage:** Strict generalization of Goal; even more flexible (allows gradations of good and bad valuations); avoids conflicts.

**Disadvantage:** Requires sophisticated modeling and planning/optimization technologies, plus utility elicitation (hard)!
Thoughts and Questions

- Goal and utility-function policies are much more true to AC
- But the Policy community seems to have placed relatively little emphasis on them

Are you content with this?

- If “Yes”, is there another community I should be asking?
- If “No”, then it would require Policy to reach out more to other research communities (largely AI) that work on
  - Modeling, Planning, Optimization, Learning, Elicitation

- The Policy community’s work on authoring policies/rules, automated conflict detection, etc. might be relevant for planning
  - Ex. PDDL (Planning Domain Description Language) describes domains in terms of predicates and actions; describes problems in terms of objects, initial states and goal specifications