The Semantic Bases for Adaptation

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Autonomy

- Property of Stakeholder
  - Freedom to act
  - Only makes sense in a social setting
- Motivates compliance
  - Other stakeholders have legitimate expectations
  - Penalties and sanctions if noncompliant
- Implies distribution
  - Implies concurrency
- Implies interaction
Autonomic software

- “Self-managing” software
  - Optimizing, healing, protecting, etc.
- Requires monitoring, reflection, and adaptation
Autonomic vs. Autonomous

- **Autonomic but not autonomous**
  - Travel agent that can book a room in an alternative hotel in case of cancellation by the original hotel, but cannot cancel hotel reservation without approval from the hotel

- **Autonomous but not autonomic**
  - Travel agent that can cancel hotel booking, but does not know how to make alternate reservations if necessary
Semantic Bases

- Autonomy
  - Commitments
    - Capture business-level expectations

- Autonomic
  - Goals
    - Capture business-level intentions
Agent

Locus of autonomy

• Has goals (beliefs, intentions, etc.)
• Is party to commitments
• Is goal-directed
  – Expressed by preferences over executions including those that involve commitment violations
  – In some suitable declarative language
Multiagent System

Consists of multiple agents

- Connectors between agents in terms of commitments
- No system-level goals
- Building a multiagent system means focussing on the interconnections
  - Does not matter whether agents expressed in terms of goals and plans, JADE, or BPEL
Adaptation

An *intentional* mechanism

- Agent adapts (in view of its goals),
  - No system-level adaptation
- Agent monitors goals and commitments (and the relevant environmental conditions)
- Agent computes trust
  - Based on its interactions
  - Based on reputation
Bases of Adaptation

Goals, Commitments, Trust

- Goals: when to adapt
- Commitments: which are the *correct* adaptations
- Trust: who to interact with

*Few adaptations without interaction*
Adaptation Examples

- In response to a hike in interest rates, cardholder transfers his credit card balance to a lower interest credit card.
- In response to changed government regulations, card issuing banks have to change their advertising, billing, and interest rate determination procedures.
- In view of loss in the stock market, cardholder stops making payment on the card.
Adaptation Examples (cont.)

- Amazon goes out of business, so the cardholder starts doing business with Barnes and Noble based on the latter's reputation.
- Issuing bank may waive late payment fee rather than risk antagonizing the cardholder and lose his business.
Proposal

Agent (Goal Model) [Commitments] Agent (Goal Model)

Interoperability, Compliance (Commitments)  Trust

Reliable Messaging

Internet
Automated Verification: Goals-Commitments

Private-public, internal-external, intentional-social

- If an agent incurs a commitment, does it have a strategy (in terms of goals, capabilities, and commitments) for satisfying the commitment?
- If an agent has a goal, does it have a strategy, possibly involving interaction with others, for achieving the goal?
Some Observations

KAOS
- Assigns leaf-level goals to agents, thus not stakeholder-oriented!

TROPOS
- Interaction hidden inside plans
- Concept of system-to-be as actor is unclear
  - Who owns it? Who is responsible for it?