Governing IT

Organizations Meet Services

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Services in IT

- Services facilitate the development of IT applications
  - Services capture reusable, composable functionalities
- Services facilitate the deployment and management of IT applications
  - Well-defined components, easier to monitor and reconfigure
  - Enable closer fine tuning with respect to key performance indicators
Today’s services

- Solve yesterday’s IT problems
- Simple computational entities
  - Like objects to be invoked
  - Not like business services
- Do not support complex, cross-enterprise, collaborative business processes
What is common across . . .

- Human service engagements
- Interoperating “peer” telcos
- Large-scale computing infrastructures
- Resource sharing at the micro level

Is the need for autonomous parties to work together
Governance versus management

- Management: by superiors of subordinates
  - Control over managed resources
  - This is what today’s services help realize

- Governance: by autonomous equals of themselves
  - Collaborative decision-making among stakeholders
  - Process of decision-making, not specific outcome
Why is governance important?

- Emerging computing scenarios often involve collaboration among autonomous parties
  - Share resources in a controlled manner
  - Configure and reconfigure
  - Enable unanticipated uses for resources
  - Administrator respecting human organizational needs
- Currently, governance is manual
Why is governance difficult?

Herding cats

- **Autonomy**: Members behave independently, constrained only by their agreements
- **Heterogeneity**: Members are independently constructed, constrained only by interface descriptions
- **Membership dynamism**: Configuration changes at runtime
- **Structural dynamism**: Members exhibit complex, evolving relationships
Achieving governance: Agents

How can we govern IT resources?

- Model IT resources as services
- Model stakeholders as agents
- An agent manages services within its purview
- Think of business service engagements rather than object-like services
- Formulate and apply policies that respect stakeholders
Achieving governance: Policies

- Most policy research is on languages and engines
- Diminishing returns polishing such research
- (And it doesn’t work as well in practice)
- Need policy models for governance, not just management
  - Vocabulary and conceptual model
  - Architecture for monitoring, compliance checking, and enactment
  - Operational semantics
  - Design patterns
System architecture
Point of governance

![Diagram showing the point of governance with PEP, PDP, and POP components, along with their interactions and data flow through History, Goals, Policies, and Configuration]

Cyberinfrastructure Services Bus
Fractal structure

- Orgs within Orgs
- It’s turtles all the way!
Operational model: coarse

\[ C_i : \]
- Violated
- Active
- Pending
- Done

\[ C_{i+1} : \]
- Violated
- Active
- Pending
- Done

Operations:
- Escalate
- Delegate / Assign
- Discharge
- Release
Operational model: fine

\[ C_1 = D(C_2) \]

\[ C_2 = D(C_1) \]

\[ C_3 = A(D(C_1)) \]

\[ C_1 \]

\[ C_2 \]

\[ C_3 \]
Computing preemption

Diagram showing interactions between various organizations and agencies, including NOAA, National Labs, VISA, NHC, ANL, and DM. The diagram illustrates the process of request, escalation, release, and preemption, with numbered steps indicating each action:

1. Request
2. Deny
3. Escalate
4. Escalate
5. Request for a new C to NHC
6. Release
7. ANL preempted
8. New C
Research directions

- Study the dynamics of contracts
- Enhance vocabulary to simplify capturing realistic scenarios
- Develop design patterns for Orgs and policies
- Study policy stratification to accommodate policies across Orgs
Summary

- Interaction as first class citizen
- Protocols versus policies
- Semantics enables
  - Refinement
  - Composition
  - Contextualization
- Subtle notions of correctness: conformance, interoperability
Thanks!

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Norms, policies, commitments

- Norms: general, community-based, not enforced by a single agent
- Policies: of an agent, not of a society (but can model an organization as an agent)
- Commitments: among agents
- Consequences of the above
  - Norms aren’t policies
  - Norms and policies aren’t commitments
Institutions

- Institutions are organizations that have an identity distinct from their members
  - Long-lived organizations
  - Enforce behavioral constraints on members

- An organization corresponding to a particular contract makes sense, but an institution doesn’t