Lecture Notes

Course Number:  CSC 513
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Example Contractual Relationships (at Outset)

- **Europa Call Center**
  - $C_0 = CC(AG, EA, reqAuth, authResponse)$
  - $C_1 = CC(AG, EA, claimResponse, payForResponse)$

- **Inspector**
  - $C_2 = CC(I, LC, inspectReq, inspectRes)$
  - $C_3 = CC(LC, I, inspectRes, payForInspection)$

- **AGFIL**
  - $C_4 = CC(AG, LC, consultingService, payForService)$

- **Customer**
  - John Doe

- **Mechanic**
  - Lee CS
Governance Understood
Broadly, Administering Service Engagements

- *IT Governance*: How IT resources are administered
- *SOA Governance*: How services are created, deployed, removed, ...
- Currently, humans achieve governance manually
  - Low productivity
  - Poor scalability to fine-grained, real time governance decisions
  - Hidden, implicit considerations yield low confidence in correctness and poor maintainability

"out of band" phone call"
Importance of Governance
Stakeholders Using Resources to Best Serve Each Other's Needs

- Share resources in a controlled manner
- Configure and reconfigure
- Enable unanticipated uses for resources
- Administer respecting human organizational needs

*In particular, stakeholders administer themselves*
Understanding Governance

Philosophy

Governance is about how stakeholders administer their resources

- Focus on stakeholders
- Focus on interactions among stakeholders, framed as normative relationships
- Focus on policies
- Focus on where the policies apply
- Focus on perspicuous specification of policies

A commitment to each other (and such)
Governance versus Management
Alternative Approaches to Administration

- Management: by superiors of subordinates
  - Control over managed resources
  - Necessary but not sufficient
- Governance: by autonomous equals of themselves
  - Collaborative decision-making among stakeholders
  - Share resources flexibly, enabling unanticipated uses
  - Administer respecting human organizational needs

Currently, governance is manual via out-of-band communications
Difficult of Governance

Independence of Stakeholders

- **Autonomy**: Stakeholders behave independently, constrained only by their agreements
- **Heterogeneity**: Stakeholders are independently constructed, constrained only by interface descriptions
- **Dynamism**: The set of stakeholders and their mutual relationships may change continually

Motivate high-level or normative descriptions
Achieving Governance: Agents and Orgs

Put collaboration center stage

Agents represent the stakeholders: people and organizations
  ▶ Provide a locus for interaction

Orgs are like institutions: have an identity and life time distinct from their members; also modeled as agents
  ▶ Examples: NCSU, UNC System, ...
  ▶ Provide a locus for roles and authorizations
  ▶ Enforce behavioral constraints on members
    ▶ Their main hold over their members is the threat of expulsion
Governance Overview

- Rule-Based Communicating Agent
  - Knowledge Base

- <<autonomous>> Policy
  - applies
  - actor of
  - constrains

- Principal
  - realizes
  - yields

- Contract Facade

- Org Role Participation
  - supports

- Contract Template

- Interaction Specification

- vikas ➔ ncsu
  - contact
  - T ➔ L

- Gradstudent ➔ role
  - Contract ➔ supports
  - univ (ncsu) ➔ contract ➔ adopts
Governance Conceptually

- **Org Role Participation** has actor
- **Org** instantiates
- **Stakeholder** is a principal
- **Communicative Act** controls
- **Liability** imposes
- **Privilege** grants
- **Qualification** requires
- **OOI** constrains
- **Org Role** involves role
- **Contract Facade** realizes
- **Org Specification**
Contracts Lifecycle

**Contract Negotiation**
- Customer proposes a contract.
- Negotiation process.
- Counterpropose option.
- May result in rejection or acceptance.
- Violation of a base commitment may trigger escalation.

**Contract Execution**
- Contract Monitoring:
  - Inactive
  - Activate service request
  - Active
  - Fulfill service request
  - Termination clause satisfied

**Contract Resolution**
- Violated clause
- Violation of a clause

**Contract Termination**
- Failed
- Fulfilled
- [Not resolvable]
Ongoing Studies
Ocean Observatories Initiative (OOI)

17 x 30m

30 year $400 M

- Primary: Operational Activity Model (OV5) document describing the entire life cycle via several use cases
  - Resources being created
  - Resources being registered and published
  - Resources being commissioned and decommissioned
  - Several more . . .

- Secondary: OOI Concept of Operations document

DoD AF
Dept of Defense
Architectural Framework

Operational View

Governance Steps

desired 4 26 views
The OV5 Register Activity Diagram
Developed by others

Define all the particulars of this product or service (e.g., location, content, function, authorities, permissions).

Registant

Characterize → Submit

Infrastructure

Registrar

Certify

Accepted? Yes No

Registration Catalog

Document → Index & Cross-Reference

Advertise? No Yes

Publish

External Catalog

Register
What We Extract from the OV5 Register Activity

- Roles
  - Registrar (e.g., facility administrator)
  - Registrant (e.g., a researcher)

- Main interactions
  - Registrant registers a new resource (e.g., a data stream) to make it available to others
  - Registrar advertises a registered resource

- Policy points for the registrar
  - Whether to accept the registrant’s request
  - Whether to advertise a registered resource
The OV5 Commission Activity Diagram

Developed by others

Diagram:
- Provider
- Resource Registered?
  - Yes
  - Validate
  - No
  - Operator
  - Test Facility
  - Certify
  - Deployment Engineer
  - Deploy
  - Verify
  - Assert
- Infrastructure
  - Register
- Document

Practitioner diagram
What We Extract from the OV5 Commission Activity

- Roles
  - Operator (e.g., a test facility or deployment engineer)
  - Provider (e.g., a researcher)
- Main interactions
  - Provider requests the operator to certify a data stream from a sensor
  - Operator completes verification of deployment of a sensor that has been requested for commissioning
- Policy point for the operator
  - Whether to accept the provider’s request
- Policy point for the provider
  - Whether to proceed to validate the deployment
Governance Operationally

- **Governance**

  - **Policy**
    - **Principal**
      - **Other Principal** (External)
      - **Self** (Local)

  - **Interaction Qua Conversation**
    - **Interaction Pattern**
    - **Interaction Specification**
    - **Interaction Role**
      - **Contract Facade**
      - **Contract**

  - **Communicative Act**
    - **Domain Capability**
      - **Organizational Capability**

- **Resource**

- **Org Role**

- **Interaction Qua Control**

- **Participation in a Role** (in connection with facade)

- **Actor**
  - **Principal**
    - **actor of**
  - **Policy**
    - **applies policy**
  - **Interaction Qua Conversation**
    - **provides context for**
  - **Interaction Pattern**
    - **involves**
  - **Interaction Specification**
    - **supports**
  - **Interaction Role**
    - **supports**
    - **maps to**
  - **Contract Facade**
    - **yields**
  - **Contract**
    - **realized as**
  - **Capability**
    - **Domain Capability**
    - **Organizational Capability**
Design
Develop
Register
Commission
Operate
Activate
Operate
Deactivate
De-Commission

Admin
Governance
decisions

Contracts
Policy
Read it
DoDAF slide in notes
Policy Model: Types

The policy interactions need to go beyond traditional access control

- Each policy can be understood in terms of its cause and its effect
- **Cause**
  - *Reactive*: triggered by a request from another stakeholder
  - *Proactive*: triggered by local observations
- **Effect**
  - *Authorization* of action to be taken on behalf of requester
  - *Enablement* of action, which would otherwise not be taken
  - *Obligation* of action, which would now be performed
Policy Model: Information

Each policy relies upon certain information in order to produce a decision

- Attributes of the parties involved
  - Qualifications, affiliations
- Attributes of the capabilities involved
  - Interactions to be carried out upon resources
  - Collated as interaction types and resource types
- Attributes of the relationships among the parties involved
  - Participations in different Orgs
  - Arrangements among institutions (captured as participations)
  - Ongoing conversations

Correct: According to these policies, is how we realize governance
Governance of Community Affiliation Scenario

User (as Member) → Enroll as member

User (as Member) → Enroll as member

Affiliate Community → Negotiate affiliation

Affiliate Community → NOT MESSAGES

Discover service in affiliate community

Negotiate usage

Engage service

(i) MANY MESSAGES
(ii) MANY CHOICES

User request

NCSU invites 3rd party info