NC STATE UNIVERSITY

ENGINEERING ONLINE

Lecture Notes

Course Number: CSC 513

Instructor: Dr. Singh

Lecture Number: 11

Outline

Contract

between two or more parties

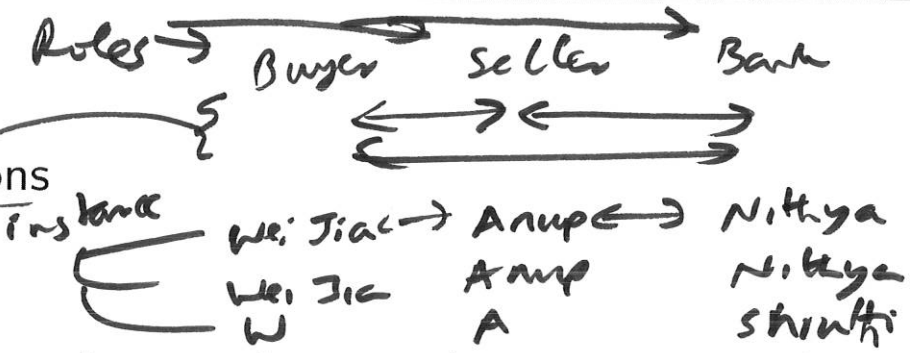
Binding agreement specifying each party's expectations on the others

- A contract structures interactions among autonomous parties
  - People and corporations
  - Governmental agencies
- Unlike a contract in programming
- Key questions: how to create, modify, perform, or monitor a contract

Motivation for Contracts

- Provide a basis for service agreements
- Crucial in open environments
  - Emphasize behavior: observable by others
  - Constrain behavior: limit autonomy
  - Except where needed, generally disregard internal implementations, thus facilitating heterogeneity

What is a Contract?



A description of business-level interactions

A reusable description of an interaction understood to preserve the participants' autonomy

of interaction

- Analogous to an abstract class or interface for objects
- Specifies well-defined roles
- Specifies messages among the roles and how they affect interaction state

types or schemas

Defer

  - Capturing commitments on a business partner playing a role
  - Setting local policies while complying with a protocol

- Stored in a repository, i.e., as an asset or resource in its own right
- Refined and composed for implementation

Importance of Governance

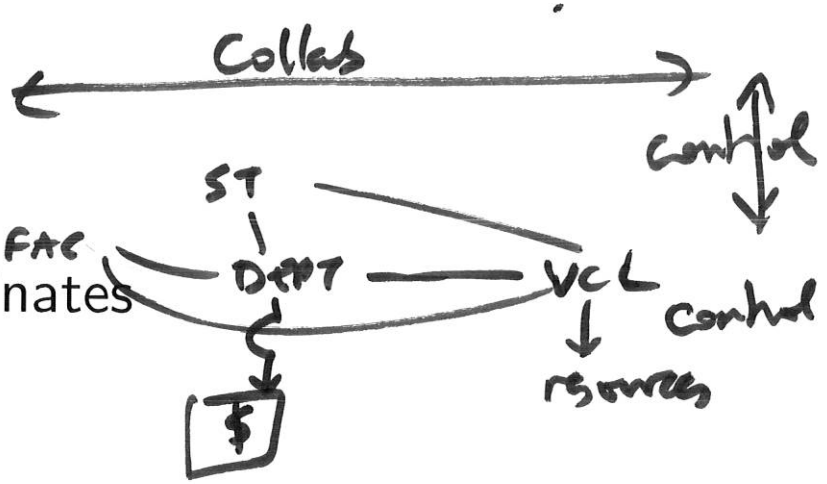
Stakeholders using resources to best serve their needs

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

In particular, stakeholders administer themselves

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
- Governance is what is needed, yet metaphors and approaches deal with management

Thus, governance is hidden: manual via out-of-band communications

Automation presupposes representation of contracts

Difficulty of Governance

not MSC

Independence of stakeholders motivates high-level normative descriptions

WHAT'S NORMAL

NORM = ISO STANDARDS
- SOMETHING ACCEPTED BY MANY
- STD FOR SIGNING A CONTRACT
- HEALTH CARE INDUSTRY STD

- *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

⇒ SOME CONSTRAINT THAT'S AGREED TO BY THE PARTICIPANTS

↳ RULES OF ENCOUNTER

Understanding Governance

Philosophy

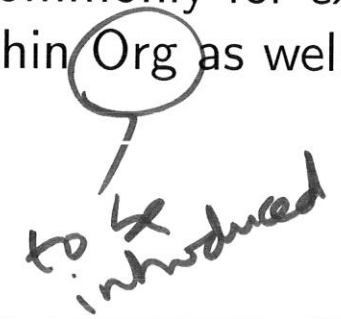
Governance is about how stakeholders administer their resources

- Focus on stakeholders
- Focus on interactions among stakeholders, framed as normative relationships
- Focus on policies (capture autonomy)
- Focus on where the policies apply (where each party acts)
- Focus on perspicuous specification of policies

Applying Contracts in IT Administration

Governance of service engagements

- 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
- Can we address governance through contracts?
  - Applied commonly for external services: SLAs generally, cloud services
  - Apply within Org as well



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Approach: Contracts and Policies

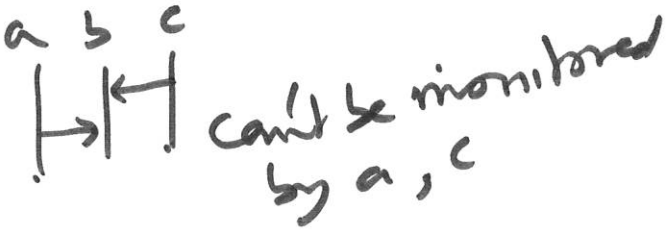
Both are centered on interaction, but ...

- Contracts are modules of abstraction over the interactions
- Policies are inherently private
- Policies lead each party to adopt a contract and decide whether and how to act given a contract
- Methodologically, we advocate going top down
  - Identify contracts
  - Identify *policy points* in a contract
  - Thus improving modularity and reusability

Outline

Prerequisites for ~~Realizing~~ Applying Contracts in Practice

- Formal, computational representations
- Determining (by each party) how to act
- Monitoring, especially locally by each party

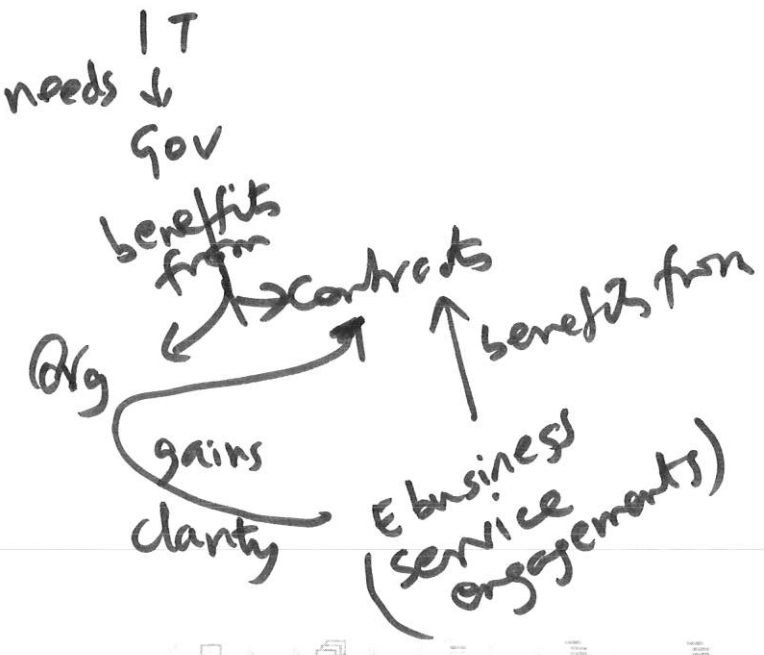


- Judging compliance
- Enforcing contracts
- Dealing with legacy contracts (textual (informal))
- Maintaining (includes creating) contracts
- Analyzing contracts, whether to adopt or enact

Hypothesis

Governance is a basis for understanding contracts even outside of IT

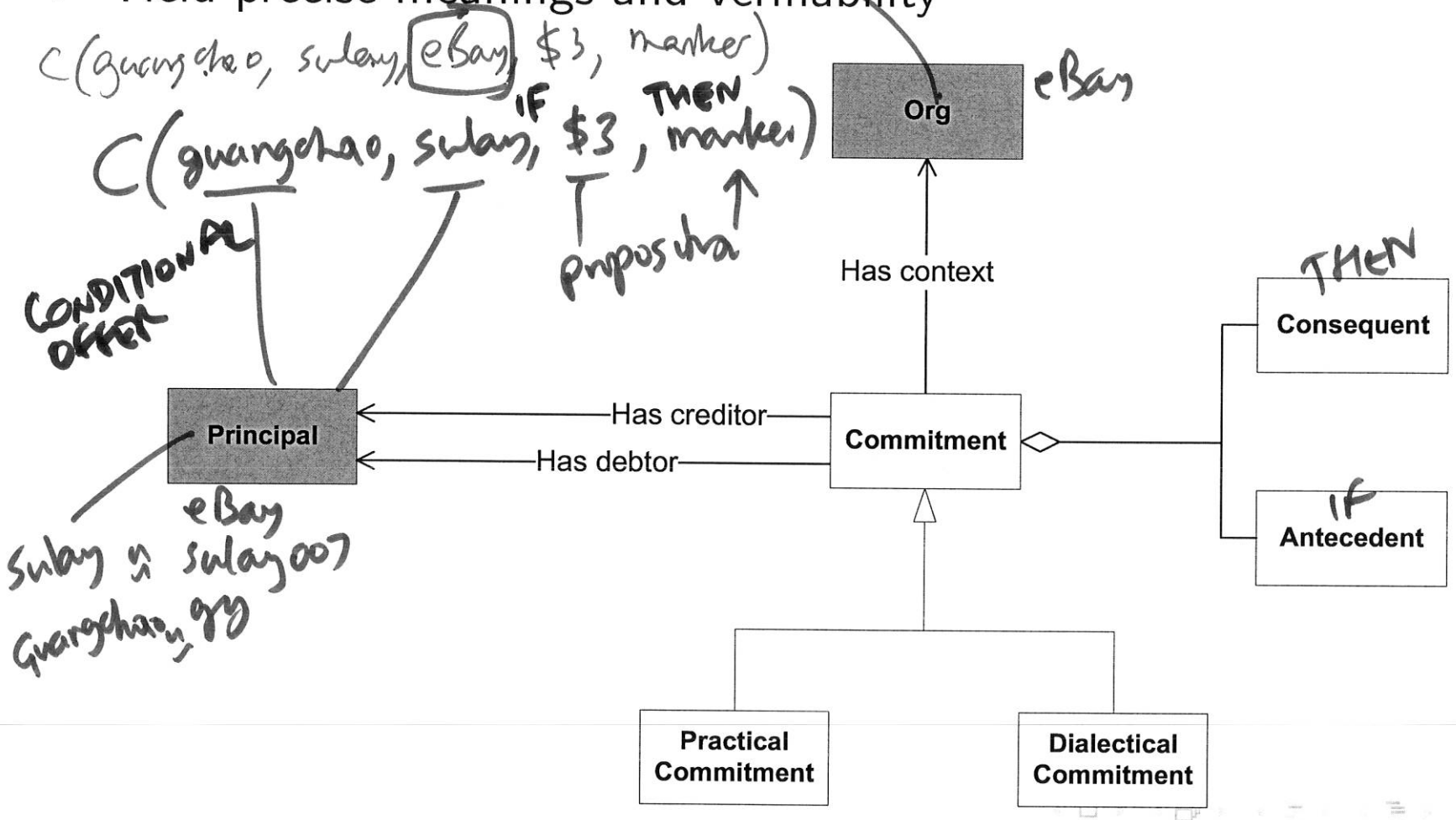
- Each contract is "governed" (not just IT resources)
- Reify organization into an Org, where
  - Members are stakeholders of the organization
  - The Org itself is a stakeholder
  - The Org provides the *context* of the contract
- The Org handles
  - Identity of its members in the Org
  - Enrollment: who can contract
  - Enforcement of contracts among its members
- Each member handles
  - How to act: policies
  - Where to monitor
  - Whether to escalate

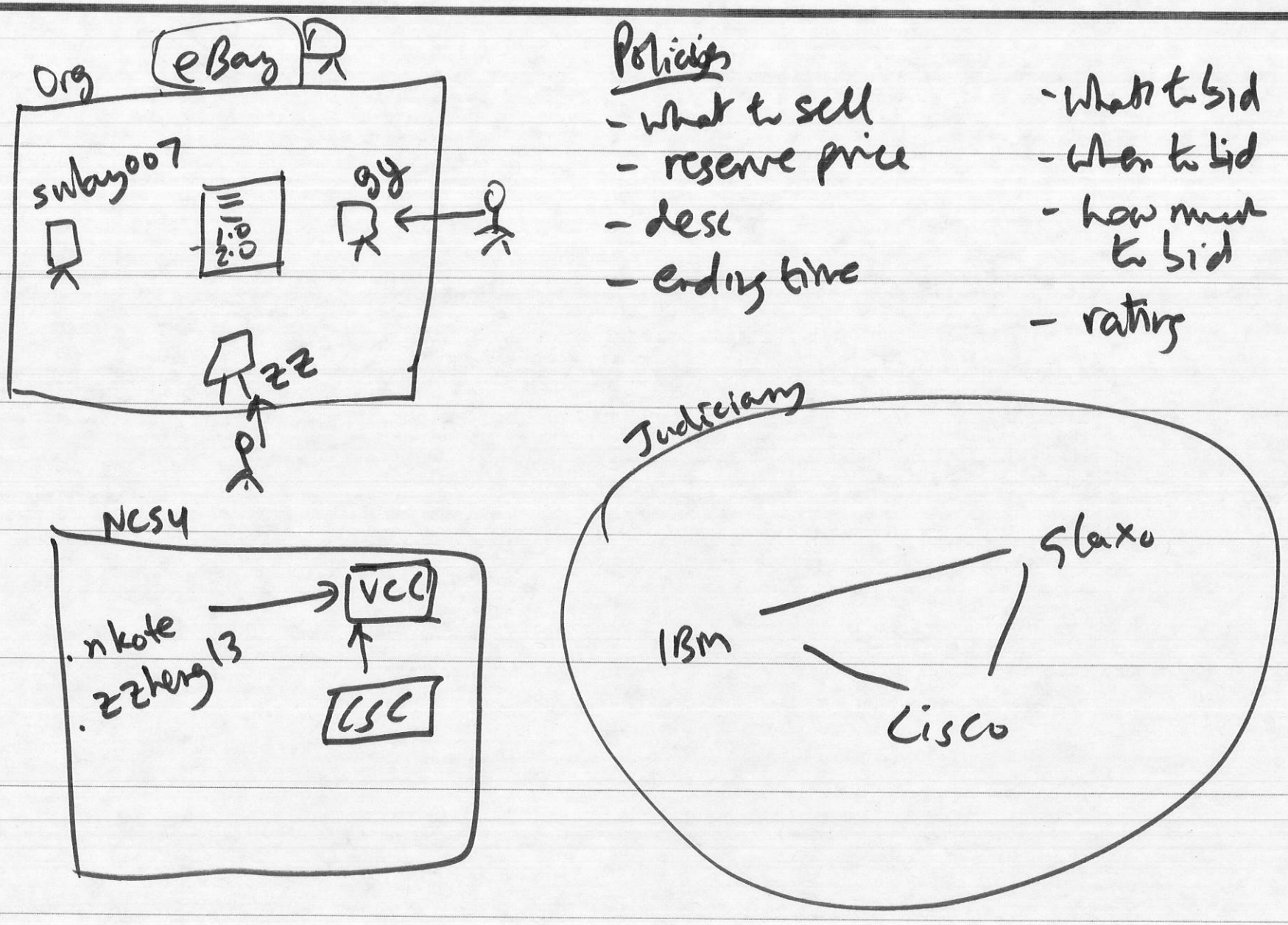


Commitments as Elements of a Contract

Express meanings of interactions

- Are atoms of contractual relationships
- Enable correctness checking of contracts
- Yield precise meanings and verifiability





Policies
- what to sell
- reserve price
- desc
- ending time

- what to bid
- when to bid
- how much to bid
- rating

COMMITMENTS INVOLVED IN THE eBAY EXAMPLE

C(guangchao, sulay, eBay, true, ship-in-three)

C(eBay, sulay, eBay, true, protect-~~$~~info) ⇐ revisit

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