

An Overview of Commitment Facets and Visibility for Interorganizational Processes

[Extended Abstract]

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Abstract

Business processes in open environments often involve multiple organizations. Effectively modeling and enacting such processes involves understanding the protocols that occur within and across such organizations and the interplay between the protocols and the structures of the organizations. This is especially so as to make the processes robust under exception conditions.

This paper proposes commitments as the unifying abstraction for modeling organizations and protocols. It introduces the notion of facets of commitments to provide a principled basis for managing commitments in organizations. Further, this paper studies a form of gray-box modeling where the structure of organizations may be made partially visible externally to improve system resilience.

1. Introduction

Business processes in open environments often span multiple organizations. The participating organizations build complex relationships. Among these, the contractual relationships reflecting the extant contracts among the partners, are crucial for business processes. Participants may have other relationships outside the scope of contracts, e.g., friendship, hostility, competition, and so on. However, such relationships are often endogenous and subjective, thus unverifiable. The contracts on the other hand are generally objective, observable, and thus verifiable.

This paper closely studies such contractual relationships and their interplay with the organizations. Specifically, contracts are modeled as a set of commitments among the participants. Commitment operations naturally model the updates to the contracts. To engage in a business process, the

parties enact a role in a business protocol and exchange messages accordingly. The semantics of the message exchange is given by its effects on the commitments. For example, by quoting a price for an item, a seller commits to the buyer to sell the item if the quoted price is paid. Our

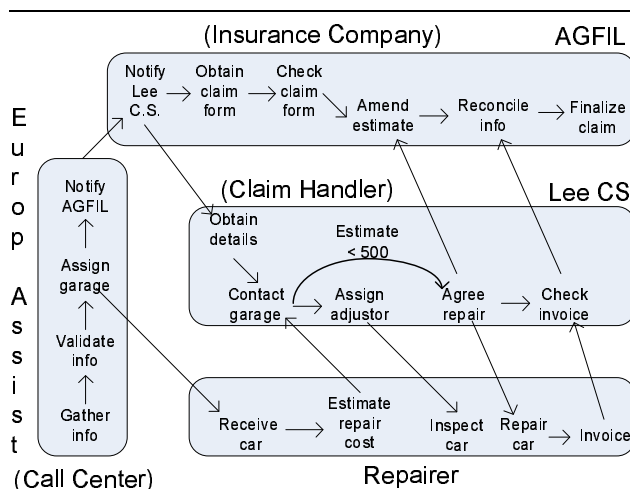


Figure 1. CrossFlow Insurance Claim Processing

previous work proposed a protocol-based methodology for developing business processes [2]. A protocol is a publishable specification of interaction among participant roles. Essentially, it specifies a set of rules that govern the interaction. The semantics of the messages is given by the commitments. Although this methodology offers software engineering benefits such as reusability, modularity, and refinement, it does not study two essential aspects of interorganizational business processes:

Individuals Vs. organizations. It assumes that the agents adopting roles in the protocols are individuals having

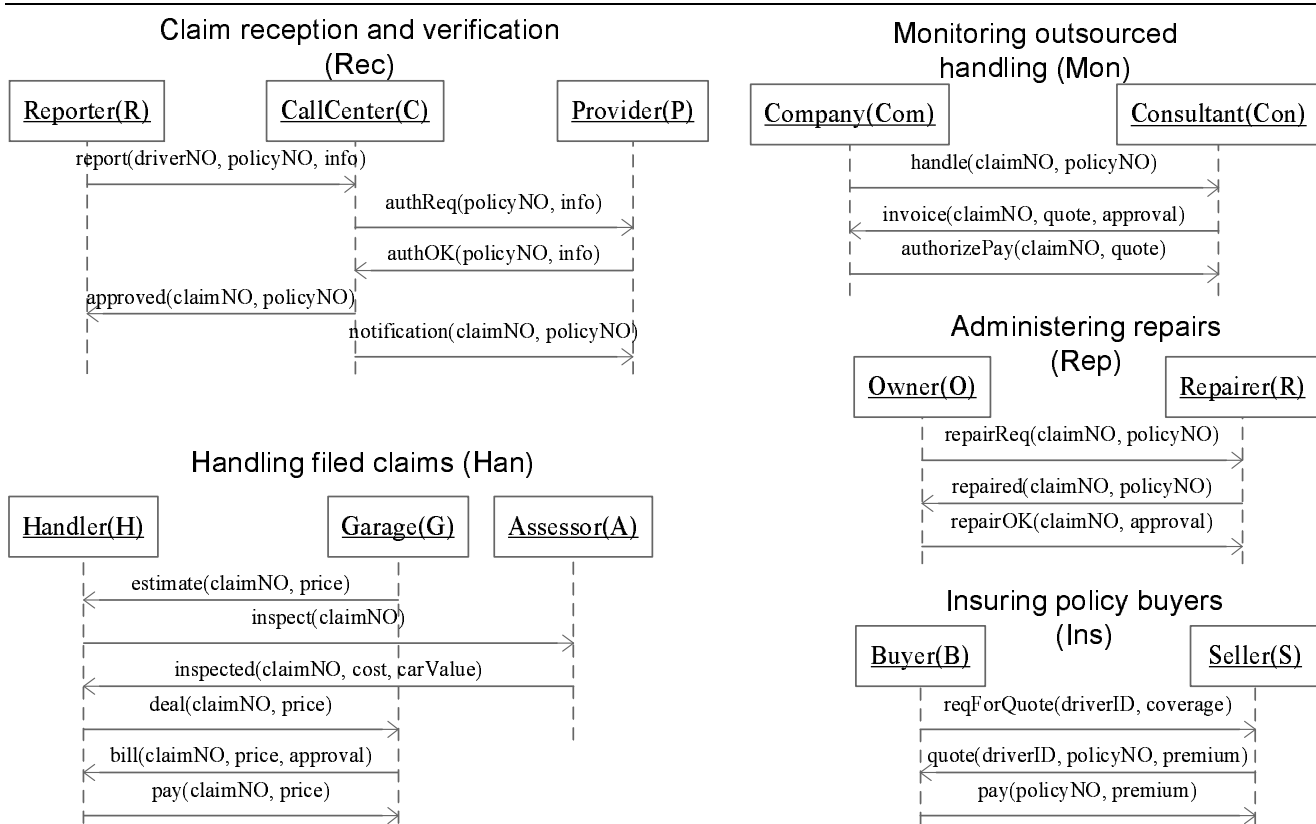


Figure 2. Scenarios from the protocols corresponding to the CrossFlow process

no deeper organizational structure. In practice, most agents have an organizational structure established via the formation of relationships among the members. Modeling interorganizational processes presupposes the modeling of the organizations and its interplay with the protocols.

Passive Vs. active commitment management. The modeling of commitments and operations over them are limited to the establishment, discharge, and violation of the commitments. Thus, the debtors and the creditors passively manage the commitments by reacting to the messages received. On the contrary, successful organizations are able to monitor the commitments that they have for others as well as the commitments that others have for them. Commitment management is almost never a one-shot deal.

This paper discusses our ongoing research for the extension of the protocol-based approach to handle these aspects while preserving the engineering benefits. Thus, our goal is to enable organizations and contracts-aware engineering of the business processes by accommodating appropriate modeling techniques in our protocol-based framework for business processes. To illustrate the concepts, this paper considers an insurance claim processing case studied

under the CrossFlow project [1]. Figure 1 shows the parties involved in the process and the process flow. AGFIL is an insurance company in the Irish market that provides domestic and commercial insurance. The present scenario deals with automobile insurance. AGFIL underwrites the insurance policy and covers the losses incurred. Europ Assist provides a 24-hour help-line service for receiving claims. Lee C. S. is a consulting firm that coordinates with AGFIL and deals with repairers to handle the claims. A network of approved repairers provide the repair service. AGFIL holds ultimate control in deciding if a given claim is valid and if payment will be made to the repairer. Figure 2 shows the protocols involved in the process.

2. Organizations, Commitments, and Contracts

Organizations provide a context to the contracts among the member agents. Also, the member agents may have contracts with the organization itself. Importantly, such organizations may be virtual, meaning they do not exist physically, but only virtually. For example, in the CrossFlow case, the contract between the policy holder and the insurance company is under a virtual organization represented by the legal

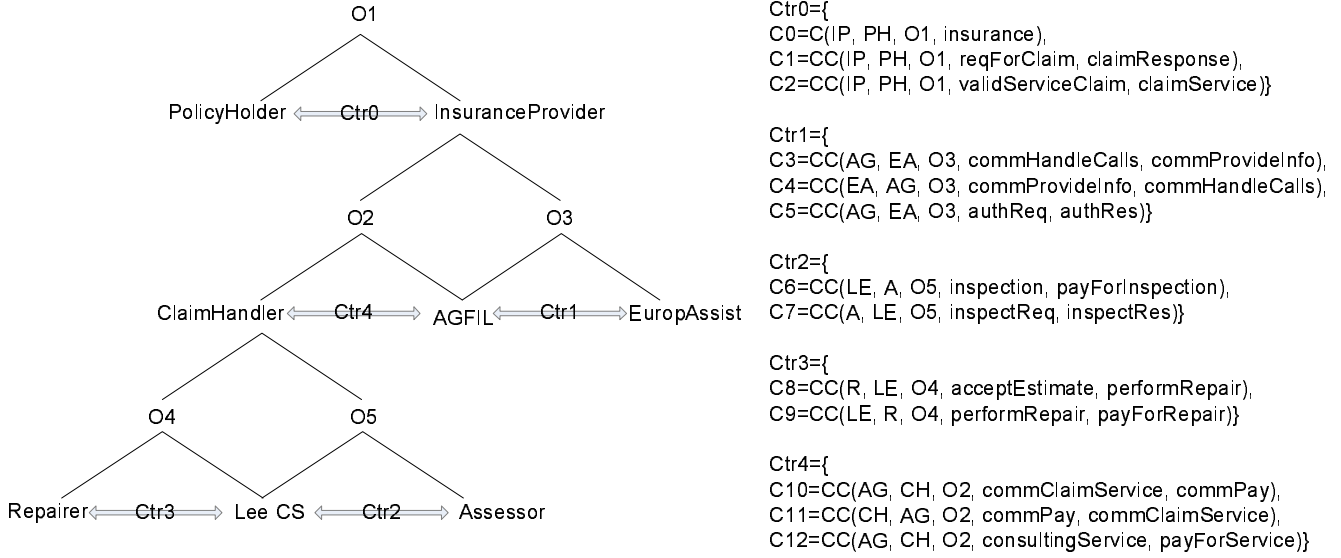


Figure 3. Organizations and Contracts in CrossFlow

context of the insurance policies. Also, the insurance company itself is a virtual organization represented by AGFIL, Europ Assist, and Lee C.S, and so on. Thus, an organization o is a tuple $\langle X, CTR \rangle$ where, X is the set of member agents and CTR is the set of contracts among the member agents and the organization. Naturally, the members can be organizations themselves.

Commitments are used to give semantics to agent interaction. As agents interact, they create and manipulate commitments. A commitment $C(x, y, o, p)$ denotes that agent x is obligated to agent y for bringing about condition p under the context of the organization o . Commitments can be *conditional*, denoted by $CC(x, y, o, p, q)$, meaning that under the context of the organization o , x is committed to y to bring about q if p holds where, p is called the precondition of the commitment. Here, $x, y \in o$ could be individuals or organizations. The conditions and the preconditions can be parameterized. Commitments are created, satisfied, and transformed in certain ways. The following are the operations defined on commitments:

- Op1.** $CREATE(x, c)$ establishes commitment c .
- Op2.** $CANCEL(x, c)$ revokes the commitment c .
- Op3.** $RELEASE(y, c)$ releases c 's debtor from the commitment c .
- Op4.** $ASSIGN(y, z, c)$ replaces y with z as c 's creditor.
- Op5.** $DELEGATE(x, z, c)$ replaces x with z as c 's debtor.
- Op6.** $DISCHARGE(x, c)$ (c 's debtor x) fulfills the commitment.

The rules regarding discharge of a commitment are given below.

- Dis1.** $\frac{C(x, y, o, p) \wedge p}{discharge(x, C(x, y, o, p))}$
- Dis2.** $\frac{CC(x, y, o, p, q) \wedge p}{create(x, C(x, y, o, q)) \wedge discharge(x, CC(x, y, o, p, q))}$
- Dis3.** $\frac{CC(x, y, o, p, q) \wedge q}{discharge(x, CC(x, y, o, p, q))}$

A contract ctr between agents x and y is the set of all commitments c such that c is one of $C(x, y, o, p)$, $CC(x, y, o, p, q)$, $C(y, x, o, p)$, or $C(y, x, o, p, q)$. Thus, the set of commitments in a contract should be under the same organizational context.

Figure 3 shows the organizations, the contracts, and the commitments in the CrossFlow process. Others have studied organizations by focusing on their communication, power, and control structures [3]. However, the hierarchical structure of Figure 3 is not the communication, the power, or the control structure of the CrossFlow organization. The communication structure (who communicates to who) is given by the protocols involved in the process. The power structure (who delegates to who) can be derived from the commitment delegations performed as part of the protocols. The control structure (who controls who) is a close match but different in spirit. Instead, we view the structure of Figure 3 as the contextual structure of CrossFlow. Naturally, the leaf nodes of the hierarchy can have structure inside them and can be elaborated to enable a detailed study. Such an ability to abstract and elaborate the structure as needed is valuable, as real organizations tend to have large structures.

3. Facets of Commitments

This section elaborates on the commitment management issue raised in Section 1. The treatment of commitments in human organizations is much more nuanced than the present modeling approaches suggest. For instance, commitments are treated as significant and resources are dedicated for a number of purposes related to a commitment, of which the first is the only one seriously considered in prior work.

- By a debtor to the fulfillment of a commitment.
- By a debtor to monitor the progress made toward the fulfillment of a commitment.
- By a debtor to anticipate problems that might lead to the violation of a commitment.
- By a creditor to monitor the progress made toward the fulfillment of a commitment.
- By a creditor to anticipate problems that might lead to the violation of a commitment.
- By a debtor and a creditor to maintain their relationship during the period that a commitment is active.
- By a context of a commitment to anticipate problems that might lead to the violation of a commitment.
- By a context of a commitment to enforce satisfaction of a commitment by the debtor.
- By a context of a commitment to determine whether appropriate contingencies apply that would justify its releasing the debtor from performing on the commitment.

Each of the above is an aspect of how agents manage their commitments to others and others' commitment to them. We propose to model such management aspects related to the commitments as the *facets* of commitments. Facets are aspects of the responsibility for satisfying a commitment. Thus, facets are a finer level of granularity on which to perform commitment operations such as delegate, assign, and so on.

Planning: Seeing How A planning facet constructs a plan for satisfying the commitment. This plan may involve business actions whose semantics may be given in terms of commitments actions such as creation of new commitments and delegation of existing commitments. It is customary for a debtor to employ a planning facet. A creditor may use a planning facet in case of an anticipated problem on part of the current debtor.

Executing: Performing It An executing facet actually carries out the steps of the plan provided by the planning facet.

Monitoring: Seeing It Through A monitoring facet monitors the progress in the current plan for satisfying the commitment. On the debtor side, it reports the status of the executing facet. On the creditor side, monitoring involves finding out the status of the debtor's execution. It also monitors the environment for relevant events.

Point-of-Contact: Seeing It Over A creditor point-of-contact facet generates reminders to the debtor and solicits current status. This status maybe reported to the monitoring facet. Reminders may be generated when the monitoring facet reports a status perceived to be old.

Anticipating: Seeing It Before An anticipating facet identifies potential problems with the current plan and suggests alternatives. On the debtor side, this would mean taking inputs from the monitoring facet, identifying problems and alternatives to avert them, and providing planning facet with alternatives to construct new plans. In addition to problems, opportunities can also be anticipated and capitalized upon.

Complying: Seeing To It This facet holds the ultimate responsibility to ensure compliance to the context. It involves validating the plans given by the planning facet to make sure they do not violate any contextual commitments, taking requisite action in face of an anticipated failure, e.g., informing the parent organization,

4. Visibility

5. Literature

References

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