

PhD in Open Constraint Satisfaction

Technical Report 2:

SSCM Scenarios

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1.1 Introduction

At present various electronic market places, auctions and negotiation systems exist, in the near future full electronic supply chains will be possible and indeed desirable to improve efficiency [1]. This situation, however, presents a problem. While humans are good at negotiation and situation analysis there are less able to handle large volumes of information and numbers of transactions. What is needed is a computer-based strategy for handling these situations. The strategy does not need to be the perfect negotiation, although it must be competent, but it must be able to deal with more negotiations more rapidly than a human operator could. A core objective of this work is to develop strategies that are able to make a profit in a situation where customers are continually requesting bundles of products and may need to be negotiated with, suppliers must be negotiated with and there is a limit to both the communication capacity available and the amount of information about the market place.

The simple supply chain model (SSCM) was developed to allow the description of simple market scenarios with the aim of developing strategies to tackle such scenarios [2]. The SSCM however, while simple, is not trivial to tackle. As a result it is necessary to develop various scenarios to constrain the SSCM and provide a way to incrementally tackle the problem. This document describes the SSCM scenarios as they are presently envisaged.

1.2 Scenario One

Scenario one constrains the SSCM the most and is intended as the first step towards tackling problems presented by the SSCM.

As such the first constraint is that customer requirements are fixed once sent. While the model allows for negotiation between customers and middlemen under scenario one this is not the case. The middleman must decide whether or not the requirements of the customer can be met or not. This is not entirely trivial as the decision must be based on the middleman's ability to obtain products from suppliers and it's assumptions about the worth of individual products.

The second constraint is that there is only one supplier per product. While the model allows for any number of suppliers for each product, in this case we are restricting the situation to remove the necessity of the middleman from choosing between suppliers.

Scenario one further assumes that the middleman knows about each of the suppliers (and is thus able to theoretically obtain any product) and that customers will initiate the contact with the middleman.

The situation we have created provides a satisfaction problem between the customers and middlemen and an optimisation problem between middlemen and suppliers, this increases the richness somewhat while being realistic to tackle. The remaining scenarios expand on this idea.

The strategies used by customers and suppliers in this scenario are very simple as a result the complexity is purely focused within the development of the middleman strategy. The task of the middleman in this case is to determine whether or not a customer's requirements can be met, if so negotiation is undertaken with suppliers to attempt to fulfil the requirement, the middleman's response being dictated by its negotiation success or failure, if not the requirement is immediately rejected.

1.3 Scenario Two

Scenario Two is a step up from Scenario One in terms of complexity. The focus of Scenario Two is on increasing the complexity of the interaction between customers and middlemen. Under Scenario One the problem was one of simply satisfying the customer or not, under Scenario Two the customers may be negotiated with. The changes from Scenario One are as follows.

The communication system is to be enhanced such that customers may communicate to middlemen reasons why a particular offer is not acceptable, thus a middleman incapable of fulfilling a customer's initial requirements but perhaps able to fulfil similar requirements, may attempt to negotiate. The communication system must not simply transfer the customer's gross requirements to the middleman as this would essentially be moving the customer's constraints problem to the middleman, instead some form of indication mechanism must be introduced. The indication mechanism would allow the customer to guide the middleman towards acceptable offers with resorting to identifying or specifying all acceptable offers in advance.

The customer is defined as having ranges of acceptability in terms of times. This is view as the customer having it's own constraint satisfaction problem to solve. The initial offer from the customer is the customer's first attempt at solving the problem. A middleman's counter offer is essentially a new potential solution to the customer's problem and is evaluated by the customer as such. If the solution is found wanting the customer will try to generate a new solution, and attempt to indicate to the middleman why the previous offer was unacceptable.

1.4 Scenario Three

Scenario Three increases the complexity of strategies further. This scenario is focused on developing the middleman supplier interaction. In the previous scenarios only one supplier was available for each product. In this scenario that constraint is removed and an arbitrary number of suppliers (equal to or greater than one) are allowed for each product. Middlemen know about all or only a subset of the suppliers (at least two per product). This scenario may force middlemen to make a choice between potential suppliers although multiple negotiations for the same product cannot be ruled out.

This extension does not necessarily require any changes to the supplier strategy however; changes to the middleman strategy may be extensive. Various possibilities are opened up by this scenario, for instance it would now be possible for a middleman to fulfil customer requirements by splitting needs for a given product between several suppliers. Another possibility is that of preference. If suppliers are provided with different negotiation characteristics it may be possible for the middleman to determine which supplier would be best suited to its current situation. For instance a malleable supplier with limited stock may be advantageous if small quantities are required quickly but, for larger quantities, a supplier that may be more difficult to negotiate with but has considerable greater stock would be a better choice.

1.5 References

- [1] On Agent-Mediated Electronic Commerce
Minghua He, et al, 2003
- [2] Technical Report 1: The Simple Supply Chain Model (SSCM)
Tim Gosling and Edward Tsang