AllianceNet: Information Sharing, Negotiation and Decision-Making for Distributed Organizations

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Abstract. We explore issues in providing support for information sharing, negotiations and decision-making to distributed autonomous organizations, grouped in alliances to improve their own ability to accomplish customers’ requests. In particular, we consider the case of an alliance of printshops offering similar and/or complementary print competencies and capabilities, competing but also collaborating with each other to perform print jobs.

We present a typical scenario of the activities within such an alliance, where the main task of the printshop managers is to schedule their portfolio of jobs. We then introduce a multi-agent architecture, called AllianceNet, allowing a manager to flexibly negotiate with the allied printshops some jobs that s/he cannot or does not wish to perform locally.

The purpose of the agents in AllianceNet is not to replace the printshop managers, but rather to assist them in the decision process by making available the information needed in the negotiations and by automating the tasks implementing the committed decisions. In particular, we discuss the kind of information used and shared among printshops, the support offered to printshop managers to make informed decisions and to consistently enact and monitor their execution.

Keywords: Negotiation, Protocols, Decentralized systems, Agent models and architecture, “Business-to-business” electronic commerce.

1 Introduction

We explore issues in providing support for information sharing, negotiations and decision-making to distributed autonomous organizations grouped in alliances. We consider here alliances of organizations offering similar and/or complementary competencies and capabilities, competing but also collaborating with each other to improve their own ability to accomplish customers’ requests. In particular, we are interested in an alliance of printshops executing print jobs (simply

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called jobs in the sequel). Each printshop may act sometimes as an “outsourcing” entity, submitting job requests to other printshops in the alliance, and sometimes as an “insourcing” entity, accepting such requests. In fact, the interactions we consider between the printshops are very general “business-to-business” interactions, so that our approach applies to any alliance of organizations, whatever their domain (the case of printshops has been chosen mainly because of its close links to Xerox core business).

The collaborations within an alliance can be partially formalized and automated as workflows, but they cannot be satisfactorily modeled by simple activity diagrams with rigid dependencies defining only synchronizations and ordering between “blackbox”-like activities. More realistically, the printshop managers should be flexibly supported in scheduling and negotiating their portfolio of jobs. For example, a printshop manager may wish to outsource a job and then select, among the printshops making insourcing offers, those providing the best cost/color-quality performance ratio. Also, the manager of an insourcing printshop may need to re-negotiate with the outsourcing printshop the commitment for a job, e.g. for changing a deadline. To be successful, an information technology tool supporting such an alliance should satisfy two constraints: it should be non-disruptive, i.e. respect the actual work practice, and at the same time it should create new opportunities.

Printshops in an alliance are fully autonomous organizations and, as such, each of them is responsible for managing its own jobs and resources. This precludes a straightforward approach to the management of the alliance, in which each partner is requested to declare to the alliance all its available resources (both human and machines), and the alliance handles all the customer requests, splitting and dispatching them in an optimal way among the different partners, using, for example, planning and job-shop scheduling techniques. Indeed, this highly centralized approach, based on a “super-scheduler”, is not adapted to the situation we consider for several reasons: (i) given the competitive context, the printshop managers are unlikely to give up control over their job portfolio and their resources; (ii) many decisions on how to best manage the jobs in a printshop must take into account information that can only be provided by the people working in that printshop itself: this information comes from their experience and the printshop local interests and is difficult to formalize and integrate in a super-scheduler; (iii) a “super-scheduler” solution in a distributed context is usually difficult to scale-up and to evolve dynamically.

Sec. 2 describes in more details the activities of a single printshop and its interactions with the alliance. Sec. 3 introduces a multi-agent architecture, called AllianceNet, supporting the negotiations occurring in the scenario previously described. In particular, we discuss the kind of information used and shared among printshops, the support offered to printshop managers to make informed decisions and to consistently enact and monitor their execution. Sec. 4 describes our current directions of investigations.