Scalable Regulation of Inter-enterprise Electronic Commerce

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Abstract. In the current electronic-commerce literature, a commercial transaction is commonly viewed as an exchange between two autonomous principals operating under some kind of contract between them—which needs to be formalized and enforced. But the situation can be considerably more complex in the case of inter-enterprise (also called business-to-business, or B2B) commerce. The participants in a B2B transaction are generally not autonomous agents, since their commercial activities are subject to the policies of their respective enterprises. It is our thesis, therefore, that a B2B transaction should be viewed as being governed by three distinct policies: the two policies that regulate the activities of the two principals, while operating as representatives of their respective enterprises, and the policy that reflects the contract between the two enterprises. These policies are likely to be independently developed, and may be quite heterogeneous. Yet, they have to interoperate, and must all be brought to bear in regulating each B2B transaction. This paper presents a mechanism for formulating such interoperating policies, and for their scalable enforcement, thus providing for regulated inter-enterprise electronic commerce.

1 Introduction

In the current electronic-commerce literature, a commercial transaction is commonly viewed as an exchange between two autonomous principals operating under some kind of contract between them. The formulation and enforcement of such contracts are among the main problems presently facing this field. But the situation can be considerably more complex, and more challenging, in the case of inter-enterprise commerce (also called business-to-business, or B2B commerce). This is because the participants in a B2B transaction are generally not autonomous agents but are subject to the policies of their respective enterprises.

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This state of affairs can be illustrated by the following example: Consider a pair of enterprises $E_1$ and $E_2$ that trade with each other under a contract defined by policy $P_{12}$ below:

**Policy $P_{12}$:** A business transaction between $E_1$, the client enterprise in this case, and $E_2$, the vendor, is initiated by a purchase order (PO) sent by some agent $x_1$ of $E_1$ to an agent $x_2$ of $E_2$, specifying the merchandise and the desired delivery time $t$. The exchange of merchandise and payment between the two agents is subject to the following provisions:
- payment should accompany the PO;
- the buyer, $x_1$, can cancel his order before the specified delivery time $t$, and will be reimbursed 90% of the payment he made, while 10% of it will go to $x_2$.
- if the merchandise has been supplied by $x_2$ by time $t$, and the order has not been canceled by $x_1$, then the seller will get his payment and the buyer will get his merchandise; otherwise, the buyer $x_1$ would be fully refunded.

Also, suppose that enterprise $E_1$ has the following policy, $P_1$, regarding such purchases:

**Policy $P_1$:** Agents in $E_1$ are allowed to purchase from $E_2$ in accordance with contract $P_{12}$, if the following conditions are met:
- $x_1$ must have a budget assigned to it by a designated budgetOfficer.
- a purchase order (PO) can be issued only if the balance in $x_1$ budget exceeds the scrip amount included in the offer. If this is the case, $x_1$’s budget is reduced accordingly.
- if the merchandise requested by $x_1$ is not delivered for whatever reason, its budget is increased by the refunds received under the contract between $E_1$ and $E_2$.

And suppose that enterprise $E_2$ has its own policy, $P_2$, regarding responses to purchase orders:

**Policy $P_2$:** Agents in $E_2$ are allowed to respond to purchase orders in accordance with contract $P_{12}$, but the arrival of purchase orders and of payments, as well as the delivery of the purchased goods, must be monitored by a designated agent called auditor.

It is clear that any purchase transaction between these two enterprises must conform to all three policies above. The problem is how can such three distinct policies be brought to bear on a single transaction?

One may attempt to deal with this problem by compiling a textual composition of the three policies into a single one, and then subject all transactions between the two enterprise to this composition. This technique has been proposed, for access-control policies, by several authors [4,2]. But textual compositions won’t do for B2B commerce, for the following reasons: First, the two enterprises are likely to consider their policies $P_1$ and $P_2$ confidential, and may be reluctant