

# Trust challenges for business-to-business networks

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Enterprise computing is currently moving towards more open, collaborative systems. Business-to-business collaboration allows enterprises to focus their resources on a few key fields of expertise, while continuing to provide broader services for customers. It also enables small and medium enterprises to compete in fields dominated by large corporations by joining together to gain more influence than they would have separately. The enterprises maintain their own independence during the collaboration, and make local decisions based on the enterprise policy. An example of a five-partner collaboration for a manufacturing chain involves a press house, a paper producer, a warehouse for storing the material, a logistics service for transferring it and a banking service for managing billing information.

There is a need for supporting this kind of collaboration through semiautomatic management tools, which will also increase the benefits realized by reducing the cost and effort involved in management. To meet this need, we have implemented a Pilarcos middleware tool for business-to-business collaboration management, which supports partner search and selection, interoperability testing and electronical contracting using a federated approach [2, 3].

Business-to-business collaboration must be built on mutual trust between partners. In an open service market, the set of potential partners is very large and continuously changing. This also sets new requirements for computational trust management, which cannot rely only on static modelling of trust relationships, such as authorization certificates [4].

Computational trust management has two tasks: upkeeping information about a trust relationship, and making decisions based it. Trust decisions are needed on joining a collaboration, and also on commitments within one as new experiences are gathered. The goal of a trust decision is to protect assets both from threats created by a positive decision, and from losses caused by a negative decision. The decision must therefore consider both risks and incen-

tives. We aim to extend the Pilarcos tool with support for automated, local trust decisions which consider both identified risks to assets and incentives, and learn from both first-hand and globally shared experience [1].

The field of trust management has relatively recently begun to move from static, certificate-based authorization models towards experience-based trust decisions. To build a solid conceptual basis for our work, we have surveyed existing trust management approaches and sought existing theory for trust decisions that address risks and incentives, and are based on experience [4, 7].

Reputation management systems focus on sharing experiences globally. There are numerous challenges in the field, and one of the central unsolved problems is credibility evaluation: autonomous actors can have various incentives to provide incorrect, incomplete or random information, and the receiving actor must be able to determine what information to use. We have looked into existing approaches to credibility evaluation, and discovered both requirements and promising techniques for the business-to-business collaboration context as well [5].

We have identified five central factors of a trust decision: risk, tolerance, reputation, importance and context. Risk represents the probabilities of positive or negative effects to assets, assuming that the trust decision is positive. Risk tolerance represents risks that the enterprise is willing to accept, forming a counterpart for risk. These two are compared to determine the result of a trust decision.

The risk and tolerance evaluations build on the other three factors. Reputation represents global and local experiences; it includes counters of past outcomes, which can be used to determine the probabilities of future behaviour. Importance represents incentives to accept possible losses, such as having to provide some kind of compensation for a negative trust decision, or wanting to gather experiences to extend the base of acceptable partners. Context represents temporary adjustments to other factors, as the state of the collaboration, the enterprise and the local management system changes: for example, the importance of product sales even at slight risk of loss can be temporarily increased when low on cash or warehouse space.

The architecture of our trust management system has two central subsystems, one for decision-making and another for upkeeping trust relationship information [6]. As the system connects to existing middleware, implementation work also involves connecting the new processes to the old in an optimal way.

In summary, we have implemented a business-to-business collaboration management middleware system, which we are now extending with trust management support. The solution is experience-based, and trust decisions evaluate both the risks and incentives related to the situation.

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