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Automated B2B Contracting Aided By New Generation Of Software Agents

For users of extended online supply chains, auction sites, and electronic storefronts, buying and selling is getting the ultimate labor saving device.

With the collapse of NASDAQ and the concomitant dip in corporate capital spending, once-hot software companies developing eBusiness applications are looking like they've lost some of their, shall we say, raison d'être.

But while the talk of online business technologies has slackened in the press, development of intelligent agents that can automate contract negotiations is still generating enthusiasm -- and moving forward at a brisk pace -- in the leading-edge work of researchers such as the Sloan School's Benjamin Grosz.

Now working in Sloan's Information Technology group, Grosz joined MIT Sloan after 12 years at IBM Research where he created and studied technologies for electronic commerce applications. His focus, however, has been primarily in the development of intelligent agent technology that can automate the increasingly complex B2B negotiations that online commercial transactions will demand in the future.

Online auctions and other commercial transactions over the Web, he points out, will be especially dependent on creating intelligently negotiated contracts through rules-based procedures carried out between multiple agents.

To that end, he is employing the Web's Extensible Markup Language (XML) to better define the business rules governing contract, trust, ordering and other policy-based negotiations for B2B agents operating in online marketplaces and virtual organizations.

"My research overall is concerned with the design and management of how automated enterprises and intelligent agents will soon communicate at a high level of shared understanding for eCommerce over what we call the "semantic Web," an overall concept for the next generation of the World Wide Web. The goal is to improve how business rules and policies are specified, communicated, and implemented in that context.

"An important technical aspect of my research's approach is the design of an XML markup language for representing business rules. This fundamental basis enables radical advances in modularity, conflict handling, and interoperability between rule sets and company databases seeking to complete transactions through online supply chain or electronic marketplace collaboration.

Automating contract execution in those applications will involve rules used to specify business processes, policies and products as part of the contract terms. But the agents and systems communicating and carrying out those rules will have to have the requisite sophistication to know how and when to make use of the information specified by those rules, e.g., price vs. quantity vs. delivery date rules, lead time to order considerations, cancellation conditions, individual vs. group price discounts, rules for refunds, creditworthiness decisions, and resolving what may be conflicting rules.

“We need to improve the fundamental knowledge representation for rules for better interoperability and executability in a dynamic environment that can be used and managed by non-specialists,” says Grosf. “We are now working on more application pilots for negotiation and authorization processes in supply chain collaboration settings as well as auctions for travel sites, and conventional electronic storefronts. But more work has to be done in how we represent rules. Ideally, they will be represented in a more declarative, less implementation-specific, manner. “Declarative” in this case means that knowledge representation defines, for any given set of premises (e.g., rules and data facts), what set of conclusions (e.g., derived data and actions) are sanctioned by the agents or systems involved.”

Those rules, Grosf points out, will also be constructed in a more interoperable and executable form using ordinary logic programs’ knowledge representation. They will also be aided through programming extensions he has developed. One of those extensions is called Courteous Logic Programming. Courteous Logic Programs provide a radical advance by making it easier to create more modular business rules that can be modified more easily as rules change and become more complex. Most importantly, however, it provides the foundation for resolving conflicts between business rules, while using XML as a business rules markup language for ease of representation and use on the Web.

“One example of how Courteous Logic Programs works would be in a situation where, an etailer may offer an item for \$10 to one set of buyers, but discount it to\$5 for a different targeted set buyers if they meet certain conditions; that is, if they are senior citizens and/or belong to an organization like the Automobile Association of America.” Grosf explains. “Courteous Logic Programs is what helps automate the application of priorities and the resolution of such potential conflicts between multiple provisions about pricing, or about delivery, etc., so that commercial transactions can be automatically executed over the Web.”

The approach Grosf and colleagues are taking to automate web contracting enables contracts/bids/auctions to be specified modularly and modified dynamically during negotiations. The rules governing these function are then executed automatically after import into multiple agents’ heterogeneous e-business processes.

Grosf and others have prototyped an earlier version of automated contracting in a freeware implementation known as IBM CommonRules, available on the IBM AlphaWorks site. That earlier approach was piloted in several application settings including EECOMS, a just completed \$29 million 3-year National Institute of Standards

and Technology project on supply chain collaboration in manufacturing. That project represents an industry-university consortium that included IBM, Baan, Boeing and TRW. The Sloan professor is also involved in more recent efforts in advancing the adoption of automated contracting thanks to grants under the DARPA Agent Markup Language program and the Center for e-Business@ MIT Vision Fund. He also is leading a new industry standards effort called Rule Markup Language that will make automated contracting through agents still more effective.

“There’s every reason to believe there could be millions -- if not billions -- of intelligent agents that will be put to work on behalf of industry and individuals over the Web in the not too distant future,” Grosf points out. “In fact, we should be seeing commercial applications of these automated contracting technologies within two to five years.”

by William Manning

For more information, please contact
Professor Benjamin Grosf
bgrosf@mit.edu,
<http://web.mit.edu/~bgrosf/www>