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Research Report

Making Electronic Commerce Easier to Use with Novel User Interfaces

José L. Abad-Peiro and Patrick Steiger

IBM Research Division
Zurich Research Laboratory
8803 Rüschlikon
Switzerland

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IBM Research Division, Zurich Research Laboratory, 8803 Rüschlikon, Switzerland

Abstract

Numerous solutions for secure electronic commerce are available today, but some of their options are too complex to be used properly by casual users, e.g., anonymity or fair-exchange capabilities within payments. On the other hand, novel types of user interfaces have arisen mainly in entertainment-oriented domains, e.g., games and multiuser "virtual worlds," that attract millions of nonprofessional users. We claim that integrating secure electronic-commerce techniques into new user-interface technologies would dramatically increase e-business in the Internet. In this paper we provide an approach to that integration based on the concept of business relationship properties.

I. INTRODUCTION

A. The Problem

Certain security properties of electronic commerce (e-commerce) services are too complex to be fully understood by nonprofessional users. For example, group signatures or anonymity with fair-exchange properties for online purchases are not easy to use by inexperienced users, who may not recognize the equivalent meaning in the real world, or may find that the parameters required in the protocols are too complex.

We claim that by adopting new user-interface technologies we can provide the users of electronic-commerce services with powerful and easier-to-use tools. New technologies applied to user interfaces, e.g., virtual worlds and network-based games, have been targeted to increase sales in the entertainment industry. Many suppliers on the Internet may have an interest in adapting these novel interfaces to capture a bigger share of the market, especially because many of their potential customers have grown up using video games more than wooden blocks.

In this paper we address the border between user-interface technologies and protocols used to implement secure e-commerce services, see Fig. 1. As both user interfaces and e-commerce services are increasing in complexity and functionality, we believe that a deeper reasoning for their optimal integration is required.

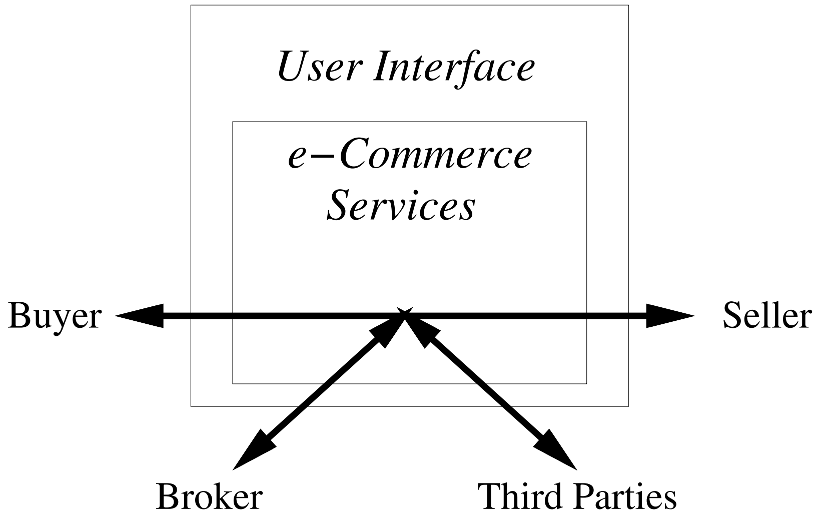

FIG. 1. Model of Electronic Commerce.

Our goal is to bring the marketplace closer to users by means of new interface technology in such a way that users need not be concerned about technical issues related to their communication media. For example, when a merchant is selling a product worth $100,000, he should not have to be concerned about the bandwidth on his link or the key length of the encryption channel. The underlying e-commerce services process the transaction respecting security and legal requirements, where as the user-interface supports the deal on a pure business level. In Fig. 2, the integration of these two elements is marked with a dashed line. This model is similar to the idea of the ISO OSI protocol stack model used to represent different layers of communication protocols and services [ISO84].

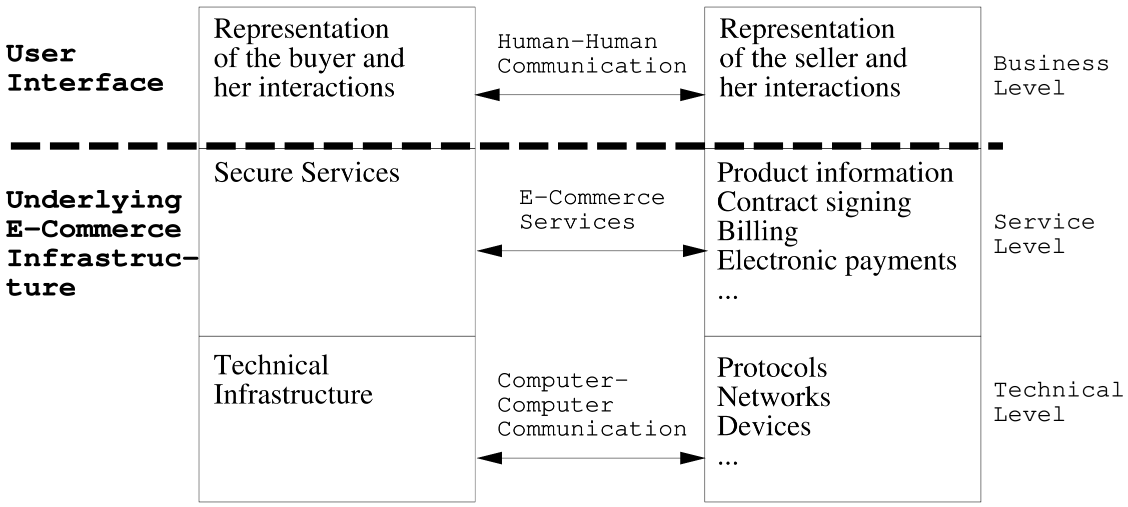

FIG. 2. Stack Model of e-Commerce.

B. Electronic Commerce Services

Many services for electronic commerce are available, e.g., product selection [Ste97], support for auctions [Int97] and other types of business negotiations [Gut98, Bea97] as well as contract signing [Ben90] and electronic payments [Aba98].

C. User Interface

Asynchronous interaction between a seller and a buyer through e-mail and the World Wide Web was the traditional way to perform retail electronic commerce before 1998. User interfaces for synchronous interaction also emerged several years ago, mainly for entertainment purposes and social interchanges [Rhe93]. Text-based chat systems and text-based interactive worlds, so-called multiuser domains (MUDs) [Cur93], were the predecessors of today's multiuser chat systems such as Microsoft Chat (formerly called Comic Chat) [Mic98] and three-dimensional virtual worlds [Dam98]. Augmented reality interfaces, also called "natural user interfaces" [Rau96], constitute new directions of development. Augmented reality "extends" the real world by augmenting it with external computational capabilities, i.e., real and virtual objects can be mixed in the same user interface, which will facilitate computers becoming ubiquitous [Wei91]. Some predict that, eventually, the physical world itself will become the interface to cyberspace [Ish97]. These emerging interaction technologies create a fascinating new realm in which to design and present electronic-commerce services in a more user-oriented way. Figure 3 summarizes the different levelgs of interaction available to a user to make use of electronic-commerce services.

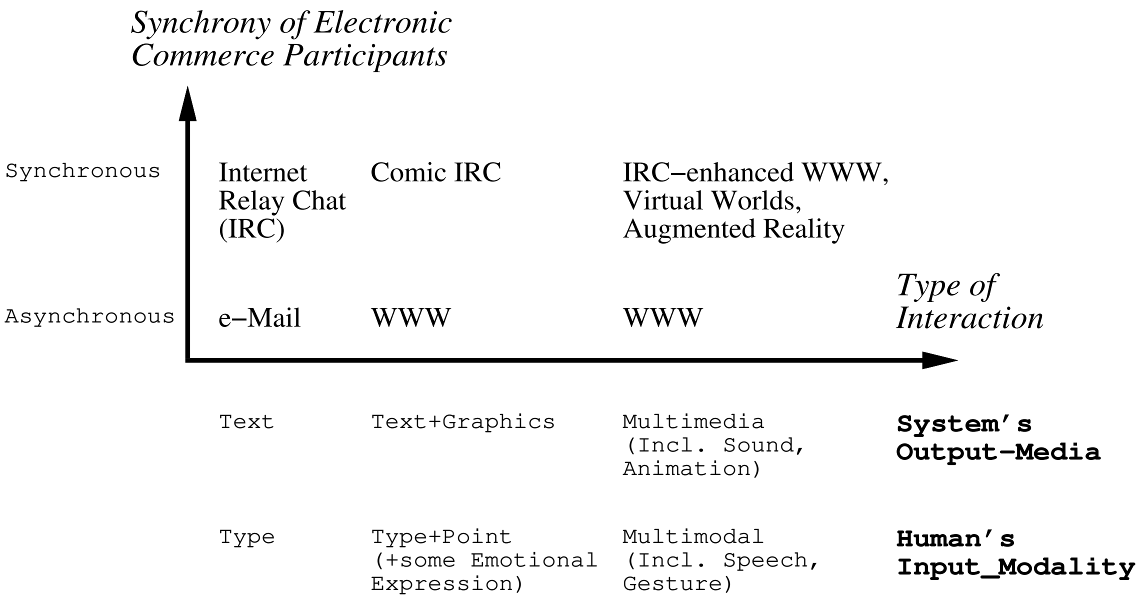

FIG. 3. Six Levels of Interaction.

In the following section we focus on the "bridge" between the service level of the e-commerce infrastructure and the business level at the user interface (indicated by the dashed line in Fig. 2).

II. BUSINESS RELATIONSHIP PROPERTIES

If we assume that it is difficult for average users to set their own security properties within an electronic-commerce framework, we need a higher level of abstraction closer to the user's real-world experience. If a user were to be represented by a software entity, such as a cartoon character or an avatar [Dam98], it would be easier for him to specify how he wishes to conduct business by using that representation. Obviously, the type of user interface determines how the representation is actually built and to what extent the user can actually specify details. In any case, the meaning of some of these properties is the same for all types of interfaces. When these properties affect the way in which business is conducted, we call them business relationship properties.

We identify five properties that a user can set to configure his business relationship (see Fig. 4 for a summary):

- The *Identification* of the user defines which e-commerce participants are allowed to obtain some knowledge about the user's real identity. There are at least three levels: *everybody*, *only-the-business-partner*, and *nobody* (strong anonymity [Chau81]).

- *Visibility* with respect to other users. A user can select how visible his actions and representation(s) are to other users. We distinguish between interactions, e.g., talking or exchanging objects, and representations, e.g., avatars, a cartoon character, or a sound. For both attributes we consider at least four levels, i.e., visible to *everybody*, *only-to-visible-users*, *only-to-business-partner*, and *nobody*.

- *Presence* of the user. A user can select from different degrees of involvement in a market transaction.* These degrees vary from *absent*, i.e., having an asynchronous interaction via e-mail or web, *delegating* a task to an automated process, e.g., a software agent that synchronously interacts with other market players, or *present* and interacting synchronously during a phase of the market transaction, e.g., in virtual worlds, comic chat environments, or in the real world enjoying pervasive computing support.

- *Trust* in other users. We identify at least three groups in which to establish a trusting relationship. A user can decide to trust *everybody*, *only-business-partners*, or *nobody*. Different degrees and types of trust can be assigned to each group.
- *Multiplicity* of user representations. Describes how many different instances of a user can exist in the system. We distinguish among four possibilities: a single representation for multiple (m) users, a single representation for a single user, multiple (n) representations per user or multiple (n) representations for multiple (m) users.

Business Relationship Property	*With respect to*	*Range of Values*			
Identification of the user	by other users	everybody	business partner	nobody	
Visibility –of representation –of the interaction	to other users	everybody	visible users only	business partner	nobody
Presence	of the user	absent	delegated presence (agents)	present	
Trust	on other users	everybody	business partner	nobody	
Multiplicity of Representations	of other users	1/m	1/1	n/1	n/m

FIG. 4. Attributes and Values of Properties for Business Relationships.

In the following section we describe several scenarios showing how e-commerce users could make use of these business relationship properties, and we discuss some of the implications regarding the different settings of respective business partners.

III. SCENARIOS

The following two scenarios demonstrate the application of business relationship properties. The protocol flow used in these scenarios is based on the model of phases in the market transaction described by Schmid [Sch93]. Basically in this model a transaction takes place in the following three phases: information, negotiation, and settlement. During the information phase a buyer looks for suppliers and products to evaluate. In the negotation phase demand and supply are tried to be matched. The settlement phase consists of delivery and payment.

*Market transactions are defined in Section III.

Schmid limited market transactions to a linear and unidirectional process from the information phase to the negotiation phase and further to the settlement phase. We have enhanced this model by introducing additional reasonable transitions, Fig. 5.

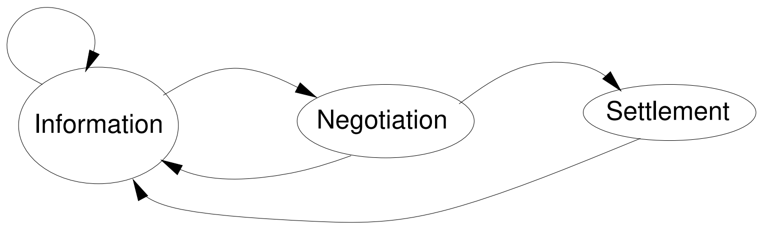

FIG. 5. Phases in the Establishment of an e-Business Transaction.

During each transition we assume there is a possibility of changing the configuration of business relationship properties.

A. Scenario 1

Let us assume that Mary, a marketing director of a sportswear company, plans to launch a new line of biking garments. For this purpose, she is looking for a market research report on the newest trends and consumer requirements in that area. As Mary is a very busy person, she may delegate the task of collecting and analyzing offers to a software agent during the information phase, i.e., the agent is Mary's *delegated presence*. Of course, the competition must not become aware of the fact that she or her company is focusing on these issues. Therefore, her agent should stay anonymous, i.e., be identified by *nobody*. On the other hand, *everybody* (especially sellers) should see and possibly hear that her agent is looking for a market research report. In this way, not only does the agent approach suppliers, but also suppliers can recognize a potential customer and approach her agent. Mary (i.e. her delegated presence) trusts *nobody*.

The initial configuration of her business relationship properties to start the market transaction is shown in Fig. 6.

Identification (Identified by):	**nobody**
Visibility (visible to):	**everybody**
Presence:	**delegated presence**
Trust:	**nobody**
Multiplicity:	**1**

FIG. 6. Initial Configuration for a Marketing Director in the Information Phase.

After some time, the agent presents Mary with several offers from various market research institutes. At this point, she may want to get involved personally in negotiations with them whether she can simply buy an existing market research report or has to order a new investigation focusing on specific details of her project. During this phase, she remains anonymous and even reduces her visibility to be seen only by the business partner with whom she is currently communicating. After negotiating with all the candidates, she decides to buy an existing report from the company Collector Inc. Only at the settlement phase of the transaction (and because she decides to do so) does she reveal her identity to her business partner, Fig. 7. Changes in the business relationship properties are indicated by an arrow.

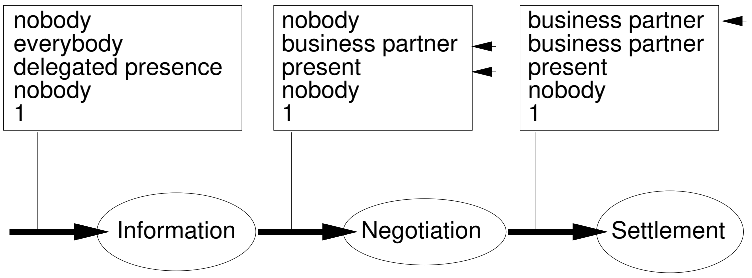

FIG. 7. Overview of Scenario 1 – Marketing Director Buys a Market Research Report.

B. Scenario 2

The second scenario is about Tim, a 16-year-old boy who wants to sell games on the Internet. He visits a marketplace in Traveler,[†] his favorite virtual world. In Traveler, many people deal with games. Tim wants to hold an auction to sell his games. He is quite clever and experienced with multiuser applications: he decides to instantiate two avatars and operate them simultaneously (i.e., a *multiplicity* of 2). The avatar A represents Tim himself, and the business relationship properties are openly configured for all phases, see Fig. 8. During the information phase, Tim presents his games to sell. In the negotiation phase, Tim (as avatar A) runs the auction. The same values of business relationship properties are kept during both phases.

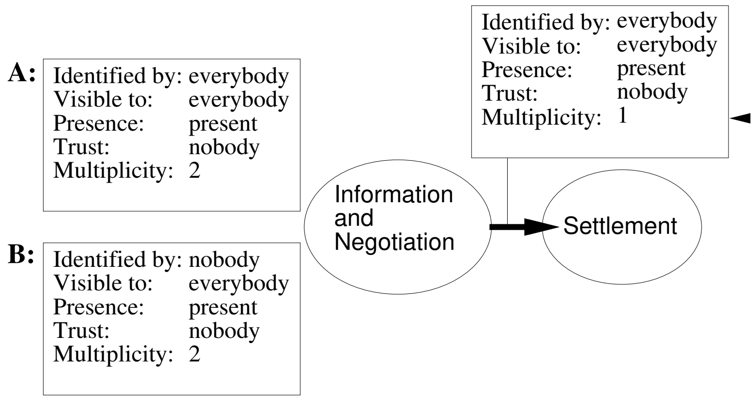

FIG. 8. Overview of Scenario 2: An Auction Type of Negotiation.

The role of avatar B is to participate in the auction as a potential buyer trying to push up the price. The setup of business relationship properties for this avatar is also the same for the information and the negotiation phase. Avatar B should stay anonymous, i.e., nobody should identify the person behind it, Fig. 8. For the settlement phase, after the auction, Tim no longer needs the additional avatar, hence B disappears and the multiplicity of Tim's business relationship changes to 1.

[†]Traveler is an existing virtual world provided by Onlive! (www.onlive.com). One cannot only fly around in three dimensions, one can also talk. As the sound is three-dimensional, too, one can estimate the direction and distance of somebody talking [Dam98].

C. Discussion

The two scenarios show how each user controls the setting of business relationship properties specific to their situation and particular goals throughout each phase of a market transaction. This is a convenient way to determine some of the security properties underlying in e-commerce services.

Let us see what happens when participants with different settings meet. For scenario 2, let us assume that, in addition to Tim's avatars A and B, another avatar C participates in the auction. Avatar C has the following configuration: [Identified by: *business partner*, visible to: *business partner*, presence: *present*, trust: *business partner*, multiplicity: *1*]. By these means, only Tim can see C through his avatar A. Any other invisible observer O lurking around would only see Tim's representation A and B. Because they as well as their interactions are visible to everybody, even A's actions/words to invisible C are visible, observer O would know that A is running an auction with B and somebody else, but neither O nor B would see or hear the representation or an action/reply from C, see Fig. 9.

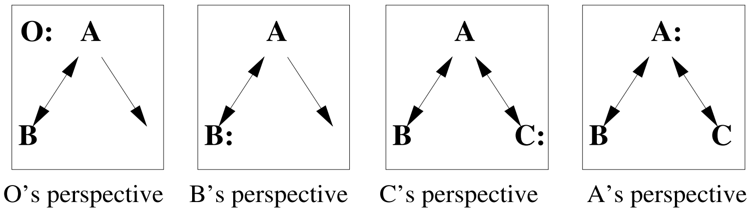

FIG. 9. Different Perspectives of Participants of Scenario 2.

IV. CONCLUSIONS AND FUTURE WORK

In this paper, the concept of business relationship properties has been introduced to show how users' preferences may dictate participation in electronic marketplaces using current e-commerce technologies. Projects such as SEMPER (Secure Electronic Marketplaces for Europe) currently support the security requirements for electronic commerce services [Wai96]. Various existing *chat* applications and *virtual societies* apply sophisticated user-interface mechanisms. Though our research has not found evidence of currently existing systems offering e-commerce services through "virtually" complex user interfaces, we consider their integration inevitable within the next few years. We hope with this paper to have enhanced the understanding of how this non-negligible step may be realized. Future work must be invested in elaborating binding relationships between the business relationship properties discussed in this paper and security properties, for example through the use of authorization policies. Another open issue is how e-commerce services can be represented in the new interfaces.

V. REFERENCES

Aba98 Abad-Peiro J, Asokan N, Steiner M, Waidner M: Designing a generic payment service. IBM Systems Journal, Vol. 37, No. 1, 1998, pp. 72-88.

Bea97 Beam C, Segev A: Automated Negotiations: A Survey of the State of the Art. CMIT Working Paper 97-WP-1022, 1997. URL: http://haas.berkeley.edu/ citm/wp-1022.pdf

Ben90 Ben-Or M, Goldreich O, Micali S, Rivest R: A Fair Protocol for Signing Contracts. IEEE Transactions on Information Theory, Vol. 36, No. 1, 1990, pp. 40-46.

Chau81 Chaum D: Untraceable electronic mail, return addresses, and digital pseudonyms. CACM, Vol. 24, No. 2, 1981, pp. 84-88.

Cur93 Curtis P, Nichols D: MUDs Grow Up: Social Virtual Reality in the Real World. Xerox PARC, Palo Alto, CA, 1993.

Dam98 Damer B: Avatars. Peachpit Press, Berkeley, CA, 1998.

Gut98 Guttman R, Maes P: Agent-mediated Integrative Negotiation for Retail Electronic Commerce. In Proceedings of the Workshop on Agent Mediated Electronic Trading (AMET'98), Minneapolis/St. Paul, MN, 1998.

Int97 International Journal of Electronic Markets, Vol. 7, No. 4 (this issue is dedicated to electronic auctions; it contains six papers on that topic), 1997. URL: http://www.electronicmarkets.org/.

Ish97 Ishii H, Ullmer B: Tangible Bits: Towards Seamless Interfaces between People, Bits and Atoms. In Proceedings of the CHI '97, Atlanta, GA, 1997, pp. 234-241.

ISO84 ISO: Basic Reference Model for Open Systems Interconnection. ISO 7498. Geneve, Switzerland, 1984.

Mic98 Microsoft: Microsoft Chat Home. URL: http://www.microsoft.com/.

Rau96 Rauterberg M, Steiger P: Pattern Recognition as a Key Technology for the Next Generation of User Interfaces. In Proceedings of the SMC '96 (Vol. 4) IEEE International Conference on Systems, Man and Cybernetics, Beijing, China, 1996, pp. 2805-2810.

Rhe93 Rheingold H: The Virtual Community: Homesteading on the Electronic Frontier. Addison-Wesley, Reading MA, 1993.

Sch93 Schmid B: Elektronische Märkte. Wirtschaftsinformatik, No. 5, 1993, pp. 465-480.

Ste97 Steiger P, Stolze M: Effective Product Selection in Electronic Catalogs. In Proceedings of the CHI '97, Atlanta, GA, 1997, pp. 291-292.

Wai96 Waidner M: Development of a Secure Electronic Marketplace for Europe. In Proceedings of the ESORICS 96, Rome, Italy, 1996, pp. 1-14.

Wei91 Weiser M: The Computer for the 21st Century. Scientific American, Vol. 265, No. 3, 1991, pp. 94-104.