

Analysis patterns for Customer Relationship Management (CRM)

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1. Introduction

In today's global trading environment, from the traditional way of selling products or services, to auctioning anything on-line, companies big or small typically have customers or partners from all over the world. Companies need to keep track of their customers, interact with them, prospect potential customers, and try to forecast what their customers will be buying in the future. In fact, not just commercial companies need these functions, but any institution that interacts with other institutions, such as universities, clubs, or social associations. We refer to all these as *organizations* because they all need similar structure and some related functions to deal with their customers or members. While universities and clubs for example, do not really trade, they need to attract students or members, keep track of their information, and interact with them in many ways. A flexible and robust customer/member data model is needed to capture all this information and accommodate different cultures, organizational structures, and backgrounds.

We describe here some aspects of recording information about customers for an organization in a trading community that sells products or services to its customers, which can be other organizations or individuals (*parties*). A trading community is defined as a group of entities taking part in some type of commerce. It includes persons and organizations. Entities in a trading community may play roles other than Seller and Buyer, such as Partner, Contact, Distributor, Dealer, Agent, Influencer, etc. Customer relationship has a broader context than classical customers, not only it represents the customer model, it also represents multiple organizations and multiple relationships that exist in a complex matrix-like environment.

There has been much work done in domain-specific areas, such as analysis patterns for Accounting [Fer02], Course Management for educational settings [Yua03], and Reservations [Fer99], but they do not capture a generic model that can be applied to the entire trading community, neither do they capture the hierarchical relationships between the parties. We introduce here the Party Relationship analysis pattern, which captures party relationships with other parties, where the party is an organization or an individual. Location aspects of these parties are described in the Party Locations and Contacts pattern. The Customer Relationship pattern combines these two patterns and adds account aspects.

Section 2 introduces an example which is used for all the patterns discussed here. Section 3 presents the Party Relationship pattern, while Section 4 discusses the Party Locations and Contacts pattern. Section 5 presents the CRM pattern. We end with some conclusions.

2. Example

Office Enterprise sells office products and services to its customers. It has traditional brick and mortar retail stores, but it also sells products on line and via mail catalog. Figure 1 shows some of the typical parties and relationships that exist in the Office Enterprise's business domain. It has employees. It has

customers who can be individuals (B2C customers) or organizations (B2B customers). Organizational customers may have special contracts with the company in order to get favorable pricing. It has suppliers who manufacturer or distribute products. It also has partners who may sell products or provide services to Office Enterprise's customers directly under certain agreement. Office Enterprise communicates with its customers and suppliers through contacts and addresses. Each customer or supplier may have more than one contact. They may also have more than one address, such as mailing address, billing address, or shipping address. Last but not least, Office Enterprise has competitors who compete with it for suppliers and customers.

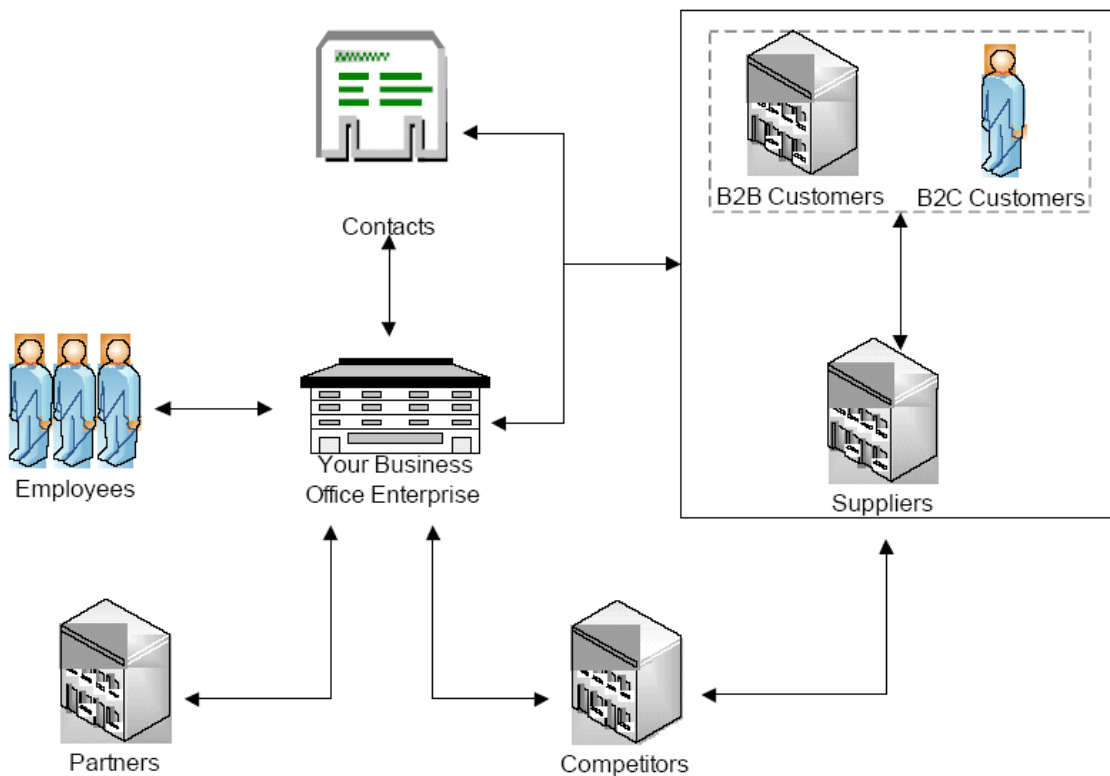


Figure 1 – A company and its relationships

3. Party Relationship Pattern

This pattern describes the parties and the relationships between parties in a trading community.

Context

Organizations in a trading community need to interact in many ways.

Problem

Companies or organizations need to interact with many other organizations or individuals to conduct their business. Those organizations may have complex relationships with the organization and with each other. How do we model the complex relationship between parties so that the company knows the answers to the following key questions at all times: Who are my customers? How are they related to each other? What are their characteristics? Who are my competitors? Who are my partners? Who are my suppliers?

The solution is affected by the following forces:

- We need to know how other parties are related to our organization so our interactions with them are appropriate and effective.
- Parties can be individuals or organizations, and we want to consider both types.
- An organization is itself a party.
- Parties can be related to each other in more than one way in a peer or hierarchical fashion.
- A party can have many relationships with the company, and furthermore, the relationships are dynamic, they can change at any given time.
- Relationships are reciprocal, they can be organization-to-organization, person-to-person, or organization-to-person.
- We need to model inter- and intra- organization relationships, and non-business relationships. Spouse Of or Child Of are examples of non-business relationships.
- We need to describe any type of relationship, including the ability to capture branches, competitors, resellers, business partners, etc.

Solution

A **Party** can be a **Person** or an **Organization** that is of interest in a business context (Figure 2). **Person** is a unique individual of interest to the organization. **Organization** is a legal entity recognized by some government authority, i.e. a branch, a subsidiary, a legal entity, a holding company, etc. **Party relationship** links two Parties to indicate the nature of the relationship between them. This association may also indicate the direction of the relationship, superior or subordinate, as well as their roles in the relationship. For example, in a employee/employer relationship, employee is a role while and employer is another role. Some example relationships are: Client of/Contractor to, Supplier to/Distributor for, Seller to/Customer of, Reports to/Manager of, Employer of/Employee of, and Partner of.

Known Uses

SAP's mySAP Business Suite includes a CRM package that handles customers and partners [sap07].

Consequences

This pattern provides the following benefits:

- We can indicate how a party (including our organization) is related to us and to other parties and describe the type of relationship it has with them..
- Parties can be individuals or organizations.
- By the use of role names in associations we can indicate how parties interact with each other.
- Parties can be related in any way, there is no restriction in the type of relationship.
- We can model business and non-business relationships, as well as inter- and intra-organization relationships.

Related Patterns

This pattern is an extension of the Party Pattern [Fow97]. Fowler describes a party as a person or organization but does not consider how parties are related. An earlier version of this pattern comes from [Hay96], who uses a similar definition and considers reporting relationships between parties. Silverston [Sil01] considers also party relationships of a more general type. All these books use ad-hoc notation, not UML, and don't consider dynamic aspects.

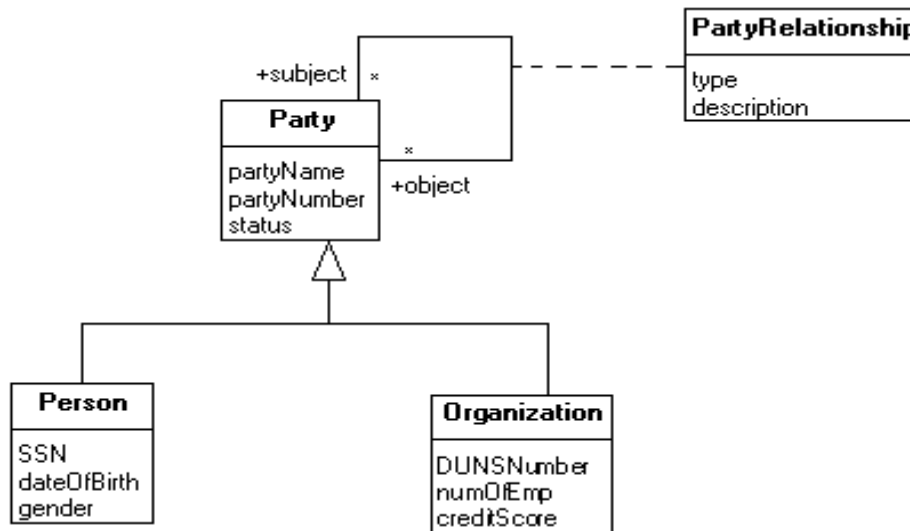


Figure 2 – Class diagram for the Party Relationship pattern.

4. Party Locations and Contacts Pattern

The Party Locations and Contacts pattern describes the places, the contacts, and the associated communication channels in a trading community.

Context

Organizations in a trading community need to interact in many ways.

Problem

The company needs to know where its parties such as customers, suppliers, partners, competitors are located, and for a specific purpose, who the contacts are, and how to contact them. How do we model the multiple locations (including their purposes), and the multiple contacts for a given party? And how to model multiple communication points for a party or a location for different purposes?

The solution is affected by the following forces:

- Companies or organizations usually have many locations, which are used for different purposes, e.g. sales outlet, customer information, research group.
- Companies or organizations usually have many contacts, intended for different purposes.
- Communication points can be different, based on the purpose of the communication. For example, some points are for email contacts, some are for visiting, some are for EDI communications.

Solution

In the class diagram of Figure 3, every party has many locations, where a **Location** is essentially an address of a physical location. A party can have many locations for different purposes, and a location can be used by many parties. A **Party Site** uniquely identifies the association between the party and the location and indicates that the particular location is used for that party. **Party Site Use** is the use of a party site (billing, shipping, training) and describes the purpose of that location; for example, mailing address, home address, billing address, or shipping address.

Contact is a person with whom we can communicate for some purpose, whether in-person, over-the-phone, or through other electronic means. A party can have many contacts, and a contact can be used by many parties. A **Party Contact** links the party and contact and indicates that the contact is used for the particular party, as well as the role or function of this contact. A **Communication Point** is an identifier for an electronic point of contact, for example a telephone number, an email address, a web URL, an EDI, etc. A Party, a Party Contact, or a Party Site can have one or more communication points for different purposes.

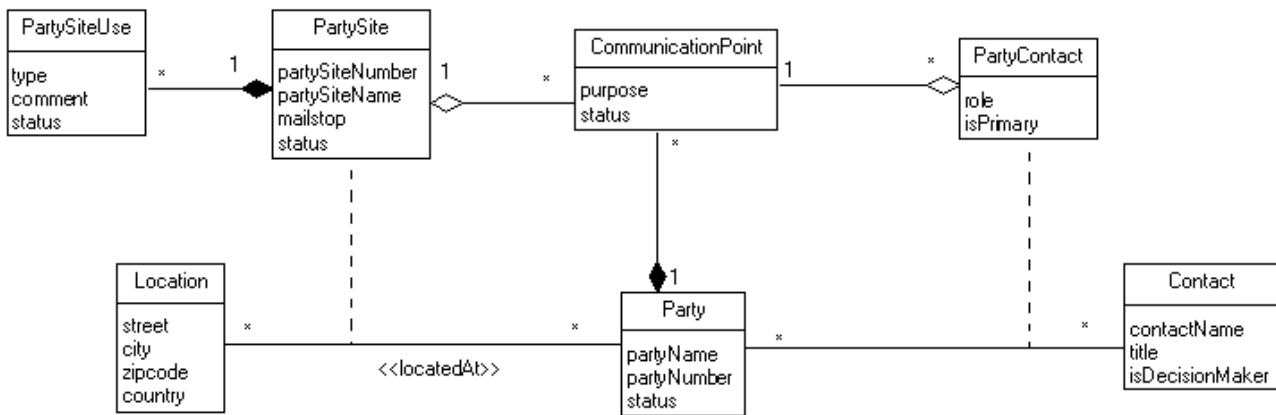


Figure 3 – Party Locations and Contacts Pattern

Known Uses

There are several commercial CRM products that have implemented versions of the Party Locations and Contacts Pattern. For example:

- RightNow [rig07] has a Locator web package to help their customers find products, store locations, and contacts.
- Oracle Customer Data Hub [Ora06].
- Siebel Customer Relationship Management Application [Sie06].

Consequences

This pattern provides the following benefits:

- It indicates the locations of a party and what purpose do they serve.
- It indicates the contacts of a party with respect to an institution and their purpose.
- It indicates the communication points needed to reach a party.

Related Patterns

This pattern usually complements the Party pattern. For example, the Party pattern in [Hay96] has also the concept of geographic location. Silverston's sales force model has the concepts of contact and contact method [Sil01].

5. Customer Relationship Management Pattern

This pattern describes the business relationships of an enterprise, considering its interaction with customers, partners, suppliers, and others. It also describes the locations and contacts to apply those relationships and some aspects of their accounts. This pattern is a composite pattern made of the Party Relationship and Party Locations and Contacts patterns.

Context

Organizations in a trading community need to interact in many ways.

Problem

An enterprise needs to manage all its related parties, such as customers, prospects, suppliers, employees, distributors, and their relationships, so the enterprise can gain valuable insight into their prospect base, understand their needs, increase sales, foster tighter and more profitable relationships with the customers, and make better business decisions. It also needs to keep track of their locations and their accounts with the enterprise. For successful business actions, a company needs to know the answers to questions such as: Who are my customers? What are their preferences? What is the status of their accounts? Where are they located? How to contact them? To be able to answer the above questions at all times, the system needs to understand the organization's customer and other parties' relationships. It also needs to know about their locations and contacts as well as the status of their accounts.

The solution is affected by the following forces:

- We need to know how other parties are related to our organization so our interactions with them are appropriate and effective.
- A party can have many relationships with the organization, and furthermore, the relationships can change at any given time.
- We need to model inter- and intra- company relationships, non-business relationships and user-defined relationships.
- We need to model the capability to offer personalized services or products, each customer has his/her own preferences, and the preferences can change dynamically.
- We need to keep track of the status of their accounts and the type of their accounts.
- Companies or organizations usually have many locations, which are used for different purposes, e.g. sales outlet, customer information, research group.
- Companies or organizations usually have many contacts, intended for different purposes.
- Communication points can be different, based on the purpose of the communication. For example, some points are for email contacts, some are for visiting, some are for EDI communications.

Solution

We combine the two patterns shown earlier. These patterns represent the complex relationships among those entities and model inter and intra company relationships, non-business relationships, and user-defined relationships. We describe the creation and maintenance of the customer information, including

organizations, locations, and the network of hierarchical relationship among them. We also keep information about the status of their accounts and their preferences.

Structure

The Customer Relationship Management pattern contains classes from the two previous patterns. Parties represent persons or organizations which have some business relationship with the organization. An **Account** is created once a party makes a purchase or establishes a financial agreement. Accounts also have locations (are assigned to a site) and can be related to other accounts.

Figure 4 shows the classes involved. **Party** represents an entity, either a **person** or an **organization**. **Party Relationship** links two Parties to indicate the nature of the relationship between them, regardless of their type. **Location** is essentially an address of a physical location. A **Party Site** uniquely identifies the association between the party and the location and indicates that the particular location is used for that party. **Party Site Use** indicates the use of a party site (billing, shipping, training). **Contact** is a person with whom we can communicate, whether in-person, over-the-phone, or through other electronic means. A **Party Contact** links the party and contact and indicates that the contact is used for the particular party. **Communication Point** indicates an electronic point of contact.

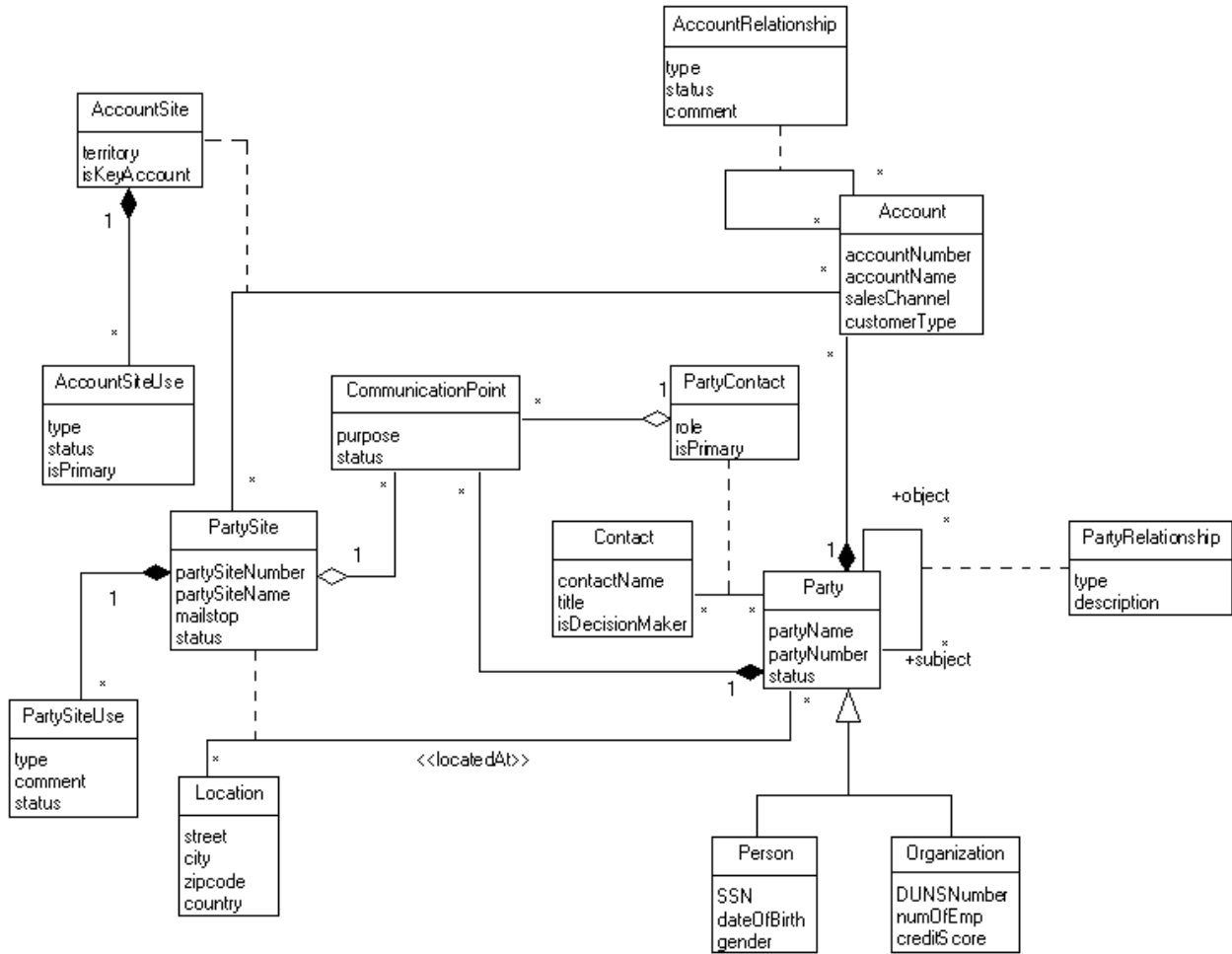


Figure 4 – Class Diagram for the Customer Relationship Pattern

Dynamics

The sequence diagram in figure 5 shows the use case for opening an account. A person opening an account becomes a party, other entities related to the party such as a location, a contact, and a communication point are created. Finally, the actual account is created. Other use cases include adding a contact to a party, adding a communications point to a party, etc.

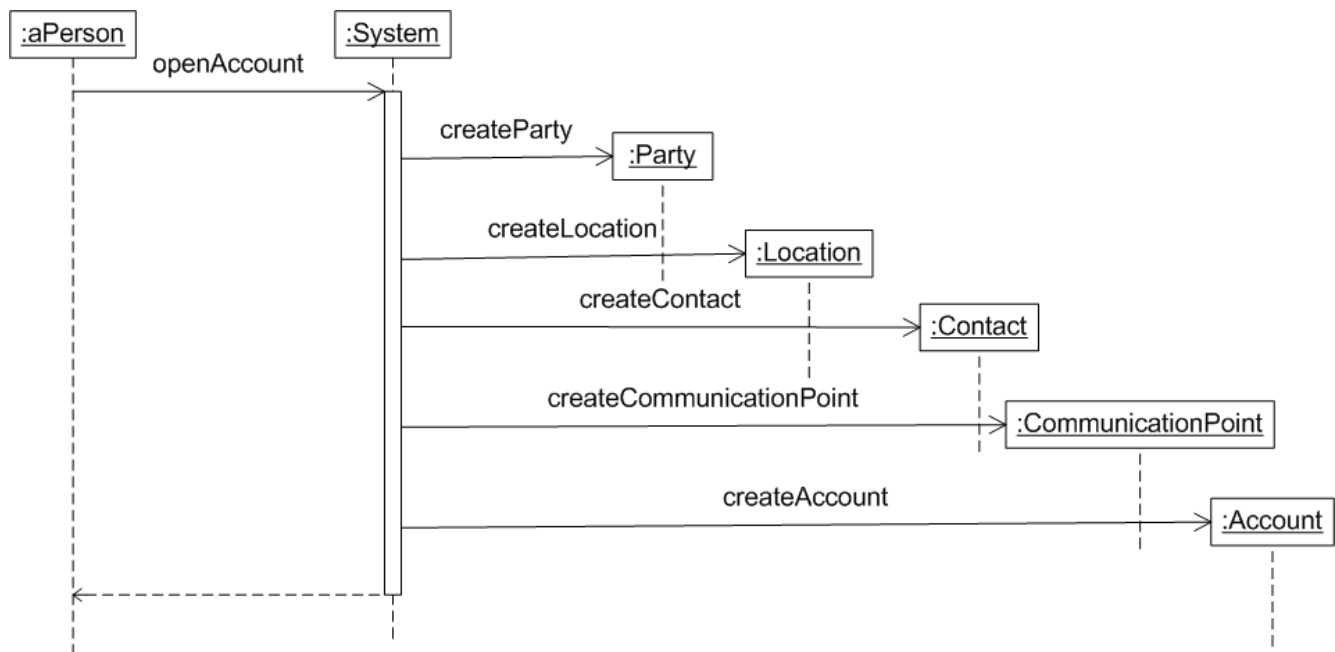


Figure 5 – Sequence Diagram for opening an Account

Known Uses

There are several commercial CRM products that have implemented entire or partial customer relationship model. For example:

- Oracle Customer Data Hub [Ora06] uses the Trading Community Architecture (TCA). TCA is a common repository for name and address information.
- Siebel Customer Relationship Management Application [Sie06]
- Microsoft CRM software [Mic06]
- SAP's mySAP Business Suite includes a CRM package [sap07].
- Salesforce CRM Unlimited Edition includes all these functions [sal07].
- NetSuite CRM+ includes all these functions [net07].

Consequences

This pattern has the following benefits:

- A Customer Relationship analysis pattern promotes broader reuse; it can be reused in many

different domains, such as retail companies, financial institutions, educational, public or government sectors, etc.

- It addresses business, non-business and user-defined relationships.
- It includes most of the information needed for efficient customer relationships management.
- It provides a complete view of a party and all of its relationships with the company, and its relationships with other members of the trading community.
- It keeps the status of accounts.

The pattern has the following liabilities:

- It may be too complex for small businesses.

Related Patterns

- [Cyp05, Fow97, Hay96, Sil01] present several variations on these patterns as well as some complementary patterns and related models.
- The Account Analysis Pattern [Fer02] adds more functions to the accounts shown here, including keeping track of transactions.
- CRM functions interact and may overlap with other business functions such as Order Management, Sales Force Automation, and Marketing, for which there are some patterns or standard models (see Fow97, Hay96, Sil01).

6. Conclusions and Future Work

Customer/member information is vital to any organization. We have presented two patterns that handle specific aspects of customer relationships and a composite pattern that combines their functions and adds a few other functions. These patterns can be used to build conceptual application models for this domain.

Business information may be highly sensitive; for example, it contains financial information that is subject to regulations, such as credit card information or purchasing records. Proper security is needed to handle this information. We are working on an extension of this pattern where role rights and other security constraints are superimposed on the functional aspects, according to our secure development methodology [Fer06].

Acknowledgements

We thank our shepherd Tiago L. Massoni for his perceptive and knowledgeable comments that significantly helped improve the quality of the paper. Our Secure Systems Research Group also made valuable comments.

References

[Cyp05] P. Cyphers, "Trading Community Architecture",
<http://repo.solutionbeacon.net/SBStandardTCAPresentation2005.pdf>

[Fer00] E.B. Fernandez and X. Yuan, "Semantic analysis patterns", *Procs. of 19th Int. Conf. on Conceptual Modeling*, ER2000, 183-195. Also available from:
<http://www.cse.fau.edu/~ed/SAPpaper2.pdf>

[Fer02] E.B.Fernandez and Y.Liu, "The Account Analysis Pattern", *Procs. of EuroPLoP (Pattern*

Languages of Programs) 2002.

<http://www.hillside.net/patterns/EuroPloP/submissions-2002.html>

[Fer06] E.B. Fernandez, M.M. Larrondo-Petrie, T. Sorgente, and M. VanHilst, "A methodology to develop secure systems using patterns", Chapter 5 in *"Integrating security and software engineering: Advances and future vision"*, H. Mouratidis and P. Giorgini (Eds.), IDEA Press, 2006, 107-126.

[Fow97] M. Fowler, *Analysis Patterns-Reusable Object Models*, Addison-Wesley, 1997

[Hay96] D.Hay, *Data model patterns-- Conventions of thought*, Dorset House Publ., 1996.

[Mic06] Extending Microsoft CRM with Reusable Patterns, <http://msdn2.microsoft.com/en-us/library/ms913853.aspx>

[net07] <http://www.netsuite.com/portal/products/main.shtml> Accessed February, 2007.

[Ora06] Oracle, The Oracle Trading Community Architecture, http://www.oracle.com/data_hub/cdh.html

[rig07] RightNow Technologies, <http://www.rightnow.com/> Accessed February 2007.

[sal07] <http://www.salesforce.com/company/> Accessed February 2007.

[sap07] SAP United States, <http://www.sap.com/usa/solutions/business-suite/crm/index.epx>

[Sie06] Siebel, Customer Relationship Management Applications <http://www.oracle.com/applications/siebel.html>

[Sil01] L. Silverston, *The data model resource book (revised edition)*, Vol. 1, Wiley 2001,

[Yua03] X. Yuan and E. B. Fernandez, "An analysis pattern for course management", *Procs. of EuroPloP'03*, 899-907.