

UML Modeling & Protection of a Domain Based System

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Summary

The present paper deals with the UML modeling of a domain based system. The domain of credit cards of a bank company is considered as a case study. Data cubes are designed for the domain of credit card system. A protection technique through an algorithm is also proposed for a security of domain based system. UML class and sequence diagrams are designed for the system. Efficiency of the security algorithm is also discussed in the last section of the paper.

Key words

UML, Class Diagram, Sequence Diagram, Data Cube, Domain Based System, Domain Security.

1. Introduction

The Unified Modeling Language (UML) is a well known recognized, powerful leading diagrammatic modeling language used for the software design of research problems. It helps to building an interactive system & also provides a common language for specifying, visualizing and documenting the software intensive systems [1]. UML is a collection of best engineering practices that have successful in the modeling for a software design of a huge and complex systems. Modeling is very useful for readability and reprocess of the systems. The visual design for software problems with features of programming concepts for the Object Oriented techniques are explained by Lieberherr et al. [2]. The modeling is an advance way of thinking to the research oriented problems in a well organized manner in real-word ideas, some important model systems are designed in [3] & [4]. In [5], a knowledge based system is explained through XMF. An other important concept of this paper is related to data cubes, which are designed for a credit card system. The cubes related to data mining generally are used to represent data along some measure of interest. The activities i.e. the data mining is shown below in the Figure 1. Structure raw data collection & converted to transform and in the next step the data is ready for pre-processed. Through these activities one can get the knowledge about the data which post-processed after data mining the knowledge.

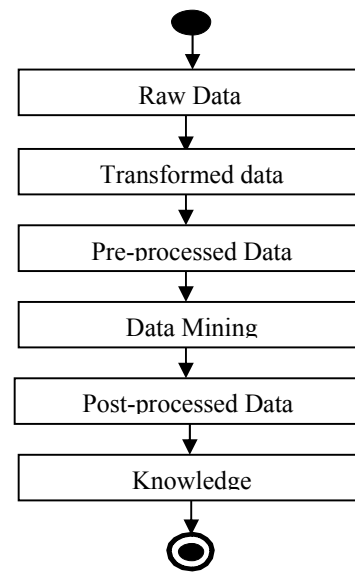


Fig.1. Activity diagram of Data Mining

[6] & [7] are the important references related to the design of data cubes through various case of the system in these references. A definite attributes are taken to be measure i.e. the attribute whose values are of interest, the attributes are selected as dimensions or functional attributes. The measure attributes are aggregated according to the dimensions & then queries are performed on the cube to retrieve decision support information, which must give result with a function of seconds that one can judge the performance of the system Optimization queries on the various databases are performed by various authors. Some of important references are [8], [9] & [10].

In the present paper a domain based system is modeled through the Class & sequence diagram representation by the use of well defined UML modeling language. A data cube of domain based system is designed by considering the domain of credit card system of a bank. Several queries are also performed to judge the performance of designed data cubes. A security algorithm is also proposed for the securing the data cubes which converts

class. The Verification_Officer class has a single Association with Application. Credit_Card has a multiple association with Bank and National_Card class & International_Card. The Verification_Officer check the application of customer and correct application send to the bank for issuing a credit card. In Application class the Customer desire to the credit card request to the bank. The Verification_Officer who handles all the activities related to card check the eligibility of customer to have card and if he is not eligible then he told to the customer that you are not fulfilling the requirement of the card, only eligible customer can get the application form for the card. After getting the application from customer application check by the Verification_Officer for completeness, verification of signature, behavior of account and also the Verification_Officer should confirm the latest address filled by the Customer the application should put in a separate file with the serial number. After this the application should be approved by the card issue branch manager. The entry of the applications should be done using the interface software provided at the branch. The application data should be uploaded to ATM switch centre (ASC) through the same software & details of card application should be entered in card application issue register. The register must ensure the track of each & every card applications. All the applications received during the day should be sent to ATM Switch Centre no the same day. The address of account holder displayed by the software should be edited as per the application form as applicable. In case the card holder did not get PIN from the ASC within 10 days of sending the date the matter should be referred senior manager ATM switch centre (ASC) & to the chief manager of Information Technology Department (ITD), after 20 days. After processing the card application data by ASC, card is sent by the card venter and PIN is sent by ASC to the branch. The ATM officer should upload the card application and issue register for date of receipt of PIN milers and card. If any unsealed/accidentally opened PIN mailer should be sent to the back ATM switch centre with request to reissue new PIN. The receipt of the card from the vendor the Verification_Officer should intimate to the customer to collect their cards and PIN personally from the branch. The Verification_Officer should keep the track for the intimation and should take care that the customer intimated for collection of the card. The customer upon intimation from the branch comes to the branch for collection of card and PIN mailer. The customer identity should be verified before issue of card and PIN mailer though signature of the register, photograph on the bank record. The Verification_Officer should make an entry of date and time issue in card application and issue register also verify the card number given on the PIN mailer and actual card number are the same. The officer should sign

in the register as the officer issuing the card and the PIN mailer.

2.2 UML Sequence Diagram

UML sequence diagram for a domain based system is shown below in Fig.3. The sequence diagram shows

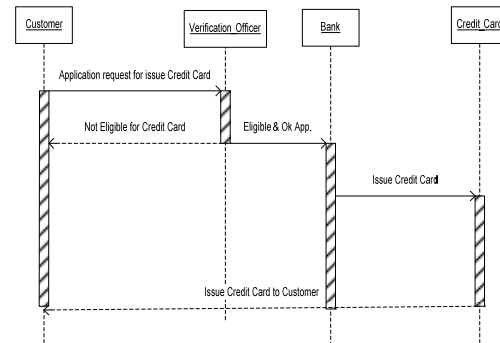


Fig.3.

UML Sequence diagram of domain based Credit Card System

This diagram shows that how a new customer to applied in a bank for a credit card. This sequence diagram shows the complete issuing process of a credit card. With four main objects shown at the top of diagram. The communications between two objects are shown by an arrow along with communication message. The vertical line shows the life line of the object. The customer applies for the credit card with request application to the bank and the verification officer checks the application whether customer fulfils all the eligibility criteria then verification officer informs to customer regarding the rejection of application request along with the reason. If the application is complete in all respect then verification officer sends the application of customer to the branch of bank. The bank issues the credit card and sends the card to the customer through the credit card department. The main purpose to draw the sequence diagram for domain based system is to check the system dynamically making perfectly or not.

3. Implementation of UML Class Model Through Data Cube

The UML class model is implemented through the design of data cube for the credit card system which concludes the data bank of bank, from the class diagram major attributes are collected & 3D view of cube

according to the three major attribute of Credit_Card class that is Customer_ID (A), Card_Number (B),Branch_Location(C) is show in Fig.4.

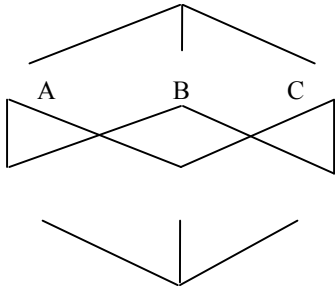
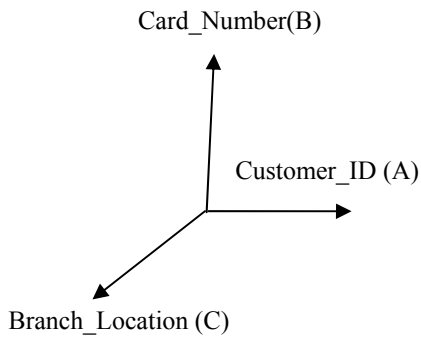


Table 1: Sample Domain of Credit Card

Customer_ID (A)	Card_Number(B)	Branch_Location (C)
AB	AC	BC

ABC

(a) 3-D Cube with the dimension A, B, C



(b) 3-D Cube with Attributes

Fig.4. 3D View of Cube

786	1352874165842636	Lucknow
432	3455701119149678	Sitapur
542	3167017191486791	Lucknow
111	1154968478799952	Biswan
765	6847895221783314	Lucknow
896	3805658478978331	Lucknow
871	3677005221789814	Lucknow
674	3805658478978331	Kanpur
.....
991	3825555478978321	Lucknow

The data bank of credit card arranged in a anomalies table shown at Table 1: this table can be contented for the N customer. Now let us consider first two records contains information related to Customer_ID(A), Card_Number(B) & Branch_Location (C).The attribute customer new may be the same but the Customer_ID is unique number allotted by the bank.

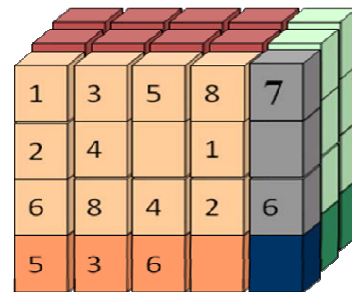


Fig.5.Front view of sample Data Cube

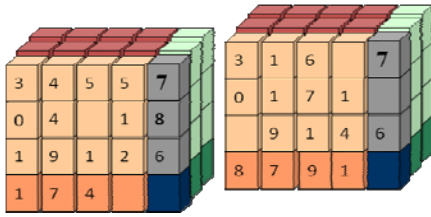


Fig.6. Entire view of sample Data Cube

The data cube formed from the data bank is a 3-dimensional representation, which each cell (A, B, C) of the cube representing a combination of attributes is shown Table 1: A sample data cube for the front view of data cube attribute is shown in Figure 5. The content of the each cell is count of the number of times that specific values come collectively in the database. Cell that shows blank basically they have value zero. The cube can be used to retrieve information from the databank & one can also search data from databank. The main aim is to retrieve the decision support information from the data cube in a very easiest way. Several queries are performed on the given domain of data cube to retrieve necessary information. The entire view of data cube of sample data is shown in Fig. 6.

Query1:

```
SELECT      Customer_ID,Card_Number,
            Brnch_Location
FROM        Table Name
CUBE BY    Customer_ID,Card_Number,
            Brnch_Location
HAVING     Customer_ID='786'
```

The output of the above query is shows the record which store in data cube with ID '786'.

Query2:

```
SELECT      Customer_ID,Card_Number,
            Brnch_Location
FROM        Table Name
CUBE BY    Customer_ID,Card_Number,
            Brnch_Location
HAVING     Customer_ID='111'and
            Branch_Location=='Biswan'
```

The output of the above query is shows the record which store in data cube with ID '111'and the Branch_Location is Biswan.

Query3:

```
SELECT      Customer_ID,Card_Number,
            Brnch_Location
FROM        Table Name
CUBE BY    Customer_ID,Card_Number,
            Brnch_Location
WHERE      Branch_Location=='Kanpur'
```

The output of the above query is shows the record which store in data cube the Branch_Location is Kanpur.

4. Protection Technique for Domain Based System

The design of domain based system must be secure, therefore a well known Rivest, Shamir, Adelman (RSA) Algorithm is proposed for securing the system file. This technique is widely used by the several banks for securing the digital signature. A sample design of RSA algorithm is shown in Fig.7.

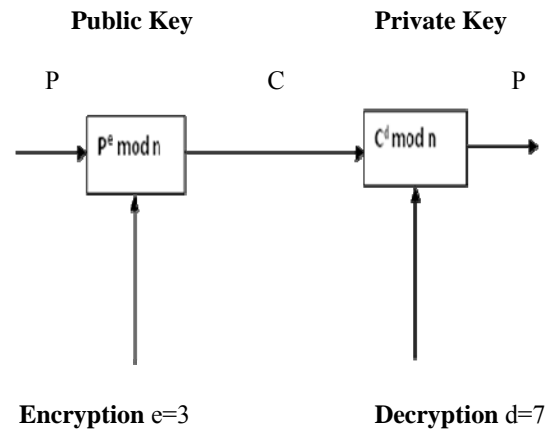


Fig.7. Encryption & Decryption System

Encryption Decryption methods are well known and the main aim of the algorithm is to compute the encryption key and decryption through the following steps,

Step1 Choose two large primes, P and Q each greater than 10¹⁰⁰

Step2 Compute n = pq and (φ(n)) = (p-1) (q-1)

Step3 Choose a no. d to be a large , random integer that is relatively prime to φ(n),

Step4 that is such that $\gcd(d, \phi(n))=1$.

Step5 Find e such that $ed \bmod \phi(n) = 1$.

The algorithm is used to secure the data bank & simple computation for securing the Card_Number is shown in Table 1. The Card_Number is taken as plain text which be converted into cyper text(C) through encryption technique & this cyper text (C) is finally converted in into plain text(P) through the decryption method as shown into the Table 2.For computations let us consider $[p=3]$ & $[q=7]$.The main purpose of proposing this algorithm that till today cracking record is not available in literature & moreover selection of price numbers are more than (10^{100}) which finally converts the cyper text and these cyper text numbers on proposing this algorithm that till today cracking

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Table 2: Implementation of RSA Algorithm on Credit Card Number Security

<i>Card_Number (Sender) Plain Text(P)</i>	$P^{e=3}$	$P^{e=3} \bmod 33$	<i>C Cyper Text</i>	$C^{d=7}$	$C^{d=7} \bmod(n=33)$ Receiver(Q)
1	1	1	1	1	1
3	27	27	27	10460353203	3
5	125	26	26	8031810176	5
2	8	8	8	2097152	2
8	512	17	17	410338673	8
7	343	13	13	62748517	7
4	64	31	31	27512614111	4
1	1	1	1	1	1
6	216	18	18	61222032	6
5	125	26	26	8031810176	5
8	512	17	17	410338673	8

4	64	31	31	27512614111	4
2	8	8	8	2097152	2
6	216	18	18	61222032	6
3	27	27	27	10460353203	3
6	216	18	18	61222032	6

5. Concluding Remarks

From the above it is concluded that the systematic procedure from UML modeling for domain based system, design through the data cube technique, implementation & protection technique for the system are explained in this paper. The UML class diagram for the domain based system is very efficient & one can get the result for several queries on the credit card domain within fraction of seconds. In the end of paper protection method for domain based system are explained. This primary work can be further expended in the field of data mining through the UML modeling.

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