**Project - Assignment I**

**Guidelines**

1. It is expected that the associates will work **on this** assignment on their own or in groups of 2 people each for section 1, 2 and 3 only. The deadline for submission is Monday 19h of March in white paper at 10 AM.   Implementation of the code will follow after classroom discussions as a next assignment

2. Brevity and clarity in language is expected. So be precise in what you write. Hazy or nebulous answers are not encouraged

3. Please be innovative in your solutions. At the same time, **simplicity is encouraged**. Container data structures can include Hashtable, Map, Multimaps, Sets, multisets, Vector, Linked List, Deque. Please think about combining data structures based on Use Case.

4. Thought process will be the focus on this assignment. So please be clear in pictorial representation. Pictorial representation will help you visualize the problem and help you in choosing right algorithms and data structures

5. Throughout the course this case study will be extended to cover additional topics. So please keep track of the solution

 6. Subsequent sections are individual contributions only. Any collaboration for expected individual contributions is strictly prohibited.

**Case Study**

Banks issue two types of credit cards. Visa and Master Card. These cards carry a card number that is of 16 digits. When customers are issued credit cards they can be one of these types. Typically the card member details are taken as input by the bank. These include

* Date of birth
* Address
* Full Name
* Identification like  Social Security Number or Drivers license
* Email id
* Card number
* Card expiry date
* Card issue date
* CVV number

Some banks like CITIBANK print the full name of the person on the card (First Name and Last name) whereas certain banks like ICICI Bank, American Express ( Please note that Amex does not issue visa or Master cards, they issue Amex cards) have a restriction of not being able to fill up more than 20 characters. In the second scenario, banks ask the customer how the name should be spelt on the card. This will give rise to another data field that will be the Name Printed on the Card Versus full name that is described earlier.

Certain banks also restrict the address field where each line on the address has a restriction of a certain number of characters whereas most of the banks have a free format per line.

1. Section 1
2. Design a data structure to hold all the necessary data for a card. You may choose to add additional fields for efficiency. Please note that if you design a Record you will look at each element

for efficiency in storage. It can vary from pointers to fixed arrays to anything else that you deem fit.

1. Design a data structure that will hold all the above data for all customers? Explain your choice on efficiency in memory, ability to adapt, or search complexity.
2. If (2) has to be a Data structure that will hold all customer data in a sorted order, what would be your data structure? Explain your choice
3. What would be your indexing criterion?
4. Banks use credit card number as in index. If that is the case how will your choice of (2) change
5. Banks also use a person’s name to index. If that is the case how will your choice of (2) change
6. If you have to give a facility that a customer can be indexed with either his name or card number what type of data structures will you use?

Section 2

1. American express uses 15 digits for its credit card. If a hypothetical bank MeToo Bank issues credit cards that can be 15 digits or 16 digits.   Will your selection of data structures in section 1 change. Will all of them change or only a few record elements will change.  Explain the rationale

Section 3

1. If you have a memory constrained device for which you are defining the solution how will your choice of data structures in Section 1 change. Explain why

Good luck

Second Assignment: Due Date – 26th March

**Section 4**:

Implement your choice of data structures and a hash table for the problem described above. Assume total number of records to be a reasonable number like 2048 or 4096 for max size

Store the customer data in a file. Use Unix File System calls for file operations. After storing, please read and output the contents on a screen

**Third Assignment- Due date to be confirmed**

**Section 5**

Create two processes.  The two processes will communicate through each other over Shared Memory. The first process will load into a shared memory segment and second process will read it from the segment and store it in a file.  Please do a file comparison programmatically to make sure both files are same. Use semaphores for synchronization and use UNIX Signals to signal end of data from one process to another process

**Section 6**

Create two processes. Design a mechanism to share the data from Process A to Process B through Sockets.  You may have to device a serialization mechanism to share this way. Do not Use UNIX Signals. Process B should detect exit of process A and then decipher the data exchange is over

**Section 7:-**

1. Can you store the data in xml format in the file. Decide what would it take to do it this way
2. What do you need to do if the data has to be stored in binary format