BSCS FINAL PROJECT

Requirements Specification Phase 1

Smart DMV (Department of Motor Vehicle)



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# Software Requirements Specification

# Version 1

# Smart DMV (Department of Motor Vehicle)

# Advisor: Zaid Munir

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Revision History

|  |  |  |  |
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| **Name** | **Date** | **Reason For Changes** | **Version** |
|  |  |  |  |
|  |  |  |  |

# Introduction and Background

In this modern age where technology is overcoming our daily routine tasks everyone is trying their best to reduce man power and create solutions to make our lives much easier. The increase in the technological environment also results in the increase of the malicious actors on the network to exploit the system to get benefit. Now-a-days, the process of motor vehicle registration is semi-digital but its network is centralized and is vulnerable to data tempering. This digitalization is not at its best due to the problem of identity management. If this process will be implemented on blockchain then it will help in reducing the fraud rate as well as reduce time required to do a lot of work. It will be beneficial for both government as well as the owners of motor vehicles in the sense of time saved, the cost reduced due to the smart contracts involved in blockchain implementation. Other than this, it has some environmental benefits due to the reduction of amount of paper used in current system results in reduced carbon dioxide released.

## Product (Problem Statement)

The problem that leads us to developing this system are the loop holes in the current system which provides benefit to malicious actors by exploiting them. Like a car can be transferred to someone else even if the car is stolen as well as owner of the car will remain blinded from the situation. This project will use Block-chain technology to develop smart contracts which will automate the process of motor vehicle registration to reduce fraud around stolen vehicle as well as to transfer vehicle title or to issue vehicle registration.

## Background

This project will help the government as well as owners of motor vehicles in the sense of saving the time, the cost reduced due to the smart contracts involved in blockchain implementation. This solution will create the openings to minimize the lack of system’s durability in terms of fraud and time required to do this procedure. Now-a-days, the process of motor vehicle registration is semi-digital but its network is centralized and is vulnerable to data tempering. This digitalization is not at its best due to the problem of identity management. If this process will be implemented on blockchain then it will help in reducing the fraud rate as well as reduce time required to do a lot of work. Other than this, it has some environmental benefits due to the reduction of amount of paper used in current system. It will improvise the current system and a step forward to make system’s efficiency in more digitalize way by making decentralized system using blockchain technology. These points leads to the development of this project.

## Scope

The scope of this project is to develop a Smart Department of Motor Vehicle(DMV) that will reduce the fraud rate, data tempering, remove few extra steps involved in current system and decreasing the time required in many processing. The system developed would be a Web and Android based application.

## Objective(s)/Aim(s)/Target(s)

* Develop a user-friendly Web based and Android based Application.
* Reduction in fraud.
* Reduce processing time related to Vehicle Registration/Transfer.
* Reduce the cost by reducing man power.

## Challenges

* Gathering the information about the current system.
* Finding loop holes in the current system.
* Learn the newly formed technologies like Hyperledger Fabric for the blockchain creation on which the project is based.
* Learn Hyperledger Composer for demo creations.
* Learn NodeJS/.Net for Web Application Development.
* Learn Android for Mobile Application Development.
* Learn Deployment on IBM Bluemix (Cloud Network).

## Learning Outcomes

* Learn to Develop a Project in collaborative environment.
* Learn to Develop as a team.
* Learn to do project in a professional manner by doing proper documentation.
* Learn new tools and technologies related to Blockchain, Web and Android Development.

## Nature of End Product

The end product would be a Web and Android Application developed on the basis of blockchain technology with user friendly interface, to help the government and the owner of vehicles to do things online in efficient way.

## Completeness Criteria

The functioning Web and Android Application based upon the blockchain technology where the user perform their activities like transferring a vehicle, etc.

## Business Goals

This system can be sold to governments around the world to digitalize their network of department of motor vehicle and achieve their goals of digitalization by replacing the existing system.

## Related Work/ Literature Survey/ Literature Review

The process of digitalizing the government institution is at its peak around the world where as the digitalization of these institution on the basis of blockchain technologies is in its preliminary phases around the world. Canadian government is exploring the potential of blockchain technology so it can implement it. Government of Dubai has launched an initiative named Smart Dubai to shift all the government transaction onto the blockchain network with a strategic goal “Dubai will be the world’s first blockchain powered government ‘Driving the Future Economy’”.

## Document Conventions

### The document is written in Times New Roman

### Normal text size is 12.

### Heading size is 14.

### Normal Line spacing is 1.0.

# Overall Description

## Product Features

* Vehicles Registration
* Imported Vehicles Registration
* Transfer of Ownership
* Misplaced/Stolen Registration Certificate
* Change of Engine Number (Alteration)

## User Classes and Characteristics

* Primary
  + Vehicle Owners who wants to register, transfer or block (in case of stolen vehicle) their vehicle.
* Secondary
  + Excise officers who will be network administrators.
* Tertiary
  + None

## Operating Environment

* Our system Website/database will be deployed on government servers which will be accessed through internet.
* Web based Application can be run on any System, browser and operating system with the processor greater or equal to Core 2 duo and Ram equivalent or greater than 2 GB
* Mobile based Application can be run on Android with Marshmallow or greater version with Ram greater than or equal to 2GB.

## Design and Implementation Constraints

Constraints and difficulties are always there in implementing something new to the existing system. Along with the advantageous facts, our system also have some boundaries for its development.

* Learning the amateur technology and implementing it.
* Regulatory Policies of the excise department due to which there is a lack of communication and results in less knowledge of current system.
* Many departments which are related to this does not provide interfaces to other applications like Banks.
* We have to use a set of specified technologies, tools and databases because of the limited technologies, tools and databases support the blockchain development for now like CouchDB, Hyperledger Fabric, Hyperledger Composer, etc.

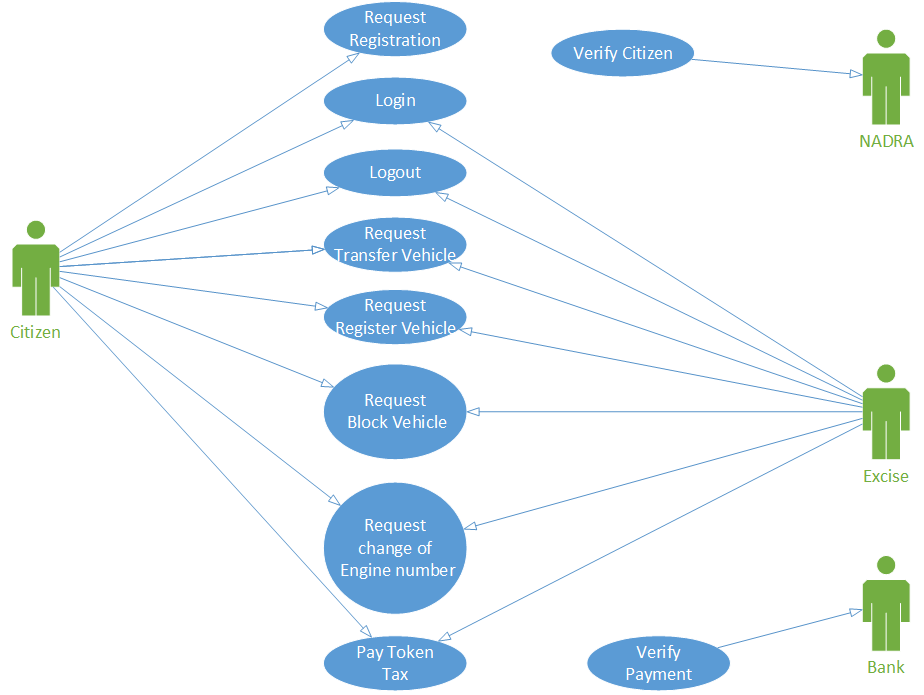
## Assumptions and Dependencies

The scope of this project is vast and because of this vastness we have to take many assumptions due to the presence of many third parties involved in it.

* The allotment of registration number (Vehicle Identification Number) is assumed to be done manually on the current system and then entered in our system.
* The payment method through bank will not be added in it because of the lack of availability of the API of bank for payment verification, instead we will use a demo portal of bank for payment verification.
* Like the above mentioned scenario of bank, there is also a similar case with the Custom Department in case of Imported Cars.

# Functional Requirements

**Use Case Diagram**

****

## Request registration

|  |  |  |  |
| --- | --- | --- | --- |
| **Identifier** | | Citizen, NADRA | |
| **Purpose** | | To Register in the Smart DMV | |
| **Priority** | | High. | |
| **Pre-conditions** | | * Registration screen must be appeared on screen. | |
| **Post-conditions** | | * Registered in the Smart DMV | |
| **Typical Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Citizen accesses the WEB/APP | | System promotes the Citizen to get register in the System |
| **2** | Citizen will verify his/her self through NADRA using Thumb Print/message identification. | | NADRA will verify the Citizen and he/she will be registered in the system. |
| **Alternate Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Invalid information entered. | | Citizen will not be registered in the System and a prompt will be displayed. |

Table 1: UC-1

## Verify Citizen

|  |  |  |  |
| --- | --- | --- | --- |
| **Identifier** | | Citizen, NADRA | |
| **Purpose** | | To verify citizen | |
| **Priority** | | High. | |
| **Pre-conditions** | | * Request verification sent to NADRA | |
| **Post-conditions** | | * NADRA will verify the citizen | |
| **Typical Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Citizen accesses the WEB/APP | | System promotes NADARA to verify citizen |
| **2** | Citizen will verify his/her self through NADRA using Thumb Print/message identification. | | NADRA will verify the Citizen. |
| **Alternate Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Invalid information entered. | | NADRA rejected the citizen registration. |

Table 2: UC-2

## Login

|  |  |  |  |
| --- | --- | --- | --- |
| **Identifier** | | Citizen, Excise | |
| **Purpose** | | Login into smart DMV system. | |
| **Priority** | | High. | |
| **Pre-conditions** | | * Login screen must be appeared on screen. * Actors must be registered. | |
| **Post-conditions** | | * User is logged-in to the system. * User have accessed to functionalities of system. | |
| **Typical Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | User enters the login information and click the login button | | System authenticates login information and give access to system. |
| **Alternate Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Invalid credentials entered | | Shows the error |
| **2** | User might not exist | | Error: User not exists |

Table 3: UC-3

## Logout

|  |  |  |  |
| --- | --- | --- | --- |
| **Identifier** | | Citizen, Excise | |
| **Purpose** | | To leave the system. | |
| **Priority** | | Medium | |
| **Pre-conditions** | | * User is logged-in. * User no longer wants to be logged-in. | |
| **Post-conditions** | | * User is logged-out. | |
| **Typical Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | User clicks on the logout button. | | * System logged out the user from the system. * System redirects the user to the login page. |
| **Alternate Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Click on another feature button. | | Open the features of the clicked feature button. |

Table 4: UC-4

## Request Register Vehicle

|  |  |  |  |
| --- | --- | --- | --- |
| **Identifier** | | Citizen, Excise | |
| **Purpose** | | To Register Vehicle in Smart DMV system. | |
| **Priority** | | High | |
| **Pre-conditions** | | * Citizen must have account in Smart DMV system. * Excise officer must have account in Smart DMV system. | |
| **Post-conditions** | | * Vehicle Must Registered. | |
| **Typical Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Citizen clicks on the New registration feature button. | | System shows the new registration requirements. |
| **2** | Citizen enters the registration number given to him by excise office and clicks on the Submit button. | | System verifies its payment and alerts the excise officer about the request. |
| **3** | Excise officer verifies the documents and accept or decline the request. | | Citizen will be informed. |
| **Alternate Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Click on Info feature button. | | Can show the procedure how Smart DVM system works. |

Table 5: UC-5

## Request Transfer Vehicle

|  |  |  |  |
| --- | --- | --- | --- |
| **Identifier** | | Citizen, Excise | |
| **Purpose** | | Transfer the vehicle to another citizen. | |
| **Priority** | | High | |
| **Pre-conditions** | | * Citizen must have account in Smart DMV system. * Excise officer must have account in Smart DMV system. | |
| **Post-conditions** | | * Vehicle transferred onto Citizen’s name. | |
| **Typical Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Citizen clicks on the Transfer feature button. | | System shows list of requirements, what system wants. |
| **2** | Citizen enters the transfer details and clicks on the Submit button. | | System verifies its payment and alerts the excise officer about the request. |
| **3** | Excise officer accept or decline the request. | | Citizen will be informed. |
| **Alternate Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Click on Info feature button. | | Can show the procedure how Smart DVM system works. |

Table 6: UC-6

## Request Block Vehicle

|  |  |  |  |
| --- | --- | --- | --- |
| **Identifier** | | Citizen, Excise | |
| **Purpose** | | To Block Vehicle in Smart DMV system. | |
| **Priority** | | High | |
| **Pre-conditions** | | * Citizen must have account in Smart DMV system. * Excise officer must have account in Smart DMV system. | |
| **Post-conditions** | | * Vehicle Must Blocked. | |
| **Typical Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Clicks on the New block registration feature button. | | System Block vehicle requirements. |
| **2** | Clicks on the Upload button. | | Actor Uploads the Digital documents. |
| **3** | Clicks on the Go Smart button. | | Smart contract executed |
| **Alternate Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Click on Info feature button. | | Can show the procedure how Smart DVM system works. |

Table 7: UC-7

## Request Change of Engine number

|  |  |  |  |
| --- | --- | --- | --- |
| **Identifier** | | Citizen | |
| **Purpose** | | To Update the Engine number in smart DMV system. | |
| **Priority** | | Medium | |
| **Pre-conditions** | | * Citizen must have account in Smart DMV system. | |
| **Post-conditions** | | * Engine number must be changed | |
| **Typical Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Clicks on the Login Button. | | Citizen must be logged in the system |
| **2** | Clicks on Change Engine Number button. | | Engine number must be change after verification. |
| **3** | Clicks on Ok button. | | Updated the New info in System |
| **Alternate Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Click on Info feature button. | | Can show the procedure how Smart DVM system works. |

Table 8: UC-8

## Verify Payments

|  |  |  |  |
| --- | --- | --- | --- |
| **Identifier** | | Bank | |
| **Purpose** | | To verify the payments. | |
| **Priority** | | Medium. | |
| **Pre-conditions** | | Bank must be linked to excise. | |
| **Post-conditions** | | Payments must be verified | |
| **Typical Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Excise send request to bank. | | Bank must receive the notification from excise. |
| **3** | Bank verify the payments details. | | Excise complete transection after verification. |
| **Alternate Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Click on Info feature button. | | Can show the procedure how Smart DVM system works. |

Table 9: UC-9

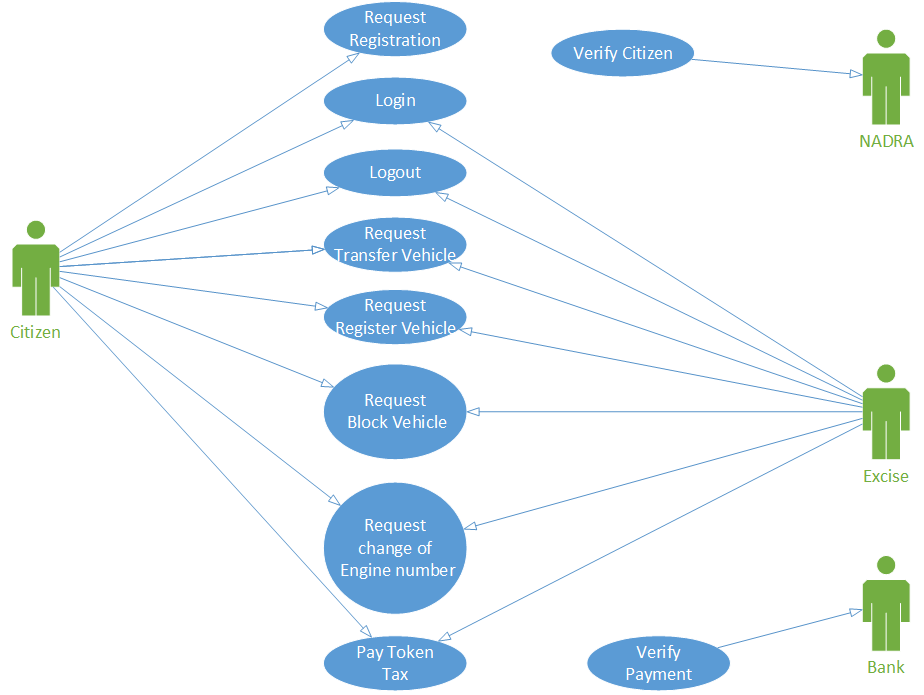
## UC-10 Token Tax

|  |  |  |  |
| --- | --- | --- | --- |
| **Identifier** | | Citizen, Excise | |
| **Purpose** | | To receive token tax of every car registered in our Smart DMV system. | |
| **Priority** | | Medium. | |
| **Pre-conditions** | | Car must be car registered in our Smart DMV system. | |
| **Post-conditions** | | Payment received | |
| **Typical Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Give Fee challan to vehicle owner. | | Generate fee challan according to car |
| **3** | Verify payment | | Bank will verify the payment |
| **Alternate Course of Action** | | | |
| **S#** | **Actor Action** | | **System Response** |
| **1** | Click on Info feature button. | | Can show the procedure how Smart DVM system works. |

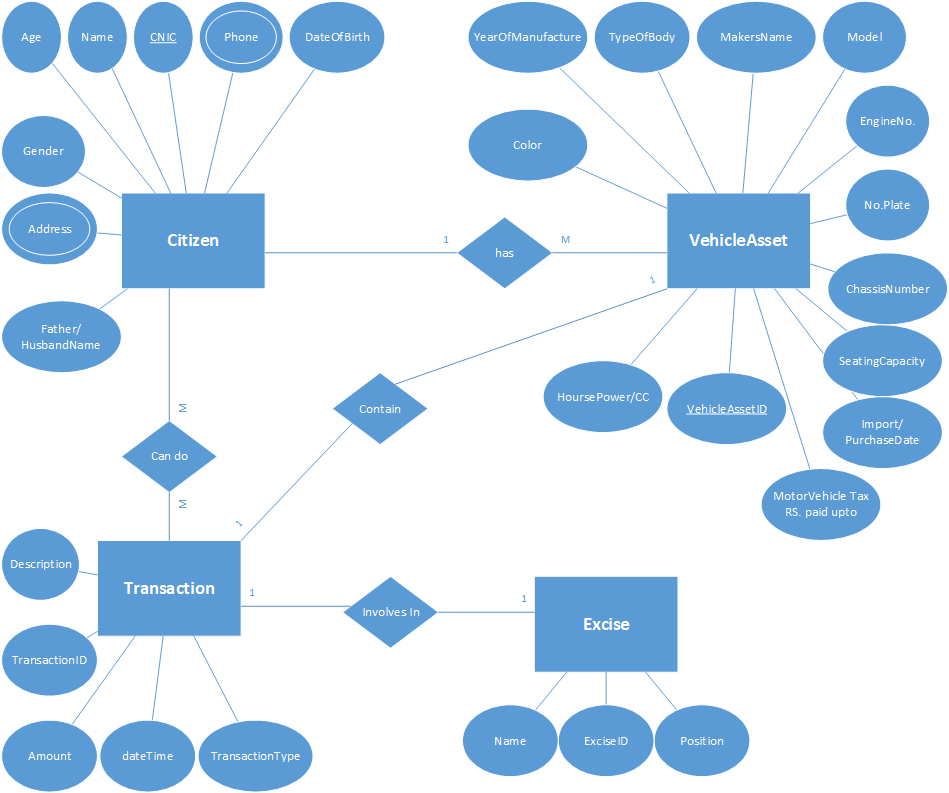
Table 10: UC-10

## Requirements Analysis and Modeling

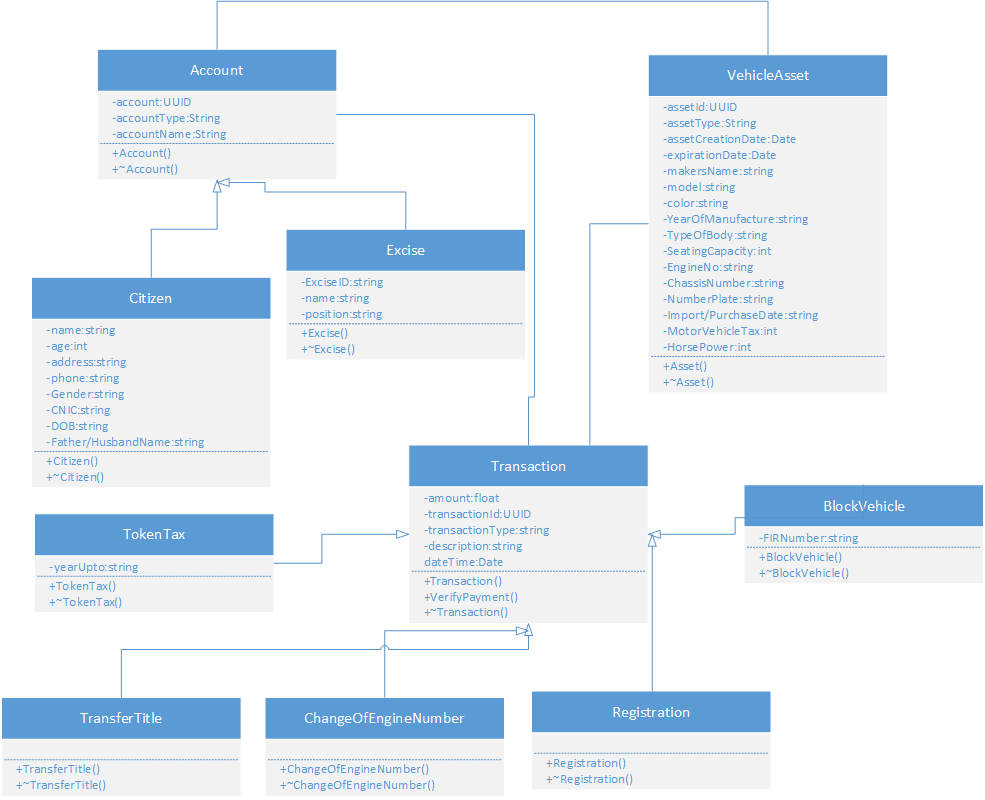
### Use Case Diagram

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### Entity Relation Diagram



### Class Diagram



### Sequence Diagram

* **Register**



* **Login**



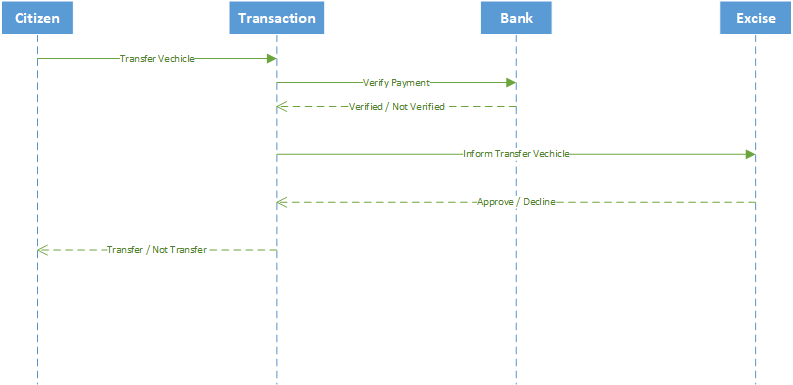
* **Logout**



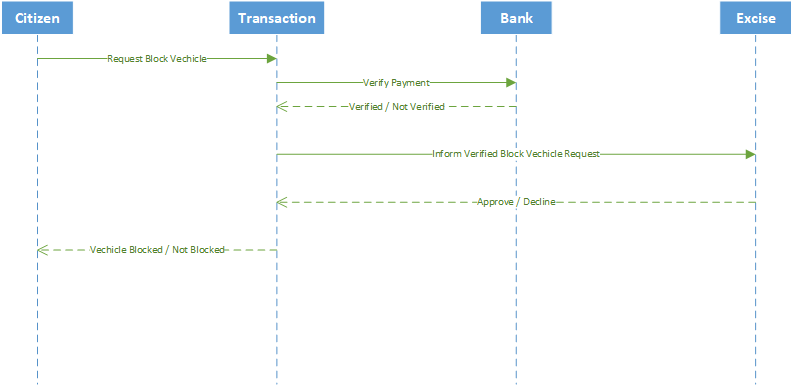
* **Request Registration**



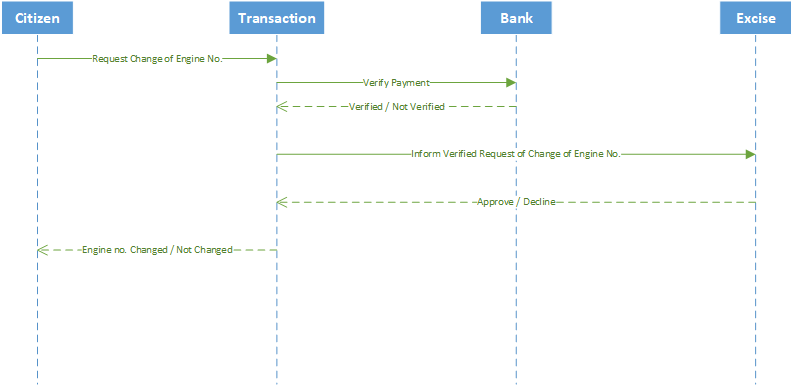
* **Transfer Vehicle**



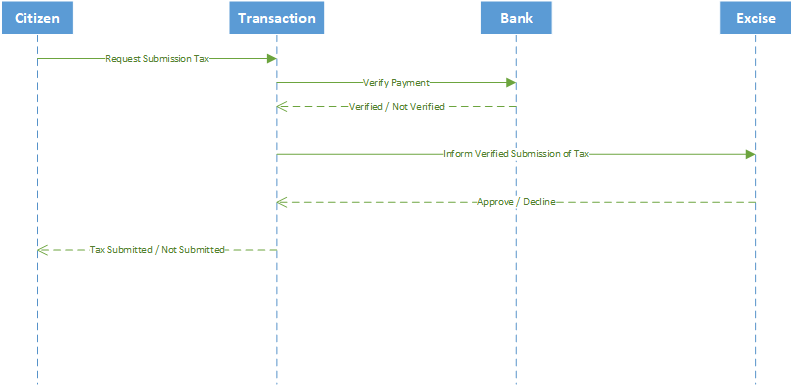
* **Block Vehicle**



* **Change Engine Number Request**



* **Token Tax Submission**



# Nonfunctional Requirements

## Performance Requirements

* The system will be scalable so that under high workload response time will not be saturated.
* It should be accessible through WEB and Android Application.

# Other Requirements

* Android Smartphone with at least Android 6.0
* Minimum i3 system with 4GB RAM, with good internet connection.

# Revised Project Plan

# 

# References

<http://smartdubai.ae/en/Pages/default.aspx>

<https://excise.punjab.gov.pk/vehicle_registration>

<http://excise.punjab.gov.pk/motorvehicle_tax>

<https://www.hyperledger.org/projects/fabric>

<https://composer-playground.mybluemix.net/>

# Appendix A: Glossary

### Block chain:

A **block chain**, originally **block chain**, is a continuously growing list of records, called blocks, which are linked and secured using cryptography.[Each block typically contains a cryptographic hash of the previous block, a timestamp and transaction data. By design, a block chain is inherently resistant to modification of the data. It is "an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way".

### Cryptographic:

**Cryptography** or **cryptology** is the practice and study of techniques for secure communication in the presence of third parties called adversaries. More generally, cryptography is about constructing and analyzing protocols that prevent third parties or the public from reading private messages various aspects in information security such as data confidentiality, data integrity, authentication, and non-repudiationare central to modern cryptography. Modern cryptography exists at the intersection of the disciplines of mathematics, computer science, electrical engineering, communication science, and physics.

* + - **Smart Contract:**

A **smart contract** is a computer protocol intended to digitally facilitate, verify, or enforce the negotiation or performance of a contract. Smart contracts allow the performance of credible transactions without third parties. These transactions are track able and irreversible. Proponents of smart contracts claim that many kinds of contractual clauses may be made partially or fully self-executing, self-enforcing, or both. The aim of smart contracts is to provide security that is superior to traditional contract law and to reduce other transaction costs associated with contracting.

* + - **Document:**

Few documents are attached which are used currently in the department of motor vehicle, i.e. TO Form, F Form, etc.

Appendix B: IV & V Report

(Independent verification & validation)

**IV & V Resource**

Name Signature

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S#** | **Defect Description** | **Origin Stage** | **Status** | **Fix Time** | |
| **Hours** | **Minutes** |
| 1 |  |  |  |  |  |
| 2 |  |  |  |  |  |
| 3 |  |  |  |  |  |
| 4 |  |  |  |  |  |

**Table** 11**: List of non-trivial defects**