



Lane Closure System

Software Design Document

May 2017

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1. Introduction

The Software Design Document (SDD) is a document to provide the written description of the software product. SDD will be used to aid in software development by providing the details for how the software should be built. Within the SDD are narrative and graphical documentation of the software design for the Lane Closure System (LCS) project including use cases model, component (workflow) models, sequence diagrams and other supporting information.

1.1 Purpose

The purpose of the Software Design Document is to provide a description of the design of the LCA fully enough to allow for software development to proceed with an understanding of what is to be built and how it is expected to be built. The Software Design Document provides information in necessary details for the software and system to be built.

1.2 Scope

This Software Design Document is for the Lane Closure System (LCS). This application is intended to be replacement to the existing Lane Closure/Restriction Procedure that is used by CoW. The LCA is designed to be the on-line application which provides support to all participants in the Lane Closure/Restriction Business Process.

1.3 Definitions, Acronyms, and Abbreviations

- **Approver** – the CoW employee (TMB) with authority to approve LCRs as well as manage LCRs which involves conflict management and follow-up; approves organisations and its users;
- **Authorized User** - Authorized Construction Agency or CoW Department personnel submitting request for a lane closure and reporting actual closures or/and restrictions;
- **CoW** – The City of Winnipeg Corporation;
- **DB Utilities** – set of functionalities providing full access to the LCA Data Base through Oracle ODBC;
- **ERD** – diagram that is formed to represent entity-relationship model (ER Model) for the LCA business process; It is the result of System Analysis to define and describe what data is important for the lane closure requesting and reporting processes;
- **GIS** – Geographic Information System which provide API to its Map Display functionality;
- **E-Mail Server** – set of functionalities imbedded in the LCA providing access to web server e-mail utilities; contains User Interface to type in a contest of notes;
- **Enforcement Officer** – Traffic Department (CoW) personnel who enforces the by-laws on lane closures;
- **ODBC** –The acronym stands for Open Database Connectivity API's which allow for standardized database access and interaction from software products;
- **Org Admin** – Construction Agency User-Administrator (Construction Agency personnel) authorized by Approver to manage organisation projects and users;
- **LCS, LCA** – Lane Closure System (LCS) - on-line web based software application to support the Lane Closure/Restriction Business Process;
- **LCR & RLC/RLR** – lane closure Request and Reports of closure/restriction; documents , managing of which is the main target of the LCS;
- **Workflow** – The movement of control and/or information through a work process that is structured into software components (tasks) with designated entity to perform them and the definition of the order or pathway from start to finish for the process;
- **Use Case** - acts as a software modeling technique that defines the features to be implemented and capture functional requirements that specify the intended behavior of the system.

1.4 References

- LCA Business Requirements (LCA-Business Requirements-v1.1.docx);
- LCA Software Requirements (LCA-Software Requirements-v1.2.xlsx);
- LCA Data Requirements (LCA-Data Requirements-v1.4-1.xlsx);
- Requirements Mapping Matrix (1003-2016_FORM N_C1_Dec0716.docx);
- LCA Process Activity Diagram (LCA-Process Activities-v1.1.vsd).
- LCA System Architecture & Design Model (LCA System Architecture V02_1.vpp)*

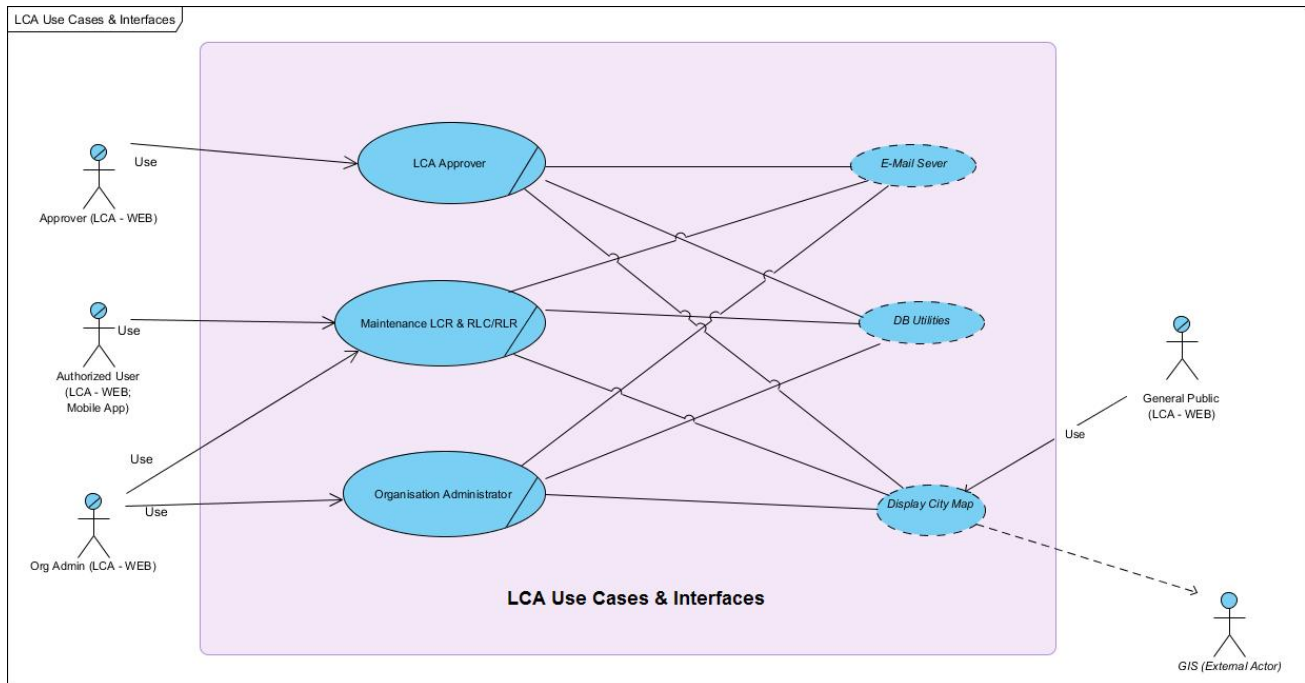
1.5 Overview

The SDD is divided into six sections with various subsections. The sections of the Software Design Document are:

1. Introduction
2. Use Cases
3. LCA Data Base Structure
4. LSA Software Architecture
5. LCA System Design
6. Mobile Reporting Lane Closure System

* The Model can be surfed by "Visual Paradigm Viewer".

2. Use Cases



LCA Use Cases & Interfaces Diagram provides the high level model of the Business Processes of the Lane Closure System (LCS).

2.1 LCA Approver

Actor:	Source:	Use Case Type:	Level:
<i>Approver</i>	<i>TMB Department</i>	<i>Business</i>	<i>Overview</i>
Covering Workflow :			
<ul style="list-style-type: none"> • Approving construction companies and its users to work with Lane Closure Projects; • Evaluating LC Requests and managing their statuses; • Monitoring LC Projects. 			
Precondition:			
Approver has successfully passed through Authentication and Authorization.			
Trigger:			
Approver received notifications from E-Mail Server about changing in LCA repository or routine daily follow-up.			

2.2 Maintenance LCR & RLC/RLR

Actor: <i>Authorized User (and Org Admin in User Hat)</i>	Source: <i>Construction Company or City Department</i>	Use Case Type: <i>Business</i>	Level: <i>Overview</i>
Covering Workflow : <ul style="list-style-type: none"> • Creating and submitting LC Request; • Creating and managing reports of closure or/and restrictions; • Creating "Emergency" Closure/Restriction Report; • Creating Contraventions for LC Requests and Reports. 			
Precondition: User has successfully passed through Authentication and Authorization.			
Trigger: User is working on Lane Closure Project; User received an e-mail notification from E-Mail Server.			

2.3 Organisation Administrator

Actor: <i>Org Admin</i>	Source: <i>Construction Company or City Department</i>	Use Case Type: <i>Business</i>	Level: <i>Overview</i>
Covering Workflow : <ul style="list-style-type: none"> • Setting Up New Organisation (for LCA); • Managing Lane Closure Projects of the organisation; • Setting Up users to work on the projects of the organisation; • Monitoring LC Requests and Reports managing by the organisation users. 			
Precondition: Org Admin has successfully passed through Authentication and Authorization.			
Trigger: Starts New Organisation; daily routine administrative duty.			

2.4 E-Mail Server

Actor: <i>All Business Use Cases</i>	Source: <i>LCA Functionality</i>	Use Case Type: <i>System</i>	Level: <i>Overview</i>
Brief Description: This Use Case describes the system functionality that provide: <ul style="list-style-type: none"> • User Interface to type in (or change standard) message; • API to the web server E-Mail functionality. 			
Trigger: Request from any software component.			

2.5 DB Utilities

Actor: <i>All Business Use Cases</i>	Source: <i>LCA Functionality</i>	Use Case Type: <i>System</i>	Level: <i>Overview</i>
Brief Description: This Use Case describes the system procedures to maintain the LCA Data Base by using ODBC API.			
Trigger: Request from any software component.			

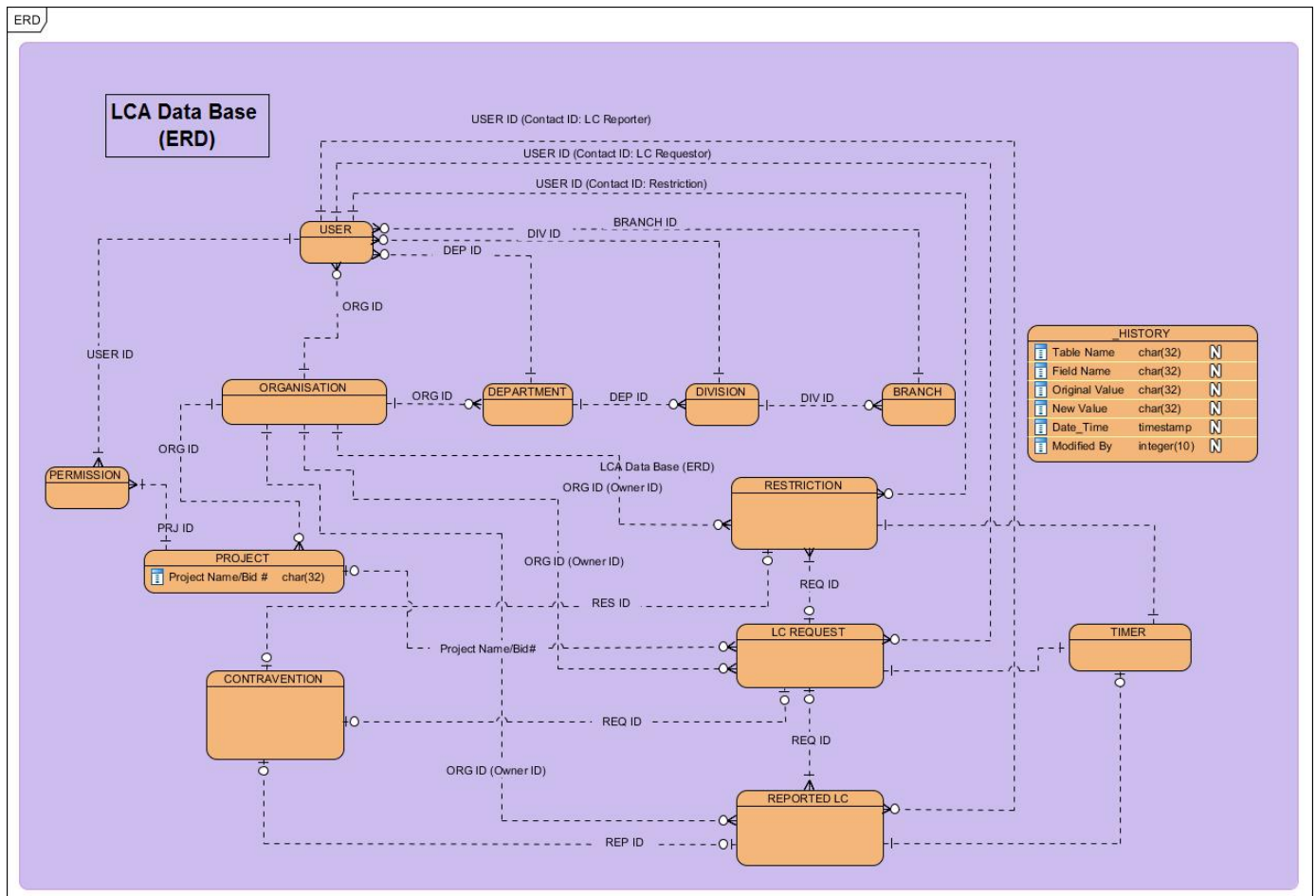
2.6 Display City Map

Actor: <i>All Business Use Cases and General Public</i>	Source: <i>LCA Functionality</i>	Use Case Type: <i>Business, System</i>	Level: <i>Overview</i>
Brief Description: This Use Case describes the visualization of the City Map together with Lane Closure Projects using GIS Functionality.			
Trigger: Request from any software component or request from General Public Interface.			

3. LCA Data Base Structure

The structure of the LCA DB provided in this document is based on the Business and Data Requirement documents of the LCA.

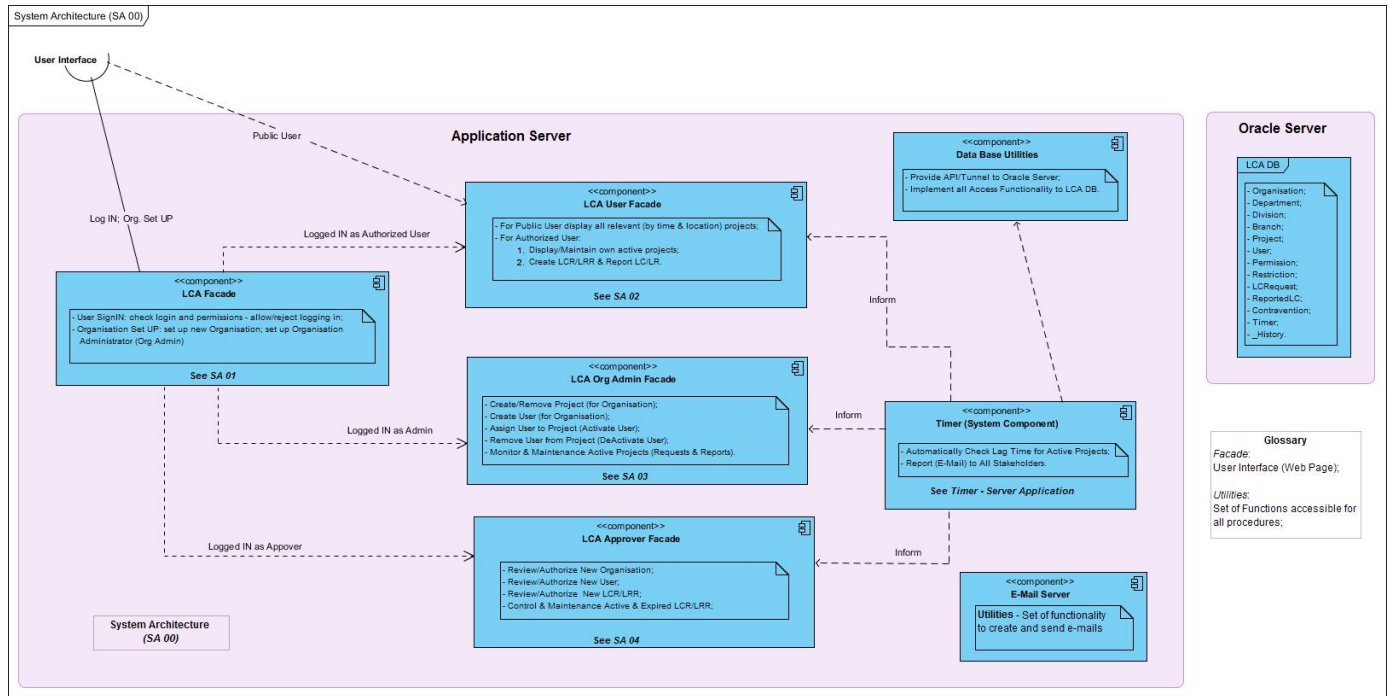
3.1 ERD – LCA Data Base



This Entity Relationship Diagram presents the Entity Relationship Model for Lane Closure System. It describes the LCA business data schema in graphical form. ERD should be used during establishing the LCA Data Base.

4. LCA Software Architecture (SA 00)

Conceptually Software Architecture of the LCA consists of the four packages and three system components. All packages have the facades through which the relative users communicate with the LCA.*



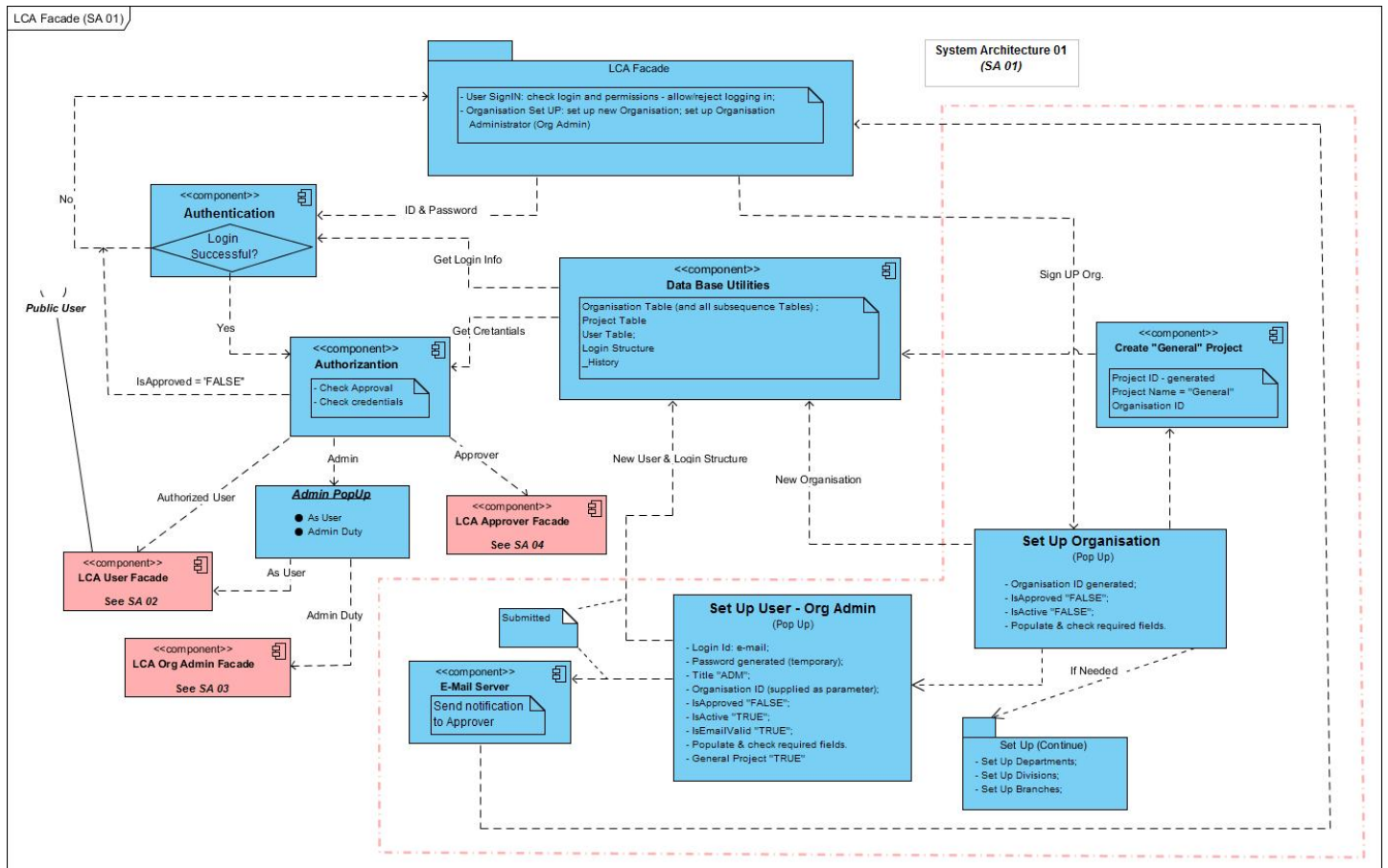
This diagram represents the high level view on the Software Architecture of the Lane Closure System.

* The file "LCA System Architecture V02_1.pdf" contains the full set of diagrams.

5. LCA Software Design

The following subsections present the LCA Software Design by the consecutive Diagrams. Each subsection contains Component Diagram(s) to describe the Workflow for the one software package.

5.1 LCA Facade Package (SA 01)



The above Diagram describes the refined Workflow of the LCA Facade Package. This package supports:

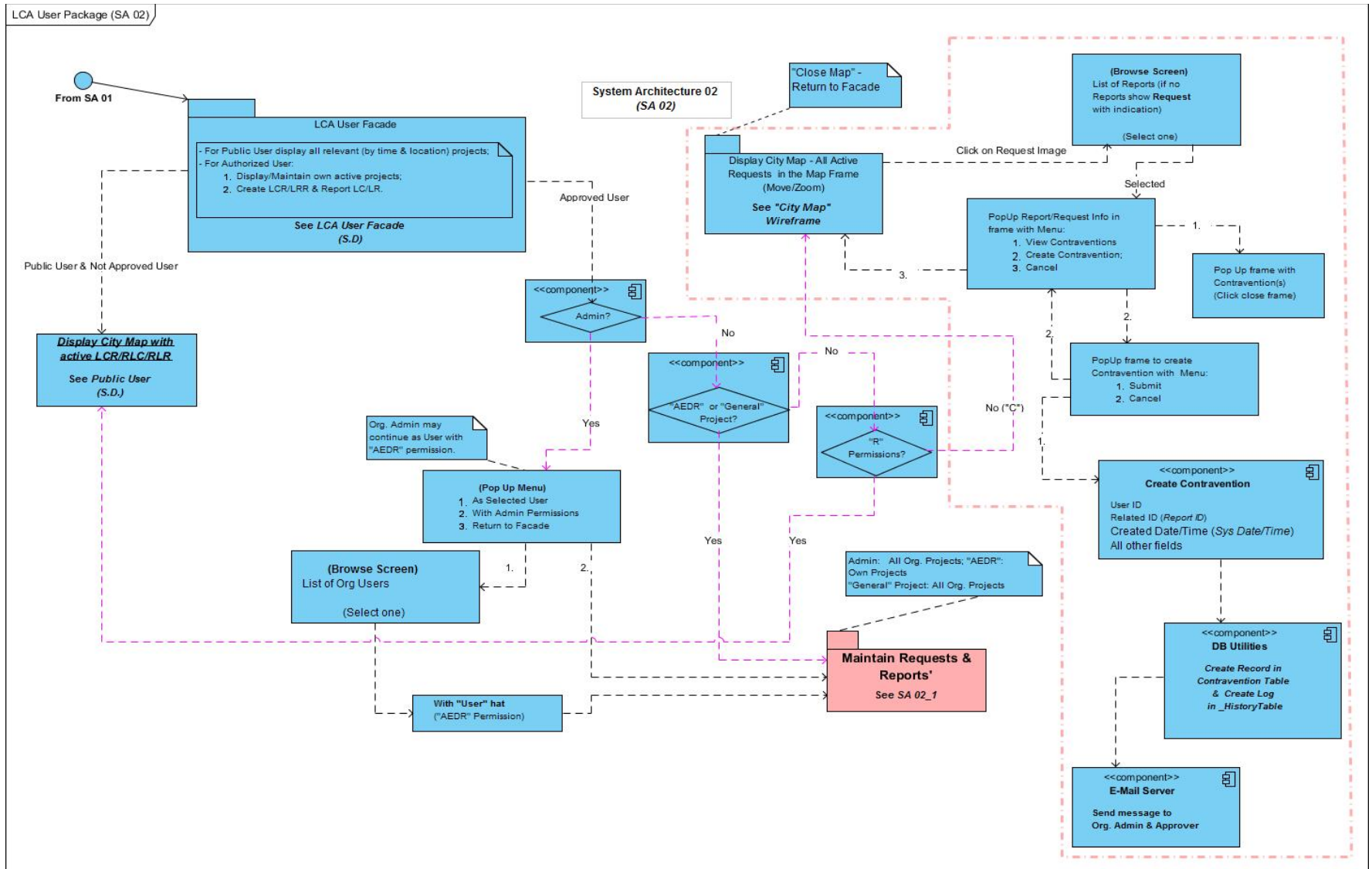
- Setting up a New Organisation and its administrator (Org Admin);
- Checking credentials of the user (if Logging In) and setting up his relevant work flow.

5.2 LCA User Package

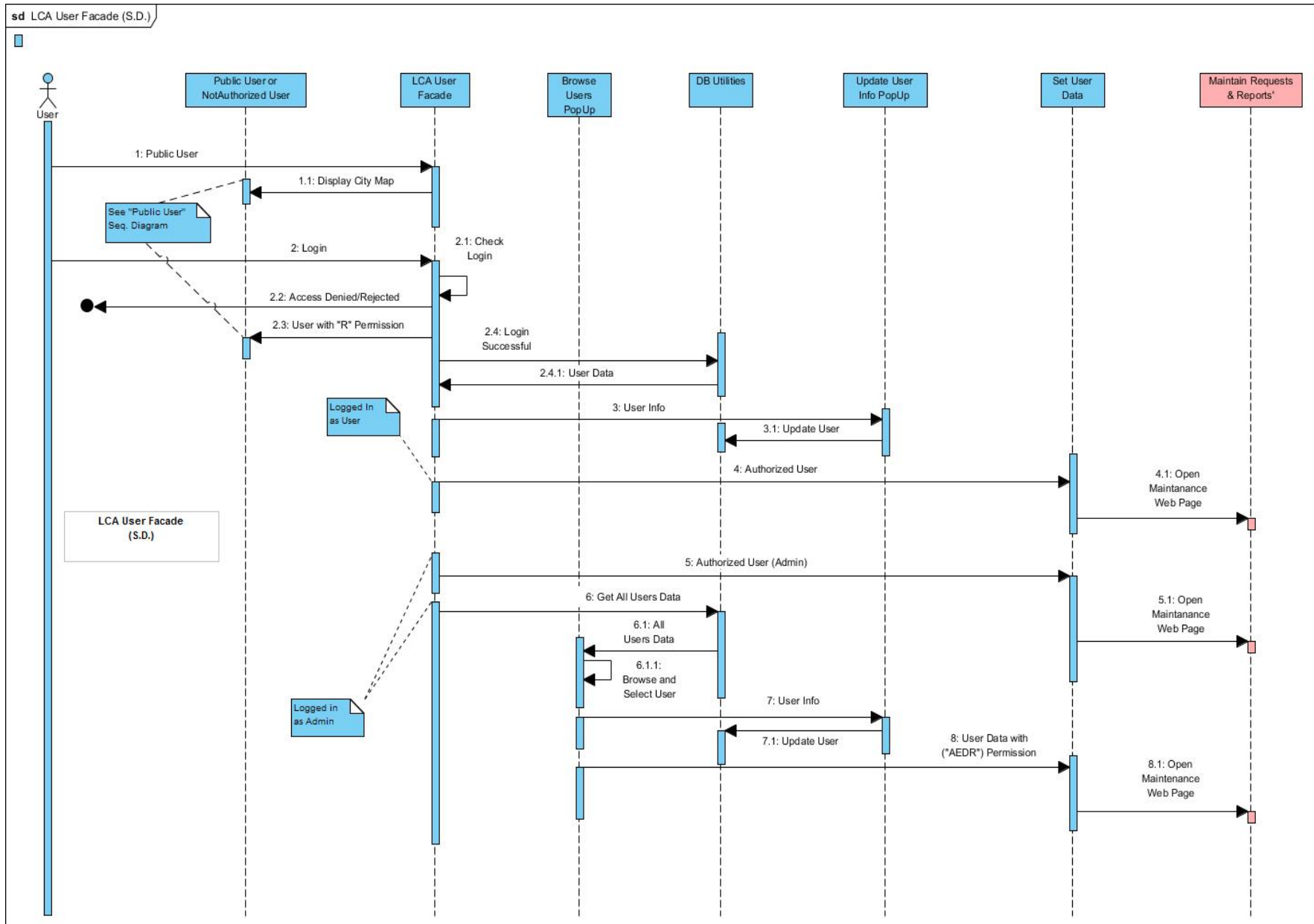
5.2.1 LCA User Facade (SA 02)

The following diagram delivers the detail Workflow for the LCA User Facade Sub-Package (Authorized User):

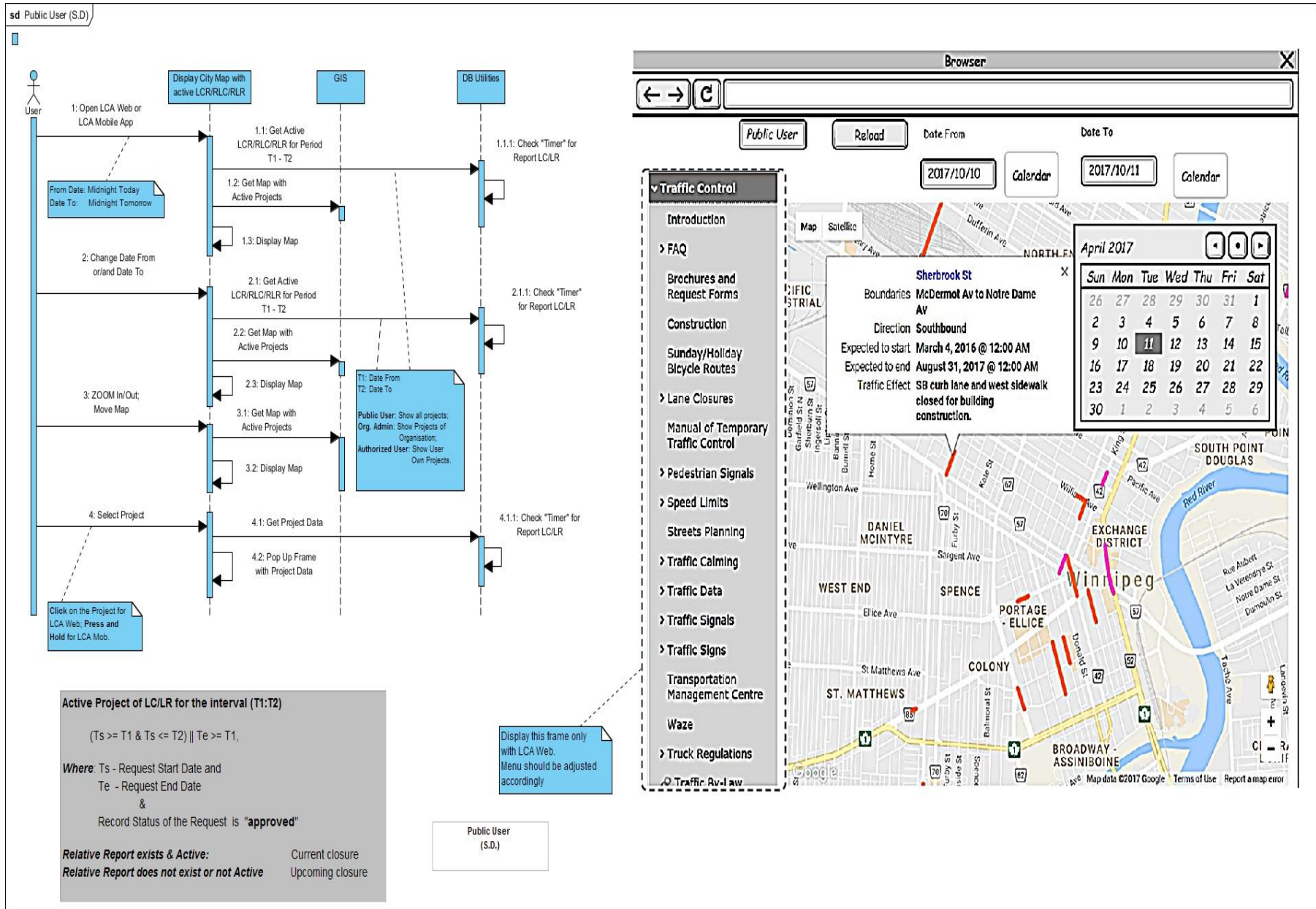
- According to the user credentials prepare working parameters for managing Requests and Reports' (SA 02_1)
- Display City Map for General Public or for User with "R" (Read) permission level
- Workflow for Enforcement Officer (User with "C" permission level) to report Contraventions



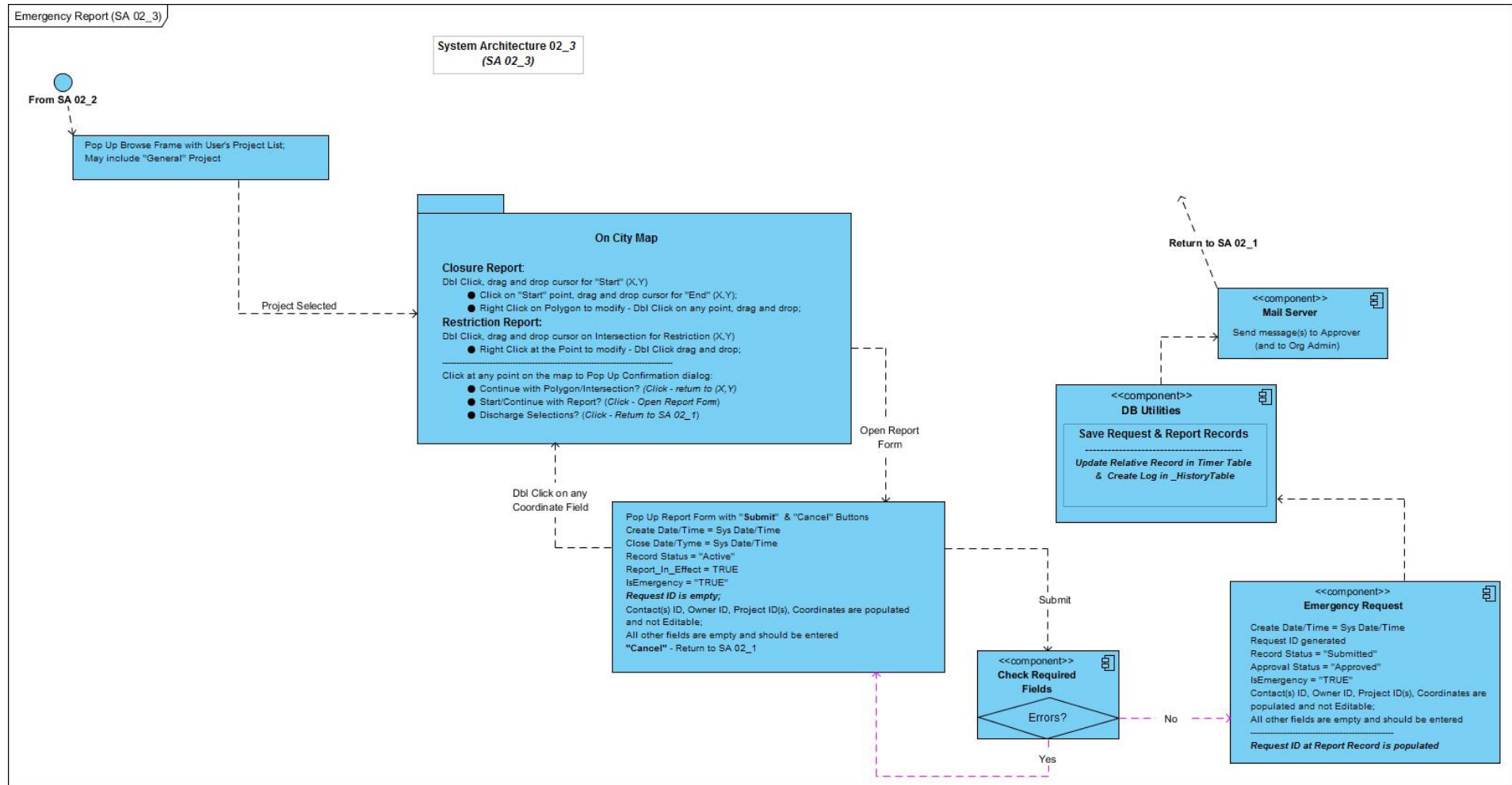
5.2.1.1 LCA User Facade - Sequential Diagram



5.2.1.2 General Public or "R" User - Sequential Diagram

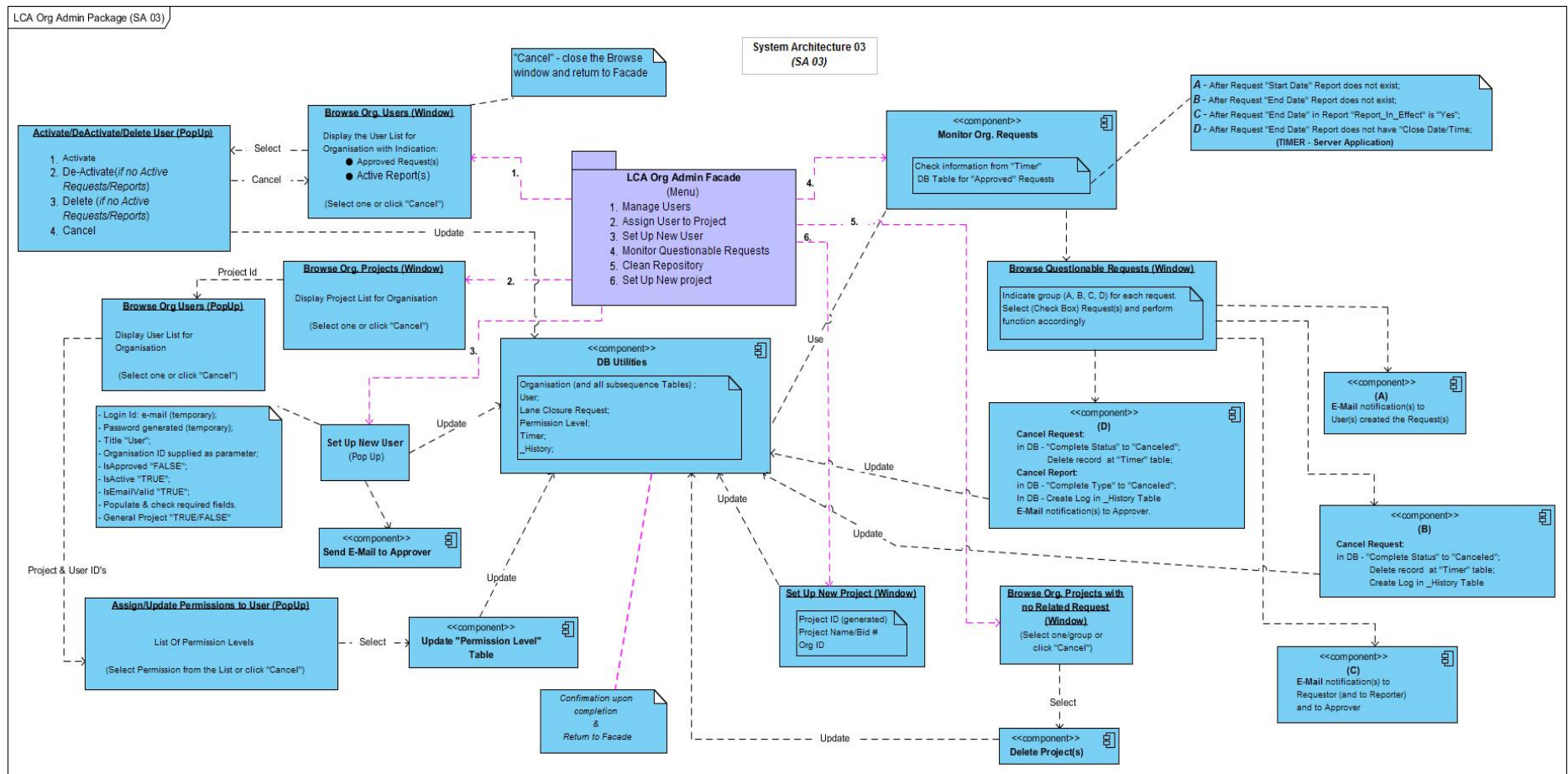


5.2.4 Emergency Report (SA 02_3)



The diagram above provides in detail the Workflow of the business process of creating the “Emergency” Closure or Restriction Report. During this operation the relative Request is creating automatically with the “Emergency” status too.

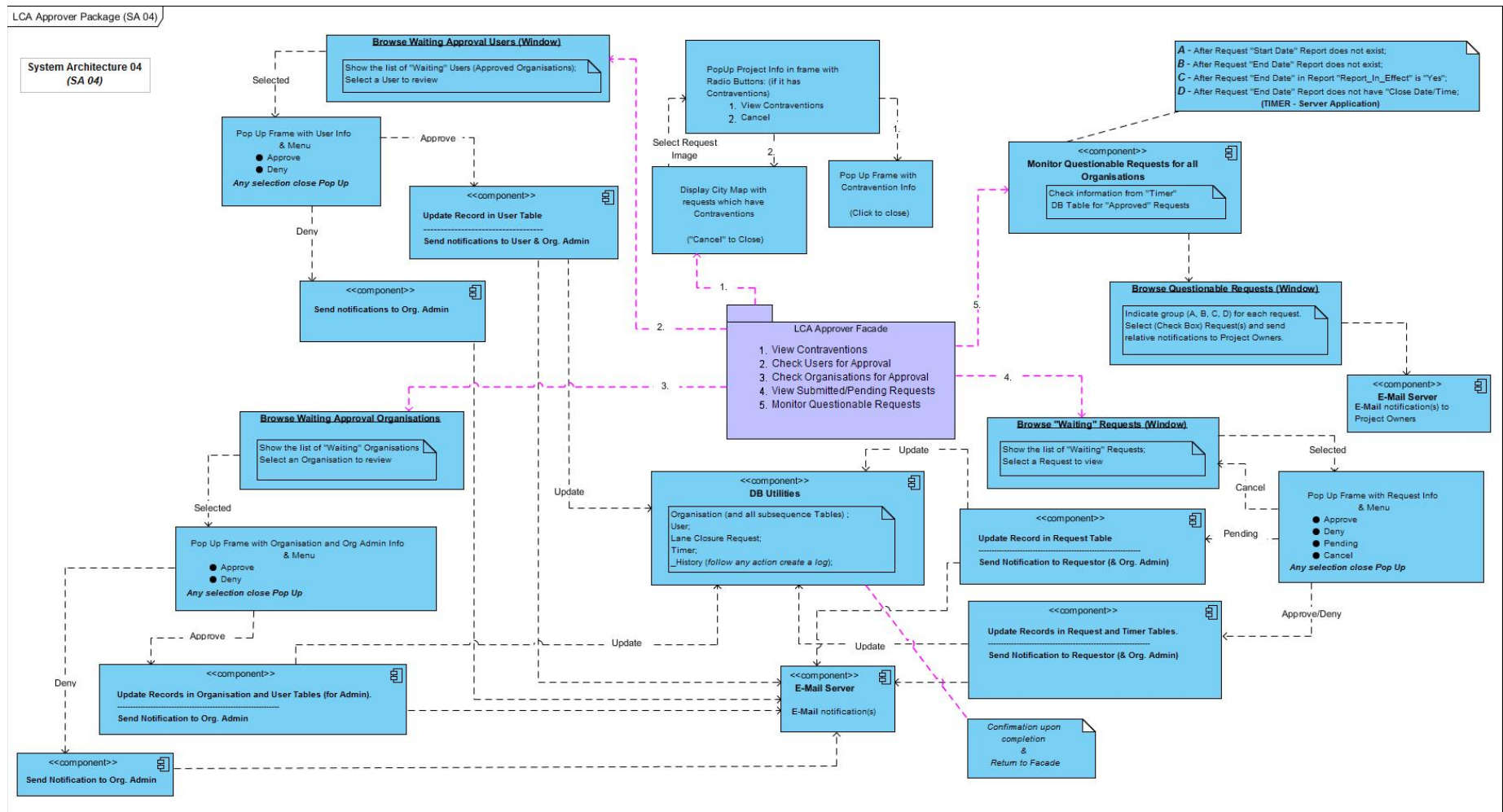
5.3 LCA Org Admin Package (SA 03)



This diagram provides the detail presentation of the Workflow of the Org Admin Package. This package covers the following business processes:

1. Manage Organisation User: Activate, DeActivate, Delete;
2. Assign User to the Project with specified Permission Level;
3. Set Up a New User for the Organisation;
4. Check relevant Status of Requests;
5. Clean Organisation Repository: Remove not relevant Projects;
6. Set Up a New Project for the Organisation.

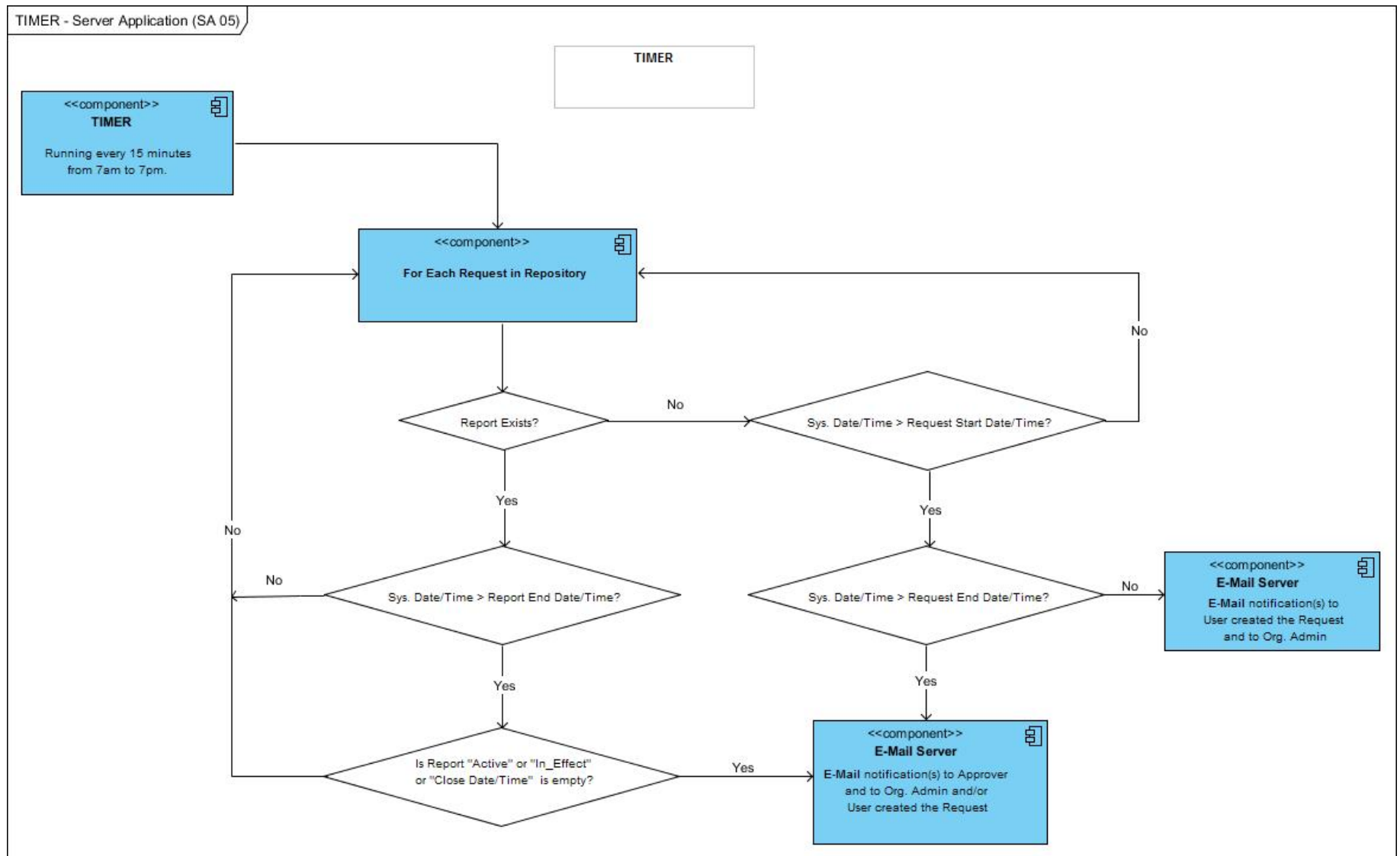
5.4 LCA Approver Package (SA 04)



The above diagram describes in details the Workflow of the LCA Approver Package. This software package supports the Approver business duties in five "streams":

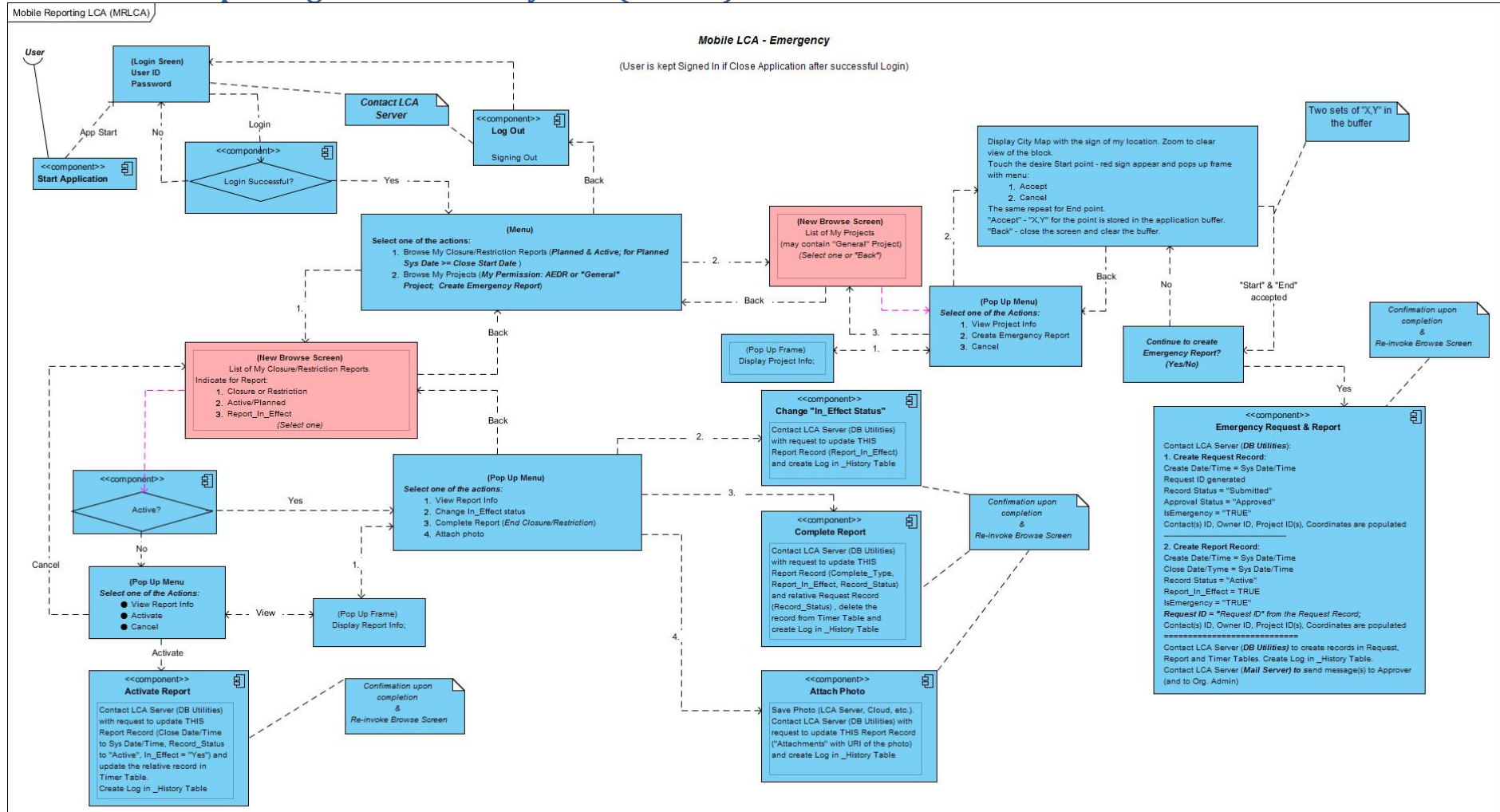
1. Check Contraventions;
2. Approve Users;
3. Approve new Organisations;
4. Monitor and manage submitted Requests;
5. Monitor Approved Requests

5.5 LCA Timer (SA 05)



This diagram presents the Control Flow for the Timer System Application which monitors the status of the approved LC Requests and relative Reports. The application is invoking every 15 minutes from 7am to 7pm.

6. Mobile Reporting Lane Closure System (MRLCS)



This component diagram provides the detail Workflow for the functionality of the mobile part of Lane Closure System. This “Mobile App” is designed to support the Authorized User during his street work. Its functionality consists of:

- Activate existing Report;
- Change In_Effect status of the Active Report;
- Attache photo to the Report;
- Complete Report (Open Closure/Restriction);
- Create "Emergency" Report & relative Request – “emergency” lane closure/restriction.