

technical report of mineral cadastre system

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Mineral Cadastre System

2014

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Review History

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# Abstract

This report is a formal description of the design of Mineral Cadastre System (MCS) and its core architecture. MCS is an integrated module of OpenM4 (OpenM4S is an acronym of National ICT R & D funded project titled “Design, Development and Deployment of an Open Source Mineral Resource Mapping, Modelling and Management System”). This report is a deliverable after the completion of project’s second quarter.

This design document serves as a basis for the detailed design and covers the following components:

* MCS architecture, scope, data design, and component design
* Requirements matrix and essential requirements

*Key words: Mineral Cadastre System, Software Design Document.*

# Introduction

## Preface

Mining Industry of Pakistan produces stones and gems which in turn are exported to generate high revenues for the Country; these minerals include Lime Stone, Coal, Chromite, Marble, Manganese, Fluorite and many others.

The Mining Industry mainly deals with minerals exploration and development and carries out different activities like geological mapping, geological investigation, drilling and reserve estimation. Mineral concession is another function of the department which includes grant of prospecting and mining licenses, and collection of royalty. Rescue operations and inspection of mines etc.

## Purpose

This document describes the architecture and system design of Mineral Cadastre system (MCS). It comprises scope of MCS, overview of document, brief system overview, general system architecture, data design of MCS, component design of MCS, human interface design and requirements matrix.It provides different views to depict different aspects of the system. It is intended to capture and convey the architecture decisions that have been made and elaborates on aspects of the system that are considered to be architecturally significant.

The views include use case view, logical view, deployment view and data view. Also described the drivers that have shaped the architecture of the system, the architectural mechanisms apply to MCS, its performance and security characteristics. MCS is intended for anyone who is interested in mapping application. Aiming to capture and transfer the architectural assessments that have been prepared in order to implement project.

## Audience (Stakeholders)

This is a technical document intended for developer and related technical resources. The audience for this document includes:

* *Client, Funding Agency & PI of the project*

The document may help these stakeholders to examine how the high level design meets the requirements.

* *Team leads, Developers, Internees, and Reviewers*

This document will be used in the design, implementation and testing phases of the Open M4S project.

* *End-Users of the Project - Administrators and Supervisors*

Administrator and supervisors of project may use this design document to understand the structure of the proposed system.

## Scope

This Software design document (SDD) represents the “as-is” architecture document of the MCS design, development and deployment snapshot. As, MCS is using the scrum software development methodology, this document will evolve during project sprints and additional details (generally marked as “to be completed”) will be included as appropriate to reflect decisions and outputs arising from design and implementation.

Mineral Cadastre System (MCS) is an important module of OpenM4S. MCS is useful to the applicant request can process through this Mineral Cadastre System. A simplified view of working of MCS is shown in Figure 1.

Figure goes here!

## Key Features

Key features and initial capabilities of MCS are presented as follows:

* Mines Owner online register
* Approval and rejection through MCS
* Expiry and Renewal process control through MCS

## Benefits

Major benefits of MCS are enlisted below:

* Reduce processing times for applications for registration and mineral cadastre changes
* Provide better access to Mines and Mineral information and improved delivery of registration and cadastral related services
* Ensure an acceptable of quality is maintained with respect to registration and license approval transactions and the associated official record of Mines and Mineral, rights, restrictions and right holders (Mines Owner)
* Reduce the processing effort for the maintenance of the official record of mines and minerals, restrictions and mine owner details.

## Overview

This document represents a big picture of MCS module. It takes account of:

* General idea of MCS
* System overview
* Suggested tools, database and programming language
* System architecture
* Data design
* Component design
* Human interface design
* Requirements matrix

## Reference Material

Here is list of references which were used as source of information while compiling this document:

* Sola
* LMS (Land Management System)
* Directorate of Mines and Mineral (KPK)

# System Overview



## Introduction

Mineral Cadastre is an interpretive process involving multiple departments of information.

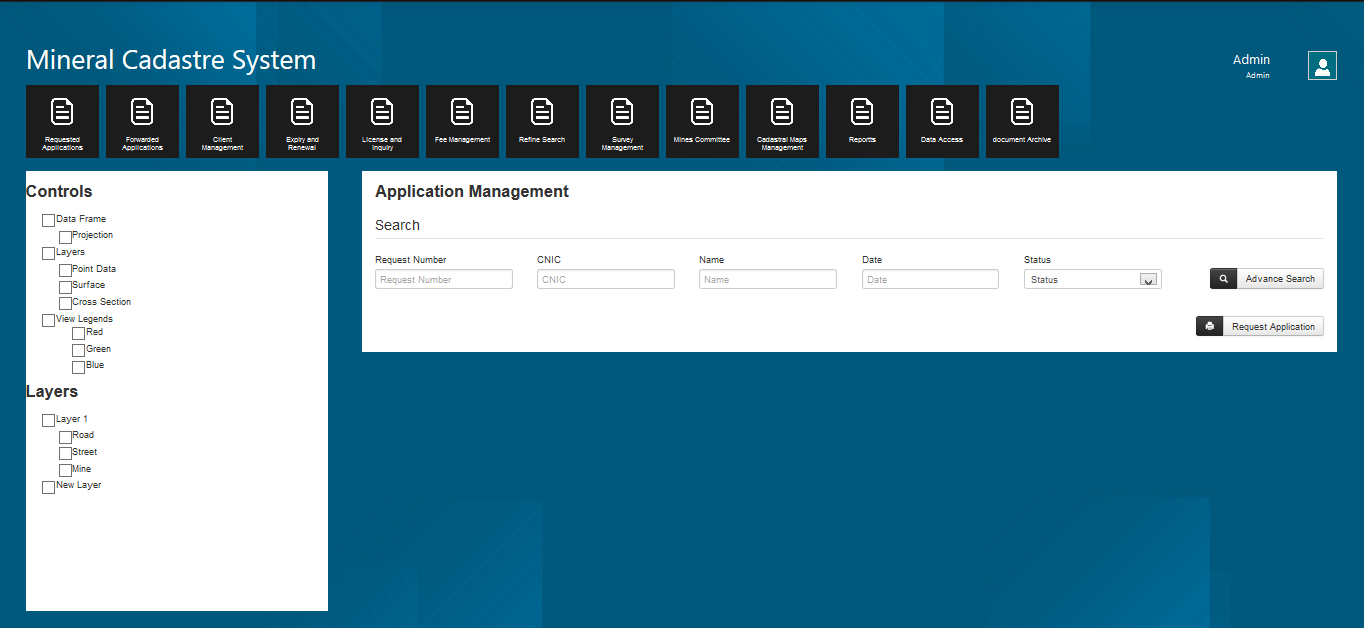


Figure 1: Architecture Overview of Presentation Layer

## Services Layer

The python drivers encapsulates the main business logic for DMS and will be implemented using eclipse and intended to be lightweight and functional.

## Data Layer

The data layer persists the MCS data into PostgreSQL database.

## External Systems

External systems identify the systems, MCS integrates with.

# System Architecture



## Architectural Design

Architecturally significant parts of the design and its decomposition into packages and subsystems comprise the logical view of MCS.

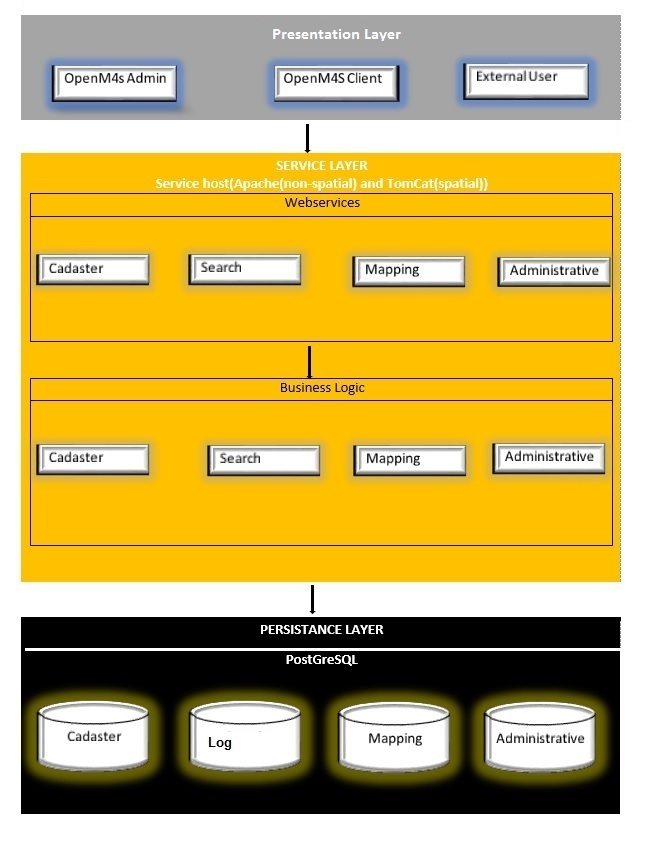


Figure 2: General Layered Architecture

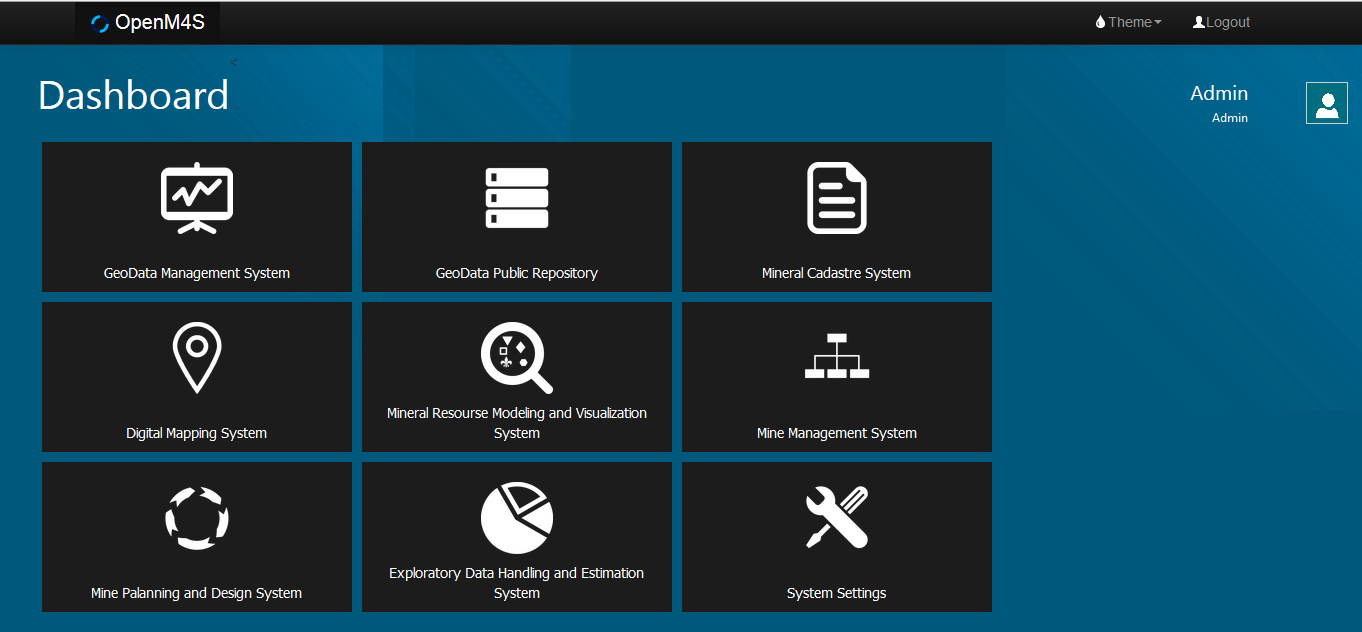


Figure 3: Dashboard Overview

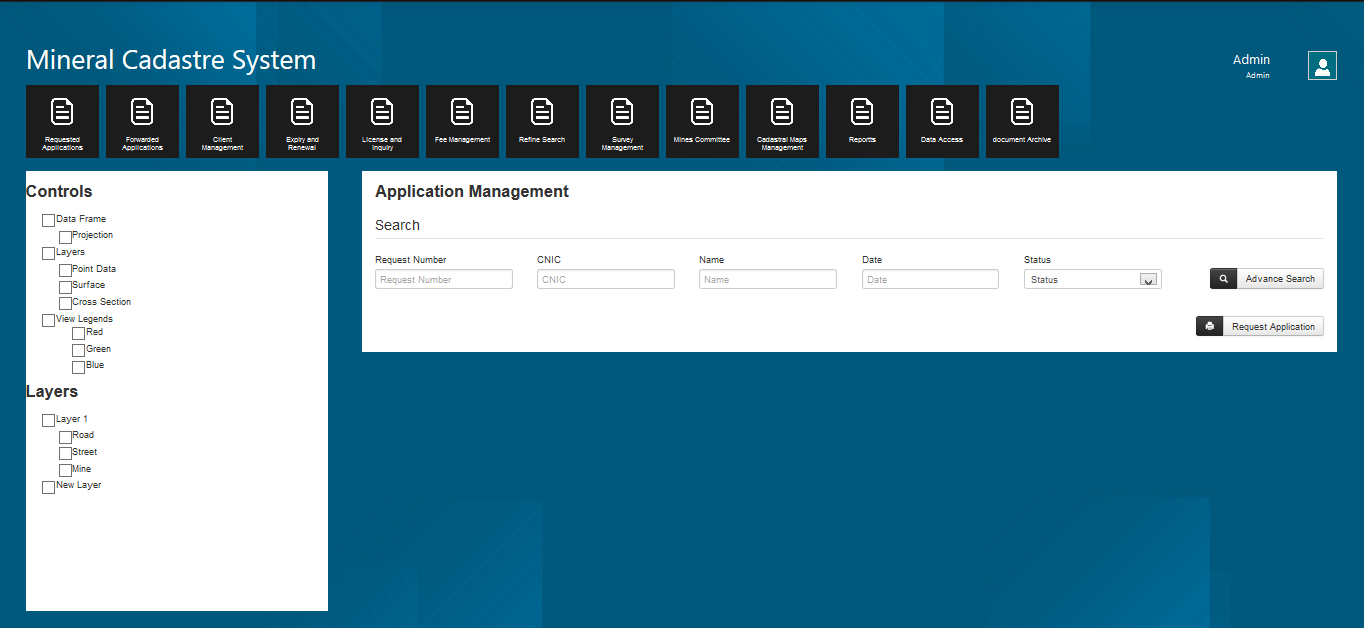


Figure 4: MCS Packages Overview

## Functional Requirement

Table 1 identifies and discusses the functional requirements of MCS that have architectural significance.

Table 1: Requirements of Architectural Significance

|  |  |  |
| --- | --- | --- |
| **Requirements** | **Descriptions** | **Significance** |
| Applicant Request for License | The applicant can make request by providing Coordinates and Attachments. | The Applicant will make request for allotment of license. |
| License Inquiry | The system will information about different type license and requirement details. | Applicant can apply for concerned license |
| Display Fee | System will display licensing fee information for different type of license | Fee Details Information for applicant. |
| Search Record | System can provide facility to user for search record through multiple fields to search for the specific record. | Search facility for the user |
| Search Mines Record filter by License Type | System will do multiple search criteria for searching of Mines record by filter through different of license. | Searching License Information with different type filter |
| Application Approval | Approval Process | The application Approval Process. |
| Initial Survey | Physical survey and drawing and checking in Top sheet by Allotting number | Initial Survey. |
| Geological Survey | Get data from other module for mining information. | Confirm Coordinates |
| Combined Report | Combined will made so that it will be available for decision for allotment of licensing. | MCS to create Report for Higher Authority. |
| Mines Committee | Select Committee member from others modules to build Mine Committee. | Committee decision will accept or reject the applicant request. |
| Final Survey | Prepare (prop lane) and make boundary to define area allotted to the applicant. | Boundary wall definition. |
| Printing | The system will provide facilities to support printing of both generated and imaged documents. | MCS to provide printing facility via MCS web portal. |
| Creation of Cadastral Maps | A mining cadastre is the cornerstone of a secure mineral rights system and records the geographical location, ownership and time validity of mining rights, and for compliance with the payment of fees and/or other requirements to keep a concession valid. |  |
| Reports Creation | Different types of Reports i.e. Issue license, expiry, renewal And inspection reports. | MCS to provide different reports at different intervals of time to facilitate the user. |
| Data Access | Extract Geospatial data of user interest data may be in raster or vector Format. | After extracting data one can draw different Maps based on such data. |
| Common Border | Border which connects two mines or pit is called common border. |  |
| Document Archive | Document Archive is to store and manage both generated and imaged documents. | MCS to implement document archive to support storage and retrieval of generated imaged documents from database. |

# Use Cases



## UC-01 Enquiry:

The client will come to the Directorate of Mines and Minerals office (or telephone or check it online) and be directed to the desk at the public counter dealing with service enquiries being either an enquiry about Specific service application or a general enquiry about what services are about provided by government, what information and supporting documents are required for each service, what are the fees for each service and what is the expected turn-around time for each service.

At the Service Enquiry Desk, the officer speaks with the client and determines the nature of their enquiry. The officer logs onto the system. The system records the starting time for the enquiry.

If it is an enquiry regarding a specific application, the officer will interrogate the system (by application number or applicant name or request number) and determine the status of the application and advise the client on how much longer it should take or what is stopping progress. An application/request status report may be printed for the client if requested.

Where the application being enquired about has been completed, the officer will retrieve any certificates or special reports resulting from the service application plus any supporting documents that are to be returned to the client and hand them over. A document receipt is printed by the system, the client signs and the signed copy of the document receipt is scanned and paper document receipt and its digital equivalent is added to paper and digital application file respectively. If all other necessary actions have been completed, the system records the paper based application file is ready for archiving by the Archivist.

Where the enquiry concerns a service that may be applied for, the officer will make such Information searches on the system as are required to verify the appropriateness of the enquired about service, what details and supporting documents are required for that service and the fees for that service. An information sheet for that service can be printed out for the client, if required. When the client leaves the service enquiry desk, the officer, notes on the system that the Enquiry has been completed. The system records the end time.

## UC-02 Submit Application:

Using forms approved by the Directorate of Mines and Minerals office, the client completes both the application form and the principal document that will be registered / approved / certified / recorded by the Directorate of Mines and Minerals office and, where there is form of title registration, annotated on the title certificate. Client can also apply online for license by filling the online form and attaching the scanned documents. If there is any fees for this step the client should pay the fees in the banks mentioned in the form then attach the receipt with the documents.

## UC-03 Lodging Application:

Once the application is submitted the principal document will need to be signed by all parties and usually this signing will need to be witnessed or notarized by someone independent of the transaction recorded or auctioned by the principal document. The client also needs to ensure all the required supporting documents are available to be submitted as part of the application and that they have available sufficient documentation to verify their personal identity and that they are entitled to register a document with respect to the property identified in the principal document.

Where it is feasible and the user is able to accurately determine the applicable fees, and there is an agency that accepts payments on behalf of the Directorate of Mines and Minerals office, the payment can be made and the receipt included as a supporting document to the application.

The Client proceeds to the appropriate public counter dealing with the lodgements of applications (possibly assisted with automated queuing system). At the counter the Officer will validate the Client’s identity in so far as the Client being entitled to make the requested transaction and similarly that all the necessary supporting documents are present. The officer will then enter details of the application (applicant name and contact details), transaction type(s) and properties affected) directly into the computer. If there is any fees for this step the client should pay the fees in the banks mentioned in the form then attach the receipt with the documents.

## UC-04 Survey Plan:

In the case of the lodgement of a survey plan, the Public Counter will identify a point (or points) on the on-line cadastral map which locates the general location and extent of the survey plan. The system will generate a unique application number. The application is printed (office and client copies) with details of the fees that need to be paid. If there is any fees for this step the client should pay the fees in the banks mentioned in the form then attach the receipt with the documents. The application file is then stored at an appropriate place within the office until the application is complete and the system allocates the application to the “back office” team.

Table 2: Use Case 01 (Enquiry)

|  |  |  |
| --- | --- | --- |
| Identifier | Capability | Feature |
| FN – 1 | Display Service Requirements | Client explains their situation and officer determines the relevant Service. Officer enters type of service and system presents a checklist of supporting documents required for the selected service with the option to print this out for the client. |
| FN – 2 | Online Checking | Client check the status of his/her application or available areas and minerals for licensing |
| FN – 3 | Display.  Service Fee | Officer enters type of service and system presents the fee or the basis for how the fee for the service is calculated. The client has the option to request a print of the fee details |
| FN – 4 | Search  Records | System to present user with a sequence of screens starting with the search criteria (including owner name etc.), followed by a list of records meeting the search criteria and finally a full display of the search target record. |
| FN – 5 | Display search Results | System will search database using the search criteria and display a list of records meeting those criteria for the user to select the specific record that is of interest. |
| FN – 6 | Print Search | Registration Officer requests the current record to be printed. |
| FN – 7 | View Cadastral Map | This map viewer will have the following characteristics and functionality:   * The map should reflect the latest and most up-to-date cadastral boundaries; * When the Cadastral Map Viewer is first displayed, it should zoom to the extent. of the area served by the Office that the user is enrolled as a user; * Access to the Cadastral Map Viewer is strictly “Read-only” for all end users; * Have the spatial functionality to zoom in, zoom-out and pan * To display the scale of the map displayed on the screen * To display the current standard coordinate values of the cursor position * Print displayed map (of the map displayed on the screen or map at the specified scale cantered on the Centre of the screen). Print to have standard copyright and disclaimer notice, that the print is not for sale, and the name of the user initiating the print and the time and date * Simple Page Setup configuration associated with Print functionality [Portrait/Landscape, set margins, title for print-out] * Simple Layer Configuration by the user including the ability to turn on and off the standard layers any associated annotation * Layer display to be automatically controlled by the map display scale with these default values for the scales at which layers become visible being configurable by the system administrator * Ability to measure distance between two user selected points and also to show accumulated distance * Progressive Search function (similar to Google) based on the parcel identifier in the Cadastral Object/ Polygon table. Where the selected instance of the Cadastral Object/ Polygon table is not a parcel, the related parcel polygon will display * Information Tool whereby when a Cadastral Object/ Polygon parcel polygon is selected, a subset of the field values will be displayed in a Tool Tip form along with a function link to print this attribute data. For instances of parcel Cadastral Object/ Polygon, the parcel / property identifiers of related Cadastral Object/ Polygon will be listed. Similar functionality to be provided for any other spatial feature classes implemented within system * Functionality described above to be available through menu structure, toolbar icons and other software structures * Functionality described above to be capable of being manually enabled or disabled by the system administrator or to be controlled by software depending on context and the role of the user * User documentation, preferably context sensitive to be available to users * System to log each time the Cadastral Map Viewer is initiated, by which user and how long the session was |
| FN – 8 | View Work In Progress | System to generate a listing of all work – in –progress (Current Work). Each row to represent an application (registration or cadastre change). |
| FN – 9 | Note Actions | System to note the time and date, action completed. A completed action can also be manually noted by the officer with the current date and time being the default but editable value for the date time field. |
| FN – 10 | Attach  Supporting  Document To  Action | Officer is able to link scanned image of supporting/associated document to a recorded action. |

Table 3: Use Case 02 (Submit Application)

|  |  |  |
| --- | --- | --- |
| Identifier | Capabilities | Features |
| FN-11 | Create New Application | Client should be able to create new application online or he/she can come to directorate and inform officer to do so. |
| FN-12 | Edit Current Application | Current application could be edited by client online or he/she can come to directorate and inform officer to do so if there is some wrong information in the applicant personal profile (e.g. address or NIC, …) |
| FN-13 | Download Form | Client can download the form for submitting application online or he/she can come to directorate and inform officer to do so. |
| FN-14 | Document attachment | Client should be able to attach all the required documents online or he/she can come to directorate and inform officer to do so. |

Table 4: Use Case 03 & 04 (Lodging Application & Survey Plan)

|  |  |  |
| --- | --- | --- |
| General (Cadastre and Registration) | | |
| Identifier | **Capabilities** | **Features** |
| FN-15 | Lodge checklist | Officer enters type of transaction and system presents a checklist of supporting documents required for selected transaction type. If all supporting documents are present, lodgement proceeds |
| FN-16 | Lodge Identify  Underlying  Property | Officer keys in parcel identifier in Google – like search. Where parcel has corresponding record or related title or map record, the user is informed and given the option to view them. Once assured that the underlying parcel / property has been identified or that the transaction applies to no specific parcel or property (e.g. power of attorney, standard form, or first registration), the officer will confirm that the parcel/ property has been correctly described. If not the application is returned. |
| FN-17 | Calculate Fees | The system shall calculate the fee applicable to the transaction. |
| FN-18 | Lodge New  Application | Officer records details on the person making the application (Owner or duly appointed person on behalf of owner) including contact details, records the receipt for the fees and the system allocates a unique application number (the next sequential number applicable to the transaction type of the application) |
| FN-19 | Lodge Survey  Plan | Officer locates general location of survey plan (cadastre change) in the Cadastral Map Viewer and then a point (or points) where a symbol and label of the survey plan number/identifier will appear as a “lodged but unapproved” survey plan |
| FN-20 | Application  Main Documents | Document details of the main document(s) to be registered/ approved are entered and links the scanned images of these documents to the appropriate  document record |
| FN-21 | Print Application | The completed application is then printed. |
| Registration Only | | |
| FN-22 | Record Rights  Restrictions  Details | Capture all the details describing the rights or restrictions affected by the transaction(s) in the application. Changes to reflect new situation are given status “pending registration/approval” and existing records to be superseded the status of “to be retired/cancelled/made historic on  Registration/approval”. |
| Identifier | **Capabilities** | **Features** |
| FN-23 | Identify Share  To Be Changed | Officer identifies parcel and system displays a list of Owners. User selects owner to be changed and likewise share to be changed if owner has more than 1 shareholding. Changes to reflect new situation are given status “pending registration/approval” and existing records to be superseded the status of “to be retired/cancelled/made historic on registration/approval” |
| FN-24 | Record New  Owner Details | Capture all the details describing the changed or new owner. Changes to reflect new situation are given status “pending registration/approval” and existing records to be superseded the status of “to be retired/cancelled/made historic on  registration/approval” |
| FN-25 | Record Transaction Title Changes | Capture all the changes to the title (apart from owner details) that will result from the registration/approval of the transaction(s) in the application. Changes to reflect new situation are given status “pending registration/approval” and existing records to be superseded the status of “to be retired/cancelled/made historic on registration/approval” |
| Documents only | | |
| FN-26 | Scan Documents | Principal and supporting documents are stored in a folder which is accessible to all authorized people such as licensing authority |
| FN-27 | Link Scanned  Images | Licensing Authority identifies the record that they wish to associate a scanned image. The Directorate goes to the central temporary repository of scanned images and identifies the relevant image file. The selected image file is renamed to a name that includes the record type and the record identifier. This renamed image file is then archived within the digital archive database, a link is stored from in the main record database and the image file is marked for deletion from the temporary image file repository at the end of each working day |
| FN-29 | Remove scanned image | Licensing authority must be able to delete a  scanned image and the link |
| FN-30 | View Scanned images | Licensing authority must be able to view scanned image (and potentially print the scanned image) from the associated database record when displayed in a form or as a link from a list of associated records (such as supporting documents). |
| Cadastre Only | | |
| Identifier | **Capabilities** | **Features** |
| FN-31 | Confirm  Underlying Parcel | System to present Surveyor with a map window highlighting the current underlying parcel as specified indeed. User to confirm or select another parcel which corrects parcel identification as entered in registration details window. System to amend status of map parcel to “subject to new survey – approval pending” |
| FN-32 | Record New  Survey | Surveyor records a point(s) which marks the general vicinity of a new survey. Surveyor can delete points defining the same (cadastre) application as is open. |
| N-33 | Attach Surveyors  Report | Surveyor links scanned image of surveyors report as supporting document for this application. |
| FN-34 | Import New  Survey Points | A comma delimited file containing Cartesian coordinates (Easting, Northing, Zone) in the native/standard (to the country) UTM coordinate system for the cadastre (from a geocentric projection such WGS 1984) is loaded, checked to see the coordinates are within the expected range and displayed on a working layer specific to this user session that can only be edited by the user. Coordinate file is added to digital archive for  cadastral surveys |
| FN-35 | Import XML file | A XML containing new parcel definitions in Cartesian coordinates (Easting, Northing, Zone) in the native/standard (to the country) UTM coordinate system (from a geocentric projection such WGS 1984) is loaded, checked to see the coordinates are within the expected range and the (parcel) polygons and boundary nodes displayed on a working layer specific to this user session that can only be edited by the user. XML file is added to digital archive for cadastral surveys |
| FN-36 | Edit Survey  Points | Ability to change survey category of any loaded point/node from “boundary Node” to “non-Boundary Survey Point”. |
| FN-37 | Form New  Cadastre Polygon | Ability to connect boundary nodes to form cadastre polygons and to edit any boundary line in the user’s working layer. System to allocate parcel (cadastre object) identifier. User to specify type of cadastre polygon (parcel, building, easement, etc.) and enter legal/surveyed area and any other parcel details. |
| Identifier | **Capabilities** | **Features** |
| FN -38 | Link New  Boundary Nodes To Existing  Cadastre Nodes | While displaying current cadastre layer(s) and the users working layer, use a drag-and-drop technique to link any new boundary nodes that also define nodes on existing cadastre layers. When linking is complete, system transforms new survey points into terms with existing coordinate values for the cadastre layer(s). Transformation holds the existing coordinate values for existing nodes and where a new boundary node was on an existing boundary vector, this relationship is maintained. Mean shift and standard error of transformation is displayed. Surveyor accepts or rejects. If accepted, the polygon(s) are copied to provisional layers and are viewable by other users. If rejected the user working layer is cleared. |
| FN-39 | Check New Parcel | Surveyor to initiate system check for topological correctness and report on any gaps, overlaps or other issues. These checks plus transformation details are written into the Quality Check for this (cadastre) application |
| FN-40 | Generate New  Parcel Plan | Surveyor to initiate generation of image file of all new parcels (in standard Parcel Plan layout and format) and their attachment as supporting documents to the (cadastre) application |

## UC-05 Approval of Application:

The Approving Officer will select an application ready for approval or registration from their Workspace. They will review, and where there are any critical issues examine them further before approving the transaction or sending it back to the “Back Office” Registration team for further action. If satisfied they:

* Approve each transaction within an application. The system will then change the status of all related records from “pending” to “current” / “approved” or “historic” (in the case of an existing record that is superseded or extinguished as a result of the registration/approval).
* Approve the cancellation or rejection of the application; the system will then change the status of all related records from “pending” to “cancelled” and the underlying original records to “current”.
* Approve the requisition to the applicant asking for remedial work. The system will change the status to “pending requisition”. When one of these approval decisions has been made by the Approving Officer, a notice will be generated and this notice, emailed, faxed or posted to the applicant. This will result (in some but not with all transaction types) the Client returning to the Directorate to collect documents.

## UC-06 Change System Settings:

The System Administrator will be responsible for making the changes to the Static Data definitions which populate system objects such as “drop down” lists and control the values permitted in certain fields The System Administrator will make no changes with respect to system settings without having obtained authorization from the Directorate.

## UC-07 Transaction Audit:

The Directorate will designate one of their Officers as an Internal Auditor needs reporting tools to perform random systematic reviews of individual transactions as well as to investigate transactions where a potential performance problem has been identified either through the regular performance reports or where a complaint has been received from a Client.

The Internal Auditor needs to be able to review what actions were completed with respect to the transaction, how long each processing step took , what key data fields were changed, the before and after key data field values and who made the changes. (i.e. a process “trace” and a key data field “trace” for the transaction under review where mistakes are identified in the title or digital cadastral map, these must be initiated as a new type of transaction, a “Register & Cadastre Correction” transaction and processed as a regular application.

## UC-08 Administrative Security:

The System Administrator will be responsible for creating new user accounts and maintaining related details such as the definition of User Roles (within the computerized system) and what functions and privileges will be associated with different User Roles. The System Administrator will make no changes with respect to user accounts (creation, modification or “retirement”) without having obtained authorization from the Directorate.

Table 5: Use Case 05 (Approval of Application)

|  |  |  |
| --- | --- | --- |
| Identifier | Capabilities | Features |
| FN-41 | View  Application | Registrar initiates approval and system displays transaction and related title records |
| FN-42 | Edit  Application | System to present Approval officer with a series of linked screens and, where practical, selection of values from a list of controlled values and default values to edit any details describing  the transaction |
| FN-43 | Cancel  Application | Approval officer can select option to cancel application with an appropriate comment in applications quality checklist. System generates Cancelation Notice sends it directly to applicant or to a Licensing Authority to send out. System also updates status  accordingly and removes transaction from “work in progress” |
| FN-44 | Re-assign  Application | Approval officer can select option to re-assign application to staff member with an appropriate comment in applications quality  Checklist |
| FN-45 | Register  Transaction | Approval officer can select option to register each transaction in an application. System updates status accordingly |
| FN-46 | Approve  Cancellation | Approval officer can select option to approve the cancellation of a previously registered right or restriction |
| FN-47 | Consider  Registration Notice | Upon registration/ approval, system generates notice of registration and attaches to application as supporting document and where feasible sends notice to applicant / relevant people |

Table 6: Use Case 06 (Changes System Settings)

|  |  |  |
| --- | --- | --- |
| Identifier | Capabilities | Features |
| FN-48 | Manage System  Settings | Local System Administrator to be able to add, modify or retire values in lists of controlled values (code lists) |

Table 7: Use Case 07 (Transaction Audit)

|  |  |  |
| --- | --- | --- |
| Identifier | Capabilities | Features |
| FN-49 | Audit Process  Trace | Internal Auditor and chief of office to request system to list all processes undertaken on a specified dealing (including changes to the cadastral map) including dates and staff member responsible for each process step |
| FN-50 | Audit Key  Data Field Trace | Internal Auditor and chief of office to request system to list all changes made to any key data field on a specified dealing, title,  Survey plan or map parcel polygon including dates and staff member responsible for each change to a key data field. |
| FN-51 | Approval officer  Correction  Initiate | Chief of office to be able to initiate a Record Correction transaction and assign it to staff member for action |

Table 8: Use Case 08 (Administrative Security)

|  |  |  |
| --- | --- | --- |
| Identifier | Capabilities | Features |
| FN-52 | Manage User  Privileges | Local System Administrator (any user for password change) to be able to change system settlings such as controlled value lists (code lists) and user privileges. |
| FN-53 | Manage User  Change Password | Any user to be able to change their own password to a new value. New password to be double entered to validate its correctness |
| FN-54 | Manage User  Privileges Roles | Local System Administrator to be able to add, modify or delete different roles and associate certain permitted actions with each role. |
| FN-55 | Manage User  Privileges Accounts | Local System Administrator to be able to add, modify, suspend or delete individual user accounts for the system |

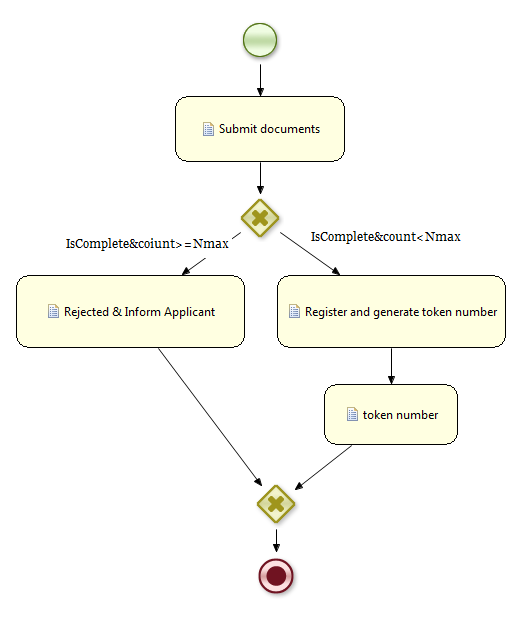
Workflows

This chapter describe the workflows of the whole process starting from submitting application till approval of license, transfer of license and extension of mines.



## Submit Application

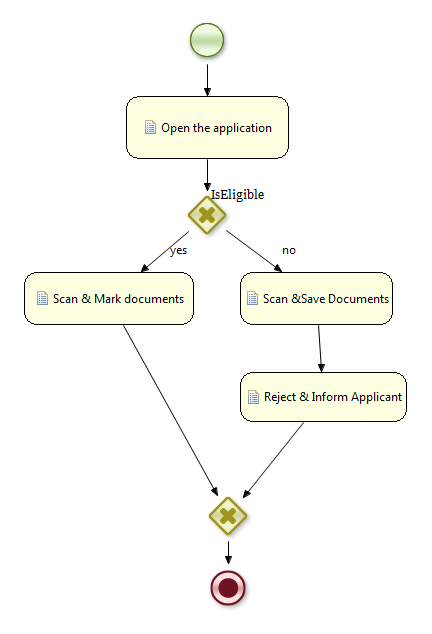
If a user wants to apply for a license he/she should submit the request first. By filling all the details required in a request form and also attach all the documents required. After the request is submitted the attached documents are checked whether the documents are complete or not. If documents are complete the applicant is informed and a token number is generated with the help of which this request can be tracked. If the documents are not complete the applicant is informed and he/she can apply for the license again if he/she didn’t reached the maximum limit for submitting application.



*Figure 5: Workflow of Submit Application*

## Lodge Application

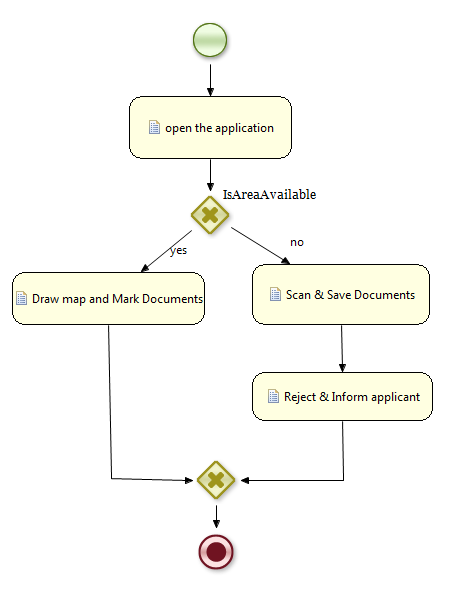
Once it is checked that the documents are complete the applicant should submit the fee so that the authority verify the documents submitted by the applicant. If the documents are valid then the documents are scanned, saved and marked for the initial survey. If the documents are not valid the applicant is informed and he/she can apply for the license again if he/she didn’t reached the maximum limit for submitting application.



*Figure 6: Workflow of Lodge Application*

## Initial Survey

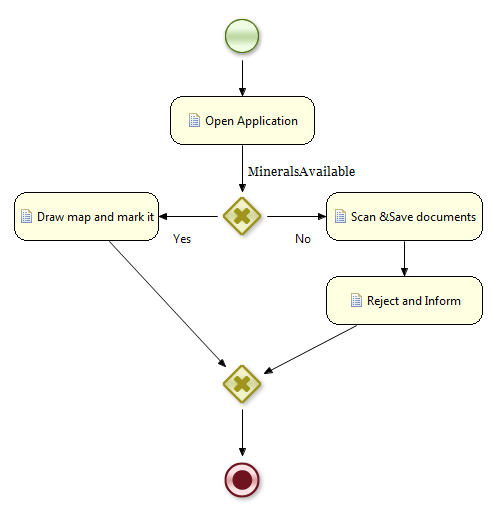
Once it is verified that the documents are valid the survey team check the coordinates and survey the place to check whether the coordinates are correct and area is available or not. If the area is available then they correct the coordinates if there is a small mismatch at the boundaries. On the basis of this survey, the survey team generates a survey report and draw the coordinates on map and mark it for the geo survey team. If the area is not available the documents are scanned and saved in rejected files. The applicant is informed and he/she can apply for the license again if he/she didn’t reached the maximum limit for submitting application.



*Figure 7: Workflow of Initial Survey*

## Geo Survey

After initial survey, the geological team visit the site to confirm the minerals for which user applied actually exists or not. If minerals exists map is drawn, if not then documents are scanned and saved in rejected file. The applicant is informed and he/she can apply for the license again if he/she didn’t reached the maximum limit for submitting application.

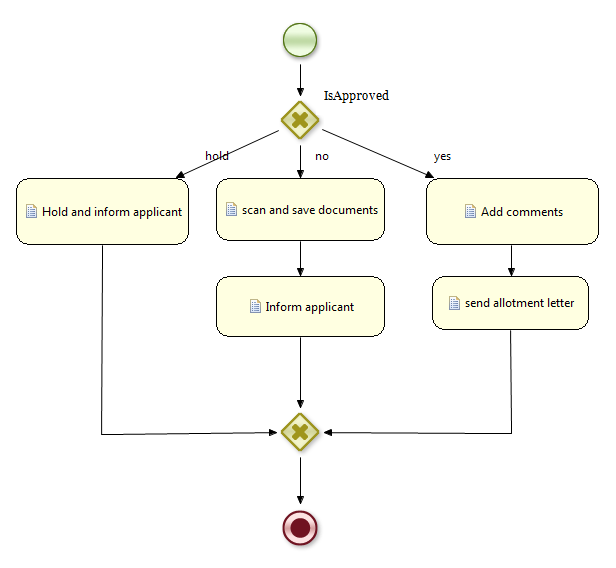


*Figure 8: Workflow of Geo Survey*

## Higher Authority / Application Approval

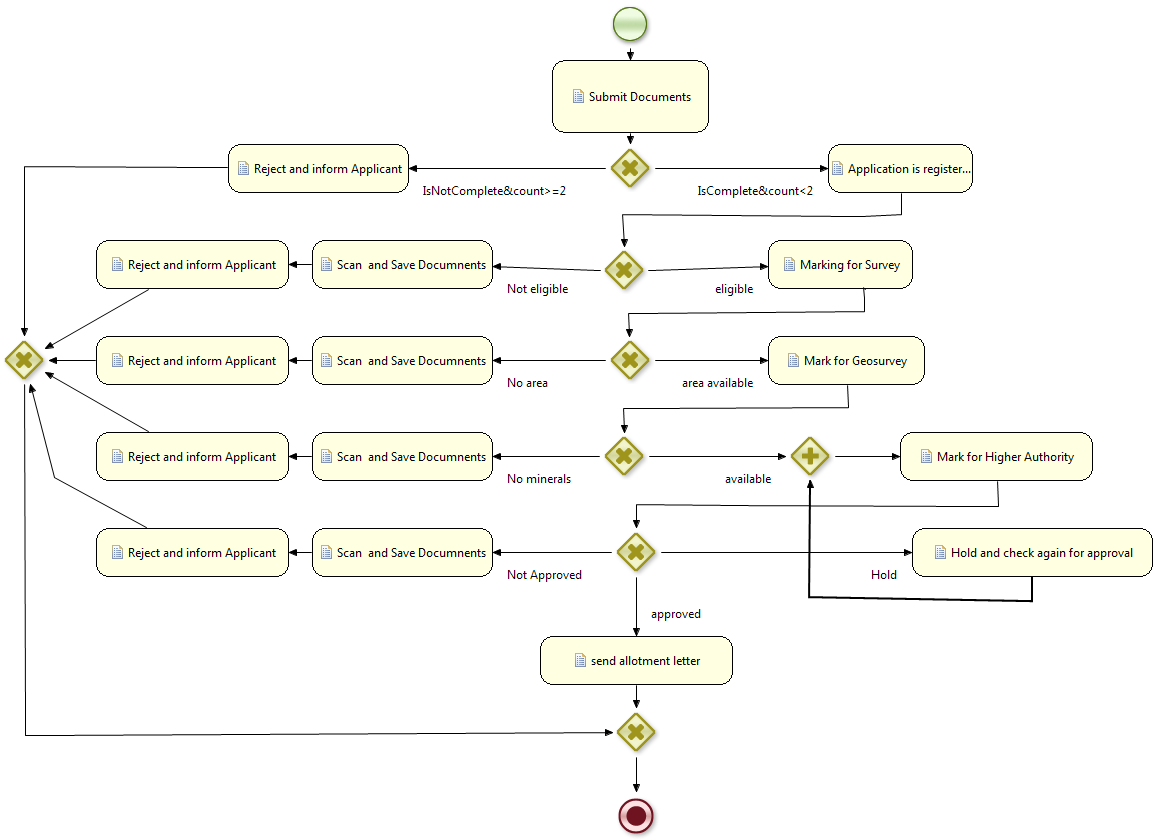
After geological survey has marked the documents the final stage is approval of this application by higher authority. There are 3 possibilities.

* Application is approved and allotment letter is issued and applicant is informed
* Application is rejected and applicant is informed and he/she can apply for the license again if he/she didn’t reached the maximum limit for submitting application.
* Application is on hold. Application is sent back to the higher authority and applicant is informed.



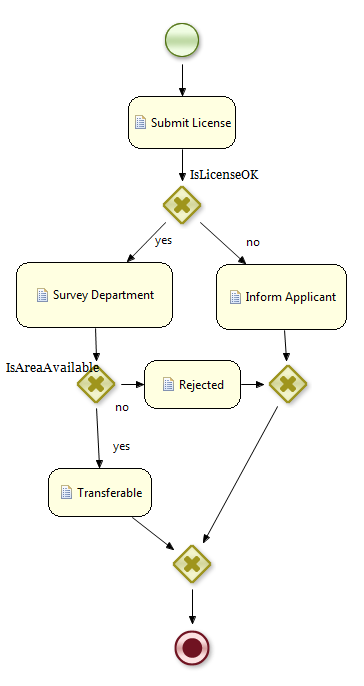
*Figure 9: Workflow of Higher Authority / Application Approval*

## Full Process



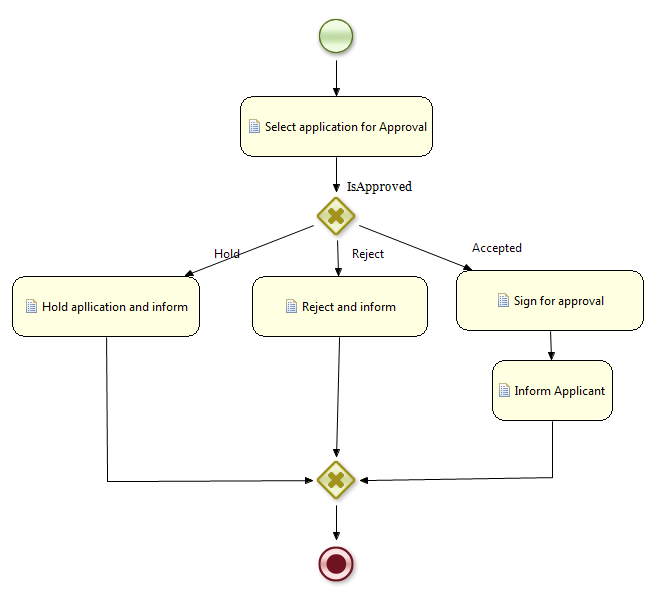
*Figure 10: Workflow of Full Process*

## Transfer Application



*Figure 11: Workflow of Transfer Application*

## Transfer Approval

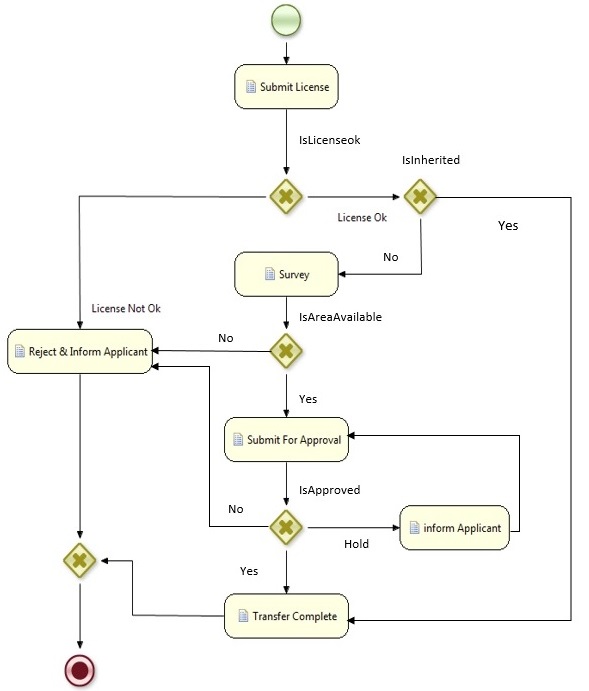


*Figure 12: Workflow of Transfer Approval*

## Full Process for Transfer Application

If a user wants to change the ownership of the license he/she own, he/she should apply for transfer. The process started by submitting license for transferring. At first the license is checked whether it is valid or not. If not, the applicant is informed that the license is not valid for transfer. If yes, then there is another check which checks whether the transfer is due to inheritance or user applied for the transfer. If the transfer is due to inheritance it is simply transfer to the person mentioned in next of kin ,but if user applied for the transfer then the license is submitted for the survey where it is checked whether the area is available or not. If area is not available the transfer is rejected if area is available then next step is marking the license to the higher authority for approval. There are 3 possibilities.

* License transfer is approved and applicant is informed
* License transfer is rejected and applicant is informed
* License transfer is on hold. License is sent back to the higher authority and applicant is informed.



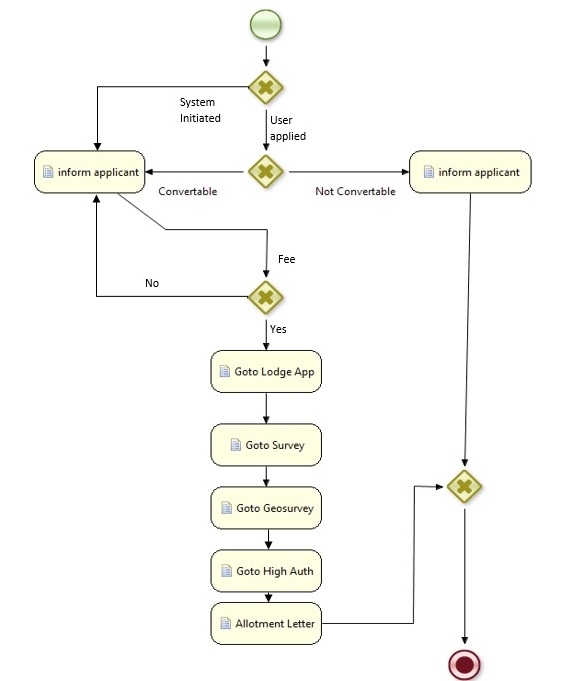
*Figure 13: Workflow of Full Transfer Application*

## Conversion

Converting license from one type to another is also an operational scenario. There are two possible cases in conversion mentioned below;

* System Initiated
* User Applied

System initiated means that user did not applied for the conversion of license instead system by itself invoked this process .we can recall it from renewal process where conversion was invoked. If this process is invoked by system then there is no need of checking whether it is convertible or not. If user apply for the conversion then first it is checked whether it convertible or not by evaluating few basic checks. If it is not convertible applicant is informed. If license is convertible then applicant is informed so that fee is submitted. Once fee is submitted the lodge application, survey, geo-survey, high authority Approval and allotment letter processes are invoked sequentially.



*Figure 14: Workflow of License Conversion Process*

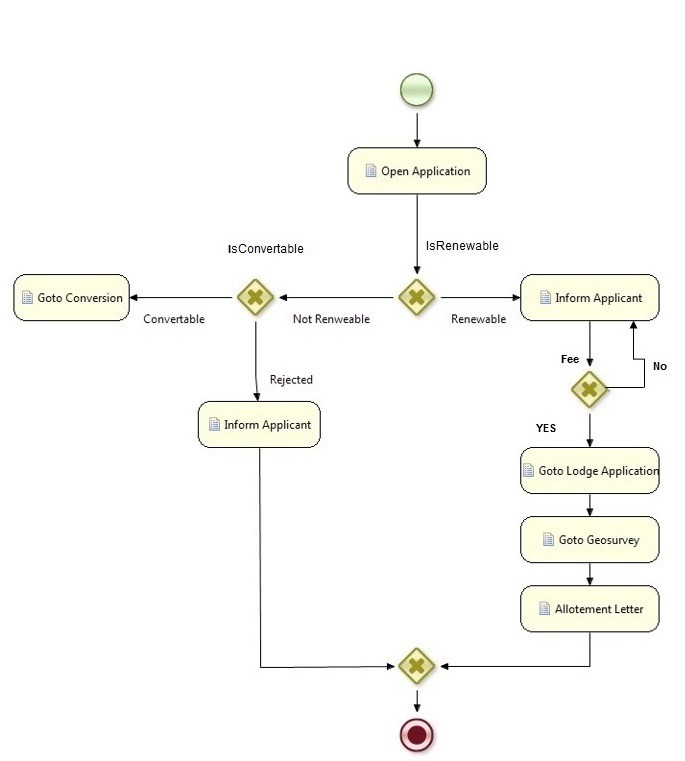
## Renewable

If a license owner wants to renew the license, following steps will be followed.

The process starts with submitting license for renewal. Few checks are evaluated to check whether the license is renewable or not. Checks are mentioned below;

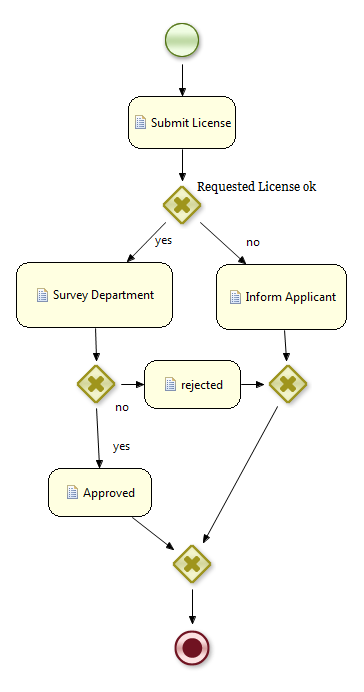
* Whether user has already reached the maximum limit for license renewal.
* The progress report is checked whether some improvement is done when the owner had the license previously
* Is there still some time remaining for the license renewal.

If the user has already reached the maximum limit then the conversion process is invoked instead of renewal process. If the progress report is not satisfactory and if there is also some time remaining in the current license, then the application is rejected and applicant is informed. If applicant meets all the requirements needed for renewal then the applicant is informed the license can be renewed and applicant should submit fee. Process will not continue until applicant submit the fee. Once fee is submitted the Lodge Application procedure is invoked. After lodging the next step is Geo survey for which Geo Survey Procedure is invoked and after that allotment letter is issued.



*Figure 15: Workflow of Application Renewal*

## Application for Mine Extension



*Figure 16: Workflow of Application for Mine Extension*

# Server-Side Web Technologies and Tools



## Frameworks

### DJango

DJango is a high-level Python Web framework that encourages rapid development and clean, pragmatic design.

Developed by a fast-moving online-news operation, DJango was designed to handle two challenges: the intensive deadlines of a newsroom and the stringent requirements of the experienced Web developers who wrote it. It lets you build high-performing, elegant Web applications quickly.

## Languages

### PHP

More than 77% of all Web Applications are written in PHP. 20,000 more top 1 million sites use PHP than a year ago. The increasing use of content management systems contributes to this trend, as 13 out of the top 14 CMS's are written in PHP.

### Python

Python is an easy to learn, powerful programming language. It has efficient high-level data structures and a simple but effective approach to object-oriented programming. Python’s elegant syntax and dynamic typing, together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms.

## Testing Tools

### PHPUnit

PHPUnit is a programmer-oriented testing framework for PHP. It is an instance of the xUnit architecture for unit testing frameworks.

### unittest

The [unittest](https://docs.python.org/3/library/unittest.html#module-unittest) unit testing framework was originally inspired by JUnit and has a similar flavor as major unit testing frameworks in other languages. It supports test automation, sharing of setup and shutdown code for tests, aggregation of tests into collections, and independence of the tests from the reporting framework.

To achieve this, [unittest](https://docs.python.org/3/library/unittest.html#module-unittest) supports some important concepts in an object-oriented way:

#### Test fixture

A test fixture represents the preparation needed to perform one or more tests, and any associate cleanup actions. This may involve, for example, creating temporary or proxy databases, directories, or starting a server process.

#### Test case

A test case is the individual unit of testing. It checks for a specific response to a particular set of inputs. [unittest](https://docs.python.org/3/library/unittest.html#module-unittest) provides a base class, [TestCase](https://docs.python.org/3/library/unittest.html#unittest.TestCase), which may be used to create new test cases.

#### Test suite

A test suite is a collection of test cases, test suites, or both. It is used to aggregate tests that should be executed together.

#### Test runner

A test runner is a component which orchestrates the execution of tests and provides the outcome to the user. The runner may use a graphical interface, a textual interface, or return a special value to indicate the results of executing the tests.

### SoapUI

SoapUI is a free and open source cross-platform Functional Testing solution. With an easy-to-use graphical interface, and enterprise-class features, SoapUI allows you to easily and rapidly create and execute automated functional, regression, compliance, and load tests. In a single test environment, SoapUI provides complete test coverage and supports all the standard protocols and technologies. There are simply no limits to what you can do with your tests. Meet SoapUI, the world's most complete testing tool!

# Client-Side Web Technologies and Tools



## Frameworks

### Sencha

Sencha creates development frameworks and tools that help you design, develop, deploy applications for desktop and mobile devices.

### MapFish

MapFish is a flexible and complete framework for building rich web-mapping applications. It emphasizes high productivity, and high-quality development.

MapFish is based on the [Pylons](http://pylonshq.com/) Python web framework. MapFish extends Pylons with geospatial-specific functionality. For example MapFish provides specific tools for creating web services that allows querying and editing geographic objects.

MapFish also provides a complete RIA-oriented JavaScript toolbox, a JavaScript testing environment, and tools for compressing JavaScript code. The JavaScript toolbox is composed of the [ExtJS](http://extjs.com/),[OpenLayers](http://www.openlayers.org/) , [GeoExt](http://www.geoext.org/) JavaScript toolkits.

MapFish is compliant with the [Open Geospatial Consortium](http://www.opengeospatial.org/) standards. This is achieved through OpenLayers or GeoExt supporting several OGC norms, like WMS, WFS, WMC, KML, GML etc.

MapFish is open source, and distributed under the [BSD](http://www.opensource.org/licenses/bsd-license.php) license.

## Languages and Standards

### JavaScript

JavaScript has always been the most important client-side programming language on the web. Another 26.500 sites started using it in 2011. It is almost a surprise that there are still 8.9% of the sites not using it.

### XHTML

In 2009 it was [predicted](http://w3techs.com/blog/entry/xhtml_usage_finally_exceeds_html_usage) that the use of XHTML will start to decline but XHTML is still gaining sites at the rate of 26,400 last year.

### HTML5

This specification defines the 5th major revision of the core language of the World Wide Web: the Hypertext Markup Language (HTML). In this version, new features are introduced to help Web application authors, new elements are introduced based on research into prevailing authoring practices, and special attention has been given to defining clear conformance criteria for user agents in an effort to improve interoperability.

## Libraries and Packages

### jQuery

jQuery gained an incredible 145.300 additional sites amongst the top 1 million Web Applications. That means that every single day of the year, 398 sites started using it. jQuery is now used by 42.8% of all Web Applications. Many see it as the de-facto standard for JavaScript libraries with a market share of 84.1%.

### GeoExt

GeoExt brings together the geospatial know how of [OpenLayers](http://openlayers.org/) with the user interface savvy of [Ext JS](http://www.sencha.com/products/js/) to help you build powerful desktop style GIS apps on the web with JavaScript.

### OpenLayers

OpenLayers makes it easy to put a dynamic map in any web page. It can display map tiles and markers loaded from any source. OpenLayers has been developed to further the use of geographic information of all kinds. OpenLayers is completely free, Open Source JavaScript, released under the [2-clause BSD License](https://raw.github.com/openlayers/openlayers/master/license.txt) (also known as the FreeBSD).

### WebGL

WebGL is a cross-platform, royalty-free API used to create 3D graphics in a Web browser. Based on OpenGL ES 2.0, WebGL uses the OpenGL shading language, GLSL, and offers the familiarity of the standard OpenGL API. Because it runs in the HTML5 Canvas element, WebGL has full integration with all Document Object Model (DOM) interfaces.

### ExtJS

Sencha Ext JS is the leading standard for business-grade web application development. With over 100 examples, 1000 APIs, hundreds of components, a full documentation suite and built in themes, Ext JS provides the tools necessary to build robust desktop applications. Ext JS also brings a rich data package that allows developers to use a model-view-controller (MVC) architecture when building their app. The MVC leverages features like Big Data Grids enabling an entirely new level of interactivity in web apps.

### jBPM (eclipse)

jBPM is a flexible, extensible framework for process languages which uses graph oriented programming as a foundation. The jBPM Eclipse plugin provides developers (and very technical users) with an environment to edit and test processes, and integrate it deeply with their applications. It provides the following features (on top of the Eclipse IDE):

#### Wizards for creation of

* A jBPM project
* A BPMN2.0 process

#### jBMP Perspective

showing the most commonly used views in a pre-defined layout

# Databases



## PostgreSQL

PostgreSQL is an object-relational database management system (ORDBMS) based on POSTGRES, Version 4.21, developed at the University of California at Berkeley Computer Science Department.

PostgreSQL is an open-source descendant of this original Berkeley code. It supports a large part of the SQL standard and offers many modern features:

* complex queries
* foreign keys
* triggers
* updatable views
* transactional integrity
* multi-version concurrency control

Also, PostgreSQL can be extended by the user in many ways, for example by adding new

* data types
* functions
* operators
* aggregate functions
* index methods
* procedural languages

## PostGIS

PostGIS is a spatial database extender for [PostgreSQL](http://postgresql.org/) object-relational database. It adds support for geographic objects allowing location queries to be run in SQL.

In addition to basic location awareness, PostGIS offers many features rarely found in other competing spatial databases

* Processing and analytic functions
* Raster map algebra
* Support for importing / exporting ESRI shapefile
* Packaged command-line for importing raster data
* Rendering and importing vector data
* Seamless raster/vector SQL callable functions
* 3D object support, spatial index, and functions
* Network Topology support
* Packaged Tiger Loader / Geocoder/ Reverse Geocoder / utilizing

# IDE

An integrated development environment (IDE) or interactive development environment is a [software application](http://en.wikipedia.org/wiki/Software_application) that provides comprehensive facilities to [computer programmers](http://en.wikipedia.org/wiki/Computer_programmer) for [software development](http://en.wikipedia.org/wiki/Software_development). An IDE normally consists of a [source code editor](http://en.wikipedia.org/wiki/Source_code_editor), [build automation](http://en.wikipedia.org/wiki/Build_automation) tools and a [debugger](http://en.wikipedia.org/wiki/Debugger). Most modern IDEs offer [intelligent code completion](http://en.wikipedia.org/wiki/Intelligent_code_completion) features.



## Web Development IDE

The IDE for the web development should have the following list of features for a complete independent development environment for web developers and programmers;

* [Back End Boxes](https://codio.com/s/features/85944871)
* [Abbreviations](https://codio.com/s/features/85868117)
* [AutoComplete](https://codio.com/s/features/)
* [Panels & Tabs](https://codio.com/s/features/#85906776)
* [Command Bar](https://codio.com/s/features/#85852403)
* [Quick Open](https://codio.com/s/features/#85852405)
* [Keyboard Shortcuts](https://codio.com/s/features/#85864550)
* [Beautification](https://codio.com/s/features/#85868118)
* [Bower](https://codio.com/s/features/#85901325)
* [File Templates](https://codio.com/s/features/#85901326)
* [Importing](https://codio.com/s/features/#85906685)
* [SSH](https://codio.com/s/features/#85908529)
* [Deployment](https://codio.com/s/features/#85908528)
* [Annotations](https://codio.com/s/features/#86012272)
* Additional Plugins Installation

## Some IDEs are:

### Aptana Studio (Windows / Mac OS X / Linux)

Aptana Is a really unique eclipse-based ide. If your work centers around Javascript and DHTML techniques and you don’t want to pay for your IDE, this is the one for you. Aptana seems to be an IDE geared towards DHTML development.

#### Pros

* If you do DHTML work, this is the IDE of your dreams
* If you do Ruby on Rails, this IDE is the perfect solution for a non-OSX machine. The Aptana OSX version is actually quite nice, but there’s other rails environments (which I’ll get to later) that are yet better.
* Jaxter is a verty cool new idea, I’m excited to see what the IDE+Jaxter will be able to produce (In terms of speed) in the future.

#### Cons

* There really aren’t really any weaknesses, I find it a bit bloated, but some people like their IDE to be bloated, because it’s synonymous for “feature-rich”. I guess that part’s up to you guys to decide.

### Adobe Dreamweaver

Dreamweaver is primarily a windows IDE, which does absolutely everything.

#### PROS:

* If you like ColdFusion, and you don’t care about crappy Javascript (if it works), AND you don’t know much about writing code, this is your dream-tool.
* It’ll even sync with your server for easy-uploading and on-the-server editing.
* Everything I’ve grown to expect from an advanced editor in 2008
* Built in documentation from O’reilly for a load of different web languages. That’s actually pretty sweet.

#### CONS:

* Leaves a GIANT memory footprint if you’re just using the editor
* On slower machines this takes FOREVER to start up and initialize
* It’s too rigid on what is and isn’t a part of the current project. I really don’t like that about it, you’ll have to go through like 2 modal windows just to add an existing file to your project.

### Eclipse (Windows / Mac OS X / Linux)

Eclipse is probably the most well-put-together open-source IDE I’ve ever encountered for Linux. Firstly, ECLIPSE IS FREE, which is awesome for how big of a product it really is.

#### PROS:

* DOES EVERYTHING. Absolutely. It’s extensible, so if it doesn’t do it already and you want it to, you can write a plugin
* Open source approach makes it available for absolutely free
* Java core minus swing makes for OS interoperability with no downsides

#### CONS:

* I think the interface is just not-so-slick in its design, but all the necessary parts are there. Sometimes things that could be small are very large (like in the file browser)
* Sometimes it’s a pain to find the right plugin, or follow the right tutorial for upgrading or adding functionality to Eclipse, but only as much as it ever is on Linux. Once it’s up and running you shouldn’t have any problems at all.

## Plugin

An independent transparent reusable piece of code to integrate in another Plugin or module or software etc. to facilitate it.

### Eclipse Plugins

There are many plugins in the marketplace of eclipse which you can download/install in the eclipse environment easily and facilitate your IDE like a complete development environment.

#### Aptana Studio 3 Plugin for Eclipse

Aptana Studio 3 plugin adds the functionality of Aptana Studio 3 to eclipse for the web development. It has support for HTML, DHTML, Javascript, PHP, Python and CSS etc.

#### EGit  Plugin (Distributed Version Control)

EGit is an Eclipse plug-in (software component) which allows you to use the distributed version control system Gitdirectly within the Eclipse IDE.

EGit is based on the JGit library. JGit is a library which implements the Git functionality in Java.

#### Mylyn (Project Management)

Mylyn is to integrate tasks into the Eclipse IDE and connect the current state of the Eclipse IDE, e.g. the context with such a task.

Software developers perform a variety of activities. They write source code for new functionality, fix bugs, write documentation, answer questions, and attend meetings and much more.

Developing software in the Eclipse IDE involves writing new classes or methods and modifying existing code.

Eclipse Mylyn allows the developer to record his activities in such a task while he is working on it. Each task has acontext which captures the involved classes, methods and the cursor position in the opened Java or text editor.

When switching between tasks, the corresponding context is restored and the editors which belong to this tasks are opened and the others are closed.

### Installing plugin in Eclipse (PyDev)

Plugin can be installed from the URL, so search it on the internet.  
The dialog to install Plugin is depicted in the following screenshot.

To install PyDev and PyDev Extensions using the Eclipse Update Manager, you need to use the **Help** > **Install New Software...** menu as shown in the Figure 1 (note that in older versions, this would be the 'Find and Install' menu).

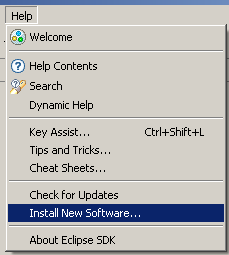


Figure 17: Installing Plugin in Eclipse: Help > Install New Software

In the next screen shown in Figure 2, enter the URL for plugin updates e.g. <http://pydev.org/updates> for PyDev updates.

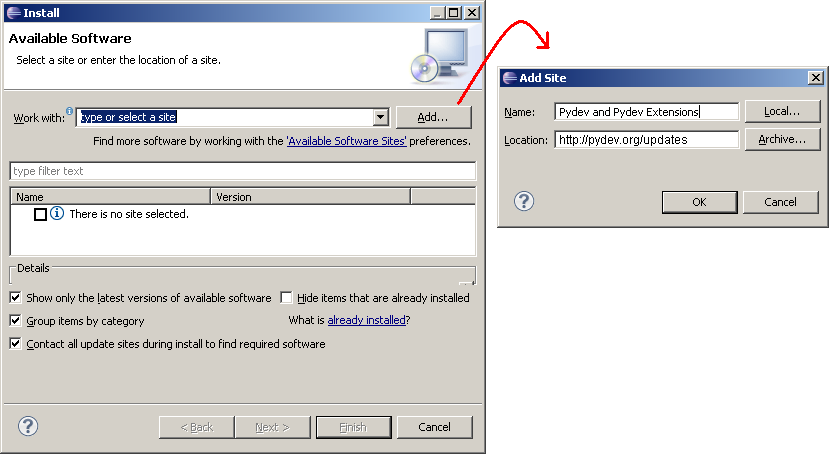


Figure 18: Installing Plugin in Eclipse: Add Update Site(s)

After entering the update sites, select the update site you entered or select **"All available sites"** and add a filter for PyDev so that it shows the contents of all the update sites that have PyDev, then select what you want to install and click **'Next'** as shown in Figure 3 and 4. **UNCHECK** the **'Contact all update sites during install to find required software'** and press **'Next'** again to confirm your selection.

And finally, read the license agreement and if you accept, select the **accept** radio button and click **'Finish'** as shown in Figure 5.

At that point, Eclipse should automatically download the plugin contents and present you to a dialog asking if you want to restart (to which you should say **'yes'**).

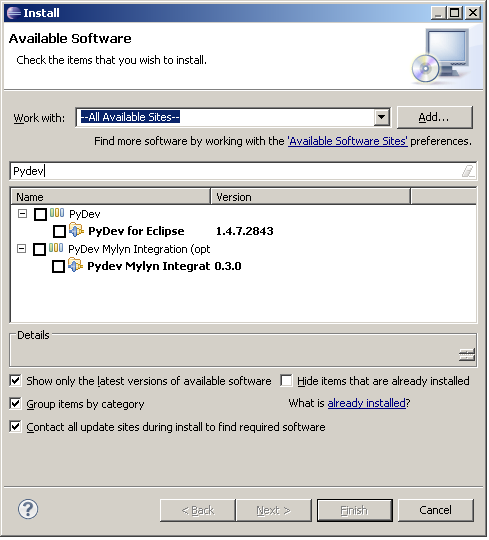
p

Figure 19: Installing Plugin in Eclipse: Select Update Packages

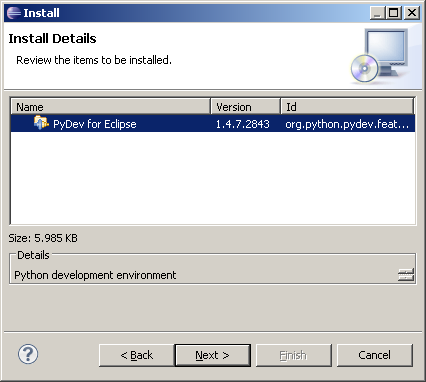


Figure 20: Installing Plugin in Eclipse: Install Details

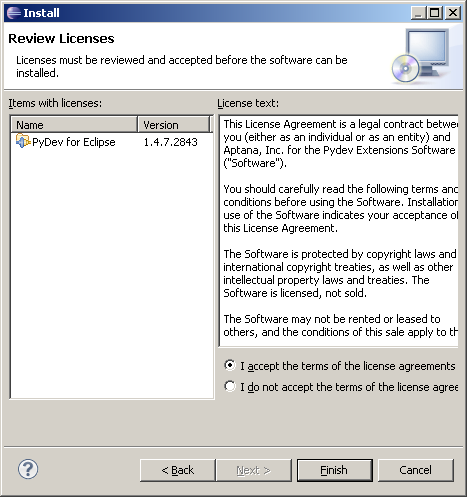


Figure 21: Installing Plugin in Eclipse: Licence Agreement

#### Possible issue on download

If you have any problem at this point with a message such as:

* An error occurred while collecting items to be installed
* No repository found containing: org.python.pydev/osgi.bundle/1.4.7.2843
* No repository found containing: org.python.pydev.ast/osgi.bundle/1.4.7.2843

That might indicate that the mirror you selected is having some network problem at that time, so, please follow the same steps with another mirror.

# Version Controlling



## Github

GitHub provide powerful features to make software development more collaborative. It provides a platform where stakeholders can assess the progress of overall project, and the details of fixed and pending issues. With GitHub multiple programmers can work on same form at same time.

### Usage:

* Please visit [www.github.com](http://www.github.com), and SignIn using your credentials.
* Select the organization from the dropdown, e.g. OpenM4S, different repositories are created to check the tasks assigned to resources and/or the issues logged under specific section.
* For reporting new issue or checking open/closed issue under this module click on issues.

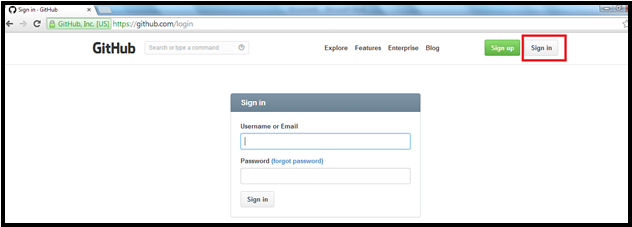


Figure 22: Github Sign In

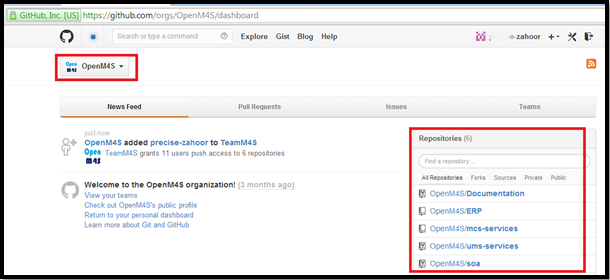


Figure 23: Github Organization and Repositories

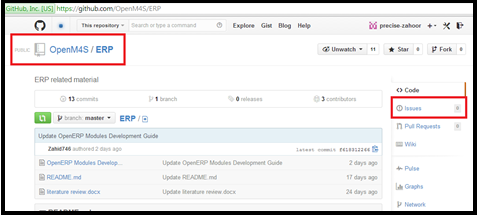


Figure 24: Github Viewing Open/Closed Issues

* For reporting new issue, click on Issues link, and new window will open for recording issue.

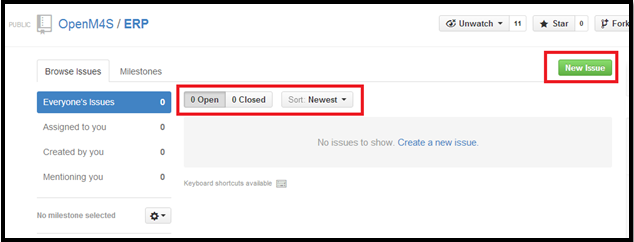


Figure 25: Github Reporting Issue

* Write Issue title, click milestone dropdown and select MRO Mobile-Issue Log, put issue description and click on submit button to submit issue.

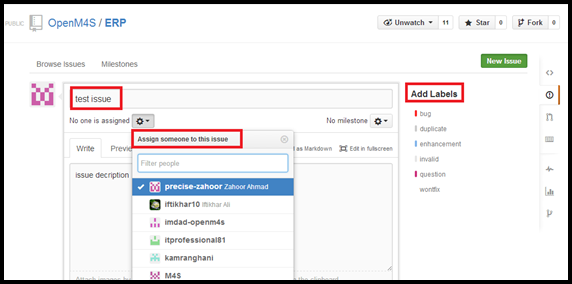


Figure 26: Github Submitting Issue