# Physical Data Design for Licensing Self-Certification Portal

## Introduction

This document provides a comprehensive description of the physical data design for the Licensing Self-Certification Portal (LSCP) project. It outlines the database structure, including tables, columns, data types, and relationships, based on the provided database schema analysis and code snippets. This document serves as a blueprint for implementing and maintaining the LSCP database.

## Database Overview

The LSCP database is designed to manage application forms, user data, workflow tasks, and related information. The database statistics indicate the following:

* Database Size: 88.10 MB
* Collections: 12
* Total Documents: 1278983
* Total Data Size: 371.24 MB

The database utilizes MongoDB for the backend data storage, as evidenced by the use of Mongoose schemas in the code. The frontend data is managed using a SQL database, likely Microsoft SQL Server 2019, as indicated in the code.

## Data Model

The data model encompasses several key entities, each represented by a collection in MongoDB and a table in the SQL database. The relationships between these entities are crucial for the system's functionality.

### MongoDB Collections

The following collections are used in the MongoDB database:

* **tasks**: Stores workflow tasks associated with applications.
* **eminutes**: Stores electronic minutes related to cases.
* **submissions**: *(Currently Empty)* Potentially intended to store submission data.
* **applications**: Stores application data.
* **notifications**: Stores notifications for users.
* **bsblocks**: Stores block IDs and their corresponding BDGIS codes.
* **cases**: Stores case details related to applications.
* **oauthtokens**: Stores OAuth tokens for authentication.
* **sysfilerefs**: Stores system file references.
* **attachments**: Stores attachments related to applications and cases.
* **users**: Stores user information.
* **adrblkfilerefs**: Stores address block file references.

### SQL Database Tables

The following tables are used in the SQL database:

* **SchoolApp\_Submissions**: Stores submission data from the frontend.
* **SchoolApp\_Infos**: Stores application information.
* **ScsMasterTable**: Stores master data used by the frontend.
* **ApRse**: Stores information about Authorized Persons (AP) and Registered Structural Engineers (RSE).
* **AdrBlk**: Stores address block information imported from BCIS.
* **Sys\_Meta\_Data**: Stores system metadata imported from BCIS.
* **LogEvents**: Stores log events for auditing.
* **Staff**: Stores staff information.
* **Test**: A test table.
* **ApplicationCase**: Stores application case information.
* **ApplicationFiles**: Stores application file information.
* **BackendUpdate**: Stores backend update information.
* **GenOtp**: Stores OTP information for login verification.

## Data Entity Descriptions

### MongoDB Collections

#### Collection: tasks

* **Description**: Stores workflow tasks associated with applications.
* **Statistics**:
  + Document Count: 5523
  + Size: 0.99 MB
  + Average Document Size: 0.18 KB
* **Fields**:
  + \_id (objectId): Unique identifier for the task.
  + \_\_v (objectId, int): Version key.
  + application (objectId): Reference to the associated application.
  + createdAt (date): Timestamp of task creation.
  + status (string): Current status of the task.
  + submissionCase (objectId): Reference to the associated case.
  + taskType (string): Type of the task (e.g., DESK\_STUDY, INITIAL\_SITE\_INSPECTION).
  + team (string): Team responsible for the task.
  + user (string, objectId): User assigned to the task.

#### Collection: eminutes

* **Description**: Stores electronic minutes related to cases.
* **Statistics**:
  + Document Count: 133
  + Size: 0.03 MB
  + Average Document Size: 0.24 KB
* **Fields**:
  + \_id (objectId): Unique identifier for the e-minute.
  + \_\_v (int): Version key.
  + comment (string): Comments related to the e-minute.
  + content (string): Content of the e-minute.
  + createdAt (date): Timestamp of e-minute creation.
  + efolio (string): E-folio number.
  + eminuteId (string): E-minute identifier.
  + from (objectId, string): User who created the e-minute.
  + status (string): Status of the e-minute.
  + subject (string): Subject of the e-minute.
  + submissionCase (objectId): Reference to the associated case.
  + sysFileRefId (string): Reference to the associated system file.
  + to (objectId, string): User to whom the e-minute is addressed.

#### Collection: submissions

* **Description**: *Currently Empty*. Potentially intended to store submission data.
* **Statistics**:
  + Document Count: 0
  + Size: 0.00 MB
  + Average Document Size: 0.00 KB
* **Fields**:
  + *No fields listed in the provided schema.*

#### Collection: applications

* **Description**: Stores application data.
* **Statistics**:
  + Document Count: 381
  + Size: 0.36 MB
  + Average Document Size: 0.96 KB
* **Fields**:
  + APP13 (object, array): AP13 data.
  + AddressOfPremiseCN (string): Address of premise in Chinese.
  + AddressOfPremiseCNFloor (string): Floor of premise in Chinese.
  + AddressOfPremiseCNUnit (string): Unit of premise in Chinese.
  + AddressOfPremiseEN (string): Address of premise in English.
  + AddressOfPremiseENFloor (string): Floor of premise in English.
  + AddressOfPremiseENUnit (string): Unit of premise in English.
  + AgeOfStudent (null, string): Age of student.
  + ApplicantAddress (string): Applicant address.
  + ApplicantEmail (string): Applicant email.
  + ApplicantFax (string): Applicant fax.
  + ApplicantMobile (string): Applicant mobile.
  + ApplicantName (string): Applicant name.
  + ApplicantNameCN (string): Applicant name in Chinese.
  + ApplicantNameEN (null, string): Applicant name in English.
  + ApplicantTel (null, string): Applicant telephone.
  + ApplicationNo (null, string): Application number.
  + ApplicationType (string): Type of application.
  + Area (string): Area.
  + BlockID (string): Block ID.
  + ContactPerson (string): Contact person.
  + ContactPersonCN (string): Contact person in Chinese.
  + ContactPersonEN (string): Contact person in English.
  + ContactPersonEmail (string): Contact person email.
  + ContactPersonTel (string): Contact person telephone.
  + DescriptionOfSchool (string, null): Description of school.
  + District (string): District.
  + EstimatedNoOfStudent (int, null): Estimated number of students.
  + FileReference (string): File reference.
  + NameOfSchoolCN (string): Name of school in Chinese.
  + NameOfSchoolEN (string): Name of school in English.
  + Region (string): Region.
  + RelatedPremise (string): Related premise.
  + RelatedPremises (array): Array of related premises.
  + SelfCertification (object, null): Self-certification details.
  + StructuralCalculation (object): Structural calculation details.
  + SubmissionType (string): Submission type.
  + \_\_v (int): Version key.
  + \_id (objectId): Unique identifier for the application.
  + address (object): Address object.
  + assignedBS (objectId, string, null): Building Surveyor assigned to the application.
  + assignedGR (objectId, null): Government Representative assigned to the application.
  + assignedSBS (string, null): Senior Building Surveyor assigned to the application.
  + createdAt (date): Timestamp of application creation.
  + updatedAt (date): Timestamp of last update.

#### Collection: notifications

* **Description**: Stores notifications for users.
* **Statistics**:
  + Document Count: 1837
  + Size: 0.24 MB
  + Average Document Size: 0.13 KB
* **Fields**:
  + \_id (objectId): Unique identifier for the notification.
  + \_\_v (int): Version key.
  + createdAt (date): Timestamp of notification creation.
  + eminute (objectId): Reference to the associated e-minute.
  + notificationType (string): Type of notification (e.g., NEW\_TASK, NEW\_EMINUTE).
  + requireSendEmail (bool): Flag indicating if an email should be sent.
  + task (objectId): Reference to the associated task.
  + user (string): User to whom the notification is addressed.

#### Collection: bsblocks

* **Description**: Stores block IDs and their corresponding BDGIS codes.
* **Statistics**:
  + Document Count: 98397
  + Size: 6.40 MB
  + Average Document Size: 0.07 KB
* **Fields**:
  + \_id (objectId): Unique identifier for the BS Block.
  + \_\_v (int): Version key.
  + bdgis (string): BDGIS code.
  + blockId (string): Block ID.

#### Collection: cases

* **Description**: Stores case details related to applications.
* **Statistics**:
  + Document Count: 451
  + Size: 1.17 MB
  + Average Document Size: 2.65 KB
* **Fields**:
  + ActualReplyDate (null, date): Actual reply date.
  + Area (string): Area.
  + AuditResult (string): Audit result.
  + CaseOfficer (string): Case officer.
  + Category (string): Category of the case.
  + District (string): District.
  + FileReference (string): File reference.
  + LAFileReference (object): LA file reference.
  + Nature (null, string): Nature of the case.
  + ObjectiontoLR (string): Objection to LR.
  + ReceivedDate (date, null): Received date.
  + Referrer (object): Referrer information.
  + Region (string): Region.
  + Remarks (string): Remarks.
  + Reminders (array): Array of reminders.
  + SubmissionType (string): Submission type.
  + SubstantialReplyDate (null, date): Substantial reply date.
  + TargetReplyDate (date, null): Target reply date.
  + ThreeTierReqt (string): Three-tier requirement.
  + ViaSCS (bool): Via SCS flag.
  + \_\_v (int): Version key.
  + \_id (objectId): Unique identifier for the case.
  + application (objectId): Reference to the associated application.
  + assignedBS (objectId): Building Surveyor assigned to the case.
  + assignedGR (objectId): Government Representative assigned to the case.
  + building\_information (object): Building information.
  + caseDescription (object): Case description.
  + caseOfficerReceive (string): Case officer receiving the case.
  + caseOfficerReply (string): Case officer replying to the case.
  + createdAt (date): Timestamp of case creation.
  + deck\_study (object): Deck study details.
  + documentChecklist (object): Document checklist.
  + dv (object): DV details.
  + frc (object): FRC details.
  + misc (object): Miscellaneous details.
  + moe (object): MOE details.
  + seniorCaseOfficerReceive (string): Senior case officer receiving the case.
  + seniorCaseOfficerReply (string): Senior case officer replying to the case.
  + site\_inspection (object): Site inspection details.
  + structural\_ccc\_bs (object): Structural CCC BS details.
  + structural\_schnlh (object): Structural SCHNLH details.
  + structural\_schnlhkinds (object): Structural SCHNLHKinds details.
  + team (string): Team assigned to the case.
  + ubw (object): UBW details.
  + updatedAt (date): Timestamp of last update.

#### Collection: oauthtokens

* **Description**: Stores OAuth tokens for authentication.
* **Statistics**:
  + Document Count: 3019
  + Size: 2.29 MB
  + Average Document Size: 0.78 KB
* **Fields**:
  + \_id (objectId): Unique identifier for the OAuth token.
  + \_\_v (int): Version key.
  + accessToken (string): Access token.
  + accessTokenExpiresAt (date): Access token expiration timestamp.
  + client (object): Client information.
  + refreshToken (string): Refresh token.
  + refreshTokenExpiresAt (date): Refresh token expiration timestamp.
  + user (objectId): Reference to the associated user.

#### Collection: sysfilerefs

* **Description**: Stores system file references.
* **Statistics**:
  + Document Count: 601808
  + Size: 204.70 MB
  + Average Document Size: 0.35 KB
* **Fields**:
  + \_id (objectId): Unique identifier for the system file reference.
  + \_\_v (int): Version key.
  + createdDt (date): Timestamp of file creation.
  + createdName (null, string): Name of the creator.
  + createdPost (null, string): Post of the creator.
  + createdSection (null, string): Section of the creator.
  + display (string): Display name of the file.
  + dvExceed (null, string): DV exceed information.
  + dvStatusDt (null, date): DV status timestamp.
  + frefPref (string, null): File reference prefix.
  + frefSeq (null, string): File reference sequence.
  + frefSuf (null, string): File reference suffix.
  + frefYr (null, string): File reference year.
  + lastModifiedDt (date): Timestamp of last modification.
  + lastModifiedName (null, string): Name of the last modifier.
  + lastModifiedPost (null, string): Post of the last modifier.
  + lastModifiedSection (null): Section of the last modifier.
  + sysFileRefId (string): System file reference ID.

#### Collection: attachments

* **Description**: Stores attachments related to applications and cases.
* **Statistics**:
  + Document Count: 370
  + Size: 0.13 MB
  + Average Document Size: 0.37 KB
* **Fields**:
  + \_id (objectId): Unique identifier for the attachment.
  + \_\_v (int): Version key.
  + application (objectId): Reference to the associated application.
  + createdAt (date): Timestamp of attachment creation.
  + efolio (null, string): E-folio number.
  + file (object, string): File details.
  + filePartNo (string): File part number.
  + receivedDate (date): Date the attachment was received.
  + remarks (string): Remarks about the attachment.
  + subType (string): Subtype of the attachment.
  + submissionCase (objectId): Reference to the associated case.
  + sysFileRefId (string): Reference to the associated system file.
  + type (string): Type of attachment.
  + updatedAt (date): Timestamp of last update.

#### Collection: users

* **Description**: Stores user information.
* **Statistics**:
  + Document Count: 116
  + Size: 0.04 MB
  + Average Document Size: 0.39 KB
* **Fields**:
  + \_id (objectId): Unique identifier for the user.
  + \_\_v (int): Version key.
  + bdgis (string): BDGIS code.
  + begis (string): BEGIS code.
  + delegateTo (string): User to whom tasks are delegated.
  + department (string): Department of the user.
  + email (string): Email address of the user.
  + group (string): Group of the user.
  + lastLoginAt (date): Timestamp of last login.
  + letterLongPosition (string): Long position on letter.
  + letterLongPositionCn (string): Long position on letter in Chinese.
  + letterName (string): Name on letter.
  + letterNameCn (string): Name on letter in Chinese.
  + letterPosition (string): Position on letter.
  + letterPositionCn (string): Position on letter in Chinese.
  + lock (bool): Account lock status.
  + luPostName (string): LU post name.
  + name (string): Name of the user.
  + notificationEmail (string): Notification email address.
  + osdpEmail (string): OSDP email address.
  + osdpLoginId (string): OSDP login ID.
  + password (string): Hashed password.
  + phoneNumber (string): Phone number.
  + position (string): Position of the user.
  + role (string): Role of the user.
  + team (string): Team of the user.
  + userType (string): Type of user.

#### Collection: adrblkfilerefs

* **Description**: Stores address block file references.
* **Statistics**:
  + Document Count: 566948
  + Size: 154.89 MB
  + Average Document Size: 0.28 KB
* **Fields**:
  + \_id (objectId): Unique identifier for the address block file reference.
  + \_\_v (int): Version key.
  + adrBlkFileRefId (string): Address block file reference ID.
  + adrBlkId (string): Address block ID.
  + createdDt (date): Timestamp of file creation.
  + createdName (null, string): Name of the creator.
  + createdPost (string): Post of the creator.
  + createdSection (null, string): Section of the creator.
  + lastModifiedDt (date): Timestamp of last modification.
  + lastModifiedName (null, string): Name of the last modifier.
  + lastModifiedPost (string): Post of the last modifier.
  + lastModifiedSection (string, null): Section of the last modifier.
  + sysFileRefId (string): System file reference ID.

### SQL Database Tables

* **SchoolApp\_Submissions**: Stores submission data from the frontend.
  + Id (BIGINT, primary key, auto-increment): Unique identifier.
  + FromId (BIGINT, nullable): Foreign key.
  + ApplicationNo (STRING, nullable): Application number.
  + SubmissionId (STRING, nullable): Submission ID.
  + FormName (STRING, nullable): Form name.
  + ApplicationType (STRING, nullable): Application type.
  + *Other fields related to applicant and contact information, address, school details, and AP/RSE information.*
  + Status (STRING, nullable): Status of the submission.
  + SubmittedDate (DATE, nullable): Submission date.
  + Synced (BOOLEAN, default: false, not null): Indicates if the submission is synced to the backend.
* **SchoolApp\_Infos**: Stores application information.
  + Id (BIGINT, primary key, auto-increment): Unique identifier.
  + FromId (BIGINT, nullable): Foreign key.
  + ApplicationNo (STRING, nullable): Application number.
  + FormName (STRING, nullable): Form name.
  + ApplicationType (STRING, nullable): Application type.
  + *Other fields related to applicant and contact information, address, school details, and AP/RSE information.*
* **ScsMasterTable**: Stores master data used by the frontend.
  + Id (BIGINT, primary key, auto-increment): Unique identifier.
  + Type (STRING, not null): Type of master data.
  + Code (STRING, not null): Code of the master data.
  + Ordering (BIGINT, nullable): Ordering of the data.
  + DataValue (STRING, nullable): Data value.
  + CaptionEN (STRING, nullable): Caption in English.
  + CaptionTC (STRING, nullable): Caption in Traditional Chinese.
  + CaptionSC (STRING, nullable): Caption in Simplified Chinese.
  + Remarks (STRING, nullable): Remarks.
  + LongTextEN (STRING, nullable): Long text in English.
  + LongTextTC (STRING, nullable): Long text in Traditional Chinese.
  + LongTextSC (STRING, nullable): Long text in Simplified Chinese.
* **ApRse**: Stores information about Authorized Persons (AP) and Registered Structural Engineers (RSE).
  + Id (BIGINT, primary key, auto-increment): Unique identifier.
  + UUID (STRING, nullable): UUID.
  + Name (STRING, nullable): Name.
  + Name\_tc (STRING, nullable): Name in Traditional Chinese.
  + RegistrationNumber (STRING, nullable): Registration number.
  + RegistrationType (STRING, nullable): Registration type.
  + ExpiryDate (DATE, nullable): Expiry date.
* **AdrBlk**: Stores address block information imported from BCIS.
  + ADR\_BLK\_ID (BIGINT, primary key, auto-increment): Unique identifier.
  + BLK\_TYPE\_ID (BIGINT, not null): Block type ID.
  + BLDG\_CAT\_ID (BIGINT, not null): Building category ID.
  + BLDG\_USAGE\_ID (BIGINT, not null): Building usage ID.
  + *Other address-related fields.*
* **Sys\_Meta\_Data**: Stores system metadata imported from BCIS.
  + SYS\_META\_DATA\_ID (BIGINT, primary key, auto-increment): Unique identifier.
  + REC\_TYPE (STRING, not null): Record type.
  + CODE (STRING, not null): Code.
  + *Other metadata-related fields.*
* **LogEvents**: Stores log events for auditing.
  + Id (BIGINT, primary key, auto-increment): Unique identifier.
  + LogAlias (STRING, nullable): Log alias.
  + IpAddress (STRING, nullable): IP address.
  + *Other log-related fields.*
* **Staff**: Stores staff information.
  + Id (BIGINT, primary key, auto-increment): Unique identifier.
  + UserId (STRING, nullable): User ID.
  + Password (STRING, nullable): Hashed password.
  + *Other staff-related fields.*
* **Test**: A test table.
  + id (INTEGER, primary key, auto-increment): Unique identifier.
  + name (STRING, not null): Name.
  + age (INTEGER, nullable): Age.
  + email (STRING, not null): Email address.
* **ApplicationCase**: Stores application case information.
  + Id (BIGINT, primary key, auto-increment): Unique identifier.
  + FromId (BIGINT, nullable): Foreign key.
  + ApplicationNo (STRING, nullable): Application number.
  + FileDate (DATE, nullable): File date.
* **ApplicationFiles**: Stores application file information.
  + Id (BIGINT, primary key, auto-increment): Unique identifier.
  + FromId (BIGINT, nullable): Foreign key.
  + ApplicationNo (STRING, nullable): Application number.
  + SubmissionId (STRING, nullable): Submission ID.
  + FileId (STRING, nullable): File ID.
  + *Other file-related fields.*
* **BackendUpdate**: Stores backend update information.
  + Id (BIGINT, primary key, auto-increment): Unique identifier.
  + ApplicationNo (STRING, nullable): Application number.
  + UpdateType (STRING, nullable): Update type.
  + *Other update-related fields.*
* **GenOtp**: Stores OTP information for login verification.
  + Id (BIGINT, primary key, auto-increment): Unique identifier.
  + ApplicationNo (STRING, not null): Application number.
  + UserId (STRING, not null): User ID.
  + Otp (STRING, nullable): OTP.
  + *Other OTP-related fields.*

## Data Relationships

The code reveals several relationships between the entities:

* **Application 1:N Cases**: An application can have multiple cases associated with it. This is evident from the CaseSchema having a field application which is a Schema.Types.ObjectId referencing the Application collection.
* **Case 1:N Tasks**: A case can have multiple tasks associated with it. This is evident from the TaskSchema having a field submissionCase which is a Schema.Types.ObjectId referencing the Case collection.
* **Application 1:N Attachments**: An application can have multiple attachments. This is evident from the AttachemntSchema having a field application which is a Schema.Types.ObjectId referencing the Application collection.
* **Case 1:N Attachments**: A case can have multiple attachments. This is evident from the AttachemntSchema having a field submissionCase which is a Schema.Types.ObjectId referencing the Case collection.
* **User 1:N Tasks**: A user can be assigned to multiple tasks. This is evident from the TaskSchema having a field user which is a Schema.Types.ObjectId referencing the User collection.
* **User 1:N OAuthTokens**: A user can have multiple OAuth tokens. This is evident from the OAuthTokenSchema having a field user which is a Schema.Types.ObjectId referencing the User collection.
* **BsBlock 1:N AdrBlkFileRefs**: An address block can have multiple file references. This is evident from the AdrBlkFileRefSchema having a field adrBlkId which is a string referencing the BsBlock collection.
* **SysFileRef 1:N AdrBlkFileRefs**: A system file reference can be referenced by multiple address block file references. This is evident from the AdrBlkFileRefSchema having a field sysFileRefId which is a string referencing the SysFileRef collection.

## Key Considerations

* **Data Types**: The code shows a mix of data types, including strings, numbers, dates, booleans, and object IDs. Choosing the appropriate data type for each field is crucial for data integrity and performance.
* **Indexing**: Indexing frequently queried fields can significantly improve query performance. Consider indexing fields like ApplicationNo, NameOfSchoolCN, NameOfSchoolEN, assignedBS, assignedGR, sysFileRefId, adrBlkId, and blockId.
* **Data Validation**: Implementing data validation rules at the model level can help ensure data quality. The code includes some basic validation, such as enum for ApplicationType and SubmissionType.
* **Relationships**: Defining relationships between collections using Mongoose's ref option allows for efficient data retrieval and querying.
* **Scalability**: As the LSCP grows, consider sharding the MongoDB database to improve scalability and performance.
* **Security**: Ensure that sensitive data, such as passwords, is properly encrypted and protected. The code uses bcrypt for password hashing.

## Conclusion

This document provides a detailed overview of the physical data design for the LSCP. By following these guidelines, the LSCP can be implemented with a robust and efficient data management system that meets the needs of the Buildings Department and its users.