Research Higher Degree Database

Physical Model

Prepared by:  
Thursdays **Group 4**

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# Questions

# Translate logical data model for target DBMS

## Select target DBMS

The target DBMS is MySQL, since this was known to be the target DBMS at the initialisation of the project, the previous two models that of the conceptual and logical have been designed to be compatible with MySQL, with limited amount of specific implementation required. This is seen (though noted not technically correct) in the form of adding variables applicable to MySQL (such as setting variables as VarChars in place of more general Strings variables) in the conceptual diagram.

The information gathered the in the previous three sections of requirements gathering and analysis, Conceptual model Diagram and documentation and logical model Diagram and documentation in their latest iteration have been reviewed and collected into a single information source.

The target, MySQL, DBMS has been studied revealing how to preform base transactions (such that Create, Read Update and Delete Base Relations are done for the most part through standard SQL (see <http://dev.mysql.com/doc/refman/5.0/en/differences-from-ansi.html>.)) and that most, if not all of the required functionality (that of. Keys, Domains and constraints) is available through the standard enterprise version as will be used in the final implementation of the database.

This was then used to produce the following **Relational database schema**

SCHEMA HERE MAYBE?

## Design base relations

**Implementing base relations**

The data base relation have been implemented using ISO SQL standard (Section 6.1) with some specific minor MySQL specific adjustments.

**Document design of base relations**

DBDL definitions of Relations

??? not sure what is meant by alternatives

## Design representation of derived data

No derived relations have been identified except those of the checklists of which will be adjust whenever a change is made through a background update of the DB by the application interface. This derived data exists to make referencing the completeness of an application quick and to provide hard coded information checklist as per the initial requirements.

It is presumed that other derived information, will be calculated as required. This include the age of an application, number of applications flagged, number of applications managed, application history etc. will be queried as by the application when needed. To aid such queries, index have been placed on the relevant foreign and primary keys that are expected to be used often.

… Something about using cached queries maybe … not sure if we will do this though

## Design general constraints

Are there any constraints?

Users can only supervise if they can supervise

# Design file organisations and indices

## Analyse transactions NOT DONE

The main transactions of the database, those that have a high impact, run frequently and or are critical to creating and updating RHD application and applicant details have been analysed. The transactions as described by the transaction pathways section of the logical documentation, section??? have been used to produce map the transactional pathways to the relations.

1. map all transaction paths to relations;

logical 3.0 plus more

1. determine which relations are most frequently accessed by transactions;

Applicant & Applicant

1. Analyse the data usage of selected transactions that involve these relations.

University Staff Members

|  |  |
| --- | --- |
| # | pathway |
|  | Look up applicant + publications + degrees + visa Status + Associated documents by applicant name |
|  | Look up applicant’s applications by applicant name |
|  | Look up applicant’s applications by applicant email |
|  | Look up incomplete applications |
|  | Look up all correspondences relevant to an application |
|  | Create new applicant and associated application records |
|  | Look up which staff member updated an Application most recently |
|  | Check for any decision recorded about an application |
|  | Look up an existing application and attach a new standard type document to an application |
|  | Look up an existing application and attached a new exceptional type document to an application |
|  | Look up an existing application and list outstanding information (checklist). |
|  | Update the checklist to confirm that a mandatory information requirement has been met |
|  | Retrieve all on-going applications for which the user has made the most recent correspondence |
|  | Record making a decision about an application |
|  | Update the status of an application |

Academic Staff

|  |  |
| --- | --- |
| # | pathway |
|  | Look up, add to, and delete from own current research areas |
|  | Search for all applications in certain research areas that have been added since a certain time |
|  | Flag interest in an application |

RHD Co-ordination Staff

|  |  |
| --- | --- |
| # | pathway |
|  | Retrieve all staff who have flagged an application, or have edited an application or applicant record most recently |
|  | Retrieve all ongoing applications |
|  | List all ongoing applications waiting for a supervisor agreement |

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## Select file organisations DONE

The file organisations are grouped by storage engines in MySQL[[1]](#footnote-1). The default InnoDB storage engine provides the required functionality for all relations, the other storage engines are designed for specific cases that do not exist in the RHD database.

## Select indices REVIEW

<http://dev.mysql.com/doc/refman/5.7/en/optimization-indexes.html>

By Default MySQL places indices on the primary key (a clustered index for InnoDB storage engine used here[[2]](#footnote-2)), these are also not null enabling fast queries.

Indices have also been placed on the foreign keys of

* Primary Relations: application, applicant, university staff member and Research area

To enable fast joining between often joined relations

* Status and Type look-up Relations: Application Status, Document Status, Visa Status, Document Type and Decision Type

To assist in common transactions

Indexes have also been placed on the first and last names and emails of applicants and staff members as these will be the primary entry into the database relations, that is, all quires of the database are expected to start by searching for an applicants or staff members name or email.

## Estimate disk space requirements 556 NOT DONE

# Design user views

The database has four possible views each inheriting the previous view, as outlined by the initial requirements documentation.

These are

* A ‘professional staff view’
  + Rights consists of insert, read and update rights to all tables except insert into the as supervisor relation (perhaps)
  + Their info Displays flagged applications, Decision/comment History and Correspondence History
* An ‘academic staff view’
  + Additional Rights include of being able to insert themselves into the ‘as supervise’ relation
  + Their info Additionally Displays all the applicants they have stated they will supervise,
* An ‘RHD Co-ordination view’
  + Additional Rights include being able to insert any staff member into the ‘as supervise’ relation
  + Their info Additionally displays the applications and applicants they manage
  + Additionally Displays statistical information on the
    - number of applications being actively managed and their status
    - speed of processing RHD applications, to help decide if the system is meeting performance requirements
* ‘RHD admin view’
  + Has the right to delete any tuple entry

# Design security mechanisms

Deletion can only be performed by RHD Admin and this is assumed to occur very rarely

<http://www.greensql.com/content/mysql-security-best-practices-hardening-mysql-tips>

# Introduce controlled redundancy if necessary

The checklist represents a form of controlled redundancy,

# Create SQL scripts for data definition

# Create SQL scripts to populate all tables with data

# Create SQL scripts for required queries

# Monitor and tune the operational system

# Update test plan

# Create SQL scripts to test system

# Test operational system

The following list is no longer needed

* Publication
* Document
* Degree
* VISA
* Correspondence
* Application
* Referee
* Decision
* Research Area
* University staff

**Pair Relations**

* Application Research Area
* Supervise as
* University\_Staff\_Member\_Research\_Area
* University\_Staff\_Member\_Research\_Area2
* University\_Staff\_Member\_Applicaiton

**Lookup Relations**

* Document Type
* Document Status
* Visa Status
* Country
* Correspondence Method
* Payment Method
* Application Status
* Award Type
* Decision

1. <http://dev.mysql.com/doc/refman/5.7/en/storage-engines.html> [↑](#footnote-ref-1)
2. <http://dev.mysql.com/doc/refman/5.7/en/innodb-index-types.html> [↑](#footnote-ref-2)