

Abertawe Leisure Centre Design & Implementation

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Abstract

With the continuous development of Abertawe Leisure Center(ALC), the number of members are increasing in the same time , so for the storage of members and course information database system also need to be improved.In the following report ,there will be a series of regular operation explanations such as Transaction, Roll back, Trigger and etc , and the reason why the author implement the operation of adding Transaction Isolation level, ER diagram, index into Database Management System.

Catalogue

1 Performance Tuning.....	1
1.1 Explanation of Indexing.....	1
1.2 The design of secondary indexes.....	1
2 Transaction.....	3
2.1 Explanation of Rollback.....	3
2.2 Explanation of Commit.....	3
2.3 Explanation of Stored Procedure.....	4
2.4 Explanation of Functions.....	5
2.5 Explanation of Triggers.....	5
2.6 The transactions in addressing situation at ALC.....	7
3 Evaluation of Design and Implementation.....	8
3.1 Explanation of Transaction	8
3.2 Anlysis of Entity Relationship Diagram	9
3.3 Transaction Isolation levels and its functions.....	10
References.....	11

1 Performance Tuning

1.1 Explanation of Indexing

When there are a large number of records in the table, to query the table, the first way of search information is the full table search, is to take out all records one by one, and the query conditions, and then return the records that meet the conditions, which will consume a large amount of database system time and cause a large number of disk I / O operations; the second is to establish the index in the table, then find the index value that meets the query conditions in the index, and finally find the corresponding records in the table quickly through the ROWID (page number) stored in the index. Old name general inspection, prepare inspection or attract. The basic unit of the composition is the index item. The item generally includes index words, instructions or notes, and source. All the indexed items are organized in an order. Its essential characteristic is to only reveal the content source or literature clues, and does not directly provide the facts and data itself. The main function is to provide clue guidance for people to obtain literature data accurately and quickly. The common indexes mainly include newspaper and paper data index, corpus article index, word index, sentence index, keyword index, special name index, theme index and so on.

1.2 The Design of the secondary indexes

The secondary index is also called the auxiliary index, because the leaf node of the secondary index stored data is the primary key. That is, with a secondary index, you can locate the position of the primary key.

Common secondary indexes include:

Unique index (Unique Key): A unique index is also a constraint. The attribute column of a unique index cannot have duplicate data, but allows the data as NULL, and a table allows the creation of multiple unique indexes. The purpose of building a unique index is mostly for the uniqueness of the data of the attribute column, not for query efficiency.

Common index (Index): The only function of a common index is to quickly query the data. A single table allows the creation of multiple common indexes, and allows data duplication and NULL.

Prefix Index (Prefix): Prefix index only applies to data of a string type. The prefix index is a creation index of the first few characters of the text, which has smaller data than the normal index, because only the first few characters are taken.

2 Transaction

2.1 Explanation of Rollback

To ensure that the database can be restored after application, database, or system errors to ensure the integrity of the database, a rollback is required. Rollback (rollback) is restoring database data to the database data status before the transaction is submitted. For example, if user A transfers money to user B, it needs to modify A and B in the database, and both sql statements must be executed or not executed. For example, the modified (update) statement of user B is executed first to increase the account amount of user B by 1000, and then the update statement of user A is executed to reduce the account amount of user A by 1000. If the account amount of user A is greater than 1000, the transaction proceeds smoothly and there is no problem. However, when the account amount of user A is less than 1000, because the transfer amount is not greater than the account amount, the second sql statement cannot be executed correctly. Prior to the database status of the update statement of B, the llback operation is required to perform the reverse operation, and the update amount of B shall be reduced by 1000. So the existence of a rollback allows the database to avoid unnecessary errors when modifying operations.

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2.2 Explanation of Commit

COMMIT Submission, indicating that all operations of the transaction are executed successfully, COMMIT tells the system that the database wants to enter a new correct

state, and that all updates to the database of the transaction should ensure that it is not lost due to the downtime of the database. ROLLBACK Rollback or rollback, indicating that a transaction must be revoked, ROLLBACK tells the system that an error has occurred, the database may be in an incorrect state, and some or all updates of the database to the transaction must be revoked.

In the PostgreSQL database, COMMIT and ROLLBACK belong to the transaction control language (Transactional Control Language, TCL), and TCL is used to maintain the consistency of data, including COMMIT, ROLLBACK, SAVEPOINT, ROLLBACK TO SAVEPOINT, SET TRANSACTION, SET CONSTRAINT and other statements. among, COMMIT Statements are used to confirm and submit database changes that have been made; ROLLBACK Used to revoke existing database changes; SAVEPOINT Statement is used to set the save point, To cancel the partial database changes, ROLLBACK The command ends a transaction, But the ROLLBACK TO SAVEPOINT does not; SET TRANSACTION Set the properties of a transaction; SET CONSTRAINT Specifies whether, after each DML statement, or after a transaction commit, Perform a deferred integrity constraint check.

2.3 Explanation of Stored Procedure

We commonly used operation database language SQL statement in the execution of the need to compile, and then execute, and the stored procedure (Stored Procedure) is a set of SQL statements in order to complete the specific function of the set, the compiled stored in the database, the user by specify the name of the stored procedure and given parameters (if the stored procedure with parameters) to execute it.

A stored procedure is a programmable function that is created and saved in the database. It can have SQL statements and some special control structures. Stored procedures are very useful when wishing to perform the same function on different applications or platforms, or to encapsulate specific functions. A stored procedure in a database can be seen as a simulation of an object-oriented approach in programming. It allows control over how the data is accessed.

Stored procedures can achieve a faster execution speed. If an operation contains a large number of Transaction-SQL code or is executed multiple times separately, then a stored procedure is executed much faster than a batch process. Because the stored procedure is precompiled. When a stored procedure is first run, the optimizer analyzes it and gives an execution plan that is eventually stored in the system table. The batch Transaction-SQL statement is much more slowly compiled and optimized for every run.

2.5 Explanation of Triggers

Database triggers are special stored procedures that run when a specific operation occurs in the database. Most triggers are defined as running when changes are made

to the data on the table. Trigger can be defined as alternate or run after DML (data manipulation language) -such as INSERT, UPDATE, and DELETE-.

2. 6 Explanation of Functions

Function is an important means used to realize some functional operations and to complete various specific operations.

merit:

- Allow standard component programming that improves the reuse, shareability, and portability of SQL statements.
- It can reduce the workload of repeating writing program segments and improve the program readability.
- Improve the efficiency of program compilation and operation, produce high-quality target code, and meet the basic requirements of "correctness, readability, robustness, efficiency and low storage requirements" of the algorithm design.

2.7 The transaction in addressing situation at ALC

In order to solve the problem of concurrent use of the database in multiple users, the authors propose solutions by using Stored Procedure, Functions, Rollback and Triggers.

For the database system with ALC, the Insert courses operation is used frequently, especially adding the membership experience course, so the author use begin and end statements to define a Stored Procedure named sp_coach (). Within Stored Procedure, the authors first declare a variable of type int v_count and assign a value of 3. In one loop of the loop body, it is implemented to insert the data into the course table and let v_count- -, the loop ends when the value of v_count is less than or equal to 0. That is to say, a single Stored Procedure operation can be inserted in three course data. Finally, if an exception is thrown during the execution of the loop, the Rollback operation rolls the data back to the Stored Procedure operation.

For the audit operations required for the Insert, Update, Delete operations, the authors define a Stored Function called fn_insert_logs. And call the trigger built in the pgsql as the return value. Within the function, the trigger is triggered if the Insert, Update,

and Delete operations are performed. An audit form is created for the manager to review.

3 Transaction

3.1 Explanation of Transaction

A transaction is a series of user-defined database operations that can be regarded as a completed logical processing work unit, either executed all or not all, and an inseparable work unit.

The data in the database is a Shared resources, so the database system usually support multiple users or different application access, and each access process is performed independently, it is possible to concurrent access data phenomenon, here is similar to the Java development of multithreaded security problem (solve sharing variable security access problem), if do not take certain measures will appear data exception.

DBMS system must provide a corresponding processing mechanism to ensure that access to each other without any interference, to ensure the correctness of the database is not damaged, in order to avoid the database inconsistency, the processing mechanism is called "concurrency control", the transaction is in order to ensure the consistency of data and a concept and means (transaction is not the only means)

To ensure the correctness and consistency of the database, there have four characteristics:

(1) Atomic nature (Atomicity)

The atoms of the transaction guarantee that a set of update operations contained in the transaction are atomic, indivisible, and are the smallest work unit of the transaction. The operations included are regarded as a whole, and the execution process follows "either all executed, or not executed", and there is no half executed, half unexecuted.

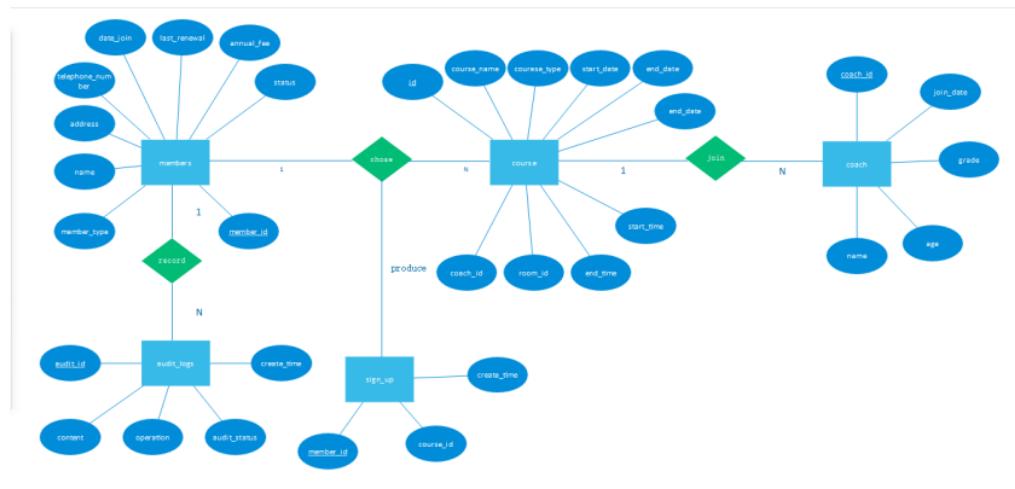
(2) Agreement (Consistency)

The consistency of the transaction requires that the transaction must meet the integrity constraints of the database, and then change the database from one consistent state to another consistent state after the transaction is executed. The consistency of transaction and atomic is inseparable, such as the example of bank transfer account to B account 1000 yuan, first A account minus 1000 yuan, then B account increase 1000 yuan, the two action is A whole, lose any consistency of operation data will be destroyed, so the two actions is A whole, or all operation, or not perform, the consistency of visible transaction is closely related to the atomic.

(3) Isolation (Isolation)

The isolation of transactions requires that transactions are separate from each other. And the execution of one transaction can not be disturbed by other transactions. Specifically, the operation of a transaction must be operated after a transaction commit. When multiple transactions are executed concurrently, it turns a concurrent transaction into a serial line.

3.2 Entity Relationship Diagram



ER graph entity (entity) or data objects in the data model, such as people, students, music can be used as a data object, represented by cube, each entity has its own entity members (entity member) or entity object (entity instance), such as student entities including zhang three, li, entity members (entity member) / entity instance (entity instance) does not need to appear in the ER diagram.

ER graph attribute (attribute) that data object has attributes, such as student with name, student number, grade attributes, expressed by oval, attribute is divided into unique attribute (unique attribute) and not unique attribute, the unique attribute is available to identify the entity instance or members of the attribute, underlined, generally entity has at least one unique attribute.

In the figure above, the entities are members, course, sign_up, Audit _ logs, and coach. Each entity has a number of different attributes, which are not listed here. Members is connected to the audit_logs by the record operation, and each members can correspond to multiple audit_logs. The same applies for course and coach. Finally, each members can correspond to the opposite course through the cause operation, simultaneously producing the sign_up.

3.3 Transaction Isolation Levels and its functions

The isolation level of the transaction

Read uncommitted (Read not submitted): Transaction B reads uncommitted data from transaction A. When A transaction writes data, B transaction is not allowed to write, but B transaction is allowed to read. Then B will read the A transaction write, but not submitted data, so dirty reading appears. Fixed an issue where updates are missing, but dirty reads appear

Read committed (Read Submitted) : Write transaction submission, can solve the dirty read problem. But two identical queries in a transaction range return different data

Lost updates and dirty reads were solved

Repeatable read (repeatable read) :When the read starts (transaction on), the modification is no longer allowed, so that the data is read the same twice within the same transaction, so it is called a repeatable read isolation level, but sometimes a phantom read may occur. Update is missing, dirty, unreadable, but phantom will occur

Serializable (Serial Chemistry):Transactions are required to be serialized, and transactions can only be executed one by one, but they cannot be executed concurrently. If the serialization cannot be realized only through the "row lock", we must ensure that the newly inserted data will not be accessed by the transactions performing the query operation. Serialization is the highest level of transaction isolation, with the highest cost, low performance, and generally rarely used, at this level, the transaction is performed in order .Can avoid dirty reading, not repeated reading, fantasy reading.

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GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

53/100

Generic Assessment Criteria	Marks available	Marks awarded
1. Engagement with Literature Skills	10	2
When writing about Commit, Stored Procedures etc, do so with reference to your database and support with citations to the literature. Engagement with a very limited range of sources, some of which are not in English so I can verify if they are credible or not. Also there are no citations in the main body of the text.		
2. Knowledge and Understanding Skills	20	10
You have a reasonable Entity Relationship Diagram. I would have expected entities for Rooms and Qualifications. The		

relationship between Coach and Course should show that a Coach can teach many Courses.		
3. Cognitive and Intellectual Skills	20	12
You have a sound critical evaluation/ critique of leisure centre scenario. From your analysis the case study problem scenario (ERD) you have proposed a coherent and appropriate, normalised to 3NF, database schema.		
4. Practical Application Skills	30	17
You have taken the ERD and produced a good database structure with Primary and Foreign Keys, indexes, procedures and functions. The database has been tested with appropriate SQL data manipulations statements. However, no example or justification or chosen indexes – only explained the use case of indexes, no additional indexes provided in the code, inserts to members did not work, varchar 11 was too short.		

A good procedure, complete with rollback functionality and looping. explained well A function for auditing was provided . Unable to test function because of the failed insert. You have shown that you can identify problems and propose appropriate solutions in complex and unpredictable contexts.		
5. Transferable Skills for Life and Professional Practice	20	12
You can communicate well, confidently and consistently in a suitable format. Your work is coherent, fluent, well-structured and organised.		

Assessment Mark (Assessment marks are subject to ratification at the Exam Board. These comments and marks are to give feedback on module work and are for guidance until they are confirmed.)

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12
