CHANDIGARH UNIVERSITY

Discover. Learn. Empower.

INSTITUTE : UIE
DEPARTMENT : APEX INSTITUTE OF TECHNOLOGY(CSE) -AIML

Bachelor of Engineering (Computer Science & Engineering)

Advanced Database Management System

Er. Vishwa Deepak (E12867)

Locks

Course Objectives

CO Number	Course Objective	Level
CO1	Develop understanding the advancement in SQL	Apply

Course Outcome

CO Number	Course Outcome	Level
CO2	Create views of data and Implement transaction control using locks.	Apply

LECTURE OUTCOMES

- Student will learn about the Granularity
- Student will learn about row level and table level locks

Granularity of data items

- A lockable unit of data defines its granularity. Granularity can be coarse (entire database) or it can be fine (a tuple or an attribute of a relation).
- Data item granularity significantly affects concurrency control performance. Thus, the degree of concurrency is low for coarse granularity and high for fine granularity.
- Example of data item granularity:
  1. A field of a database record (an attribute of a tuple)
  2. A database record (a tuple or a relation)
  3. A disk block
  4. An entire file
  5. The entire database

Levels Of Locking In DBMS

- The locking in a database can be done at 4 levels, which start with the database at the highest level and down via table and page to the row at the lowest level.
    1. **Database Level**
    2. **Table Level**
    3. **Page-Level**
    4. **Row Level**

TYPES OF LOCKS

- There are 5 locks types in the locking

- **Exclusive (X) Lock-**
  This method of locking differentiates the locks based on their usage. This also ensures that the data or information of a page will be reserved exclusively for those transactions that used the exclusive lock.
- **Shared (S) Lock –**
  This method of locking is applied only to the read operations. If this lock is applied to any row or a page, then it will reserve that row or page for the read operation.

❖**Intent exclusive (IX) Lock –**

This method of locking explicit locking at a lower level with exclusive or shared locks. This means that if a transaction has used this type of lock, then it must be a case of modifying the lower level of resources by imposing exclusive lock separately.

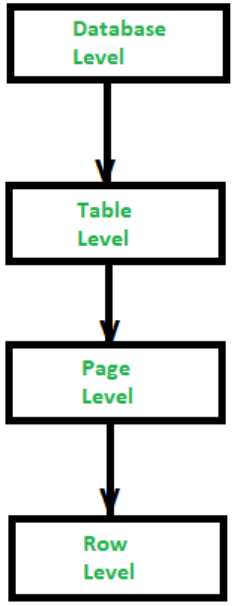
❖**Intent shared (IS) Lock –**

This method of locking is explicit locking at a lower level of the tree but only with shared locks. This means that if a transaction has used this type of lock, then it must be a case of reading the lower level of resources by imposing shared lock separately.

❖**Shared intent exclusive (SIX) Lock –**

This method of locking states that the transaction is used to read the resources at a lower level.

Level Of Hierarchy In Locking



Source: https://www.geeksforgeeks.org/levels-of-locking-in-dbms/

ROW LEVEL :

- This level of locking is less restrictive as compared to other levels of locking. At the row level, if a concurrent transaction is accessing different rows in the same relationship, even if the rows are located on the same page, then this can be accepted by database systems. Here at this level, DBMS allows concurrent transactions to access the rows of the same relation even in the case of where the rows are on the same page. At this level, we can apply 3 different types of locks, i.e, Exclusive, Shared, Update and these locks have already been discussed above and also, particular rows are locked in a query on this level.

APPLICATIONS OF ROW LEVEL –

- It is very costly compared to other levels of locking.
- It’s also very restrictive.

TABLE LEVEL :

- At the table level, the full table or relation is locked. Now, If let's say there are two relations in a database say, R1 and R2, where R1 uses tables, then R2 cannot use it. But, two transactions can access the same database only if they are accessing different relations. A transaction using a level of the table will hold shared and/or exclusive table locks. At the table level, there are 5 different types of locks. i.e, Exclusive (X), Shared (S), Intent exclusive (IX), Intent shared (IS), and Shared with intent exclusive (SIX) and these locks have already been discussed above.

APPLICATIONS OF TABLE LEVEL –

- This type of locking level is not suitable for multi-user database management systems.
- It is also primarily used in preventing a relation from being dropped in a DML operation.

Database Level :

- At the database level, the full or complete database is locked. Now, If let's say there are two relations in a database. If say, R1 and R2, where R1 uses tables, then R2 cannot use them. You will always find a shared lock on this level that is used whenever a transaction is connected to a database. On this level, we use shared locking to prevent dropping of the database or restoring a database backup over the database in use. Let's see an example. When we use a SELECT statement to read some data, a shared lock will be applied on the database level, an intent shared lock will be applied on the table and on the page level, and a shared lock on the row itself.
- **Applications of Database level –**
- This type of locking is suitable for a group of processes.
- This type of locking is very slow, so it is not used for the online version of multi-user DBMS.

Page Level :

- The Page-level always consists of fixed size i.e, power of 2 or 2^i type. A table can span several pages and a page can contain several tuples of one or more relations. At the page level, an intent shared lock (IS) will be imposed. This lock is capable of locking a table, shared, or exclusive page. An intent exclusive lock (IX) or intent update lock (IU) will be imposed if there's a case of DML statements (i.e. insert, update, delete).
- **Applications of Page level –**
- This type of locking level is suitable for multi-user database management systems.
- They are comparatively fast but also there are various conflicts.

SUMMARY

Explained Granularity.

Explained Row level and table level Locks

HOME WORK

- Why granularity is required?
- What is Table level Lock?.

REFERENCES

Text Book:

1. Database Systems Concepts, design and Applications, S. K. SIngh

Reference book:

1. An Introduction to Database Systems, C.J. Date

2. Database System Concepts, Korth, Henry

Web References:

1. https://www.geeksforgeeks.org/levels-of-locking-in-dbms/

THANK YOU

Mail at: Vishwa.e12867@cumail.in