**What is a recursive relationship? Give an example not used in the text.**

***answer:->***A recursive relationship is a relationship between an entity and itself. For example, given the entity PERSON, a recursive relationship could be used to show a PERSON and his or her SIBLINGs (brothers and sisters).

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**Difference Between Deferred Update and Immediate Update**

**Deferred Update vs Immediate Update**

Deferred Update and Immediate Update are two techniques used to maintain transaction log files of Database Management Systems (DBMS). Transaction log (also referred to as the journal log or the redo log) is a physical file that stores the Transaction ID, the time stamp of the transaction, the old value and the new values of the data. This allows the DBMS to keep track of the data before and after each transaction. When the transactions are committed and the database is returned to a consistent state, the log might be truncated to remove the committed transactions.

**Deferred Update**

Deferred update also called NO-UNDO/REDO is a technique used to recover/support transaction failures that occur due to operating system, power, memory or machine failures. When a transaction runs, any updates or alterations made to the database by the transaction are not done immediately. They are recorded in the log file. Data changes recorded in the log file are applied to the database on commit. This process is called “Re-doing”. On rollback, any changes to data recorded in the log file are discarded; hence no changes will be applied to the database. If a transaction fails and it is not committed due to any of the reasons mentioned above, the records in the log file are discarded and the transaction is restarted. If the changes in a transaction are committed before crashing, then after the system restarts, changes recorded in the log file are applied to the database.

**Immediate Update**:-Immediate update also called UNDO/REDO, is also another technique used to recover/support transaction failures that occur due to operating system, power, memory or machine failures. When a transaction runs, any of the updates or alterations made by the transaction are written directly in to the database. Both the original values and the new values are also recorded in the log file before changes are made to the database. On commit all changes made to the database are made permanent and the records in the log file are discarded. On rollback old values are restored in to the database using the old values stored in the log file. All the changes made by transactions to the database are discarded and this process is called “Un-doing”. When the system restarts after a crash, all the database changes are made permanent for committed transactions. For uncommitted transactions, original values are restored using the values in the log file.

**What is the difference between Deferred Update and Immediate Update** Even though Deferred Update and Immediate Update are two methods for recovering after a system failure, the process that each method uses is different. In differed update method, any changes made to the data by a transaction are first recorded in a log file and applied to the database on commit. In immediate update method, changes made by a transaction are directly applied to the database and old values and new values are recorded in the log file. These records are used to restore old values on rollback. In differed update method, records in the log file are discarded on roll back and are never applied to the database. One disadvantage of deferred update method is the increased time taken to recover in case of a system failure. On the other hand, frequent I/O operations while the transaction is active, is a disadvantage in immediate update method.

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Advantages and Disadvantages of deferred update technique

***The recovery scheme using a log with deferred updates has the following advantages of the recovery scheme with immediate updates:***

* + The scheme is easier and simpler to implement since fewer operations and routines are needed, i.e., no UNDO.
  + The scheme requires less overhead since no extra I/O operations need to be done until commit time (log records are kept in main memory the entire time).
  + Since the old values of data do not have to be present in the log records, this scheme requires less log storage space.
* ***The disadvantages of the deferred modification scheme are:***
  + When a data item need to be accessed, the transaction can no longer directly read the correct page from the database buffer, because a previous write by the same transaction to the same data item may note have been propagated to the database yet. It might have updated a local copy of the data item and deferred the actual database modification. Therefore finding the correct version of a data item becomes more expensive.
  + The scheme allows less concurrency then the recovery scheme with immediate updates. This is because write locks are held by transactions till commit time.
  + For long transaction with many updates, the memory space occupied by log records and local copies of data item may become too high.

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***Immediate update***

* Advantages:
  + Immediate update allows higher concurrency because transactions write continuously to the database rather than waiting until the commit point.
* Disadvantages:
  + Step 2 above can lead to cascading rollbacks - time consuming and may be problematic.

Disadvantage of pure immediate update: ·

1. It requires a huge disk cache to maintain all of the before images. ·

2. The possibility of long, cascaded rollbacks makes it particularly unsuitable in its pure form. · Guaranteeing recoverability is a complex task. ·

3. It is difficult to envision any practical database system which would require cascaded rollback as part of its recover strategy.

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***drawbacks to the shadow-page technique:***

1. **Commit overhead.** The commit of a single transaction using shadow paging requires multiple blocks to be output -- the current page table, the actual data and the disk address of the current page table. Log-based schemes need to output only the log records.
2. **Data fragmentation.** Shadow paging causes database pages to change locations (therefore, no longer contiguous.
3. **Garbage collection.** Each time that a transaction commits, the database pages containing the old version of data changed by the transactions must become inaccessible. Such pages are considered to be*garbage* since they are not part of the free space and do not contain any usable information. Periodically it is necessary to find all of the garbage pages and add them to the list of free pages. This process is called *garbage collection* and imposes additional overhead and complexity on the system.

### Disadvantages of the shadow paging system

 Data will suffer from fragmentation as the data is divided up into pages that may or not be in linear order for large sets of related data.

 Garbage will accumulate in the pages on the disk as data is updated and pages loose any references. For example if i have a page that contains a data item X that is replaced with a new value then a new page will be created (remember we always create a new page to update data in a new location). Once the shadow page table is updated nothing will refrence the old value of X.

***ADVANTAGES:->***

***1.*** no overhead for writing log records.

2. no undo/ no redo algorithm

3. recovery is faster

***Disadvantages:->***

1. data gets fragmented or scattered.

2. after every transaction completion database pages containing old version of modified data need to be garbage collected.

3.hard to extend algorithm to allow transaction to run concurrently

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Advantages of shadow-paging over log-based schemes

– no overhead of writing log records; recovery is trivial

• Disadvantages :

– Commit overhead is high (many pages need to be flushed)

– Data gets fragmented (related pages get separated)

– After every transaction completion, the database pages containing old versions of modified data need to be garbage collected and put into the list of unused pages

– Hard to extend algorithm to allow transactions to run concurrently

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***! Advantages of shadow-paging over log-based schemes***

! no overhead of writing log records

! recovery is trivial

***! Disadvantages :***

! Copying the entire page table is very expensive " Can be reduced by using a page table structured like a B+-tree – No need to copy entire tree, only need to copy paths in the tree that lead to updated leaf nodes

! Commit overhead is high even with above extension " Need to flush every updated page, and page table

! Data gets fragmented (related pages get separated on disk)

! After every transaction completion, the database pages containing old versions of modified data need to be garbage collected

! Hard to extend algorithm to allow transactions to run concurrently " Easier to extend log based schemes

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