ITC-6000

Assignment 4

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# Question 1

**Chapter 9 noted that CASE tools provide database administrators with a cost and time effective way of developing databases.**

* **Explain three aspects of CASE technology vendors. Compare and contrast at least three examples of CASE products. In addition, discuss the advantages and disadvantages of using CASE tools to build a database.**

**Computer Aided Software Engineering (CASE)**:

* It’s the implementation of computer facilitated tools and methods in software development
* It is used to ensure a high-quality and defect-free software
* It is used to automate SDLC activities
* It ensures a check-pointed and disciplined approach and helps designers, developers, testers, managers and others to see the project milestones during development
* It accelerates the development of project to produce desired result and helps to uncover flaws before moving ahead with next stage in software development
* These require a central repository, which can serve as a source of common, integrated and consistent information
* Central repository is a central place of storage where product specifications, requirement documents, related reports and diagrams, other useful information regarding management is stored
* Central repository also serves as data dictionary

**CASE Tools Types:**

* Diagram Tools
* Process Modelling Tools
* Project Management Tools
* Documentation Tools
* Design Tools
* Analysis Tools
* Maintenance Tools
* Configuration Management Tools
* Change Control Tools
* Programming Tools
* Prototyping Tools
* Web Development Tools
* Quality Assurance Tools

**3 Aspects of CASE Tools:**

* **Upper Case Tools**: Used in Planning, Analysis and Design. Focuses on concept-level products and tend to ignore design
* **Lower Case Tools**: Concentrate on details of Implementation, Testing and Maintenance
* **Integrated Case Tools**: Supports both the early and later stages of SDLC. The most useful type in database design is integrated CASE tools

**Advantages:**

* Productivity in development
* Helps standardization of notations and diagrams
* Improved quality through automated checking
* Help communication between development team members
* Automatic preparation and update of documentation
* Encouragement of prototyping and incremental development
* Automatic preparation of program code from requirements definition
* Reduced maintenance systems
* Reduction of generation of errors
* Easier recognition of bugs during development
* Savings in maintenance resources required

**Disadvantages:**

* Limitations in flexibility of documentation
* Inadequate standardization
* Costs associated with the use of the tool: purchase + training
* Slow implementation
* Unrealistic expectations
* May lead to restriction to the tool's capabilities
* Staff resistance to CASE tools

**CASE technology and tool vendors:**

* **Artiso Visual Case:** It is a tool for software development, database design, database maintenance and business analysis developed by Artiso Corp
* **DB-MAIN**: It is a modeling tool dedicated to Database Application Engineering. It was developed by University of Namur’s LBID
* **iGrafx Flow Charter:** It is process analysis and modeling tool developed by iGrafx
* **MetaEdit+:** It is a tool for designing a modeling language and then generate diagramming functionalities. It was developed by Metacase company
* **Microsoft Visio**: It is a diagramming program for Microsoft Windows that uses vector graphics to create diagrams
* **OmniGraffle**: It is a diagramming application for Mac OS X operating system developed by The Omni Group. It can create diagrams, flow charts, org charts, and illustrations
* **Rational Rose**: It is a UML modeling and model-driven development tool which was developed originally by Rational Software. It has the ability to integrate with existing integrated development environments or languages
* **SmartDraw**: It is a diagramming tool developed by SmartDraw.com
* **ArgoUML**: It is a UML diagramming tool written in Java developed by Tigris
* **Visible Analyst**: It is an integrated Strategic Planning, Data Modeling, Business Process Modeling (BPMN), UML Modeling, and Structured Analysis and Design Modeling developed by Visible

**CASE Products Comparison:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S. No | Features | Rational Rose | Microsoft Visio | SmartDraw | DB-Main | Omni Graffle |
| 1 | Data Flowing Diagram | Yes | Yes | Yes | No | Yes |
| 2 | Work Flow Diagram | Yes | Yes | Yes | No | Yes |
| 3 | Data Dictionary | Yes | Yes | No | Yes | No |
| 4 | Code Generation | Yes | Yes | No | Yes | No |
| 5 | Import & Export | Yes | Yes | No | Yes | No |
| 6 | Testing | Yes | No | No | No | No |
| 7 | Analysis Tools | Yes | No | No | No | No |
| 8 | Report Generation | Yes | Yes | No | No | No |
| 9 | Form Generation | Yes | Yes | No | No | No |

# Question 2

**Using library resources or the Internet, identify a database management system that processes database transactions.**

* **Briefly describe what happens to the application when deadlocking occurs. Explain some of the adverse effects of deadlocking, and conclude by listing recommended actions that can be taken to avoid deadlocking on this application.**

**Transaction:**

A transaction is a logical unit of database processing that includes one or more database access operations such as an insertion, deletion, modification, and retrieval. Instructions are always atomic in nature i.e. either an instruction execute completely or it does not execute at all. But it is possible to have partially executed programs which means some instructions are executed but some are not. According to the user either a work is done or not done therefore a transaction is that of instructions which perform a logical unit of work.

**Transactional Database:**

A transactional database is a database management system (DBMS) that has the capability to roll back or undo a database transaction or operation if it is not completed appropriately. Although this was a unique capability several decades ago, today the majority of relational database systems support transactional database operations.

**Deadlocks:**

* In a multi-process system, deadlock is an unwanted situation that arises in a shared resource environment, where a process indefinitely waits for a resource that is held by another process
* A deadlock is a state in which each member of a group of actions, is waiting for some other member to release a lock. Deadlock is a very common problem when the system is handling multiple processes
* Deadlocks are not healthy for a system. In case a system is stuck in a deadlock, the transactions involved in the deadlock are either rolled back or restarted
* Software and hardware lock are used to handle shared resources and implement process. But on the other hand, we need to prevent deadlock from happening because it might cause damage to operational level
* Use necessary tools to monitor the system process. It is important to diagnose the deadlock before it possible occurs
* **Lock Logic Analysis, Lock Ordering, Lock Timeout, and Single Thread** are common technologies used to avoid Deadlocks

**Deadlock Prevention:**

* Removing mutual exclusion
* Removing hold and wait condition
* Preemption of resources
* Avoid circular wait condition

**Deadlock Avoidance**:

Deadlock can be avoided if resources are allocated in such a way that it avoids the deadlock occurrence. There are two algorithms for deadlock avoidance

* Wait/Die
* Wound/Wait

# Question 3

**SQL Server is Microsoft’s popular database engine that uses the Structured Query Language (SQL) to accept requests for data access. Learn about SQL Server’s backup strategies.**

* **Mention the types of data corruption that might occur in an environment using SQL Server.**
* **Discuss some database backup requirements that a database administrator should consider when devising a backup strategy for the organization’s DBMS.**
* **Describe the different types of backup techniques supported by SQL Server.**
* **Conclude by explaining why it is essential to have a solid backup strategy as part of an organization's efforts to maintain database transaction integrity.**

**Structured Query Language (SQL):**

It is a database language designed for managing data held in a relational database management system. In a DBMS, the SQL database language is used to:

* Create the database and table structures
* Perform basic data management chores (add, delete and modify)
* Perform complex queries to transform raw data into useful information

**Microsoft SQL Server:**

It’s a relational database management system (RDBMS) that supports a wide variety of transaction processing, business intelligence and analytics applications in corporate IT environments. Microsoft SQL Server is one of the three market-leading database technologies, along with Oracle Database and IBM's DB2.

**Types of Data Corruption in Microsoft SQL Server Database:**

* Corruption is caused by errors and failures in your storage media and\or power supply
* Hard disks, like all mechanical devices, will fail someday for some reason
* Solid state storage is not mechanical, but it will also fail eventually
* The most common cause of corruption for both mechanical and solid-state media is a power failure during a write to disk
* **SQL Page Level Corruption** **-** All data information of Microsoft SQL stored at the page level
* Abrupt system shutdown while the database is opened and Changes in SQL account
* **Page Header Corruption** **-** Every SQL server database page involves header that maintains the control over the way of data information stored in the page
* **Index Corruption in SQL Server -** An index is the most important component in a relational database that helps in the recovery of the database from a table. These components are created for both tables as well as views
* Virus infection and Bugs in SQL server itself
* **Boot Page Corruption -** It is like as the file header, which provides the Metadata information. But, instead of giving the data information, the boot page provides whole information about a database
* More than 95% of corruption happens due to hardware failure
* Upgrading SQL Server from previous versions to newer one also, at times, results in the corruption of database

**Database Backup Requirements:**

Backing up your SQL Server databases, running test restores procedures on your backups, and storing copies of backups in a safe, off-site location protects you from potentially catastrophic data loss. Backing up is the only way to protect your data.

Before implementing backup strategy, the supervisor should fully understand the need within the organization, its cost and effectiveness. Recovery process may take time and labors, so a good backup strategy must satisfy both timing requirement and cost-efficiency.

**Different Backup techniques that SQL supports:**

* Automating and Monitoring Backups
* Backup Logs and Catalogs
* Database Catalog Maintenance
* Validating Backups
* Setting up dependencies
* Decide what needs to back up?
* Shorten data backup period
* Database Restore Testing
* Develop a Backup Retention Policy
* Mix and match backup methods
* Backing up SQL server system database
* Practice database security

**Conclusion:**

* Backing up your business information is as crucial as conducting daily business itself. Which is why you need a solid backup strategy
* With a proper backup policy, you can secure all your business data—files, documents, client and customer correspondence, and in-house or remote team communications
* No matter which industry or sector you serve, proper backup is pivotal. Data loss can seriously cripple a business of any size
* A good backup strategy is the best way to avoid losing essential information due to systems failures, security breaches or plain old human error
* Currently, cloud backup seems to be most popular, but I argue that Solid backup is still necessary for any companies
* In some cases, the solid backup is more effective. For example, when your power is down, you need the solid backup to recovery
* In addition, when you have a very large dataset, solid backup can provide you with more speed possibility
* Solid backup also makes it possible combined with hardware protections