PEERS INSTITUTE   FACULTY : Mr. MADHAVA RAO   Wednesday ①

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SQLSERVER DBA

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* Database Environment Life Cycle

1st — Designing phase → DB Designers, DB Architectures.
2nd — Implementation phase → Scripting Logic Code → DB Developers
3rd — Maintenance phase → Administering, installation → DB Admin

For Real Time projects → Development DB System
→ Testing DB System
→ Production/OLTP System Eg: Banking
TeleCom domain, Hospital, Commercial

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* Systems to Manage as a DBA

(1) Development DBA
(2) Production DBA → OLTP Systems
→ OLAP Systems | DW Systems | BI Systems
For Reports, Analysis, Historical Data, etc.,
(3) BI DBA

* Development DBA → Ist phase
→ IInd phase
→ IIIrd phase.

* Production DBA —— IIIrd phase

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* Roles & Responsibilities of Production DBA

Roles of Production DBA

1. Installation & Configuration
2. Security → Server Level, DB Level → Encryption / Decryption, logins.
3. Maintenance & Automation Module
4. Standby Servers Setup [For High Availability]
   * Log shipping
   * Mirroring
   * Replication
5. Monitoring & Troubleshooting
   * Connectivity issues
   * Performance issues.

* Roles of BI - DBA

MSBI Administration → SSIS
→ SSRS
→ SSAS

- installation
- Configuration
- deployment
- Security
- Monitoring

* Clustering Practical Implementation
  * OS Level
  * Server Level

PAGE

* DBA Related.

7. Service Oriented Architecture (S.O.A)
   - Service Broker (SSSB) → Asynchronous Messaging
   - Notification Services (SSNS)
   - DB Mail integration (SMTP)
   - HTTP End points.
8. Oracle Integration
9. Database SnapShots → image of a db → Used for reporting purposes ; Read only
10. Data partitions
11. DataBase Mirroring → Automatic Failover — Redirected to Secondary server
12. Security Enhancements [Keys, Certificates]
13. Maximum no. of instances on single Computer in 2005 — 50 instances.
14. Full Support for 32 bit/ 64 bit platforms.
15. Log Shipping & clustering Enhancements
16. Online Indexing.
17. Peer to peer Replication → Used for Network Load Balancing.

Note : 1 – 6 . For Developers purpose
7 – 17 For DBA purpose

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2. Work Station Components

* SSMS - Sql Server Management Studio.

* Configuration Tools → SCM - Sql Server Configuration Manager
→ SAC - Sql Server Surface Area Configuration
↳ It is removed in Sql Server 2008

* Performance Tools → Sql Profiler
→ DTA → Database Engine Tuning Advisor

* BIDS Tools

* Connectivity components

* Documentation [Books online]

2. Editions of SQL Server.

SQL Server 2005/2008 is available in 6 editions and can be differentiated by considering the following list

* Features Set
* Price
* O/S Compatibility
* Hardware Maximum Support.

(a) Mobile Edition : * Only for small devices [Mobile device, pocket PC etc,]
* windows CE, windows XP Tablet PC.

(b) Express Edition : * Free Edition
* Limited DB Engine features only
* No MSBI features
* No Client Tools
* All windows O/S

(c) WorkGroup Edition [Small Organization] → 32 bit only
* Limited DB Engine Features
* Limited SSIS Development
* Client Tools
* All windows O/S.
* Price $ 750

(d) Standard Edition [Medium Organization] → 32 bit / 64 bit
* DB Engine features
* DWH/ BI Modules (SSIS, SSRS; SSAS)
* No Advanced DB Engine features
- DB Snapshots, Data partitions,
- Online indexing, Advanced SSIS/ SSAS/ SSRS.
* Only 2 node clustering possible.
* Max. 4 processors — Not Scalable
* Licensing price for one server — $ 2000.

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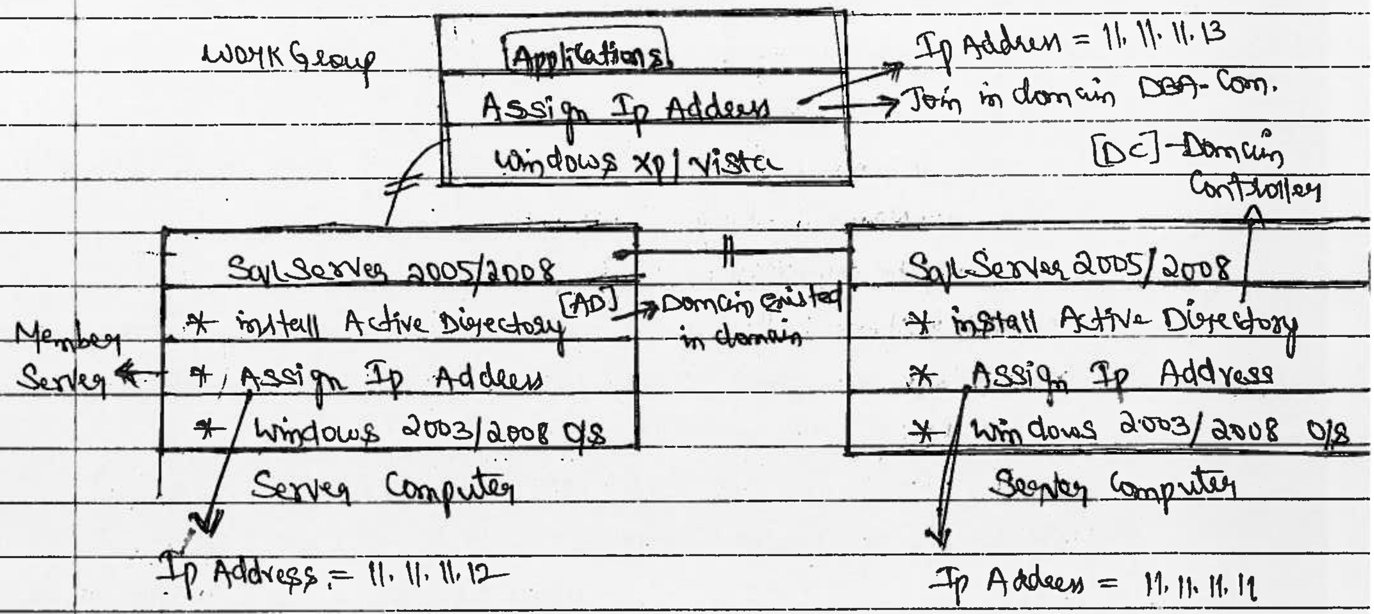
* Installation process.

5. Setup the Operating System → Server O/S



O/S Level Job

Server Computer: Domain Controller / Member Server

* install the server o/s of windows 2000/2005/2008.

* Promote WorkGroup as Domain Controller / Member Server

* Assign Ip Address

* install Active Directory → Start → RUN → dcPromo

Client Computer: WorkGroup

* install the windows xp/vista O/S.

* Assign the Ip Address.

* Join in the existing domain

} O/S

On Server Computer

* Install Sql Server all Components (Server Components + client Tools)

} Sql Server

On client Computer

* install only client Components.

} Sql Server

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* 1. **Practical : Installing the default instance [Server Computer]**

* Open SQLServer 2005 S/W

X 86 → 32 bit

X 64 → Itenium (IA) → 64 bit

* Two Sub-folders

① Servers

② Tools

* Goto "Server" folder and double click on "Setup.exe"

wey. * Pre-Requisites installed

(.net F/W, SqL Native client, Setup Support files)

* System Configuration check

* Components to Install screen Appears

/ . check the Required Components

/ SqLServer DB Engine

/ SSIS

/ SSRS, SSAS, SSNS.

/ Workstation Components & Development Tools.

Server

Server Components

client Tools.

* click "Advanced" button to change the installation path

* Instence Configuration

— default instence (or)

— named instence

* Specify Service Accont

/ Use built-in System Account (or)

/ Domain Accont

* Service Account means O/S user Account

Under this account Context, Services will be running on the Compute

/ For Stand Alone Computer, Local System Account is ReCommended.

/ For N/W, Domain Account is ReCommended.

* To Create a Domain Account, click on

/ Start —

/ All programs

/ Administrative Tools

/ Active Directory Users & Computers

To Connect to Named Instance

ServerName = Computer\Instance Name
= Peers\Testing
= Peers\Server2

Verification : Start → programs → MS Sql Server 2005
→ Verify Client Tools
Open [O/S] Services window
Start → Run → Services.msc

SqlServer MSSqlServer → Default Instance
SqlServer (Testing) → Named Instance

* **Practical : Installing client Components / Tools only on client Computer.**

* Follow the installation process.
* Components Lists Screen Dialogue box appears.
* check only WorkStation Components & Development TOOLS.

* **Practical : Installing Connectivity Components only on Client Computer.**

* Follow the installation process.
* Components Lists Screen Dialogue box appears.
* Check only WorkStation Components & Development Tools.
* Now click on "Advanced" button
* Cancel the different Components Under 'client Components" except – Connectivity Components.
* Continue the installation process.

* **Trouble Shooting Installation failure :**

* Open installation Summary Report
C:\ program files\ Microsoft SQL Server\ 90\ Setup BootStrap\ Log
↓
Summary.txt files
↓
SqlSetup XXXX $\xrightarrow{\text{Number}}$ — ComputerName — ComponentName . Log
↓ Eg : SQLSetup0042 — Peers — SQL.log
Core
SQL
AS, RS, NS
↓
Analysis Services, Reporting Services, Notification Services

(2) Configuration and optimization.

SqlServer 2005 provides 2 Configuration tools.

(a) SqlServer Configuration Manager (SCM)

(b) Sql Server Surface Area configuration (SAC)

(a) Surface Configuration Manager (SCM)

Open SCM using the following steps

Start → programs → MS SqlServer 2005

Select 'Configuration Tools' and then

Select 'SCM'.

(i) START| STOP | RESTART the services

Select "SQLServer 2005 Services"

Select particular Instance Service and Right click and then

select start/ stop/ Restart

Right click → properties (change service Account)

(ii) Server protocols Configuration :

Select "SQL Server 2005 Network Configuration"

Select protocols for a particular instance.

Right click on Protocol → Select Enable/ Disable.

Right click on particular instance service changed.

(iii) client protocols Configuration

Select 'SQL Native Client Configuration.

Select "Client protocols"

Enable / Disable particular protocol.

Four Protocols :

1. Shared Memory : Supports only Local Connections

2. Named pipes : Supports Local & Remote Connections.
Low performance & less Security

3. Tcp/Ip : Supports Local & Remote connections
High performance & More Security.

4. VIA (Virtual interface Adapter):
Same as Tcp/Ip
Designed for non-windows O/s and non-tcp/ip networks.

* **SQL Server Environment**

Database Engine Organizes the databases into 2 Categories :

1. System Databases
2. User Databases

In SQLServer 2000, built-in databases

1. System Databases
   Master ; MSdb ; Model ; Tempdb
2. User Databases
   Pubs ; Northwind.

In SQLServer 2005, built-in databases

1. System Databases
   * Master * MSdb * Model, * Tempdb * Resource
2. User Databases
   * Empty ; * optionally we can setup
   → AdventureWorks
   → AdventureWorksDW databases.

* **Purpose of System Databases**

(1) **Master** : Master database is startup database.

it maintains : * Logins information
* Databases information
* Configurations
* Linked Servers information
* Permissions, Errors info etc,

System Tables
↳ Syslogins
Sysdatabases
SysServers
Sysprocesses
Sysmessages ....

(2) **MSdb** : This maintains * Jobs, Alerts, Operators
* Schedules.
* Database mail Configuration
* Backups History, Jobs History
* Maintenance plan History etc,

System Tables
↳ Sysjobs
Sysoperators
Sysalerts
SysSchedules

backupset
backup file
... ...
Sysjobhistory

Development Tools in Sql-Server 2005 → Query Editor

1. SSMS – SqlServer Management Studio → Object Explorer → Gui
  ↳ Gui based.

2. SQLCMD – Command Line Tool

* **1. SSMS :** SSMS provides * Query Editor
* Object Explorer → Gui based.

SSMS allows us to manage SqlServer & MSBI Services

→ How to use Query Editor ?

Open SSMS [Start → Run → Sqlwb] → Sqlworkbench

* To open Query Editor

* click on "New Query" button in the Tool bar.

* a Connection window is displayed
  ↳ ServerType = Database Engine
  ↳ ServerName = Peers → default instance
    = Peers\Server10 → Named instance
  ↳ Authentication = Windows Authentication
  ↳ Click on "Connect" button

Note : To write Comments in T-Sql
  (1) -- Single Line Comment Eg : -- Sample Notes
  (2) /* Multi-Line Comment */

To Execute T-sql Script → Press F5 (button) function key

To Show or Hide Results windows → press ctrl + R

Examples : * List out Current Server Name, Login information
  * How to find Current SqlServer Properties ?

Serverproperty(PropertyName)
↓

* ServerName * productVersion
* Collation * Product Level → Returns Service packs infor
* Edition * isclustered → 0 – non-clustered
    1 – clustered.
* Instance Name * isSingleUser → 0 – multi-user mode
    1 – Single user mode

Note: Product Level : * RTM No Service pack → Service packs info
  * SP1
  * SP2

RTM — Release to Manufacture.

Example : How to Create a database using object explorer ?
Select 'Databases'
Right click on 'New Database' and type
Database = Bankdb and click on 'OK' button.

Default path of Database files Created
<Home directory>:\ MSSQL\ Data → datafile → .mdf Extension
→ logfile → .ldf Extension.

(Command Line Tool)

* 2. SQLCMD :

In Sql Server 7.0/2000
*isql
* Osql → Odbc.
In SqlServer 2005
* Sqlcmd (new) → oledb
→ high performance

* Used to interact with Sql Server from Command prompt and Executes T-Sql scripts at the Command prompt.

To open Command prompt
(Start → Run → cmd):

```
C:\ Sqlcmd -E -SServerName
(or) C:\sqlcmd -UuserName -Ppwd -SserverName.
1>
2> T-SQL Script
3> Go
```

Note: 'Go' Represents End of batch
it will submit the T-Sql statements
to the Sql Server.

Options : -E → Windows Authentication
-U → SQL Server Authentication
-P → SQL Server Authentication
-S → Server Name
-i → input Script file
-o — output Script file.

Ex : How to use SQL cmd ?

```
C:\>Sqlcmd -E -Speers\Server10
1> use Master
2> Go
3> Select name, crdate
4> From Sysdatabases
5> Go
```

Note : To Exit Sql Server
C:\
1> Exit

④ Verify the Network Connectivity

* open the Command prompt on Server Computer

* C:\>

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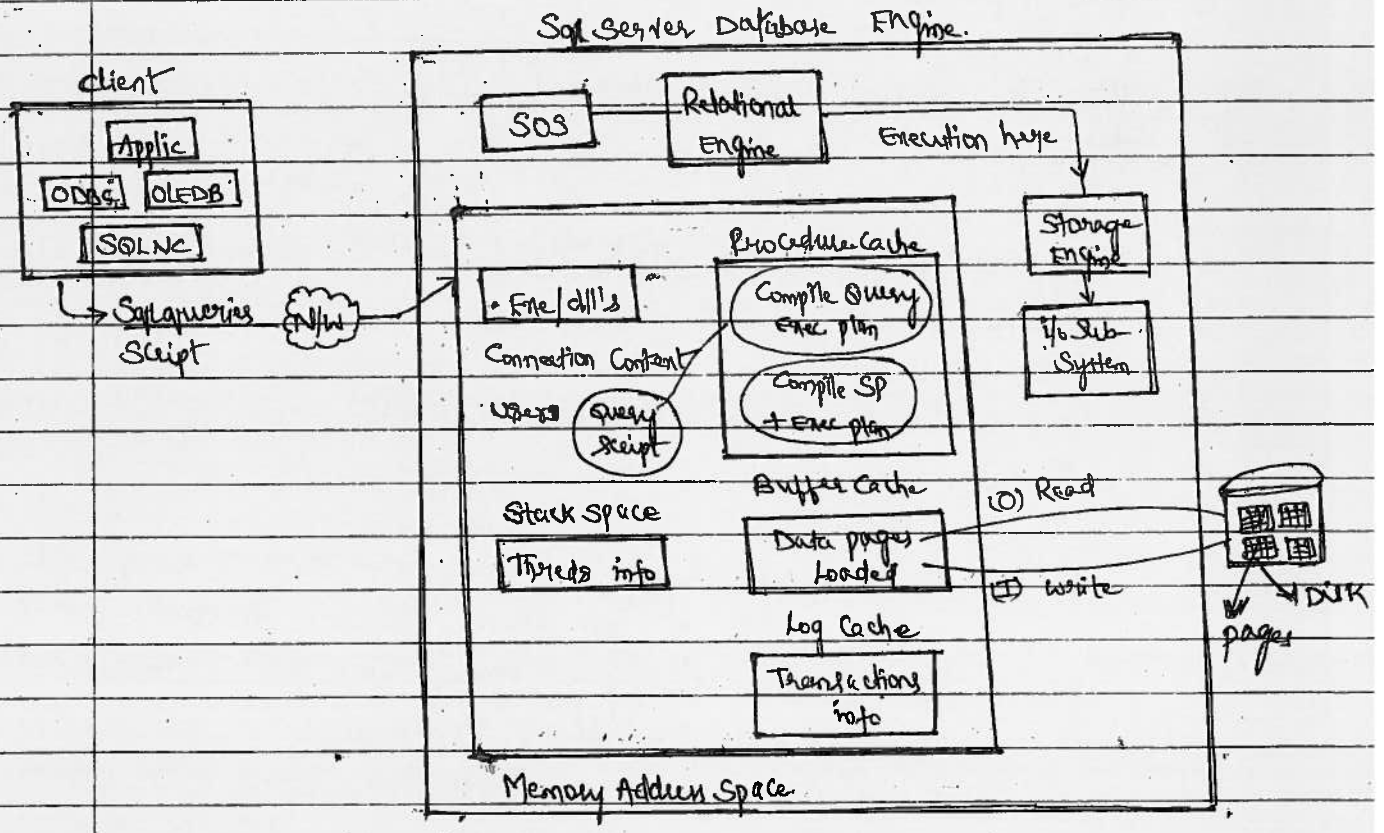
* SqlServer Architecture



* Minimum Memory per Query — Means how much memory is allocated for single query submitted by the user.

By default 1 MB is allocated.

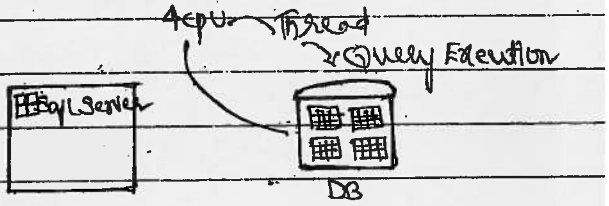
Threads Configuration [SOS] → SqlOS

* SOS Creates a thread to process the user request.
* Each thread takes memory of 512 kb.
* Minimum no. of worker threads by default — 32,767.

Eg: Concurrent Users Load on particular Sql Server — 1500

(1) Exec Sp_Configure 'Max. worker Threads', '1600'

```
ReConfigure
Go.
```



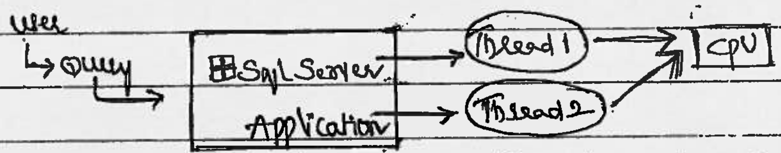
Processor's Configuration. (cpu):

0 1 0 1

Affinity Mask — 5   P1 P2 P3 P4

Affinity Mask — 10   1 0 1 0

* Priority Boost



* Sql Server will support by default SMP — Symmetric Multi Processing.
* Affinity Mask decides which processes is allocated for Execution purpose.
* Affinity i/o Mask decides which processes is allocated for i/o.
  By default, dynamically processors will be allocated for Execution & i/o.
* Priority Boost means Sql Server threads provided with the highest priority on the server Computer.

Ex: $\bar{P_1}$ $\underline{P_2}$ $\bar{P_3}$ $\underline{P_4}$ — 1 0 1 0 — 10 → P1 P3 allocate i/o

0 1 0 1 — 5 → P2 P4 allocate i/o

(1) Exec Sp_Configure 'Affinity i/o Mask', '10'

```
ReConfigure
Go
```

(2) Exec Sp_Configure 'Affinity mask', '5'

```
ReConfigure
Go
```

(3) Exec Sp_Configure 'Priority Boost', '1' → To Enable

```
ReConfigure
Go.
```

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* **Practical** : How to start SQL Server in Single User Mode ?

* Open SCM Sql Server Configuration Manager

* Select Sql Server Services

* Select particular instance of SQL Server (Eg: Server1)

* Right click on properties of Server Name/ instance.

Select "Advanced" option

In Startup parameters

...... ; –m and click OK.

Note: –m here changes to multi-user mode.

* Restart the DB Engine service.

* Single user Mode means only one User [Sys Admin] Can be Connected to Sql Server

* This User Can open only one Connection.

* [DAC] **Dedicated Administrative Connection** : using Command prompt, using Management Studio.

* New feature in Sql Server 2005.

* DAC Connection will use a special thread, separate port no.

* DAC will give faster Connection when Compared to normal Connection.

* only 1 DAC Connection Can be established at a time. ie only sys Admin

Usage : Generally, Administrator will establish DAC to resolve the server or db level problems.

Q. How to Establish DAC ?

* We have 2 ways to establish DAC.

(1) SSMS

↳ Connection window

↳ Server Name = admin : Peers\Server10

(2) Sql cmd

```
                 (Windows Authentication)
                   ↗                        ↗ DAC
c:\> Sql cmd  –E   – SServerName   –A
```

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* Properties of a Database File : file Specification

① Name = Logical Name. This should be different for each file in particular DB.

② FileName = physical path of the file.

③ Size = initial size of the file

④ MaxSize = Maximum size of the data file.

⑤ FileGrowth = Autogrowth of the file.

Eg:
```
    Name = 'xyz'
    FileName = 'C:\Hello.mdf'
    Size = 10Mb
    MaxSize = 30Mb
    FileGrowth = 3mb
```

* Practical : Create a DataBase with 1 data & 1 log file.

```
Create database Salesdb
ON
  ( Name = 'xyz',
    FileName = 'C:\Salesdbdata1.mdf',
    Size = 3Mb,
    MAXSize = 10Mb,
  ) FileGrowth = 1Mb
Log ON
  ( Name = 'abc'
    FileName = 'c:\Salesdblog1.ldf',
    Size = 2mb,
    MaxSize = 7mb,
  ) FileGrowth = 1mb
```

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* Eg: Create a Database with default properties → path will be in Sql Server Home direct

```
Create Database bankdbdata
```

Default properties : <Home Directory>\data

* bankdbdata.mdf	* bankdbdata_log.ldf
Size = 1.14mb	Size = 504 kb
MaxSize = Unlimited	maxSize = 2 B
FileGrowth = 1Mb	FileGrowth = 10% Size.

-- ~~Ex~~ Ex : Adding a New Log file to a Database.

```
Alter Database Salesdbdata
  Add Log file
    ( Name = 'log2',
      fileName = 'D:\ saleslog2.ldf',
      Size = 3mb,
      Max Size = 7Mb,
    ) file Glowth = 1Mb
```

* <u>File Groups</u> * Logical Group of one or more data files in the DB.
* File Groups allows us to organize the datafiles.

In SQL Server, a database Can have 2 types of file groups.

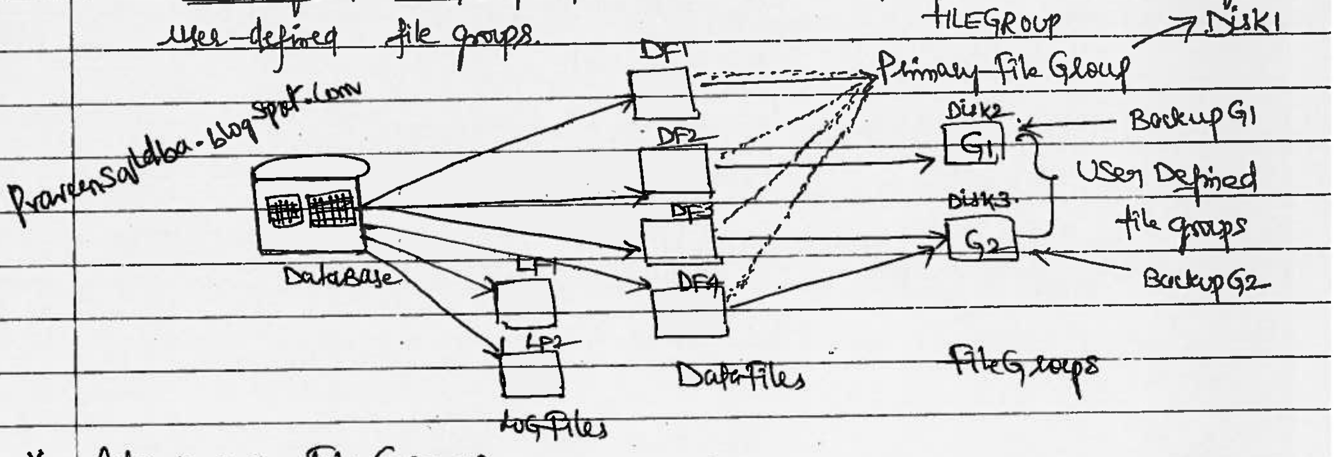
① primary file Group (Built-in)

② User defined file Group.

file Group Concept Can be applied to only data files (only) but not to log files.

1. <u>Primary File Group</u> → [FG] : A database Can have only one primary FG. This is a mandatory in the database.

2. <u>User defined file Group</u> :[optional] : A database Can have many user-defined file groups.



* <u>Advantages of File Groups</u>

1. Backup & Restore of a particular file group will save the time of Complete db backup & restore.

2. FileGroups allows us to maintain space for the objects (generally for tables, indexes) on specific file group.

3. File Groups can be organized across multiple drives/ disks for i/o performance.

4. Data partition implementation requires file groups in the DB.

5. particular FileGroup can be marked as Read-only.

```
log ON
  (   Name = 'Log1',
      FileName = 'C:\Salesdblog1.ldf',
      Size = 2mb,
      MaxSize = 10Mb,
  )   File Growth = 1mb
```

* Practical 2. Adding file Groups & DataFiles to an Existing database.

```
Alter Database [DatabaseName]
        Add filegroup  fgName
        Modify Filegroup fgName
                default/ read-only.
        Remove filegroup fgName
        Add File
          ( Data file Specification )
        To Filegroup fgName.
```

Eg:

```
Alter Database Salesdb1
      Add file group  G3
Alter Database  Salesdb1
   Add file
     (   Name = 'S4',
         FileName = 'C:\Salesdb40.ndf',
         Size = 2mb,
         MaxSize = 10mb,
     )   Filegrowth = 1mb
         To file group  G3
```

* Practical 3. Creating objects (Tables, Indexes) on particular file group.

```
Create Table  TableName
 (
      Column1  datatype,
      Column2  datatype, ...
 )

      ON FilegroupName
      Textimage  ON filegroupName
```

* To implement Data partitioning on a New Table we have to follow 3 steps :

Step 1 : Identify the partition Column.

Customers ⟶ Table Name.

* CustNo — int ⟶ partition Column.

* CustName

* Age

Step 2 : Prepare partition Function

Partition Function decides the range of values to create the partition based on partition Scheme.

How to create the partition Function ?:

Syntax : Create partition Function
AnyName (partitionColumn datatype)
AS RANGE [LEFT/ RIGHT]
FOR Values (boundary Values)

Eg : Create partition Function pf1 (int)
As Range Left
For Values (1000, 2000, 3000)

Left	Right
−∞ — 1000	−∞ — 999
1001 — 2000	1000 — 1999
2001 — 3000	2000 — 2999
3001 — +∞	3000 — +∞

Step 3 Prepare the partition Scheme.

partition scheme decides physical storage of each partition on a particular file group ie, mapping each partition with file group

How to create Partition Scheme ?

Syntax : Create partition Scheme Anyname
AS partition [partition-Function-Name]
To [Filegroup-name]

Eg : Create partition Scheme PS1
AS partition fg1
TO (G1, G2, G3, G4)

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Database Configuration → Properties

① To list all the properties of a database.

Use Master

Exec Sp_~~dboption~~ → dboption

② To set the database property

Exec Sp_dboption dbname, property, value.

Go.

(or) Alter Database dbname
Set property [ON/OFF]

Practical : Starting & Stopping the Database.

ONLINE : Means start the database
Database is in operational mode.

/ OFFline : Means stop the database.
Database is not in operational mode.

To Start the DataBase.

Exec Sp_dboption 'Salesdb1', 'Offline', 'False' → {Off Line; Start Mode; operational Mode

Exec Sp_dboption 'Salesdb1', 'off line', 'True' → {Off Line, stop mode, Non-operational mode

Alter Database Salesdb1
Set ON Line } To start a particular db, online/ operational

Alter Database Salesdb1
Set off Line } To stop a particular db, offline/ non-operational

Using GUI Mode : Select a particular database
Click on Tasks
Select 'Off line' to stop the database
Select 'Bring ON Line' to start the database.

User Access Mode for a particular Database.

Eg: Alter Database dbname
Set Single_User / Multi_User / Restricted_User

Single_User ↓ only one "SysAdmin" user can access

Multi_User ↓ Multiple users can access ↓ Default mode when installed.

Restricted_User ↓ Multiple 'System Admin' users can access.

2. Collation : This property decides
- Language culture settings
- Sorting order behaviour
- Case sensitivity behaviour , etc.

This can be defined at 3 levels :

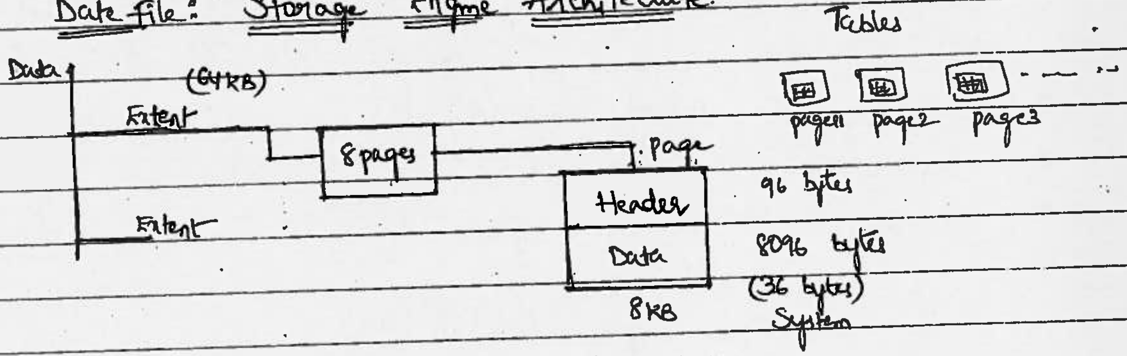
① instance / Server level
only at the time of installation of Sql Server

② Database Level.
* default is inherent from instance.
* we can change it at any time we want

③ Table & Column level
* default : inherent from databases
* we can change it when ever we want.

Physical Storage of Database.
Database Means
① Data file (Storage Engine Architecture)
② Log file (Transaction System Architecture)

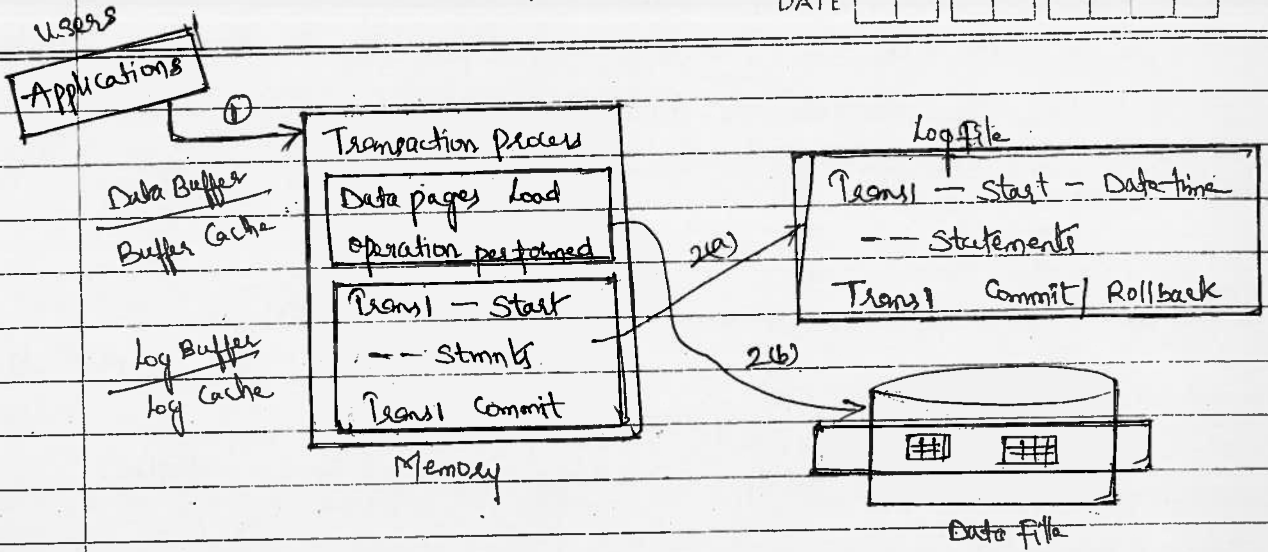
Date file : Storage Engine Architecture.



Extent : This a logical partition in the data file.
Each Extent size is 64 KB.
We have 2 types of Extents

① Uniform Extent : All pages in the extent is allocated for single - Object.
② Mixed Extent : All pages in the extent is allocated for multiple - Objects (more than 1 table or objects).

Page : page means a data block in the Extent.
Each page size is 8 KB.
Page Conteins 2 Sections.
(a) Header : Addresses, links to other pages,...
(b) Data : Actual Row Stores.



1. Operations performed in the DB tables creates transaction process in the memo Data pages Loaded, Operations applied & simultaneously transaction details will return into log cache..

2. check point signal is generated periodically. Once check point is raised log buffers transactions are saved into log file on the persistent storage and is called the 'hardening process'.

3. Data buffers modified pages are saved into the data file objects for the committed transactions.

checkpoint : Means an internal process periodically executed by the database Engine.

Note (1) implicit transactions — Auto commit [by default]

(2) explicit transactions — Begin Tran
≡
Commit

2. SQL Server Authentication.

In this mode, O/s user must provide separate login & pwd to Connect to Sql Server.

Built-in Sql Server login

Username = sa

password = ? (to be provided at the time of installation or after install'n)

Note: windows O/s Administrator's group member, built-in Sql Server login "sa" will have "Sysadmin" role in Sql Server by default.

Practical 1 : Setting the pwd / changing the pwd of Sql Server login after installation.

In object Explorer,

↳ Connect to Sql Server with "Sysadmin" previlege → windows

[windows Authentication] ....

Practical 2 : Changing Authentication mode after installation of Sql Server.

In object Explorer

↳ Connect to Sql Server with "SysAdmin" → (windows Authen)

Right click on server and

Select "properties"

In "Security" page

↳ Server Authen'n : ○ windows Authentication

○ Sql Server Auth & windows Auth'n → Mixed mo

↳ Right click on Server and Restart.

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Practical : Sql Server Authentication login — Creation.

* In object Explorer, Connect to Sql-Server with 'SysAdmin' previleges

Expand 'Security' Option.

Right click on "Logins"

Select 'New Login'

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In 'Select a page' dialog box

Select "General" page option.

Now Select "Sql Server Authentication"

Login Name = Kiran

password = XXXX

Confirm pwd = XXXX

policy pwd : □ Enforce pwd policy

(win O/S pwd policy is inherited) □ Enforce pwd Expiration

□ User must change pwd at next login

Default DB : Master

click 'OK'

Testing : * Log on to O/S under any O/S user account.

* Try to Connect to Sql Server under "Sql Server Authentication"

with login Created previously — Eg: Kiran

Principal : * This means a login/ application which is accessing SqlServer-resources is Called principal.

* windows O/S Level [User, Groups]

* Sql Server Level [Logins, Roles]

* Database Level [Users, Roles]

Securables : This means an object in the Sql-Server.

They may be — Server Level Objects

— Database Level Objects

— Schema Level Objects

I Server Level
- * Server/ instance
- * Logins
- * Databases
- * Endpoint
- * Server Roles.

II DataBase Level
- * Database.
- * Users
- * Certificates
- * Symmetric/ Asymmetrickeys
- * Full-text indexing
- * Schemas
- * Service Broker objects
- * Assemblies

III Schema Level
- * Tables
- * Views
- * Stored Procedures
- * Synonyms
- * User defined types
- * User-defined Aggregates

Note: Login — Server level
User — Database level.

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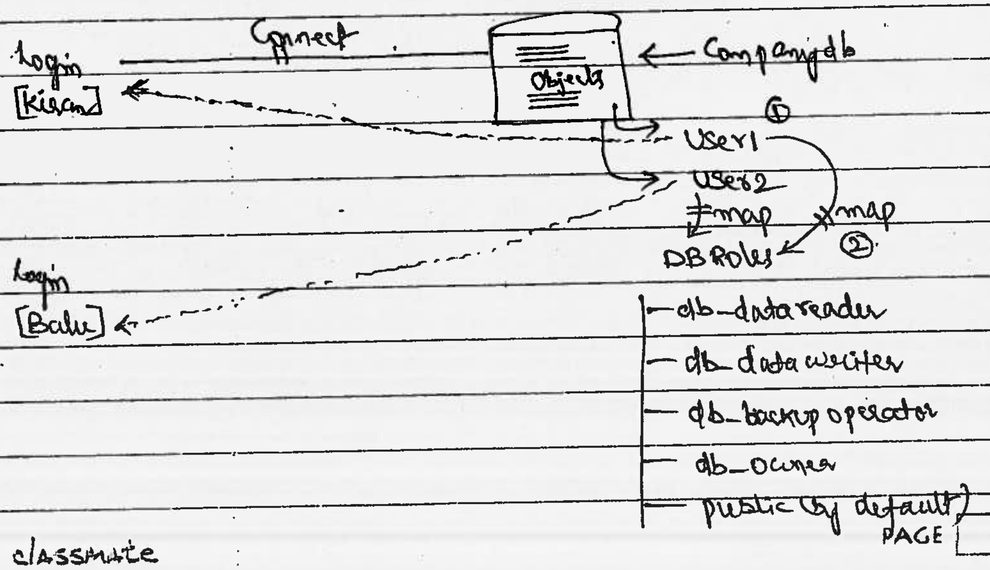
Practical: Mapping login with Fixed Server Roles

Eg. * Login [Kiran] $\xrightarrow[\text{with}]{\text{mapping}}$ [Server Admin / Process Admin / dbcreator]

* In object Explorer, Connect to sql server with "SysAdmin" previleges.
* Expand 'Security'
* Expand 'Logins'
  ↳ Select a particular login [Eg: kiran].
    Right click on [Kiran login] it &
    Select properties
    In [kiran] properties Dialog box
      Under Select a page options
        Select "Server Roles"
        Map the Required Roles
          Eg: dbcreator
              Server Admin
              Processadmin
              Public [by default]
      Atlast, click OK

2. Database Roles: Database level Securables permissions.

Eg:
login $\xrightarrow{\text{map}}$ Companydb → database name
Eg: [Kiran]
□ dbowner
□ datareader
□ backup operator
□ dbdatawriter



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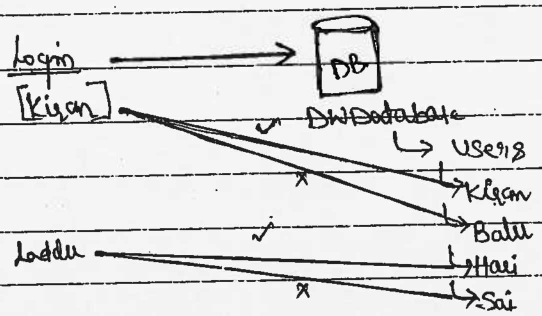
How to Test: Log on to Sql Server as 'Kiran' and verify the permissions



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Note: In a db, we can Create only one db user for a specific login.

3. Custom Roles: Schema level Securable permissions

This is also called as 'User-defined' database roles.

In Sql Server, we have 2-types of Custom Roles.

(a) Custom Database Roles.

* Prepared with a set of permissions on Collection of Objects

* DB Users Can be mapped with Custom 'db' roles directly.

(b) Custom Application Roles

* Prepared with set of permissions on Collection of Objects.

* DB Users Cannot be mapped with Custom Application Roles directly

* These roles can be protected with a special password.

Practical: Creating a custom db role, and mapping a db user with Custom-

* In Object Explorer, Connect to sql server with Sysadmin previleges role.

* Expand databases

* Select a particular database Eg: DWHDB.

↳ Expand 'Security'

↳ Right click on 'Roles'

↳ Select 'New' → New DBRole

A 'Database Role' dialog box Opens.

Select 'General page'

Enter Role Name = abcrole

owner = dbo

Now Select 'Securables' Page.

Click 'Search' button.

'Add Objects' Dialog box Opens.

What

- Specific Objects
- All objects of the types
-

↳ Search
↳ Speeific objects
↳ Browse for objects
↳ Select Req. Tables, sp, views
click ok

on the selected objects — Grant the req. permissions.

Click ok.

How a Sql Server Login can access Application Role permissions ?

Connect to Sql Server as 'kisan' for eg.

```
use dbname
go
Exec sp_setapprole Rolename, password.
```

Note : Every time a Sql login connected to Sql server, sp_setapprole must be executed.

Working with DCL Commands — Data Control language

These Commands are used to manage the permissions at Schema or object level.

① GRANT
② DENY
③ REVOKE

1. GRANT : This is used to Grant the permissions.

Syntax :
```
Grant <permissions> on Objectname
To dbusername
[with Grant option]
```

2. DENY : This is used to Cancel the permissions.

Syntax :
```
Deny <permissions>
on objectname
To dbusername
```

3. REVOKE : This is also used to Cancel the granted permissions.

Syntax :
```
Revoke <permissions>
on Objectname
From dbusername
[Cascade]
```

Revoke is also used to unblock the denied permissions.

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With Grant option : This allows the 'user' to grant the given permissions to other users also

-- Connect to SQL server 2005 as an administrator.

```
Use DWHDB
Go
Grant Select, insert      → table Name
 on dimproductcategory
 TO Sqluser1
 with Grant option
```

Testing : Connect to Sqlser as 'SQL' user

```
Use DWHDB
Go
Select * from dimproduct Category
Go
Grant Select, insert
on dimproduct Categorye
to Sqlus
```

Result or Access Tested

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SCHEMA : This is a logical Container in a database used to organize the objects.

* Schema will act as a 'name space' in the database.

* Schema Contains objects like Tables, Views, Stored procedures, Functions, --

* In Sql Server 2000, only built-in ~~Sch~~ Schema is available.

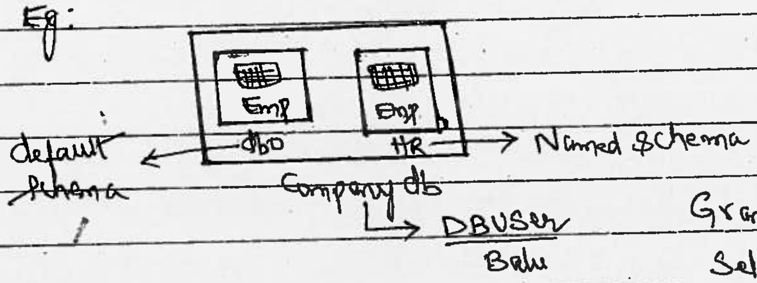
* We Cannot Create Named Schema

* In sql Server 2005

→ Built-in Schema

→ Named Schema (We Can Create) → user defined

Eg:



Grant on HR Schema

Select, insert

Schema provides 2 Advantages :

1. Avoids naming ~~p~~ conflict problem for database objects.

2. Permissions can be granted at Schema level instead of individual object level.

Note : Every Schema should have a owner.

Owner may be a database user in the Current database.

* In sql server 2000,

Every db user is associated with a Schema of 'Same name' ie, 'dbo' user binded with Self Schema only.

* In Sql Server 2005,

we have built-in db users/ roles as Schemas.

↳ dbo

↳ guest

↳ Information_Schema

↳ sys [New in Sql Server 2005]

* Custom db users/roles are separated from Schemas.

* A database user can be mapped with one or more Schemas

T-Sql Script in Security.

Eg① Creating Windows Authentication Login in SQL Server.

Step 1. Create a Windows Domain Account in Active Directory Users & Computers'.

Username = praveenm

Password = @peers123

Step 2. Connect to Database Engine with 'Sys Admin' previleges.

```
Create Login [domain Name/ username]
From windows
with Default_Database = ?,
Default_Language = ?
```

Eg:
```
-- As an Admin
Create Login [dba/ Balu]
From windows
with Default_Database = Master,
Default_Language = US_English.
```

dba → domainname

Balu → username

Note: All the properties for windows O/S password policies are inherited into SQL Server.

Eg.② Creating SQL Server Authentication Login.

Connect to DB Engine with Administrator Previlages.

Syntax:
```
Create Login [Login Name]
with password = ?,
Default_Database = ?,
Default_language = ?,
check Expiration = ON/OFF,
Check_policy = OFF/ ON.
```

Eg:
```
Create Login Hari
with password = '@peers123',
Default_Database = Master,
Default_Language = US_English,
Check_Expiration = ON,
check_policy = ON
```

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Full Access of db.

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-- Map the above created db user with the dbo roles required.

Exec Sp_addrolemember 'db_owner', 'hari'.

* **ENCRYPTION & DECRYPTION : [Protecting Sensitive Data]**

* Encryption → plaintext Converting into Ciphertext

* Decryption → Ciphertext Converting into plaintext.

In Sql Server 2000, Encryption & Decryption

↳ Com dll's — third party tools were used.

In Sql Server 2005, Encryption & Decryption.

↳ Com dll's

↳ Third party tools

↳ .Net Assemblies (CLR integration)

↳ Built-in objects (Keys, certificates)

* **Encryption Hierarchy**

Windows O/S level [DPAPI]

↓

Server Server Level [Service Master Key]

↳ Sql Server Storage level Encryption.

↓

Database level

↳ Objects (Keys; Certificates)

* To implement Encryption on db objects level, we have to follow 3 steps.

Step 1: Create the database Master Key.

Syntax: Create Master Key

Encryption by password = 'Anypassword'

* Creating db Master Key will Enable the db to support Encry & 'dec

* A db Can have only one Master Key.

Step 2 Create the Key / Certificate

-- Syntax [Symmetric Key]

Create Symmetric Key [KeyName]

with Algorithm = AnyAlgorithm

Encryption by password = 'Any password'

Note: We can use Symmetric keys, Asymmetric key, Certificate or — Combination of these.

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* DECRYPTION PROCESS

1. Open the Symmetric Key
2. Use 'decryptbyKey' built-in-function

    decryptbyKey (Column/data)

    ↳ This returns binary data

    ↳ Use type conversion functions to Convert into target type.

```
Eg:  Step1 :  open Symmetric Key Key1
               Decryption By
               Password = '@Peers123'
               Go
                                        ~~built-in function~~
     Step2 :  Select Custno,
              Cast ( DecryptbyKey (Creditcardno) as int) as  CCNo
              From  Customerdata ← tablename
   type Conversion
   function.
```

* DIFFERENCE BETWEEN SYMMETRIC & ASYMMETRIC KEY.

Symmetric Key	Asymmetric Key.
* Uses single Key for Encryption & Decryption.	* Uses two Keys [one Key for Encryption one for Decryption].
* Based on "Symmetric" Algorithms	* Based on 'Asymmetric' Algorithms
Eg: DES — Data Encryption Stnd (Standard)	Eg: AES — Advanced Encryption Std.

* CERTIFICATES : A Certificate is a Security Object which Can be used for Encryption/ decryption.

A Certificate can be used along with Symmetric or Asymmetric Key.

```
-- Syntax :  Create  Certificate  Certif-name
              Encryption By  password = 'Any pwd'
              with Subject = AnyText
-- Built-in functions : ① EncryptbyCert (parameters)
                         ② DecryptbyCert (parameters)
```

Combination : Creating Symmetric Key using certificate

```
Create  Symmetric Key [Keyname]
with Algorithm = Any Algm.
Encryption By Certificate  Certifname
```

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