Implementing and Managing SQL Server 2000

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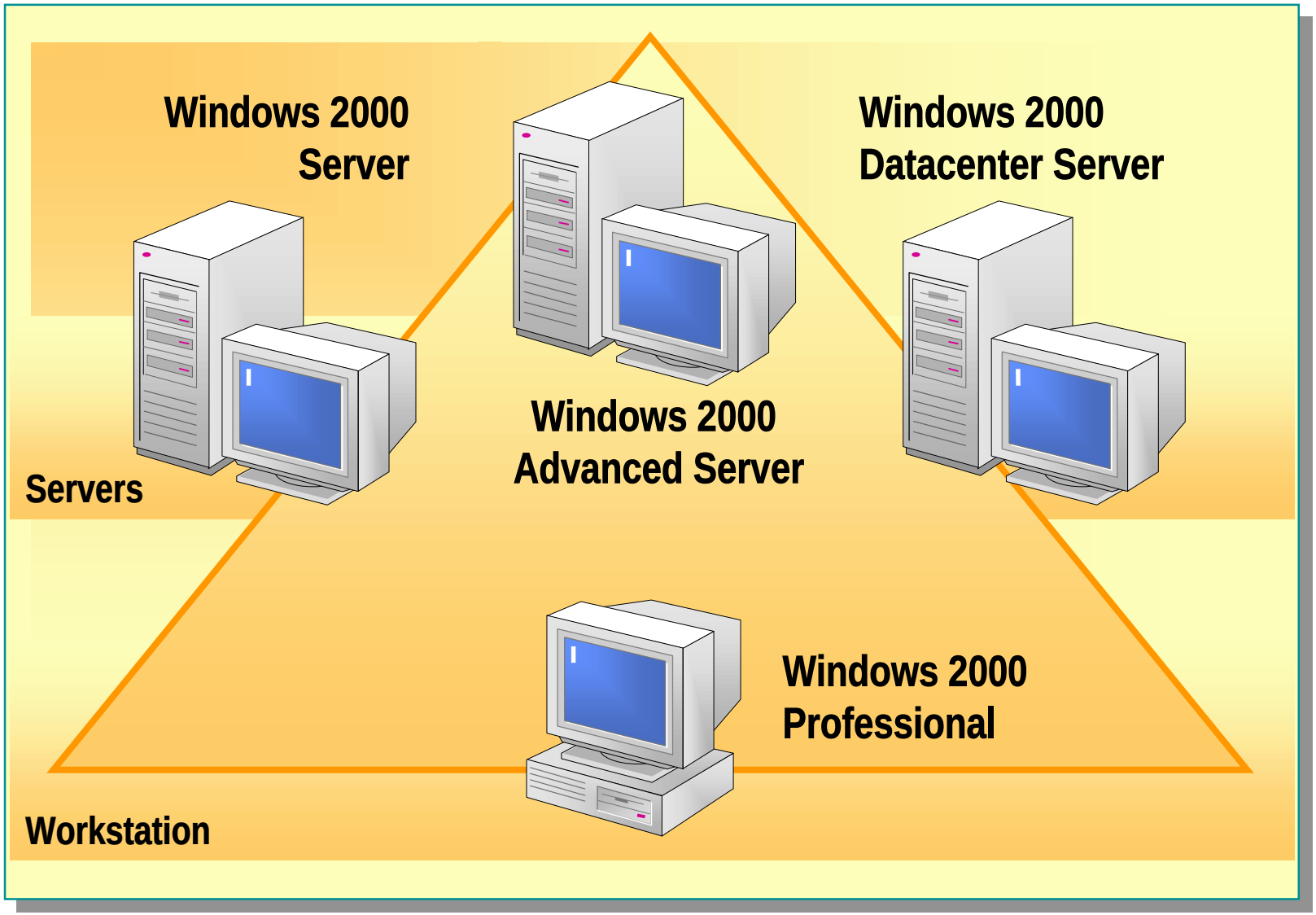
Agenda

- SQL Server 2000 Features
- Configuration Planning
- Capacity Planning
- Installing SQL Server 2000
- Utilities and Tools

Windows 2000 Family



Versions of Windows 2000

- **Professional (workstation)**
  - Up to 2 CPUs, 4 GB memory
- **Server (standard server)**
  - Up to 4 CPUs, 4 GB memory
- **Advanced Server (clusters)**
  - Up to 8 CPUs, 8 GB memory, clusters, load balancing
- **Datacenter (mission critical)**
  - Up to 32 CPUs, 64 GB memory, clusters, load balancing

Versions of SQL Server 2000

- **SQL Server 2000 Personal Edition**
  - No client access
- **SQL Server 2000 Standard Edition**
  - Up to 4 CPUs, 2 GB memory
  - Windows 2000 Server/Advanced Server/Datacenter (not on Windows 2000 Professional)
- **SQL Server 2000 Enterprise Edition**
  - Utilize platform's CPU and memory capabilities
  - Windows 2000 Server/Advanced Server/Datacenter (not on Windows 2000 Professional)
  - Clustering services (Advanced Server/Datacenter only)
- **SQL Server 2000 WinCE (Embedded)**

Basic Features

- T-SQL (SQL Server's version of SQL)
- Query optimizer
- Stored Procedures
- Extended Stored Procedures (external DLLs)
- Entity integrity (primary key constraint columns)
- Data types
- Defaults
- Triggers
- Transactions
  (Atomicity Consistency Isolation Durability)

SQL Server Enhancements

- **Memory support**
  8 GB Advanced, 64 GB Datacenter
- **Multiple instances**
  Mixed 6.5, 7.0, and 2000
- **Distributed partitioned views**
  Federated database tables
- **Failover clustering**
  Reinstalls, add nodes, fail-back, IP
- **XML support**
  FOR XML clause in SQL, new SPs

SQL Server Enhancements (continued)

- **Maintenance operations**
  Faster DBCC
- **Referential integrity**
  ON UPDATE, ON DELETE
- **Full text searches**
  Change tracking, image text extract
- **New data types**
  bigint, sql_variant, table
- **Index enhancements**
  Computed columns, order

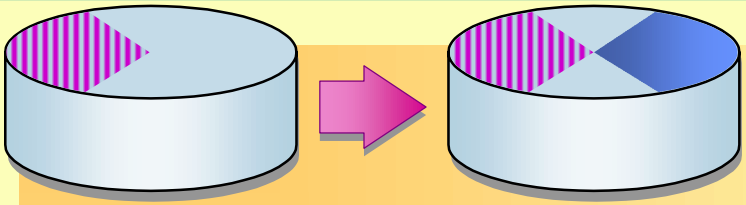
Administration Enhancements

- **Log shipping**
  Warm standby
- **Performance Analyzer**
  New tool in Enterprise Manger
- **SQL Server profiler**
  Limit by time or file size
- **SQL Server query analyzer**
  Includes object browser
- **Replication enhancements**
  Queued updates, schema changes

Administration Enhancements (continued)

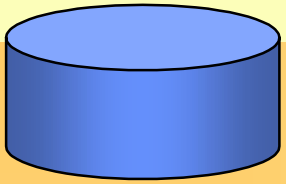
- **Data Transformation Service enhancements**
  - Multiphase data pump
  - Parameterized queries
- **OLAP**
  - Analysis Services updates
  - New cube types
  - Data mining
- **Meta data services**
  - XML encoding
  - Repository engine enhancements
- **English query**
  - Graphical user interface
  - SQL project wizard

Replication



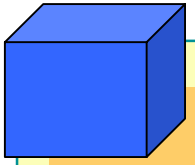
Snapshot replication	Periodically takes a picture of the data
Transactional replication	Starts with a snapshot, then updates data with each transaction
Merge replication	Two-way replication. Uses triggers and timestamps to update data both ways.

Database Layout



- **Data files**
- **Transaction log**
- **Space calculation**
  - Data
  - Indexes
  - Temporary data
  - Transaction log

Analysis Services (OLAP)



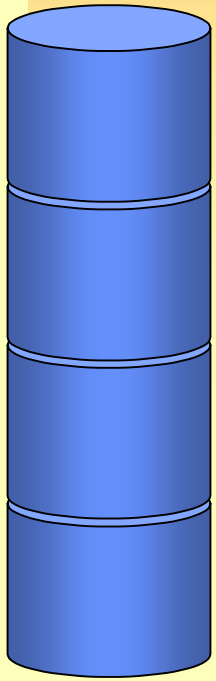
- Must specifically install Analysis Services
- Data cubes - aggregate tables
- Data warehouse framework – API
- DTS – load & transform data
- Repository of interfaces and schema models
- Data mining – algorithms for building cubes
- English Query – English to SQL
- XML support - for app to app data transfer

Development Options

- **ODBC**
  - Industry standard API set for database access
- **OLE-DB**
  - COM interface to data
- **ADO**
  - Higher-level object-oriented interface over OLE-DB
- **DB-Library**
  - SQL Server specific API library
- **ESQL/C**
  - Pre-compiler allowing embedded SQL in C programs

Configuration Planning

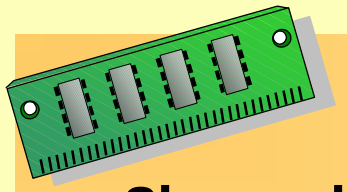
- **Disk I/O**
  - RAID 0 Disk striping
    Operations per disk = (reads + writes) / # of disks
  - RAID 1 Mirroring
    Operations per disk = (reads + (2 * writes)) / 2
  - RAID 5 Disk striping with parity
    Operations per disk = (reads + (4 * writes)) / # of disks
  - RAID 10 Disk striping and mirroring
    Operations per disk = (reads + (2 * writes)) / # of disks



Capacity Planning

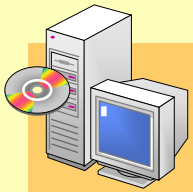
- **CPU utilization**
  - Linear growth vs. exponential growth
  - Response time
  - Single CPU v. multiple CPU
- **Memory usage**
- **Disk I/O**
  - Log files
  - database
- **Network traffic**
  - Size = messages/sec * message_length * bits/byte
  - Utilization(%) = bytes/sec / network_capacity * 100

Memory Capacity



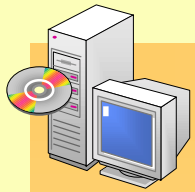
- **Size cache to achieve close to 90% cache hit ratio**
- **Allow 500 KB per connected user**
- **Memory=system + database process + #users * 500KB**
  - [Windows =~ 64 – 128 MB]
  - [SQL Server = 5.5 MB (up to 11MB)]
- **Expect 25 MB for small system, 70 MB for medium, and 215 MB for large system**

Installation SQL Server 2000



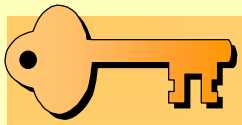
- **H/W Requirements**
  - Pentium 166 MHz or better
  - 64 MB (128 MB recommended)
  - 1 GB Disk minimum; 250MB for SQL Server
- **Check hardware in Hardware Compatibility List (hcl.txt)**
- **Can use either NTFS or FAT; NTFS more reliable**
- **Can use Window NT or Windows 2000; Windows 2000's Active Directory**
- **Install new, or Upgrade from SQL Server 7.0 or 6.5**

Installation Decisions



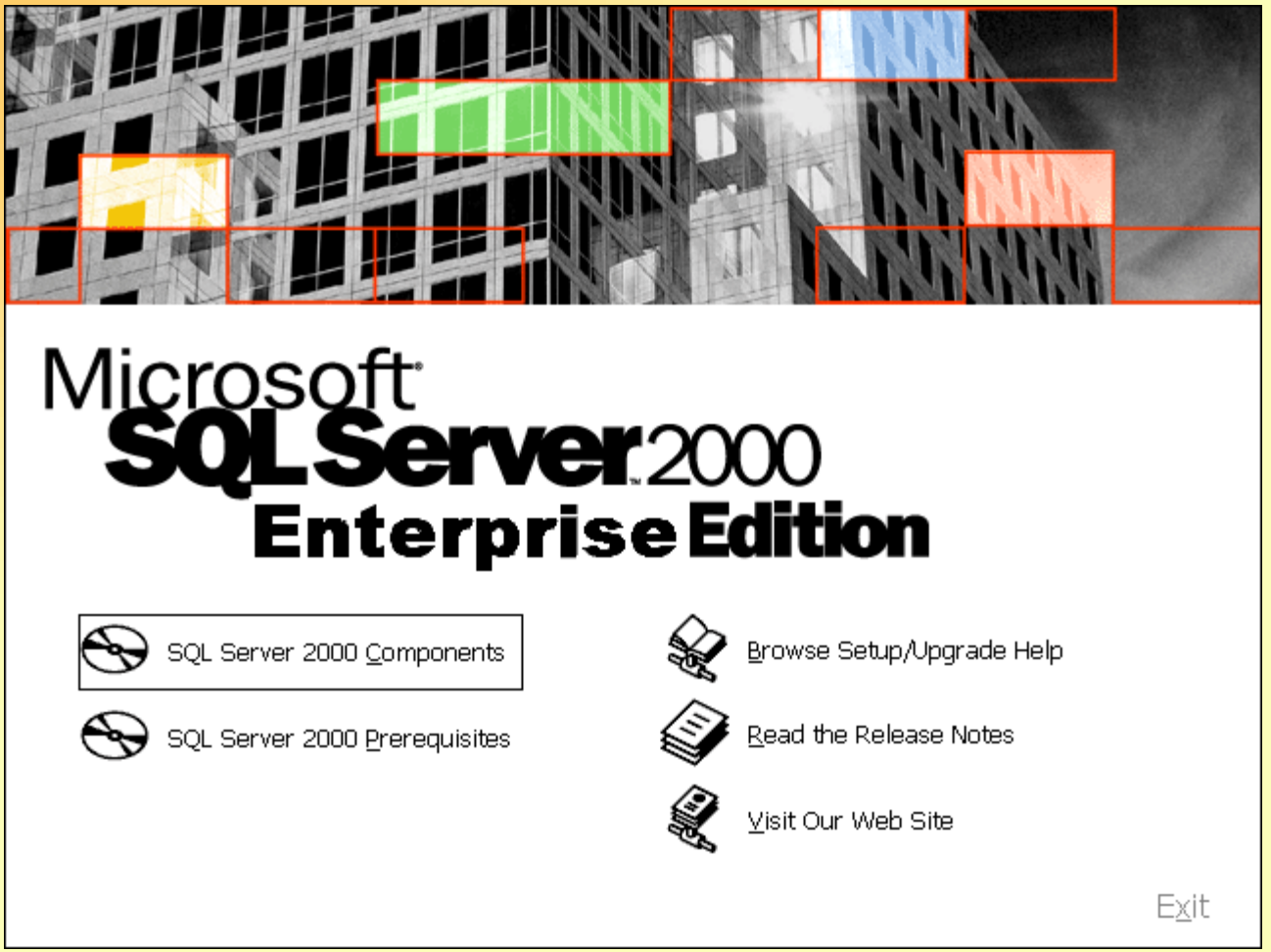
- **Path of program files**
- **Path of data files**
- **Account for services**
  - Can be different for each service or one for all
  - Use the Local System account or a domain account
- **Authentication mode**
  - Windows
  - Mixed: Windows and SQL Server

Authentication Modes

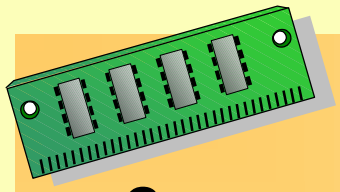


- **Windows authentication mode**
- **Mixed authentication mode**
- **Must use Mixed mode under Windows 95/98/ME or web**
- **Windows authentication mode is better**
  - Secure validation
  - Password management

Install

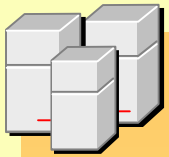

Microsoft
SQL Server 2000
Enterprise Edition
SQL Server 2000 Components
SQL Server 2000 Prerequisites
Browse Setup/Upgrade Help
Read the Release Notes
Visit Our Web Site
Exit

Extended Memory Usage



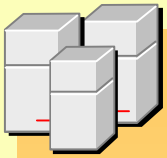
- **Can expand from normal 2GB address space to 3GB by using the boot.ini “/3GB” switch**
  - Only available on Windows 2000 Advanced Server and Windows 2000 Datacenter versions
  - Runs OS in 1GB address space
  - Runs applications in 3GB address space
  - Example of boot.ini usage: multi(0)disk(0)rdisk(0)partition(2)\WINNT="Windows 2000 Advanced Server" /3GB /basevideo /sos
- **Must set SQL command “awe enabled”, per instance**
  - sp_configure “awe enabled”, 1

SQL Server Component Services



- **SQL Server**
  - Process: sqlservr.exe
- **SQL Service Manager**
  - Process: sqlmangr.exe
- **SQL Agent**
  - Process: sqlagent.exe
- **Microsoft Search**
  - Process: mssearch.exe
- **Distributed Transaction Controller (DTC)**
  - Installed if not already present

SQL Server Services



- **SQL ServerService**
  - Instance named “MSSQL$*InstanceName*”
  - Manages database, resources, connections
  - Executes T-SQL, ensures data consistency
- **SQL Server Agent Service**
  - Instance named “SQLAGENT$*InstanceName*”
  - Executes jobs, alerts, notifications, and maintenance
- **Microsoft Search**
  - Full-text search

Starting and Stopping SQL Server

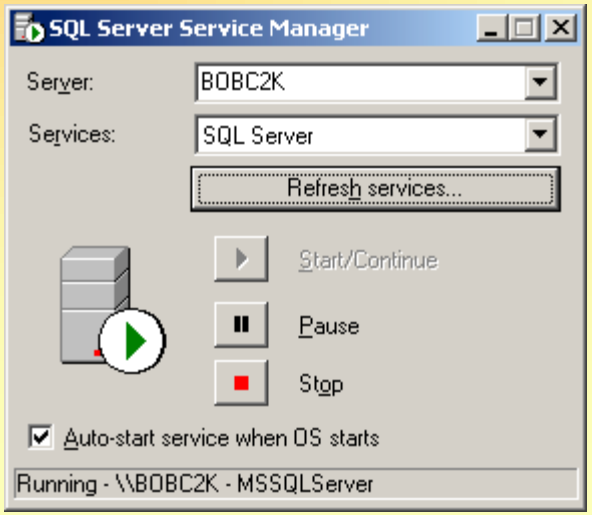
- **SQL Server can be started using any one of these**
  - SQL Server Manager
  - SQL Server Enterprise Manager
  - Windows 2000 Service Control Manager
  - Net Start *serviceName*

Utilities and Tools

- Service Manager
- BCP (Bulk Copy Program)
- Enterprise Manager
- Server Network Utility
- Client Network Utility
- Profiler
- Query Analyzer
- Import and Export Data
- SNMP

SQL Server Service Manager

- **Start, Stop, Pause, Resume SQL Server Services**



BCP

- **Bulk Copy program**
  - Import and export program
  - Use can be defined in a DTS package

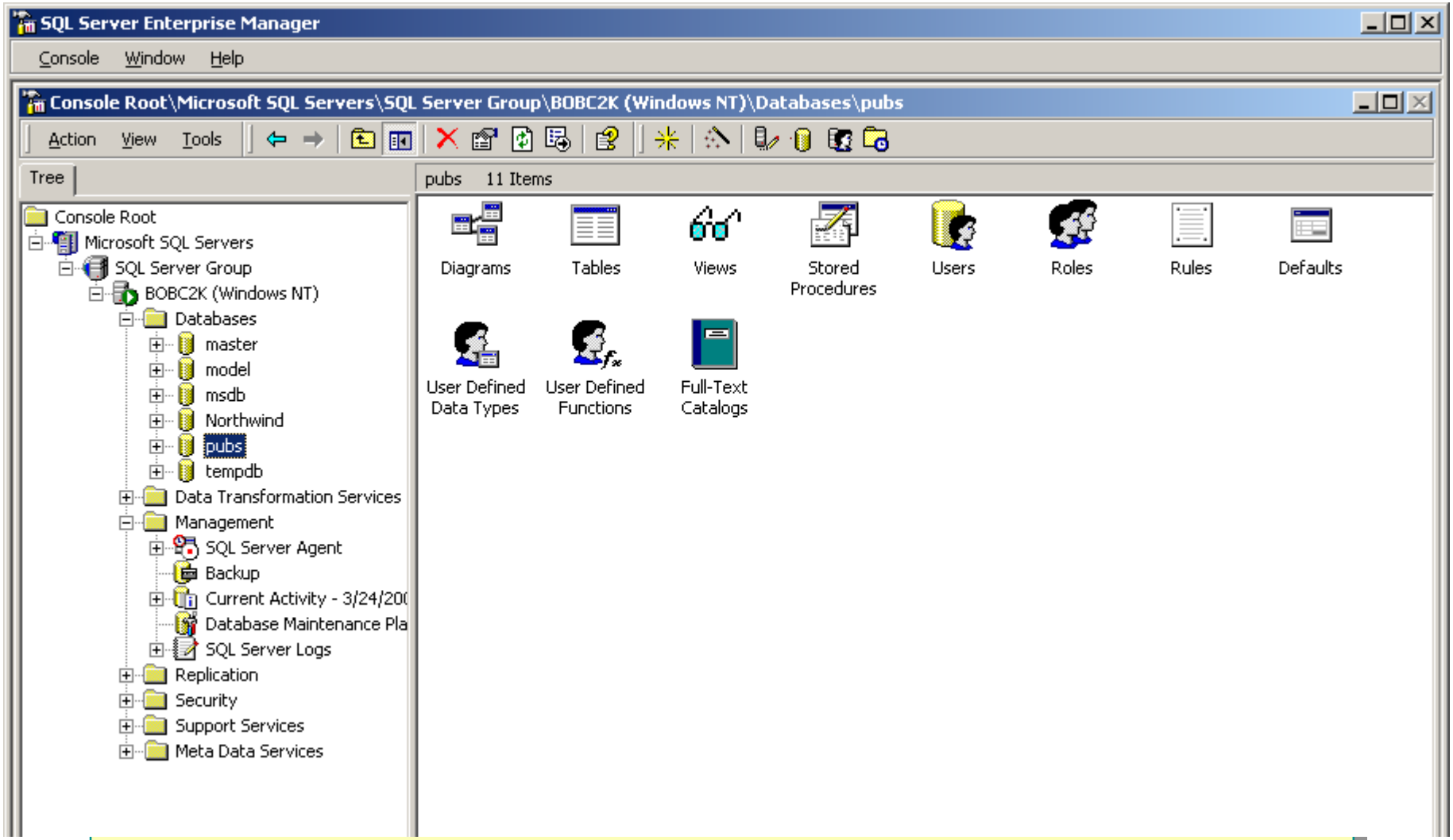
Loading the Database

- BCP (Bulk Copy Program) is an external command prompt program that is used to load and export data files in or out of a SQL Server database.
- BULK INSERT is a T-SQL command to copy data files into a database.
- SQL Server has a Data Transformation Services (DTS) wizard that includes the ability to easily import or export data files.

Enterprise Manager

- Current server activity
- User connections
- Manage processes and process states
- Objects and object locks
- Send a message to a connected user

Enterprise Manager



Database Maintenance Plans

- Optimizations
- Integrity checks
- Complete database backups
- Transaction log backups

- Run wizard from Enterprise Manager, database Maintenance Planner from Tools menu

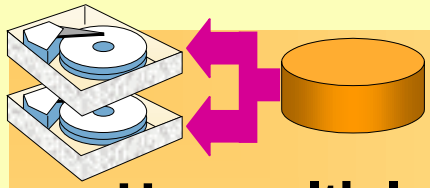
Jobs

- **Once defined can be run once, any # of times, or scheduled at regular intervals**
- **SQLServerAgent must be running**
- **Define job:**
  - Use Enterprise Manager
  - T-SQL scripts
  - Create Job Wizard
  - SQL-Distributed Management Objects (SQL-DMO)

Backup Types

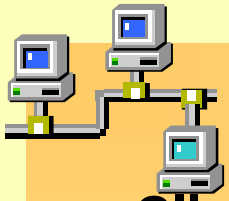
- Full – all data in database or file group
- Differential – only data that changed since last backup
- Transaction Log – backup & truncate transaction log
- Filegroup – specific group of files
- Data file – single file

Enhancing Backup Performance



- Use multiple backup devices
- Use multiple data files in database
- Use multiple LAN segments
- Stage the backup (backup to files, copy files to tape)
- Use differential backups

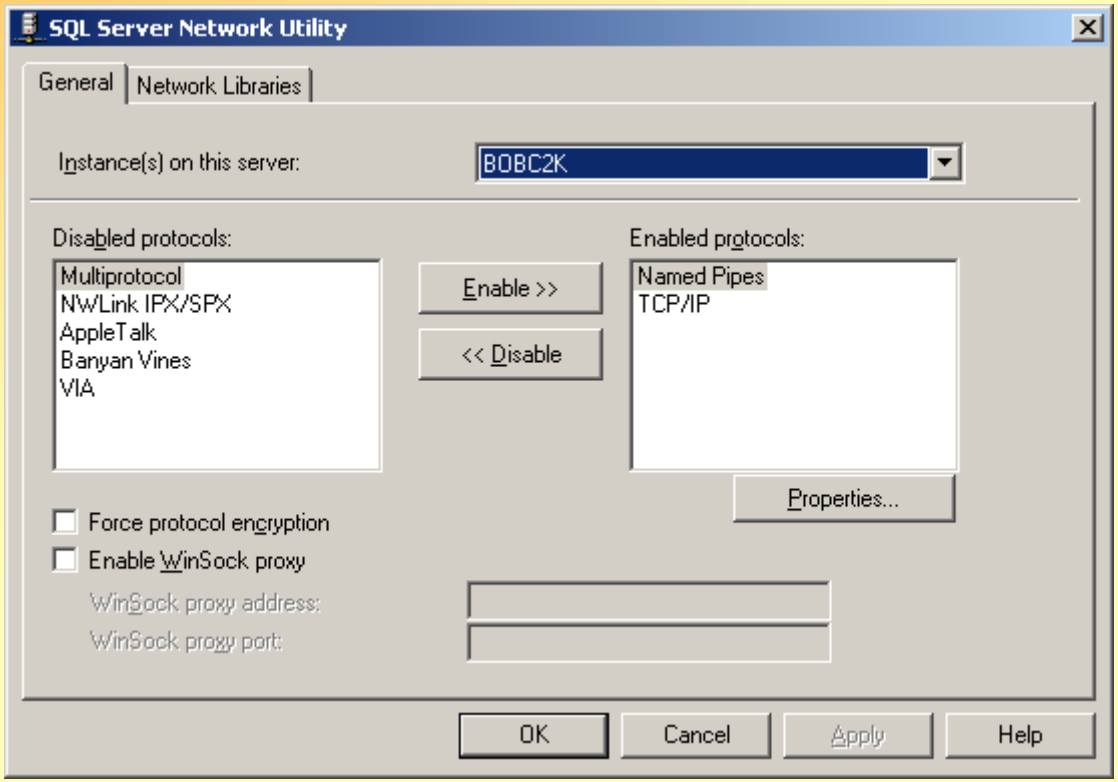
Client and Server Network Utility



- **Client Network Utility**
  - Configure DB-Library and Net-Libraries for client machine
  - Can define aliases for servers used
- **Server Network Utility**
  - Use to manage Net-Libraries on server
  - Generally not needed

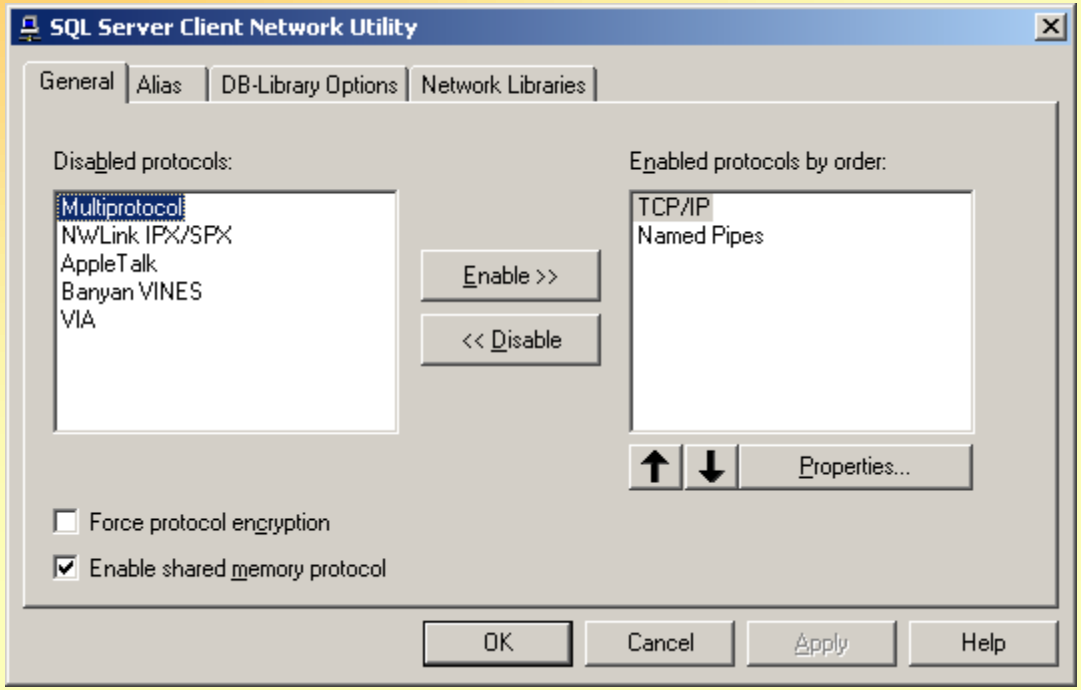
Server Network Utility

- **Manage server connections**



Client Network Utility

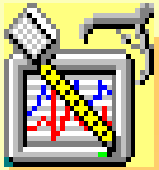
- **Manage client connections**



SQL Profiler

- Monitor database activity
- Filters can define user actions, applications, or commands to monitor
- Can drill in to display any SQL statement send to the database by an application or user

Performance Monitor Extension



- **Allows Windows Performance Monitor tool to**
  - View CPU use
  - Memory use
  - Number of users
  - Transactions per second

Capacity Performance Measurements

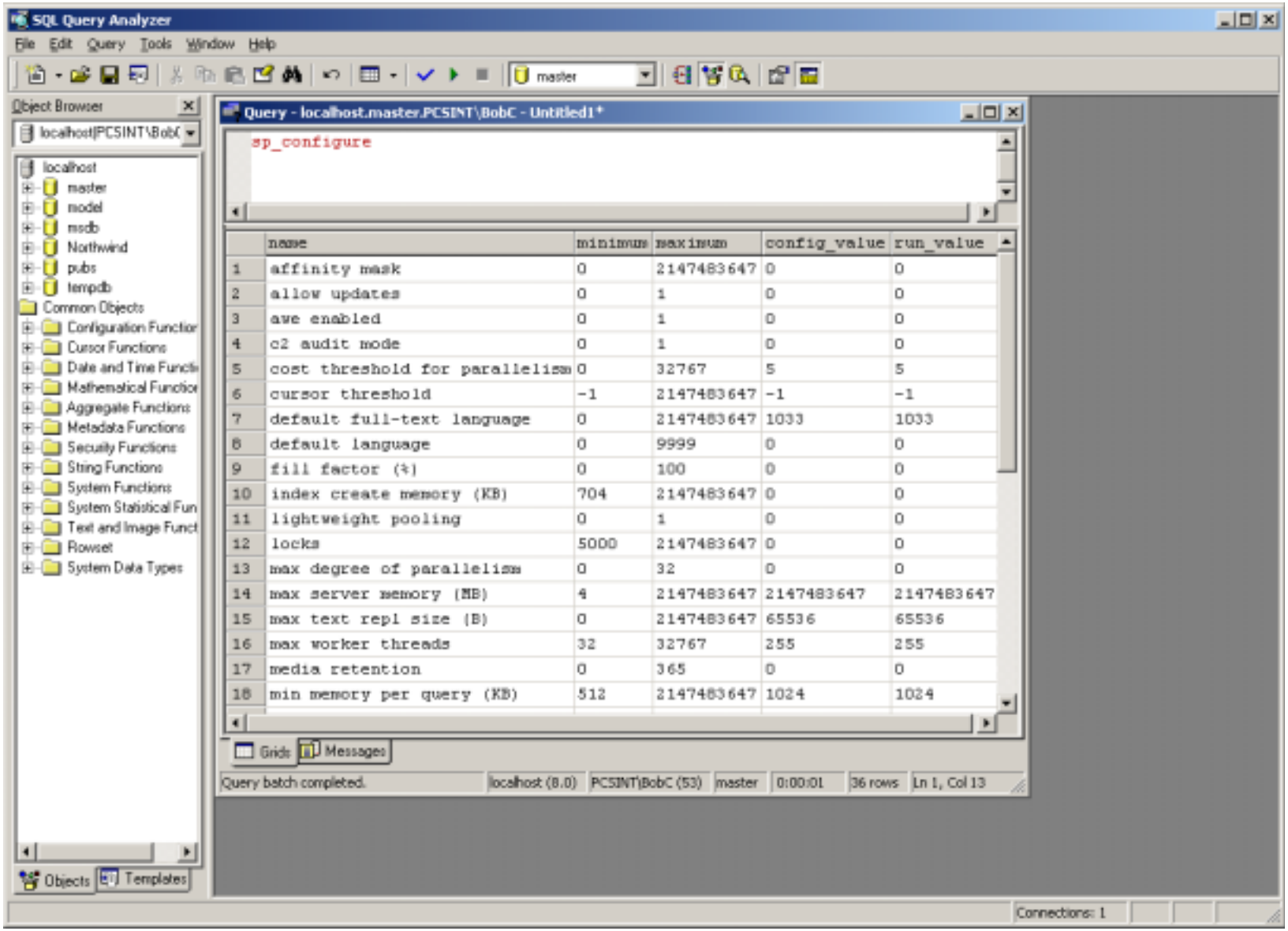
- Performance Monitor

Object	Counter
Processor	% Processor Time
PhysicalDisk	% Disk Time, Avg. Disk Queue Length
Memory	Page Faults/second Available Bytes
Network Interface	Bytes Total/sec
SQLServer: Memory Manager	Connection Memory

Query Analyzer

- Create SQL queries
- Create database objects
- Execute stored procedures
- Debug performance problems (Show Execution Plan)
- Edit data in a table
- Start Query Analyzer or run “isqlw”
- Manage Indexes

Query Analyzer



Import and Export Data

- **Data Transformation Services Wizard**

SNMP

- **Must have a copy of mssql.mib on workstation monitoring SQL Servers**
- **Can monitor**
  - Configuration parameters
  - Performance information
  - Access databases
- **Only works on default instance**

Microsoft
SQL Server 2000