Database Programing with ADO.NET

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Topics

- Introduction to ADO.NET
- Understanding Data Providers
- ADO.NET Objects
  - Connection
  - Command
  - Reader
- Invoking stored procedures
- Transaction and Transaction processing
- Working in disconnected environment
  - DataSet
  - DataAdapter
  - DataTable
  - DataRow
  - DataColumn

ADO .NET: Database Connectivity

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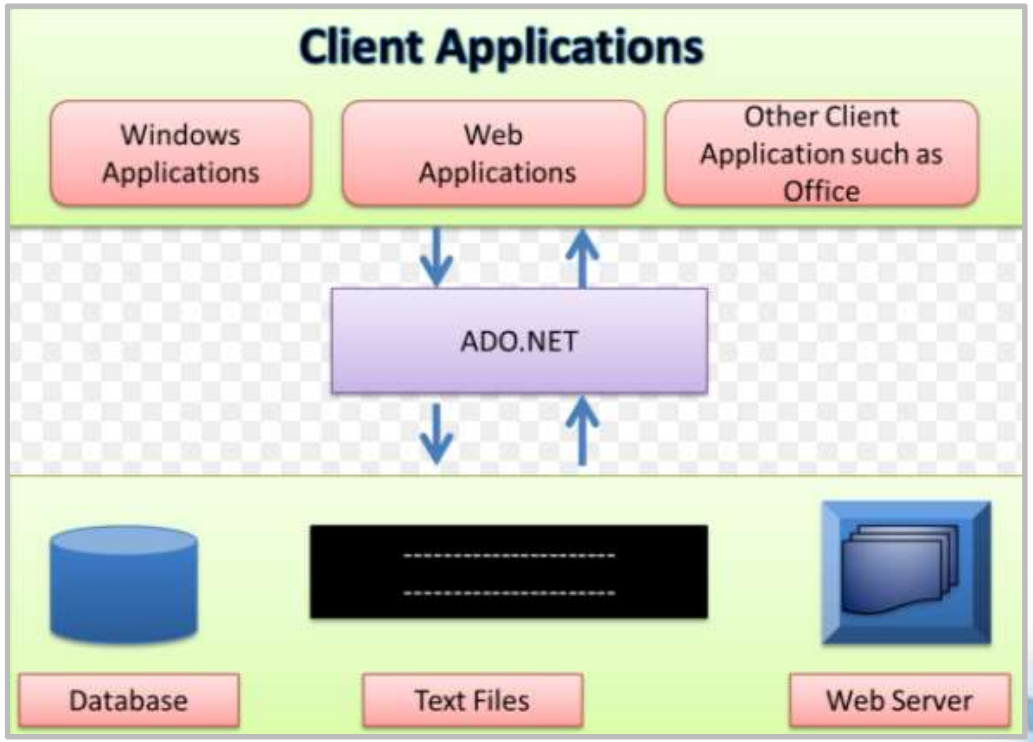
- **ADO .NET structure makes is easy to:**
  - Connect to a database / data store
  - Run SQL queries against it
  - Store and further process query results
  - Add/Update/Delete records from database



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Introduction to ADO.NET

- **ADO.NET** is the new database technology of the .NET platform, and it builds on **Microsoft ActiveX Data Objects** (ADO).
- Provides data access services in the Microsoft .NET platform
- An object-oriented set of libraries that allows you to interact with data sources

Introduction to ADO.NET

- **ADO.NET** is a set of classes that expose data access services to the .NET developer
- These classes are found in *System.Data.dll* and are integrated with the XML classes in *System.Xml.dll*
- There are two central components of **ADO.NET** classes: the DataSet, and the **.NET** Framework **Data Provider**.

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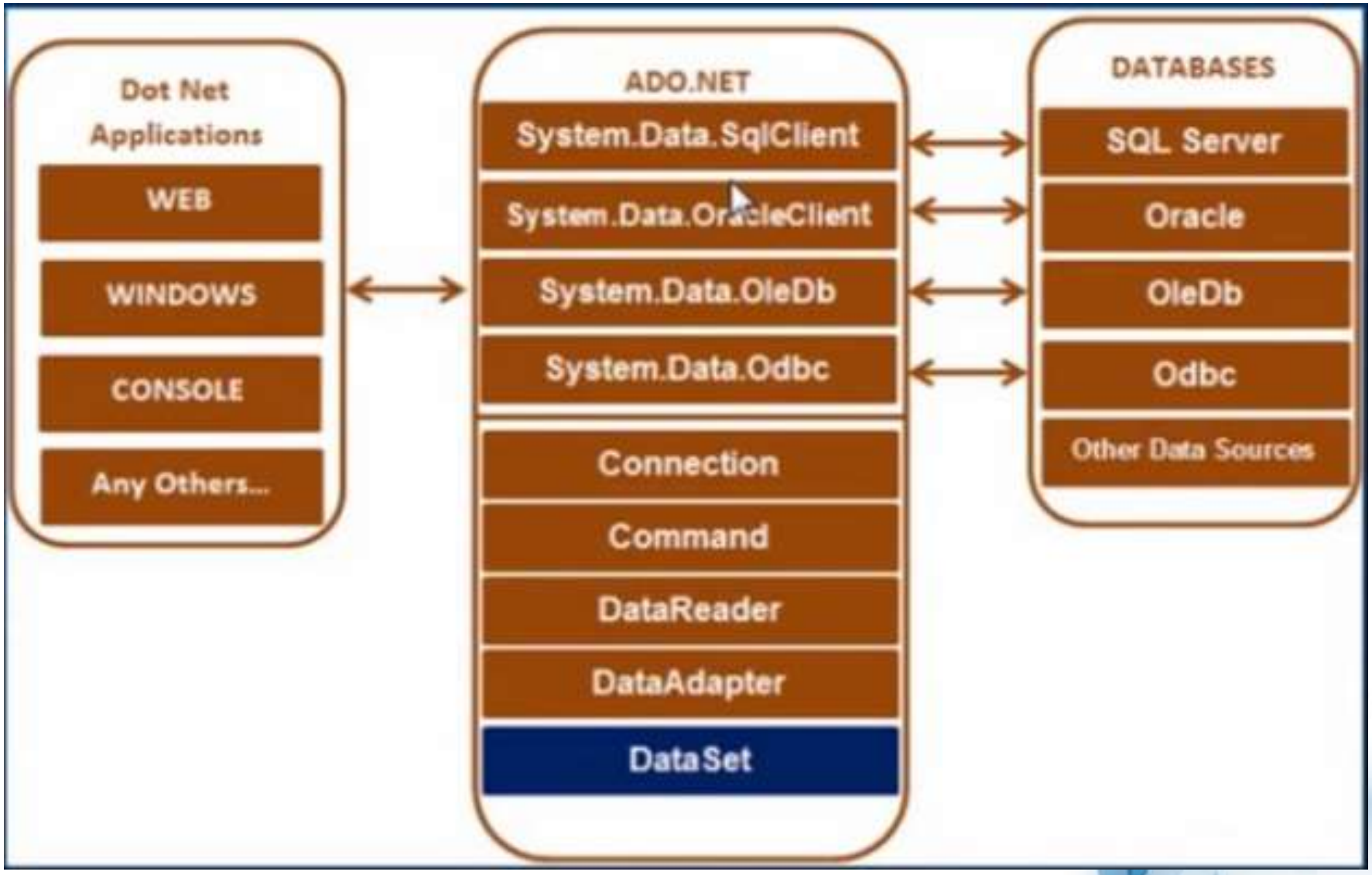
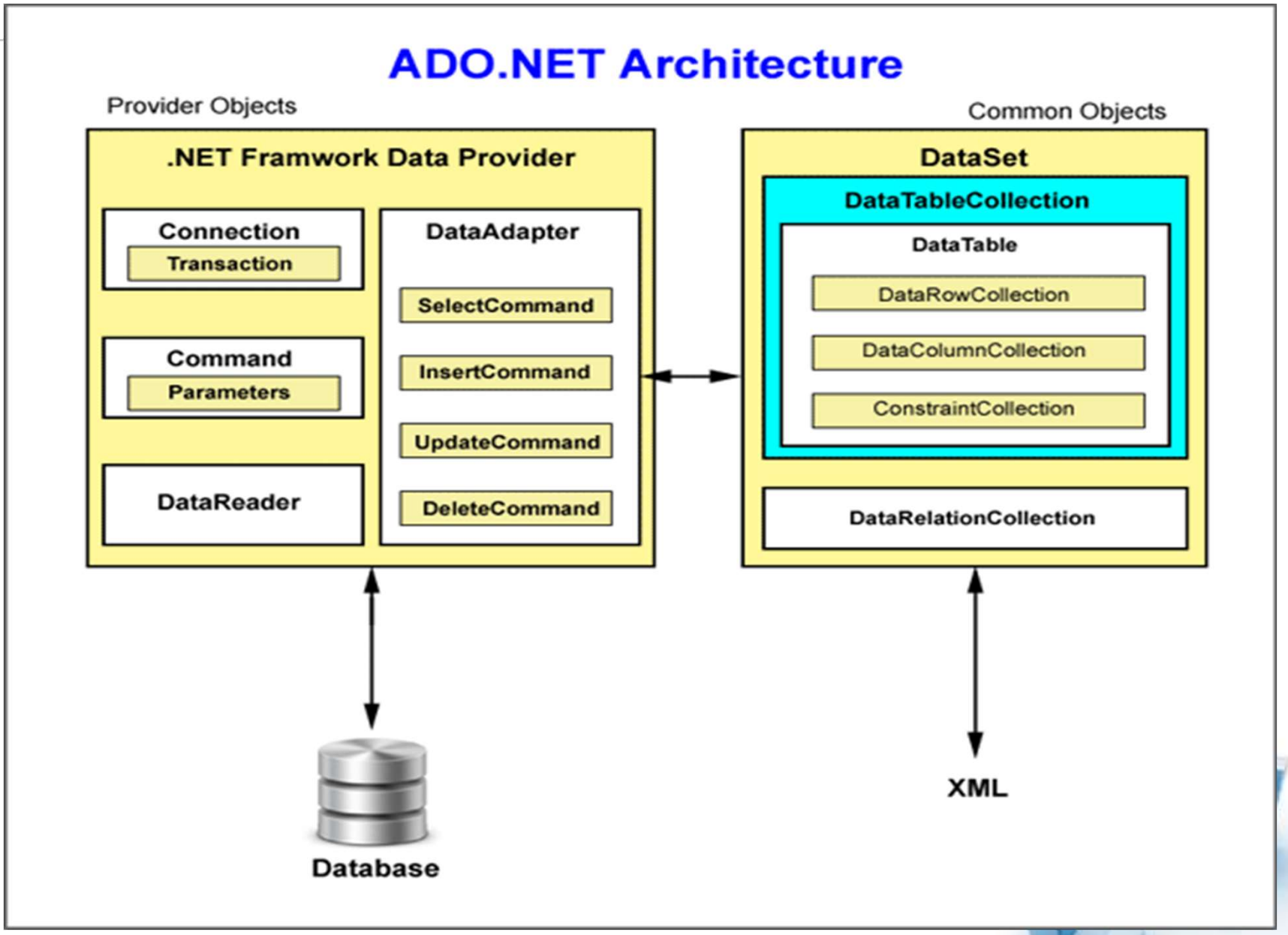
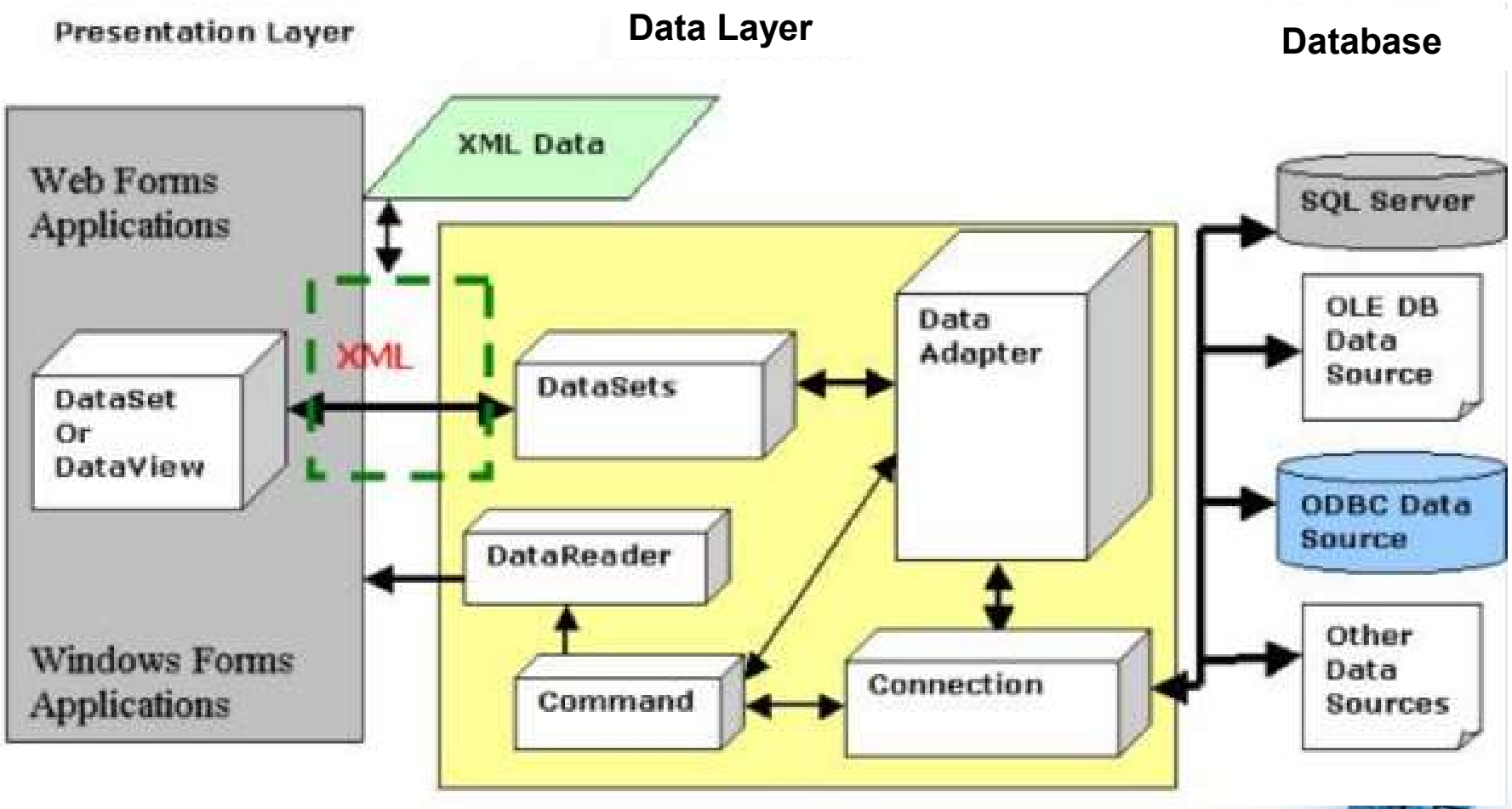
ADO.Net Object Model





ADO.Net in N-Tier Architecture



Data Provider

- ADO.NET allows us to interact with different types of data sources and different types of databases
- Since different data sources expose different protocols, we need a way to communicate with the right data source using the right protocol
- ADO.NET provides a relatively common way to interact with data sources, but comes in different sets of libraries for each way you can talk to a data source
- These libraries are called **Data Providers** and are usually named for the protocol or data source type they allow you to interact with

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Data Provider

Provider Name	API Prefix	Data source description
ODBC Data Provider	Odbc	Data Sources with an ODBC interface. Normally older data bases
OleDb Data Provider	OleDb	Data Sources that expose an OleDb interface, i.e. Access or Excel
Oracle Data Provider	Oracle	For Oracle Databases
SQL Data Provider	Sql	For interacting with Microsoft SQL Server
Borland Data Provider	Bdp	Generic access to many databases such as Interbase, SQL Server, IBM DB2, and Oracle

ADO.NET Namespaces

- ADO.NET ships with four database client namespaces for: SQL Server, Oracle, ODBC, OLE DB data sources

Namespace	Brief description
System.Data	All generic data access classes
System.Data.Common	Classes shared (or overridden) by individual data providers
System.Data.Odbc	ODBC provider classes
System.Data.OleDb	OLE DB provider classes
System.Data.ProviderBase	New base classes and connection factory classes
System.Data.Oracle	Oracle provider classes
System.Data.Sql	New generic interfaces and classes for SQL Server data access
System.Data.SqlClient	SQL Server provider classes
System.Data.SqlTypes	SQL Server data types

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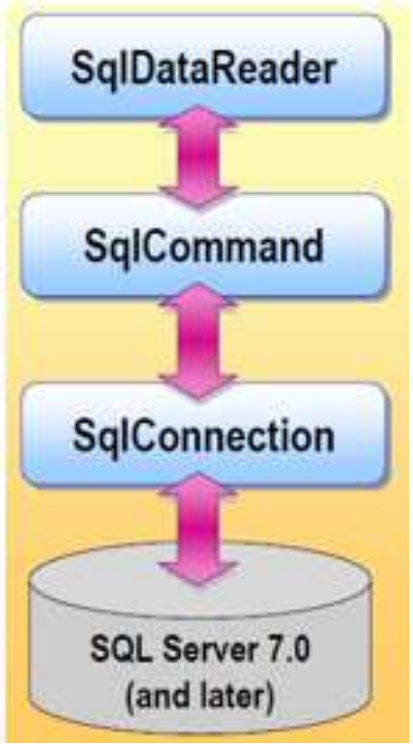
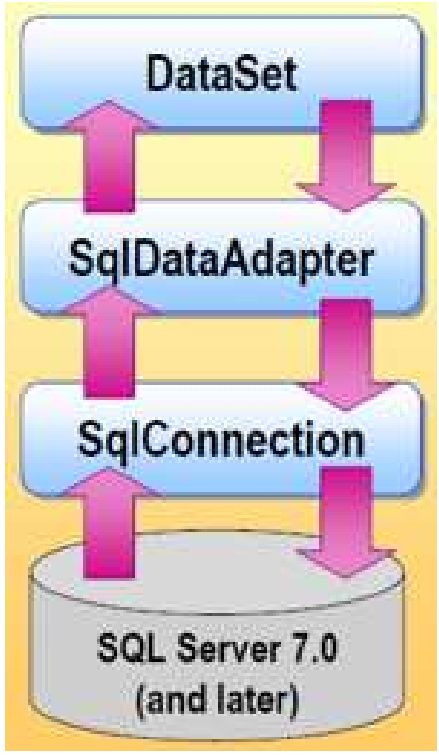
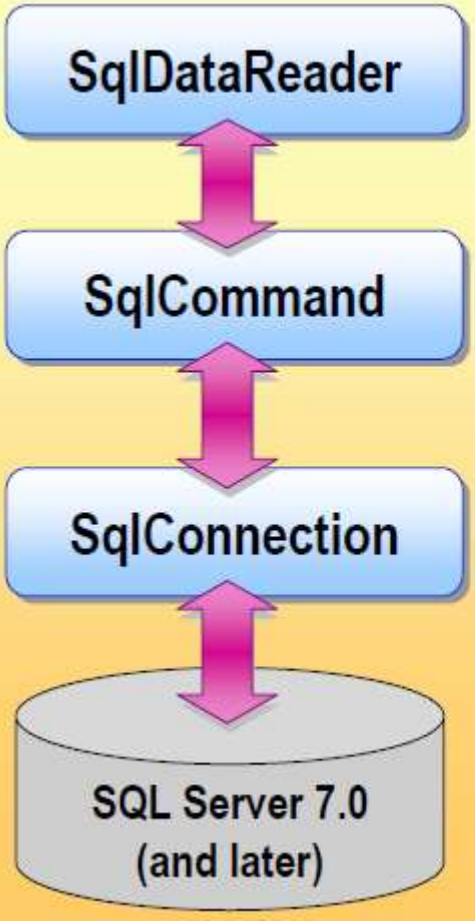
ADO.Net Data Access Scenarios

Connected Architecture and **Disconnected Architecture**





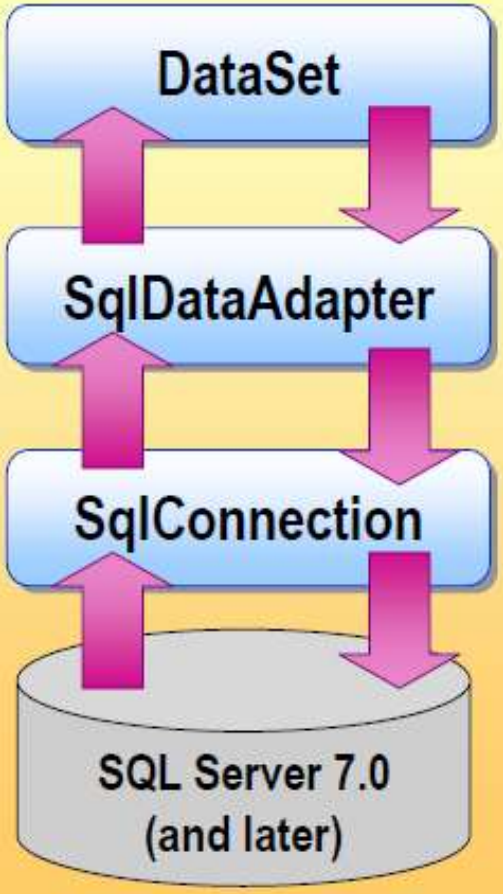
ADO.Net Connected Scenario



- In a connected scenario, resources are held on the server until the connection is closed

1. Open connection
2. Execute command
3. Process rows in reader
4. Close reader
5. Close connection

ADO.Net Disconnected Scenario



- In a disconnected scenario, resources are not held on the server while the data is processed

1. Open connection
2. Fill the DataSet
3. Close connection
4. Process the DataSet
5. Open connection
6. Update the data source
7. Close connection

ADO.NET Classes

- ADO.NET contains a number of database - specific classes
- These classes implement a set of standard interfaces defined within the System.Data namespace, allowing the classes to be used in a generic manner if necessary
- For example, both the SqlConnection and OleDbConnection classes derive from the DbConnection class, which implements the IDbConnection interface
- ***Note:*** *We will be focusing on Sql Server specific classes*

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ADO.NET Classes

Classes	Brief description
SqlConnection, OleDbConnection, OracleConnection, ODBCConnection	Used to connect to the database
SqlCommand, OleDbCommand, OracleCommand, ODBCCommand	Used as wrappers for SQL statements or stored procedure calls.
SqlDataReader, OleDbDataReader, OracleDataReader, ODBCDataReader	Used as a forward only, connected data reader
SqlParameter, OleDbParameter, OracleParameter, ODBCParameter	Used to define a parameter to a stored procedure
SqlTransaction, OleDbTransaction, OracleTransaction,ODBCTransaction	Used for a database transaction, wrapped in an Object
SqlDataAdapter, OleDbDataAdapter, OracleDataAdapter, ODBCDataAdapter	Used to hold select, insert, update, and delete commands, which are then used to populate a DataSet and update the database.

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The DataSet

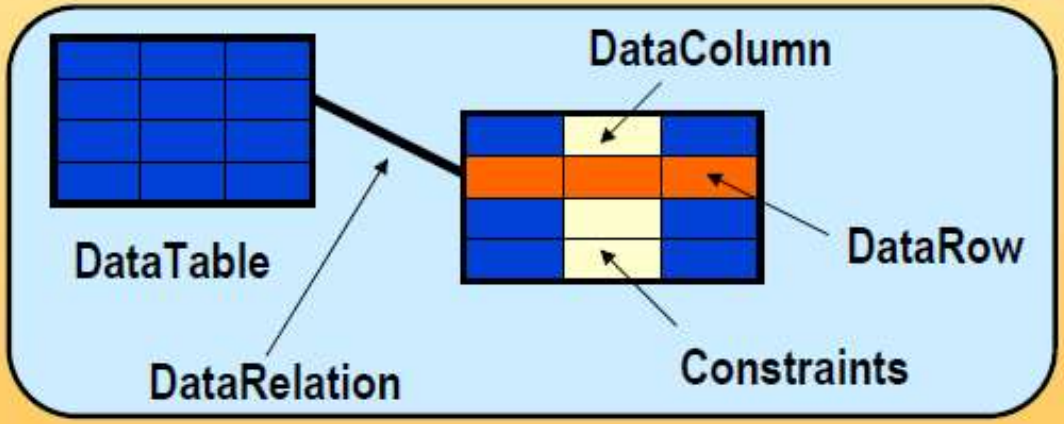
ADO.NET DISCONNECTED DATA MODEL

DataSet

- A DataSet is an in-memory data store that can hold numerous tables
- It is the heart of your disconnected data model
- DataSets only hold data and do not interact with a data source
- The DataSet class has been designed as an offline container of data. It has no notion of database connections
- The DataSet object is made up of two objects:
  - DataTableCollection object containing null or multiple DataTable objects (Columns, Rows, Constraints).
  - DataRelationCollection object containing null or multiple DataRelation objects which establish a parent/child relation between two DataTable objects

Dataset Object Model

- **Common collections**
  - Tables (collection of DataTable objects)
  - Relations (collection of DataRelation objects)
- **Data binding to Web and Windows controls supported**
- **Schema can be defined programmatically or using XSD**



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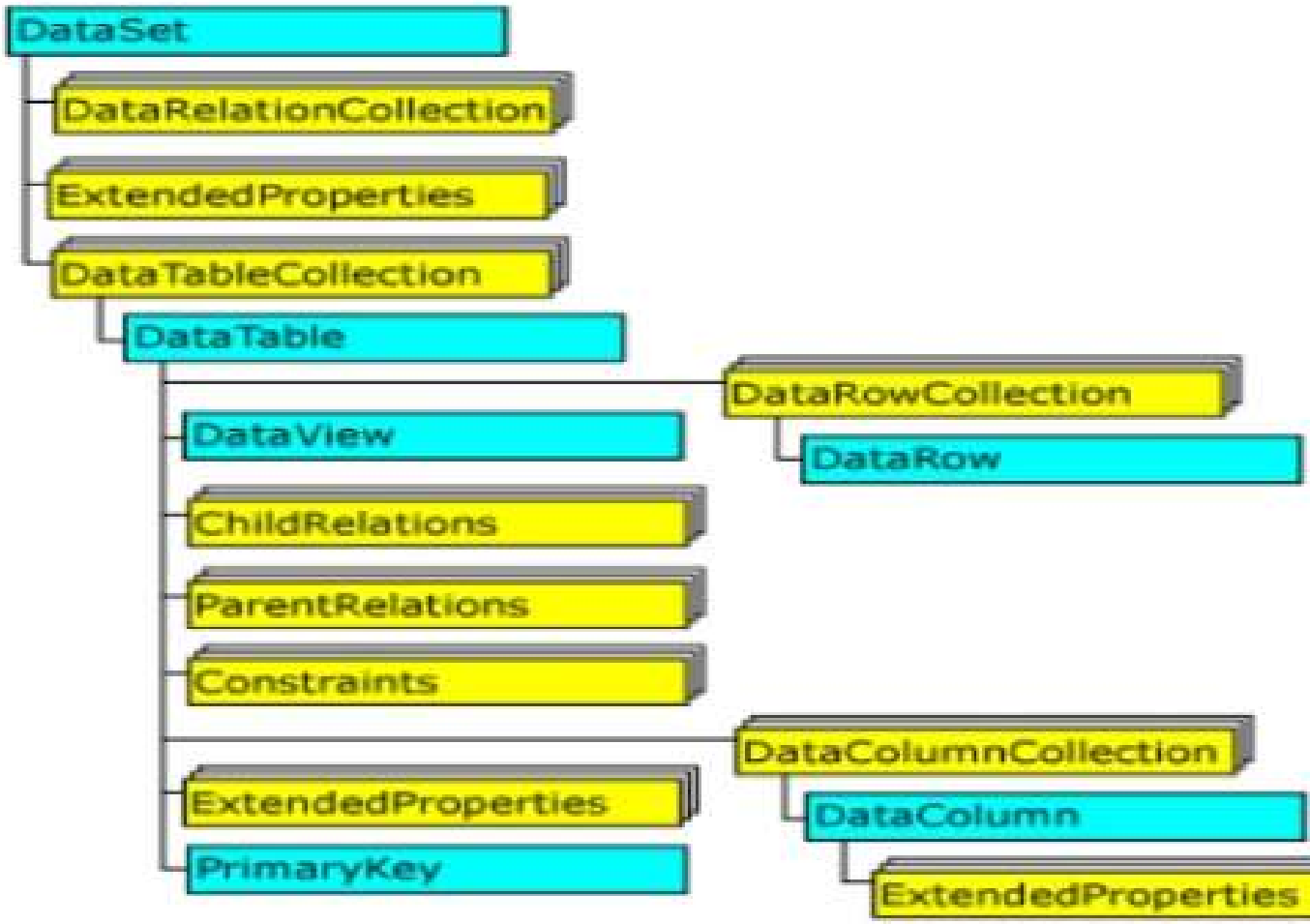
DataSet Object Model

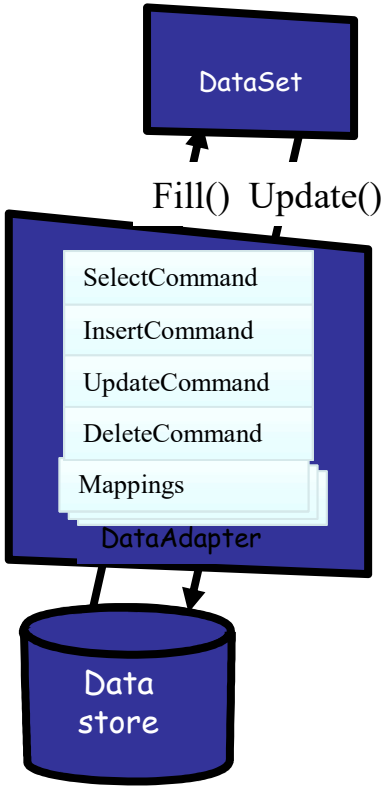


Data Adapters

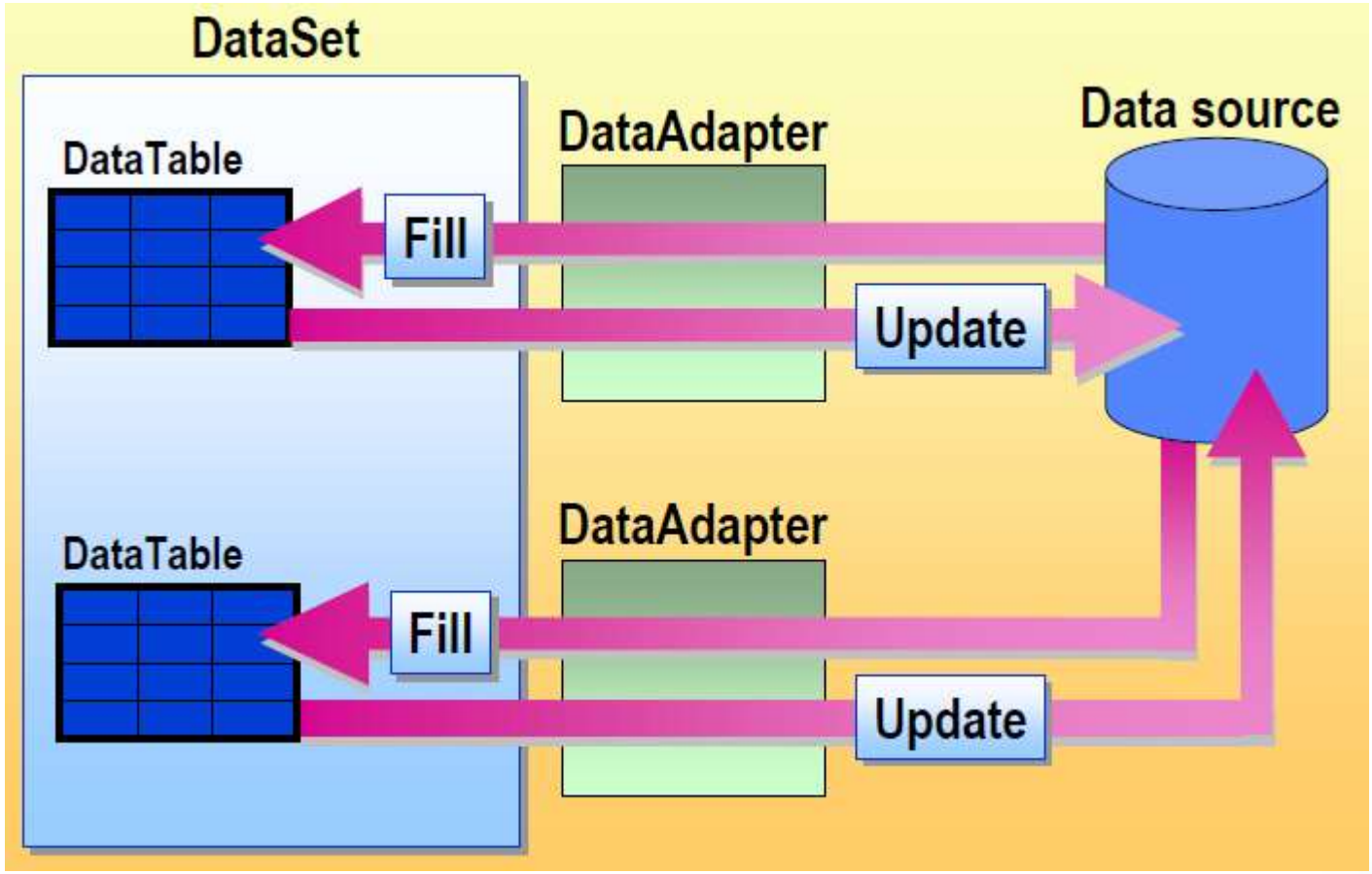
- **Data adapters** are an integral part of ADO.NET managed providers, which are the set of objects used to communicate between a **data** source and a dataset.
- (In addition to **adapters**, managed providers include connection objects, **data** reader objects, and command objects.)

DataAdapter

- Loads a table from a data store and writes changes back.
  - Exposes two methods:
    - Fill(DataSet,DataTable)
    - Update(DataSet,DataTable)
  - Provides mappings between tables & columns
  - User provides insert/update/delete commands
    - Allows use of Stored Procedures
    - CommandBuilder component available
  - Allows single DataSet to be populated from multiple different datasources



Data Adaptor



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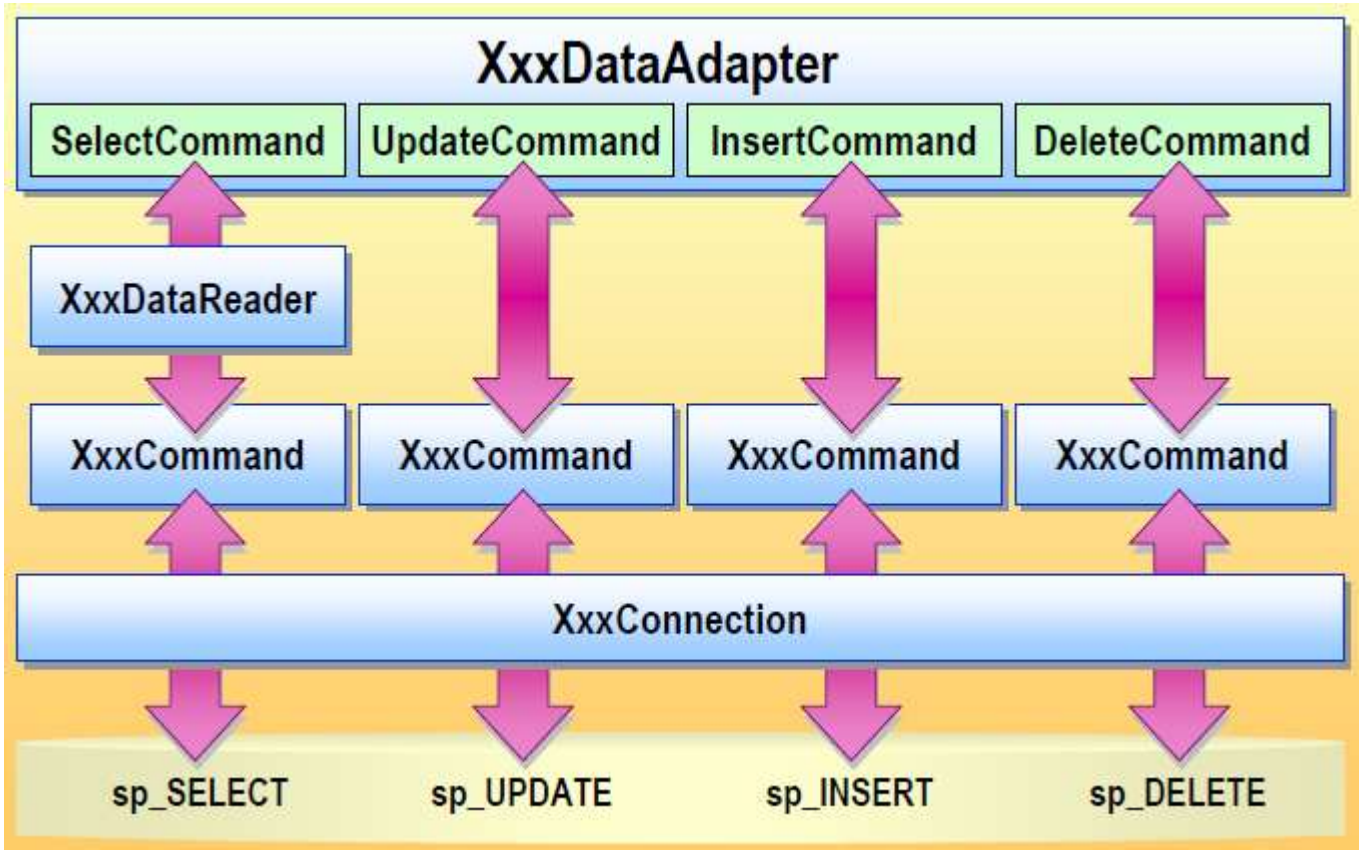
Data Adaptor Object Model



ADO.Net

1. Which .net Data Provider offers best performance when connected to SQLServer Database ?

a. OLEDB provider

b. ODBC provider

c. SQLServer .NET Data Provider

d. SQLServer Data provider

ADO.Net

2. Which object of ADO.Net has the best performance for retrieving the data

a) DataSet
b) DataReader
c) Data Provider
d) DataAdapter

ADO.Net

3. Which of the following Namespace is used for better performance when connecting to SQLServer ?

a) System.Data
b) System.Data.SQLClient
c) System.Data.Oledb
d) System.Data.OracleClient

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4. When we need to retrieve only a single value from the Database, which Method is efficient?

a) ExecuteReader()
b) ExecuteScalar()
c) ExecuteNonQuery()
d) ExecuteXmlReader()

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5. If we are not returning any records from the database which method of command object is used?

a) ExecuteReader ()
b) ExecuteScalar ()
c) ExecuteXmlReader()
d) ExecuteNonQuery()

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6. To populate the data set, which method of DataAdapter is used?

a) GetData()
b) FillData()
c) FillDataset()
d) Fill()

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7. Two users are trying to update the row in a database at the same time. Assuming that optimistic concurrency is not used for concurrency control in this case, what will be the result ?

a) The Second Update overwrites the first update
b) Error will be raised when the Second update happens
c) Second update does not happen at all
d) None of the above

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Question time

Please try to limit the questions to the topics discussed during the session. Thank you.