Chapter 15

ADO.NET Program Design

15-1 Using ADO.NET Namespace

- **According to different databases**
  ⇨ **decide which Data Provider to use**

- **Can use "using" statement to include assigned ADO.NET namespace when designing program**

- **ADO.NET often used namespaces:**
  1. System.Data
  2. System.Data.OleDb
  3. System.Data.SqlClient

ADO.NET Namespaces

System.Data

- **System.Data is the core of ADO.NET:**
  - contains basic classes of ADO.NET
  - contains main method to access data
  - define classes like DataSet, Tables, Rows, Columns and so on

- **Usage:**
  Using System.Data;

System.Data Namespaces:

Class	Description
DataSet	Data stored in main memory
DataTable	A data table in DataSet
DataRow	A data row in DataTable
DataColumn	A data column in DataTable

System.Data.OleDb

- **System.Data.OleDb provides classes to access OLE DB**
- **Often used to connect Access, SQL Server 6.5 or earlier versions**

- **Classes:**

Class	Description
OleDbConnection	Use connection string to access OLE DB data source
OleDbCommand	Execute SQL statement in OLE DB
OleDbDataReader	Read data source row from OLE DB data source
OleDbDataAdapter	Contains command collection and database link, used to fill DataSet and update record

System.Data.SqlClient

- **System.Data.SqlClient namespace is used for connecting SQL Server 7.0 and newer version**

- **Classes:**

Class	Description
SqlConnection	Use connection string to open SQL Server connection
SqlCommand	Execute SQL statement
SqlDataReader	Read data row from SQL Server
SqlDataAdapter	Include data commands and database connection, to fill DataSet and update SQL Server data source

15-2 ADO.NET Objects

Connection object

- **Connects program and data source**

- **Due to type of data source, there are 2 objects OleDbConnection and SqlConnection**

- **Most used Connection Object members:**

Member	Description
ConnectionString	Get or set string to access database
ConnectionTimeout	Get or set connection time out
Database	Get or set database name
DataSource	Get or set name of connected data source
Open() method	Open connected database
Close() method	Close connected database

1.Connection Object Usage

Example(ConnectionOleDb):
Connect D:\friend.mdb Access database and show the data source, then close the connection

```
01    using System.Data.OleDb;
...
02      private void Form1_Load(object sender, EventArgs e)
03      {
04          string cn =
                "Provider = Microsoft.Jet.OLEDB.4.0; Data Source=" +
                    Application.StartupPath + "\\friend.mdb" ;
05          OleDbConnection db = new OleDbConnection(cn);
06          db.Open();
07          MessageBox.Show(db.DataSource, "資料來源");
08          db.Close();
09      }
```
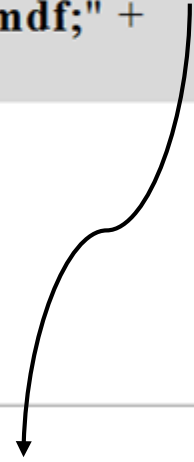
Example(ConnectionSql):

Connect Database1 database on local SQL Server and show data source, then close the connection

```
01    using System.Data.SqlClient;
...
02       private void Form1_Load(object sender, EventArgs e)
03       {
04          string cn = @"Data Source=(LocalDB)\MSSQLLocalDB;"+
                "AttachDbFilename=|DataDirectory|Database1.mdf;" +
                "Integrated Security=True";
05          SqlConnection db = new SqlConnection(cn);
06          db.Open();
07          MessageBox.Show(db.Database, "資料庫");
08          db.Close();
09       }
```

"AttachDbFilename=D:\\database\\Database1.mdf;" +

2.Command Object

- **Program can execute SQL command on data source**
- **Due to different data source, there are mainly 2 objects**
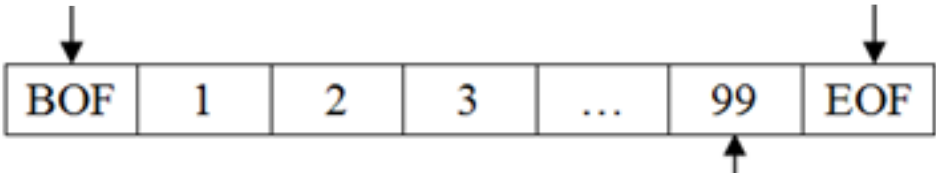- **OleDbCommand and SqlCommand**
- **Command Object Members:**

Member	Description
CommandText	Get or set SQL command or table name of data source
CommandType	Get or set data source type of CommandText
ExecuteReader()	Pass CommandText to Connection and use DataReader to read which fit SQL command
ExecuteNonQuery()	Execute SQL and return number of matched data

3.DataReader Object

- **Make program read data source rapidly**
  - ⇨ **read data stream row to row (record)**
  - ⇨ **put data into memory or show on control item**

- **Due to type of data source, there are**
  - **- OleDbDataReader**
  - **- SqlDataReader**

DataReader Members

Member	Description
FieldCount	Get column number of data row, return 3 for 3 columns
Item[i] collection	Get data at i^{th} column, start from 0
Item[column_name]	Get data at designated column name
GetName(i) method	Get name of ith column
Read() method	Begin from 1st record, move record pointer to the last one gradually. If the record pointer is at EOF, return false Start pointer — End pointer | BOF	1	2	3	…	99	EOF | Last record

Example(DataReaderOleDb):

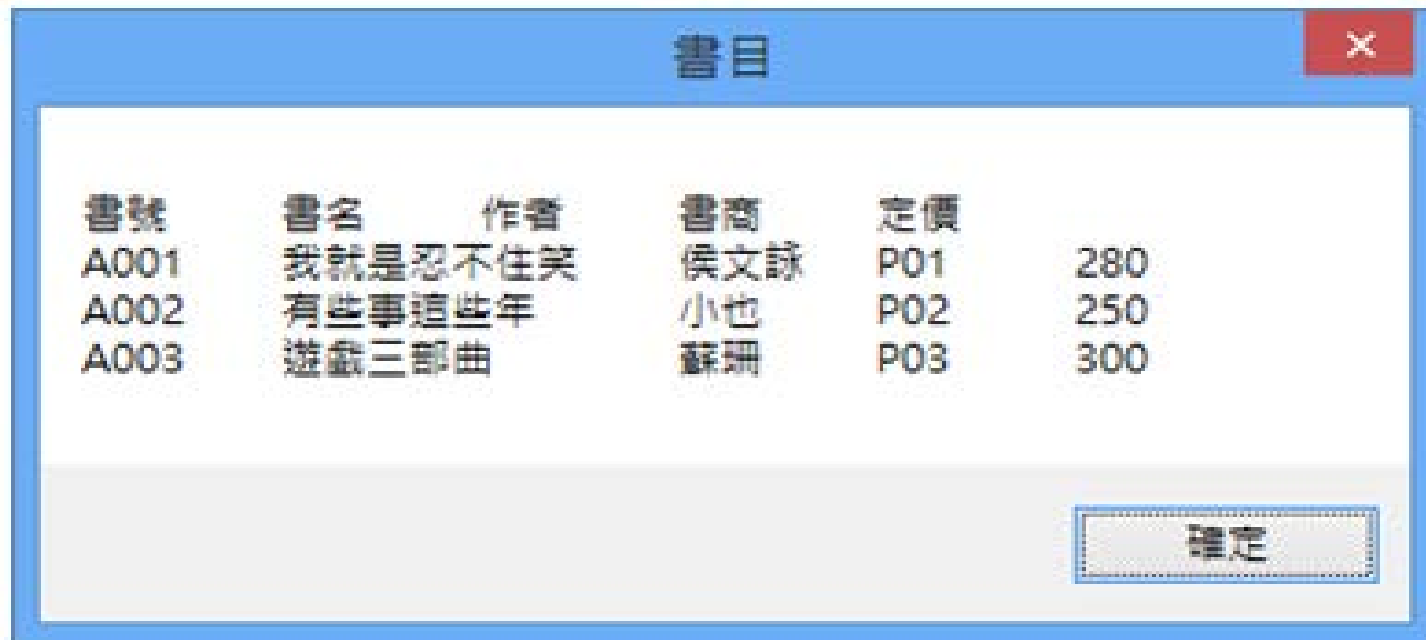Connect D:\friend.mdb Access database and show all records on the dialog, then close the connection

Example(DataReaderSql):

Show the first 3 records of Database1 in local SQL Server
https://msdn.microsoft.com/zh-
tw/library/system.data.sqlclient.sqlconnection.connectionstring(v=vs.110).aspx

Integrated Security: When false, User ID and Password are specified in the
connection. When true, the current Windows account credentials are used for
authentication.

Use SqlCommand Object to Edit Table Record

SqlCommand ExecuteNonQuery() method can be used for adding, modifying and deleting designated record in table, steps:

Step 1: use SqlConnection object to connect designated database

Step 2: use SqlCommand object to assign SQL statement

Step 3: use ExecuteNonQuery() method to execute SQL statement to modify record

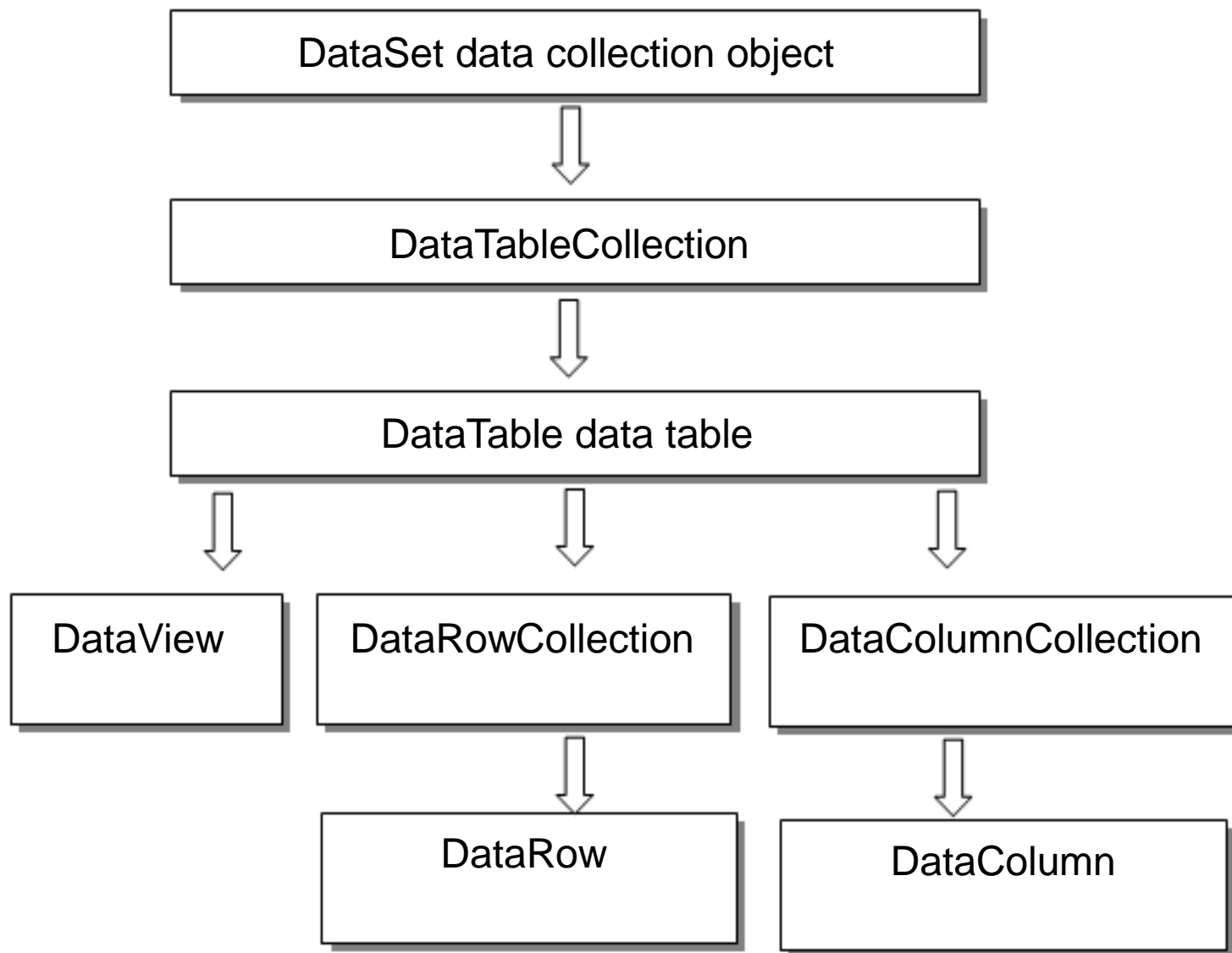**Step 4: use Close() method of SqlConnection object to close connected database**

4.DataSet Object

- **DataSet object is database catch data in memory**

- **Use DataSet object to operate database off-line**

- **DataSet object is formed by one or more data tables**

DataSet Object Structure

```
┌─────────────────────────────────────────┐
│       DataSet data collection object      │
└─────────────────────────────────────────┘
                     ⇓
┌─────────────────────────────────────────┐
│            DataTableCollection            │
└─────────────────────────────────────────┘
                     ⇓
┌─────────────────────────────────────────┐
│            DataTable data table           │
└─────────────────────────────────────────┘
        ⇓            ⇓              ⇓
┌──────────┐  ┌──────────────┐  ┌──────────────────┐
│ DataView │  │DataRowCollection│ │DataColumnCollection│
└──────────┘  └──────────────┘  └──────────────────┘
                     ⇓                  ⇓
              ┌──────────┐       ┌──────────────┐
              │ DataRow  │       │  DataColumn  │
              └──────────┘       └──────────────┘
```

DataSet Object Members

Member	Description
DataSetName	Get or set name of current data set
Tables	Get table collection in DataSet
Clear() method	Can erase all data in table
Dispose() method	Release resource used by DataSet

DataTable Object

- **Member of DataSet, stands for a table**
- **DataTable Members:**

Member	Description
DataSet	Get DataSet which DataTable belongs to
TableName	Get or set name of DataTable
Rows	Get collection of data rows
Columns	Get collection of data column
PrimaryKey	Get or set primary key of DataTable
Clear() method	Can erase all data in DataTable
Dispose() method	Can release resource used by DataTable

Example(DataTableSample)

5.DataAdapter Object

- **Data adapter between data source and DataSet**
- **Read data to DataSet and return result to data source**
- **DataAdapter Members:**

Member	Description
SelectCommand	Get or set SQL command run in data source
InsertCommand	Get or set SQL command for insertion run in data source
DeleteCommand	Get or set SQL command for deletion run in data source
UpdateCommand	Get or set SQL command for updating run in data source
Fill() method	Fill data into DataSet or DataTable
Update() method	Calls the respective INSERT, UPDATE, or DELETE statements for each inserted, updated, or deleted row

Example(DataAdapterOleDb):

Connect to D:\friend.mdb Access database and show all data records of "通訊錄" table on DataGridView control item

https://msdn.microsoft.com/zh-tw/library/system.windows.forms.datagridview.datasource(v=vs.110).aspx

	編號	姓名	生日	電話	已婚
▶	1	張三丰	1911/1/1	0900-0000000	☐
	2	張無忌	1922/2/2	0922-2222222	☑
	3	梁詠琪	1977/7/7	0977-7777777	☑
	4	郭采潔	1988/8/8	0988-8888888	☐
	5	關詩敏	1999/9/9	0999-9999999	☐
✱					☐

Example(DataAdapterSql):

Connect Database1 database on local SQL Server and show all data records of
"通訊錄" table on DataGridView control item

https://msdn.microsoft.com/zh-
tw/library/system.data.sqlclient.sqlconnection.connectionstring(v=vs.110).aspx

Integrated Security: When false, User ID and Password are specified in the
connection. When true, the current Windows account credentials are used for
authentication.

Example(EditEmp):

Design a program to add, modify delete records of employees.
Requirements:
1. All records of employees are shown in the DataGridView
2. Input data on employee ID, name, profession and salary, press "Add", "Modify" or "Delete" to edit designated employee record in employee table

Result:

Design User Interface

Add relation between two table

```
Dataset ds = new DataSet();
SqlDataAdapter daPublisher = new SqlDataAdapter
      ("SELECT * FROM 出版者", cn);
daPublisher.Fill(ds,"出版者");
SqlDataAdapter daBook = new SqlDataAdapter
      ("Select * FROM 書目", cn);
daBook.Fill(ds,"書目");
ds.Relations.Add("FK_出版者_書目"
      , ds.Tables["出版者"].Columns["編號"],
      , ds.Tables["書目"].Columns["書商"]);
```

- **Use the "Relations.Add" in the "DataSet" object to make association among the [出版者]number field, [書目], and [書商] field in the "DataTable". Lastly, name the associated object as [FK_出版者_書目]**

Practice 15.1: DataCombine

- **Use SQL command to connect database hospital.mdf.**
- **Add two datagridview to show two tables "系科別" "doctor"**
- **Make a relation between "系科別.Pid" & "doctor.所屬系別編號"**
- **Use message box to show if the database are connected successfully or not.**

Form1

	Pid	系別	樓層
▶	1	小兒科	2F
	2	放射科	B2F
	3	母科	B1F
	4	神經內科	B1F
	5	神經外科	B1F

	Did	name	所屬系別編號	職稱	薪水
▶	5	捷克阿	1	主任	250000
*					

Form1

	Pid	系別	樓層
	1	小兒科	2F
	2	放射科	B2F
▶	3	母科	B1F
	4	神經內科	B1F
	5	神經外科	B1F

	Did	name	所屬系別編號	職稱	薪水
▶	2	陳一郎	3	主治	200000
	4	劉四校	3	住院	180001
*					

The End

Take a Break …