# VII. Windows Forms – Databases, Clipboard

## Contents

1. Databases ........ 1

1.1. Connected Data Access Architecture ........ 1

1.2. Disconnected Data Access Architecture ........ 5

2. Clipboard ........ 7

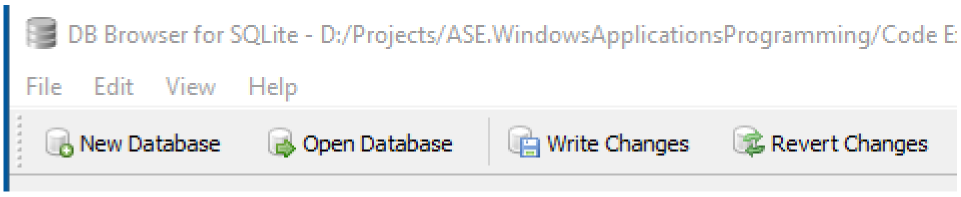
## 1. Databases

Data Access technologies:

- **ADO.NET - Active Data Objects**
- NHibernate
- Entity Framework

Activity

1. Install DB Browser for SQLite http://sqlitebrowser.org/


DB Browser for SQLite - D:/Projects/ASE.WindowsApplicationsProgramming/Code E
File
Edit
View
Help
New Database
Open Database
Write Changes
Revert Changes

2. Choose the option "New Database"
3. Add a new table as follows (you can also use the designer)

```
CREATE TABLE `Participant` (
        `Id`        INTEGER NOT NULL PRIMARY KEY AUTOINCREMENT UNIQUE,
        `LastName`        TEXT,
        `FirstName`       TEXT,
        `BirthDate`       TEXT
);
```

### 1.1. Connected Data Access Architecture

Activity

C# Sample code available at http://online.ase.ro – "DataBaseCommand" Sample

4. Create a copy of the "BasicListView" project and name it "DataBaseCommand"
5. Add SQLite libraries using NuGet (recommended) or directly from the website (http://system.data.sqlite.org/index.html/doc/trunk/www/index.wiki)
6. Add a new SQLiteConnection attribute ("_dbConnection" ) to the "MainForm" class as follows.

```
public partial class MainForm : Form
{
      #region Attributes
      private readonly SQLiteConnection _dbConnection;
      private readonly List<Participant> _participants;
      #endregion

      . . .
}
```

7. Instantiate the “dbConnection” attribute in the constructor of the “MainForm” class.

```
public MainForm()
{
      InitializeComponent();

      _participants = new List<Participant>();


      //Best practice
      //Define the connection string in the settings of the application and retrieve it
using ConfigurationManager.AppSettings["ConnectionString"]
      //dbConnection = new
SQLiteConnection(ConfigurationManager.AppSettings["ConnectionString"]);
      _dbConnection = new SQLiteConnection("Data Source=database.db");
}
```

8. Set the tag property for the ListViewItems as follows.

```
public void DisplayParticipants()
{
      lvParticipants.Items.Clear();

      foreach (Participant participant in _participants)
      {
            var listViewItem = new ListViewItem(participant.LastName);
            listViewItem.SubItems.Add(participant.FirstName);
            listViewItem.SubItems.Add(participant.BirthDate.ToShortDateString());

            listViewItem.Tag = participant;

            lvParticipants.Items.Add(listViewItem);
      }
}
```

9. Add the method that will be used to insert new participants in the database.

```
public void AddParticipant(Participant participant)
{
      var dbCommand = new SQLiteCommand();
      dbCommand.Connection = _dbConnection;
      dbCommand.CommandText = "insert into Participant(LastName, FirstName, BirthDate)
values(@lastName,@firstName,@birthDate);  SELECT last_insert_rowid()";

      try
      {
            //1. Add the new participant to the database
            _dbConnection.Open();
            dbCommand.Transaction = _dbConnection.BeginTransaction();

            var lastNameParameter = new SQLiteParameter("@lastName");
            lastNameParameter.Value = participant.LastName;
            var firstNameParameter = new SQLiteParameter("@firstName");
            firstNameParameter.Value = participant.FirstName;
            var birthDateParameter = new SQLiteParameter("@birthDate");
            birthDateParameter.Value = participant.BirthDate;

            dbCommand.Parameters.Add(lastNameParameter);
            dbCommand.Parameters.Add(firstNameParameter);
            dbCommand.Parameters.Add(birthDateParameter);

            participant.Id = (long)dbCommand.ExecuteScalar();

            dbCommand.Transaction.Commit();

            //2. Add the new participants to the local collection
            _participants.Add(participant);
      }
      catch (Exception)
      {
            dbCommand.Transaction.Rollback();
            throw;
      }
      finally
      {
            if (_dbConnection.State != ConnectionState.Closed) _dbConnection.Close();
      }
}
```

10. Change the “btnAdd_Click” event handler as follows

```
private void btnAdd_Click(object sender, EventArgs e)
{
      var lastName = tbLastName.Text;
      var firstName = tbFirstName.Text;
      var birthDate = dtpBirthDate.Value;

      var participant = new Participant(lastName, firstName, birthDate);

      try
      {
            AddParticipant(participant);
            DisplayParticipants();
      }
      catch (Exception ex)
      {
            MessageBox.Show(ex.Message);
      }
}
```

11. Add the method that will be used to get the existing participants from the database.

```
public void LoadParticipants()
{
      const string stringSql = "SELECT * FROM Participant";
      try
      {
            _dbConnection.Open();
            SQLiteCommand sqlCommand = new SQLiteCommand(stringSql, _dbConnection);
            SQLiteDataReader sqlReader = sqlCommand.ExecuteReader();
            try
            {
                  while (sqlReader.Read())
                  {
                        _participants.Add(new Participant((long) sqlReader["Id"], (string)
sqlReader["LastName"],
                              (string) sqlReader["FirstName"], DateTime.Parse((string)
sqlReader["BirthDate"])));
                  }
            }
            finally
            {
                  // Always call Close when done reading.
                  sqlReader.Close();
            }
      }
      finally
      {
            if (_dbConnection.State != ConnectionState.Closed) _dbConnection.Close();
      }
}
```

12. Handle the Load events of the "MainForm" class as follows

```
private void MainForm_Load(object sender, EventArgs e)
{
      try
      {
            LoadParticipants();
            DisplayParticipants();
      }
      catch (Exception ex)
      {
            MessageBox.Show(ex.Message);
      }
}
```

13. Add the method that will be used to delete existing participants from the database

```
public void DeleteParticipant(Participant participant)
{
      const string stringSql = "DELETE FROM Participant WHERE Id=@id";
      try
      {
            //Remove from the database
            _dbConnection.Open();
            SQLiteCommand sqlCommand = new SQLiteCommand(stringSql, _dbConnection);
            var idParameter = new SQLiteParameter("@id");
            idParameter.Value = participant.Id;
            sqlCommand.Parameters.Add(idParameter);

            sqlCommand.ExecuteNonQuery();

            //Remove from the local copy
            _participants.Remove(participant);
      }
      finally
      {
            if (_dbConnection.State != ConnectionState.Closed) _dbConnection.Close();
      }
}
```

14. Handle the “Delete” button as follows

```
private void btnDelete_Click(object sender, EventArgs e)
{
	if (lvParticipants.SelectedItems.Count == 0)
	{
		MessageBox.Show("Choose a participant");
		return;
	}

	if (MessageBox.Show("Are you sure?", "Delete participant", MessageBoxButtons.YesNo,
MessageBoxIcon.Warning) ==
		DialogResult.Yes)
	{
		try
		{
			DeleteParticipant((Participant) lvParticipants.SelectedItems[0].Tag);
			DisplayParticipants();
		}
		catch (Exception ex)
		{
			MessageBox.Show(ex.Message);
		}
	}
}
```

15. Implement the edit functionality in order to allow the user to modify the data, for previously entered participants.

## 1.2. Disconnected Data Access Architecture

### Activity

C# Sample code available at http://online.ase.ro – “DataBaseDataAdapter” Sample

1. Create a copy of the “BasicListView” project and name it “DataBindingSample”.
2. Replace the “ListView” control with a “DataGrid” control (Name: dgvParticipants).
3. Modify the “MainForm” class as follows.

```
public partial class MainForm : Form
{
	private readonly SQLiteConnection _dbConnection ;
	private readonly SQLiteDataAdapter _dbDataAdapter;
	private readonly DataSet _dsParticipants;

	public MainForm()
	{
		InitializeComponent();

		//Best practice
		//Define the connection string in the settings of the application and retrieve
it using ConfigurationManager.AppSettings["ConnectionString"]
		//var dbConnection = new
SQLiteConnection(ConfigurationManager.AppSettings["ConnectionString"]);
		_dbConnection = new SQLiteConnection("Data Source = database.db");

		_dsParticipants = new DataSet();
```

```
            var selectCommand = new SQLiteCommand("SELECT Id, LastName, FirstName, 
BirthDate FROM Participant", _dbConnection);

            _dbDataAdapter = new SQLiteDataAdapter(selectCommand);
            _dbDataAdapter.RowUpdated += _dbDataAdapter_RowUpdated;

            var deleteCommand = new SQLiteCommand("DELETE FROM Participant WHERE Id = @Id", 
_dbConnection);
            deleteCommand.Parameters.Add(new SQLiteParameter("@Id"));
            _dbDataAdapter.DeleteCommand = deleteCommand;

            var insertCommand = new SQLiteCommand("INSERT INTO Participant (LastName, 
FirstName, BirthDate) VALUES (@LastName, @FirstName, @BirthDate);", _dbConnection);
            insertCommand.Parameters.Add(new SQLiteParameter("@LastName"));
            insertCommand.Parameters.Add(new SQLiteParameter("@FirstName"));
            insertCommand.Parameters.Add(new SQLiteParameter("@BirthDate"));
            _dbDataAdapter.InsertCommand = insertCommand;

            var updateCommand = new SQLiteCommand("UPDATE Participant SET LastName = 
@LastName, FirstName=@FirstName, BirthDate = @BirthDate WHERE Id = @Id", _dbConnection);
            updateCommand.Parameters.Add(new SQLiteParameter("@LastName", DbType.String, 
"LastName"));
            updateCommand.Parameters.Add(new SQLiteParameter("@FirstName", DbType.String, 
"LastName"));
            updateCommand.Parameters.Add(new SQLiteParameter("@BirthDate", DbType.String, 
"LastName"));
            updateCommand.Parameters.Add(new SQLiteParameter("@Id", DbType.Int64, "Id"));
            _dbDataAdapter.UpdateCommand = updateCommand;
      }

      #region Events
      private void MainForm_Load(object sender, EventArgs e)
      {
            try
            {
                  _dbDataAdapter.Fill(_dsParticipants, "Participant");
            }
            catch (Exception ex)
            {
                  MessageBox.Show(ex.Message);
            }

            //DataBinding Grid
            dgvParticipants.DataSource = _dsParticipants.Tables["Participant"];
            //dgvParticipants.Columns["Id"].Visible = false;
      }

      private void btnAdd_Click(object sender, EventArgs e)
      {
            DataRow newParticipantRow = _dsParticipants.Tables["Participant"].NewRow();

            newParticipantRow["LastName"] = tbLastName.Text;
            newParticipantRow["FirstName"] = tbFirstName.Text;
            newParticipantRow["BirthDate"] = dtpBirthDate.Value;

            _dsParticipants.Tables["Participant"].Rows.Add(newParticipantRow);
      }

      private void btnPersistChanges_Click(object sender, EventArgs e)
      {
            try
            {
                  _dbDataAdapter.Update(_dsParticipants, "Participant");
                  //_dsParticipants.AcceptChanges();
            }
            catch (Exception ex)
            {
                  MessageBox.Show(ex.Message);
            }
      }

      private void _dbDataAdapter_RowUpdated(object sender,
System.Data.Common.RowUpdatedEventArgs e)
      {
            //https://msdn.microsoft.com/en-us/library/ks9f57t0%28v=vs.110%29.aspx
            if (e.StatementType == StatementType.Insert)
            {
                  var getIdCommand = new SQLiteCommand("SELECT last_insert_rowid()",
_dbConnection);
                  e.Row["Id"] = (long)getIdCommand.ExecuteScalar();
            }
      }
      #endregion
}
```

## 2. Clipboard

### Activity

C# Sample code available at http://online.ase.ro – "ClipboardSample" Sample

1. Create a new project with the name "ClipboardSample"
2. Create the UI in Figure 1
3. Handle the Click event on the "Copy Text" button as follows

```
//Copy text from text box onto the clipboard
Clipboard.SetText(tbCopy.Text);
```

4. Handle the Click event on the "Paste Text" button as follows

```
//If clipboard has text, paste it into the text box
if (Clipboard.ContainsText())
{
      tbPaste.Text = Clipboard.GetText();
}
else
{
      MessageBox.Show("Clipboard does not contain any text");
}
```

5. Check the rest of the sample online.

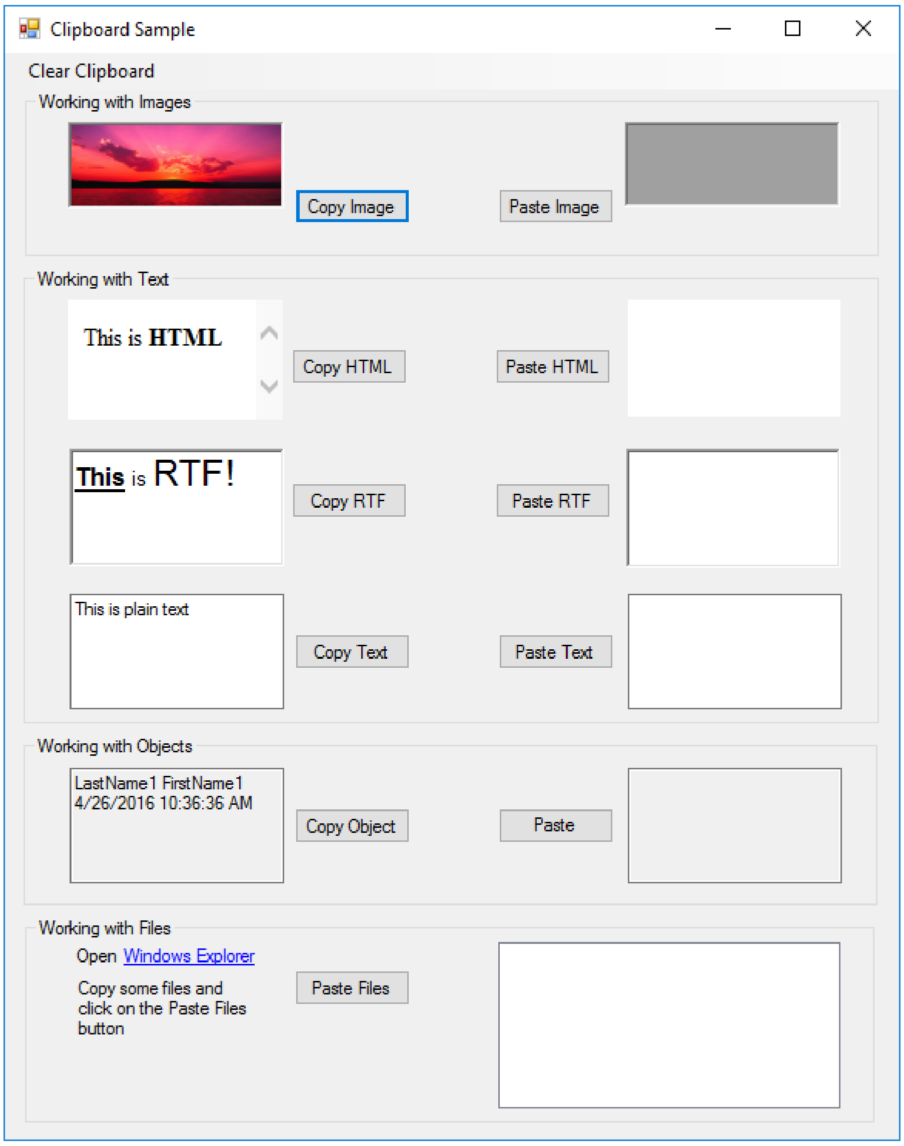


**Figure 1 ClipboardSample**