ComponentOne

Zip for WinForms

GrapeCity US

GrapeCity
201 South Highland Avenue, Suite 301
Pittsburgh, PA 15206
Tel: 1.800.858.2739 | 412.681.4343
Fax: 412.681.4384
Website: https://www.grapecity.com/en/
E-mail: us.sales@grapecity.com

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Table of Contents

- Zip for .NET Overview 2
  - Help with WinForms Edition 2
  - Creating a Mobile Device Application 2
  - Migrating a Zip for .NET Project to Visual Studio 2005 2-3
- Key Features 4-5
- Zip for .NET Fundamentals 6
  - High Level: C1ZipFile, C1ZipEntry and C1ZipEntryCollection Classes 6-7
  - Medium Level: C1ZStreamReader and C1ZStreamWriter Classes 7-9
  - Low Level: ZStream Class 9
- Zip for Mobile Devices Fundamentals 10
- Zip for .NET Samples 11
- Zip for .NET Task-Based Help 12
  - Compressing Datasets 12-13
  - Compressing an Entire Folder into a Zip File 13-14
  - Creating a Zip File with Multiple Entries 14-15
  - Extracting Files from Zip Entry to Memory 15-16
  - Reading a Zipped File Using a StreamReader 16-17
  - Retrieving Images from a Zip File 17-19
  - Saving a String Variable to a Zip File 19-20
  - Setting the Level of Compression 20-21
  - Using Passwords to Protect Zip Files 21-22
- Zip for .NET Tutorials 23
  - Compressing Data in Memory 23-32
  - Compressing Files 32-40
  - Compressed Serialization 40-47
  - Handling Zip Files 47-60
- Zip for .NET Frequently Asked Questions 61

Zip for .NET Overview

Quickly compress data, saving disk space and network bandwidth, and easily manipulate and work with compressed data. **Zip for .NET** allows you to compress files from your applications, including system and hidden files, and add and delete compressed files and folders; you can even read and write to zip files stored in streams.

Zip for .NET classes are supported in all .NET development platforms including WinForms, ASP.NET, WPF, Mobile, and a special Silverlight version exists in Silverlight Edition.

Getting Started

To get started, review the following topics:

- Key Features
- Zip for .NET Fundamentals
- Samples

Help with WinForms Edition

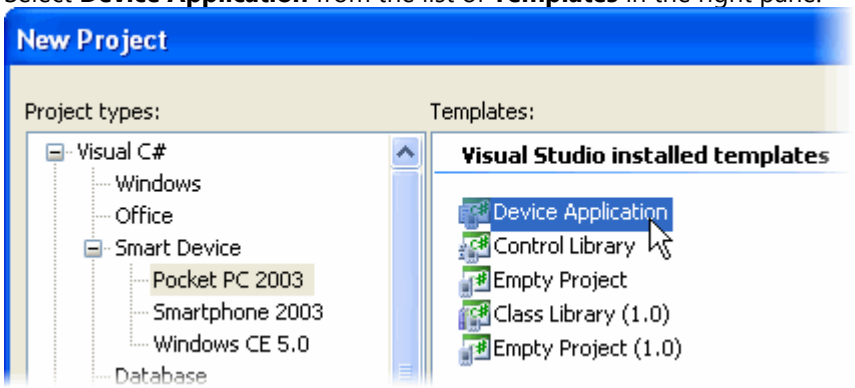
Getting Started

For information on installing **ComponentOne Studio WinForms Edition**, licensing, technical support, namespaces and creating a project with the control, please visit Getting Started with WinForms Edition.

Creating a Mobile Device Application

To create a new .NET 2.0 device application project, complete the following steps:

1. From the **File** menu in Microsoft Visual Studio .NET, select **New | Project**. The **New Project** dialog box opens.
2. Under **Project Types**, expand the **Visual Basic** or **Visual C#** node. Note that one of these options may be located under **Other Languages**.
3. Expand the **Smart Device** node and select one of the smart devices listed.
4. Select **Device Application** from the list of **Templates** in the right pane.



5. Enter a name in the **Name** textbox and click **OK**. A new project is created, and a new Form1 is displayed in the Designer view.
6. Reference the C1Zip assembly in your project.

Migrating a Zip for .NET Project to Visual Studio 2005

To migrate a project using ComponentOne components to Visual Studio 2005, there are two main steps that must be

performed. First, you must convert your project to Visual Studio 2005, which includes removing any references to a previous assembly and adding a reference to the new assembly. Second, you must update the project References to use the new C1.C1Zip.2.dll.

To convert the project:

1. Open Visual Studio 2005 and select **File | Open | Project/Solution**.
2. Locate the **.sln** file for the project that you wish to convert to Visual Studio 2005. Select it and click **Open**. The **Visual Studio Conversion Wizard** appears.
3. Click **Next**.
4. Select **Yes, create a backup before converting** to create a backup of your current project and click **Next**.
5. Click **Finish** to convert your project to Visual Studio 2005. The **Conversion Complete** window appears.
6. Click Show the conversion log when the wizard is closed if you want to view the conversion log.
7. Click **Close**. The project opens. Now you must remove references to any of the previous ComponentOne .dlls and add references to the new ones.
8. Go to the Solution Explorer (**View | Solution Explorer**), select the project, and click the **Show All Files** button.

   > **Note:** The **Show All Files** button does not appear in the Solution Explorer toolbar if the Solution project node is selected.

9. Expand the **References** node, right-click C1.C1Zip and select **Remove**.
10. Right-click the **References** node and select **Add Reference**.
11. Locate and select **C1.C1Zip.2.dll**. Click **OK** to add it to the project.

Key Features

Some of the main features of **Zip for .NET** that you may find useful include the following:

- **Major operations**

  With **Zip for .NET**, you can:

  - Obtain global information on a zip file.
  - Obtain a detailed list of a zip file's contents via a collection object.
  - Delete files from within a zip file.
  - Test the integrity of a zip file and its contents.
  - Add and retrieve comments for individual files in the zip file.
  - Get and set the global zip file comment.
  - Control what path information is stored in the zip file for each file.
  - Zip system and hidden files.
  - Control the amount of compression applied to files being zipped.
  - Specify the path where files will be uncompressed to.
  - Work on temporary copies of zip files, for maximum safety.
- **Compress and Expand Folders**

  With Zip you can easily compress and expand folders while preserving folder structure.

- **Read and Write to Streams**

  Zip can read and write to zip files stored in streams in addition to actual files using the C1ZipFile.Open(Stream) method. This allows reading zip files embedded in application resources or stored in database fields instead of in actual files.

- **Get and Set File Information**

  Easily obtain zip file information including a detailed list of the zip file's contents. You can also control file information by adding and retrieving comments and control path information for individual entries in the zip file, and getting and setting the global zip file comment.

- **File Integrity and Safety**

  With Zip you can test the integrity of a zip file and its contents and work on temporary copies of zip files to ensure maximum safety.

- **Compress and Manipulate Compressed Files**

  Compress files, including system and hidden files, and easily manipulate compressed files by deleting files from within a zip file, controlling the amount of compression applied to files being zipped, and specifying the path where files will be uncompressed to.

- **Incorporates the ZLIB Advantage**

  ZLIB is a general-purpose, lossless data-compression library with a portable, cross-platform data format. Unlike Unix compress and GIF image format LZW compression, the ZLIB compression method essentially never expands the data (LZW doubles or triples the file size in extreme cases) and has a memory footprint independent of input data.

- **Support for Zip64**

  C1Zip now supports Zip64 files. This allows for entries longer than the usual 4 gig limit and also allows more entries per zip file. The maximum number of entries per ZIP file is 2,147,483,647 (int.MaxValue). The maximum uncompressed entry size is 9,223,372,036,854,775,807 (long.MaxValue).

- **Fast, low memory usage compression engine**

The low memory compression engine lets you:

  - Zip files or memory buffers into new or existing zip files.
  - Unzip files to disk or directly to memory.
  - Compress and decompress strings or buffers completely in memory.
  - Stream-based compression and decompression for maximum flexibility.

- **100% managed C# code**

  C1.C1Zip.ZLib is a C# implementation of Adler and Gailly's ZLIB code and contains a main class ZStream that handles stream-based compression and decompression. ZLIB handles the actual data compression and decompression.

  ZLIB is designed to be a free, general-purpose, lossless data-compression library for use on virtually any computer hardware and operating system. The ZLIB data format is itself portable across platforms. Unlike the LZW compression method used in Unix compress and in the GIF image format, the compression method currently used in ZLIB essentially never expands the data. (LZW can double or triple the file size in extreme cases.) ZLIB's memory footprint is also independent of the input data.

- **Simple, intuitive object model**

  Zip for .NET contains three main classes:

- C1ZStreamWriter is a stream object that takes regular data on input, compresses it, and writes it out to an underlying stream. You can compress data to files, memory, or any other type of stream. You can attach a **BinaryWriter** object to C1ZStreamWriter to write objects directly, without dealing with byte arrays.
- C1ZStreamReader is a stream object that takes a compressed stream as input and decompresses it as it reads data from the underlying compressed stream. You can attach a **BinaryReader** object to C1ZStreamReader to read objects directly, without dealing with byte arrays.
- C1ZipFile is a class that deals with zip files. It allows you to create, open, and modify zip files. C1ZipFile has a Entries property that represents a collection of entries in a zip file.

Zip for .NET Fundamentals

The classes in the **C1Zip** library are divided into three levels:

Level	Main Classes	Description
High	C1ZipFile, C1ZipEntry, C1ZipEntryCollection	Use these classes to create, open, and manage ZIP files. You can inspect the contents of ZIP files, test their integrity, add, delete, and extract entries to and from ZIP files.
Medium	C1ZStreamReader, C1ZStreamWriter	Use these classes to compress and expand data into and out of regular .NET streams (including memory, file, and network streams).
Low	ZStream	This is the lowest level class in **C1Zip**. It is a 100% C# implementation of Zlib, the popular data-compression library written by Jean-loup Gailly and Mark Adler. ZStream is used by the higher level classes in C1Zip.

High Level: C1ZipFile, C1ZipEntry and C1ZipEntryCollection Classes

These are the highest level classes in the **C1Zip** library. They allow you to create and manage zip files. Using zip files to store application data provides the following benefits:

- You can consolidate many files into one, making application deployment easier.
- You can compress the data, saving disk space and network bandwidth.
- The zip format is an open standard, supported by many popular applications.

C1ZipFile Class

The C1ZipFile class encapsulates a zip file. After you create a C1ZipFile object, you can attach it to an existing zip file or tell it to create a new empty zip file for you. For example:

To write code in Visual Basic

Visual Basic

```
' Create a C1ZipFile object.
Dim myZip As New C1ZipFile()
' Create a new (empty) zip file.
myZip.Create("New.zip")
' Open an existing zip file.
myZip.Open("Old.zip")
```

To write code in C#

C#

```
// Create a C1ZipFile object.
C1ZipFile myZip = new C1ZipFile();
// Create a new (empty) zip file.
myZip.Create("New.zip");
// Open an existing zip file.
```

```
myZip.Open("Old.zip");
```

C1ZipEntryCollection Class

After you have created or opened a zip file, use the Entries collection to inspect the contents of the zip file, or to add, expand, and delete entries. For example:

To write code in Visual Basic

Visual Basic

```
myZip.Entries.Add("MyData.txt")
myZip.Entries.Add("MyData.xml")
myZip.Entries.Add("MyData.doc")
Dim zipEntry As C1ZipEntry
For Each zipEntry In  myZip.Entries
   Console.WriteLine(zipEntry.FileName)
Next zipEntry
myZip.Open("Old.zip");
```

To write code in C#

C#

```
myZip.Entries.Add("MyData.txt");
myZip.Entries.Add("MyData.xml");
myZip.Entries.Add("MyData.doc");
foreach (C1ZipEntry zipEntry in myZip.Entries)
    Console.WriteLine(zipEntry.FileName);
```

C1ZipEntry Class

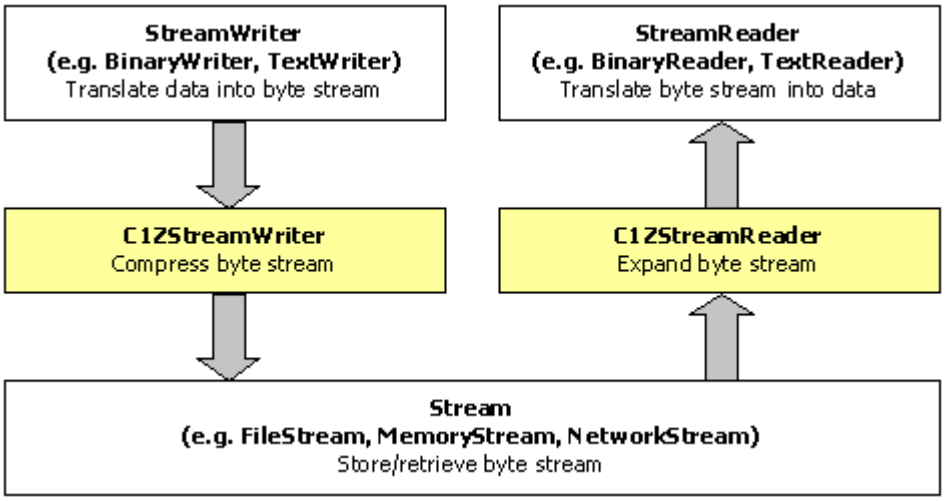
The C1ZipEntry class exposes properties and methods that describe each entry, including its original file name, size, compressed size, and so on. It also has a OpenReader method that returns a stream object, so you can read the entry contents without expanding it first.

Medium Level: C1ZStreamReader and C1ZStreamWriter Classes

The C1ZStreamReader and C1ZStreamWriter classes allow you to use data compression on any .NET streams, not only in zip files.

To use C1ZStreamReader and C1ZStreamWriter objects, attach them to regular streams and read or write the data through them. The data is compressed (or expanded) on the fly into (or out of) the underlying stream.

This design allows great integration with native .NET streams. The diagram below illustrates how it works:



For example, the code below saves an ADO.NET **DataTable** object into a stream and then reads it back:

To write code in Visual Basic

Visual Basic

```
' Save the DataTable into a compressed stream.
Dim bf As New Runtime.Serialization.Formatters.Binary.BinaryFormatter()
Dim fout As New FileStream("test.tmp", FileMode.Create)
bf.Serialize(fout, DataTableOut)
fout.Close()
' Read the compressed data.
Dim fin As New FileStream("test.tmp", FileMode.Open)
Dim DataTableIn As DataTable = bf.Deserialize(fin)
```

To write code in C#

C#

```
// Save the DataTable into compressed stream.
System.Runtime.Serialization.Formatters.Binary.BinaryFormatter bf = new
System.Runtime.Serialization.Formatters.Binary.BinaryFormatter();
FileStream fout = new FileStream("test.tmp", FileMode.Create);
bf.Serialize(fout, DataTableOut);
fout.Close();
// Read the compressed data.
FileStream fin = new FileStream("test.tmp", FileMode.Open);
DataTable DataTableIn = (DataTable)bf.Deserialize(fin);
```

To add data compression, you would simply add two lines of code:

To write code in Visual Basic

Visual Basic

```
' Save the DataTable into a compressed stream.
Dim bf As New Runtime.Serialization.Formatters.Binary.BinaryFormatter()
Dim fout As New FileStream("test.tmp", FileMode.Create)
Dim compressor As New C1ZStreamWriter(fout)
bf.Serialize(compressor, DataTableOut)
```

```
fout.Close()
' Read the compressed data.
Dim fin As New FileStream("test.tmp", FileMode.Open)
Dim decompressor As New C1ZStreamReader(fin)
Dim DataTableIn As DataTable = bf.Deserialize(decompressor)
```

To write code in C#

C#

```
// Save the DataTable into a compressed stream.
System.Runtime.Serialization.Formatters.Binary.BinaryFormatter bf = new
System.Runtime.Serialization.Formatters.Binary.BinaryFormatter();
FileStream fout = new FileStream("test.tmp", FileMode.Create);
C1ZStreamWriter compressor = new C1ZStreamWriter(fout);
bf.Serialize(compressor, DataTableOut);
fout.Close();
// Read compressed data.
FileStream fin = new FileStream("test.tmp", FileMode.Open);
C1ZStreamReader decompressor = new C1ZStreamReader(fin);
DataTable DataTableIn = (DataTable)bf.Deserialize(decompressor);
```

Low Level: ZStream Class

This is the lowest-level class in the **C1Zip** library, and it is used extensively by the higher-level classes described above.

Most users will never need to use ZStream directly. It is the most flexible, but the hardest to use component in the **C1Zip** library. ZStream is a C# implementation of the ZLIB library. ZLIB is an open-source library written by Jean-loup Gailly and Mark Adler.

For more information on ZLIB, check http://www.info-zip.org/ or http://www.gzip.org/.

Zip for Mobile Devices Fundamentals

The mobile version of **Zip for .NET** allows you to quickly develop Microsoft.NET Compact Framework-based applications for your mobile devices, such as personal digital assistants (PDA's), mobile phones, and more. It implements several classes that allow you to add data compression to your applications.

Zip for Mobile supports all members of the object model that are supported by the .NET Compact Framework.

Note that the code examples provided in this documentation are examples for using **Zip for .NET**. If you would like to see samples for the mobile version, they are installed with **Zip for Mobile Devices**, or you can get them online at https://www.grapecity.com/en/samples.

Zip for .NET Samples

Please be advised that this ComponentOne software tool is accompanied by various sample projects and/or demos, which may make use of other development tools included with ComponentOne Studio Enterprise.

Please refer to the pre-installed product samples through the following path:

Documents\ComponentOne Samples\WinForms

Click one of the following links to view a list of **C1Zip** samples:

Visual Basic Samples

Sample	Description
Files	Shows how to compress and expand individual files. This sample calls the C1.C1Zip namespace.
Memory	Shows how to compress and expand memory streams. This sample calls the C1.C1Zip namespace.
Serialization	Shows how to add compression to the .NET serialization support. This sample calls the C1.C1Zip namespace.
ZipFileDemo	Shows how to implement a simple zip utility. This sample uses the C1.C1Zip namespace.
ZipFileSimple	Shows how to implement a simple zip utility. This sample lets you create, open, and edit standard zip files. Note that this is a stripped-down version of the ZipFileDemo sample.

C# Samples

Sample	Description
Files	Shows how to compress and expand individual files. This sample calls the C1.C1Zip namespace.
InMemoryCompression	Shows how to create and use an in-memory archive. This sample calls the C1.C1Zip namespace.
Memory	Shows how to compress and expand memory streams. This sample calls the C1.C1Zip namespace.
SelfExtract	Self-extracting application. This sample calls the C1.C1Zip namespace.
Serialization	Shows how to add compression to the .NET serialization support. This sample calls the C1.C1Zip namespace.
ZipFileDemo	Shows how to implement a simple zip utility. This sample uses the C1.C1Zip namespace.
ZipImages	Shows how to retrieve images directly from a zip file. This sample calls the C1.C1Zip namespace.

Zip for Mobile Devices Samples (Visual Basic and C#)

Sample	Description
DataSet	Add compression to the .NET serialization support. This sample calls the C1.C1Zip namespace.
LongString	Compress and expand strings. This sample calls the C1.C1Zip namespace.
ZipFile	Implement a simple zip utility. This sample calls the C1.C1Zip namespace.

Zip for .NET Task-Based Help

The task-based help section assumes that you are familiar with programming in the Visual Studio environment. If you are a novice to **C1Zip**, see the Zip for .NET Tutorials first.

Each task-based help topic provides a solution for specific tasks referencing the C1.C1Zip namespace. Each topic also assumes that you have created a new .NET project.

Compressing Datasets

To write a dataset into a compressed zip file, use the following code:

To write code in Visual Basic

Visual Basic

```
Private Sub SaveDataSet(ds As DataSet)
    ' Open/create zip file.
    Dim zip As New C1.C1Zip.C1ZipFile()
    zip.Open("c:\temp\dataset.zip")
    ' Write the dataset into the zip file.
    Dim s As Stream = zip.Entries.OpenWriter(ds.DataSetName, True)
    Try
        ds.WriteXml(s, XmlWriteMode.WriteSchema)
    Finally
        s.Dispose()
    End Try
End Sub
Private Sub CheckDataSet(ds As DataSet)
    ' Open/create zip file.
    Dim zip As New C1.C1Zip.C1ZipFile()
    zip.Open("c:\temp\dataset.zip")
    ' Read the dataset from the zip file.
    Dim dsTest As New DataSet(ds.DataSetName) '
    Dim s As Stream = zip.Entries(ds.DataSetName).OpenReader()
    Try
        dsTest.ReadXml(s)
    Finally
        s.Dispose()
    End Try
    ' Check that the datasets are equivalent.
    Dim i As Integer
    For i = 0 To ds.Tables.Count - 1
        Dim dt1 As DataTable = ds.Tables(i)
        Dim dt2 As DataTable = dsTest.Tables(i)
        Debug.Assert((dt1.TableName = dt2.TableName And dt1.Columns.Count =
dt2.Columns.Count And dt1.Rows.Count = dt2.Rows.Count))
    Next i
End Sub
```

To write code in C#

C#

```
private void SaveDataSet(DataSet ds)
{
     // Open/create zip file.
    C1.C1Zip.C1ZipFile zip = new C1.C1Zip.C1ZipFile();
    zip.Open(@"c:\temp\dataset.zip");

    // Write the dataset into the zip file.
    using (Stream s = zip.Entries.OpenWriter(ds.DataSetName, true))
    {
        ds.WriteXml(s, XmlWriteMode.WriteSchema);
    }
}
private void CheckDataSet(DataSet ds)
{
    // Open/create zip file.
    C1.C1Zip.C1ZipFile zip = new C1.C1Zip.C1ZipFile();
    zip.Open(@"c:\temp\dataset.zip");

    // Read the dataset from the zip file.
    DataSet dsTest = new DataSet(ds.DataSetName);
    using (Stream s = zip.Entries[ds.DataSetName].OpenReader())
    {
        dsTest.ReadXml(s);
    }

    // Check that the datasets are equivalent.
    for (int i = 0; i < ds.Tables.Count; i++)
    {
        DataTable dt1 = ds.Tables[i];
        DataTable dt2 = dsTest.Tables[i];
        System.Diagnostics.Debug.Assert(dt1.TableName == dt2.TableName &&
dt1.Columns.Count == dt2.Columns.Count && dt1.Rows.Count == dt2.Rows.Count);
    }
}
```

Compressing an Entire Folder into a Zip File

To compress an entire folder into a zip file, preserving the folder structure for later expansion, use the AddFolder method.

For example, to compress the contents of the "c:\temp" folder, including all subfolders, use the following code:

To write code in Visual Basic

Visual Basic

```
C1Zip.Entries.AddFolder("c:\temp\", "*.*", True)
```

To write code in C#

C#

```
C1Zip.Entries.AddFolder(@"c:\temp\", "*.*", true);
```

To extract the folder later, including the original folder structure, use the following code:

To write code in Visual Basic

Visual Basic

```
C1Zip.Entries.ExtractFolder("c:\temp\")
```

To write code in C#

C#

```
C1Zip.Entries.ExtractFolder(@"c:\temp\");
```

Creating a Zip File with Multiple Entries

To stream multiple XML files directly into the zip file, use the OpenWriter method. That returns a stream that you can write to, and when the stream is closed it is added to the zip file.

Add the following code to the **Click** event:

To write code in Visual Basic

Visual Basic

```
Private Sub Button1_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
Handles Button1.Click
    Dim zip As New C1ZipFile()
    zip.Create("c:\temp\test.zip")
    Dim s As Stream = zip.Entries.OpenWriter("entry1", True)
    Dim sw As New StreamWriter(s)
    sw.WriteLine("Hello world")
     ' Continue writing as much as you want...
    sw.Close()
    s = zip.Entries.OpenWriter("entry2", True)
    sw = New StreamWriter(s)
    sw.WriteLine("Hello again")
     ' Continue writing as much as you want...
    sw.Close()
End Sub
```

To write code in C#

C#

```
private void button1_Click(object sender, System.EventArgs e)
{
    C1ZipFile zip = new C1ZipFile();
    zip.Create(@"c:\temp\test.zip");
    Stream s = zip.Entries.OpenWriter("entry1", true);
    StreamWriter sw = new StreamWriter(s);
    sw.WriteLine("Hello world");
      // Continue writing as much as you want...
```

```
    sw.Close();
    s = zip.Entries.OpenWriter("entry2", true);
    sw = new StreamWriter(s);
    sw.WriteLine("Hello again");
      // Continue writing as much as you want...
    sw.Close();
}
```

To read an entry without saving it to a file, use the OpenReader method on the entry object.

> **Note:** OpenWriter is a member of the C1ZipEntryCollection class, while OpenReader is a member of the C1ZipEntry class.

Extracting Files from Zip Entry to Memory

To extract a file from a zip to memory variable (for instance, a Byte array), use the following function:

To write code in Visual Basic

Visual Basic

```
Private Function GetDataFromZipFile(zipFileName As String, entryName As String) As
Byte()
     ' Get the entry from the zip file.
    Dim zip As New C1ZipFile()
    zip.Open(zipFileName)
    Dim ze As C1ZipEntry = zip.Entries(entryName)
     ' Copy the entry data into a memory stream.
    Dim ms As New MemoryStream()
    Dim buf(1000) As Byte
    Dim s As Stream = ze.OpenReader()
    Try
        While True
            Dim read As Integer = s.Read(buf, 0, buf.Length)
            If read = 0 Then
                Exit While
            End If
            ms.Write(buf, 0, read)
        End While
    Finally
        s.Dispose()
    End Try
    s.Close()
     ' Return result.
    Return ms.ToArray()
End Function
```

To write code in C#

C#

```
private byte[] GetDataFromZipFile(string zipFileName, string entryName)
```

```
{
       // Get the entry from the zip file.
    C1ZipFile zip = new C1ZipFile();
    zip.Open(zipFileName);
    C1ZipEntry ze = zip.Entries[entryName];
       // Copy the entry data into a memory stream.
    MemoryStream ms = new MemoryStream();
    byte[] buf = new byte[1000];
    using (Stream s = ze.OpenReader())
    {
        for (;;)
        {
            int read = s.Read(buf, 0, buf.Length);
            if (read == 0) break;
            ms.Write(buf, 0, read);
        }
    }
      // There's no need to call close because of the C# 'using'
      // statement above but in VB this would be necessary.
      //s.Close();
       // Return result.
    return ms.ToArray();
}
```

Reading a Zipped File Using a StreamReader

To read a zipped file using a **StreamReader**, add the following code:

To write code in Visual Basic

Visual Basic

```
 ' Open a zip file.
Dim zip As New C1ZipFile()
zip.Open("c:\temp\myzipfile.zip")
 ' Open an input stream on any entry.
Dim ze As C1ZipEntry = zip.Entries("someFile.cs")
Dim s As Stream = ze.OpenReader()
 ' Open the StreamReader on the stream.
Dim sr As New StreamReader(s)
 ' Use the StreamReader, then close it.
```

To write code in C#

C#

```
 // Open a zip file.
C1ZipFile zip = new C1ZipFile();
zip.Open(@"c:\temp\myzipfile.zip");

// Open an input stream on any entry.
C1ZipEntry ze = zip.Entries["someFile.cs"];
```

```
Stream s = ze.OpenReader();

// Open the StreamReader on the stream.
StreamReader sr = new StreamReader(s);

// Use the StreamReader, then close it.
```

Retrieving Images from a Zip File

To retrieve images directly from a zip file, first add the following code to the **Form_Load** event to compress several image files into a zip file:

To write code in Visual Basic

Visual Basic

```
 ' Build a list of images in resource directory, and add them all to a zip file.
Dim zip As New C1ZipFile()
Form1_Load(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles
MyBase.Load
     ' Get the application directory.
    Dim s As String = Application.ExecutablePath
    s = s.Substring(0, s.IndexOf("\bin")) + "\resources"
     ' Create the zip file.
    zip.Create((s + "\images.zip"))
     ' Populate the zip file and list.
    Dim f As String
    For Each f In  Directory.GetFiles(s)
        Dim fname As String = f.ToLower()
         ' Skip self.
        If fname.EndsWith("zip") Then
            GoTo ContinueForEach1
        End If
         ' Add to the list.
        ListBox1.Items.Add(Path.GetFileName(fname))
         ' Add to the zip file.
        zip.Entries.Add(fname)
        ContinueForEach1:
    Next f
End Sub
```

To write code in C#

C#

```
 // Build a list of images in resource directory, and add them all to a zip file.
C1ZipFile zip = new C1ZipFile();
private void Form1_Load(object sender, System.EventArgs e)
{

     // Get the application directory.
    string s = Application.ExecutablePath;
```

```
    s = s.Substring(0, s.IndexOf(@"\bin")) + @"\resources";

     // Create the zip file.
    zip.Create(s + @"\images.zip");

     // Populate the zip file and list.
    foreach (string f in Directory.GetFiles(s))
    {
        string fname = f.ToLower();

         // Skip self.
        if (fname.EndsWith("zip")) continue;

         // Add to the list.
        listBox1.Items.Add(Path.GetFileName(fname));

         // Add to the zip file.
        zip.Entries.Add(fname);
    }
}
```

To allow you to select an image, retrieve a stream with the image data (OpenReader method), and load the image (Image.**FromStream** method), add the following code to the **SelectedIndexChanged** event:

To write code in Visual Basic

Visual Basic

```
 ' Show selected image.
Private Sub ListBox1_SelectedIndexChanged(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles ListBox1.SelectedIndexChanged
     ' Get the selected item.
    Dim item As String = CStr(listBox1.SelectedItem)
     ' Load the image directly from a compressed stream.
    Dim s As Stream = zip.Entries(item).OpenReader()
    Try
        pictureBox1.Image = CType(Image.FromStream(s), Image)
    Catch
    End Try
     ' Done with stream.
    s.Close()
End Sub
```

To write code in C#

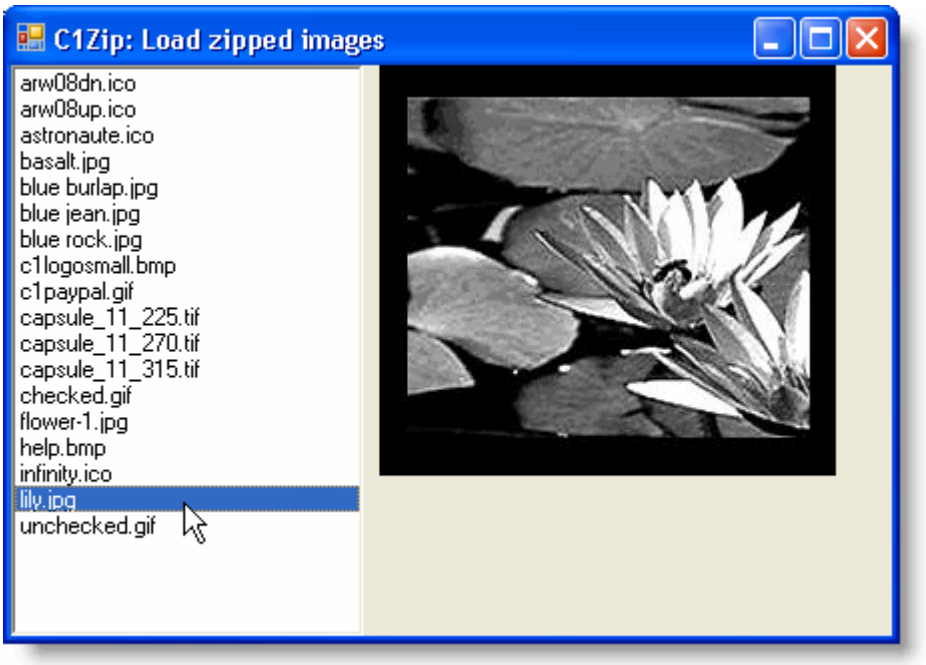
C#

```
 // Show selected image.
private void listBox1_SelectedIndexChanged(object sender, System.EventArgs e)
{
     // Get the selected item.
    string item = (string)listBox1.SelectedItem;
     // Load the image directly from a compressed stream.
```

```
    Stream s = zip.Entries[item].OpenReader();
    try
    {
        pictureBox1.Image = (Image)Image.FromStream(s);
    }
    catch {}
     // Done with stream.
    s.Close();
}
```

This topic illustrates the following:

This example shows several types of images, including ICO, GIF, TIFF, BMP, and JPG images.



Saving a String Variable to a Zip File

To save a string variable to a zip file, use one of the following methods:

- C1ZipEntryCollection.**OpenWriter** method

  Use the OpenWriter method to get a stream writer, write the string into it, and then close it. The data is compressed as you write it into the stream, and the whole stream is saved into the zip file when you close it.

- **MemoryStream** method

  Use a **MemoryStream** method; write the data into it, and then add the stream to the zip file. Note that this method requires a little more work than the OpenWriter method, but is still very manageable.

The following code shows both methods. Add the code to the **Button_Click** event:

To write code in Visual Basic

```
Visual Basic
```

```
 Private Sub Button1_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button1.Click
    Dim str As String = "Shall I compare thee to a summer's day? " + "Thou art more
lovely and more temperate. " + "Rough winds do shake the darling buds of May, " +
"And summer's lease hath all too short a date."
    Dim zipFile As New C1ZipFile()
    zipFile.Create("c:\temp\strings.zip")
     ' Method 1: OpenWriter.
    Dim stream As Stream = zipFile.Entries.OpenWriter("Shakespeare.txt", True)
    Dim sw As New StreamWriter(stream)
    sw.Write(str)
    sw.Close()
      ' Method 2: Memory Stream.
    stream = New MemoryStream()
    sw = New StreamWriter(stream)
    sw.Write(str)
    sw.Flush()
    stream.Position = 0
    zipFile.Entries.Add(stream, "Shakespeare2.txt")
    stream.Close()
End Sub
```

To write code in C#

C#

```
private void button1_Click(object sender, System.EventArgs e)
{
    string str = "Shall I compare thee to a summer's day? " +
        "Thou art more lovely and more temperate. " +
        "Rough winds do shake the darling buds of May, " +
        "And summer's lease hath all too short a date.";
     C1ZipFile zipFile = new C1ZipFile();
    zipFile.Create(@"c:\temp\strings.zip");
     // Method 1: OpenWriter.
    Stream stream = zipFile.Entries.OpenWriter("Shakespeare.txt", true);
    StreamWriter sw = new StreamWriter(stream);
    sw.Write(str);
    sw.Close();
     // Method 2: Memory Stream.
    stream = new MemoryStream();
    sw = new StreamWriter(stream);
    sw.Write(str);
    sw.Flush();
    stream.Position = 0;
    zipFile.Entries.Add(stream, "Shakespeare2.txt");
    stream.Close();
}
```

Setting the Level of Compression

To minimize the file size of the compressed file, set the compression level on the C1ZStreamWriter's constructor by using the following code:

To write code in Visual Basic

```
Visual Basic
Dim fn As String = Path.GetTempFileName()
Dim fs As New FileStream(fn, FileMode.Create)
Dim compressor As New C1ZStreamWriter(fs, CompressionLevelEnum.BestCompression)
```

To write code in C#

```
C#
string fn = Path.GetTempFileName();
FileStream fs = new FileStream(fn, FileMode.Create);
C1ZStreamWriter compressor = new
C1ZStreamWriter(fs,CompressionLevelEnum.BestCompression);
```

Note that the code sample above sets the compression level to **BestCompression**, which has the highest compression time and the lowest speed. Other compression level options on the C1ZStreamWriter's constructor include the following:

- **BestSpeed** has low compression time and the highest speed.
- **DefaultCompression** has normal compression time and speed.
- **NoCompression** has no compression.

Using Passwords to Protect Zip Files

To create password-protected zip files, set the Password property to a non-empty string before creating any entries. Each entry may have its own password. For example:

To write code in Visual Basic

```
Visual Basic
C1Zip.Password = "password"
C1Zip.Entries.Add(someFile)
```

To write code in C#

```
C#
C1Zip.Password = "password";
C1Zip.Entries.Add(someFile);
```

To extract this entry later, the Password property must be set to the same value in effect when the entry was added. For example:

To write code in Visual Basic

```
Visual Basic
' Will fail, password not set.
C1Zip.Password = ""
```

```
C1Zip.Entries.Extract(someFile)
' Will fail, wrong password.
C1Zip.Password = "pass"
C1Zip.Entries.Extract(someFile)
 ' Will succeed.
C1Zip.Password = "password"
C1Zip.Entries.Extract(someFile)
```

To write code in C#

C#

```
// Will fail, password not set.
C1Zip.Password = "";
C1Zip.Entries.Extract(someFile);
 // Will fail, wrong password.
C1Zip.Password = "pass";
C1Zip.Entries.Extract(someFile);
 // Will succeed.
C1Zip.Password = "password";
C1Zip.Entries.Extract(someFile);
```

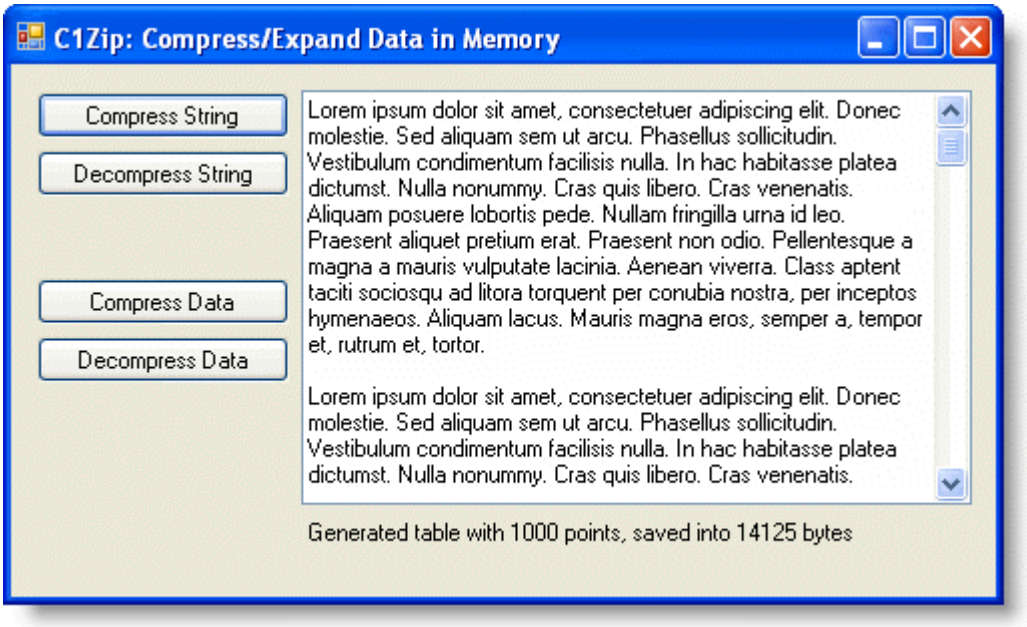
Zip for .NET Tutorials

The following topics contain tutorials that illustrate some of the main features in the **C1Zip** library. The tutorials walk you through the creation of several simple projects, describing each step in detail. See the included Zip for .NET Samples for additional examples that can be used as a reference.

Tutorial	Description
Compressing Data in Memory	Shows how you can compress and expand arbitrary data in memory. This technique is useful in any situation where you keep memory streams while the application is running. By compressing the streams, you can reduce the memory requirements for your application.
Compressing Files	Shows how you can compress individual files so they take up less disk space and are less exposed to access by users. Note that these are not zip files, just individual compressed files. The last tutorial covers zip files.
Compressed Serialization	Shows how you can combine Zip with .NET serialization to save objects into streams that are a fraction of the regular size. If you are serializing objects into XML streams, the savings in disk space and network bandwidth can be huge.
Handling Zip Files	Shows how you can open, inspect, add, and remove files in a zip archive. Using the zip format for your application storage needs has several advantages: it is an open-standard, well-documented, space-efficient format.

Compressing Data in Memory

This tutorial shows how you can compress basic data types such as strings and doubles into memory streams, and expand the data back when you read it from the streams. Here is what the final application will look like:



Step 1: Create the main form.

Start a new Visual Studio project. From the Toolbox, add the following controls to the form, by performing a drag-

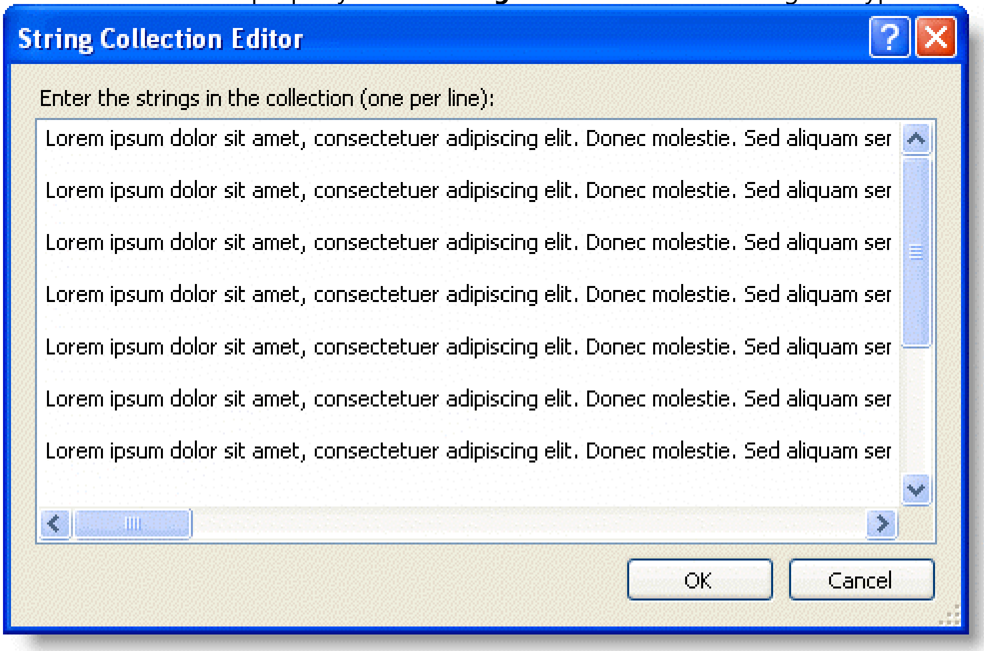
and-drop operation or by double-clicking the component:

- Four **Button** controls along the left edge of the form, as shown in the picture above. In the Properties window make the following changes to each **Button** control:

Button	Button.Text Property	Button.Name Property	Button.Enabled Property
1	Compress String	**btnCompressString**	True (Default)
2	Decompress String	**btnExpandString**	**False**
3	Compress Data	**btnCompressData**	True (Default)
4	Decompress Data	**btnExpandData**	**False**

> **Note:** The **Decompress String** and **Decompress Data** buttons cannot be used until we have some compressed data to expand.

- A **TextBox** on the upper-right of the form. Set the **MultiLine** property to **True**. Select the **ellipsis** button located next to **Lines** property. In the **String Collection Editor** dialog box type text to use as an initial value.



- A **Label** control below the text box.

Step 2: Add a reference to the C1Zip assembly.

Go to the Solution Explorer window and click the **Show All Files** button. Right-click on **References**, and select the **Add Reference** menu option. Select the C1.C1Zip assembly from the list, or browse to find the C1.C1Zip.2.dll file.

Select the **Form1.vb** tab (**Form1.cs** for C#) or go to **View|Code** to open the Code Editor. At the top of the file, add the following statements:

To write code in Visual Basic

Visual Basic

```
Imports System.IO
Imports C1.C1Zip
```

To write code in C#

C#

```
using System.IO;
using C1.C1Zip;
```

This makes the objects defined in the C1Zip assembly visible to the project and saves a lot of typing.

Step 3: Add code to compress strings.

Double-click the **Compress String** command button, and add the following code to handle the **btnCompressString_Click** event:

To write code in Visual Basic

Visual Basic

```
Private m_CompressedString As Byte()
Private Sub btnCompressString_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles btnCompressString.Click
     ' Compress the string.
    Dim ticks As Long = DateTime.Now.Ticks
    m_CompressedString = CompressString(textBox1.Text)
     ' Tell the user how long it took.
    Dim ms As Integer
    ms = (DateTime.Now.Ticks - ticks) / TimeSpan.TicksPerMillisecond
    Dim lenBefore As Integer = textBox1.Text.Length * 2
    Dim lenAfter As Integer = m_CompressedString.Length
    Dim msg As String
    msg = String.Format("Compressed from {0} bytes to " &  "{1} bytes in {2}
milliseconds.", lenBefore, lenAfter, ms)
    MessageBox.Show(msg, "Compressed", MessageBoxButtons.OK,
MessageBoxIcon.Information)
     ' We can now expand it.
    btnExpandString.Enabled = True
End Sub
```

To write code in C#

C#

```
private byte[] m_CompressedString;
private void btnCompressString_Click(object sender, EventArgs e)
{
     // Compress the string.
     long ticks = DateTime.Now.Ticks;
    m_CompressedString = CompressString(textBox1.Text);
     // Tell the user how long it took.
    int ms = (int)((DateTime.Now.Ticks - ticks) / TimeSpan.TicksPerMillisecond);
    int lenBefore = textBox1.Text.Length * 2;
    int lenAfter = m_CompressedString.Length;
    string msg = string .Format("Compressed from {0} bytes to " + "{1} bytes in {2}
milliseconds.", lenBefore, lenAfter, ms);
    MessageBox.Show(msg, "Compressed", MessageBoxButtons.OK,
MessageBoxIcon.Information);
```

```
     // We can now expand it.
    btnExpandString.Enabled = true;
}
```

The first main line declares a member variable called **m_CompressedString** which will be used to hold the compressed data (encoded as a byte array). The second main line calls a utility function **CompressString** that compresses a given string into a byte array that can later be expanded to restore the original string. The remainder of the code is used to measure how long the compression process took and to show a dialog box with statistics.

(Note that the **lenBefore** variable is calculated as the length of the string times two. This is because .NET strings are Unicode, and each character actually takes up two bytes.)

Add the following code which implements the **CompressString** function:

To write code in Visual Basic

Visual Basic

```
Public Function CompressString(ByVal str As String) As Byte()
     ' Open the memory stream.
    Dim ms As MemoryStream = New MemoryStream()
      ' Attach a compressor stream to the memory stream.
    Dim sw As C1ZStreamWriter = New C1ZStreamWriter(ms)
      ' Write the data into the compressor stream.
    Dim writer As StreamWriter = New StreamWriter(sw)
    writer.Write(str)
      ' Flush any pending data.
    writer.Flush()
      ' Return the memory buffer.
    CompressString = ms.ToArray()
End Function
```

To write code in C#

C#

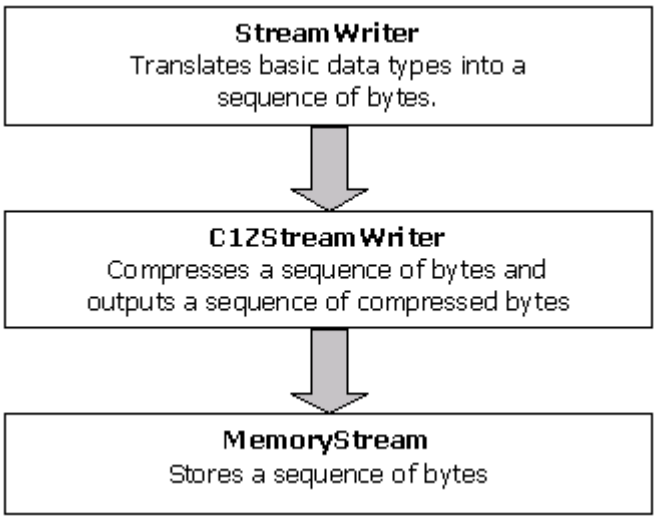
```
public byte[] CompressString(string str)
{
     // Open the memory stream.
    MemoryStream ms = new MemoryStream();
     // Attach a compressor stream to the memory stream.
    C1ZStreamWriter sw = new C1ZStreamWriter(ms);
     // Write the data into the compressor stream.
    StreamWriter writer = new StreamWriter(sw);
    writer.Write(str);
     // Flush any pending data.
    writer.Flush();
     // Return the memory buffer.
    return ms.ToArray();
}
```

The function starts by creating a new memory stream. This stream will automatically allocate a memory buffer to hold the compressed data.

Next, the function creates a C1ZStreamWriter object and attaches it to the new memory stream. Any data written to

the C1ZStreamWriter object will be compressed and written to the memory stream.

The C1ZStreamWriter object only supplies the basic Stream methods for writing bytes and byte arrays. To be able to write other basic types such as strings, integers, and so on, we attach a **StreamWriter** object to the C1ZStreamWriter. Here's a diagram that shows how this works:



After the **StreamWriter** is set up, all we need to do is call its **Write** method to write the string into the compressed memory stream. When done writing, we also call the **Flush** method to make sure all cached input is written out.

Finally, the code uses the **ToArray** method to return the byte array that was created by the memory stream.

Step 4: Add code to expand strings.

To expand the string, we need to follow the reverse sequence of steps used to compress. Double-click the **Decompress String** button, and add the following code to handle the **btnExpandString_Click** event:

To write code in Visual Basic

Visual Basic

```
Private Sub btnExpandString_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles btnExpandString.Click

    ' Expand the string.
    Dim ticks As Long = DateTime.Now.Ticks
    TextBox1.Text = ExpandString(m_CompressedString)

    ' Tell the user how long it took.
    Dim ms As Integer = (DateTime.Now.Ticks - ticks) / TimeSpan.TicksPerMillisecond
    Dim lenBefore As Integer = m_CompressedString.Length
    Dim lenAfter As Integer = TextBox1.Text.Length * 2
    Dim msg As String
    msg = String.Format("Expanded from {0} bytes to {1} bytes " & "in {2}
milliseconds.", lenBefore, lenAfter, ms)
    MessageBox.Show(msg, "Expanded", MessageBoxButtons.OK,
MessageBoxIcon.Information)
End Sub
```

To write code in C#

C#

```
private void btnExpandString_Click(object sender, EventArgs e)
{

    // Expand the string.
    long ticks = DateTime.Now.Ticks;
    textBox1.Text = ExpandString(m_CompressedString);

    // Tell the user how long it took.
    int ms = (int)((DateTime.Now.Ticks - ticks) / TimeSpan.TicksPerMillisecond);
    int lenBefore = m_CompressedString.Length;
    int lenAfter = textBox1.Text.Length * 2;
    string  msg;
    msg = string .Format("Expanded from {0} bytes to {1} bytes " + "in {2}
milliseconds.", lenBefore, lenAfter, ms);
    MessageBox.Show(msg, "Expanded", MessageBoxButtons.OK,
MessageBoxIcon.Information);
}
```

The main line calls the utility function **ExpandString** that takes a byte array and returns the original string. Add the following code for the **ExpandString** function:

To write code in Visual Basic

Visual Basic

```
Public Function ExpandString(ByVal buffer As Byte()) As String
     ' Turn buffer into a memory stream.
    Dim ms As MemoryStream = New MemoryStream(buffer)
     ' Attach a decompressor stream to the memory stream.
    Dim sr As C1ZStreamReader = New C1ZStreamReader(ms)
     ' Read uncompressed data.
    Dim reader As StreamReader = New StreamReader(sr)
    ExpandString = reader.ReadToEnd()
End Function
```

To write code in C#

C#

```
public string ExpandString(byte[] buffer)
{
     // Turn buffer into a memory stream.
    MemoryStream ms = new MemoryStream(buffer);
     // Attach a decompressor stream to the memory stream.
    C1ZStr
    // Read uncompressed data.
    StreamReader reader = new StreamReader(sr);
    return reader.ReadToEnd();
}
```

If you run the project now, you can already experiment with string compression and decompression. You can change the text in the text box, or paste new content into it, then compress and expand the string to see how much it compresses.

Step 5: Add code to compress binary data.

Compressing binary data is just as easy as compressing strings. The only difference is that instead of attaching a StreamWriter object to the compressor stream, you attach a BinaryWriter object.

Double-click the **Compress Data** button and add the following code to handle the **btnCompressData_Click** event:

To write code in Visual Basic

Visual Basic

```
Private m_CompressedData As Byte()
Private Sub btnCompressData_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles btnCompressData.Click
     ' Open the memory stream.
    Dim ms As MemoryStream = New MemoryStream()
     ' Attach a compressor stream to the memory stream.
    Dim sw As C1ZStreamWriter = New C1ZStreamWriter(ms)
     ' Attach a BinaryWriter to the compressor stream.
    Dim bw As BinaryWriter = New BinaryWriter(sw)
     ' Write a bunch of numbers into the stream.
    Dim i As Integer
    Dim count As Integer = 1000
    bw.Write(count)
    For i = 0 To count - 1
        Dim a As Double = i * Math.PI / 180.0
        bw.Write(i)
        bw.Write(a)
        bw.Write(Math.Sin(a))
        bw.Write(Math.Cos(a))
    Next i
     ' Flush any pending output.
    bw.Flush()
     ' Save the compressed data.
    m_CompressedData = ms.ToArray()
     ' Done.
    Dim msg As String
    msg =String.Format("Generated table with {0} points," & " saved into {1} bytes",
count, m_CompressedData.Length)
    Label1.Text = msg
     ' We can now expand it.
    btnExpandData.Enabled = True
End Sub
```

To write code in C#

C#

```
private void btnCompressData_Click(object sender, EventArgs e)
{
```

```
       // Open the memory stream.
    MemoryStream ms = new MemoryStream();
     // Attach a compressor stream to the memory stream.
    C1ZStreamWriter sw = new C1ZStreamWriter(ms);
      // Attach a BinaryWriter to the compressor stream.
    BinaryWriter bw = new BinaryWriter(sw);
      // Write a bunch of numbers into the stream.
    int i;
    int count = 1000;
    bw.Write(count);
    for (i = 0 ; i <= count - 1; i++)
    {
        double a = i * Math.PI / 180.0;
        bw.Write(i);
        bw.Write(a);
        bw.Write(Math.Sin(a));
        bw.Write(Math.Cos(a));
    }
      // Flush any pending output.
    bw.Flush();
      // Save the compressed data.
    m_CompressedData = ms.ToArray();
      // Done.
    string  msg;
    msg =string .Format("Generated table with {0} points," +
        " saved into {1} bytes", count, m_CompressedData.Length);
    label1.Text = msg;
      // We can now expand it.
    btnExpandData.Enabled = true;
}
```

The code starts by declaring a member variable called **m_CompressedData** which will be used to hold the compressed data (encoded as a byte array).

Then it sets up the **MemoryStream**, C1ZStreamWriter, and **BinaryWriter** objects as before (the only difference is we're now using a **BinaryWriter** instead of a **StreamWriter**).

Next, the code writes data into the stream using the **Write** method. The **BinaryWriter** object overloads this method so you can write all basic object types into streams. Finally, the **Flush** method is used as before, to make sure any cached data is written out to the compressed stream.

Step 6: Add code to expand the binary data.

Expanding the compressed binary data is just a matter of setting up the decompressor stream and reading the data like you would read it from a regular stream.

Add the following **Click** event handler code for the **Decompress Data** command button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnExpandData_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles btnExpandData.Click
     ' Open the memory stream on saved data.
```

```
    Dim ms As MemoryStream = New MemoryStream(m_CompressedData)
     ' Attach a decompressor stream to the memory stream.
    Dim sr As C1ZStreamReader = New C1ZStreamReader(ms)
     ' Read the uncompressed data.
    Dim i As Integer
    Dim br As BinaryReader = New BinaryReader(sr)
    Dim count As Integer = br.ReadInt32()
    For i = 0 To count - 1
        Dim deg As Integer = br.ReadInt32()
        Dim rad As Double = br.ReadDouble()
        Dim sin As Double = br.ReadDouble()
        Dim cos As Double = br.ReadDouble()
    Next i
     ' Done, tell the user about it.
    Dim msg As String
    msg = String.Format("Read table with {0} points " & "from stream with {1}
bytes.", count, m_CompressedData.Length)
    Label1.Text = msg
End Sub
```

To write code in C#

C#

```
private void btnExpandData_Click(object sender, EventArgs e)
{
     // Open the memory stream on saved data.
    MemoryStream ms = new MemoryStream(m_CompressedData);
     // Attach a decompressor stream to the memory stream.
    C1ZStreamReader sr = new C1ZStreamReader(ms);
     // Read the uncompressed data.
    int i;
    BinaryReader br = new BinaryReader(sr);
    int count = br.ReadInt32();
    for (i = 0 ; i <= count - 1; i++)
    {
        int deg = br.ReadInt32();
        double rad = br.ReadDouble();
        double sin = br.ReadDouble();
        double cos = br.ReadDouble();
    }
     // Done, tell the user about it.
    string  msg;
    msg = string .Format("Read table with {0} points " +
        "from stream with {1} bytes.", count, m_CompressedData.Length);
    label1.Text = msg;
}
```

The code reads the data but does not display it. You can step through it in debug mode to make sure the data being read is the same that was written in.

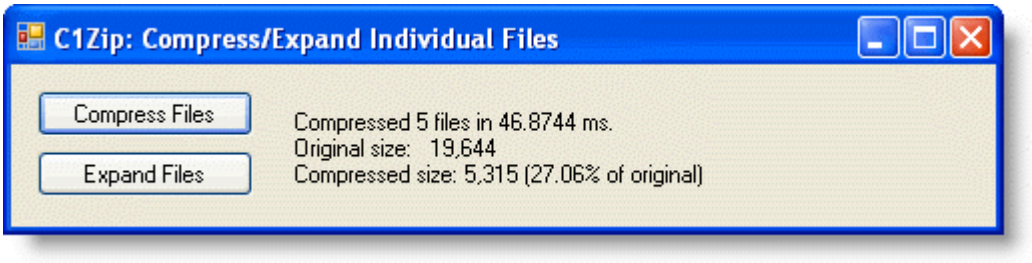
If you run the project and click the compress/decompress data buttons, you will see that the data is saved in an array with 14,125 bytes. To save this data in a regular stream, it would take [4 + 1000 * (4 + 8 * 3)] = 28,004 bytes. So we

compressed it to about half the original size.

This concludes the Compressing Data in Memory tutorial.

Compressing Files

This tutorial shows how you can compress and expand individual files. Note that these are not zip files; they are just compressed streams on disk. Zip files are covered in the Handling Zip Files tutorial. Here is what the final application will look like:



Step 1: Create the main form.

Start a new Visual Studio project and from the Toolbox, add the following controls to the form:

- Two **Button** controls along the left edge of the form, as shown in the picture above. In the Properties window make the following changes:

Button	Button.Text Property	Button.Name Property	Button.Enabled Property
1	Compress Files	**btnCompress**	True (Default)
2	Expand Files	**btnExpand**	**False**

  Note that the **Expand Files** button cannot be used until we have some compressed files to expand.

- A **Label** control on the right of the buttons. This control will display statistics about the compression/expanding process.

Step 2: Add a reference to the C1Zip assembly.

Go to the Solution Explorer window and click the **Show All Files** button. Right-click on **References**, and select the **Add Reference** menu option. Select the C1.C1Zip assembly from the list, or browse to find the C1.C1Zip.2.dll file.

Select the **Form1.vb** tab (**Form1.cs** in C#) or go to **View|Code** to open the Code Editor. At the top of the file, add the following statements:

To write code in Visual Basic

Visual Basic

```
Imports System.IO
Imports C1.C1Zip
```

To write code in C#

C#

```
using System.IO;
using C1.C1Zip;
```

This makes the objects defined in the **C1Zip** and **System.IO** assemblies visible to the project and saves a lot of typing.

Step 3: Define the directory names for the compressed and expanded files.

In the Code Editor of the form, define the following constants:

To write code in Visual Basic

Visual Basic

```
Private Const DIR_COMP = "\compressed"
Private Const DIR_EXP = "\expanded"
```

To write code in C#

C#

```
private const string DIR_COMP = @"\compressed";
private const string DIR_EXP = @"\expanded";
```

These are the directory names where the compressed and expanded files will be stored (relative to the directory where the tutorial application is located on your disk).

Step 4: Add code to compress files.

Add the following code to handle the **Click** event for the **Compress Files** command button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnCompress_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles btnCompress.Click
     ' Get the application directory.
    Dim appPath As String = Application.ExecutablePath
    Dim i As Integer = appPath.IndexOf("\bin\")
    If i > 0 Then appPath = appPath.Substring(0, i)
     ' Create a directory for compressed files.
    If (Directory.Exists(appPath + DIR_COMP)) Then
        Directory.Delete(appPath + DIR_COMP, True)
    End If
    Directory.CreateDirectory(appPath + DIR_COMP)
     ' Prepare to collect compression statistics.
    Dim count As Long
    Dim size As Long
    Dim sizeCompressed As Long
    Dim ticks As Long = DateTime.Now.Ticks
     ' Compress all files in the application dir into the compressed dir.
    Dim files As String() = Directory.GetFiles(appPath)
```

```
    Dim srcFile As String
    For Each srcFile In files
        Dim dstFile As String
        dstFile = appPath + DIR_COMP + "\" + Path.GetFileName(srcFile) + ".cmp"
         ' Compress file.
        CompressFile(dstFile, srcFile)
         ' Update stats.
        count = count + 1
        size = size + New FileInfo(srcFile).Length
        sizeCompressed = sizeCompressed + New FileInfo(dstFile).Length
    Next srcFile
     ' Show stats.
    Dim msg As String = String.Format("Compressed {0} files in {1} ms." & vbCrLf &
"Original size:   {2:#,###}" & vbCrLf & "Compressed size: {3:#,###} ({4:0.00}% of
original)", count, (DateTime.Now.Ticks - ticks) / TimeSpan.TicksPerMillisecond, size,
sizeCompressed, (sizeCompressed / size) * 100.0)
    Label1.Text = msg
     ' Now we can expand.
    btnExpand.Enabled = True
End Sub
```

To write code in C#

C#

```
private void btnCompress_Click(object sender, EventArgs e)
{
     // Get the application directory.
    string appPath = Application.ExecutablePath;
    int i = appPath.IndexOf(@"\bin\");
    if (i > 0) appPath = appPath.Substring(0, i);
       // Create a directory for compressed files.
    if ((Directory.Exists(appPath + DIR_COMP)))
        Directory.Delete(appPath + DIR_COMP, true);
    Directory.CreateDirectory(appPath + DIR_COMP);
       // Prepare to collect compression statistics.
    long count = 0;
    long size = 0;
    long sizeCompressed = 0;
    long ticks = DateTime.Now.Ticks;
       // Compress all files in the application dir into the compressed dir.
    foreach (string srcFile in Directory.GetFiles(appPath))
    {
        string dstFile = appPath + DIR_COMP + @"\" + Path.GetFileName(srcFile) +
".cmp";
           // Compress file.
        CompressFile(dstFile, srcFile);
           // Update stats.
        count++;
        size += new FileInfo(srcFile).Length;
        sizeCompressed += new FileInfo(dstFile).Length;
    }
```

```
       // Show stats.
    string  msg = string .Format("Compressed {0} files in {1} ms.\n\r" + "Original
size:   {2:#,###}\n\r" + "Compressed size: {3:#,###} ({4:0.00}% of original)", count,
(DateTime.Now.Ticks - ticks) / TimeSpan.TicksPerMillisecond, size, sizeCompressed,
(sizeCompressed / size) * 100.0);
    label1.Text = msg;
       // Now we can expand.
    btnExpand.Enabled = true;
}
```

The main line calls the utility function **CompressFile** utility method to compress each selected file. The compressed files are stored in the **\compressed** directory under the application folder. They have the same name as the original file, plus a CMP extension.

Add the following code for the **CompressFile** function:

To write code in Visual Basic

Visual Basic

```
Private Function CompressFile( dstFile As String, srcFile As String) As Boolean
     ' Prepare to compress file.
    Dim retval As Boolean = True
    Dim srcStream As FileStream = Nothing
    Dim dstStream As FileStream = Nothing
    Try
         ' Open the files.
        srcStream = New FileStream(srcFile, FileMode.Open, FileAccess.Read)
        dstStream = New FileStream(dstFile, FileMode.Create, FileAccess.Write)
         ' Open a compressor stream on the destination file.
        Dim sw As C1ZStreamWriter = New C1ZStreamWriter(dstStream)
         ' Copy the source into the compressor stream.
        StreamCopy(sw, srcStream)
    Catch
         ' Exception? Tell the caller we failed.
        retval = False
     Finally
         ' Always close our streams.
        If Not (srcStream Is Nothing) Then srcStream.Close()
        If Not (dstStream Is Nothing) Then dstStream.Close()
    End Try
     ' Done.
    CompressFile = False
End Function
```

To write code in C#

C#

```
private bool CompressFile(string  dstFile, string  srcFile)
{
     // Prepare to compress file.
    bool retval = true;
    FileStream srcStream = null;
```

```
    FileStream dstStream = null;
    try
    {
         // Open the files.
        srcStream = new FileStream(srcFile, FileMode.Open, FileAccess.Read);
        dstStream = new FileStream(dstFile, FileMode.Create, FileAccess.Write);
         // Open a compressor stream on the destination file.
        C1ZStreamWriter sw = new C1ZStreamWriter(dstStream);
         // Copy the source into the compressor stream.
        StreamCopy(sw, srcStream);
    }
    catch
    {
         // Exception? Tell the caller we failed.
        retval = false;
    }
    finally
    {
         // Always close our streams.
        if (srcStream != null) srcStream.Close();
        if (dstStream != null) dstStream.Close();
    }
     // Done.
    return false;
}
```

The function starts by creating two new file streams: one for the source file and one for the compressed file. Then it creates a C1ZStreamWriter object and attaches it to the destination stream. Next, it calls the **StreamCopy** function to transfer data from the source file and write it into the compressor stream.

Finally, the function closes both streams. Note the use of the **Finally** statement to ensure that both streams are properly closed even if there are exceptions while the function is executing.

The **StreamCopy** function simply copies bytes from one stream to another. Here's the code:

To write code in Visual Basic

Visual Basic

```
Private Sub StreamCopy(dstStream As Stream, srcStream As Stream)
    Dim buffer(32768) As Byte
    Dim read As Integer
    Do
        read = srcStream.Read(buffer, 0, buffer.Length)
        dstStream.Write(buffer, 0, read)
    Loop While read > 0
    dstStream.Flush()
End Sub
```

To write code in C#

C#

```
private void StreamCopy(Stream dstStream, Stream srcStream)
{
```

```
    byte[] buffer= new byte[32768];
    for (;;)
    {
        int read = srcStream.Read(buffer, 0, buffer.Length);
        if (read == 0) break;
        dstStream.Write(buffer, 0, read);
    }
    dstStream.Flush();
}
```

Note that the function calls the **Flush** method after it is done to ensure that any cached data is written out when the function is done copying. This is especially important when dealing with compressed streams, since they cache substantial amounts of data in order to achieve good compression rates.

Step 5: Add code to expand files.

Add the following code to handle the **Click** event for the **Expand Files** command button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnExpand_Click(sender As Object, e As EventArgs) Handles btnExpand.Click
     ' Get the application directory.
    Dim appPath As String = Application.ExecutablePath
    Dim i As Integer      = appPath.IndexOf("\bin\")
    If i > 0 Then appPath = appPath.Substring(0, i)
     ' Create a directory for expanded files.
    If Directory.Exists(appPath + DIR_EXP) Then
        Directory.Delete(appPath + DIR_EXP, True)
    End If
    Directory.CreateDirectory(appPath + DIR_EXP)
     ' Prepare to collect compression statistics.
    Dim count As Long
    Dim size As Long
    Dim sizeExpanded As Long
    Dim ticks As Long = DateTime.Now.Ticks
     ' Expand all files in the "compressed" dir to the "expanded" dir.
    Dim srcFile As String
    Dim files As String()
    files = Directory.GetFiles(appPath + DIR_COMP)
    For Each srcFile In files
         ' Expand file.
        Dim dstFile As String = appPath + DIR_EXP + "\" + Path.GetFileName(srcFile)
        dstFile = dstFile.Replace(".cmp", "")
        ExpandFile(dstFile, srcFile)
         ' Update stats.
        count = count + 1
        size = size + New FileInfo(srcFile).Length
        sizeExpanded = sizeExpanded + New FileInfo(dstFile).Length
    Next srcFile
     ' Show stats.
```

```
    Dim msg As String
    msg = String.Format("Expanded {0} files in {1} ms." & vbCrLf & "Original size:
{2:#,###}" & vbCrLf & "Expanded size: {3:#,###} ({4:0.00} x size of compressed)",
count, (DateTime.Now.Ticks - ticks) / TimeSpan.TicksPerMillisecond, size,
sizeExpanded, sizeExpanded / size)
    Label1.Text = msg
End Sub
```

To write code in C#

C#

```
private void btnExpand_Click(object sender, EventArgs e)
{
     // Get the application directory.
    string appPath = Application.ExecutablePath;
    int i = appPath.IndexOf(@"\bin\");
    if (i > 0) appPath = appPath.Substring(0, i);
     // Create a directory for expanded files.
    if (Directory.Exists(appPath + DIR_EXP))
        Directory.Delete(appPath + DIR_EXP, true);
    Directory.CreateDirectory(appPath + DIR_EXP);
     // Prepare to collect compression statistics.
    long count = 0;
    long size = 0;
    long sizeExpanded = 0;
    long ticks = DateTime.Now.Ticks;
     // Expand all files in the "compressed" dir to the "expanded" dir.
    foreach (string srcFile in Directory.GetFiles(appPath + DIR_COMP))
    {
         // Expand file.
        string  dstFile = appPath + DIR_EXP + @"\" + Path.GetFileName(srcFile);
        dstFile = dstFile.Replace(".cmp", "");
        ExpandFile(dstFile, srcFile);
         // Update stats.
        count++;
        size += new FileInfo(srcFile).Length;
        sizeExpanded += new FileInfo(dstFile).Length;
    }
     // Show stats.
    string msg = string .Format("Expanded {0} files in {1} ms.\r\n" + "Original size:
{2:#,###}\r\n" + "Expanded size: {3:#,###} ({4:0.00} x size of compressed)", count,
(DateTime.Now.Ticks - ticks) / TimeSpan.TicksPerMillisecond, size, sizeExpanded,
sizeExpanded / size);
    label1.Text = msg;
}
```

The main line calls the utility function **ExpandFile** utility method to expand the files that were compressed earlier. The expanded files are stored in the **\expanded** directory under the application folder. They have the same name as the original file, minus the CMP extension.

Here's the code for the **ExpandFile** function:

To write code in Visual Basic

Visual Basic

```
Private Function ExpandFile(dstFile As String, srcFile As String) As Boolean
     ' Prepare to expand file.
    Dim retval As Boolean = True
    Dim srcStream As FileStream = Nothing
    Dim dstStream As FileStream = Nothing
    Try
         ' Open the files.
        srcStream = New FileStream(srcFile, FileMode.Open, FileAccess.Read)
        dstStream = New FileStream(dstFile, FileMode.Create, FileAccess.Write)
         ' Open an expander stream on the compressed source.
        Dim sr As C1ZstreamReader = New C1ZStreamReader(srcStream)
         ' Copy the expander stream into the destination file.
        StreamCopy(dstStream, sr)
    Catch
         ' Exception? Tell the caller we failed.
        retval = False
    Finally
         ' Always close our streams.
        If Not (srcStream Is Nothing) Then srcStream.Close()
        If Not (dstStream Is Nothing) Then dstStream.Close()
    End Try
   ' Done.
  ExpandFile = retval
End Sub
```

To write code in C#

C#

```
private bool ExpandFile(string dstFile, string srcFile)
{
     // Prepare to expand file.
    bool retval = true;
    FileStream srcStream = null;
    FileStream dstStream = null;
    try
    {
        // Open the files.
        srcStream = new FileStream(srcFile, FileMode.Open, FileAccess.Read);
        dstStream = new FileStream(dstFile, FileMode.Create, FileAccess.Write);
         // Open an expander stream on the compressed source.
        C1ZStreamReader sr = new C1ZStreamReader(srcStream);
         // Copy the expander stream into the destination file.
        StreamCopy(dstStream, sr);
    }
    catch
    {
         // Exception? Tell the caller we failed.
        retval = false;
```

```
    }
    finally
    {
         // Always close our streams.
        if (srcStream != null) srcStream.Close();
        if (dstStream != null) dstStream.Close();
    }
     // Done.
    return retval;
}
```

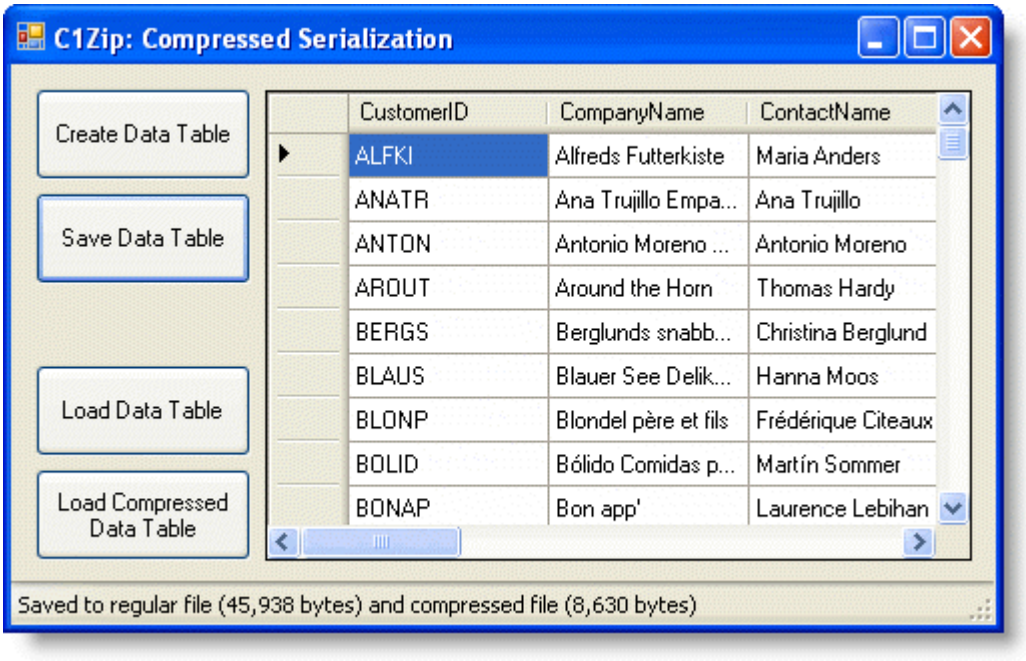
The function is similar to **CompressFile**, except it attaches a C1ZStreamReader to the source stream instead of attaching a C1ZStreamWriter to the destination stream.

This concludes the Compressing Files tutorial.

Compressed Serialization

This tutorial shows how you can serialize objects in compressed files, and then load them back into the memory.

The sample creates a data table using the NorthWind database. The table is saved (serialized) into regular and compressed streams. Finally, the data is loaded back from either stream. Here is what the final application will look like:



Step 1: Create the main form.

Start a new Visual Studio project and from the Toolbox, add the following controls to the form:

- Four **Button** controls along the left edge of the form, as shown in the picture above. In the Properties window make the following changes to each **Button** control:

Button	Button.Text Property	Button.Name Property	Button.Enabled Property

1	Create Data Table	**btnCreate**	True (Default)
2	Save Data Table	**btnSave**	**False**
3	Load Data Table	**btnLoad**	**False**
4	Load Compressed Data Table	**btnLoadCompressed**	**False**

- Note that the save and load buttons cannot be used until the data table has been created or saved.
- A **DataGridView** control on the right of the form.
- A **ToolStripStatusLabel** control docked at the bottom of the form. To add this control, first add a **StatusStrip** control to the form. Then click the **Add ToolStripStatusLabel** drop-down arrow and select **StatusLabel**. A **ToolStripStatusLabel** control appears and is docked at the bottom of the form.

Step 2: Add references and Imports statements.

Go to the Solution Explorer window and click the **Show All Files** button. Right-click on References, and select the **Add Reference** menu option. Select the C1.C1Zip assembly from the list, or browse to find the C1.C1Zip.2.dll file.

Select the **Form1.vb** tab (**Form1.cs** in C#) or go to **View|Code** to open the Code Editor. At the top of the file, add the following statements:

To write code in Visual Basic

Visual Basic

```
Imports System.IO
Imports System.Data.OleDb
Imports System.Runtime.Serialization.Formatters.Binary
Imports C1.C1Zip
```

To write code in C#

C#

```
using System.IO;
using System.Data.OleDb;
using System.Runtime.Serialization.Formatters.Binary;
using C1.C1Zip;
```

This declares the namespaces of the classes used in the project.

Step 3: Declare constants.

In the Code Editor of the form, type or copy the following lines in the body of the form implementation:

To write code in Visual Basic

Visual Basic

```
Private Const FN_REGULAR = "\DataTable.regular"
Private Const FN_COMPRESSED = "\DataTable.compressed"
Private Const MDBFILE = " C:\Users\\Documents\ComponentOne
Samples\common\C1NWIND.MDB"
```

To write code in C#

C#

```
private const string FN_REGULAR = @"\DataTable.regular";
private const string FN_COMPRESSED = @"\DataTable.compressed";
private const string MDBFILE = @"C C:\Users\\Documents\ComponentOne
Samples\common\C1NWIND.MDB";
```

These constants define the name of the database used to populate the data table and the file names used to serialize the data.

Step 4: Add code to create the data table.

Add the following code to handle the **Click** event for the **Create Data Table** button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnCreate_Click(sender As Object,e As EventArgs) Handles btnCreate.Click

    ' Open the table.
    Dim conn As String
    conn = "Provider=Microsoft.Jet.OLEDB.4.0;Data Source=" & MDBFILE & ";"
    Dim rs As String = "select * from customers"
     ' Show status.
    Cursor = Cursors.WaitCursor
    ToolStripStatusLabel1.Text = "Loading data from mdb file..."
     ' Load data.
    Dim da As OleDbDataAdapter = New OleDbDataAdapter(rs, conn)
    Dim ds As DataSet = New DataSet()
    Try
        da.Fill(ds)
    Catch
        MessageBox.Show("Could not load data from " + MDBFILE)
    End Try
     ' Show status.
    Cursor = Cursors.Default
    ToolStripStatusLabel1.Text = "Loaded " & ds.Tables(0).Rows.Count & " records from
mdb file."
     ' Bind to the grid.
    DataGridView1.DataSource = ds.Tables(0)
     ' Enable the save button.
    btnSave.Enabled = True
End Sub
```

To write code in C#

C#

```
private void btnCreate_Click(object sender,EventArgs e)
{
     // Open the table.
    string conn =  "Provider=Microsoft.Jet.OLEDB.4.0;Data Source=" + MDBFILE + ";";
    string rs = "select * from customers";
```

```
     // Show status.
    Cursor = Cursors.WaitCursor;
    toolStripStatusLabel1.Text = "Loading data from mdb file...";
     // Load data.
    OleDbDataAdapter da = new OleDbDataAdapter(rs, conn);
    DataSet ds = new DataSet();
    try
    {
        da.Fill(ds);
    }
    catch
    {
        MessageBox.Show("Could not load data from " + MDBFILE);
    }
     // Show status.
    Cursor = Cursors.Default;
    toolStripStatusLabel1.Text = "Loaded " + ds.Tables[0].Rows.Count +  " records
from mdb file.";
     // Bind to the grid.
    dataGridView1.DataSource = ds.Tables[0];
     // Enable the save button.
    btnSave.Enabled = true;
}
```

The function uses standard ADO.NET objects and methods to create and populate a **DataTable** object, which is then bound to the **DataGrid** control.

Step 5: Add code to save the data table.

Add the following code to handle the **Click** event for the **Save Data Table** button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnSave_Click(sender As Object, e As EventArgs) Handles btnSave.Click
     ' Get the data table from the grid.
    Dim dt As DataTable = DataGridView1.DataSource
     ' Show status.
    Cursor = Cursors.WaitCursor
    ToolStripStatusLabel1.Text = "Serializing data to regular file..."
     ' Serialize the data set to a regular file.
    Dim fn As String = Application.StartupPath + FN_REGULAR
    Dim fs As FileStream = New FileStream(fn, FileMode.Create)
    Dim bf As BinaryFormatter = New BinaryFormatter()
    bf.Serialize(fs, dt)
    Dim lenRegular As Long = fs.Length
    fs.Close()
     ' Show status.
    Cursor = Cursors.WaitCursor
    ToolStripStatusLabel1.Text = "Serializing data to compressed file..."
     ' Serialize the data set to a compressed file.
```

```
    fn = Application.StartupPath & FN_COMPRESSED
    fs = New FileStream(fn, FileMode.Create)
    Dim compressor As C1ZStreamWriter = New C1ZStreamWriter(fs)
    bf = New BinaryFormatter()
    bf.Serialize(compressor, dt)
    Dim lenCompressed As Long = fs.Length
    fs.Close()
     ' Show status.
    Cursor = Cursors.Default
    ToolStripStatusLabel1.Text = string.Format( "Saved to regular file ({0:#,###}
bytes) and " & "compressed file ({1:#,###} bytes)", lenRegular, lenCompressed)
     ' Enable the load buttons.
    btnLoad.Enabled = True
    btnLoadCompressed.Enabled = True
End Sub
```

To write code in C#

C#

```
private void btnSave_Click(object sender, EventArgs e)
{
     // Get the data table from the grid.
     DataTable dt = (DataTable)dataGridView1.DataSource;
     // Show status.
    Cursor = Cursors.WaitCursor;
    toolStripStatusLabel1.Text = "Serializing data to regular file...";
     // Serialize the data set to a regular file.
    string fn = Application.StartupPath + FN_REGULAR;
    FileStream fs = new FileStream(fn, FileMode.Create);
    BinaryFormatter bf = new BinaryFormatter();
    bf.Serialize(fs, dt);
    long lenRegular = fs.Length;
    fs.Close();
     // Show status.
    Cursor = Cursors.WaitCursor;
    toolStripStatusLabel1.Text = "Serializing data to compressed file...";
     // Serialize the data set to a compressed file.
    fn = Application.StartupPath + FN_COMPRESSED;
    fs = new FileStream(fn, FileMode.Create);
    C1ZStreamWriter compressor = new C1ZStreamWriter(fs);
    bf = new BinaryFormatter();
    bf.Serialize(compressor, dt);
    long lenCompressed = fs.Length;
    fs.Close();
     // Show status.
    Cursor = Cursors.Default;
    toolStripStatusLabel1.Text = string.Format("Saved to regular file ({0:#,###}
bytes) and " + "compressed file ({1:#,###} bytes)", lenRegular, lenCompressed);
     // Enable the load buttons.
    btnLoad.Enabled = true;
    btnLoadCompressed.Enabled = true;
```

```
}
```

The first set of code serializes the **DataTable** into a regular file, and the second serializes the **DataTable** into a compressed file. Note that only one additional line is required to compress the data.

In both cases, the serialization is executed by the **BinaryFormatter** object. The only difference is that in the first case, the **Serialize** method is called with a regular file stream as a parameter; in the second, a C1ZStreamWriter is used instead.

Step 6: Add code to load the data table from the regular file.

Add the following code to handle the **Click** event for the **Load Data Table** button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnLoad_Click(sender As Object, e As EventArgs) Handles btnLoad.Click
     ' Clear grid, show status.
    Cursor = Cursors.WaitCursor
    DataGridView1.DataSource = Nothing
    ToolStripStatusLabel1.Text = "Loading from regular file..."
     ' Deserialize from regular file.
    Dim fn As String = Application.StartupPath & FN_REGULAR
    Dim fs As FileStream = New FileStream(fn, FileMode.Open)
    Dim ticks As Long = DateTime.Now.Ticks
    Dim bf As BinaryFormatter = New BinaryFormatter()
    Dim dt As DataTable = bf.Deserialize(fs)
    Dim ms As Long = (DateTime.Now.Ticks - ticks) / TimeSpan.TicksPerMillisecond
    fs.Close()
     ' Show result.
    Cursor = Cursors.Default
    DataGridView1.DataSource = dt
    ToolStripStatusLabel1.Text = "Loaded from regular file in " & ms.ToString() & "
ms."
End Sub
```

To write code in C#

C#

```
private void btnLoad_Click(object sender, EventArgs e)
{
     // Clear grid, show status.
    Cursor = Cursors.WaitCursor;
    dataGridView1.DataSource = null;
    toolStripStatusLabel1.Text = "Loading from regular file...";
     // Deserialize from regular file.
    string fn = Application.StartupPath + FN_REGULAR;
    FileStream fs = new FileStream(fn, FileMode.Open);
    long ticks = DateTime.Now.Ticks;
    BinaryFormatter bf = new BinaryFormatter();
    DataTable dt = (DataTable)bf.Deserialize(fs);
    long ms = (DateTime.Now.Ticks - ticks) / TimeSpan.TicksPerMillisecond;
```

```
    fs.Close();
     // Show result.
    Cursor = Cursors.Default;
    dataGridView1.DataSource = dt;
    toolStripStatusLabel1.Text = "Loaded from regular file in " + ms.ToString() + "
ms.";
}
```

The first main line of code creates a new **BinaryFormatter** object and the second one calls its **Deserialize** method. The **Deserialize** method takes a single parameter: the stream in which the object is defined. In this case, the stream is a regular file stream.

Step 7: Add code to load the data table from the compressed file.

Add the following code to handle the **Click** event for the **Load Compressed Data Table** button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnLoadCompressed_Click(sender As Object, e As EventArgs) Handles
btnLoadCompressed.Click
     ' Clear grid, show status.
    Cursor = Cursors.WaitCursor
    DataGridView1.DataSource = Nothing
    ToolStripStatusLabel1.Text = "Loading from compressed file..."
     ' Deserialize from compressed file.
    Dim fn As String = Application.StartupPath + FN_COMPRESSED
    Dim fs As FileStream = New FileStream(fn, FileMode.Open)
    Dim ticks As Long   = DateTime.Now.Ticks
    Dim decompressor As C1ZstreamReader
    decompressor = New C1ZStreamReader(fs)
    Dim bf As BinaryFormatter = New BinaryFormatter()
    Dim dt As DataTable = bf.Deserialize(decompressor)
    Dim ms As Long = (DateTime.Now.Ticks - ticks) / TimeSpan.TicksPerMillisecond
    fs.Close()
     ' Show result.
    Cursor = Cursors.Default
    DataGridView1.DataSource = dt
    ToolStripStatusLabel1.Text = "Loaded from compressed file in " & ms.ToString() &
" ms."
End Sub
```

To write code in C#

C#

```
private void btnLoadCompressed_Click(object sender, EventArgs e)
{
     // Clear grid, show status.
    Cursor = Cursors.WaitCursor;
    dataGridView1.DataSource = null;
    toolStripStatusLabel1.Text = "Loading from compressed file...";
```

```
    // Deserialize from compressed file.
    string fn = Application.StartupPath + FN_COMPRESSED;
    FileStream fs = new FileStream(fn, FileMode.Open);
    long ticks = DateTime.Now.Ticks;
    C1ZStreamReader decompressor;
    decompressor = new C1ZStreamReader(fs);
    BinaryFormatter bf = new BinaryFormatter();
    DataTable dt = (DataTable)bf.Deserialize(decompressor);
    long ms = (DateTime.Now.Ticks - ticks) / TimeSpan.TicksPerMillisecond;
    fs.Close();
    // Show result.
    Cursor = Cursors.Default;
    dataGridView1.DataSource = dt;
    toolStripStatusLabel1.Text = "Loaded from compressed file in " + ms.ToString() +
" ms.";
}
```

The main lines are similar to the code used to deserialize data from a regular file. The only difference is that instead of passing a regular file stream to the **Deserialize** method, we now use a C1ZStreamReader object.

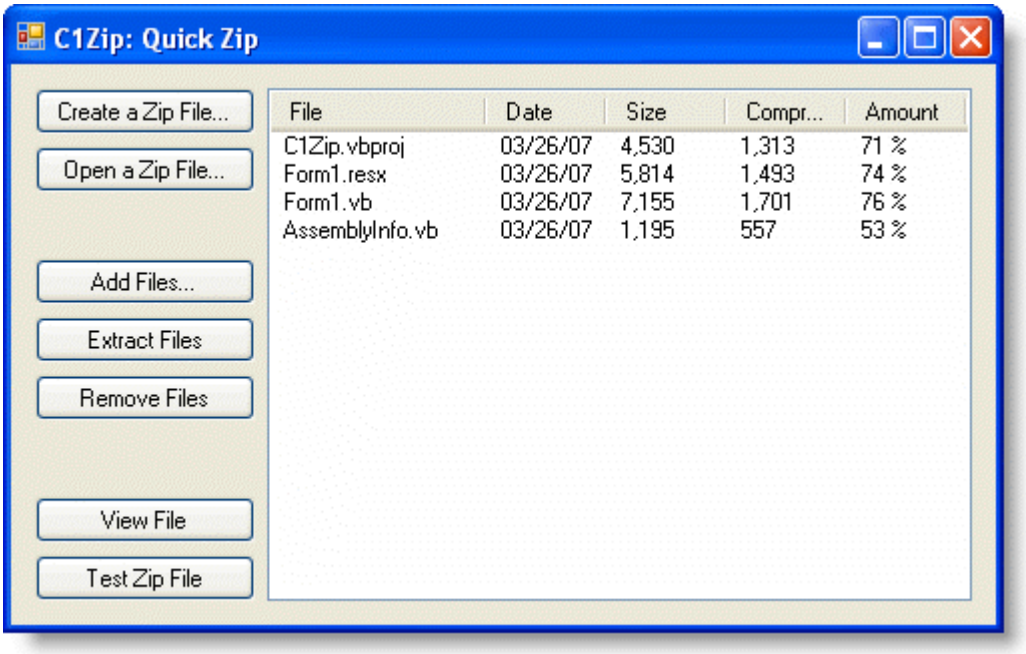
This concludes the Compressed Serialization tutorial.

Handling Zip Files

This tutorial shows how you can handle zip files, including the following operations:

- Creating a zip file.
- Opening an existing zip file.
- Adding entries to the zip file.
- Extracting entries from the zip file.
- Removing entries from the zip file.
- Expanding entries into memory streams.
- Testing the integrity of a zip file.

Here is what the final application will look like:



Note: This is a very simple application, designed to highlight the main functionality of the C1ZipFile object. The distribution disk also includes a more sophisticated version, which supports more advanced features such as drag and drop, zipping folders, setting the compression level, and so on.

Step 1: Create the main form.

Start a new Visual Studio project.

1. From the Toolbox, add the following controls to the form:
   - Seven **Button** controls along the left edge of the form, as shown in the picture above. In the Properties window make the following changes to each **Button** control:

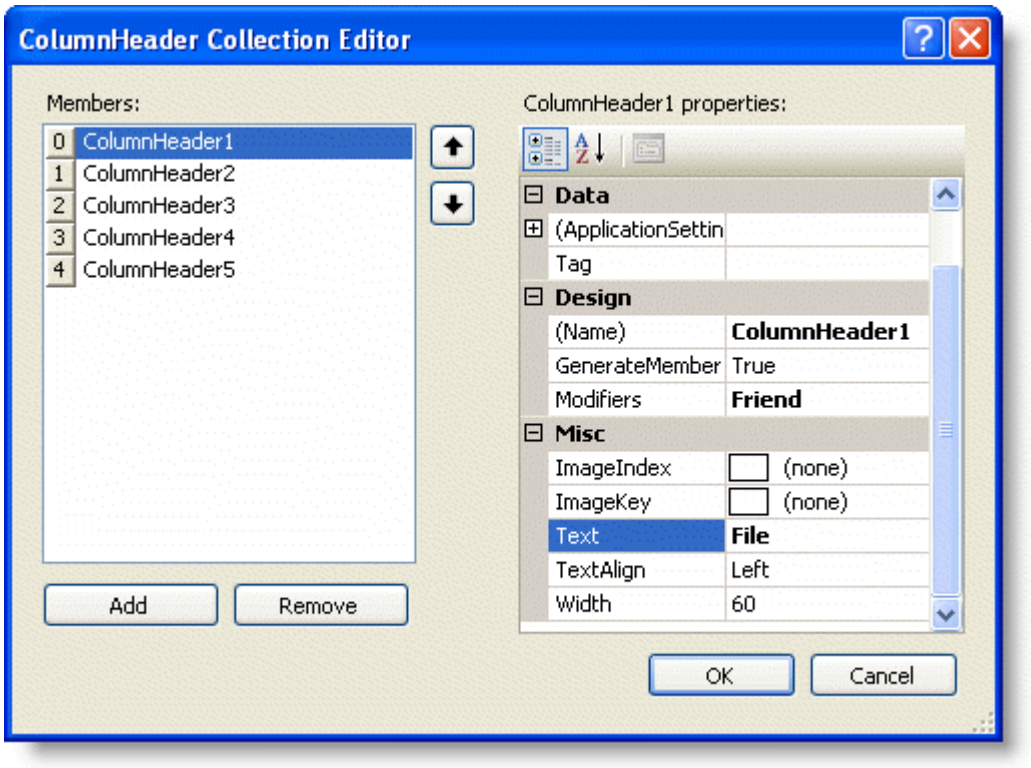
Button	Button.Text Property	Button.Name Property
1	Create Zip File...	**btnNew**
2	Open Zip File...	**btnOpen**
3	Add Files...	**btnAdd**
4	Extract Files	**btnExtract**
5	Remove Files	**btnRemove**
6	View File	**btnView**
7	Test Zip File	**btnTest**

   - A **ListView** control covering the right part of the form. In the Properties window, click on the **ellipsis** button next to the **Columns** property. The **ColumnHeader Collection Editor** dialog box appears.

     Note: The **Column Header Collection Editor** can also be accessed by clicking **Edit Columns** in the **ListView Tasks** menu. To access the **ListView Tasks** menu, click the smart tag (▶) in the upper right corner of the **ListView** control.

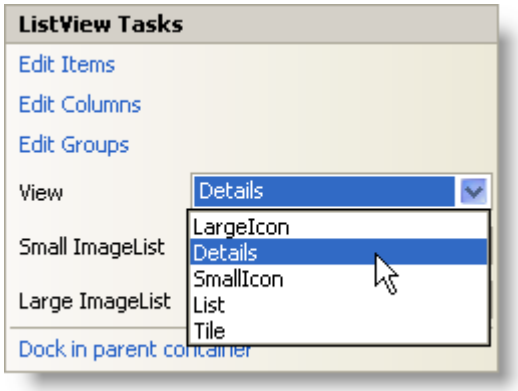
2. Click the **Add** button to add five ColumnHeaders, and then set the **Text** property of each column to **File**, **Date**, **Size**, **Compressed**, and **Amount**, respectively.

   Here is what the **ColumnHeader Collection Editor** should look like:



3. Select **OK** to close the editor box.

   Note that to view the column headers, in the Properties window set the **View** property to **Details** or in the **ListView Tasks** menu, select **Details** from the **View** drop-down box.



Step 2: Add a reference to the C1Zip assembly.

Go to the Solution Explorer window, right-click on References, and select the **Add Reference** menu option. Select the C1.C1Zip assembly from the list, or browse to find the C1.C1Zip.2.dll file.

Select the **Form1.vb** tab (**Form1.cs** in C#) or go to **View|Code** to open the Code Editor. At the top of the file, add the following directives:

To write code in Visual Basic

Visual Basic
`Imports System.IO`

```
Imports C1.C1Zip
```

To write code in C#

```
C#
using System.IO;
using C1.C1Zip;
```

This makes the objects defined in the C1Zip and System.IO assemblies visible to the project.

Step 3: Declare a C1ZipFile object.

Switch to the Code Editor and type (or copy) the following data member declaration:

To write code in Visual Basic

```
Visual Basic
Private m_Zip As C1ZipFile
```

To write code in C#

```
C#
private m_Zip As C1ZipFile;
```

This is the main object in this application. It implements the methods used to handle zip files.

Step 4: Add code to initialize the C1ZipFile object.

Add the following code to the **Form_Load** event:

To write code in Visual Basic

```
Visual Basic
Private Sub Form1_Load(sender As Object, e As EventArgs) Handles MyBase.Load
      ' Create the C1ZipFile member.
    m_Zip = New C1ZipFile()
End Sub
```

To write code in C#

```
C#
private void Form1_Load(object sender, EventArgs e)
{
  // Create the C1ZipFile member.
    m_Zip = new C1ZipFile();
}
```

This code creates a new C1ZipFile object and assigns it to the **m_Zip** member. Note that the C1ZipFile object cannot be used yet. It needs to be attached to an existing zip file first using the Open method (or to a new one using the Create method).

Step 5: Add code to create a zip file.

Add the following code to handle the **Click** event for the **Create Zip File** command button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnNew_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
Handles btnNew.Click
     ' Show open file dialog.
    Dim fo As SaveFileDialog = New SaveFileDialog()
    fo.FileName = "*.zip"
    If fo.ShowDialog() <> Windows.Forms.DialogResult.OK Then
        Exit Sub
    End If
     ' Open zip file.
    Try
        m_Zip.Create(fo.FileName)
    Catch
        MessageBox.Show("Can't create ZIP file, please try again.", "C1Zip")
    End Try
     ' Update display.
    UpdateDisplay()
End Sub
```

To write code in C#

C#

```
private void btnNew_Click(object sender, EventArgs e)
{
    // Show open file dialog.
    SaveFileDialog fo = new SaveFileDialog();
    fo.FileName = "*.zip";
    if (fo.ShowDialog() != DialogResult.OK ) return;
     // Open zip file.
    try
    {
        m_Zip.Create(fo.FileName);
    }
    catch
    {
        MessageBox.Show("Can't create ZIP file, please try again.", "C1Zip");
    }
     // Update display.
    UpdateDisplay();
}
```

Step 6: Add code to open a zip file.

Add the following code to handle the **Click** event for the **Open Zip File** command button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnOpen_Click(sender As Object, e As EventArgs) Handles btnOpen.Click
     ' Show open file dialog.
    Dim fo As OpenFileDialog = New OpenFileDialog()
    fo.FileName = "*.zip"
    If fo.ShowDialog() <> Windows.Forms.DialogResult.OK Then Exit Sub
    Try
        m_Zip.Open(fo.FileName)
    Catch
        MessageBox.Show("Invalid ZIP file, please try again.")
    End Try
      ' Update display.
    UpdateDisplay()
End Sub
```

To write code in C#

C#

```
private void btnOpen_Click(object sender, EventArgs e)
{
     // Show open file dialog.
    OpenFileDialog fo = new OpenFileDialog();
    fo.FileName = "*.zip";
    if (fo.ShowDialog() != DialogResult.OK ) return;
    try
    {
        m_Zip.Open(fo.FileName);
    }
    catch
    {
        MessageBox.Show("Invalid ZIP file, please try again.");
    }
     // Update display.
    UpdateDisplay();
}
```

The main line calls the Open method on the C1ZipFile object to attach the object to an existing zip file. Note the use of a **Try/Catch** statement, mainly to handle situations where the use selects a file that is not a zip file.

After opening the file, the code calls the **UpdateDisplay** utility function to display the contents of the zip file.

Step 7: Add code to update the display.

Next, add the **UpdateDisplay** utility function to display the contents of the zip file:

To write code in Visual Basic

Visual Basic

```
Private Sub UpdateDisplay()
```

```
     ' Update the ListView control to show the zip file contents.
    With ListView1
         ' Remove any existing items.
        .Items.Clear()
         ' Add each entry.
        Dim ze As C1ZipEntry
        For Each ze In m_Zip.Entries
             ' Calculate the compression amount.
            Dim pct As Double = 0
            If ze.SizeUncompressed > 0 Then
                pct = 1 - ze.SizeCompressed / ze.SizeUncompressed
            End If
             ' Build ListView item.
            Dim items(4) As String
            items(0) = ze.FileName
            items(1) = Format(ze.Date, "MM/dd/yy")
            items(2) = Format(ze.SizeUncompressed, "#,##0")
            items(3) = Format(ze.SizeCompressed, "#,##0")
            items(4) = Format(pct, "00 %")
            Dim lvi As ListViewItem = New ListViewItem(items)
             ' Save ZipEntry into item tag.
            lvi.Tag = ze
             ' Add item to ListView.
            .Items.Add(lvi)
        Next ze
         ' Update UI.
        Dim hasEntries As Boolean = (.Items.Count > 0)
        btnExtract.Enabled = hasEntries
        btnRemove.Enabled = hasEntries
        btnTest.Enabled = hasEntries
    End With
End Sub
```

To write code in C#

C#

```
private void UpdateDisplay()
{
     // Remove any existing items.
    listView1.Items.Clear();
     // Add each entry.
    foreach (C1ZipEntry ze in m_Zip.Entries)
    {
        // Calculate the compression amount.
        double pct = 0;
        if (ze.SizeUncompressed > 0)
        {
            pct = 1 - (((double)ze.SizeCompressed) / ((double)ze.SizeUncompressed));
        }
        // Build ListView item.
        ListViewItem lvi = new ListViewItem(new string[] { ze.FileName,
```

```
Microsoft.VisualBasic.Strings.Format(ze.Date, "MM/dd/yy"),
Microsoft.VisualBasic.Strings.Format(ze.SizeUncompressed, "#,##0"),
Microsoft.VisualBasic.Strings.Format(ze.SizeCompressed, "#,##0"),
Microsoft.VisualBasic.Strings.Format(pct, "00 %") });
        // Save ZipEntry into item tag.
        lvi.Tag = ze;
        // Add item to ListView.
        listView1.Items.Add(lvi);
    }
    // Update UI.
    bool hasEntries = (listView1.Items.Count > 0);
    btnExtract.Enabled = hasEntries;
    btnRemove.Enabled = hasEntries;
    btnTest.Enabled = hasEntries;
}
```

The main lines start by declaring a C1ZipEntry object and using it in a **ForEach** loop over the entries in the zip file (m_Zip.Entries).

For each entry, the function creates a **ListViewItem** containing the information extracted from the C1ZipEntry object and adds the new entry to the **ListView** control. Note that the C1ZipEntry object itself is also saved in the **Tag** property of the ListView items.

Finally, the code enables or disables the command buttons depending on whether or not there are entries available to be extracted, removed or tested.

Step 8: Add code to test the integrity the zip file.

Add the following code to handle the **Click** event for the **Test Zip File** command button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnTest_Click(sender As Object, e As EventArgs) Handles btnTest.Click
     ' Test each entry.
    Dim ze As C1ZipEntry
    For Each ze In m_Zip.Entries
        If Not ze.CheckCRC32() Then
            MessageBox.Show("** Entry " & ze.FileName & " has errors.", "C1Zip",
MessageBoxButtons.OK, MessageBoxIcon.Error)
            Exit Sub
        End If
    Next
     ' If we got here, everything is OK.
    MessageBox.Show("All entries passed CRC check", "C1Zip")
End Sub
```

To write code in C#

C#

```
private void btnTest_Click(object sender, EventArgs e)
{
     // Test each entry.
```

```
    foreach (C1ZipEntry ze in m_Zip.Entries)
    {
        if (!ze.CheckCRC32())
        {
            MessageBox.Show("** Entry " + ze.FileName + " has errors.", "C1Zip",
MessageBoxButtons.OK, MessageBoxIcon.Error);
            return;
        }
    }
     // If we got here, everything is OK.
    MessageBox.Show("All entries passed CRC check", "C1Zip");
}
```

The main lines declare a C1ZipEntry variable and use it to loop over the entries in the zip file. The routine then calls the CheckCRC32 method on each entry to check whether the actual checksum of the bytes stored in the file matches the checksum stored in the entry header. The function returns true if the values match and false if they don't (which indicates the entry is corrupted).

Step 9: Add code to view the contents of an entry.

Add the following code to handle the **Click** event for the **View File** command button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnView_Click(sender As Object, e As EventArgs) Handles btnView.Click
     ' Get the first selected item that is not a directory.
    Dim ze As C1ZipEntry = Nothing
    Dim lvi As ListViewItem
    For Each lvi In ListView1.SelectedItems
        Dim zeItem As C1ZipEntry = lvi.Tag
        If (zeItem.Attributes And FileAttributes.Directory) = 0 Then
            ze = zeItem
            Exit For
        End If
    Next lvi
     ' Make sure we got something.
    If ze Is Nothing Then
        MessageBox.Show("Sorry, no files to show...", "C1Zip")
        Exit Sub
    End If
     ' Read entry content into a string.
    Dim entry As Stream = ze.OpenReader()
    Dim sr As StreamReader = New StreamReader(entry)
    Dim entryText As String = sr.ReadToEnd()
    entry.Close()
     ' Make sure the entry is not too big for the MessageBox.
    If entryText.Length > 16000 Then
        entryText = entryText.Substring(0, 16000)
    End If
     ' Show the entry in the message box.
```

```
    MessageBox.Show(entryText, ze.FileName)
End Sub
```

To write code in C#

C#

```
private void btnView_Click(object sender, EventArgs e)
{
     // Get the first selected item that is not a directory.
    C1ZipEntry ze = null;
    foreach (ListViewItem lvi in listView1.SelectedItems)
    {
        C1ZipEntry zeItem = lvi.Tag as C1ZipEntry;
        if ((zeItem.Attributes == 0) && (FileAttributes.Directory == 0))
        {
            ze = zeItem;
            break;
        }
    }
     // Make sure we got something.
    if (ze == null )
    {
        MessageBox.Show("Sorry, no files to show...", "C1Zip");
        return;
    }
     // Read entry content into a string.
    Stream entry = ze.OpenReader();
    StreamReader sr = new StreamReader(entry);
    string  entryText = sr.ReadToEnd();
    entry.Close();
     // Make sure the entry is not too big for the MessageBox.
    if (entryText.Length > 16000 )
    {
        entryText = entryText.Substring(0, 16000);
    }
     // Show the entry in the message box.
    MessageBox.Show(entryText, ze.FileName);
}
```

The function starts by choosing the first selected zip entry that is not a subdirectory. If a valid entry cannot be found, the function exits.

The function then calls the OpenReader method to obtain a **Stream** that can be used to read the contents of the entry. There are no temporary files or additional delays involved in this step; the data is expanded as it is read from the stream.

Next, the function reads the entry content directly into a string using the **ReadToEnd** method on the **StreamReader** object, then closes the stream.

Finally, the string is truncated and displayed in a message box.

Note that this function was designed to show the contents of short text files. If you try to view the contents of binary files, it will show only a couple of characters.

Step 10: Add code to add entries to the zip file.

Add the following code to handle the **Click** event for the **Add Files** command button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnAdd_Click(sender As Object, e As EventArgs) Handles btnAdd.Click
     ' Get list of files to add.
    Dim fo As OpenFileDialog = New OpenFileDialog()
    fo.Multiselect = True
    fo.FileName = "*.*"
    If fo.ShowDialog <> Windows.Forms.DialogResult.OK Then Exit Sub
     ' Add files in the list.
    Dim file As String
    For Each file In fo.FileNames()
        m_Zip.Entries.Add(file)
    Next file
     ' Done.
    UpdateDisplay()
End Sub
```

To write code in C#

C#

```
private void btnAdd_Click(object sender, EventArgs e)
{
     // Get list of files to add.
    OpenFileDialog fo = new OpenFileDialog();
    fo.Multiselect = true;
    fo.FileName = "*.*";
    if (fo.ShowDialog() == DialogResult.OK)
    {
         // Add files in the list.
        foreach (string file in fo.FileNames)
        {
            m_Zip.Entries.Add(file);
        }
         // Done.
        UpdateDisplay();
    }
}
```

Adding new entries to a zip file is easy. The main line simply calls the Add method on the C1ZipFile object, passing a string that contains the full name of the file to be added. That's all there is to it.

Step 11: Add code to extract a zip entry.

Add the following code to handle the **Click** event for the **Extract Files** command button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnExtract_Click(sender As Object, e As EventArgs) Handles
btnExtract.Click
     ' Make sure we have some selected entries.
    Dim cnt As Integer = ListView1.SelectedIndices.Count
    If cnt = 0 Then
        MessageBox.Show("Sorry, no files to extract...", "C1Zip")
        Exit Sub
    End If
     ' Confirm with user.
    Dim dr As DialogResult
    Dim msg As String
    msg = "Please confirm that you want to extract " + cnt.ToString() + " entries."
    dr = MessageBox.Show(msg, "C1Zip", MessageBoxButtons.OKCancel,
MessageBoxIcon.Question)
    If dr <> Windows.Forms.DialogResult.OK Then Exit Sub
     ' Extract all selected entries
    Dim lvi As ListViewItem
    Dim ze As C1ZipEntry
    For Each lvi In ListView1.SelectedItems
        ze = lvi.Tag
        If ze.SizeCompressed > 0 Then
             m_Zip.Entries.Extract(ze.FileName)
        End If
    Next lvi
     ' Done.
    UpdateDisplay()
End Sub
```

To write code in C#

C#

```
private void btnExtract_Click(object sender, EventArgs e)
{
     // Make sure we have some selected entries.
    int cnt = listView1.SelectedIndices.Count;
    if (cnt == 0)
    {
        MessageBox.Show("Sorry, no files to extract...", "C1Zip");
        return;
    }
     // Confirm with user.
    DialogResult dr;
    string  msg;
    msg = "Please confirm that you want to extract " + cnt.ToString() + " entries.";
    dr = MessageBox.Show(msg, "C1Zip", MessageBoxButtons.OKCancel,
MessageBoxIcon.Question);
    if ( dr != DialogResult.OK )  return;
     // Extract all selected entries.
    C1ZipEntry ze;
```

```
    foreach (ListViewItem lvi in ListView1.SelectedItems)
    {
        ze = (C1ZipEntry)lvi.Tag;
        if ( ze.SizeCompressed > 0 )
        {
            m_Zip.Entries.Extract(ze.FileName);
        }
    }
     // Done.
    UpdateDisplay();
}
```

The most important line calls the Extract method on the Entries property of the C1ZipFile object. The parameter is the string that contains the file name of the entry (which is stored in the entry's FileName property).

By default, the Extract method expands the entry and saves it in the same directory where the zip file is located. There are other versions of this method that allow you to specify the destination directory and file name for the expanded file. For more details, see the C1.C1Zip Namespace section.

Step 12: Add code to remove entries from the zip file.

Add the following code to handle the **Click** event for the **Remove Files** command button:

To write code in Visual Basic

Visual Basic

```
Private Sub btnRemove_Click(sender As Object, e As EventArgs) Handles btnRemove.Click
     ' Make sure we have some selected entries.
    Dim cnt As Integer = ListView1.SelectedIndices.Count
    If cnt = 0 Then
        MessageBox.Show("Oops, no files to remove...", "C1Zip")
        Exit Sub
    End If
     ' Confirm with user.
    Dim dr As DialogResult
    Dim msg As String
    msg = "Please confirm that you want to delete " + cnt.ToString() + " entries."
    dr = MessageBox.Show(msg, "C1Zip", MessageBoxButtons.OKCancel,
MessageBoxIcon.Question)
    If dr <> Windows.Forms.DialogResult.OK Then Exit Sub
     ' Delete all selected entries.
    Dim lvi As ListViewItem
    Dim ze As C1ZipEntry
    For Each lvi In ListView1.SelectedItems
        ze = lvi.Tag
        m_Zip.Entries.Remove(ze.FileName)
    Next lvi
     ' Done.
    UpdateDisplay()
End Sub
```

To write code in C#

C#

```
private void btnRemove_Click(object sender, EventArgs e)  {
     // Make sure we have some selected entries.
    int cnt = listView1.SelectedIndices.Count;
    if (cnt == 0 )
    {
        MessageBox.Show("Oops, no files to remove...", "C1Zip");
        return;
    }
     // Confirm with user.
     DialogResult dr;
    string  msg;
    msg = "Please confirm that you want to delete " + cnt.ToString() + " entries.";
    dr = MessageBox.Show(msg, "C1Zip", MessageBoxButtons.OKCancel,
MessageBoxIcon.Question);
    if (dr != DialogResult.OK) return;
     // Delete all selected entries.
    foreach (ListViewItem lvi in listView1.SelectedItems)
    {
        C1ZipEntry ze = (C1ZipEntry)lvi.Tag;
        if (ze.SizeCompressed > 0)
        {
            m_Zip.Entries.Remove(ze.FileName);
        }
    }
     // Done.
    UpdateDisplay();
}
```

The most important line calls the Remove method on the Entries property of the C1ZipFile object. The parameter is the string that contains the file name of the entry (which is stored in the entry's FileName property).

This concludes the Handling Zip Files tutorial.

Zip for .NET Frequently Asked Questions

Here are some frequently asked questions (FAQs) about **Zip for .NET**:

How much data can be stored in a ZIP file comment? I would like to use it to store information in XML.
They are limited to 32k. However, if you are going anywhere near that value, it would be better to add that information as a separate file instead.
What is the maximum number of files that can be stored in a ZIP file?
Same limit, 32k entries. The total length of the zip file is limited to 4 gigs. All these limits are related to the types of variables used in the zip file specification. Interestingly, there's a proposed spec for 64-bit extensions to the zip format, but that's not widely used yet, and there is a lot of debate still going on.

For more information about **C1Zip**, visit GrapeCity website.