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Module 1

Overview of the Microsoft .NET Framework

Contents:

Question and Answers

Review

1. List the components of the .NET Framework.

   Answer: The common language runtime, .NET Framework class library, data and XML, XML Web services and Web Forms, and Windows Forms.

2. What is the purpose of the common language runtime?

   Answer: It provides an environment in which you can execute code.

3. What is the purpose of the common language specification?

   Answer: It defines a set of features that all .NET languages should support.

4. What is an XML Web service?

   Answer: An XML Web service is a programmable Web component that can be shared among applications on the Internet or an intranet.

5. What is a managed environment?

   Answer: A managed environment is an environment that provides services, such as garbage collection, security, and other related features.

Module 2

Introduction to a Managed Execution Environment

Contents:

Question and Answers

Review

1. Name the root namespace for types in the .NET Framework.

   Answer: The System namespace is the root namespace for types in the .NET Framework.

2. What class and methods can your application use to input and output to the console?

   Answer: You can use the common language runtime's Console class of the System namespace for input and output to the console of any string or numeric value by using the Read, ReadLine, Write, and WriteLine methods.

3. When compiling code that makes references to classes in assemblies other than mscorlib.dll what must you do?

   Answer: You must use the /reference compilation switch. The /reference compilation option allows the compiler to make information in the specified libraries available to the source that is currently being compiled. The /r switch is equivalent to /reference.

4. What is the code produced by a .NET compiler called?

   Answer: Microsoft intermediate language (MSIL), sometimes called managed code.

5. What .NET component compiles MSIL into CPU specific native code?

   Answer: The just-in-time (JIT) compiler.

6. What feature of .NET ensures that object memory is freed?

   Answer: The garbage collection process.

Multimedia

Media Type	Title
Macromedia Flash Animation	.NET Applications

Module 3

Working with Components

Contents:

Question and Answers

Review

1. How do .NET methods indicate failure?

   Answer: All .NET Framework methods indicate failure by throwing exceptions.

2. What namespace contains the classes to create a Windows Form application?

   Answer: The Windows Forms library is located in the System.Windows.Forms namespace.

3. What is the default extension for ASP.NET pages?

   Answer: By default, ASP.NET files have an .aspx extension or .ascx for user controls.

Multimedia

Media Type	Title
Macromedia Flash Animation	ASP.NET Execution Model

Module 4

Deployment and Versioning

Contents:

Question and Answers

Review

1. What part of the assembly identifies its imported and exported types and its version information?

   Answer: The manifest.

2. What software does a computer require to run a .NET application locally?

   Answer: The .NET Framework common language runtime.

3. Name two simple ways to run a .NET Framework application.

   Answer: Copy the executable file and referenced assemblies to the local computer, or access them on a file server.

4. Describe how an application can use an assembly that is located in an application's subdirectory.

   Answer: Create a configuration file in the application's directory that specifies a PrivatePath as follows:

```
<configuration>
      <runtime>
        <assemblyBinding
           xmlns="urn:schemas-microsoft-com:asm.v1">
           <probing privatePath="MyStringer"/>
        </assemblyBinding>
      </runtime>
</configuration>
```

5. What kind of assembly can be placed in the global assembly cache and be versioned?

   Answer: A strong-named assembly.

6. What command is used to generate public-private key pairs?

   Answer: The Strong Name (Sn.exe) tool is used to generate a new key pair and place them in a file:

```
sn -k orgKey.snk
```

7. What command is used to install a strong-named assembly into the global assembly cache?

   Answer:

```
>gacutil -i <filename>
```

Module 5

Common Type System

Contents:

Question and Answers

Review

1. What are the differences between value types and reference types?

   Answer: Value types are allocated on the stack, assigned as copies, and passed by value.

   Reference types are allocated on the heap, assigned as references, and passed by reference.

2. What are the differences between fields and properties?

   Answer: A field is a data value in a class that can be directly accessed and manipulated by other classes.

   A property is a value in a class that is accessed through get and set accessor methods. The actual data value of a property may be stored in the class instance, or calculated when accessed.

3. How do you create an enumeration in C#?

   Answer: Use the enum keyword:

   ```
   enum name : type
   {
   ...literals...
   }
   ```

4. What is an interface?

   Answer: An interface is a contractual description of a set of related methods and properties.

5. How is encapsulation supported by the .NET Framework?

   Answer: Encapsulation is supported through access modifiers, such as public, protected, internal, and private.

Module 6

Working with Types

Contents:

Question and Answers

Review

1. What kind of algorithm should you use to implement the **GetHashCode** method?

   Answer: The algorithm should be efficient and return a unique number.

2. What is the default behavior of the **ToString** method?

   Answer: The default behavior of the ToString method is to return the name of the class.

3. How can you determine if two separate object references are the same object?

   Answer: Use the ReferenceEquals method to compare the two references.

4. If you override the **Equals** method, what else should you override?

   Answer: You should override the == and != operators.

5. When should you use a private constructor?

   Answer: Use a private constructor to prevent a class from being instantiated. An example of such a class is a singleton class with static methods and fields.

6. When should you use implicit conversions, and when should you use explicit conversions?

   Answer: Use implicit conversions for improved readability and use. Use explicit conversions when the conversion could cause a loss of data or throw an exception.

7. When do boxing operations occur?

   Answer: Boxing occurs when a value type is converted to an Object type.

   Unboxing occurs when the value is retrieved from an Object type.

8. How do you explicitly implement an interface?

   Answer: Do not use the public access modifier. Use the name of the interface in front of the field or method names. For example, void IFoo.DoSomething().

Module 7

Strings, Arrays, and Collections

Contents:

Question and Answers

Review

1. Enter the code to read an integer from the console and assign it to a variable named **aNumber**.

   Answer:

   ```
   int MyInt = int.Parse(Console.ReadLine());
   ```

2. What class should you use to improve performance when you want to perform repeated modifications to a string?

   Answer:

   ```
   System.Text.StringBuilder
   ```

3. Name and briefly describe the interfaces implemented by **System.Array**.

   Answer: ICloneable: Supports cloning, which creates a new instance of a class with the same value as an existing instance.

   IList: Represents a collection of objects that can be individually indexed.

   ICollection: Defines size, enumerators, and synchronization methods for all collections.

   IEnumerable: Exposes the enumerator, which supports a simple iteration over a collection.

4. What does it mean to say that an enumerator is required to be safe?

   Answer: The enumerator must have a fixed view of the items in a collection that remains the same, even if the collection is modified.

5. Create an array that contains the integers 1, 2, and 3. Then use the C# **foreach** statement to iterate over the array and output the numbers to the console.

   Answer:

   ```
   int[ ] numbers = {1, 2, 3};

   foreach (int i in numbers) {

       System.Console.WriteLine("Number: {0}", i);

   }
   ```

6. What is the name of the interface that is implemented by classes that contain an ordered collection of objects that can be individually indexed? Name the **System.Collections** classes that implement this interface.

   Answer: The IList interface is implemented by Array, ArrayList, StringCollection, and TreeNodeCollection.

7. What is the name of the interface for collections of associated keys and values? Name the **System.Collections** classes that implement this interface.

   Answer: The IDictionary interface is implemented by Hashtable, DictionaryBase, and SortedList.

8. Generic collection classes require runtime type-casting of their items to obtain the true type of the items in the collection classes. Name the issues raised by runtime casting.

   Answer: Type-checking cannot be done at compile time.

   Performance overhead of casting.

   In the case of collection of value types, boxing and unboxing operations.

Module 8

Delegates and Events

Contents:

Question and Answers

Review

1. Write the code to declare a delegate that is named **ProcessOrderCallback** for the following method:

```
static public bool ProcessOrder(int Quantity, string Item) { //...
}
```

Answer:

```
public delegate bool ProcessOrderCallback (int Quantity,

    string, string Item);
```

2. Write the code to call the following **EnterOrder** method, instantiating and passing an instance of the **ProcessOrderCallback** delegate that refers to a public static method that is named **Foo** in the public class **Bar**.

```
static public void EnterOrder(
      ProcessOrderCallback processOrderCallback) { //...
};
```

Answer:

```
EnterOrder( new ProcessOrderCallback(Bar.Foo) );
```

3. Write the body of the static method **EnterOrder** that takes as an argument an instance of the delegate that is declared in question 1. **EnterOrder** outputs to the console strings to prompt for an item name and quantity and reads in the user's input. **EnterOrder** should invoke the callback delegate with this information.

Answer:

```
static public void EnterOrder(

ProcessOrderCallback   processOrderCallback)  {

Console.WriteLine("Enter Item Name:");

string name = Console.ReadLine();

Console.WriteLine("Enter Item Quanity:");

int quantity = Int32.Parse( Console.ReadLine() );

processOrderCallback(quantity, name);

}
```

4. Using the following declarations, write the code to add delegate **b** to **a**'s invocation list.

```
delegate void MyDelegate();
MyDelegate a, b;
a = new MyDelegate(Bar1.Foo1);
b = new MyDelegate(Bar2.Foo2);
```

Answer: a += b;

5. Use the **event** keyword to write the code to declare a public static event for a delegate type **ProcessOrderEventHandler**.

   Answer:

```
public static event ProcessOrderEventHandler

    processOrderHandler;
```

6. Describe when you should use a delegate and when you should use an event.

   Answer: Use a delegate when:

   - **You want a C-style function pointer.**
   - **You want single callback invocation.**
   - **You want the callback function to be registered in the call or at construction time, not in a separate add method.**

   Use an event when:

   - **Client code signs up for the callback prior to the occurrence of events, typically through a separate add method.**
   - **More than one client object will be affected.**

Module 9

Memory and Resource Management

Contents:

Question and Answers

Review

1. Describe two common problems with manual memory management that the .NET Framework's automatic memory management addresses.

   Answer: Failure to release memory (Memory leaks)

   Accessing invalid memory (dangling pointer references)

2. Describe the .NET Framework mechanism that is used to provide implicit resource management.

   Answer: During the finalization phase of garbage collection, garbage collection calls Finalize code (C# destructor), which allows an object to properly clean up its resources before its memory resources are freed.

3. State why explicit resource management is desirable. Describe the interface that a class should inherit from and the method(s) that a class should implement to provide explicit memory management.

   Answer: Implicit resource management is non-deterministic, and therefore an application cannot know exactly when a resource will be freed. Explicit resource management allows a client to invoke a method to deterministically free the resource. Therefore, classes should inherit from IDisposable and implement its Dispose method.

   Also garbage collection's non-deterministic ordering of calls to finalize code makes it dangerous for classes to refer to other objects during finalization. Therefore, explicit resource management may be the only safe way for a class to refer to other objects when it releases resources, as, for example, when it flushes buffers.

4. State the purpose of weak references.

   Answer: Weak references are useful in applications that have large amounts of easily reconstructed data that should be maintained to improve performance. A weak reference allows garbage collection to collect these objects if memory in the managed heap is low.

5. Explain how and why generations are used by garbage collection.

   Answer: When garbage collection is invoked to free heap space, its performance is improved because it only compacts the section of the managed heap that contains generation 0 objects. Typically, the newer an object is, the shorter its lifetime will be. Therefore, sufficient space is usually freed when generation 0 is compacted. If sufficient space cannot be obtained when generation 0 is compacted, garbage collection will compact the older generations.

Multimedia

Media Type	Title
Macromedia Flash Animation	Simplified Garbage Collection
Macromedia Flash Animation	Garbage Collection

Module 10

Data Streams and Files

Contents:

Question and Answers

Review

1. Name at least three types of .NET Framework streams and how they differ.

   Answer: FileStream does reads and writes to a file.

   MemoryStream does reads and writes to memory.

   BufferedStream is used to buffer reads and writes to another stream.

   NetworkStream provides the underlying stream of data for network access.

2. Name the three basic stream operations.

   Answer: Read, Write, and Seek.

3. Name the classes that are used to read and write primitive types as binary values.

   Answer: BinaryReader and BinaryWriter.

4. Name the method used to provide random access to files.

   Answer: Seek.

5. Name the class that you would use to monitor changes to a file system.

   Answer: FileSystemWatcher.

6. Name the two important features that the .NET Framework's isolated storage provides for an application.

   Answer: Isolation and Safety.

Module 11

Internet Access

Contents:

Question and Answers

Review

1. Name the four parts of the following URI:

   http://www.microsoft.com/default.htm?foo=bar

   Answer: Scheme identifier http

   Server identifier www.Microsoft.com

   Path identifier /default.htm

   Query String ?foo=bar

2. Write the line of code that creates a **WebRequest** to the URI in question 1.

   Answer:

   ```
   WebRequest req = WebRequest.Create
   ("http://www.microsoft.com/default.htm?foo=bar");
   ```

3. Write the line of code that gets a **WebResponse** from the **WebRequest** in question 2.

   Answer:

   ```
   WebResponse resp = req.GetResponse();
   ```

4. Write the line of code that gets a **Stream** from the **WebResponse** in question 3.

   Answer:

   ```
   Stream respstrm = resp.GetResponseStream();
   ```

5. Name the type of Web-specific exceptions that are thrown by the **GetResponse** method.

   Answer: WebException

6. State how a **WebRequest** can be made to use the Secure Socket Layer (SSL) protocol.

   Answer: URI begins with https.

7. Name at least three authentication methods that are supported by the .NET Framework.

   Answer: Basic

   Digest

   Negotiate

   NTLM

   Kerberos

Module 12

Serialization

Contents:

Question and Answers

Review

1. Declare a serializable class named **Foo** with two integer fields **F1** and **F2** in which **F2** is transient and should not be serialized.

   Answer:

   ```
   [Serializable] public class Foo {

     int F1;

     [NonSerialized] int F2;

   }
   ```

2. Name and describe the two kinds of formatters that the .NET Framework provides.

   Answer: BinaryFormatter for a compact binary

   SoapFormatter for XML representation

3. Describe what a class should do to provide custom serialization.

   Answer: The class should inherit from the ISerializable interface, implement the interface's GetObjectData method, and provide a constructor that takes SerializationInfo and StreamingContext parameters.

4. What kind of data that is not normally accessible by clients can be made visible by serialization?

   Answer: Private object state

Module 13

Remoting and XML Web Services

Contents:

Question and Answers

Review

1. Can two application domains that are on the same computer each have a channel that listens on the same port number?

   Answer: Ports are a machine-wide resource; therefore, on one computer, it is illegal to register multiple channels that listen on the same port number, even if the channels are registered in different application domains.

2. What is the purpose of a proxy?

   Answer: The proxy object acts as a representative of the remote object and ensures that all calls that are made on the proxy are forwarded to the correct remote object instance. All methods that are called on the proxy are automatically forwarded to the remote class, and any results are returned to the client.

3. Can a remotely instantiated object be returned by value?

   Answer: No. All objects that are instantiated remotely are returned by reference.

4. What determines whether a remotely instantiated object's parameters and return values are passed by reference or by value?

   Answer: Objects whose classes are marked with the SerializableAttribute are marshal-by-value, and objects that inherit from System.MarshalByRefObject are marshal-by-reference.

5. What file extension is typically used by ASP.NET-hosted XML Web services?

   Answer: ASP.NET provides support for XML Web services with the .asmx file.

6. In ASP.NET, how do you specify that a service is defined in a prebuilt assembly, and where should that assembly's DLL be located in relation to the ASP.NET application?

   Answer: The .asmx file should contain the single line:

   <%@ WebService Class="<namespace>.<classname>" %>

   The assembly library DLL should be in the application's \Bin subdirectory.

7. How can a client invoke an XML Web service that is not implemented by using the .NET Framework or in which the XML Web service's assembly or source code is not available?

   Answer: The Web Services Description Language tool (Wsdl.exe) can be used to read the WSDL description of an XML Web service and create a proxy class. The client can use the proxy class to invoke the methods of the XML Web service.

Module 14

Threading and Asynchronous Programming

Contents:

Question and Answers

Review

1. State one advantage and one disadvantage of using multiple threads in an application.

   Answer: Advantages: Threading maintains the responsiveness of the user interface while background processing is occurring, allows for subtasks to be assigned different priorities, and allows a long-running task to be done in the background.

   Disadvantages: Overhead with thread creation and running may decrease performance; sharing data between threads is complex and prone to errors.

2. Write the code to execute a thread on the static method in a class named **MyClass** that is declared: **static void MyMethod()**.

   Answer:

   ```
   Thread t1 = new

       Thread(new ThreadStart(MyClass.MyMethod));

   t1.Start();
   ```

3. Name the three .NET Framework categories of techniques for providing thread safety when data must be shared between concurrently executing threads.

   Answer: Synchronized Context, Synchronized Code Regions, Manual Synchronization.

4. If you want to get or set properties, or call methods on a control from a background thread, what must you do?

   Answer: You must marshal the call to the thread on which the control was created by using one of the control's thread safe methods: Invoke, BeginInvoke, and EndInvoke.

5. In the second part of an asynchronous call operation, name the four ways that the caller can know when the asynchronous operation has completed.

   Answer: Callback method, poll, call end method, wait for event.

Multimedia

Media Type	Title
Macromedia Flash Animation	Asynchronous Programming

Module 15

Interoperating Between Managed and Unmanaged Code

Contents:

Question and Answers

Review

1. List the steps for calling an API function that is implemented in a DLL.

   Answer: Declare the API function with the static and extern C# keywords, attach the DllImport attribute to the function specifying the name of the DLL that exports the unmanaged function, and optionally specify marshaling information.

2. What is pinning?

   Answer: Pinning is a technique in which data, in its current memory location, is temporarily locked to keep it from being relocated by the common language runtime's garbage collector.

3. List the tasks that are performed when the Type Library Importer is run on a type library file.

   Answer: The Type Library Importer converts unmanaged COM coclasses to C# classes with a constructor (that does not have parameters) and no other methods, converts unmanaged COM vtable interfaces to C# interfaces, and converts unmanaged COM structures to C# structures with public fields.

4. Which attribute must you use to suppress runtime security checks that are preformed when managed code calls unmanaged code?

   Answer: SuppressUnmanagedCodeSecurityAttribute

5. List some best practices when using .NET code from COM clients.

   Answer: Define an explicit interface for COM clients to use rather than generating the class interface, and avoid caching dispatch identifiers (DISPIDs).

6. Which must you use to prevent the class interface from being generated?

   Answer: Set the Value property of the ClassInterfaceAttribute to ClassInterfaceType.None

Module 16

Using Microsoft ADO.NET to Access Data

Contents:

Question and Answers

Review

1. What are some of the new objects in the ADO.NET object model?

   Answer: Some of the new objects in the ADO.NET object model are: DataSet, DataAdapter, DataView, DataReader, and DataTable.

2. What is the difference between a **DataSet** and a **DataView**?

   Answer: DataSet is a collection of DataTables and a DataView is a custom view of the DataTables in a DataSet.

3. What is the difference between a **DataSet** and a **DataReader**?

   Answer: The DataReader is designed to produce a read-only, forward-only stream returned from the database.

   The DataSet is designed to handle the actual data from a data store. It represents a cache of data, with database-like behavior. It can contain tables, columns, relationships, constraints, and data.

4. What is the purpose of the **DataAdapter** object?

   Answer: A DataAdapter object is a tool that is used to create and initialize various tables. It allows for the retrieval and saving of data between a DataSet object and the source data store. It is responsible for pulling out data from the physical store and pushing it into data tables and relations.

5. Which method is used to populate a **DataSet** with results of a query?

   Answer: The method that is used to populate the DataSet with results of a query is the Fill method.

Multimedia

Media Type	Title
Macromedia Flash Animation	Using ADO.NET to Access Data

Module 17

Attributes

Contents:

Question and Answers

Review

1. Can you tag individual objects by using attributes?

   Answer: No. Attributes can be associated with classes or other types, or with methods, parameters, return values, constructors, assemblies, delegates, events, interfaces, properties, or fields, but not with individual objects.

2. Where are attribute values stored?

   Answer: An attribute value is stored with the metadata of the programming element that it was used with.

3. What mechanism is used to determine the value of an attribute at run time?

   Answer: Reflection.

4. Define an attribute class called **CodeTestAttributes** that is applicable only to classes. It should have no positional parameters and two named parameters called *Reviewed* and *HasTestSuite*. These parameters should be of type **bool** and should be implemented by using read/write properties.

   Answer:

```
using System;

[AttributeUsage(AttributeTargets.Class)]

public class CodeTestAttributes: System.Attribute

{

    public bool Reviewed

    {

        get { return reviewed; }

        set { reviewed = value; }

    }

    public bool HasTestSuite

    {

        get { return hasTestSuite; }

        set { hasTestSuite = value; }

    }

    private bool reviewed, hasTestSuite;

}
```

5. Define a class called **Widget**, and use **CodeTestAttributes** from the previous question to mark that **Widget** has been reviewed but has no test suite.

Answer:

```
[CodeTestAttributes(Reviewed=true, HasTestSuite=false)]

class Widget

{

    ...

}
```

6. Suppose that **Widget** from the previous question had a method called **LogBug**. Could **CodeTestAttributes** be used to mark only this method?

   Answer: No. CodeTestAttributes can only target whole classes.

Resources

Contents:

Internet Links

The Web sites listed below provide additional resources.

Web Site	URL
MSDN Home	http://msdn.microsoft.com
Microsoft Training & Services	http://www.microsoft.com/traincert
Microsoft .NET	http://www.microsoft.com/net
GotDotNet Home Page	http://www.gotdotnet.com

Send Us Your Feedback

You can search the Microsoft Knowledge Base for known issues at Microsoft Help and Support before submitting feedback. Search using either the course number and revision, or the course title.

Note Not all training products will have a Knowledge Base article – if that is the case, please ask your instructor whether or not there are existing error log entries.

Courseware Feedback

Send all courseware feedback to support@mscourseware.com. We truly appreciate your time and effort. We review every e-mail received and forward the information on to the appropriate team. Unfortunately, because of volume, we are unable to provide a response but we may use your feedback to improve your future experience with Microsoft Learning products.

Reporting Errors

When providing feedback, include the training product name and number in the subject line of your e-mail. When you provide comments or report bugs, please include the following:

- Document or CD part number
- Page number or location
- Complete description of the error or suggested change

Please provide any details that are necessary to help us verify the issue.

Important All errors and suggestions are evaluated, but only those that are validated are added to the product Knowledge Base article.
