An Overview of the .NET Technology

Hanspeter Mössenböck
What is .NET?

A new software platform for the desktop and the Web

unmanaged applications

operating system (Windows, Linux, Unix, ...)

What is .NET?

A new software platform for the desktop and the Web

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Common Language Runtime

- interoperability, security, garbage collection, versioning, ...

class library

- GUI, collections, threads, network, reflection, XML, ...
What is .NET?

A new software platform for the desktop and the Web

- unmanaged applications
- managed applications
- web applications

- class library
- Web Forms
- Web Services
- ASP.NET

- Common Language Runtime
- Web server (IIS)

- operating system (Windows, Linux, Unix, ...)

ASP.NET, Web Forms, Web Services

- Web GUI (object-oriented, event-based, browser-independent)
- distributed services over RPC (SOAP, HTTP)
What is .NET?

A framework and more...

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operating system (Windows, Linux, Unix, ...)

.NET Framework

+ **tools** (Visual Studio .NET, ildasm, gacutil, ...)
+ **servers** (SQL server, BizTalk server, Exchange server, ...)
+ **services** (My Services, Passport service, ...)
# Goals of .NET

To unify desktop and Web programming

**So far**

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<th>Desktop programming</th>
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*Under .NET*

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<td>object-oriented (ASP.NET)</td>
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<td>uniform class library</td>
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Goals of .NET

Interoperability between programming languages

So far
- millions of lines of code in C++, Fortran, Visual Basic, ...
- very limited interoperability
Goals of .NET

Interoperability between programming languages

So far
- millions of lines of code in C++, Fortran, Visual Basic, ...
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Under .NET
- binary compatibility between more than 20 languages (C#, C++, VB.NET, Java, Eiffel, Fortran, Cobol, ML, Haskell, Pascal, Oberon, Perl, Python, ...)

Class in VB.NET
Public Class A
    Public x As Integer
    Public Sub Foo() ...
End Class

Subclass in C#
    class B : A {
        public string s;
        public void Bar() {...} 
    }

Used in Eiffel
    class Client feature
        obj: B;
        ...
        create obj;
        obj.Bar;
        ...
    end
Goals of .NET

Web Services: distributed applications on the Internet

Usage of the Internet so far
- Email
- Web browsers (show information for human users)
Goals of .NET

Web Services: distributed applications on the Internet

Usage of the Internet so far
- Email
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Under .NET: B2B applications without a Web browser

Based on simple standards
- HTTP
- SOAP (XML)
- Remote Procedure Calls
Goals of .NET

Simpler dynamic Web pages

So far
- ASP (mixture of HTML and VBScript or Javascript)
**Goals of .NET**

Simpler dynamic Web pages

*So far*
- ASP (mixture of HTML and VBScript or Javascript)

*Under .NET*
- ASP.NET (clear separation of HTML and script code)

object-oriented
event-based
interactively composable (RAD)
custom GUI elements possible
efficient (compiled server code)
state management
authorisation / authentification
...

**Shopping Cart**

<table>
<thead>
<tr>
<th>Product ID</th>
<th>Product Name</th>
<th>Model</th>
<th>Quantity</th>
<th>Price</th>
<th>Subtotal</th>
<th>Remove</th>
</tr>
</thead>
<tbody>
<tr>
<td>401</td>
<td>Fake Moustache</td>
<td>TCMRJ</td>
<td></td>
<td>$999.99</td>
<td>$999.99</td>
<td></td>
</tr>
<tr>
<td>368</td>
<td>Toaster Boat</td>
<td>DNTRPR</td>
<td></td>
<td>$999.98</td>
<td>$13,999.8</td>
<td></td>
</tr>
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</table>

Total: $29,599.97
Goals .NET

More quality and convenience

- Security
  - public key signatures
  - code-based access rights
- Side by side execution
  - end of "DLL hell"
  - versioning
- Zero-impact installation
  - no Registry entries necessary
  - clean deinstallation
- Different clients
  - PCs, mobiles, embedded systems
Interoperability

C#  C++  VB  ...

compiler  compiler  compiler  compiler

CIL code (+ metadata)

loader

verifier

JIT compiler

machine code

if (a > b) max = a; else max = b;

CIL

IL_0004: ldloc.0
IL_0005: ldloc.1
IL_0006: ble.s  IL_000c
IL_0008: ldloc.0
IL_0009: stloc.2
IL_000a: br.s  IL_000e
IL_000c: ldloc.1
IL_000d: stloc.2

Intel code

mov ebx,[-4]
mov edx,[-8]
cmp ebx,edx
jle 17
mov ebx,[-4]
mov [-12],ebx
...
Assemblies are the smallest units for
- deployment
- versioning
- loading

Assemblies are the classes:
- class A
- class B
- class C

CIL code for A
CIL code for B
CIL code for C

manifest
metadata
version number
public key
interface description
- classes
- methods
- fields
- parameters
- types
- ...

allows:
- dynamic loading
- version checking
- reflection

Loader
Literature

Web

- www.microsoft.com/net/
- msdn.microsoft.com/net/
- www.gotdotnet.com
- www.devhood.com
- www.go-mono.com
- dotnet.jku.at

Books

- Albahari, Drayton, Merrill: C# Essentials, O'Reilly, 2001
- Box: Essential .NET, Addison Wesley, 2002