

The Mono Development Platform

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Novell.



Gnome Project.

Bring Linux to the desktop.

- Started in 1997
- Fill the gaps on the desktop offering.
- Raising the programming level:
 - Component-based software.
 - Raise programming level: language bindings.

Technically:

- C-based APIs, contracts to bind it.
- CORBA used for exposing components APIs.
- Far from perfect solutions.
- Bindings came out of schedule.



The Ximian Background.



Ximian: focused on making Linux succeed on Desktop.

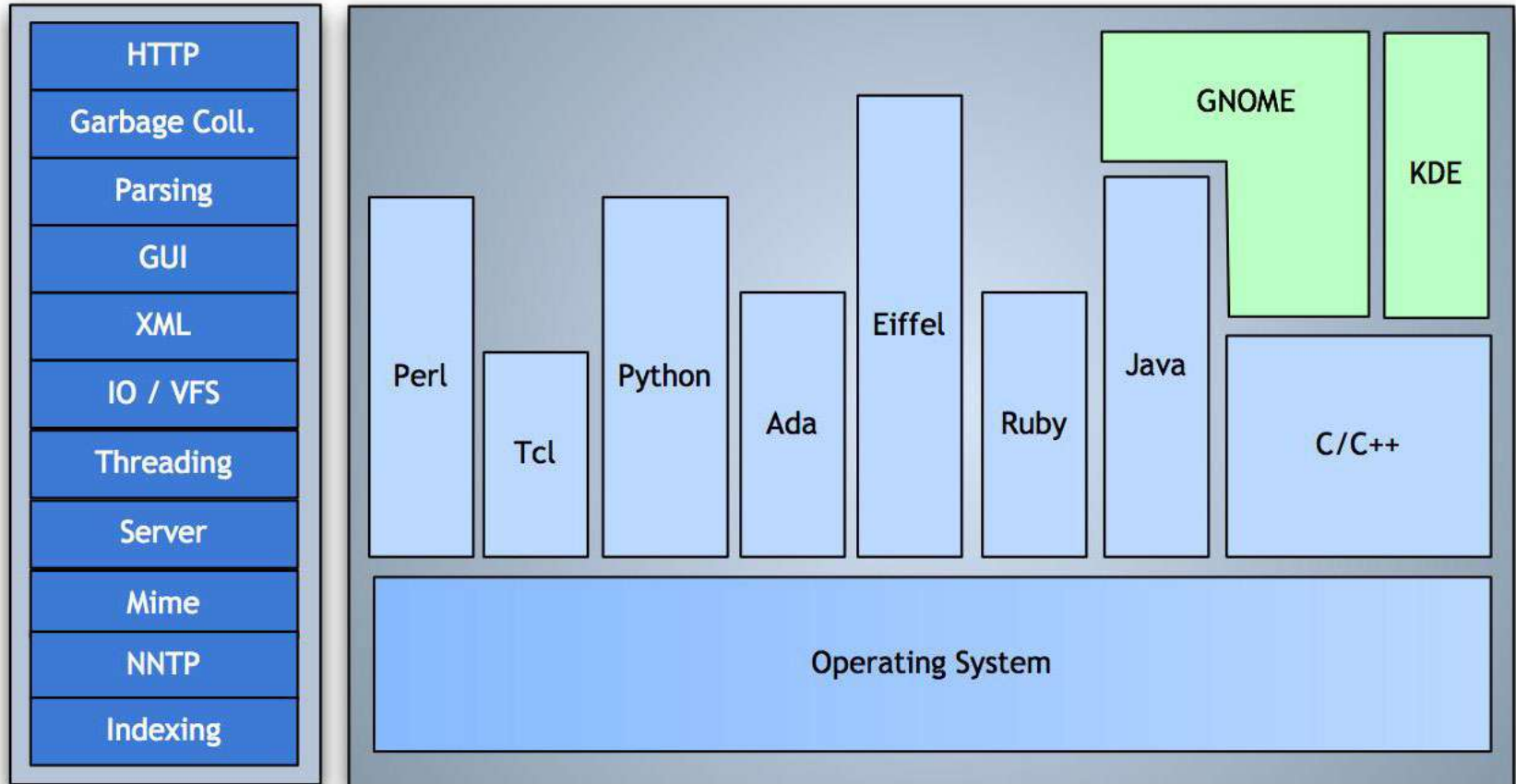
Evolution: our large application

- Standards compliant, best email/calendar/address.
- Complex: multi-threaded, multi-process
- Too many standards.
- Innovation was hard
- At peak for 1.0: 17 developers, 2.5 years Too Expensive.

We needed better tools.



Unix: Everyone Building its Own Platform





What is Mono?

A complete and modern development platform for Linux and an Open Source implementation of .NET

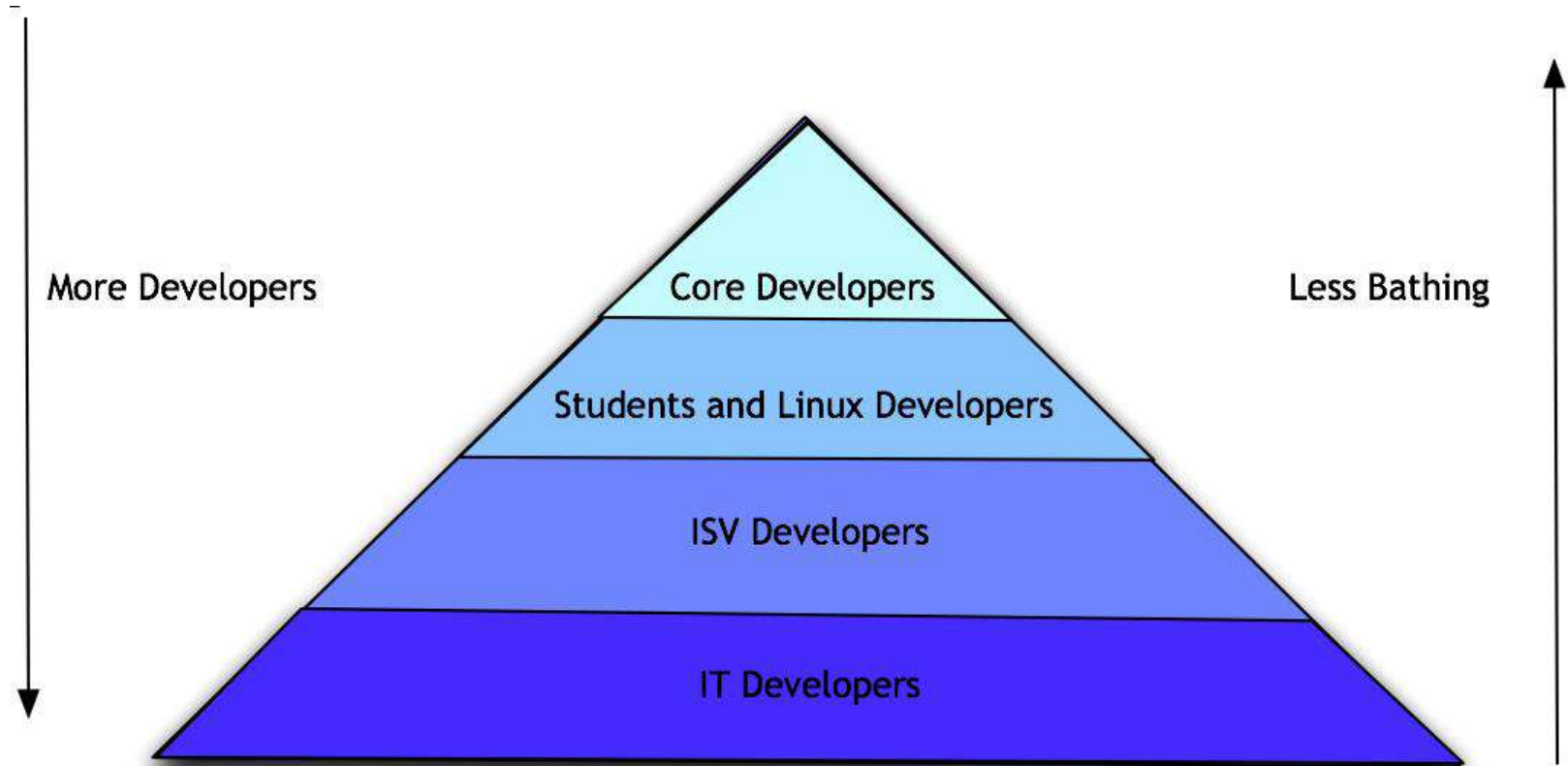
- Cross platform:
 - Unix family: Linux, MacOS X, Solaris, HP-UX, AIX.
 - Windows family: 2000, NT, XP.
 - Embedded systems (tiny profile).
- Open Source compilers and tools:
 - Today: C# language, Java, Nemerle.
 - Preview: VB.NET, Jscript, Python.

Increase developer productivity

- Most modern tools available today.

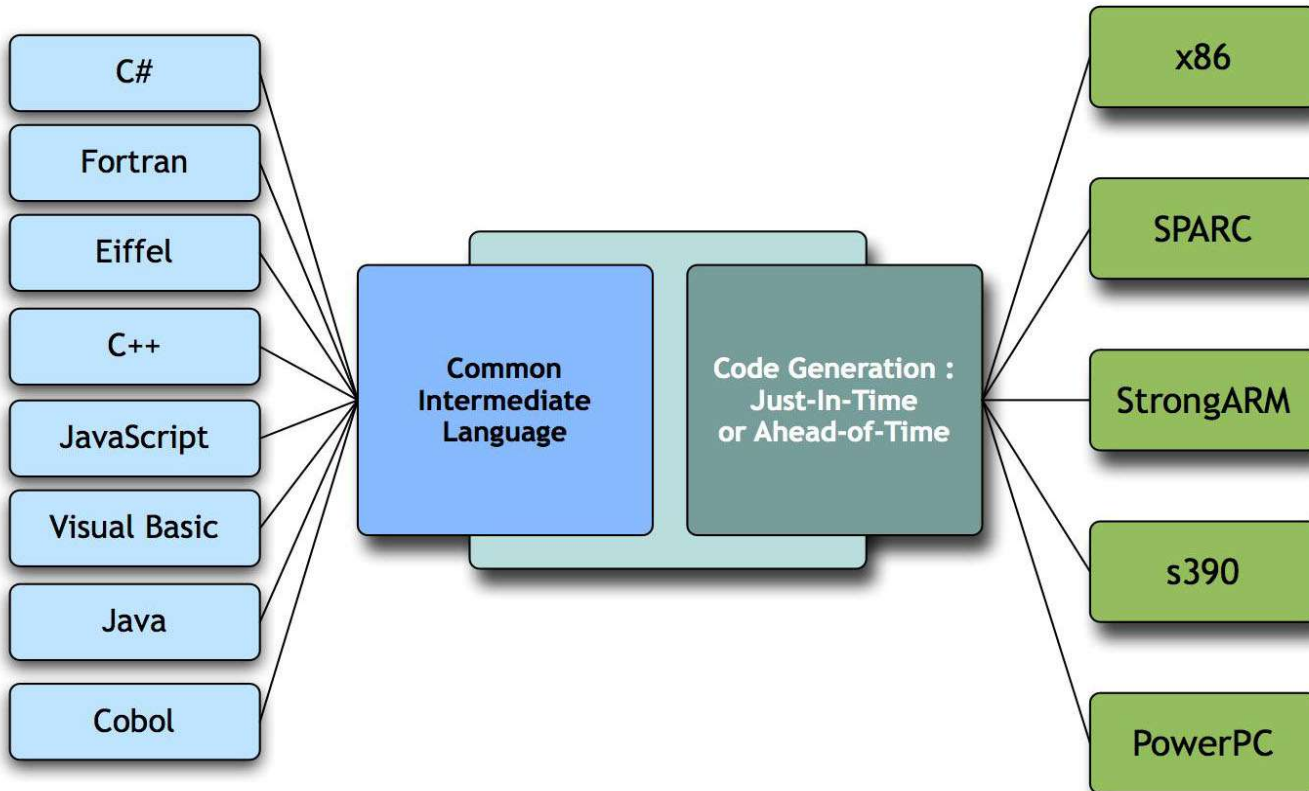
Ease transition from Windows to Linux development

Developer Platform Tolerance



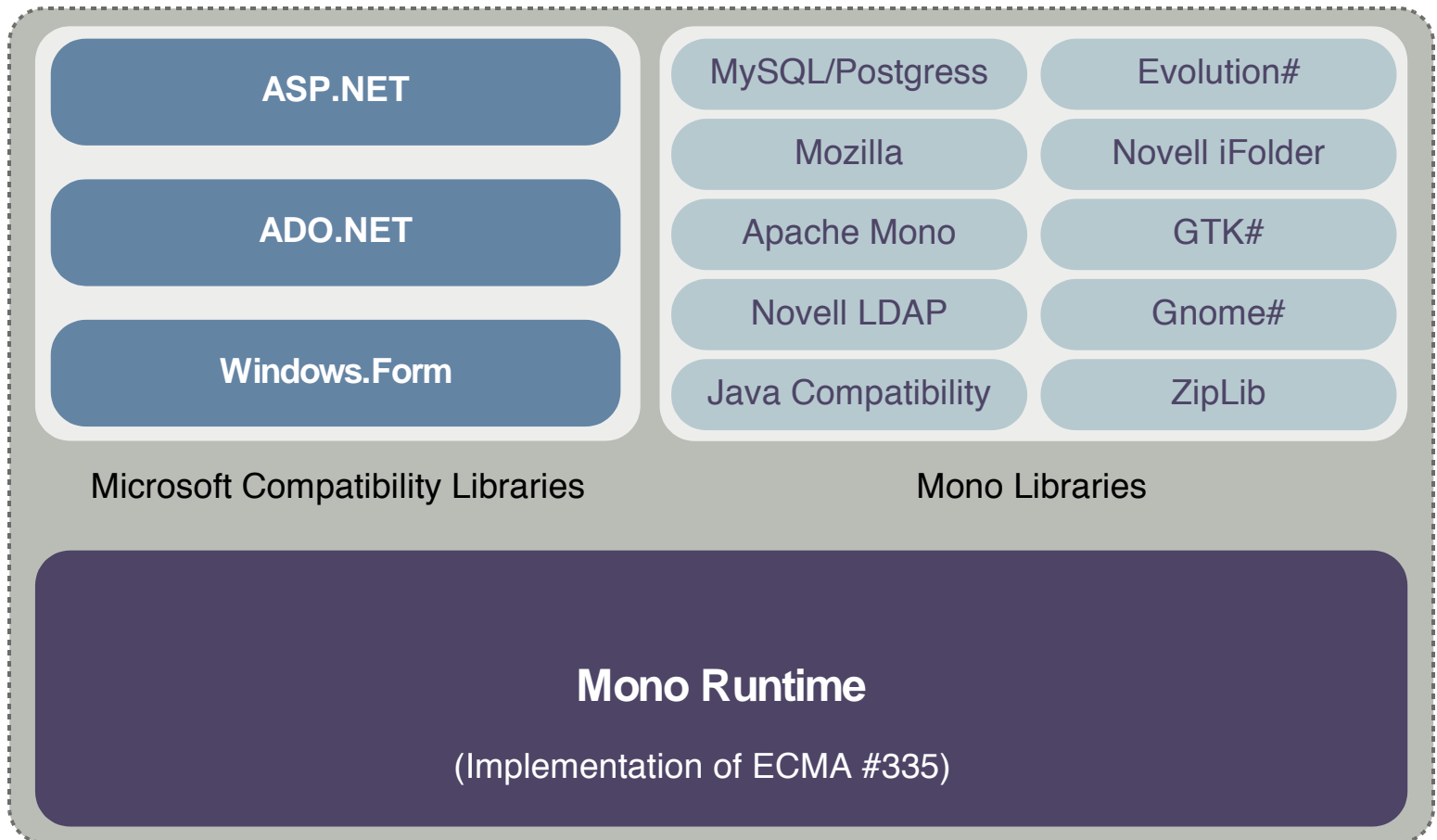


Multi-language and multi-platform.



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What is Mono ?





Reuse.

Existing .NET:

- Third party components written in C#, VB.
- Third party compilers.

Java:

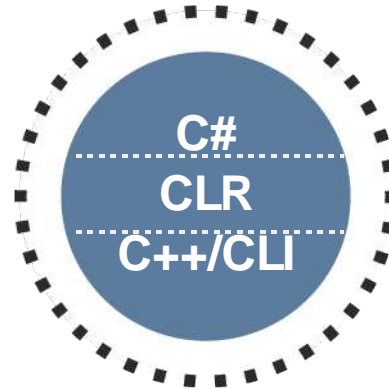
- Seamless integration of Java libraries and applications.
- Execute C# and Java code side-by-side
- Share components, expose components.
- The IKVM Virtual Machine.

The Ultimate Open Source Reuse.

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.NET, .NET or .NET ?

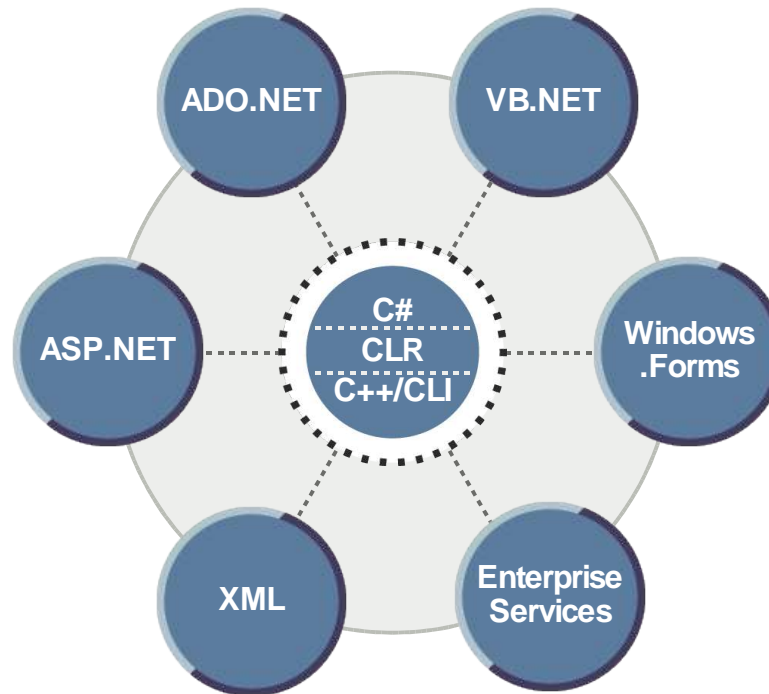
ECMA



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.NET, .NET or .NET ?

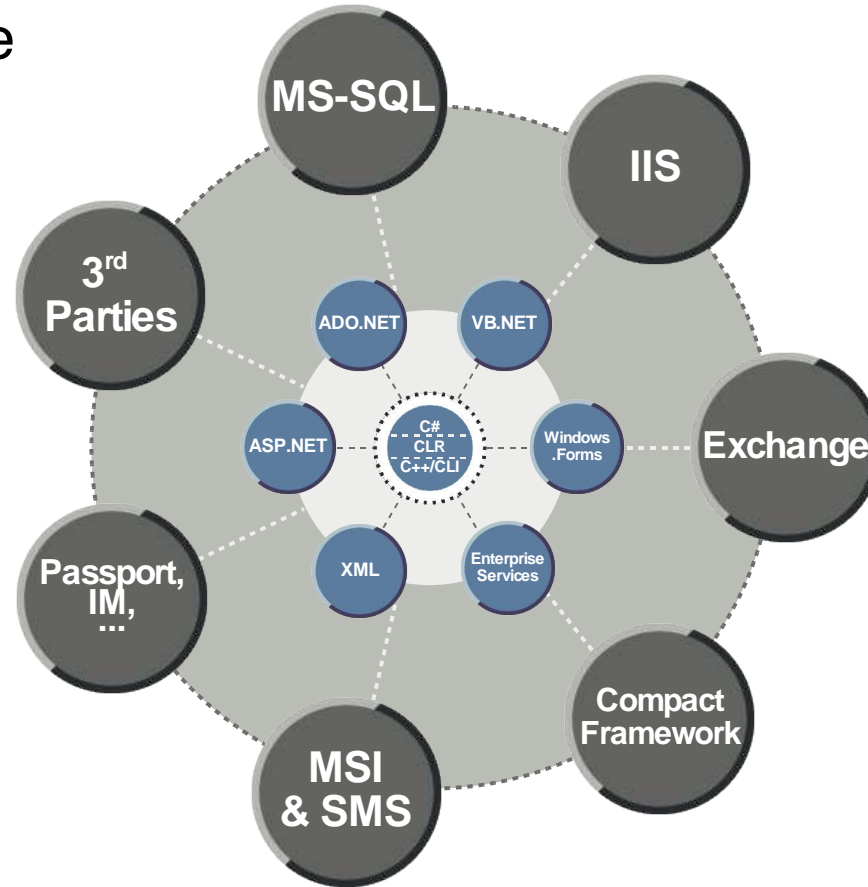
.NET 1.1



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.NET, .NET or .NET ?

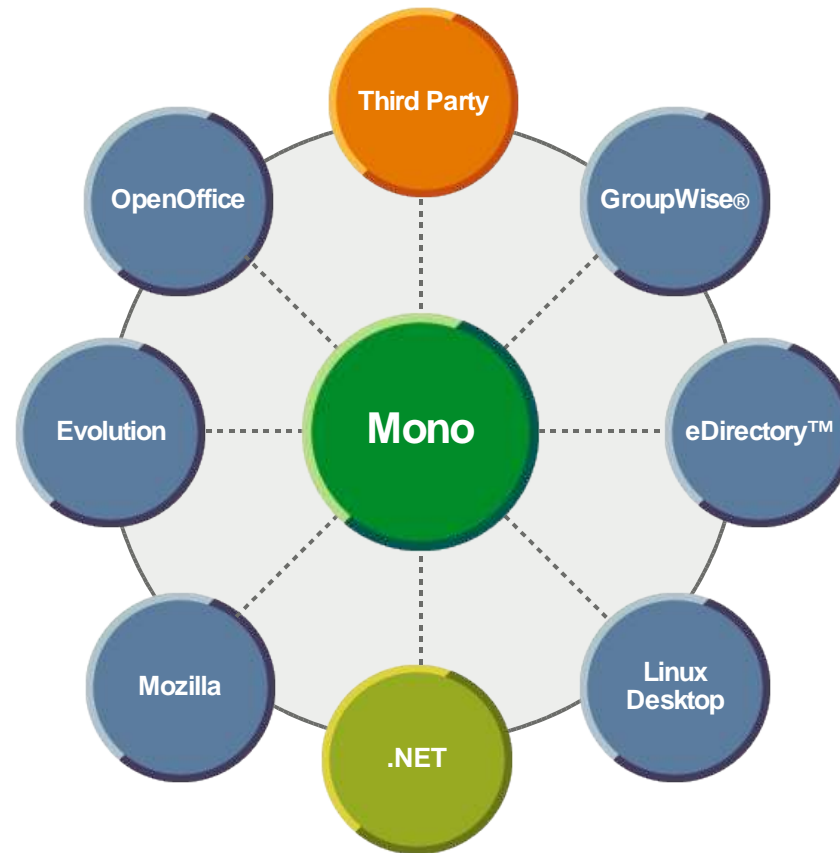
.NET Universe



Microsoft Software Ecosystem



Novell Software Ecosystem



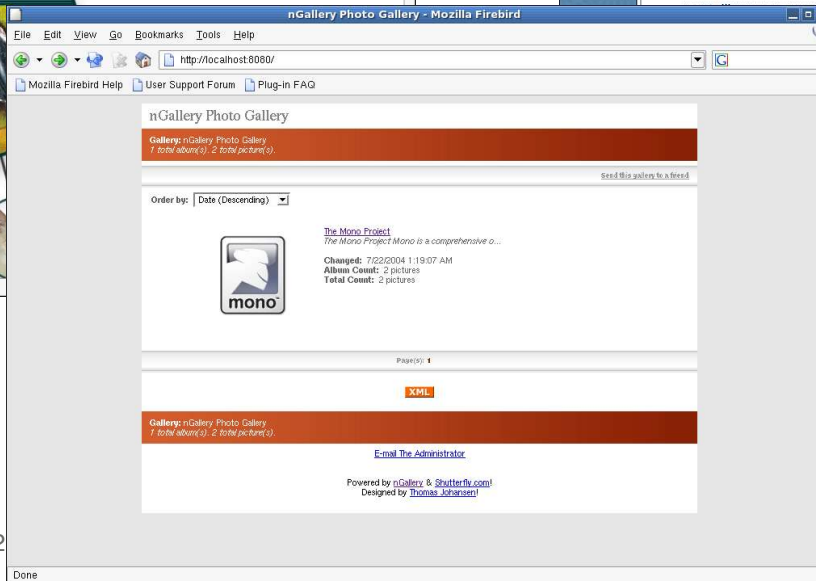
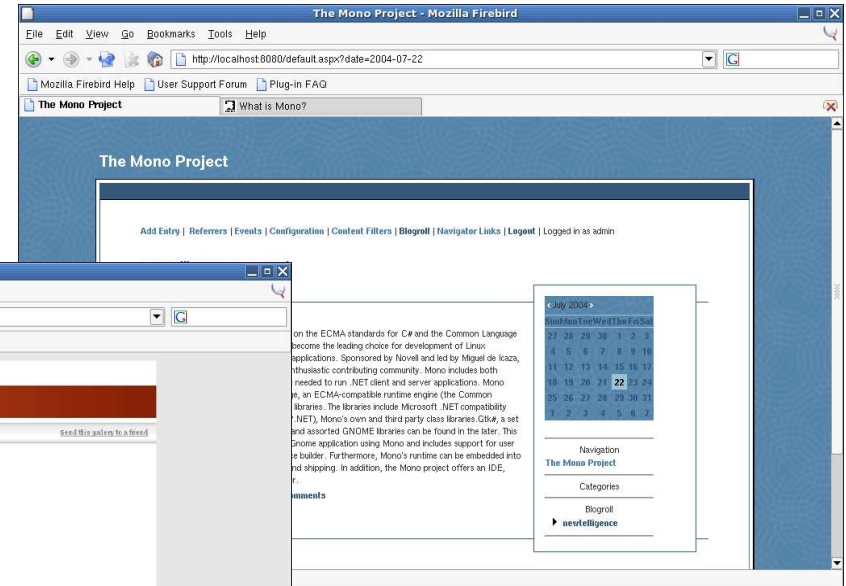
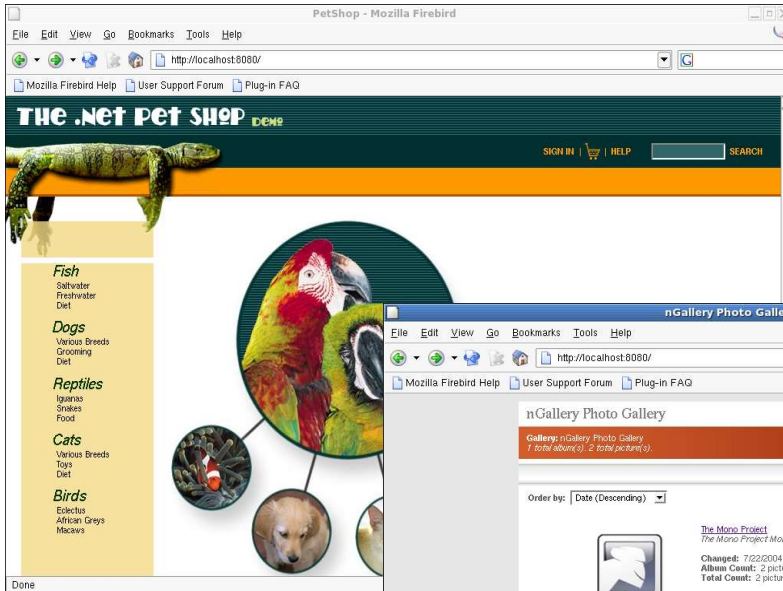
Most components are O.S.S.



Server side: ASP.NET

Most people want to run ASP.NET

- Works-with and Powered-by.



on the ECMA standards for C# and the Common Language become the leading choice for development of Linux applications. Sponsored by Novell and led by Miguel de Icaza, enthusiastic contributing community. Mono includes both needed to run .NET client and server applications. Mono is, an ECMA-compatible runtime engine (the Common libraries. The libraries include Microsoft .NET compatibility (NET), Mono's own and third party class libraries. Gtk, a set and assorted GNOME libraries can be found in the list. This Phone application using Mono and includes support for user builder. Furthermore, Mono's runtime can be embedded into shipping. In addition, the Mono project offers an IDE, r.

ments

July 2004						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
27	28	29	30	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
1	2	3	4	5	6	7



Desktop Development.

Leverage features of Unix, Linux, Gnome.

Gtk# -- Replacement for Windows.Forms:

- Constraint-based dialogs
 - Internationalization.
- Accessible (508(c) compliant).

Mozilla integration (gecko-sharp, XPCOM#).

Graphics:

- OpenGL, Glitz
- Cairo, SVG (2D API)



Desktop Development.

System.Windows.Forms (SWF)

- 100% managed implementation based on X11 libs
- to be delivered in Feb 2005
- Very important, needs some love

Cocoa#

- Native GUI API for MacOS X
- Early Stages
- also includes ObjC#



Solution

- Solution Sample (1 entry)
 - Sample
 - Resource Files
 - gui.glade
 - References
 - AssemblyInfo.cs
 - Main.cs

```

1 // project created on 7/22/2004 at 2:14 AM
2 using System;
3 using Gtk;
4 using Glade;
5
6 public class GladeApp
7 {
8     public static void Main (string[] args)
9     {
10         new GladeApp (args);
11     }
12
13     public GladeApp (string[] args)
14     {
15         Application.Init();
16
17         Glade.XML gxm1 = new Glade.XML (null, "gui.glade", "window1", null);
18         gxm1.Autoconnect (this);
19         Application.Run();
20     }
21
22     /* Connect the Signals defined in Glade */
23     public void OnWindowDeleteEvent (object o, DeleteEventArgs args)
24     {
25         Application.Quit ();
26         args.RetVal = true;
27     }
28 }
29
30

```

Palett

Selector

GTK+ Basic

GTK+ Additional

Gnome

Deprecated

Glade Window

Back Forward

label1

Properties: frame1

Widget	Packing	Common	Signals
Cell X:	0		
Cell Y:	1		
Col Span:	3		
Row Span:	2		
H Padding:	0		
V Padding:	0		
X Expand:		No	
Y Expand:		Yes	
X Shrink:		No	
Y Shrink:		No	
X Fill:		Yes	
Y Fill:		Yes	

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IDEs

MonoDevelop

- <http://www.monodevelop.com>

Eclipse

Emacs, VIM, ...

VisualStudio.NET



Migration

What applications ?

Desktop Applications

- Office Suite, IM, Internet Browsing, e-mail
- Web Applications (client, IE specific ?)
- Rich Client Applications
- Utilities

Server Applications

- Web Applications (server)
- Web Services
- Databases
- ...



Rich Client Applications (1/2)

Win32 applications / MFC

- C, C++ (Visual C, C++)
- VB6
- PowerBuilder
- Delphi

Solutions:

- Wine / CrossOver (Win32 emulation)
- VMWare, Bosch (Windows+x86 emulation)
- Remote execution (Terminal Services, RDP, Citrix, VNC)



Rich Client Applications (2/2)

Java Applications

Build once, run anywhere !

But no so much on the Desktop...



.NET Applications

- VB.NET
- C#
- Managed C++, C++/CLI
- Delphi.NET
- Others (Cobol.NET, Fortran.NET, ...)

Server Applications

Web Applications, Web Services, Remoting services

- J2EE application
- PHP, Python, Ruby (Rare on Windows)
- ASP.NET applications (System.Web.Forms and Services)
- ASP applications (not ASP.NET)
 - Old Microsoft web application technology
 - VBScript/Jscript
 - Mix of HTML and code
 - No RAD tools
 - Painful
- COM, COM+, CORBA, ...



But what is .NET ?

New application development framework from Microsoft

- Spawns across all of Microsoft's offering, umbrella marketing

.NET Applications:

- Usually built in VS.NET on Windows
- Runs on the .NET VM (compiled to MSIL)
- Uses the .NET core libraries
- Might use a language runtime
- Might make calls to different APIs (System.Windows.Forms, ADO.NET, XML, ...)
- Might make native calls (Platform Invokes)
- May use third party controls
- Console, GUI (SWF, GTK#, VxWorks, ...), or Web applications and also Web Services



.NET binaries and Mono

Mono is binary compatible with Microsoft .NET

- runs .NET .exe and DLLs
- but only .NET ones, not win32 ones
- You can re-compile with *mcs* but you don't need to
- What you'll find in your Mono directory:
 - .exe files (`mono application.exe`)
 - .dll files
 - Shared libraries
 - Mapping files
- Mono includes GAC (Global Assembly Cache) support
 - Protection from DLL-Hell



C#

Mono 1.0 includes a C# 1.0 compiler and C# 2.1 extensions (generics in beta)

Mono 2.0 will include a C# 2.1 compiler

Current CVS includes generics and anonymous method supports.

C# is the language of choice even though the CLR is multi-language

- Are you sure ?



VB.NET

VB.NET compiler and runtime in current CVS
Final release with Mono 1.2 (Feb 2005)
Can run ASP.NET pages since August 2004



Key to migration efforts

Perception: Most VB6 developers are adopting
VB.NET

- Reality ?

ADO.NET & Databases

Regardless of what it does, your application is likely to make DB access Complete implementation of ADO.NET in Mono 1.0

Includes data providers for Oracle, MS-SQL Server, MySQL, Progress...

Possible to migrate from MS-SQL to MySQL (for example) but not necessary

- Migration Applications (MSSQL-to-MySQL)
- Migration guides

<http://dev.mysql.com/tech-resources/articles/migrating-from-microsoft.html>

Also available, Gda# & GnomeDB#

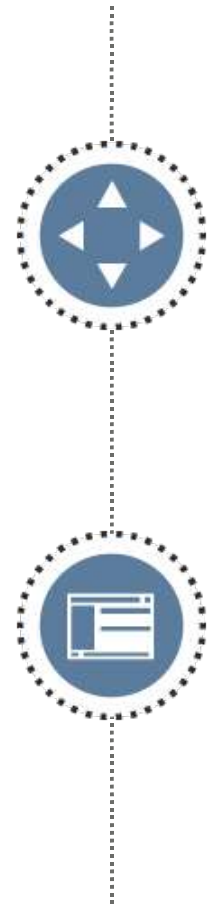
Data access via Soap/Web (then use System.Web.Services and System.XML) or Remoting

System.Windows.Forms

Mono 1.2 (Feb 2005) will includes
SWF compatibility

Essential to seamless migration of
classics Windows .NET GUI
applications

What of Gtk# ?



Gtk#

Set of .NET bindings for the gtk+ toolkit and assorted GNOME libraries

Allows you to build fully native Gnome application using Mono and includes support for user interfaces built with the Glade interface builder.

Cross platform (Linux, Windows, MacOS X, Solaris, ...)

True .NET API, not just a wrapper to C++ bindings



System.Windows.Forms or
Gtk# ?

ASP.NET

Mono includes support for ASP.NET
(Web Applications and Web Services)

- XSP
 - Standalone server
 - ASP.NET & static HTML only
 - Development time
 - Back-end for mod_mono
- mod_mono
 - Plugin for Apache (v1&v2)
 - Uses Apache for all common web server tasks
 - Unix sockets communication

ASP.NET

Language support

- Most applications use VB.NET or C#
 - Need for a Code Provider for additional language support
- C# with Mono 1.0
- VB.NET with Mono 1.2 (February)

Pages compiled at runtime

- ASP.NET 2.0 includes Pre-compiled pages support

Careful of IIS specific programming outside of ASP.NET

Web Services, remoting, ...

Third Party controls

P/Invoke

Platform Invocation services : Native calls

Trivial to use

Unsafe Code, leaving the sandbox safety

Opportunity for platform inconsistencies

Does the native code you invoke in
Windows exist in Linux?



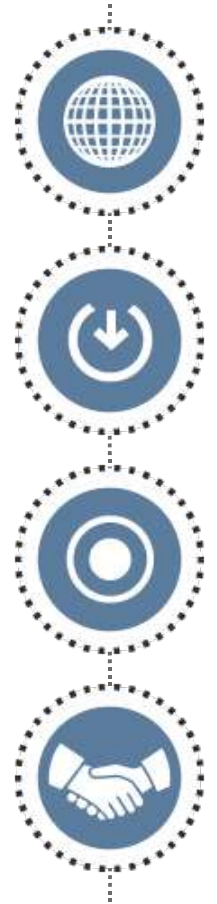
Third Party controls

Business logic, GUI controls, Web Controls, Web Services, Statistics libraries, ...

Is it a pure .NET implementation or just a wrapping of native windows controls or code ?

Is it a clean .NET application ?

The Mono team is working with third party providers for Mono certification.



IDEs

MonoDevelop

- <http://www.monodevelop.com>

Eclipse

Emacs, VIM, ...

VisualStudio.NET



Mono for Windows ???

Now I am confused...



Mono has always been available for Windows

- Sanity Check
- Co-host with Microsoft .NET
- XSP
- GTK#/GTK+ for Windows
- VS.NET plugin, documentation, Gtk# development,
...

Enterprise Services

Provides the features of COM+ in .NET

- MTS
- IIS
- MSMQ

Not implemented in Mono

- Very rarely used
- Soon to be EOL by Indigo APIs
- Very dependent on Windows' internals



Development Community



Mono Development Community.

Mono is an effort lead by Novell.

- 20 Engineers from Novell.
- 300 developers from the Open Source community.
- Benevolent Dictator: Miguel De Icaza

Like other open source efforts, other companies help:

- Embedded system vendors.
- Mainsoft
- SourceGear.

Reuse pieces of open source code:

- Intel's ORP research.
- SGI/HP's Boehm GC.



Mono Development Community.

n different projects: makes it easy to contribute (mostly C#, C)

- Compilers (C#, VB.NET, Nemerle, JavaScript, IronPython, ...)
- Interpreters, JIT compilers (x86, Sparc V9/10, AMD64, PPC, PPC64, S390, S390X, ARM, Linux, MacOS, Windows, Solaris...)
- Virtual Machine
- IDEs (MonoDevelop, Eclipse, Visual Studio .NET)
- APIs (MS compatibility, Mono Exclusive, Third Party)
- Networking & Servers (Remoting, XSP, SOAP), Database access (ADO.NET)
- Native GUIs, Cross Platform GUIs (GTK#, SWF, Cocoa#, others)
- Demo applications, Regression Tests
- Installers, Packaging
- **QA**
- **Docs**



Mono Development Community.

Communication

- **IRC** (irc.gimp.net - #mono)
- Mailing Lists (<http://www.mono-project.com/about/mailling-lists.html>)
- Web Site (<http://www.mono-project.com> & others)
- Blogs (<http://www.go-mono.com/monologue>)



Mono Development Community.

Futures

- ARM
- .NET 2.0
 - XML 2.0
 - ASP.NET 2.0
 - ADO.NET 2.0
 - C# 2.1
- Longhorn
 - Avalon
 - WinFS
 - Indigo
- Mono Specific
 - GUI Builder for GTK#
 - Data binding

Driving Innovation in O.S.S.

The screenshot displays a Linux desktop environment with a dark grey theme. The top panel shows the menu bar with 'Programs', 'System', and 'Help', and the system clock indicating 'Tue Jun 29, 12:59 PM'. The desktop background features a folder icon and a window titled 'Bleeding-Edge Search Tool'. The search tool window has a search bar with the text 'miguel' and a 'Find' button. Below the search bar, the results are categorized into three sections: 'People', 'Email', and 'Pictures'. The 'People' section shows a match for 'Miguel de Icaza' with a profile picture and contact information. The 'Email' section displays a list of 19 matches, including 'Novell: Mono JIT position, the interview', 'Mono Hackers mailing list', and 'RE: [Mono-devel-list] DotGNU competition?'. The 'Pictures' section shows 14 matches, including 'miguel.gif', 'miguel.png', and 'miguel-cutout.xcf'. The desktop environment includes a sidebar with icons for 'Computer', 'nat's Home', 'bar', 'BOD', 'chord', 'Download', and 'engelbar'. The taskbar at the bottom shows the search tool window and other background applications.

Programs System Help Tue Jun 29, 12:59 PM


Computer nat's Home bar BOD chord Download Download engelbar

Communication Not to Brief up

Bleeding-Edge Search Tool

Enter search terms: miguel Find




People -- 1 Match

 **Miguel de Icaza**
miquel@novell.com
IM: icamiquel (AIM)
617-216-7076 (Mobile)

Email -- 19 Matches *Displaying Matches 1 to 10* [Next Matches >>](#)

- Novell: Mono JIT position, the interview.** (Inbox)
From Miguel de Icaza , Nov 1, 2003, 5:06 AM
- Mono Hackers mailing list.** (Inbox)
From Miguel de Icaza , Oct 20, 2003, 6:01 PM
- RE: [Mono-devel-list] DotGNU competition??** (Inbox)
From Miguel de Icaza , Aug 27, 2003, 6:36 PM
- Re: new hirers** (Inbox)
From Carlos Montero-Luque , Aug 22, 2003, 5:09 AM
- Re: LiveCD with XD2** (Drafts)
From Nat Friedman , Jan 1, 0001, 12:00 AM
- [Desktop-bangalore] Linux Bangalore/2003 Update - "Novell Booth"** (Inbox)
From Krishnan R. , Dec 7, 2003, 11:48 AM
- Minutes of the Board meeting Aug 26 2003** (Inbox)
From Jody Goldberg , Aug 29, 2003, 8:53 PM
- GNOME Foundation Elections - Official list of candidates** (Inbox)
From Vincent Untz , Nov 10, 2003, 10:10 AM
- Minutes of the Board meeting 2003 Nov 18** (Inbox)
From Jody Goldberg , Nov 28, 2003, 2:30 PM
- Minutes of the Board meeting 2003 Nov 4** (Inbox)
From Jody Goldberg , Nov 14, 2003, 2:29 PM

Pictures -- 14 Matches *Displaying Matches 1 to 10* [Next Matches >>](#)

-  **miguel.gif**
43.5 kb
Modified: Mar 7, 2001, 1:29 AM
-  **miguel.png**
64 x 96
Truecolor with alpha
8.3 kb
-  **miguel-cutout.xcf**
4.7 Mb
Modified: Jan 7, 2002, 7:49 PM

[NatFriedman-GUADEC-5-Pendulum] Bleeding-Edge Search Tool



Driving Innovation

By improving the developer's productivity on Linux, Mono is driving innovation on the Linux Desktop:

- Beagle/Dashboard
- Simias/iFolder 3.0
- f-spot
- TomBoy
- Desktop (i-print, RedCarpet, Virtual Office)

Mono in Real Life

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Mono Success Stories

City of Munich: ASP.NET

- 350 servers, 150,000 users.

SourceGear: Vault Software 2.0

- Web Services Client to Microsoft .NET

MonoDevelop IDE

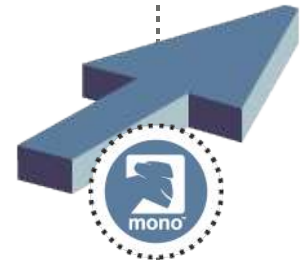
- Ported from Windows in record time.

Novell iFolder

- Cross platform development.

Lee County of Florida, SourceGear, Mainsoft, ...

Mainsoft (MainWin for J2EE), Winfessor, Virtuoso (OpenLink).



Mono

Roadmap (calendar quarters)

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun

1Q04 2Q04 3Q04 4Q04 1Q05 2Q05 3Q05 4Q05 1Q06 2Q06

Mono 1.0

- Open Source multi-platform .NET implementation
- Gtk# 1.0, Java IKVM
- Core tools (C# Compiler, Runtime, Debugger, MonoDoc)
- Supported deployment on Linux (PPC & x86), Windows and MacOS X
- Establishes parity with Microsoft .NET 1.1

Mono 2.0

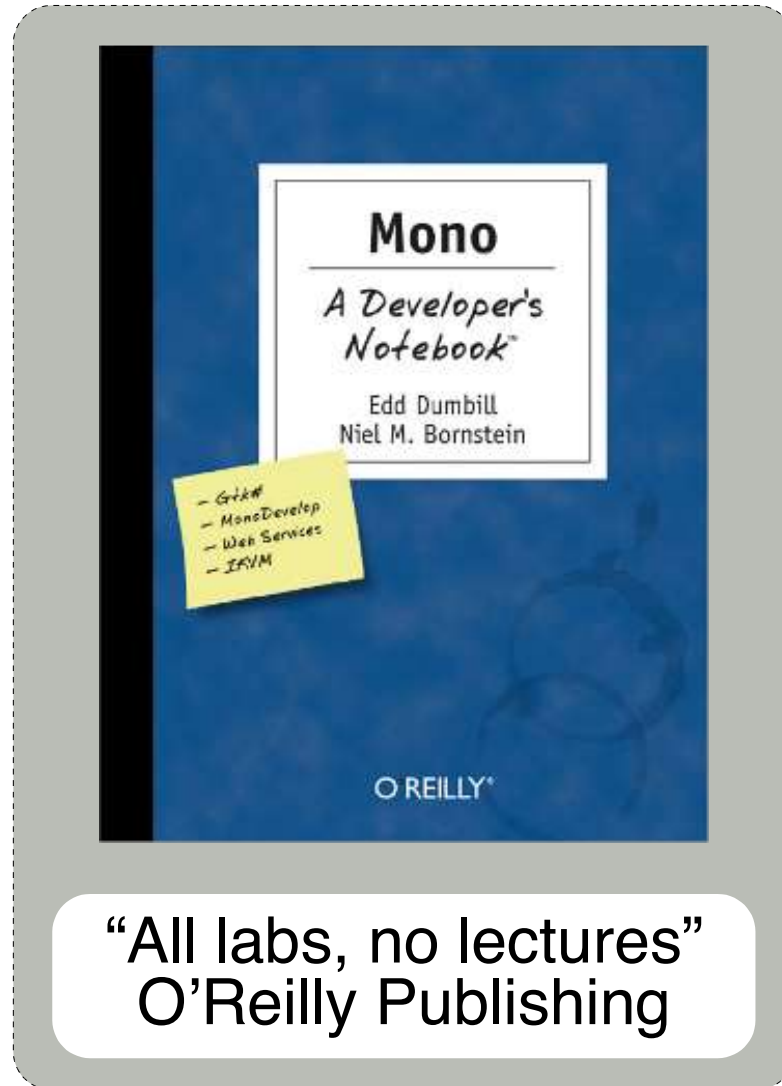
- Establishes parity with Microsoft .NET 2.0
 - ASP.NET 2.0
 - XML 2.0
 - C# 2.1
- Update of Mono Exclusive APIs
- Preview of select Longhorn features

Mono 1.2

- Implementation of Windows.Forms
- Preview of .NET 2.0 features:
 - ASP.NET 2.0 & XML 2.0
 - C# 2.0
- VB.NET 1.0
- GTK# updated for Gnome 2.6 APIs and data bindings support.



Mono - A Developer's Handbook



More Mono



<http://www.mono-project.com>

mono@ximian.com

Questions & Answers

Novell®

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