

Libraries and tools for C++

...0100100100100..01010...
...0100100100100..01010...2
...0100100100100..01010...

FI MUNI
26.11. 2012

Juraj Michálek

blog: <http://georgik.sinusgear.com>

twitter: <http://twitter.com/sinusgear>

Something about me ;-)



Content

- Node.js
 - V8, Node bindings
- Gui
 - QT, FLTK, FLUID, wxWidgets
- Special HW
 - Android NDK, Arduino
- Patterns ACE
- Tools

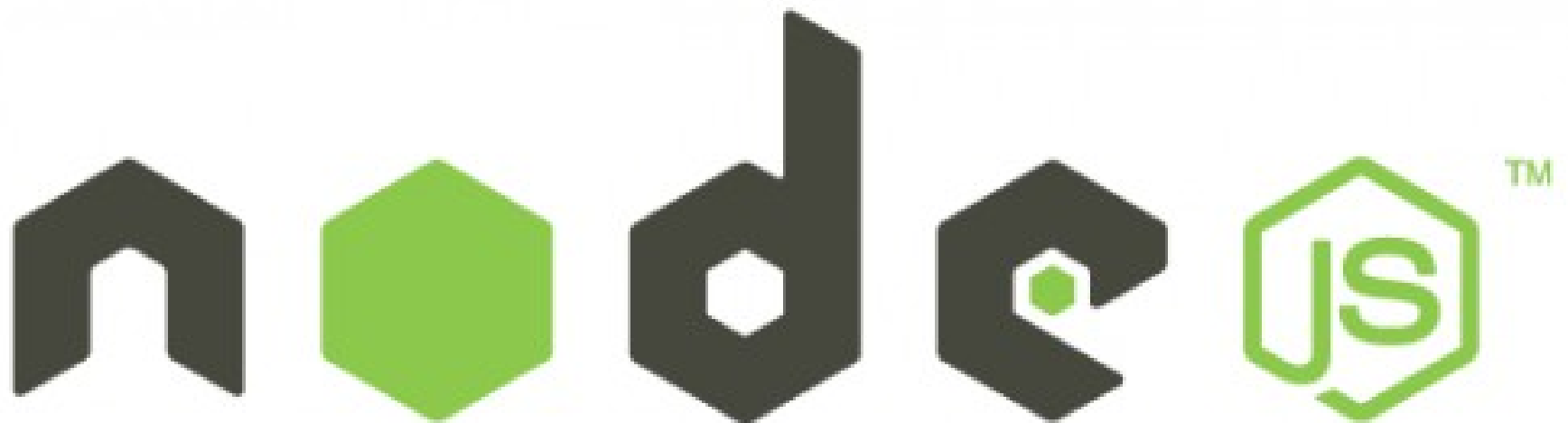
Clone examples

Available at GitHub:

<https://github.com/georgik/fimuni-c-cpp-examples>

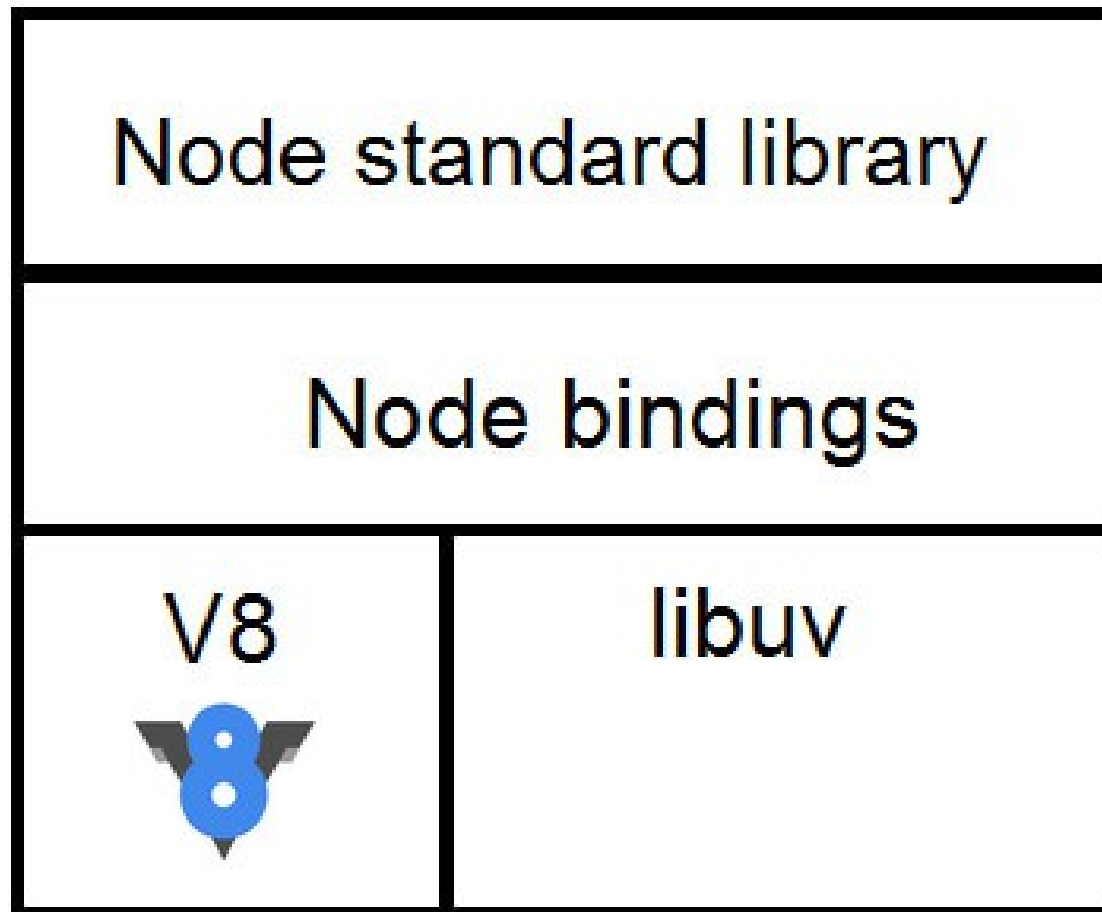
```
git clone git://github.com/georgik/fimuni-c-cpp-examples.git
```





<http://nodejs.org/>

Architecture of Node.js



V8



4x4 Ford V8 engine

V8



Google's open source JavaScript engine
<http://code.google.com/p/v8/>

V8 in context of Chrome



GYP



gyp

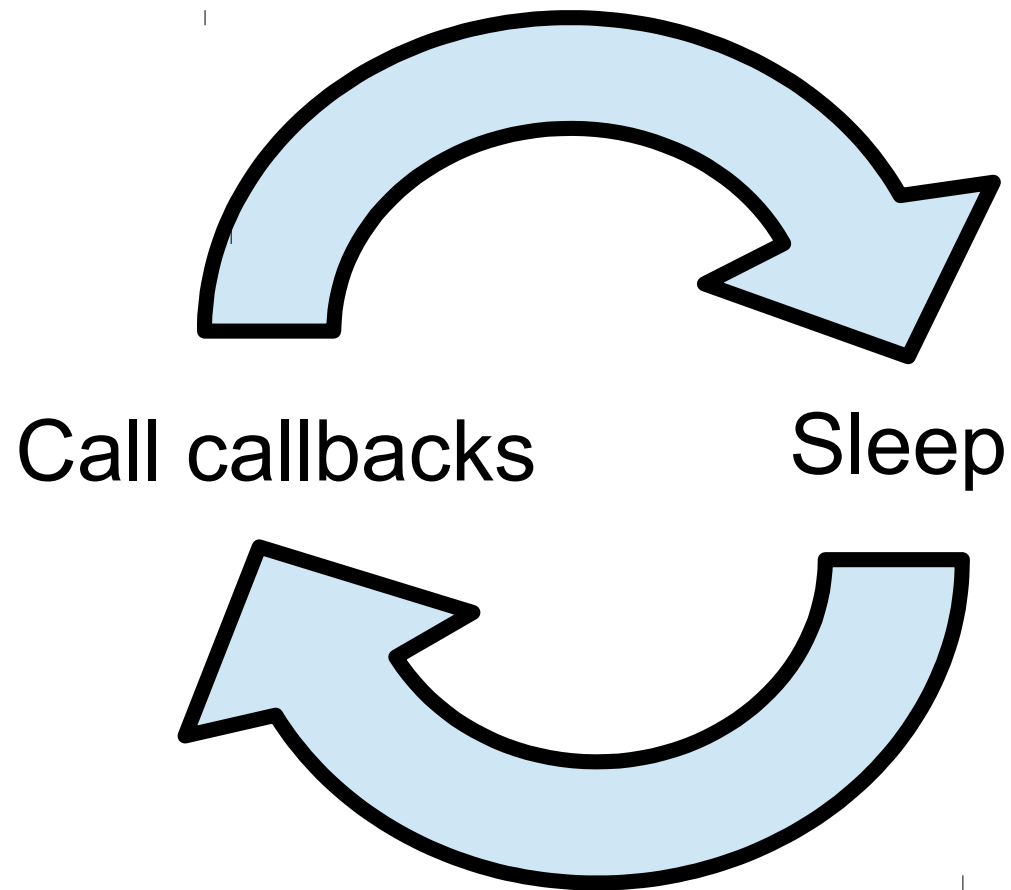
Generate Your Projects

<http://code.google.com/p/gyp/>

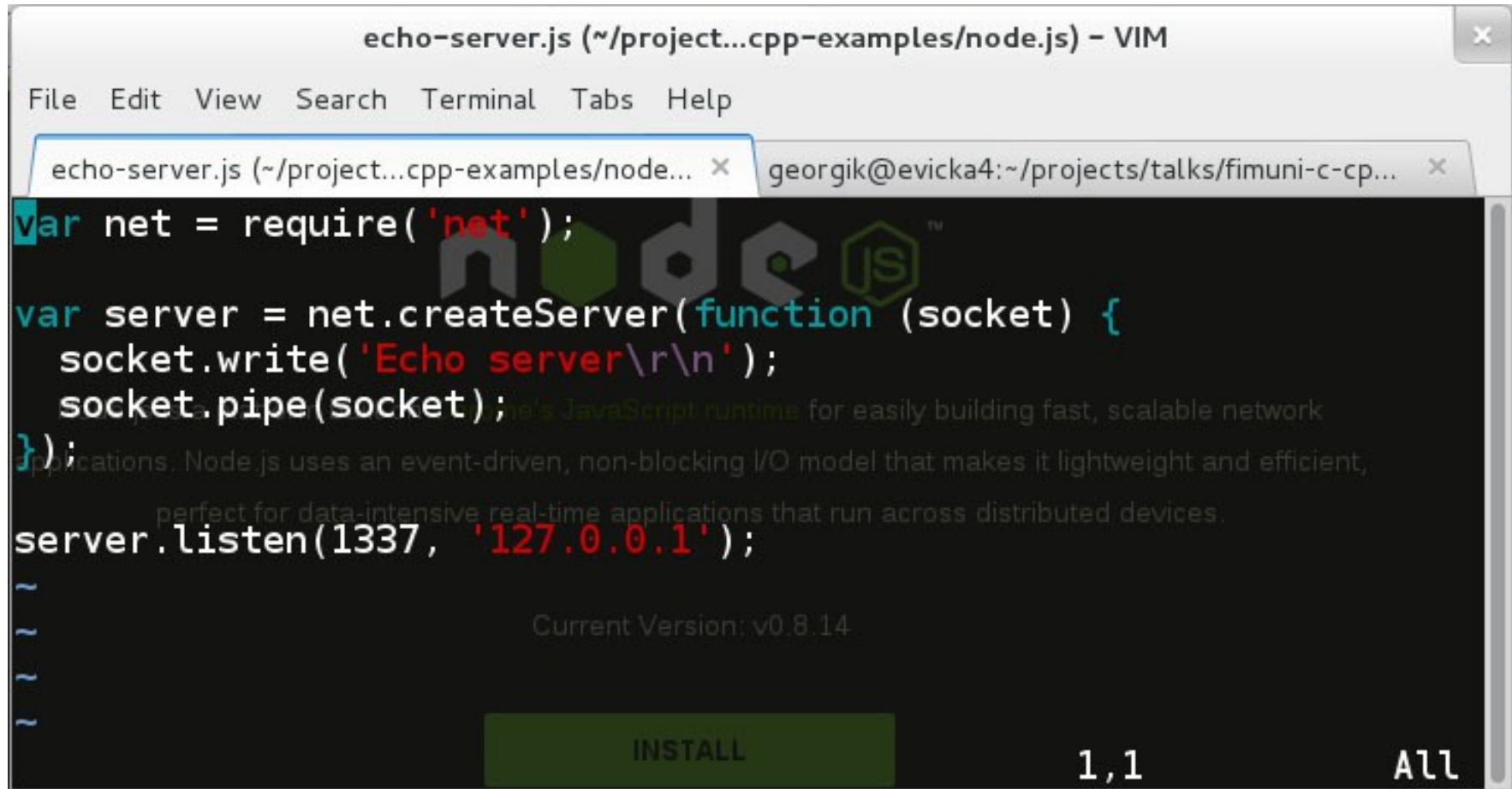
GYP example

```
{
  'targets': [
    {
      'target_name': 'All',
      'type': 'none',
      'dependencies': [
        '../preparser/preparser.gyp:*',
        '../samples/samples.gyp:*',
        '../src/d8.gyp:d8',
        '../test/cctest/cctest.gyp:*',
      ],
    }
  ]
}
```

libuv – event loop



Sample server in JS



The image shows a VIM editor window titled "echo-server.js (~/.project...cpp-examples/node.js) - VIM". The window has a menu bar with "File", "Edit", "View", "Search", "Terminal", "Tabs", and "Help". Below the menu bar, there are two tabs: "echo-server.js (~/.project...cpp-examples/node.js)" and "georgik@evicka4:~/projects/talks/fimuni-c-cp...". The main content area displays the following JavaScript code:

```
var net = require('net');  
var server = net.createServer(function (socket) {  
  socket.write('Echo server\r\n');  
  socket.pipe(socket);  
});  
server.listen(1337, '127.0.0.1');
```

At the bottom of the window, there is a footer with the text "Current Version: v0.8.14" and a green "INSTALL" button. To the right of the button, the text "1,1" and "All" are visible.

Node.js wraps

```
tcp_wrap.cc
├── node
│   ├── AddressToJS(const sockaddr *)
│   ├── ConnectWrap
│   └── TCPWrap
│       ├── ~TCPWrap()
│       ├── AfterConnect(uv_connect_t *, in
│       ├── Bind(const Arguments &)
│       ├── Bind6(const Arguments &)
│       └── Connect(const Arguments &)
│           ├── Connect6(const Arguments &)
│           ├── GetPeerName(const Arguments
│           ├── GetSockName(const Argument
│           └── Initialize(Handle<Object>)
```

```
Handle<Value> TCPWrap::Connect(const Arguments& args) {
    HandleScope scope;

    UNWRAP(TCPWrap)

    String::AsciiValue ip_address(args[0]);
    int port = args[1]->Int32Value();

    struct sockaddr_in address = uv_ip4_addr(*ip_address, port);

    // I hate when people program C++ like it was C, and yet I do it too.
    // I'm too lazy to come up with the perfect class hierarchy here. Let's
    // just do some type munging.
    ConnectWrap* req_wrap = new ConnectWrap();
```

Knižnica



- ClanLib game Simple Development Kit
- <http://www.clanlib.org>

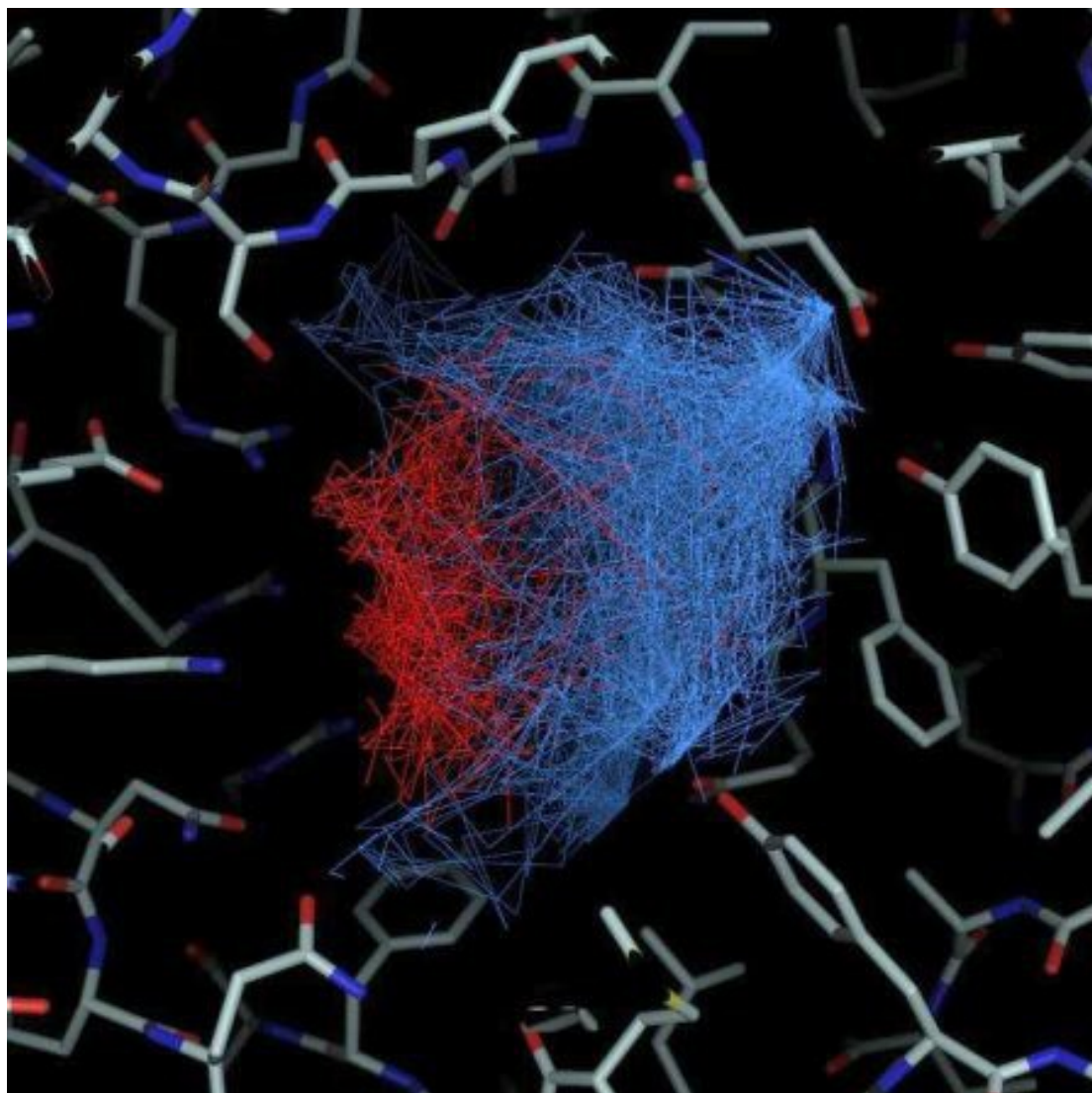
Knižnica

- ➔ Mesa



- <http://mesa3d.sourceforge.net>

Dino



GUI



Graphic User Interface

Vhodné knihovny



QT

FLTK

wxWidgets

QT



Code less.
Create more.
Deploy everywhere.

Nokia:

<http://qt.nokia.com>

QT

- produkt firmy Trolltech, neskôr Nokia
- licencie: open source aj komrčné
- knižnica vznikla v roku 1996
- podporuje C++ a Javu

Platformy

- MS/Windows
- Unix/X11 - Linux, Sun Solaris, HP-UX, Compaq Tru64 UNIX, IBM AIX, IRIX, Mac OS X
- Embedded - Linux platforms with framebuffer support.

Code less.

Create more.

Deploy everywhere.

C++
Java



Windows
Mac OS
Linux/X11
Windows CE
Embedded Linux
S60 (coming soon)

QT Creator IDE

- nástroj na tvorbu GUI
- rozvrhnutú plochu ukladá do XML súboru
- z XML definície sa generuje kód programu



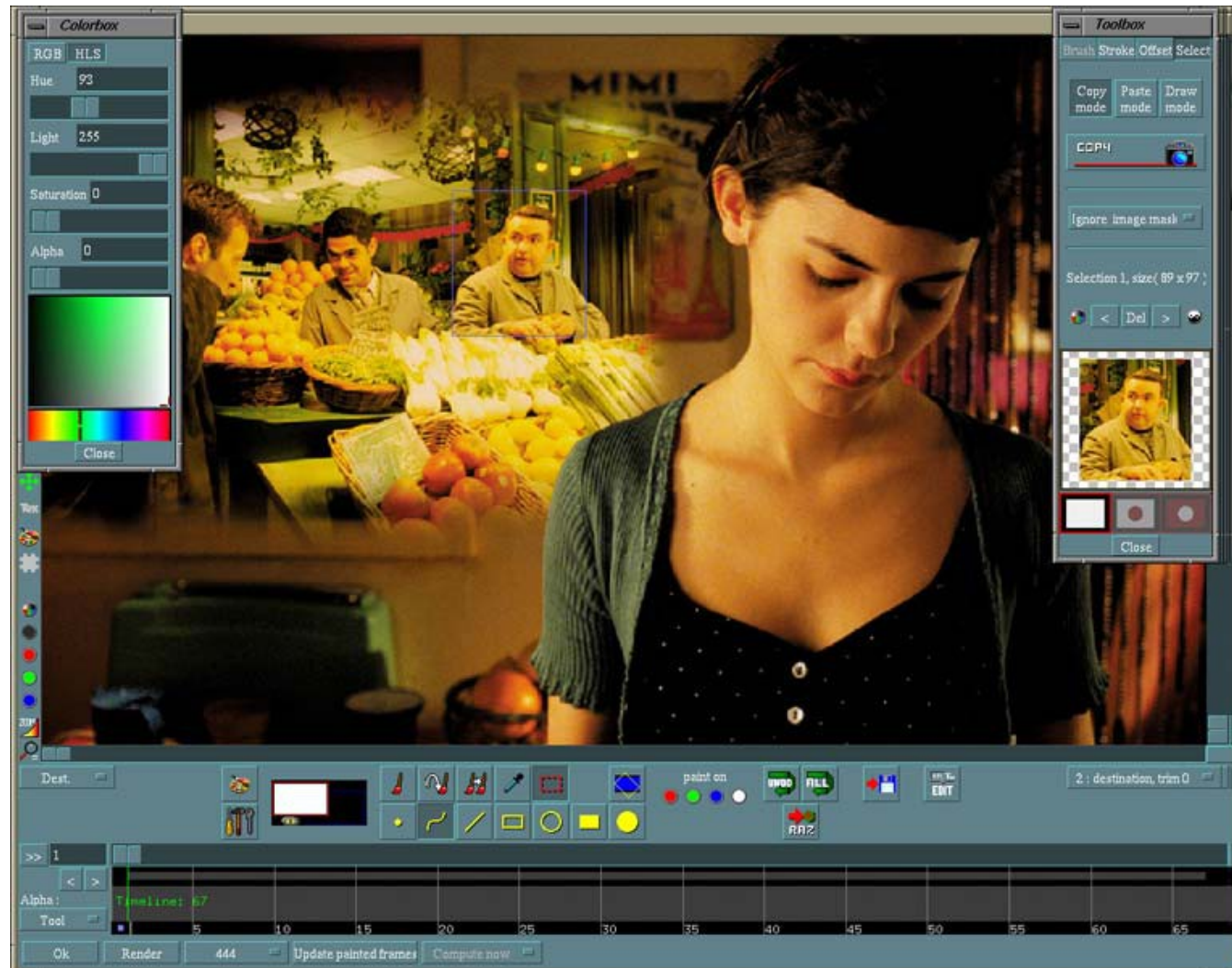
Kompilácia

- uloženie projektu
- vytvorenie Makefile z projektu
 - `qmake -o Makefile test.pro`
- kompilácia
 - `make`

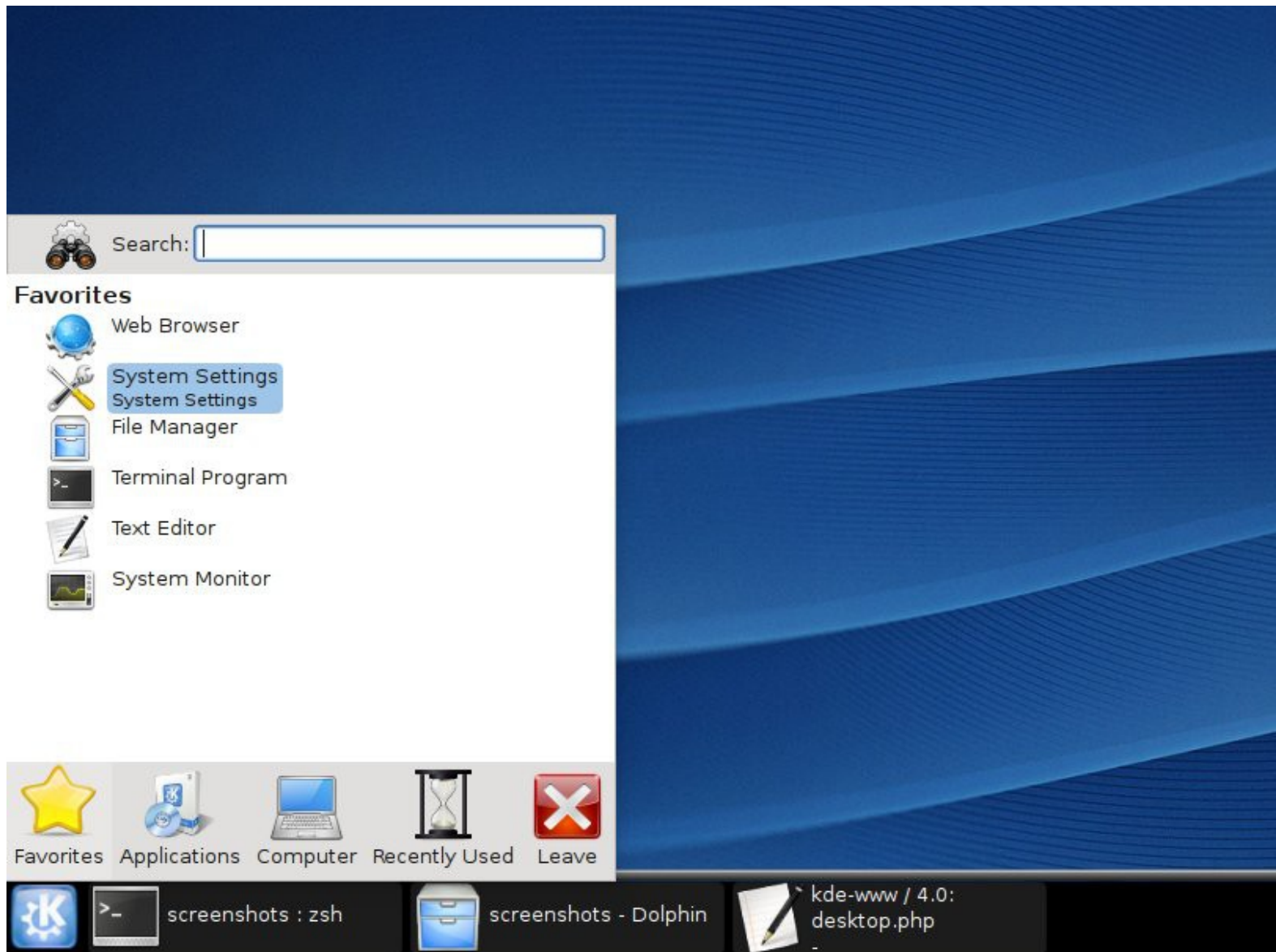
Linguist

- nástroj na preklad aplikácii
- umožňuje oddeliť kód od textov
- prekladateľ a programátor pracujú samostatne

Amélia



KDE



FLTK



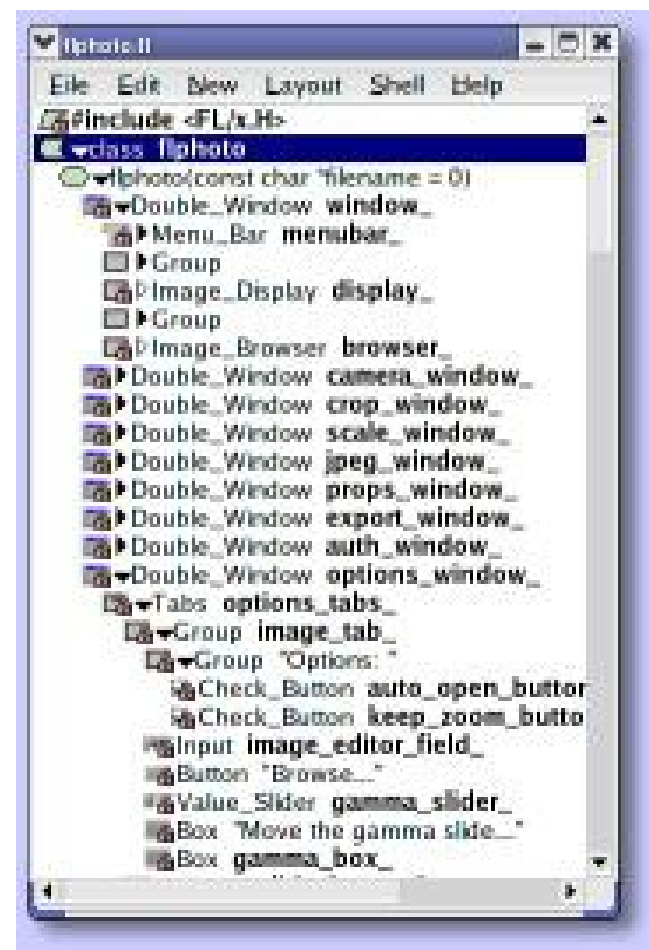
<http://www.fltk.org>

Knižnica FLTK

- The Fast Light Tool Kit
- Autor: Bill Spitzak
- venoval sa vývoju rozhraní pre Sun Microsystems
- veľa myšlienok zjednodušil a vložil do kitu
- nízko-úrovňová kompatibilita - 10% odlišnosti

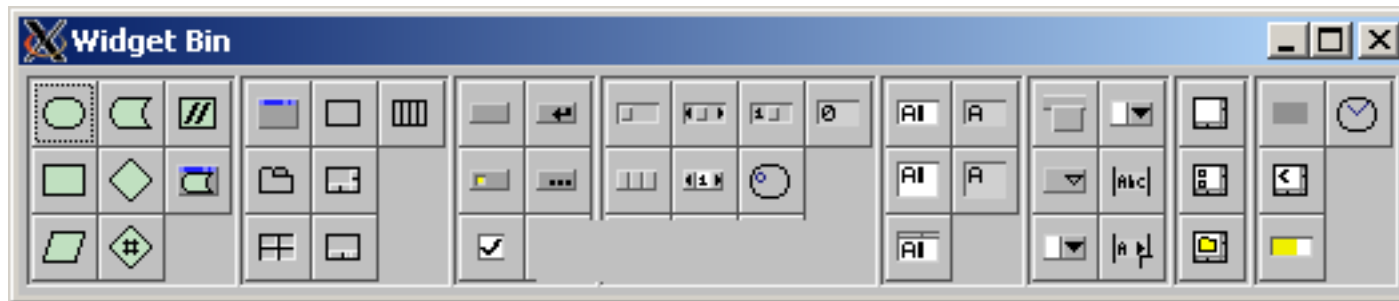
Platformy

- Unix, Linux
- Microsoft Windows
- MacOS
- s podporou OpenGL a GLUT



FLUID

- Fast Light User-Interface Designer
- jednoduchý designer na tvorbu GUI

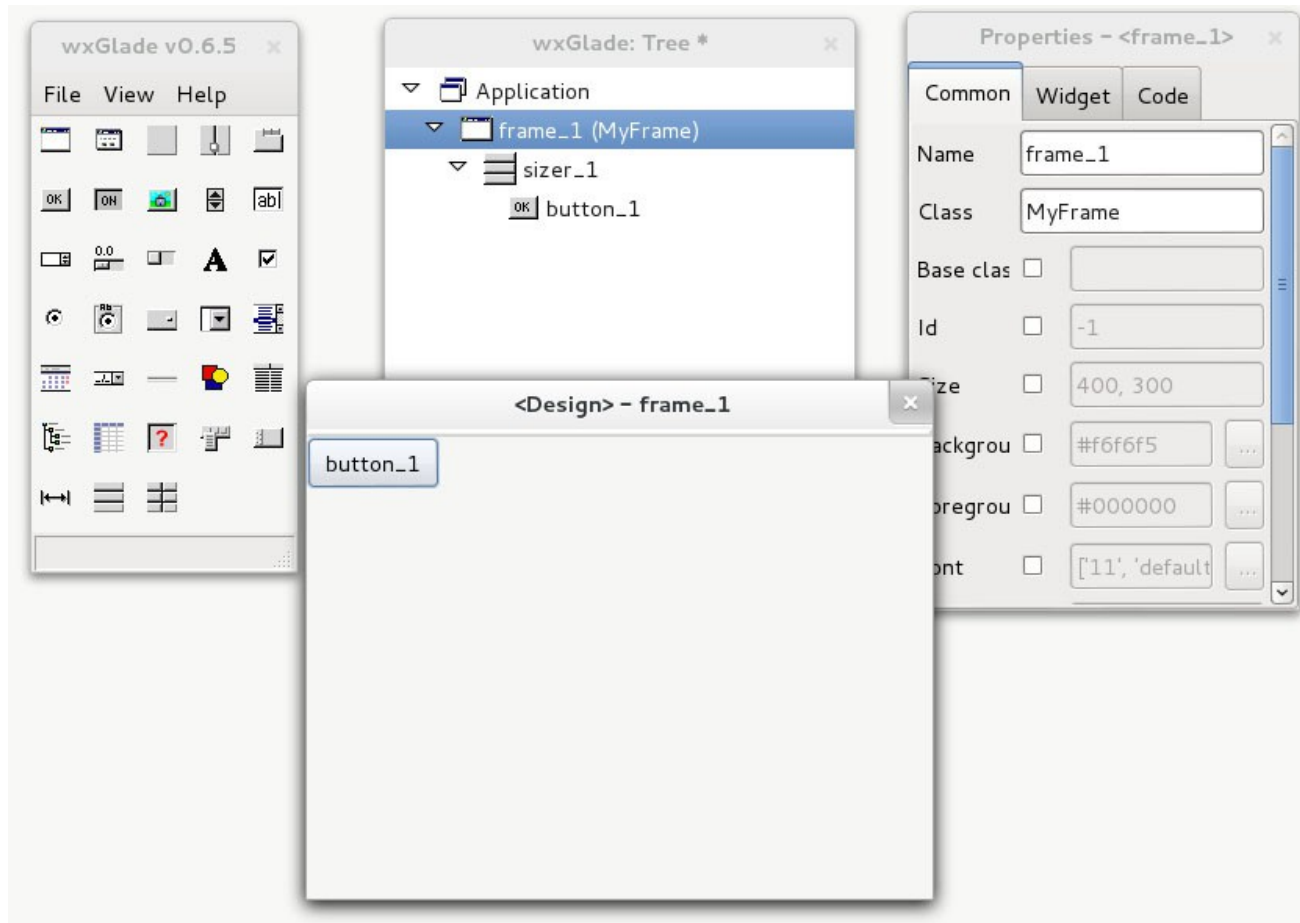


wxWidget



<http://www.wxwidgets.org/>

wxGlade



Android – Native Development Kit



ANDROID
developers

- ➔ <http://developer.android.com/sdk/ndk/>
- ➔ **Pozor!**
 - ➔ App nemusí byť optimálnejšia než napísaná v Java

NDK

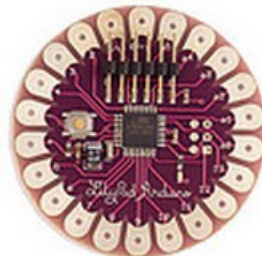
- stiahnut' SDK a NDK
- `export PATH=$PATH:/cesta/sdk/tools:/cesta/ndk`
- `cd /cesta/ndk/samples/hello-jni`
- `android update project -p . -s`
- `ndk-build`
- `ant debug`

Adobe Alchemy

- zaujímavý experiment
- C/C++ kód skompilovaný pre FlashPlayer
 - AVM2
- prenositeľnosť
 - príklad: Doom
 - <http://labs.adobe.com>



Arduino



➔ <http://www.arduino.cc/playground/Interfacing/CPPWindows>

ACE

- The ADAPTIVE Communication Environment
 - <http://www.cs.wustl.edu/~schmidt/ACE.html>
- Open source C++ framework
 - reactor, proactor
 - acceptor, connector



Java Native Interface - JNI

```
public class HelloWorld {  
    private native void sayHello();  
  
    public static void main(String[] args) {  
        System.loadLibrary("library");  
        new HelloWorld().sayHello();  
    }  
}
```







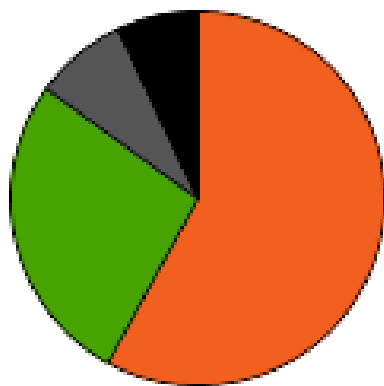
<http://www.boost.org>

- “...one of the most highly regarded and expertly designed C++ library projects in the world.”
 - Herb Sutter and Andrei Alexandrescu

Boost

LANGUAGES

	C++	58%
	HTML	27%
	XML	8%
	Other	7%



Boost C++ Libraries, updated 01 Oct 2010

more at chloh.com/cpp

PROJECT COST

This calculator estimates how much it would cost to hire a team to write this project from scratch.

Include	<input type="text" value="Markup And Code"/>
Codebase	17,215,641 LOC
Effort (est.)	5426 Person Years
Avg. Salary	<input type="text" value="\$55000"/> /year
	\$298,442,657

Boost C++ Libraries, updated 01 Oct 2010 more at chloh.com/cpp

Boost Test Library

- Test everything that could possibly break
- jednoduchá tvorba testovacích prípadov
- TestSuite – TestCase
- test je spustiteľný program
- bjam integruje spúšťanie testov



TestCase

```
using namespace boost::unit_test_framework;
```

```
/**  
 * Test basic marshaller functionality  
 */  
void testServerQuery()  
{  
    ServerQuery query = ServerQuery();  
  
    query.session = "112";  
    query.userId = "janko";  
  
    BOOST_CHECK_EQUAL( query.sessionAsChar(), "112" );  
    BOOST_CHECK_EQUAL( query.userIdAsChar(), "janko" );  
}
```



Jam



- náhrada Makefile
- rozšíriteľné funkcie
- automatická detekcia header files
- prenositeľné: Unix, Windows, VMS, Mac
- malý CPU overhead
- build obrovských projektov
- škálovateľné

jam + TestCase

- Jamfile (Jamroot)
 - import testing ;
 - run tests/testServerQuery.cpp server ;
- Shell
 - \$ bjam
 - ...patience...
 - ...found 2 targets...
 - ...updating 2 targets...
 - *** test passed ***

Valgrind

debugging a profiling

memcheck

helgrind - race condition, thread profiling



Modes debugger



Local application

Attach to local process

Attach to remote process

Post-mortem

Application crashed

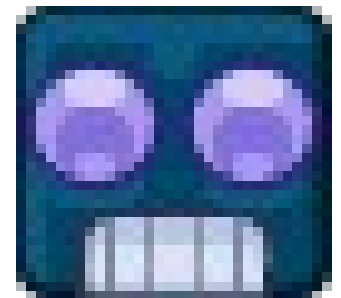


Post-mortem analysis

Image from memory: coredump

Quick analysis of coredump

```
(georgik@traper:pts/6)~--(/tmp)
(10:43: )~--(Št,okt15)
(georgik@traper:pts/6)~--(/tmp)
(10:44: )~--(Št,okt15)
[1] 532
(georgik@traper:pts/6)~--(/tmp)
(10:44: )~--(Št,okt15)
[1] + quit (core dumped) xeyes
(georgik@traper:pts/6)~--(/tmp)
(10:44: )~--(Št,okt15)
gdb /usr/bin/xeyes core
(no debugging symbols found)
Core was generated by `xeyes'.
Program terminated with signal 3, Quit.
#0  0xb802f424 in __kernel_vsyscall ()
(gdb) bt full ←
#0  0xb802f424 in __kernel_vsyscall ()
No symbol table info available.
#1  0xb7dbd42b in poll () from /lib/i686/cmov/libc.so.6
No symbol table info available.
#2  0xb7fdb2f7 in _XtWaitForSomething () from /usr/lib/libXt.so.6
No symbol table info available.
#3  0xb7fdc75b in XtAppNextEvent () from /usr/lib/libXt.so.6
```



Strace

```
georgik@pidi:/tmp | 80x24 | pts/0
File Edit View Search Terminal Help
open("sse2/libpthread.so.0", 0_RDONLY) = -1 ENOENT (No such file or directory)
open("cmov/libpthread.so.0", 0_RDONLY) = -1 ENOENT (No such file or directory)
open("libpthread.so.0", 0_RDONLY) = -1 ENOENT (No such file or directory)
access("/etc/ld.so.nohwcap", F_OK) = -1 ENOENT (No such file or directory)
open("/lib/i386-linux-gnu/i686/cmov/libpthread.so.0", 0_RDONLY) = 3
read(3, "\177ELF\1\1\1\0\0\0\0\0\0\0\0\0\3\0\3\0\1\0\0\0\220L\0\0004\0\0\0"...
512) = 512
fstat64(3, {st_mode=S_IFREG|0755, st_size=117009, ...}) = 0
mmap2(NULL, 98816, PROT_READ|PROT_EXEC, MAP_PRIVATE|MAP_DENYWRITE, 3, 0) = 0xb75
31000
mmap2(0xb7546000, 8192, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_DENYWRIT
E, 3, 0x14) = 0xb7546000
mmap2(0xb7548000, 4608, PROT_READ|PROT_WRITE, MAP_PRIVATE|MAP_FIXED|MAP_ANONYMOU
S, -1, 0) = 0xb7548000
close(3) = 0
open("tls/i686/sse2/cmov/libattr.so.1", 0_RDONLY) = -1 ENOENT (No such file or d
irectory)
open("tls/i686/sse2/libattr.so.1", 0_RDONLY) = -1 ENOENT (No such file or direct
ory)
open("tls/i686/cmov/libattr.so.1", 0_RDONLY) = -1 ENOENT (No such file or direct
ory)
open("tls/i686/libattr.so.1", 0_RDONLY) = -1 ENOENT (No such file or directory)
open("tls/sse2/cmov/libattr.so.1", 0_RDONLY) = -1 ENOENT (No such file or direct
ory)
```

Mutextrace

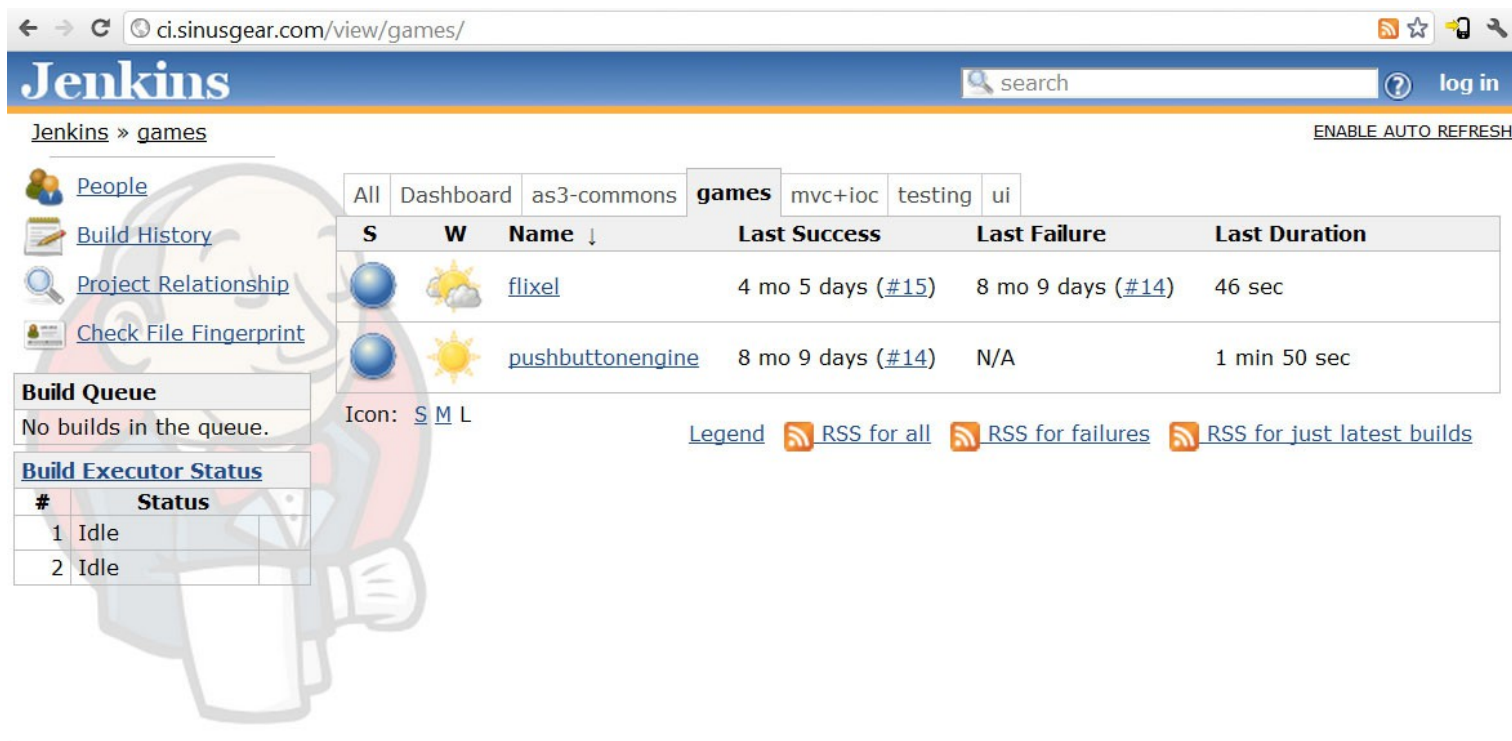
- ➔ mutextrace ./mutex-tester-app param1 param2
 - ➔ lock #1, free -> thread 1
 - ➔ init #2
 - ➔ lock #2, free -> thread 1
 - ➔ unlock #1
 - ➔ lock #1, free -> thread 1
 - ➔ init #3
 - ➔ lock #3, free -> thread 1
 - ➔ unlock #1

Maven pre C++




- web: <http://maven.apache.org>
 - mvn [parametre|ciele]
- súbor s definíciou projekt
 - pom.xml
- plugin pre C++
 - native-maven-plugin

Kontinuálna integrácia

- rýchla kontrola po commite
- Jenkins CI – príklad:
 - <http://ci.sinusgear.com>

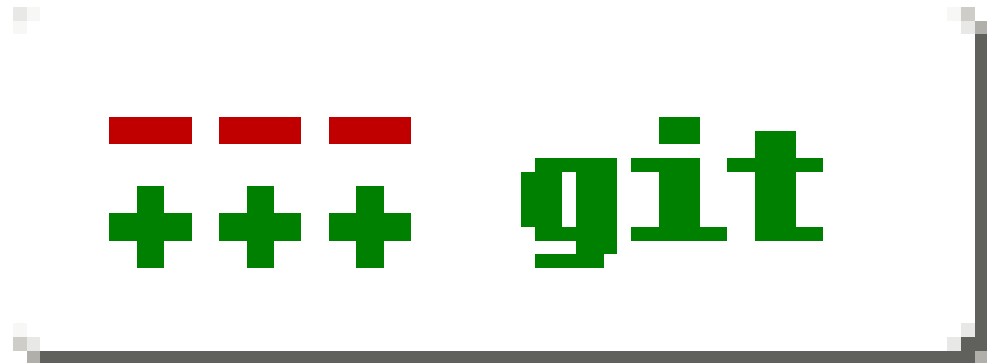


The screenshot shows the Jenkins web interface for the 'games' project. The browser address bar displays 'ci.sinusgear.com/view/games/'. The page header includes the Jenkins logo, a search bar, and a 'log in' link. Below the header, there are navigation links for 'People', 'Build History', 'Project Relationship', and 'Check File Fingerprint'. The main content area features a table with columns for 'S', 'W', 'Name', 'Last Success', 'Last Failure', and 'Last Duration'. The table lists two builds: 'fixel' and 'pushbuttonengine'. The 'fixel' build has a status of 'Success' (blue sun icon) and a last success time of '4 mo 5 days (#15)'. The 'pushbuttonengine' build has a status of 'Success' (blue sun icon) and a last success time of '8 mo 9 days (#14)'. Below the table, there is a 'Build Queue' section indicating 'No builds in the queue.' and a 'Build Executor Status' table showing two executors in an 'Idle' state. The footer of the page includes the text 'Page generated: Nov 17, 2011 6:06:44 PM' and 'Jenkins ver. 1.420'.

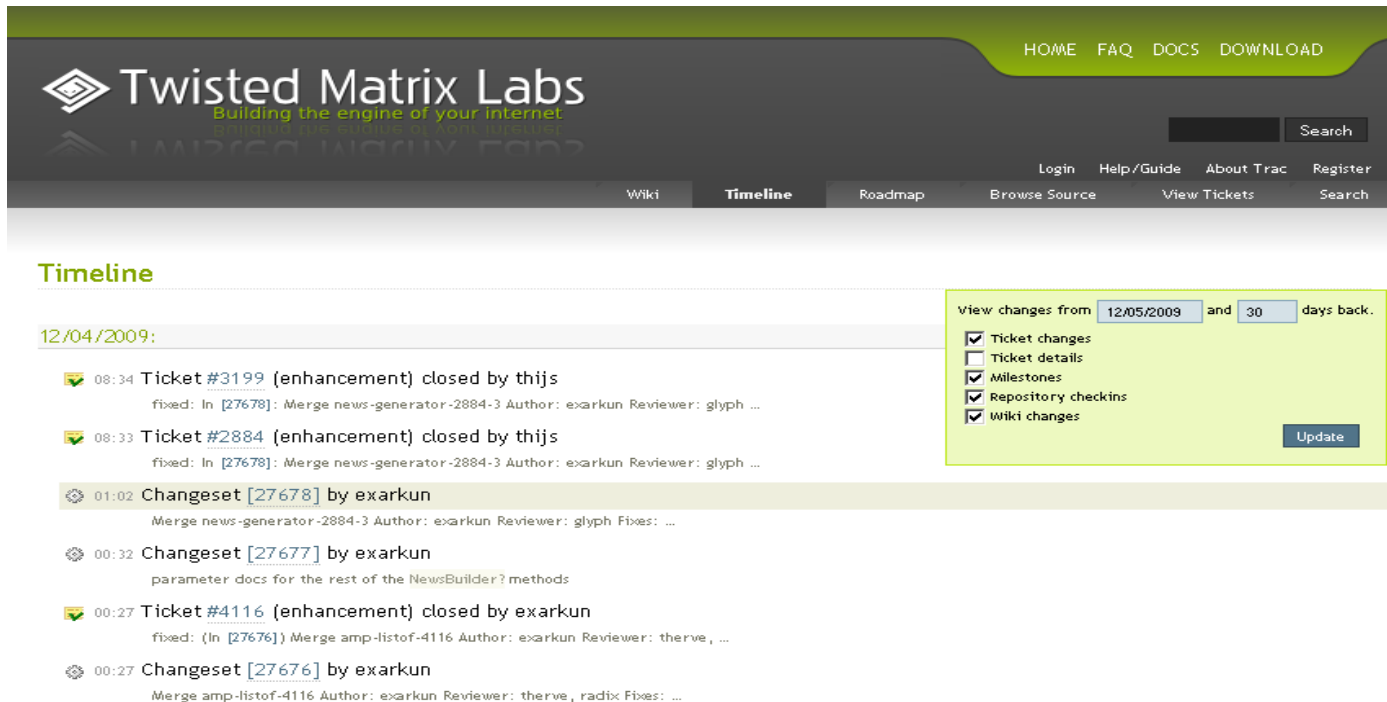
S	W	Name ↓	Last Success	Last Failure	Last Duration
		fixel	4 mo 5 days (#15)	8 mo 9 days (#14)	46 sec
		pushbuttonengine	8 mo 9 days (#14)	N/A	1 min 50 sec

GIT

- oproti SVN možnost lokálních commitov
- Social Coding
 - <http://www.github.com>



- Source Control & Project Management
 - <http://trac.edgewall.org>
 - <http://trac-hacks.org/>



The screenshot displays the Trac web interface for Twisted Matrix Labs. The header includes the company logo and name, navigation links (HOME, FAQ, DOCS, DOWNLOAD), a search bar, and user options (Login, Help/Guide, About Trac, Register). The main content area is titled "Timeline" and shows a list of changes from December 4, 2009. A control panel on the right allows filtering the view by ticket changes, milestones, repository checkins, and wiki changes.

Twisted Matrix Labs
Building the engine of your internet

HOME FAQ DOCS DOWNLOAD

Search

Login Help/Guide About Trac Register

Wiki **Timeline** Roadmap Browse Source View Tickets Search

Timeline

12/04/2009:

- 08:34 Ticket #3199 (enhancement) closed by thijs
fixed: In [27678]: Merge news-generator-2884-3 Author: exarkun Reviewer: glyph ...
- 08:33 Ticket #2884 (enhancement) closed by thijs
fixed: In [27678]: Merge news-generator-2884-3 Author: exarkun Reviewer: glyph ...
- 01:02 Changeset [27678] by exarkun
Merge news-generator-2884-3 Author: exarkun Reviewer: glyph Fixes: ...
- 00:32 Changeset [27677] by exarkun
parameter docs for the rest of the NewsBuilder? methods
- 00:27 Ticket #4116 (enhancement) closed by exarkun
fixed: (In [27676]) Merge amp-listof-4116 Author: exarkun Reviewer: therve, ...
- 00:27 Changeset [27676] by exarkun
Merge amp-listof-4116 Author: exarkun Reviewer: therve, radix Fixes: ...

View changes from 12/05/2009 and 30 days back.

- Ticket changes
- Ticket details
- Milestones
- Repository checkins
- Wiki changes

Update

GNU a Windows

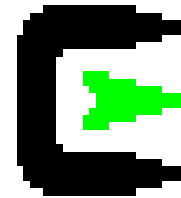
- Minimalist GNU For Windows

- <http://www.mingw.org>

- Cygwin

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

- <http://cygwinports.dotsrc.org/>



Python



- silný objektovo orientovaný jazyk
- platformovo nezávislý
- integrovateľný s C a C++
 - <http://www.python.org>
 - <http://www.py.cz>



Twisted

- udalost'ami riadený sieťový framework
- podpora TCP, UDP, SSL/TLS, multicast
- Unix sockets
- veľké množstvo protokolov
 - HTTP, NNTP, IMAP, SSH, IRC, FTP...
 - <http://twistedmatrix.com/trac/>

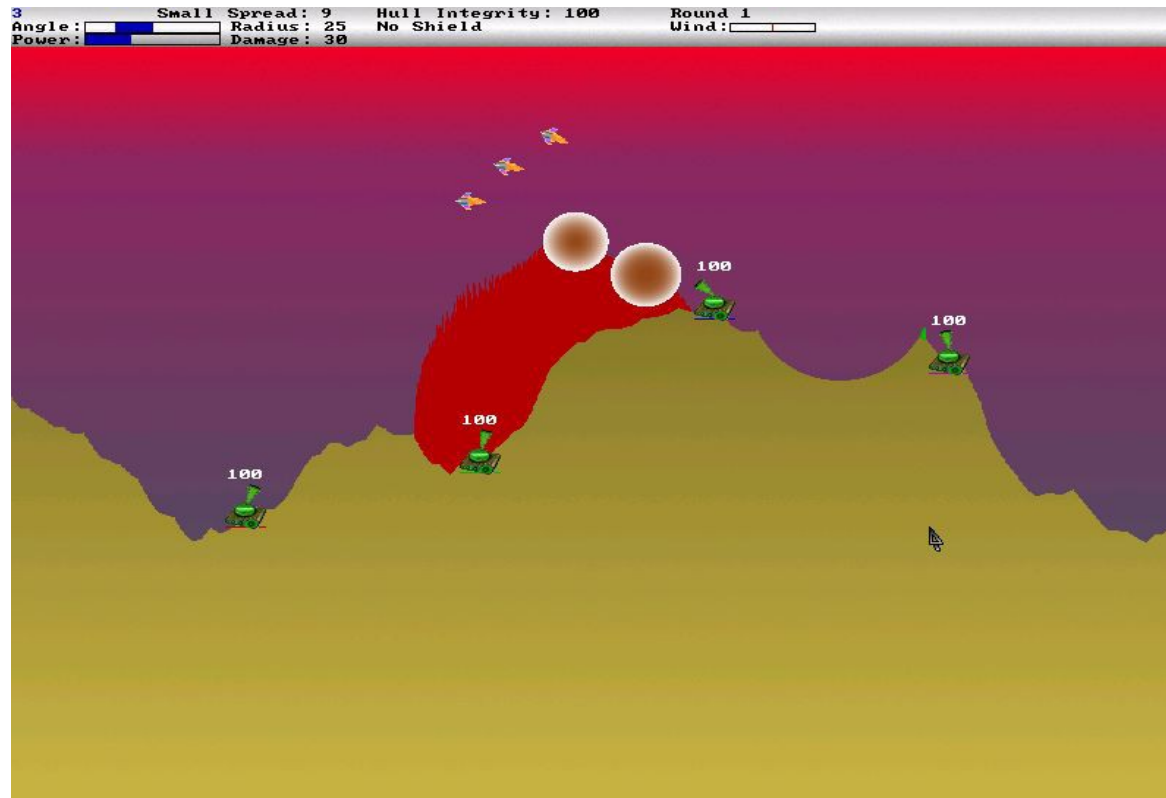


Project

- GitHub
 - <http://www.github.com>
- Google Code
 - <http://code.google.com/opensource>
- SourceForge
 - <http://sourceforge.net>
- FreeCode
 - <http://freecode.com>
- CodePlex – MS Platforma
 - <http://codeplex.com>



Atomic Tanks as open source



Open source it.
Somebody can continue in your work
<http://atanks.sf.net>

Ohloh

Compare open source projects
<http://www.ohloh.net>



Include	<input type="text" value="Markup And Code"/>
Codebase	385,818
Effort (est.)	102 Person Years
Avg. Salary	\$ <input type="text" value="55000"/> year
\$ 5,598,652	



se-radio.net



<http://www.se-radio.net>

A je tu záver

Otázky?

EOF

...0100100100100..01010...
...0100100100100..01010...2
...0100100100100..01010...

FI MUNI, Brno 2012
Juraj Michálek

blog: <http://georgik.sinusgear.com>
twitter: <http://twitter.com/sinusgear>