

There is more to C

26.11. 2012

FI MUNI

Juraj Michálek

<http://georgik.sinusgear.com>

<http://twitter.com/sinusgear>

Something about me ;-)



Content

Why C rocks?



libuv



The GTK+ Project

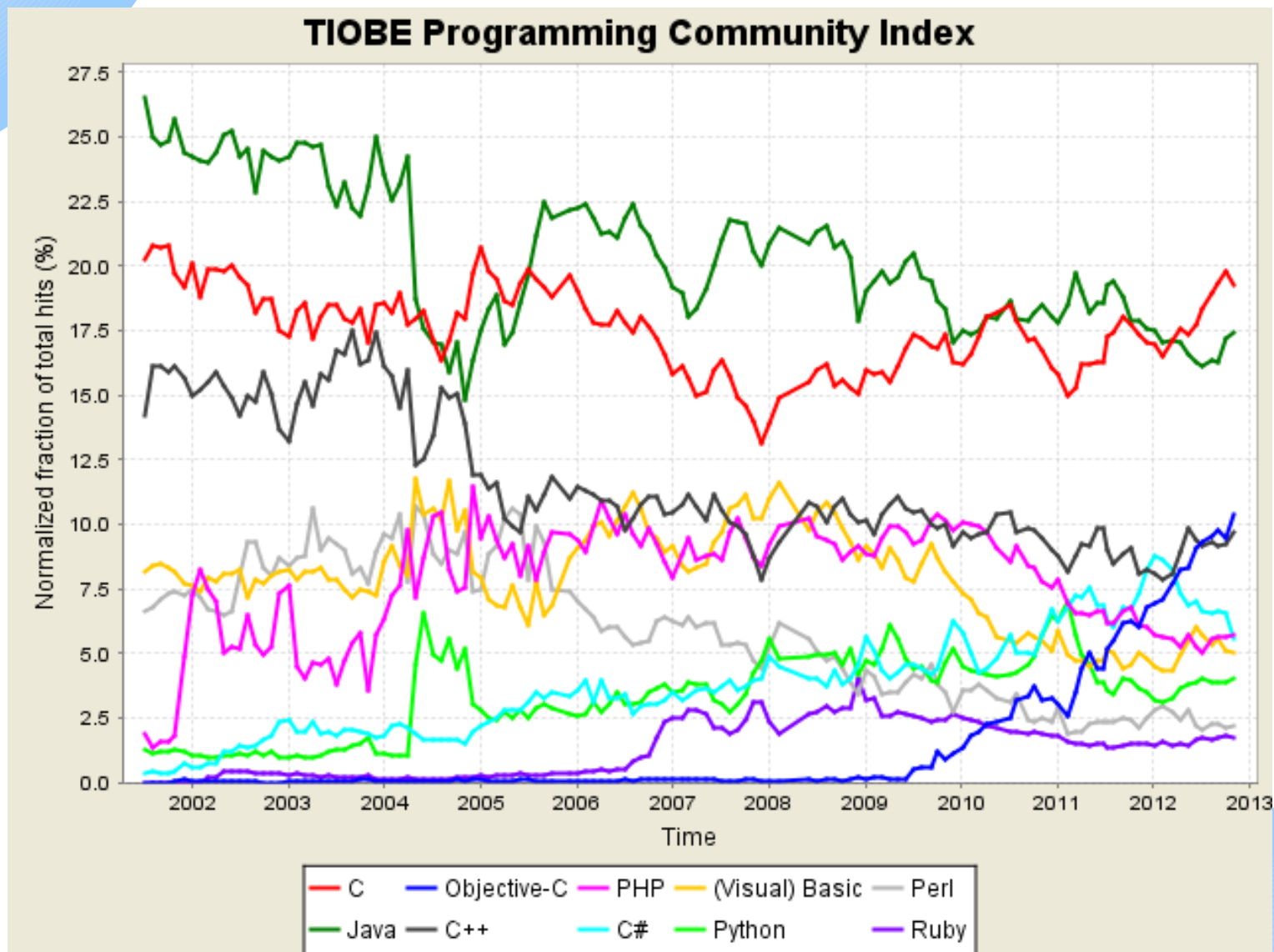


#1 language 2012

Position Nov 2012	Position Nov 2011	Delta in Position	Programming Language	Ratings Nov 2012	Delta Nov 2011	Status
1	2	↑	C	19.224%	+1.90%	A
2	1	↓	Java	17.455%	-0.42%	A
3	6	↑↑↑	Objective-C	10.383%	+4.40%	A
4	3	↓	C++	9.698%	+1.61%	A
5	5	=	PHP	5.732%	-0.36%	A
6	4	↓↓	C#	5.591%	-1.73%	A
7	7	=	(Visual) Basic	5.032%	-0.01%	A
8	8	=	Python	4.062%	+0.45%	A
9	10	↑	Perl	2.182%	+0.10%	A
10	11	↑	Ruby	1.739%	+0.24%	A
11	9	↓↓	JavaScript	1.278%	-1.29%	A
12	16	↑↑↑↑	Delphi/Object Pascal	0.995%	+0.12%	A
13	13	=	Lisp	0.951%	-0.23%	A
14	14	=	Pascal	0.881%	-0.11%	A
15	23	↑↑↑↑↑↑↑	Visual Basic .NET	0.769%	+0.24%	A-
16	19	↑↑↑	Ada	0.662%	+0.04%	B
17	12	↓↓↓↓	PL/SQL	0.632%	-0.81%	B
18	18	=	Lua	0.631%	0.00%	A-
19	15	↓↓↓↓	MATLAB	0.620%	-0.34%	B
20	24	↑↑↑↑	Assembly	0.585%	+0.06%	B

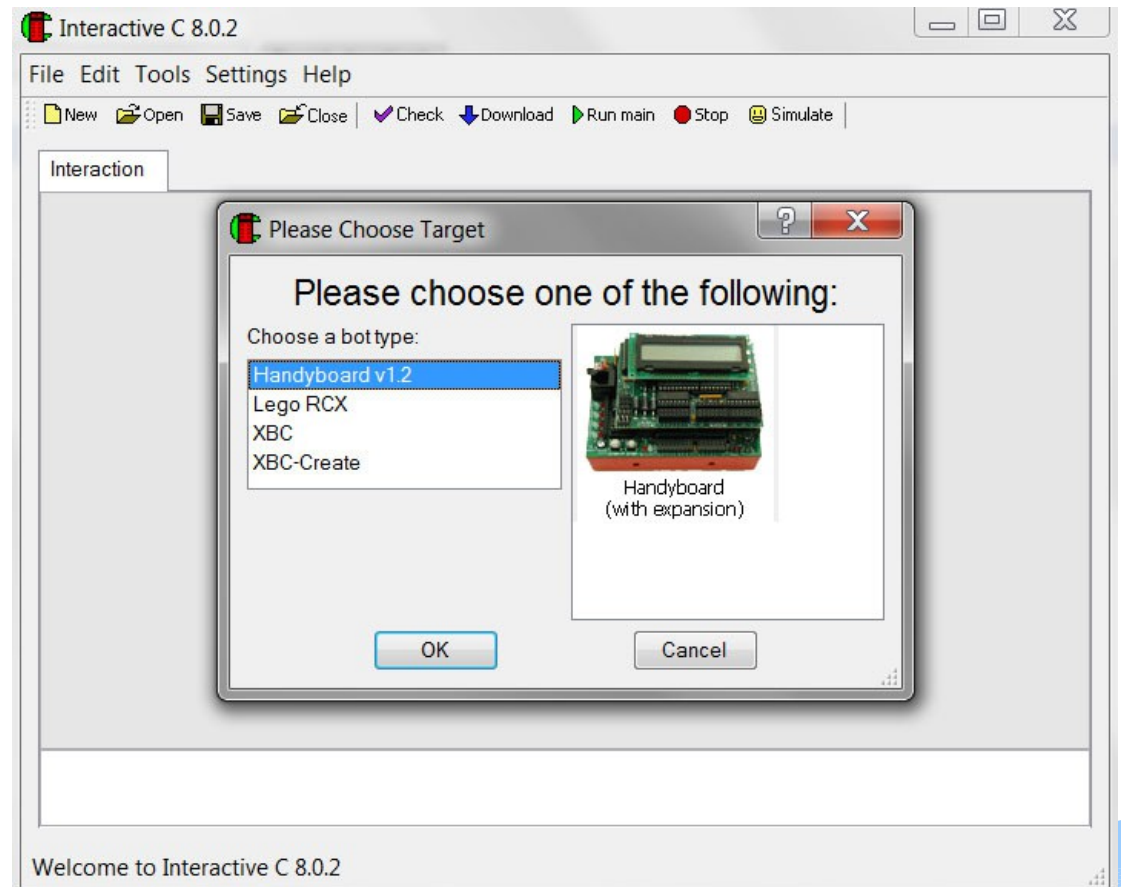
<http://www.tiobe.com>

Trends



Interactive C - Robot

- Handyboard
- Motorola 68AX11
- derived from C
- <http://www.kipr.org>
- <http://www.boatball.org>



Portability

Linux – Windows – Mac – BSD

***Unix/Windows
Porting
Dictionary***



<http://suacommunity.com/>

Clone examples



Available at GitHub:

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

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

Allegro



Allegro Low Level Game Routines

Allegro - features

keyboard, mouse, touch screen
audio, video, graphics
timers, events
data files

Allegro 5.1

Win, Lin, Mac

iOS, Android

<http://alleg.sourceforge.net/a5docs/refman/>

Initialization

```
al_init();
```

Graphic environment

```
al_create_display(int w, int h)
```

ALLEGRO_BITMAP

Structure for bitmaps

```
ALLEGRO_BITMAP *bmp = create_bitmap(x,y);
```

Graphics

```
al_putpixel(x, y, color)
```

```
al_load_bitmap(filename);
```

```
al_draw_bitmap(bmp, 10, 10, 0);
```

Release memory

```
al_destroy_bitmap(bmp);
```



Keyboard

```
al_install_keyboard()  
al_uninstall_keyboard()
```

```
event.keyboard.keycode
```



Mouse

```
al_install_mouse()  
al_uninstall_mouse()
```

```
al_get_mouse_state(&msestate);
```

Additional Allegro libraries

Allegttf - True Type fonts support

AllegGL – HW accelerated graphics

DUMB - audio (Vorbis/Ogg)

Compilation

Configuration script:
allegro-config

Linux, Unix, MacOS:

```
gcc foo.cc -o foo `allegro-config --libs`
```

```
gcc foo.cc -o foo `pkg-config --libs --cflags  
allegro-5.0`
```

iPhone – requires Xcode

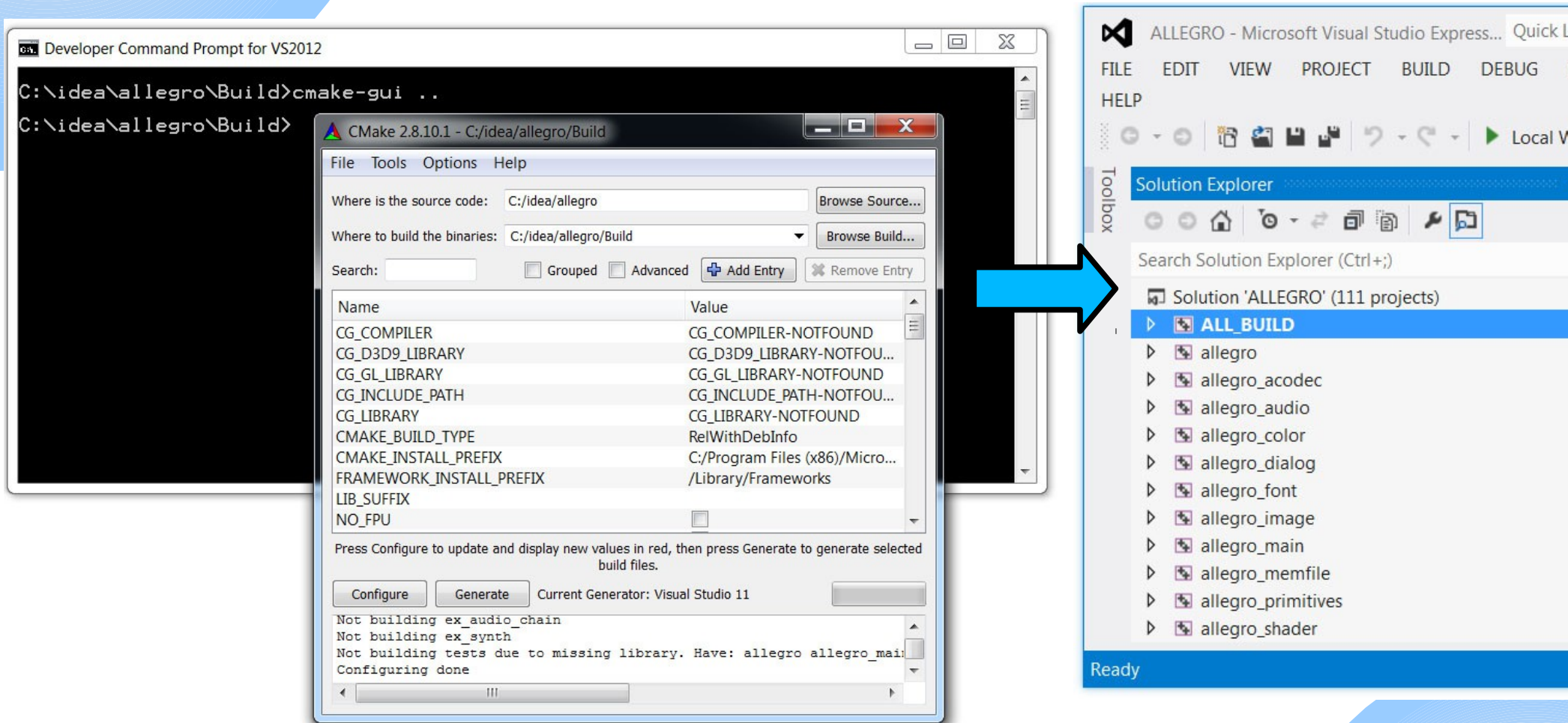
Android – requires Android SDK

CMake – Cross Platform Make



<http://www.cmake.org>

Allegro – CMake – MSVC 2012



Requires: DirectX SDK (e.g. Windows SDK for Windows 8)

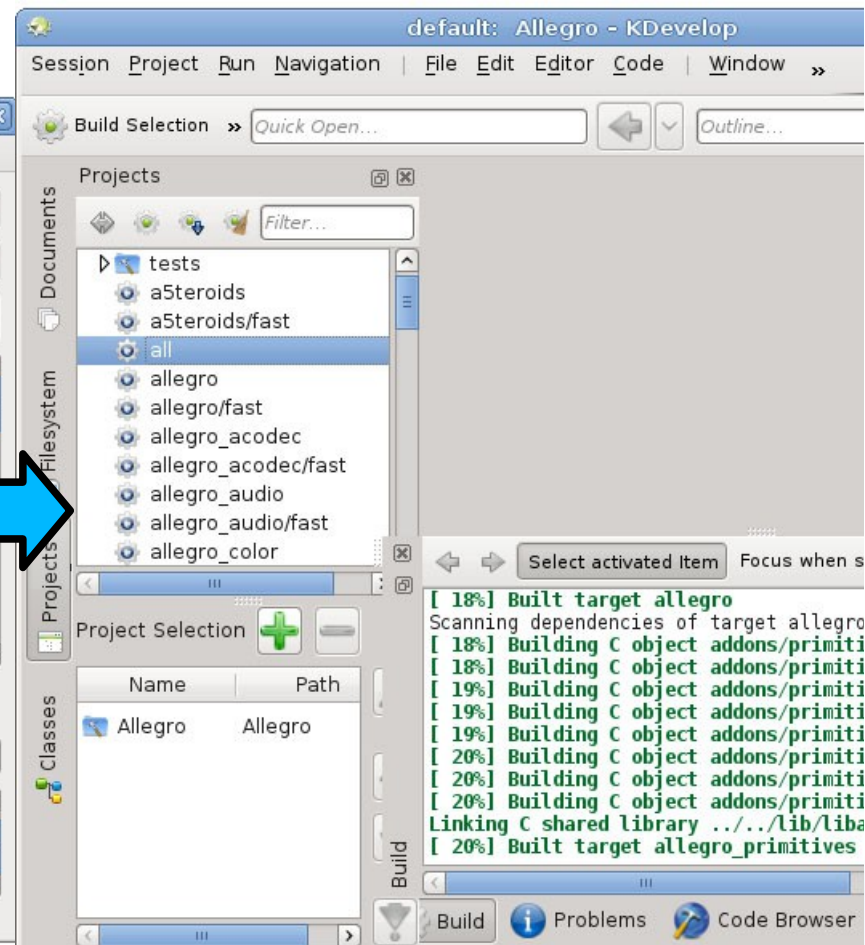
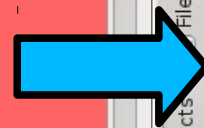
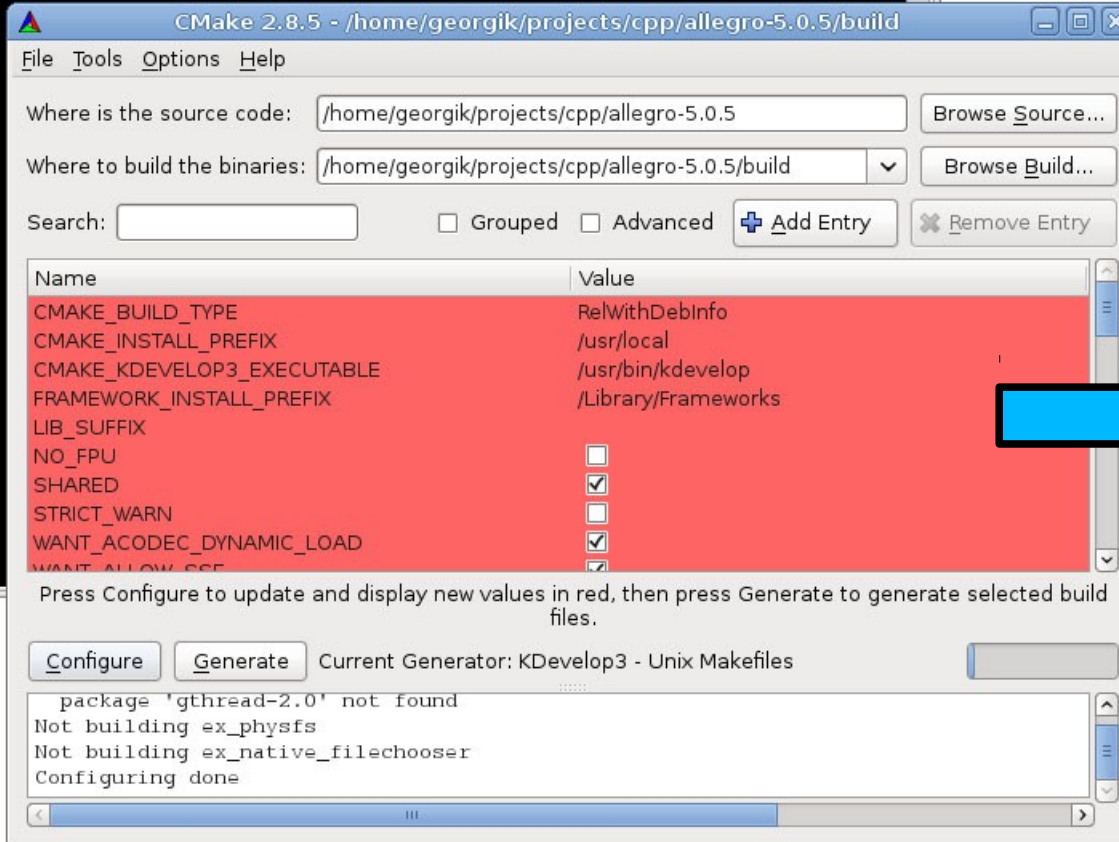
Small tweak to run examples: <http://georgik.sinusgear.com/2012/11/18/allegro5-1-and-visual-studio-2012-unable-to-start-examples-missing-dll-files/>

Allegro – CMake - KDevelop4

```
georgik@chameleon:~/projects/cpp/allegro-5.0.5 | 80x24 | pts/0
File Edit View Terminal Tabs Help

georgik@chameleon:~/projects/cpp/allegro-... x georgik@chameleon:~/projects | 80x24 | pts/1 x

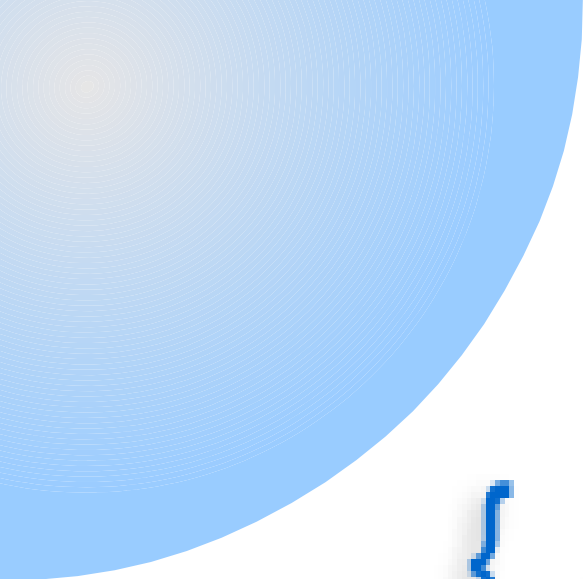
(georgik@chameleon:pts/0) (~/projects/cpp/allegro-5.0.5)
(:11:01:~) cmake-gui
```



Sources

Library: <http://alleg.sourceforge.net>

Wiki: <http://wiki.allegro.cc/>

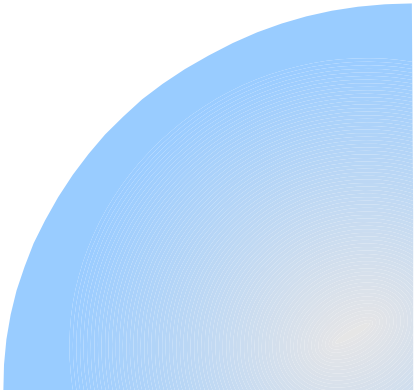


{ allegro.cc }

game developing community network

Game development community network

<http://www.allegro.cc>





Simple Direct Media Layer

Init/quit

`SDL_init(flags)`

`SDL_quit()`

Graphics

```
SDL_SetVideoMode(width, height,  
                  video_bpp, videoflags)
```

Store in memory: `SDL_SWSURFACE`

Store on graphics card: `SDL_HWSURFACE`

Visual data

SDL_Surface

```
SDL_CreateRGBSurface(SDL_SWSURFACE,  
width, height, 32, rmask, gmask, bmask,  
amask);
```

Visual data

```
SDL_Surface *SDL_LoadBMP(const char *file)
```

Copy from one memory to another:

```
SDL_BlitSurface(src, srcrect, dst,  
                dstrect);
```

Keyboard

```
SDL_PollEvent(SDL_Event *event)
```

```
event.key.keysym.sym
```

Timer

```
static int counter;
```

```
SDL_SetTimer(interval, tick_callback);
```

Mouse

```
SDL_GetMouseState(*x, *y);
```

Text

Not implemented



Extensions

support for GL

extension for many languages

Ada, Eiffel, Java, Lua, Perl, PHP, Pike, Python,
Ruby

176 additional libraries

SDL based Libraries

SDL_mixer – audio mixer

SDL_image – image formats

SDL_net – network support

Source

<http://www.libsdl.org>

Compilation

`sdl-config`

Linux, Windows, BeOS, Mac OS

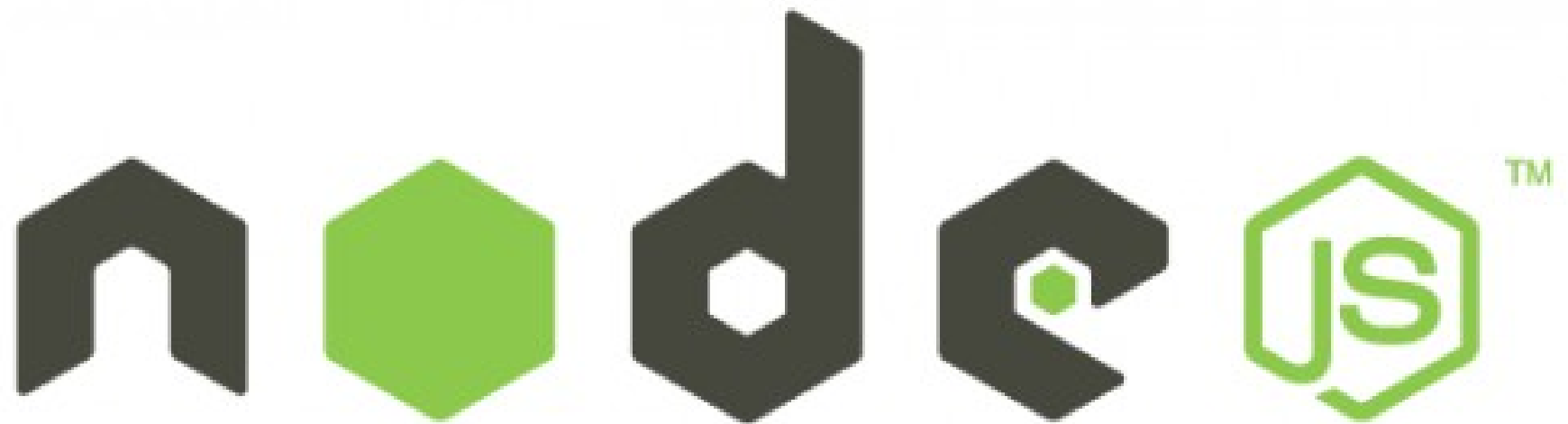
```
gcc foo.cc -o foo `sdl-config --libs`
```

PyGame

Power of C and Power of Python

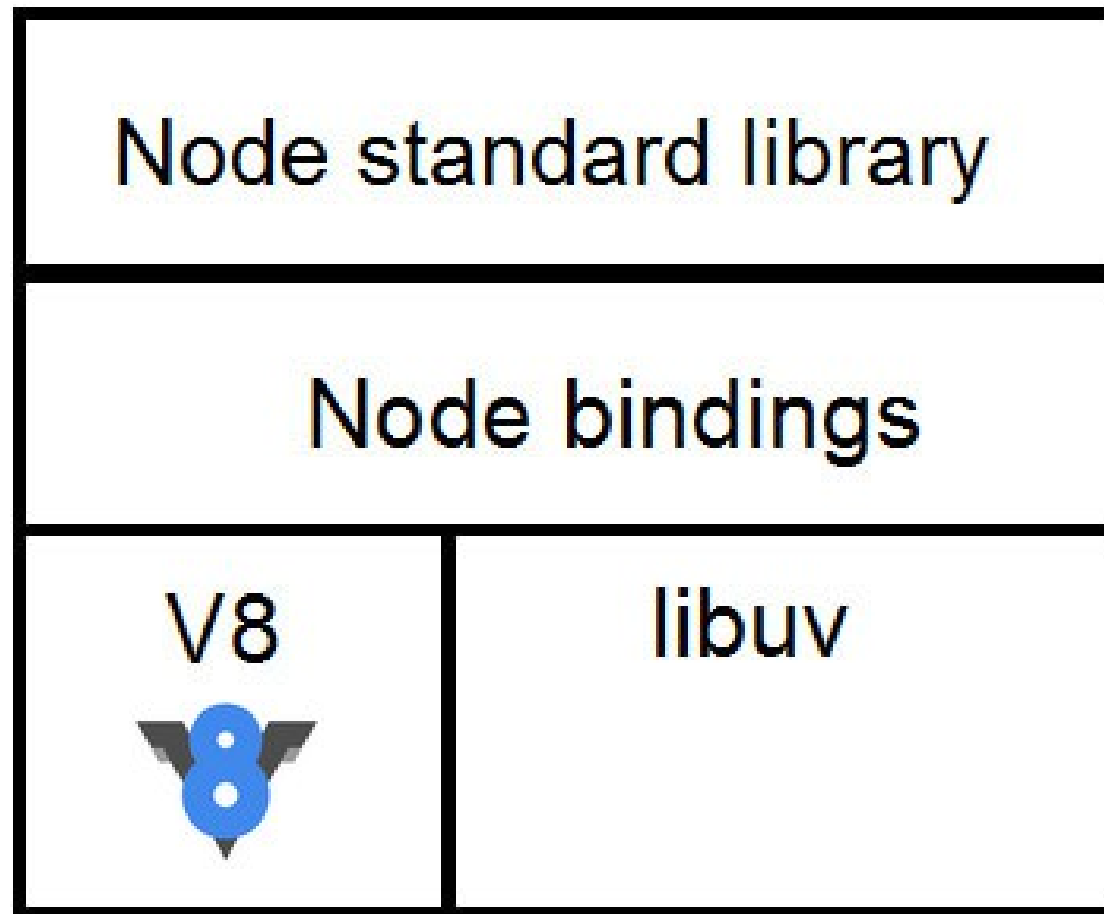
<http://www.pygame.org>





<http://nodejs.org/>

Architecture of Node.js



libuv

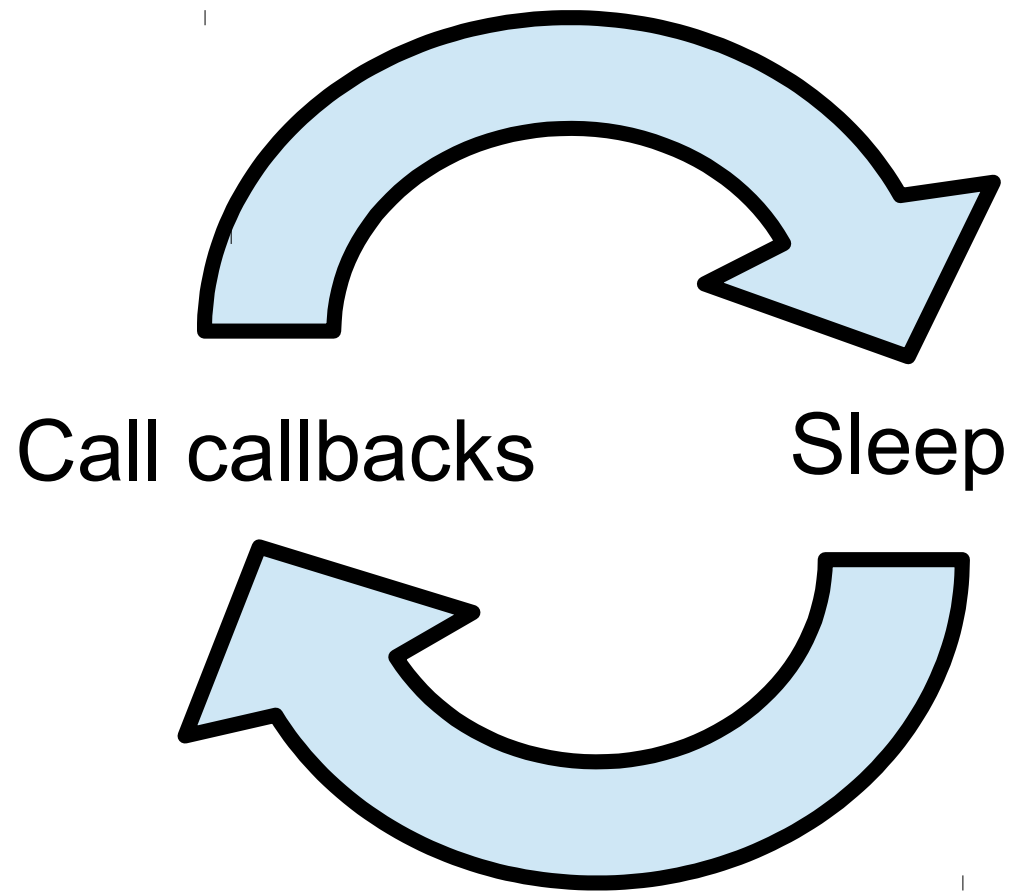
High performance evented I/O library
which offers the same API
on Windows and Unix

libuv

<https://github.com/joyent/libuv>

<http://nikhilm.github.com/uvbook/index.html>

libuv – event loop



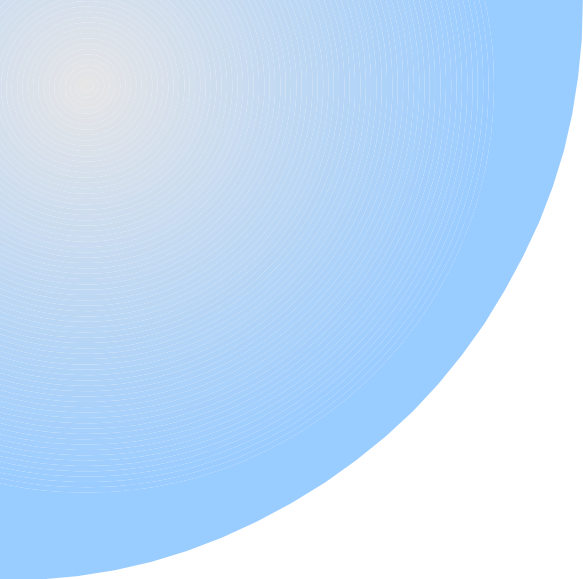
libuv - example

```
#include <stdio.h>
#include <uv.h>

int main() {
    uv_loop_t *loop = uv_loop_new();

    printf("Now quitting.\n");
    uv_run(loop);

    return 0;
}
```



Features

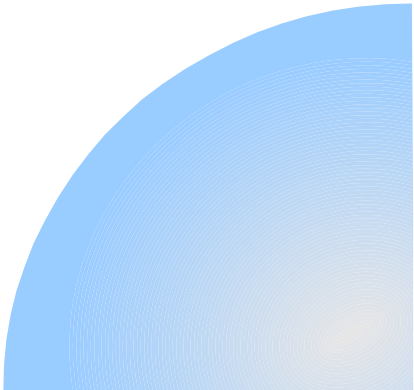
Filesystem

Networking

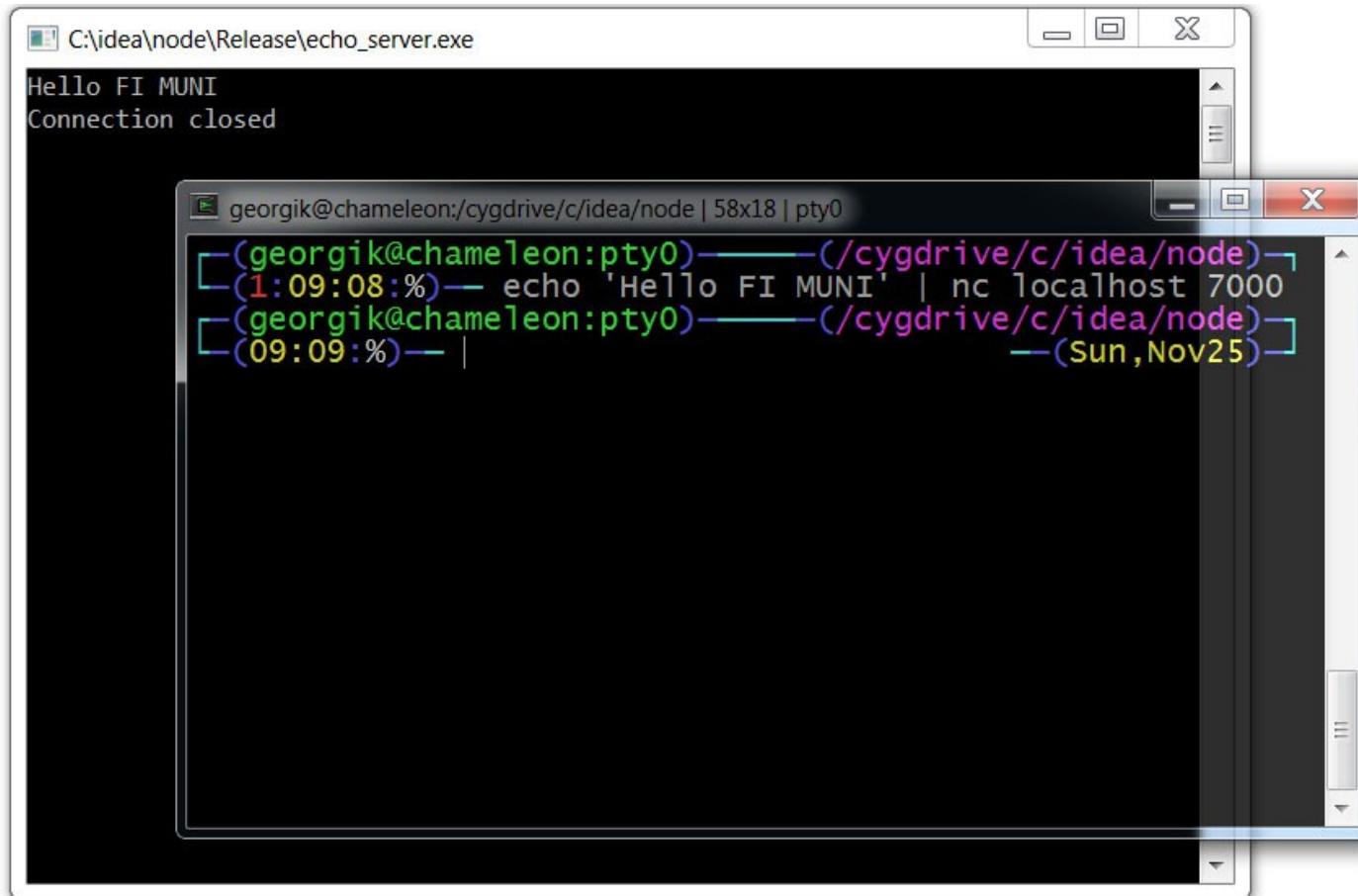
Threads

Processes

Utilities



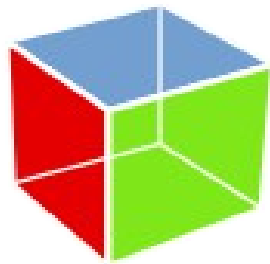
TCP server example



The image shows two overlapping terminal windows. The background window is a Windows command prompt titled "C:\idea\node\Release\echo_server.exe" with the output "Hello FI MUNI" and "Connection closed". The foreground window is a Linux terminal titled "georgik@chameleon:/cygdrive/c/idea/node | 58x18 | pty0" showing a sequence of commands and their outputs: a prompt, a command to run 'echo' through 'nc', and a date command.

```
C:\idea\node\Release\echo_server.exe
Hello FI MUNI
Connection closed

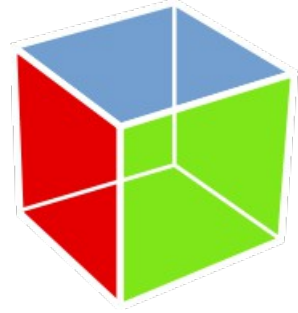
georgik@chameleon:/cygdrive/c/idea/node | 58x18 | pty0
[georgik@chameleon:pty0]—(/cygdrive/c/idea/node)→
[1:09:08:%]— echo 'Hello FI MUNI' | nc localhost 7000
[georgik@chameleon:pty0]—(/cygdrive/c/idea/node)→
[09:09:%]— |                                     —(Sun,Nov25)→
```



The GTK+ Project

<http://www.gtk.org>

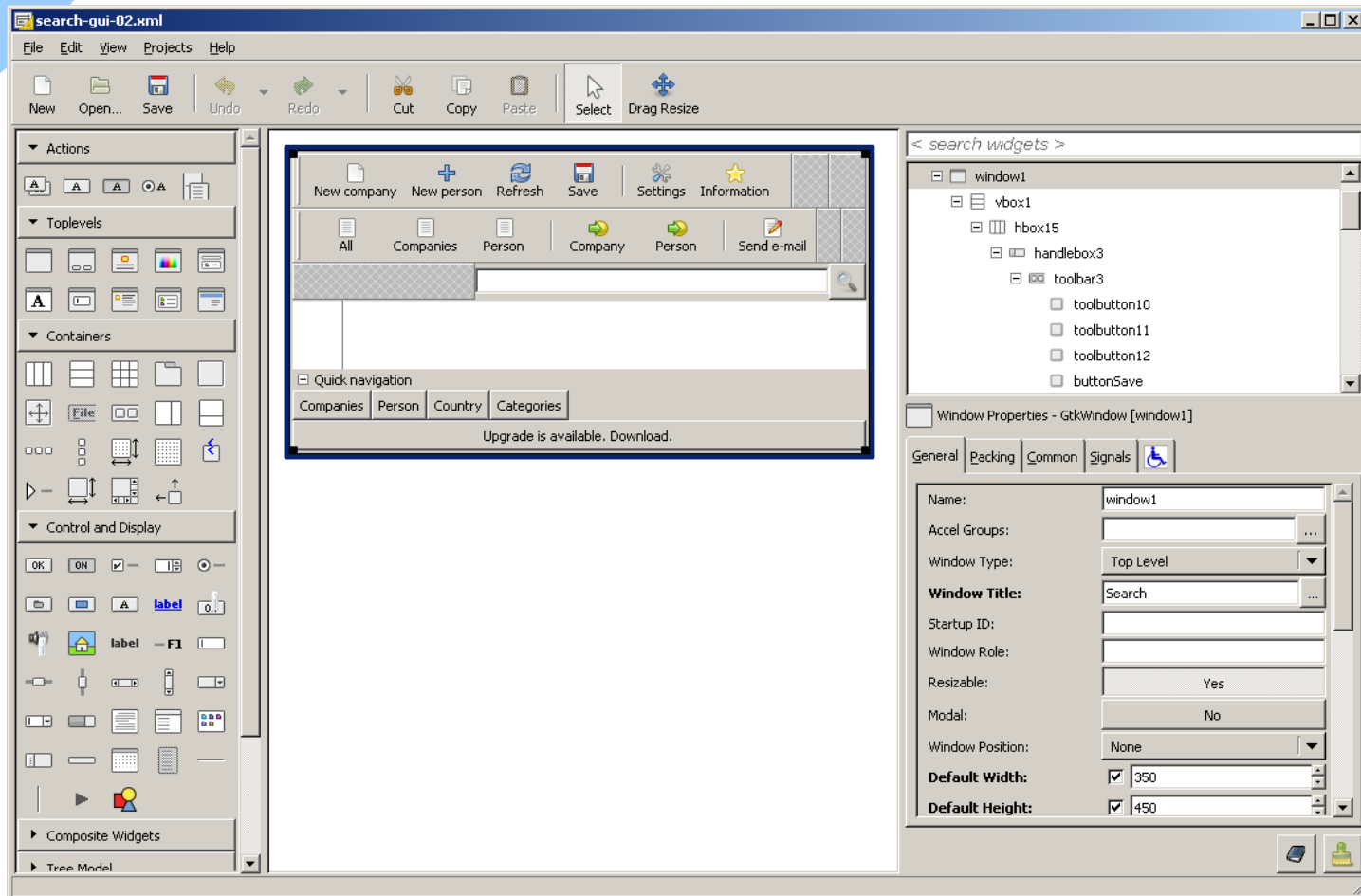
GTK



GIMP ToolKit

C++, Guile, Perl, Python, TOM, Ada95, Objective
C, Free Pascal, Eiffel...

Glade 3



<http://glade.gnome.org>

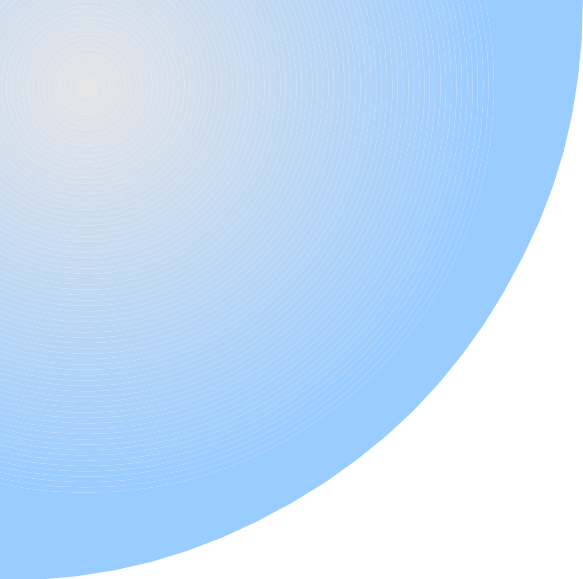
Valgrind

debugging a profiling

memcheck

helgrind - race condition, thread profiling





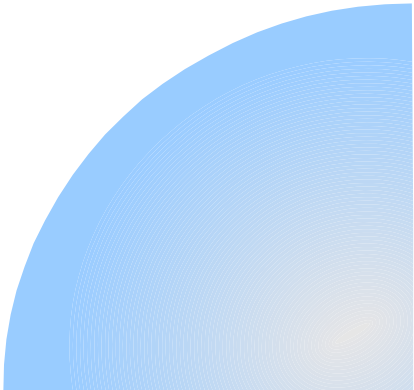
Modes debugger

Local application

Attach to local process

Attach to remote process

Post-mortem



Application crashed

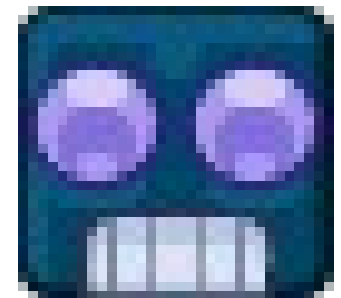


Post-mortem analysis

Image from memory: coredump

Quick analysis of coredump

```
(georgik@traper:pts/6)~--(/tmp)~
(10:43: )~ ulimit -c unlimited--(Št,okt15)~
(georgik@traper:pts/6)~--(/tmp)~
(10:44: )~ xeyes&--(Št,okt15)~
[1] 532
(georgik@traper:pts/6)~--(/tmp)~
(10:44: )~ pkill -3 -f xeyes--(Št,okt15)~
[1] + quit (core dumped) xeyes
(georgik@traper:pts/6)~--(/tmp)~
(10:44: )~ gdb /usr/bin/xeyes core--(Št,okt15)~
(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

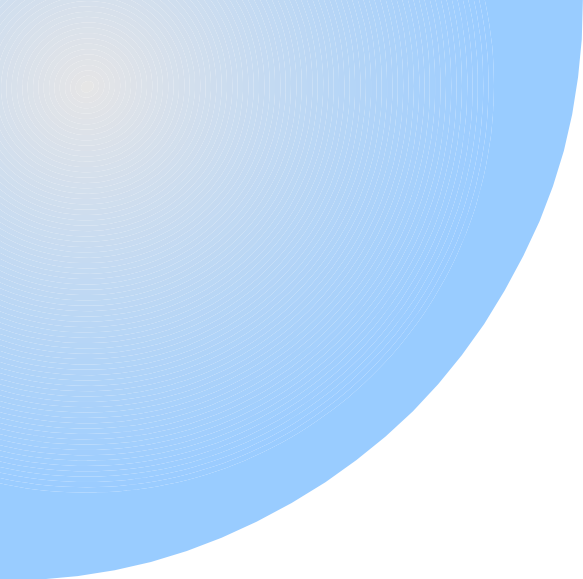
```
georgik@pidi:/tmp | 80x24 | pts/0
File Edit View Search Terminal Help
open("sse2/libpthread.so.0", 0_RDONLY) = -1 ENOENT (No such file or directory)
open("cmov/libpthread.so.0", 0_RDONLY) = -1 ENOENT (No such file or directory)
open("libpthread.so.0", 0_RDONLY) = -1 ENOENT (No such file or directory)
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



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



EOF

26.11. 2012
FI MUNI

Juraj Michálek
<http://georgik.sinusgear.com>
<http://twitter.com/sinusgear>

