
Halfix x86 emulator

Halfix is a portable x86 emulator written in C99. It allows you to run legacy operating systems on modern platforms.

Why?

I made this mostly for fun, and because it was a great way to learn about the x86 PC architecture. On a more practical level, it can be used for: - Testing out or developing operating systems - Running old programs or operating systems that no longer work on modern computers or you wouldn't want to risk running on your personal computer. - Simulating other x86-based systems (the CPU component can be isolated relatively easily and used in other projects) - Testing web browser performance

Building and Running

You will need `node.js`, a C99-compatible compiler, `zlib`, and Emscripten (only if you're targeting the browser). Make sure that the required libraries are in a place where the compiler can find them. No pre-build configuration is required.

The display driver uses `libsdl`, but if you're on Windows, there's a native port that uses the Win32 API and doesn't require SDL.

```
1 # Debug, native
2 node makefile.js
3 # Debug, Emscripten, asm.js
4 node makefile.js emscripten
5 # Debug, Emscripten, WebAssembly
6 node makefile.js emscripten --enable-wasm
7
8 # Release, native
9 node makefile.js release
10 # Release, Emscripten, asm.js
11 node makefile.js emscripten release
12 # Release, Emscripten, WebAssembly
13 node makefile.js emscripten --enable-wasm release
14
15 # Win32 API build (no SDL required)
16 node makefile.js win32
17 # Win32 API build, release
18 node makefile.js win32 release
19
20 # For more options and fine tuning
21 node makefile.js --help
22
```

```
23 # Chunk an image
24 node tools/imgsplit.js os.img
25
26 # Run in browser
27 http-server
```

Check the project wiki for more details.

System Specifications

- CPU: x86-32 (FPU, MMX, SSE, SSE2, some SSE3, PAE)
- RAM: Configurable - anywhere from 1 MB to 3584 MB
- Devices:
 - Intel 8259 Programmable Interrupt Controller
 - Intel 8254 Programmable Interval Timer
 - Intel 8237 Direct Memory Access Controller
 - Intel 8042 “PS/2” Controller with attached keyboard and mouse
 - i440FX chipset (this doesn’t work quite so well yet)
 - * 82441FX PMC
 - * 82371SB ISA-to-PCI bus
 - * 82371SB IDE controller
 - * ACPI interface
 - Intel 82093AA I/O APIC
- Display: Generic VGA graphics card (ET4000-compatible) with Bochs VBE extensions, optionally PCI-enabled
- Mass Storage:
 - Generic IDE controller (hard drive and CD-ROM)
 - Intel 82077AA Floppy drive controller (incomplete, but works in most cases)
- Dummy PC speaker (no sound)

Compatibility

It boots a wide range of operating system software, including all versions of DOS, most versions of Windows (excluding Windows 8), newer versions of OS/2 Warp (3 and 4.5), ReactOS, some varieties of Linux (ISO Linux, Damn Small Linux, Red Star OS 2, Buildroot, Ubuntu), 9Front, NeXTSTEP, several hobby OSes, and probably more.

See Compatibility for more details.

Self-Virtualization

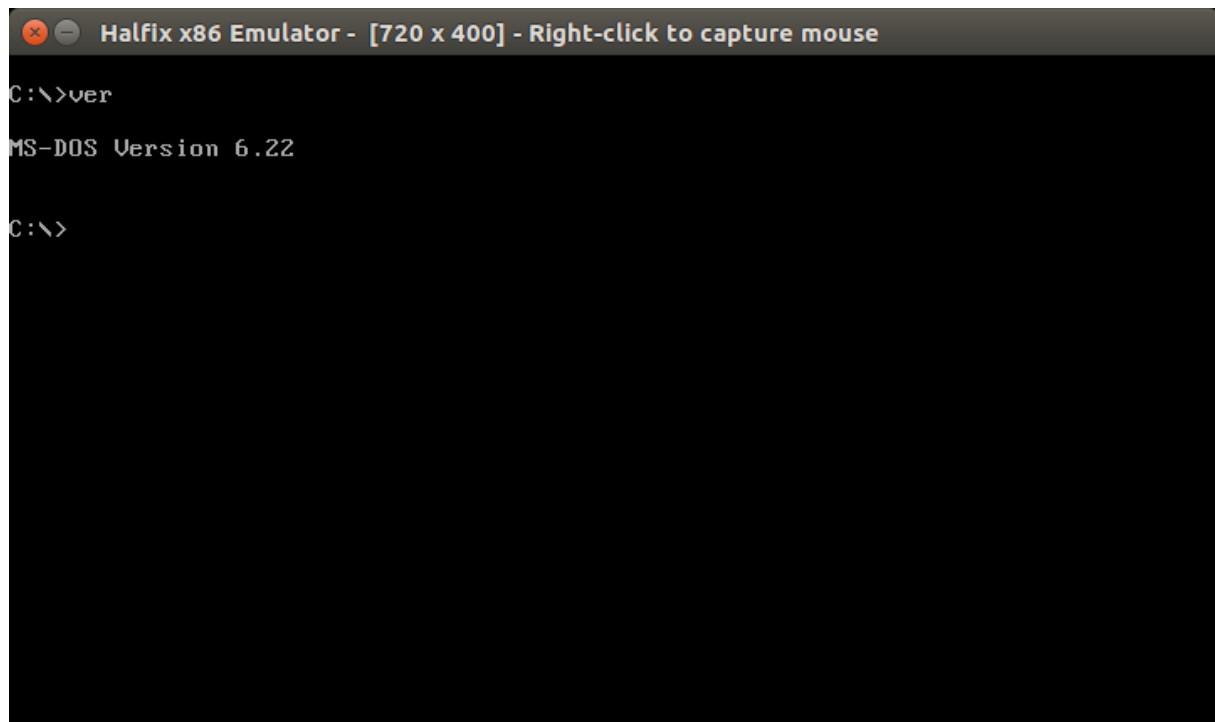
Can you run the emulator inside the emulator?

Yes, but not very quickly.

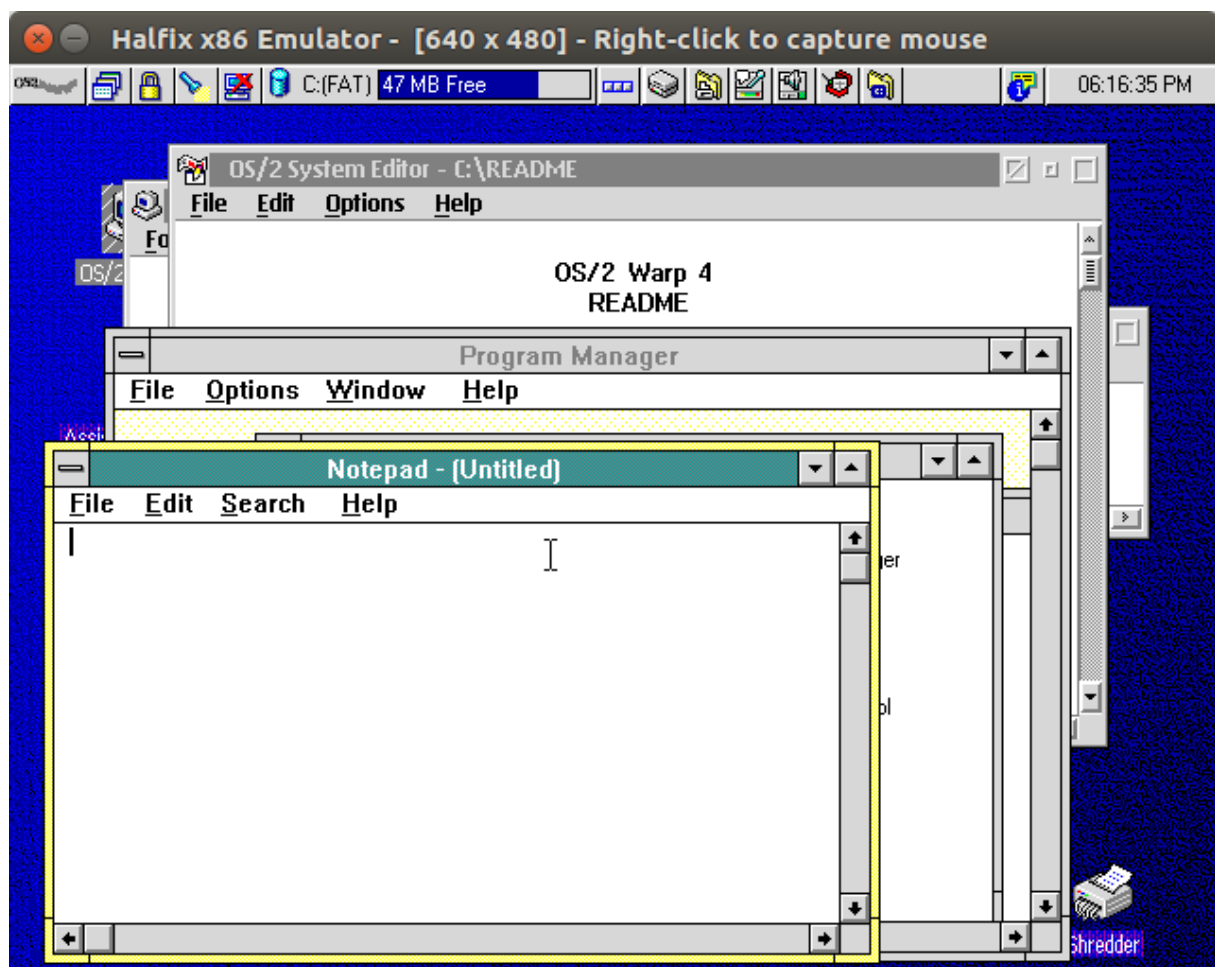


Screenshots

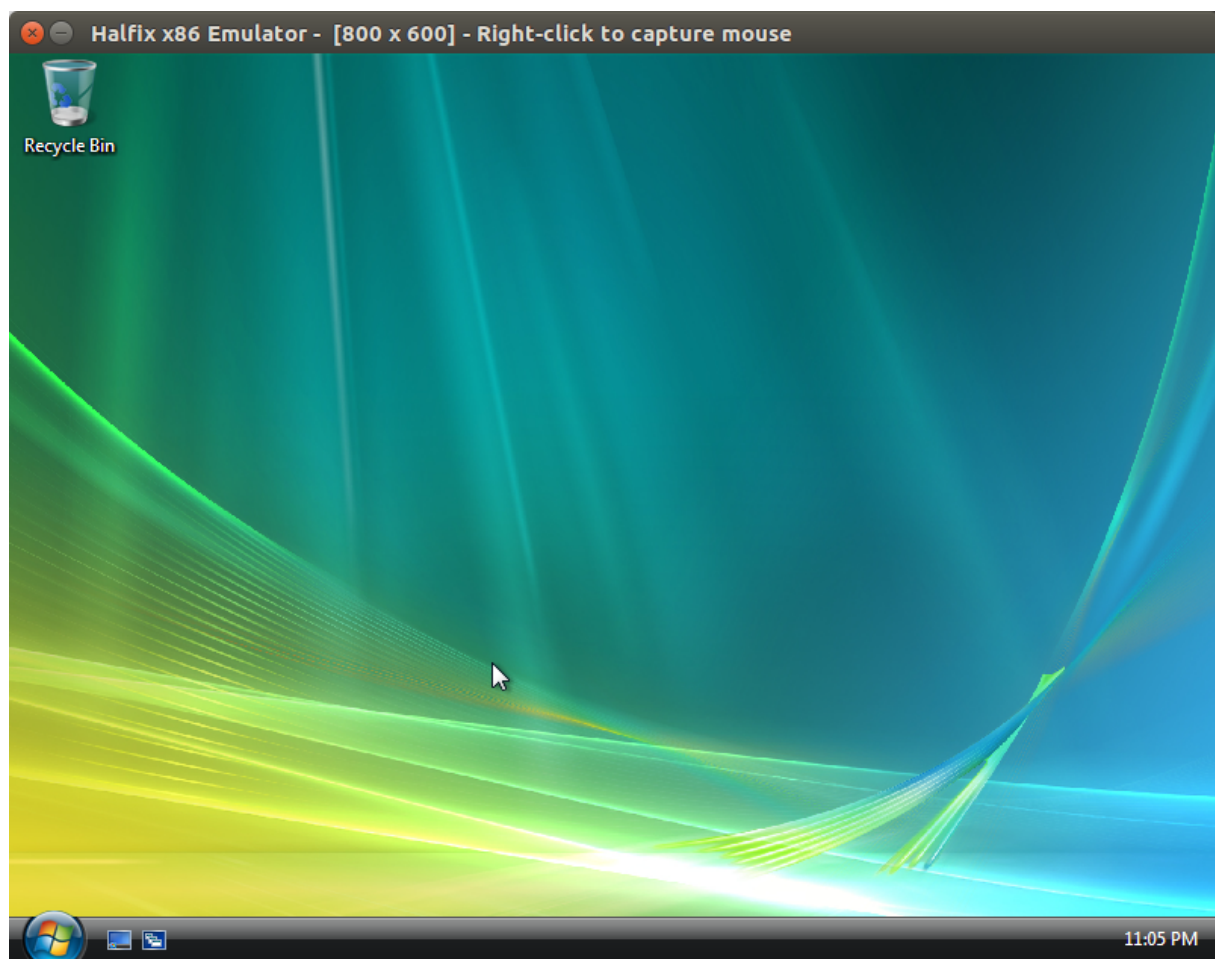
MS-DOS



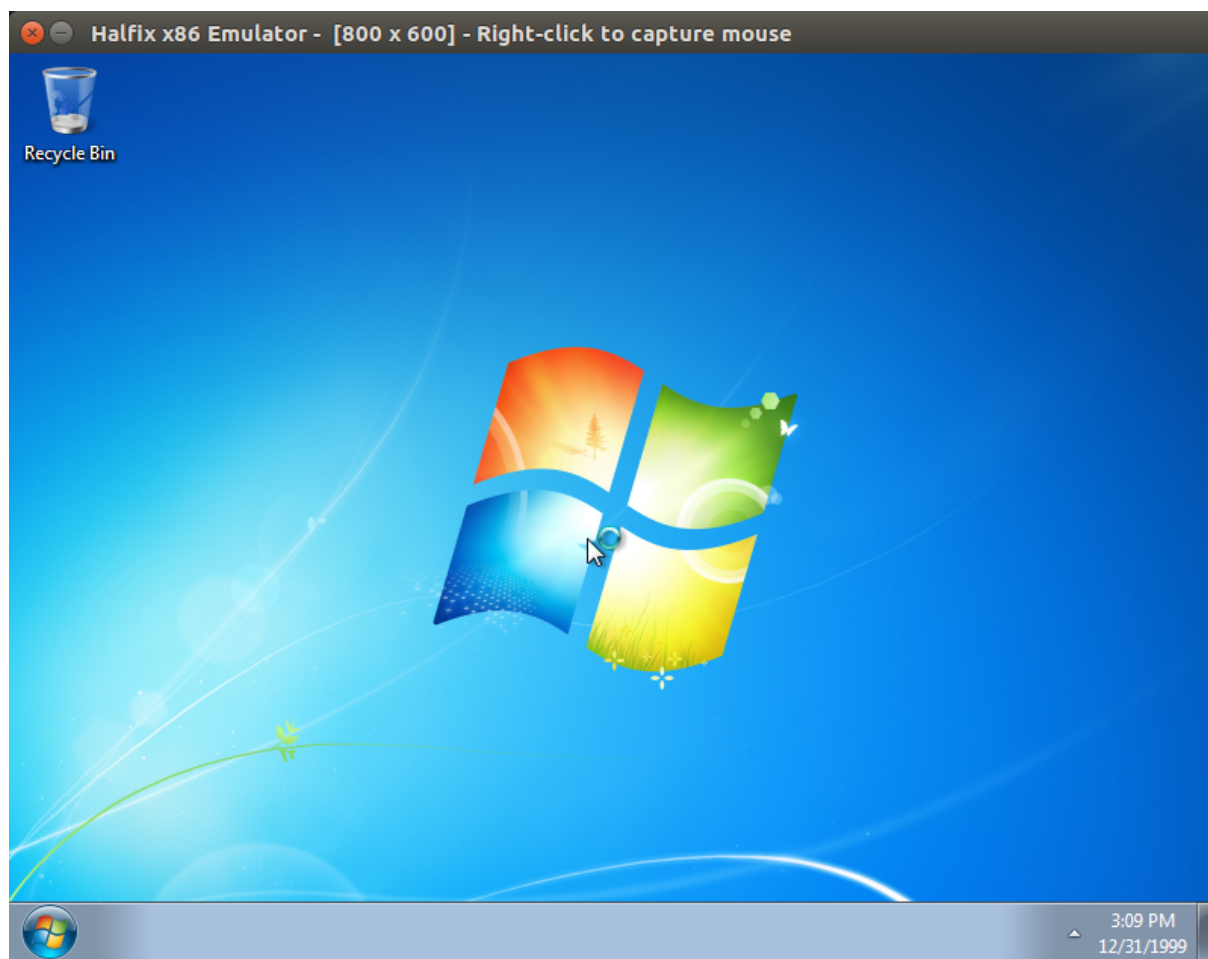
OS/2 Warp 4.5



Windows Vista



Windows 7



The same Windows 98 disk image as in the Halfix in Halfix screenshot running in Firefox

Lock Mouse Pointer

Pause

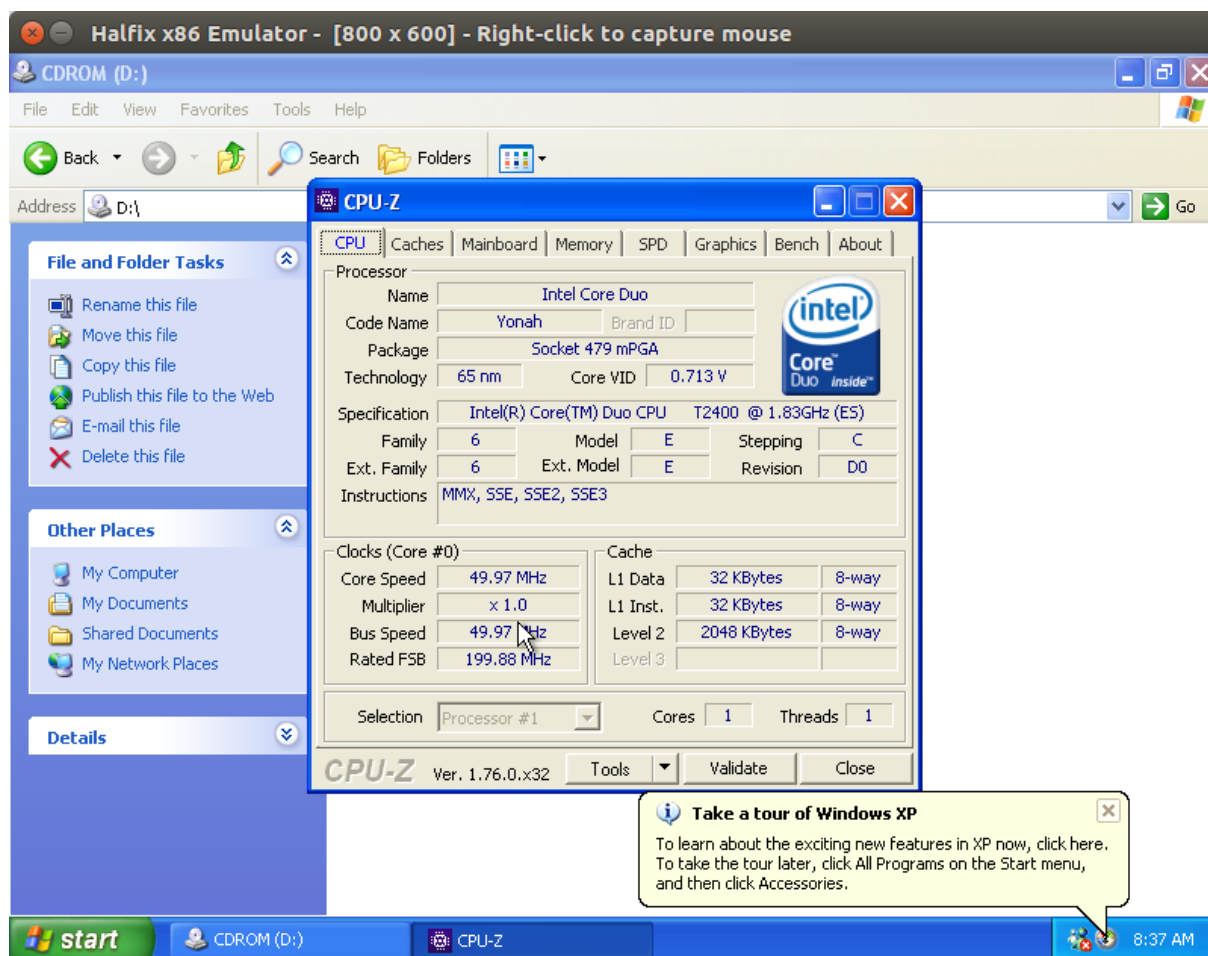
Loading file ../halfix-dev/disks/win98/blk000002ed.bin: , Total Bytes Loaded: 25.25 MB Speed: 19.63 MIPS



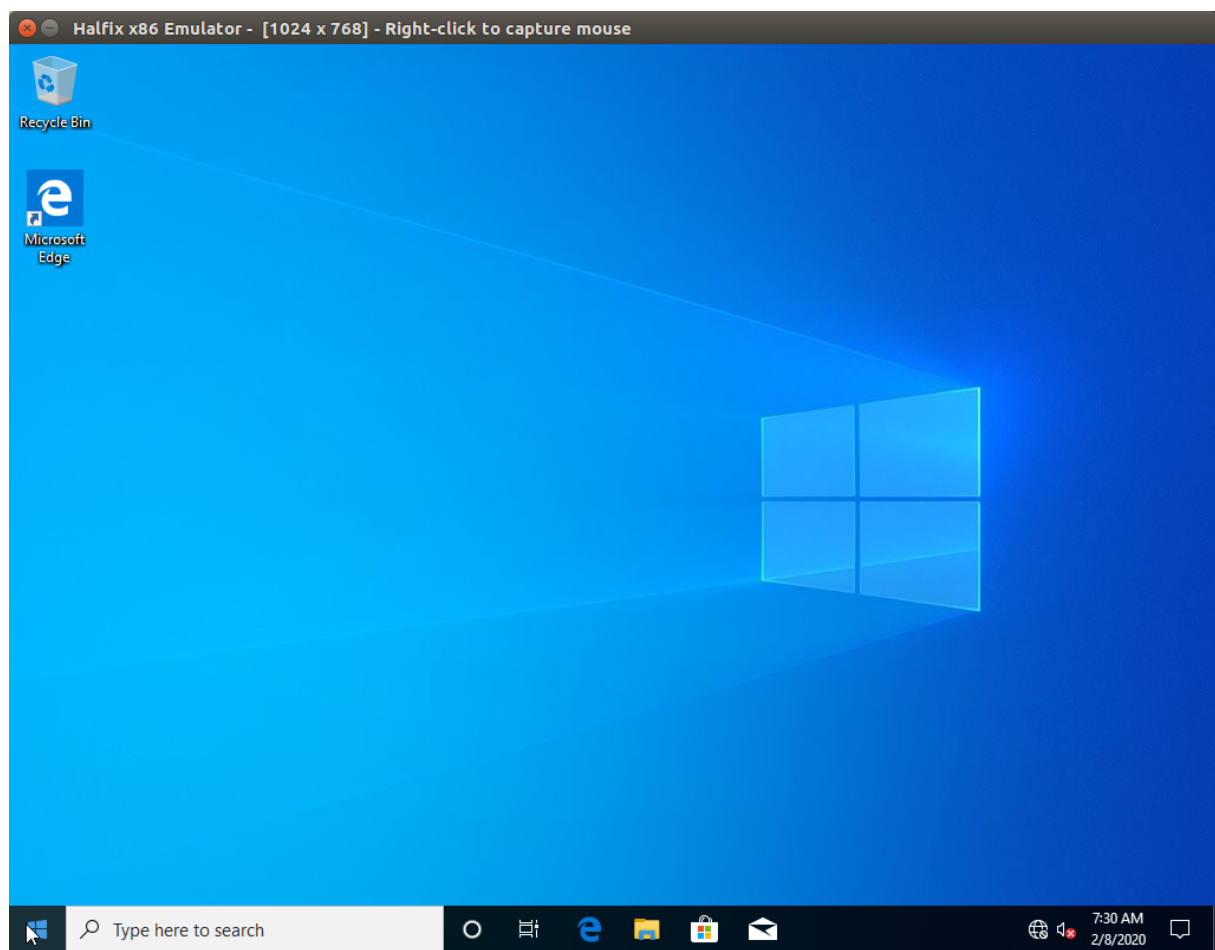
```
PC memory size: 32 mb VGA memory: 32 mb
Initializing disk 0
BIOS says: '$Revision: 13073 $ $Date: 2017-02-16 22:43:52 +0100 (Do, 16. Feb 2017) $'
BIOS says: 'Starting rombios32'
BIOS says: 'Shutdown flag 0'
BIOS says: 'ram_size=0x02000000'
BIOS says: 'ram_end=32MB'
BIOS says: 'Found 1 cpu(s)'
```

On mobile, tap on the text box to raise keyboard

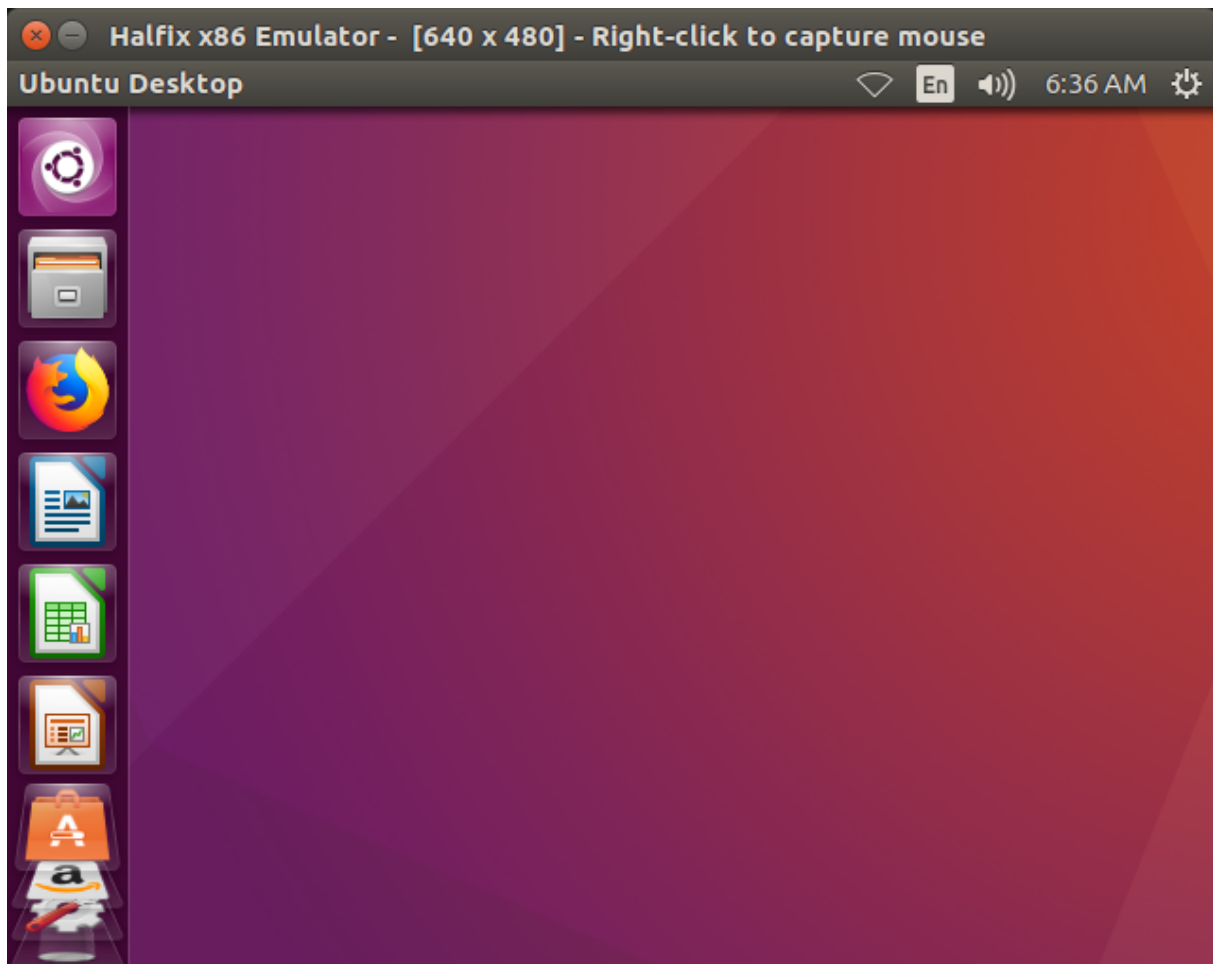
CPU-Z on Windows XP



Windows 10



Ubuntu



Transferring Files

Create a directory with all the files you want to transfer and create an ISO image.

```
1 mkisofs -o programs.iso -max-iso9660-filenames -iso-level 4 programs/
```

Now update the configuration file as follows:

```
1 # Note: it does not hae to be ata0-slave.
2 # I have not tested it with anything but ata0-slave.
3 [ata0-slave]
4 inserted=1
5 type=cd
6 file=/tmp/programs.iso
7 driver=sync
```

Now boot up your operating system and copy the files from the CD-ROM to the hard drive.

Known Issues

- SSE3 is not fully supported
- Performance isn't terrible, but it isn't fantastic either (70-100 MIPS native, 10-30 MIPS browser)
- Timing is completely off
- Windows 8 doesn't boot (see this issue)
- FPU exceptions are probably very incorrect
- Most devices aren't complete, but enough is implemented to boot modern OSes.
- The configuration file parser isn't very good

License

GNU General Public License version 3

Similar Projects

- v86
- JSLinux
- jemul8

Credits

The FPU emulator uses an modified version of Berkeley SoftFloat from the Bochs emulator.