Atari ST Free Operating Systems

Vincent Rivière

foss-north.se // 2018-04

About me

Contact: vincent.riviere@freesbee.fr
a.k.a. *BlankVector* on some forums

Vincent Rivière

- French guy, 42 years old
- Born in south of France, living in Paris
- Currently working as software developer in University Paris 1 Panthéon-Sorbonne

First owned computer in 1992:

The Atari ST

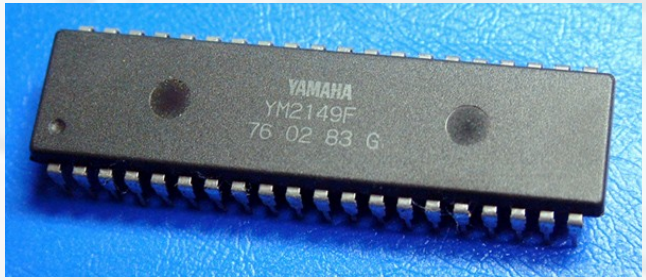
ATARI

Atari ST: General

- Available since 1985
- CPU: **Motorola 68000** @ 8 MHz
- RAM: Between 512 KB and 4 MB
- With color monitor or TV:
  320x200 (16 colors), or 640x200 (4 colors)
- With monochrome monitor:
  640x400 (black and white)

Atari ST: Sound

- Basic YM-2149 soundchip,
  same as AY-3-8910 found
  in Amstrad CPC, ZX Spectrum, Oric.
  3 square wave voices



- MIDI ports for synthesizers
  Very popular among musicians

Atari ST: Storage

- 3”½ floppies, double density
  same 720 KB format as PC (FAT12)

- Additional external hard disk:
  - ACSI (Atari specific)
  - SCSI (with adapters)
    typical capacity from 20 to 100 MB

Operating System: TOS
The Operating System

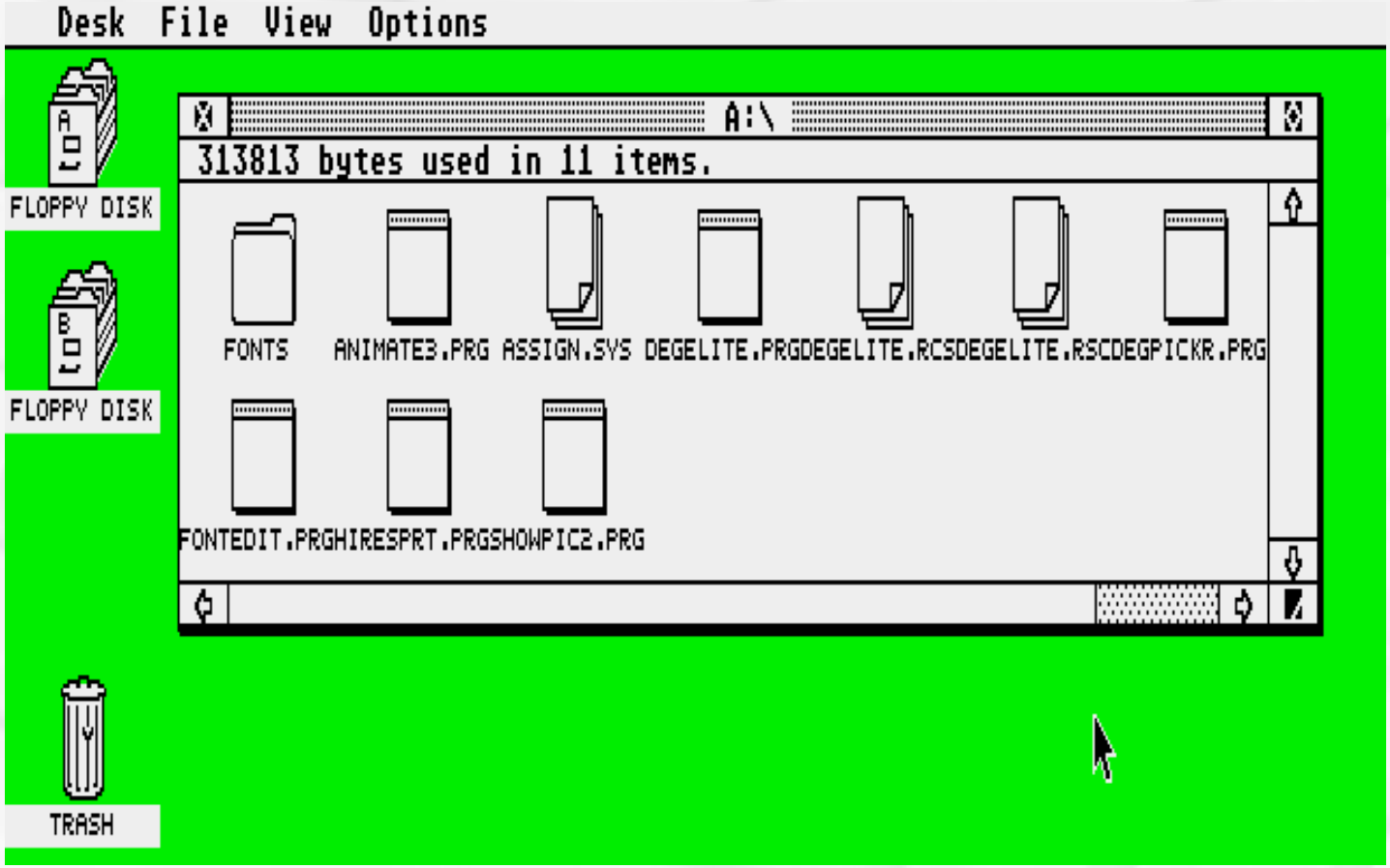
- Mainly graphical programs with mouse, menus, windows and dialogs
- Also supports full-screen text programs
- Can run a single program at once + desktop accessories

GEM Desktop 1/3

Low resolution
320x200
16 colors

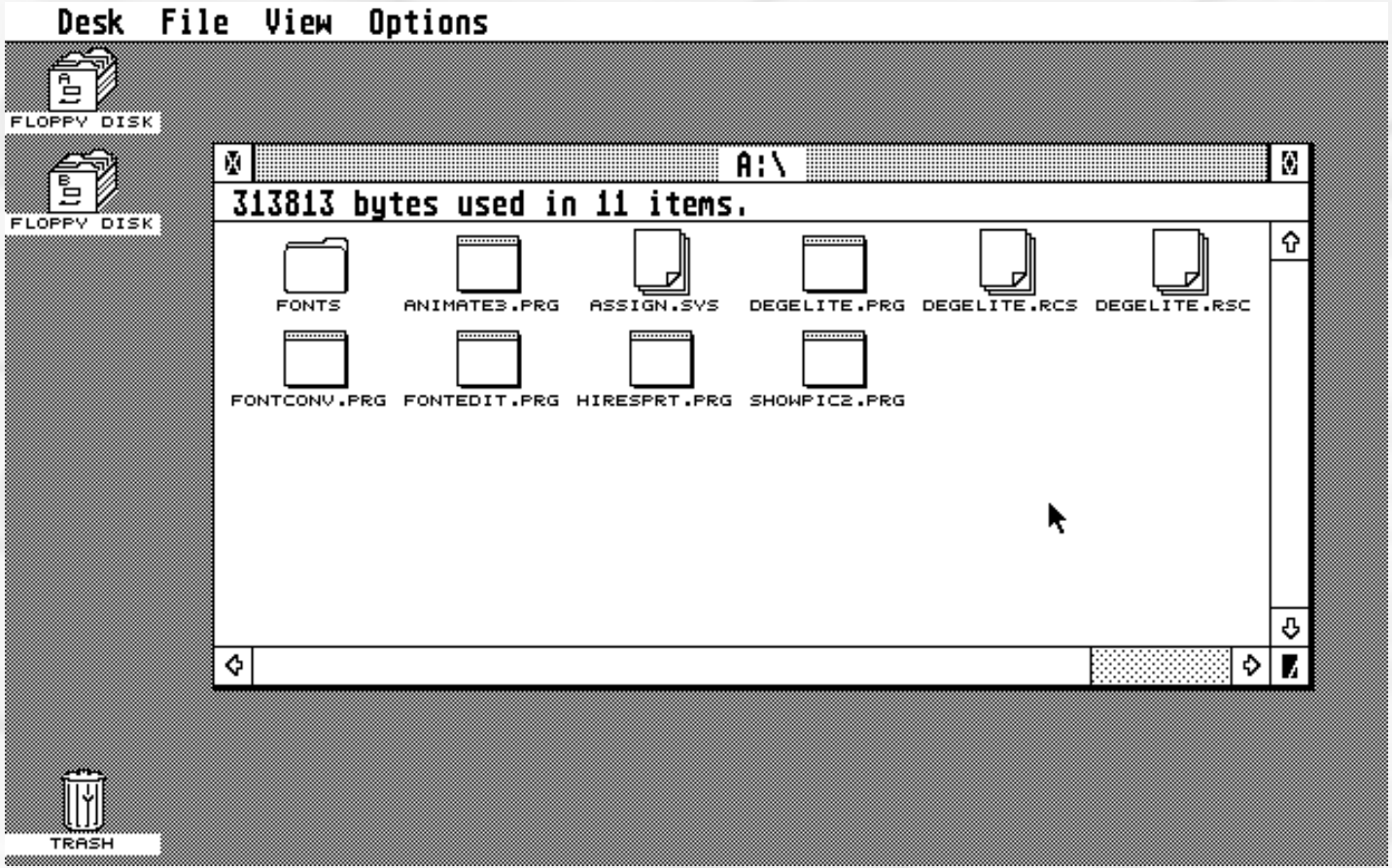
GEM Desktop 2/3

Medium resolution
640x200
4 colors



GEM Desktop 3/3

High resolution 640x400 mono-chrome



Some **Atari programs**

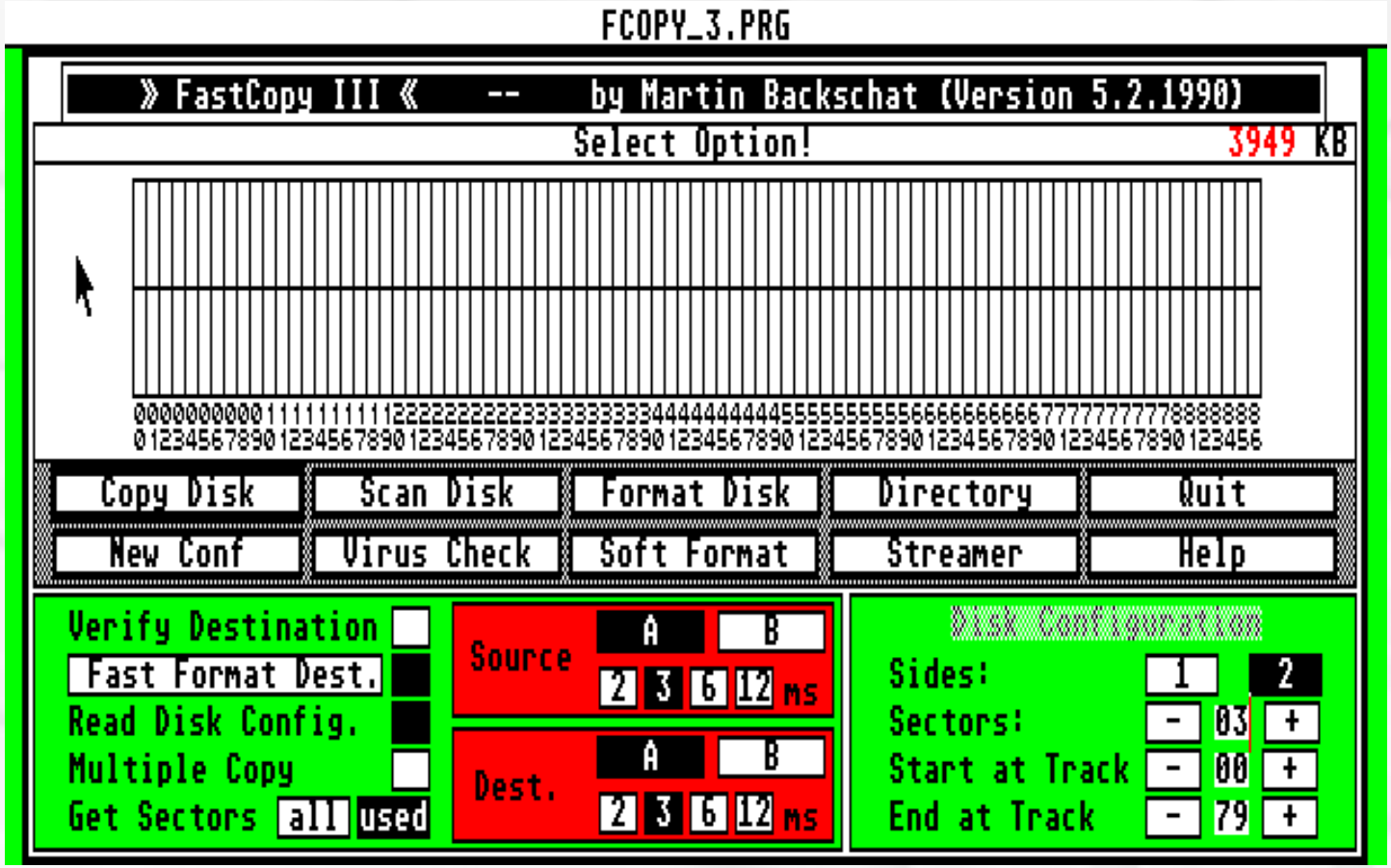
based on my own experience

between 1992 and 1997

Dialog-based application

FastCopy III

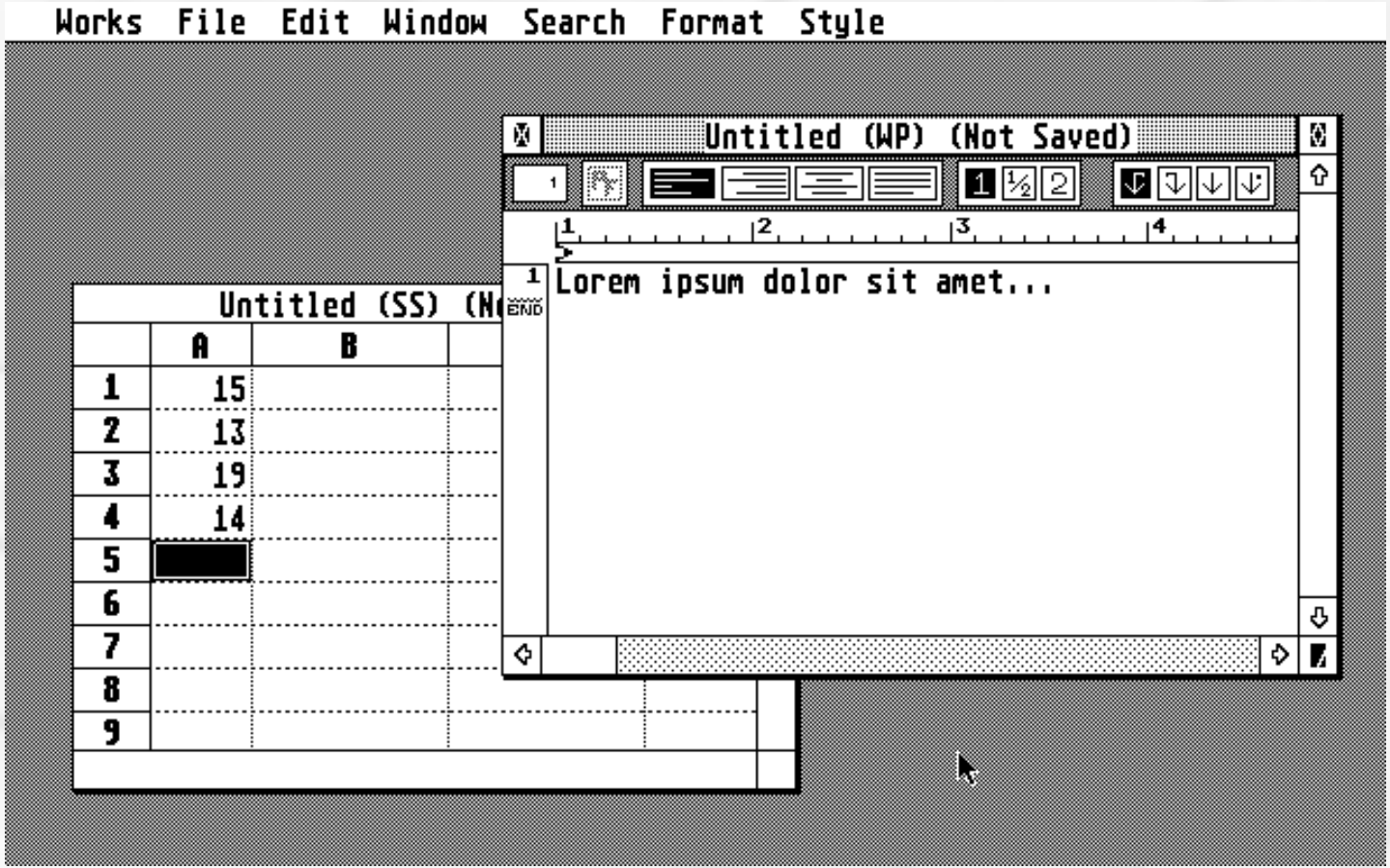
Floppy copier



Window-based application

Atari Works

Word processor, spreadsheet, database

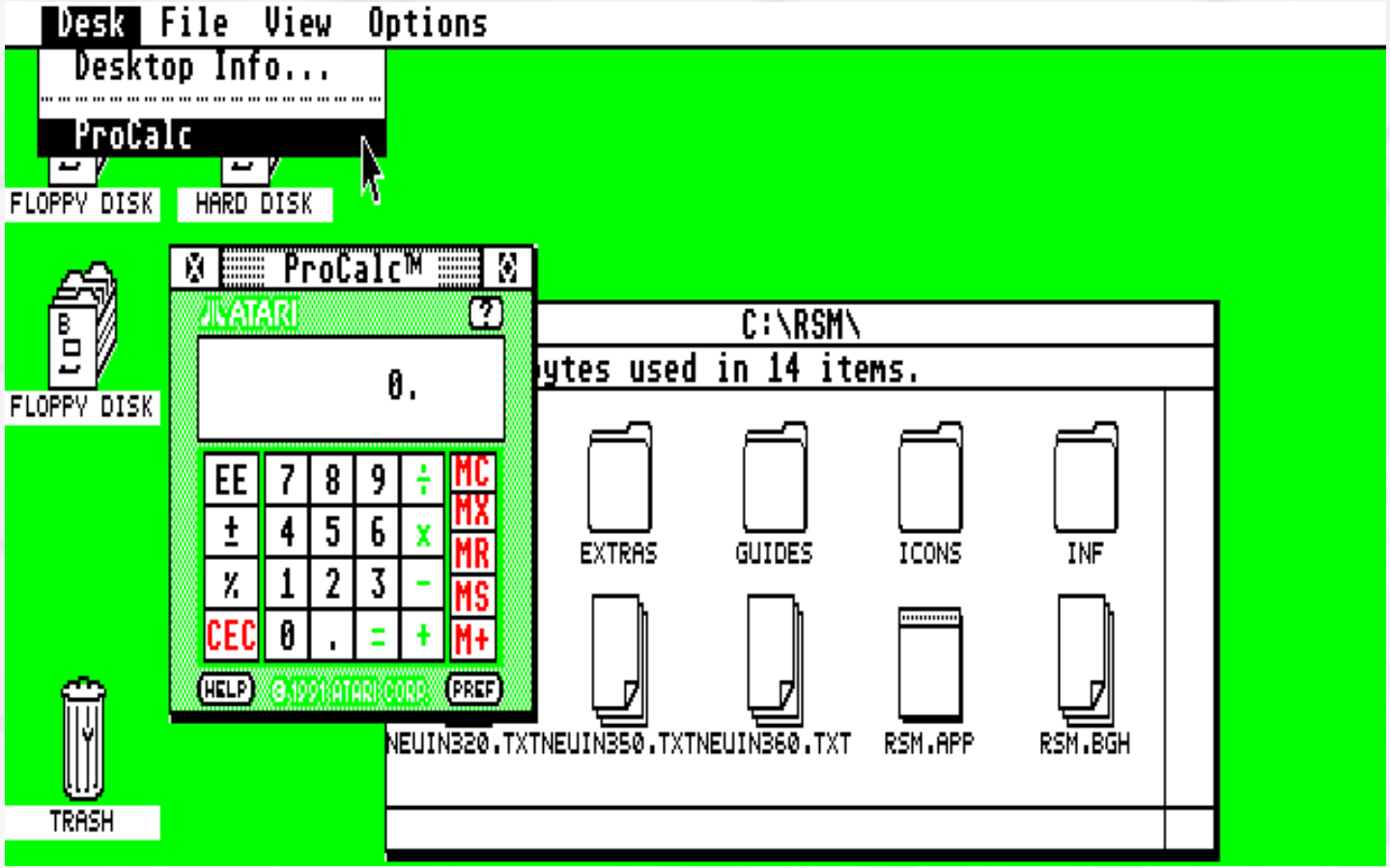


Desktop accessory

ProCalc

Desktop calculator

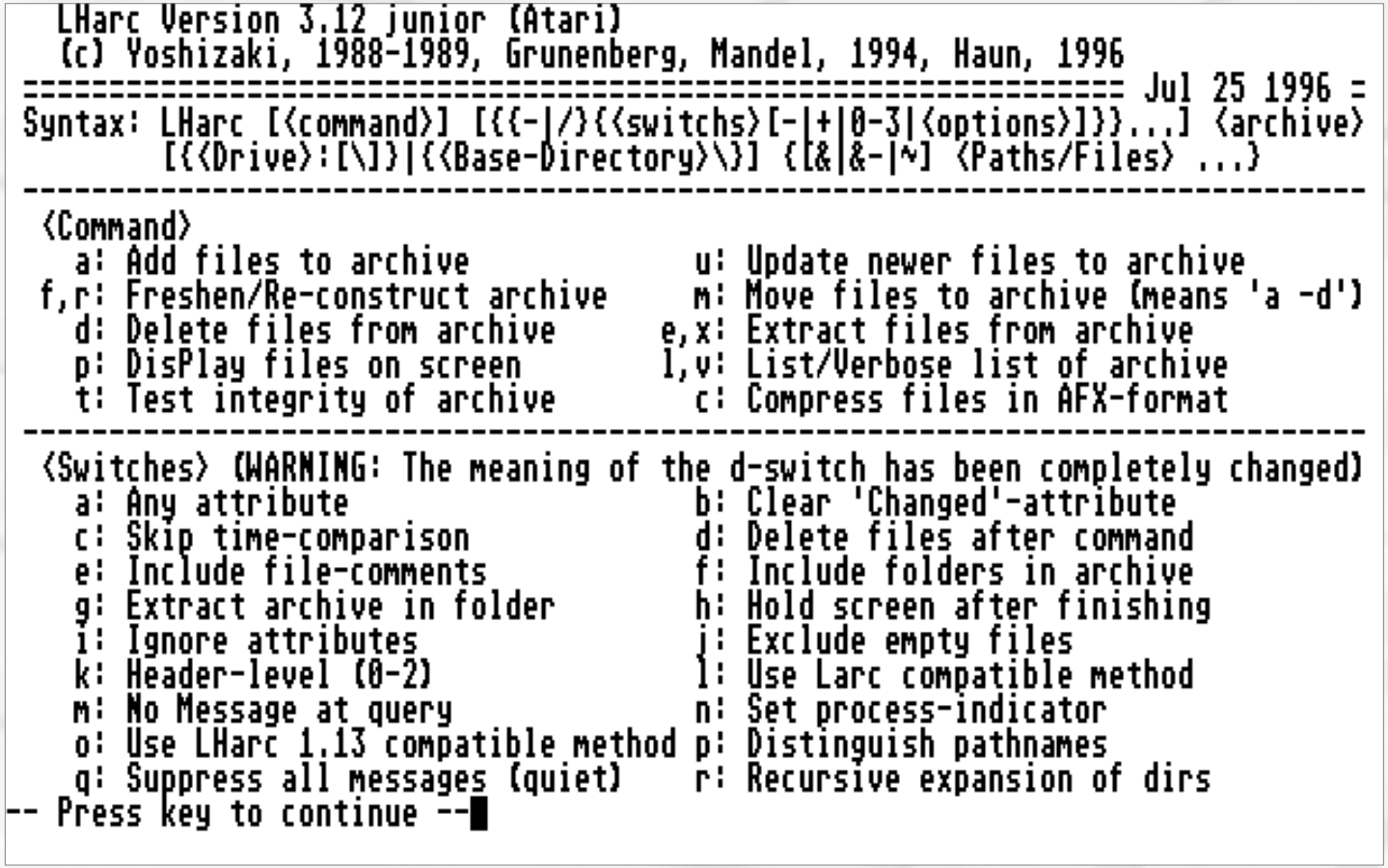
Limited cooperative multitasking



Text Mode application

LHarc

archiver



Games

Wings of Death

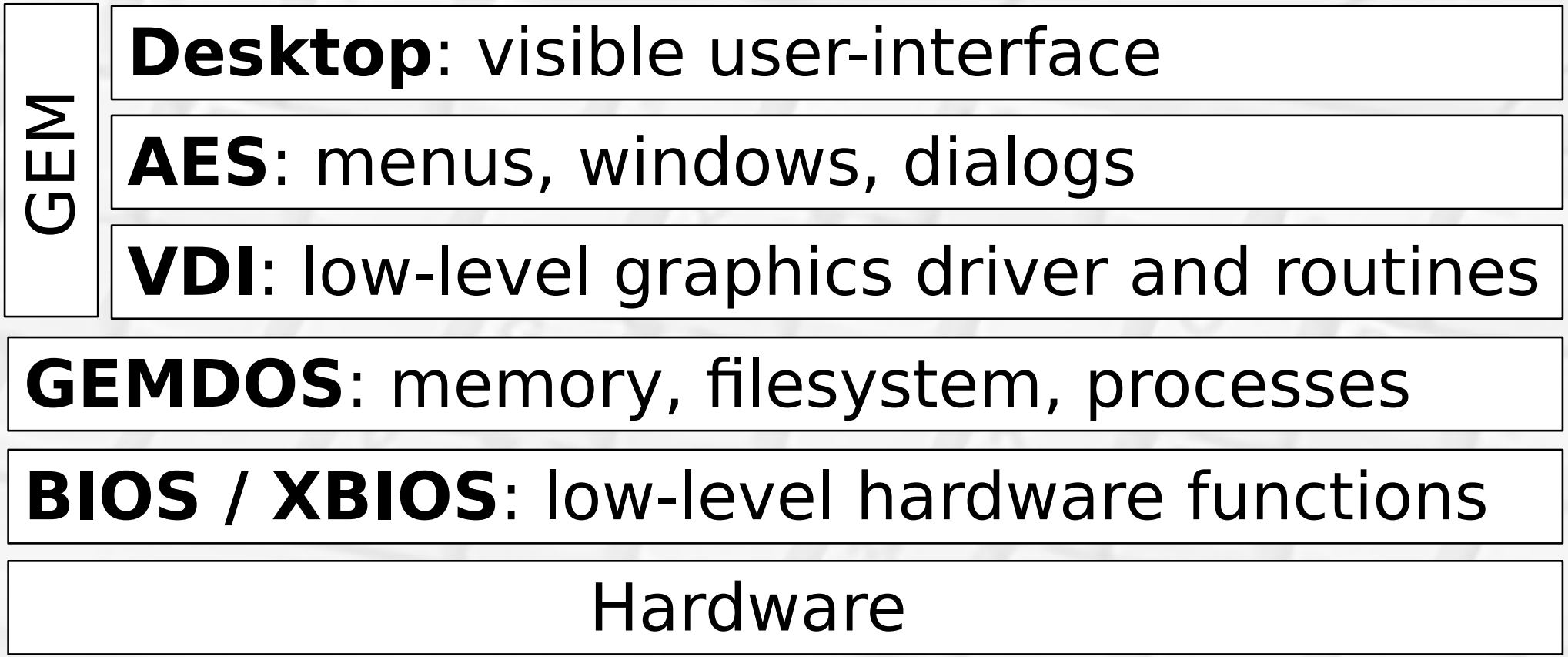
Demos!

Cuddly Demos

Atari TOS could be seen as...

- GUI similar to Macintosh
- API similar to MS-DOS...
- ... with very different BIOS
- Fortunately much cleaner and nicer than PC thanks to the 68000 processor.

TOS internals



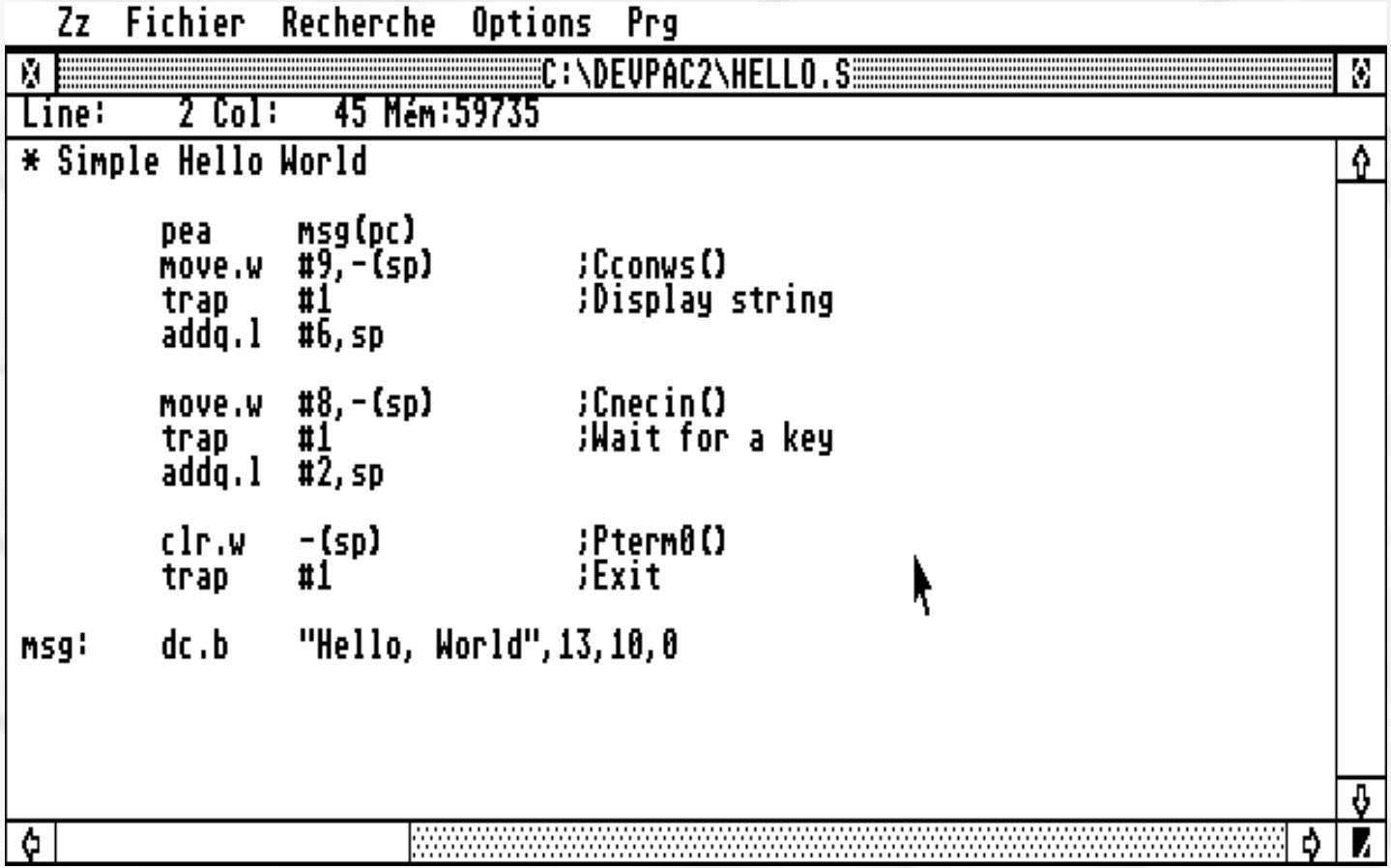
Programming

- Basic: GFA, Omikron...
- Assembly: Devpac...
- C (with hard disk): Pure C...

Assembly language

Devpac2

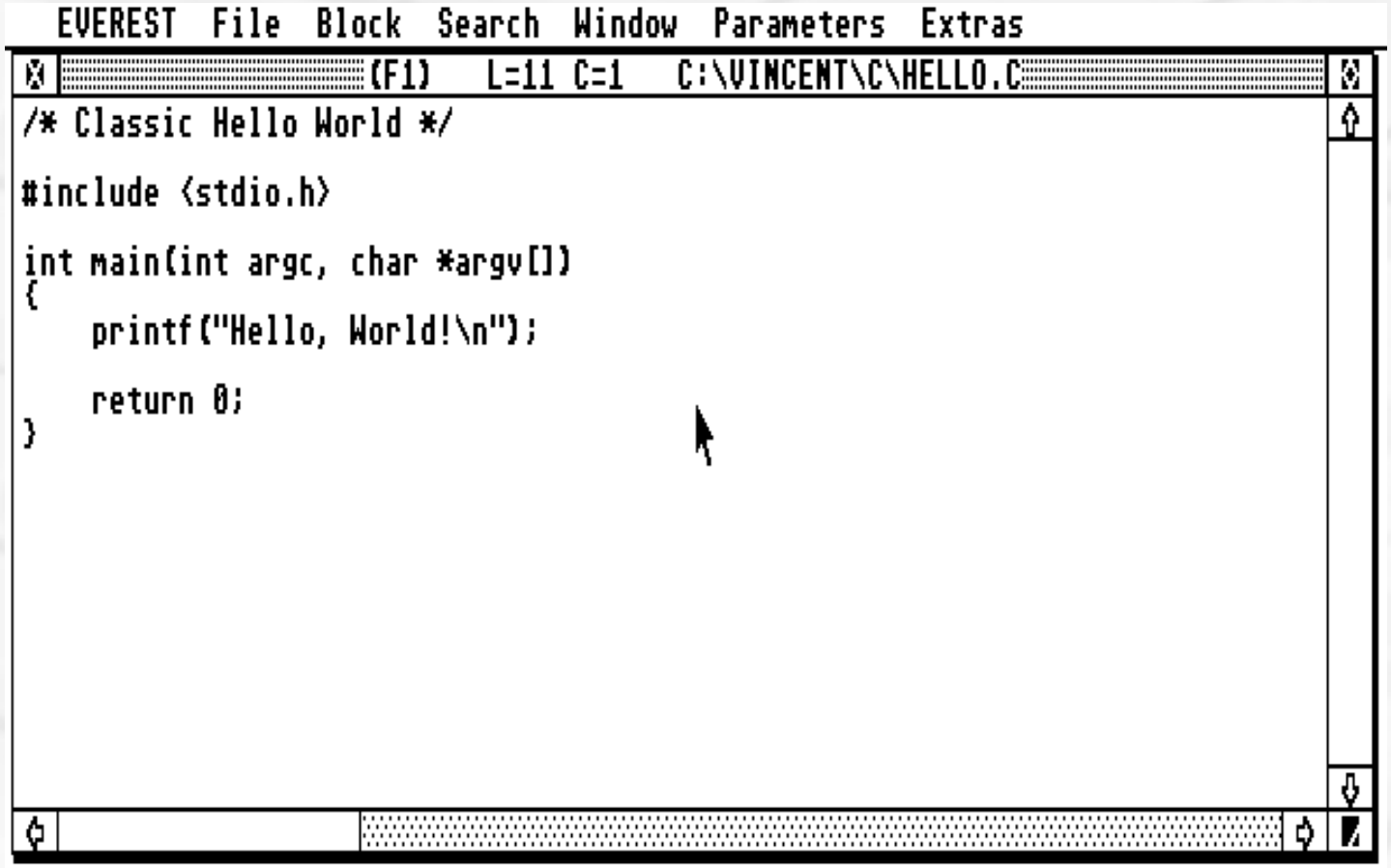
GenST2
editor
assembler



C language

Everest

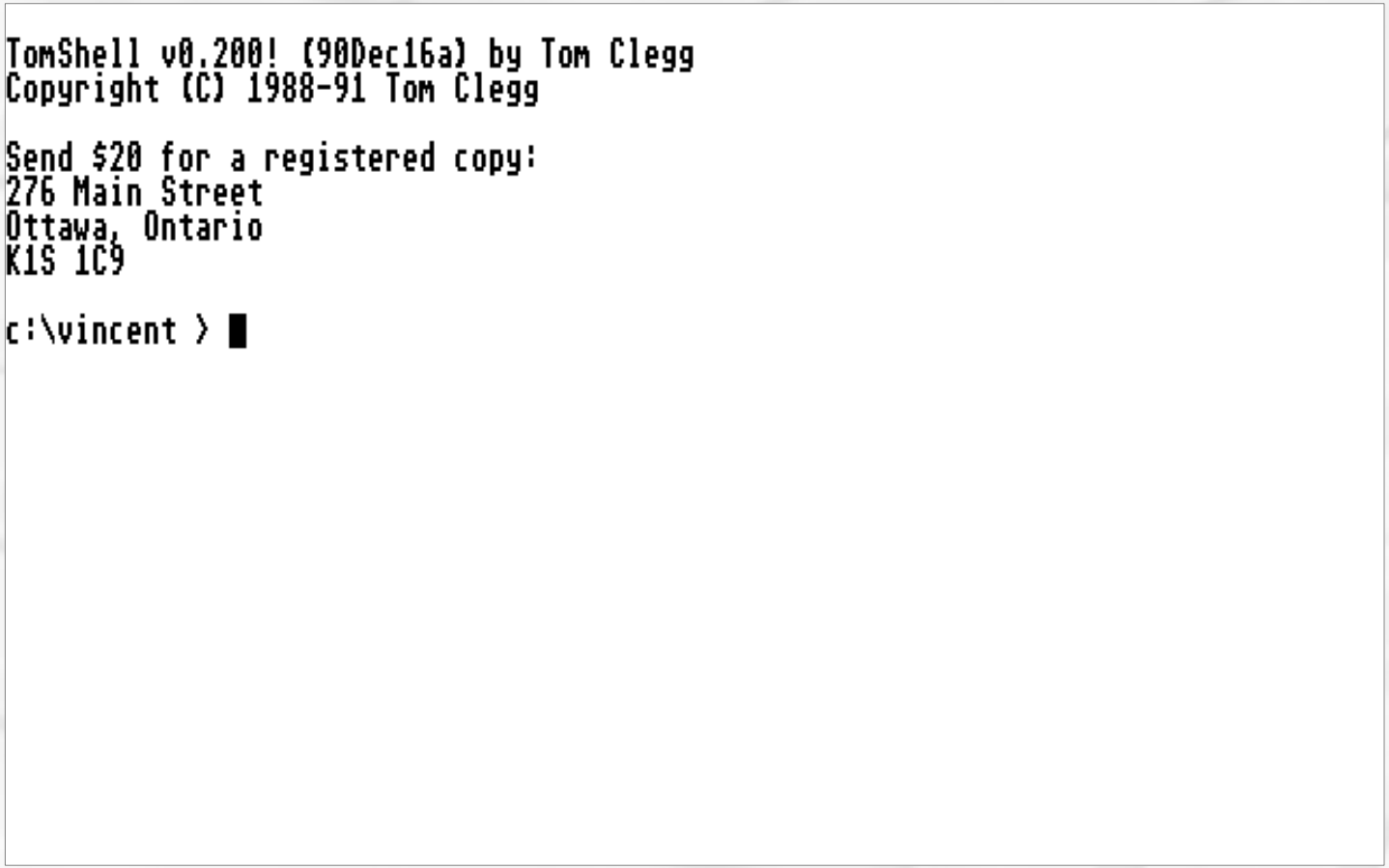
Text editor



Few CLI, but nice ones

TomShell

Command line interface



C compilers

C68

Free command-line ANSI C compiler

```
c:\vincent\c > dir hello.c
----a  hello.c              134  Apr 10, 2018  20:13:04
134 bytes used in 1 items.
c:\vincent\c > cc68x hello.c -o hello.tos -v
cpp -S -D__TOS__ -D__C68__ -D__MSHORT__ -ansi -T hello.c c:\tmp\hello.i
c68 c:\tmp\hello.i c:\tmp\hello.s
as68 c:\tmp\hello.s c:\tmp\hello.o
rm -f c:\tmp\hello.i
rm -f c:\tmp\hello.s
ld -o hello.tos crt0.o c:\tmp\hello.o c:\usr\lib\libc.a
rm -f c:\tmp\hello.o
c:\vincent\c > dir hello.tos
----a  hello.tos          15336  Apr 10, 2018  20:14:02
15336 bytes used in 1 items.
c:\vincent\c > hello
Hello, World!
c:\vincent\c >
```

A few years before...

Something unexpected appeared on Atari computers.

MiNT: MiNT is Not TOS

Released in 1990 by Eric R. Smith, for Atari ST

- **Preemptive multitasking kernel**
- Works on top of TOS
- Device drivers support
- Alternate file system support (MINIX, ext2)
- Long File Names support
- Extends the TOS API (GEMDOS) with **UNIX-like features**
- Includes TCP/IP stack

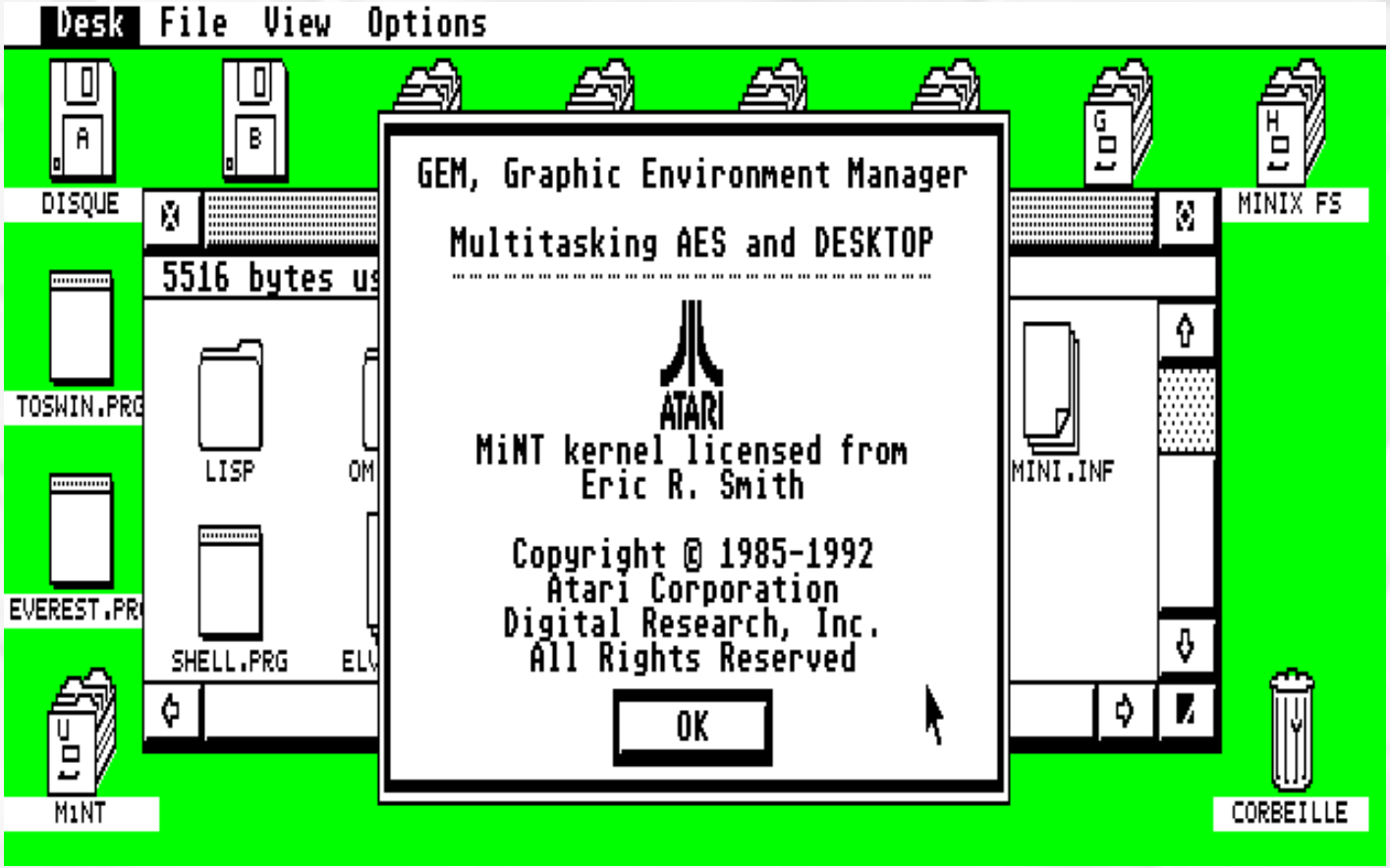
1992: Atari MultiTOS

- Atari hired Eric R. Smith
- MultiTOS =
  MiNT kernel
  + multitasking AES (user interface)
  + multitasking desktop
- Nice but a bit slow, needs RAM
- Mainly for high-end TT / Falcon

As MiNT became licensed by Atari,
as part of MultiTOS,
it was renamed to...

MiNT: MiNT is Now TOS

MultiTOS on my 4 MB STe



MiNT compatibility

- Generally good with utilities which respect the OS
- Multitasking is disabled when programs switch to supervisor mode
- No virtual memory, but optional **memory protection**: stricter memory checking, can affect some programs

MiNT could be compared to...

- Windows 95
  running on top of MS-DOS
- Clean, multitasking API
  running on top of old
  single-tasking BIOS

MiNTLib 1/3

- **C standard library** for major compilers: Pure C, C68, GCC...
- Provides **POSIX API**
- Translate POSIX calls at runtime
  - To MiNT system calls if available
  - Otherwise to TOS system calls

MiNTLib 2/3

- Binaries can automatically
  take advantage of MiNT features
  at runtime, when available.
- Example: POSIX directory API
  opendir(), readdir()...
  can automatically use Long File Names
  with MiNT kernel and proper filesystem

MiNTLib 3/3

- Concretely: Most GNU / Linux software can be built out of the box for MiNT, without specific adaptations.
- When not requiring advanced OS features, binaries can even run on plain TOS. Example: tar

MiNTLib could be seen as...

- A static library which provides similar functionality as Cygwin environment for Windows.
- Even transparent CR/LF translation is supported.

bash & C68 running on MiNT

```
/c/vincent/c/hello>echo $BASH_VERSION
1.14.0(1)
/c/vincent/c/hello>uname -a
TOS/MiNT ? Jan 1990 1.62/1.12 Atari STE
/c/vincent/c/hello>ll
-rw-rw----   1 root     sys          134 Nov 20 00:06 hello.c
/c/vincent/c/hello>cc68x hello.c -o hello -v
cpp -S -D__TOS__ -D__C68__ -D__MSHORT__ -ansi -T hello.c u:\tmp\hello.i
c68 u:\tmp\hello.i u:\tmp\hello.s
as68 u:\tmp\hello.s u:\tmp\hello.o
rm -f u:\tmp\hello.i
rm -f u:\tmp\hello.s
ld -o hello crt0.o u:\tmp\hello.o u:\usr\lib\libc.a
rm -f u:\tmp\hello.o
/c/vincent/c/hello>ll
-rw-rw----   1 root     sys          134 Nov 20 00:06 hello.c
-rw-rw----   1 root     sys        15336 Nov 20 00:12 hello
/c/vincent/c/hello>./hello
Hello, World!
/c/vincent/c/hello>
```

1997: End of my first Atari era

- Pushed my Atari STe to its limits.
- Not enough CPU for my needs, specially exercises of image processing.
- Time to switch to something faster.

Meanwhile,
on the Atari scene...

Other Atari machines...

- Mega ST
- STe
- Mega STe
- TT: 68030
- Falcon: 68030 + DSP
- Clones: Hades, Milan...
- Accelerators: CT60...


Atari TT

NVDI

- Commercial software
  from Behne & Behne Systemsoftware
- **Fast** replacement of the **VDI** layer
  Visible speedup with on any machine
- Improved graphics driver
- Support for graphics cards (closed API)
- Printing driver

Atari company 1/2

- 1993: Atari **stopped** all computer activities, focusing only on the Jaguar console, then only on game licenses.
- Owner changed several times:
  - 1996: JTS Corporation
  - 1998: Hasbro Interactive
  - 1999: Infogrames
  - 2009: Infogrames is renamed to Atari

Atari company 2/2

- All TOS-related software, including ROMs, is now unofficially considered as **abandonware**
- But concretely, that software is still under the Atari copyright, closed source.
- Who owns the rights of TOS today?
  ⇨ **legally unusable**

Special case of MiNT kernel

- Provided as open source:
  Copyright 1990,1991,1992 Eric R. Smith.
  Copyright 1992,1993,1994 Atari Corporation.
- Supported by people on the MiNT Mailing List
- Renamed to **FreeMiNT** kernel
- 2000: Put into CVS

SpareMiNT distribution

- FreeMiNT kernel
- GCC 2.x + MiNTLib
- **RPM** packages (Red Hat)
- Huge efforts to provide a full UNIX-like environment: many, many Free packages mostly from GNU/Linux.

SpareMiNT
The FreeMiNT Software Archive

2000~2010

1997-2003: My C++ period

- Obsessed by C++, Object-Oriented Programming, templates, unit tests.
- Considered using C++ to create a multi-platform framework for games.
- Wanted recent **GCC cross-compiler** for GameBoy Advance.
- Started training with GCC cross-compiler for my favorite target... the **Atari ST** 😬

Patrice Mandin's invaluable work

SpareMiNT binutils and GCC 2.x patches upgraded to **GCC 3.x**

Everything **clearly** explained

Build an Atari cross-compiler for Linux

gcc 3.3 and binutils 2.13.2.1

This text tries to explain the steps to follow to setup the necessary tools to cross-compile m68k-atari-mint software on a different machine.
I have used the available patches from the Sparemint site, along with the original (gcc & binutils) archives.
These are the steps I followed to build these utilities. The power of recent machines are well superior to the Ataris, the compilation time for heavy software is greatly reduced, so we might as well use them.
Note: The mintlib is necessary (binaries and include files) to compile a cross-compiler. If you know how to build a cross-compiler only with sources files, please let me know.

Etape 1: Get the necessary archives

- Binutils sources:
  binutils-2.13.2.1.tar.gz:
- MiNT patch for binutils :
  binutils-2.13.2.1-mint-2.diff.gz (21 KB)
- Gcc sources:
  gcc-3.3.tar.gz
- MiNT patch for gcc :
  gcc-3.3-mint.diff.gz (5 KB)
- Compiled mintlib (include and lib):
  mintlib-devel-0.57.3.tar.gz

I spent several ***years***

- working alone
- upgrading versions
- fighting old and new bugs
- getting help from binutils/GCC mailing lists and Bugzilla

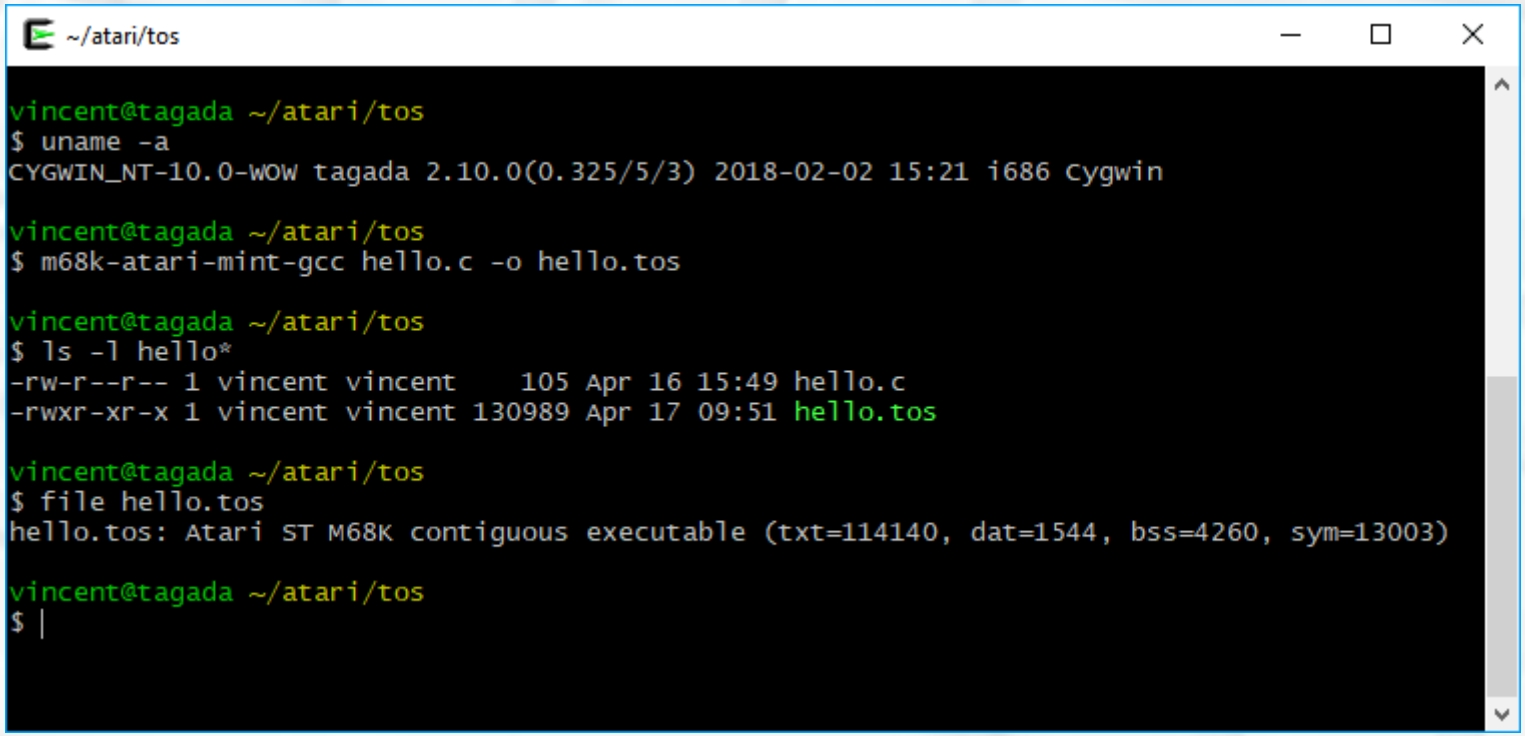
July 2007: First public release!

Vincent Rivière's m68k-atari-mint cross-tools
http://vincent.riviere.free.fr/soft/m68k-atari-mint/

- Ready-to use cross-tools binaries for **Cygwin**
- Packages: binutils, **GCC 4.x**, MiNTLib, PML...
- Carefully respected **GPL requirements**:
  Original sources, MiNT patches,
  build scripts, binary packages

Cygwin

Full UNIX-like environment for Windows



Cross-tools announces

Usenet Newsgroups:

- comp.sys.atari.st
- fr.comp.sys.atari

Beginning of my public contributions

Detailed article about cross-tools

Software Developer's Journal
Extra
April 2012

Porting GCC to a new target
The case of Atari ST computers

Full magazine
legally available on my website

Working with the community

- Very good feedback
- Still an active community,
  using emulators or real hardware
- I was quickly oriented
  to the **MiNT Mailing List**.

MiNT Mailing List

- The place where serious things are discussed
- Central place about FreeMiNT, MiNTLib, SpareMiNT, GCC, and MiNT support for real hardware and emulators.
- Address changed several times

People taught me
a lot of things
about contemporary
MiNT environments.

Here is the situation I discovered
in 2007, still valid today.

Real hardware

- Most used hardware:
  Falcon 030 + **CT60 accelerator**
  - 68060 CPU @ 66 or 100 MHz
  - SDRAM FastRAM from 64 to 512 MB
- CompactFlash instead of IDE hard disk
- Sometimes: SuperVidel graphics card

Atari Falcon 030

CT60
accelerator
for Falcon 030

by
Rodolphe
Czuba

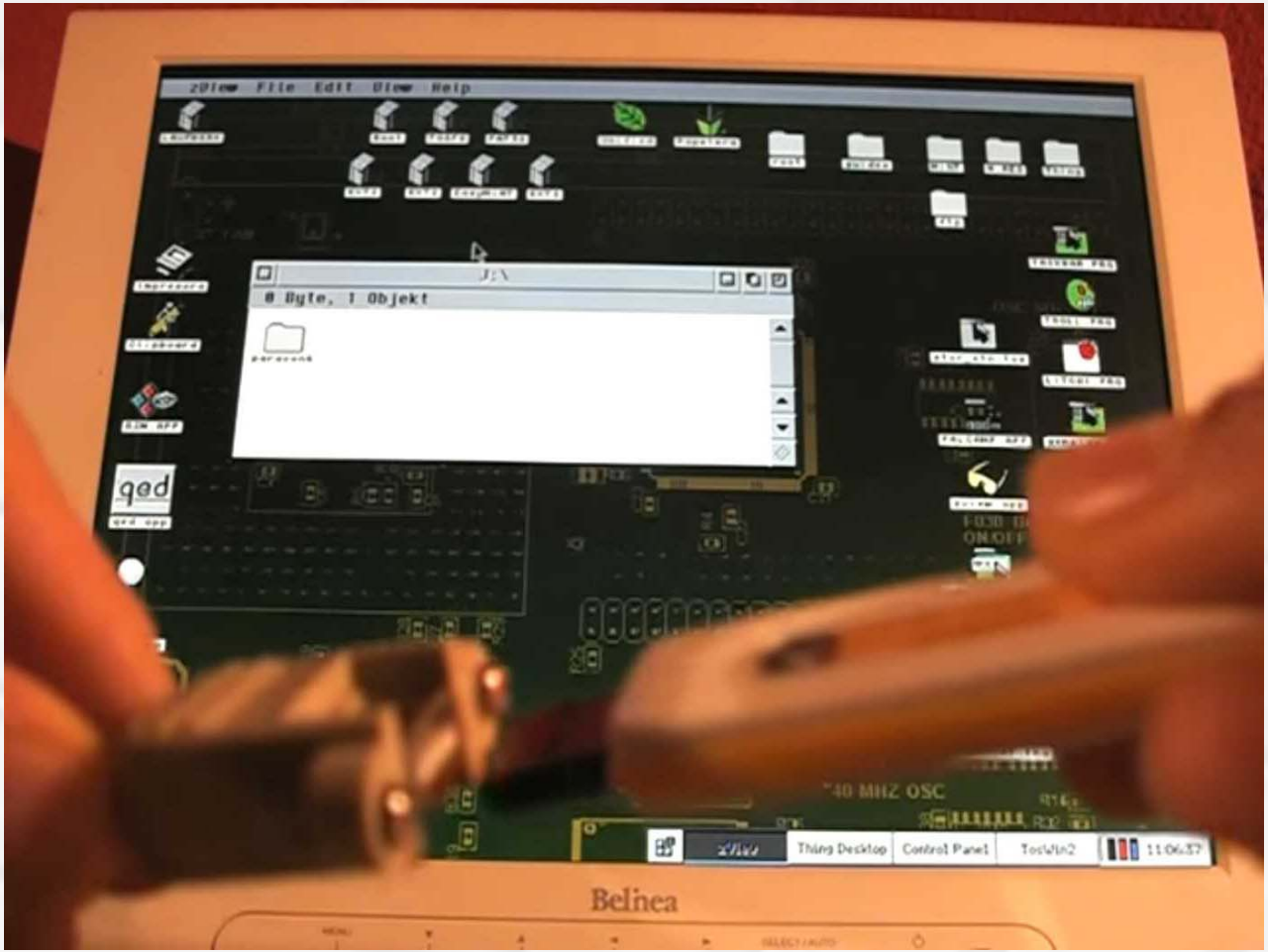
68060 CPU
FastRAM

SuperVidel
graphics card
for CT60

by
Nature

USB driver
for FreeMiNT

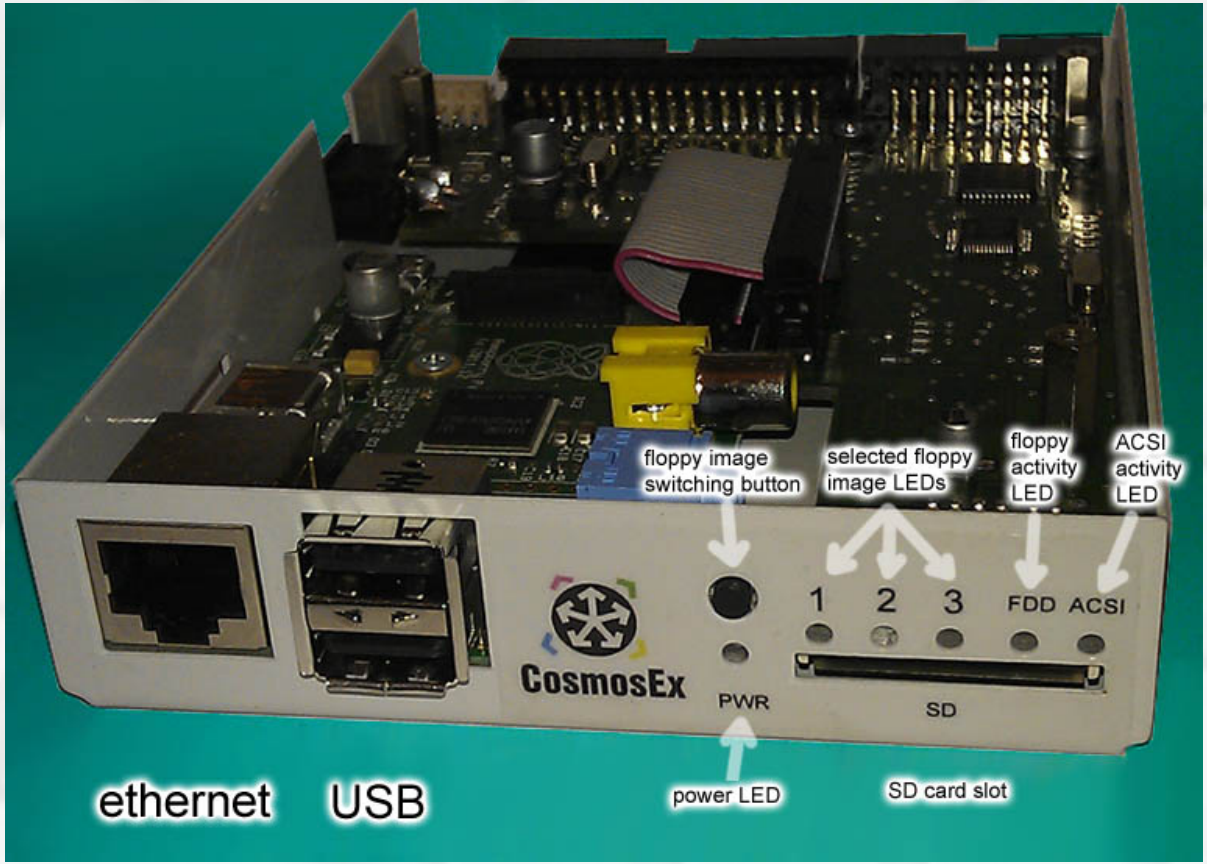
by
David Gálvez



CosmosEx

Hard disk, floppy, USB keyboard and mouse, network, emulated with Raspberry Pi and SD Card

by Jookie



Other hardware 1/2

- **EtherNat**: Ethernet and USB interfaces for the CT60
- **UltraSatan**: ACSI hard disk emulation from SD Card
- **HxC Floppy Emulator**: Floppy emulator from SD Card
- **Gotek floppy emulator** with HxC or FlashFloppy firmware

Other hardware 2/2

- **Eiffel interface**: Use PS/2 keyboard and mouse on Atari machines
- **Exxos Store (and forum)**: many, many extensions and replacement parts for original Atari hardware
- **Lotharek's Lair**: Many hardware for various machines

Emulators 1/2

- ARAnyM: Atari Running on Any Machine
  Partial Falcon emulator + software extensions
  68040 CPU (from WinUAE)
  with optional JIT (Just In Time compiler).
  Mainly developed for Linux.
- Targets **software compatibility**,
  Native Features, and **speed**.
  By far, the fastest MiNT environment.

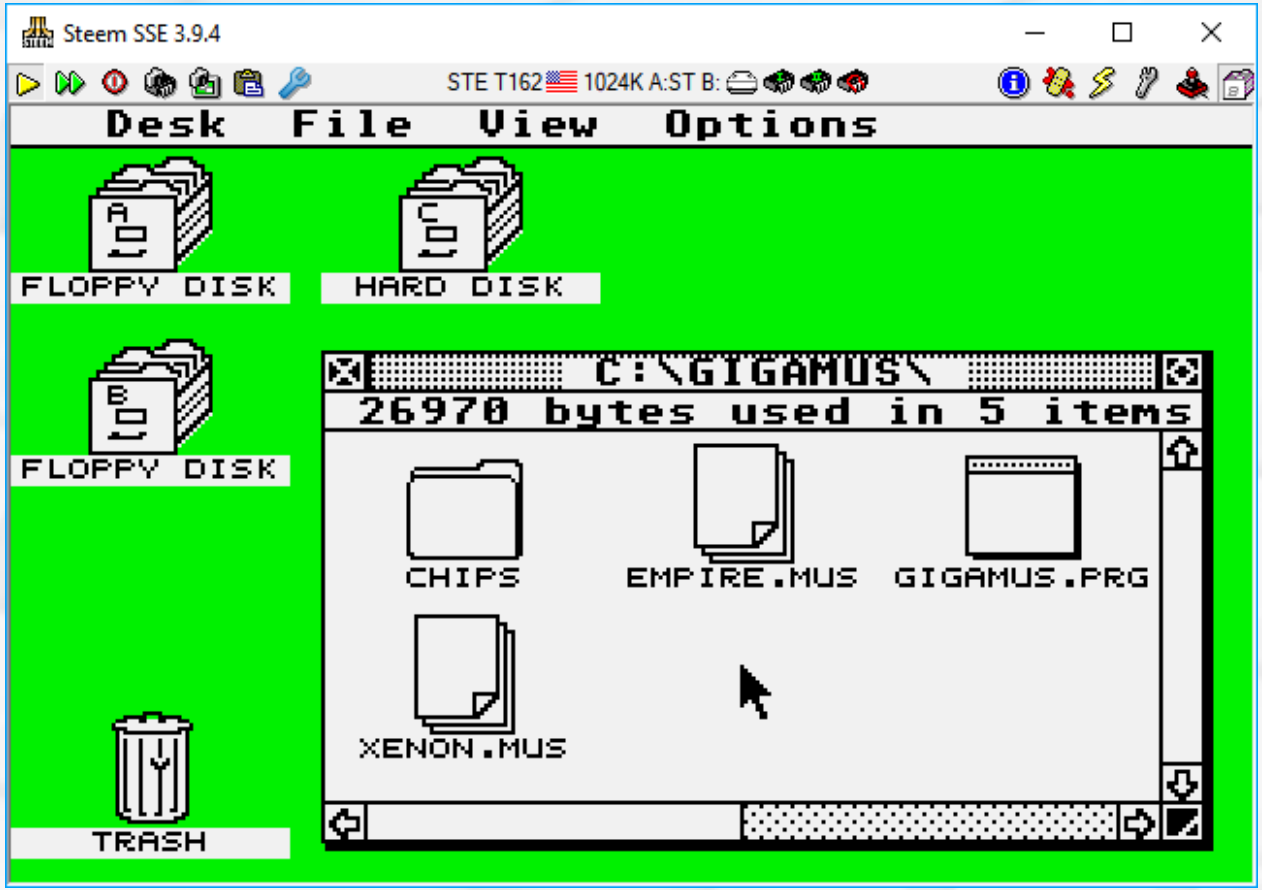
Emulators 2/2

- Hatari: ST / STe / TT / Falcon emulator
  Many custom combinations : CPU, etc.
  Mainly developed for Linux.
- Steem SSE: ST / STe emulator
  Mainly developed for Windows.
- Both target **accurate hardware emulation**, but few software extensions.
  Rarely used with MiNT.

Steem SSE

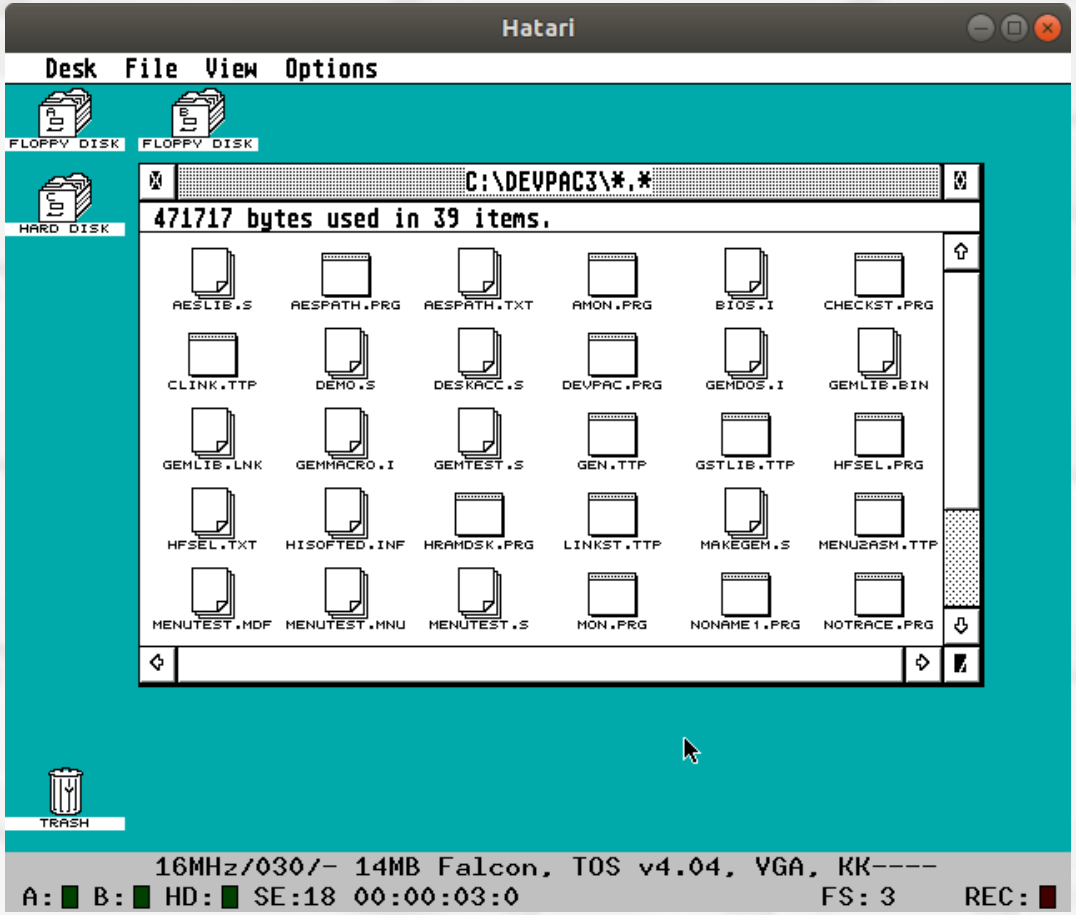
Fork of original
Steem Engine

by
Steven Seagal



Hatari

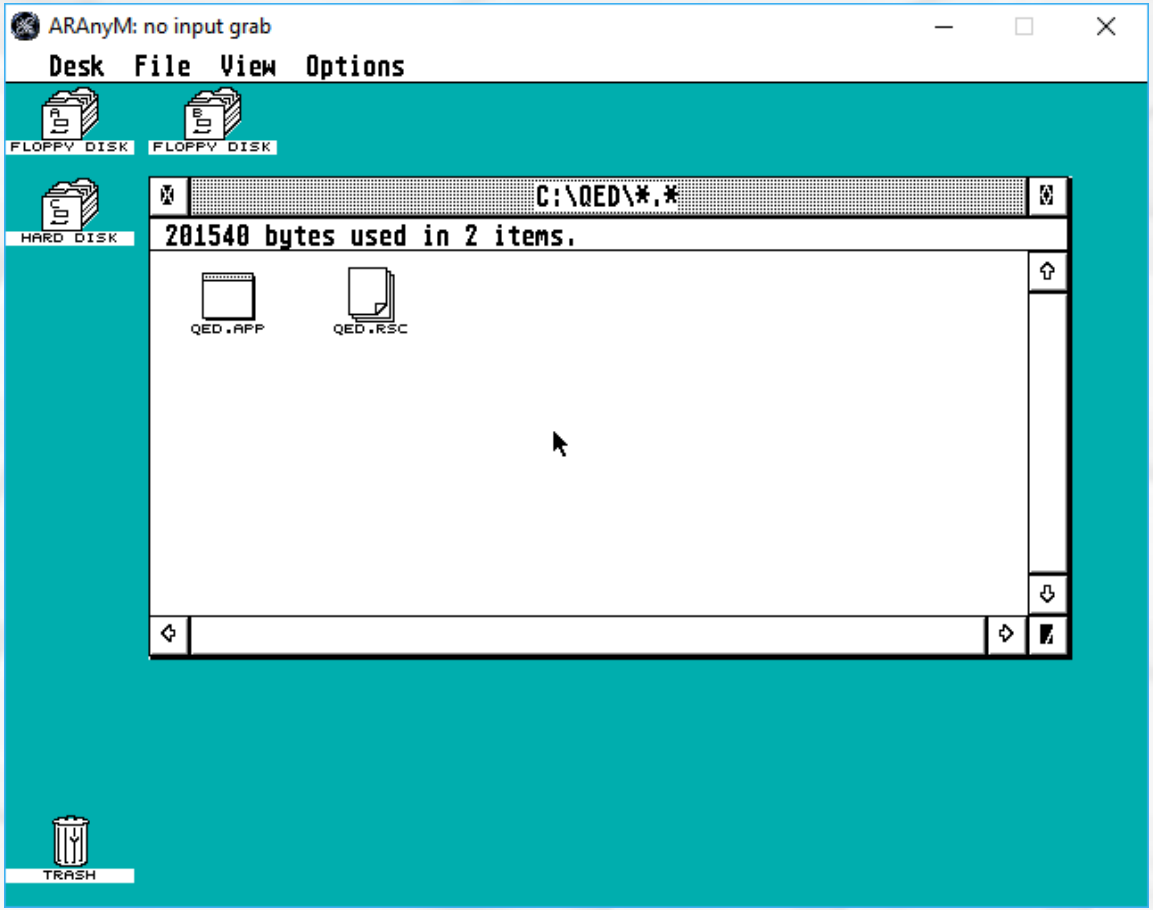
Example:
Falcon emulation,
hard disk
emulated
from host folder



ARAnyM 1/2

Partial
Falcon emulation
with 68040
+ extensions

Calls itself
“Virtual Machine”



ARAnyM 2/2

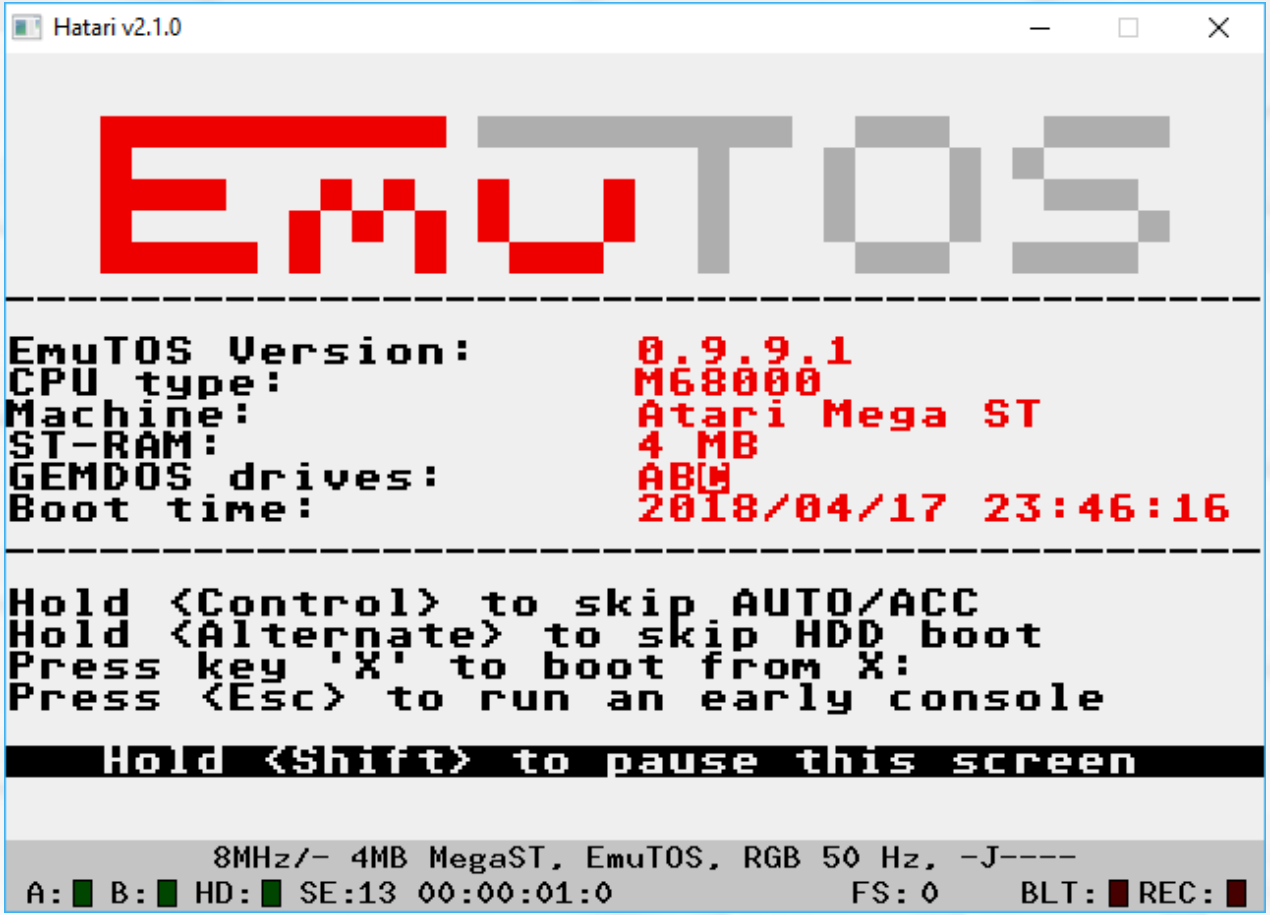
Many unique features available through “NatFeats”
Requires specific drivers.
Designed for fastest possible experience.

- Debug output
- Extended True Color video modes
- Accelerated graphics
- Access to Host Filesystem
- Network, SCSI, mass storage...

EmuTOS 1/4

Free (GPL) Operating System compatible with TOS

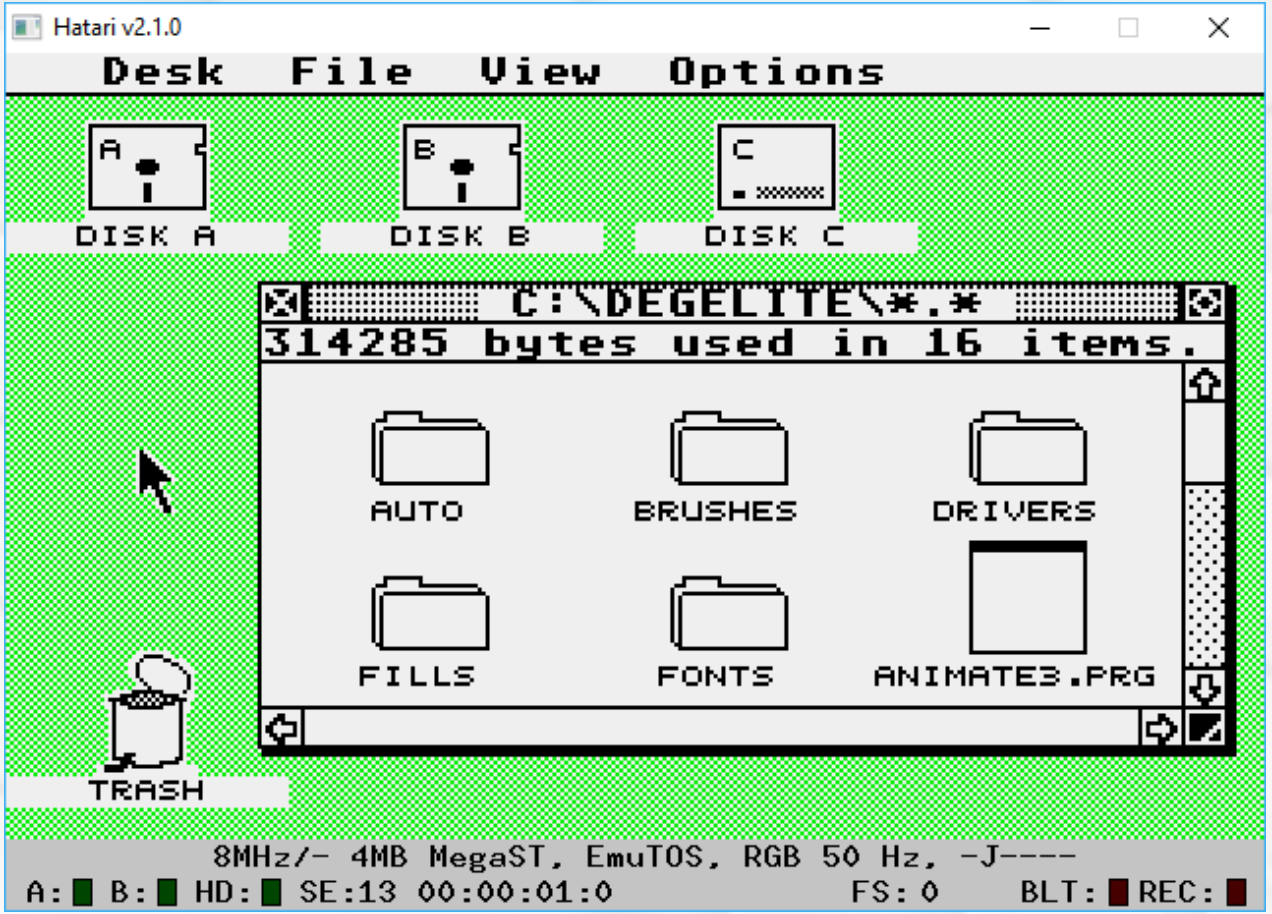
Alternative to Atari ROMs



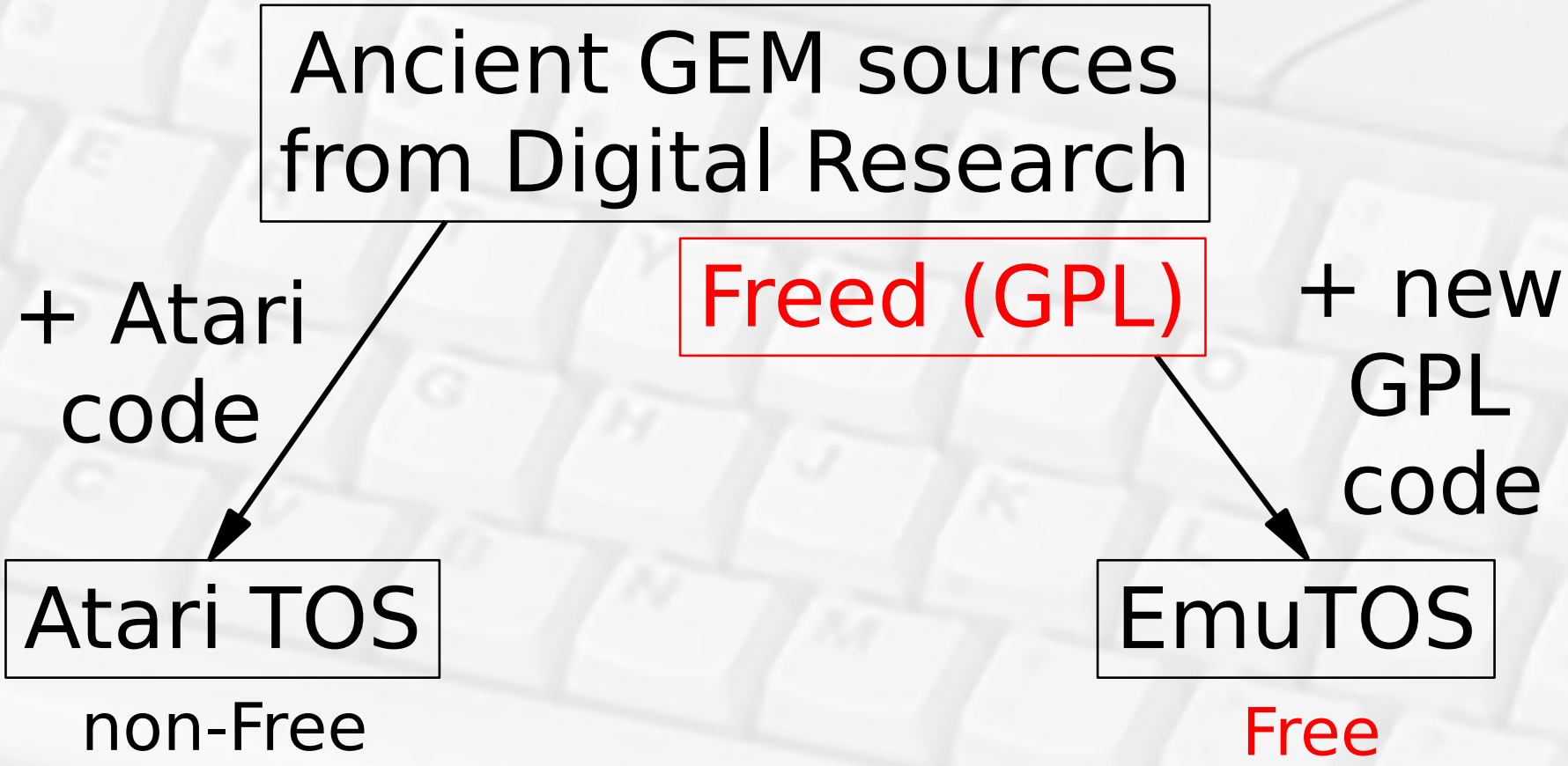
EmuTOS 2/4

Similar system to Atari TOS

But different implemen-tation



EmuTOS 3/4


Ancient GEM sources from Digital Research
+ Atari code
Freed (GPL)
+ new GPL code
Atari TOS
non-Free
EmuTOS
Free

EmuTOS main features 4/4

- Supports all Atari computers
- Provided as many variants, 9 languages
  - ROM, mainly for emulators
  - RAM, as floppy or PRG, for real hardware
- Can even support non-Atari machines
- Built-in **hard-disk driver**
- Atari or PC partition tables, FAT16 partitions
- Built-in EmuCON command-line interpreter

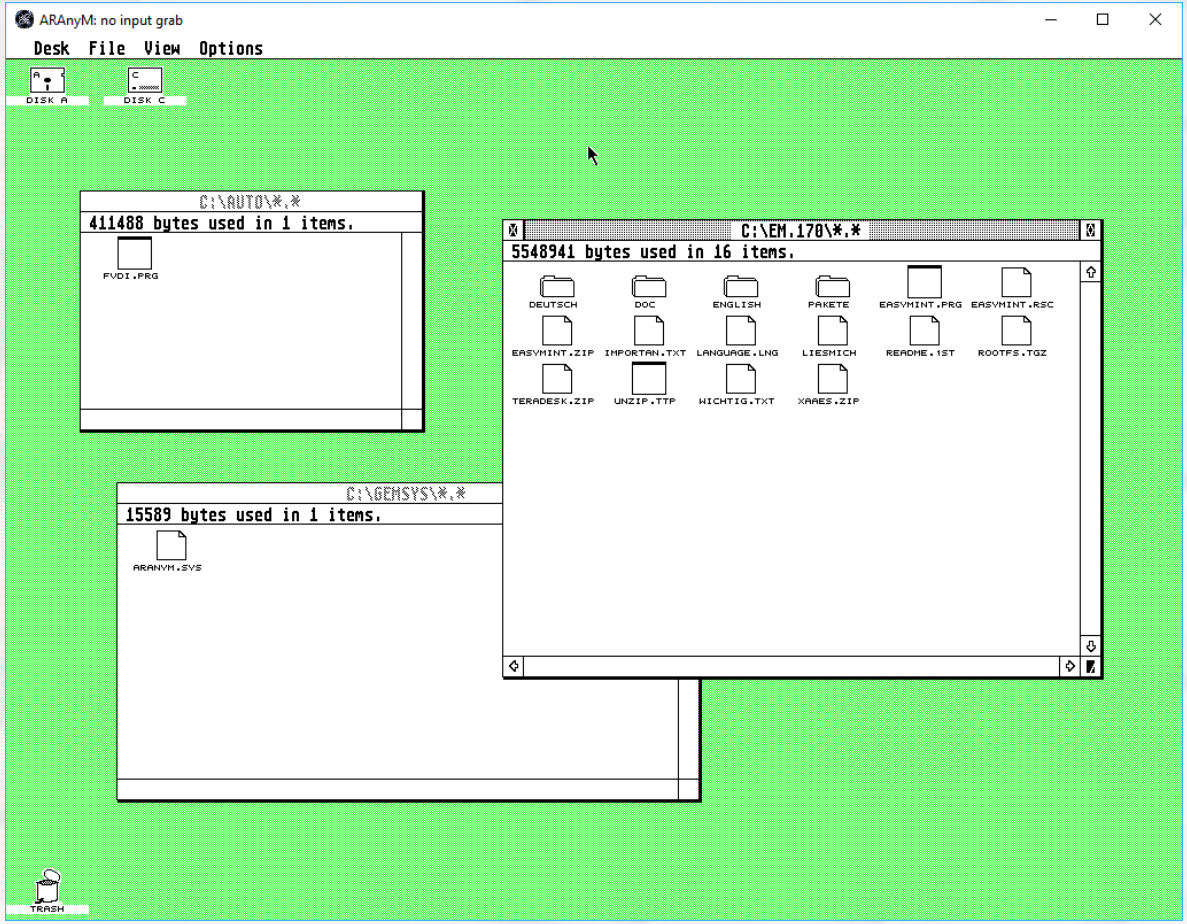
fVDI 1/2

- New **VDI implementation** (graphics driver) by Johan Klockars
- Free Software (GPL)
- Supports **external drivers** with public API
- Explicit support for **ARAnyM extended video modes**

fVDI 2/2

ARAnyM,
EmuTOS
and fVDI

in 1024x768
32-bit

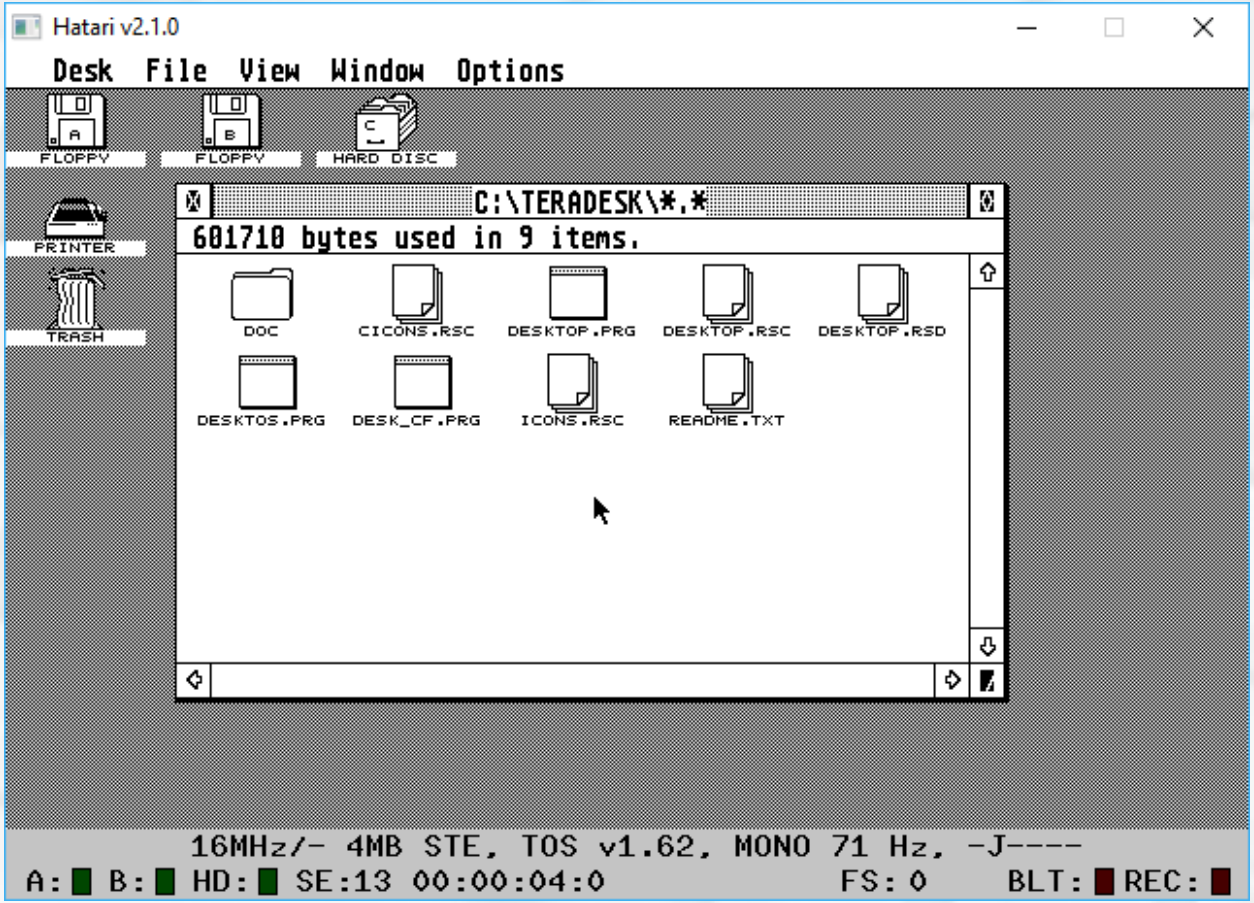


Tera Desktop 1/2

- Improved GEM desktop
- Free Software (GPL)
- Supported since 1991!
- Support for multitasking AES like MultiTOS, XaAES, MyAES...

Tera Desktop 2/2

Hatari,
STe emulation,
high resolution,
Tera Desktop

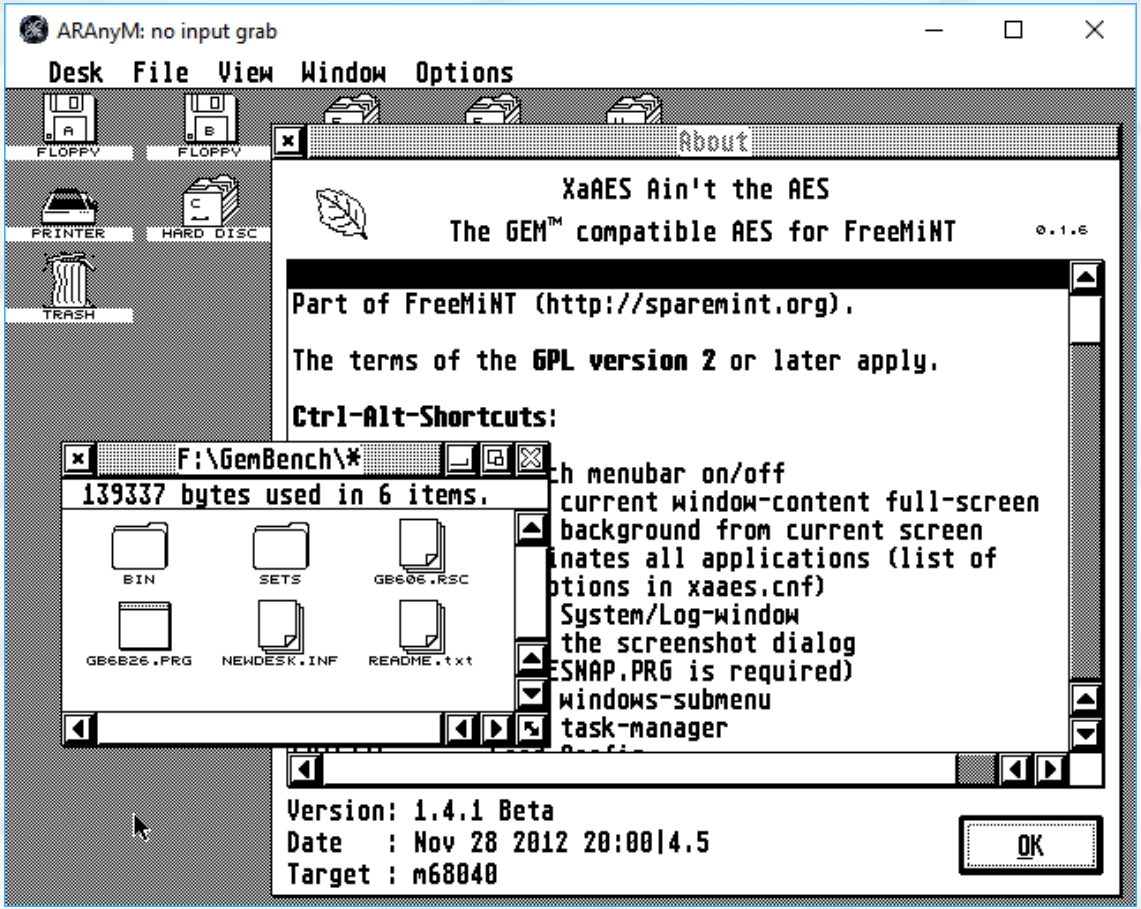


XaAES 1/2

- **Multitasking AES** for FreeMiNT (windowed environment)
- Free Software (GPL) **provided with FreeMiNT**
- Requires an alternative desktop such as Tera Desktop

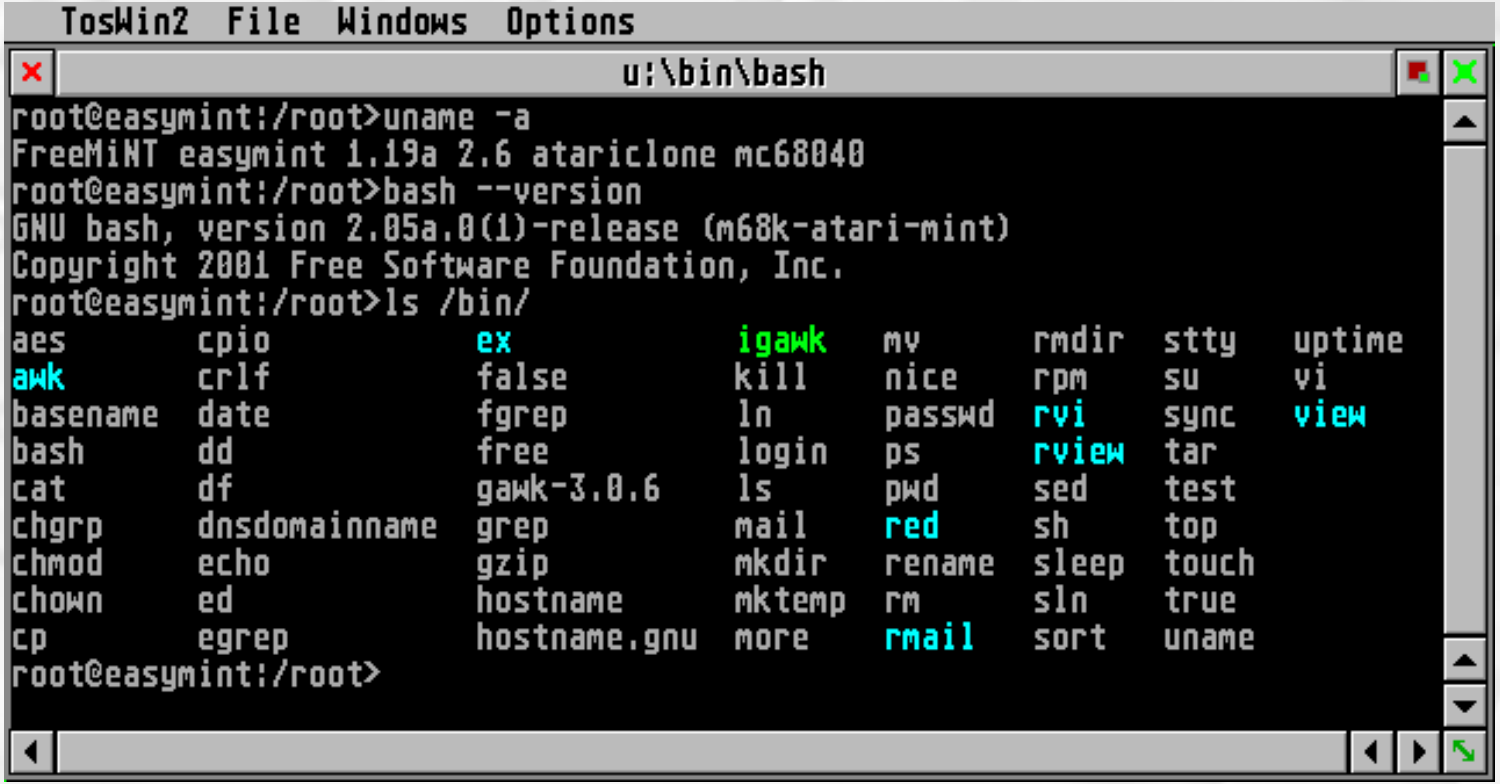
XaAES 2/2

ARAnyM,
EmuTOS,
FreeMiNT,
XaAES,
Tera Desktop



TosWin2

Windowed terminal emulator



API Documentation

tos.hyp

by Gerhard Stoll

Putting all together...

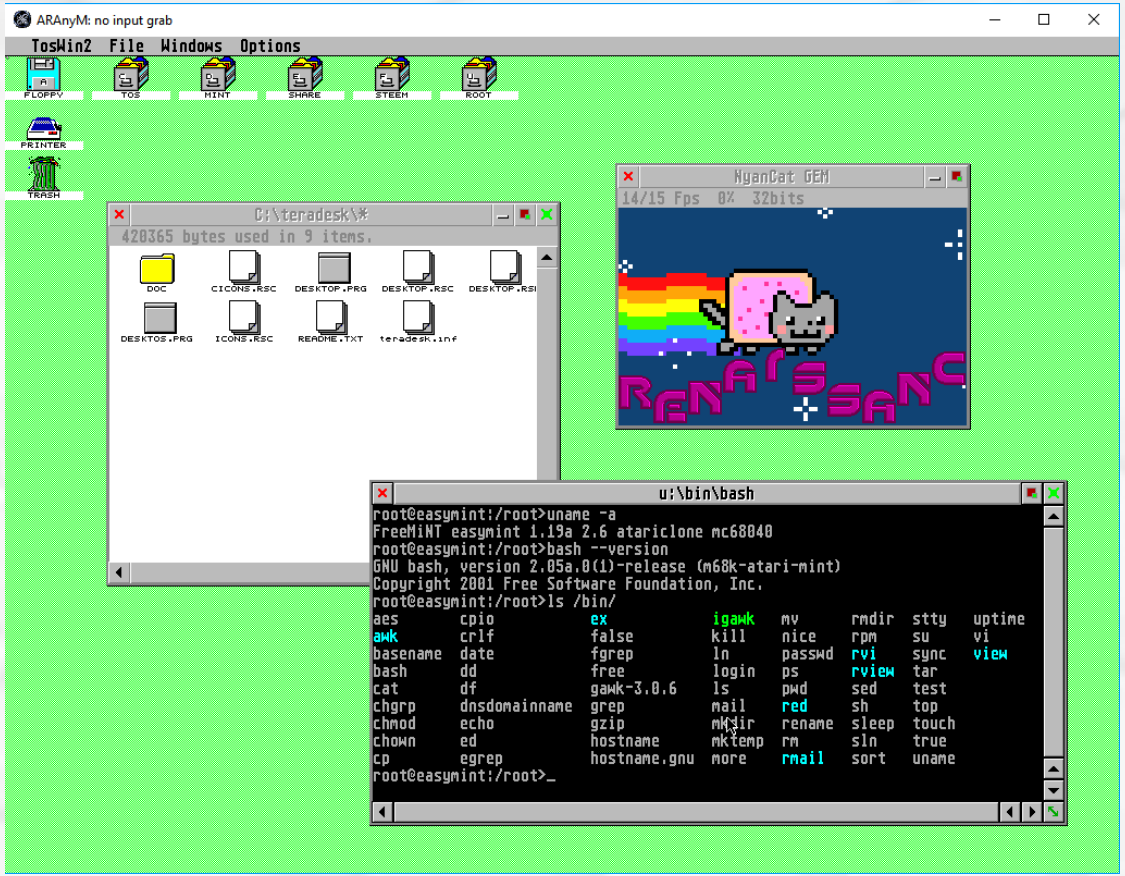
- ARAnyM
- EmuTOS
- FreeMiNT
- XaAES
- Tera Desktop
- and more...

EasyMiNT installer

- A **user-friendly installer** for SpareMiNT distribution
- By Marc-Anton Kehr
- Discontinued in 2015 with version 1.90

Example installation

ARAnyM
EmuTOS
FreeMiNT
fVDI
XaAES
Tera Desktop
TosWin2
bash
NyanCat



AFROS

Atari FRee Operating System

Distribution for ARAnyM + Live CD based on Slax Linux

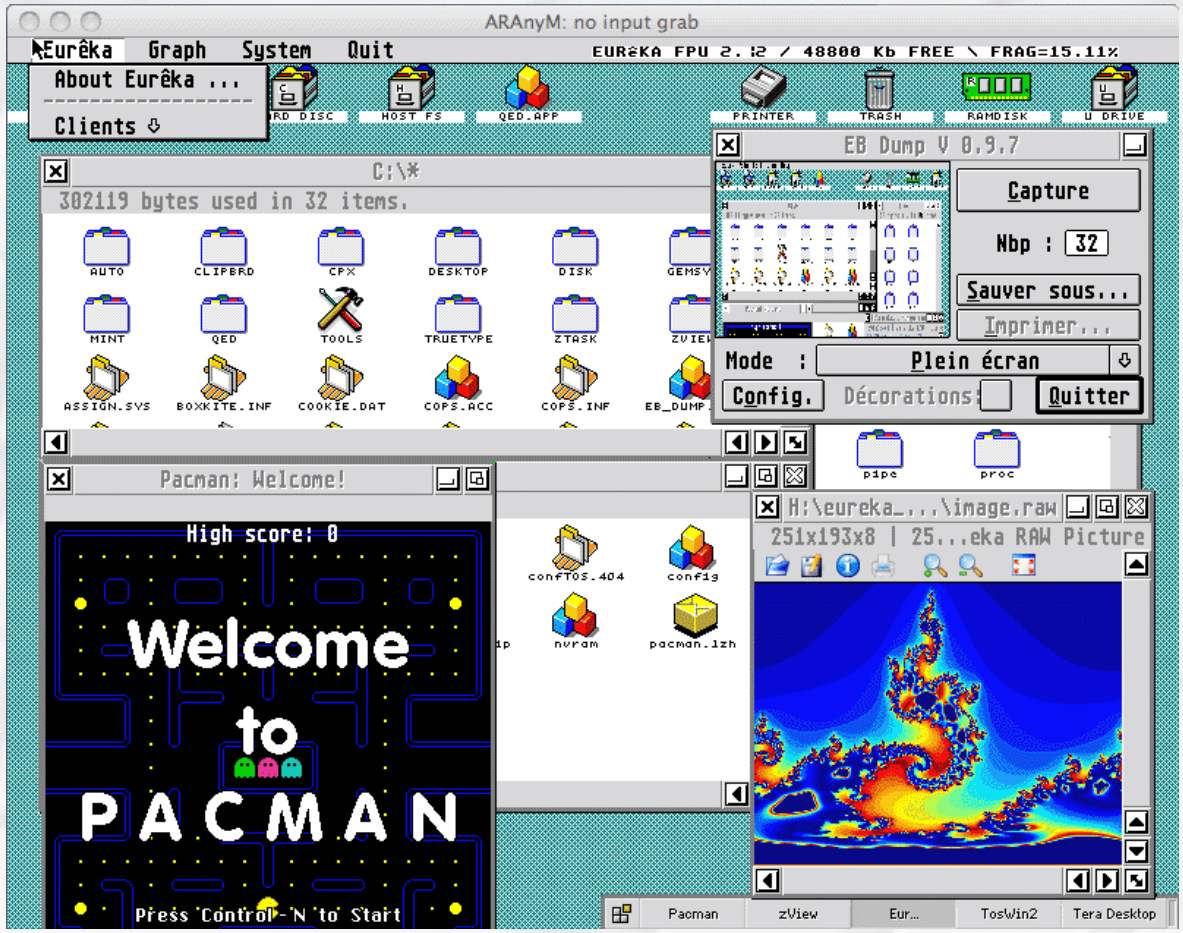
by Petr Stehlík

miniPack

Distribution for ARAnyM

Supports Windows, Linux, Macintosh, PlayStation 3

by François LE COAT

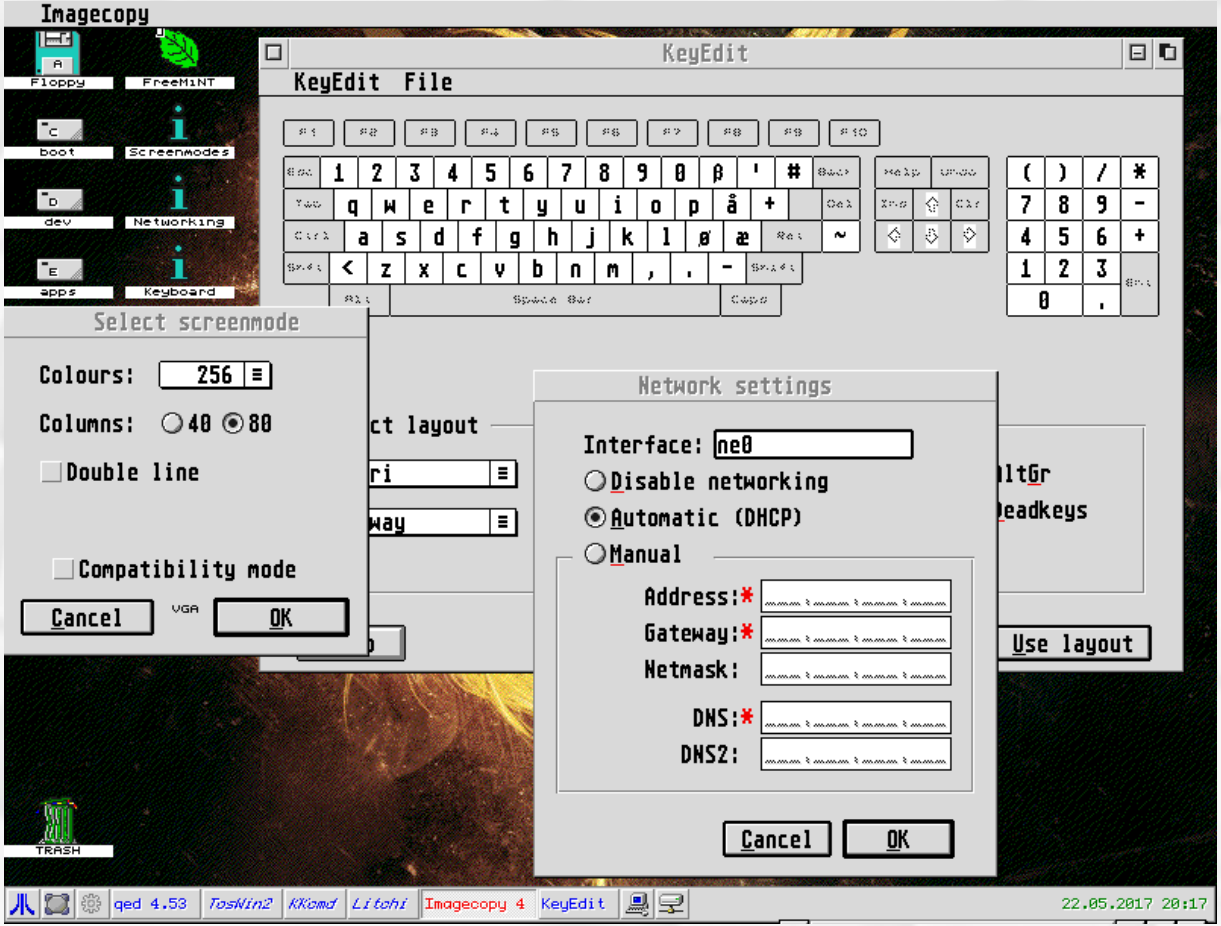


VanillaMiNT

VanillaMiNT

Simple FreeMiNT distribution for 68030 and higher

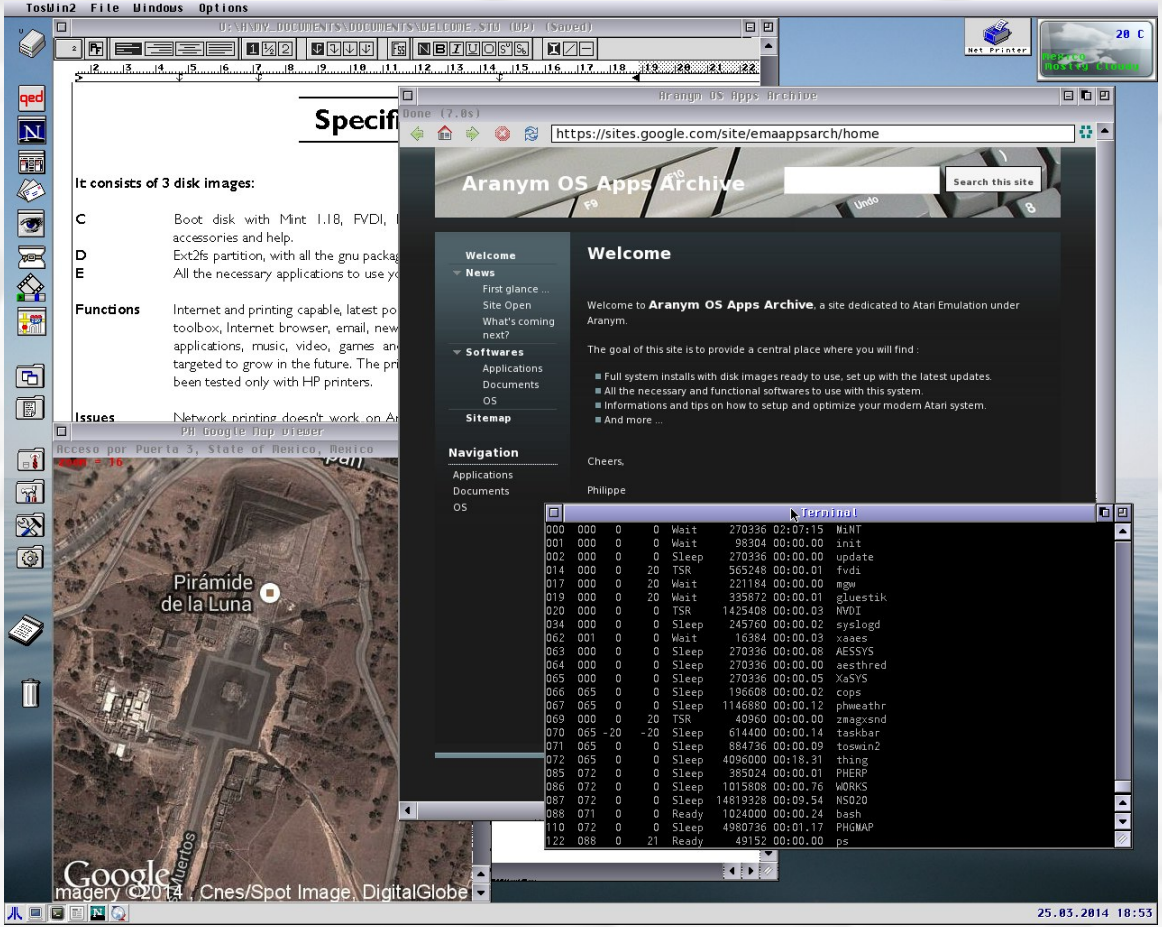
by Jo Even Skarstein



EasyAraMiNT

FreeMiNT distribution for ARAnyM

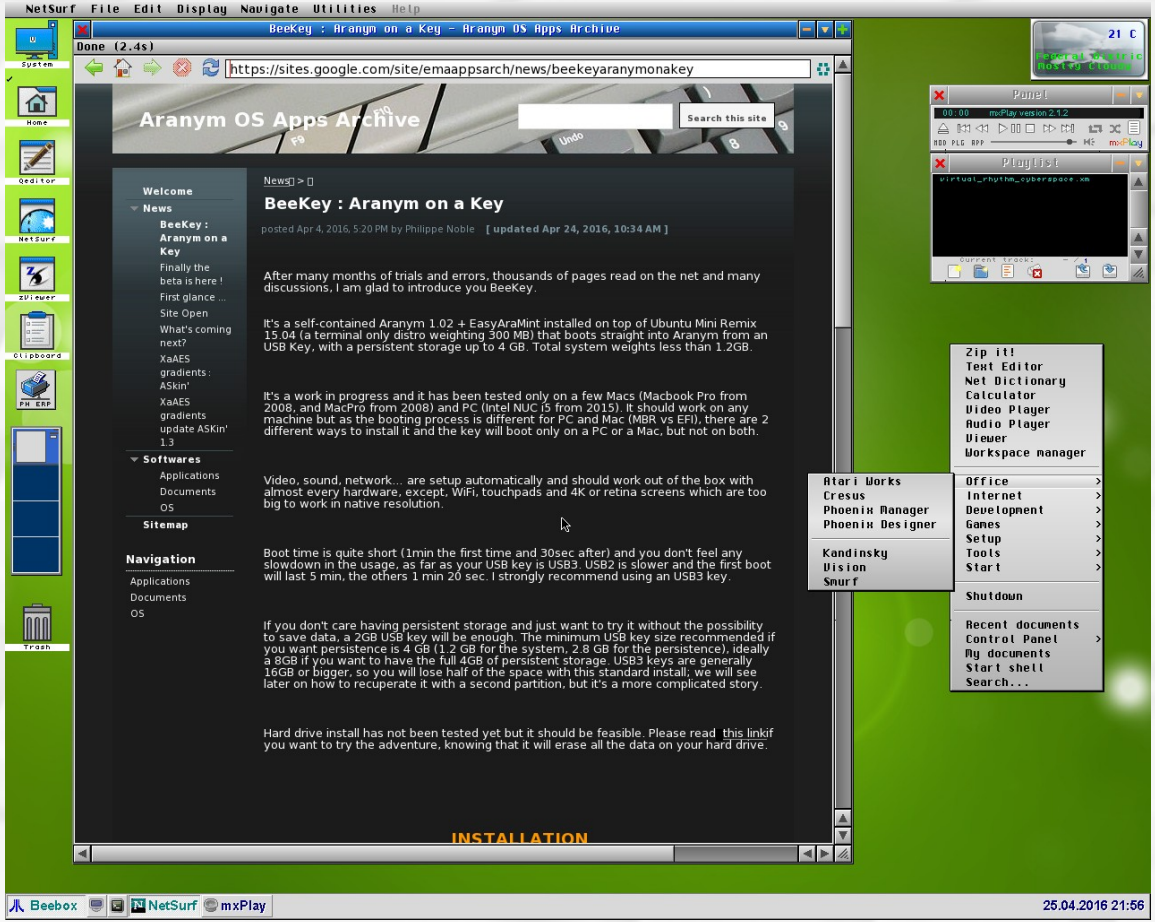
by Philippe Noble



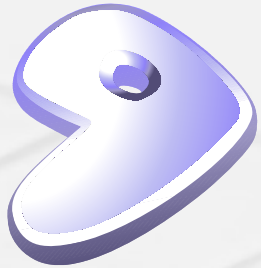
BeeKey / BeePi

Live distribution
of ARAnyM
for PC / Mac
/ Raspberry Pi
based on
minBian

by
Philippe Noble



Gentoo FreeMiNT



Port of Gentoo distribution
over FreeMiNT kernel

By Alan Hourihane

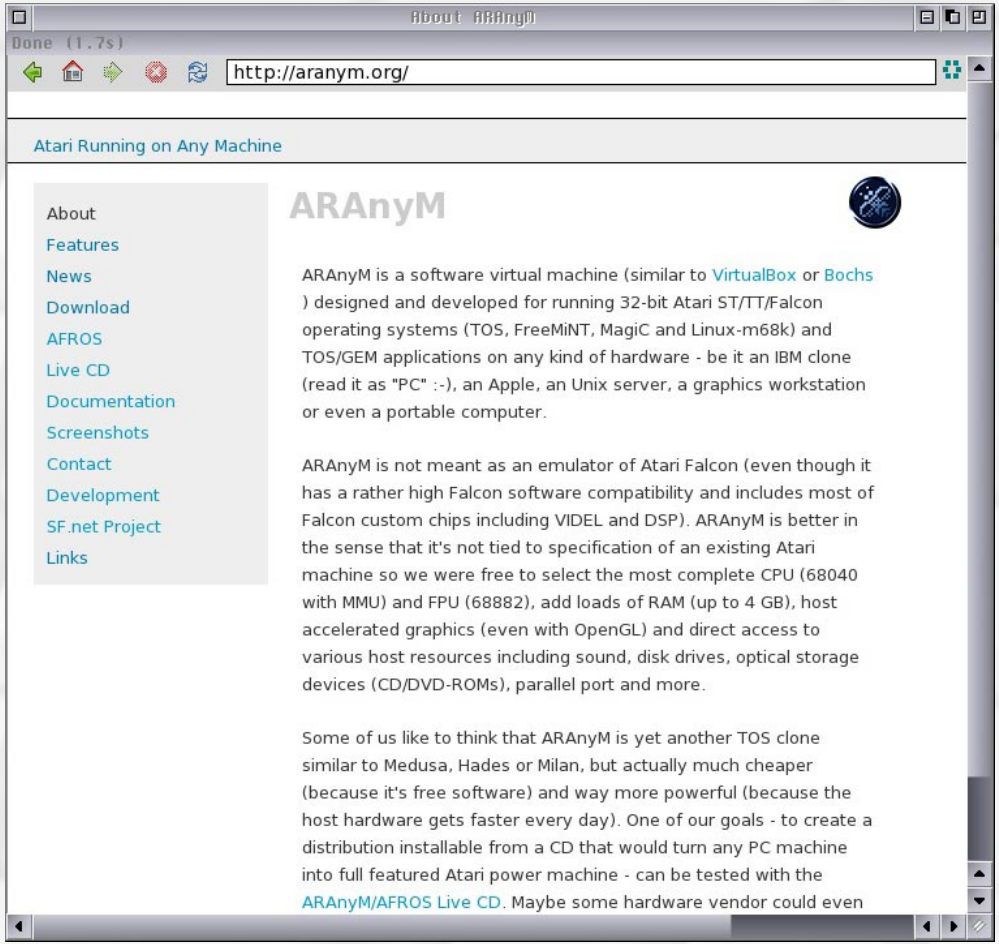
(mirror)

Some remarkable software...

NetSurf

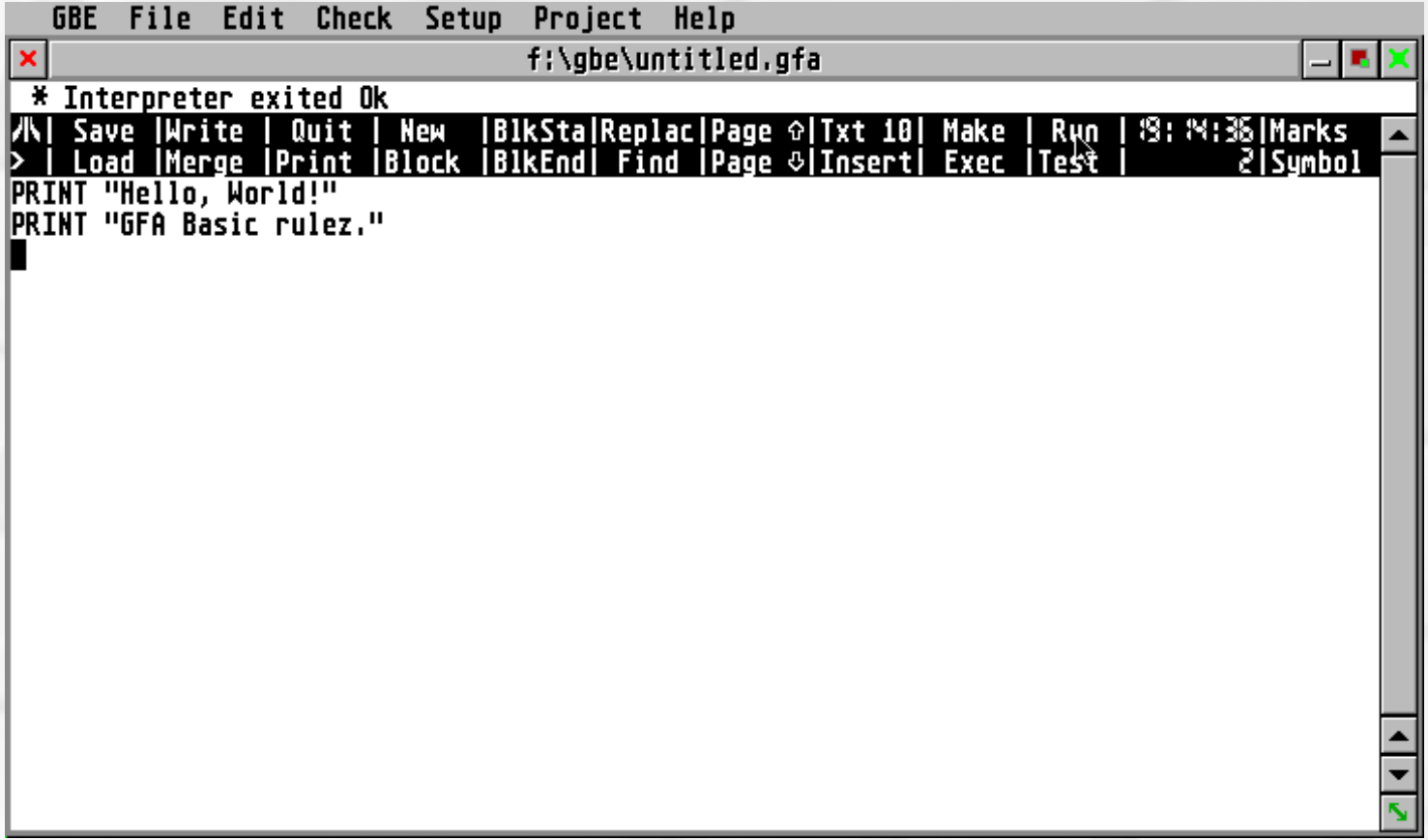
Web Browser

ported by
Ole Loots



GFA Basic Editor

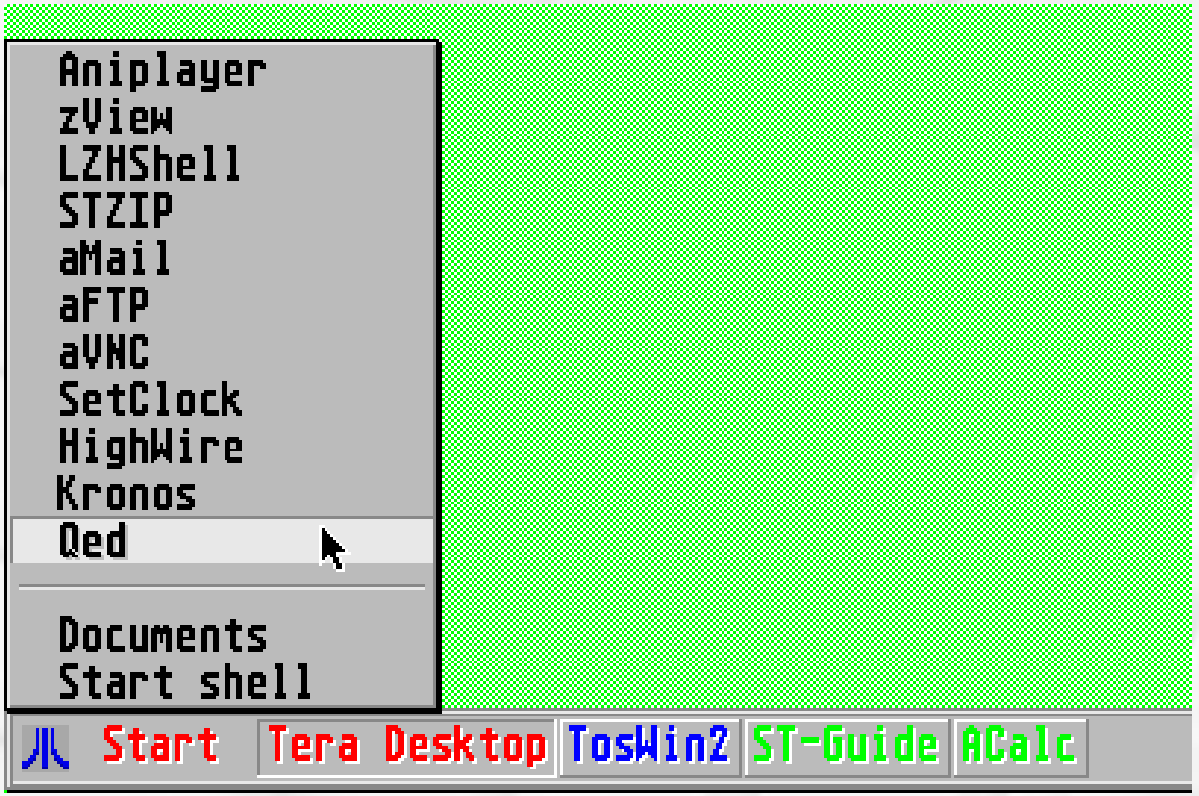
Maintained by Lonny Pursell



Taskbar

Taskbar launcher

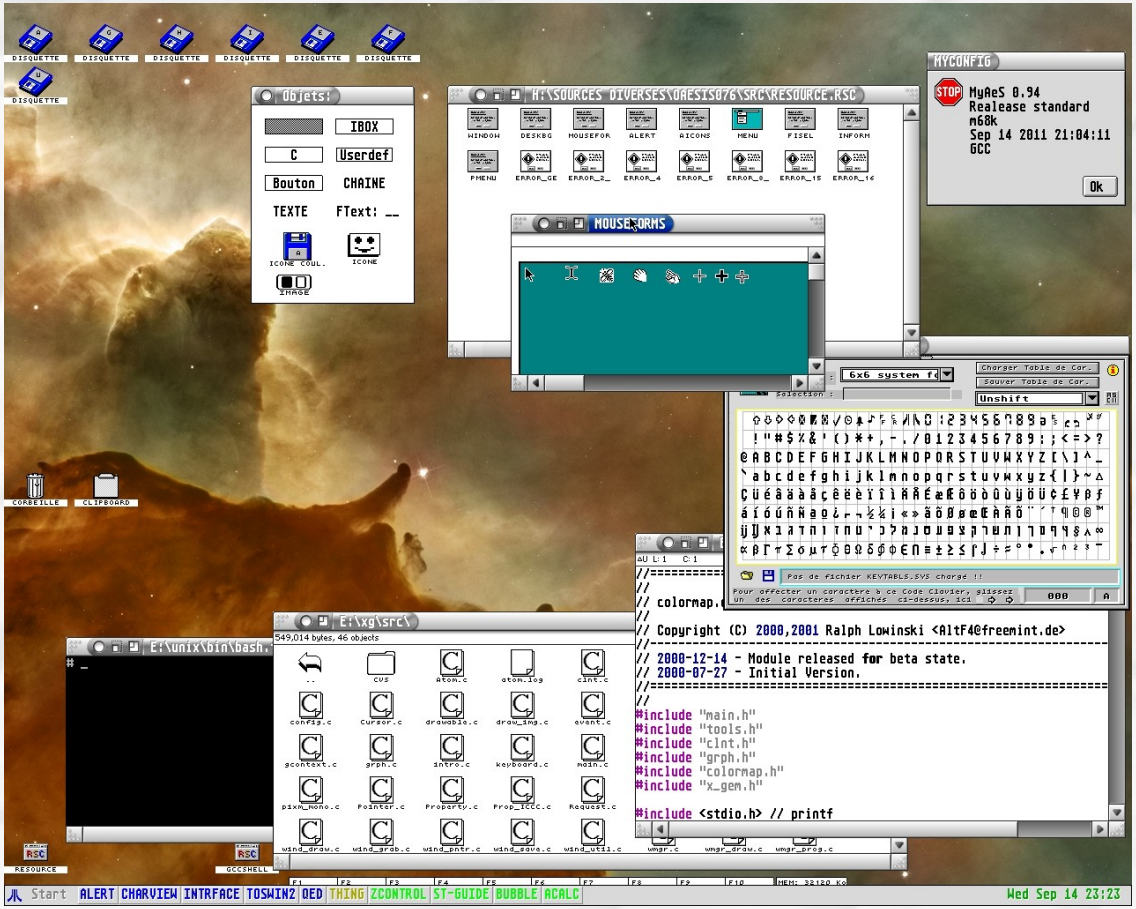
by Jo Even Skarstein



MyAES

Full AES replacement, alternative to XaAES

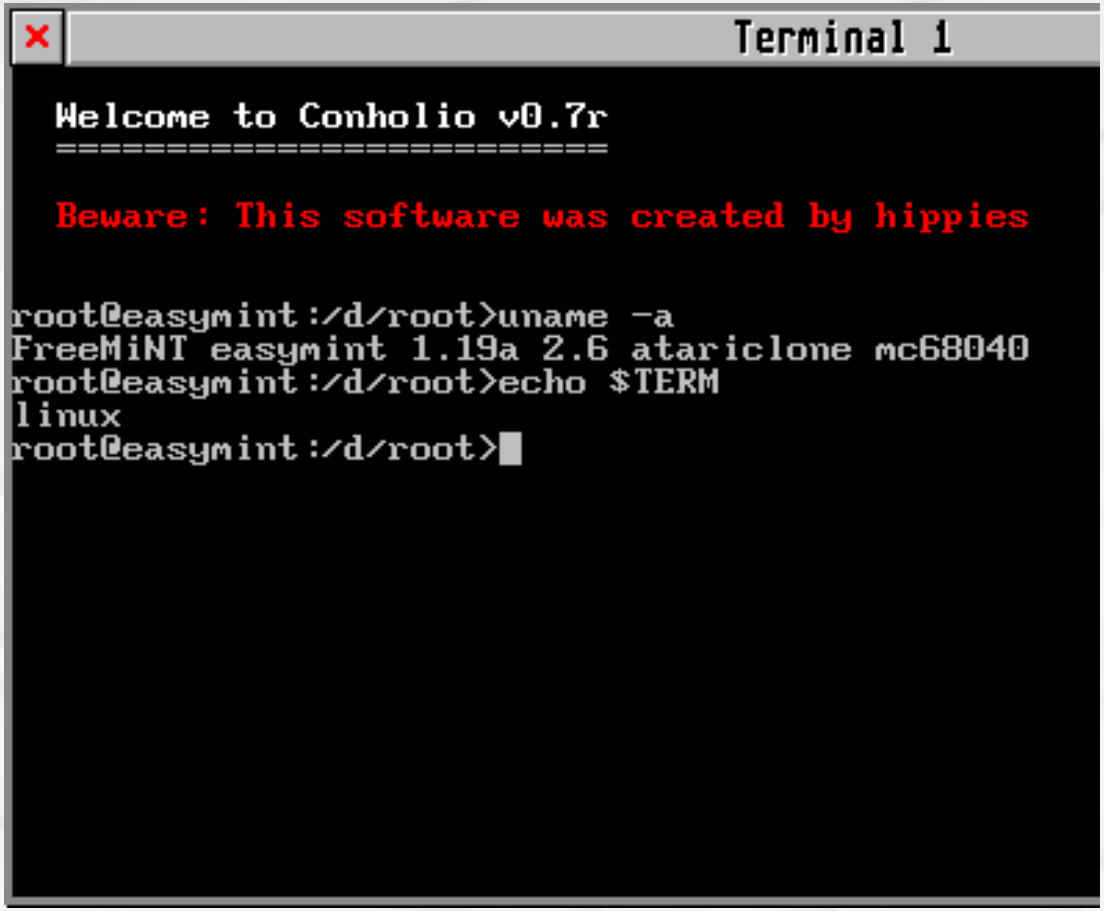
by Olivier Landemarre



Conholio

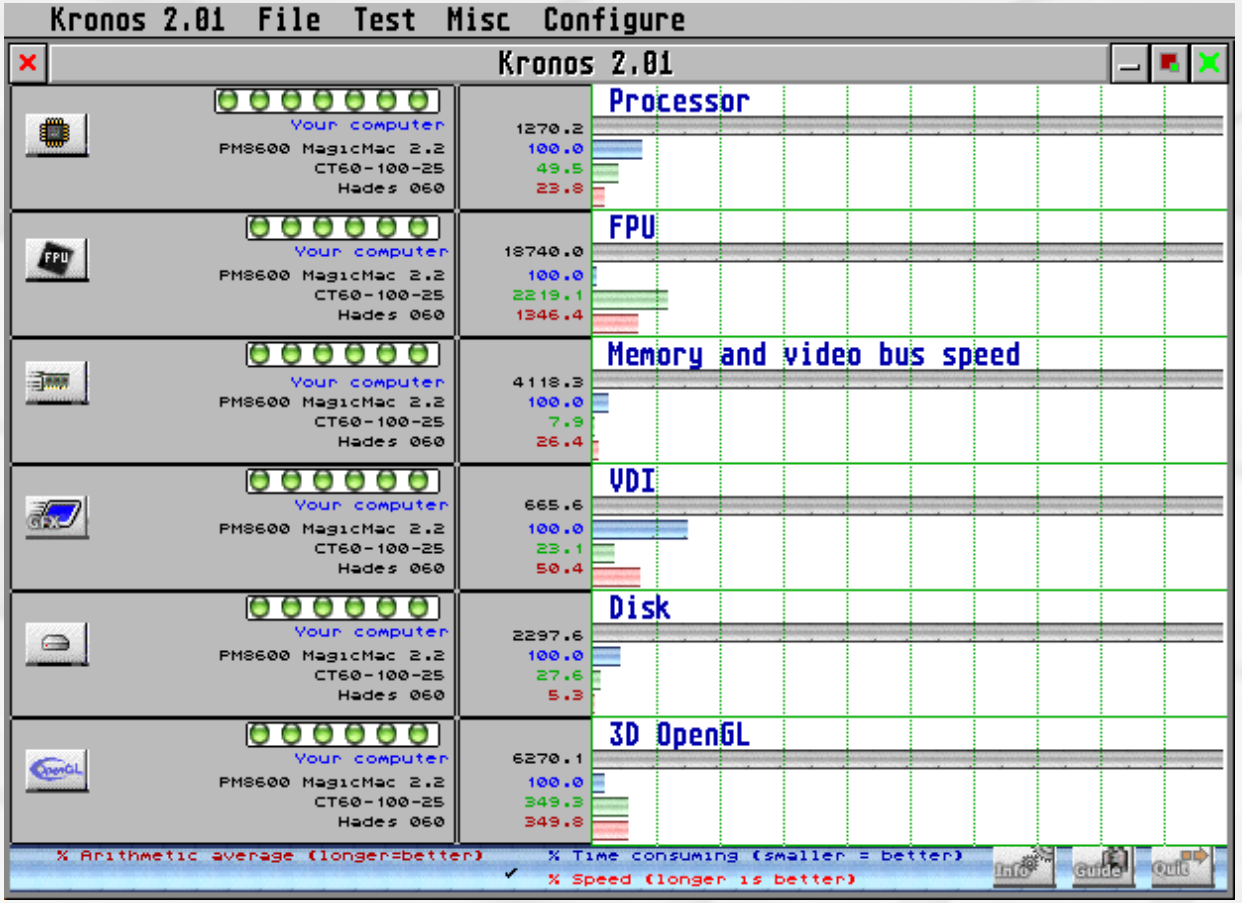
Terminal emulator by Peter Persson

Based on Linux virtual consoles



Kronos

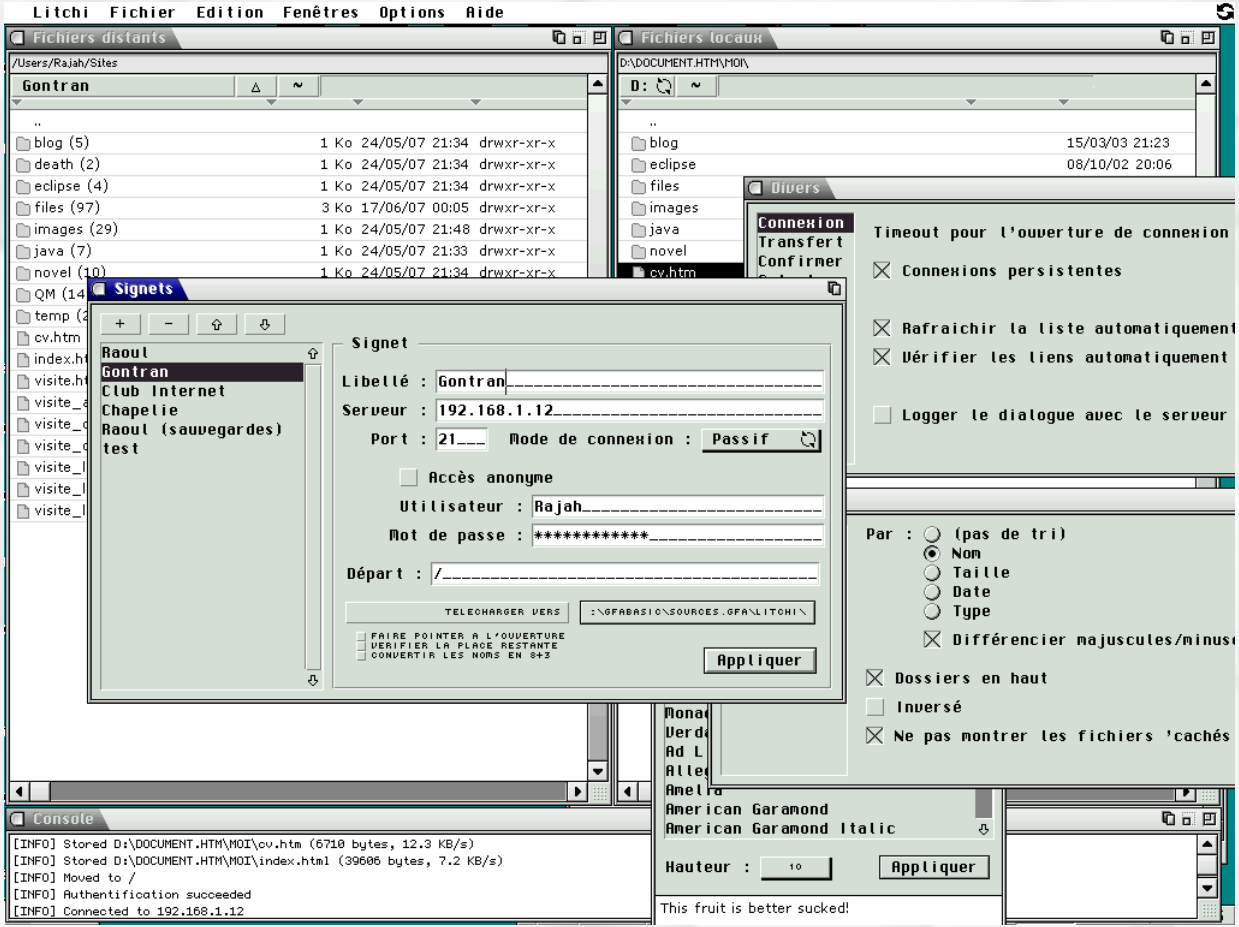
Benchmark
by
Olivier
Landemarre



Litchi

FTP client
with
SSL support

by
Rajah Lone



Aniplayer

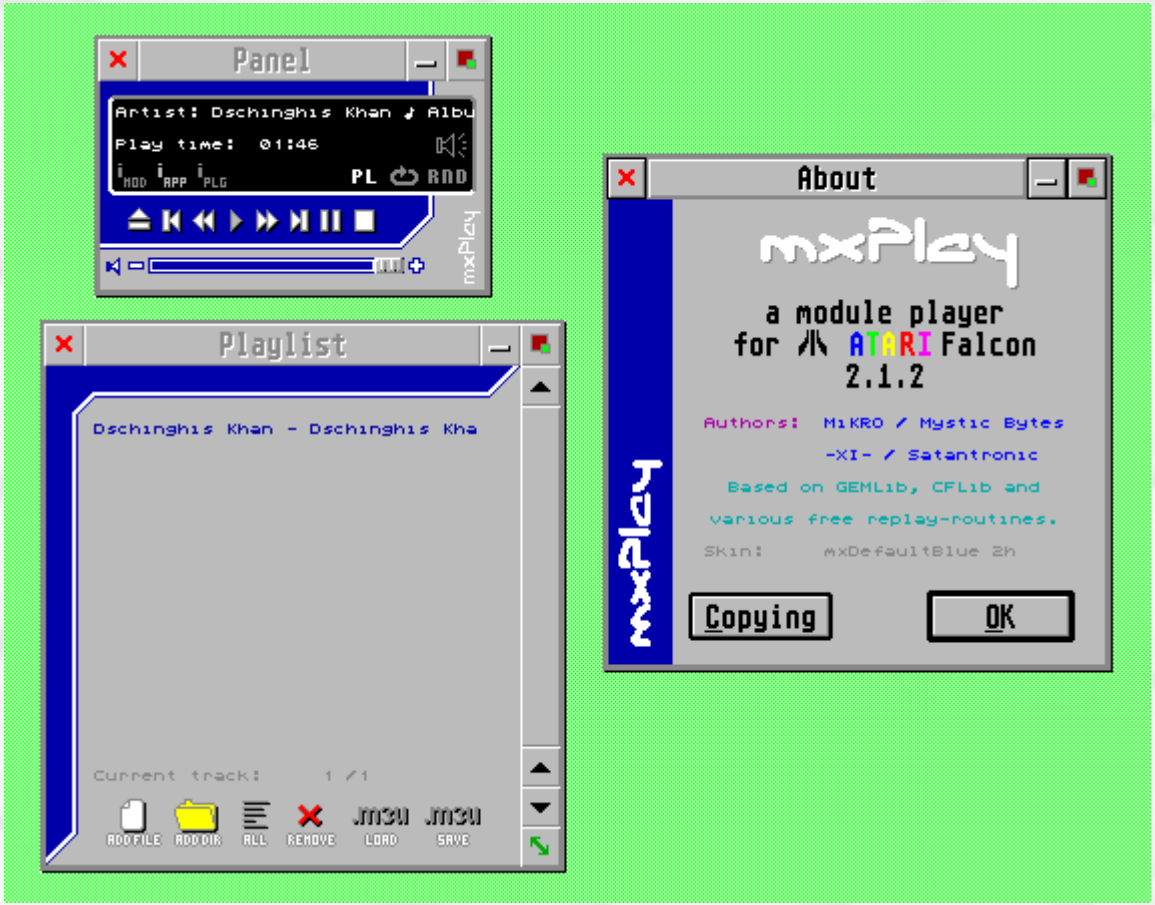
Audio
and video
player

by
Didier
Méquignon

mxPlay

Audio player

by
Miro Kropáček
and -XI-

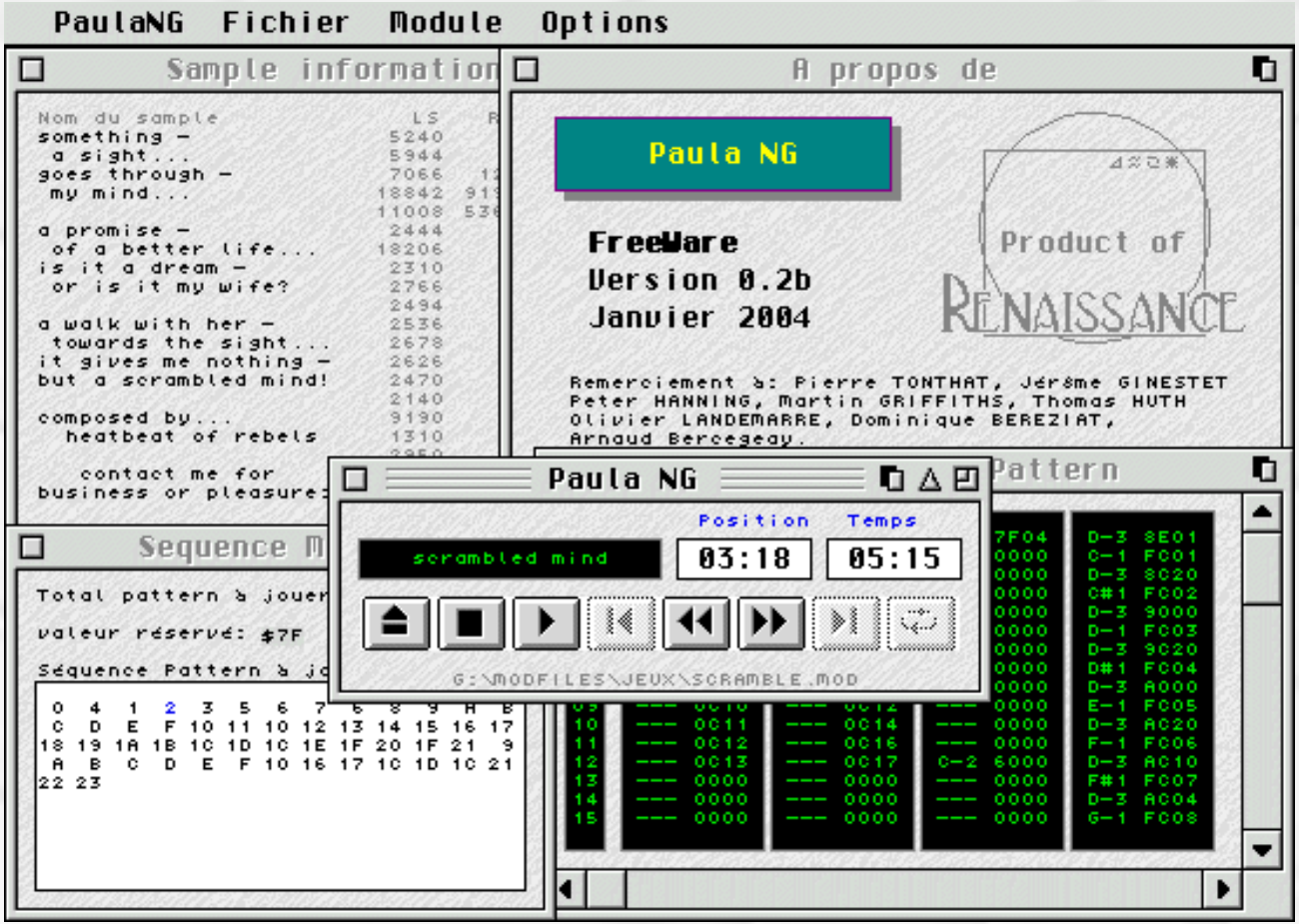


PaulaNG

MOD player

by Daroou / Renaissance

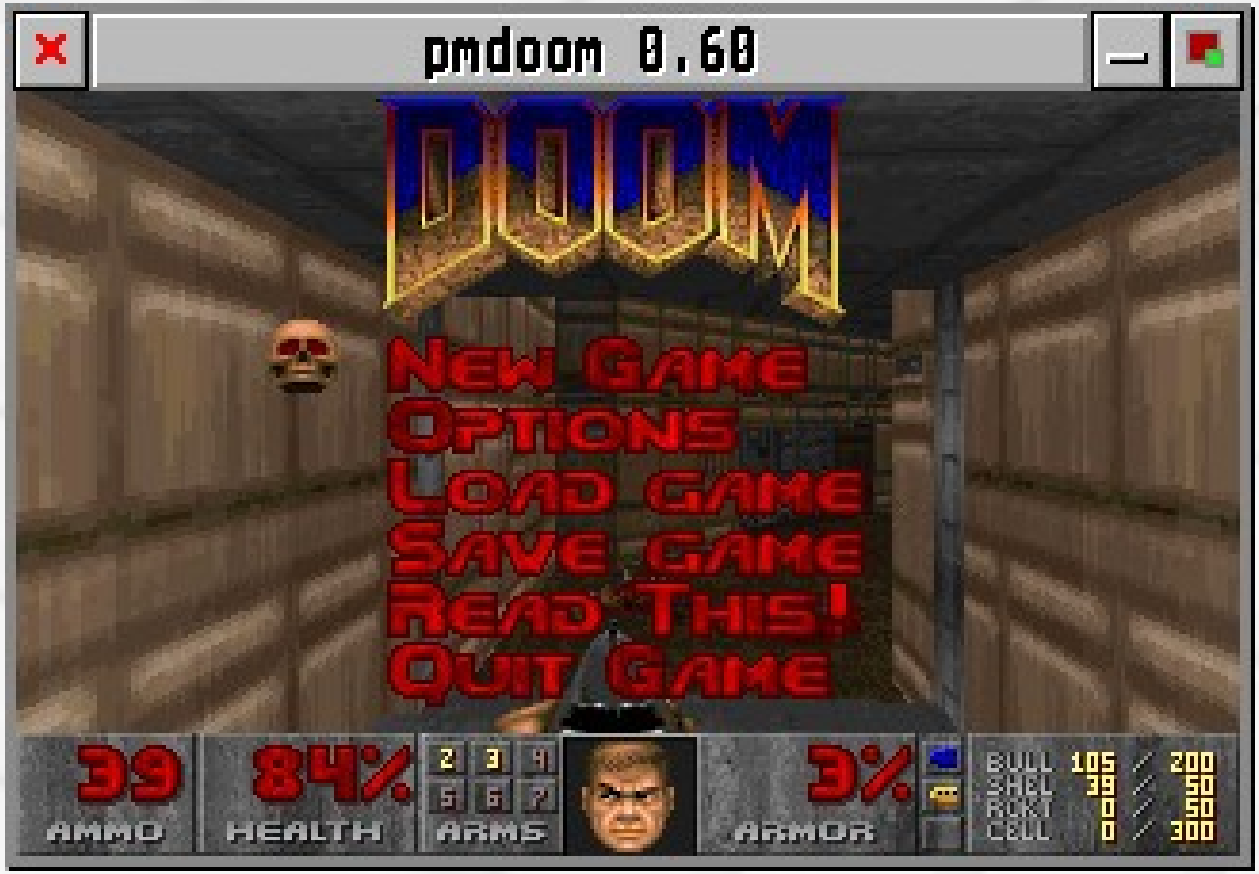
uses the library MOD.LDG



PmDoom

Doom port
for SDL

by
Patrice
Mandin



My own recompilation of some GNU/Linux packages (and more)

arc arj bash bison bzip2 coreutils ctris dhcp diffutils dosbox e2fsprogs file findutils flex freemint fvdi gawk gdb grep groff gzip hatari hypview iperf less lha make man microemacs myman nano ncompress ncurses net-tools netkit-ftp nfs nfs-server openssh patch ping pmdoom portmap povray qed samba sed Sharity-Light strace tar tofrodos toswin2 unrar unzip util-linux vim wget xz zip zoo

Other free C compilers

- **AHCC** by Henk Robbers
  compatible with famous Pure C
- **vasm** by Frank Wille
  vbcc by Volker Barthelmann
- **GCC 7 Brown Edition**
  by The Brown Duo
- **GCC 7** by Thorsten Otto
  updated fork of my cross-tools, and more

And many, many other software…

Even if Atari has abandoned
its computers in 1993,
they are still alive and kicking
thanks to **the community**
and **Free Software**.

Where to start ?

Central starting point :

freemint.github.io

And the story continues

- 2007 was the starting point
  of my public contributions
- GCC 4.x patches
  and cross-compiler binaries for Cygwin
  gave a **new impulse** to the community
- Other projects appeared,
  I contributed to some.

Other cross-tools binaries 1/2

- Few people enjoy Windows and Cygwin, they asked for binaries on more platforms.
- I created Debian packages, and provided Ubuntu binaries. First in my own repository, then on Ubuntu PPA.

debian

ubuntu

Other cross-tools binaries 2/2

- Keith Scroggins and Miro Kropáček have compiled native GCC 4.x for MiNT. Community was very happy, as lots of people prefer working natively.
- Other binaries were contributed:
  - Dan Horák for Fedora/RHEL GNU/Linux
  - Philipp Donzé for MacOS X
  - Benjamin Gérard for Cygwin 64-bit

GitHub

- Sources were originally stored in CVS or Subversion, on SourceForge or AtariForge.
- Nowadays, most projects have moved to GitHub. Organizations: ARAnyM, EmuTOS, FreeMiNT, FireBee
- Sources and **full history** are provided for MiNT software, as well as binutils, GDB, and GCC patches.

Travis CI 1/2

- In January 2017, Miro Kropáček used Travis CI continuous integration service to **automatically build** all the FreeMiNT kernel components on **each commit**.

- Result is deployed to JFrog Bintray and easily available on the FreeMiNT Project website.

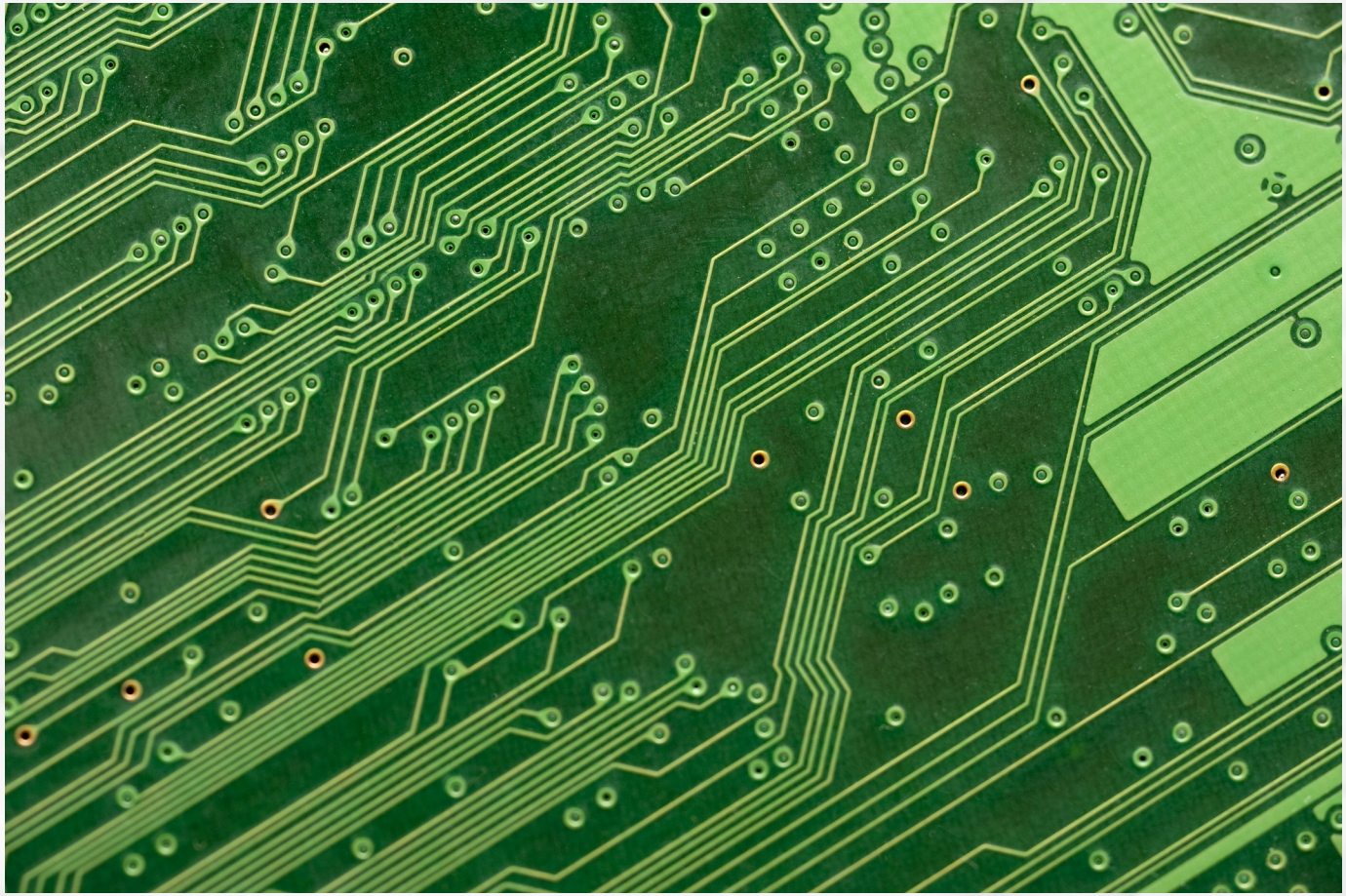
JFrog Bintray

Travis CI 2/2

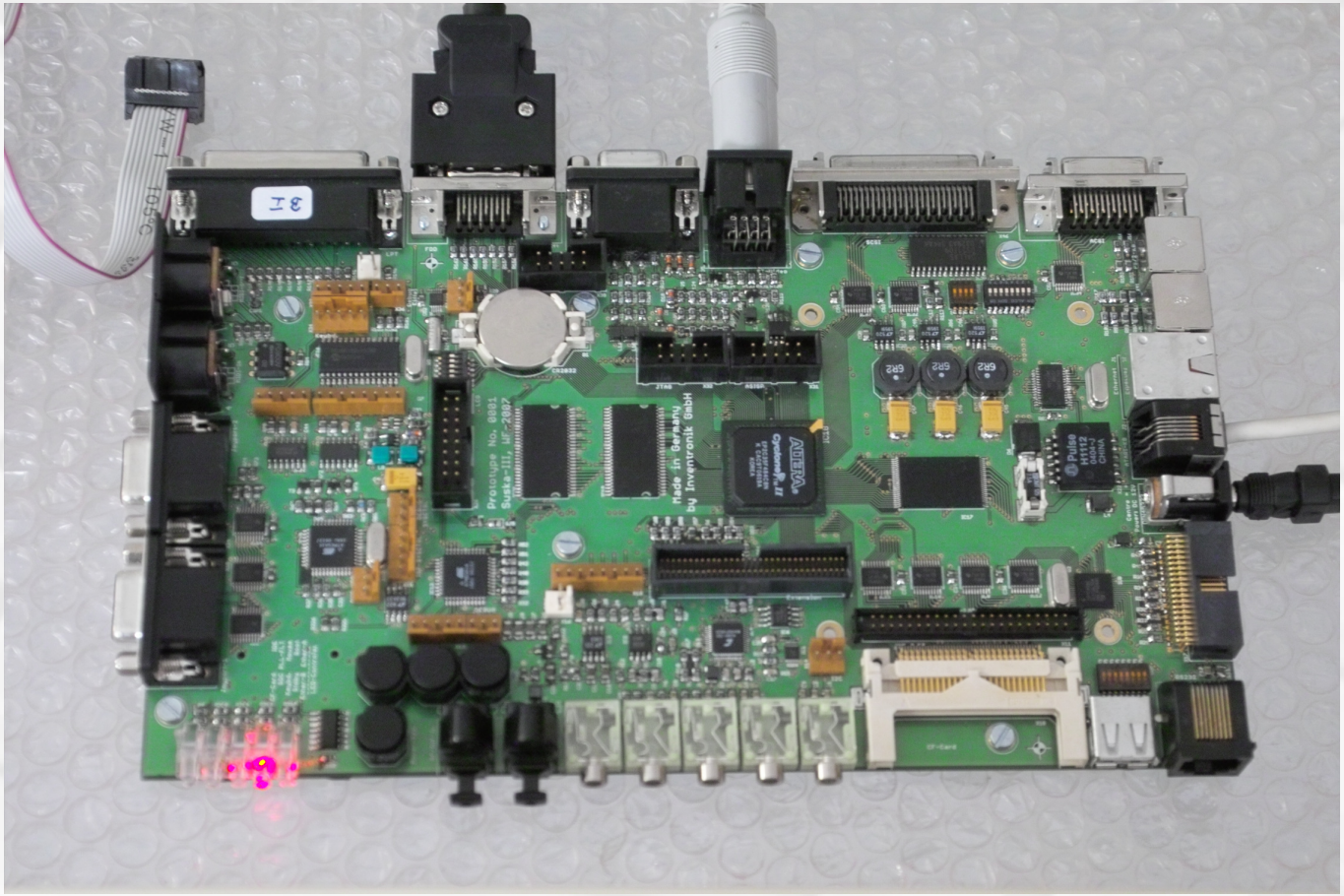
- I used the same technique for EmuTOS.
  On each commit, binary snapshots
  are automatically built by Travis CI
  and deployed to SourceForge.

- I also tried similar technique
  for the binutils/GCC cross-tools.
  Whenever a new patch is pushed,
  all the 56 Ubuntu PPA binaries are rebuilt.
  Still experimental, but useful.

Hardware projects!



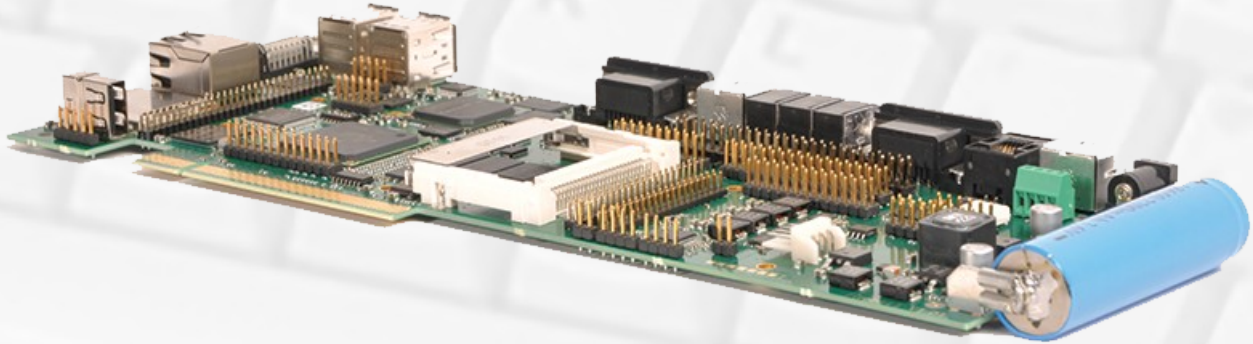
Suska



Suska board by Wolfgang Förster

Full Atari ST in an FPGA

FireBee



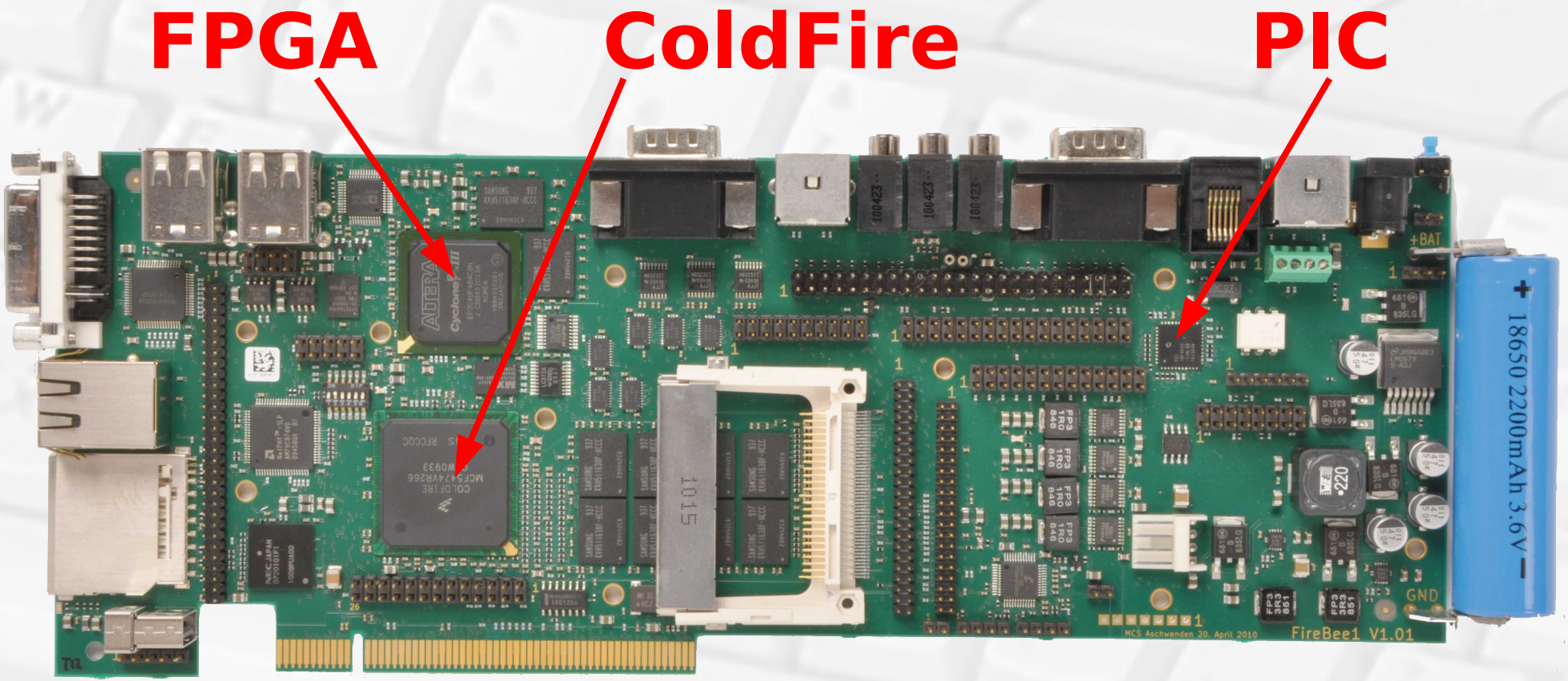
by the
ACP team

Atari
Coldfire
Project

FireBee

- Designed by the ACP team:
  Atari Coldfire Project
- Overall specification:
  Atari **Falcon** compatible computer
  but with a **ColdFire CPU @ 264 MHz**
  and many extensions
- Manufactured by:
  Medusa Computer Systems

FireBee



FireBee

- **ColdFire V4e**: main CPU
- FPGA: Atari hardware emulation
- PIC: auxiliary tasks
- And many I/O ports
- **Open hardware**: plans available
- See all details on firebee.org

ColdFire

- Successor of 68000 family,
  but incompatible
  due to many missing instructions
- Microcontroller with many embedded features: timers, Ethernet, PCI...
- Faster (up to 266 MHz, or more)
- Mainly used in embedded systems

FireBee

- Hardware design
  by Fredy Aschwanden
  and Wolfgang Förster

- Basically:
  - Suska FPGA core
  - Modified to emulate Falcon hardware
  - Without 68000 FPGA (use ColdFire)

FireBee Operating Systems

- **EmuTOS** for ColdFire
  100% ColdFire native
  But no 68000 emulation

- **FireTOS**
  Partial 68060 emulation
  Advanced hardware support

EmuTOS for ColdFire 1/3

- EmuTOS is compatible with Falcon with a 68030 CPU
- The FireBee is a Falcon with a ColdFire CPU
- Solution: “just” add ColdFire CPU support into EmuTOS.

EmuTOS for ColdFire 2/3

- This was my main task in 2009:
  - Add ColdFire support to the cross-tools
  - Manually **patch all assembler files**
  - Add ColdFire support to all libraries
  - Fight against software and hardware bugs
- But finally worked fine 🙂

EmuTOS for ColdFire 3/3

- Limitations:
  - **ColdFire CPU support only**, no 680x0 emulation
  - Only works with programs recompiled for ColdFire, 680x0 binaries unsupported
- Was mainly used in early days to debug the FireBee hardware
- Also used by purists who like all native

FireTOS

- By Didier Méquignon
- Main OS for the FireBee
- Runs FreeRTOS behind the scenes
- Partial **68060 emulation** with CF68KLib
- Runs patched TOS 4.04
- Support **extended video modes**
- Support **USB keyboard and mouse**
- Support both 680x0 and ColdFire binaries

FireBee Compatibility

- Hardware:
  - Partial Falcon emulation:
    lacks DSP, Falcon sound...
  - Still some bugs in emulated hardware
- FireTOS:
  Quite good software compatibility,
  but not perfect.
- EmuTOS:
  - ColdFire binaries only
  - Few support for extended hardware

Patching for ColdFire

- I continued patching software for ColdFire
  - **FreeMiNT** + drivers
  - XaAES
  - Libraries
- Long, but generally easy
  - C software: just recompilation
  - Assembly: manual patching

Typical ColdFire patch

Fix missing movem predecrementation

```
#ifdef __mcoldfire__
        lea     -44(sp),sp
        movem.l d2-d7/a2-a6,(sp)
#else
        movem.l d2-d7/a2-a6,-(sp)
#endif
```

EmuTOS on FireBee

FireBee,

Eiffel adapter,

PS/2 keyboard
and mouse

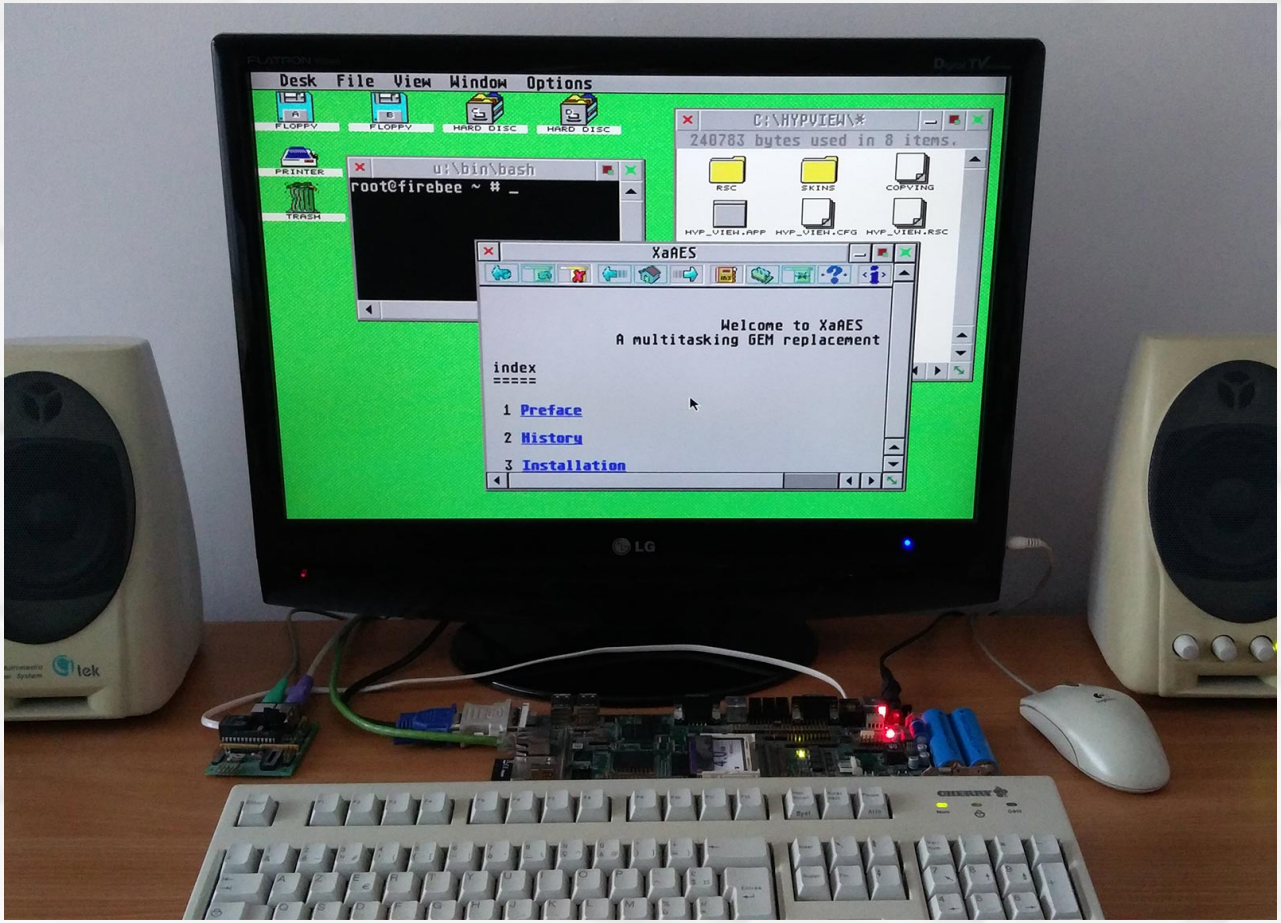
Falcon VGA
640x480
16 colors

EmuTOS + FreeMiNT on FireBee

FireBee,

XaAES,
TeraDesktop,
bash,
HypView

100% ColdFire
software



Experimental Hack: 68Kemu

- CPU emulator
  based on **Musashi** 68000 emulator
- Goal: Run 68000 programs on ColdFire OS
- Main idea:
  - Run user program on emulated CPU
  - And **switch to real CPU during OS calls**
- Can help running some 68000 programs
  on EmuTOS for ColdFire, and FireTOS
- Still issues with callbacks

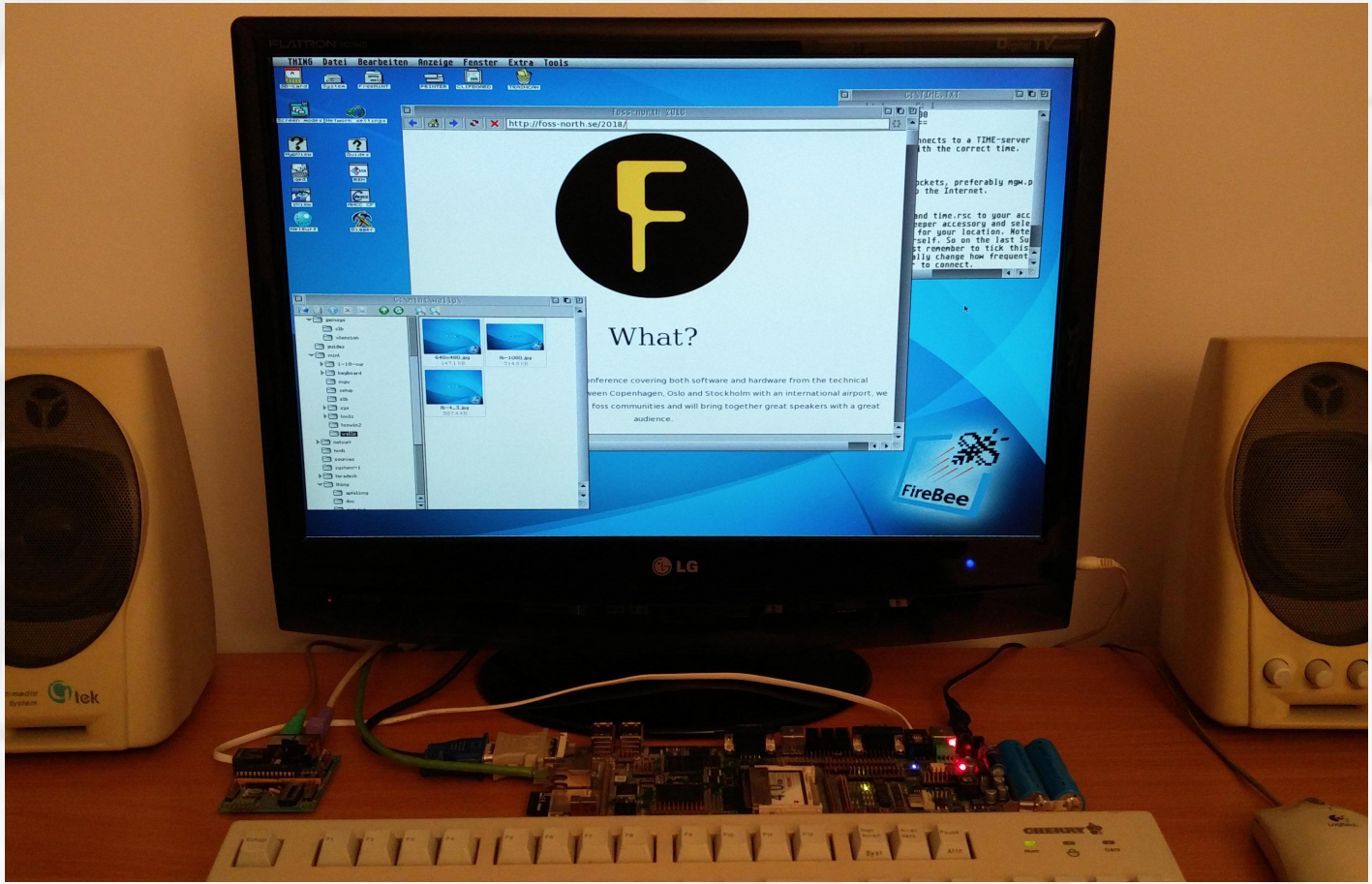
Putting all together

- Official FreeMiNT setup
  for the FireBee
  by Jo Even Skarstein
- Essential software, ready to be run
- Includes tools for
  easy graphics and network setup

Official FreeMiNT setup for the FireBee

FireBee,
FireTOS,
1280x960
32-bit

Thing Desktop
zView
NetSurf
HypView



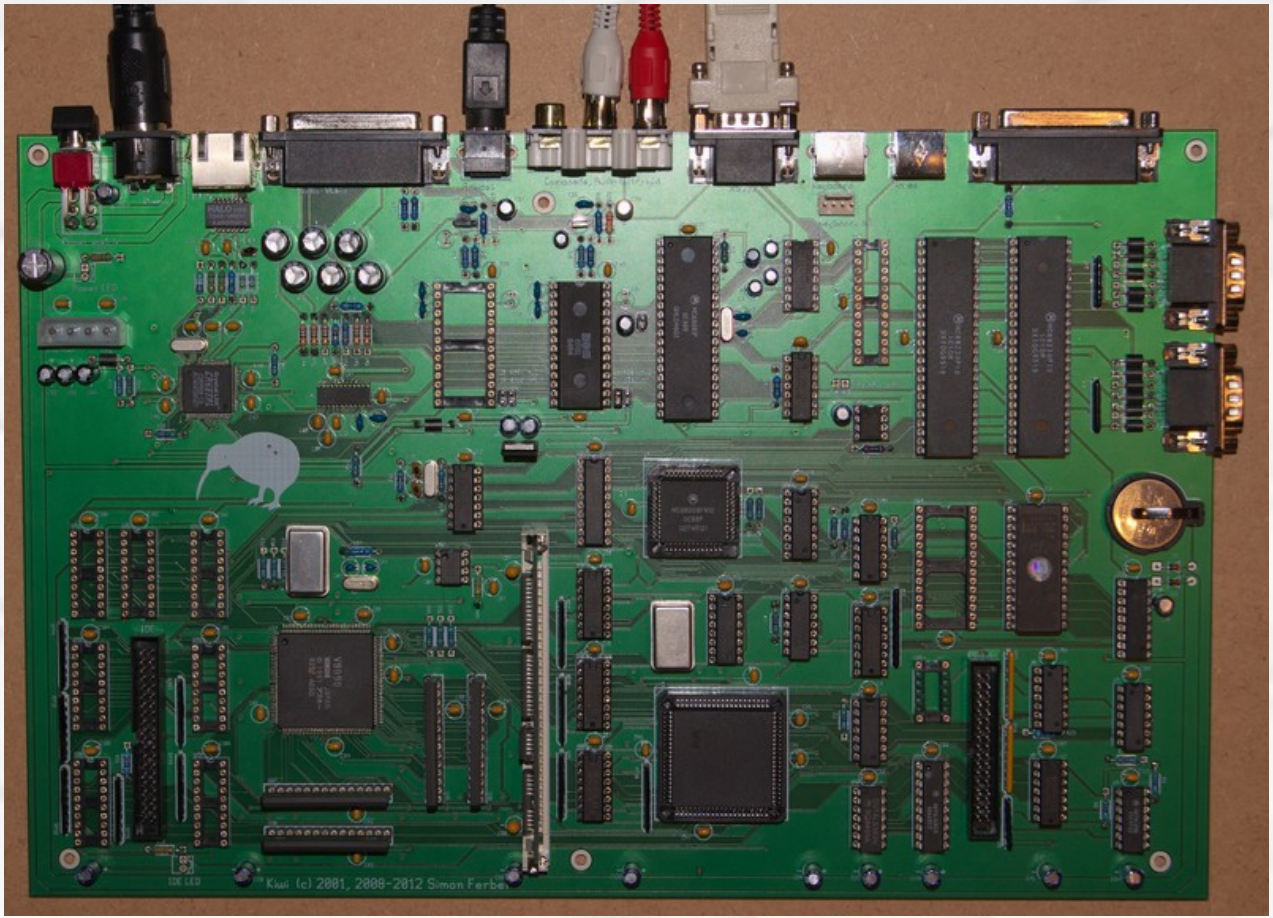
Exotic hardware!

Kiwi board

Kiwi board by Simon Ferber

68008-based computer

Can run EmuTOS



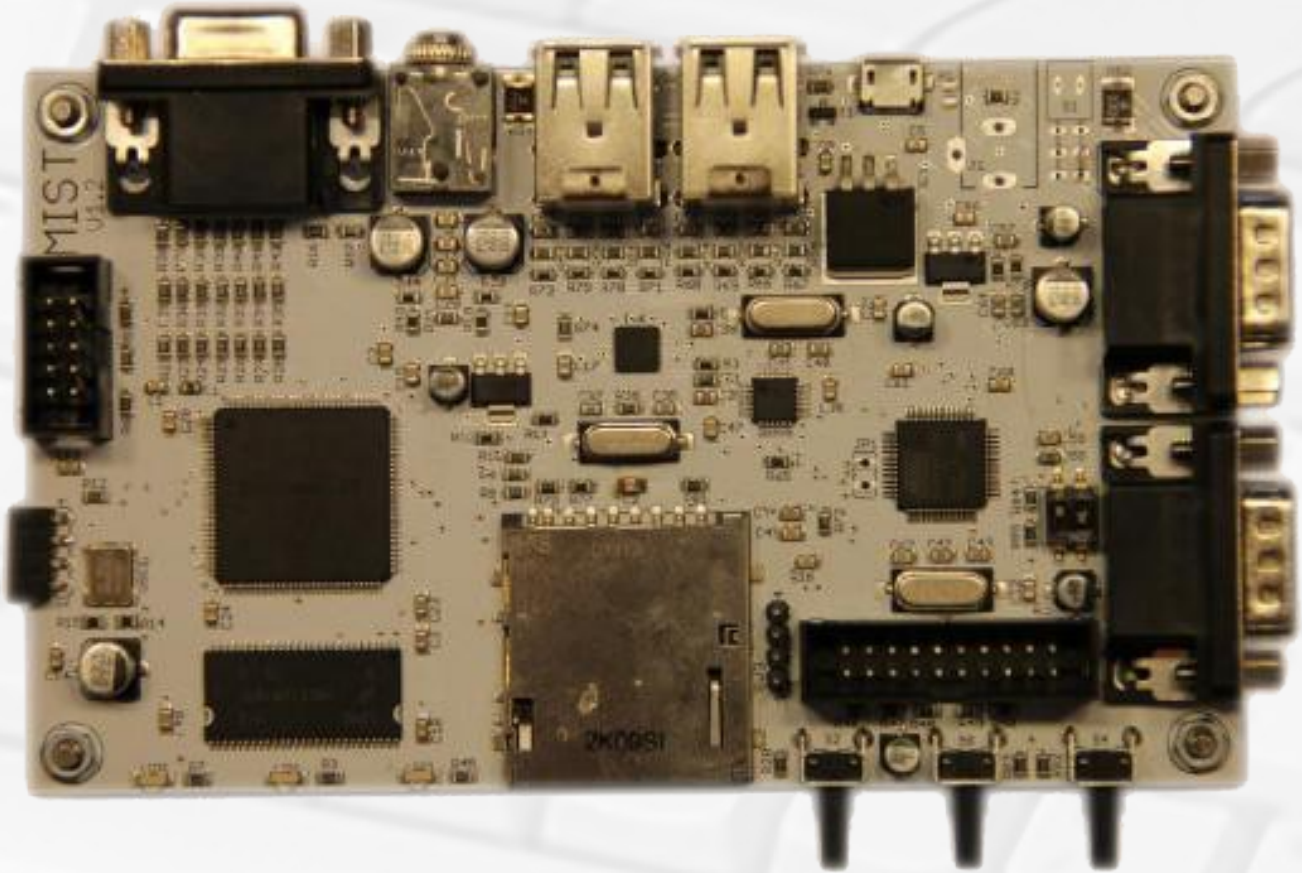
MIST

by Till Harbaum

FPGA-based

Many cores to emulate old machines: Atari ST, Amiga...

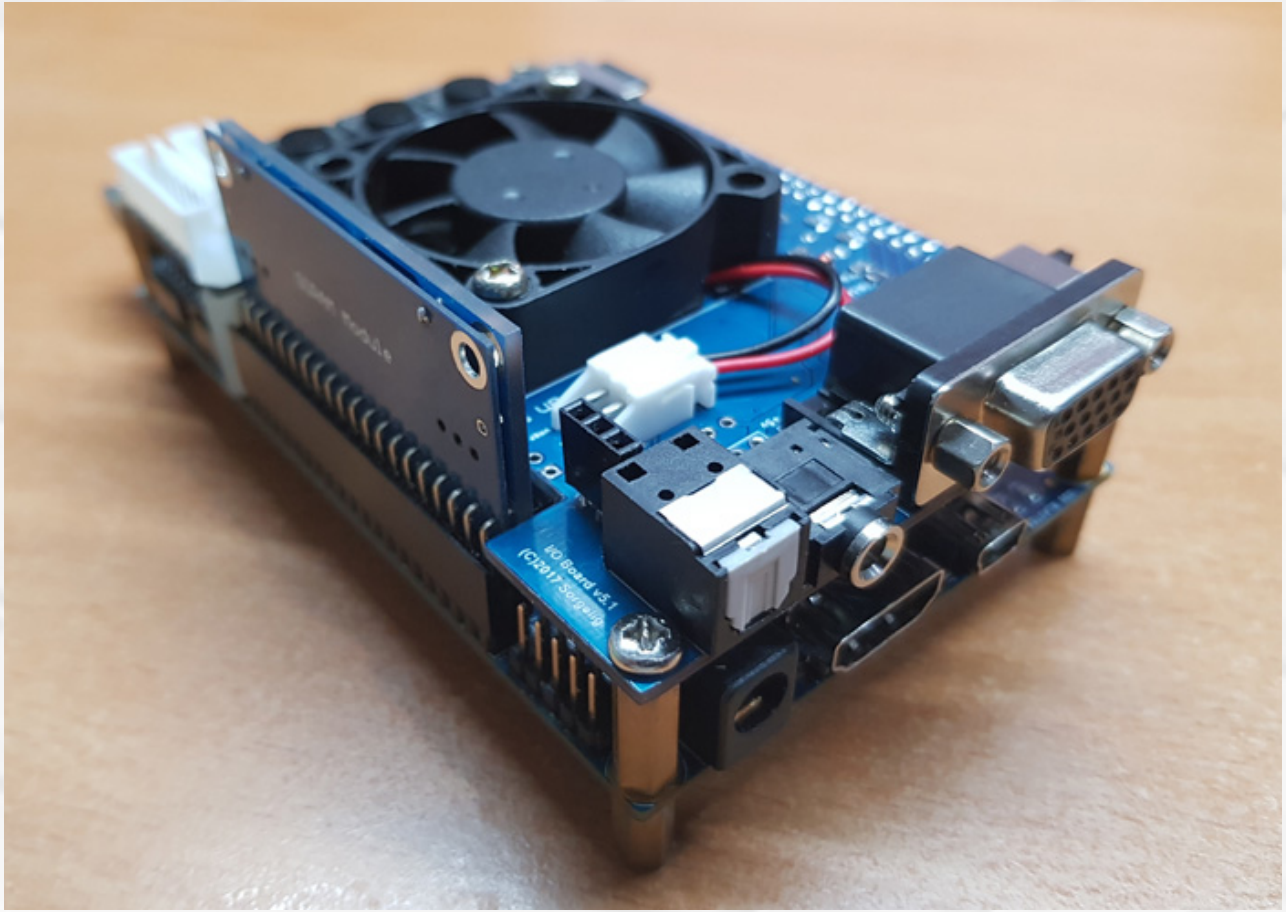
MiST board



MiSTer board

by Alexey Melnikov

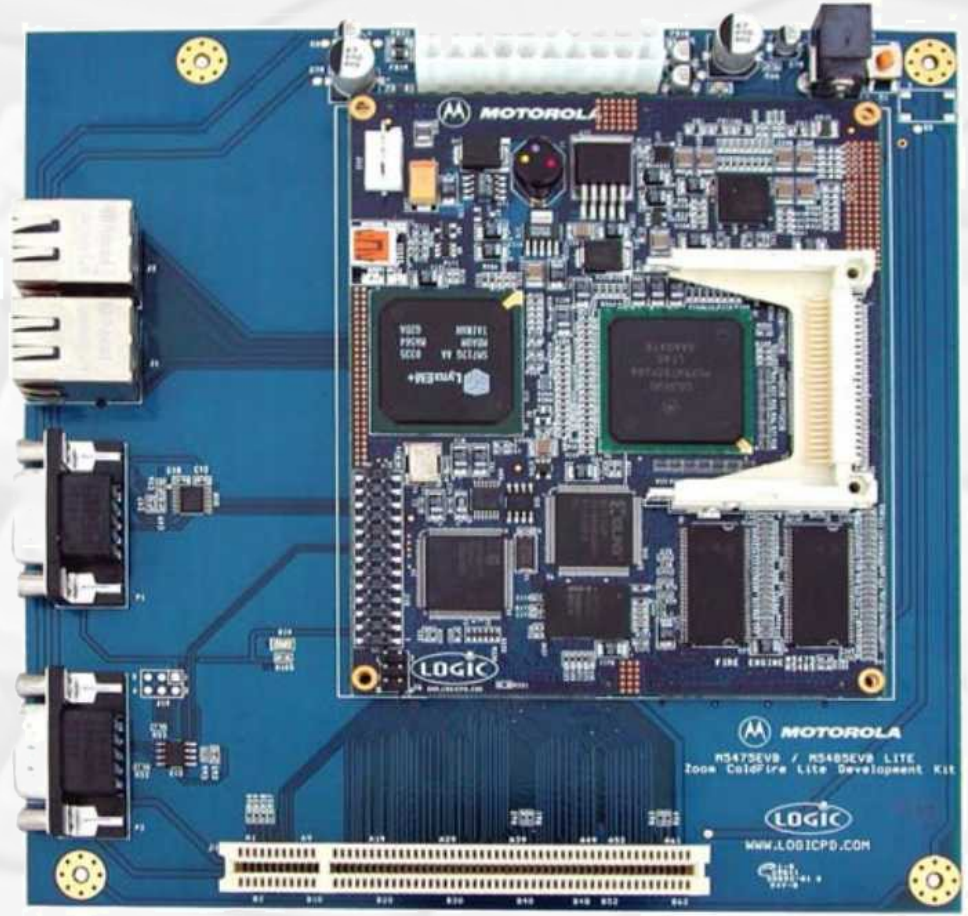
Clone of **MiST** based on **Terasic DE10-nano** board



ColdFire Evaluation Boards

Can run
EmuTOS for ColdFire
and FreeMiNT
in **text mode**
through RS-232
terminal

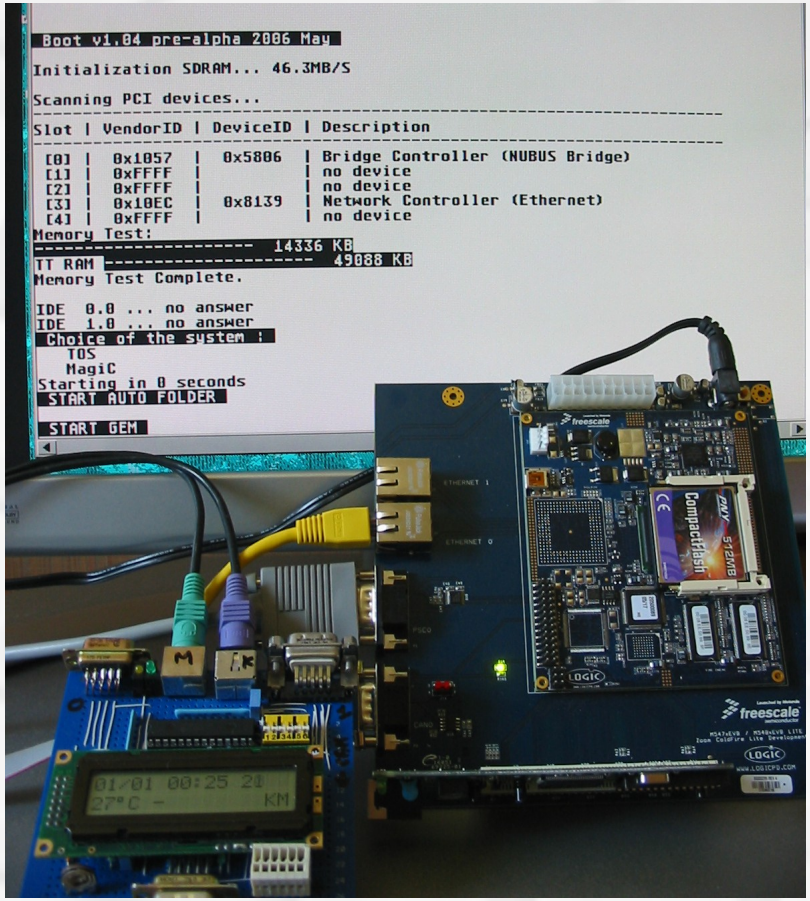
Was used to debug
EmuTOS for ColdFire
before FireBee availability



FireTOS origins

Before the FireBee,
Didier Méquignon
used ColdFire
Evaluation Boards
to create FireTOS
and debug the CTPCI add-on
for Falcon / CT60

With accelerated support
of **ATI Radeon** PCI cards!



EmuTOS in terminal

Can also run FreeMiNT, bash, SSH server...

Many challenges 1/2

- Support for **new CPU**:
  ColdFire V4e
- Support for **non-Atari hardware**:
  ability to run without legacy hardware
- Support for **foreign hardware**:
  implement BIOS with new low-level drivers

Many challenges 2/2

- **FreeMiNT** for non-Atari hardware
  - Actually, very few hardware dependencies
  - Mainly uses the underlying BIOS for all I/O (block and character devices)
  - Key to success is reliable support from underlying (Emu/Fire)**TOS**

BaS_gcc: alternate firmware

- By Markus Fröschle
- **Alternate bootstrap** for the FireBee and ColdFire Evaluation Boards
- Provides **network access** to FreeMiNT, combined to FEC driver.
- Can be flashed with EmuTOS to transform a ColdFire Evaluation Board to a **standalone** Atari ColdFire machine

EmuTOS for Amiga!

EmuTOS for Amiga

- Not so hard because:
  - EmuTOS for **non-Atari hardware** was already done for ColdFire Evaluation Boards
  - Amiga has a standard **68000 CPU**
  - Amiga 1-plane interlaced video mode is compatible with **ST-High** mode
- Just a few BIOS routines to implement

Reuse AROS routines?

- Tried to reuse some routines from AROS: floppy driver, AUTOCONFIG
- Worked fine
- But **incompatible open-source licenses**
  - EmuTOS uses GPL
  - AROS uses APL
- Binary redistribution is not possible
- I slowly replace AROS routines by writing new GPL ones

EmuTOS for Amiga: compatibility

- Requirement for Atari programs:
  - Do not access hardware directly, **use OS calls** instead
  - Support monochrome video mode
- The above requirements:
  - Exclude almost all games
  - But allow most utilities

Vampire V2
Apollo 68080

Supported by
EmuTOS
for Amiga

Amiga: Vampire V2 accelerators

- Based on **FPGA**
- Fast **Apollo 68080** CPU
- HDMI output (SAGA chipset)
- Supported by **EmuTOS for Amiga**
- Maybe some day on Atari hardware?

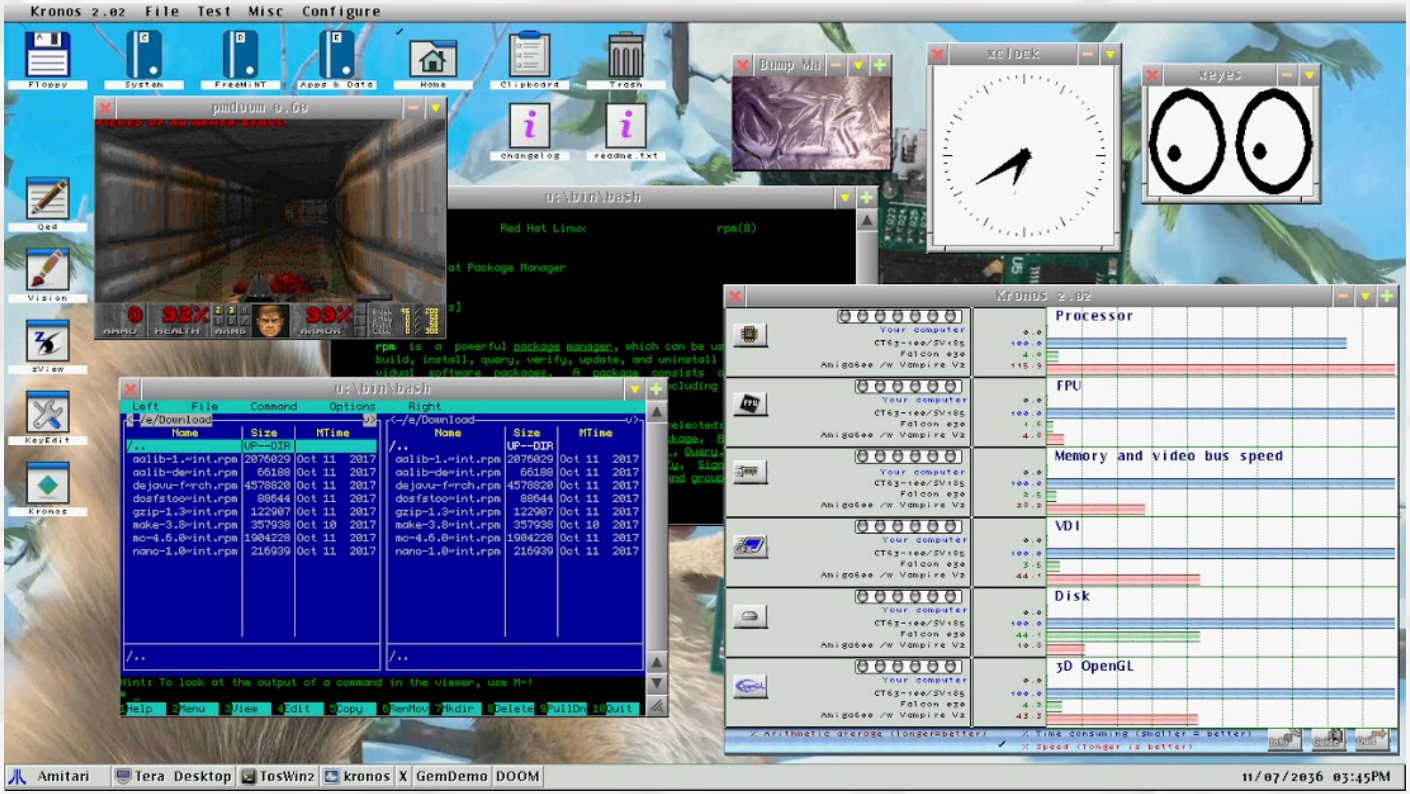
fVDI driver for SAGA

- Remember: VDI is TOS graphics layer
- fVDI is **Free Software** VDI replacement
- I wrote an **fVDI driver** for SAGA
- This allows EmuTOS for Amiga
  to use Vampire **HDMI output**
  with **extended color video modes**

Amitari distribution

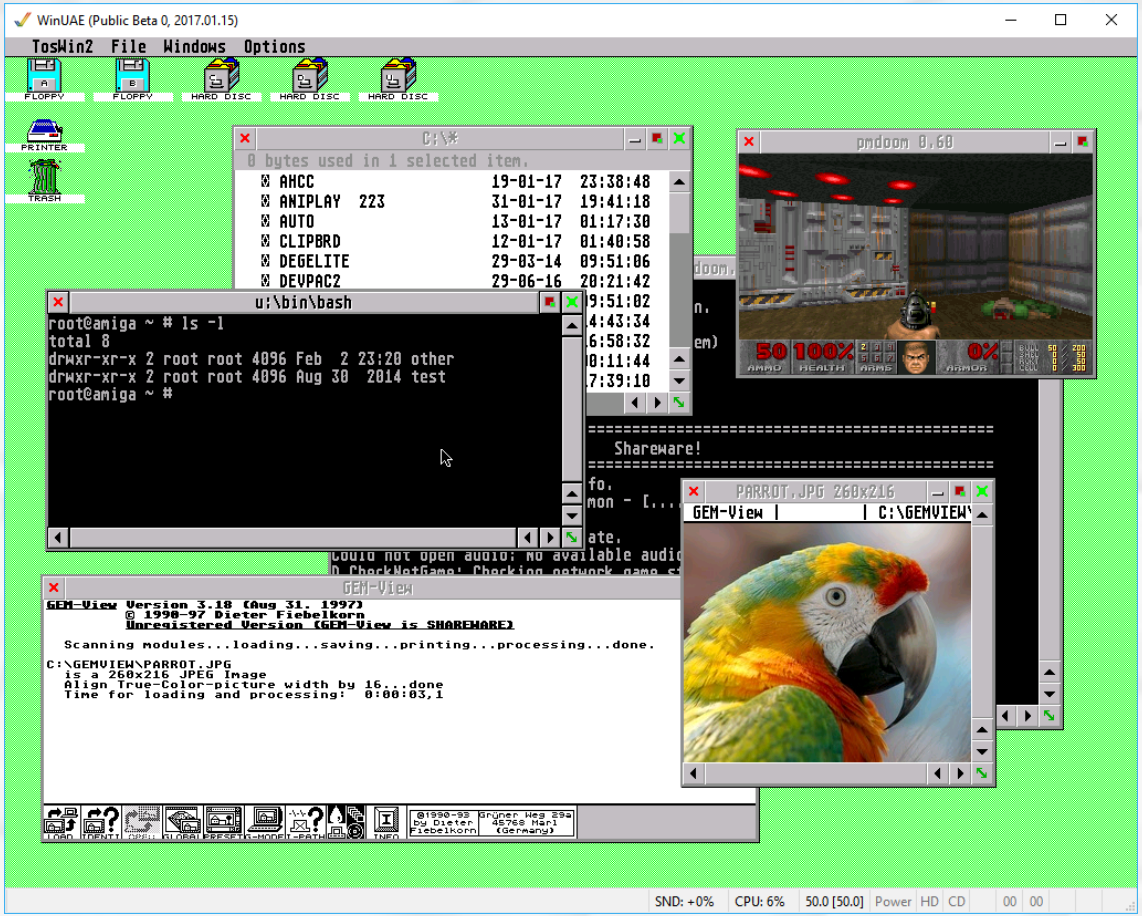
Full FreeMiNT distribution for Amiga + Vampire

By Stefan Niestegge



fVDI driver for WinUAE

This is
an **Amiga** emulator
running
EmuTOS ROM,
fVDI driver
for extended
RTG video modes,
and standard
FreeMiNT binaries



Let’s Free Old Software!

- Sometimes, after people’s requests, or spontaneously, old companies agree to Free their old software:
  - **Thing** desktop by Arno Welzel and Thomas Binder
  - **Diamond Edge** and **Diamond Back** by Anodyne Software
  - **Geneva and NeoDesk** by Gribnif Software
  - **AtariX** (successor of MagicMacX)
- **Kudos to all of you!**
  This is the only way to keep software alive.

Conclusion

- Atari has unofficially abandoned TOS in 1993
- But the **community** has continued, and still continues, to develop TOS-compatible systems far beyond their original scope
- This has only been possible thanks to **Free Software**
- The story **will continue**!

My main contributions

- GCC 4 and Atari cross-tools
- EmuTOS for ColdFire
- EmuTOS for Amiga
- FreeMiNT for non-Atari hardware
- fVDI driver for WinUAE and Vampire
- Many bugfixes everywhere

Join the community

- Atari-Forum
- MiNT Mailing List
- EmuTOS Mailing List
- Amiga Apollo Forum

Want more?

Subscribe to my new YouTube channel:

Special Thanks
to Johan Thelin
for foss-north organization

and all the Atari community

foss-north.se // 2018-04