Atari 8-bits & Linux

Emulating and enhancing real Atari 8-bit hardware using Linux

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August 19, 2013
What were they? Overview

• 1979 – 1992
• Similarities to Atari VCS (2600) before it, and Commodore Amiga after it (Jay Miner involved in all three)
• 6502 8-bit CPU @ 1.79MHz
• 64KB RAM (expandable to 4MB), 10KB OS ROM
• Cartridge slot (lots of games!)
• Serial I/O with daisy-chain support (Later models included Parallel Bus Interface)
• Cassette, floppy disk ($) and hard drive ($$$) storage
What were they? Gfx & Sfx

• 4-channel mono sound
  (8-channel stereo hacks exists)
• Graphics real graphics (for those days)
  – Various bitmapped & text modes with user-definable character sets (fonts)
    • 320x192 high resolution monochrome
    • 40x24 thru 160x192 4-color bitmap modes
    • 40x24 mono and multicolor character modes
    • 20x24, 20x12 color, but not-multicolor char
    • Coarse & fine scrolling
    • Graphics chip has Direct Memory Access; can be changed on a per-scanline basis
      (e.g., part of the screen scrolls through a larger area, the rest stays static)
    • Modes can be set on a per-scanline basis (Display List)
      (e.g., graphics with a text ‘window’ at the bottom)
    • Per-scanline interrupts can be set (Display List Interrupts)
      (e.g., change color palette, change font, reposition sprite, change scroll values, etc.)
  – “Player/Missile Graphics” (aka sprites); overlay, underlay, mix
    • Hardware collision detection
  – 128 color palette; 256 possible
What were they? Photos!
What were they used for?

- Games
- Education
- Home office
- Programming
- Games
Emulating on Linux

- Atari800 - [http://atari800.sourceforge.net/](http://atari800.sourceforge.net/)
- MESS - [http://www.mess.org/](http://www.mess.org/)
- JavaScript MESS (beta)  
- Windows-based emulators (under virtualization) might work too!
  - Altirra - [http://www.virtualdub.org/altirra.html](http://www.virtualdub.org/altirra.html)
  - Atari800Win PLus - [http://atariarea.krap.pl/PLus/index_us.htm](http://atariarea.krap.pl/PLus/index_us.htm)
- Many more...
Getting OS ROM

Before Atari Corp. reverse-merged with JTS, it gave Darek Mihocka (Emulators, Inc.) permission to include Atari OS and BASIC ROMs with his “PC XFormer” emulator for MSDOS. They can be retrieved from a demo version of PCXF that was made available. e.g.:

http://sourceforge.net/projects/atari800/files/ROM/

There were other OS ROMs back in the day, and new alternatives today, as well...
**Getting Software**

- **Warning:** Much software is available for download, but often not legitimately.
- **However,** tons of public domain (and these days, even open source) software is available, with more released every year!
- **Try, for example:**
  - [http://www.atarimania.com/atari-400-800-xl-xe.html](http://www.atarimania.com/atari-400-800-xl-xe.html)
Getting Information

- Atari Archives - http://www.atariarchives.org/
  - Contents of classic books, posted with permission from copyright holders
  - Ditto, but for magazines (sister site); more than Atari, now
- AtariAge - http://atariage.com/
  - News & forums (all Atari, not just 8-bit)
- Tip of the iceberg... so much more, I don't know where to begin
Real Atari + Linux #1 – SIO2SD

• External device with an SD card reader, Atari SIO cable, small back-lit display, and navigation/control buttons

• The Atari sees it as a series of floppy disks (that is, the Atari doesn't need to be modified)

• Use Linux (or Win or Mac) to load up SD card with disk images (e.g., “.atr”) or executables (that you'd normall load from a DOS on the Atari; SIO2SD will provide bootstrap!)

• I bought an SIO2SD for $70 from Poland
Real Atari + Linux #1 – SIO2USB

• External device with USB connection, Atari SIO cable, small back-lit display, and navigation/control buttons
• The Atari sees it as a series of floppy disks
• Also has built-in realtime clock the Atari can use
• Similar to SIO2SD, but uses any USB mass storage device
Real Atari + Linux #2 – SIO2PC

• Connects Atari to PC via serial or USB
• The Atari sees PC as a series of floppy disks, and can also show up as printer, RS232 (e.g. modem)

(SIO2SD & SIO2USB are basically stand-alone embedded solutions based on this older concept; it dates back to early 1990s, the MSDOS days!)

• Use with:
  - atarisio (text mode for Linux)
  - AspeQt (GUI for Linux/Windows)
  - SIO2PC (text mode for MSDOS)
  - APE (GUI for Windows)
    (supports backing up and emulating copy-protected Atari disks, with ProSystem cable)
Real Atari + Linux #3 – MaxFlash

• Cartridge with flash memory
• Load with cartridge ROM dumps, or disk images or executables; doesn't work over SIO, so some games/apps won't be compatible
• Cart plugs into USB widget, or just use the Atari to program it directly!
• Use USB widget with a Perl command-line tool (Linux), or GUI tool (Windows)

http://www.atarimax.com/flashcart/documentation/
Real Atari + Internet

- Atari → SIO2PC → Linux, emulating RS232
- Atari
  → real RS232 device (e.g., Atari 850, P:R:Conn. ($))
  → RS232-to-ethernet (e.g., Lantronix UDS-10 ($$$))
- There are BBSes running on Atari 8-bits that you can telnet into over the Internet!
Real Atari + Internet, no middleman

- Dragon Cartridge -
  http://www.atari8ethernet.com/
Cross-assembly on Linux

  “a mostly Mac/65 compatible cross-assembler”

  originally written as a Quick Assembler replacement

  multi-pass crossassembler for 6502 & 65816 processors

- **ca65** - [http://oliverschmidt.github.io/cc65/doc/ca65.html](http://oliverschmidt.github.io/cc65/doc/ca65.html)
  The “cc65” C cross compiler's own cross-assembler
  (can be used on its own)

- Undoubtedly a number of others!

- Also check out 6502 Source Code Repository - [http://www.6502.org/source/](http://www.6502.org/source/)
Cross-compiling on Linux - C

- cc65
  - Complete cross development package macro assembler, C compiler, linker, librarian & other tools
  - Originally based on cc65 for the Atari itself
  - Was: http://www.cc65.org/, but no longer maintained as of March 2013!
  - Now: http://oliverschmidt.github.io/cc65/
Cross-compiling on Linux – C - Example

/* hiworld.c */

#include <stdio.h>
#include <unistd.h>

int main(void) {
    int i;

    printf("Hello, world.\n");

    sleep(2);

    for (i = 0; i < 1000; i++) {
        printf(".");
    }

    return(0);
}

CC65_HOME=/usr/local/lib/cc65

all: hiworld.xex

clean:
    -rm hiworld.xex
    -rm hiworld.o

hiworld.xex: hiworld.c
    cl65 -t atari hiworld.c
    mv hiworld hiworld.xex

run: hiworld.xex
    atari800 -nobasic -run hiworld.xex

Hello, world.
Cross-compiling on Linux – Action!

- Action! was an integrated editor, compiler, and debugger on a cartridge. High-level code, but still very fast. Syntax similar to ALGOL 68.

- Projects to create Action! cross compilers:
  - Effectus - [http://gury.atari8.info/effectus/](http://gury.atari8.info/effectus/)
    Uses MADS assembler
Some older new games…

- **Gem Drop** (1998)
  Action puzzle, based on “Magical Drop III” arcade game. (Written by your’s truly in Action!; ported to C + libSDL for Linux & other modern platforms, as “Gem Drop X”)

- **Castle Crisis** (2003)
  Based on “Warlords” arcade game.
  (Basically, multiplayer “Breakout”)

- **Beef Drop** (2004)
  Based on “Burger Time” arcade game.
Some recent new games...

- **His Dark Majesty** (2010)
  Turn-based strategy. (Cross-compiled C!)
  [http://hdm.atari.pl/](http://hdm.atari.pl/)

- **Tempest Xtreem** (2008)
  Updated version of Tempest arcade game, that plays more like Tempest 2000
  Atari Jaguar game
  [http://members.tcq.net/video61/tempest1.html](http://members.tcq.net/video61/tempest1.html)

- **Crownland** (2007)
  Scrolling jump-and-run game

- **Yoomp!** (2007)
  3D action puzzle
  [http://yoomp.atari.pl/](http://yoomp.atari.pl/)
Newest new games...

- **Pac-Man Arcade** (2012)
  Conversion of 1980s “Ms. Pac-Man” by Atari to a more arcade-perfect version of original “Pac-Man” than the 1980s “Pac-Man” by Atari

- **Ridiculous Reality** (2012)
  Puzzle jump-and-run game based on mobile game “Continuity”

- **Asteroids emulator** (2012)
  Original arcade game was 6502, so this emulates the rest of the hardware on Atari 8-bit
  [http://web.utanet.at/nkehrer/ast800xl.html](http://web.utanet.at/nkehrer/ast800xl.html)

- **Line Runner** (2012)
  Version of a popular Android/iPhone game
New Atari Hardware
(not Linux-related, but interesting)

- **Incognito board**
  Turn an Atari 800 into an XL-compatible, and then some!
  (64KB (vs 48K) accessible RAM, 1MB installed; Parallel Bus Interface; CompactFlash storage; SpartaDosX; Real Time Clock)

- **VBXE**
  FPGA-based video upgrade
  [http://spiflash.org/block/15.html](http://spiflash.org/block/15.html)

- **SIDE2**
  Cartridge providing Compact Flash drive, SpartaDosX, Real Time Clock
Conclusion

- Atari 8-bits have a 35 year history
- Tons of activity in the early days, then a lull, and now a resurgence
  - FPGAs, cheap manufacturing, fast modern PCs
  - Internet: forums, chat rooms, YouTube, archives
- Easy to dip your toes in (play some Pac-Man)
- Going deeper, hardware & software choices abound!
  - Too much for a mini-talk; most beyond my experience level, anyway