

PowerPC Development Workstation

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Why Do We Want a PowerPC Workstation?

- Hardware vendors want to make it as easy as possible to develop software.
 - So a workstation should be inexpensive and relatively quick at building software.
- Hardware vendors like to sell hardware, but people only buy hardware to run software.
- The software ecosystem has a spiralling effect (good or bad).
 - Software availability drives volumes, which brings more software.
 - Lack of software shrinks volumes, making the market less attractive for other software.
 - Even if it's just a few key applications.
- The “software ecosystem” is more narrow than “Power Architecture”.
 - PowerPC user-level software is mostly compatible between processors, assuming the same OS.
 - We're mostly talking about Linux.

Commercial Software Development

- How big is the market?
 - Lots of consumers = more potential sales.
 - A small number of specialized consumers could still be fine (e.g. HPC).
- Chicken and egg: How do you grow a market without software? How do you get software for a small market?
- If the market is big, expensive development systems are justified.
 - But there are still budgets.

Open Source Software Development

- Open source development is driven by hobbyists.
 - They do it for the love. Who cares how big the market is?
 - Sexy hardware = more love.
 - Hobbyists are very price-sensitive (especially those with spouses).
 - Development done at home.
 - Hobbyists are noise- and heat-sensitive.
- Most PowerPC open source hobbyists use Power Macintosh systems.
- An increasing amount of open source development is driven by corporate developers.
 - Linux, Eclipse, GNU toolchain, etc.
- Companies like to leverage open source development.
 - We will now discover exactly how much hobbyists contribute to PowerPC open source software development.

Embedded Software Development

- Embedded companies develop integrated devices, including hardware, firmware, OS, and software.
- Evaluation boards / reference platforms are developed by processor vendors to support their processors.
 - Potential customers can evaluate if the processor is suitable for a given application.
 - If so, the customer can modify the reference design to reduce cost and develop a custom hardware platform.
 - Before hardware is available, evaluation boards can be used for software development.
- Evaluation boards are usually expensive relative to workstations.
- Embedded processors are underpowered relative to workstations.
 - Cross-compiling from an (x86) workstation for the embedded target is the norm.
- They don't want to reinvent all the wheels, only their secret sauce (value-add).
 - A vibrant software ecosystem means there are lots of wheels ready to use.

PowerPC Workstations

Apple

- Power Macintosh used desktop-class processors from Freescale and IBM.
 - 601, 603, 604, 750, 74xx, 970
- 6 Jun 2005: Apple announced it would switch all products to Intel processors by end of 2007.
- 18 Aug 2006: Apple announced the last PowerPC products (PowerMac G5) were switched to Intel processors.

IBM Workstations

- Prices start at \$3000 for a 1-way 2GHz PowerPC 970.
- “Quiet” means 60 decibels.
- Hot.
- IO components not aimed at desktop users.
 - Serial Attached SCSI (SAS), USB 1.x, forget audio.
- Performance
 - Today SMP PowerPC 970 is in the x86 ballpark.
 - Tomorrow it won't be.

Building a PowerPC Workstation

- Goal: cheapest price for desktop-class performance.
- Available desktop-class processors
 - PA Semi 1682M engineering sample: \$700
 - POWER5, Cell are not a standard products.
- 2GHz PowerPC 970MP (quantity 1000) plus northbridge: \$270
 - Contact your IBM sales representative or distributor for most up-to-date pricing.
- Motherboard design costs
 - IBM donated 970 reference design to Power.org.
- Production costs
 - 970 motherboards are 12-16 layers.
 - x86 motherboard manufacturers typically do 4-6 layer boards.
 - Needing more layers can quadruple the motherboard price.
- Distribution costs
 - Build-to-order vs inventory, shipping, warranty service, etc.

Building a PowerPC Workstation: Business Case

- Advantages over x86?
 - Not price, performance, virtualization, heat, power consumption, software availability.
 - Altivec?
- What volume can we expect?
- How do you run Windows software?
- Is there any software exclusive to PowerPC?

Workstation Alternatives

Remote Access

- Universities around the globe host public accounts on PowerPC servers.
 - IBM System p5 servers; Apple G5s for AltiVec development
 - This is great even for developers with slower PowerPC hardware.
- Geographies: Australia, Brazil, China, Germany, India, US
- Linux distributions: Debian, Gentoo, Red Hat, Slackware, SuSE
- Sign up for a free account; ssh in and start hacking.
- Great for open source; not suitable for proprietary development.
- Doesn't motivate as much as hardware in your hands.

Cross-compiling

- Compile PowerPC binaries on an x86 host.
 - Deploy them on the PowerPC target to run and test.
- For the GNU toolchain, crosstool makes it easy to create the cross-compiler.
 - <http://kegel.com/crosstool>
- Debugging can be a little tricky, since the source is on the host and the binary is on the target.
 - You can also build a cross-debugger as long as you have a usable communications link between host and target.
- Some software is very difficult to cross-compile.
- Not sure how well commercial toolchains and IDEs support cross-compiling.

Simulators

- Cross-compile **and** run on the (x86) host.
- Simulators are useful on their own for hard-to-debug problems or when hardware availability is limited.
- Ultimately you'll need a target to test on.
 - Simulators can be functionally inaccurate or don't cover the whole system.
 - Simulators are probably much slower than the target.
- qemu
 - Popular open-source simulator.
- IBM systemsim
 - Free for download for PowerPC 970 and Cell BE.
- Virtutech Simics
 - Commercial product that supports a wide range of architectures.

Conclusion

- More software is good for hardware vendors.
- More software is good for software vendors.

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