



# From Zero to SPECfp2000... Porting Debian to IA-64

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# Objectives



- Tell an interesting story... how the Debian IA-64 port happened.
- Lessons learned porting Debian to five architectures
- How HP works with Debian and the larger Open Source development community
- How HP uses Linux internally today
- Solving portability problems improves software quality

# What is Debian?



- 'The Debian Project is an association of individuals who have made common cause to create a free operating system.'
- More specifically, Debian:
  - is one of the most popular GNU/Linux distributions
  - runs on the most architectures
  - is a completely open volunteer organization
  - is quite international
  - is the largest GNU/Linux distribution
  - works with companies to develop and maintain software
  - is Focused on Freedom
  - is well represented in the Free Software world

# A Few Debian Statistics



- Debian is a project of Software in the Public Interest
  - Debian runs on everything from handhelds to mainframes...
  - 11 released architectures
    - alpha arm hppa i386 ia64 m68k mips[el] powerpc s390 sparc
    - ports in progress to Hitachi SuperH and AMD Opteron
    - also working with HURD and BSD kernels
  - 1262 people
  - 8012 source packages
  - 13456 binary packages

# Map of Debian Developers



# Map of Debian Users



# Recent Reader's Choice Awards



- Linux Journal 2003 Readers' Choice Awards
  - Debian won the category of “Favourite Distribution”
- Linux Enterprise Reader's Choice 2003
  - Debian won the category “Best Enterprise Distribution”
- Linux New Media Award 2003
  - Debian won the category “Best Distribution”
  - Along with Knoppix, which is derived from Debian, they received more than 60% of the votes.

# Background – Debian Port to PARISC



- PARISC architecture was not supported by Linux...
- Various internal discussions at HP
- The Puffin Group announces a port, October 1998
- HP agrees to participate, March 1999
- Linuxcare acquired the Puffins
  - No longer just a “fun” project
  - Contract to continue porting efforts
- HP wanted a complete distribution...





# Why Debian for PARISC?

- Commercial distributions wanted “real money”
- The Debian project acts like a “commons”, where individuals and companies can contribute as their needs dictate without legal or contractual complications.
- Debian developers often have credibility with upstream maintainers, can help get new developments adopted.
- Zero external cost for deployment.
- Some engineers at HP and Linuxcare were already registered Debian developers...
- But... successfully working with Debian means accepting the community development model... commercial distributions or support partners may be required to meet needs for traditional software support elements?

# How HP Engaged Debian



- No Forks!
  - Must be a “real” Debian port
  - Merge all code upstream immediately
- Continue contract with Linuxcare for toolchain support
- Hire existing Debian developers, and encourage HP engineers to join the Debian project
- PARISC hardware made available to Debian
- Provide hosting and bandwidth of some Debian servers

# The IA-64 Port



- Very different from PARISC port...
  - Large industry investment in and focus on IA-64
  - Kernel and toolchain in reasonable shape
  - Commercial distributions had a head-start, which helped when starting the Debian port
- HP already a significant contributor to IA-64 Linux
  - HP Labs hosting key contributors
    - David Mosberger
    - Stephane Eranian
  - Joint developers of the architecture with Intel

# Getting Started

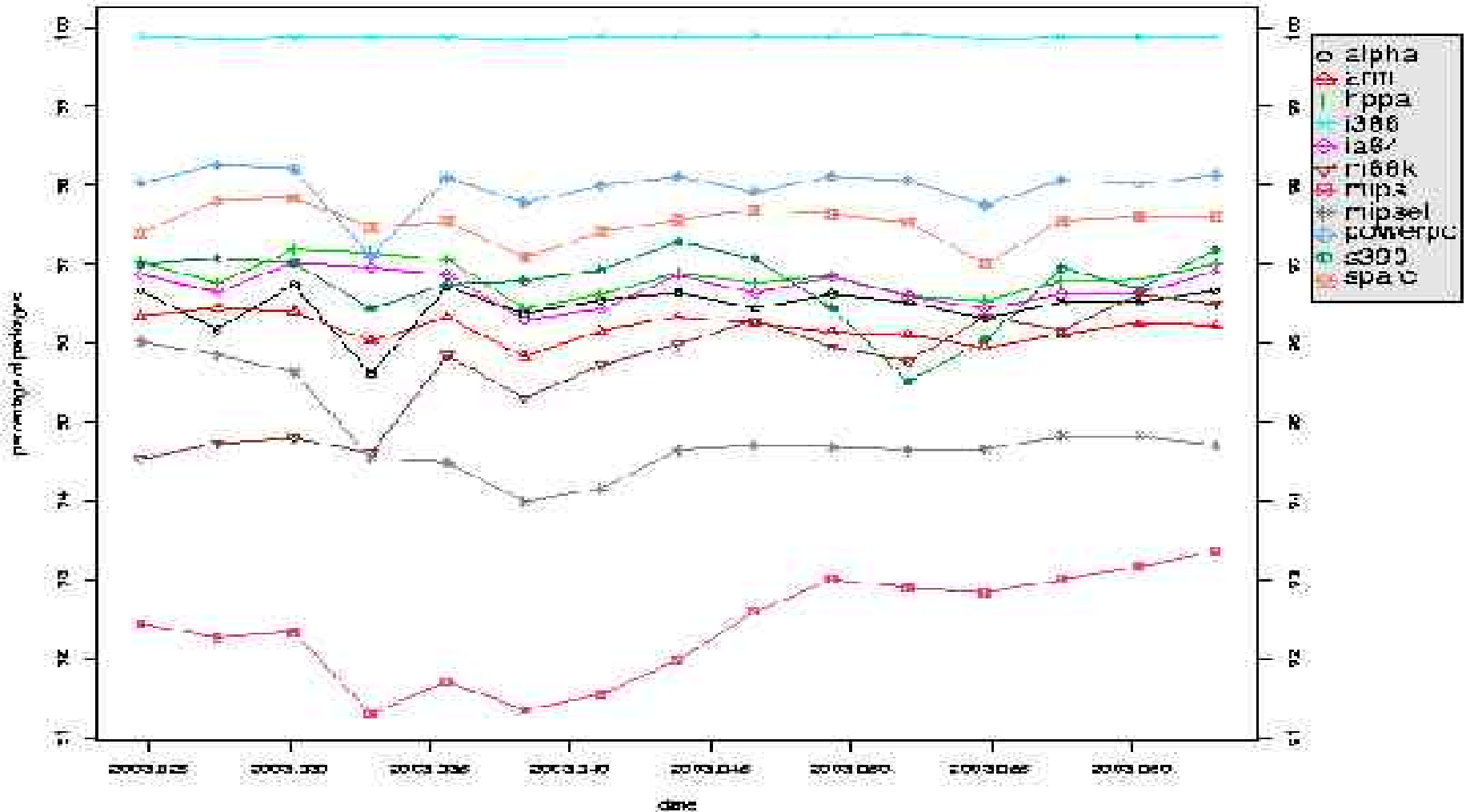


- Before Debian acquired hardware, some packages were built on systems hosted by SourceForge
- HP unknowingly provides Debian a machine...
  - Evaluation systems provided to Agilent Technologies
  - One ends up on Bdale's desk...
  - Installed an early TurboLinux pre-release
  - CPU stepping and firmware issues
  - Compiled in chroot until self-hosting
  - Debian autobuilder activated
  - Intention to release with “woody” announced
  - HP hires Bdale...

# Percent Built for Each Debian Architecture



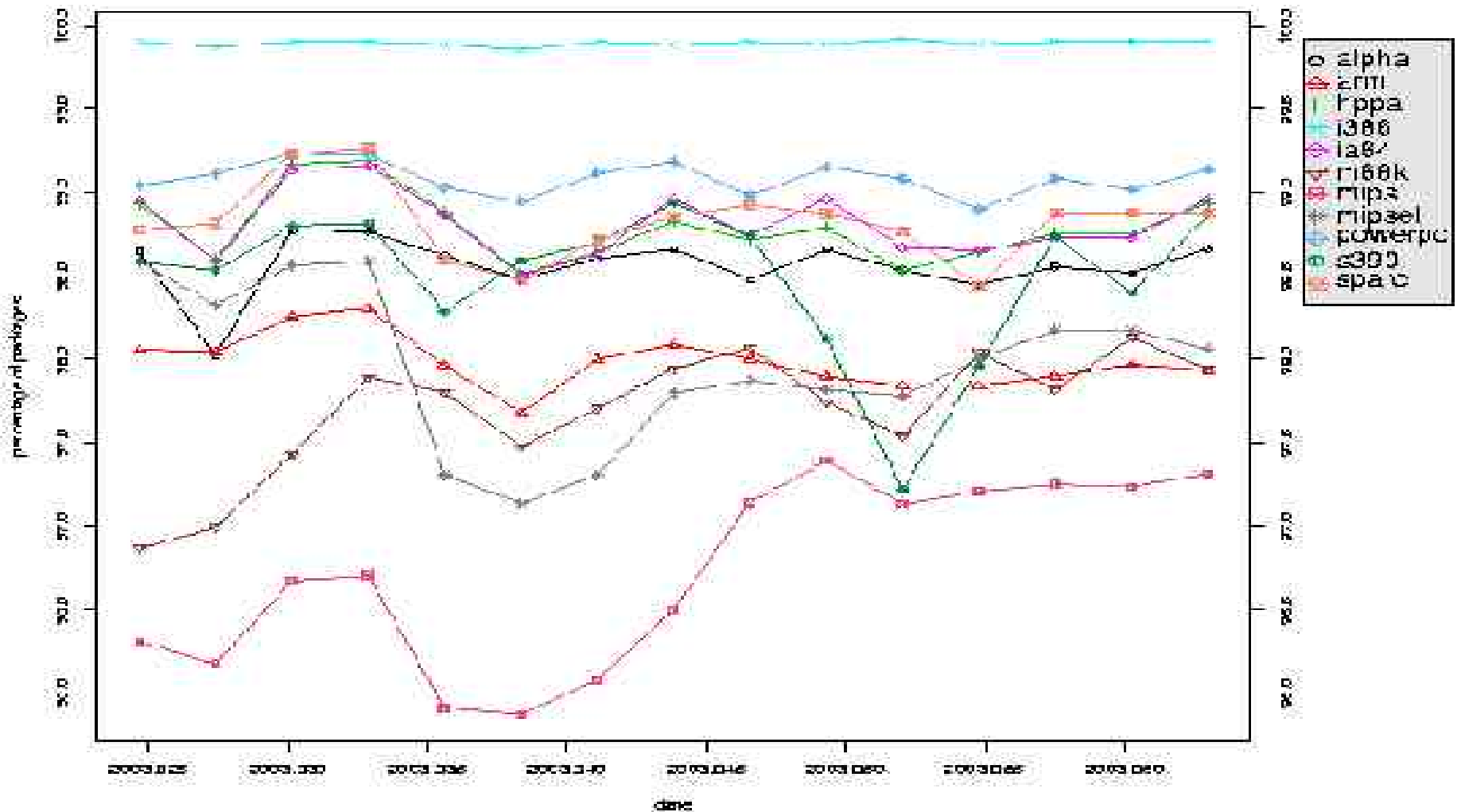
What percent is built for each architecture (past two weeks)



# How Up-to-Date Each Architecture Is



How architectures are keeping up (past two weeks)



# Lessons Learned from Porting



- In my experience, most portability problems come from programmer laziness, expressed as ambiguity.
- Bad assumptions about objects all being 32 bits!
  - IA-64 is “LP64”    Integers 32 bits, Long and Pointers 64
  - Compiler “implicit declaration” warnings are really errors
- Mixing PIC and non-PIC at linker time is a bad idea...
- Not all platforms have all features
  - Serial consoles on servers
  - No sound hardware on mainframes
- New architectures **MUST** track development kernel and toolchain revisions, or upstream maintainers ignore them

# How HP Uses Debian



- Development Platform
  - HP develops on Debian, contributes developments to the Open Source community, then works with commercial distributors to help them incorporate the new features.
- Hardware Enablement
  - Most Itanium 2 systems ran Debian as their first OS boot!
  - Early shipment of carrier-grade and blade servers
- Benchmarks – HP Itanium2 SPECfp2000 a new record!
- HP Enablement Kit for Linux on Itanium Systems
- iPAQ distributions are Debian derived
  - familiar – minimal Linux environment
  - intimate – full Debian for the iPAQ



# HP's Linux commitment



**“The question for us isn’t, ‘Will Linux dominate the world?’, but ‘What part of the world will Linux dominate?’”**

**Carly Fiorina  
CEO, Hewlett Packard Company  
Linuxworld 2002**

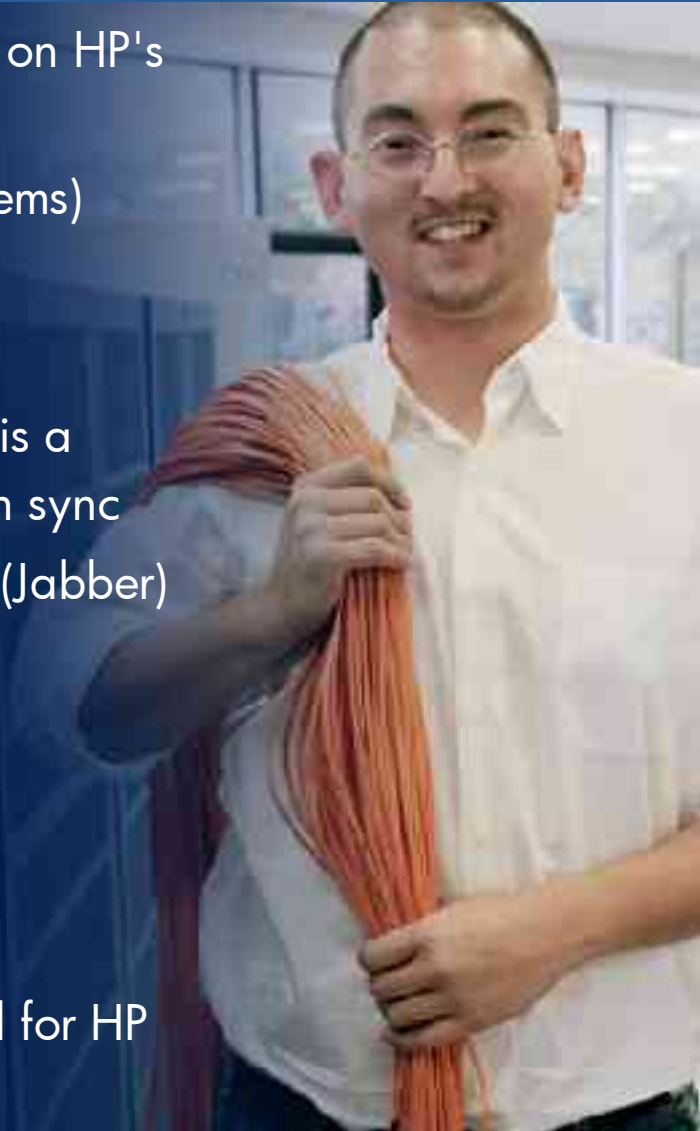


# HP's Internal Use of Linux



## Over 4000 systems and growing ...

- All external email is routed through Linux rim servers on HP's firewalls - to the tune of >3TB/year
- DNS infrastructure is rolling out on Linux (~100 systems)
- Enterprise Directory service hosted on Linux clusters.
- Client DHCP service delivery hosted on Linux
- Network time is provided by Linux rim servers - NTP is a critical element to keeping our routers and network in sync
- HP's internal and secure instant messaging network (Jabber) is implemented on Linux servers
- Linux clients and servers in use for electronic design automation [Synopsys]
- Oracle 9iRAC application testing and validation for production deployment
- Utility Data Center with 36 Itanium Linux nodes used for HP Labs compute needs - growing to 144 nodes



# To Learn More



- Debian project web site is [www.debian.org](http://www.debian.org), each port has a page like [www.debian.org/ports/ia64](http://www.debian.org/ports/ia64) with more information on the port.
- HP
  - Linux product information at [www.hp.com/linux](http://www.hp.com/linux)
  - HP supported Open Source projects (Debian, Samba, etc) [opensource.hp.com](http://opensource.hp.com)
- Linux for iPAQ - [handhelds.org](http://handhelds.org)
- IA-64 Linux Kernel: Design and Implementation
- Bdale's talks are online at [www.gag.com/~bdale/talks](http://www.gag.com/~bdale/talks)



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