

# Testing GCC and Osprey using Debian

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- Background of this testing effort
- Methodology: tools and other practices
- Results
- Conclusions



- I'm not a GCC engineer but a developer of a Linux distribution
- Two requirements from our point of view:
  - Compiler has to work reliably on all of our architectures (12+)
  - Packages need to compile with the new compiler
- March 2006: what would happen if we moved to GCC 4.1?



# Background

```
class foo {  
foo::foo(void);  
};
```

t.c:2: error: extra qualification 'foo::' on member 'foo'

About 200 bugs like these. 300 bugs related to 4.1 in total.  
About 6 compiler bugs too.



# Why Debian?

It provides great test coverage:

- 12 hardware architectures
- About 11000 source packages, 60% of which need to be compiled

It can easily be built from source:

- Common way of building software packages
- Build dependency information



## GCC 4.2

- Snapshots of GCC 4.2 from SVN every 3-4 weeks
- Using different optimization levels
  - `-O1-O3`
  - `-Os`
  - `-msched-control-spec`
  - `-fprefetch-loop-arrays`

## Osprey

- One full test with Osprey, the alternative back-end on IA-64
- Assess the status of Osprey on a large scale basis



# The process

- Generate a list of all software packages
- Start building the packages
- ... and look for failures
- Failures:
  - Obvious compiler bugs (ICE: internal compiler error)
  - Other compiler bugs (e.g. undefined reference to 'L13')
  - Temporary build problems in packages
  - Bugs in software shown by the new compiler
- Analyze and reduce compiler bugs:
  - delta
- Report compiler bugs:
  - Look at Bugzilla first!
  - Send good reports plus testcases
- Pester people to get bugs fixed. . .



- Tool to bootstrap a basic Debian system
- Automatically retrieves .debs and creates a basic chroot environment
- Supports woody (oldstable), etch (stable), testing, unstable and others



- Tool for building binary packages from Debian sources
- Automatically installs build dependencies
- Can leave sources in the chroot upon failure



- Tool to easily use chroot environments
- Supports LVM snapshots
- New versions of sbuild require schroot



## GCC 4.2

- About 8 IA-64 specific bugs and 10 generic bugs
- Testing was done fairly late in the release cycle
- No specific failure pattern except maybe the scheduler (4-5 bugs)

## Osprey

- About 60 bugs
- One bug affected over 1000 software packages
- Some failures because of unknown command line flags



- Test GCC 4.3 and maybe various branches
- Find ways to automate this work more, e.g. by automatically ignoring known failures
- Assess SUSE's build system
- Test other compilers (e.g. LLVM)



# Conclusions

- About 20 defects in GCC 4.2 and 60 defects in Osprey on IA-64 have been identified and reported.
- The majority of these bugs, including all IA-64 specific GCC bugs, have in the meantime been fixed by developers.
- This testing effort has contributed to reliable compiler technology on IA-64.

