

Porting The SAS System to HP-UX on the Itanium

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Who is SAS Institute

- Largest Private Software Company
- 22 years of Double Digit Growth
- 31% of 1998 revenues re-invested in R&D (\$270 Million)
- 98% of Fortune 100 are SAS customers
- Software Licensed Annually
- 98% Retention of customers
- Over 3 million users at 30,000 customers worldwide

Supported Platforms For SAS Version 9

- HP-UX PA
- HP-UX Itanium
- Tru64
- Open VMS
- OS/390
- Solaris
- AIX
- Linux x86
- Windows (NT, 2000, XP)

“Designing The Future”

Operating Systems For Itanium (in 1999)

- HP/UX
- Windows
- Project Monterey (IBM/SCO/Sequent)
- Modesto (Novell)
- Solaris
- Tru64
- Linux

Source: <http://www.intel.com/design/itanium/gettingstarted/> June 1999

How To Port To A New Platform

- Get Compiler and other tools
- Get the hardware
- Get the OS
- Compile
- Test
- Ship

Key Milestone Checklist

Clean App For IA-64 Architecture - Porting Checklist (Syntax, Compiler issues)	Status
Invalid casts between pointers and ints (and/or longs)	
Invalid printf specifiers	
Usage of existing APIs with pointer(and/or long) as parameters, return values	
Usage of undocumented/reserved bit fields	
Remove hardcoded values for size of data types	
Remove hardcoded values for Bit shift values	
Remove hardcoded constants in Memory allocation functions	
Fix unguarded "ifdefs" from defaulting to unwanted code generation	
Fix accessing data structure members via constant offsets	
Algorithms that make use of special bits in pointer arithmetic assuming fixed size	
In-line assembly code	
Self modifying code	
Appropriately modify portions of code storing/restoring on-disk structures	
Portions of code utilizing data-packing	

Intel.

The SAS System

- More than 2000 separate executables
- Over 29 million lines of code
(less than .1% Itanium specific)
- Mostly written in c
- Some assembler
- Runtime machine code generation (JIT)

Porting to 64 bit platforms

- First 64 bit port in 1993 (Alpha/OSF)
- Large File Summit activity in 1996
- 3 more 64 bit ports in 2000
HP/UX PA, AIX, Solaris

Early Development Environment

- Cross Compiler/Linker
- Simulator
- Development System – “Lion”
- Bug reports to HP

Progress

- Successful compilation
- Native tools
- Compiler updates
- OS Updates
- Lots of debugging
- More bug reports

More Progress

- Tools updates
- OS Updates
- More testing and debugging

Our First Public Appearance

**“SAS First To Demonstrate Enhanced
Performance On New HP-UX
Itanium™ Lion System”**

DUBLIN, Ireland (June 19, 2000)

Continuing Development

- SAS Code base moved from 8.2 to 9.0
- More coding, testing, debugging
- Using the optimizer and other tools

Summer 2002 – Release!

- Itanium 2
- HP-UX 11i, Version 1.6
- SAS Version 9.0

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