PathScale™ Compiler Suite

QLOGIC®

The clear choice for 64-bit application development focused on maximum performance.

: C, C++, & Fortran Compilers
: for the AMD and Intel EM64T
: Processors

PathScale Compiler Suite

High Performance Compilers

- **C, C++, and Fortran Compilers**
- **Industry leading optimizations**
- **32-bit and 64-bit compilation**
- **Code generation for AMD64 and EM64T**
- **OpenMP 2.5 C/C++/FORTRAN**
- **Compatible with GNU/gcc tool chain**
- **Enhanced debugger for C++ and FORTRAN**

KEY FEATURES

- Faster ports with less source code modification
- Uses standard flags so most make files just work.
- Mix and match GNU and PathScale compiled objects

- Uses standard GNU toolchain
- Pathdb compatible debugger with enhanced C++/FORTRAN support and gdb syntax
- FORTRAN 77/90/97 with Popular Extensions, and Enhanced Libraries
- Cray/SGI Fortran 95 extensions and character pointers

- Big-endian/Little-endian Fortran I/O
- OpenMP 2.5 capable Fortran
- Free downloadable Pathscale optimized AMD Core Math Library
- Tested with the Intel Math Kernel Library
- Works with popular commercial debuggers

MAXIMUM PERFORMANCE AND COMPATIBILITY

The QLogic PathScale™ Compiler Suite represents the highest-performance 64-bit C, C++ and Fortran compilers for Linux-based environments. This advanced compiler suite takes advantage of the unique high-performance 64-bit features of both the Advanced Micro Devices AMD64 and the Intel® Xeon™ EM64T architectures.

The PathScale compiler includes a world-class "Every Known Optimization" framework purpose built for inserting new optimization techniques to improve performance. At PathScale, poor compiler optimization is considered a bug and a challenge to our development team.

DERIVED FROM PROVEN FOUNDATIONS

Noted for its mature FORTRAN and excellent Optimizer, the PathScale compiler suite is derived from the SGI®/Cray®compiler. PathScale modernized this compiler with OpenMP 2.5 and a gnu C/C++ front-end, and enhanced the code generator to support AMD64 and Intel EM64T processors. The result across all languages, is the world's highest performance 64-bit Linux compiler with complete GNU tool chain compatibility.

In real-world application testing, HPC end-users have experienced up to 40% performance gain over alternative compiler products. This makes the

QLogic PathScale Compiler Suite the clear choice for 64-bit computing clusters focused on maximum performance.

OPTIMIZED FOR AMD OPTERON AND INTEL EM64T SYSTEMS

The QLogic PathScale Compiler Suite maximizes the performance of application code when compiled for AMD Opteron systems. With AMD Opteron advantages like complex addressing modes, large register sets, more efficient parameter passing and SSE2/3DNow!™ support, 64-bit code will simply perform better on this processor. In addition, inline AMD64 assembly code can be issued.

FLEXIBLE PURCHASING OPTIONS

The QLogic PathScale Compiler Suite is sold as a subscription service, which includes all major and minor product enhancements, bug fixes, performance improvements, and access to customer support. The subscription is sold on a per developer basis. Perpetual license options are also available

WORLD CLASS SUPPORT

QLogic provides advanced technical support by some of the best compiler engineering talent in the industry. QLogic treats performance problems as bugs, and provides excellent assistance in application porting and tuning.

C, C++, & Fortran Compilers for the AMD and Intel EM64T Processors

PathScale Compiler Suite

64 bit

TECHNICAL SPECIFICATIONS

PATHSCALE COMPILER SUITE FEATURES

Functional Components
- GNU C/C++ front-end compatible with OpenMP 2.5
- Fortran 95 with Cray/SGI extensions and OpenMP 2.5
- Optimizer and Fortran derived from SGI Open64 code base
- Pathdb command line debugger
- Tuned libraries including ACML 3.5

AMD64 SPECIFIC CAPABILITIES

- Support for inline assembly code
- Long address support
- Supports AMD64 ABI (x86-64)
- Utilizes full 64-bit ISA including SSE2/3DNow!™ and register sets
- Instruction scheduling for the AMD out-of-order core

EM64T SPECIFIC CAPABILITIES

- All SSE3 instructions available
- Single precision complex (except div/mult)
- Unaligned loads
- Intruction scheduling for the Intel EM64T core

MAJOR OPTIMIZATIONS

Code Generation
- Control flow optimization
- If-conversion
- Instruction scheduling
- Global register allocation
- Loop unrolling
- Peephole optimization

LOOP NEST OPTIMIZER

- Loop-caused dependency analysis
- Loop Interchange
- Cache Blocking
- Loop Fission
- Loop Fusion
- Outer loop unrolling
- Prefetching
- Scalar Expansion and Array Expansion
- Gather-scatter
- Pad arrays to reduce cache conflicts
- Vectorization (including SIMD)

BINARY AND SOURCE CODE COMPATIBILITY

C/C++ Compatibility
- Source compatible at GNU 3.3.X with OpenMP 2.5
- 100% binary interoperability, including name mangling
- Mix and match GNU and PathScale compiled objects

Fortran compatibility
- Source compatible Fortran 77/90/95 with Cray/ extensions including full pointer support
- OpenMP 2.5 support
- All common Fortran 77 extensions for compiling "dusty deck" code
- Links with g77 compiled libraries
- Custom libraries included, including libm and ACML2.5
- Big-endian/Little-endian Fortran I/O

Debugger (pathdb) compatibility
- Well formatted printing of Fortran variables, arrays, expressions
- Understands Fortran 77 and 90 types, and expression operators
- Properly prints standard C++ templates, maps, vectors, lists and dynamic types
- Gdb compatible commands and works with gnu compiled code
- Step backward capabilit

GLOBAL SCALAR OPTIMIZATION

Pre-optimizer
- Goto conversion and loop normalization
- Alias analysis (flow-free and flow-sensitive)
- Tail recursion elimination
- Dead store and dead code elimination
- Induction variable canonicalization
- Copy propagation

Main optimizer
- Partial redundancy elimination based on SSAPRE framework
  - Global common sub-expression
  - Loop invariant code motion
  - Strength reduction
  - Linear function test replacement
- Induction variable elimination
- Register promotion

INTER-PROCEDURAL ANALYSIS

- Operates across multiple compilation runs
- Function inlining
- Inter-procedural constant propagation of globals and parameters
- Dead function and dead variable elimination
- Automatic common block padding

TESTED OPERATING SYSTEMS

SuSE™ Linux Professional 9.2 and 9.3
SuSE Linux Enterprise Server 8 and 9
Red Hat™ Enterprise Linux Workstation 3 and 4
Red Hat Fedora Core 2, Core 3

For a list of authorized resellers, visit **www.qlogic.com/pathscale**

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SN0058046-00 Rev A 5/06