

*The Clear Choice for Maximizing
64-Bit Application Performance*



EKOPath Compiler Suite

C, C++ and Fortran Compilers for AMD64 and Intel EM64T Processors



The PathScale EKOPath Compiler Suite Includes:

- C, C++, and Fortran Compilers
- Industry leading optimizations
- 32-bit and 64-bit compilation
- Code generation for x86, AMD64 and EM64T
- OpenMP 2.5 C/C++/FORTRAN
- Automatic parallelization
- Compatible with GNU/gcc tool chain
- Enhanced debugger for C++ and FORTRAN

Features and Benefits

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

Works with Popular Commercial Debuggers

- Etnus TotalView™, Streamline DDT™, Absoft Fx2™
- Pathdb debugger supplied with enhanced C++/FORTRAN support and gdb syntax

FORTRAN 77/90/95 with Popular Extensions, and Enhanced Libraries

- Cray/SGL Fortran 95 extensions and character pointers
- Big-endian/Little-endian Fortran I/O
- OpenMP 2.5 capable Fortran
- Free downloadable PathScale optimized ACML 2.7

Maximum Performance and Compatibility

The PathScale EKOPath™ Compiler Suite represents the highest-performance 64-bit C, C++ and Fortran compilers for Linux-based x86 environments. This advanced compiler suite takes full advantage of the unique high-performance 64-bit features of both the Advanced Micro Devices AMD64 and the Intel® Xeon™ EM64T architectures.

EKO stands for "Every Known Optimization". It refers to a compiler 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

PathScale compilers are derived from the SGI®/Cray® compiler suite, noted for its mature FORTRAN and excellent optimizer. 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 PathScale EKOPath Compiler Suite the clear choice for maximizing 64-bit application performance.

Optimized for AMD Opteron Systems

The PathScale EKOPath 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 SSE, 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 PathScale EKOPath Compiler Suite is typically 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

PathScale provides advanced technical support by some of the best engineering talent in the industry. PathScale treats lack of performance leadership as a bug, and provides excellent assistance in application porting and tuning.

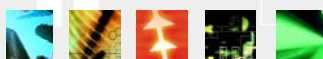
Building Popular Codes with EKOPath

PathScale tests and provides build instructions for many well known codes such as: AMBER, CHARMM, FFTW, GROMACS, MM5, MPICH and NAMD.

The PathScale EKOPath Compiler Engineering Team

Our EKOPath Compiler engineering team is led by Dr. Fred Chow, who was the Chief Scientist at SGI for the MIPS-based compilers and the lead architect of the Pro64 compiler.

Prior to his work at SGI, Fred was the lead Compiler architect at MIPS Computer Systems. The MIPS compiler was a productization of his pioneering Ph.D. research at Stanford University. He currently holds eight patents.



PathScale EKOPath Compiler Suite Specifications



PathScale: Accelerating Cluster Performance

PathScale is dedicated to developing innovative high-performance computing technologies that enable breakthroughs in science and engineering. Through superior technology, PathScale will deliver software and hardware solutions to help solve the most complex computational challenges that shape the future of science and business.

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



PathScale Inc.
2071 Stierlin Court Suite 200
Mountain View CA 94043 USA

tel: 650.934.8100
fax: 650.428.1969

www.pathscale.com
sales@pathscale.com

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 2.7

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 AMD out-of-order core

EM64T Specific Capabilities

- All SSE3 instructions available
- Single precision complex (except div/mult)
- Unaligned loads
- Instruction 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)

Automatic Parallelization

- Examines sequential code for parallelism
- Restructures automatically to run efficiently on multiprocessor or multi-core systems

Binary and Source Code Compatibility C/C++ Compatibility

- Source compatible at GNU 3.3.X with OpenMP 2.5
- 100% binary interoperability with 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
- 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 capability

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

The PathScale EKOPath Compiler Suite contains on a common distribution medium both PathScale proprietary and open-source software components. All open source software is licensed in full compliance with the applicable open source license. PathScale modifications to GPLed source are licensed under the GPL. End-users can receive source code for all of the open source components of the PathScale EKOPath Compiler Suite, along with their binary distribution, in compliance with section (3a) of the GPL. Open source license terms do not apply to the PathScale proprietary code, which includes code such as run-time performance enhancing libraries that are independent and separate works. End users may not transfer, sublicense or distribute PathScale proprietary code to any third party. Except as permitted in the PathScale Subscription Agreement, end-users may not copy or modify PathScale proprietary code.

© 2005 PathScale, Inc. All rights reserved. PathScale, the PathScale logo, EKOPath, InfiniPath, OptiPath, and Accelerating Cluster Performance are trademarks of PathScale, Inc. HyperTransport and HTX are licensed trademarks of the HyperTransport Technology Association. AMD, the AMD Arrow logo, AMD Opteron and combinations thereof are trademarks of Advanced Micro Devices, Inc. Other trademarks are the property of their respective owners.

Rev. EP1105