



Moblin.org – Open Source Development for the Intel powered Mobile Internet Device



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SFTS003

Invent the new reality.

Intel Developer
FORUM

Agenda

- **Mobile Internet Device (MID) Overview**
- **Introduction to Moblin.org**
- **Tools for MID development**

Mobile Internet Device Overview



Communication



Entertainment



Information



MIDs will deliver “The Full Internet in your Pocket”

Moblin

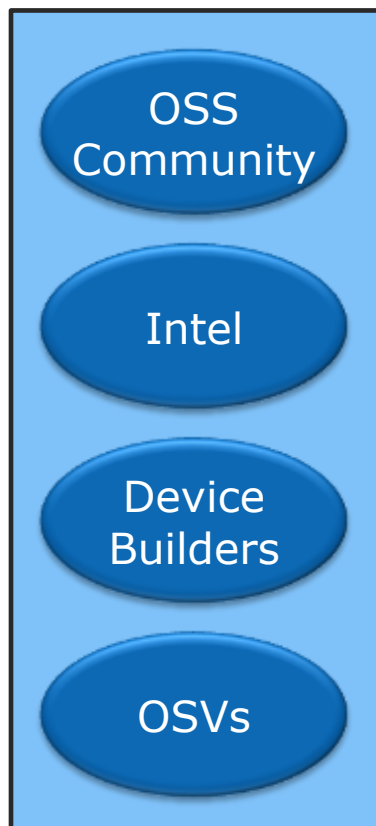
The Open Source Platform for Linux* on MIDs

- Core stack Optimized for Intel® Centrino™ Atom Processor Technology
- Active Open Source Community
- Software Development Resources
- Growing Ecosystem

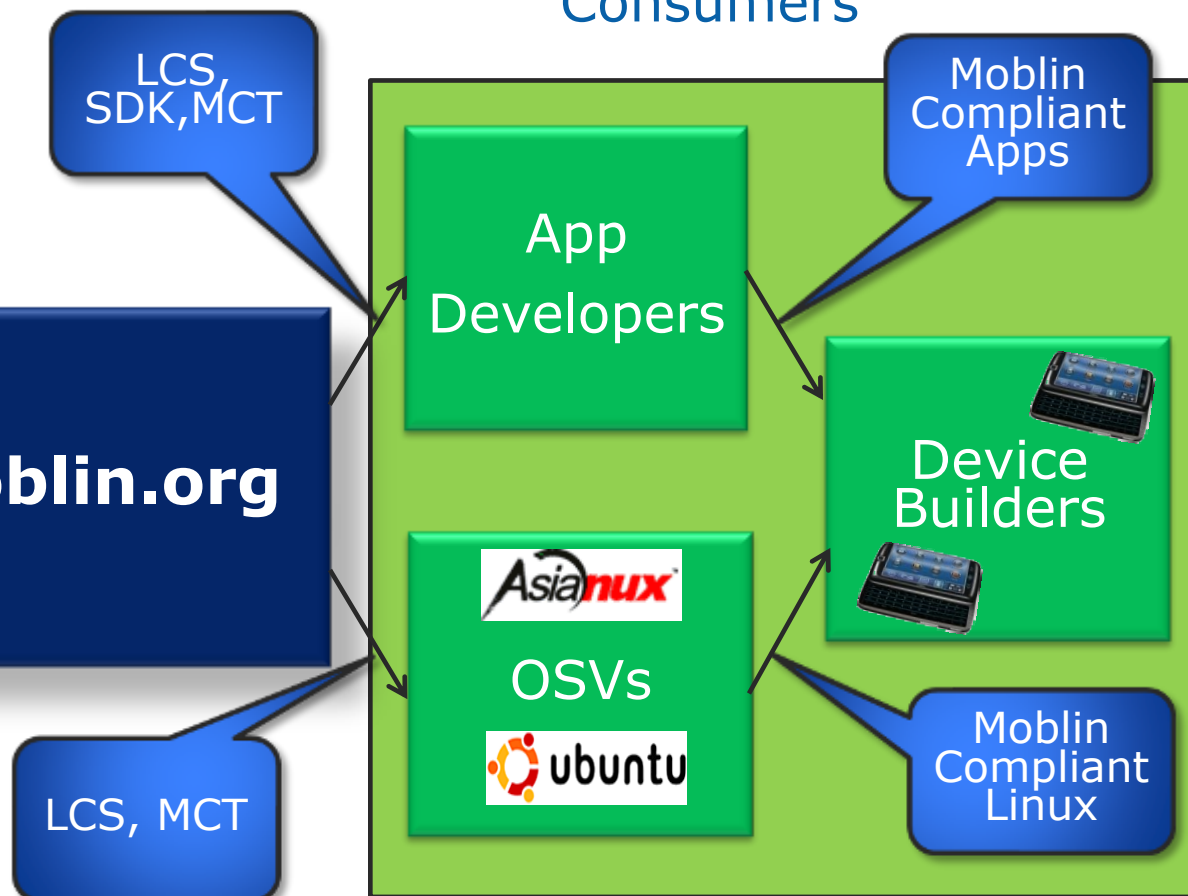


Moblin's Role in the Ecosystem

Contributors



Consumers

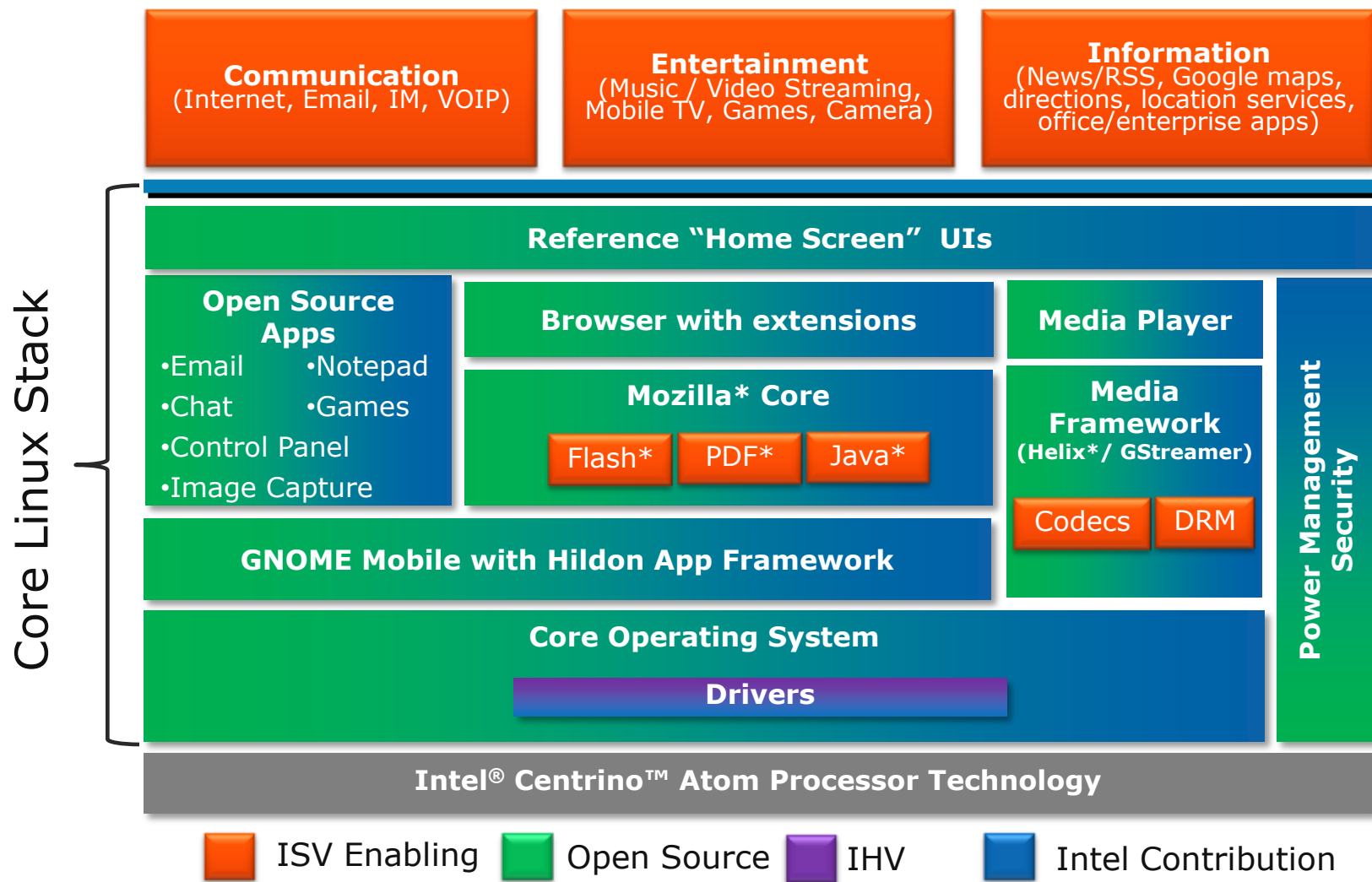


LCS = Linux Core Stack

SDK = Software Development Kit

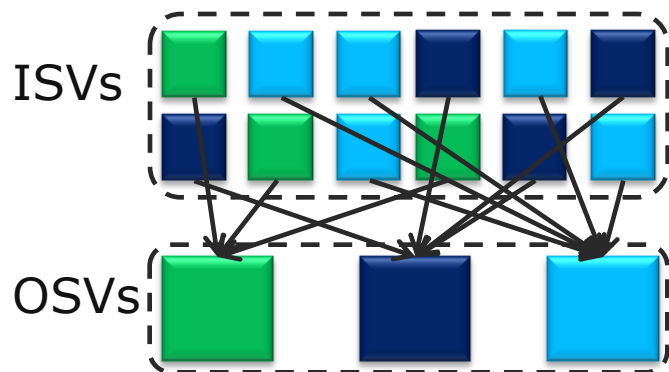
MCT = Moblin Compliance Test-suite

Moblin Core Linux* Stack



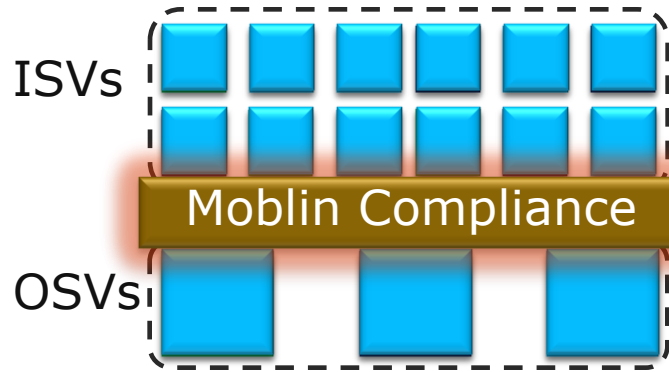
Why Moblin Compliance?

Without Compliance



- Fragmented Ecosystem
- Greater ISV cost / fewer ISVs
- Inconsistent OSV feature set
- Doesn't Scale!

With Compliance



- Unified Ecosystem
- Apps Binary Compatible
- Uniform OSV capability
- Great Scalability

Moblin Compliance is Critical for MIDs

Achieving Moblin Compliance

Moblin Compliance Specification

**OSVs and ISVs
Build to the Spec**

Moblin Compliance Test-Suite: OSVs

- Library Verification Tool
- Function Validation Tests
- Codec Validation Tests
- Browser Compliance Test

Moblin Compliance Test-Suite: ISVs

- Application Compliance Test

**OSVs and ISVs
Verify with MCT**

Moblin Software Development Kit

Core Development Tools

- Image Creator
- PowerTop
- GNU Toolchain

Intel® Software Development Products

- Intel® C++ Compiler For Linux*
- Intel® IPP Libraries
- Intel® VTune™ Analyzer
- JTAG Debugger / Apps Debugger

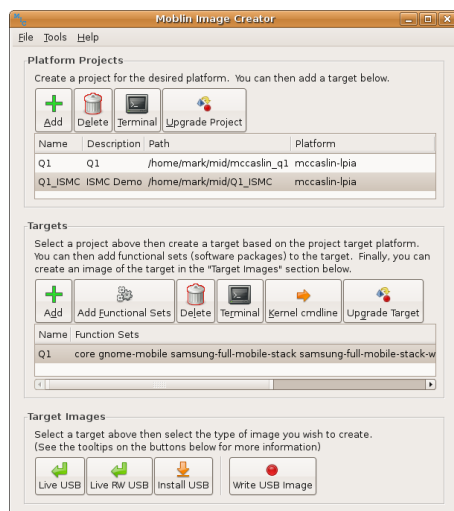
Sample Apps & Documentation

- Open source sample apps
- Application Design, Development, and Optimization Guides
- Moblin Porting Guides (Windows*, Java*)

*Other names and brands may be claimed as the property of others

Moblin Development Model

**Linux-based
Development System**



**Moblin
Image Creator**

**Result is Linux Core Stack
Runs on Target MID**

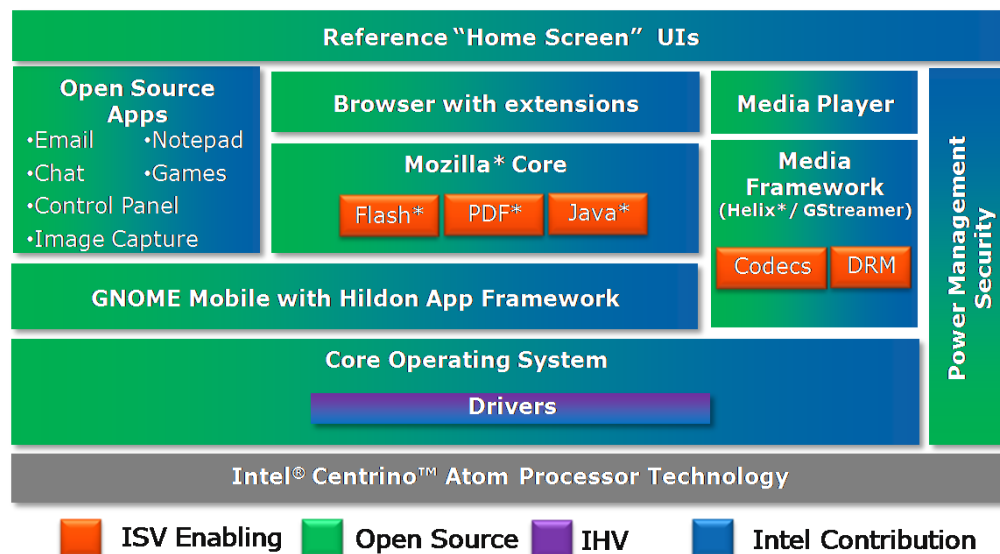
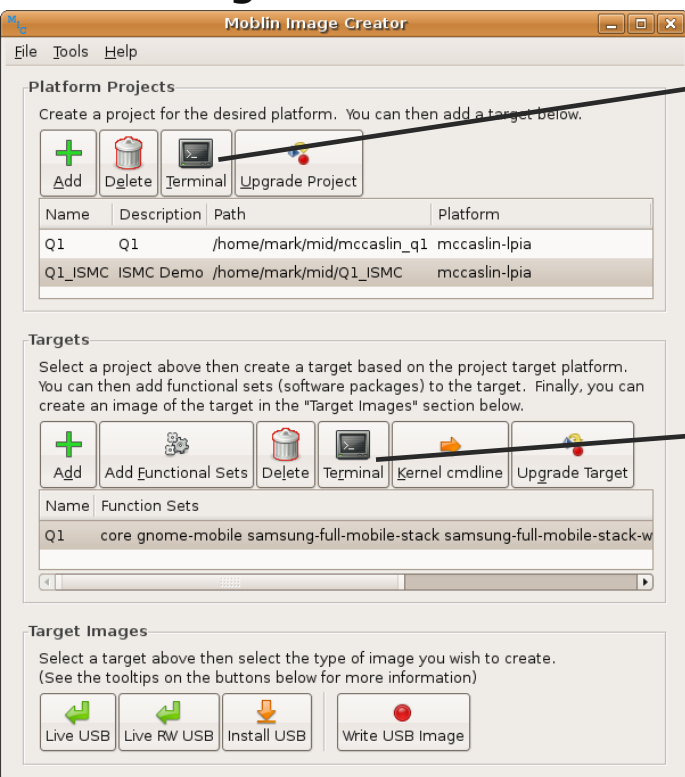
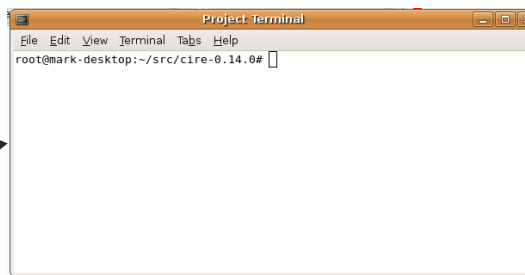


Image Creator Key Concepts

Image Creator

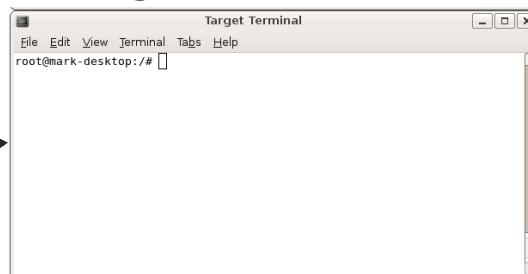


Project Development Environment



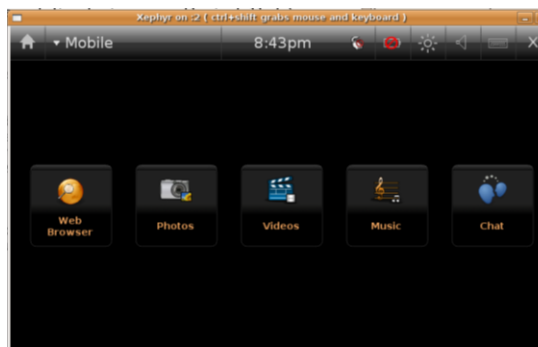
- Contains everything needed to build applications

Target Environment



- Contains target file system
- Application binaries go here

Test Environment



- Test MID UI using Xephyr
- Launched from Target Environment

Image Creator Demo

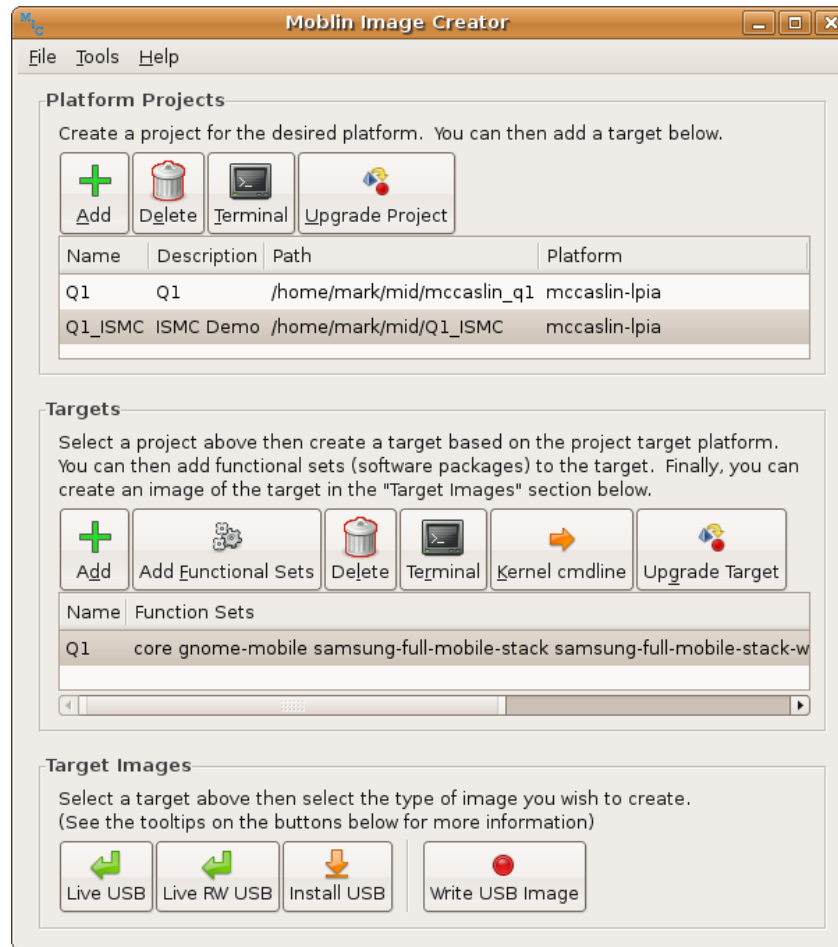


Image Creator Enables Rapid Development

Software Design Cycle

Intel® C++ Compiler

Highly optimizing
Full support for
Intel® Atom™
processor Z5xx
GCC compatible

Intel® IPP Library

Highly optimized
multimedia functions
Tailored to
Intel® Atom™
processor Z5xx



Intel® Debuggers

Intel® Atom™
processor Z5xx and
chipset Support
Kernel and low-level
driver debugging
Application debugging
Built-in flash memory tool
Execution trace support

Intel® VTune™ Analyzer

Tune code actually
running on device
Performance bottleneck
identification
Tuning Assistant

From board bring-up to application optimization
From code generation to validation and optimization

Intel® C++ Software Development Tool Suite

For Linux* OS Supporting Mobile Internet Devices

Outstanding performance

- Increased application software performance can help to extend battery life time

IA-32 architecture customization increases productivity & efficiency

- Find issues faster with system-level JTAG and application debugging

Technology alignment

- Latest Intel® Atom™ Processor Z5xx and chipset support

Excellent customer support

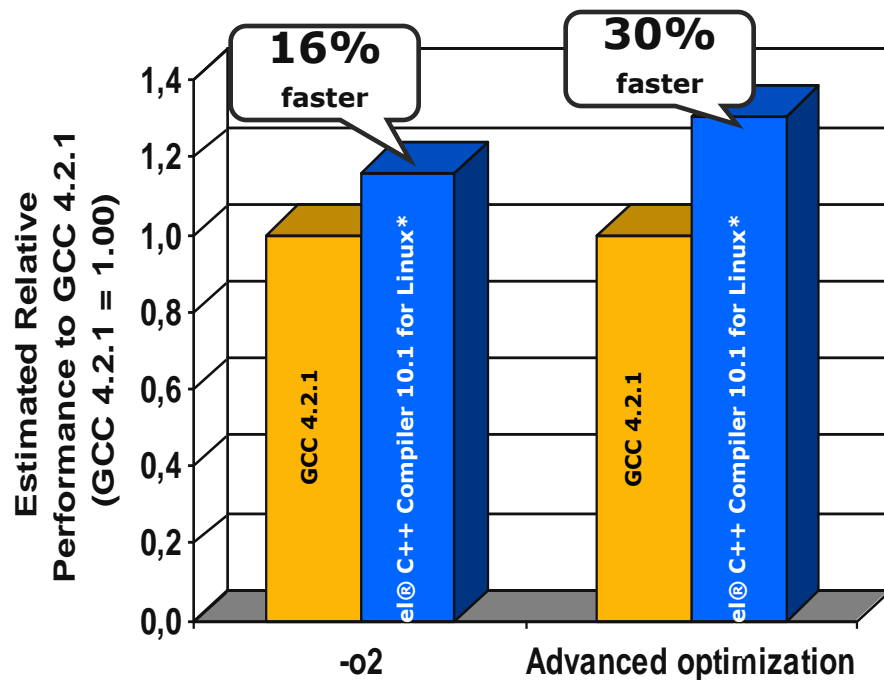
Linux Compiler Features

Compiler Features	Benefits
Performance	Significantly faster than GCC High performing code maps directly into application quality and battery lifetime
In-order scheduler	Compiler optimization switch that re-arranges/optimizes application code to be executed with best performance on Intel's Low-power IA technology Better performance of system- and application software helps to reduce power consumption of a mobile device
Profile Guided Optimization	Multi-stage optimization method with feedback loop Improves application performance by reducing instruction-cache thrashing, reorganizing code layout, shrinking code size, and reducing branch mispredictions
GCC Compatibility	Intel Compiler provides GCC language extensions and is source and binary code compatible with GCC Saves efforts in porting/re-using existing code

SPEC CPU2000 Benchmark (Estimated)

Estimated SPECint*_base2000

ICC10.1 vs. GCC4.2.1



■ GCC 4.2.1 ■ Intel® C++ Compiler 10.1 for Linux*

Estimated based on the following configuration assumptions:

Compilers:

Intel C/C++ Compiler 10.1.013 for Linux

GCC 4.2.1 (as contained in Ubuntu/MOBLIN 2008/02/05)

Hardware:

Intel® Atom™ Processor Z530 (code-named: Silverthorne) processor @ 1.60 GHz

CPU:

1596.138 MHz (according to Linux /proc/cpuinfo)

HT enabled (according to BIOS + Linux /proc/cpuinfo)

FSB:

533 MHz (according to BIOS)

L1 cache: 24 KB

L2 cache: 512 KB

512 MB Memory (RAM)

Board: Intel internal reference board

Target Operating System:

Ubuntu/MOBLIN 2008/02/05

installed on a hard disc drive (no USB stick)

SPECint_base2000:

Version 1.3

SPEC and SPECint are trademarks of the Standard Performance Evaluation Corporation. For more information see <http://www.spec.org>.

Compiler switches used:

-o2:

GCC: "-O2 -m32"

ICC: "-xL -O2 -vec"

Advanced optimization:

GCC: "-m32 -fprofile-use -O3 -funroll-all-loops"

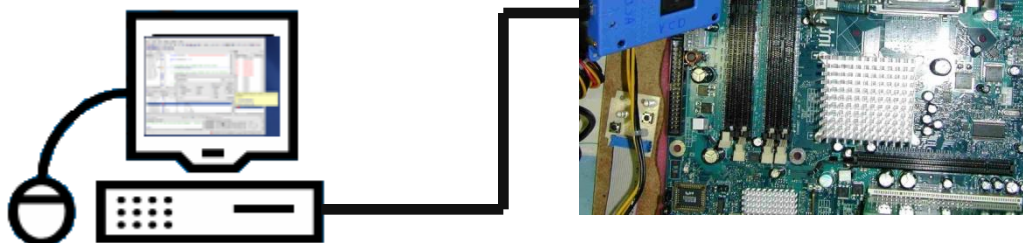
ICC: "-xL -prof_use -O3 -ipo -no-prec-div"

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System and Application Debugger

System Debugging



JTAG System Debugging

- Connects through In-Target Probe eXtended Debug Port (ITP-XDP).
- Requires JTAG connector on the target hardware and Intel® XDP3 JTAG hardware interface
- Flash Memory support
- Ideal for kernel debugging and board bring-up phase
- Linux* OS awareness

Application Debugging



Application Debugging

- Connects through TCP/IP
- Requires debug agent on the target
- Linux* OS awareness
- Ideal for application development

Show and change the content of all processor registers

convenient access to architectural registers - analyze register changes after instruction execution



Graphical representation of peripheral registers and bit fields with online documentation

Easy and fully documented access to all processor registers and peripherals. Change register contents on the fly, without recompilation

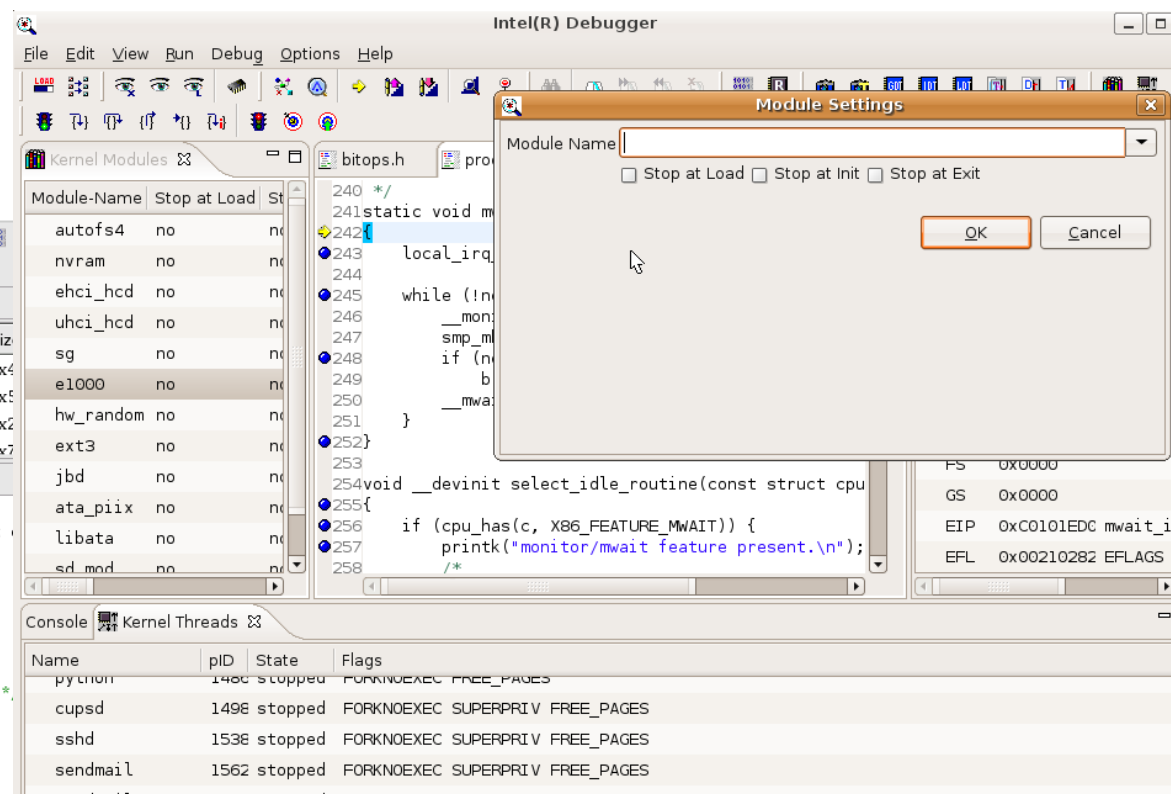
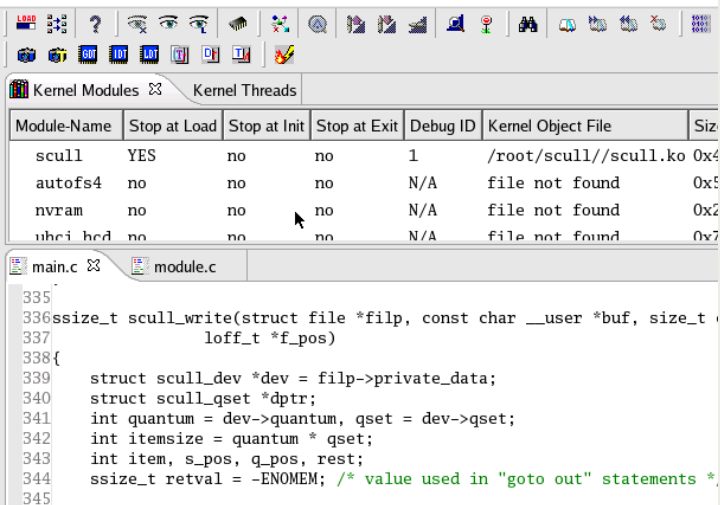
Note: JTAG Debugger requires the Intel(R) XDP3 JTAG hardware interface

Trace Support

- enables viewing of execution history
- enhances understanding of the flow of an executed program
- analyze the history to find errors in or caused by executions
- identify the root cause for exceptions

Type	Code Addr.	Opcode	Source/Disassembly
SOURCE	kernel/profile.c:profile_hit(int,void*)	Line 383	
BRANCH	CS:0xc011a00e	C3	ret
SOURCE	arch/i386/kernel/apic.c:smp_apic_timer_interrupt(class *)	Line 1199	
EXEC	CS:0xc010f1c9	83C408	add esp, 0x8h
SOURCE	arch/i386/kernel/apic.c:smp_apic_timer_interrupt(class *)	Line 1198	
BRANCH	CS:0xc010f1cc	E98FF20000	jmp irq_exit
SOURCE	include/asm/thread_info.h:irq_exit(void)	Line 92	
EXEC	CS:0xc011e460	B800F0FFFF	mov eax, -0x1000
EXEC	CS:0xc011e465	21E0	and eax, esp
SOURCE	kernel/softirq.c:irq_exit(void)	Line 167	
EXEC	CS:0xc011e467	81681400000100	sub DWORD PTR [eax+irq_exit+07h], 0x10000h
SOURCE	kernel/softirq.c:irq_exit(void)	Line 168	

OS awareness



- monitor kernel modules and system threads (JTAG only)
- access status information
- Halt, debug threads and applications and modules individually
- debugging of Linux* memory images (JTAG only)

Intel® Integrated Performance Primitives (IPP) Library

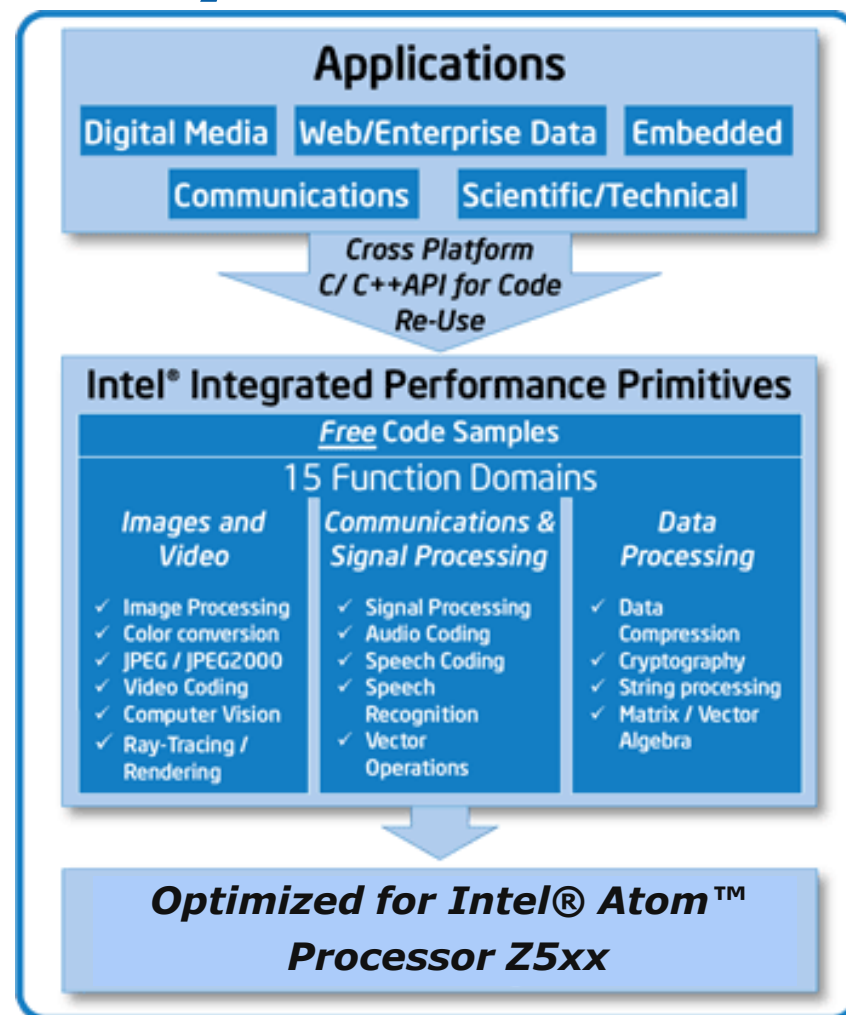
Highly optimized multimedia functions

- Images & video
- Communication & signal processing
- Data processing

Rapid application development

Cross-platform compatibility & code re-use

Outstanding performance

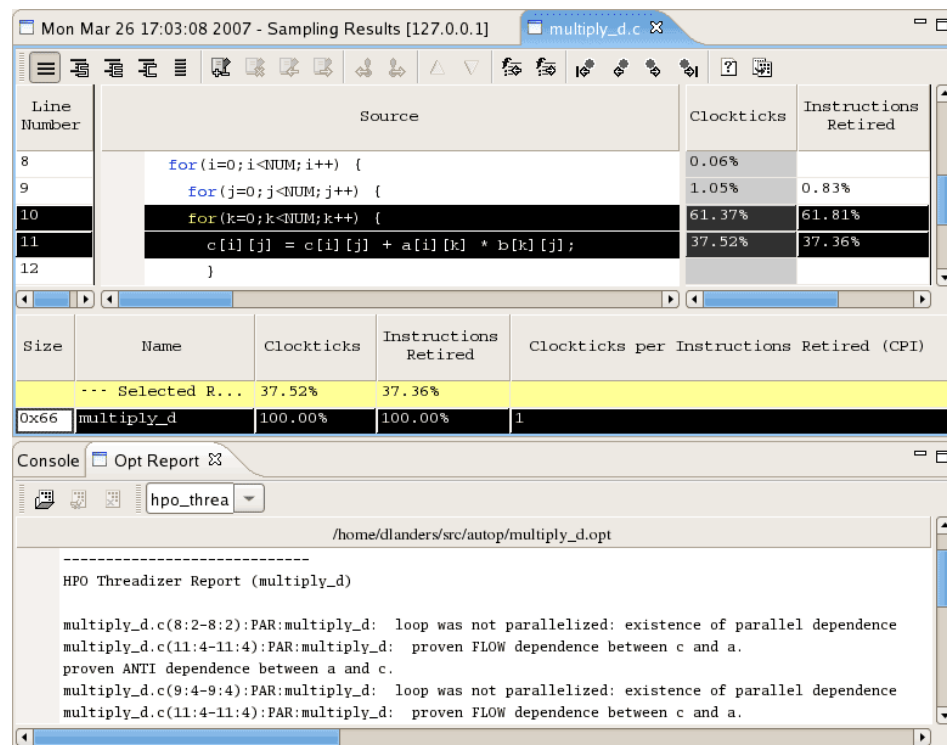


Intel® VTune™ Analyzer

Identifies hard to find performance bottlenecks

Features

- Tune process or thread parallel code
- Low overhead sampling
- Monitor processor events like cache misses etc.
- View results on source or assembly
- Linux*: Connection to Intel® C++ compiler analysis and intuitive hotspot navigator
- Sampling collector for Mobile Internet Devices



Pricing & Support Model

- Tools are free – pay for support

■ 3 support levels

- ✓ Self help/forum – for free
- ✓ 15days limited start-up support – for free
- ✓ Full support – 1yr \$599, 2nd yr and subsequent \$240

- Tools Availability

■ Software: www.intel.com/software/products/mid

■ JTAG Hardware: MIDDevTools@intel.com

- ✓ Intel® XDP3 JTAG hardware is targeting mainly hardware manufacturers and is available for customers who have a valid “Full support” contract and a CNDA with Intel in place.

- Support Model

- Self-help and community support in Intel-moderated forums for free
- Intel Premier Support available for purchase

**Use Intel® MID Software Development Products for
higher performance on MIDs**

Summary

- MIDs will deliver “The Full Internet in your Pocket”
- Moblin is the Open Source Platform for Linux* on MIDs
- Use Intel® MID Software Development Products for higher performance on MIDs

Call to Action!

Get connected with Moblin:

- Sign up on the Moblin Mailing List Today
- Sign on to the IRC channel
- Get started with development using Moblin Image Creator

Get connected with Intel tools:

- Start at www.intel.com/software/products/mid

For More Information

Feel free to email me any questions or comments:

mark.skarpness@intel.com (Moblin)

danny.zhang@intel.com (Moblin)

ulrich.dumschat@intel.com (MID Tools)

***Or better yet – use the Moblin Mailing List
(dev@moblin.org)!***

For More Information

MID Application UI Design Guide

- http://www.moblin.org/documents/MID_app_design_guide.pdf

MID Core Requirements

- http://www.moblin.org/documentation_corerequirements.html

Suggestions on How to Start Contributing

- <http://www.moblin.org/moblin-into-action.html>

Moblin Mailing List Subscription

- http://www.moblin.org/mail-list_subscribe.html

Moblin IRC Channel

- [#moblin at irc.freenode.net](http://irc.freenode.net/#moblin)

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