Prague 2008
Intel Keynote
David C. Stewart
Intel Corporation
Empowering OpenSolaris Developers on Intel Hardware

OpenSolaris Developer Conference
June 27, 2008

David C. Stewart
Agenda

• How Intel empowers through hardware and software innovation
• Empowering through enabling OpenSolaris on Intel hardware
• How the community enables you the developer

Key thought: Only by working together can we keep OpenSolaris innovative and cool
How Intel empowers through hardware and software innovation

“Tick”
Shrink current architecture

“Tock”
New micro architecture
Intel’s Tick Tock; Roadmap for Predictable Innovations

- 2005-06: 
  - **TICK**
  - **TOCK**
  - Intel® Pentium® D, Xeon®, Core™ processors

- 2007-08: 
  - **TICK**
  - **TOCK**
  - PENRYN processors
  - NEHALEM processors

- 2009-10: 
  - **TICK**
  - **TOCK**
  - WESTMERE processors
  - SANDY BRIDGE processors

- 65nm
- 45nm
- 32nm
<table>
<thead>
<tr>
<th>Middleware &amp; Applications</th>
<th>Development Tools</th>
<th>Operating Systems</th>
<th>Virtualization Software</th>
<th>Platform Firmware</th>
<th>Platform Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apache Software Foundation</td>
<td>Eclipse, Java, NetBeans</td>
<td>Windows, OpenSolaris, Solaris, X</td>
<td>Xen, Sun xVM, VMware, Citrix, Oracle, Microsoft</td>
<td>Drivers: Graphics, wireless...</td>
<td>Intel Atom, Intel Core, Intel Itanium</td>
</tr>
<tr>
<td>JBoss, MySQL, OpenOffice</td>
<td>Intel Software Development Products</td>
<td>Intel Architecture</td>
<td>VMware, Citrix, Oracle, Microsoft</td>
<td>EFI Framework</td>
<td>Intel Xeon, Intel Itanium, Intel Centrino</td>
</tr>
</tbody>
</table>

*Other names and brands may be claimed as the property of others.
Intel is an open source leader

Middleware & Applications
- The Apache Software Foundation

Development Tools
- eclipse
- Java
- NetBeans

Operating Systems
- Windows
- openSolaris
- Solaris

Virtualization Software
- Xen
- Sun xVM
- VMware

Platform Firmware
- Drivers: Graphics, wireless...
- EFI Framework

Open source projects

Example:

Third largest developer of Linux contributing over 5% of Linux over the past year

Intel empowers developers through relentless innovation
Empowering through enabling OpenSolaris on Intel hardware

Areas of Development

- Performance Enhancement
- Power Management
- I/O Acceleration Technology
- Virtualization Technology
- Predictive Self-Healing
- Driver Support
Results of Intel / Sun collaboration

- Intel and Sun engineers collaborating since January 2007
- Intel focusing on OpenSolaris for development
- Sun back-ports select OpenSolaris enhancements to Solaris 10 updates
- Numerous code contributions and collaboration on future platform advances

Contributions/consulting:
- Microcode update
- CPUID for Core2 and Nehalem
- Libc optimizations for Core2 and Nehalem
- NUMA support for Nehalem
- Performance counter support for Core2
- SSE 2, 3, Supplemental SSE3, SSE 4.1, 4.2
- C-state framework
- PowerTOP DTrace infrastructure
- 4965 Wireless LAN support
- Zoar and Oplin NIC support
- Graphics drivers for Centrino Pro, vPro, AMT
- IO Acceleration Technology
- Virtualization Technology in xVM

Strength of Open Source speeds innovation
How to get great performance with no app changes

- Performance runs deep within Intel’s DNA
- Sun’s Solaris team has similar focus, complementary methods
- Intel delivering Core2 (and future) optimizations in libc and in kernel
- Improvements in micro benchmarks
- Opportunity: Try SNV 87 and later and give us feedback (64bit mem ops)

Performance is tuned for current and future Intel processors
Goals for power utilization

- **Active Power**: Use lower P-States to scale power to required need.
- **Idle Power**: Lower C-states to save the most power when you don’t need it.


Quickly increase power when you need it, lower when you don’t.
PowerTOP

- PowerTOP available for Solaris
  - To show what wakes up your system from saving power
  - Uses DTrace

Top causes for wakeup

ACPI info

P-State residency

C-State residency

Download at http://www.opensolaris.org/os/project/tesla/work/powertop
Power Management Development Areas

- Tickless kernel
- Power-friendly scheduling
- P-State improvement
- C-state support
- HPET timer
- Interrupt binding

Join us at http://opensolaris.org/os/project/tesla/
OpenSolaris vs “best in class” power use

“We have more work to do for Solaris to be best-in-class"
Unlocking Virtualization on Xeon

- Intel® Virtualization Technology
- Interoperability
- Performance optimizations

- Manageability at scale
- Availability
- Security and compliance

Xen

Sun xVM

opensolaris
## xVM Enabling for Intel processors

<table>
<thead>
<tr>
<th></th>
<th>Today</th>
<th>Tomorrow</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>xVM Server</strong></td>
<td>V1.0 will support VT-x, extended page tables, VTPR, WBINVD for better performance, reliability</td>
<td>Future version supports VT-d and VT-d2 device assignment for higher performance</td>
</tr>
<tr>
<td><strong>xVM VirtualBox</strong></td>
<td>VT-x, good performance</td>
<td>Blazing fast on Intel Architecture</td>
</tr>
<tr>
<td><strong>xVM Ops Center</strong></td>
<td>Intel Architecture support</td>
<td>Device assignment</td>
</tr>
</tbody>
</table>

Join us at [http://opensolaris.org/os/community/xen/](http://opensolaris.org/os/community/xen/)
FMA and Intel® Xeon® processors

- Fault Management Architecture in Solaris saves millions in service costs
- Intel platform support – Bensley and Caneland platforms
- Error injection: ensures that FMA code paths work correctly
- Reporting of physical location of failed DIMMs
- Future processors – new RAS features in Nehalem

RAS support is great for 2 and 4 socket servers
Developer Tools

- Sun Studio 12 Compiler (released June 2007) with Xeon-specific optimizations
- Sun Studio Performance Analyzer: latest Intel Architecture performance counters

- Threading Building Blocks for Solaris –
  - http://threadingbuildingblocks.org

- Transitive® QuickTransit®-
  - Run Solaris/SPARC binaries on Solaris/Xeon
  - http://www.transitive.com/

Tools are ready for you to optimize for Xeon
Desktop/Mobile Driver Support - Wireless Driver

- www.opensourcewireless.org
- Focus on 4965 and future Wifi planned
- Downloadable uCode and dual licensed header files
- Phase 1 – completed
  - 802.11 A/B/G
  - Infrastructure mode
  - power/temperature calibration (FCC regulatory)
  - Rx sensitivity calibration
  - WEP
- Phase 2 -- expected completion late summer
  - 802.11 A/N
  - WPA

Intel is fully engaged in enabling and optimizing OpenSolaris

Solaris: Not just for servers
How the community enables you the developer

- OpenSolaris community has embraced Intel
  - Intel has brought great players to OpenSolaris (20+ year veterans in kernel architecture)
  - Sun has really top-notch Solaris engineers that have worked really well together
  - Community has great passion and desire to advocate

- Compatibility ethic + ARC = Frustration (sometimes)

- We need to grow and attract more experienced community developers who can advance OpenSolaris
Contrasting Development Styles

- First thing delivered: Product requirements, architecture spec, design document
- Code is developed after debugged, unit tested
- ARC case
- Mail sent out giving notification of put back
- *Big bang release*

- First thing delivered: code, as a collection of self-consistent patches
- Designs in comments, typically ignored
- Email feedback, discussion, argument
- Maintainer either approves or not
- *Incremental release*

OpenSolaris can get features to market faster
Model mismatch makes it hard to attract Linux kernel devs
Other barriers to entry

- Open source developers show concern about signing contributor agreement
- Hard to know who to talk to, no place to send patches like Linux
- Recognition / kudos to developers not obvious

- If “code is king” with Open Source, identify contributors and make them happy

Make it a joy to be an OpenSolaris developer
Where to go from here

• Establish a clear vision for growing open source cred
  – Lower barriers of entry
  – Make it easier for developers to contribute, document the process well
  – Identify the maintainers / contributors

This is a great community – we can make it better
Greybeards no more

“Unix beardies get legal over OOXML” – typical headline on http://www.theinquirer.net
Summary

• Intel empowers developers through relentless innovation
• Intel is fully engaged in enabling OpenSolaris
• This is a great community – we can make it better
Thanks!