



# A Complete Open Source Stack: Hardware to Web 2.0

Matt Ingenthron  
Josh Berkus

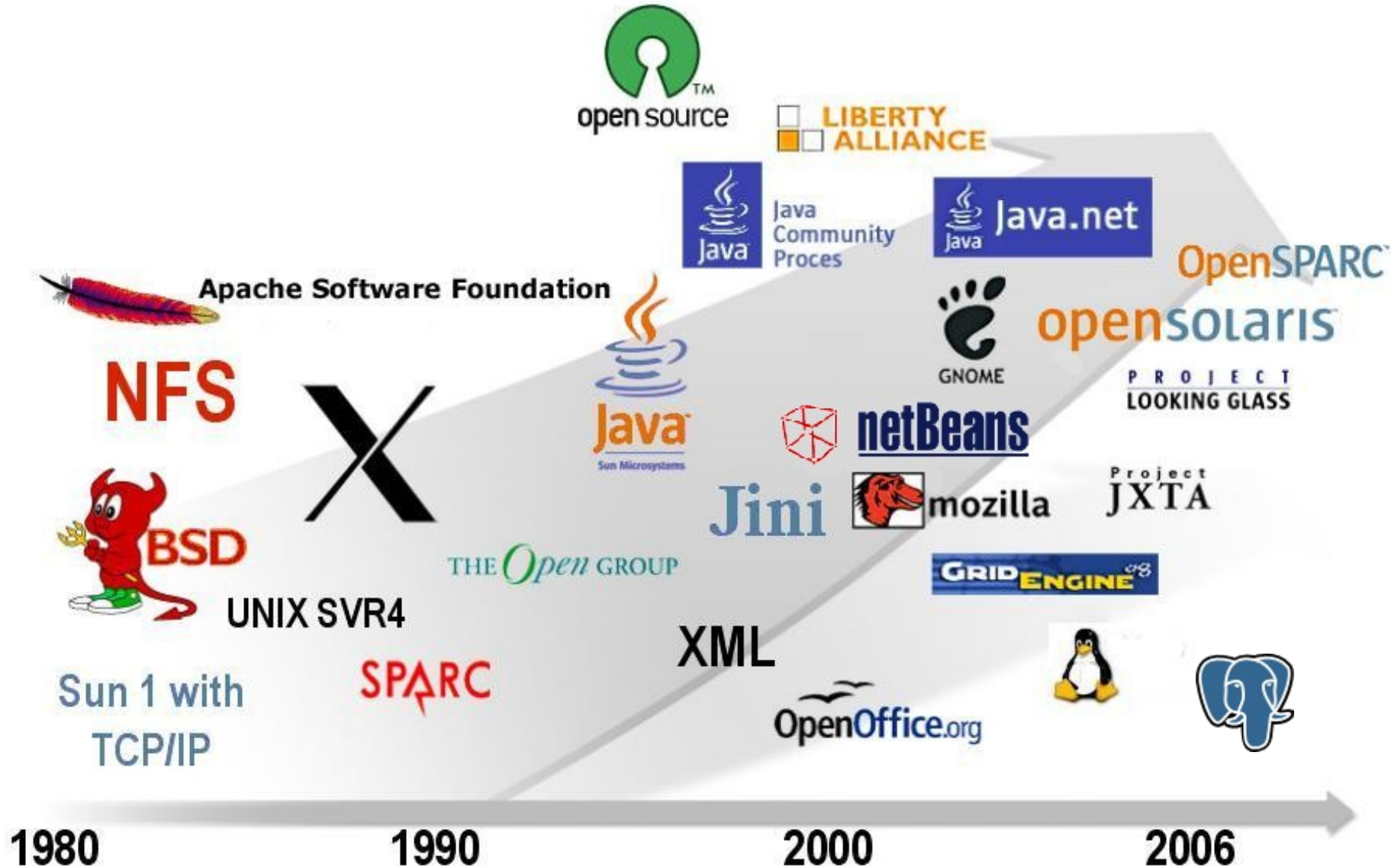
Sun Microsystems, Inc.



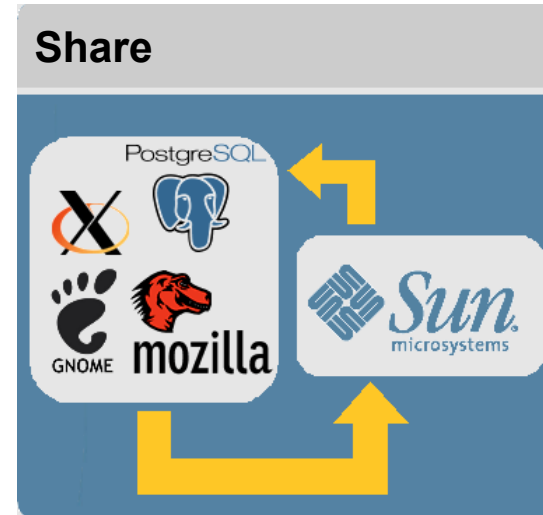
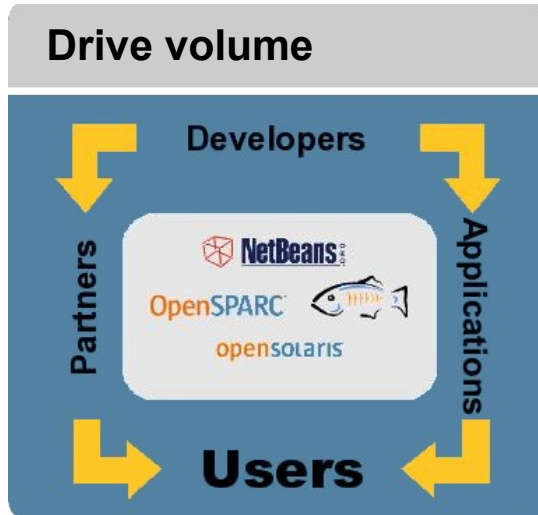
# Agenda

- Introduction
  - > Sun in Open Source
  - > Special guest: Josh Berkus
- OpenSPARC™
- OpenSolaris™
- CoolStack™
- OpenJDK™, project Glassfish
- Other items, futures
- Questions

# Sun's History of Community



# Sun's Open Source Strategies



# Sun contributes to GNU/Linux

| Rank | Company                             | Person/months | Estimated \$ value |
|------|-------------------------------------|---------------|--------------------|
| 1    | <b>Sun Microsystems Inc</b>         | <b>51,372</b> | <b>404 m</b>       |
| 2    | <b>IBM Corp</b>                     | 14,865        | 116 m              |
| 3    | <b>Red Hat Corp</b>                 | 9,748         | 76 m               |
| 4    | <b>Silicon Graphics Corp</b>        | 7,736         | 61 m               |
| 5    | <b>SAP AG</b>                       | 7,493         | 60 m               |
| 6    | <b>MySQL AB</b>                     | 5,747         | 45 m               |
| 7    | <b>Netscape Communications Corp</b> | 5,249         | 41 m               |
| 8    | <b>Ximian Inc</b>                   | 4,985         | 39 m               |
| 9    | <b>RealNetworks Inc</b>             | 4,412         | 35 m               |
| 10   | <b>AT&amp;T</b>                     | 4,286         | 34 m               |

## European Commission

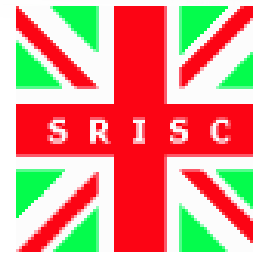
Economic impact of FLOSS on innovation and competitiveness of the EU ICT sector

January 2007

# OpenSPARC

- Jonathan Schwartz with the BU's, meets with David Yen
  - > David decides to release the CoolThreads (a.k.a. Niagara Processor)
    - Yes, the whole thing: Verilog, testing tools
    - GPLv2 license
  - > Not Sun's first Open Source SPARC release
- Subsequent adoption by Simply RISC

## ULTRASPARC



# Four Converging Trends:

Network Computing Is  
Thread Rich



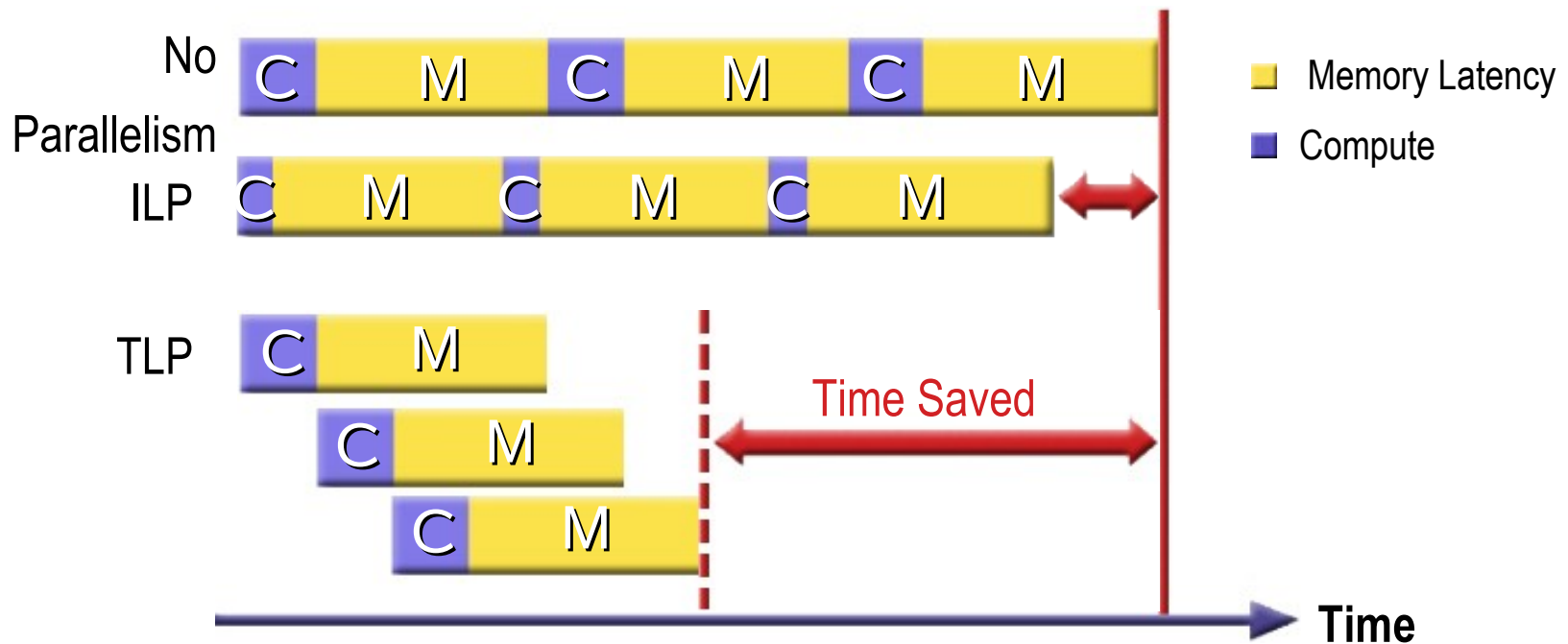
Moore's Law Provides an  
Ever-Increasing  
Transistor Budget

Worsening  
Memory Latency



Growing Complexity  
of Processor Design

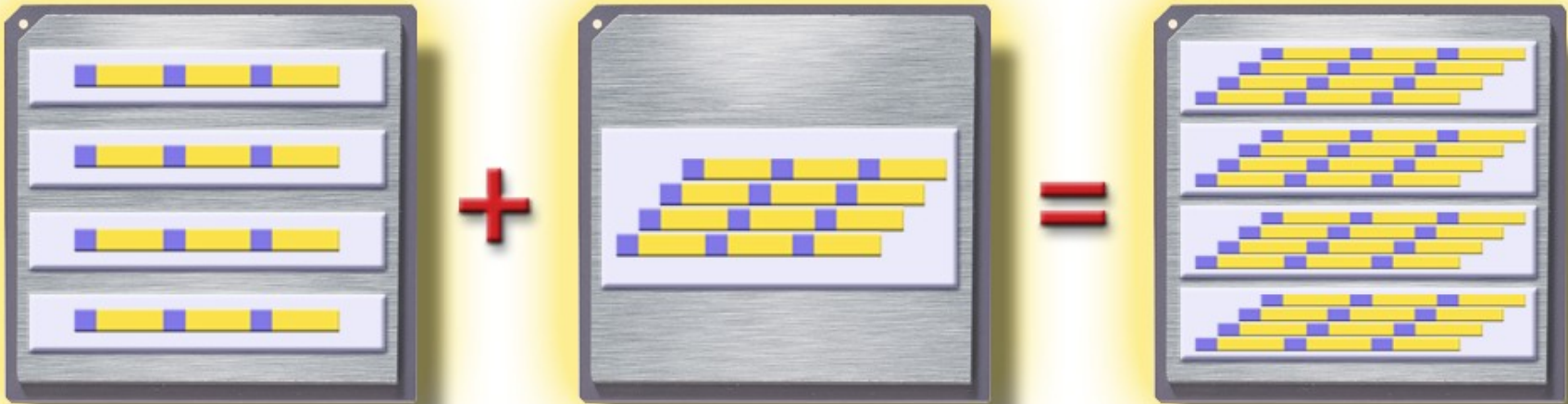
# Comparing Modern CPU Design Techniques



- ILP Offers Limited Headroom
- TLP Provides Greater Performance Efficiency



# Chip Multi-Threading (CMT)



**CMP**

(chip multiprocessing)

**n cores per processor**

**HMT**

(hardware multithreading)

**m strands per core**

**CMT**

(chip multithreading)

**n x m threads per processor**

# UltraSPARC T1 Capabilities

- Aggressive CMT and multi-core design
  - > 8 CPU cores, 4 threads per core
- Hardware Virtualization
  - > LDOMs allow adding multiple OSs
- Designed to solve the 21<sup>st</sup> century problems
  - > SWaP metric demonstrates the problem

$$SWaP = \frac{\text{Performance}}{\text{Space} \times \text{Power Consumption}}$$

# OpenSolaris

- Launched nearly 2 years ago, full buildable environment 1 year ago
- Goals/Challenges
  - > Acknowledge and build the community around Solaris
  - > Open Source is not just about the source, it's about the community
- Who has adopted OpenSolaris
  - > SchilliX
  - > Nexenta
  - > Solaris Express
- Open Governance Board

opensolaris™

# OpenSolaris Capabilities

- DTrace: dynamic, production quality tracing to allow administrators to answer tough questions
- ZFS: the Zettabyte filesystem, ease of use, unmatched reliability
- Zones: resource controlled, separate containers for virtualized Solaris environments
- SMF: service *management* integrated with Role Based Access Control
- Cryptographic Framework: unified access/implementation of algorithms, transparent access to crypto accelerators
- Process Rights Management: taking the root out of root
- Fault Management: enhancing reliability by responding to system faults

# OpenSolaris Futures

- Network Automagic: setup and resolve networking in system environment without intervention
- Enhanced Intel Platform Support: graphics, wifi, performance improvement, power management, virtualization, fault management
- PRESTO: automatic printing configuration
- Xen: Dom0 and DomU support
- libc\_i18n rewrite: move to Open Source i18n (part of project emancipation)
- Availability Suite: software, block-based snapshot and WAN replication
- SATA AHCI enhancements: more AHCI compliant chipsets, port multiplier, MSI interrupt, power management
- PowerPC port: port of the core Solaris kernel to the Power architecture

# CoolStack & CoolTools

- Pre-tuned, optimized binaries for both UltraSPARC and x64
  - > Simplifying how you obtain the AMP stack
  - > Pre-optimizing a number of the binaries
    - Sun Performance Engineering carried out specific testing with a variety of configuration/compilation options to determine a good set of optimizations
    - Installable packages, source plus documentation and community support through the forums
  - > CoolTools
    - GCC for SPARC Systems
    - ATS: Automatic Tuning and Troubleshooting System
    - Faban: Benchmark development and deployment kit

# OpenJDK

- GPLv2 announcement of the full Java Developers Kit that is Sun's to give
  - > Releases of redistributable binaries for encumbered portions of the JDK
- Available today:
  - > The HotSpot virtual machine
  - > The Java language compiler (javac)
  - > Eventually, everything to be released
    - And hopefully Open Source replacements written for encumbered code
- Available under other licenses today:
  - > The full Java source



# Mustang Component JSRs

202: Class File Update

199: Compiler API

*Ease of Development*

269: Annotation Processors

221: JDBC 4.0 software

223: Scripting

*XML*

105: XML Digital Signature

173: Streaming API for XML

222: JAXB 2.0

*Web Services*

250: Common Annotations

181: WS Metadata

224: JAX-WS 2.0



# OpenJDK Technology

## Interesting Stuff That You Might've Missed...

10. Attach-on-demand monitoring
9. JConsole plugin API
8. jhat OQL
7. Solaris™ Dynamic Tracing (DTrace) support
6. Annotation processing done by javac
5. Class-path wildcards
4. Free disk-space API
3. Password prompting
2. **javax.swing.GroupLayout**
1. JAX-WS can do RESTful web services

# GlassFish



Over 1400 members and 350,000 downloads\*

Includes **Java EE 5, JWS DP** and other Web services technologies

Builds best with NetBeans, available Eclipse plug-in

Basis for the Sun Java System Application Server PE 9

[java.sun.com/javaee/GlassFish](http://java.sun.com/javaee/GlassFish)

Building a Java EE 5 open source application server

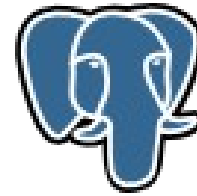
\*Source: Sun 2/06 – See website for latest stats

# Project GlassFish



- Open Source Java application server
  - > The complete Java EE™ RI
  - > Initially under a CDDL license, but later added GPLv2
- Adoption by a number of projects and companies
  - > BEA using components in Weblogic
  - > Apache Geronimo considering adopting components
- Many Glassfish extras:
  - > jMaki, Hibernate, Spring, Spring 2.0
  - > MySQL, PostgreSQL, JavaDB (a.k.a. Apache Derby)
  - > NetBeans, Eclipse, JProfiler, IntelliJ IDEA

# PostgreSQL



- Enterprise-class open source database
  - > advanced SQL features
  - > vertical scalability to 32 cores
  - > supports terabytes of data
  - > top ratings for security & reliability
  - > alternative to Oracle, DB2, SQLServer
- Large, established open source community
  - > community-owned project
  - > twenty years of development
  - > more than 20 corporate sponsors
  - > millions of installations in dozens of countries

# Sun and PostgreSQL

- History
  - > Hired core team member: April 06
  - > Integrated PostgreSQL into Solaris: June 06
  - > Enterprise support for PostgreSQL: June 06
- Contributions
  - > JDBC driver improvements
  - > Improved Solaris support, performance
  - > Benchmarking expertise & help on scalability
  - > Niagara testing server
  - > DTrace probes for PostgreSQL 8.2

# Demonstration

# Projects Sun Contributes to....

Apache Derby  
Apache Tomcat  
JRuby  
Gnome  
OpenPrinting  
gcc and other  
gnu utilities  
PHP  
Debian Linux  
OpenMPI  
DTrace on FreeBSD  
X.org  
MySQL  
JXTA.org  
Gentoo Linux  
Mozilla.org  
Fortress  
OpenSSL  
FreeBSD  
Apache Ant  
Apache Webserver  
Ubuntu Linux

# Resources

- OpenSparc: [opensparc.net](http://opensparc.net)
- OpenSolaris: [opensolaris.org](http://opensolaris.org)
- CoolStack: [cooltools.sunsource.net/coolstack/](http://cooltools.sunsource.net/coolstack/)
- OpenJDK: [openjdk.dev.java.net](http://openjdk.dev.java.net)
- PostgreSQL: [postgresql.org](http://postgresql.org)  
[sun.com/software/solaris/postgresql.jsp](http://sun.com/software/solaris/postgresql.jsp)
- Project Glassfish: [glassfish.dev.java.net](http://glassfish.dev.java.net)
- Blogs: [planetpostgresql.org](http://planetpostgresql.org)  
[blogs.sun.com/mingenthron](http://blogs.sun.com/mingenthron)





**Thank you!**

[matt.ingenthron@sun.com](mailto:matt.ingenthron@sun.com)

[josh.berkus@sun.com](mailto:josh.berkus@sun.com)

