Hot Chips Panel Session

Software or Silicon--

What's the Best Route to Java?

Moderator:
John Wharton, Applications Research

Panel:
John Banning, Silicon Graphics
Brian Case, Consultant/
    Microprocessor Report
David S. Hardin, Rockwell Int'l
Marty Hopkins, IBM
Bill Joy, Sun Microsystems
John Novitsky, MicroModule Systems/
    Microprocessor Report
Marc Tremblay, Sun Microelectronics
What's the Best Route to Java?

Agenda

Introductions
Issue Overview
Opening Positions
Rebuttals
Panel Discussion
Audience Q&A
Audience Survey

Raise your hands...

...If you believe in JavaChips™?

...If you DON'T believe in JavaChips?

...If you think it's pretty strange for engineers to be make design decisions based on religious convictions?
What's the Best Route to Java?

What is "Java"?

- Language Proper?
- Class Library Support?
- Background Features? (G.C., Threads, Security)
- Platform Independence?
- Bytecode Distribution Format?
- JVM Specification?

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What's the Best Route to Java?

Conventional Workstation/PC Design Issues

"Dynamic" Applications
Disk/DRAM-Based
Memory Intensive
Third-Party Binaries
Network Connectivity
Statistical Performance
  - Integer
  - FPU
Price/Performance
Address Space++
Register Width++
Register Count++
Embedded Controller Design Issues

"Static" Applications
ROM-Based
  - Code Density
I/O Intensive
Real-Time
  - Multi-Tasking
  - Deterministic Performance
In-House Source
System Integration
Adequate Performance
Adequate Address Space
Power-Sensitive
System Cost
Feature Creep
Execution Robustness
Time to Market
Cheapest Adequate CPU Wins
Custom Silicon Advantages

Die size minimization
Die cost minimization
Power minimization
System integration
Code density?
Security paranoia?
Raises bar for competition?
Inherently ≥ "standard"?!!
What's the Best Route to Java?

Standard Silicon Advantages

Lower Risk
- Off-the-shelf suppliers
- Multiple sources
- Extensibility

Economies of scale

NRE defrayed $10^n$ ways

Better die packing, process
Tools, training, documentation...
Foundation of $\mu$P philosophy
What's the Best Route to Java?

Hardware Enhancement Spectrum

- Off the Shelf Hardware
- Unenhanced S/W interpretation
- Interpretation routines in on-chip ROM
- H/W translation of JVM bytecodes to native/µCode
- Full-Custom Hardware
- Accelerator logic for VPC, VSP, stack buffering
- Direct bytecode decoding, execution
- Background processing for G.C., security tasks
- Hardware support for MP, fine-grained thread support
What's the Best Route to Java?

Software Enhancement Spectrum

"Conventional" software interpretation

Conventional SW bytecode interpretation

Demand-driven expansion of critical loops

Load-time (JIT) retargeting of application, class-library byte codes

Install-time retargeting of application, class-library byte codes

Conventional compilation of application, class-library source

"Conventional" direct execution