

# **Java Runtime Project Review**

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Plaintiff's Exhibit

7393

Comes V. Microsoft

# **Delivery Vehicles**

- IE4/Memphis
- SDK for Java 2.0/Inet SDK
- Mac IE (RTM Q4)
- IIS/NT5 (RTM 10/15/97)
- VJ98 (RTM 2/28/98)

# **Key Features**

- Continued performance leadership
- New Garbage Collector
- ActiveX-Beans integration
- Capabilities-based security model
- Package management
- Debugging/profiling support
- Application Foundation Classes
- DirectX3 and Direct Animation Java wrappers
- Internationalization
- MCF
- Win32 DLL calling
- JDK 1.1 support

# **New Features in JDK 1.1**

- Object serialization
- Reflection
- Java Beans
- Internationalization
- Security
- JAR
- JDBC
- AWT, IO, Net and Math enhancements
- Inner classes
- RMI - NOT INCLUDED
- JNI - NOT SUPPORTED

# **Schedule - Beta 2**

- Week of May 26 - Code Complete/Bug Bash
- Week of June 2 - Begin restricted checkins; start daily IE4 drops
- Week of June 9 - More restricted checkins; strict war team approval
- Week of June 16 - Steady state of ZERO P1 bugs; fix shipstoppers only
- Week of June 23 - Release candidates

# **Schedule - RTW**

- Code complete - 7/14
- Final bug bash - 7/14 - 8/13
- Final drop to IE - August 22

# Post Beta 2 Work Items

- Native System Library Support/MCF
- Package Management Enhancements
- Security Model Refinements
- ActiveX/Beans Enhancements, JAR integration
- JIT Debugging
- AWT Enhancements - Clipboard, 1.1 merge
- Disco Object Clusters
- Performance
  - GUI Perf tuning
  - Working set reduction
  - Load time improvements

# Post IE4 Work Items

- IIS requirements
  - GC of classes
  - Server side security privileges
- VJ98 requirements
  - New debugging APIs
  - Bytecodes and new language features
- Beans/Enhancements
  - Drag/Drop
  - Expando properties
- AFC Enterprise Libraries
- Disco
- Native code compilation
- Advanced Security
- Support UNIX ports



# Bug Stats

- Pri 1 HOT - 17
- Pri 1 - 204
- Pri 2 - 235
- Pri 3 - 15
- Incoming Pri 1 rate ~20/day

# Release Criteria - Beta 2

- Pass all BVTs - passing most x86 builds; AXP blocked by IE4
- Pass component level tests - passing except AFC, security, package mgt, 1.02 compatibility
- Pass 100 Applet Compat tests at 100% - 72%
- Pass 500 Applet Compat tests at 90 - 78%
- No Pri 1 bugs - 219
- Pass 90% of JCK - 95%
- Perf at least 5% faster than any other VM; passing except AWT
- Stress passing at least 90% - 57%
- Self-host at least 400 people - ???

# Test Strategy

- Comprehensive BVTs
- Applet Compatibility
- JCK
- SDK
- Test Development
  - | Class Library - AFC, Disco.
  - | Test tools - automation/distribution
  - | VM
  - | Package management
  - | Security
  - | COM
  - | ActiveX/Beans
- Stress

# Testing Synchronization

- IE4 - subset BVTs, work with Trident on applet test team
- VJ98 - debug, VM, server side
- Win CE - use our test suites
- DirectX - run their self-host tests
- IIS - run their server side suites
- Trident in Java - use some of our tests
- UW - security and verifier testing

# Footprint

- Download size to IE4
  - 2.6MB x86
  - 2.1MB Alpha
- Further reduction possible?

## **Beta 2 Risks**

- AFC
  - Conflicting goals of performance, cross platform, great Win32 support
  - JDK 1.02 support
- Testing coverage
  - Security/package management
  - AFC cross platform/1.02 compatibility

# Strategy

# **What is Java?**

- **Variety of technologies**
  - Language, virtual machine
  - Class libraries (APIs)
  - JavaOS
  - Microprocessor, NCS, servers, etc.
- **Unprecedented market acceptance**
- **Key benefits/tradeoffs**
  - Broad reach vs. performance/functionality/integration
  - Productivity
- **Still immature**



# **Microsoft's Commitment to Java**

## ***100% Committed to World's Best Java***

- Programming language neutral
  - Extend Java language/VB support
  - Integrate well with OLE installed base
- Many unmet needs
  - Exposing Win32 benefits to Java
  - Enhancing perf through native code
- Market driven
- Great business model fit
- Making end-to-end investment

# **Microsoft's Java Strategy**

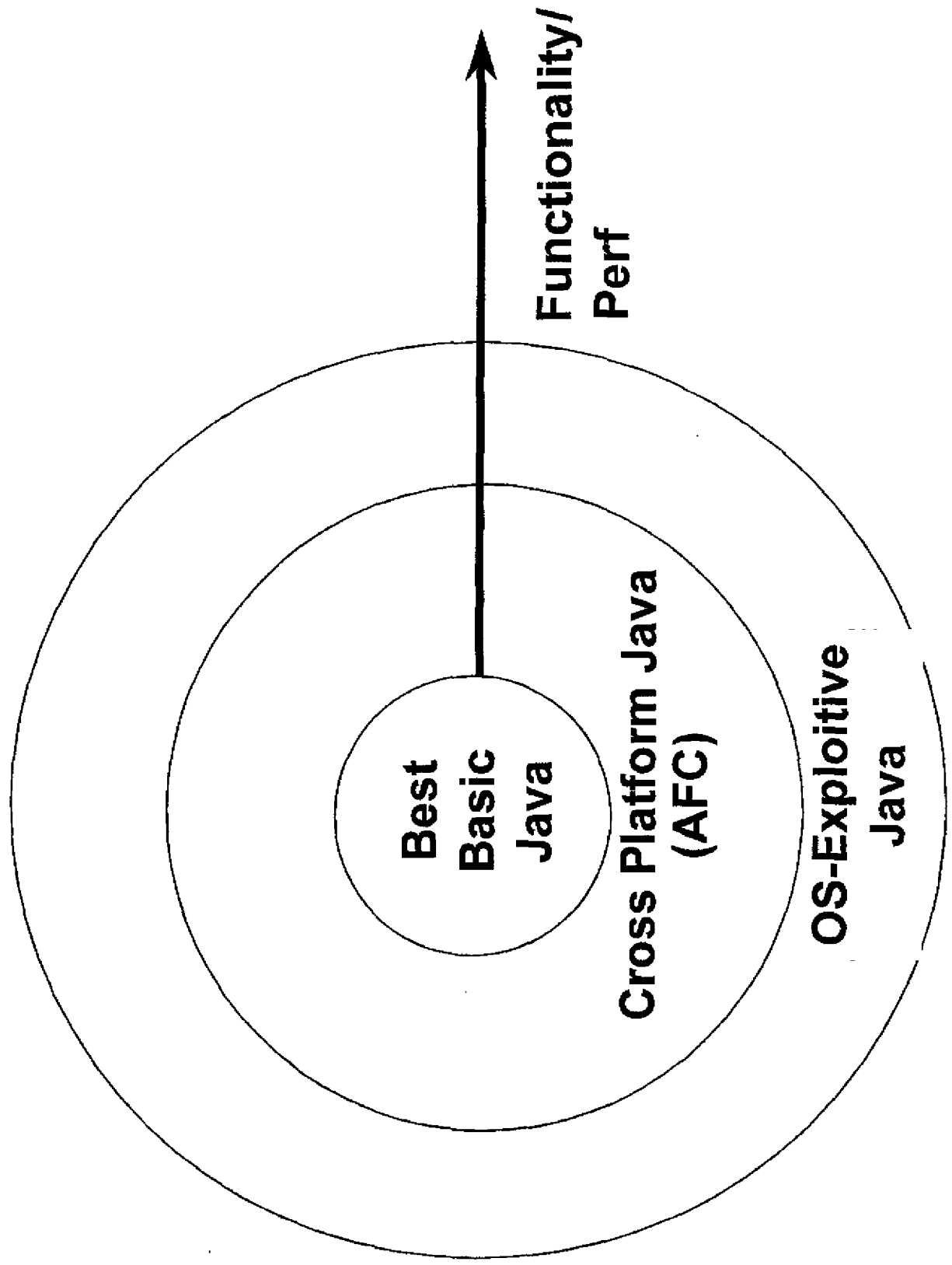
## ***Best Way to Develop and Run Java Applications***

- **World class technology**
- **Best development tool support**
- **Best runtime (virtual machine)**
  - | **Fastest with Pure Java**
  - | **Native code for platform dependent perf**
- **Best component support**
  - | **Seamless ActiveX integration**
  - | **Licensing/revenue model**
- **Best class libraries**
  - | **Advantage Windows**
  - | **Hook developers with Microsoft Controlled APIs**
- **Java -- just another part of Windows**

# **Make developers successful**

- Choice - write LCD cross platform and full-fledged Windows applications in Java
- Fully exploit customer software and hardware investments
- Provide a business model

# Range of Developer Choices



**Finance/  
Integration**

# Microsoft Java Investments

Microsoft  
Application Foundation Classes

Microsoft  
VM

Microsoft  
VM

Microsoft  
VM

Microsoft  
V

Win32

MacOS

Windows  
3.1

UNIX

Windows  
CE

**Class Libraries**

**Virtual Machine**

**Operating System**

**Microsoft  
VM**

**Other  
VM**

**Other OS**

# **IE 3.0 Virtual Machine**

- Official Win32® Reference Implementation
- Fastest, safest, most scalable, most reliable, most functional
- Fully compatible
- Critically acclaimed by press and developers
- Microsoft is largest provider of Java today
  - Win 95 OSR2, IIS, IE
- Free ISV redistribution via SDK
- Focused on pragmatic innovation



# **Competitive Situation - Netscape**

- Early leader on Java
- Falling behind
- Abandoning platform ambitions
- Diverging from Sun on security
- Missing Beans support in Nav4
- Tension with Sun but will unite against Microsoft if pushed

# **Competitive Situation - Sun**

- Java is not Microsoft's enemy, Sun is
- Capture the API, swap out Windows underneath
- Sun is doing Java equivalent of every Win32 API
- Revenue model challenged
- Repeating UNIX strategy; claim open standard, be the leading implementation
- Battle is for the Win32 implementation of Java

# **Strategic Challenges**

- How to support the language but not the platform
- Kill 100% Pure Java
- Burst the bubble without being the bully
- Enlist allies
- Stop standardization scam
- JavaSoft relationship

## Strategic Challenges - APIs

- Must separate language/VM/class libraries
- Need API story
  - Hard to call Win32 from Java today
  - Can't compete with Sun in Java-only APIs
  - COM3 APIs are a ways off

