Java™ Technology Overview
JC, J2ME, J2SE, J2EE

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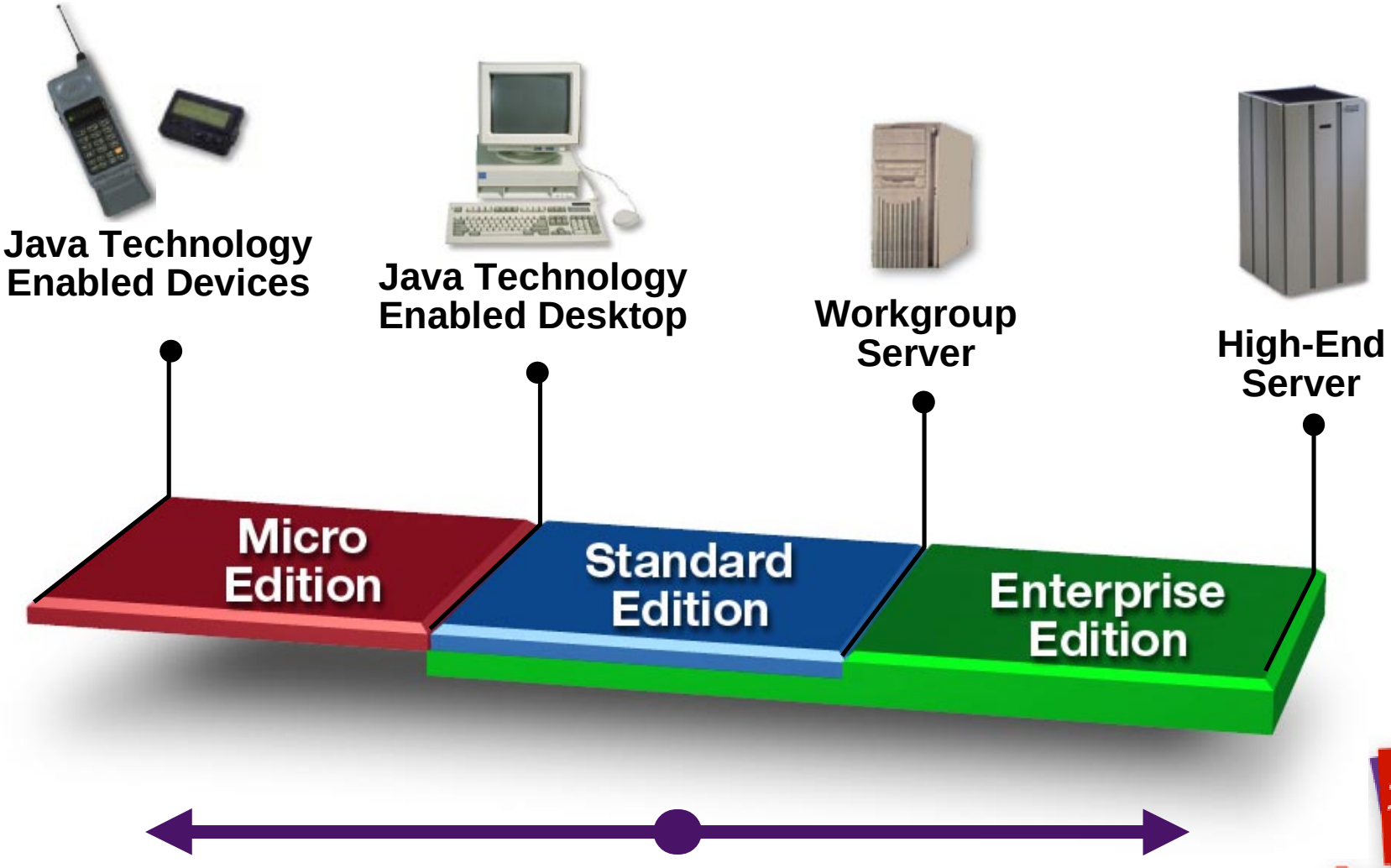
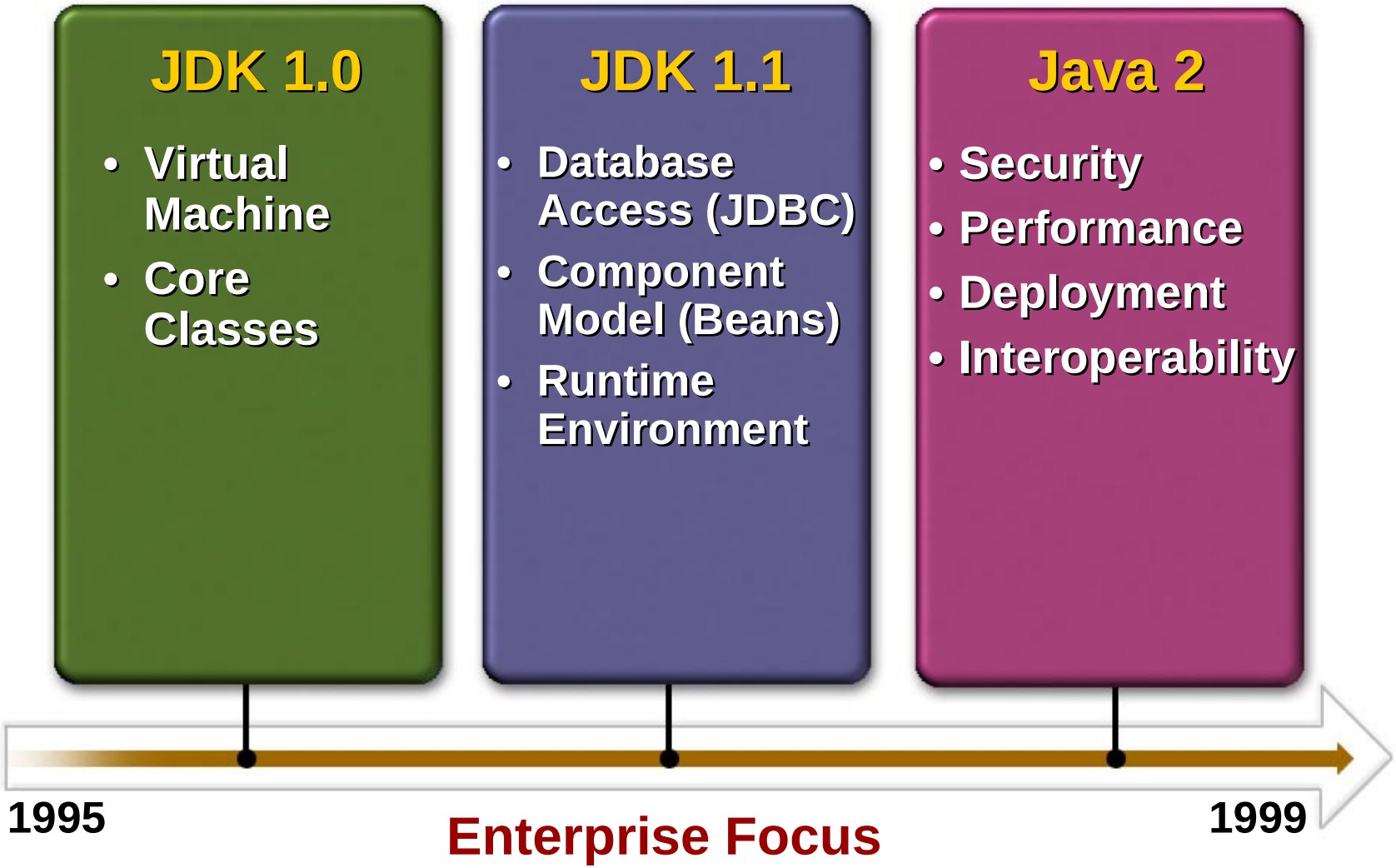
Java™ 2 Platform Editions



How the Java™ Platform Matured



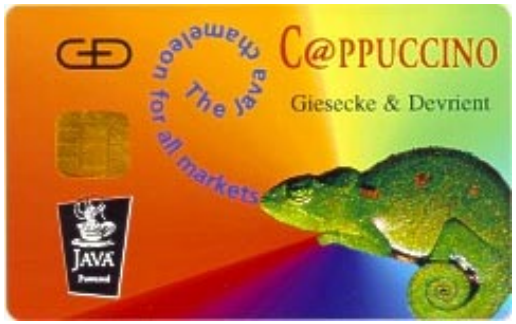
Why Put Java™ Technology In a Smart Card?

- Why not? One platform, from Smart Cards to Super Computers
- Scalable technology
- OOP for smart cards
- Ease and effectiveness of the Java programming language
- Web browser model…

The Smallest Java™ Platform

- Smart cards are small computing devices
  - Clock and power come from the reader
  - Clock speeds starting from 3.5 MHz
  - I/O starting from 9600 baud
  - 8-, 16-, and 32-bit processors
- Our target minimum platform:
  - 512 bytes RAM (I/O, stack)
  - 24 KB ROM (VM, applets, native functions)
  - 8 KB EEPROM (applets, object heap)
  - 8-bit processor

Java Card™ Technology-based Products



Java Card™ Technology Supporters

- **Card Manufacturers**
  - Bull CP8
  - De La Rue
  - Gemplus
  - Giescke & Devrient
  - Hitachi
  - IBM
  - InCard
  - Keycorp
  - NEC Corporation
  - Oberthur
  - Orga
  - Schlumberger
  - Toshiba
  - TL Malaysia
- **Silicon Vendors**
  - Dallas Semiconductor
  - Inside Technologies
  - Motorola
  - NCT/Advancel Logic
  - Siemens
  - Vanguard
- **System Integrators**
  - Centura Software
  - NatWest, Platform 7
  - Wave Systems
- **Financial Institutions**
  - Visa
  - Sermepa
  - Citibank

This is more than 95% of the card industry!

What Is Java Card™ Technology?

- Java™ programming language for smart cards
  - Standards based, OO programming for smart cards
- The Java Card technology defines:
  - A subset of the Java programming language and virtual machine definition suitable for smart card applications
  - Core and extension Java Card APIs
  - Java Card Runtime Environment (JCRE)

Java Card™ Language/VM Subset

- Support a minimal set of essential language elements
- Retain true OOP
- Let go of everything else
- Revolutionary advance over current assembly and C programming

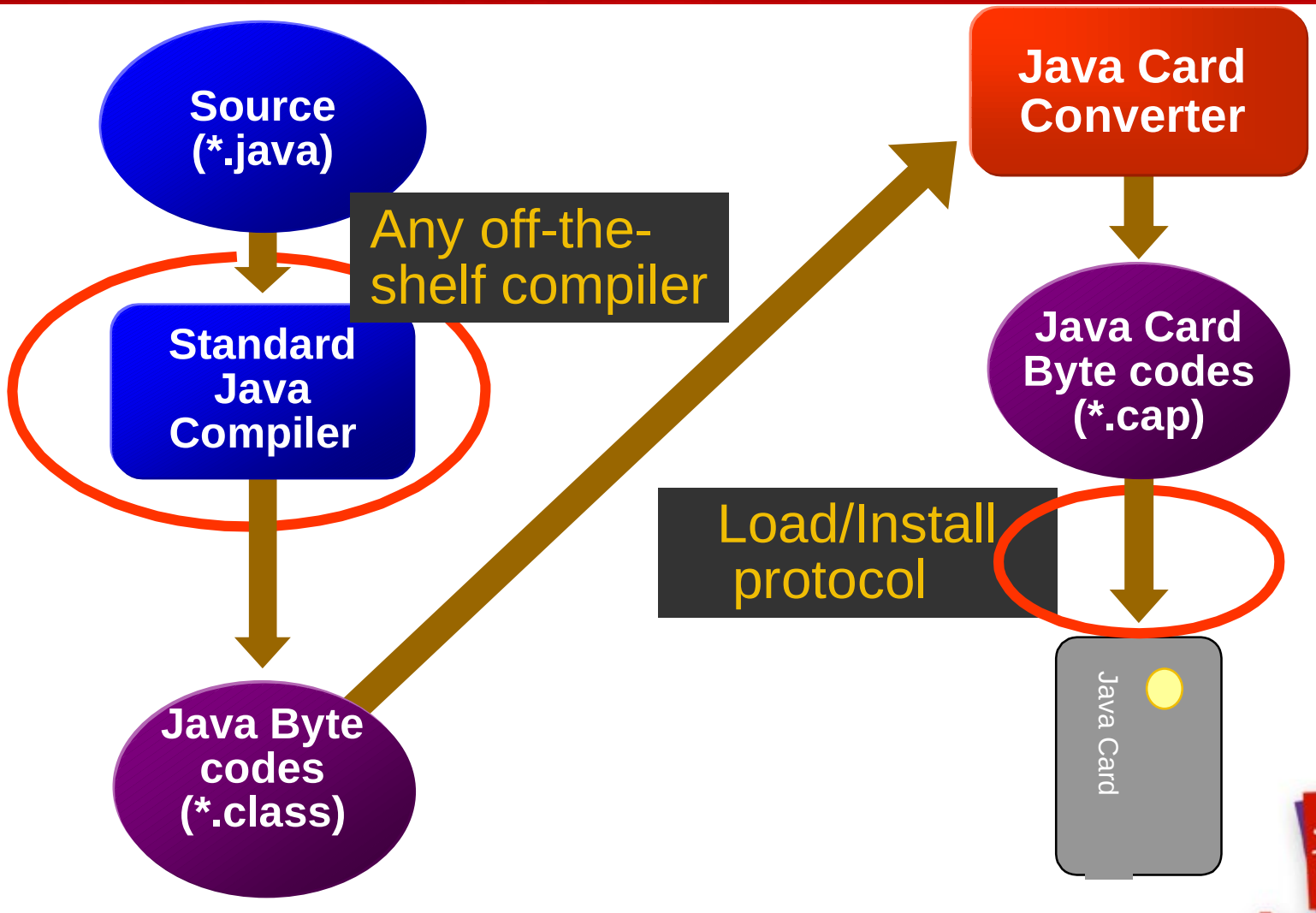
Supported

- Primitive data types
  - `boolean`
  - `byte`
  - `short`
  - `int`
- Objects
- Arrays
- Virtual methods
- Dynamic allocation
- Packages
- Exceptions
- Interfaces

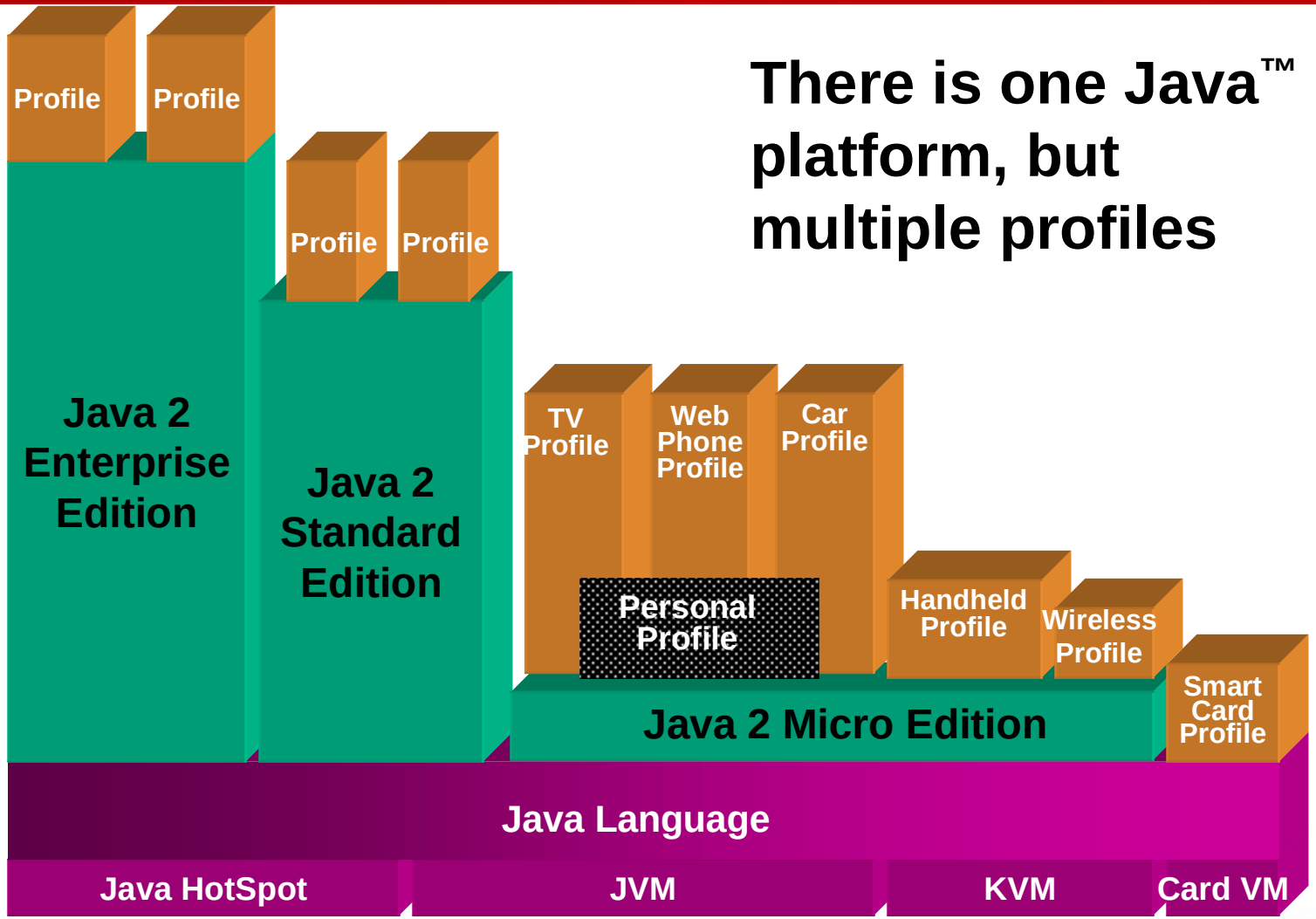
Not Yet Supported

- Float, double, long
- Char, strings
- Multi-dimensional arrays
- First class classes (reflection)
- Security manager
- Class loader
- Garbage collection
- Finalization
- Threads

Development Flow for Java Card™ Technology



Java™ 2 Platform, Micro Edition (J2ME) and Profiles



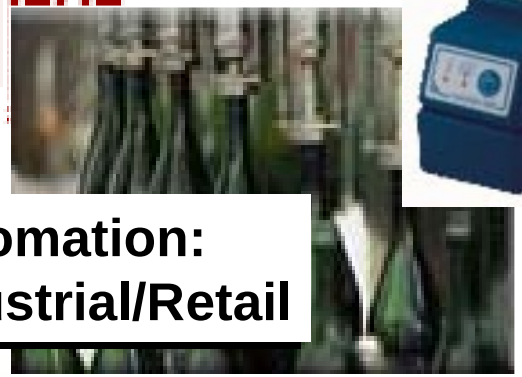
There is one Java™ platform, but multiple profiles

The Digital Home Today

48 products with a microprocessor

Scalability Within the Consumer Embedded Market

Commercial Embedded Market

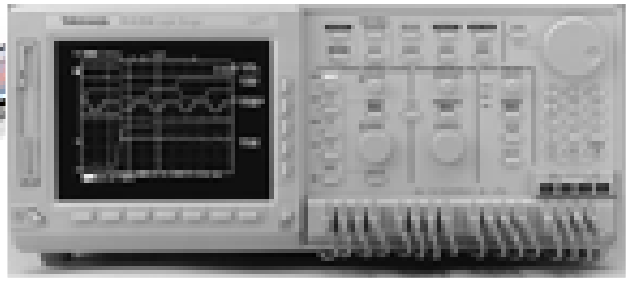


Automation: Industrial/Retail

Routers and Switches

Aerospace

Printers



Measurement Devices

Medical Devices

JavaOne
Sun's 1999 Worldwide Java Developer Conference

Embedded Device Characteristics

- Functionality built into system ROM
- High degree of reliability
- Dedicated functionality
- Varied input devices
- Limited user interface, if any
- Limited memory

Device Manufacturer's Challenge

- Manage development costs
  - Numerous chips and OSs to support
  - Increasing software content and complexity
- Manage new product categories for new markets, e.g. set-top boxes
- Decrease time to market
  - Pressure to accommodate holiday buying
  - Shrinking product life cycles

Changes in Technology in Embedded Devices

Past

- Proprietary
- Stand-alone
- Fragmented

Java™ Technology

Future

- Standards-based
- Networked
- Open and flexible

- Lower costs
- Faster time to market
- More flexible development

KRDL EduPad

- PDA for educational use
- Pilot project in July 1999
- Eventual deployment in 300 schools

CyberFone Communications Device

- Communications device
  - Telephone
  - Video
  - Internet access
  - Data transaction
- Available 3Q99

Alcatel Webphone

- Internet appliance for the home market
  - Full web browsing capabilities
  - PIM

Mobinetix POS Terminal

- **Multimedia, Internet-enabled POS terminal**
  - **Ability to deliver ads, surveys, etc.**
  - **Applets used to control hardware functionality**

General Instruments Set-Top Box

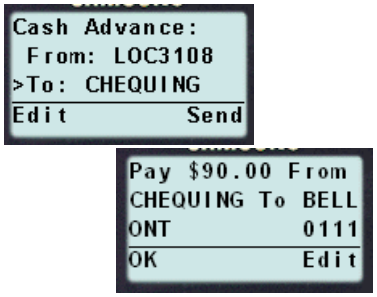
- **Digital interactive set-top box**
  - **Enhanced viewer experience**
  - **Electronic commerce**

724 Financial Software

- **E-banking and e-brokerage**
  - **Bank transactions, stock quotes, news, etc.**
  - **Working today at Bank of Montreal**

On device w/PersonalJava platform

On Palm Pilot



On PCS phone

HongKong Telecom

- Horse racing
- Pay-per-view
- Home shopping

Towards a Consumer Java™ Technology

- Make some Java libraries optional
- Shrink static memory footprint
- Minimize runtime memory usage
- Provide customizable User Interface
- Protect and extend Write Once, Run Anywhere™

Why This Area Is Important

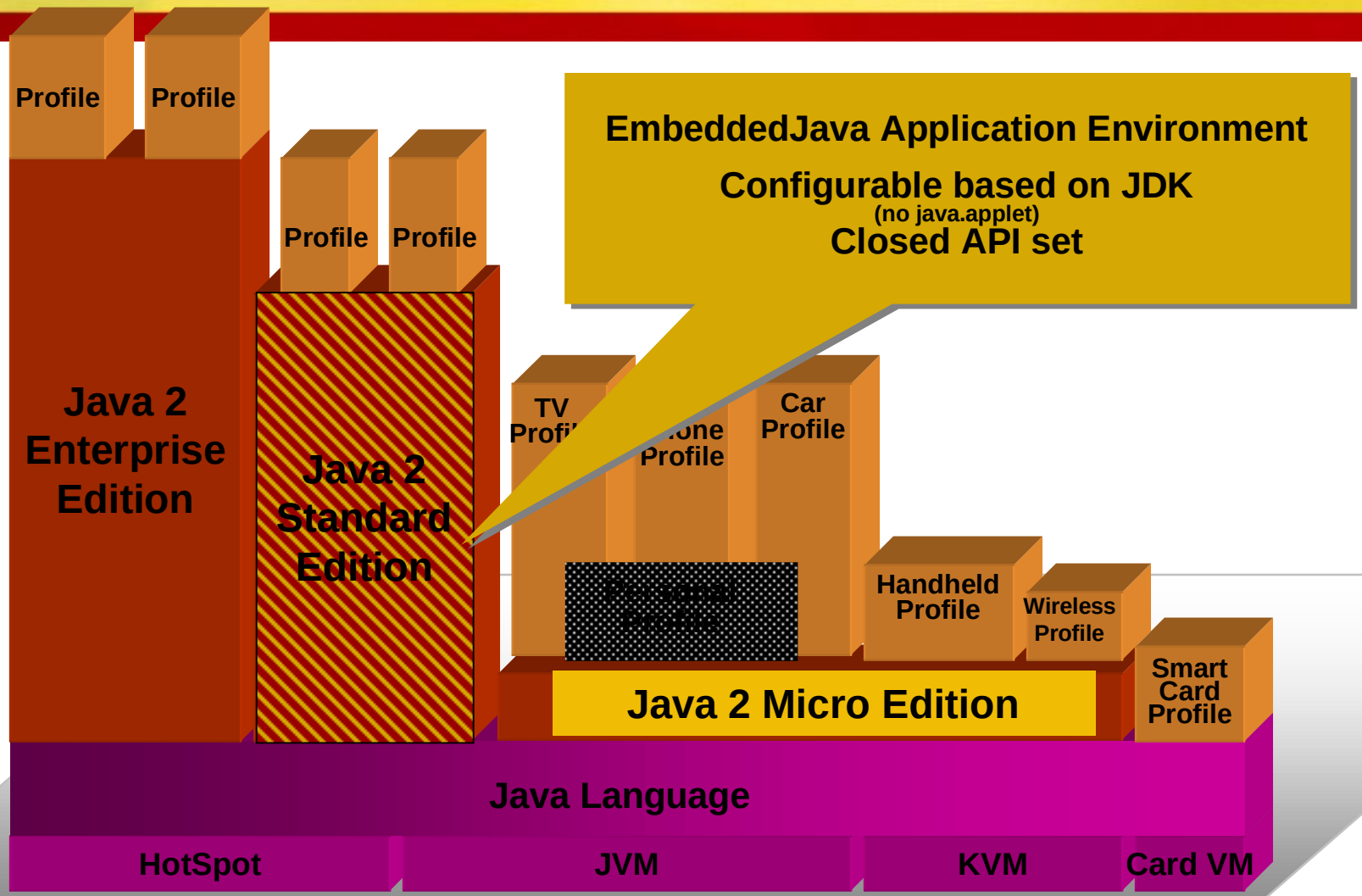
- Rapid growth in number and variety of web-connected consumer devices
- 60+ million users of wireless devices with Java™ technology estimated within next five years
- 1 billion mobile phones expected to exist by year 2005
- Vast increase in use of networks, servers, and infrastructure

PersonalJava™ Technology—Enables Web-Centric Devices

Future Direction for PersonalJava™ Technology

- The technology (or “profile”) for Web-centric devices
  - Displays Web pages with near-desktop fidelity
  - Runs Web applets
  - Runs device-targeted applets
  - Runs applets / applications from smaller profiles
- Will continue to serve the needs of this market; Other devices that were previously forced toward PersonalJava technology now have alternatives that better meet their needs

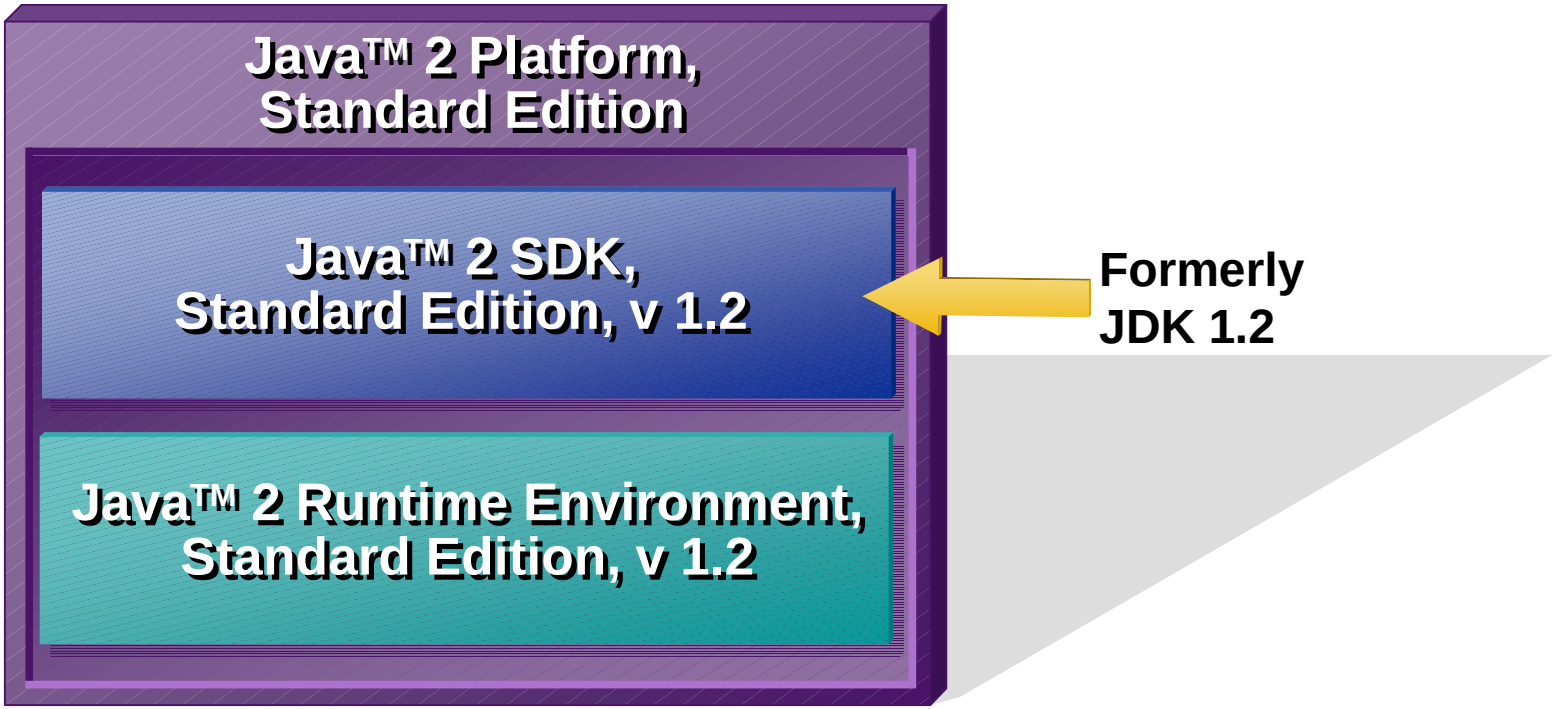
EmbeddedJava™ AE



EJAE Product Definition

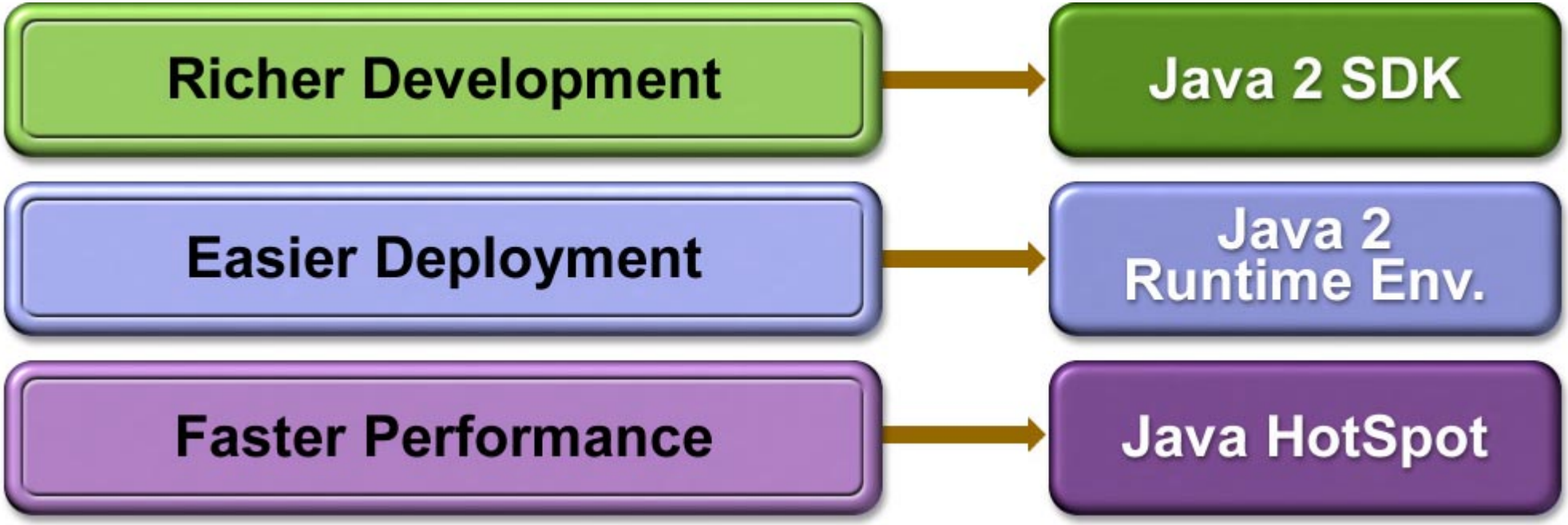
- To make EJAE ideal for:
  - RTOS, system integrators, and device manufacturers
- Creating embedded devices with:
  - Dedicated functionality
- Who want to leverage:
  - The Java™ programming language,
  - And utilize a configured set of class libraries
- And don't require published API sets

Java™ 2 Standard Edition

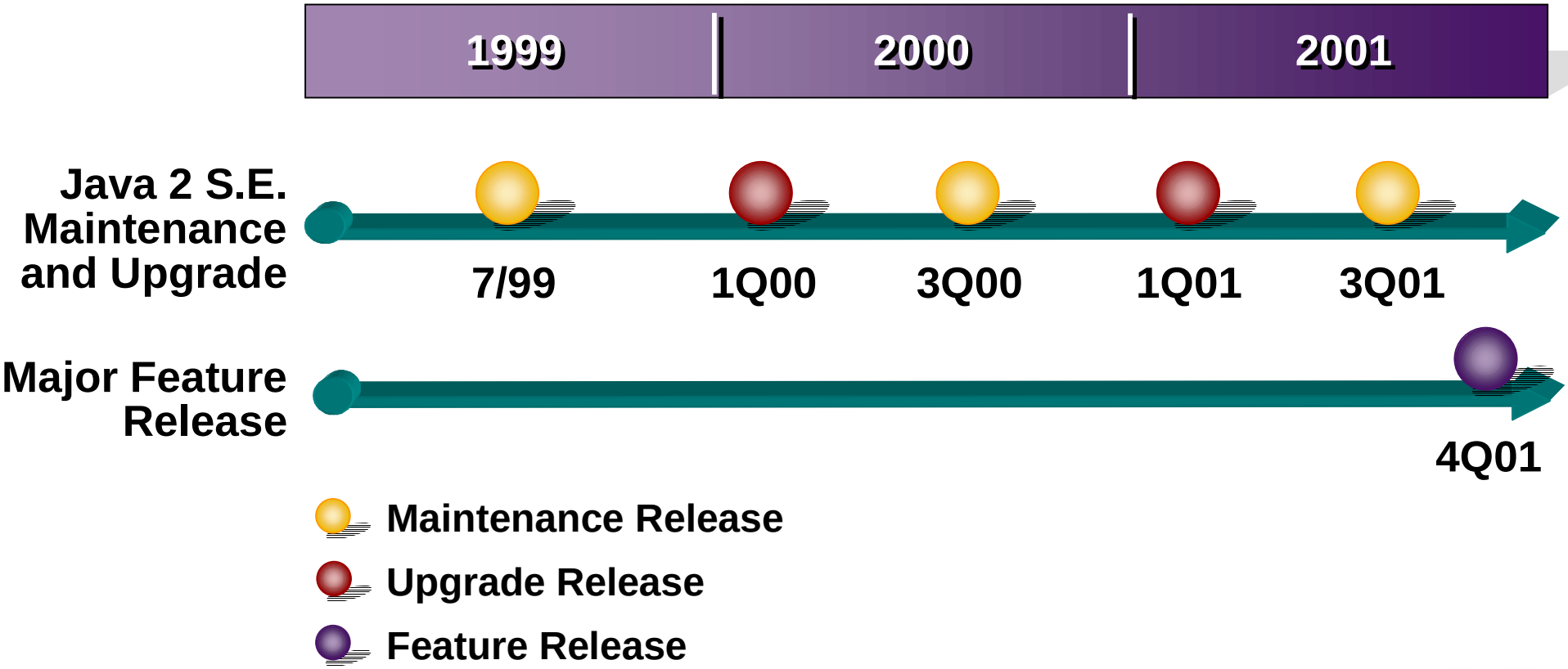


Java™ 2 Platform Delivers

Evolution and Roadmap



Java™ 2 Platform, Standard Edition Roadmap



Focus for 1999 and 2000

- Stability
- Compatibility
- Performance
- Deployment

Millions of Desktops!

- Netscape Communicator 5.0
- CD-ROMS with AOL Client Software

J2EE Platform

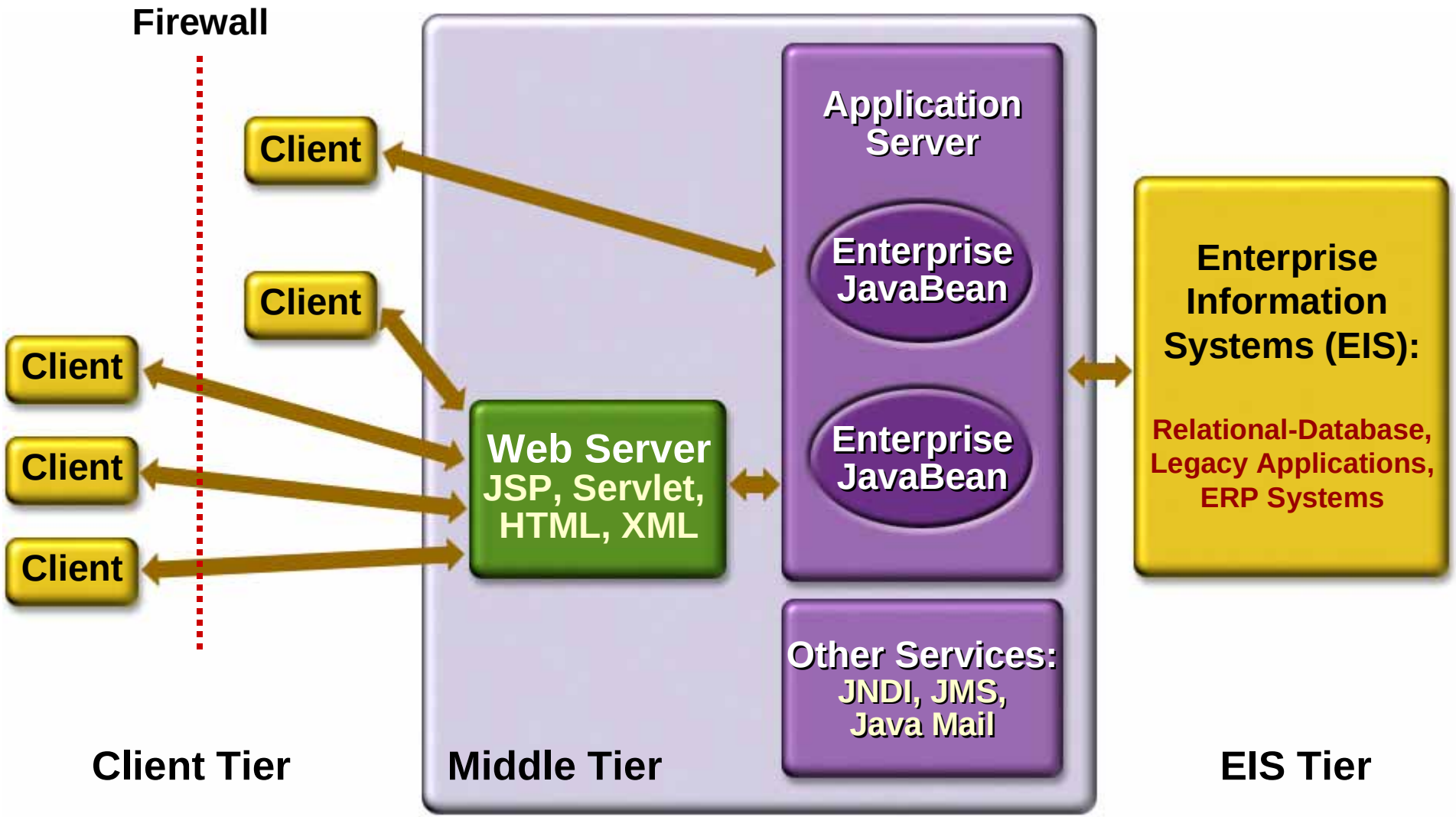
J2EE Containers Handle

- Concurrency (multi user)
- Consistency (Transactions)
- Security
- Availability
- Scalability
- Administration
- Integration
- Distribution

J2EE Components Handle

- Presentation
- Business logic
- Data access

The J2EE Environment
Enabling End-to-end Solutions



J2EE API Summary

- J2SE 1.2
- JDBC™ 2.0
- RMI/IIOP 1.0
- EJB 1.1
- Servlet 2.2
- JSP 1.1
- JNDI 1.2
- JTA 1.0
- JMS 1.0
- JavaMail™ 1.1
- JAF 1.0

Recursos

Java Card

http://java.sun.com/products/javacard

Java 2 Micro Edition

http://java.sun.com/j2me

Java 2 Standard Edition

http://java.sun.com/j2se

Java 2 Enterprise Edition

http://java.sun.com/j2ee

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