Java Everywhere

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Agenda

- Data
- Web Services
- Java
- Ease of Development
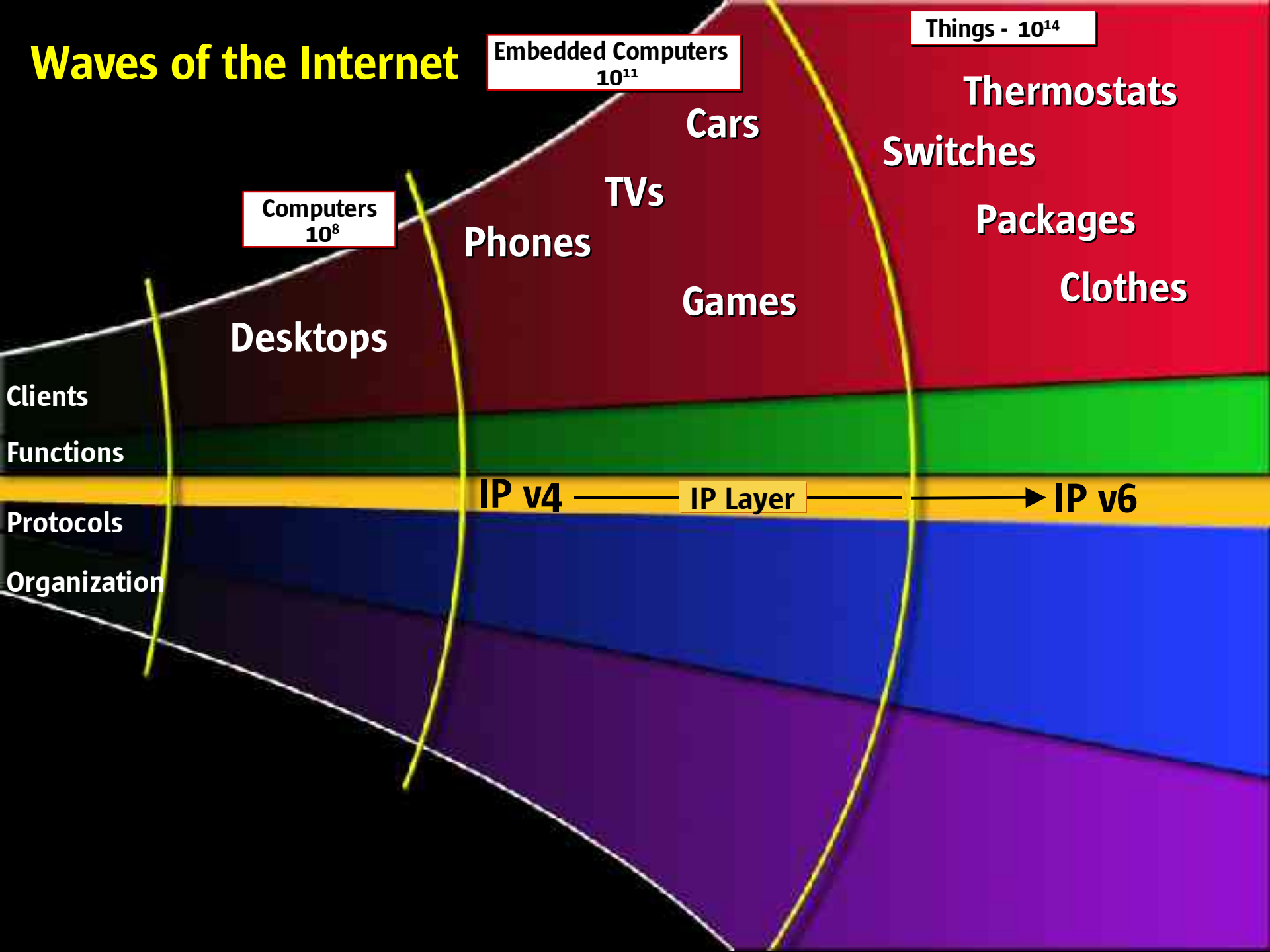- Summary

Data

An Internet of Computers

An Internet of Things That Embed Computers

An Internet of Things

10^8

10^{11}

10^{14}

Waves of the Internet

Embedded Computers 10^{11}

Things - 10^{14}

Thermostats

Cars

Switches

TVs

Packages

Computers 10^8

Phones

Clothes

Games

Desktops

Clients

Functions   Transfers   Transactions   Content   Telemetry   Control

IP v4 —————— IP Layer —————→ IP v6

Protocols

FTP   SMTP   X   RMI/IIOP

RPC/XDR

Identity

Organization   Telnet   LDAP   SOAP

HTTP   Jini

Client/Server   UDDI

JXTA

N-tier   Web Applications

Web Services   Polyarchical

Fractal
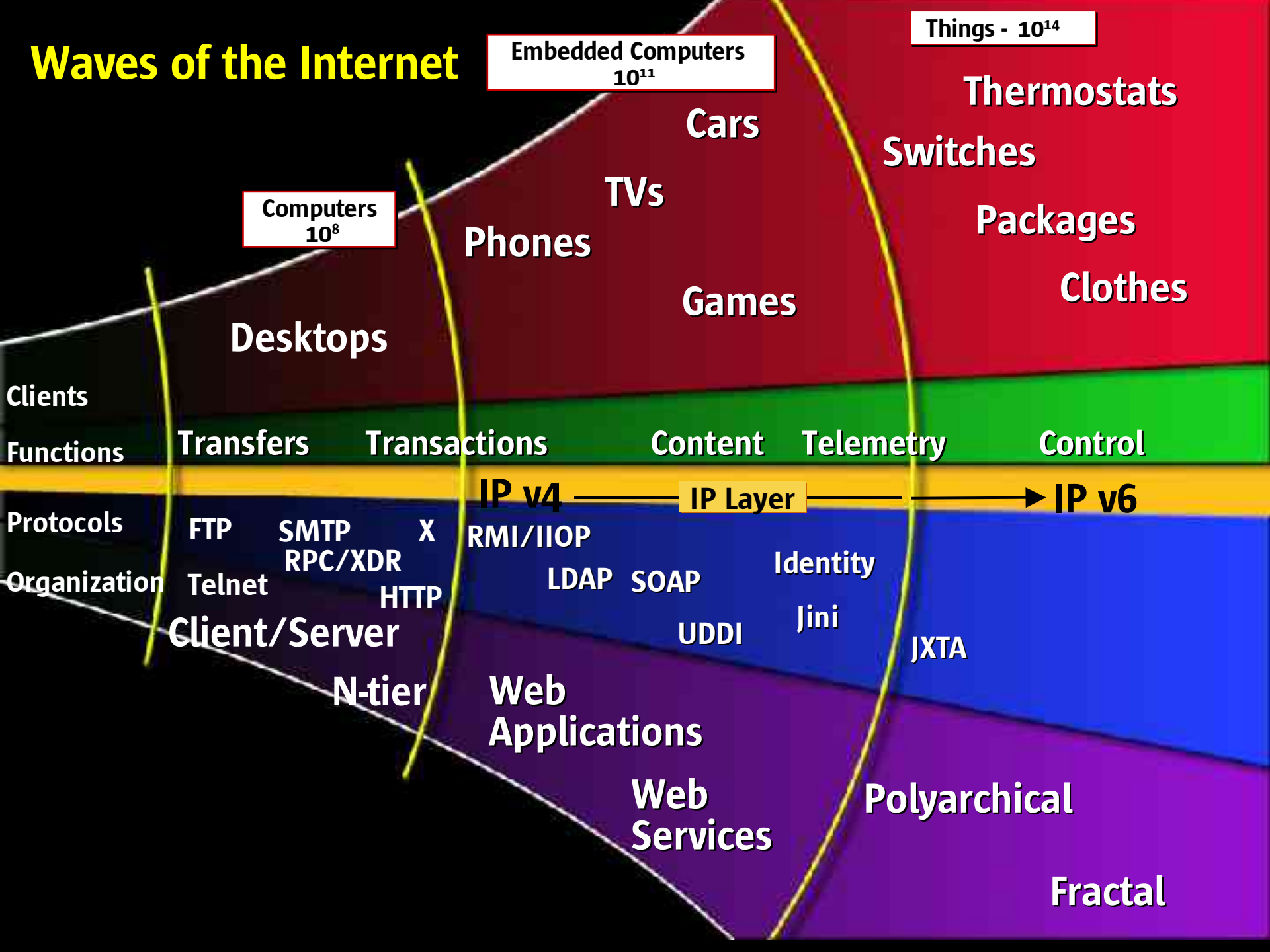
Auto-ID
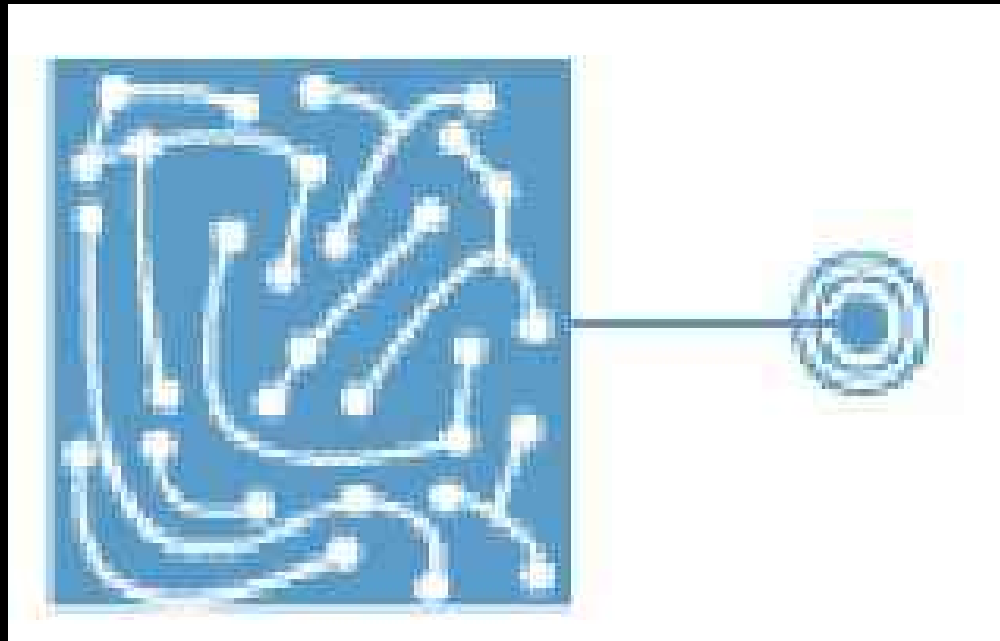
RFID: The New Barcode

- Radio Frequency Identity Tags
- Data can be changed
- No line of site required
- 96-bits is plenty of storage

Lots Of Possibilities...

- Supply chain management
- Parcel tracking
- Refrigerator/oven
- Washing machine
- Personalised advertising
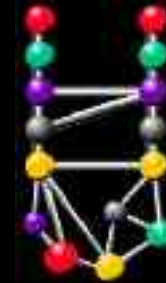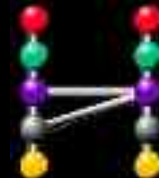- Use your imagination...

Three "Laws" of Computing

- Moore's Law
  - Computing power doubles every 18 months
- Gilder's Law
  - Network bandwidth capacity doubles every 12 months
- Metcalfe's Law (Net Effect)
  - Value of network increases exponentially as number of participants increases
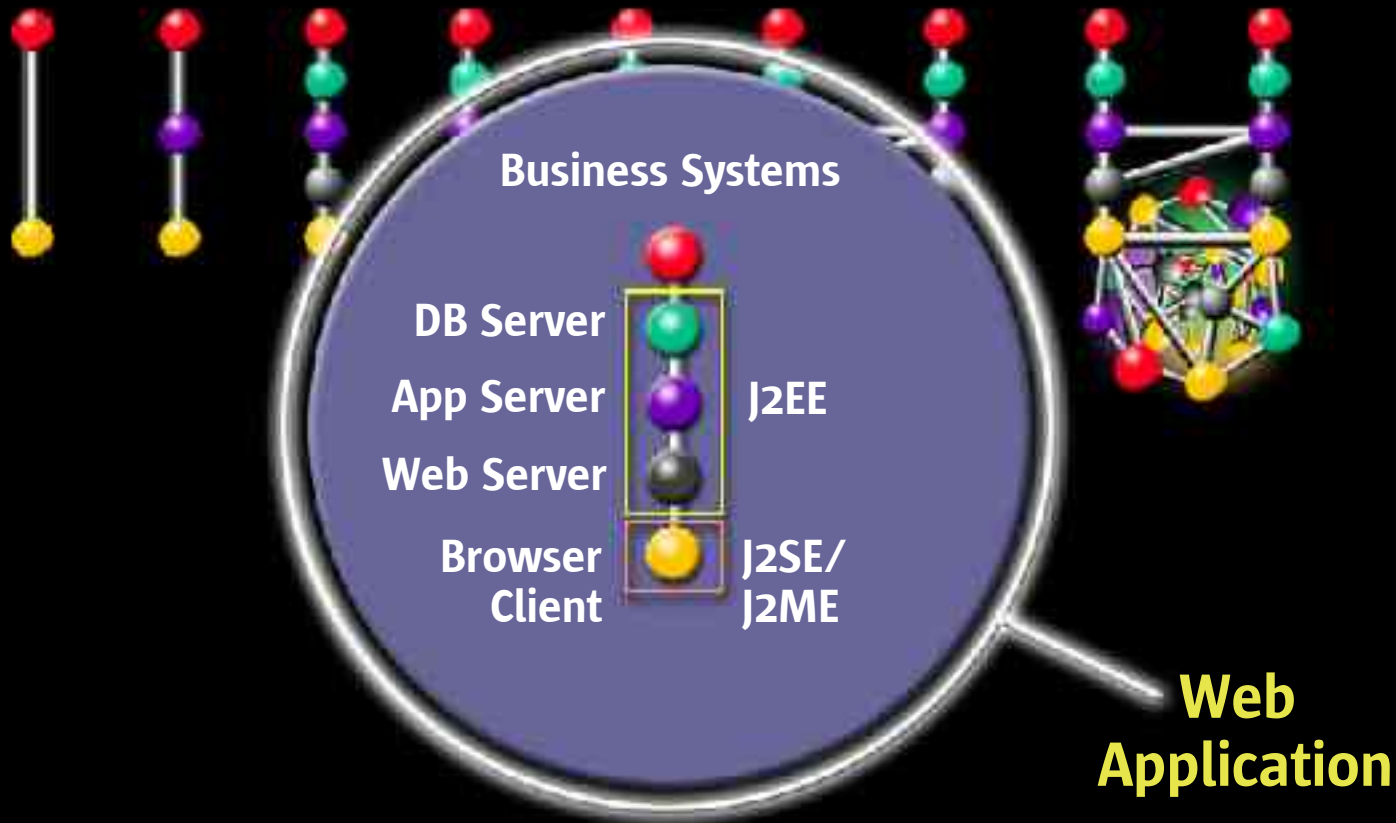
Platform Evolution

Catch Phrase	The Network Is the Computer	Objects	Legacy to the Web	The Computer Is the Network	Network of Embedded Things	Network of Things
Scale	100s	1,000s	1,000,000s	10,000,000s	100,000,000s	100,000,000s
When/Peak	1984/1987	1990/1993	1996/1999	2001/2003	1998/2004	2004/2007
Leaf Protocol(s)	X	X	+HTTP (+JVM)	+XML Portal	+RM	Unknown
Directory(s)	NS, NS+	+CDS	+LDAP(*)	+UDDI	+Jini	+?
Session	RPC, XDR	+CORBA	+CORBA, RM	+SOAP, XML	+RM/Jini	+?
Schematic						

Web Services

Design Patterns: Web Application

Business Systems

DB Server

App Server — J2EE

Web Server

Browser
Client — J2SE/
J2ME

Web
Application

Design Patterns: Web Service

Bus.
Sys.

DB

App

Web

Browser

XML
(UDDI,
SOAP)

J2EE

J2SE/
J2ME

Context and Identity
(LDAP, Policy, Liberty)

Web
Service
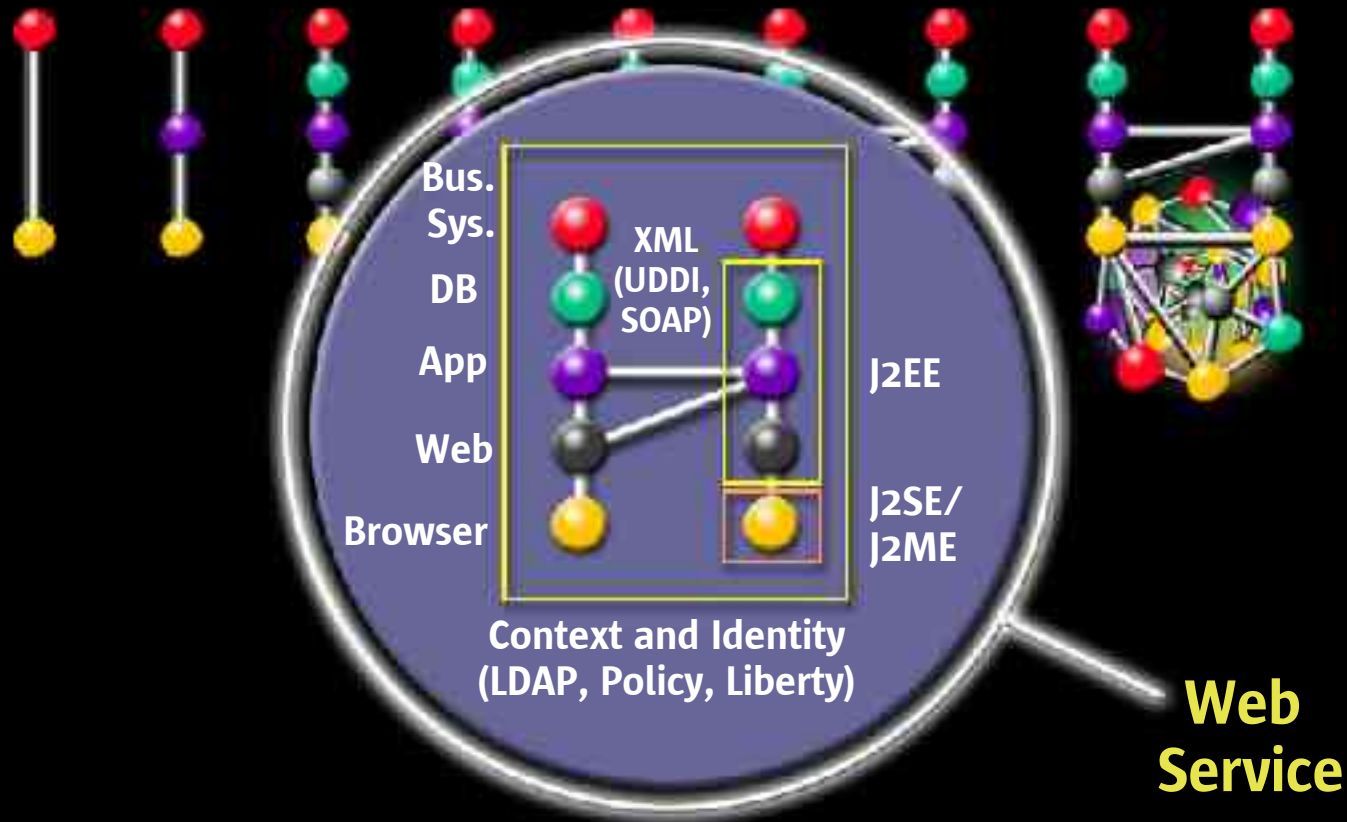
Web Services Adoption

- 1st phase
  - Concerted deployment internally within an organization

- 2nd phase
  - Selective deployment with outside business partners

- 3rd phase
  - Wider deployment with outside business partners

First Generation Web Services

- XML based
- Message-based
- Language independent
- Dynamically located
- Accessed over the internet
- Loosely coupled
- Using standard protocols

Web Services Inhibitors

- Basic web services designed for RPC
  - B2B is different
  - Reliability
  - Choreography
  - Security
- Performance
  - XML massively degrades network performance
  - ASN.1 being considered
- Politics!
  - Too many standards
  - Royalties?

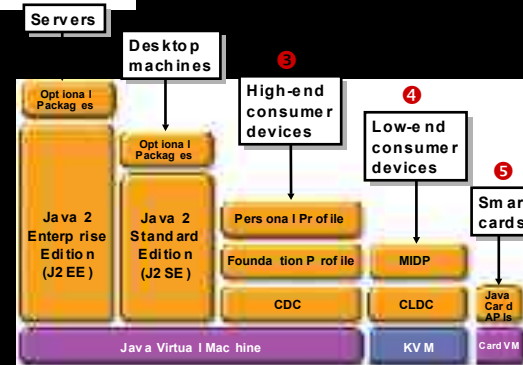# Java

A Brief History of Java

1991 –
Duke gets on
the stage with
Oak from
Project Green

1995 –
The world
gets to know
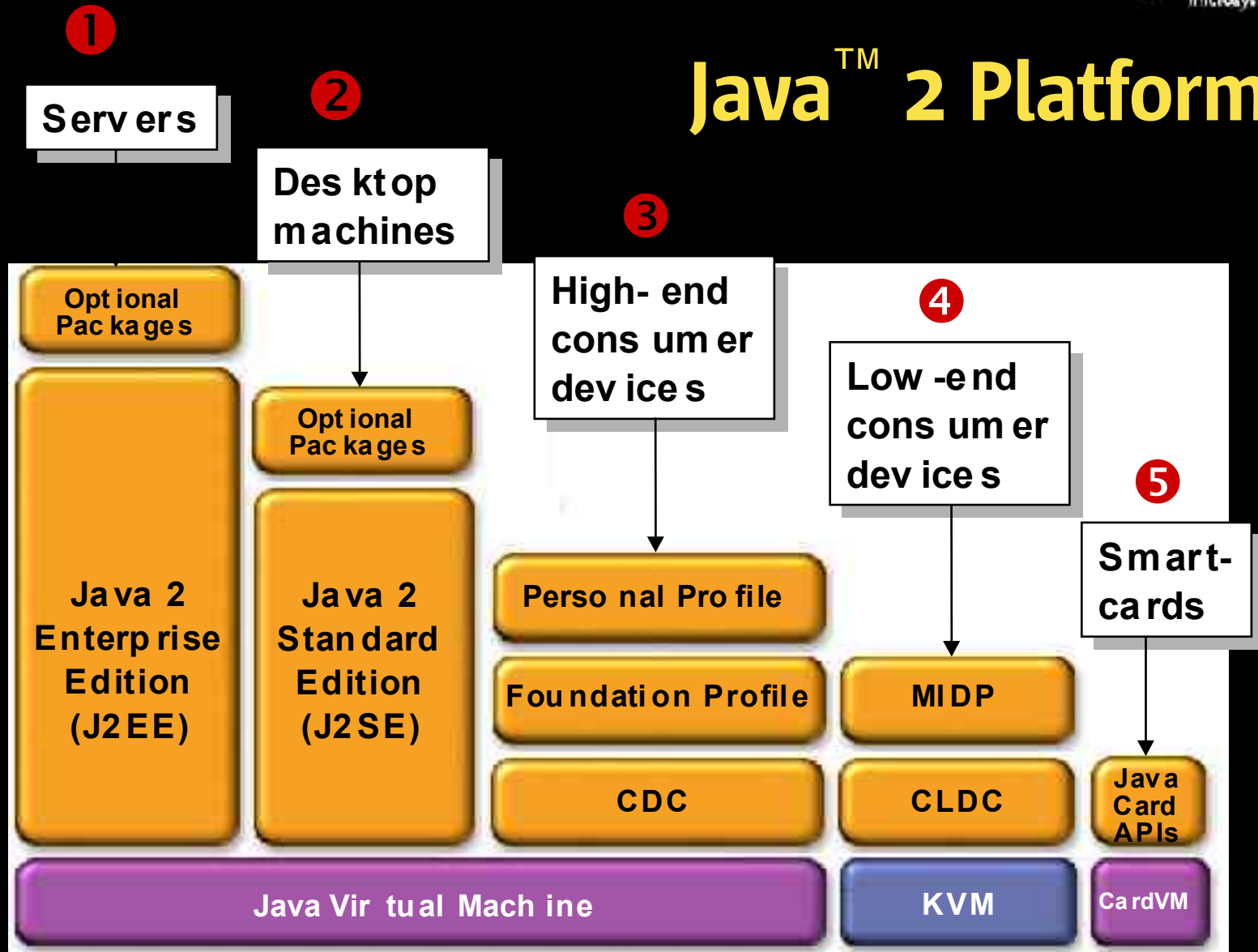about Java.
The applet is
born.

1999 –
Java2 enters with
the "Family"

2003 – Java
Everywhere

Java Stats

- Java in 100% of Fortune 500 companies
  - 78% of executives view Java as the choice for web services
- Java installed on 550 million desktops
- 150 Java enabled mobile phone models
- More than 3 million Java developers
- JRE is second most popular download on the internet
- Java is widely recognised consumer brand
  - Most non-techies associate it with Microsoft!

JavaCard, the World's Most Widely Deployed Identity Solution

- 300M deployed (and growing)

- 95% of smart card market

- Every GSM phone

- Defense Department

- National Health Insurance of Taiwan - 22M Users

- Amex, Citigroup, Providian

- Everyone over 12 in Belgium
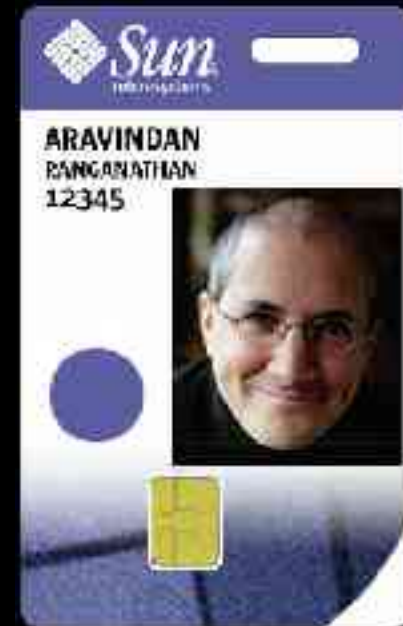
Java Community Process

- Executive committee
- Java Specification Request
  - Currently 224+ Requests
- Expert Group
  - Interested companies/individuals
- Public Review
- Reference Implementation
- Compatability Test Kit
  - Sun/Apache scholarship fund

The Java Community: Strength in Numbers

- Java programmers:
    2.5 million, as of 2001 (source: Gartner)
    Prediction of 4 million by 2003 (source: IDC)
- Java in universities:
    78% teach Java, 50% require Java
    (source: The Middleware Company)
- Java usage is expected to grow 29.4% in 2003 alone
    (source: IDC Worldwide Developer Model, via http://www.devx.com/judgingjava/articles/skills/)

Sun's "mantra"

- Innovate
  - 2/3 of Sun's R&D is in software

- Cooperate on Standards and Specs.
  - Java Community Process

- Produce reference implementations
  - Java Web Services Developer Pack

- Integrate into products
  - Sun ONE products

JDK Themes

- 1.0 – First Release
- 1.1 – New event model
- 1.2 – Performance, New APIs
- 1.3 – Performance, Hot Spot
- 1.4 – Performance, Reliability, Availability
- 1.5 – Performance, Ease of development

JDK 1.5, "Tiger"

- Next major J2SE release
  - Biggest impact on language since JDK1.0
- Themes & features still under design
- Will go through the JCP

  <u>ALL FEATURES ARE TENTATIVE</u>

JDK 1.5 Themes

- Compatibility, Compatibility, Compatibility!
- Quality
- Monitoring and Manageability
- Performance and Scalability
- Client for XML and Web Services
- Ease of Development

Monitoring & Manageability

- JMX Management API (JSR-003)
  Support for CIM/WBEM and SNMP
- JVM Monitoring & Management API
  JSR-174
  Local API, but also mapped to JMX
  New JVM profiling API (JSR-163)
  replaces experimental JVMPI

Performance Related

- More support for big heaps
  - Improved concurrent/parallel collection
- Yet more HotSpot tuning
- Faster startup time
- Reduced footprint

Selected Language Updates

- Generics (JSR-014)
- Metadata (JSR-175)
- Iterating over collections
- Enumerated types
- Autoboxing of primitive types
- Support for importing constants
- Memory Model clarifications

JDK 1.5 Miscellany …

- Unicode 3.1
  - 2 unicode values for each surrogate char
- Java Isolation API (JSR-121)
- API for javac compiler
- Disconnected JDBC^{TM} RowSets (JSR-114)
- New File System interface
- Perhaps: asynchronous I/O
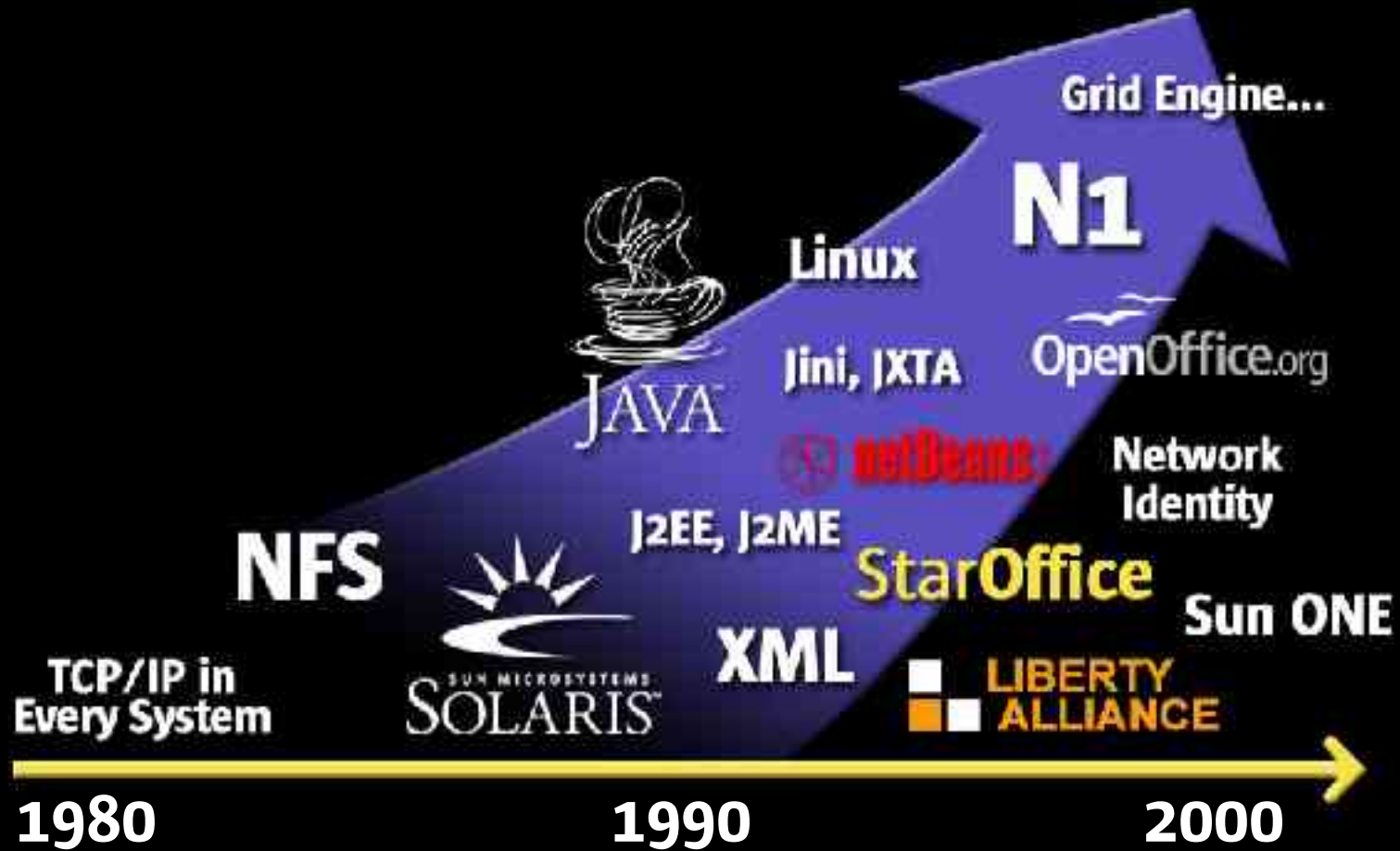- printf !!!!

J2EE 1.5

- More web service standards
  - SOAP 1.2, WSDL 1.2?
  - WS-Security? XML DSIG? XML ENC?
- JSRs in progress
  - JSR-173 – Streaming API for XML
  - JSR-181 – Web Services Metadata
  - JSR-183 – Web Services Message Security
- Ease of development
  - Replace deployment descriptor with Metadata
  - Java Server Faces

Developer Tools

- Project Rave
- Project Relator
- Project ACE

Summary

Java Everywhere

- Freedom of choice
  - Write once, run anywhere

- Open Standard
  - JCP

- Constantly evolving
  - New features to ease development

- Still the best programming language

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