

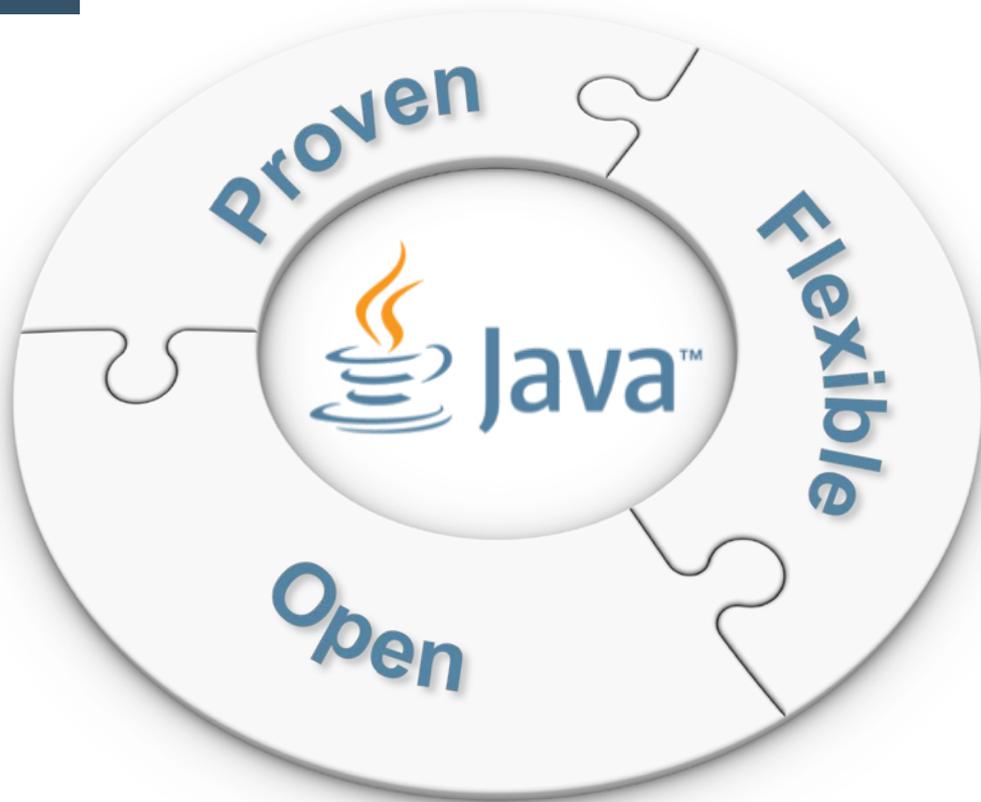
# Java and the Internet of Things

**Henrik Stahl**  
Vice President  
Java Product Management

MAKE THE  
FUTURE  
JAVA

ORACLE®





9 Million+ Java developers worldwide

#1 Choice for developers

#1 Development platform

5 of Top 5 OEMs ship Java ME

3 Billion mobile phones run Java

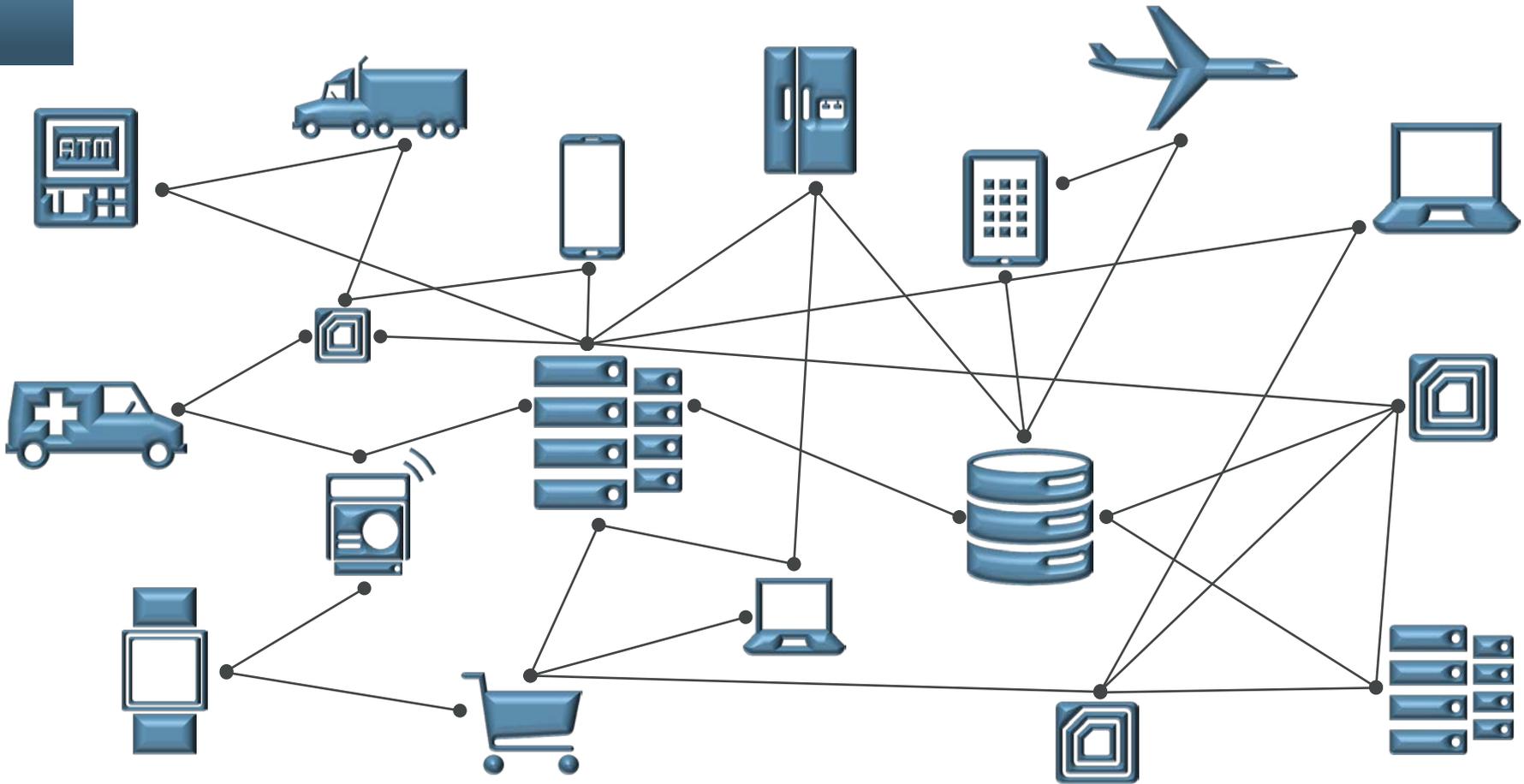
100% of Blu-Ray players ship with Java

97% of enterprise desktops run Java

89% of desktops in USA run Java

5 Billion Java Cards in use

125 Million TV devices run Java



# The Path to IoT Services

## Reduce Complexity

- Interoperability & Standards
- Provisioning & Management

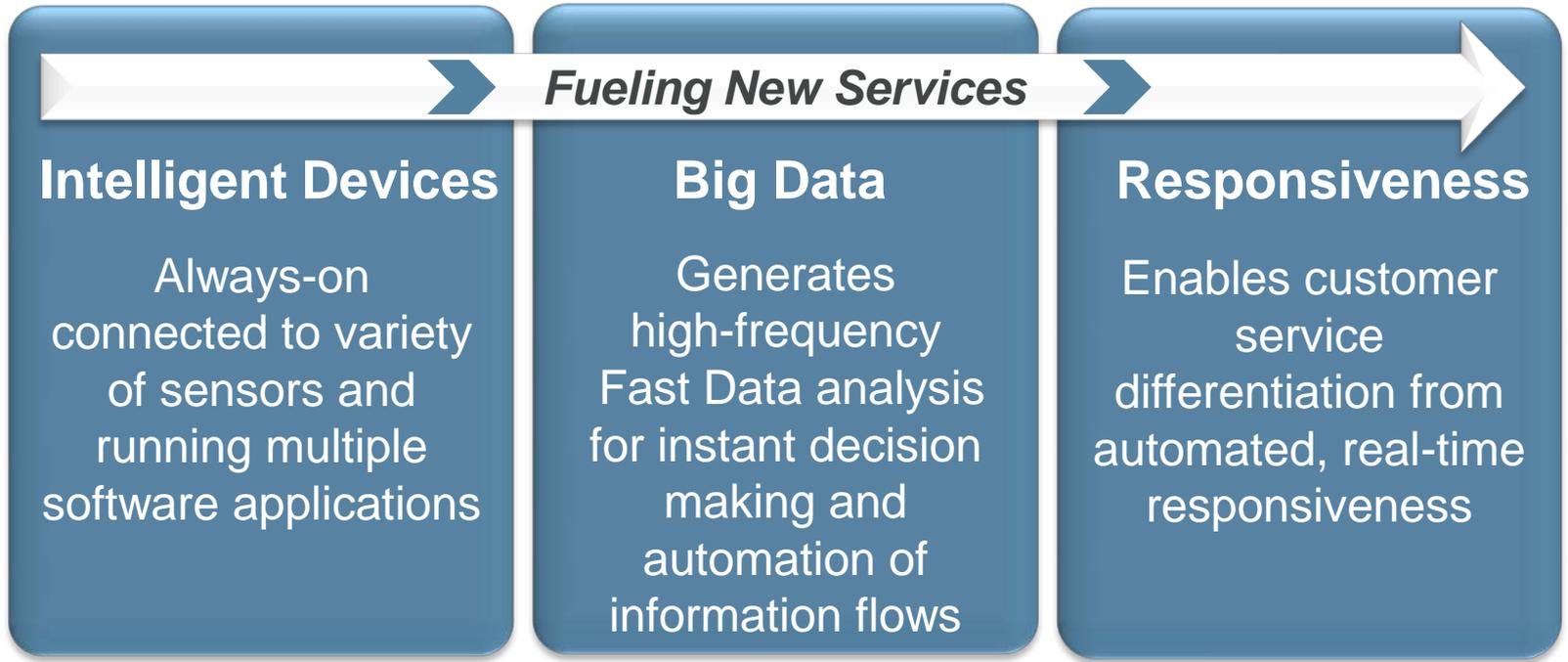
## Drive Innovation

- Developer Productivity
- Device Lifecycle

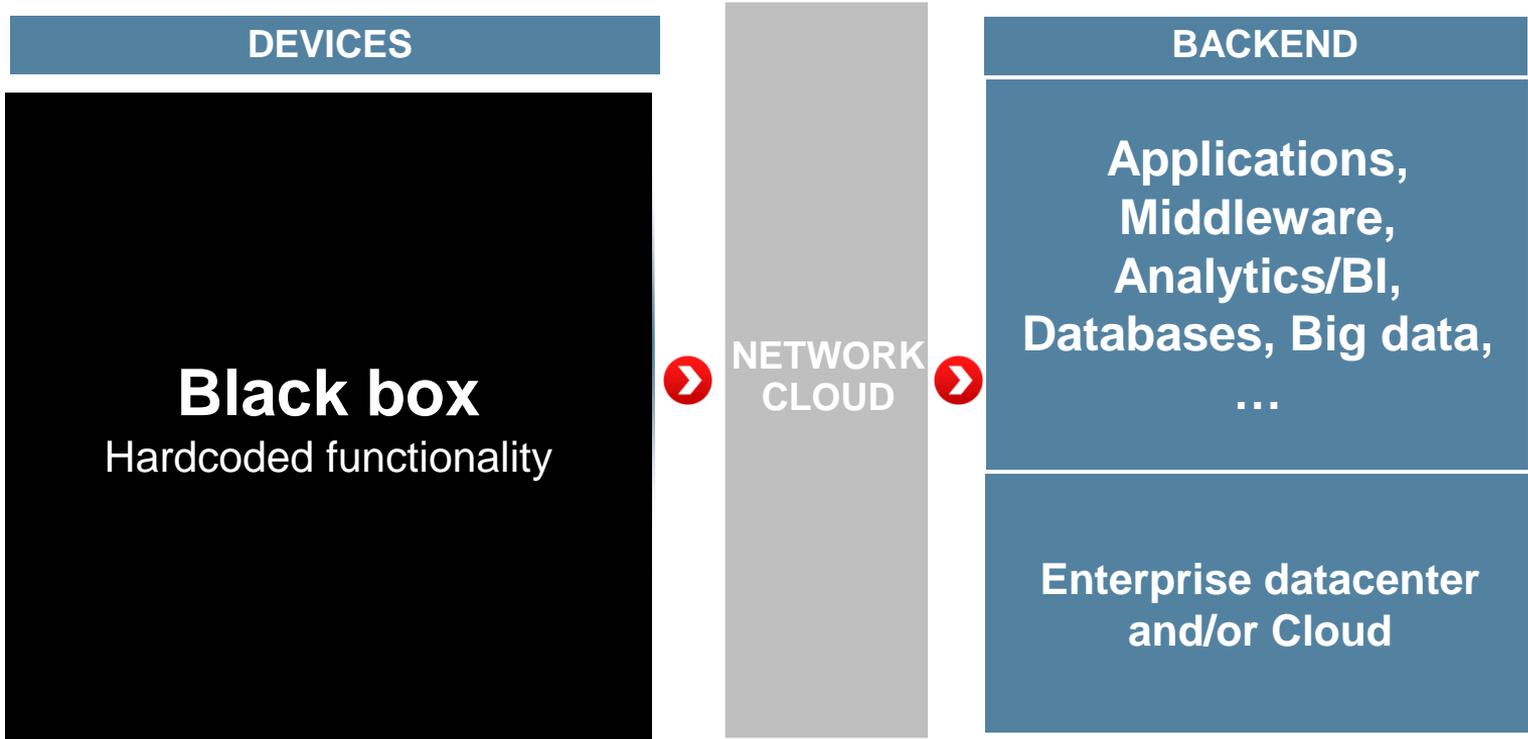
## Create Opportunity

- Data Capture
- Real-Time Analytics
- Reduced Human Interaction
- New Services

# Challenges in the IoT Era



# Early IoT architecture



# Requirements on intelligent devices

1

## Application Platform

Streamline how IoT applications are developed, secured & deployed

2

## Distributed Intelligence

Make predictive decisions quicker and closer to the source of the data

3

## Integration

Connect intelligent devices to existing enterprise applications

4

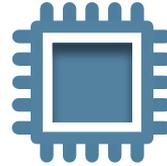
## Security

Protect against malware and threats, manage security and identity of data and devices

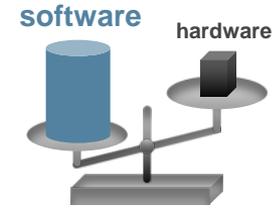
# IoT Is Changing the Device



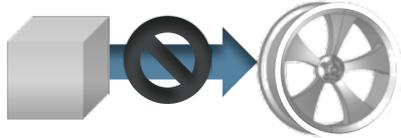
Highly diverse and rapidly changing use cases & technologies



Hardware capabilities & connectivity evolving rapidly



Value is in software, but embedded software development is difficult



Expensive to reinvent and reintegrate must-have features (management, security, etc.)



Volume & value of data is gaining importance as a business driver



Time-to-market and flexibility are key to success

# Device Needs



Always On



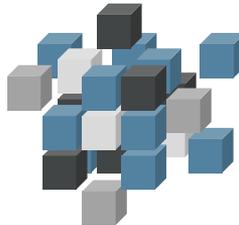
Performant and Scalable



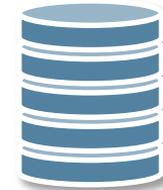
Secure



Remotely Manageable



A Platform  
for New Services



Provide Local Intelligence

# Vendor Ecosystem Needs



Manage BOM & Profit



Innovation and  
Competitive Edge



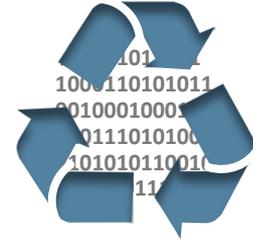
Standards &  
Regulatory Compliance



Time to Market

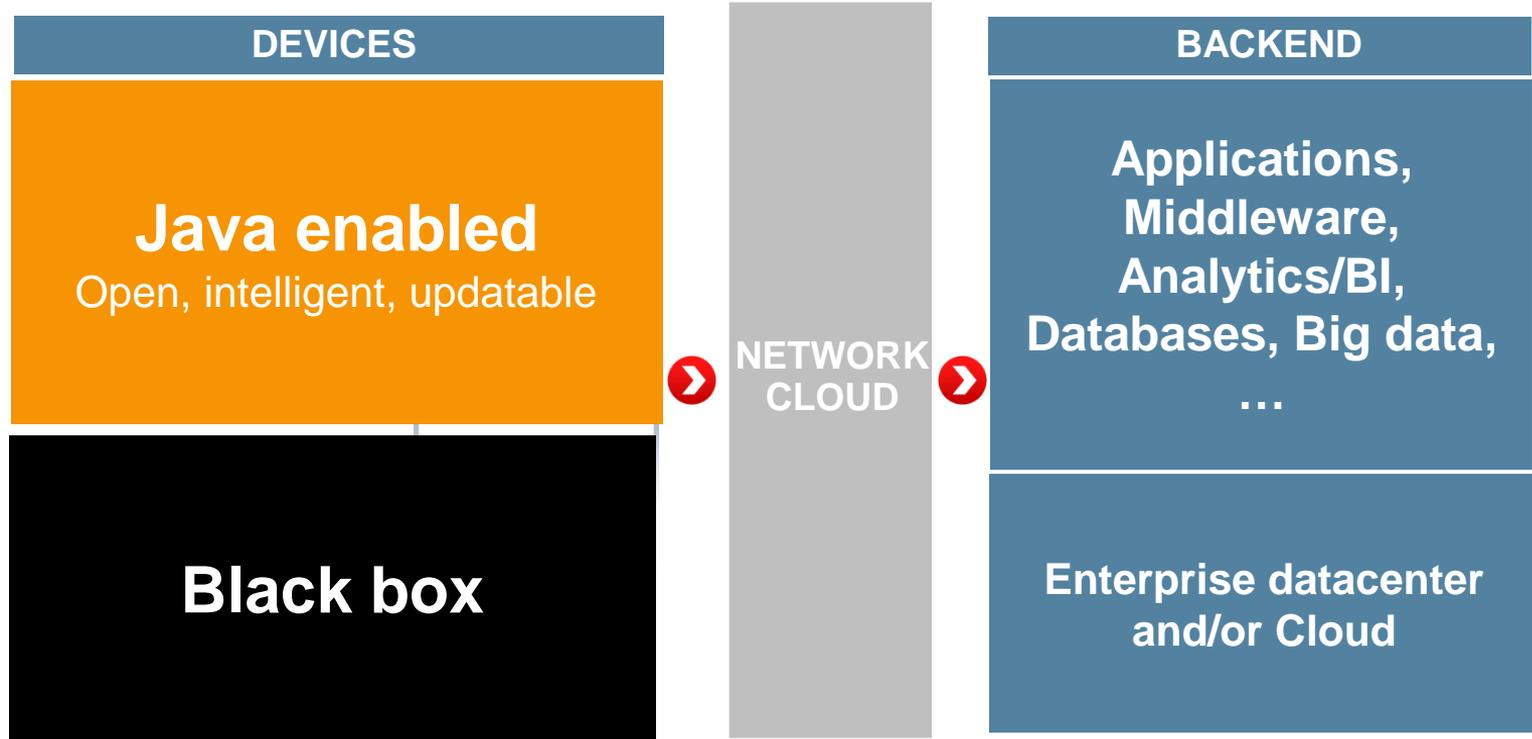


Readily Available  
Resources

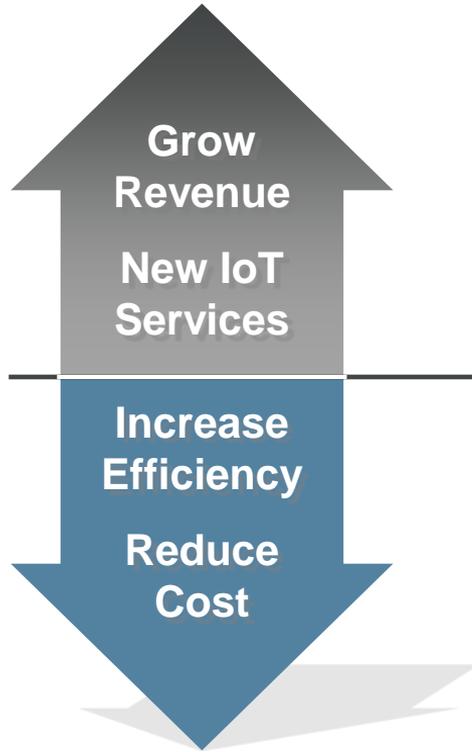


Reuse Across Markets

# IoT Architecture, take two

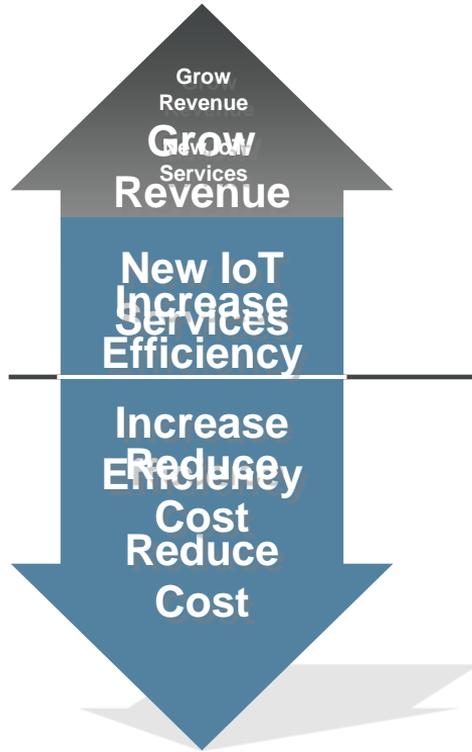


# Business Value of Java in Embedded



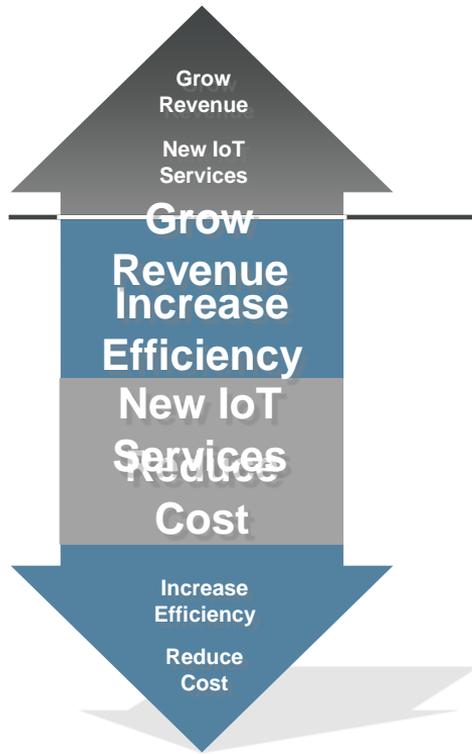
- Extended Product Lifecycle
  - Enhanced Experience
  - Increased Market Reach/multiple UEs
  - Proven, Reliable, Secure
- 
- Control over BOM and Roadmap
  - Strong Resource Availability
  - Shorter Time-to-Market
  - Reduced Support Costs
  - Reduced Risk

# Business Value of Java in Embedded



- **Control over BOM and roadmap:** Common Java platform across broad choice of hardware and OS delivering portability
- **Strong resource availability:** Widest, most diverse eco-system fueled by over 9m developers globally
- **Shorter Time-to-Market:** Standard commercial platform reducing QA cycles and reinvention – invest more cycles to innovate
- **Reduced Support costs** via remote management and update
- **Reduced Risk:** Widely deployed, secure, standards based platform – deployed globally – backed by Oracle.

# Business Value of Java in Embedded



- **Extended Product Lifecycle:** In-market update to deliver new and manage services powered by industry standards
- **Enhanced Experience:** Increased device level interoperability and integration, fewer silo's to manage
- **Increased Market Reach/Multiple UEs:** Re-use common modules across multiple domains.
- **Proven, Reliable, Secure:** From the SIMcard to the enterprise data center

# Java Embedded Overview

Footprint

10MB-100MB

1MB-10MB

50KB-1MB



Java Card

Java ME

Java SE

SECURITY

SMALL

MEDIUM

LARGE

# Java IoT Vision

Any Device...

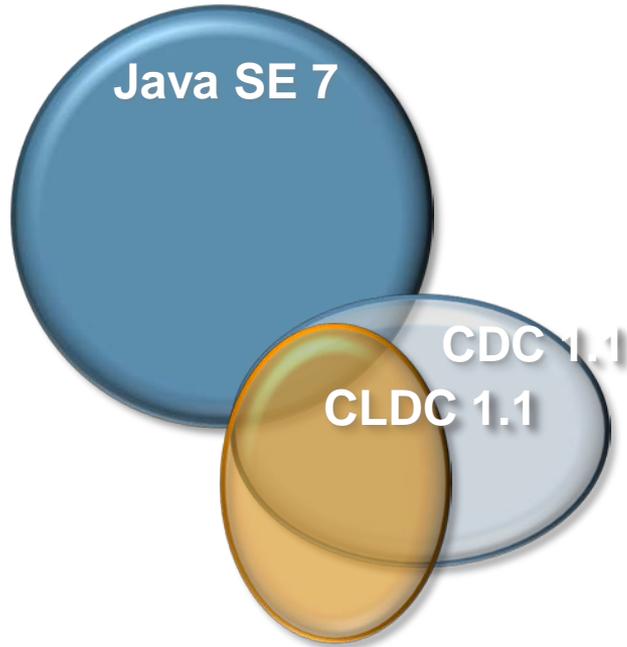
Any Market...

Any Size...

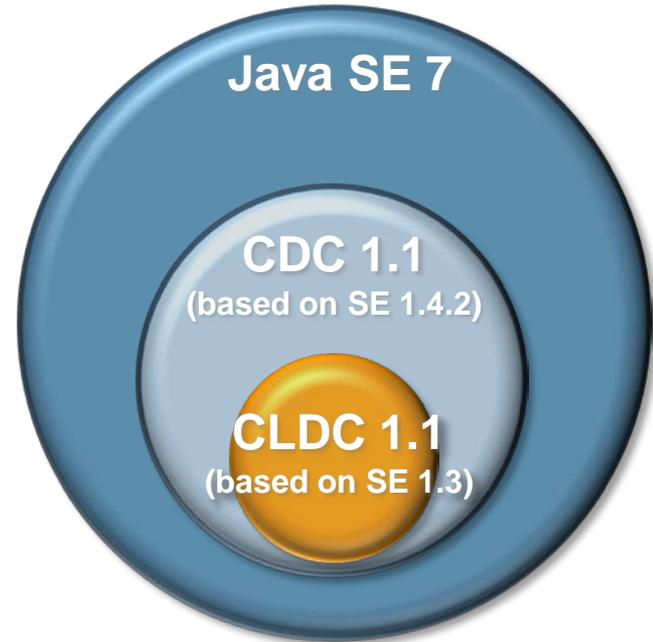


# Today

## APIs

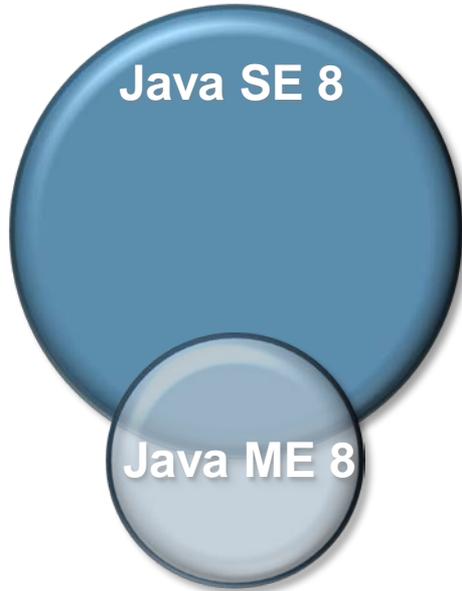


## Language

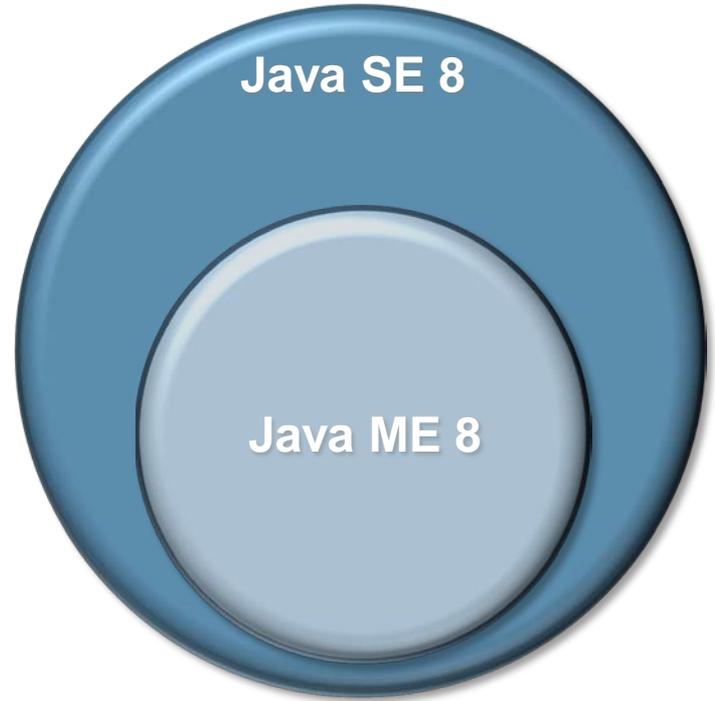


# Java 8

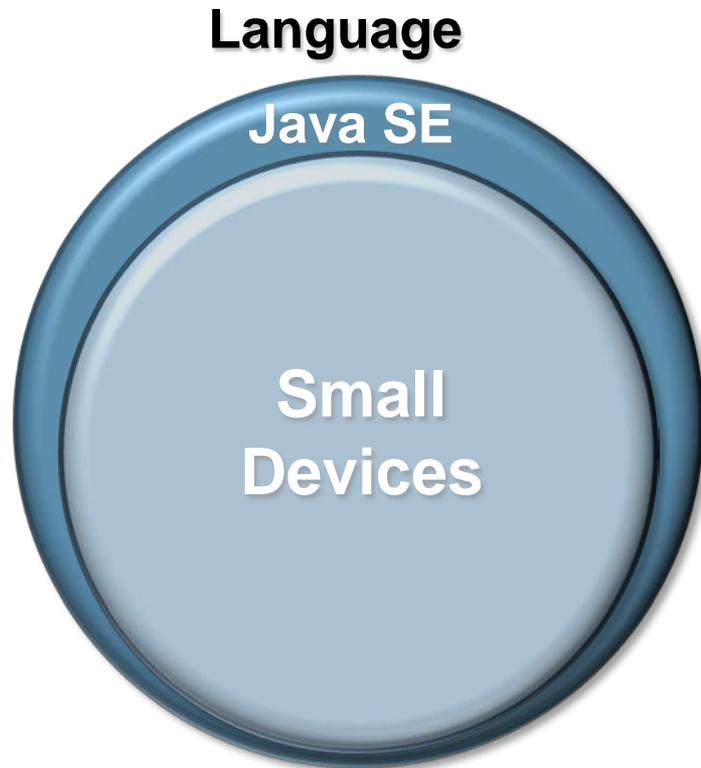
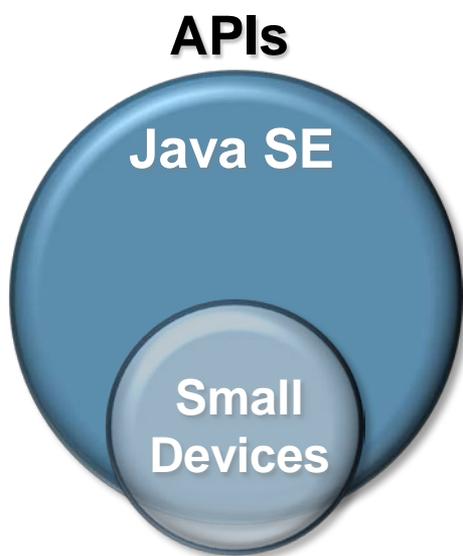
## APIs



## Language



# Beyond Java 8



# Stripped Implementations

New in Java ME 8 and Java SE 8

- Use cases: IoT devices and App Store deployments
- Users will be permitted to bundle an application with a subset of Java SE or Java ME, removing all unused portions for the smallest possible size
- Licensees must still ship complete and compatible implementations
- Changes to licensing terms and/or TCK Rules will be needed to ensure that end users creating stripped implementations do not fragment the platform or introduce incompatibilities
- The details are still being worked out - we will keep you informed

# Requirements on Stripped Implementations

- Must be derived from a complete compatible implementation
- Cannot be changed once created
- Must be "closed" (not expose APIs - cannot load new code)
- Must function identically to the pre-stripped application

# Future direction

- Unify language between ME/SE completely (if possible)
- Modularity in SE 9 & OSGi interop
- Investigate Java for smaller form factors (extreme low power sensors)
- Functionality for IoT
  - CoAP, DTLS (ARM)
  - MQTT (IBM)
  - Device I/O API (Oracle)
  - Update to sensor, bluetooth, USB, location, ...?

# Questions (for another day?)

- **Oracle's** current path
  - Java ME/SE and supportive functionality in JCP
  - OSGi as “large embedded” app container
  - Follow protocol/interop work in other standards bodies
  - Industry specific standards in industry alliance groups (HGI)
- Do you agree with this structure? Would you prefer another?
- What is your view on Java as an IoT “device platform”? Do you support it? Prefer another solution? If so, which one and why?
- What would you like to contribute?