Course Name:
Advanced Java

Lecture 1
Topics to be covered

- History
- Introduction to Java
- Characteristics of Java
- Data types

What is Java?

- An Object-Oriented Programming Language developed at Sun Microsystems
- A Virtual Machine (run-time environment) that can be embedded in web browsers (e.g. Netscape Navigator, Microsoft Internet Explorer and IBM WebExplorer) and operating systems.
- A set of standardized Class libraries (packages), that support:
  - Creating graphical user interfaces
  - Communicating over networks
  - Controlling multimedia data

History

- James Gosling and Sun Microsystems
- Oak
- Java, May 20, 1995, Sun World
- HotJava
  - The first Java-enabled Web browser
- JDK Evolutions
- J2SE, J2ME, and J2EE

Characteristics of Java

- Java is simple
- Object-Oriented
- Distributed
- Interpreted
- Robust
- Secure
- Architecture-neutral
- Portable
- High-performance
- Multithreaded
- dynamic

Java is Simple

- Java is not just a language for use with the Internet.
- It is a full featured Object-Oriented Programming Language (OOPL).
- Java is a bit easier than the popular OOP language C++.
- Java uses automatic memory allocation and garbage collection.

What is Object-Oriented Programming?

- Think of OOP as a set of implementation techniques that
  - Can be done in any programming language
  - Are very difficult to do in most programming languages
  - OOP provides great flexibility, modularity, and reusability.

Java is Distributed

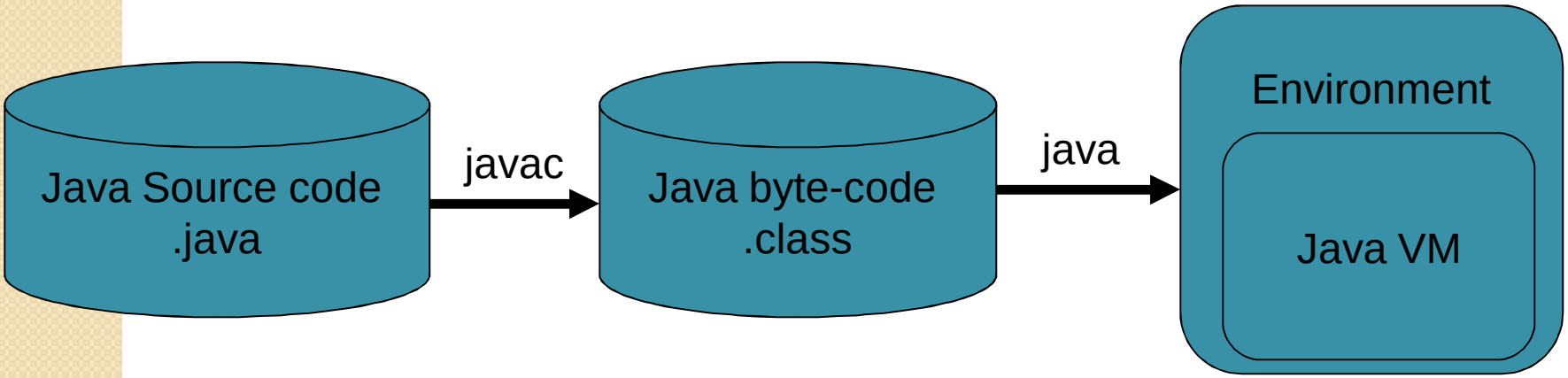
- Distributed computing involves several computers working together on a network.
- Java's concurrency features make is unique for developing many interactive and networked applications.

Java is Interpreted

- Java Virtual Machine:
  - Java is compiled to byte-codes whose target architecture is the Java Virtual machine (JVM).
  - The virtual machine is embeddable within other environments, e.g. web browser and operating systems.
  - Utilize a byte-code verifier when reading in byte-codes. The class loader is employed for “classes” loaded over the network (enhances security)

Java Virtual Machine

- JVM



Java is Robust

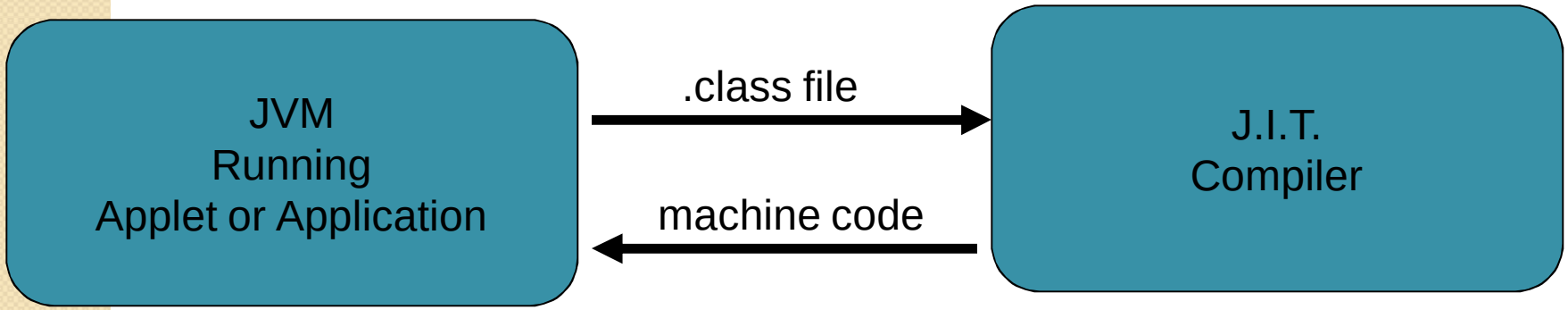
- Robust means reliable.
- No programming language can ensure complete reliability.
- Java puts a lot of emphasis on early checking for possible errors, because Java compilers can detect many problems that would first show up at execution time in other languages.
- Java has a runtime exception-handling feature to provide programming support for robustness.

Java Is Architecture-Neutral

- Java is interpreted.
- JIT compiler
  - Just-in-time compilers
  - This provides
    - Improved performance
    - Better match to specific hardware

JIT Compiler

- JIT- takes byte-codes and change it to machine code.

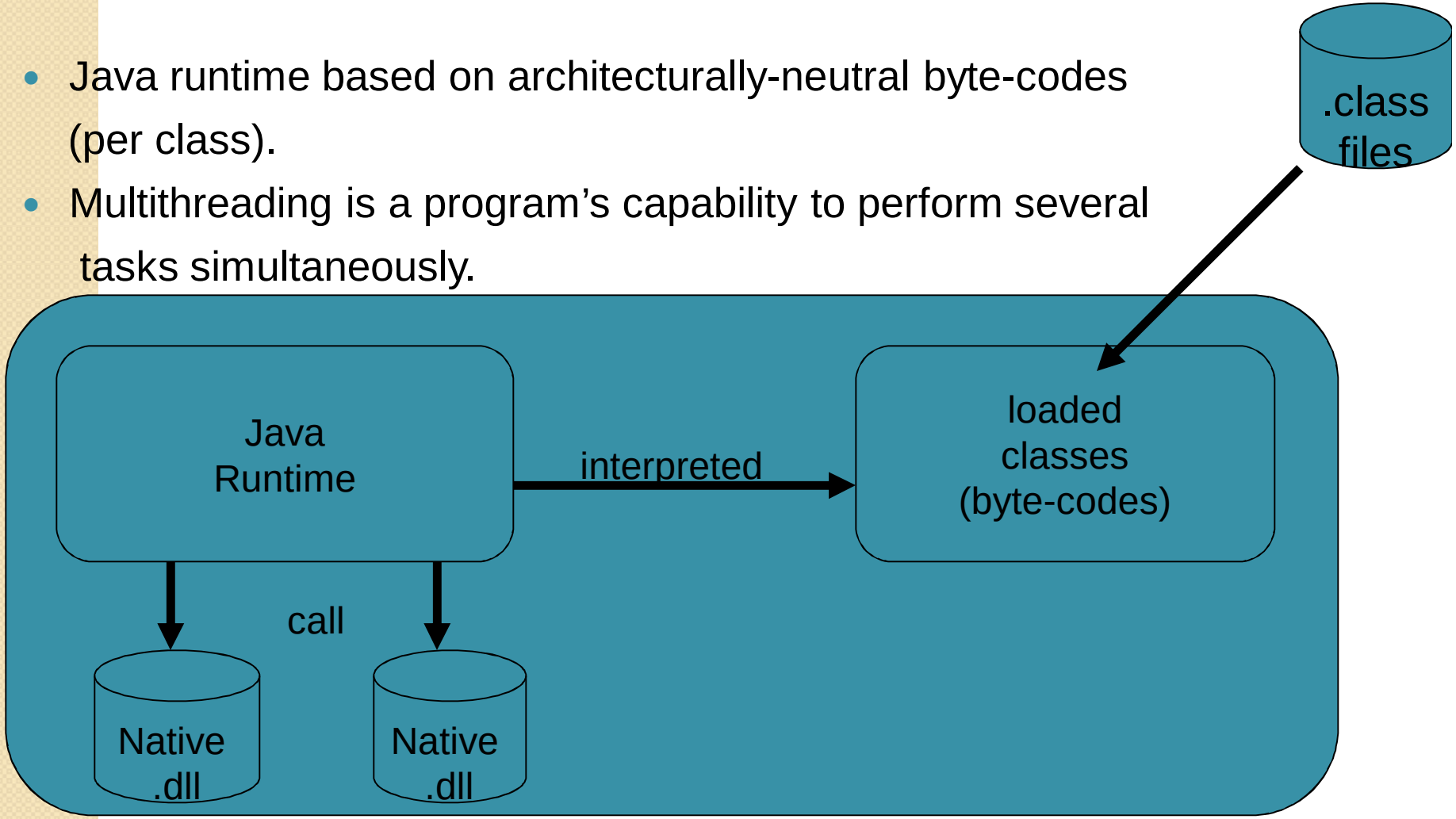


JIT Compiler

- Because of the need for architecture independence, performance tuning must be performed on the client-side.
- This client-side compilation is known as Just-In-Time (JIT) compilation.

Portable, Dynamic, Multithreaded, and Extensible

- Java runtime based on architecturally-neutral byte-codes (per class).
- Multithreading is a program's capability to perform several tasks simultaneously.



Advantages

- Byte-code is a compact machine language form. In Java the target machine is the Java Virtual Machine (VM).
- These byte-codes are thus portable across architecture boundaries.
- Applets and Applications have “class” files loaded on their behalf in order to execute.

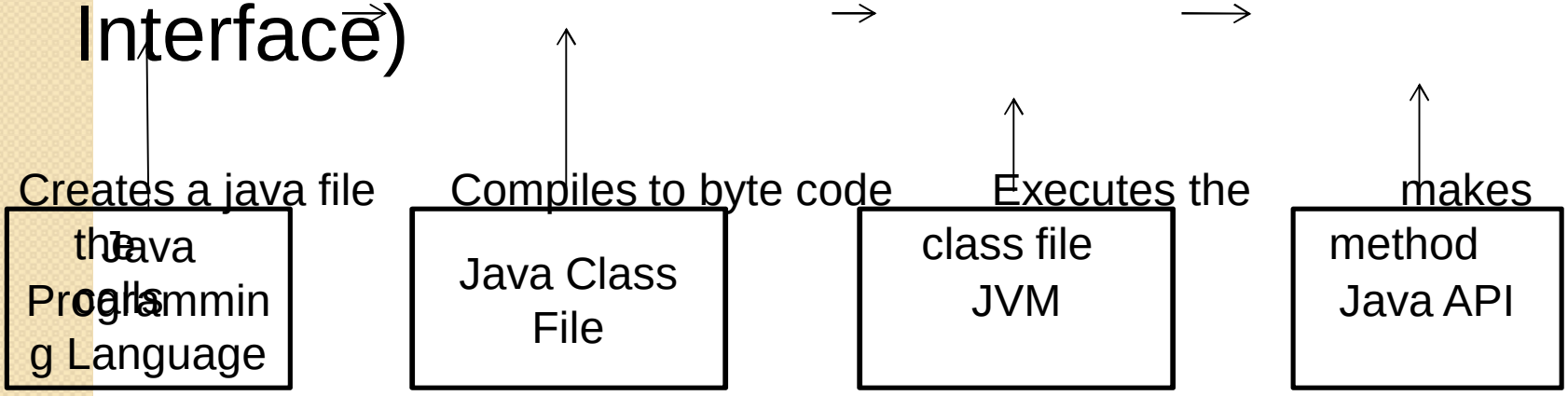
JDK Editions

- Java Standard Edition (J2SE)
  - J2SE can be used to develop client-side standalone applications or applets.
- Java Enterprise Edition (J2EE)
  - J2EE can be used to develop server-side applications such as Java servlets and Java ServerPages.
- Java Micro Edition (J2ME).
  - J2ME can be used to develop applications for mobile devices such as cell phones.

Java Architecture

Java Architecture consists of four components:

- Java programming language
- Java class file
- JVM(Java Virtual Machine)
- Java API(Application programming Interface)



Data Types

The data that is stored in memory can be of many types.

Data types in java can be classified into two categories:

- Primitive
- Reference

Primitive Data types

Primitive data types can further be divided into four categories:

- Numeric

  Byte, int, short, long

- Fractional

  Float, double

- Character
- Boolean

Reference Data type

When we create an object, we need to store the reference of that object in some variable and that variable is called reference variable and the data type for that variable is called reference data type.