Java

rudalson@gmail.com

Table Of Contents

Coding Convention

- Indentation
  - Tab VS Space ?
  - 2 VS 4 VS 8 ?
- Brace location
  - Next VS Current ?
- 변수 명
- Eclipse formatter 부터

Java 7

- Project Coin
- JDK 7 In Action - Learn With Java Tutorials and Developer Guides
- Using New Core Platform Features In Real Code

The Six Coin Features and How They help

- Consistency and clarity
  - 1. Improved literals
  - 2. Strings in switch
- Easier to use generics
  - 3. SafeVarargs (removing varargs warnings)
  - 4. Diamond
- More concise error handling
  - 5. Multi-catch and precise rethrow
  - 6. Try-with-resources

Integral Binary Literals

```
// An 8-bit 'byte' value:
byte aByte = (byte)0b00100001;

// A 16-bit 'short' value:
short aShort = (short)0b1010000101000101;

// Some 32-bit 'int' values:
int anInt1 = 0b10100001010001011010000101000101;
int anInt3 = 0B101; // The B can be upper or lower case.

// A 64-bit 'long' value. Note the "L" suffix:
long aLong =
0b1010000101000101101000010100010110100001010001011010000101000101L;
```

Underscores in Literals

```
long creditCardNumber = 1234_5678_9012_3456L;
long socialSecurityNumber = 999_99_9999L;

long hexWords = 0xCAFE_BABE;
long maxLong = 0x7fff_ffff_ffff_ffffL;

byte nybbles = 0b0010_0101;
long bytes = 0b11010010_01101001_10010100_10010010;
```

```
// Courtesy Josh Bloch
int bond =
        0000_____0000_____00000000000000__00000000000000000+
      00000000_____00000000_____00000000000000__00000000000000000+
     000____000_____000____000_____000_____0000__00_____0+
    000_____000_____000_____000_____________0000___00_____0+
   0000_____0000___0000_____0000_____________0000_____0_____0+
   0000_____0000___0000_____0000_____________0000_____________0+
   0000_____0000___0000_____0000_____________000+__0000000000+
   0000_____0000___0000_____0000_____________0000+
    000_____000_____000_____000_____________0000+
     000____000_____000____000_____________00000+
      00000000_____00000000_____0000000+
        0000_____0000_____000000007;
```

Strings in switch Statements

```
public String getTypeOfDayWithSwitchStatement(String dayOfWeekArg) {
    String typeOfDay;
    switch (dayOfWeekArg) {
       case "Monday":
          typeOfDay = "Start of work week";
          break;
       case "Tuesday":
       case "Wednesday":
       case "Thursday":
          typeOfDay = "Midweek";
          break;
       case "Friday":
          typeOfDay = "End of work week";
          break;
       case "Saturday":
       case "Sunday":
          typeOfDay = "Weekend";
          break;
       default:
          throw new IllegalArgumentException("Invalid day of the week: " + dayOfWeekArg);
    }
    return typeOfDay;
}
```

Strings in switch Statements

What is there to discuss?

- What does switching on a null do? ***(NullPointerException)***
- Can null be a case label? ***(No.)***
- Case-insensitive comparisons? ***(No.)***
- Implementation
  - relies on a particular algorithm be used for String.hashCode
  - on average faster than if-else chain with >3 cases

Safe Varargs

아 몰랑 ~

Diamond <>

```
Set<List<String>> setOfLists = new HashSet<List<String>>();

Set<List<String>> setOfLists = new HashSet<>();
```

Diamond Use

- **Assignment Statement**
  - List<Map<String,Integer>> listOfMaps;
    …
    listOfMaps = new ArrayList<>();
- **Return Statement**
  - public Set<Map<BigInteger,BigInteger>> compute() {
  - …
  - return new Set<>();
  - }

Multi-Catch and Precise Rethrow

- Multi-catch:
  - ability to catch multiple exception types in a single catch clause

```
try {
    ...
} catch (FirstException | SecondException) { ... }
```

- Precise rethrow:
  - change in can-throw analysis of a catch clause

The try-with-resources Statement

```
private List<String> readFile(String fileName) {
        List<String> lines = new ArrayList<String>();
        BufferedReader reader = null;
        try {
                reader = new BufferedReader(new FileReader(fileName));
                String line;
                while ((line = reader.readLine()) != null) {
                        lines.add(line);
                }
        } catch (FileNotFoundException ex) {
                ex.printStackTrace();
        } catch (IOException ex) {
                ex.printStackTrace();
        } finally {
                try {
                        if (reader != null) {
                                reader.close();
                        }
                } catch (IOException e) {
                        // 이건..... 쫍...
                }
        }
        return lines;
}
```

The try-with-resources Statement

```
static String readFirstLineFromFile(String path) throws IOException {
  try (BufferedReader br = new BufferedReader(new FileReader(path))) {
    return br.readLine();
  }
}
```

Prior to Java SE 7

```
static String readFirstLineFromFileWithFinallyBlock(String path) throws IOException {
  BufferedReader br = new BufferedReader(new FileReader(path));
  try {
    return br.readLine();
  } finally {
    if (br != null) br.close();
  }
}
```

NIO.2 File System API

Background and Motivation

The platform was long overdue something better than java.io.File

- Doesn’t work consistently across platforms
- Lack of useful exceptions when a file operation fails
- Missing basic operations, no file copy, move, ...
- Limited support for symbolic links
- Very limited support for file attributes
- No bulk access to file attributes
- Badly missing features that many applications require
- No way to plug-in other file system implementations

New File System API

- Path – used to locate a file in a file system
- Files – defines static methods to operate on files, directories and other types of files
- FileSystem
  - Provides a handle to a file system
  - Factory for objects that access the file system
  - FileSystems.getDefault returs a reference to the default FileSystem
- FileStore – the underlying storage/volume

```
public class Test {

    public static void main(String[] args) {
            FileSystem fileSystem = FileSystems.getDefault();
            FileSystemProvider provider = fileSystem.provider();

            System.out.println("Provider: " + provider.toString());
            System.out.println("Open: " + fileSystem.isOpen());
            System.out.println("Read Only: " + fileSystem.isReadOnly());

            Iterable<Path> rootDirectories = fileSystem.getRootDirectories();
            System.out.println();
            System.out.println("Root Directories");
            for (Path path : rootDirectories) {
                    System.out.println(path);
            }

            Iterable<FileStore> fileStores = fileSystem.getFileStores();
            System.out.println();
            System.out.println("File Stores");
            for (FileStore fileStore : fileStores) {
                    System.out.println(fileStore.name());
            }
    }
}
```

```
Provider: sun.nio.fs.WindowsFileSystemProvider@1db9742
Open: true
Read Only: false

Root Directories
C:\
D:\
E:\
F:\
G:\
H:\
I:\

File Stores

ssd1
ssd2
data
ssd3
Samsung1TB
```

```java
public class FileSystemExampleV {
	public static void main(String[] args) throws Exception {
		FileSystem fileSystem = FileSystems.getDefault();

		for (FileStore store : fileSystem.getFileStores()) {
			System.out.println("드라이버명: " + store.name());
			System.out.println("파일시스템: " + store.type());
			System.out.println("전체 공간: " + store.getTotalSpace() + " 바이트");
			System.out.println("사용 중인 공간: " + (store.getTotalSpace() - store.getUnallocatedSpace()) + " 바이트");
			System.out.println("사용 가능한 공간: " + (store.getTotalSpace() - store.getUsableSpace()) + " 바이트");
			System.out.println();
		}

		System.out.println("파일 구분자: " + fileSystem.getSeparator());
		System.out.println();

		for (Path path : fileSystem.getRootDirectories()) {
			System.out.println(path.toString());
		}
	}
}
```

```
사용 중인 공간: 114883612672 바이
사용 가능한 공간: 114883612672 바

드라이버명: ssd1
파일시스템: NTFS
전체 공간: 256058060800 바이트
사용 중인 공간: 193507590144 바이
사용 가능한 공간: 193507590144 바

드라이버명: ssd2
파일시스템: NTFS
전체 공간: 256058060800 바이트
사용 중인 공간: 114384744448 바이
사용 가능한 공간: 114384744448 바

드라이버명: data
파일시스템: NTFS
전체 공간: 2000396742656 바이트
사용 중인 공간: 953533616128 바이
사용 가능한 공간: 953533616128 바

드라이버명: ssd3
파일시스템: NTFS
전체 공간: 500104687616 바이트
사용 중인 공간: 239441858560 바이
사용 가능한 공간: 239441858560 바

드라이버명: Samsung1TB
파일시스템: NTFS
전체 공간: 1000194011136 바이트
사용 중인 공간: 841152049152 바이
사용 가능한 공간: 841152049152 바

파일 구분자: \

C:\
D:\
E:\
F:\
G:\
H:\
I:\
```

Java 8

- What's New in JDK 8
  - Lambda
    - Default Methods
    - Optional
    - Type Annotation
  - Nashorn
  - Concurrency
    - Stamped Lock
    - Concurrent Addr
    - Parallel Sorting
  - 그리고 그 외?
    - New Date API
    - OS Process Control

JVM Language

- Java
- Scala
  - Play, Akka
- Clojure
- Groovy
  - Grails, Gradle
- JRuby
- Jython
- Kotlin
  - Jetbrain

CLR

- C#
- Visual Basic
- F#
- Iron Python
- Iron Ruby
- Power Shell
- Java
  - J#

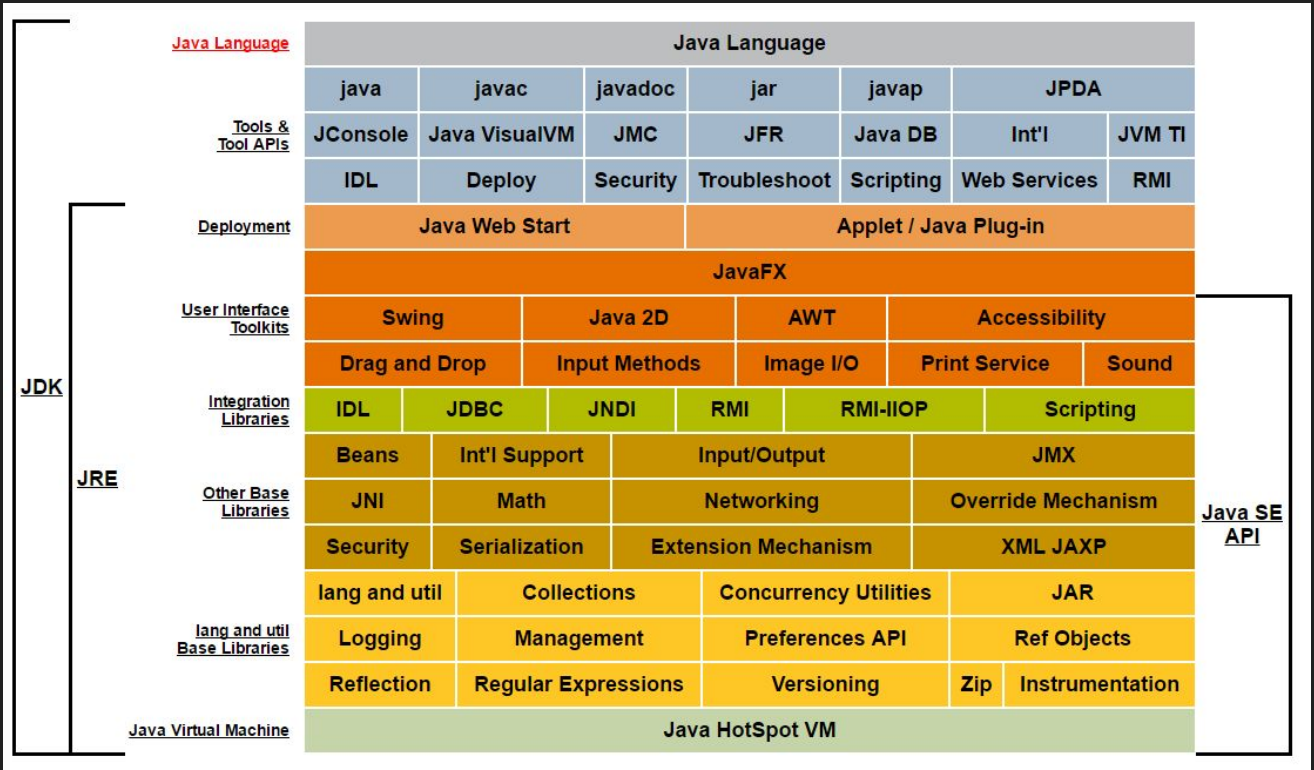
그 외

- C/C++
- Java Script
- Go
- Haskell
- OCaml
- Erlang
- Swift
- Dart
- Type Script

앞으로...

- 함수 패러다임
- 메타 프로그래밍
- Concurrent 프로그래밍

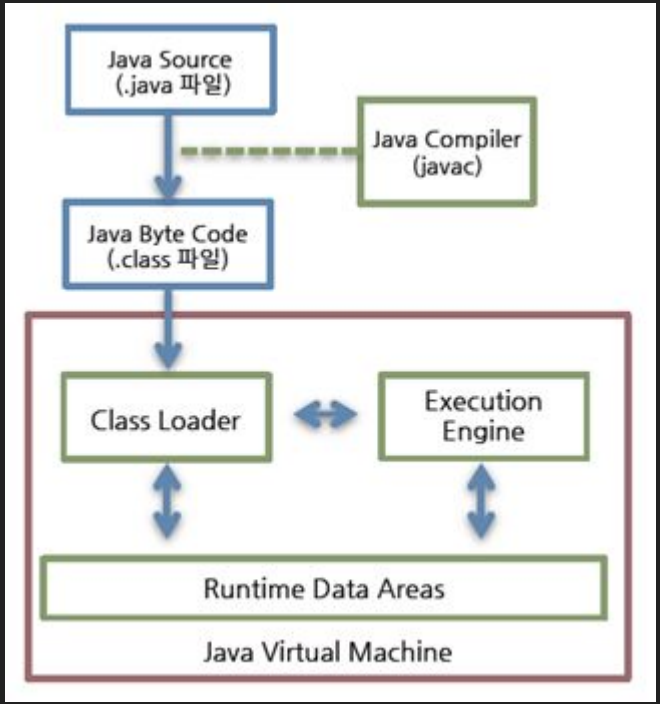
Description of Java Conceptual Diagram



JVM

- 스택 기반의 가상 머신 (NOT Register 기반)
  - Dalvik VM은???
- 심볼릭 레퍼런스(NOT Address 기반)
- 가비지 컬렉션
- 기본 자료형을 명확하게 정의해 플랫폼 독립성 보장
- 네트워크 바이트 순서
  - Little endian vs Big endian

JVM 구조


Java Source
(.java 파일)
Java Compiler
(javac)
Java Byte Code
(.class 파일)
Class Loader
Execution
Engine
Runtime Data Areas
Java Virtual Machine

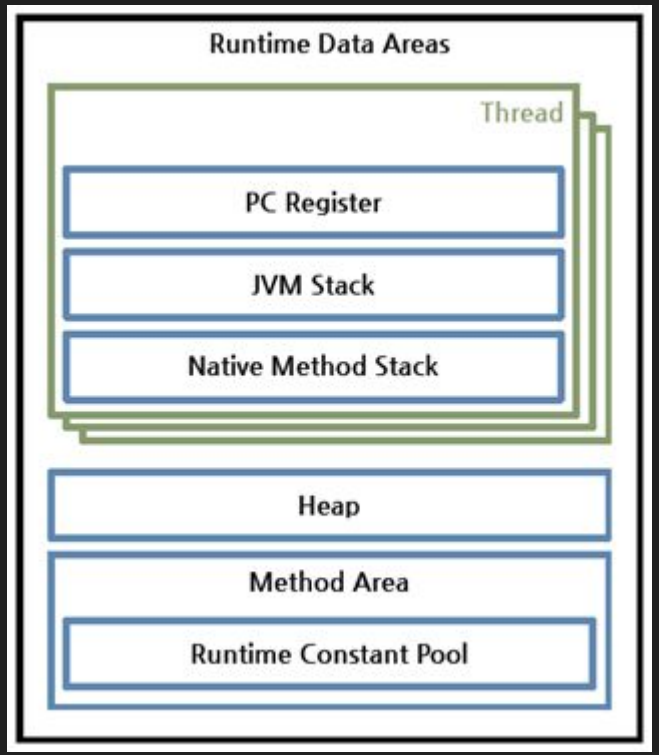
Java Byte Code

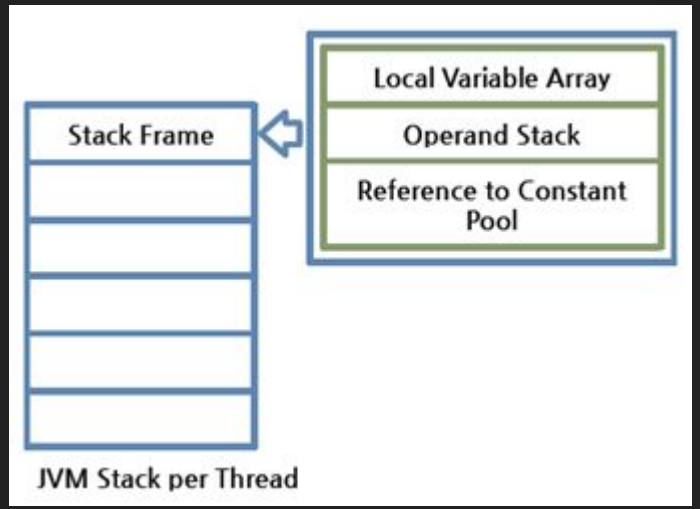
```
public void add(java.lang.String);
    Code:
            0: aload_0
            1: getfield #15;  // Field admin:Lcom.mantech.mccs/user/UserAdmin;
            4: aload_1
            5: invokevirtual #23;       // Method com/mantech/mccs/user/UserAdmin.addUser:(Ljava/lang/String;)Lcom/mantech.mccs/user/User;
            8: pop
            9: return
```

```
aload_0             = 0x2a
getfield            = 0xb4
aload_1             = 0x2b
invokevirtual       = 0xb6
```

```
2a b4 00 0f 2b b6 00 17 57 b1
```

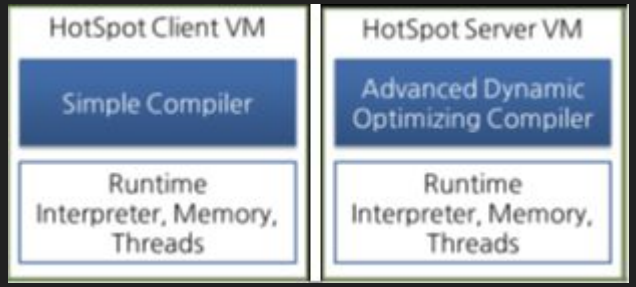
Runtime Data Areas

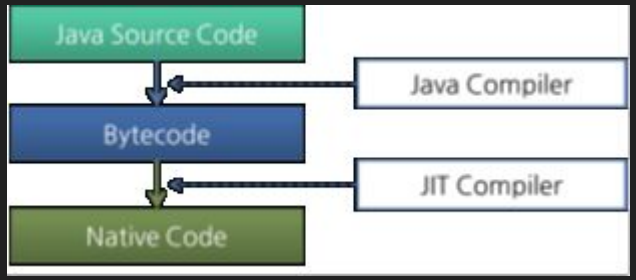


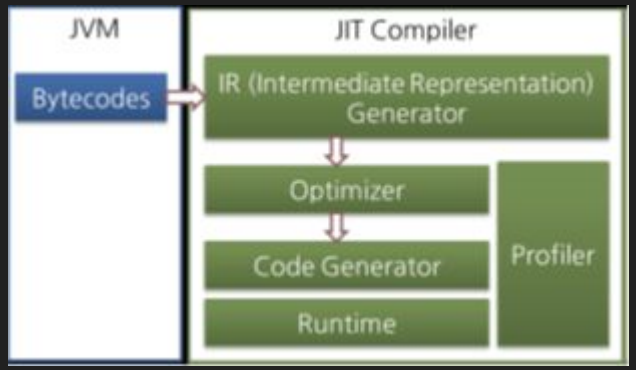


Execution Engine

- Interpreter
- JIT(Just In Time)
- Oracle hotspot VM
  - From JDK 1.3 ~
  - Dalvik VM from Android 2.2 ~
- IBM AOT(Ahead-Of-Time)
  - From JDK6

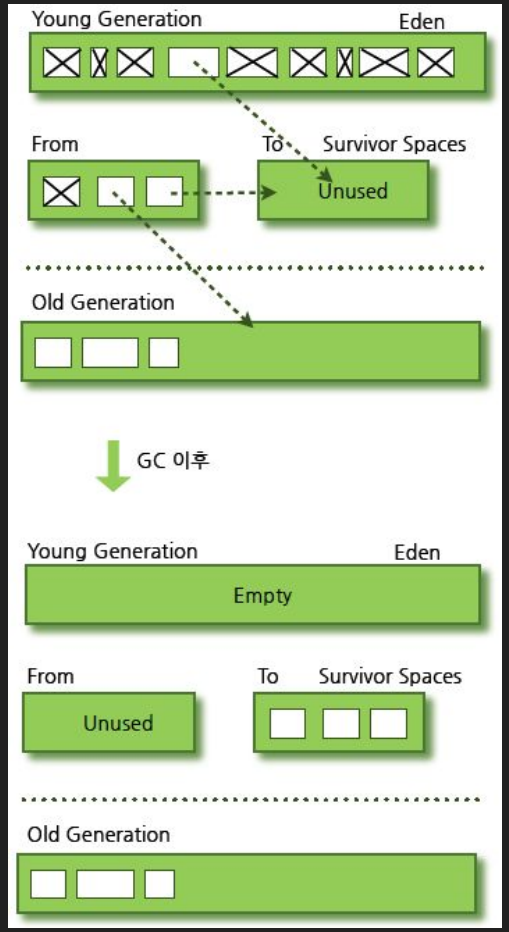






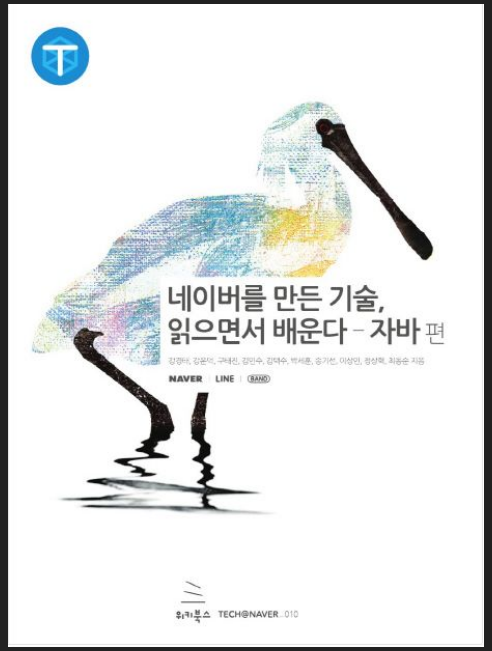
Garbage Collection

- “stop-the-world”
- Young Generation
  - Eden
  - Survivor(2개)
- Old Generation (JDK 7)
  - Serial GC
  - Parallel GC
  - Parallel Old GC(Parallel Compacting GC)
  - Concurrent Mark & Sweep GC
  - G1(Garbage First) GC



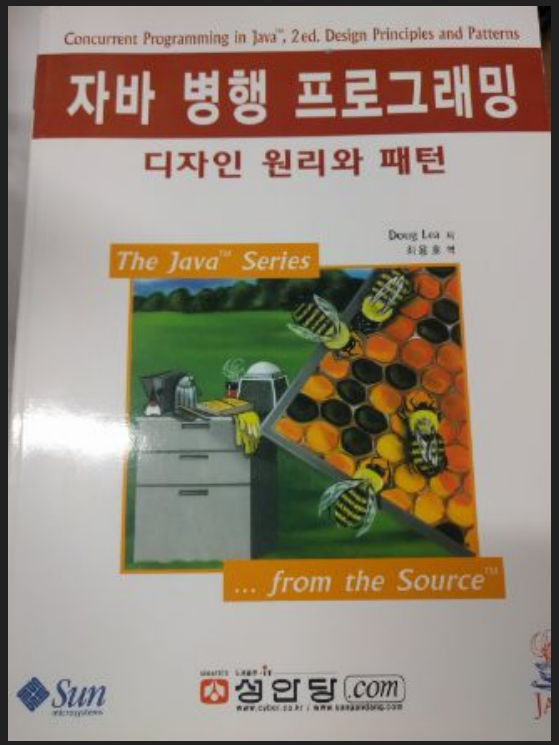
And more...

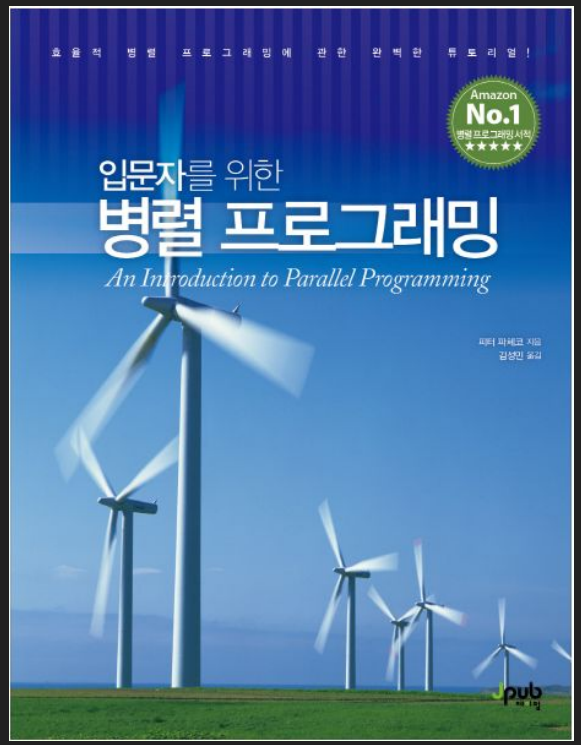
- BTrace
-



Multithread

Concurrent VS Parallel

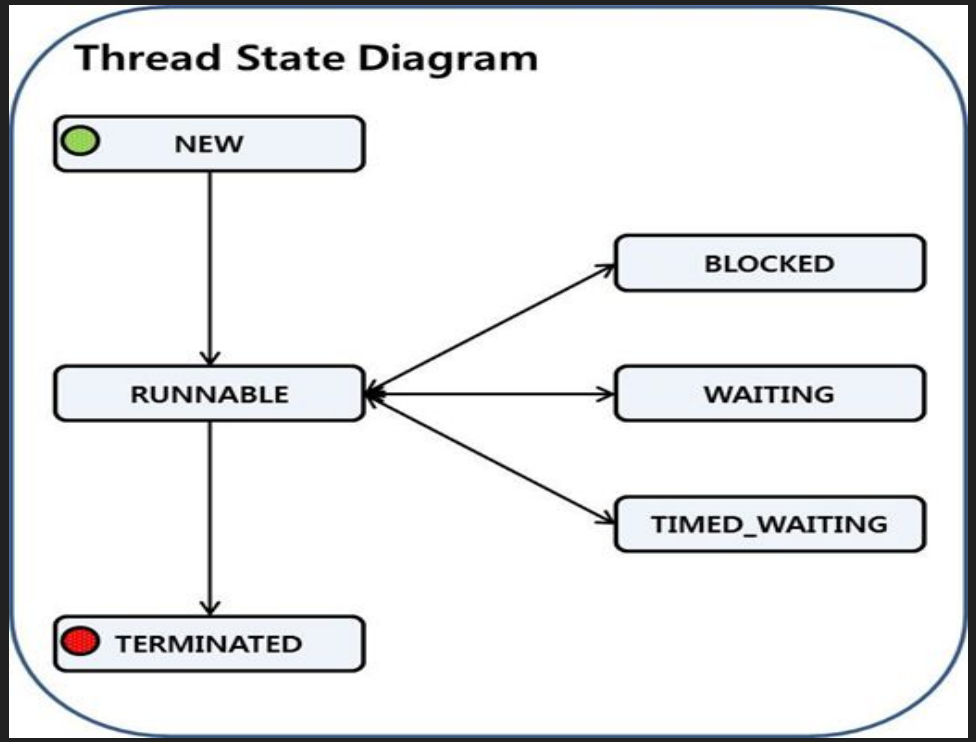




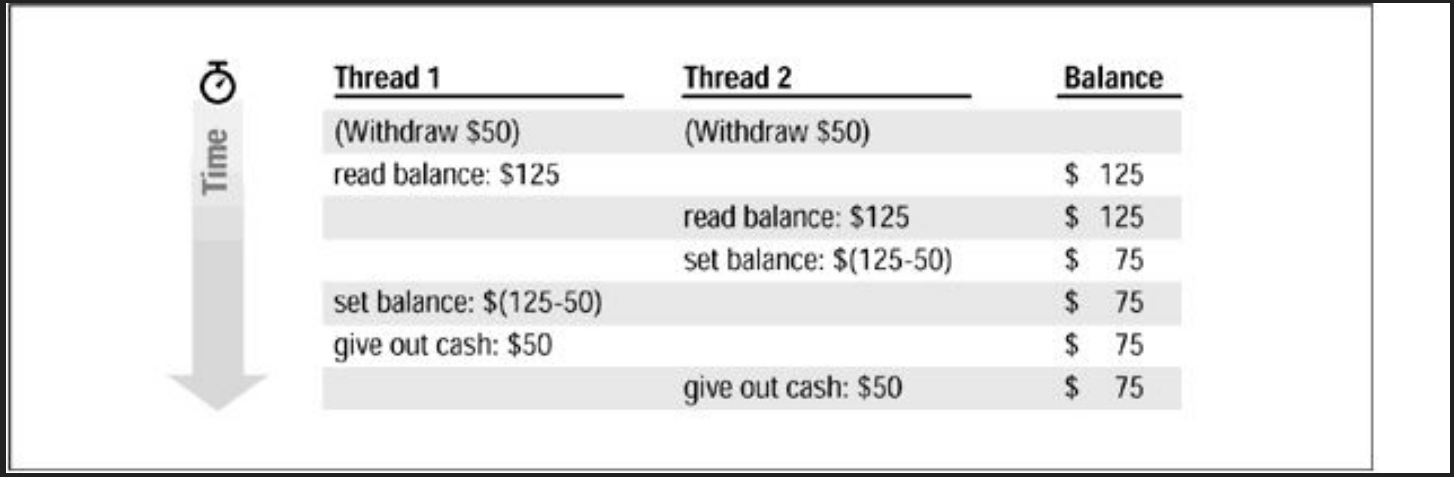
Java Thread

스레드 상태

- NEW
- RUNNABLE
  - BLOCKED
  - WAITING
  - TIMED_WAITING
- TERMINATED



Race condition



Thread 1	Thread 2	Balance
(Withdraw $50)	(Withdraw $50)	
read balance: $125		$ 125
	read balance: $125	$ 125
	set balance: $(125-50)	$ 75
set balance: $(125-50)		$ 75
give out cash: $50		$ 75
	give out cash: $50	$ 75

Monitor

- Muitual exclusion
  - acquire
  - release
- Synchronized

synchronized instance

```
synchronized void method() {
        …
}

void method() {
        synchronized (this) {
                …
        }
}
```

synchronized class

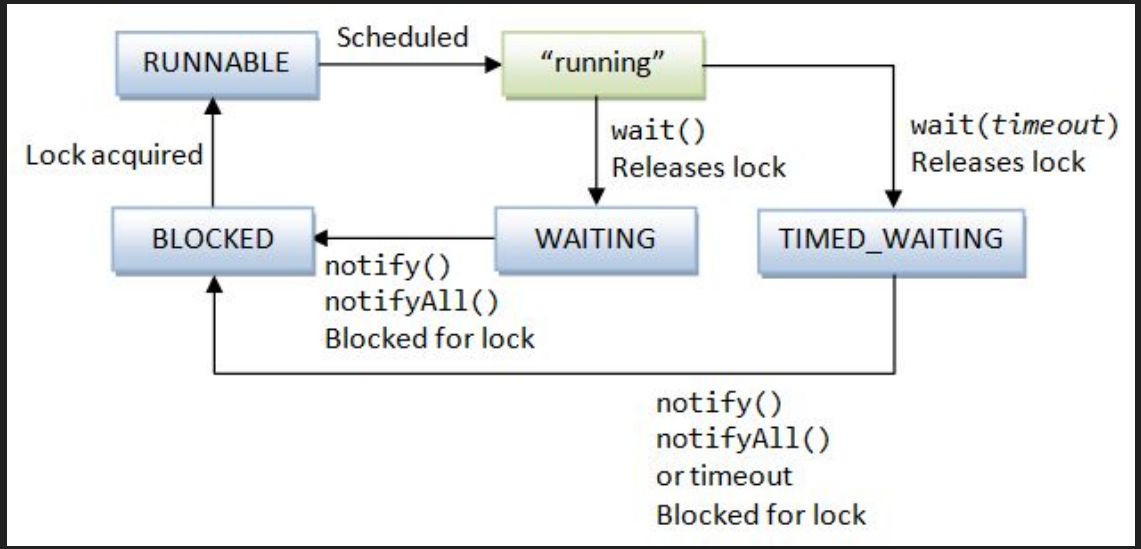
```
class Something {
        static synchronized void method() {
                …
        }
}

class Something {
        static void method() {
                synchronized (Something.class) {
                        …
                }
        }
}
```

Synchronized?

```
public synchronized void setName(String name) {
        this.name = name;
}

public synchronized void setAddress(String address) {
        this.address = address;
}
```

쓰레드 협조

- wait
- notify/notifyAll



volatile?

“***visibility***를 확보하기 위해 ***barrier reordering*** 을 한다.”

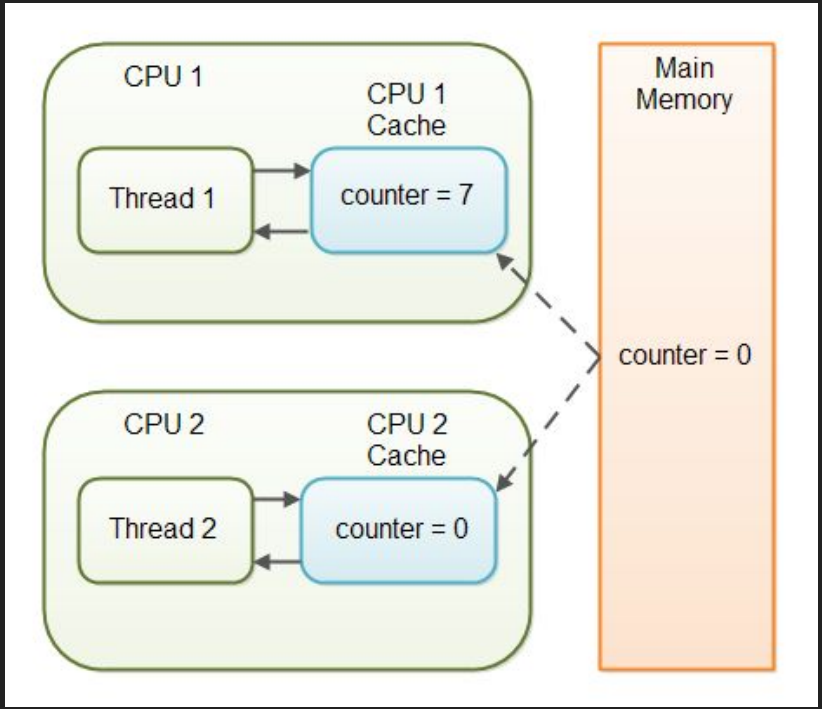
Reorder

```
class Something {
	private int x = 0;
	private int y = 0;

	public void write() {
		x = 100;
		y = 50;
	}

	public void read() {
		if (x < y) {
			System.out.println("x < y");
		}
	}
}
```

```
public class Reorder {

	public static void main(String[] args) {
		final Something obj = new Something();

		new Thread() {  // Thread A
			public void run() {
				obj.write();
			}
		}.start();

		new Thread() {  // Thread B
			public void run() {
				obj.read();
			}
		}.start();
	}
}
```

x < y가 출력될 수 있을까?

Visibility


CPU 1
CPU 1
Cache
Thread 1
counter = 7
Main
Memory
counter = 0
CPU 2
CPU 2
Cache
Thread 2
counter = 0

volatile

java의 volatile은 2가지 기능

1. 변수의 동기화
2. long, double 을 atomic 단위 취급