Nesneye Yönelik Programlam
BLM2012

Öğr. Grv. Furkan ÇAKMAK

Ders Tanıtım Formu ve Konular

BLM2012 Nesneye Yönelik Programlama Hafta 12

Hafta	Tarih	Konular
1	01.03.2022	Dersin ve Java Dilinin Genel Tanıtımı, Sınıflar, Nesneler, Üyeler, Final ve Static Kavramları
2	08.03.2022	UML Sınıf Şemaları, Kurucular ve Sonlandırıcılar, Denetim Akışı, Nesneleri Oluşturulması
3	15.03.2022	Kurucuların ve Metotların Çoklu Tanımlanması, İlkeller, String ve Math Sınıfları
4	22.03.2022	Sahiplik ve Kullanma İlişkileri, Tek Yönlü ve İki Yönlü Sahiplik Kavramları
5	29.03.2022	Kalıtım, Metotların Yeniden Tanımlanması ve Çoklu Metot Tanımlamadan Farkı
6	05.04.2022	NYP'da Özel Konular: Abstract Classes, Interfaces, Enum Sınıfları
7	12.04.2022	Exception Handling, Unit Test
8	21.04.2022	1. Ara Sınav (10:00-12:00)
9	26.04.2022	Temel Veri Yapılarının Jenerik Sınıflar Eşliğinde Kullanımı (Liste ve Eşleme Yapıları).
10	03.05.2022	Ramazan Bayramı
11	10.05.2022	Tip dönüşümü, Dosyalar ve Akışlar ile Çalışmak (Serileştirme ve Ters İşlemi), İç Sınıflar
12	17.05.2022	Paralel Programlamaya Giriş - Multithreading
13	24.05.2022	2. Ara Sınav
14	31.05.2022	GUI (Graphical User Interface) Kavramlarına Giriş

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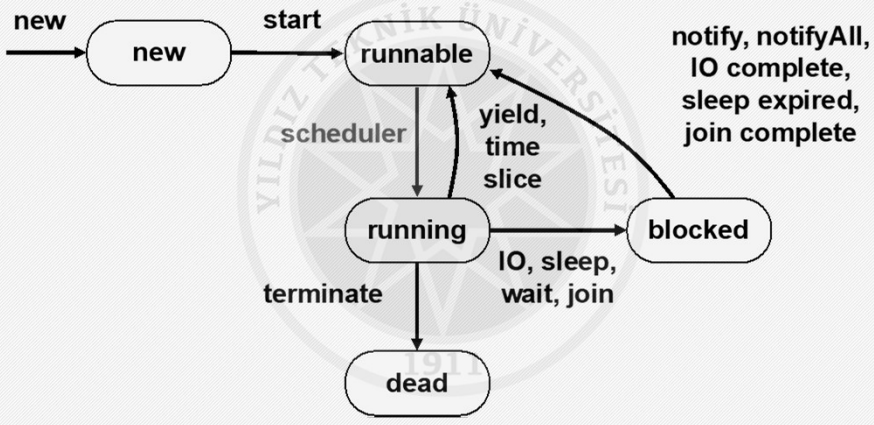
MULTITHREADING

- Multitasking, multiple processes and multithreading:
  - Multitasking is the ability to have more than one program working at the same time.
  - Nowadays, you are likely to have a computer with its CPU having multiple cores.
  - Each core can execute one or more tasks, i.e. processes, depending on the CPU architecture.
  - A process can sometimes be divided into threads that may run in parallel, i.e. concurrently running sub-processes.
    - If there are enough hardware resources, i.e. cores, the time it takes to complete a process will drop significantly.
    - However, this increase in the performance will not be in the order of the available cores.
      - The concurrently running threads will sooner or later need to synchronize with each other.
      - Moreover, creating a process or a thread takes some execution time as well.

MULTITHREADING (CON'T)



MULTITHREADING (CON'T)

- How should a thread wait?
  - If a thread is unable to continue its task because of an obstacle, that thread should wait until the obstacle has been removed.
    - Obstacle: The needed information has not arrived from the network, another thread, the user, etc.
  - You should not do "busy waiting", i.e. executing dummy instructions such as running empty loops for 10.000 times.
  - Instead, you should put that thread into the blocked state by using the sleep command.
  - A sleeping thread, unlike a busy waiting one, does not consume system resources.
  - A sleeping thread is at risk of becoming unable to awake.
    - You must catch the java.lang.InterruptedException, which is a checked exception.

MULTITHREADING (CON'T)

- Procedure for running a task in a separate thread:
  1. Place the code for the task into the run method of a class that implements the Runnable interface.
  2. Create an object of your class
  3. Create a Thread object from the Runnable
  4. Start the thread by using Thread.start method (do not call the run method directly)
- Do not code your own threads by inheriting from the Thread class.
  - Otherwise you will lay your only inheritance right to waste.
- Let's make a demonstration with a nonsense application about people watching a match:
  - Each person will shout for the team they support when he or she becomes excited.
  - There is a possibility for each person to become excited in 0-1000 ms.
  - Each person become exhausted after shouting 10 times.

MULTITHREADING (CON'T)


```
package nyp14a;
import java.util.Random;

public class SoccerFan implements Runnable {
        public final static int STEPS = 10;
        public final static int DELAY = 1000;
        private String teamName, shoutPhrase;

        public SoccerFan( String teamName, String shoutPhrase ) {
                this.teamName = teamName;
                this.shoutPhrase = shoutPhrase;
        }

        public void run() {
                Random generator = new Random();
                try {
                        for( int i = 0; i < STEPS; i++ ) {
                                System.out.println( teamName + " " + shoutPhrase );
                                Thread.sleep( generator.nextInt(DELAY) );
                        }
                }
                catch (InterruptedException e) {
                        e.printStackTrace();
                }
        }
}
```


MULTITHREADING (CON'T)

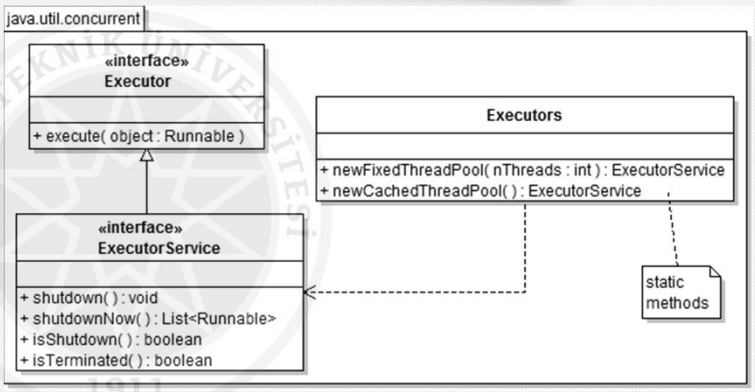

```
package nyp14a;

public class Match {
        public static void main(String[] args) {
                Thread aThread;
                aThread = new Thread( new SoccerFan("G.S.", "Rulez!") );
                aThread.start( );
                aThread = new Thread( new SoccerFan("G.S.", "is the champ!") );
                aThread.start( );
                aThread = new Thread( new SoccerFan("F.B.", "is no.1!") );
                aThread.start( );
                aThread = new Thread( new SoccerFan("F.B.", "is the best!") );
                aThread.start( );
        }

}
```

MULTITHREADING (CON'T)

- Thread pools:
  - Running a small number of tasks in separate threads is acceptable.
  - But do not forget that actual processing units in a typical CPU is rather low, and creating a thread has also a processing cost.
  - Therefore, if you are to execute a large number of tasks, you should use a thread pool instead.
  - Java provides the following interfaces and classes for this purpose:



MULTITHREADING (CON'T)

- java.util.concurrent.ExecutorService:
  - public void shutdown( ) :
    - Shuts down the executor, but allows the tasks currently in the pool to be completed. New threads are not accepted to the pool.
    - We need to use this method for a safe ending.
  - public List<Runnable> shutdownNow( )
    - Shuts down immediately, stops the unfinished threads and returns them in a list.
  - public boolean isShutdown( ):
    - Returns true if the executor is shut down.
  - public boolean isTerminated( ):
    - Returns true if all the tasks in the pool are terminated.
    - Can be used in the main method for waiting the threads to be finished

MULTITHREADING (CON'T)

- java.util.concurrent.Executor:
  - public void execute(Runnable object): Executes the given task
- java.util.concurrent.Executors:
  - public static ExecutorService newFixedThreadPool(nThreads : int)
    - Creates a thread pool that reuses a fixed number of threads
  - public static ExecutorService newCachedThreadPool( )
    - Creates a thread pool that creates new threads as needed, but will reuse previously constructed threads when they are available

MULTITHREADING (CON'T)

- IDE'den gösterim yapalım.

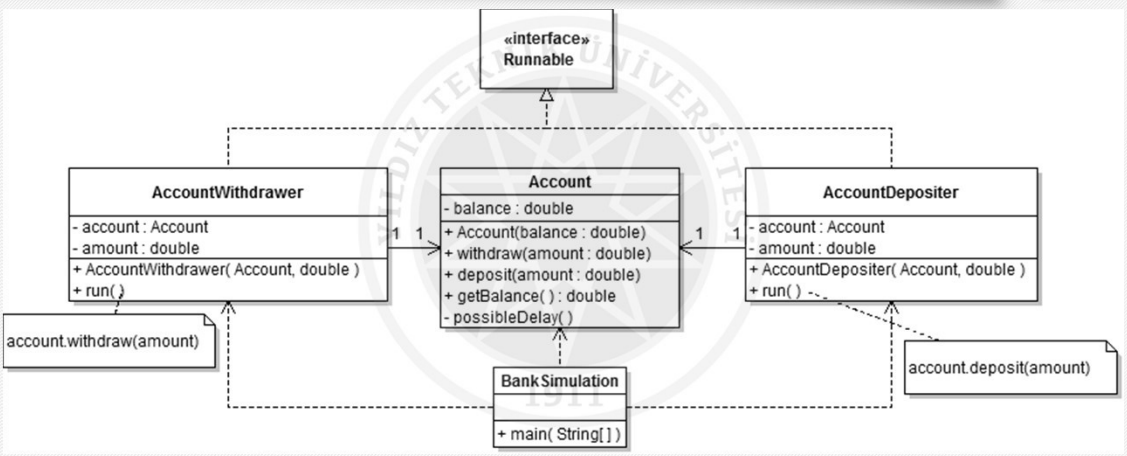
MULTITHREADING (CON'T)

- Exceptions and multithreading:
  - Throwing an unchecked exception from the run() method is easy.
  - You cannot change the method signature of the run method to declare that an unchecked exception can be thrown.
  - To throw a checked exception from the run() method, you need to:
    1. Code the multithreaded task that can throw the exception in a normal member method
    2. Declare that method as throws SomeCheckedException
    3. Call that method from run() and use try/catch properly.

MULTITHREADING (CON'T)

- Race condition:
  - In most practical multithreaded applications, two or more threads need to share access to the same data.
  - What happens if two threads have access to the same object and each calls a method that modifies the state of the object?
    - As you might imagine, the threads can step on each other's toes! :!
    - Depending on the order in which the data were accessed, corruptpted objects can result.
    - Such a situation is often called a race condition.

MULTITHREADING (CON'T)



MULTITHREADING (CON'T)

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- About the data structures and multithreading:
  - Remember the data structures section: Some data structures are thread-safe, i.e. synchronized
  - Vector<E> and Hashtable<K,V>
  - Use those data structures when multithreading is to be used.
- IDE'den gösterim yapalım.

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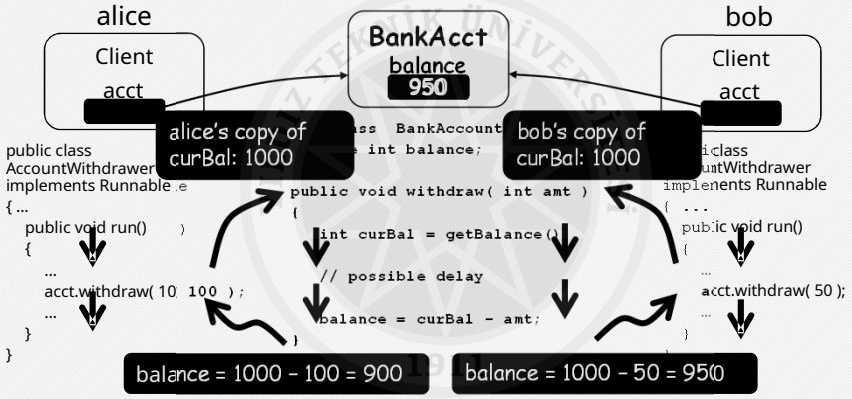
MULTITHREADING (CON'T)



Sabırla Dinlediğiniz İçin Teşekkürler