Concurrency:
State Models & Design Patterns

Practical Session

Week 11
Assignment 11

Preview
A11 - Exercise 1

Answer the following questions about Petri nets:

a) List and briefly explain all the elements a petri net consists of.

b) How can nets model concurrency and synchronization?

c) What is the reachability set of a net? How can you compute this set?

d) What kinds of Petri nets can be modeled by finite state processes?

e) What are some simple conditions for guaranteeing that a net is bounded?

f) What could you add to Petri nets to make them Turing-complete?
A11 - Exercise 2

Perform some *analysis* on the provided Petri nets:

a) Provide the definition of the Petri net in figure 1.
b) Provide the definition of the Petri net in figure 2.
c) Is the Petri net in Figure 2 bounded? Safe? Conservative? Are all the transitions live?
A11 - Exercise 3

Two machines need to interact with a database. The machines can read, write or stay idle. **Model** the situation using Petri nets ensuring that the machines cannot write at the same time.

Use the Petri net editor in the web site of the course. Hand-drawn Petri net diagrams are acceptable, **but make them readable please!**
Answer the following questions about lock objects and threads:

a) How do the classes ReentrantLock and Semaphore support fairness?
   
   *Hint: You may have to look at the Java documentation.*

b) What are daemon threads in Java? What is their purpose? How can you create them?