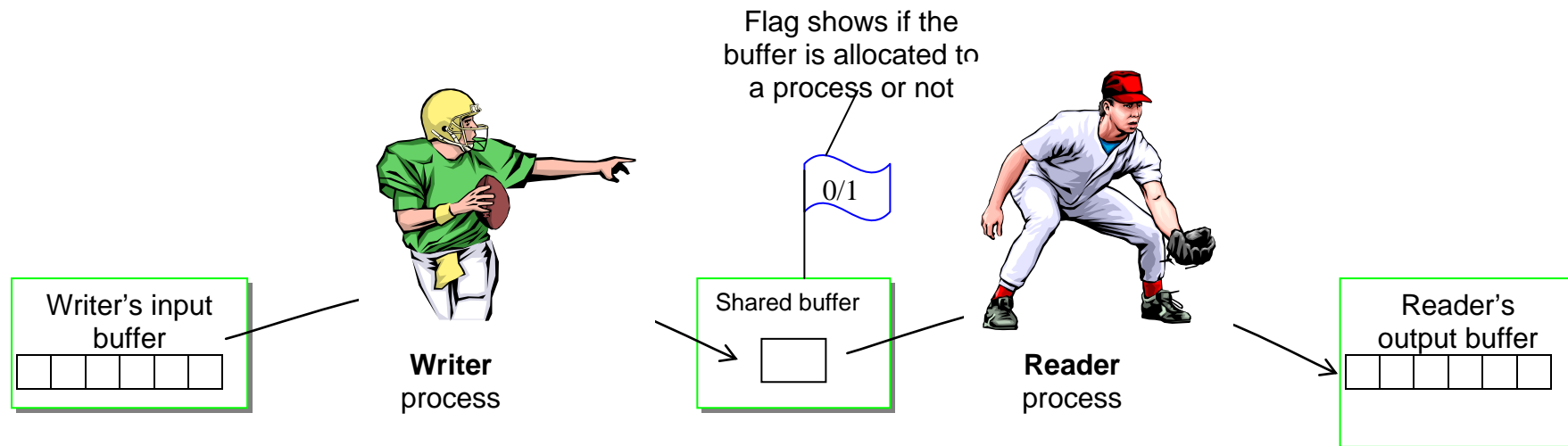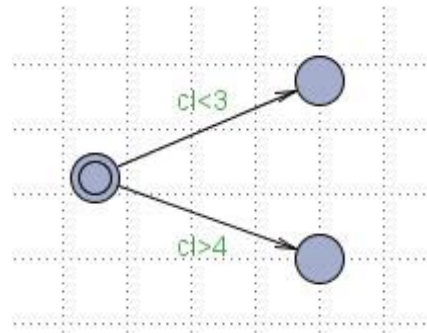# Home assignment 1

Reader-writer protocol modeling and model checking

<u>Task 1</u>: Model a reader-writer system in UPPAAL:

1. Two parallel processes interchange data. „Writer" process takes a value from its input buffer (with length 6 slots) and sends its content slot by slot over a shared buffer (size 1slot) to the „Reader" process. Reader saves the data to its output buffer (with length 6 slots). Data interchange is synchronous – neither of the processes try to read nor write until previous data is successfully transmitted / saved.

2. Add a constraint so that a writing cycle cannot be started until 5 time units has passed from the last cycle ending.

3. Add a non-deterministic constraint that data in the shared buffer can corrupt – resulting that instead of data written to buffer – there's a code 99. Corruption can occur if „Reader" reads from the shared buffer outside time interval <u>3, 4</u> time units (**starting from the beginning of write cycle**).

Flag shows if the buffer is allocated to a process or not

0/1

| Writer's input buffer | **Writer** process | Shared buffer | **Reader** process | Reader's output buffer |

The figure shows a timed automaton with an initial location and two transitions. The transition to the upper location is guarded by $cl < 3$ and the transition to the lower location is guarded by $cl > 4$.

Task 2: Verification by model checking

4. Prove that there exists an execution path so that Writer's input buffer data will be sent successfully to Reader's output buffer within at most 33 time units.

5. Prove that always there exists a time interval such that the data transfer from Writer's input buffer to Reader's output buffer ensures error free data transfer.