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## Tutorials – #1 à 2 – Hoare’s Monitors

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### Exercise 1 – Producer/Consumer Models

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We consider the Producer-Consumer model in which two families of processes access a shared buffer to deposit (Producer processes) or withdraw (Consumer processes) messages. The buffer is managed in a circular way. Withdrawals are done in the order of the deposits.

We propose to write a Hoare’s monitor to synchronise the access to the common buffer according to the different variants stated below.

This monitor is specified as follows:

```

Monitor Prod_Conso {
  void put(. . . ); -- used by a Producer process to deposit a message
  void get(. . . ); -- used by a Consumer process to withdraw a message
end Prod_Conso ;
  
```

#### Variant 1 – N-cells buffer, messages of a single type

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This is the basic variant, in which the buffer capacity is up to N messages and the policy applied is the one described above. Only a single type of messages is considered.

#### Variant 2 – Two types of messages, alternated deposits

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Now, the messages considered may be of two types (for example, black/white or recto/verso...).

A Producer deposits messages of a certain type. Messages are put in an alternating way. Withdrawals are done according to the same policy as above.

#### Variant 3 – Two types of messages, choice of a message type when consumed

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In this variant, Producers are still of two types but the deposits are not necessarily alternate. Consumers are also of two types and a Consumer specifies the type of message it wants to withdraw. However, withdrawals are still done in the order of the deposits.

### Questions

For each variant:

- Specify the monitor.
- Specify the blocking and waking conditions of a Producer process and a Consumer process.
- Deduce the state variables and the “condition” variables used in the monitor.
- Give the “code” (algorithm) of the monitor.