ALBERT-LUDWIGS-
UNIVERSITÄT FREIBURG

Network Protocol Design and Evaluation

Exercise 3

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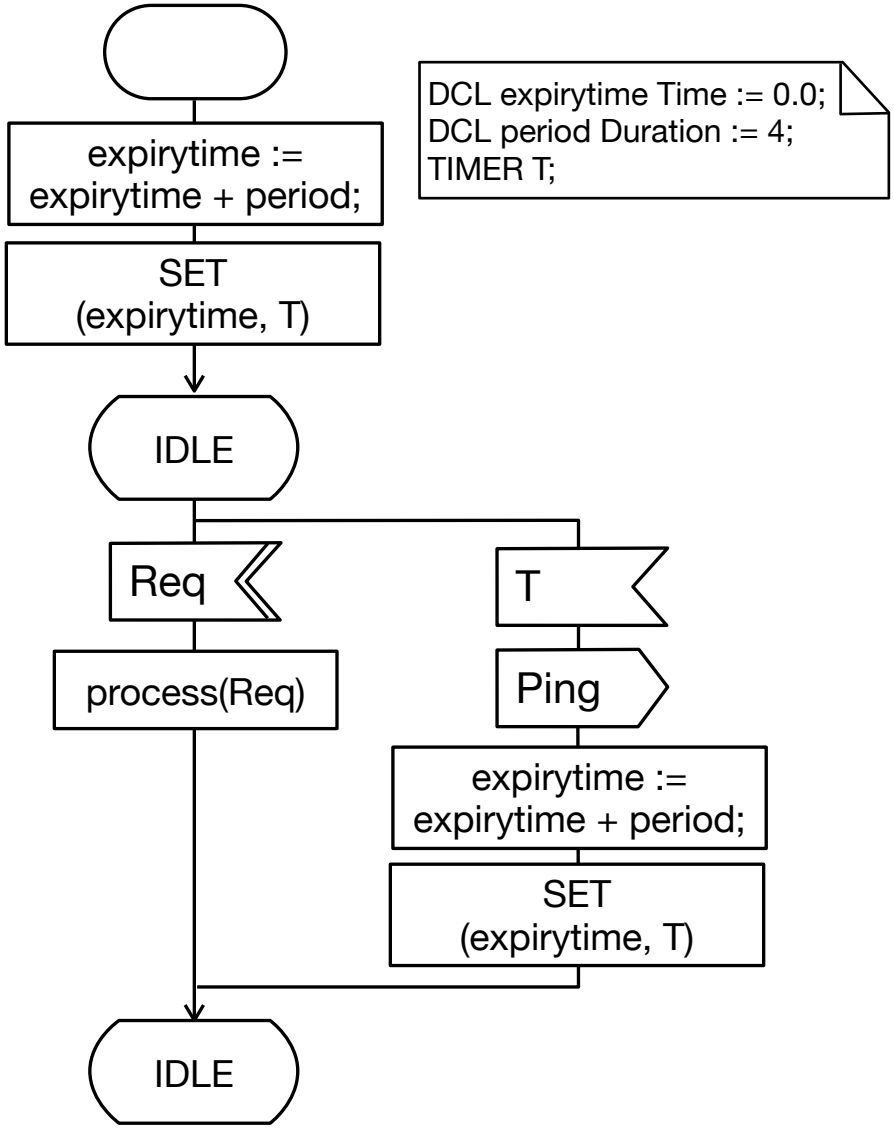
Exercise 3

Task 1 *SDL and Message Sequence Charts*

A server responds to request messages (`Req'') and sends Ping messages in regular intervals of 4 sec according to the specification given below. Assume that requests arrive at time 1, 3, 5, 6, 7, 15 and that processing a request takes 2 sec. Draw a MSC of the server for time 0-16. Consider the alternative timer setting `expirytime := NOW + period;` and draw a MSC for this variant.

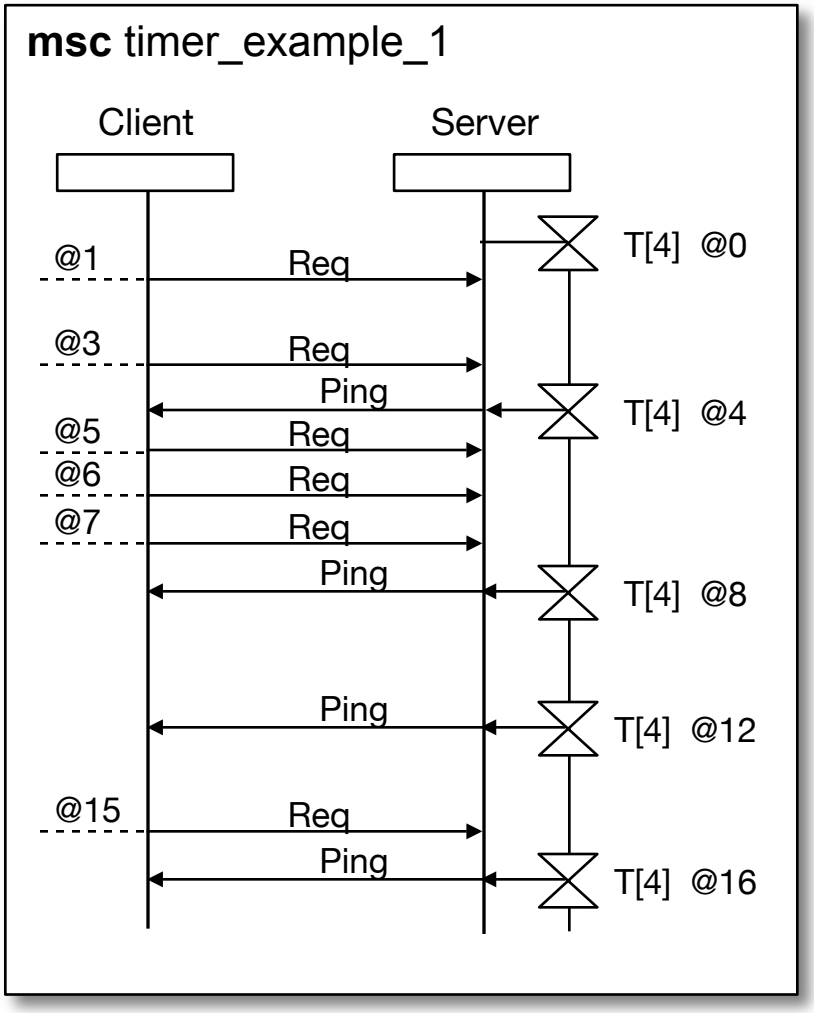

DCL expirytime Time := 0.0;
DCL period Duration := 4;
TIMER T;
expirytime :=
expirytime + period;
SET
(expirytime, T)
IDLE
Req
process(Req)
T
Ping
expirytime :=
expirytime + period;
SET
(expirytime, T)
IDLE

A note on timers

- Timer events are handled like incoming messages

- “When an inactive timer is set, a Time value is associated with the timer. Provided there is no reset or other setting of this timer before the system time reaches this Time value, a signal with the same name as the timer is put in the input port of the agent. The same action is taken if the timer is set to a Time value less than or equal to **now**”
  (from the SDL Specification)

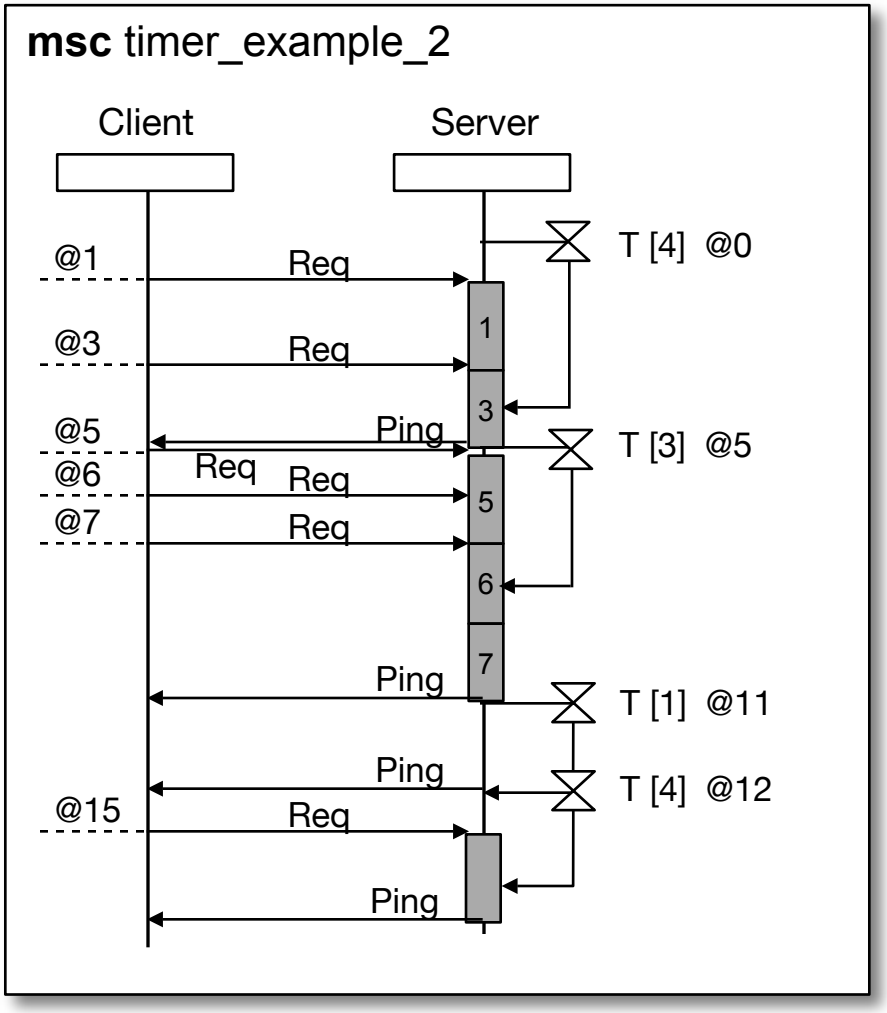
Task 1



Wrong!

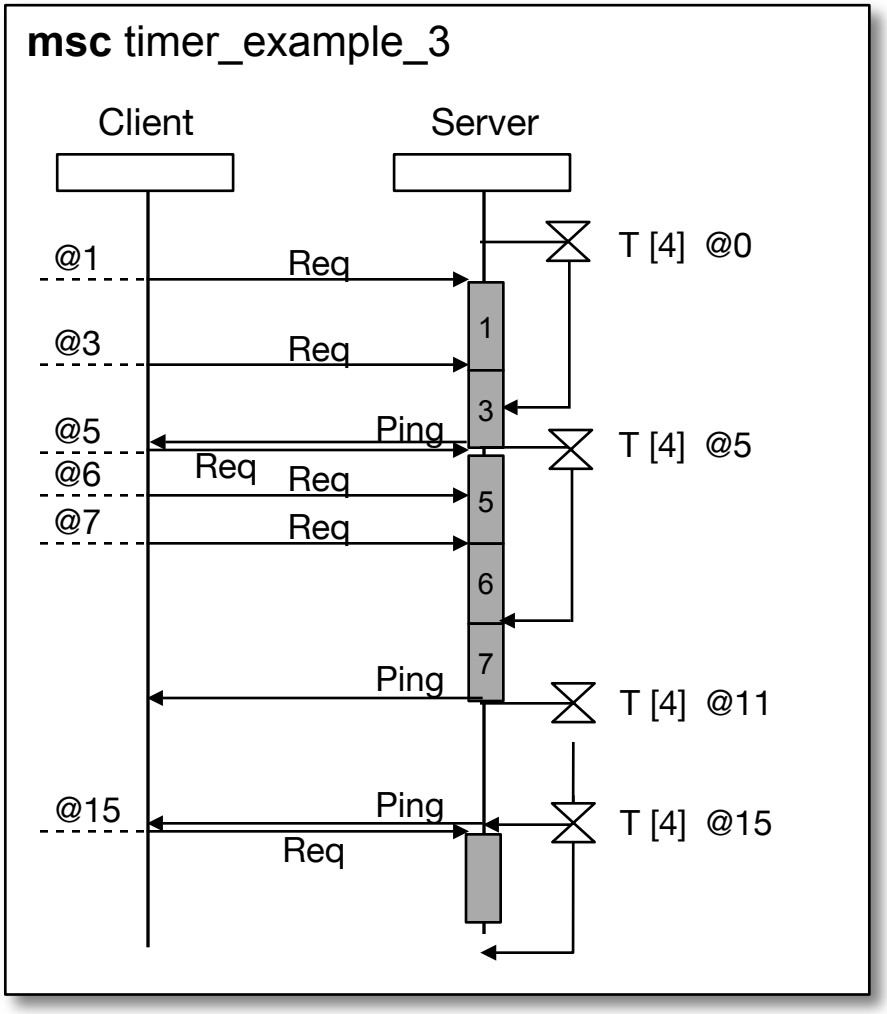
Processing time of the Req messages is not considered

Task 1



The server is busy for 2 sec each for processing Req messages

Task 1



Alternative Variant

```
expirytime :=
  NOW + period;
```

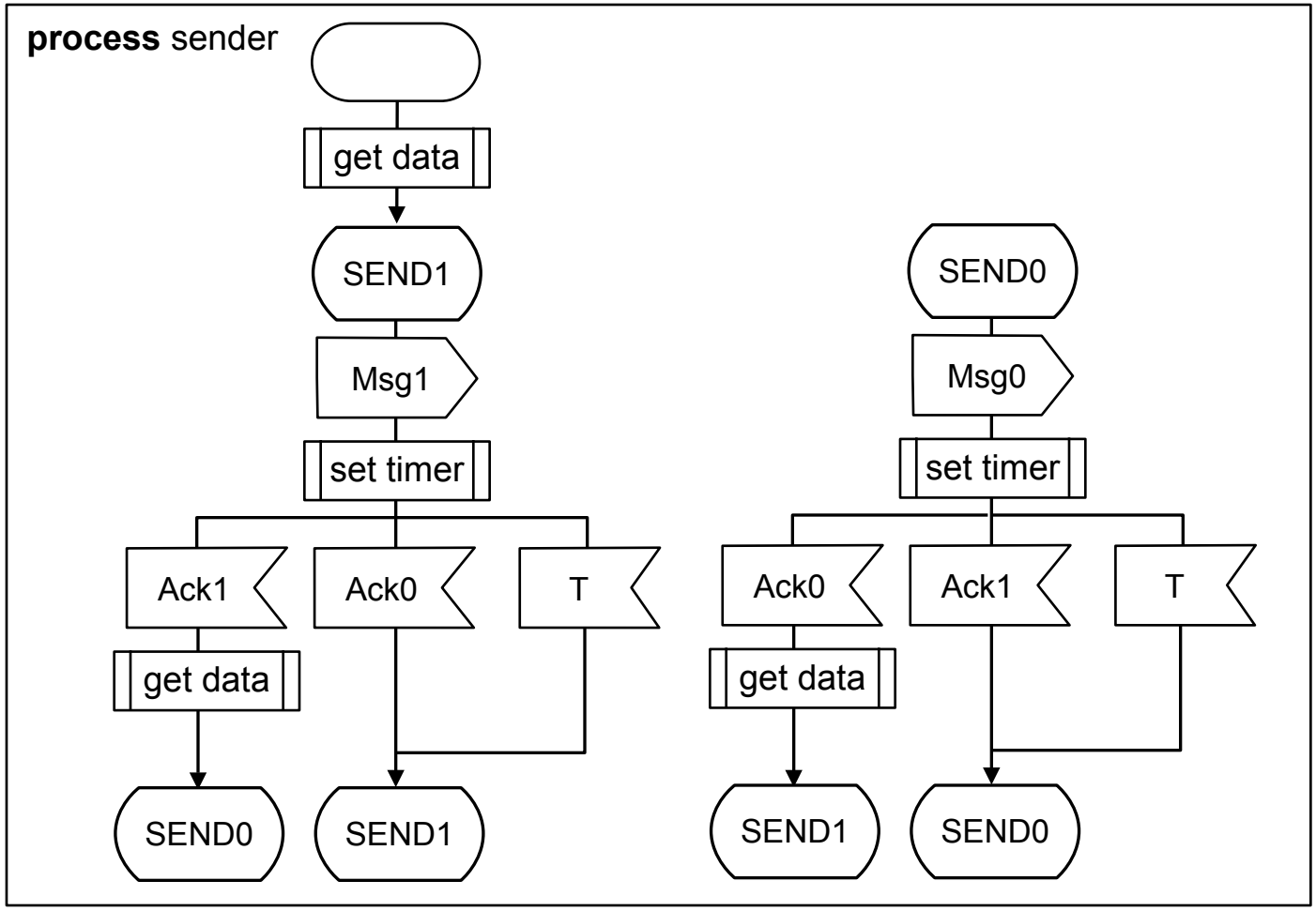
Exercise 3

Task 2 *Alternating Bit Protocol*

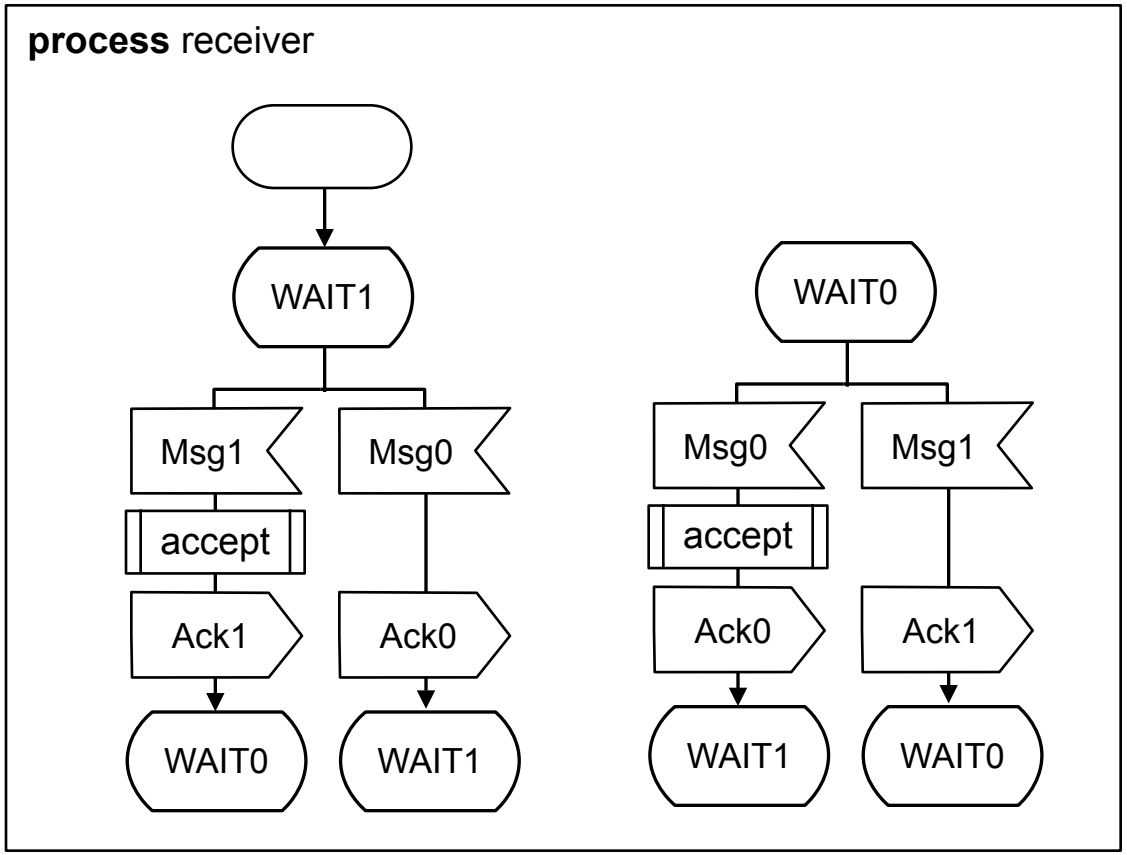
Consider the Alternating Bit Protocol for an unreliable channel. Lost messages are retransmitted after a timeout. What happens if we allow that messages arrive out of order?

- Describe a scenario, where out-of-order arrival leads to a failure of the protocol. What kind of failures may happen?
- Try to fix the protocol and give a formal specification of your new protocol.

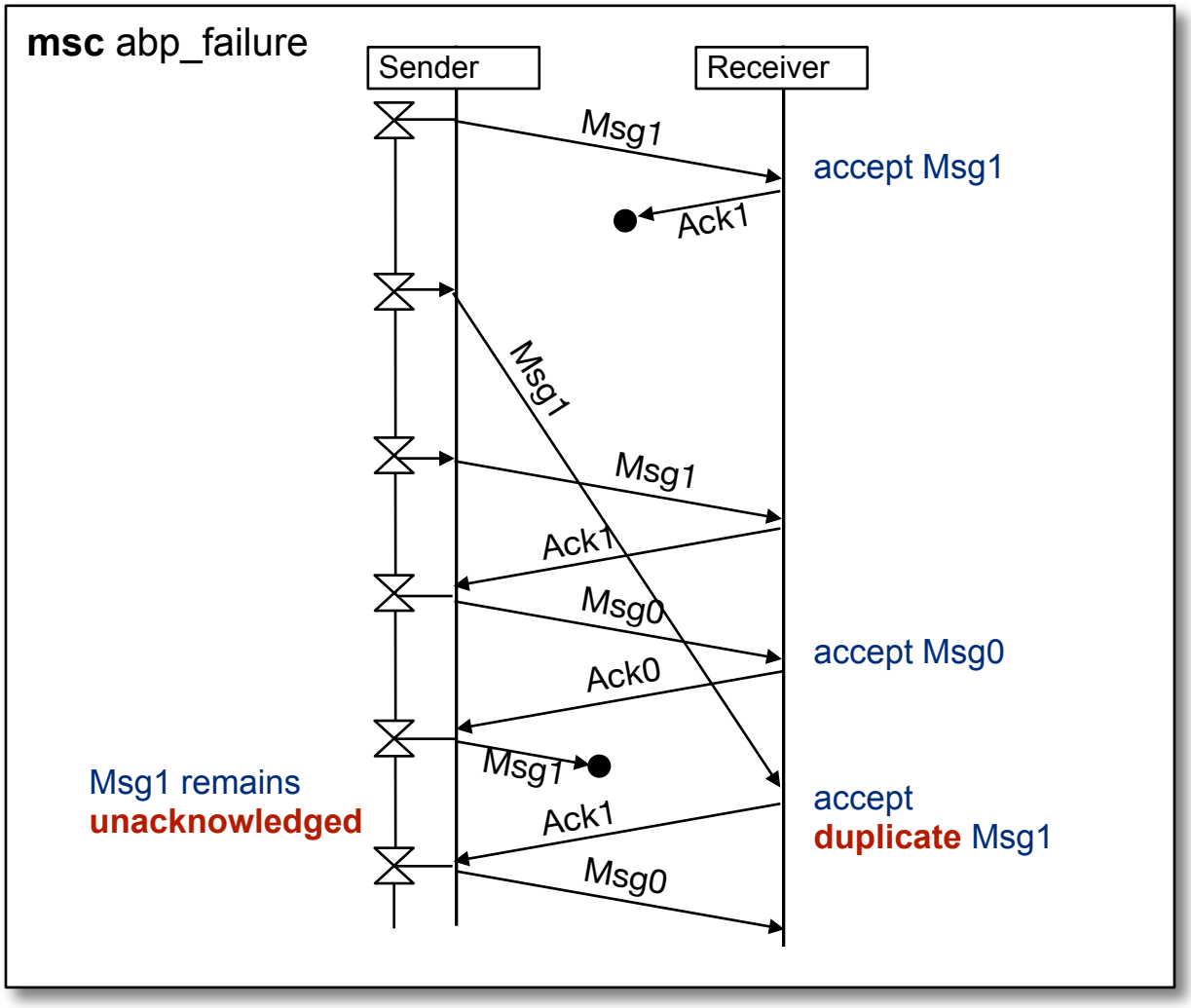
Alternating Bit Protocol, Sender



Alternating Bit Protocol, Receiver

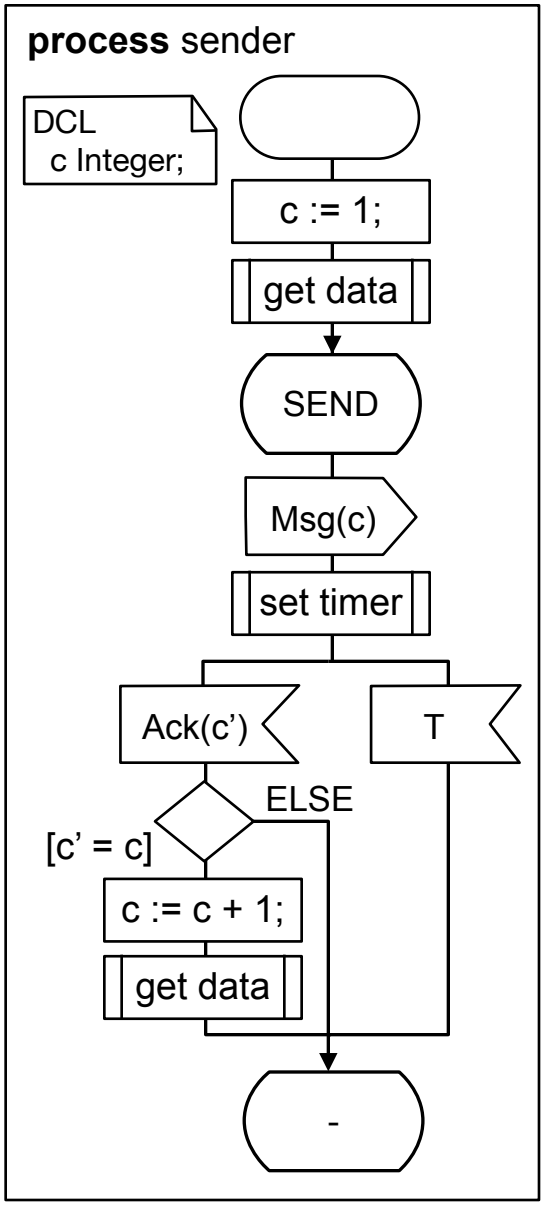


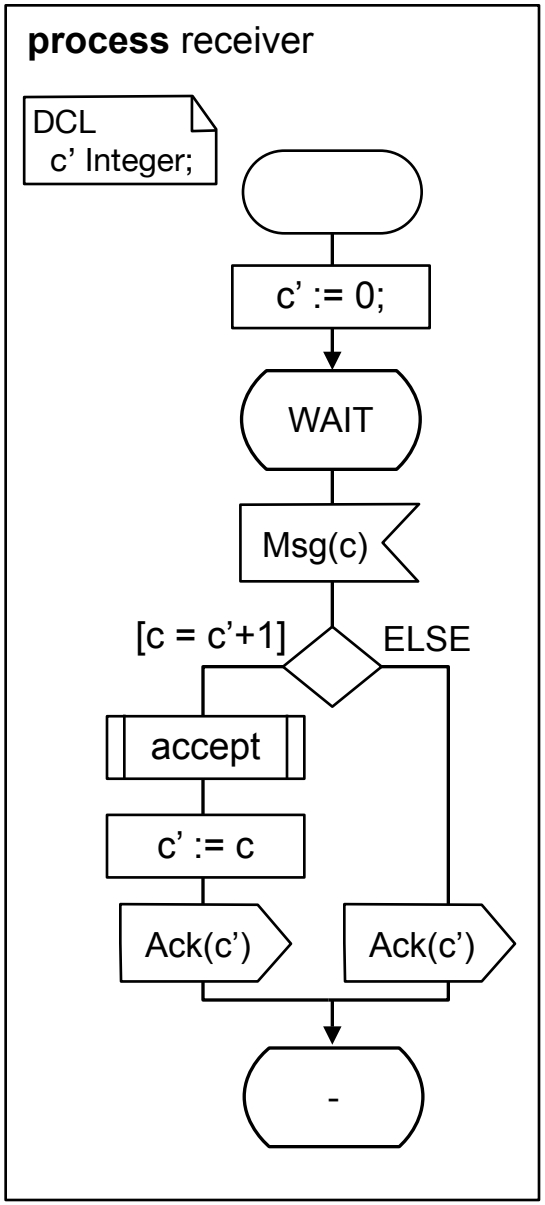
Error Scenario



ABP+

Sequence numbers are added to the messages. The sender repeats transmitting a message until it is acknowledged with a matching sequence number.





Out-of-order scenario