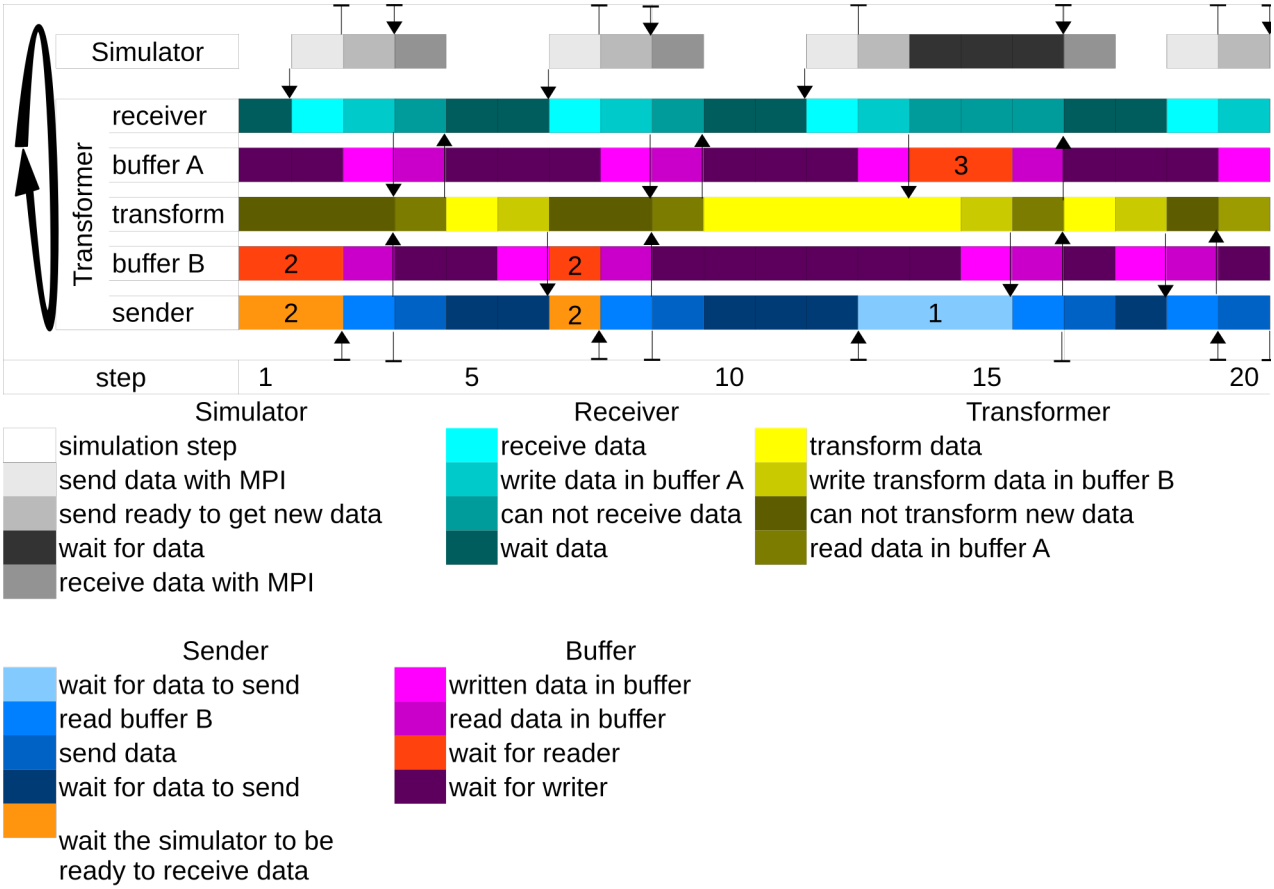
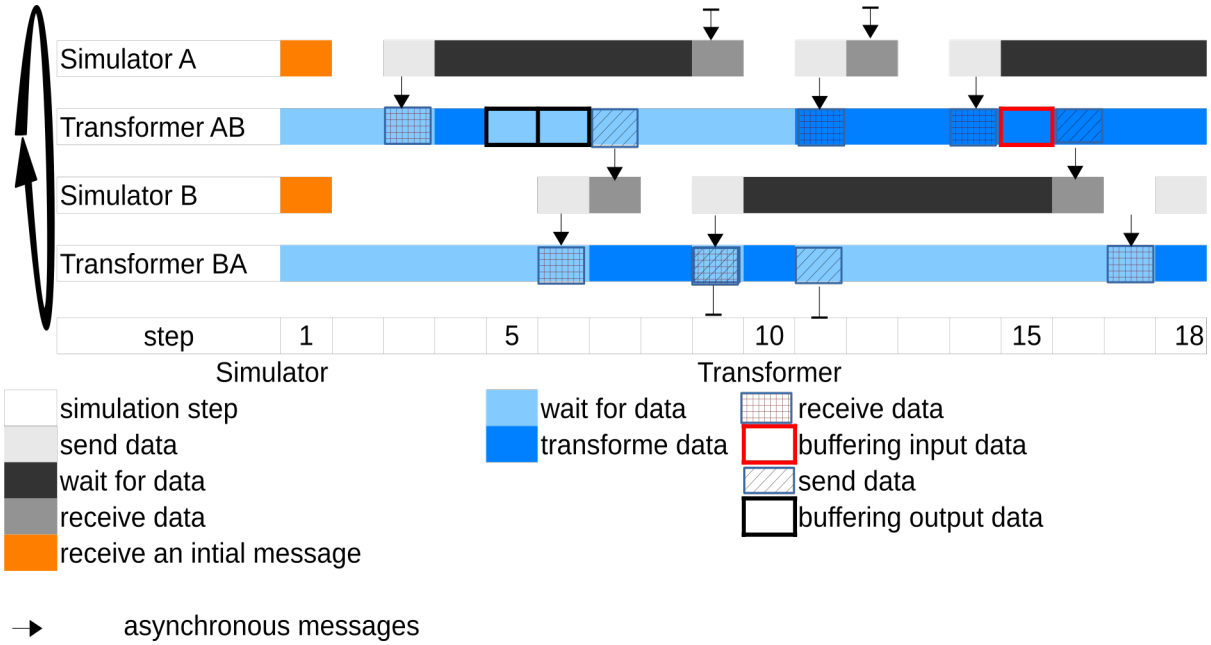


1 sender waits for data to transfer to a simulator
2 sender waits for the simulator and buffer B buffers data
3 receiver wait for the transformer and buffer A buffer data
→ asynchronous messages

Use of buffer memory to temporize communication:

This diagram schematically presents the conceptional states that simulators and transformers can be in during processing. For clarity, the states are illustrated with a configuration where the transformed data are sent back to the simulator itself. The transformer functionally comprises three components: receiver, transformer and sender. The data transfer between these components is based on a shared buffer data structure. The states of the components are marked in the diagram with different colours. Grey colours for the simulation states, Green for the receiver would get data from the simulator, Yellow for the transformation component, and Blue for the sender. The buffers are marked in purple colours. The two states of particular interest, names "wait for reader" and "wait for writer", are marked in red and dark purple. **The buffers can only be read or written to be a single process, and this is one root cause for the slowdown in processing speed due to wait states.** Additionally, the black arrows identify messages sent asynchronously between the different components to inform of state changes, typically the availability of buffers.
Three different types of wait states are marked with numbers: 1. The sender waits for data, as the transformed data is not yet available in the buffer. 2. The sender waits for the simulator for the simulator to be ready to receive new data. 3. The receiver has to wait for the transformer to be ready with its calculations and release the buffer.



Synchronisation of simulators:

This diagram schematically presents the conceptional states that a set of two simulators and two transformers can be in during processing. The state of each module is marked with different colours. Grey colour for the simulators, except the reception of the initial message in orange. Blue colour for the transformers. Additionally to the different blue, the hatching of the state represents the action of receiving and sending data and the contour of the state represents the fact of buffering data. The synchronisation between simulators uses asynchronous message passing: At each synchronisation step, simulators receive input data, after which the next step is simulated. In addition, the transformer adjusts the time of communication with simulators following its state and the state of the simulators. The adjustment is based on the usage of buffers and the ability to receive and send data simultaneously (step 9 transformer BA).