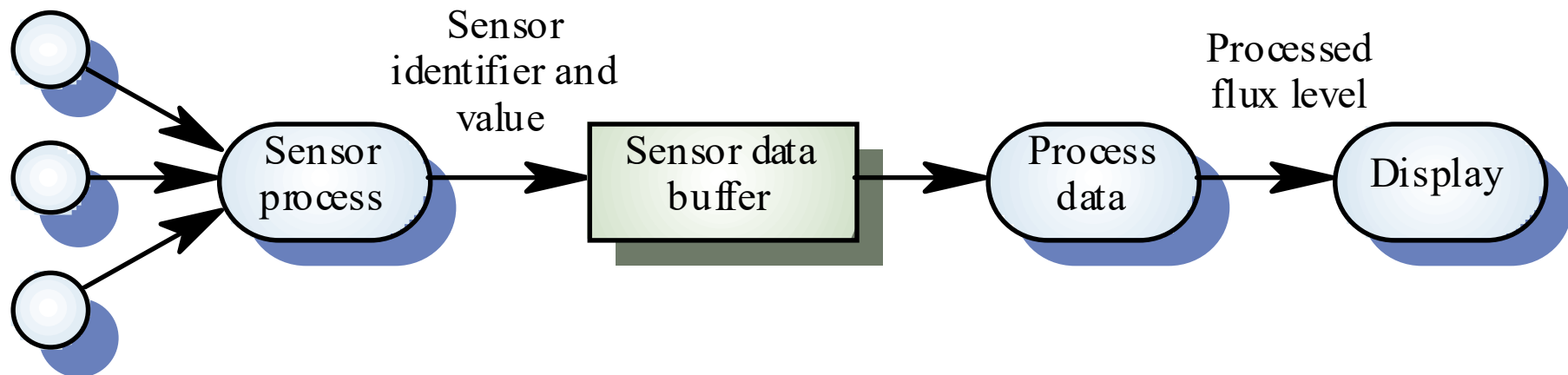# Data acquisition systems

Data acquisition systems

- Collect data from sensors for subsequent processing and analysis.

- Data collection processes and processing processes may have different periods and deadlines.

- Data collection may be faster than processing e.g. collecting information about an explosion.

- Circular or ring buffers are a mechanism for smoothing speed differences.
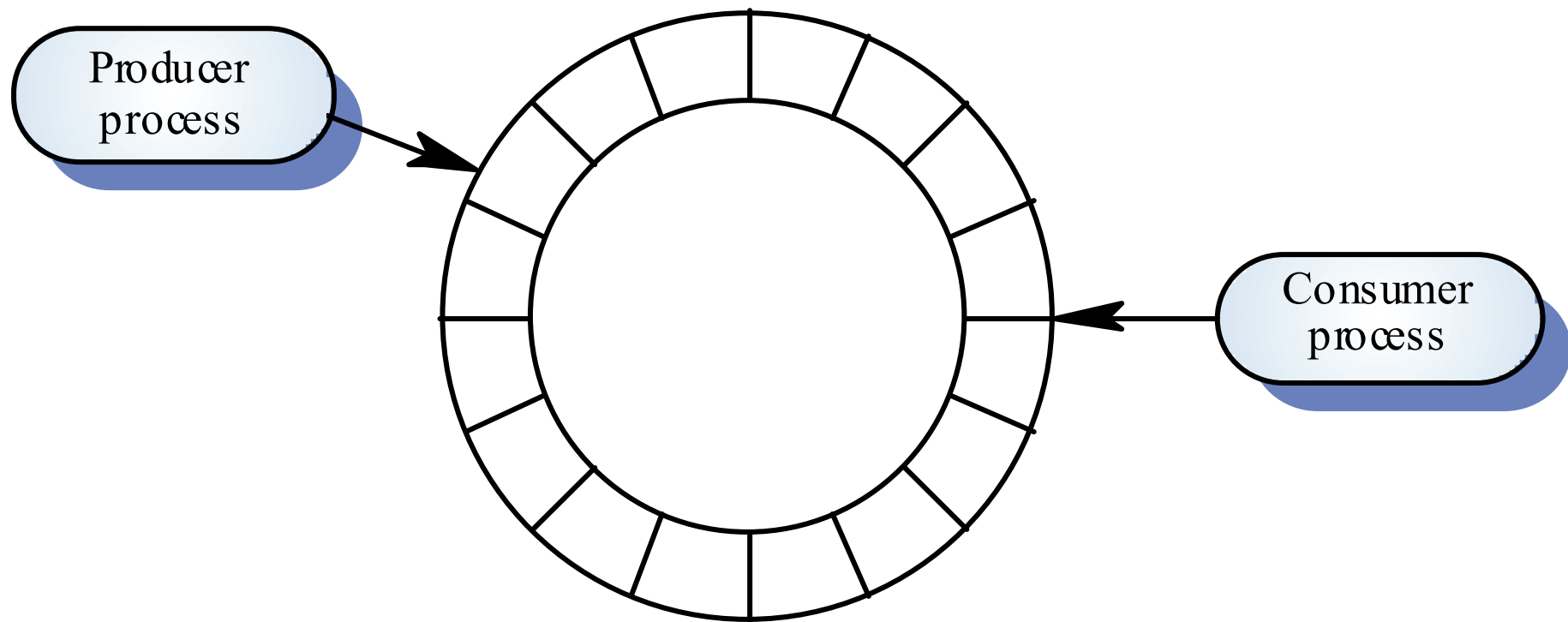
Reactor data collection

- A system collects data from a set of sensors monitoring the neutron flux from a nuclear reactor.

- Flux data is placed in a ring buffer for later processing.

- The ring buffer is itself implemented as a concurrent process so that the collection and processing processes may be synchronized.

Reactor flux monitoring

Sensors (each data flow is a sensor value)

Sensor
identifier and
value

Processed
flux level

Sensor
process

Sensor data
buffer

Process
data

Display

A ring buffer

Mutual exclusion

- Producer processes collect data and add it to the buffer. Consumer processes take data from the buffer and make elements available

- Producer and consumer processes must be mutually excluded from accessing the same element.

- The buffer must stop producer processes adding information to a full buffer and consumer processes trying to take information from an empty buffer.