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# EECE 276

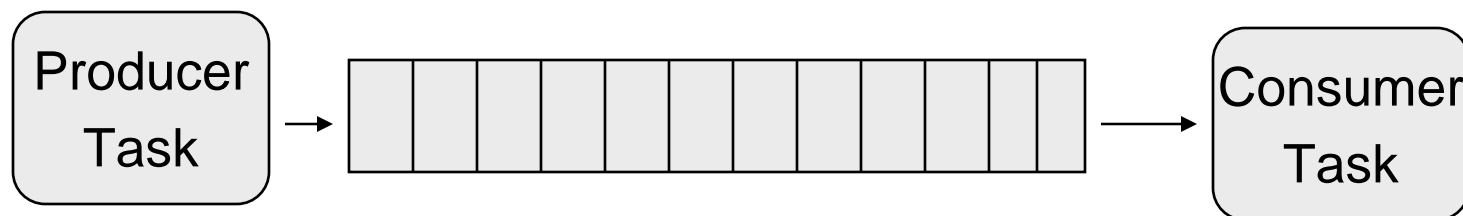
# Embedded Systems

Task communication:  
Queues, mailboxes, pipes

# Task communication

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- Tasks need to communicate:



- Shared data structure: Queue
- Operations: (RTOS services)
  - » Queue Initialize(int size): create and set up for size
  - » Void Enqueue(Queue q,void\* item): block if full, else put
  - » Void\* Dequeue(Queue q): block if empty, else get
- Multiple tasks use it: *mutual exclusion* is enforced

# Task communication

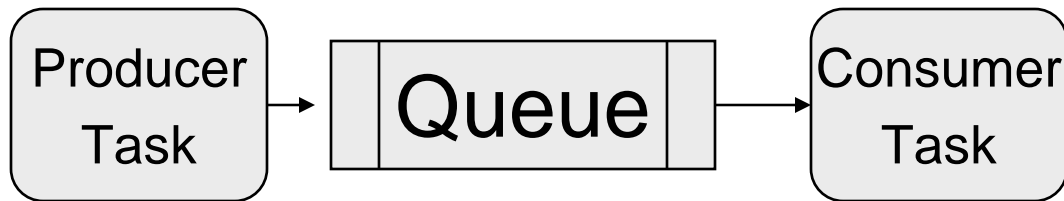
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- Mailboxes:
  - » Similar to queues, (usually) has a single element and two states: empty/full
  - » If multiple tasks are waiting for a mailbox, the highest priority one gets the message
- Pipes:
  - » Streams of data
  - » Typically use `fwrite()/fread()` operations
  - » Arbitrary length and data format

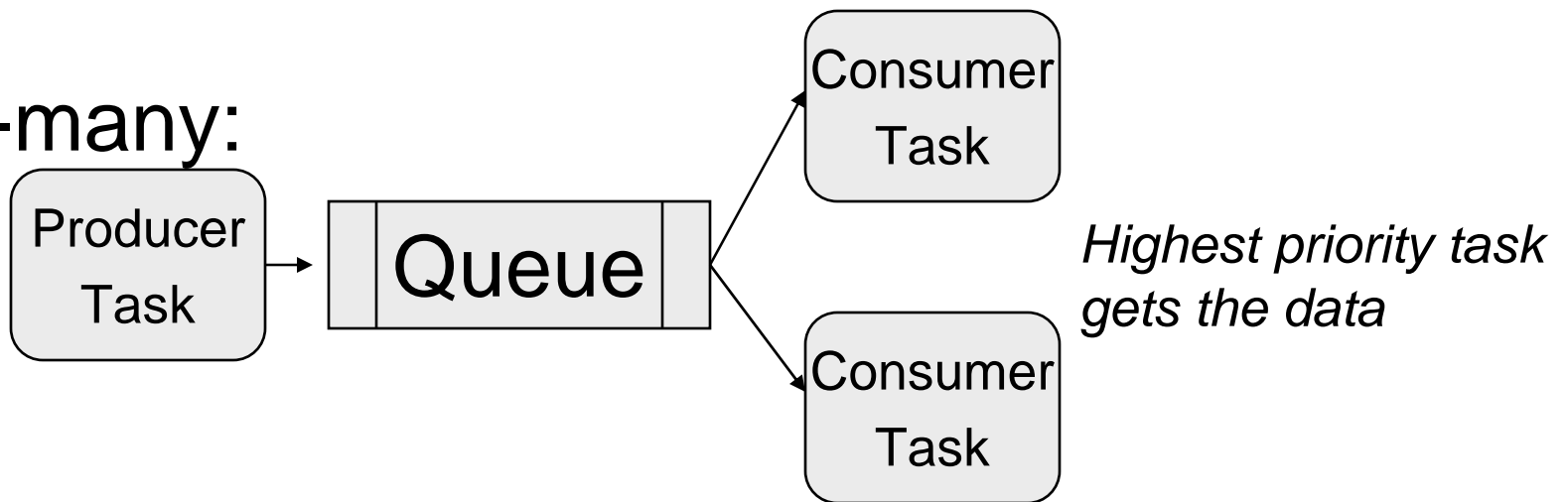
# Using queues

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1-to-1:



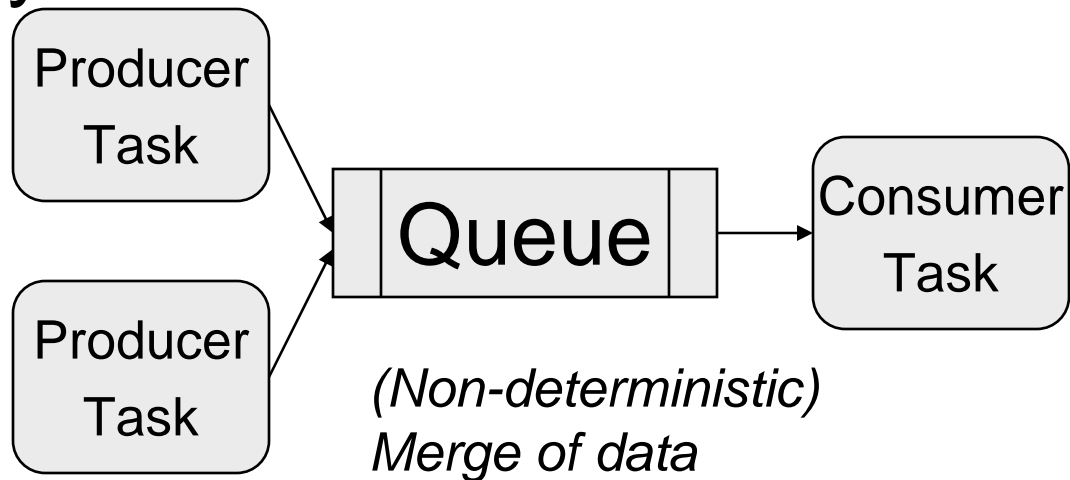
1-to-many:



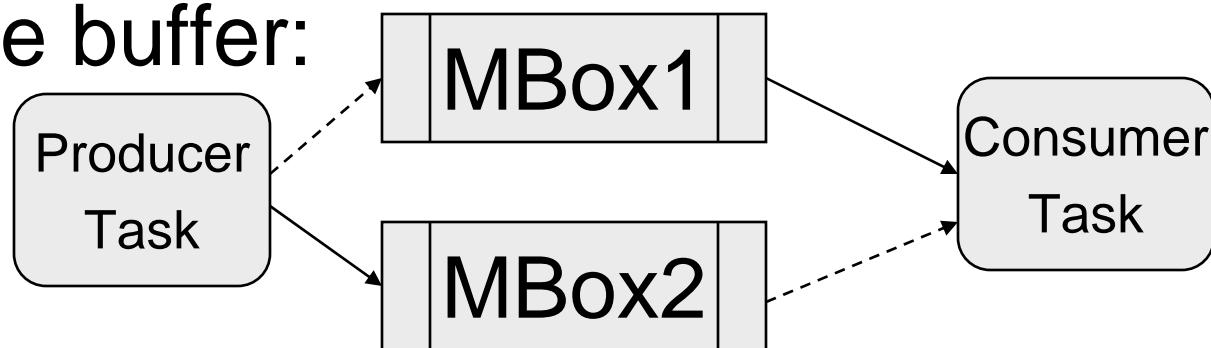
# Using queues, mailboxes

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Many-to-1:



Double buffer:



# Problems with queues, etc.

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- If of finite size, task may block/receive error if full/empty
- Passing pointers as queue elements: data becomes shared (“ownership” changes)
- The sender and the receiver must agree on the format/meaning of the data passed
  - » void\* is not a very good idea
- Memory management: running out of memory space leads to disasters (or reboots)