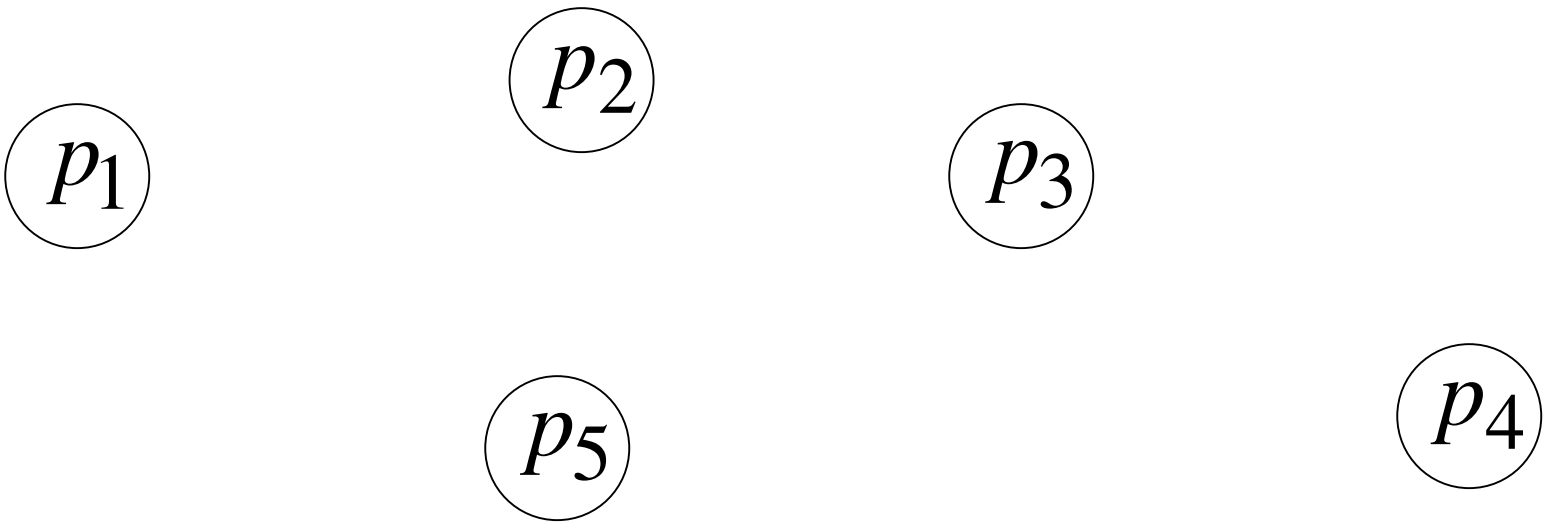
# Distributed Computing Algorithms
# CSCI-6966

# Distributed Computing:

everything not centralized

many processors



# Distributed Systems:

- Internet
- The machines of our department
- ATM machines, bank accounts

# What is then parallel computing?

Many processors in the same machine

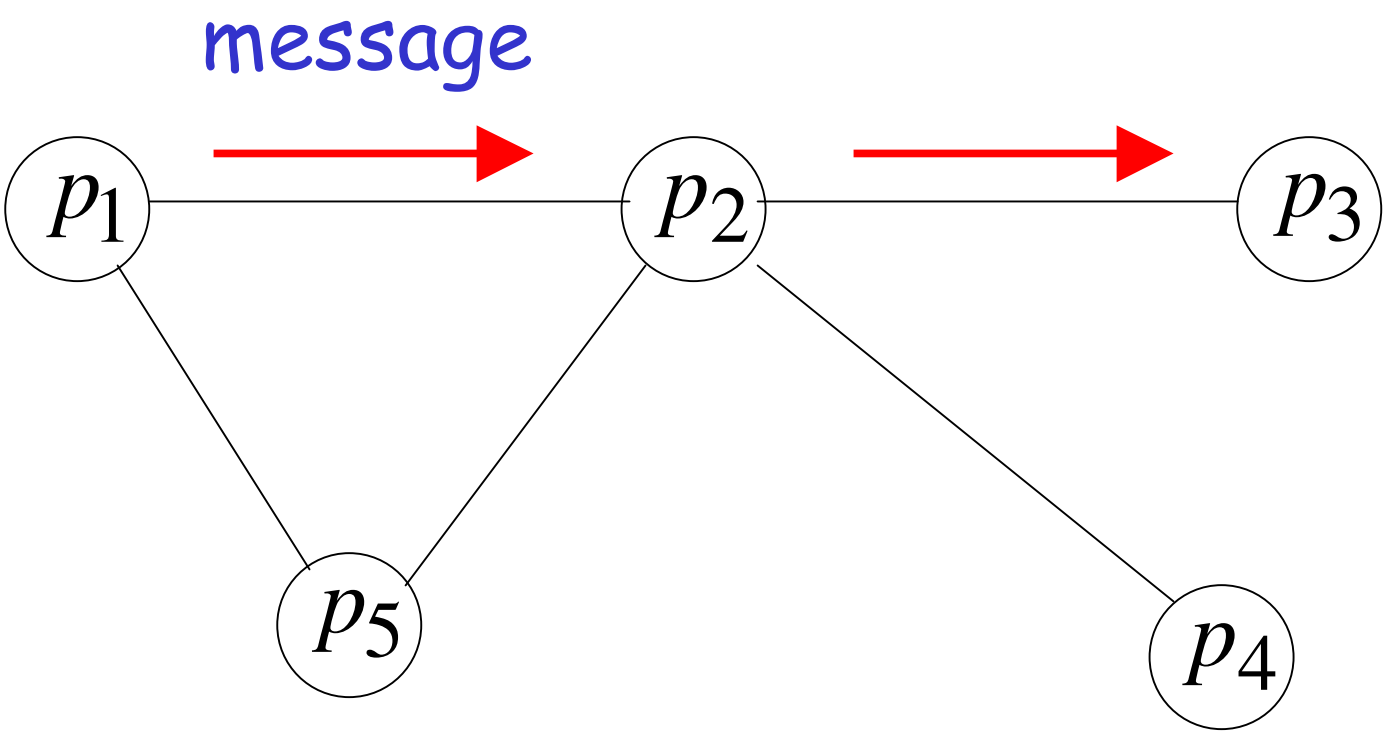
All processors solve the same task

A restricted form of distributed computing

# Basic Distributed Systems:

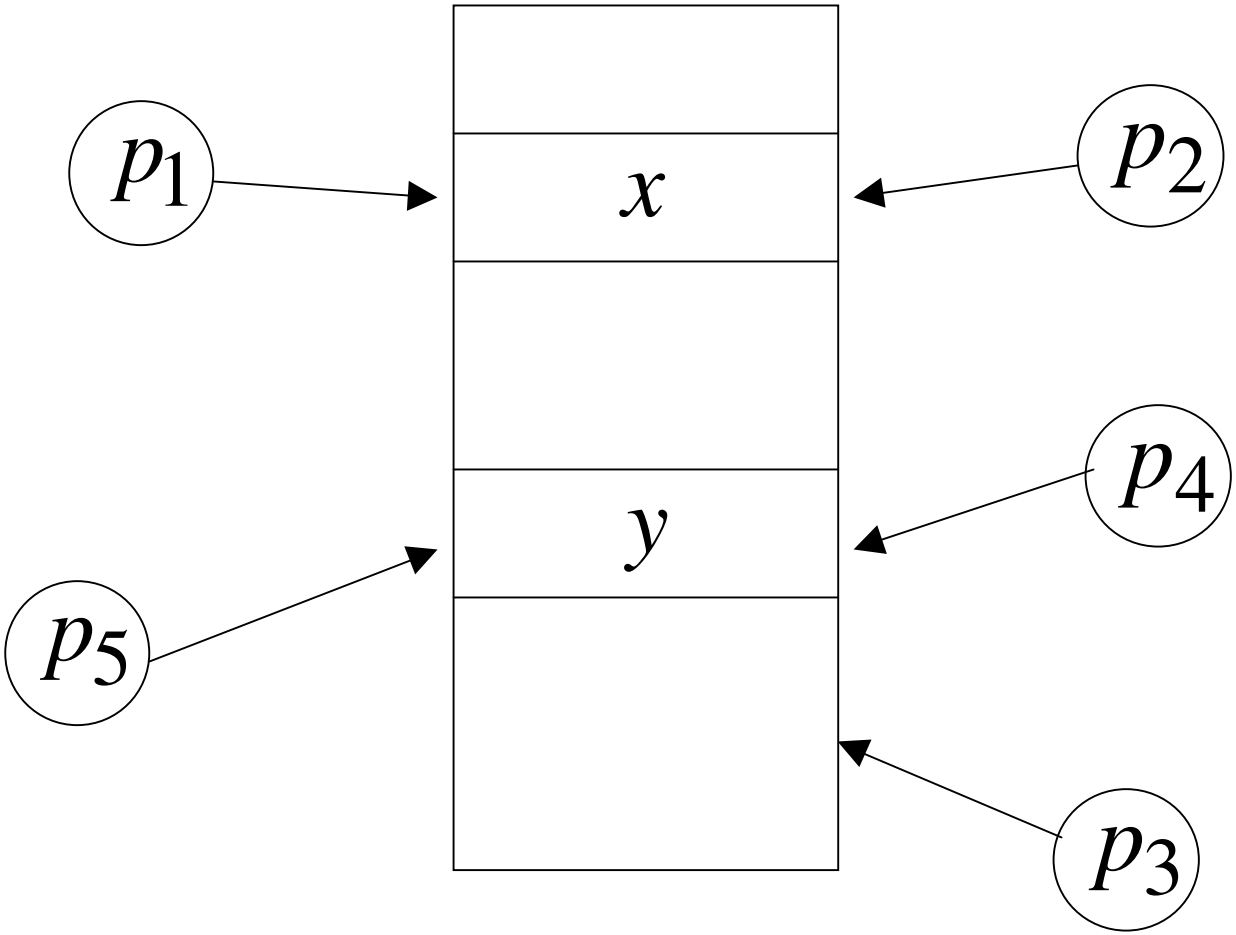
- Message passing
- Shared Memory

# Message Passing Systems




Can be implemented easily in hardware

# Shared Memory Systems




Not easy to implement in hardware

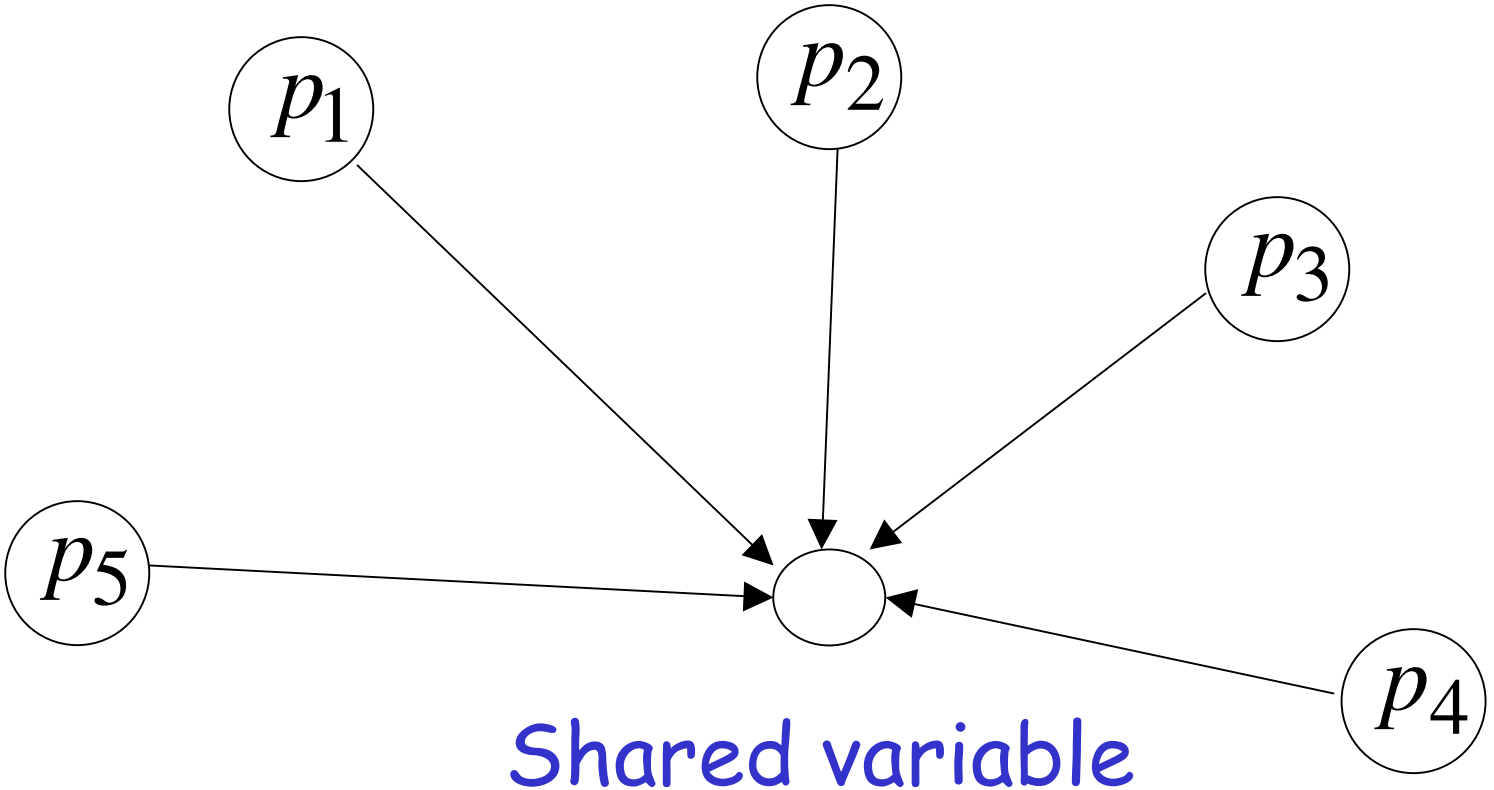
Easy to write distributed programs

# Distributed Algorithms

Several problems:

- Communication Problems
- Coordination Problems
- Specific problems

# The counting problem

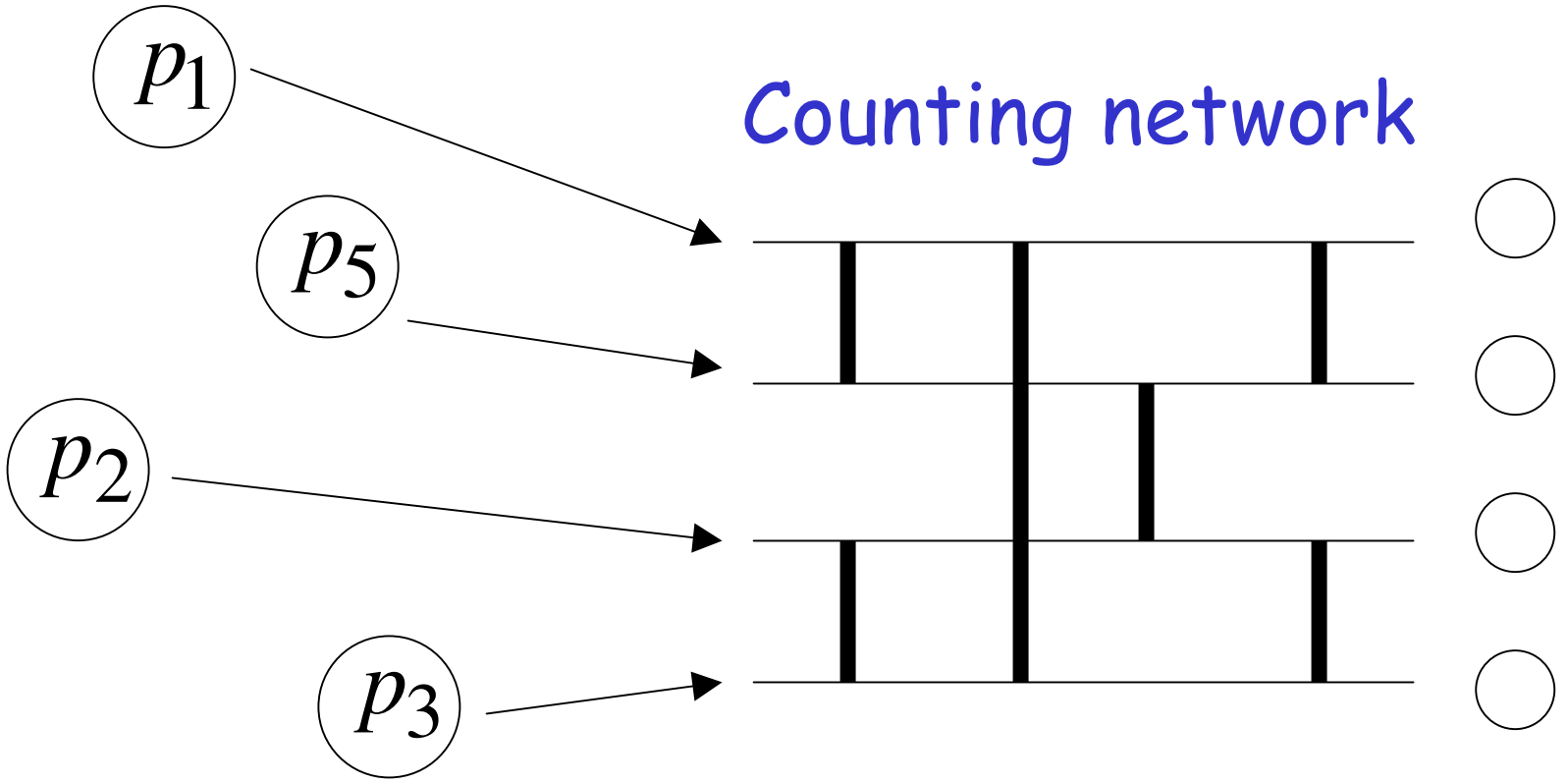



Shared variable

$0, 1, 2, 3, \ldots$

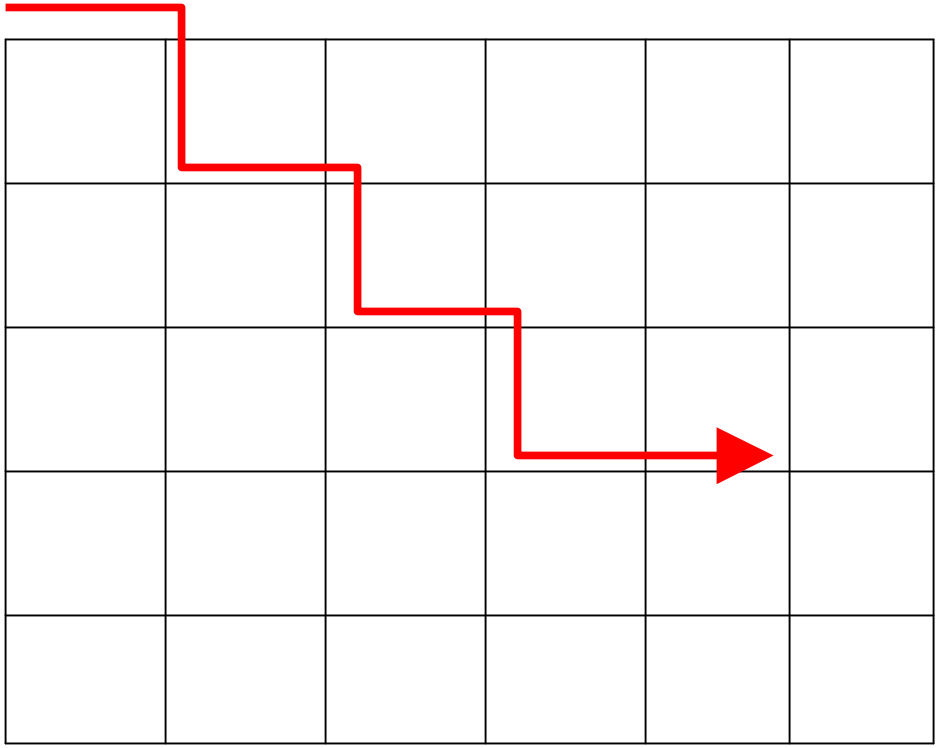
Sequential Bottleneck

# Solution:

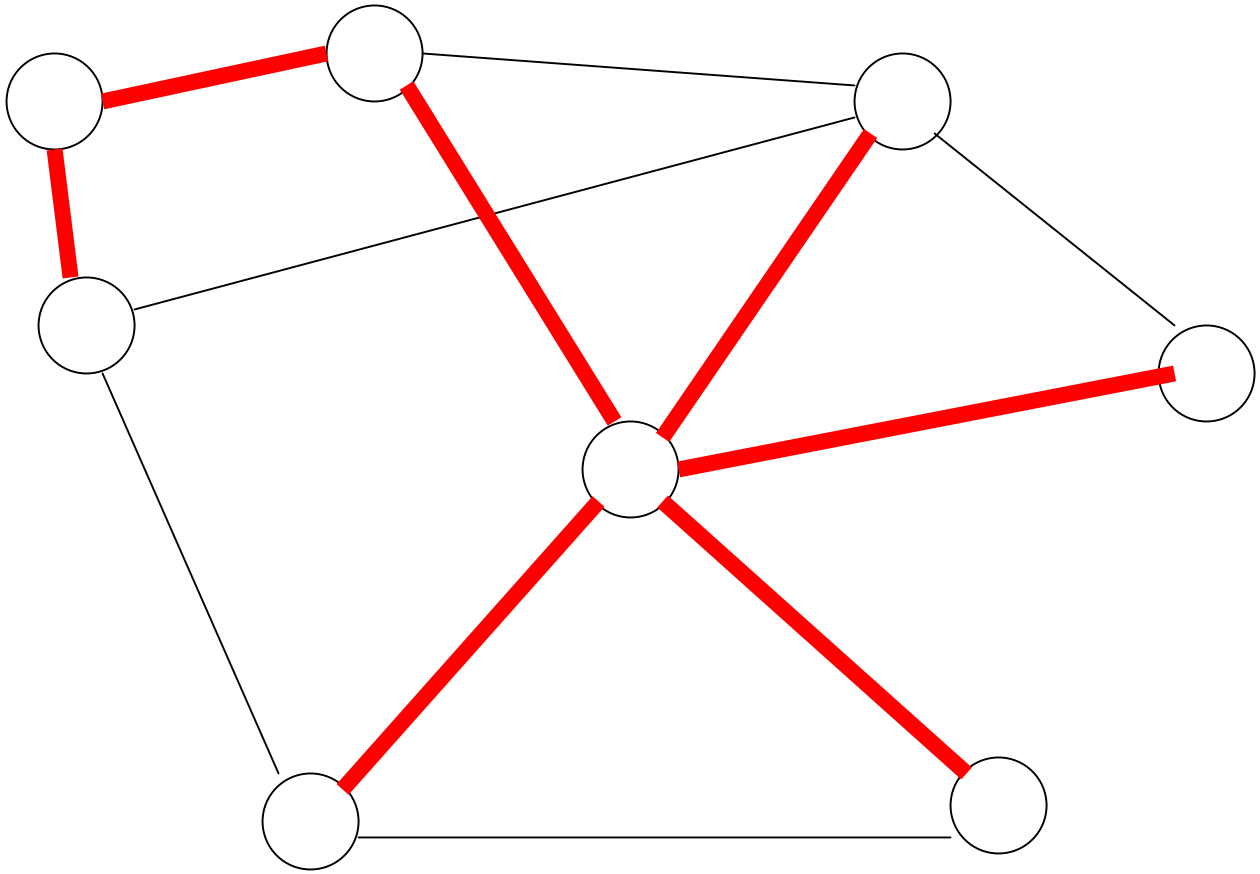



many shared variables

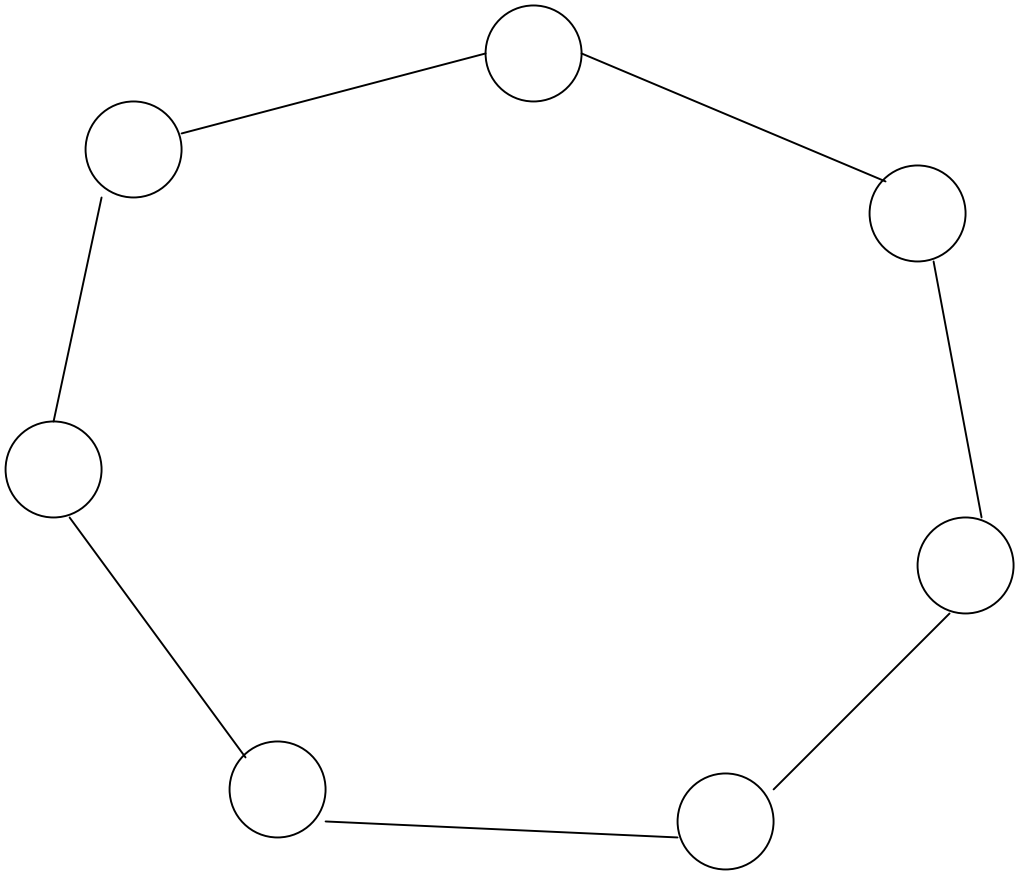
# Routing Problem



# Finding the spanning tree problem

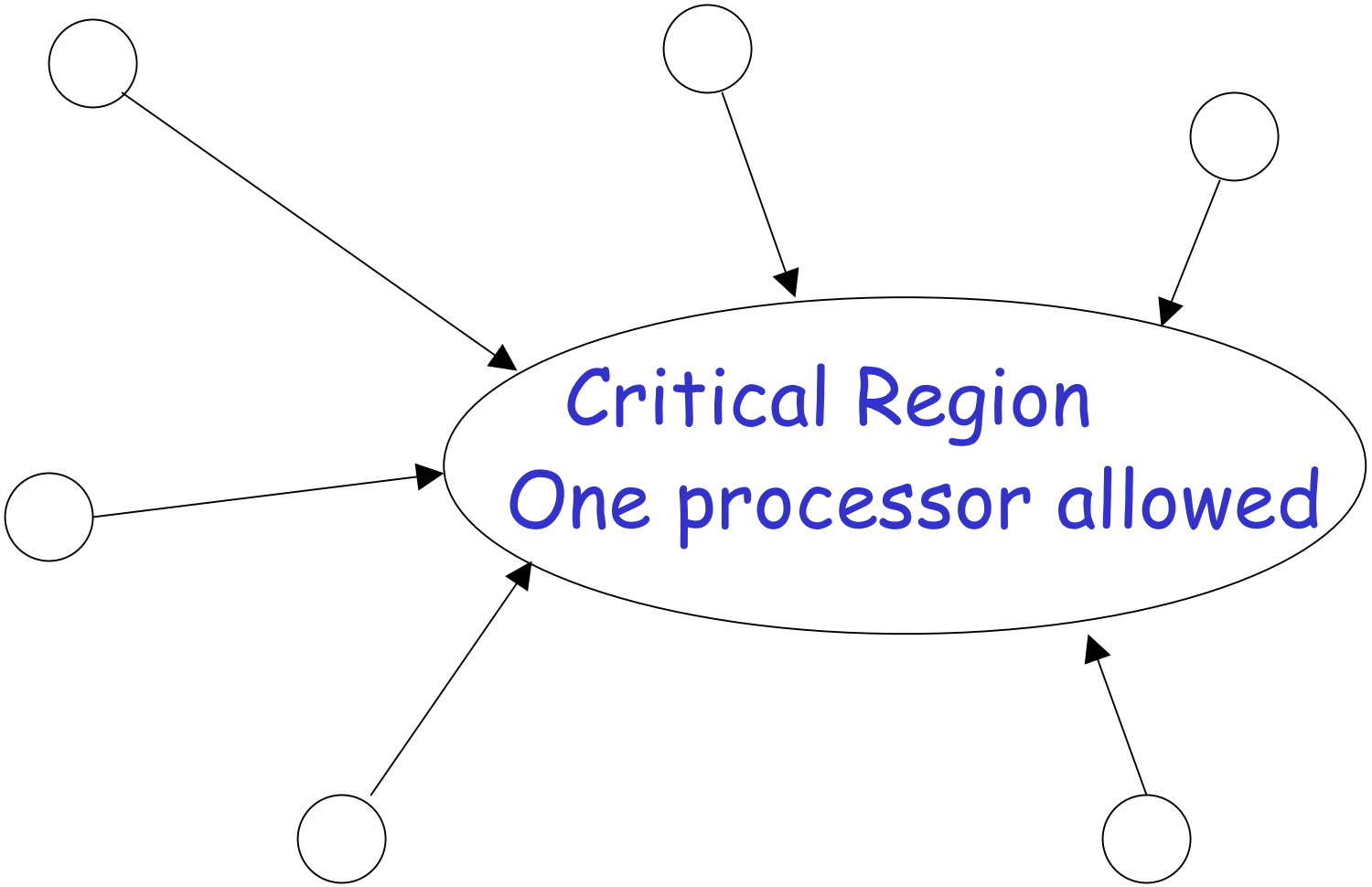
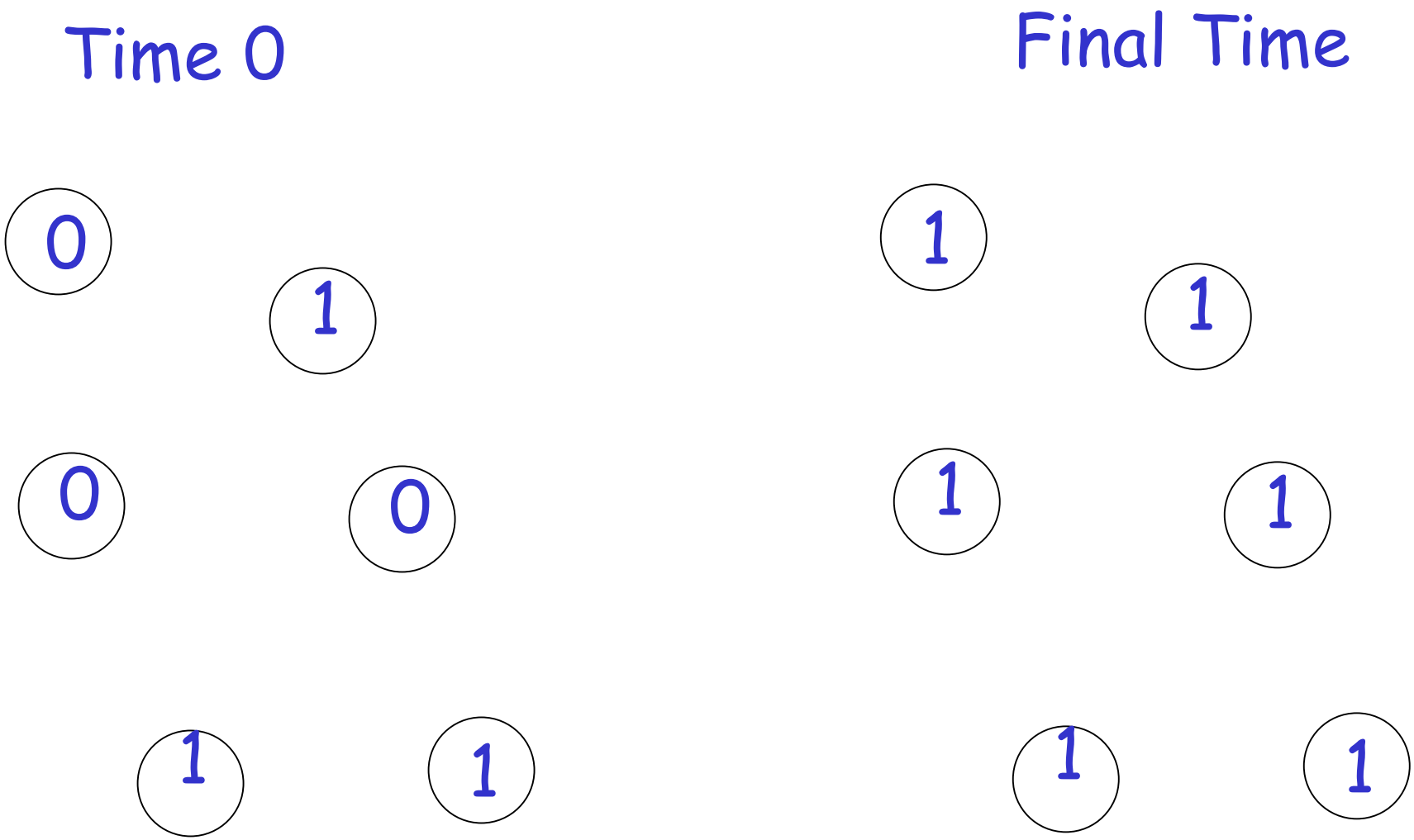


# Leader election problem



Leader

# Mutual Exclusion Problem



# Consensus Problem