

Course: UCS1502 - Microprocessors and Interfacing

Multiprocessor Configurations

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Learning outcome of this module:

To understand the details of various multiprocessor configurations

If a microprocessor system contains more components that can execute instructions independently, then the system is called multiprocessor system.

2 basic multiprocessor configurations:

1. Closely coupled
2. Loosely coupled

Advantages

- Improves performance ratio of the systems.
- Several processors may be combined to fit the need of an application.
- Task are divided among the modules.
- If failure occurs, it is easier to find and replace the malfunctioning processor.

Issues

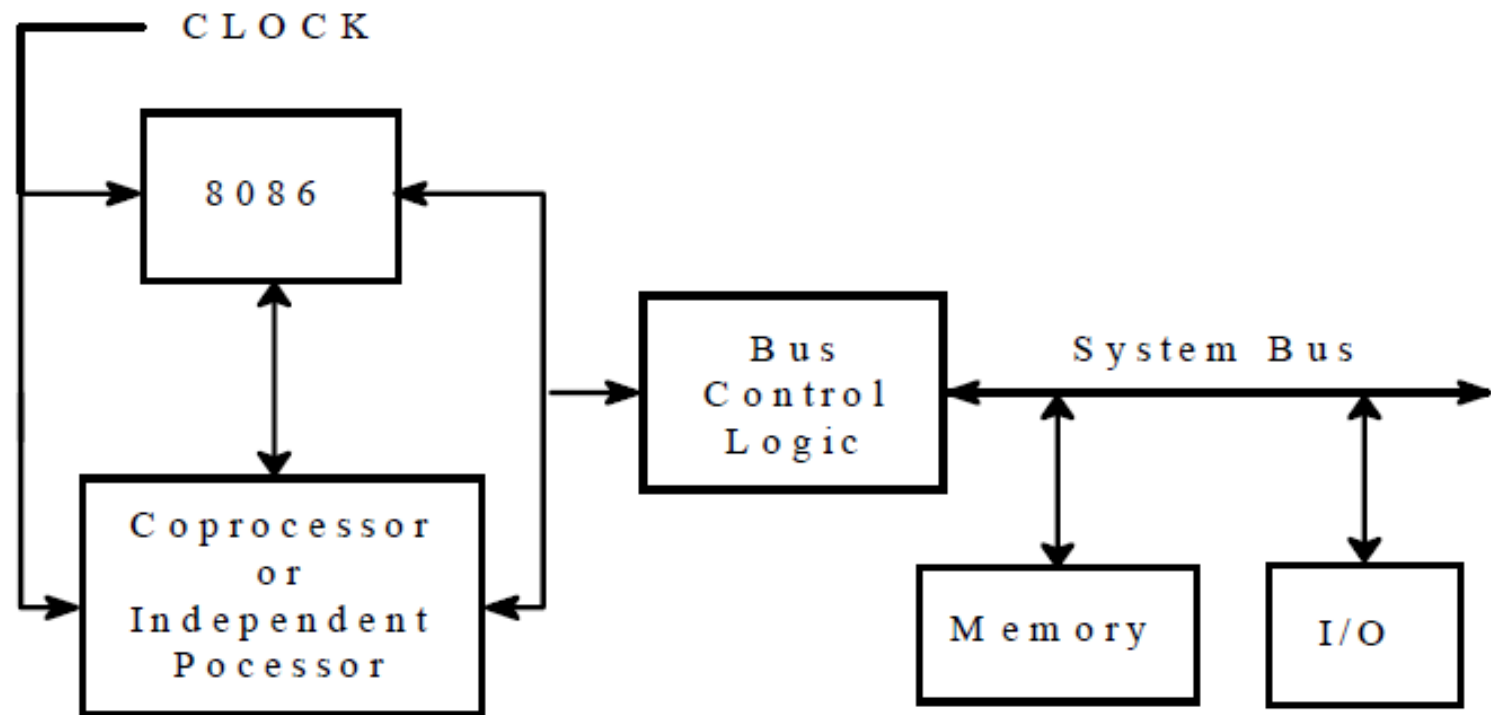
- Bus contention
- Interprocessor communication
- Resource sharing

In Closely coupled configurations, both the CPU and the external processor share:

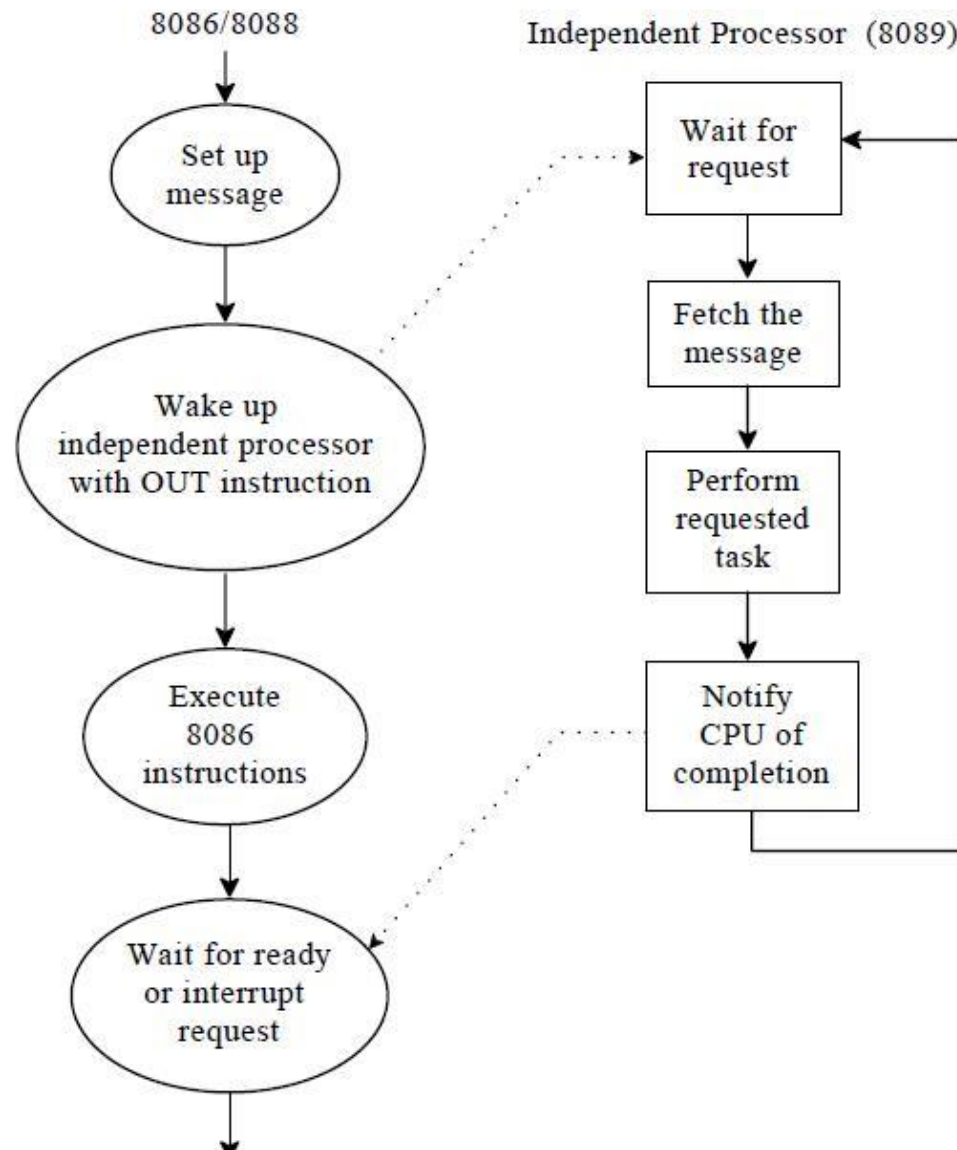
- Memory
- I/O system
- Bus & bus control logic
- Clock generator

Closely coupled configuration

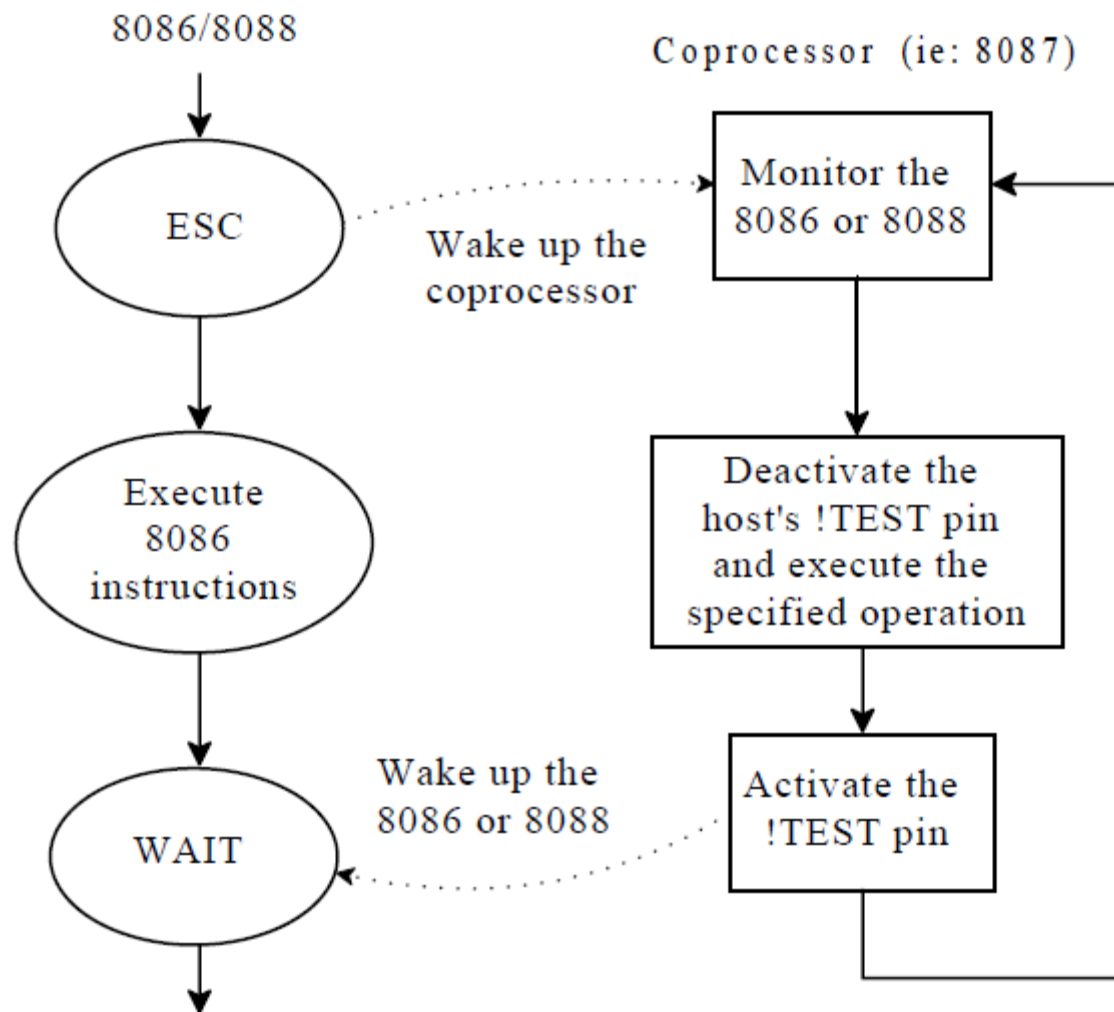
Closely Coupled Configuration:



Closely coupled configuration



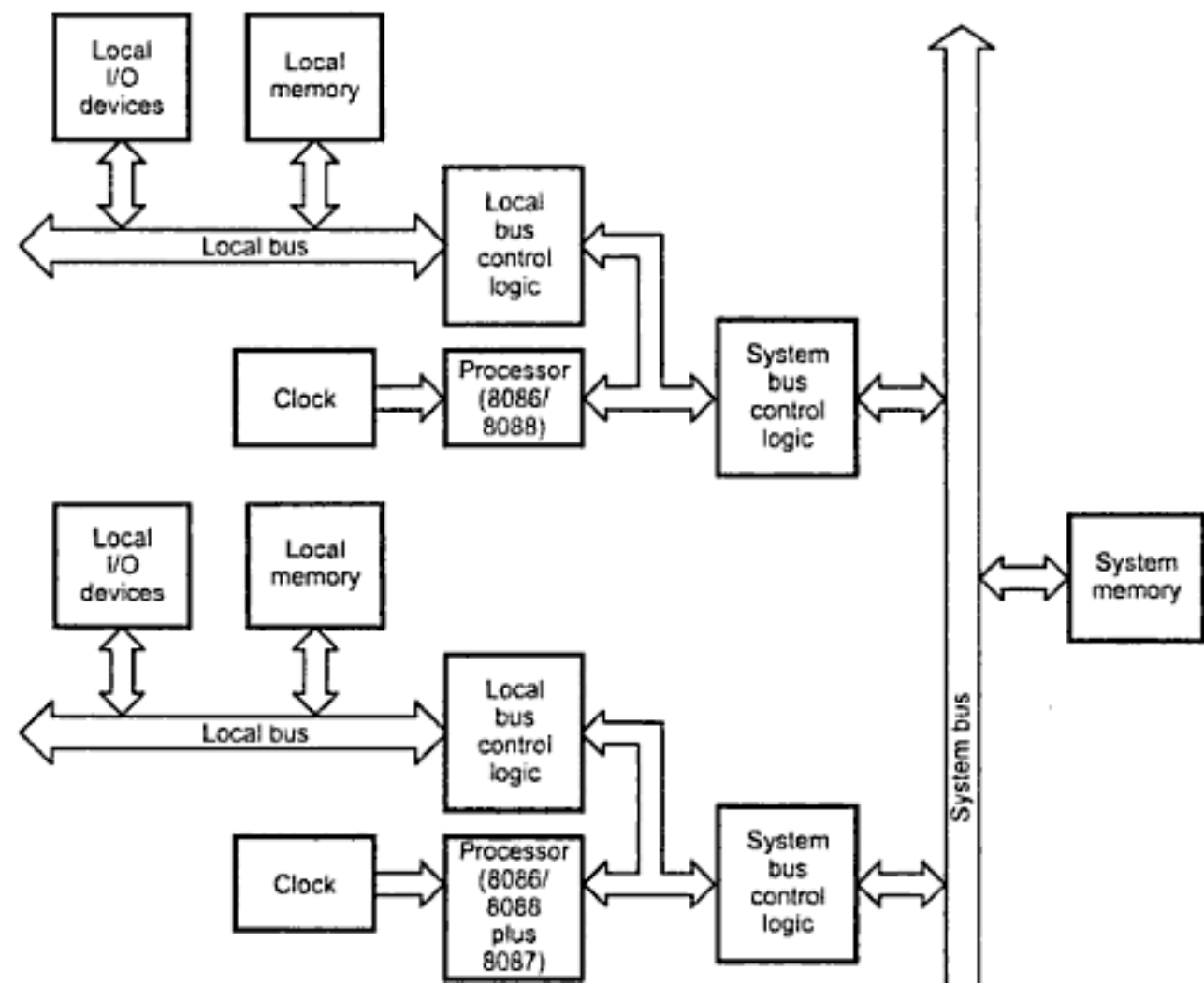
Closely coupled configuration



Loosely Coupled Configuration:

- has shared system bus, system memory, and system I/O
- each processor has its own clock as well as its own memory (in addition to access to the system resources, such as the system clock)
- clocks are of similar frequency, but asynchronous towards each other

Loosely coupled configuration



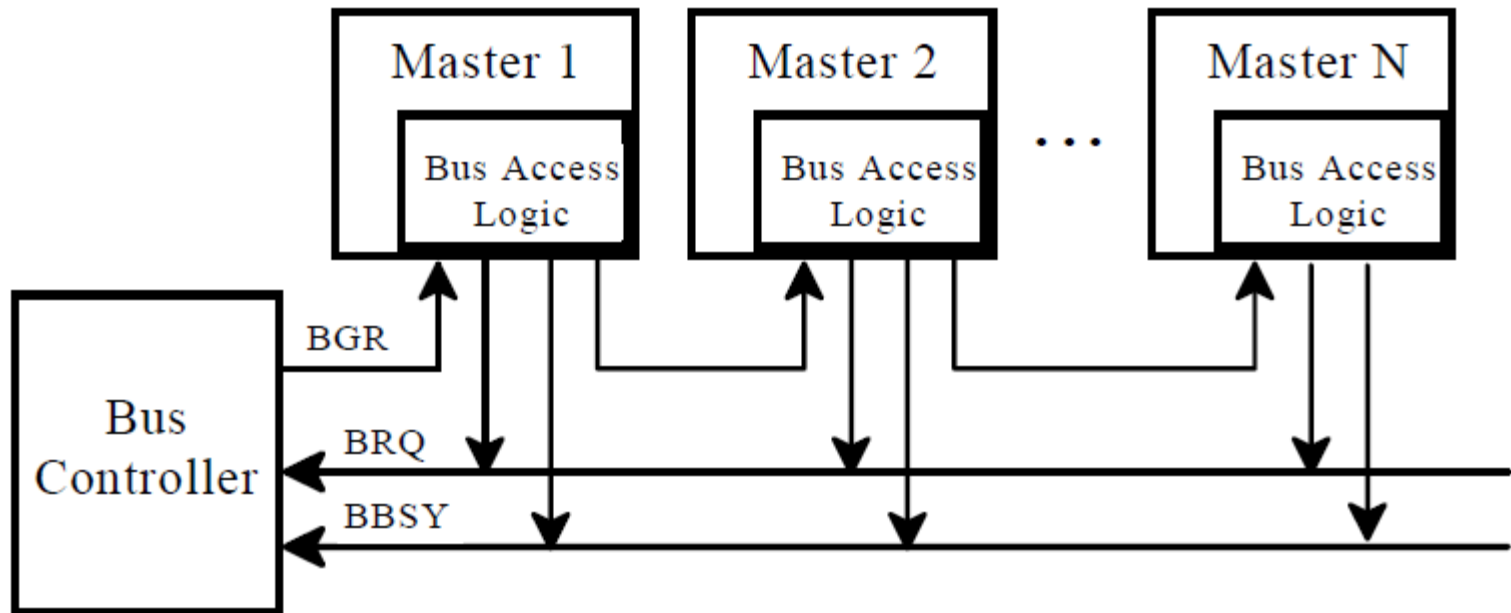
Bus Allocation Schemes

- Daisy Chaining
- Polling
- Independent Priority

Daisy Chaining:

- Need a bus controller to monitor bus busy and bus request signals
- Sends a bus grant to a Master , each Master either keeps the service or passes it on
- Master releases the Bus Busy signal when finished

Daisy Chaining



Advantages

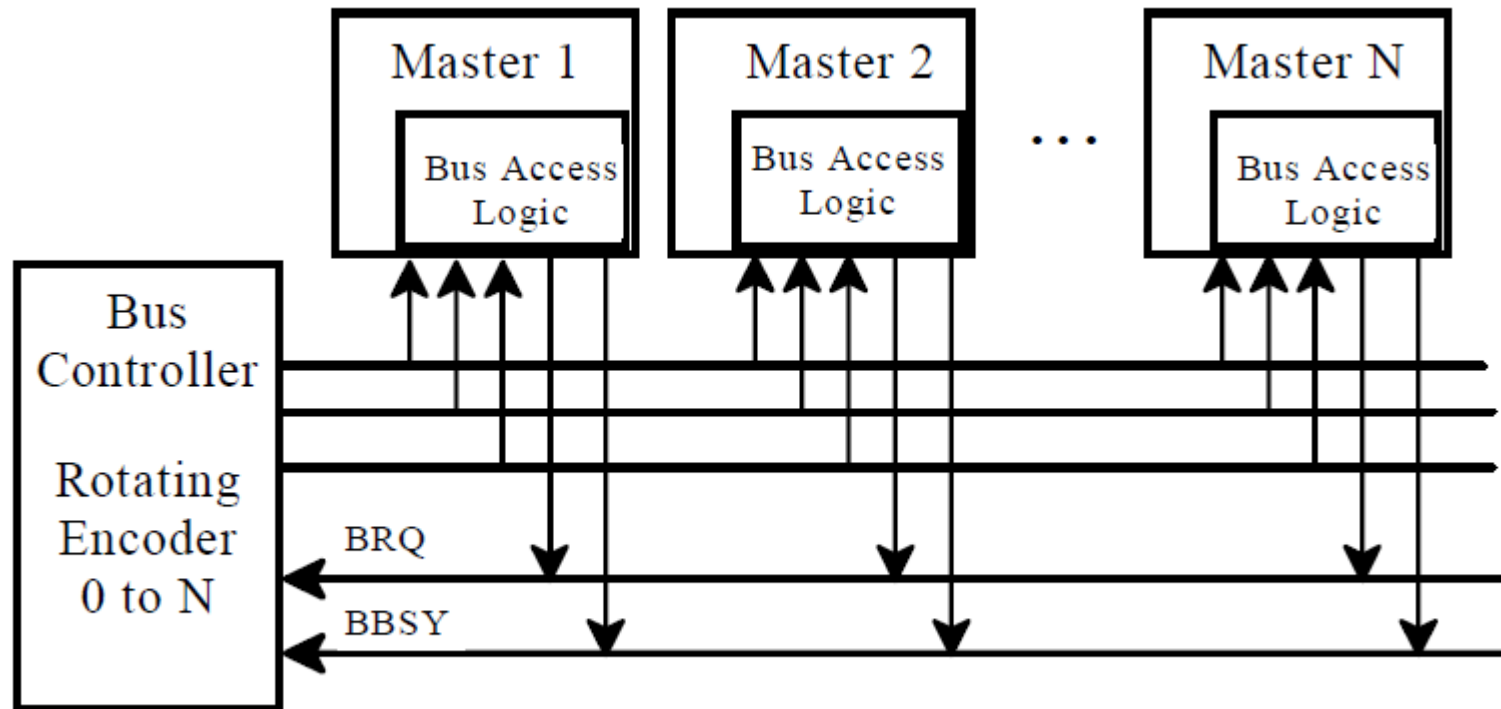
- It is simpler and cheaper method
- It requires the least number of lines and this number is independent of the number of masters in the system

Disadvantages

- Propagation delay is proportional to the number of masters
- The priority of the master is fixed by its physical location
- Failure of one system causes the whole system to fail

Polling

Polling



Polling:

- A set of address lines are driven by controller to address the masters
- When a bus request is received from a device, controller generates the addresses on the address lines.
- When the requesting master recognizes its address, it activates the BUSY line.
- Once the busy line is activated , the controller stops generating further addresses

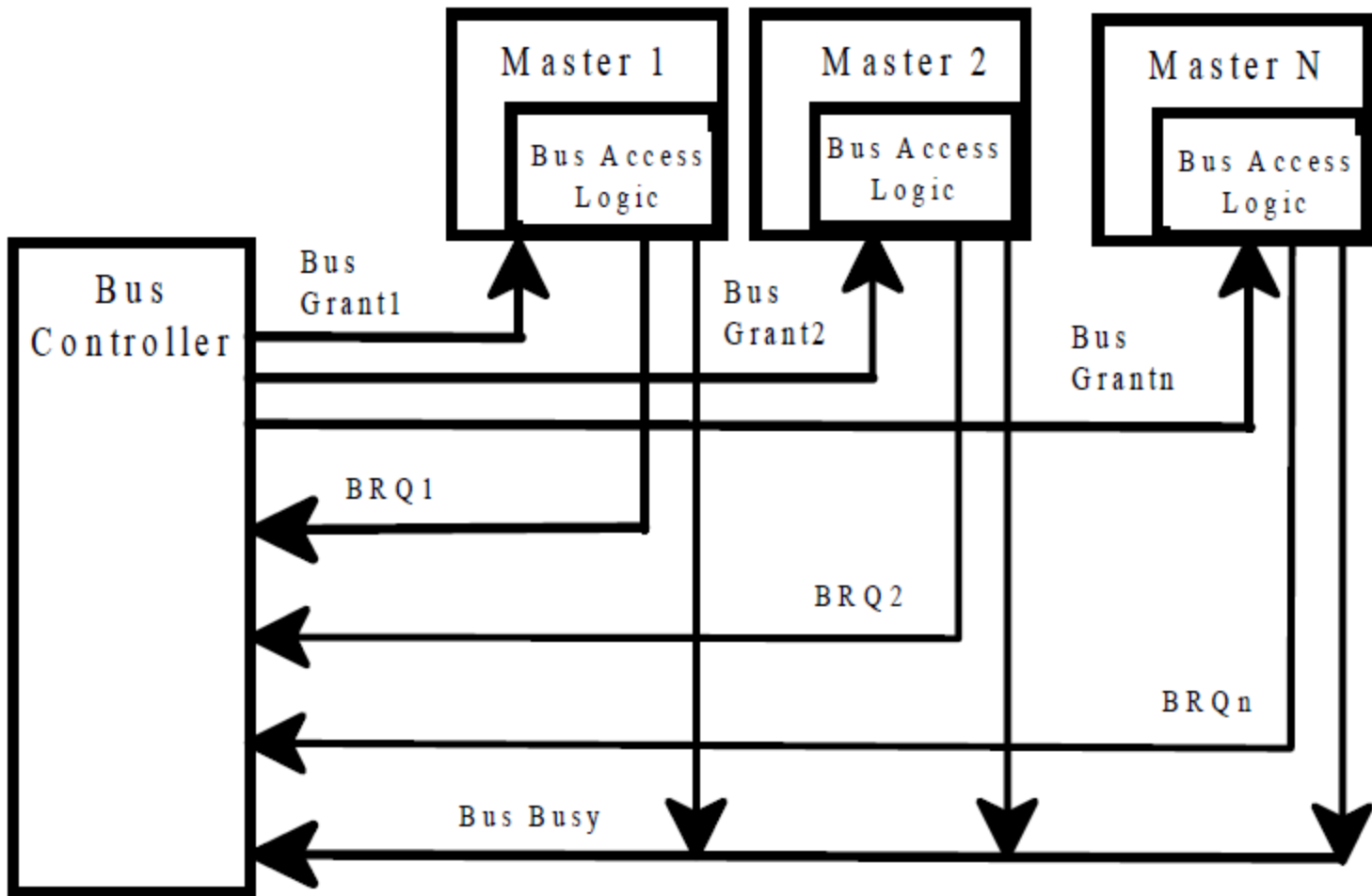
Advantages

- The priority can be changed by altering the polling sequence stored in the controller
- If one module fails entire system does not fail

Independent Priority

- Each master has a separate pair of bus request and bus grant line
- Each pair has priority assigned to it.
- Fixed priority or rotating priority can be given.

Independent Priority



Advantages

- Due to separate pairs of bus request and bus grant signals, arbitration is fast and is independent of the number of masters in the system

Disadvantages

- It requires more bus request and grant signals($2 \cdot n$ signals for n modules).

Thank you