CS305
Computer Architecture

Bus Arbitration

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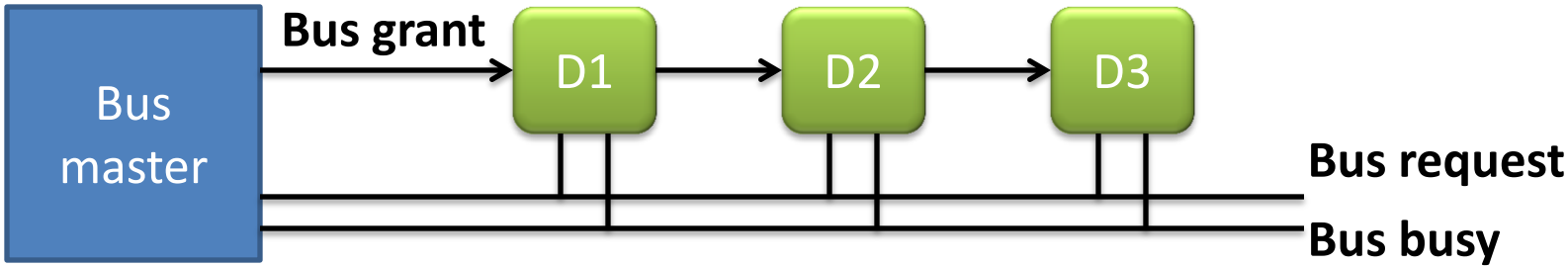
Bus Arbitration

- Arbitration: deciding who gets access to the bus
  - For driving the transaction
- Decided centrally, by bus master/controller
  - Always only one master device per bus
- Three arbitration mechanisms
  - Daisy chain
  - Polling
  - Independent request
- Each uses special control lines for such arbitration

Daisy Chaining



Steps:

1. If bus not busy, make bus request
2. Master activates bus grant
3. If device gets bus grant, mark bus busy

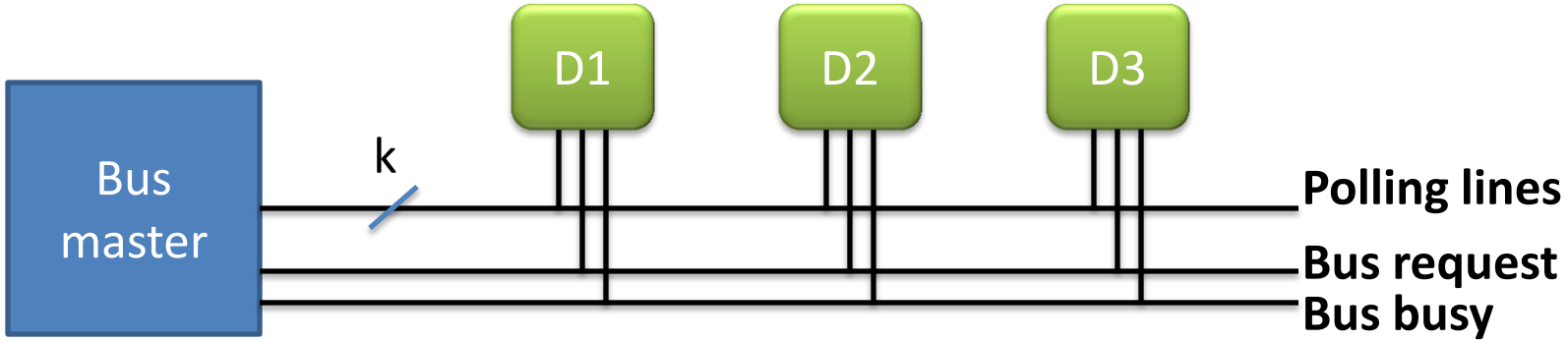
(+) Simple

(+) Only three extra bus lines

(–) Hardwired priority

(–) Poor fault tolerance

Polling



Steps:

1. If bus not busy, make bus request
2. Master polls by placing device ID on polling lines (master decides priority)
3. If device gets bus grant, mark bus busy

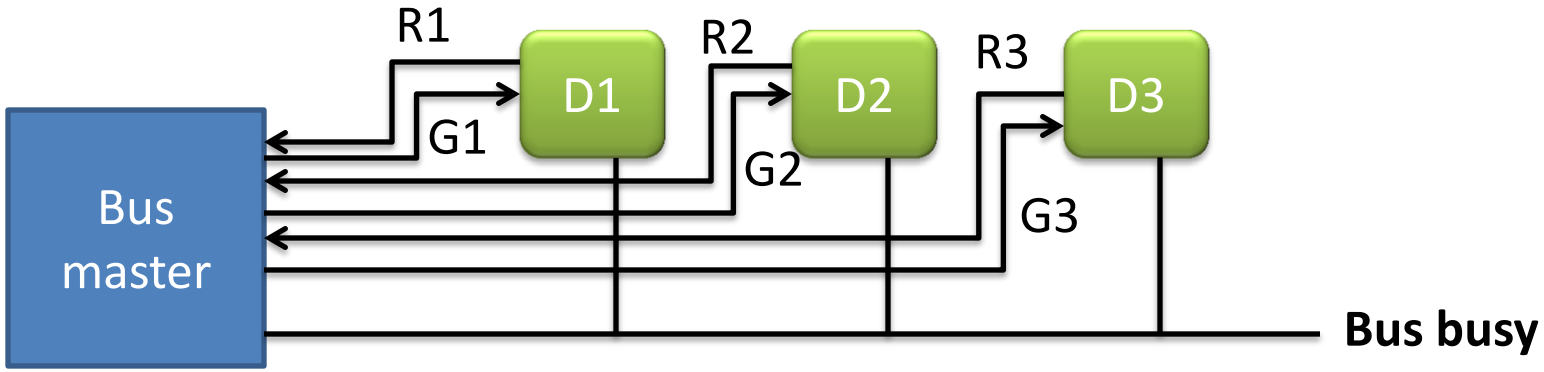
(+) No disadvantage of daisy chain

(+) Dynamic priority possible

(–) Extra poll lines

(–) Polling delay

Independent Request



Steps:

1. If bus not busy, make bus request
2. Master decides who to grant access, and indicates through grant line
3. If device gets bus grant, mark bus busy

(+) Fast

(+) Dynamic priority possible

(–) 2n lines for n devices!

Summary

- Bus arbitration mechanisms:
  - Daisy chaining: only 3 bus lines, but inefficient
  - Polling: O(log(n)) bus lines, but polling delay
  - Independent request: fast, but 2n bus lines