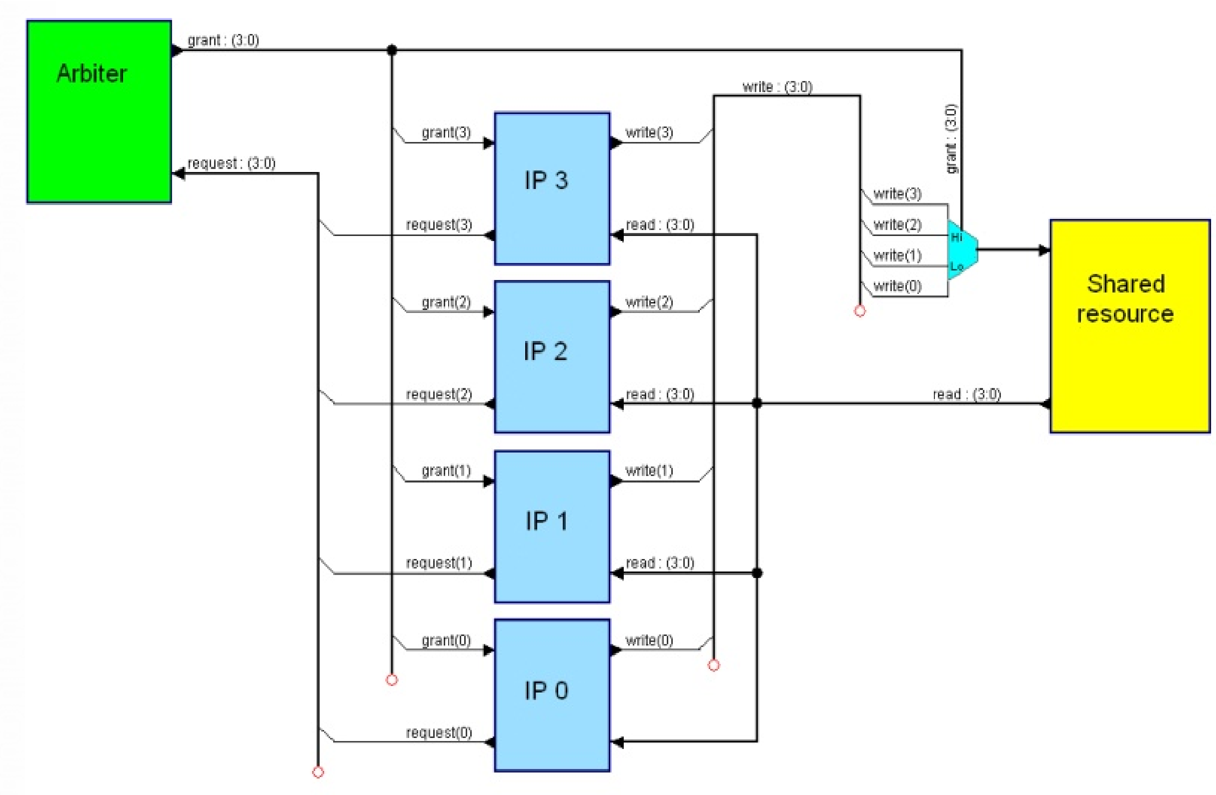
Paper exercise 2 bonus

When many blocks (blue in the figure above) want to use one shared resource (yellow in the figure) such as a memory or a bus, an arbiter block is needed (green in the figure), which decides which block gets to use the resource.

Design the combinational request-grant type arbiter for this system. The arbiter gets request wires as input, and grant signal is used to select the highest priority, which is the one with the lowest index in this case (request[0] has the highest priority). Use at most two-input basic gates.



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Bonus problem answer

Request				Grant			
[3]	**[2]**	**[1]**	**[0]**	**[3]**	**[2]**	**[1]**	**[0]**
1	0	0	0	1	0	0	0
x	1	0	0	0	1	0	0
x	x	1	0	0	0	1	0
x	x	x	1	0	0	0	1
0	0	0	0	0	0	0	*0*

lo prior *hi prior*

Grant [3]= Req[3] · Req[2]' · Req[1]' · Req[0]'
Grant [2]= Req[2] · Req[1]' · Req[0]'
Grant [1]= Req[1] · Req[0]'
Grant [0]= Req[0]

Using 2-input gates

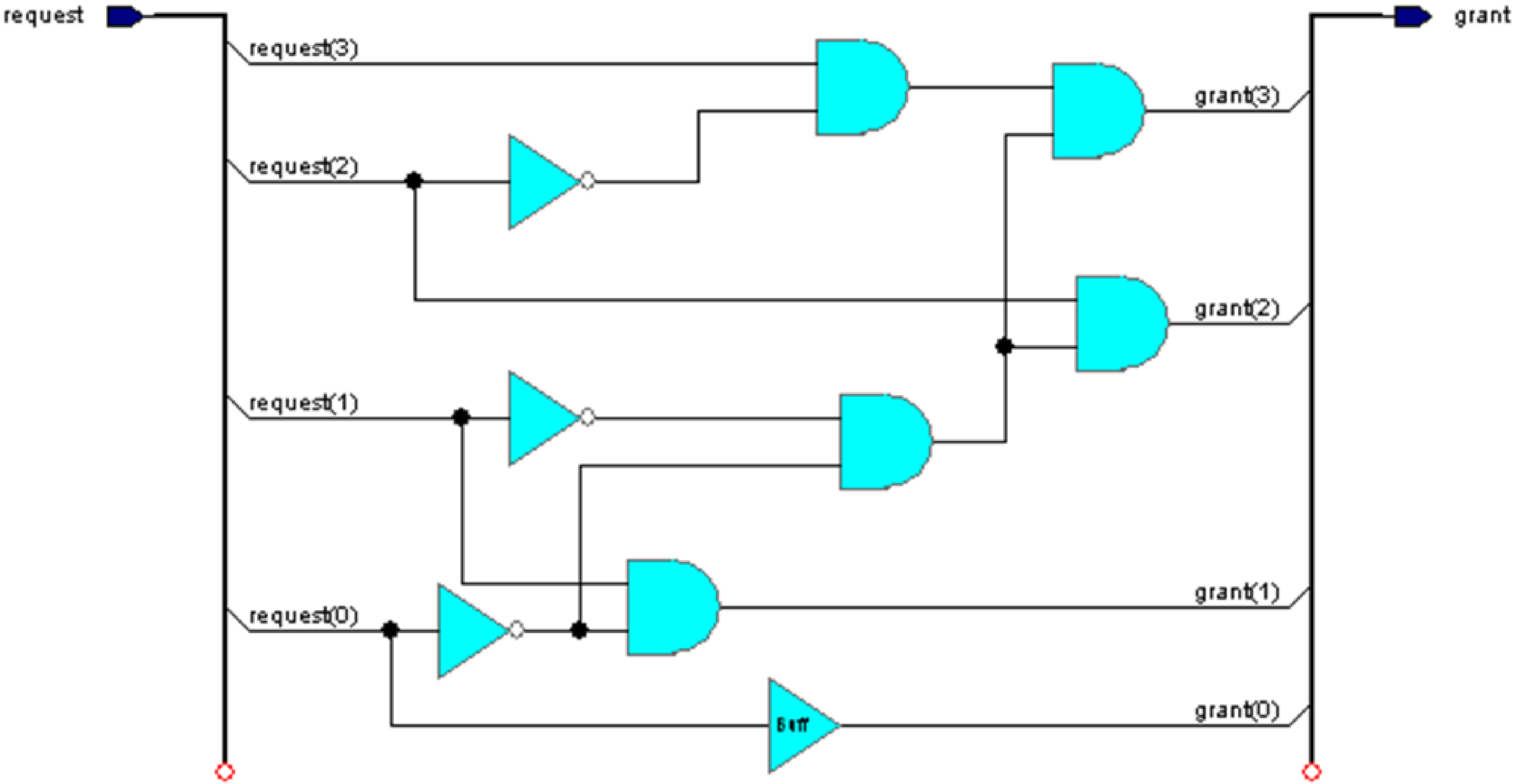
Grant [3]= (Req[3] · Req[2]') · (Req[1]' · Req[0]') A = Req[1]' · Req[0]'
(Req[3] · Req[2]') · A

Grant [2]= Req[2] · (Req[1]' · Req[0]')
= Req[2] · A

Grant [1]= Req[1] · Req[0]'

Grant [0]= Req[0]

Bonus problem answer


request
request(3)
request(2)
request(1)
request(0)
Buff
grant
grant(3)
grant(2)
grant(1)
grant(0)