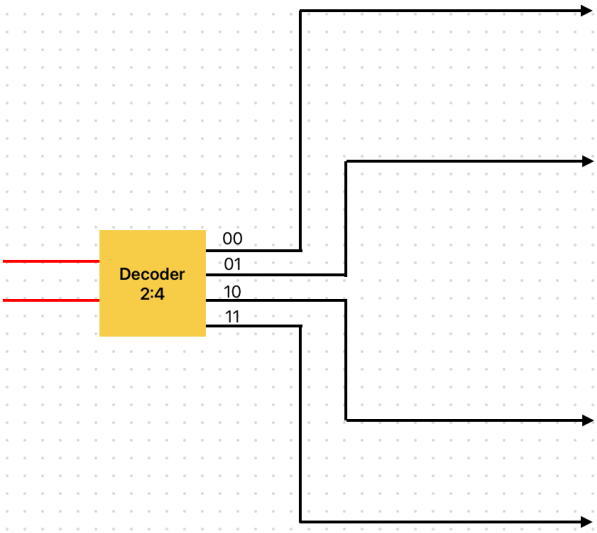
Construct a **4 x 16k** using **1 x 4k** memories

	4 x 16k	**1 x 4k**
Data bus width	4 bits	1 bit
Address bus width	$2^x = 16k$ $2^x = 2^4 \times 2^{10}$ $2^x = 2^{14}$ $\therefore x = 14$	$2^x = 4k$ $2^x = 2^2 \times 2^{10}$ $2^x = 2^{12}$ $\therefore x = 12$
Capacity	4 x 16 k bits 8 x 8 k bits 8 k bytes 8KB	1 x 4 k bits 0.5 x 8 k bits 0.5 k bytes 0.5KB

1) Check the address bus width of both

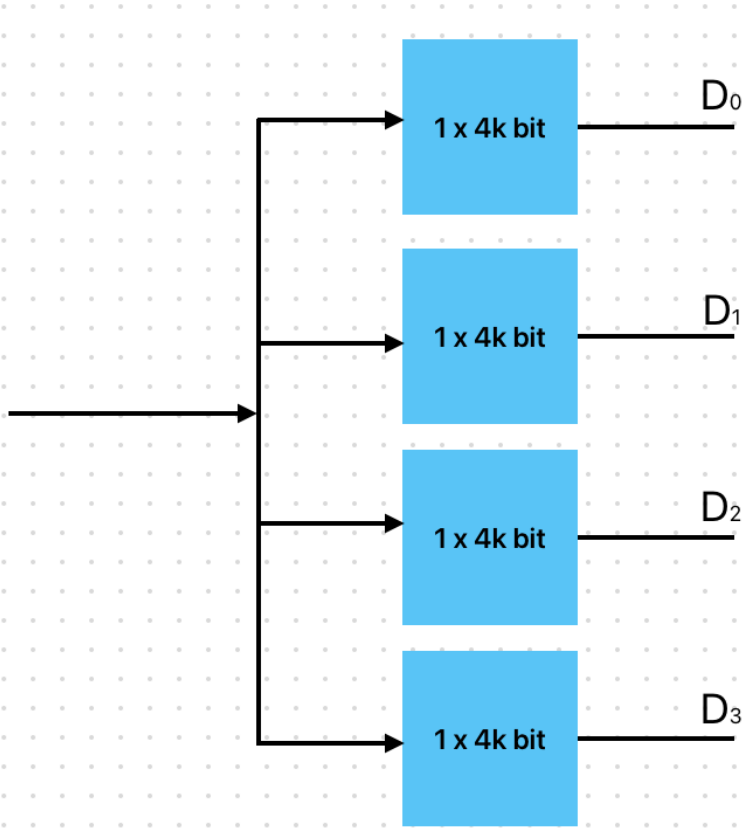
The 1 x 4k memory only have 12 addresses bus,
4 x 16k memory have 14 addresses
So we need 2 extra addresses
We can give them using decoder



Having 2 addresses from decoders left we can get 4 new paths from decoders right (2^2=4 [$2^{\text{no address we need more}}$]) we can name them as above. Since there are 2 addresses on left and 4 on right we can give the ratio 2:4 on decoder.

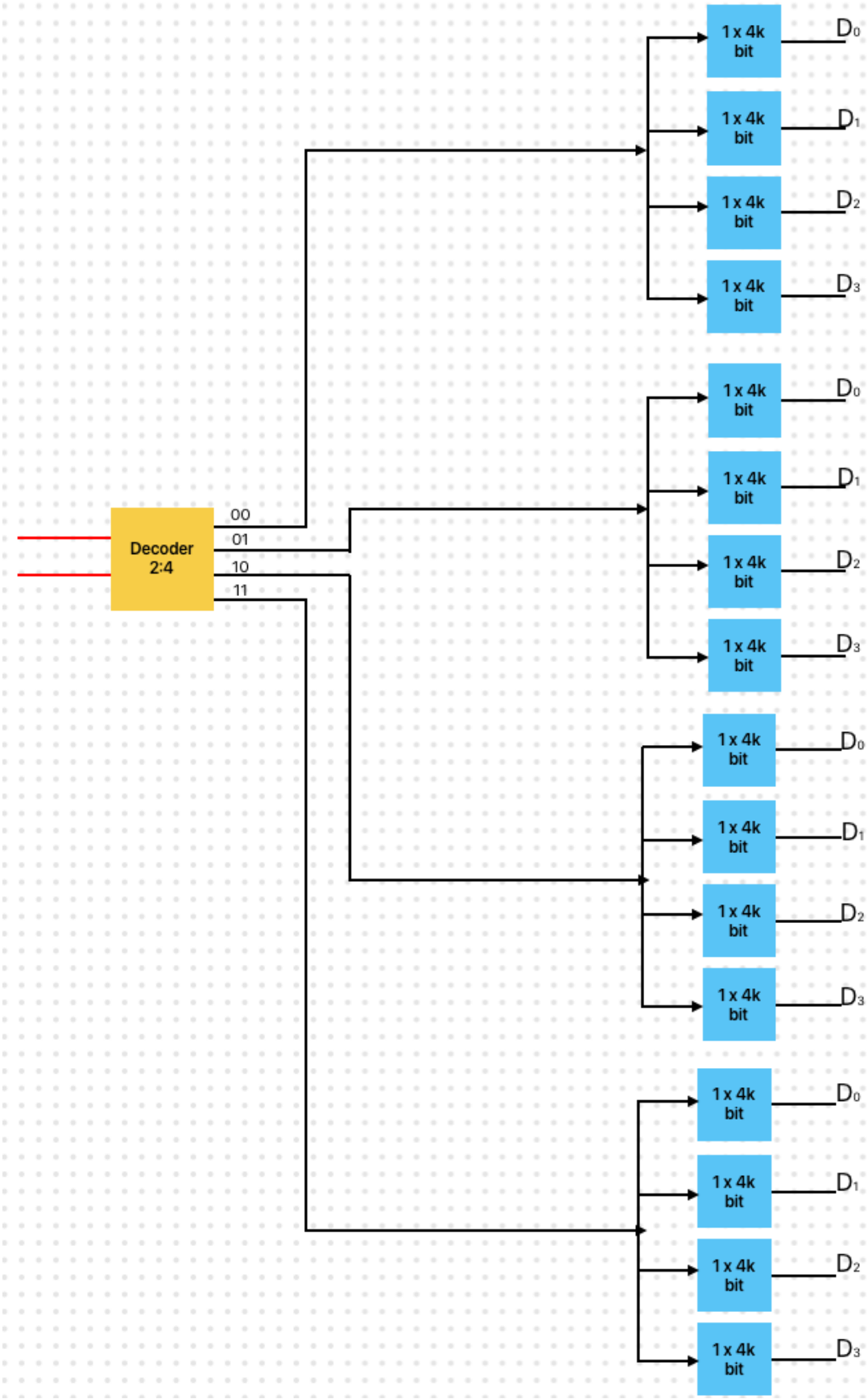
2) Now we need to connect our 1x4k memories to these 4 wires.
But there is a problem 1x4k memory only have 1bit of data bus, but we need 4bits of data bus in 4 x 16k memory

To create 4bits using 1bit we need to combine 4 1x4k memories together

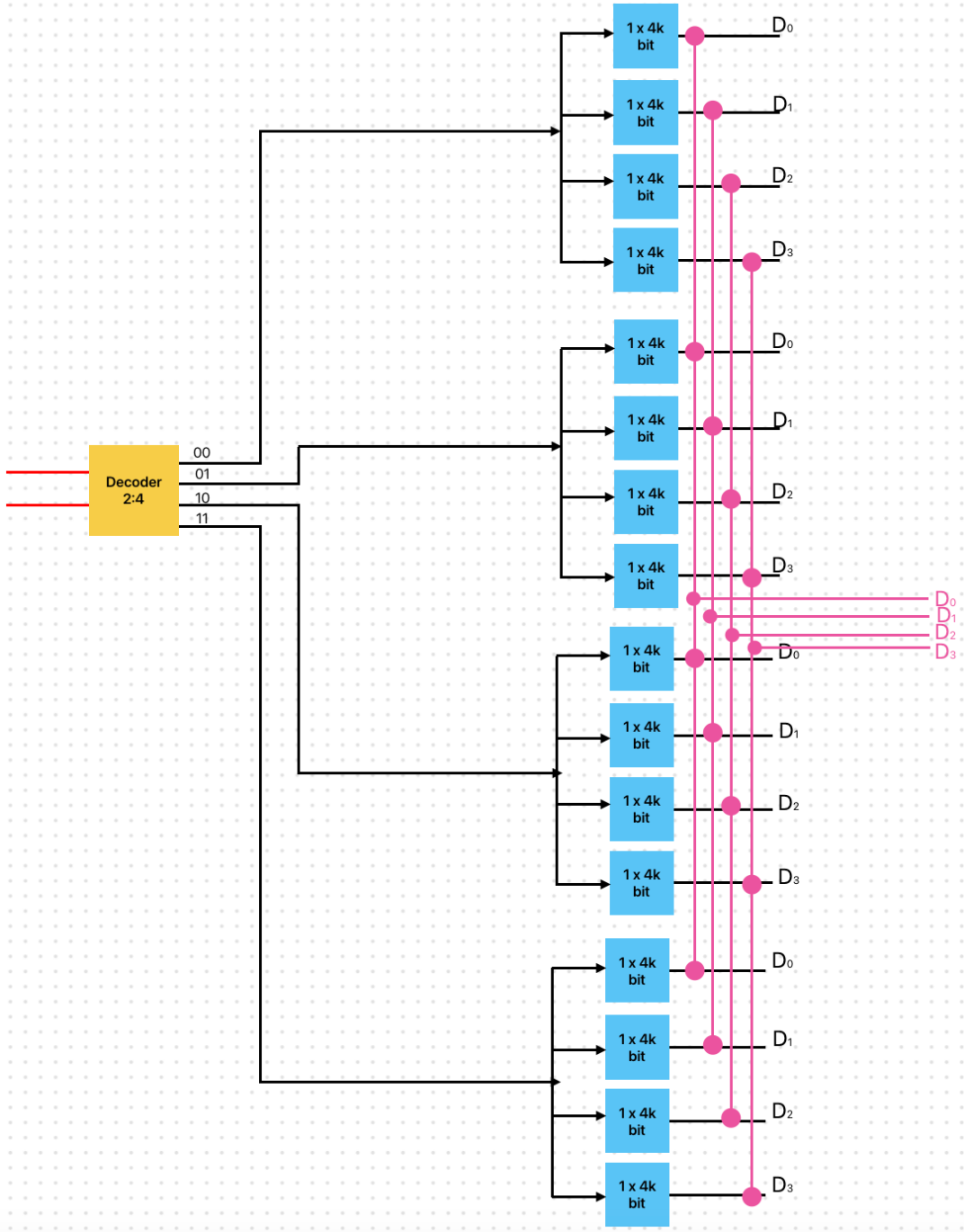


Now we have created 4bit data bus with memory using 1x4k memories.

3)We need to connect 4 of these to wires from decoder

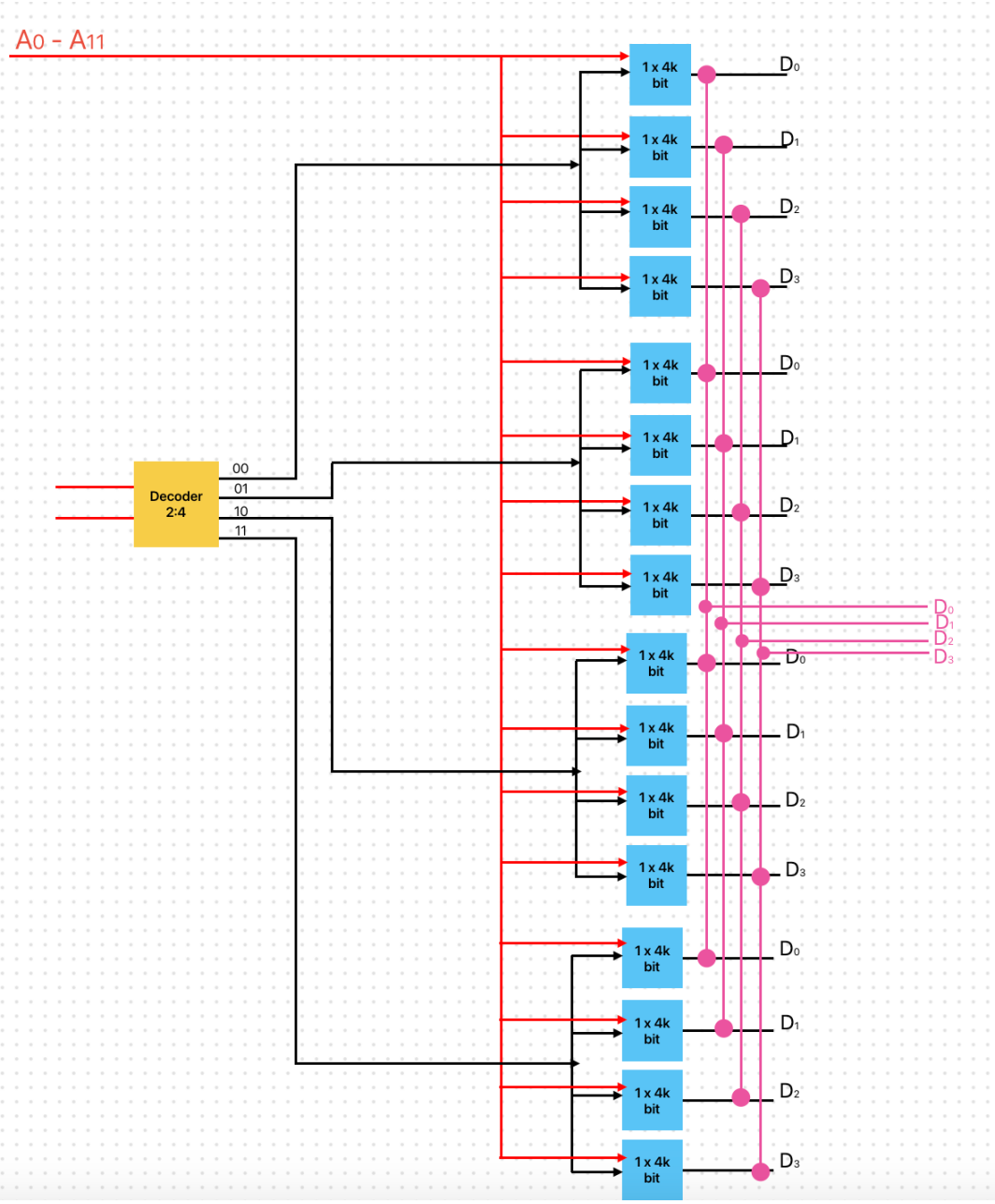


4) Now we need to combine relative data wires together else there would be 16 data wires we only need 4



Now there are only 4 data wires

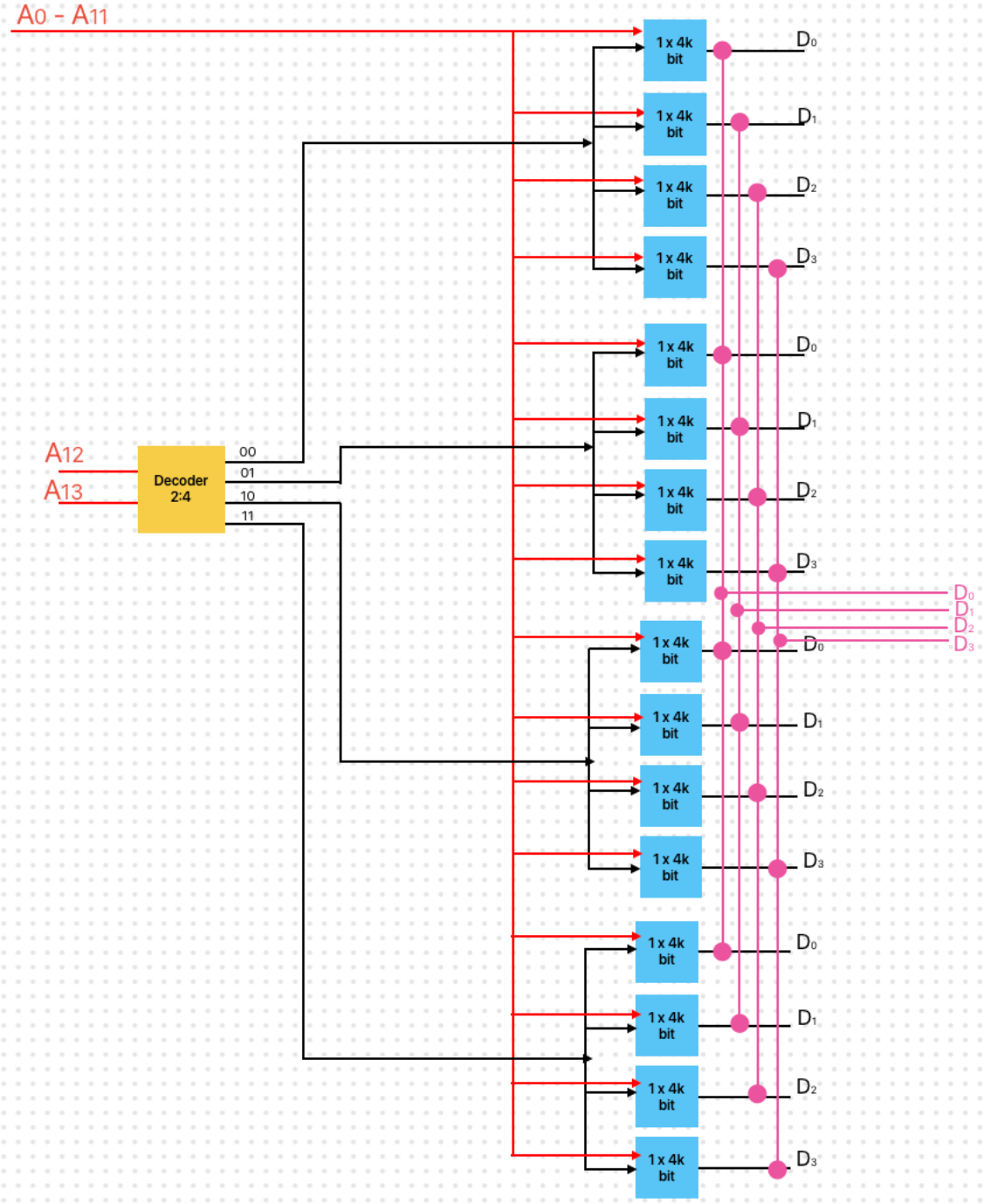
5) Finally we can give the 12 address we discussed on 1st step , to each of this 1 x 4k memories



We have 12 addresses there

We can give them as A_0-A_{11} (There are 12 addresses when we start counting from 0 and end with 11)

6) And we can name the other addresses we gave to decoder as remain.



Now we have a 4 x 16k memory using 1x4k memories.