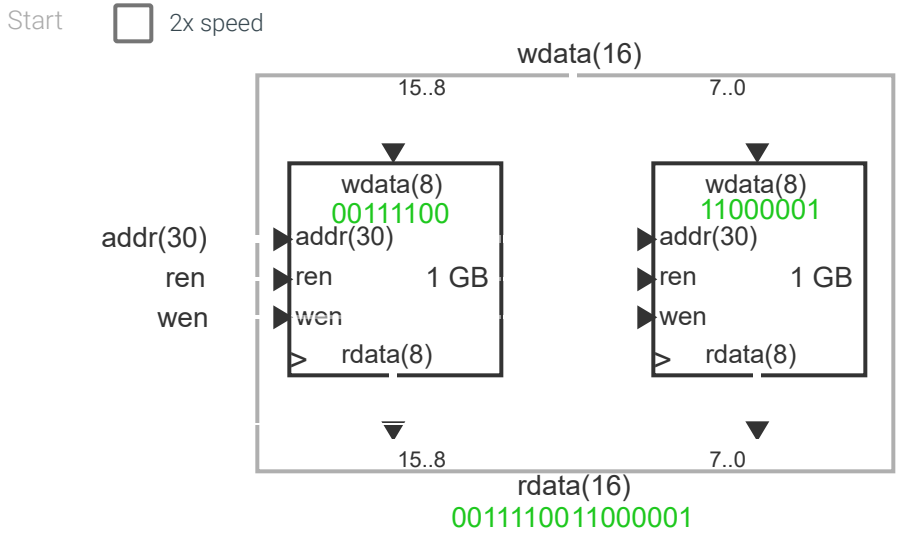
8.3 Composing memory

Composing memory chips horizontally

Because small memory chips may be cheap and widely available due to chip economics, building a memory by composing memory chips is often cheaper than buying a single larger chip.

A designer may wish to create a wider memory, in which case memory chips can be composed horizontally, as below.

PARTICIPATION ACTIVITY 8.3.1: Composing two memory chips horizontally into a memory with twice as many bits per location.



PARTICIPATION ACTIVITY

8.3.2: Composing memory chips horizontally.

1) A designer wishes to build a 32-bit wide memory using 1G x 8 memory chips. How many memory chips are needed?
   - 4
   - 8

2) A memory with 1 G addresses has 30 address inputs. If two 1G x 8 memory chips are composed horizontally to build a 16-bit-wide memory, how many address lines connect to the left chip?
   - 29
   - 30

3) A designer wishes to build a 10-bit wide memory using any number of 8-bit wide memory chips. How many chips are required?
   - 2
   - Not possible

Composing memory chips vertically

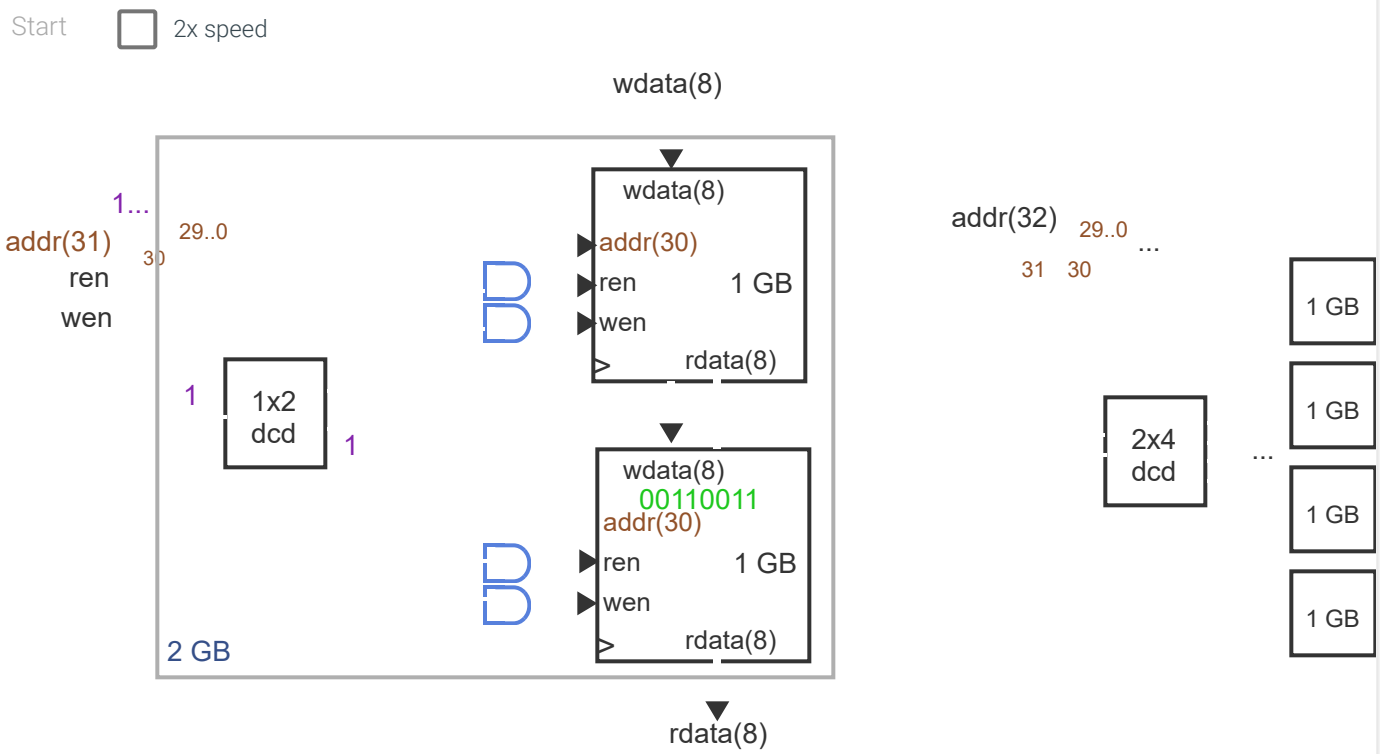
A designer may wish to create a memory with more locations, in which case memory chips can be composed vertically, as

For this purpose, when read is not enabled, a memory chip outputs neither 0's nor 1's, but electrically outputs nothing, allow rows' read data output lines to simply be connected when creating a larger memory.

PARTICIPATION ACTIVITY

8.3.3: Composing two memory chips vertically into a memory with twice as

many locations.



PARTICIPATION ACTIVITY 8.3.4: Composing memory chips vertically.

1) Two 1 GB memory chips are composed into a 2 GB memory. What size decoder is needed? Type 1x2, 2x4, or 3x8.

Check Show answer

2) Two 1 GB memory chips are composed into a 2 GB memory. Which address bit controls the decoder? Type 33, 32, 31, or 30.

Check Show answer

3) 256-byte memory chips (8 address inputs) are composed into a 1 KByte memory (10 address inputs). What size decoder is used? Type 1x2, 2x4, 3x8, or 4x16.

Check Show answer

4) 256-byte memory chips (8 address inputs) are composed into a 1 KByte memory (10 address inputs). What address bits control the decoder? Type either:
10, 9
9, 8
9, 8, 7
9

Check Show answer

5) Eight 1 KB memory chips (10 address inputs) named C0, C1, ..., C7 (top to bottom) are composed into an 8 KB memory (13 address inputs). Which chip is active for address 1110110000000?

Check Show answer

6) A designer has 1 KB (1K x 8) memory chips available. The designer wants to create a 4K x 24 memory. How many 1 KB chips will be needed?

Check Show answer

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