

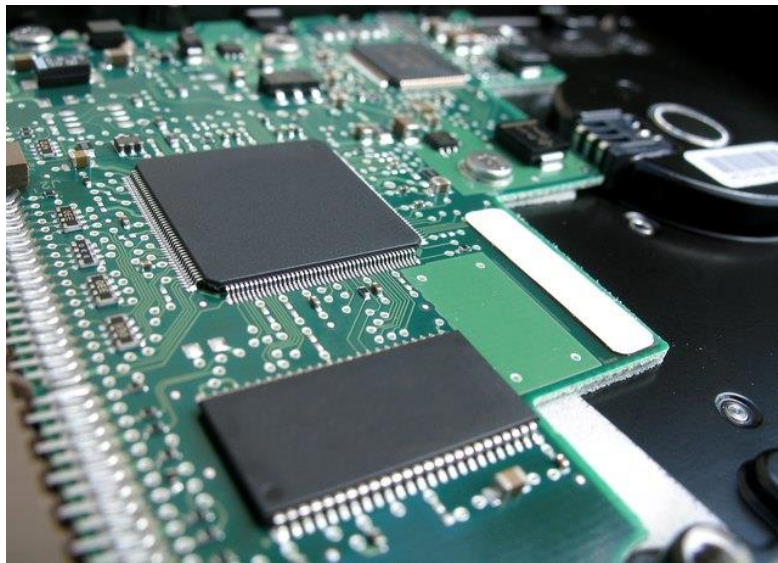


جامعة القادسية
كلية التربية



Lecture 5

Computer Architecture



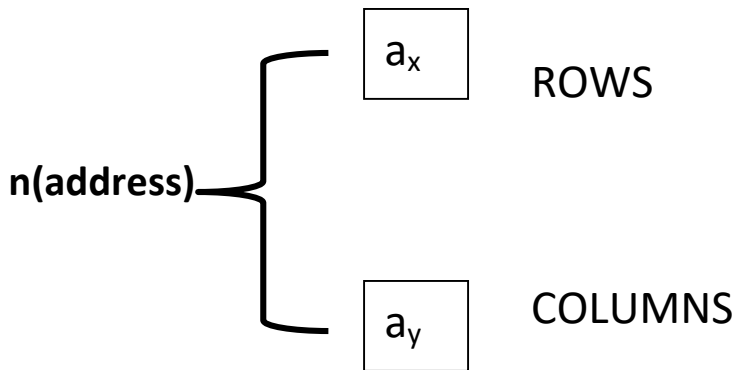
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Two Dimensional Memory:

في التنظيم ثنائي الأبعاد ، يتم تقسيم الذاكرة على شكل صفوف وأعمدة (array). كل صف يحتوي على مجموعة من الخلايا (cells) التي تخزن البتات التي تمثل البيانات . وهناك وحدة تحليل الشفرة decoder وهي دائرة توافقية تحتوي على خطوط إدخال n وخطوط إخراج 2^n سيحدد أحد خطوط الإخراج الصف الذي يحتوي على العنوان في الـ MAR والبيانات التي يتم تمثيلها بهذا الصف والتي سيتم تحديدها وإما قراءتها أو كتابتها عبر سطور البيانات.

يتكون الهيكل الداخلي للذاكرة سواء RAM أو ROM من خلايا ذاكرة خزنية. وهذه الخلايا تكون مرتبة على شكل مصفوفات ذات بعدين (2 dimension) وفي هذه الحالة نحتاج الى 2 decoder والعنوان n يقسم الى جزئين صفوف rows وتمثل بـ (a_x) واعمدة columns وتمثل بـ (a_y) .



حيث ان :

$$N_x = 2^{a_x} \text{ (عدد الخلايا في الصفوف) , } N_y = 2^{a_y} \text{ (عدد الخلايا في الاعمدة)}$$

$$N = N_x * N_y \text{ (عدد الخلايا الكلي)}$$

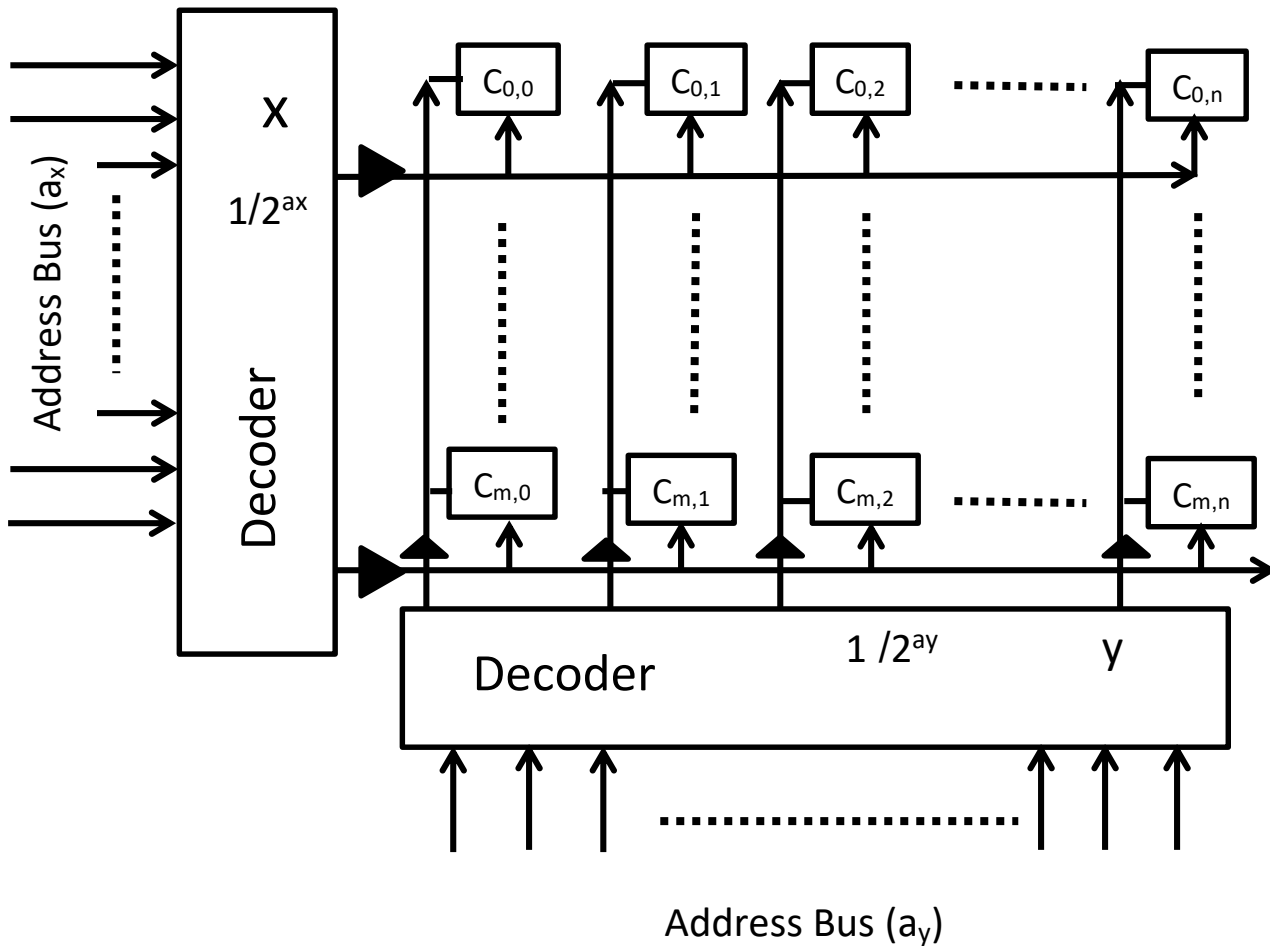
$$\text{If } N_x = N_y = \sqrt{N}$$

$$\text{No. of drivers} = 2\sqrt{N}$$

Else

$$\text{No. of drivers} = N_x + N_y$$

Type : 2 decoder (1 out of \sqrt{N})



Two – Dimensional Addressing Scheme

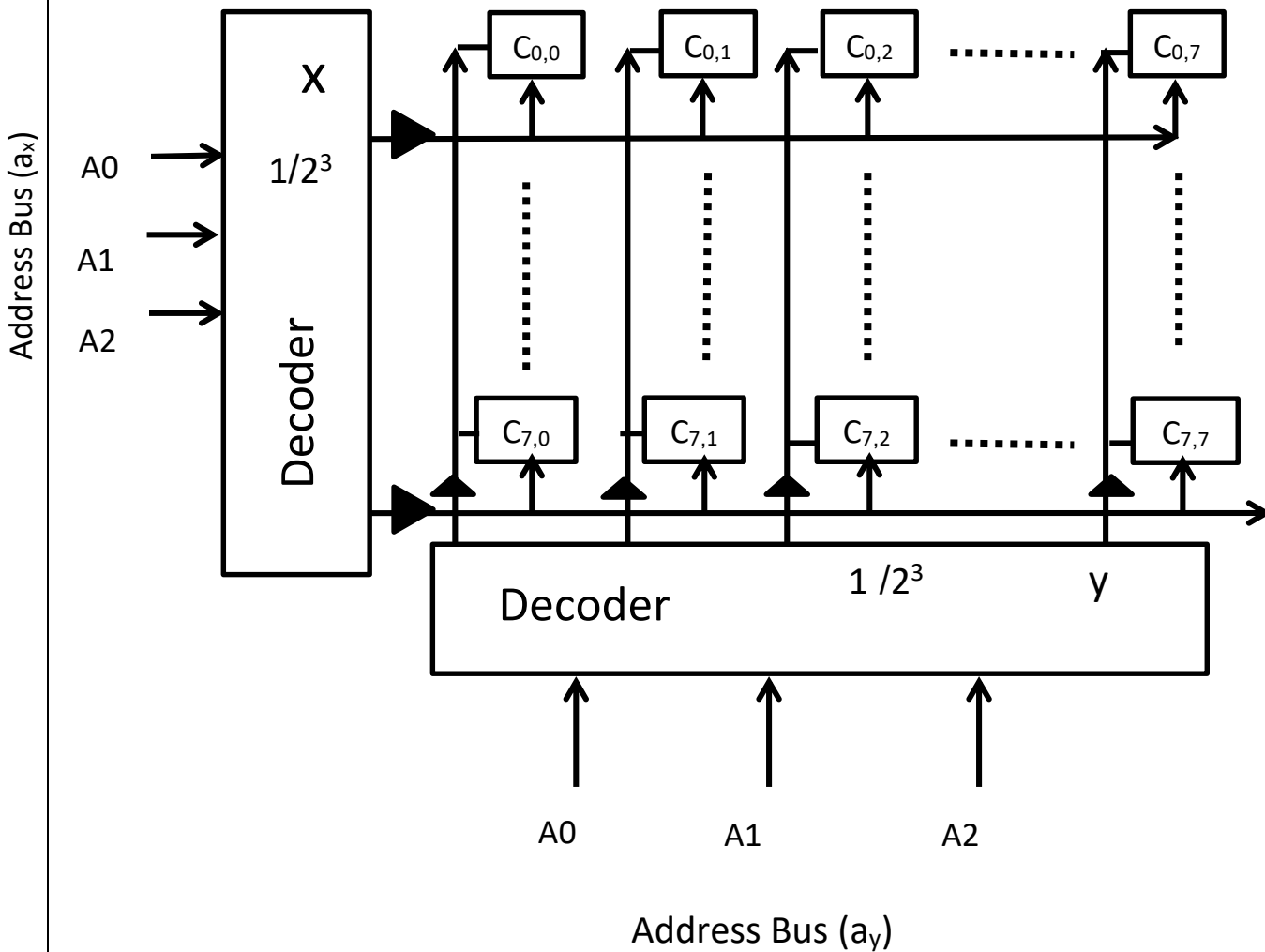
EX1) Assume $d=2$, $n=6$ find:

1. no. of rows?
2. no. of columns?
3. Total cells?
4. no. of drivers?

5. no. and type of decoders?
6. Draw internal structure for this memory?

Sol.) $n=6 \longrightarrow a_x=3 \longrightarrow a_y=3$

1. no. of rows = $N_x=2^3=8$
2. no. of columns = $N_y=2^3=8$
3. $N= N_x * N_y= 8*8= 64$ no. of total cells
4. No. of drivers = $2\sqrt{N}=2\sqrt{64}=2*8=16$
5. Two decoder (1 out of 8)
6. Internal structure for this memory:

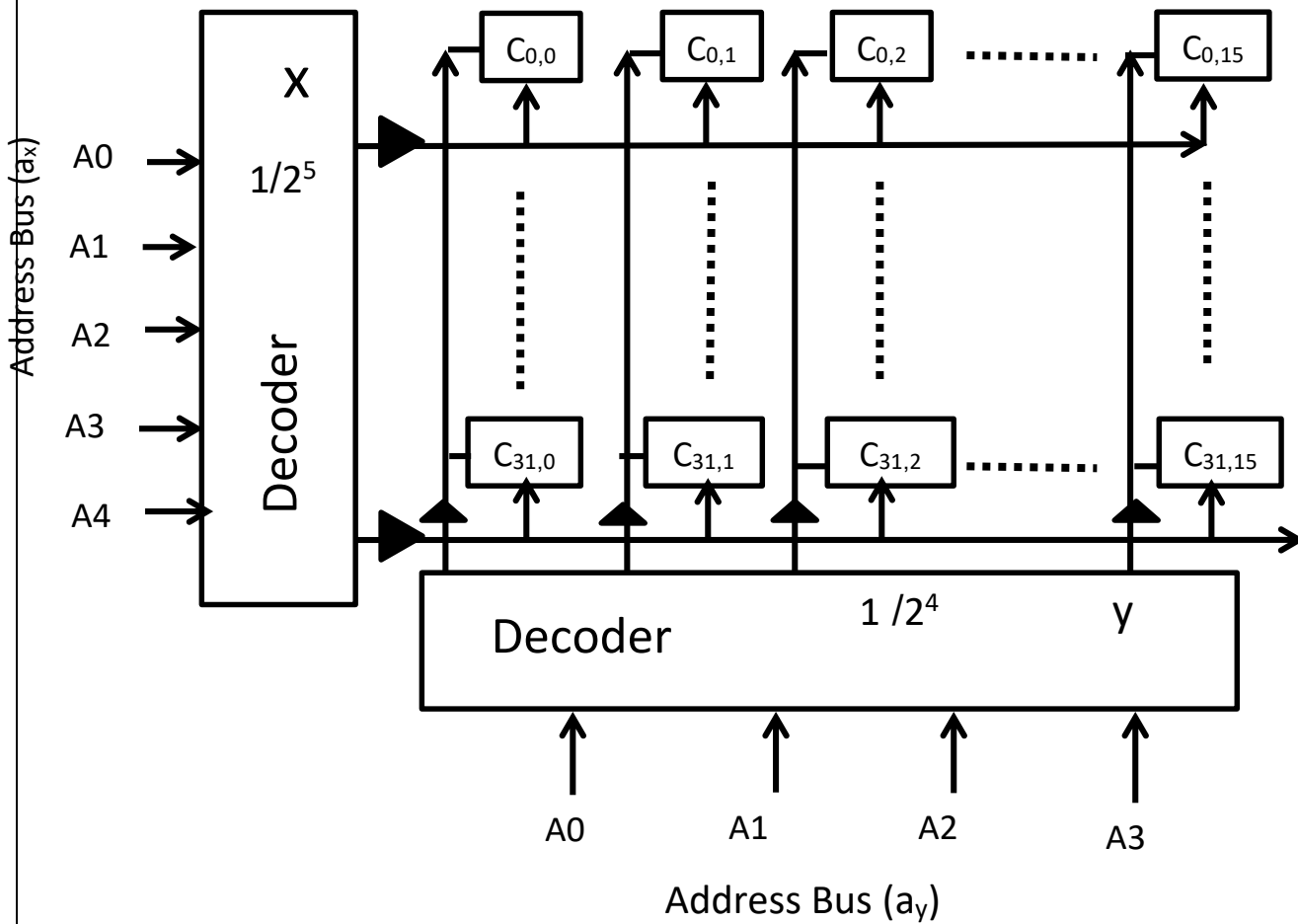


EX2) Assume $d=2$, $n=9$ find:

1. The rows
2. The columns
3. Total cells
4. no. of drivers?
5. no. and type of decoders?
6. Draw internal structure for this memory?

Sol.) $n=9 \longrightarrow a_x=5 \longrightarrow a_y=4$

1. no. of rows = $N_x=2^5= 32$
2. no. of columns = $N_y= 2^4= 16$
3. $N= N_x * N_y=2^5*2^4 = 2^9 = 512$ no. of total cells
4. No. of drivers = $N_x + N_y= 32+16= 48$
5. One decoder (1 out of 32)
One decoder (1 out of 16)
6. Internal structure for this memory:



EX3) Assume $d=2, n=8$ find:

1. no. of rows?
2. no. of columns?
3. Total cells?
4. no. of drivers?
5. no. and type of decoders?
6. Draw internal structure for this memory?

EX4) Assume $d=2$, $N=256$ find:

1. no. of rows?
2. no. of columns?
3. no. of drivers?
4. no. and type of decoders?
5. no. address line?

Sol.) $N=256 = 2^8$

1. no. of rows = $N_x=2^4= 16$
2. no. of columns = $N_y=2^4= 16$
3. No. of drivers = $2\sqrt{N}=2\sqrt{256}=2*16=32$
4. Two decoder (1 out of 16)
5. Address line = $256=2^8=8$

EX5) Assume $d=2$, $N=32$ find:

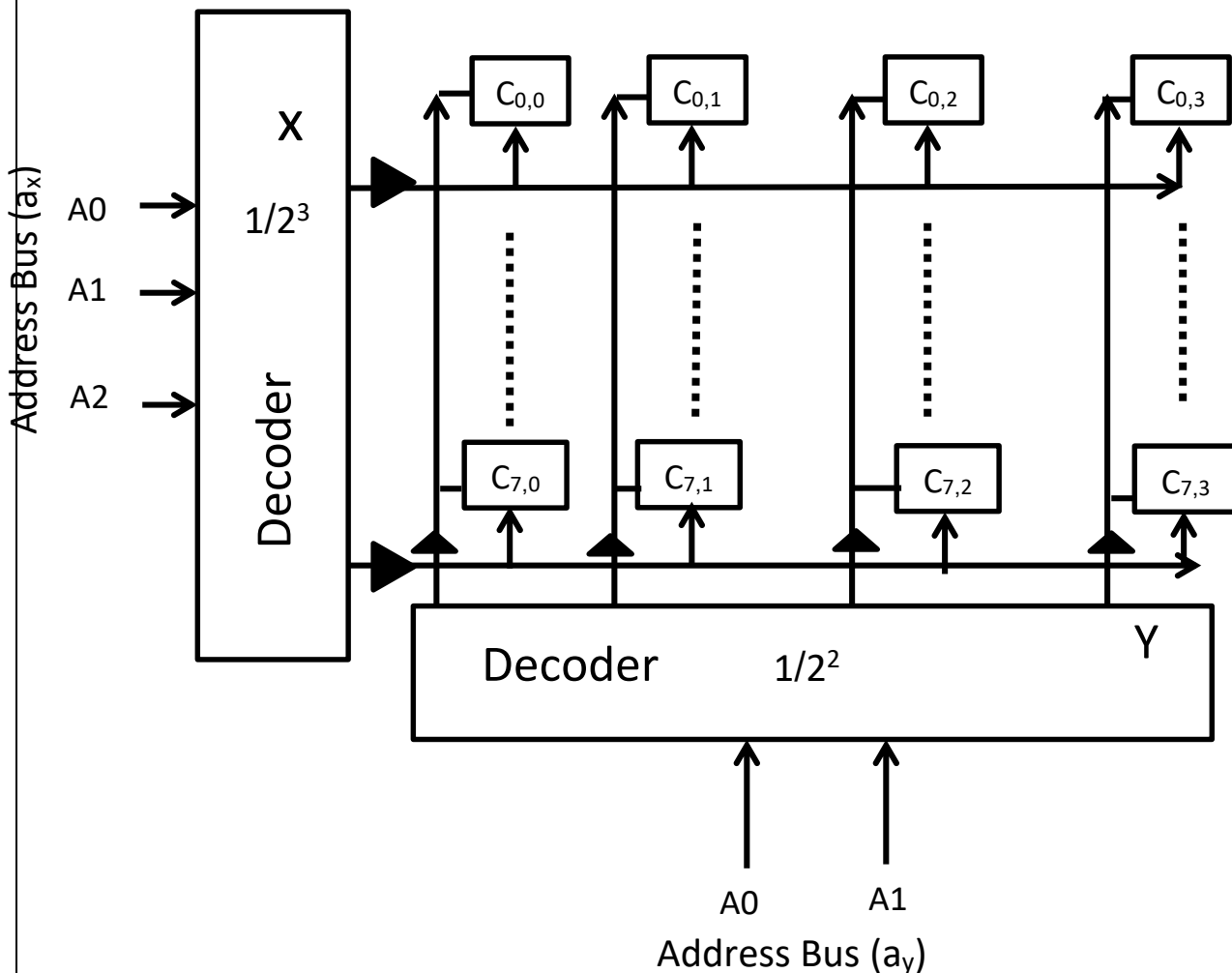
1. no. of rows?
2. no. of columns?
3. no. of drivers?
4. no. and type of decoders?
5. no. address line?
6. Draw internal structure for this memory?

Computer Architecture

Sol.) $N=32 = 2^5$

$$n=5 \longrightarrow a_x=3 \longrightarrow a_y=2$$

1. no. of rows = $N_x=2^3=8$
2. no. of columns = $N_y=2^2=4$
3. no. of drivers = $N_x + N_y=2^3 + 2^2 = 12$
4. One decoder (1 out of 8)
One decoder (1 out of 4)
5. $N=32=2^5=5$ no. address line
6. Internal structure for this memory:



EX6) Using 2-dimensional RAM organization scheme, if $N=1K$ find:

1. no. of rows?
2. no. of columns?
3. no. of drivers?
4. no. and type of decoders?
5. Draw internal structure for this memory?

Sol.) $N=2^{10} \longrightarrow a_x=5 \longrightarrow a_y=5$

1. no. of rows = $N_x=2^5=32$
2. no. of columns = $N_y=2^5=32$
3. no. of drivers = $2\sqrt{N} = 2\sqrt{1024} = 2 \times 32 = 64$
4. Two decoder (1 out of 32)
5. Internal structure for this memory:

