

## 邏輯合成與驗證 PA1

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### 2. (a)

mul.blif

```
lsv > pa1 > ≡ mul.blif
1 .model mul
2 .inputs a1 a0 b1 b0
3 .outputs y3 y2 y1 y0
4 .subckt myand A=a0 B=b1 O=w0
5 .subckt myand A=a0 B=b0 O=y0
6 .subckt myand A=a1 B=b0 O=w2
7 .subckt myand A=a1 B=b1 O=w3
8 .subckt myand A=w0 B=w2 O=w4
9 .subckt myand A=w3 B=w4 O=y3
10 .subckt myxor A=w0 B=w2 O=y1
11 .subckt myxor A=w3 B=w4 O=y2
12 .end
13
14 .model myand
15 .inputs A B
16 .outputs O
17 .names A B O
18 11 1
19 .end
20
21 .model myxor
22 .inputs A B
23 .outputs O
24 .names A B O
25 01 1
26 10 1
27 .end
28
```

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### 2. (b)

Commands: print\_stats

```
abc 01> read mul.blif
Hierarchy reader flattened 8 instances of logic boxes and left 0 black boxes.
abc 02> print_stats
mul : i/o = 4/ 4 lat = 0 nd = 8 edge = 16 cube = 10 lev = 3
abc 02> show
abc 02> Warning: Cannot convert string "-*-Helvetica-Medium-R-Normal--*-140-*-*P-*-ISO8859-1" to type FontStruct
Warning: Cannot convert string "-*-Helvetica-Medium-R-Normal--*-120-*-*P-*-ISO8859-1" to type FontStruct
Warning: Cannot convert string "-*-Helvetica-Medium-R-Normal--*-100-*-*P-*-ISO8859-1" to type FontStruct
Warning: Cannot convert string "-*-Helvetica-Bold-R-Normal--*-120-*-*P-*-ISO8859-1" to type FontStruct

abc 02> strash
abc 03> show
abc 03> Warning: Cannot convert string "-*-Helvetica-Medium-R-Normal--*-140-*-*P-*-ISO8859-1" to type FontStruct
Warning: Cannot convert string "-*-Helvetica-Medium-R-Normal--*-120-*-*P-*-ISO8859-1" to type FontStruct
Warning: Cannot convert string "-*-Helvetica-Medium-R-Normal--*-100-*-*P-*-ISO8859-1" to type FontStruct
Warning: Cannot convert string "-*-Helvetica-Bold-R-Normal--*-120-*-*P-*-ISO8859-1" to type FontStruct

abc 03> collapse
abc 04> show bdd -g
abc 04> Warning: Cannot convert string "-*-Helvetica-Medium-R-Normal--*-140-*-*P-*-ISO8859-1" to type FontStruct
Warning: Cannot convert string "-*-Helvetica-Medium-R-Normal--*-120-*-*P-*-ISO8859-1" to type FontStruct
Warning: Cannot convert string "-*-Helvetica-Medium-R-Normal--*-100-*-*P-*-ISO8859-1" to type FontStruct
Warning: Cannot convert string "-*-Helvetica-Bold-R-Normal--*-120-*-*P-*-ISO8859-1" to type FontStruct
[]
```

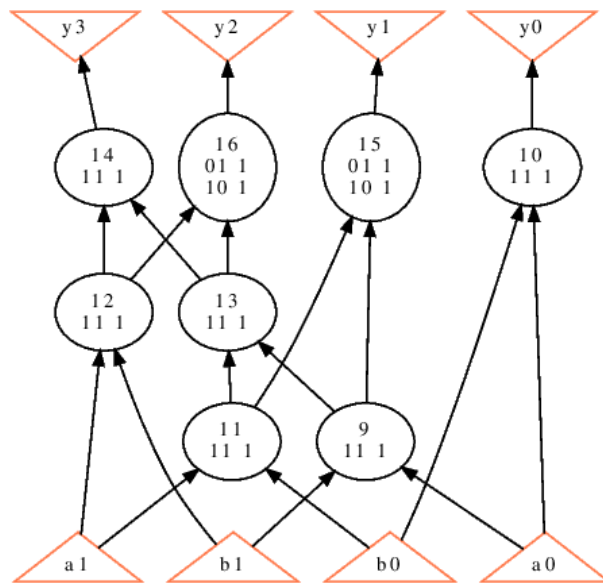
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Network structure (show)

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Network structure visualized by ABC  
Benchmark "mul". Time was Mon Sep 11 13:39:30 2023.

The network contains 8 logic nodes and 0 latches.

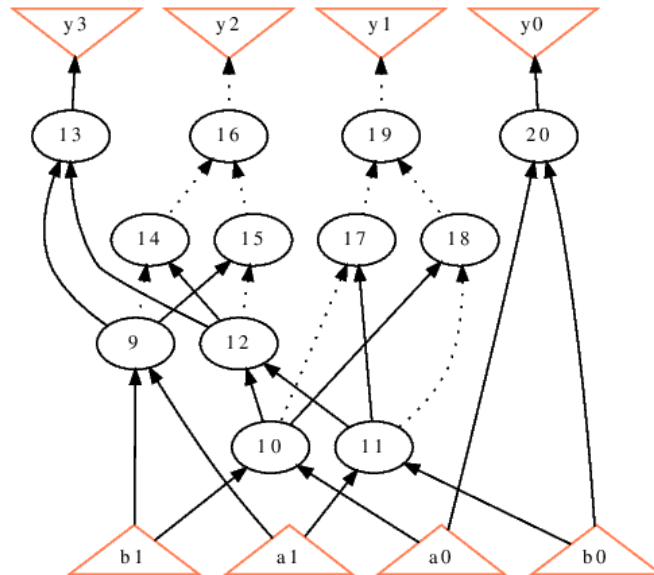


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Strash, show

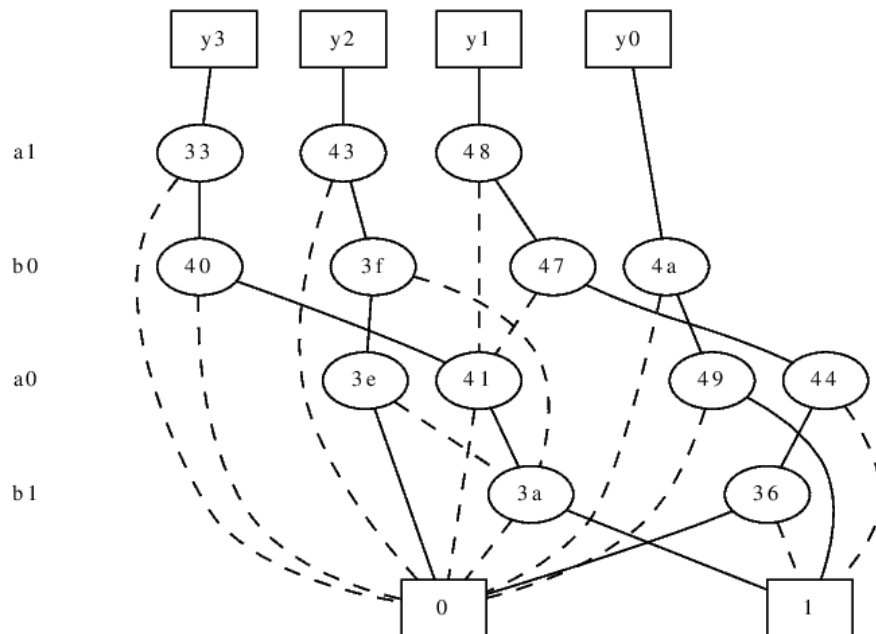
Network structure visualized by ABC  
 Benchmark "mul". Time was Mon Sep 11 13:39:40 2023.

The network contains 12 logic nodes and 0 latches.



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Collapse, show\_bdd -g



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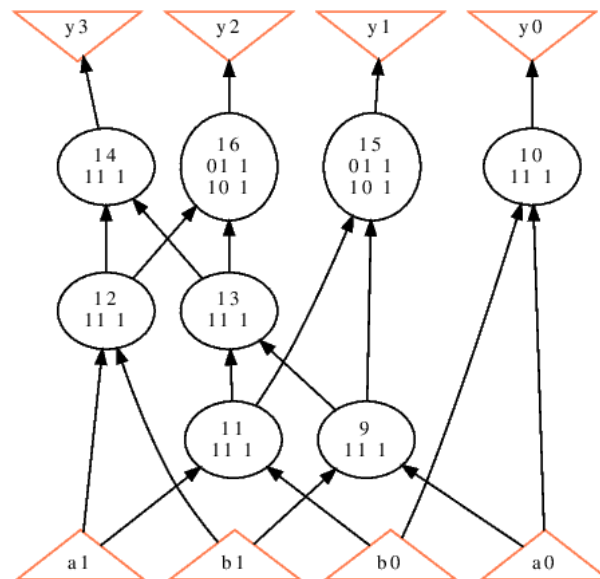
3. (a)

1. Aig, show. Basically it is the same as network structure shown in 2(b), since "aig"

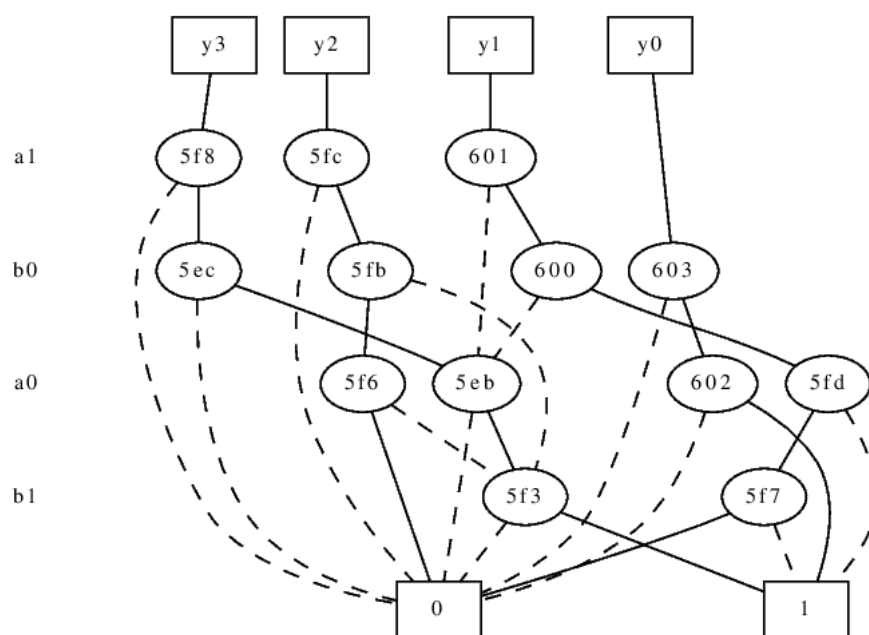
command “converts local functions of the nodes to AIGs.” (quote from <http://people.eecs.berkeley.edu/~alanmi/abc/abc.htm>), which means it only change the data structure inside node. Global picture is still the same.

Network structure visualized by ABC  
Benchmark "mul". Time was Wed Sep 13 14:02:51 2023.

The network contains 8 logic nodes and 0 latches.



2. Bdd, show\_bdd -g. This picture is the same as “collapse, show\_bdd -g” shown in 2(b), only differs in its node name.



3(b)

read mul.blif

strash

logic

show

Network structure visualized by ABC  
Benchmark "mul". Time was Mon Sep 11 15:36:28 2023.

The network contains 12 logic nodes and 0 latches.

