LSV PA1

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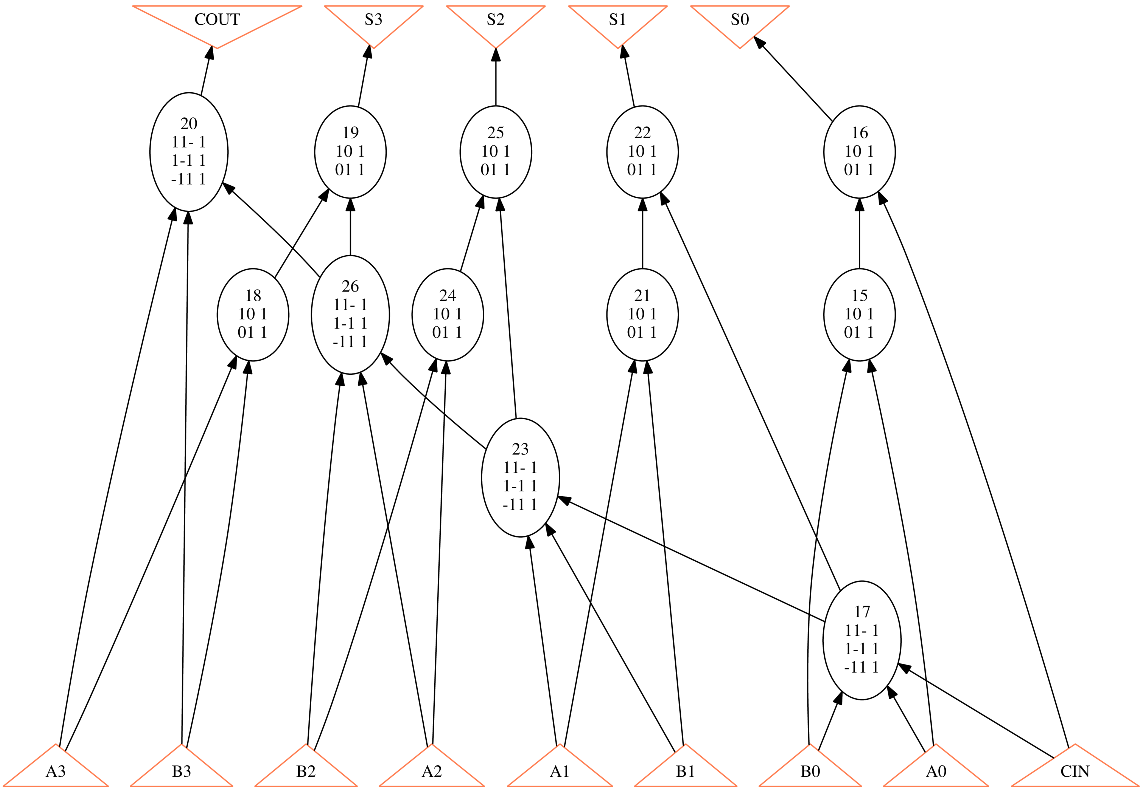
Part 1.

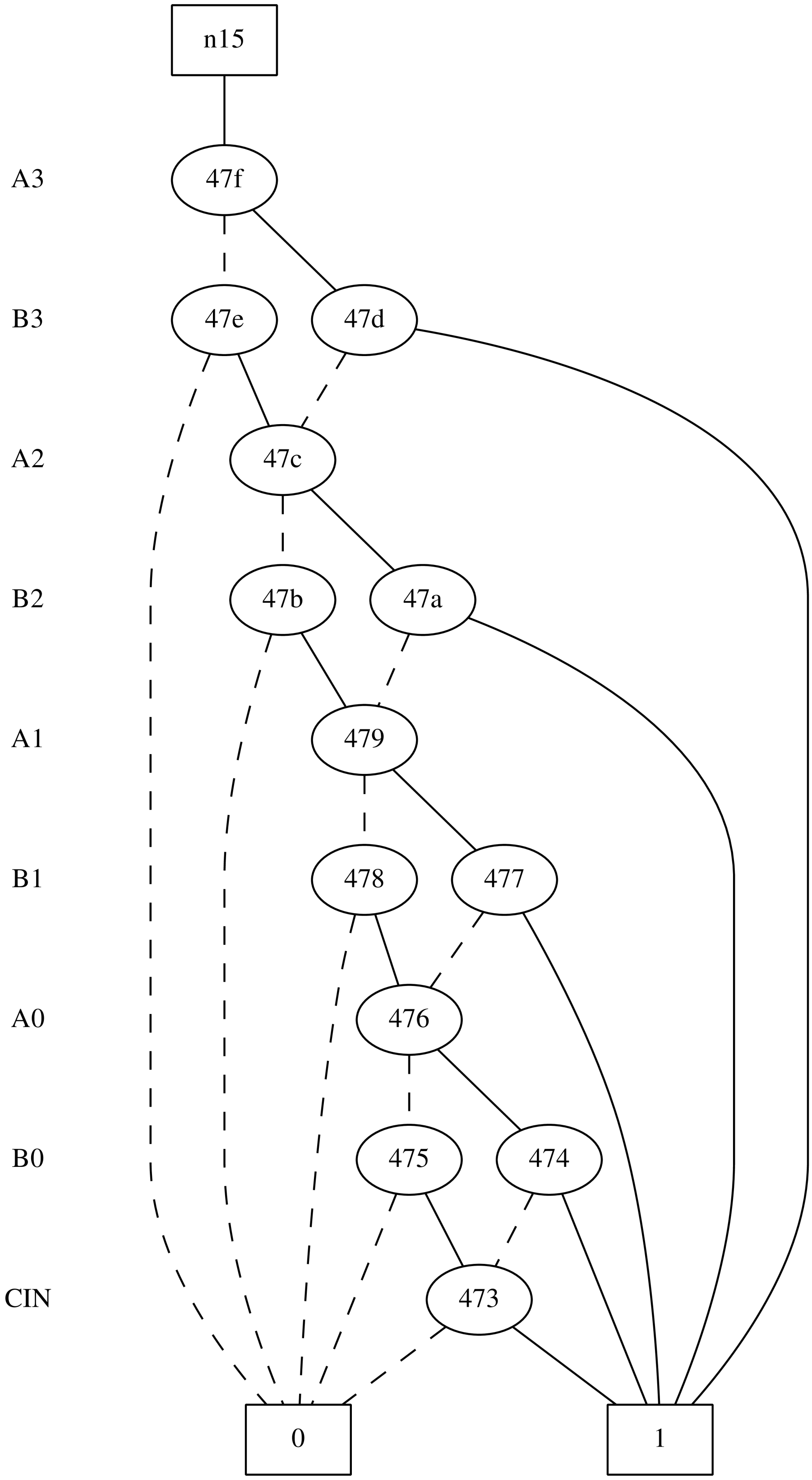
`show`

Network structure visualized by ABC
Benchmark "4bitadder". Time was Thu Oct 15 03:04:32 2020.

The network contains 12 logic nodes and 0 latches.



show_bdd


n15
A3
47f
B3
47e
47d
A2
47c
B2
47b
47a
A1
479
B1
478
477
A0
476
B0
475
474
CIN
473
0
1

Part 2.

(a) Compare the following differences with the four-bit adder example

Initial `print_stats` on 4bitadder:

```
4bitadder     : i/o =    9/    5  lat =    0  nd =    12  edge =     28
cube =    28  lev = 4
```

1. logic network in AIG (by command `aig`) vs. structurally hashed AIG (by command `strash`)

- `aig`: As the name of the command, it changes the logic network represent method to AIG. But if you use `show` to take a look at the function, you would found that the figure doesn't change.
- `strash`: This command also produced AIG, but it transform the network by one-level structural hashing. Unlike `aig`, the AIG that `strash` produced is represented by 2-input AND gate and its complemented attributes on the edges.

After executing `aig` on 4bitadder, the `print_stats` shows:

```
4bitadder     : i/o =    9/    5  lat =    0  nd =    12  edge =     28
aig  =    40  lev = 4
```

After executing `strash` on 4bitadder, the `print_stats` shows:

```
4bitadder     : i/o =    9/    5  lat =    0  and =    40  lev = 12
```

In `aig`, we can clear see that it has 40 `aig` and 28 `edge`. And in `strash`, we can see that `lev` becomes bigger, and there's no `aig` attributes but 40 `and`.

2. logic network in BDD (by command `bdd`) vs. collapsed BDD (by command `collapse`)

- `bdd`: As the name of the command, it changes the logic network represent method to BDD. But if you use `show` to take a look at the function, you would found that the figure doesn't change.
- `collapse`: Different from `bdd`, though `collapse` also represented the function by BDD in the end, it COLLAPSE the logic network to one-level only. So from CI to CO, it would only has one node in its path.

After executing `bdd` on 4bitadder, the `print_stats` shows:

```
4bitadder     : i/o =    9/    5  lat =    0  nd =    12  edge =     28
bdd  =    32  lev = 4
```

After executing `collapse` on 4bitadder, the `print_stats` shows:

```
4bitadder      : i/o =    9/    5  lat =    0  nd =     5  edge =     33
bdd  =    43  lev = 1
```

We found that `lev` becomes 1 in `collapse`, and it has more `edge` and `bdd` than `bdd`.

(b) Given a structurally hashed AIG, find a sequence of ABC command(s) to covert it to a logic network with node function expressed in sum-of-products (SOP).

To convert AIG to SOP expressed logic network, we can convert it to strashed AIG first, then we can use `logic` command to produce SOP:

```
strash;
logic;
```