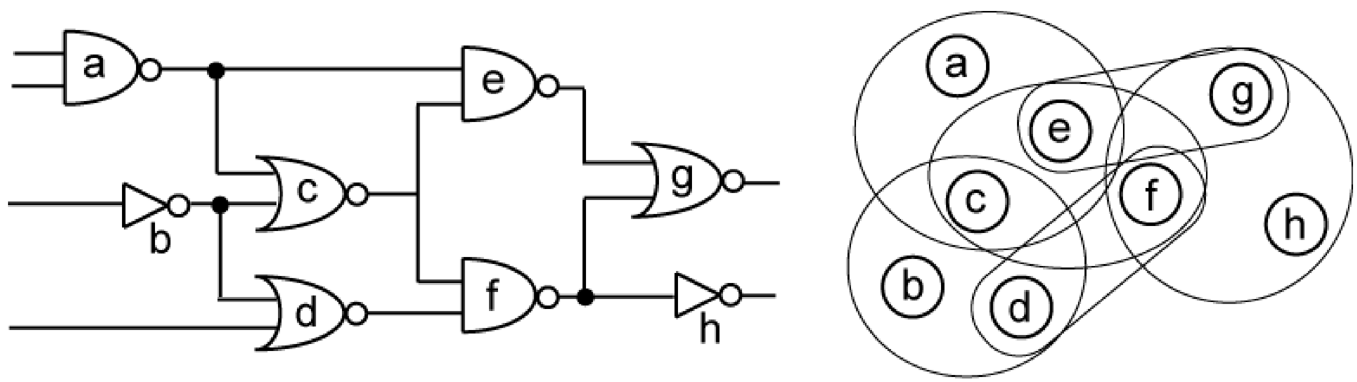
Fiduccia-Mattheyses Algorithm

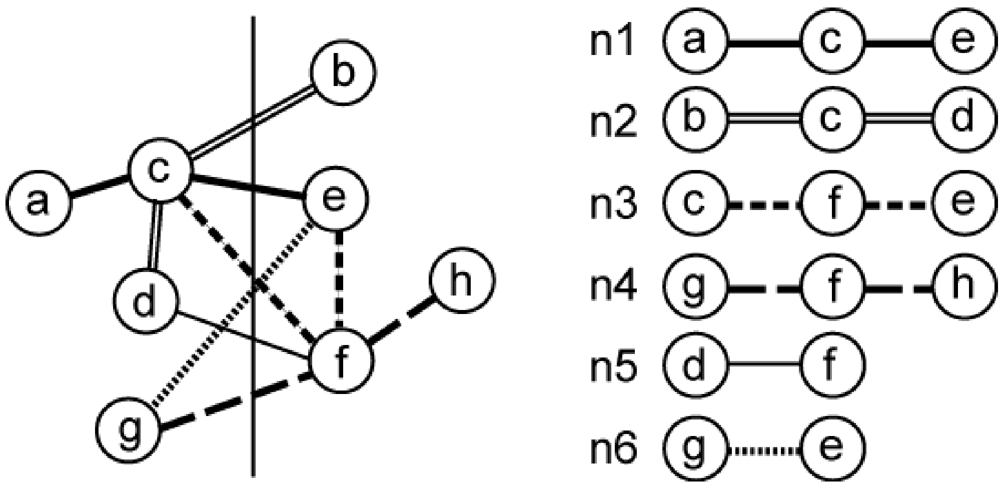
- Perform FM algorithm on the following circuit:
  - Area constraint = [3,5]
  - Break ties in alphabetical order.



(a) (b)

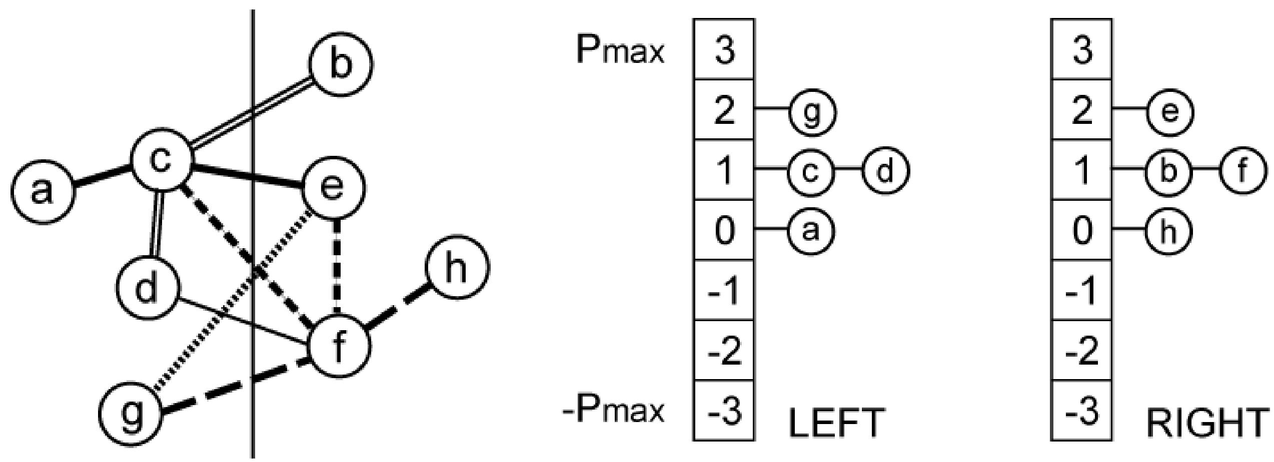
Initial Partitioning

- Random initial partitioning is given.



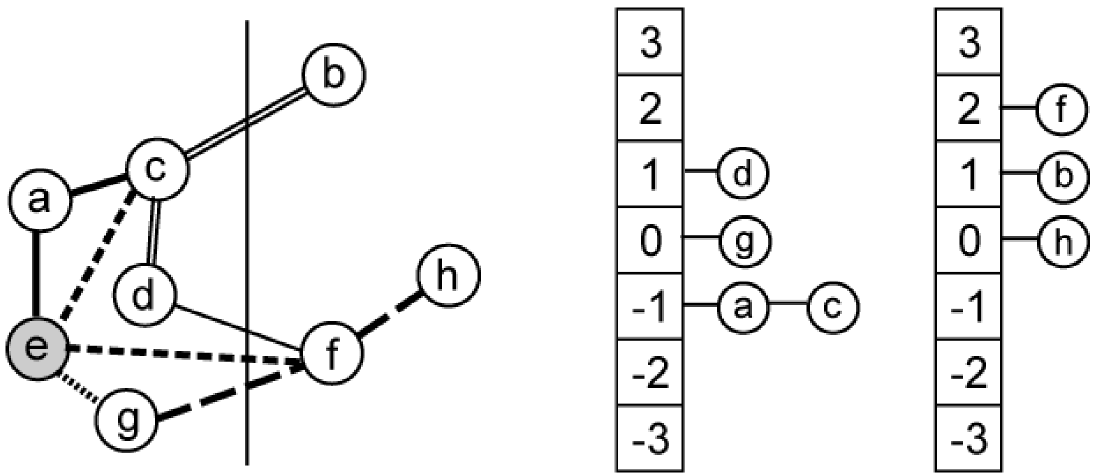
Gain Computation and Bucket Set Up

cell c: c is contained in net $n_1 = \{a, c, e\}$, $n_2 = \{b, c, d\}$, and $n_3 = \{c, f, e\}$. n_3 contains c as its only cell located in the left partition, so $FS(c) = 1$. In addition, none of these three nets are located entirely in the left partition. So, $TE(c) = 0$. Thus, $gain(c) = 1$.



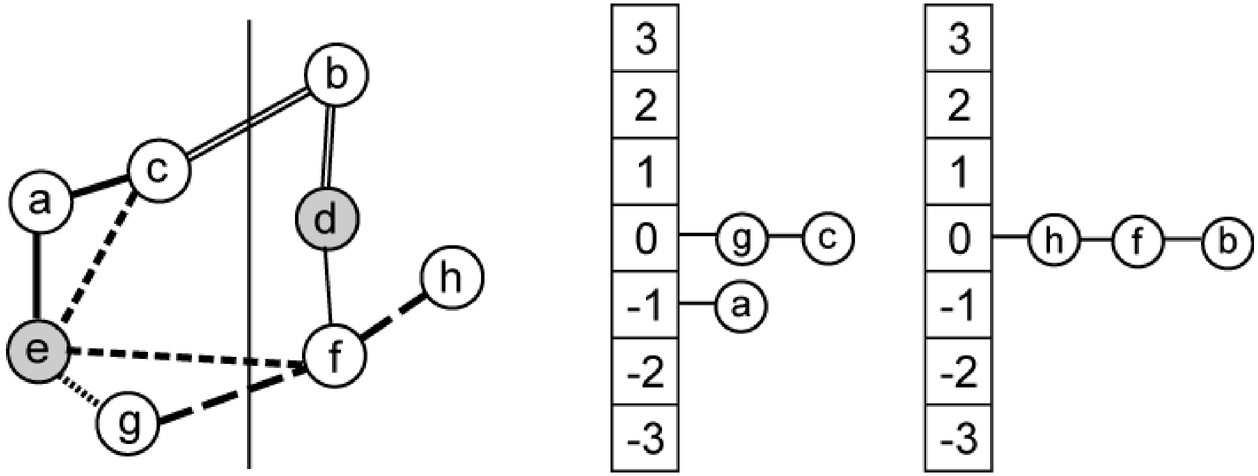
First Move

move 1: From the initial bucket we see that both cell g and e have the maximum gain and can be moved without violating the area constraint. We move e based on alphabetical order. We update the gain of the unlocked neighbors of e, $N(e) = \{a, c, g, f\}$, as follows: $gain(a) = FS(a) - TE(a) = 0 - 1 = -1$, $gain(c) = 0 - 1 = -1$, $gain(g) = 1 - 1 = 0$, $gain(f) = 2 - 0 = 2$.



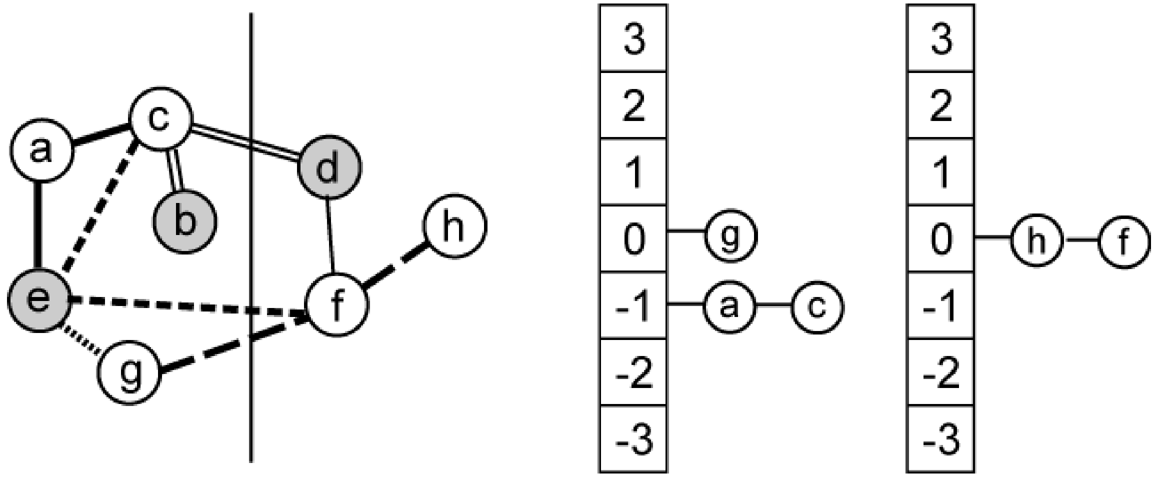
Second Move

move 2: f has the maximum gain, but moving f will violate the area constraint. So we move d. We update the gain of the unlocked neighbors of d, $N(d) = \{b, c, f\}$, as follows: $gain(b) = 0 - 0 = 0$, $gain(c) = 1 - 1 = 0$, $gain(f) = 1 - 1 = 0$.



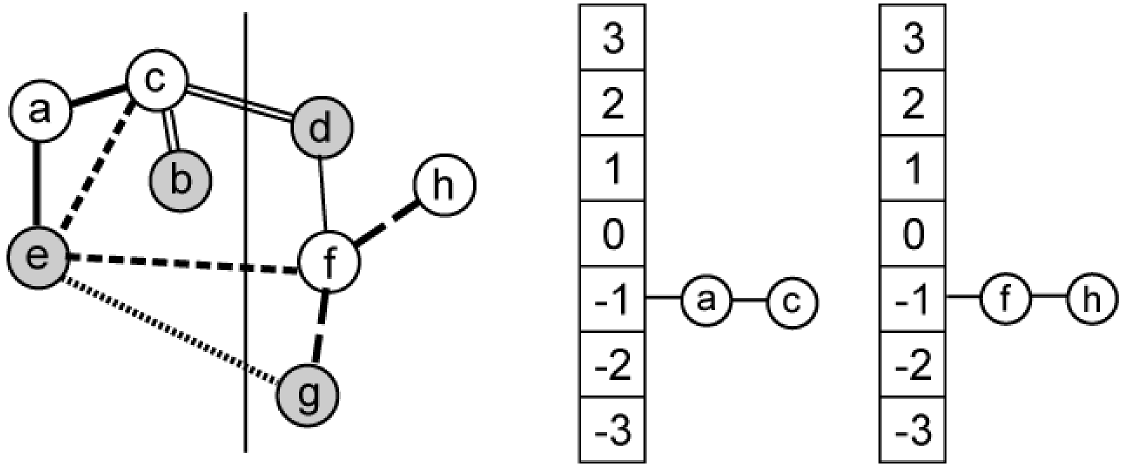
Third Move

move 3: Among the maximum gain cells $\{g, c, h, f, b\}$, we choose b based on alphabetical order. We update the gain of the unlocked neighbors of b, $N(b) = \{c\}$ as follows: $gain(c) = 0 - 1 = -1$.



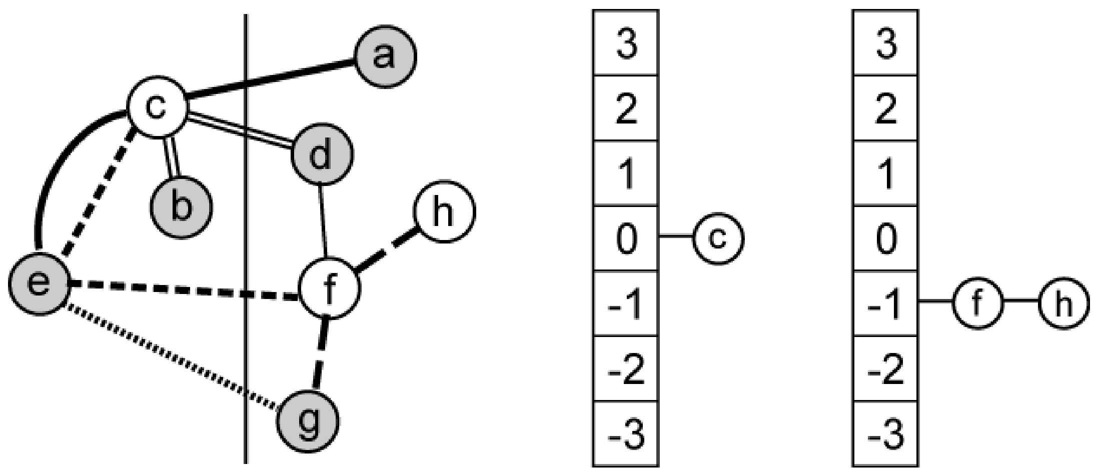
Forth Move

move 4: Among the maximum gain cells $\{g, h, f\}$, we choose g based on the area constraint. We update the gain of the unlocked neighbors of g, $N(g) = \{f, h\}$, as follows: $gain(f) = 1 - 2 = -1$, $gain(h) = 0 - 1 = -1$.



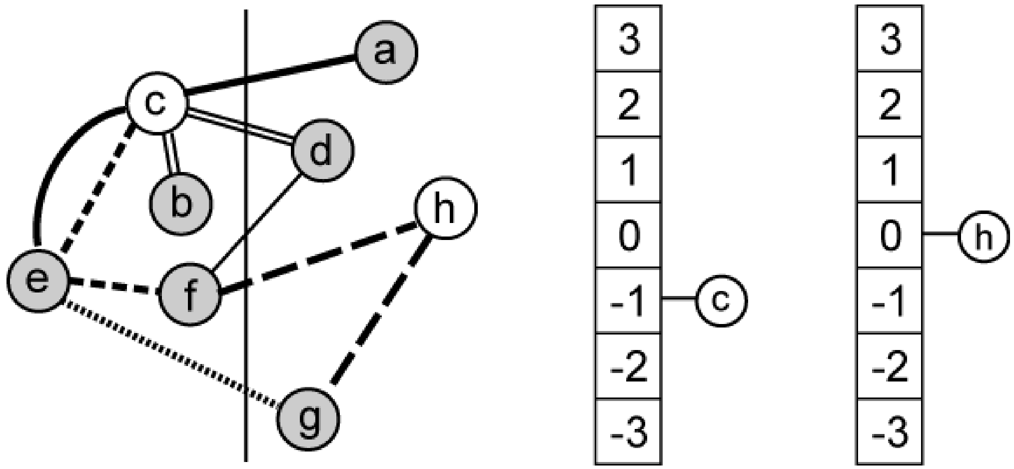
Fifth Move

move 5: We choose a based on alphabetical order. We update the gain of the unlocked neighbors of a, $N(a) = \{c\}$, as follows: $gain(c) = 0 - 0 = 0$.



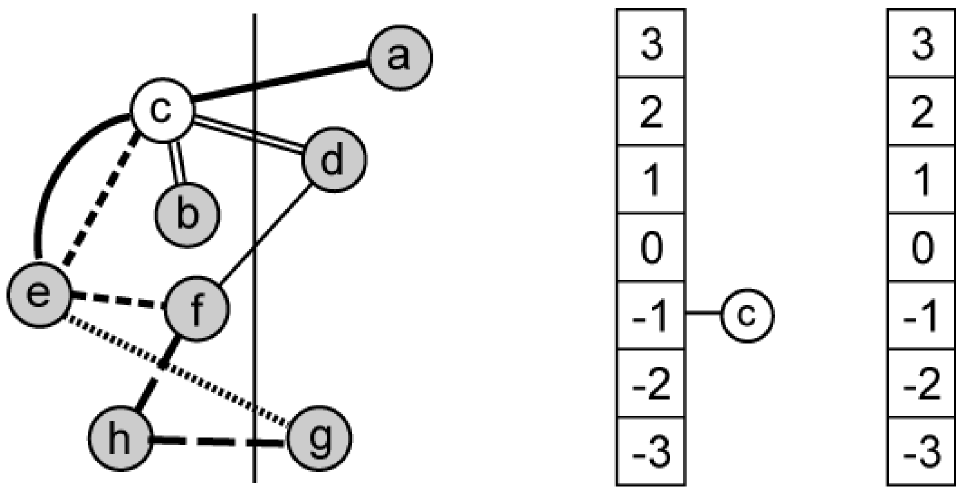
Sixth Move

move 6: We choose f based on the area constraint and alphabetical order. We update the gain of the unlocked neighbors of f, $N(f) = \{h, c\}$, as follows: $gain(h) = 0 - 0 = 0$, $gain(c) = 0 - 1 = -1$.



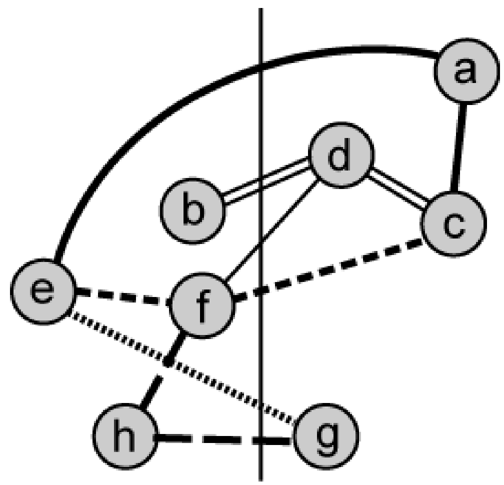
Seventh Move

move 7: We move h. h has no unlocked neighbor.



Last Move

move 8: We move c.



Summary

- Found three best solutions.
  - Cutsize reduced from 6 to 3.
  - Solutions after move 2 and 4 are better balanced.

i	cell	$g(i)$	$\sum g(i)$	cutsize
0	-	-	-	6
1	e	2	2	4
2	$\boldsymbol{d}$	**1**	**3**	**3**
3	$\boldsymbol{b}$	**0**	**3**	**3**
4	$\boldsymbol{g}$	**0**	**3**	**3**
5	a	-1	2	4
6	f	-1	1	5
7	h	0	1	5
8	c	-1	0	6