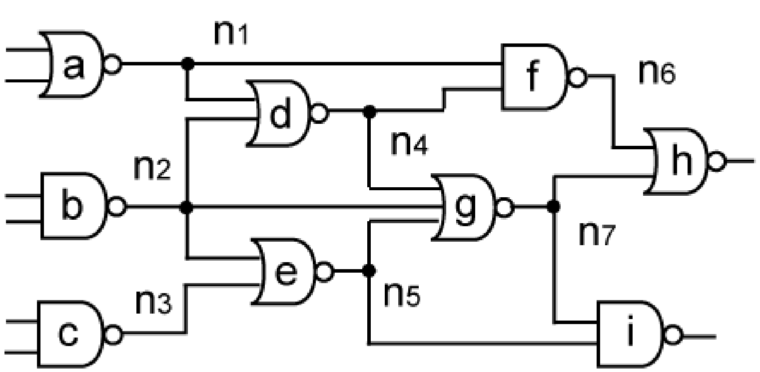
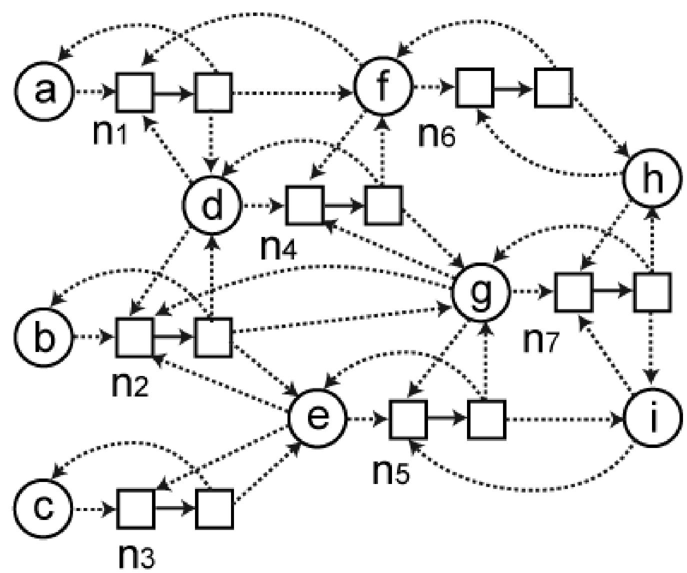
Network Flow-based Bipartitioning

- Perform flow-based bipartitioning under:
  - Area constraint [4,5]
  - Source = *a*, sink = *i*
  - Break ties alphabetically

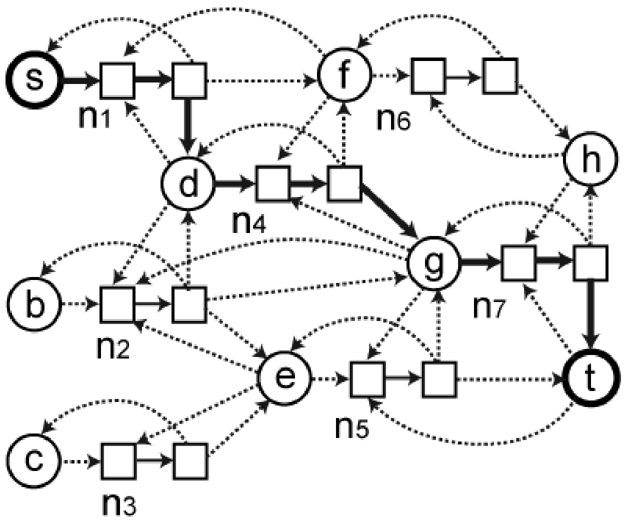




First Max-Flow and Its Cut

Figure 2.25 shows a maximum flow value of 1 (= not unique). Net n_1, n_4, and n_7 are saturated and define the partitioning solutions shown in Table 2.7. For example, removal of n_1 leads to a a-i mincut. But, removal of n_4 or n_7 does not lead to a a-i mincut. Thus, we cut n_1 and obtain the following solution:

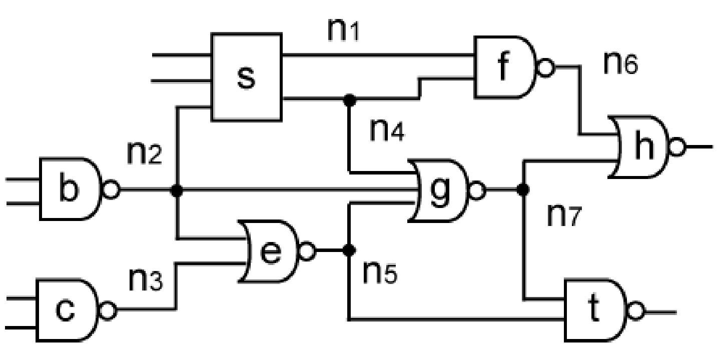
$$P_s = \{s\}, P_t = \{b, c, d, e, f, g, h, t\}$$



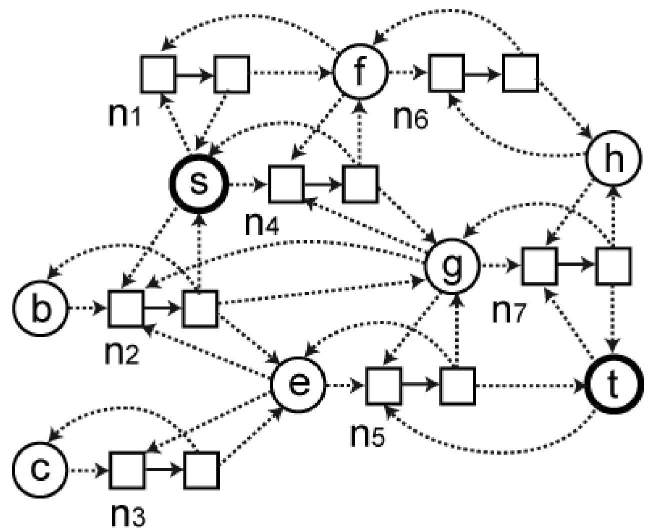
cut net	source partition	sink partition
n_1	s	b, c, d, e, f, g, h, t
n_4	no cut	no cut
n_7	no cut	no cut

First Node Merging

We chose $P_s = \{s\}, P_t = \{b, c, d, e, f, g, h, t\}$. Since the area of P_s is smaller than the lower bound of 4, we choose a node from the sink side. In this case, the node should be contained in the cut net n_1. Since $n_1 = \{a, d, f\}$, we choose d based on alphabetical order.



circuit after merging *s* and *d*

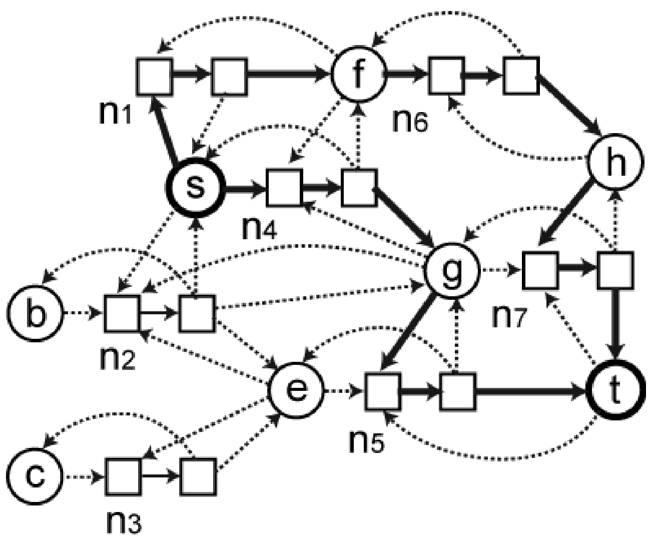


flow-network

Second Max-Flow and Its Cut

Figure 2.27 shows the augmenting paths, and the maximum flow (value = 2). Net n_1, n_6, n_7, n_4, and n_5 are saturated and define the partitioning solutions shown in Table 2.8. Since the max-flow value is 2, our cutset contains two nets n_7 and n_5. This results in:

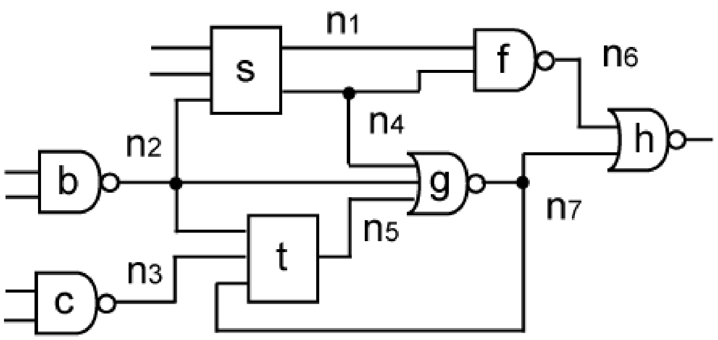
$$P_s = \{s, b, c, e, f, g, h\}, P_t = \{t\}$$



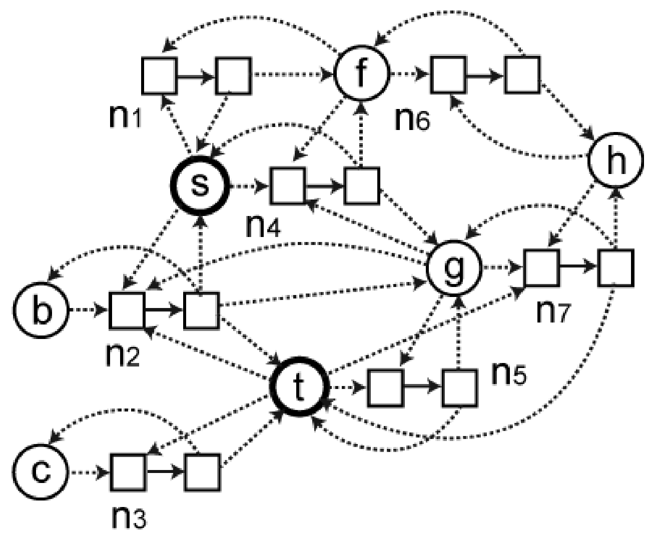
cut net	source partition	sink partition
n_1, n_4	no cut	no cut
n_1, n_5	no cut	no cut
n_6, n_4	no cut	no cut
n_6, n_5	no cut	no cut
n_7, n_4	no cut	no cut
n_7, n_5	s, b, c, e, f, g, h	t

Second Node Merging

We chose $P_s = \{s, b, c, e, f, g, h\}$, $P_t = \{t\}$. Since the area of source partition is larger than the upper bound of 5 above, we choose a node from the source side. The set of nodes contained in n_7, n_5 and partitioned into the source side include $\{g, h, e\}$. Thus, we choose e to merge with t based on alphabetical order.



circuit after merging *e* and *t*

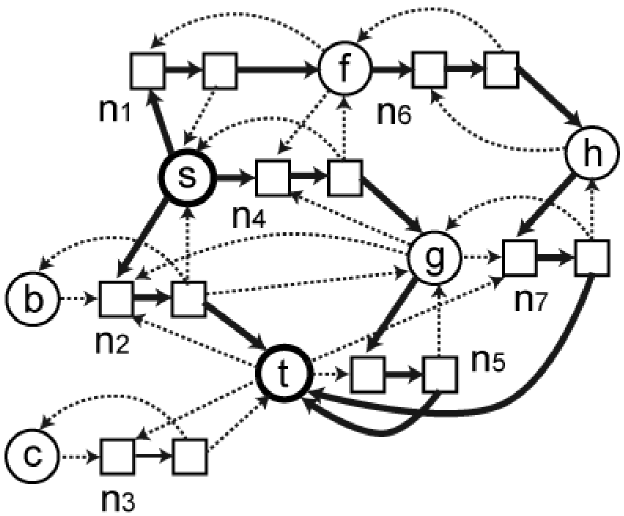


flow-network

Third Max-Flow and Its Cut

Figure 2.29 shows the augmenting paths, and the maximum flow (value = 3). Net n_1, n_6, n_7, n_4, n_5, and n_2 are saturated and define the partitioning solutions shown in Table 2.9. We found three balanced partitioning solutions with the cutsize of 3.

$$(\{a,b,d,f\},\{c,e,g,h,i\}),(\{a,b,d,f,h\},\{c,e,g,i\})$$
$$(\{a,d,f,g,h\},\{b,c,e,i\})$$



cut net	source partition	sink partition
n_1, n_4, n_2	s, b	c, t, g, f, h
n_1, n_5, n_2	no cut	no cut
n_6, n_4, n_2	s, b, f	c, t, g, h
n_6, n_5, n_2	no cut	no cut
n_7, n_4, n_2	s, f, h, b	c, t, g
n_7, n_5, n_2	s, f, g, h	c, t, b