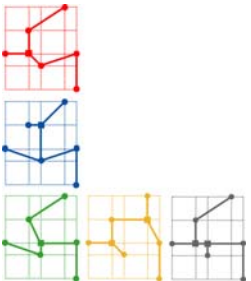
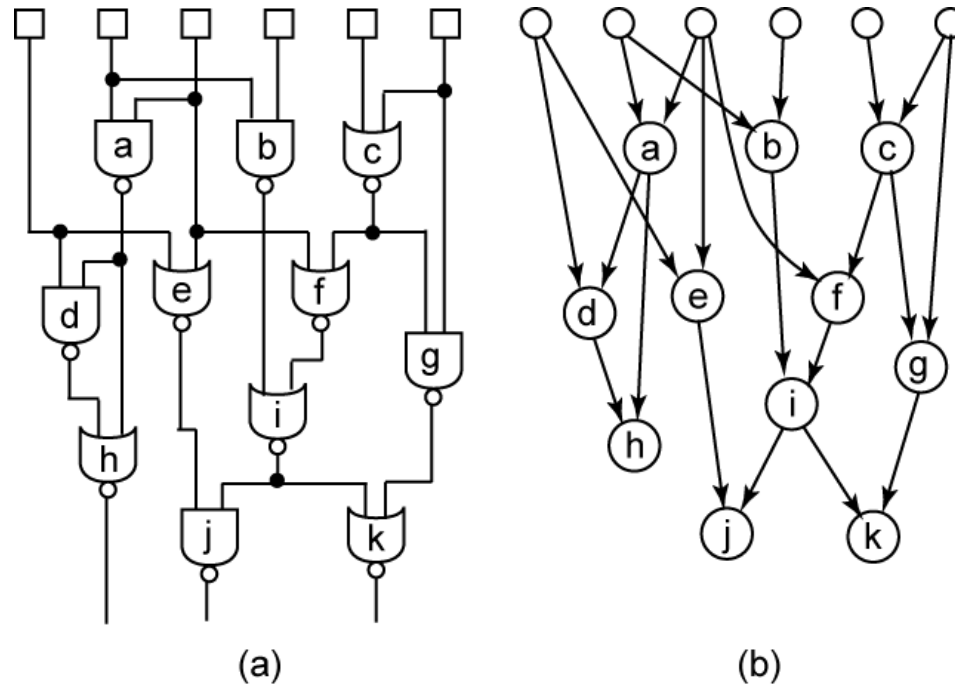


FlowMap Algorithm

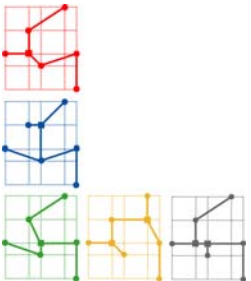
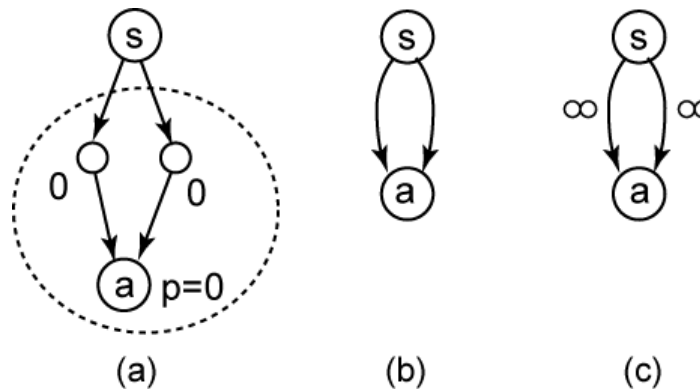
- Perform clustering on the following 2-bounded network
 - Intra-cluster and node delay = 0, inter-cluster = 1
 - Pin constraint = 3



Label Computation

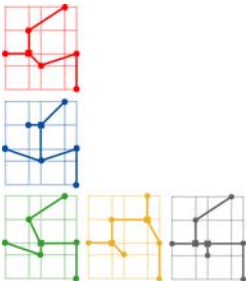
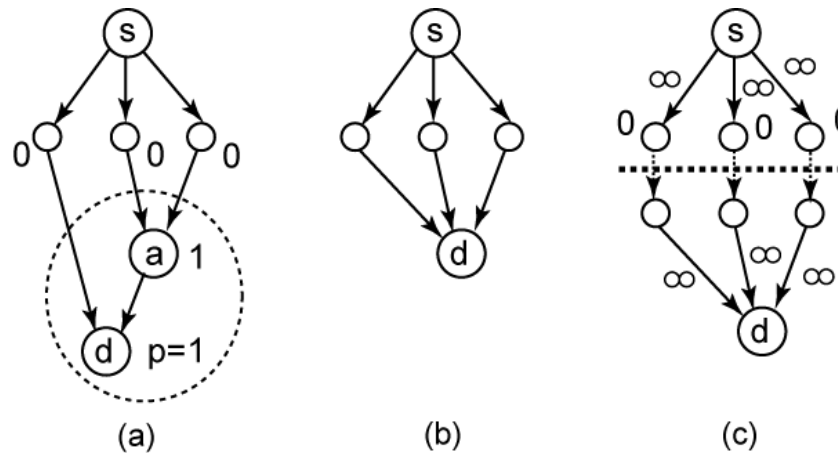
First, all PIs are assigned zero for their label. We then visit the remaining nodes in topological order $T = [a, b, c, d, e, f, g, h, i, j, k]$.

- (a) node a : We first build N_a as shown in Figure 1.7(a). We see that $p = 0$. This helps us build N'_a and N''_a as shown in Figure 1.7(b) and Figure 1.7(c). Note that it is not possible to find a cut in N''_a with a cutsize smaller or equal to $K = 3$. Thus, $\overline{X}_a = \{a\}$ and $l(a) = p + 1 = 1$.



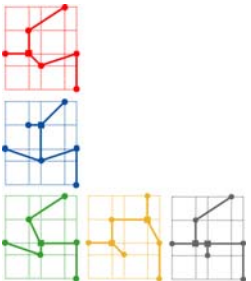
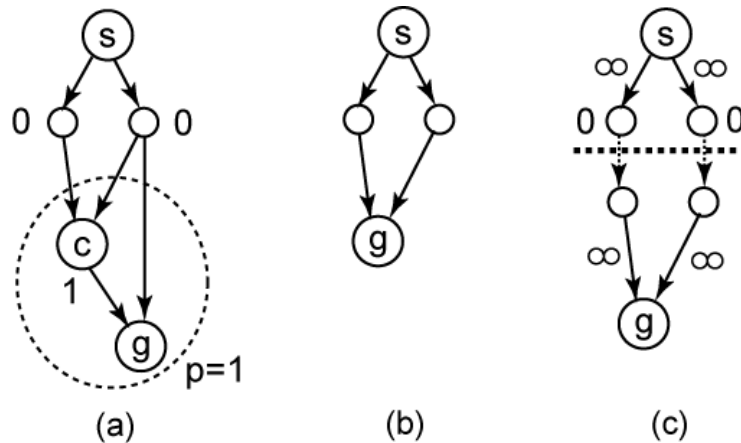
Label Computation (cont)

- (c) node d : Figure 1.8 shows N_d , N'_d , and N''_d under $p = 1$. There is a possible cut in N''_d as shown on Figure 1.8(c), where the maximum flow value and the cutsizes is 3. The height of this cut is zero because the label for all nodes in the source-side partition is zero. Node a and d are partitioned to the sink-side. Thus, $\overline{X}_d = \{a, d\}$, and $l(d) = p = 1$.



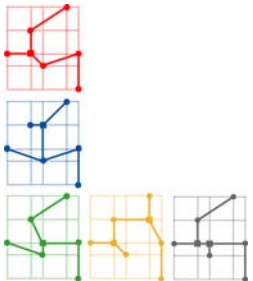
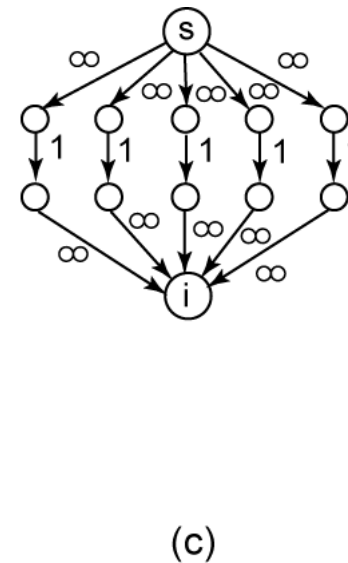
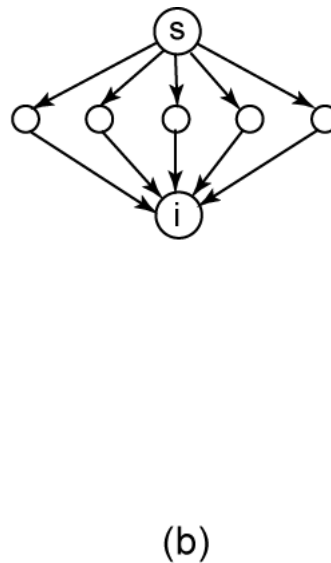
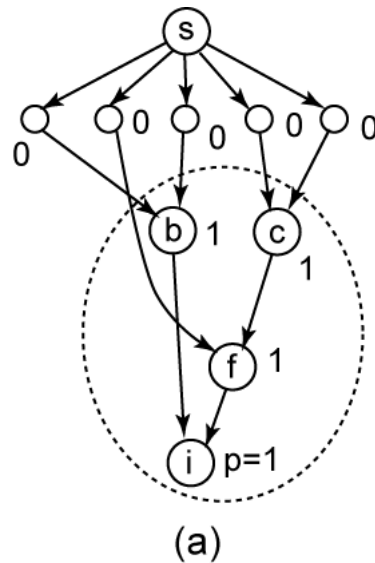
Label Computation (cont)

- (f) node g : Figure 1.9 shows N_g , N'_g , and N''_g . There is only one cut possible in N''_g as shown on Figure 1.9(c). Thus, $\overline{X}_g = \{c, g\}$, and $l(g) = p = 1$.



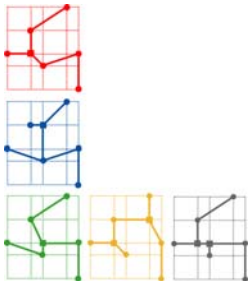
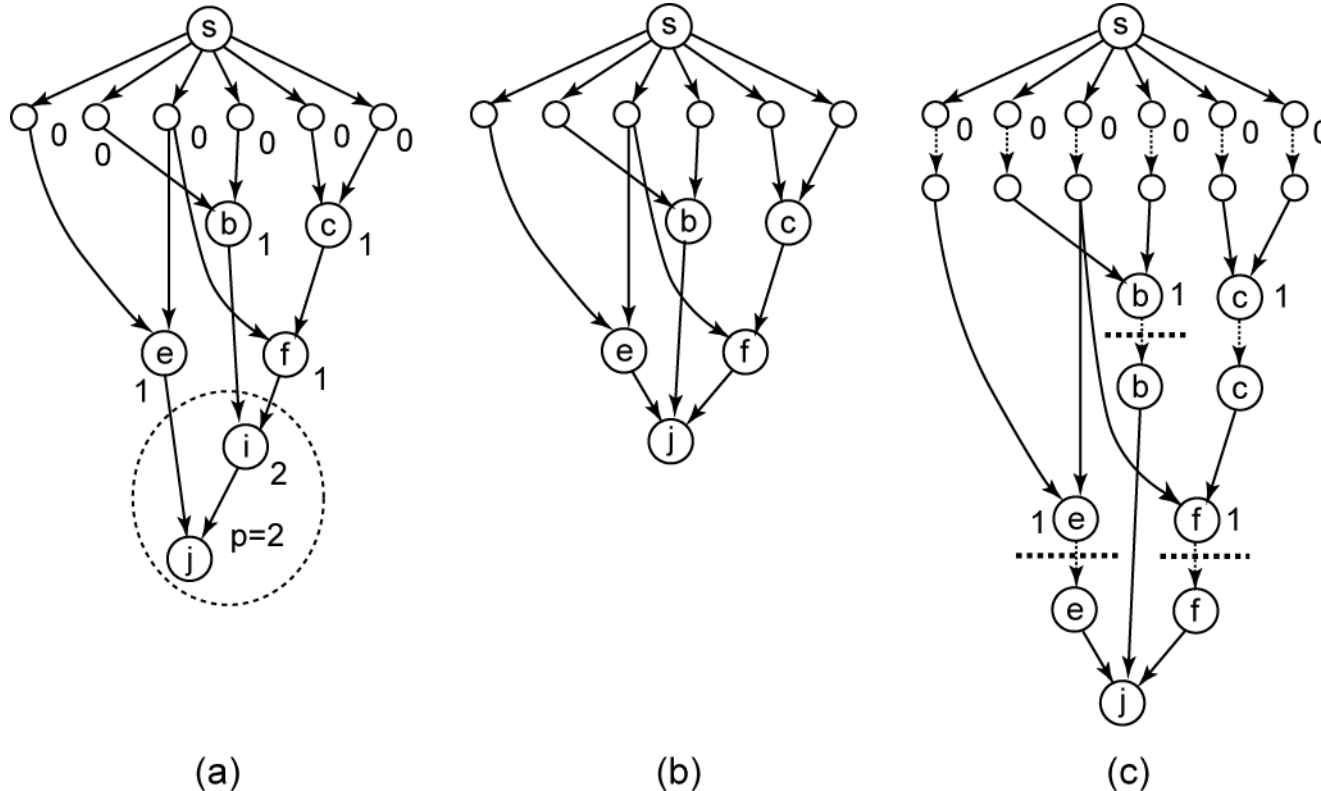
Label Computation (cont)

- (h) node i : Figure 1.11 shows N_i , N'_i , and N''_i . We see that $p = 1$. In this case, N''_i does not contain a K-feasible cut. Thus, $\bar{X}_i = \{i\}$, and $l(i) = p + 1 = 2$.



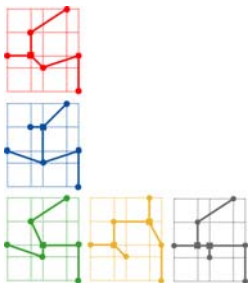
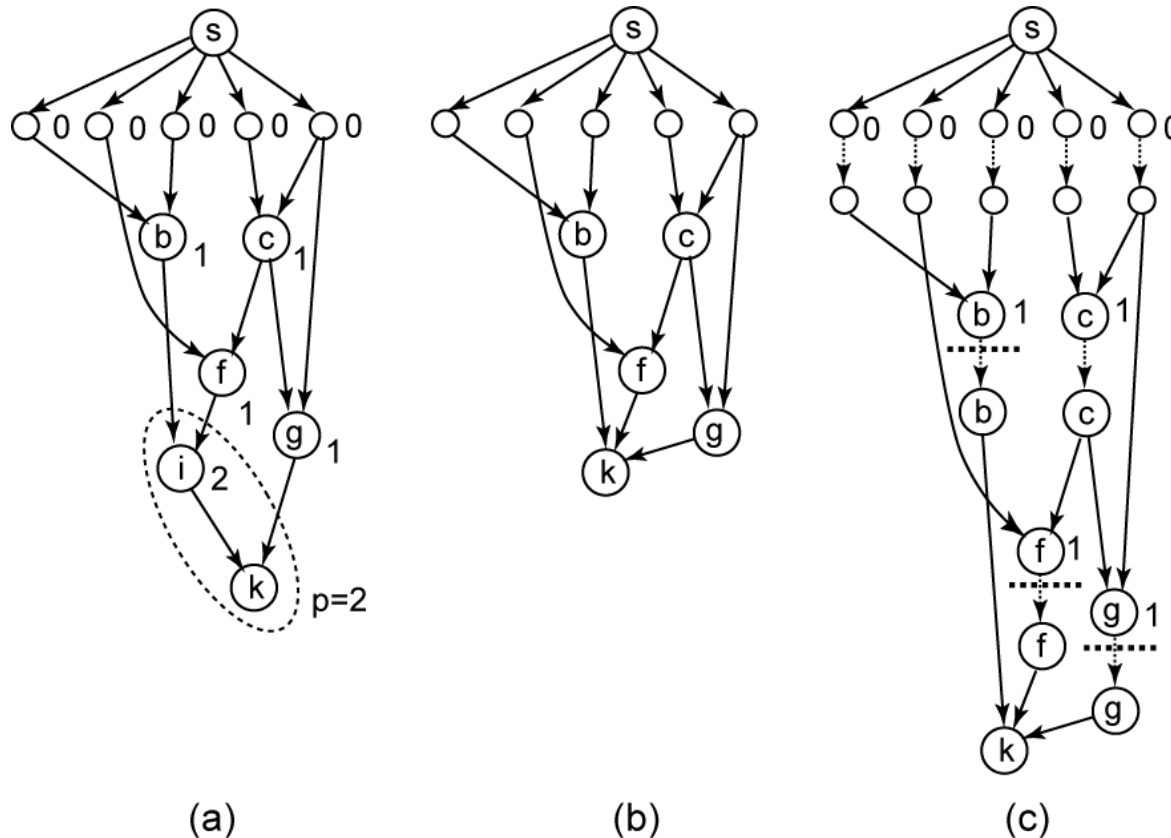
Label Computation (cont)

- (i) node j : Figure 1.12 shows N_j , N'_j , and N''_j . $p = 2$ in this case. There is only one K-feasible cut in N''_j , and its height is 1. Thus, $\bar{X}_j = \{i, j\}$, and $l(j) = p = 2$.



Label Computation (cont)

- (j) node k : Figure 1.13 shows N_k , N'_k , and N''_k . $p = 2$ in this case. There is only one K-feasible cut in N''_k , and its height is 1. Thus, $\bar{X}_k = \{i, k\}$, and $l(k) = p = 2$.

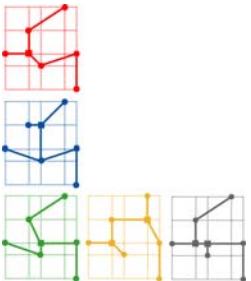


Label Computation (cont)

■ Summary

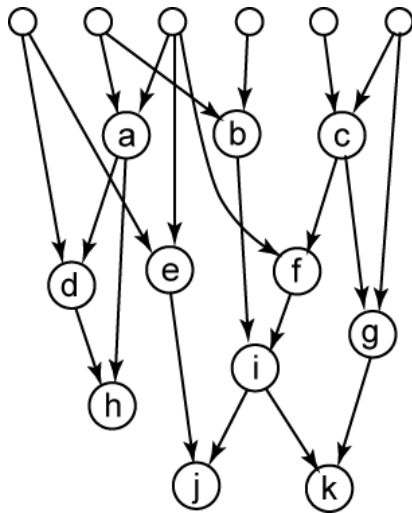
- Max label = max delay in the clustered network = 2

node	label	clustering
<i>a</i>	1	$\{a\}$
<i>b</i>	1	$\{b\}$
<i>c</i>	1	$\{c\}$
<i>d</i>	1	$\{a, d\}$
<i>e</i>	1	$\{e\}$
<i>f</i>	1	$\{c, f\}$
<i>g</i>	1	$\{c, g\}$
<i>h</i>	1	$\{a, d, h\}$
<i>i</i>	2	$\{i\}$
<i>j</i>	2	$\{i, j\}$
<i>k</i>	2	$\{i, k\}$



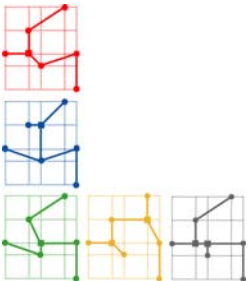
Clustering Phase

- Traverse the nodes from PO to PI
 - We begin with $L = \text{POs} = \{h, j, k\}$
 - Clustering is based on



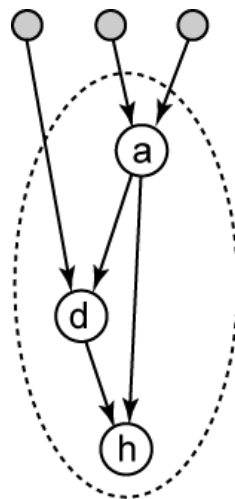
+

node	label	clustering
<i>a</i>	1	{ <i>a</i> }
<i>b</i>	1	{ <i>b</i> }
<i>c</i>	1	{ <i>c</i> }
<i>d</i>	1	{ <i>a</i> , <i>d</i> }
<i>e</i>	1	{ <i>e</i> }
<i>f</i>	1	{ <i>c</i> , <i>f</i> }
<i>g</i>	1	{ <i>c</i> , <i>g</i> }
<i>h</i>	1	{ <i>a</i> , <i>d</i> , <i>h</i> }
<i>i</i>	2	{ <i>i</i> }
<i>j</i>	2	{ <i>i</i> , <i>j</i> }
<i>k</i>	2	{ <i>i</i> , <i>k</i> }

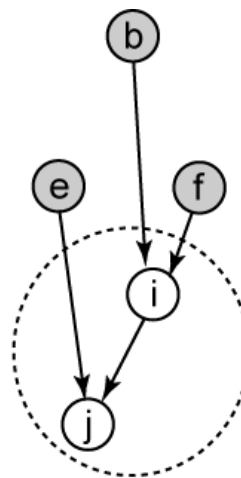


Clustering Phase (cont)

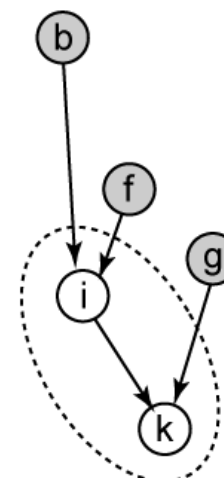
- (a) remove h from L . Then, h' , the K-LUT implementation of h , contains $\{a, d, h\}$ according to Table 1.3. We note that $input(h')$ contains three PI nodes as shown in Figure 1.14(a). Since we do not add PI nodes into L , we have $L = \{j, k\}$.



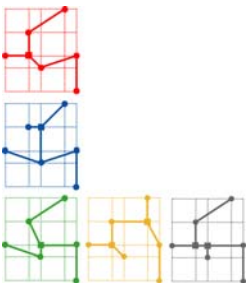
(a)



(b)

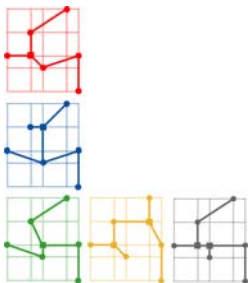
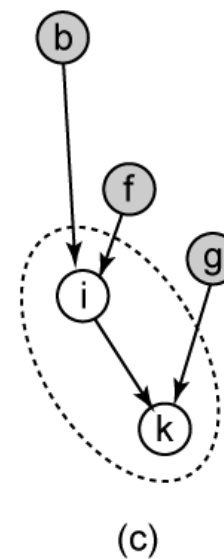
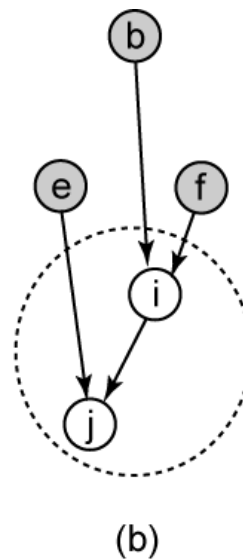
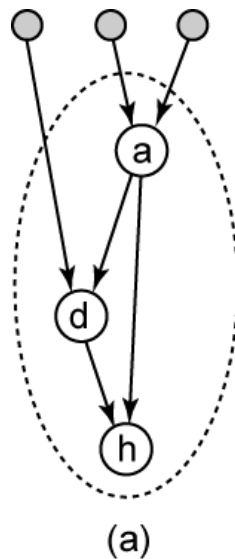


(c)



Clustering Phase (cont)

- (b) remove j from L : $j' = \{i, j\}$ according to Table 1.3. We see that $input(j') = \{e, b, f\}$ as shown in Figure 1.14(b). Thus, $L = \{k\} \cup \{e, b, f\} = \{k, e, b, f\}$.
- (c) remove k from L : $k' = \{i, k\}$, and $input(k') = \{b, f, g\}$ as shown in Figure 1.14(c). Thus, $L = \{e, b, f\} \cup \{b, f, g\} = \{e, b, f, g\}$.

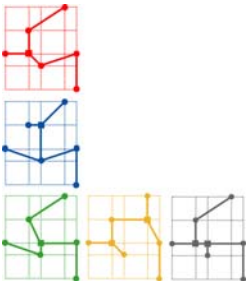


Clustering Phase (cont)

■ Summary

- 6 clusters (= LUT-3) are generated
- Node c and i are duplicated

root	elements
h	$\{a, d, h\}$
j	$\{i, j\}$
k	$\{i, k\}$
e	$\{e\}$
b	$\{b\}$
f	$\{c, f\}$
g	$\{c, g\}$



Clustered Network

- Max delay = 2

