Mincut Placement

- Perform quadrature mincut onto 4 × 4 grid
  - Start with vertical cut first

\[
\begin{align*}
  n_1 &= \{e, f\} \\
  n_2 &= \{a, c, i\} \\
  n_3 &= \{b, f, g\} \\
  n_4 &= \{c, g, l\} \\
  n_5 &= \{d, l, h\} \\
  n_6 &= \{e, i, j\} \\
  n_7 &= \{f, j\} \\
  n_8 &= \{g, j, k\} \\
  n_9 &= \{l, o, p\} \\
  n_{10} &= \{h, p\} \\
  n_{11} &= \{i, m\} \\
  n_{12} &= \{j, m, n\} \\
  n_{13} &= \{k, n, o\}
\end{align*}
\]

undirected graph model w/ k-clique weighting
thin edges = weight 0.5, thick edges = weight 1
Cut 1 and 2

- First cut has min-cutsize of 3 (not unique)
  - Both cuts 1 and 2 divide the entire chip

(a) cut 1

(b) cut 2, 1st-level quadrants formed
Cut 3 and 4

- Each cut minimizes cutsize
  - Helps reduce overall wirelength
Cut 5 and 6

- 16 partitions generated by 6 cuts
  - HPBB wirelength = 27
Recursive Bisection

- Start with vertical cut
  - Perform terminal propagation with middle third window

(a) cut 1

(b) cut 2
Cut 3: Terminal Propagation

- Two terminals are propagated and are “pulling” nodes
  - Node $k$ and $o$ connect to $n$ and $j$: $p_1$ propagated (outside window)
  - Node $g$ connect to $j$, $f$ and $b$: $p_2$ propagated (outside window)
  - Terminal $p_1$ pulls $k/o/g$ to top partition, and $p_2$ pulls $g$ to bottom
Cut 4: Terminal Propagation

- One terminal propagated
  - Node $n$ and $j$ connect to $o/k/g$: $p_1$ propagated
  - Node $i$ and $j$ connect to $e/f/a$: no propagation (inside window)
  - Terminal $p_1$ pulls $n$ and $j$ to right partition
Cut 5: Terminal Propagation

- Three terminals propagated
  - Node $i$ propagated to $p_1$, $j$ to $p_2$, and $g$ to $p_3$
  - Terminal $p_1$ pulls $e$ and $a$ to left partition
  - Terminal $p_2$ and $p_3$ pull $f/b/e$ to right partition
Cut 6: Terminal Propagation

- One terminal propagated
  - Node $n$ and $j$ are propagated to $p_1$
  - Terminal $p_1$ pulls $o$ and $k$ to left partition
Cut 7: Terminal Propagation

- Three terminals propagated
  - Node $j/f/b$ propagated to $p_1$, $o/k$ to $p_2$, and $h/p$ to $p_3$
  - Terminal $p_1$ and $p_2$ pull $g$ and $l$ to left partition
  - Terminal $p_3$ pull $l$ and $d$ to right partition
Cut 8 to 15

- 16 partitions generated by 15 cuts
  - HPBB wirelength = 23
Comparison

- Quadrature vs recursive bisection + terminal propagation
  - Number of cuts: 6 vs 15
  - Wirelength: 27 vs 23