Buffered Steiner Trees for Difficult Instances

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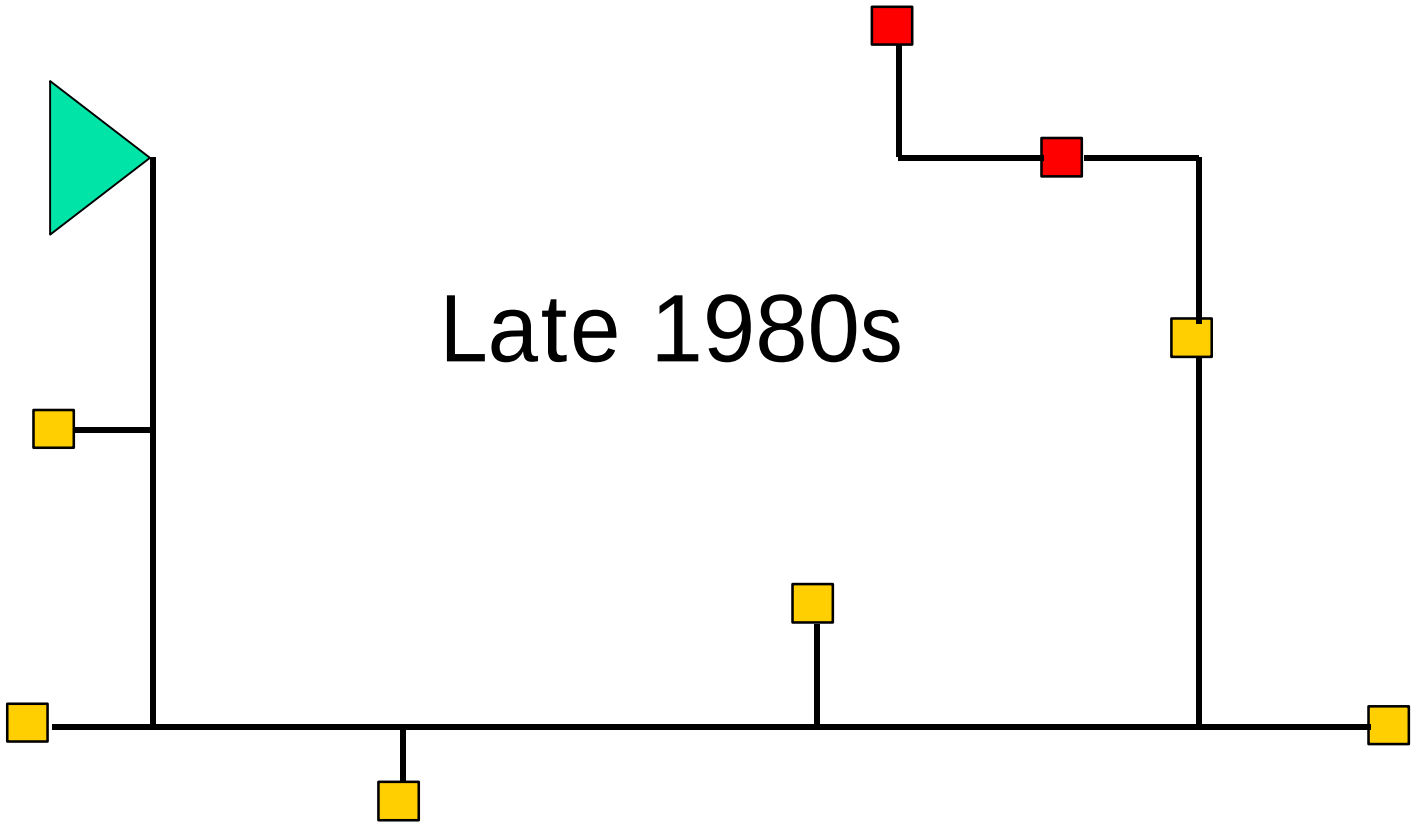
What Is So Difficult?



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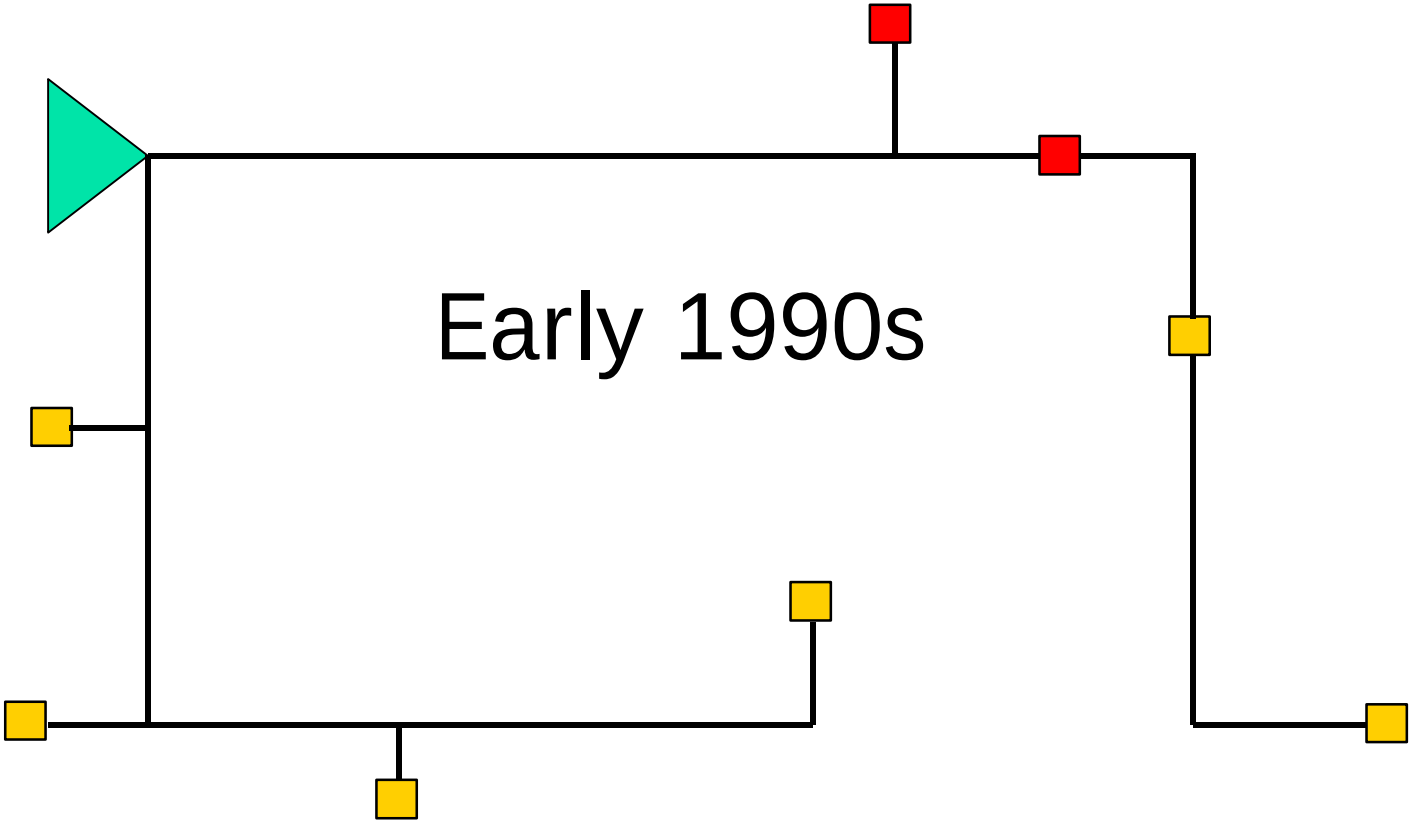
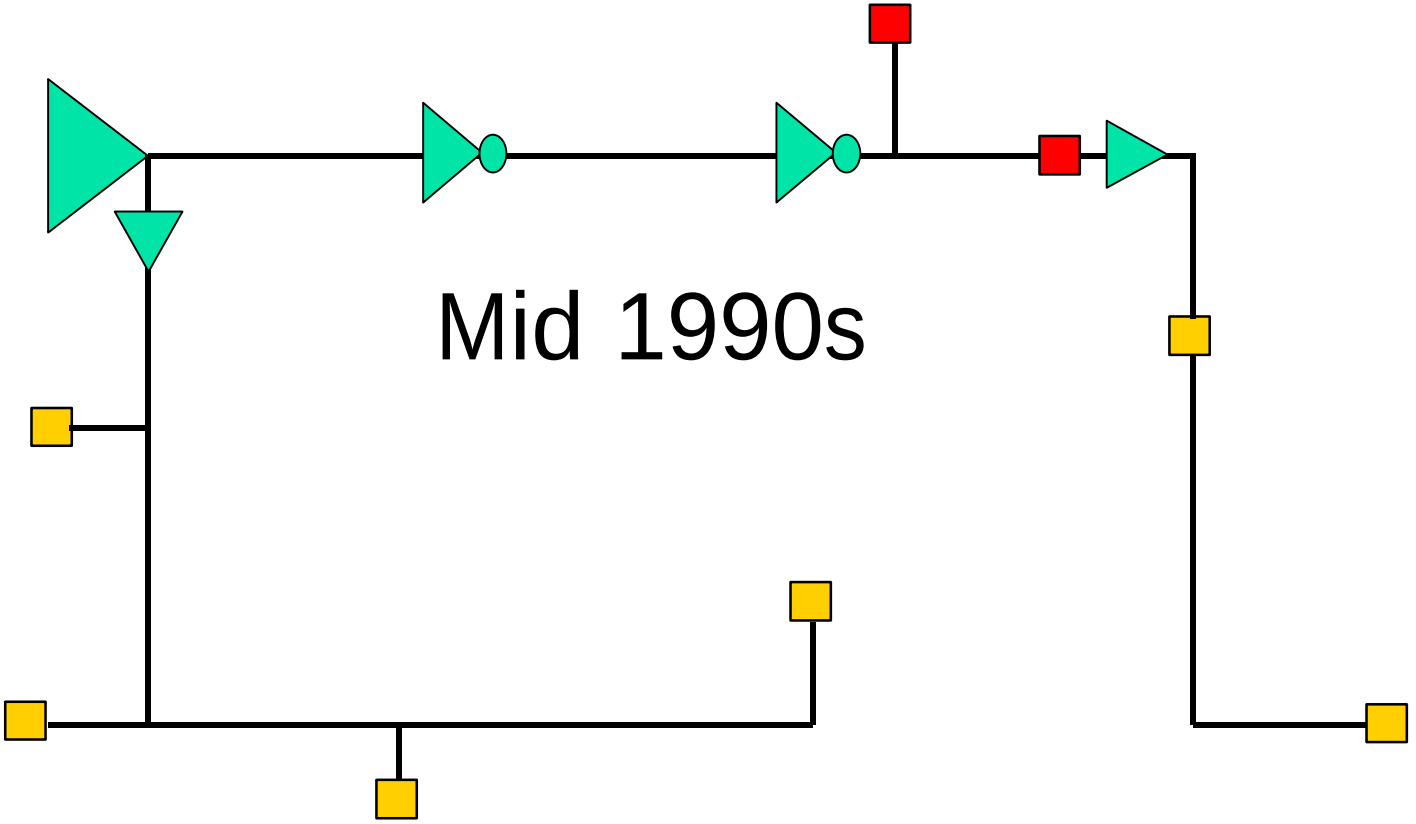
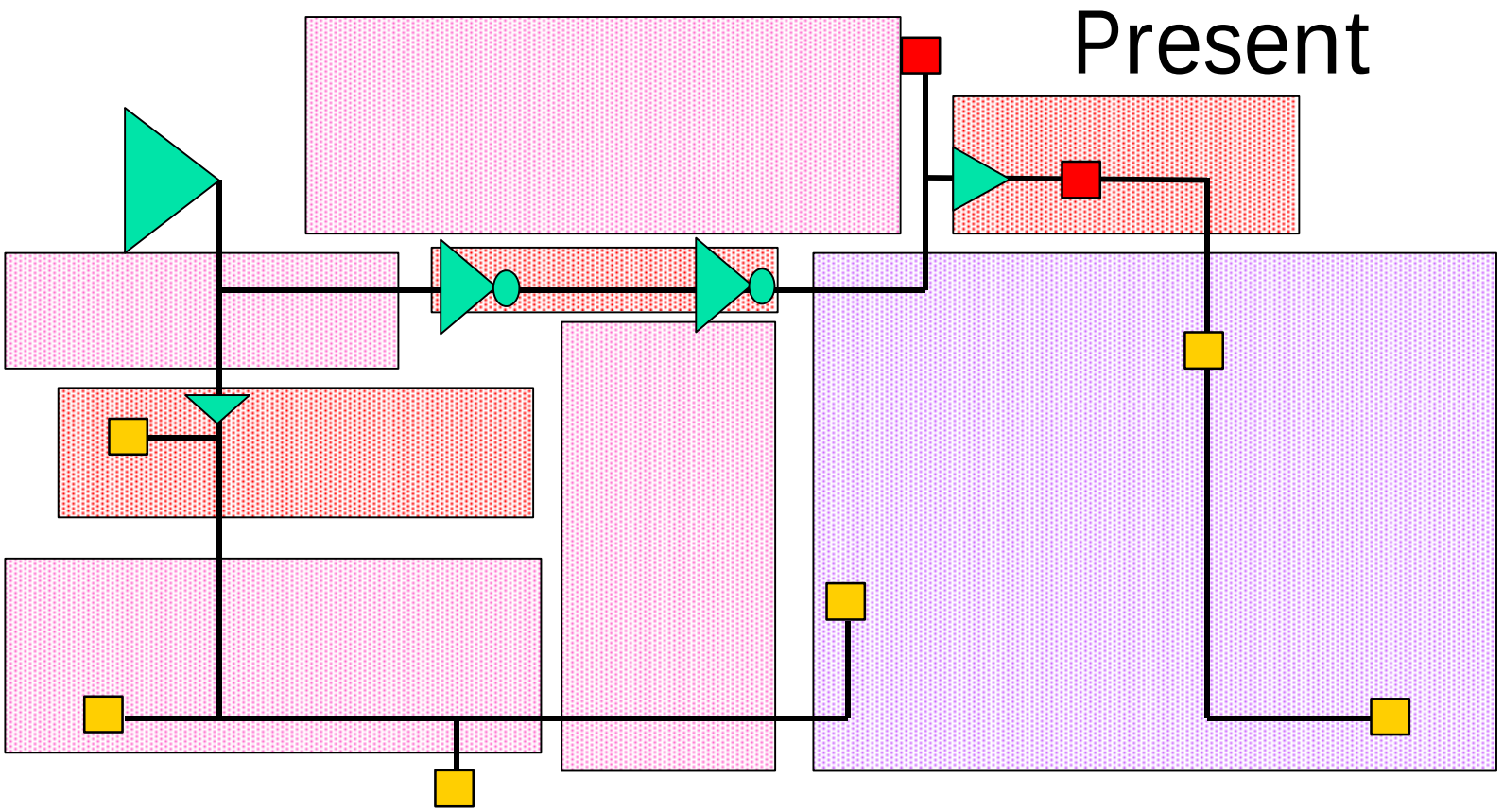
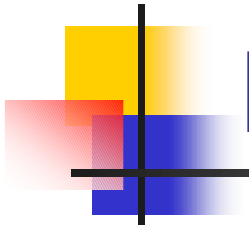


What Is So Difficult?



What Is So Difficult?

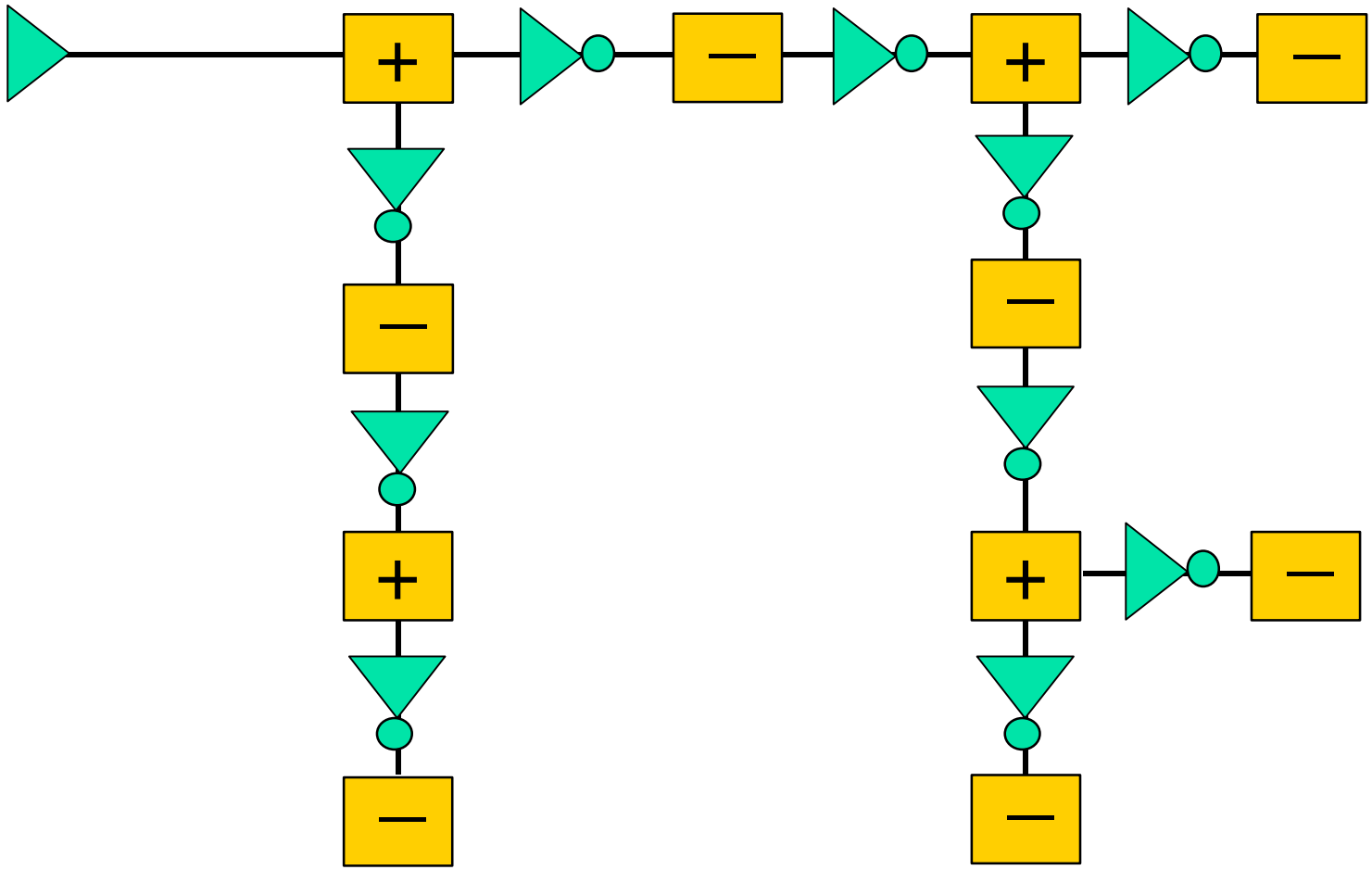




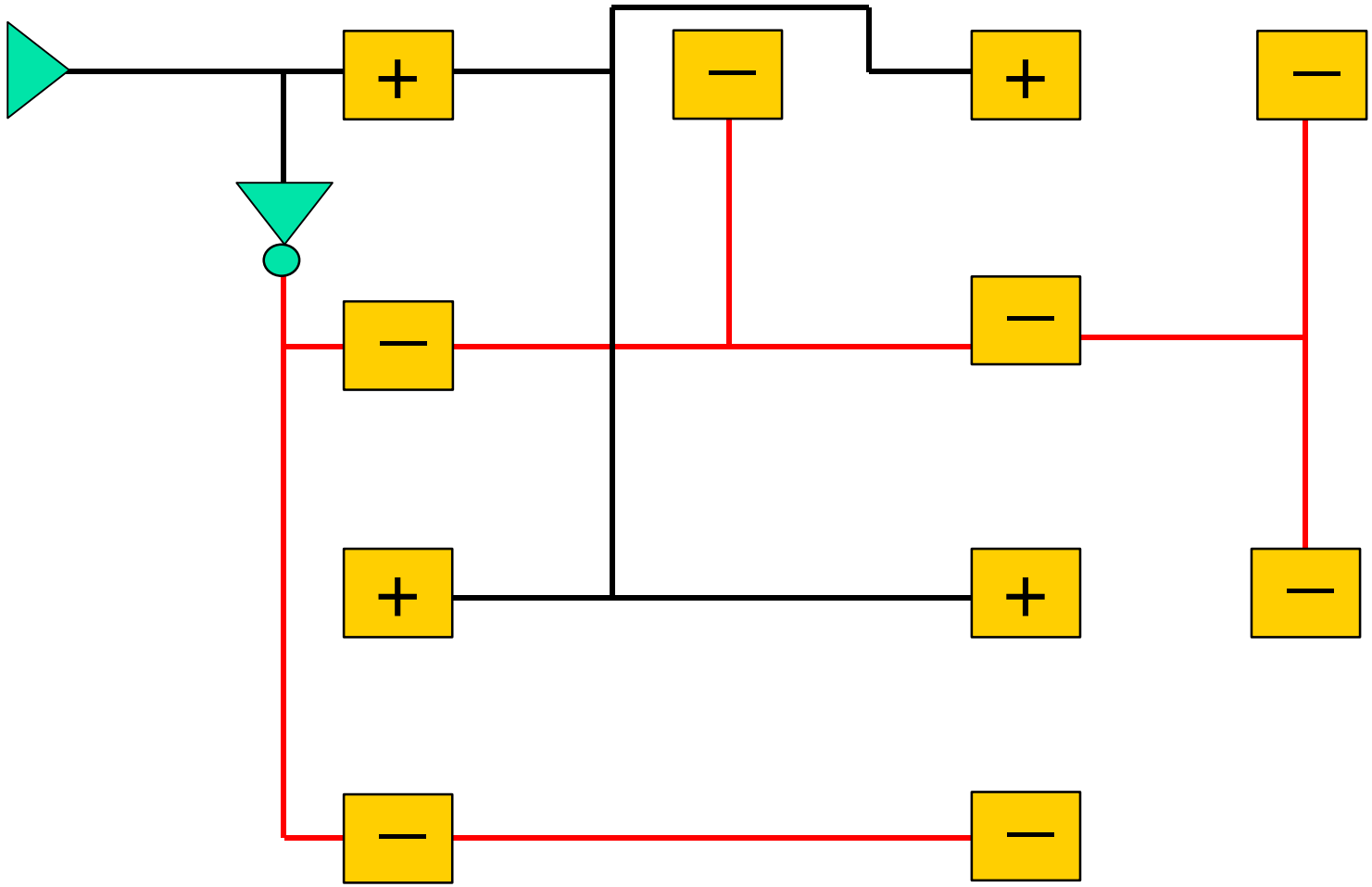
Ripping out Synthesis Trees

- Ugly pre-PD buffered trees
- Inverted sinks
- Trivial van Ginneken/Lillis change
  - Normal sinks: one positive candidate
  - Inverted sinks: one negative candidate
- No big deal

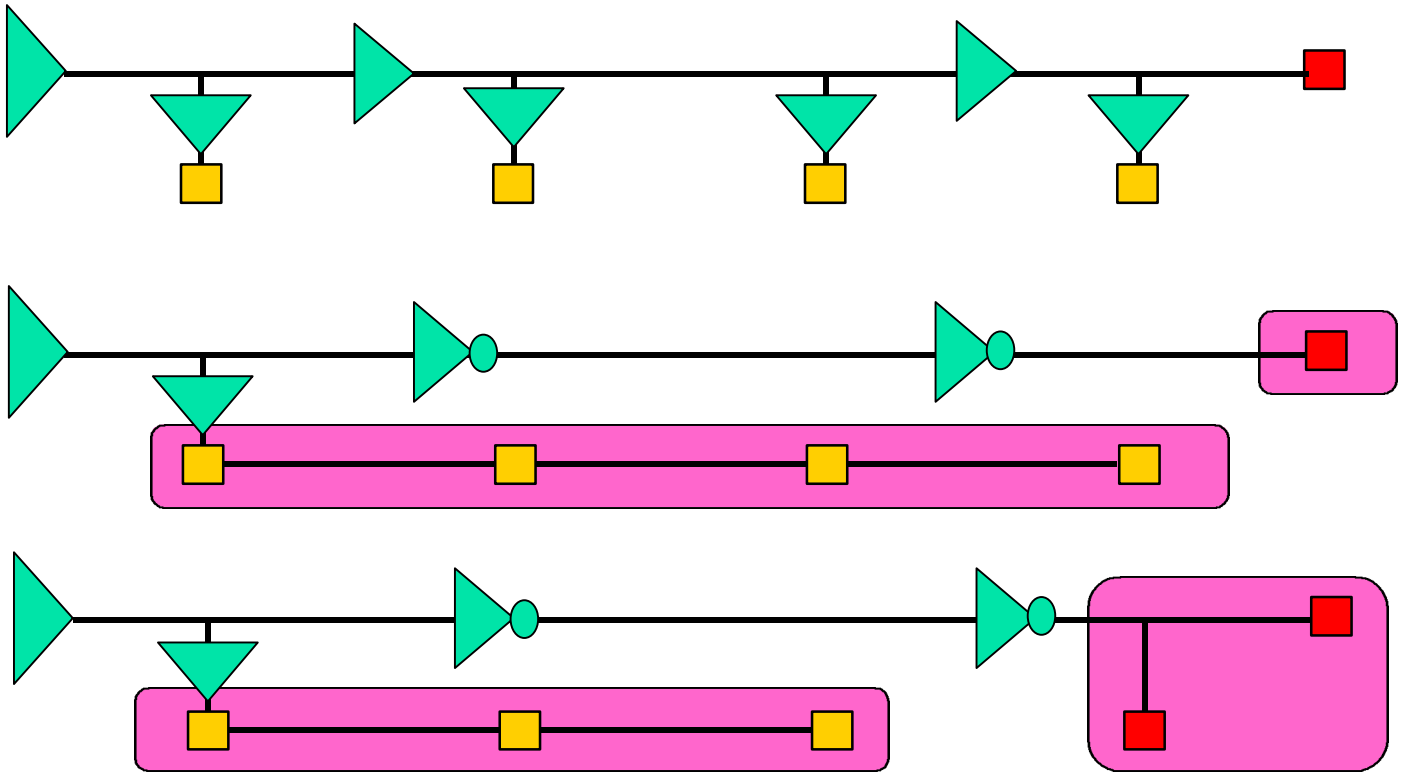
Or Is It?



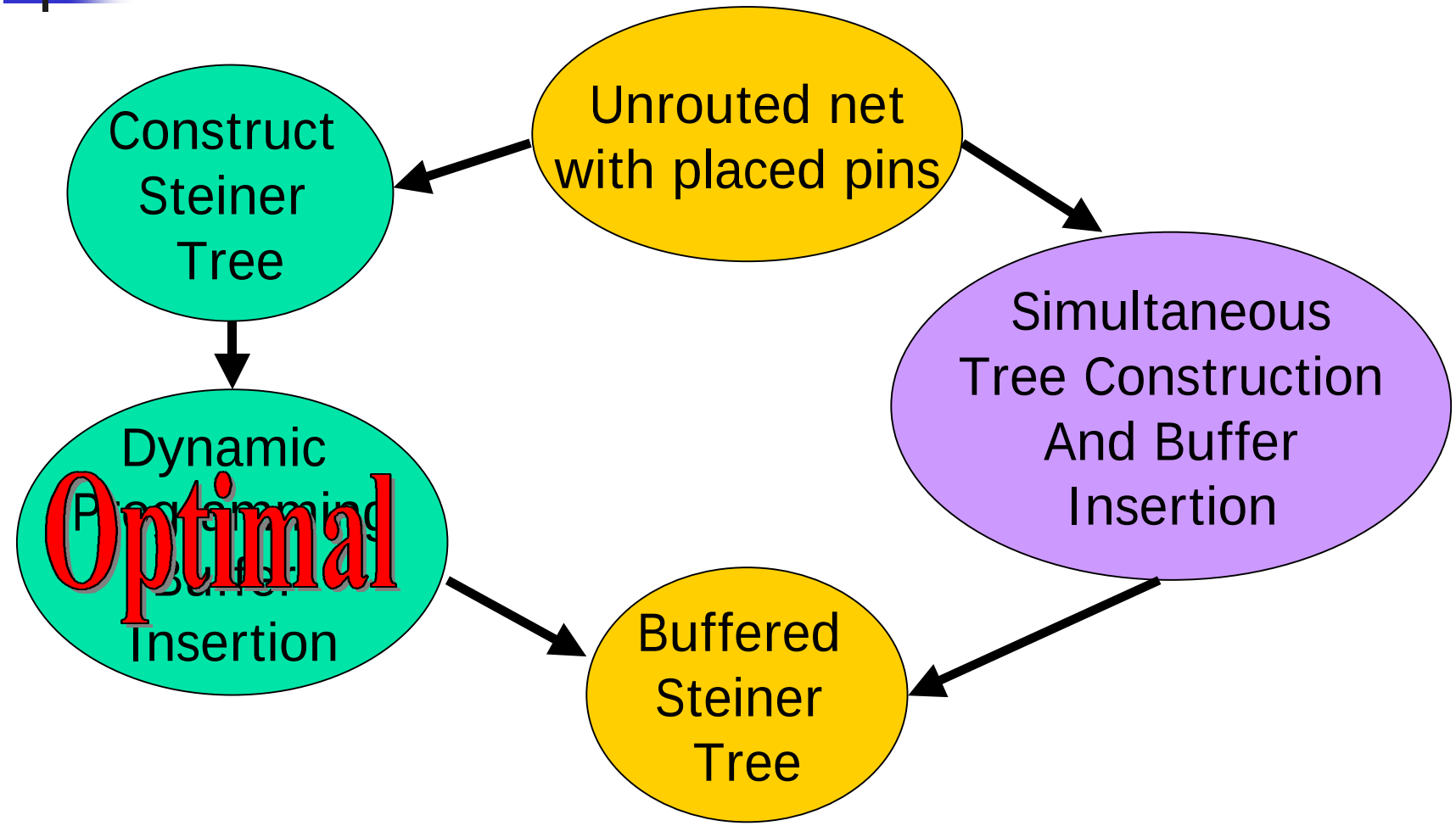
But Look What Happens

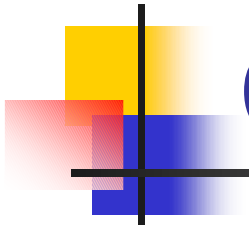


Buffer Aware Trees



The Texas Two Step

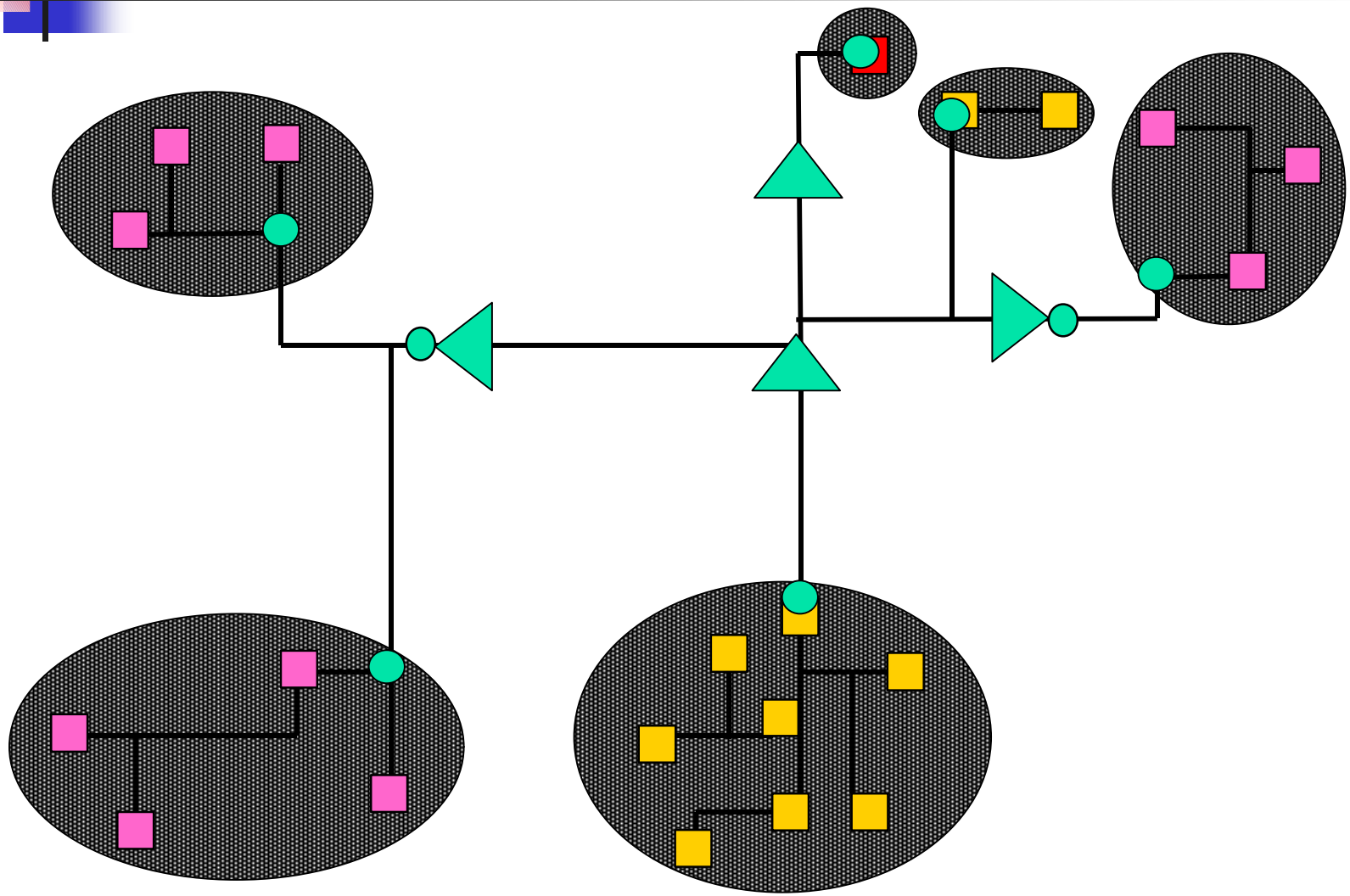




C-Tree Algorithm

- Two-level tree
- Cluster sinks by
  - Polarity
  - Manhattan distance
  - Criticality
- Form tree for each cluster
- Form top-level tree

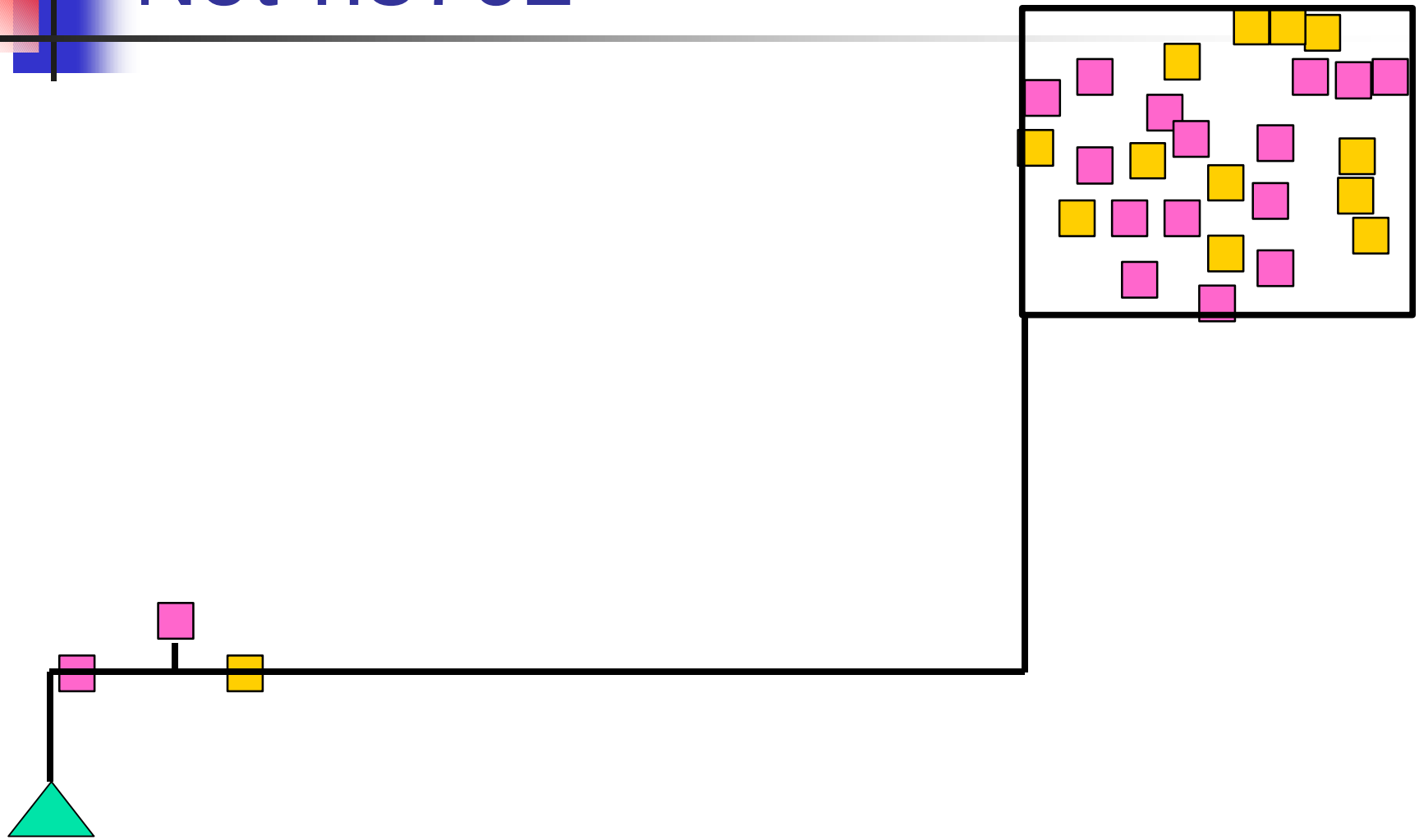
C-Tree Example

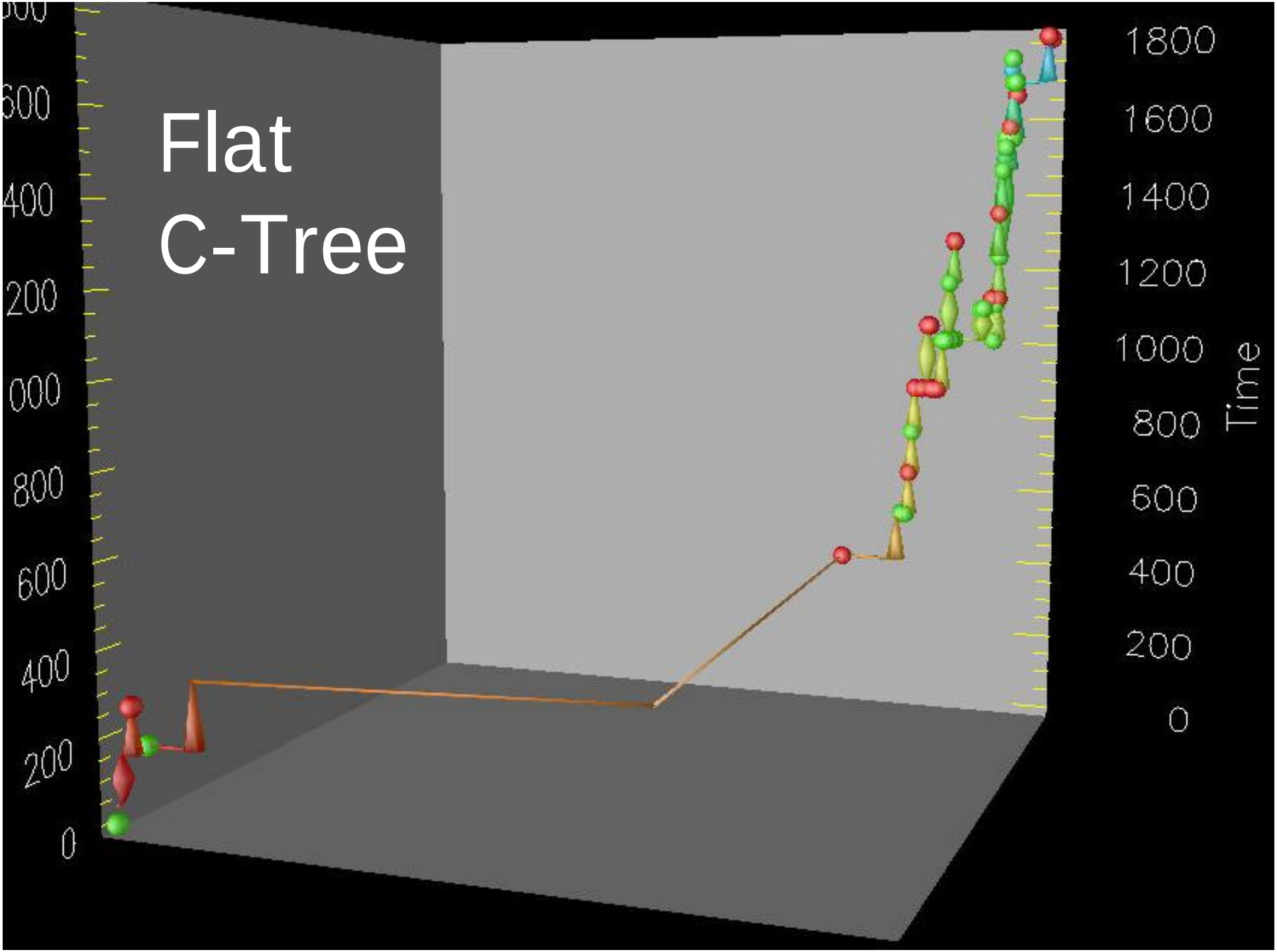


Net n8702 (44 sinks)

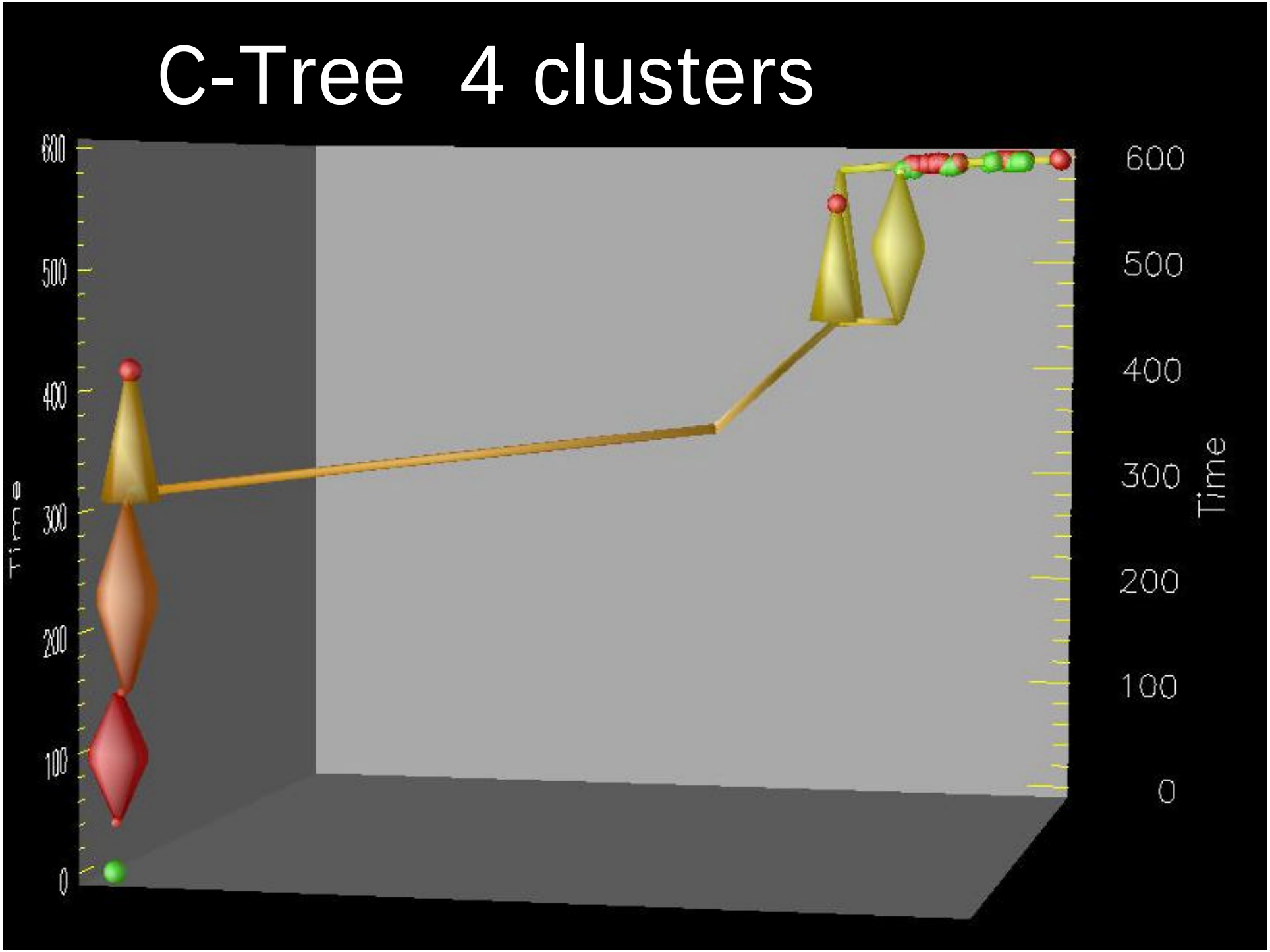
Algorithm	Worst slack	buffers	wire	CPU Time
C-Tree (9)	258	11	4386	0.9
C-Tree (2)	355	9	7688	1.5
Flat C-Tree	-101	26	4061	1.4
P-Tree	99	19	4089	4.1
BP-Tree	295	21	4119	861

Net n8702

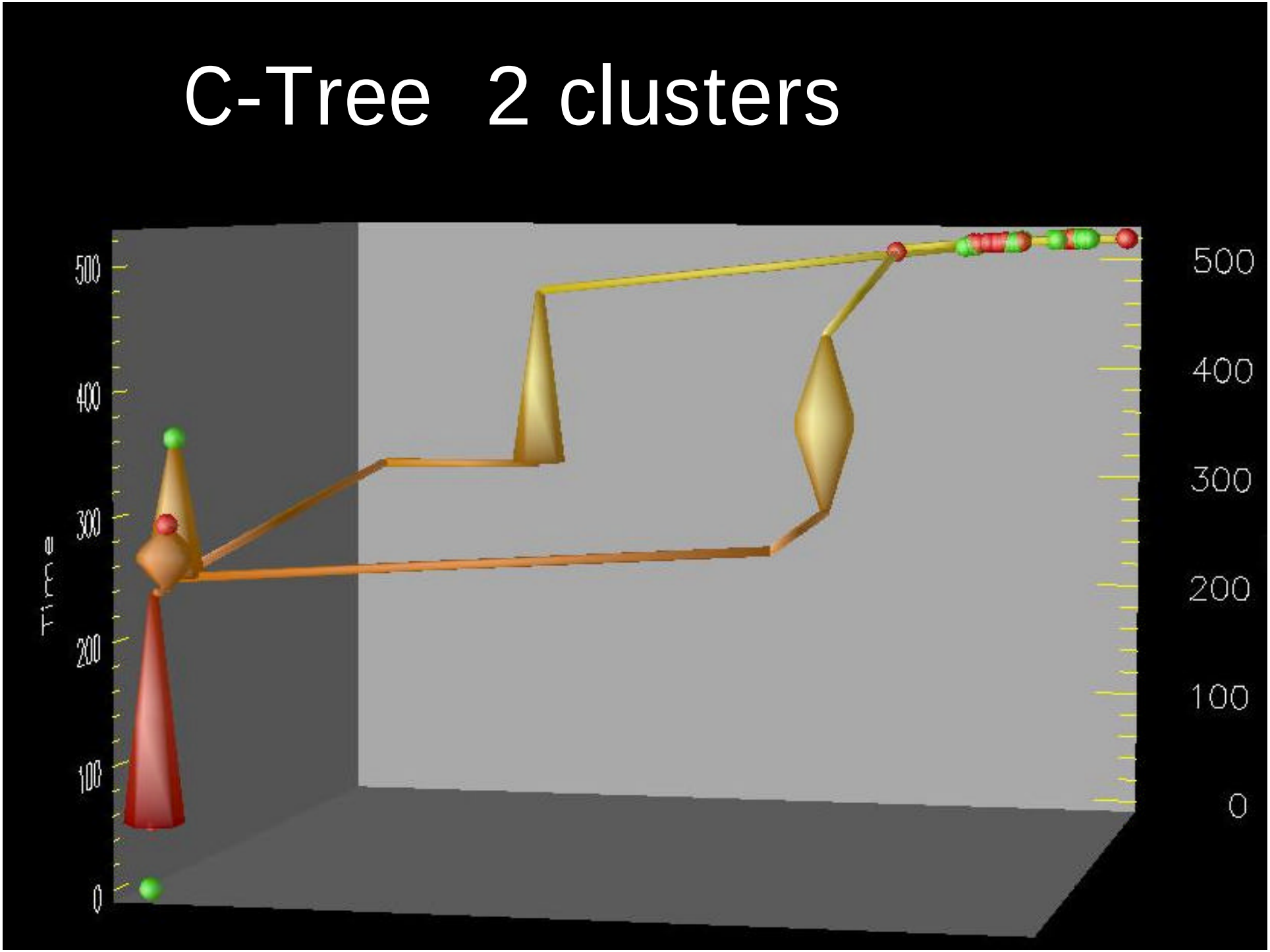


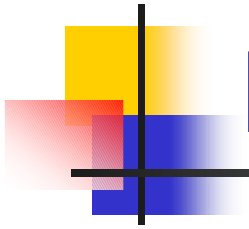

Flat
C-Tree
1800
1600
1400
1200
1000
800
600
400
200
0
Time

C-Tree 4 clusters



C-Tree 2 clusters





Difficult Steiner Instances

- Polarity/criticality makes it hard
- 3d trade-off
  - Buffers
  - Wire length
  - Timing
- Work on it!