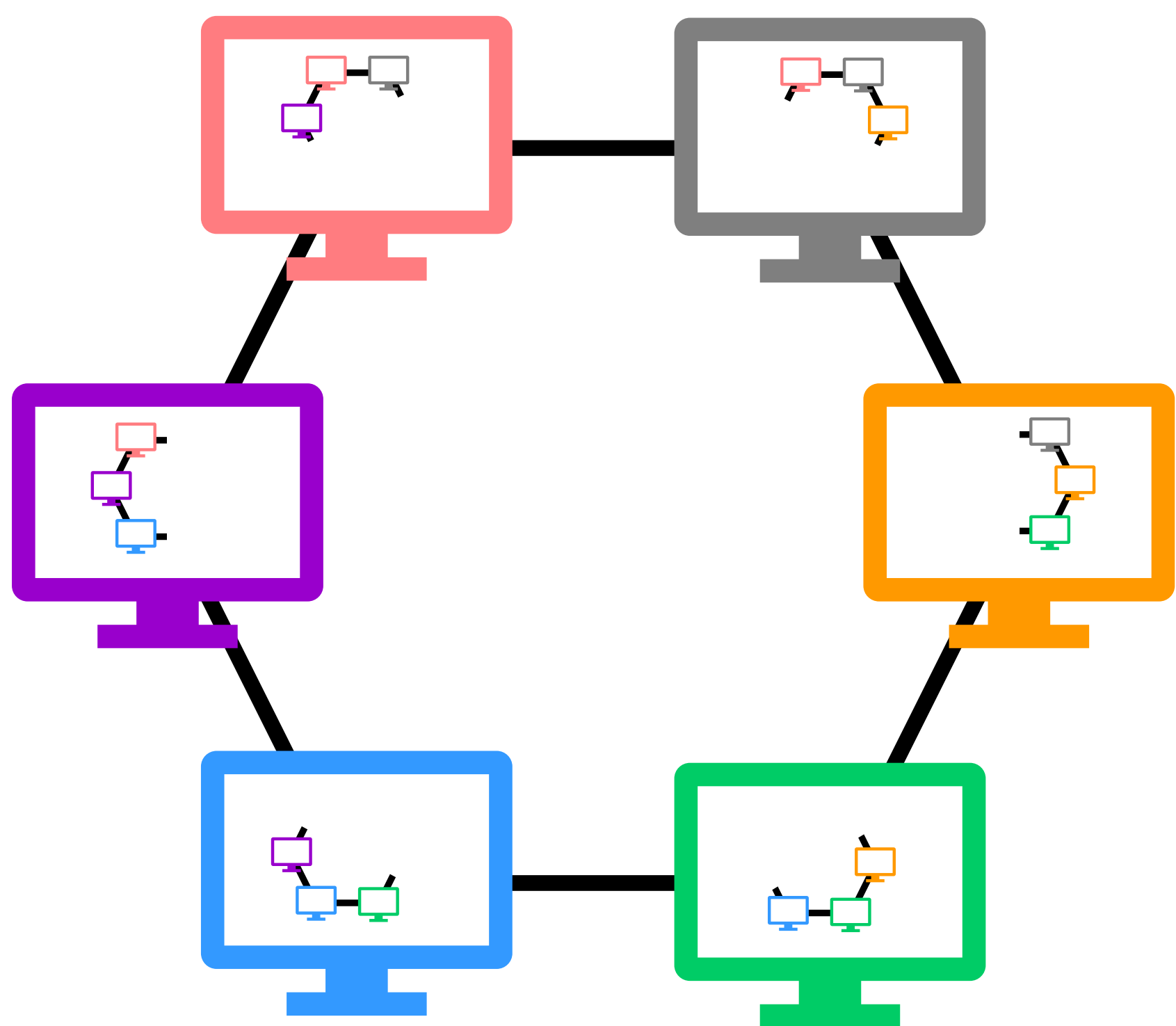
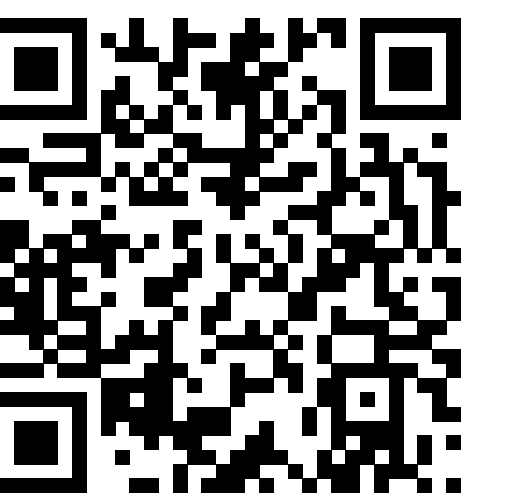
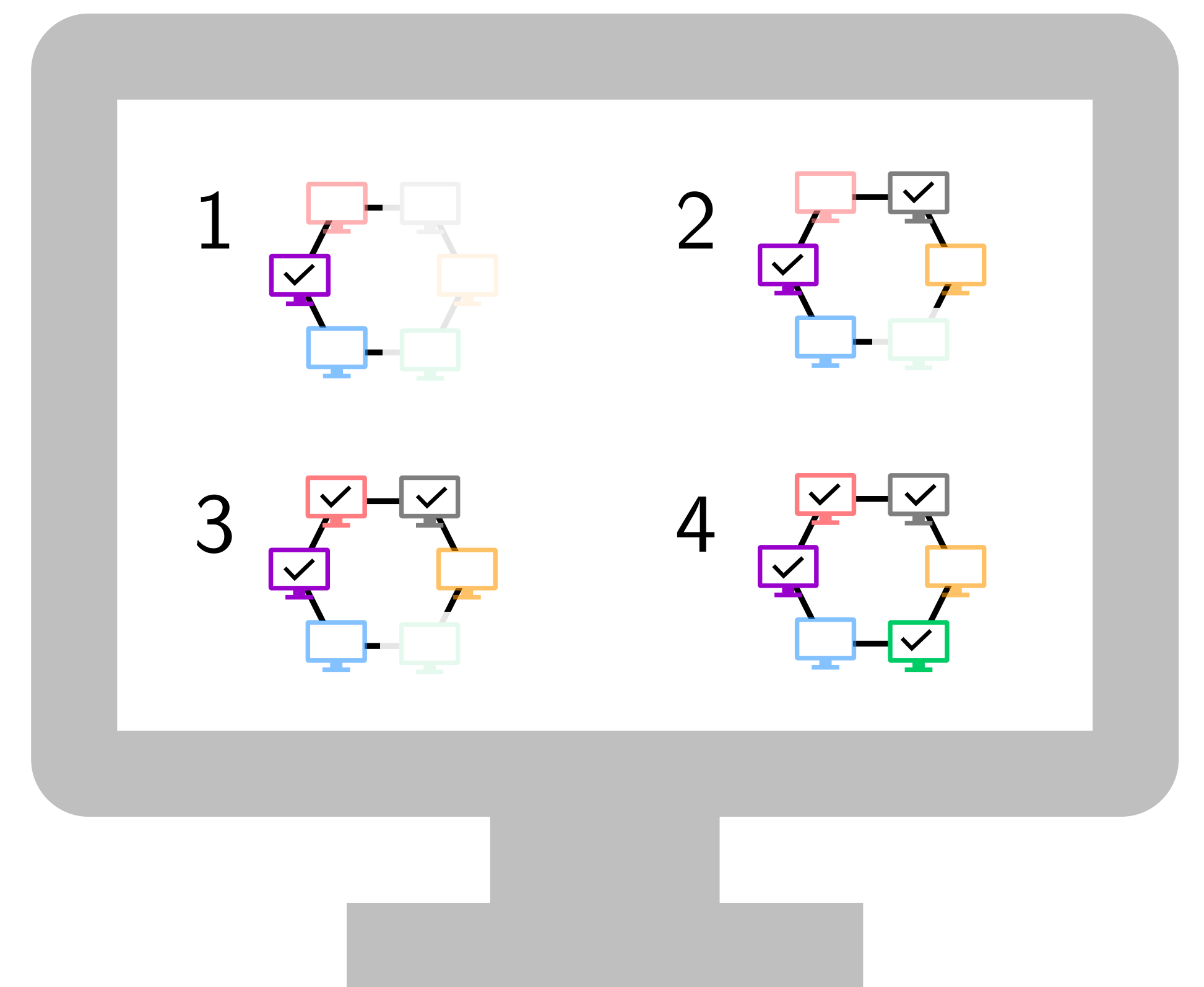


Online Algorithms with Lookaround



Nodes decide their output based on their local views



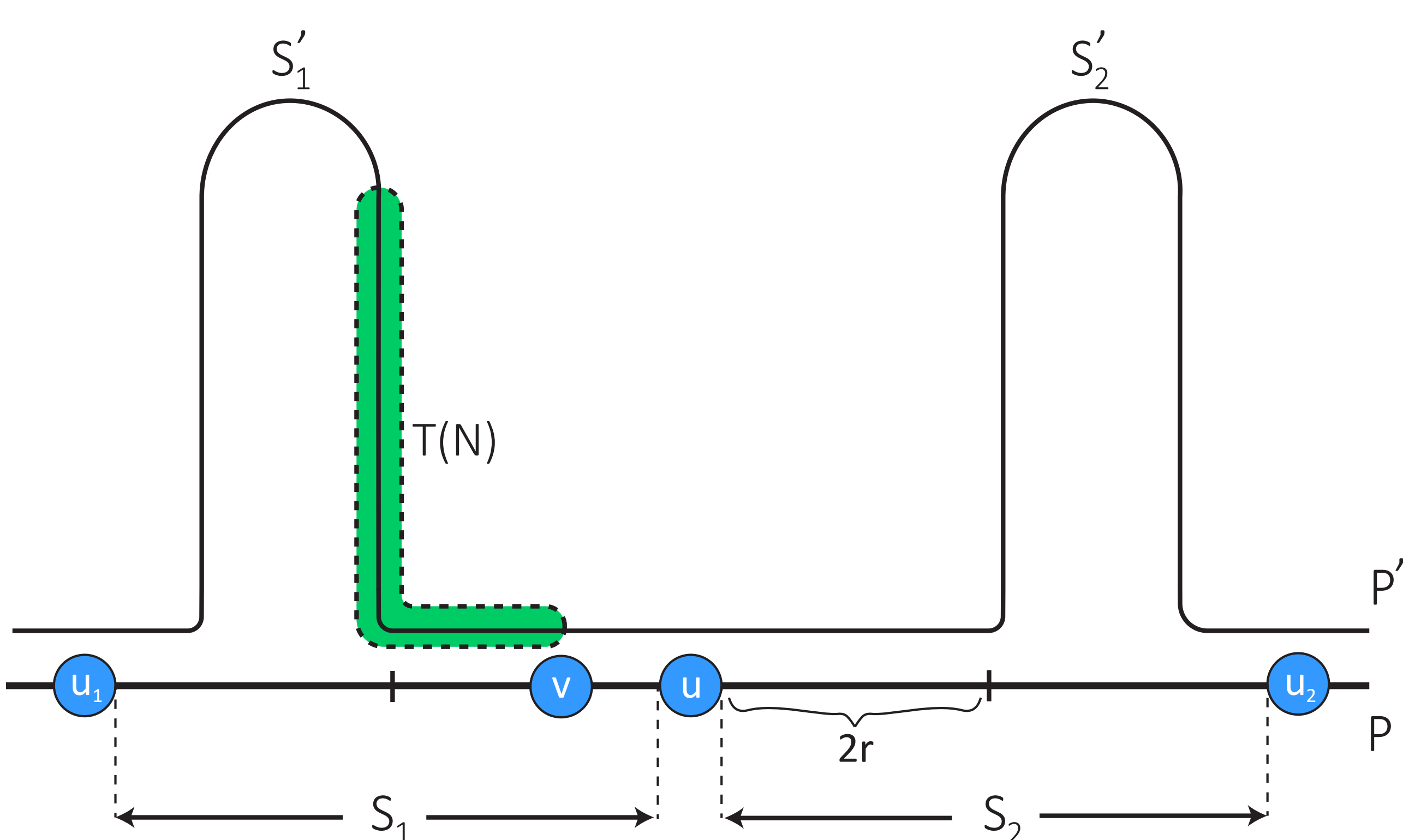
Nodes are processed in online fashion, and they can see their local neighborhoods



LCLs[†] in paths and trees: LOCAL $\approx$ Online-LOCAL

Pumping lemma on paths:

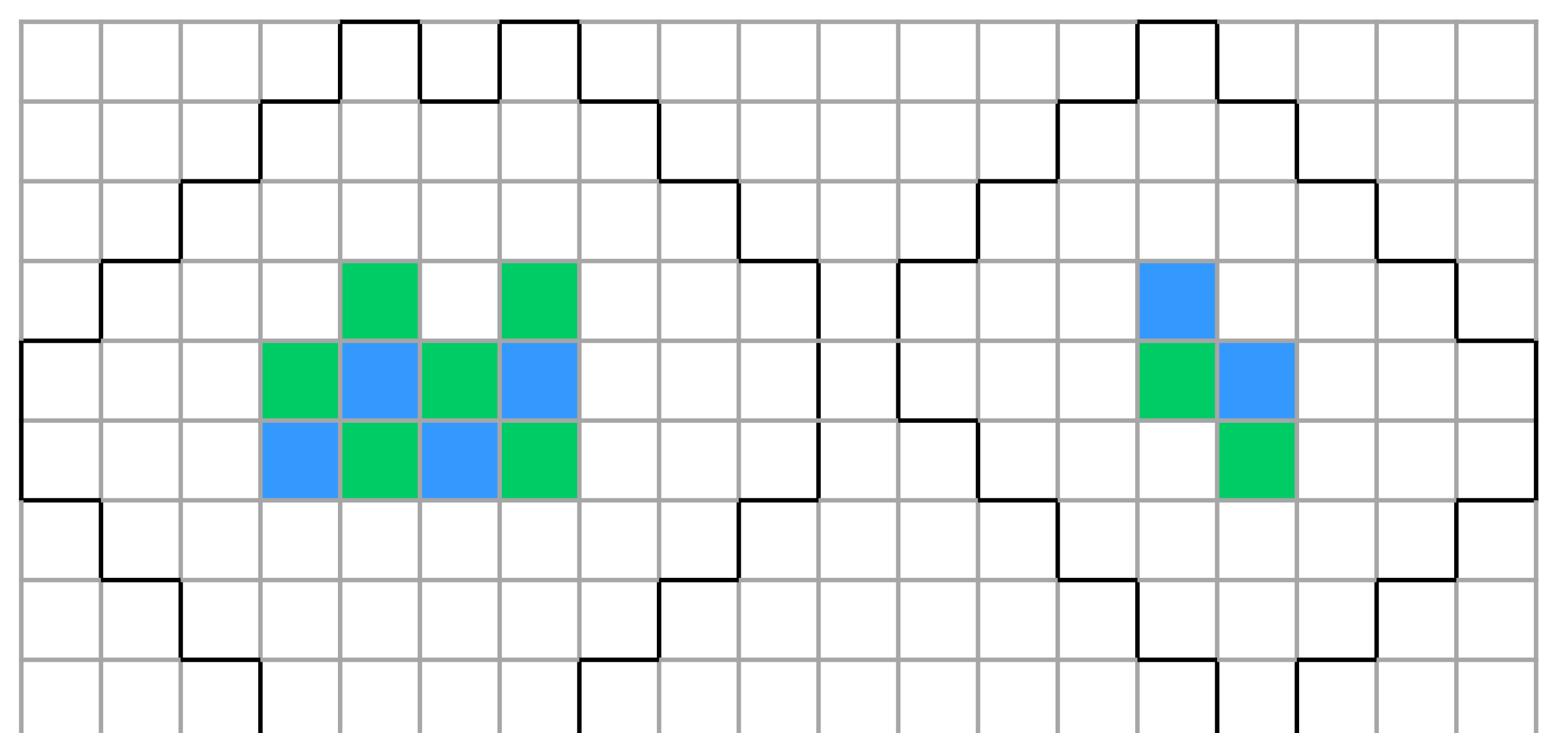
Path segments can be pumped into longer segments without affecting the result near endpoints:



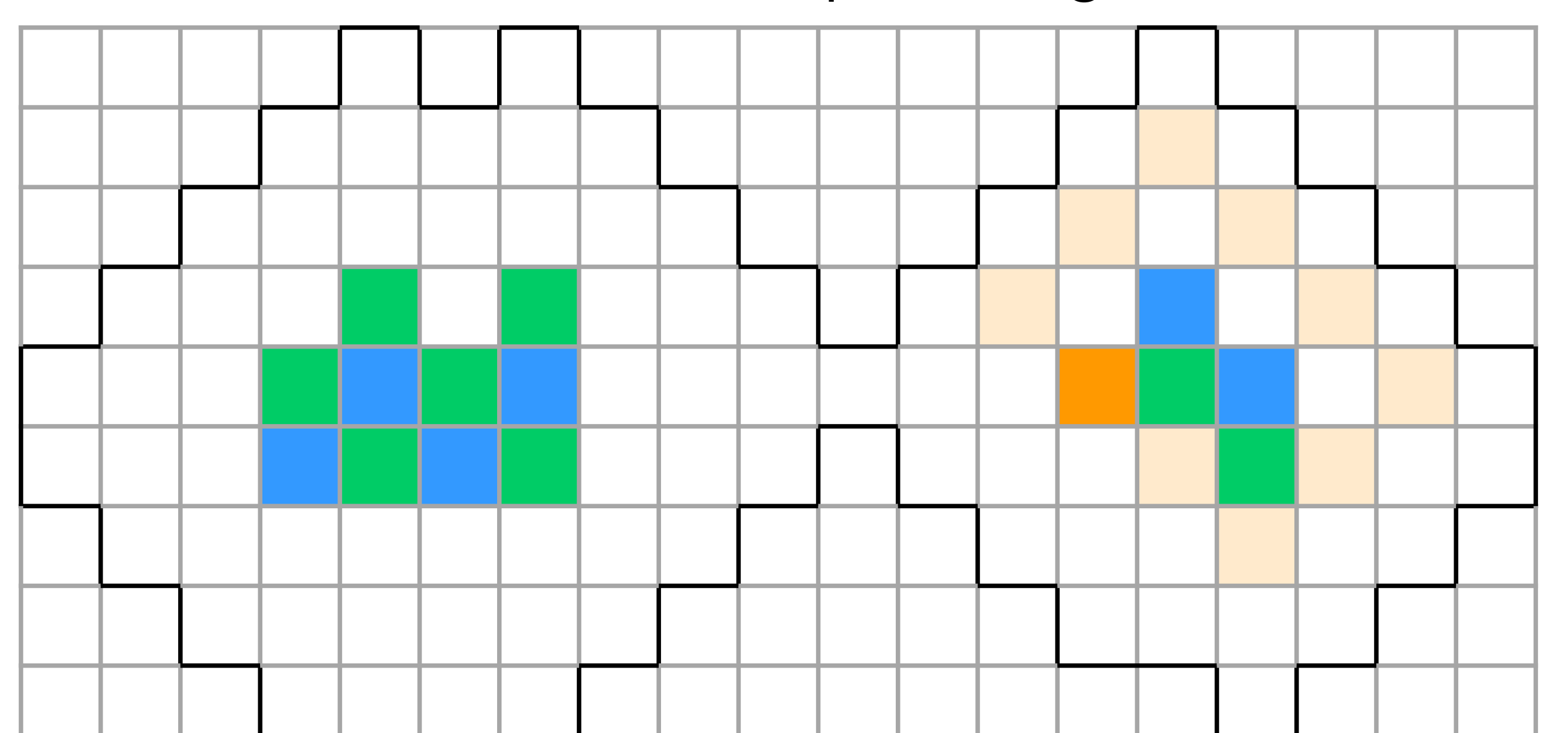
LCLs[†] in grids: LOCAL $\neq$ Online-LOCAL

3-coloring a grid in Online-LOCAL:

1. Greedily 2-color the grid:



2. Draw border around incompatible regions:



- $O(\log n)$ view suffices for Online-LOCAL.
- Requires $\Omega(\sqrt{n})$ view in LOCAL.

[†]Locally Checkable Labeling Problems (LCLs)

Every node (or edge) needs to be assigned a label from a finite set of labels. A labeling is valid for the whole graph if and only if it is valid around every node. For example, coloring with k colors, maximal independent set, minimal dominating set and maximal matching are all LCL problems.