

Detect Region Changes Locally in Sensor Networks

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Detect Region Changes Locally

- Set a threshold in advance. Whether a node is in a high activity region or not is determined by the value of the node
- Region changes can be detected locally by comparing neighbor values and region ID maintained
- Have some problems in distributed networks



Detect Region Changes Locally

■ Topological changes

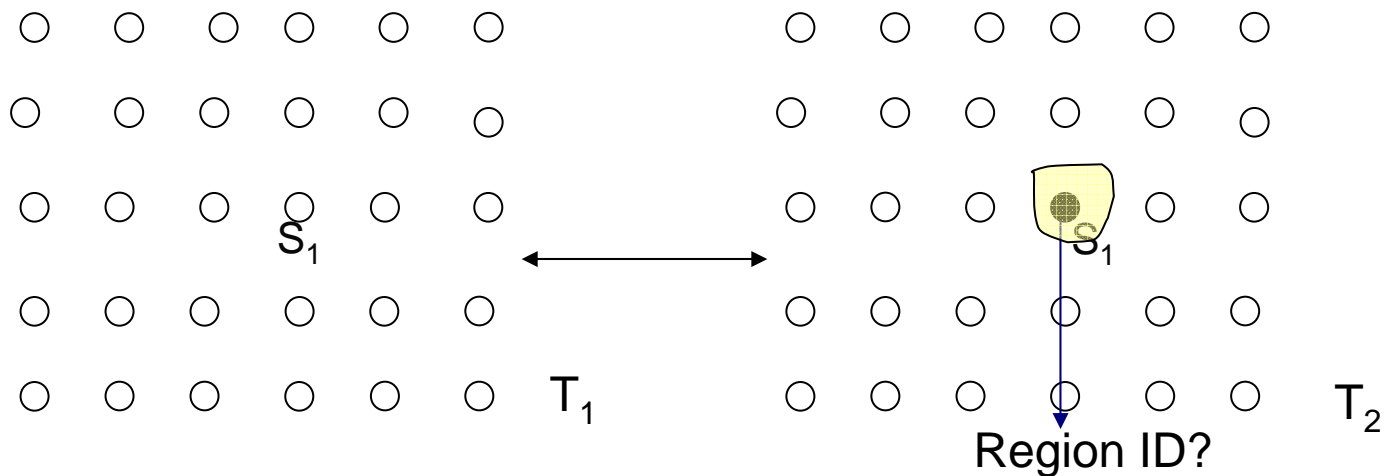
- ✓ Appearance and disappearance
- ✓ Self merge **and self split**
- ✓ **Merge and split**
- ✓ Hole appearance and disappearance

■ Non-topological changes

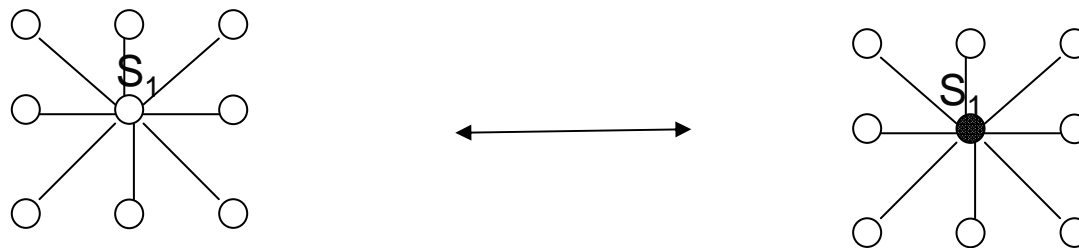
- ✓ Expansion and contraction

Detect Region Changes Locally

- Region appearance and disappearance

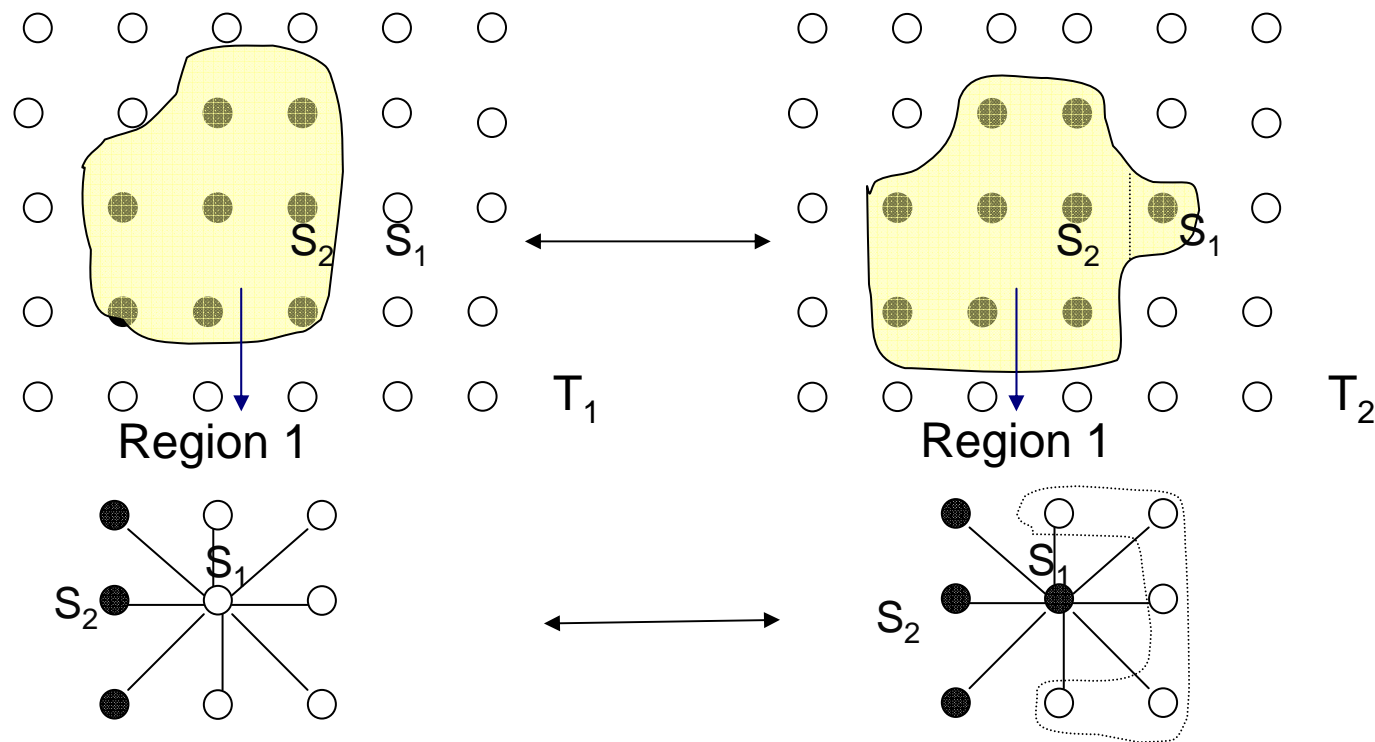


How to assign a unique region ID to s_1 ?



Detect Region Changes Locally

- Expansion: S_2 can pass Region ID to S_1 and S_1 reports an expansion of Region 1

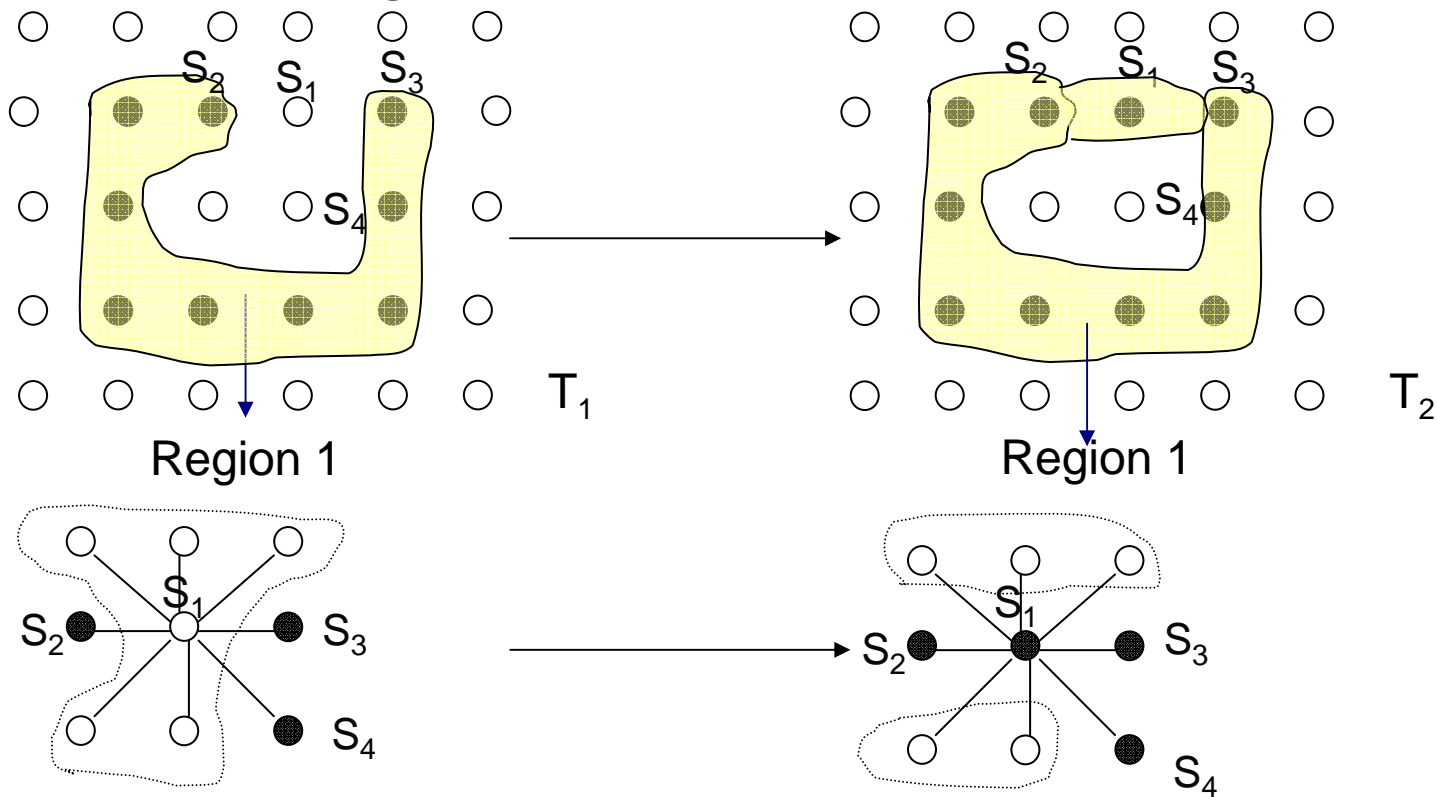


Note: S_1 maintains no Region ID and some of its neighbors are in the region

Now S_1 is in the region and all neighbor's states are unchanged

Detect Region Changes Locally

■ Self merge can be detected

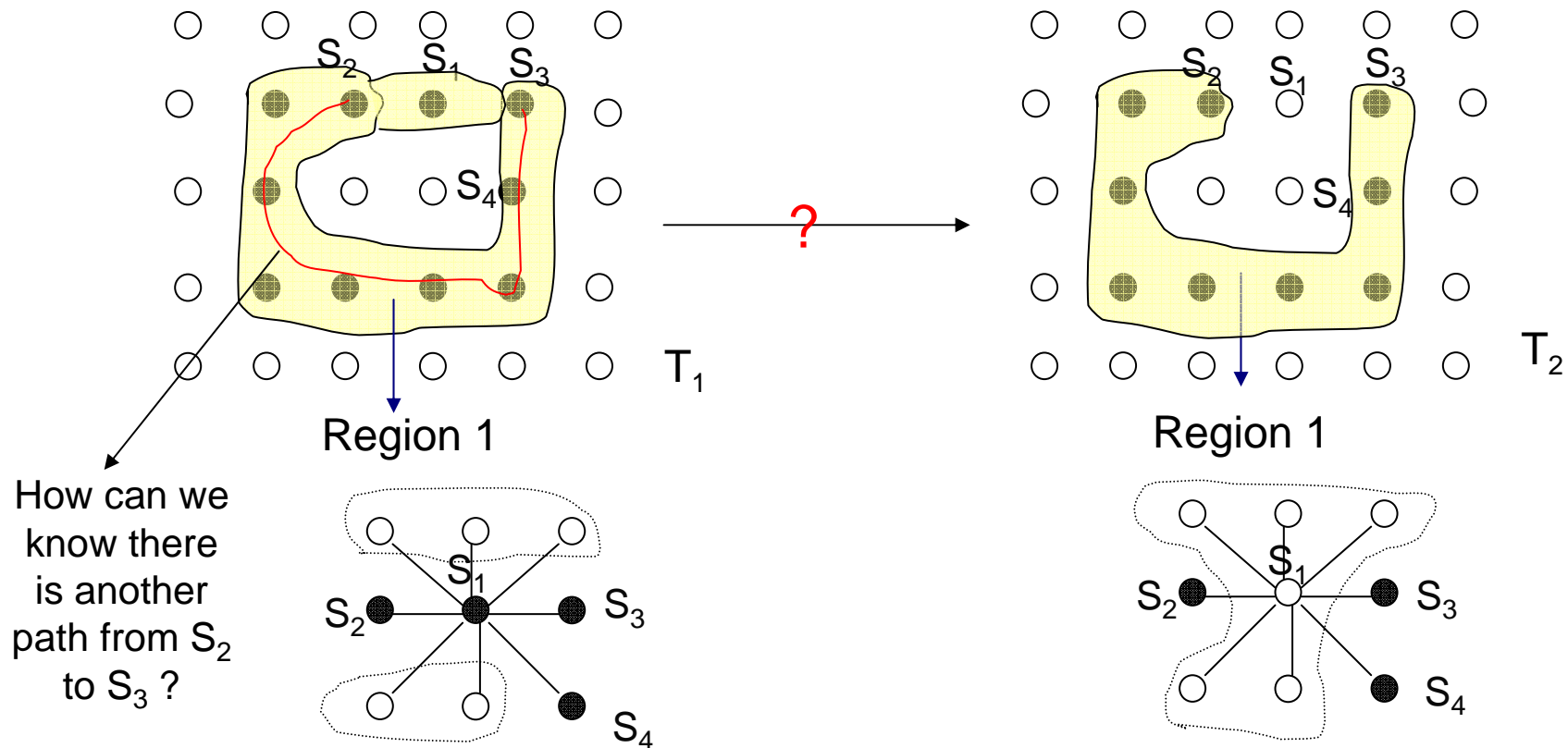


Note: S_2 , S_3 and S_4 have the same region ID and they are not continuous by cyclic order

Now S_1 is in the region and S_2 , S_3 and S_4 partition neighbors of S_1 into two parts

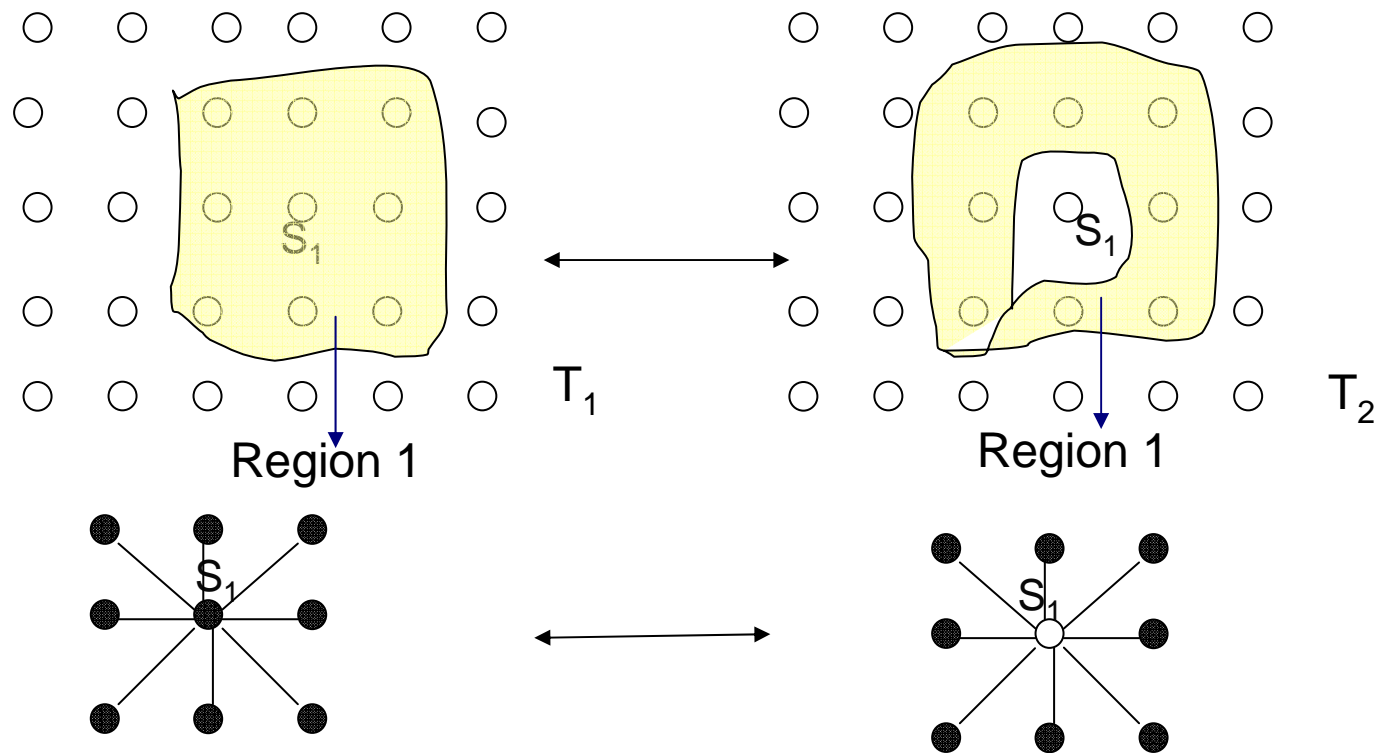
Detect Region Changes Locally

- Detecting self split is difficult



Detect Region Changes Locally

- Hole appearance and disappearance



Note: S_1 has the same region ID and values as all neighbors

Now S_1 maintains no Region ID and all neighbors' states are unchanged

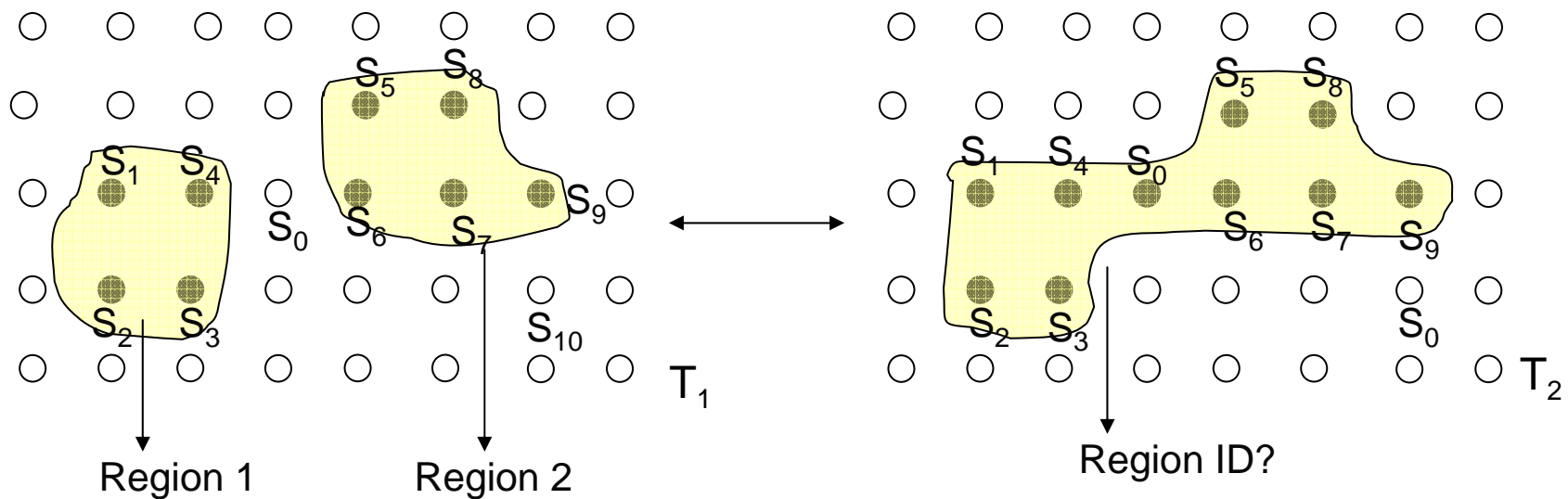


Problems

- Problems when consider merge and split
 - ✓ How to define new region ID?
 - ✓ How to update Region ID in distributed networks?
 - ✓ Let the base station know the ID change (relatively easy)

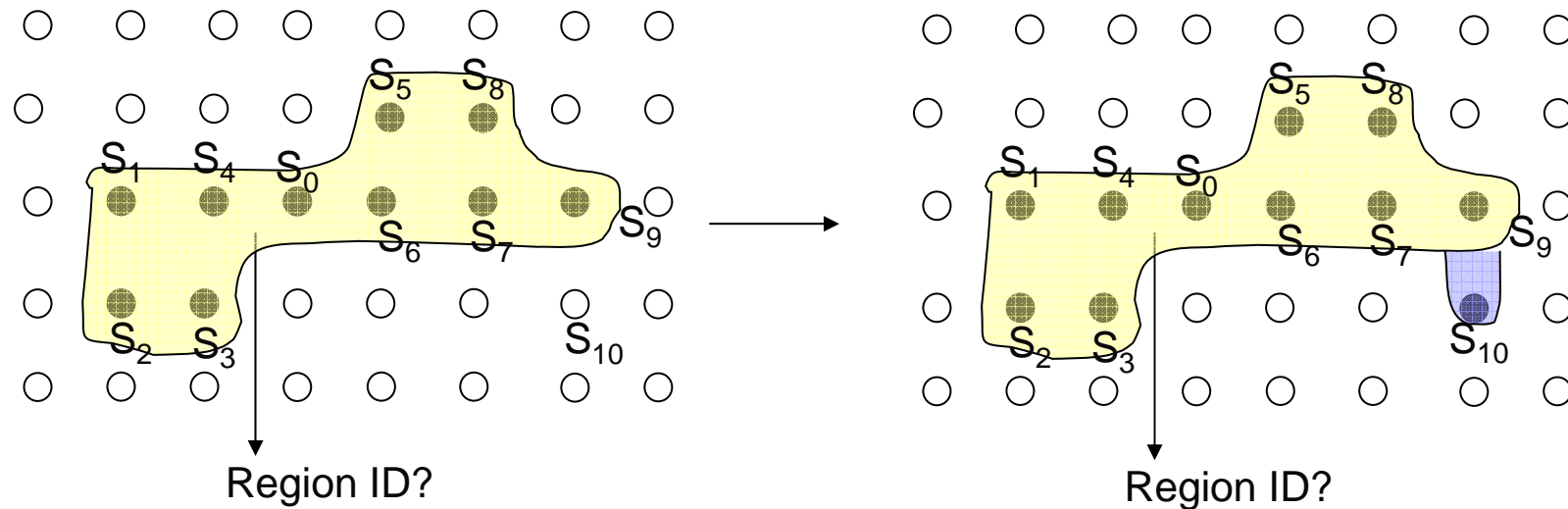
Detect Region Merge Locally

- How to define new Region ID?
- The base should know that there is only one region after the merger (report a merger and the new ID)
- How to let S_1 - S_9 know the new region ID quickly?



Detect Region Merge Locally

- S_{10} should know that I am the expansion of the new region (region 2 does not exist now!)





Detect Region Changes Locally

- Performances: hard to exceed many mature (spatial and temporal) suppression techniques.
- But one big difference is that we report changes and they report values.



Thanks!

