Abstract topology analysis of the join phase of the merge protocol with \textit{astra}

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Star abstraction

- idea: consider only the “role” of a node, consisting of
  - its label (process state)
  - labels of its partner nodes
  - and the connections between the node and its partner nodes.

Notions: Star, core node, axis, outer nodes
Example of abstraction ($\alpha$)

- Concrete graph
- Split into concrete stars
- Abstract them into abstract stars
- Remove duplicates
Property evaluation

- No two nodes labelled *flw* are connected to each other with an edge labelled *ldr*.

- A node labelled *pass* or *ld* always has at least one node labelled *flw* connected via some edge labelled *flws*.
Results

- **tool:** astra

- completeness of system: only “join” phase — in contrast to existing abstraction based tools (hiralysys), astra has no problems with the arising topologies (drawbacks: fails to analyze merge phase (work in progress))

- completeness of analysis: arbitrarily many processes

- performance: < 1 MB memory, < 1 sec processor time on any reasonably modern machine.

- output flexibility: graphviz, GDL, XGDL, Tulip and METAPOST, no filtering

- power of property evaluation: subgraph matching with negative application conditions
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