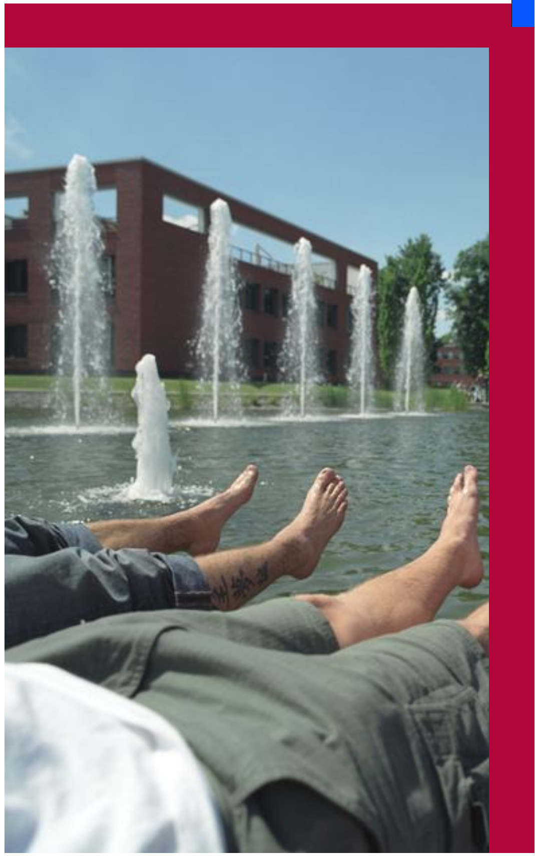
HPI Hasso Plattner Institut

IT Systems Engineering | Universität Potsdam



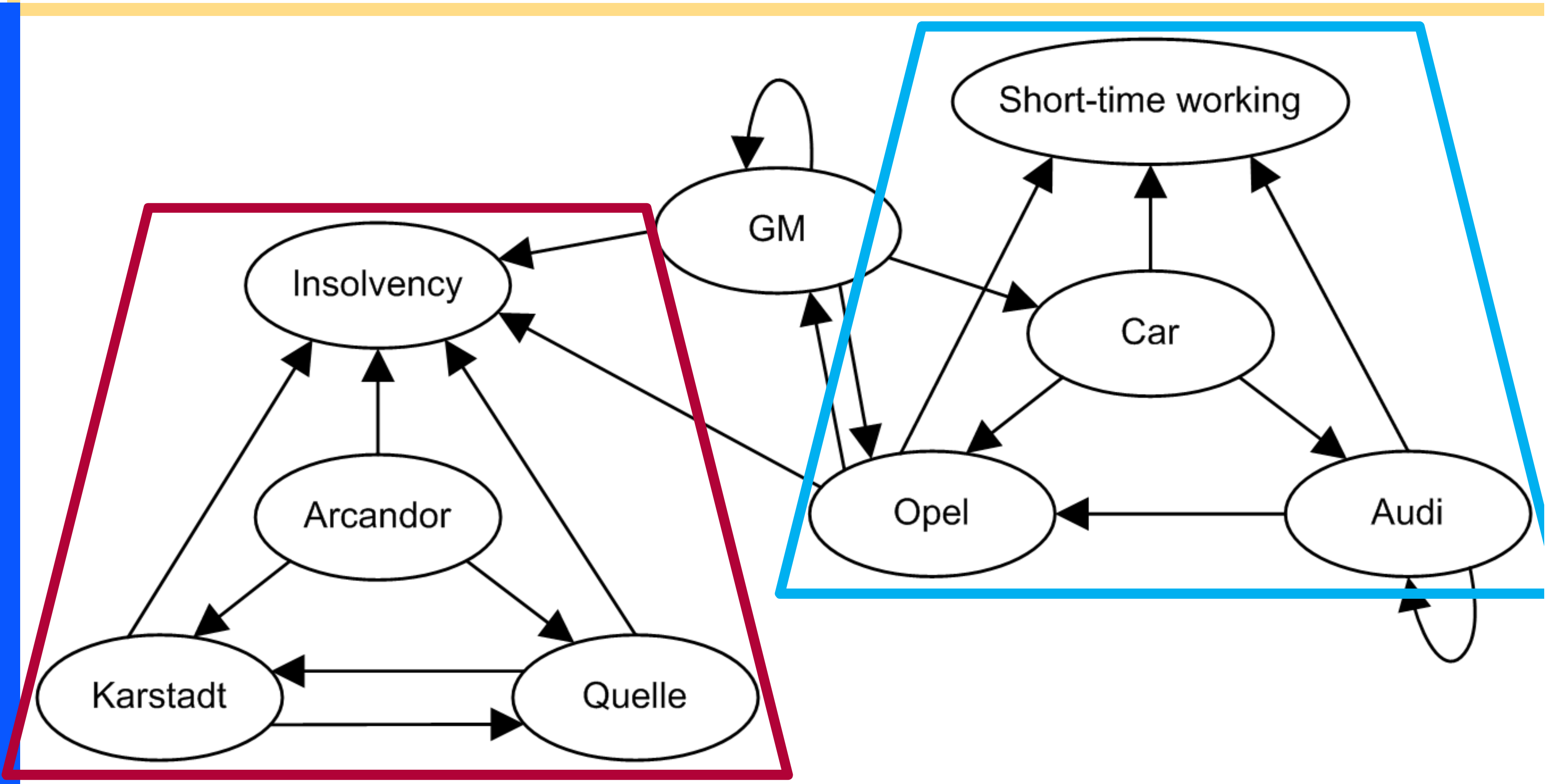
Graph Twiddling in a MapReduce World
Jonathan Cohen

Adv. MapReduce Algorithms winter term 09/10
HPI

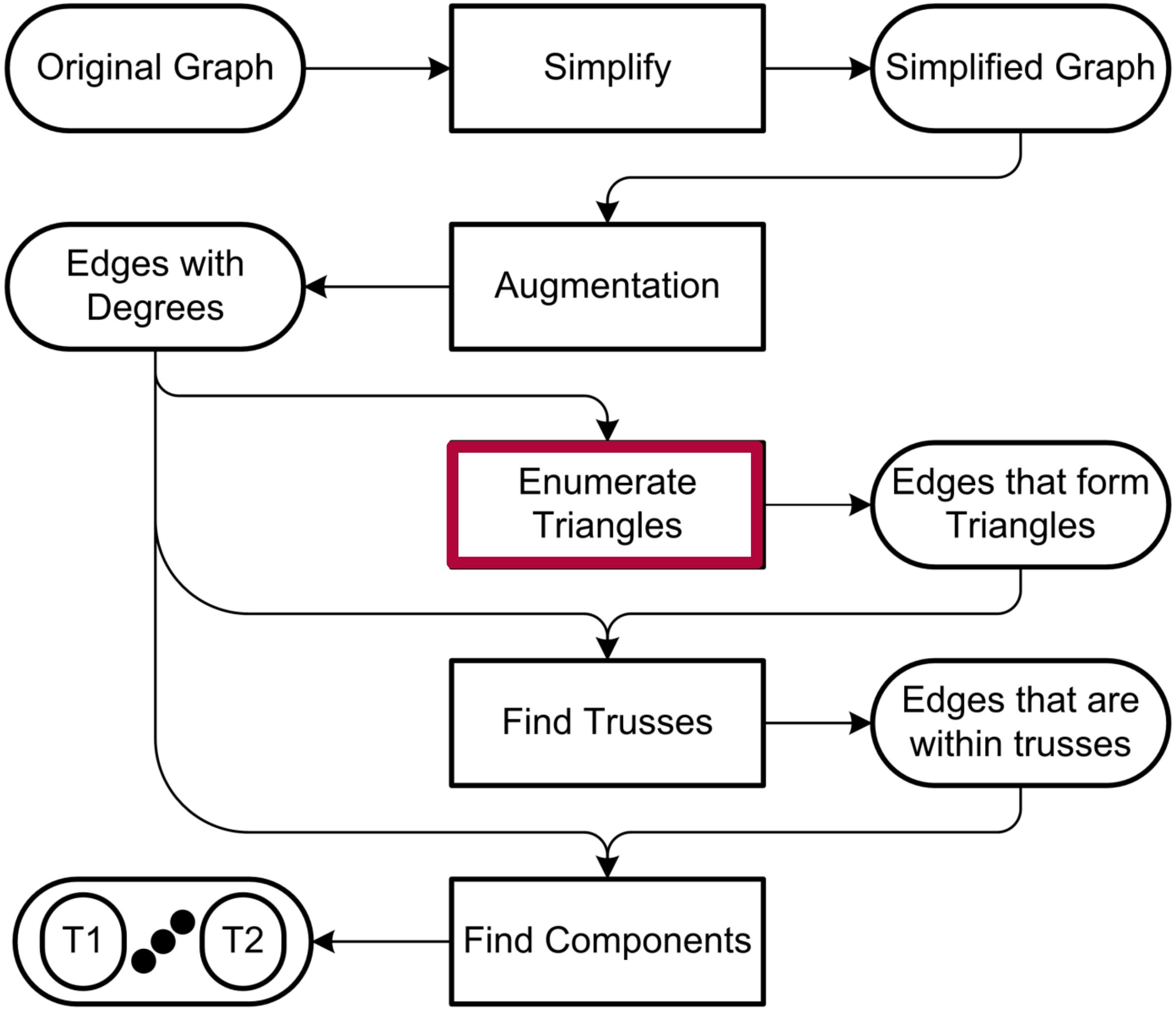
Winter presentation II – implementation

Arvid Heise, Michael Leben

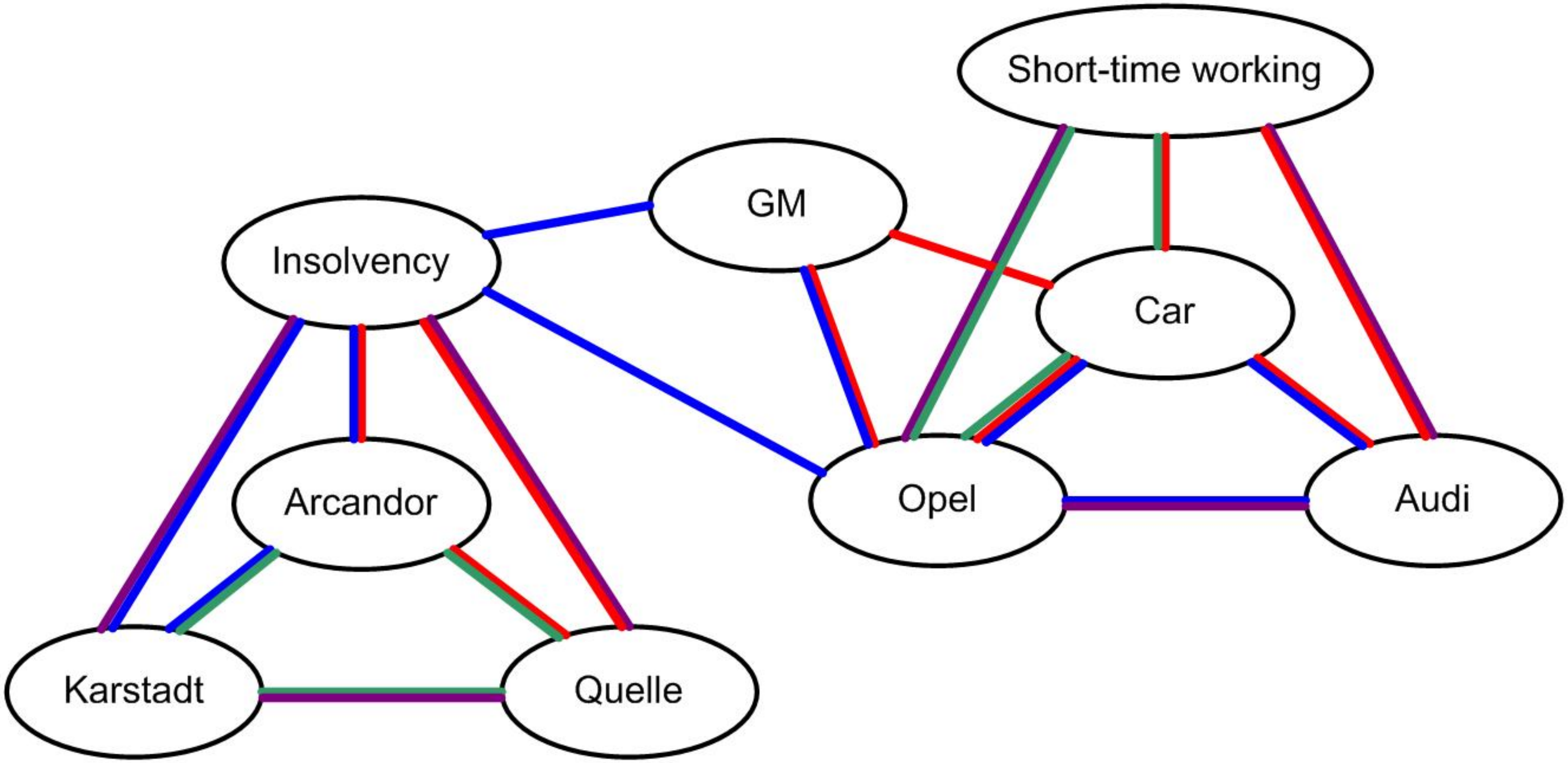
Use Case: Find Domains in Wikipedia



Process Overview

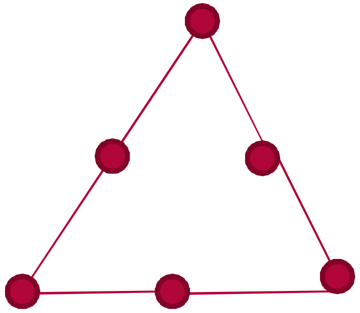


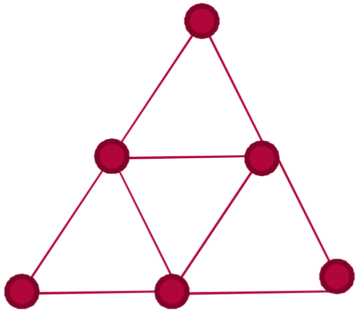
Process: Finding Triangles

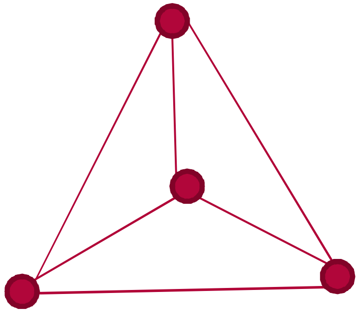


Process: Finding Trusses

Examples: no Truss, a 3-Truss, a 4-Truss

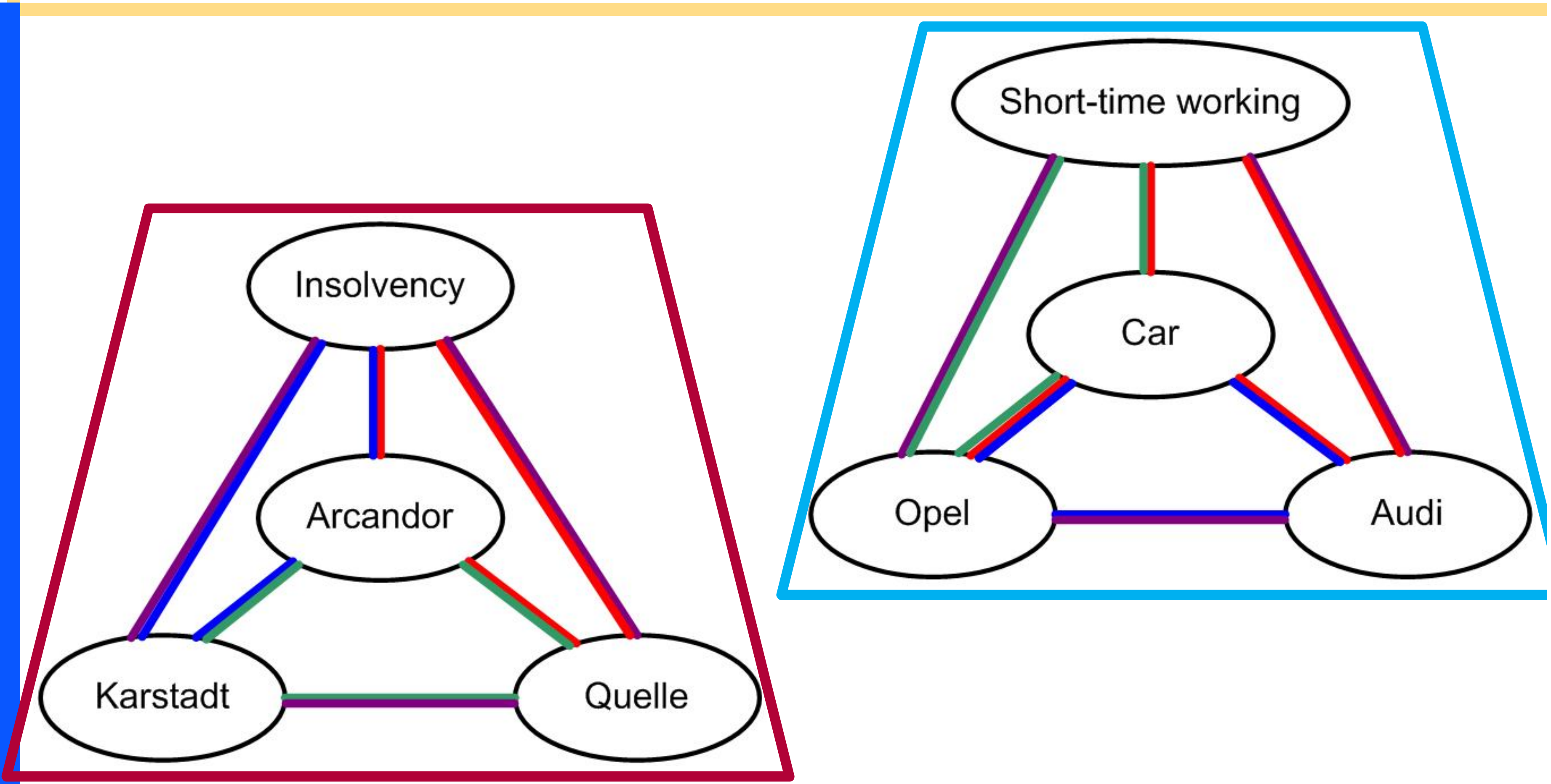






- A K-Truss is a subgraph, in that each edge is part of k-2 triangles within the truss.

Process: Finding Trusses



- A K-Truss is a subgraph, in that each edge is part of k-2 triangles within the truss.

Process: Finding Trusses | Influence of *K* on trusses

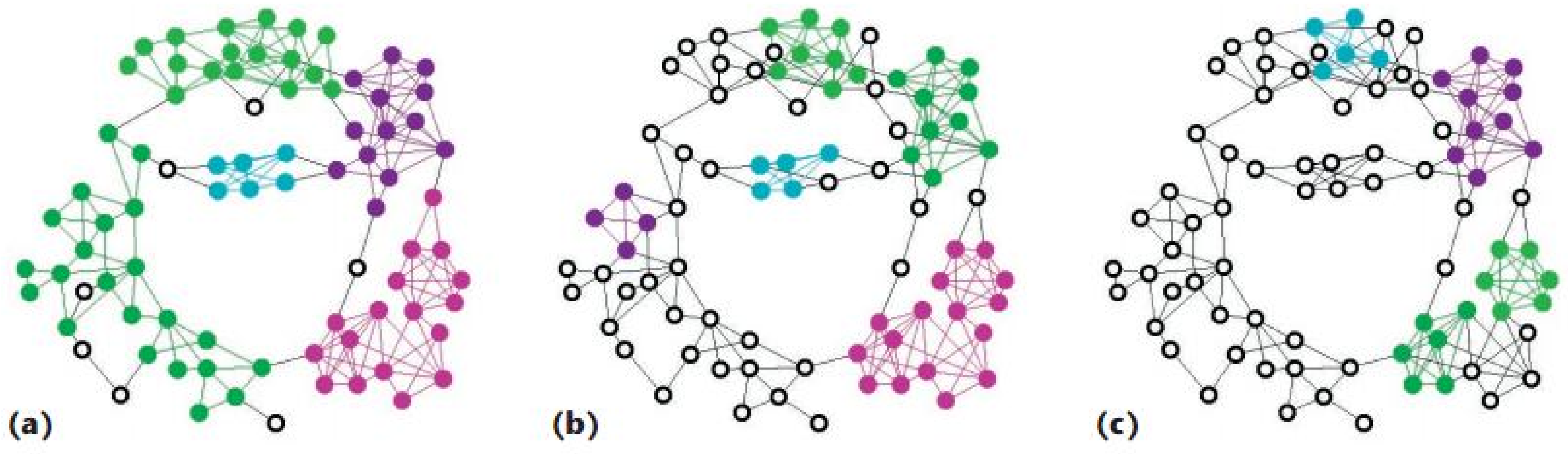


Figure 8. Trusses of a graph. Each truss has a randomly assigned color: (a) 3-trusses, (b) 4-trusses, and (c) 5-trusses. Vertices and edges not in trusses are black; such vertices are also hollow.

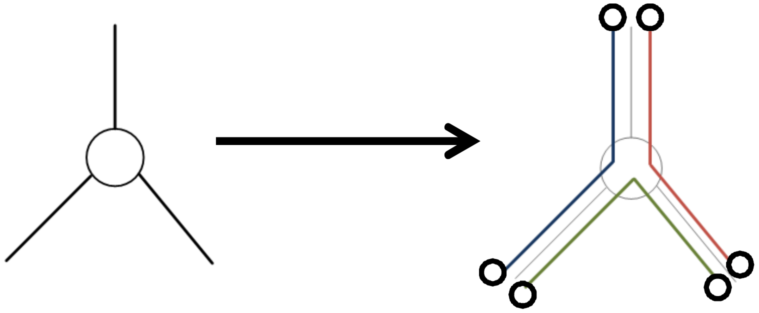
Our practical evaluation

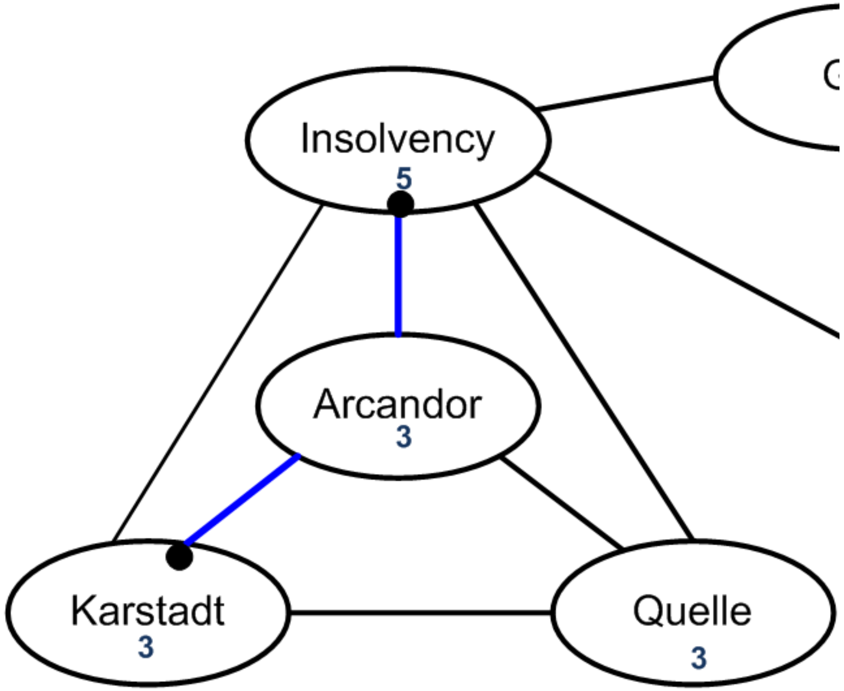
- Cohen used Social Networks
  - More or less equal degrees

- Dbpedia data: links between articles are edges
  - few nodes are extremely central
  - most are very isolated

  - Examples from our sample data:
    - USA (Degree of 88,000)
    - France (Degree of 33,000)
    - 2008 (Degree of 20,000)

Triad Problem

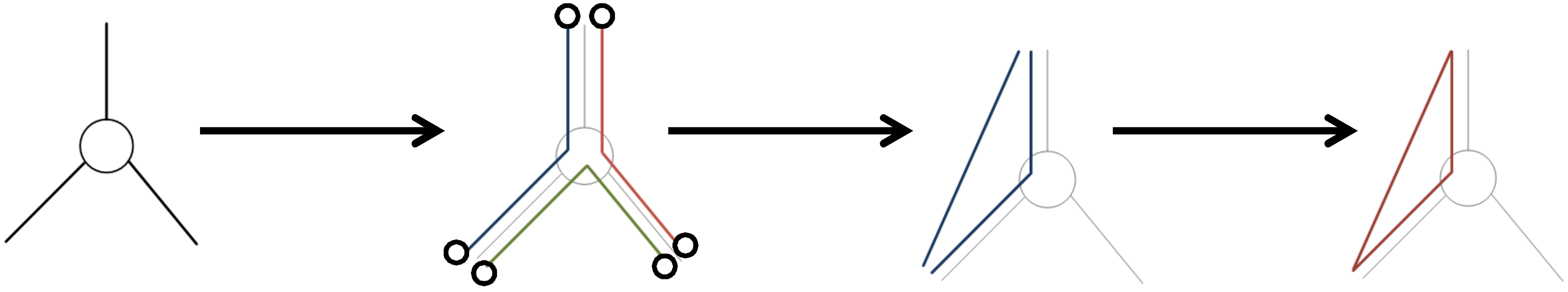




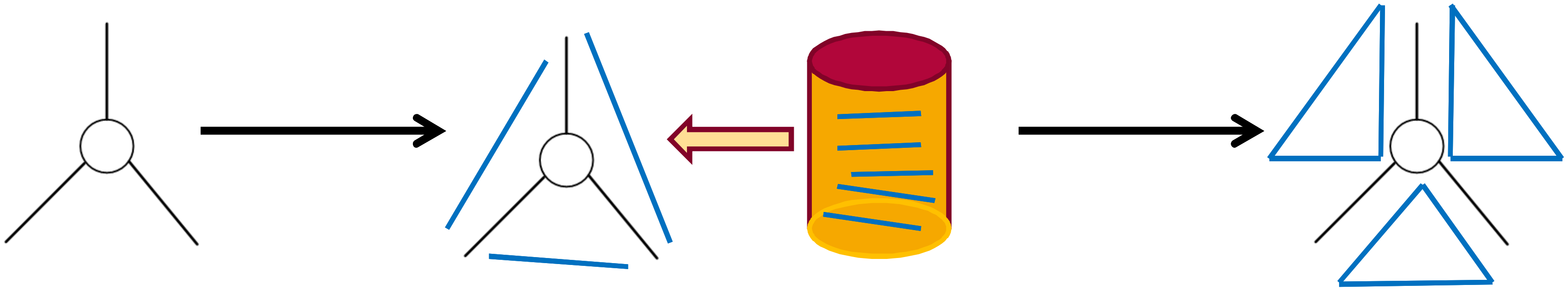
- High vertex degree leads to huge number of triads
- Combination of any pair of neighbors

Solution of Triad Problem

- Before: each potential triangle part (triad) traverses the cluster



- Solution with “distributed cache”:
  - □ each reducer accesses the complete edge file



First results

- Sample data contains x% of the vertices of the complete dataset (900 Mbyte)
  - □ “40%” (150 Mbyte) 5617 vertices in 41 9-Trusses
  - □ 4869 vertices in one *garbage cluster*

  - □ “30%” (83 Mbyte) 1389 vertices in 26 9-Trusses
  - □ but one *garbage cluster* contains 1016 vertices

- the bigger K is, the smaller and fewer clusters become
- What is the best cluster size?