



Wintersemester 2014/15

Selected Topics in Efficient Algorithms

<http://www14.in.tum.de/lehre/2014WS/>

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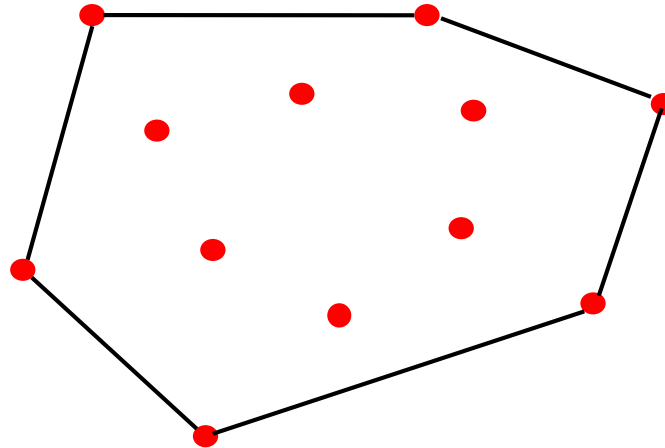
Organization



Seminar Sessions: 2 SWS
Mon 14:00–16:00, MI 03.11.018

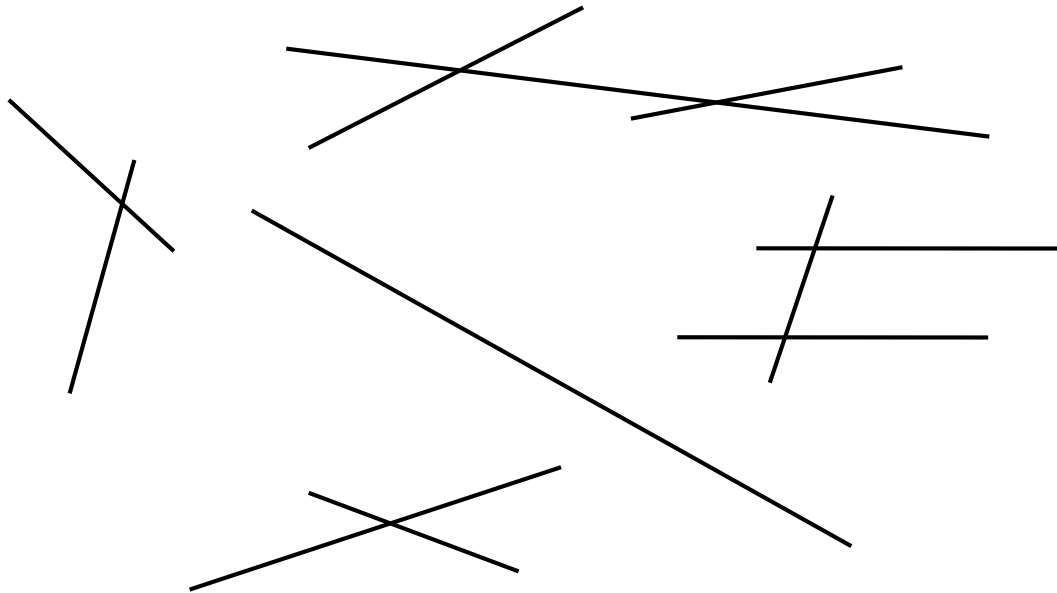
Duties: Presentation of 60 minutes
Write-up of 8 to 10 pages

1. Computational geometry: Convex hulls



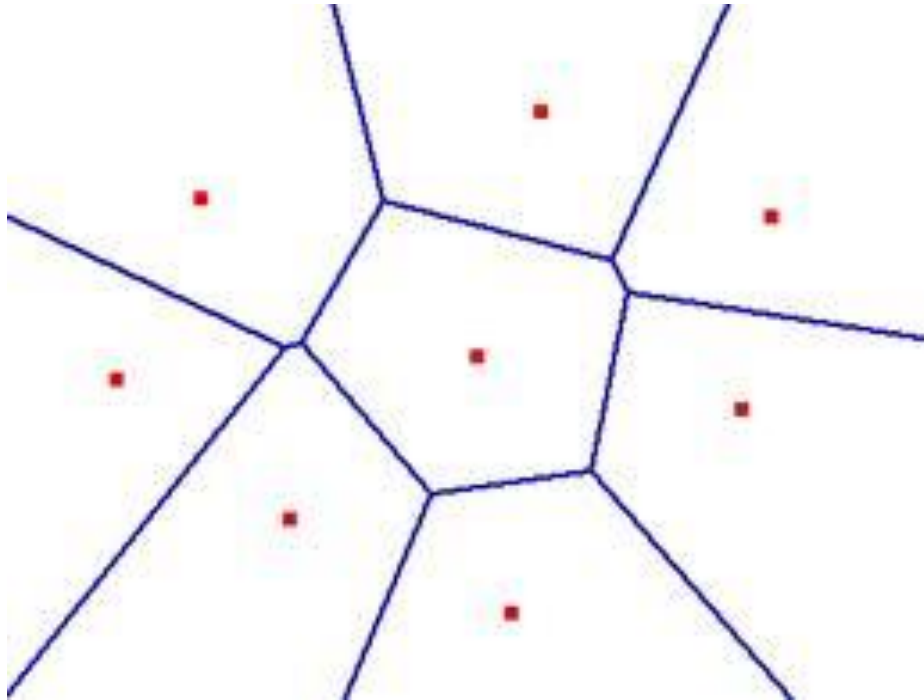
M. De Berg, O. Cheong, M. van Kreveld, M. Overmars.
Computational Geometry. Chapter 1 & 11.

2. Comp. geometry: Line segment intersection



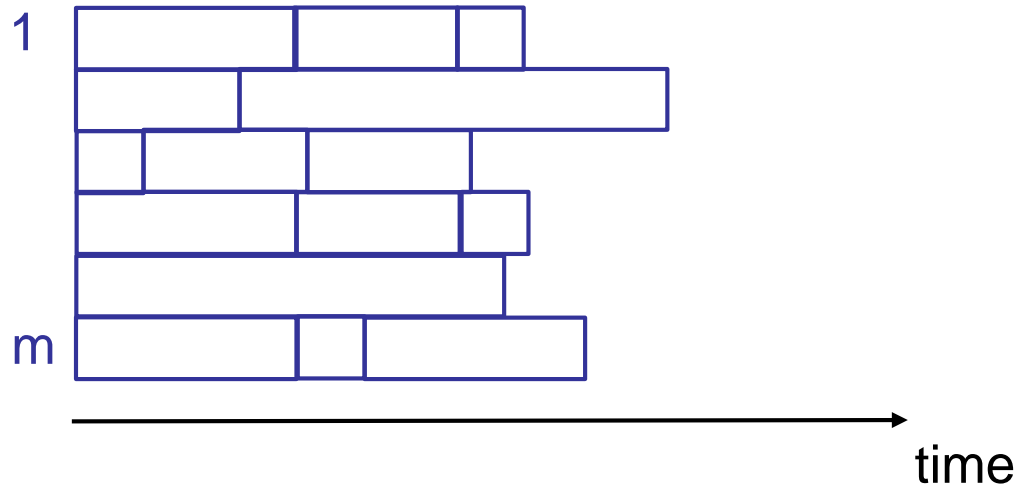
M. De Berg, O. Cheong, M. van Kreveld, M. Overmars.
Computational Geometry. Chapter 2.

3. Comp. geometry: Voronoi diagrams



M. De Berg, O. Cheong, M. van Kreveld, M. Overmars.
Computational Geometry. Chapter 7.

4. Scheduling: Makespan minimization



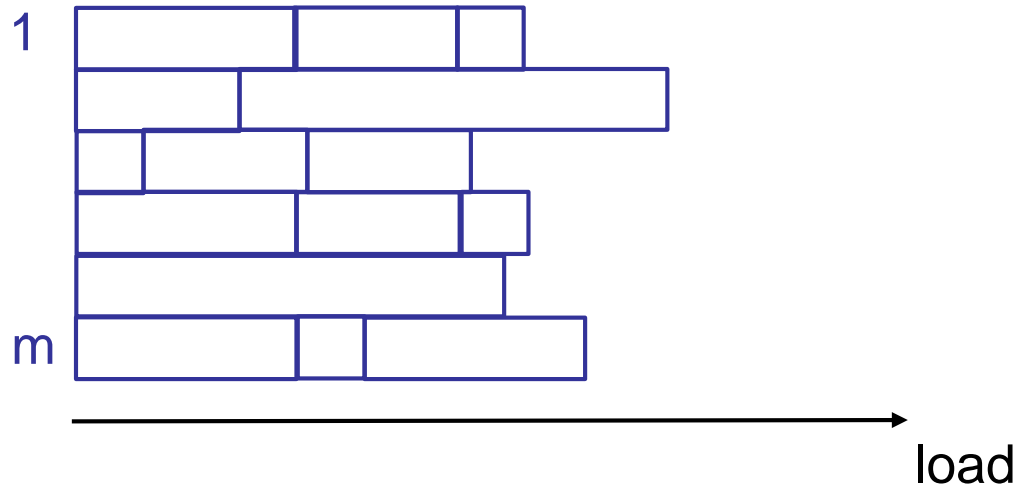
m identical parallel machines

Input portion: Job J_i with individual processing time p_i .

Goal: Minimize the completion time of the last job in the schedule.

R. Graham. Bell Systems Techn. Journal 1965;
SIAM J. Applied Math., 1969.

5.Scheduling: Load balancing game



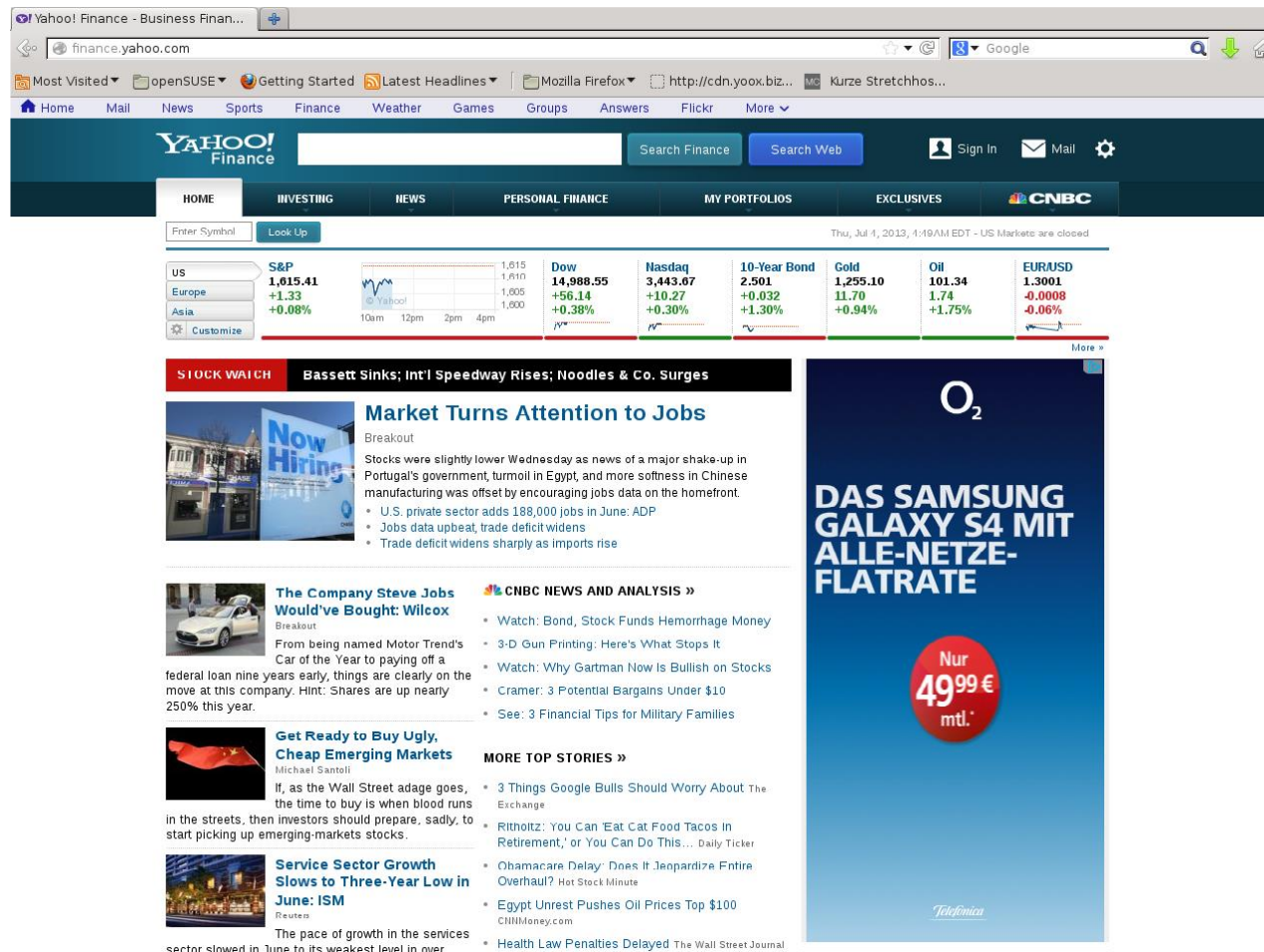
Each job controlled by **selfish agent**.

Cost of an agent is the load of the selected machine.

Social cost: Makespan of the solution.

B. Vöcking. In: Algorithmic Game Theory, Chapter 20, 2007.

6.Scheduling: Story boarding

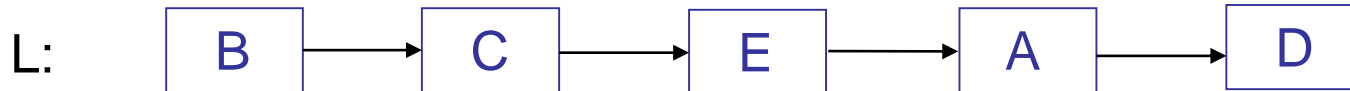


The screenshot shows the Yahoo! Finance website interface. At the top, there's a navigation bar with 'HOME', 'INVESTING', 'NEWS', 'PERSONAL FINANCE', 'MY PORTFOLIOS', 'EXCLUSIVES', and 'CNBC'. Below this is a search bar and a 'Sign In' button. The main content area features a 'STOCK WATCH' section with a headline 'Bassett Sinks; Int'l Speedway Rises; Noodles & Co. Surges'. A prominent article titled 'Market Turns Attention to Jobs' is highlighted, with a sub-headline 'Breakout' and a brief summary: 'Stocks were slightly lower Wednesday as news of a major shake-up in Portugal's government, turmoil in Egypt, and more softness in Chinese manufacturing was offset by encouraging jobs data on the homefront.' Below this are several other news snippets, including 'The Company Steve Jobs Would've Bought: Wilcox' and 'Get Ready to Buy Ugly, Cheap Emerging Markets'. On the right side, there's a large advertisement for the Samsung Galaxy S4, featuring the text 'DAS SAMSUNG GALAXY S4 MIT ALLE-NETZE-FLATRATE' and a price tag of 'Nur 49,99 € mtl.'. The bottom of the page shows a list of 'MORE TOP STORIES' with various financial news headlines.

A. Dasgupta, A. Ghosh, H. Nazerzadeh, P. Raghavan SODA 2009.
 S. Albers, A. Passen, ICALP 2013.

7. Data structures: List update

Unsorted linear list



$\sigma = A A C B E D A \dots$

Request: Access to item in the list

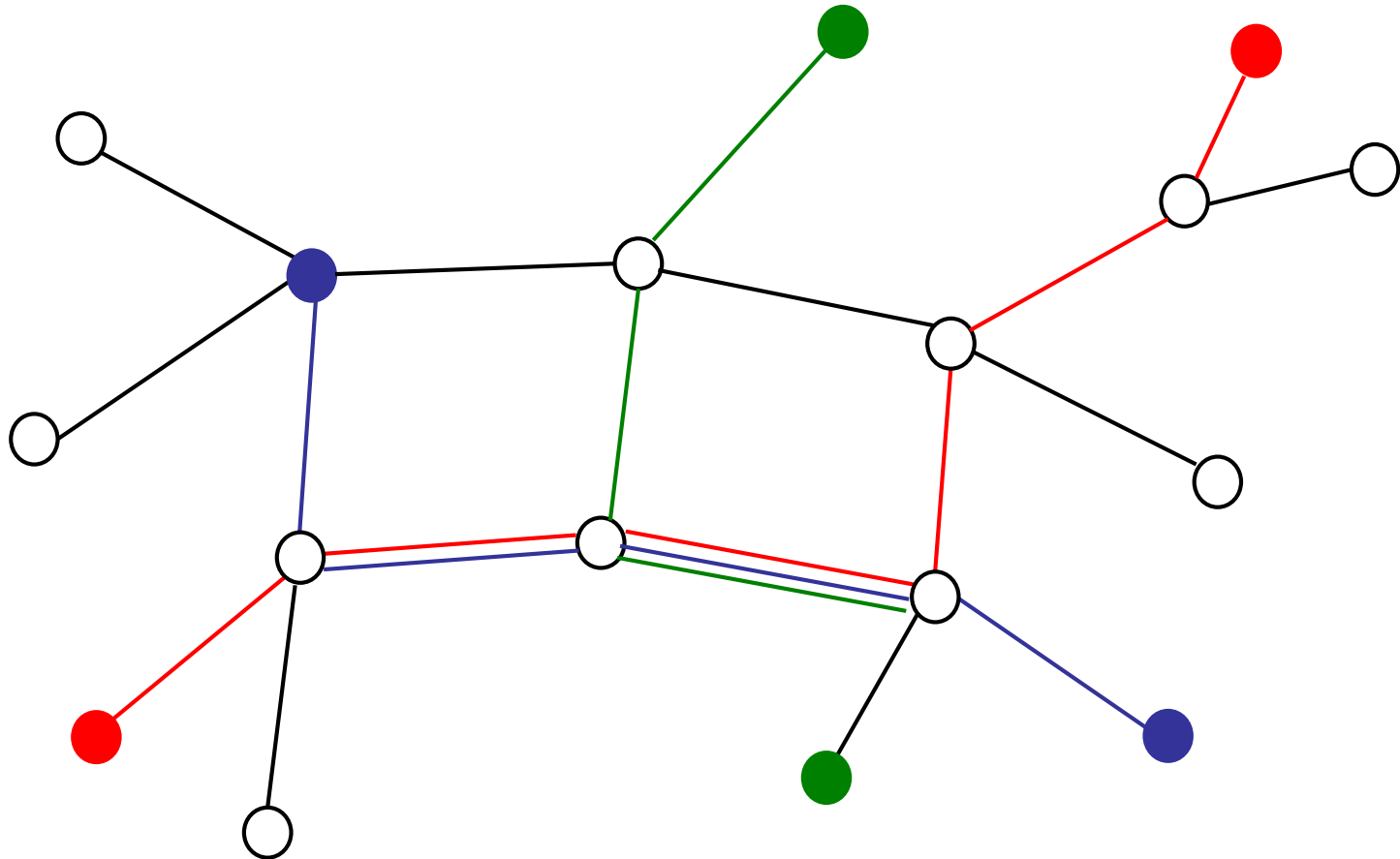
Cost: Accessing the i -th item in the list incurs a cost of i .

Goal: Minimize cost paid in serving σ .

Applications: Data compression

S. Albers, S. Lauer. On list update with locality of reference. ICALP 2008.

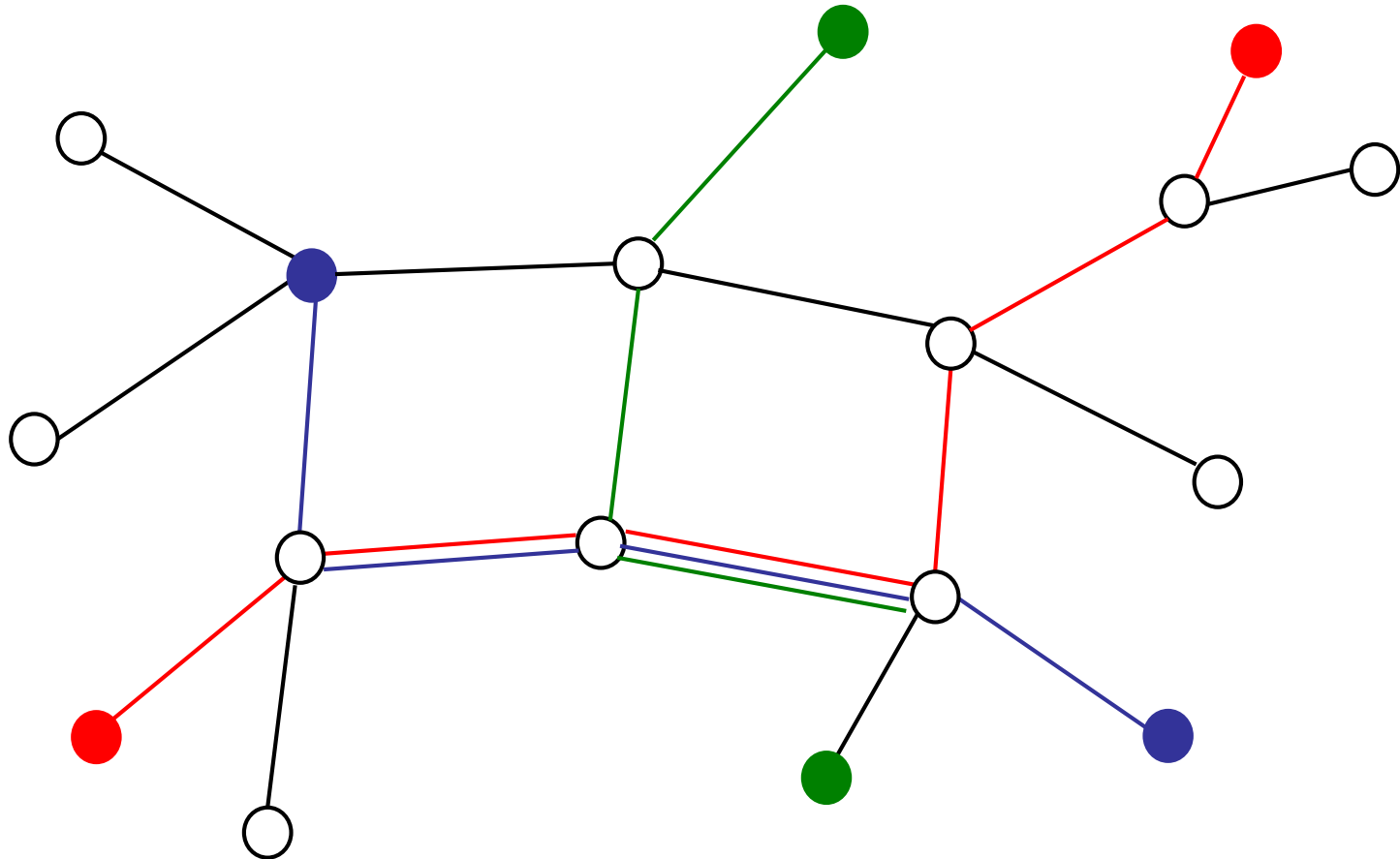
8. Network design: Fair cost allocation



$G=(V,E,c)$ pairs (s_i,t_i) If k agents use e , each pays $c(e)/k$

Anshlevich, Dasgupta, Kleinberg, Tardos, Wexler. SICOMP 2008.

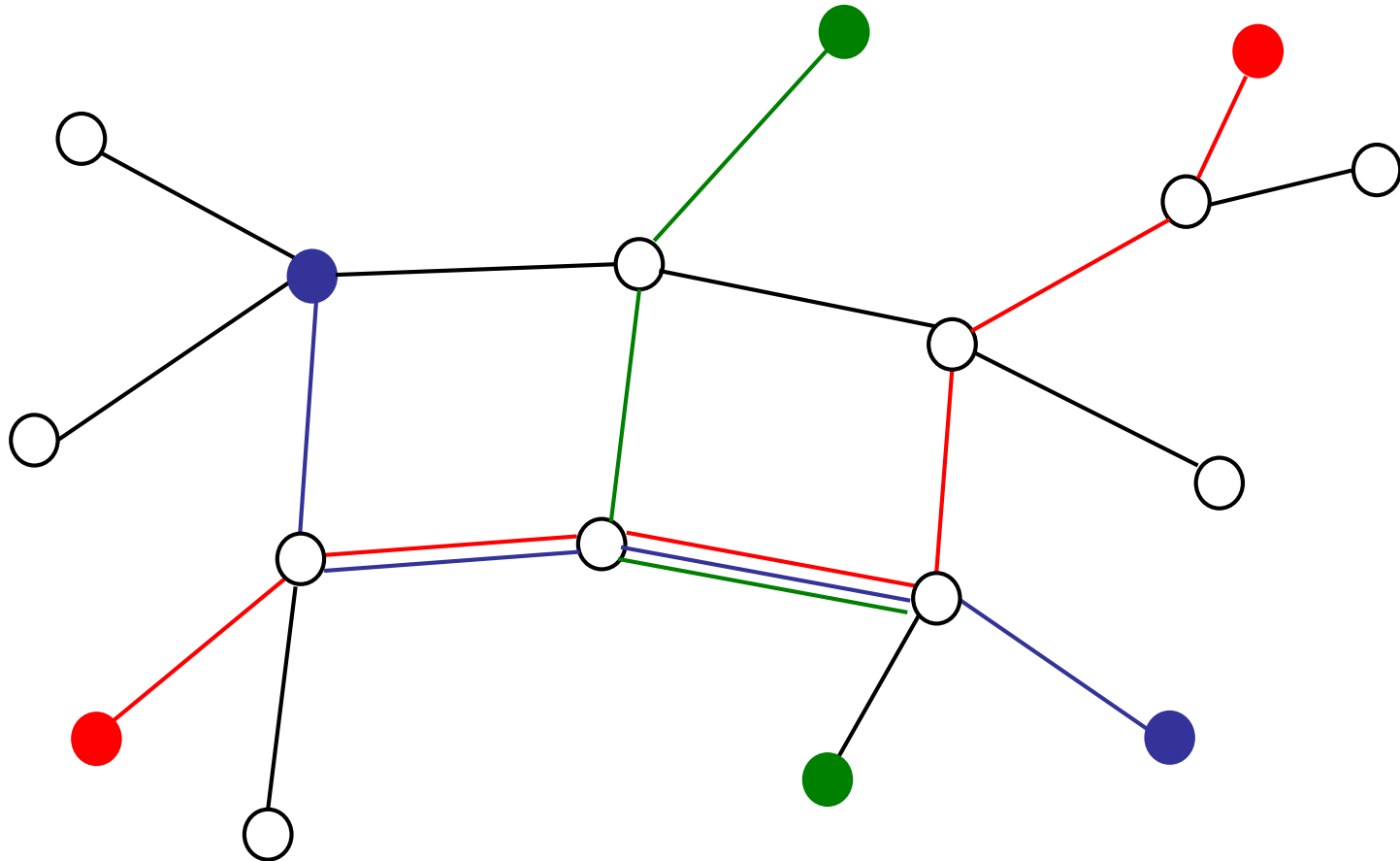
9. Network design: Arbitrary payments



$G=(V,E,c)$ pairs (s_i,t_i) Cost of an edge may be split arbitrarily.

Anshlevich, Dasgupta, Tardos, Wexler. Theory of Computing, 2008.

10. Routing: Energy optimization



$G=(V,E)$ pairs (s_i,t_i) $\min \sum_e f(l_e)$ where $f(l) = c + l^\alpha$

Andrew, Antonakopoulos, Zhang, Min-cost network design with dis-(economies) of scale. FOCS 2010.