

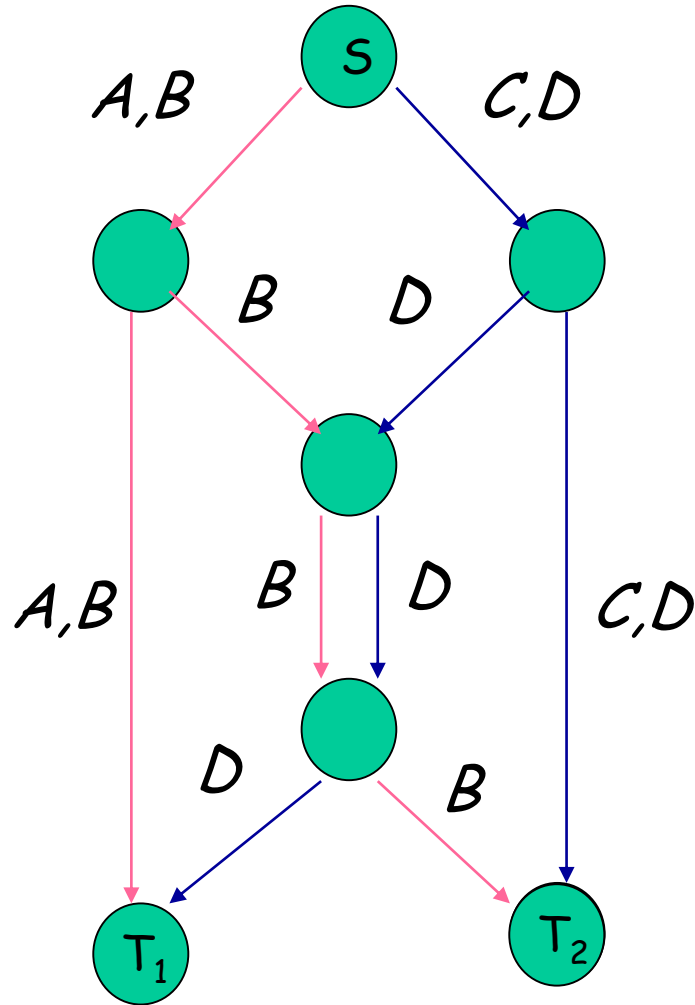
# Throughput optimization ...

- Max-flow optimization
  - Zongpeng's slides: 2-8
  
- Network coding
  - Butterfly example
  - Zongpeng's slides: 14-16



Let's start with throughput ...

Without network coding ...

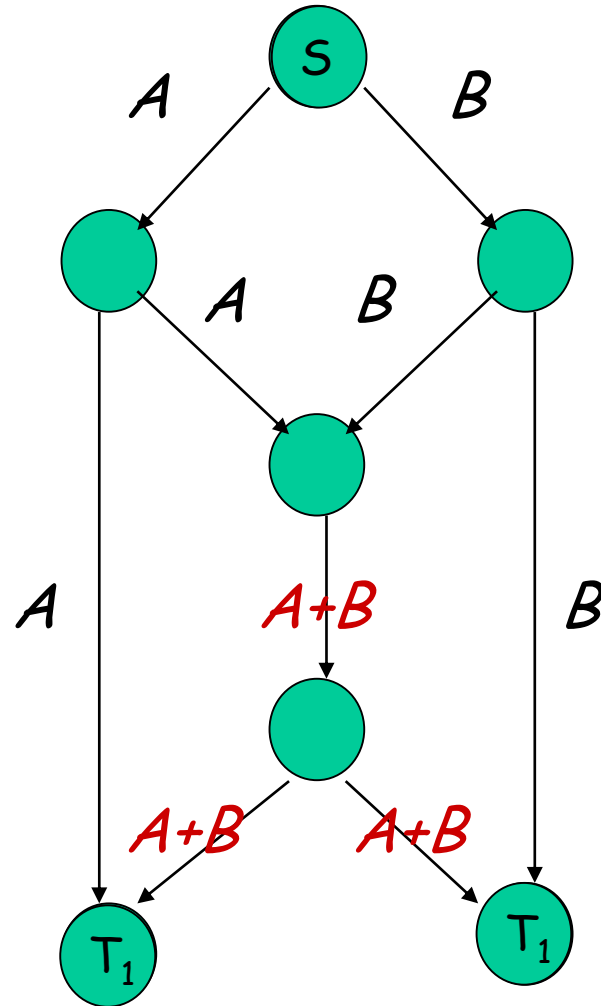


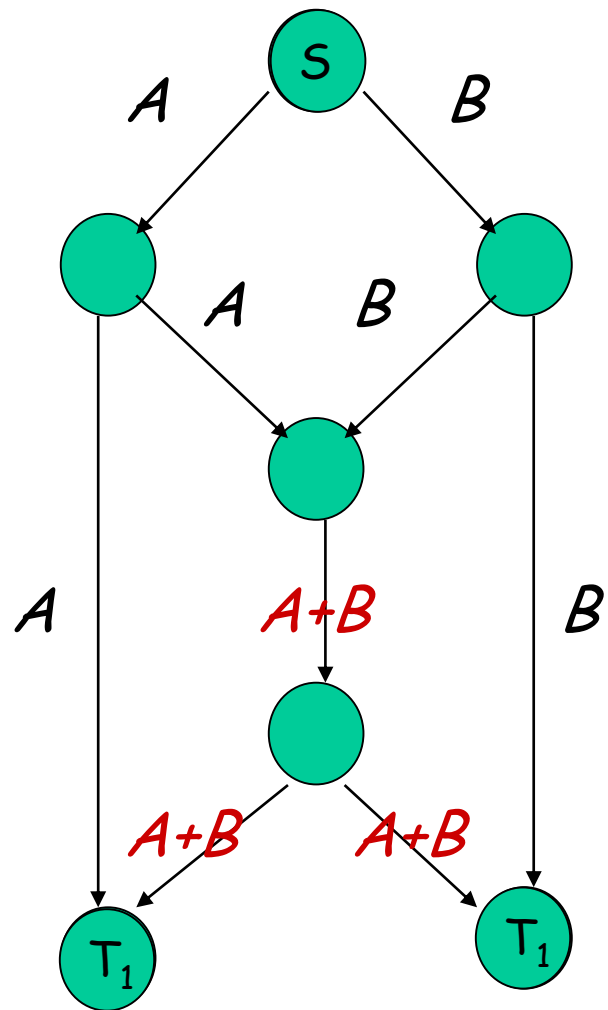
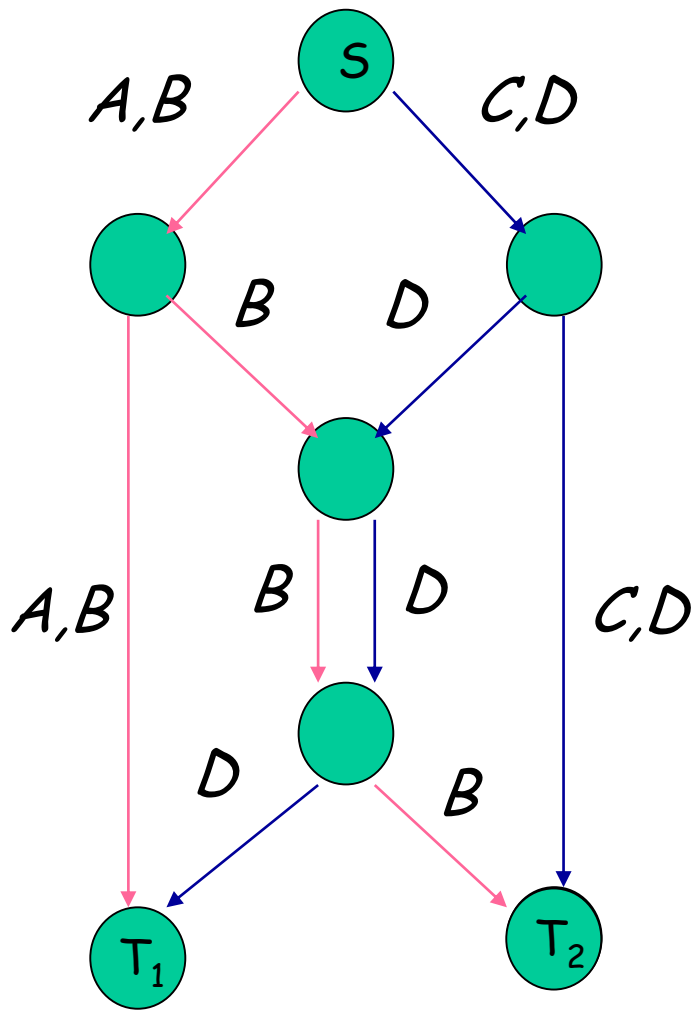
- $T_1$  and  $T_2$  both get  $\frac{3}{4}$  streams (75% of sender's capacity)

- Optimization problem equal to "packing of Steiner trees" (NP-hard problem)

With network coding ...

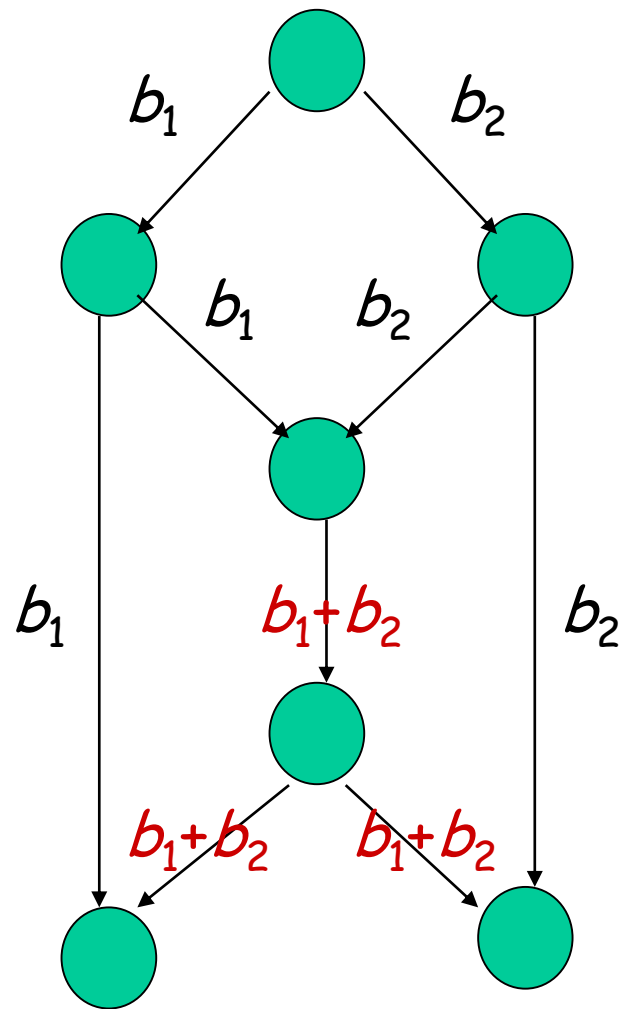
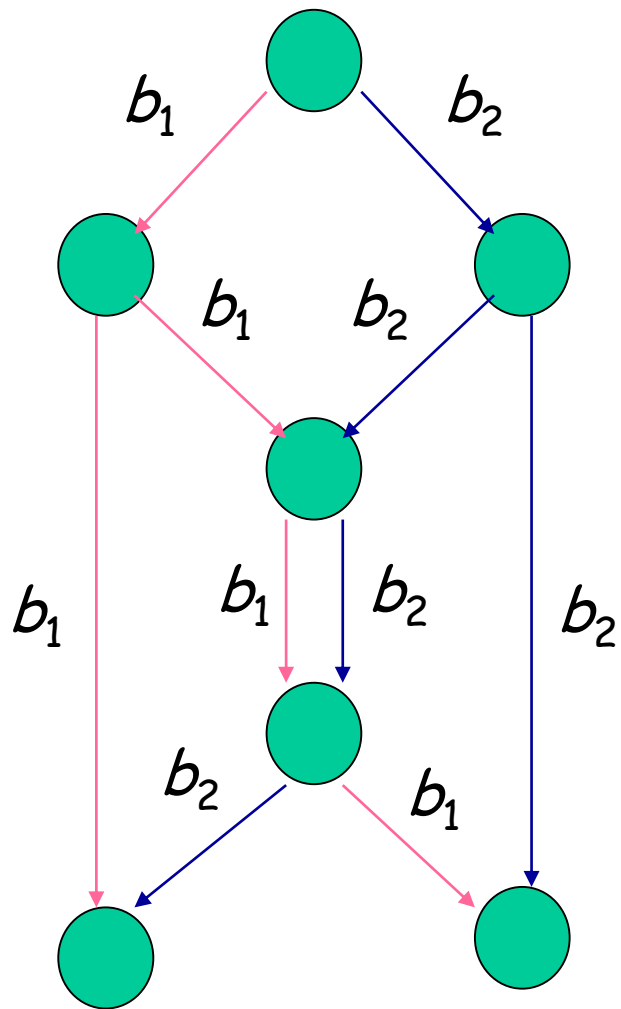
- T1 and T2 both get 2/2 streams (100% of senders capacity)
- Improvement by 33%





- Savings can also be in terms of "bandwidth"

...





□ ...or "time" ...

# Network Coding

- A technique to improve:
  1. network throughput
  2. efficiency
  3. scalability
  - ...
- Information is coded at potentially every node

