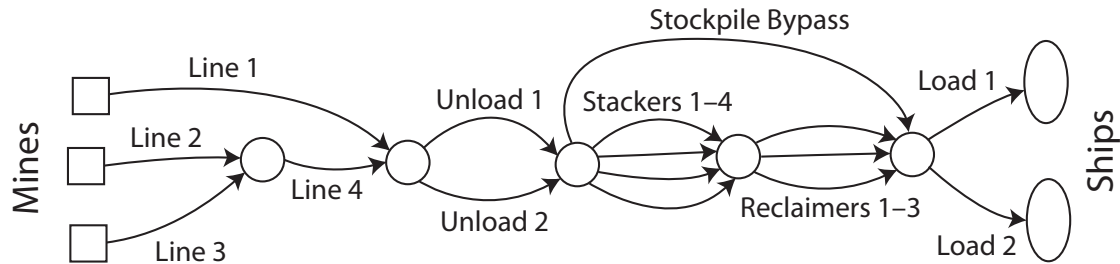


Week 7 – Coal Line Maintenance

Throughput of coal from mine to port to ship is a critical issue for Australia's largest coal systems. Press reports of huge queues of ships waiting to be loaded are common and these queues are expensive for the industry. A typical but simple diagram for a coal system is shown below.



More generally, we can describe a coal system using a collection of nodes and arcs. Some of the nodes are source nodes (mines) and some are sink nodes (ships). For each arc we know the origin and destination nodes and the maximum weekly throughput of the arc.

- Develop a linear programming model of a general coal system that determines how much coal to move on each arc so as to maximise the total throughput. This throughput is the total amount of coal moved out of the source nodes, which will be equal to the total amount of coal moved into the sink nodes. For all other nodes the total amount of coal moved into the node will be same as the total amount of coal moved out of the node.
- In order to keep the system running smoothly, it needs to be maintained. Assume we are given a set of maintenance tasks applying to the arcs, with at most one task for each arc. For each arc we know whether or not it has a maintenance task and the effort (in man days) for the maintenance task.

We wish to schedule all the known maintenance tasks over the next T weeks. For each week we know the maximum man days available for maintenance, which may vary from week to week.

Assume that each maintenance task must be started and finished in the same week, and that when an arc is being maintained its throughput goes down to 0 for the whole week.

Develop a mixed integer programming model to produce a maintenance schedule for the next T weeks so as to maximise the total throughput.