Network maintenance problem

In Australia, huge quantities of resources such as coal and iron ore are mined and exported. To send these resources overseas, rail networks are used to transport them from the mines to the ports. Once at the ports, other machines are used to move the materials towards and eventually onto the ships. The limiting factor in this operation is often the capacity of the transportation network.

Consider a network of nodes, N, some of which are source nodes (mines) and others are sink nodes (ships), and of arcs, A, each of which has a capacity u_a. We want to maximise the flow through this network over a series of time periods, T, subject to a number of maintenance requests, R. Each maintenance request has a release time Re_t, a duration Dur_t and a deadline De_t and an associated arc. The set R_a contains the requests which affect arc $a \in A$. When an arc is being maintained, no resources can flow across it. For convenience, the sets δ_i^+ and δ_i^- contain the arcs that flow into and out of node i respectively.