

A fundamental problem for overlay networks is to *\emph{safely}* exclude leaving nodes, i.e., the nodes requesting to leave the overlay network are excluded from it without affecting its connectivity. To rigorously study self-stabilizing solutions to this problem, the Finite Departure Problem (FDP) has been proposed (Foreback et al.). In the FDP we are given a network of processes in an arbitrary state, and the goal is to eventually arrive at (and stay in) a state in which all leaving processes irrevocably decided to leave the system while for all weakly-connected components in the initial overlay network, all staying processes in that component will still form a weakly connected component.

In the standard interconnection model, the FDP is known to be unsolvable by local control protocols, so oracles have been investigated that allow the problem to be solved (ibid.). To avoid the use of oracles, we introduce a new interconnection model based on relays. Despite the relay model appearing to be rather restrictive, we show that it is universal, i.e., it is possible to transform any weakly-connected topology into any other weakly-connected topology, which is important for being a useful interconnection model for overlay networks. Furthermore, we can show that the relay layer is self-stabilizing meaning it is able to autonomously recover from faults.

Apart from this, our model allows processes to grant and revoke access rights, which is why we believe it to be of interest beyond the scope of the work carried out by us so far.