

Rendezvous in Networks in Spite of Delay Faults

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Abstract. Two mobile agents, starting from different nodes of an unknown network, have to meet at a node. Agents move in synchronous rounds using a deterministic algorithm. Each agent has a different label, which it can use in the execution of the algorithm, but it does not know the label of the other agent. Agents do not know any bound on the size of the network. In each round an agent decides if it remains idle or if it wants to move to one of the adjacent nodes. Agents are subject to *delay faults*: if an agent incurs a fault in a given round, it remains in the current node, regardless of its decision. If it planned to move and the fault happened, the agent is aware of it. We consider three scenarios of fault distribution: random (independently in each round and for each agent with constant probability $0 < p < 1$), unbounded adversarial (the adversary can delay an agent for an arbitrary finite number of consecutive rounds) and bounded adversarial (the adversary can delay an agent for at most c consecutive rounds, where c is unknown to the agents). The quality measure of a rendezvous algorithm is its cost, which is the total number of edge traversals.

For random faults, we show an algorithm with cost polynomial in the size n of the network and *polylogarithmic* in the larger label L , which achieves rendezvous with very high probability in arbitrary networks. By contrast, for unbounded adversarial faults we show that rendezvous is not possible, even in the class of rings. Under this scenario we give a rendezvous algorithm with cost $O(n\ell)$, where ℓ is the smaller label, working in arbitrary trees, and we show that $\Omega(\ell)$ is the lower bound on rendezvous cost, even for the two-node tree. For bounded adversarial faults, we give a rendezvous algorithm working for arbitrary networks, with cost polynomial in n , and *logarithmic* in the bound c and in the larger label L .