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A minimum-hop routing algorithm based on distributed information.

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Summary: A new, distributed algorithm for the dynamic computation of minimum-hop paths in a computer network is presented. The new algorithm is an extension of the Bellman-Ford algorithm for shortest-path computation. According to the new algorithm, each node maintains the successor (next hop) and shortest distance in number of hops of the paths to each network destination; update messages from a node are sent only to its neighbors, and these messages contain the length in hops of the selected path to network destinations. A node always chooses new successors that are equidistant or closer to the destinations than the node's current successor to the same destination. No update is sent before all replies are received for the previous one. The new algorithm is shown to converge in a finite time after an arbitrary sequence of topological changes and to be loop free at every instant. Its performance is compared with the performance of various other extensions of the Bellman-Ford algorithm. We show that none of those extensions eliminates the counting-to-infinity problem and those cases in which the new algorithm provides an improvement over the basic Bellman-Ford algorithm. We conclude that there is a need for algorithms with a stronger internodal coordination, such as those reported previously in the literature by Jaffe and Moss and the author.

Keywords: routing; distributed algorithms; minimum-hop; network; shortest-path
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