Finite Greed:

Limits to Greedy Routing in Located Meshes

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Abstract

Greedy forwarding provides a very simple, but unreliable, method of location-based routing for traffic in mesh networks. This paper investigates 'supergreedy routing', an extension to greedy forwarding which increases routing reliability without adding significantly to protocol complexity.

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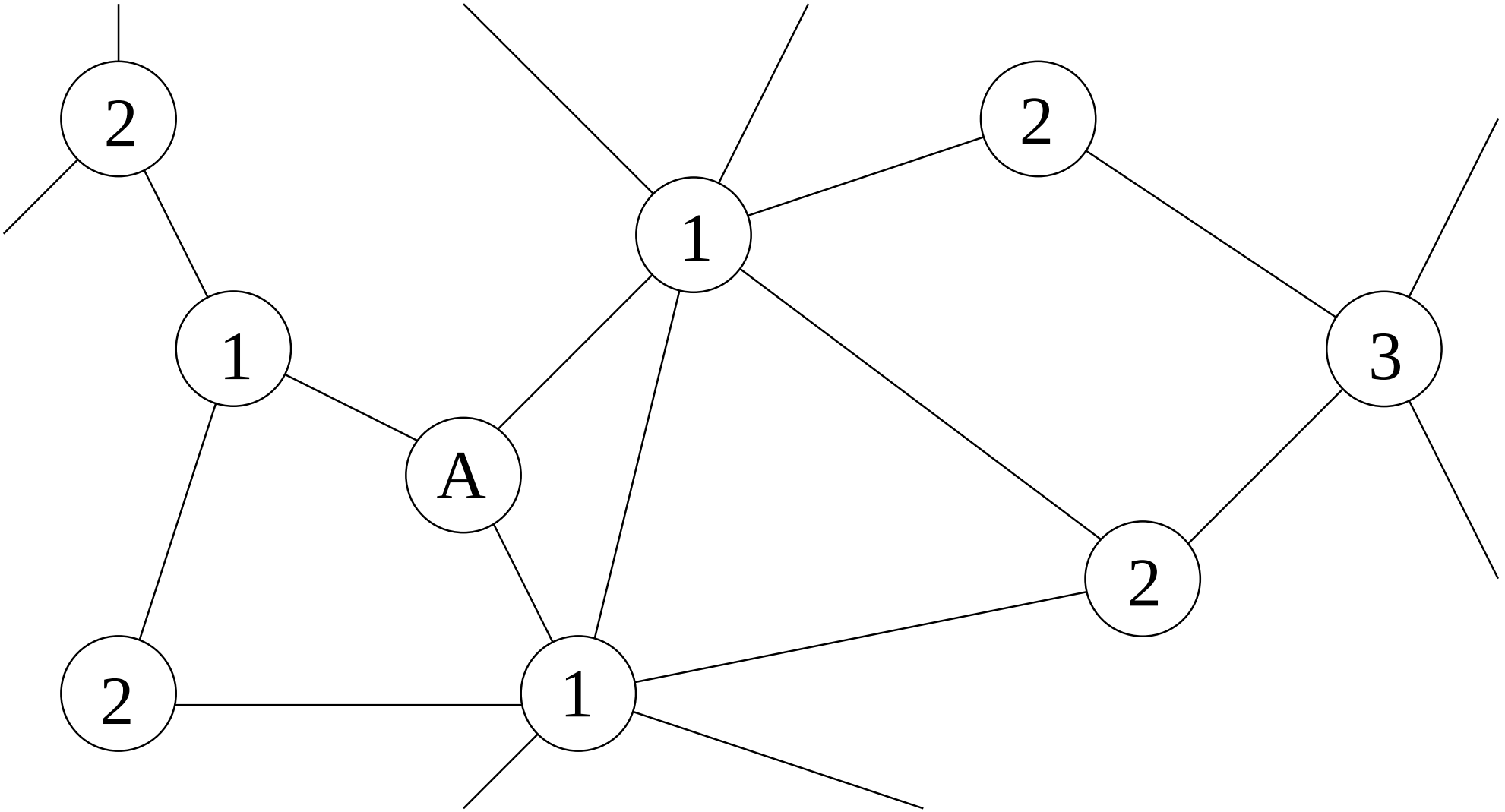
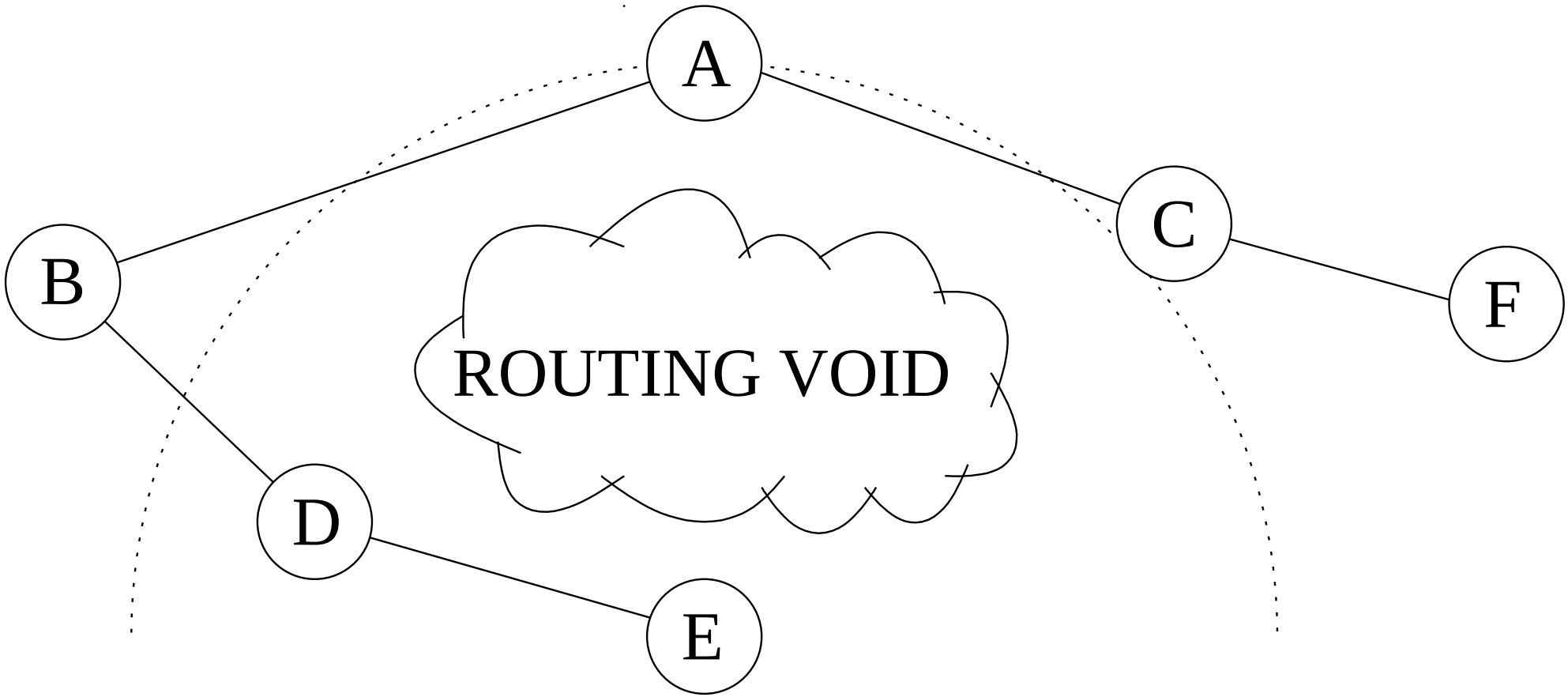
Neighbourhoods



Greedy Forwarding Voids



Given a method `findclosest(dest,s)` which finds the closest neighbour to location `dest` with stratum $\leq$ `s`:

```
method findbest(dest)
{
   s ← ∞
   do {
      best ← findclosest(dest,s)
      if (!best) return NULL
      dest ← best.location
      s ← best.stratum - 1
   } while (s)
   return best
}
```

Testing

- – 400 nodes in a 1km × 1km area
  - – node range varying from 70 to 110 meters
  - – Routability measured by testing all 159600 possible routes
- – 6400 nodes in a 4km × 4km area
  - – Node ranges varying from 90 to 110 meters
  - – testing 10000 randomly selected routes

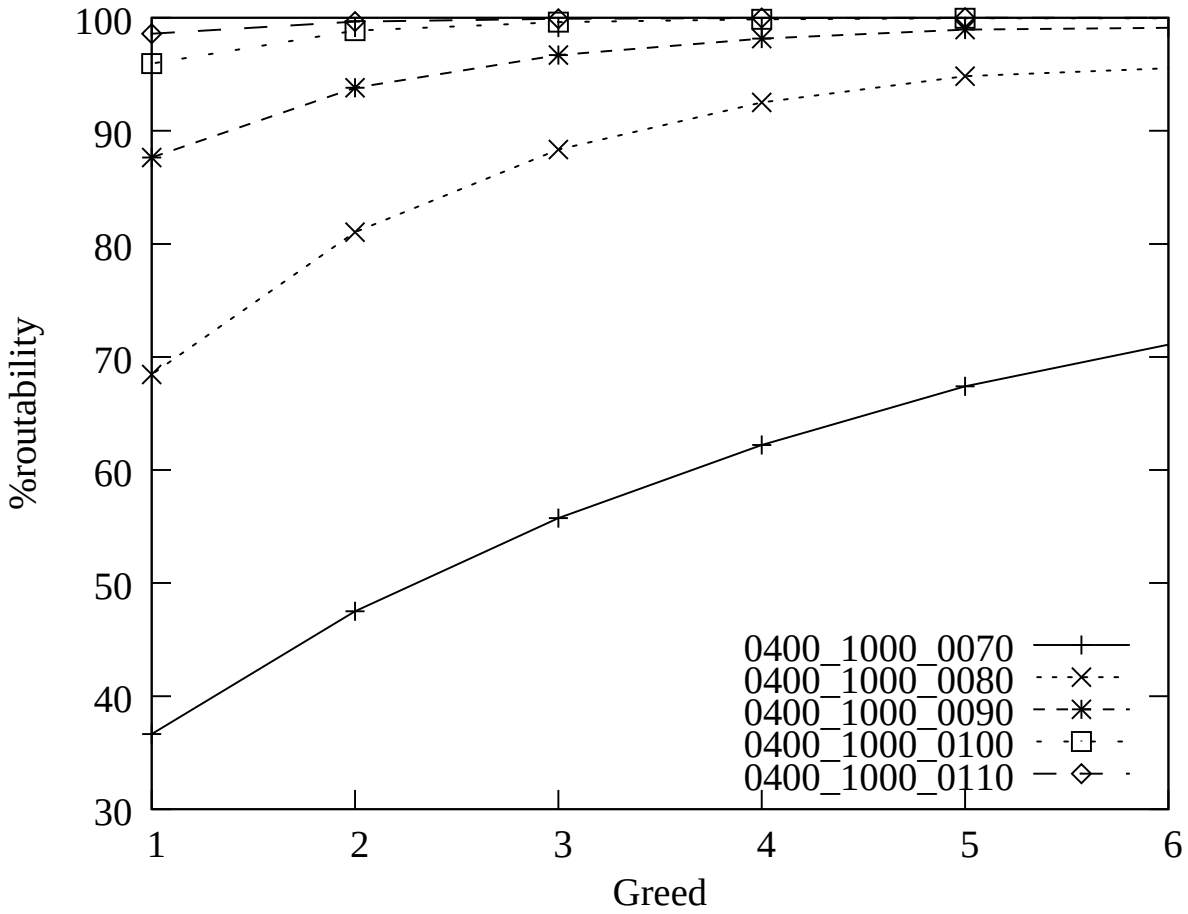


Figure 1: Routability tests of a 400-node mesh network: Five sets of experiments were conducted by varying the transmission range of the nodes to 70, 80, 90, 100 and 110 m.

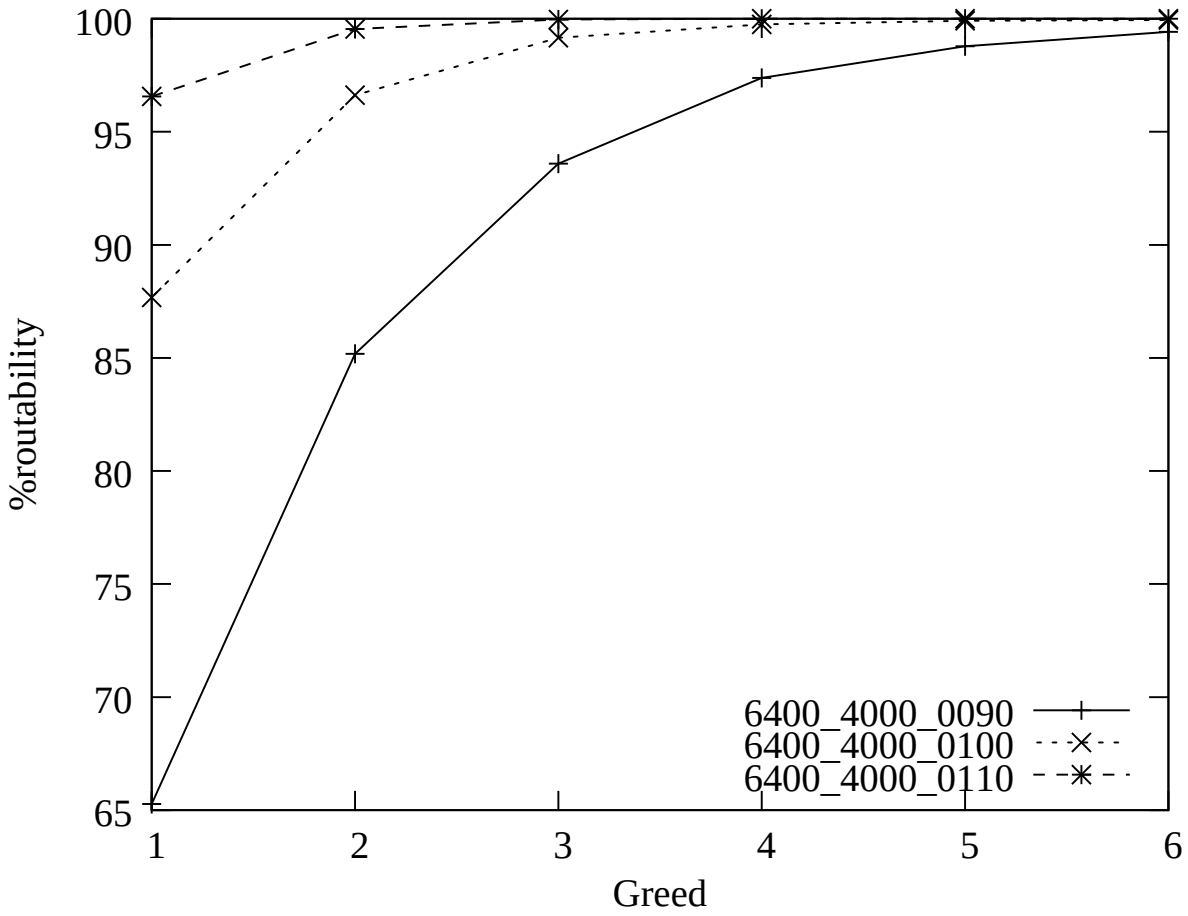


Figure 2: Routability tests of a 6400-node mesh network: Three sets of experiments were conducted by varying the transmission range of the nodes to 90, 100 and 110 m.

Costs

- Larger neighbourhoods require more information to be broadcast.
- Cost increases rapidly with neighbourhood size.

Conclusions

Supergreedy routing provides a significant improvement in routing reliability at a small cost in broadcast traffic and a very small increase in algorithmic complexity.

Further Work

When supergreedy routing fails, it is because a node knows of no neighbour closer to the packet destination than itself: its neighbourhood is insufficiently large. When this occurs, a node could solicit for suitable n-neighbours and amend its routing table. Additionally, n-neighbours which do not increase the reliability of forwarding could be dropped from the routing table.