Analyzing the Impact of Mobility in Ad Hoc Networks

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Motivation

- Do DSR and AODV consider user mobilities?

- Link and route lifetime distributions vs. mobility

- Link breakage due to:

  – Node mobility

  – Collision/Interference

- Better understanding the impact of the two contributors will help design better MAC and routing protocols!

Related Work

- Random
  - Random waypoint mobility model: individual
    - Johnson96
  - Random reference point group mobility model
    - Hong99
- Deterministic
  - ??
- Question: realistic or synthetic?

Goals

- Investigate how realistic the two popular modes are

- Gather real mobility data set

  - 20 PDAs in ad hoc mode

  - Faculty, students, and staff members at ETH

  - A week (10:00am - 5:00pm)

  - Move arbitrarily

  - Analyze connectivity, the lifetime distribution of wireless links and routes between any pairs
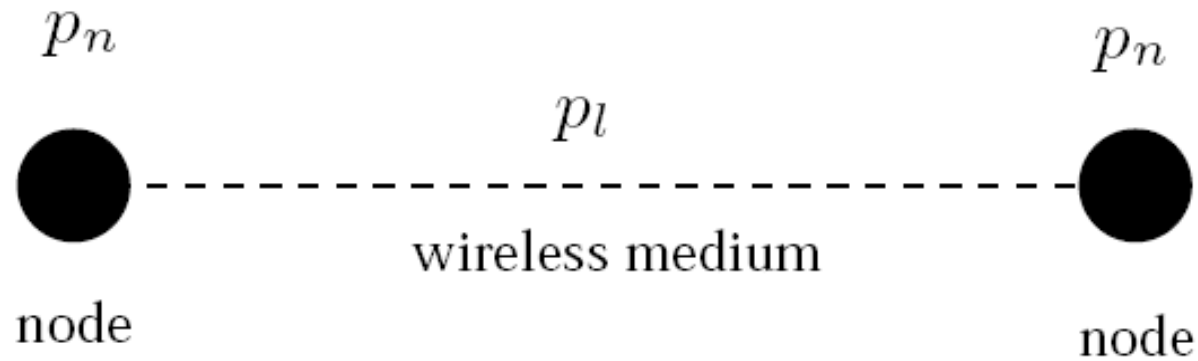
Connectivity Model

- Each node periodically broadcasts

- Each node counts received packets from any other nodes

- 50% or more reception is considered "alive"

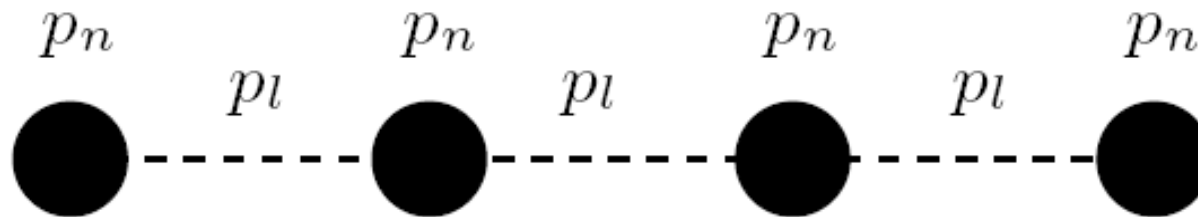- Other definitions of "alive" are possible

CDFs of Empirical Overall Link and Route Residual lifetime
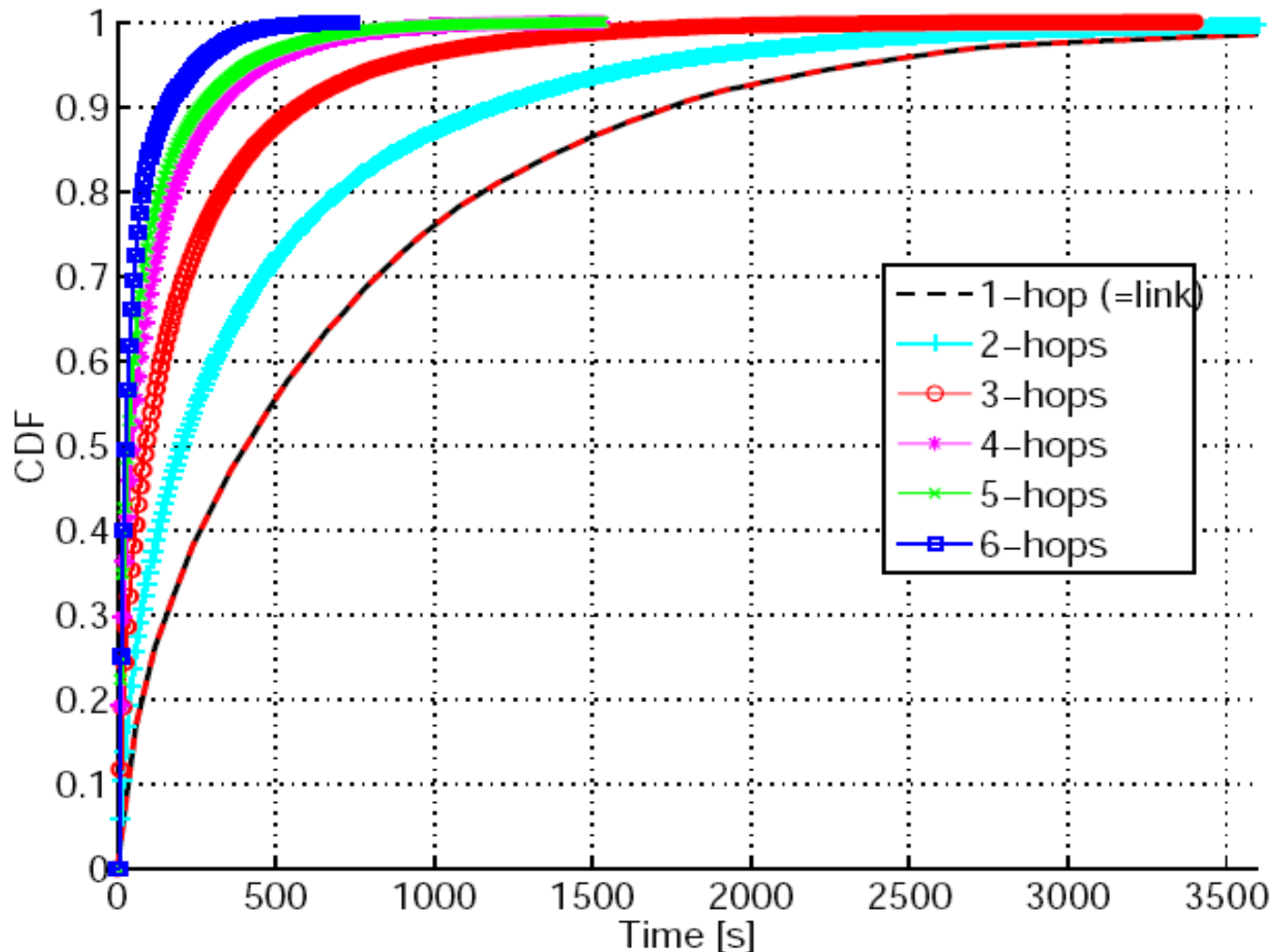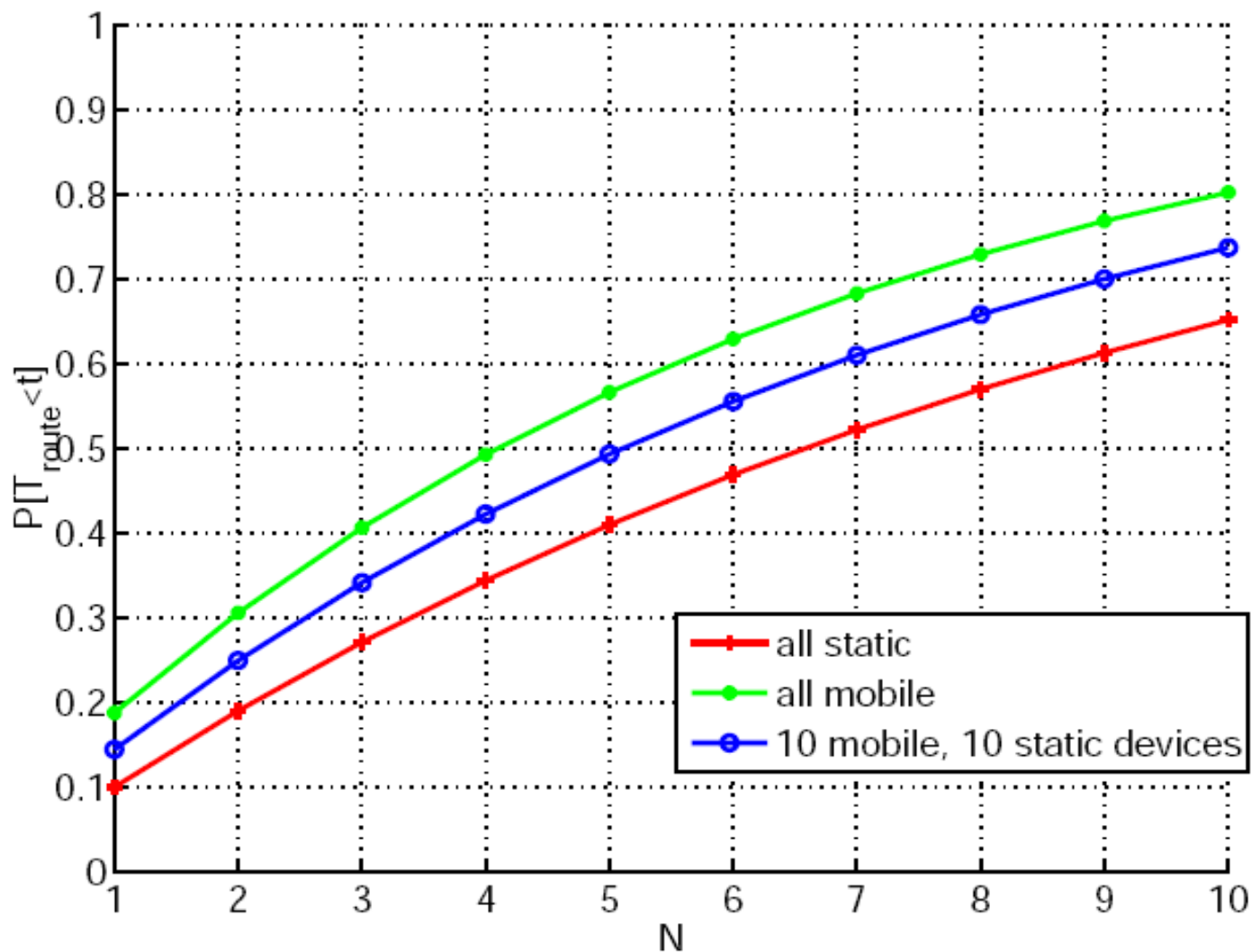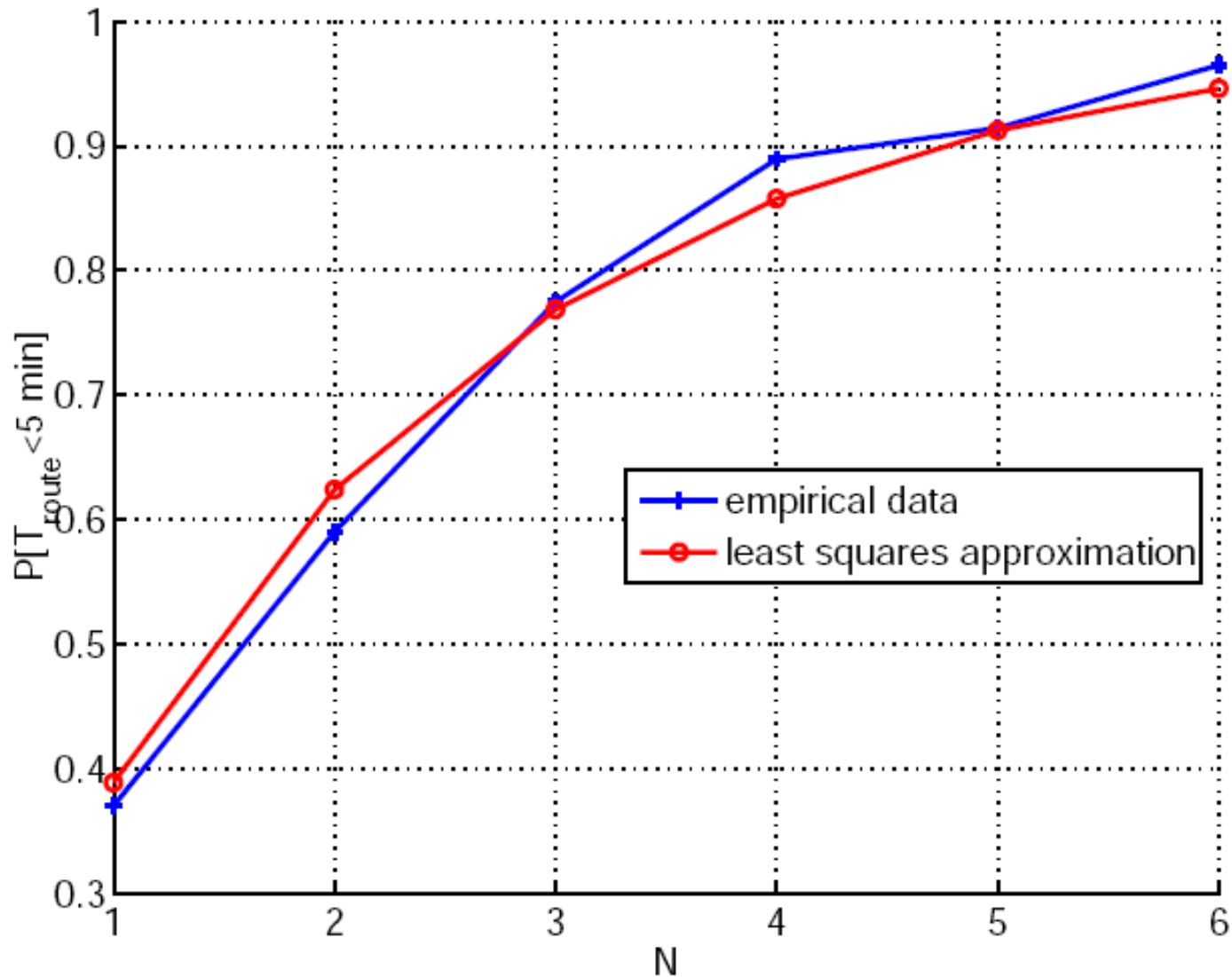
Failure Model

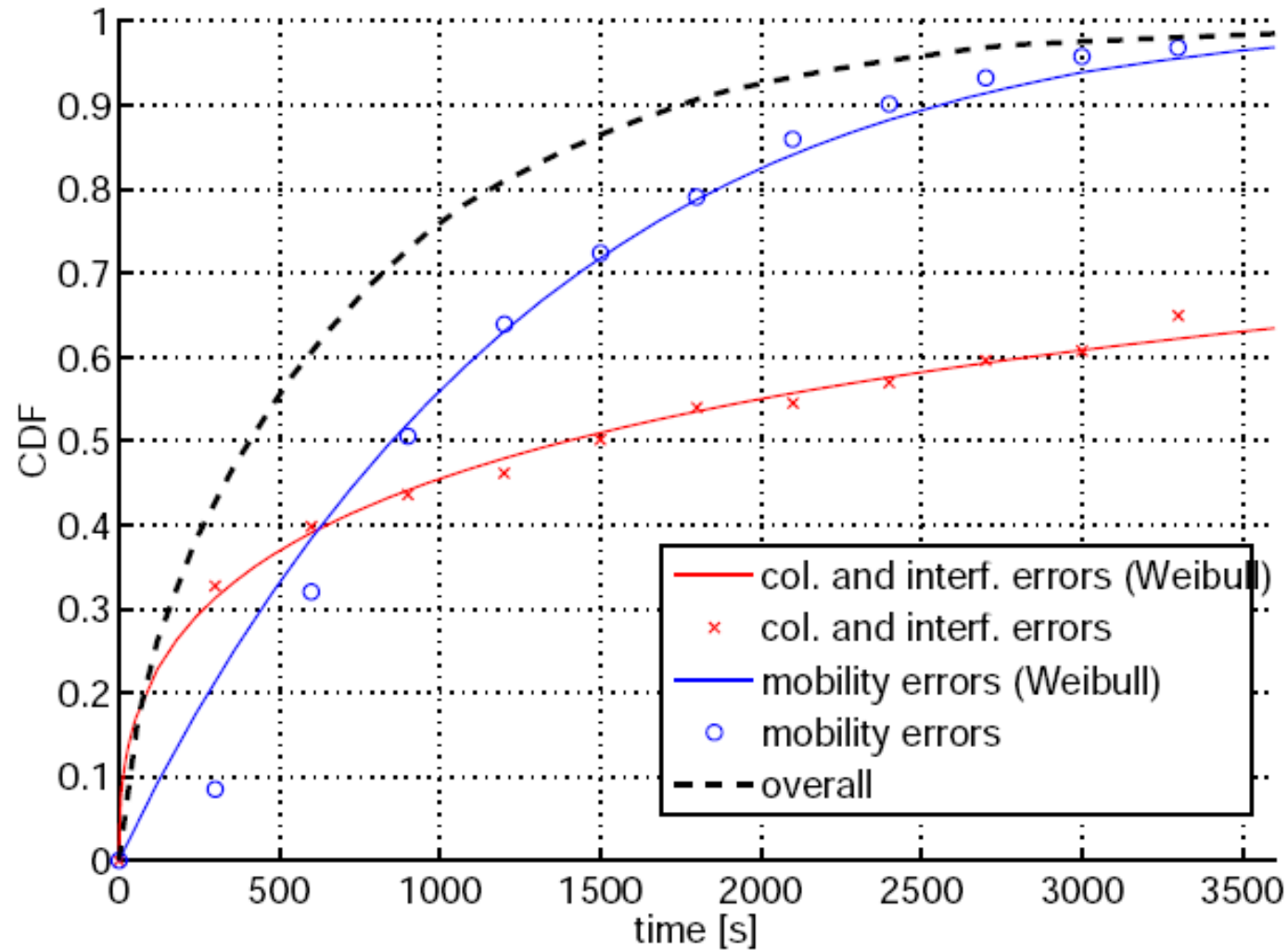(a) Link

(b) Route with $N=3$

Formulation

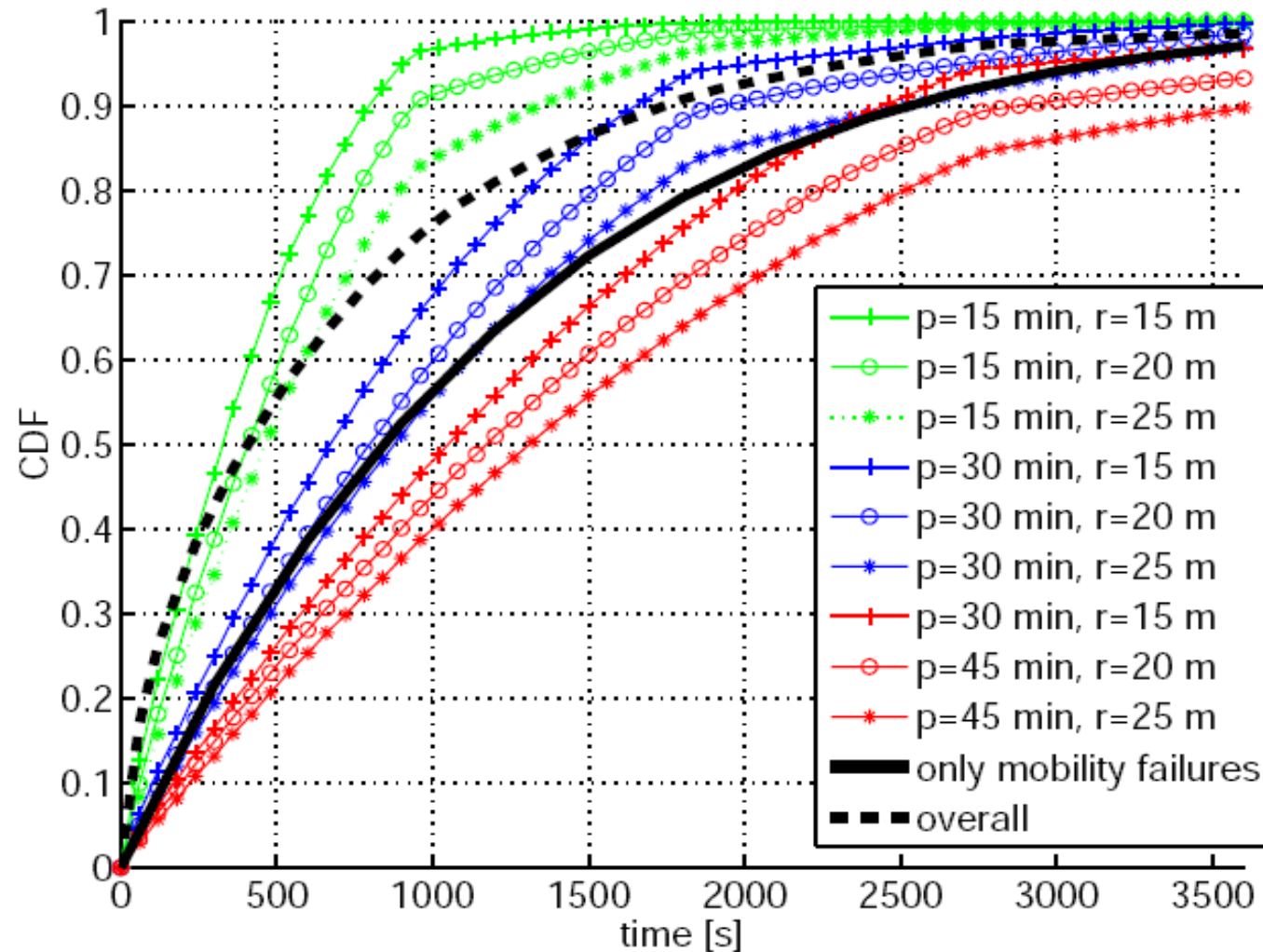# Probability that the residual lifetime is less than t

Probability that the lifetime of a route is shorter than 5 minutes

CDF of conditional residual link lifetime

Link residual lifetime with random waypoint mobility model

Link residual lifetime with random reference point group mobility model