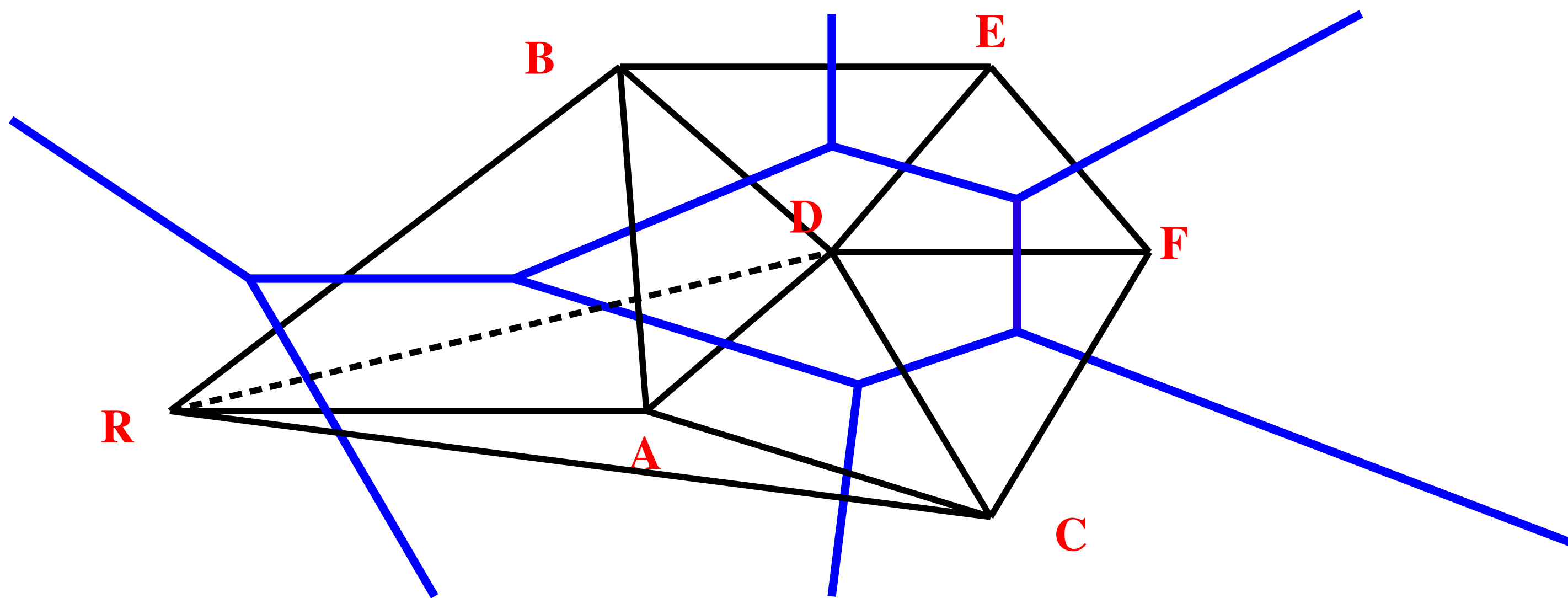


# AOI cast by Tolerance Based Compass Routing in Distributed Virtual Environments

## Our Approach: A Voronoi Based P2P DVE

- Each peer P is paired with a Voronoi region including points closer to P than to any other peer
- Delaunay Overlay**: a peer P dynamically connects to its Voronoi neighbours, i.e. peers managing a region overlapping its Voronoi region
- Compass Routing(CR)** in Delaunay Overlays:
  - R: target of the routing
  - D chooses A as next hop toward R because  $R \hat{D} A < R \hat{D} B$



## AOI Cast through Reverse Compass Routing

AOI cast can be implemented by **reversing** Compass Routing

- R(root) is the peer that generates the heartbeat
- A sends the heartbeat received from R to D because D would choose A as next hop toward R

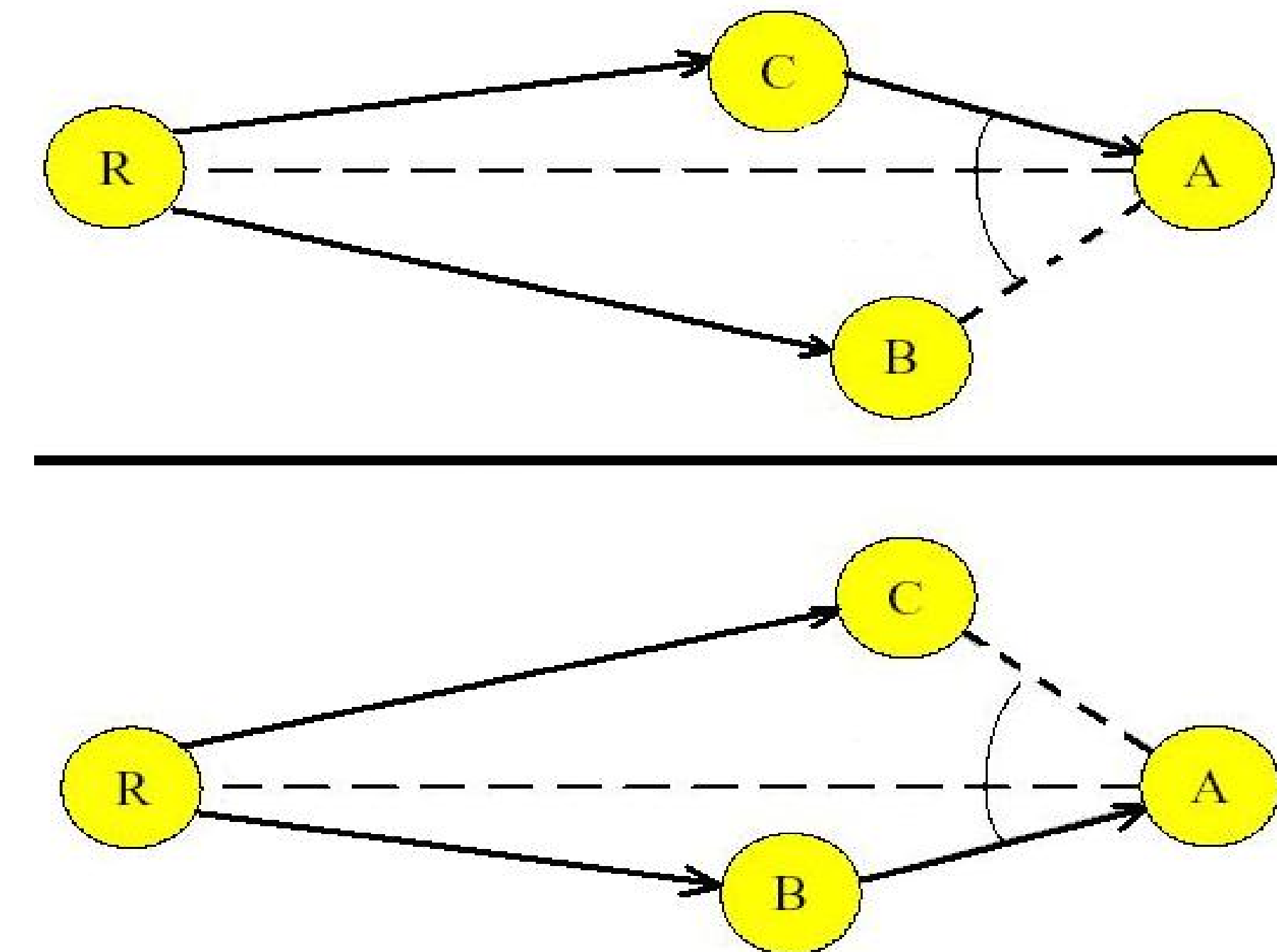
Compass Routing in a **constrained areas (AOI)**

- no hop outside the AOI is required when a **circular AOI** is considered
- zig-zag in and out of the AOI is required when considering differently shaped AOI

## Tolerance Based Compass Routing

Due to the movement of the peers

- the overlay changes and the local views of the Delaunay overlay should be updated
- network delay** may generate inconsistencies in the local view of the peers
- the positional drift in the local views can break Compass Routing

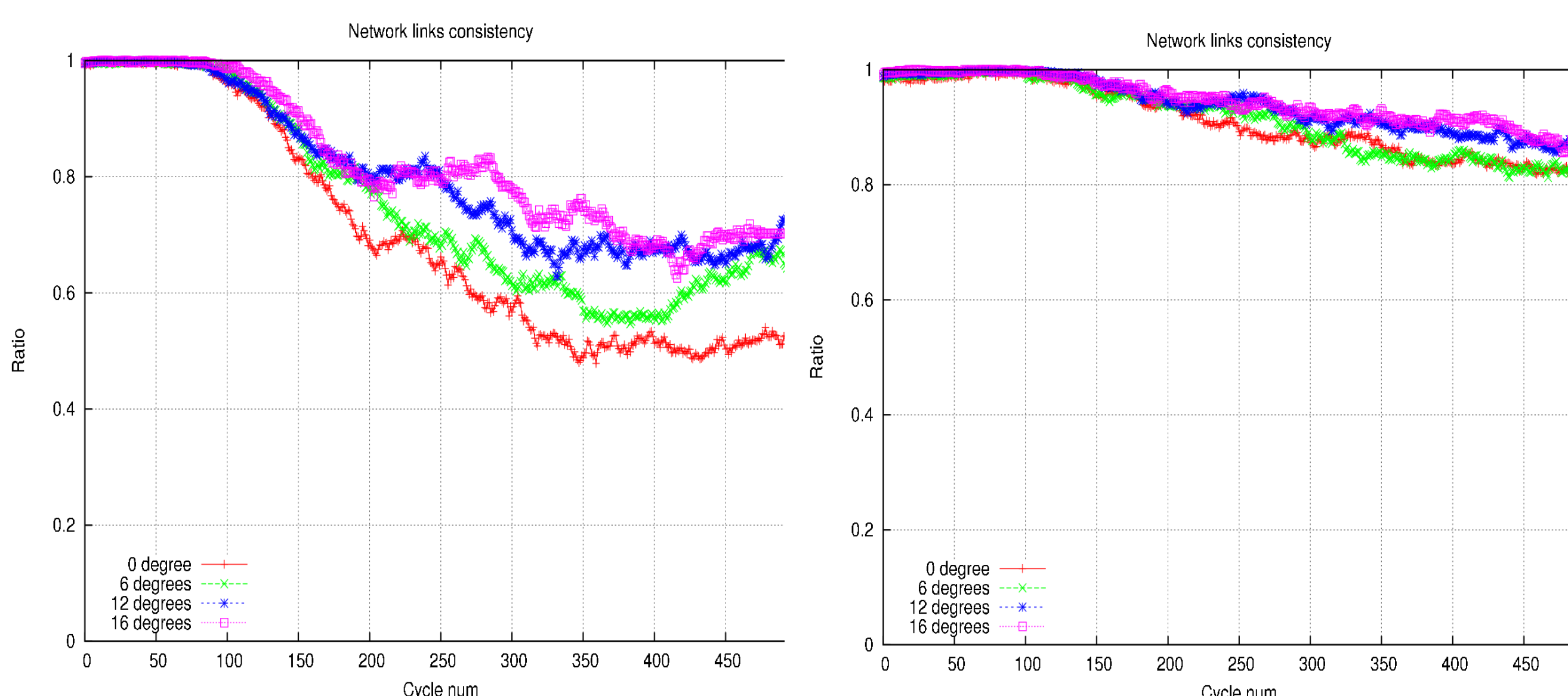


On the top: local view of B, on the bottom: local view of C

- both peers think the other one should forward the heartbeat to A, neither forward it
- heartbeat loss may generate overlay disconnections
- this situation often occurs in **crowding scenarios**, i.e. when a large number of peers gather in the same region of the DVE

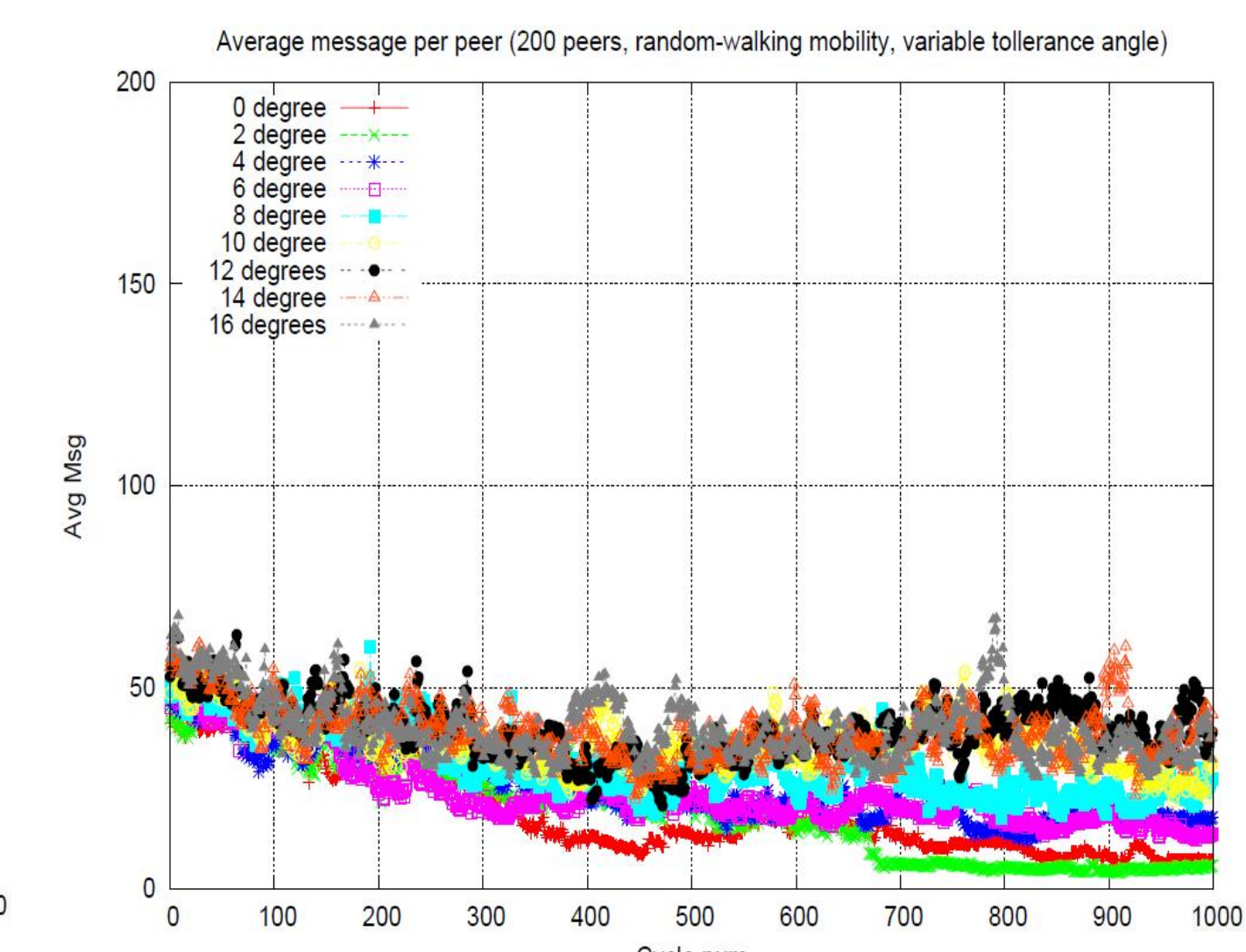
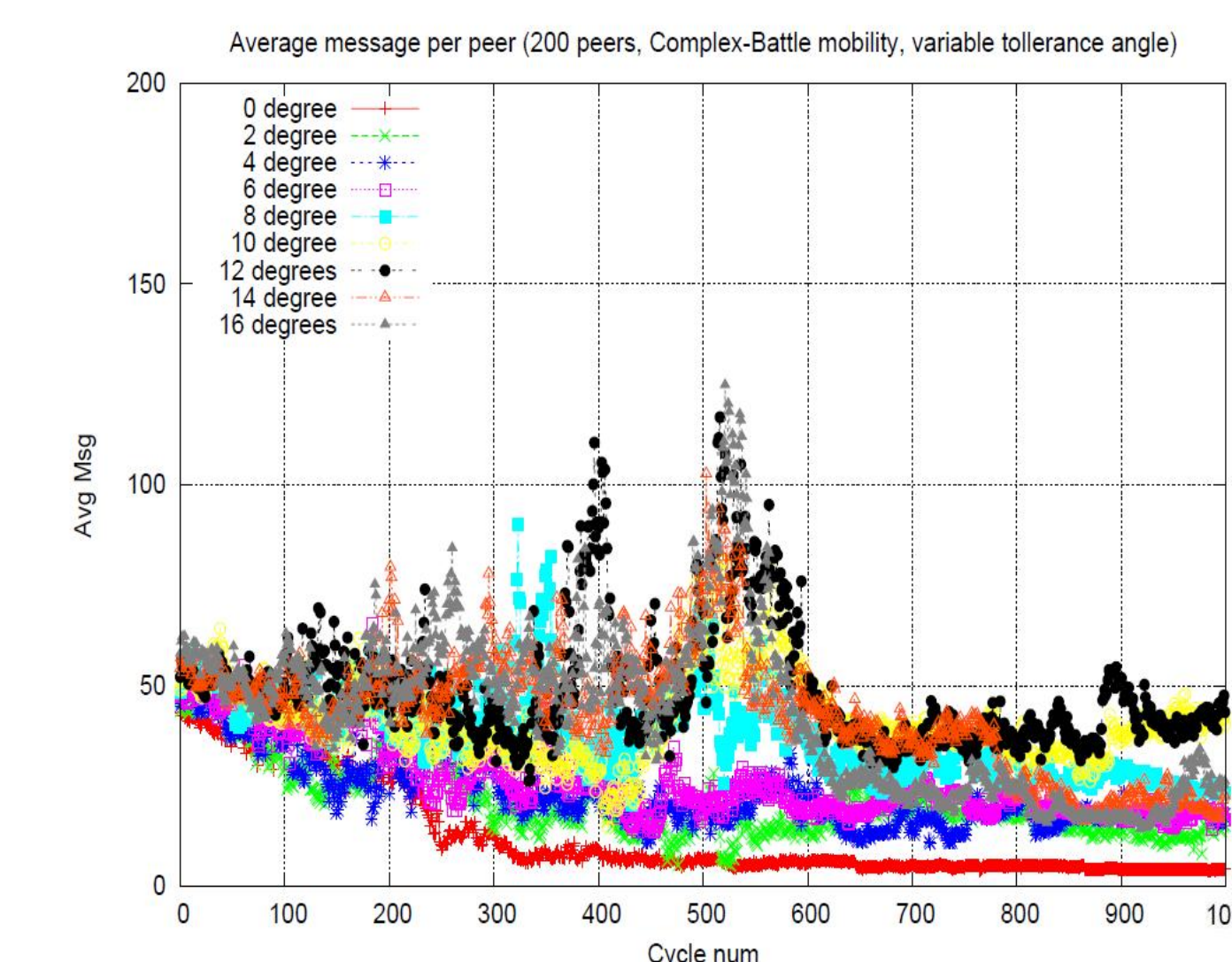
Our Solution:

- define a network-wide **Tolerance Threshold T**
- B sends the heartbeat to A when  $R \hat{A} B < R \hat{A} C + T$



## Experimental Results

- Simulations through **Peersim**
- Two **mobility models**:
  - Random Walk, Complex Battle
- We have evaluated
  - on the left: **link consistency**
  - on the right: **number of messages**as function of the tolerance threshold
- Results: for larger tolerance threshold, less disconnections, but more redundant messages



Who are we?

Michele Albano and Laura Ricci (University of Pisa), Antonio Quartulli (University of Trento), Luca Genovali (IMT, Lucca)

Contact: ricci@di.unipi.it



ALTI STUDI LUCCA