Opportunistic routing in extremely dense networks

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In Brief

the research is about the design of a routing protocol that uses estimated location to geographically route messages in extremely crowded environments.

Why is it a **Challenge** ??

around
3 million visitors
in peak seasons
every year

Satellite/GPS

injury

Lost

Cellular
Tower
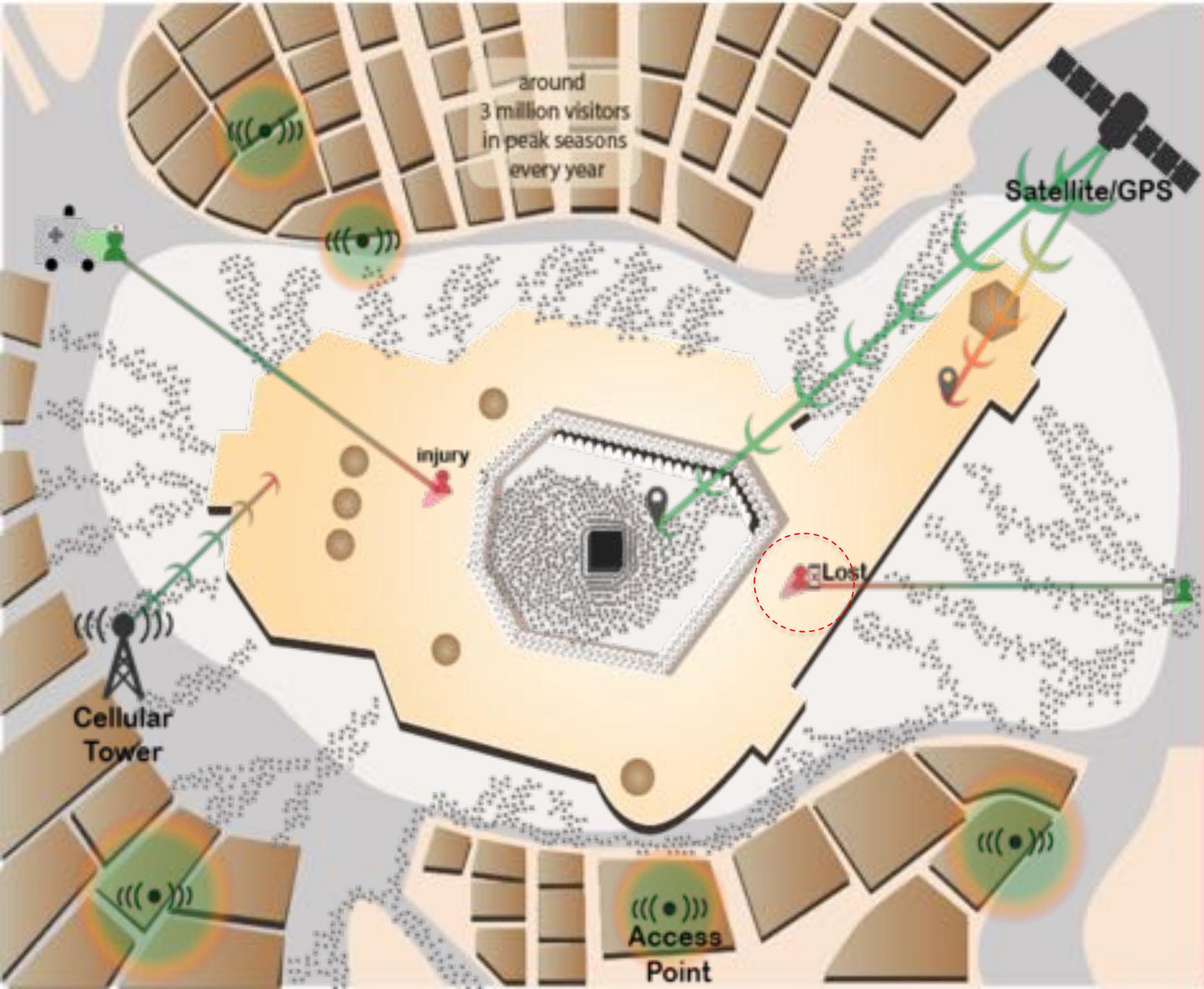
Access
Point

Large space

Complex architecture

Large population in frequent movement

no network infrastructure

Loss of connectivity

Location & Communication

Predicting Location accurately

Successfully Routing While Maintaining Connectivity

Challenging

Delay Tolerant Networks (DTN)

Location Prediction System

Geographical Routing Protocol
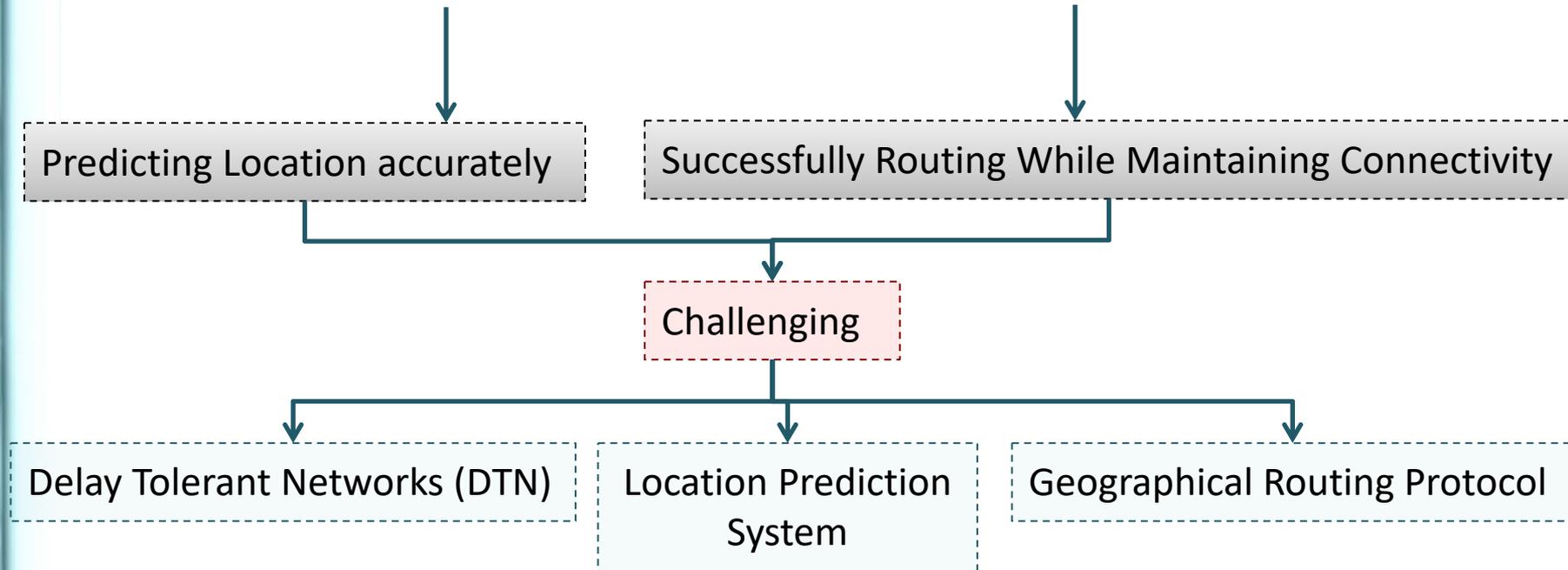
Delay Tolerant Network (DTN)

DTN is a network architecture that tries to enable successful packet delivery in extreme environments.

Characteristics

Custody Transfer

Store and Forward strategy

Protocols that generate and disseminate replicas

Source

Destination

Location Estimation System

```
                    techniques

Pedestrian Dead Reckoning   Collaborative localisation   Particle filter
```
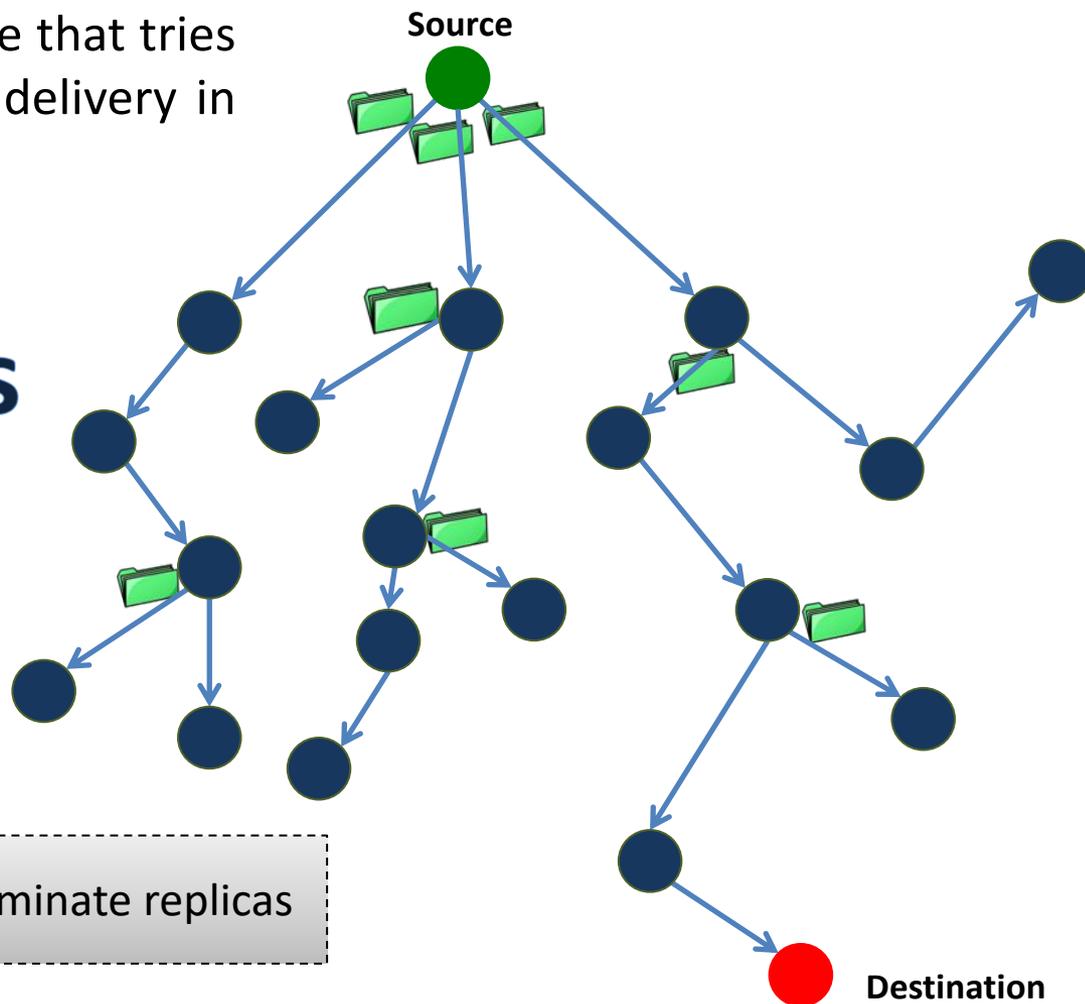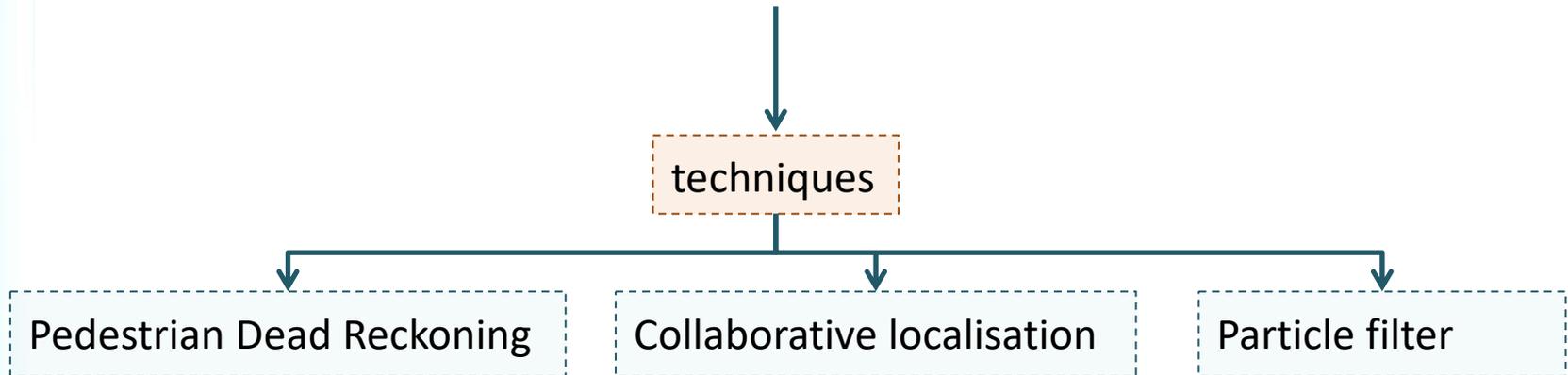
Location Estimation System
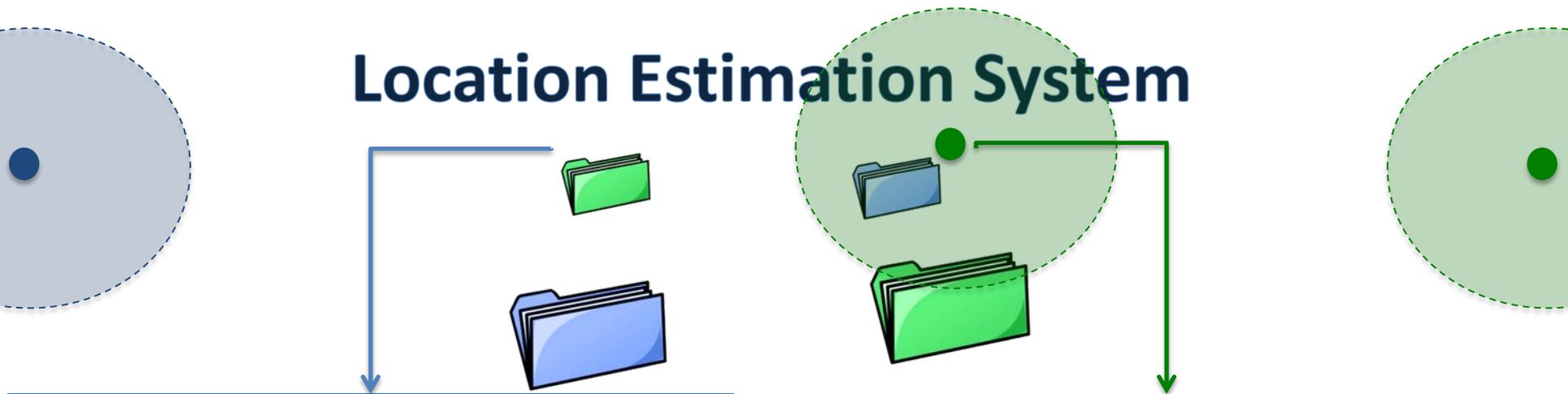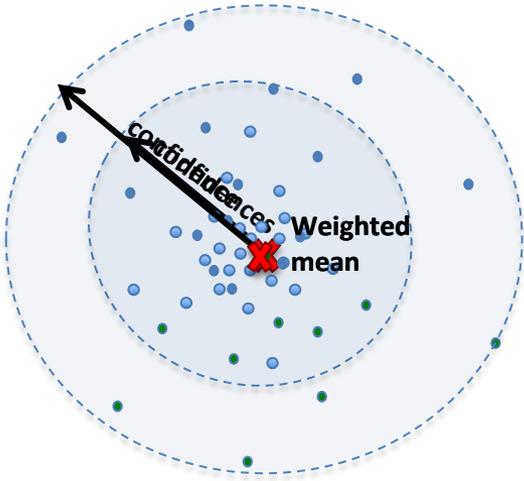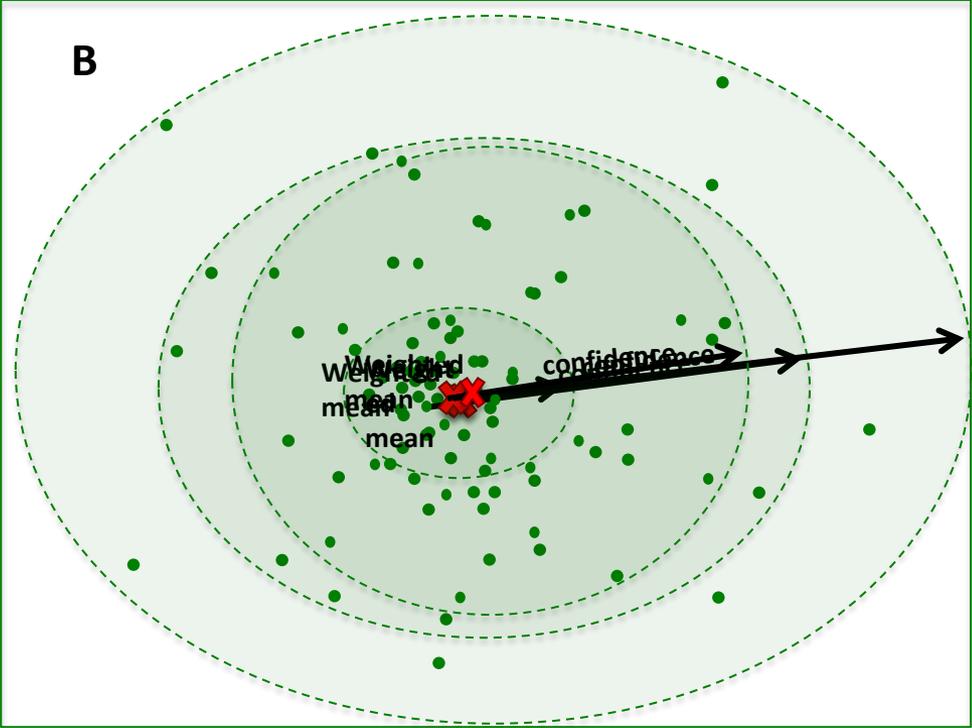
Features

- **Collaborative information and particle filters is used to correct and smooth the error (when no GPS is available).**

- **Particle filters are moved based on PDR information.**

- **Confidence is used along with particle filters to integrate different "readings" of the location.**

Geographical Routing Protocol

```
      Routing                          Forwarding
          |                                |
          +--------------+-----------------+
                         v
                   Challenging
                         |
          +--------------+-----------------+
          v                                v
```

Error: routing information becomes stale as nodes move

Error : location estimation deteriorates through time
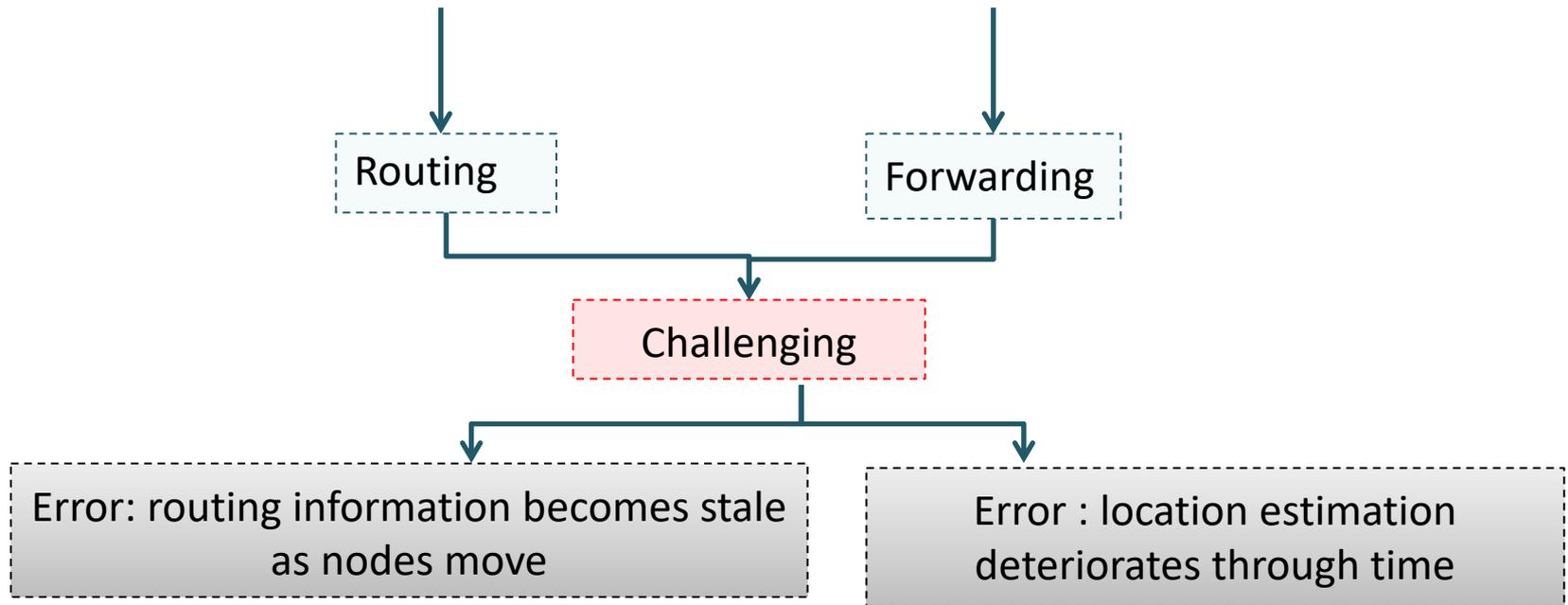
Building Routing Tables

Direct Encounter

Announcement

Announcements

Encountered node location

Source Node

Existing geo-region in the received routing table

Aggregation

Receiver
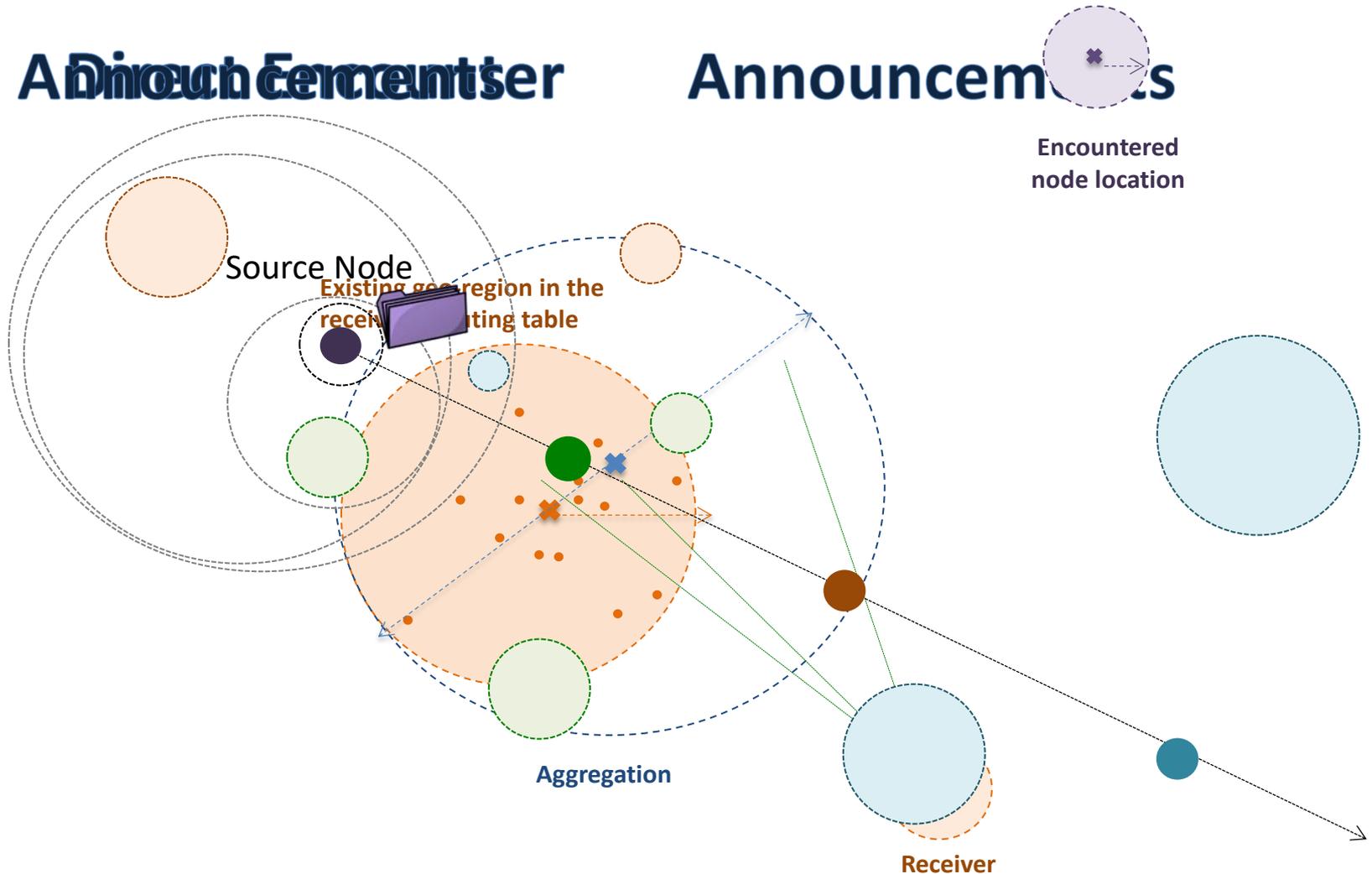
Refrence: Acer, U.G., Kalyanaraman, S. and Abouzeid, A.A., 2010. Weak state routing for large-scale dynamic networks. *IEEE/ACM Transactions on Networking*, *18*(5), pp.1450-1463.

Forwarding

C

Newly redirected region

Local routing table for source node

Region	Center	Radius Special strength	bitSet
A	(x,y)	10	
B	(x,y)	50	
C	(x,y)	30	
D	(x,y)	100	
E	(x,y)	90	

A
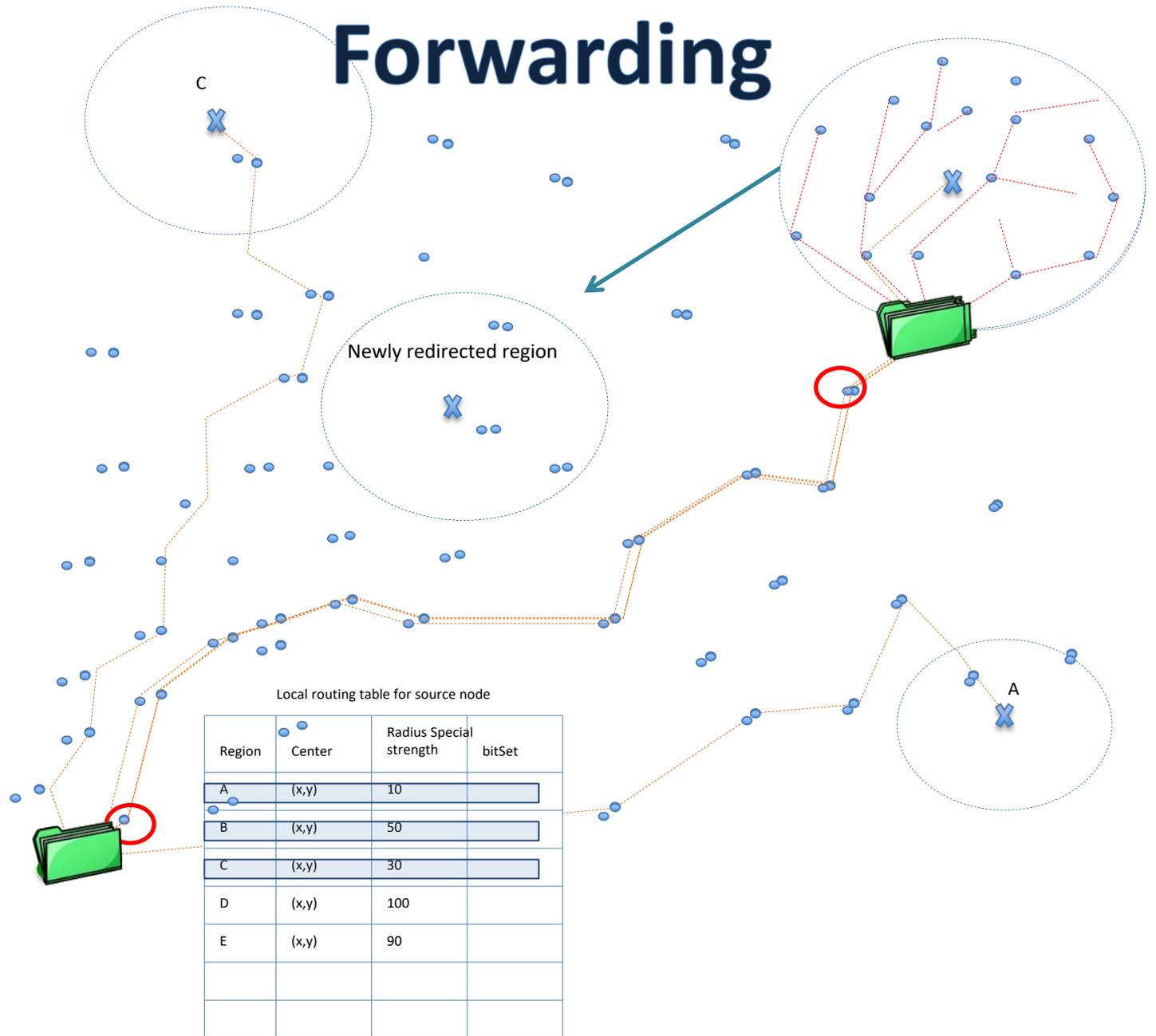
Current and Future Works

- **Implementation in the ONE Simulator.**

- **Experimental Evaluation(modeled maps and mobility models).**

- **Disaster and evacuation scenarios in such extreme cases.**

Thank you

$p(z|x)$

Generate particles

Apply a uniform weight for all particles

$W(x)$

Normalize weights

Move particles based on system prediction