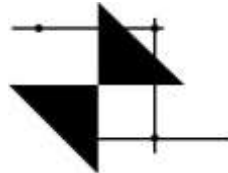# Ad Hoc Networks - Protocols and Open Problems

Prof Sanjay Srivastava

DA-IICT, Gandhinagar

Modelling and **Analysis** **Group** of
NeTworks
(**MAGNeT**)

Two day workshop on Ad Hoc Networks: Design, Applications, and Models. DAIICT Oct 2-3, 2009

Questions that come to mind? - Nodes

- **Behaviour of transmitter, receiver**

    - Medium, environment, other emitters

    - Radio range as a function of transmitted power r(p)

- **How to conserve energy of the node**

    - Embedded controller architecture

    - Real time OS issues

    - Distributed processing of date

- **Very cheap nodes**

    - At the cost of high failure rate?

Questions that come to mind? - Topology

- **Topology Issues**

  - Connectivity is a function of transmission power (goes up)

  - Routing performance is a function of connectivity (improves)

  - Throughput (think contention) – (deteriorates)

  - Node Life time (goes down with power)

  - Deployment Flexibility – (connectivity is controllable)

Questions that come to mind? - Routing

- **Routing Issues**

  - Mobility Induced problems

    - Links break, Neighbourhood changes

  - Reduce overhead or improve performance

    - Performance

      - low delay

      - high delivery ratio

      - Robustness to mobility

  - Routing + Data Aggregation

Questions that come to mind? – Pervasive Computing

- **Context Generation**

- **Context obfuscation**

- **Cooperation**

Pervasive Computing - Context

- **Current location**
  - location detection eg using GPS

- **User activity**
  - Walking, driving etc.

- **Ambient environment**
  - theatre, Mall, Meeting etc

- **Local resources**
  - Device capabilities

Pervasive Computing – Obfuscation

- Notion of K-anonymity

    - Data can pinpoint a user only upto a group of K users

- Fuzzy data

    - Time obfuscation

    - Coordinate obfuscation

Pervasive Computing – Cooperation

- Cooperation Enforcement

  - Important in resource limited systems

  - Cooperation is required for network operations

- Incentives:

  - Barter system for packet forwarding
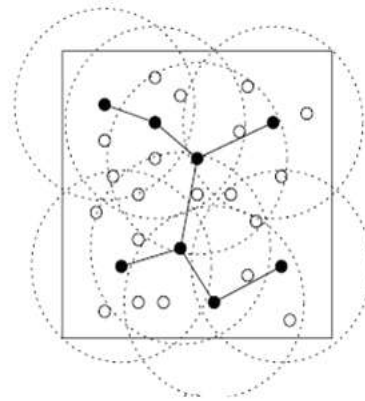
  - Payment Mechanisms

  - Reputation Systems
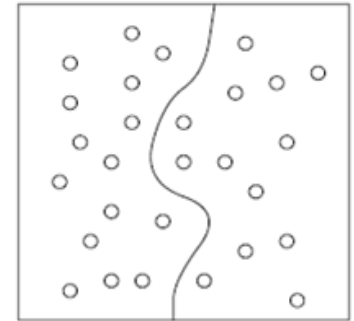
Ad Hoc Networks – Coverage Problem

- Coverage: Measure of Quality of Service
    - How well a region is covered?

    - Probability that an object will be detected
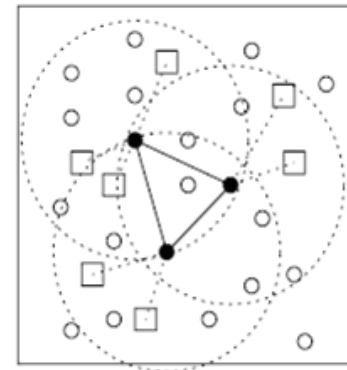
Types of Coverage:

- Blanket coverage
- Barrier coverage
- Point coverage
- Path coverage
- Exposure
- Surface coverage.
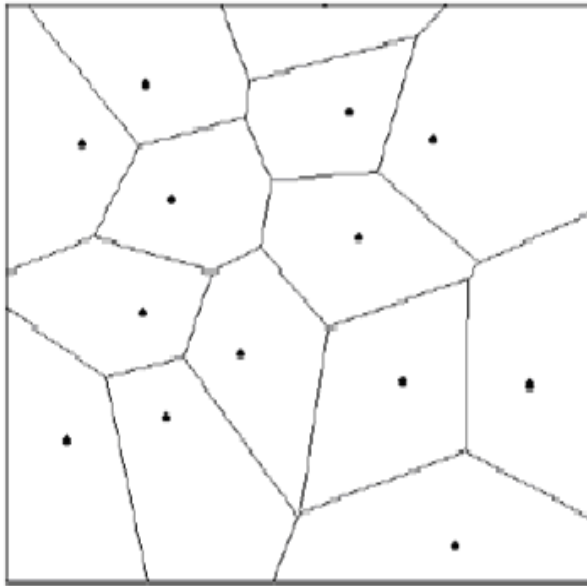

Blanket coverage   Barrier coverage
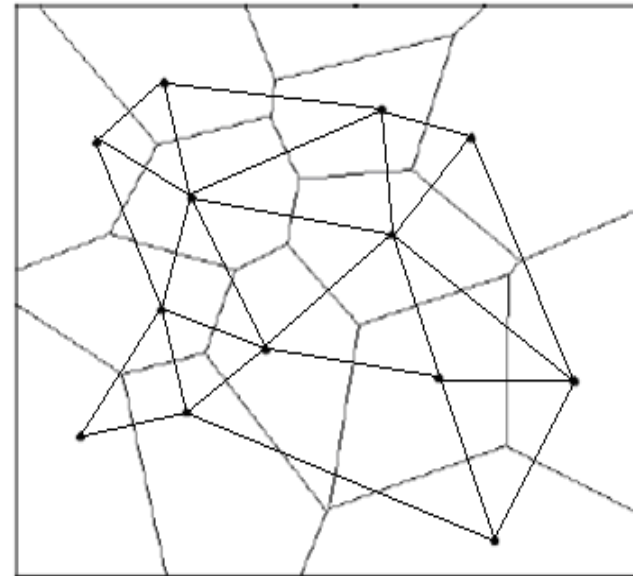
Point coverage

(Courtesy – Rucha Kulkarni)

Lowest Exposure Path

- Voronoi diagrams
- Delaunay triangulations

Voronoi Diagram

Delaunay triangulation