

Ad hoc Networking with Swarm Intelligence

Justin Yackoski

Degas Networking Group

Computer and Information Sciences

University of Delaware

<http://degas.cis.udel.edu>

Essence of Swarm Intelligence

1. Positive and negative feedback

search good solutions and stabilize the results

2. Amplification of fluctuation

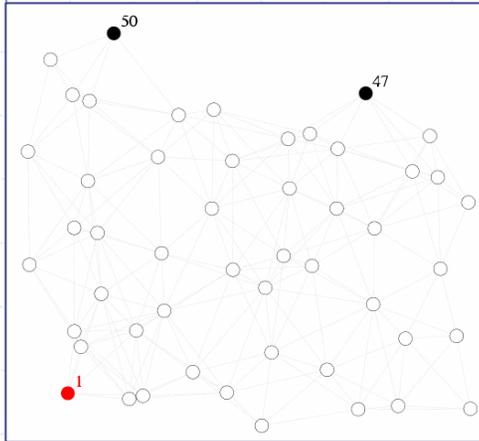
discover new solutions and adapt to changing environment

3. Multiple interactions

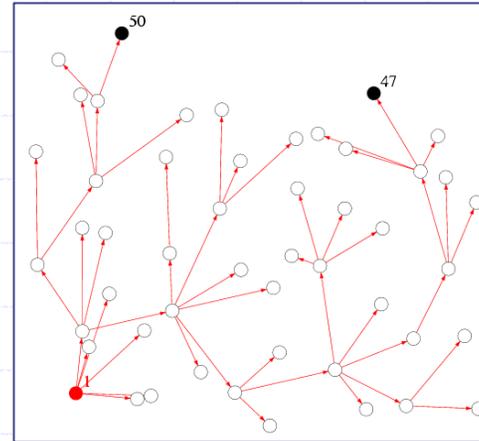
allows collaborations among distributed entities to coordinate and self-organize

◆ **A distributed adaptive control mechanism**

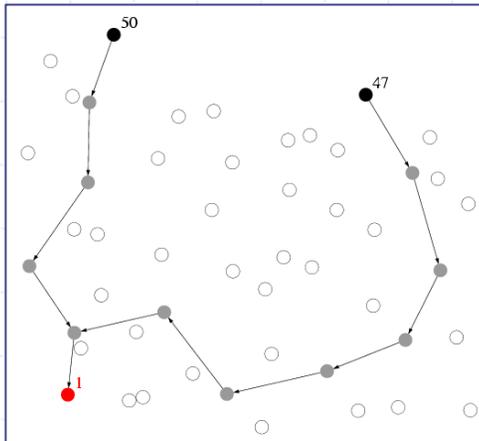
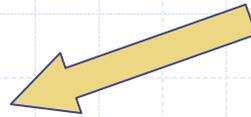
Snapshots of Multicast Operations



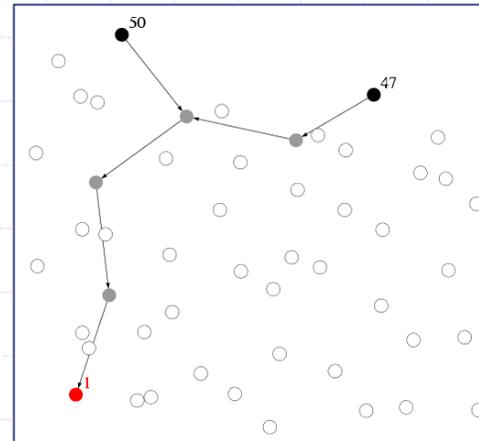
**Network
Topology**



**Core Announce
Propagation**

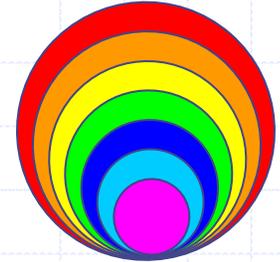
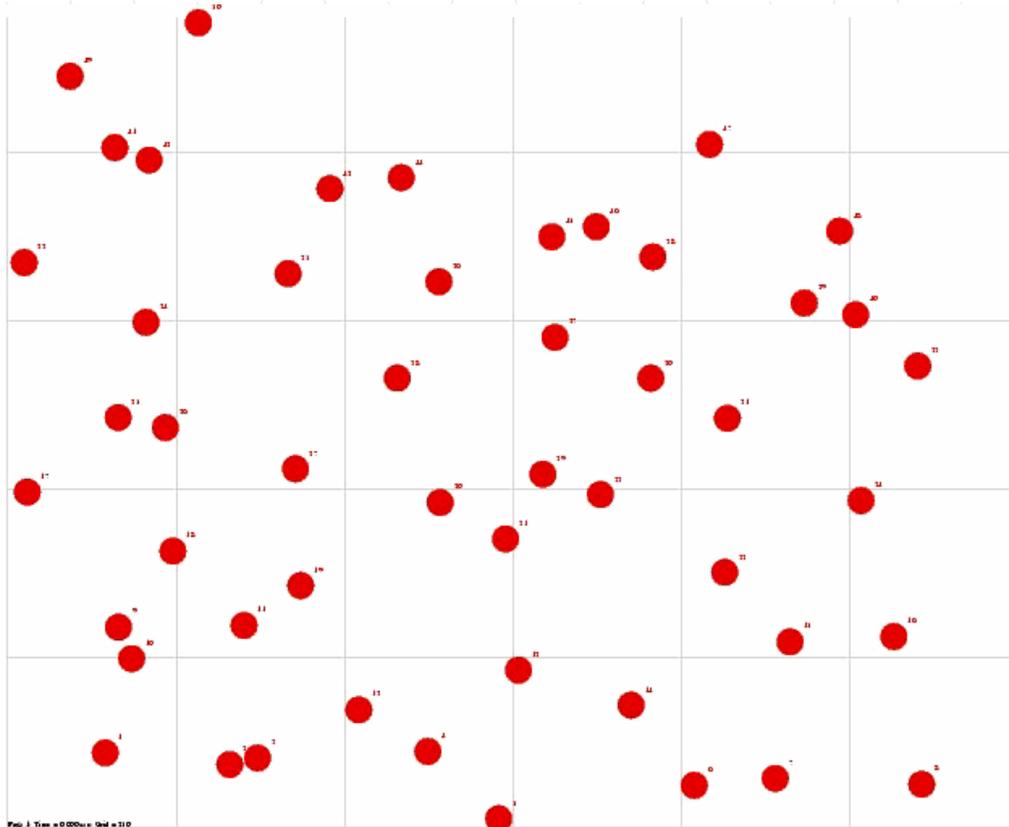


**Initial
Forwarding Set**



**Evolved
Forwarding Set**

Distributed Topology Control



Ad hoc Networking with SI

- ◆ Unicast routing
- ◆ Multicast routing
- ◆ Topology Control
- ◆ Energy conservation
- ◆ Feature interactions – **cross-layer** and **cross-feature**
- ◆ Resource discovery – *e.g.* tracking in MANET
 - Querying **timely** information
 - ◆ Where is the vehicle *now*?
 - Querying **time indexed** information
 - ◆ Where was the vehicle *at 3pm*?