

Routing Minitask Report



Palo Alto Research Center (PARC)

Group members:

UC Berkeley (UCB)

Notre Dame (ND)

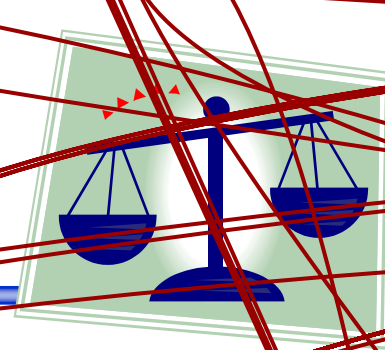
Ohio State (OSU)

Vanderbilt University (VU)

University of Virginia (UVA)

June 2004

Motivation

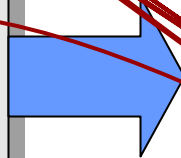


➤ **Routing Modeling:**

- ✓ *Networks*
- ✓ *Applications*
- ✓ *Metrics*

➤ **Layered Architecture:**

- ✓ *Algorithm Repository*
- ✓ *Component Sharing*
- ✓ *Plug and Play*



➤ **Routing Strategies:**

- ✓ *Tree-based*
- ✓ *Flooding-based*
- ✓ *Search-based*

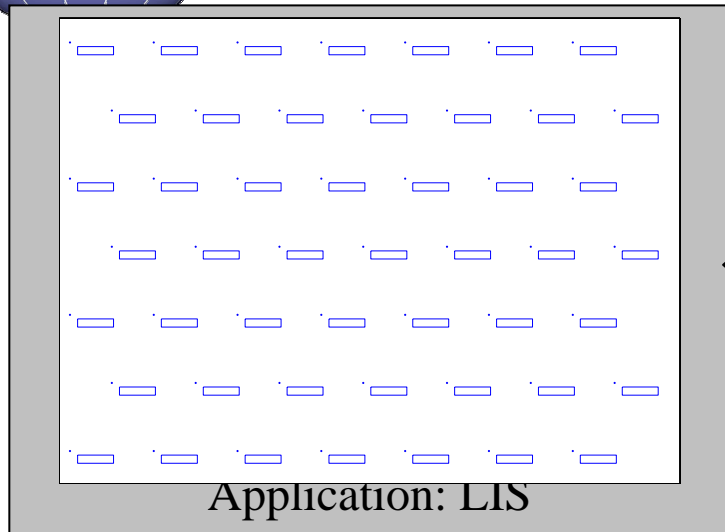
➤ **Application Scenarios:**

- ✓ *Dynamic-to-static*
- ✓ *Dynamic-to-mobile*
- ✓ *Many-to-one*

Rmase

**Application-oriented
Routing Strategy Comparisons**

Rmase Modeling: Network Topology



Uniform or random
networks, with holes

Prowler - Application Parameters

Parameters for application 'RMASE'

Parameter Groups = Network Topology

Xsize = 7

Ysize = 7

Xdist = 1

Ydist = 1

Xoffset = 0

Yoffset = 0

Xdensity = 1

Ydensity = 1

Xshift = 0

Yshift = 0

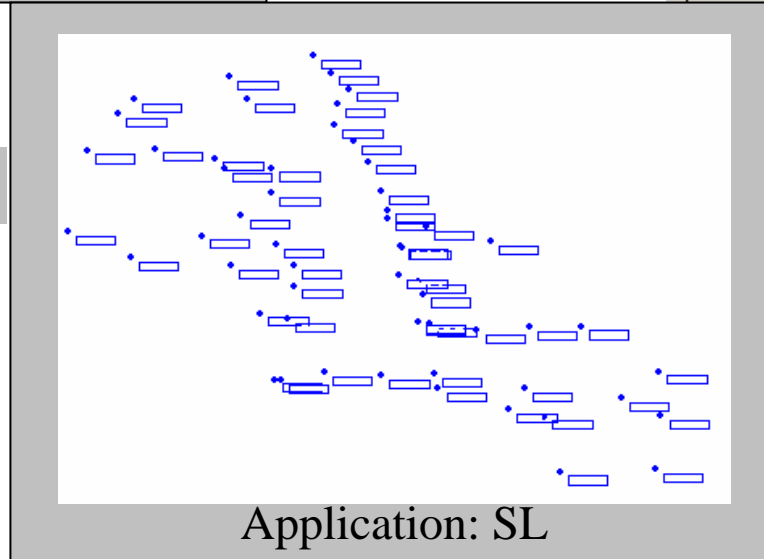
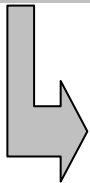
☐ wraparound

AliveProb = 1

☒ UseTopologyFile

TopologyFileName = sl_topology

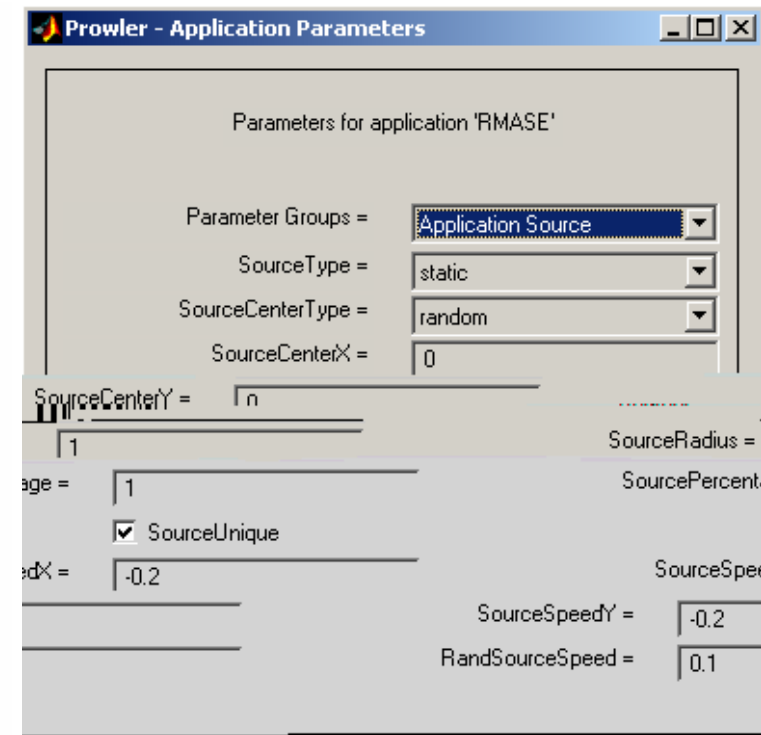
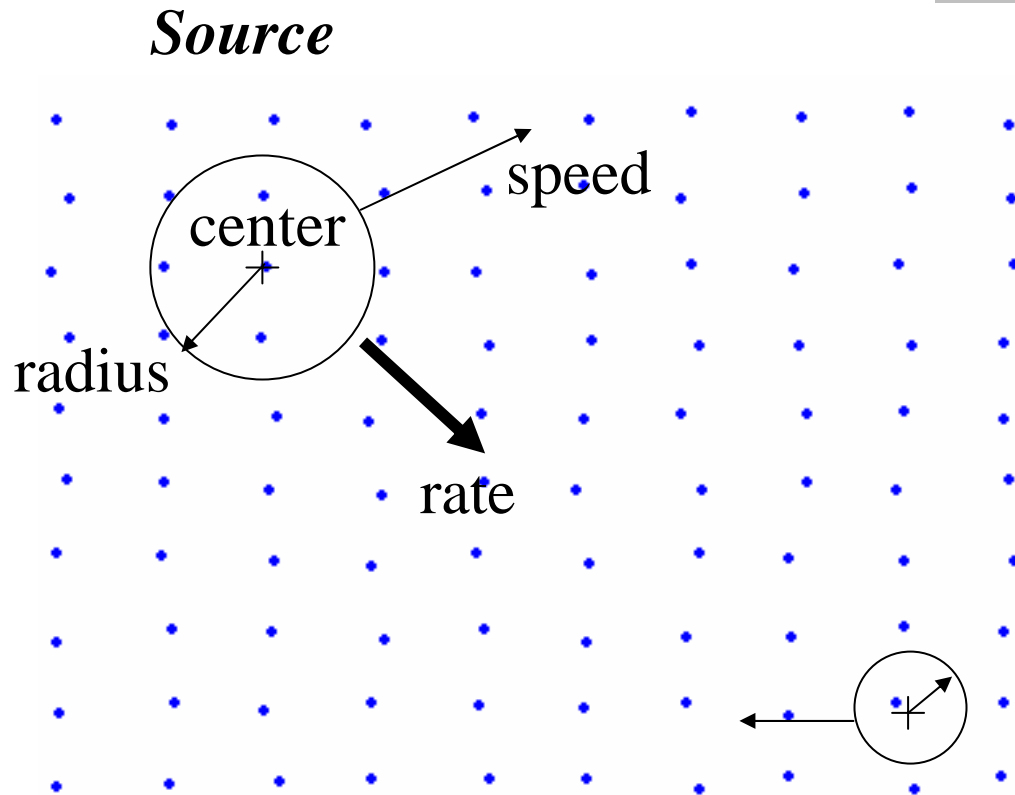
User given topologies



Rmase Modeling: Application Scenarios



User given trace: (ID, Time)



Destination

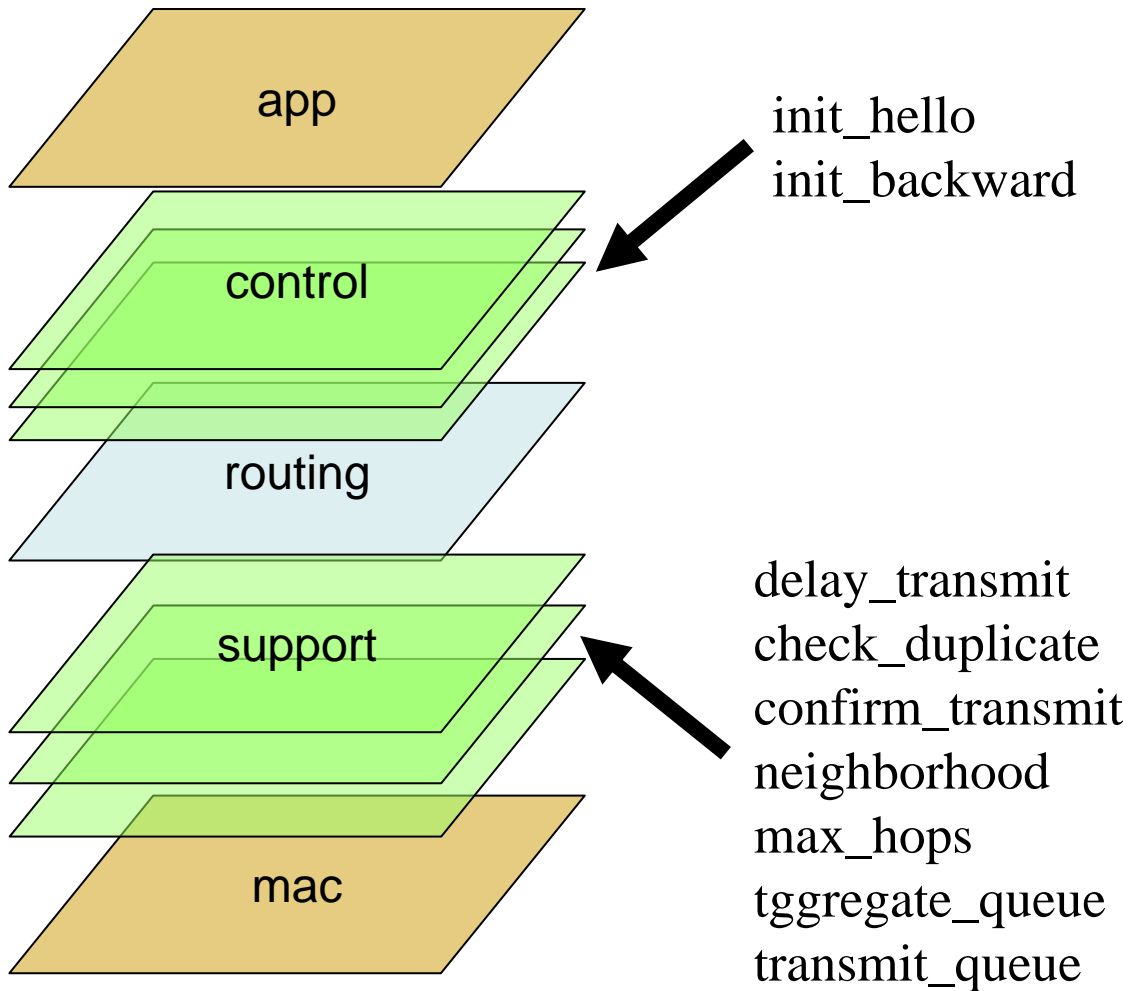
Rmase Modeling: Performance Metrics



Layered Routing Architecture



Common Routing Components



Taxonomy of Algorithm Repository



Component Strategies of Routing Algorithms



Application-oriented Comparisons



- Assumptions

- Radio Model:

$$P_{rec,ideal}(d) \leftarrow P_{transmit} \frac{1}{1+d^\gamma}$$

$$P_{rec}(i,j) \leftarrow P_{rec,ideal}(d_{i,j})(1+\alpha(i,j))(1+\beta(t))$$

$$\alpha : N(0, \sigma_\alpha), \sigma_\alpha \leftarrow 0.45$$

$$\beta : N(0, \sigma_\beta), \sigma_\beta \leftarrow 0.02$$

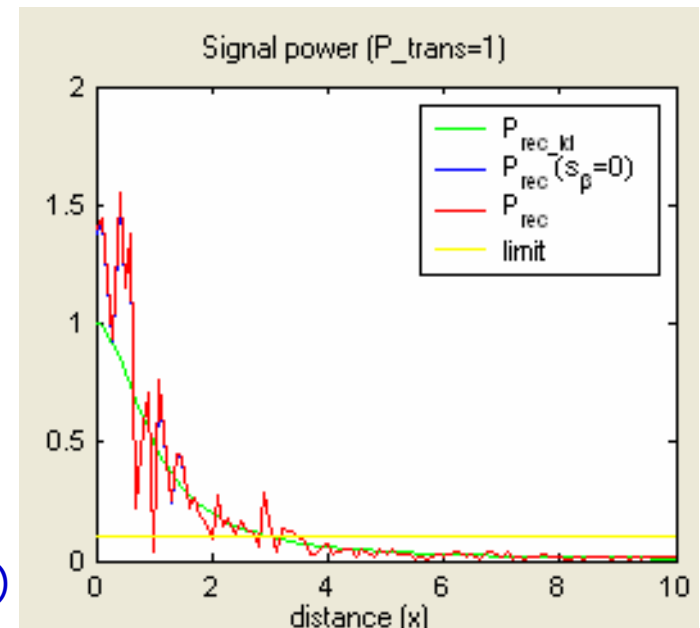
$$i \leftarrow j \Leftrightarrow P_{rec}(i,j) > \Delta$$

- Radio Strength: constant

- Algorithm Parameters: default

- Applications

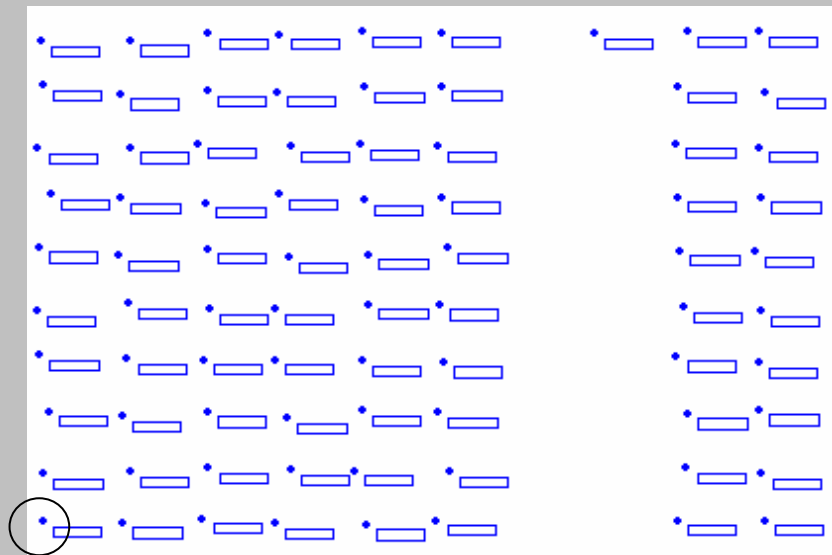
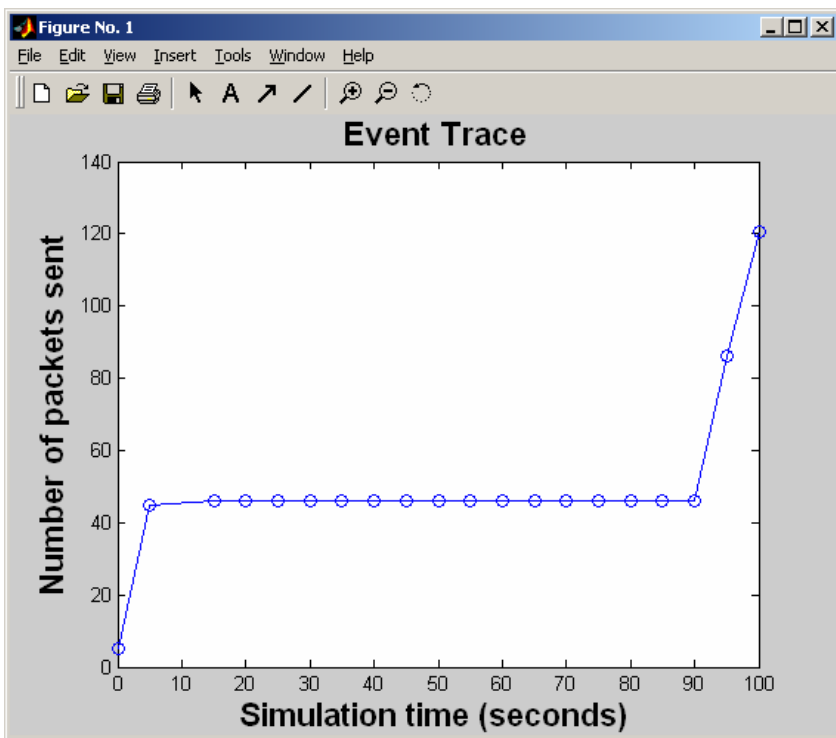
- LIS: A Line in the Sand (OSU)
 - RFT: Red Force Tagging (ND)
 - PEG: Pursuer/Evader Game (UCB)
 - SL: Shooter Localization (VU)
 - OSU: OSU Testbed (OSU)



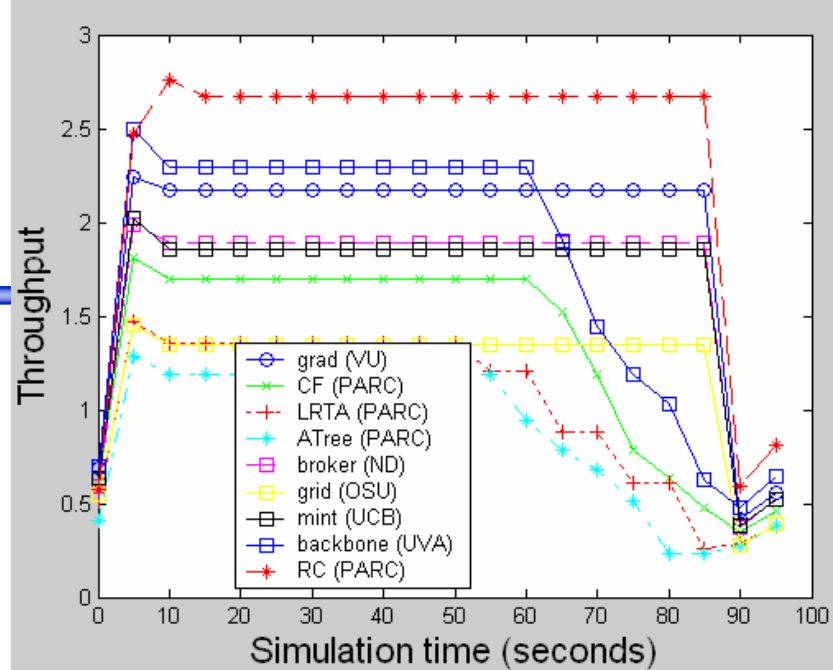
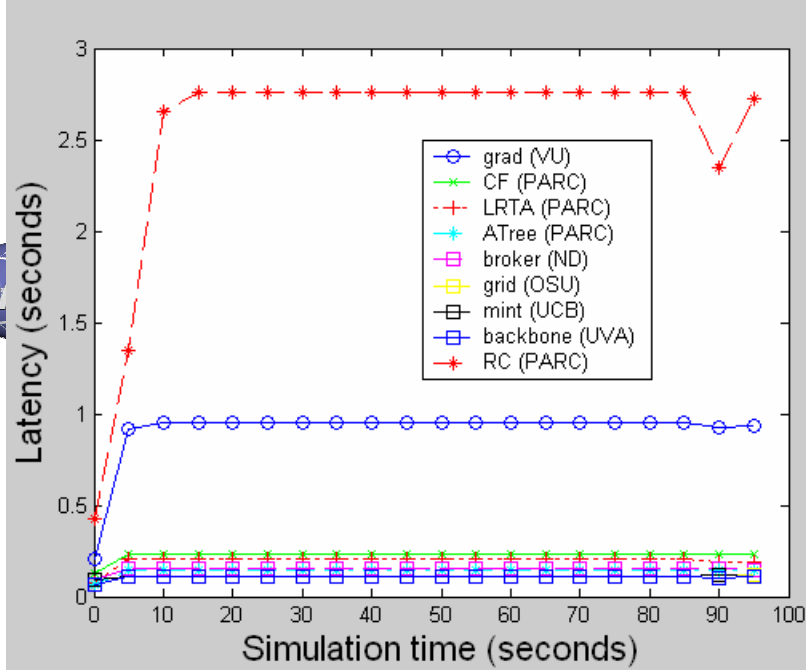
A Line in the Sand



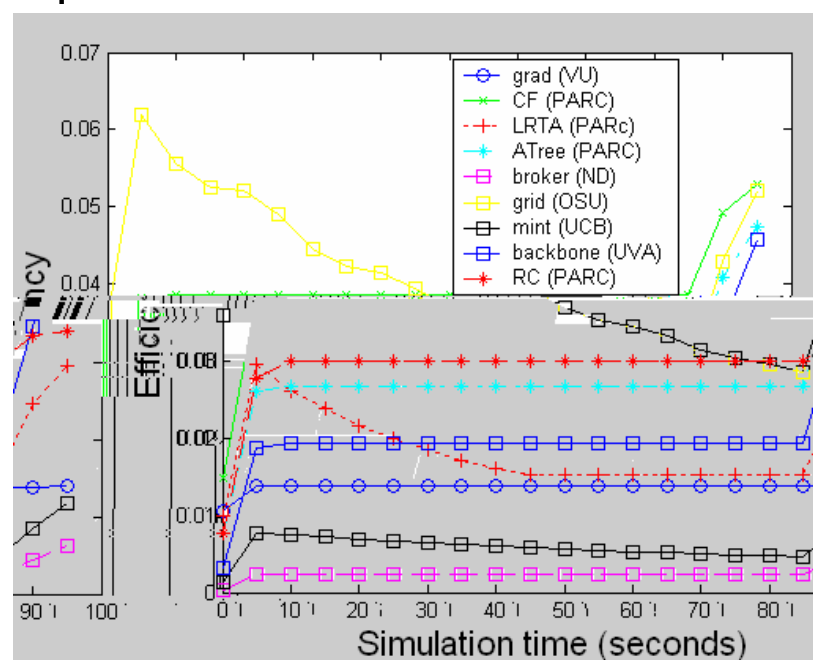
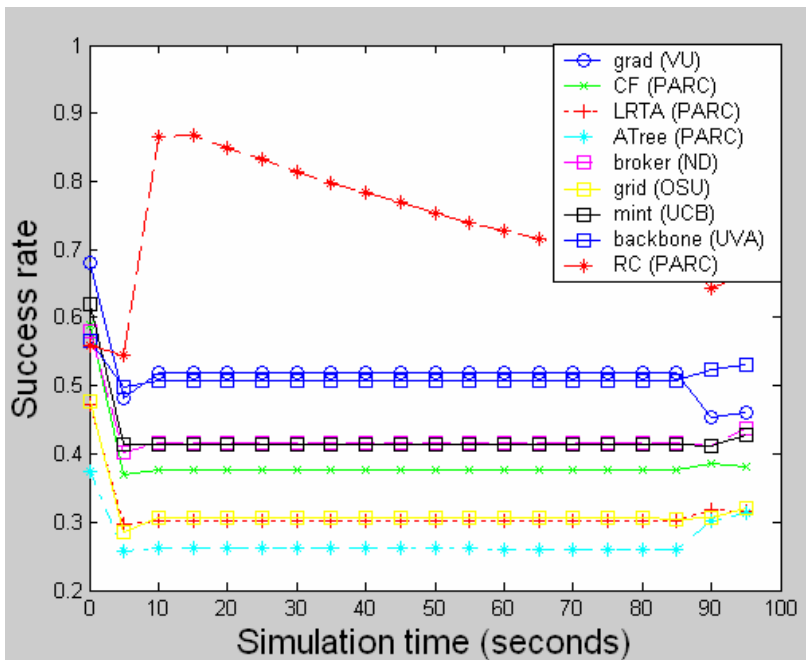
- Source: given trace
- Destination: static at (0,0)
- Simulation time: 100 s
- Total runs: 10



Application: LIS



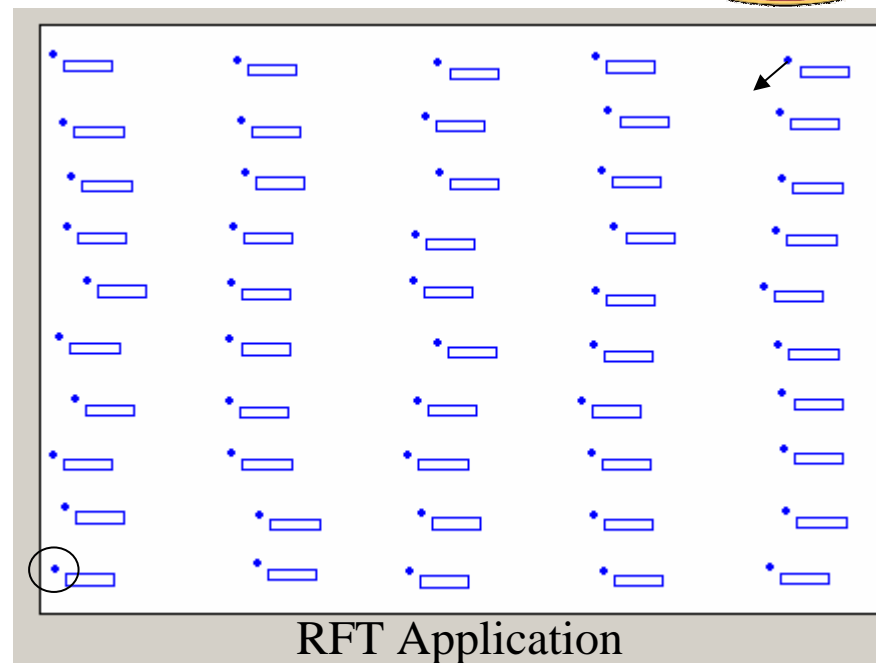
LIS Experiments

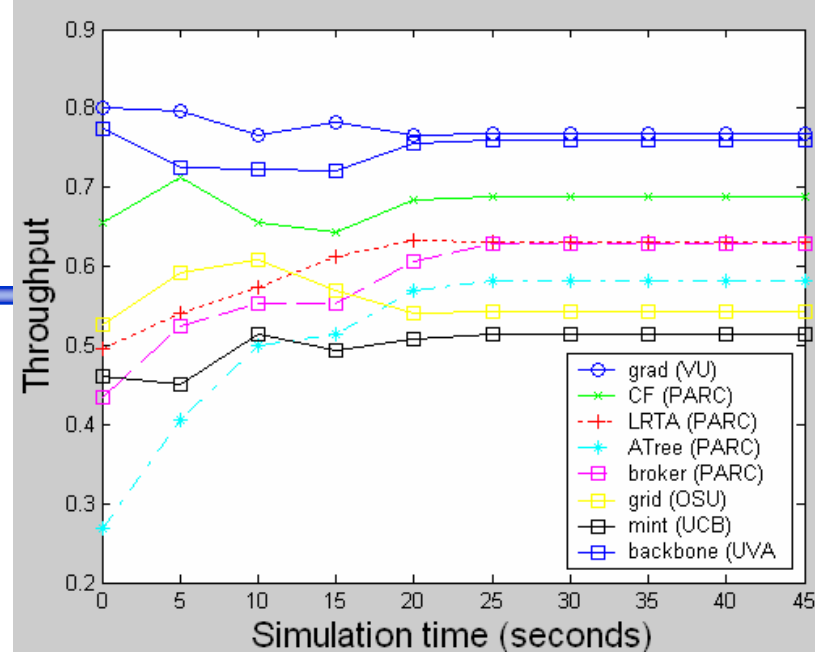
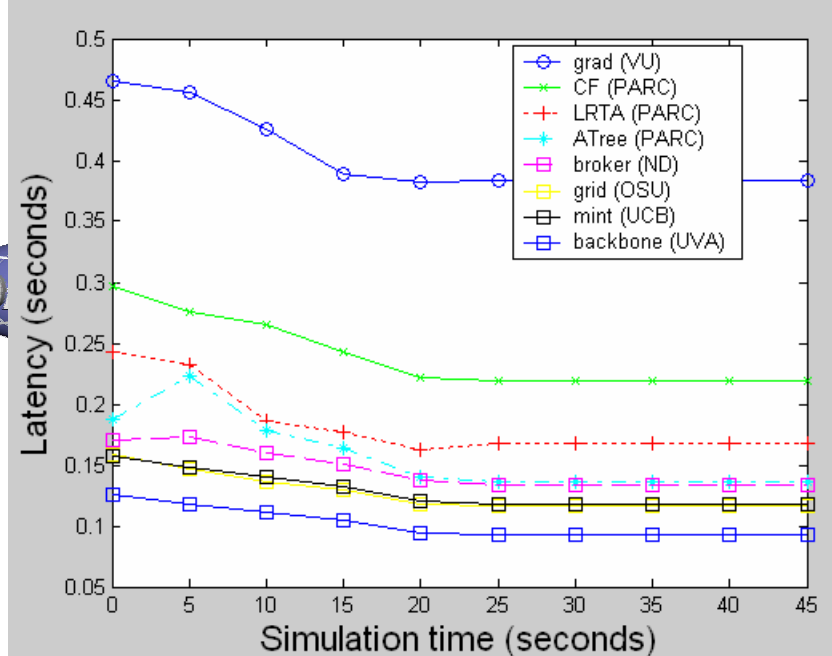


Red Force Tagging

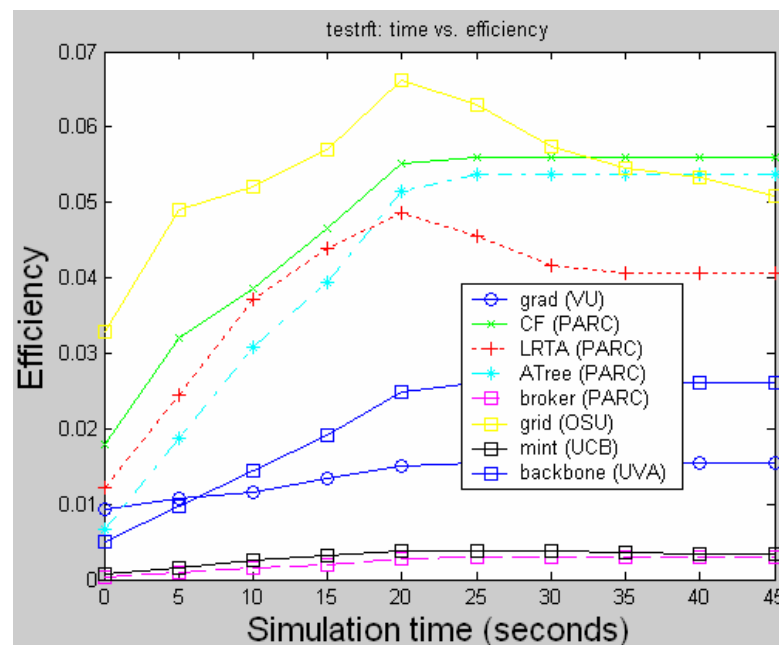
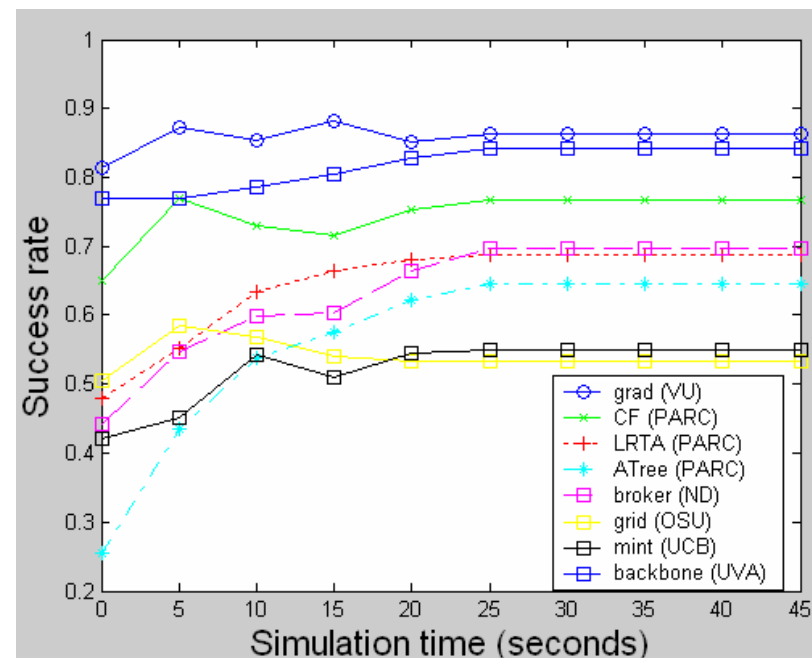


- Source:
 - dynamic, speed 0.2/s
 - Rate 1p/s
- Destination:
 - static at (0, 0)
- Simulation time: 50 s
- Total runs: 10





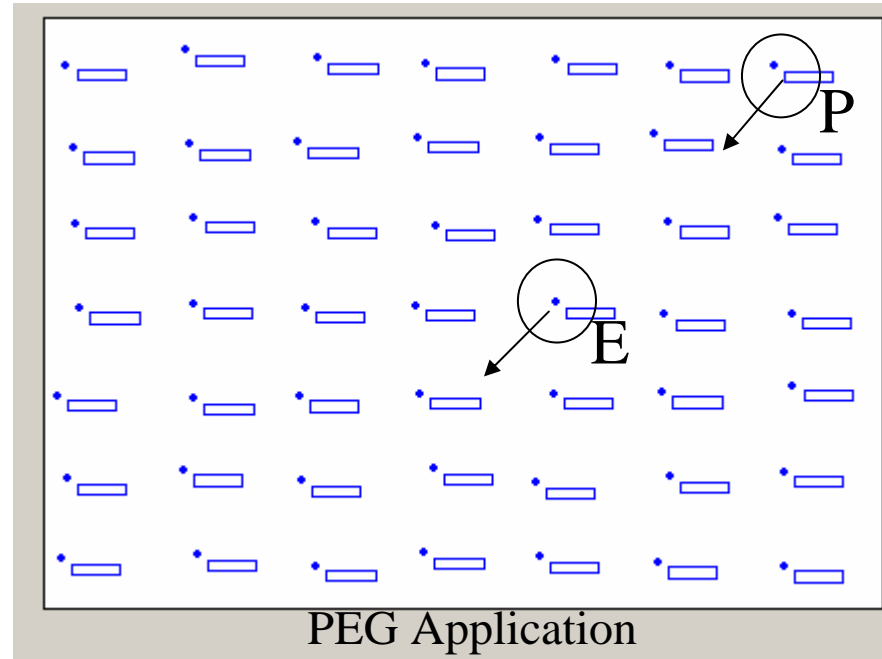
RFT Experiments

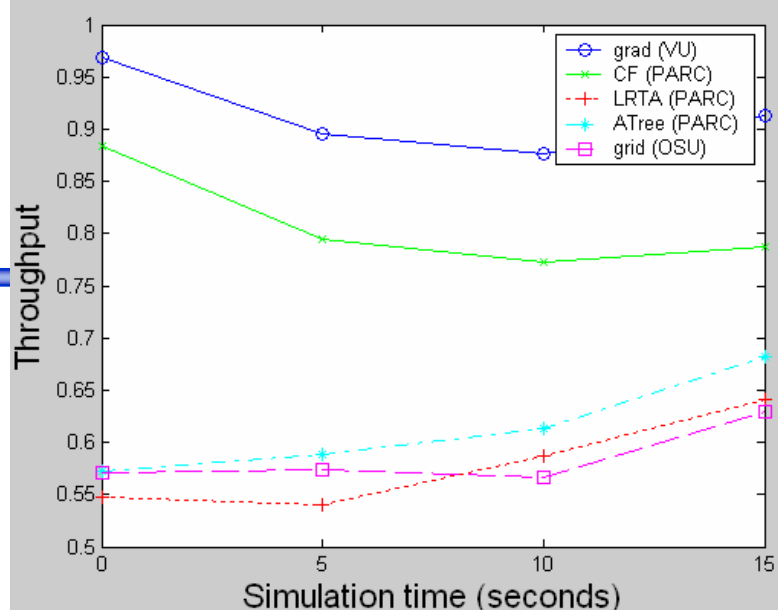
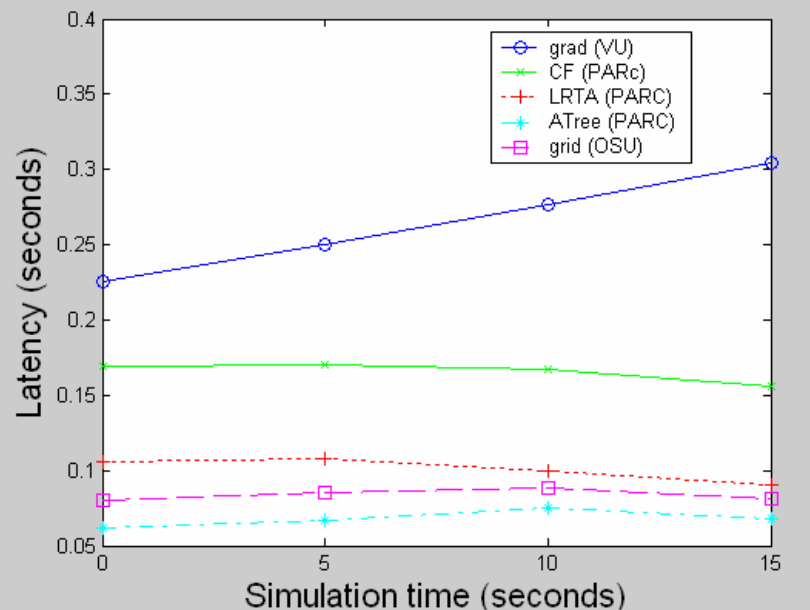


Pursuer/Evader Game

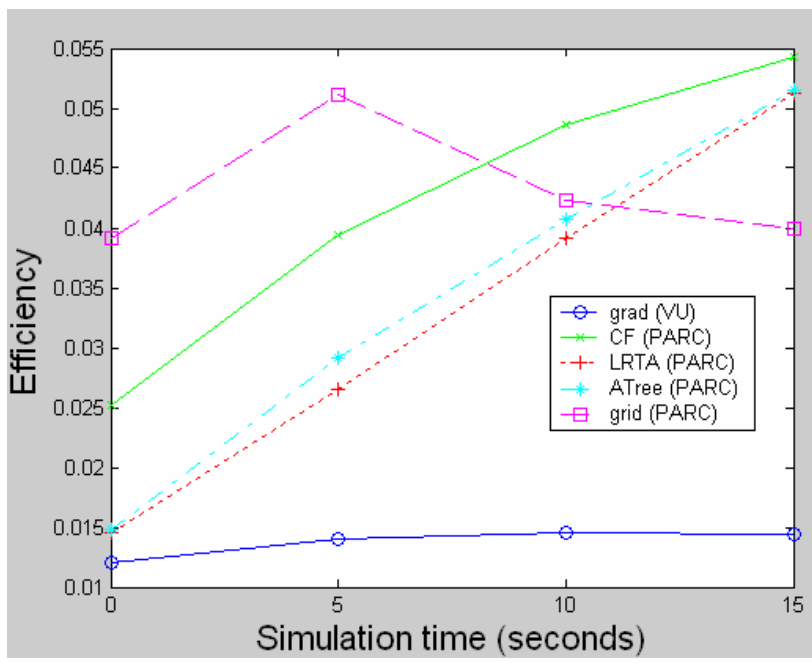
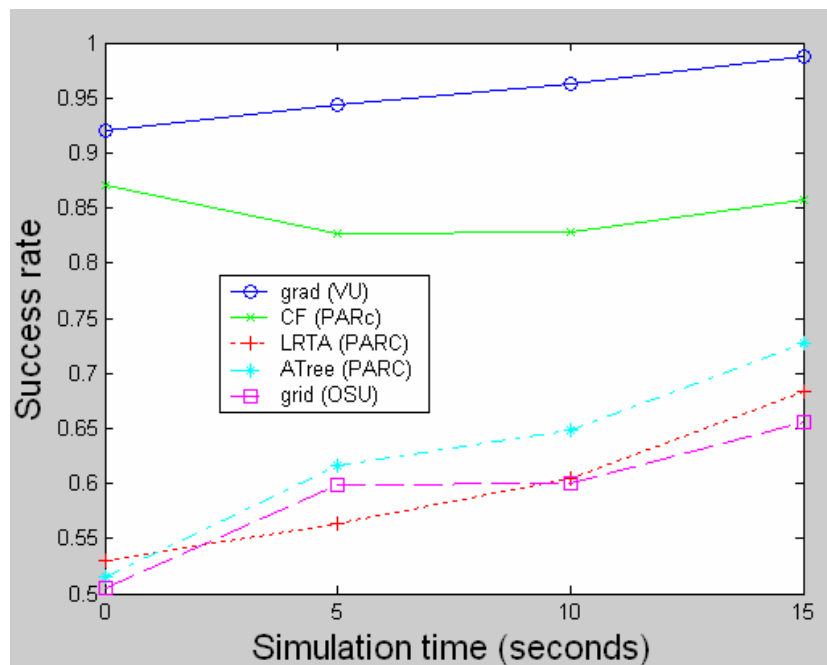


- Source:
 - dynamic, speed 0.2/s
 - Rate 1p/s
- Destination:
 - Mobile, speed 0.2/s
- Simulation time: 20 s
- Total runs: 10



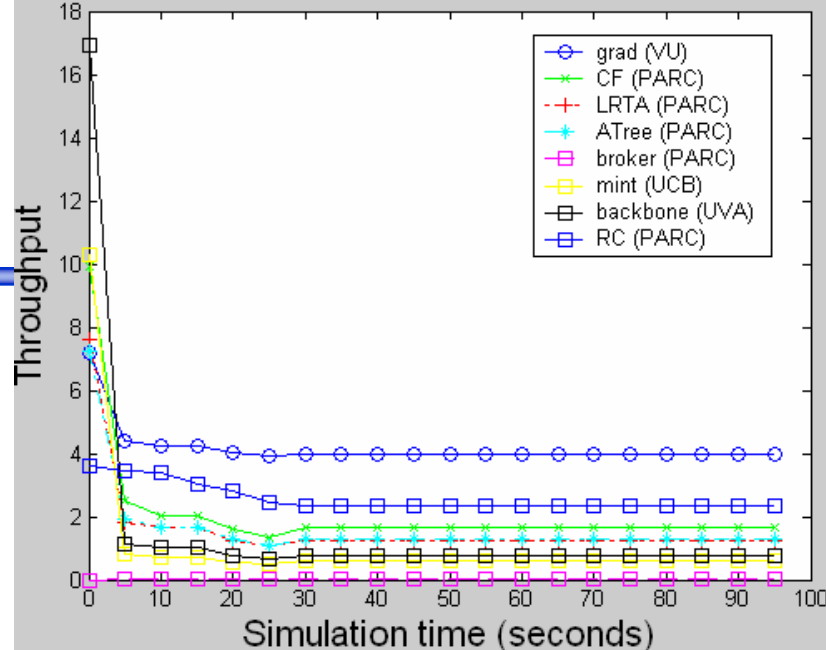
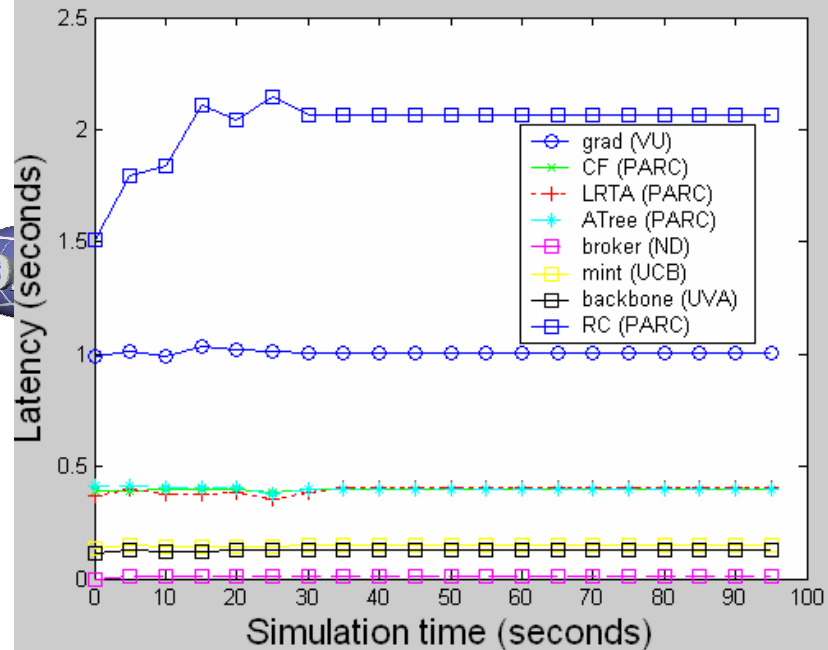


PEG Experiments

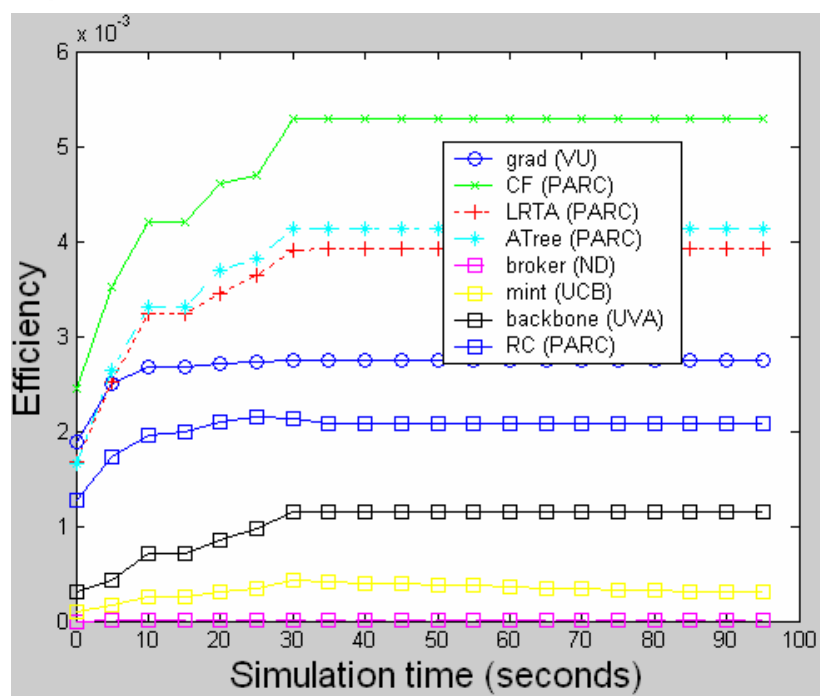
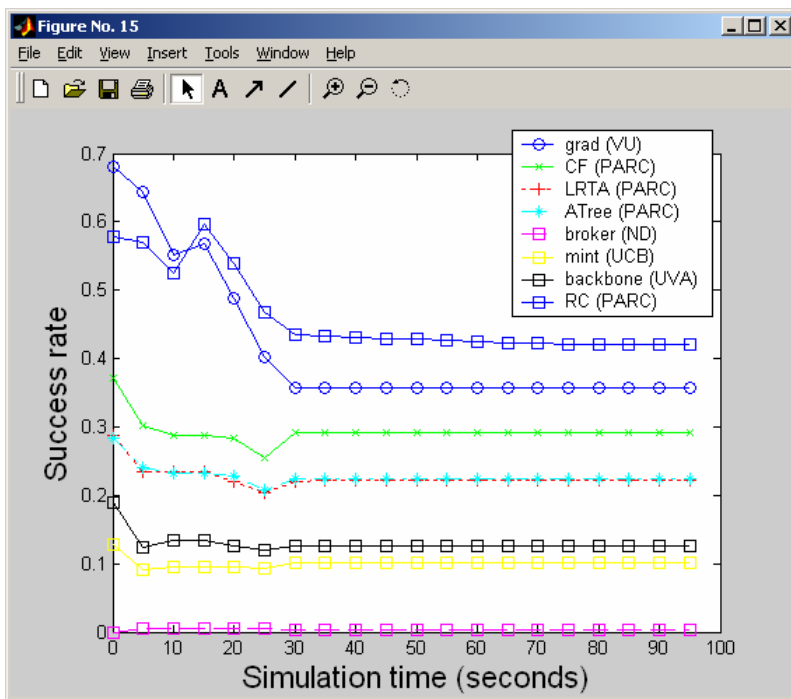


Shooter Localization





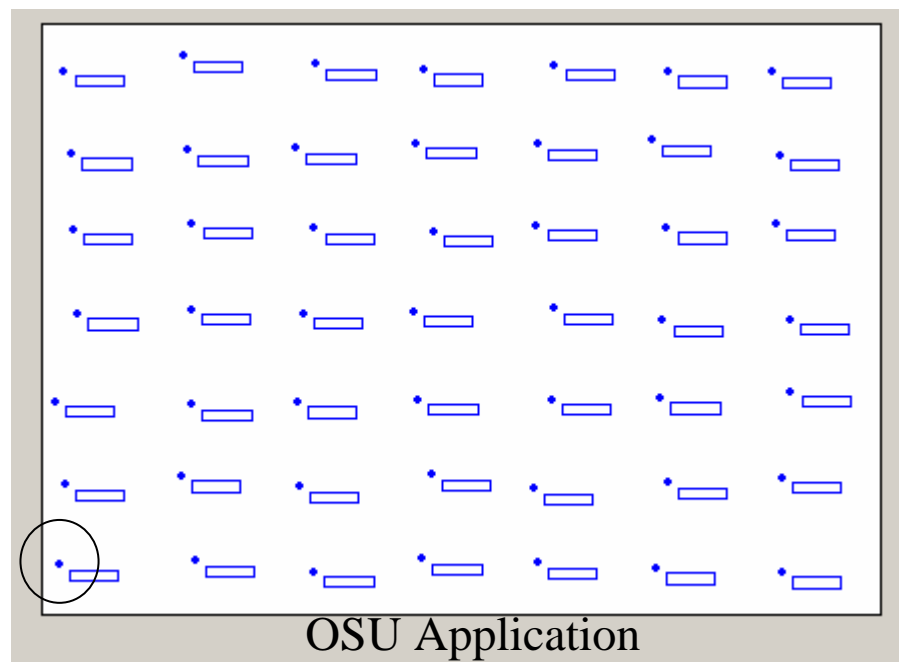
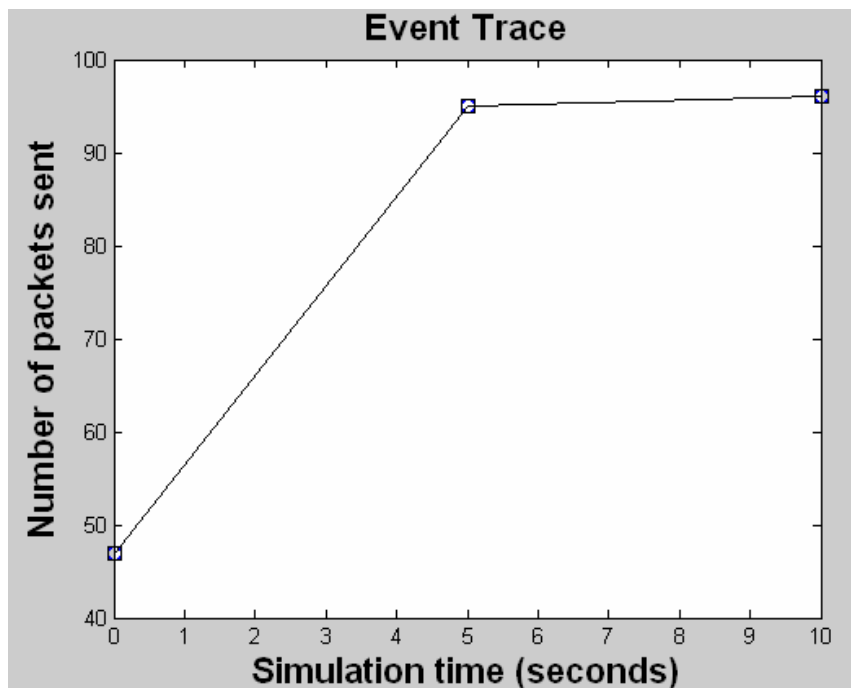
SL Experiments



OSU Testbed



- Source: give trace
- Destination: static at (0, 0)
- Simulation time: 15 s
- Total runs: 10

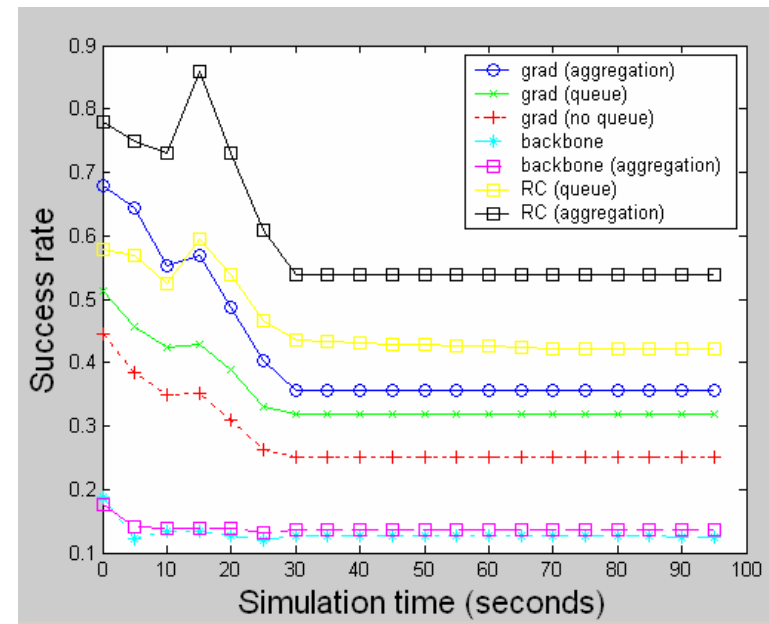
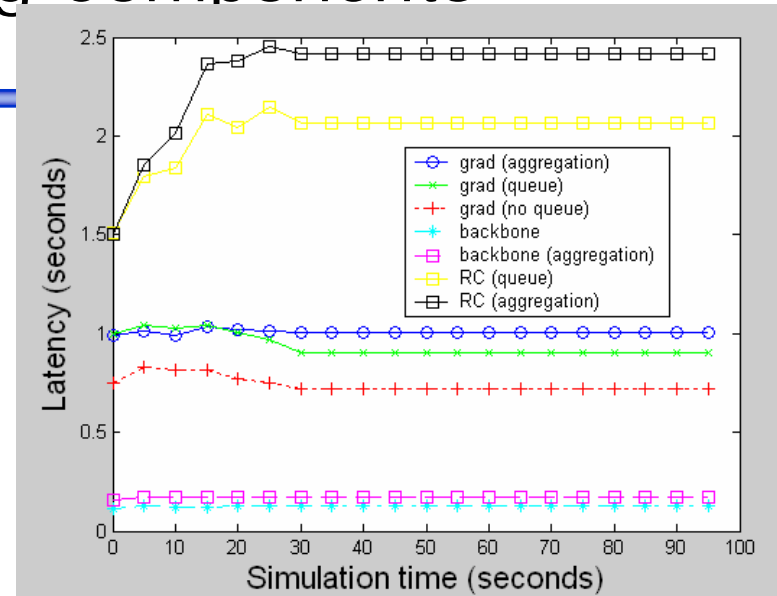




Plug-Play Routing Components



- grad:
 - with aggregation
 - with transmit queue
 - without queue
- RC:
 - with aggregation
 - with transmit queue
- backbone:
 - with aggregation
 - without aggregation



Lessons Learned: Modeling and Simulation



Rmase

- Plug/play reusable routing components
- Model routing applications
- Analyze routing algorithms
- Optimize routing performance



Take Away Points



Thanks

