The Mobile Ad-hoc Networking Interoperability And Cooperation (MANIAC) Challenge

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The MANIAC Challenge

- An opportunity to explore interactions in an impromptu ad hoc network
  - Incentive structures for cooperation
  - Emergent behavior

www.maniacchallenge.org

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In a nutshell…

- 3-year research project with funding from NSF's NeTS program
  - 1st competition to be held in November 2007, co-located with Globecom 2007
  - Looking for participants, collaborators, sponsors
- Developed…
  - An API to facilitate dynamic decisions in routing and forwarding
  - A distributed monitoring tool to observe traffic, network topology and cooperation

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Motivation: interoperability and cooperation

- Cooperation among nodes is required to support multi-hop communications in ad hoc networks
- Non-cooperative or selfish behavior should be discouraged and detected, and nodes engaging in such behavior should be isolated

- What are efficient strategies for cooperation in a network of autonomous nodes making independent decisions regarding cooperation, reputation, etc. ?

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Motivation: broadly speaking…

- Experimental work on MANETs has been largely restricted to tightly controlled experimental testbeds
  - This project provides the opportunity to observe traffic patterns, topology, throughput, etc., of a MANET “in the wild”
- In its first year, the MANIAC challenge focuses on cooperation in routing and packet forwarding
  - In its second year, we hope to look at the adaptations at the lower layers of the protocol stack

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How will it work? (1/2)

- Teams of two people (two laptops with 802.11 capabilities)
- Teams must run the MANIAC API and OLSR as the routing protocol
- Teams design and implement solutions for efficient forwarding decisions (and for detection of “free-riders”) in the MANET
- Organizers operate “reference nodes” in the MANET, responsible for generating traffic for each team and for monitoring the network

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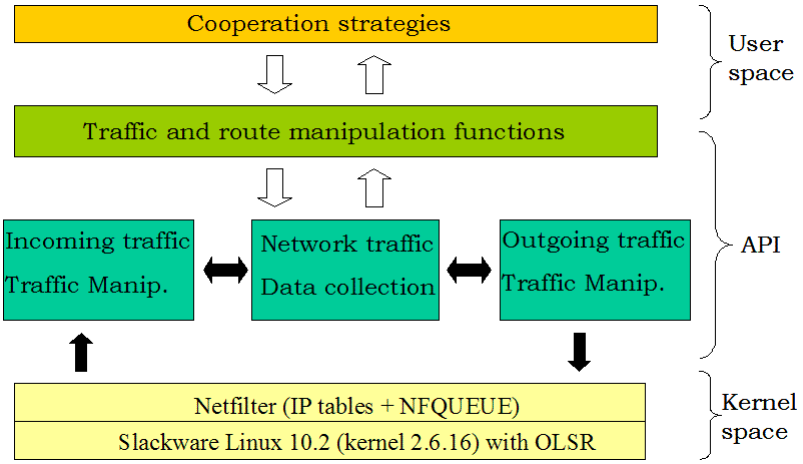
How will it work? (2/2)



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Who wins?

- A team's score is based on how many packets destined to the team are correctly delivered to the team (for real-time traffic, within a deadline)

  minus

  how many packets the team forwards for its opponents
- Winners are declared in two categories
  - Based on an objective score using the criterion above
  - Based on subjective assessment of solution by a panel of academic and industrial researchers

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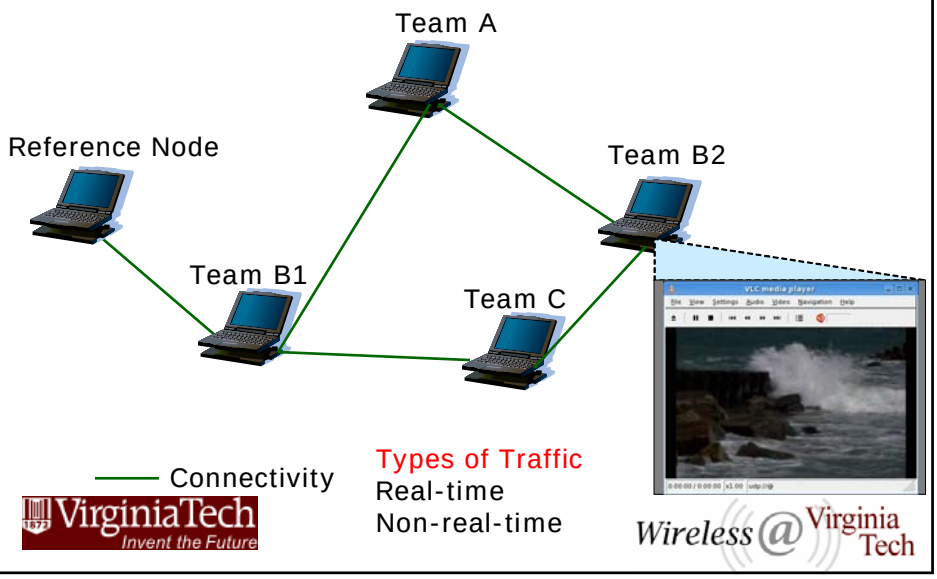
Example (1/2)



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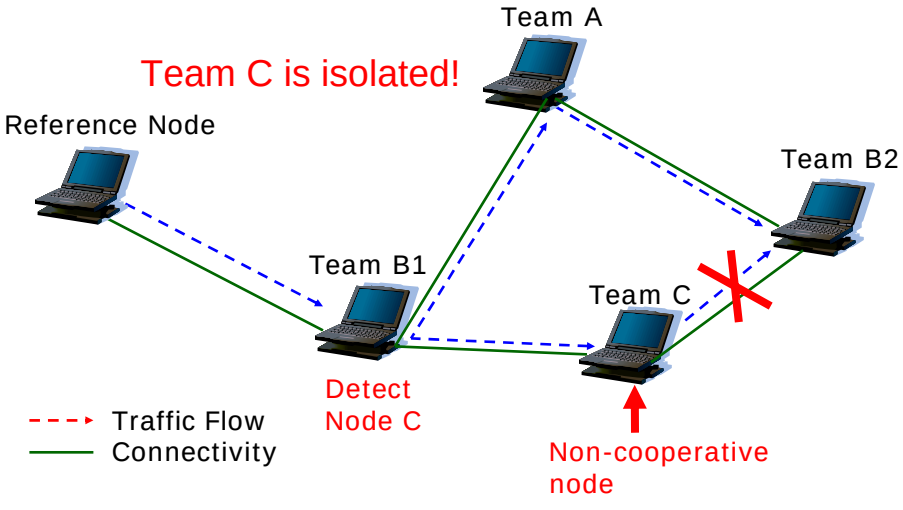
Example (2/2)



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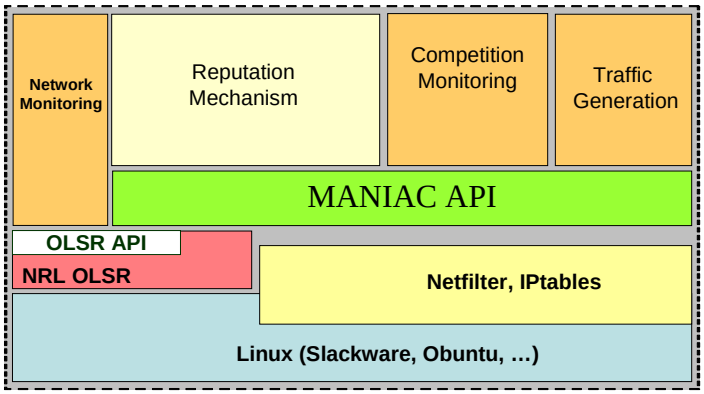
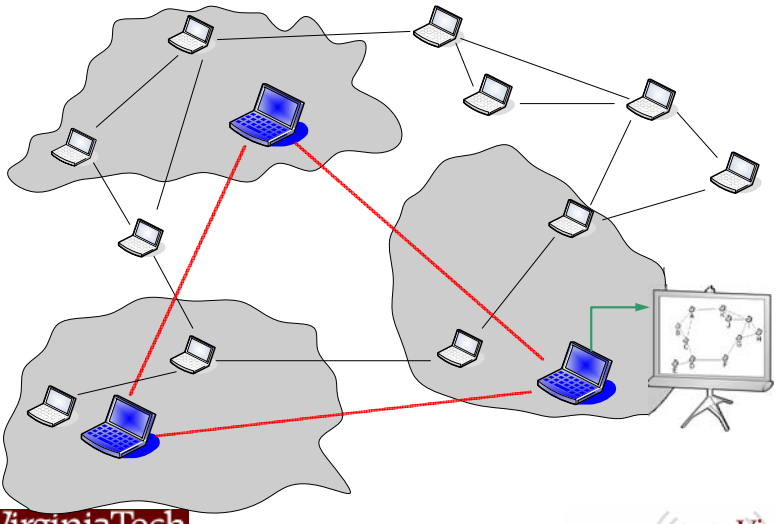
MANIAC API (1/2)



MANIAC API (2/2)

- The MANIAC API provides each team/node with the capability to:
  - Select, based on IP source/destination addresses, which packets to drop or forward
  - Redirect traffic through any of its one-hop neighbors
  - Obtain statistics indicating the effectiveness of its decision
- It also logs statistics used by the organizers in the calculation of the team's score

Monitoring the Competition



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Monitoring Software

- Implemented in Java, captures network traffic promiscuously by employing JPCAP packet capture tool.
- Analyzes two types of traffics :
  - OLSR HELLO and TC messages
  - TCP/UDP data packets
- Produces a picture of the topology and traffic and cooperation assessment.
- Presents the updated state of the network on the GUI in a dynamic manner

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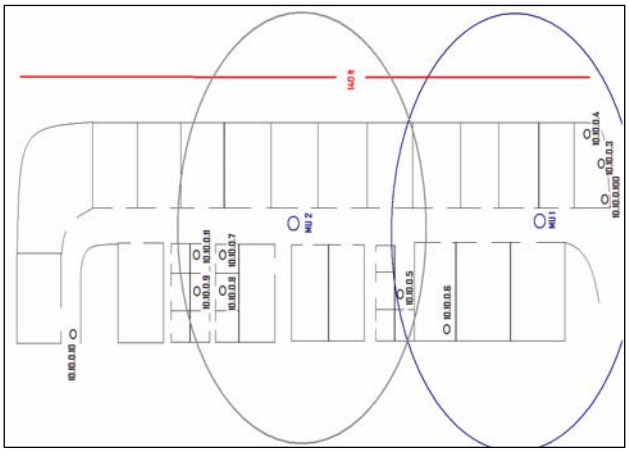
Monitoring Software Example



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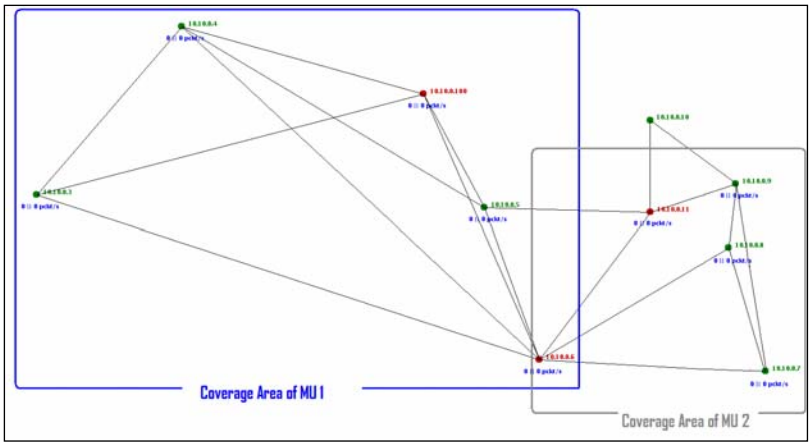
Monitoring Example: a picture of the topology



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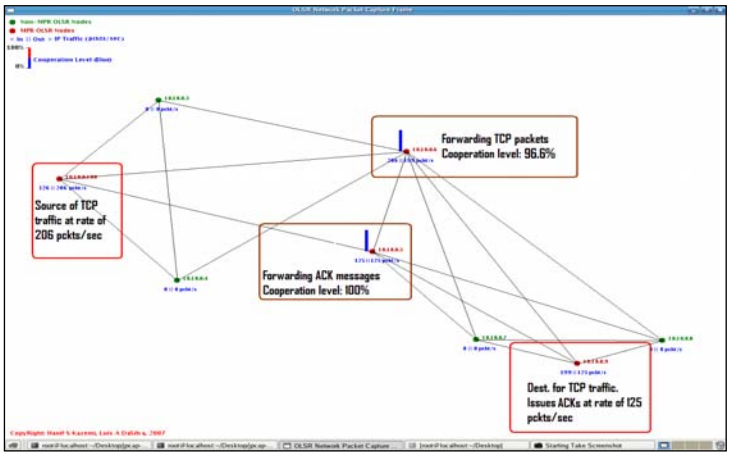
Monitoring Example: Traffic and Cooperation



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Logistics

- Competition will take place on November 25-26 in Washington, DC, co-located with Globecom 07
  - Experiment will primarily take place on the first day
  - Presentations by teams on the second day
- The winning team gets bragging rights and the satisfaction of a job well done…
  - Plus monetary awards provided by industrial sponsors
- We will provide student travel grants

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In conclusion…

- If you…
  - Are involved in experimental work in wireless networks, or
  - Are looking for a cool project to provide hands-on experience on ad hoc networks to undergraduate or graduate students, or
  - Have ideas on areas of synergy between MANIAC and a project you are involved in
- We would like to hear from you and hope to see you at Globecom in Washington, DC, in November

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Questions?

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