Simulating Challenges in \textit{ns-2} for Resilient Networks

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\url{www.ittc.ku.edu/resilinets}

- **Goal:** network resilience and survivability
  - understanding resilience of current networks
  - design of more resilient future networks
- **Challenges to normal operation include:**
  - large scale natural disasters
    - e.g. hurricanes, tsunami, floods, earthquakes
  - attacks from an intelligent adversary
- **Problem**
  - how to simulate these challenges … to improve network defenses and resistance

\section*{Challenge Model}

- Challenge over an area of network …
  - \(n\)-sided polygon: \((x_0,y_0), (x_1,y_1), \ldots (x_{n-1},y_{n-1})\)
  - circle with center at \((x_0,y_0)\) and radius \(r\)
  - ellipse foci at \((x_1,y_1), (x_2,y_2)\) & semi-axes \(a, b\)
  - … for a given time interval \((t_i, t_j)\)
- **Challenge types**
  - node or link down/out
  - wireless link attenuation or jamming
  - traffic attacks (DoS and DDoS)
  - type (e.g. wired/wireless)
  - class (e.g. important peering node)

\section*{Problem Statement}

- **Complex simulation scripts**
  - network topology
  - protocol and parameters
- **Simulating challenges**
  - manual and careful removal of links & nodes
  - \(c \times n\) simulation scripts for \(c\) challenges on \(n\) networks
- **New approach**
  - separate network model from challenges
  - generic challenge types and topologies … applied to various network structures
  - only \(c+n\) simulation input files

\section*{Implementation}

- **Inputs:**
  - challenge description \textit{.txt}
  - network infrastructure \textit{.tcl}
- **Generator** produces challenged \textit{ns-2} model
  - input to conventional \textit{ns-2} simulation run
  - generates trace to plot results

\textbf{Funding for this research provided in part by the National Science Foundation and the Fulbright Program 24 June 2008}