Mobile Wireless Networking
The University of Kansas EECS 882
Ad Hoc Routing in ns-3

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http://www.ittc.ku.edu/~jgps/courses/mwnets

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Ad Hoc Routing in ns-3

Outline

SR.1 Overview of MANETs in ns-3
SR.2 Ad hoc routing examples
SR.3 Laboratory assignment

24 October 2011
KU EECS 882 – Mobile Wireless Nets – Ad Hoc Routing
MWN-SR-2

– 1 –
Mobile Ad Hoc Networks

Overview

- MANETs are typically
  - wireless
  - mobile
  - little or no reliance on infrastructure
  - communication among peers
  - limited network resources
Network Layer

Services and Functions

- Network layer provides services to layer 4
- Link layer provides services to layer 3
- Network layer operates both HBH and E2E
- Network layer functions are:
  - forwarding
  - routing
  - signalling
  - addressing
  - traffic management
- In MANETs are all of these functions available?

Routing in ns-3

Routing Protocols for Wired Links

- Global centralized routing
  - based on shortest path first algorithm
  - only for wired links (PPP and CSMA)
    - wireless nodes can use, but does not consider medium effects
  - unicast
  - GlobalRouter interface in each node advertises LSA
  - each node has a routing table
- Nix-vector routing
  - intended for large topologies
  - targeted for simulations with wired links
Routing in ns-3

MANET Routing Protocols in ns-3

- AODV: ad-hoc on demand distance vector
  - based on RFC 3561
- DSDV: destination-sequenced distance vector
  - developed by Hemanth Narra and Yufei Cheng @ ResiliNets
- DSR: dynamic source routing
  - developed by Yufei Cheng @ ResiliNets
  - under review: http://codereview.appspot.com/4823051
- OLSR: optimised link state routing
  - mostly compliant with RFC 3626

Ad Hoc Routing in ns-3

Ad Hoc Routing Examples

SR.1 Overview of MANETs in ns-3
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Ad Hoc Routing Examples

Global Routing in ns-3

- Global centralized routing
  - by default added to node by InternetStackHelper
  - Ipv4GlobalRoutingHelper::PopulateRoutingTables();

Ad Hoc Routing Examples

OLSR in ns-3

- OLSR routing
  OlsrHelper olsr;
  Ipv4StaticRoutingHelper staticRouting;
  Ipv4ListRoutingHelper list;
  list.Add (staticRouting, 0);
  list.Add (olsr, 10);
  InternetStackHelper internet;
  internet.SetRoutingHelper (list);
  internet.Install (nodes);
Ad Hoc Routing Examples

AODV in ns-3

- AODV routing
  
  ```
  AodvHelper aodv;
  InternetStackHelper stack;
  stack.SetRoutingHelper (aodv);
  stack.Install (nodes);
 Ipv4AddressHelper address;
  address.SetBase ("10.0.0.0", "255.0.0.0");
  interfaces = address.Assign (devices);
  ```

Ad Hoc Routing in ns-3

Laboratory Assignment

SR.1 Overview of MANETs in ns-3
SR.2 Ad hoc routing examples
SR.3 Laboratory assignment
Ad Hoc Routing in ns-3
Assignment Configuration

- Only 4 STA nodes
  - in ad-hoc mode
- Default physical and channel characteristics
  - optional: add propagation and loss model of your choice
- Non-QoS MAC with default configuration
- CBR traffic
- IP address block of your choice
- Enable ASCII tracing
  - for all IPv4 interfaces (EnableAsciiIpv4All) and mobility

Assignment Configuration

- Mobility model to use GaussMarkovMobilityModel
  - with default values in 2D
    - only x and y coordinates
  - set initial positions randomly
- Routing: DSDV
  - with default values
- Submission deadline: 17 November 2011
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Extra Credit

- Using the same DSDV configuration, except:
  - use DSR routing protocol
- State steps on how to merge DSR from below page
  - http://codereview.appspot.com/4823051
  - into your local ns-3.12 directory
- Briefly contrast the two routing models...
- ... from a simulation point of view
  - advantages/disadvantages?
  - easiness/difficulty?
  - briefly compare in few sentences (open question)
  - answer it only if you are sending the DSR simulation model
    • will not grade pure theoretical answers

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Assignment Submission Guidelines

- Write 1–2 page summary
- Report should include the following sections:
  - experiment setup and procedure (topology, issues, etc.)
  - conclusions (what you learned, etc.)
- You can discuss with other students but ...
  ... everyone must submit individual report
- Attach .cc file along with your submission
- Send report in PDF to: GTA and cc: Dr. Sterbenz
Ad Hoc Routing in ns-3
EECS 882 Assignment Submission Guidelines

- Send only source files (.cc, .pl, .pdf, etc.)
  - this means no .zip, zipped, .tar files
  - no reason to send trace files
- **Always** to: GTA and **cc**: Dr. Sterbenz
- **Brownie points for identifying and fixing ns-3 bugs**
- ns-3 scripts will be graded based on
  - functionality
    - major grade will be deducted for errors!!!
    - warnings will reduce your grade as well
  - documentation
    - use sensible file names: e.g. lab1_ikus.cc

Ad Hoc Routing in ns-3
EECS 882 Commenting Guidelines

- Use comments as necessary:
  - Boilerplate... (optional)
  - //GNU release blah ...
  - /* File name: lab1_ikus.cc
  - Purpose: This is a sample script etc.
  - Author: Ima KU Student
  - Date: 24 October 2011
  - Version: 1 */
  - #include <
    >
- Use comments for block of codes:
  - // This is an example comment for a block of code
### Further Reading

- **Finish all tutorial chapters** (if you haven’t yet)

- **AODV API**

- **DSDV API**

- **OLSR API**

- **DSR code**
  - [http://codereview.appspot.com/4823851](http://codereview.appspot.com/4823851)

### Acknowledgements

Some material in these foils comes from the ns-3 tutorial presentations from conferences, workshops:

- **Tom Henderson**, *ns-3 tutorial*
  - **SIMUTools 2009**
  - [http://www.nsnam.org/tutorials.html](http://www.nsnam.org/tutorials.html)

- **Gustavo Carneiro**, *NS-3 Tutorial*
  - **RTCM 2009**
  - [http://telecom.inescporto.pt/~gjc/NS-3-RTCM.pdf](http://telecom.inescporto.pt/~gjc/NS-3-RTCM.pdf)

Ad Hoc Routing in ns-3
Other References

- C++ tutorials online
  - and many more links and books on the subject
- GDB
  - http://www.gnu.org/software/gdb/
- valgrind
  - http://valgrind.org/
- gnuplot
  - http://www.gnuplot.info/
- Python
  - http://www.python.org/