Routing in Networks of Varying Connectivity

Andrew Grundy
amg@cs.nott.ac.uk
http://cs.nott.ac.uk/~amg
B46b

Overview

• The Problem Domain
• Existing Solutions
• The Work
• The Evaluation
• Questions
The Problem Domain

Wired Networks

Wireless Networks

Wireless Ad-Hoc Networks

Mobile Wireless Ad-Hoc Networks
Mobile Ad-hoc NETwork (MANET)

Disconnected Mobile Wireless Ad-Hoc Networks
Disconnection Tolerant Network (DTN)

Mobile Ad-hoc NETwork (MANET)

• End-to-end connectivity is assumed
• Topology is not Fixed
• One-hop set (neighboring nodes) may change

Disconnection Tolerant Network (DTN)

• End-to-end connectivity is not assumed
• Topology is not Fixed
• One-hop set is likely to vary considerably over time
Existing Solutions

MANET Routing
Pro-active
Attempt to keep an up to date view of the entire network.
Re-active Source Routing
Acquire a route to a destination at the point you need to send them data.

DTN Forwarding
Wait
Hold onto a packet, until you become connected to the destination.

Restricted Flood
Beacon the packet hop by hop for the duration of the time to live.

Controlled Flood
Only forwarding to a subset of nodes, selected based on our experience forwarding packets to them.

Dynamic Source Routing (DSR)
Route Acquisition

Route Request

Route Request / Reply
Piggyback

Route Reply

Update Routing Table

RREQ / RREP

RREP / RREP
Dynamic Source Routing (DSR)
Route Failure

Send Data

Route Fail

The Work

Why Source Routing?

- Route Acquisition - Source Routing for Disconnected Environments

  What are the assumptions?

- Disconnection Tolerant Data Forwarding

  Why not TCP?

- Packet Scheduling / Duty Cycling

  Why is this needed?
Route Acquisition Over Time

Route Acquisition - Acknowledgement

A

RREQ

Update Knowledge

Update Routing Table

RREP

Update Knowledge

C

RQAK

Route To B?

Route To A?

B

RPAK

Update Knowledge

Update Routing Table

RPAK / RQAK

RREQ / RREP

Forward

ID: 1
Route: A

ID: 1
Route: A

ID: 1
Route: A

ID: 1
Route: A

ID: 1
Route: A

ID: 1
Route: A

ID: 1
Route: A

ID: 1
Route: A

ID: 1
Route: A

ID: 1
Route: A
Disconnection Tolerant Data Forwarding

Receive Packet

Forward Packet

Resend Packet

On Fail

TTL > 0

Send Route Failure Packet

Pass Packet To Application Level

Drop Packet

We Are Destination

We Are Source

We Are On Route

Send Route Failure Packet

Packet Scheduling / Duty Cycling

Day 1

Day 2

Day 3

On

OFF
The Evaluation

Average Delay (Seconds)  Success Ratio (%)

- DSR & Zigbee
- DSR & 802.11
- DSRR & Zigbee
- DSRR & 802.11
The Evaluation

802.11

Routing Packet Count

Data Packet Count

Zigbee

Routing Packet Count

Data Packet Count
Questions?