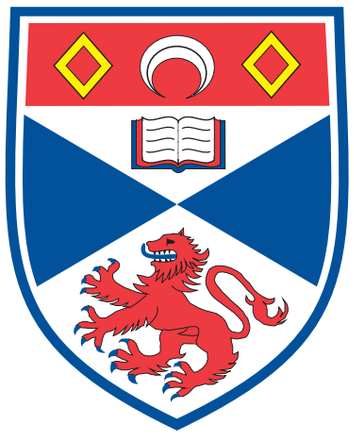
Social Information for Delay-Tolerant Network Routing

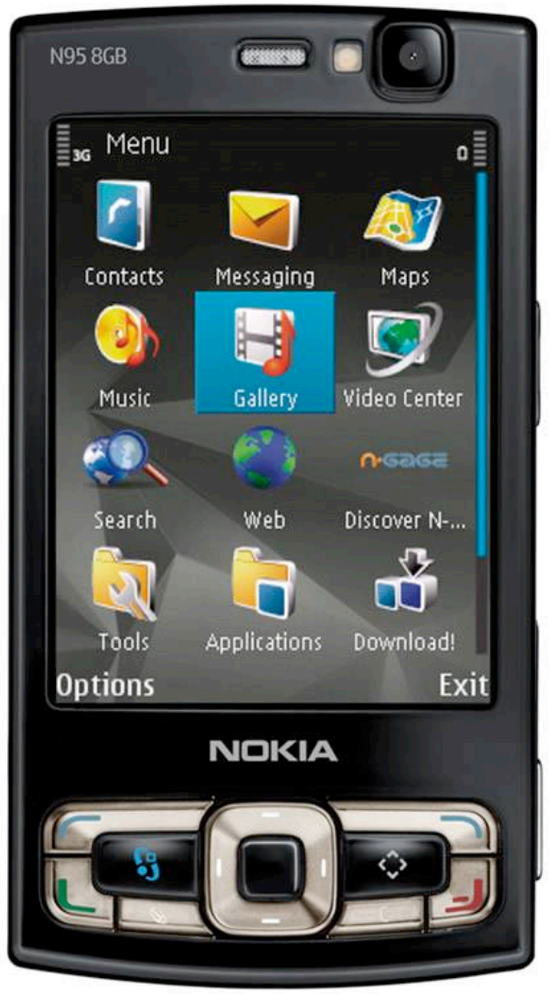
Greg Bigwood
School of Computer Science
University of St Andrews
gjb@cs.st-andrews.ac.uk
www.cs.st-andrews.ac.uk/~gjb



University
of
St Andrews

Mobile DTNs

- Ad hoc
- Episodic connectivity
- High delay
- Traditional TCP/IP does not cope
- Small wireless mobile devices
- Store-and-forward architecture
- Constrained power

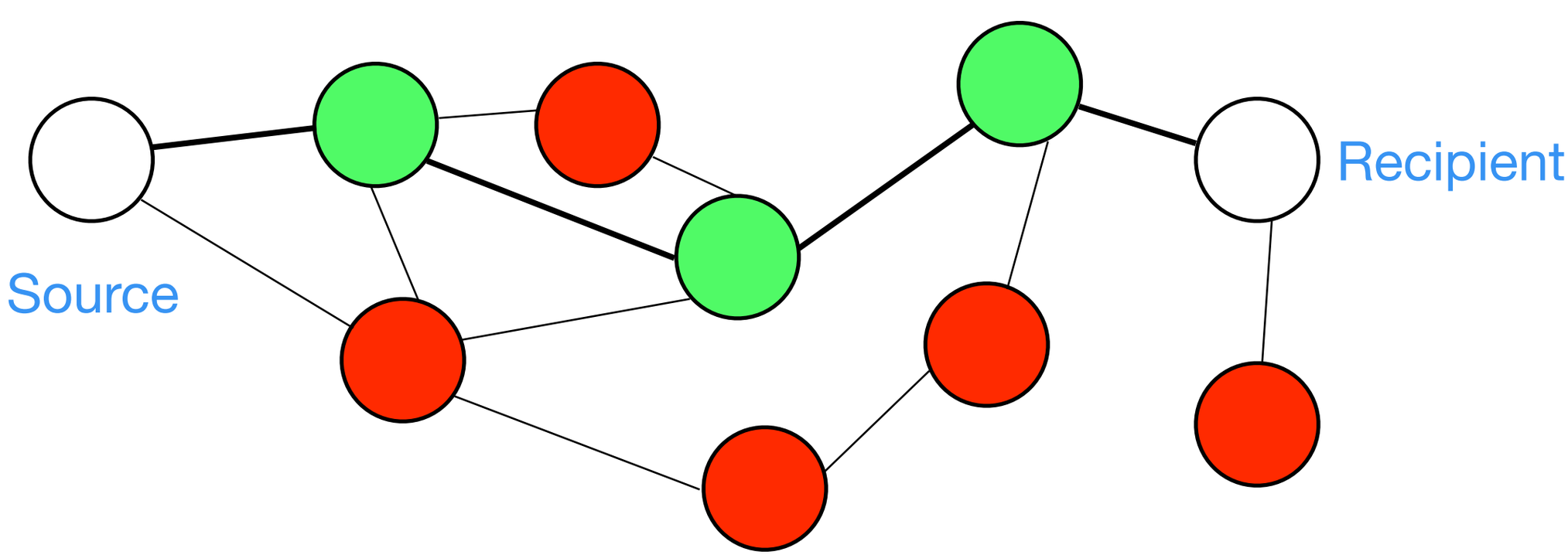


Social networks for DTN routing

- Discover topology as they are ad hoc
- People encounter many different individuals throughout the day
- Exploiting the social links individuals have in order to aid routing
- Can we use social networks to improve DTN performance?

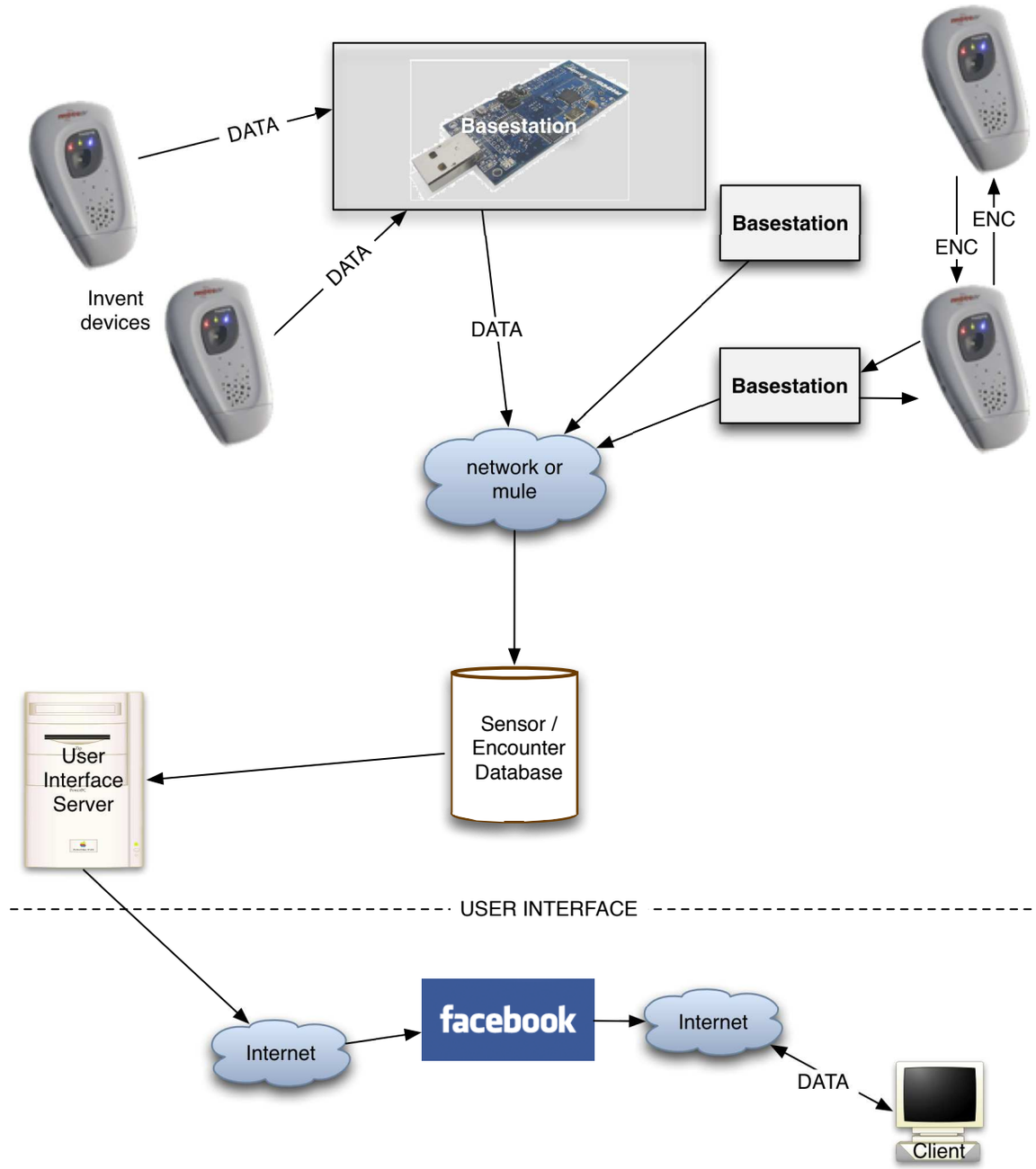
Using Social Networks for DTN routing

- Obtain list of users social contacts
- Only forward messages via these individuals
- More efficient than flooding?



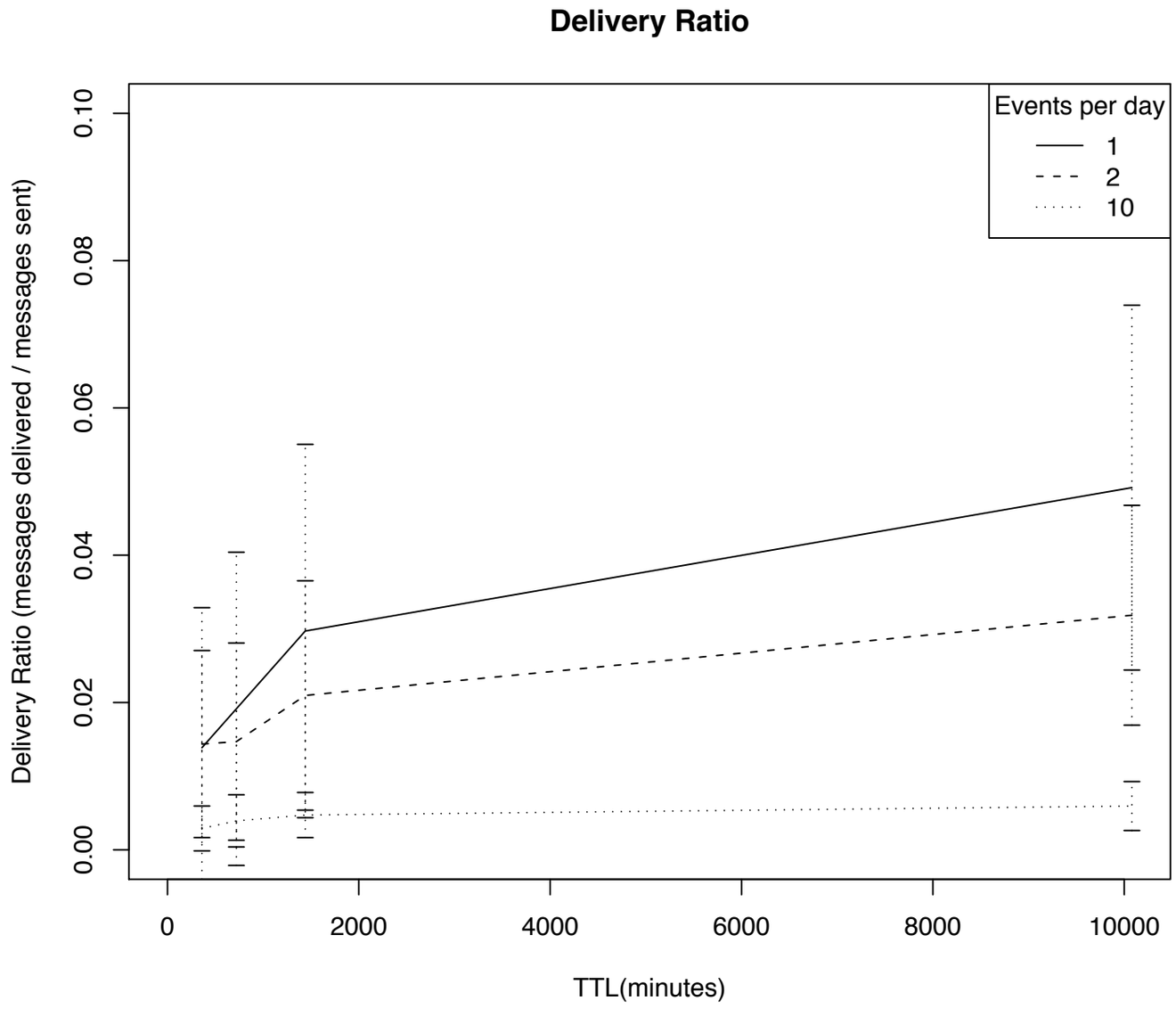
Experiment

- Explore social network routing
- Collected records from 25 users for 80 days
- Records: node seen, timing and RSSI
- 112,292 encounters
- Trace-driven simulation of message passing app



Results

- Results for one month
- Records were sparse
- Low delivery ratio
- Standard deviation overlaps

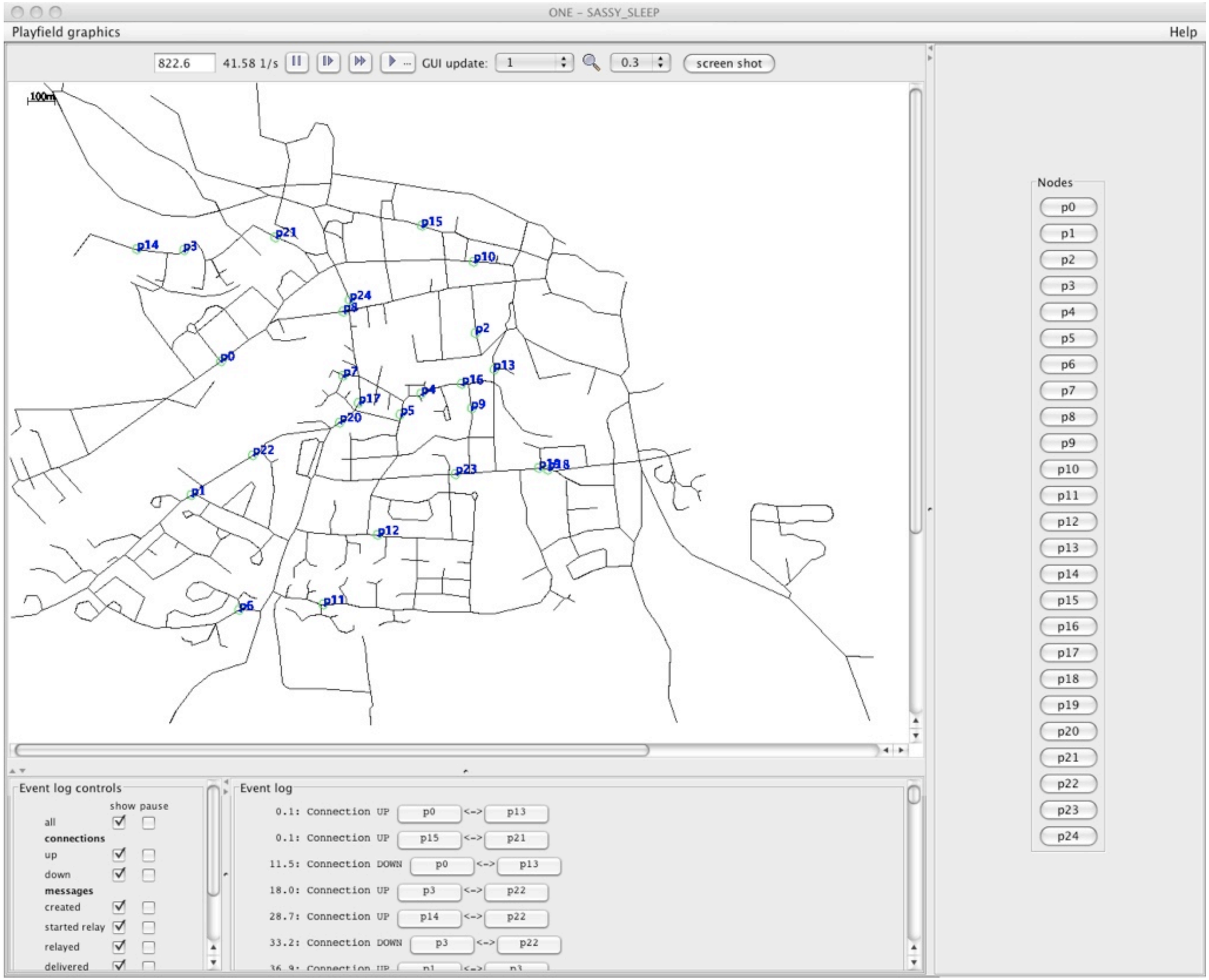


Challenges

- Tmote Invent hardware not fully supported by TinyOS2
- Small memory (48KB)
- Event-based programming in NesC
- Battery life around 12 hours
- Short range: 12-16m
- Difficult to encourage participants to carry motes at all times

Mobility Simulation

- “Filling in” gaps in sensor data
- Simulate user movement with mobility model
- Random waypoint model, constrained to roads
- Nodes must be at locations when their real world counterparts were
- Second simulation with sleep cycle
- Simulate message passing application
- Working on these in the future


ONE - SASSY_SLEEP
Playfield graphics
Help
822.6
41.58 1/s
GUI update:
1
0.3
screen shot
100m
p14
p3
p21
p15
p10
p24
p8
p2
p0
p7
p13
p16
p4
p17
p5
p9
p20
p22
p23
p18
p1
p12
p6
p11
Nodes
p0
p1
p2
p3
p4
p5
p6
p7
p8
p9
p10
p11
p12
p13
p14
p15
p16
p17
p18
p19
p20
p21
p22
p23
p24
Event log controls
show pause
all
connections
up
down
messages
created
started relay
relayed
delivered
Event log
0.1: Connection UP p0 <-> p13
0.1: Connection UP p15 <-> p21
11.5: Connection DOWN p0 <-> p13
18.0: Connection UP p3 <-> p22
28.7: Connection UP p14 <-> p22
33.2: Connection DOWN p3 <-> p22

Conclusions and Future work

- There are challenges to DTN creation
- Can result in sparse dataset
- Sensible hardware doesn’t always lead to sensible results
- Getting the users involved is more important
- Adding mobility to sims
- Would like to analyse other data sets