Android MANET testbed

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Introduction

- We live in a era of increasing number of mobile devices
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- A lot of time cellular connection is not available
  - Emergency scenarios
  - Remote areas
  - …
MANET

- Mobile Ad-hoc Network
- Group of nodes, equal between them
- No centralized coordinator
- (Optionally) Routing capabilities per node, extending the network
- Difficult to test in a real scenario
  - Mobility
  - Repeatable network configuration
  - Collect logs
Mobile devices

- Open-Source operative system
  - Android
- Big range of devices to choose from
  - Some of them with GPS
- Linux like environment to execute scripts
Make Android devices suitable for MANET research
WiFi 802.11 IBSS in Android

- No API to configure this type of networks
- No API to configure IP addresses
  - Removed in 4.0
- No routing protocol
- Some drivers don’t support them
Developed solution

Structure

NetConfig
- Edit
- Start | Stop
- Manage Interface
- Setup Network
- Setup Network Parameters

Routing
- Reload routing protocols
- List protocols
- Start | stop

Tools
- Ping
- Traceroute
- Get known routes
- GPS trace
Developed solution

- Smart defaults
  - IP address and network from auto-configuration space
- Option to edit network parameters
- One click start/stop
Developed solution

- Support for multiple routing protocols
  - Loadable from SD Card
  - Scripts to start/stop
  - Parameter settings
Developed solution

- Tools for evaluate the network
  - Get route table
  - Ping other devices
  - Traceroute
  - Log position
Tests

SH-AP

SH-IBSS

MH-IBSS
Tests

Discharge rate with traffic sent from A to C at maximum rate (54Mbps)
Tests
Throughput received, traffic sent at maximum rate (54Mbps)
Tests

RTT

SH-AP

SH-IBSS

MH-IBSS

RTT (ms)

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Problems

- Needs root access
  - Insecure

- Range of supported devices
  - Most of chipsets don’t correctly support IBSS networks
  - Tested working:
    - Google Nexus S
    - Samsung Galaxy Tab 10.1
  - Tested not working:
    - Google Nexus 4
    - Google Nexus 5
    - Motorola Moto G (2013)
What’s next

- WiFi 802.11s
  - Mesh at MAC layer
  - Path discovery protocol included
    - But can be replaced 😊

- Problems
  - Drivers/chipset support
    - Overcome with mac80211
What’s next

• WiFi 802.11s
  • Tested with mac80211 in Google Nexus 4
    • How to: http://static.pt/androidmesh/
  • But a bit problematic:
    • Needs custom kernel compiled
    • Open-source driver
      • Not well developed and supported
Questions?