Enhanced Mobility Management in Wireless Mesh Networks

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JDIR 2008
Outline

- Introduction
- Mobility Management in Mesh Networks
- Enhanced Mobility Management (EMM)
- MeshDV vs EMM
- Conclusion
Mobility Wireless Mesh Networks

- Detect Clients movement
- Keep alive established connections
- No software installation
MeshDVNet — MeshDVNet architecture:

- Soekris net4521 box
- Based on Linux (Crux)
- IPv6 – only
- MeshDV software:
  - Python modules
  - Click software
- Iperf tool
MeshDVNet — Mobility Management (problem 1)

But where is PcB?
MeshDVNet – Mobility Management (problem 1)

Reason: NDP cache not refreshed
MeshDVNet — Mobility Management (problem 2)

REQUEST

But where is PcB?

MCREQ

CRREP

REQUEST

REPLY

MCREQ: Multicast Client REquest

CRREP: Client Request REply

PcA

PcB

BOX 01

BOX 05

BOX 09
MeshDVNet — Mobility Management (problem 2)

But where is PcA?

MeshDVNet – Mobility Management (problem 2)
MeshDVNet — Mobility Management (problem 2)

Reason: wireless card driver timeout
MeshDVNet — Problems’ cause

• Cause 1:
  – NDP cache is not refreshed instantaneously

• Cause 2:
  – MeshDV is based on wireless card driver detection (3 minutes timeout)
Enhanced Mobility Management (EMM)

- All routers use the same address called Common IP (CIP)
- Client NDP “cookies”
  - Cookie=(CIP, Mac)
- Uses UNA packet (Unsolicited Neighbor Advertisement) [RFC 2461]
EMM — EMM Overview

Send TCP Packets to PcB

But where is PcB?

CREQ CRREP

BOX 01

CIP

UNA(MAC1, CIP)

Send TCP Packets to PcB

CIP

CIP - MAC1

TCP Request 1

ACK 1

TCP Request 2

ACK 2

TCP Request 3

ACK 3

CIP

CIP - MAC5

UNA(MAC5, CIP)

Reply to (CIP, MAC1)

CERR (PcA is not here)

CREQ

CRREP

BOX 05

NS PcA (addr src == CIP)

ACK 3

PcA

PcB

CREQ

CRREP

CWIT (PcA has moved)

EMM – EMM Overview

CERR (PcA is not here)

CREQ

CRREP

CWIT (PcA has moved)

EMM – EMM Overview

CERR (PcA is not here)

CREQ

CRREP

CWIT (PcA has moved)
EMM – EMM performance (UDP)
EMM – EMM performance (TCP)

Traffic behavior when TCP server moves

Throughput (Kbits/sec)

Time (sec)

180 200

36 seconds

Timeout

RTO

2RTO

4RTO

Timeout

Timeout

Timeout
EMM – Resuming the results

Disconnection Time (sec)

- PING -
- TCP -
- UDP -

Sender moves
Receiver moves
Server moves
Client moves
Server moves
Client moves

~3s
~40s
<1s
Conclusion

- Enhanced Mobility Management (EMM)
  - Based on NDP cache cookies
  - Important improvement:
    - 80% gain for TCP
    - 99.5% gain for UDP

- Future Work:
  - Sub-seconds analysis
  - DHT based lookup
Thank you for your attention