Implementation of our Multipath DYMO Routing

draft-park-manet-multipath-analysis-scenarios-02

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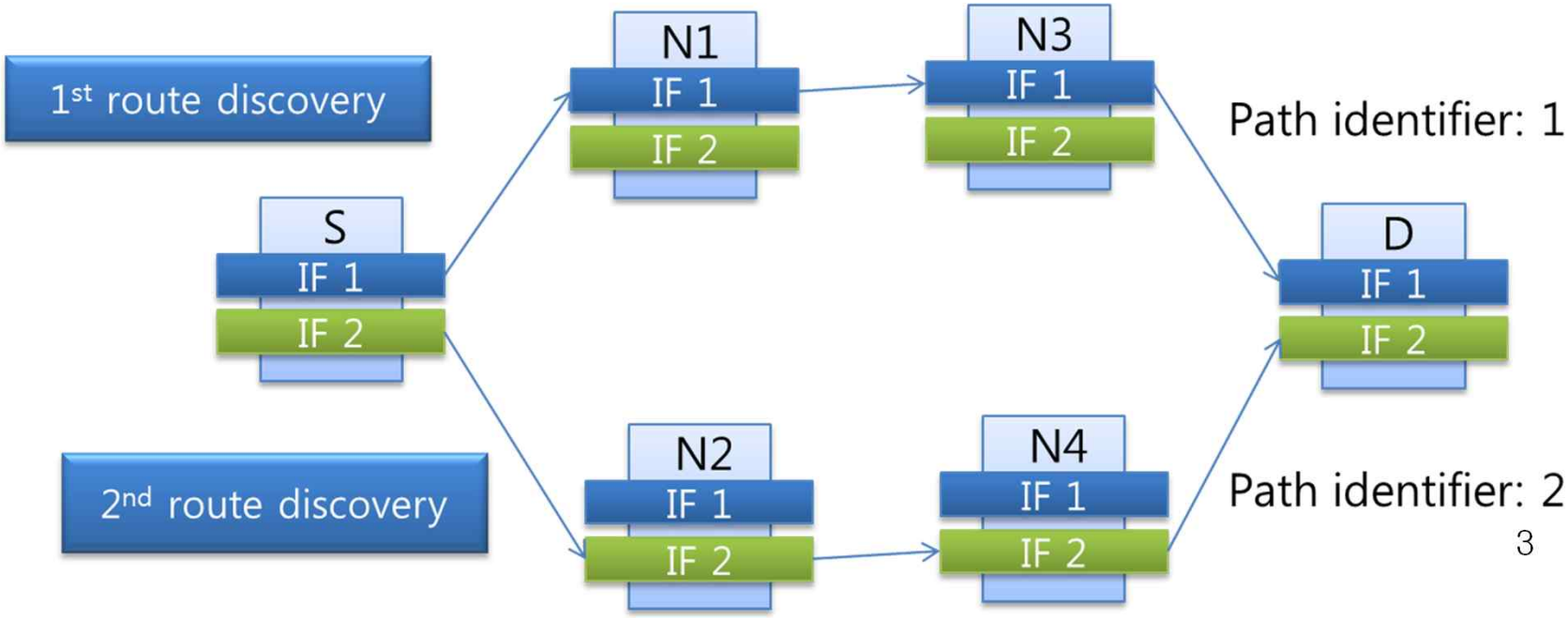
Motivation

- Recently, mobile stations can be easily equipped with homogeneous or heterogeneous multiple radio interfaces.
- Single path routing protocols have the limitations for using multiple radio resources.
- Route discovery for multiple routes and concurrent packet transmissions can achieve higher utilization of multiple radio resources.

Our Approach

- In order to improve the end-to-end throughput, paths which can maximize the utilization of channels and interfaces are selected.
- Find interface-disjoint paths (Multipath DYMO)



Multiple Path Discovery

- Find two interface-disjoint paths
  - Paths do not share the same interface.
- Perform DYMO route discovery twice or more
  - In order to identify multiple paths, path-identifier (path-ID) is used.
  - Path Identifier
    - Identify multiple routes to the same dst
    - When finding multiple routes, the src does not increase sequence number, but increase path ID.

Packet Forwarding

- Packet transmission policy
  - The source node should be scheduled to forward packets by considering traffic loads of multiple paths.

Link/Path Selection

- Ad hoc networks usually use the hop count as routing metric.
  - high-quality routes may not be found.
- Various link/path metrics can be used when selecting links/paths, such as ETT, ETX and WCETT.
- Design factors of Link/path metrics
  - Hop count, Link quality, Channel diversity, Interference, Traffic load, and so on.

Simulation Parameters

- Simulation tool : NS2 (ns2-2.34)
- Routing Protocol : DYMO, Multipath DYMO
- Network Topology : 3x3 Grid
- Mobility : None
- Applications : CBR (Constant Bit Rate)
- MAC : IEEE 802.11a
- Number of radio interface : 1 ~ 4 (per node)

Performance: Throughput

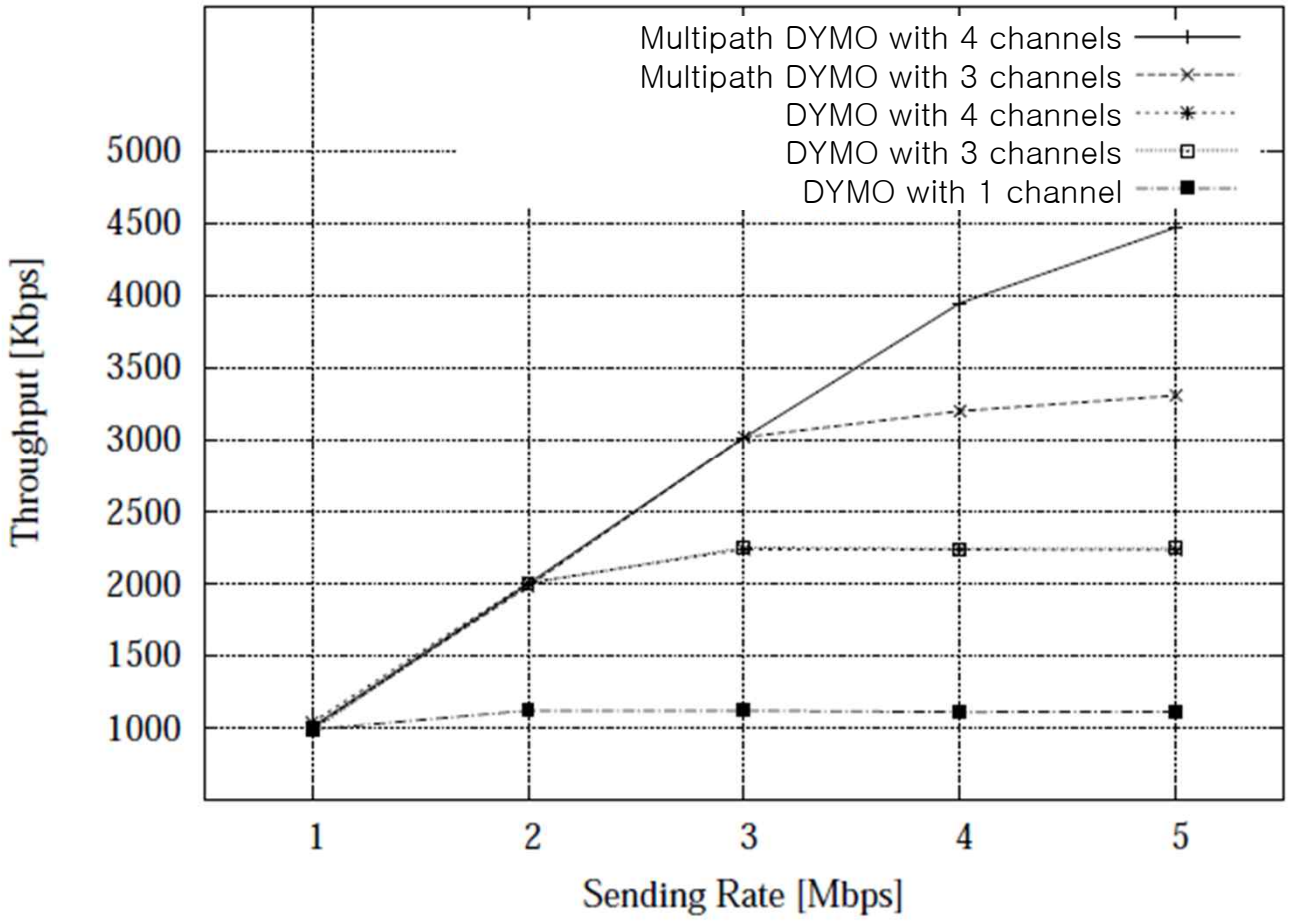


Fig. Comparison of throughput

Performance: E2E Packet Delay

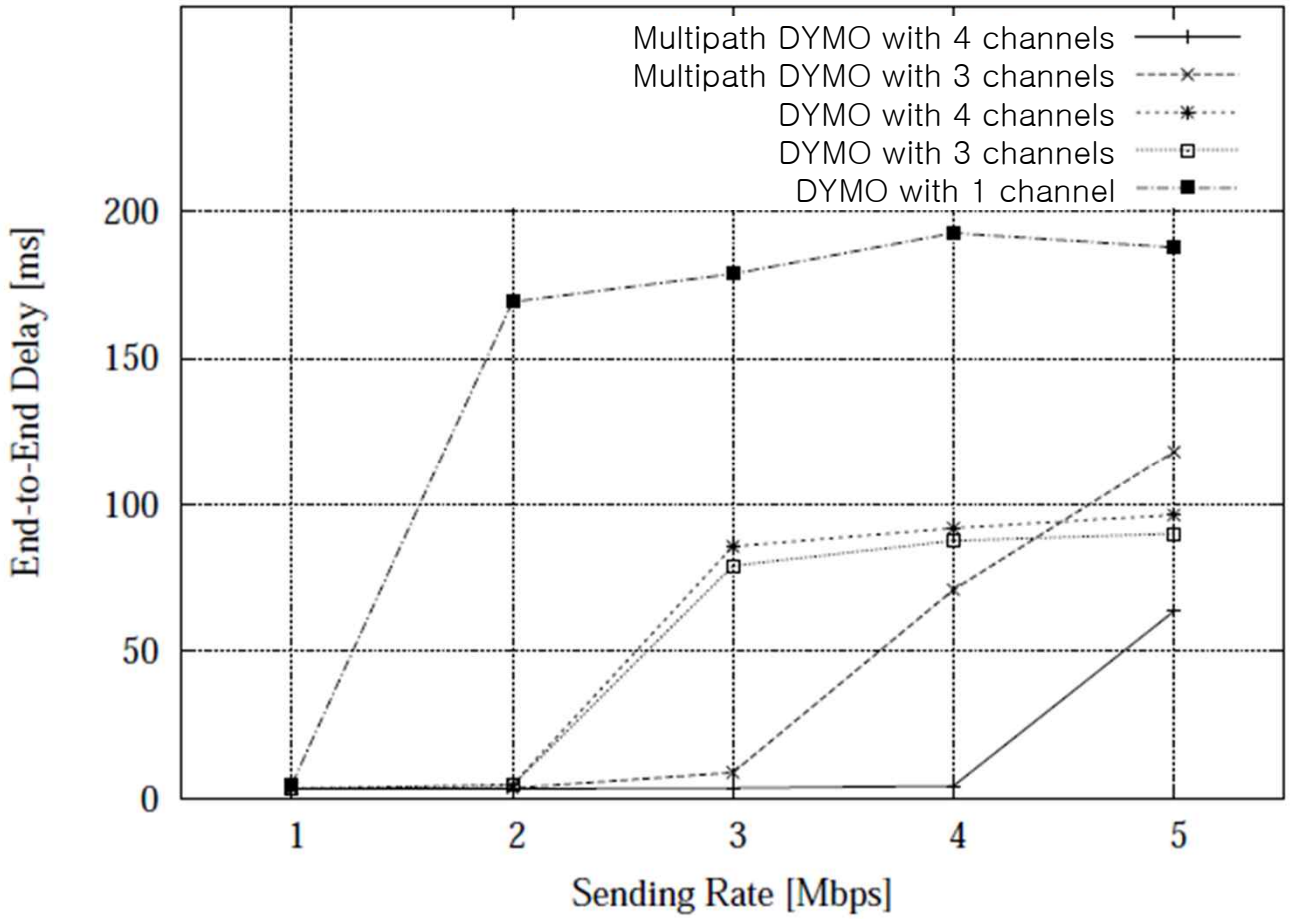
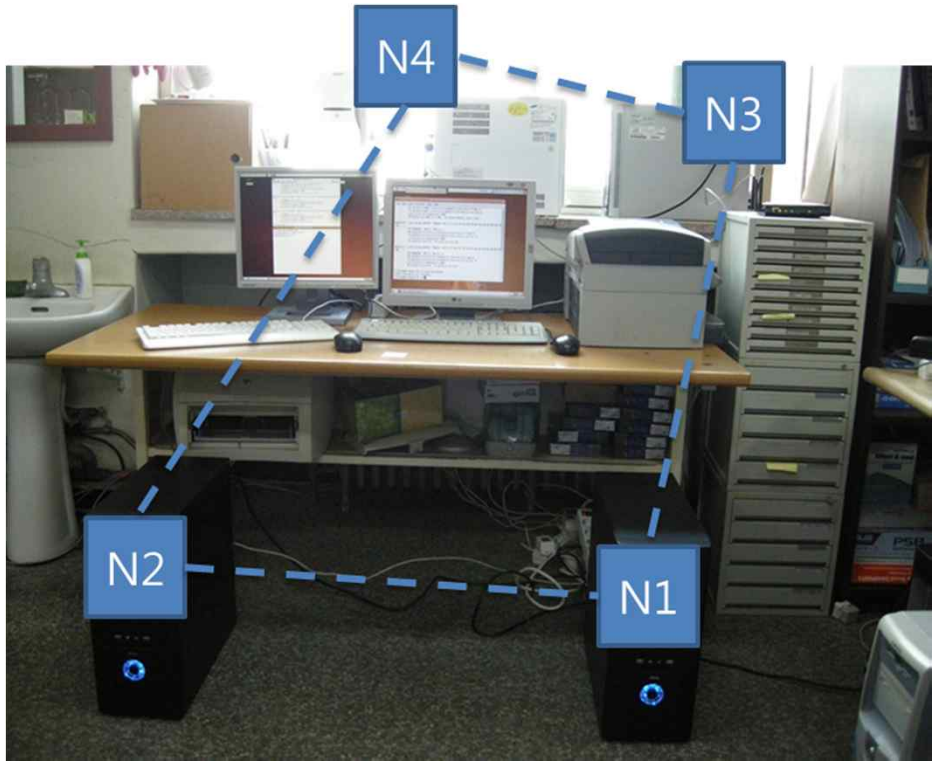


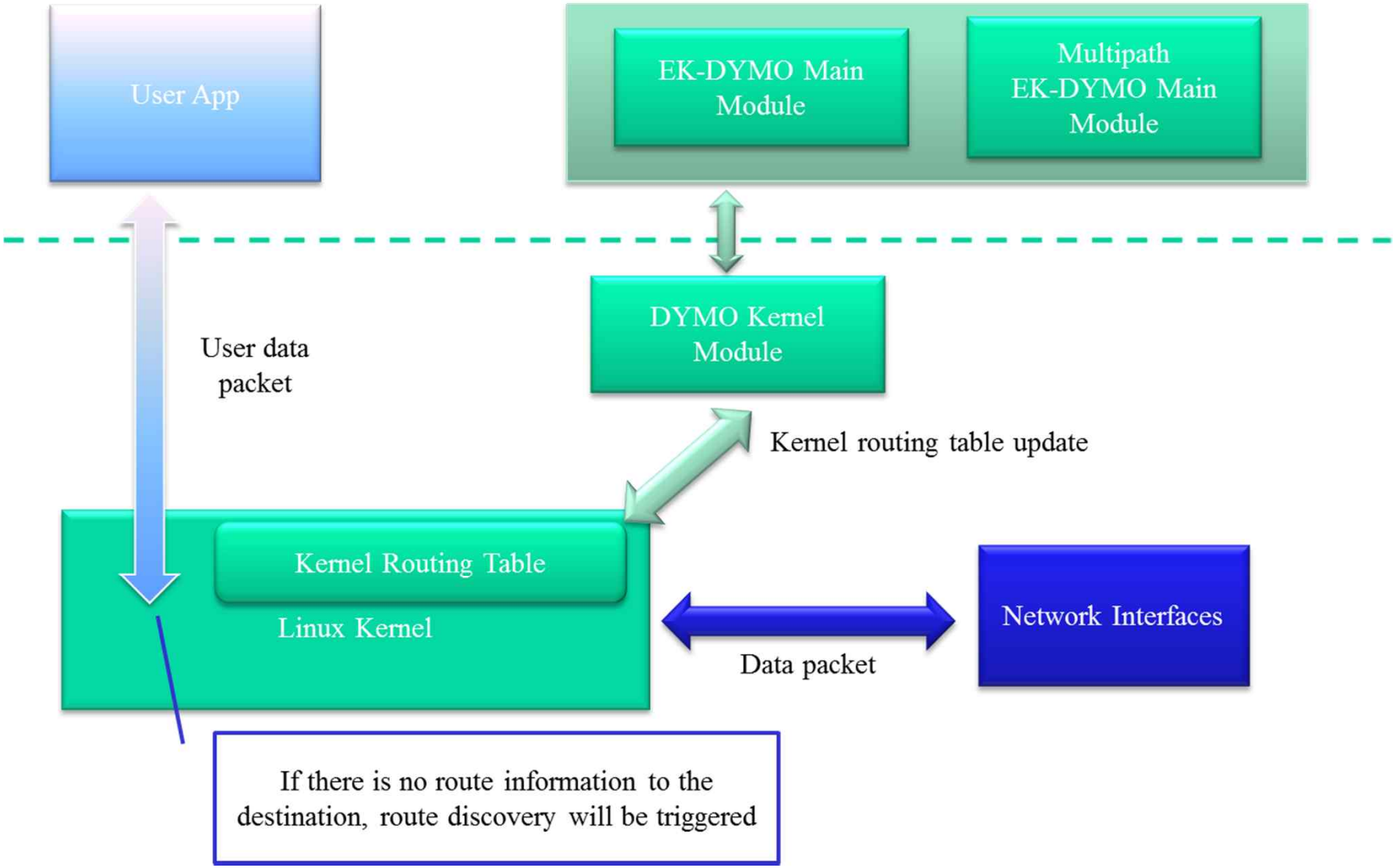
Fig. Comparison of end-to-end packet delay

Implementation (1/2)

- 4 nodes with 2 radio interfaces per each node
- Multipath DYMO is developed based on the EK-DYMO implementation.



Implementation (2/2)



Ping Test

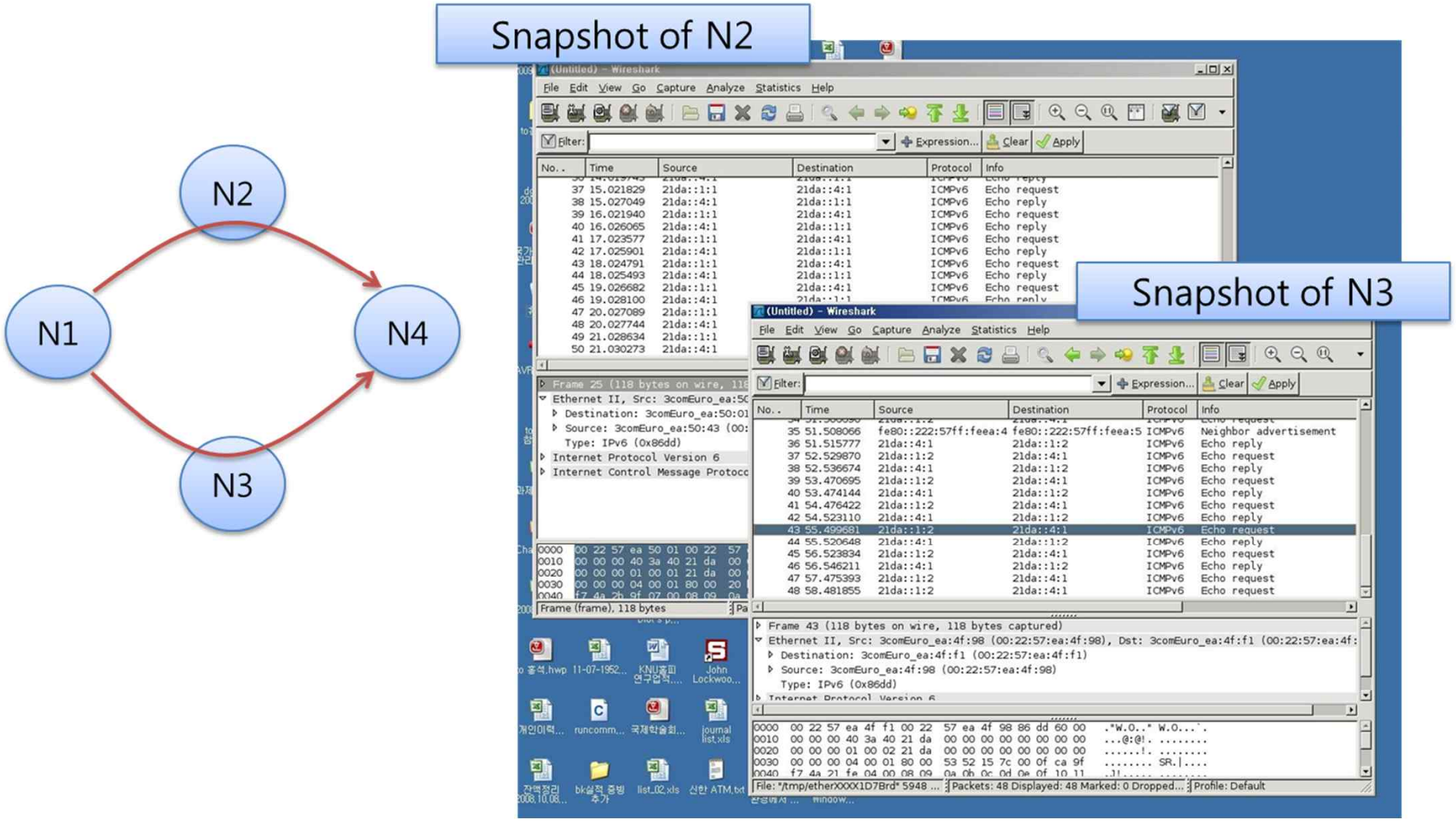


Fig. Snapshot of packet transmissions of N2 and N3 using Wireshark

Future Works

- Our future works
  - L2 routing in Mesh network,
  - IoT/M2M routing, …
- In WG
  - What is next step ?