Dynamic Index NAT as a Mobility Solution in OMNeT++

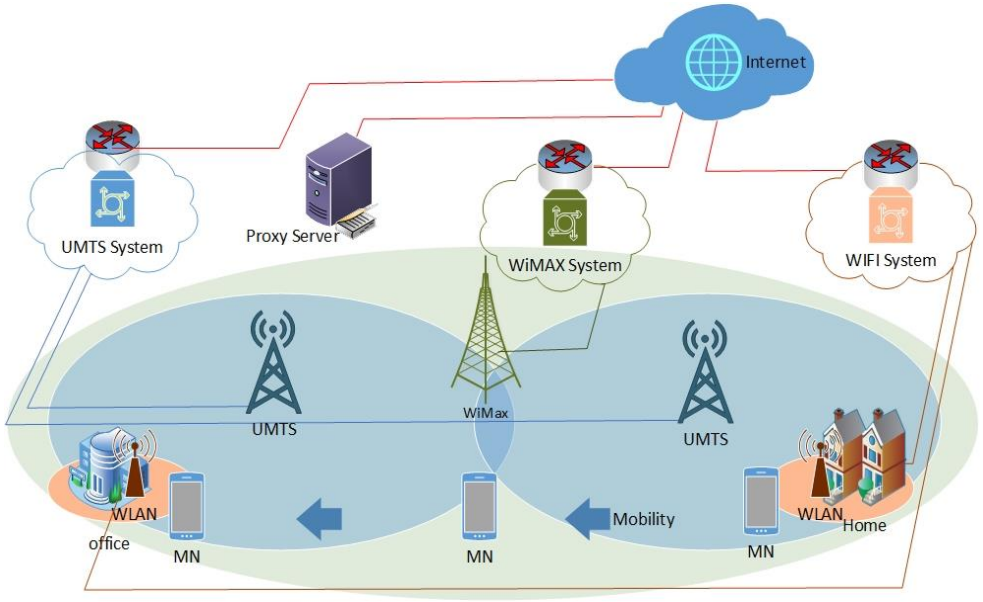
Atheer Al-Rubaye, Jochen Seitz
Communication Networks Group
Technische Universität Ilmenau

Outline

- Motivation and Goals
- Objectives
- Modules and Scheme
- Mobility Solutions
- Address Resolution
- Simulations
- Conclusion

Motivation

- Coexistence of hetero. Networks: WLAN, WiMAX, UMTS…
- Applications and usage scenarios: Internet anywhere anytime.
- User preferences.
- Data offloading.



Goals

- Ubiquities environment:

  mobile and stationary nodes may want to handover.
- Seamless VHO with QoS consideration.

Objectives

In VHO, just installing multiple interfaces is not enough. Further required objectives:

1.Gathering of information:

- Locally measured, broadcasted and user input.

2.Decision making:

- Simple robust multi-criteria: AHP.

3.Management of interfaces.

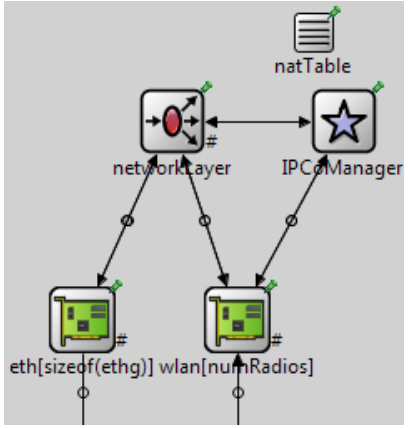
4.Address resolution:

- Heterogeneous networks; different subnets ⇨ handover means a new IP address.
- Session interruption because packets are still destined to the old IP address.

Modules and scheme

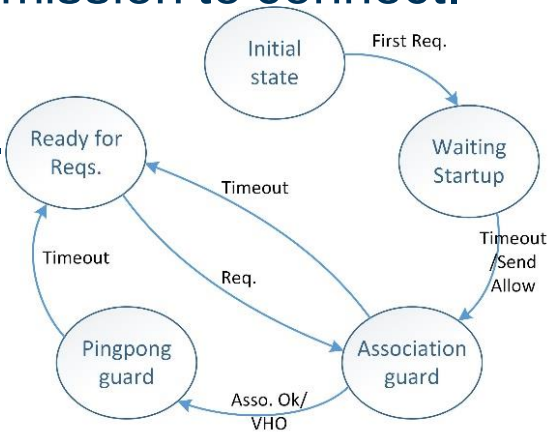
Modules implemented in INET:

- `IPCoManager`: a cross-layer module.
- `AHP`: a decision algorithm.
- `VHOController`: for management of intf.
- `NatTable`: performs NAT in gateway.



VHO Process:

- Interfaces gather info. and send requests for permission to connect.
- Initial request, Association, Ping Pong and Dual timers are set in the `VHOController`.
- Permission is granted if approved by `AHP`.
- Switch connection to selected interface.
- **DINAT** procedure.

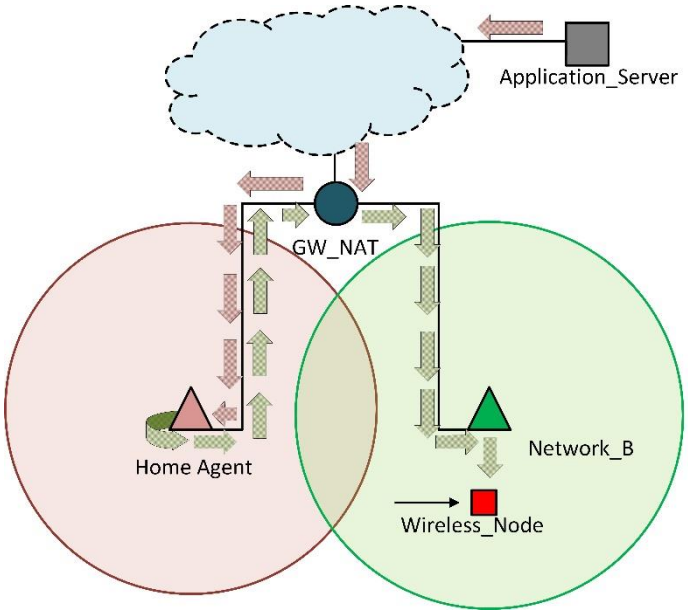


Mobility Solutions

Related to addressing issue:

- MIPv4
- MIPv6
  - Delay during tunnel establishment.
  - Nonoptimal routing through the home agent.

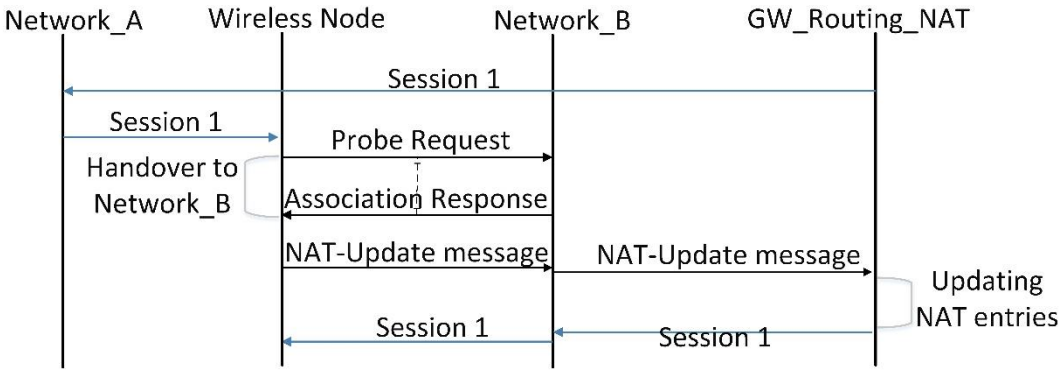
- Extensions PMIPv6, HMIPv6,..
  - IPv6 addresses still not dominant.
  - Private IPv4 address is a de facto.
  - Support of mobility extension is required.
  - Does not support soft handover.

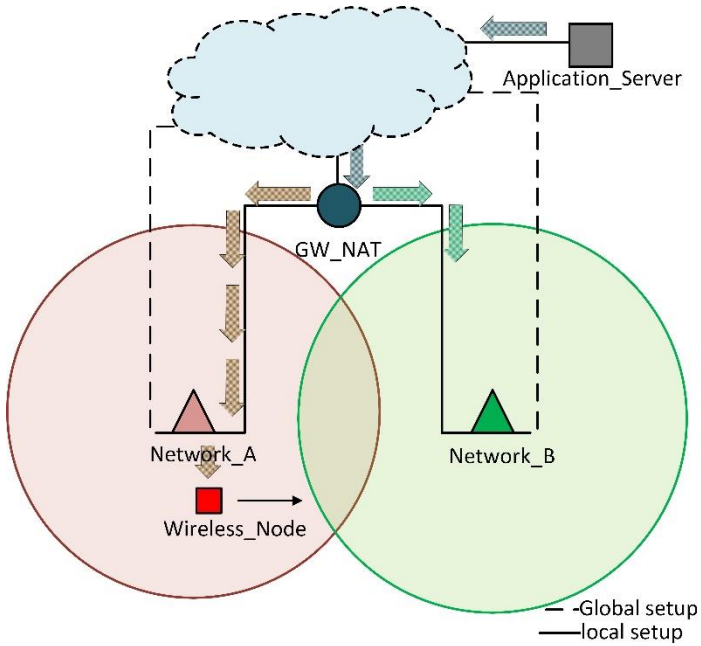


Address Resolution

Dynamic index NAT (DINAT):

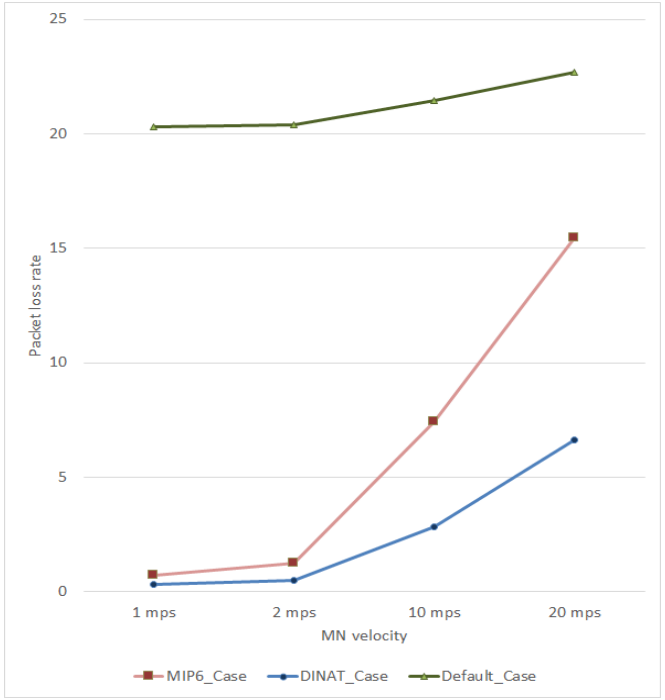
- Proxy/NAT server for address resolution.
- Loosely coupling, but restricted use case.
- NAT update (NU) msg. at handover.
- Packets are re-directed to the new point of attachment.



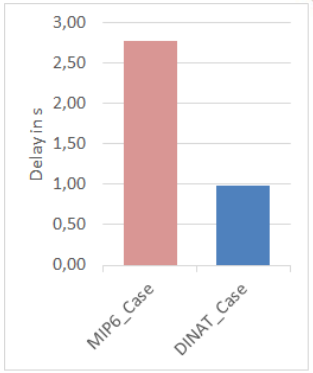


Simulations

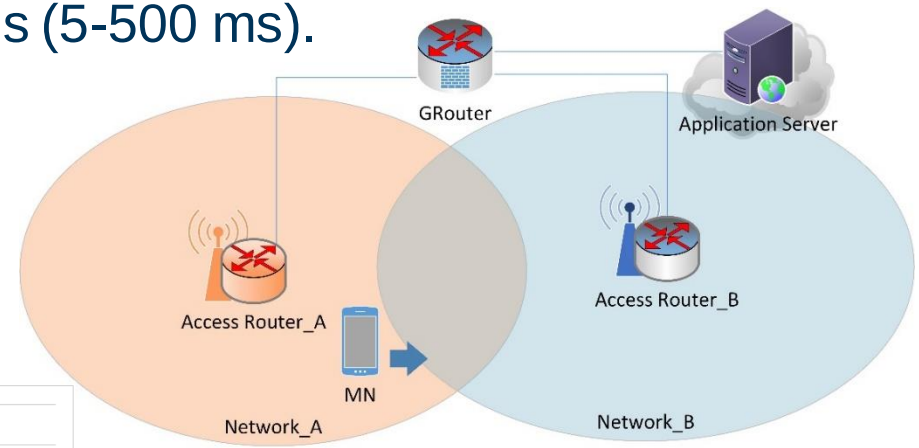
- Single wireless interface. `AHP` and `VHOController` are not included.
- Linear mobility with constant speed (1-20 mps).
- Video stream with sending intervals (5-500 ms).



Packet loss rate at the application layer



Delay due to VHO at the application layer



Conclusion

- Enhanced performance.
- A solution for private IPv4 addresses.
- No modification needed beyond the local network.
- However, uncommon coupling setup.

Future work:

- DINAT server in the global network.
- Hierarchical design.
- Feasibility and performance of `VHOController` and `AHP` in VHO.
- Performance with load of users and traffic.
- Realistic mobility scenarios.

Thank you

Q?