MIRON

MIPv6 Route Optimization for NEMO

Carlos J. Bernardos <cjbc@it.uc3m.es>
Marcelo Bagnulo <marcelo@it.uc3m.es>
María Calderón <maria@it.uc3m.es>

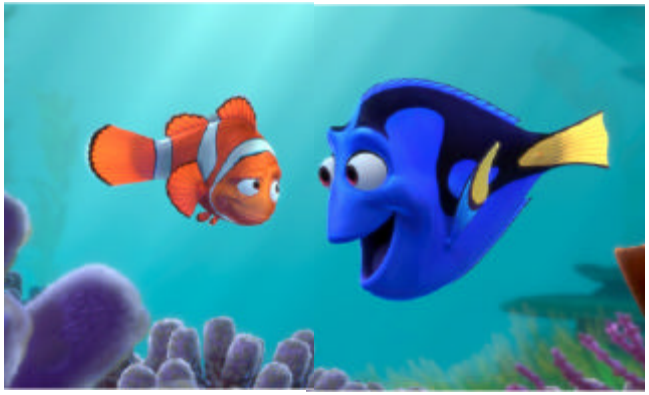
University Carlos III of Madrid - Spain

2004-08-11

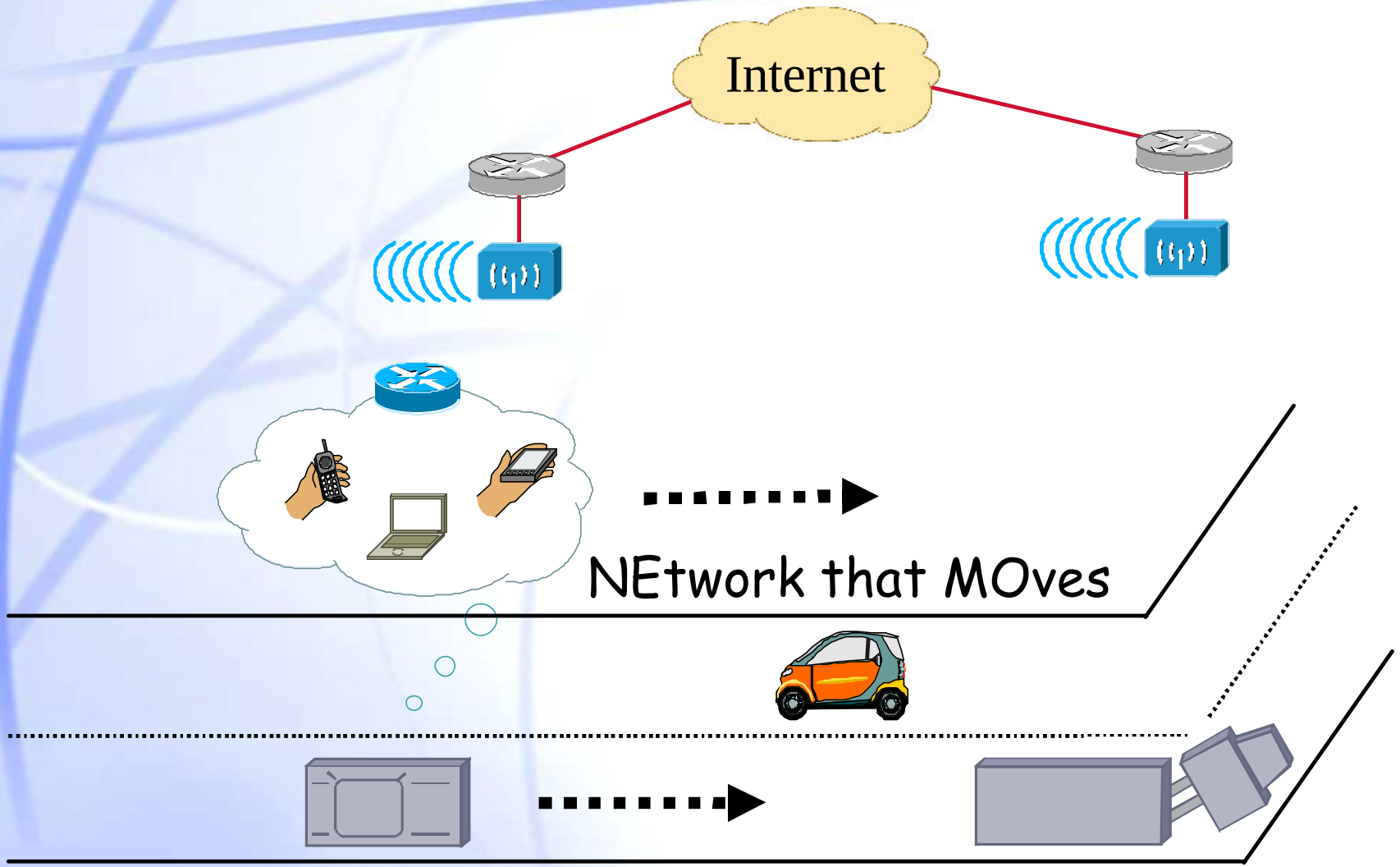
Departamento de INGENIERIA TELEMATICA
www.it.uc3m.es

Outline

- **Network Mobility**
  - **Network Mobility support**
- **NEMO Basic Protocol**
- **MIRON**
  - **Single Mobile Network**
  - **Nested Mobile Networks**
  - **Performance evaluation**
- **Conclusions and future work**
- **References**



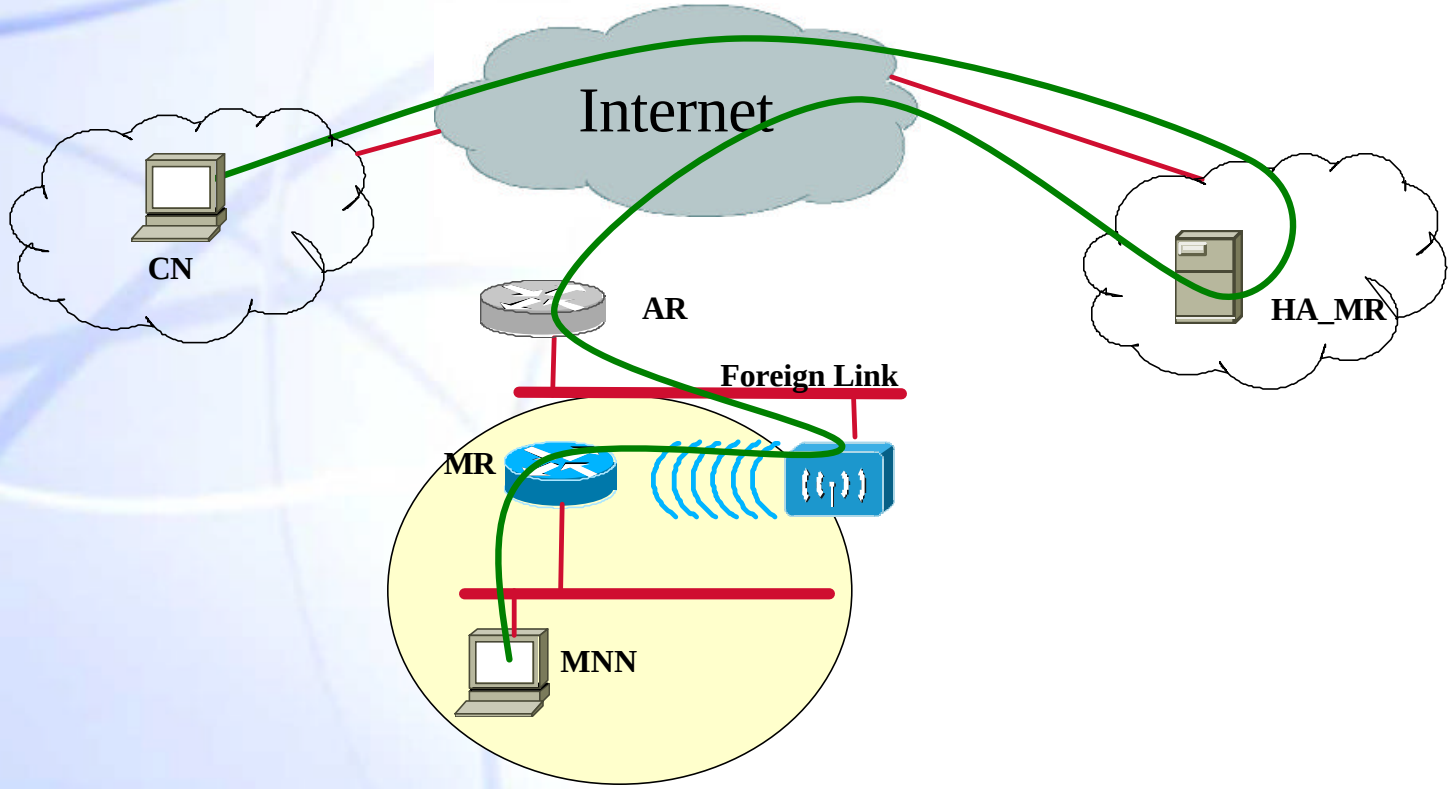
Network Mobility



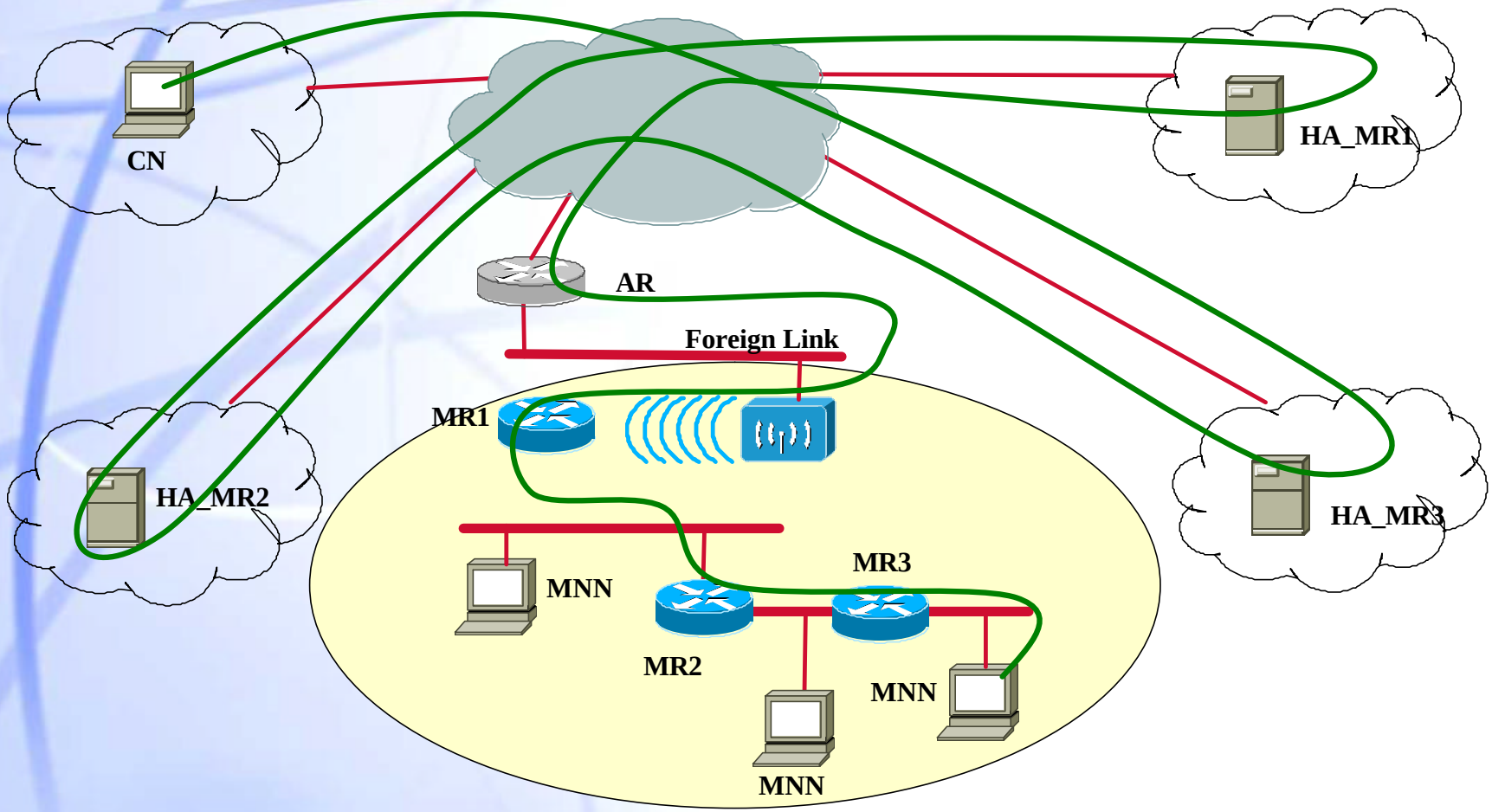
Network Mobility support

- **Demand for Internet access in mobile platforms (e.g. trains, buses) is increasing**
- **There are some proposals for supporting Network Mobility**
- **One of them is done within the IETF NEMO WG**
  - **NEMO Basic Support Protocol**
    - **Mobility managed at IP level**
    - **Based on Mobile IPv6 protocol (i.e. terminal mobility)**
    - **Bidirectional tunnel between MR and HA**

NEMO Basic Support Protocol (I)



NEMO Basic Support Protocol (II)



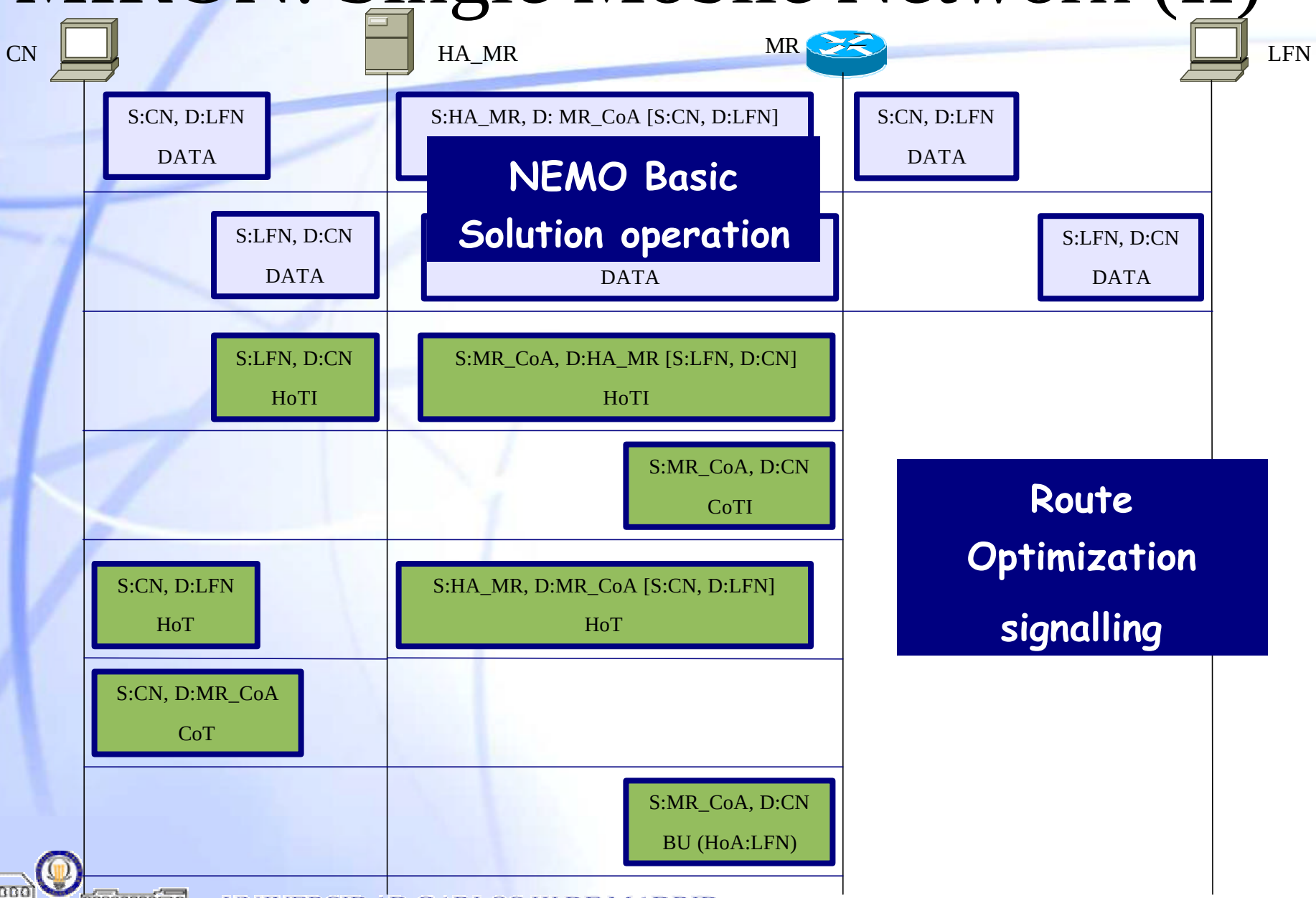
Route Optimization issue

- **NEMO Basic Support Protocol has one of the problems of Mobile IPv6:**
  - **Triangle Routing**
    - **Solved in Mobile IPv6 with the Route Optimization support**
    - **MIRON adapts MIPv6 RO to optimize CN-LFN flows**
- **Besides, NEMOs can be NESTED**
  - **Pinball Routing**
    - **Some solutions proposed so far**
      - No one seems to solve the problem properly
    - **MIRON proposes an address delegation mechanism with built-in routing that avoids the tunnel overhead**

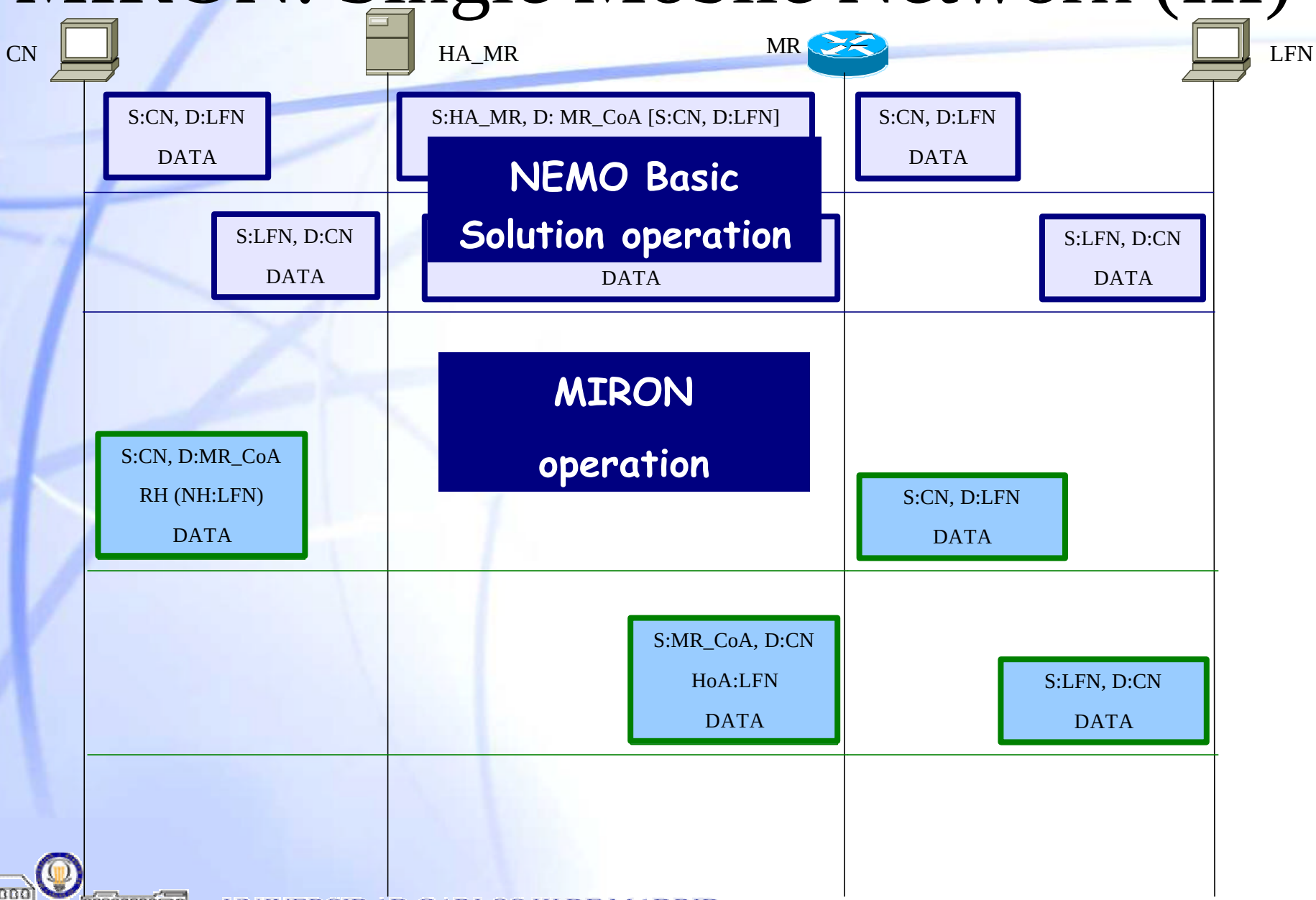
MIRON. Single Mobile Network (I)

- **Goals and requirements**
  - **To provide Transparent Route Optimization between a LFN and a CN**
    - **Avoiding triangle routing**
    - **Preserving CN and LFN operation unchanged**
- **Basically consists in performing MIPv6 Route Optimization procedure between the MR (on behalf of the LFN) and the CN**
  - **The solution profits from the installed base of CNs that support MIPv6 RO**

MIRON. Single Mobile Network (II)



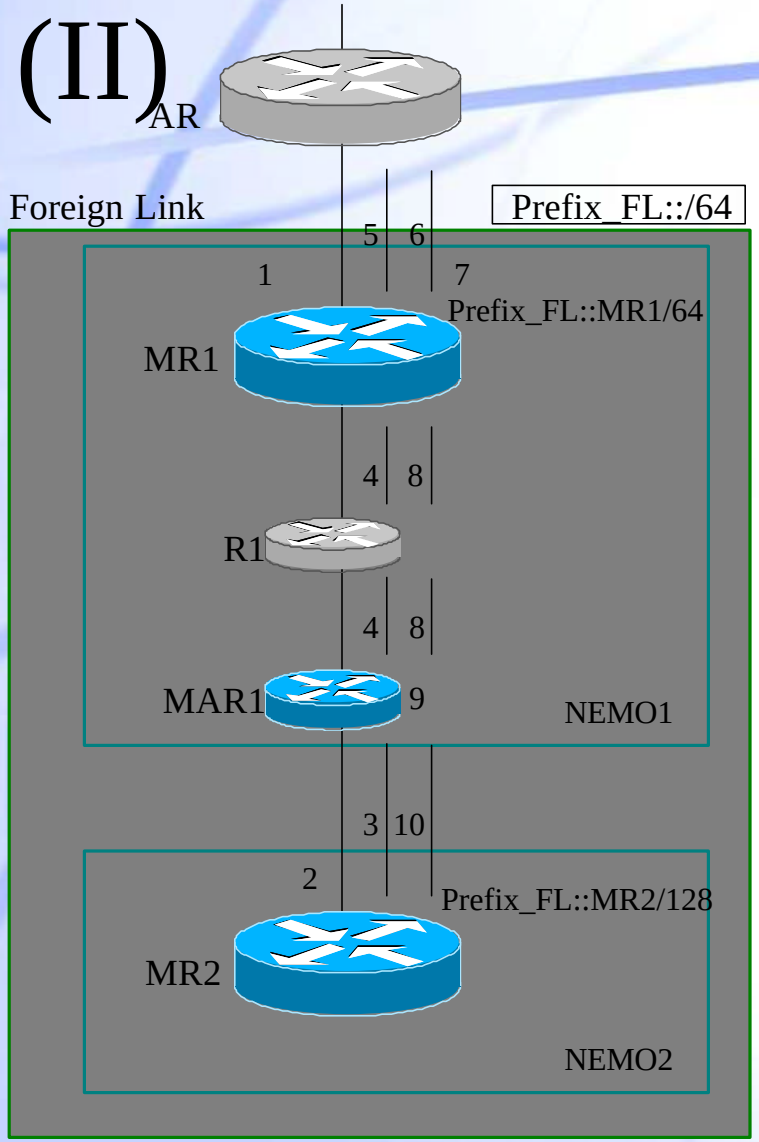
MIRON. Single Mobile Network (III)

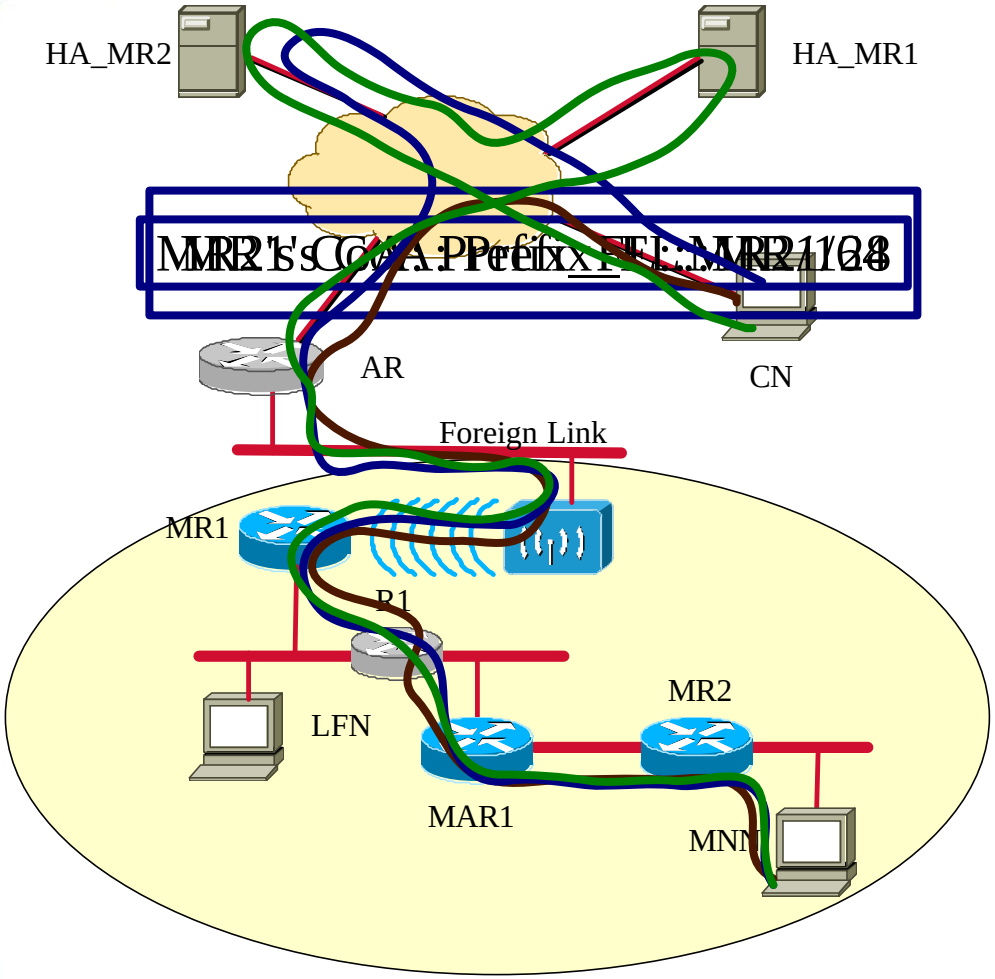


MIRON. Nested Mobile Networks (I)

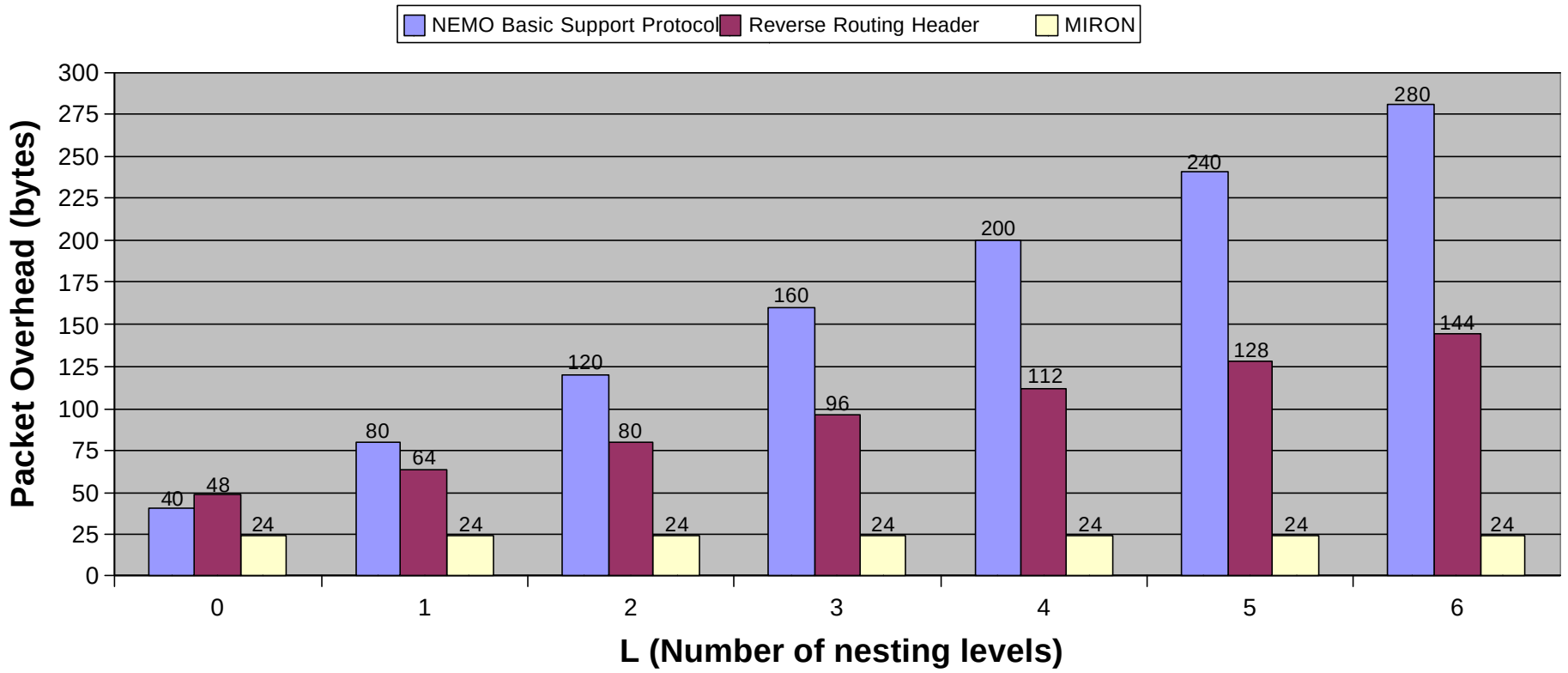
- **Goals and requirements**
  - **To provide Transparent Route Optimization for Nested Mobile Networks**
    - **Avoiding pinball routing**
    - **Preserving CNs and MNNs operation unchanged**
- **Basically consists in delegating topologically correct IPv6 addresses to every MR within a nested NEMO**
  - **Routing of packets within the NEMO is also provided**

MIRON. Nested Mobile Networks (II)





MIRON. Performance evaluation



MIRON. Conclusions and future work

- **MIRON provides Route Optimization for NEMO**
  - **LFN-CN RO**
    - **Route Optimization between LFN and CN (MR performs MIPv6 RO on behalf of the LFN)**
    - **Avoid triangle routing**
    - **Requires flow identification and tracking**
  - **Nesting RO**
    - **Provides valid and reachable IPv6 addresses to every MR within the nested, to be used as CoAs**
    - **Avoid pinball routing**
    - **Can be used also separately to avoid tunnels introduced by nesting (or together with the previous)**
    - **Use of prefix delegation should also be studied**

References

- ***Nemo Basic Support Protocol*. Vijay Devarapalli et al. draft-ietf-nemo-basic-support-01 (work-in-progress)**
- ***Network Mobility Support Terminology*. T. Ernst et al. draft-ietf-nemo-terminology-01 (work-in-progress)**
- ***Network Mobility Support Goals and Requirements*. T. Ernst. draft-ietf-nemo-requirements-02 (work-in-progress)**
- ***Mobility Support in IPv6*. D. Johnson et al. draft-ietf-mobileip-ipv6-24 (work-in-progress)**
- ***Taxonomy of Route Optimization models in the Nemo Context*. P. Thubert et al. draft-thubert-nemo-ro-taxonomy-02 (work-in-progress)**
- **I*Pv6 Reverse Routing Header and its application to Mobile Networks*. P. Thubert et al. draft-thubert-nemo-reverse-routing-header-04 (work-in-progress)**
- **EU FP6 DAIDALOS Project. http://www.ist-daidalos.org**

MIRON

MIPv6 Route Optimization for NEMO

Carlos J. Bernardos <cjbc@it.uc3m.es>
Marcelo Bagnulo <marcelo@it.uc3m.es>
María Calderón <maria@it.uc3m.es>

University Carlos III of Madrid - Spain

2004-08-11

Departamento de INGENIERIA TELEMATICA
www.it.uc3m.es