Mobility in the Integration of Mobile Ad-hoc Networks

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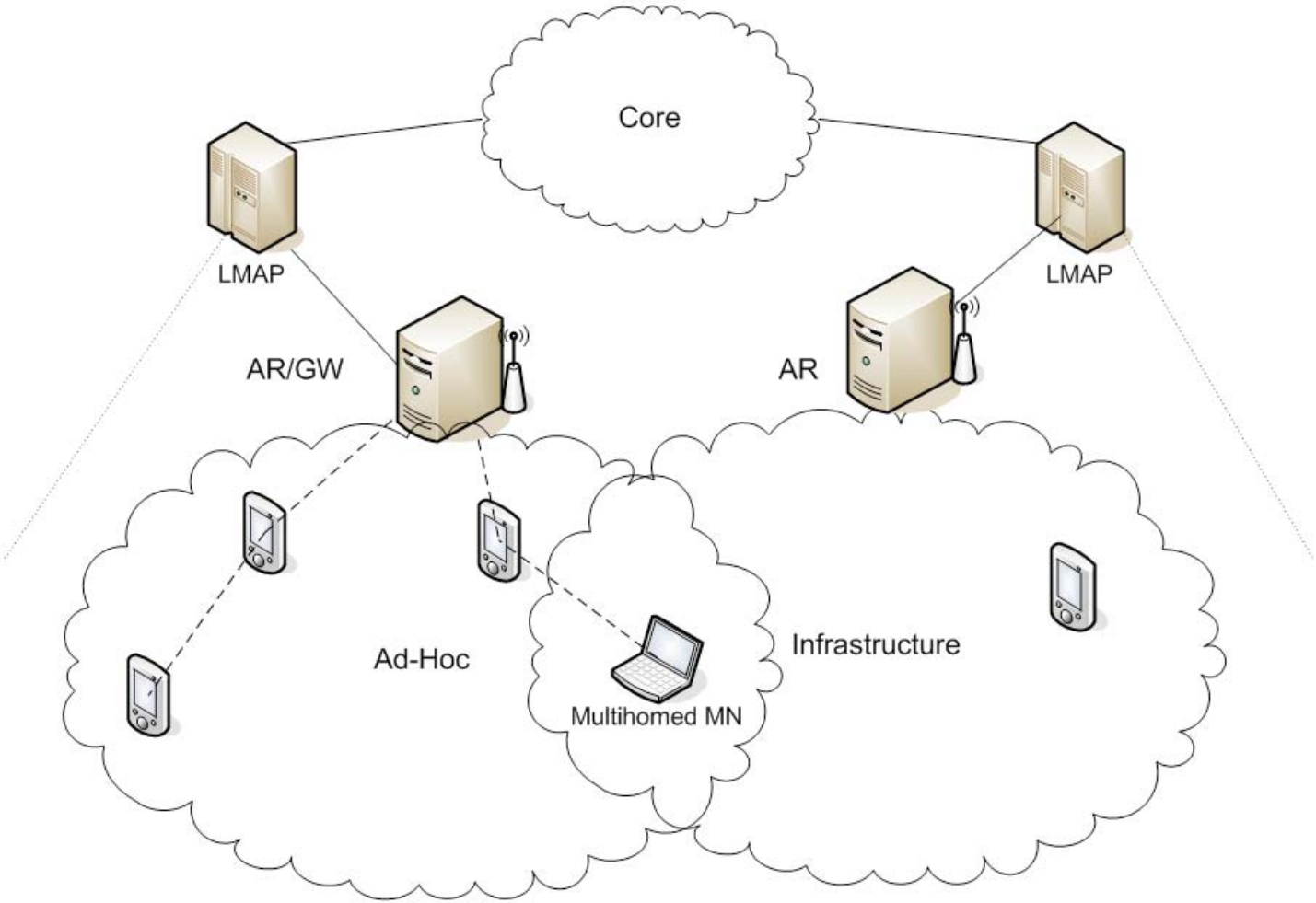
Rafael Sarrô

Instituto de Telecomunicações

Daidalos II network

- Ubiquitous access through the integration of heterogeneous access networks
- Seamless mobility between access networks
- Split mobility management
  - Local Mobility Management
  - Global Mobility Management
- Common framework for mobility signalling
  - IEEE 802.21 Media Independent Handover standard
- Host multihoming
  - Concurrent access through all interfaces

Split mobility management



Mobile Ad hoc Networks

- Multihop networks
  - Communications end points can be separated by several hops
- Communications are performed at IP level
  - All nodes in the MANET are routers
- Connected to the core network by the gateway
  - Intermediates all the communications between the MANET nodes and the core network
  - Does not automatically knows when a node joins the network

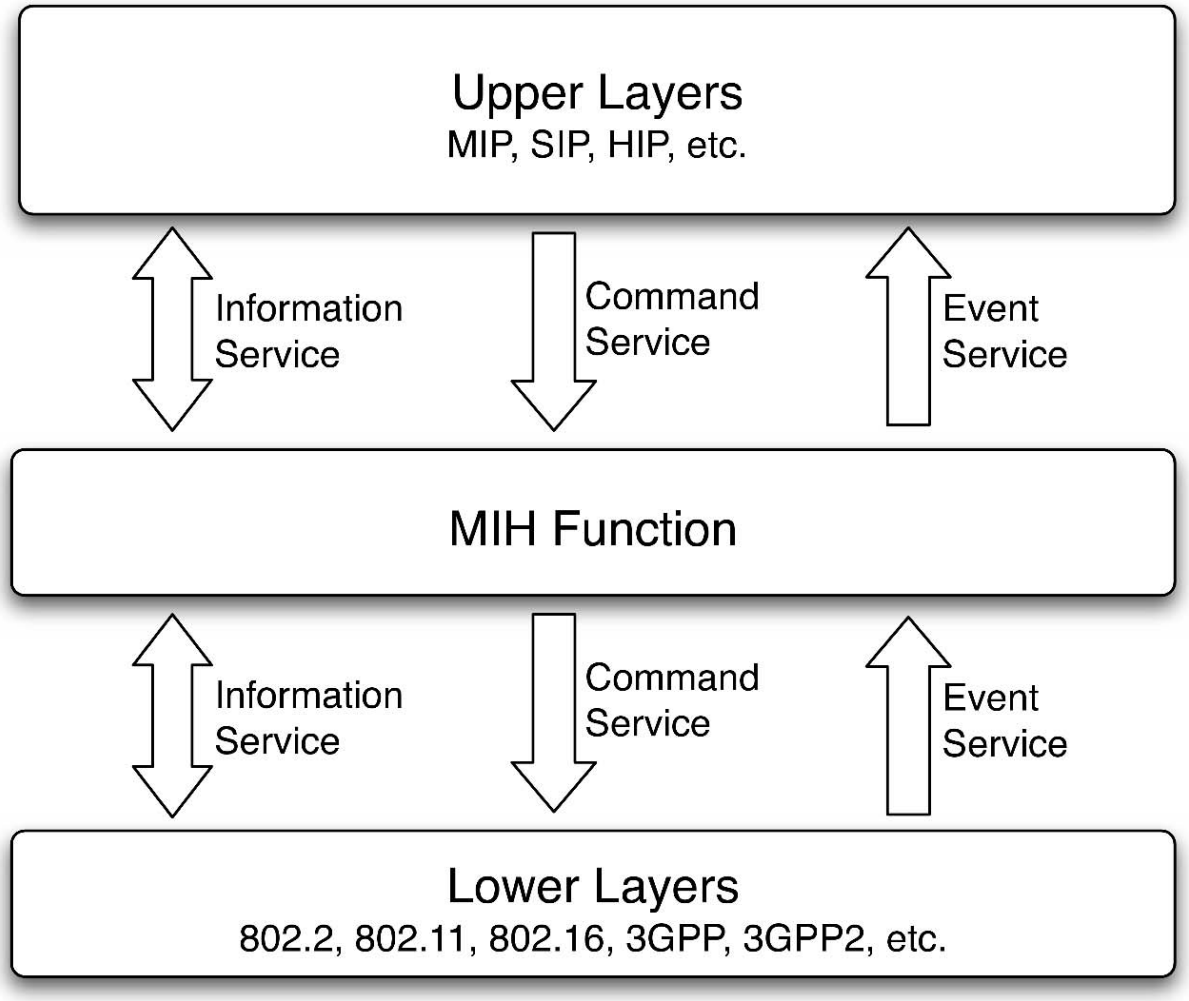
Network Based Local Mobility Management

- New network element
  - Local Mobility Anchor (LMA) point
  - Responsible for register and update location of nodes inside the LMD
- Access Routers cooperate with the LMA
  - Communicate the location of the MN inside the LMD
  - Update this location upon node movement
- Access Routers must detect the mobile node presence in the network
  - Upon attachment and on node movement
  - MANET nodes have to perform explicit signalling to be detected

IEEE 802.21 Media Independent Handover

- Common framework to perform handover in 802-based networks and cellular networks
- Media Independent Handover function
  - Abstraction layer between the drivers and the mobility controlling modules
  - Receives events generated from the drivers
  - Provides technology independent handover commands
    - That are translated in the specific commands for each driver
  - Commands and events can travel in the network
    - Network elements can subscribe to events produced on the terminal

IEEE 802.21 MIH



MANET support for IEEE 802.21 MIH

- 802.21 not suited for MANET
  - Oriented for single link access networks
  - Link layer events (L2) have little use in MANET environments
  - In 802.11, messages are transported in L2
- New abstraction layer: The MANET Wrapper
  - Located below the MIHF and above the drivers
  - Presents the MANET as an L3 technology
    - Messages are transported in UDP
  - Filters events generated by the driver
  - Generates events based on routing information and auto-configuration messages
    - Closely cooperates with routing and auto-configuration modules
  - Hides MANET multihop network as a virtual link between the MN and the Gateway

Mobility

- Bootstrapping
- Handover candidates discovery
- Mobility execution

Bootstrapping

- Unique Local IPv6 Unicast Address (ULA)
  - Allows the mobile node to communicate with the gateway
  - Can be routed by the routing protocols
  - Only provides access to the gateway
- The mobile node sends credentials to the gateway
- The gateway verifies the information and sends the network prefix to the mobile node
  - Node generates a global IPv6 address based on the prefix

Handover candidates discovery

- Create a list of possible handover destination
- Two phase process
  - First phase: network scan
  - Second phase: scan validation
- Scan validation
  - Connect to each ad hoc network found
  - Verify connectivity to the gateway
  - Can detect network belonging to different domains
- Process performed by the MANET Wrapper
  - Aided by the auto-configuration protocol

Mobility process

- Four phases process
  - Candidate discovery
  - Handover preparation
    - Handover permission is requested to the network
  - Handover execution
    - Node moves to new network
  - Handover conclusion
    - AR detect new node and updates its location with the LMA
    - If is a different domain
      - ↗ Mobile node gets new address
      - ↗ **MIPv6 is triggered to update the global location**
- All signalling in the access network is performed by 802.21
- NetLMM as local mobility protocol

Multihoming

- Multihoming at the global mobility domain
  - Handled by Mobile IPv6,
    - Enhanced to support multiple CoA registration per HoA
  - MANET unaware
  - MANET with multiple gateways
    - Uplink traffic is send to the correct gateway using IPv6-in-IPv6 tunnels
    - Downlink traffic used Flow Identifiers (FID) extension to MIPv6 to reach the correct gateway

      ↗ **Each FID is bound to a CoA belonging to one of the gateways**
- Multihoming at the local mobility domain
  - Multiple gateways in the same LMD
  - Mobile Node has only one CoA for all gateways
  - Requires FID extension in the LMD protocol
    - LMD chooses the right gateway based on FID
    - Gateway sends traffic directly to the target CoA

Conclusion

- MANET modified to
  - Support the IEEE 802.21 Media Independent Handover
  - Integrate with localized mobility management scheme
  - Support host multihoming

Thank you

