

NetLMM Protocol Overview

(draft-giaretta-netlmm-dt-protocol-00.txt)

**66th IETF
NetLMM Working Group
Montreal, Quebec Canada
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[Members]

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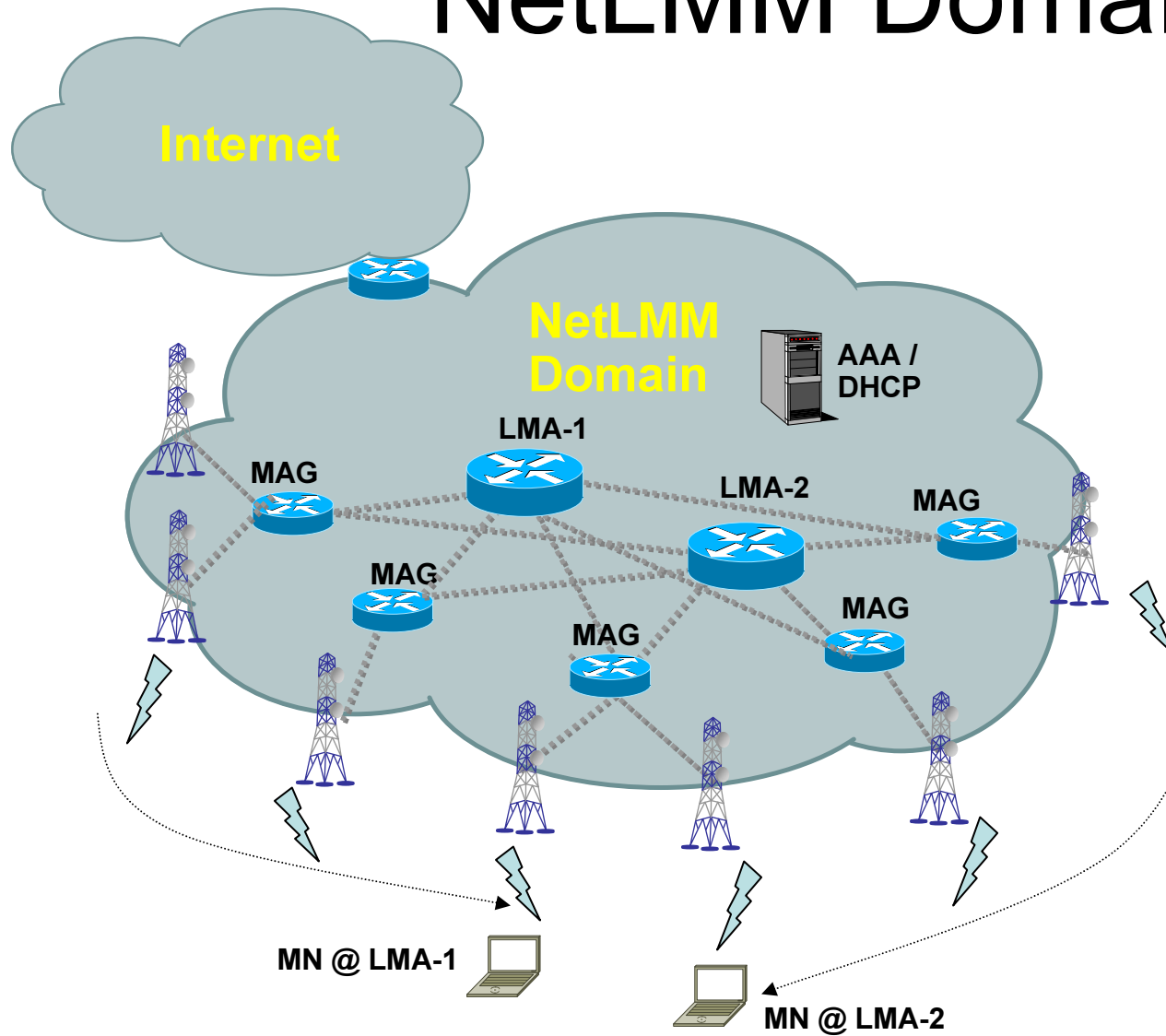
[NetLMM Overview]

- NetLMM Domain
- Terminology
- NetLMM Messages
- Control Message Flows
- Data Flow

[Terminology]

- NetLMM Address – The invariant IP address on the MN inside the NetLMM domain
- NNP - NetLMM Network Prefix is the IPv6 link prefix of the NetLMM Address
- LMA – Local Mobility Anchor is the function provided by the router which owns the NNP
- MAG – Mobility Access Gateway is the function provided by the Access Router

NetLMM Domain



- MN has **IP address anchored at LMA**, which advertises the network prefix via routing protocol.
- **Routing** for IP address is established **between MAG and LMA**, the two NetLMM entities serving the MN.
- MN can **move between MAGs** using the **same IP address** for data communications.

[NetLMM Messages]

- LMA Allocation Request / Reply
- Associate Request / Reply
- Disassociate Request / Reply
- Location Registration / Ack
- Location Deregistration / Ack
- Routing Setup / Ack
- Routing Remove / Ack
- MN Address Setup / Ack
- MN Address Remove / Ack
- Heartbeat / Ack

[Message Transport]

- UDP
 - Reliability mechanism (i.e. retransmission and timers)
- SCTP (For Future Study)

	Function	Message	Signaling Direction
1	Connect/capability exchange	Associate	MAG => LMA
2	Authorize MN for service on LMA	LMA Allocation	(Any) => LMA
3	Inform that MN is at MAG	Location Registration	MAG => LMA
4	Inform that IP address detected for MN (SLAAC or DHCP)	MN Address Setup	MAG => LMA
5	Inform that IP address no longer in use by MN	MN Address Remove	MAG => LMA
6	Inform that MN detached from network	Location Deregistration	MAG => LMA
7	Provide NETLMM prefix	Location Registration Ack	MAG <= LMA
8	Provide address(es) of MN	Routing Setup	MAG <= LMA
9	Delete address(es) of MN	Routing Remove	MAG <= LMA
10	Delete MN state (e.g. handover or policy)	Location Deregistration	MAG <= LMA
11	Connectivity check	Heartbeat	MAG ⇔ LMA
12	Disconnect	Disassociate	MAG ⇔ LMA

Message Types

- LMA Allocation Request
 - Message sent to the LMA, authorizing service (i.e. yes or no) for a particular MN Identifier. This may come from various sources.
 - Message contains a MN Identifier.
 - Message is optional. LMA is configured to serve MN with or without this authorization.
- LMA Allocation Reply
 - Success or LMA is locally authorized for all MNs.

Message Types

- Associate Request
 - MAG sends message to the LMA for setting up the control and data plane relationship (e.g. functional capabilities, MAG ID exchange, and supported data forwarding modes)
 - Forwarding mode
 - Requested data transport (e.g. IPinIP tunnel or MPLS)
 - Bidirectional or forward-only path
- Associate Reply
 - Success or error code
 - LMA sends its capabilities, LMA ID, agreed upon data forwarding mode, etc. to the MAG

Message Types

- Disassociate Request
 - MAG sends message to the LMA for tearing down the control and data plane relationship
- Disassociate Reply Ack
 - Success code

Message Types

- Location Registration
 - MAG sends to LMA when MN is detected to have accessed the network without an IP address.
 - Message contains MN Identifier and MAG ID.
 - IP address of MN is unknown
- Location Registration Ack
 - Success or denial (see Error Codes)
 - If success, then LMA sends the NETLMM Prefix to be used in Router Advertisement

Message Types

- Location Deregistration
 - MAG sends to LMA when MN is detected to have moved away.
 - LMA sends to previous MAG when MN is at new location.
 - Message contains MN Identifier and source (i.e. MAG or LMA ID).
- Location Deregistration Ack
 - Success

Message Types

- Routing Setup
 - LMA sends to MAG in response to Location Registration when mobility state exists for MN.
 - Message contains MN Identifier, LMA ID, Routing Tag, and one or more IP addresses.
- Routing Setup Ack
 - Success or error code
 - Message contains MN Identifier, MAG ID, Routing Tag.

Message Types

- Routing Remove
 - LMA sends to MAG for deletion of routing for one or more IP addresses.
 - Message contains MN Identifier, LMA ID, and one or more IP addresses.
- Routing Remove Ack
 - Success

Message Types

- MN Address Setup
 - MAG sends message to LMA when MN is detected to have accessed the network with an IP address (e.g. DHCP, DAD)
 - Message contains MN Identifier, MAG ID, Routing Tag, and IP address.
- MN Address Setup Ack
 - Success or error code

Message Types

- MN Address Remove
 - MAG sends message to LMA when MN is detected to no longer be using an IP address .
 - Message contains MN Identifier, MAG ID, and IP address.
- MN Address Remove Ack
 - Success

Message Types

- Heartbeat
 - Sent by either MAG or LMA to peer to obtain connectivity status.
- Heartbeat Ack

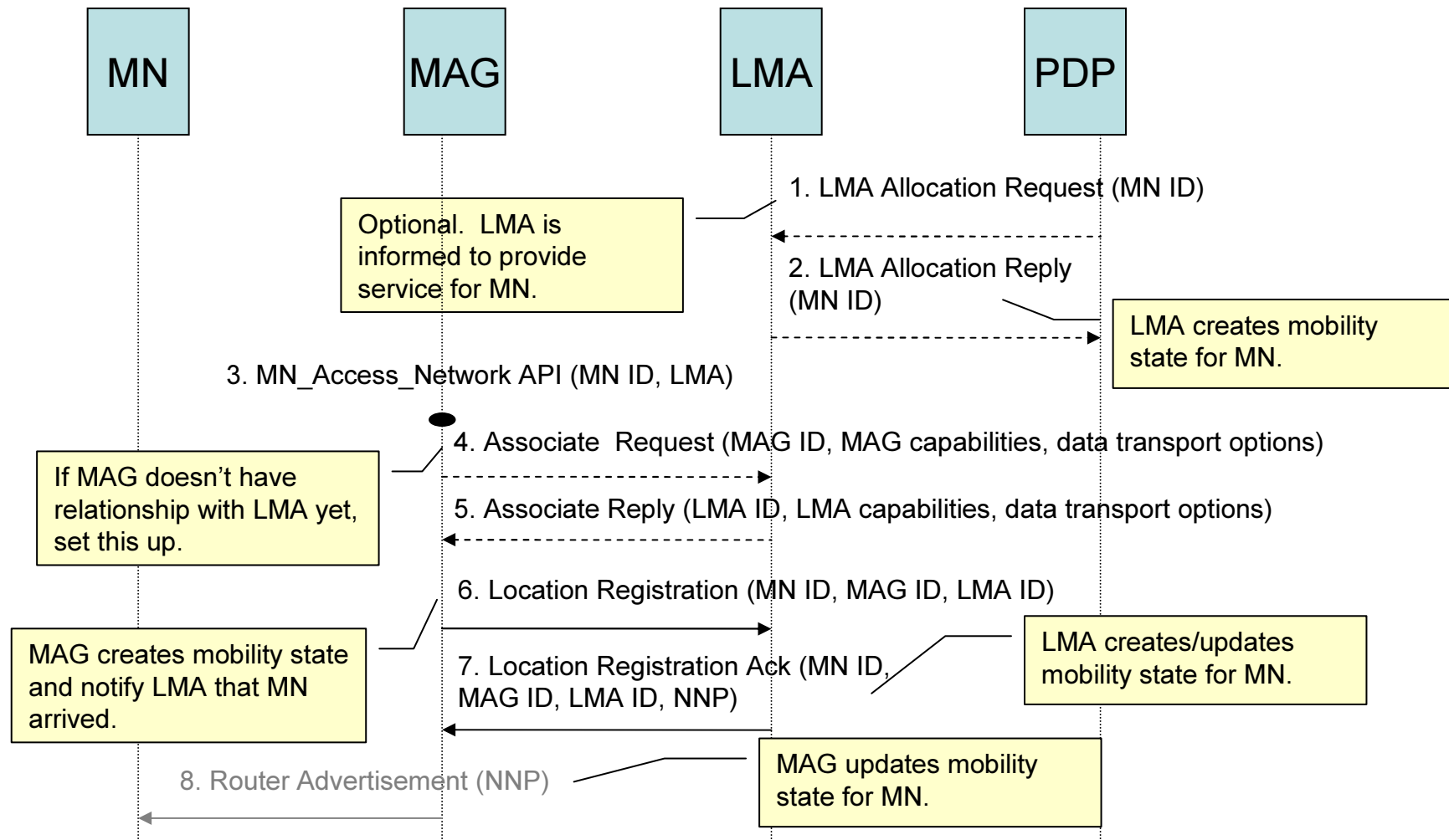
Error Codes

- Administratively prohibited
 - Disallow due to administrative policy reason
- Lack resources
 - Resource is unavailable to provide service
- Unauthorized MN
 - LMA sends to MAG in response to Location Registration or Routing Update for MN that is not authorized for service
- Invalid IP address
 - LMA sends to MAG in Routing Update Ack when Routing Update contained an IP address that is not allowed
- Over IP address limit
 - LMA sends to MAG in Routing Update Ack when the maximum number of IP addresses allowed for MN has been exceeded

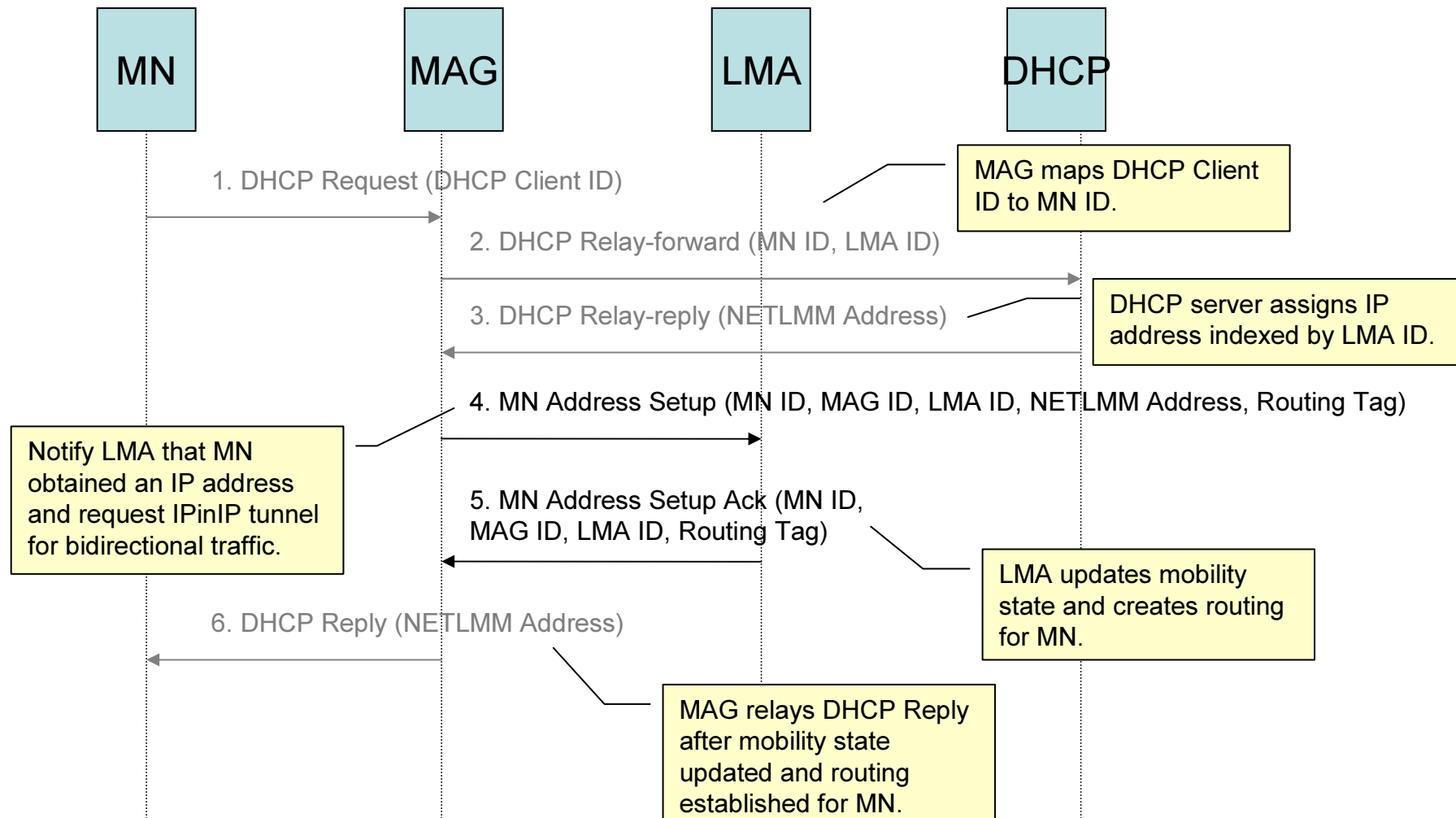
Call Flow Scenarios

- Initial network access
- Stateful address assignment via DHCP
- Stateless address auto-configuration (SLAAC)
- Multiple IP address via SLAAC
- IP address release notification from DHCP server
- MAG to MAG handover
- DHCP renewals on new MAG
- IP address obtained by SLAAC detected to be no longer in use
- Network detachment
- IP multicast join group

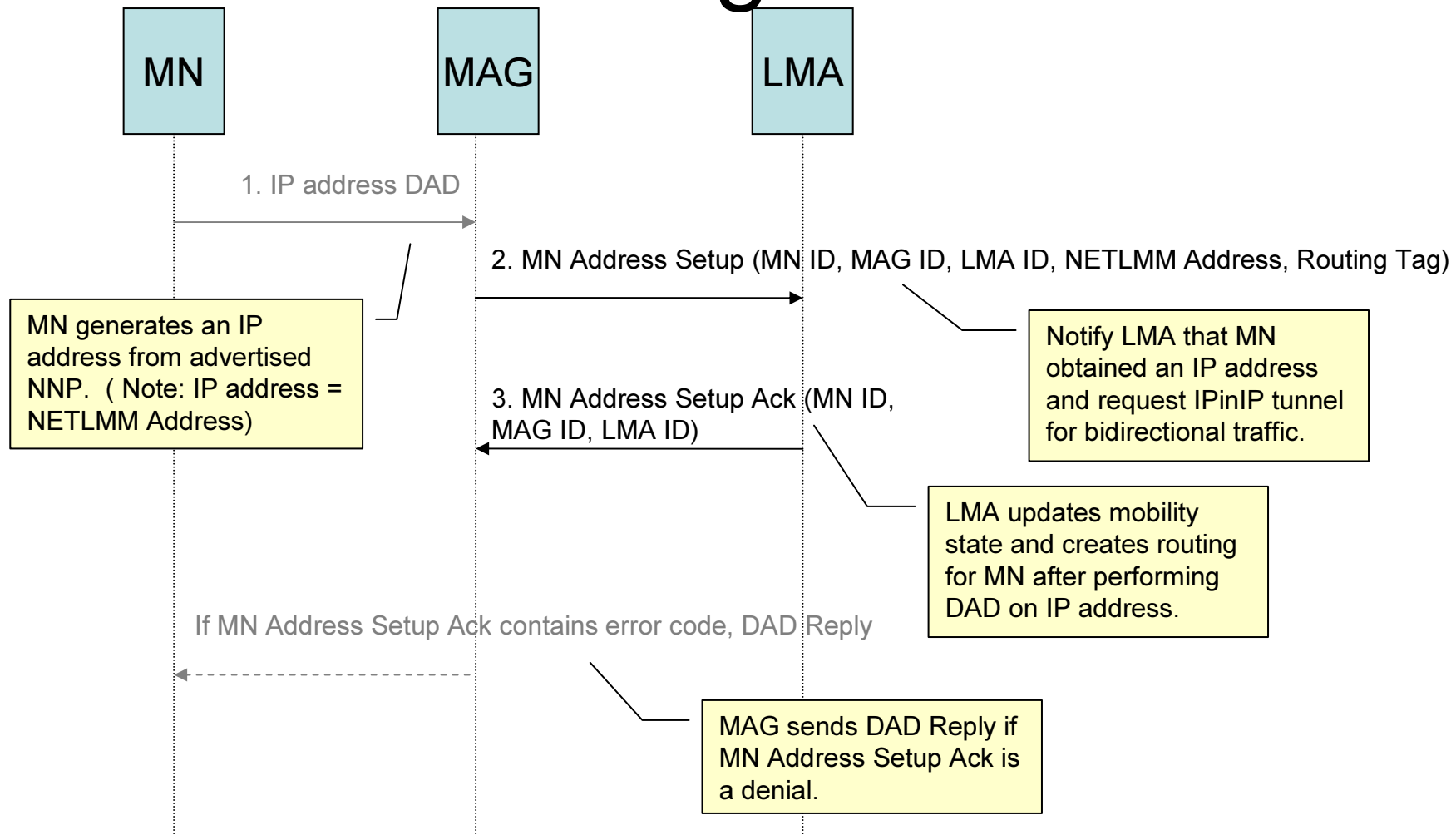
Initial Network Access



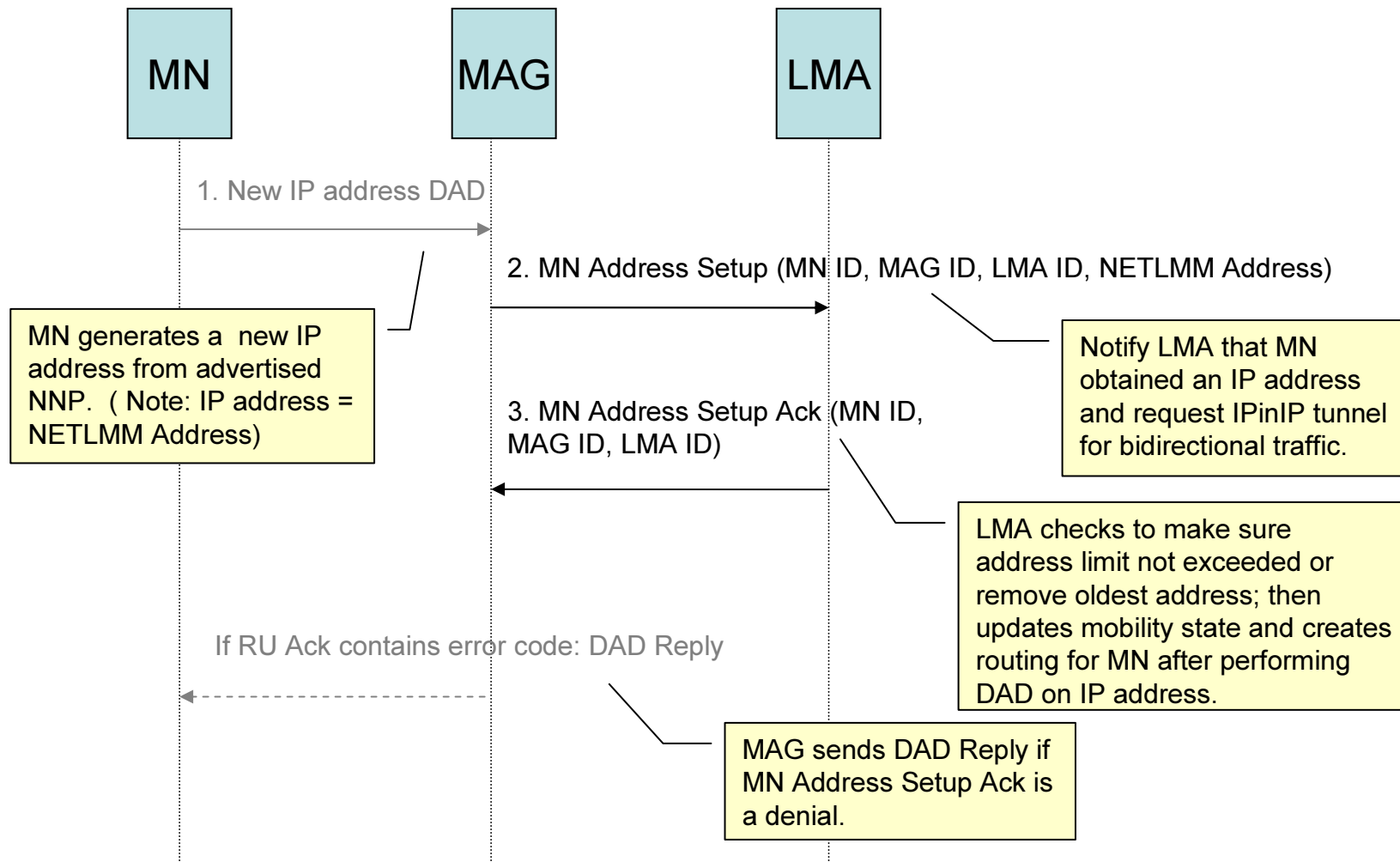
Stateful Address Assignment via DHCP



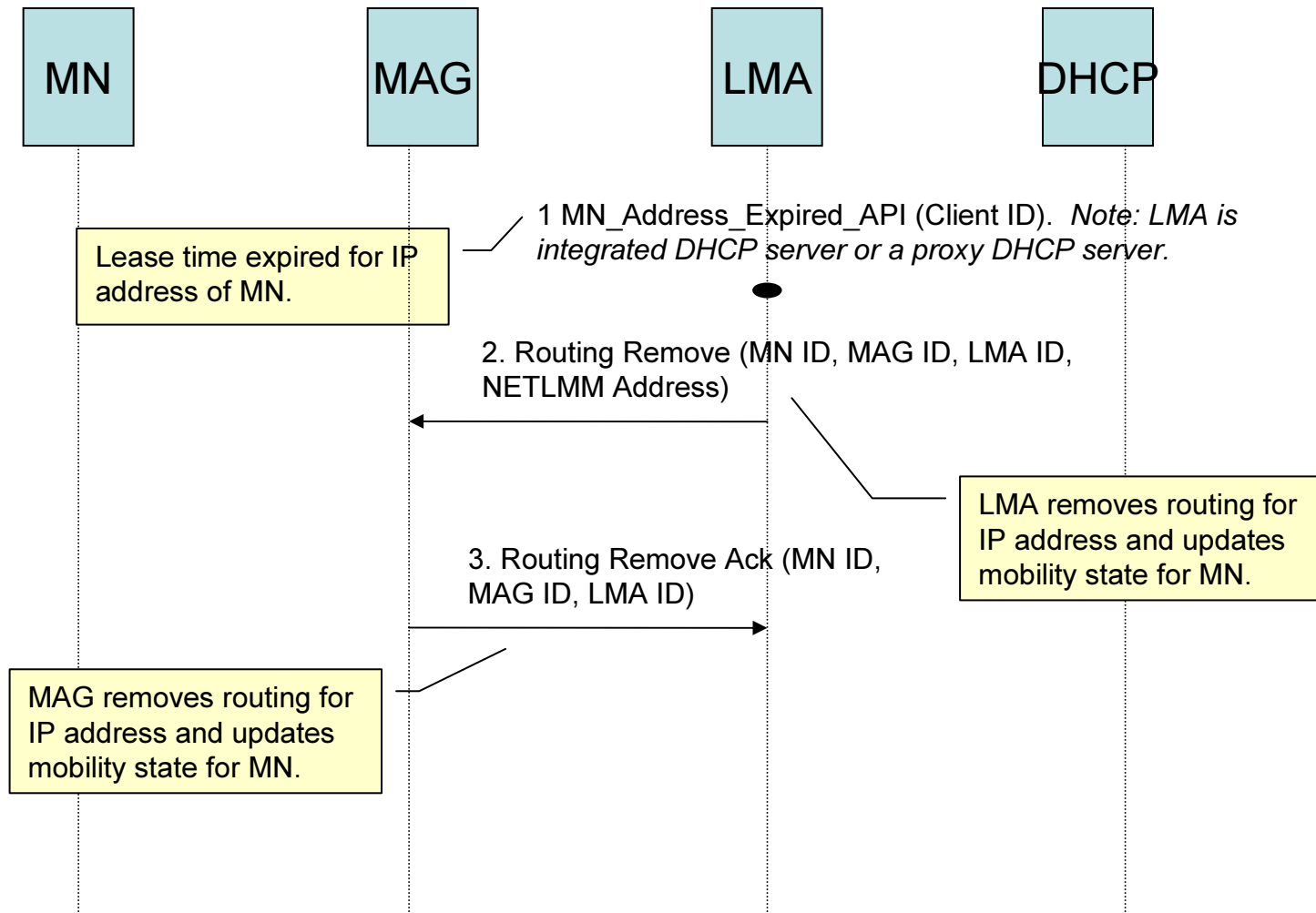
Stateless Address Auto-Configuration



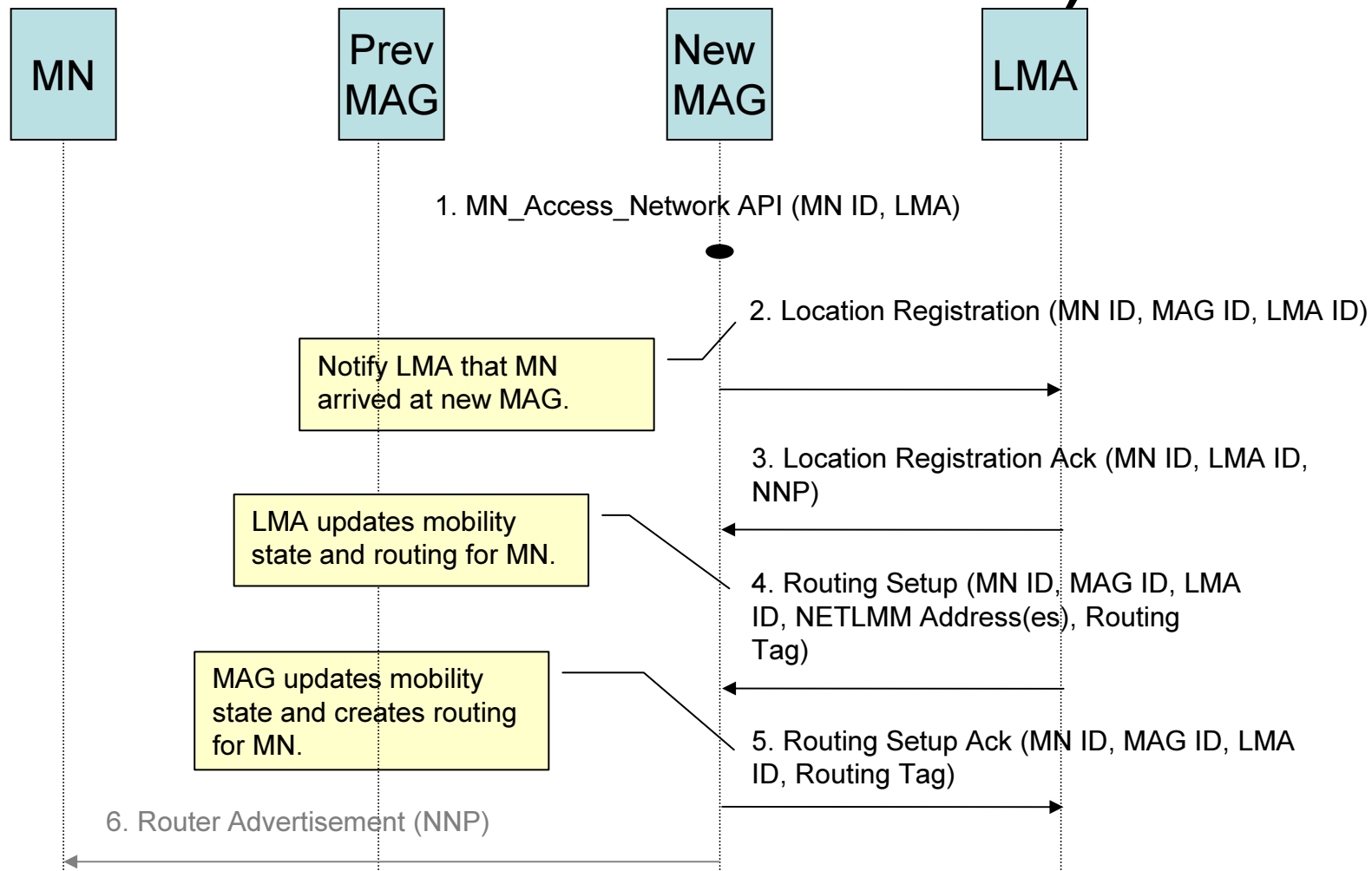
Multiple IP Addresses via SLAAC



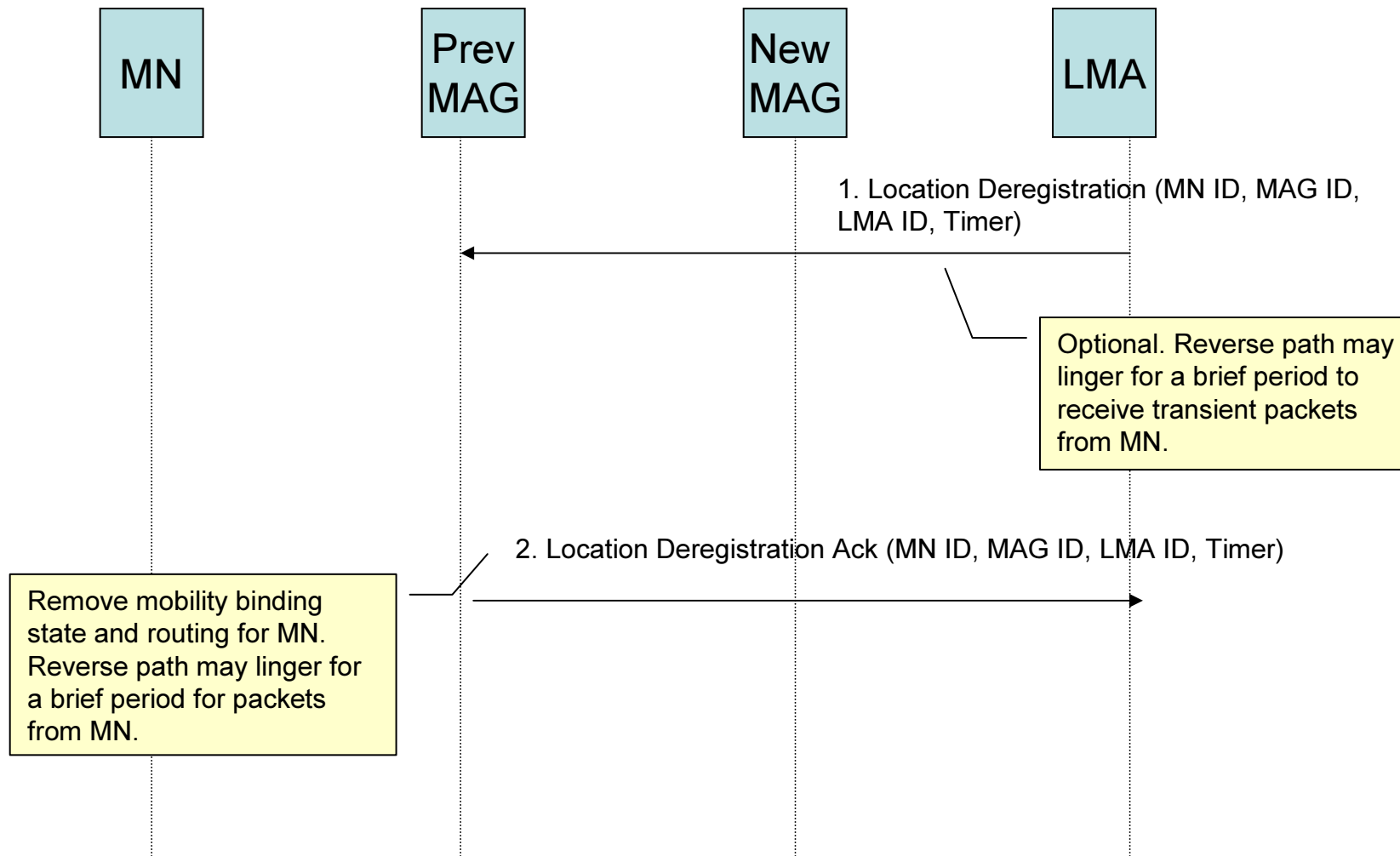
IP address release notification from DHCP server



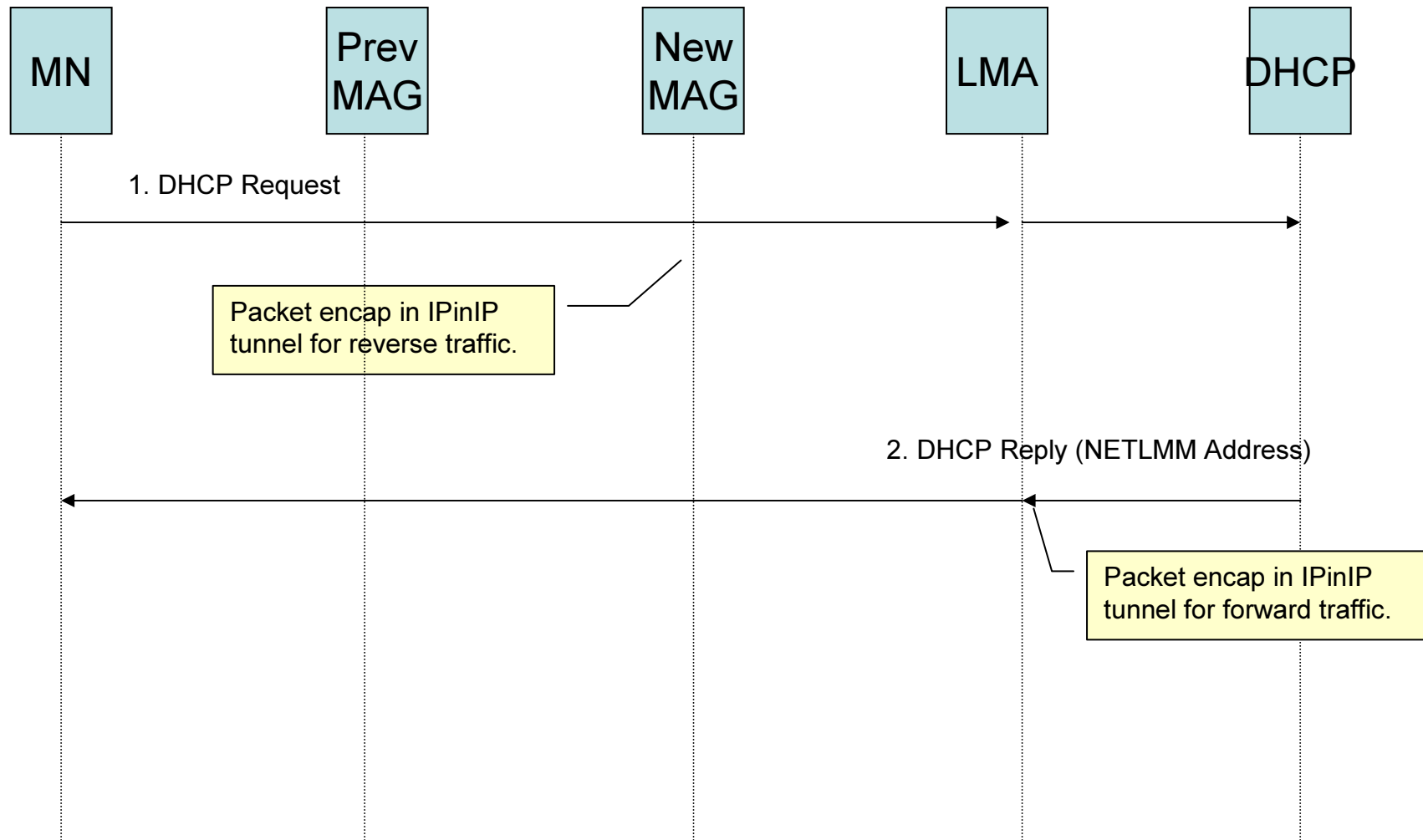
MAG to MAG Handover (No Context Transfer)



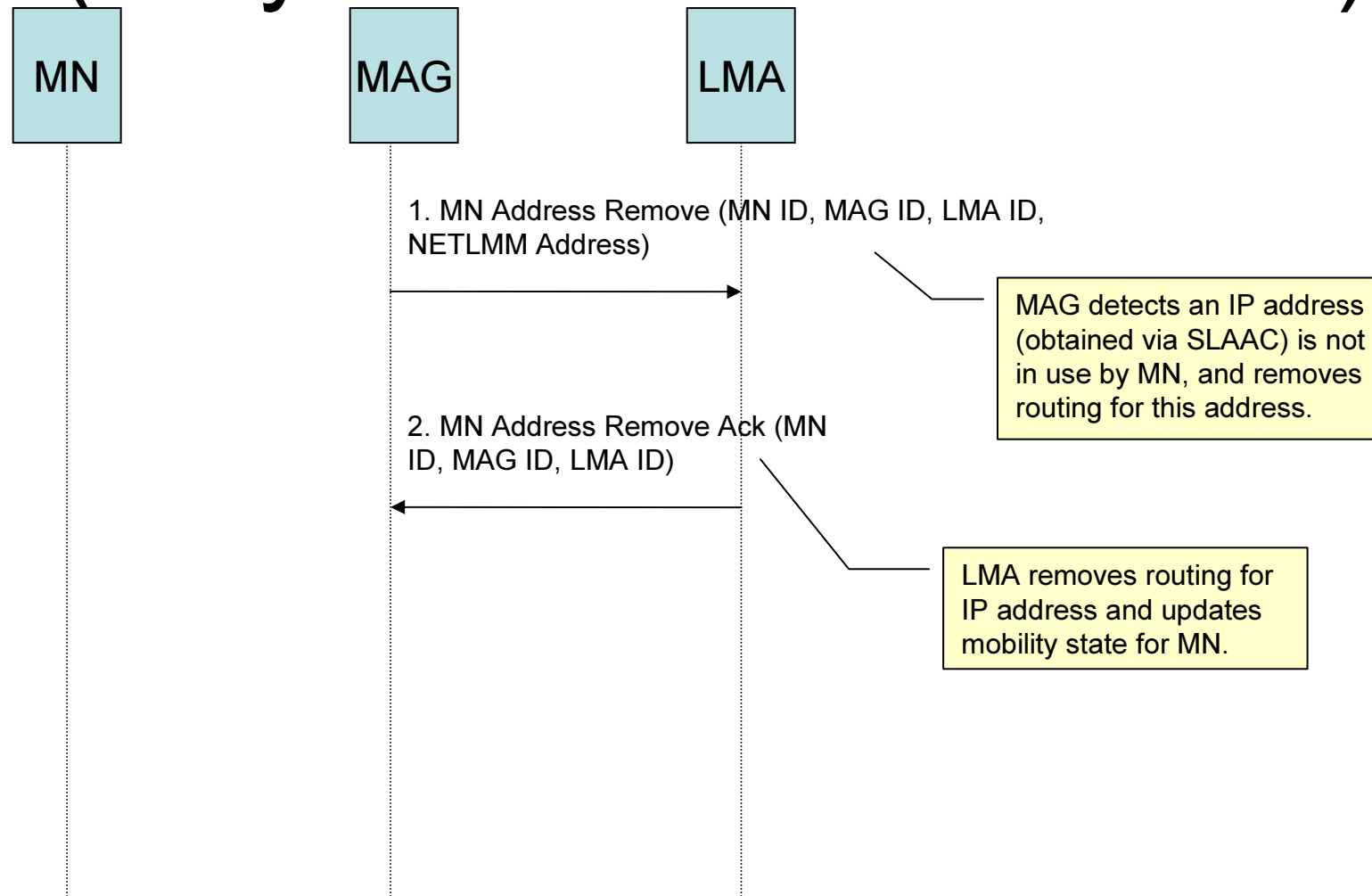
Resource Revocation



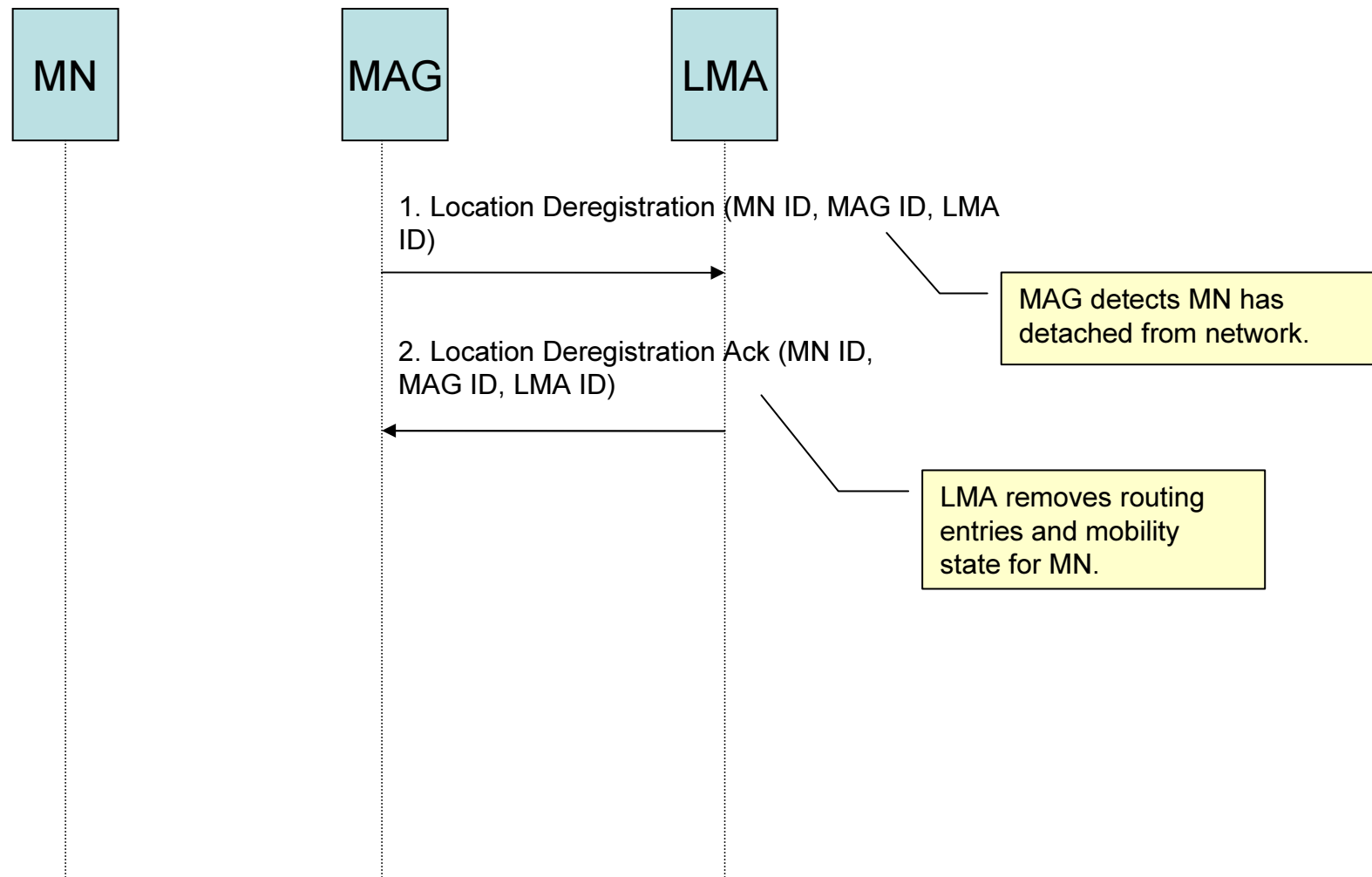
DHCP Renewal on New MAG



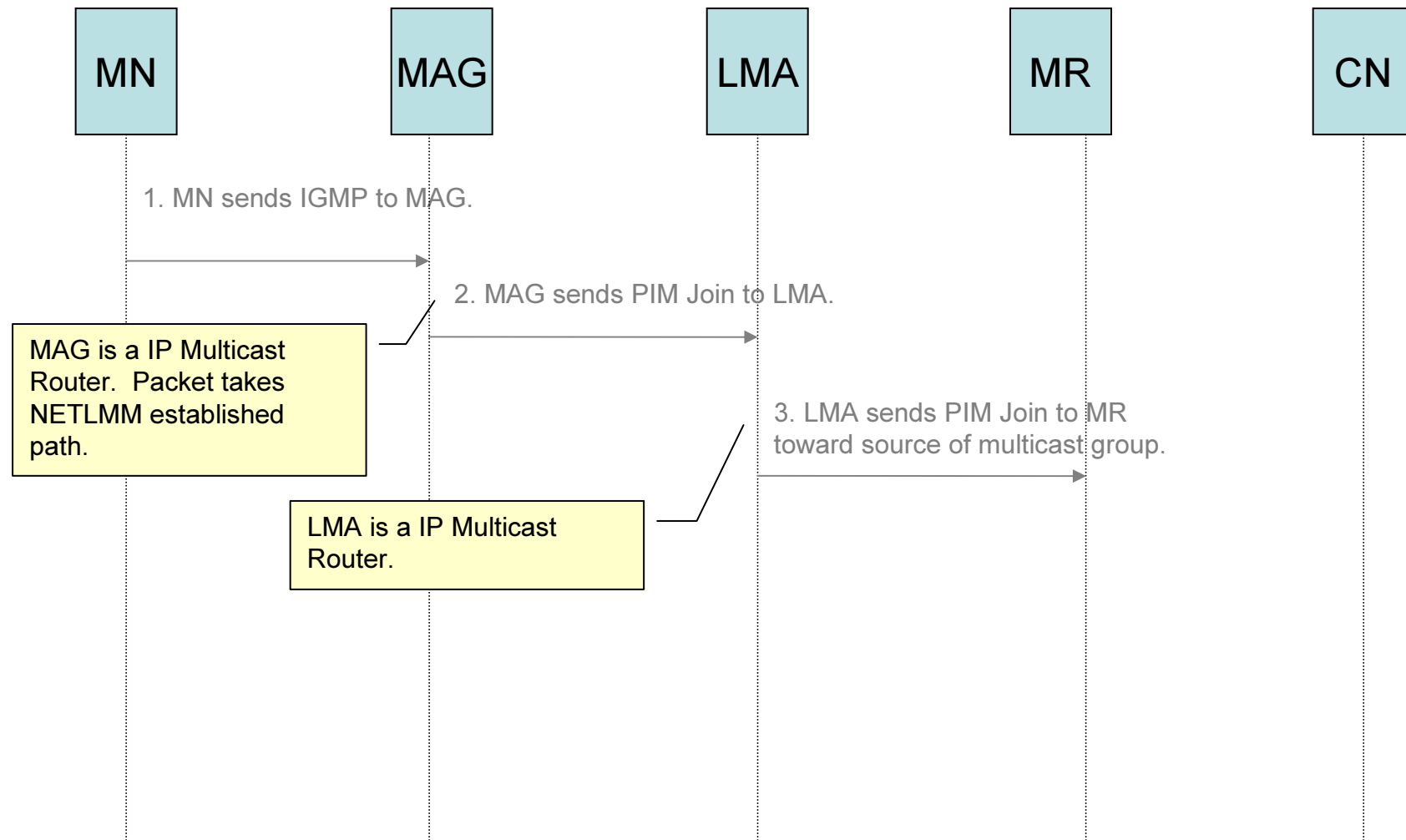
IP Address is no Longer in Use (Only when known for sure!)



Network Deattachment



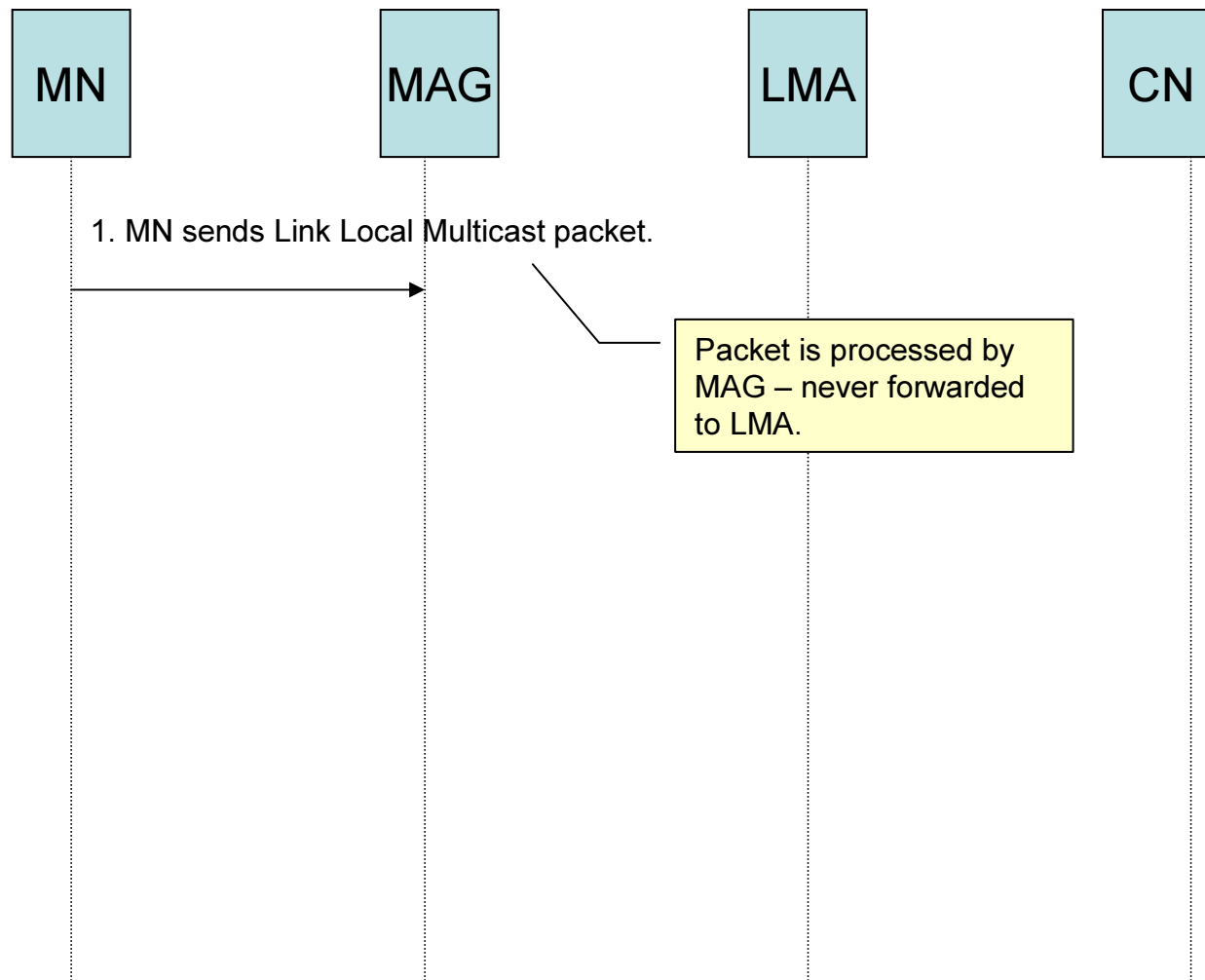
IP Multicast Join Group



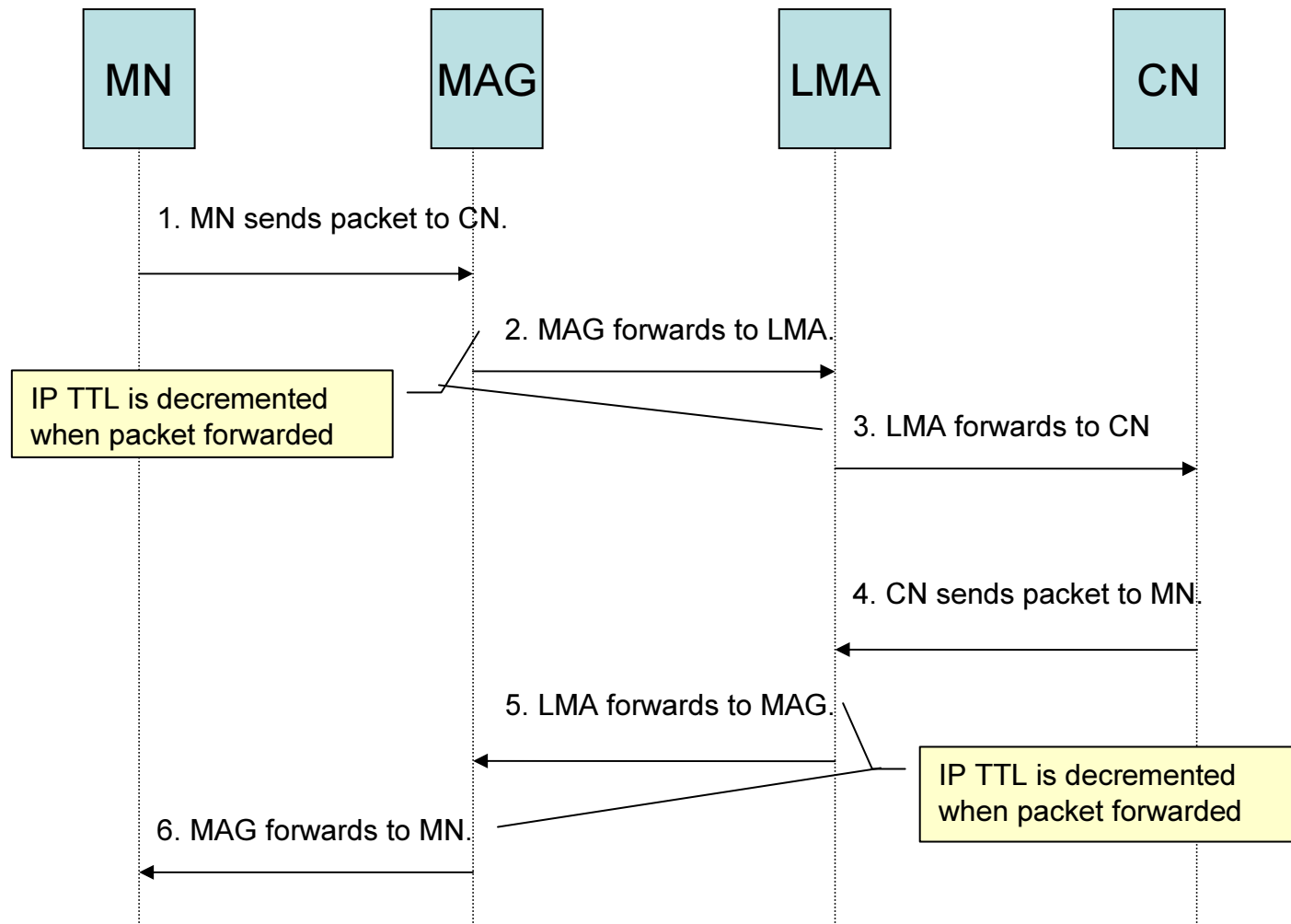
Data Flow Scenarios

- Link Local Multicast
- Unicast
- IP Multicast

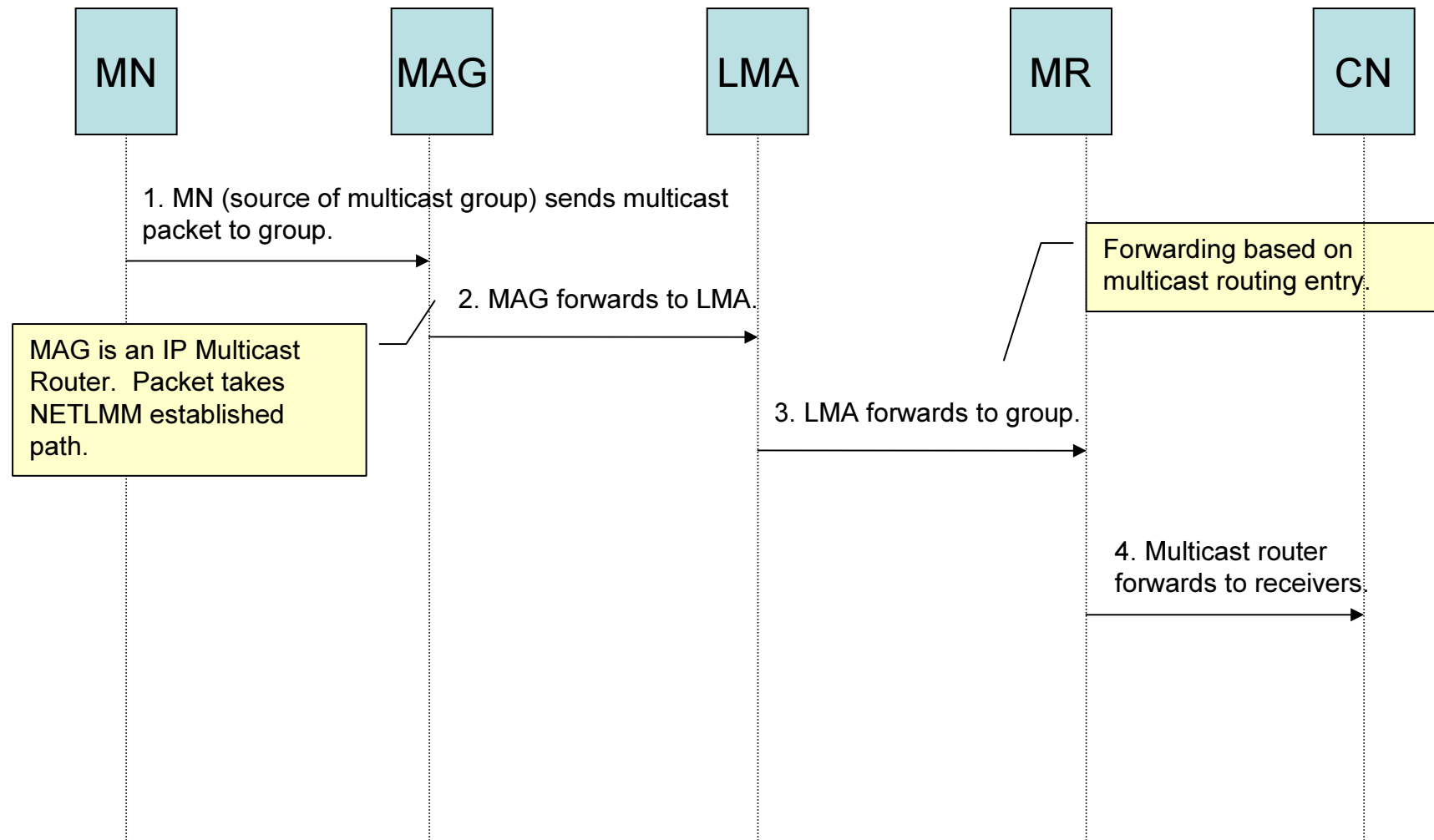
Link Local Multicast Traffic



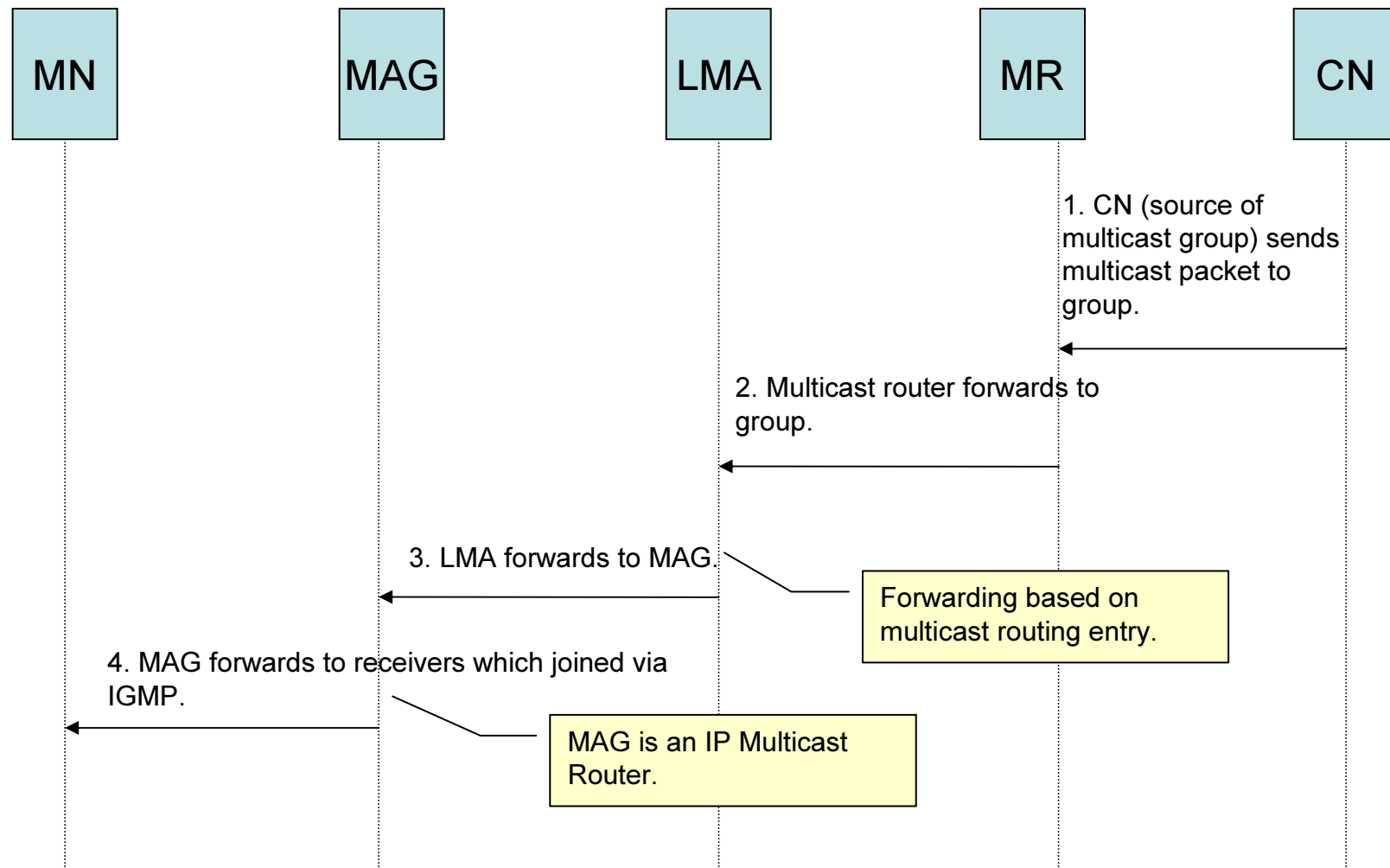
Unicast Traffic



MN Sourcing IP Multicast Traffic



MN Receiving IP Multicast Traffic



Upcoming Work Items

- Describe the re-send mechanism for control messages, in order to provide reliable delivery.
- Add an "LMA Announce message" which can be multicast from a newly connected LMA to trigger listening MAGs to send it Association Requests.
- Add the capability to do bulk MN de-registrations and possibly registrations.
- Define how capability exchanges are handled, and how a unique common capability is derived, for instance to find the tunnelling method to be used as a result of the Association Request and Reply.
- Add message and signalling optimization according to Section 5.12 (Message Optimization).
- And more ...

[Summary]

- Initial version draft-giaretta-netlmm-dt-protocol-00.txt published on June 19, 2006
- More work items, identified in draft, remain to be resolved
- Inputs are welcomed for the high level perspective - the functional entities, the protocol exchanges, and the required fields
- Further details will be worked out when there is rough consensus