Update of C2C-CC Requirements for NEMO Route Optimization

draft-baldessari-c2ccc-nemo-req-01
IETF-69 - 26/07/2007 - NEMO WG

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Outline

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Deployment Scenario

- NEMO to be used for non-critical safety applications and for infotainment
  => relaxed requirements

- sub-IPv6 C2C Network Layer provides ad-hoc routing with geographical broadcast domain
  => IPv6 is not aware of multi-hop network (single link from IPv6 perspective)
  => RO design is not directly affected and requirements are more general
Summary of Changes from -00

- Requirements restricted to the RO scope
- Removed requirements that are too specific to the C2C-CC technical approach
- Refined definition of requirements
- First cross-check with aviation industry requirements
  (draft-eddy-nemo-aero-reqs-00)
RO Scenarios

• Reference: RO Solution Space Analysis (RFC 4889)
• non-nested NEMO RO case (RFC 4889, Section 3.1)
• RO between MR and Correspondent Entity. CE can be:
  1. a NEMO MR. E.g. vehicles or other mobile networks
  2. a NEMO RO-enabled router. E.g. newly deployed routers that serve 
     dedicated CN.
  3. a NEMO RO-enabled CN. E.g. RSUs installed along the road.
  4. a MIPv6 RO-enabled CN
• Case 4 might blow up solution complexity => it was assigned a lower 
  priority as compared with 1,2,3
Req 1 - Separability

“A RO technique, including its establishment procedure, MUST have the ability to be bypassed by applications that desire to use bidirectional tunnels through the HA.”

• In other words, RO can be triggered and does not start automatically for every data traffic

• Motivation:
  – in some cases, it might not be beneficial to activate RO (delay due to setup procedure, privacy, security ...)

• Considerations:
  – design or implementation issue?
  – also required by aviation industry
Req 2 - MNN IPsec

“A RO technique SHOULD allow MNNs connected to the MR to use IPsec as if they were connected to a regular access router.”

- In other words, nodes of the mobile networks should be able to use full IPsec functionalities

- **Motivation:**
  - no pre-existing relationship between MR (vehicle’s embedded router) and MNN (passenger devices)

- **Considerations:**
  - IPsec support is understood, as it is part of IPv6 requirements
    => will be probably removed

To be removed because evident?
Req 3 - RO Security

“A RO technique MUST prevent malicious nodes to claim false MNP ownership.”

[“In order to achieve this, a RO technique MAY make use of security features provided by the sub-IPv6 C2C-CC Network layer (e.g. cryptographic protection), but it MUST NOT introduce new security leaks for the C2C-CC applications or render their security measures ineffective.”]

• In other words, a procedure like MIPv6 Return Routability is requested. Optionally, it can make use of specific security provided by the C2C stack.

• **Motivation:**
  – threats analysis that led to MIPv6 RR (RFC 4225)

• **Considerations:**
  – compatibility with legacy MIPv6 RR is not required by C2C-CC
**Req 4 - Privacy Protection**

“A RO technique MUST not require that the MNP is revealed to all nodes in the visited network.”

“Instead, a RO technique MUST allow for revealing the MNP only to selected nodes in the visited network.”

“Furthermore, a RO technique SHOULD allow that MNP and HoA are not exchanged as clear text.”

- In other words, C2C-CC is concerned about privacy in the ad-hoc domain and is designing mechanisms to prevent traceability of vehicles. Location privacy is also a concern.

- **Motivation:**
  - tracking of vehicles in ad-hoc domain to be minimized
  - tracking of vehicles from the Internet to be minimized

- **Considerations:**
  - users will be aware that by using the Internet their privacy is potentially decreased
  - nevertheless, RO with privacy protection is highly desirable
Req 5 - Multihoming

“A RO technique MUST allow a MR to be simultaneously connected to multiple access networks, having multiple prefixes and Care-Of Addresses in a MONAMI6 context.”

- In other words, NEMO RO should be usable for every CoA registered with the HA.

- **Motivation:**
  - vehicles to be equipped with multiple interfaces (802.11a/b/g, 802.11p, 3G, ...)

- **Considerations:**
  - RO scheme is not necessarily aware of the presence of multiple interfaces
  - also required by aviation industry
 Req 6 - Coexistence with Sub-IPv6 RO

“A RO technique MUST allow for coexistence in the same OBU with a RO technique offered by the sub-IPv6 C2C-CC Network layer. The OBU MUST be able to choose which technique to use when both are simultaneously available.”

• In other words, C2C-CC stack to provide functions that inject IPv6 routes in the routing table. NEMO RO should coexist with that.

• Motivation:
  – C2C-CC specific deployment of NEMO

• Considerations:
  – this requirement should not be any difficult to achieve
Conclusions and next steps

- A solution for MR-CE non-nested RO is required by the C2C-C Consortium

- Requirements have been clarified but some refining is still needed
  - To be added: Delay for RO establishment
  - To be removed: IPsec (understood)
  - Improvements in terminology/citations

- Similarities with aviation requirements seem to allow for design of multipurpose solutions (but it’s too early to state that)