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A Note on NAT64 Interaction with Mobile IPv6
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NAT64 Mobility

August 2009

Abstract

This memo discusses potential NAT64 technology repercussions for mobile nodes using Mobile IPv6 stack.

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1. Introduction

NAT64 technology described in [[I-D.ietf-behave-v6v4-xlate-stateful](#)], enables rapid IPv4 network conversion to a pure IPv6 stack while keeping possible the contact with the remaining IPv4 networks. It follows that nodes attached to a NAT64-powered network operate with an IPv6 stack only.

This memo aims to highlight potential NAT64 repercussions for mobile nodes using Mobile IPv6 ([[I-D.ietf-mext-rfc3775bis](#)]) and operating from behind a NAT64.

2. Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [[RFC2119](#)].

[3.](#) NAT64 Incompatibility with Mobile IPv6

It is interesting to start this section by mentioning that NAT technology in general has had from its infancy the rare feature of being incompatible with the Internet. Hence, the described new incompatibility should not come as a surprise!

NAT64 mechanism relies on DNS64 technology described in [\[I-D.ietf-behave-dns64\]](#) to provide the querying host with a synthetic DNS response in which, the queried FQDN is locally translated to an IPv6 address using the v6 prefix assigned to the NAT64 v6 interface. By inserting the translated IPv6 address in the synthetic DNS response, the querying node is tempted to believe that the destination is also using an IPv6 stack which in turn, enables establishing a session between the two nodes.

As NAT64 technology may have the potential of becoming widely deployed, we are tempted to study its behavior in the presence of a v6 mobility dimension. For this purpose, we assume that a mobile node (MN) configured with an IPv6 home address (HoA) leaves its NAT64-powered home network and attaches to a foreign NAT64-powered network where it configures a new IPv6 address, i.e., care-of address

(CoA). In the following, we look into two scenarios which require using MIPv6 either to establish a new session or to try to switch the data packets exchange to the optimal path via using MIPv6 route optimization (RO) mode.

In a first scenario, we consider that before detaching from its home network, the MN has established a session with a corresponding node (CN) which is attached to an IPv4 network. However, due to the NAT64 presence in the home network, the MN believes that it is talking with an IPv6-enabled CN and hence, it decides upon attaching to the new NAT64-powered foreign network, to run MIPv6 return routability (RR) procedure with the CN by sending first a home test init (HoTI) message via its home agent. It is clear that such message will be discarded either by a "more" intelligent NAT64 (i.e., in which case it may be followed by an ICMP message sent to the MN) or by the CN. In both cases, the MN will correctly realize at some point that the RR procedure cannot succeed. Consequently, there is no harm inflicted to the MN and more importantly, no data packet loss since the MN will keep using MIPv6 bidirectional tunneling (BT) mode.

However, the situation becomes problematic when we consider another scenario in which, the MN decides to establish a session with the same CN from the foreign NAT64-powered network. In such case, the MN will first obtain a synthetic DNS reply which presents the CN as being an IPv6-enabled node. Based on that, the MN may either try to create a binding at the CN by running first the RR procedure which

will ultimately fail (i.e., for the same reasons as in the first scenario) or more likely, will initiate the session with the CN by using the BT mode then switching to the RO mode. In this case, the MN tunnels first its data packets to its HA without having them being intercepted by the foreign NAT64. However, after reaching the HA, the data packets will most likely be dropped at some point. This is due to the presence of the foreign NAT64 IPv6 prefix in the CN's IPv6 address.

[4.](#) Security Considerations

This memo describes scenarios where a NAT64 can inflict harm to a mobile node visiting the associated network.

[5.](#) Acknowledgements

Thanks to Francis Dupont and Joel Halpern for reviewing the document at an early stage.

[6.](#) References

[6.1.](#) Normative References

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