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June 2023

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Recommended Citation

Sardara, Mauro; Auge, Jordan; Muscariello, Luca; and Mantellini, Angelo, "FAST NETWORK ADDRESS TRANSLATION TRAVERSAL FOR CONNECTION MIGRATION", Technical Disclosure Commons, (June 13, 2023)
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FAST NETWORK ADDRESS TRANSLATION TRAVERSAL FOR CONNECTION MIGRATION

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ABSTRACT

Conventional mechanisms for traversing a network address translation (NAT) device can be slow and, as such, may limit dynamic traffic management of traffic flows through network edge devices. Presented herein are techniques that provide a mechanism to support connection migration (e.g., from the cloud to the edge) with fast NAT traversal.

DETAILED DESCRIPTION

In a call, all endpoints potentially sit behind network address translation (NAT) devices (typically referred to as 'NATs'). These endpoints can include both the clients at their network providers (e.g., ISPs) and cloud/edge nodes in microservice architectures.

An Interactive Connectivity Establishment (ICE) framework is typically used to traverse NATs but can slow due to the number of checks that typically have to be performed to facilitate such traversal. This is necessary at the beginning of a call and is suitable for bootstrapping edge nodes before they can be used (e.g., to connect to the cloud nodes, for instance). However, this can also become a problem when dynamic traffic management through the edge is desired.

To this end, techniques are presented herein that can be used to help speed up NAT traversal when a client attaches to an edge relay in order to migrate a flow in progress. In some instances, the edge might be offered as a service, rather than as part of the application control plane.

Consider an example architecture through which techniques of this proposal may be illustrated, as shown below in Figure 1, involving a client (C), a server (S), and an edge device (E).

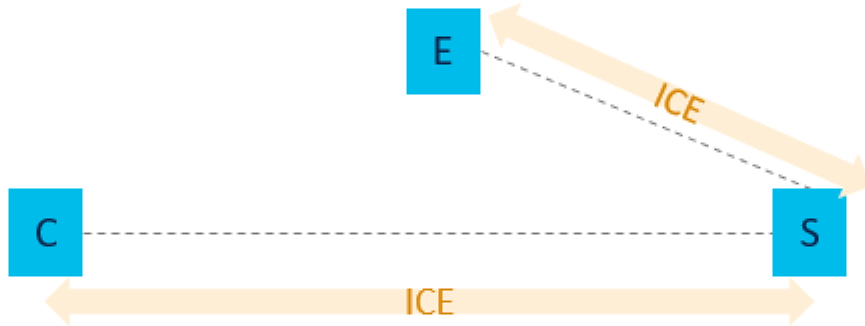

Figure 1: Example Architecture

Under the architecture of Figure 1, a three-phase approach may be provided in accordance with techniques of this proposal in order to facilitate fast NAT traversal, as follows:

1. Out-of-band, during edge deployment, the edge device E performs regular ICE/Trickle ICE negotiations with the server S;
2. At connection start, the client C also attaches to the cloud server S and also performs ICE negotiations with the server;
3. For call migration to the edge E, the server already knows the valid (IP, port) tuples for the edge (can client C) and can communicate this in the control plane message toward the client C or the edge E to start the migration.

From a control plane perspective, valid ICE candidates may be collected and distributed as part of the edge association procedure.

From a data plane perspective, in the case of a not-too-restrictive NAT, client C should be able to communicate without delay. For more restrictive implementations on one side, as can be seen from the previous ICE procedures, client C may send a control packet towards edge E as part of the data plane (which might be used to exchange contextual information, authentication from the client) and, immediately after, a useful packet.

In the case of exceptional packet reordering, server S could buffer the received packets for a short amount of time before receiving authentication from the client, or the client C could simply implement reattempts. In terms of hybrid Information-Centric Networking (hICN) architectures, a mapping application could be leveraged for the

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mobility signalization update for each locally produced prefix in order to properly update the face with the correct IP/port to be used. This will have the effect to both create the correct adjacency in the edge device E and the route towards the client C.

Accordingly, techniques presented herein can help to speed-up NAT traversal when a client attaches to an edge relay in order to migrate a flow in progress.