Gratuitous Neighor Discovery. Creating Neighbor Cache Entries on First-Hop Routers

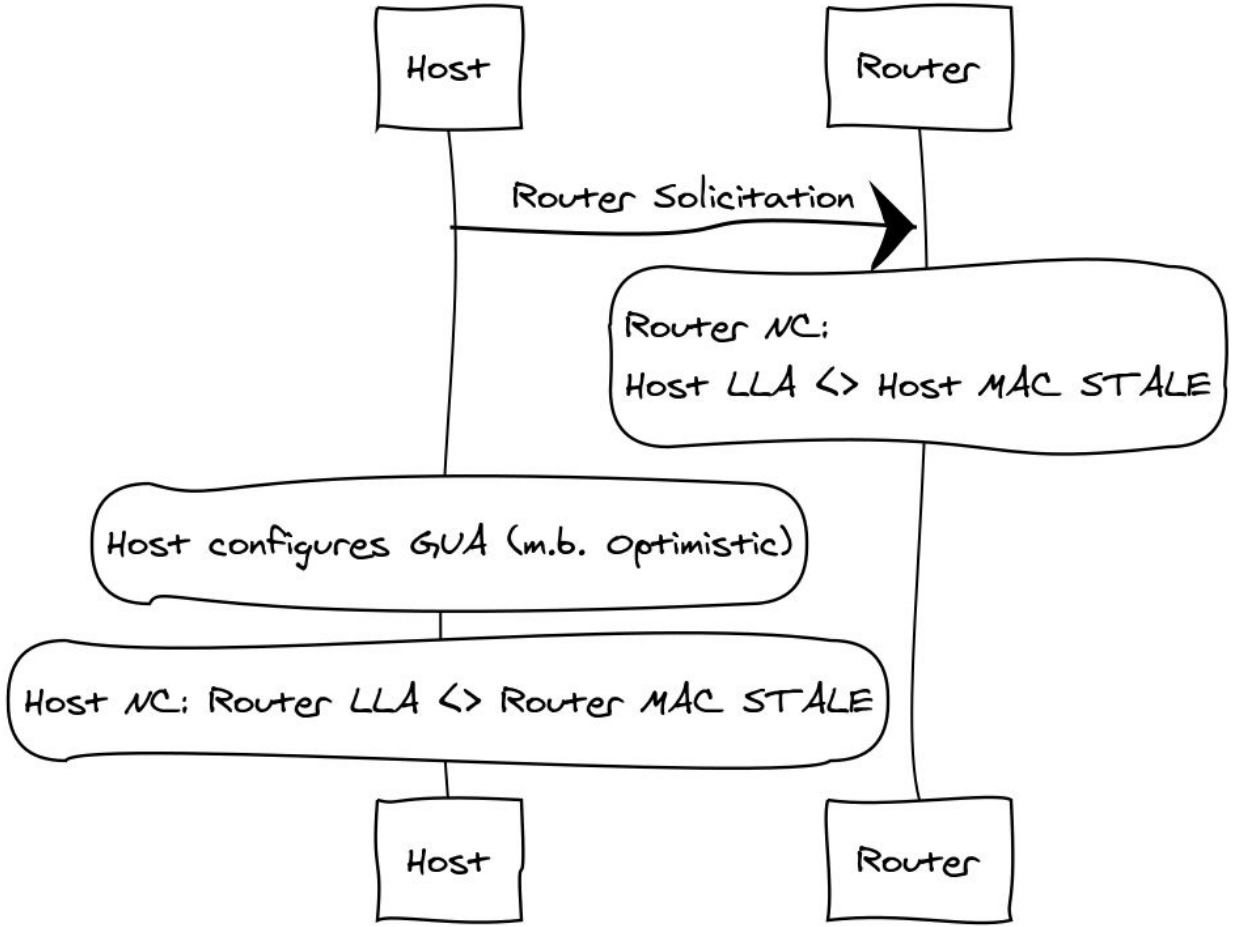
draft-linkova-6man-grand-00

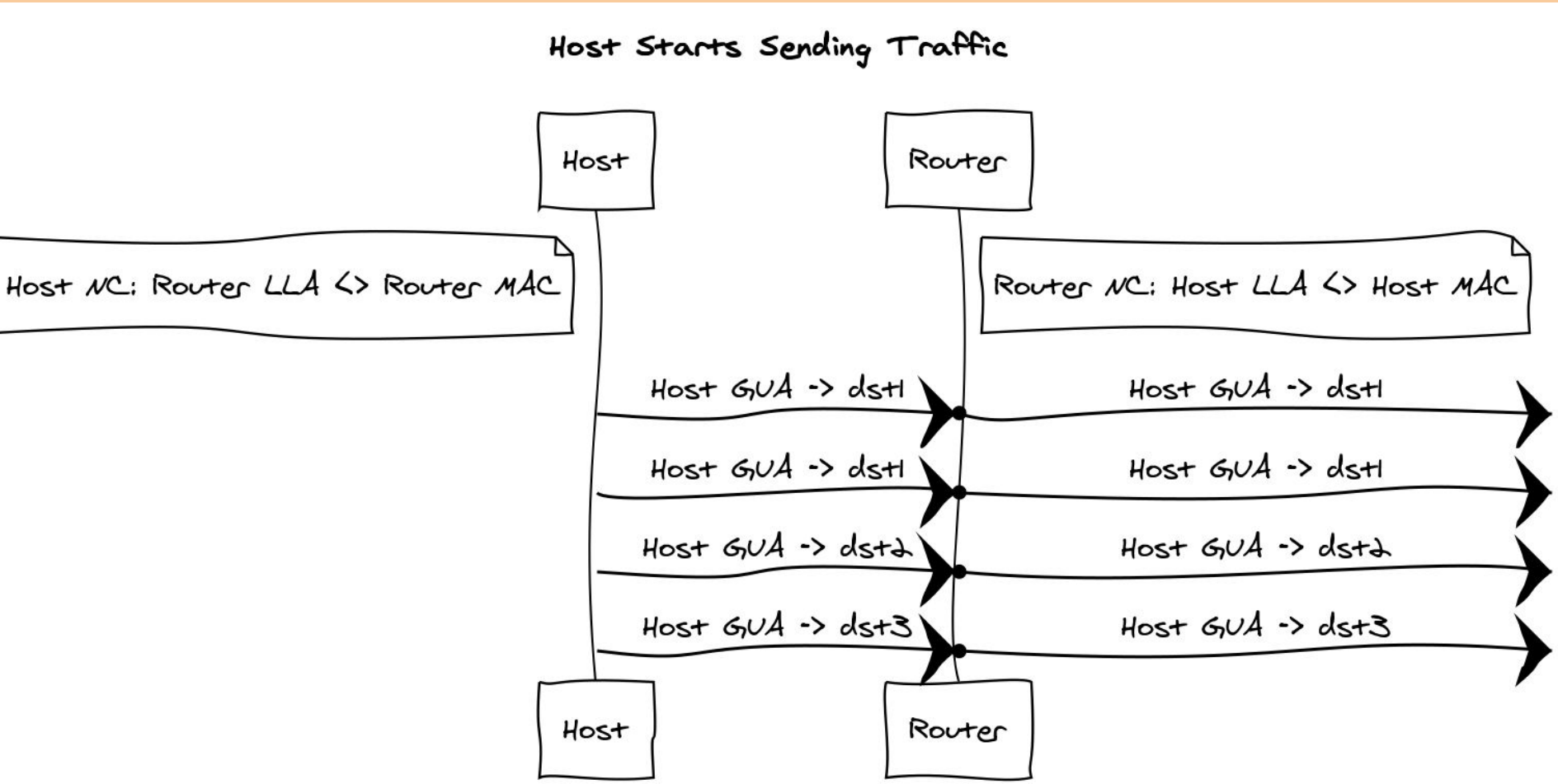
Jen Linkova

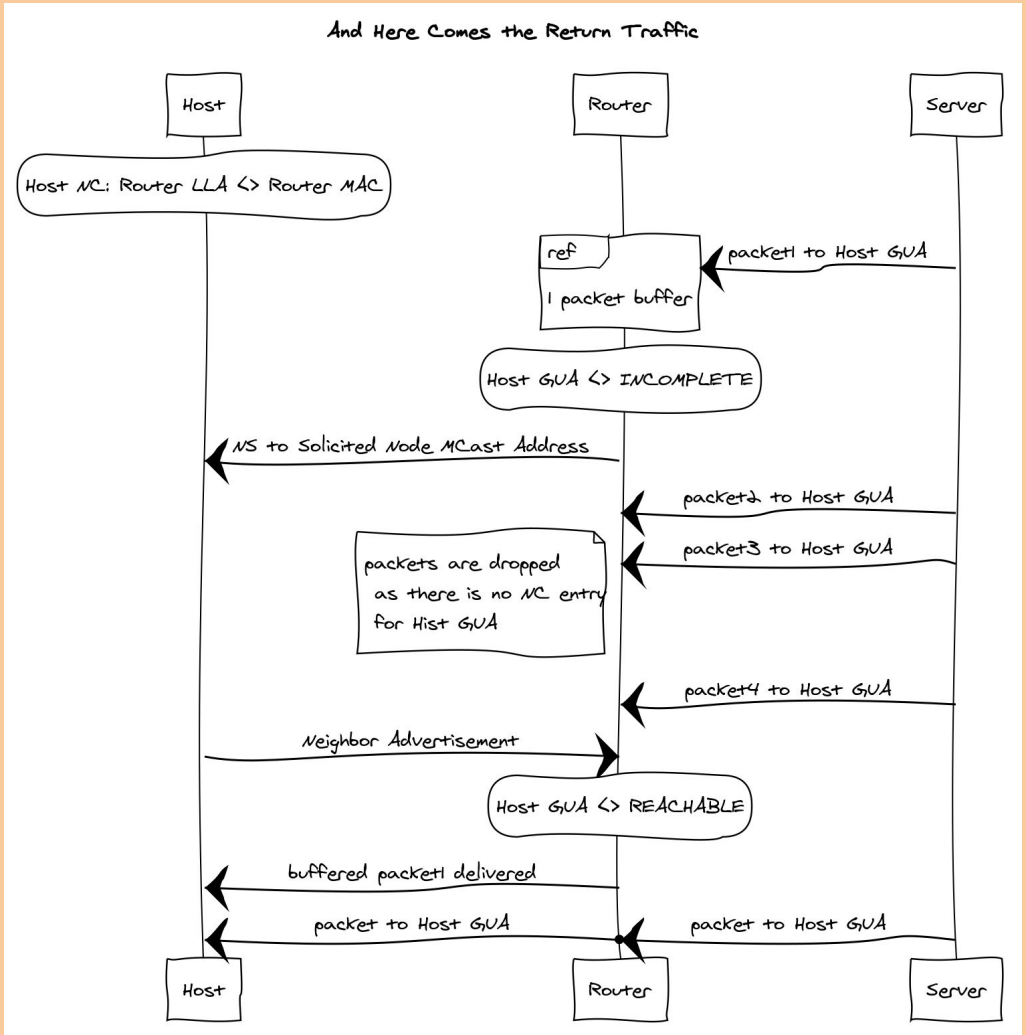
IETF106, Nov 2019

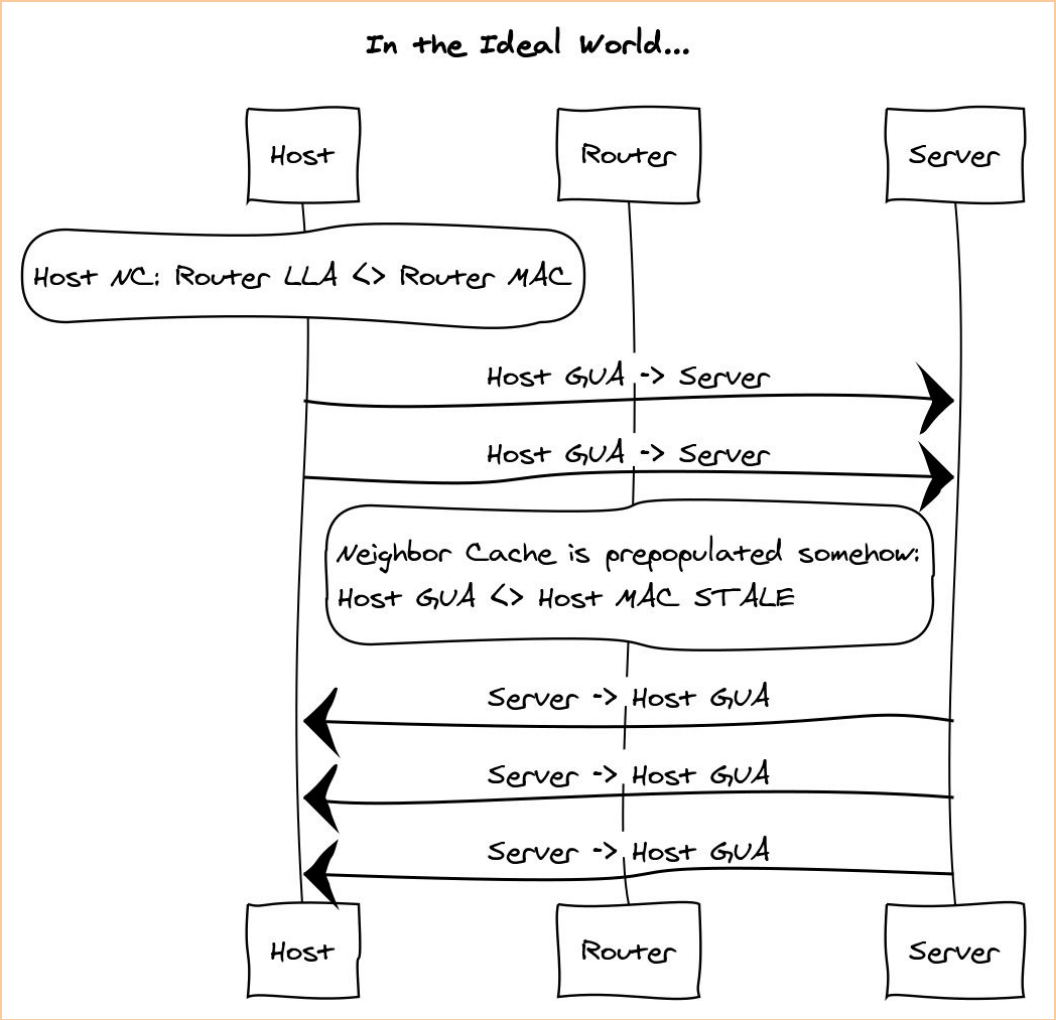
If you have not read the draft

Host Joins the Network




Host Starts Sending Traffic
Host
Router
Host NC: Router LLA <> Router MAC
Router NC: Host LLA <> Host MAC
Host GUA -> dst1
Host GUA -> dst1
Host GUA -> dst1
Host GUA -> dst1
Host GUA -> dst2
Host GUA -> dst2
Host GUA -> dst3
Host GUA -> dst3
Host
Router


And Here Comes the Return Traffic
Host
Router
Server
Host NC: Router LLA <> Router MAC
ref
1 packet buffer
packet1 to Host GUA
Host GUA <> INCOMPLETE
NS to Solicited Node MCast Address
packet2 to Host GUA
packet3 to Host GUA
packets are dropped
as there is no NC entry
for Hist GUA
packet4 to Host GUA
Neighbor Advertisement
Host GUA <> REACHABLE
buffered packet1 delivered
packet to Host GUA
packet to Host GUA
Host
Router
Server


In the Ideal World...
Host
Router
Server
Host NC: Router LLA <> Router MAC
Host GUA -> Server
Host GUA -> Server
Neighbor Cache is prepopulated somehow:
Host GUA <> Host MAC STALE
Server -> Host GUA
Server -> Host GUA
Server -> Host GUA
Host
Router
Server

Dual-Stack Network

- Hosts sends Gratuitous ARP
- Routers get their cache updated
- Happy Eyeballs

IPv6-Only Networks: RFC4861

"When a valid Neighbor Advertisement is received (either solicited or unsolicited), the Neighbor Cache is searched for the target's entry. If no entry exists, ***the advertisement SHOULD be silently discarded***.

There is ***no need to create an entry*** if none exists, ***since the recipient has apparently not initiated any communication with the target***".

True for host2host, not for routers!

- draft-ietf-v6ops-nd-cache-init-00
  - Problem statement
  - Various solution approaches
- draft-linkova-6man-grand-00
  - Proposed solution (changes to RFC4861)
  - Security considerations

Solution Requirements

MUST:

- Creating a new STALE (or INCOMPLETE) entry if one does not exist
- MUST NOT override the existing entry
- Work for Optimistic addresses too

Nice to Have:

- Work for asymmetric flows (multiple routers)

What Can We Do?

- Nothing (working as intended)
- Host sends unsolicited NAs, routers create entries
- Routers glean from DAD packets
- Host sends NS to routers from GUA source Would not work for Optimistic address
- Host sends RS from GUA source Would not work for Optimistic address (unless routers do unicast RAs
- Host sends data traffic to the router
- ~~Routers buffer more data packets while doing address resolution~~
- ~~Transit data packets trigger address resolution~~ (*)

(*) not in the draft currently

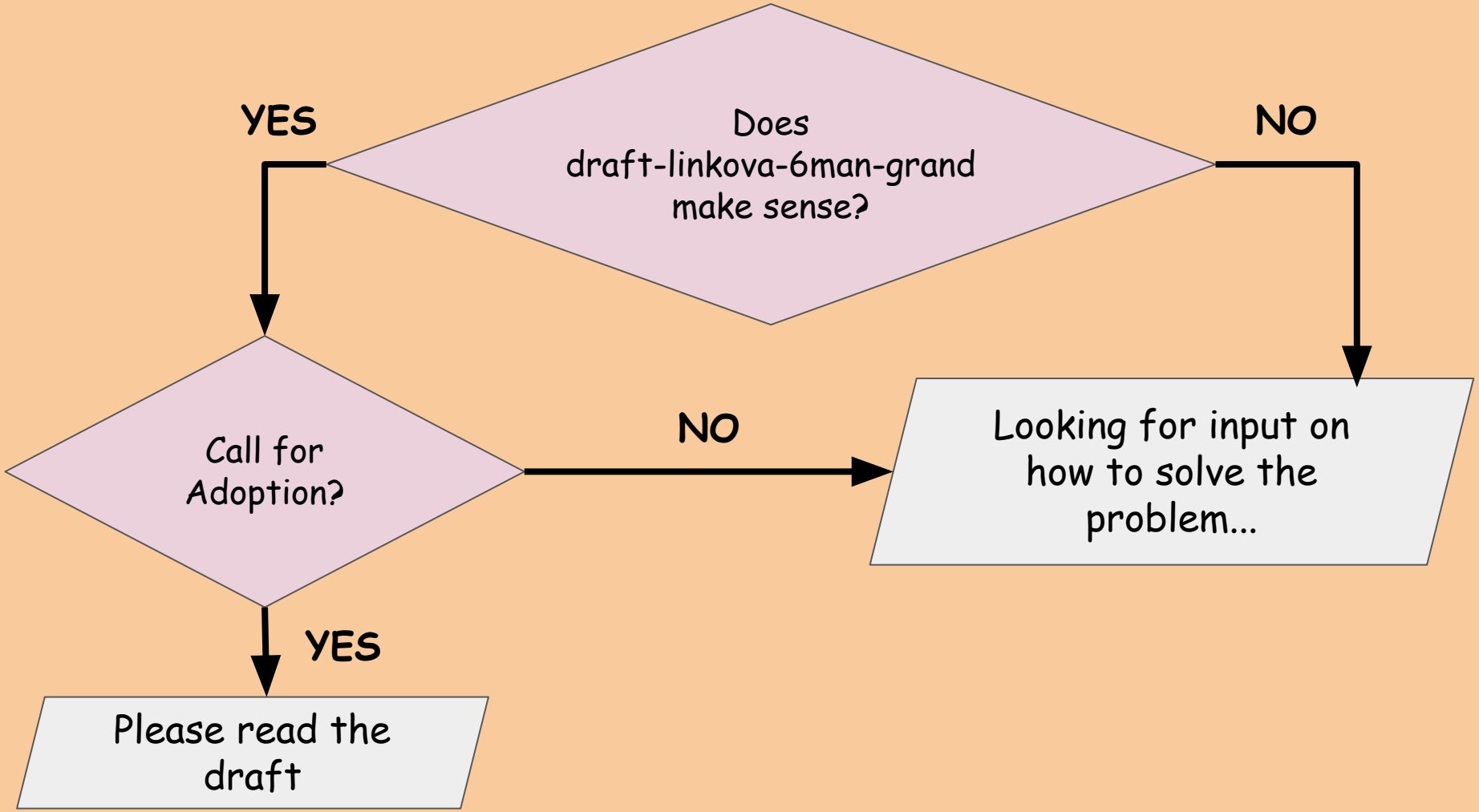
Proposed Changes

- Hosts SHOULD send Gratuitous NAs when a new address is configured on the interface
  - Override flag set to 0
- Routers MAY create STALE entries upon receiving unsolicited NAs

Avoiding disruption

- If an entry exists in any state ex. INCOMPLETE:
  a. Receiving unsolicited NA makes it STALE - no disruption
- INCOMPLETE entry:
  a. The router has sent a multicast NS
  b. Unsolicited NA received: INCOMPLETE -> STALE
  c. The rightful owner responds with 'solicited, Override set':
  d. link-layer address in the Target Link-Layer Address inserted into the cache, STALE -> REACHABLE

Packets for the GUA are sent to the wrong host between b and c. But they would have been dropped (ex. for the first packet anyway).


Does
draft-linkova-6man-grand
make sense?
YES
NO
Call for
Adoption?
NO
Looking for input on
how to solve the
problem...
YES
Please read the
draft