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

draft-linkova-6man-grand-00

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If you have not read the draft
Host Joins the Network

**Host**

**Router**

**Router Solicitation**

**Router NC:**
Host LLA <-> Host MAC STALE

**Host configures GvA** (m.b. Optimistic)

**Host NC:**
Router LLA <-> Router MAC STALE

**Host**

**Router**
Host Starts Sending Traffic

Host NC: Router LLÅ <-> Router MAC

Router NC: Host LLÅ <-> Host MAC

Host GvÅ -> dst1
Host GvÅ -> dst1
Host GvÅ -> dst2
Host GvÅ -> dst3
Host GvÅ -> dst1
Host GvÅ -> dst1
Host GvÅ -> dst2
Host GvÅ -> dst3
And Here Comes the Return Traffic

Host

Host MC: Router LLÅ to Router MAC

Router

ref

1 packet buffer

carrier to Host GUA

Host GUA -> INCOMPLETE

MC to Solicited Node MCast Address

packets are dropped as there is no MC entry for Host GUA

Neighbor Advertisement

Host GUA -> REACHABLE

buffered packet delivered

packet to Host GUA

Host

Router

Server

packet to Host GUA

packet to Host GUA

packet to Host GUA

packet4 to Host GUA

packet3 to Host GUA

packet2 to Host GUA

packet1 to Host GUA

In the Ideal World...

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
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
- Host sends RS from GUA source
- 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

Would not work for Optimistic address (unless routers do unicast RAs)
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

SHOULD MAY be SHOULD?
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

Call for Adoption?

YES

Please read the draft

NO

NO

Looking for input on how to solve the problem...