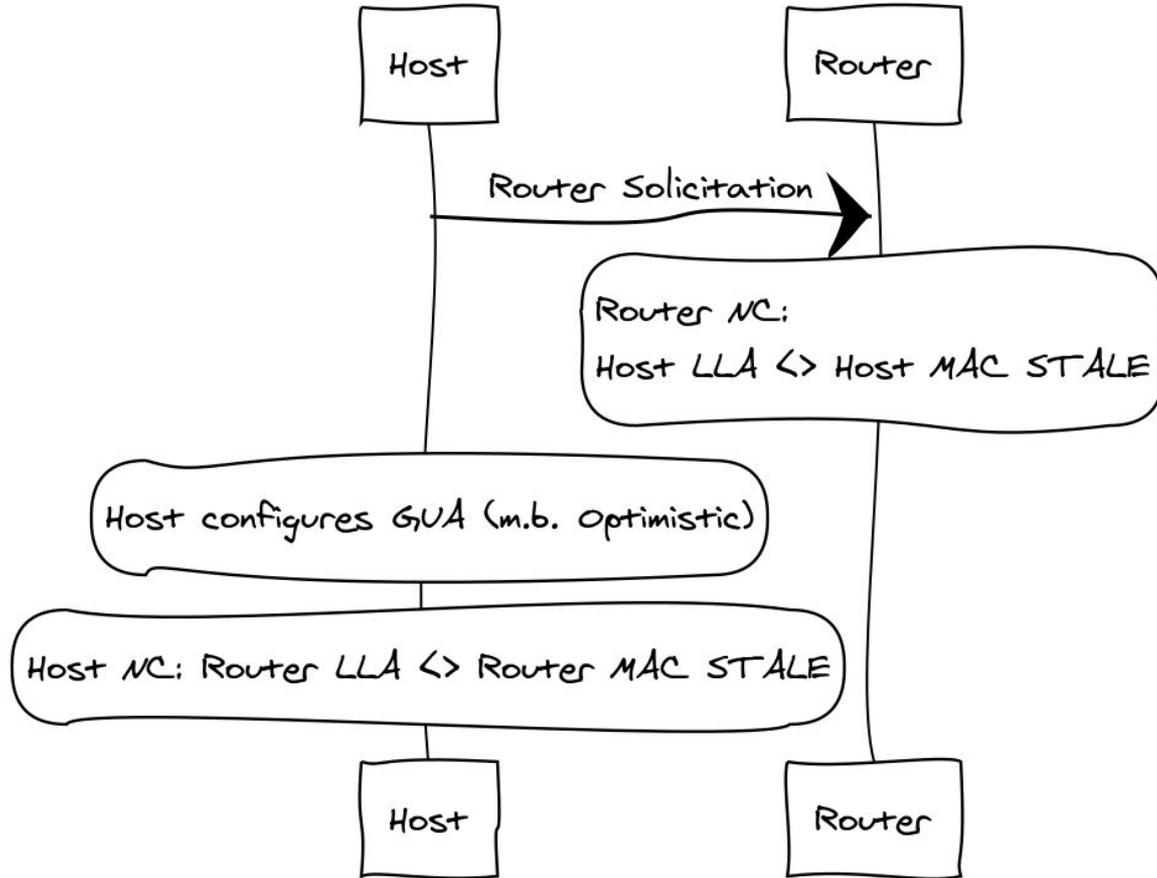


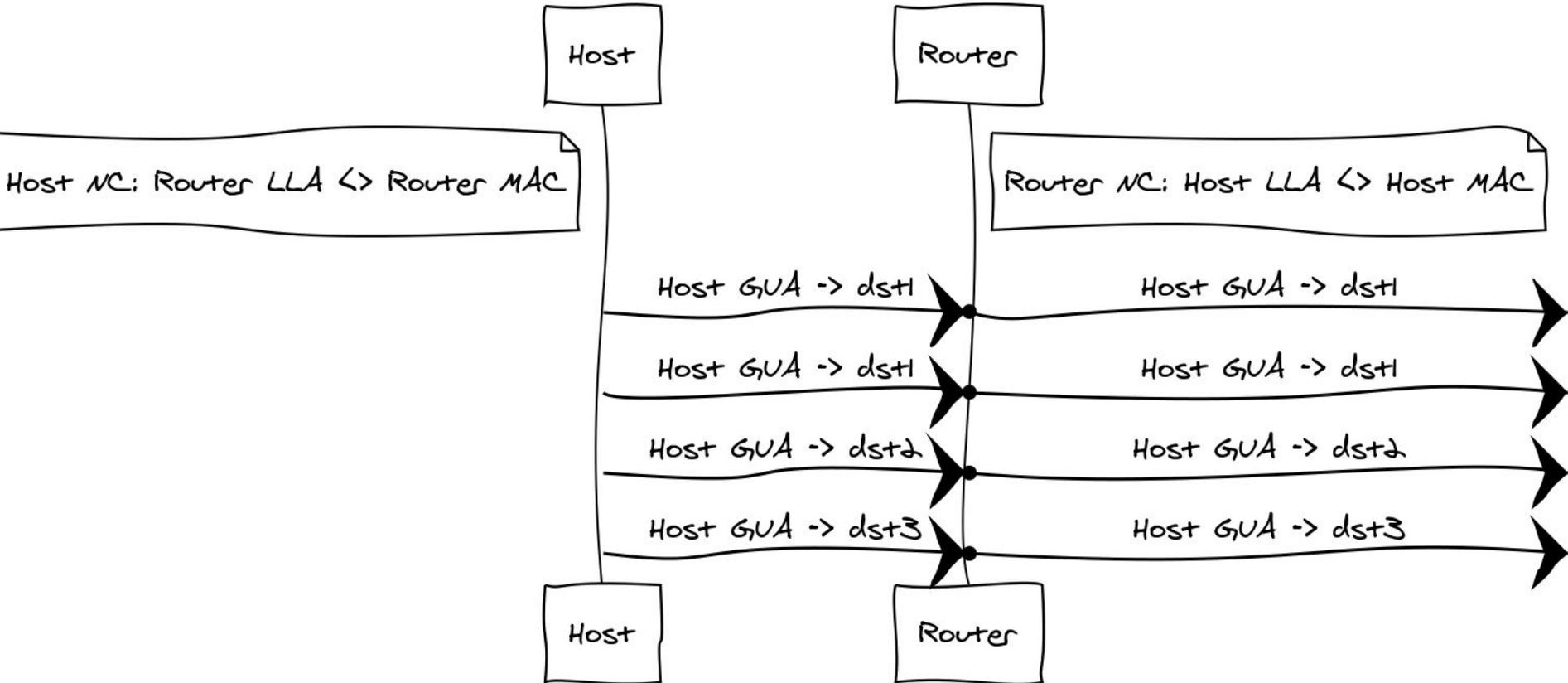
# draft-linkova-v6ops-nd-cache-init-01

Jen Linkova  
IETF105, July 2019

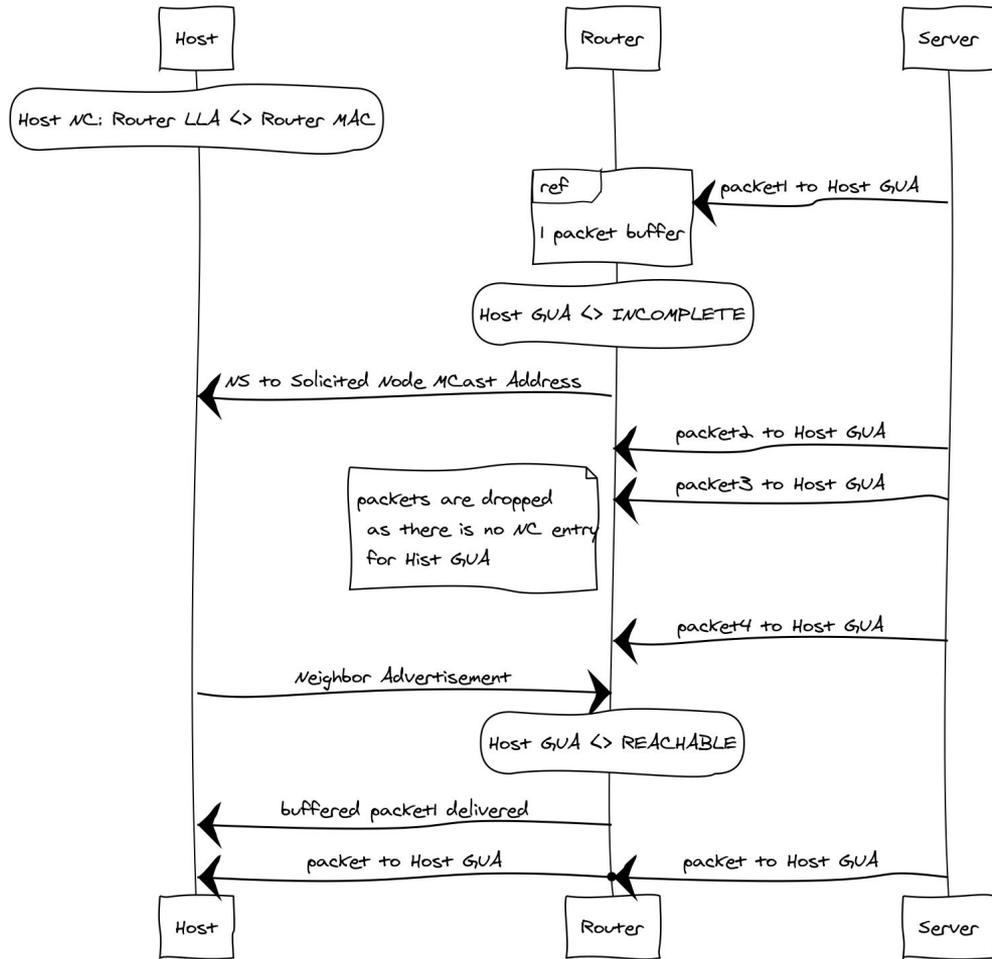
# Host Joins the Network



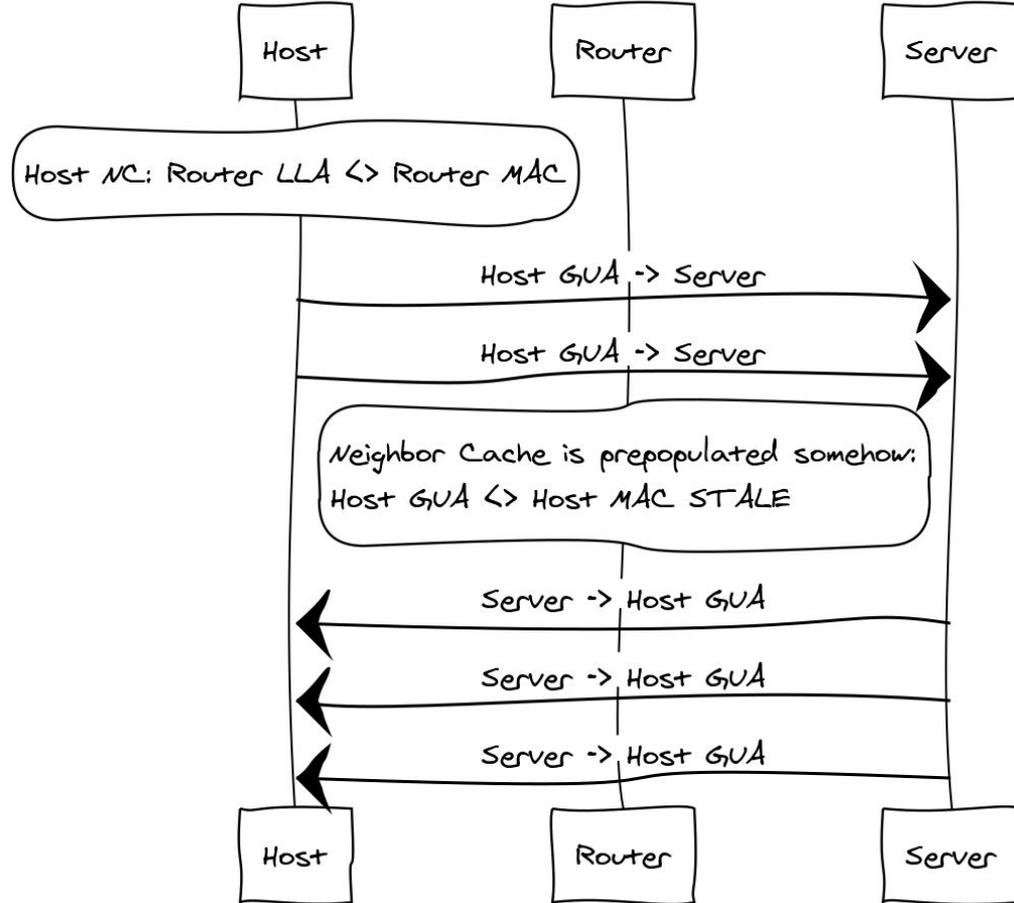
# Host Starts Sending Traffic



And Here Comes the Return Traffic



In the Ideal World...



# Dual-Stack Network

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

# IPv6 and RFC4861

## 7.2.5. Receipt of Neighbor Advertisements

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.

Not a case for host2router communication.

# Impact

- Almost Inevitable packet loss
- Noticeable delay in using the network
- Negative perception of IPv6-Only networks

# What Can We Do?

- Nothing
- Modernize Neighbor Discovery
- Make hosts advertise their addresses
  - Might require tweaking Neighbor Discovery on routers
- Fix hosts
- ~~Make routers buffer more packets~~

# Requirements

## MUST:

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

## Nice to Have:

- Work for asymmetric traffic flows

# Do Nothing aka "Working as Intended"

*"It's a cosmetic issue, just a few packets, transport/applications shall deal with it"*

## Pros:

- Easy

## Cons:

- Unhappy Eyeballs
- Unhappy support
- More resistance to deploy IPv6

# Use Registration-Based ND/RFC8505

*As proposed by Pascal Thubert*

## Pros:

- Would solve the problem

## Cons:

- Might introduce other issues (e.g. state recovery)
- Migration Strategy is unclear

# Host Sends Unsolicited NAs + Routers Glean "Gratuitous ARP" for Neighbor Discovery

## 7.2.5. Receipt of Neighbor Advertisements

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.

...unless the receiving device is a router...

## Pros:

- RFC4861-Compliant
  - It says 'SHOULD'
- Already implemented in some platforms
- Updates all routers

## Cons:

- Changes to hosts required
- Needs to be configurable (to prevent attacks)
- "Smart" WiFi devices

# Host Sends NS from GUA to Router

- Source:
  - Host GUA
- Destination:
  - Host default router link-local address
- Options:
  - SLLA set to the host MAC

## Pros:

- RFC6583-compliant routers might prioritize those packets

## Cons:

- Changes to hosts required
- **Prohibited for Optimistic addresses**
- "Smart" WiFi devices

# Host Sends RS from GUA to its Router

- Source:
  - Host GUA
- Destination:
  - ff02::2
- Options:
  - SLLA set to the host MAC - ONLY if the GUA is not optimistic

## Pros:

- RFC6583-compliant routers might prioritize those packets
- Cache updated on all routers

## Cons:

- Changes to hosts required
- **Prohibited for Optimistic addresses(\*)**
- "Smart" WiFi devices

(\*)Would work w/o SLLA if routers respond with unicast solicited RAs

# Host Pings the Router

## Pros:

- Works even with "smart" WiFi middleboxes

## Cons:

- Packets could be blocked
- Load on routers
- Only active router is updated

# Proposed Tactical Solution

Hosts send unsolicited NAs when:

- If optimistic DAD is used: new optimistic address assigned
- Else: tentative -> preferred state change

Routes glean from unsolicited NAs  
(configurable)

# Security Considerations

No changes proposed re: existing entries

All solutions discussed only creates an entry

Threat model: malicious host trying to exhaust the router NC:

Malicious hosts can do it today

QUESTIONS?

COMMENTS?