draft-yourtchenko-6man-dad-issues-01

Issues with DAD in IPv6

IETF92, Dallas

Changes (-00 to -01)

- Incorporated comments – thank you!
  - Lorenzo Colitti, Suresh Krishnan, Hemant Singh, Hesham Soliman, Eric Vyncke, James Woodyatt
- Long list ➔ Three Sections
  - Open Issues
  - Solved Issues
  - Observations
- Coauthors: Erik + Andrew

Solved Issues

- Interaction with looped interface
  - Enhanced DAD draft
- Delays before an address can be used
  - Optimistic DAD RFC (with some disclaimers)

Observations

- Duplicate L2 address detection
- Usage of DAD to create state
- No support of multi-link subnets
- Anycast Addresses and DAD
- Implementations using DAD once per IID
- Backward compatibility and presence of DAD proxies

Open Issues
Robustness and Efficiency

- Interaction with delay in forwarding
- Behavior on links with unreliable mcast
- Partition-join (in)tolerance
- Behavior on collision
- Energy Efficiency
- Wake-up and L2 events

Interaction with delay in forwarding

- With bridge + modem or IEEE 802 STP
  - Host sees link up but but all packets dropped
- If outage when address configured => DAD probe(s) lost
  - Failure to detect any duplicate
- FWIW resilent-rs solves this for RS/RA exchange

Behavior with unreliable L2 multicast

- DAD probe and resulting NA (if duplicate) both multicast
- For links multicast much less reliable than unicast
  - WiFi being prime example
- Add-hoc experimentation on IETF 90 WiFi
  - 4 out of 5 cases of duplicate addresses not detected
- Note: IEEE 802.11aa working on better reliability for multicast streams such as video

Partition-join (in)tolerance

- DAD checks for duplicates at address configuration time only
- Some parts of the link could be partioned and later the partition heals
  - Might be able to reach some nodes and not others
  - More general form of "delay in forwarding"
- Note: IPv4 has ACD [RFC5227] which does contiguous duplicate detection
  - Designed for IPv4 link-locals which have high collision probability

Behavior on collision

- RFC4862 doesn't specify retry/recover on collision
  - Reason is EUI-64 heritage (can't form new EUI-64)
  - Some hosts might reset/disable the interface!
  - This text is unfortunate: "Clarified that on failure of Duplicate Address Detection, IP network operation should be disabled and that the rule should apply when the hardware address is supposed to be unique."
- RFC4941 [privacy addresses] specify to generate a new IID and try again
- DHCPv6 SHOULD DAD and decline if duplicate
- Even if EUI-64 or static, don't need to disable the interface as long as the link-local address is OK
  - Would make it more robust in the face of collisions

Energy Efficiency

- Network efficiency
  - Multicast DAD consumes more bandwidth than unicast on WiFi
- Host efficiency – better support sleeping hosts
  - Packets to solicited-node MC might cause unneeded wakeup
    - Host implementation needs filtering
    - MC packets might be broadcast at L2 for some links
  - To defend its address(es) host has to always listen on the solicited node multicast address(es)
    - Not allowed to sleep
- Note: Potential techniques for making DAD robust might result in reduced efficiency

Wake-up and L2 events

- RFC4862 specifies to do DAD on when assigning address to interface
  - No mention of what to do on link up/down
- DNA [RFC6059] says SHOULD NOT DAD when re-attaching to previously visited link
  - Risk of undetected duplicates; effectively partitioned
- DNA could instead have recommended to always DAD probe
  - Would have resulted in additional delay and (multicast) packets

Questions for WG

- Does the WG want to work on solving some of the problems?

- Work on only the robustness problems?

- Work on the efficiency/sleeping host one?

- Work on both?

Rough ideas in draft-nordmark-6man-dad-approaches

- Improve robustness with contiguous DAD
  - Inspired by IPv4 ACD – but avoid broadcast
  - Send DAD announce to solicited-node multicast
  - Improvement on list [Sowmini]
    - Avoid doing it for every NS/NA – rate limited, periodic?
    - Defend (more) if static address; less if privacy/random addr
- Allow sleep with robust DAD using sleep proxy
  - Host provides lifetime of binding – new option or ARO
  - Proxy checks for duplicate and acks/nacks accordingly; records address
  - Proxy responds to DAD probes for recorded addresses