Failure and Reachability Detection

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Reachability Detection

- Multihoming:

  1. dectect failures

  2. route around them

- Management of address candidate important but out of scope

- Terminology: address pair = unidirectional path

Simple Approach

- Simple approach: "ping" all source/dest pairs, pick best round trip time

- Doesn't detect unidirectional reachability

- Doesn't scale well: $n_a * n_b$
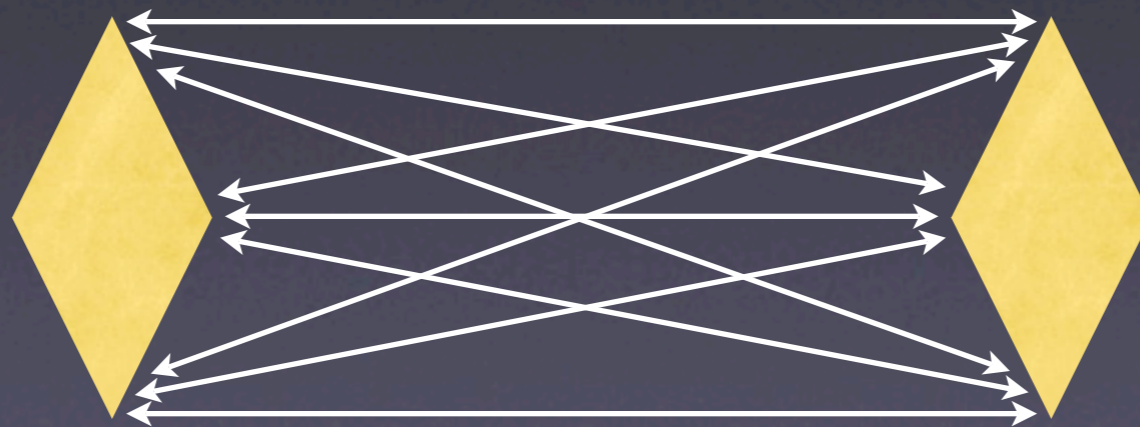
Complexity++

- Use semi-reliable procedure to indicate probe was received

    - finds unidirectional connectivity

- Use heuristics to pick good candidates, stop probing when results are reasonable

    - avoids (now $2n^2$) exploration explosion

    - but: may not find "best" link

This is hard work...

- So split off a separate light-weight protocol to confirm previously existing reachability

- Two suggestsions for this:

  - "correspondent unreachability detection" (CUD)

  - "forced bidirectional communication" (FBD)

CUD

- Similar to IPv6 neighbor unreachability detection (NUD):

  - upper layer protocols indicate that there is progress

  - if no ULP progress, do request/response connectivity test

  - if this fails, full reachability exploration

FBD

- Observation: most protocols generate traffic in both directions

- Make this a rule, generate "keepalive" when otherwise traffic in one direction

  - When only packets in one direction: suspected failure, do full reachability exploration

Tradeoffs

- CUD needs positive ULP feedback to be efficient

- f-bidi needs no cooperation from ULP but may be able to use negative ULP feedback

- FBD only adds packets in the otherwise idle direction

More Tradeoffs

- CUD: sender detects failures in either direction

- FBD: receiver detects failure in incoming direction

  - depend on other side to detect failures in our outgoing

- Uncooperating ULPs: CUD always probes

Granularity

- Detect host-to-host reachability

- Detect ULID-to-ULID reachability

  - all traffic between hosts/ULIDs over same locator pair!

- Detect locator-to-locator reachability

- Sweet spot probably at ULID-to-ULID but reuse locator-to-locator info

Heuristics and Optimizations

- When other side initiates full reachability exploration, we should probably do it too

  - They may know something we don't

- Three way check confirms both directions, less packets but rely more on other side

- What's happening to other sessions?

- ICMP, layer 2 and 3 events...

NATs and Firewalls

- NATs: protocol may be reused for IPv4

- Want fate sharing with real traffic

  - Can't be done: we'd have to be TCP or IP option, but IP options == firewall trouble

- Fate sharing with shim (or other?) negotiation doable, need to encapsulate

- Do we want to sneak by firewalls?

Security

- Probably don't want to do reachability detection for completely unknown correspondents, but bar not too high

- So need room for auth data of some sort

- Must be light-weight!

- Avoid amplification and redirection attacks

To Do

- Integrate new draft with Jari's

- Send text!