Outline

- Why do we need them?
- ICN Ping (draft-mastorakis-icnrg-icnping-03)
- ICN Traceroute (draft-mastorakis-icnrg-icntraceroute-03)
Why do we need them?

- Need for some lightweight mechanisms/tools to provide some troubleshooting information before employing more “heavy-duty” tools like CCNInfo
ICN Ping

draft-mastorakis-icnrg-icnping-03
ICN Ping Functionality

- **Target Flavors**
  - Is an ICN forwarder reachable?
  - Is a producer application reachable?
  - Is a cached object reachable?

- **RTT measurements**
  - Run several pings and provide times for each response
Reachability

- **Is an ICN forwarder reachable?**
  - Forwarders need names
  - Either globally routable, named under the name of their administrator (e.g., “/att/forwarder3”), or use forwarding hint to reach the forwarder’s administrative domain
  - Forwarder names need to be known

- **Is a producer application reachable?**
  - Discover the forwarder with local connectivity to (an instance of) the application

- **Is a cached object reachable in some on-path CS?**
  - If so, return administrative name of forwarder, where the object is cached
Multipath

- E.g. RTT measurements in presence of multipath?
  - Path Identification
    - PathId TLV in Data Message packet header
  - Path Steering
    - PathId TLV in Interest Message packet header causes Interest to follow the reverse path of the Data Message that returned the PathId
  - Path Discovery
    - For Interests sent without PathIds, forwarders will switch Interests, making a probabilistic choice among next hops
Echo Request/Reply

- **Echo request**
  - Target Name
  - PathId
  - CS bypass

- **Echo reply**
  - Responding forwarder name
    - Goal: user can reach this entity directly to ask for further management/administrative information (either through Interest/Data exchanges or CCNInfo)
  - Return code (type of reachability, 1-3)
    - Reply should be signed to avoid reflection attacks
Packet Processing Process

● Re-use Interest/Data/IntReturn Message Types
  ○ Largely match Interest/Data forwarding semantics
  ○ Avoid aggregation with other pings or with Interests: Include random nonce in name
  ○ Avoid CS caching of response: ExpiryTime TLV=0, freshness period = 0
  ○ Header PathId for identification/steering (not restricted to echo)

● Echo Request/Reply Packet Types
  ○ Quick identification of ping messages
  ○ Allows forwarding semantic differences
    ■ Application node response from forwarder, i.e. Interest not passed to locally attached target application

● Matching can be FIB LPM-based (e.g. add entry for local router name to FIB, with internal next-hop)
ICN Traceroute

draft-mastorakis-icnrg-icntraceroute-03
ICN Traceroute Functionality

- **Target Flavors**
  - What is the path to an ICN forwarder?
  - What is the path to a producer application?
  - What is the path to a cached object?

- **Path hop-by-hop RTT measurements**
  - Run several protocol exchanges for each hop and provide times for each response

- **High overlap with ping functionality/mechanisms/procedures**
Differences with ICN Ping

- Two packet types: TracerouteRequest, TracerouteReply

- Core mechanism based on HopLimit Expiry (expanding ring search)
  - Additional reply code from responding forwarder: HopLimitExpired