Publisher Mobility

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IP Host Mobility

- A host moves from one network to another network

  - Need to get a new address in the visited network

- This breaks a couple of things

  - Ongoing TCP connections will break due to the address change.

  - Cannot initiate connection to the mobile since its new address is not known.

- Many solutions have been proposed, including mobile IP, but they all end up chasing the moving node.
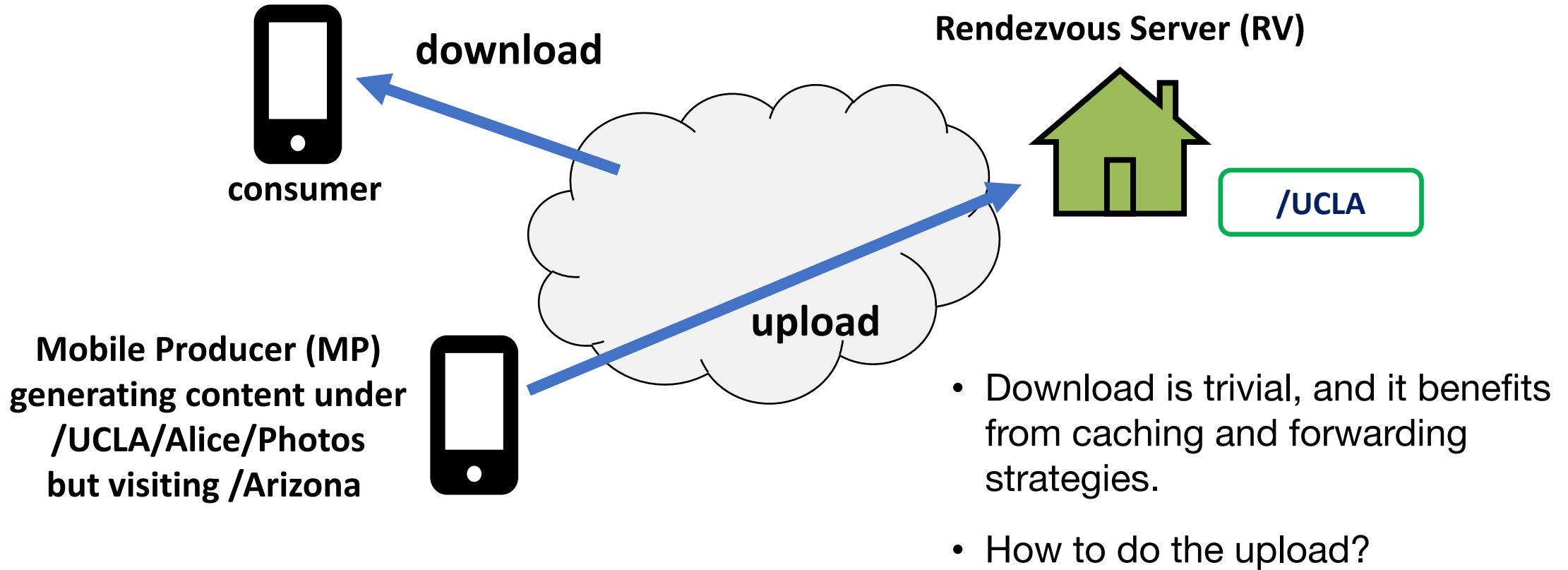
Mobility Support in NDN

- Even a host's location may change, the contents and their names do not.

  - Requests can be satisfied by caches and data mules.

  - It can work even without ever having end-to-end connectivity.

- Consumer mobility is supported out of the box, no need of any other mechanism.

  - Simply retransmit unanswered Interests

- Producer mobility, however, needs help.

  - How to retrieve contents that are produced by a mobile producer?

Solution Space

- Broadcast the Interest (by consumer)

  - Guaranteed to find the content

  - Can be optimized by NDN Self-learning, i.e., broadcast the first Interest, learn the path, and unicast the later Interests.

  - Only works when broadcast is appropriate, i.e., local network environment.

- Announce the content's name prefix (by producer)

  - Inject the content's prefix into routing system.

  - Doesn't scale to the number of such prefixes.

  - Only works in the early stage when not much content or mobile.

- Meet at a rendezvous

  - Upload the content to the rendezvous server and let consumers to retrieve from the rendezvous.

  - Doesn't require any form of broadcast.

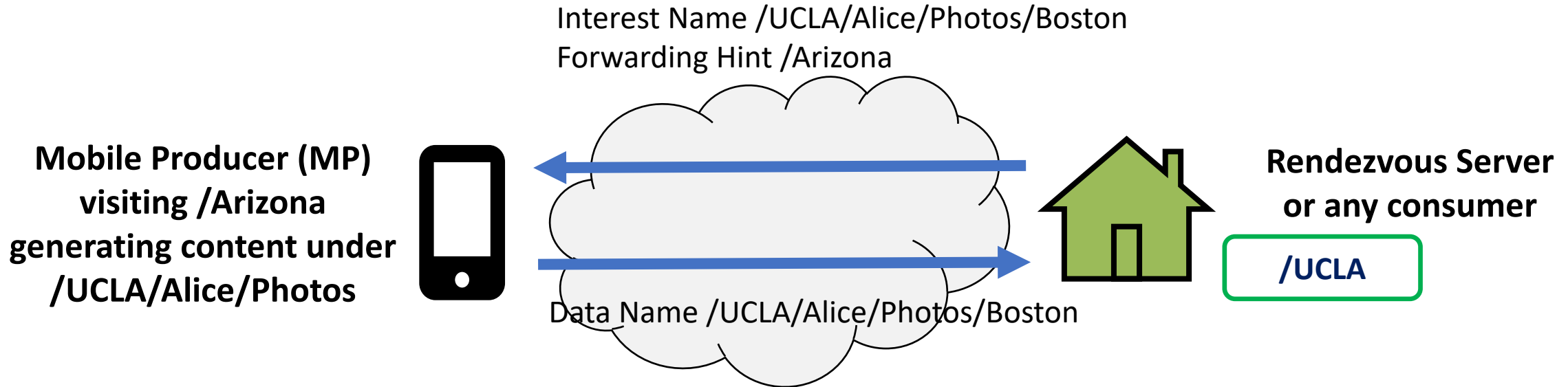 - Analogous to home agent, but in NDN sense.

Rendezvous Server

download

consumer

Rendezvous Server (RV)

/UCLA

upload

Mobile Producer (MP) generating content under /UCLA/Alice/Photos but visiting /Arizona

- Download is trivial, and it benefits from caching and forwarding strategies.

- How to do the upload?

Uploading from mobile to the rendezvous

- Pull data from mobile to rendezvous

  - E.g., rendezvous sends an Interest for /UCLA/Alice/Photos, but that Interest needs to be forwarded to the mobile, which may be visiting another network, say /Arizona.

- Forwarding Hint

  - rendezvous/consumer learns about the visited network /Arizona.

  - sends Interests carrying both Interest name and /Arizona.

- Kite

  - No need to know the visited network

  - Mobile sends an Interest to Rendezvous, which then sends Interests following the existing "bread scum" to trace back to the mobile.

Forwarding Hint

Interest Name /UCLA/Alice/Photos/Boston
Forwarding Hint /Arizona

Mobile Producer (MP) visiting /Arizona generating content under /UCLA/Alice/Photos

Rendezvous Server or any consumer

/UCLA

Data Name /UCLA/Alice/Photos/Boston

- Interest carries both Name and Hint.

- Routers use the Name in content matching, e.g., CS lookup.

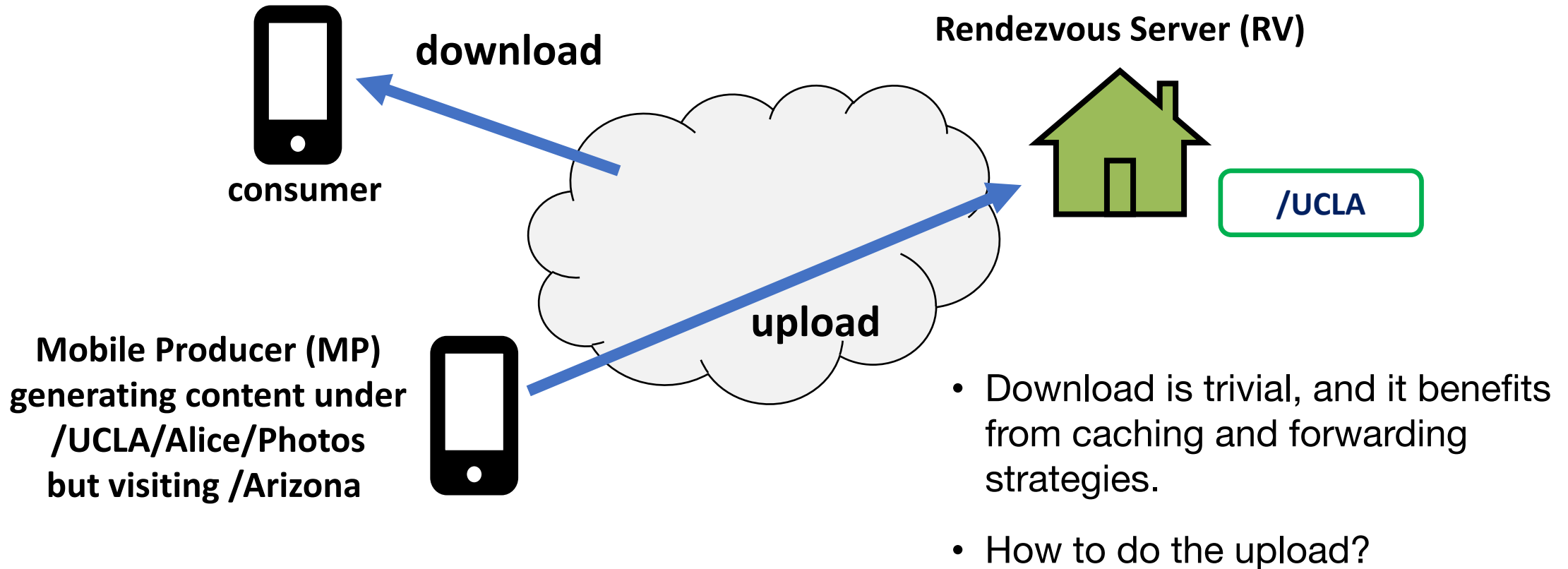- Routers consider both the Name and the Hint in forwarding decision.

Learning the prefix of visited network

- The mobile learns the name prefix of the visited network

  - A local bootstrapping mechanism, analogous to DHCP.

- The mobile can notify the rendezvous about the name prefix of visited network.

  - E.g., include it as a name component in an Interest from mobile to rendezvous, likely app-specific, works for known consumers.
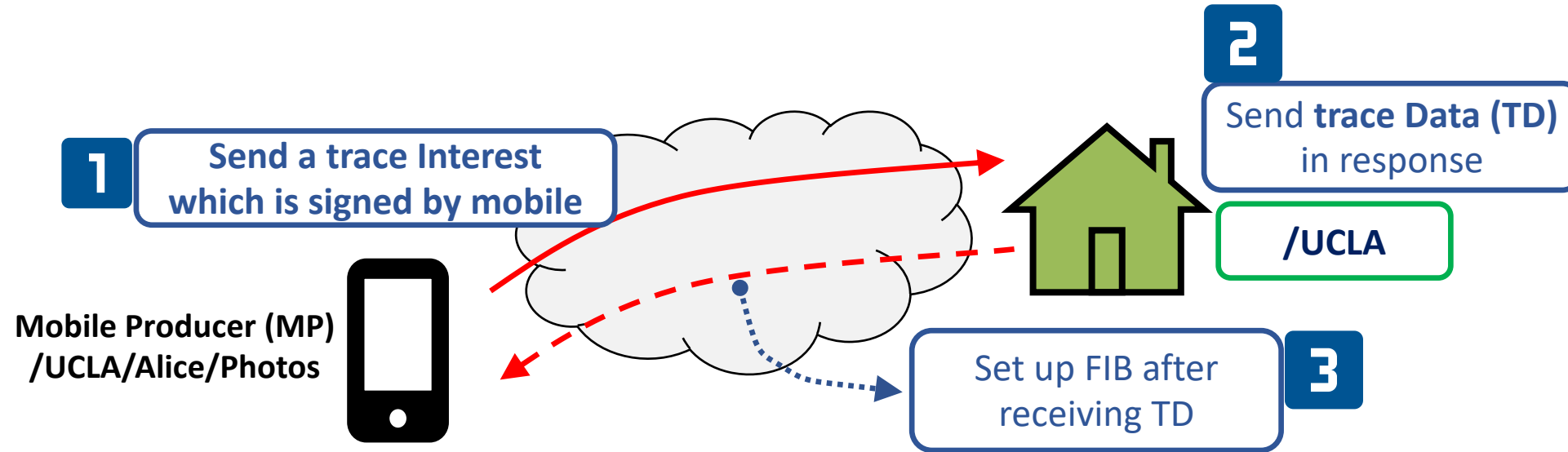
NDNS

- A general way is to use a name mapping service, NDNS.
  - /UCLA/Alice/Photos => /Arizona
  - Mobile producer updates NDNS about the mobile's current visited network.
  - Others who want to retrieve the content can query NDNS to obtain the visited prefix.
  - This mapping information is secured by the MP's signature.

- This is also a solution to global routing scalability
  - Map content prefixes to ISP name prefixes, so the core routers only need to know about ISP prefixes.

Using Rendezvous Server

download

consumer

Rendezvous Server (RV)

/UCLA

upload

Mobile Producer (MP) generating content under /UCLA/Alice/Photos but visiting /Arizona

- Download is trivial, and it benefits from caching and forwarding strategies.

- How to do the upload?

Kite

1 **Send a trace Interest which is signed by mobile**

2 Send **trace Data (TD)** in response

/UCLA

Mobile Producer (MP)
**/UCLA/Alice/Photos**

3 Set up FIB after receiving TD

- No need to know the visited prefix.

- Routers install FIB entry for /UCLA/Alice/Photos upon receiving trace Data.

- Then rendezvous can issue Interests to retrieve contents under /UCLA/Alice/Photos.

- This FIB entry only exists on the path, and is maintained soft-state.

Route Setup and Content Retrieval

Handover

issues a new TI

trace

trace

expires on itself
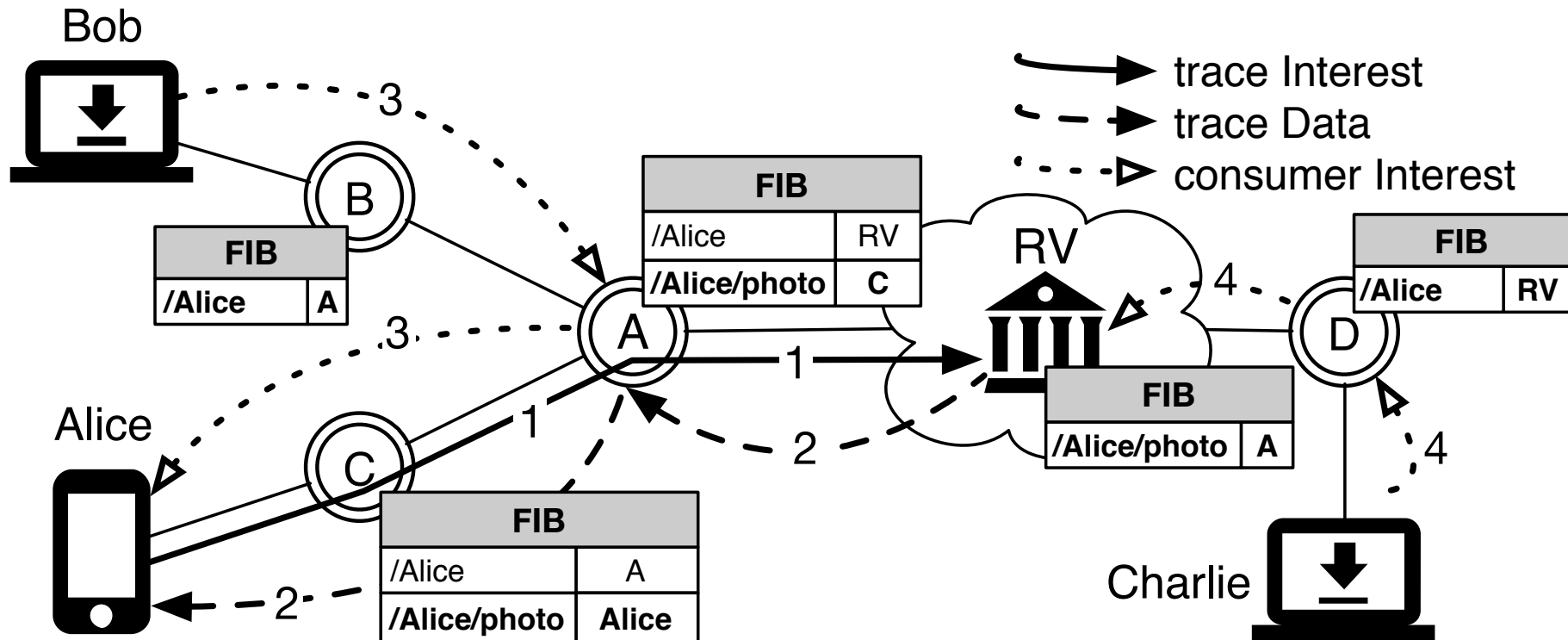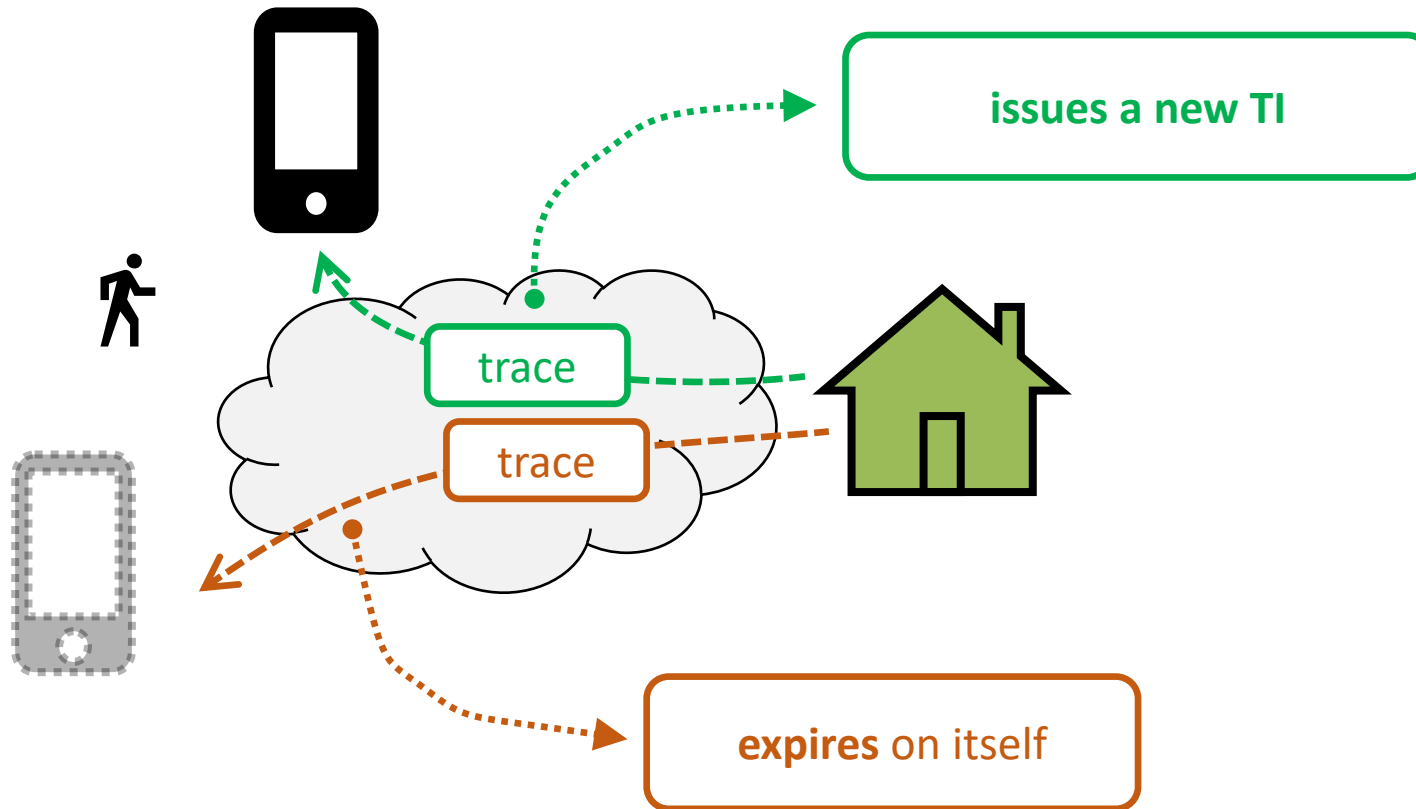
Current Status

- Publications
    - Forwarding hint and NDNS
        - http://named-data.net/publications/snamp-ndn-scalability/
    - Kite
        - To appear in this conference: https://conferences.sigcomm.org/acm-icn/2018/proceedings/icn18-final23.pdf
- Code
    - Ongoing effort. Basic features of forwarding hint is supported in NFD. Supporting pieces for Kite will be done soon, and implementation of Kite implementation will follow.