# Broker-based Pub/Sub System for NDN

**Haksuh Kim, Sung-Hyuk Byun, Namseok Ko, and Sun-Me Kim**

Electronics and Telecommunications Research Institute (ETRI)

{tuple, shbyun, nsko, kimsunme}@etri.re.kr

Dec. 1, 2020

# Motivations

- A few Pub/Sub mechanisms in current NDN
  - Partial-sync mode of Psync
  - Periodic requests with long-lived Interests
- Not scalable and limited especially in low-performance IoT producers
- Not flexible as in IP-based mechanisms : no wildcard topic matches
- We need a flexible and scalable pub/sub architecture for NDN

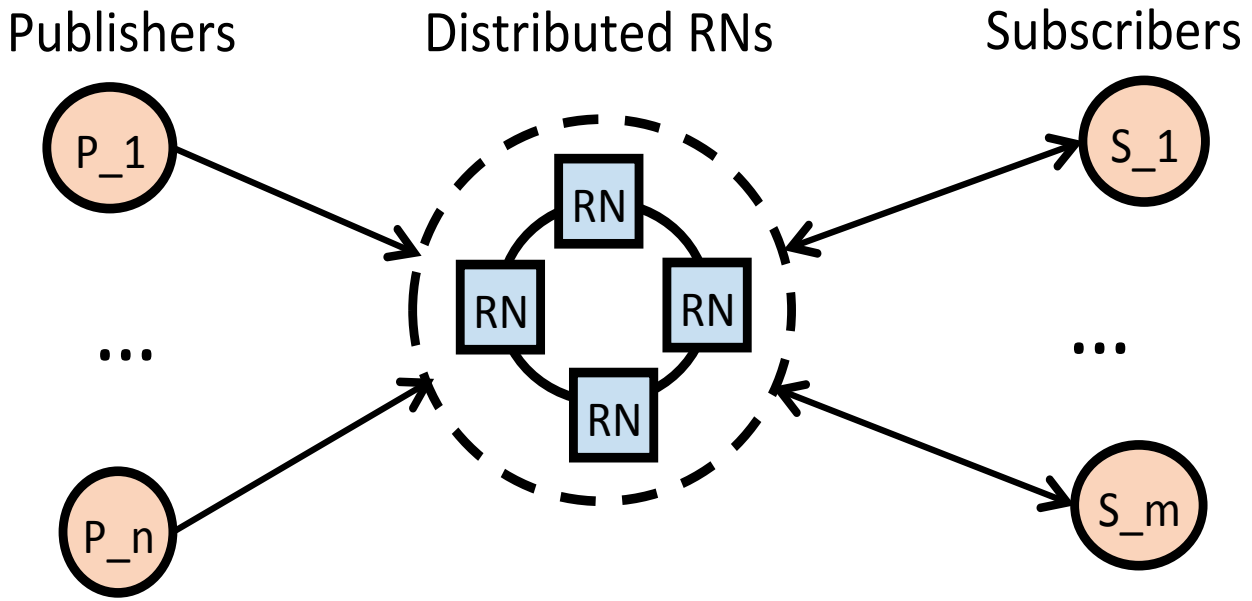
# Design Directions

- To cope with low-performance producers
  - Broker-based approach
- To support scalability
  - Multiple brokers
- To support flexibility
  - MQTT-like wildcard Topic matches
    - Single-level wildcard (+), e.g., /prefix/etri/7d/+/temp
    - Multi-level wildcard (#), e.g., /prefix/etri/7d/#
    - Multiple wildcards can be supported in a Topic
  - Topics are defined by subscribers

# Architecture Overview

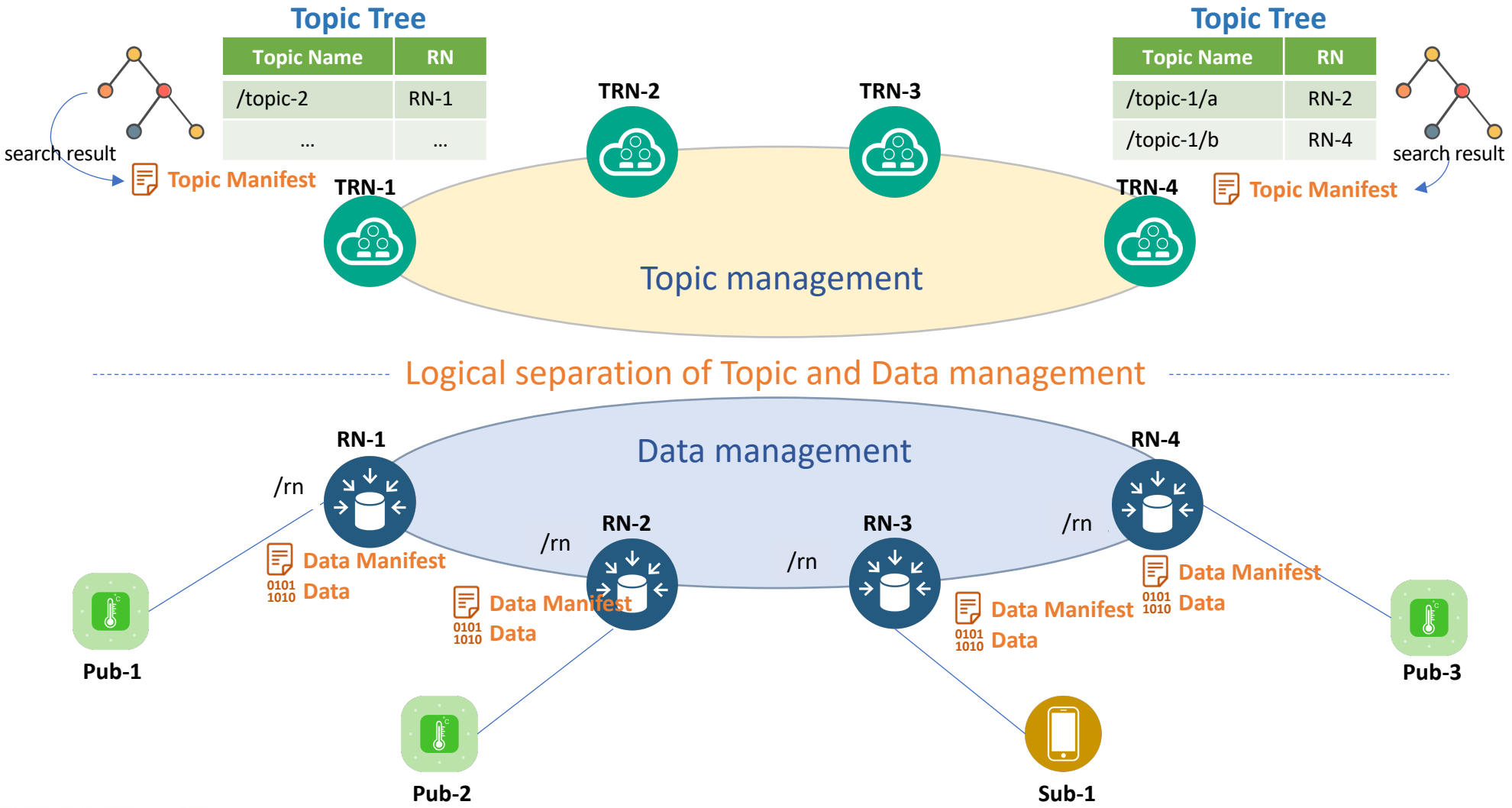
- Multiple brokers (or Rendezvous Nodes)
  - Do brokering of publishers and subscribers
  - Store published data for limited performance publishers

    ※ Note that data can be stored in devices themselves and other external repositories
  - Manage published data (names) based on DHT




High-level Architecture

# Architecture Overview



# Architecture Overview

- Logical separation of Topic and Data management
  - A Data RN is an RN for data management and a Topic RN is an RN for topic management
  - Pub/sub service has a service prefix, rn and each RN has its own node prefix, rn-x
- Naming scheme
  - Data
    - /<data stream name>/[sequence-number] : e.g., /etri/7d/room385/temp/1
  - Command
    - /<service prefix>/<command>/<data name>: e.g., /rn/PA/etri/7d/room385/temp

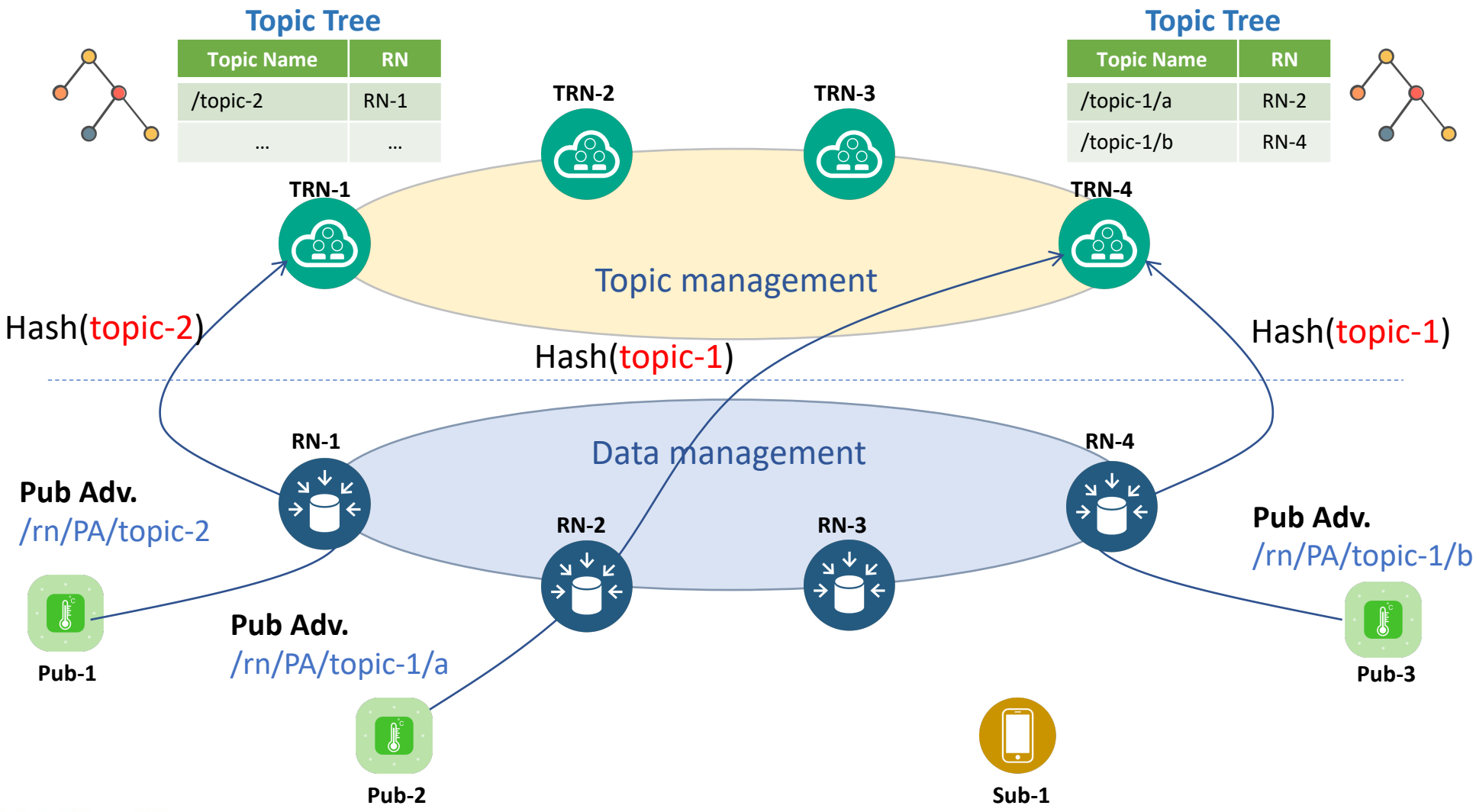
# Protocol Messages (Commands)

- Publish Procedure
  - Publish Advertisement (PA): Advertise the name of a data stream to publish
  - Publish Unadvertisement (PU): Revoke the publish of a data stream
  - Publish Data (PD): publish a data
- Subscribe Procedure
  - Subscribe Topic Subscription (ST): Subscribe to a topic (request a topic manifest)

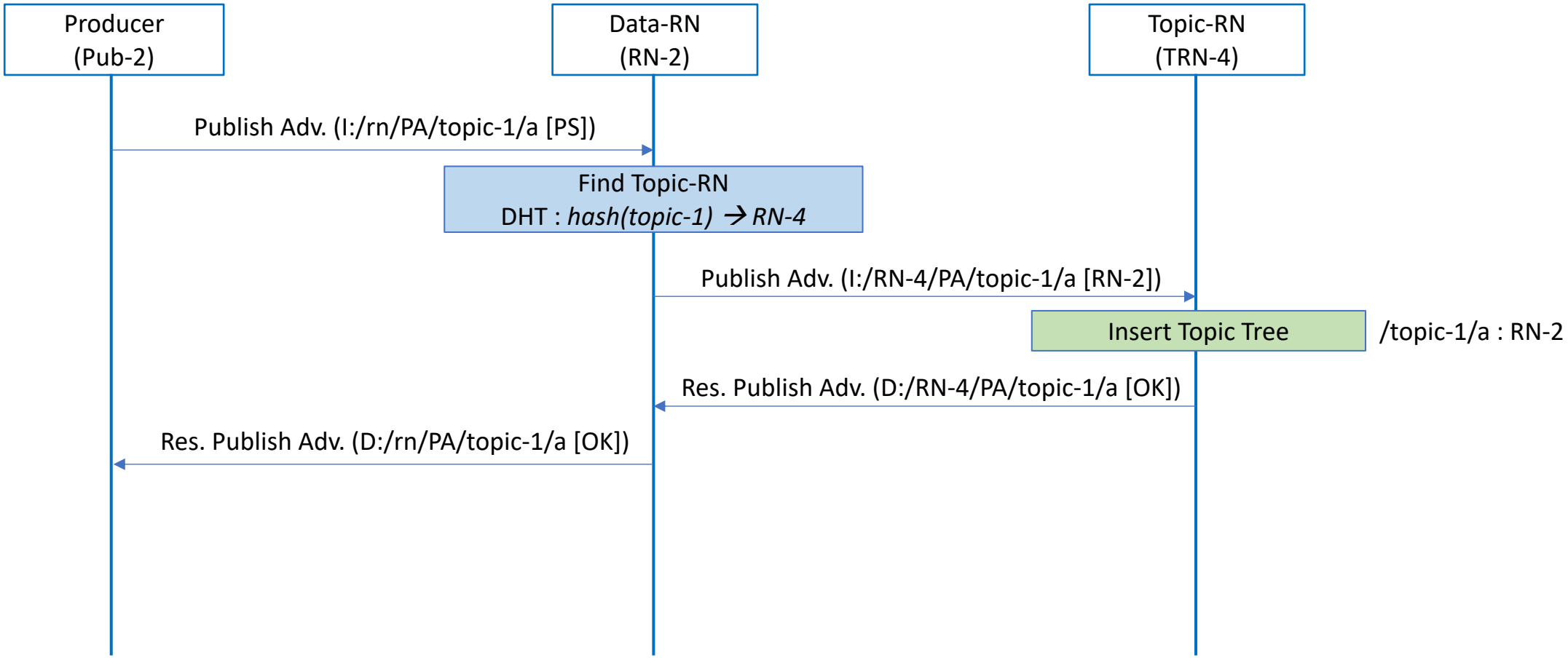
    * Topic manifest : a list of data RN holding subscribed data streams
  - Subscribe Manifest Request (SM): Request a data manifest (to a specific Data RN)

    * Data manifest : data names for a data stream
  - Subscribe Data Request (SD): Request a data (to a specific Data RN)

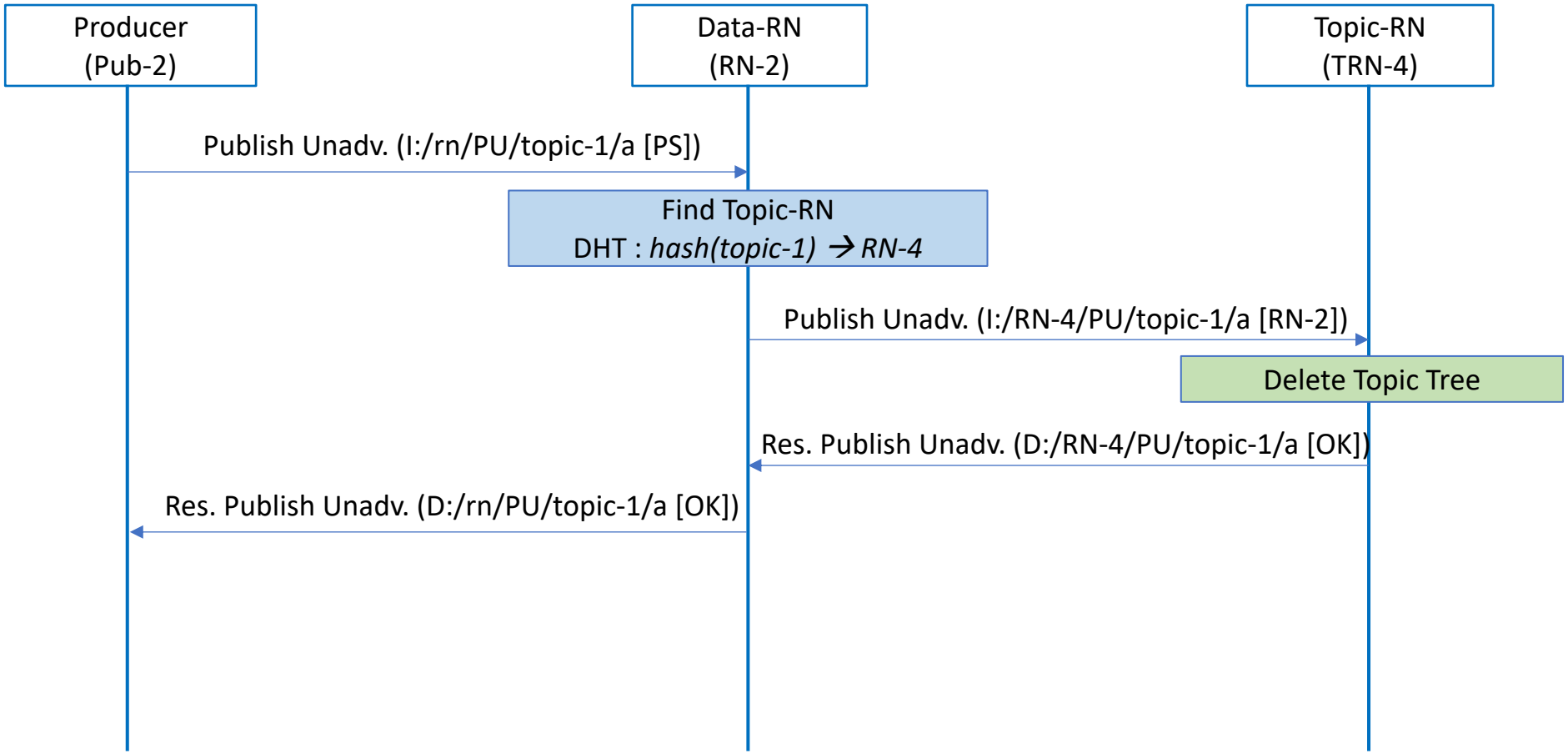
# Publish Advertisement



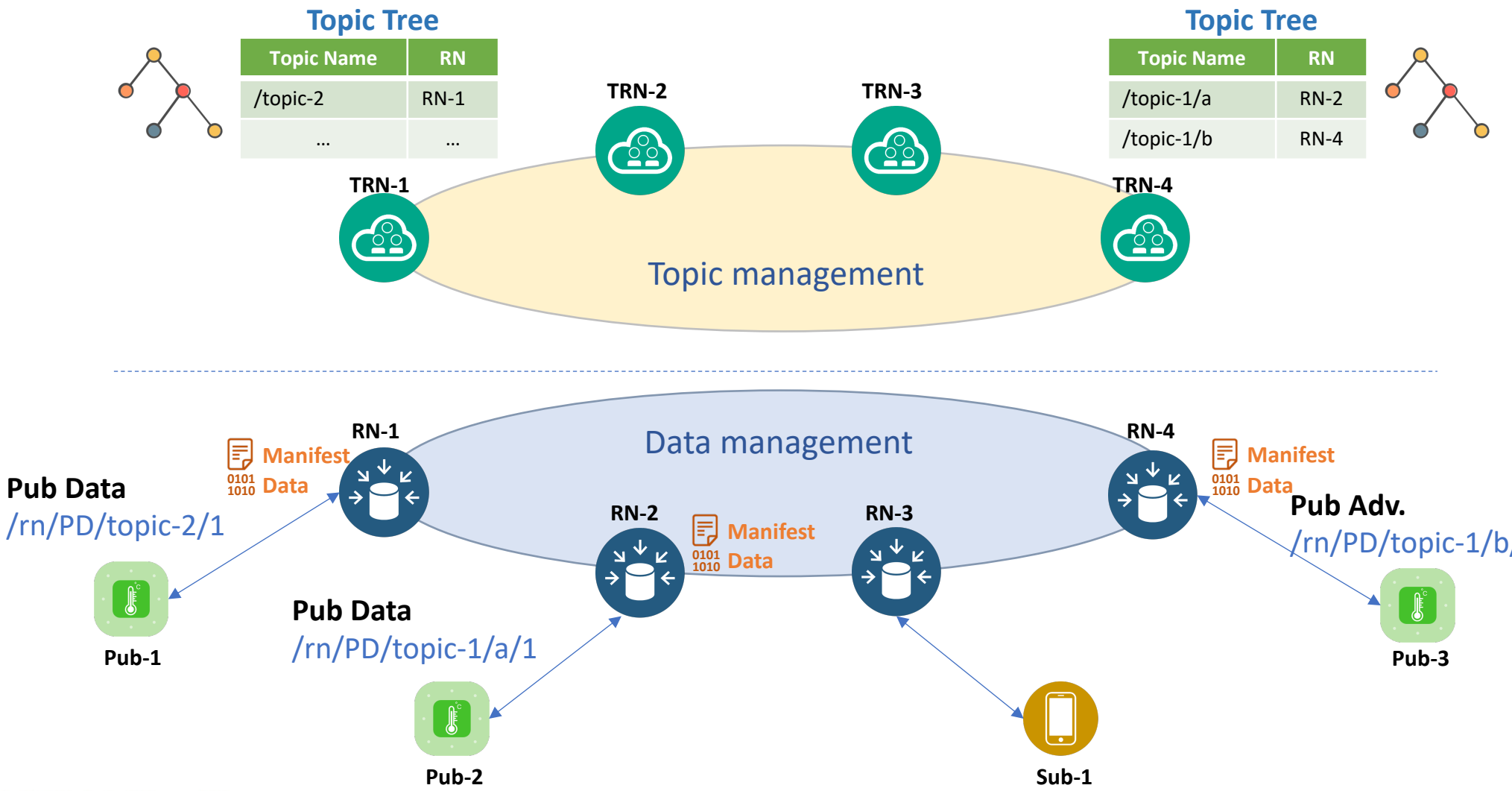
# Publish Advertisement



# Publish Unadvertisement



# Publish Data



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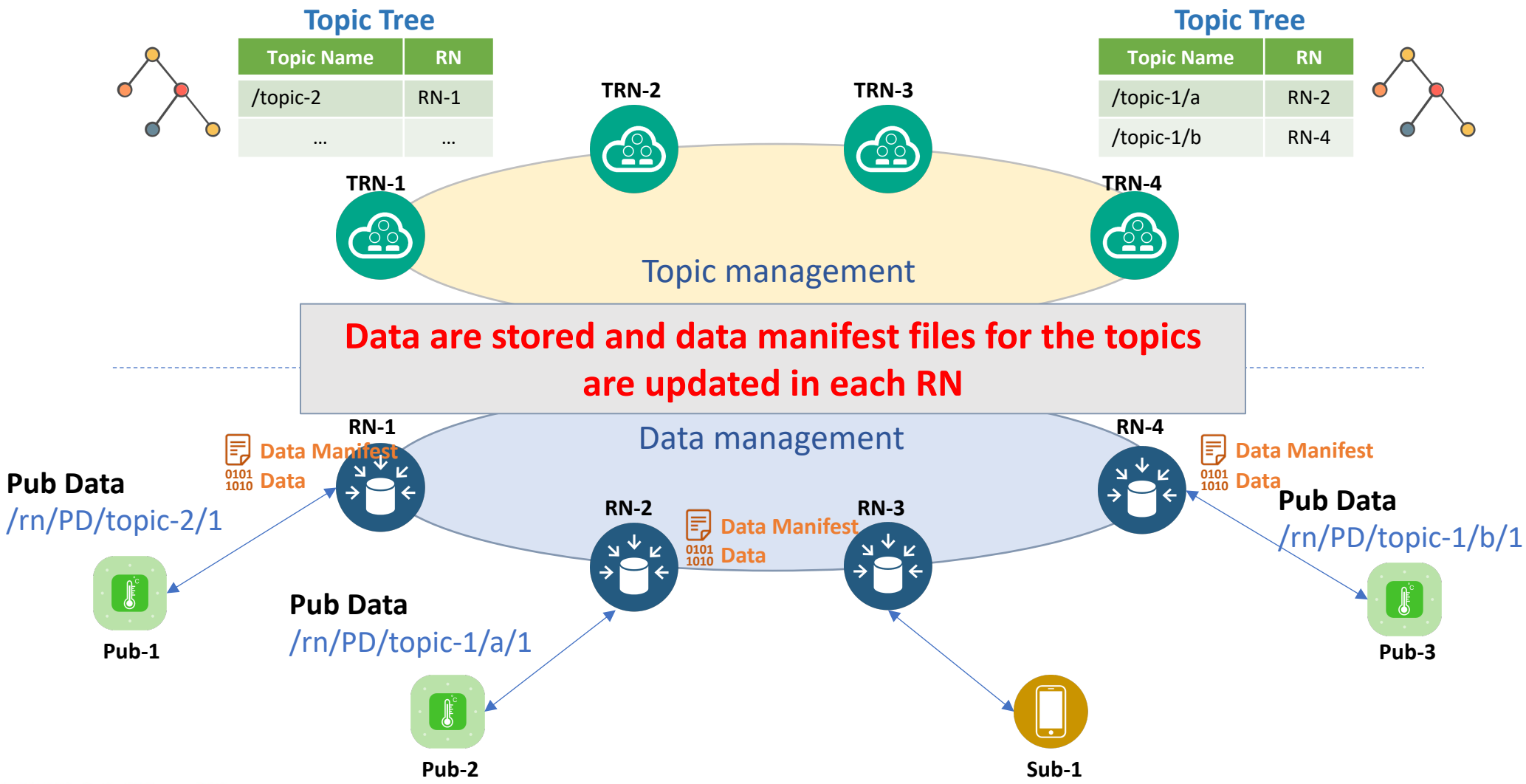
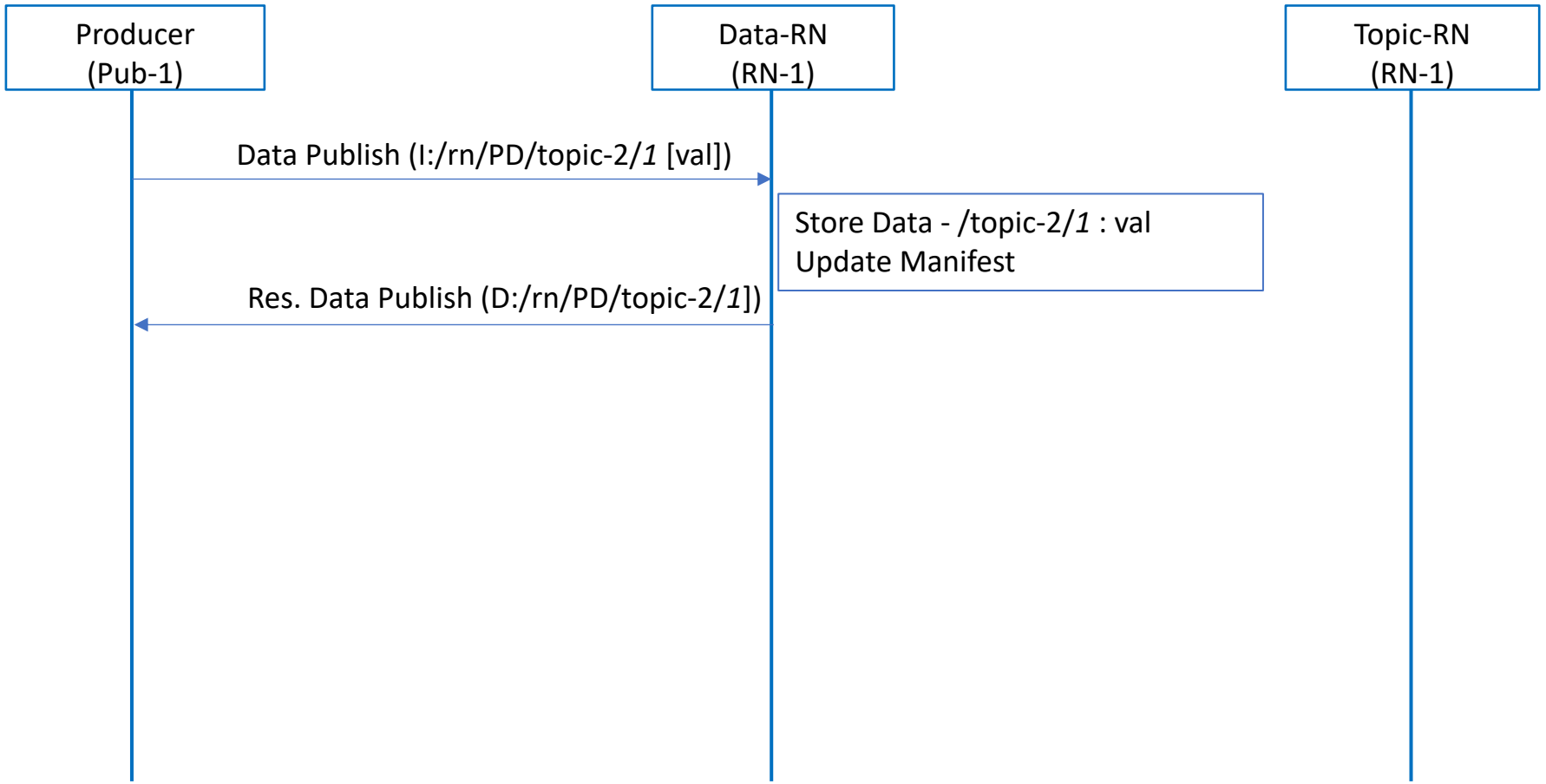
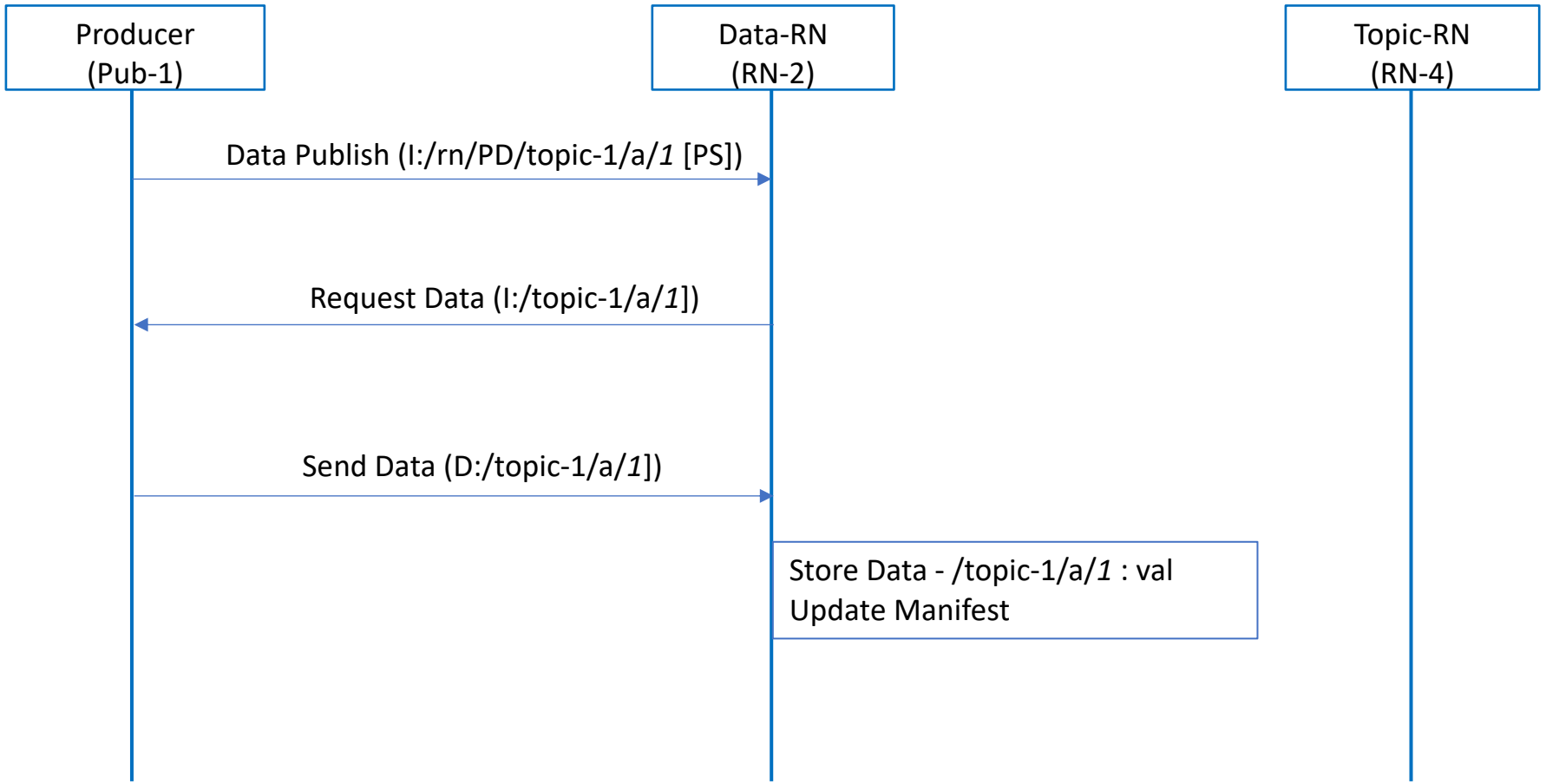


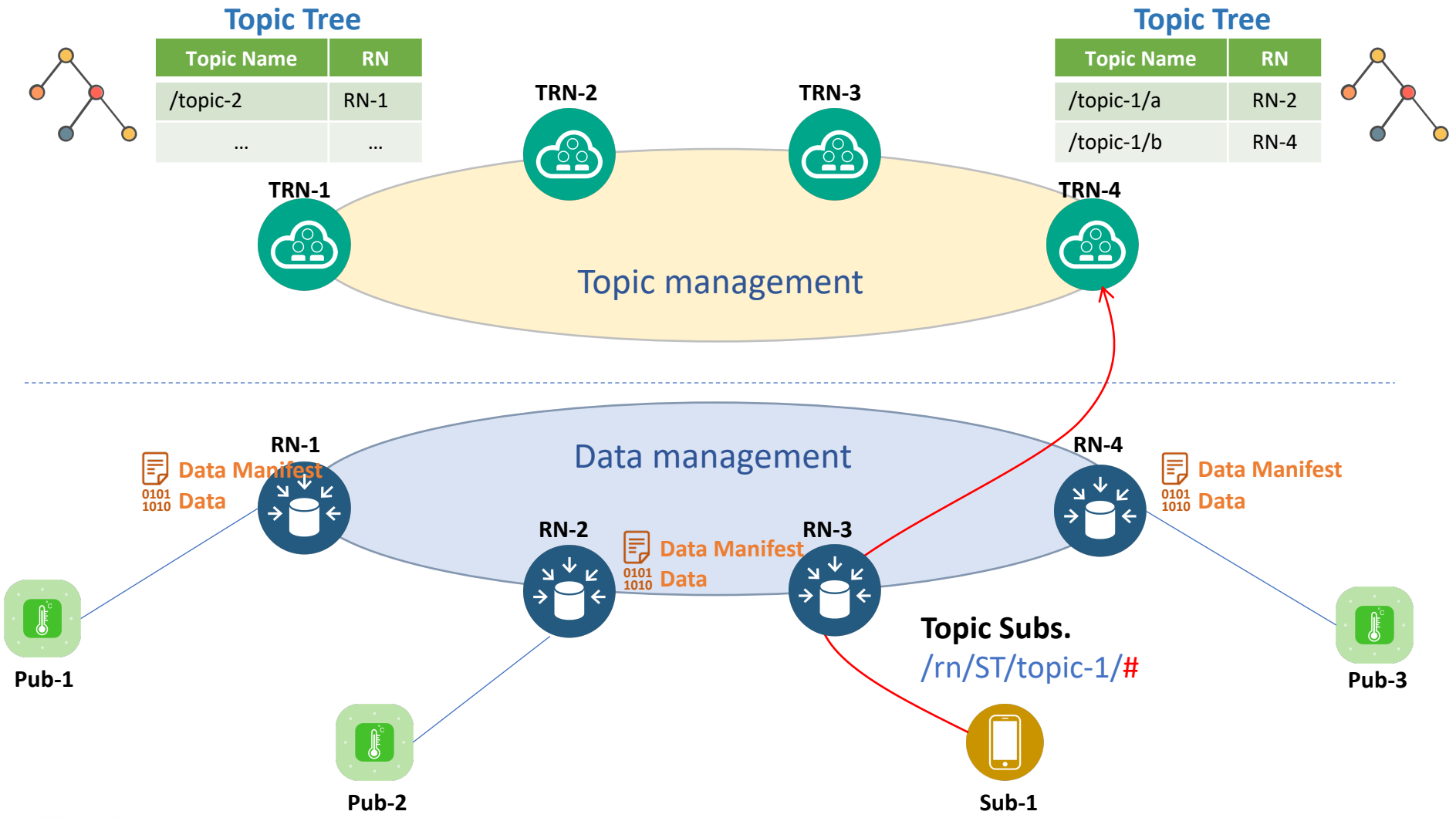
# Publish Data (small data)



# Publish Data (large data)



# Topic Subscription



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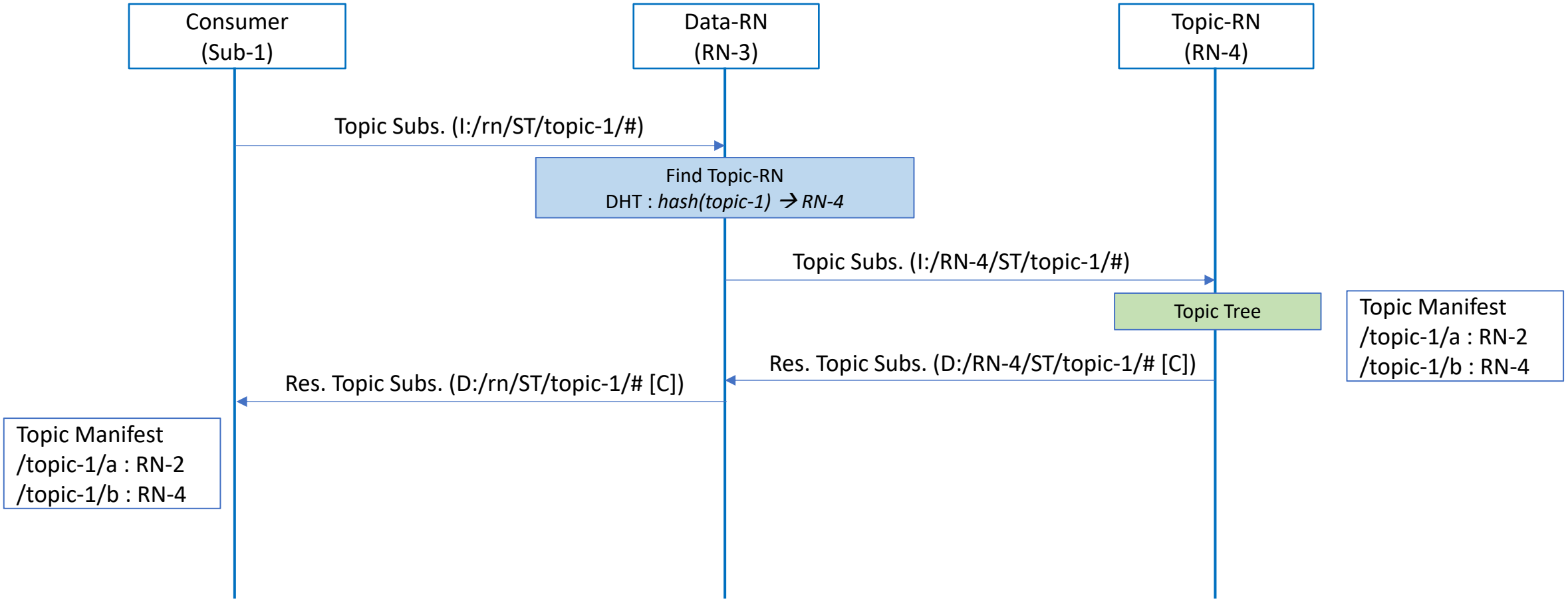
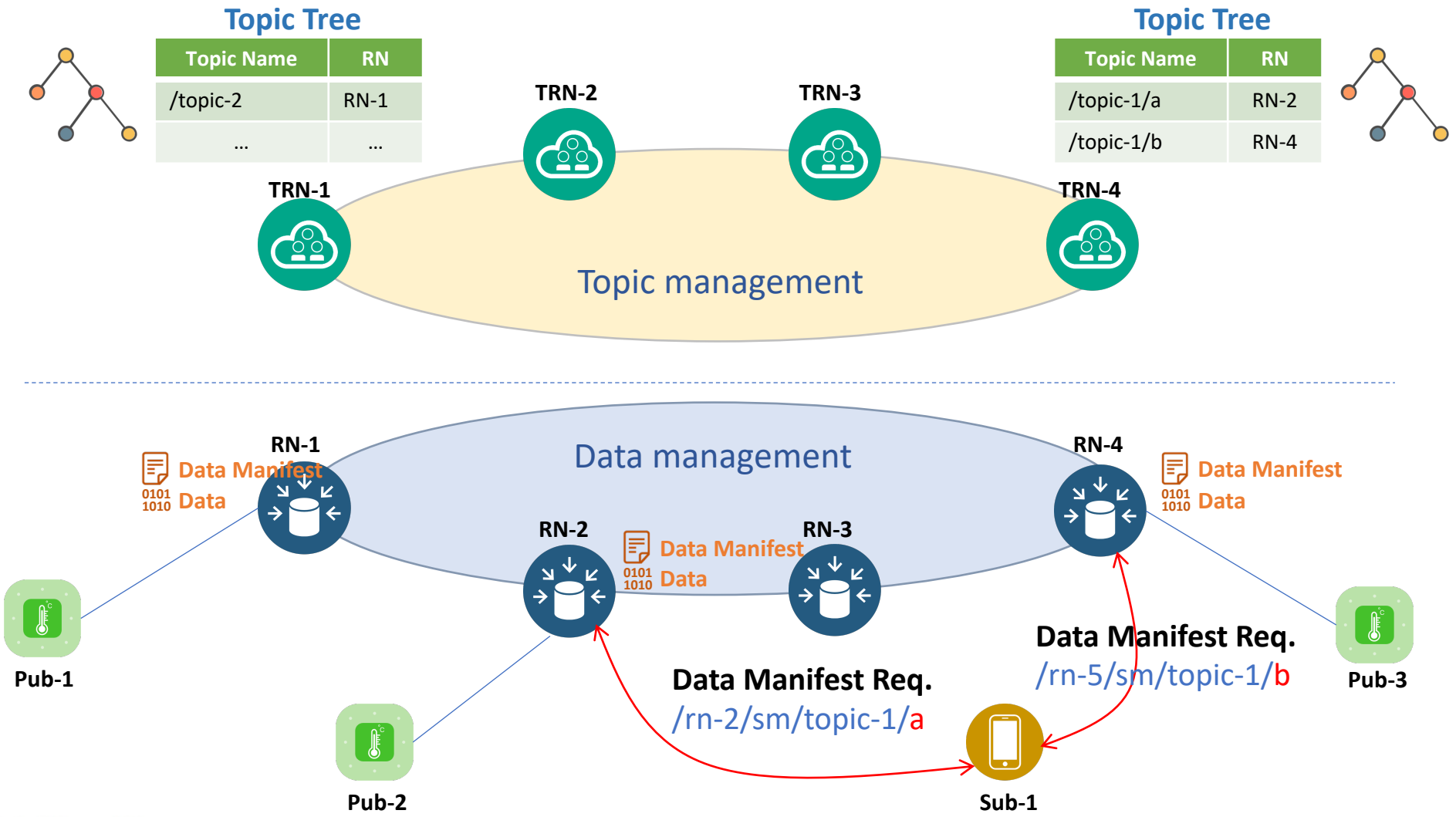


# Data Manifest Request



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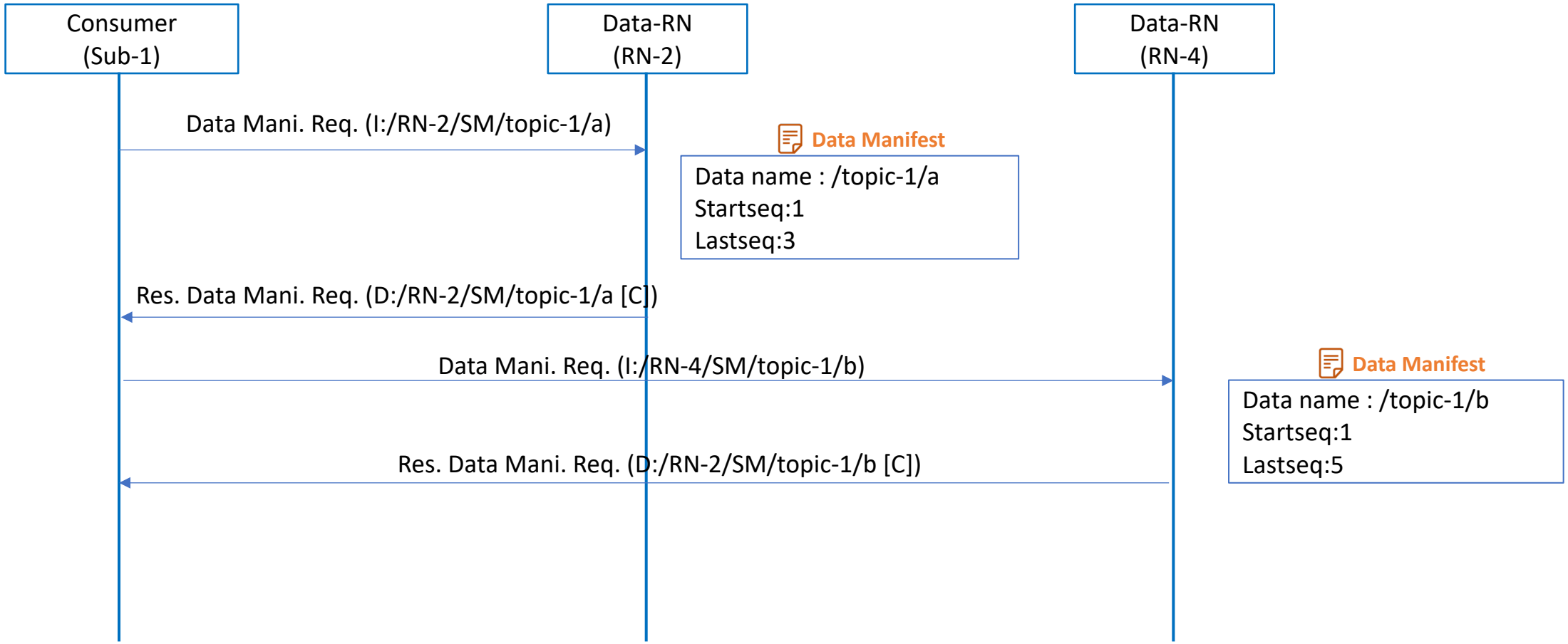

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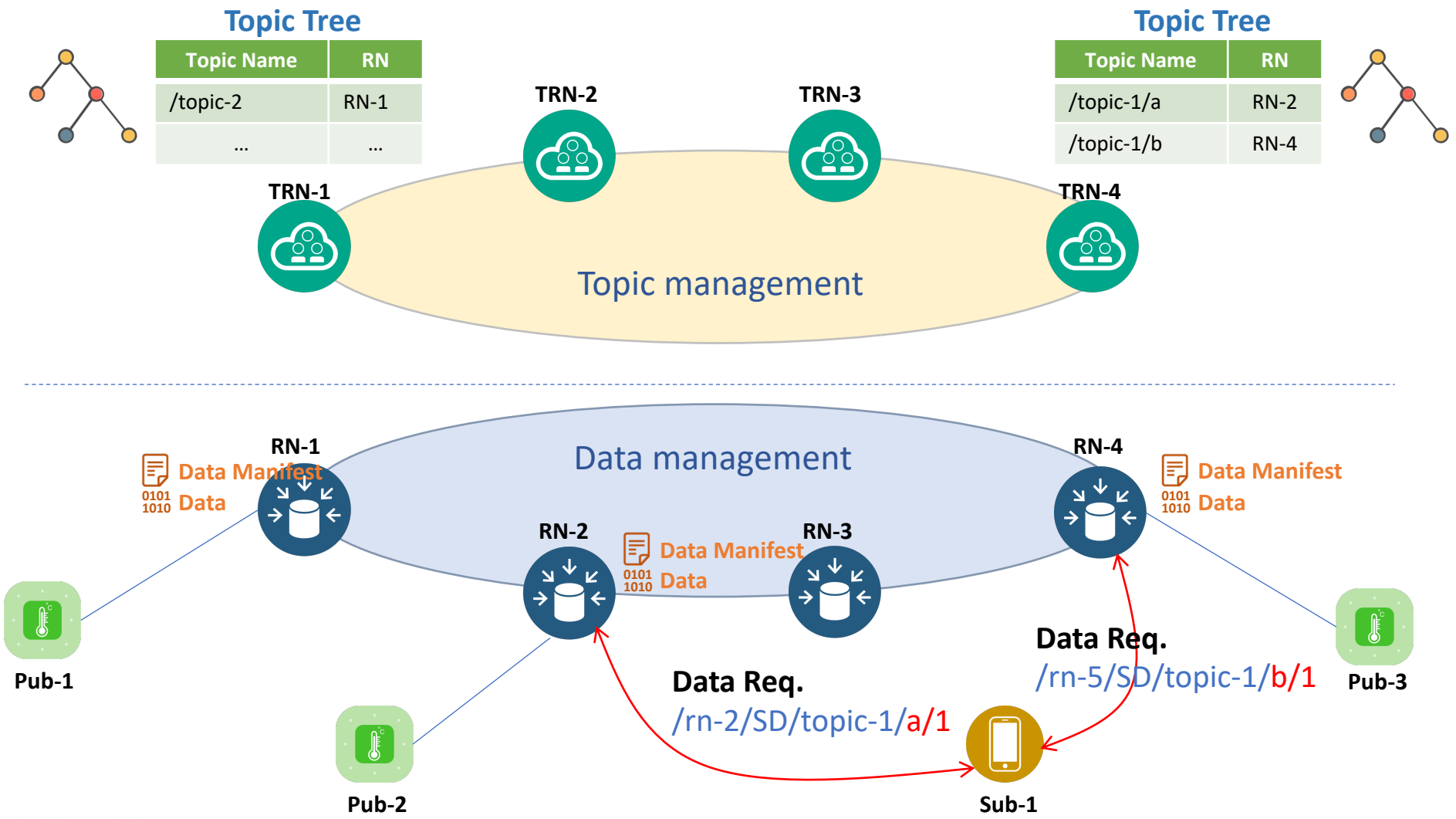

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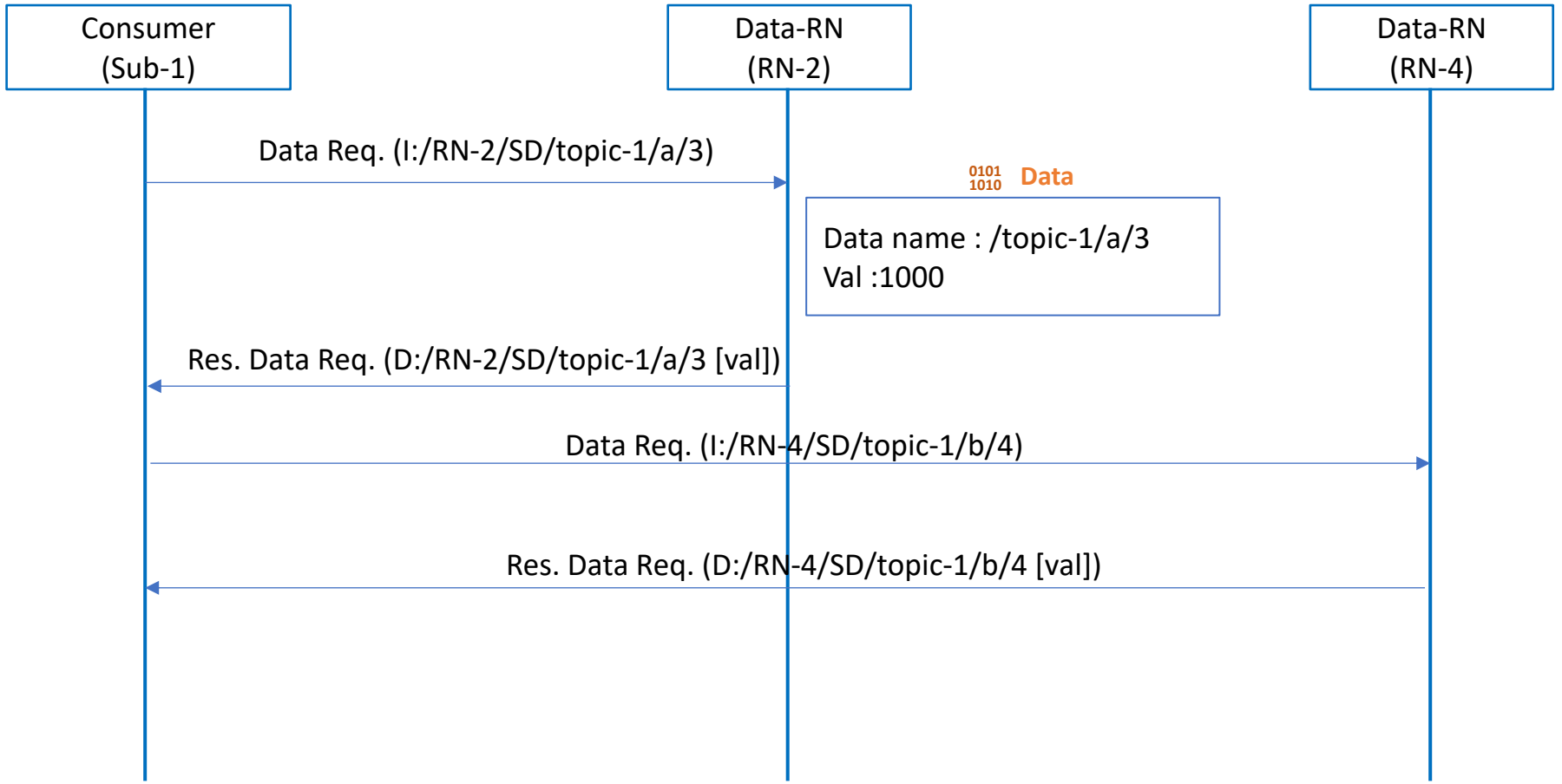
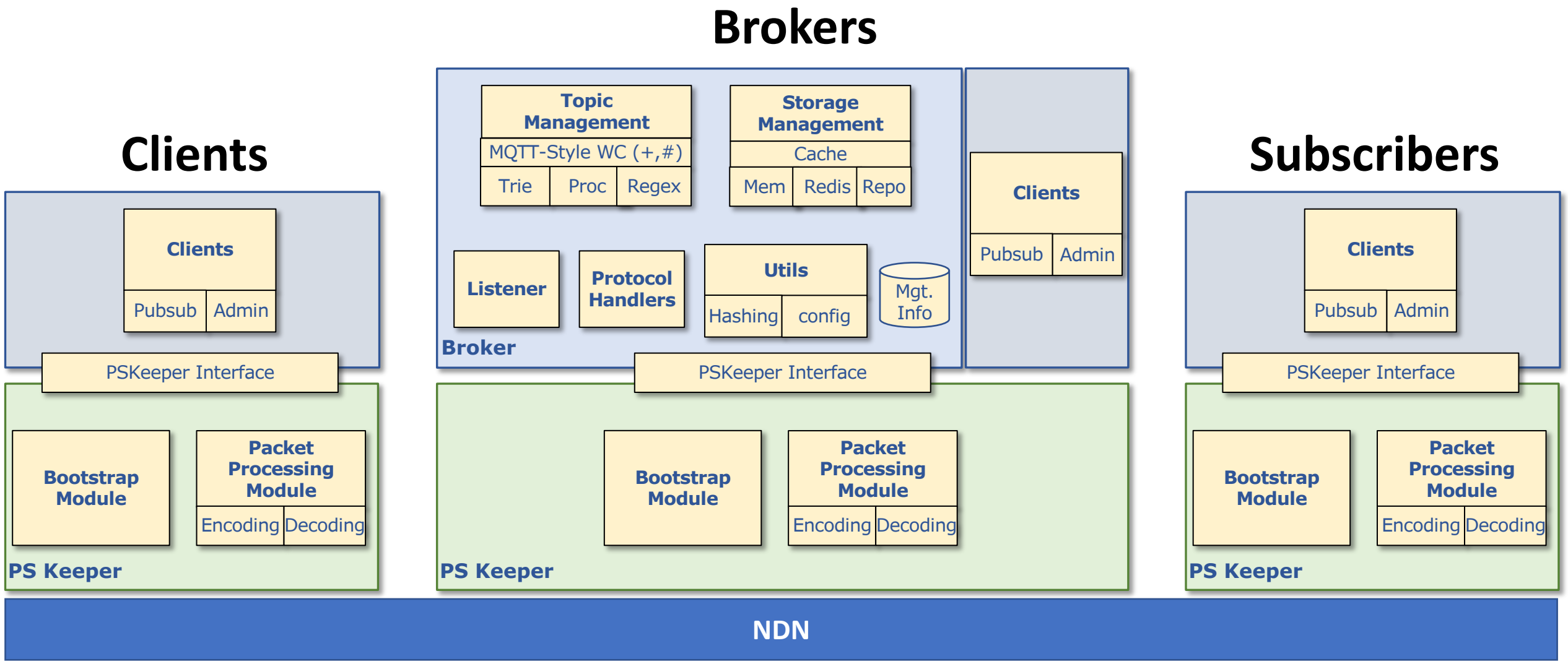
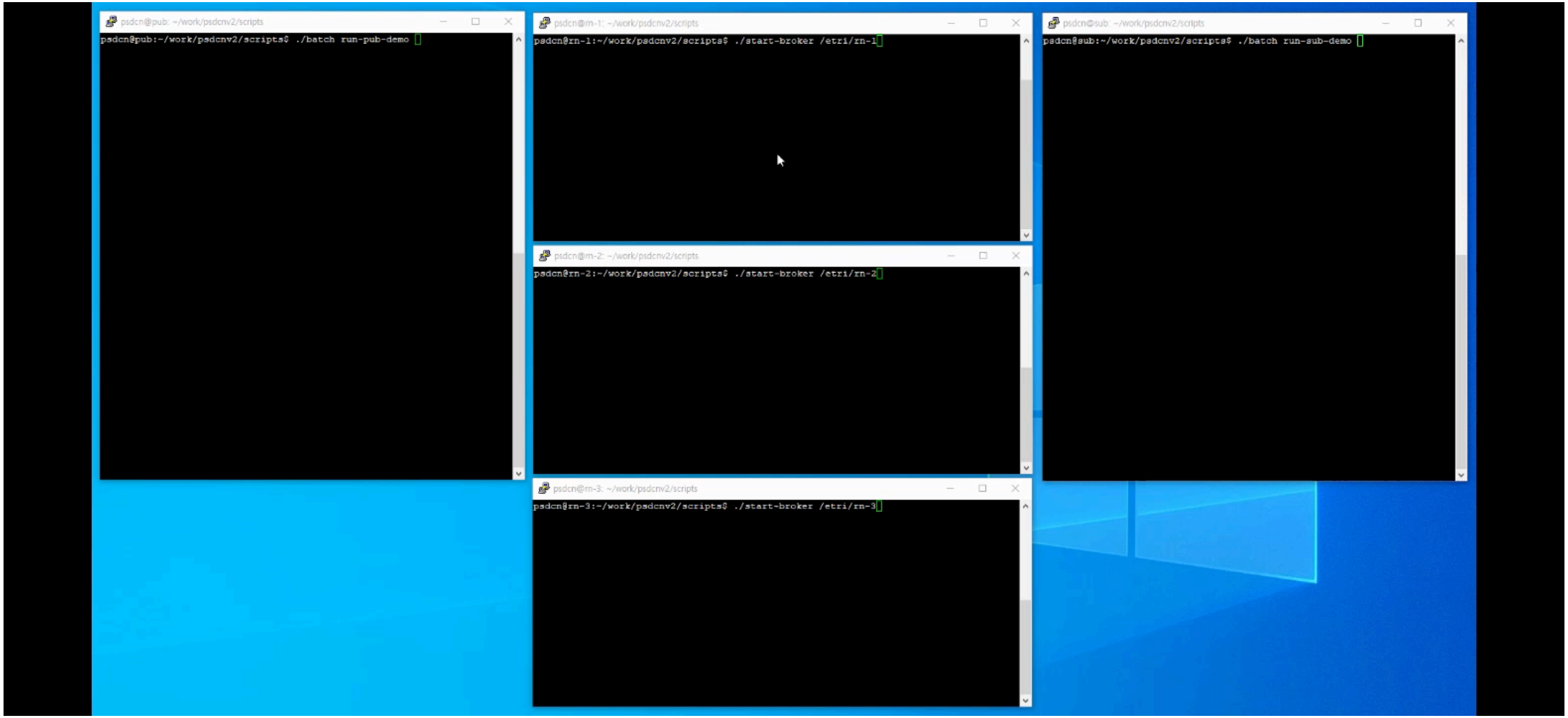


# SW Function Blocks



# Demo


psdcn@pub: ~/work/psdcnv2/scripts
psdcn@pub:~/work/psdcnv2/scripts$ ./batch run-pub-demo
psdcn@rn-1: ~/work/psdcnv2/scripts
psdcn@rn-1:~/work/psdcnv2/scripts$ ./start-broker /etri/rn-1
psdcn@rn-2: ~/work/psdcnv2/scripts
psdcn@rn-2:~/work/psdcnv2/scripts$ ./start-broker /etri/rn-2
psdcn@rn-3: ~/work/psdcnv2/scripts
psdcn@rn-3:~/work/psdcnv2/scripts$ ./start-broker /etri/rn-3
psdcn@sub: ~/work/psdcnv2/scripts
psdcn@sub:~/work/psdcnv2/scripts$ ./batch run-sub-demo

# Summary

- Broker-based Pub/Sub for NDN
- Scalable and flexible than existing mechanisms
- Plan to release our code as open source software soon

# Thank You!