

# Hyperbolic Routing in Testbed

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# Testbed Deployment Steps

1. Calculate hyperbolic coordinates using the testbed topology (Dima/Rodrigo, done)
2. Update NFD code to include ASF forwarding strategy (Vince, done)
3. Evaluate testbed setup in mini-NDN (Ashlesh) - two weeks
4. (a) install new NFD binary (fit into release schedule) and change the default strategy to ASF; (b) configure testbed nodes with hyperbolic routing and hyperbolic coordinates (John/Ashlesh) - partly done, a week
5. Switch testbed nodes to HR routing (John/Ashlesh) - one month
  1. Run NDNping to measure delay and loss (John/Ashlesh)
  2. Measure NLSR's routing overhead and ASF's probing overhead (John/Ashlesh)
6. Optional: measure performance under node/link failures (John/Ashlesh)

# Hyperbolic Routing - System Issues

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# How to distribute coordinates in large deployment (name resolution)?

Van's proposal:

1.name prefix -> coordinates mapping can be in a DNS-like hierarchy

- first level: /com/att, /com/comcast, /edu/memphis, /com/cnn...
- second level: /com/att/la, /com/att/mem, /att/boston, ...
- more levels depending on each AS's needs

2.first level mapping is downloaded to every node and FIB entries can be pre-calculated for those coordinates

3.If first level mapping is too big for the FIB, then you can store them in the RIB, but use FIB caching to retrieve those entries on demand

4.second and more levels will be in each AS's network (e.g., ATT routers will have ATT's lower level mappings)

5.when an interest for /com/att/mem/... arrives at a router outside of ATT, it uses the /com/att FIB entries.

6.when the interest gets to ATT, it will use FIB entries for /com/att/mem/...

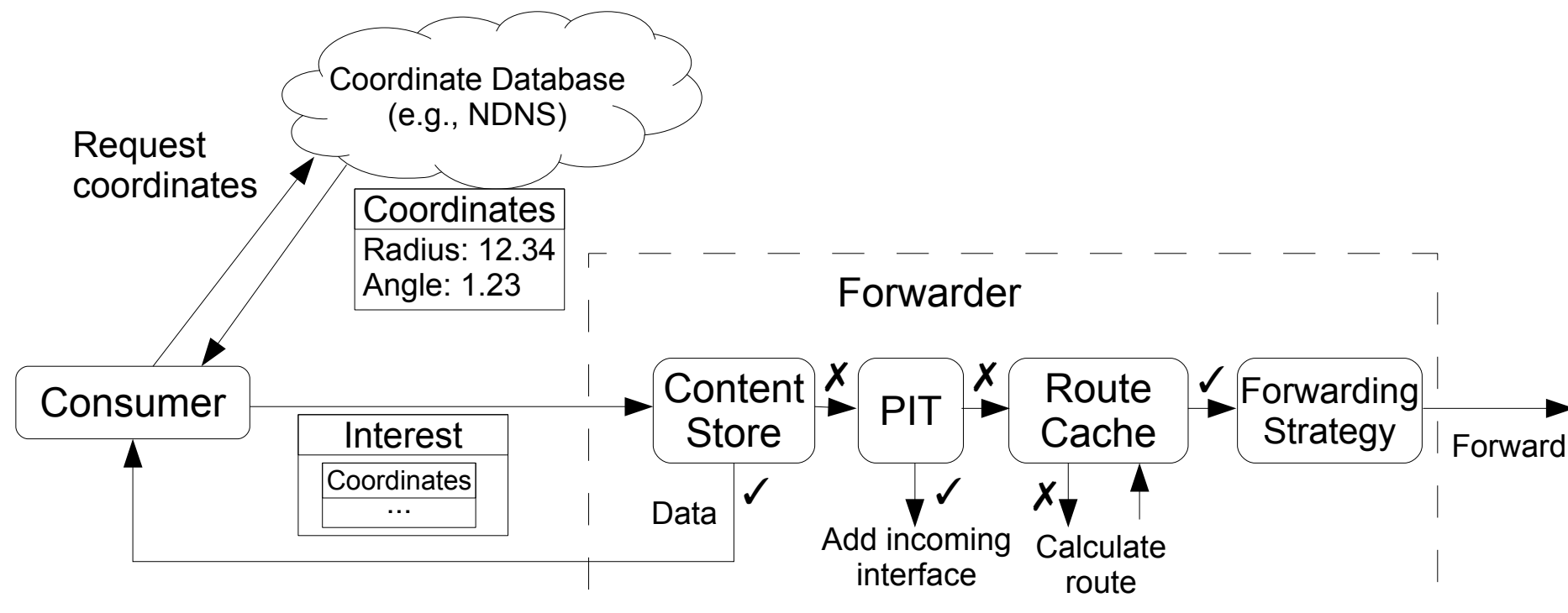
7.what about application names (e.g., /beichuan/video...)?

1.there can be a Name-Coordinate Resolver in every AS for these unknown names, application name's coordinates should be related to coordinates of the routers close to the content (use sync among the resolvers to obtain the mappings)

2.alternatively, use NDNS to map application names to provider names?

# Questions 1: Why not let consumer obtain coordinates and put them in Interest?

- is this because we want late binding? why?



# Question 2: Interest Multicast

- how to do Interest multicast at network layer under hyperbolic routing? assuming members can come and go
- include all the coordinates of the members in the mapping?
- but this introduces dynamics in the mapping when members come and go.

# Question 3: how to stop forwarding interests when producer (site) fails under HR?

- end application can give up after a certain number of tries
- do we need network mechanisms to handle this? If so, then some options below
  - propagate the failure in routing?
  - propagate the failure information in name resolution? when the producer fails, who will do this?
  - use NACK to propagate the failure in forwarding plane? but will expire after some time
  - if a popular node fails, use some mechanism to propagate failure (popular content may be cached somewhere on the other hand); otherwise, do not bother

# Question 4: local vs. global coordinates

- in order to do HR distance calculation, every router needs global coordinates
- are there needs for local coordinates?



# Question 5: AS may cover large area

- ATT on west coast and east coast, what are the coordinates that represent ATT?

# Question 6: Google and other content providers

- How to assign coordinates to content providers that are not an AS?

# To-do List

- Reduce delay stretch
  - try to rebuild the topology from scratch (Dima/Vania: obtain the geo coordinates of the cities where the machines are and do the rebuilding. John: send the order of appearance of the nodes)
- Testbed experiments
  - todo list in slide 2 (John and Ashlesh)
  - set up new testbed topology that Dima and Vania have created (John)
  - rerun experiments (John and Ashlesh)
- scaling experiments (up to 1000 nodes)
  - use MiniNet cluster edition (Ashlesh)
  - use NSF cloud infrastructure or Amazon services (if cluster cannot scale to 1000 nodes) (Ashlesh)
  - generate and re-embed larger synthesis topologies (Rodrigo)
- long-term issues
  - distribution of coordinates (Lan)
    - need to talk to Van (see questions in previous slides)
  - computation of coordinates (Dima)
    - local vs. global
    - incorporate delay information in embedding