DABBER

Information-centric Routing for Opportunistic Wireless Networks

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Data Reachability Based Routing (DABBER)

Introduction

Terminology

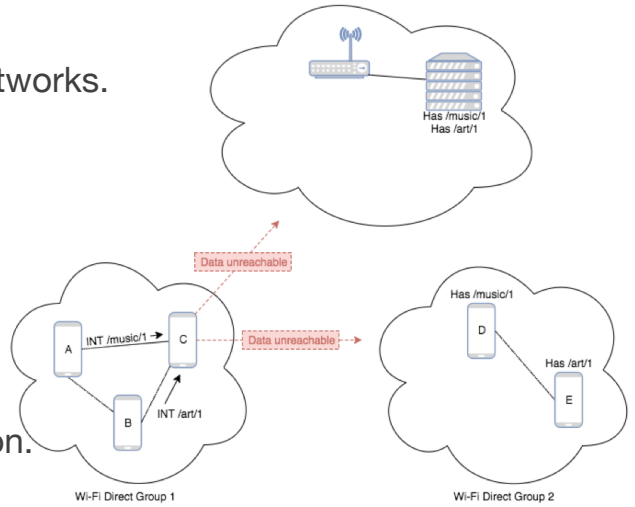
- **Opportunistic wireless networks** -> multi-hop wireless networks where finding an end-to-end path between any pair of nodes at any moment in time may be a challenge.

Applicability

- Affordable pervasive data access.
- Low cost extension of access networks.
- Edge/Fog computing.
- V2X networks.

Motivation

- Extensive number of (forwarding) proposals for opportunistic wireless networks (e.g. ProPhet, dLife, Scorp).
- Initial set of routing proposals for wired NDN networks (e.g. OSPFN, NSLR).
- Lack of forwarding/routing proposals for NDN over opportunistic wireless networks.



Goal

- Extend the reach of NDN to opportunistic wireless networks.
- Avoid flooding the network with Interest packets:
  - Major requirement of opportunistic networks: controlled packet replication.
- Selective forwarding of Interest packets based on:
  - Data reachability information.
  - Context awareness (neighborhood and node itself).

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Baseline

Metrics to assess opportunities for transmission of Interest packets

Node Weight

- Node Availability (A): measure of internal status:
  - E.g. resource status (battery; CPU, combination as well); and app status (e.g. use of specific apps over time).
- Node Centrality (C): measure of external status:
  - Current approach = average contact duration * nr of contacts over a specific time window T).
  - It may also be based on other aspects, such as resources.

Link Weight

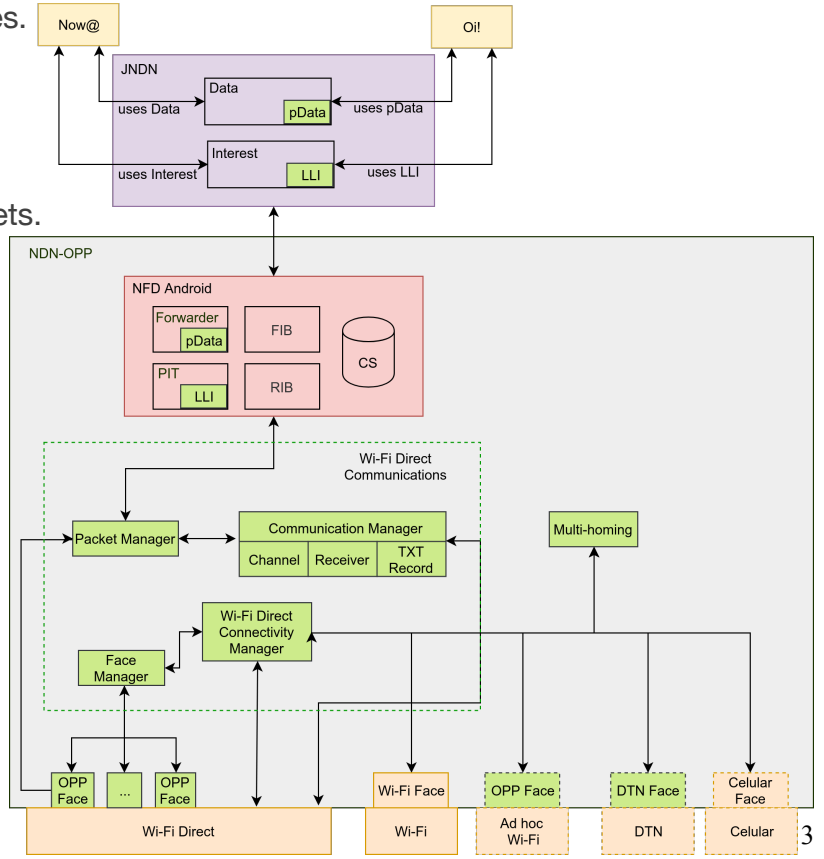
- Nodes Similarity (I): measures the clustering similarity between two nodes.
  - Rationale = link weight is proportional to the similarity between nodes.
  - Based upon contact duration, battery status, mostly used apps, etc.

Path Weight

- Availability of different data sources:
  - Dissemination of Name Prefix + validity.
- Time lapse between forwarding Interest packets and receiving data packets.

NDN-OPP: NDN Android to Opportunistic Networks

- New concepts: Opportunistic Face (OPPFace); DTN Face.
- Works on top of Wi-Fi direct:
  - Two communication models: connection oriented; connectionless.
- Two methods for push communication: Long Lived Interests (LLI); pData
- New routing: Dabber
- V1.0 on:
  - GitHub: https://github.com/COPELABS-SITI/ndn-opp
  - Google Play: Package pt.ulusofona.copelabs.ndn



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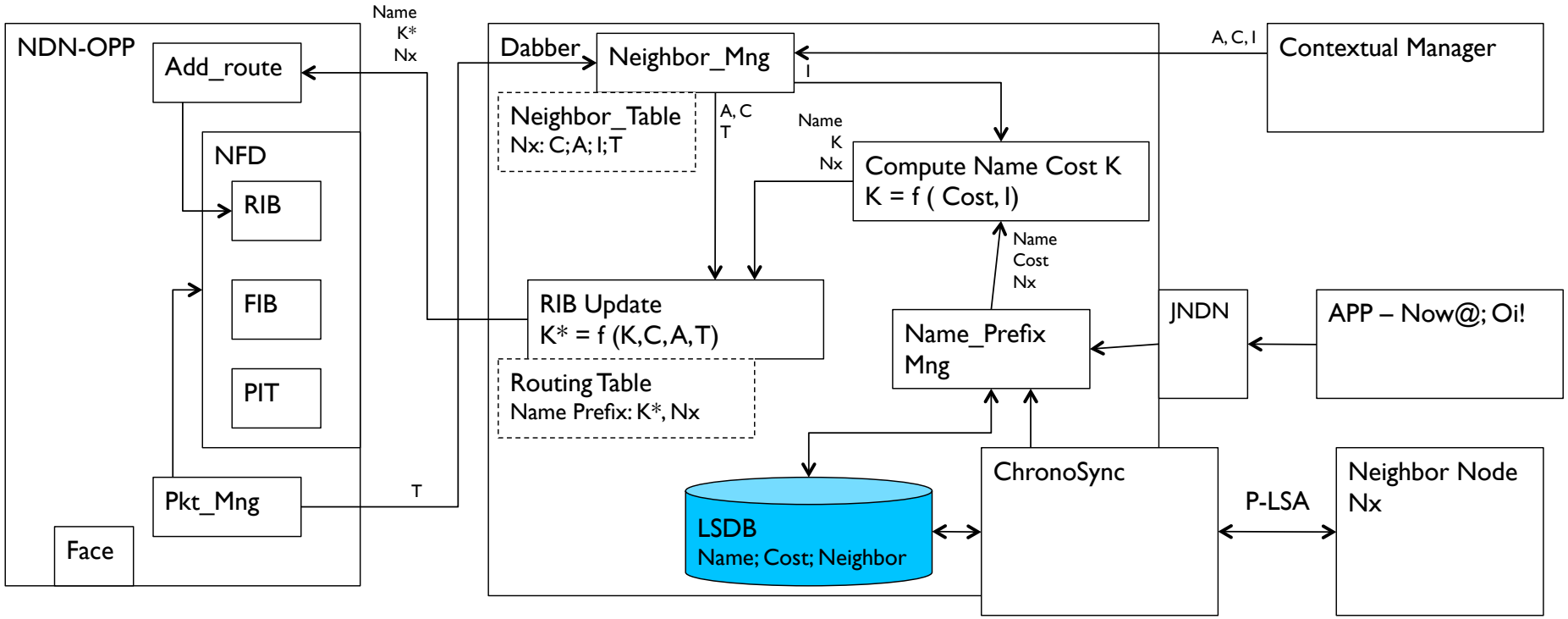
Architecture



Naming

DABBER nodes: /<network>/<operator>/<home>/<node>,

- <network> : international transit network allowing roaming services for the mobile operator;
- <operator> refers to the operator providing the mobile service;
- <home> is the network site of the mobile operator where the node is registered;
- <node> is the mobile equipment

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P-LSA Dissemination

Prefix LSA

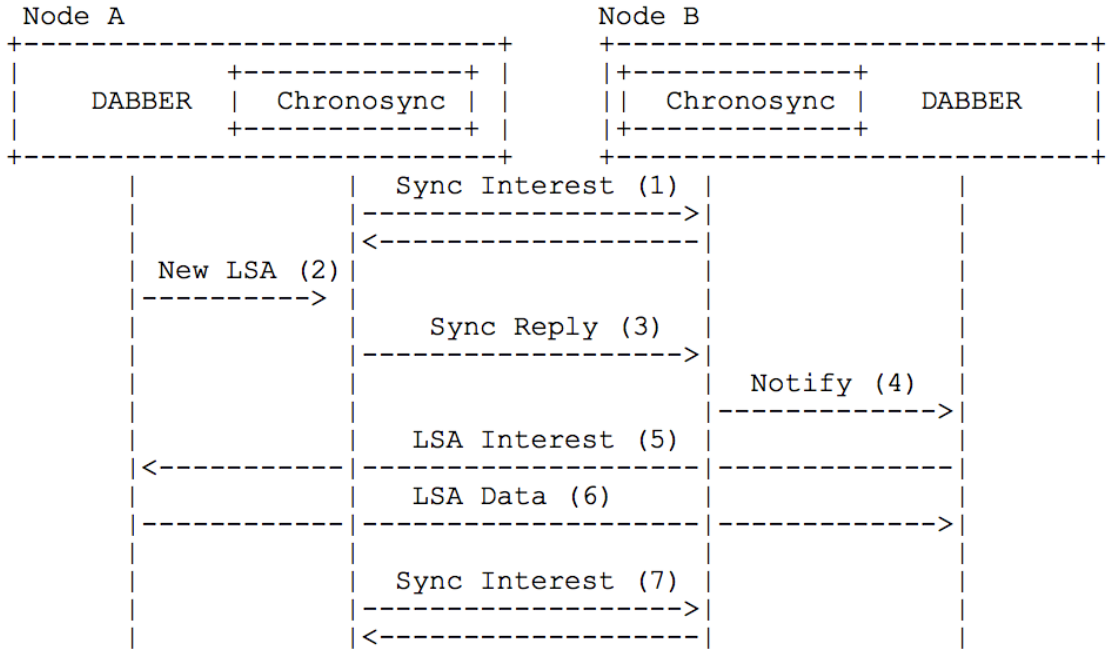
LSA Name	NeighborID	Number of Prefixes	Prefix 1	Cost 1	…	Prefix N	Cost N	Signature

Each LSA used by DABBER has the name

- <network>/<operator>/<home>/<node>/DABBER/LSA/Prefix/<version>.

LSA Dissemination

DABBER makes usage of ChronoSync



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New P-LSA: Set of Operations

New P-LSA with Prefix /NDN/video/Lisbon/ from neighbor Na

- LSDB updated by Chronosync with the Name Prefix, Cost and neighbor Na.
- Computes cost of new Name Prefix:
  - Computes K = f (Cost, I), where I = similarity metric with Na.
  - Computes K* = f (K, C, A, T), Where C and A measure availability and centrality of Na; T measures RTT towards source through face to Na.
- Internal routing table updated with new entry:
  - May use Increase diversity logic: RIB updated if k* helps to increase diversity of the name prefix.
  - Table ordered by name prefix and cost.
- Local LSDB updated with Name Prefix, K*, Na.
- RIB updated based on Downward Path Criterion:
  - Basic: Rib updated with X entries including the one with the lowest cost plus X-1 neighbors that have a cost lower than the cost that the current node has to the name prefix.
  - Extension: Also considers any face over which the name prefix can be reached with a cost equal to the cost that the current node has itself to the name prefix.
- FIB updated from RIB (multicast forwarding strategy used).
- Periodically:
  - Re-compute K* for each name prefix (It is assumed C, A, T to vary more than K.
  - Updates internal routing table and RIB.

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References

Normative

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