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.

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).

Goal

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

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Applicability

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

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Data Reachability Based Routing (DABBER)
Baseline

**Metrics to assess opportunities for transmission of Interest packets**

- **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.
- **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.
- **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
DABBBER
Architecture

Naming
DABBBER 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
DABBER
P-LSA Dissemination

Prefix LSA

<table>
<thead>
<tr>
<th>LSA Name</th>
<th>NeighborID</th>
<th>Number of Prefixes</th>
<th>Prefix 1</th>
<th>Cost 1</th>
<th>...</th>
<th>Prefix N</th>
<th>Cost N</th>
<th>Signature</th>
</tr>
</thead>
</table>

Each LSA used by DABBER has the name

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

LSA Dissemination
DABBER makes usage of ChronoSync

---

**Node A**

```
DABBER + Chronosync +
+-------------------+
|                  |
| Sync Interest (1) |
| New LSA (2)       |
+-------------------+
```

**Node B**

```
DABBER + Chronosync +
+-------------------+
|                  |
| Notify (4)        |
| Sync Interest (7) |
| LSA Data (6)      |
| LSA Interest (5)  |
| Sync Reply (3)    |
+-------------------+
```

---
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.
References

Normative


• Sofia, Rute C.; Santos, Igor; Soares, José; Diamantopoulos, Sotiris; Sarros, Christos-Alexandro; Vardalis, Dimitris; Tsaoussidis, Vassilis; d’Angelo, Angela. “UMOBILE D4.5 – Report on Data Collection and Inference Models”. Technical Report, September 2018.


Some Informative


• Seweryn Dynerowicz, Paulo Mendes, "Named-Data Networking in Opportunistic Networks", Demo in ACM ICN, Berlin, Germany, September 2017.