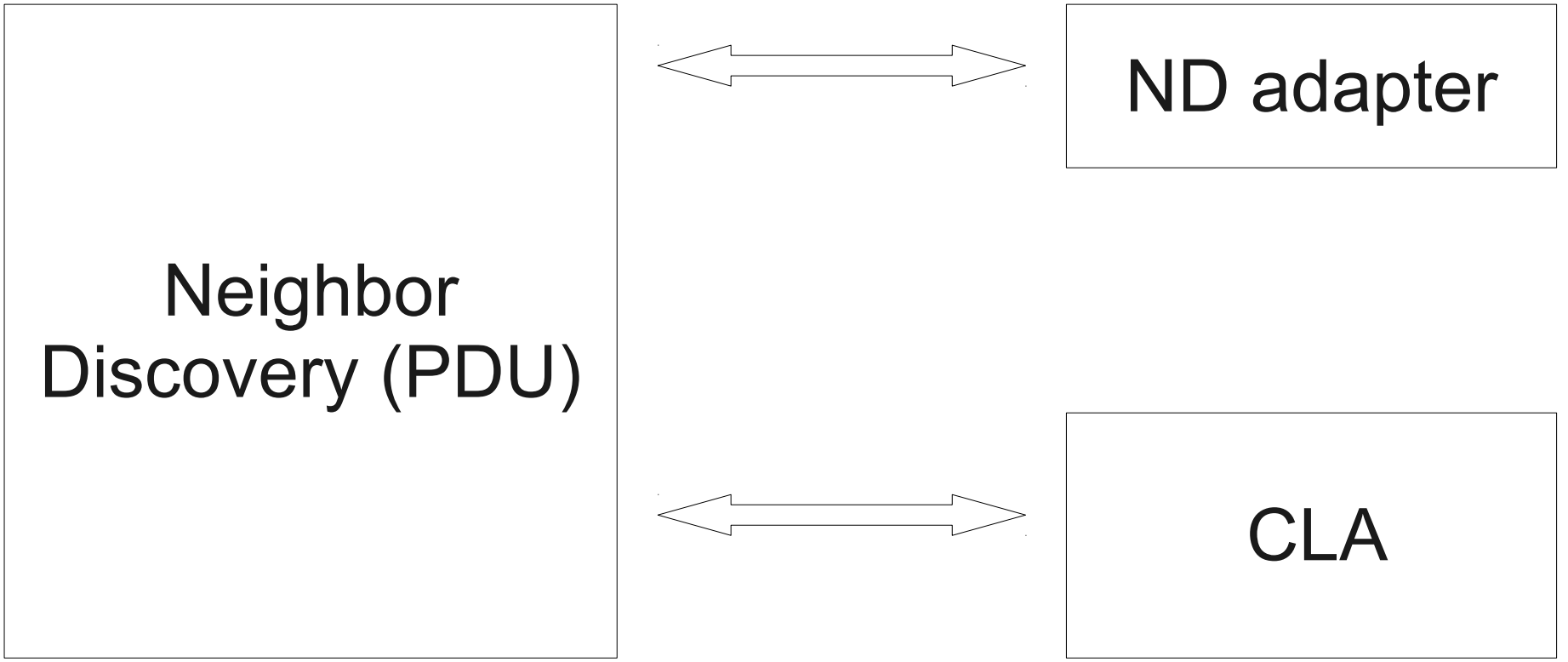
BBN ND Requirements

- Low overhead for some definition of low
- Support for multicast/broadcast and unicast
- Support for mobility, high degree of link dynamics
- Architecture that allows for extensibility ND on CLs other than IP
- IP Specific (???)
  - Originally implemented for IP
  - New architecture only has UDP adapter

IPND Considerations

- Inside/Outside BP?
- Broadcast media
- Overhead/Frequency
- Bidirectionality
  - 1-hop neighbor list
  - Bloom filter
- Hold-down

BBN ND Architecture



Component Interaction

- CLA registers its association with an adapter
- Neighbors discovered via a particular adapter are conveyed to associated CLAs
- Allows single IPND implementation used across multiple IP-related CLAs
  - UDP CLA
  - TCP CLA
  - NORM CLA

Inside/Outside BP?

- BBN Implementation avoids BP in ND
  - Primary block overhead
  - Also enable shared neighbor discovery across multiple CLAs (a CLA is required for sending a bundle, potential bootstrapping problem)

Broadcast media

- Nice to have a protocol that is not n^2 in a wireless medium, multicast-aware
- Need to support distinct channels
  - Multiple multicast groups
  - Multiple unicast (potentially multi-hop in underlay)

Overhead/Frequency

- In some cases, high frequency beaconing is desired
  - Maximize contact opportunity
  - Decreases latency for discovery of down links
    - Example from Epidemic dissemination
- Allow high overhead fields (most) to be optional
  - If I receive 1-hop info and service adverts from a neighbor, presume that information doesn't change across received beacons that don't include that information
  - Provision to request 1-hop info and service adverts on demand? (hold-down might suppress these indefinitely)
- Hold-down should help substantially (unimplimented)

Bidirectionality

- Many routing protocols presume bidirectional links
- MANETs in practice may have links with only unidirectional capability for many reasons:
  - Local interference, multi-path, asymmetric radio power and antenna configurations
- Epidemic protocol
  - Multicast optimization, “Active Offers Exclusive”
  - Offers may get “stuck” to neighbor to which I cannot transmit

Bidirectionality

- MANET solutions often involve advertisement of 1-hop neighborhood in beacons
- Bloom filter seems like an attractive way to more compactly determine bidirectionality
  - If I receive enough beacons to consider a neighbor up, I add the neighbor to my bloom filter advert.
  - If I receive a beacon with a bloom filter that includes my hash, the link is bidirectional

Hold-down

- If I send data to address X, suppress beacons on that channel
- If I receive data on channel X, take the sender's transmission as an implicit beacon
- Reduces overhead
- Requires notion of beacons that don't include 1-hop Bloom filter
- Requires addition CLA/ND interaction
  - Hey ND! I just got data – suppress beacons for neighbor Foo associated with my adapter