

IPv6 over Wireless and Wireless ND (WiND)

draft-thubert-6man-ipv6-over-wireless

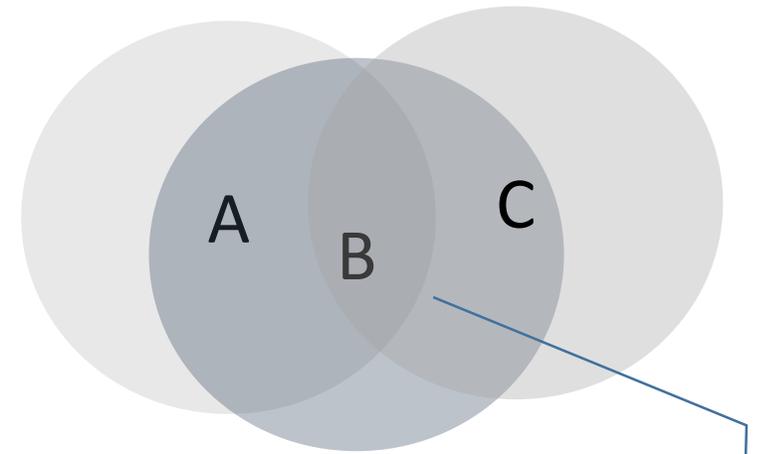
Pascal Thubert

IETF 105

Montreal

Unmet expectations

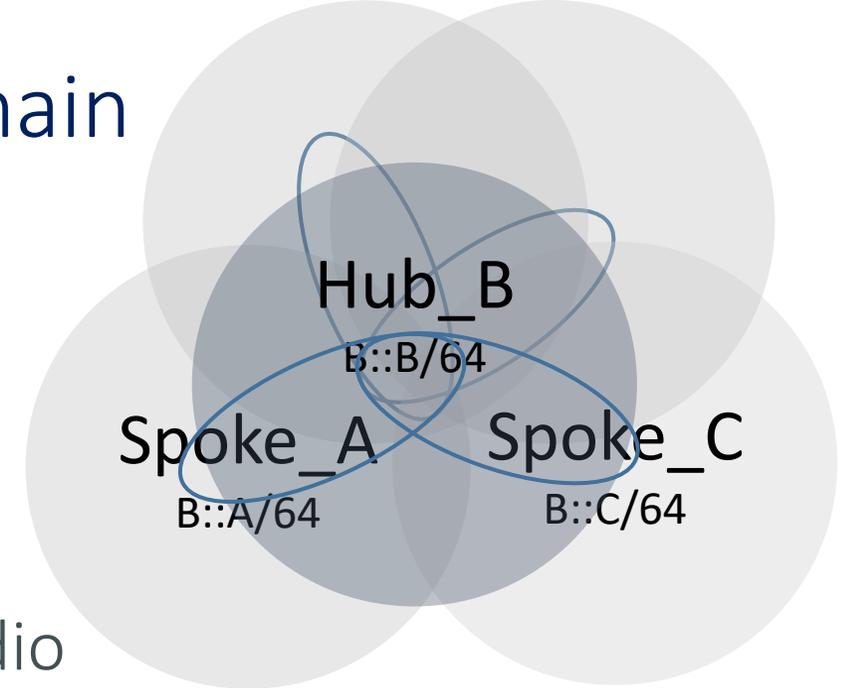
- IPv6 ND is designed for P2P and Transit Links
 - Wireless is usually reflexive but natively non-transitive
 - Requires extensions for NBMA (without MAC-layer emulated transitive properties)
- IPv6 ND over MAC-layer transit emulation is not wireless friendly
 - E.g., over L2R, learning bridges, Wi-Fi Infrastructure Mode
 - Broadcast intensive (no support for multicast)
- Other mismatches
 - Fast Roaming '11r' (ND has no sense of order of events)
 - Intermittent Connectivity (fails all of NUD, DAD and lookup)
 - Fast Initial Link Setup '11ai' (ND is reactive, causes loss of first packets)
 - Increased sensitivity to DoS attacks (Use ND to trigger broadcasts remotely)



Non transitive:
B can talk to A and C
but A and C cannot
see reach other

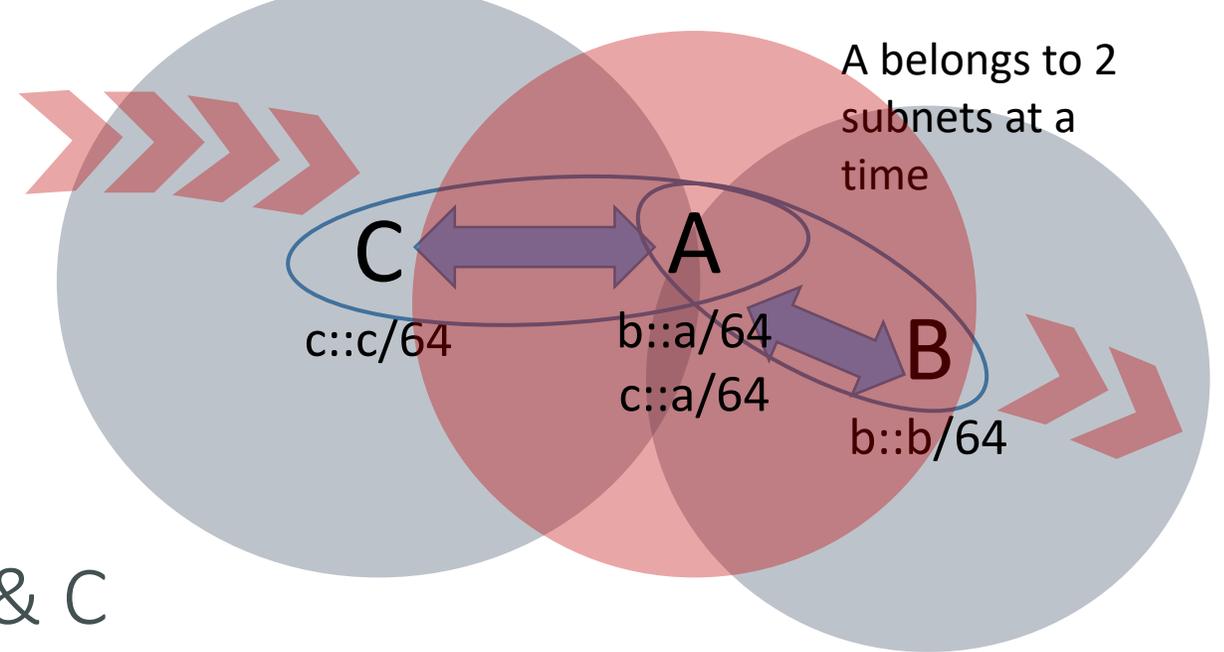
Link and Link Local vs. PHY broadcast domain

- A plain radio Interface connects to a physical radio broadcast domain (vs. a MAC-layer emulated broadcast domain)
- An IPv6 bidirectional Link can be created where radio broadcast domain overlap enough that A sees B and B sees A.
- Link-Local Addresses need to be unique for a communicating pairs only
- The IPv6 Link is usually reflexive though often asymmetrical
- The IPv6 Link is usually not transitive unless special measures taken
- As a node moves, it meets other nodes and IPv6 Links are formed



Other Things to Adjust

- Matching source IP to router
 - A must with radio mobility
 - E.g., car A attached to RSUs B & C
 - Each RSU enforcing SAVI for its prefix
 - Providing reachability back to a CoA based on its prefix
- Aggressive DNA (Detecting Network attachment)
 - Rapid discovery (advertisement interval option in RA)
 - Permanently assess reachability of DRL and prune rapidly
 - May reuse a GUA if come back within reg. lifetime



Questions to the group

- Archiving value -> should we publish ?
- Transfer WiND to 6MAN for maintenance and extensions?
- Generalize RFC 8505 (and WiND suite) over non-6lo Link ?

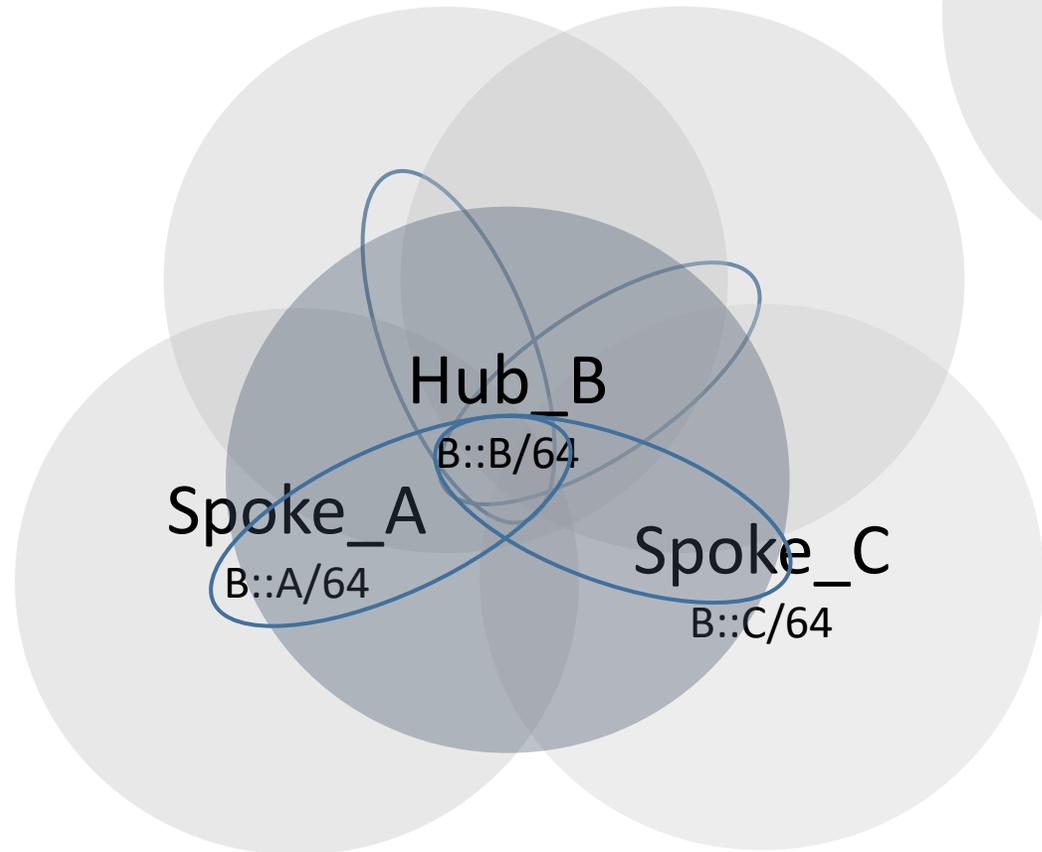
Status

- Triggered by IPWAVE IPv6-over-OCB, need a baseline for wireless
- Inherit from 10 years of work at 6lo, millions of nodes deployed
- draft-thubert-6man-ipv6-over-wireless-03 out
- Discusses radio broadcast domain, native and emulated
- Introduces WiND, compares to ND on native MAC (no emulation)
- Discusses applicability / use cases
- Next rev on host and routers behavior, e.g., matching router.

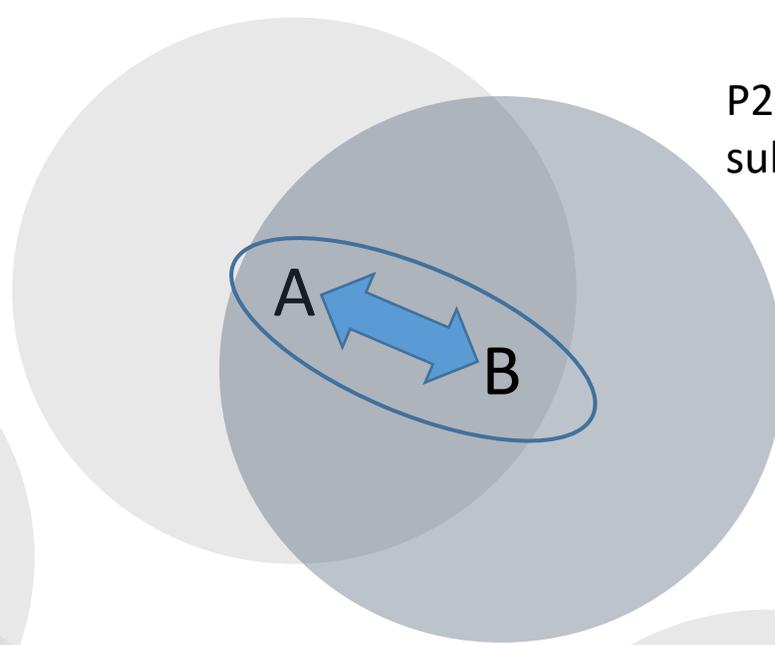
RFC 8505 registration vs. 802.11 association

- Association allows a proactive setting of the bridging state
 - Allows the APs to eliminate broadcast lookups
 - Compares to reactive learning bridge
- WiND
 - Reproduces the association model at L3
 - Leverages the state for address protection and SAVI
 - Routing inside the subnet replaces bridging
 - Proxy ND at the wire / wireless edge

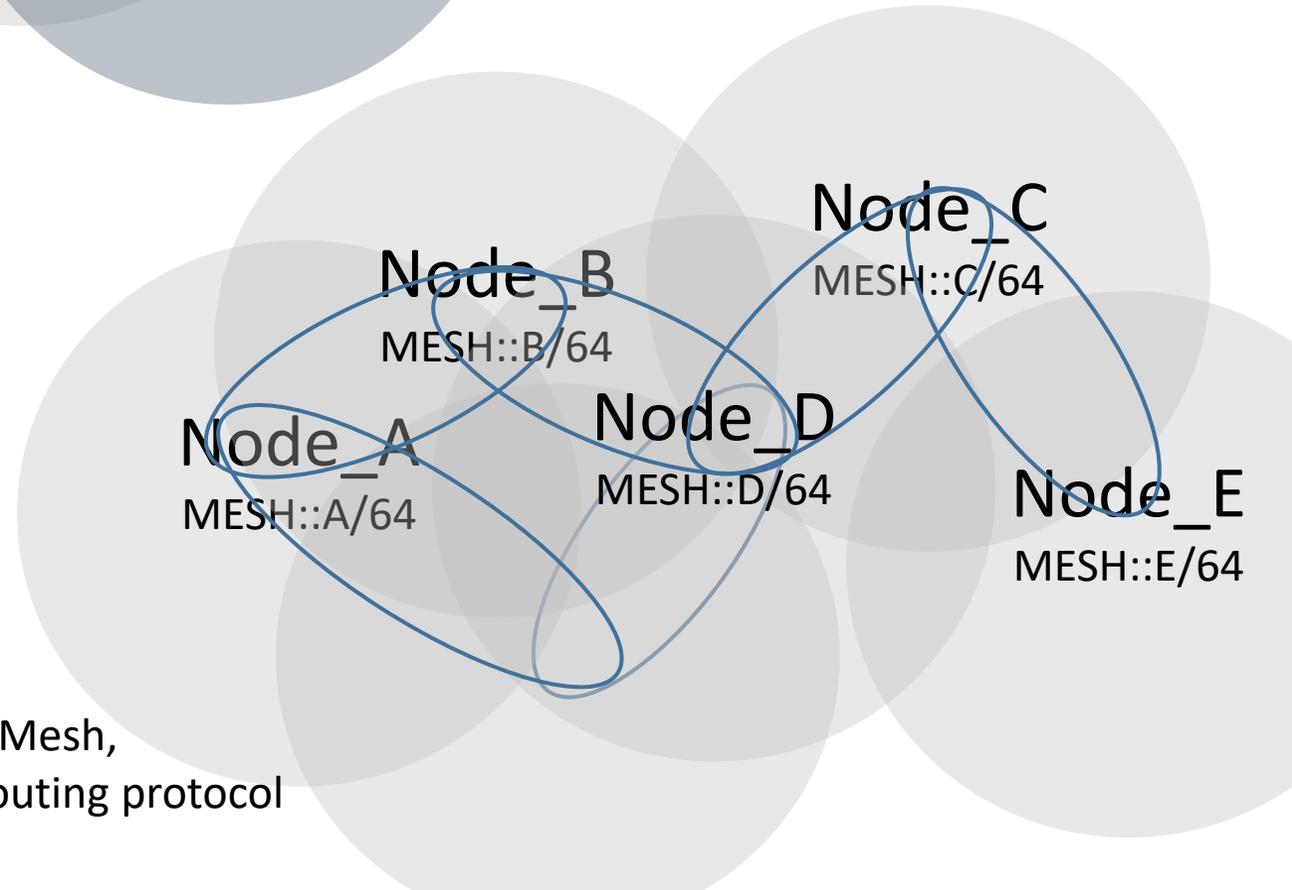
SubNet models



Hub and Spoke
HUB_B maintains state for visitors for their registration lifetime and relays packet



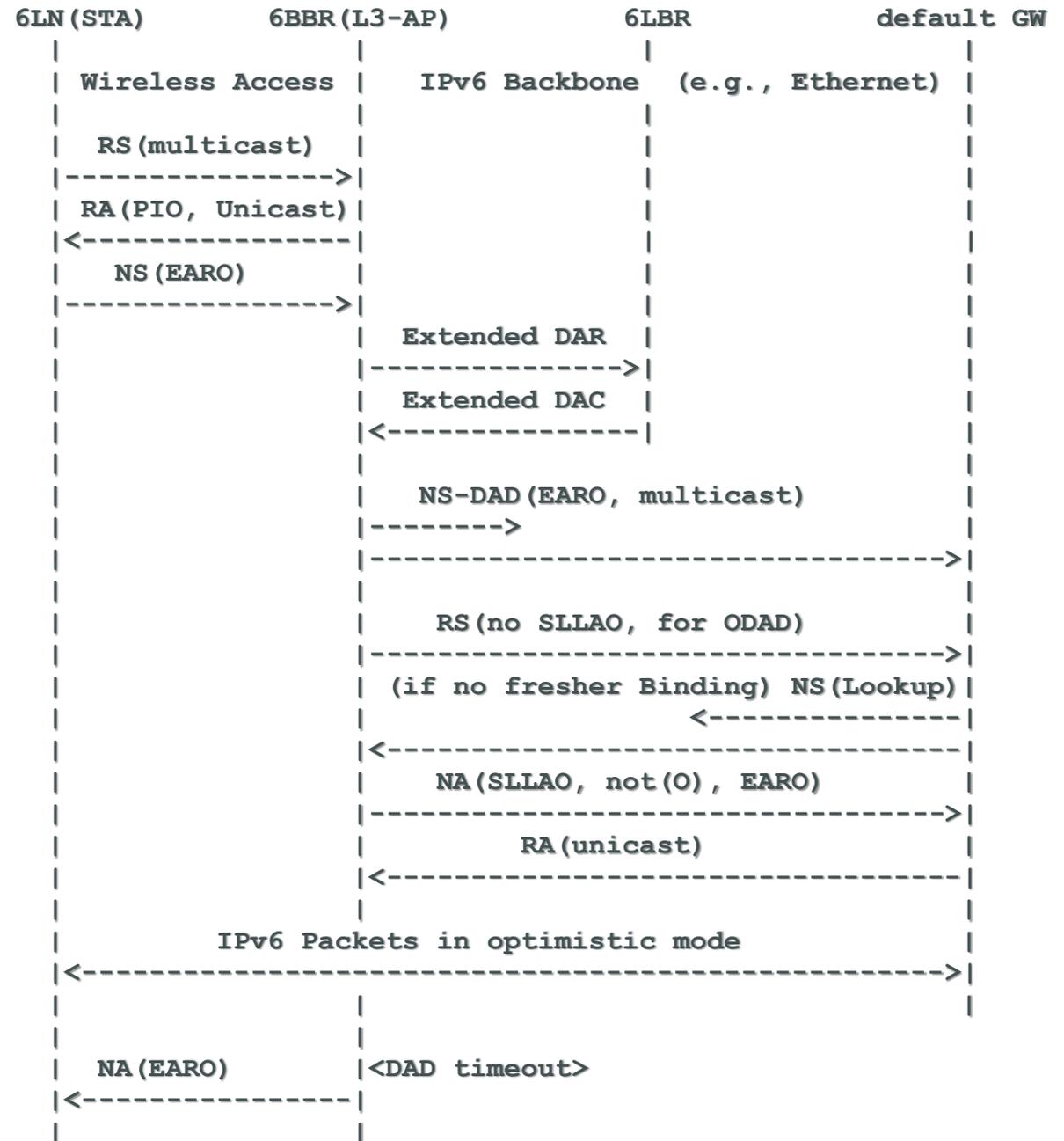
P2P, the simplest subnet model



Route-Over Mesh,
requires a routing protocol

WiND General Design

- Registration for guaranteed service
 - Even with intermittent connectivity
 - DAD protection on behalf for lifetime
 - Extensible for lookup
- Routing vs. Bridging Proxy
 - Bridging advertises the SLLA of the 6LN
 - Routing hides the 6LN and routes
 - Routing keeps L2 stable
- Model
 - Link is broadcast domain
 - Subnet <> Link
 - => Not on-link and routing



6lo standard work



A proactive setting of proxy/routing state to avoid multicast due to reactive Duplicate address detection and lookup in IPv6 ND

- [RFC 8505](#) (Issued 11/2018)
 - The registration mechanism for proxy and routing services
 - Analogous to a Wi-Fi association but at Layer 3
- [draft-ietf-6lo-backbone-router](#) (WGGLC complete 1/25)
 - Federates 6lo meshes over a high-speed backbone
 - ND proxy analogous to Wi-Fi bridging but at Layer 3
- [draft-ietf-6lo-ap-nd](#) (WGGLC complete 3/26)
 - Protects addresses against theft (Crypto ID in registration)
- [draft-thubert-6lo-unicast-lookup](#)
 - Provides a 6LBR on the backbone to speed up DAD and lookup
- [draft-thubert-6man-ipv6-over-wireless](#) (new draft)
 - IPv6 ND vs. WiND applicability to wireless networks

