IPv6 Addresses for Ad Hoc Networks

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https://datatracker.ietf.org/doc/draft-templin-6man-mla

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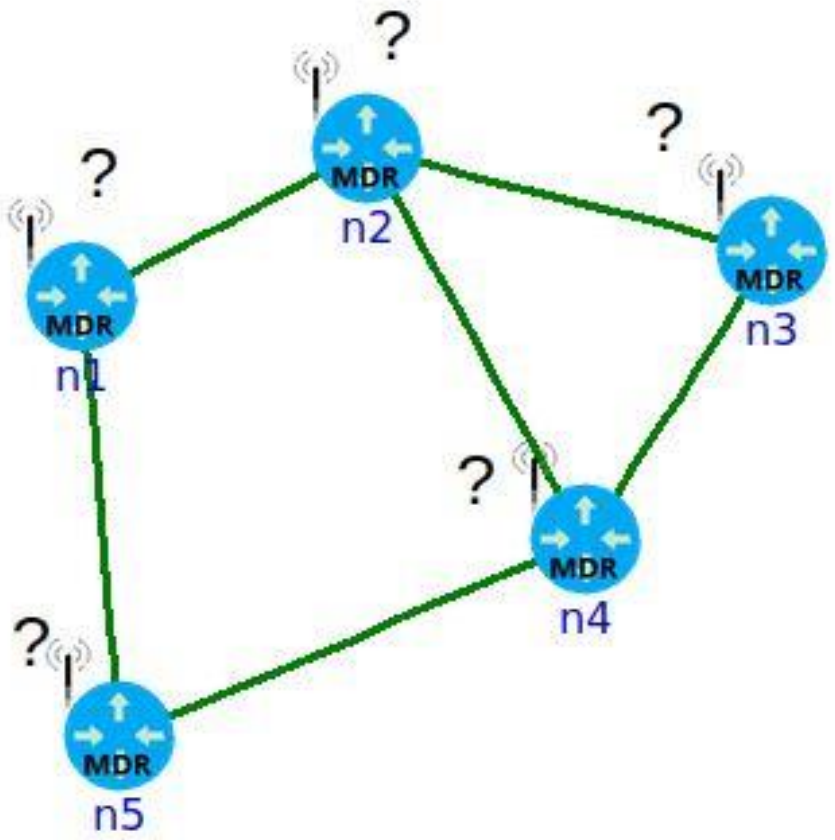
Summary of the Draft

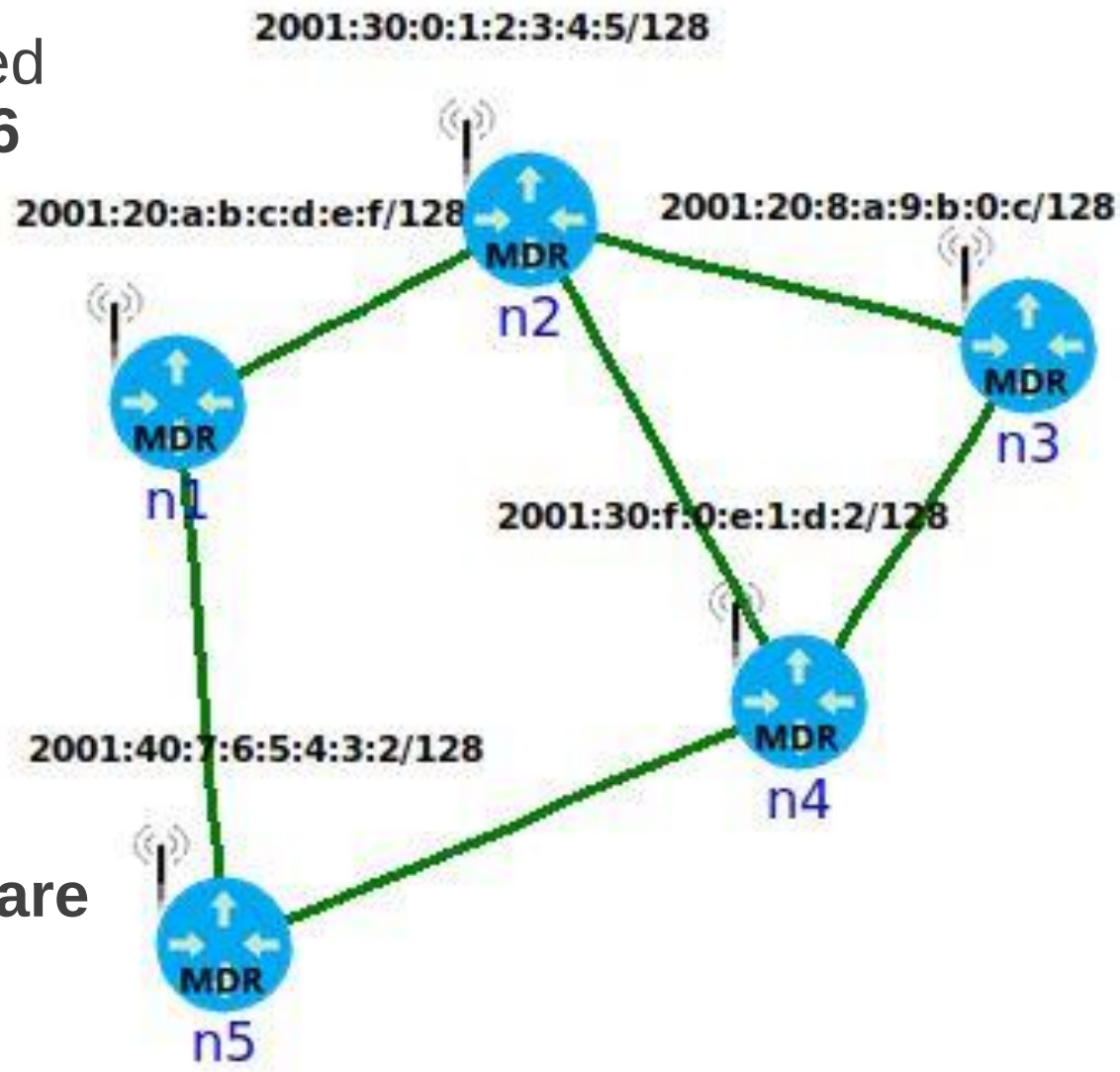
“When two or more IPv6 nodes come together within an Ad Hoc network operating region, they must be able to assign unique addresses, discover multihop routes and exchange IPv6 packets with peers even if there is no Internetworking infrastructure present.”

- **RFC5889 recommends GUAs/ULAs** (isolated Ad-hoc network coordinated provisioning often not possible)
- **RFC5889 explains why LLA use limited** (Ad Hoc network interface multilink nature)
- **Multilink Local Addresses (MLAs) needed:**
  - Extremely high assurance of Ad-Hoc network uniqueness
  - Self-generated by node or coordinated with a registration authority
  - Uniqueness properties persist across network partitions/merges
  - Must support localized multihop forwarding over multiple links
  - **Assigned to Ad-hoc network interfaces as /128s**



Ad Hoc Network Example

- MLAs are 128-bit identifiers with well-formed IPv6 prefixes, and therefore also **valid IPv6 addresses**
- Nodes assign MLAs to interfaces as ***/128* Optimistic Addresses** [RFC4429]
- Nodes inject MLAs into Ad Hoc network routing protocols as **host routes** (example routing protocols: OSPF-MDR, OLSRv2, AODVv2)
- Supports Ad Hoc network-local **IPv6 multihop routing and forwarding**
- **Applies equally for static networks that are not particularly mobile or wireless**



IPv6 Addresses for Ad-hoc Networks

- RFC5889 (“IPv6 Addressing Model in Ad Hoc Networks”) explains why **Link-Locals (LLAs)** have limited applicability (**Ad Hoc network multilink nature**)
- RFC5889 recommends GUAs/ULAs, **but must be assigned by centralized authority that coordinates address provisioning; subnet prefixes**
- RFC3879 (“Deprecating Site Local Addresses”) asserts “Site is an Ill-Defined Concept” – **but “Ad-Hoc network” is a coherent logical concept based on interface connections to dynamically changing topologies**
- **Need: Multilink Local Addresses (MLAs):**
  - Self-generated
  - Self-asserted
  - Ad-Hoc network local scope
  - subject of this document

MLA “Type 1” – 2001:TBD::/28

- IPv6 prefix 2001:TBD::/28 followed by 100 random bits
- 100 bits of randomness - collisions extremely unlikely
- IPv6 nodes can self-generate; assert within Ad-hoc local scope
- Should not appear in global name service
- **Example:**

  2001:TBDx:de12:4b74:884e:9d2a:73fc:2d94

MLA “Type 2” - ORCHIDv2 [RFC7343]

- IPv6 prefix 2001:20::/28 followed by a 4-bit ORCHID Generating Algorithm ID (OGA-ID) followed by 96-bit Encode_96(Hash) of Context ID
- IPv6 nodes can self-generate; assert ORCHIDv2 without supporting infrastructure, but with fewer (pseudo)-random bits (96)
- Can serve as a node identifier; may appear in global name service
- **Example:**

  2001:20:280:1405:a3ad:1952:ad0:a69e

MLA “Type 3” - HHIT/DET [RFC9374]

- IPv6 prefix 2001:30::/28 followed by 28-bit Hierarchy ID (HID) followed by 8-bit HHIT Suite ID followed by 64-bit ORCHID hash
- Must be registered with a registration authority before use
- Ad Hoc network nodes can assert registered Type 3’s as unique addresses
- Can serve as a node identifier; may appear in global name service
- Advantage:
  - supports attestation of a node’s claimed address
  - supports registered address-based authentication
- **Example:**

  2001:30:5efe:2018:c63d:9724:fca:1237

What About fec0::/10?

- RFC3879 formally deprecates site-local prefix fec0::/10
- Implementations stopped supporting addresses taken from that block
- Even today 20 years after the deprecation, implementations still remember
- The Multilink Local addressing scope now replaces the deprecated site-local addressing scope

Assigning MLAs to Ad Hoc Network Interfaces

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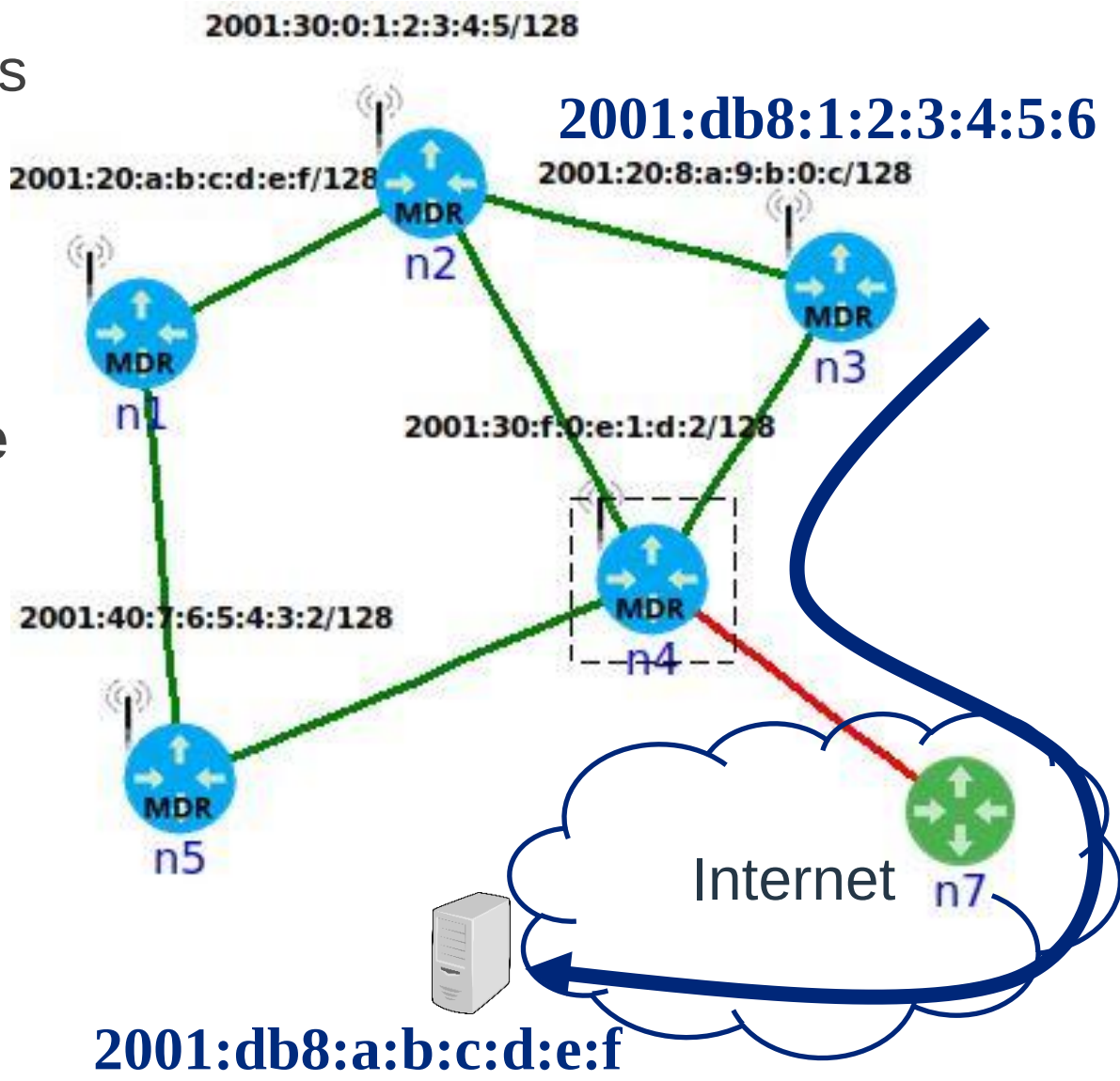
- Nodes assign MLAs to interfaces as ***/128* Optimistic Addresses** [RFC4429]
- Nodes inject MLAs into Ad Hoc network routing protocols as **host routes**
  - (example routing protocols: OSPF-MDR, OLSR, AODVv2)
- Supports Ad Hoc network-local **IPv6 multihop routing and forwarding**

Ad Hoc Network Connected to Internet

- **Proxy/servers** provide intermittent/continuous Internet connectivity for Ad Hoc network
- Proxy/Servers delegate GUAs/ULAs via **SLAAC; DHCPv6**
- Ad Hoc network nodes assign GUAs/ULAs to **Overlay Multilink Network (OMNI) Interface**
- Ad Hoc network traversal to access Internet services via **OMNI encapsulation (**IPv6 address selection rules apply)



Next Steps

- https://datatracker.ietf.org/doc/draft-templin-6man-mla
- Work currently targeted for 6MAN, since it applies for all Ad Hoc network types and not just MANETs
- Supporting comments on 6MAN list welcome

- See also:
- https://datatracker.ietf.org/doc/draft-templin-6man-aero
- https://datatracker.ietf.org/doc/draft-templin-6man-omni