

MANET/Autoconf Topics

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IETF67 – Autoconf wg

References

- “Observations on “Link” in MANET/
Autoconf and Other Contexts” - ‘draft-templin-
manet-autoconf-link-00.txt’
- “MANET Autoconfiguration using DHCP” -
‘draft-templin-autoconf-dhcp-02.txt’
- “MANET subnet model” list discussions -
‘<http://www1.ietf.org/mail-archive/web/autoconf/current/msg00485.html>’
‘<http://www1.ietf.org/mail-archive/web/autoconf/current/msg00496.html>’

Observations on “Link”

OSI Reference Model

- OSI reference model 3-sublayer decomposition for L3:
 - Internet sublayer (Layer-3c) – IP layer
 - link enhancement sublayer (Layer-3b) – intra-MANET routing; tunneling to harmonize heterogeneous links (if needed)
 - link access sublayer (Layer-3a) – IP-to-MAC address mapping layer

Link Characteristics

- For MANET Routers on semi-broadcast links (i.e., transmission-range-limited links), “link” can mean:
 - pair-wise relationships between nbrs
 - transmission-range-limited neighborhood
 - entire MANET (Layer-3a or Layer-3b with tunneling)

Relays/Tunnels

- with L3a MANET routing:
 - entire MANET looks like Ethernet link (but, only for homogeneous link technologies)
 - No relays/tunnels needed to span MANET in single IP hop
- with L3b MANET routing:
 - when no L3b link enhancement is used, application-specific relays needed for link-scoped service support at L3c
 - when L3b link enhancement (i.e., tunneling) is used, L3c link-scoped services work as-normal across entire MANET

MANET/Autoconf Using DHCP

First-Order Considerations

- MRs configure MLAs (e.g., RFC4193 ULAs) and engage in the MANET routing protocol
- MGs link MANET to provider network or global internet, and configure a DHCP relay/server
- Two choices:
 - MR configures DHCP client-only and tunnel client's broadcast/multicast requests across MANET to MGs
 - MR configures both DHCP client and DHCP relay, and forwards its own requests to MGs

Client-only Tunneling Method

- requires either application-specific relays or treat entire MANET as a “link” using intra-site tunneling, e.g., 6over4, ISATAP, etc.
- Multicast-in-multicast tunneling requires SMF; Multicast-in-unicast tunneling requires MG address discovery (e.g., via tunneled RAs)
- DHCPv4 requires new “MLA Option” so MGs can relay DHCP Replies to correct MR
- DHCPv6 can put MLAs in “peer-address”

Client-relay Forwarding Method

- DHCP client/relay approach:
 - MR configures both DHCP client and relay
 - client and relay talk over loopback interface
 - relay discovers address(es) of MG(s) (e.g., via RAs) and forwards requests there (can also use site-scoped multicast)
 - no need for tunneling
 - works for DHCPv6; haven't found a way to make it work for DHCPv4 yet

MANET Subnet Model (IPv6)

“Classical IP Subnet” Model

- MANET interfaces configure link-local (LL) addresses and shared prefix for both address configuration; on-link determination (i.e., prefix length shorter than 128):
 - all MANET interfaces that assign the prefix and configure addresses from the prefix must be attached to the same link and run DAD on the link
 - useful only for MANETs that comprise a single link (either L3a or tunneled L3b)
 - **multilink subnet** for L3b MANETs w/o link-enhancement

“No-Subnet” Model (aka “Multi-subnet MANET” Model)

- MANET interfaces configure LL and MLAs only; global prefixes procured for non-MANET links:
 - LL needed for IPv6 ND protocol operation on local link
 - Probabilistically-unique MLAs used for intra-site communications
 - Global prefixes delegated for non-MANET links using, e.g., “MANET Autoconf using DHCP” – no DAD needed over MANET interface since globals applied to non-MANET links
 - With SEND LLs, proxy/relay-DAD needed in case colliding nodes move onto the same link
 - When LL’s administratively configured for uniqueness, proxy/relay-DAD not needed

“/64 Subnet-Per-Interface” Model

- MANET interfaces configure unique prefix (/64 assumed):
 - LL/MLA considerations same as for “No Subnet” model (i.e., Relay/Proxy DAD needed for SEND)
 - Global prefixes delegated for MANET links using TBD autoconf mechanism.
 - Autoconf mechanism can’t be DHCP prefix delegation since prefix is assigned to MANET interface
 - Autoconf mechanism can be SLAAC if each MR gets a unique set of PIOs in RAs from MGs
 - proxy/relay DAD not needed for globals

“Singleton Subnet-Per-Interface” Model

- MANET interfaces configure shared prefix for address configuration but not on-link determination (i.e., prefix length = 128):
 - LL/MLA considerations same as for “No Subnet” model (i.e., Relay/Proxy DAD needed for SEND)
 - autoconf mechanism can be SLAAC or DHCP with ‘L=0’ in PIOs
 - consistent with RFC3627, Section 4.3
 - proxy/relay DAD needed for both LLs, globals

Things To Think About (1)

- MANET/Autoconf is for *routers*; not hosts. But:
 - RFC2462(bis), section 1: “The (stateless address) autoconfiguration process ...only to hosts and not routers.”
 - RFC2462(bis), section 5: “...how routers (auto)configure their interfaces is beyond the scope of this document.”
- Router interfaces are required to configure Subnet-Router Anycast addresses - (RFC4291, Section 2.8) and (RFC3627), but can't be used for singleton subnets
 - Subnet-Router anycast really only useful on local link since prefix length can't be determined from off-link (?)
 - Subnet-Router anycast not widely used (?)

Things To Think About (2)

- Routers must configure at least one non-link-local address so that ICMPs errors can be returned
- Global unicast address prefix length:
 - RFC4291, Section 2.5.4: “All global unicast addresses ... have a 64-bit interface ID field (i.e., $n + m = 64$)”
 - RFC3627, Section 4.3: operational practices sometimes use longer prefixes, including /128
 - ‘draft-iab-multilink-subnet-issues’, Section 4.2 gives guidance for prefix length determination