

MANET Autoconfiguration

Fred L. Templin

fred.l.templin@boeing.com

Goals

- Automatically configure addresses, prefixes and other information
- Avoid multilink subnet issues
- Avoid address duplication
- Discover and select exit routers
- Support mobile networks
- Use existing mechanisms

Types of addresses/prefixes

- **Link-local (LL)** - non-routable; local link only
- **MANET-local (MLA)** - routable within a MANET
- **Unique-local (ULA)** - routable within a MANET and also between interconnected MANETs
- **Centrally-assigned Unique-local (ULA-C)** - same as ULA, but also registered with a central authority
- **Global (derived from home network)** - globally routable and taken from home network prefix space; used for *home address; mobile network prefix*
- **Global (delegated from MNBR)** - globally routable and delegated by MNBR; used for *care-of address, visited network prefix*

Challenges

- MANETs are ***multi-link sites*** - they are formed over asymmetric reachability links
 - see RFC4903 (Multi-link Subnet Issues) and draft-ietf-autoconf-manetarch-04.txt (MANET Architecture)
- MANETs are ***multi-hop*** - there may be multiple IP forwarding hops between nodes within the same MANET
 - link-scoped functions do not work as expected (RA/RS, DAD, NUD, LLNMR, mDNS, etc.)
- MANET interfaces are inherently neither ***ingress*** nor ***egress*** - they are ***neutral***

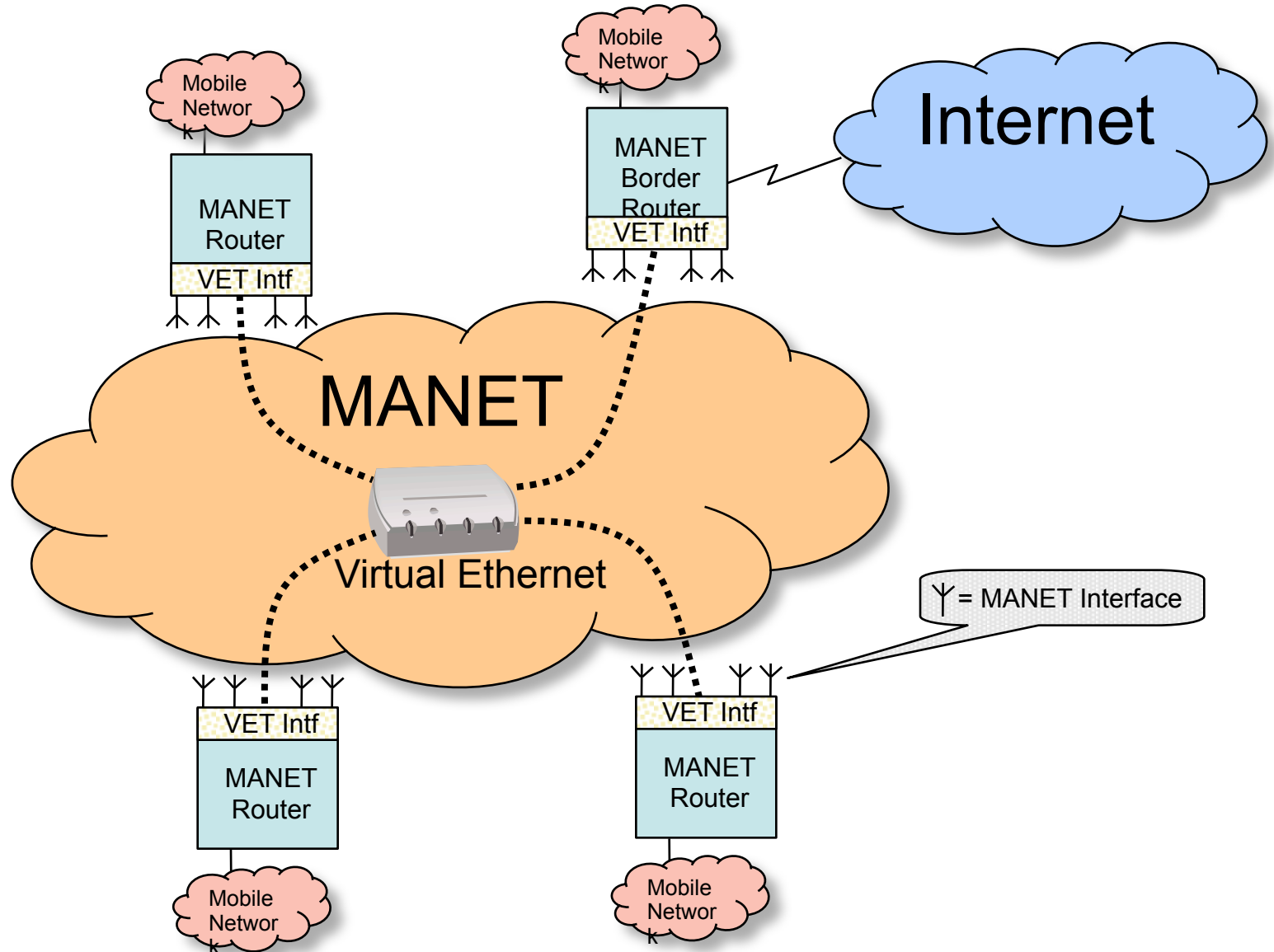
Two basic solutions

- Raw use of the MANET multilink site with changes to neighbor discovery model (discussed in draft)
- Virtualize the MANET to appear as a shared link via IP-in-IP encapsulation
 - ∅ *We call this “Virtual Ethernet (VET)”*
 - ∅ *THE IDEA AND NAME ARE NOT NEW!*

Virtual Ethernet (VET)

- Each MANET Router (MNR) configures a VET interface over its (underlying) MANET interfaces
- Each VET interface connects to an imaginary shared link (i.e., a “Virtual Ethernet”)
- Each VET interface configures a LL address
- Then:
 - All MNRs are single-hop neighbors on the VET
 - IPv6 Autoconfiguration is done over the VET
 - Link-scoped services work as-normal over the VET

MANET with Virtual Ethernet (VET)



MNR Autoconfiguration Procedure

- configure MANET Local Addresses (MLAs) on MANET interfaces (DHCP, ULA, manual config, etc.)
- engage in MANET routing protocol (if necessary)
- configure VET interface(s) over underlying MANET interfaces and assign LL address(es)
- discover MANET Border Routers (MNBRs): (DHCP server discovery, FQDN lookup, routing protocol/cross-layer information, anycast, etc.)
- perform RS/RA exchange w/MNBR(s) over VET

Autoconfiguration Procedure (2)

- get DHCP prefix delegations (e.g., /64s, /128s, etc.) from MNBRs for assignment on loopback/ingress interfaces
- self-generate ULA/ULA-C prefixes for assignment on loopback and/or ingress interfaces (independent of other autoconfig steps)
- (TBD) auto-configure IPv6 addresses on VET interfaces using SLAAC based on prefixes in RAs (is this needed?)
- MNR can now:
 - select exit router(s)
 - send binding updates to home agents (if necessary)
 - tunnel packets with home network source addr to HA
 - send packets with visited network source addr on global scope
 - send packets with ULA/ULA-C source addr within site or between interconnected sites

Operation with Multiple MNBRs

- RFC4191 (“Default Router Preferences and More Specific Routes”)
- Discovery of multiple MNBRs to be used as exit routers to get off the MANET
- MNR must use the MNBR it obtained its visited network prefix from as default:
 - MNBR may itself be a MR away from its home network, and delegating prefixes from its home prefix
- Further discussion on multiple MNBRs in draft section 3.1

MLA DAD Considerations

- MLAs assigned to MANET interfaces should be managed and/or statistically unique such that MANET-wide *pre-service DAD* not needed
- *in-service DAD* recommended to detect duplication due to partitions/merges/etc.

Other DAD Considerations

- No MANET-wide DAD needed for DHCP prefix delegation because each MNR receives unique prefix(es)
- No MANET-wide DAD needed for ULA/ULA-C due to statistical uniqueness
- No MANET-wide DAD needed for link-local addresses assigned to VET interface that are derived from MLA addresses

Drafts

- The combined draft:
 - draft-templin-autoconf-dhcp
- The virtual ethernet draft (update needed):
 - draft-templin-autoconf-virtual
- The multilink site draft (update needed):
 - draft-templin-autoconf-multilink

Co-Authors

- Steve Russert
- Seung Yi
- (contributions from Ian Chakeres; Thomas Henderson)

Backups

VET Interface “Portals”

- enhanced portal (i.e., IP-in-IP encaps):
 - MANET appears as a unified shared link
 - TTL not decremented
 - all MRs are neighbors
 - standard ND works as-normal
- unenhanced portal (i.e., non-encaps)
 - MANET appears as a multilink site
 - TTL decremented
 - multiple IP hops between MRs
 - need a “site-scoped” equivalent of ND

VET Output

