Network Layer Routing - III
RIP-2 and RIPng

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Routing Information Protocol - Version 2

RIP-2 (RFC 2453 - http://www.ietf.org/)

Why? RIP-1 does not

- consider AS, IGP/EGP (interior gateway protocol/ exterior gateway protocol) interaction.
- support subnetting.
- support authentication.

All the above came after RIP-1 development.

Lack of subnetmask - serious problems.

Currently RIP-1 does the following

- If all non-network bits are 0, subnetmask equals netmask.
- If some non-network bits are set, subnetmask is not determined.
- Subnet route and host route cannot be differentiated.
- some routers choose subnet mask of the interface over which route was learned to determine the route type.

network address and host address can be identified due to fixed netmasks. This cannot be done with subnets.

Autonomous System : network (including subnets inside it) adminsitered by single entity.

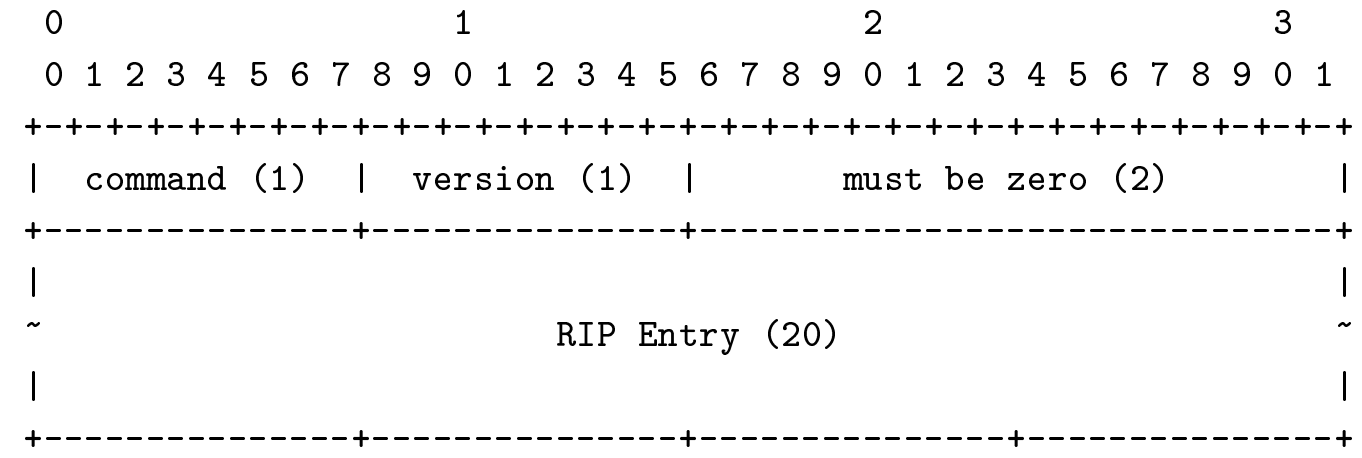
- Each AS will have its own routing technology. (different in different AS's)
- Routing protocol within AS - known as IGP (Interior Gateway protocol).
- Routing protocol between AS's is different and known as EGP (Exterior Gateway protocol).

RIP - designed as IGP in moderately sized AS's.

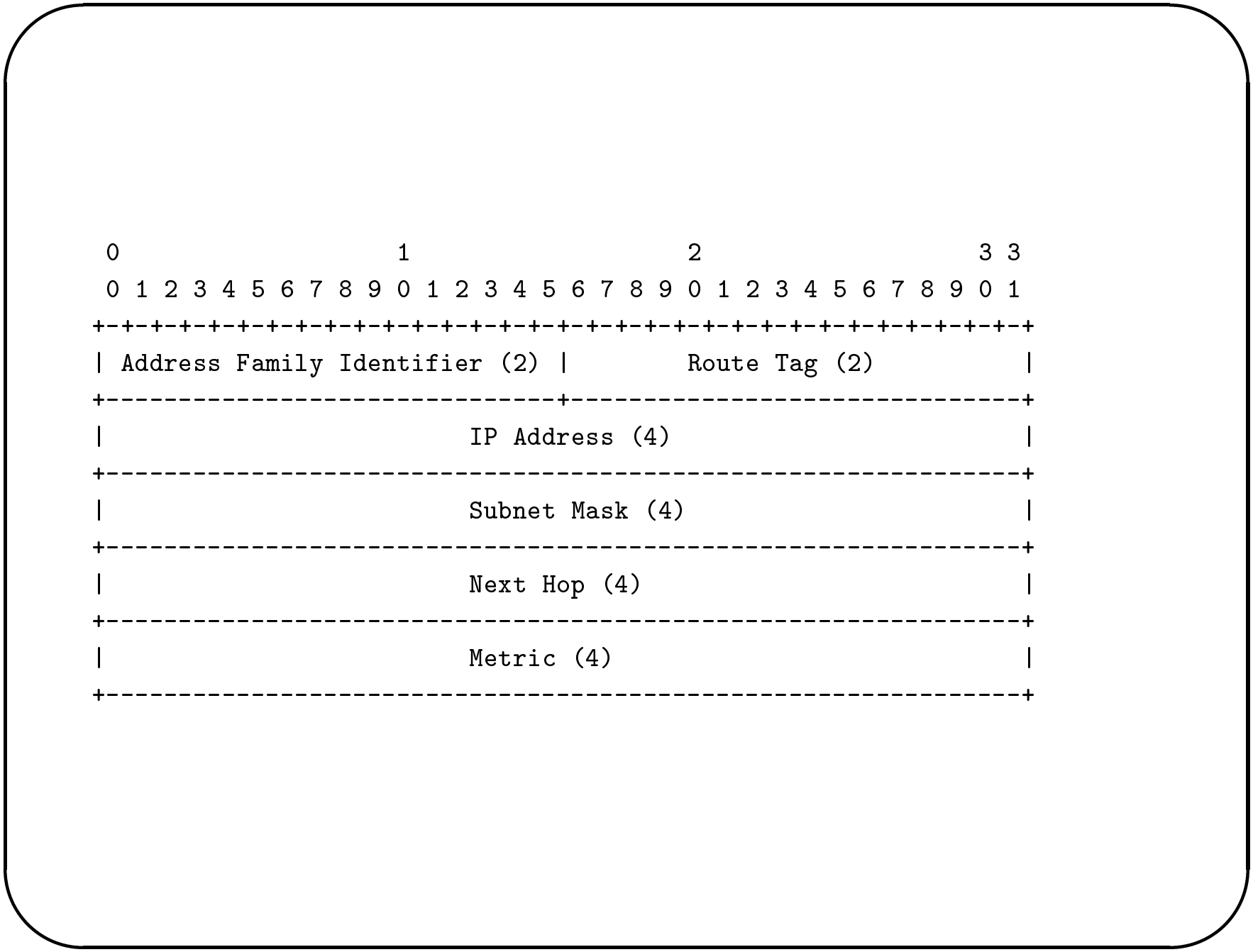
Limitations of RIP-1 as well as RIP-2

- Longest path should be less than or equal to 15 hops.
- count to infinity
- fixed meterics.

Protocol Extension

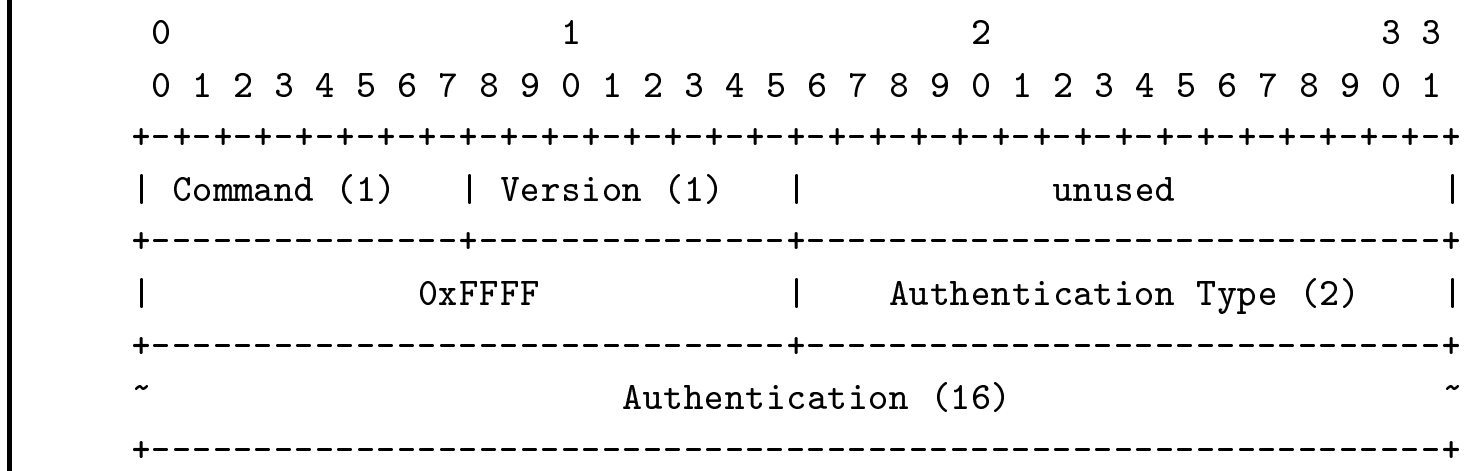


There can be multiple RIP entries (RTE - routing table entry) (At most 25)


0 1 2 3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
Address Family Identifier (2)
Route Tag (2)
IP Address (4)
Subnet Mask (4)
Next Hop (4)
Metric (4)

If address family identifier of first and only first RTE is 0xFFFF

- Remaining RTE contains authentication information not routing table information.
- hence 24 RTE's can be there when authentication is used.
- If no authentication, no entry should have address family identifier as 0xFFFF.



Only authetication type at the moment is simple password (denoted by number 2)

Remaining six octets contains plain text password. If password is less than 16 octets, it must be left justified and padded with (0x00)'s.

Route Tag

- This should be preserved and readvertised with route.
- used to separate *internal* RIP routes (routes for networks within RIP routing domains.) from *External* RIP routes (imported from and EGP or another IGP)

Subnetmaks

- when this is applied to an IP address (bitwise ANDed) - we get network address.
- If this field is zero, no subnetmask.

- When RIP-1 router get RIP-2 router entry.
  - Information internal to one network is never advertised on another network.
  - Information about a more specific subnet may not be advertised where RIP-1 router assumes it to be host route.
  - Supernet routes should not be advertised when they can be misunderstood.

Next Hops

- Next hop IP address to which packets for this destination should be forwarded.
- 0.0.0.0 means next hop is the orginator of this advertisement.
- If received next hop is not directly reachable, value of 0.0.0.0 is assumed.

Multicasting

- To reduce the processing load of hosts, multicasting can be used instead of broadcasting for periodic updates.
- IP multicast address used for this is 224.0.0.9
- These will be inter-router message and not forwarded by routers.

Backward compatibility

- RIP-2 router responds with RIP-1 messages to RIP-1 requests.

Compatibility switch

- should be there in all RIP-2 implementation.
- should be configurable on per interface basis.
- there are four switch settings.
  - RIP-1; only RIP-1 messages are present)

  - RIP-1 compatibility; in this RIP-2 messages are broadcasted.
  - RIP-2; RIP-2 messages are multicasted.
  - none ; disable sending of RIP messages.

- Recomended that RIP-1 or RIP-2 be used.
- RIP-1 compatibility should not used unless all possible consequences are well understood by administrator.

- Routers should also implement receive control switch
  - RIP-1 only
  - RIP-2 only
  - both
  - none
- receive control switch should be configurable on per interface basis.

Authentication

- Routers not configured for authentication of RIP-2 messages.
  - RIP-1 and RIP-2 unauthenticated messages will be accepted.
  - authenticated RIP-2 will be discarded.
- Router is configured to authenticate RIP-2 messages.
  - All RIP-1 and authenticated RIP-2 message passing authentication test are accepted.

- unauthenticated and failed authenticated RIP-2 are discarded.

For maximum security

- RIP-1 messages should be ignored, when authentication is ON.
- Routing info from RIP-2 messages will be propagated by RIP-1 message in unathenticate manner.

RIPng

RIP next generation (RFC2080) (http://www.ietf.org/)

- allows routers to exchanges information on IPv6 networks.
- This is also variant of RIP hence based on distance vector algorithm.
- should only be implemented in routers.

Meteric

- can vary from 1 to 16, 16 is ∞.
- set by network administrator for directly connected networks.
- additionaly, administrator specifies IPv6 address prefix and prefix length for these directly connected networks.

Each router should have routing table with entries having following fields.

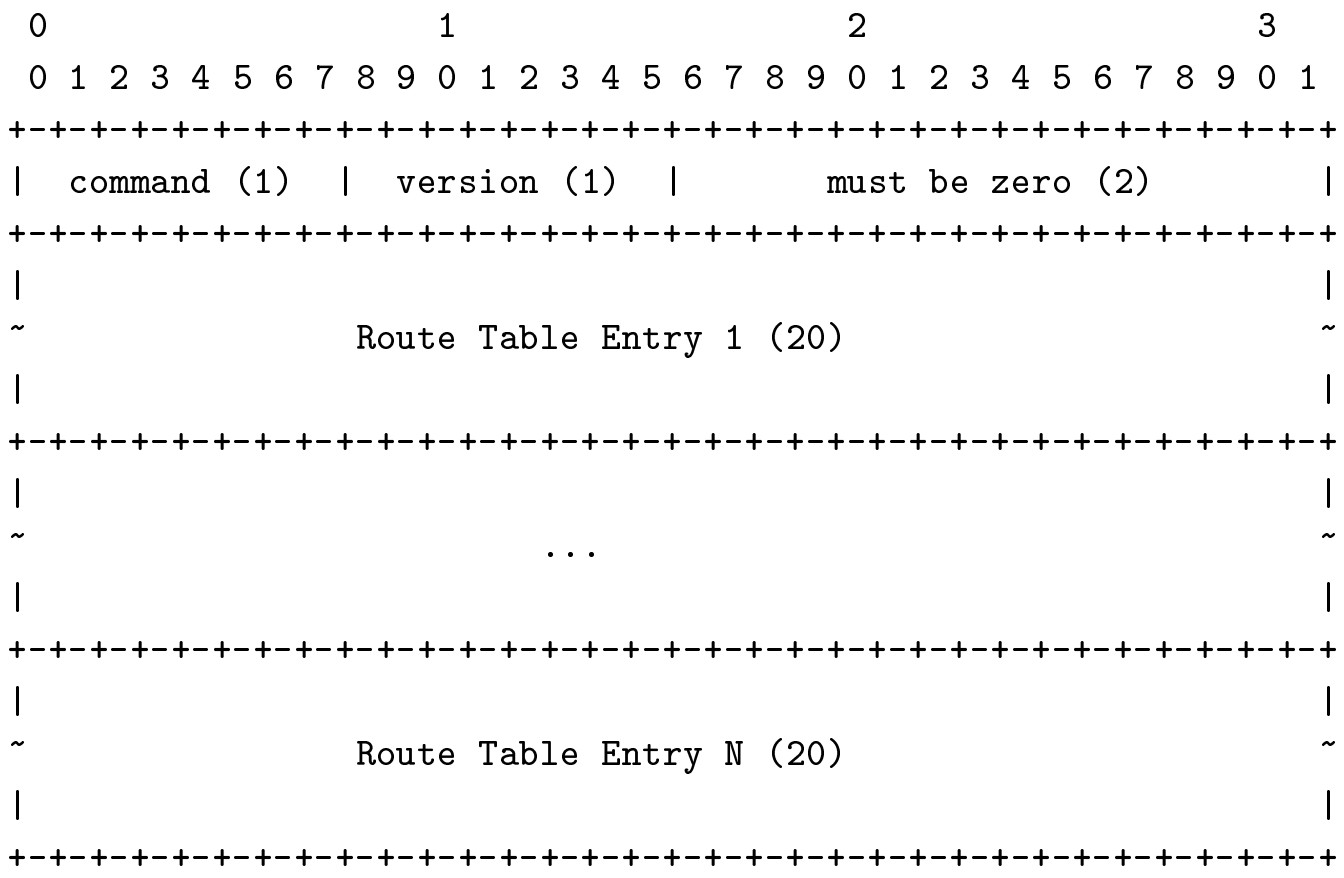
- IPv6 prefix for destination.
- meteric - total cost of moving datagram from router to destination.

- IPv6 address of next router along the path to destination. (for destination directly connected to network, this is not needed.)
- flag telling that route has changed recently (referred to as route change flag).
- timers associated with flag.

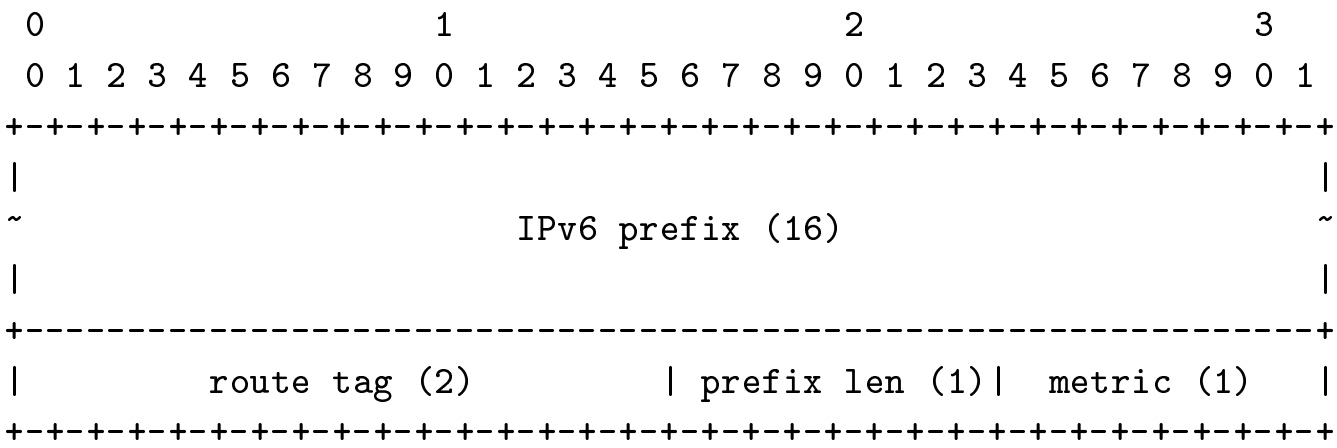
RIPng uses UDP port 521 (RIPng port)

- unsolicited messages are sent to port 521.
- response to request is sent ot port from where request originates.

Format of RIPng messages



Each RTE has format



This document defines version-1 of RIPng.

commands can be

- 1: Request - request for sending all or part of routing table.
- 2: Response - message containing all or part of routing table
  - may be sent in response to a request.
  - may be sent as unsolicited update message.

Route tag

- should be preserved and readvertised
- method to separate **internal** and **external** RIPng routes. (external routes might have been import via EGP or some other IGP.)

Prefix length

- length (0-128) for significant bits starting from left of prefix.

next hop - specified by RTE. This nexthop RTE is valid for all RTEs following it, till another nexthop RTE is encountered or the datagram ends.

- identified by 0xFF in meteric field.
- prefix field contain IPv6 address of next hop.
- route tag and prefix len are set to zero and ignored on reception.