

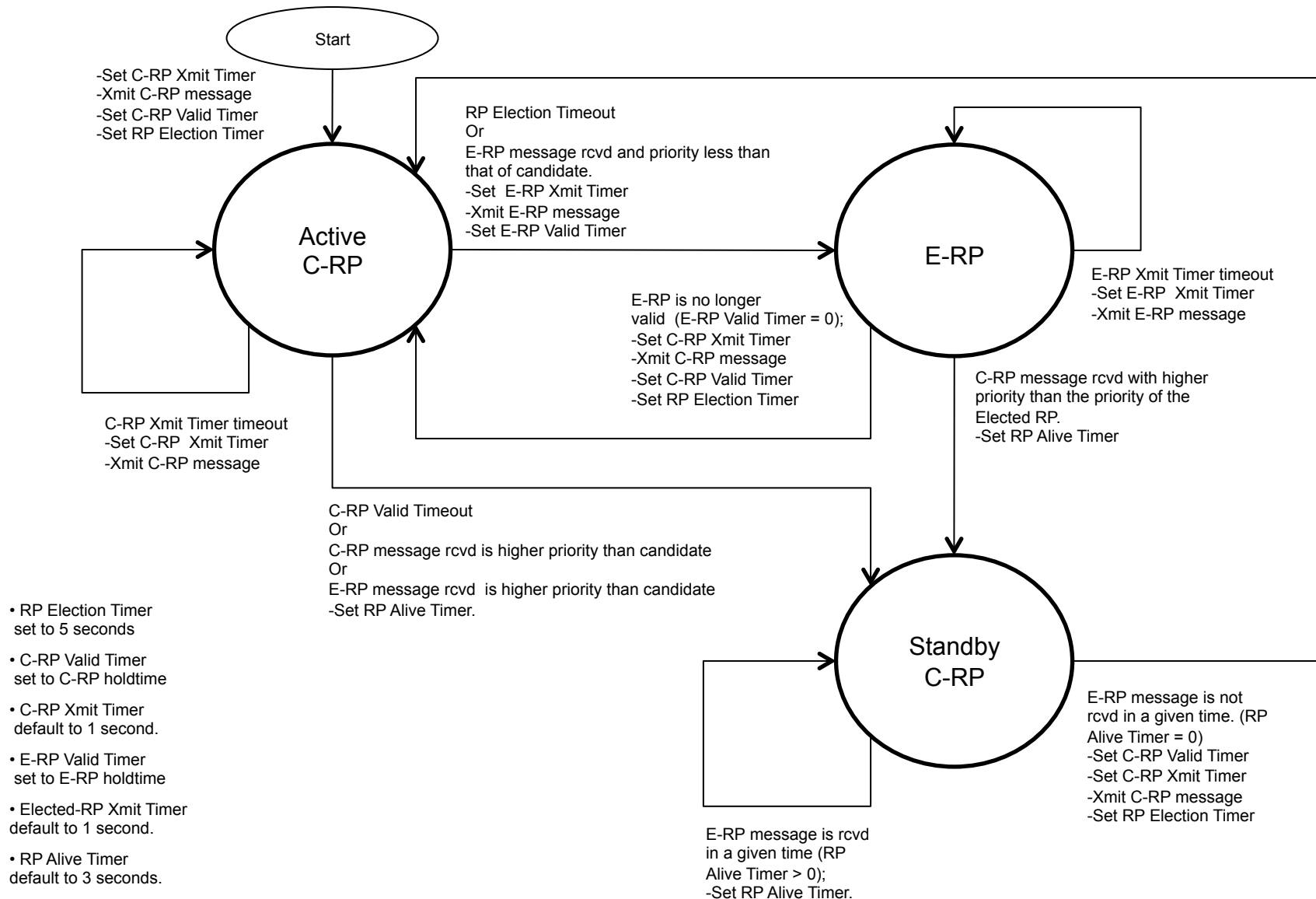
Desired Behavior

- This proposed mechanism provides a robust means of electing an RP from a subset of the domain's PIM routers which are configured and advertised as Candidate RPs (C-RPs).
- C-RPs flood their presents to the multicast domain using an existing PIM v2 message called the "Candidate-RP-Advertisement" message.
- The elected RP is chosen as the available C-RP with the highest priority value.
- The elected RP floods its election to the multicast domain using a new PIM v2 message called the "Elected-RP-Advertisement" message or alternately a modified "Candidate-RP-Advertisement" message renamed the "Candidate/Elected-RP-Advertisement" Message.
- Deterministic RP functionality is supported since the highest priority C-RP available is always chosen as RP.
- If no RP can be elected, the domain PIM routers default to operate in PIM DM.

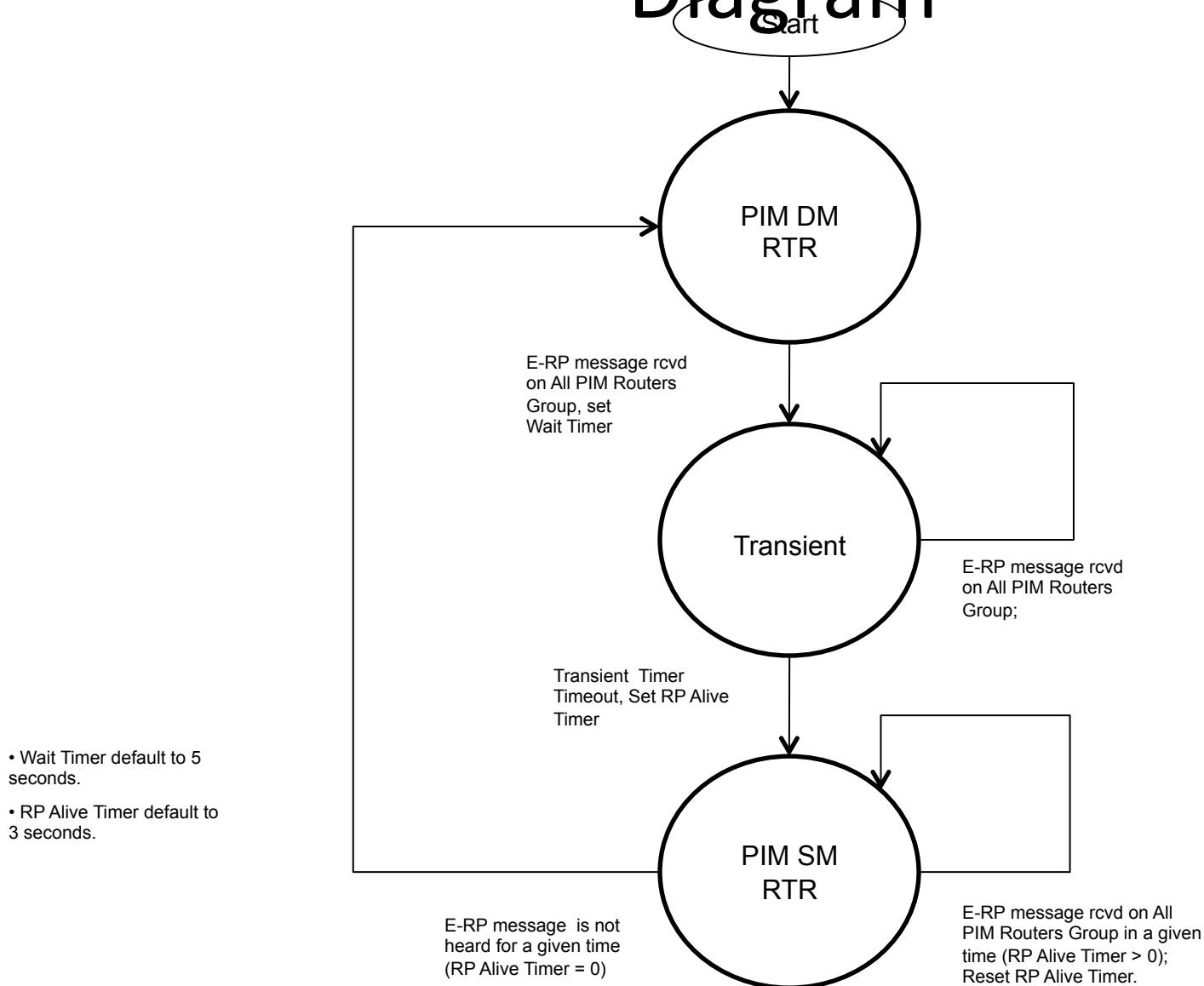
Assumptions

- A Multicast domain operating in PIM SM requires at least one Rendezvous Point (RP). An RP may support multiple multicast groups but no more than a one RP can support any multicast group.
- This mechanism should support IPv4 and IPv6 address families.
- A modestly sized C-RP set should be supported by this mechanism.
- This mechanism should allow IPv4 and IPv6 multicast to operate on the same infrastructure but distinct from one other. Therefore, the candidate RP sets for IPv4 and IPv6 should not intersect.
- This mechanism is intended for well managed, relatively low bandwidth, modestly sized multicast domains. Because of this, only a single RP is required to service all multicast groups.
- This mechanism is built upon the IETF standards track Protocol Independent Multicast (PIM) version 2 specification (RFC 4601). It is not intended to operate with PIM v1.
- All PIM routers in the multicast domain should be configured to utilize this protocol, either as C-RPs or non C-RPs.
- For each IP address family, the C-RPs and Elected RP have a PIM domain unique integer priority value [0:10]. The larger the priority value, the greater its relative importance.

Candidate RP State Transition Diagram



Non-Candidate RP State Transition Diagram



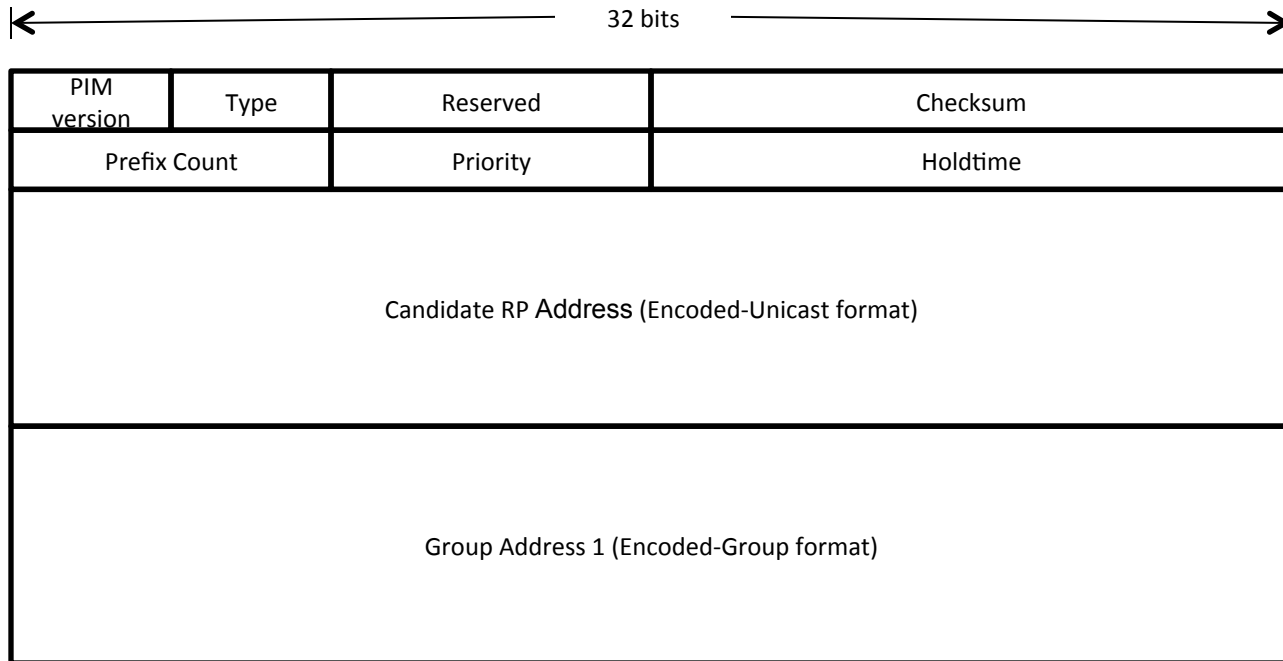
All-PIM ROUTERS Multicast Group

- The ALL-PIM-ROUTERS group for IPv4 is 224.0.0.13.
- The ALL-PIM-ROUTERS group for IPv6 is ff02::d.

Messages

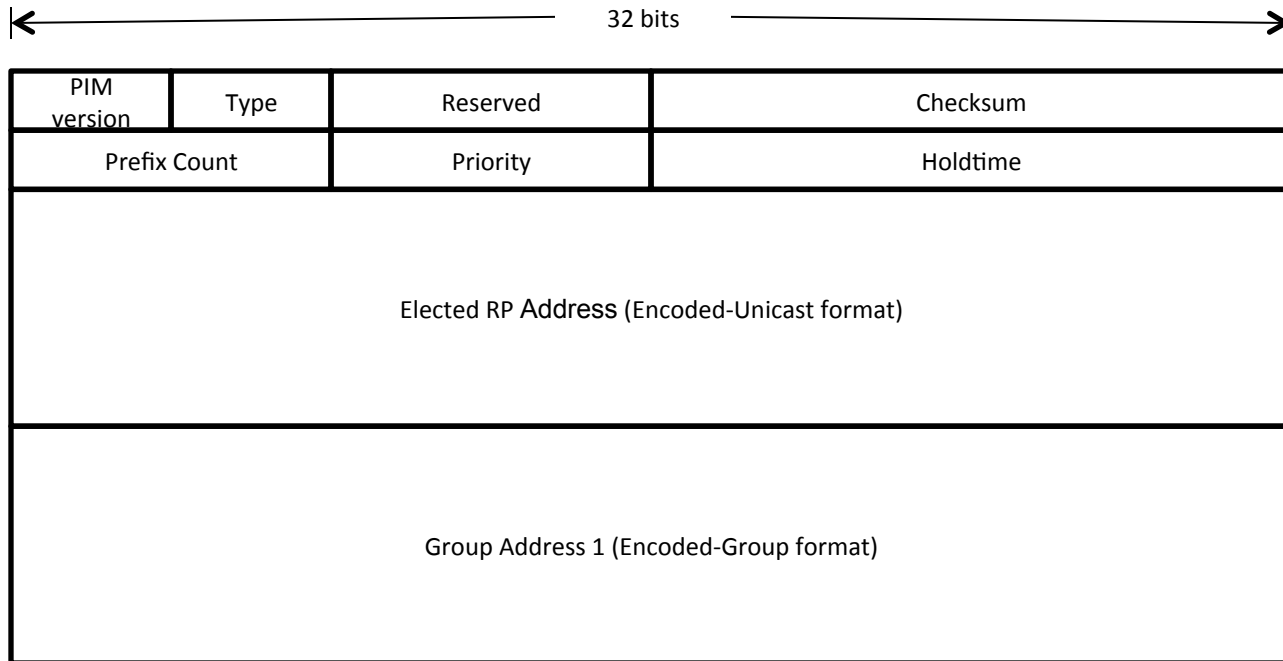
- Existing PIM v2 message utilized
 - Candidate-RP-Advertisement (Type = 8)
 - Multicast to “All PIM Routers” address, not unicast to BSR as in IETF RFC 5059.
- New PIM v2 message needed
 - Elected-RP-Advertisement (Type = 11)
 - Identical to the Candidate-RP-Advertisement message except for the value of the Type field.
 - Only one RP should advertize as the elected RP at any time.
- Alternately, slightly modify Candidate-RP-Advertisement message creating Candidate/Elected-RP-Advertisement message
 - One bit in the reserved field could be used
 - Candidate = 0
 - Elected = 1

IPv6 Candidate-RP-Advertisement Message



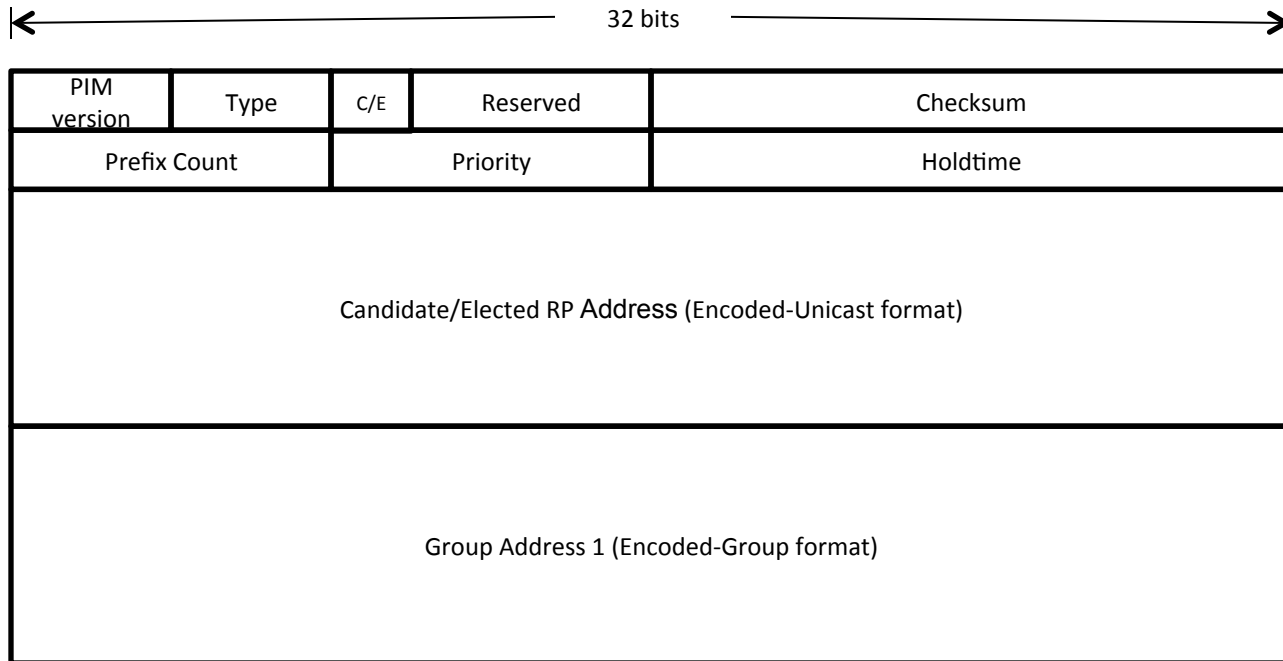
- PIM version = 2
- Type = 8
- Prefix Count = 1
- Priority = (1:10)
- Holdtime = Time the candidate is valid.
- Group Address 1 = the entire IPv6 multicast address space

IPv6 Elected-RP-Advertisement Message



- PIM version = 2
- Type = 11
- Prefix Count = 1
- Priority = (1:10)
- Holdtime = Time the elected RP is valid. If = 0, then valid indefinitely
- Group Address 1 = the entire IPv6 multicast address space

IPv6 Candidate/Elected-RP-Advertisement Message



- PIM version = 2
- Type = 8
- C/E = 0, Candidate
- C/E = 1, Elected
- Holdtime = Time the candidate/elected RP is valid.
 - If C/E = 1 and Holdtime = 0, then RP is valid indefinitely
- Prefix Count = 1
- Priority = (1:10)
- Group Address 1 = the entire IPv6 multicast address space

Timers

- RP Election Timer
- C-RP Valid Timer
 - Set to the C-RP holdtime value when the first C-RP message is transmitted from a candidate.
- C-RP Xmit Timer
 - Default to 1 second.
- E-RP Valid Timer
 - Set to the Elected RP holdtime value when an RP is first elected. If Elected RP holdtime = 0, RP is always valid.
- E-RP Xmit Timer
 - Default to 1 second.
- RP Alive Timer
 - Utilized to synchronize the reinitialization of a PIM network after the failure of the E-RP.
- Wait Timer

References

- RFC 3973, "Protocol Independent Multicast - Dense Mode (PIM-DM): Protocol Specification (Revised)"
- RFC 4601, "Protocol Independent Multicast - Sparse Mode (PIM-SM): Protocol Specification (Revised)"
- RFC 5059, "Bootstrap Router (BSR) Mechanism for Protocol Independent Multicast (PIM)"
- RFC 6016, "A Registry for PIM Message Types"