

Forwarding in the context of Time-Variant Routing(TVR)

draft-blanchet-tvr-forwarding

Marc Blanchet
marc.blanchet@viagenie.ca
IETF 116 Yokohama

Rationale

- Space communications are scheduled based on time windows to communicate. Therefore, when there is no reachability to destination, the forwarding node has to temporarily « store » the bundle/packet until reachability is re-established.
- Motivation:
 - currently developing a Bundle Protocol stack in Swift for Apple platforms (and Linux): Aim is to get BP apps on an (Astronaut) iPhone. (Android is next).
 - Questions came up: policies regarding holding/dropping/forwarding bundles; data model/file format for contact plans
- Looked at available BP stack implementations: variable support, including « TBD ». No easy way to specify various behaviours
- Purpose of the draft:
 - specify policies for what to do in forwarding: when storage is full, priorities when reachability is restored,
 - While coming from BP, generalized it for IP.
 - Data model that could be modelled in Yang.
- NOTE: instead of using « packet-bundle » words everywhere, using packet, but it also means bundle.

Forwarding Behaviour

- If the destination is unreachable, the packet is not discarded and therefore saved in memory. Whether volatile or non-volatile is an implementation decision.
- The packet should be saved with a timestamp to be used by policies described in this document.
- When a new route is installed, or in general when the forwarding table has changed, then saved packets are parsed, and those that can be sent are sent, in order of the preference policy discussed next.

Policies are Needed

- Policies are needed to guide the forwarding engine when the following events happen.
 - Packet memory store is full and a new packet is incoming.
 - A destination becomes reachable by a new route entry in the forwarding table. Which stored packets should be forwarded first.
 - A packet has expired. BP Bundles have lifetimes. IP packets have TTL (IPv4) or Hop Limit (IPv6). However, this specification does not change the behavior of IP packets when TTL or Hop Limit has a value of zero.
 - The capability of storing packets for a forwarding node may be resource demanding, especially in scenarios where node resources are very limited, such as in space. Therefore, the forwarding node owner may want to have preference on which types of packets are stored or not. For example, the forwarding node may prefer by policy to store packets based on the source address, destination address, both addresses or various fields, such as Flow Label, Diffserv or else. Bundles also have various fields that may be used for such policies.
 - When a packet needs to be dropped, an error should be sent back to the source. Both IP and BP has those error messages. However, in a constraint environment, error messages may be too costly to send back to source. Another case is when the packet is just "too" old to make an error message relevant to be sent. A policy may tell the forwarding node to not send error messages back to source when dropping packets.

Drop Policy

- Drop policy (when packets have to be removed from storage):
 - Drop oldest:
 - Drop last from these sources.
 - Drop last for these destinations.
 - Drop last if a field is set to a value.
- Error Messages Reply policy (to be added to the drop policy)
 - do not send error message:
 - send error message only if newer than x min/hour/day

Forwarding Policy

- Forwarding Policy (when a destination becomes reachable; priorities):
 - Forward first from these sources
 - Forward first for these destinations
 - Forward first if a field is set to a value

Comments Received/TODO

- Why IP (Tony Li): some use cases where delays is « not too much » but still requires time-variant routing.
- Yang model
- weighted multiple concurrent policies?
- Default policy?
- Define the IP/BP header fields that can be used for policies

Next Steps

- WG Adoption
- Specification: [draft-blanchet-tvr-forwarding](#)
- Looking for more comments
- marc.blanchet@viagenie.ca