Multicast Content Distribution

SDN networks controlled by ONOS are capable of forwarding almost any type of unicast traffic, in its current form. As an increasing number of enterprises are adopting SDN, it is imperative that additional support is provided for Multicast, to distribute video, as an example.

In this use case, we have extended ONOS to handle IP Multicast traffic by developing the MFWD app. This specific use case is concentrated on deploying SDN for an IP Multicast network on the send side of a production network. The network topology can be viewed as a core network with two types of edges, the sending edge where IP Multicast streams are injected into the network, and the receiving edge where the multicast streams are consumed. The core connects the sending and receiving edges.

This architecture of MFWD app is composed of four primary functionalities:

1. **Multicast Route Table**: Maintains multicast forwarding state within the ONOS controller
2. **Multicast Forwarding Module**: Registers for and handles all live multicast traffic
3. **Multicast Intent Manager**: Responsible for interacting with the ONOS Intent Service, which in turn establishes the flows in the switches responsible for forwarding the multicast traffic
4. **CLI and REST**: User and programmatic interfaces built on the respective ONOS services used to configure and monitor the multicast state.

The Multicast Route Table (MRT), which may at times be referred to as the Multicast Routing Information Base (MRIB), is the repository that consolidates multicast routing state in ONOS. This multicast routing state is comprised of data from: live multicast traffic, configurations from the CLI and REST interface and in
future implementations, additional apps such as PIM-SSM emulation and IGMPv3 proxy. The MRT is also responsible for interacting with the Multicast Intent Manage that ultimately modifies forwarding state within the switches. The multicast routes are divided into two categories: a) group routes (\(*, G\)) also known as Any Source Multicast (ASM) and b) source routes (S, G), also known as Source Specific Multicast (SSM). Both these route types are supported by MFWD app. Tiered architecture for the ONOS app MFWD is depicted below.

The MRT maintains a set of McastGroup entries that are responsible for all groups the app is maintaining state for. The McastGroup entry serves two purposes: first to maintain forwarding state for \((*, G)\) ASM route, second as a parent container for all McastSource routes (S, G) routes that share the same multicast group address G. McastRouteBase, the parent (or base class) of both \((*, G)\) and (S, G) routes which maintains a single ingress ConnectPoint and set of egress ConnectPoints along the corresponding methods that allow the multicast forwarding state to be added, removed and modified.

The McastIntentManager is responsible for registering and interacting with the ONOS Intent Service to formulate and change intents based on specific multicast routes. The intent manager is also responsible for withdrawing intents and cleaning up after MFWD when the application is deactivated.

The McastForwarding module is responsible for handling live multicast packets that do not match an existing flows in the OpenFlow switches that have been passed upstream to the controller. If no multicast forwarding state exists, the McastForwarding module will create multicast state as needed.
For more details, please refer to Wiki page