Algorithm For D-ARPSpoof

1 Data Structures Used

1. HashMap<OFPort,ArrayList<Vlan, IP, Mac>> : ipPortMap
2. HashMap<MacAddress,HashMap<Vlan,Switch-Port>> : macPortMap

2 Algorithm

2.1 Handling Packet-IN DHCP Messages

2.1.1 Updating Data Structures

- **DHCP REQUEST**

  1. Delete the mapped mac address for inPort and incoming packet's MAC Address from macPortMap.
  2. If ipPortMap has entry for inPort and incomingPacket's vlan ID then delete that entry.
  3. If macPortMap does not have any entry for incoming packet's source MAC Address and vlan id, then add those entry in macPortMap.

- **DHCP ACKNOWLEDGEMENT**

  1. Get Switch-Port pair from macPortMap for destination mac address and vlan id and name that as pair.
  2. Add following entry in ipPortMap:
     <*pair.switch* , *pair.port* , vid , dhcpPayload.yourIPAddress , destination-MAC>

2.1.2 Updating Flow Rules

- **DHCP REQUEST**

  1. If ipPortMap has entry for received switch, input port and incomingPacket's vlan id then remove flow entry from current switch with :
     - inPort : incomingPacket's input port.
     - vlan-vid : incomingPacket's vlan id

- **DHCP ACKNOWLEDGEMENT**

  1. Get Switch-Port pair from macPortMap for destination mac address and vlan id and name that as pair.
  2. Then add a flow rule to block all ARP packet from the current input port. Write this flow with priority 10.
  3. Add flow in *pair.switch* to direct the packet with
     - IP address : dhcp-payload's yourIPAddress
     - vlan-vid : incomingPacket's vlan id
     - inPort : *pair.port*

     to goto flow table 1 of *pair.switch* . Write this flow with priority 20.

2.2 Handling DHCP-ACK PacketOut Messages

Same as section 2.1.1 DHCP ACKNOWLEDGEMENT handling.

2.3 Handling ARP

1. Check for packet's target protocol address and vlan id in ipPortTable. If not present then drop it otherwise get <Switch-Port> pair associated with it. Name it destination.
2. Get <Switch-Port> pair associated with packet's sender protcol address and vlan id. Name it source.
3. Get the path from source to destination using routing service and name it 'path'.
4. Install the rules as:

```
Match m = (EtherType,ARP) + (Vlan-id , Packet vlan-id)+(ArpTargetProtocolAddress , Packet
    ArpTargetProtocolAddress);
List<SwitchPortPair> list = path;
for(index = list.size-1;index>0;index-=2){
   installFlowRule(table-id=2, match=m, switch=list[index].switch, priority=30,
       action=output(list[index].port);
}
pushPacket(switch=curSwitch, packet=packet-in, outPort=list[1].port, inPort=list[0].port);
```

2.4 Handling Switch Added event

1. Write flow rule to forward all ARP packets to controller in flow table 1 of added switch with priority 0. (Default flow for table 1)

2.5 Handling Switch Removed event

1. Remove all entry of removed swith from ipPortMap
2. Also, Remove all entry of removed switch from macPortMap.