Tutorial

IP lookup - Bitmap algorithm

Find all the files

The following files are required:

- Controller: ip-lookup.py
    - tree.py
    - node.py
    - readingconfig.py
- Topology Files
    - topology.py
    - config

The files are available at https://github.com/NBajanca/bitmap-IPlookup.

In the Topology folder there are different network topologies, one must be chosen and the name changed to the ones above.

Start the controller

To start the controller the controller file and all its imports (tree.py, node.py, readingconfig.py and config) should be in the app directory of ryu.

In a terminal window we start the controller with following calls:

1. cd (ryu directory)

2. PYTHONPATH=. ./bin/ryu-manager ryu/app/ip_lookup py

```
--Packet IN: Switch id[1], Src MAC[00:00:00:00:00:01], Dst MAC[ff:ff:ff:ff:ff:ff], Port[1]
  Broadcast packet
  Received ARP request for dst IP 195.0.0.254
  Sent gratious ARP reply [195.0.0.254]-[00:00:00:11:11:01] to 195.0.0.1
--Packet IN: Switch id[1], Src MAC[00:00:00:00:00:01], Dst MAC[00:00:00:11:11:01], Port[1]
  --- IP LOOKUP
  --- src_ip[195.0.0.1], dst_ip[154.128.0.2]


Lookup of IP 154.128.0.2 (binary: 10011010100000000000000000000010)
Found child in 5
Found result in 8


Search ended!
Result: 3
  --- Destination present on switch ['154.128.0.254', '16', '00:00:00:11:11:09', 's3', '3']
  --- Output port set to 2
  --- Changing destination mac to 00:00:00:00:00:0a
---------
--Packet IN: Switch id[3], Src MAC[00:00:00:00:00:0a], Dst MAC[ff:ff:ff:ff:ff:ff], Port[2]
  Broadcast packet
  Received ARP request for dst IP 154.128.0.254
  Sent gratious ARP reply [154.128.0.254]-[00:00:00:11:11:09] to 154.128.0.2
--Packet IN: Switch id[3], Src MAC[00:00:00:00:00:0a], Dst MAC[00:00:00:11:11:09], Port[2]
  --- IP LOOKUP
  --- src_ip[154.128.0.2], dst_ip[195.0.0.1]


Lookup of IP 195.0.0.1 (binary: 11000011000000000000000000000001)
Found result in 2


Search ended!
Result: 1
  --- Destination present on switch ['195.0.0.254', '8', '00:00:00:11:11:01', 's1', '1']
  --- Output port set to 1
  --- Changing destination mac to 00:00:00:00:00:01
---------
```

Start Mininet

To start mininet the topology files (topology.py and config) must be in the same directory.

In another terminal window we start the controller with following calls:

1. cd (topology and configuration files directory)

2. sudo mn --custom topology.py --topo mytopo --mac --controller remote --pre config

In the above command:

- custom starts mininet from a custom topology file
- topo mytopo uses the topology set in the topology file
  - --mac means that mininet will sequentially assign mac addresses to the various devices
- controller remote means that we are using a remote controller
  - --pre config means that the config file is used to configure the network

```
user@polimi-SR:~/Documents$ sudo mn --custom topology.py --topo mytopo --mac --controller remot
e --pre config
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16 h17 h18 h19 h20 h21 h22 h23 h24 h25 h26
h27 h28 h29 h30 h31 h32 h33 h34 h35 h36 h37 h38 h39 h40 h41 h42 h43 h44 h45 h46 h47 h48
*** Adding switches:
s1 s2 s3 s4 s5 s6 s7 s8 s9 s10 s11 s12
*** Adding links:
(h1, s1) (h2, s1) (h3, s1) (h4, s1) (h5, s2) (h6, s2) (h7, s2) (h8, s2) (h9, s3) (h10, s3) (h11
, s3) (h12, s3) (h13, s4) (h14, s4) (h15, s4) (h16, s4) (h17, s5) (h18, s5) (h19, s5) (h20, s5)
 (h21, s6) (h22, s6) (h23, s6) (h24, s6) (h25, s7) (h26, s7) (h27, s7) (h28, s7) (h29, s8) (h30
, s8) (h31, s8) (h32, s8) (h33, s9) (h34, s9) (h35, s9) (h36, s9) (h37, s10) (h38, s10) (h39, s
10) (h40, s10) (h41, s11) (h42, s11) (h43, s11) (h44, s11) (h45, s12) (h46, s12) (h47, s12) (h4
8, s12)
*** Configuring hosts
h1 h2 h3 h4 h5 h6 h7 h8 h9 h10 h11 h12 h13 h14 h15 h16 h17 h18 h19 h20 h21 h22 h23 h24 h25 h26
h27 h28 h29 h30 h31 h32 h33 h34 h35 h36 h37 h38 h39 h40 h41 h42 h43 h44 h45 h46 h47 h48
*** Starting CLI:
-------------------------------------------------------
Configuring network
-------------------------------------------------------
Assign IP address to hosts
*** Starting controller
*** Starting 12 switches
s1 s2 s3 s4 s5 s6 s7 s8 s9 s10 s11 s12
*** Starting CLI:
mininet> h1 ping h10
PING 154.128.0.2 (154.128.0.2) 56(84) bytes of data.
64 bytes from 154.128.0.2: icmp_seq=1 ttl=64 time=8.76 ms
64 bytes from 154.128.0.2: icmp_seq=2 ttl=64 time=4.05 ms
64 bytes from 154.128.0.2: icmp_seq=3 ttl=64 time=7.62 ms
64 bytes from 154.128.0.2: icmp_seq=4 ttl=64 time=4.16 ms
^C
--- 154.128.0.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3005ms
rtt min/avg/max/mdev = 4.055/6.150/8.765/2.085 ms
```