GoBGP

- Open Source BGP implementation
  - https://github.com/osrg/gobgp

- Written in Go

- Main Target Applications
  1. High performance Route Server for IX
  2. Integration with data analysis systems
  3. BGPd for white box switches

Motivation

Why another BGP implmentation?

SDN Era has begun

We need SDN-Native BGP implementation !

GoBGP Overview

What SDN-Native means

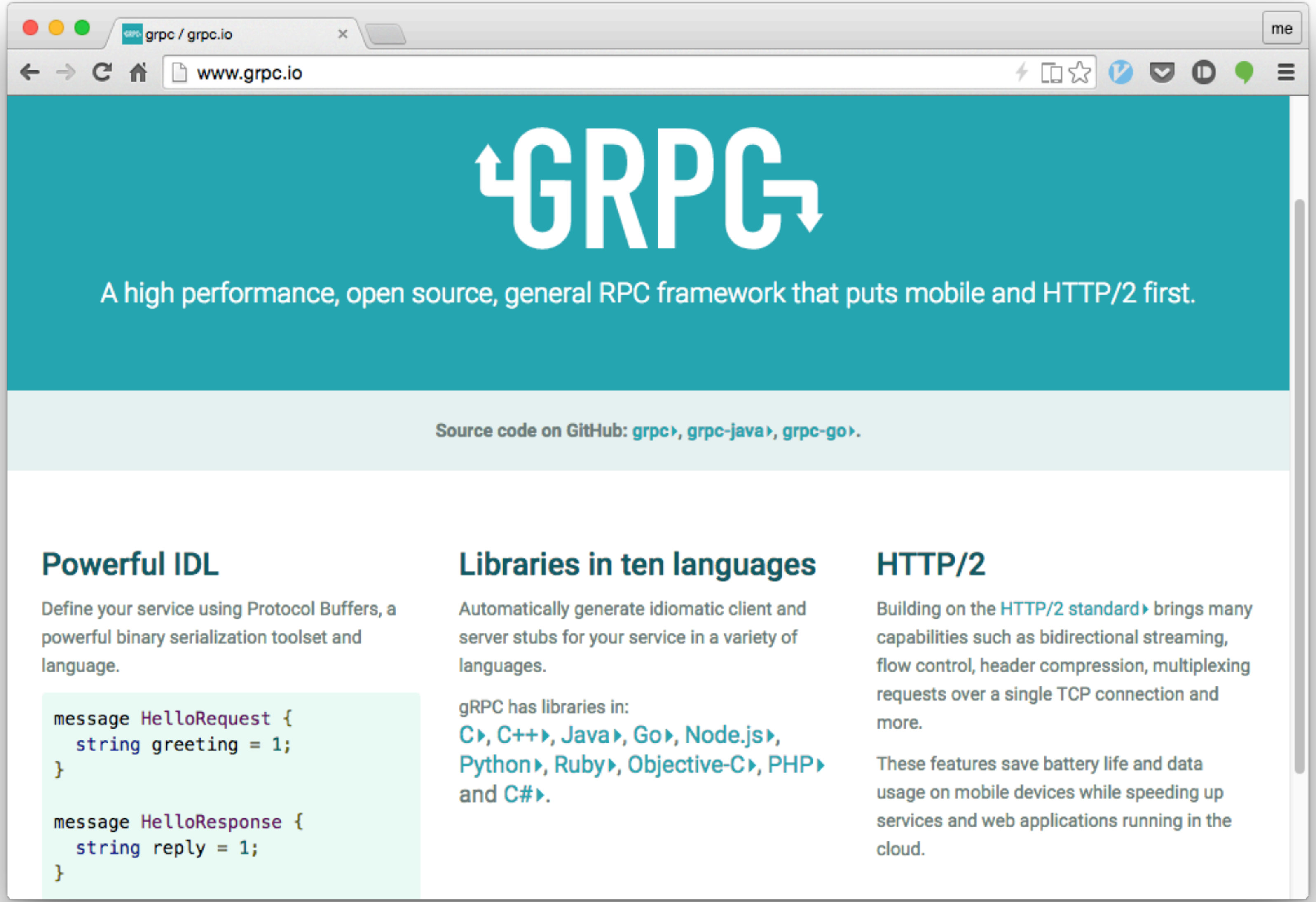
1. High Performance
   - Existing OSS BGPd are mainly single-threaded
   - GoBGP can exploit multicore
   - Aimed to be run on modern/commodity hardwares

GoBGP Overview

What SDN-Native means

1. High Performance
2. API-first Architecture
   - Existing BGPd are mainly CLI-first
     - Automation/Integration using "expect" is painful…
   - GoBGP uses gRPC
     - 10 languages binding
   - Integration with your software is smooth

GoBGP Overview



A high performance, open source, general RPC framework that puts mobile and HTTP/2 first.

Source code on GitHub: grpc▸, grpc-java▸, grpc-go▸.

Powerful IDL

Define your service using Protocol Buffers, a powerful binary serialization toolset and language.

```
message HelloRequest {
  string greeting = 1;
}

message HelloResponse {
  string reply = 1;
}
```

Libraries in ten languages

Automatically generate idiomatic client and server stubs for your service in a variety of languages.

gRPC has libraries in:

C▸, C++▸, Java▸, Go▸, Node.js▸, Python▸, Ruby▸, Objective-C▸, PHP▸ and C#▸.

HTTP/2

Building on the HTTP/2 standard▸ brings many capabilities such as bidirectional streaming, flow control, header compression, multiplexing requests over a single TCP connection and more.

These features save battery life and data usage on mobile devices while speeding up services and web applications running in the cloud.

GoBGP Overview

What SDN-Native means

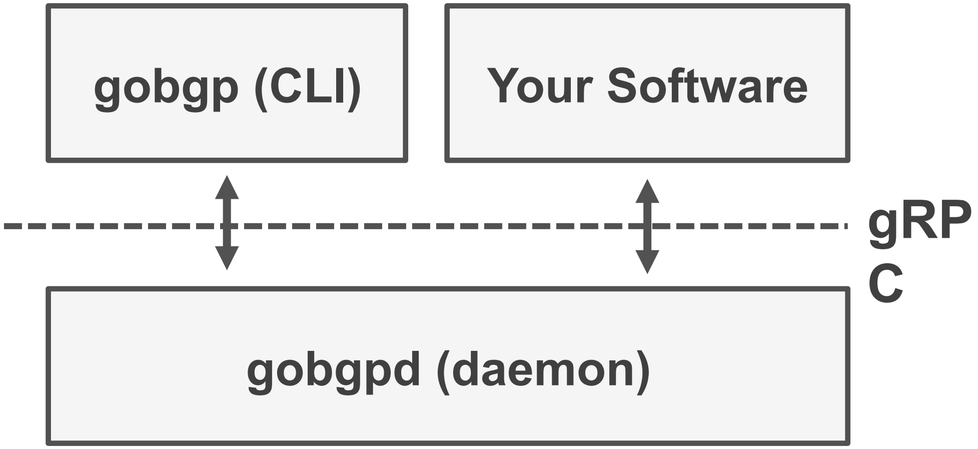
1. High Performance
2. API-first Architecture
3. Vendor-Neutral Configuration Model
    - Existing BGPd configuration varies
    - GoBGP uses OpenConfig
        - YANG model for BGP
        - draft-ietf-idr-bgp-model-00
        - Cisco's support just announced

GoBGP Overview

What SDN-Native means

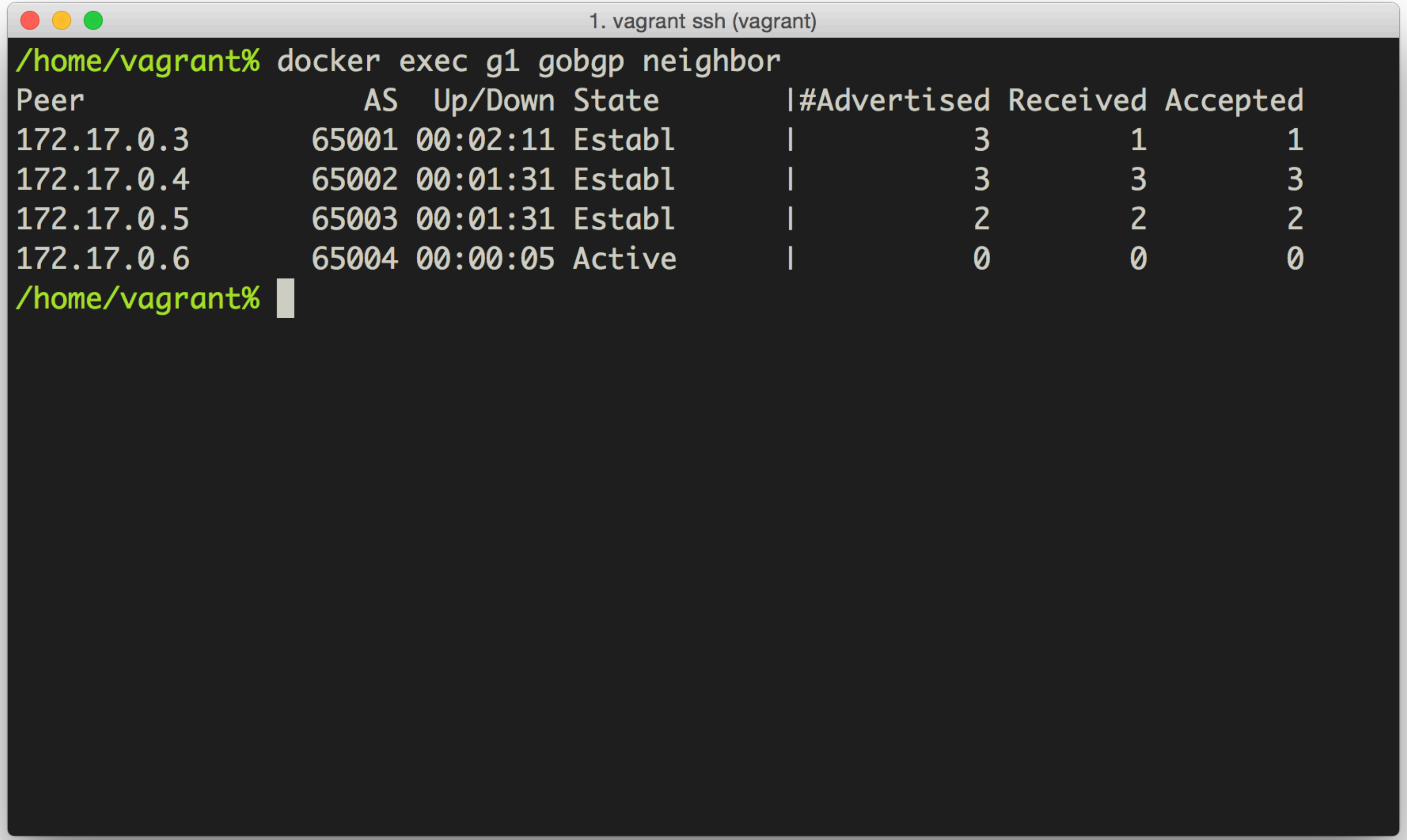
1. High Performance
   - Go
2. API-first Architecture
   - gRPC
3. Vendor-Neutral Configuration Model
   - OpenConfig

GoBGP Basics



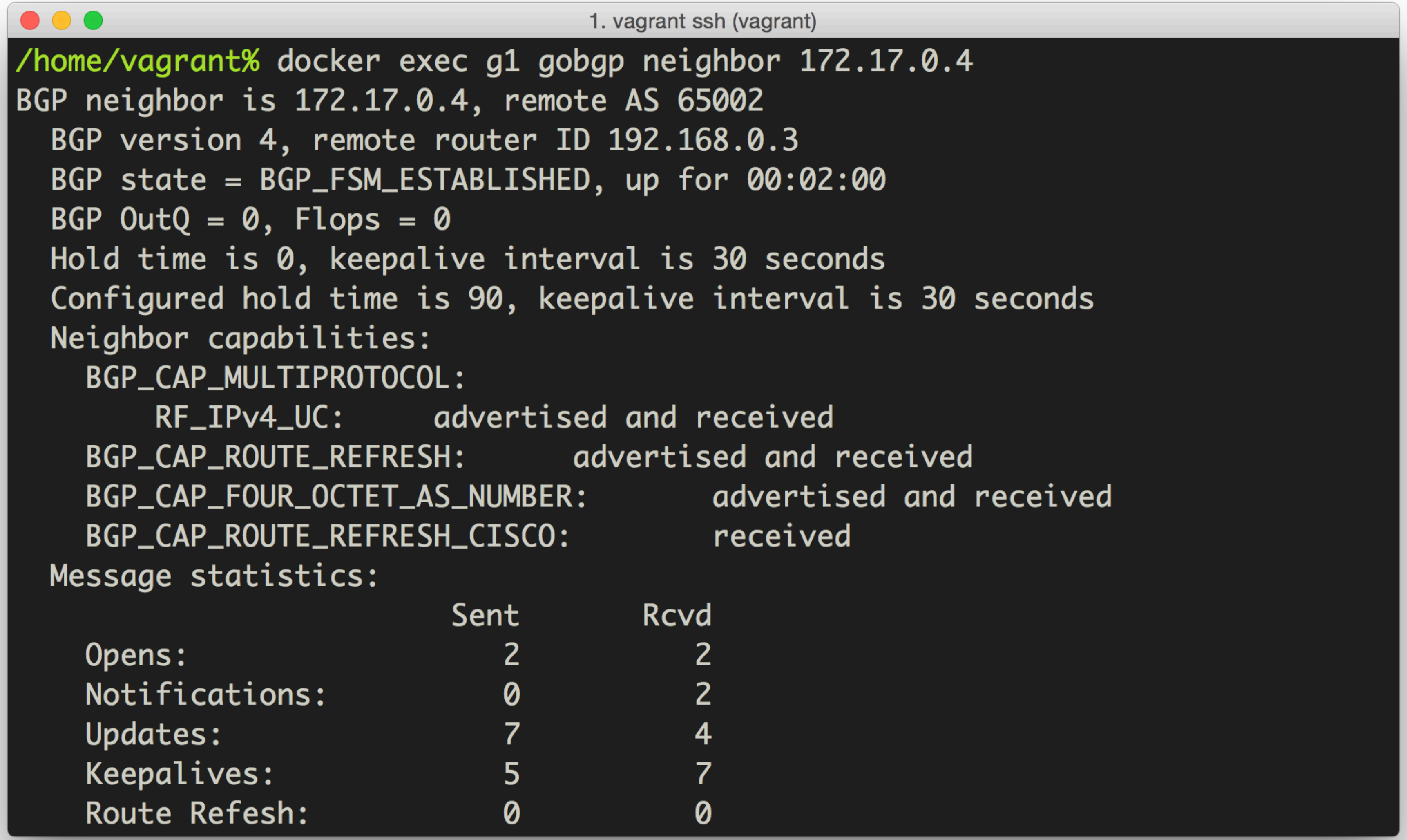
- Comes with two binary
  - gobgpd : bgp daemon
  - gobgp : cli tool (uses gRPC underneath)

GoBGP Basics – show neighbors



```
/home/vagrant% docker exec g1 gobgp neighbor
Peer                AS  Up/Down State       |#Advertised Received Accepted
172.17.0.3       65001 00:02:11 Establ      |          3        1        1
172.17.0.4       65002 00:01:31 Establ      |          3        3        3
172.17.0.5       65003 00:01:31 Establ      |          2        2        2
172.17.0.6       65004 00:00:05 Active      |          0        0        0
/home/vagrant% 
```

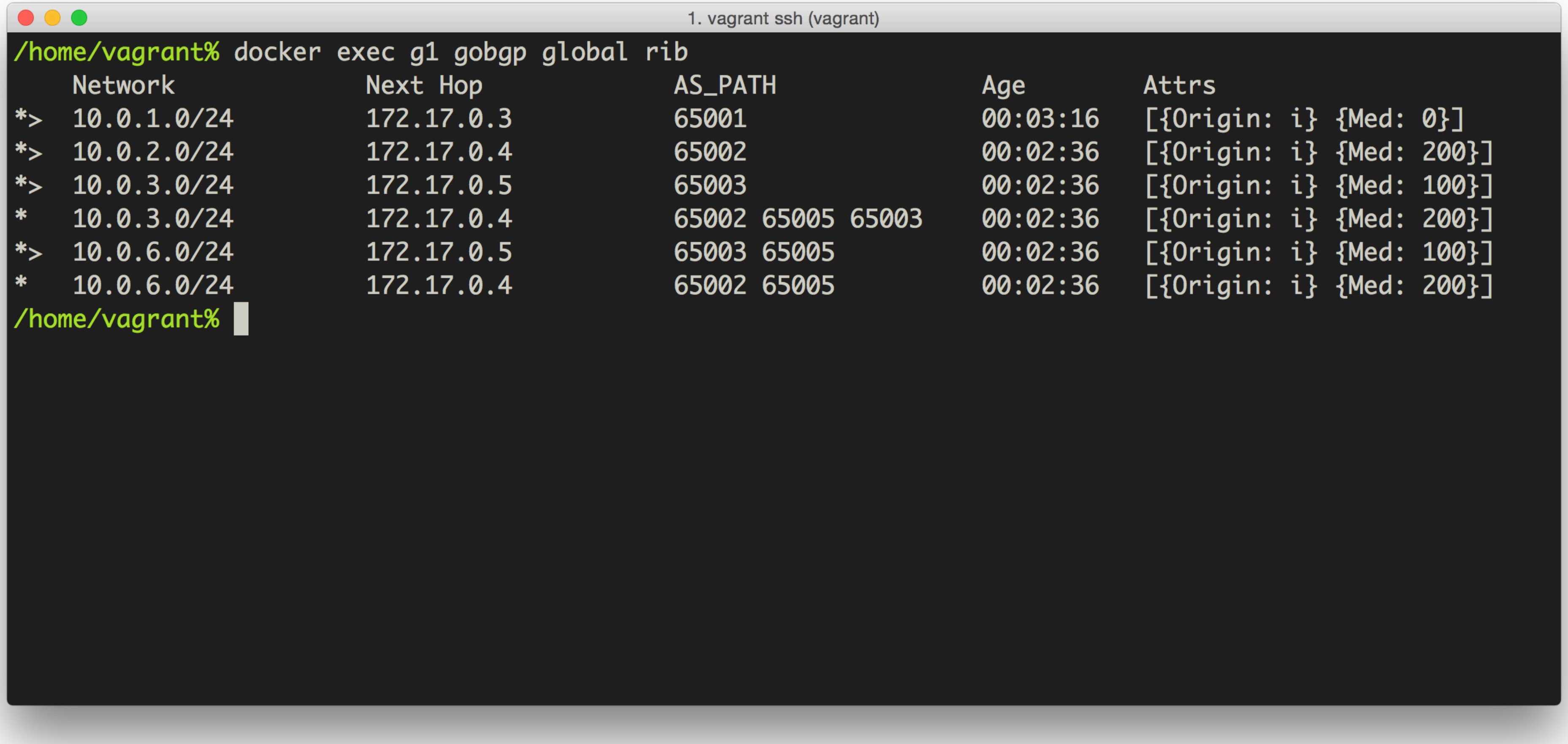
GoBGP Basics – show neighbor



1. vagrant ssh (vagrant)

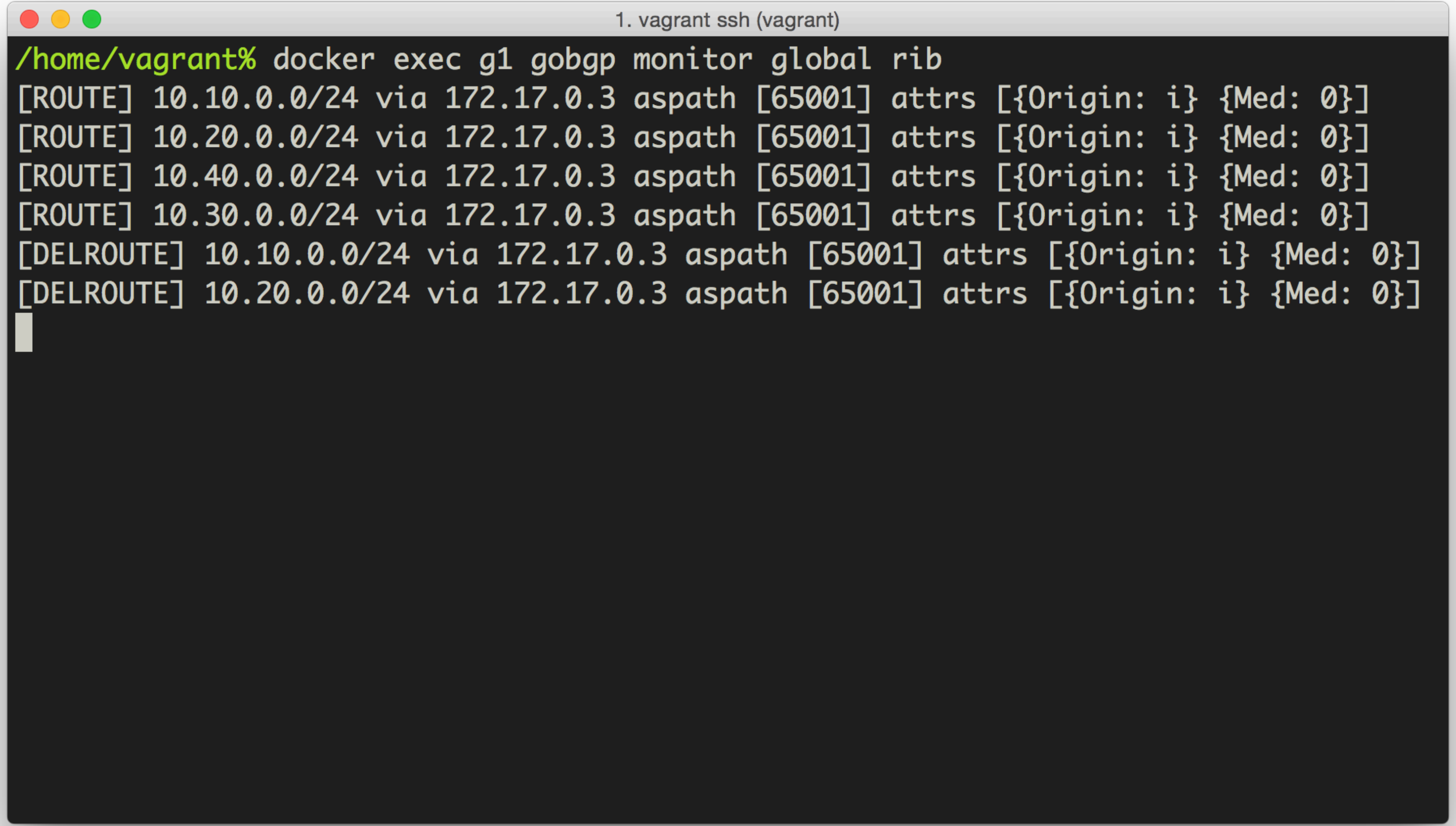
```
/home/vagrant% docker exec g1 gobgp neighbor 172.17.0.4
BGP neighbor is 172.17.0.4, remote AS 65002
  BGP version 4, remote router ID 192.168.0.3
  BGP state = BGP_FSM_ESTABLISHED, up for 00:02:00
  BGP OutQ = 0, Flops = 0
  Hold time is 0, keepalive interval is 30 seconds
  Configured hold time is 90, keepalive interval is 30 seconds
  Neighbor capabilities:
    BGP_CAP_MULTIPROTOCOL:
        RF_IPv4_UC:     advertised and received
    BGP_CAP_ROUTE_REFRESH:      advertised and received
    BGP_CAP_FOUR_OCTET_AS_NUMBER:       advertised and received
    BGP_CAP_ROUTE_REFRESH_CISCO:        received
  Message statistics:
                         Sent       Rcvd
    Opens:                  2          2
    Notifications:          0          2
    Updates:                7          4
    Keepalives:             5          7
    Route Refesh:           0          0
```

GoBGP Basics – show global rib



```
/home/vagrant% docker exec g1 gobgp global rib
    Network             Next Hop             AS_PATH              Age        Attrs
*>  10.0.1.0/24         172.17.0.3           65001                00:03:16   [{Origin: i} {Med: 0}]
*>  10.0.2.0/24         172.17.0.4           65002                00:02:36   [{Origin: i} {Med: 200}]
*>  10.0.3.0/24         172.17.0.5           65003                00:02:36   [{Origin: i} {Med: 100}]
*   10.0.3.0/24         172.17.0.4           65002 65005 65003    00:02:36   [{Origin: i} {Med: 200}]
*>  10.0.6.0/24         172.17.0.5           65003 65005          00:02:36   [{Origin: i} {Med: 100}]
*   10.0.6.0/24         172.17.0.4           65002 65005          00:02:36   [{Origin: i} {Med: 200}]
/home/vagrant% 
```

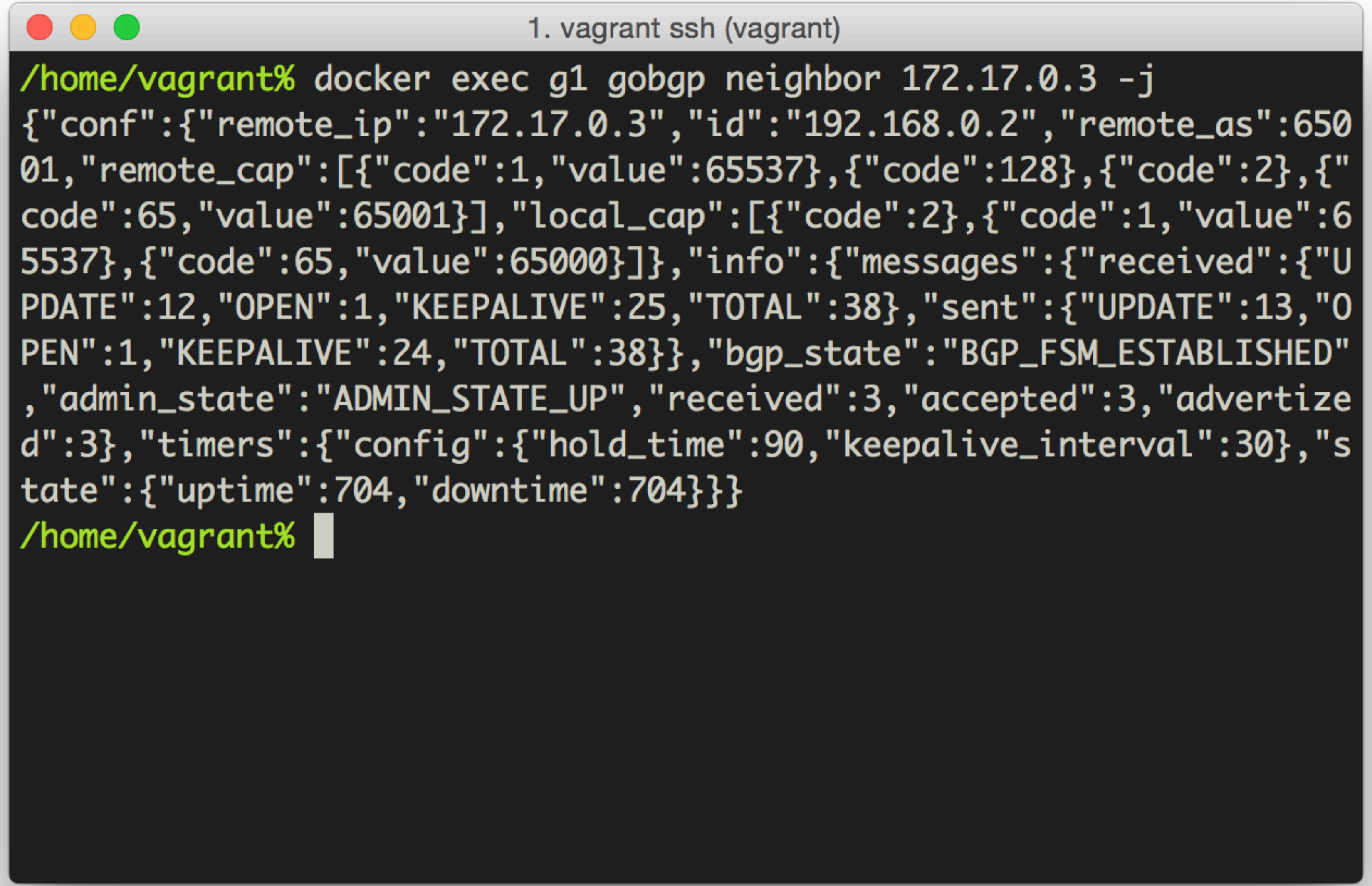
GoBGP Basics – monitor new best



1. vagrant ssh (vagrant)

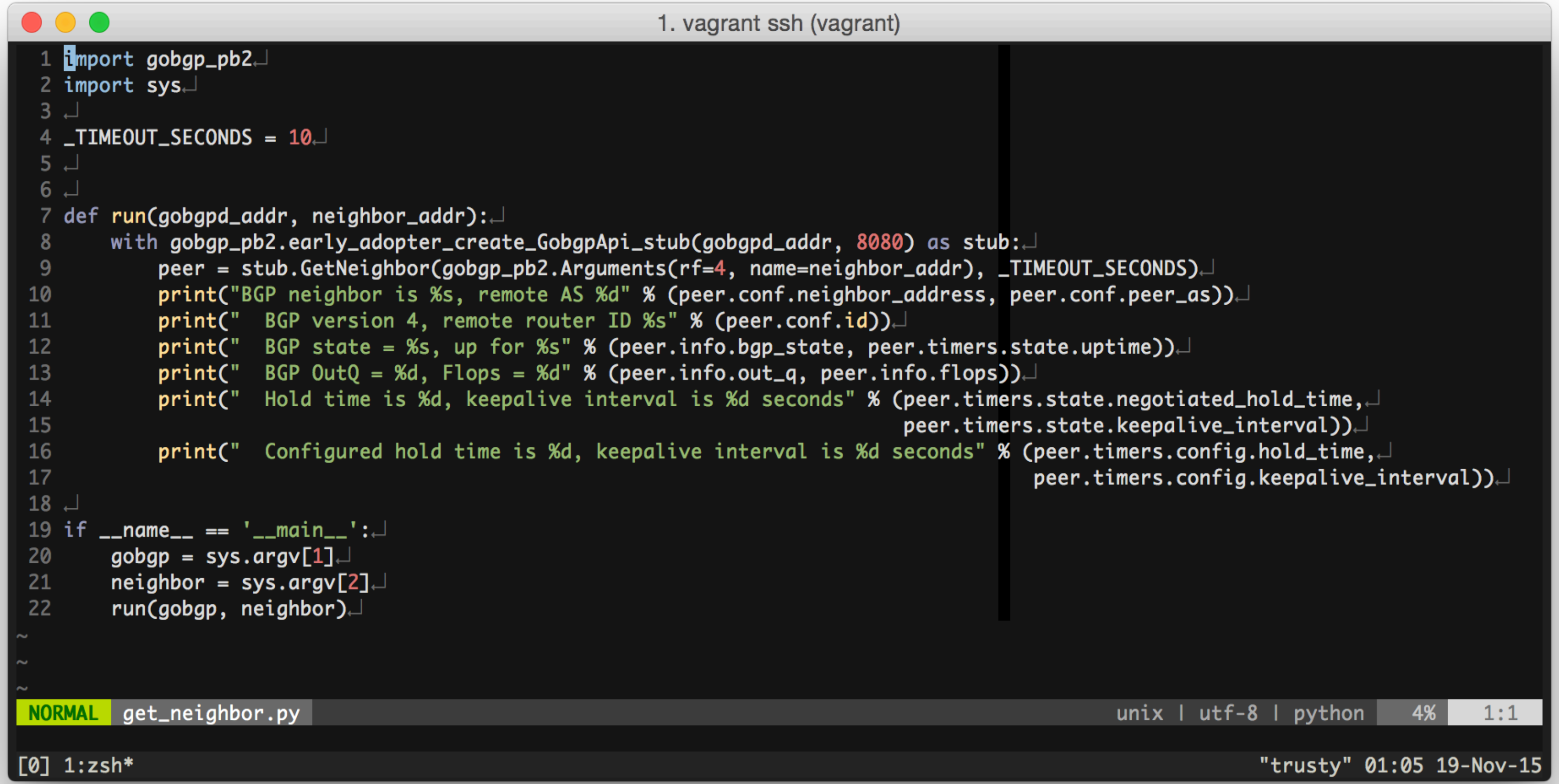
```
/home/vagrant% docker exec g1 gobgp monitor global rib
[ROUTE] 10.10.0.0/24 via 172.17.0.3 aspath [65001] attrs [{Origin: i} {Med: 0}]
[ROUTE] 10.20.0.0/24 via 172.17.0.3 aspath [65001] attrs [{Origin: i} {Med: 0}]
[ROUTE] 10.40.0.0/24 via 172.17.0.3 aspath [65001] attrs [{Origin: i} {Med: 0}]
[ROUTE] 10.30.0.0/24 via 172.17.0.3 aspath [65001] attrs [{Origin: i} {Med: 0}]
[DELROUTE] 10.10.0.0/24 via 172.17.0.3 aspath [65001] attrs [{Origin: i} {Med: 0}]
[DELROUTE] 10.20.0.0/24 via 172.17.0.3 aspath [65001] attrs [{Origin: i} {Med: 0}]
```

GoBGP Basics - json option



```
/home/vagrant% docker exec g1 gobgp neighbor 172.17.0.3 -j
{"conf":{"remote_ip":"172.17.0.3","id":"192.168.0.2","remote_as":650
01,"remote_cap":[{"code":1,"value":65537},{"code":128},{"code":2},{"
code":65,"value":65001}],"local_cap":[{"code":2},{"code":1,"value":6
5537},{"code":65,"value":65000}]},"info":{"messages":{"received":{"U
PDATE":12,"OPEN":1,"KEEPALIVE":25,"TOTAL":38},"sent":{"UPDATE":13,"O
PEN":1,"KEEPALIVE":24,"TOTAL":38}},"bgp_state":"BGP_FSM_ESTABLISHED"
,"admin_state":"ADMIN_STATE_UP","received":3,"accepted":3,"advertize
d":3},"timers":{"config":{"hold_time":90,"keepalive_interval":30},"s
tate":{"uptime":704,"downtime":704}}}
/home/vagrant% 
```

GoBGP Basics – use from python



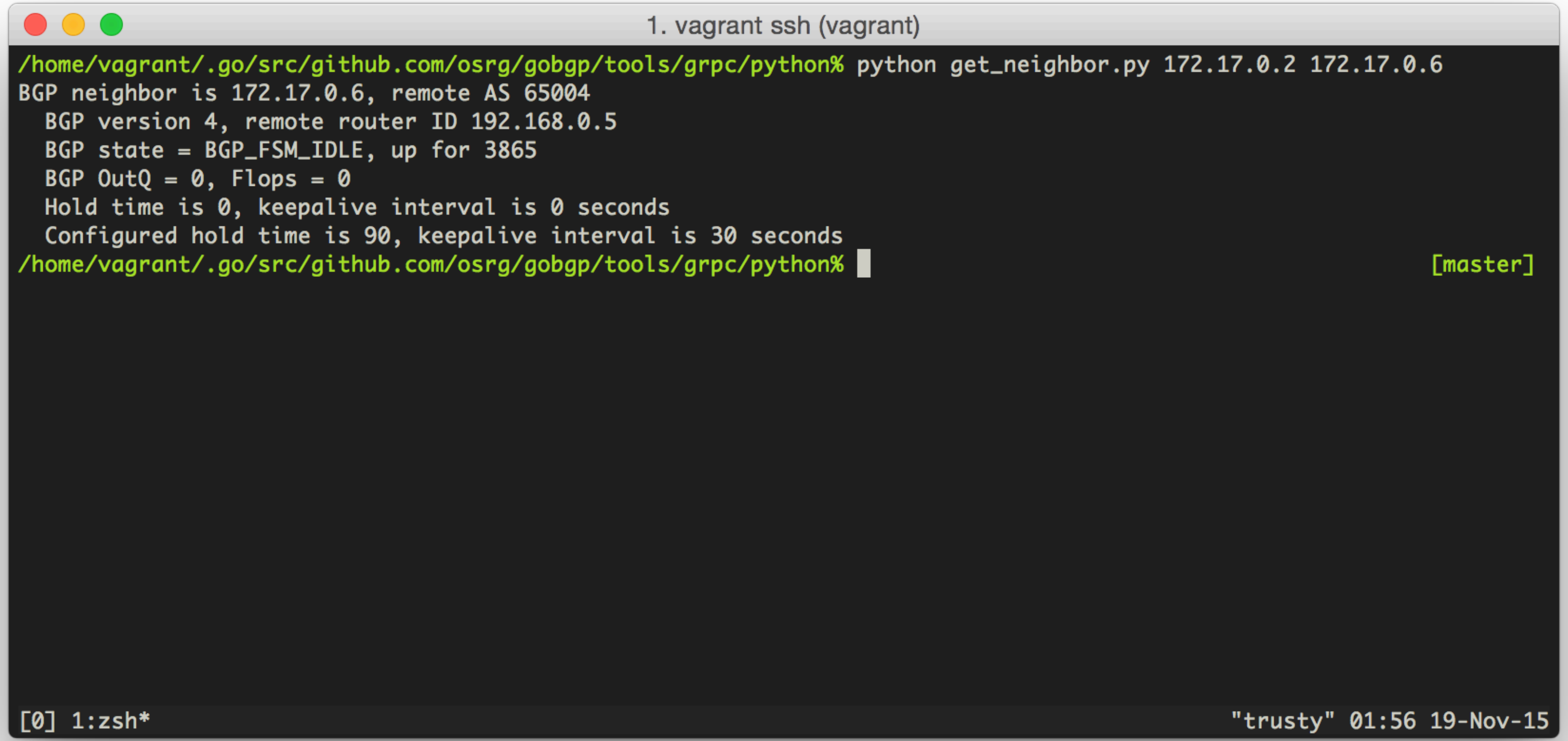
1. vagrant ssh (vagrant)

```
import gobgp_pb2
import sys

_TIMEOUT_SECONDS = 10


def run(gobgpd_addr, neighbor_addr):
    with gobgp_pb2.early_adopter_create_GobgpApi_stub(gobgpd_addr, 8080) as stub:
        peer = stub.GetNeighbor(gobgp_pb2.Arguments(rf=4, name=neighbor_addr), _TIMEOUT_SECONDS)
        print("BGP neighbor is %s, remote AS %d" % (peer.conf.neighbor_address, peer.conf.peer_as))
        print("  BGP version 4, remote router ID %s" % (peer.conf.id))
        print("  BGP state = %s, up for %s" % (peer.info.bgp_state, peer.timers.state.uptime))
        print("  BGP OutQ = %d, Flops = %d" % (peer.info.out_q, peer.info.flops))
        print("  Hold time is %d, keepalive interval is %d seconds" % (peer.timers.state.negotiated_hold_time,
                                                                       peer.timers.state.keepalive_interval))
        print("  Configured hold time is %d, keepalive interval is %d seconds" % (peer.timers.config.hold_time,
                                                                                  peer.timers.config.keepalive_interval))

if __name__ == '__main__':
    gobgp = sys.argv[1]
    neighbor = sys.argv[2]
    run(gobgp, neighbor)
~
~
~
NORMAL  get_neighbor.py                                               unix | utf-8 | python   4%    1:1

[0] 1:zsh*                                                              "trusty" 01:05 19-Nov-15
```

- This snippet results in…

GoBGP Basics – use from python

- This! No more “expect”



```
/home/vagrant/.go/src/github.com/osrg/gobgp/tools/grpc/python% python get_neighbor.py 172.17.0.2 172.17.0.6
BGP neighbor is 172.17.0.6, remote AS 65004
  BGP version 4, remote router ID 192.168.0.5
  BGP state = BGP_FSM_IDLE, up for 3865
  BGP OutQ = 0, Flops = 0
  Hold time is 0, keepalive interval is 0 seconds
  Configured hold time is 90, keepalive interval is 30 seconds
/home/vagrant/.go/src/github.com/osrg/gobgp/tools/grpc/python%                                        [master]

[0] 1:zsh*                                                                   "trusty" 01:56 19-Nov-15
```

Main Target Application

1. **High performance Router Server for IX**

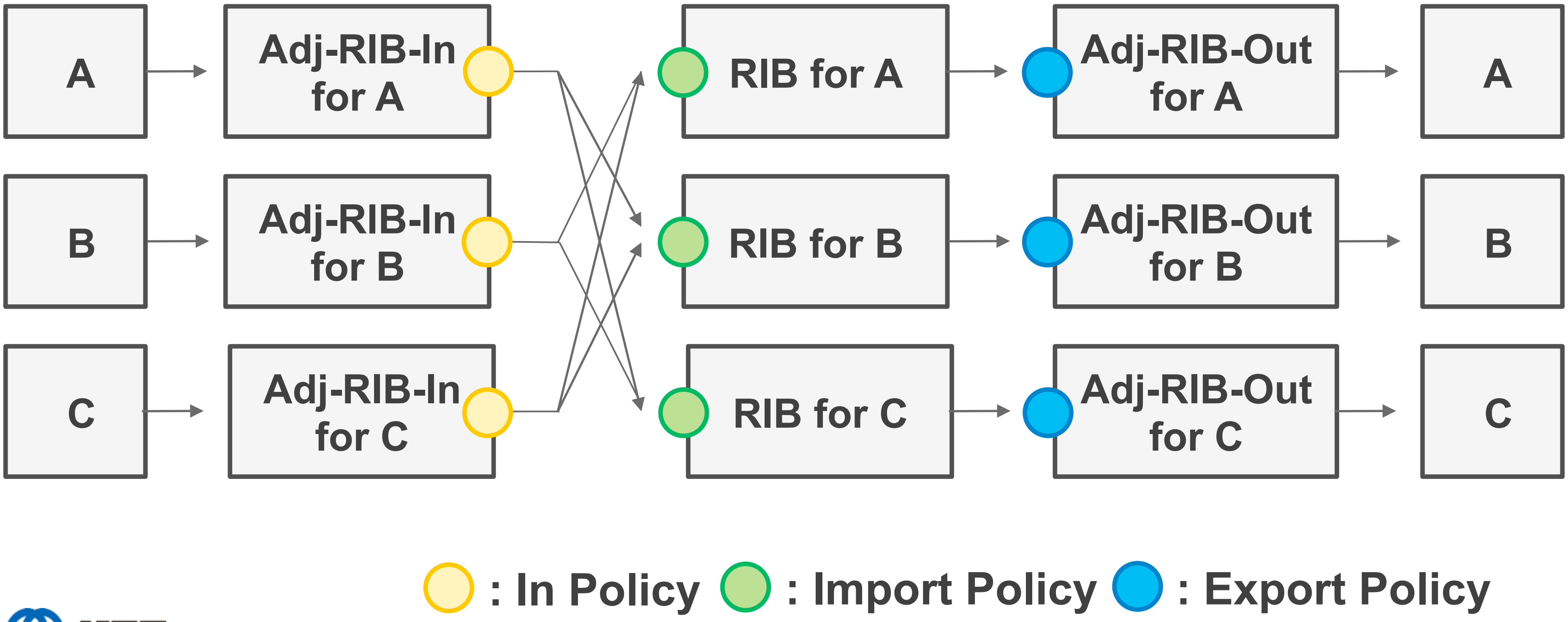
2. Integration with data analysis systems

3. BGPd for whitebox switches

Route Server for IX

GoBGP as a route server

- supports multiple RIBs
- flexible policy enforcement points



Supported Policy Condition/Action

- Condition
  - Prefix, Source neighbor
  - AS Path (contents, length)
  - Community, Extended Community
  - RPKI validation result
- Action
  - Permit/Deny
  - Add/Replace/Remove (extended) community, med, aspath
  - Arithmetic operation of med

Main Target Application

1. High performance Router Server for IX

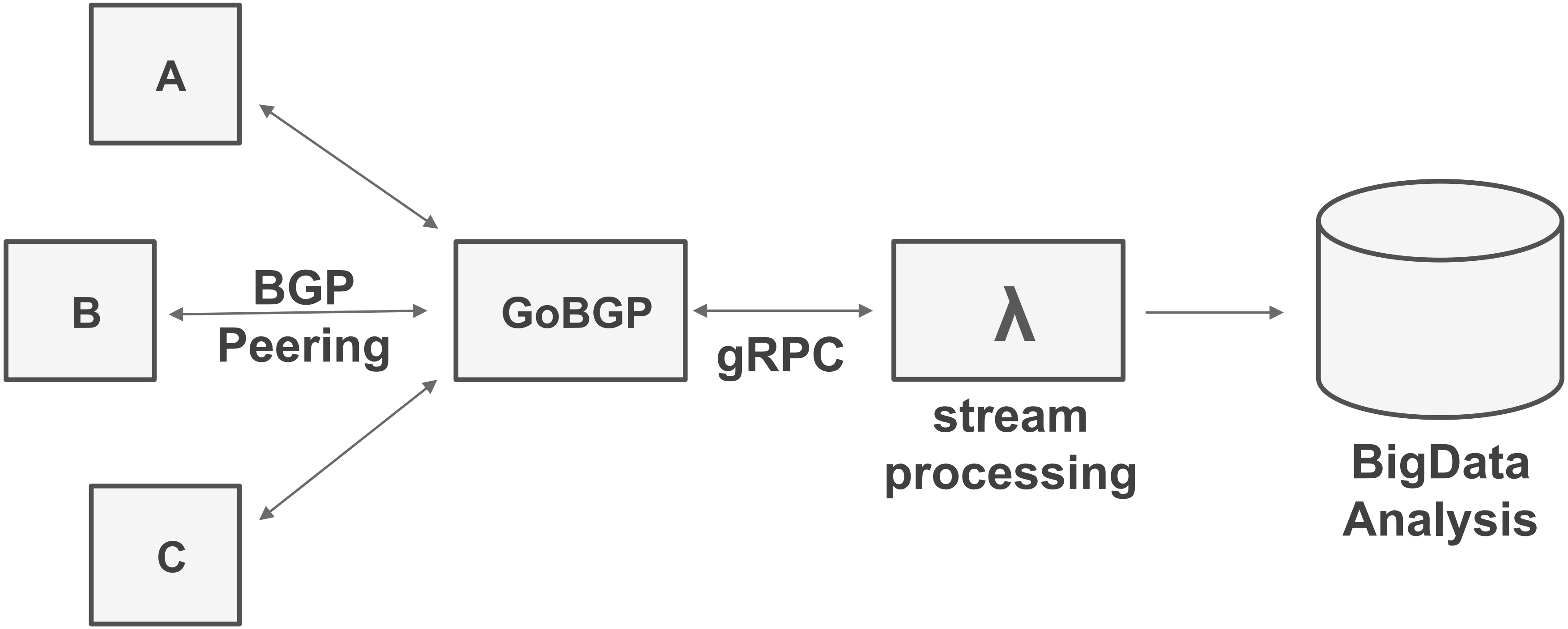
2. **Integration with data analysis systems**

3. BGPd for whitebox switches

Integration with data analysis systems

GoBGP as a BGP sub-system for data analysis

e.g) BGPmon(Colorado State Univ.), FastNetMon



Main Target Application

1. High performance Router Server for IX

2. Integration with data analysis systems

3. BGPd for whitebox switches

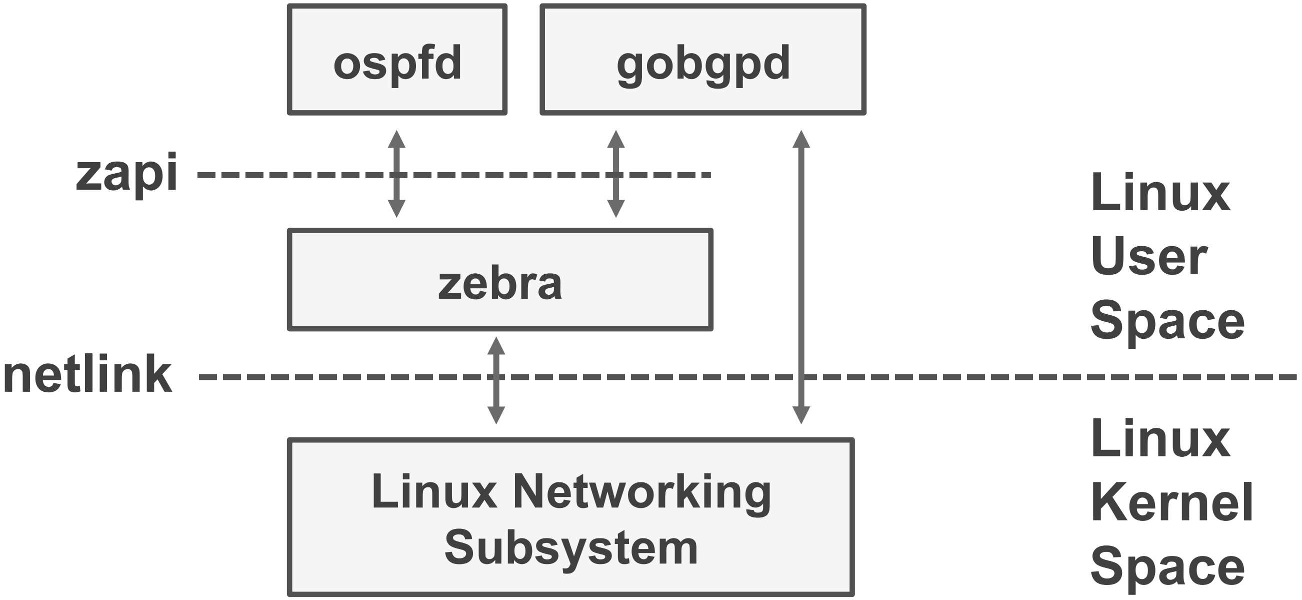
BGPd for whitebox switches

- BIG wave of open-networking
  - Network commoditization
  - Expansion of the use of whitebox switches

- GoBGP can be run on top of whitebox switches
  - Ported on Cumulus and Open Network Linux

BGPd for whitebox switches

- FIB modification via zapi and netlink
  - zapi : api for zebra and quagga routing daemons
  - IPv4/IPv6 unicast FIB modification is done via zapi
  - Other FIB modification is done via netlink
    - e.g) zapi doesn't support mac fdb modification



BGPd for whitebox switches

- Usecase: EVPN+VXLAN
  - mac address exchange occers in BGP
- Interoperability with Cisco/Juniper! @Interop Tokyo 2015

NOC ラック #13
次世代型コントロールプレーンを
活用した VXLAN 相互接続実証実験
APC
5120-48G SI Switch
SmartCS
QFX5100-48T
QFX5100-48T
GoBGP
EVPN/VXLAN Spine/Leaf 対応スイッチ
Cisco Nexus 9396PX

Other features

- Full route MRT injection less than 1min
  - For testing your new gear
- Route monitoring (MRT dump)
  - BMP is also on the roadmap
- Route Reflector
  - Addpath is also on the roadmap
- RPKI validation
- Flowspec
- VPN support (L2VPN(EVPN), L3VPN, VRF, RTC)

Summary

Please try it out !

Your comment, feedback, patch

and star on github is very welcome ;)