

BGP simple peering and announcements

Zestawianie połączeń BGP oraz rozgłaszanie informacji o sieciach

- Celem zajęć jest zapoznanie się z podstawami działania protokołu BGP.
- W ramach zajęć należy:
 - Stworzyć i skonfigurować dwa routery BGP należące do dwóch różnych systemów autonomicznych.
 - Zaobserwować przebieg zestawiania połączeń pomiędzy sąsiadami BGP.
 - Skonfigurować rozgłaszanie sieci (ang. *announcement*).
 - Sprawdzić zawartość tablic routingu.
 - Zapoznać się z działaniem maszyny stanów sesji BGP.
 - Zaobserwować komunikaty wymieniane pomiędzy routerami w trakcie informowania o osiągalności sieci przez routery BGP
 - Skonfigurować trzeci router i zestawić wieloskokowe połączenie BGP.

netkit lab

bgp: simple-peering

bgp: announcement

Version	2.0
Author(s)	G. Di Battista, M. Patrignani, M. Pizzonia, F. Ricci, M. Rimondini
E-mail	contact@netkit.org
Web	http://www.netkit.org/
Description	setting up a bgp peering between two autonomous systems

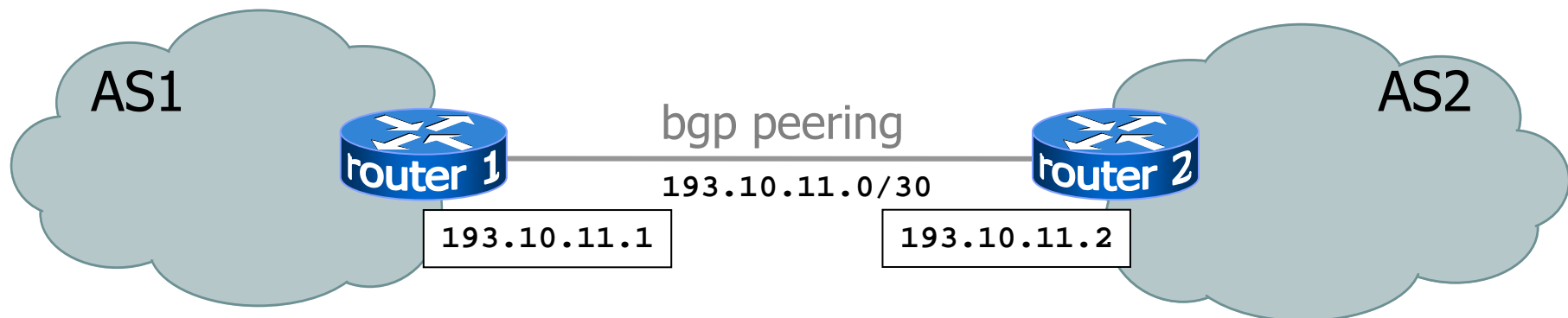
Modified for the purpose of the IP Networks lab

copyright notice

- All the pages/slides in this presentation, including but not limited to, images, photos, animations, videos, sounds, music, and text (hereby referred to as “material”) are protected by copyright.
- This material, with the exception of some multimedia elements licensed by other organizations, is property of the authors and/or organizations appearing in the first slide.
- This material, or its parts, can be reproduced and used for didactical purposes within universities and schools, provided that this happens for non-profit purposes.
- Information contained in this material cannot be used within network design projects or other products of any kind.
- Any other use is prohibited, unless explicitly authorized by the authors on the basis of an explicit agreement.
- The authors assume no responsibility about this material and provide this material “as is”, with no implicit or explicit warranty about the correctness and completeness of its contents, which may be subject to changes.
- This copyright notice must always be redistributed together with the material, or its portions.

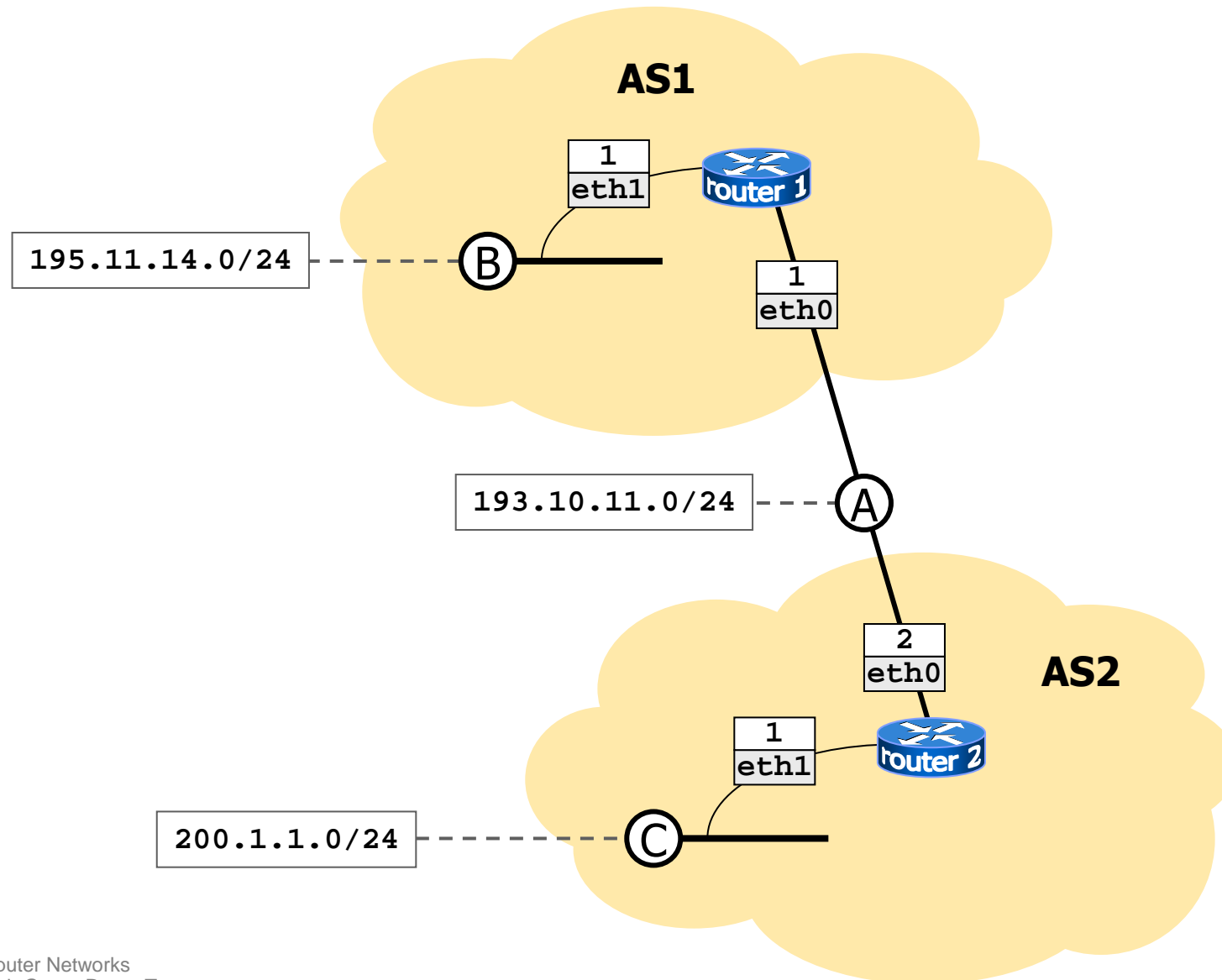
a bgp peering between two ases

- bgp allows routers to exchange information only if a peering session is up
- a bgp peering is the **tcp connection** over which routing information will be exchanged



topology

create (vstart) and configure r1 and r2



Lab Scenario Personalization

- Modify the default scenario in the following way: change the network IP addresses to
`<LAB-ID>.10.11.0/30,`
`195.<LAB-ID>.14.0/24,`
`200.<LAB-ID>.1.0/24,`
where LAB-ID is your personal ID assigned by the lab instructor
- **Note well:** from now-on
 - Command-line commands should reflect this change, therefore there can be differences in the outputs shown in the manual

turn on bgpd and zebra daemons

- in the `bgpd.conf` file specify the bgp log file

```
log file /var/log/zebra/bgpd.log
```

- turn the bgp debugging on by adding the following lines to the `bgpd.conf` file

```
debug bgp
debug bgp events
debug bgp fsm
debug bgp keepalives
debug bgp updates
```

peering configuration commands

command syntax

```
! <a-comment-on-a-single-line>
```

command syntax

```
router bgp <my-as-number>
```

command syntax

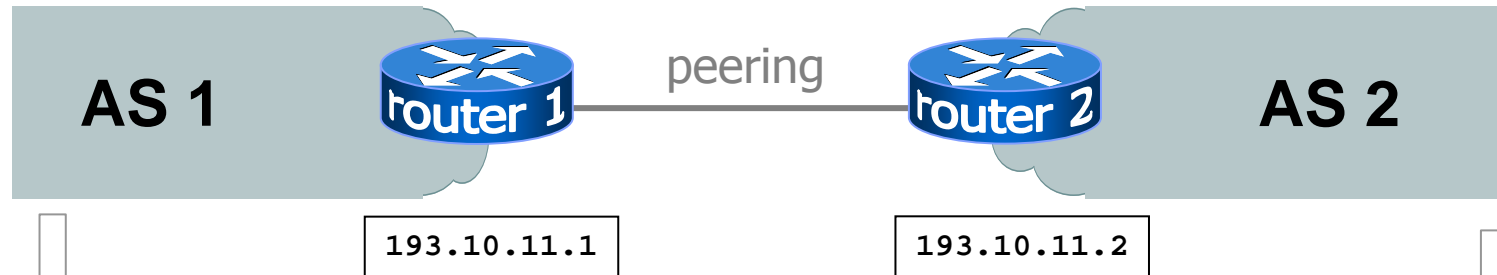
```
neighbor <neighbor-ip> remote-as <neighbor-as-num>
```

command syntax

```
neighbor <neighbor-ip> description <text>
```


peering configuration

configure BGP peering on r1 and r2



```
! router 1 configuration file
router bgp 1
neighbor 193.10.11.2 remote-as 2
neighbor 193.10.11.2 description Router 2
```

```
! router 2 configuration file
router bgp <AS number>
neighbor <neighbor address> remote-as <AS number>
neighbor <neighbor address> description <description>
```

a simple peering

- check the routing tables

```
router1:~# route
Kernel IP routing table
Destination      Gateway          Genmask          Flags  Metric  Ref    Use  Iface
193.10.11.0      *               255.255.255.0    U      0        0     0   eth0
195.11.14.0      *               255.255.255.0    U      0        0     0   eth1
router1:~#
```

- no routing protocol (**not even bgp!**)
is propagating routing information
- only local routes are known

a simple peering

- check the log file of the bgp daemon

router1

```
router1:~# less /var/log/zebra/bgpd.log
2007/05/22 11:01:06 BGP: BGPd 0.94 starting: vty@2605, bgp@179
2007/05/22 11:01:14 BGP: 193.10.11.2 [FSM] Timer (start timer expire).
2007/05/22 11:01:14 BGP: 193.10.11.2 [FSM] BGP_Start (Idle->Connect)
2007/05/22 11:01:14 BGP: 193.10.11.2 went from Idle to Connect
2007/05/22 11:01:14 BGP: 193.10.11.2 [Event] Connect start to 193.10.11.2 fd 9
2007/05/22 11:01:14 BGP: 193.10.11.2 [FSM] Non blocking connect waiting result
2007/05/22 11:01:17 BGP: 193.10.11.2 [Event] Connect failed (Operation now in
progress)
2007/05/22 11:01:17 BGP: 193.10.11.2 [FSM] TCP_connection_open_failed
(Connect->Active)
2007/05/22 11:01:17 BGP: 193.10.11.2 went from Connect to Active
2007/05/22 11:01:31 BGP: [Event] BGP connection from host 193.10.11.2
2007/05/22 11:01:31 BGP: [Event] Make dummy peer structure until read Open
packet
/var/log/zebra/bgpd.log
```

a simple peering

- check the command line interface of bgpd

```
router1
bgpd> show ip bgp summary
BGP router identifier 195.11.14.1, local AS number 1
0 BGP AS-PATH entries
0 BGP community entries

Neighbor      V    AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
193.10.11.2    4     2     53     55       0     0   0 00:53:00      0

Total number of neighbors 1
bgpd> █
```

Reporting

- Please deliver the following items to the UPEL system using your account
 1. A photocopy or a screenshot showing the output of the following command executed on router router1
 - **show ip bgp summary**

a simple peering

■ check the peering status

```
router1
bgpd> show ip bgp neighbors
BGP neighbor is 193.10.11.2, remote AS 2, local AS 1, external link
Description: Router 2 of AS2
BGP version 4, remote router ID 200.1.1.1
BGP state = Established, up for 00:57:51
Last read 00:00:49, hold time is 180, keepalive interval is 60 seconds
Neighbor capabilities:
  Route refresh: advertised and received (old and new)
  Address family IPv4 Unicast: advertised and received
Received 58 messages, 0 notifications, 0 in queue
Sent 60 messages, 0 notifications, 0 in queue
Route refresh request: received 0, sent 0
Minimum time between advertisement runs is 30 seconds

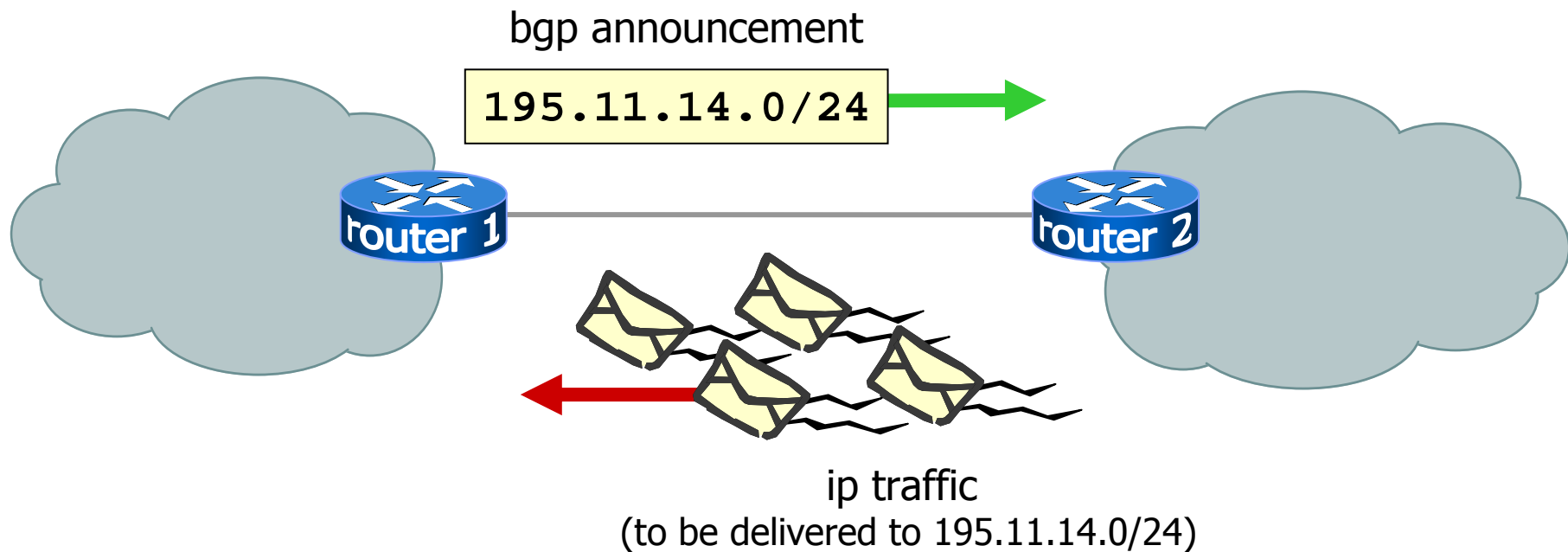
For address family: IPv4 Unicast
  Community attribute sent to this neighbor (both)
  0 accepted prefixes

Connections established 1; dropped 0
Local host: 193.10.11.1, Local port: 179
Foreign host: 193.10.11.2, Foreign port: 3452
Next hop: 193.10.11.1
Next hop global: fe80::fcfd:c1ff:fe0a:b01
Next hop local: ::
BGP connection: non shared network
Read thread: on Write thread: off

bgpd> █
```

announcements and traffic flows

- bgp allows a router to offer connectivity to another router
- “offering connectivity” means “promising the delivery to a specific destination”



announcement commands

—cisco command syntax—

```
network <network-ip> mask <network-mask>
```

—zebra command syntax—

```
network <network-ip/network-mask>
```

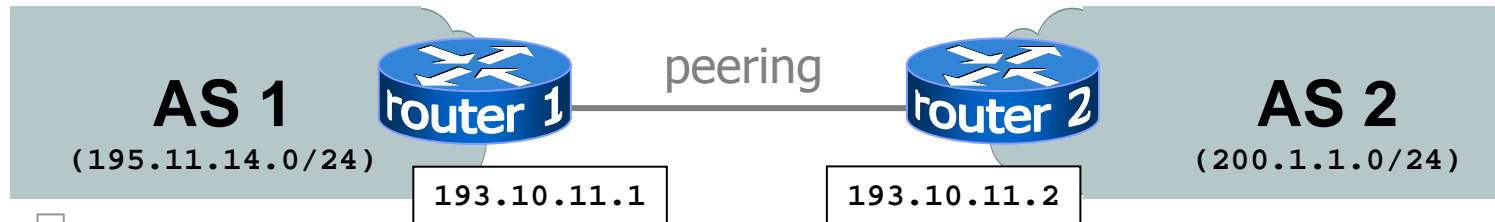
- this command flags a network as local to the as
- without further specifications the network will be announced to all peers
- notice that the network
 - may not be local
 - is not even required to exist(!)

announcement commands

- observe that the **network** command
 - *does not* inject any route in the kernel forwarding table
 - checks whether the network address matches the netmask; if it does not, the command is automatically replaced in the router configuration; for example:
 - **network 193.100.0.0/8**
is replaced by
network 193.0.0.0/8
 - **network 1.2.3.4/0**
is replaced by
network 0.0.0.0/0

announcement configuration

configure BGP announcements on r1 and r2

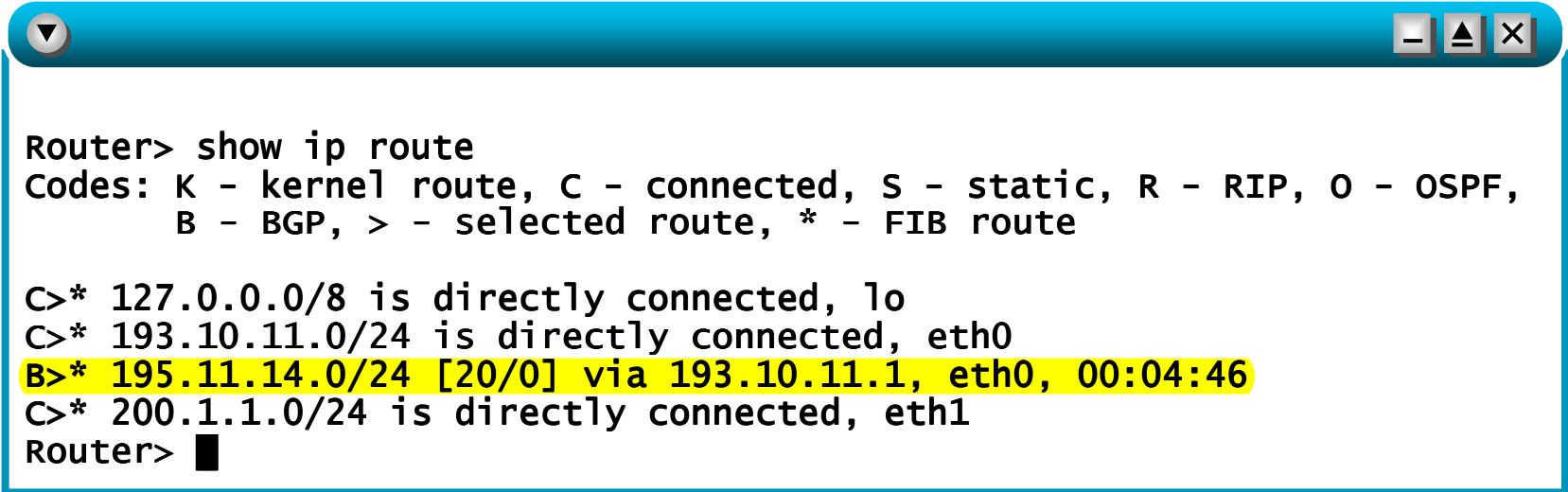


! router 1 configuration file
router bgp 1
network 195.11.14.0/24
neighbor 193.10.11.2 remote-as 2

! router 2 configuration file
router bgp <AS number>
network <network address>/<mask>

announcement example

■ check the zebra routing table



```
Router> show ip route
Codes: K - kernel route, C - connected, S - static, R - RIP, O - OSPF,
      B - BGP, > - selected route, * - FIB route

C>* 127.0.0.0/8 is directly connected, lo
C>* 193.10.11.0/24 is directly connected, eth0
B>* 195.11.14.0/24 [20/0] via 193.10.11.1, eth0, 00:04:46
C>* 200.1.1.0/24 is directly connected, eth1
Router> █
```

announcement example

- check the bgpd log file

▼ router2

```
router2:~# less /var/log/zebra/bgpd.log
2007/05/22 12:36:57 BGP: 193.10.11.1 [FSM] Receive_KEEPAIVE_message
(Established->Established)
2007/05/22 12:36:58 BGP: 193.10.11.1 [FSM] Timer (routeadv timer expire)
2007/05/22 12:36:58 BGP: 193.10.11.1 send UPDATE 200.1.1.0/24
2007/05/22 12:36:58 BGP: 193.10.11.1 rcvd UPDATE w/ attr: nexthop
193.10.11.1
2007/05/22 12:36:58 BGP: 193.10.11.1 rcvd 195.11.14.0/24
2007/05/22 12:36:58 BGP: 193.10.11.1 [FSM] Receive_UPDATE_message
(Established->Established)
2007/05/22 12:36:58 BGP: 193.10.11.1 [FSM] Timer (routeadv timer expire)
2007/05/22 12:37:50 BGP: Performing BGP general scanning
2007/05/22 12:37:57 BGP: 193.10.11.1 [FSM] Timer (keepalive timer expire)
2007/05/22 12:37:57 BGP: 193.10.11.1 [FSM] KeepAlive_timer_expired
(Established->Established)
2007/05/22 12:37:57 BGP: 193.10.11.1 sending KEEPAIVE
/var/log/zebra/bgpd.log
```

sent
announcement

received
announcement

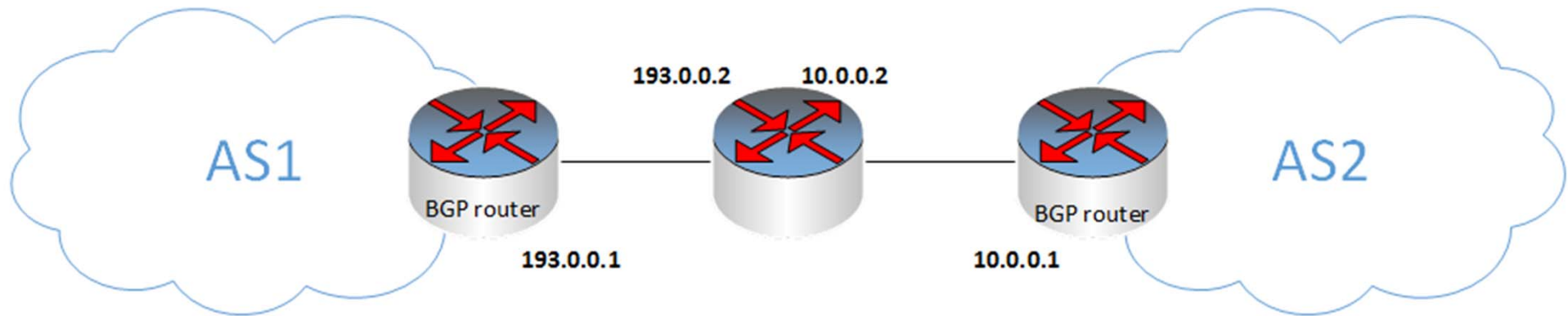
announcement example

- check the bgpd cli (command line interface)
 - type `"show ip bgp neighbors"`
 - type `"show ip bgp 200.1.1.0"`
- ping `"200.1.1.0"`

Reporting

- Please deliver the following items to the UPEL system using your account
 1. A photocopy or a screenshot showing the output of the following commands executed on router router1
 - **show ip bgp neighbors**
 - **show ip bgp 200.<LAB-ID>.1.0**

modify the lab (ebgp-multi-hop)



- change the peering configuration according to the new addressing scheme
- make sure that peering is established

Reporting

- Please deliver the following items to the UPEL system using your account
 1. A photocopy or a screenshot showing the output of the following command
 - **ping** from an interface in AS1 to an IP address in AS2
 - **ping -R** from an interface in AS1 to an IP address in AS2
 - routing tables of routers R1, R2, and R3 (**show ip route**)