BGP: Local Preference attribute
BGP: Atrybut lokalnej preferencji

- Celem zajęć jest ugruntowanie wiedzy dotyczącej atrybutu **Local Preference**, pozwalającego na zarządzanie ruchem w kierunku wychodzącym z danego systemu AS.

- W ramach zajęć zostanie uruchomione 6 ruterów z podstawową konfiguracją sieciową oraz częściową konfiguracją BGP.

- W ramach zajęć należy:

  - Sprawdzić osiągalność sieci i przebieg tras w podstawowej konfiguracji BGP (bez ustawionego atrybutu **LocPref**).

  - Skonfigurować właściwe wartości atrybutu **LocPref** na odpowiednich ruterach.

  - Sprawdzić osiągalność sieci i przebieg tras po zastosowaniu atrybutu **LocPref**.

Traffic Engineering with BGP

BGP: Outbound Traffic Control

Authors: Piotr Pacyna, Katarzyna Kosek-Szott

Overview

Objective: show propagation of prefixes between ISPs in BGP multi-homing scenario

- **ISP can**

  - manipulate prefix during propagation/processing to satisfy its own goals regarding path selection

  - implement its own policies for inbound and outbound flows

- **Specifically, we will see that**

  - **Part I (LocalPref)**: ISP **can**

    - influence path selection process carried out by their own BGP routers
    - influence the path for **outbound traffic**

Outline

- General idea: insert additional information into **BGP Update** messages

  - Extra information propagated with the prefix and evaluated by BGP routers during the BGP decision process

  - Appropriate routes installed in routing tables of BGP routers

  - Inter-domain traffic routed following the chosen routes

Part I
Outbound traffic control with LocPref

Part I Outline

- **Goal**
  - Influence on path selection for **outbound traffic**, i.e., traffic originated in a local AS, destined to a network in another AS
- **Idea**
  - Path selection for outbound traffic carried out in a local AS by BGP routers, which determine the egress router for the traffic
- **Method**
  - Selection of the best path, including selection of the egress router, is determined by the BGP decision process. Decision is based on path attributes.
  - The choice of the preferred egress router can be influenced by modifying path attributes for a prefix
  - Prefix is manipulated and admitted (propagated) into local AS to let routers decide
  - Local AS routers select the path, which is "preferred", over any other path(s), in accordance with the BGP decision process

Example: the use of Local Preference attribute for controlling **outbound** traffic
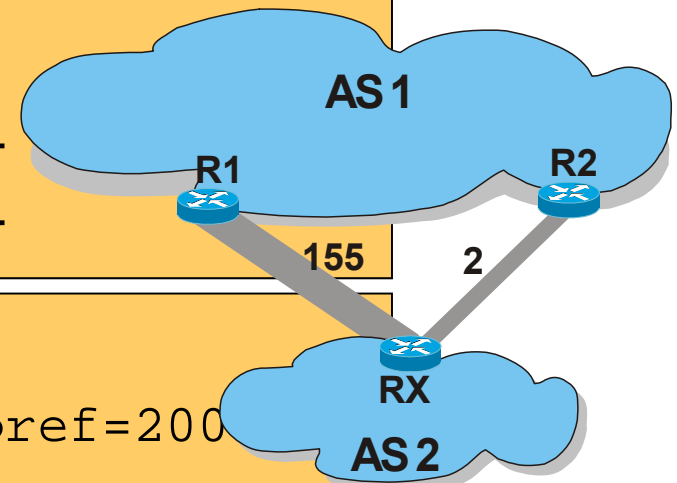
AS1 view (provider view)

```
Import:  from AS2 RX at R1 set localpref=300;
         from AS2 RX at R2 set localpref=100;
         accept AS2


Export:  to AS2 RX at R1 announce ANY
         to AS2 RX at R2 announce ANY
```

AS2 view (customer view)

```
Import:  from AS1 R1 at RX set localpref=200;
         from AS1 R2 at RX set localpref=100;
             accept ANY
Export:  to AS1 R1 at RX announce AS2
         to AS1 R2 at RX announce AS2
```
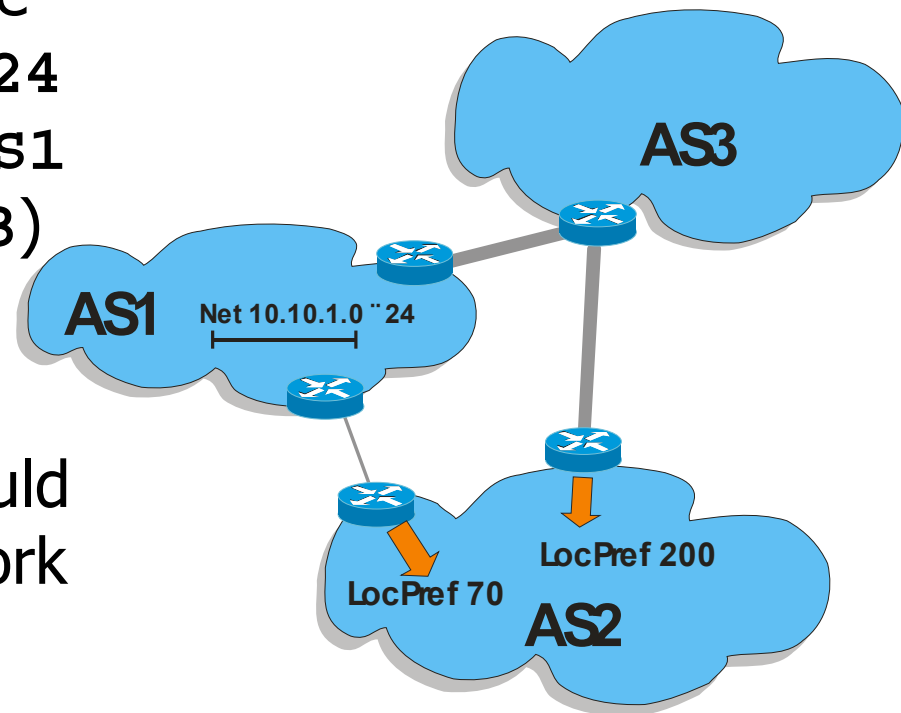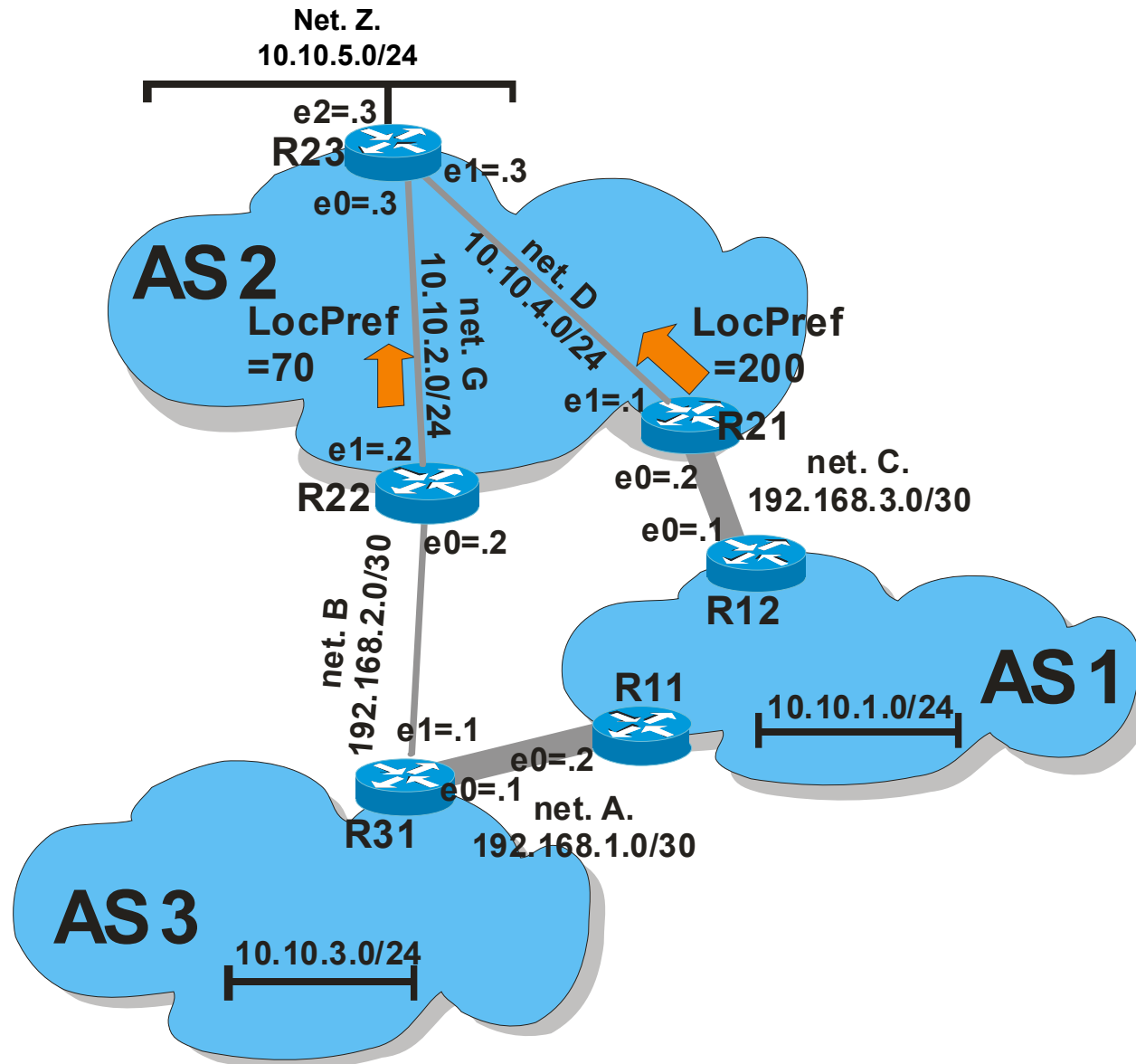
Example for Local Preference

- **LocPref** is set in **AS2** on the received prefix **10.10.1.0/24** (the prefix is received from **AS1** directly and from **AS1** via **AS3**)

- The **LocPref** values indicate that BGP routers in **AS2** "should prefer" path via **AS3** to network **10.10.1.0/24**

AS3

AS1   Net 10.10.1.0 ¨ 24

LocPref 200

LocPref 70

AS2

Network Topology

Net. Z.
10.10.5.0/24

e2=.3

R23

e1=.3

e0=.3

AS 2

LocPref
=70

net. D
10.10.4.0/24

net. G
10.10.2.0/24

LocPref
=200

e1=.1

R21

e1=.2

R22

e0=.2

net. C.
192.168.3.0/30

e0=.2

e0=.1

R12

net. B
192.168.2.0/30

R11

AS 1

10.10.1.0/24

e1=.1

e0=.2

R31

e0=.1

net. A.
192.168.1.0/30

AS 3

10.10.3.0/24

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Lab Scenario Personalization

- Modify the default scenario in the following way:
  - change the network Z IP address to `<LAB-ID>.10.5.0/24`, 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

`AS2` (Provider) Perspective

- **Start the lab**. Zebra is 'up and running', interfaces are up, networks are configured.

- Note the networks
  - `10.10.1.0/24` in AS1
  - `10.10.3.0/24` in AS3

- … but first check configuration of `R31,` `R21,` and `R22`

Check Configuration of R31, R21, and R22

- Step 1
  - Check the general configuration of the `zebra` routing daemon

- Step 2
  - Check if the `bgpd` routing daemon is turned on in `zebra` on R31, R21, and R22

- Step 3
  - Verify if `bgpd` is properly configured

Changing `R21` and `R22` Configuration

- The **`next-hop-self`** attribute can be used on `R21` and `R22` to privide reachability of the next-hop routers (instead of IGP)

    - `#neighbor <peer> next-hop-self`

- „This command specifies an announced route's nexthop as being equivalent to the address of the bgp router" [Quagga manual]

- Additional information on **`next-hop-self:`**

    http://www.getnetworking.net/bgp/bgp-next-hop-self

Reachability over BGP

- Run `ping 10.10.3.1` on `R23`
  - Q1: Which path is selected?
  - Q2: Why this path is chosen and not the other one?

- Q3: Is there any method to make the router `R23` choose the other path? What are the possibilities?

Changing `R21` and `R22` Configuration

- To configure `R21` and `R22` (see next slide) do **one** of the following
  - Telnet to `bgpd`
    - Configure BGP
    - Issue the `#clear ip bgp *` command
  - Use `#vtysh`
    - Configure BGP
    - Issue the `#clear ip bgp *` command
  - Edit the `bgpd.conf` file
    - Put BGP configuration
    - Restart `zebra`

Exemplary Configuration

```
router bgp  xxx
      network nn.nn.nn.nn/mm
      neighbor aa.bb.cc.dd  remote-as nnnn
      neighbor aa.bb.cc.dd route-map myRouteMap in
  !
  route-map myRouteMap permit  10
      set local-preference xx
  !
```

Route Map – command syntax

```
command syntax
neighbor <neighbor-ip> route-map <r-map-name> in
```

```
command syntax
neighbor <neighbor-ip> route-map <r-map-name> out
```

```
command syntax
route-map <r-map-name> permit <seq-number>
  match <announce-property>
  set <attribute-setting>

  ...
```

```
command syntax
route-map <r-map-name> deny <seq-number>
  match <announce-property>
  set <attribute-setting>

  ...
```

Testing routes from `R23` to AS3

- Execute `ping` from `R23` to 10.10.3.1

- Q4: Which path is selected for "ICMP echo request" and "ICMP echo reply" packets? Why?

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 **R23**:

     - `ping –I <Lab-ID>.10.5.3 -R 10.10.3.1`