

BGP: Multi Exit Discriminator Attribute

BGP: Atrybut MED

- Celem zajęć jest ugruntowanie wiedzy dotyczącej atrybutu **MED**, pozwalającego na zarządzanie ruchem w kierunku wchodzącym do 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 **MED**).
 - Skonfigurować właściwe wartości atrybutu **MED** na odpowiednich ruterach.
 - Sprawdzić osiągalność sieci i przebieg tras po zastosowaniu atrybutu **MED**.

Traffic Engineering with BGP

BGP: Inbound Traffic Control

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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 II (MED):** ISP **can attempt**
 - to influence path selection process made by routers of neighbor ISPs
 - to influence the path for **inbound 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 II

Inbound traffic control with MED

Part II Outline

■ Goal

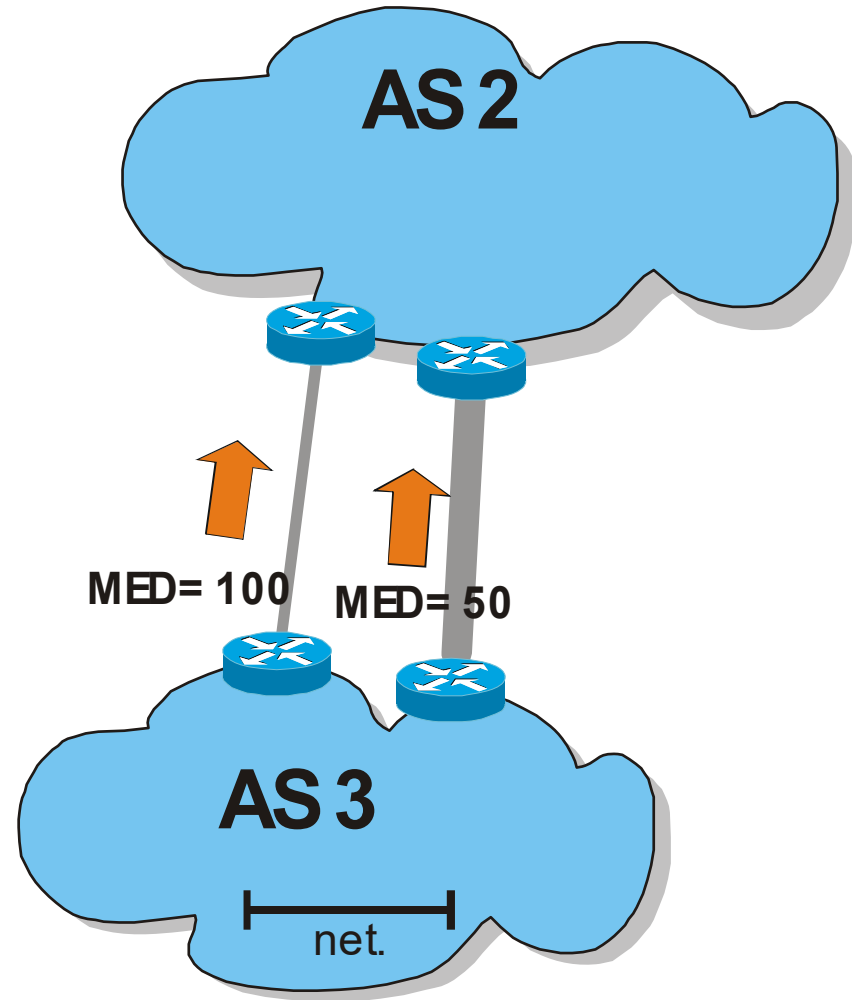
- Try to influence the paths for **inbound traffic**, i.e. traffic arriving into our ISP domain

■ Method

- Modify attributes of AS Path messages advertised by our BGP routers to neighbouring ASs
- By modifying attributes prior to message advertisement we will try to influence decisions made by neighbouring BGP routers when selecting best routes to networks located in our AS

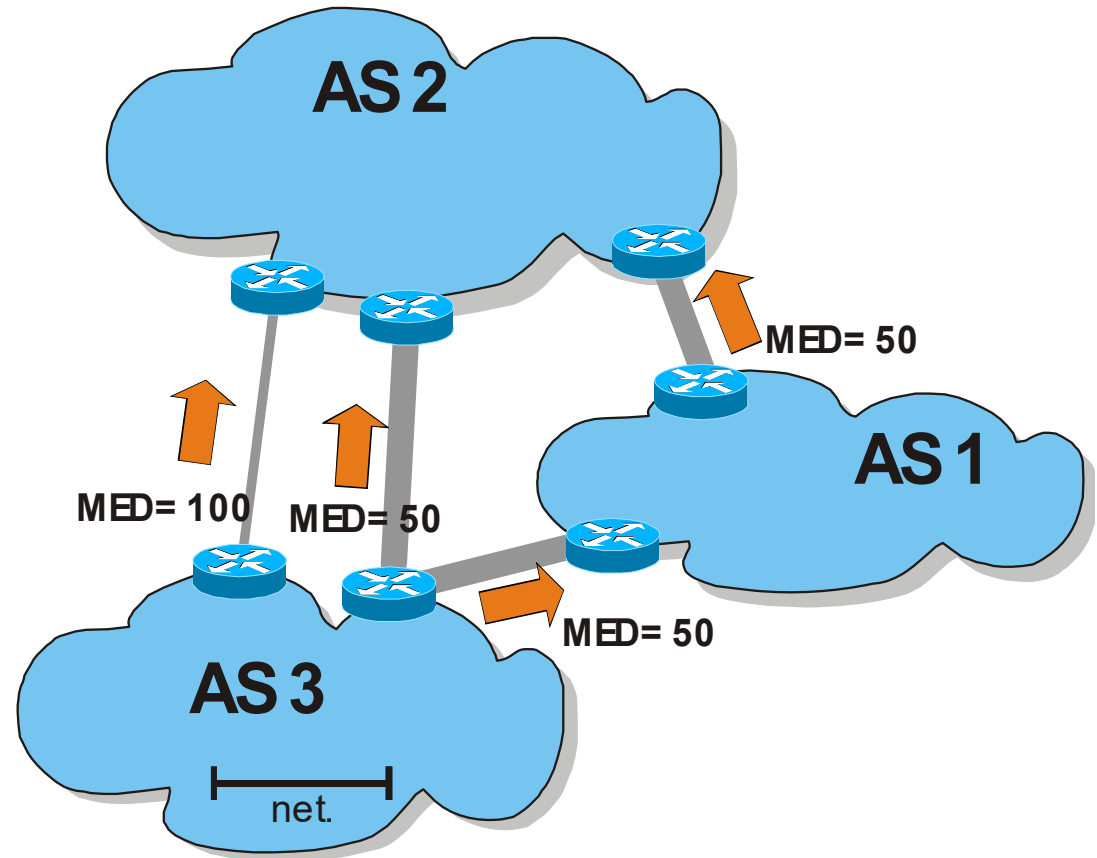
Insertion of Multiple Exit Discriminator (MED)

- MED value is set on prefixes advertised by AS3 in order to "tell" AS2 routers that AS3 'would like' to receive traffic over the high bandwidth link



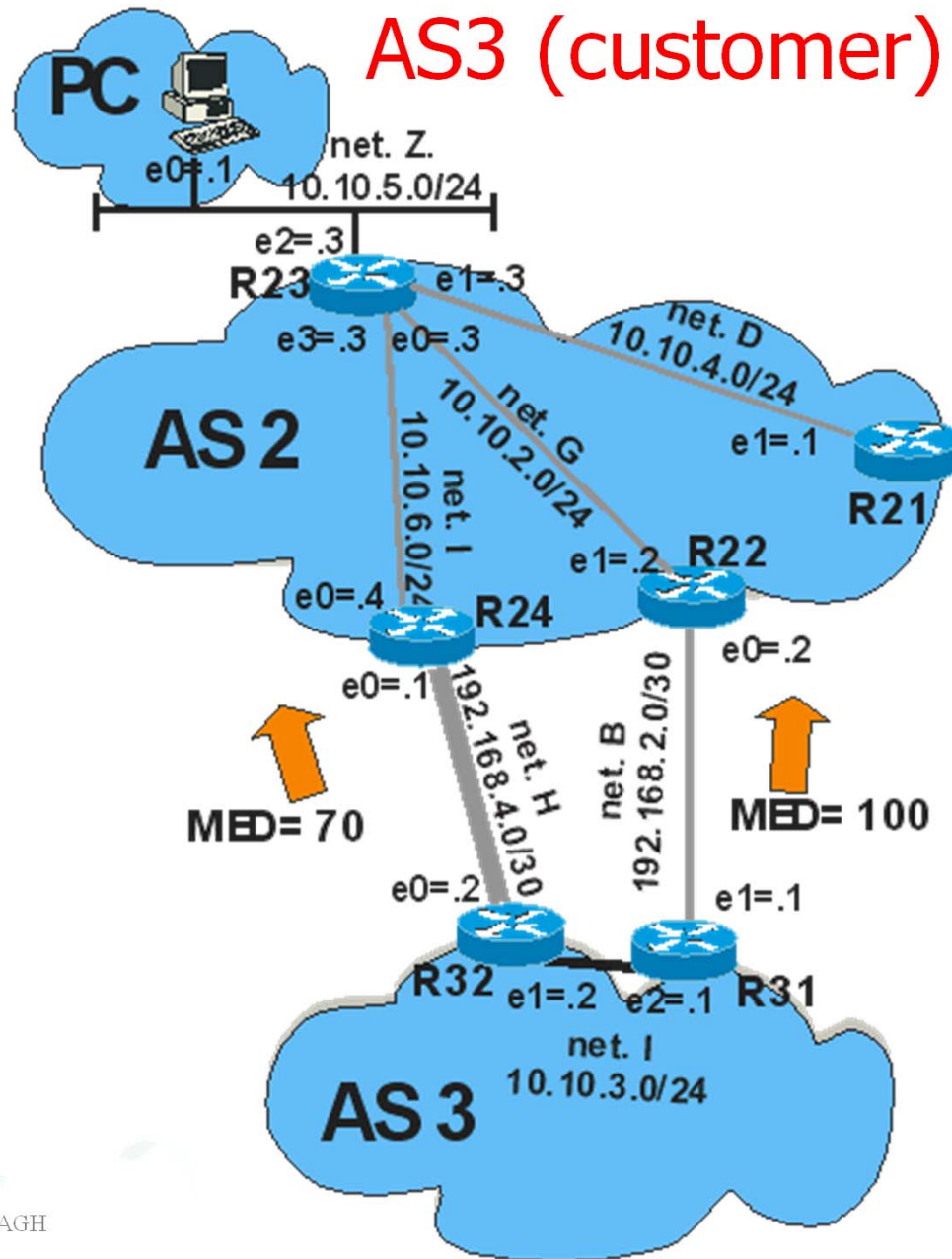
Insertion of Multiple Exit Discriminator (MED)

- **MED** value set on prefix 'net.' advertised by **AS3** in order to "tell everybody" that **AS3** 'would like' to receive traffic for network 'net.' over high bandwidth links
- Note that **MED** value related to the same prefix but received in **AS2** from different Autonomous Systems **will not be compared!**



Network Topology

AS3 (customer) perspective



- **Start the lab**
- zebra is 'up and running'
- interfaces are up
- networks are configured
- **Need to configure R24, R22, R31 and R32**

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

Changing Router Configuration

- Select **one** of the following ways to configure appropriate routers:
 - Telnet to `bgpd`
 - Configure BGP
 - Issue the `clear ip bgp *` command
 - Use `#vtysh`
 - Configure BGP
 - Issue the `clear ip bgp *` command

Testing routes from R23 to R31 *before* setting MED

- Configure routers: R24, R22, R31 and R32
- Check the result of the `show ip bgp 10.10.3.0` command on router R23. Explain the selection process of the `best` path. Hint
- Execute `ping -R` from R23 to 10.10.3.1/24 and to 10.10.3.2/24
- Q1: Which path is selected for the ICMP "echo request" and "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 -R 10.10.3.1`
 - `Ping -R 10.10.3.2`

Changing R31 and R32 Configuration

Exemplary Configuration

- Configure R31 and R32 with appropriate MED values

```
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 out
!
route-map myRouteMap permit 10
    set metric xx
!
```

Testing routes from R23 to R31 **after** setting MED

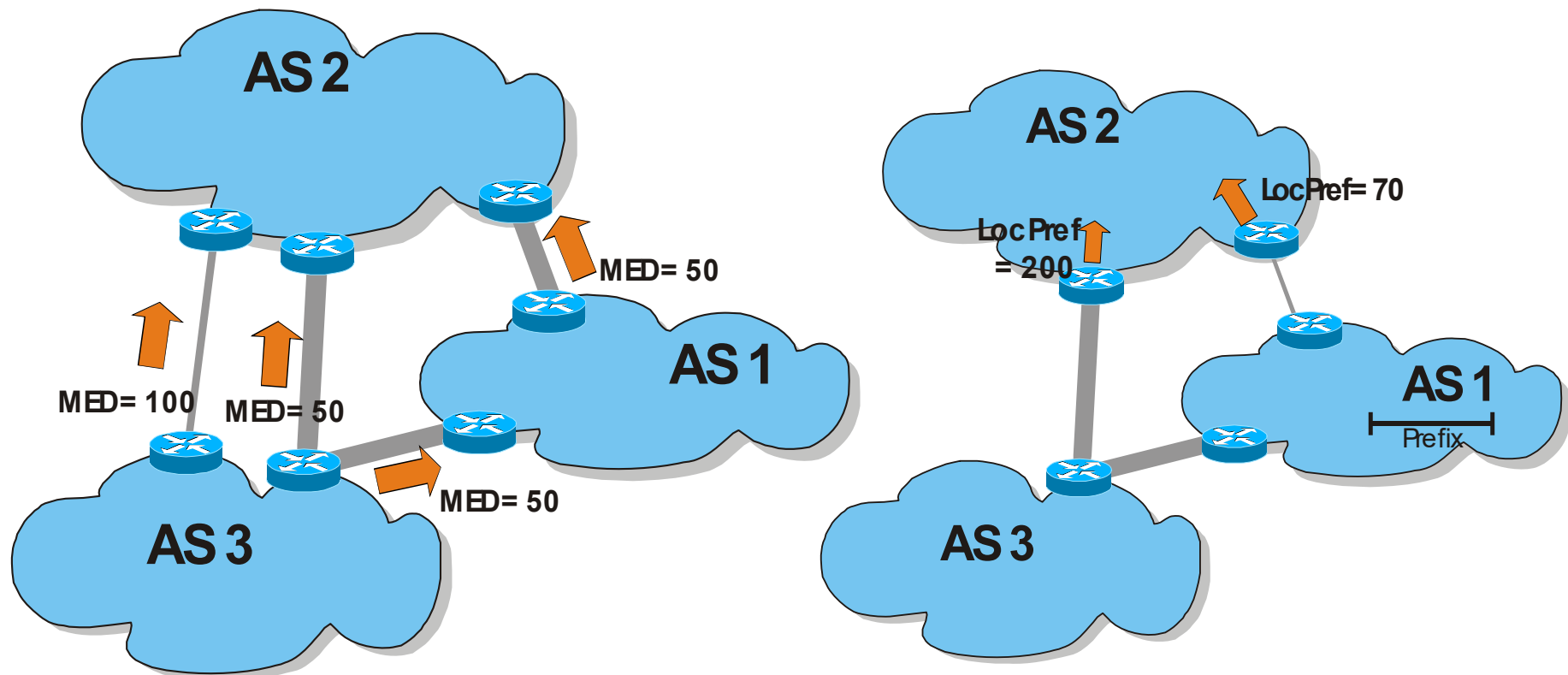
- **Execute ping -R from R23 to 10.10.3.1/24 and to 10.10.3.2/24**
- **Q2:** Which path is selected for "ICMP echo request" and "ICMP echo reply" packets? Why?

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 -R 10.10.3.1`
 - `Ping -R 10.10.3.2`

Exercise

BGP Decision Process with LocPref and MED used simultaneously



BGP Decision Process with **LocPref** and **MED** used simultaneously

- **Q3**: Which path will be selected by routers in **AS2** to reach **AS1** in the scenario from page 27?
 - a) without **LocPref** and **MED** attributes
 - b) with **LocPref** only
 - c) with **MED** only
 - d) with both **LocPref** and **MED**

Conclusions

- The level of control over flows is different for inbound and outbound flows
- The level of control over **outbound traffic** is **strong**
 - It requires configuration of ISPs own routers
 - ISP can precisely influence local selection of routes leading to remote destinations (outbound traffic)
- The control over **inbound traffic** is **weak**
 - ISP has limited ability to control choices that other ISPs make to direct traffic to local networks (inbound traffic)
- Therefore, the level of control is asymmetric

Internet Resources

- Using BGP's local preference to influence outbound routing

<http://evilrouters.net/2009/03/07/using-bgps-local-preference-to-influence-outbound-routing/>

- Using AS path prepending to influence inbound routing

<http://evilrouters.net/2009/03/07/using-as-path-prepend-to-influence-inbound-routing/>