

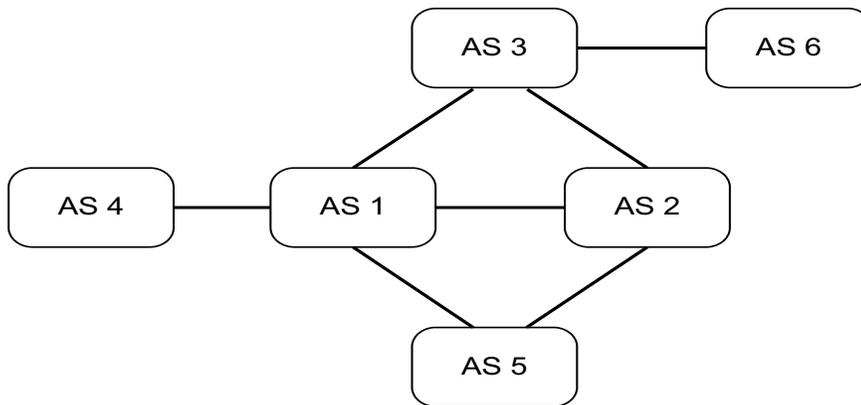
# ECE 461 – Internetworking

## Problem Set 5

### Problem 1. Policy Based Routing in BGP

The figure shows a network with six autonomous systems. AS4 “owns” the prefix 10.0.1.0/24 and sends an advertisement to AS1 with the following prefix, and ORIGIN and AS-PATH attributes:

*10.0.1.0/24, ORIGIN{AS4}, AS-PATH{AS4}.*



- Assume that no routing policies are employed (i.e., no advertised routes are selectively ignored and all known routes are advertised). Explain how the other autonomous systems process and disseminate the advertisement for prefix 10.0.1.0/24. Indicate which autonomous systems advertise the prefix to their neighboring autonomous systems. Provide the ORIGIN and AS-PATH attributes used in the advertisements.
- Now consider that autonomous systems AS1, AS2, and AS3 are transit networks, and AS4, AS5, and AS6 are stub networks. For each autonomous system, explain how the processing and advertisement for prefix 10.0.1.0/24 should be changed (compared with your answer to (a)).

### Problem 2.

Suppose a BGP router sees the following two advertisements for destination network 10.0.1.0/8:

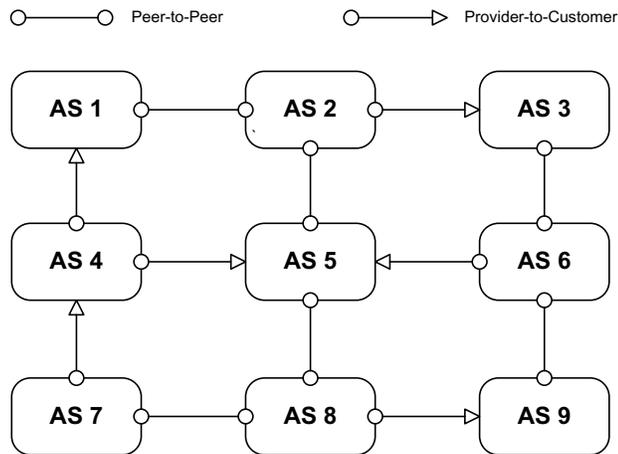
10.0.1.0/8, AS-PATH { 202, 101, 89, 59 }

10.0.1.0/8, AS-PATH { 876, 32 }

Explain how the second advertised AS-PATH could result in a longer route.

**Problem 3.**

Consider the network of autonomous systems shown in the figure. The edges indicate the peer relationships and the customer/provider relationships between the autonomous system (For a customer-provider relationship, the circle indicates the provider and the triangle indicates the customer).



- a. Determine if the following pairs of autonomous systems can exchange traffic with each other via a BGP route. For each case, briefly explain your answer. If a route exists, provide the likely routing path between the autonomous systems. If a route does not exist, provide the reason.
  - a1) AS 1 and AS 9.
  - a2) AS 2 and AS 8.
  - a3) AS 7 and AS 3.
  - a4) AS 4 and AS 6.
  - a5) AS 1 and AS 6.
  
- b. Suppose that the relationship between AS 2 and AS 5 is changed to a provider-to-customer relationship, with AS 5 as provider and AS2 as customers. Which of your answers to part (a.) change and which remain the same? If an answer changes, provide an explanation (give a reason if a route does not exist and provide the route when a route exists).