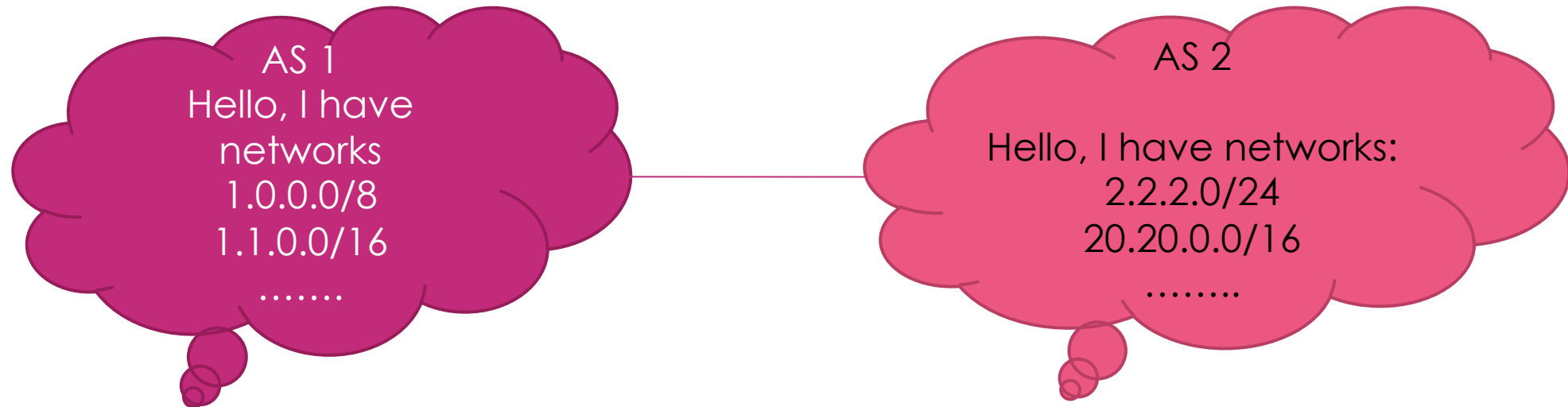


Non optimal routing
caused by incompatibility
of 32-bit ASN with the old
router software.

KAZRENA CASE STUDY

BGP - Exterior Routing Protocol



Autonomous System

- ▶ What is an Autonomous System (AS)?
 - ▶ A set of routers under a single technical administration, using an *interior gateway protocol (IGP)* and common metrics to route packets within the AS and using an *exterior gateway protocol (EGP)* to route packets to other AS's
 - ▶ Sometimes AS's use multiple IGPs and metrics, but appear as single AS's to other AS's
- ▶ Each AS assigned unique ID
- ▶ AS's peer at network exchanges

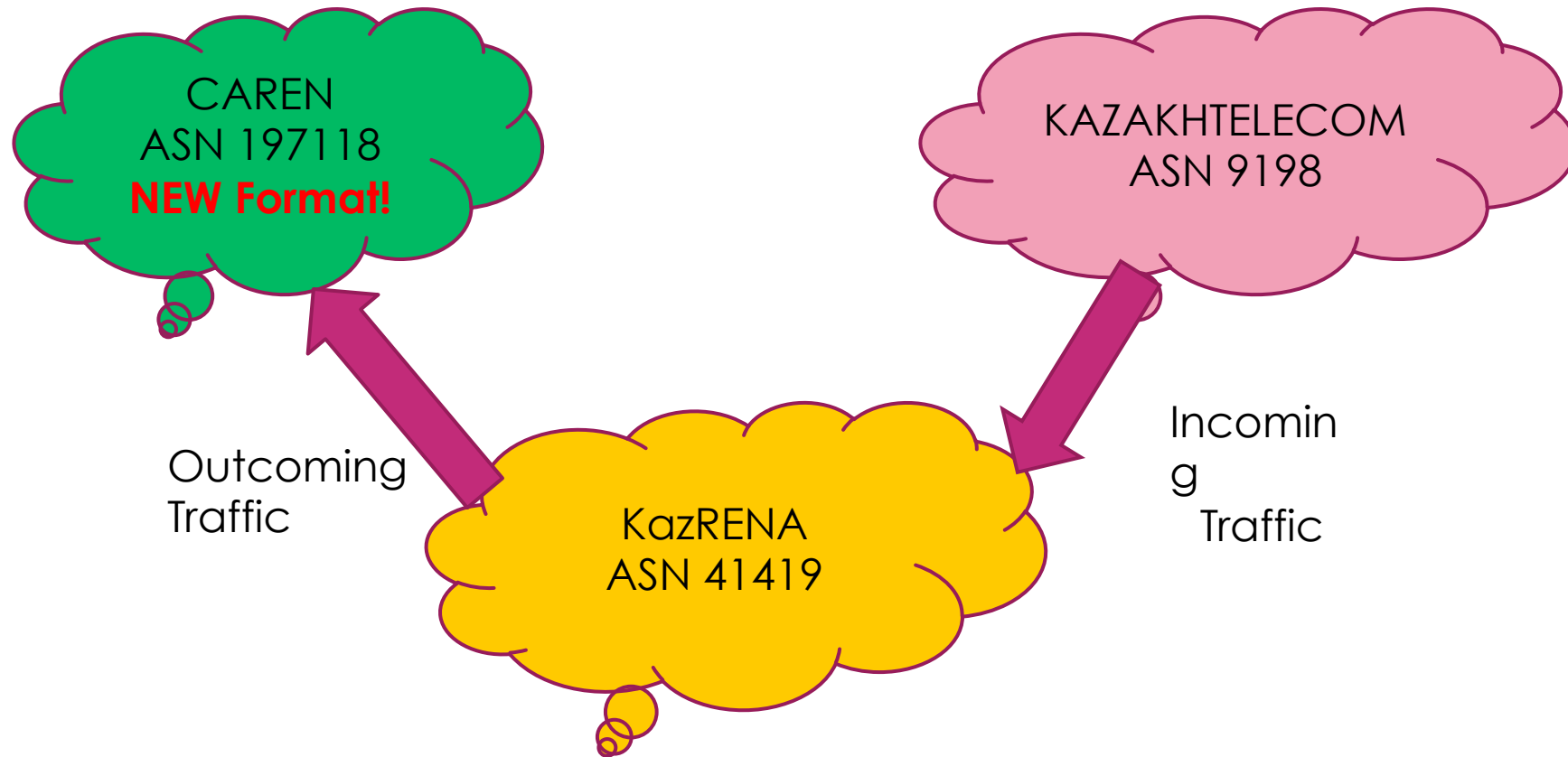
AS Numbers (ASN)

- ▶ ASN is unique identifier of autonomous systems
- ▶ Initially, ASN was 16-bit binary number
- ▶ Maximum number of ASN – 65535
- ▶ Now we are running out of 16-bit ASN
- ▶ In 2007 IETF adopted new 32-bit format of ASN (RFC4893)

Asymmetric Routing Problem

- ▶ From the very beginning of exploitation of this dual-homed environment KazRENA faced with the problem asymmetric routing.
- ▶ Packets were sent via GEANT but returned via local ISP.

BGP asymmetric routing in KazRENA



Routing software supporting of 32-bit Asn

- ▶ Cisco IOS 12.4(24)T, 12.0(32)S12 and above
Cisco IOS XR 3.4(1) and above
Juniper JUNOS 9.1R1 and above
Juniper JUNOSe 4.1.0 and above
Quagga 0.99.10 and above
Redback SEOS 2.0 and above

BGP as_path issue with new format ASN

- ▶ Router with outdated software without support of new format ASN replaces 32-bit ASN with special 16-bit placeholder ASN – 23456.
- ▶ That causes problems with BGP AS_PATH attribute:
- ▶ If there are several 32-bit ASes in AS_PATH all of them replaced by the same placeholder 16-bit ASN.
- ▶ As analysis shows some ISPs use routing policies which gives very low priority for AS_PATH with ASN 23456.

Research Topic

- ▶ During writing this article new set of the manual tracing by using several looking glasses were made and no placeholder 16-bit ASN 23456 was found.
- ▶ But the scale of this tracing was not large.
- ▶ It is interesting to test global Internet by some automated tool to know if there are ASes which are not upgraded their router software yet. This research task could be good project for RIPE



▶ Thank for
attention!