KHALED ROUTING PROTOCOL (KRP)

https://www.ietf.org/archive/id/draft-omar-krp-06.txt

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- KRP is a new Exterior Gateway Protocol (KRP) that is used to route IP packets from the source host to the destination host through various Autonomous Systems (ASs) over the global Internet.

- The enhancements that KRP adds are:

a) Decreases the BGP routing table by 80%.

b) Enhancing the routing function.

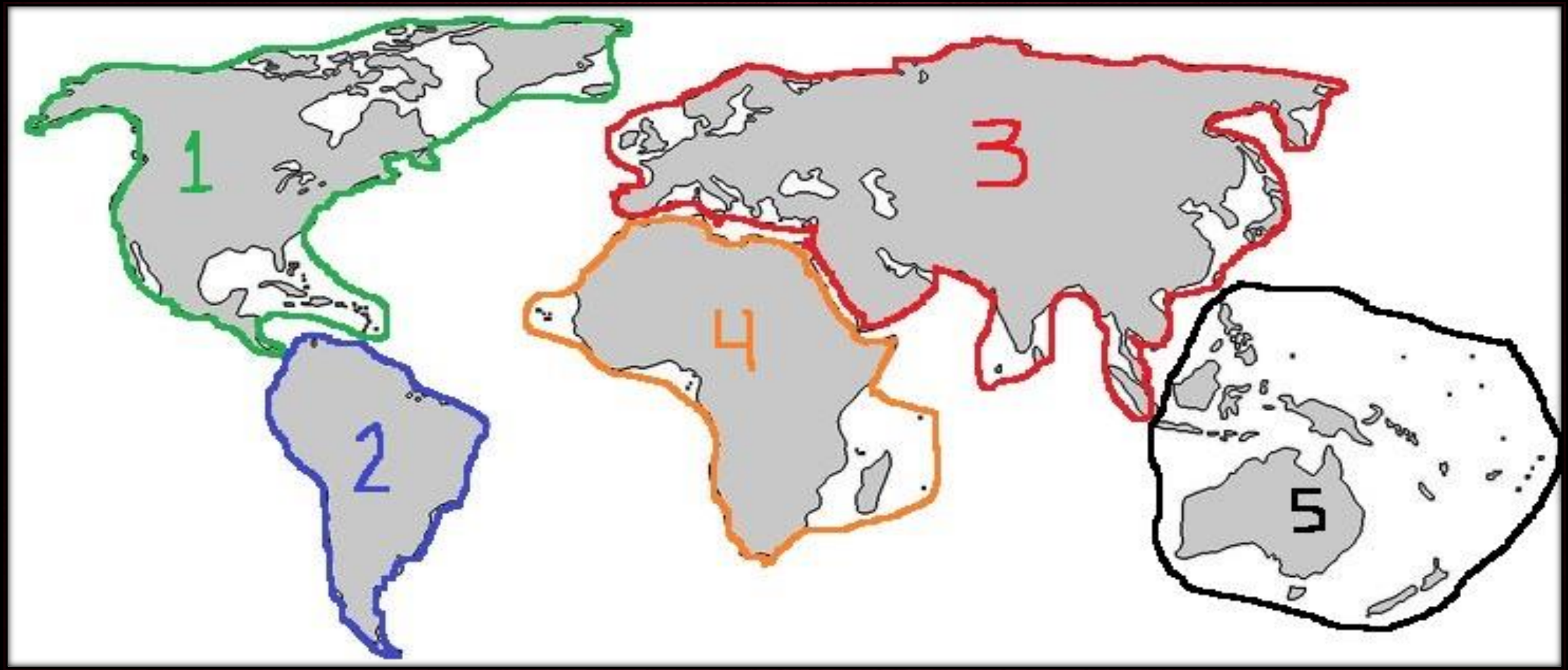
c) Enhancing the QoS.

KRP REGIONS

The globe will be subdivided into 5 logical Regions.

Region Number (RN)→ A unique number that identifies a Region.

KRP REGIONS



KRP REGIONS

- The 1st hexadecimal digit of the 2nd group of an IPv6 address determines on which Region Number this IPv6 address is located.

2001:2D51:8A51:4D24::/64 ➔ Region Number 3

- The 1st octet of an IPv4 address determines on which Region Number this IPv4 address is located.

80.144.15.22 ➔ Region Number 4

REGION NUMBER TABLE (RNT)

Region Number (RN)	1st Hexadecimal Digit Of the 2nd group of an IPv6 address	1st Octet Of an IPv4 address
1	0 – 5 – A – F	ARIN Pool
2	1 – 6 – B	LACNIC Pool
3	2 – 7 – C	RIPE NCC/APNIC Pool
4	3 – 8 – D	AFRINIC Pool
5	4 – 9 – E	APNIC Pool

KRP ROUTERS

- Regional Boarder Router (RBR).
- Regional Router (RR).
- Local KRP AS Router (LKAR).

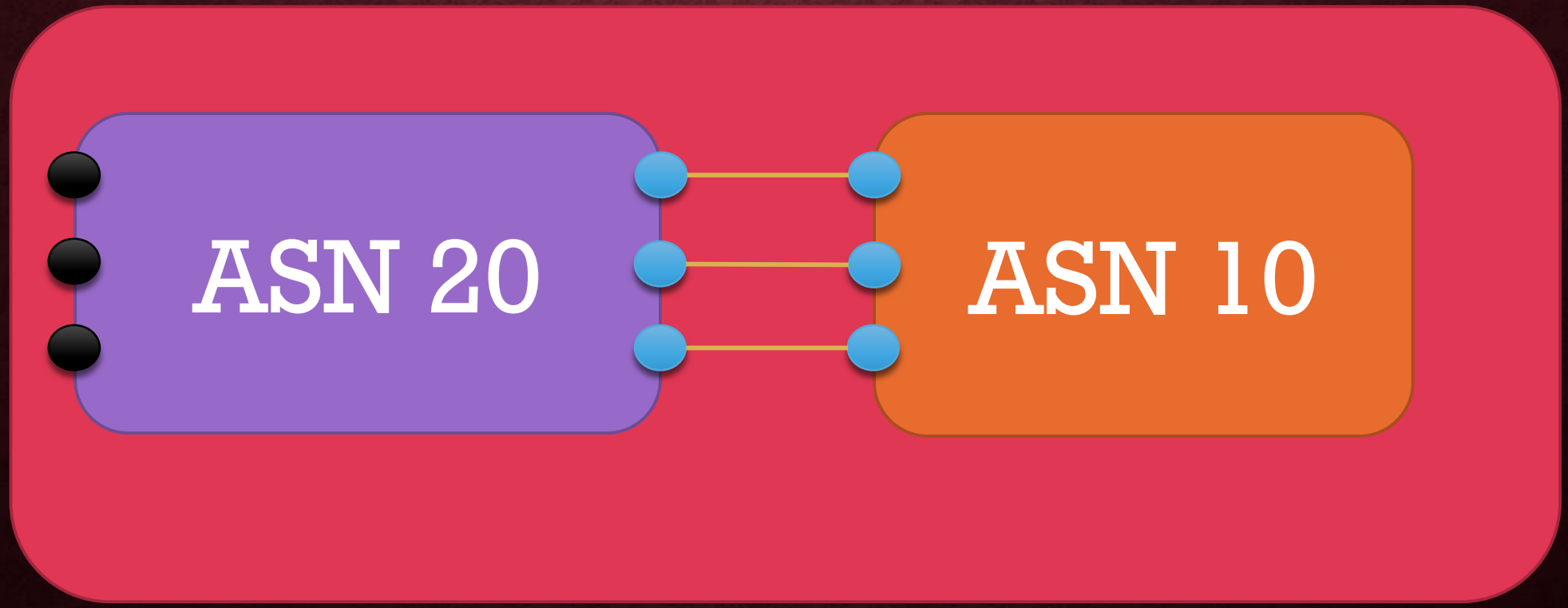
REGIONAL BOARDER ROUTER (RBR)

REGIONAL BOARDER ROUTER (RBR)

A router in a Region (with an Assigned RN) that has at least one interface connected to a router's interface in another different region (with another assigned RN).

REGIONAL ROUTER (RR)

RN 3

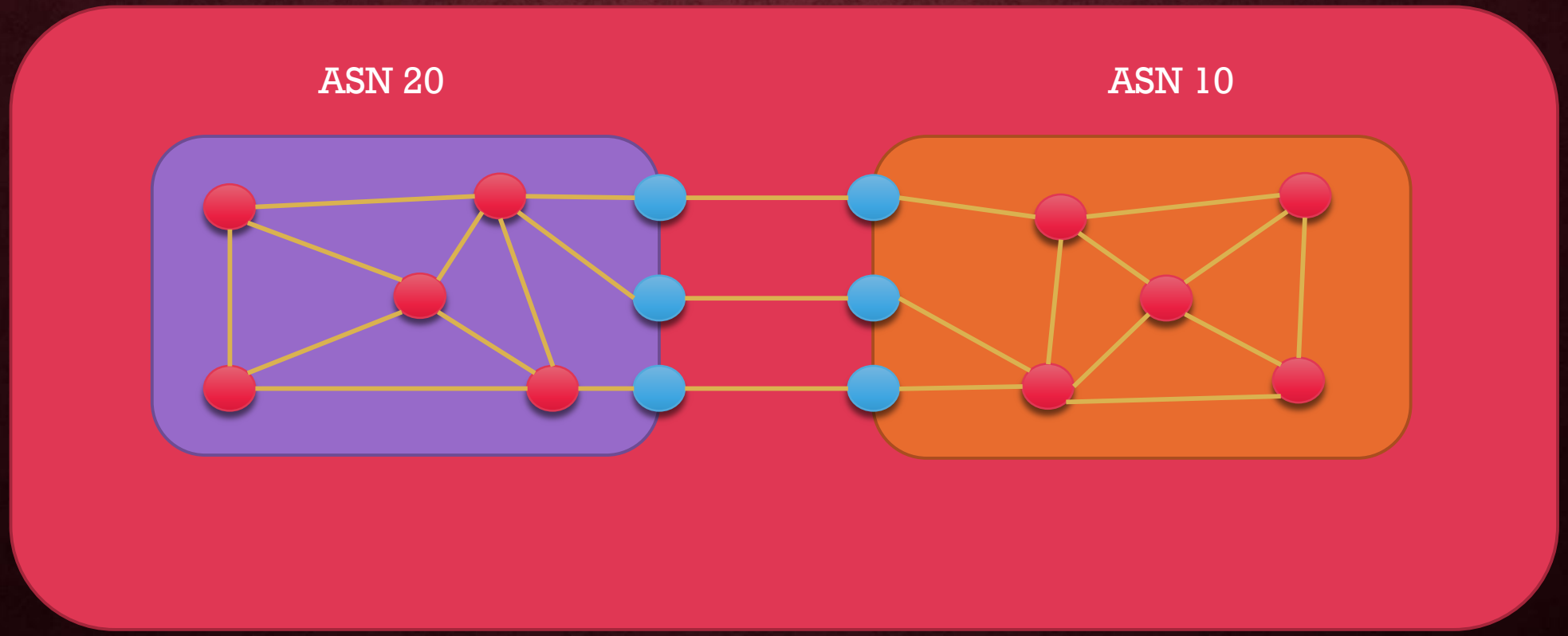


REGIONAL ROUTER (RR)

A router in a local AS that has at least one interface connected to a router's interface in another different AS in the same region.

LOCAL KRP AS ROUTER (LKAR)

RN 3



LOCAL KRP AS ROUTER (LKAR)

A router in an AS that has all interfaces connected to other routers in the same AS in the same region.

KRP ROUTERS

- Each KRP router is configured with a Region Number (RN) that identifies in which region that router is located.
- All KRP routers' interfaces will be assigned by default to the configured Region Number (RN).

- First, the two connected KRP routers' interfaces exchange their RNs:

  If they are the same, the two KRP routers are RRs.

  If they are different, the two KRP routers are RBRs.
- Second, the two connected KRP routers' interfaces exchange their KRP ASNs:

  If they are the same, the two KRP routers are LKARs.
  If they are different, the two KRP routers are RRs.

Note:-

- For ISPs and Enterprises, the RN and KRP ASN are configured **manually** on every KRP router.

- For Enterprises, the RN and KRP ASN must be stored on every assigned GUA (in case of IPv6) and on every public IP address (in case of IPv4).

KRP FORWARDING MECHANISM

KRP requires the IPv6 and IPv4 assignment for enterprises must follow these requirements:

a) The 2nd two groups of an IPv6 address are represented as follows:

xxxx|yyyy|yyyy|yyyy:yyyy|yyyy|yyyy|yyyy (Binary digits)

XYYY:YYYY (Hexa-decimal digits)

where X hex-digit is associated with a specific Region Number (RN). and XYYY.YYYY hex digits represents the KRP ASN.

KRP FORWARDING MECHANISM

b) The 4 octets of an IPv4 address are represented as follows:

xxxxxxxx.yyyyyyyy.yyyyyyyy.yyyyyyyy (Binary digits)

XXYY.YYYY (Hexa-decimal digits)

where XX hex-digits are associated with a specific Region Number (RN).
and XXYY.YYYY Hex digits represents the KRP ASN.

Note:-

- The Region Number (RN) is unique for every region.
- The KRP ASN must be unique for every AS.
- For IPv4, the 4 octets are represented in decimal in the IPv4 address itself, but the KRP ASN is represented in 8 hexa-decimal digits.
- For IPv4, Enterprises can be assigned more than one KRP ASN.

KRP TABLES AND MESSAGES

There are 3 types of tables, 2 RBR messages and 1 RR message that KRP uses:

KRP ROUTER REGIONAL TABLE (RT)

- Each RBR and RR creates its own Regional Table (RT).

- The Regional Table (RT) is as follows:

Local RN	Remote RN	Traffic Class	Local KRP ASN	RBR KRP ASN

KRP ROUTER FORWARDING TABLE (FT)

- The Forwarding Table (FT) is as follows:

Local KRP ASN	Remote KRP ASN	RBR KRP ASN	Best AS Path	Output Interface	Next-hop IP Address

KRP ROUTER IGP ROUTING TABLE (IRT)

- The IGP Routing Table is as follows:

Prefix (Subnet)	Metric	Output Interface	Next-hop IP Address

RBR MESSAGES

- RBR Advertised Message Information for the local region's RRs is as follows:

Remote RN	RBR KRP ASN	Traffic Class	No. of Hops	RBR IP Address

- RBR Advertised Message Information for the remote region's RBR is as follows:

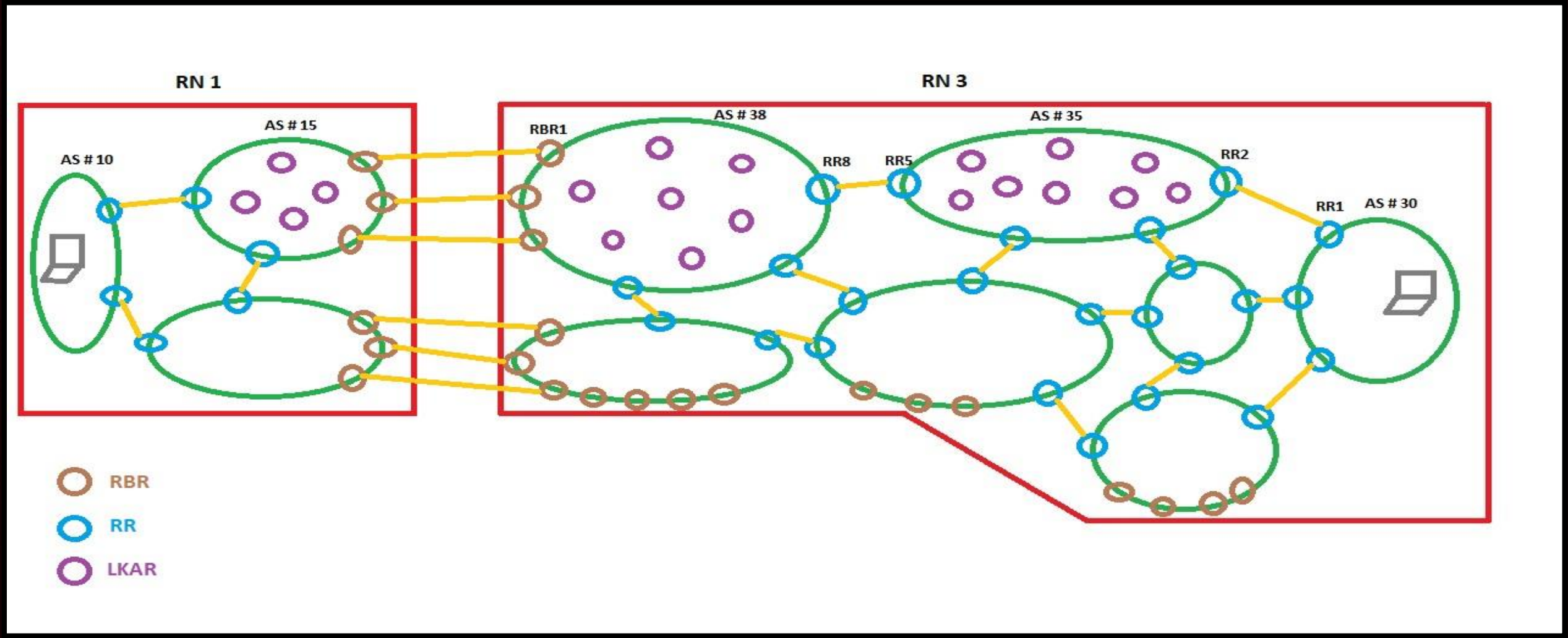
Local RN	Remote RN	Traffic Class	No. of Hops	Timeout Value	RBR KRP ASN

RR MESSAGE

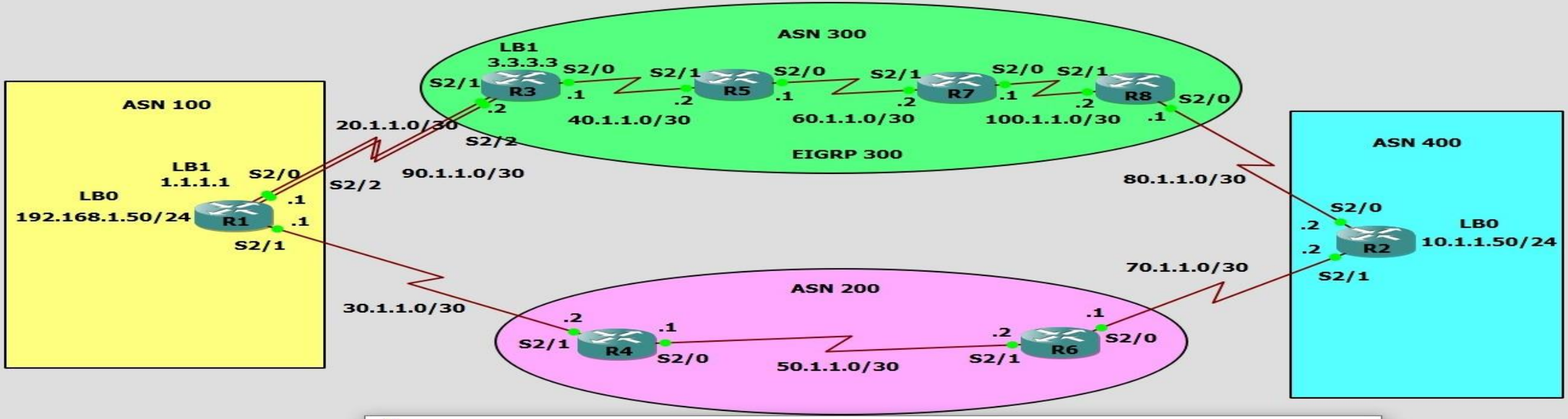
- RR Advertised Message Information for the local AS is as follows:

Local KRP ASN	Remote KRP ASN	Traffic Class	RR IP Address

EXAMPLE


RN 1
RN 3
AS # 10
AS # 15
RBR1
AS # 38
RR8
RR5
AS # 35
RR2
RR1
AS # 30
RBR
RR
LKAR

AS WEIGHT

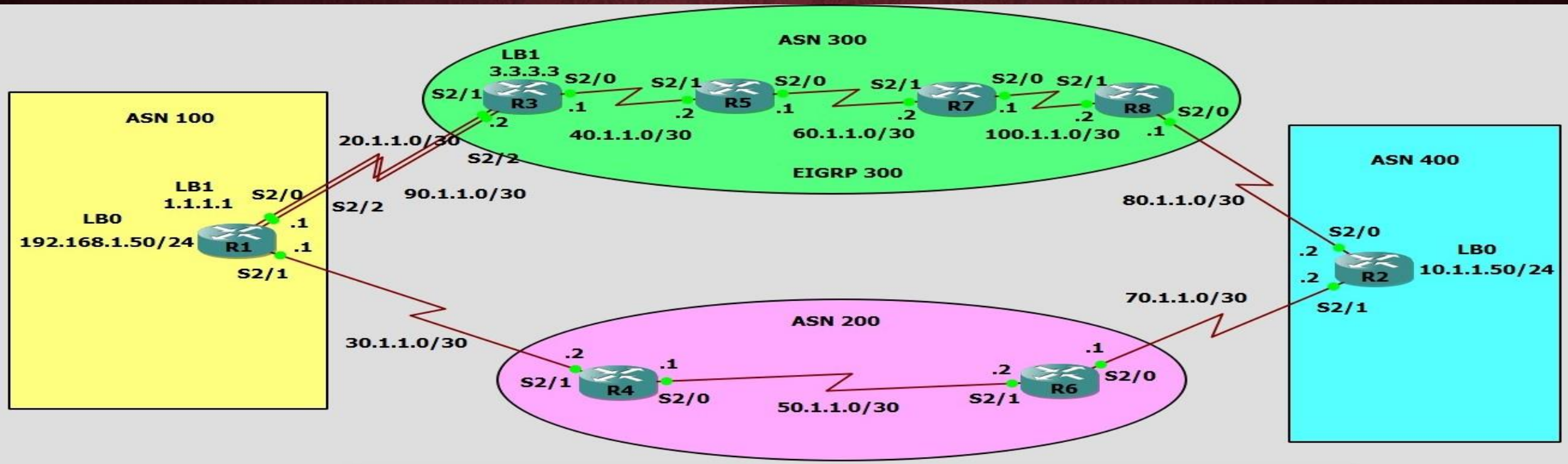


R1

	Network	Next Hop	Metric	LocPrf	Weight	Path
*>	10.1.1.0/24	3.3.3.3			0	300 400 i
*		30.1.1.2			0	200 400 i
r>	20.1.1.0/30	3.3.3.3	0		0	300 i
r>	30.1.1.0/30	30.1.1.2	0		0	200 i
*>	40.1.1.0/30	3.3.3.3			0	300 i
*>	50.1.1.0/30	30.1.1.2	0		0	200 i
*>	60.1.1.0/30	3.3.3.3			0	300 i
*	70.1.1.0/30	3.3.3.3			0	300 400 i
*>		30.1.1.2			0	200 i
*>	80.1.1.0/30	3.3.3.3			0	300 i
*		30.1.1.2			0	200 400 i
r>	90.1.1.0/30	3.3.3.3	0		0	300 i
*>	100.1.1.0/30	3.3.3.3			0	300 i
*>	192.168.1.0	0.0.0.0	0		32768	i

R1#

AS WEIGHT



R1

```
R1#traceroute 10.1.1.50
Type escape sequence to abort.
Tracing the route to 10.1.1.50
VRF info: (vrf in name/id, vrf out name/id)
  1 20.1.1.2 [AS 300] 80 msec 48 msec 28 msec
  2 40.1.1.2 [AS 300] 68 msec 80 msec 64 msec
  3 60.1.1.2 [AS 300] 100 msec 132 msec 76 msec
  4 100.1.1.2 [AS 300] 100 msec 196 msec 184 msec
  5 80.1.1.2 [AS 300] 252 msec 256 msec 184 msec
R1#
```