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OSPF RID's, BGP RID's, The BGP Rule of Synchronization and Route-Reflectors

To initiate this discussion, let's restate the Rule of Synchronization:

An IBGP learned prefix will not be advertised to another BGP speaker unless that same prefix resides in the IBGP speaker's local IGP table. The IGP table in this context is the forwarding table which can be viewed by "show ip route".

The Rule of Synchronization is an anti-blackholing measure. It prevents an IBGP speaker from advertising an IBGP learned prefix that the speaker itself has no route for. Stated another way, only when an IBGP speaker possesses a corresponding IGP forwarding table entry for an IBGP learned prefix will that same IBGP speaker advertise the prefix to another BGP speaker.

The Rule of Synchronization possesses an additional requirement when OSPF is the underlying IGP within a BGP domain. Let's look at the RFC 1745 (downloadable from ftp://ftp.rfc-editor.org/in-notes/rfc1745.txt).

The "Section 3. BGP/IDRP Identifier and OSPF router ID" states:

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The BGP/IDRP identifier MUST be the same as the OSPF router id at all
times that the router is up.
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Note. This white paper will discuss only BGP.

The questions are:

1) What is BGP identifier in this context?
2) What is OSPF router id in this context?

To answer the first question, we need to refer to RFC 1771:

```
BGP Identifier:

This 4-octet unsigned integer indicates the BGP Identifier of
the sender. A given BGP speaker sets the value of its BGP
Identifier to an IP address assigned to that BGP speaker.  The
value of the BGP Identifier is determined on startup and is the
same for every local interface and every BGP peer.
```

Two things we want to stress here are:

1). The BGP Identifier of the sender. The sender is the other side of a BGP peer relationship. In case of different AS numbers, the sender is EBGP speaker; in case of the same AS number, the sender is IBGP speaker.

2). The other issue to stress is: an IP address assigned to a BGP speaker. In the CISCO implementation, it is the BGP RID: the highest IP address assigned to a loopback interface or the highest IP address assigned to an active non-loopback interface (if an IP address has not been assigned to a loopback interface) or the IP address specified in the router-id command under the router bgp configuration.

The answer for the second question is router id of the OSPF ASBR speaker; the speaker where the BGP prefix is injected into the OSPF domain.

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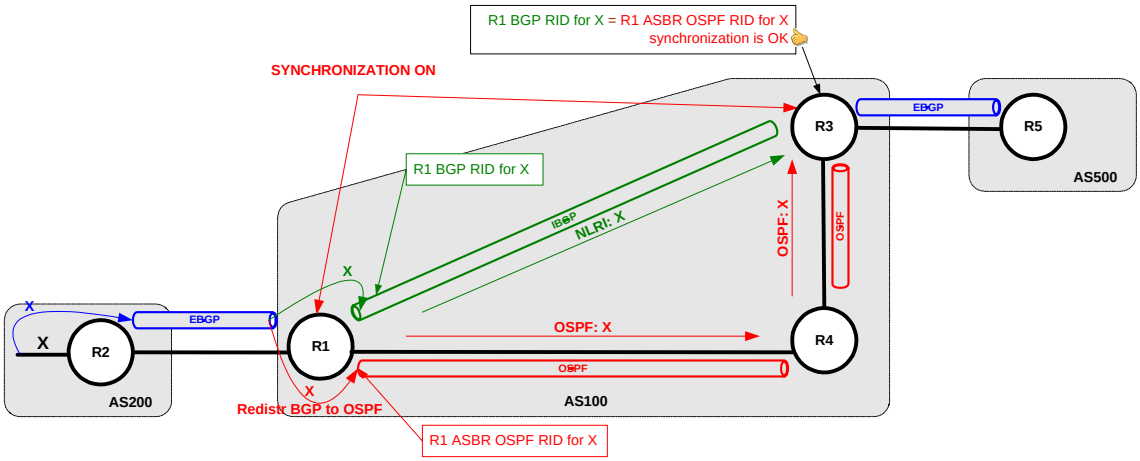
By default, the OSPF RID and BGP RID are the same on every router, since the rule for Router-ID selection is the same for both routing protocols.

The following two scenarios graphically illustrate the rules stated above.

Scenario 1

In this scenario, network X is advertised from the router R2 AS 200 and propagated to AS 100 via EBGP. R1 is the receiver of X from AS 200 to AS 100. Since AS 100 uses the synchronization approach, NLRI X is redistributed in the OSPF routing process on R1 to provide the IGP match for the BGP learned prefix.



R1 becomes the ASBR for prefix X. Prefix X is advertised via IBGP and OSPF to R3. R3 receives X both ways via IBGP and via OSPF. R3 will check the BGP identifier of prefix X which is the BGP RID of R1 and it will also check the OSPF RID which is the ASBR OSPF RID of R1. In this case, both RID-s are the same, and the synchronization rule is fulfilled.

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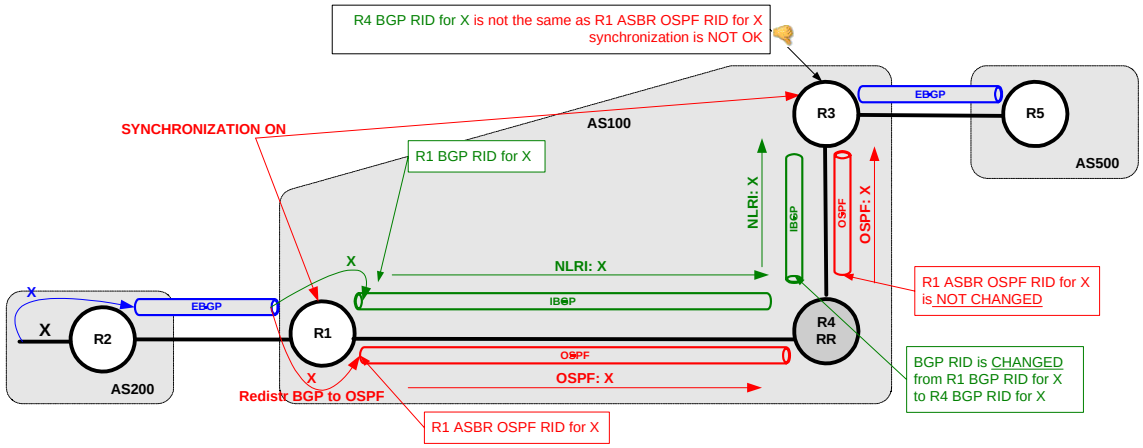
Scenario 2

Notice, there is not a direct BGP peer relationship between R1 and R3 in this scenario. Therefore, router R4 is configured as a Router Reflector.



Other conditions remain the same. R2 advertises prefix X from AS 200 to AS 100. R1 receives prefix X and redistributes it into OSPF becoming an ASBR for prefix X; in addition, R1 advertises prefix X to R4 via IBGP peer between R1 and R4. R4 receives prefix X via OSPF and floods it to R3, R4 does not change the OSPF RID for prefix X. It is still the OSPF RID of R1, the originating ASBR. Since R4 is a Route Reflector, it advertises prefix X to the IBGP peer between R4 and R3. R3 receives prefix X both ways: from the IBGP peer between R4 and R3 where R4 is the sender with the BGP Identifier set to the BGP RID of R4 and from OSPF with the R1's OSPF RID as the ASBR RID. The BGP RID for prefix X and the OSPF RID for prefix X do not match. Therefore, the rule of synchronization is not fulfilled.

Note: Other IGPs (RIP, IGRP, EIGRP, ISIS) are not affected by this behavior. The requirement for an IGP RID to match an advertising IBGP speakers RID will only occur when the Rule of Synchronization is enabled and the underlying IGP running between the IBGP speakers is OSPF. If the IGP was ISIS, EIGRP or RIP, the requirement for IGP RID's to match BGP RID's will not arise. Therefore, be on the lookout to spot this hidden issue when you encounter a scenario whenever the Rule of Synchronization is applied and the underlying IGP is OSPF.