Intra-AS Route Server

- **Proposed as a solution to the Internal BGP / IDRP “full-mesh” problem.**
  - Reduces the number of IBGP connections maintained at border routers.
  - Does not involve IGPs:
    Does not rely on extensions to any IGP.
    Does not increase amount of information maintained by IGPs.
    Does not create additional IGP traffic.
  - REQUEST mechanism allows border routers to “forget” about some IBGP advertisements.
- **Goals:**
  - Minimize changes to existing exterior gateway protocols.
  - Provide redundancy of distribution of routing information to “clients”.
  - Minimize routing information traffic to clients.
  - Distribute service load between route servers (if multiple servers present).
  - Avoid complexity.
- **Non-Goals:**
  - Route Server Discovery
  - Route Filtering

Intra-AS Route Server (2)

- **Operation Overview**
  - An AS contains one or more *Route Server Clusters* (RSC).
  - Each RSC is identified by a Route Server Cluster Identifier, which is a 16-bit number that must be unique within an AS.
  - An RSC consists of one or more *Route Servers* (RS).
  - Each border router, also known as a *Route Server Client* (RC), is assigned to an RSC.

- **Intra-Cluster operation**
  - Each RS establishes an IBGP connection with all other RSs in its cluster.
  - Each RC establishes an IBGP connection with all RSs in its cluster.
  - Each RC sends UPDATEs to all of the RSs in its cluster.
  - In most cases, only one RS will service (send UPDATES to) a client.
  - An RS does not “echo” an RC’s advertisement.
  - UPDATEs are also exchanged between RSs in a cluster.
  - RSs process new clients in such a way as to push new clients to the least loaded RS.

- **Inter-Cluster operation**
  - Full-mesh model:
    Each RS establishes an IBGP connection with all RSs in other clusters.
    UPDATEs are sent over inter-cluster IBGP connections for routes received from clients.
  - Hierarchical model:
    IBGP connections between clusters form a tree.
    UPDATEs are sent to another cluster for all routes, except those learned via that cluster.
    Responsibility of the system administrator to avoid routing loops.

Intra-AS Route Server (3)

- **Extensions to BGP:**

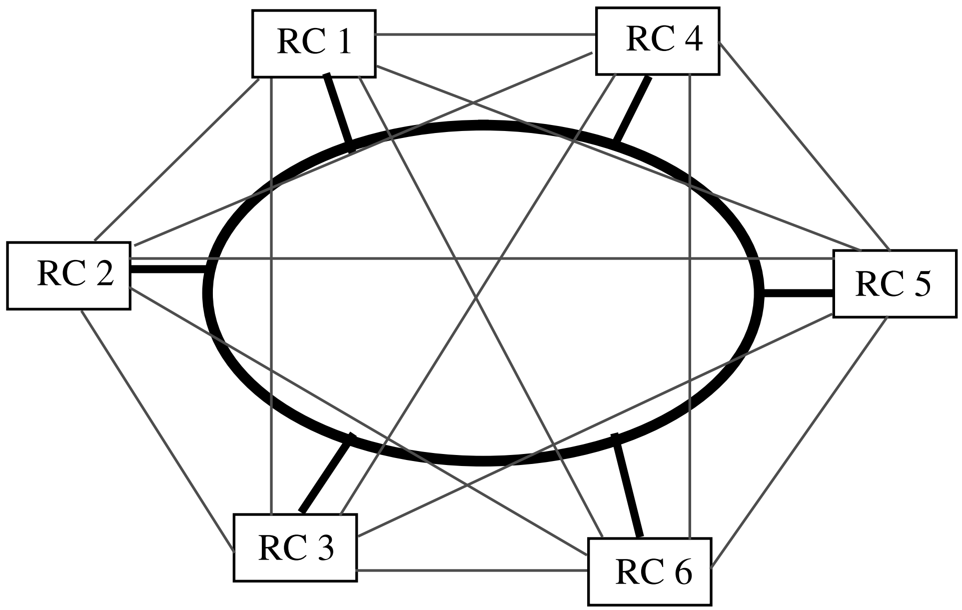
  - IDENTIFICATION message:
    Only used on RS - RS IBGP connections.
    Sent after OPEN message.
    Contains the RS Cluster ID.

  - LIST message:
    Only used on intra-cluster RS - RS IBGP connections.
    Identifies which borders routers (RCs) are being serviced by the sending RS.
    Each transmission contains ALL RCs serviced.

  - UPDATE message: IMPORT_ROUTER_ID path attribute.
    Optional, non-transitive.
    Only used in UPDATEs transmitted by RSs to RCs and other RSs.
    Contains the BGP Identifier of the border router that originated the advertisement.

  - Additional NOTIFICATION error codes and subcodes.

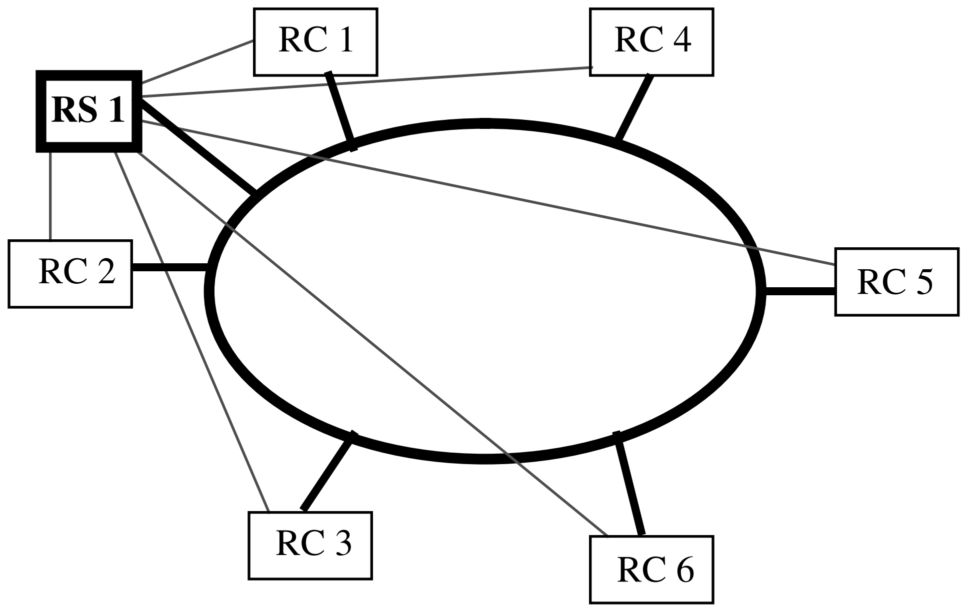
Intra-AS Route Server (4)



IBGP CONNECTIONS (15)

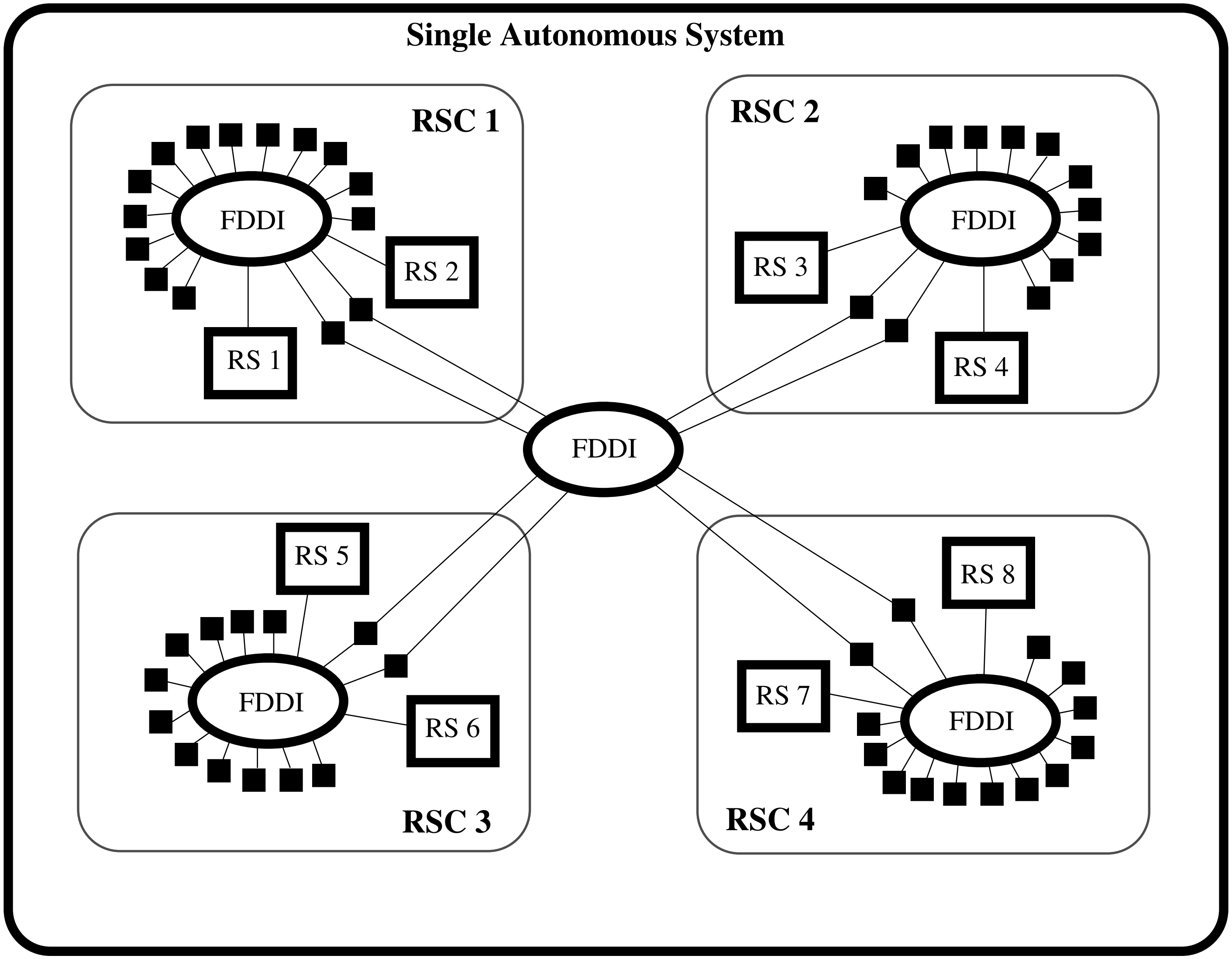
Intra-AS Route Server (5)

Introduce a single cluster with one route server.....



IBGP CONNECTIONS (6)

Intra-AS Route Server (6)



Intra-AS Route Server (7)

- **In this example: 55 border routers**
  - Using traditional IBGP: 1485 IBGP connections.
  - Adding 8 IBGP route servers in 4 clusters: 138 IBGP connections.
    110 connections between border routers (RCs) and RS.
    4 Intra-cluster RS connections
    24 Inter-cluster RS connections