# Optimizing the OSPF Data Base

Kuber Vikram Singh[1], Inderjeet Yadav[2]

[1]M.Tech Scholar, Department of Computer Science & Engineering, NGFCET,
Maharshi Dayanand University, Palwal, INDIA.
[2]Assistant Professor, Department of Computer Science & Engineering, NGFCET,
Maharshi Dayanand University, Palwal, INDIA.
*E-mail:[1]KuberVikramSingh@gmail.com, [2]yadavcse@gmail.com , www.ngfcet.com*

***Abstract : -*** OSPF routing protocol major problem are large size Per Area and OSPF maintain multiple copies of routing information's. Lower convergence time i.e. slower Processing, Band width is wasted, increase of memory needed due to OSPF large data base Per Area.

We will provide solutions for large data base problem that will increase the OSPF performance, reduce the size of routing table, and reduce the memory size, reduce hardware cost.

***Keywords****: OSPF, OSPF Data Base, Topology Table, Routing Table, Memory;*

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## 1. Introduction

The OSPF is Link-State Routing Protocol. Link-State means it uses LPU packets for forming Neighbour ship, Route Advertisement, Updating information, etc. OSPF works by forming AREA i.e. Collection of same network domain. AREA -0 i.e. Backbone area is must in a network. All areas must be collected to AREA-0 for proper functioning of network. There can be indirect-connectivity by Virtual-Links to AREA-0 by any other network Different areas communicate with each other through AREA-0 only. Therefore connectivity of each area to AREA-0 is must.AREA-0 can split into multiple small REA-0s but connectivity must be there in them.

There are different types of routers as per uses:

1. ABR-Area Boundary Router
2. ASBR-Autonomous System Boundary Router
3. BB-Backbone router in Area-0
4. DR-Designated Router
5. BDR-Backup Designated Router

LSA means Link-State-Advertisement used for sending information through areas.

**Types of LSAs**

1. LSA-type1: router
2. LSA-type2:network
3. LSA-type3:network-summary by ABR(1+2), for subnets listed in one area
4. LSA-type4: ASBR-summary by ASBR, for host route information
5. LSA-type5: AS-external by ASBR for external injected routes into OSPF
6. LSA-type6: similar to LSA5 but not supports by CISCO
7. LSA-types7: NSSA-External by ASBR inside NSSA area, instead of LSA-5

**Types of AREAs**

1. Regular AREAs
2. Special AREAs

**Special AREAs**

1. STUB: Not Support LSA type-4,5
2. Totally STUB: Not Support LSA type-3,4,5
3. NSSA: Not LSA type-4,5 but generate LSA-7 for sending External Routes
4. Totally NSSA: Not support LSA type-3,4,5

**Problem in OSPF**

Major Problem is large size Database per area i.e. Large LSDB per Area. Large LSDB results in lower convergence time. Lower convergence means slower processing and Bandwidth is wasted. Large routing table size

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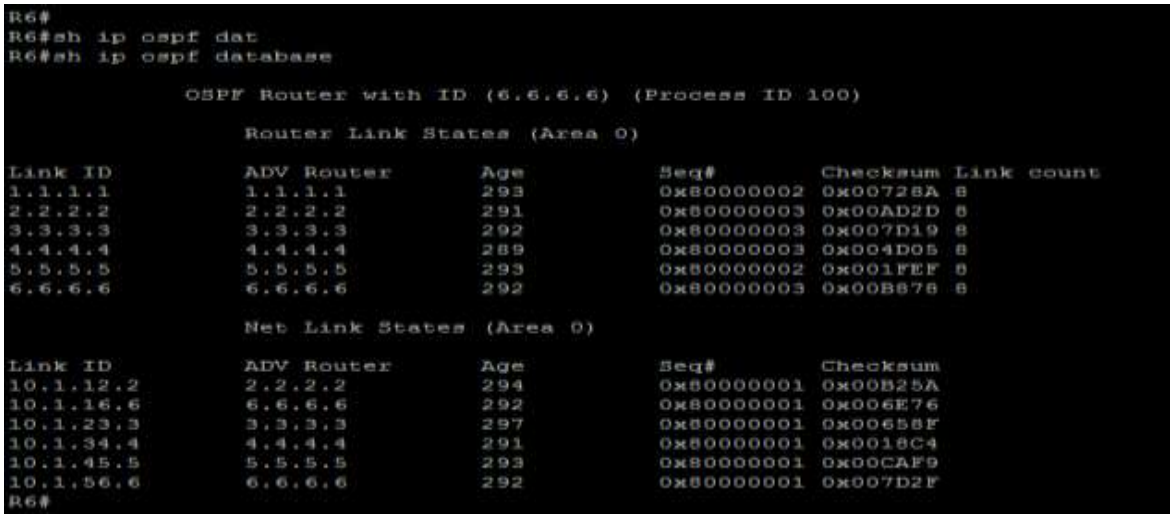

```
R6#
R6#sh ip ospf dat
R6#sh ip ospf database

            OSPF Router with ID (6.6.6.6) (Process ID 100)

                Router Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum Link count
1.1.1.1         1.1.1.1         293         0x80000002 0x00728A 8
2.2.2.2         2.2.2.2         291         0x80000003 0x00AD2D 8
3.3.3.3         3.3.3.3         292         0x80000003 0x007D19 8
4.4.4.4         4.4.4.4         289         0x80000003 0x004D05 8
5.5.5.5         5.5.5.5         293         0x80000002 0x001FEF 8
6.6.6.6         6.6.6.6         292         0x80000003 0x00B878 8

                Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
10.1.12.2       2.2.2.2         294         0x80000001 0x00B25A
10.1.16.6       6.6.6.6         292         0x80000001 0x006E76
10.1.23.3       3.3.3.3         297         0x80000001 0x00658F
10.1.34.4       4.4.4.4         291         0x80000001 0x0018C4
10.1.45.5       5.5.5.5         293         0x80000001 0x00CAF9
10.1.56.6       6.6.6.6         292         0x80000001 0x007D2F
R6#
```

**Fig. 1.1 OSPF database without route summarization**

## 2. Background

The aim is to achieve a solution for the large database per area problem encounters with OSPF. Finding a relevant solution to large database problem resulting better convergence time is the only objective.

Providing Solution for Large Database Problem. Providing intra-area solution i.e. Route-Summarization as Well as LSA Summarization within an Area. Intra-area summarization can be done by two types: route summarization and LSA summarization either manually or automatic by OSPF itself. Combining concept of EIGRP route summarization over OSPF protocol. Each router summarizes the routes by itself i.e. each router summarizes the routes present in its own type-1 LSA so that it can advertise this summary route to others OSPF neighbor routers.

Route summarization for type-1 and type-2 LSAs with in an area helps in reducing the database size as well as routing table per router per area.

## 3. Proposed Work

Route Summarization for keeping routing table small helps conserve memory and improve the time required by a router to forward packets. Route filtering allows an engineer to reduce the size of routing table, but with the side effect of limiting the destinations reachable by each router. That effect may or may not be acceptable, given the other design goals of a particular inter network, and given the need to operate the network.

Route summarization allows an engineer to keep track the routing table more manageable, without limiting reach ability. Instead of advertising the routers for every subnet, a router advertises a single route that represents the same range of IP address as more than one subnet. Each router can forward packets to the same set of addresses (destinations), but the routing table is smaller.

Thus, our proposal for OSPF intra-area route summarization is that the summary route advertised by an OSPF router within an area (i.e. intra-area) should be flooded to all OSPF routers including ABR. But other OSPF routers only receives the summary route, while ABR receives all the information i.e. summary route plus the routers in LSA-1 (all link-counts) with LSA-1 router-id corresponding to each router within that area, so that inter-area query scope could be summarize i.e. query-scope for inter-area for that summary route will be reduced. Thus, save time and traffic (bandwidth) for unnecessary travelling of packet to that router and then discard by particular OPSF router if route is not present within the advertised summary route of that router.

The LSA exchange only carry the summary route to other OSPF neighbor's routers, rather than complete network information type-1 LSA and router with in an area. Each router thus calculates the SPF process on that summary route only.

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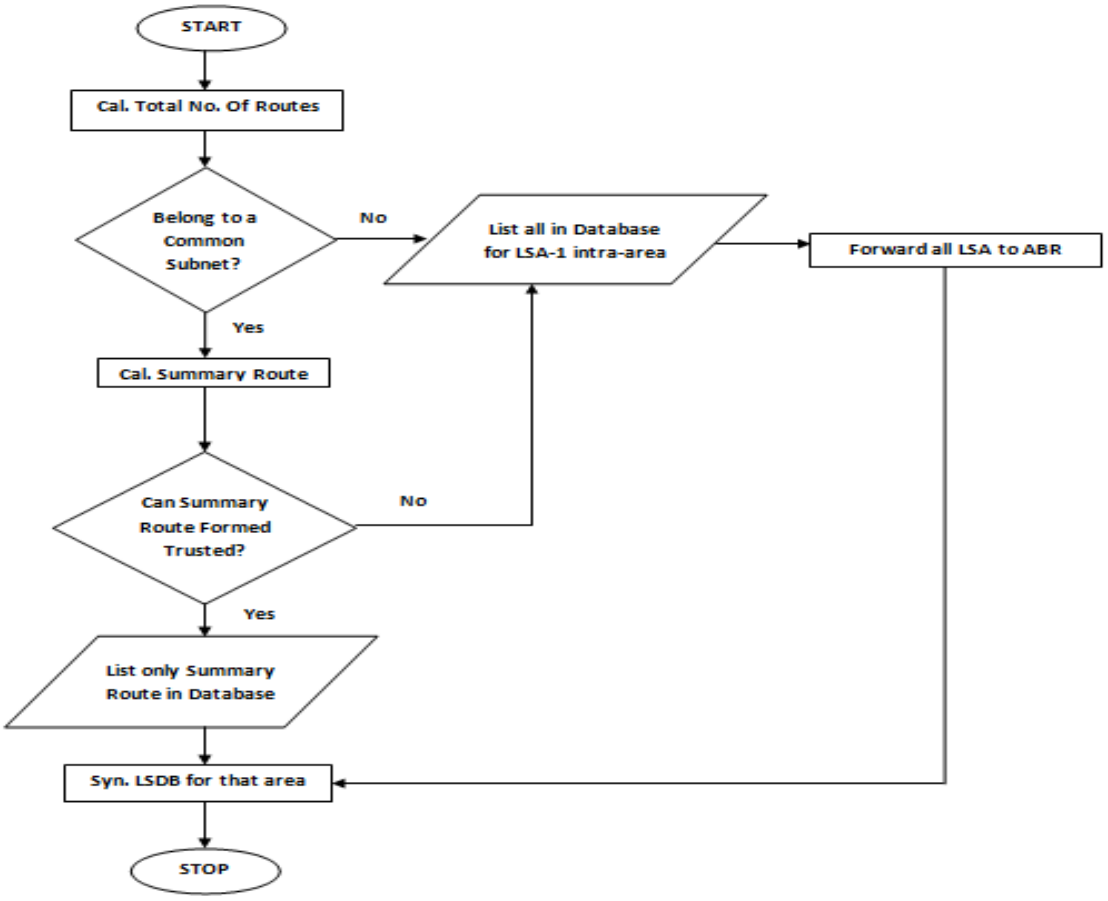


**Fig. 3.1 Flow chart of New OSPF Design**

### 3.1 PROPOSED OSPF DESIGN IMPLEMENTATION SNAPSHOTS

This new design has same number of routes but with reduced size database and reduced size routing table as shown

```
OSPF DataBase of ABR with Router-id :[6]

Router LSA : Type-1 Link State Advertisement

R-id[1]: 10 1 0 0  mask 21
R-id[2]: 20 1 0 0  mask 21
R-id[3]: 30 1 0 0  mask 21
R-id[4]: 40 1 0 0  mask 21
R-id[5]: 50 1 0 0  mask 21
R-id[6]: 60 1 0 0  mask 21

Summary LSA : Type-3 Link State Advertisement

R-id[6]: 0 0 0 0  mask 0
```

**Fig. 3.2 OSPF NEW DATABASE**

After intra-area route summarization we get a reduced database for each router within a common area. The size is reduced to much extend as compared to previous OSPF database.

The routing table for ABR must contain all the routes within the network so as to have a better connectivity between different areas.

This will surely not reduce the ABR overhead but will help in saving unwanted traffic flowing through the network if route is not present in summary route generated by a particular OSPF router.

OSPF new routing table of ABR after route summarization as shown

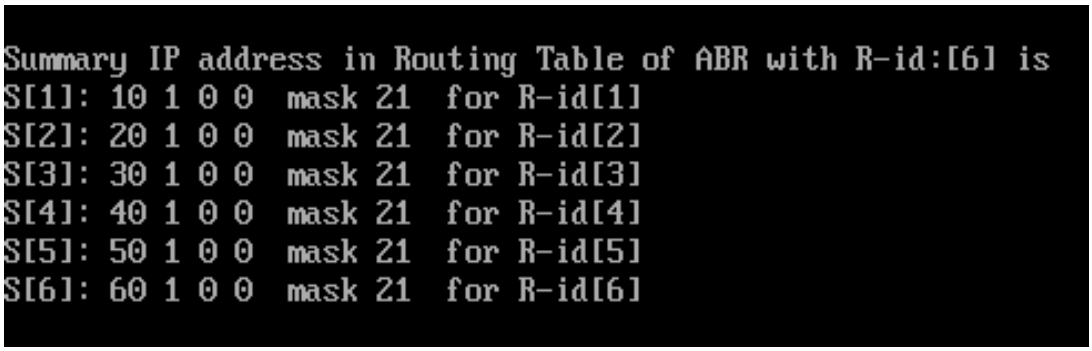


**Fig.3.3 OSPF new routing table of ABR after route summarization**

### 3.2 Proposed Work Advantages

1. Reduced the size of routing table by nearly 33%
2. Reduced size Database size by almost 40%
3. Saving hardware cost by around 25%
4. Saving look-up time of Routing Table by 33%
5. Reduces query scope within an OSPF area
6. Compatible with current OSPF working

## 4. Conclusion Future work

Better Processing and lower convergence time is always a challenge in networking and saving bandwidth is always required.

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