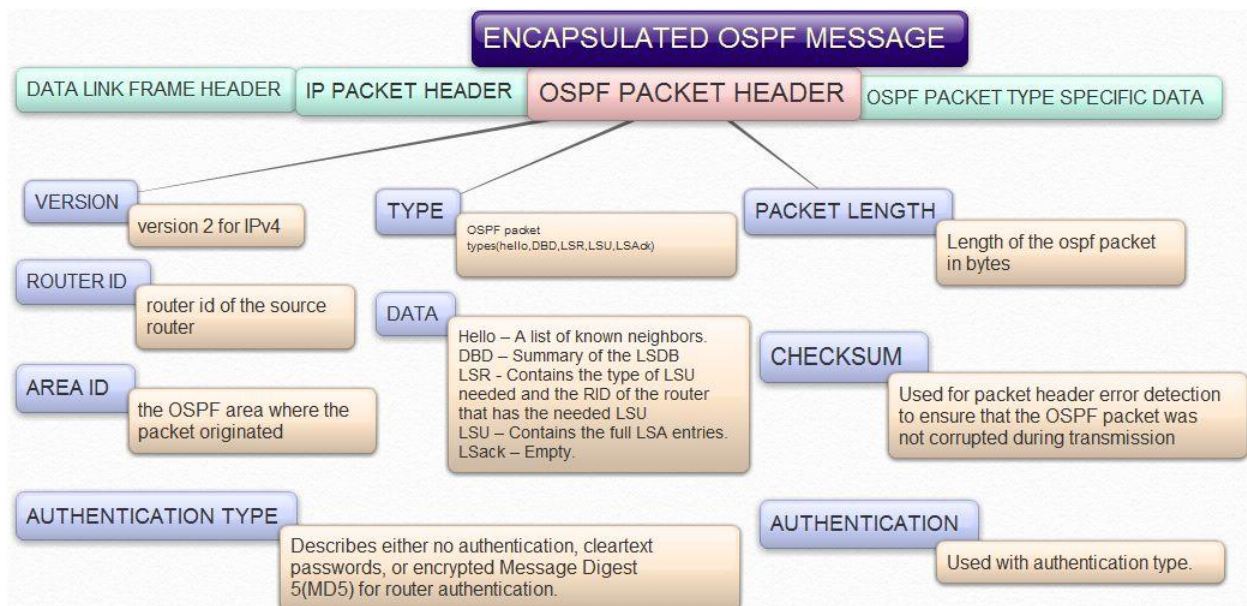
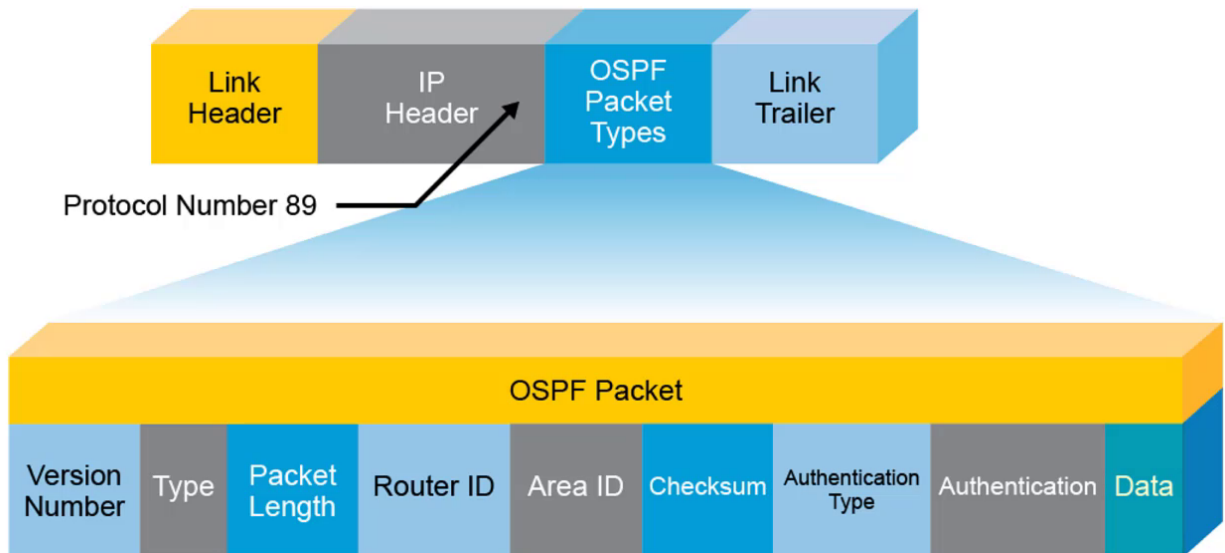


## OSPF Packet Types:

All OSPF packets share a common OSPF Header. This header allows the receiving router to validate and process the packets. The format of common OSPF header is:



Version	OSPF version 2 for IPV4.
Message Type	Type of OSPF packet, 1 for Hello Packet, 2 for Database Descriptor Packet, 3 for Link State Request Packet, 4 for Link State Update Packet, and 5 for Link State Ack Packet.
Packet Length	Total length of OSPF Packet.
Sources OSPF Router	The Router ID of the Advertising Router.
Area ID	32-bit Area ID assigned to the interface sending the OSPF packet.
Checksum	Standard IP Checksum of OSPF Packet.
Auth Type	Authentication Type, 0 for no Password, 1 for Plain-text password and 2 for MD5.
Auth Data	Authentication data to verify the packet's integrity.

To check all five different types of OSPF packets first start Wireshark capture and then enable OSPF protocols on both routers R1 and R2.



## 1. Hello Packet:

Hello packets are OSPF packet Type 1. These packets are multicast periodically to 224.0.0.5 multicast address on all interfaces enabling dynamic discovery of neighbors and maintain neighbor relationships. Hello Message is used for Neighbor Discovery and Keep Alive. However, there are various contents that are sent from one router to another router. You can also see all these contents with the help of Wireshark. OSPF Version, Type 1, Packet Length, Router-ID, Area-ID, Checksum, Authentication Type, Authentication data, Network Mask, Hello Interval, dead Interval, Priority, Neighbor Router-ID, DR, BDR Router-ID, Stub-Flag and more.

```
▼ Open Shortest Path First
  ▼ OSPF Header
    Version: 2
    Message Type: Hello Packet (1)
    Packet Length: 48
    Source OSPF Router: 2.2.2.2
    Area ID: 0.0.0.0 (Backbone)
    Checksum: 0xb993 [correct]
    Auth Type: Null (0)
    Auth Data (none): 0000000000000000
  ▼ OSPF Hello Packet
    Network Mask: 255.255.255.252
    Hello Interval [sec]: 10
    ▶ Options: 0x12, (L) LLS Data block, (E) External Routing
    Router Priority: 1
    Router Dead Interval [sec]: 40
    Designated Router: 10.1.12.2
    Backup Designated Router: 10.1.12.1
    Active Neighbor: 1.1.1.1
  ▶ OSPF LLS Data Block
```

## 2. Database Descriptor Packet:

The DBD packets are OSPF packet Type 2. This message is used to synchronize LSDB (Link State Database) between two Routers. The OSPF router summarizes the local database and the DBD packets carry a set of LSAs belonging to the database. When a neighbor sees an LSA that is more recent than its own database copy, it requests this newer LSA from the neighbor. This message usually used in the Ex-Start state.

No.	Time	Source	Destination	Protocol	Length	Info
83	169.307836159	10.1.12.1	10.1.12.2	OSPF	78	DB Description
85	169.313106985	10.1.12.2	10.1.12.1	OSPF	78	DB Description
86	169.320372295	10.1.12.1	10.1.12.2	OSPF	78	DB Description
87	169.331753458	10.1.12.2	10.1.12.1	OSPF	618	DB Description
89	169.338714857	10.1.12.1	10.1.12.2	OSPF	78	DB Description

```
▶ Frame 83: 78 bytes on wire (624 bits), 78 bytes captured (624 bits) on interface eth0, id 0
▶ Ethernet II, Src: 50:0b:00:01:00:00 (50:0b:00:01:00:00), Dst: 50:0b:00:03:00:00 (50:0b:00:03:00:00)
▶ Internet Protocol Version 4, Src: 10.1.12.1, Dst: 10.1.12.2
▼ Open Shortest Path First
  ▼ OSPF Header
    Version: 2
    Message Type: DB Description (2)
    Packet Length: 32
    Source OSPF Router: 1.1.1.1
    Area ID: 0.0.0.0 (Backbone)
    Checksum: 0x935c [correct]
    Auth Type: Null (0)
    Auth Data (none): 0000000000000000
  ▼ OSPF DB Description
    Interface MTU: 1500
    ▶ Options: 0x52, 0, (L) LLS Data block, (E) External Routing
    ▶ DB Description: 0x07, (I) Init, (M) More, (MS) Master
    DD Sequence: 4252
  ▶ OSPF LLS Data Block
```

### 3. Link State Request Packet:

The Link State Request (LSR) packet is an OSPF packet Type 3. It is used to request specific link-state records from an OSPF neighbor router. However, this is initiated by the OSPF Master which is chosen in Ex-Start state. After DBD packets exchange process, the router may find it does not have an up-to-date database. The LSR packet is used to request pieces of neighbor database that is more up-to-date.

The image shows a Wireshark capture of an OSPF Link State Request (LSR) packet. The packet list pane shows a single entry: No. 88, Time 169.337577321, Source 10.1.12.1, Destination 10.1.12.2, Protocol OSPF, Length 382, Info LS Request. The packet details pane shows the following structure:

- Frame 88: 382 bytes on wire (3056 bits), 382 bytes captured (3056 bits) on interface eth0, id 0
- Ethernet II, Src: 50:0b:00:01:00:00 (50:0b:00:01:00:00), Dst: 50:0b:00:03:00:00 (50:0b:00:03:00:00)
- Internet Protocol Version 4, Src: 10.1.12.1, Dst: 10.1.12.2
- Open Shortest Path First
  - OSPF Header
    - Version: 2
    - Message Type: **LS Request (3)**
    - Packet Length: 348
    - Source OSPF Router: 1.1.1.1
    - Area ID: 0.0.0.0 (Backbone)
    - Checksum: 0xe4a8 [correct]
    - Auth Type: Null (0)
    - Auth Data (none): 0000000000000000
  - Link State Request
  - Link State Request
  - Link State Request

### 4. Link State Update Packet:

Link State Update (LSU) packets are OSPF packet Type 4. LSU (Link State Update), is a reply to LSR (Link State Request). When the OSPF Master router, sends LSR to slave router, then Slave Router provides Link State Records to Master Router using LSU (Link State Update) message. Each LSA contains routing, metric and topology information to describe a portion of OSPF network. The local router advertises LSA within an LSU packet to its neighboring routers. In addition, the local router advertises the LSU packet with information in response to an LSR packet.

The image shows a Wireshark capture of an OSPF Link State Update (LSU) packet. The packet list pane shows two entries: No. 75, Time 158.473195184, Source 10.1.12.1, Destination 224.0.0.5, Protocol OSPF, Length 98, Info LS Update; and No. 76, Time 158.546679769, Source 10.1.12.1, Destination 224.0.0.5, Protocol OSPF, Length 110, Info LS Update. The packet details pane for the first entry shows the following structure:

- Frame 75: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface eth0, id 0
- Ethernet II, Src: 50:0b:00:01:00:00 (50:0b:00:01:00:00), Dst: IPv4mcast\_05 (01:00:5e:00:00:05)
- Internet Protocol Version 4, Src: 10.1.12.1, Dst: 224.0.0.5
- Open Shortest Path First
  - OSPF Header
    - Version: 2
    - Message Type: **LS Update (4)**
    - Packet Length: 64
    - Source OSPF Router: 1.1.1.1
    - Area ID: 0.0.0.0 (Backbone)
    - Checksum: 0x99fc [correct]
    - Auth Type: Null (0)
    - Auth Data (none): 0000000000000000
  - LS Update Packet
    - Number of LSAs: 1
      - LSA-type 5 (AS-External-LSA (ASBR)), len 36

## 5. Link State Acknowledgment Packet:

Link State Acknowledgment (LSAck) packets are OSPF packet Type 5. As the name suggests, the LS-Ack message is used for acknowledgment purposes. This acknowledgment is for LSU message. With the help of this message, we can examine that the receiver end OSPF router successfully receives LSU (Link State Update). OSPF requires acknowledgment for the receipt of each LSA. Multiple LSAs can be acknowledged in a single LSAck packet.

No.	Time	Source	Destination	Protocol	Length	Description
77	161.028277007	10.1.12.2	224.0.0.5	OSPF	98	LS Acknowledge
78	164.081715501	10.1.12.2	224.0.0.5	OSPF	94	Hello Packet
81	169.297188493	10.1.12.1	224.0.0.5	OSPF	90	Hello Packet
82	169.300525900	10.1.12.2	10.1.12.1	OSPF	94	Hello Packet
83	169.307836159	10.1.12.1	10.1.12.2	OSPF	78	DB Description
84	169.308271057	10.1.12.1	10.1.12.2	OSPF	94	Hello Packet

```
Frame 77: 98 bytes on wire (784 bits), 98 bytes captured (784 bits) on interface eth0, id 0
  Ethernet II, Src: 50:0b:00:03:00:00 (50:0b:00:03:00:00), Dst: IPv4mcast_05 (01:00:5e:00:00:05)
  Internet Protocol Version 4, Src: 10.1.12.2, Dst: 224.0.0.5
  Open Shortest Path First
    OSPF Header
      Version: 2
      Message Type: LS Acknowledge (5)
      Packet Length: 64
      Source OSPF Router: 2.2.2.2
      Area ID: 0.0.0.0 (Backbone)
      Checksum: 0x2156 [correct]
      Auth Type: Null (0)
      Auth Data (none): 0000000000000000
    LSA-type 5 (AS-External-LSA (ASBR)), len 36
      .000 1110 0001 0000 = LS Age (seconds): 3600
      0... .. = Do Not Age Flag: 0
      Options: 0x20, (DC) Demand Circuits
      LS Type: AS-External-LSA (ASBR) (5)
      Link State ID: 4.4.4.1
      Advertising Router: 1.1.1.1
      Sequence Number: 0x80000004
      Checksum: 0x2963
      Length: 36
    LSA-type 1 (Router-LSA), len 48
      .000 1110 0001 0000 = LS Age (seconds): 3600
      0... .. = Do Not Age Flag: 0
      Options: 0x22, (DC) Demand Circuits, (E) External Routing
      LS Type: Router-LSA (1)
      Link State ID: 1.1.1.1
      Advertising Router: 1.1.1.1
```