

# Discussing Simple OSPF Communication Blocks

---



**Sean Wilkins**

NETWORK ENGINEER AND AUTHOR

@Sean\_R\_Wilkins [www.infodispersion.com](http://www.infodispersion.com)



# Module Overview



# Module Overview



Reviewing what a link state advertisement is



# Module Overview



Reviewing what a link state advertisement is

Digging into the router LSA (type 1)

Digging into the network LSA (type 2)

Digging into the external LSA (type 5)



Let's focus on OSPF  
information exchange



# OSPF Communications

Two different exchanges:

Using DBD packets



# OSPF Communications

Two different exchanges:

Using link state packets  
(request, update,  
acknowledgment)



# DBD Matching



Link state type

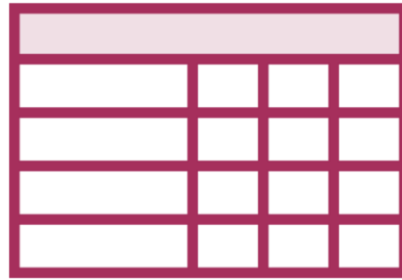




# DBD Matching



Link state type



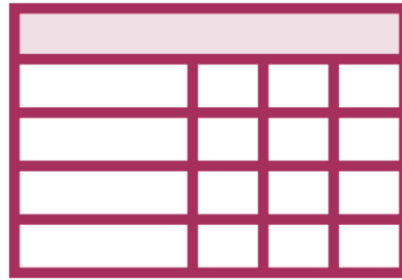
Link state ID



# DBD Matching



Link state type



Link state ID



Advertising device RID







---

If LSAs are missing





---

If LSAs are missing

Requested using a link state request packet



LSAs send back using  
link state update packet



# Link State Acknowledgement

Exchange completed using  
link state acknowledgment  
packet



# Link State Acknowledgement

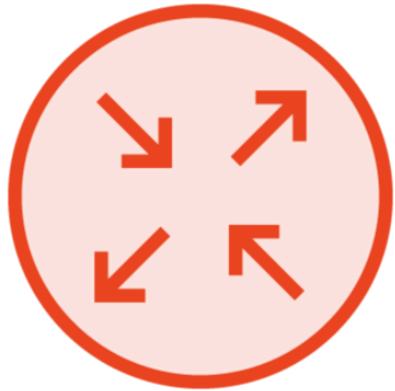
If not seen, will be  
retransmitted





# What Are the Different LSA Types?

Coverage including:

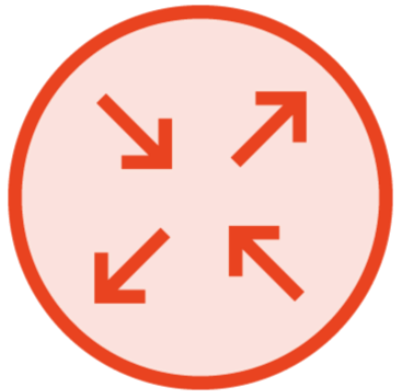


Router (type 1)



# What Are the Different LSA Types?

Coverage including:



Router (type 1)

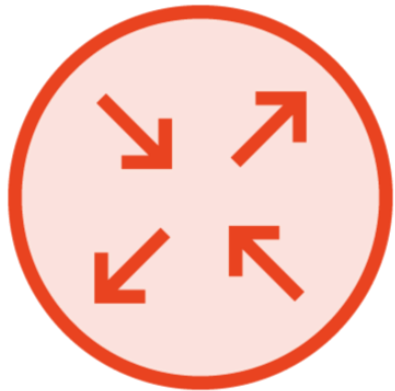


Network (type 2)



# What Are the Different LSA Types?

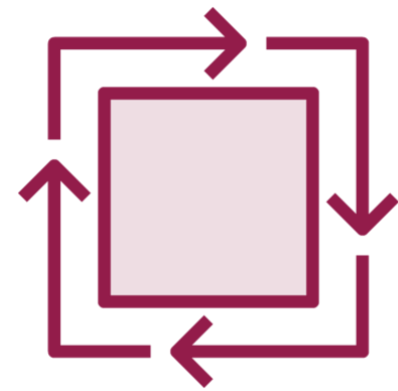
Coverage including:



Router (type 1)



Network (type 2)



External (type 5)



# Router LSA (Type 1)



# Router LSA (Type 1)



**Generated by all OSPF devices**



# Router LSA (Type 1)



**Generated by all OSPF devices**

**Amount of information varies**



# Router LSA (Type 1)



**Generated by all OSPF devices**

**Amount of information varies**

**Sent to every area device**



# Router LSA - Type 1

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age															Options					1											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum															Length																
0				V E B			0								# of Links																





# Router LSA - Type 1

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age															Options										1						
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum															Length																
0				V E B			0							# of Links																	



# Router LSA - Type 1

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age															Options										1						
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum															Length																
0				V E B			0							# of Links																	



# Router LSA - Type 1

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age															Options										1						
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum															Length																
0				V E B			0							# of Links																	



# Router LSA - Type 1

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age																Options						1									
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum																Length															
0				V E B			0				# of Links																				

Identical



# Router LSA - Type 1

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31			
Link State Age															Options										1									
Link State ID																																		
Advertising Router																																		
Link State Sequence Number																																		
Link State Checksum															Length																			
0				V			E			B			0					# of Links																
Link ID																																		
Link Data																																		
Type								# of TOS										Metric																



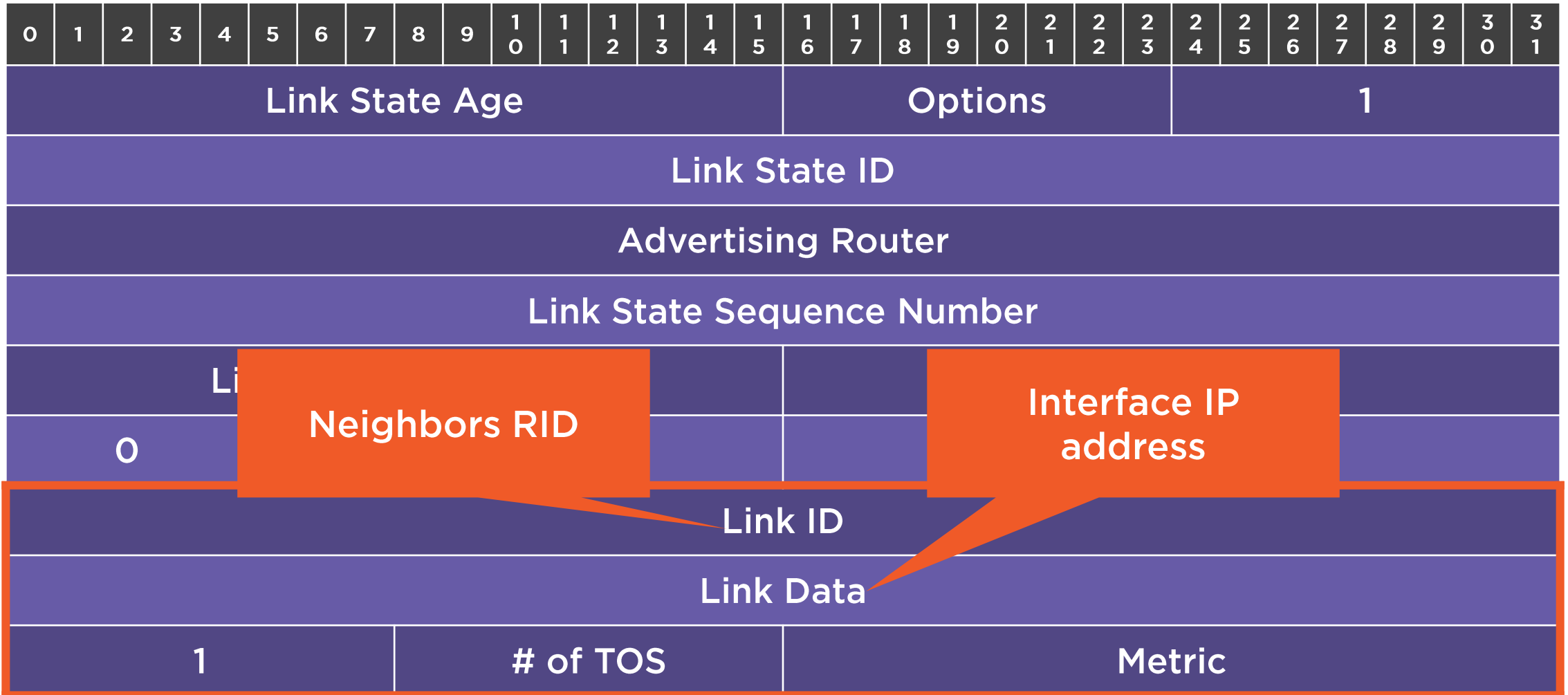
# Router LSA - Type 1

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age										Options										1											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link Type																Length															
0																# of Links															
Link ID																															
Link Data																															
1																# of TOS								Metric							

Point to point



# Router LSA - Link Type 1 - PtP



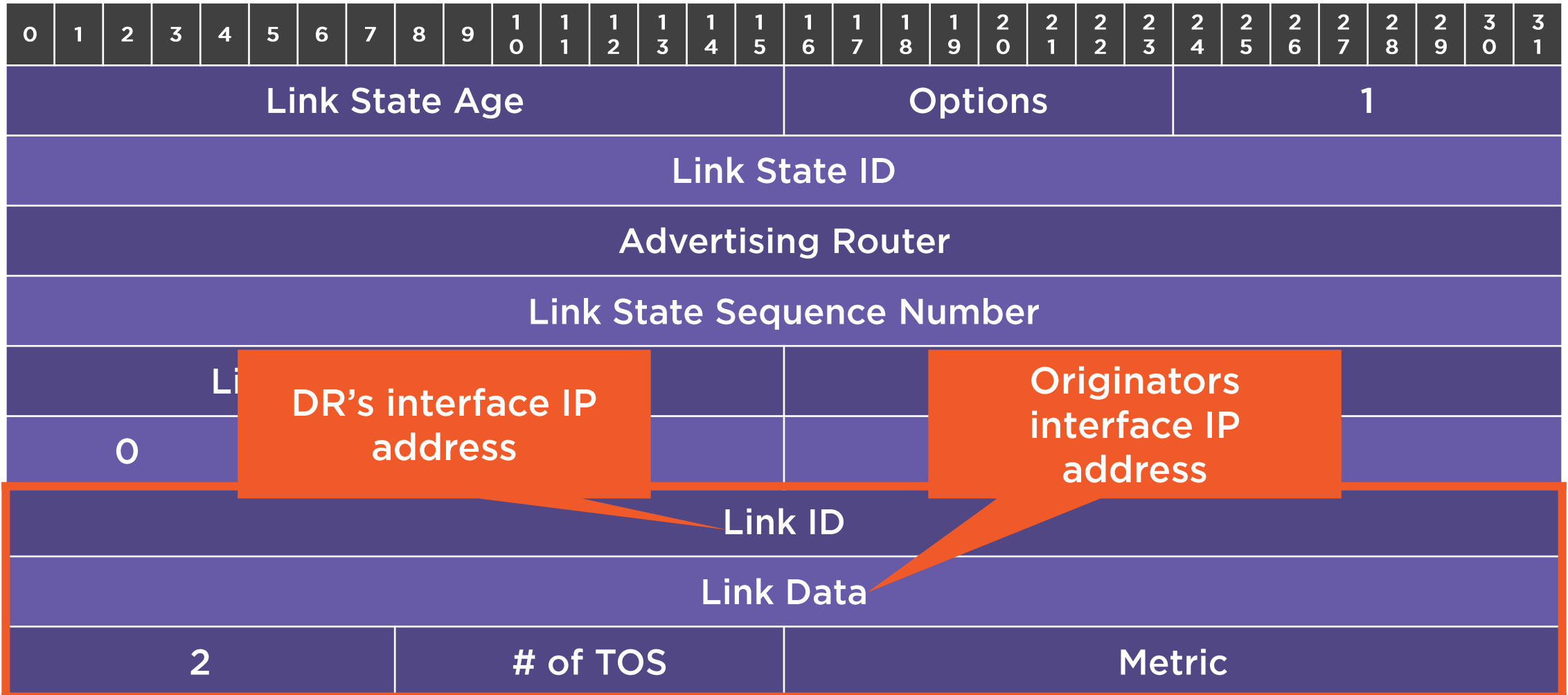
# Router LSA - Link Type 2 - Transit

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31																	
Link State Age															Options					1																												
Link State ID																																																
Advertising Router																																																
Link State Sequence Number																																																
Link Type															Length																																	
0															Transit																	# of Links																
Link ID																																																
Link Data																																																
2										# of TOS										Metric																												





# Router LSA - Link Type 2 - Transit

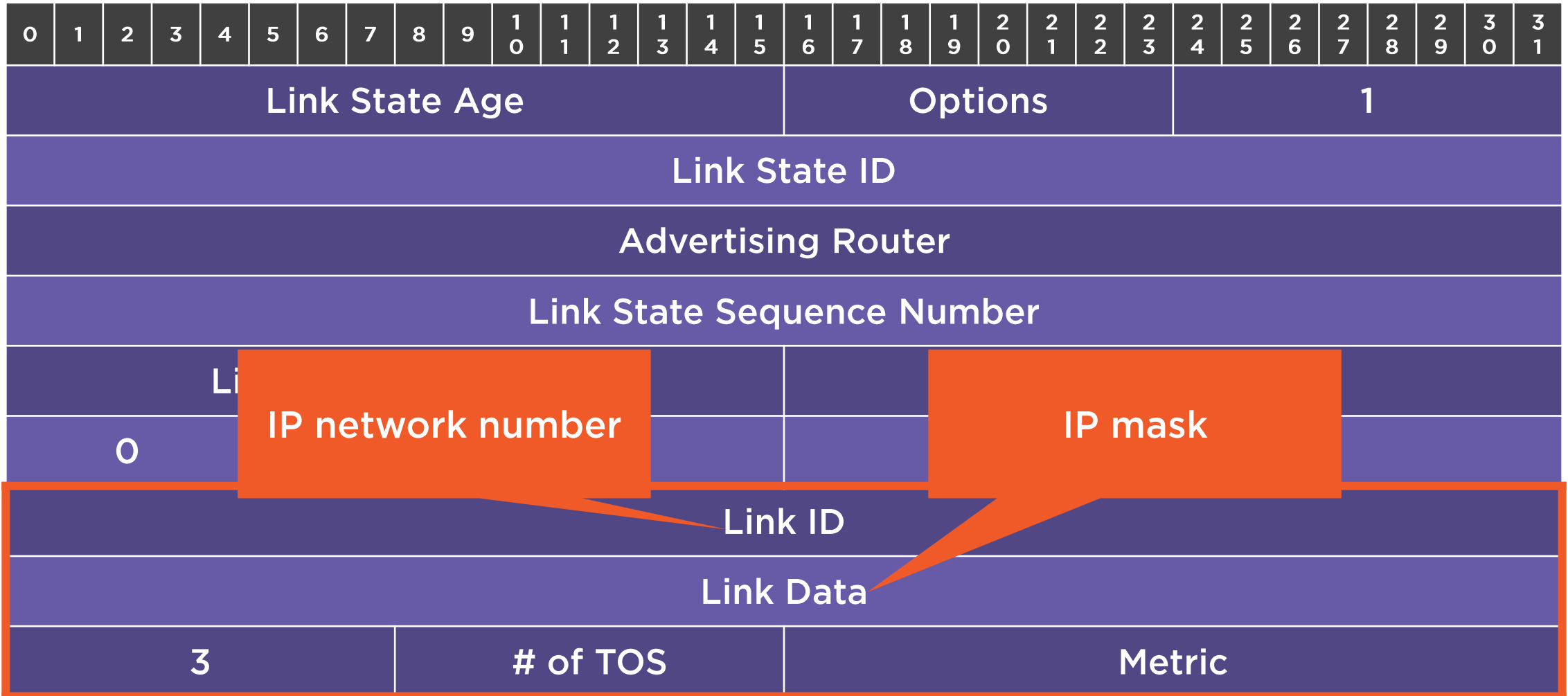


# Router LSA - Link Type 3 - Stub

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31																
Link State Age										Options										1																											
Link State ID																																															
Advertising Router																																															
Link State Sequence Number																																															
Link Type																Length																															
0																Stub																# of Links															
Link ID																																															
Link Data																																															
3																# of TOS								Metric																							



# Router LSA - Link Type 3 - Stub

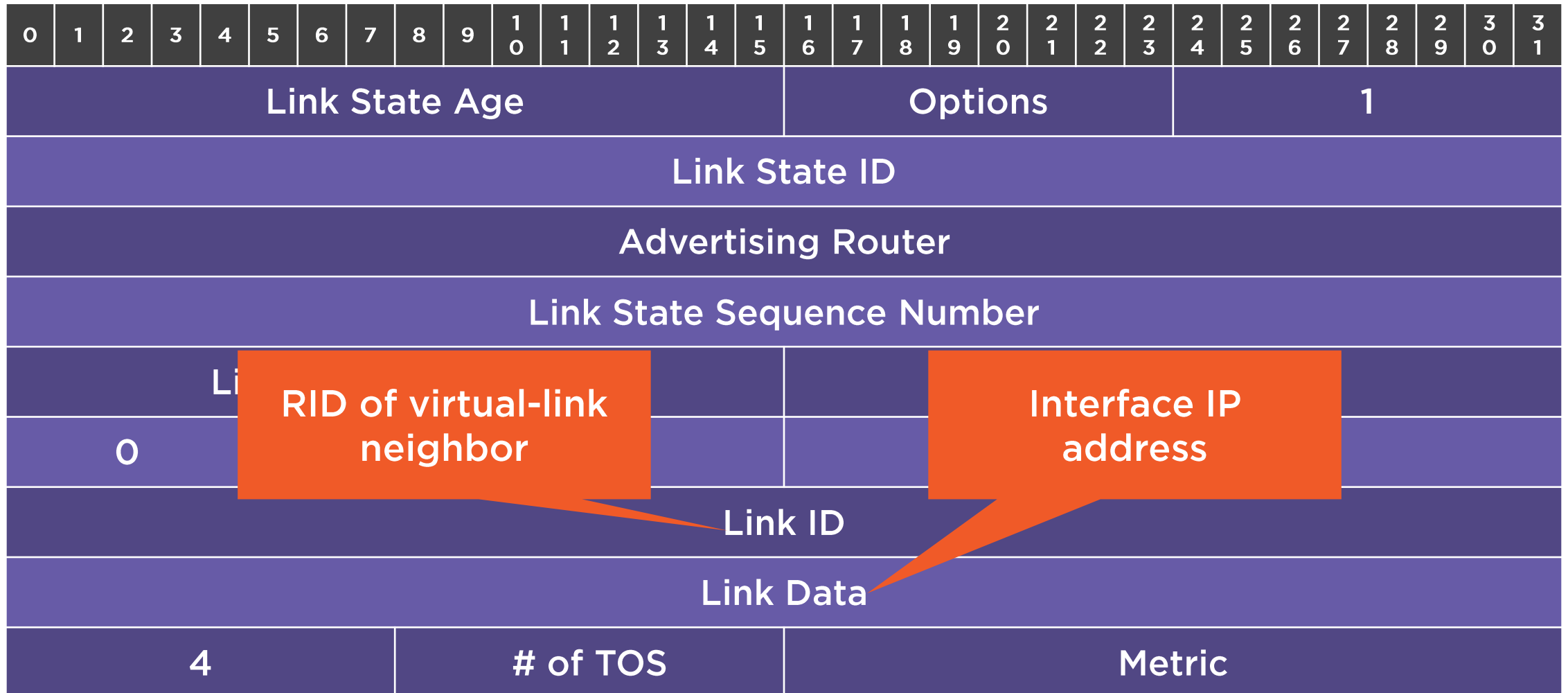


# Router LSA - Link Type 3 - Stub - PtMP

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age										Options										1											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link ID																Interface IP address															
0																255.255.255.255															
Link Data																															
3								# of TOS								Metric															



# Router LSA - Link Type 4 - Virtual Link



Let's move into the lab



# Network LSA - Type 2

Only used on links  
with DR



# Network LSA - Type 2

DR generates this  
LSA





# Network LSA - Type 2

Sent to every area device



# Network LSA - Type 2

2+

**At least two devices required**



# Network LSA - Type 2

2+



At least two devices required

One device would result in only  
router LSA

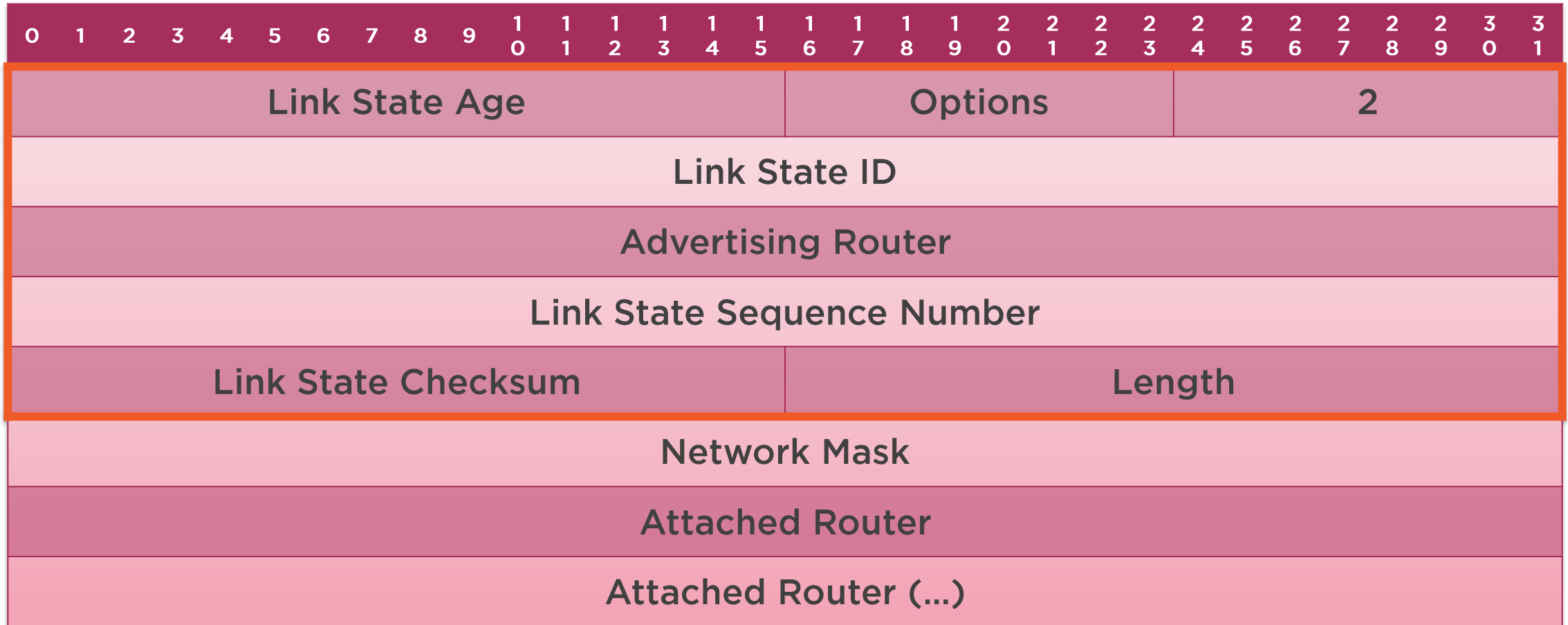


# Network LSA - Type 2

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age										Options										2											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum																Length															
Network Mask																															
Attached Router																															
Attached Router (...)																															



# Network LSA - Type 2



# Network LSA - Type 2

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Link State Age										Options					2										
Link State ID																									
Advertising Router																									
Link State Sequence Number																									
Link State Checksum										Length															
Network Mask																									
Attached Router																									
Attached Router (...)																									



# Network LSA - Type 2

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age										Options										2											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum																Length															
Network Mask																															
Attached Router																															
Attached Router (...)																															



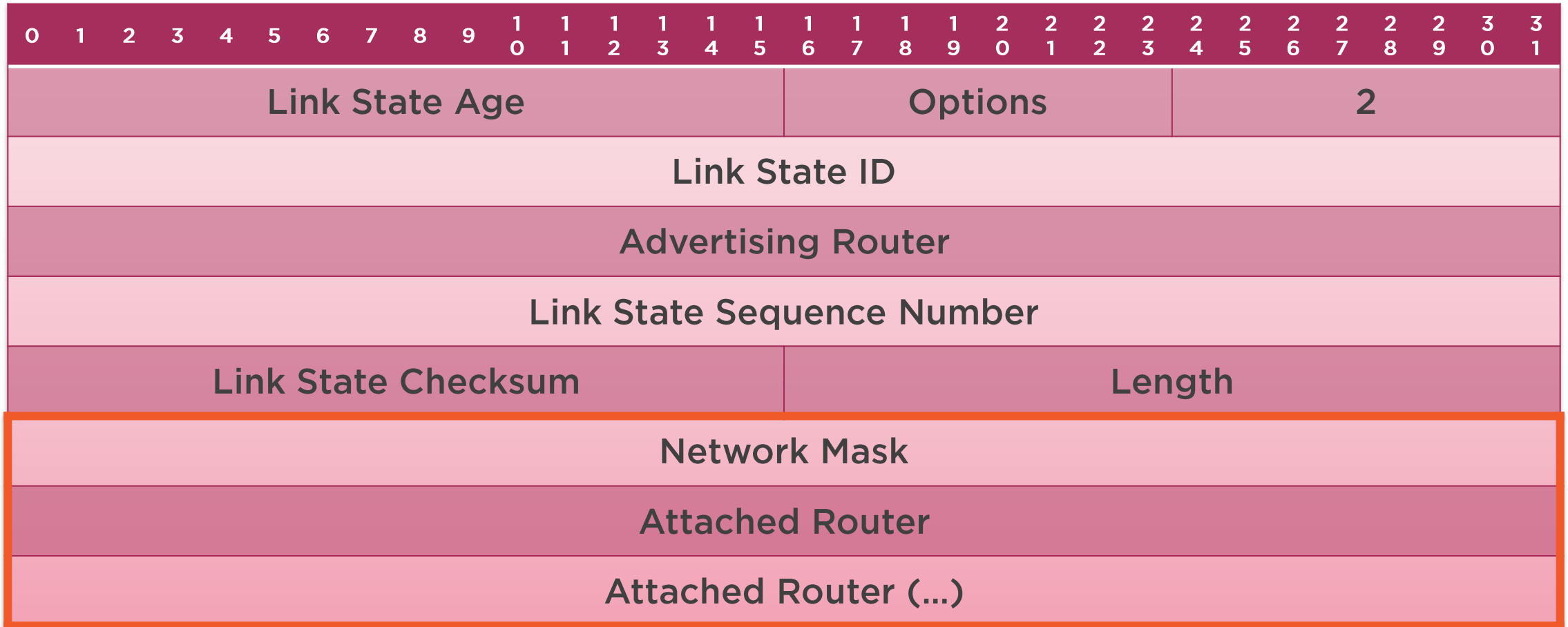
# Network LSA - Type 2

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age										Options										2											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum																Length															
Network Mask																															
Attached Router																															
Attached Router (...)																															

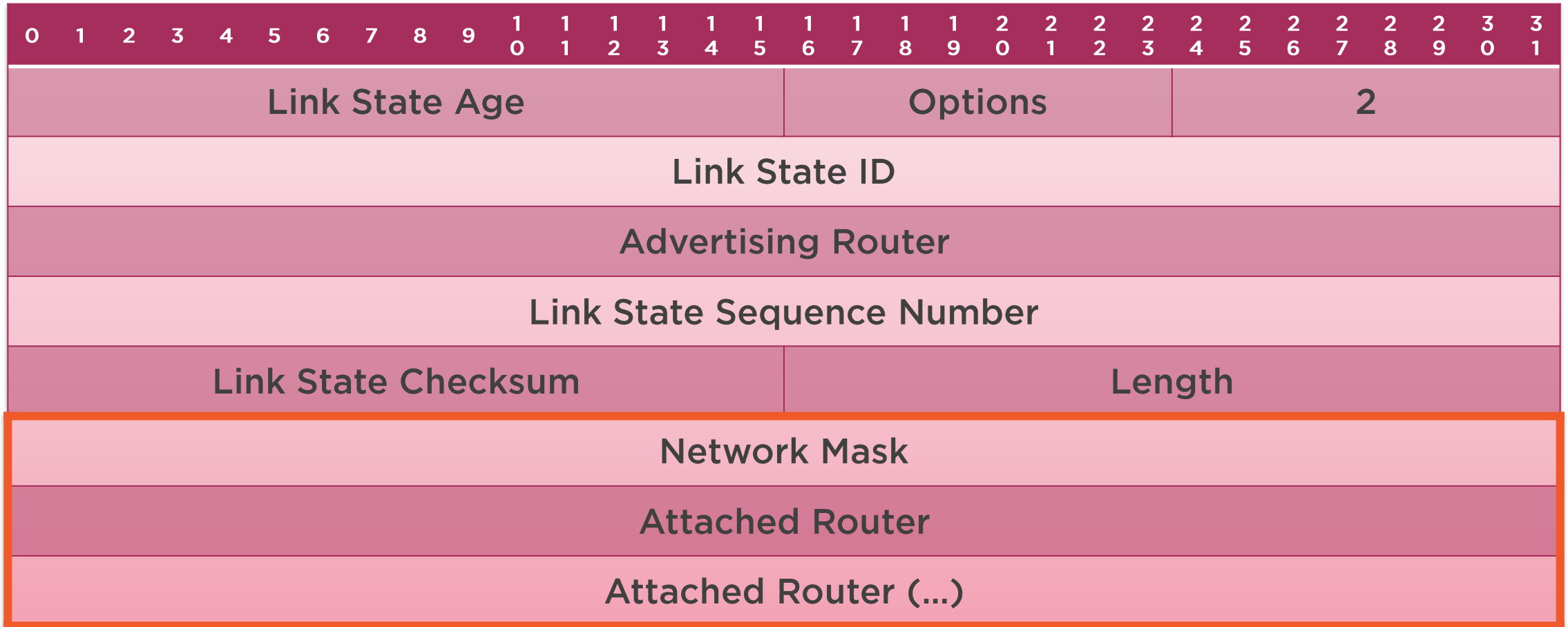




# Network LSA - Type 2



# Network LSA - Type 2



# Network LSA - Type 2

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Link State Age										Options					2										
Link State ID																									
Advertising Router																									
Link State Sequence Number																									
Link State Checksum										Length															
Network Mask																									
Attached Router																									
Attached Router (...)																									



# Network LSA - Type 2

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Link State Age										Options					2										
Link State ID																									
Advertising Router																									
Link State Sequence Number																									
Link State Checksum										Length															
Network Mask																									
Attached Router																									
Attached Router (...)																									



# External LSA - Type 5



# External LSA - Type 5



**Advertises networks outside of OSPF**



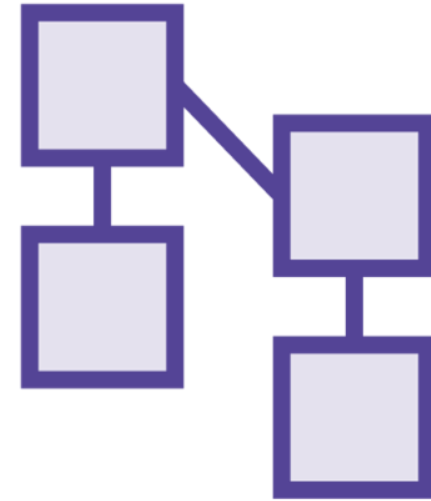
# External LSA - Type 5



**Advertises networks outside of OSPF**  
**Taken from other sources**



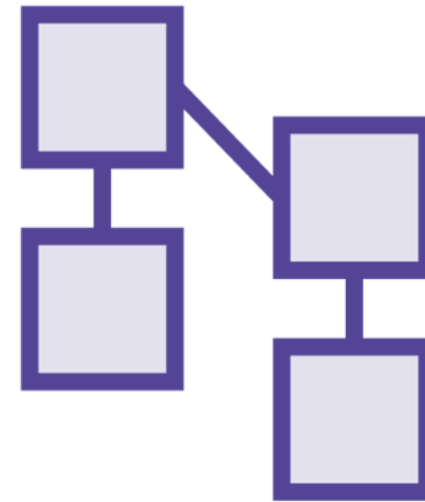
## External LSA - Type 5





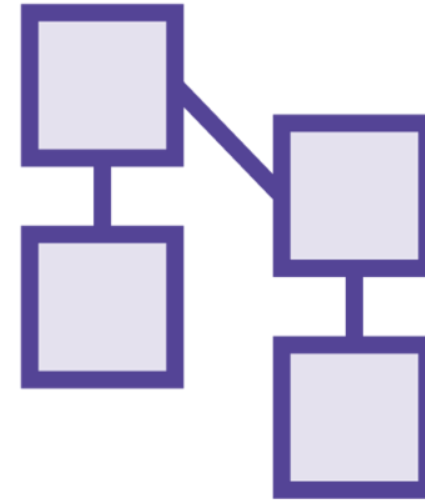
## External LSA - Type 5

Originated by connecting device



## External LSA - Type 5

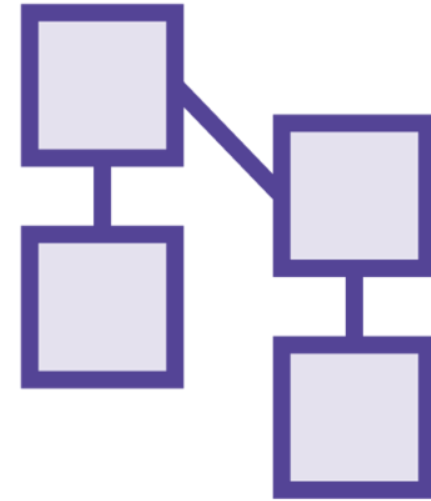
Originated by connecting device  
Autonomous system boundary router  
(ASBR)



## External LSA - Type 5

Originated by connecting device  
Autonomous system boundary router  
(ASBR)

Send to every OSPF device



# External LSA - Type 5

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age										Options										5											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum																Length															
Network Mask																															
E	0										Metric																				
Forwarding Address																															
External Route Tag																															



# External LSA - Type 5

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Link State Age										Options										5					
Link State ID																									
Advertising Router																									
Link State Sequence Number																									
Link State Checksum										Length															
Network Mask																									
E	0					Metric																			
Forwarding Address																									
External Route Tag																									



# External LSA - Type 5

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age										Options										5											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum																Length															
Network Mask																															
E	0										Metric																				
Forwarding Address																															
External Route Tag																															



# External LSA - Type 5

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Link State Age										Options										5					
Link State ID																									
Advertising Router																									
Link State Sequence Number																									
Link State Checksum												Length													
Network Mask																									
E	0										Metric														
Forwarding Address																									
External Route Tag																									



# External LSA - Type 5

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age										Options										5											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum																Length															
Network Mask																															
E	0										Metric																				
Forwarding Address																															
External Route Tag																															





# External LSA - Type 5

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age										Options										5											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum																Length															
Network Mask																															
E	0										Metric																				
Forwarding Address																															
External Route Tag																															



# External LSA - Type 5

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age										Options										5											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum																Length															
Network Mask																															
E	0										Metric																				
Forwarding Address																															
External Route Tag																															

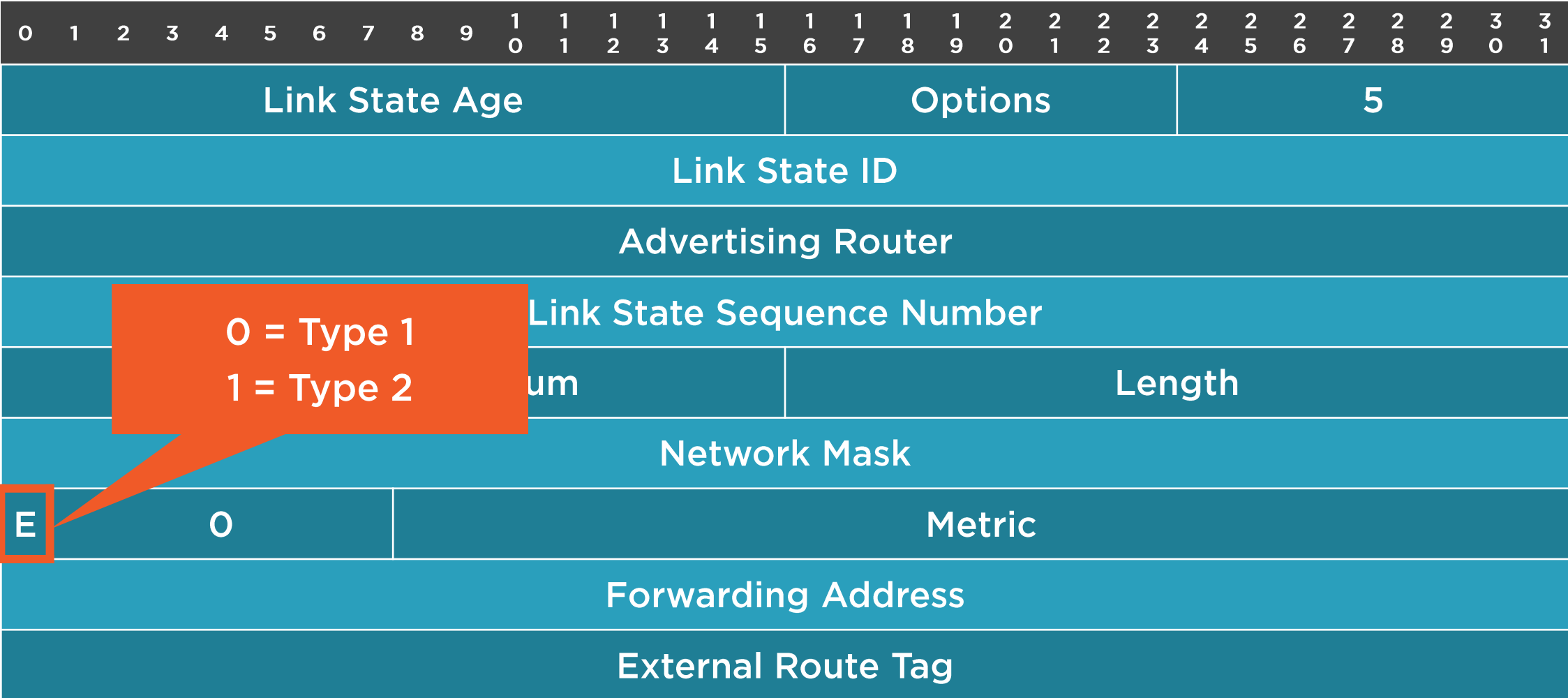


# External LSA - Type 5

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age										Options										5											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum																Length															
Network Mask																															
E	0										Metric																				
Forwarding Address																															
External Route Tag																															



# External LSA - Type 5

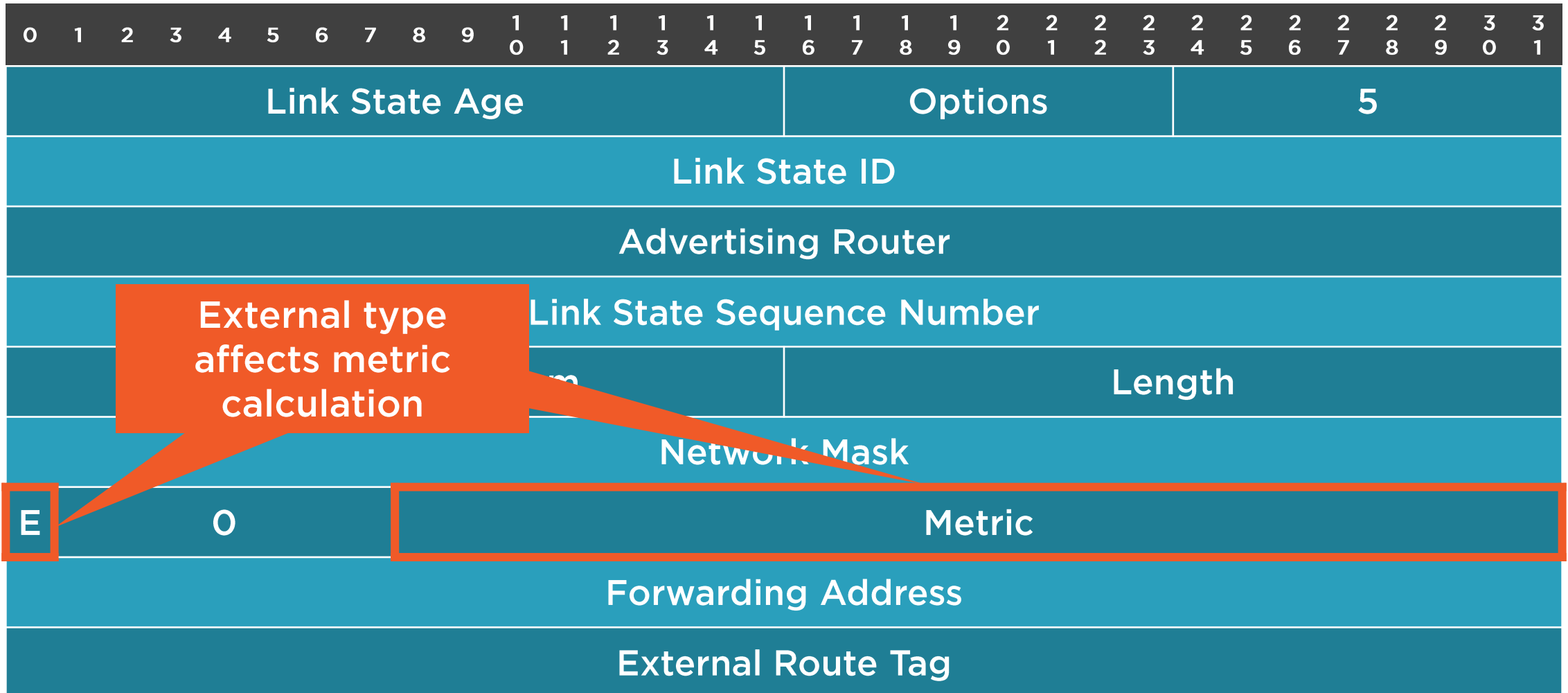


0 = Type 1  
1 = Type 2

**E**



# External LSA - Type 5



# External LSA - Type 5

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age										Options										5											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum																Length															
Network Mask																															
E	0										Metric																				
Forwarding Address																															
External Route Tag																															



# External LSA - Type 5

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Link State Age										Options										5											
Link State ID																															
Advertising Router																															
Link State Sequence Number																															
Link State Checksum																Length															
Network Mask																															
E	0										Metric																				
Forwarding Address																															
External Route Tag																															



# Summary





# Summary



Reviewing what a link state advertisement is



# Summary



Reviewing what a link state advertisement is

Digging into the router LSA (type 1)

Digging into the network LSA (type 2)

Digging into the external LSA (type 5)



# Lab Topology

