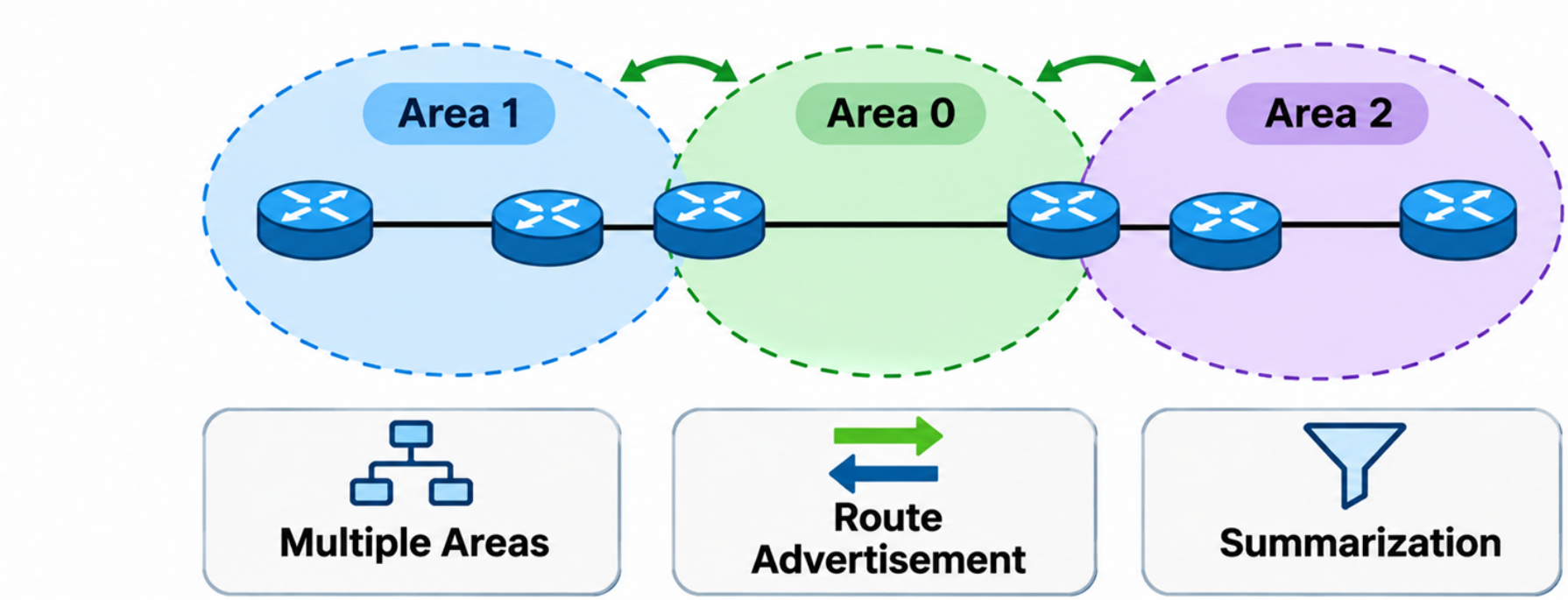
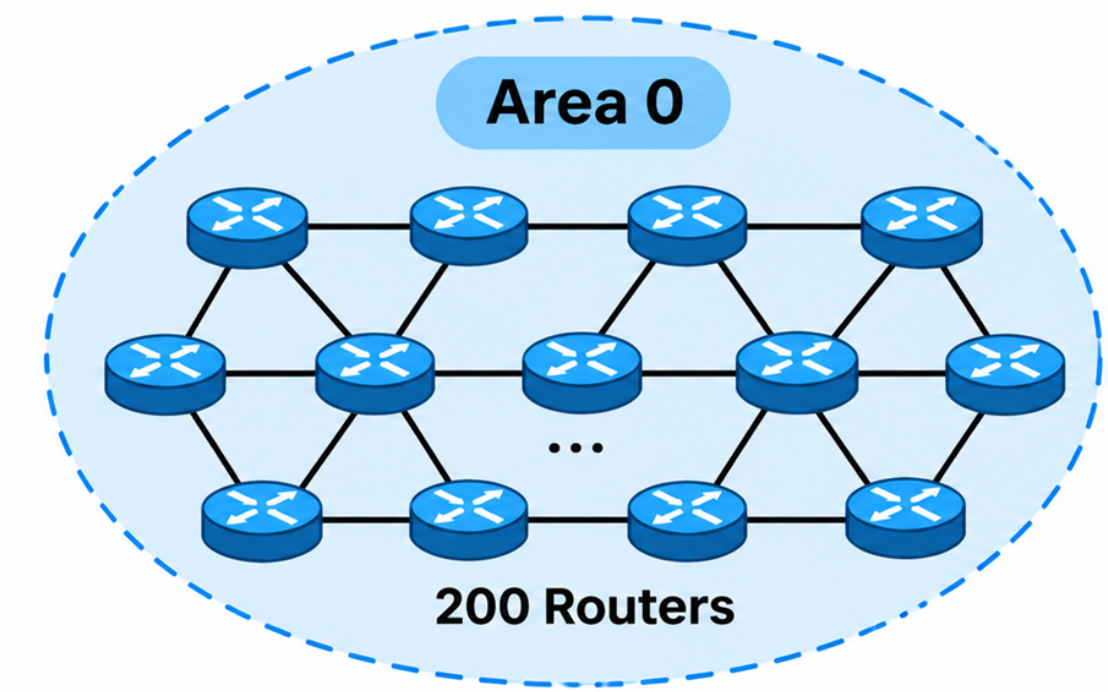
Understanding OSPF Multiarea Architecture, Route Advertisement, and Summarization

Introduction



Why OSPF Uses Multiple Areas



Large
Link-State Database
(Full Topology)

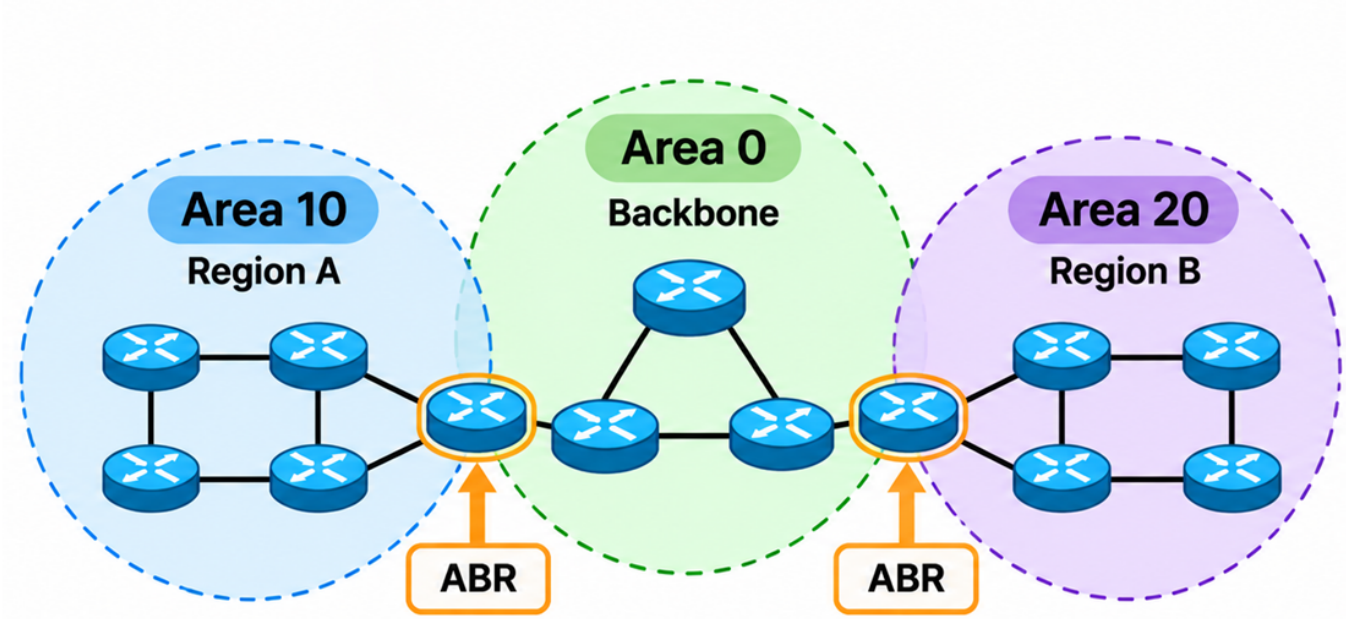
Frequent
Link State Changes

SPF

Higher
Control-Plane Processing
(More SPF Calculations)

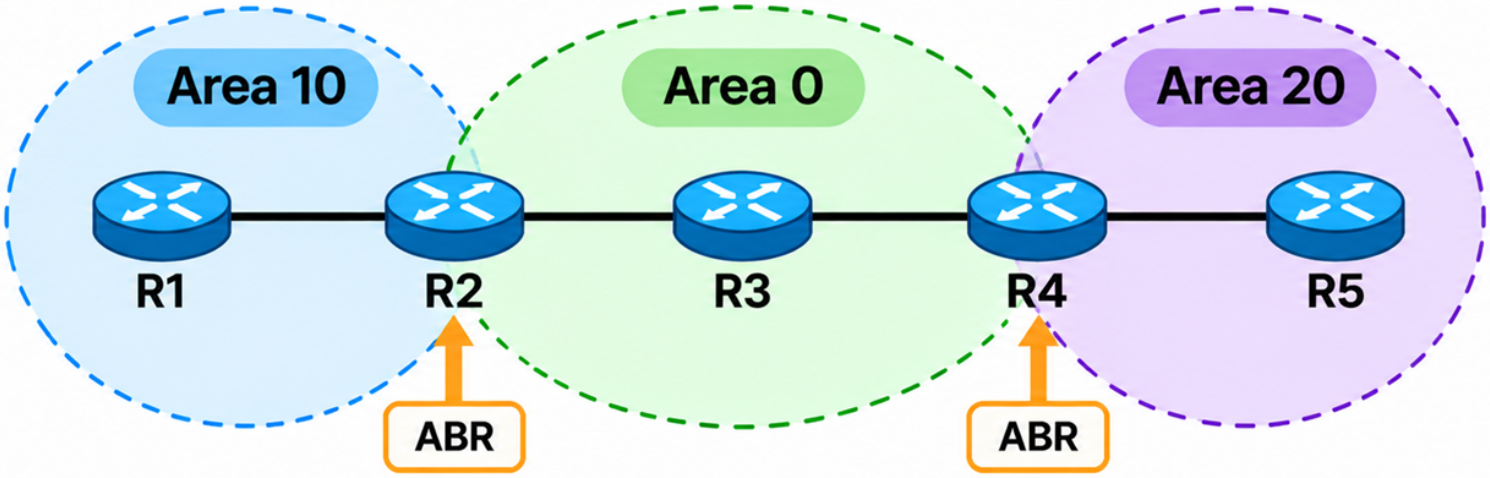
Understanding OSPF Multiarea Architecture, Route Advertisement, and Summarization

Why OSPF Uses Multiple Areas -> Dividing the Network into Areas



- Smaller Areas (Area 0, 10, 20)
- Area-Scoped Topology
- Interarea Routes via ABRs
- Improved Scalability

Our OSPF Multiarea Topology



R1 : Area 10

R2 : Area 10 and Area 0 (ABR)

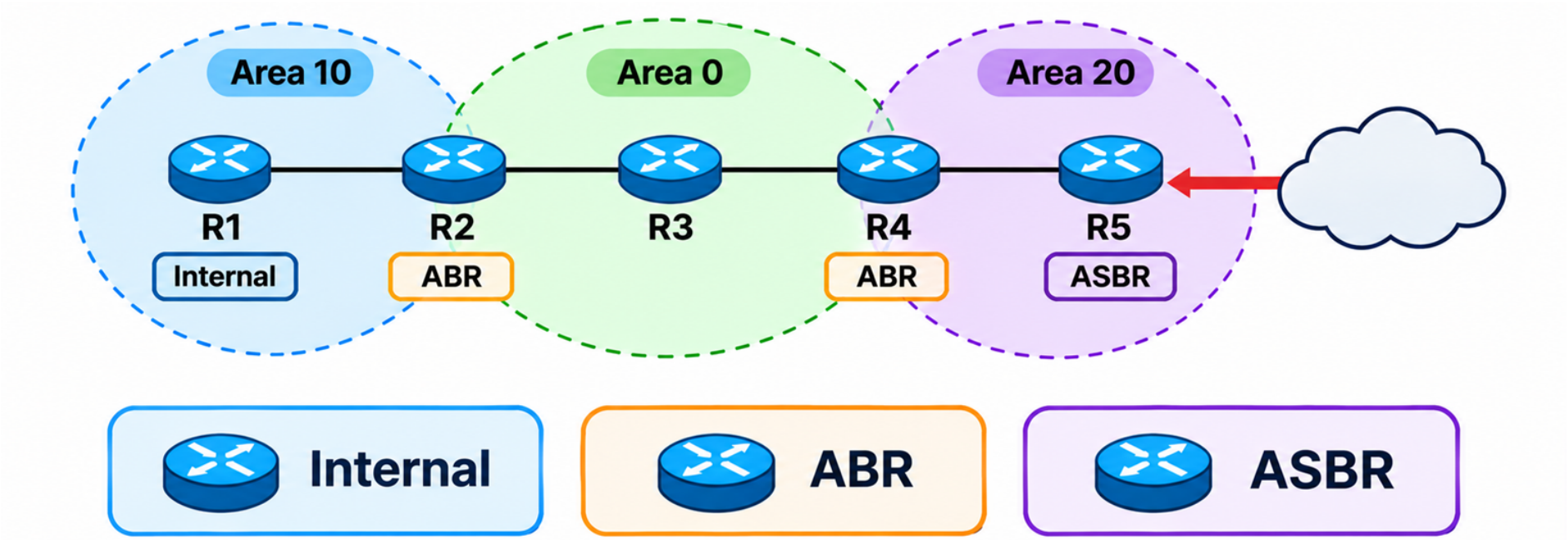
R3 : Area 0

R4 : Area 0 and Area 20 (ABR)

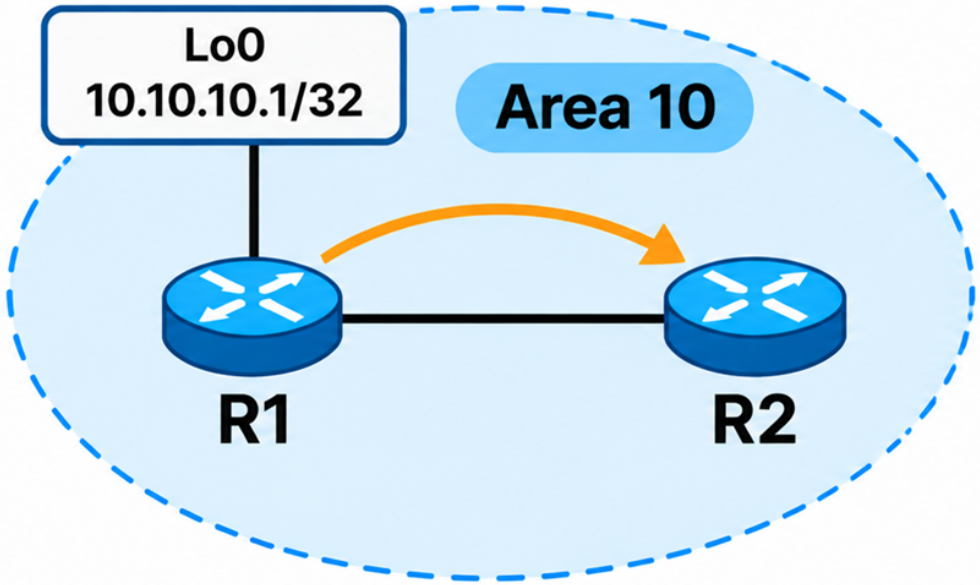
R5 : Area 20

Understanding OSPF Multiarea Architecture, Route Advertisement, and Summarization

Our OSPF Multiarea Topology -> Router Roles



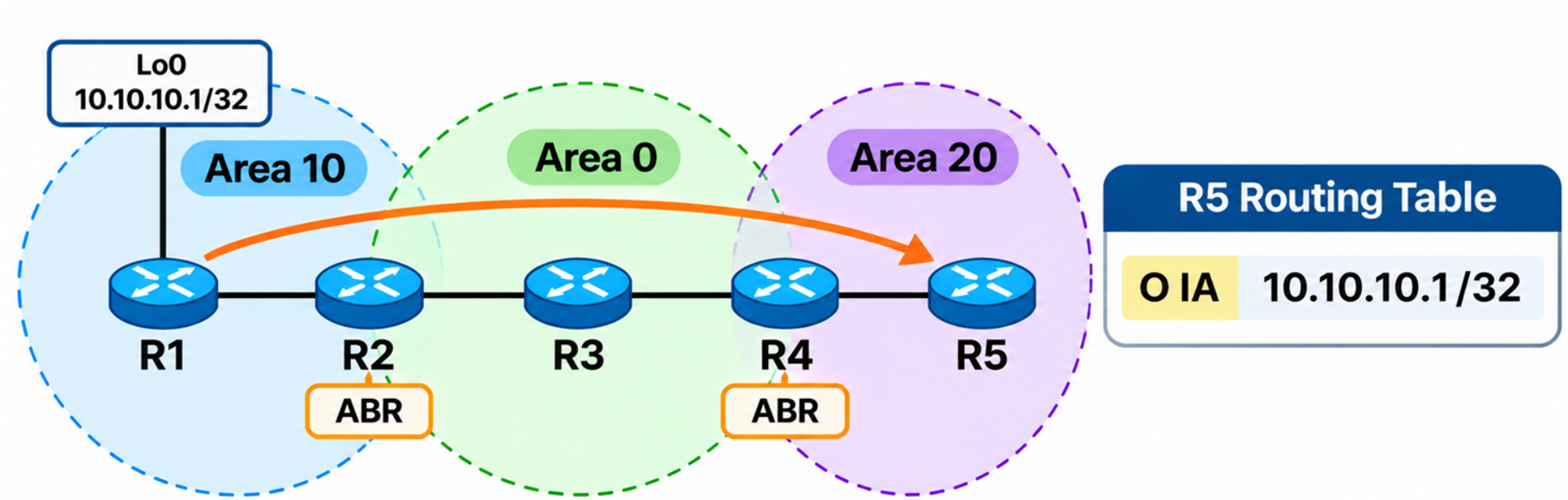
OSPF Route Types -> Intra-Area Routes



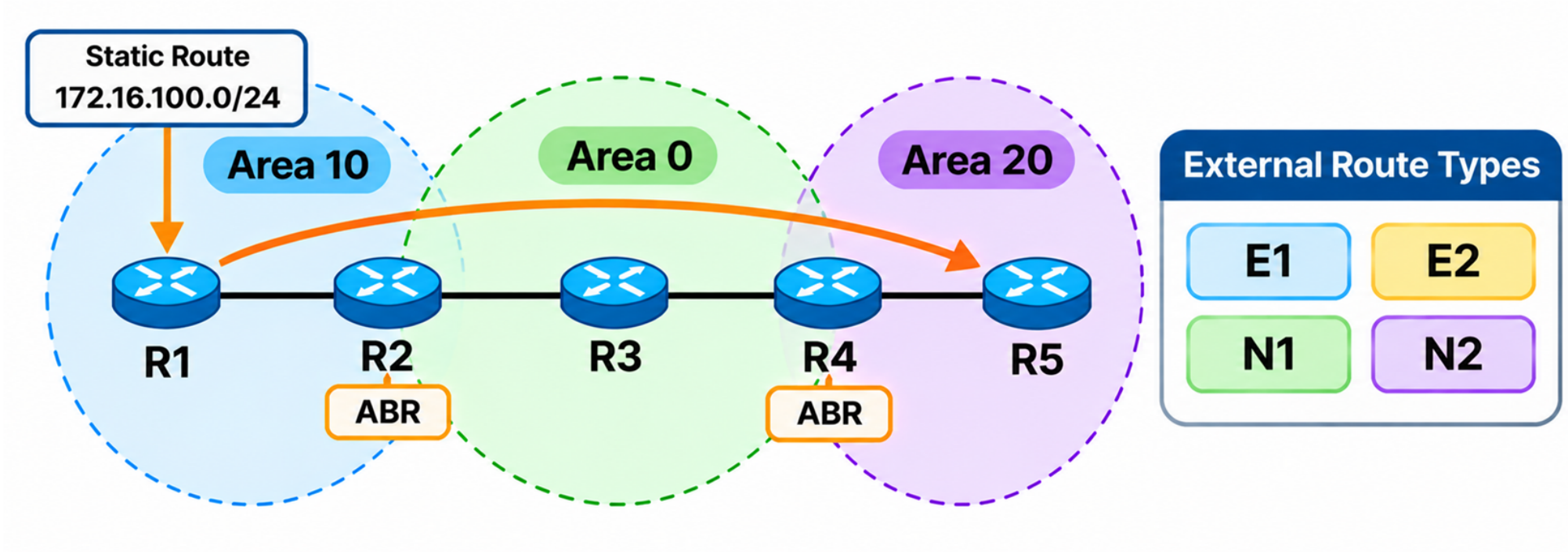
R2 Routing Table

O	10.10.10.1/32

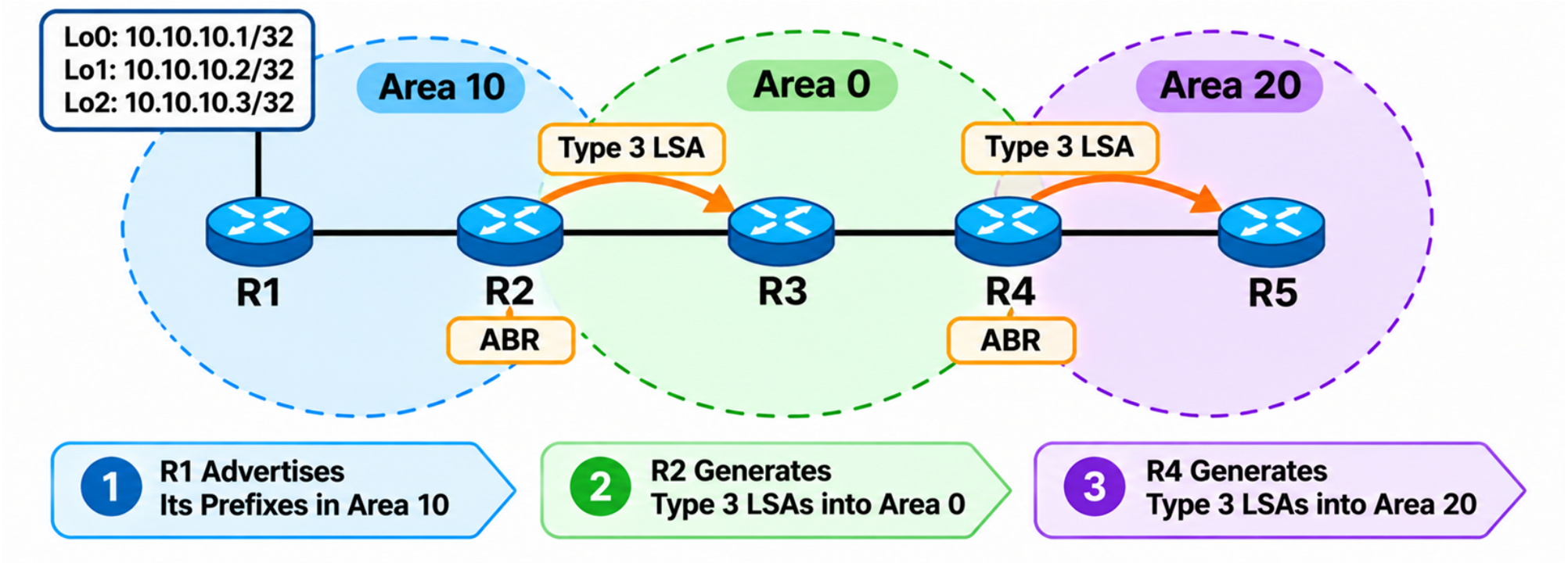
OSPF Route Types -> Interarea Routes



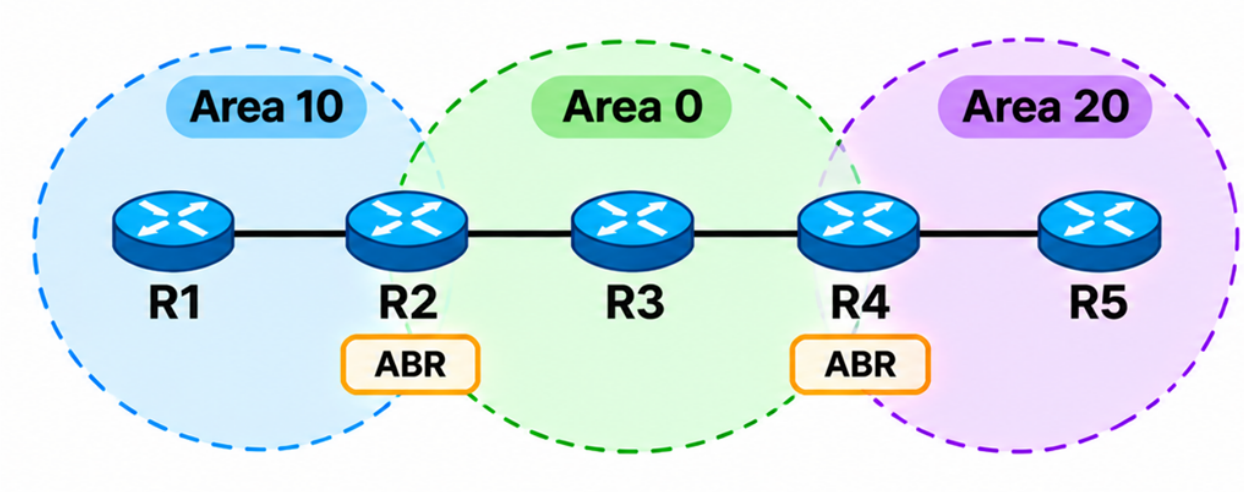
OSPF Route Types -> External Routes



OSPF Route Advertisement Between Areas



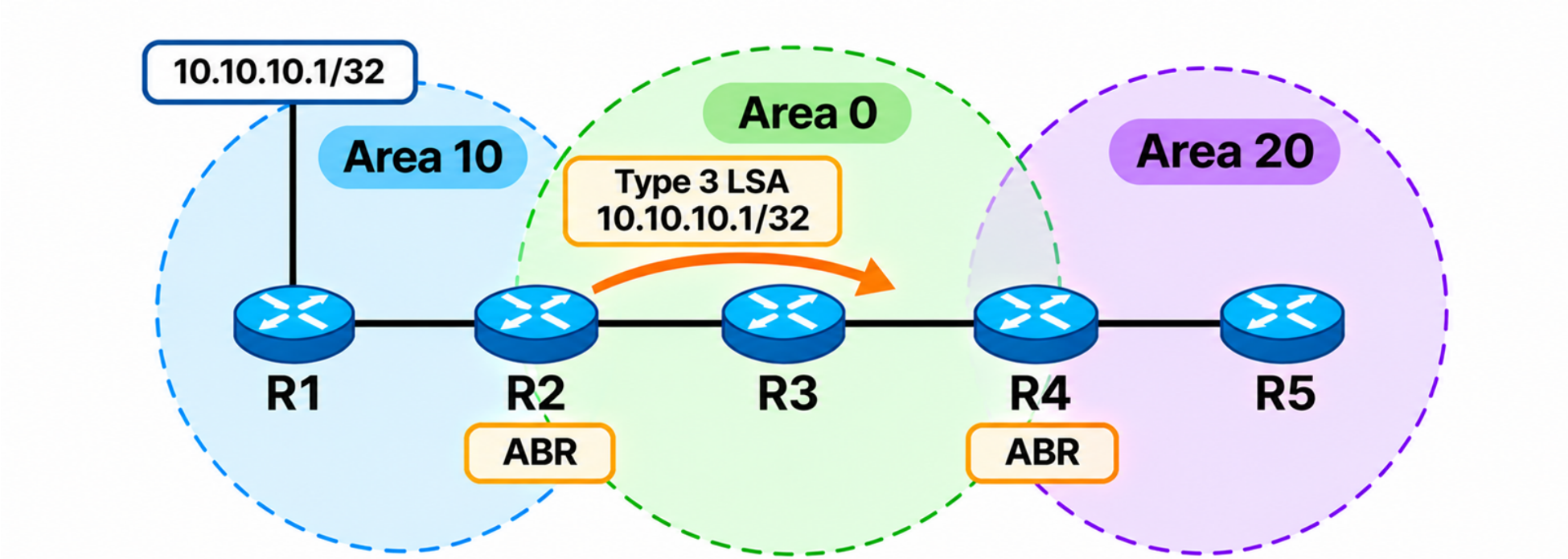
OSPF LSAs in Multiarea Routing -> Type 1 and Type 2 LSAs



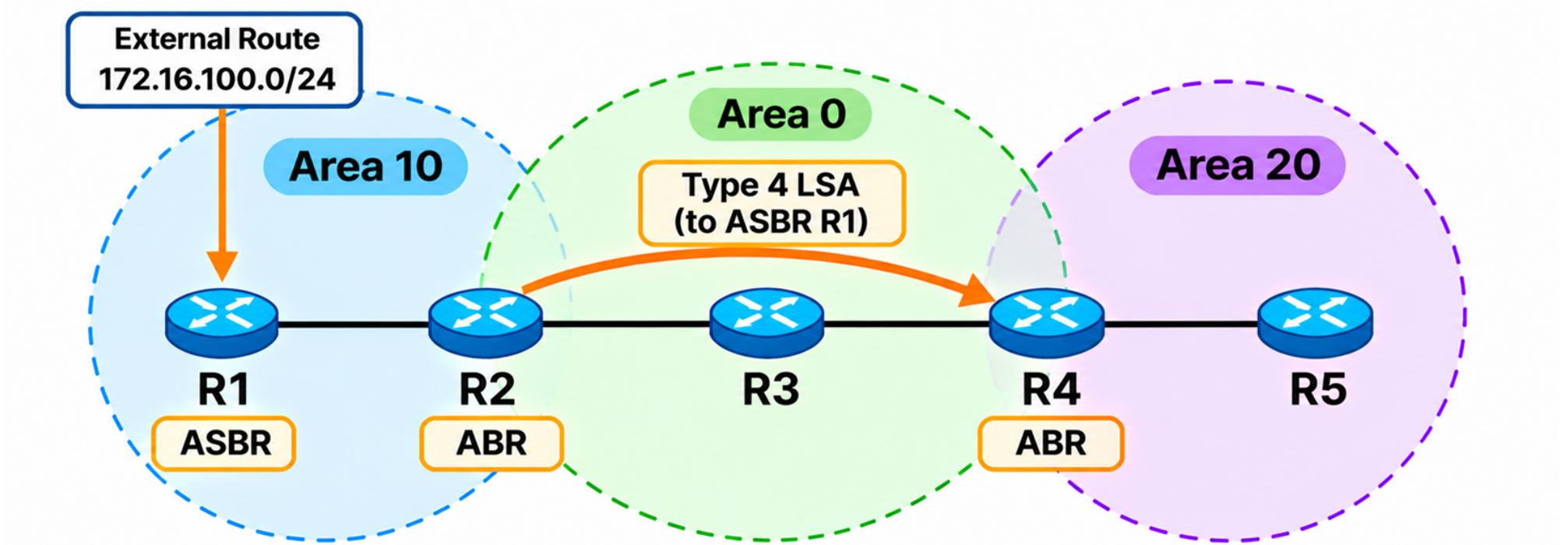
Relevant LSA Types

Type 1 Router LSA	Describes router connectivity within an area.
Type 2 Network LSA	Describes routers on a transit multiaccess network (DR).

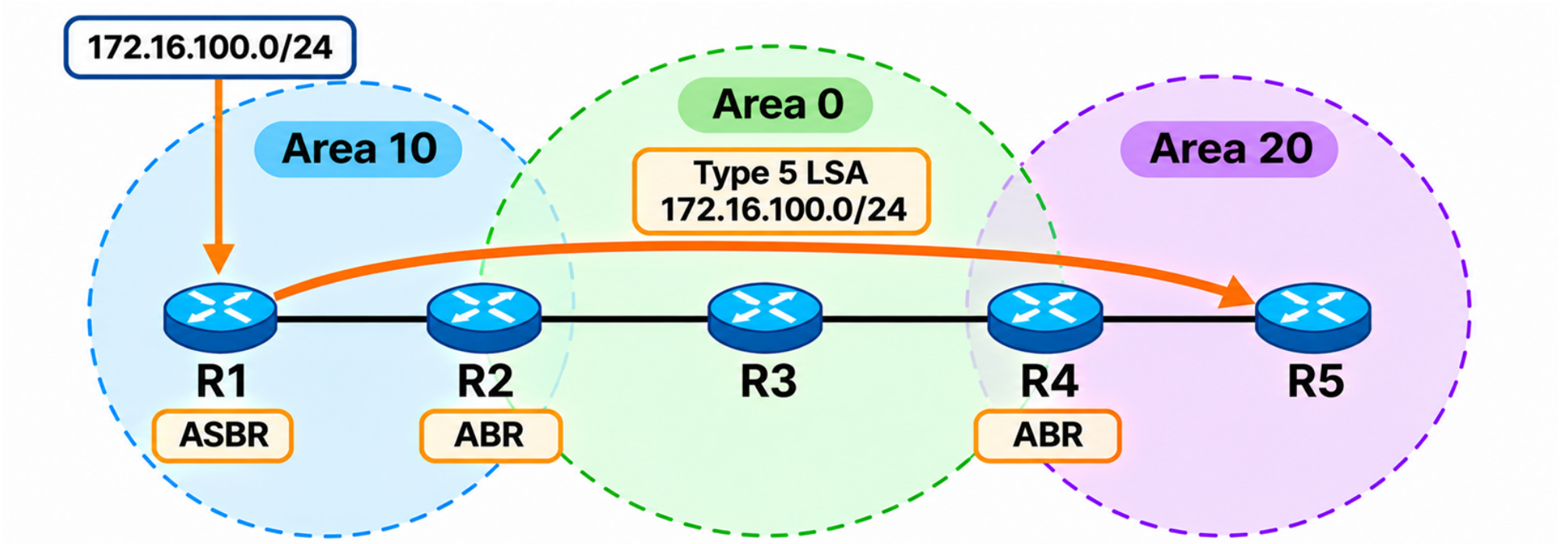
OSPF LSAs in Multiarea Routing -> Type 3 Summary LSAs



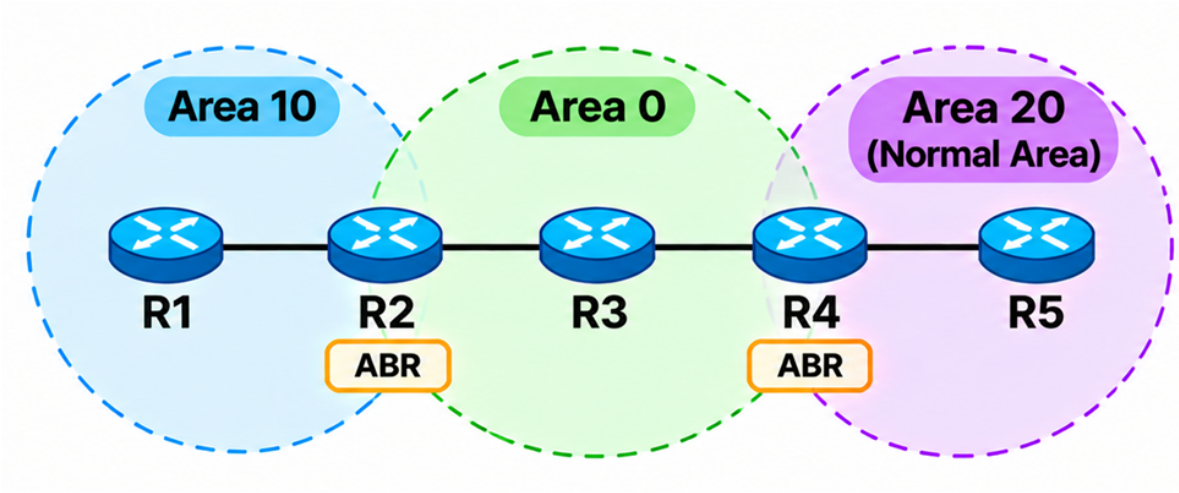
OSPF LSAs in Multiarea Routing -> Type 4 ASBR Summary LSAs



OSPF LSAs in Multiarea Routing -> Type 5 External LSAs



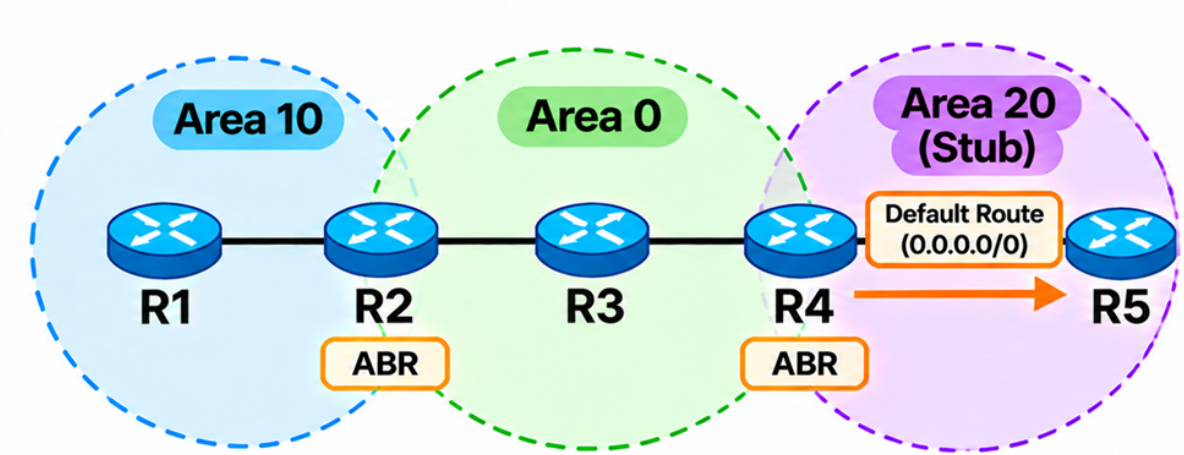
OSPF Area Types -> Normal Areas



Normal Area

- Can receive intra-area routes.
- Can receive interarea routes (Type 3 LSAs).
- Can receive external routes (Type 5 LSAs).

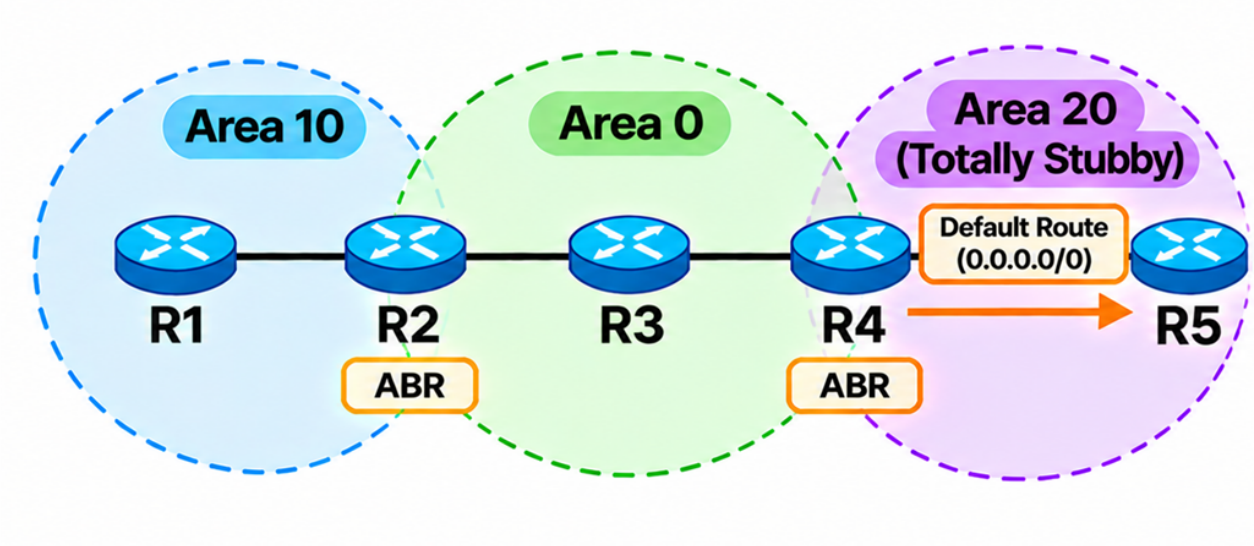
OSPF Area Types -> Stub Areas



Stub Area

- Receives interarea routes (Type 3 LSAs).
- Receives a default route (from the ABR).
- Does not receive external routes (Type 5 LSAs).
- An ASBR cannot be inside a stub area.

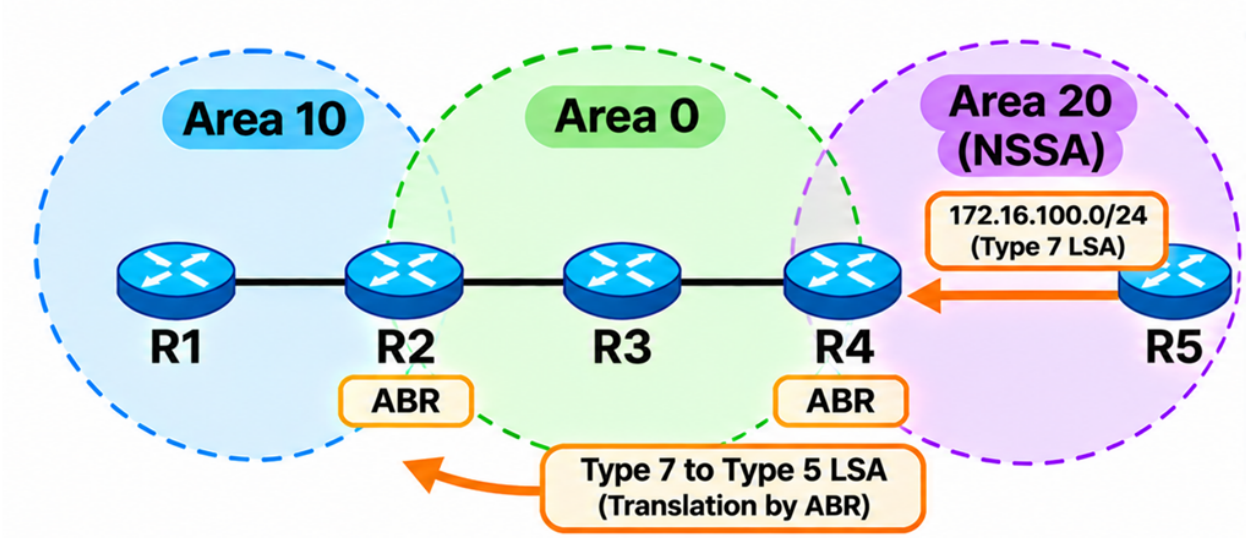
OSPF Area Types ->Totally Stubby Areas



Totally Stubby Area

- Receives only a default route (from the ABR).
- Does not receive interarea routes (Type 3 LSAs).
- Does not receive external routes (Type 5 LSAs).

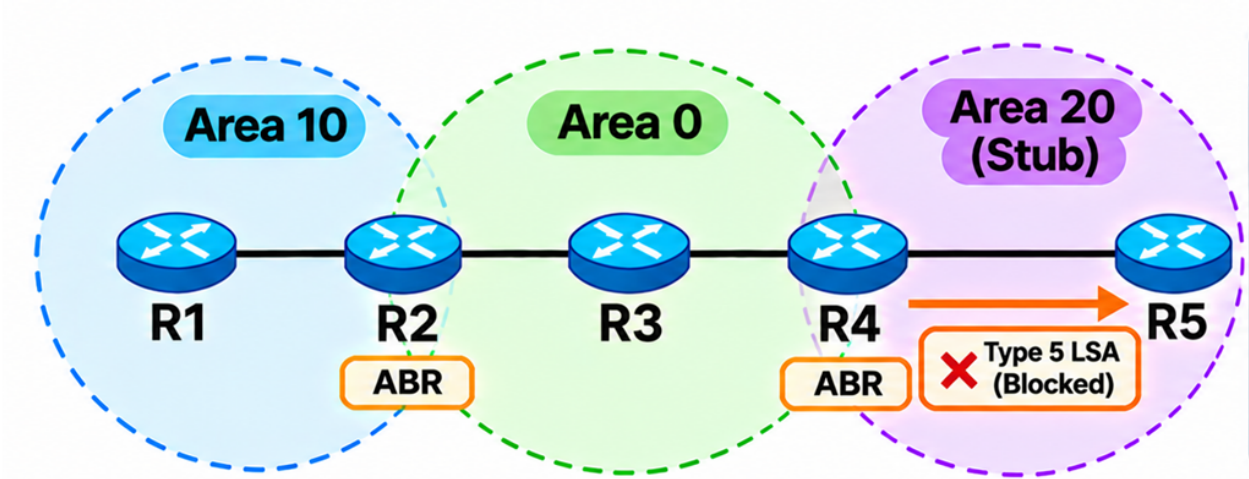
OSPF Area Types -> Not-So-Stubby Areas



NSSA (Not-So-Stubby Area)

- Allows an ASBR and external route redistribution.
- Uses Type 7 LSAs inside the NSSA.
- The NSSA ABR can translate Type 7 LSAs to Type 5 LSAs.
- Can be configured with additional restrictions (e.g., totally NSSA).

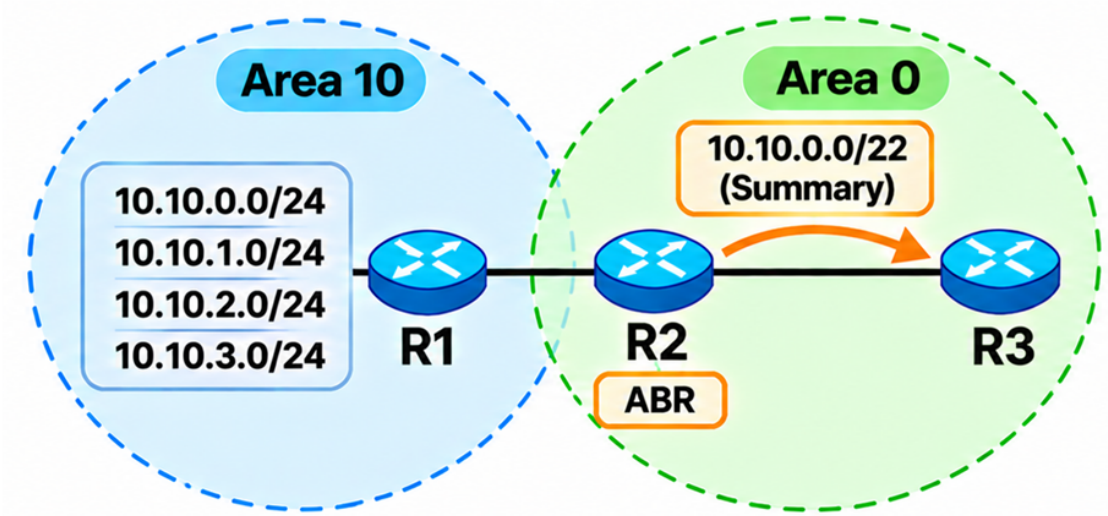
OSPF Area Types -> Why Area Types Matter for Troubleshooting



Key Takeaways

- Missing routes do not always indicate a failure.
- In a stub area, external Type 5 LSAs are intentionally blocked.
- When troubleshooting, first verify the OSPF area type.

OSPF Route Summarization



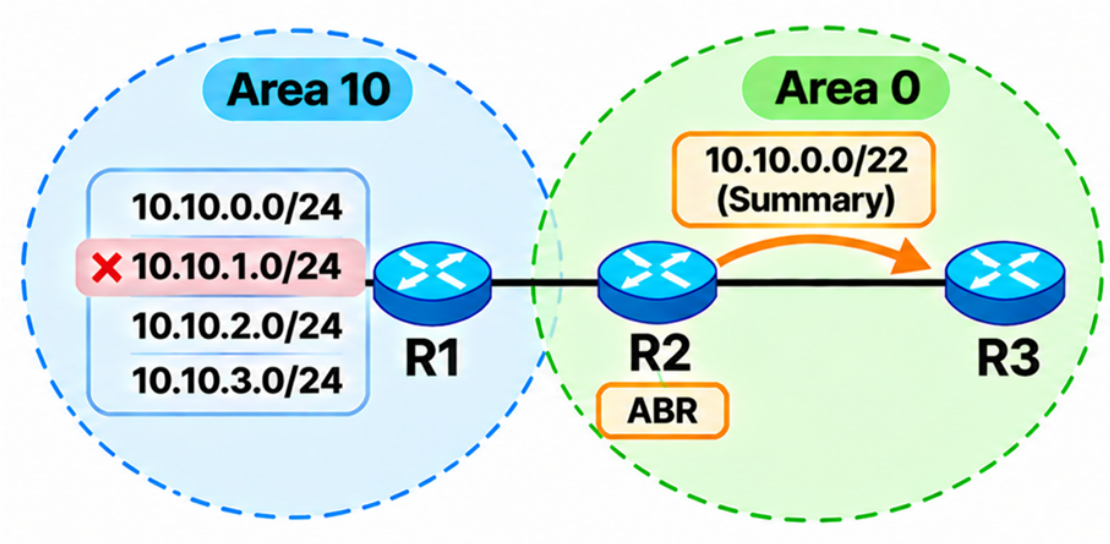
Without Summarization

R2 advertises four interarea routes (4 × Type 3 LSAs).

With Summarization

R2 advertises one summary route (10.10.0.0/22) as a single Type 3 LSA.

OSPF Route Summarization -> Why Summarization Is Useful



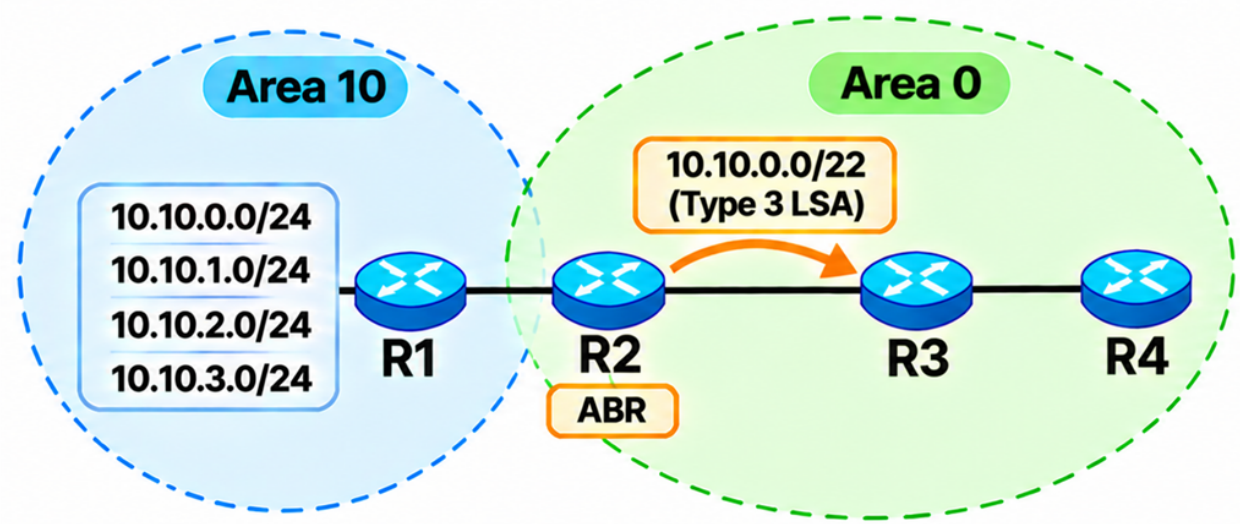
Benefits

- Fewer routing entries.
- Reduced interarea information.
- Hides individual prefix changes.

Consideration

- May hide failures and discard traffic to an unavailable subnet.

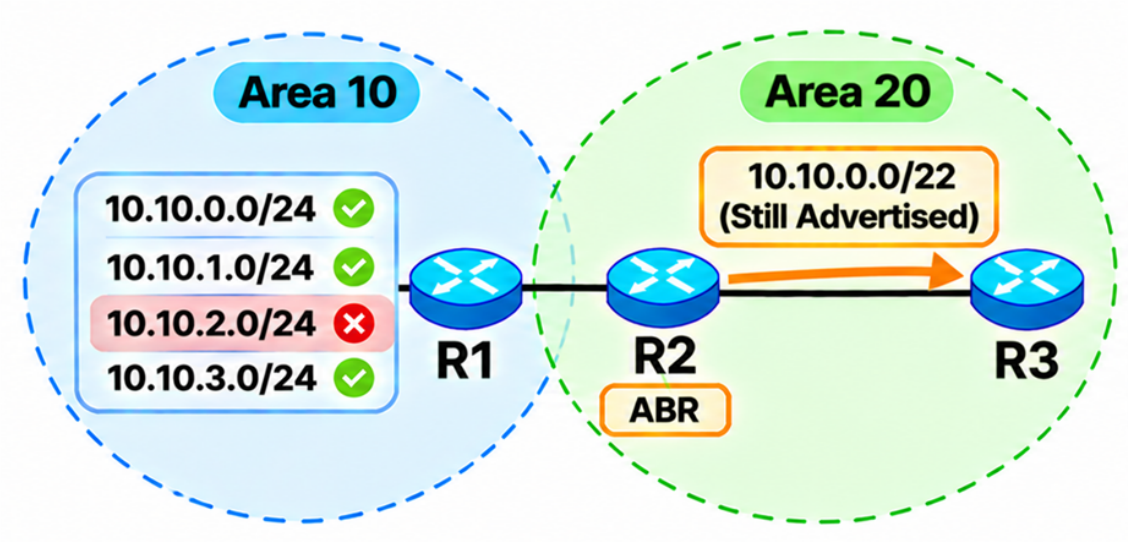
Interarea Summarization at ABRs



Key Points

- Summarization is configured at the ABR.
- R2 advertises 10.10.0.0/22 as a Type 3 LSA into Area 0.
- R3 and R4 learn a single summary route.
- Reduces the number of interarea advertisements.

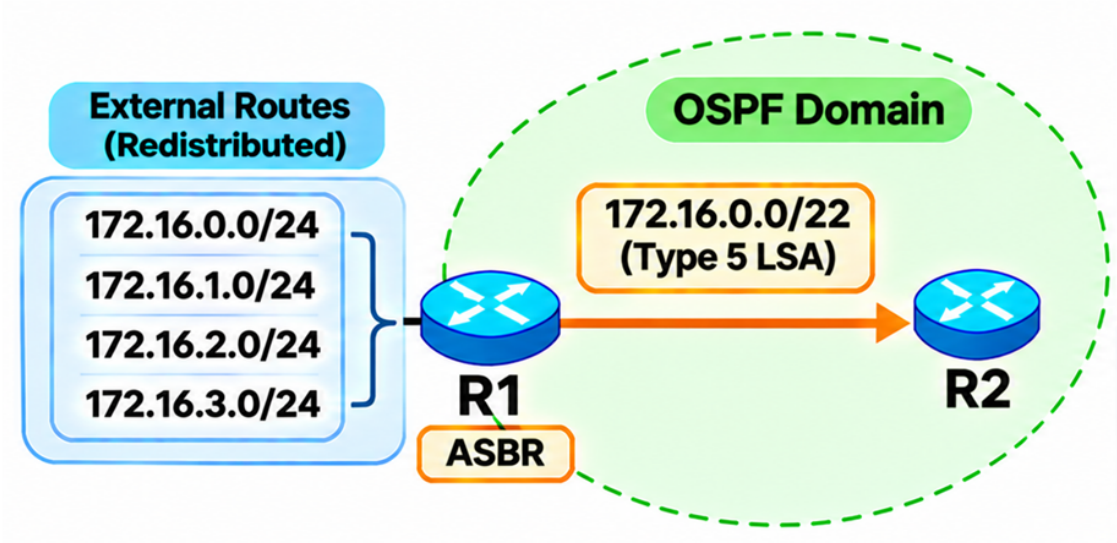
What Happens if One Subnet Fails?



Result

- The aggregate 10.10.0.0/22 remains in the routing table.
- Traffic is forwarded to R2 for reachable subnets.
- Traffic to 10.10.2.0/24 cannot be delivered (the subnet is unavailable).

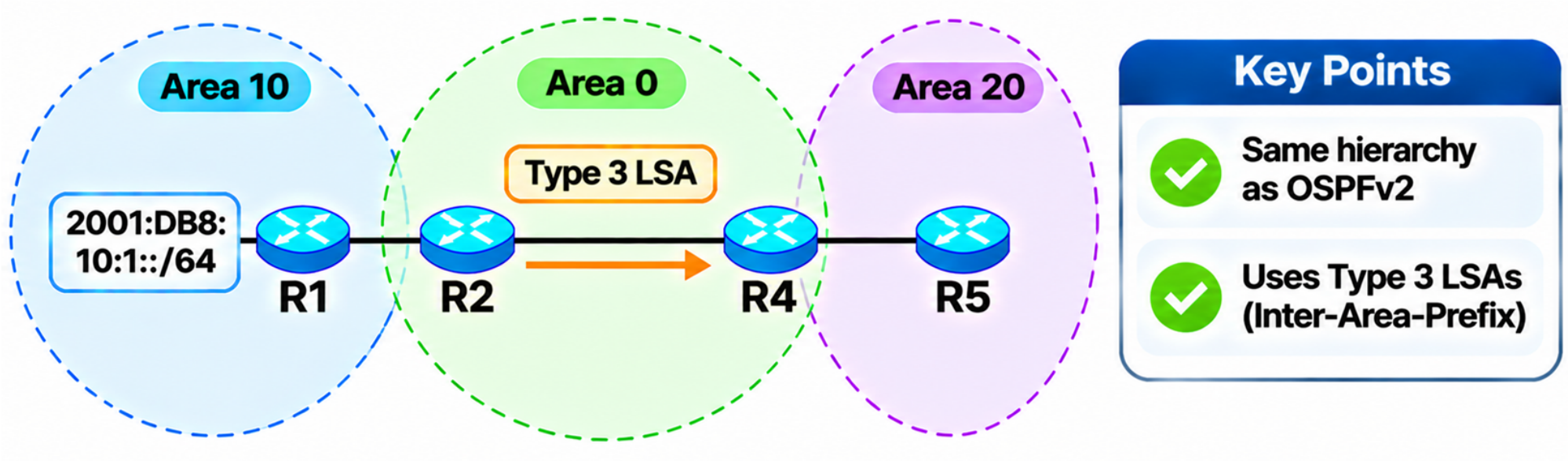
External Route Summarization



Summarization Types

Interarea Summarization	Performed at an ABR (for routes between areas).
External Summarization	Performed at an ASBR (for redistributed external routes).

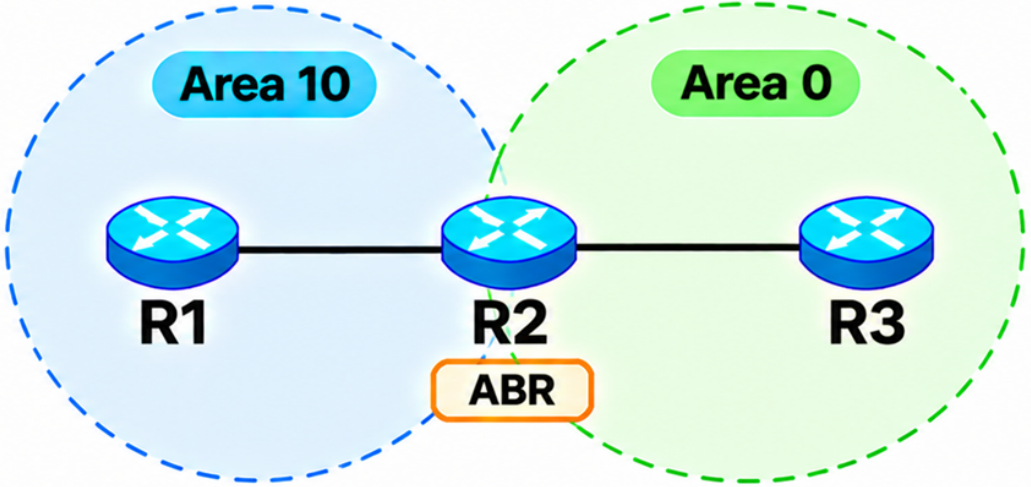
OSPFv3 Multiarea Route Advertisement -> OSPFv3 Interarea Prefix Advertisements



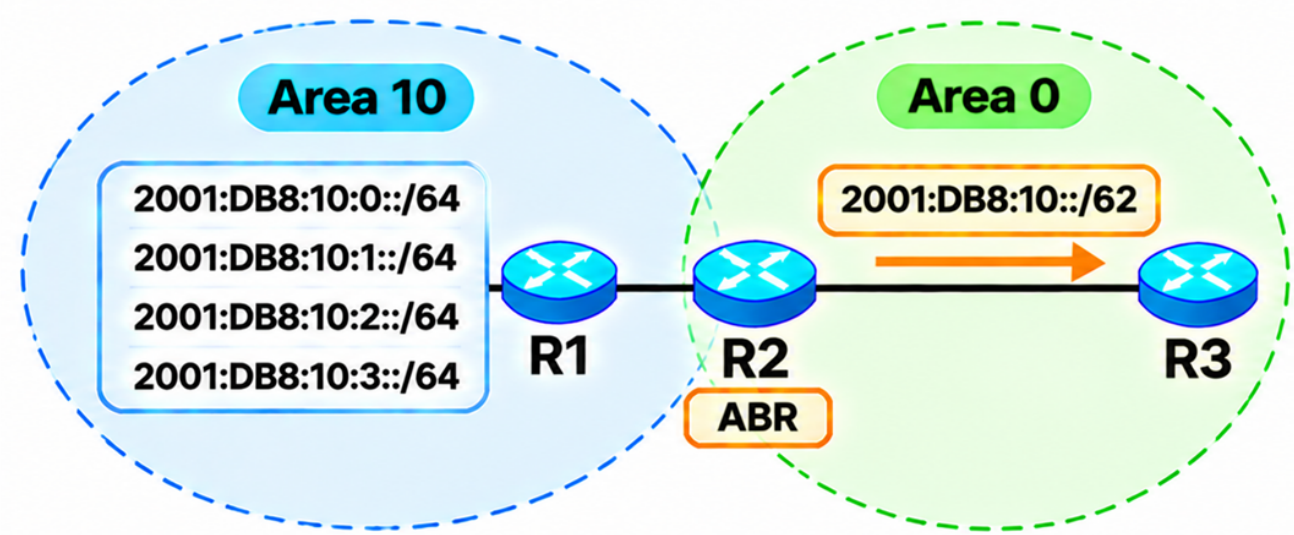
OSPFv3 Multiarea Route Advertisement -> OSPFv3 Additional LSA Types

Type 8
Link LSA

Type 9
Intra-Area-Prefix LSA



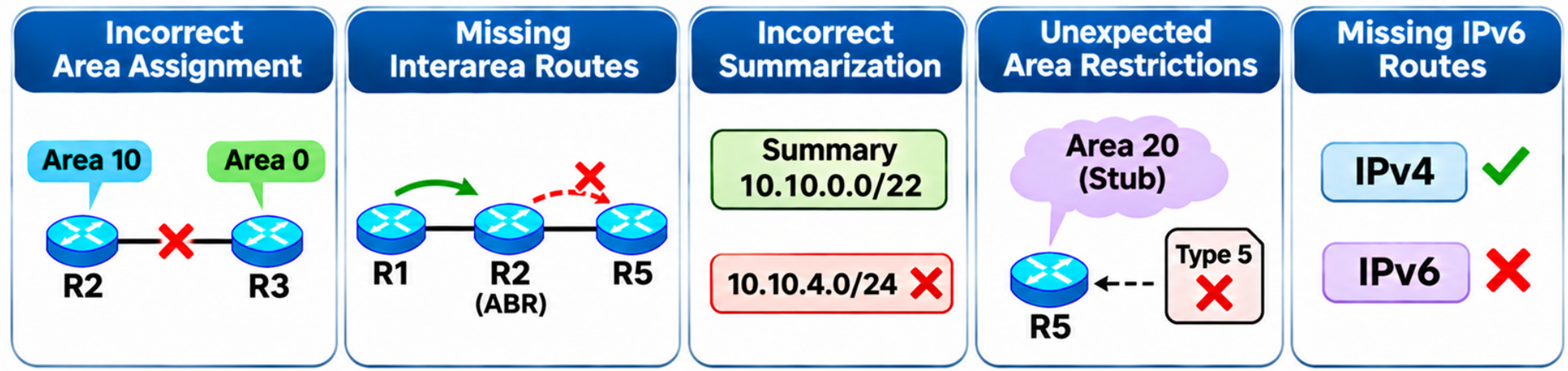
OSPFv3 Route Summarization



Key Benefits

- Fewer routing entries
- Less interarea advertisements
- Better change containment

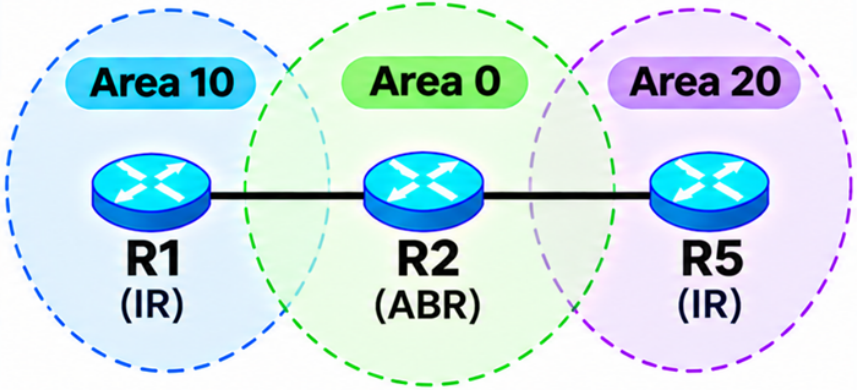
Common Multiarea Routing Problems



Understanding OSPF Multiarea Architecture, Route Advertisement, and Summarization

Lecture Summary

- Why Multiarea Design
- OSPF Router Roles (IR / ABR / ASBR)
- Route Advertisement (Intra-Area / Inter-Area)



- Area Types (Normal / Stub / NSSA)
- Route Summarization (Interarea / External)
- OSPFv3 Multiarea (IPv6)

CCNP SPRI 300-510 by Arash Deljoo