

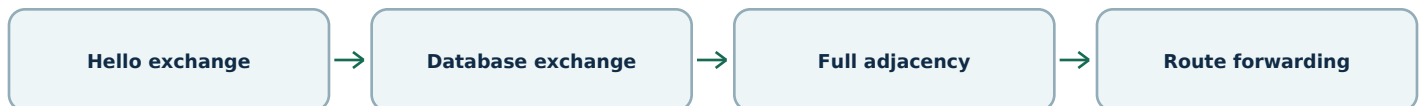
ROUTING | REV 2.0 | REVIEWED 2026-10-10

OSPF neighbors, routes & failure states

01 / Quick reference and concepts

Use neighbor state to narrow the fault, then verify the intended prefix reaches the routing and forwarding tables.

OSPFv2 IPv4 examples, Cisco IOS XE and Junos. OSPFv3, NBMA, virtual links and vendor-specific defaults need their own scope.



An adjacency becoming Full validates database synchronization with that neighbor; it does not prove an application path.

State / item	Meaning	First check
Down / Init	No usable bidirectional hello exchange	Link, area, timers, filtering
2-Way	Bidirectional hellos	Can be normal between DROTHERs
ExStart / Exchange	Database negotiation / exchange	MTU, IDs, packet loss
Loading	Missing LSAs being requested	Loss and retransmission evidence
Full	Database synchronization complete	Then inspect prefix and next hop
IP protocol 89	OSPF transport	Not TCP/UDP port 89
224.0.0.5 / .6	AllSPFRouters / AllDRouters	Link-local multicast roles

What to understand first

- Area, authentication, compatible hello/dead timers and link/network-type assumptions must agree where required. On ordinary broadcast links, DR/BDR behavior determines which pairs become fully adjacent.
- A persistent 2-Way state is not automatically a fault. Two DROTHER routers on a broadcast network normally do not form Full adjacency with each other.
- Persistent ExStart/Exchange can indicate an MTU mismatch or exchange problem. Compare interface MTU and database-description evidence instead of bypassing MTU checks immediately.
- OSPF cost influences path selection. An LSA in the database, an OSPF-selected route, an installed RIB entry and a resolved forwarding next hop are distinct evidence.

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02 / Commands and worked example

Replace documentation addresses, example interfaces and every <PLACEHOLDER>. Check command help for your model/release and routing context. Examples are documentation-reviewed, not executed on customer equipment.

Cisco IOS XE

Read-only EXEC

```
show ip ospf neighbor
show ip ospf interface
show ip ospf database
show ip route 192.0.2.10
```

Inspect: Match neighbor state to link type, then check the destination route and outgoing path.

Junos

Read-only operational

```
show ospf neighbor
show ospf interface detail
show ospf database
show route 192.0.2.0/24 detail
```

Inspect: Use the correct routing instance and inspect protocol preference and resolved next hop.

Illustrative adjacency failure

Illustrative teaching example, not captured device output.

```
Peer state: ExStart for several minutes
Local interface MTU: 1500
Peer interface MTU: 9000
Affected link: routed Ethernet
```

- The mismatch is a strong lead, not the only possible cause. Confirm exchange evidence and the intended MTU end to end.
- An approved correction should align the design; do not blindly enable an MTU-ignore workaround.

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03 / Troubleshooting and acceptance

1. Verify interface state, local/peer addresses and OSPF-enabled link context.
2. Compare area, authentication, timers, router IDs and network type.
3. Use the state table to inspect hello versus database exchange evidence.
4. For a missing prefix, follow database -> protocol route -> installed route -> forwarding entry.
5. Test the affected application and reverse path after convergence.

Common mistakes

- Treating every 2-Way neighbor as broken.
- Changing router IDs or restarting the process before collecting evidence.
- Using Full adjacency as the sole deployment acceptance test.

Acceptance checks

- Expected adjacencies match link type and remain stable.
- Required prefixes and next hops are installed in the correct table.
- Forward, reverse and planned failover application tests pass.

Primary references

[RFC 2328: OSPFv2](#)[Cisco OSPF ExStart / Exchange troubleshooting](#)[Junos OSPF verification and monitoring](#)

Original Wolex diagrams, scenarios and troubleshooting sequences. Vendor names identify platform scope; no affiliation is implied.

[Read the full web guide and supporting references](#)[Deployment and migration help](#) | [Network security review from Wolex](#)