

FUNDAMENTALS | REV 2.0 | REVIEWED 2026-10-10

IPv6 addressing & neighbor discovery

01 / Quick reference and concepts

Read IPv6 prefixes and troubleshoot link-local neighbors, router advertisements and dual-stack failures.

IPv6 unicast and Neighbor Discovery. CLI examples target IOS XE and Junos operational modes; routing-instance and platform options vary.



Neighbor Discovery resolves local neighbors. Router advertisements can supply the default router; a DHCPv6 lease alone does not prove one exists.

Item	Meaning	Example / note
Global unicast	Globally scoped address	2001:db8::/32 is documentation only
Link-local	Valid on the local link	fe80::/10; identify the interface
Loopback	This host	::1/128
Unspecified	No assigned address	::/128
Multicast	Group delivery	ff00::/8; no IPv6 broadcast
LAN prefix	Common SLAAC design	/64; not every link must be /64

What to understand first

- IPv6 has 128 bits, usually written as eight hexadecimal groups. Leading zeros may be omitted; one run of zero groups can be compressed with ::. Canonical text uses lowercase and the longest eligible run.
- The prefix length identifies network bits. A /48 allocation contains 65,536 /64 prefixes. 2001:db8:1200:30::/64 and 2001:db8:1200:31::/64 are separate LANs.
- ICMPv6 supports Neighbor Discovery and path-MTU feedback. IPv4-style blanket ICMP blocking can break IPv6 even when addresses and routes look correct.
- Duplicate Address Detection, neighbor reachability, RA flags and address lifetimes are separate checks. Dual-stack applications may choose IPv6 even while IPv4 tests pass.

FUNDAMENTALS | REV 2.0 | REVIEWED 2026-10-10

IPv6 addressing & neighbor discovery

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 ipv6 interface brief
show ipv6 neighbors
show ipv6 route
```

Inspect: Check address state, neighbor status and default route; inspect the specific interface for RA settings.

Junos

Read-only operational

```
show interfaces terse
show ipv6 neighbors
show route table inet6.0
```

Inspect: inet6.0 is the default IPv6 table. Use the appropriate instance table for tenant traffic.

Illustrative dual-stack failure

Illustrative teaching example, not captured device output.

```
Client: 2001:db8:1200:30::25/64
Neighbor: fe80::1 on the client link
IPv4 application: works
IPv6 default route: absent
```

- The neighbor can resolve locally while the remote application still has no route. Check the RA/default-router path.
- These are teaching observations, not captured device output. Do not infer a default route from an assigned address.

FUNDAMENTALS | REV 2.0 | REVIEWED 2026-10-10

IPv6 addressing & neighbor discovery

03 / Troubleshooting and acceptance

1. Confirm whether the failing attempt used IPv4 or IPv6; check DNS A and AAAA answers.
2. Check address validity and DAD status, then the intended /64 and VLAN.
3. Inspect the link-local neighbor on the correct interface and whether an RA supplies a usable router.
4. Check the destination prefix and reverse route in the correct IPv6 table.
5. If small traffic works but transfers stall, review ICMPv6 Packet Too Big delivery and tunnel MTU.

Common mistakes

- Using multiple :: compressions in one address.
- Treating a link-local address as unique without its link/interface context.
- Assuming IPv4 firewall rules, DNS results or tests also validate IPv6.

Acceptance checks

- Both address families pass the intended application tests.
- ND/RA behavior matches design and unwanted RAs are controlled.
- Path-MTU feedback works and address lifetimes are documented.

Primary references

[RFC 4291: IPv6 addressing](#)[RFC 5952: IPv6 text representation](#)[RFC 4861: Neighbor Discovery](#)[Junos IPv6 neighbor inspection](#)

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](#)