🧭 Upgrading your network tools

Unified + Workshop Edition

🧩 Why This Change?

Linux networking used to rely on a **collection of small tools**, each handling one job:

Tool	Purpose
`ifconfig`	Show or configure interfaces
`route`	Display or modify routing tables
`arp`	Manage neighbor (ARP) cache
`netstat`	Show sockets, routing, interfaces
`ipmaddr`, `iptunnel`	Manage multicast/tunnels

Each had **different syntax**, **limited IPv6 support**, and were **inconsistent**.

👉 Enter the `iproute2` suite — the **modern replacement** that unifies all those tasks under **one coherent command**: `ip`.

⚙️ What is `iproute2`?

`iproute2` is the current standard networking toolkit for Linux.

It replaces:

- `ifconfig` → `ip addr`, `ip link`
- `route` → `ip route`
- `arp` → `ip neighbor`
- `netstat` → `ss`

Developed to handle:

- **IPv4 and IPv6 natively**
- **Multiple addresses per interface**
- **Advanced routing (policy, multipath, VRF)**
- **Consistent, scriptable syntax**

🧱 The Core Concept

All `ip` commands follow a simple pattern:

```
ip [OBJECT] [COMMAND] [OPTIONS]
```

Examples:

- `ip addr show`
- `ip link set eth0 up`
- `ip route add 10.0.0.0/24 via 192.168.1.1`
- `ip neighbor show`

💡 Think of `ip` as a single command with many "subcommands" for specific network objects.

🔍 Basic Equivalents

Legacy Command	Modern Equivalent (`ip`)
`ifconfig`	`ip addr show` or `ip link show`
`ifconfig eth0 up`	`ip link set eth0 up`
`ifconfig eth0 192.168.1.10/24`	`ip addr add 192.168.1.10/24 dev eth0`
`route -n`	`ip route show`
`route add default gw 192.168.1.1`	`ip route add default via 192.168.1.1`
`arp -n`	`ip neighbor show`
`arp -d 192.168.1.5`	`ip neighbor del 192.168.1.5 dev eth0`

🧠 Working with Neighbors (ARP/ND)

Old way:

```
arp -n
```

New way:

```
ip neighbor show
```

To add or delete entries:

```
ip neighbor add 192.168.1.5 lladdr 00:11:22:33:44:55 dev eth0
ip neighbor del 192.168.1.5 dev eth0
```

Works for both **IPv4 ARP** and **IPv6 Neighbor Discovery**.

🛰️ From `netstat` → `ss` — Modern Socket Inspection

Why replace `netstat`?

- `netstat` is deprecated and slow — parses `/proc` directly.
- Lacks modern protocol visibility (IPv6, SCTP, etc.).
- `ss` is part of `iproute2`: fast, filterable, and script-friendly.

Common equivalences

`netstat`	`ss`
`netstat -tuln`	`ss -tuln`
`netstat -tanp`	`ss -tanp`
`netstat -rn`	`ip route show`
`netstat -s`	`ss -s`

Practical examples

```
ss -tuln           # TCP/UDP listening ports
ss -t state estab  # Established TCP sessions
ss -uap            # UDP sockets with process names
```

Faster than `netstat` and supports fine-grained filters.

Filtering

```
ss -t state listening
ss -u src 192.168.1.10
ss -t dst 10.0.0.5:22
ss -tan 'sport = :443' | grep ESTAB
```

Bonus: Statistics

```
ss -s
```

Displays TCP/UDP totals, retransmits, queues — great for diagnostics.

💡 Try: `watch -n1 ss -s` for live socket stats.

🧮 Examples: Common Tasks

Task	Old Command	New Command
Show interface IPs	`ifconfig`	`ip -brief addr`
Show default gateway	`route -n`	`ip route show default`
Bring up interface	`ifconfig eth0 up`	`ip link set eth0 up`
Check ARP table	`arp -n`	`ip neighbor show`
Show routing	`netstat -rn`	`ip route`
Check listening ports	`netstat -tuln`	`ss -tuln`

💡 Why Scripts Should Use `ip` and `ss`

- Structured, predictable text output.
- JSON available (`ip -j` , `ss -j`).
- Fast, non-blocking, IPv6-ready.
- Excellent for automation and monitoring pipelines.

📃 Quick Reference Cheat Sheet

```
ip addr show            # Show IP addresses
ip link show            # Show interfaces
ip route show           # Show routes
ip neighbor show        # Show ARP/ND entries
ss -tuln                # Show listening sockets
ss -s                   # Socket statistics summary
```

🧱 Migration Summary

Legacy Tool	Status	Replacement
`ifconfig`	Deprecated	`ip addr`, `ip link`
`route`	Deprecated	`ip route`
`arp`	Deprecated	`ip neighbor`
`netstat`	Deprecated	`ss`
`ipmaddr`, `iptunnel`	Deprecated	`ip maddr`, `ip tunnel`

✅ Wrap-Up

🎯 **Old habits:** `ifconfig`, `route`, `arp`, `netstat`
🚀 **Modern tools:** `ip addr`, `ip route`, `ip neighbor`, `ss`
🧠 **Mindset:** Unified, scriptable, and future-proof.

💬 Questions?

```
$ ip help
$ ss --help
```