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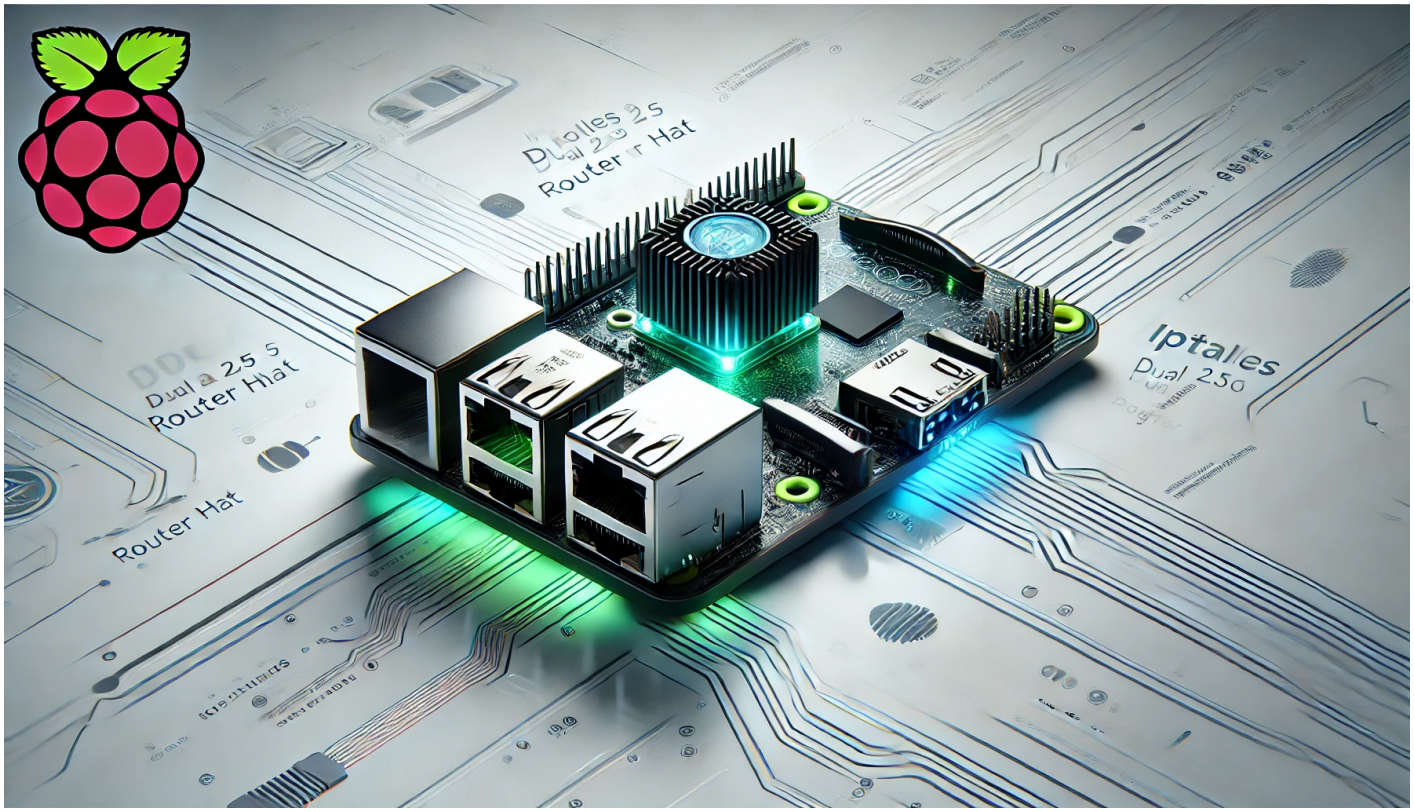

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Building a Router with RPI5

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A compact, high-performance home/SMB router built on **Raspberry Pi 5** with the **Radxa Dual 2.5G Router HAT**. Runs on Raspberry Pi OS with a lean Linux stack (**ifupdown + iptables + dnsmasq**) and optional services like **Pi-hole**, **Unbound** (recursive DNS), and a **Wi-Fi AP**. The project includes shell scripts and documentation to reproduce the setup end-to-end, including **NVMe migration** for reliability and speed.

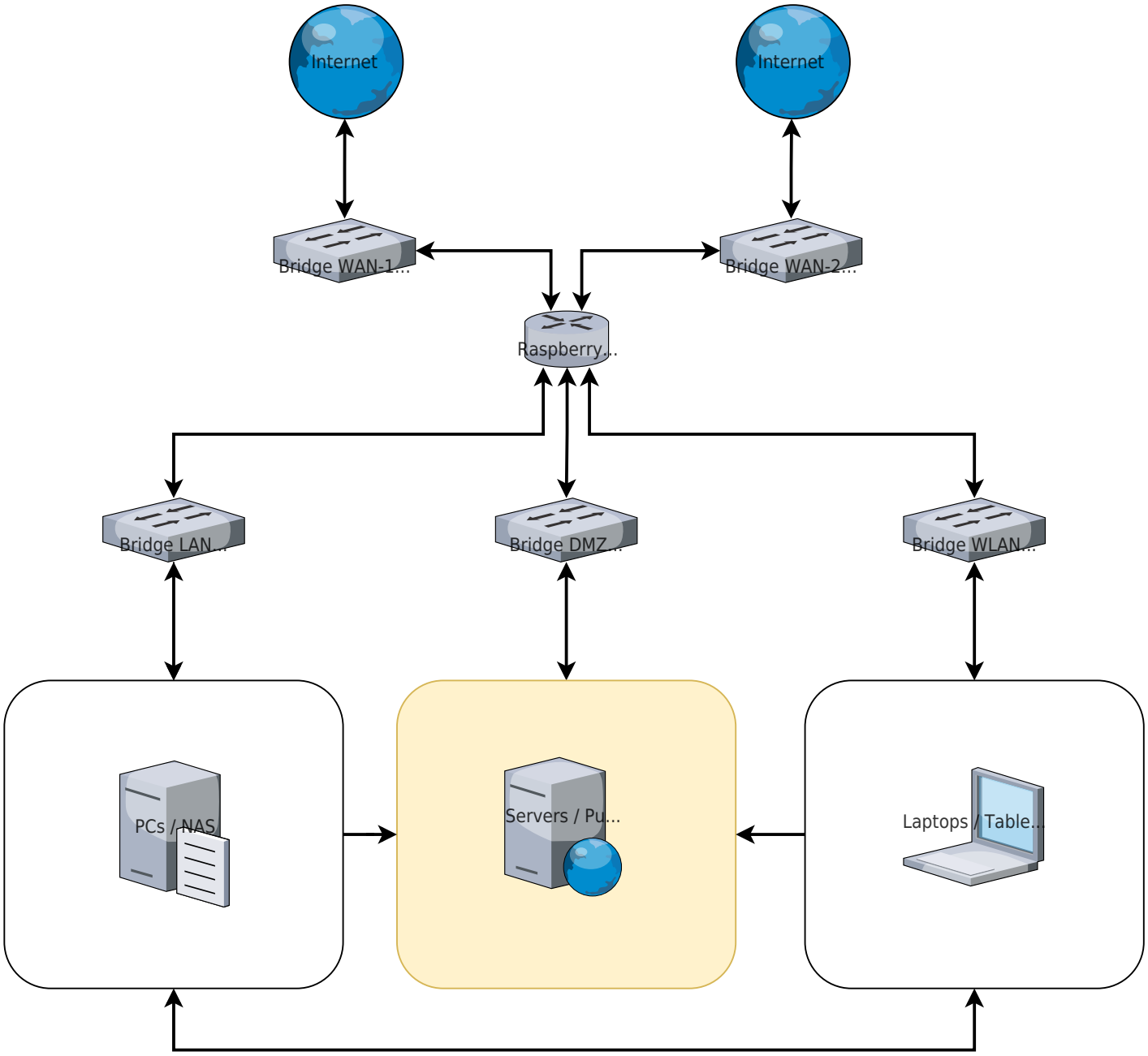
Features

- **Three-zone routing**: WAN (`eth0`), LAN (`eth1`), DMZ (`eth2`)
- **Clean networking**: `ifupdown` for addresses, `iptables` for firewall/NAT, `dnsmasq` for

DHCP

- **sane defaults**: secure INPUT policy, LAN-only SSH, DHCP/DNS per zone, NAT out via WAN
- **NVMe boot/migration**: scripted SD→NVMe clone, resize, and boot order tweak
- **Optional Pi-hole**: Pi-hole owns :53; system dnsmasq does DHCP + local DNS on :5353
- **Optional Unbound**: local recursive resolver on 127.0.0.1#5335 (DNSSEC, no 3rd-party upstreams)
- **Optional Wi-Fi AP**: guest (routed subnet on `wlan0`) or bridged (LAN extender via `br0`)
- **Idempotent scripts**: re-runnable installers that won't clobber working configs
- **Firewall extras**: examples for port-forward, DNS-redirect, and guest isolation

Network Topology



Defaults & Behavior

- **Subnets**: LAN `192.168.10.0/24`, DMZ `192.168.20.0/24` (guest Wi-Fi `192.168.30.0/24` if enabled)
- **Gateway IPs**: LAN `192.168.10.1`, DMZ `192.168.20.1`, Wi-Fi `192.168.30.1`
- **DHCP pools**: `.100–.200` per subnet (configurable in scripts)
- **Firewall**:
  - INPUT: **DROP** by default; allow loopback, established/related, DHCP/DNS from LAN/DMZ, **SSH from LAN only**
  - FORWARD: allow LAN/DMZ→WAN; block unsolicited WAN→LAN/DMZ; LAN↔DMZ

    blocked unless explicitly allowed
    - NAT: MASQUERADE out via WAN
- **Pi-Hole mode (optional)**: Pi-hole/FTL on **:53**; system `dnsmasq` on **:5353** serves local zones; Pi-hole forwards `lan/dmz` to `127.0.0.1#5353`
- **Unbound (optional)**: Pi-hole upstream set to `127.0.0.1#5335` for local recursion (DNSSEC in Unbound)

Quick Start

Requires Raspberry Pi OS (Bookworm), RPi5 with Radxa Dual 2.5G HAT, and basic console access.

```
# 1) Get the installer
curl -fsSL https://raw.githubusercontent.com/LaswitchTech/router-pi5/stable/install.sh -o install.sh
chmod +x install.sh

# 2) Run base router setup (ifupdown + iptables + dnsmasq)
sudo ./install.sh

# 3) (Optional) Add services later
#   Pi-hole DNS front-end
sudo ./add-pihole.sh
#   Unbound recursive resolver
sudo ./add-unbound.sh
#   Guest Wi-Fi AP (routed)
sudo ./add-ap-wifi-guest.sh
#   Bridged Wi-Fi AP (LAN extender)
sudo ./add-ap-wifi-bridge.sh
```

Heads-up: if you already installed Pi-hole, it binds port **53**. The system `dnsmasq` used for DHCP must be moved to **port 5353** (the scripts handle this). To diagnose conflicts: `sudo ss -lunp '( sport = :53 or sport = :5353 )'`

Documentation

Review the full documentation including:

- **Installation** (router base, NVMe migration)
- **Pi-hole integration** (dnsmasq → 5353, local zones, optional DNS redirect)
- **Unbound** (secure recursion, DNSSEC)
- **Wi-Fi AP** (guest routed vs bridged)
- **Port forwarding & hairpin NAT** examples
- **Troubleshooting** (port 53 conflicts, DHCP scope, PCIe enable on Pi 5)

Hardware, Parts & Costs

Brand	Part	Vendor	Qty	Price
Raspberry Pi	5 (4–8 GB)	Amazon	1	143.00 C$
Raspberry Pi	5 Active Cooler	Amazon	1	17.31 C$
Radxa	Dual 2.5G Router HAT	AliExpress	1	60.68 C$
Radxa	Power DC12 60W	AliExpress	1	17.89 C$
			Total	238.88 $CAD

Upload

Gallery

Roadmap

- Merge add-on scripts behind **`install.sh` flags** (e.g., `–with-pihole`, `–with-unbound`, `–with-ap-guest|bridge`)
- Optional **PHP admin** for templating configs & safe reloads (diff + rollback)
- SQM/CAKE for bufferbloat control
- Support for redundant WANs
- WireGuard site-to-site & remote-access presets
- VLAN templates and multiple SSID support (hostapd multi-BSS)

Troubleshooting Snippets

```
# Who's using port 53 / 5353?
```

```
sudo ss -lntup '( sport = :53 or sport = :5353 )'
sudo ss -lunp  '( sport = :53 or sport = :5353 )'

# Pi-hole DNS reload + logs
sudo pihole reload dns
journalctl -u pihole-FTL -n 50 --no-pager

# dnsmasq status & lease file
systemctl status dnsmasq
cat /var/lib/misc/dnsmasq.leases
```

License & Credits

Code and docs are in the repo; see **LICENSE** file for details. Thanks to the Raspberry Pi, Radxa, and open-source communities.

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