BUILDING YOUR PRIVATE AND RELIABLE DNS: SYNCHRONIZED ADGUARD HOME

PRACTICAL DEPLOYMENT AND MANAGEMENT FOR A SECURE NETWORK

THOMAS BUSCH

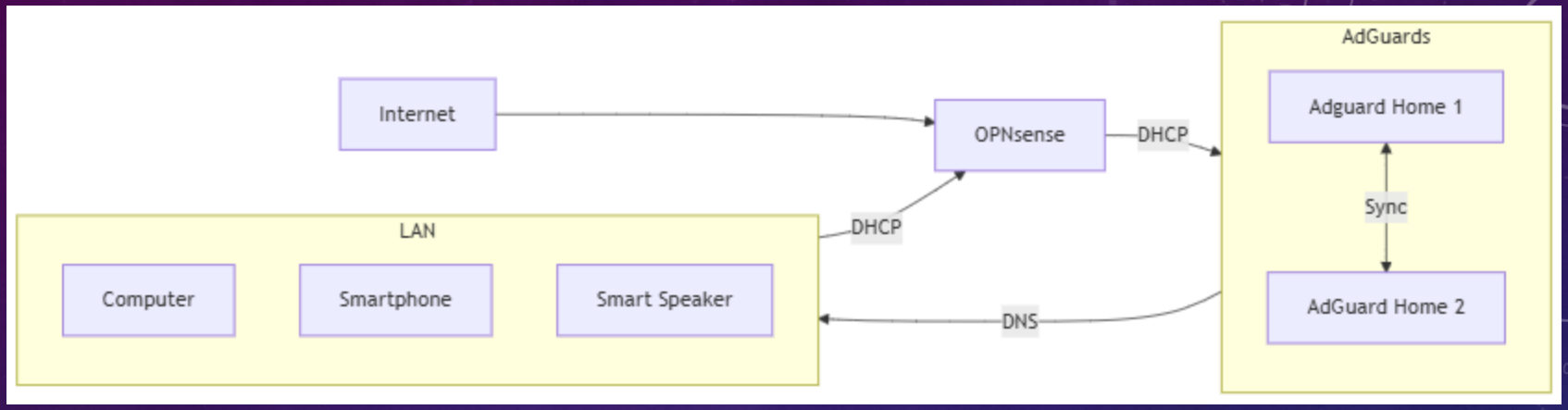
TAKING CONTROL: BUILDING A PRIVATE AND SECURE FOUNDATION

- **The Goal:** Establish a **reliable local DNS infrastructure** that enhances privacy and security.
- *Why Bother?* Default DNS from ISPs is often slow, insecure, and tracks your activity. We're building something better.
  - AdGuard Home: Our chosen tool – a powerful, open-source DNS server with ad and tracker blocking.
- **Key Benefits:**
  - **Privacy:** Block trackers and telemetry at the network level.
  - **Security:** Filter out malicious domains and protect against phishing.
  - **Performance:** Faster browsing through caching and optimized DNS resolution.
  - **Control:** Manage your DNS settings and filtering rules directly.

ENSURING CONTINUOUS OPERATION: THE POWER OF TWO

- **Single Point of Failure is a No-Go:** Relying on one DNS server leaves you vulnerable to downtime.
- **Redundancy with Synchronized Instances:** Our solution involves two AdGuard Home instances working together.
- **Benefits of Redundancy:**
  - **High Availability:** If one server fails, the other seamlessly takes over.
  - **Resilience:** Planned maintenance or unexpected issues won't disrupt your DNS.
  - **Improved Uptime:** A more robust and reliable local DNS infrastructure.

UNDERSTANDING THE COMPONENTS AND THEIR INTERACTIONS



- **Network Topology:** As shown in the diagram above, our setup consists of primary and secondary AdGuard Home instances.
- **DNS Flow:**
  - Client devices primarily query the main instance (192.168.1.11)
  - Automatic failover to secondary instance (192.168.1.12) if primary is unavailable
- **Synchronization:** Ensures configuration consistency
- **Upstream DNS:** Both instances can query multiple upstream providers for redundancy

WHAT YOU'LL NEED FOR A SUCCESSFUL DEPLOYMENT

- **Two Linux Machines:** The foundation of our **reliable local DNS infrastructure**.
  - Physical servers, VMs, or Raspberry Pis – your choice.
  - Stable network connectivity and static IPs (or DHCP reservations).
- **Command Line Access:** Essential for **practical deployment methods**.
- **Basic Linux Skills:** Familiarity with common commands.
- **Docker (Optional but Recommended):** Simplifies deployment and management.
- **A Clear Understanding of Your Network:** Knowing your IP ranges and gateway.

PLANNING YOUR DEPLOYMENT

- **Phase 1: Preparation**
  - Network planning and IP allocation
  - Server preparation and updates
  - Documentation review
- **Phase 2: Installation**
  - Primary instance setup and testing
  - Secondary instance setup and testing
  - Initial configuration and synchronization
- **Phase 3: Configuration**
  - Filter list selection and implementation
  - Custom rules creation
  - DNS rewrites setup
- **Phase 4: Testing**
  - Basic functionality testing
  - Failover testing
  - Performance benchmarking
- **Phase 5: Client Migration**
  - Update DNS settings via DHCP
  - Verify connectivity
  - Monitor for issues

CONTAINERIZED DEPLOYMENT: INSTALLING ADGUARD HOME

- docker volume create work
- docker volume create conf
- docker run --name adguardhome\

  --restart unless-stopped\

  -v work:/opt/adguardhome/work\

  -v conf:/opt/adguardhome/conf\

  -p 53:53/tcp -p 53:53/udp\

  -p 80:80/tcp -p 443:443/tcp -p 443:443/udp -p 3000:3000/tcp\

  -p 853:853/tcp\

  -p 784:784/udp -p 853:853/udp -p 8853:8853/udp\

  -p 5443:5443/tcp -p 5443:5443/udp\

  -d adguard/adguardhome

CONFIGURING YOUR PRIMARY ADGUARD HOME INSTANCE

- Access the AdGuard Home web interface: http://<IP_Address_of_Instance_1>:3000 (or port 80 for Docker).
- Set an administrator username and password.
- Choose upstream DNS servers. Consider:
  - Cloudflare (1.1.1.1, 1.0.0.1)
  - Quad9 (9.9.9.9, 149.112.112.112)
- Avoid your ISP's default DNS servers.

SETTING UP YOUR BACKUP ADGUARD HOME SERVER

- Install AdGuard Home on your second Linux machine (using CLI or Docker).
- In the initial setup, you can skip configuring upstream DNS servers as this will be handled by our instance synchronization.

MAINTAINING CONSISTENCY ACROSS YOUR DNS INFRASTRUCTURE

- About AdGuardHome-Sync:
  - Dedicated tool for keeping AdGuard Home instances synchronized
  - Supports configuration sync, filters, and DNS rewrites
  - Available via both CLI and Docker container
- Prerequisites:
  - Both AdGuard Home instances must be running and accessible
  - Network connectivity between instances
  - Docker (if using container deployment) or Go runtime (if using CLI)

ADGUARDHOME-SYNC CONFIGURATION

- Step 1: Create Docker Volume

  docker volume create syncconfig
- Step 2: Locate Configuration Directory
  - docker volume inspect syncconfig
  - Usually located at: /var/lib/docker/volumes/syncconfig/_data/
- Step 3: Create Configuration File
  - Navigate to the volume directory and create `adguardhome-sync.yaml`:

```
cron: "* * * * *"
# runs the synchronisation on startup
runOnStart: true
continueOnError: false
origin:
url: http://192.168.1.11
  username: username
  password: password
replicas:
  - url: http://192.168.1.12
  username: username
  password: password
api:
  port: 8080
  username: username
  password: password
darkMode: true
features:
  generalSettings: true
  queryLogConfig: true
  statsConfig: true
  clientSettings: true
  services: true
  filters: true
dhcp:
  serverConfig: true
  staticLeases: true
dns:
  serverConfig: true
  accessLists: true
  rewrites: true
```

DOCKER CONTAINER DEPLOYMENT

- Step 1: Deploy Container

  docker run -d \

  --name=adguardhome-sync \

  -p 8080:8080 \

  -v syncconfig:/config \

  --restart unless-stopped \

  ghcr.io/bakito/adguardhome-sync:latest

- Step 2: Verify Synchronization
  - Check sync logs in container
  - Verify changes propagate between instances
  - Monitor sync status in web UI

UNDERSTANDING HOW CHANGES PROPAGATE

- **Configuration Changes:**
  - Changes made to primary instance automatically sync to secondary
  - Includes filters, DNS rewrites, and settings
- **Recovery Process:**
  - Secondary instance maintains service during primary outage
  - Primary automatically re-syncs upon recovery

TESTING AND VALIDATING YOUR SETUP

- On Instance 2, verify that the settings match Instance 1.
- Make a small change on Instance 1 and check if it synchronizes to Instance 2.
- Test DNS resolution through both instances using `dig` or `nslookup`.

MAPPING DOMAINS TO LOCAL IPS: BECAUSE YOU CAN

- Ever wanted your browser to think `my.super.secret.server` is actually at 192.168.1.50? Now you can!
- AdGuard Home lets you create **local DNS records**, overriding what the internet *thinks* is true.
- **Why would you do this, you ask? Excellent question!**
  - **Local Development:** Testing a website locally before unleashing it on the world? Map a pretty domain to your `localhost`.
  - **Internal Services:** Access internal servers by name, not just IP addresses. Because remembering `intranet.corp` is easier than `10.0.0.123`.
  - **Blocking at a Deeper Level (Sometimes):** While blocklists are great, you can also point particularly annoying domains to `0.0.0.0` or a local 'block page'. It's like sending them to the digital void.
  - **Fun with Network Pranks (Use Responsibly!):** Okay, maybe don't redirect your friend's favorite website to a picture of a cat. But the power is there!
- **Configuration is Simple:**
  - In the AdGuard Home web interface, navigate to "Filters" -> "DNS rewrites".
  - Add the domain name and the IP address you want it to resolve to. Boom! Magic.

IMPROVING PERFORMANCE WITH LOCAL CACHING

- AdGuard Home automatically caches DNS queries.
- Reduces latency and load on upstream servers.
- View cached queries in the "Query Log".
- Invalidate cache entries if needed.

CREATING A SAFER ONLINE ENVIRONMENT

- **Recommended Filter Lists:**
  - AdGuard DNS filter (https://adguardteam.github.io/AdGuardSDNSFilter/Filters/filter.txt)
  - Rpi-List (https://raw.githubusercontent.com/RPiList/specials/master/Blocklisten/malware)
  - Anudeep's Blacklist (https://raw.githubusercontent.com/anudeepND/blacklist/master/adservers.txt)
- **Custom Rules Examples:**
  - ||gambling.*^$important
  - ||adult.*^$important
  - ||*porn*^$important
- **Whitelist Important Services:**
  - Educational websites (*.edu, *.school.com)
  - Learning platforms (khan academy, coursera, etc.)
- **Implementation Time Estimates:**
  - Basic Setup: 30-45 minutes
  - Fine-tuning Rules: 1-2 hours
  - Testing: 1 hour
- **Regular Maintenance:**
  - Review blocked domains weekly
  - Update filter lists monthly
  - Test effectiveness quarterly

POINTING YOUR DEVICES TO YOUR ADGUARD HOME INFRASTRUCTURE

The Easy Way:

- On your Router, find the DHCP settings
- Set the DNS server addresses

The Hard Way:

- On each device, find the network settings.
  - Locate the DNS server settings.
  - Manually configure DNS servers:
    - Primary DNS: IP address of Instance 1
    - Secondary DNS: IP address of Instance 2

KEEPING YOUR PRIVATE DNS INFRASTRUCTURE HEALTHY

- Regularly update AdGuard Home Via:
  - Web Interface
  - Cli
  - Watchtower (Docker)
- Monitor system resources and AdGuard Home logs.
- Manage blocklists and filters: review and update regularly.

TROUBLESHOOTING AND GENERAL INQUIRIES

- **Q:** What DNS server addresses should I use on my devices?
  - **A:** Primary: Instance 1 IP, Secondary: Instance 2 IP.
- **Q:** What if one server goes down?
  - **A:** The other will handle requests automatically.
- **Q:** Why are some ads still showing?
  - **A:** First-party ads; consider more blocklists or custom rules.
- **Q:** How to add more blocklists?
  - **A:** Web interface -> Filters -> DNS blocklists.
- **Q:** Internet seems slow?
  - **A:** Check server resources, query log; caching helps.
- **Q:** Sync issues?
  - **A:** Verify IP, network connectivity, instance credentials.
- **Q:** Need to install anything on clients?
  - **A:** No, just change DNS settings or set via DHCP.
- **Q:** Why two instances?
  - **A:** Redundancy for reliability.

TAKING BACK CONTROL OF YOUR DNS

- You've built a reliable and private DNS infrastructure.
- Redundancy ensures high availability.
- Synchronization keeps configurations consistent.
- AdGuard Home provides powerful ad blocking and privacy features.
- Continue exploring advanced features and customizations.

Q&A