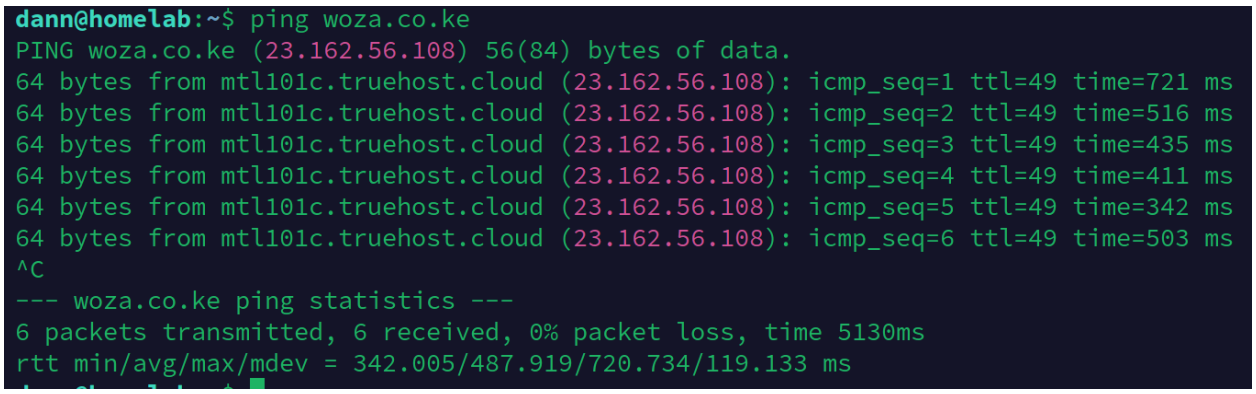
Module 2: Essential Troubleshooting Tools

This module covers some essential tools for network diagnostics, log analysis, debugging, and external web services.

Command-Line Tools

Command-line tools are indispensable for quick and precise troubleshooting of network and server issues. Below are key tools and their applications:

1. **ping**
    - **Purpose:** Tests the connectivity between the local machine and a remote server.
    - **Usage:** `ping example.com`
    - **Output:** Round-trip time, packet loss, and network latency.



2. **traceroute** (Linux) / **tracert** (Windows)
    - **Purpose:** Traces the path packets take to reach a destination server.
    - **Usage:** `traceroute example.com` or `tracert example.com`

- **Output:** Hop-by-hop details to identify network bottlenecks or failures.

```
dann@homelab:~$ traceroute woza.co.ke
traceroute to woza.co.ke (23.162.56.108), 64 hops max
  1   192.168.1.1  3.167ms  1.363ms  1.352ms
  2   100.64.0.1  283.910ms  202.873ms  208.803ms
  3   172.16.251.46  205.068ms  200.454ms  204.918ms
  4   206.224.65.208  516.142ms  488.185ms  533.494ms
  5   206.224.65.178  204.130ms  203.117ms  205.104ms
  6   62.115.37.20  208.964ms  200.807ms  204.178ms
  7   *  *  *
  8   130.117.1.1  206.979ms  154.639ms  256.727ms
  9   64.125.29.59  308.436ms  306.598ms  245.996ms
 10   *  64.125.28.37  334.417ms  *
 11   154.54.44.162  273.357ms  307.315ms  306.283ms
 12   154.54.45.42  308.048ms  306.484ms  235.752ms
 13   *  *  *
 14   *  *  *
```

3. **dig** (Domain Information Groper)
   - **Purpose:** Queries DNS records to troubleshoot domain-related issues.
   - **Usage:** `dig example.com A`
   - **Output:** Returns DNS record details such as IP address, TTL, and authoritative nameservers.

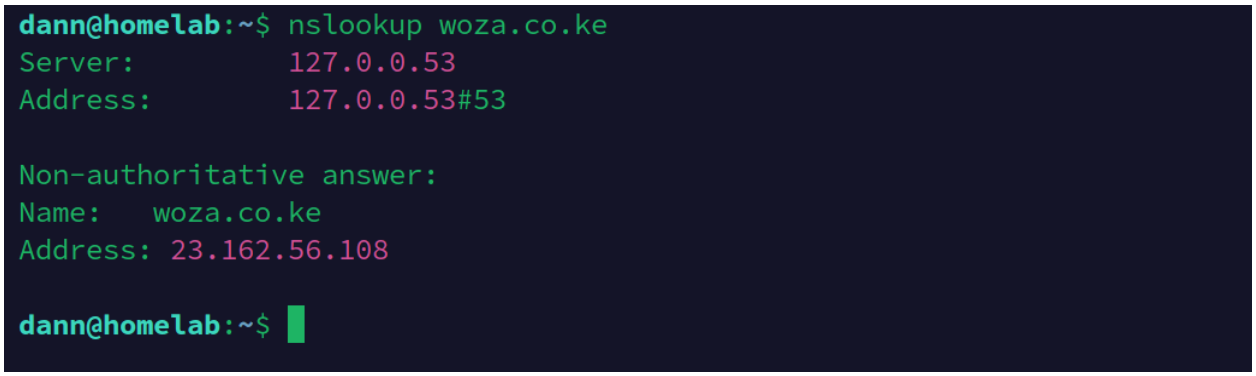
```
dann@homelab:~$ dig woza.co.ke A

; <<>> DiG 9.18.28-0ubuntu0.22.04.1-Ubuntu <<>> woza.co.ke A
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 14416
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;woza.co.ke.                    IN      A

;; ANSWER SECTION:
woza.co.ke.             6696    IN      A       23.162.56.108

;; Query time: 1 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Wed Dec 18 10:02:00 EAT 2024
;; MSG SIZE  rcvd: 55
```

4. **netstat**
    - **Purpose:** Displays active network connections and port usage.
    - **Usage:** `netstat -tuln`
    - **Useful for checking if certain ports are open, e.g port 25.**
    - **Output:** Lists listening ports, protocols, and established connections.

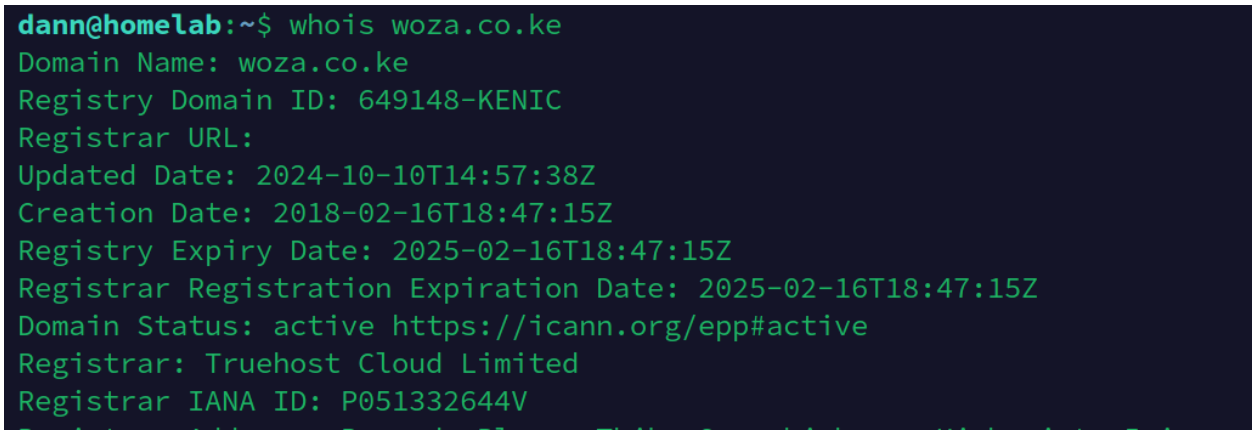
```
[root@srv ~]# netstat -tuln
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
tcp        0      0 0.0.0.0:25              0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:8090            0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:443             0.0.0.0:*               LISTEN
tcp        0      0 127.0.0.1:[redacted]    0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:993             0.0.0.0:*               LISTEN
tcp        0      0 0.0.0.0:995             0.0.0.0:*               LISTEN
```

5. **nslookup**
    - **Purpose:** Resolves domain names to IP addresses and queries DNS records.
    - **Usage:** `nslookup example.com`

- **Output:** Provides details about DNS resolution and authoritative servers.



6. **whois**
   - **Purpose:** Retrieves domain registration information.
   - **Usage:** `whois example.com`
   - **Output:** Displays registrar details, domain status, and expiration date.

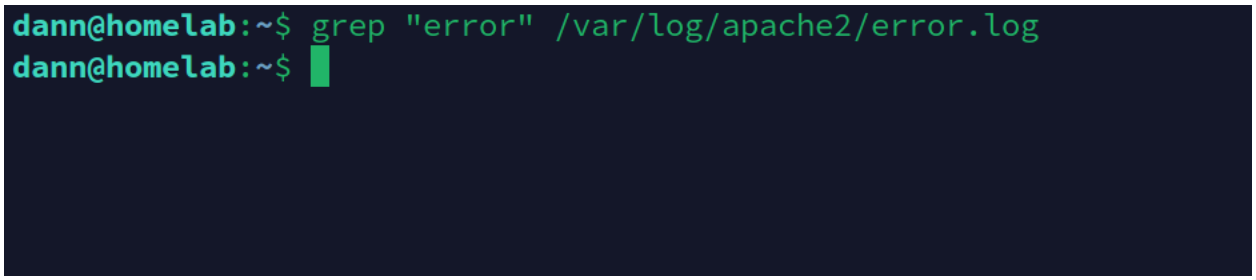


Log Analysis Tools

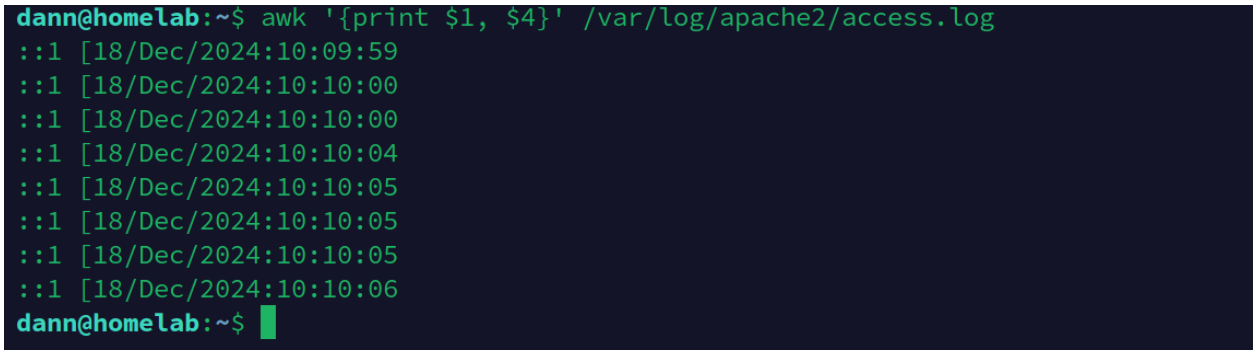
Log files provide critical insights into server behavior, errors, and performance. These tools help extract and analyze relevant information:

1. **grep**
   - **Purpose:** Searches for specific patterns within log files.
   - **Usage:** `grep "error" /var/log/apache2/error.log`

- **Output:** Lists all lines containing the keyword "error."



2. **awk**
    - **Purpose:** Processes and extracts data from log files.
    - **Usage:** `awk '{print $1, $4}' /var/log/apache2/access.log`
    - **Output:** Extracts the first and fourth columns, such as IP addresses and timestamps.



Debugging Tools

Advanced debugging tools are useful for isolating and analyzing system or application-level issues:

1. **strace**
    - **Purpose:** Traces system calls made by a process.
    - **Usage:** `strace -p <process_id>`
    - **Output:** Detailed system call information for debugging applications.

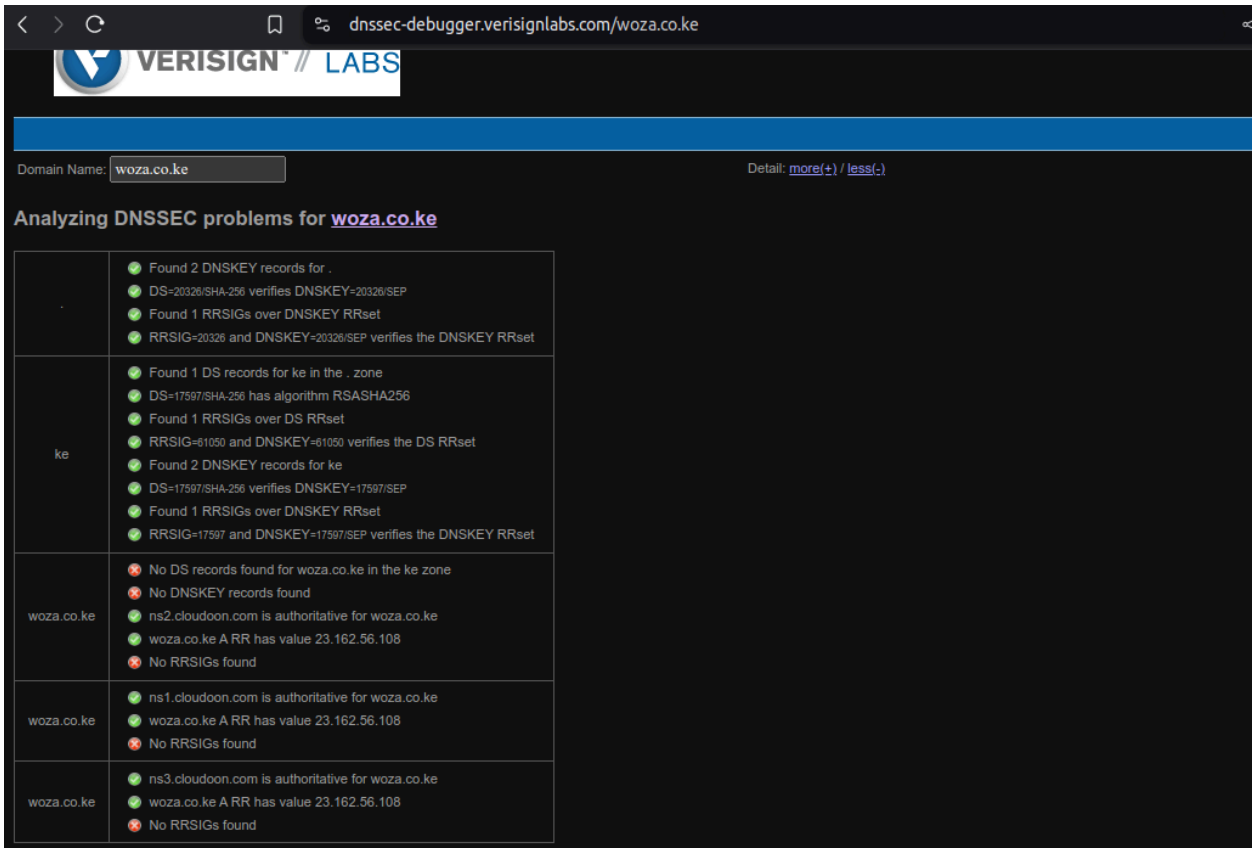
```
[root@srv ~]# strace -p 861681
strace: Process 861681 attached
select(6, [3 4 5], NULL, NULL, {tv_sec=16, tv_usec=370828}
) = 0 (Timeout)
rt_sigprocmask(SIG_SETMASK, ~[ILL TRAP ABRT BUS FPE SEGV CONT SYS RTMIN RT_1], NULL, 8) = 0
openat(AT_FDCWD, "postmaster.pid", O_RDWR) = 10
read(10, "861681\n/var/lib/pgsql/data\n17314"..., 8191) = 102
close(10)                               = 0
getpid()                                = 861681
rt_sigprocmask(SIG_SETMASK, [], NULL, 8) = 0
select(6, [3 4 5], NULL, NULL, {tv_sec=60, tv_usec=0}) = ? ERESTARTNOHAND (To be restarted if no handle
r)
--- SIGUSR1 {si_signo=SIGUSR1, si_code=SI_USER, si_pid=861688, si_uid=26} ---
stat("logrotate", 0x7ffc1e640cb0)       = -1 ENOENT (No such file or directory)
getpid()                                = 861681
getpid()                                = 861681
clone(child_stack=NULL, flags=CLONE_CHILD_CLEARTID|CLONE_CHILD_SETTID|SIGCHLD, child_tidptr=0x7f706cf70
150) = 677887
rt_sigreturn({mask=[]})                 = -1 EINTR (Interrupted system call)
rt_sigprocmask(SIG_SETMASK, ~[ILL TRAP ABRT BUS FPE SEGV CONT SYS RTMIN RT_1], NULL, 8) = 0
rt_sigprocmask(SIG_SETMASK, [], NULL, 8) = 0
select(6, [3 4 5], NULL, NULL, {tv_sec=60, tv_usec=0}) = ? ERESTARTNOHAND (To be restarted if no handle
r)
```

External Web Services

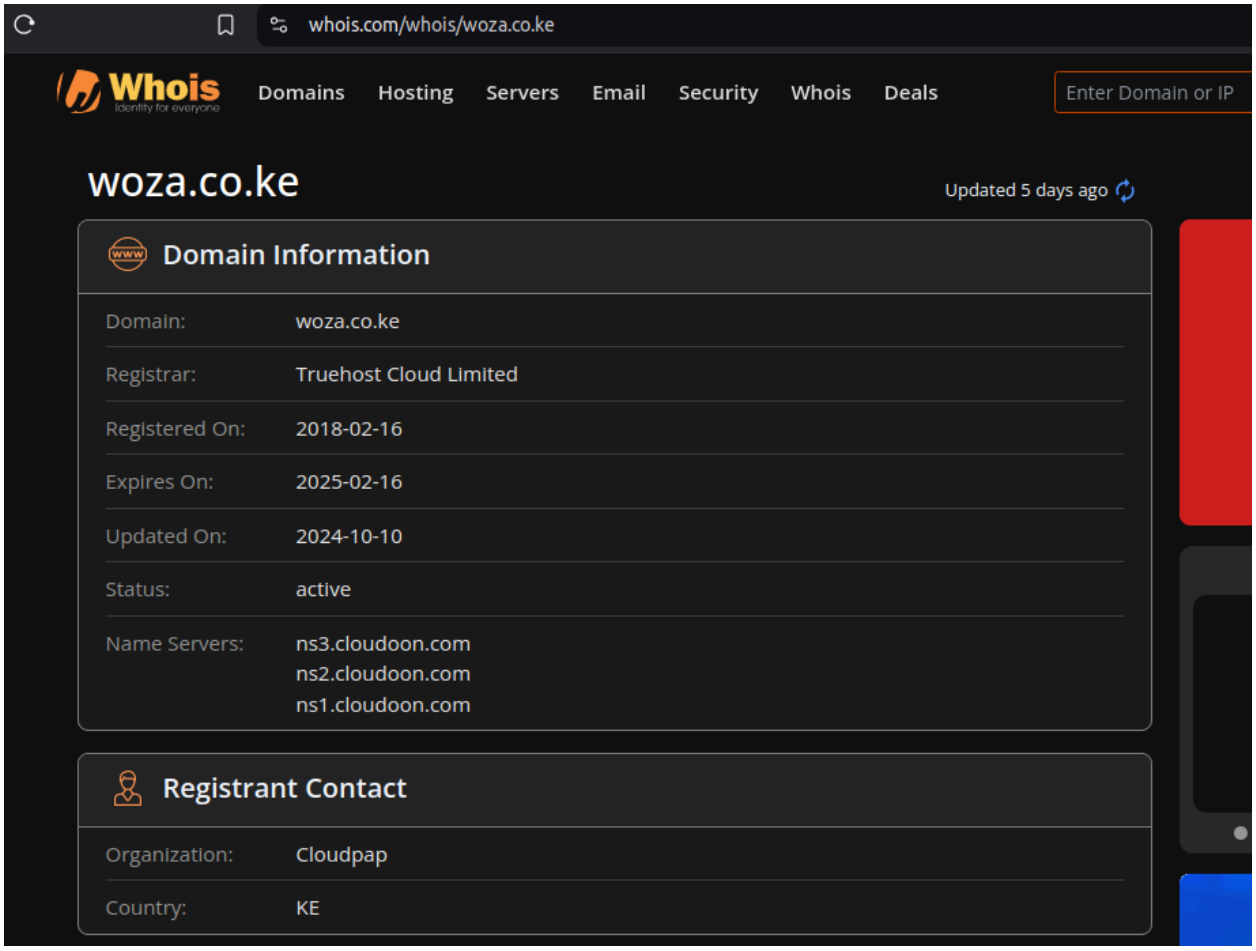
Online tools complement command-line utilities by offering additional insights and verification:

1. **DNSchecker.org**
    - **Purpose:** Verifies DNS propagation globally.
    - **Usage:** Enter the domain name to check record updates across multiple locations.

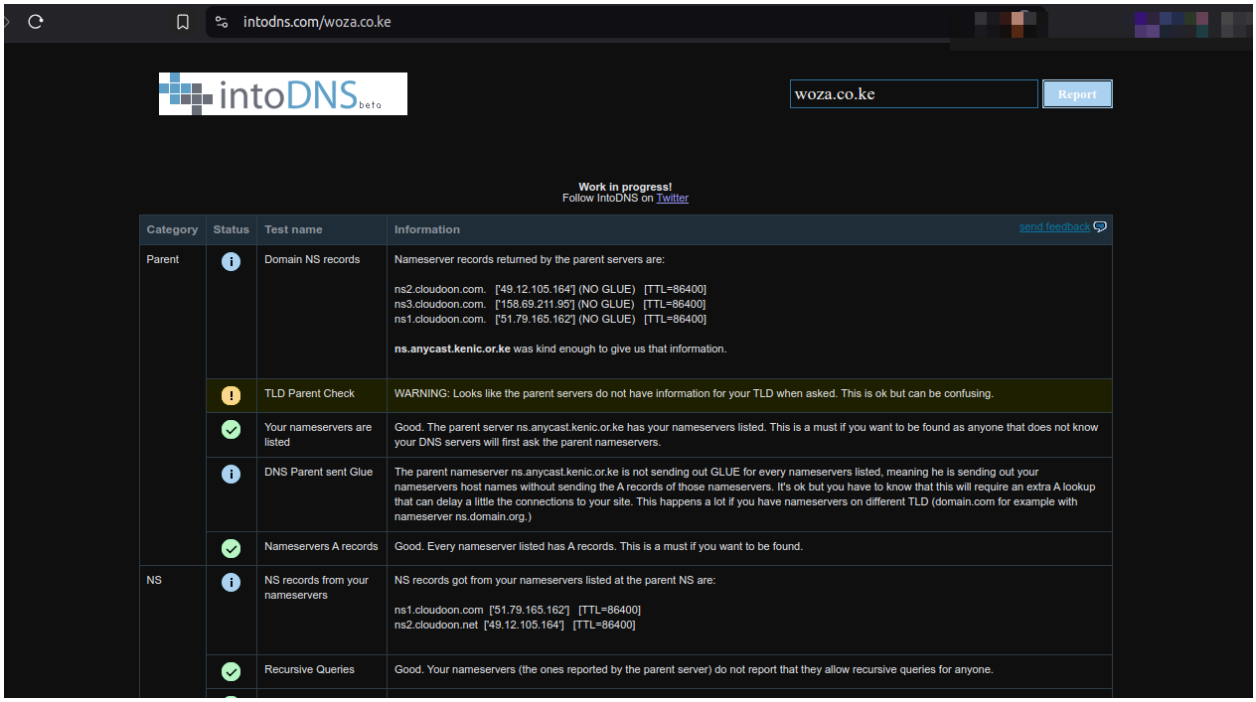
2. **DNSSEC Debugger (https://dnssec-debugger.verisignlabs.com/)**
    - **Purpose:** Analyzes and validates DNSSEC configurations.
    - **Usage:** Enter the domain name to check for DNSSEC-related issues.



3. **whois.com**
    - **Purpose:** Provides domain registration details.
    - **Usage:** Enter the domain name to view registrar and owner information.



4. **IntoDNS.com**
    - **Purpose:** Offers a comprehensive DNS health check.
    - **Usage:** Enter the domain name to get insights into DNS configuration, mail servers, and potential issues.


intodns.com/woza.co.ke
intoDNS beta
woza.co.ke
Report
Work in progress!
Follow IntoDNS on Twitter
Category
Status
Test name
Information
send feedback
Parent
Domain NS records
Nameserver records returned by the parent servers are:
ns2.cloudoon.com. ['49.12.105.164'] (NO GLUE) [TTL=86400]
ns3.cloudoon.com. ['158.69.211.95'] (NO GLUE) [TTL=86400]
ns1.cloudoon.com. ['51.79.165.162'] (NO GLUE) [TTL=86400]
ns.anycast.kenic.or.ke was kind enough to give us that information.
TLD Parent Check
WARNING: Looks like the parent servers do not have information for your TLD when asked. This is ok but can be confusing.
Your nameservers are listed
Good. The parent server ns.anycast.kenic.or.ke has your nameservers listed. This is a must if you want to be found as anyone that does not know your DNS servers will first ask the parent nameservers.
DNS Parent sent Glue
The parent nameserver ns.anycast.kenic.or.ke is not sending out GLUE for every nameservers listed, meaning he is sending out your nameservers host names without sending the A records of those nameservers. It's ok but you have to know that this will require an extra A lookup that can delay a little the connections to your site. This happens a lot if you have nameservers on different TLD (domain.com for example with nameserver ns.domain.org.)
Nameservers A records
Good. Every nameserver listed has A records. This is a must if you want to be found.
NS
NS records from your nameservers
NS records got from your nameservers listed at the parent NS are:
ns1.cloudoon.com ['51.79.165.162'] [TTL=86400]
ns2.cloudoon.net ['49.12.105.164'] [TTL=86400]
Recursive Queries
Good. Your nameservers (the ones reported by the parent server) do not report that they allow recursive queries for anyone.