This project implements a simple Proxy Application in Go, providing features such as basic firewall functionality, rate limiting, geo-blocking, logging, and a web-based user interface.

The Proxy Application includes the following features:

1. Basic Firewall Features:

- Source/Destination IP blocking.
- Source/Destination port blocking.
- Protocol-based blocking (e.g., block all HTTPS traffic).

2. Rate Limiting:

- Limit the number of requests from a particular source IP within a specific time frame (e.g., max 100 requests per minute).
- Limit the total bandwidth used by a particular IP or service.

3. Geo-blocking:

- Block or allow traffic based on the geographic location of the source or destination IP using a GeoIP database.

4. Logging:

- Log all blocked traffic with timestamps, source/destination IPs, and the reason for blocking.
- Implement a mechanism to regularly rotate and archive logs.

5. Information:

- Develop a web-based UI that allows an admin to set rules, view logs, and monitor the system.
- Display statistics such as bandwidth usage over time.

6. Test Coverage:

- Implement unit tests for both the firewall logic and the UI.
- Aim for at least 80% code coverage.

7. Static Analysis (Linting):

- The Code adheres to best practices and standards.
- Utilize `golangci-lint`.
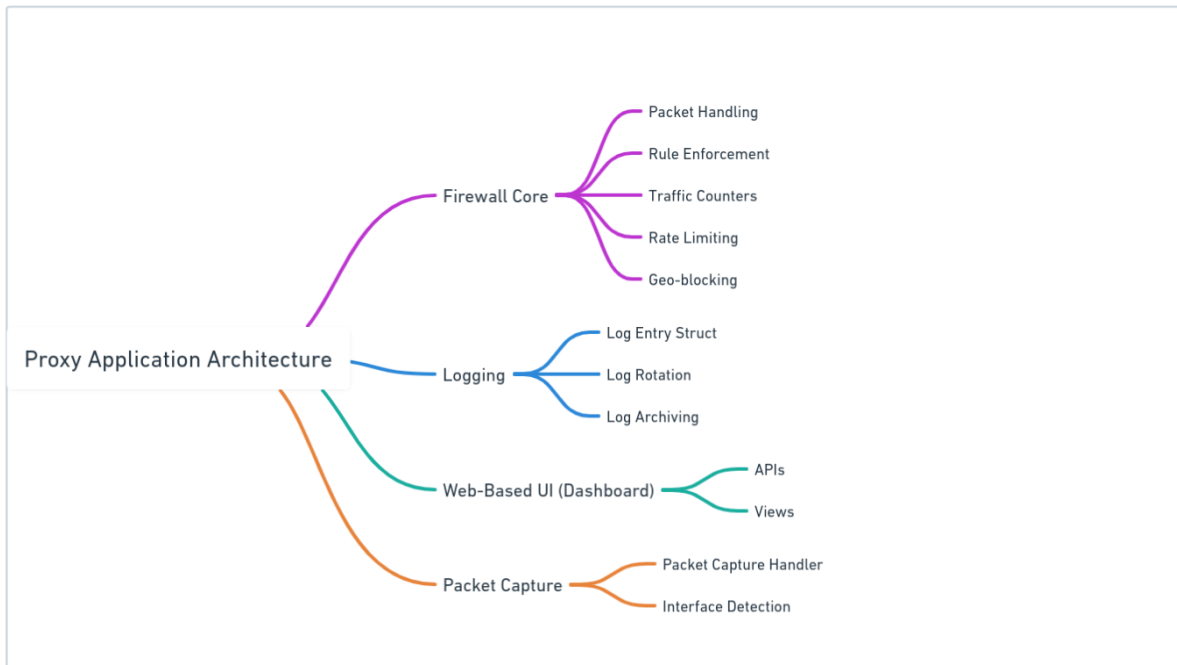
Proxy Application Architecture:

1. Firewall Core:

Description: The central component responsible for managing the firewall's core functionality, including handling incoming packets, enforcing rules, and updating counters.

Components:

- Packet Handling
- Rule Enforcement
- Traffic Counters
- Rate Limiting
- Geo-blocking
- SSL Inspection (if applicable)

Dependencies:

- iptables (for rule enforcement)
- geoip2.Reader (for GeoIP data)

2. **Logging:**

   Description: Manages the logging of blocked traffic, including timestamps, source/destination IPs, and reasons for blocking.

   Components:

   - Log Entry Struct
   - Log Rotation
   - Log Archiving

3. **Web-Based UI (Dashboard):**

   Description: Provides a user interface for administrators to configure firewall rules, view logs, and monitor system statistics.

   Components:

   - Fiber Framework
   - Dashboard Routes
   - Log Viewer
   - System Statistics Display

4. **Packet Capture:**

   Description: Captures incoming and outgoing packets for analysis and processing by the firewall core.

   Components:

   - Packet Capture Handler
   - Interface Detection
   - Packet Inspection
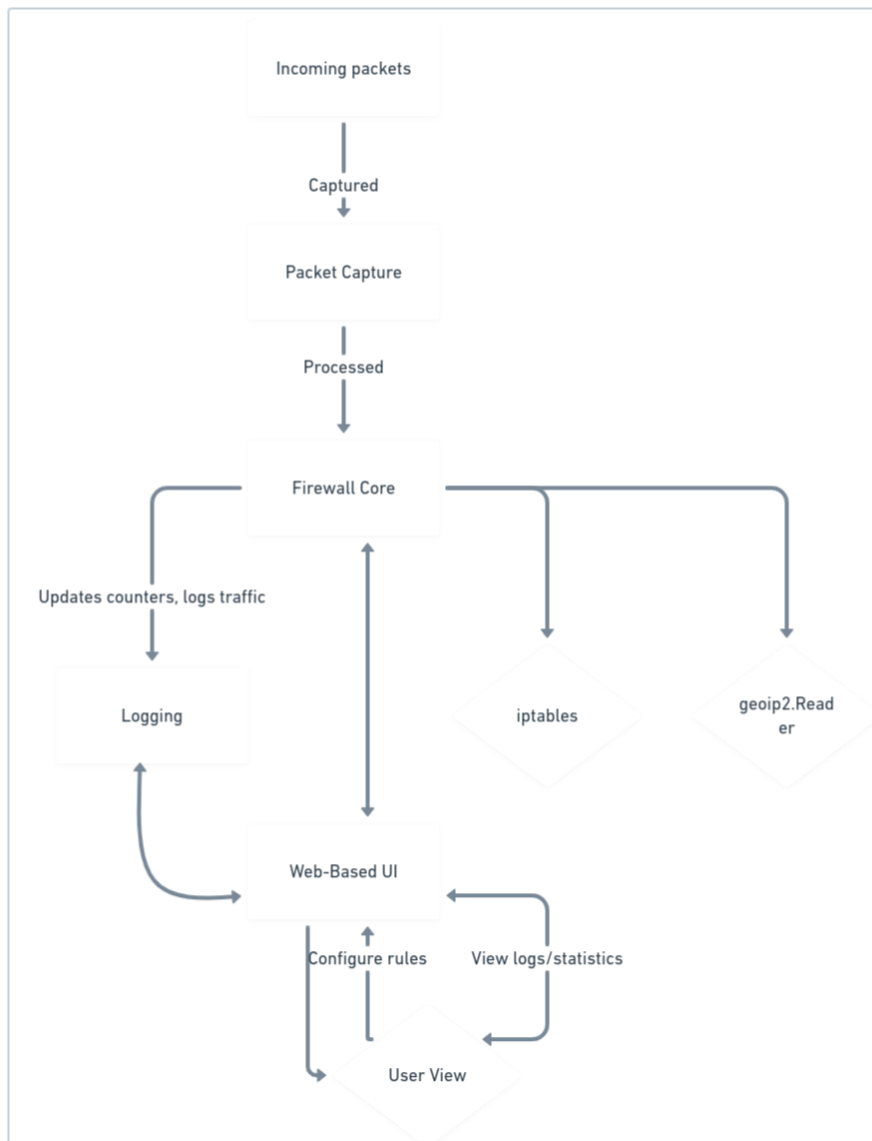
5. **Testing:**

   Description: Includes unit tests to ensure the reliability and correctness of the firewall's functionality.

   Components:

- Test Suites for Core Components
- Mocks and Stubs for External Dependencies

Interaction Flow:

- Incoming packets are captured by the Packet Capture component.
- Captured packets are passed to the Firewall Core for analysis and rule enforcement.
- The Firewall Core updates traffic counters, enforces rules (blocking or allowing traffic), and logs blocked traffic.
- The Web-Based UI interacts with the Firewall Core to display statistics, configure rules, and view logs.
- Logging handles the storage and rotation of log entries over time.

Incoming packets

↓ Captured

Packet Capture

↓ Processed

Firewall Core

Updates counters, logs traffic

Logging

iptables

geoip2.Reader

Web-Based UI

Configure rules   View logs/statistics

User View

Made with ◆ Whimsical

127.0.0.1:8000

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[incoming] 51.104.15.253:443 -> 192.168.1.67:33766 (TCP) - 2023-12-10 11:05:0

[incoming] ***Dropping packet from blocked country*** 136.143.191.84:443 -> 192.168.1.67:60800 (TCP) - 2023-12-10 11:05:0

[outgoing] 192.168.1.67:60800 -> 136.143.191.84:443 (TCP) - 2023-12-10 11:05:0

[incoming] ***Dropping packet from blocked country*** 108.156.245.9:443 -> 192.168.1.67:57676 (TCP) - 2023-12-10 11:05:0

[incoming] ***Dropping packet from blocked country*** 108.156.245.9:443 -> 192.168.1.67:57676 (TCP) - 2023-12-10 11:05:0

[incoming] ***Dropping packet from blocked country*** 108.156.245.9:443 -> 192.168.1.67:57676 (TCP) - 2023-12-10 11:05:0

Block/Unblock IP

IP Address:

[Block] [Unblock]

Block/Unblock Port

Port Number:

[Block] [Unblock]

Block/Unblock Protocol

Protocol:

[Block] [Unblock]

Block/Unblock Country

Country:

Country list
United States

[Block] [Unblock]

Blocked traffic from United States geo-location

Rate Limiting an IP

Rate Limit:

IP Address:

[Save]

127.0.0.1:8000

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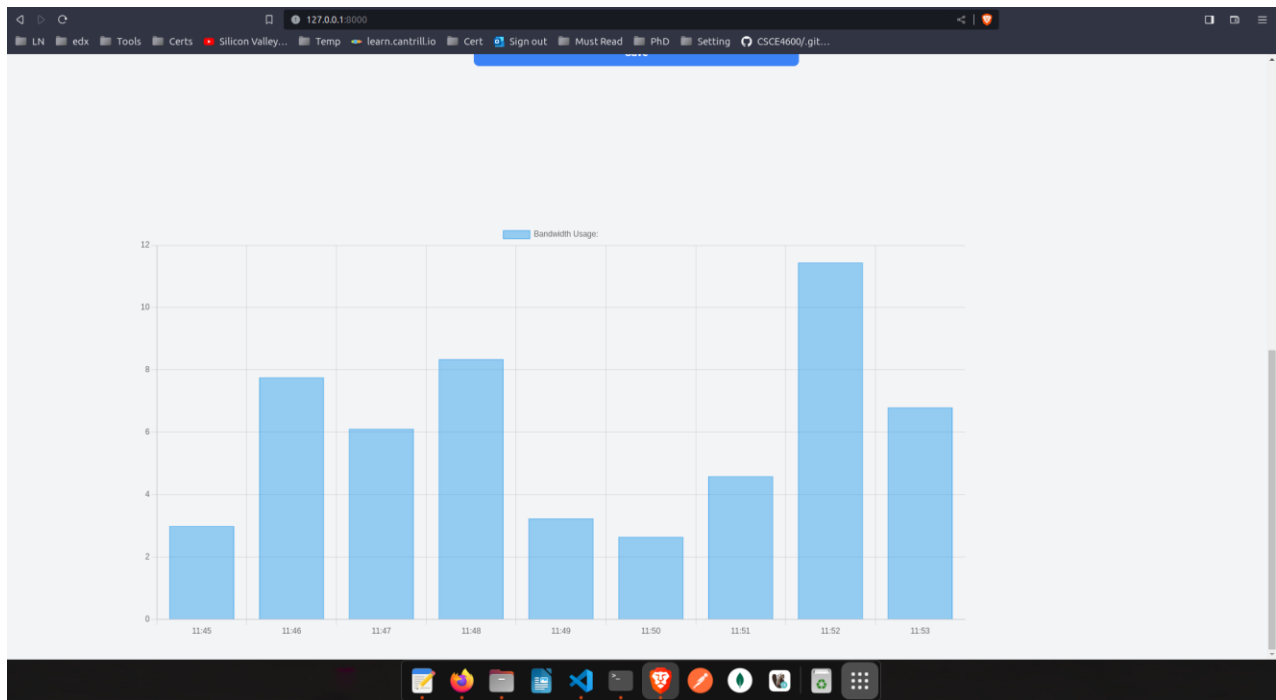
Bandwidth Usage:

File   Edit   Selection   View   Go   Run   Terminal   Help

EXPLORER

∨ PROXY
  › bin
  ∨ db
    GeoIP2-Country.mmdb
    GeoLite2-Country-Locations-en-b...   U
    GeoLite2-Country-Locations-en.csv
  ∨ firewall
    firewall_test.go   M
    firewall.go   M
    packet_capture_test.go
    packet_capture.go
  ∨ logs
    current_log.txt   M
    firewall_log_2023-12-08.txt
  ∨ ui
    handler_test.go   M
    handler.go   M
    webui_test.go
    webui.go   M
  ∨ views
    ∨ layouts
      layout.html   M
    404.html
    homePage.html   M
    coverage.out   M
    Dockerfile
    GeoIP.sh   M
    go.mod
    go.sum
    go.work
    go.work.sum
    main.go
    main.html
    README.md
    readme.txt

Tabs: handler_test.go M | coverage.out M | webui_test.go | packet_capture_test.go | firewall_test.go M | firewall.go M | handler.go M | webui.go M

coverage.out

```
 1  proxy/firewall/firewall.go:61:        RootDir              100.0%
 2  proxy/firewall/firewall.go:68:        NewFirewall          73.5%
 3  proxy/firewall/firewall.go:149:       Start                40.0%
 4  proxy/firewall/firewall.go:160:       handlePacket         80.0%
 5  proxy/firewall/firewall.go:210:       saveLog              100.0%
 6  proxy/firewall/firewall.go:220:       Get_in_out_log       100.0%
 7  proxy/firewall/firewall.go:226:       rotateLogs           78.6%
 8  proxy/firewall/firewall.go:255:       logBlockedTraffic    77.8%
 9  proxy/firewall/firewall.go:281:       BlockIP              77.8%
10  proxy/firewall/firewall.go:298:       UnblockIP            77.8%
11  proxy/firewall/firewall.go:316:       GetBlockedIPs        83.3%
12  proxy/firewall/firewall.go:328:       BlockPort            87.5%
13  proxy/firewall/firewall.go:344:       UnblockPort          87.5%
14  proxy/firewall/firewall.go:362:       BlockProtocol        87.5%
15  proxy/firewall/firewall.go:379:       UnblockProtocol      87.5%
16  proxy/firewall/firewall.go:396:       RateLimitIP          92.3%
17  proxy/firewall/firewall.go:423:       GetBlockedCountries  83.3%
18  proxy/firewall/firewall.go:463:       GetGeoCountryList    85.7%
19  proxy/firewall/firewall.go:497:       GeoBlock             78.6%
20  proxy/firewall/firewall.go:546:       GeoUnBlock           78.6%
21  proxy/firewall/firewall.go:596:       isBlockedCountry     58.8%
22  proxy/firewall/firewall.go:627:       updateTrafficCounters 88.9%
23  proxy/firewall/firewall.go:643:       updateBandwidthUsage 85.7%
24  proxy/firewall/firewall.go:667:       getTotalLength       100.0%
25  proxy/firewall/firewall.go:693:       DisplayBandwidthUsage 100.0%
26  proxy/firewall/packet_capture.go:17:  NewPacketCapture     75.0%
27  proxy/firewall/packet_capture.go:26:  Start                100.0%
28  proxy/firewall/packet_capture.go:34:  Close                100.0%
29  proxy/firewall/packet_capture.go:39:  GetOutboundIP        83.3%
30  proxy/ui/handler.go:16:               blockIPHandler       87.5%
31  proxy/ui/handler.go:33:               unblockIPHandler     87.5%
32  proxy/ui/handler.go:50:               blockPortHandler     87.5%
33  proxy/ui/handler.go:67:               unblockPortHandler   87.5%
34  proxy/ui/handler.go:84:               blockProtocolHandler 100.0%
35  proxy/ui/handler.go:98:               unblockProtocolHandler 100.0%
36  proxy/ui/handler.go:111:              displayBandwidthUsageHandler 72.7%
37  proxy/ui/handler.go:138:              rateLimitIPHandler   85.7%
38  proxy/ui/handler.go:164:              geoBlockHandler      85.7%
39  proxy/ui/handler.go:180:              geoUnBlockHandler    85.7%
40  proxy/ui/handler.go:196:              geoCountryListHandler 75.0%
41  proxy/ui/handler.go:206:              homeHandler          100.0%
42  proxy/ui/handler.go:213:              logsHandler          100.0%
43  proxy/ui/handler.go:224:              rulesHandler         100.0%
44  proxy/ui/handler.go:230:              NotFound             100.0%
45  proxy/ui/webui.go:11:                 StartWebUI           58.1%
46  total:              (statements)      80.0%
```

Ln 46, Col 1 (31 selected)   Spaces: 4   UTF-8   LF   Plain Text   Go Update Available   Analysis Tools Missing   Prettier

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```
42  proxy/ui/handler.go:213:              logsHandler          100.0%
43  proxy/ui/handler.go:224:              rulesHandler         100.0%
44  proxy/ui/handler.go:230:              NotFound             100.0%
45  proxy/ui/webui.go:11:                 StartWebUI           58.1%
46  total:              (statements)      80.0%
47
```

PROBLEMS   OUTPUT   DEBUG CONSOLE   TERMINAL   PORTS

```
● ali@Latitude-5520:~/works/Learning/golang/proxy$ bin/golangci-lint run
○ ali@Latitude-5520:~/works/Learning/golang/proxy$
```

bash
bash

Ln 46, Col 1 (31 selected)   Spaces: 4   UTF-8   LF   Plain Text   Go Update Available   Analysis Tools Missing   Prettier