

**Tugas Akhir Mata Kuliah Pemrograman Jaringan  
Pemrograman Jaringan D**



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**PROGJAR D  
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## A. Pendahuluan

*Reverse Proxy* adalah server yang berada di depan server web dan meneruskan permintaan klien (misalnya *web browser*) ke server web tersebut. *Reverse Proxy* biasanya diterapkan untuk membantu meningkatkan keamanan, kinerja, dan keandalan. Sedangkan, *Load Balancing Reverse Proxy* mendistribusikan permintaan klien yang masuk di antara sekelompok server, dalam setiap kasus mengembalikan respons dari server yang dipilih ke klien yang sesuai. Pada dokumen ini akan dijelaskan penerapan studi kasus *Reverse Proxy* dan *Load Balancing Reverse Proxy* menggunakan Bahasa Pemrograman Python.

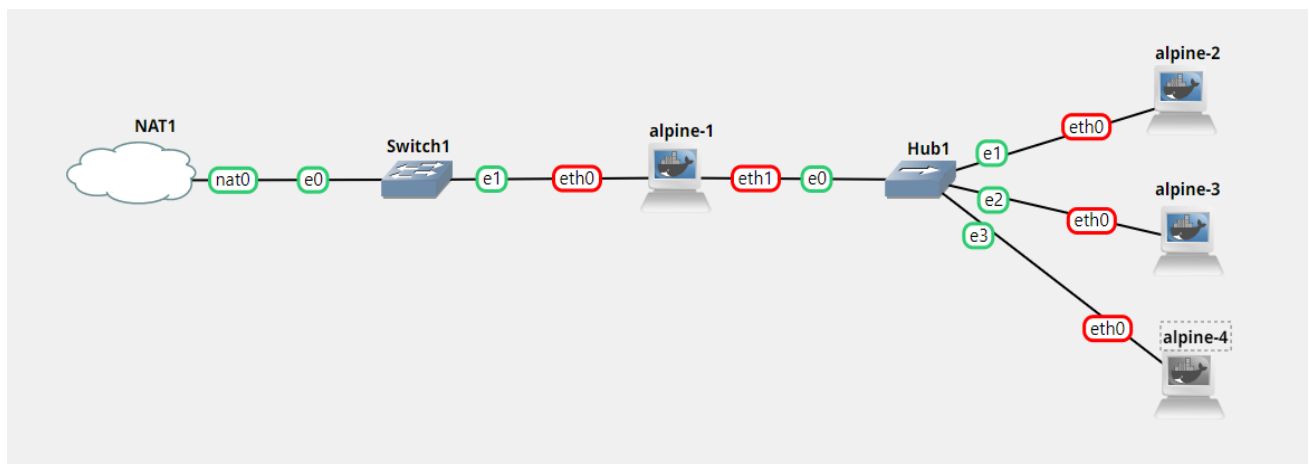
## B. Anggota dan Jobdesk Kelompok

1. Aulia Ihza Hendradi – Melakukan Pengujian Apache Benchmark untuk *Load Balancing Reverse Proxy*, Memperbaiki glob dan pengecek 404 http\_get pada http.py, Pemecahan HTTP untuk setiap Server Backend, Memperbaiki Respons dari *Threaded Load Balancing Reverse Proxy*, Mengerjakan Laporan.
2. Kinasihurrabb Moralluhung – Desain arsitektur untuk studi kasus *Reverse Proxy* dan *Load Balancing Reverse Proxy*, Implementasi awal untuk *Reverse Proxy*, Implementasi awal untuk *Threaded Load Balancing Reverse Proxy*, Mengerjakan laporan.

## C. Arsitektur dan Konfigurasi

### 1. Reverse Proxy

- Gambar Arsitektur

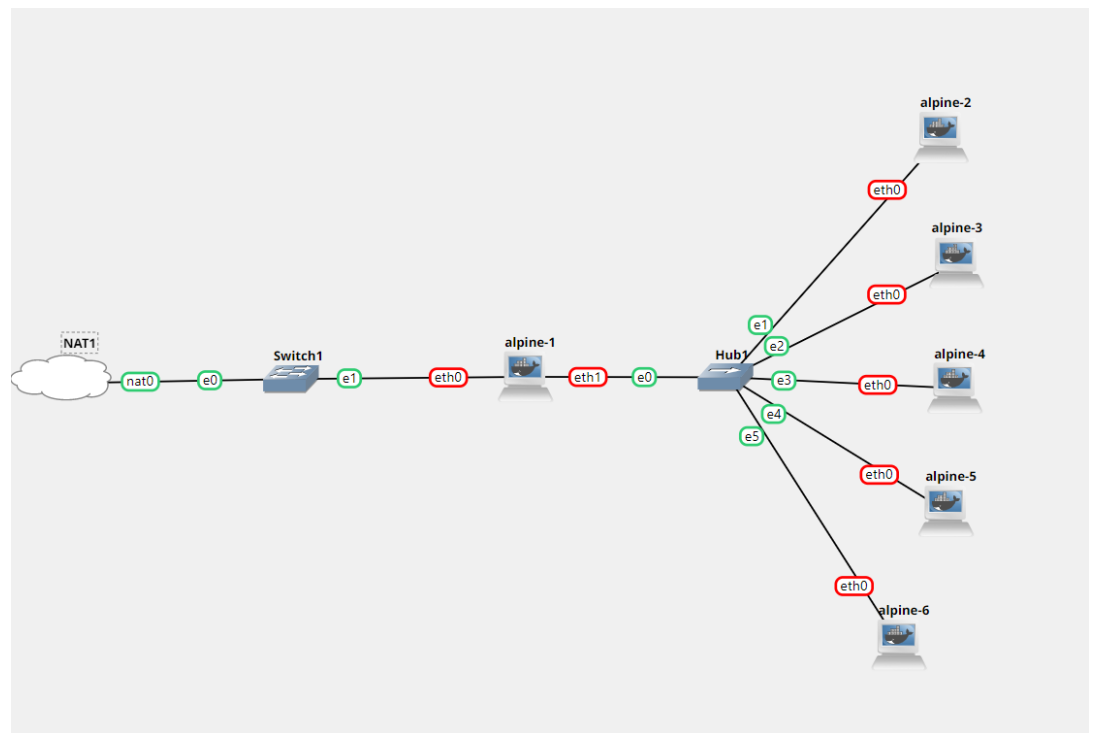


- **Konfigurasi**

| Nama Node  | Peran                | IP                    | Port  |
|------------|----------------------|-----------------------|-------|
| Alpine - 1 | Reverse Proxy Server | Localhost (127.0.0.1) | 18000 |
| Alpine - 2 | Default Server       | Localhost (127.0.0.1) | 8888  |
| Alpine - 3 | Image Web Server     | Localhost (127.0.0.1) | 8889  |
| Alpine - 4 | PDF Web Server       | Localhost (127.0.0.1) | 8890  |

## 2. Load Balancing Reverse Proxy

- **Gambar Arsitektur**



- **Konfigurasi**

| Nama Node   | Peran                               | IP                       | Port  |
|-------------|-------------------------------------|--------------------------|-------|
| Alpine – 1a | Reverse Proxy Server - Threaded     | Localhost<br>(127.0.0.1) | 666   |
| Alpine – 1b | Reverse Proxy Server - Asynchronous | Localhost<br>(127.0.0.1) | 44444 |
| Alpine - 2  | Web Server                          | Localhost<br>(127.0.0.1) | 9001  |
| Alpine - 3  | Web Server                          | Localhost<br>(127.0.0.1) | 9002  |
| Alpine - 4  | Web Server                          | Localhost<br>(127.0.0.1) | 9003  |
| Alpine - 5  | Web Server                          | Localhost<br>(127.0.0.1) | 9004  |
| Alpine - 6  | Web Server                          | Localhost<br>(127.0.0.1) | 9005  |

## D. Pengujian

### 1. Reverse Proxy

Pengujian pada *reverse proxy* akan menggunakan **dua HTTP Client**, yakni **curl** dan **web browser** berupa **Google Chrome**. Untuk metode **curl** digunakan parameter **-v (verbose)** untuk menampilkan detail **request** dan **-output** untuk menyimpan objek khusus untuk *Image* dan *PDF Web Server*.

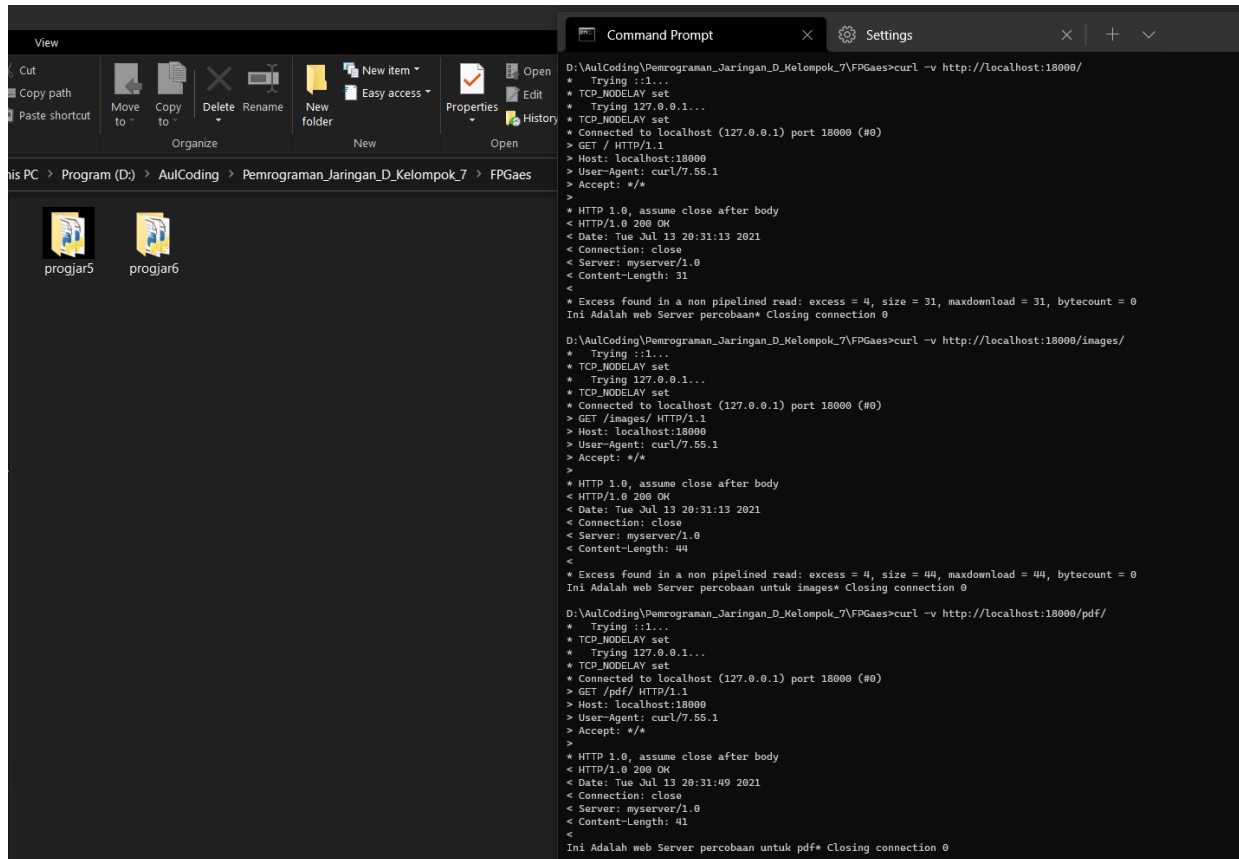
### 2. Load Balancing Reverse Proxy

Pengujian untuk *Load Balancing Reverse Proxy* akan menggunakan **Apache Benchmark** untuk menyajikan *request* dalam tingkatan *concurrency* yang berbeda – beda untuk menguji kemampuan arsitektur dalam menangani *traffic* yang diberikan.

## E. Screenshot Hasil

### 1. Reverse Proxy

- Pengujian curl -v untuk ketiga laman utama server



The screenshot displays a Windows File Explorer window on the left, showing the directory path `D:\AulCoding > Pemrograman_Jaringan_D_Kelompok_7 > FPGaes`. Two files, `progjar5` and `progjar6`, are visible. On the right, a Command Prompt window shows the execution of three `curl -v` commands to test a web server at `localhost:18000`.

```
D:\AulCoding\Pemrograman_Jaringan_D_Kelompok_7\FPGaes>curl -v http://localhost:18000/
* Trying ::1...
* TCP_NODELAY set
* Trying 127.0.0.1...
* TCP_NODELAY set
* Connected to localhost (127.0.0.1) port 18000 (#0)
> GET / HTTP/1.1
> Host: localhost:18000
> User-Agent: curl/7.55.1
> Accept: */*
>
* HTTP 1.0, assume close after body
< HTTP/1.0 200 OK
< Date: Tue Jul 13 20:31:13 2021
< Connection: close
< Server: myserver/1.0
< Content-Length: 31
<
* Excess found in a non pipelined read: excess = 4, size = 31, maxdownload = 31, bytecount = 0
Ini Adalah web Server percobaan* Closing connection 0

D:\AulCoding\Pemrograman_Jaringan_D_Kelompok_7\FPGaes>curl -v http://localhost:18000/images/
* Trying ::1...
* TCP_NODELAY set
* Trying 127.0.0.1...
* TCP_NODELAY set
* Connected to localhost (127.0.0.1) port 18000 (#0)
> GET /images/ HTTP/1.1
> Host: localhost:18000
> User-Agent: curl/7.55.1
> Accept: */*
>
* HTTP 1.0, assume close after body
< HTTP/1.0 200 OK
< Date: Tue Jul 13 20:31:13 2021
< Connection: close
< Server: myserver/1.0
< Content-Length: 44
<
* Excess found in a non pipelined read: excess = 4, size = 44, maxdownload = 44, bytecount = 0
Ini Adalah web Server percobaan untuk images* Closing connection 0

D:\AulCoding\Pemrograman_Jaringan_D_Kelompok_7\FPGaes>curl -v http://localhost:18000/pdf/
* Trying ::1...
* TCP_NODELAY set
* Trying 127.0.0.1...
* TCP_NODELAY set
* Connected to localhost (127.0.0.1) port 18000 (#0)
> GET /pdf/ HTTP/1.1
> Host: localhost:18000
> User-Agent: curl/7.55.1
> Accept: */*
>
* HTTP 1.0, assume close after body
< HTTP/1.0 200 OK
< Date: Tue Jul 13 20:31:49 2021
< Connection: close
< Server: myserver/1.0
< Content-Length: 41
<
Ini Adalah web Server percobaan untuk pdf* Closing connection 0
```

- Pengujian curl -v dengan --output untuk pokijan.jpg pada Image Web Server dan nfc.pdf pada PDF Web Server

```

D:\AulCoding\Pemrograman_Jaringan_D_Kelompok_7\FPGAes>curl -v http://localhost:18000/images/pokijan.jpg --output pokiman.jpg
% Total % Received % Xferd Average Speed Time Time Time Current
Dload Upload Total Spent Left Speed
* TCP_NODELAY set
* Trying 127.0.0.1...
* TCP_NODELAY set
* Connected to localhost (127.0.0.1) port 18000 (#0)
> GET /images/pokijan.jpg HTTP/1.1
> Host: localhost:18000
> User-Agent: curl/7.55.1
> Accept: */*
>
* HTTP/1.0, assume close after body
< HTTP/1.0 200 OK
< Date: Tue Jul 13 20:33:49 2021
< Connection: close
< Server: myserver/1.0
< Content-Length: 15702
< Content-type: image/jpeg
<
{ [84 bytes data]
100 15702 100 15702 0 0 15702 0 0:00:01 --:--: 0:00:01 26434
* Closing connection 0

D:\AulCoding\Pemrograman_Jaringan_D_Kelompok_7\FPGAes>curl -v http://localhost:18000/pdf/nfc.pdf --output pdfbaru.pdf
% Total % Received % Xferd Average Speed Time Time Time Current
Dload Upload Total Spent Left Speed
* TCP_NODELAY set
* Trying 127.0.0.1...
* TCP_NODELAY set
* Connected to localhost (127.0.0.1) port 18000 (#0)
> GET /pdf/nfc.pdf HTTP/1.1
> Host: localhost:18000
> User-Agent: curl/7.55.1
> Accept: */*
>
* HTTP/1.0, assume close after body
< HTTP/1.0 200 OK
< Date: Tue Jul 13 20:33:54 2021
< Connection: close
< Server: myserver/1.0
< Content-Length: 550558
< Content-type: application/pdf
<
{ [14 bytes data]
100 537K 100 537K 0 0 58950 0 0:00:11 0:00:11 --:--: 49549
* Closing connection 0
D:\AulCoding\Pemrograman_Jaringan_D_Kelompok_7\FPGAes>

```

- Log di Reverse Proxy

```

C:\Python39\python.exe D:/AulCoding/Pemrograman_Jaringan_D_Kelompok_7/FPGAes/progjar5/server_thread_http.py
WARNING:root:connection from ('127.0.0.1', 3242)
WARNING:root:data dari client: GET / HTTP/1.1
Host: localhost:18000
User-Agent: curl/7.55.1

WARNING:root:balas ke client: b'HTTP/1.0 200 OK\r\nDate: Tue Jul 13 20:38:41 2021\r\nConnection: close\r\nServer: myserver/1.0\r\nContent-Length: 31\r\n\r\nIni Adalah web Server'
WARNING:root:data dari client: Accept: */*

WARNING:root:balas ke client: b'HTTP/1.0 400 Bad Request\r\nDate: Tue Jul 13 20:38:41 2021\r\nConnection: close\r\nServer: myserver/1.0\r\nContent-Length: 0\r\n\r\n\r\n\r\n'

```

- Log di Image Web Server

```

C:\Python39\python.exe D:/AulCoding/Pemrograman_Jaringan_D_Kelompok_7/FPGAes/progjar5/server_thread_http_image.py
WARNING:root:connection from ('127.0.0.1', 3245)
WARNING:root:data dari client: GET /images/ HTTP/1.1
Host: localhost:18000
User-Agent: curl/7.55.1
Accept: */*

WARNING:root:balas ke client: b'HTTP/1.0 200 OK\r\nDate: Tue Jul 13 20:38:41 2021\r\nConnection: close\r\nServer: myserver/1.0\r\nContent-Length: 44\r\n\r\nIni Adalah web Server'
WARNING:root:connection from ('127.0.0.1', 3252)
WARNING:root:data dari client: GET /images/pokijan.jpg HTTP/1.1
Host: localhost:18000
User-Agent: curl/7.55.1
Accept: */*

WARNING:root:balas ke client: b'HTTP/1.0 200 OK\r\nDate: Tue Jul 13 20:38:42 2021\r\nConnection: close\r\nServer: myserver/1.0\r\nContent-Length: 15702\r\nContent-type: image/jpeg'

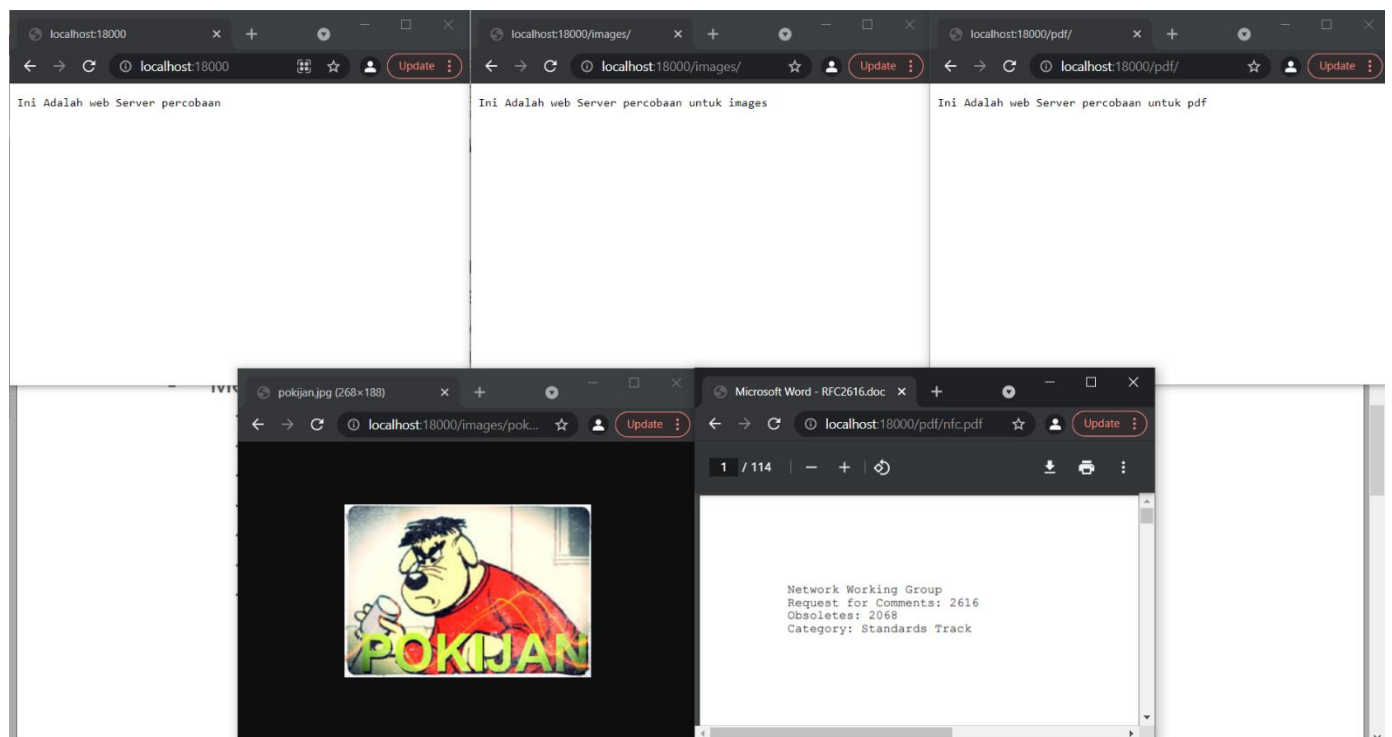
```

- **Log di PDF Web Server**

```

\n0000204031 00000 n \n0000534588 00000 n \n0000204158 00000 n \n0000209267 00000 n \n0000534676 00000 n \n0000209394 00000 n \n0000214625 00000 n \n0000534764 00000 n
\n0000214752 00000 n \n00000219414 00000 n \n0000533482 00000 n \n0000021953 00000 n \n0000534946 00000 n \n0000224716 00000 n \n0000229164 00000 n
\n0000535028 00000 n \n00000229291 00000 n \n0000533857 00000 n \n0000534370 00000 n \n0000535116 00000 n \n0000234014 00000 n \n0000238075 00000 n \n0000535204 00000 n
\n0000238202 00000 n \n0000243037 00000 n \n0000535292 00000 n \n0000243164 00000 n \n0000247793 00000 n \n0000535380 00000 n \n0000247920 00000 n \n0000252612 00000 n
\n0000535468 00000 n \n0000252370 00000 n \n0000535556 00000 n \n0000257839 00000 n \n0000262737 00000 n \n0000535644 00000 n \n0000262864 00000 n
\n0000266098 00000 n \n0000535732 00000 n \n0000266249 00000 n \n0000271025 00000 n \n0000535820 00000 n \n0000271176 00000 n \n0000535988 00000 n \n0000535908 00000 n
\n0000276112 00000 n \n0000281032 00000 n \n0000534519 00000 n \n0000535996 00000 n \n0000281171 00000 n \n0000285655 00000 n \n0000536084 00000 n \n0000285794 00000 n
\n0000289876 00000 n \n0000536172 00000 n \n0000289982 00000 n \n0000294079 00000 n \n0000536268 00000 n \n0000294206 00000 n \n0000299785 00000 n \n0000536348 00000 n
\n0000299912 00000 n \n0000304213 00000 n \n0000536436 00000 n \n0000308430 00000 n \n0000308338 00000 n \n0000536524 00000 n \n0000308605 00000 n \n0000312560 00000 n
\n0000536612 00000 n \n0000312711 00000 n \n0000318039 00000 n \n0000536700 00000 n \n0000318166 00000 n \n0000322552 00000 n \n0000536788 00000 n \n0000322679 00000 n
\n0000327863 00000 n \n0000536168 00000 n \n0000536876 00000 n \n0000327969 00000 n \n0000332886 00000 n \n0000536964 00000 n \n0000333013 00000 n \n0000333785 00000 n
\n0000537052 00000 n \n0000337912 00000 n \n0000342744 00000 n \n0000537140 00000 n \n0000343271 00000 n \n0000343778 00000 n \n0000537228 00000 n \n0000347885 00000 n
\n0000352424 00000 n \n0000537316 00000 n \n0000352542 00000 n \n0000353690 00000 n \n0000537404 00000 n \n0000353787 00000 n \n0000361560 00000 n \n0000537492 00000 n
\n0000361687 00000 n \n0000366502 00000 n \n0000537580 00000 n \n0000366629 00000 n \n0000371534 00000 n \n0000537668 00000 n \n0000371661 00000 n \n0000376499 00000 n
\n0000541817 00000 n \n0000537756 00000 n \n0000376626 00000 n \n0000381654 00000 n \n0000537844 00000 n \n0000381781 00000 n \n0000386256 00000 n \n0000537932 00000 n
\n0000386383 00000 n \n0000391059 00000 n \n0000538020 00000 n \n0000391186 00000 n \n0000395908 00000 n \n0000538108 00000 n \n0000396047 00000 n \n0000400639 00000 n
\n0000538196 00000 n \n0000400778 00000 n \n0000405181 00000 n \n0000538284 00000 n \n0000405320 00000 n \n0000405956 00000 n \n0000538372 00000 n \n0000409737 00000 n
\n0000415205 00000 n \n0000538460 00000 n \n0000415332 00000 n \n0000420248 00000 n \n0000538548 00000 n \n0000420387 00000 n \n0000424869 00000 n \n0000541936 00000 n
\n0000538636 00000 n \n0000425008 00000 n \n0000429798 00000 n \n0000538724 00000 n \n0000429925 00000 n \n0000435285 00000 n \n0000538812 00000 n \n0000435424 00000 n
\n0000440770 00000 n \n0000538900 00000 n \n0000440897 00000 n \n0000445972 00000 n \n0000538988 00000 n \n0000446123 00000 n \n0000449950 00000 n \n0000539766 00000 n
\n0000456089 00000 n \n0000454361 00000 n \n0000539164 00000 n \n0000454478 00000 n \n0000455848 00000 n \n0000539252 00000 n \n0000458944 00000 n \n0000462612 00000 n
\n0000539340 00000 n \n0000462729 00000 n \n0000465450 00000 n \n0000539428 00000 n \n0000465577 00000 n \n0000468288 00000 n \n0000542600 00000 n \n0000542262 00000 n
\n0000539516 00000 n \n0000468415 00000 n \n0000473698 00000 n \n0000539604 00000 n \n0000473837 00000 n \n0000478924 00000 n \n0000539692 00000 n \n0000479851 00000 n
\n0000482902 00000 n \n0000539780 00000 n \n0000483029 00000 n \n0000484793 00000 n \n0000539868 00000 n \n0000489132 00000 n \n0000493339 00000 n \n0000539956 00000 n
\n0000493466 00000 n \n0000497868 00000 n \n0000540044 00000 n \n0000497186 00000 n \n0000499688 00000 n \n0000540132 00000 n \n0000499805 00000 n \n0000504347 00000 n
\n0000529243 00000 n \n0000540220 00000 n \n0000504499 00000 n \n0000505986 00000 n \n0000540308 00000 n \n00005410027 00000 n \n0000541523 00000 n \n0000542513 00000 n
\n0000542412 00000 n \n0000540396 00000 n \n0000541584 00000 n \n00005520147 00000 n \n0000540484 00000 n \n00005520268 00000 n \n0000542564 00000 n \n0000540572 00000 n
\n0000542683 00000 n \n00
```

- **Pengujian di Browser Google Chrome**



## 2. Load Balancing Reverse Proxy

### • Log di Threaded Reverse Proxy Load Balancer

```
server_thread_9001 x server_thread_9002 x server_thread_9003 x server_thread_9004 x server_thread_9005 x lbthread x
WARNING:root:connection from ('127.0.0.1', 22530)
WARNING:root:koneksi diteruskan ke ('localhost', 9001)
WARNING:root:connection from ('127.0.0.1', 22532)
WARNING:root:koneksi diteruskan ke ('localhost', 9002)
WARNING:root:connection from ('127.0.0.1', 22534)
WARNING:root:koneksi diteruskan ke ('localhost', 9003)
WARNING:root:connection from ('127.0.0.1', 22536)
WARNING:root:koneksi diteruskan ke ('localhost', 9004)
WARNING:root:connection from ('127.0.0.1', 22538)
WARNING:root:koneksi diteruskan ke ('localhost', 9005)
WARNING:root:connection from ('127.0.0.1', 22540)
WARNING:root:koneksi diteruskan ke ('localhost', 9001)
WARNING:root:connection from ('127.0.0.1', 22542)
WARNING:root:koneksi diteruskan ke ('localhost', 9002)
WARNING:root:connection from ('127.0.0.1', 22544)
WARNING:root:koneksi diteruskan ke ('localhost', 9003)
WARNING:root:connection from ('127.0.0.1', 22546)
WARNING:root:koneksi diteruskan ke ('localhost', 9004)
WARNING:root:connection from ('127.0.0.1', 22548)
WARNING:root:koneksi diteruskan ke ('localhost', 9005)
```

### • Log di Asynchronous Reverse Proxy Load Balancer

```
async_server9001 x async_server9002 x async_server9003 x async_server9004 x async_server9005 x lb x
WARNING:root:connection from ('127.0.0.1', 31767)
WARNING:root:koneksi dari ('127.0.0.1', 31767) diteruskan ke ('localhost', 9001)
WARNING:root:connection from ('127.0.0.1', 31770)
WARNING:root:koneksi dari ('127.0.0.1', 31770) diteruskan ke ('localhost', 9002)
WARNING:root:connection from ('127.0.0.1', 31771)
WARNING:root:koneksi dari ('127.0.0.1', 31771) diteruskan ke ('localhost', 9003)
WARNING:root:connection from ('127.0.0.1', 31774)
WARNING:root:koneksi dari ('127.0.0.1', 31774) diteruskan ke ('localhost', 9004)
WARNING:root:connection from ('127.0.0.1', 31775)
WARNING:root:koneksi dari ('127.0.0.1', 31775) diteruskan ke ('localhost', 9005)
WARNING:root:connection from ('127.0.0.1', 31778)
WARNING:root:koneksi dari ('127.0.0.1', 31778) diteruskan ke ('localhost', 9001)
WARNING:root:connection from ('127.0.0.1', 31779)
WARNING:root:koneksi dari ('127.0.0.1', 31779) diteruskan ke ('localhost', 9002)
WARNING:root:connection from ('127.0.0.1', 31782)
WARNING:root:koneksi dari ('127.0.0.1', 31782) diteruskan ke ('localhost', 9003)
WARNING:root:connection from ('127.0.0.1', 31783)
WARNING:root:koneksi dari ('127.0.0.1', 31783) diteruskan ke ('localhost', 9004)
WARNING:root:connection from ('127.0.0.1', 31786)
WARNING:root:koneksi dari ('127.0.0.1', 31786) diteruskan ke ('localhost', 9005)
```



## F. Tabel Hasil Apache Benchmark untuk Kasus 2

### 1. Threaded Reverse Proxy Load Balancer

| Jumlah HTTP Server | Concurrency | Jumlah Complete Request | Non-2xx response | Jumlah request per second | Time Per request (mean across) |
|--------------------|-------------|-------------------------|------------------|---------------------------|--------------------------------|
| 1                  | 2           | 10000                   | 0                | 378.12 #/sec              | 2.645 ms                       |
|                    | 5           | 10000                   | 0                | 4.64 #/sec                | 215.722 ms                     |
|                    | 10          | 10000                   | 0                | 4.89 #/sec                | 204.429 ms                     |
| 2                  | 2           | 10000                   | 0                | 443.85 #/sec              | 2.253 ms                       |
|                    | 5           | 10000                   | 0                | 157.43 #/sec              | 6.352 ms                       |
|                    | 10          | 10000                   | 0                | 11.14 #/sec               | 89.779 ms                      |
| 3                  | 2           | 10000                   | 0                | 456.06 #/sec              | 2.193 ms                       |
|                    | 5           | 10000                   | 0                | 759.17 #/sec              | 1.317 ms                       |
|                    | 10          | 10000                   | 0                | 57.57 #/sec               | 17.371 ms                      |
| 4                  | 2           | 10000                   | 0                | 435.01 #/sec              | 2.299 ms                       |
|                    | 5           | 10000                   | 0                | 753.43 #/sec              | 1.327 ms                       |
|                    | 10          | 10000                   | 0                | 120.10 #/sec              | 8.326 ms                       |
| 5                  | 2           | 10000                   | 0                | 353.06 #/sec              | 2.832 ms                       |
|                    | 5           | 10000                   | 0                | 748.18 #/sec              | 1.337 ms                       |
|                    | 10          | 10000                   | 0                | 155.60 #/sec              | 6.427 ms                       |

### 2. Asynchronous Reverse Proxy Load Balancer

| Jumlah HTTP Server | Concurrency | Jumlah Complete Request | Non-2xx response | Jumlah request per second | Time Per request (mean across) |
|--------------------|-------------|-------------------------|------------------|---------------------------|--------------------------------|
| 1                  | 2           | 10000                   | 0                | 525.19 #/ssec             | 1.904 ms                       |
|                    | 5           | 10000                   | 0                | 3.92 #/sec                | 254.829 ms                     |
|                    | 10          | 10000                   | 0                | 3.92 #/sec                | 254.961 ms                     |
| 2                  | 2           | 10000                   | 0                | 539.83 #/sec              | 1.852 ms                       |
|                    | 5           | 10000                   | 0                | 10.36 #/sec               | 96.524 ms                      |
|                    | 10          | 10000                   | 0                | 5.91 #/sec                | 169.075 ms                     |
| 3                  | 2           | 10000                   | 0                | 527.32 #/sec              | 1.896 ms                       |
|                    | 5           | 10000                   | 0                | 656.13 #/sec              | 1.524 ms                       |
|                    | 10          | 10000                   | 0                | 9.05 #/sec                | 110.452 ms                     |
| 4                  | 2           | 10000                   | 0                | 496.25 #/sec              | 2.015 ms                       |
|                    | 5           | 10000                   | 0                | 676.01 #/sec              | 1.479 ms                       |
|                    | 10          | 10000                   | 0                | 11.73 #/sec               | 85.277 ms                      |
| 5                  | 2           | 10000                   | 0                | 420.57 #/sec              | 2.378 ms                       |
|                    | 5           | 10000                   | 0                | 445.18 #/sec              | 2.246 ms                       |

|  |    |       |   |             |           |
|--|----|-------|---|-------------|-----------|
|  | 10 | 10000 | 0 | 14.38 #/sec | 69.539 ms |
|--|----|-------|---|-------------|-----------|

## G. Kesimpulan dan Penutup

Untuk *Reverse Proxy*, dapat dilihat ketika *Reverse Proxy Server* menerima *request* dalam *path URL* tertentu (PDF dan Image) maka *request* akan diteruskan ke *backend server* sesuai dengan *request* yang dispesifikasikan. Hal ini tentunya bermanfaat pada saat kita membuat sebuah *website* yang melakukan *hosting* suatu konten. Agar semua *traffic* tidak menuju pada *server* utama, kita dapat mengimplementasikan *Reverse Proxy* agar kita dapat membagi *traffic* yang datang pada masing – masing *webserver* yang sesuai. Pada *Reverse Proxy Server*, proses *traffic forwarding* dapat dibuktikan dengan log yang tertulis pada *Reverse Proxy Server*. Sedangkan, dari sudut pandang *client* yang dapat dilihat hanyalah *request* yang dikirimkan ke *Reverse Proxy Server* serta respons yang dikirimkan dari *backend server* yang dihantarkan melalui *Reverse Proxy Server*.

Untuk *Load Balancing Reverse Proxy*, dapat dilihat dari perbandingan hasil dua *apache benchmark* diatas, *Threaded Reverse Proxy Load Balancer* memiliki performa yang lebih baik jika dibandingkan dengan *Asynchronous Reverse Proxy Load Balancer* dalam aspek jumlah *request* yang berhasil dijalankan setiap detik untuk level konkurensi 5 dan 10. Akan tetapi, *Asynchronous Reverse Proxy Load Balancer* juga memiliki kelebihan pada uji konkurensi tingkat 2, ia unggul pada pengujian tersebut. Sehingga, dapat disimpulkan bahwa masing – masing model memiliki kelebihan dan kekurangan masing – masing untuk tingkatan konkurensi dalam tes. Perlu diingat, bahwa level konkurensi menentukan seberapa banyak *request* yang dapat diproses dalam waktu yang bersamaan.

Dari dokumen tugas akhir mata kuliah pemrograman jaringan yang telah ditulis, diharapkan pembaca dapat memperoleh informasi terkait dengan arsitektur, konfigurasi, pengujian, serta hasil dan perbandingan mengenai arsitektur *Reverse Proxy* dan *Load Balancing Reverse Proxy* yang telah dibuat dan diuji oleh penulis.