

Studi Kasus Fase 3



Jaringan Komputer
Semester 2024-2025 Gasal
Partial Network Reimplementation

01.



Akmal Ramadhan
2206081534

02.



Alden Luthfi Arrahman
2206028932

03.



Muhammad Nabil Mu'afa
2206024972

Tim Kami

Mamah Minta GCP

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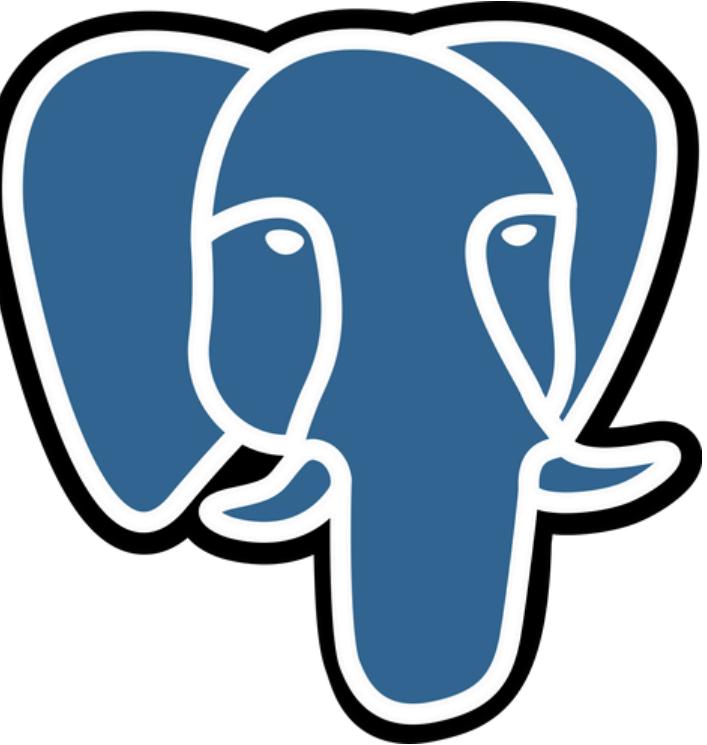
Daftar Isi

- Pemilihan Teknologi
- Rancangan Topologi Jaringan di Google Cloud Platform (GCP)
- Simulasi Hasil Implementasi Parsial Infrastruktur Jaringan

Pemilihan Teknologi



NGINX



Rancangan Topologi Jaringan di Google Cloud Platform (GCP)

Konfigurasi VPC dan Subnet

VPC Internal

Konfigurasi	Name	Subnet Creation Mode	Region	IP Stack Type	IPv4 Range	Private Google Access	Flow Logs
Subnet Area Belakang	subnet-area-belakang	custom	us-east1	IPv4 (single-stack)	172.22.4.0/23	off	internal-mht
Subnet Area Utara	subnet-area-utara				172.22.6.0/23		
Subnet Gedung A	subnet-gedung-a				172.22.8.0/22		
Subnet Gedung B	subnet-gedung-b				172.22.0.0/22		
Subnet Gedung Bundar	subnet-gedung-bundar				172.22.9.0/27		

OVERVIEW SUBNETS STATIC INTERNAL IP ADDRESSES FIREWALLS FIREWALL ENDPOINTS ROUTES VPC NETWORKING

Subnets + ADD SUBNET MANAGE FLOW LOGS

Filter Enter property name or value

Name ↑	Region	Stack Type	Primary IPv4 range	Gateway	Private Google Access	Flow logs
subnet-area-belakang	us-east1	IPv4 (single-stack)	172.22.4.0/23	172.22.4.1	Off	Off
subnet-area-utara	us-east1	IPv4 (single-stack)	172.22.6.0/23	172.22.6.1	Off	Off
subnet-gedung-a	us-east1	IPv4 (single-stack)	172.22.8.0/24	172.22.8.1	Off	Off
subnet-gedung-b	us-east1	IPv4 (single-stack)	172.22.0.0/22	172.22.0.1	Off	Off
subnet-gedung-bundar	us-east1	IPv4 (single-stack)	172.22.9.0/27	172.22.9.1	Off	Off

Rancangan Topologi Jaringan di Google Cloud Platform (GCP)

Konfigurasi VPC dan Subnet

VPC Eksternal

Konfigurasi	Name	Subnet Creation Mode	Region	IP Stack Type	IPv4 Range	Private Google Access	Flow Logs
Subnet Publik	subnet-public	custom	us-east1	IPv4 (single-stack)	192.168.1.0/29	off	off

The screenshot shows the 'SUBNETS' tab selected in the Google Cloud Platform interface. It displays a table with one row for the subnet 'subnet-public'. The table columns include Name, Region, Stack Type, Primary IPv4 range, Gateway, Private Google Access, and Flow logs.

Name	Region	Stack Type	Primary IPv4 range	Gateway	Private Google Access	Flow logs
subnet-public	us-east1	IPv4 (single-stack)	192.168.1.0/29	192.168.1.1	Off	Off

Berbeda dengan IPv4
Range pada C02? 🤯

Rancangan Topologi Jaringan di Google Cloud Platform (GCP)

Konfigurasi Firewall

VPC Internal

Name	allow-ssh-from-gedung-a	allow-ssh-from-internet-to-gedung-a
Direction	subnet-gedung-a → all internal-mht	all host → subnet-gedung-a
Logs	off	
Network	internal-mht	
Priority	1000	
Direction of Traffic	Ingress (<i>traffic masuk</i>)	
Action on Match	Allow	
Targets	Specified target tags	
Target Tags	ssh-internal	ssh-gedung-a
Source Filter	IPv4 ranges	
Source IPv4 Ranges	172.22.8.0/24	0.0.0.0/0
Second Source Filter	None	
Protocols and Ports	tcp:22	
Fungsi	Mengatur <i>end device</i> pada gedung A agar dapat melakukan SSH pada semua <i>end devices</i> di VPC Internal	Dapat melakukan SSH pada <i>end devices</i> gedung A dan tidak dapat melakukannya pada <i>end devices</i> pada subnet lain.

Rancangan Topologi Jaringan di Google Cloud Platform (GCP)

Konfigurasi Firewall

VPC Eksternal

Name	allow-access-db-from-gedung-a	allow-http-https-from-internet	allow-ssh-from-gedung-a-to-server
Direction	subnet-gedung-a -> server-publik-website, server-publik-backup	all host -> server-website	subnet-gedung-a -> all public-mht
Logs	off		
Network	public-mht		
Priority	1000		
Direction of Traffic	Ingress (<i>traffic masuk</i>)		
Action on Match	Allow		
Targets	Specified target tags		All instances in the network
Target Tags	allow-db-access-from-gedung-a	allow-http-https	
Source Filter	IPv4 ranges		
Source IPv4 Ranges	172.22.8.0/24	0.0.0.0/0	172.22.8.0/24
Second Source Filter	None		
Protocols and Ports	tcp:5432	tcp:80, 443 icmp	tcp:22
Fungsi	Membuka akses database PostgreSQL melalui port 5432 agar hanya bisa diakses via admin device di subnet Gedung A	Membuka akses website SMANU M.H. Thamrin yang di-host pada server-publik-website	Membuka akses ssh ke semua server di VPC public-mht agar hanya bisa diakses via admin device di subnet Gedung A

Rancangan Topologi Jaringan di Google Cloud Platform (GCP)

Konfigurasi Virtual Machine (Instance)

Konfigurasi	pc-gedung-b	pc-area-belakang	pc-area-utara	pc-gedung-a	pc-gedung-bundar
Name	pc-gedung-b	pc-area-belakang	pc-area-utara	pc-gedung-a	pc-gedung-bundar
Region	us-east1				
Zone	us-east1-c				
Machine Series	e2				
Machine Type	e2-micro				
Operating System	Ubuntu				
OS Version	Ubuntu 22.04 LTS (x86/64)				
Allow HTTP traffic	off				
Allow HTTPS traffic	off				
Network Tags	None				
Network Interface	internal-mht				
Subnetwork	subnet-gedung-b	subnet-area-bela kang	subnet-area-utar a	subnet-gedung-a	subnet-gedung-b undar
Boot Disk Size	10 GB				
Network Tier	Premium				
Others	Default				

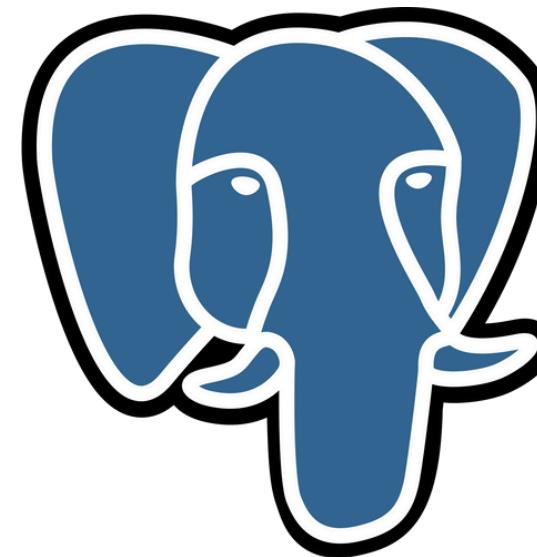
VPC Internal

Konfigurasi	server-public-website	server-public-moodle	server-public-backup
Name	server-public-website	server-public-moodle	server-public-backup
Region	us-east1		
Zone	us-east1-c		
Machine Series	e2		
Machine Type	e2-medium		
Operating System	Ubuntu		
OS Version	Ubuntu 22.04 LTS (x86/64)		
Allow HTTP traffic	off		
Allow HTTPS traffic	off		
Network Tags	None		
Network Interface	public-mht		
Subnetwork	subnet-public		
Boot Disk Size	10 GB		
Network Tier	Premium		
Others	Default		

VPC Eksternal

Rancangan Topologi Jaringan di Google Cloud Platform (GCP)

Konfigurasi PostgreSQL



PostgreSQL diinstall menggunakan perintah sudo apt-get install postgresql.

Karena yang bisa mengontrol database ini hanya teknisi sekolah, maka perlu dibuat firewall dengan nama **allow-db-access-from-gedung-a** dengan protokol **TCP:5342** yang membatasi ingress connection ke database hanya bisa dilakukan oleh device yang ada pada subnet Gedung A.

Rancangan Topologi Jaringan di Google Cloud Platform (GCP)

Implementasi Website Resmi



```
services:
  django_unicorn:
    volumes:
      - static:/staticfiles
    env_file:
      - .env
    build: .
    ports:
      - "8000:8000"
  nginx:
    build: ./nginx
    ports:
      - "80:80"
      - "443:443"
    volumes:
      - static:/staticfiles
      - /etc/letsencrypt/live/smanumht-jar.com/fullchain.pem:/fullchain.pem
      - /etc/letsencrypt/live/smanumht-jar.com/privkey.pem:/privkey.pem
    depends_on:
      - django_unicorn

volumes:
  static:
```

<https://smanumht-jar.com>

Rancangan Topologi Jaringan di Google Cloud Platform (GCP) Implementasi E-Learning

```
upstream django {
    server django_unicorn:8000;
}

server {
    listen 443 ssl http2;
    listen [::]:443 ssl http2;

    server_name smanumht-jar.com www.smanumht-jar.com;
    ssl_certificate /fullchain.pem;
    ssl_certificate_key /privkey.pem;

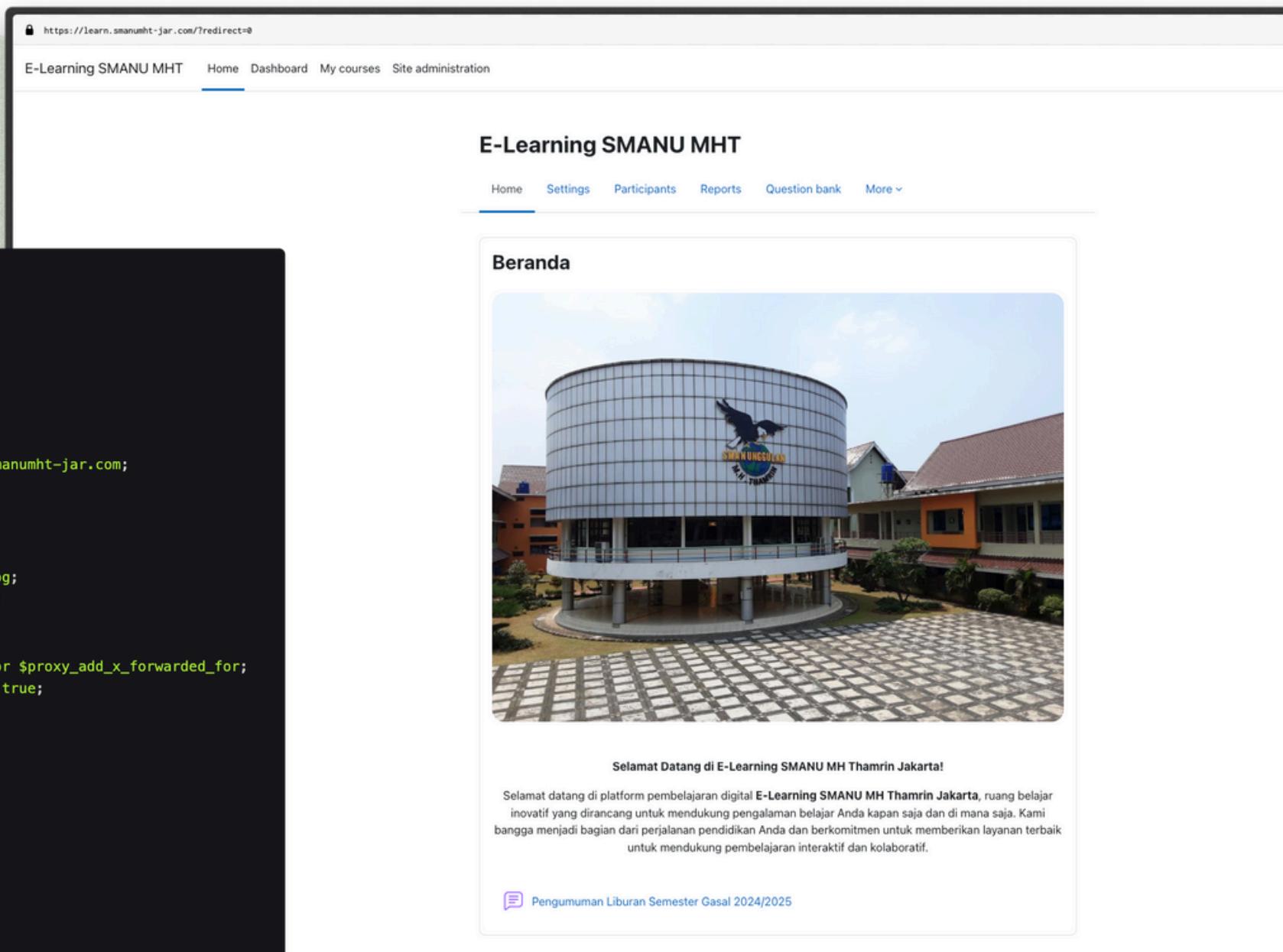
    access_log /var/log/nginx/access.log;
    error_log /var/log/nginx/error.log;

    location / {
        proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
        proxy_set_header X-NginX-Proxy true;
        proxy_set_header Host $host;
        proxy_pass http://django;
        proxy_redirect off;
    }

    location /static/ {
        alias /staticfiles/;
    }
}

server {
    listen 80;
    listen [::]:80 default_server;
    server_name smanumht-jar.com www.smanumht-jar.com;

    location / {
        return 301 https://$host:$request_uri;
    }
}
```



<https://learn.smanumht-jar.com/my/>

```
# Copyright Broadcom, Inc. All Rights Reserved.
# SPDX-License-Identifier: APACHE-2.0

services:
  mariadb:
    image: docker.io/bitnami/mariadb:latest
    environment:
      # ALLOW_EMPTY_PASSWORD is recommended only for development.
      - ALLOW_EMPTY_PASSWORD=yes
      - MARIADB_USER=bn_moodle
      - MARIADB_DATABASE=bitnami_moodle
      - MARIADB_CHARACTER_SET=utf8mb4
      - MARIADB_COLLATE=utf8mb4_unicode_ci
    volumes:
      - 'mariadb_data:/bitnami/mariadb'
  moodle:
    image: docker.io/bitnami/moodle:4.5
    ports:
      - '8080:8080'
      - '8443:8443'
    environment:
      - MOODLE_DATABASE_HOST=mariadb
      - MOODLE_DATABASE_PORT_NUMBER=3306
      - MOODLE_DATABASE_USER=bn_moodle
      - MOODLE_DATABASE_NAME=bitnami_moodle
      # ALLOW_EMPTY_PASSWORD is recommended only for development.
      - ALLOW_EMPTY_PASSWORD=yes
    volumes:
      - 'moodle_data:/bitnami/moodle'
      - 'moodledata_data:/bitnami/moodledata'
    depends_on:
      - mariadb
  nginx:
    build: ./nginx
    ports:
      - "80:80"
      - "443:443"
    volumes:
      - /etc/letsencrypt/live/learn.smanumht-jar.com/fullchain.pem:/fullchain.pem
      - /etc/letsencrypt/live/learn.smanumht-jar.com/privkey.pem:/privkey.pem
    depends_on:
      - moodle
  volumes:
    mariadb_data:
      driver: local
    moodle_data:
      driver: local
    moodledata_data:
      driver: local
```

Simulasi Hasil Implementasi Parsial Infrastruktur Jaringan

Hasil Uji Konektivitas Antar-Instance

SSH ke Gedung A melalui Internet

```
nabilmuafa@nabilmuafa in ~
→ ssh user@34.75.219.107 -i .ssh/jarkom-nabil
Enter passphrase for key '.ssh/jarkom-nabil':
Welcome to Ubuntu 24.04.1 LTS (GNU/Linux 6.8.0-1020-gcp x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Fri Dec 27 07:52:06 UTC 2024

System load: 0.0          Processes:      129
Usage of /: 29.4% of 8.65GB  Users logged in:   1
Memory usage: 26%          IPv4 address for ens4: 172.22.8.2
Swap usage: 0%

* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
just raised the bar for easy, resilient and secure K8s cluster deployment.

https://ubuntu.com/engage/secure-kubernetes-at-the-edge

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

Last login: Fri Dec 27 07:52:07 2024 from 110.138.89.150
user@pc-gedung-a:~$
```

```
logout
Connection to 34.75.219.107 closed.
> ssh user@34.75.219.107 -i ~/ssh/alden.luthfi_2206028932
Welcome to Ubuntu 24.04.1 LTS (GNU/Linux 6.8.0-1020-gcp x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Fri Dec 27 07:52:06 UTC 2024

System load: 0.0          Processes:      129
Usage of /: 29.4% of 8.65GB  Users logged in:   1
Memory usage: 26%          IPv4 address for ens4: 172.22.8.2
Swap usage: 0%

* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
just raised the bar for easy, resilient and secure K8s cluster deployment.

https://ubuntu.com/engage/secure-kubernetes-at-the-edge

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

Last login: Fri Dec 27 07:52:20 2024 from 158.140.182.113
user@pc-gedung-a:~$
```

Simulasi Hasil Implementasi Parsial Infrastruktur Jaringan

Hasil Uji Konektivitas Antar-Instance

SSH Selain ke Gedung A (End Device Subnet Lain)

```
nabilmuafa@nabilmuafa in ~
→ ssh user@35.231.9.250
ssh: connect to host 35.231.9.250 port 22: Connection timed out

nabilmuafa@nabilmuafa in ~
→ ssh user@104.196.111.2
ssh: connect to host 104.196.111.2 port 22: Connection timed out

nabilmuafa@nabilmuafa in ~
→ ssh user@34.74.89.128
ssh: connect to host 34.74.89.128 port 22: Connection timed out

nabilmuafa@nabilmuafa in ~
→ ssh user@34.139.103.53
ssh: connect to host 34.139.103.53 port 22: Connection timed out
```

Simulasi Hasil Implementasi Parsial Infrastruktur Jaringan

Hasil Uji Konektivitas Instance dengan Server

```
user@pc-gedung-a:~$ ssh user@192.168.1.2
Enter passphrase for key '/home/user/.ssh/id_ed25519':
Welcome to Ubuntu 24.04.1 LTS (GNU/Linux 6.8.0-1020-gcp x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/pro

System information as of Fri Dec 27 06:33:37 UTC 2024

  System load:  0.03           Processes:          131
  Usage of /:   52.3% of 8.65GB  Users logged in:    0
  Memory usage: 15%
  Swap usage:   0%

* Strictly confined Kubernetes makes edge and IoT secure. Learn how MicroK8s
  just raised the bar for easy, resilient and secure K8s cluster deployment.
  https://ubuntu.com/engage/secure-kubernetes-at-the-edge

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

Last login: Fri Dec 27 06:01:35 2024 from 172.22.8.2
user@server-public-website:~$ █
```

SSH ke Server

```
user@pc-area-belakang:~$ ssh user@192.168.1.2
ssh: connect to host 192.168.1.2 port 22: Connection timed out
user@pc-area-belakang:~$ █
```

```
user@pc-area-utara:~$ ssh user@192.168.1.2
ssh: connect to host 192.168.1.2 port 22: Connection timed out
user@pc-area-utara:~$ █
```

```
user@pc-gedung-b:~$ ssh user@192.168.1.2
ssh: connect to host 192.168.1.2 port 22: Connection timed out
user@pc-gedung-b:~$ █
```

```
user@pc-gedung-bundar:~$ ssh user@192.168.1.2
ssh: connect to host 192.168.1.2 port 22: Connection timed out
user@pc-gedung-bundar:~$ █
```

Simulasi Hasil Implementasi Parsial Infrastruktur Jaringan

Hasil Uji Konektivitas Instance dengan Server

Akses ke Situs Utama

```
user@pc-gedung-a:~$ curl https://smanumht-jar.com

<!DOCTYPE html>
<html>
<head>

<link rel="stylesheet" href="/static/css/dist/styles.css?v=1735282142">

<meta charset="UTF-8">
<title>Situs Resmi SMANU MHT</title>
</head>

<body>
<header class="h-20 sticky top-0 bg-blue-400 shadow-xl">
<div class="container mx-auto flex justify-between items-center h-full">
<a class="text-2xl font-bold">SMANU MHT</a>
<nav>
<ul class="flex space-x-4">
<li><a class="px-4 py-2">Home</a></li>
<li><a class="px-4 py-2">About</a></li>
<li><a class="px-4 py-2">Contact</a></li>
</ul>
</nav>
</div>
</header>

<main class="w-screen p-32 flex justify-center items-center text-center">
<p class="font-extrabold text-[28rem] overflow-hidden text-wrap">
    SITUS RESMI SMANU MHT
</p>
</main>

<footer class="h-20 bg-gray-800 bottom-0 static text-white flex justify-center items-center">
<p>© 2024 SMANU MHT</p>
</footer>
<script src="/static/django-browser-reload/reload-listener.js" data-worker-script-path="/static/django-browser-reload/reload-worker.js" data-events-path="/__reload_events/" defer><script>
```

Simulasi Hasil Implementasi Parsial Infrastruktur Jaringan

Hasil Uji Konektivitas Instance dengan Server

Akses Database ke Server

```
user@pc-gedung-a:~$ psql -U postgres -h 192.168.1.2 -p 5432 -d absensi_kartu
Password for user postgres:
psql (16.6 (Ubuntu 16.6-0ubuntu0.24.04.1))
SSL connection (protocol: TLSv1.3, cipher: TLS_AES_256_GCM_SHA384, compression: off)
Type "help" for help.

absensi_kartu=# select * from absensi;
 id_absensi | kartu_id      | waktu_presensi | status_absensi
-----+-----+-----+-----+
 1 | RFID123456789 | 2024-12-01 07:15:00 | Hadir
 2 | RFID987654321 | 2024-12-01 07:35:00 | Terlambat
 3 | RFID456123789 | 2024-12-01 07:28:00 | Hadir
 4 | RFID789123456 | 2024-12-01 07:45:00 | Terlambat
 5 | RFID321654987 | 2024-12-01 07:05:00 | Hadir
(5 rows)

absensi_kartu=# \q
user@pc-gedung-a:~$ psql -U postgres -h 192.168.1.4 -p 5432 -d absensi_kartu
Password for user postgres:
psql (16.6 (Ubuntu 16.6-0ubuntu0.24.04.1))
SSL connection (protocol: TLSv1.3, cipher: TLS_AES_256_GCM_SHA384, compression: off)
Type "help" for help.

absensi_kartu=# select * from absensi;
 id_absensi | kartu_id      | waktu_presensi | status_absensi
-----+-----+-----+-----+
 1 | RFID123456789 | 2024-12-01 07:15:00 | Hadir
 2 | RFID987654321 | 2024-12-01 07:35:00 | Terlambat
 3 | RFID456123789 | 2024-12-01 07:28:00 | Hadir
 4 | RFID789123456 | 2024-12-01 07:45:00 | Terlambat
 5 | RFID321654987 | 2024-12-01 07:05:00 | Hadir
(5 rows)

absensi_kartu=# \q
user@pc-gedung-a:~$
```

```
user@pc-area-belakang:~$ psql -U postgres -h 192.168.1.2 -p 5432 -d absensi_kartu
psql: error: connection to server at "192.168.1.2", port 5432 failed: Connection timed out
Is the server running on that host and accepting TCP/IP connections?
user@pc-area-belakang:~$

user@pc-area-utara:~$ psql -U postgres -h 192.168.1.2 -p 5432 -d absensi_kartu
psql: error: connection to server at "192.168.1.2", port 5432 failed: Connection timed out
Is the server running on that host and accepting TCP/IP connections?
user@pc-area-utara:~$

user@pc-gedung-b:~$ psql -U postgres -h 192.168.1.2 -p 5432 -d absensi_kartu
psql: error: connection to server at "192.168.1.2", port 5432 failed: Connection timed out
Is the server running on that host and accepting TCP/IP connections?
user@pc-gedung-b:~$

user@pc-gedung-bundar:~$ psql -U postgres -h 192.168.1.2 -p 5432 -d absensi_kartu
psql: error: connection to server at "192.168.1.2", port 5432 failed: Connection timed out
Is the server running on that host and accepting TCP/IP connections?
user@pc-gedung-bundar:~$
```

Simulasi Hasil Implementasi Parsial Infrastruktur Jaringan

Hasil Uji Konektivitas Instance dengan Server

Akses ke Situs Moodle

```
user@pc-gedung-a:~$ curl https://learn.smanumht-jar.com/
<!DOCTYPE html>

<html dir="ltr" lang="en" xml:lang="en">
<head>
    <title>Home | E-Learning SMANU MHT</title>
    <link rel="shortcut icon" href="https://learn.smanumht-jar.com/theme/image.php/boost/theme/1735279814/favicon" />
    <meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<meta name="keywords" content="moodle, Home | E-Learning SMANU MHT" />
<link rel="stylesheet" type="text/css" href="https://learn.smanumht-jar.com/theme/yui_combo.php?rollup/3.18.1/yui-moodlesimple-min.css" /><script id="firstthemeshheet" type="text/css">/**<br/>
Required in order to fix style inclusion problems in IE with YUI **/</script><link rel="stylesheet" type="text/css" href="https://learn.smanumht-jar.com/theme/styles.php/boost/1735279814_1735279863/all" />
<script>
//<![CDATA[
var M = {}; M.yui = {};
M.pageLoadStartTime = new Date();
M.cfg = {"wwwroot": "https://learn.smanumht-jar.com", "apibase": "https://learn.smanumht-jar.com/vr.php/api", "homeurl": {}, "sesskey": "OjCnRM1XIL", "sessionTimeout": "28800", "sessionTimeoutWarning": "1200", "themerev": "1735279814", "slasharguments": 1, "theme": "boost", "iconSystemModule": "core/icon_system_fontawesome", "jsrev": "1735279814", "admin": "admin", "svgicons": true, "userTimezone": "Europe/London", "language": "en", "courseId": 1, "courseContextId": 2, "contextId": 2, "contextInstanceId": 1, "langrev": 1735279821, "templateRev": "1735279814", "siteId": 1, "userId": 0}; var yui1ConfigFn = function(me) {if(/-/skin|reset|fonts|grids|base/.test(me.name)){me.type='css';me.path=me.path.replace(/\.\js/,'.\css');me.path=me.path.replace(/\yui2-skin/,'/assets/skins/sam/yui2-skin')}};
```



Terima Kasih

Template Salindia:
Canva - Graphic Designer