



Cloud Server Project: dptech.online

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Unit: ICT171 - Server Environments and Architectures

Project Name: DP IT Technology

Project Type: Cloud-hosted IT services website with secure access **Primary**

Important Links

Item	Enlace
Main Server Website	https://dptech.online
Test Server Website	https://dptech2.online
Public IP (Main)	http://3.107.180.255/
Public IP (Test)	http://13.237.145.105/
GitHub Repository and Video	https://github.com/DiegoF-Git/dptech-server
Video	https://drive.google.com/file/d/11duZoOSc0iHV3zHagozMK2RU6HUgiklo/view?usp=sharing https://youtu.be/ju6WTU65M8Q

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Project Purpose and Scope

This cloud infrastructure project was built to create a fully functional IT services website **dpotech.online** using AWS EC2 intended to emulate a live business environment. DPTech provides a variety of services including hardware repairs and replacement, virus removal, data retrieval, networking support and cloud IT consulting. The solution was designed to be full secure, cost-efficient and scalable with some automated processes to simulate a production quality cloud deployment. The scope included buying a domain, changing DNS records a domain registrar, launching a Linux EC2 instance, loading and configuring a web server, setting up TLS, writing a backup process, using cron to automate different processes and documenting a total cost of ownership over three years. Each of these tasks was performed in such a manner to create the most reproducible and releasable instance which would allow for the sever to be redeployed independently at a later date.

Why Infrastructure as a Service (IaaS)?

This project specifically uses IaaS (AWS EC2) rather than Platform as a Service (PaaS) or Software as a Service (SaaS) to demonstrate:

- Full control over the server environment
- Manual configuration and deployment skills
- SSH access for direct server management
- Real-world server administration experience
- Complete understanding of the technology stack

Documentation Approach

This documentation is designed to be:

- **Reproducible:** Another ICT171 student could rebuild this server without additional research
- **Complete:** All commands, configurations, and decisions are documented
- **Professional:** Written as technical documentation for IT staff
- **Practical:** Focused on real implementation

Cloud Infrastructure Overview

Element	Detail
Platform	AWS EC2 – IaaS
Instance Type	t3.micro (Free Tier eligible)
OS	Ubuntu Server 24.04 LTS
Main	3.107.180.255 (172.31.13.70 private IP)

Element	Detail
Test (with Elastic IP)	13.237.145.105 (172.31.4.126 private IP)
Security Rules	TCP: 22 (SSH), 80 (HTTP), 443 (HTTPS)

Local Machine Setup

- **Operating System:** Windows 11
- **Terminal Tool:** MobaXterm
- **SSH Key File:** D:\amazon\diegokey.pem
- **Website Files Folder:** D:\amazon\webEC2
- **Git Client:** GitHub Desktop
- **Git Files Folder:** D:\github\dpotech-server

Domain Configuration

Domains registered on [Namecheap](#) and configured as follows:

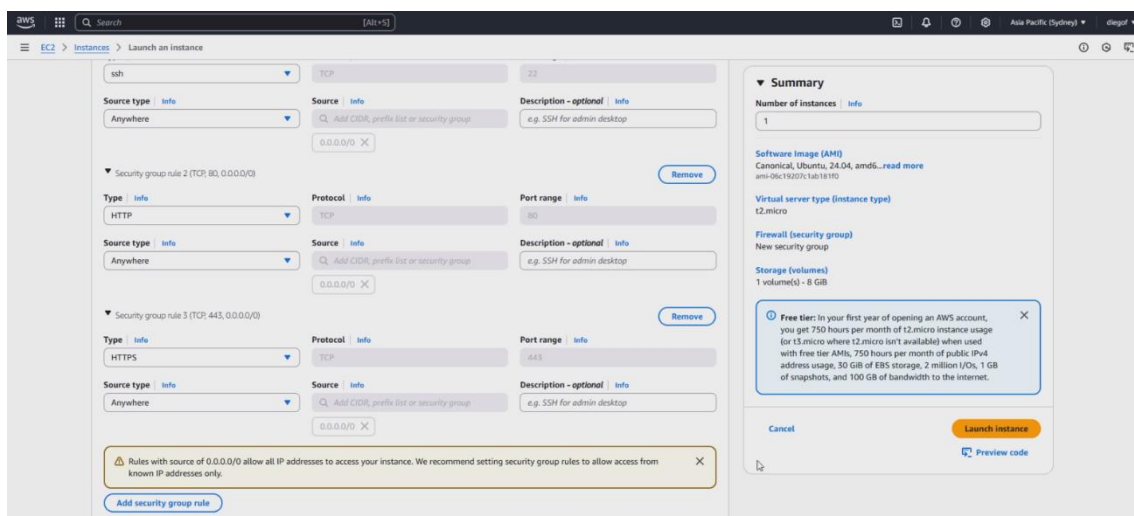
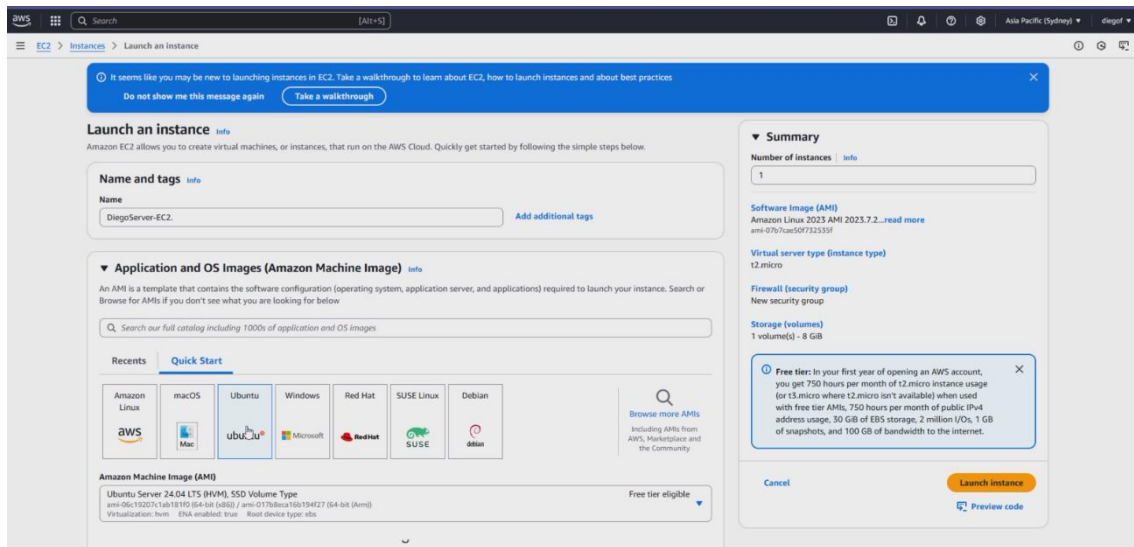
Domain	IP Address	SSL	Purpose
dpotech.online	3.107.180.255	✓	Main server
dpotech2.online	13.237.145.105	✓	Replica Test server for documentation

Both domains use A records pointing to their respective public Elastic IPs.

Hosting Platform: Amazon EC2

Amazon EC2 (Elastic Compute Cloud) was selected for this project due to its flexibility, affordability, and industry relevance.

Step-by-Step Configuration:



Enter the page:

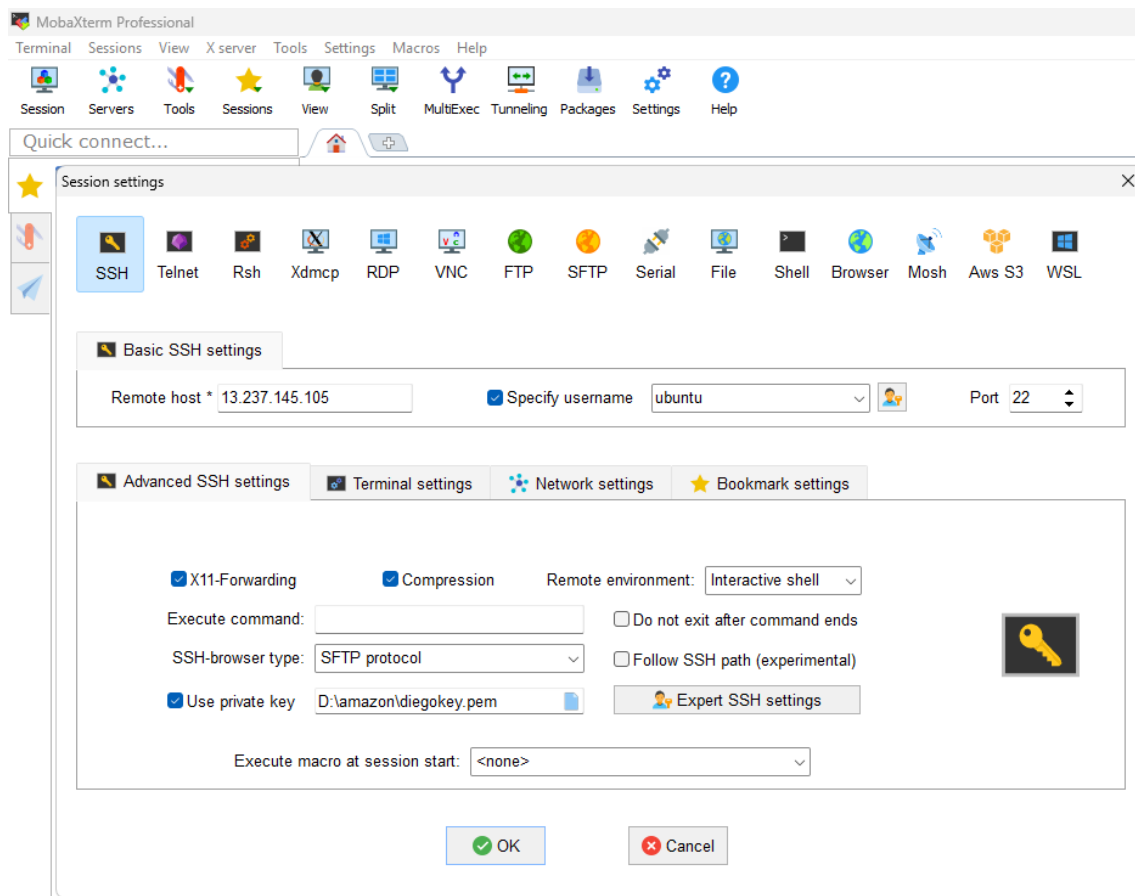
- <http://aws.amazon.com/ec2/>

Or console page:

- <https://console.aws.amazon.com>
- Logged into AWS Console and selected EC2 from the Services menu.
- Launched a new instance
- Name and tags, name: DiegoServer-EC2 (DiegoServer2-EC2 Replica Test server)
- using **Ubuntu Server 24.04 LTS (64-bit ARM)**.
- Chose **t3.micro** instance type under the free tier.
- Created a new key pair (diegokey.pem) and downloaded it securely.
- Set up the security group to allow incoming traffic on TCP ports:
 - 22 (SSH) for secure shell access
 - 80 (HTTP) for web access

- 443 (HTTPS) for encrypted connections

SSH Connection



```
▶ SSH session to ubuntu@13.237.145.105
  • Direct SSH      : ✓
  • SSH compression : ✓
  • SSH-browser     : ✓
  • X11-forwarding  : ✓ (remote display is forwarded through SSH)

▶ For more info, ctrl+click on help or visit our website.

Welcome to Ubuntu 24.04.2 LTS (GNU/Linux 6.8.0-1029-aws x86_64)

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

System information as of Mon Jun  9 07:06:38 UTC 2025

System load:  0.0          Processes:           113
Usage of /:   33.6% of 6.71GB Users logged in:        0
Memory usage: 26%          IPv4 address for enx0: 172.31.4.126
Swap usage:   0%

* Ubuntu Pro delivers the most comprehensive open source security and
  compliance features.

https://ubuntu.com/aws/pro

Expanded Security Maintenance for Applications is not enabled.

6 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

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

Last login: Mon Jun  9 07:02:55 2025 from 220.245.4.190
ubuntu@ip-172-31-4-126:~$
```

- Used MobaXterm from Windows to SSH into the server:
- `ssh -i diegokey.pem ubuntu@3.107.180.255`

Note: For the test server used:

- `ssh -i diegokey.pem ubuntu@13.237.145.105`

Key File Security in MobaXterm

Set proper permissions for the key file

```
chmod 400 /drives/d/amazon/diegokey.pem
```

Verify permissions

```
ls -la /drives/d/amazon/diegokey.pem
```

First Connection Checklist

1. Ensure EC2 instance is running in AWS Console
2. Verify Security Group allows SSH (port 22) from your IP
3. Confirm key file has correct permissions (400)

4. Use correct username: ubuntu for Ubuntu Server

Apache-Server

```
ubuntu@ip-172-31-4-126:~$ sudo apt install apache2 -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils libapr1t64 libaprutil1-dbd-sqlite3 libaprutil1-ldap libaprutil1t64 liblua5.4-0 ssl-cert
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom www-browser
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils libapr1t64 libaprutil1-dbd-sqlite3 libaprutil1-ldap libaprutil1t64 liblua5.4-0 ssl-cert
0 upgraded, 10 newly installed, 0 to remove and 2 not upgraded.
Need to get 2084 kB of archives.
After this operation, 8094 kB of additional disk space will be used.
Get:1 http://us-east-2.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 libapr1t64 amd64 1.7.2-3.1ubuntu1 [160 kB]
Get:2 http://us-east-2.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libaprutil1t64 amd64 1.6.3-1.1ubuntu7 [91.9 kB]
Get:3 http://us-east-2.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libaprutil1-dbd-sqlite3 amd64 1.6.3-1.1ubuntu7 [11.2 kB]
Get:4 http://us-east-2.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libaprutil1-ldap amd64 1.6.3-1.1ubuntu7 [9116 B]
Get:5 http://us-east-2.ec2.archive.ubuntu.com/ubuntu noble/main amd64 liblua5.4-0 amd64 5.4.6-3build2 [166 kB]
Get:6 http://us-east-2.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 apache2-bin amd64 2.4.58-1ubuntu8.6 [1330 kB]
Get:7 http://us-east-2.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 apache2-data all 2.4.58-1ubuntu8.6 [163 kB]
Get:8 http://us-east-2.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 apache2-utils amd64 2.4.58-1ubuntu8.6 [97.2 kB]
Get:9 http://us-east-2.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 ssl-cert amd64 2.4.58-1ubuntu8.6 [90.2 kB]
Get:10 http://us-east-2.ec2.archive.ubuntu.com/ubuntu noble/main amd64 ssl-cert all 1.1.2ubuntu1 [17.8 kB]
Fetched 2084 kB in 0s (8342 kB/s)
Preconfiguring packages ...
Selecting previously unselected package libapr1t64:amd64.
(Reading database ... 78678 files and directories currently installed.)
Preparing to unpack .../6-libapr1t64_1.7.2-3.1ubuntu1_amd64.deb ...
Unpacking libapr1t64:amd64 (1.7.2-3.1ubuntu1) ...
Selecting previously unselected package libaprutil1t64:amd64.
Preparing to unpack .../1-libaprutil1t64_1.6.3-1.1ubuntu7_amd64.deb ...
Unpacking libaprutil1t64:amd64 (1.6.3-1.1ubuntu7) ...
Selecting previously unselected package libaprutil1-dbd-sqlite3:amd64.
Preparing to unpack .../2-libaprutil1-dbd-sqlite3_1.6.3-1.1ubuntu7_amd64.deb ...
Unpacking libaprutil1-dbd-sqlite3:amd64 (1.6.3-1.1ubuntu7) ...
Selecting previously unselected package libaprutil1-ldap:amd64.
Preparing to unpack .../3-libaprutil1-ldap_1.6.3-1.1ubuntu7_amd64.deb ...
Unpacking libaprutil1-ldap:amd64 (1.6.3-1.1ubuntu7) ...
Selecting previously unselected package liblua5.4-0:amd64.
Preparing to unpack .../4-liblua5.4-0_5.4.6-3build2_amd64.deb ...
Unpacking liblua5.4-0:amd64 (5.4.6-3build2) ...
Selecting previously unselected package apache2-bin.
Preparing to unpack .../5-apache2-bin_2.4.58-1ubuntu8.6_amd64.deb ...
Unpacking apache2-bin (2.4.58-1ubuntu8.6) ...
Selecting previously unselected package apache2-data.
Preparing to unpack .../6-apache2-data_2.4.58-1ubuntu8.6_all.deb ...
Unpacking apache2-data (2.4.58-1ubuntu8.6) ...
Selecting previously unselected package apache2-utils.
Preparing to unpack .../7-apache2-utils_2.4.58-1ubuntu8.6_amd64.deb ...
Unpacking apache2-utils (2.4.58-1ubuntu8.6) ...
Selecting previously unselected package apache2.
Preparing to unpack .../8-apache2_2.4.58-1ubuntu8.6_amd64.deb ...
Unpacking apache2 (2.4.58-1ubuntu8.6) ...
```



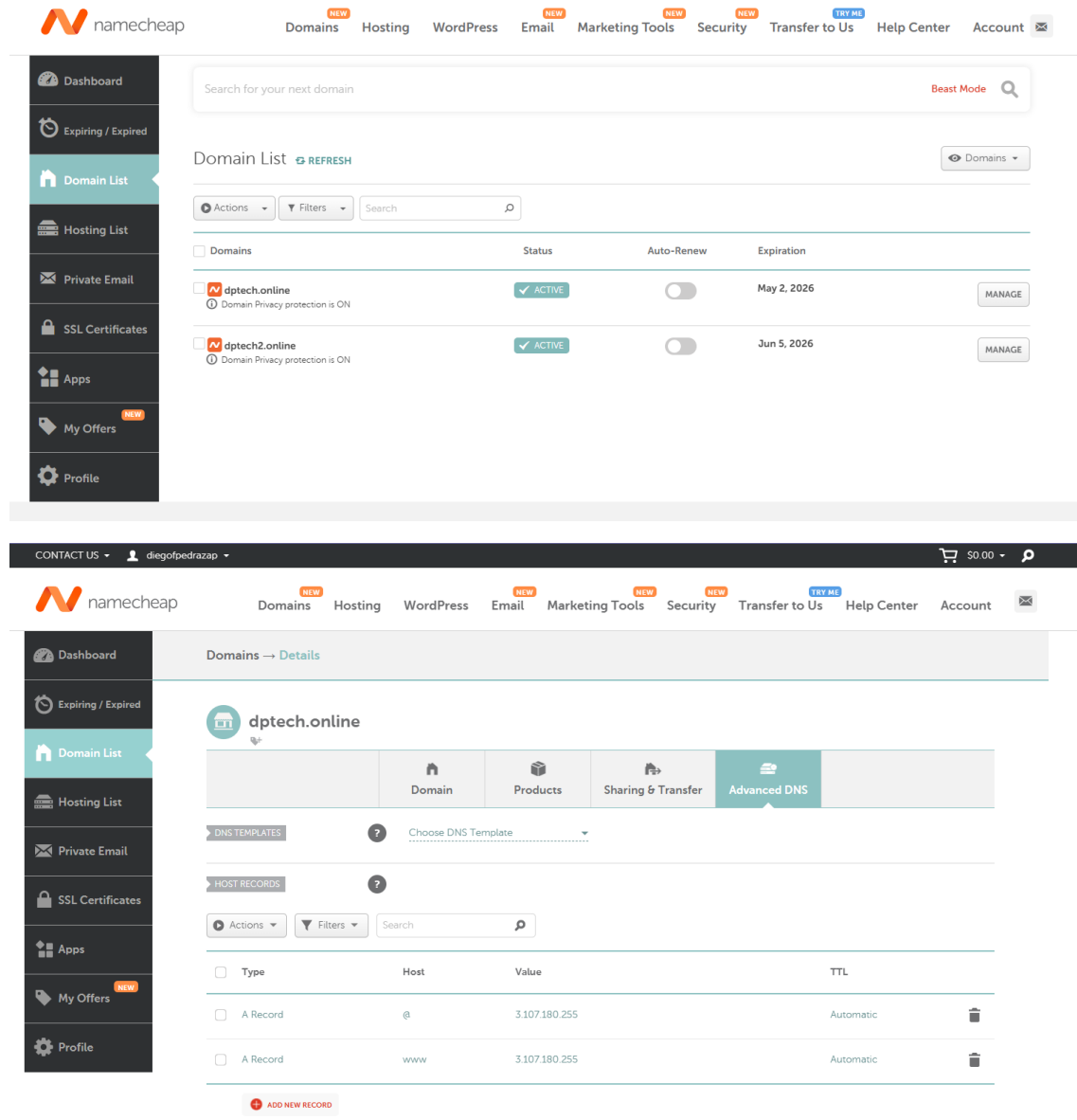
- Updated the package list and installed Apache web server:
- sudo apt update
- sudo apt install apache2 -y
- sudo systemctl enable apache2
- sudo systemctl start apache2
- Verified service with systemctl status apache2 and accessed the default Apache landing page from a browser.

Testing Apache Installation

1. Local test: curl http://localhost

2. **External test:** Navigate to `http://YOUR_EC2_IP` in that case 3.107.180.255 (Main Server) or 13.237.145.105 (Test Server) in browser
3. **Check logs:** `sudo tail -f /var/log/apache2/access.log`

Domain Registration and DNS Setup



The screenshot shows the Namecheap dashboard with the 'Domain List' section active. It displays a table of domains with columns for Actions, Filters, Search, Status, Auto-Renew, and Expiration. Two domains are listed: `dpotech.online` and `dpotech2.online`, both with 'ACTIVE' status and 'Domain Privacy protection is ON'. Below the table, there is a 'DNS TEMPLATES' section and a 'HOST RECORDS' section. The 'HOST RECORDS' section shows a table with columns for Type, Host, Value, and TTL. Two A records are listed for the domain `dpotech.online`, both pointing to the IP address 3.107.180.255. The first record is for the host `@` and the second is for the host `www`. Both records have a TTL of 'Automatic'. There is an 'ADD NEW RECORD' button at the bottom of the table.

Domain List

Domains	Status	Auto-Renew	Expiration
<input type="checkbox"/> <code>dpotech.online</code> Domain Privacy protection is ON	✓ ACTIVE	<input type="checkbox"/>	May 2, 2026
<input type="checkbox"/> <code>dpotech2.online</code> Domain Privacy protection is ON	✓ ACTIVE	<input type="checkbox"/>	Jun 5, 2026

Host Records

Type	Host	Value	TTL
<input type="checkbox"/> A Record	@	3.107.180.255	Automatic
<input type="checkbox"/> A Record	www	3.107.180.255	Automatic

[ADD NEW RECORD](#)

CONTACT US ▾ diegopedrazap ▾ \$0.00 ▾

namecheap Domains ^{NEW} Hosting WordPress ^{NEW} Email ^{NEW} Marketing Tools ^{NEW} Security ^{NEW} Transfer to Us ^{TRY ME} Help Center Account

Dashboard Domains → Details

dpotech2.online

Domain Products Sharing & Transfer **Advanced DNS**

DNS TEMPLATES ? Choose DNS Template ▾

HOST RECORDS ?

Actions ▾ Filters ▾ Search 🔍

Type	Host	Value	TTL
<input type="checkbox"/> A Record	@	13.237.145.105	Automatic
<input type="checkbox"/> A Record	www	13.237.145.105	Automatic

ADD NEW RECORD

- Purchased the domain dpotech.online from Namecheap (\$1.16 AUD/year).
- Purchased the domain dpotech2.online from Namecheap (\$1.16 AUD/year).
- Logged into Namecheap Dashboard > Domain List > Manage > Advanced DNS.
- **For dpotech.online:**
 - Added A record: @ pointing to 3.107.180.255
 - Added A record: www pointing to 3.107.180.255
- **For dpotech2.online (Test Server):**
 - Added A record: @ pointing to 13.237.145.105
 - Added A record: www pointing to 13.237.145.105
- Set TTL to Automatic for both domains.
- Confirmed DNS propagation using external DNS checkers and the following terminal commands:
 - dig dpotech.online
 - nslookup dpotech.online
 - wget http://dpotech.online
 - curl -Iv https://dpotech.online
- Full propagation occurred within approximately 15–20 minutes.

TLS Certificate Setup (Let's Encrypt)

```
ubuntu@ip-172-31-4-128:~$ sudo snap install core
core 16-2.61.4-20241002 from Canonical✓ installed
ubuntu@ip-172-31-4-128:~$ sudo snap refresh core
snap "core" has no updates available
ubuntu@ip-172-31-4-128:~$ sudo snap install --classic certbot
certbot 4.0.0 from Certbot Project (certbot-eff) installed
ubuntu@ip-172-31-4-128:~$ sudo ln -s /snap/bin/certbot /usr/bin/certbot
ubuntu@ip-172-31-4-128:~$ sudo certbot --apache
Saving debug log to /var/log/letsencrypt/letsencrypt.log
Enter email address or hit Enter to skip:
Enter 'c' to cancel: die_fpp@hotmail.com

-----
Please read the Terms of Service at:
https://letsencrypt.org/documents/LE-SA-v1.5-February-24-2025.pdf
You must agree in order to register with the ACME server. Do you agree?
(Y/n): Y

-----
Would you be willing, once your first certificate is successfully issued, to
share your email address with the Electronic Frontier Foundation, a founding
partner of the Let's Encrypt project and the non-profit organization that
develops certbot? We'd like to send you email about our work encrypting the web,
EFF news, campaigns, and ways to support digital freedom.
(Y/n): N
Account registered.
Please enter the domain name(s) you would like on your certificate (comma and/or
space separated) (Enter 'c' to cancel): dptech2.online www.dptech2.online
Requesting a certificate for dptech2.online and www.dptech2.online

Successfully received certificate.
Certificate is saved at: /etc/letsencrypt/live/dptech2.online/fullchain.pem
Key is saved at: /etc/letsencrypt/live/dptech2.online/privatekey.pem
This certificate expires on 2025-09-03.
These files will be updated when the certificate renews.
Certbot has set up a scheduled task to automatically renew this certificate in the background.

Deploying certificate
Successfully deployed certificate for dptech2.online to /etc/apache2/sites-available/000-default-le-ssl.conf
We were unable to find a vhost with a ServerName or Address of www.dptech2.online.
Which virtual host would you like to choose?
1: 000-default.conf | dptech2.online | HTTPS | Enabled
2: 000-default-le-ssl.conf | dptech2.online | HTTPS | Enabled
Select the appropriate number [1-2] then [enter] (press 'c' to cancel): 2
Successfully deployed certificate for www.dptech2.online to /etc/apache2/sites-available/000-default-le-ssl.conf
Congratulations! You have successfully enabled HTTPS on https://dptech2.online and https://www.dptech2.online

-----
If you like Certbot, please consider supporting our work by:
  * Donating to EFF: https://letsencrypt.org/donate
  * Donating to EFF: https://eff.org/donate-le
-----
ubuntu@ip-172-31-4-128:~$
```

To enable secure connections:

- Ensured port 443 was open in the EC2 instance's security group.
- `wget http://dptech.online`
- `sudo apt update`
- `sudo apt install snapd -y`
- `sudo snap install core`
- `sudo snap refresh core`
- `sudo snap install --classic certbot`
- `sudo ln -s /snap/bin/certbot /usr/bin/certbot`
- `sudo certbot --apache`

Perform the following sub-actions when prompted:

In the Enter email address... field: enter the email address, `die_fpp@hotmail.com` was entered.

In "You must agree in order to register with the ACME server. Do I agree?", answer (Y) is: Y

Next option, answer (No): N

Then in `dptech2.online` enter `www.dptech2.online`, which is a "Requesting a certificate for both."

And finally, choose 2: 00-default-le-ssl.conf, choose: 2

- Installed Snap and Certbot tools:
- `sudo snap install core`
- `sudo snap refresh core`
- `sudo snap install --classic certbot`
- `sudo ln -s /snap/bin/certbot /usr/bin/certbot`
- Installed the certificate with Apache integration:
- `sudo certbot --apache`
- Selected both domains during the prompt (dptech.online and www.dptech.online).
- Auto-redirect from HTTP to HTTPS was enabled.
- Verified certificate with browser (lock icon) and CLI tools:

curl -Iv https://dptech.online

```
ubuntu@ip-172-31-4-126:~$ curl -Iv https://dptech2.online
* Host dptech2.online:443 was resolved.
* IPv6: (none)
* IPv4: 13.237.145.105
* Trying 13.237.145.105:443...
* Connected to dptech2.online (13.237.145.105) port 443
* ALPN: curl offers h2,http/1.1
* TLSv1.3 (OUT), TLS handshake, Client hello (1):
* CAfile: /etc/ssl/certs/ca-certificates.crt
* CAPath: /etc/ssl/certs
* TLSv1.3 (IN), TLS handshake, Server hello (2):
* TLSv1.3 (IN), TLS handshake, Encrypted Extensions (8):
* TLSv1.3 (IN), TLS handshake, Certificate (11):
* TLSv1.3 (IN), TLS handshake, CERT verify (15):
* TLSv1.3 (IN), TLS handshake, Finished (20):
* TLSv1.3 (OUT), TLS change cipher, Change cipher spec (1):
* TLSv1.3 (OUT), TLS handshake, Finished (20):
* SSL connection using TLSv1.3 / TLS_AES_256_GCM_SHA384 / X25519 / id-ecPublicKey
* ALPN: server accepted http/1.1
* Server certificate:
* subject: CN=dptech2.online
* start date: Jun  5 19:53:33 2025 GMT
* expire date: Sep  3 19:53:32 2025 GMT
* subjectAltName: host "dptech2.online" matched cert's "dptech2.online"
* issuer: C=US; O=Let's Encrypt; CN=E6
* SSL certificate verify ok.
* Certificate level 0: Public key type EC/prime256v1 (256/128 Bits/secBits), signed using ecdsa-with-SHA384
* Certificate level 1: Public key type EC/secp384r1 (384/192 Bits/secBits), signed using sha256WithRSAEncryption
* Certificate level 2: Public key type RSA (4096/152 Bits/secBits), signed using sha256WithRSAEncryption
* using HTTP/1.x
> HEAD / HTTP/1.1
> Host: dptech2.online
> User-Agent: curl/8.5.0
> Accept: */*
>
* TLSv1.3 (IN), TLS handshake, Newsession Ticket (4):
* TLSv1.3 (IN), TLS handshake, Newsession Ticket (4):
* old SSL session ID is stale, removing
< HTTP/1.1 200 OK
HTTP/1.1 200 OK
< Date: Thu, 05 Jun 2025 20:54:34 GMT
Date: Thu, 05 Jun 2025 20:54:34 GMT
< Server: Apache/2.4.58 (Ubuntu)
Server: Apache/2.4.58 (Ubuntu)
< Last-Modified: Thu, 05 Jun 2025 17:02:29 GMT
Last-Modified: Thu, 05 Jun 2025 17:02:29 GMT
< ETag: "29af-636d61424c07b"
ETag: "29af-636d61424c07b"
< Accept-Ranges: bytes
Accept-Ranges: bytes
< Content-Length: 10671
Content-Length: 10671
< Vary: Accept-Encoding
Vary: Accept-Encoding
< Content-Type: text/html
Content-Type: text/html
<
* Connection #0 to host dptech2.online left intact
ubuntu@ip-172-31-4-126:~$
```

- Confirmed certificate was issued by Let's Encrypt and set to renew automatically.

Website

Updating Files

Every time changes are made, this is the process of updating files from our main computer to the EC2 server, from the local terminal then in the Ubuntu terminal where the files are copied to the Ubuntu user folder and then to the /var/www/ destination.



```
* MobaXterm Professional v25.1 *
(X server, SSH client and network tools)

* Your computer drives are accessible through the /drives path
* Your DISPLAY is set to 192.168.1.105:0.0
* When using 'ssh', your remote DISPLAY is automatically forwarded
* Each command status is specified by a special symbol (/ or *)

Registered to another (1 user)

[2] 2025-06-06 18:20:27 [P] /home/mobaxterm cd /drives/d/amazon/webEC2/v2
[2] 2025-06-06 18:20:31 [P] /drives/d/amazon/webEC2/v2 ls
about.html contact.html css index.html services.html
[2] 2025-06-06 18:20:35 [P] /drives/d/amazon/webEC2/v2 chmod 400 /drives/d/amazon/diegokey.pem
[2] 2025-06-06 18:20:52 [P] /drives/d/amazon/webEC2/v2 scp -i /drives/d/amazon/diegokey.pem /drives/d/amazon/webEC2/v2/*.html ubuntu@3.107.180.255:/home/ubuntu/
100% 10KB 164.9KB/s 00:00
100% 8096 105.3KB/s 00:00
100% 9285 147.1KB/s 00:00
100% 23KB 263.4KB/s 00:00
[2] 2025-06-06 18:21:07 [P] /drives/d/amazon/webEC2/v2 scp -i /drives/d/amazon/diegokey.pem -r /drives/d/amazon/webEC2/v2/css ubuntu@3.107.180.255:/home/ubuntu/
```

In MobaXterm terminal:

```
cd /drives/d/amazon/webEC2/v2
```

```
chmod 400 /drives/d/amazon/diegokey.pem
```

```
scp -i /drives/d/amazon/diegokey.pem /drives/d/amazon/webEC2/v2/*.html
ubuntu@3.107.180.255:/home/ubuntu/
```

```
scp -i /drives/d/amazon/diegokey.pem -r /drives/d/amazon/webEC2/v2/css
ubuntu@3.107.180.255:/home/ubuntu/
```

```
• MobaXterm Professional Edition v25.1 •
(SSH client, X server and network tools)

► SSH session to ubuntu@3.107.180.255
• Direct SSH : ✓
• SSH compression : ✓
• SSH-browser : ✓
• X11-forwarding : ✓ (remote display is forwarded through SSH)

► For more info, ctrl+click on help or visit our website.

Welcome to Ubuntu 24.04.2 LTS (GNU/Linux 6.8.0-1026-aws x86_64)

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

System information as of Fri Jun 6 10:21:04 UTC 2025

System load: 0.08          Processes: 112
Usage of /: 38.6% of 6.71GB Users logged in: 0
Memory usage: 32%         IPv4 address for enX0: 172.31.13.70
Swap usage: 0%

* Ubuntu Pro delivers the most comprehensive open source security and
  compliance features.

https://ubuntu.com/aws/pro

Expanded Security Maintenance for Applications is not enabled.

45 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

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

*** System restart required ***
Last login: Fri Jun 6 10:15:36 2025 from 220.245.4.190
ubuntu@ip-172-31-13-70:~$ sudo mv /home/ubuntu/*.html /var/www/html/
ubuntu@ip-172-31-13-70:~$ sudo rm -r /var/www/html/css
ubuntu@ip-172-31-13-70:~$ sudo mv /home/ubuntu/css /var/www/html/
ubuntu@ip-172-31-13-70:~$ sudo chown -R www-data:www-data /var/www/html/
ubuntu@ip-172-31-13-70:~$ sudo systemctl reload apache2
ubuntu@ip-172-31-13-70:~$
```

On the server via SSH: In summary

```
sudo mv /home/ubuntu/*.html /var/www/html/
```

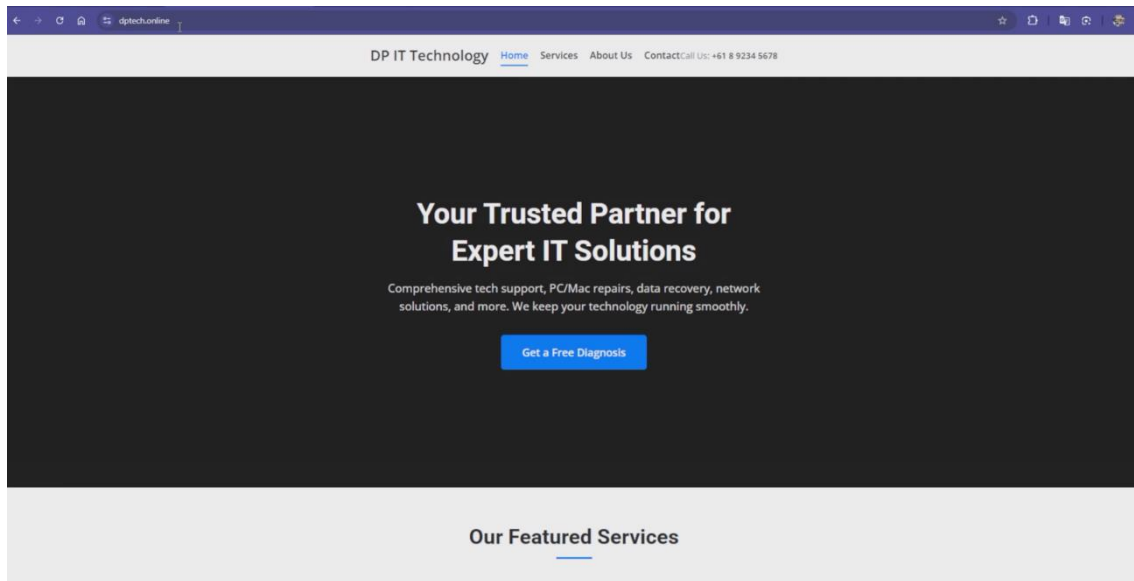
```
sudo rm -r /var/www/html/css
```

```
sudo mv /home/ubuntu/css /var/www/html/
```

```
sudo chown -R www-data:www-data /var/www/html/
```

```
sudo systemctl reload apache2
```

Website-Update



- Cleaned the default contents of /var/www/html:
- `sudo rm /var/www/html/index.html`
- Uploaded custom HTML, CSS, and images using MobaXterm:
- `scp -i diegokey.pem index.html ubuntu@3.107.180.255:/var/www/html/`
- Verified file permissions and ownership:
- `sudo chown www-data:www-data /var/www/html/index.html`
- Reloaded Apache to confirm new content:
- `sudo systemctl reload apache2`
- Website loaded properly at <https://dptech.online/>.

Website Design and Template Attribution

The frontend of the **dptech.online** website was developed using a customized HTML/CSS template based on the open-source Bootstrap template:

- **Source template:** [Business Frontpage – Start Bootstrap](#)
- **License:** [MIT License](#)

The template was adapted to match the branding and service structure of DP Tech. This includes modified color schemes, HTML sections, and service categories.

Icons Used

This project makes use of **Font Awesome Free Icons** to enhance visual clarity and modern design:

- [Font Awesome](#)
- **License:** Free icons are released under **Creative Commons Attribution 4.0** and **MIT License**

DP IT Technology Services Summary

DP IT Technology is an independent IT solutions provider offering a comprehensive range of technical services including:

- **Support & Maintenance**
PC/Mac & Mobile Repair, Help Desk (Remote/On-site), Virus Removal & Optimization, Preventive Maintenance
- **Hardware & Assembly**
Custom PC Building, Component Upgrades, Hardware Diagnostics, Component Sales
- **Software & Data**
OS & Application Installation, Advanced Data Recovery, Secure Backup Solutions, Software Configuration
- **Networks & Infrastructure**
Network Design & Installation, Server Administration, Network Security (Firewalls, VPN), Structured Cabling
- **Additional Services**
Strategic IT Consulting, Technology Training, Cloud Solutions, Business IT Support
- **Contact Us**
Ready to help with your technology needs. Contact us for a free consultation!

Script

Script 1: Daily Status Report

Objective

The `daily_status_report.sh` script is designed to generate a snapshot of the server's status including uptime, CPU and memory usage, and disk space. It stores the output in a timestamped file under `/home/ubuntu/server_reports/`.

Step-by-step Instructions

1. Create the folder to store the reports

```
mkdir -p /home/ubuntu/server_reports
```

2. Create the script file

```
nano /home/ubuntu/daily_status_report.sh
```

3. Paste the following content

```
#!/bin/bash

# Script to generate server status report
# Author: Diego Pedraza
# This script creates comprehensive server status reports

NOW=$(date +"%Y-%m-%d_%H-%M")
REPORT="/home/ubuntu/server_reports/report_${NOW}.txt"
```

```

echo "===== SERVER STATUS REPORT =====" > $REPORT
echo "Date and Time: $(date)" >> $REPORT
echo "-----" >> $REPORT
echo "Uptime:" >> $REPORT
uptime >> $REPORT
echo "" >> $REPORT
echo "CPU and Memory Usage:" >> $REPORT
top -b -n1 | head -n 10 >> $REPORT
echo "" >> $REPORT
echo "Disk Usage:" >> $REPORT
df -h >> $REPORT
echo "" >> $REPORT
echo "Free Memory:" >> $REPORT
free -h >> $REPORT
echo "" >> $REPORT
echo "Top 5 Processes by Memory Usage:" >> $REPORT
ps aux --sort=-%mem | head -n 5 >> $REPORT

```

```

echo "Report saved to: $REPORT"

```

Use Ctrl + O to save and Ctrl + X to exit.

4. Make the script executable

```

chmod +x /home/ubuntu/daily_status_report.sh

```

5. Test the script manually

```

/home/ubuntu/daily_status_report.sh

```

Verify the result in:

```

ls -la /home/ubuntu/server_reports/

```

6. Make the script system-wide

```

sudo mv /home/ubuntu/daily_status_report.sh /usr/bin/daily_status_report

```

```

sudo chown ubuntu /usr/bin/daily_status_report

```

Now you can run it from any location with:

```

daily_status_report

```

Script 2: Apache Monitor

Objective

This script checks whether the Apache service (apache2) is active. If it's not running, it automatically restarts the service and logs the event. It's useful for keeping your website always online without requiring manual checks.

Step-by-step Instructions

1. Create the log directory

```
mkdir -p /home/ubuntu/apache_logs
```

2. Create the script file

```
nano /home/ubuntu/apache_monitor.sh
```

3. Paste the following content

```
#!/bin/bash

# Apache Monitoring Script
# Author: Diego Pedraza
# Monitors Apache service and automatically restarts if needed

LOGFILE="/home/ubuntu/apache_logs/apache_monitor.log"
TIMESTAMP=$(date +"%Y-%m-%d %H:%M:%S")

echo "[${TIMESTAMP}] Checking Apache service..." >> $LOGFILE

# Check if Apache is active
if systemctl is-active --quiet apache2
then
    echo "[${TIMESTAMP}] Apache is running." >> $LOGFILE
else
    echo "[${TIMESTAMP}] Apache is NOT running. Restarting..." >> $LOGFILE
    sudo systemctl start apache2
    if systemctl is-active --quiet apache2
    then
        echo "[${TIMESTAMP}] Apache successfully restarted." >> $LOGFILE
    else
        echo "[${TIMESTAMP}] Failed to restart Apache!" >> $LOGFILE
    fi
fi
```

fi

fi

Save with Ctrl + O, then exit with Ctrl + X.

4. Make the script executable

```
chmod +x /home/ubuntu/apache_monitor.sh
```

5. Test it manually

First stop the service (just for testing):

```
sudo systemctl stop apache2
```

Then run the script:

```
/home/ubuntu/apache_monitor.sh
```

Check the log with:

```
cat /home/ubuntu/apache_logs/apache_monitor.log
```

6. Make it system-wide (optional)

```
sudo mv /home/ubuntu/apache_monitor.sh /usr/bin/apache_monitor
```

```
sudo chown ubuntu /usr/bin/apache_monitor
```

Now you can run it from anywhere:

```
apache_monitor
```

Scripts Summary

These two scripts demonstrate automation capabilities on the server:

- **daily_status_report:** Provides comprehensive system health monitoring
- **apache_monitor:** Ensures website availability through automatic service recovery

Both scripts can be scheduled via cron for fully automated operation.

Cron Job Setup

- Opened crontab:
- `sudo nano /etc/crontab`
- Added the following entries:
- `0 * * * * ubuntu /usr/bin/daily_status_report`
- `* /5 * * * * ubuntu /usr/bin/apache_monitor`
- Checked cron logs to verify automatic execution
- Confirmed scripts are running automatically as scheduled

Clarification on Dual Domains

Important Note: The screenshots and video documentation come from the test server (dptech2.online) as the original production server (dptech.online) was deployed in Assignment 1 and has been continuously run since then without documentation of the setup process.

- **dptech.online – Primary website hosted on an EC2 instance (IP: 3.107.180.255) deployed in Assignment 1. Since I did not create an Elastic IP, I have not restarted or shut down the server, to avoid losing the IP registered in Assignment1.**
- **dptech2.online – Mirror server created for video and documentation purposes, using Elastic IP (13.237.145.105).**

The two domains are nearly identical in functionality and configuration. The test server was created to properly record the setup steps which were missed initially on the main instance.

Total Cost of Ownership (TCO) - 3 Year Analysis

Three-Year Cost Summary

Platform	Year 1	Year 2	Year 3	3-yr Grand Total
On-Prem	\$10,094	\$3,116	\$3,240	\$16,450
Cloud Platform (IaaS)	\$1,344	\$1,385	\$1,426	\$4,155
Web Platform (SaaS)	\$862	\$888	\$915	\$2,665

Cloud Platform (IaaS) - Cost Breakdown (AUD)

AWS EC2 (Amazon Elastic Compute Cloud) is a web service that provides secure, resizable compute capacity in the cloud. It is designed to make web-scale cloud computing easier for developers.

Cost Bucket	Year 1	Year 2	Year 3	3-yr Sub-Total
Compute (t3.small 0.0408 AUD/h, +3%)	\$357	\$368	\$379	\$1,104
Storage (gp3 100 GB, +3%)	\$61	\$63	\$65	\$189
Daily Snapshots (30 GB, +3%)	\$298	\$307	\$316	\$921
Data Transfer (100 GB/mo @ \$0.12/GB, +3%)	\$154	\$159	\$164	\$477
Route 53 + Domain	\$49	\$49	\$49	\$147
DevOps Labour (6h @ \$55, +3%)	\$330	\$340	\$350	\$1,020

Cost Bucket	Year 1	Year 2	Year 3	3-yr Sub-Total
Contingency 10% (Opex)	\$95	\$99	\$103	\$297
IaaS Annual Total	\$1,344	\$1,385	\$1,426	\$4,155

On-Prem (Dell R550) - Cost Breakdown (AUD)

Cost Bucket	Year 1	Year 2	Year 3	3-yr Sub-Total
CapEx (server + UPS + FW)	\$7,006	\$-	\$-	\$7,006
Rack & Cooling	\$300	\$318	\$337	\$955
Power (250W avg @ \$0.30 kWh, +6%)	\$657	\$697	\$739	\$2,093
Software (cPanel \$60 / Acronis 120, +3%)	\$420	\$433	\$446	\$1,299
Domain + DNS	\$26	\$27	\$27	\$80
IT Staff (0.5 FTE @ \$85, +3%)	\$1,320	\$1,360	\$1,401	\$4,081
Contingency 10% (Opex)	\$272	\$281	\$290	\$843
On-Prem Annual Total	\$10,094	\$3,116	\$3,240	\$16,450

Web Platform (SaaS) - Cost Breakdown (AUD)

WordPress.com is a hosted Software as a Service (SaaS) platform that allows users to create and manage websites and blogs without needing to manage the underlying server infrastructure, security, or software updates.

Cost Bucket	Year 1	Year 2	Year 3	3-yr Sub-Total
Plan Subscription (US\$15/mo, +3%)	\$286	\$274	\$292	\$822
Media Overage (10 GB/yr @ \$1.20/GB, +6%)	\$12	\$13	\$14	\$39
Domain (internal)	\$26	\$27	\$27	\$80

Cost Bucket	Year 1	Year 2	Year 3	3-yr Sub-Total
Content Manager (10/mo @ \$40, +3%)	\$480	\$494	\$509	\$1,483
Contingency 10% (Opex)	\$78	\$80	\$83	\$241
SaaS Annual Total	\$862	\$888	\$915	\$2,665

Final Testing Checklist

- ✓ DNS resolves and A records confirmed
- ✓ Apache Web Server fully operational
- ✓ HTTPS enabled with valid certificate
- ✓ Website content deployed successfully
- ✓ Backup script tested manually and via cron
- ✓ Files timestamped correctly with zip format
- ✓ Server secure, ports configured properly
- ✓ Platform aligns with real-world IT business simulation

Troubleshooting Guide

Common Issues and Solutions

SSH Connection Issues

Error: Permission denied (publickey)

Solution: Check key file permissions in terminal in (my case used MobaXterm)

```
chmod 400 /drives/d/amazon/diegokey.pem
```

Error: Connection timeout

Solution: Verify security group allows SSH from your IP

Check AWS Console > EC2 > Security Groups > Inbound Rules

DNS Not Resolving

Check DNS propagation status

```
dig dptech.online @8.8.8.8
```

```
nslookup dptech.online
```

If not resolving after 30 minutes:

1. Verify A records in Namecheap dashboard

2. Check IP address is correct

3. Clear local DNS cache

Apache Issues

Apache not starting

sudo systemctl status apache2

sudo journalctl -xe | grep apache2

Check for configuration errors

sudo apache2ctl configtest

Common fix: Another service using port 80

sudo netstat -tulpn | grep :80

SSL Certificate Problems

Certificate not working

sudo certbot certificates

Force renewal if needed

sudo certbot renew --force-renewal

Check Apache SSL module

sudo a2enmod ssl

sudo systemctl restart apache2

Website Not Loading

Check file permissions

ls -la /var/www/html/

Files should be owned by www-data

Fix permissions if needed

sudo chown -R www-data:www-data /var/www/html/

sudo chmod -R 755 /var/www/html/

Check Apache error logs


```
sudo tail -f /var/log/apache2/error.log
```

Performance Monitoring

System Resource Monitoring

Real-time system monitoring

```
htop
```

Disk usage

```
df -h
```

Memory usage

```
free -m
```

Apache connections

```
sudo netstat -anp | grep :80 | wc -l
```

Apache status module (if enabled)

```
sudo a2enmod status
```

```
sudo systemctl restart apache2
```

Log Analysis

Monitor Apache access logs

```
sudo tail -f /var/log/apache2/access.log
```

Check for errors

```
sudo tail -f /var/log/apache2/error.log
```

System logs

```
sudo journalctl -f
```

Security Best Practices

Server Hardening Steps Implemented

1. SSH Security

- Key-based authentication only

- Password authentication disabled
- Root login disabled

2. Firewall Configuration

- Only necessary ports open (22, 80, 443)
- Security groups properly configured

3. Regular Updates

`sudo apt install`

4. SSL/TLS Configuration

- HTTPS enforced with redirect
- Strong cipher suites
- Regular certificate renewal

5. File Permissions

- Proper ownership for web files
- Restricted access to sensitive files
- Regular permission audits

Backup Best Practices

- Automated daily backups via cron
- Timestamped archives for version history
- Optional off-site backup capability
- Regular backup testing and verification

Video

link is on Github

Video Content Overview

The video demonstration covers:

1. Live server functionality demonstration
2. SSH connection process
3. Apache configuration walkthrough
4. SSL certificate verification
5. Backup script execution
6. Website navigation and features

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