Apache Web Server Installation & Maintenance Lab Documentation

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Lab Overview

Objectives

- Install, administer and maintain an Apache web server
- Configure virtual hosts to host multiple websites on a single server
- Understand Apache configuration and management

Environment

- **OS:** Ubuntu Linux
- **Server:** Apache2
- **IP Address:** 10.200.194.4 (external), 127.0.0.1 (localhost)
- **Domains configured:** webserverlab.com, example.com, anothervhost.com

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Task 1: Setting up Apache Web Server

Step 1: Installation

```
# Update package index
sudo apt update

# Install Apache2
sudo apt install apache2
```

Step 2: Firewall Configuration

```
# List available UFW profiles
sudo ufw app list

# Allow Apache through firewall
sudo ufw allow 'Apache'

# Verify firewall status
sudo ufw status
```

Step 3: Service Management

```
# Check Apache status
sudo systemctl status apache2

# Start/Stop/Restart Apache
sudo systemctl start apache2
sudo systemctl stop apache2
sudo systemctl restart apache2
sudo systemctl reload apache2

# Enable/Disable auto-start
sudo systemctl enable apache2
sudo systemctl disable apache2
```

☐ Checkpoint 1: Default Apache Page

- **Status:** COMPLETED ☐
- **URL:** http://10.200.194.4, http://localhost, http://127.0.0.1
- **Result:** Default Apache2 Ubuntu page displayed successfully

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Task 2: Setting up Virtual Hosts

Domain Configuration

Added the following entries to /etc/hosts:

```
127.0.0.1 webserverlab.com
127.0.0.1 example.com
127.0.0.1 www.example.com
127.0.0.1 anothervhost.com
127.0.0.1 www.anothervhost.com
```

Virtual Host 1: example.com

Directory Structure

```
sudo mkdir -p /var/www/example.com/html
sudo chown -R $USER:$USER /var/www/example.com/html
sudo chmod -R 755 /var/www/example.com
```

HTML Content

Location: /var/www/example.com/html/index.html

```html
<html>
  <head>
    <title>Welcome to Example.com!</title>
  </head>
  <body>
    <h1>Success! The example.com server block is working!</h1>
  </body>
</html>
```

Apache Configuration

Location: /etc/apache2/sites-available/example.com.conf
```

```
<VirtualHost *:80>
ServerAdmin admin@example.com
ServerName example.com
ServerAlias www.example.com
DocumentRoot /var/www/example.com/html
ErrorLog ${APACHE_LOG_DIR}/error.log
CustomLog ${APACHE_LOG_DIR}/access.log combined
</VirtualHost>
```

Enable Site

```
sudo a2ensite example.com.conf
sudo a2dissite 000-default.conf
sudo apache2ctl configtest
sudo systemctl restart apache2
```

Virtual Host 2: anothervhost.com

Directory Structure

```
sudo mkdir -p /var/www/anothervhost.com/html
sudo chown -R $USER:$USER /var/www/anothervhost.com/html
sudo chmod -R 755 /var/www/anothervhost.com
```

HTML Content with Styling

Location: /var/www/anothervhost.com/html/index.html

```
<html>
  <head>
    <title>Welcome to Another Virtual Host!</title>
    <style>
      body {
        font-family: Arial, sans-serif;
        background-color: #f0f8ff;
        color: #333;
        text-align: center;
        padding: 50px;
      }
      h1 {
        color: #2c3e50;
      }
      p {
        font-size: 18px;
      }
    </style>
  </head>
  <body>
    <h1>⬚ Success! Another Virtual Host (anothervhost.com) is working! ⬚</
    <p>This is a different website running on the same Apache server!</p>
    <p>Virtual hosts allow multiple websites on a single server.</p>
  </body>
</html>
```

Apache Configuration

Location: /etc/apache2/sites-available/anothervhost.com.conf

```
<VirtualHost *:80>
ServerAdmin admin@anothervhost.com
ServerName anothervhost.com
ServerAlias www.anothervhost.com
DocumentRoot /var/www/anothervhost.com/html
ErrorLog ${APACHE_LOG_DIR}/error.log
CustomLog ${APACHE_LOG_DIR}/access.log combined
</VirtualHost>
```

Enable Site

```
sudo a2ensite anothervhost.com.conf
sudo apache2ctl configtest
sudo systemctl reload apache2
```

Checkpoints Completed

☐ Checkpoint 1: Apache Installation (2 Marks)

- **Status:** COMPLETED ☐
- **Evidence:** Default Apache page accessible at http://10.200.194.4
- **Date:** November 19, 2025

☐ Checkpoint 2: Single Virtual Host (5 Marks)

- **Status:** COMPLETED ☐
- **Evidence:** example.com virtual host working correctly
- **URL:** http://example.com
- **Date:** November 19, 2025

☐ Checkpoint 3: Virtual Host Behavior Analysis (4 Marks)

- **Status:** COMPLETED ☐
- **Analysis:**
  - When default site is disabled, the first enabled virtual host (example.com) serves all unmatched requests
  - http://webserverlab.com now shows example.com content
  - http://127.0.0.1 also shows example.com content
  - This is because Apache serves the first available virtual host when no specific match is found

☐ Checkpoint 4: Multiple Virtual Hosts (4 Marks)

- **Status:** COMPLETED ☐
- **Evidence:**
  - example.com serving distinct content
  - anothervhost.com serving different styled content
  - Both virtual hosts working independently on the same server

Configuration Files

Apache Sites Available

```
/etc/apache2/sites-available/
├── 000-default.conf (disabled)
├── example.com.conf (enabled)
└── anothervhost.com.conf (enabled)
```

Apache Sites Enabled

```
/etc/apache2/sites-enabled/
├── example.com.conf -> ../sites-available/example.com.conf
└── anothervhost.com.conf -> ../sites-available/anothervhost.com.conf
```

Web Document Roots

```
/var/www/
├── html/ (default - unused)
├── example.com/html/index.html
└── anothervhost.com/html/index.html
```

Testing Results

Successful Tests

URL	Expected Result	Actual Result	Status
http://example.com	Example.com page	☐ Correct page displayed	PASS
http://www.example.com	Example.com page	☐ Correct page displayed	PASS
http://anothervhost.com	Anothervhost.com page	☐ Correct page displayed	PASS
http://www.anothervhost.com	Anothervhost.com page	☐ Correct page displayed	PASS
http://127.0.0.1	First virtual host	☐ example.com page	PASS
http://webserverlab.com	First virtual host	☐ example.com page	PASS

Command Line Testing

```
# Test example.com
curl http://example.com
# Returns: example.com HTML content

# Test anothervhost.com
curl http://anothervhost.com
# Returns: anothervhost.com HTML content with styling

# Test IP direct access
curl http://127.0.0.1
# Returns: example.com HTML content (first virtual host)
```

Troubleshooting

Common Issues Encountered

1. **Configuration Syntax Errors**

   - **Solution:** Use `sudo apache2ctl configtest` before reloading
   - **Result:** All configurations passed syntax check

2. **Permission Issues**

   - **Solution:** Proper ownership and permissions set with `chown` and `chmod`
   - **Result:** Web directories accessible by Apache

3. **Domain Resolution**

- **Solution:** Added entries to `/etc/hosts` for local testing
- **Result:** All domains resolve correctly to localhost

Warning Messages

```
AH00558: apache2: Could not reliably determine the server's fully
qualified domain name, using 127.0.1.1. Set the 'ServerName' directive
globally to suppress this message
```

- **Impact:** Cosmetic warning only, does not affect functionality
- **Status:** Configuration working properly despite warning

Important Apache Files and Directories

Configuration Directories

- `/etc/apache2/` - Main Apache configuration directory
- `/etc/apache2/apache2.conf` - Main Apache configuration file
- `/etc/apache2/ports.conf` - Port configuration
- `/etc/apache2/sites-available/` - Available virtual host configurations
- `/etc/apache2/sites-enabled/` - Enabled virtual host configurations

Content Directories

- `/var/www/html/` - Default document root
- `/var/www/example.com/html/` - Example.com document root
- `/var/www/anothervhost.com/html/` - Anothervhost.com document root

Log Files

- `/var/log/apache2/access.log` - Access logs
- `/var/log/apache2/error.log` - Error logs

Useful Commands

```
# Enable/Disable sites
sudo a2ensite sitename.conf
sudo a2dissite sitename.conf

# Enable/Disable modules
sudo a2enmod module_name
sudo a2dismod module_name

# Test configuration
sudo apache2ctl configtest

# Service management
sudo systemctl {start|stop|restart|reload|status} apache2
```

Next Steps

Pending Tasks

☐ **Checkpoint 5: Dynamic Websites (5 Marks)**

- **Task:** Deploy two dynamic websites using HTML and JavaScript
- **Requirements:**
  - HTML forms accepting 2-3 user inputs

- JavaScript to handle form submissions
- Deploy on two separate virtual hosts
- **Status:** PENDING

Recommendations for Checkpoint 5

1. **Calculator Website**

   - Create a simple calculator with HTML forms
   - Use JavaScript for calculations
   - Deploy on example.com

2. **User Profile Website**

   - Create a user registration/profile form
   - Use JavaScript for form validation
   - Deploy on anothervhost.com

3. **Additional Virtual Host**

   - Consider creating a third virtual host if needed
   - Example: calculator.com, profile.com

Learning Outcomes Achieved

1. ☐ **Apache Installation and Configuration**

   - Successfully installed Apache2 on Ubuntu
   - Configured firewall settings
   - Managed Apache service

2. ☐ **Virtual Host Configuration**

   - Created multiple virtual hosts on single server
   - Understood virtual host priority and behavior
   - Configured domain name resolution

3. ☐ **Web Server Management**

   - Used Apache management commands
   - Enabled/disabled sites and configurations
   - Tested and validated configurations

4. ☐ **File System Organization**

   - Organized web content in proper directory structure
   - Set appropriate permissions and ownership
   - Understood Apache directory layout

5. ☐ **Testing and Validation**

   - Tested virtual hosts through browser and command line
   - Validated configuration syntax
   - Analyzed server behavior

Conclusion

Successfully completed the first four checkpoints of the Apache Web Server Installation &
Maintenance lab. All virtual hosts are functioning correctly, and the server is properly
configured to serve multiple websites. Ready to proceed with dynamic website
development for Checkpoint 5.