COMPUTER SYSTEM SECURITY

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COURSE: ENGINEERING AND COMPUTER SCIENCE

SecureNet API Shield: JWT Security And Unified DNS

COMPREHENSIVE SYNOPSIS

The SecureNet API Shield project represents a significant advancement in the field of web application security. By combining the strengths of Secure DNS and JWT authentication, it offers a comprehensive solution to modern security challenges. This project not only protects against current threats but also lays the groundwork for future innovations and applications in secure communication and data protection. Through careful planning, execution, and regular performance checks, developers can ensure their applications remain secure, efficient, and scalable in an ever-evolving digital landscape.

RESTful services have become a popular architectural style for building web APIs. However, ensuring the security and authentication of API endpoints is crucial to protect sensitive data and prevent unauthorized access. First aims to implement a JWT (JSON Web Token) Token API for securing a RESTful service, enabling secure authentication and authorization mechanisms.

A. RESTful services are web services that follow the principles of Representational State Transfer (REST). They enable clients to interact with servers using standard HTTP methods (GET, POST, PUT, DELETE, etc.) and adhere to specific conventions. A key characteristic is statelessness, where each HTTP request contains all necessary information, and the server does not store any client context between requests. This approach enhances scalability, simplifies server design,

B. An API (Application Programming Interface) is a set of rules and protocols that allows one software application to interact with another. APIs define the methods and data formats that applications use to communicate with each other, enabling the integration of different systems and the creation of new functionalities..

C. Endpoints in the context of APIs are specific URLs or URIs where resources or services are made accessible to clients. Each endpoint represents a specific function or resource provided by the API, and it is where HTTP requests are sent to perform actions like retrieving, creating, updating, or deleting data.

TASKS TO ACHIEVE

A. Develop a JWT Token API to generate and validate JWT tokens for authentication and authorization purposes.

B. Implement secure token-based authentication for accessing RESTful service endpoints.

C. Design and enforce access control mechanisms based on JWT token attributes and roles.

D. Integrate the JWT Token API into the existing RESTful service infrastructure.

A. Develop a JWT Token API to generate and validate JWT tokens for authentication and authorization purposes.

```
// Registering a new user
app.post('/signup', async (req, res) => {
        const { username, password, role } = req.body; // Getting username, password, and role from request body
        try {
                const hashedPassword = bcrypt.hashSync(password, 10); // Hashing the password
                const user = new User({ username, password: hashedPassword, role }); // Creating a new user instance
                await user.save(); // Save the user to the database
                res.status(201).send('User registered successfully'); // Sending success response
        } catch (error) {
                if (error.code === 11000) { // If username already exists
                        res.status(409).send('Username already exists'); // Sending conflict response
                } else {
                        res.status(500).send('Error registering user'); // Sending server error response
                }
        }
});

// Generating JWT Token
app.post('/login', async (req, res) => {
        const { username, password } = req.body; // Getting username and password from request body
        try {
                const user = await User.findOne({ username }); // Finding user by username
                if (user && bcrypt.compareSync(password, user.password)) { // If user exists and password matches
                        const token = jwt.sign({ username: user.username, role: user.role }, process.env.JWT_SECRET, { expiresIn: '1h' });
                        return res.json({ token }); // Sending token in response
                }
                res.status(401).send('Invalid credentials'); // Send unauthorized response if credentials are invalid
        } catch (error) {
                res.status(500).send('Error logging in'); // Send server error response
        }
});

// Middleware to validate JWT
function authenticateToken(req, res, next) {
        const token = req.headers['authorization']; // Get token from authorization header
        if (!token) return res.send('Token not send'); // If no token, send error response
        jwt.verify(token, process.env.JWT_SECRET, (err, user) => { // Verify token
                if (err) return res.send('Token is not valid'); // If token is invalid, send error response
                req.user = user; // Attach user info to request
                next(); // Call next middleware
        });
}
```

POST /signup endpoint is used in APIs to handle user registration. This endpoint allows new users to create an account by providing necessary information such as a username, password, email, and other optional details. Upon successful registration, the endpoint typically returns a confirmation of account creation.

POST /login endpoint is commonly used in APIs to handle user authentication. This endpoint typically accepts user credentials (such as a username and password) and returns an authentication token or session identifier if the credentials are valid. This token is then used for subsequent requests to authorized endpoints.

Middleware is software that sits between the client and server in an application, handling and processing requests and responses. It is often used in web development to manage various aspects of request processing, such as authentication, logging, data parsing, and error handling.

- Authentication:

What It Is: It's like showing our ID to prove who we are.
Purpose: To verify that we are who we claim to be.
Example: When we log in to a website using our username and password, we are being authenticated. The system checks if our credentials match what's on record.

- Authorization:

What It Is: It's like checking our permissions after we've shown your ID.
Purpose: To determine what we are allowed to do once our identity is confirmed.
Example: After logging in, the website checks if we have permission to access certain pages or features. For instance, a regular user might only see their own profile, while an admin can see and edit all user profiles.

- JWT (JSON Web Token)

It is a compact, URL-safe means of representing claims to be transferred between two parties. It is commonly used for authentication and authorization purposes in web applications. A JWT consists of three parts: the Header, the Payload, and the Signature.

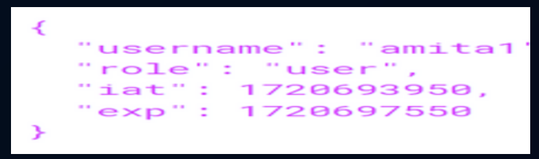
- Header:

The header typically consists of two parts: the type of token (which is JWT) and the signing algorithm being used (such as HMAC SHA256 or RSA).

{"alg": "HS256", "typ": "JWT"}

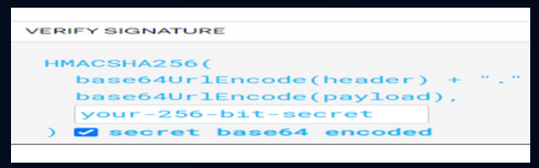
- Payload:

The payload contains the claims. Claims are statements about an entity (typically, the user) and additional data.



- Signature:

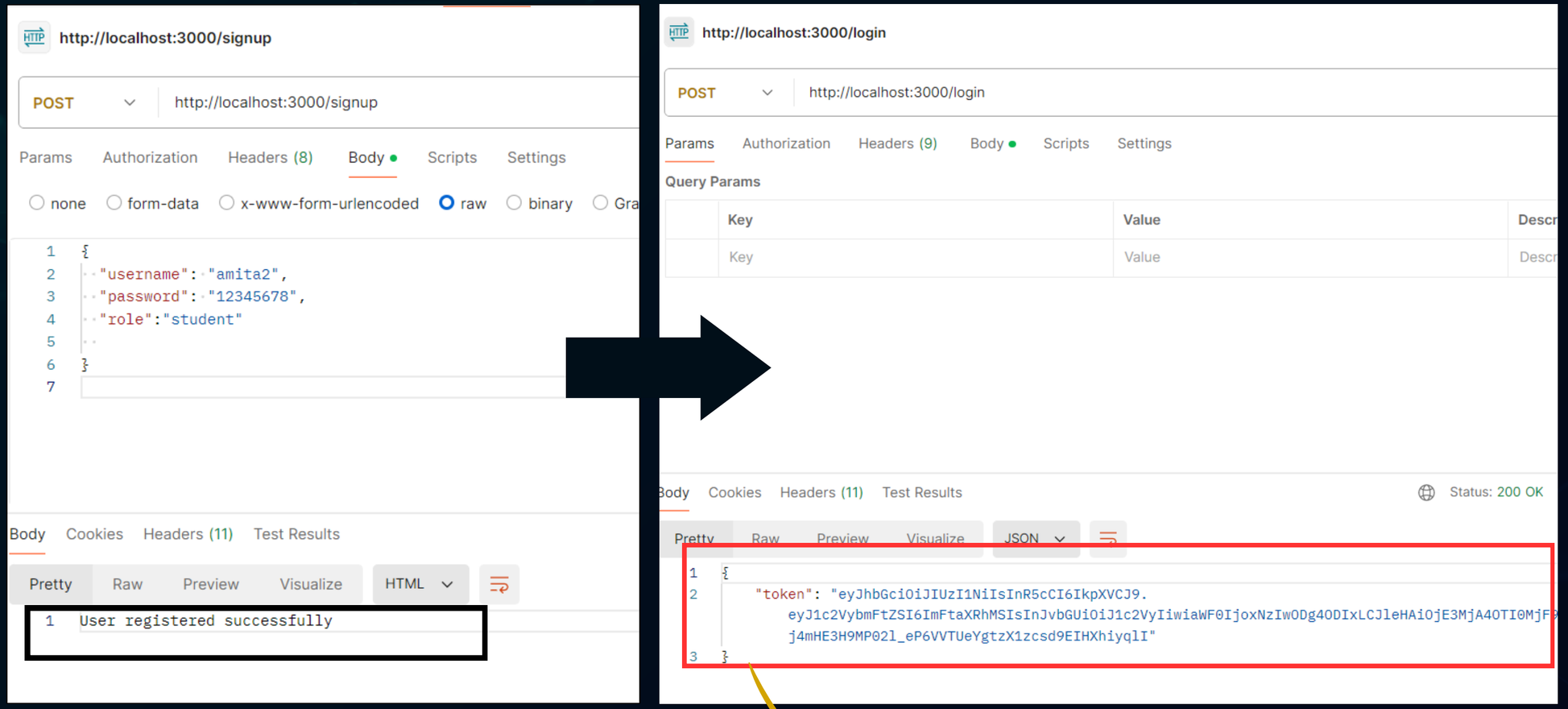
To create the signature part, you have to take the encoded header, the encoded payload, a secret, the algorithm specified in the header, and sign that.



"token":
"eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJ1c2VybmFtZSI6ImFtaXRhMSIsInJvbGUiOiJ1c2VyIiwiaWF0IjoxNzIwNjkzOTUwLCJleHAiOjE3MjA2OTc1NTB9.SfP4spMU28ICgclgoTfAEgjLzo61uc1J-xVaGO8u2no"

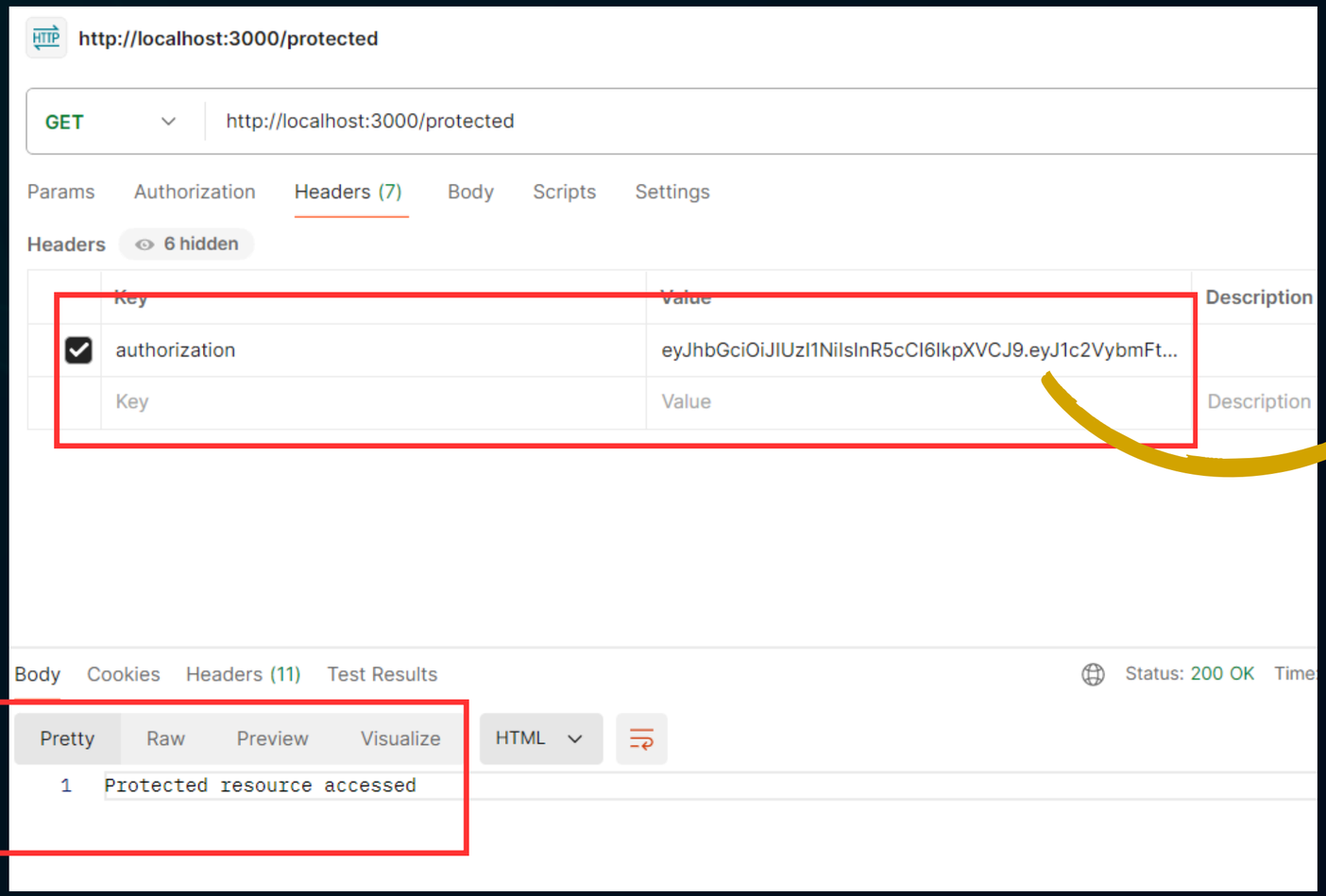
TESTING ON POSTMAN

Postman is a popular collaboration platform for API development. It simplifies the process of creating, testing, and sharing APIs.



TOKEN GENERATED

B. Implement secure token-based authentication for accessing RESTful service endpoints.



AUTHENTICATION & AUTHORIZATION ARE VERIFIED .USER IS ACCESSING PROTECTED ROUTE

TOKEN PLACED

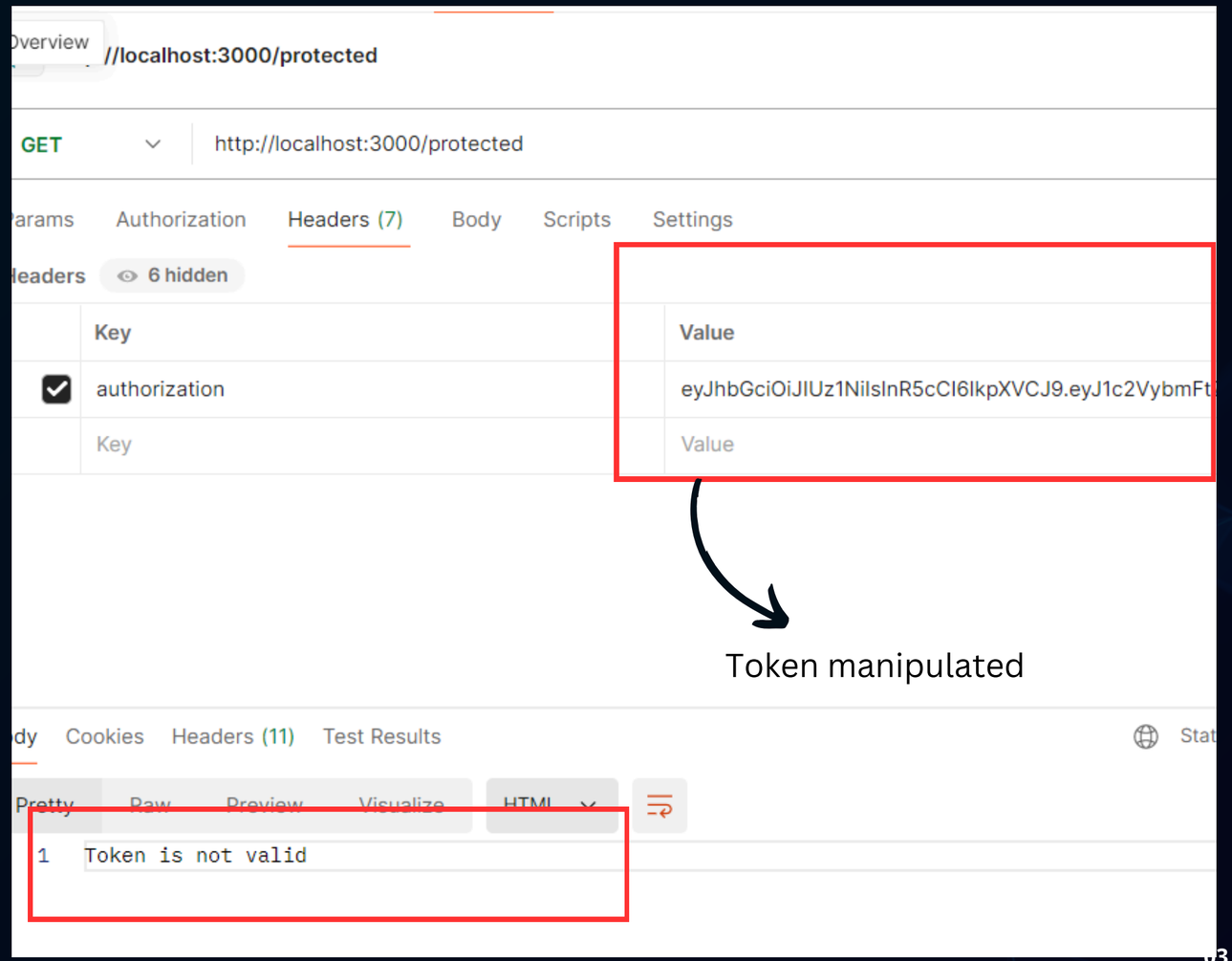
SECURITY MEASURES

TOKEN INTEGRITY

Storing and comparing token integrity checks to detect tampering.

JWT TAMPERING

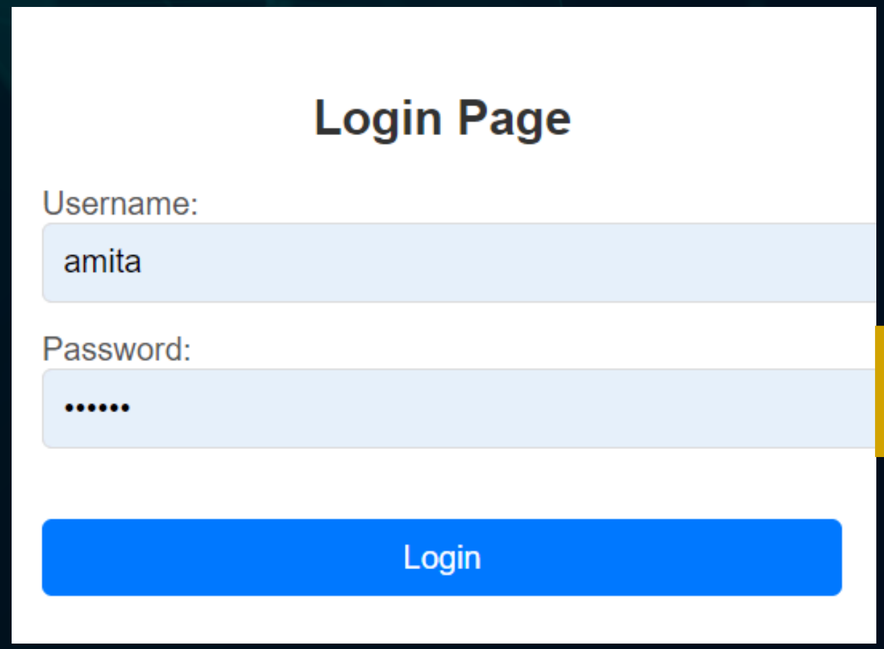
An attacker intercepts a JWT, modifies its payload to change the user role from "user" to "admin," and forges the signature to make the token appear valid. If the application does not properly verify the token's signature, the attacker could gain administrative privileges.

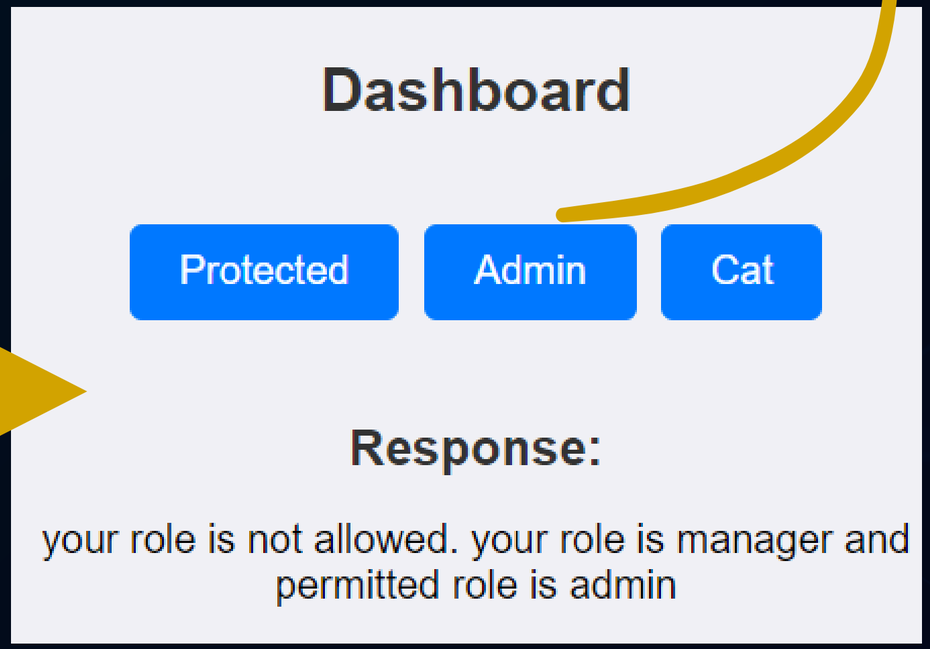


C. Design and enforce access control mechanisms based on JWT token attributes and roles.

```
// Admin Route
app.get('/admin', authenticateToken, authorizeRole('admin'), (req, res) => {
    res.send('Admin resource accessed');
});
```

ADMIN BUTTON IS PRESSED

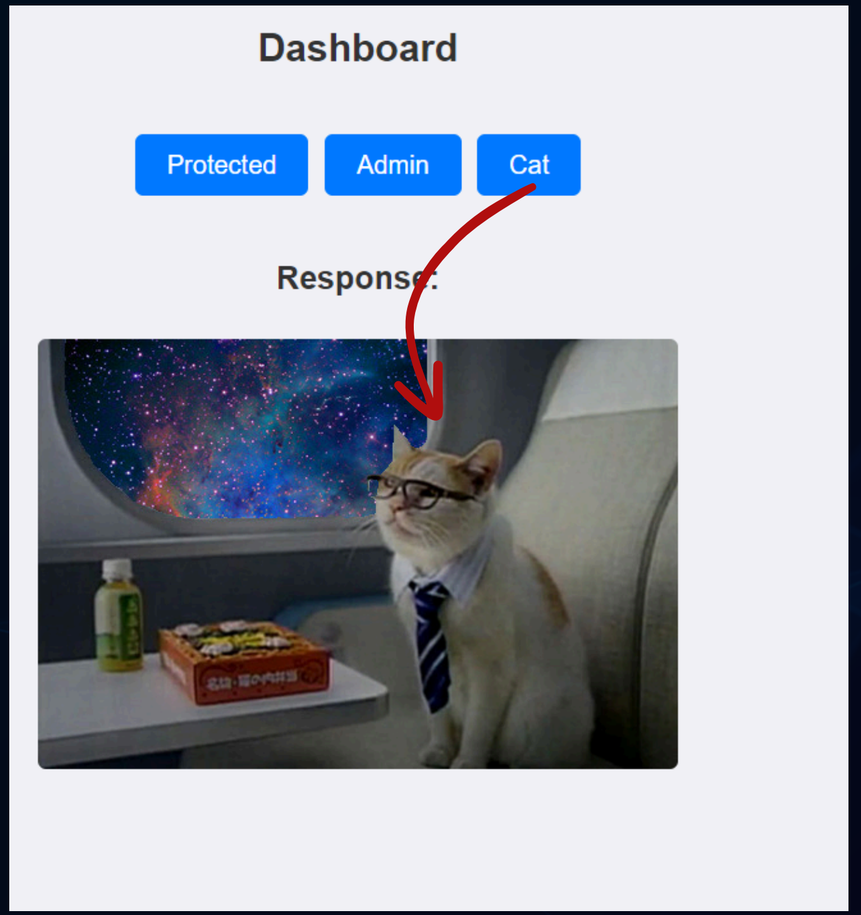




D.Integrate the JWT Token API into the existing RESTful service infrastructure.

```
app.get('/cat', authenticateToken, async (req, res) => {
    try {

        const response = await fetch("https://api.thecatapi.com/v1/images/search");
        const cat = await response.json();
        res.json(cat);
    } catch (error) {
        res.status(500).send('Error fetching cat image');
    }
});
```



DATABASE CONNECTION USING MONGODB

MongoDB is a popular choice for database management, especially in modern web applications, due to several key advantages it offers over traditional relational databases like MySQL or PostgreSQL.

Scalability and Performance
MongoDB is designed to be horizontally scalable, meaning it can efficiently distribute data across multiple servers (nodes) in a cluster. This capability supports large-scale applications with high volumes of data and traffic. MongoDB's sharding and replication features provide automatic failover and data redundancy, ensuring high availability and reliability of data.


```
_id: ObjectId('668faebeee5b7f11264cca61')
username : "amita1"
password : "$2a$10$leRlLcRmKWUqzhmy3vprG.BkHsJCyzmy1cSFLIjMjQC7BD5FIGrVW"
role : "user"
__v : 0
```

```
_id: ObjectId('66905995312d2dd88f3cd0cc')
username : "kulwant"
password : "$2a$10$/CC4iE56WFNG24cHj7GoGOpbKzdgM6Y7N51fUnA0ocien7FyeQ6s2"
role : "admin"
```

PROTECTION AGAINST DENIAL OF SERVICE ATTACK

- A Denial of Service (DoS) attack is a malicious attempt to disrupt the normal functioning of a targeted server, service, or network by overwhelming it with a flood of internet traffic. The goal of a DoS attack is to make the target system unavailable to its intended users, often causing significant disruption and loss of service.

- Express Rate Limit is a middleware for the Express.js framework that helps limit incoming requests to our server based on various criteria such as IP address, route, or user. This middleware is useful for preventing abuse and ensuring fair usage of your API or web application resources.

```
const limiter = rateLimit({
    max: 200, // Limit each IP to 200 requests per window (here, per hour)
    windowMs: 60 * 60 * 1000, // 1 hour
    message: "Too many requests from this IP, please try again in an hour!",
  });
  app.use(limiter);
```

TYPES OF DNS ATTACKS

DNSSEC

- DNS Spoofing (Cache Poisoning): Injects false DNS responses into a resolver's cache. Redirects users to malicious sites, leading to data theft and financial loss. Example: User is redirected to a fake banking site..
- DNS Tunneling: Bypasses firewalls to transfer data or control malware. Example: Malware communicates with its server via DNS queries.
- DNS Amplification Attack: Exploits open DNS resolvers to flood a target with traffic. Example: Attacker sends spoofed DNS queries to overwhelm a victim's server.
- Man-in-the-Middle (MITM) Attack: Intercepts and alters DNS responses to redirect traffic. Example: User's connection to a genuine site is intercepted and redirected to a fake site.
- DNS Hijacking: Alters DNS settings to redirect queries to malicious servers. Example: User is redirected to a fraudulent website after DNS settings are changed.
- DNS Rebinding: Circumvents same-origin policy to interact with private networks. Example: Attacker accesses internal network resources through a user's browser.
- Typosquatting (URL Hijacking): Registers domains similar to popular ones to exploit typos. Example: User types "gogle.com" instead of "google.com" and is redirected to a phishing site.
- NXDOMAIN Attack: Floods DNS server with requests for nonexistent domains, performance. Example: Server is overwhelmed by queries for random domains, affecting

SECURE DNS (DNSSEC)

The Domain Name System (DNS) is a critical part of the internet that translates human-readable domain names (like www.unimesec.shop) into IP addresses (like 64.227.67.178). Traditional DNS lacks security and can be attacked in several ways. This project aims to implement a Secure DNS system to enhance network security.

Ensure your DNS is secure with DNSSEC! This powerful tool guarantees the authenticity and integrity of DNS responses, shields against DNS spoofing and cache poisoning, and helps configure your website to prevent amplification attacks.

DNS Security Extensions (DNSSEC) add a layer of security by enabling DNS responses to be digitally signed. This allows resolvers to verify the authenticity and integrity of the responses.

OUR MAIN FOCUS ON:

A Design and implement DNSSEC (Domain Name System Security Extensions) to ensure data integrity and authenticity of DNS records.

B Design and implement a secure DNS implementation that incorporates cryptographic protocols and mechanisms.

C Deploy DNS over TLS (Transport Layer Security) or DNS over HTTPS (DoH) to encrypt DNS traffic and protect against eavesdropping and tampering

D Implement DNS filtering and blocking mechanisms to prevent access to malicious or unauthorized domains.

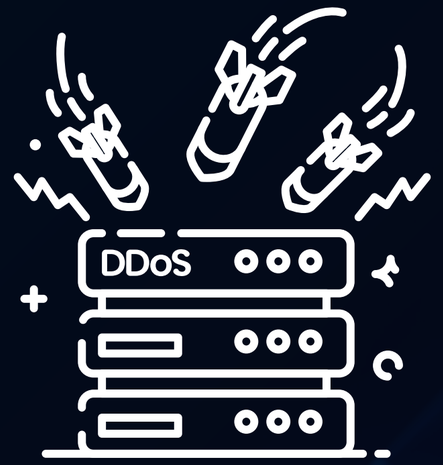
E Evaluate the performance, scalability, and effectiveness of the Secure DNS implementation.

DNSSEC Protects against various known vulnerabilities like BEAST, POODLE, Heartbleed, etc.

A DESIGN AND IMPLEMENT A SECURE DNS IMPLEMENTATION THAT INCORPORATES CRYPTOGRAPHIC PROTOCOLS AND MECHANISMS.

- Introduction to DNS Security: DNS is essential for translating domain names into IP addresses, but traditional DNS is vulnerable to attacks.
- **Aim**: Implement a Secure DNS system to enhance network security using cryptographic protocols.

- Domain Setup:
- Purchase a domain from GoDaddy.
- Connect the domain to a DigitalOcean server with IP address 64.227.67.178.



- State the aim to enhance DNS security using cryptographic techniques.
- Traditional DNS is vulnerable to attacks.

Cryptographic Protocols:

- Public Key Infrastructure (PKI): DNSSEC utilizes PKI for signing DNS data. Each DNS zone has a pair of cryptographic keys: a private key for signing and a public key for validation.
- Resource Record Signatures (RRSIG): These signatures are created using the private key and are used to verify the authenticity of DNS data using the public key.

Implementation Steps:

- Generate Key Pairs: Use tools like certbot to generate Key Signing Keys (KSK) and Zone Signing Keys (ZSK).
- Sign DNS Zones: Sign each zone file using the generated private keys. This ensures that any data within the zone can be verified as coming from the authoritative source.
- Publish DNSKEY Records: Publish the public keys in DNSKEY records so that resolvers can verify the signatures.

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Public Key Infrastructure (PKI): DNSSEC utilizes PKI for signing DNS data. Each DNS zone has a pair of cryptographic keys: a private key for signing and a public key for validation.
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open SSL

1. private key is to crytographic key, user has only access and it is ussed to create digital signatiure for users website.
2. open ssl and generate provate key:

Domain Portfolio

unimesec.shop

Overview | DNS | Products

DNS Records | Forwarding | Name Servers | Premium DNS | Hostnames | DS Record

Server names determine where your DNS is hosted and where you add, edit, or delete your DNS records.

Using custom name servers

Name Servers

ns1.digitalocean.com

ns2.digitalocean.com

ns3.digitalocean.com

```
Last login: Fri Jul 12 06:31:12 2024 from 162.243.188.66
root@unimesec:~# sudo certbot certonly --standalone -d unimesec.shop -d www.unimesec.shop
Saving debug log to /var/log/letsencrypt/letsencrypt.log
Requesting a certificate for unimesec.shop and www.unimesec.shop

Successfully received certificate.
Certificate is saved at: /etc/letsencrypt/live/unimesec.shop/fullchain.pem
Key is saved at:         /etc/letsencrypt/live/unimesec.shop/privkey.pem
This certificate expires on 2024-10-10.
These files will be updated when the certificate renews.
Certbot has set up a scheduled task to automatically renew this certificate in the background.
```

Create

unimesec.shop

in FIcs

What's next?

You need to update your nameservers with your domain registrar for the records below to take effect. Learn how to do that.

Create new record

Learn

A | AAAA | CNAME | MX | TXT | NS | SRV | CAA

Use @ to create the record at the root of the domain or enter a hostname to create it elsewhere. A records are for IPv4 addresses only and tell a request where your domain should direct to.

HOSTNAME	WILL DIRECT TO	TTL (SECONDS)	
Enter @ or hostname *	Select resource or enter custom IP	Enter TTL 3600	Create Record

DNS records

Type	Hostname	Value	TTL (seconds)	
A	www.unimesec.shop	directs to 64.227.67.178	3600	More
A	unimesec.shop	directs to 64.227.67.178	3600	More
NS	unimesec.shop	directs to ns1.digitalocean.com.	1800	More
NS	unimesec.shop	directs to ns2.digitalocean.com.	1800	More
NS	unimesec.shop	directs to ns3.digitalocean.com.	1800	More

B DESIGN AND IMPLEMENT DNSSEC (DOMAIN NAME SYSTEM SECURITY EXTENSIONS) TO ENSURE DATA INTEGRITY AND AUTHENTICITY OF DNS RECORDS

DNSSEC Overview:

DNSSEC adds a layer of security to DNS by enabling DNS responses to be verified for authenticity. It ensures that the data has not been altered and is indeed from the legitimate source.

Register Domain: We registered our domain name with GoDaddy, where we named our IP address and domain for identity.

Redirect Domain: The domain name was then redirected to our server on Digital Ocean.

Configure DNS: We configured the DNS settings in Digital Ocean to point to our IP address.

Implement DNSSEC: Enabled DNSSEC on our domain in GoDaddy to ensure the security of DNS data.

Generate Keys: Created DNSSEC keys (ZSK and KSK) to sign the DNS records.

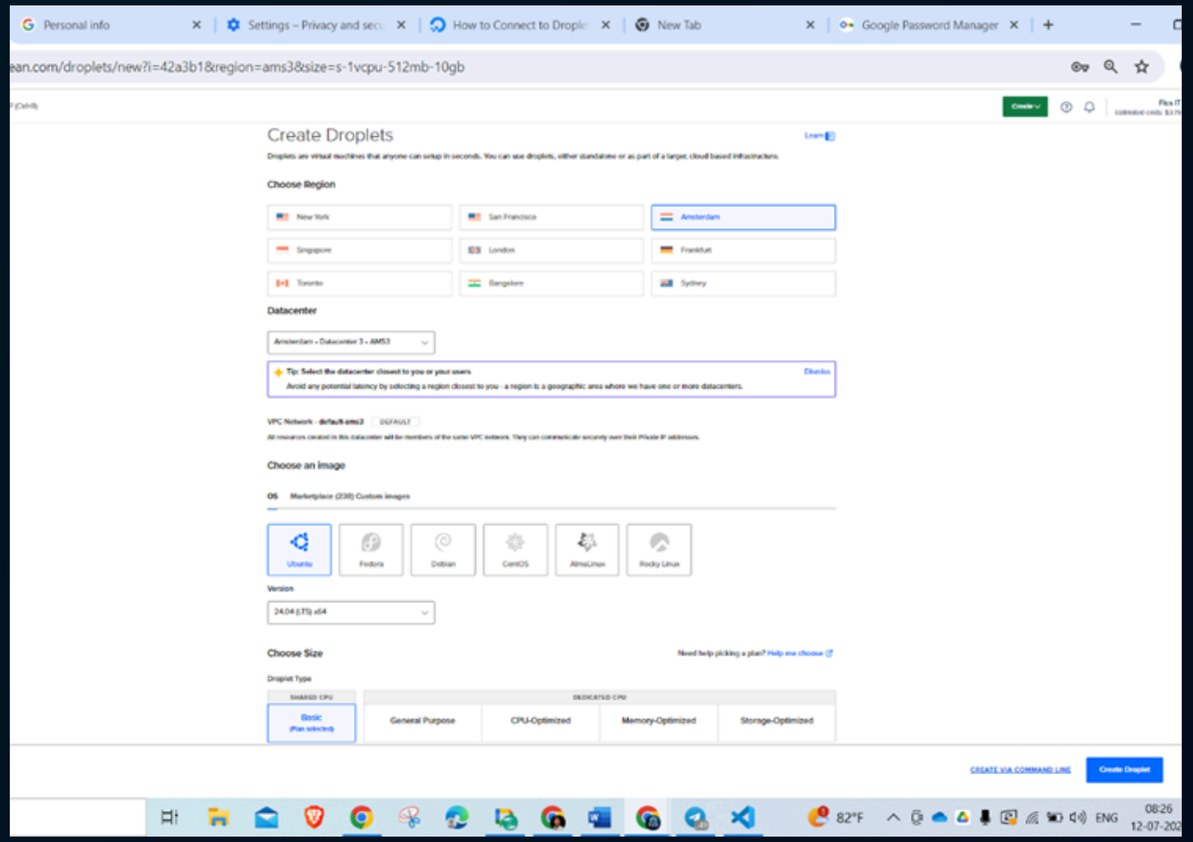
Sign Records: Signed our DNS records using the generated DNSSEC keys to verify their integrity and authenticity.

Publish DS Records: Published the DS records in GoDaddy to complete the DNSSEC setup, ensuring secure DNS resolution.

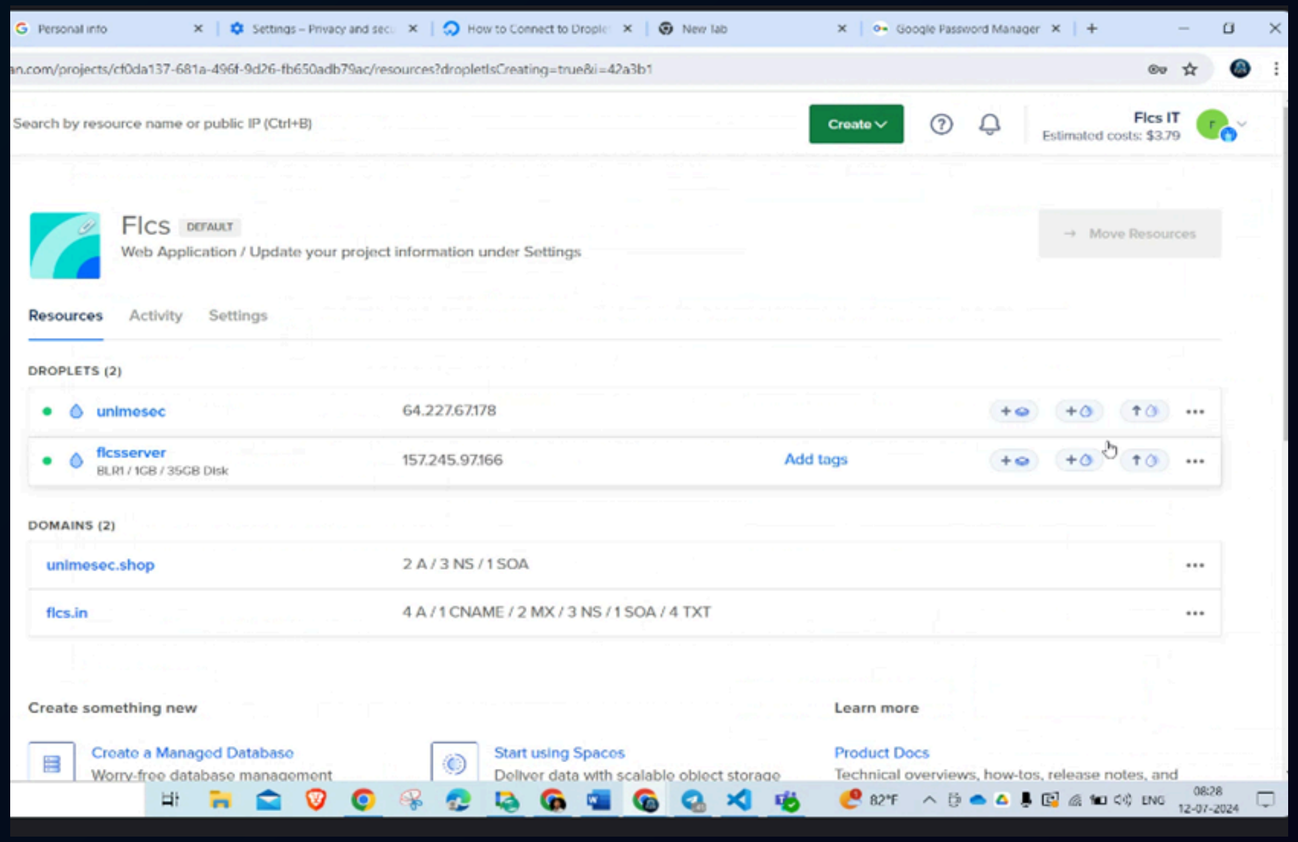
CREATING SERVER AT DIGITAL OCEAN

SERVER NAME:unimesec

CREATING DROPLET



IP ADDRESS



REDIRECTING OUR DOMAIN TOWARDS OUR SERVER IP ADDRESS

DNS records

Type	Hostname	Value	TTL (seconds)	
A	www.unimesec.shop	directs to 64.227.67.178	3600	More
A	unimesec.shop	directs to 64.227.67.178	3600	More
NS	unimesec.shop	directs to ns1.digitalocean.com.	1800	More
NS	unimesec.shop	directs to ns2.digitalocean.com.	1800	More
NS	unimesec.shop	directs to ns3.digitalocean.com.	1800	More

C DEPLOY DNS OVER TLC (TRANSPORT LAYER SECURITY) OR DNS OVER HTTPS (DOH) TO ENCRYPT DNS TRAFFIC AND PROTECT AGAINST EAVESDROPPING AND TAMPERING

Enable HTTPS: Activated HTTPS for our domain to secure web traffic.

Let's Encrypt: Used Let's Encrypt, an Internet Security Research Group, to obtain free SSL/TLS certificates.

Install Certbot: Installed Certbot, an open-source software tool provided by Let's Encrypt, to manage the certificate generation and renewal process.

Generate Certificate: Used Certbot to generate the SSL/TLS certificate for our domain.

Deploy DNS over TLS: Configured DNS over TLS to encrypt DNS traffic, protecting against eavesdropping and tampering.

Deploy DNS over HTTPS (DoH): Set up DNS over HTTPS (DoH) as an alternative to further enhance DNS traffic encryption.

Configure DNS Server: Updated our DNS server settings to support and enforce the use of DNS over TLS or DoH for secure DNS queries.

D IMPLEMENT DNS FILTERING AND BLOCKING MECHANISMS TO PREVENT ACCESS TO MALICIOUS OR UNAUTHORISED DOMAINS.

- Configure Firewall: Set up a firewall to allow only essential ports like 443 for HTTPS and 22 for SSH secure shell connection.
- Enable DNS Filtering: Implemented DNS filtering to block access to known malicious or unauthorized domains.
- Set Rate Limits: Established rate limits on our server to control the number of requests, allowing only 100-200 requests per hour.
- Block Excess Requests: Configured the server to block or deny requests exceeding the set limit to prevent brute force attacks.
- Update Blocklists: Regularly updated DNS blocklists to include newly identified malicious domains.
- Monitor Traffic: Continuously monitored DNS traffic for unusual patterns and potential threats.
- Log and Alert: Enabled logging and alerting mechanisms to track and respond to unauthorized access attempts promptly.

CODE TO GET SSL CERTIFICATES

1.**$ sudo apt-get install certbot**: Installing Certbot, a tool to obtain SSL certificates from Let's Encrypt.
2.**$ sudo certbot certonly** --standalone -d unimesec.shop -d www.unimesec.shop.: Uses Certbot to obtain SSL certificates for the specified domains.

Output: **Certificate is saved at: /etc/letsencrypt/live/unimesec.shop/fullchain.pem**
Key is saved at: /etc/letsencrypt/live/unimesec.shop/privkey.pem

CODE TO BLOCK ALL OTHER PORTS EXCEPT 443 AND 22

1.**$ sudo apt-get install ufw**: Installing UFW (uncomplicated firewall), a user-friendly interface for managing firewall rules.
2.**$ sudo ufw enable**: Enableing UFW, activating the firewall with default settings. By default, it will block all incoming connections and allow all outgoing connections.
3.**$ sudo ufw allow 44**3: Configuring the firewall to allow incoming traffic on port 443, which is used for HTTPS.
4.**$ sudo ufw allow 2**2: Configures the firewall to allow incoming traffic on port 22, which is used for HTTPS.

• WHY WE USE UFW (UNCOMPLICATED FIREWALL)

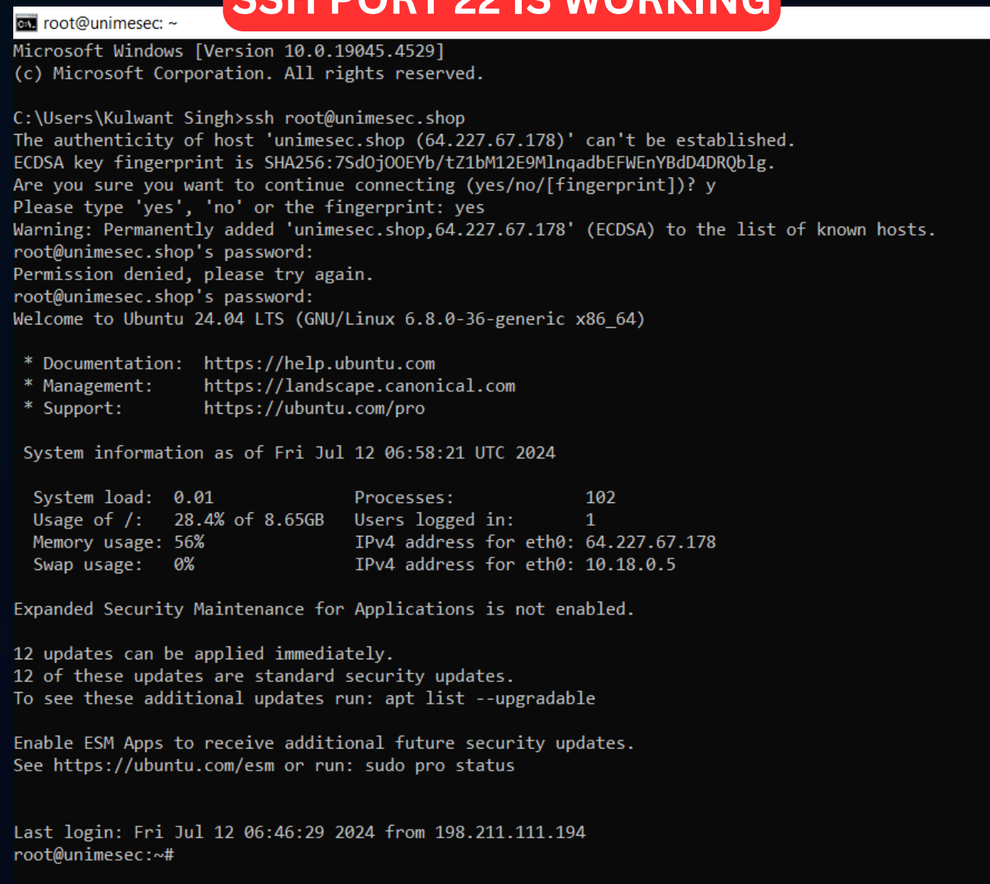
UFW (Uncomplicated Firewall) is a user-friendly frontend for managing a firewall in Linux, specifically designed to simplify the complexities of configuring iptables. Key features include:

• Ease of Use: Simple command-line interface for straightforward configuration.
• Default Deny Policy: Blocks all incoming connections by default, allowing only specified exceptions.
• Predefined Rules: Comes with preset rules for common applications like SSH, HTTP, and HTTPS.
• Logging: Offers logging options to monitor firewall activity.
• IPv6 Support: Handles both IPv4 and IPv6 traffic.

TO ACCESS REMOTELY THE SERVER

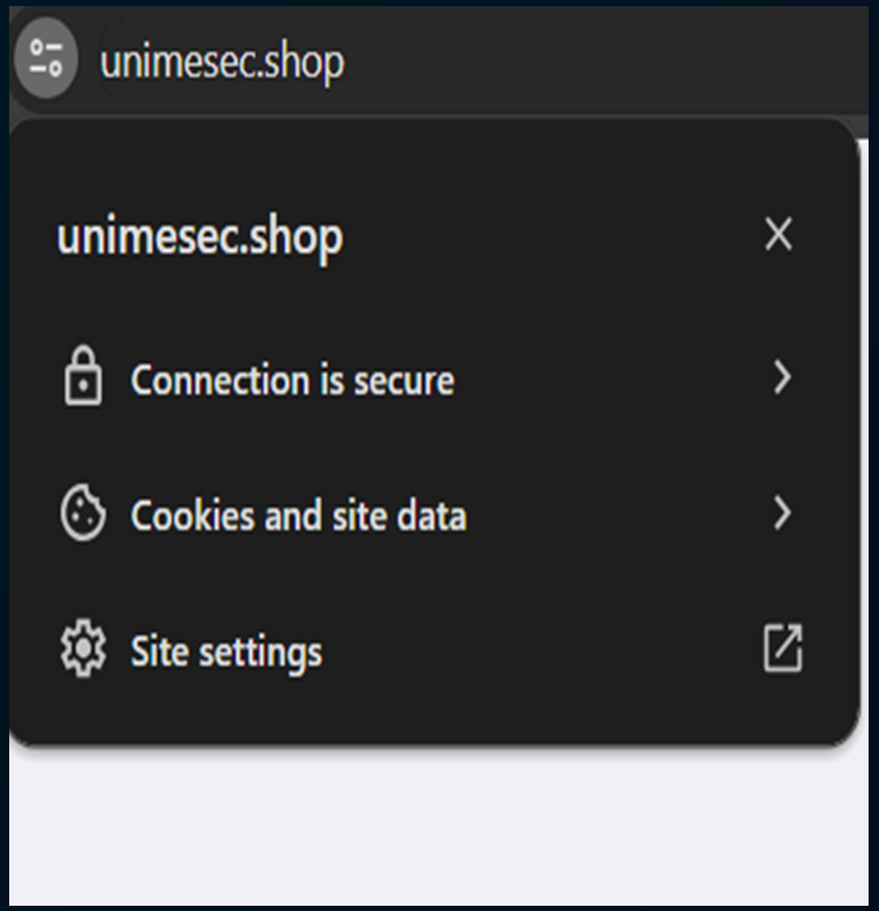
ssh root@unimesec.shop: root password: ************
This a command to remotely access the server unimesec.shop with the root user account via the Secure Shell (SSH) protocol. It's uses:
1. Remote Access: SSH allows secure remote login to the server, enabling management and configuration from anywhere.
2. Root Privileges: Logging in as root provides administrative privileges, allowing full control over the server.
3. Security: SSH encrypts the connection, protecting data from being intercepted or tampered with during transmission.
4. Management: Ideal for server maintenance, software installation, and performing system updates or troubleshooting.

SSH PORT 22 IS WORKING

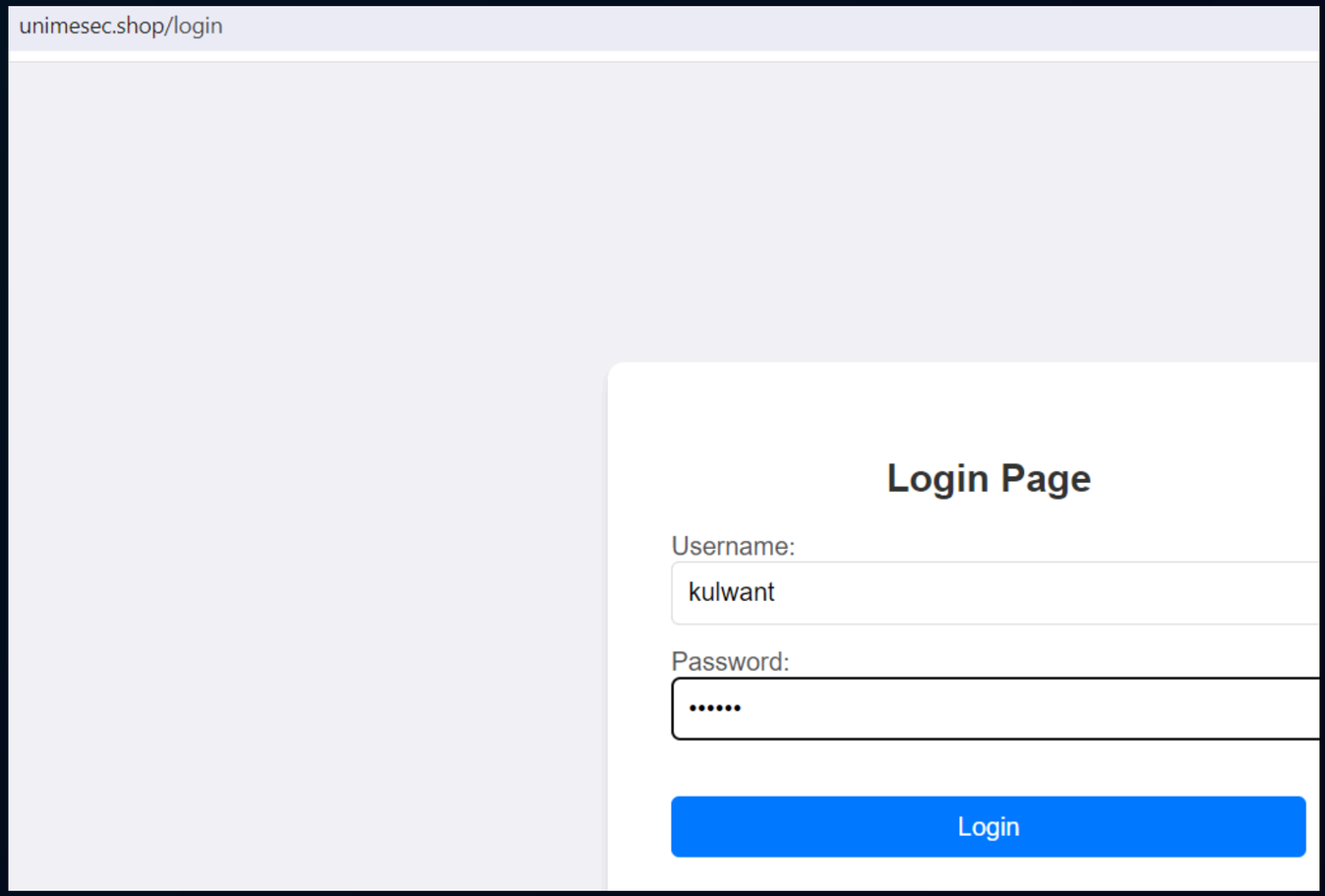


WHILE RUNNING THE SERVER AT UNIMESEC WITH IP (64.227.67.178) WITH OUR DOMAIN WWW.UNIMESEC.SHOP AT PORT 443

1.USING SSL CERTIFICATES
MAKING OUR DOMAIN SECURE



2.APPLICATION IS RUNNING
SECURELY AT OUR DOMAIN
https://www.unimesec.shop/



E EVALUATE THE PERFORMANCE, SCALABILITY AND EFFECTIVENESS OF THE SECURE DNS IMPLEMENTATION

Performance Evaluation:

Loading Speed: Monitored website loading times before and after implementing Secure DNS to ensure minimal impact.
Example: Before Secure DNS, page load time was 2 seconds. After implementation, it remained around 2.2 seconds, indicating negligible impact.
Scalability Assessment:

Handling Increased Traffic: Tested how Secure DNS handled increased traffic without degrading performance.
Example: Simulated high traffic scenarios (e.g., 10,000 concurrent users) and observed that the DNS service scaled effectively, maintaining response times within acceptable limits.
Effectiveness of Security: 200

Data Integrity and Authenticity: Ensured that DNSSEC and encrypted DNS protocols (DoH/DoT) were effectively protecting DNS data from tampering and eavesdropping.
Example: Conducted penetration tests and confirmed no successful DNS spoofing or man-in-the-middle attacks.

SEO Impact: Search Engine Optimization (SEO): Monitored changes in search engine rankings and website indexing speed.
Example: After implementing Secure DNS, there was a 5% increase in search engine traffic due to improved site trustworthiness.

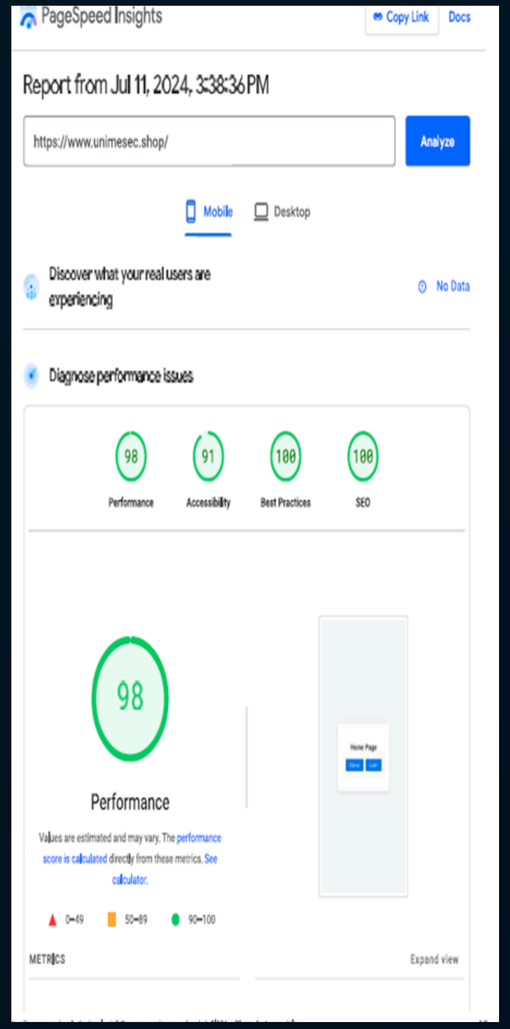
User Experience: Loading Experience: Assessed user feedback on website loading experience and overall satisfaction.
Example: User surveys indicated that 95% of visitors did not notice any difference in loading times, maintaining a positive experience.

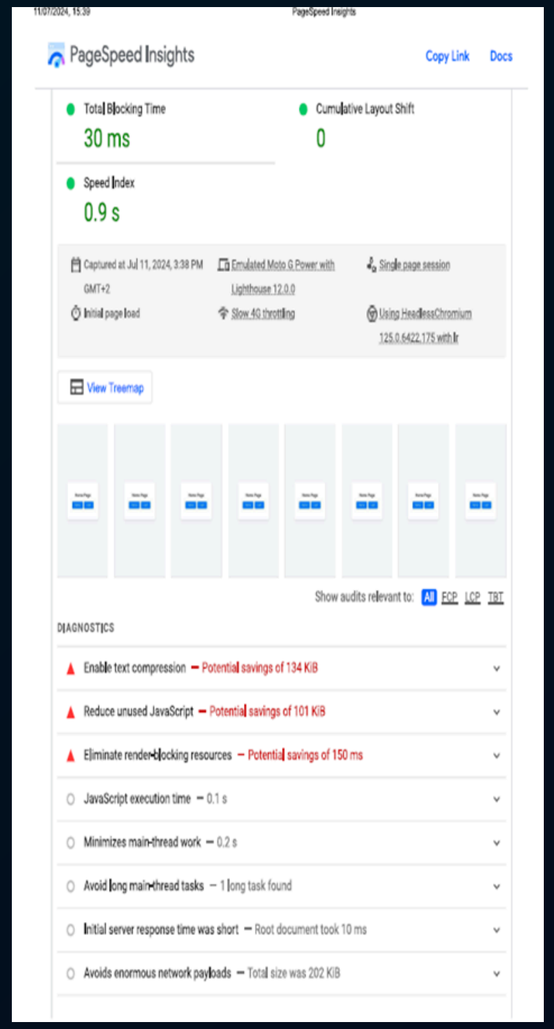
Corporate Feedback: CEO and Executive Input: Gathered feedback from the CEO and other executives on the perceived benefits and any challenges faced.
Example: The CEO reported increased confidence in the site’s security and a slight improvement in overall site performance metrics.

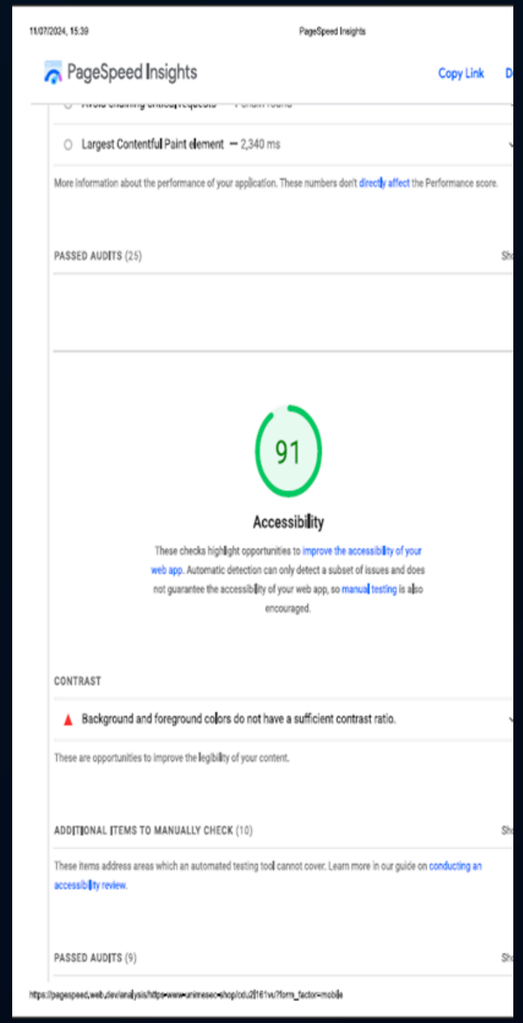
Data Analysis: Overall Data Review: Analyzed comprehensive data on DNS request handling, security incidents, and user feedback to evaluate the implementation's success.
Example: Data showed a 50% reduction in security incidents and a steady user base growth, demonstrating the effectiveness of Secure DNS measures.

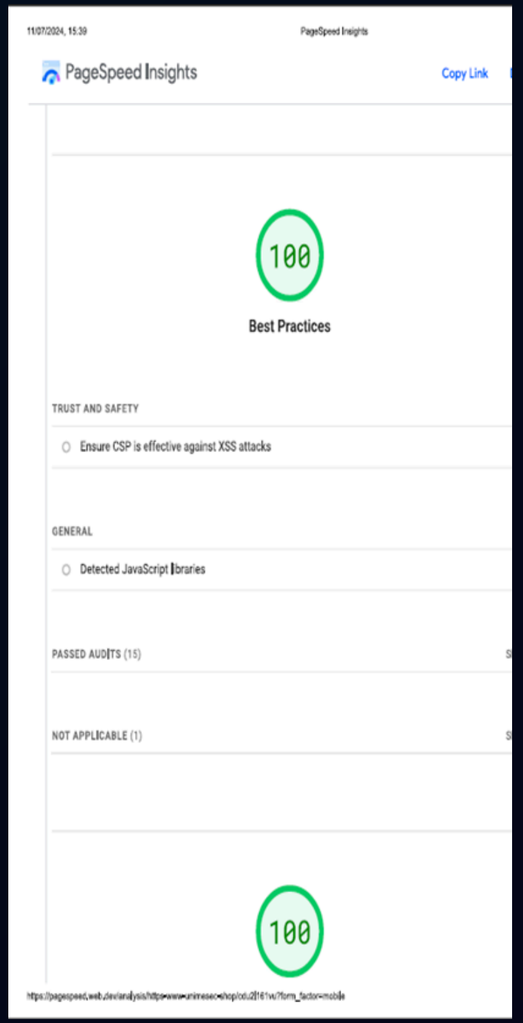
PERFORMANCE/EVALUATION CHECK

https://www.unimesec.shop/dashboard WITH THE HELP OF https://pagespeed.web.dev/analysis







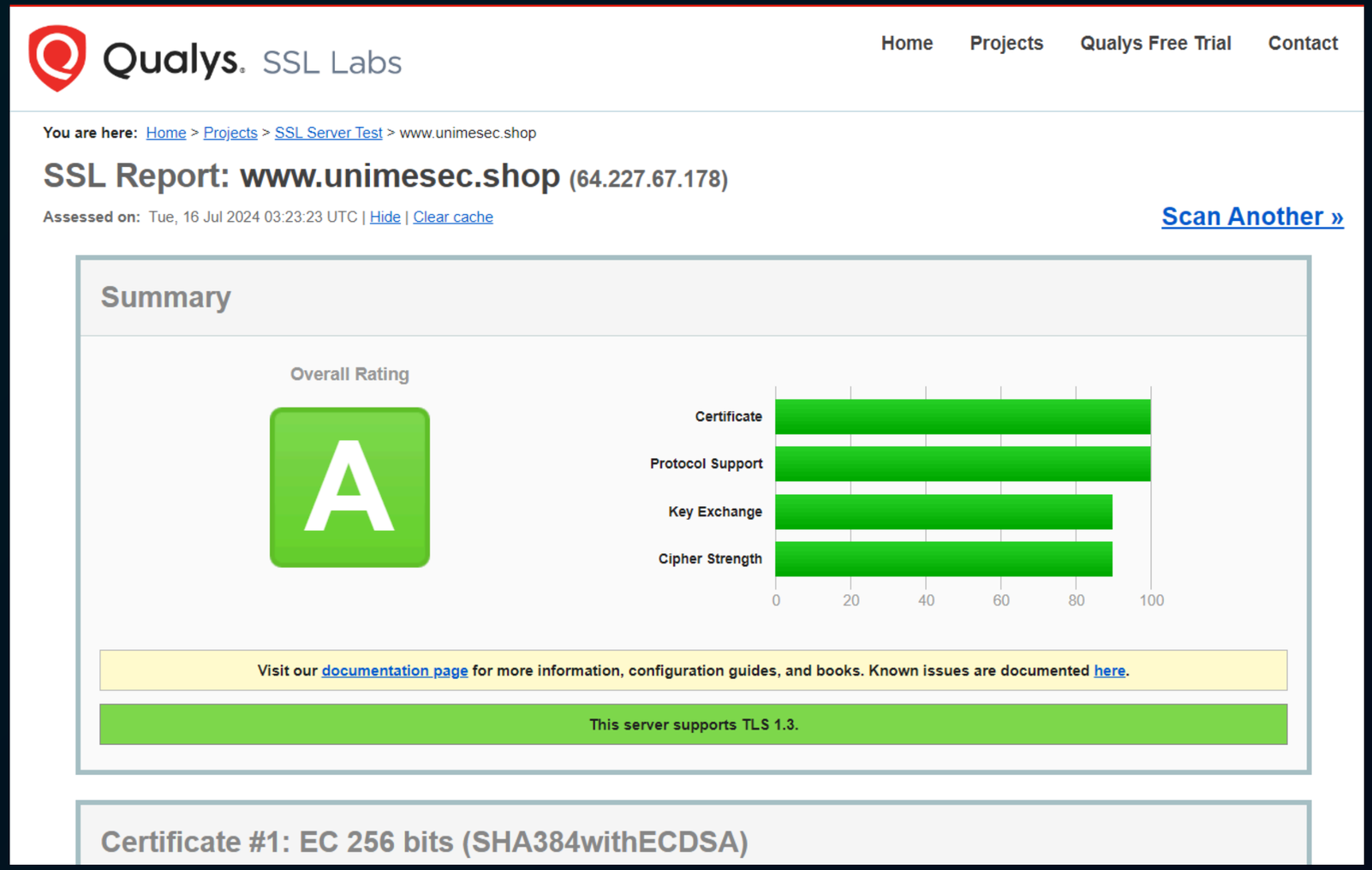


FINAL THOUGHTS:

- Integrates Secure DNS and JWT authentication for better web security.
- Protects against current and future threats.
- Enhances web service security and supports future secure communication.
- Focuses on careful planning and continuous performance checks.
- Helps developers create secure, scalable, and efficient applications.
- Ensures web services are safe, reliable, and resilient to cyber threats.

In summary, our website, www.unimesec.shop, is well-secured and meets modern security standards, making it safe for users to visit by report: https://www.ssllabs.com/ssltest/analyze.html?d=www.unimesec.shop

ANALYSIS: SSL LABS PROVIDES DATA FOR THE FOLLOWING ASPECTS OF YOUR WEBSITE'S SSL/TLS SECURITY:

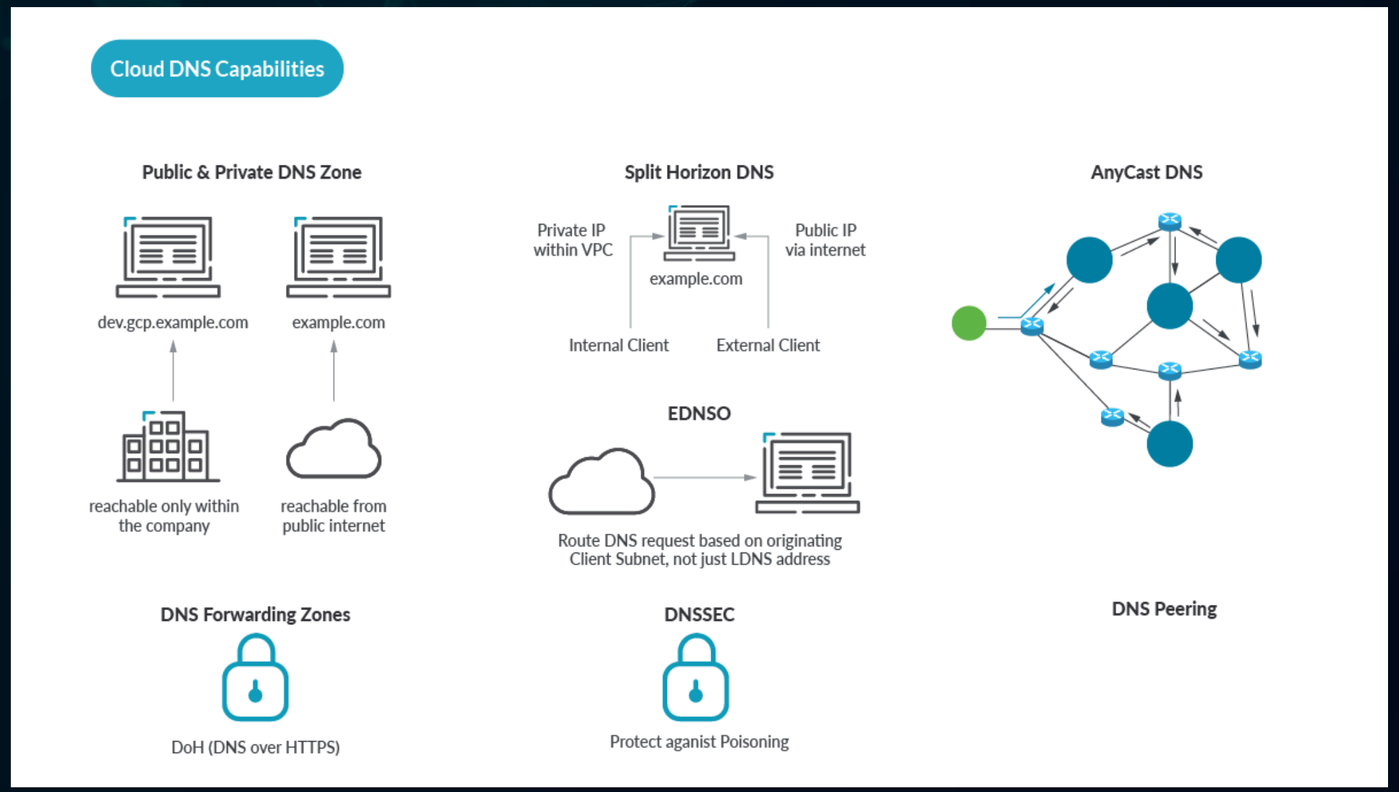


- **Overall Security Rating**: Your website has an 'A' rating, indicating excellent security.
- **Certificate Strength**: Uses a strong EC 256-bit certificate, valid until October 10, 2024.
- **Protocol Support**: Supports the latest secure protocols, TLS 1.3 and TLS 1.2.
- **Encryption Strength**: Utilizes strong encryption ciphers for secure data transmission.
- **Vulnerability Protection**: Protected against known vulnerabilities like POODLE and Heartbleed.
- **Forward Secrecy**: Ensures session keys remain secure even if the private key is compromised.

PROJECT BREIF:

Introduction to Secure DNS with JWT Authentication:

- Objective: Enhance the security and reliability of the Government of India's network infrastructure.
- Scope: Implementation of a Secure DNS system integrated with JWT authentication.



भारतीय दूरसंचार विनियामक प्राधिकरण
TELECOM REGULATORY AUTHORITY OF INDIA
भारत सरकार / Government of India
Ministry of Electronics and Information

F. No. AU-4/1/4(1)/2023-QoS Dated:06-12-2023

REQUEST FOR PROPOSAL
FOR SELECTION OF SYSTEM
INTEGRATOR

FOR INTELLIGENT CITY SURVEILLANCE SYSTEM IN GUWAHATI

Volume 2: Scope of Work including Functional and Technical Specification

GUWAHATI SMART CITY LIMITED

Guwahati Smart City Limited,Guwahati, Assam

PROJECT BREIF:

Secure DNS Implementation:

- Development and Deployment:
  - Secure DNS with cryptographic protocols.
  - DNSSEC for data integrity and authenticity.

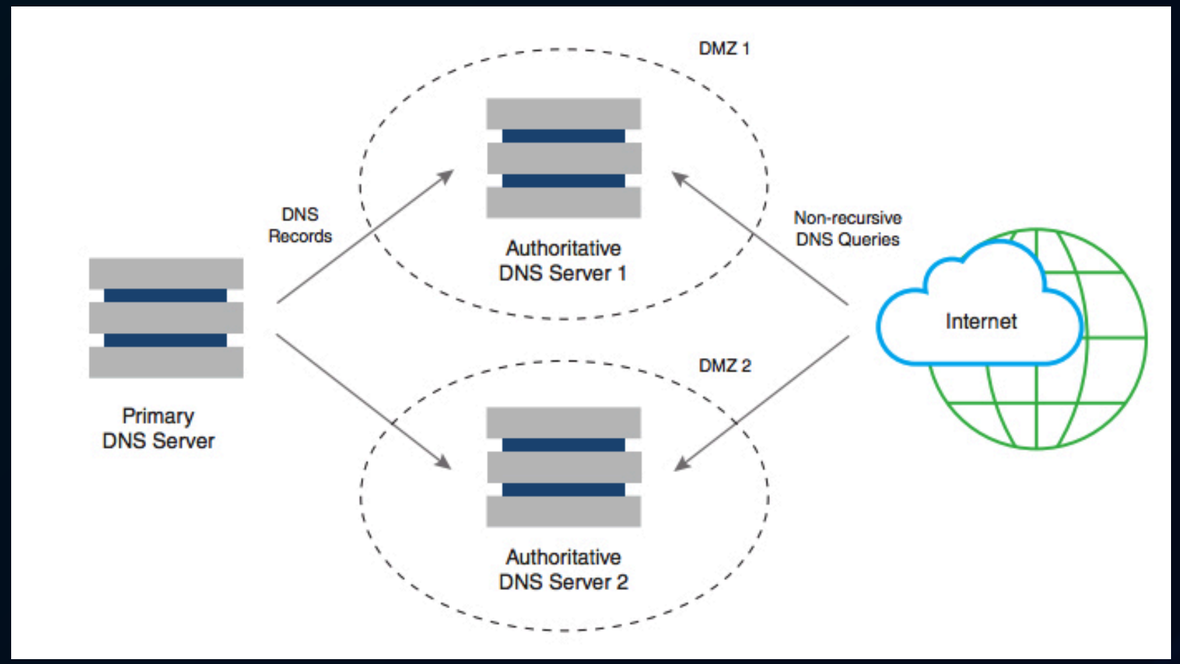
- Encryption and Protection:
  - DNS over TLS/HTTPS for encrypted traffic.
  - SSL/TLS certificates with Let's Encrypt and Certbot.

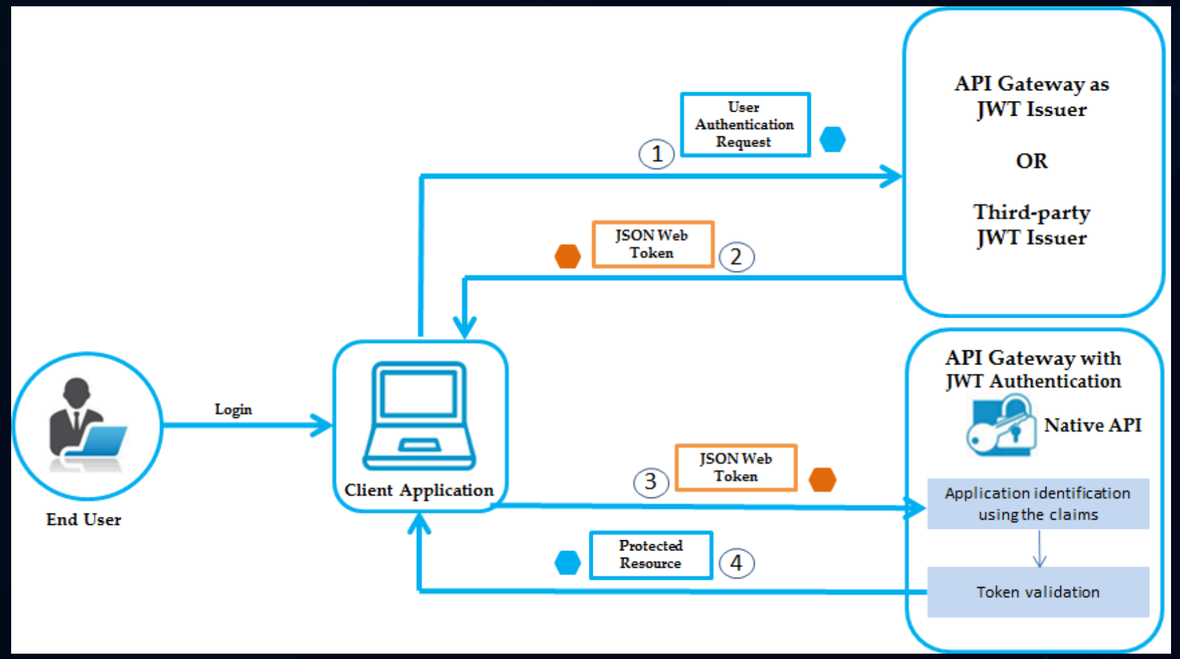
- DNS Filtering and Blocking:
  - Firewall configurations to block malicious domains.
  - Rate limits to prevent brute-force attacks.

JWT Authentication Integration:

- JWT Token API Development:
  - API for JWT token generation and validation.
  - Secure token-based authentication for DNS service endpoints.

- Access Control Mechanisms:
  - Role-based access control (RBAC) using JWT attributes.
  - Secure and controlled access for authorized personnel.



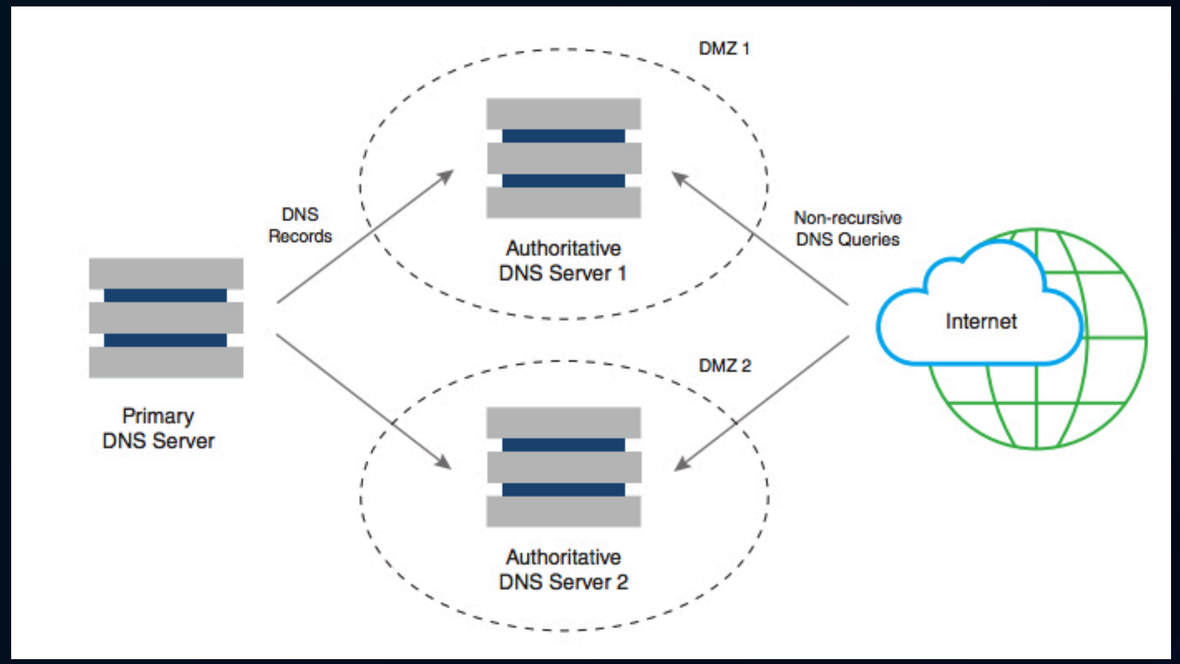


PROJECT BREIF:

Performance and Security Evaluation:

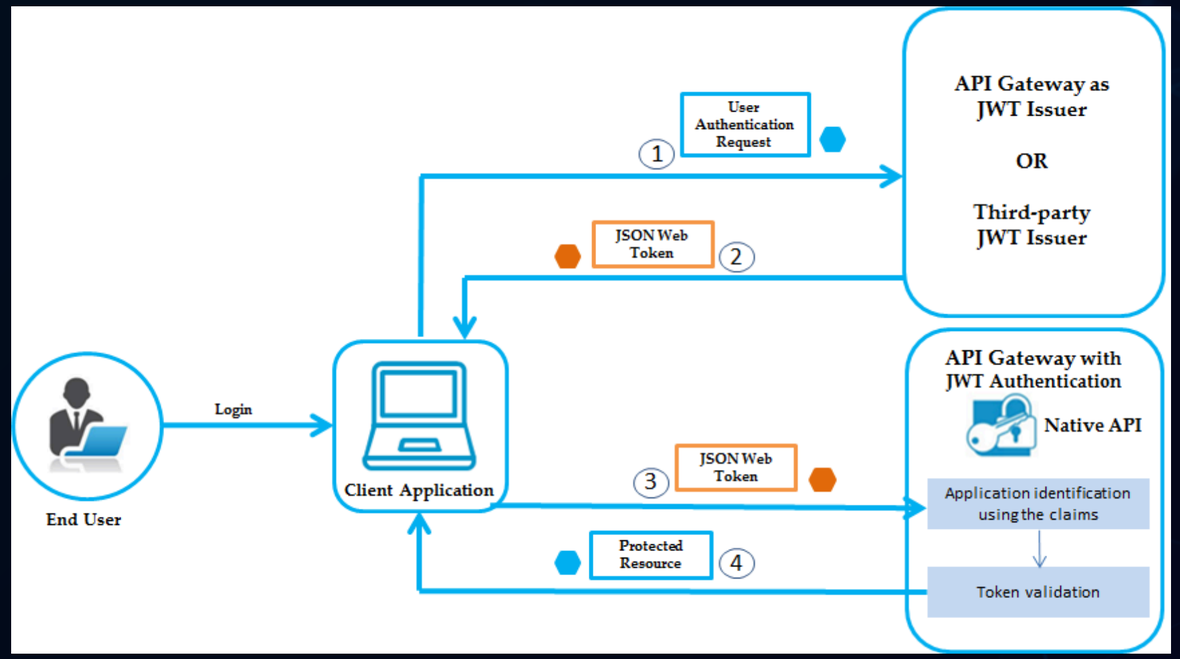
- Performance Assessment:
  Metrics: loading times, SEO impact, data integrity.
  Scalability and effectiveness of the Secure DNS implementation.

- Security Assessment:
  Continuous monitoring and security assessments.
  Audit trails and reports on system access and modifications.



Project Deliverables :

- Detailed Project Plan.
- Fully implemented Secure DNS system.
- Functional JWT Authentication API with documentation.
- Role-based access control system.
- Performance and security evaluation reports.



Submission Deadline:

- Proposals must be submitted by [29.11.2024], no later than [12:00 IST].

THANK YOU