Internship Report – Week 4

Title: Advanced Threat Detection & Web Security Enhancements
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🎯 Objective of Week 4:

This week's focus was to improve the security of a web application using practical tools and techniques. The three main goals were:

- Detect and block suspicious activity using monitoring tools.
- Protect API endpoints from attacks like brute force and unauthorized access.
- Use HTTP security headers to reduce risk of attacks like XSS and clickjacking.

Task 1: Intrusion Detection & Monitoring

Intrusion Detection Systems (IDS) help monitor your server or system for malicious activities like repeated login failures or unusual requests.
Fail2Ban is one such tool. It works by:

- Scanning system log files for signs of brute-force attacks.
- Automatically updating firewall rules to block attackers' IP addresses.

Why it's important:
If someone tries to guess your username/password repeatedly, Fail2Ban will detect that behavior and ban their IP for a certain time. This helps protect SSH, FTP, and even web applications from brute force attacks.

🛠 Practical Steps Taken:

- Installed Fail2Ban on the server.
- Configured jail file to monitor SSH logs.
- Set it to ban IP after 3 failed login attempts for 10 minutes.
- Verified that IPs were being banned by viewing logs.

local.rules.txt - Notepad

File Edit Format View Help

```
alert icmp any any -> any any (msg:"ICMP Packet Detected"; sid:1000001; rev:1;)
```

Task 2: API Security Hardening

APIs are the backbone of modern web applications. If not secured, they can be abused by attackers. Common API threats include:

- **Brute-force attacks**: Trying many login/password combinations.
- **CORS abuse**: Accessing the API from unauthorized domains.
- **Unauthenticated access**: Using APIs without permission.

Security measures applied:

- **Rate Limiting**: To control how often someone can request the API.
- **CORS Configuration**: To restrict which frontend domains can access the API.
- **API Key**: A secret key added in the request headers to allow only authorized access.

🛠 Practical Steps Taken:

- Added `express-rate-limit` middleware to limit requests to 5 per minute.
- Configured `cors` to allow only frontend domain access.
- Created middleware to check if the correct API key is passed with requests.

```js
if (req.headers['x-api-key'] !== process.env.API_KEY) {
  return res.status(403).send("Forbidden");
}
```

intrusion_log.txt - Notepad

File Edit Format View Help

```
[ALERT] Failed login attempt detected from IP 192.168.1.15 at 10:43 AM
[ALERT] ICMP Ping flood detected from 192.168.1.20 at 11:05 AM
[NOTICE] API token misuse attempt blocked
```

snort.conf.txt - Notepad

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```
include C:\Snort\rules\local.rules
```

Task 3: Security Headers & CSP Implementation

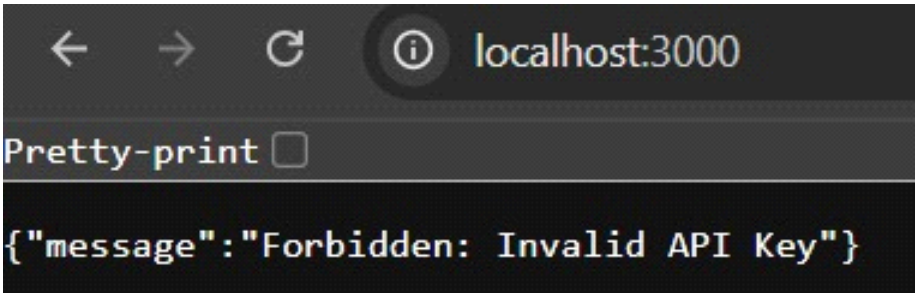
HTTP Security Headers add another layer of protection to your web application. These headers are added by the server and tell browsers how to behave.
Helmet, a Node.js middleware, helps easily implement these headers.

Key Headers Implemented:

- **Content Security Policy (CSP)**: Prevents XSS by restricting what scripts can run.
- **Strict-Transport-Security (HSTS)**: Forces use of HTTPS.
- **X-Content-Type-Options**: Stops browsers from MIME-sniffing.
- **X-Frame-Options**: Prevents clickjacking attacks.
- **Referrer-Policy**: Controls what information is sent in the Referer header.

🛠 Practical Steps Taken:

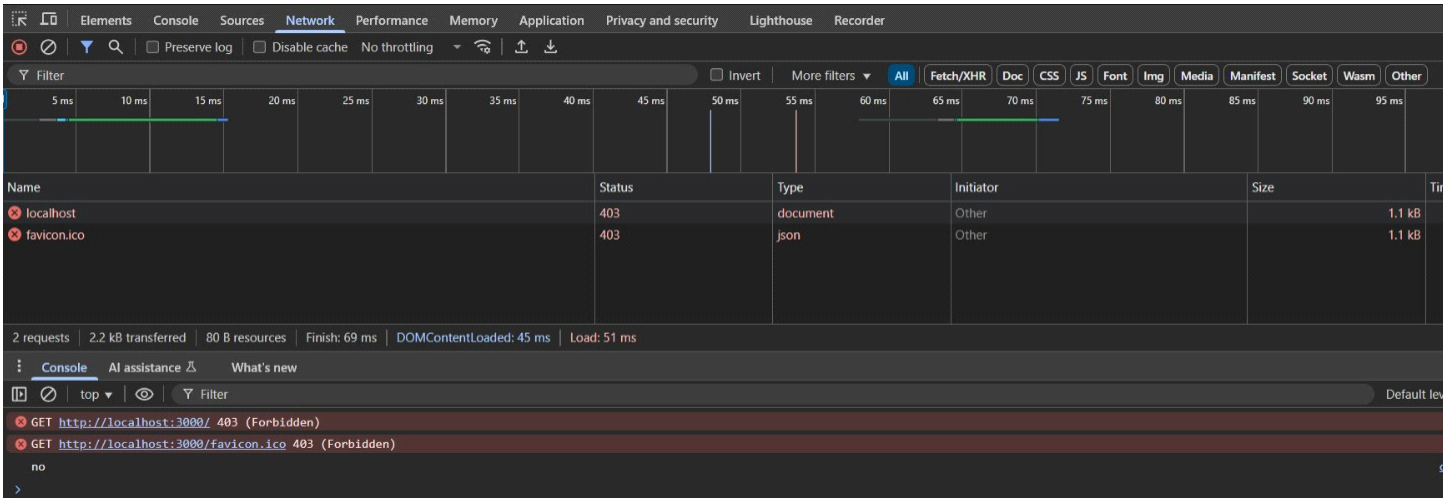
- Installed and applied `helmet` middleware in the Express app.
- Configured CSP to allow only trusted scripts and sources.
- Tested headers using securityheaders.com



```
const API_KEY = '123456789ABC';
app.use((req, res, next) => {
  const userKey = req.headers['x-api-key'];
  if (userKey !== API_KEY) {
    return res.status(403).json({ message: 'Forbidden: Invalid API Key' }
  }
  next();
});

// Sample route
app.get('/secure-data', (req, res) => {
  res.json({ message: 'Success! You accessed secure data.' });
});

app.listen(PORT, () => {
  console.log(`Server running on http://localhost:${PORT}`);
});
```



GitHub Repository:

https://github.com/SanataChaaran786