Vulnerability Assessment and Penetration Testing Report (VAPT)

Application Name : Denmark (M360 Newsroom)
Type : API
Date of Assessment : 19-12-2023
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Executive Summary

Purpose of the Assessment

This manual security testing report provides an in-depth analysis of our application's security posture, conducted in accordance with the Open Web Application Security Project (OWASP) testing standards. The assessment focused on addressing the OWASP Top 10 vulnerabilities, aiming to identify and mitigate potential security risks within the application.

Summary of Findings
The assessment revealed a range of vulnerabilities and security issues within the application. Key findings include:

- OWASP Top 10 Vulnerabilities: High and medium-severity vulnerabilities related to the OWASP Top 10 were identified.
- General Findings: No Additional vulnerabilities were found, such as inadequate error handling etc.
- Data Exposure: Few instances of data exposure and information leakage were detected.

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Issue	Host	Severity	Confidence	Status
CORS : Arbitrary Origin Trusted	**https://nrapi.publishstory.co/**	**High**	**Confirmed**	**Open**

Curl Snippet :

```
curl -i -s -k -X $'GET' \
    -H $'Host: nrapi.publishstory.co' -H $'Sec-Ch-Ua: \"Chromium\";v=\"116\", \"Not)A;Brand\";v=\"24\", \"Google Chrome\";v=\"116\"' -H $'Sec-Ch-Ua-Mobile: ?0' -H $'Sec-Ch-Ua-Platform: \"macOS\"' -H $'Upgrade-Insecure-Requests: 1' -H $'User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/116.0.0.0 Safari/537.36' -H $'Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7' -H $'Sec-Fetch-Site: none' -H $'Sec-Fetch-Mode: navigate' -H $'Sec-Fetch-User: ?1' -H $'Sec-Fetch-Dest: document' -H $'Origin: https://attacker.com' -H $'Accept-Encoding: gzip, deflate, br' -H $'Accept-Language: en-GB,en-US;q=0.9,en;q=0.8' -H $'Connection: close' \

$'https://nrapi.publishstory.co/newsroomApi/rendering/getsiteResources?clientId=2&websiteId=1'
```

Description :

The application implements an HTML5 cross-origin resource sharing (CORS) policy for this request that allows access from any domain.

The application allowed access from the requested origin **https://attacker.com**

An HTML5 cross-origin resource sharing (CORS) policy controls whether and how content running on other domains can perform two-way interaction with the domain that publishes the policy. The policy is fine-grained and can apply access controls per-request based on the URL and other features of the request.

Trusting arbitrary origins effectively disables the same-origin policy, allowing two-way interaction by third-party web sites. Unless the response consists only of unprotected public content, this policy is likely to present a security risk.

If the site specifies the header Access-Control-Allow-Credentials: true, third-party sites may be able to carry out privileged actions and retrieve sensitive information. Even if it does not, attackers may be able to bypass any IP-based access controls by proxying through users' browsers.

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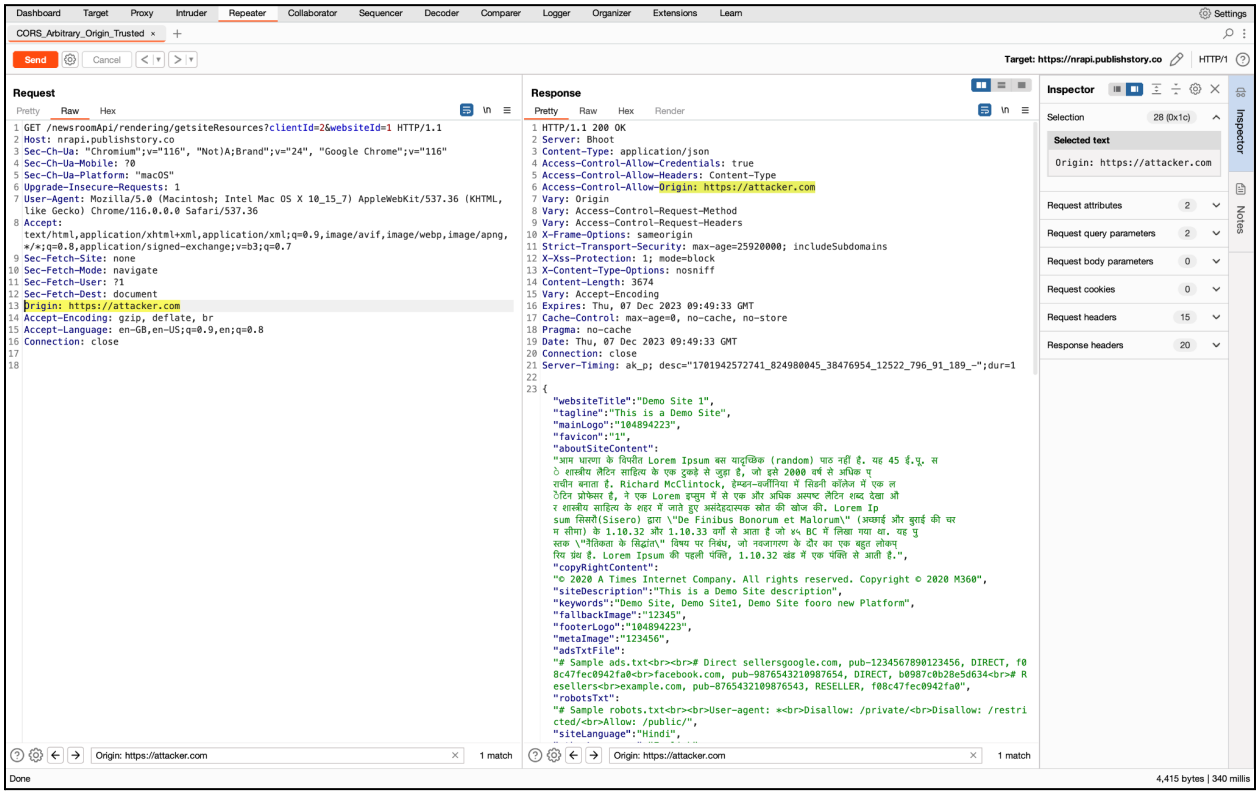
Steps to produce :

By altering the origin header in a request to any arbitrary domain, the application responds by providing a CORS (Cross-Origin Resource Sharing) response header, Access-Control-Allow-Origin (ACAO), with the value specified in the origin header of the request.

This potentially leads to CORS issue where any domain making cross origin request is basically allowed to access its resources.

Proof of concepts :



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Impact :

- Increased Attack Surface: Allowing requests from any origin significantly broadens the attack surface. Attackers can make cross-origin requests from various websites, potentially leading to security vulnerabilities.
- Cross-Site Request Forgery (CSRF): Allowing arbitrary origins may increase the risk of CSRF attacks. An attacker could trick users into making unintended requests to your API, exploiting their authenticated sessions.
- Data Exposure: Sensitive data exposed by your API might be accessible from unauthorized origins, leading to data exposure and confidentiality breaches.
- Unauthorized Access: Allowing any origin without proper authentication and authorization checks may result in unauthorized access to resources, undermining the security of your application.
- Cross-Site Scripting (XSS) Amplification: If your API returns sensitive information and is accessible from arbitrary origins, it could be used to amplify the impact of Cross-Site Scripting (XSS) attacks on other websites.

Mitigation :

Rather than using a wildcard or programmatically verifying supplied origins, use a whitelist of trusted domains.

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Issue	Host	Severity	Confidence	Status
Broken Authentication	**https://nrapi.publishstory.co/**	**High**	**Confirmed**	**Open**

Curl Snippet :

```
curl -i -s -k -X $'GET' \
    -H $'Host: nrapi.publishstory.co' -H $'Cache-Control: max-age=0' -H $'Sec-Ch-Ua: \"Not_A Brand\";v=\"8\", \"Chromium\";v=\"120\", \"Google Chrome\";v=\"120\"' -H $'Sec-Ch-Ua-Mobile: ?0' -H $'Sec-Ch-Ua-Platform: \"macOS\"' -H $'Upgrade-Insecure-Requests: 1' -H $'User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/120.0.0.0 Safari/537.36' -H $'Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7' -H $'Sec-Fetch-Site: none' -H $'Sec-Fetch-Mode: navigate' -H $'Sec-Fetch-User: ?1' -H $'Sec-Fetch-Dest: document' -H $'Accept-Encoding: gzip, deflate, br' -H $'Accept-Language: en-GB,en-US;q=0.9,en;q=0.8' -H $'Connection: close' \

$'https://nrapi.publishstory.co/newsroomApi/rendering/getsiteResources?clientId=2&websiteId=1'
```

Description :

The API endpoint is serving responses without requiring proper authentication, allowing unauthenticated users to access sensitive data or perform actions within the system. This issue poses a significant security risk as it opens the door for unauthorized access, data exposure, and potential misuse of the API functionalities

Steps to produce :

Just directly hit the endpoint in the browser or via curl and its response is served back without any authentication

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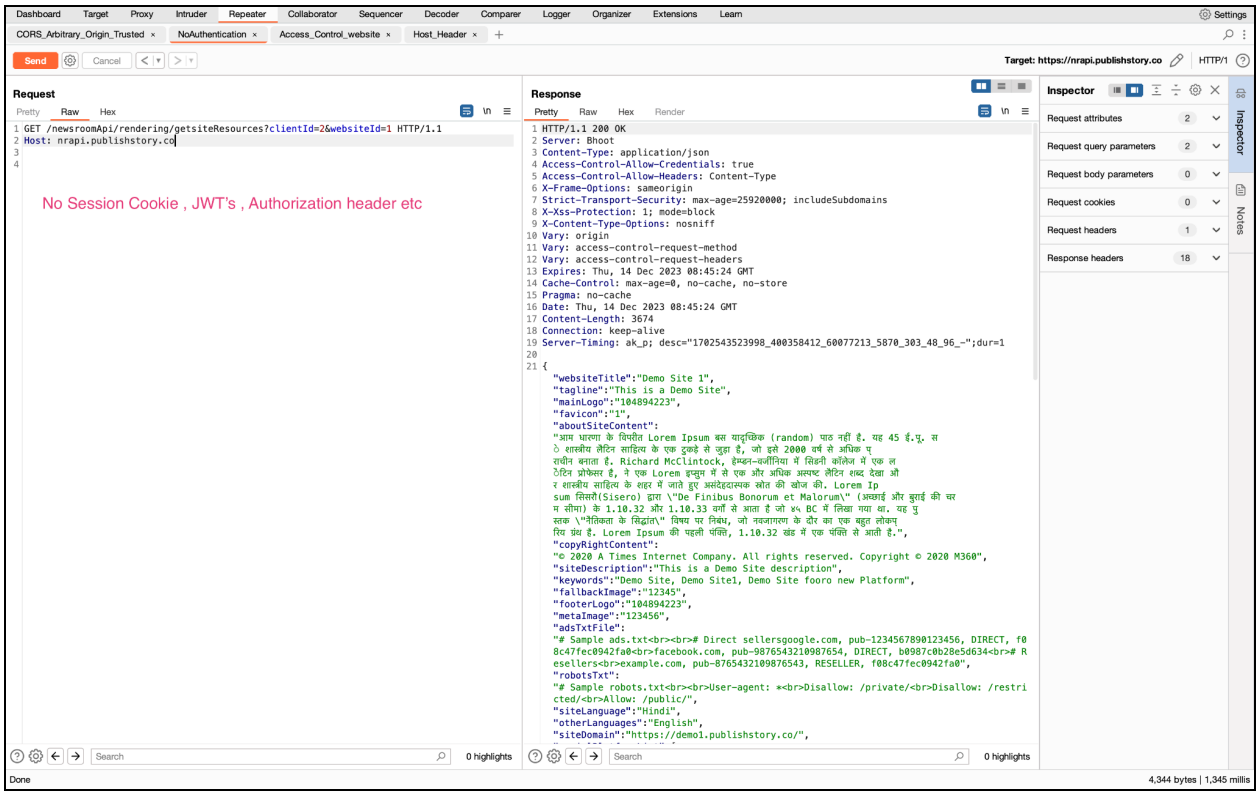
Proof of concepts :



Impact :

- Unauthorized Access:Unauthorized Access: Attackers can exploit the absence of authentication to gain unauthorized access to the API, potentially compromising sensitive information or functionalities.
- Data Exposure:Sensitive data transmitted or processed by the API may be exposed to unauthorized entities, leading to confidentiality breaches.
- Misuse of Functionality : Unauthenticated users may exploit API functionalities in unintended ways, causing disruptions or unauthorized operations within the system.

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Mitigation :

- Make sure you know all the possible flows to authenticate to the API (mobile/ web/deep links that implement one-click authentication/etc.). Ask your engineers what flows you missed.
- Read about your authentication mechanisms. Make sure you understand what and how they are used. OAuth is not authentication, and neither are API keys.
- Don't reinvent the wheel in authentication, token generation, or password storage. Use the standards.
- Credential recovery/forgot password endpoints should be treated as login endpoints in terms of brute force, rate limiting, and lockout protections.
- Require re-authentication for sensitive operations (e.g. changing the account owner email address/2FA phone number).
- Where possible, implement multi-factor authentication.
- Implement anti-brute force mechanisms to mitigate credential stuffing, dictionary attacks, and brute force attacks on your authentication endpoints. This mechanism should be stricter than the regular rate limiting mechanisms on your APIs.
- Implement account lockout/captcha mechanisms to prevent brute force attacks against specific users. Implement weak-password checks.
- API keys should not be used for user authentication. They should only be used for API clients authentication.

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Issue	Host	Severity	Confidence	Status
Insecure Direct Object References (IDOR)	**https://nrapi.publishstory.co/**	**High**	**Confirmed**	**Open**

Curl Snippet :

```
curl -i -s -k -X $'GET' \
    -H $'Host: nrapi.publishstory.co' -H $'Cache-Control: max-age=0' -H $'Sec-Ch-Ua: \"Not_A Brand\";v=\"8\", \"Chromium\";v=\"120\", \"Google Chrome\";v=\"120\"' -H $'Sec-Ch-Ua-Mobile: ?0' -H $'Sec-Ch-Ua-Platform: \"macOS\"' -H $'Upgrade-Insecure-Requests: 1' -H $'User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/120.0.0.0 Safari/537.36' -H $'Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7' -H $'Sec-Fetch-Site: none' -H $'Sec-Fetch-Mode: navigate' -H $'Sec-Fetch-User: ?1' -H $'Sec-Fetch-Dest: document' -H $'Accept-Encoding: gzip, deflate, br' -H $'Accept-Language: en-GB,en-US;q=0.9,en;q=0.8' -H $'Connection: close' \

$'https://nrapi.publishstory.co/newsroomApi/rendering/getsiteResources?clientId=2&websiteId=1'
```

Description :

The API endpoint allows users to access different content by manipulating a query parameter. This behavior can be exploited by attackers to force the API to serve content that may not be intended for their access level, potentially leading to unauthorized access to sensitive information.

Steps to produce :

Changing websiteId query parameter value from original one to different numeric values allows us to enumerate different responses.

Proof of concepts :

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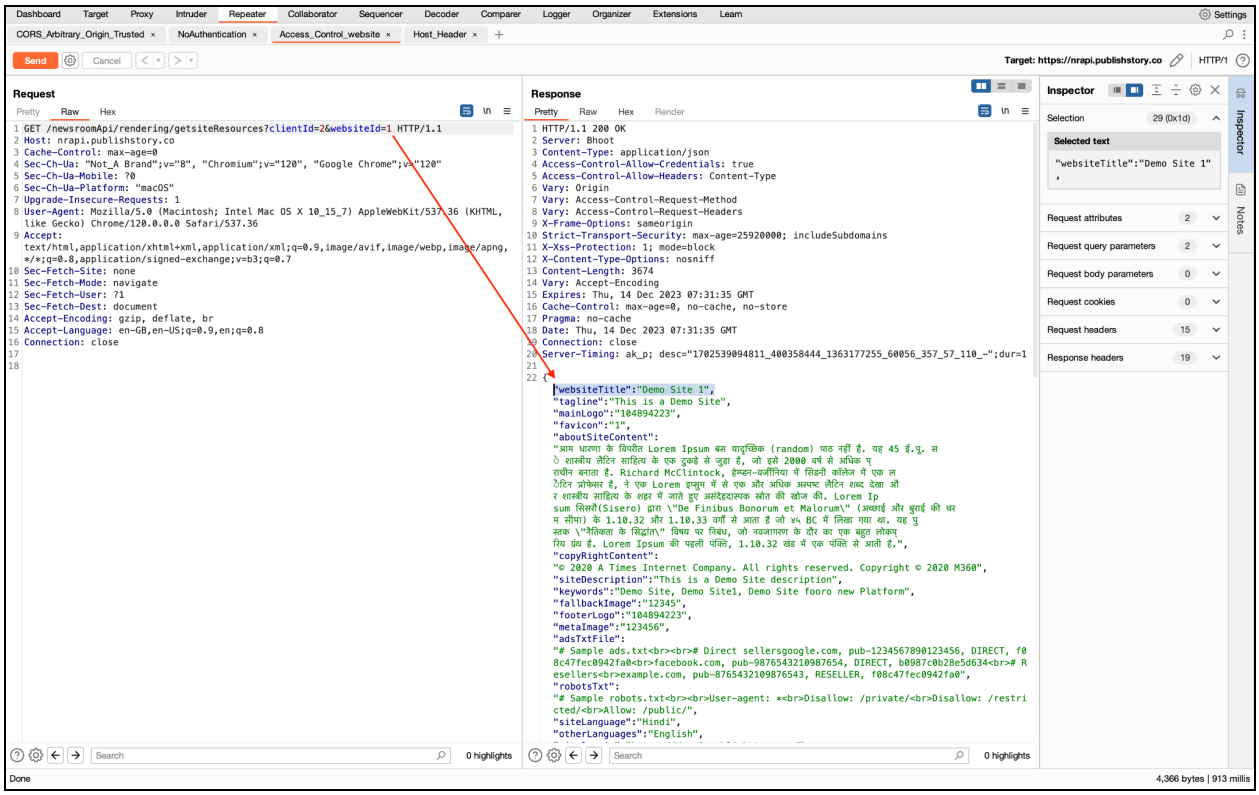

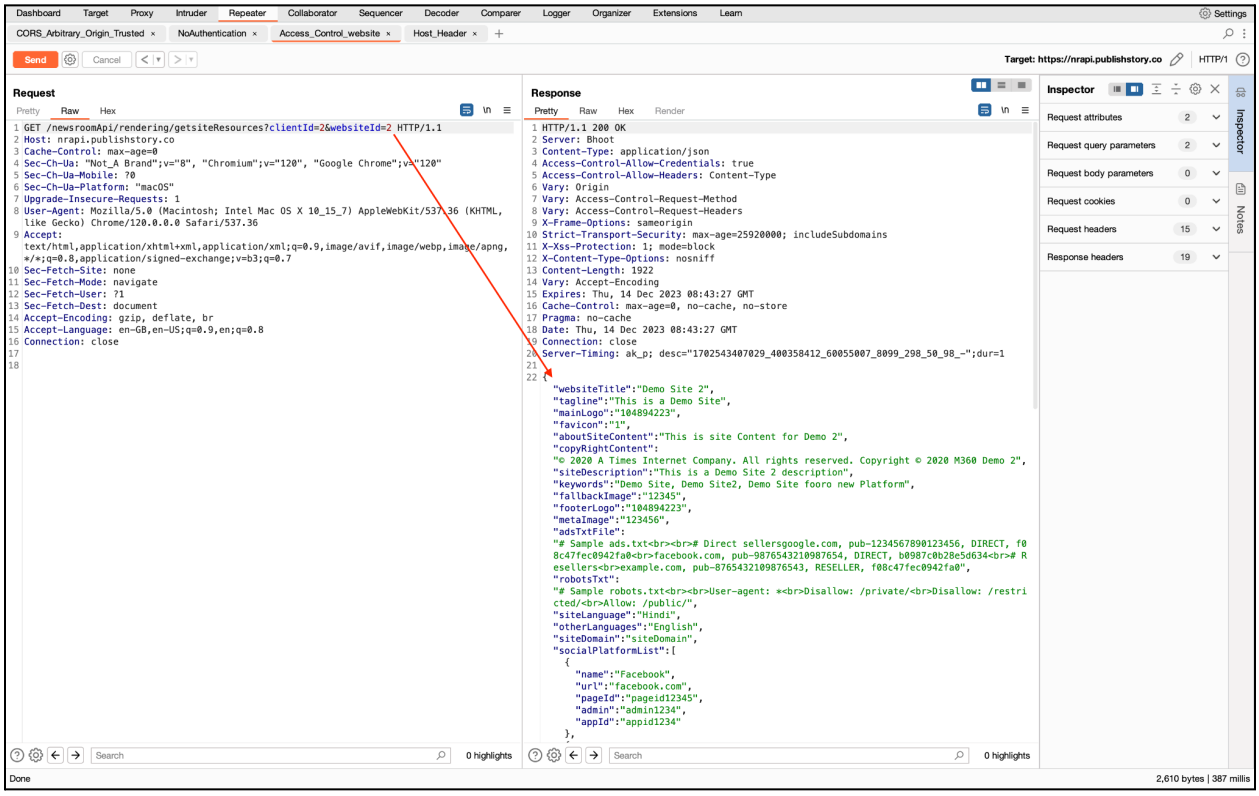

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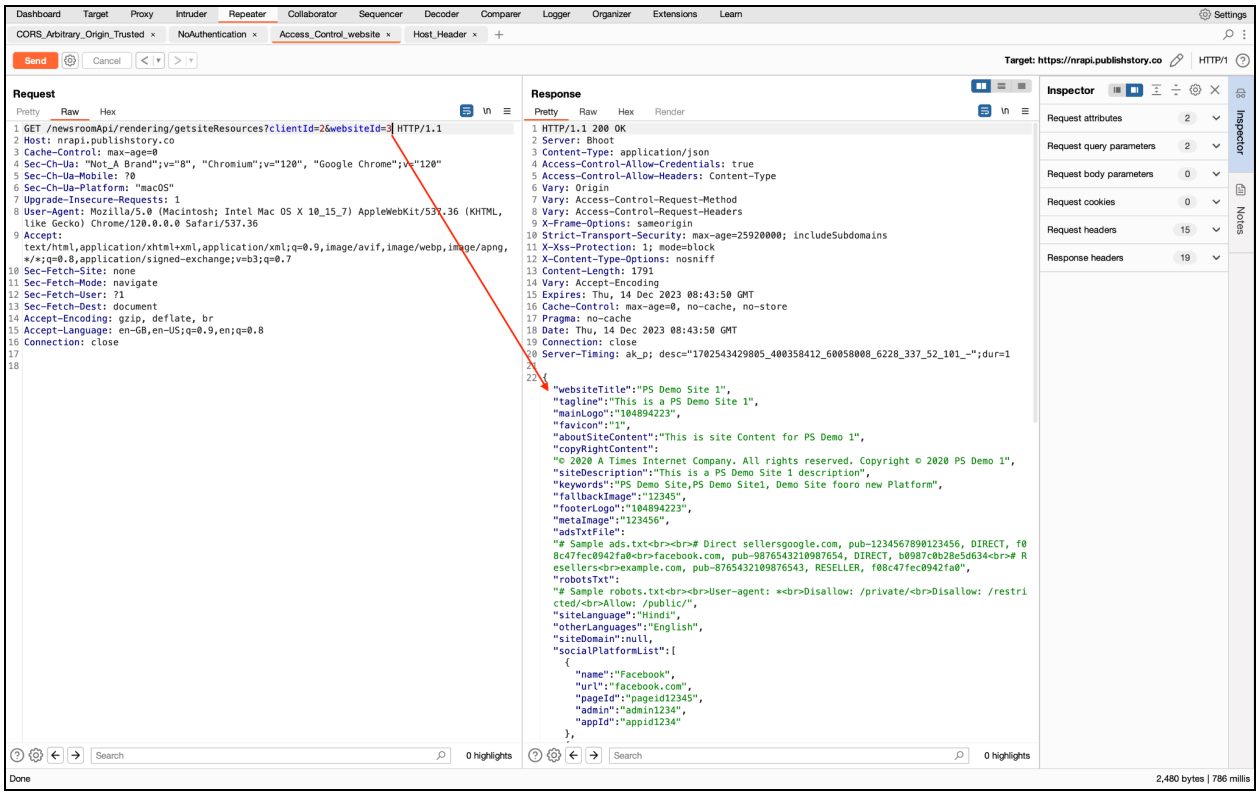

Impact :

Unauthorized Data Access:
Attackers can manipulate the query parameter to access data or content that they are not authorized to view.
Information Disclosure:
Sensitive information may be disclosed to unauthorized users, leading to confidentiality breaches.
Data Integrity:
Manipulating the query parameter may result in unintended modifications to data, affecting data integrity.

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Mitigation :

- Implement Proper Authorization: Ensure that access to different content is properly authorized based on user roles and permissions. Implement strong access controls to restrict access to authorized users.
- Use Indirect References: Instead of directly referencing objects or content, use indirect references that are harder for attackers to guess or manipulate.
- Validate and Sanitize Input: Implement input validation and sanitization to ensure that the values provided in query parameters are legitimate and within expected ranges.
- Enforce Session Management: If user sessions are involved, ensure that session management is secure and that users cannot manipulate session-related parameters to gain unauthorized access.
- Logging and Monitoring: Implement logging mechanisms to monitor and detect suspicious activities, such as repeated attempts to manipulate query parameters.
- Conduct Security Testing: Perform regular security testing, including penetration testing and code reviews, to identify and address vulnerabilities associated with direct object references.

Discussion Points:

- Security Awareness: Discuss the importance of secure coding practices with the development team to raise awareness about the risks associated with insecure direct object references.
- Access Control Design: Review and refine the access control design to ensure that only authorized users have access to specific content.
- Security Testing: Discuss the need for regular security testing to identify and address vulnerabilities, including those related to direct object references.
- Documentation: Document the proper usage of the API, including guidelines for handling query parameters and ensuring secure access.

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Issue	Host	Severity	Confidence	Status
Open Redirect	**https://nrapi.publishstory.co/**	**High**	**Confirmed**	**Open**

Curl Snippet :

```
curl -i -s -k -X $'GET' \
    -H $'Host: nrapi.publishstory.co' -H $'Sec-Ch-Ua: \"Not_A Brand\";v=\"8\", \"Chromium\";v=\"120\", \"Google Chrome\";v=\"120\"' -H $'Sec-Ch-Ua-Mobile: ?0' -H $'Sec-Ch-Ua-Platform: \"macOS\"' -H $'Upgrade-Insecure-Requests: 1' -H $'User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/120.0.0.0 Safari/537.36' -H $'Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/avif,image/webp,image/apng,*/*;q=0.8,application/signed-exchange;v=b3;q=0.7' -H $'Sec-Fetch-Site: same-site' -H $'Sec-Fetch-Mode: navigate' -H $'Sec-Fetch-User: ?1' -H $'Sec-Fetch-Dest: document' -H $'Referer: https://identity.publishstory.co/' -H $'Accept-Encoding: gzip, deflate, br' -H $'Accept-Language: en-GB,en-US;q=0.9,en;q=0.8' \

$'https://nrapi.publishstory.co/newsroomApi/userAuthenticate?host=https://anything.com&tempCode=W9BcBB2kMRgXlTSTVOJR7OV24jBXSE0M7XvQYaEAs--f4yB7nBIbTA'
```

Description :

Open redirect vulnerabilities typically arise when a web application uses user-input to construct a URL for redirection without validating or sanitizing the input properly. Instead of redirecting users to a fixed and trusted URL, the application redirects them to the URL specified in the user-provided input.

Steps to produce :

By changing the host query parameter value in the GET request , we were able to find a redirect towards the specified host.

Below screenshots provides how we captured that specific request i.e. :

We requested https://pagebuilder.publishstory.co/ in web browser and followed the normal flow by providing username and password

Captured a request where if the host parameter value changed to some arbitrary host value then it redirects us to that host

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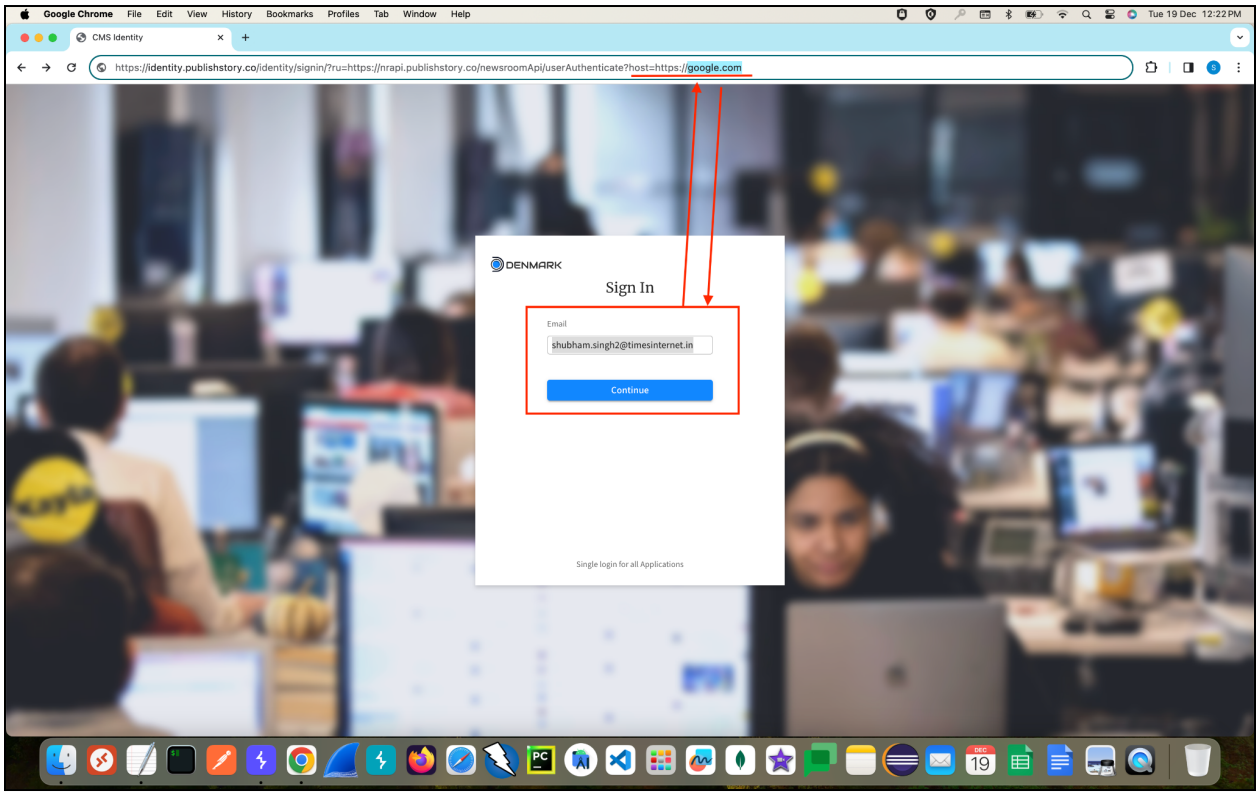
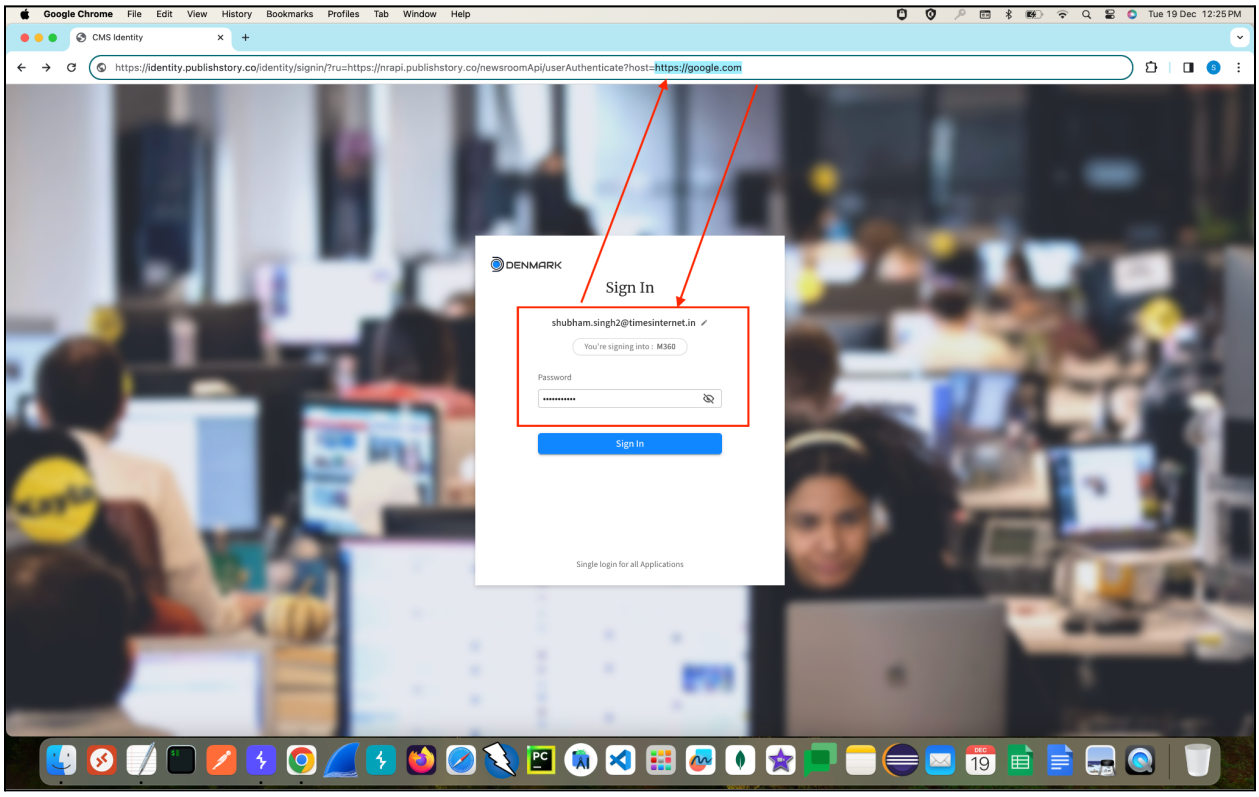
Proof of concepts :





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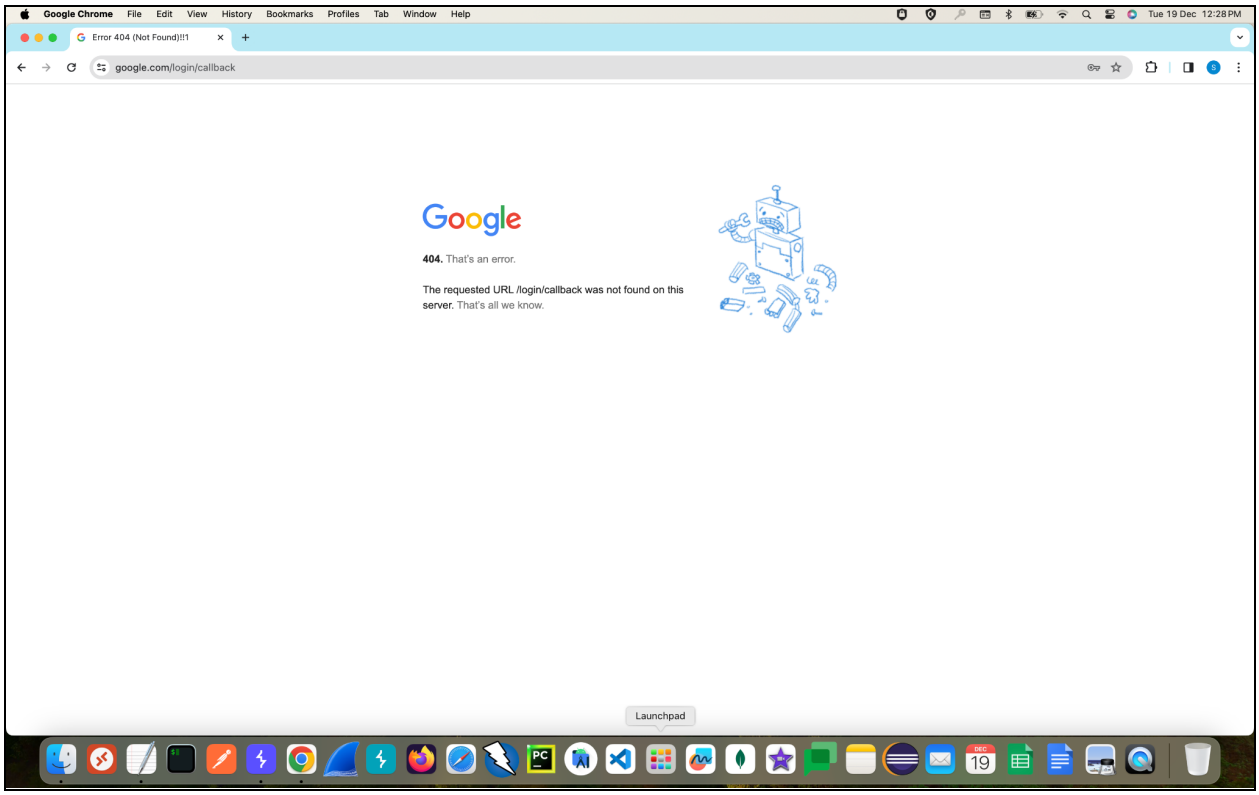

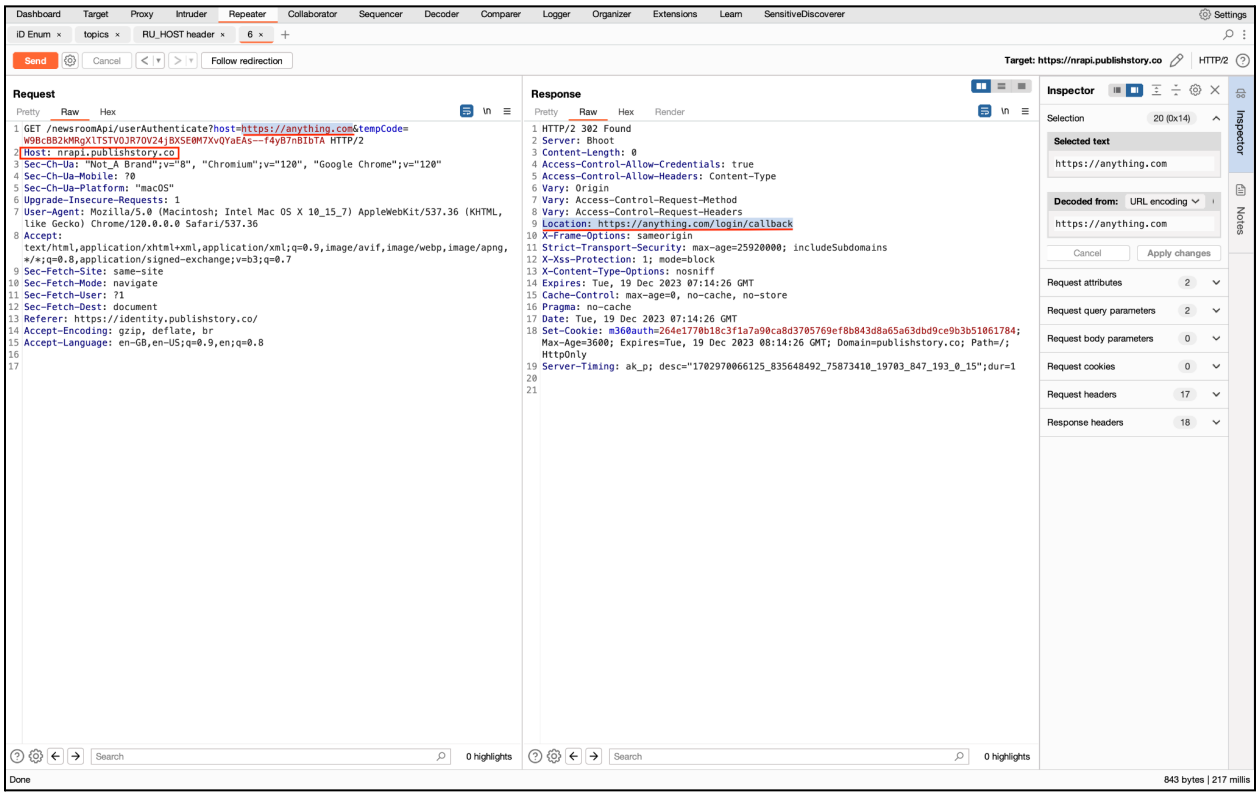

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Impact :
The impact of an open redirect vulnerability can be significant. Attackers can exploit it to trick users into visiting malicious websites, leading to phishing attacks, spreading malware, or stealing sensitive information. It can also be used in combination with other attacks to manipulate user sessions or perform other malicious activities.

Mitigation :

To mitigate open redirect vulnerabilities, consider implementing the following best practices:

- Input Validation: Always validate and sanitize user inputs, especially when constructing URLs for redirection. Ensure that user-provided URLs are safe and expected.
- Whitelisting: Maintain a whitelist of trusted URLs to which the application is allowed to redirect users. Validate user inputs against this whitelist to ensure they are legitimate destinations.
- Use Safe Redirection Methods: When redirecting users, use safe and trusted redirection methods provided by the programming language or framework. Avoid using user-input directly to construct the redirect URL.
- Security Headers: Implement security headers such as Content Security Policy (CSP) and Strict-Transport-Security (HSTS) to enhance overall security and prevent certain types of attacks.

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Environmental Limitations:
NA

Lack of Details:
NA

Recommendations :

- To address these findings and enhance the security of M360 Newsroom API , the following recommendations are provided:
- Remediate OWASP Top 10 Vulnerabilities: Prioritize and resolve OWASP Top 10 vulnerabilities promptly to reduce the application's attack surface.
- Enhance Authentication and Authorization: Strengthen authentication mechanisms and ensure proper authorization checks are in place.
- Implement Robust Session Management: Enhance session management controls to prevent session hijacking and fixation.
- Data Protection: Encrypt sensitive data both in transit and at rest to mitigate data exposure risks.
- Access Control: Review and enforce access controls to prevent unauthorized access to sensitive resources.
- Logging and Monitoring: Enhance logging practices to facilitate incident detection and response.

Conclusion :
The VAPT assessment has highlighted significant security vulnerabilities in M360 Newsroom API , which could expose it to various cyber threats. Addressing these findings is critical to ensure the confidentiality, integrity, and availability of the application.

Next Steps :
We recommend that the team should take the following steps:

- Review the detailed findings and recommendations in subsequent sections of this report.
- Prioritize and plan remediation efforts based on the severity and potential impact of the identified vulnerabilities.
- Continuously monitor the application's security posture and conduct regular security assessments to stay ahead of emerging threats.

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