Threat Modeling Report

Created on 4/18/2017 11:09:05 AM

Threat Model Name: ACE Threat Model

Owner:

Reviewer:

Contributors:

Description:

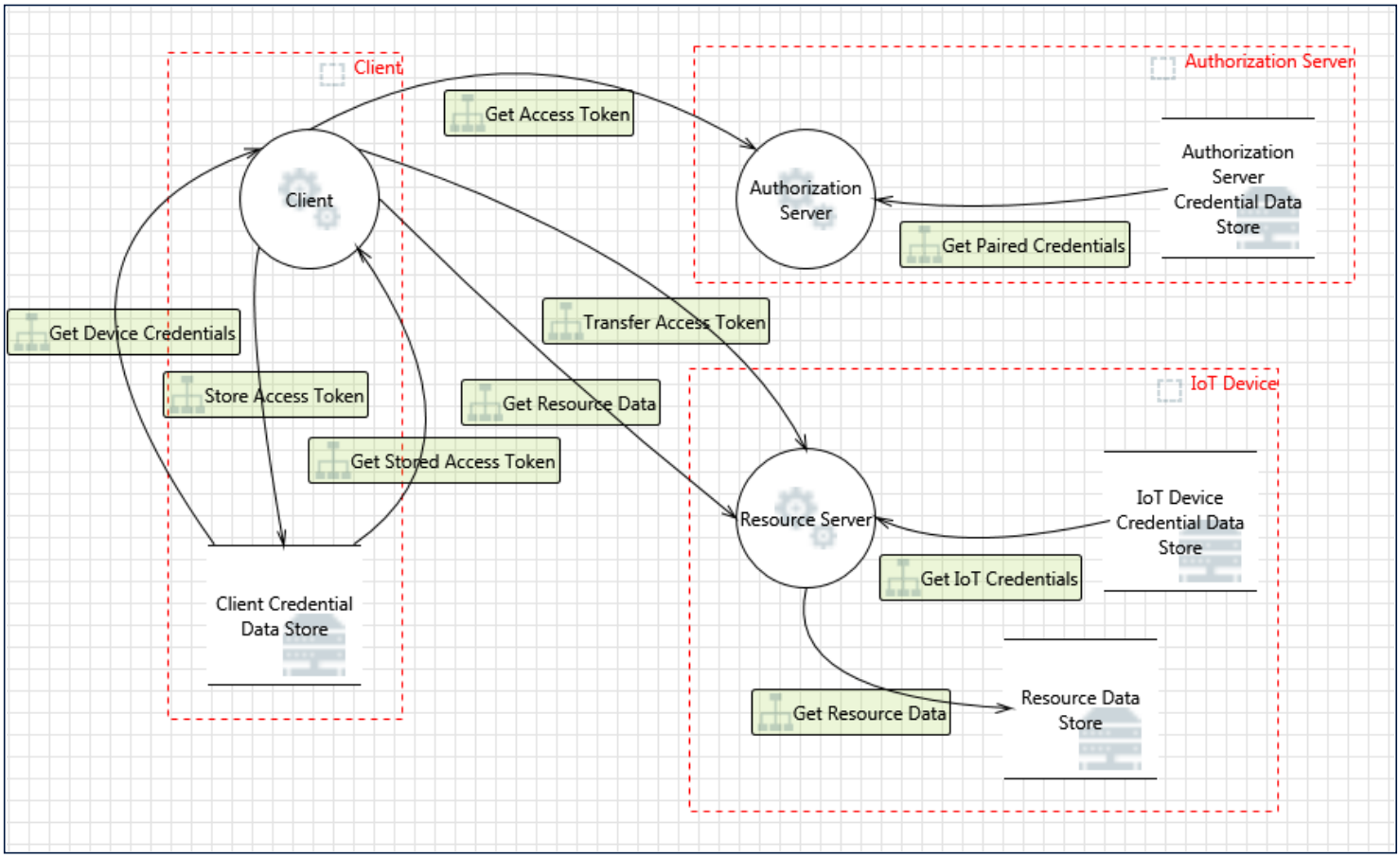
Assumptions:

External Dependencies:

Threat Model Summary:

Not Started	0
Not Applicable	17
Needs Investigation	29
Mitigation Implemented	0
Total	46
Total Migrated	0

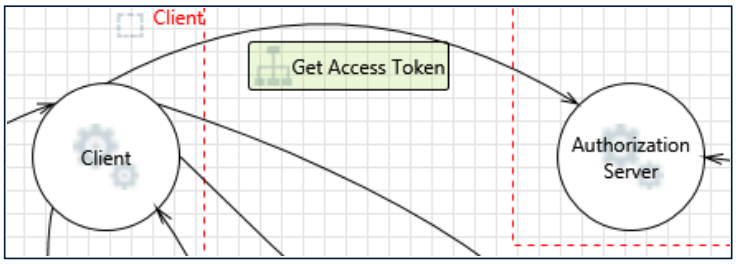
Diagram: ACE Threat Model



ACE Threat Model Diagram Summary:

Not Started	0
Not Applicable	17
Needs Investigation	29
Mitigation Implemented	0
Total	46
Total Migrated	0

Interaction: Get Access Token



1. Spoofing the IoT Client Process [State: Needs Investigation] [Priority: High]

Category: Spoofing
Description: IoT Client may be spoofed by an attacker and this may lead to unauthorized access to Authorization Server. Consider using a standard authentication mechanism to identify the source process.
Justification: Node theft/impersonation is likely in tactical environments.

2. Spoofing the Authorization Server Process [State: Needs Investigation] [Priority: High]

Category: Spoofing

Description: Authorization Server may be spoofed by an attacker and this may lead to information disclosure by IoT Client. Consider using a standard authentication mechanism to identify the destination process.

Justification: Node theft/impersonation is likely in tactical environments.

3. Potential Lack of Input Validation for Authorization Server [State: Needs Investigation] [Priority: High]

Category: Tampering

Description: Data flowing across Get Access Token may be tampered with by an attacker. This may lead to a denial of service attack against Authorization Server or an elevation of privilege attack against Authorization Server or an information disclosure by Authorization Server. Failure to verify that input is as expected is a root cause of a very large number of exploitable issues. Consider all paths and the way they handle data. Verify that all input is verified for correctness using an approved list input validation approach.

Justification: Tampering with communications is likely in tactical environments.

4. Potential Data Repudiation by Authorization Server [State: Not Applicable] [Priority: High]

Category: Repudiation

Description: Authorization Server claims that it did not receive data from a source outside the trust boundary. Consider using logging or auditing to record the source, time, and summary of the received data.

Justification: This is not applicable to IoT tactical scenarios.

5. Data Flow Sniffing [State: Needs Investigation] [Priority: High]

Category: Information Disclosure

Description: Data flowing across Get Access Token may be sniffed by an attacker. Depending on what type of data an attacker can read, it may be used to attack other parts of the system or simply be a disclosure of information leading to compliance violations. Consider encrypting the data flow.

Justification: Communications eavesdropping is likely in tactical environments.

6. Potential Process Crash or Stop for Authorization Server [State: Not Applicable] [Priority: High]

Category: Denial Of Service

Description: Authorization Server crashes, halts, stops or runs slowly; in all cases violating an availability metric.

Justification: If the AS crashes due to DoS is it indicative of a potential attack and should not continue operating.

7. Data Flow Generic Data Flow Is Potentially Interrupted [State: Not Applicable] [Priority: High]

Category: Denial Of Service

Description: An external agent interrupts data flowing across a trust boundary in either direction.

Justification: If the flow is interrupted it is indicative of a potential attack and should not continue operating.

8. Elevation Using Impersonation [State: Needs Investigation] [Priority: High]

Category: Elevation Of Privilege

Description: Authorization Server may be able to impersonate the context of IoT Client in order to gain additional privilege.

Justification: This is an important limitation of OAuth 2.0. The AS can always issue access tokens to itself and impersonate clients, given that one of the features of OAuth is to avoid pre-provisioning the RS with information about the client. This is a potential problem that is true of any federated system.

9. Authorization Server May be Subject to Elevation of Privilege Using Remote Code Execution [State: Needs Investigation] [Priority: High]

Category: Elevation Of Privilege

Description: IoT Client may be able to remotely execute code for Authorization Server.

Justification: Malicious client could obtain access to run other code on the AS.

10. Elevation by Changing the Execution Flow in Authorization Server [State: Needs Investigation] [Priority: High]

Category: Elevation Of Privilege

Description: An attacker may pass data into Authorization Server in order to change the flow of program execution within Authorization Server to the attacker's choosing.

Justification: Malicious client could obtain access to run other code on the AS.

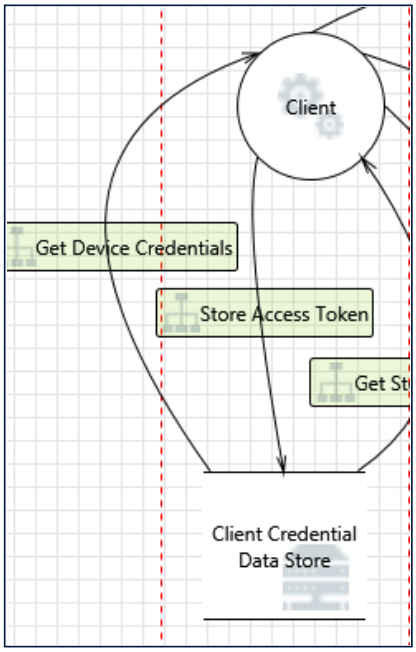
11. Cross Site Request Forgery [State: Needs Investigation] [Priority: High]

Category: Elevation Of Privilege

Description: Cross-site request forgery (CSRF or XSRF) is a type of attack in which an attacker forces a user's browser to make a forged request to a vulnerable site by exploiting an existing trust relationship between the browser and the vulnerable web site. In a simple scenario, a user is logged in to web site A using a cookie as a credential. The other browses to web site B. Web site B returns a page with a hidden form that posts to web site A. Since the browser will carry the user's cookie to web site A, web site B now can take any action on web site A, for example, adding an admin to an account. The attack can be used to exploit any requests that the browser automatically authenticates, e.g. by session cookie, integrated authentication, IP whitelisting, … The attack can be carried out in many ways such as by luring the victim to a site under control of the attacker, getting the user to click a link in a phishing email, or hacking a reputable web site that the victim will visit. The issue can only be resolved on the server side by requiring that all authenticated state-changing requests include an additional piece of secret payload (canary or CSRF token) which is known only to the legitimate web site and the browser and which is protected in transit through SSL/TLS. See the Forgery Protection property on the flow stencil for a list of mitigations.

Justification: We need to investigate because of the ACE dependence on OAuth.

Interaction: Get Device Credentials



12. Weak Access Control for a Resource [State: Needs Investigation] [Priority: High]

Category: Information Disclosure

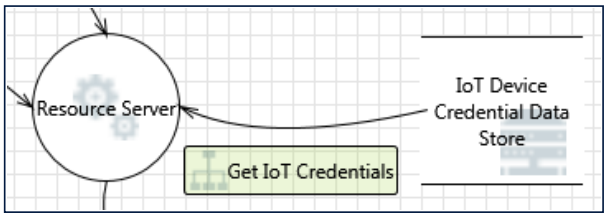
Description: Improper data protection of Client Credential Data Store can allow an attacker to read information not intended for disclosure. Review authorization settings.

Justification: Credentials need to be protected especially if resource server manages sensitive data.

13. Spoofing of Source Data Store Credential Data Store [State: Not Applicable] [Priority: High]

Category: Spoofing
Description: Client Credential Data Store may be spoofed by an attacker and this may lead to incorrect data delivered to IoT Client. Consider using a standard authentication mechanism to identify the source data store.
Justification: Credential data stores and IoT client reside on the same node.

Interaction: Get IoT Credentials



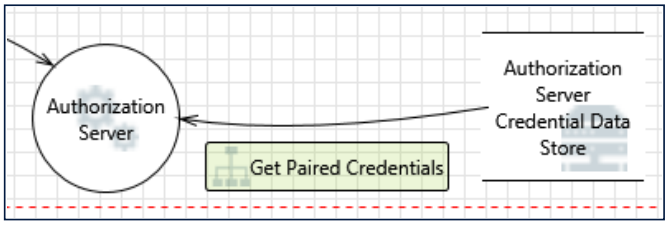
14. Spoofing of Source Data Store IoT Device Credential Data Store [State: Not Applicable] [Priority: High]

Category: Spoofing
Description: IoT Device Credential Data Store may be spoofed by an attacker and this may lead to incorrect data delivered to Resource Server. Consider using a standard authentication mechanism to identify the source data store.
Justification: Credential data stores and resource server reside on the same node.

15. Weak Access Control for a Resource [State: Needs Investigation] [Priority: High]

Category: Information Disclosure
Description: Improper data protection of IoT Device Credential Data Store can allow an attacker to read information not intended for disclosure. Review authorization settings.
Justification: Credentials need to be protected especially if resource server manages sensitive data (resource-constrained device may limit mitigation).

Interaction: Get Paired Credentials



16. Spoofing of Source Data Store Authorization Server Credential Data Store [State: Not Applicable] [Priority: High]

Category: Spoofing
Description: Authorization Server Credential Data Store may be spoofed by an attacker and this may lead to incorrect data delivered to Authorization Server. Consider using a standard authentication mechanism to identify the source data store.
Justification: Credential data stores and resource server reside on the same node.

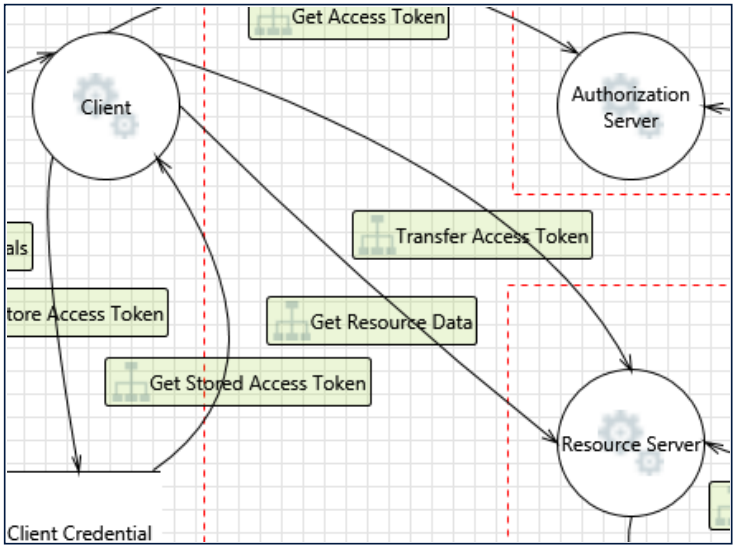
17. Weak Access Control for a Resource [State: Needs Investigation] [Priority: High]

Category: Information Disclosure
Description: Improper data protection of Authorization Server Credential Data Store can allow an attacker to read

information not intended for disclosure. Review authorization settings.

Justification: Credentials need to be protected especially if resource server manages sensitive data.

Interaction: Get Resource Data



18. Spoofing the IoT Client Process [State: Needs Investigation] [Priority: High]

Category: Spoofing

Description: IoT Client may be spoofed by an attacker and this may lead to unauthorized access to Resource Server. Consider using a standard authentication mechanism to identify the source process.

Justification: Node theft/impersonation is likely in tactical environments.

19. Spoofing the Resource Server Process [State: Needs Investigation] [Priority: High]

Category: Spoofing

Description: Resource Server may be spoofed by an attacker and this may lead to information disclosure by IoT Client. Consider using a standard authentication mechanism to identify the destination process.

Justification: Node theft/impersonation is likely in tactical environments.

20. Potential Lack of Input Validation for Resource Server [State: Needs Investigation] [Priority: High]

Category: Tampering

Description: Data flowing across Get Resource Data may be tampered with by an attacker. This may lead to a denial of service attack against Resource Server or an elevation of privilege attack against Resource Server or an information disclosure by Resource Server. Failure to verify that input is as expected is a root cause of a very large number of exploitable issues. Consider all paths and the way they handle data. Verify that all input is verified for correctness using an approved list input validation approach.

Justification: Tampering with communications is likely in tactical environments.

21. Potential Data Repudiation by Resource Server [State: Not Applicable] [Priority: High]

Category: Repudiation

Description: Resource Server claims that it did not receive data from a source outside the trust boundary. Consider using logging or auditing to record the source, time, and summary of the received data.

Justification: This is not applicable to IoT tactical scenarios.

22. Data Flow Sniffing [State: Needs Investigation] [Priority: High]

Category: Information Disclosure

Description: Data flowing across Get Resource Data may be sniffed by an attacker. Depending on what type of data an attacker can read, it may be used to attack other parts of the system or simply be a disclosure of information leading to compliance violations. Consider encrypting the data flow.

Justification: Communications eavesdropping is likely in tactical environments.

23. Potential Process Crash or Stop for Resource Server [State: Not Applicable] [Priority: High]

Category: Denial Of Service

Description: Resource Server crashes, halts, stops or runs slowly; in all cases violating an availability metric.

Justification: If the RS crashes due to DoS it is indicative of a potential attack and should not continue operating.

24. Data Flow Generic Data Flow Is Potentially Interrupted [State: Not Applicable] [Priority: High]

Category: Denial Of Service

Description: An external agent interrupts data flowing across a trust boundary in either direction.

Justification: If flow is interrupted it is indicative of a potential attack and should not continue operating.

25. Elevation Using Impersonation [State: Needs Investigation] [Priority: High]

Category: Elevation Of Privilege

Description: Resource Server may be able to impersonate the context of IoT Client in order to gain additional privilege.

Justification: if an IoT Client obtains an access token that is valid for several RS, one of these RS could use the token to impersonate the client towards the other RS.

26. Resource Server May be Subject to Elevation of Privilege Using Remote Code Execution [State: Needs Investigation] [Priority: High]

Category: Elevation Of Privilege

Description: IoT Client may be able to remotely execute code for Resource Server.

Justification: Malicious client could obtain access to run other code on the RS.

27. Elevation by Changing the Execution Flow in Resource Server [State: Needs Investigation] [Priority: High]

Category: Elevation Of Privilege

Description: An attacker may pass data into Resource Server in order to change the flow of program execution within Resource Server to the attacker's choosing.

Justification: Malicious client could obtain access to run other code on the RS.

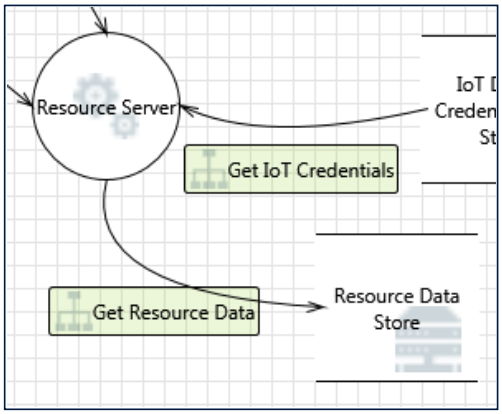
28. Cross Site Request Forgery [State: Needs Investigation] [Priority: High]

Category: Elevation Of Privilege

Description: Cross-site request forgery (CSRF or XSRF) is a type of attack in which an attacker forces a user's browser to make a forged request to a vulnerable site by exploiting an existing trust relationship between the browser and the vulnerable web site. In a simple scenario, a user is logged in to web site A using a cookie as a credential. The other browses to web site B. Web site B returns a page with a hidden form that posts to web site A. Since the browser will carry the user's cookie to web site A, web site B now can take any action on web site A, for example, adding an admin to an account. The attack can be used to exploit any requests that the browser automatically authenticates, e.g. by session cookie, integrated authentication, IP whitelisting, … The attack can be carried out in many ways such as by luring the victim to a site under control of the attacker, getting the user to click a link in a phishing email, or hacking a reputable web site that the victim will visit. The issue can only be resolved on the server side by requiring that all authenticated state-changing requests include an additional piece of secret payload (canary or CSRF token) which is known only to the legitimate web site and the browser and which is protected in transit through SSL/TLS. See the Forgery Protection property on the flow stencil for a list of mitigations.

Justification: We need to investigate because of the ACE dependence on OAuth.

Interaction: Get Resource Data



29. Spoofing of Destination Data Store Resource Data Store [State: Not Applicable] [Priority: High]

Category: Spoofing

Description: Resource Data Store may be spoofed by an attacker and this may lead to data being written to the attacker's target instead of Resource Data Store. Consider using a standard authentication mechanism to identify the destination data store.

Justification: This is not applicable because the data store resides on the same node.

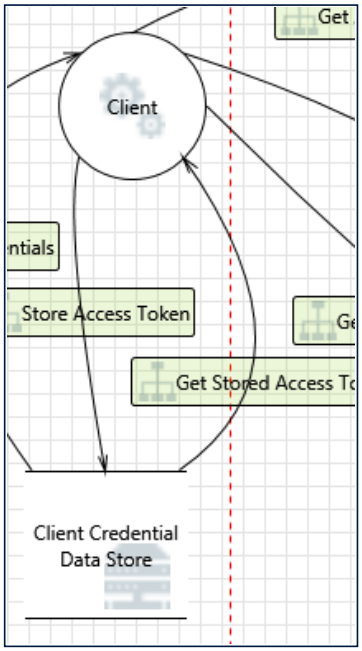
30. Potential Excessive Resource Consumption for Resource Server or Resource Data Store [State: Not Applicable] [Priority: High]

Category: Denial Of Service

Description: Does Resource Server or Resource Data Store take explicit steps to control resource consumption? Resource consumption attacks can be hard to deal with, and there are times that it makes sense to let the OS do the job. Be careful that your resource requests don't deadlock, and that they do timeout.

Justification: This is not applicable because the data store resides on the same node.

Interaction: Get Stored Access Token



31. Weak Access Control for a Resource [State: Needs Investigation] [Priority: High]

Category: Information Disclosure

Description: Improper data protection of Client Credential Data Store can allow an attacker to read information not intended for disclosure. Review authorization settings.

Justification: Credentials need to be protected especially if resource server manages sensitive data.

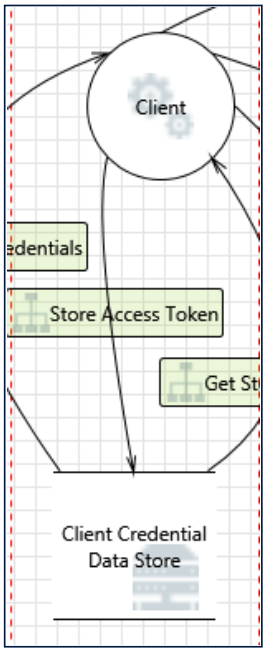
32. Spoofing of Source Data Store Client Credential Data Store [State: Not Applicable] [Priority: High]

Category: Spoofing

Description: Client Credential Data Store may be spoofed by an attacker and this may lead to incorrect data delivered to IoT Client. Consider using a standard authentication mechanism to identify the source data store.

Justification: This is not applicable because the data store resides on the same node.

Interaction: Store Access Token



33. Potential Excessive Resource Consumption for IoT Client or Client Credential Data Store [State: Not Applicable] [Priority: High]

Category: Denial Of Service

Description: Does IoT Client or Client Credential Data Store take explicit steps to control resource consumption? Resource consumption attacks can be hard to deal with, and there are times that it makes sense to let the OS do the job. Be careful that your resource requests don't deadlock, and that they do timeout.

Justification: This is not applicable because the data store resides on the same node.

34. Weak Credential Storage [State: Needs Investigation] [Priority: High]

Category: Information Disclosure

Description: Credentials held at the server are often disclosed or tampered with and credentials stored on the client are often stolen. For server side, consider storing a salted hash of the credentials instead of storing the credentials themselves. If this is not possible due to business requirements, be sure to encrypt the credentials before storage, using an SDL-approved mechanism. For client side, if storing credentials is required, encrypt them and protect the data store in which they're stored

Justification: Credentials need to be protected especially if resource server manages sensitive data.

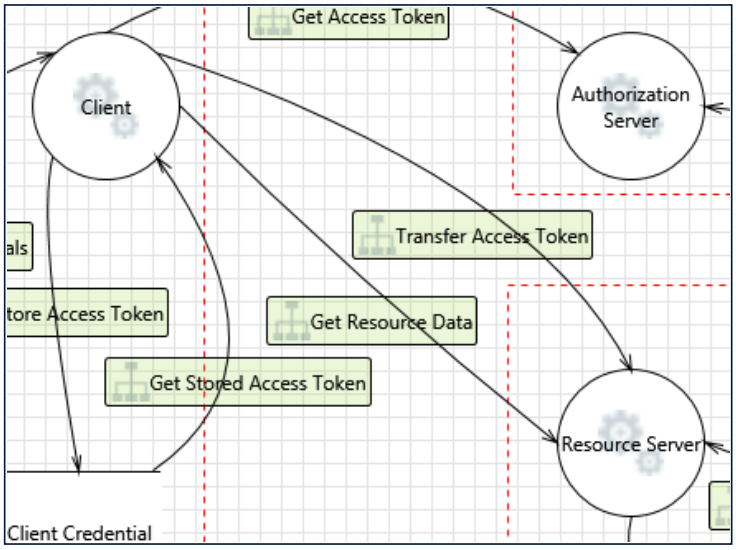
35. Spoofing of Destination Data Store Client Credential Data Store [State: Not Applicable] [Priority: High]

Category: Spoofing

Description: Client Credential Data Store may be spoofed by an attacker and this may lead to data being written to the attacker's target instead of Client Credential Data Store. Consider using a standard authentication mechanism to identify the destination data store.

Justification: This is not applicable because the data store resides on the same node.

Interaction: Transfer Access Token



36. Spoofing the IoT Client Process [State: Needs Investigation] [Priority: High]

Category: Spoofing

Description: IoT Client may be spoofed by an attacker and this may lead to unauthorized access to Resource Server. Consider using a standard authentication mechanism to identify the source process.

Justification: Node theft/impersonation is likely in tactical environments.

37. Spoofing the Resource Server Process [State: Needs Investigation] [Priority: High]

Category: Spoofing

Description: Resource Server may be spoofed by an attacker and this may lead to information disclosure by IoT Client. Consider using a standard authentication mechanism to identify the destination process.

Justification: Node theft/impersonation is likely in tactical environments.

38. Potential Lack of Input Validation for Resource Server [State: Needs Investigation] [Priority: High]

Category: Tampering

Description: Data flowing across Transfer Access Token may be tampered with by an attacker. This may lead to a denial of service attack against Resource Server or an elevation of privilege attack against Resource Server or an information disclosure by Resource Server. Failure to verify that input is as expected is a root cause of a very large number of exploitable issues. Consider all paths and the way they handle data. Verify that all input is verified for correctness using an approved list input validation approach.

Justification: Tampering with communications is likely in tactical environments.

39. Potential Data Repudiation by Resource Server [State: Not Applicable] [Priority: High]

Category: Repudiation

Description: Resource Server claims that it did not receive data from a source outside the trust boundary. Consider using logging or auditing to record the source, time, and summary of the received data.

Justification: This is not applicable to IoT tactical scenarios.

40. Data Flow Sniffing [State: Needs Investigation] [Priority: High]

Category: Information Disclosure

Description: Data flowing across Transfer Access Token may be sniffed by an attacker. Depending on what type of data an attacker can read, it may be used to attack other parts of the system or simply be a disclosure of information leading to compliance violations. Consider encrypting the data flow.

Justification: Communications eavesdropping is likely in tactical environments.

41. Potential Process Crash or Stop for Resource Server [State: Not Applicable] [Priority: High]

Category: Denial Of Service

Description: Resource Server crashes, halts, stops or runs slowly; in all cases violating an availability metric.

Justification: If the RS crashes due to DoS it is indicative of a potential attack and should not continue operating.

42. Data Flow Generic Data Flow Is Potentially Interrupted [State: Not Applicable] [Priority: High]

Category: Denial Of Service

Description: An external agent interrupts data flowing across a trust boundary in either direction.

Justification: If flow is interrupted it is indicative of a potential attack and should not continue operating.

43. Elevation Using Impersonation [State: Needs Investigation] [Priority: High]

Category: Elevation Of Privilege

Description: Resource Server may be able to impersonate the context of IoT Client in order to gain additional privilege.

Justification: if an IoT Client obtains an access token that is valid for several RS, one of these RS could use the token to impersonate the client towards the other RS.

44. Resource Server May be Subject to Elevation of Privilege Using Remote Code Execution [State: Needs Investigation] [Priority: High]

Category: Elevation Of Privilege

Description: IoT Client may be able to remotely execute code for Resource Server.

Justification: Malicious client could obtain access to run other code on the RS.

45. Elevation by Changing the Execution Flow in Resource Server [State: Needs Investigation] [Priority: High]

Category: Elevation Of Privilege

Description: An attacker may pass data into Resource Server in order to change the flow of program execution within Resource Server to the attacker's choosing.

Justification: Malicious client could obtain access to run other code on the RS.

46. Cross Site Request Forgery [State: Needs Investigation] [Priority: High]

Category: Elevation Of Privilege

Description: Cross-site request forgery (CSRF or XSRF) is a type of attack in which an attacker forces a user's browser to make a forged request to a vulnerable site by exploiting an existing trust relationship between the browser and the vulnerable web site. In a simple scenario, a user is logged in to web site A using a cookie as a credential. The other browses to web site B. Web site B returns a page with a hidden form that posts to web site A. Since the browser will carry the user's cookie to web site A, web site B now can take any action on web site A, for example, adding an admin to an account. The attack can be used to exploit any requests that the browser automatically authenticates, e.g. by session cookie, integrated authentication, IP whitelisting, … The attack can be carried out in many ways such as by luring the victim to a site under control of the attacker, getting the user to click a link in a phishing email, or hacking a reputable web site that the victim will visit. The issue can only be resolved on the server side by requiring that all authenticated state-changing requests include an additional piece of secret payload (canary or CSRF token) which is known only to the legitimate web site and the browser and which is protected in transit through SSL/TLS. See the Forgery Protection property on the flow stencil for a list of mitigations.

Justification: We need to investigate because of the ACE dependence on OAuth.