THE CUSTOMER SUCCESS PLATFORM
SALES SERVICE MARKETING COMMUNITY ANALYTICS APPS

Secure Coding
SSL, SOAP and REST

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Astha Singhal

Product Security Engineer

Astha Singhal

- Working with product teams from design to implementation to help them build secure applications for our customers.
- Conduct penetration tests on salesforce applications.
- Facilitating the security process via better security training and enabling self-service for product teams.
- Helping them understand security bugs and guiding through remediation of security issues.

API first

- Defining the behaviors of an application in terms of its operations, their inputs and outputs and underlying types.
- Exposing these API interfaces to build custom integrations.
- Custom integrations can build wider functionality based on the API
- Makes your app easier to integrate with - Facilitates broader usage
- Don’t have to worry about the presentation layer
- Building more API centric applications

Building secure APIs

- No presentation layer -> no UI layer security issues.
- Specific issues relating to the API format
- Issues like secure storage, authentication, authorization still exist
- Business logic flaws

SOAP

- **S**imple **O**bject **A**ccess **P**rotocol is a protocol specification for exchanging structured information in the implementation of web services.
- Uses the XML message format and relies on another transfer protocol (like HTTP) for transmission

```
POST /InStock HTTP/1.1
Host: www.example.org
Content-Type: application/soap+xml; charset=utf-8
Content-Length: nnn

<?xml version="1.0"?>
<soap:Envelope
xmlns:soap="http://www.w3.org/2001/12/soap-envelope"
soap:encodingStyle="http://www.w3.org/2001/12/soap-encoding">

<soap:Body xmlns:m="http://www.example.org/stock">
  <m:GetStockPrice>
    <m:StockName>IBM</m:StockName>
  </m:GetStockPrice>
</soap:Body>

</soap:Envelope>
```

```
HTTP/1.1 200 OK
Content-Type: application/soap+xml; charset=utf-8
Content-Length: nnn

<?xml version="1.0"?>
<soap:Envelope
xmlns:soap="http://www.w3.org/2001/12/soap-envelope"
soap:encodingStyle="http://www.w3.org/2001/12/soap-encoding">

<soap:Body xmlns:m="http://www.example.org/stock">
  <m:GetStockPriceResponse>
    <m:Price>34.5</m:Price>
  </m:GetStockPriceResponse>
</soap:Body>

</soap:Envelope>
```

REST

- **RE**presentational **S**tate **T**ransfer is a means of expressing specific entities in a system by URL path elements.
- Allows interaction with a web-based system via simplified URL's
- No POST body required

```
GET http://www.example.org/inStock/getStockPrice/
IBM
```

Building secure APIs

- Make sure to do proper input validation
  - Make sure that the user input adheres to the expected format.
  - Make sure to build secure whitelists for limiting the inputs.
  - Don’t rely on blacklist filtering.
- Make sure to use secure parsers for parsing XML in SOAP requests
  - Don’t build your own parsers!
- Validate incoming content types
  - The server should make sure that the request content matches the specified content type header
  - Reject unexpected Content type headers.
- Set Content-type correctly based on the response type.
  - Don’t assume that the user supplied Accept header is a valid response content type.
  - Set `X-Content-Type-Options: nosniff`

Authentication

- Since there is no UI tied to it, the API endpoints make assumptions about how authentication information is provided.
- It is important to understand these assumptions and build secure implementations when building custom integrations.
- A few ways that can be used to provide authentication information are:
  - Custom headers
  - Session cookies
  - API keys
  - Username and Password

Authentication issues

- Don’t use BASIC Auth
  - Sending your long term secret in each and every request is not a good security practice.
  - Make sure to establish a session based short term authentication credential.
- Use session based authentication using custom headers
  - Instead of using the Cookie header, make sure to use custom Auth header to send session token values.
- Using API keys for Authentication
  - Make sure to not send your API keys as a part of the URL. URLs may be getting logged in places like proxy servers and third party tracking sites.
- OAuth tokens to verify identity via another provider
  - Make sure that the Oauth tokens are least privilege.

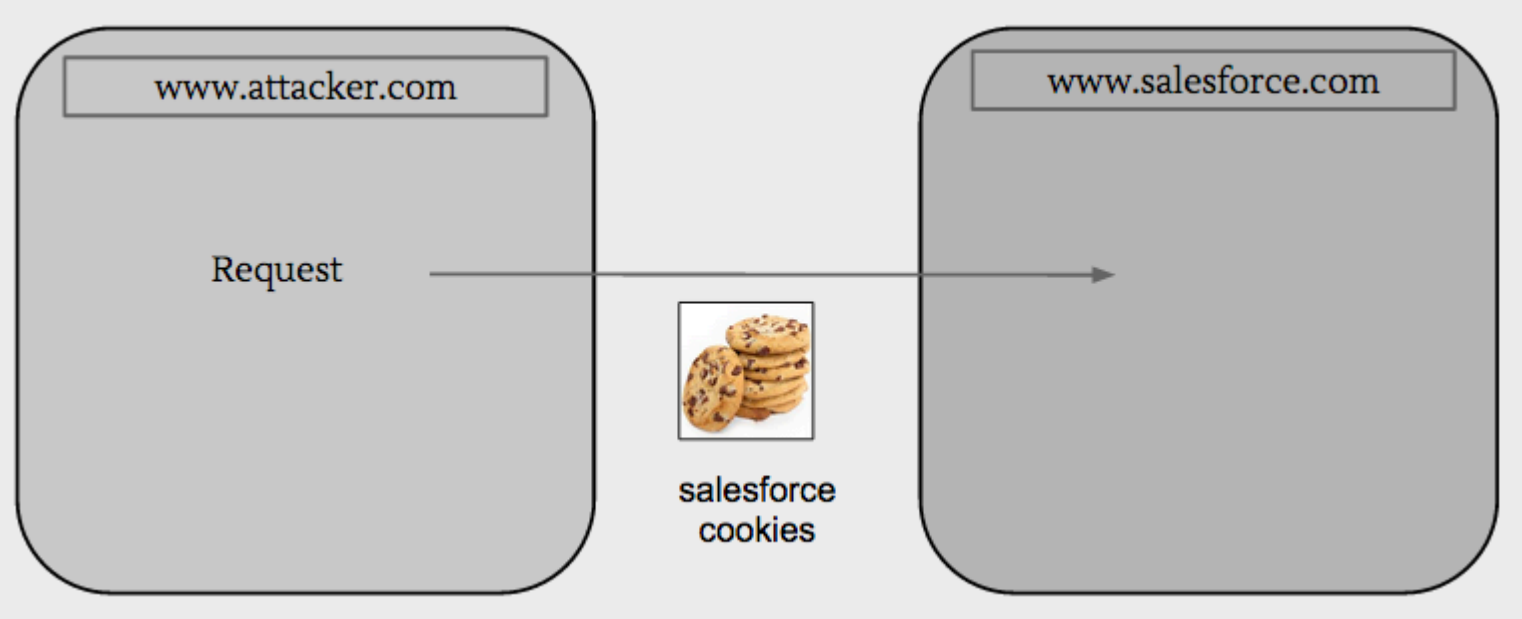
Authentication issues

- When calling APIs from the UI directly via AJAX callouts, make sure to generate an access token for the API endpoint, instead of using the session cookie directly.
- Generating a custom API token gives you better control in terms of being able to define the access scope of the token and maintaining least privilege.
- Using the session cookie directly would lead to disabling HTTPONLY on your session cookie.

Authorization issues - CSRF

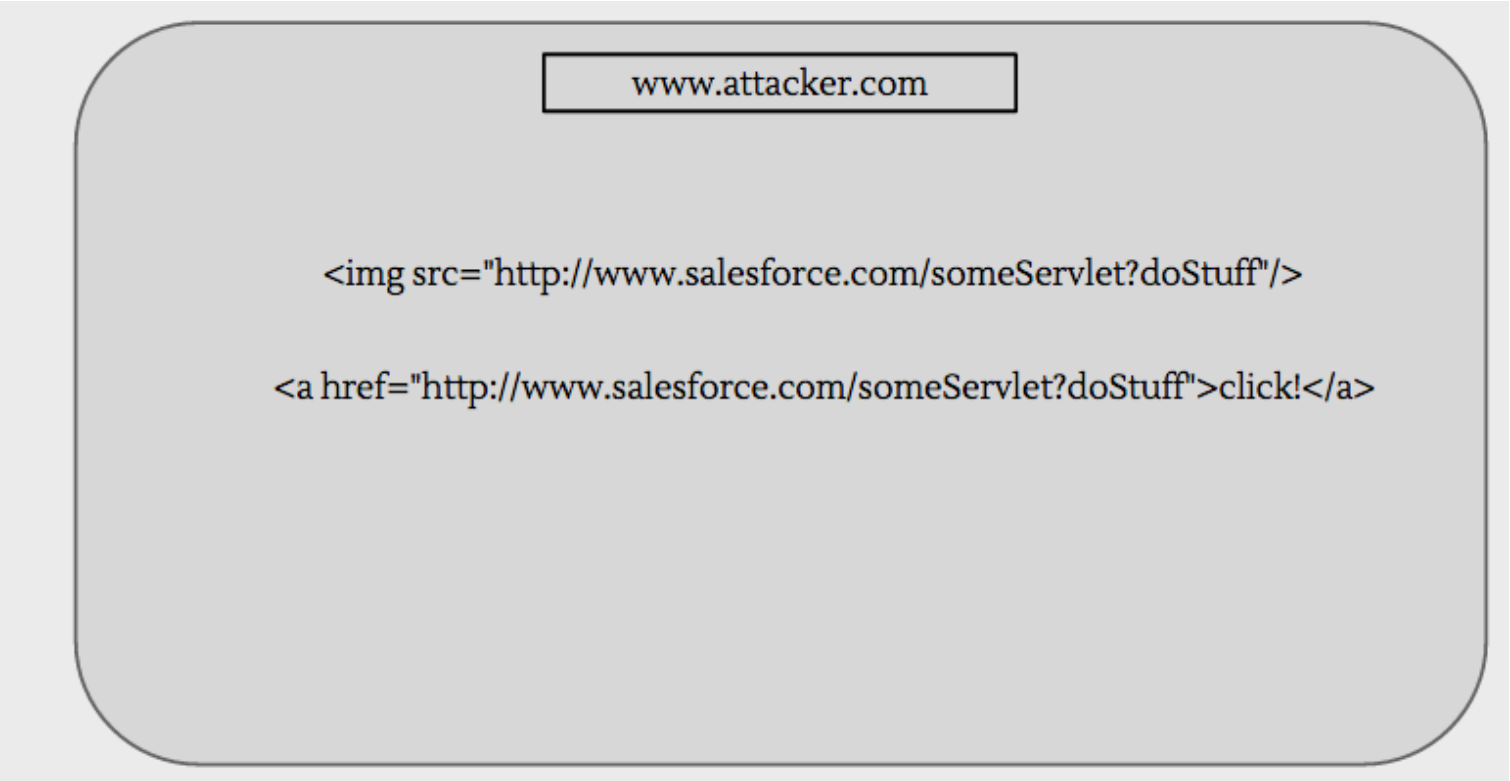
- Cookies are sent by the browser for all requests, including cross-domain requests.

- What this means is every time a request is made to salesforce.com from your browser, it would automatically include the cookies set for that domain.



Authorization issues - CSRF

- An attacker can thus force a user to make legitimate requests with attacker supplied parameters to any site via something like this:



Authorization issues - CSRF

- For API No page load, so no CSRF token load. Instead, using an 'Auth' header
  - CSRF Protection via custom headers since headers aren't auto-tracked & sent by browsers (unlike cookies)
  - Make sure to reject request when no Auth header present, don’t fallback to Cookie in that case. (Defeats the whole purpose).

Authorization using OAuth

- Tokens should be least privilege
  - OAuth tokens are based on a specific scope, API access tokens should be generated appropriately for desired scope.
  - Make sure to securely store OAuth refresh tokens on the external app
  - Follow industry best practices for secure storage on the platform you are using to build your application.
  - Don’t log access tokens on both client and server side.

Authorization – HTTP methods

- Make sure to whitelist allowable HTTP methods.
- Not all methods are valid for all endpoints.
- Make sure to define authorization correctly for the different HTTP verbs on the same endpoint.
  - For example: A user might be allowed to GET a resource, but not DELETE it.

Transport Security

Security Expectations of HTTP

- None
- Anyone on the network can eavesdrop traffic
- Anyone on the network can modify content
- Anyone on the network can divert traffic

Secure Sockets Layer

- A user visiting a site over HTTP has no assurance that the user is interacting with the legitimate site
- SSL allows a server to authenticate itself to a client and vice versa
- In addition to that, it also ensures that user communication cannot be intercepted by a malicious third party on the network.

Secure Sockets Layer

- Make sure that web servers have up-to-date SSL configurations.
- Supporting weaker ciphers and older protocol versions leads to compromising the security guarantees of SSL.
- A good tool to test server configurations:

https://www.ssllabs.com/ssltest/index.html

DEMO – ssllabs

Interacting with the Salesforce API

- All standard APIs enforce user CRUD/FLS restrictions.
- Custom web services written in Apex run in System context.
- Make sure to add CRUD, FLS and Sharing checks when building custom web services.
- Be sure to enable API access only for profiles that necessarily need it.

Interacting with the Salesforce API

- API access to an org allows a user to bypass presentation layer controls (Visualforce pages, standard page layouts) and comes with some unique situations to be aware of.
- For cases where sharing is enforced via Apex and VF would be unprotected when accessed via API.
- Some objects do not allow CRUD/FLS/Sharing to be configured (For eg: Custom settings in local namespace)
- API access allow easy mass extraction of data. So be careful while providing API access.

Summary

- Handle authentication credentials carefully.
- Make sure to not use Cookie header for Authorization to prevent CSRF.
- Always perform proper input validation on all user supplied input.
- Make sure to keep data secure in transit by using well configured SSL endpoints.

Thank You

Secure Development Sessions

Secure Coding: Field-level Security, CRUD, and Sharing
Monday, October 13 @ 11:00 a.m. - 11:40 a.m.

Secure Coding: Storing Secrets in Your Salesforce Instance
Monday, October 13 @ 2:00 p.m. - 2:40 p.m.

Building Secure Mobile Apps
Monday, October 13 @ 5:00 p.m. - 5:40 p.m.

Protect Your Data Against Malicious Scripts
Tuesday, October 14 @ 11:00 a.m. - 11:40 a.m.

Secure Coding: External App Integration
Wednesday, October 15 @ 9:00 a.m. - 9:40 a.m.

Secure Coding: SSL, SOAP, and REST
Thursday, October 16 @ 10:30 a.m. - 11:10 a.m.

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Announcements:

Force.com Code Scanner now supports Salesforce1 and JavaScript! Try it here: http://bit.ly/SF1Scanner

Chimera Web App Scanner alpha nominations are open. Partners apply at: http://bit.ly/SFChimera

Live security office hours are available in the Partner Zone.

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Additional Resources

- Secure Coding Guidelines - https://developer.salesforce.com/page/Secure_Coding_Storing_Secrets
- Salesforce StackExchange - http://salesforce.stackexchange.com/questions/tagged/security
- Developer.Salesforce.com Security Forum - https://developer.salesforce.com/forums (full link hidden)
- Salesforce Security resources - https://developer.salesforce.com/page/Security
- Security Office Hours (Partners) - http://security.force.com/security/contact/ohours