Securing APEX Applications

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Speaker Qualifications:

- Josh Millinger, President, Niantic Systems, LLC
- CS degrees from UW-Madison, Johns Hopkins
- Former Oracle Sales Consultant and Founder of the Oracle Partner Technology Center
- 11+ Years of Oracle Web Development Experience
- Have Been Developing with and Teaching ApEx Since Well Before It Was Even Released as a Product! Started with Excel Migration as first project
Niantic Systems

- Oracle Consulting with a Focus on Application Express
- Oracle Forms/Reports
- Discoverer
- Application Express Training
- Mentoring
- Customers in the Federal, Commercial, Healthcare, Higher Education, Construction verticals
Securing Your ApEx Applications

- Security Balance
- Create & Review Example Application
- Declaratively Secure Example Application
- Programmatic Measures
- Deployment Considerations
- Apex 3.2 New Security Features
- Other Considerations
How Secure is Secure Enough?

It depends on:

• What you’re protecting
• Who you are protecting it from
• The likelihood of someone wanting to steal what you are protecting
• The repercussions you would face if someone were to successfully steal it

Unfortunately, adding Security is typically event-driven
Declarative & Programmatic Security Options
Categories Defined

- *Declarative* – Little to no programming required
- *Programmatic* – Requires at least a small amount of coding by the developer
Declarative Security Tools

- Authentication - Authentication Scheme Gallery
- Authorization – Access Control Page
- Session State Protection
- Deployment Build Status
- Password Rules
Simple Application Example
User Authentication

Identifying the User
Authentication Considerations

- Rarely Deploy with ApEx Authentication
- Externally Managed Users e.g. Less Work (LDAP)
- Common Options in the Gallery
- Switching Schemes is Easy
  - Independent of Application
  - “Open Door” Can Be Handy
- Can Always Roll Your Own (Not Trivial)
  - LDAP vs Local Tables Example
QUICK DEMONSTRATION
Changing Authentication Schemes
Access Control
Regulating Users Within the Application
Access Control

- Managed through Authorization Schemes
- Schemes Applied Against Constructs
- Evaluation at Page or Session Level
Regulating Users Within an Application the Easy Way
• Admin, Edit, & View Users
• Wizard Generated Components
  • Administration Page
  • Authorization Schemes
• Two Tables in Application Schema
  -APEX_ACCESS_SETUP
  -APEX_ACCESS_CONTROL
• Two Static LOVs
• Application Modes
• Independent of Authentication Schemes
• Applying the Authorization Schemes Still Requires Thought!
Demonstration

Declarative Access Control
Session State Protection
Consider this situation:

An unauthenticated malicious user visits your site. He notices that when he clicks on the View Details link for Content Items, he sees something like this:

http://hostname...:P2_CONTENT_ID:1
Session State Protection

• So he clicks the link, and then changes the 1 to a 2, so the link now looks like this:

  http://hostname...:P2CONTENT_ID:2

• But that Content Item is restricted to Members Only, and the malicious user was able to view it!
You have just fallen victim to one of the most popular form of hacking: URL Tampering

- Requires no programming skills
- ANYONE can learn how to do it
- And the results can be disastrous!
Declarative Session State Protection

- Introduced in ApEx 2.0
- How it works:
  - Rules applied to Items and Pages
  - Generates an additional Checksum and passes that as part of the URL
  - If the Checksum is absent or altered for protected item(s), the page will not render
Declarative Session State Protection:

- Unrestricted
- Restricted
  - *Application-Level Items*
  - *Display-Only Page-Level Items*
- Checksum Required: Application Level
- Checksum Required: User Level
- Checksum Required: Session Level
Demonstration
Session State Protection
Declarative Deployment Considerations
Declarative Deployment Considerations

- Restrict ApEx Access
- Build Status
Declarative Deployment Considerations

- Restrict ApEx Access
- Developer Access
- Administrator Access
• A Q U I C K L O O K

Preventing Developer Access
BEGIN
    WWV_FLOW_API.SET_SECURITY_GROUP_ID(
        p_security_group_id=>10);
    WWV_FLOW_PLATFORM.SET_PREFERENCE(
        p_preference_name => 'DISABLE_ADMIN_LOGIN',
        p_preference_value => 'N');
end;
/

• Set Build Status to “Run Application Only” to disallow:
  • Debug
  • Trace
  • Developer Access
3.1 Runtime Engine

- 3.1 introduced new feature to “lock down” the ApEx instance from development.
- By running scripts you can turn production instance into an entirely “Runtime” only instance that prevents all developer access.
Programmatic Security Considerations
Programmatic Security Considerations

- SQL Injection Attacks
- Cross-Site Scripting Attacks
- VPD – Security starts at the database level
SQL Injection Attacks
SQL Injection

Consider a Simple PL/SQL Query Region...

```
DECLARE
    q varchar2(4000);
BEGIN
    q := 'SELECT *
        FROM tasks
        WHERE assigned = :APP_USER ';
    IF :P1_SEARCH is not NULL THEN
        q := q || ' AND category
        = ' || :P1_SEARCH ;
    END IF;
    return q;
END;
```
When a user provides “Email” for P1_SEARCH our query will be...

```
SELECT * 
FROM tasks 
WHERE assigned=:APP_USER 
AND category = 'Email'
```
...but when a user provides “Email OR 1=1” for P1_SEARCH our query becomes...

```sql
SELECT *
FROM tasks
WHERE ....
    AND category =
        'Email' or
        'a' = 'a'
```

...So **never** arbitrarily append user input into your application queries.
Cross Site Scripting
Consider the following PL/SQL Region…

```plsql
HTP.P ('The value of P1_ITEM is ` || &P1_ITEM.);
```
A clever user could set P1_ITEM with malicious javascript like so…

f?p=APP:PAGE:SESSION:::P1_ITEM:<some malicious javascript>
Cross Site Scripting, cont.

…which would cause our simple PL/SQL region to render the offending javascript directly on our page as...

The value of P1_ITEM is <some malicious jscript>
Cross Site Scripting, cont.

- **Never** arbitrarily render user input to the browser!
- Use tools like `htf.escape_sc` when possible to convert special characters...

```
HTP.P ('The value of P1_ITEM is ` ||
  htf.escape_sc(:P1_ITEM));
```
...so that our region would render as...

The value of P1_ITEM is &lt;some malicious jscript&gt;

...which would successfully neutralize the attempted attack.
Don’t Forget the Database!

- Schema access may be possible from outside of your web application using ad-hoc query tools for example.
- VPD policies ensure access is properly controlled at the database level.
- Leveraged from within ApEx at application level.
DEMONSTRATION

APEX & VPD
More Extra-Application Measures

- Critical Patch Updates
- Operating System Security Patches/Updates
- Use Secure Sockets Layer (SSL)
- Password Policies (much like in ApEx 3.0)
3.2 Security Features

• Password Fields
  – Submitted, but not put in session state
• Data can now be stored encrypted in session state (e.g., passwords)
• Can save values before branching so URL doesn’t contain values
• Find at Risk Passwords with new built-in report
• Can use Session 0 for public pages
• Set max session length and idle timeout
Securing Your ApEx Applications: The Wrap-Up

- Decide on a Security Balance
- Use the Right Tools for the Right Jobs
  - Declarative Options
  - Programmatic Techniques
  - Consider Other Means of Data Access
Thank You!

- If you’re so inclined, send me questions & comments directly:
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