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

Security Balance:

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

Q U I C K D E M O N S T R A T I O N

Changing Authentication Schemes

Access Control

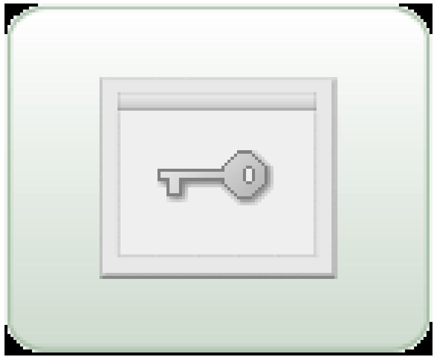
Regulating Users Within the Application

Access Control

- Managed through Authorization Schemes
- Schemes Applied Against Constructs
- Evaluation at Page or Session Level

Access Control Page Wizard

Regulating Users Within an Application the Easy Way



Access Control Page

- 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

Access Control Page, cont.

- Application Modes
- Independent of Authentication Schemes
- Applying the Authorization Schemes Still Requires Thought!

D E M O N S T R A T I O N

Declarative Access Control

Session State Protection

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...:P2_CONTENT_ID:2

- But that Content Item is restricted to Members Only, and the malicious user was able to view it!

Session State Protection

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

- D E M O N S T R A T I O N

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 QUICK LOOK

Preventing Developer Access

Deployment Considerations, cont.

```
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;
/
```

Deployment Considerations, Cont.

- 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;
```

SQL Injection, cont.

When a user provides “Email” for
P1_SEARCH

our query will be…

```
SELECT *
  FROM tasks
 WHERE assigned=:APP_USER
   AND category = ‘Email’
```

SQL Injection, cont.

…but when a user provides "Email OR 1=1" for P1_SEARCH our query becomes…

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

…So ***never*** arbitrarily append user input into your application queries.

Cross Site Scripting

Cross Site Scripting

Consider the following PL/SQL Region...

```
HTP.P (‘The value of P1_ITEM is ‘ ||
                 &P1_ITEM.);
```

Cross Site Scripting, cont.

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));
```

Cross Site Scripting, cont.

…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

- 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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