



SAGE Computing Services

Consulting and customised training workshops

Best Practices in Apex Development

Penny Cookson
Managing Director

www.sagecomputing.com.au

Agenda

- Managing Workspaces
- Templates
- Where to put your code
- Security
- Documenting an Apex application
- Tips and techniques

Designing the Workspace Structure

Single workspace
with lots of
applications?

Multiple workspaces
with small numbers
of applications?

- Which developers will work on the applications?
- What schemas do the applications access?
- Do I need to subscribe to objects in a different application?

Recommendations on Naming Standards



Have Them

Naming Standards

- Keep default names for page items where possible, i.e. Pn_COLUMNNAME
- Additional display information use Pn_CONTENTNAME or Pn_CONTENTNAME_DISP
- Application items F_NAME or APP_NAME
- Meaningful name for Page Validations, e.g checkdates, validate_mandatory_items
- Meaningful name for Page Processes, e.g check_dependencies, clear_state, create_event
- Meaningful name for Application Processes, e.g app_check_dependencies, app_clear_state, app_create_event

Naming Standards

- Meaningful name for Page Computations, that indicates the item being set
- Meaningful name for Application Computations, that indicates the item being set, e.g set_surname, set_f_total, set_app_current_id, e.g set_surname, set_total
- Name Lists of Values for the information being fetched, e.g. ORGANISATIONS_LOV, or if the LOV is for a specific page, ORGANISATIONS_P415_LOV
- Use a standard alias for an application, e.g. TM for the timesheet, this can also be used as a prefix to the names of database packages
- Give each page an alias

Some Obvious Stuff

- Use the Wizards where possible
- Go with the product
- Do not hard code formatting attributes
- Never reference an application id
`http://server:port/pls/apex/f?p=TS:CAL:&SESSION.:::::`
- Do not change Oracle
templates/stylesheets/JavaScript files
- Designate ranges of pages for functional areas of
the application
- Number everything in increments > 1
- Generate DML using Object Browser

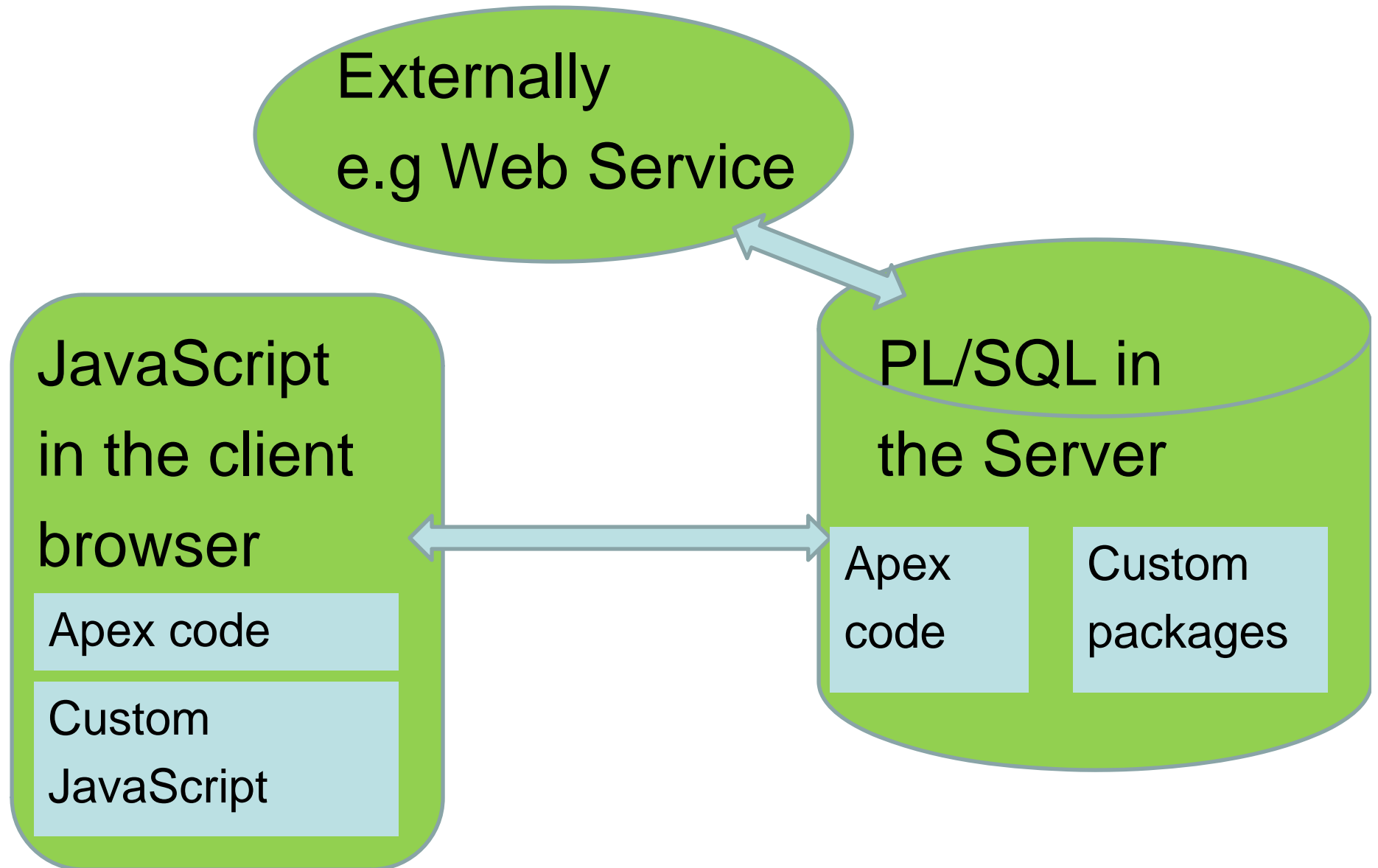
UI Defaults

- Define UI Defaults before creating any pages
- Initial creation only in 3.2
- Bi directional in 4.0

Where to Put your Code

- In a central location where it can get maximum reuse
- In a location that makes application maintenance as easy as possible
- As close as possible to the location where the code will be executed

Where Code Will be Executed



Define in Database Packages

Any business logic
that manipulates
data in database
tables



PL/SQL
packages in
the Server

Process: 2 of 2 Name: submit_file

Show All

Name

Process Point

C

Wrong Approach

Name

Page: 19 Upload timesheet

* Name

Type: PL/SQL anonymous block

Process Point

Sequence

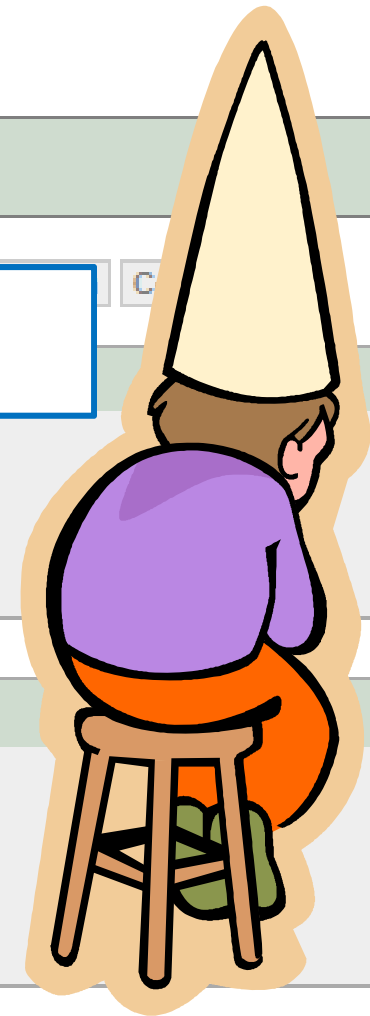
Process Point

Run Process

Source

* Process [\[Download Source\]](#)

```
insert into employee_files
values (:P19_FILE_NAME,:P19_PAR_ID,:P19_COMMENTS);
```



Process: 2 of 2 Name: submit_file

Show All Name Process Point Source Messages Conditions Authorization Configuration Comments

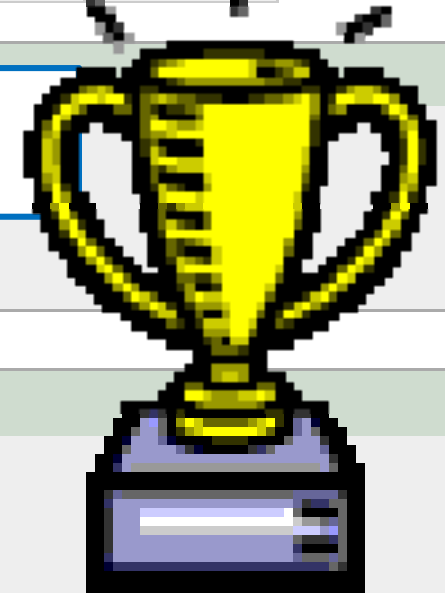
Name

Page: 19 Upload timesheet

* Name submit_file

Type: PL/SQL anonymous block

Right Approach



Process Point

Sequence 10

Process Point On Submit - After Computations and Validations

Run Process Once Per Page Visit (default)

Source

* Process [Download Source]

```
begin
    emp_util.create_emp_file(p_filename =>:P19_FILE_NAME,
                           p_par_id   =>:P19_PAR_ID,
                           p_comments =>:P19_COMMENTS);
end;
```

Manipulating Session State

This is OK

Page Validation: 3 of 3 Name: check_dates

Show All

Validation

Error Message

Conditions

Authorization

Configuration

Comments

Validation

Page: 7 Employee Details

* Name

* Sequence

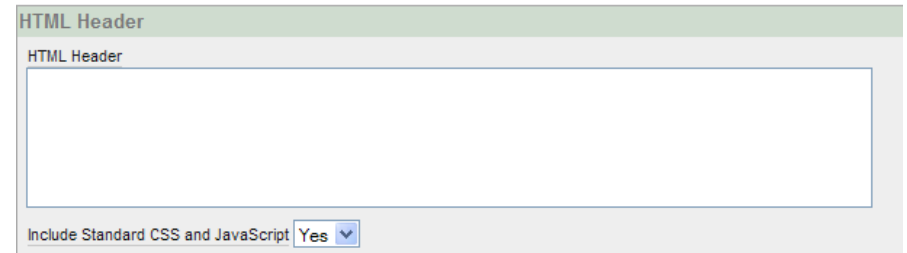
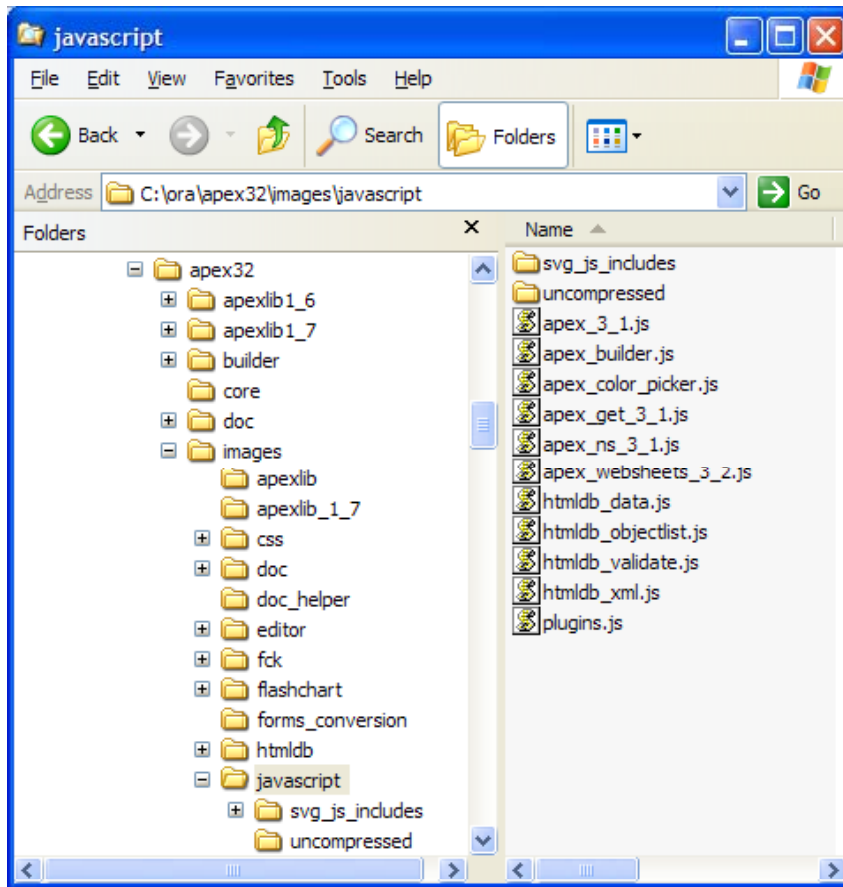
Type



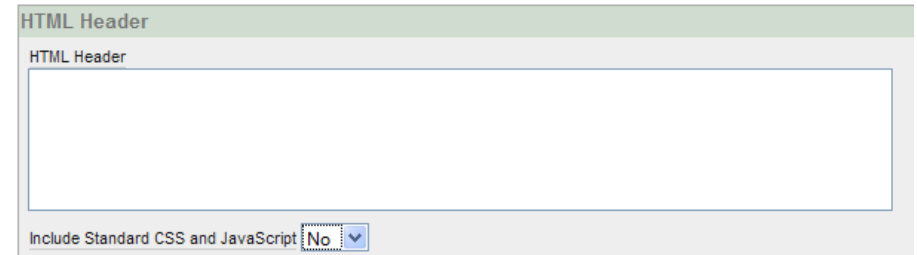
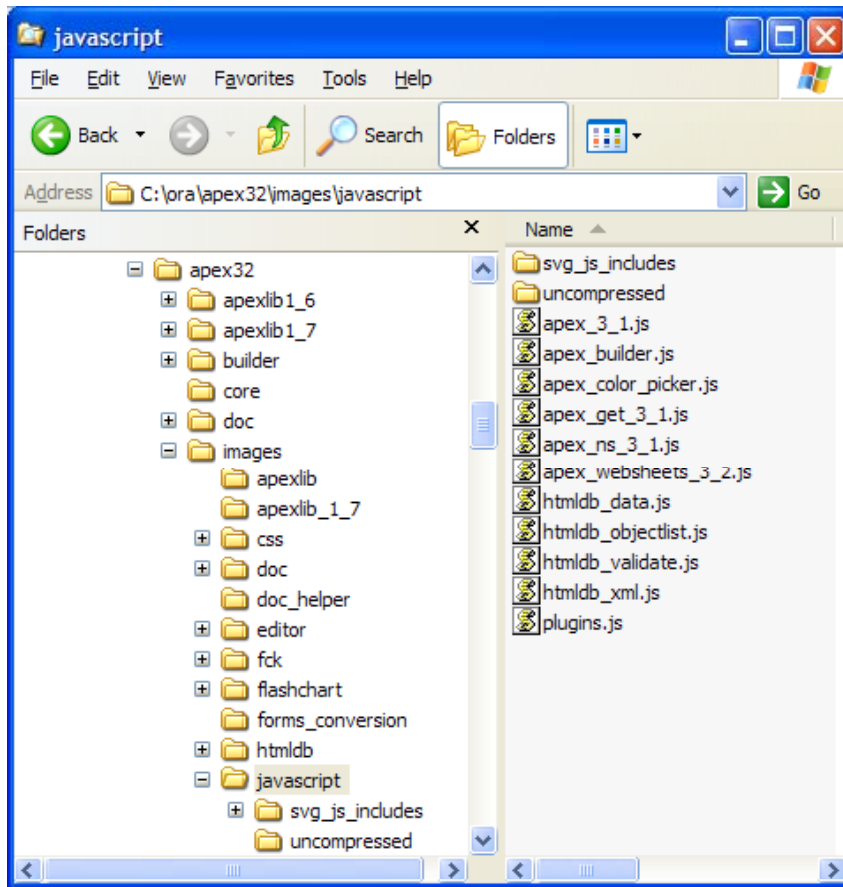
* Validation Expression 1

```
TO_DATE (:P7_EFF_FROM) <= TO_DATE (:P7_EFF_TO)
```

Apex JavaScript Code



Apex JavaScript Code



Your JavaScript Code

Page

Page Name: EMPLOYEES
Title: EMPLOYEES
HTML Header: <script language="JavaScript"
HTML Body:
Help Text: No help is available for this
Page Group:

Template:
Header Text:
Footer Text:
Build Option:
Authorization:
Cached:

**Wrong
Approach**



Show All Name Display Attributes Header and Footer HTML

HTML Header

HTML Header

```
<script language="JavaScript1.1" type="text/javascript">
<!--
function getMinMax (jobId, minSal, maxSal)
{
    var minSalObj = document.getElementById(minSal);
    var maxSalObj = document.getElementById(maxSal);

    var ajaxRequest = new
        htmldb_Get(null, &APP_ID., 'APPLICATION_PROCESS=getRange', 0);
    var job = html_SelectValue(jobId);
    ajaxRequest.add('P2_JOB_ID', job);
    ajaxResult = ajaxRequest.get();
    if (ajaxResult)

        { var salArray = ajaxResult.split("|");
          minSalObj.value = salArray[0];
```

Your JavaScript Code

HTML Region on Page 0

Right Approach



Identification

Page: 0 Common_Page

Title JavaScript Routines

☐ exclude title from translation

Type HTML Text

Static ID

Region Attributes

User Interface

Template No Template

Display Point Page Template Body (3. items above region content)

Sequence 31

Column 1

[Body] [Pos.1] [Pos.2] [Pos.3] [Pos.4]

Region HTML table cell attributes

Source

Region Source

```
<script src="#IMAGE_PREFIX#javascript/sage_lib.js" type="text/javascript">
</script>
```

Your JavaScript Code

Reference in the Page Templates

Right Approach

Definition

* Header

```
<html lang="%BROWSER_LANGUAGE%">
<head>
<title>#TITLE#</title>

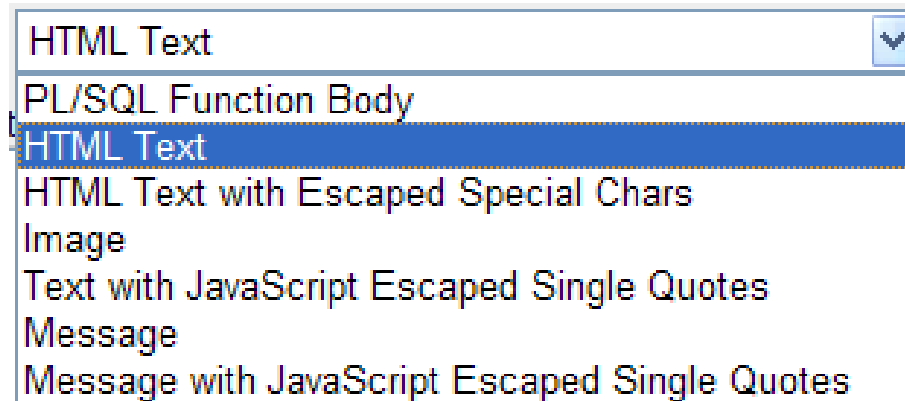
<script src="%IMAGE_PREFIX#javascript/sage.js" type="text/javascript"></script>

<link rel="stylesheet" href="%IMAGE_PREFIX#themes/theme_12/theme_3_1.css" type="text/css" />
#HEAD#
</head>
<body #ONLOAD#>#FORM_OPEN#
```

Note that if you have multiple Page Templates you will need to reference the library in each one

Use Shortcuts

- Commonly used pieces of code or text



- Use
 - To substitute text into a Javascript routine
 - In HTML associated with regions, including the source of html regions and header and footer text of any region.
 - In region templates
 - In item label attributes
 - Item default values

Example

JavaScript Shortcut
PL/SQL Shortcut

Defining Substitution Strings

- You can define substitution strings in the Application Definition

Substitutions	
Substitution String	Substitution Value
COMPANYNAME	Sage Computing Services
DISPLAYTITLE	Timesheet Application

- Reference the substitution strings in a template

```
Footer
#REGION_POSITION_05#
#FORM_CLOSE#
Company: &COMPANYNAME.
Application: &DISPLAYTITLE.
</body>
</html>
```

Using the Database

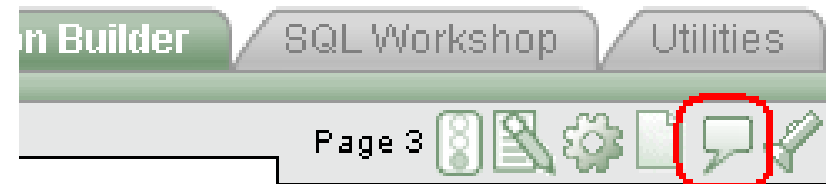
- sys_parameters table
- Function util.getparam
- Create application items to store the values
- Create Computations to populate the application items from the database using the packaged function
- Reference the application items in a template
- Provide the values for application or page properties

Example

Storing Reference Information in the Database

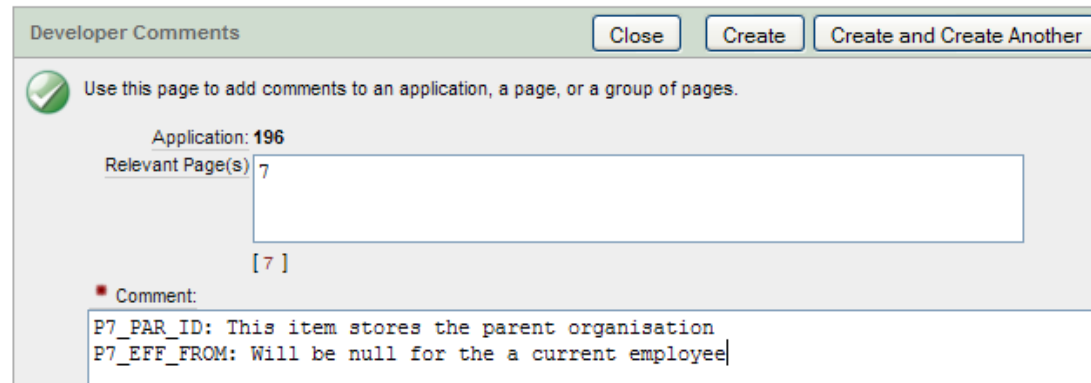
Documenting an Apex Application

- Apex is Largely Self Documenting
- Document exceptions
- Commenting pages
 - Purpose (if its not obvious)
 - Anything weird about the page design /coding
 - Modification History

A screenshot of the 'Developer Comments' dialog box. The dialog has a title bar with 'Developer Comments' and buttons for 'Close', 'Create', and 'Create and Create Another'. The main content area starts with a green checkmark icon and the text: 'Use this page to add comments to an application, a page, or a group of pages.' Below this, there is a label 'Application: 105' and a text input field for 'Relevant Page(s)'. Underneath the input field is a small '[3]' label. Then, there is a label '* Comment:' followed by a large text area containing the text: 'This page is designed to demonstrate the threat of SQL Injection.'

Documenting an Apex Application

- No documentation lower than page level
- Prefix page comment with component /item name



Developer Comments

Close Create Create and Create Another

Use this page to add comments to an application, a page, or a group of pages.

Application: 196

Relevant Page(s) 7

[7]

Comment:

P7_PAR_ID: This item stores the parent organisation
P7_EFF_FROM: Will be null for the a current employee

- You can then search the comments for references to a particular component



Create Comment View Comments Manage Comments

Page Comment P7_EFF_FROM Developer - All - Display 15 Go

Page(s)	Comment	Date Created	Developer
7	P7_PAR_ID: This item stores the parent organisation P7_EFF_FROM: Will be null for the a current employee	72 seconds ago	ADMIN

1 - 1

What Every Developer Wants to Hear

- Do not comment unnecessarily
- The application is stored in Oracle database tables – query them

Where to Locate Files

- **#IMAGE_PREFIX#**

virtual directory where your files are physically located

- **#WORKSPACE_IMAGES#**

files that have been uploaded into the Apex repository

- **#APP_IMAGES#**

files that have been uploaded into the Apex repository for a specific Application

Example

Determining the File Location Dynamically

Backup

- **Application backups**

Part of your regular database backup

Are you sure the DBA backs up the DEV database?

Do you really want to have to grovel to the DBA to get the whole database back?

Export the Application daily

- **Page backups**

Export a page before significant work

If you stuff up try export as of 5 mins ago

Page Zero

- Page 0 items appear on all pages

Navigation

Breadcrumbs

Task lists

Contact details

Copyright/Privacy text

Example – Task Lists

- Multiple tasks lists
- Each applies to a set of pages

This can be
hard to maintain

Page 0 View Definition Go

Page 0 components will be rendered on every page.

Page Rendering



Page

Page Name: [Common Page](#) Template: [Application default](#)
Title: [Common Page](#) Header Text:
HTML Header: Footer Text:
HTML Body: Build Option:
Help Text: Authorization: [No](#)
Page Group: Cached: No

Regions

Display Point: Region Position 01

1 [Breadcrumb](#) [Breadcrumb Entry](#)

Display Point: Region Position 03

11 [Employee Tasks List](#) Conditional

21 [Timesheet Tasks List](#)

Conditional Display

Condition Type

Current Page Is Contained Within Expression 1 (comma delimited list of pages)

[PL/SQL] [item=value] [item not null] [request=e1] [page in] [page not in] [exists] [none] [never]

Expression 1



8,14,15,16

Example – Task Lists

- **Avoid Using Page Numbers**

Conditional Display

Condition Type

PL/SQL Expression  

[PL/SQL] [item=value] [item not null] [request=e1] [page in] [page not in] [exists] [none] [never]

Expression 1

```
wwv_flow.get_page_alias IN ('CAL','APP','TIM','TIMENT')
```

Example – Task Lists

- Using a Page Attribute

Comments

Comments

Generated by calendar wizard.08-OCT-2004 10:30:16
<TASK_LIST>TIMESHEET_TASKS<\TASK_LIST>

```
FUNCTION get_page_comment
RETURN apex_application_pages.page_comment%type
IS
    v_page_comment apex_application_pages.page_comment%type;
BEGIN
    SELECT page_comment
    INTO   v_page_comment
    FROM   apex_application_pages
    WHERE  application_id = nvl(v('APP_ID'),196)
    AND    page_id = nvl(v('APP_PAGE_ID'),8);

    RETURN v_page_comment;

END get_page_comment;
```

Example – Task Lists

- **Get the information you want from the comment**

```
FUNCTION get_property(p_property IN VARCHAR2)
RETURN VARCHAR2
IS
    v_property      VARCHAR2(1000);
    v_page_comment  apex_application_pages.page_comment%TYPE := get_page_comment;
BEGIN
    v_property := substr(v_page_comment,instr(v_page_comment,p_property)+11,
                        instr(v_page_comment,replace(p_property,'<','<\'))
                        - (instr(v_page_comment,p_property)+11));

    RETURN v_property;
END get_property;
```

Example – Task Lists

- Use the property to set the conditional processing of the Task List on Page 0

Conditional Display

Condition Type

PL/SQL Expression

[PL/SQL] [item=value] [item not null] [request=e1] [page in] [page not in] [exists] [none] [never]

Expression 1

```
sage_apex_util.get_property('<TASK_LIST>') = 'TIMESHEET_TASKS'
```

Common Processing

- Page 0 has no processing
- Define Computations and Processes at Application Level

Firing of the process is dependent on the page number
Fires for large numbers of pages



On Load: Before Header (page template header)
On Load: After Header (page template header)
On Load: Before "Body" Region(s)
On Load: After "Body" Region(s)
On Load: Before Footer (page template footer)
On Load: After Footer (page template footer)
On Submit: After Page Submission - Before Computations and Validations
On Submit: After Page Submission - After Computations and Validations

+ a Condition

Firing of the process is dependent on the page specific information
Fires for small numbers of pages

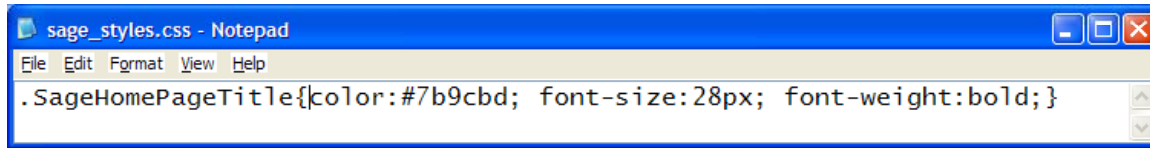


On Demand: Run this application process when requested by a page process.

Invoke from specific pages

Custom Styles

- Define your styles in your own .css file



- Reference your stylesheet in a page template or Page 0

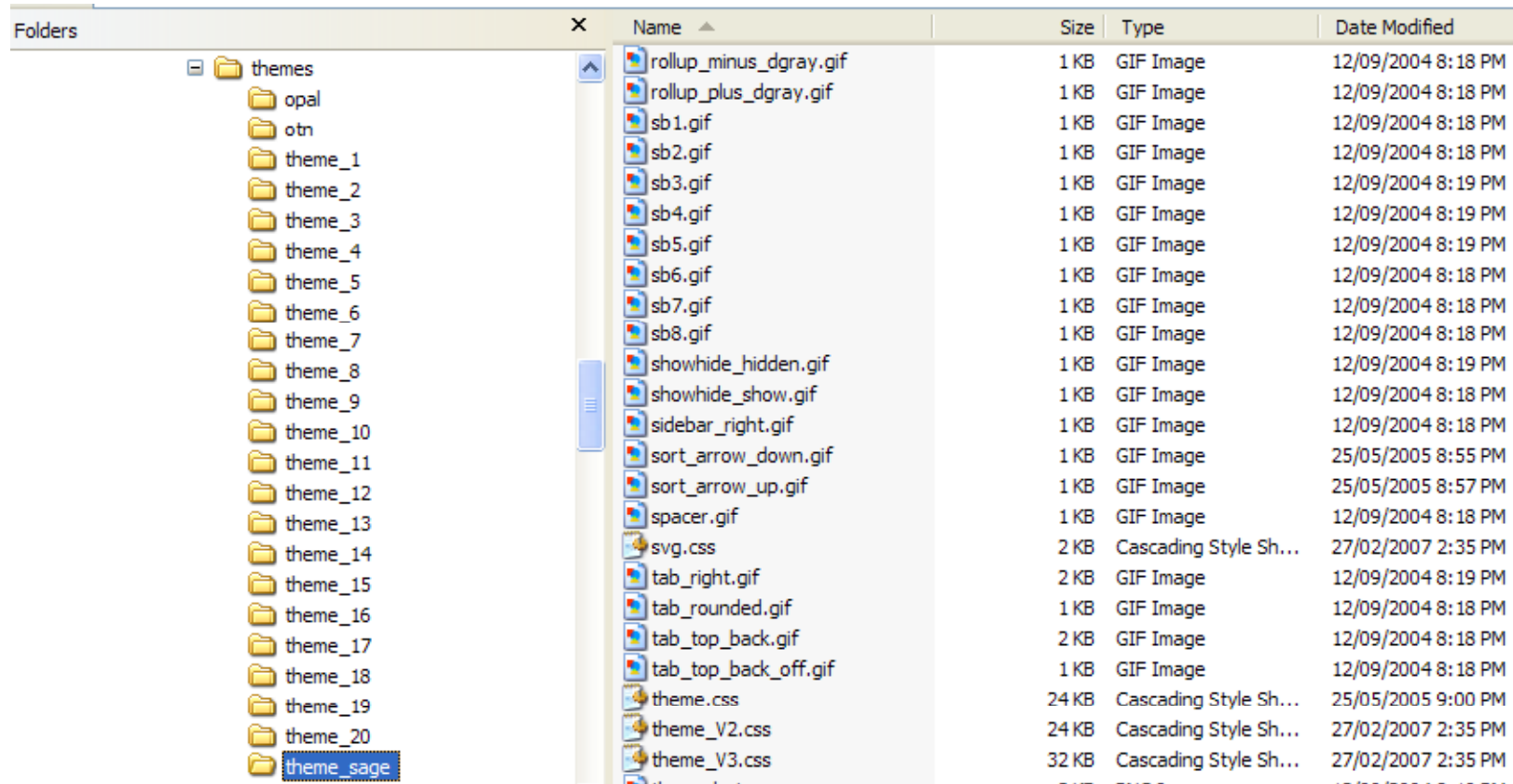
```
<html lang="#BROWSER_LANGUAGE.">
<head>
<title>#TITLE#</title>
<link rel="stylesheet" href="#IMAGE_PREFIX#themes/theme_10/theme_V3.css" type="text/css" />
<link rel="stylesheet" href="#IMAGE_PREFIX#themes/theme_10/sage_styles.css" type="text/css"
/>
```

- Refer to the style in custom text

```
Source
Region Source
<div class="SageHomePageTitle">Welcome to the Timesheet Application</div>
```


Themes and Templates

- Copy the theme directory structure that most closely matches your requirements

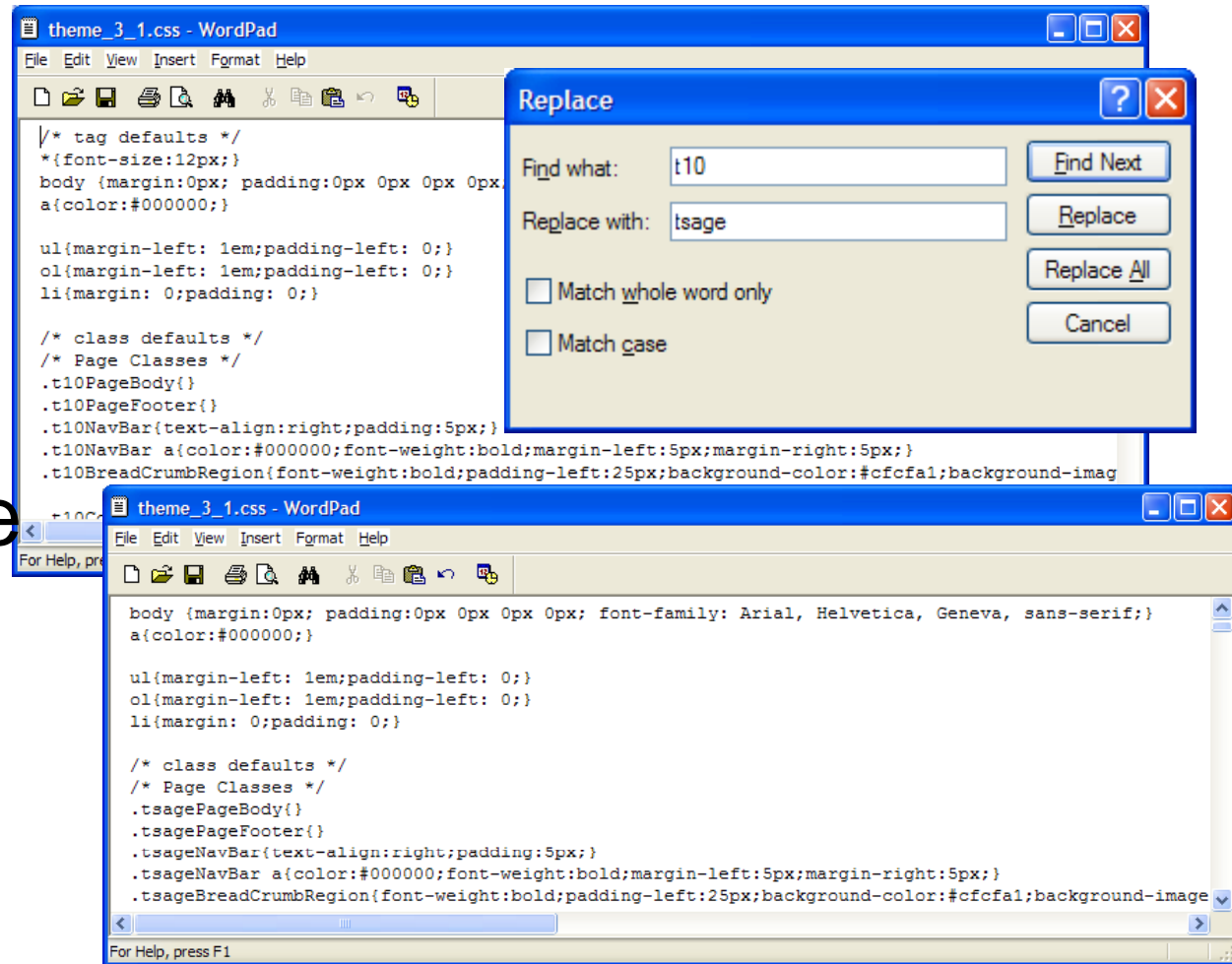


Folders	Name	Size	Type	Date Modified
themes	rollup_minus_dgray.gif	1 KB	GIF Image	12/09/2004 8:18 PM
opal	rollup_plus_dgray.gif	1 KB	GIF Image	12/09/2004 8:18 PM
otn	sb1.gif	1 KB	GIF Image	12/09/2004 8:18 PM
theme_1	sb2.gif	1 KB	GIF Image	12/09/2004 8:18 PM
theme_2	sb3.gif	1 KB	GIF Image	12/09/2004 8:19 PM
theme_3	sb4.gif	1 KB	GIF Image	12/09/2004 8:19 PM
theme_4	sb5.gif	1 KB	GIF Image	12/09/2004 8:19 PM
theme_5	sb6.gif	1 KB	GIF Image	12/09/2004 8:18 PM
theme_6	sb7.gif	1 KB	GIF Image	12/09/2004 8:18 PM
theme_7	sb8.gif	1 KB	GIF Image	12/09/2004 8:18 PM
theme_8	showhide_hidden.gif	1 KB	GIF Image	12/09/2004 8:19 PM
theme_9	showhide_show.gif	1 KB	GIF Image	12/09/2004 8:18 PM
theme_10	sidebar_right.gif	1 KB	GIF Image	12/09/2004 8:18 PM
theme_11	sort_arrow_down.gif	1 KB	GIF Image	25/05/2005 8:55 PM
theme_12	sort_arrow_up.gif	1 KB	GIF Image	25/05/2005 8:57 PM
theme_13	spacer.gif	1 KB	GIF Image	12/09/2004 8:18 PM
theme_14	svg.css	2 KB	Cascading Style Sh...	27/02/2007 2:35 PM
theme_15	tab_right.gif	2 KB	GIF Image	12/09/2004 8:19 PM
theme_16	tab_rounded.gif	1 KB	GIF Image	12/09/2004 8:18 PM
theme_17	tab_top_back.gif	2 KB	GIF Image	12/09/2004 8:18 PM
theme_18	tab_top_back_off.gif	1 KB	GIF Image	12/09/2004 8:18 PM
theme_19	theme.css	24 KB	Cascading Style Sh...	25/05/2005 9:00 PM
theme_20	theme_V2.css	24 KB	Cascading Style Sh...	27/02/2007 2:35 PM
theme_sage	theme_V3.css	32 KB	Cascading Style Sh...	27/02/2007 2:35 PM

Themes and Templates

- Edit the stylesheet for the current Apex version

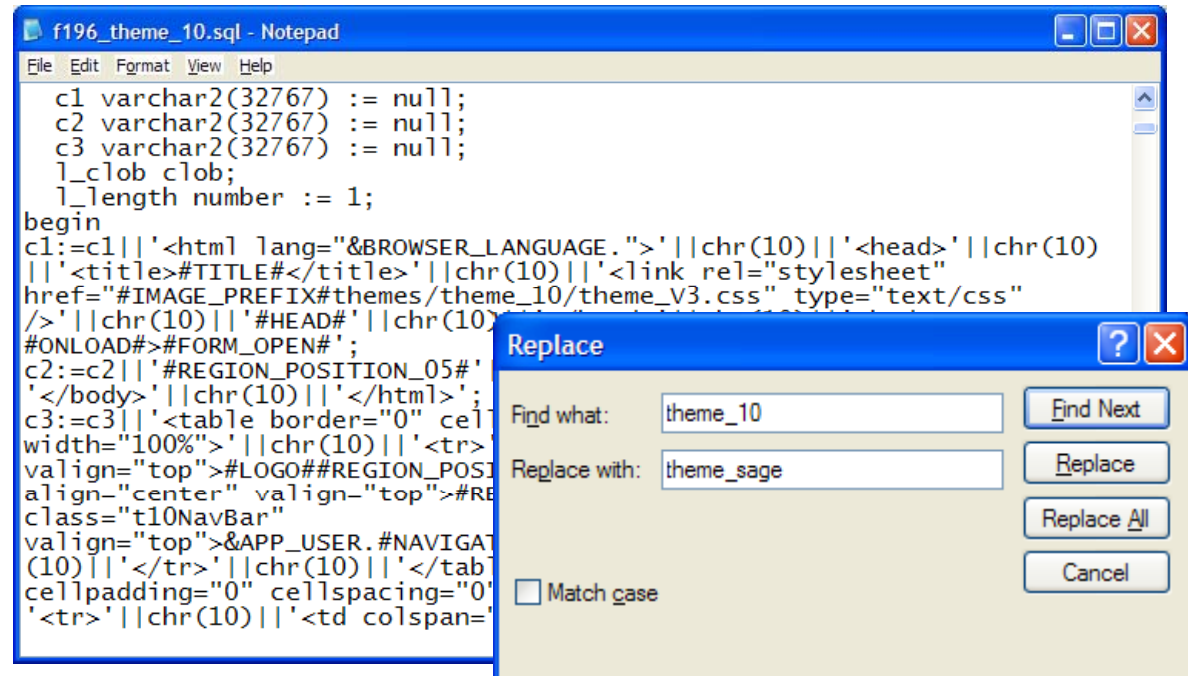
Replace all instances of the old theme name with your custom name



Themes and Templates

- Export the standard Apex theme you are using to a file

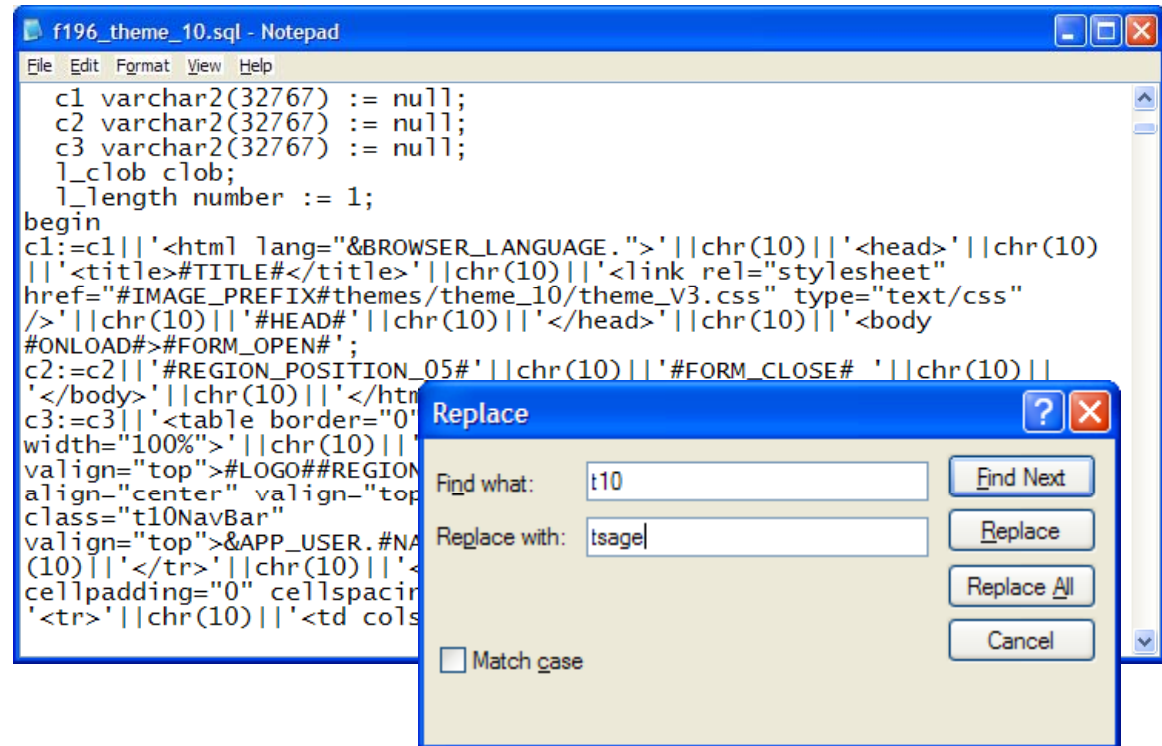
Replace any references to the original theme directory with your custom directory



Themes and Templates

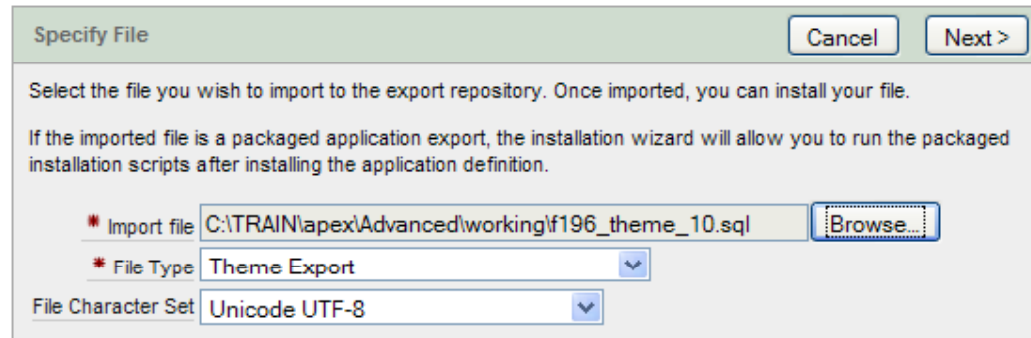
- Export the standard Apex theme you are using to a file

Replace all references to t10 with tsage



Themes and Templates

- Import the edited theme file



Specify File

Cancel Next >

Select the file you wish to import to the export repository. Once imported, you can install your file.

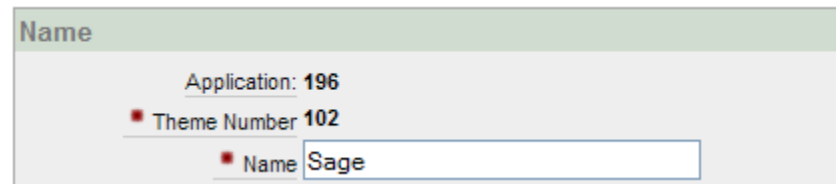
If the imported file is a packaged application export, the installation wizard will allow you to run the packaged installation scripts after installing the application definition.

* Import file C:\TRAIN\apex\Advanced\working\196_theme_10.sql Browse...

* File Type Theme Export

File Character Set Unicode UTF-8

- Edit the theme and changes its name



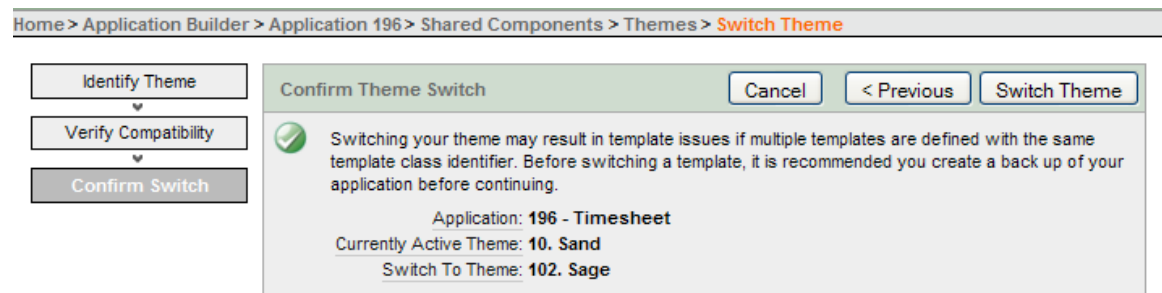
Name

Application: 196

* Theme Number 102

* Name Sage

- Switch to the new theme



Home > Application Builder > Application 196 > Shared Components > Themes > Switch Theme

Identify Theme

Verify Compatibility

Confirm Switch

Confirm Theme Switch

Cancel < Previous Switch Theme

Switching your theme may result in template issues if multiple templates are defined with the same template class identifier. Before switching a template, it is recommended you create a back up of your application before continuing.

Application: 196 - Timesheet

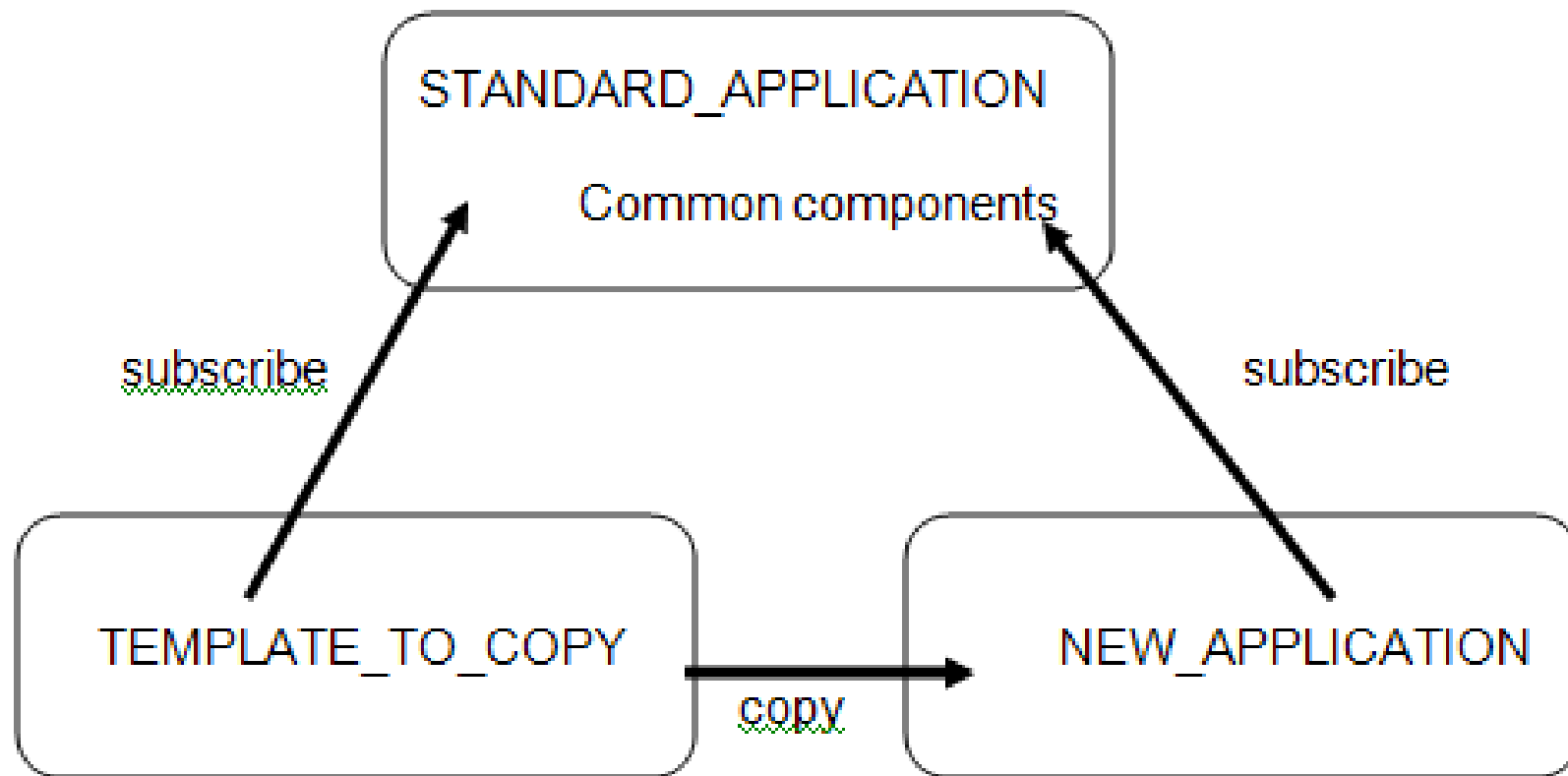
Currently Active Theme: 10. Sand

Switch To Theme: 102. Sage

Security

- Do a security audit before releasing to test
- Use bind variables to avoid SQL injection
- Escape all uploaded data
- Use session state protection
 - Do not allow application items to be changed from the URL
 - Use checksums on pages
- Do not use embedded PL/SQL gateway for internet apps
- Use runtime only environment
- Use 0 session id for public applications
- Use report to check password items
- Consider DB features such as VPD and encryption

Standard Application



Creating a Standard Application

- Create STANDARD_APPLICATION.
- Add all common components that can be subscribed to
- Copy STANDARD_APPLICATION to TEMPLATE_TO_COPY
- Subscribe the objects in TEMPLATE_TO_COPY to those in STANDARD_APPLICATION
- Add any components that cannot use subscribe to the TEMPLATE_TO_COPY application

Example

A Standard and Template_to_copy
application

Check Your Application

- Use Patrick Wolf's Apex essentials to check the application
- www.oracleapex.info



SAGE Computing Services

Consulting and customised training workshops

Questions?

Presentations are available from our website:

www.sagecomputing.com.au

enquiries@sagecomputing.com.au

penny@sagecomputing.com.au



SAGE Computing Services

(Unrepentant Marketing)

Register for the Next

Application Express V3.2 course:

23rd ,25th and 26th November

Advanced course:

8th – 9th December

Call in at the Sage Computing Services exhibition booth, or contact Penny

penny@sagecomputing.com.au

0419904458