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APEX 23.1
Native Push Notifications

+

Easy Background Processing

Steve Muench
APEX Dev Team
April 21st, 2023



A Career Dedicated to Oracle App Dev Tools...

1990

SQL*Forms Support Engineer

Oracle Forms PM

Project Sedona PM

ADF BC PM

OraMag

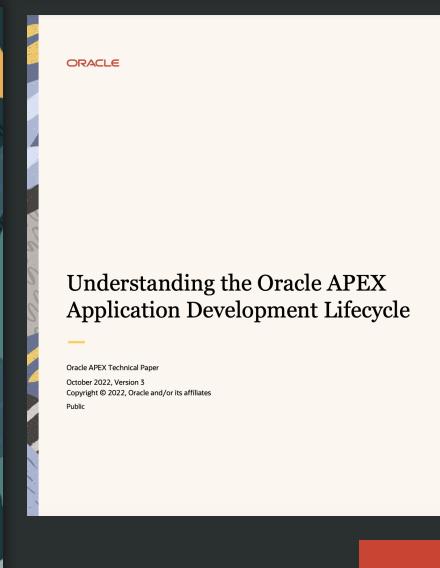
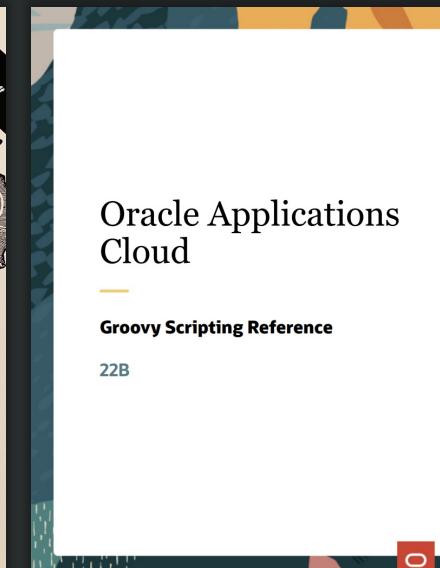
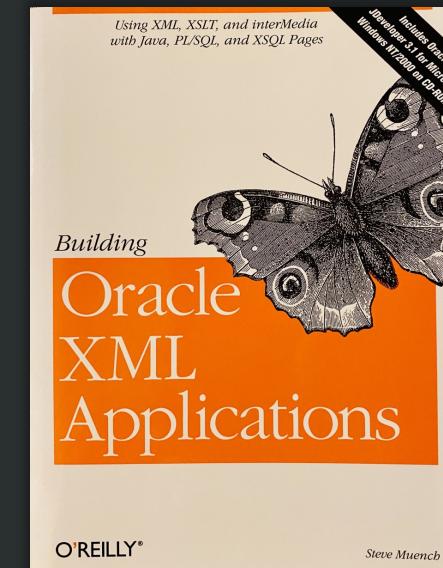
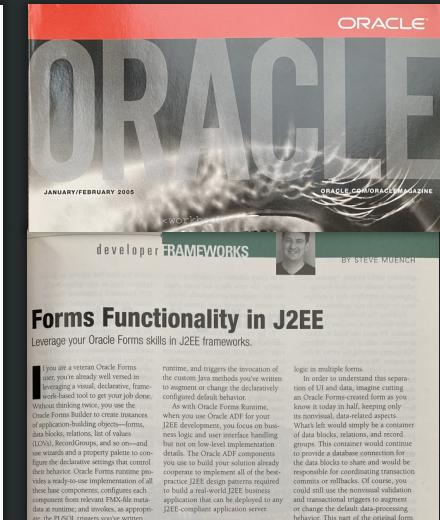
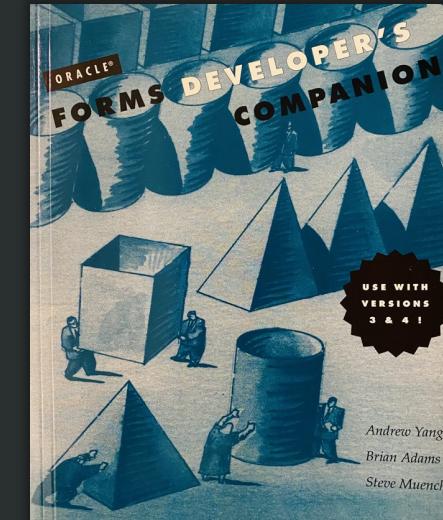
XML

ADF Developer/Architect

Oracle APEX
Architect

UC Berkeley, BA Math, Dec 1989

2021



New Feature Highlights in APEX 23.1

- **Send native push notifications to mobile and desktop subscribers**
- **Organize page processes into groups and easily run in the background**
- Create UI components using only templating skills for reuse in Page Designer
- Invoke REST APIs declaratively as page processes
- Configure REST data sources automatically from an OpenAPI 3 description
- Modernized Object Browser with persistent, filterable object tree

New Feature Highlights in APEX 23.1

- Improvements to context-sensitive help in the APEX App Builder
- Plugins can support 25 attributes (up from 15)
- Copy pages from the Create Page Wizard
- One-click, secure access to SQL Developer Web
- Save and run application without closing modal code editor
- New color picker
- And many smaller enhancements

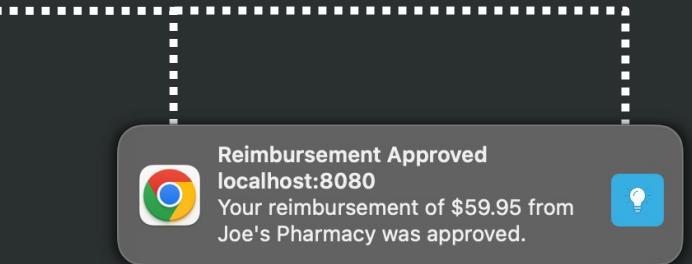
APEX 23.1

Native Push Notifications

What are Push Notifications?



- Device-specific alert messages...
- Sent by an infrastructure platform on behalf of an app
- To a user who has opted-in to receive them
- Which arrive even if app is closed or device is locked, but
- Whose *visualization* is affected by device-specific user prefs
- And *delivery* can be delayed by "Do Not Disturb" prefs.
- They can open an appropriate app when clicked/tapped on
- Work well with *PWA-installed* apps and *persistent authentication*, but not dependent on them



One-Click Enabling of Push Notifications for a New App

Screenshot of the Oracle APEX App Builder interface showing the creation of a new application.

Header: APEX, App Builder, SQL Workshop, Team Development, Gallery, User Profile (steve demo).

Section: Create an Application

- Icon:** Lightbulb icon.
- Name:** Amazing APEX App
- Appearance:** Vita, Side Menu

Pages: Add Page, Home, Blank, Edit.

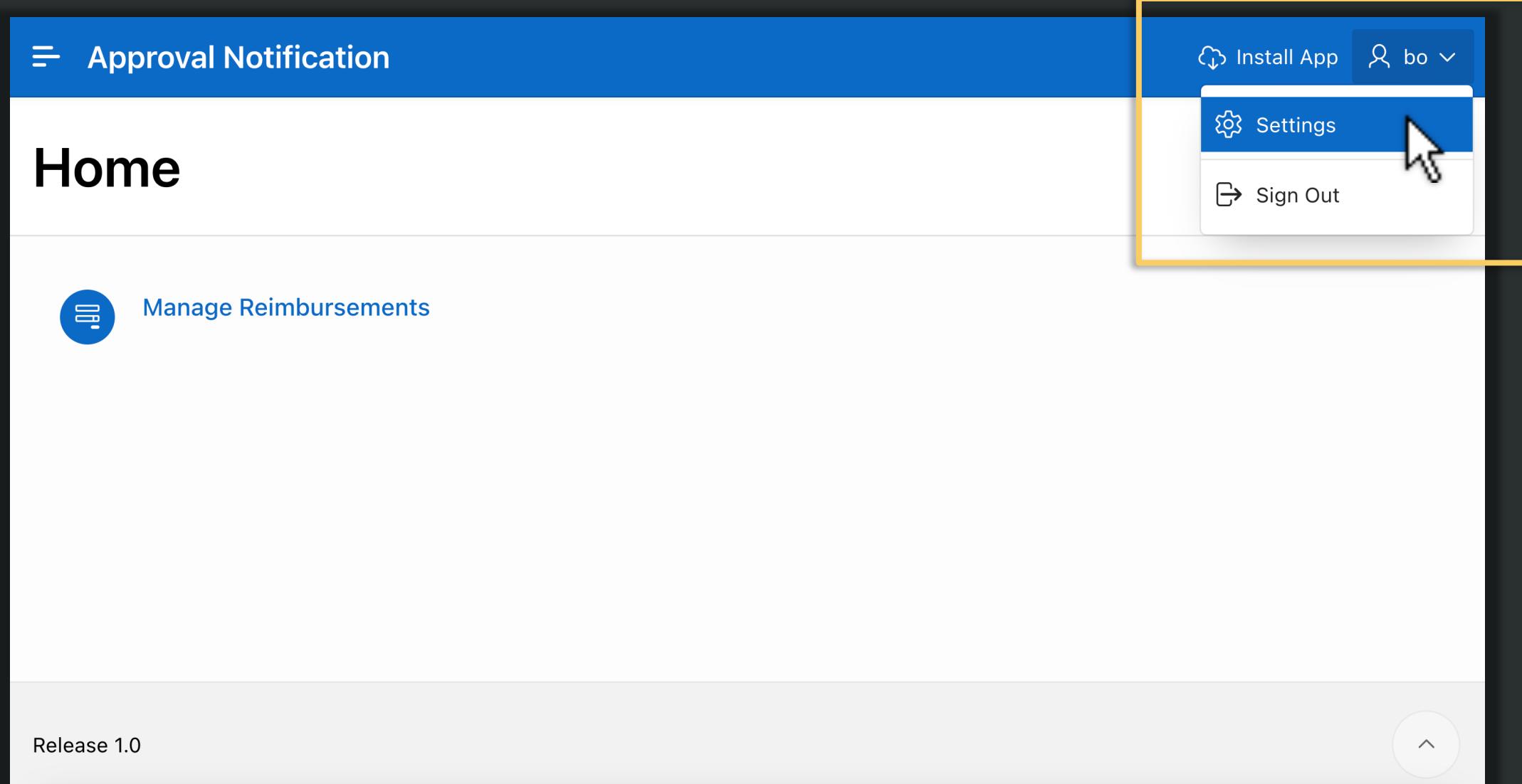
Features: Check All

- Install Progressive Web App** Give your app the ability to be installed
- Access Control** Enable role-based user authorization
- Push Notifications** Allow users to receive push notifications
- About Page** Add about this application page
- Activity Reporting** Include user activity and error reports
- Configuration Options** Enable or disable application features

Buttons: Cancel, Create Application.

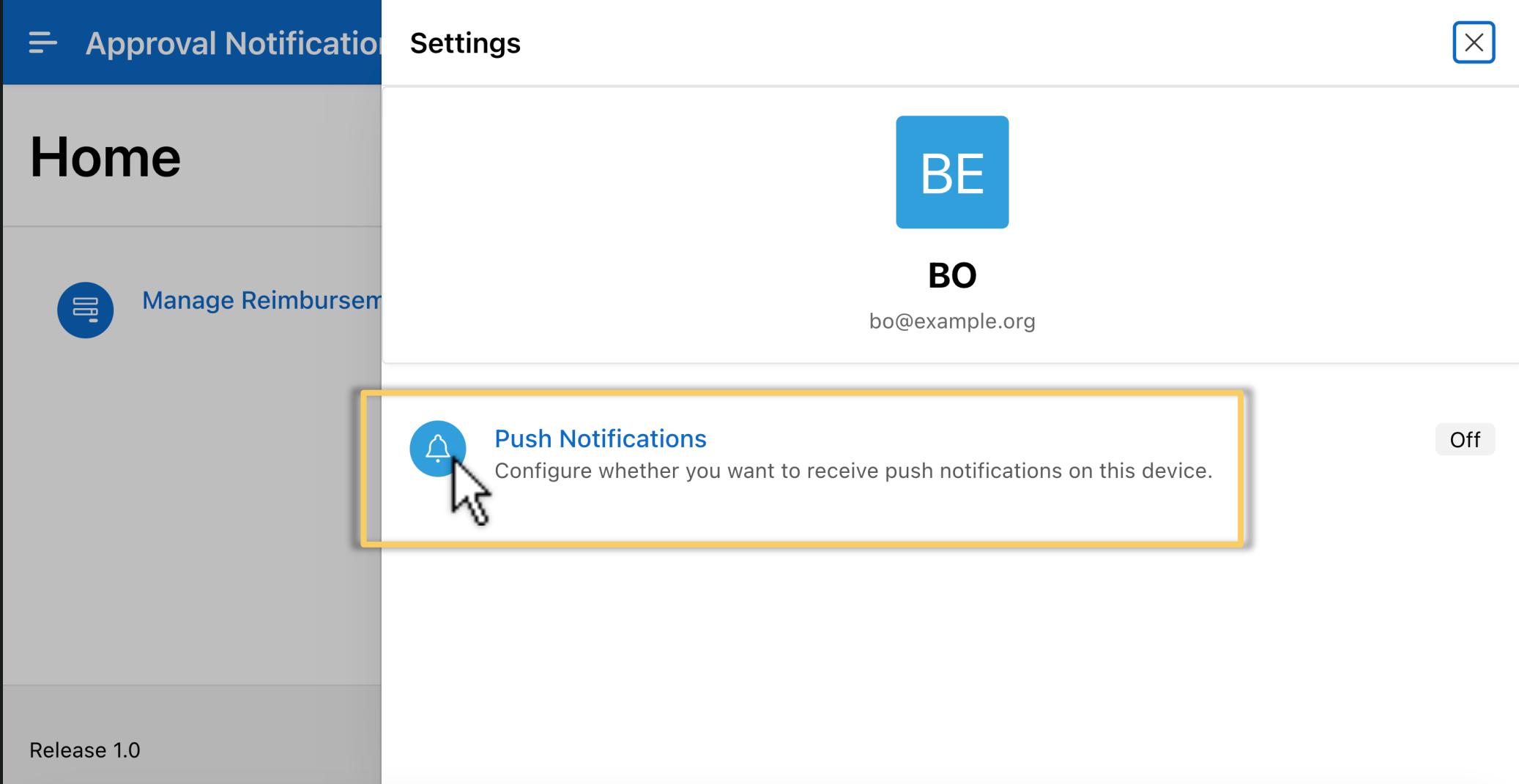
A yellow box highlights the "Push Notifications" feature, and a cursor points to its checkbox.

New User Settings Navigation Bar List Entry



The screenshot shows a mobile application interface with a dark background. At the top, a blue navigation bar contains the text "Approval Notification" and a three-line menu icon. Below the bar, the word "Home" is displayed in a large, bold, black font. On the left side of the main content area, there is a blue circular icon with a white document icon and the text "Manage Reimbursements" next to it. At the bottom of the screen, the text "Release 1.0" is visible. In the top right corner, there is a user profile icon with the letters "bo" and a dropdown menu. This menu is highlighted with a yellow border and contains three items: "Install App", "Settings" (which is the item currently being selected, indicated by a cursor icon), and "Sign Out".

Others User Settings In the Future, or Add Your Own



Approval Notifications Settings X

Home

Manage Reimbursement Requests BE

BO
bo@example.org

Push Notifications Off

Configure whether you want to receive push notifications on this device.

Release 1.0

End Users Opt-in on Each Device to Receive Notifications

≡ Approval Notifications

Home

Manage Reimbursement Requests

Release 1.0

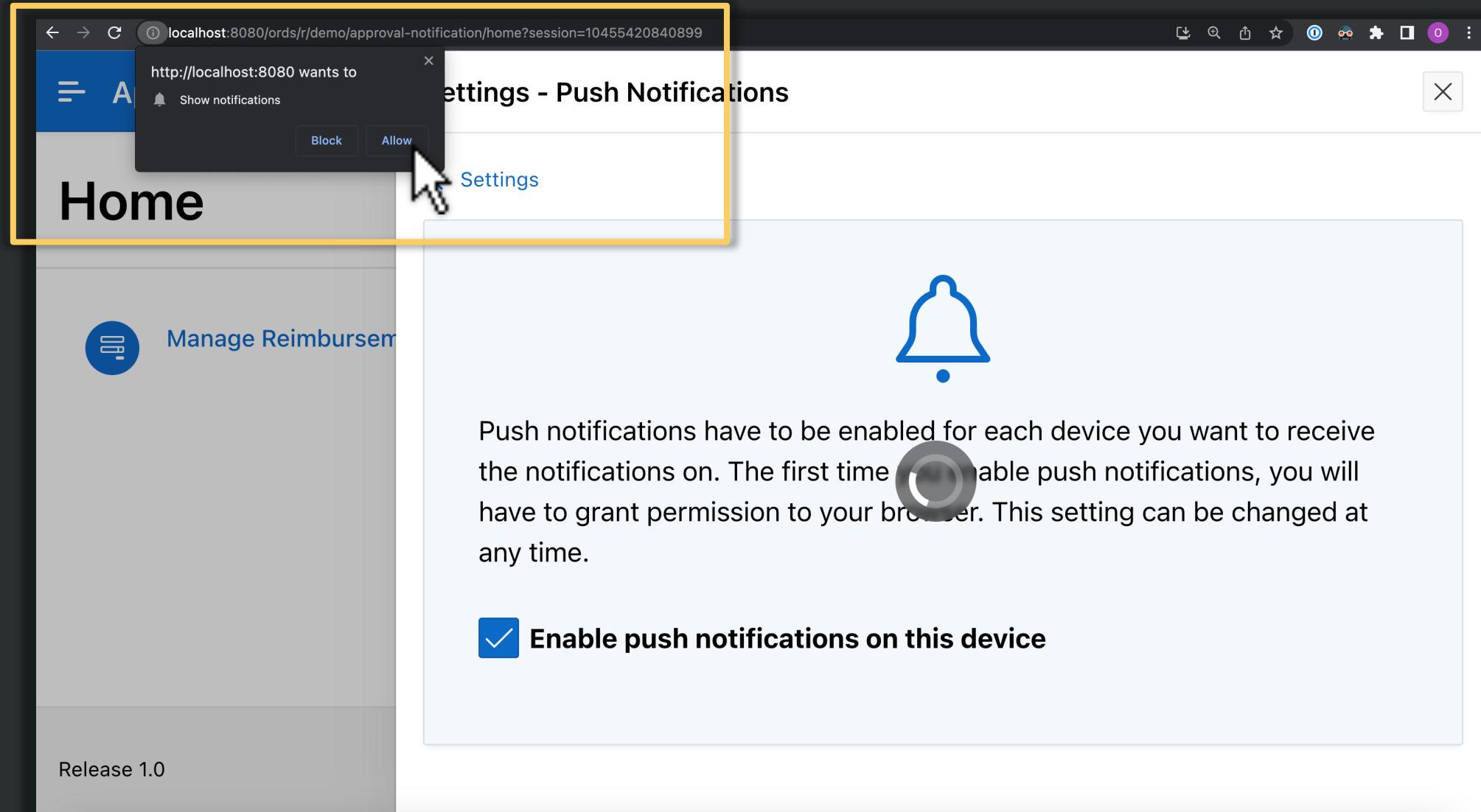
Settings - Push Notifications

◀ Settings

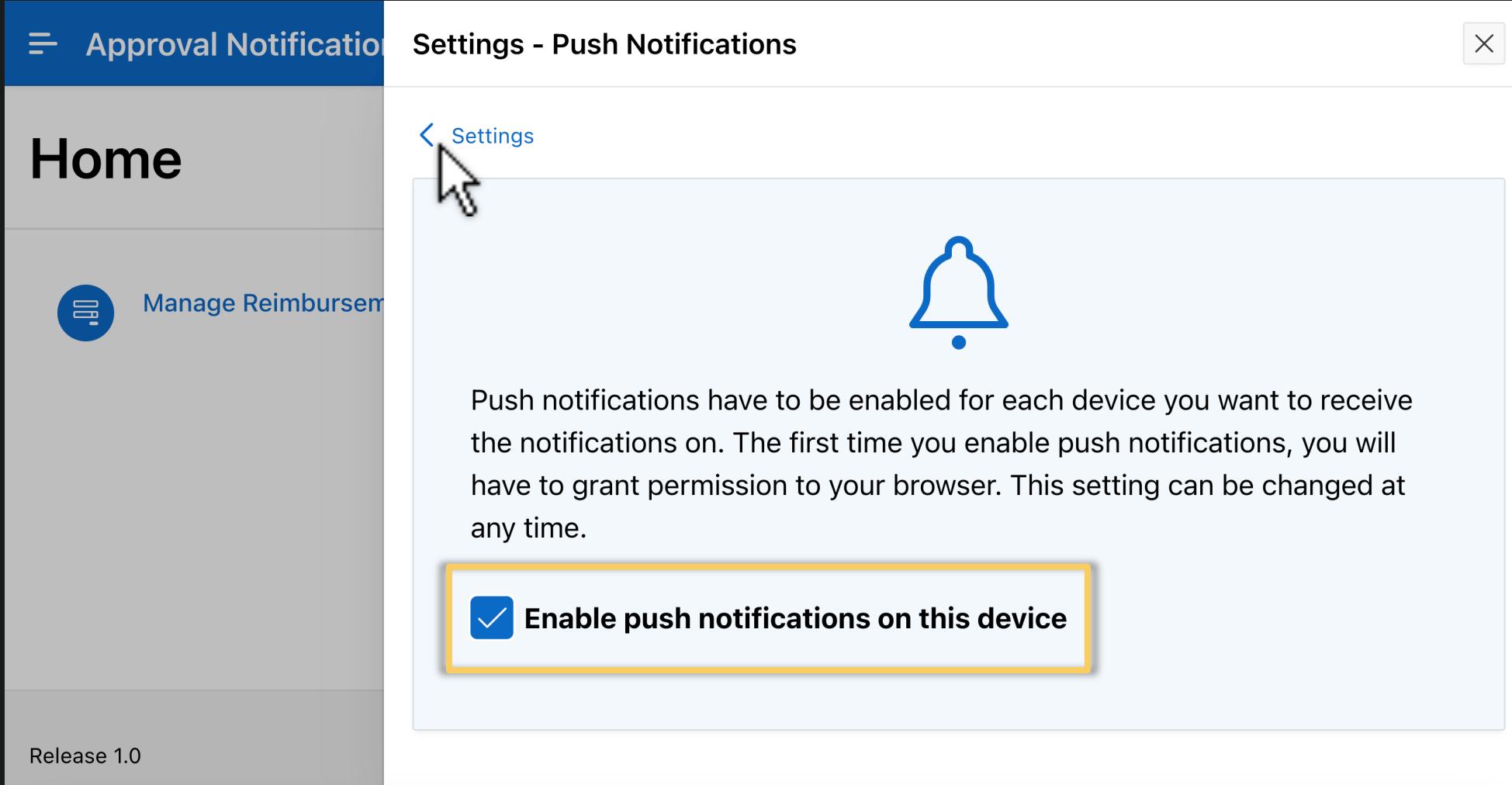
 Push notifications have to be enabled for each device you want to receive the notifications on. The first time you enable push notifications, you will have to grant permission to your browser. This setting can be changed at any time.

Enable push notifications on this device

First Time User Must Allow Notifications



User Remains Subscribed for this App Until They Disable



Approval Notifications

Home

Manage Reimbursements

Release 1.0

Settings - Push Notifications

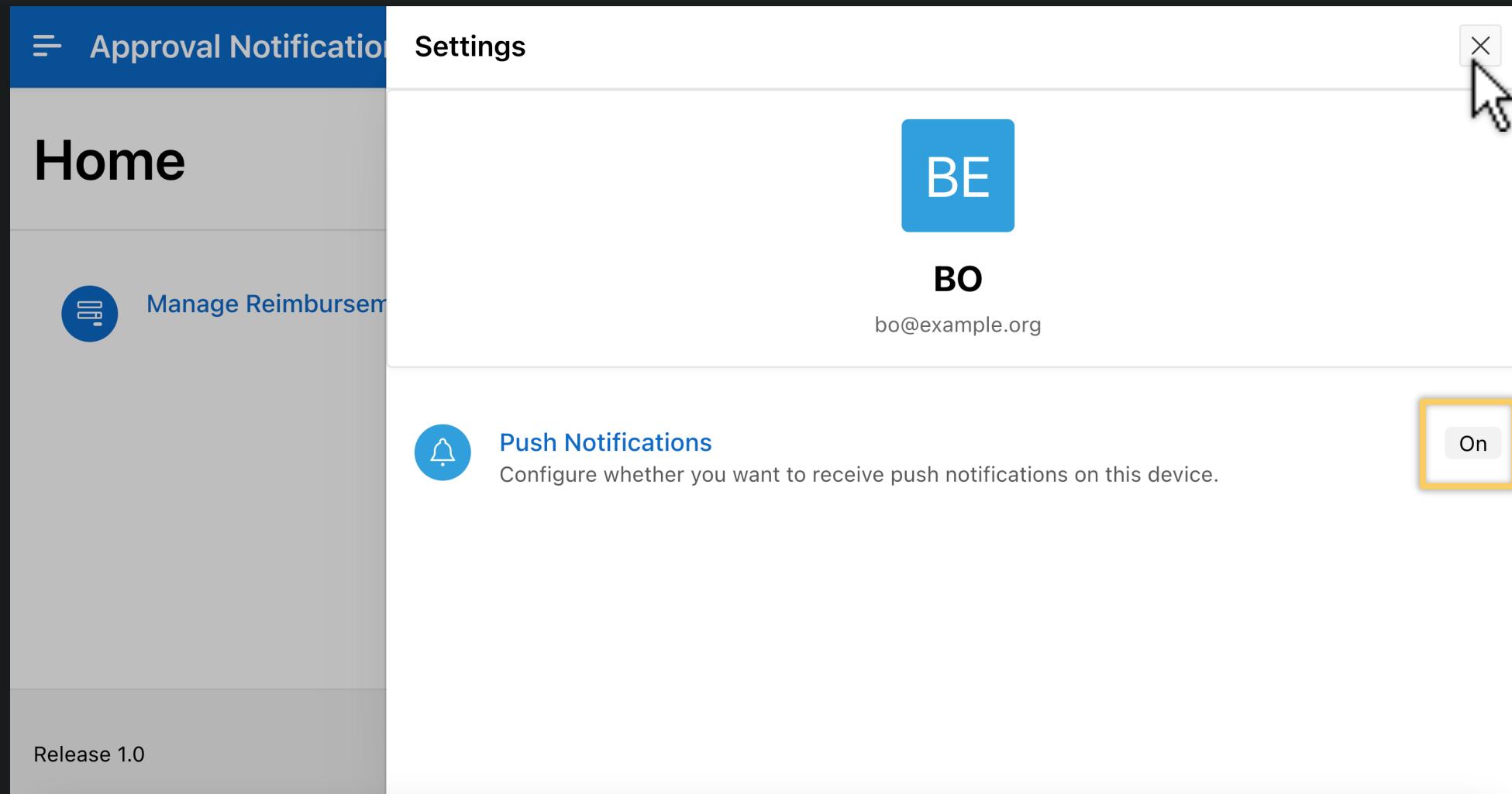
Settings

Enable push notifications on this device

Push notifications have to be enabled for each device you want to receive the notifications on. The first time you enable push notifications, you will have to grant permission to your browser. This setting can be changed at any time.



User Remains Subscribed for this App Until They Disable



Imagine an App for Requesting a Reimbursement...

≡ Approval Notification  bo

Manage Reimbursements

New Reimbursement

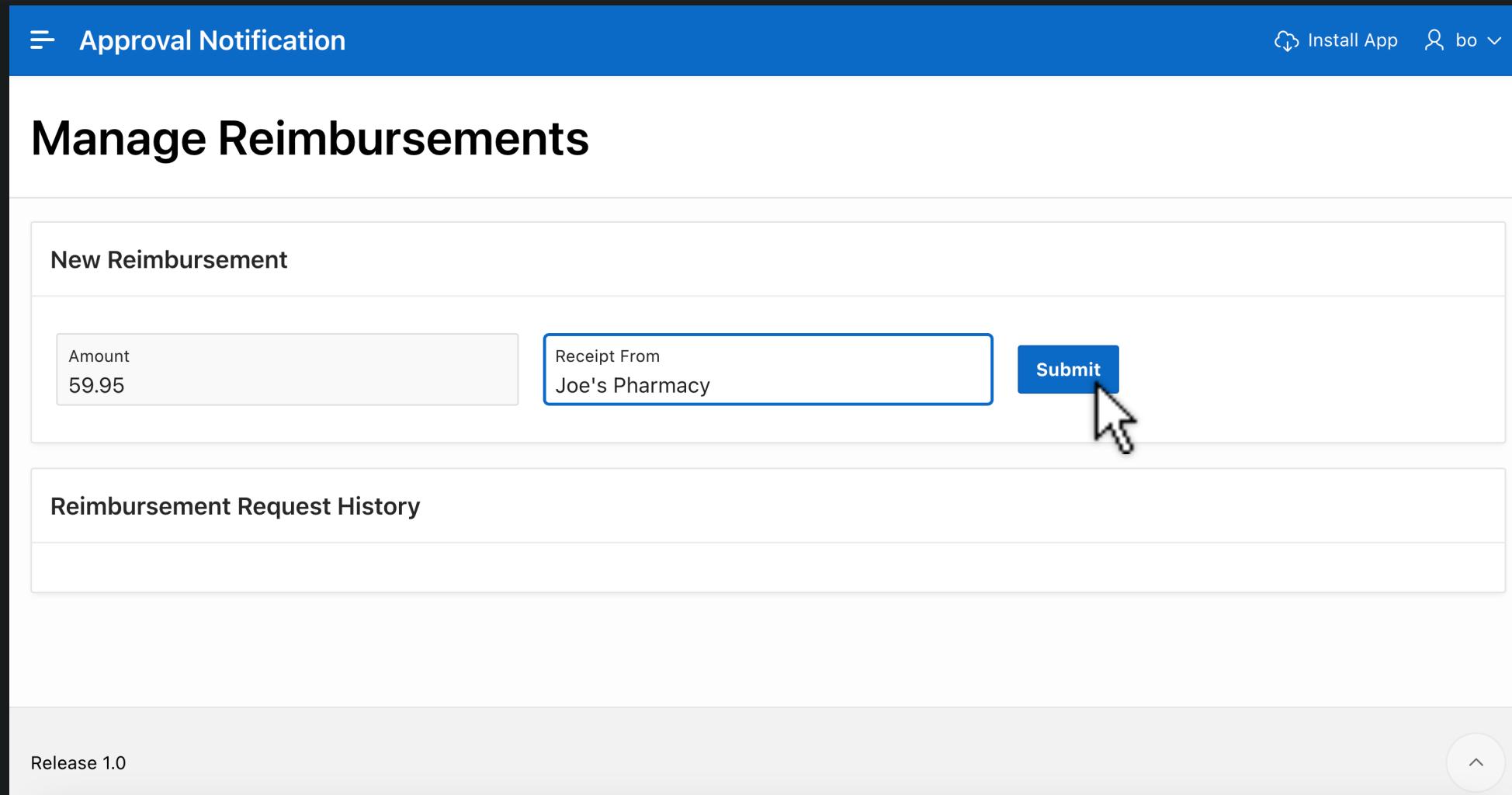
Amount
59.95

Receipt From
Joe's Pharmacy

Submit

Reimbursement Request History

Release 1.0



Imagine an App for Requesting a Reimbursement...

≡ Approval Notification

 Reimbursement request submitted.

Manage Reimbursements

New Reimbursement

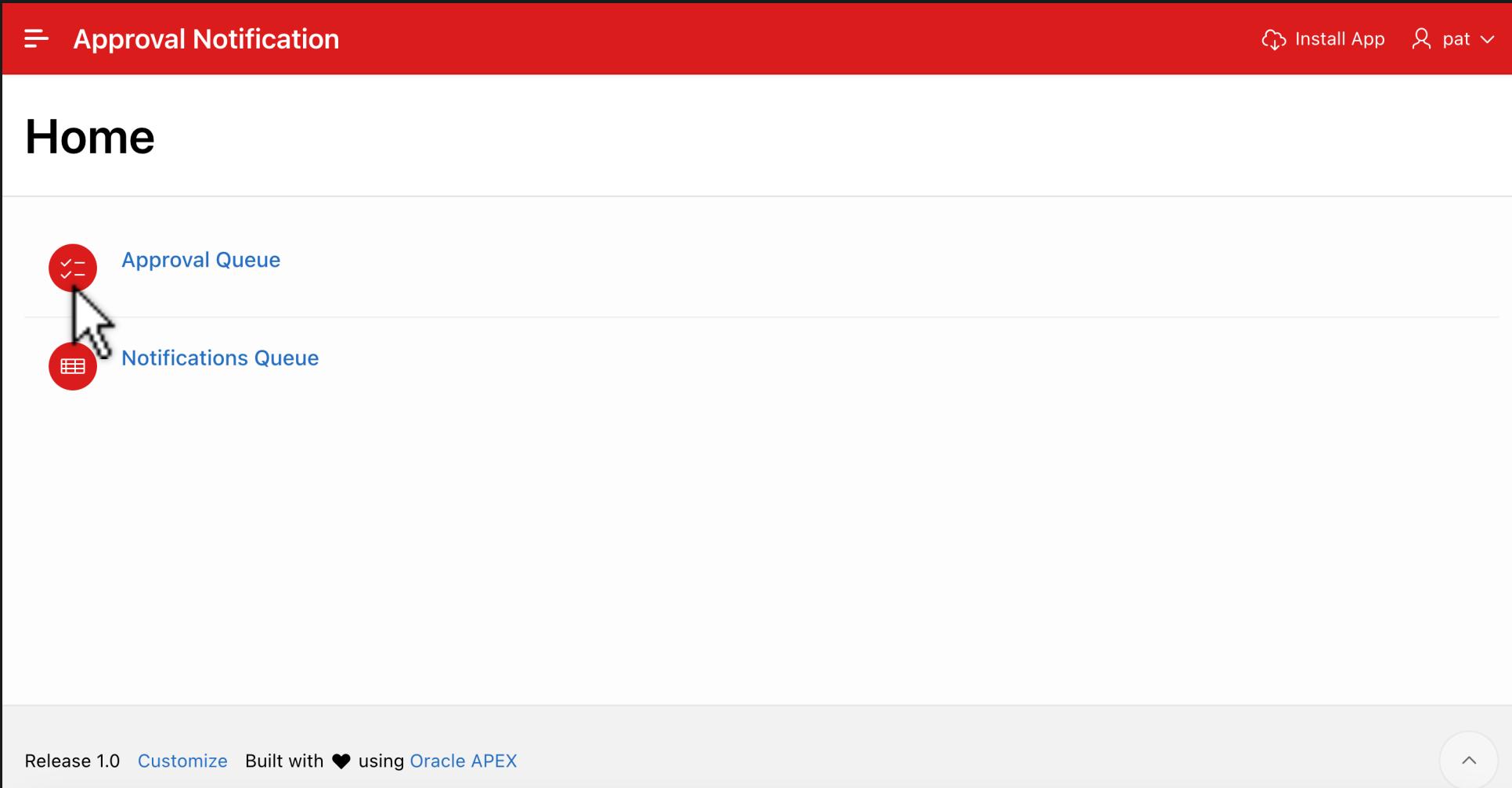
Amount Receipt From **Submit**

Reimbursement Request History

Id	Amount	Status	Receipt From	Created
1	59.95	REVIEWING	Joe's Pharmacy	4/11/2023

1 - 1

Backoffice Staff Member Approves the Request...



The screenshot shows a web application interface with a red header bar. The header contains the text "Approval Notification" on the left and "Install App" with a search icon on the right. Below the header, the word "Home" is displayed in a large, bold, black font. Underneath "Home", there are two red circular buttons with icons: one with a checkmark and a minus sign, and another with a grid. To the right of these buttons, the text "Approval Queue" and "Notifications Queue" is displayed in blue. A cursor arrow is pointing towards the "Approval Queue" button. At the bottom of the page, there is a footer bar with the text "Release 1.0" and "Customize" followed by "Built with ❤ using Oracle APEX". On the far right of the footer, there is a small circular button with an upward arrow and a red square button with a white circle.

Backoffice Staff Member Approves the Request...

≡ Approval Notification Logout pat ↻

Approval Queue

Search...

Due Date ▼ Show expired tasks

Claim for \$59.95 from Joe's Pharmacy by BO
Claim Approval · Initiated by bo

Approve Reject

 A hand cursor icon is positioned over the 'Approve' button, indicating it is the target of a click action.

Release 1.0 [Customize](#) Built with ❤ using [Oracle APEX](#)



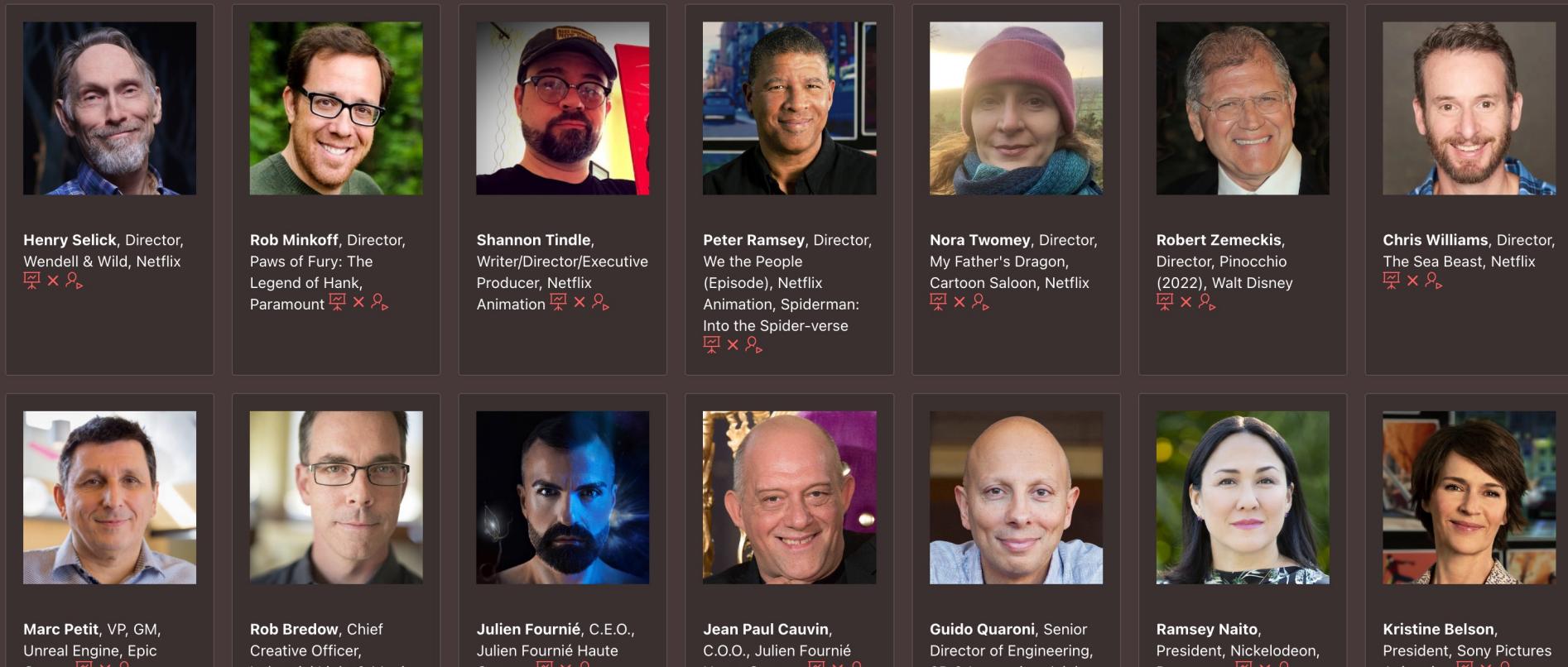
User Gets Notified Even if Relevant APEX App's Not Open

Conference - Speaker Lineup

VIEW Conference 2022

Home Sessions Speakers **Speaker Lineup** Speaker List Session Schedule Edition Speakers Bulk Setup

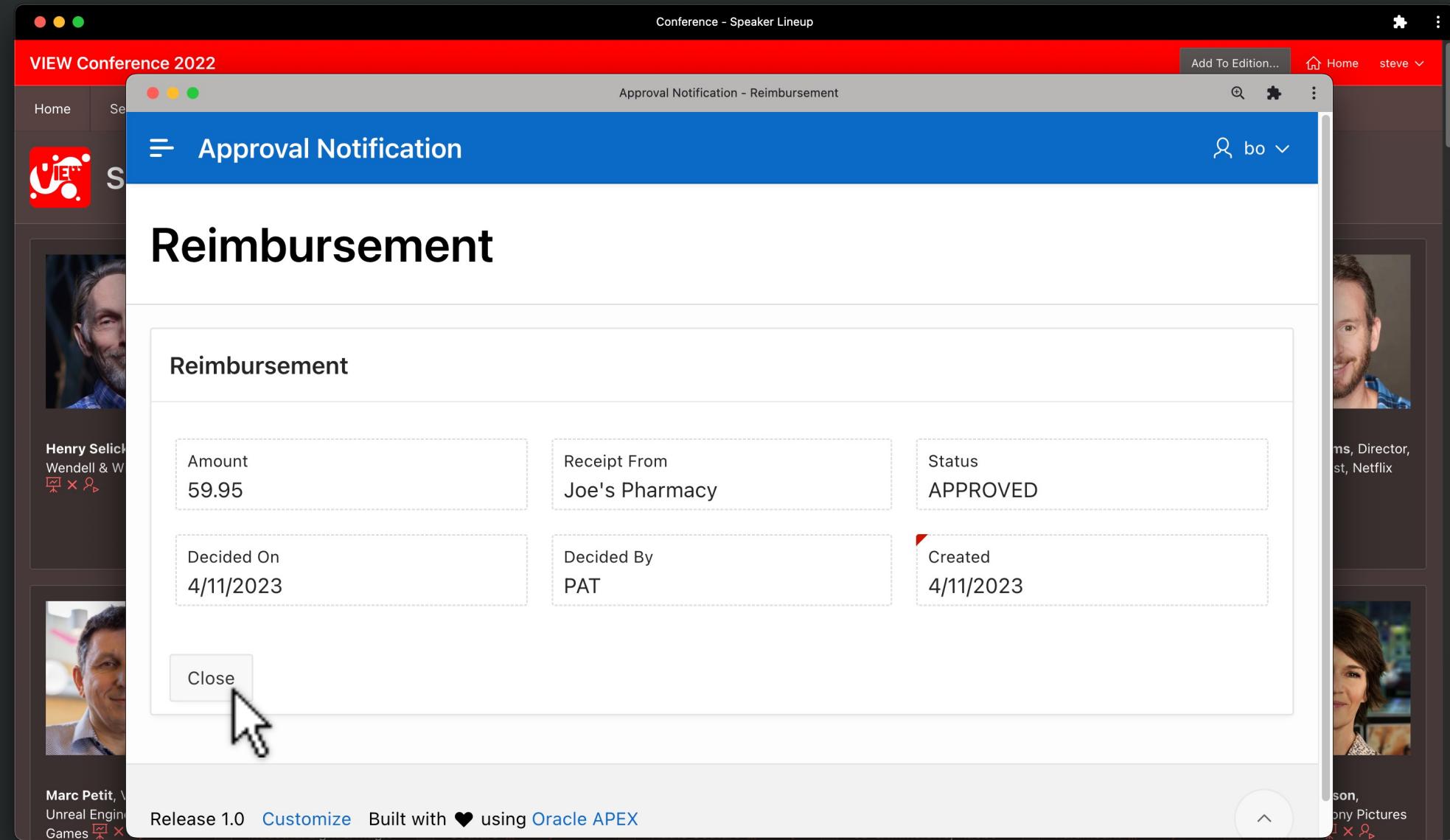
Speaker Lineup



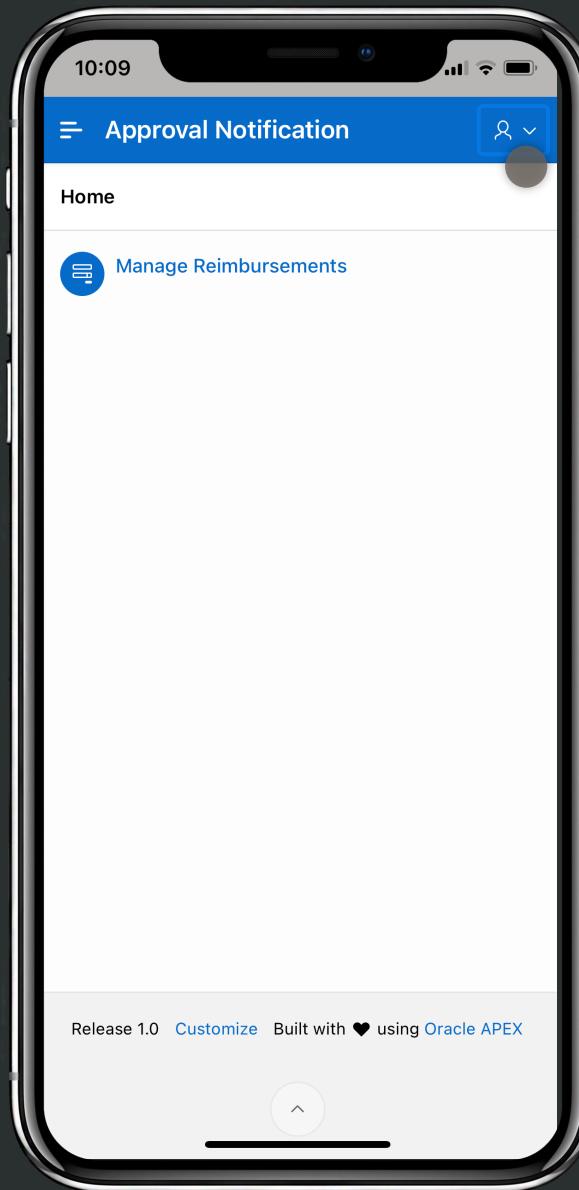
Reimbursement Approved
localhost:8080
Your reimbursement of \$59.95 from
Joe's Pharmacy was approved.

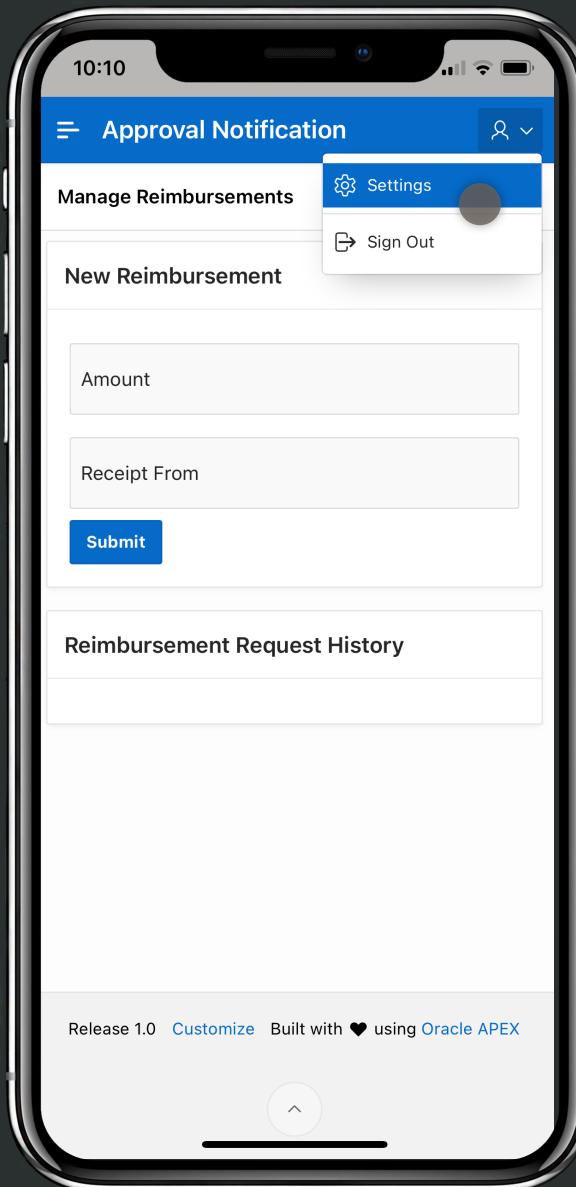
Clicking the Notification Opens App & Shows Detail



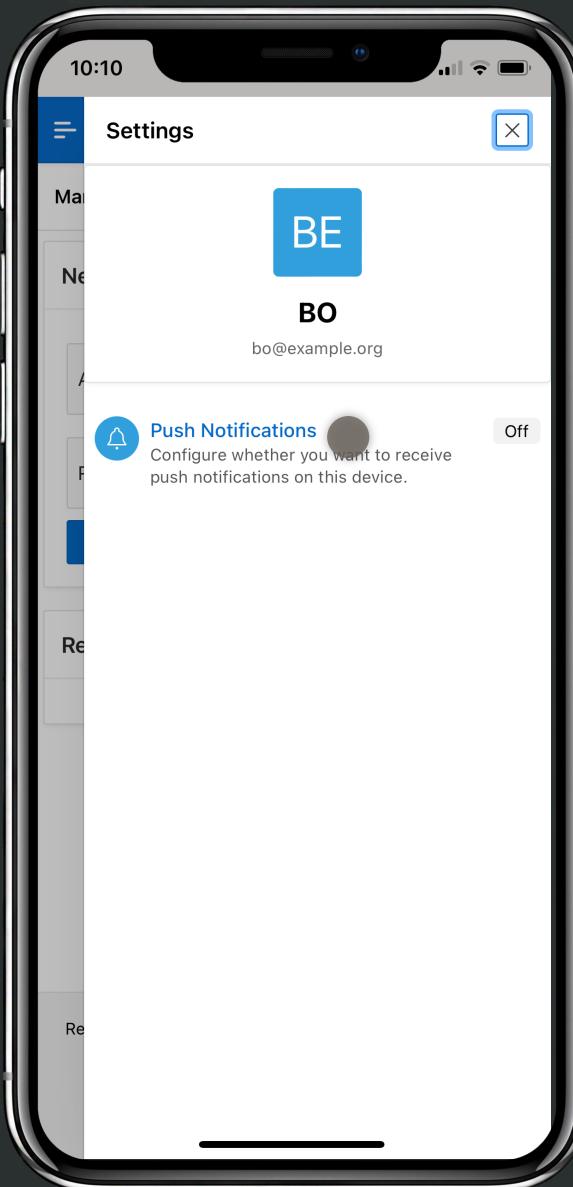
Same APEX App Works as PWA on Mobile Devices



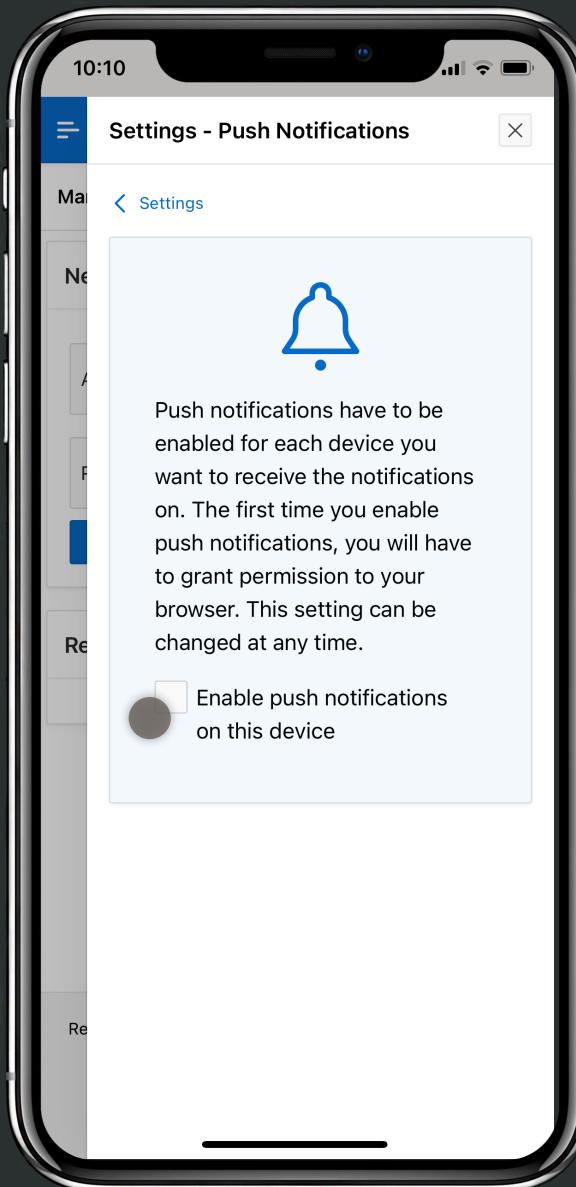
User Has to Opt-in to Push Notifications on Each Device



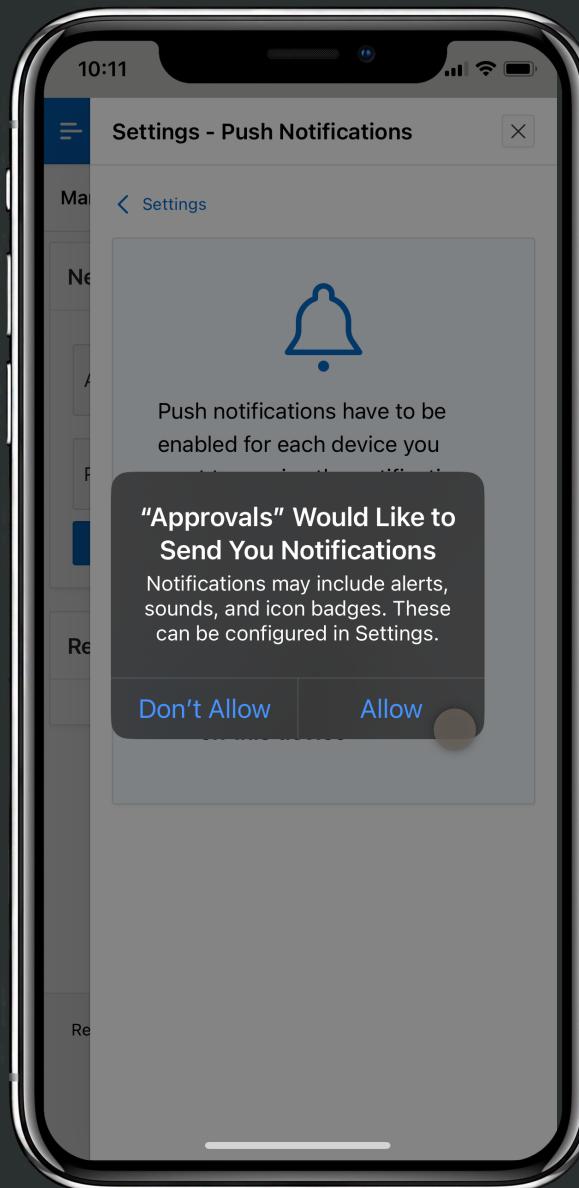
User Has to Opt-in to Push Notifications on Each Device



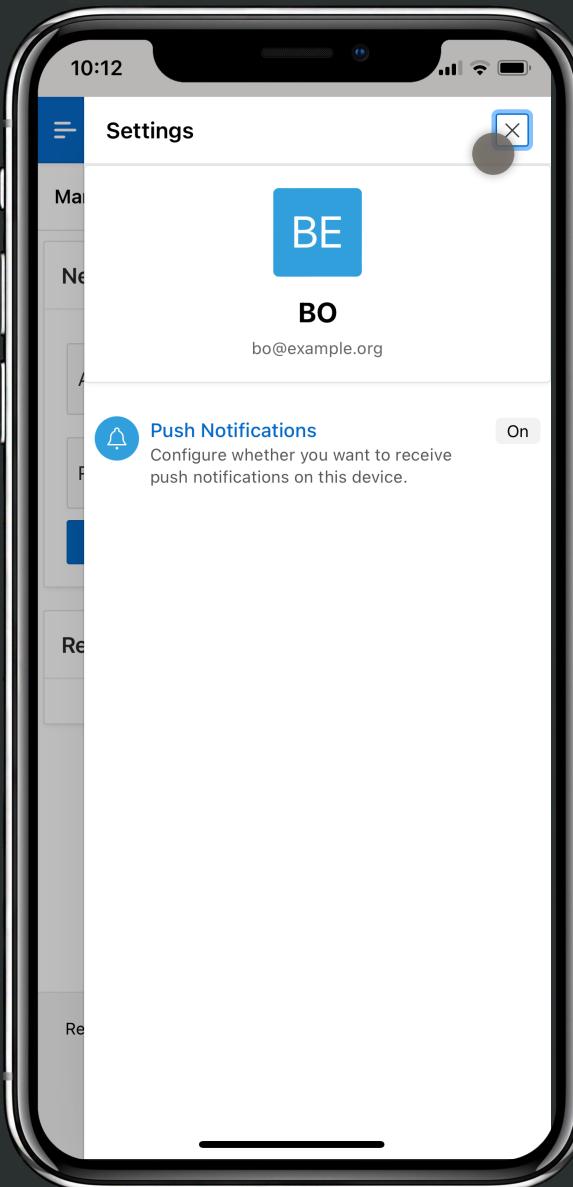
User Has to Opt-in to Push Notifications on Each Device



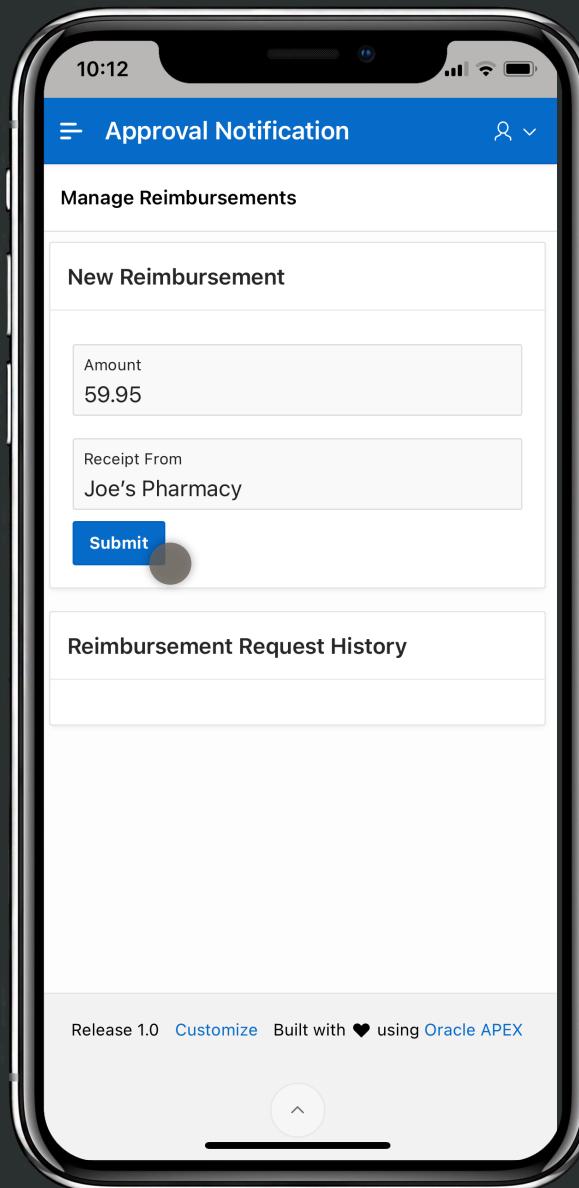
Device Asks User to Allow the Subscription



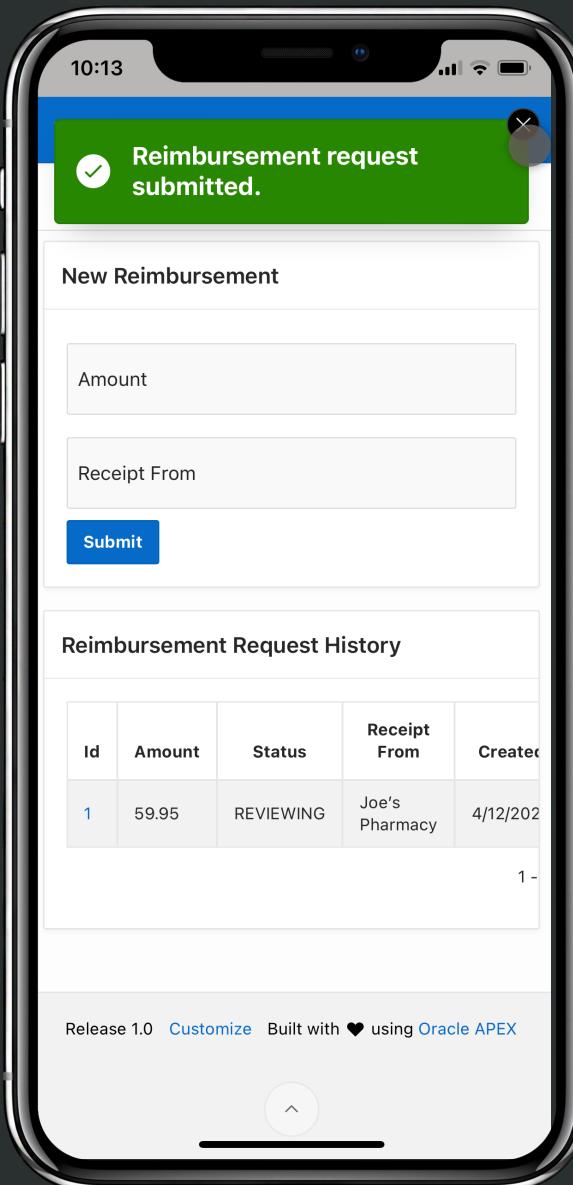
User Remains Subscribed for this App Until They Disable



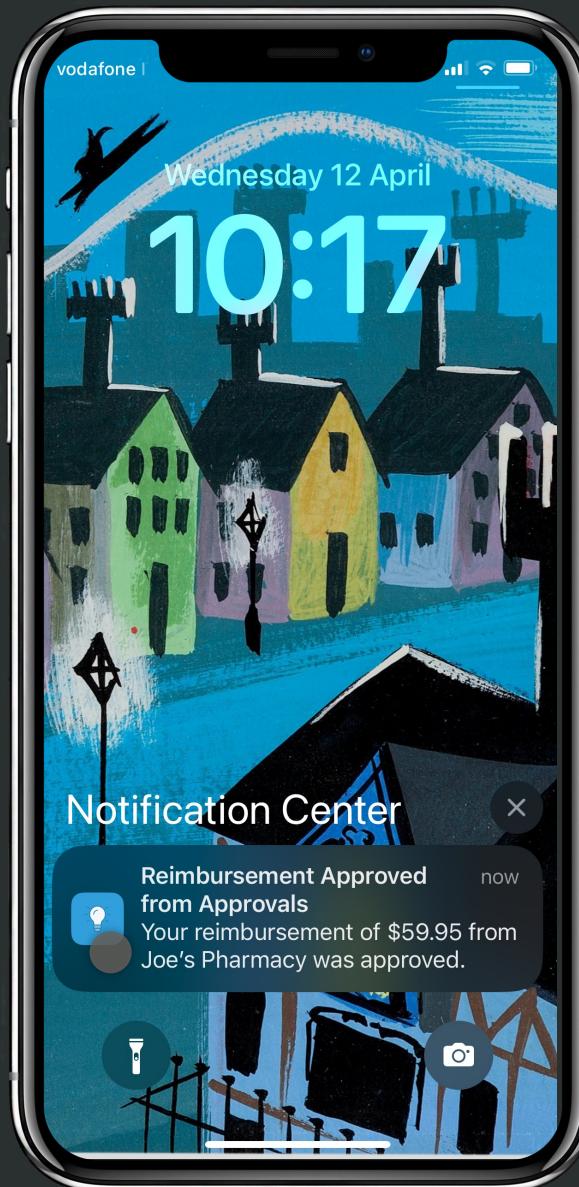
Submitting an Reimbursement Request from iPhone



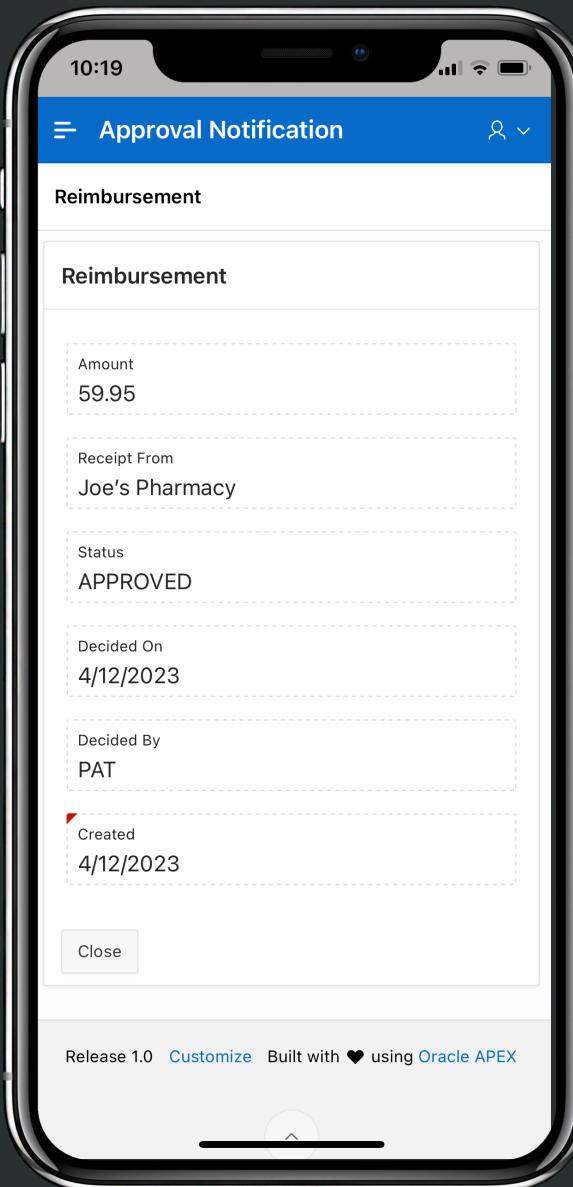
Submitting an Reimbursement Request from iPhone



Once Reimbursement is Approved, User Gets Notified



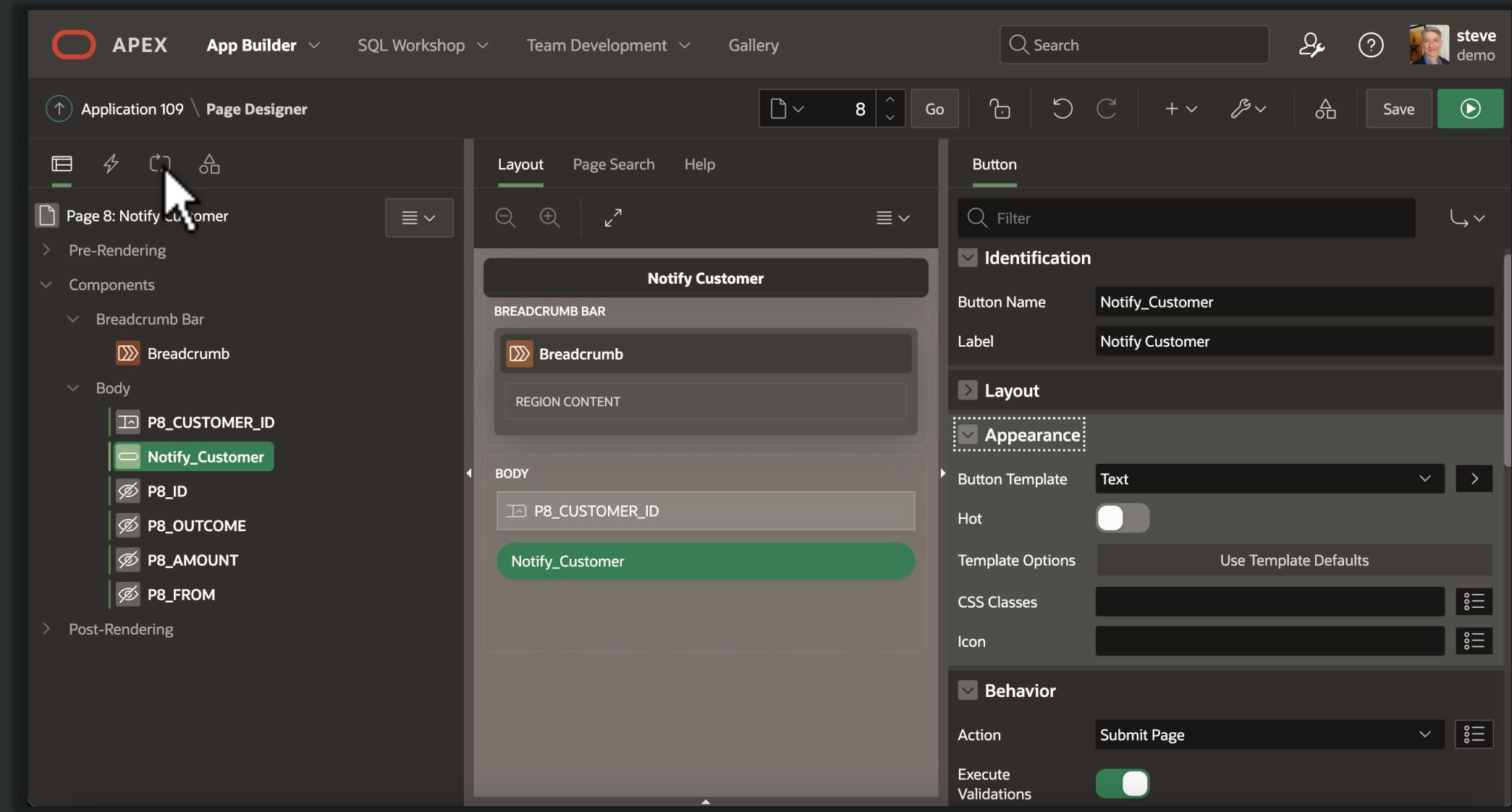
Tapping the Notification Opens App & Shows Detail



Benefits Natively from All Device Notification Features

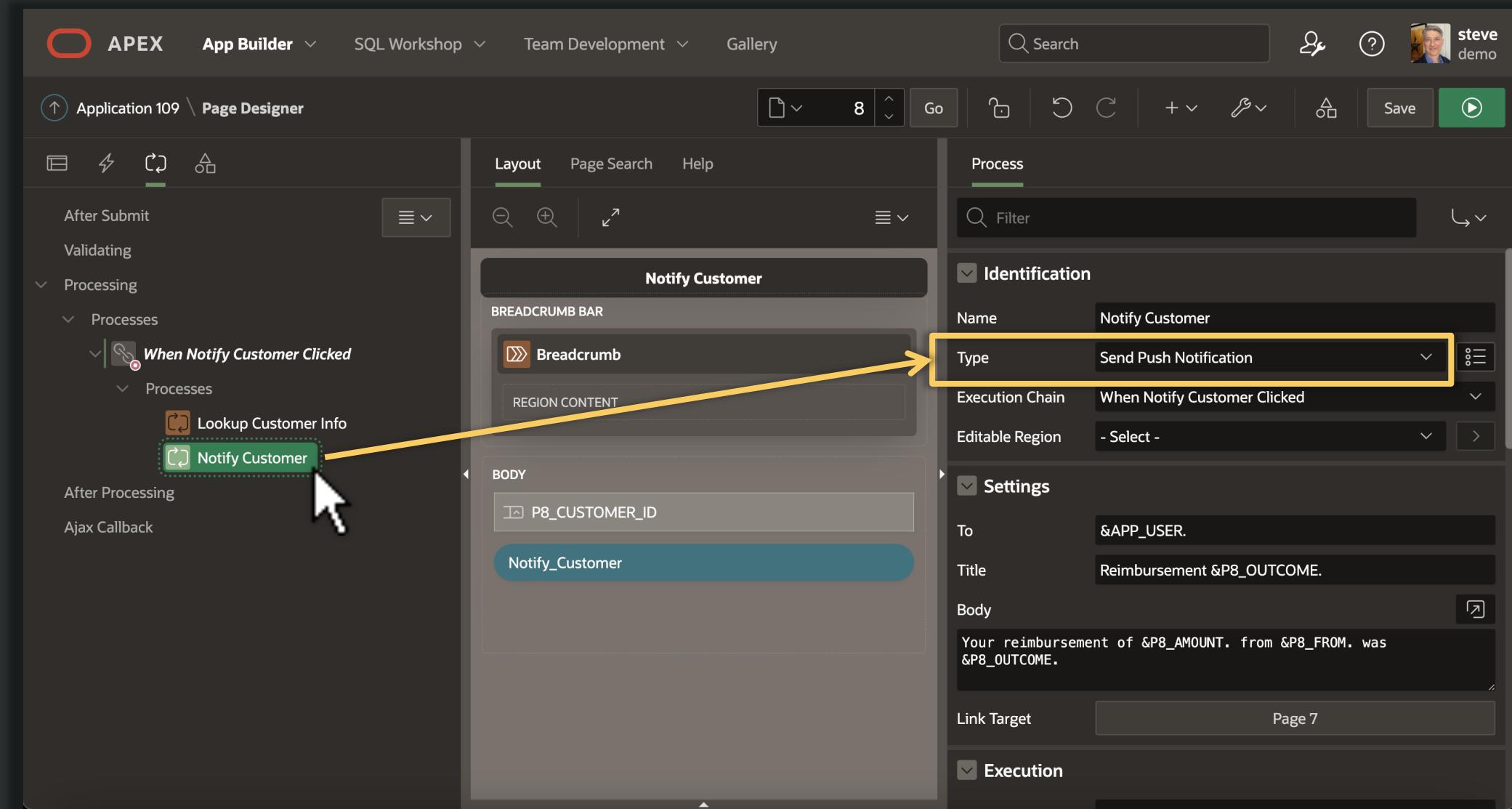


Sending Push Notifications: Page Process



The screenshot shows the Oracle APEX App Builder Page Designer interface. The top navigation bar includes links for APEX, App Builder, SQL Workshop, Team Development, and Gallery, along with a search bar and user profile for 'steve demo'. The main area is titled 'Application 109 \ Page Designer' and shows the structure of 'Page 8: Notify Customer'. The left sidebar lists components: Pre-Rendering, Components (Breadcrumb Bar, Breadcrumb), Body (P8_CUSTOMER_ID, Notify_Customer, P8_ID, P8_OUTCOME, P8_AMOUNT, P8_FROM), and Post-Rendering. The central workspace displays a page layout with a 'Notify Customer' title, a breadcrumb region, and a body region containing a text input field for 'P8_CUSTOMER_ID' and a green button labeled 'Notify_Customer'. The right sidebar is the 'Button' configuration panel, which is expanded to show the 'Identification', 'Layout', 'Appearance', and 'Behavior' sections. The 'Identification' section shows 'Button Name: Notify_Customer' and 'Label: Notify Customer'. The 'Layout' section shows 'Button Template: Text'. The 'Appearance' section shows 'Hot' status as off and 'Template Options: Use Template Defaults'. The 'Behavior' section shows 'Action: Submit Page' and 'Execute Validations' as on. The bottom right corner features a large orange APEX logo.

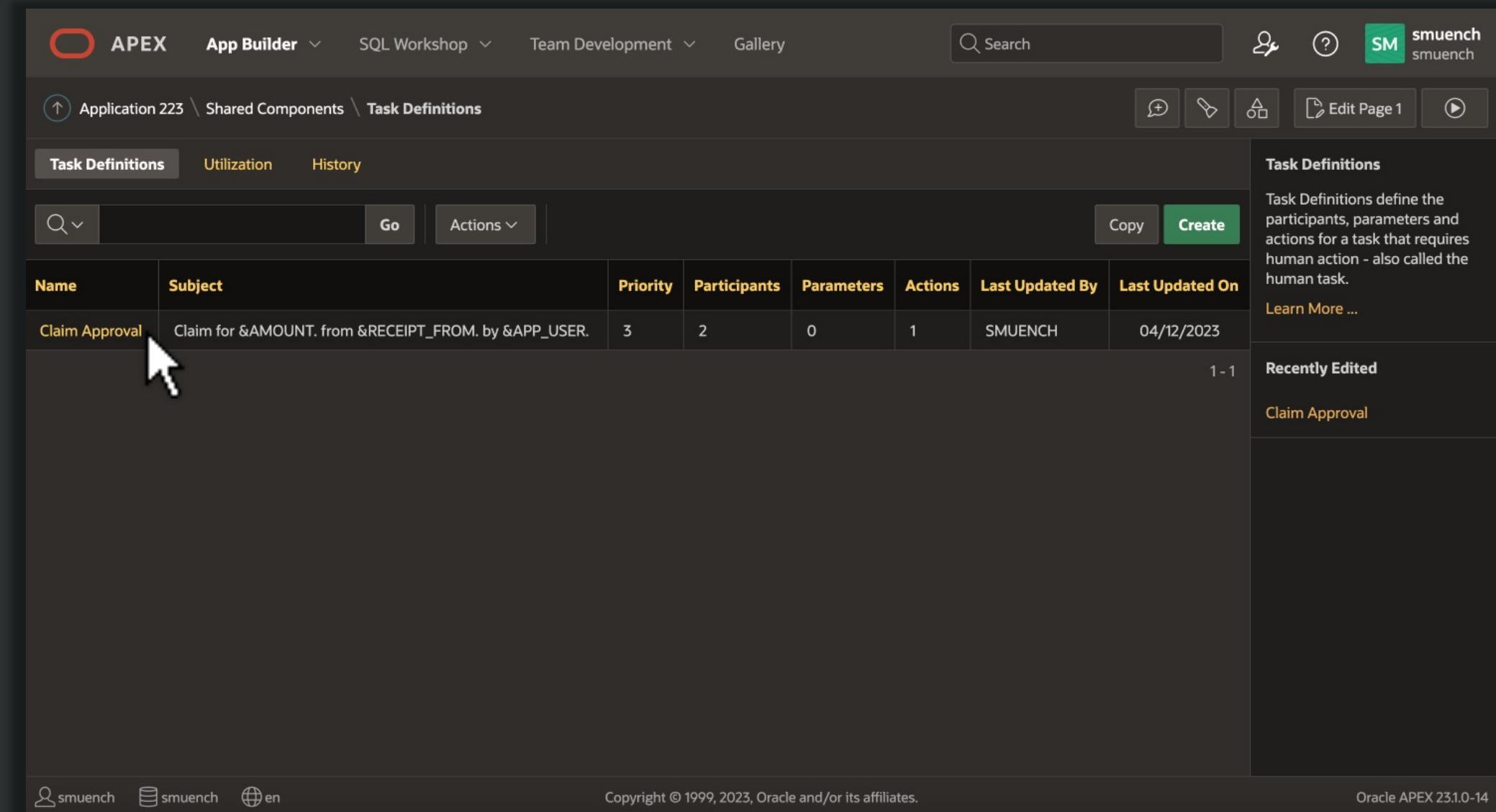
Sending Push Notifications: Page Process



The screenshot shows the Oracle APEX App Builder interface for an application named "Application 109" in "Page Designer". The main area displays a page with a title "Notify Customer" and a region titled "Notify_Customer". The left sidebar shows the process flow: "When Notify Customer Clicked" leads to "Lookup Customer Info" and then "Notify Customer". The "Notify Customer" step is highlighted with a green dashed border and a yellow arrow points from it to the configuration panel on the right. The configuration panel is titled "Process" and shows the following details:

- Name:** Notify Customer
- Type:** Send Push Notification (highlighted with a yellow box)
- Execution Chain:** When Notify Customer Clicked
- Editable Region:** - Select -
- Settings:**
 - To:** &APP_USER.
 - Title:** Reimbursement &P8_OUTCOME.
 - Body:** Your reimbursement of &P8_AMOUNT. from &P8_FROM. was &P8_OUTCOME.
- Link Target:** Page 7
- Execution:** (partial view)

Sending Push Notifications: PL/SQL API from Task Def



The screenshot shows the Oracle APEX interface for managing Task Definitions. The top navigation bar includes links for APEX, App Builder, SQL Workshop, Team Development, and Gallery, along with a search bar and user profile information for smuench.

The current page is 'Task Definitions' under 'Shared Components' for 'Application 223'. The page has tabs for Task Definitions, Utilization, and History, with the Task Definitions tab selected. A search bar and a 'Create' button are visible.

A table displays the following data for a single Task Definition:

Name	Subject	Priority	Participants	Parameters	Actions	Last Updated By	Last Updated On
Claim Approval	Claim for &AMOUNT. from &RECEIPT_FROM. by &APP_USER.	3	2	0	1	SMUENCH	04/12/2023

A tooltip for 'Task Definitions' is displayed on the right side of the table, explaining that they define participants, parameters, and actions for a task requiring human action. It also includes a 'Learn More ...' link.

Below the table, a 'Recently Edited' section shows the 'Claim Approval' task.

Page footer links include smuench, smuench, and en, along with copyright information (Copyright © 1999, 2023, Oracle and/or its affiliates.) and the Oracle APEX version (Oracle APEX 23.1.0-14).

Sending Push Notifications: PL/SQL API from Task Def

The screenshot shows the Oracle APEX interface for managing Task Definitions. The top navigation bar includes links for APEX, App Builder, SQL Workshop, Team Development, and Gallery, along with a search bar and user profile 'smuench'. The page title is 'Task Definition: Claim Approval' under 'Application 223 \ Shared Components \ Task Definitions \ Claim Approval'. The main content area displays the 'Task Definition: Claim Approval' configuration with tabs for Show All, Name, Settings, Deadline, Participants, Parameters, Actions, Comments, and Last Updated. The 'Name' tab is active, showing fields for Name ('Claim Approval') and Static ID ('CLAIM_APPROVAL'). The 'Settings' tab shows a Subject line template: 'Claim for &AMOUNT. from &RECEIPT_FROM. by &APP_USER.' and a Priority dropdown set to '3-Medium'. The 'Parameters' tab shows a Task Details Page URL: 'f?p=&APP_ID.:4:&SESSION.::&DEBUG.:RP;4:P4_TASK_ID:&TASK_ID.'. The 'Actions Source' is set to 'None'. On the right side, a sidebar provides detailed descriptions for Task Definitions, Task Definition Participants, Task Definition Parameters, and Task Definition Actions, along with a list of available actions: Claim, Complete, Delegate, and Update Comment.

Task Definition: Claim Approval

Show All Name Settings Deadline Participants Parameters Actions Comments Last Updated

Name

* Name Claim Approval

* Static ID CLAIM_APPROVAL

Settings

* Subject Claim for &AMOUNT. from &RECEIPT_FROM. by &APP_USER.

* Priority 3-Medium

Task Details Page URL f?p=&APP_ID.:4:&SESSION.::&DEBUG.:RP;4:P4_TASK_ID:&TASK_ID.

Actions Source None

Task Definitions
Task Definitions define the properties of a human task. They are used to create task instances and then perform the appropriate action (examples are approving or rejecting the task instances. Tasks can also be claimed, released, delegated, canceled.

Task Definition Participants
define the participants of a human task who can act on the task. Participants can be either of type Potential Owner or Business Administrator .

Task Definition Parameters
define the parameters of a human task. These are typically attributes of a system of records for which the task has been defined. They constitute the payload of the task.

Task Definition Actions
fire once for an event performed on the task. Events can be:

- Claim
- Complete
- Delegate
- Update Comment

Sending Push Notifications: PL/SQL API from Task Def

Task Definition: Claim Approval

Actions: Edit | Add Row | Cancel | Delete | Apply Changes

Show All Name Settings Deadline Participants Parameters Actions Comments Last Updated

Click **Add Row** to create the first Parameter.

Actions

Add Action

Search: All Text Columns Go Actions ▾ Edit Reset

On Event

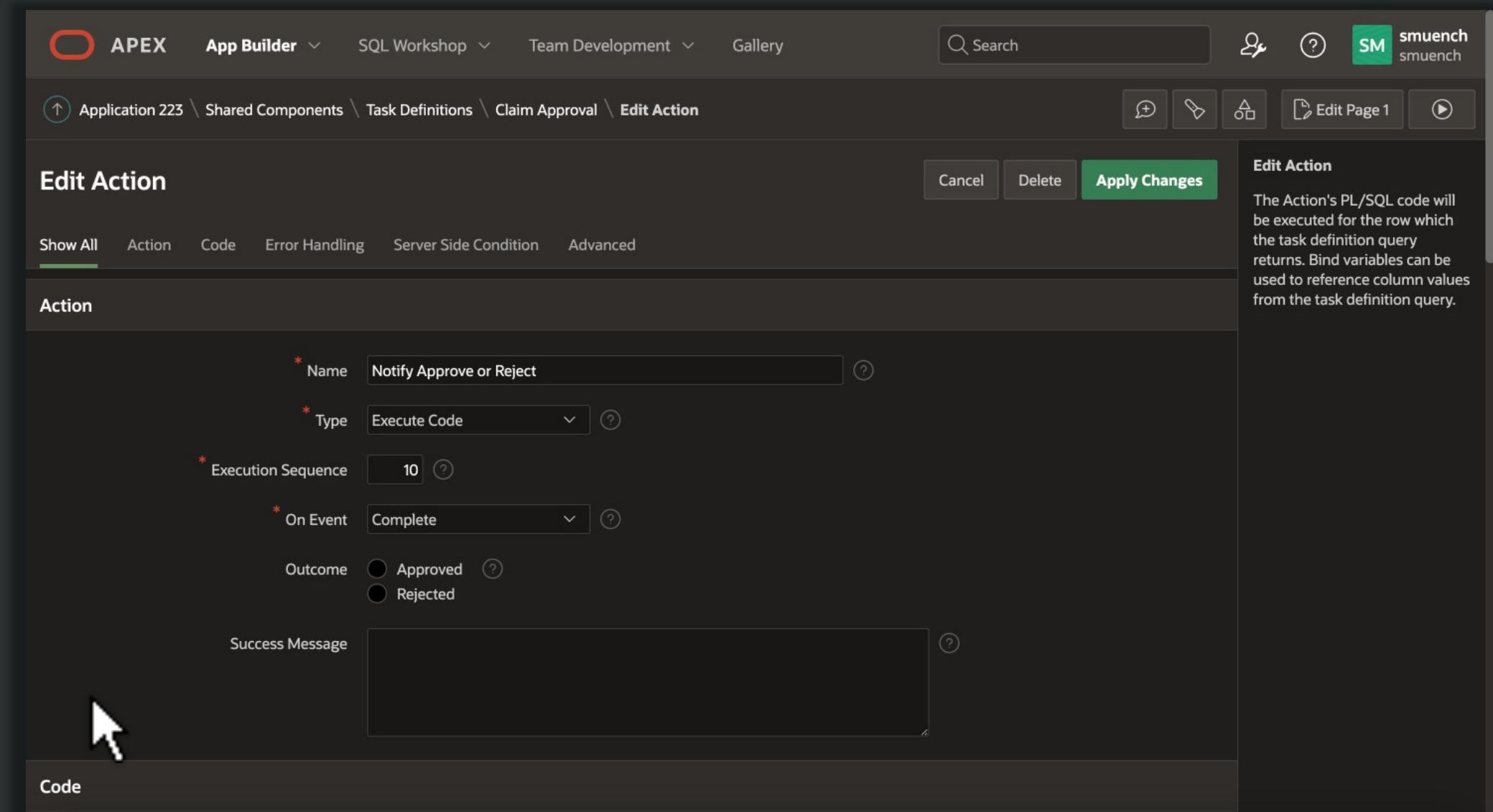
	Name	Outcome	Execution Sequence ↑	Action Type
On Event: Complete	Notify Approve or Reject		10	Execute Code

1 rows selected Total 1

Comments

Comments

Sending Push Notifications: PL/SQL API from Task Def



The screenshot shows the Oracle APEX App Builder interface, specifically the 'Edit Action' page for a 'Claim Approval' task definition. The page has a dark theme with a navigation bar at the top.

Page Navigation:

- Top navigation: APEX, App Builder (selected), SQL Workshop, Team Development, Gallery.
- Search bar: Search (magnifying glass icon).
- User profile: smuench (with a green 'SM' icon).

Breadcrumb: Application 223 \ Shared Components \ Task Definitions \ Claim Approval \ Edit Action

Action Buttons:

- Cancel, Delete, Apply Changes (green button).
- Page navigation icons: back, forward, search, etc.

Section Headers:

- Edit Action
- Action
- Code
- Error Handling
- Server Side Condition
- Advanced

Action Configuration:

- Name:** Notify Approve or Reject
- Type:** Execute Code
- Execution Sequence:** 10
- On Event:** Complete
- Outcome:** Approved, Rejected
- Success Message:** (Empty text area)

Right Panel:

Edit Action: The Action's PL/SQL code will be executed for the row which the task definition query returns. Bind variables can be used to reference column values from the task definition query.

Code Tab: A cursor icon is hovering over the 'Code' tab at the bottom left.

Sending Push Notifications: PL/SQL API from Task Def

Code

Edit Action

Location Local Database REST Enabled SQL Service

Cancel Delete Apply Changes

Show All Action Code Error Handling Server Side Condition Advanced

Code ?

```
1 apex_pwa.send_push_notification(
2     p_user_name  => :CREATED_BY,
3     p_title      => 'Reimbursement '||initcap(:APEX$TASK_OUTCOME),
4     p_body       => 'Your reimbursement of ' || :AMOUNT || ' from ' || :RECEIPT_FROM ||
5                      ' was ' || lower(:APEX$TASK_OUTCOME)||'.',
6     p_target_url => apex_util.host_url||
7                     apex_page.get_url([p_page => 'reimbursement-notification',
8                     p_items=> 'p7_id',
9                     p_values=> :APEX$TASK_PK])
10 );
11 update eba_demo_reimbursement
12 set status = upper(:APEX$TASK_OUTCOME),
13     decided_by = :APP_USER,
14     decided_on = sysdate
15 where id = :APEX$TASK_PK;
16 
```

Examples

Error Handling

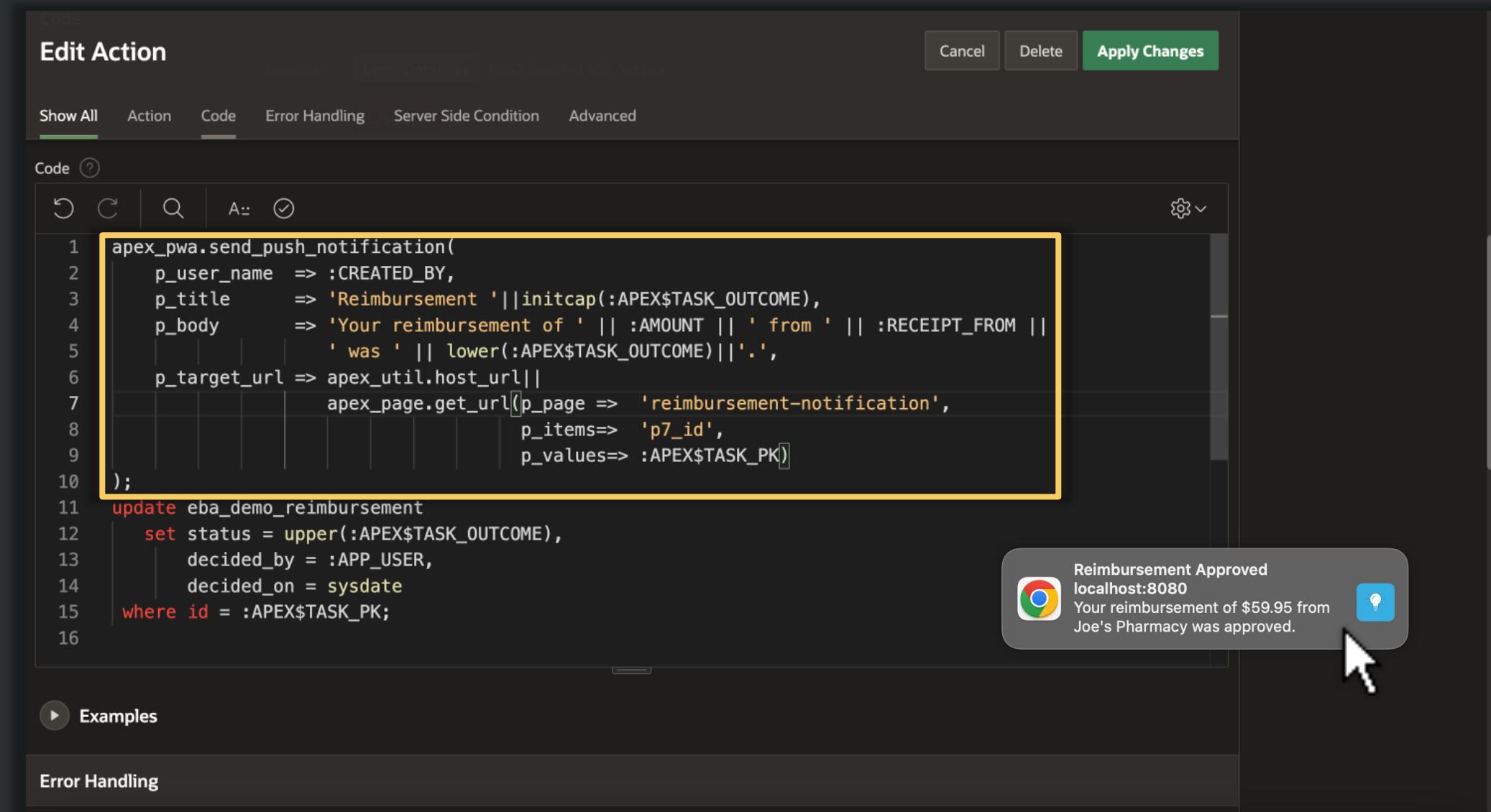
Code ?

Cancel Delete **Apply Changes**

Code ?

1 apex_pwa.send_push_notification(
2 p_user_name => :CREATED_BY,
3 p_title => 'Reimbursement '||initcap(:APEX\$TASK_OUTCOME),
4 p_body => 'Your reimbursement of ' || :AMOUNT || ' from ' || :RECEIPT_FROM ||
5 ' was ' || lower(:APEX\$TASK_OUTCOME)||'.',
6 p_target_url => apex_util.host_url||
7 apex_page.get_url([p_page => 'reimbursement-notification',
8 p_items=> 'p7_id',
9 p_values=> :APEX\$TASK_PK])
10);
11 update eba_demo_reimbursement
12 set status = upper(:APEX\$TASK_OUTCOME),
13 decided_by = :APP_USER,
14 decided_on = sysdate
15 where id = :APEX\$TASK_PK;
16

Reimbursement Approved
localhost:8080
Your reimbursement of \$59.95 from
Joe's Pharmacy was approved.



Sending Push Notifications: PL/SQL API from Task Def

Code

Edit Action

Location Local Database REST Enabled SQL Service

Cancel Delete Apply Changes

Show All Action Code Error Handling Server Side Condition Advanced

Code (1)

```
1 apex_pwa.send_push_notification(
2     p_user_name  => :CREATED_BY,
3     p_title      => 'Reimbursement '||initcap(:APEX$TASK_OUTCOME),
4     p_body       => 'Your reimbursement of ' || :AMOUNT || ' from ' || :RECEIPT_FROM ||
5                      ' was ' || lower(:APEX$TASK_OUTCOME)||'.',
6     p_target_url => apex_util.host_url|| apex_page.get_url(p_page => 'reimbursement-notification',
7                                         p_items=> 'p7_id',
8                                         p_values=> :APEX$TASK_PK)
9 );
10 );
11 update eba_demo_reimbursement
12     set status = upper(:APEX$TASK_OUTCOME),
13         decided_by = :APP_USER,
14         decided_on = sysdate
15     where id = :APEX$TASK_PK;
16 );
```

Examples

Error Handling

N.B. The target must be an *absolute URL*

Sending Push Notifications: PL/SQL API from Task Def

Code

Edit Action

Location: Local Database / REST Enabled SQL Service

Cancel Delete Apply Changes

Show All Action Code Error Handling Server Side Condition Advanced

Code (1)

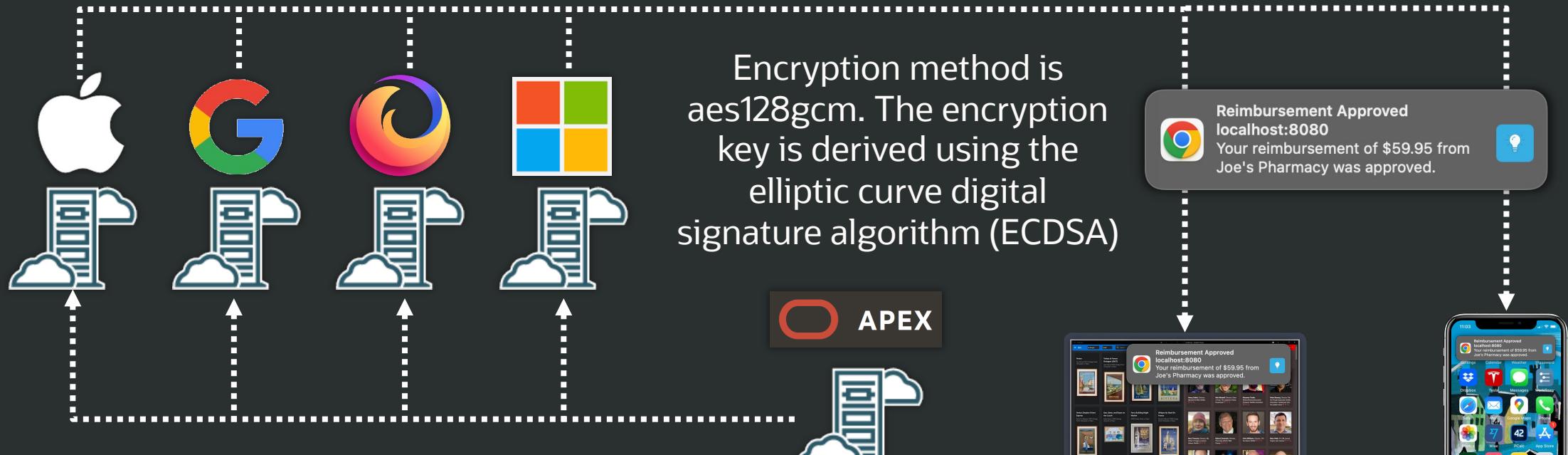
```
1 apex_pwa.send_push_notification(
2     p_user_name  => :CREATED_BY,
3     p_title      => 'Reimbursement '||initcap(:APEX$TASK_OUTCOME),
4     p_body       => 'Your reimbursement of ' || :AMOUNT || ' from ' || :RECEIPT_FROM ||
5                      ' was ' || lower(:APEX$TASK_OUTCOME)||'.',
6     p_target_url => apex_util.host_url||
7                      apex_page.get_url(p_page => 'reimbursement-notification',
8                      p_items=> 'p7_id',
9                      p_values=> :APEX$TASK_PK)
10 );
11 apex_pwa.push_queue; ←
12 update eba_demo_reimbursement
13   set status = upper(:APEX$TASK_OUTCOME),
14   decided_by = :APP_USER,
15   decided_on = sysdate
16 where id = :APEX$TASK_PK;
17
```

Examples

Error Handling

Handy for demos, but not needed in practice.

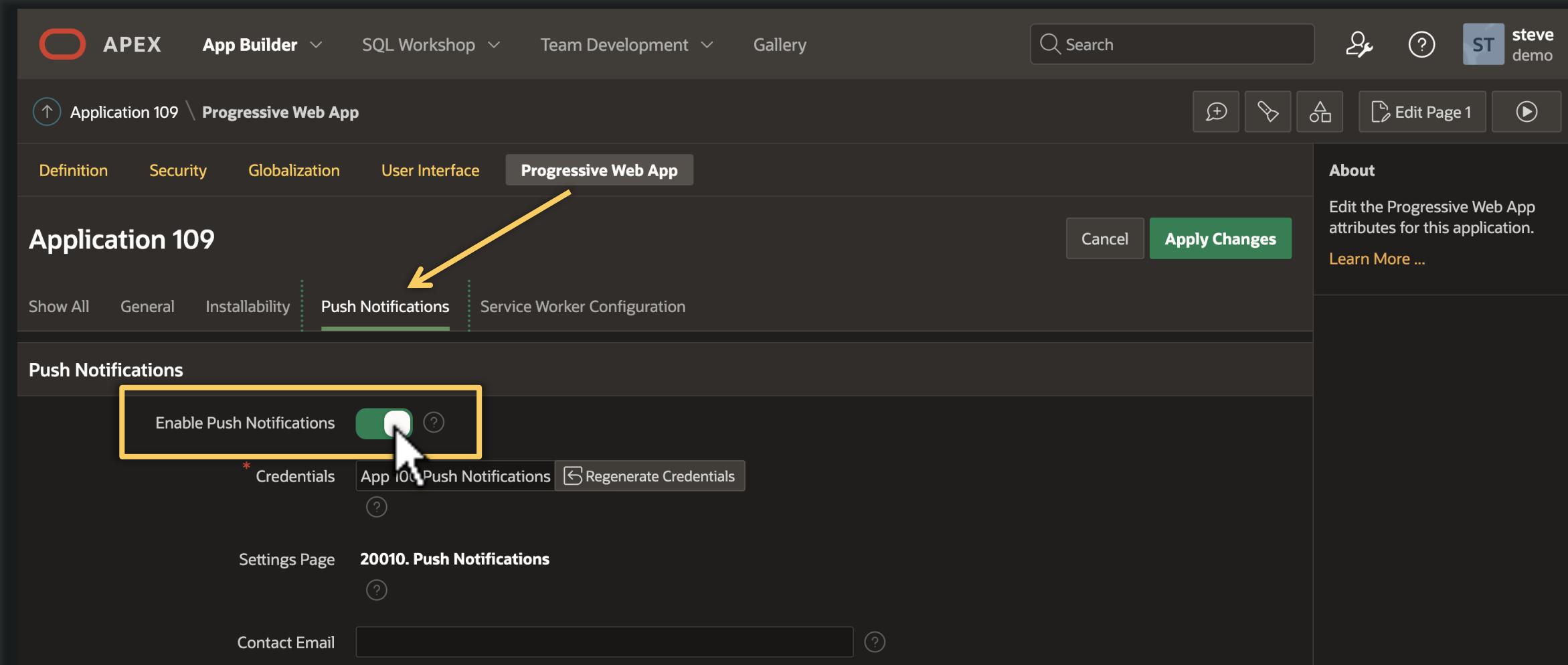
Delivery Uses Secure, Vendor-Appropriate REST Services



HTTPS message has an Authorization header containing a Voluntary Application Server Id (VAPID) with a "cryptographically signed" token that proves the APEX app is allowed to send a notification to the intended recipient. The notification payload is encrypted cryptographically.



Enabling Push Notifications Support in an Existing App



The screenshot shows the Oracle APEX App Builder interface for an application named "Application 109". The "Progressive Web App" tab is selected. In the "Push Notifications" section, a yellow arrow points to the "Enable Push Notifications" switch, which is highlighted with a yellow box. The switch is currently in the "on" position. Below the switch, there are "Credentials" and "Regenerate Credentials" buttons. The "Service Worker Configuration" tab is also visible. The "About" sidebar on the right provides information about editing the Progressive Web App attributes for the application.

APEX App Builder SQL Workshop Team Development Gallery

Search

Application 109 \ Progressive Web App

Definition Security Globalization User Interface Progressive Web App

Application 109

Show All General Installability Push Notifications Service Worker Configuration

Push Notifications

Enable Push Notifications [?](#)

* Credentials [?](#) App 109 Push Notifications [?](#) Regenerate Credentials [?](#)

Settings Page [20010. Push Notifications](#) [?](#)

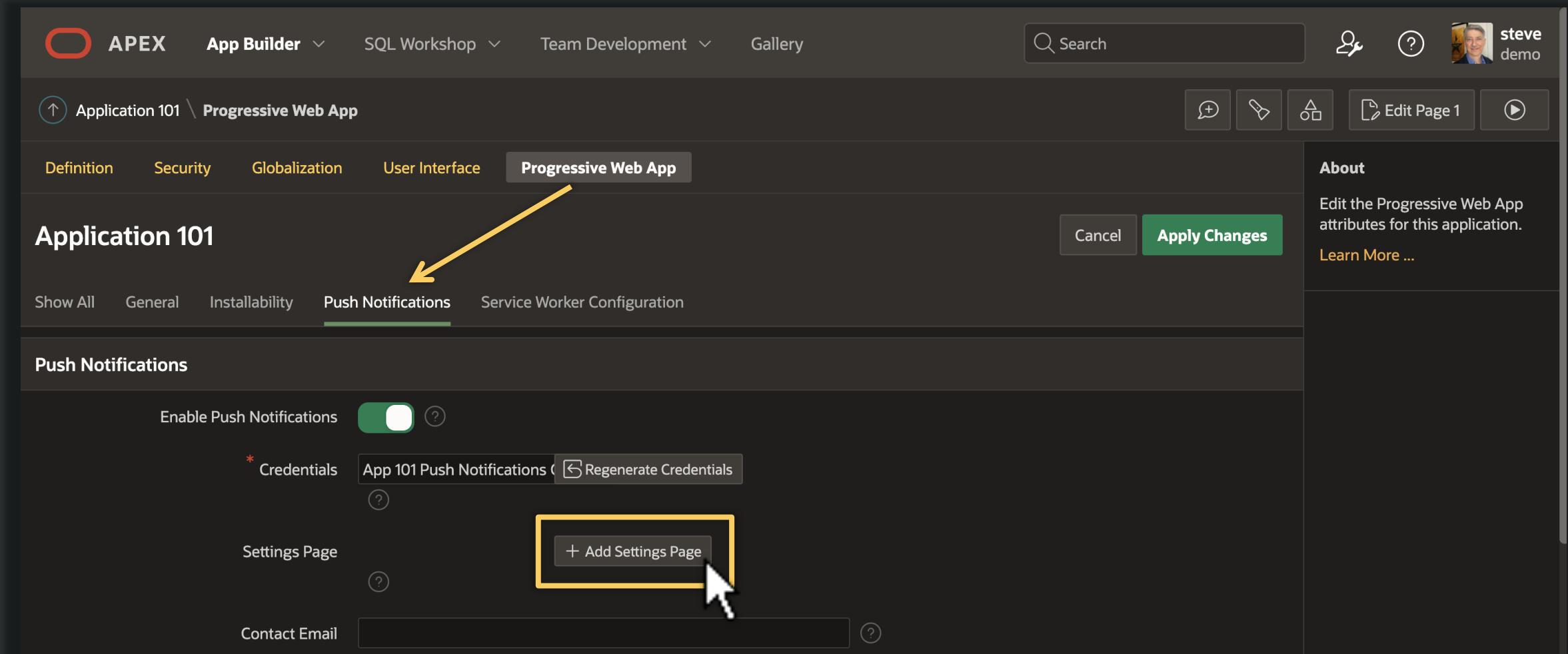
Contact Email [?](#)

About

Edit the Progressive Web App attributes for this application.

Learn More ...

Enabling Push Notifications Settings in an Existing App



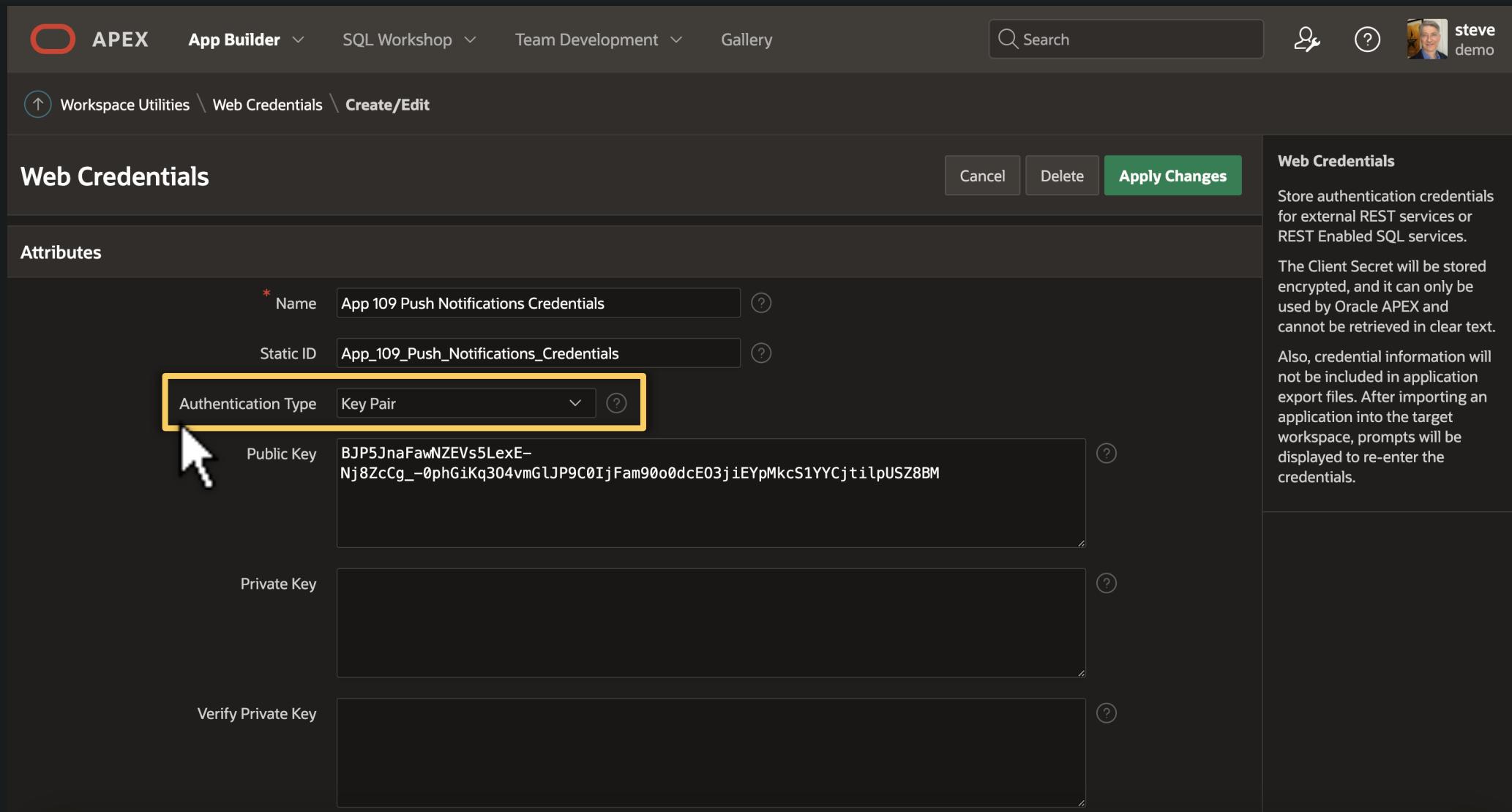
The screenshot shows the Oracle APEX App Builder interface for an application named "Application 101". The "Progressive Web App" tab is selected. A yellow arrow points to the "Push Notifications" tab in the navigation bar. The "Push Notifications" section is active, displaying the following configuration:

- Enable Push Notifications:** A toggle switch is turned on.
- Credentials:** A section labeled "App 101 Push Notifications" with a "Regenerate Credentials" button.
- Settings Page:** A section with a "Settings Page" label and a "Contact Email" input field. A yellow box highlights the "Add Settings Page" button, and a cursor is hovering over it.
- Buttons:** "Cancel" and "Apply Changes" buttons.

The right sidebar contains an "About" section with the following text:

Edit the Progressive Web App attributes for this application.
[Learn More ...](#)

Push Notification *Key Pair* is New Kind of Credential



The screenshot shows the Oracle APEX 'Web Credentials' creation/edit screen. The 'Authentication Type' dropdown is highlighted with a yellow box and a cursor is hovering over it. The dropdown shows 'Key Pair' as the selected option. The 'Name' field contains 'App 109 Push Notifications Credentials' and the 'Static ID' field contains 'App_109_Push_Notifications_Credentials'. The 'Public Key' field contains a long string of characters: 'BJP5JnaFawNZEvs5LexE-Nj8ZcCg_-0phGiKq304vmG1JP9C0IjFam90o0dcE03jiEYpMkcS1YYCjtilpUSZ8BM'. The 'Web Credentials' sidebar on the right provides a brief description of the feature.

Web Credentials

Store authentication credentials for external REST services or REST Enabled SQL services. The Client Secret will be stored encrypted, and it can only be used by Oracle APEX and cannot be retrieved in clear text. Also, credential information will not be included in application export files. After importing an application into the target workspace, prompts will be displayed to re-enter the credentials.

Attributes

* Name: App 109 Push Notifications Credentials

Static ID: App_109_Push_Notifications_Credentials

Authentication Type: Key Pair

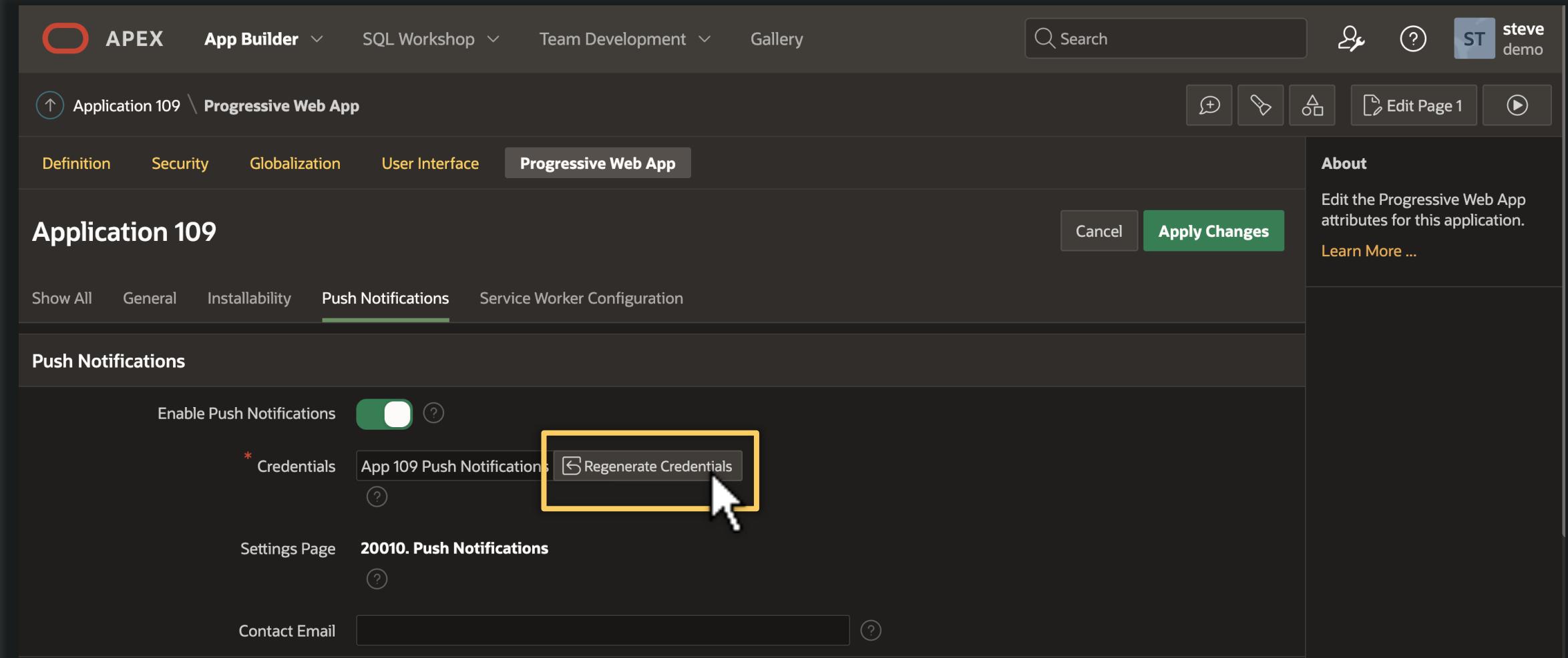
Public Key: BJP5JnaFawNZEvs5LexE-Nj8ZcCg_-0phGiKq304vmG1JP9C0IjFam90o0dcE03jiEYpMkcS1YYCjtilpUSZ8BM

Private Key:

Verify Private Key:

Cancel Delete Apply Changes

After Initial App Import into a Workspace, Must Regenerate Signing Keys Credentials !



APEX App Builder SQL Workshop Team Development Gallery Search steve demo

Application 109 \ Progressive Web App

Definition Security Globalization User Interface **Progressive Web App**

Application 109 Cancel Apply Changes

Show All General Installability **Push Notifications** Service Worker Configuration

Push Notifications

Enable Push Notifications ?

* Credentials **App 109 Push Notifications** ? Regenerate Credentials

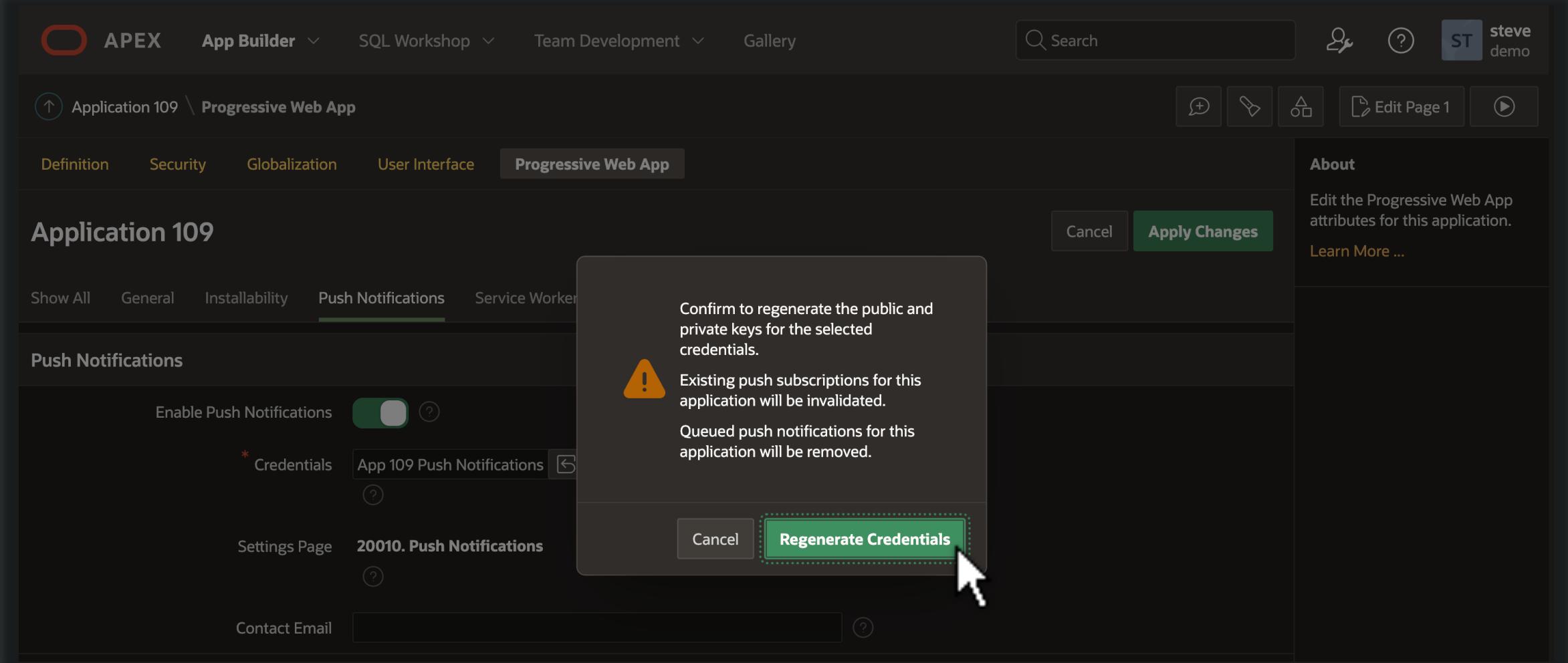
Settings Page **20010. Push Notifications** ?

Contact Email ?

Edit Page 1 ?

About Edit the Progressive Web App attributes for this application. [Learn More ...](#)

After Initial App Import into a Workspace, Must Regenerate Signing Keys Credentials !



The screenshot shows the Oracle APEX App Builder interface. The top navigation bar includes links for APEX, App Builder, SQL Workshop, Team Development, and Gallery, along with a search bar and user profile information for 'steve demo'. The current page is 'Application 109 \ Progressive Web App'. The 'User Interface' tab is selected, showing the 'Progressive Web App' configuration. The 'Push Notifications' tab is active, with the 'Enable Push Notifications' switch turned on. Below it, the 'Credentials' section shows 'App 109 Push Notifications' and a 'Settings Page' link to '20010. Push Notifications'. A modal dialog box is displayed, containing a warning message: 'Confirm to regenerate the public and private keys for the selected credentials. Existing push subscriptions for this application will be invalidated. Queued push notifications for this application will be removed.' It includes 'Cancel' and 'Regenerate Credentials' buttons, with the latter being highlighted with a dotted border. The overall interface is dark-themed.

Symptom of Failing to Regenerate Signing Keys After Initial Import of an Application

The image displays two screenshots related to push notification settings in Oracle APEX.

Left Screenshot: Approval Notification Home Page

The page shows a DevTools interface for application apex.oraclecorp.com/pls/apex/r/stevemuench/app... . A modal window is open, showing a list of issues. One issue is highlighted with a yellow box and a cursor pointing to it:

- Push subscription error: Failed to execute 'subscribe' on 'PushManager': The provided applicationServerKey is not valid.

Right Screenshot: Settings - Push Notifications

The settings page shows a yellow error message box:

- 1 error has occurred
 - This device failed to enable push notifications.

A blue bell icon is present. Below the message, the text states:

Push notifications have to be enabled for each device you want to receive the notifications on. The first time you enable push notifications, you will have to grant permission to your browser. This setting can be changed at any time.

A checkbox labeled "Enable push notifications on this device" is checked.

Page Footer

Release 1.0 Customize Built with ❤ using Oracle APEX

ORACLE INTERNAL App 11143 Page 20010 Session Debug Quick Edit Customize

Push Notification Target URL: Open App & Detail Page

By default, clicking or tapping on a notification opens the related APEX app's home page. Using a *custom target URL* you can make the interaction more specific and useful.

Reimbursement

Amount	Receipt From	Status
59.95	Joe's Pharmacy	APPROVED
Decided On	Decided By	Created
4/11/2023	PAT	4/11/2023

Close

Reimbursement Approved
localhost:8080
Your reimbursement of \$59.95 from Joe's Pharmacy was approved.

Conference - Speaker Lineup

Approval Notification - Reimbursement

VIEW Conference 2022

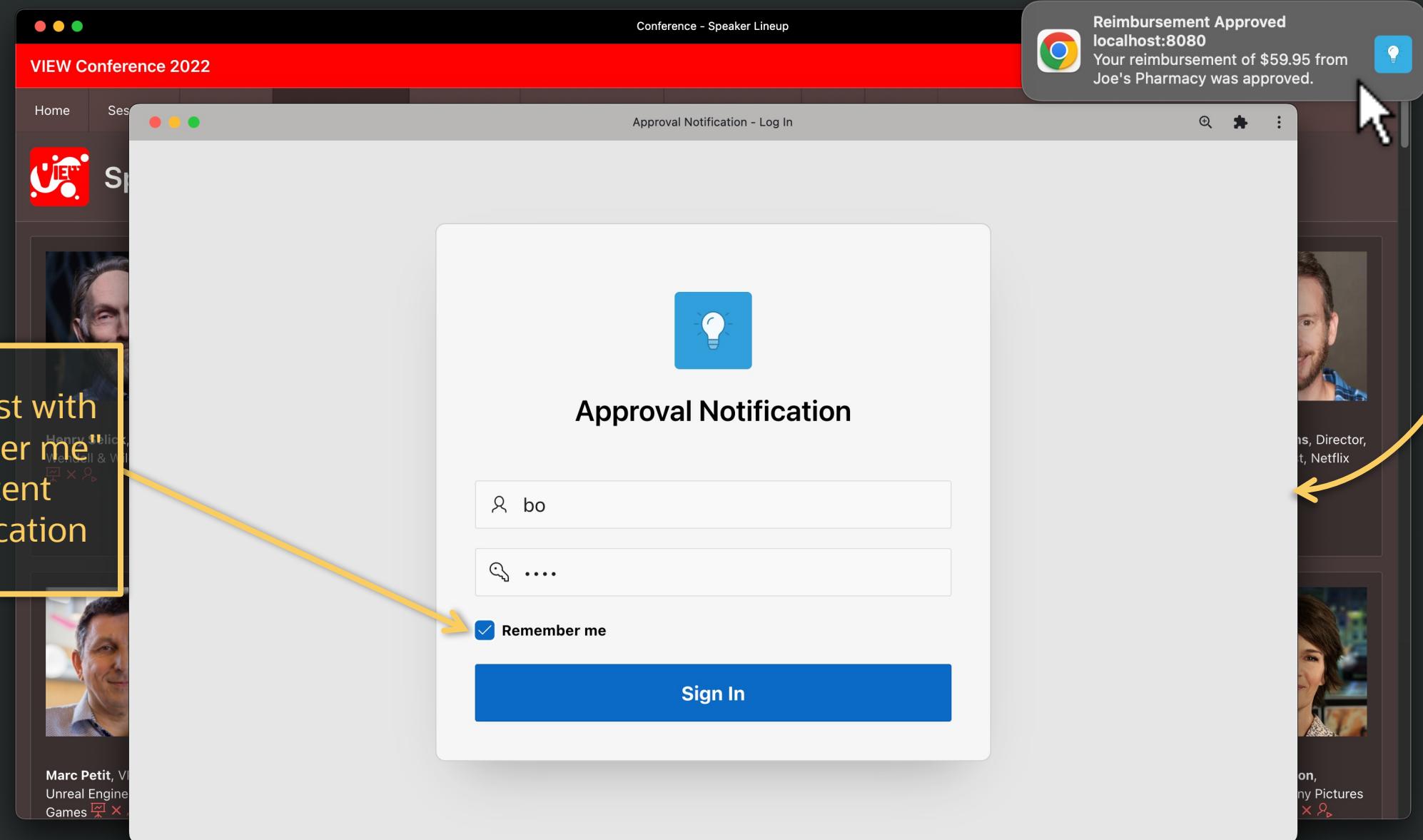
Home Sessions Speaker

Speaker

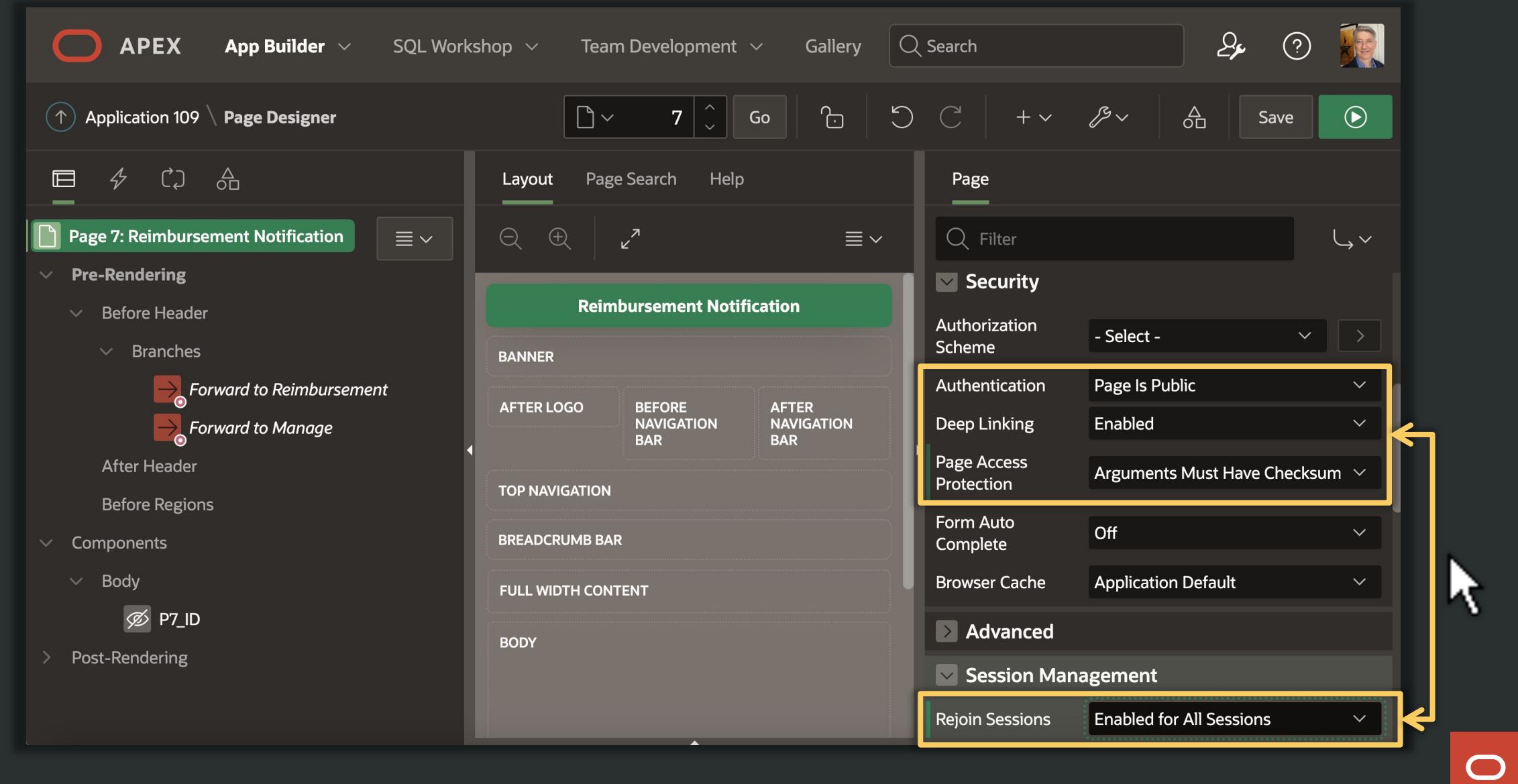
Marc Petit, VP, GM, Unreal Engine, Epic Games

Release 1.0 Customize Built with ❤ using Oracle APEX

Push Notification Target URL: Open App & Detail Page



Page Security Settings for Push Notification Target to Bring Persistently Authenticated User to Details



The screenshot shows the Oracle APEX Page Designer interface for 'Page 7: Reimbursement Notification'. The page title is 'Reimbursement Notification'. The security settings on the right are highlighted with a yellow box and a mouse cursor pointing to the 'Page Access Protection' dropdown.

Page Security Settings:

- Authentication:** Page Is Public
- Deep Linking:** Enabled
- Page Access Protection:** Arguments Must Have Checksum
- Form Auto Complete:** Off
- Browser Cache:** Application Default

Advanced:

- Session Management:** Rejoin Sessions, Enabled for All Sessions

Need to Enable Instance Level Rejoin Sessions

Security Settings Authorized URLs

Security

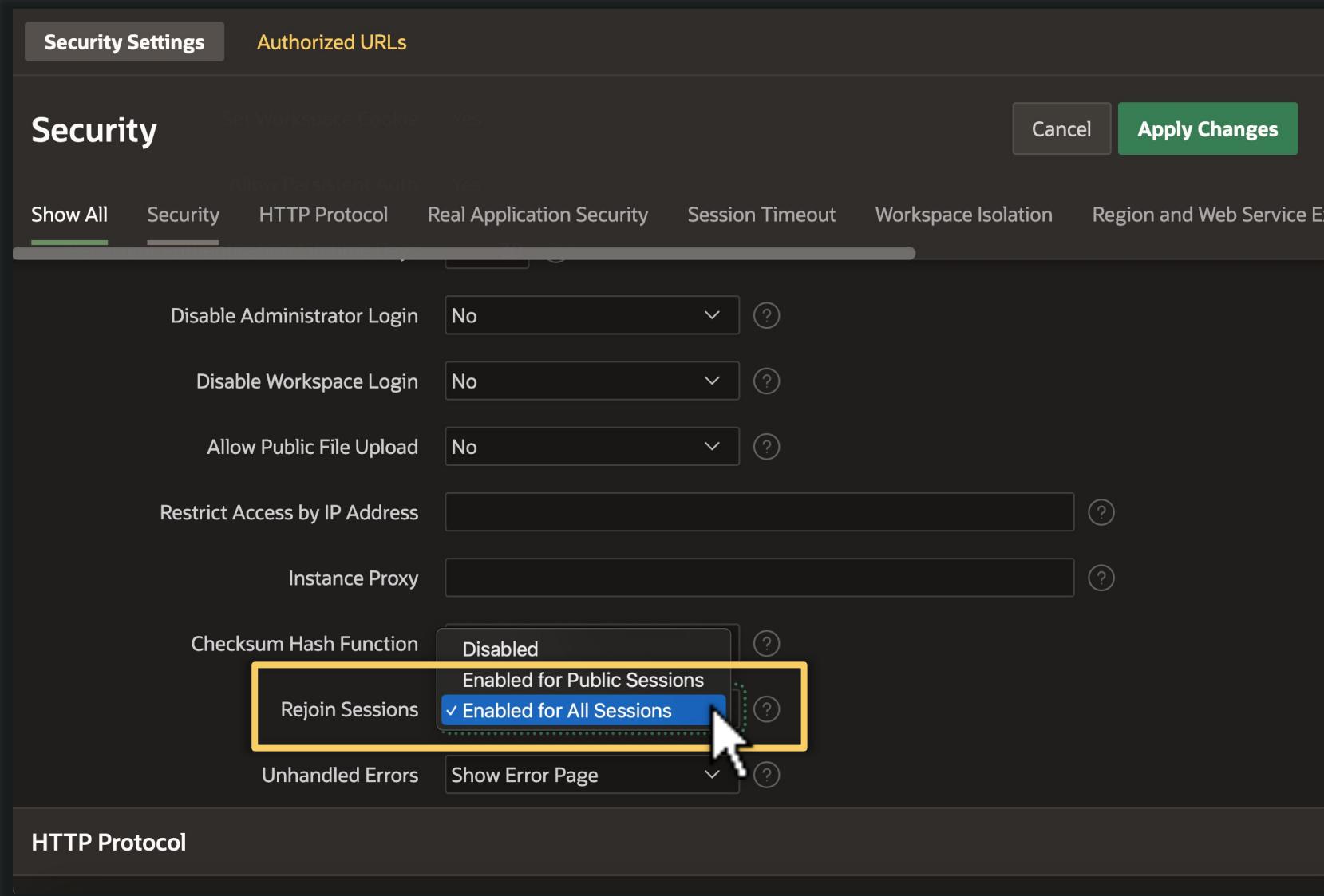
Set Workspace Cookie: Yes Allow Persistent Auth: Yes

Show All Security HTTP Protocol Real Application Security Session Timeout Workspace Isolation Region and Web Service E...

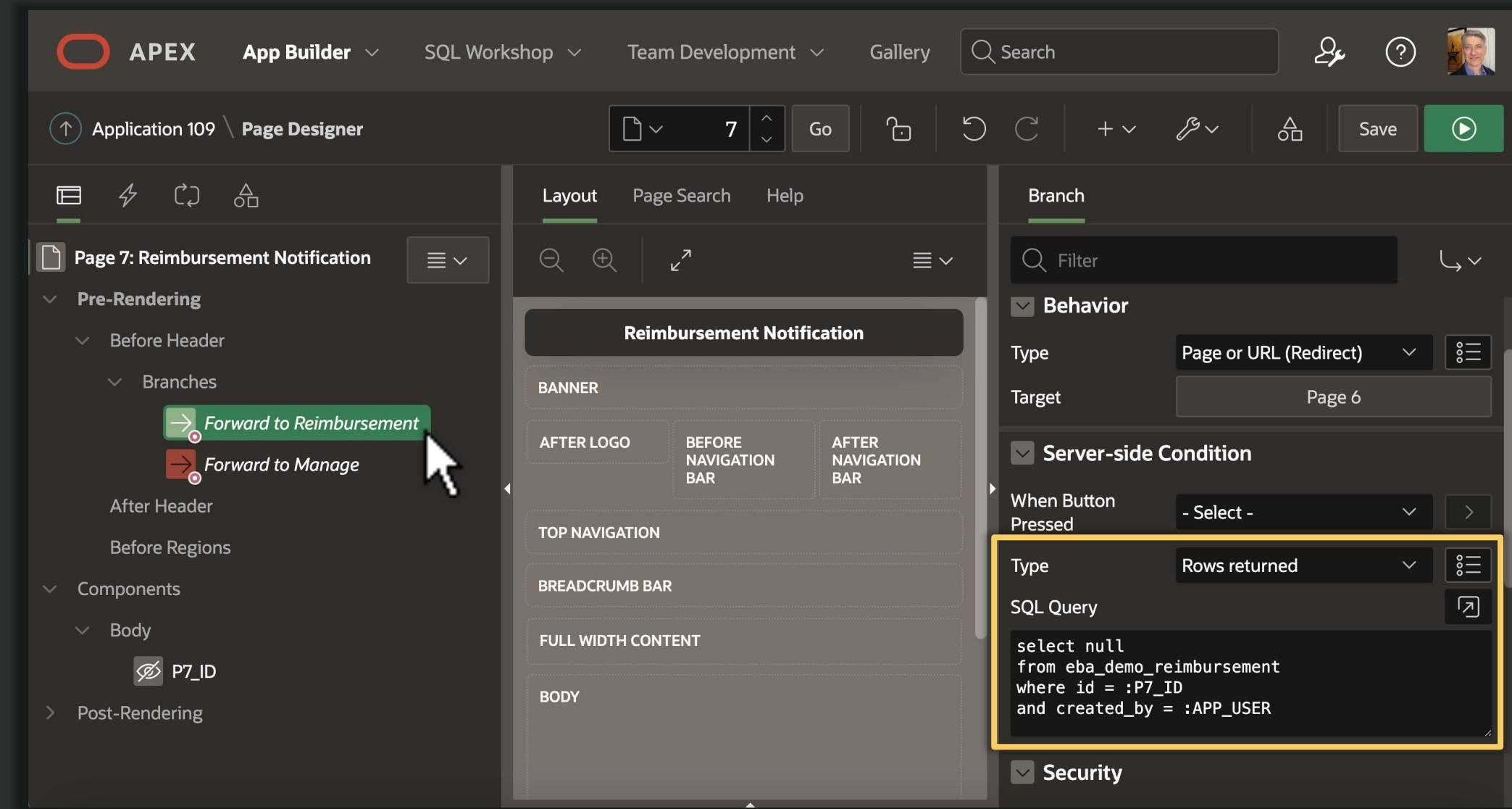
Disable Administrator Login	No	?
Disable Workspace Login	No	?
Allow Public File Upload	No	?
Restrict Access by IP Address		?
Instance Proxy		?
Checksum Hash Function	Disabled	?
Rejoin Sessions	Enabled for Public Sessions	?
	✓ Enabled for All Sessions	?
Unhandled Errors	Show Error Page	?

HTTP Protocol

Cancel **Apply Changes**



Conditional Branch to Authenticated Detail Page



The screenshot shows the Oracle APEX App Builder interface for Application 109, specifically the Page Designer. The page is titled "Reimbursement Notification". The left sidebar shows the page structure with sections like Pre-Rendering, Components, and Body. In the Body section, there is a component for "P7_ID". The right sidebar is focused on the "Branch" configuration for this component. A yellow box highlights the "Server-side Condition" section, which is set to "When Button Pressed" and "Rows returned". The SQL query defined is:

```
select null
from eba_demo_reimbursement
where id = :P7_ID
and created_by = :APP_USER
```

If Behind a Firewall, Need to Configure Proxy Server

- Apple
 - *.push.apple.com
- Microsoft
 - *.notify.windows.com
- Mozilla
 - updates.push.services.mozilla.com
- Google
 - android.googleapis.com
 - fcm.googleapis.com



Manage Instance \ Security

Security Settings **Authorized URLs**

Security

Show All **Security** HTTP Protocol Real Application Security Session Timeout Workspace Isolation Region and

Security

Configure service level security settings typically used to lock down a production service.

Set Workspace Cookie	Yes	(?)
Allow Persistent Auth	Yes	(?)
Persistent Authentication Lifetime Days	30	(?)
Disable Administrator Login	No	(?)
Disable Workspace Login	No	(?)
Allow Public File Upload	No	(?)
Restrict Access by IP Address		(?)

Instance Proxy: company-proxy.example.org (?)

Instance No Proxy Domains: localhost, 127.0.0.1, us.example.org (?)

APEX instance level

If Behind a Firewall, Need to Configure Proxy Server

- Apple
 - *.push.apple.com
- Microsoft
 - *.notify.windows.com
- Mozilla
 - updates.push.services.mozilla.com
- Google
 - android.googleapis.com
 - fcm.googleapis.com



APEX application level

Application 109 \ Edit Application Definition

Definition Security Globalization User Interface Progressive Web App

Application 109

Show All Name Properties Availability Error Handling Global Notification Substitutions Build Options

Properties

friendly URLs Allow Feedback Logging Debugging

Compatibility Mode 21.2 / 22.1 / 22.2 / 23.1

Application Email From Address

Proxy Server No Proxy Domains

Oracle Text Extraction

Oracle Text Extraction

APEX_230100 User Needs Outbound Endpoint ACL Grants

- Apple
 - *.push.apple.com
- Microsoft
 - *.notify.windows.com
- Mozilla
 - updates.push.services.mozilla.com
- Google
 - android.googleapis.com
 - fcm.googleapis.com



Installation Guide

Table of Contents

- ▶ Preface
- ▶ 1 Changes in Release 22.2 for Oracle APEX Installation Guide
- ▶ 2 Oracle APEX Installation Requirements
- ▶ 3 APEX Installation Overview
- ▶ 4 Upgrading from a Previous APEX Release
- ▶ 5 Utilizing the Multitenant Architecture in Oracle Database 12c or Later
- ▶ 6 Installing and Configuring APEX and Oracle REST Data Services
 - 6.1 Performing Pre-installation Tasks for APEX
 - 6.2 About SQLcl Support
 - ▶ 6.3 Downloading and Installing APEX
 - ▶ 6.4 Downloading and Installing Oracle REST Data Services (ORDS)
 - ▶ 6.5 Configuring Oracle REST Data Services
 - ▶ **6.6 Enabling Network Services in Oracle Database**
 - 6.6.1 When and Why Network Services Must be Enabled
 - 6.6.2 Granting Connect Privileges in Oracle

6.6 Enabling Network Services in Oracle Database

You must enable network services in Oracle Database to send outbound mail, use Web services, or use template-based PDF report printing with BI Publisher in Oracle APEX.

When and Why Network Services Must be Enabled
Enabling network services enables support for sending outbound mail in Oracle APEX, use of Web services in APEX, and PDF report printing with BI Publisher.

Granting Connect Privileges in Oracle Database 12c or Later
Procedures `CREATE_ACL`, `ASSIGN_ACL`, `ADD_PRIVILEGE` and `CHECK_PRIVILEGE` in `DBMS_NETWORK_ACL_ADMIN` are deprecated in Oracle Database 12c. Oracle recommends to use `APPEND_HOST_ACE`.

Troubleshooting an Invalid ACL Error
Learn how to identify any invalid ACL error by running the query.

Parent topic: [Installing and Configuring APEX and Oracle REST Data Services](#)

6.6.1 When and Why Network Services Must be Enabled

Enabling network services enables support for sending outbound mail in Oracle APEX, use of Web services in APEX, and PDF report printing with BI Publisher.

By default, the ability to interact with network services is disabled in Oracle Database 11g Release 2 or later. Therefore, if you are running Oracle APEX with Oracle Database 11g Release 2 or later, you must use the new `DBMS_NETWORK_ACL_ADMIN` package to grant connect privileges to any host for the `APEX_220200` database user. Failing to grant these privileges results in issues with:

- Sending outbound mail in Oracle APEX.

APEX_230100 User Needs Outbound Endpoint ACL Grants

- Apple
 - *.push.apple.com
- Microsoft
 - *.notify.windows.com
- Mozilla
 - updates.push.services.mozilla.com
- Google
 - android.googleapis.com
 - fcm.googleapis.com

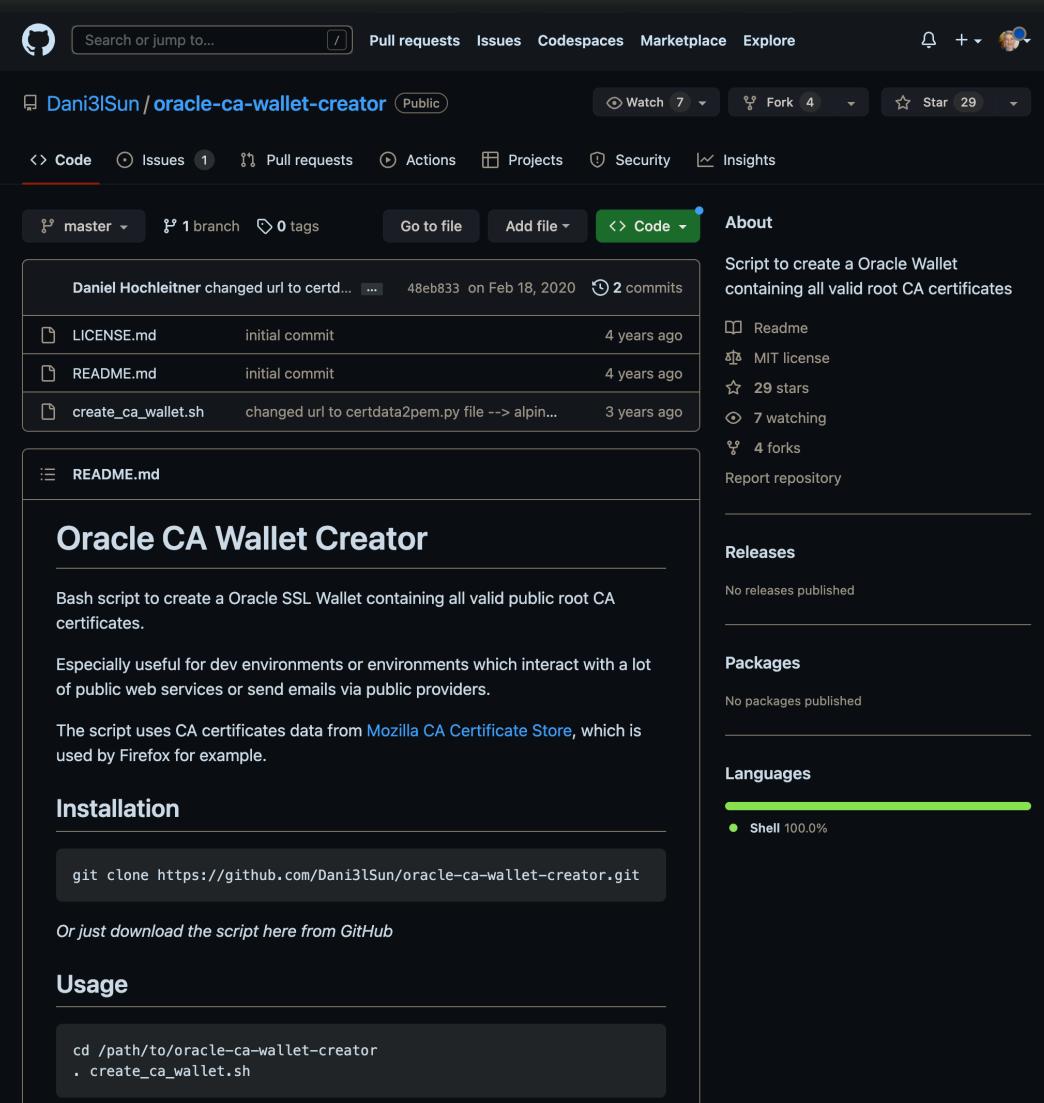


```
declare
  l_principal varchar2(20) := 'APEX_230100';
  l_hosts apex_t_varchar2 := apex_t_varchar2(
    '*.push.apple.com',
    '*.notify.windows.com',
    'updates.push.services.mozilla.com',
    'android.googleapis.com',
    'fcm.googleapis.com');
begin
  for j in (select column_value as hostname from table(l_hosts)) loop
    dbms_network_acl_admin.append_host_ace (
      host      => j.hostname,
      lower_port => 443,
      upper_port => 443,
      ace       =>
        xs$ace_type(privilege_list => xs$name_list('connect'),
                     principal_name => l_principal,
                     principal_type => xs_acl.ptype_db));
    dbms_network_acl_admin.append_host_ace (
      host      => j.hostname,
      ace       =>
        xs$ace_type(privilege_list => xs$name_list('resolve'),
                     principal_name => l_principal,
                     principal_type => xs_acl.ptype_db));
    dbms_network_acl_admin.append_host_ace (
      host      => j.hostname,
      lower_port => 443,
      upper_port => 443,
      ace       =>
        xs$ace_type(privilege_list => xs$name_list('http'),
                     principal_name => l_principal,
                     principal_type => xs_acl.ptype_db));
  end loop;
end;
```



Configuring APEX Wallet Path with Root Certificates

Wallet is preconfigured for APEX Service or APEX on Autonomous DB



The screenshot shows the GitHub repository page for 'oracle-ca-wallet-creator'. The repository is public and has 2 commits, 1 issue, and 4 forks. The README.md file contains the following content:

```
Oracle CA Wallet Creator

Bash script to create a Oracle SSL Wallet containing all valid public root CA certificates.

Especially useful for dev environments or environments which interact with a lot of public web services or send emails via public providers.

The script uses CA certificates data from Mozilla CA Certificate Store, which is used by Firefox for example.

Installation

git clone https://github.com/Dani3lSun/oracle-ca-wallet-creator.git

Or just download the script here from GitHub

Usage

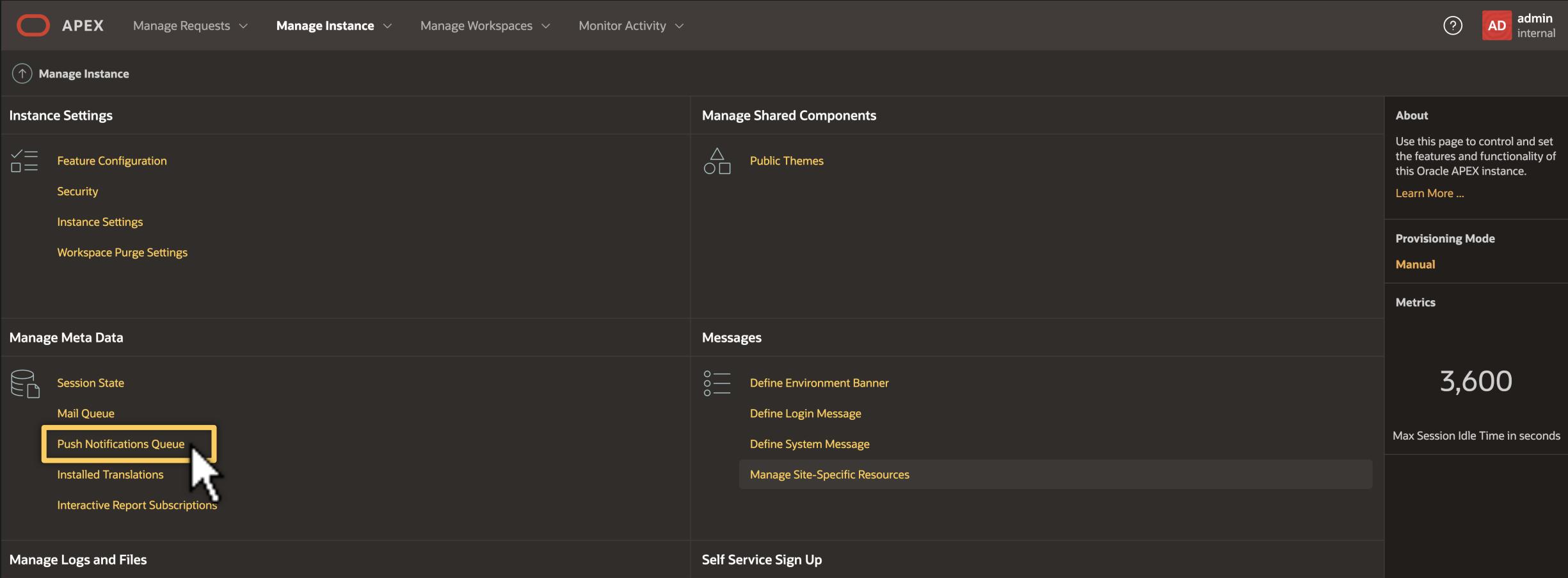
cd /path/to/oracle-ca-wallet-creator
./create_ca_wallet.sh
```



<https://github.com/Dani3lSun/oracle-ca-wallet-creator>



Push Notifications Queue



The screenshot shows the Oracle APEX 'Manage Instance' interface. The top navigation bar includes links for 'APEX', 'Manage Requests', 'Manage Instance', 'Manage Workspaces', and 'Monitor Activity'. On the far right, there is a user icon labeled 'AD admin internal'.

The main content area is divided into several sections:

- Instance Settings** (left sidebar): Includes 'Feature Configuration' (selected), 'Security', 'Instance Settings', and 'Workspace Purge Settings'.
- Manage Shared Components** (center): Includes 'Public Themes' (with a triangle and square icon).
- About** (right sidebar): Describes the page as a way to control and set features for the Oracle APEX instance, with a 'Learn More ...' link.
- Manage Meta Data** (left sidebar): Includes 'Session State', 'Mail Queue', 'Push Notifications Queue' (highlighted with a yellow box and a cursor), 'Installed Translations', and 'Interactive Report Subscriptions'.
- Messages** (center): Includes 'Define Environment Banner', 'Define Login Message', 'Define System Message', and 'Manage Site-Specific Resources'.
- Provisioning Mode** (right sidebar): Set to 'Manual'.
- Metrics** (right sidebar): Shows a value of '3,600' for 'Max Session Idle Time in seconds'.
- Manage Logs and Files** (bottom left): Includes a 'Self Service Sign Up' link.

Push Notifications Queue

APEX Manage Requests Manage Instance Manage Workspaces Monitor Activity ? AD admin internal

Manage Instance

Instance Settings Manage Shared Components About

APEX Manage Requests Manage Instance Manage Workspaces Monitor Activity ? AD admin internal

Manage Instance Push Notifications Queue

Force Push Queue Push Queue

Q Search: All Text Columns Go Actions Save Reset

Workspace	Application	User Name	Title	Body	Icon URL	Target URL	Send Attempts	Error Message	Created On
DEMO	109	BO	Reimbursement...	Your reimbursement of \$...		http://localhost:8080/ords/r/dem...	8	ORA-29024: Certificate validation failure	04/11/2023

1 rows selected Total 1

Push Notifications Queue
Monitor push notifications in the queue.
Remove individual notifications from the queue.
Push the queue to trigger sending all pending push notifications.

Installed Translations Manage Site-Specific Resources

Interactive Report Subscriptions

Manage Logs and Files Self Service Sign Up



Push Notification Subscriptions View

APEX_APPL_PUSH_SUBSCRIPTIONS

Approval Notification - Subscriptions

Approval Notification

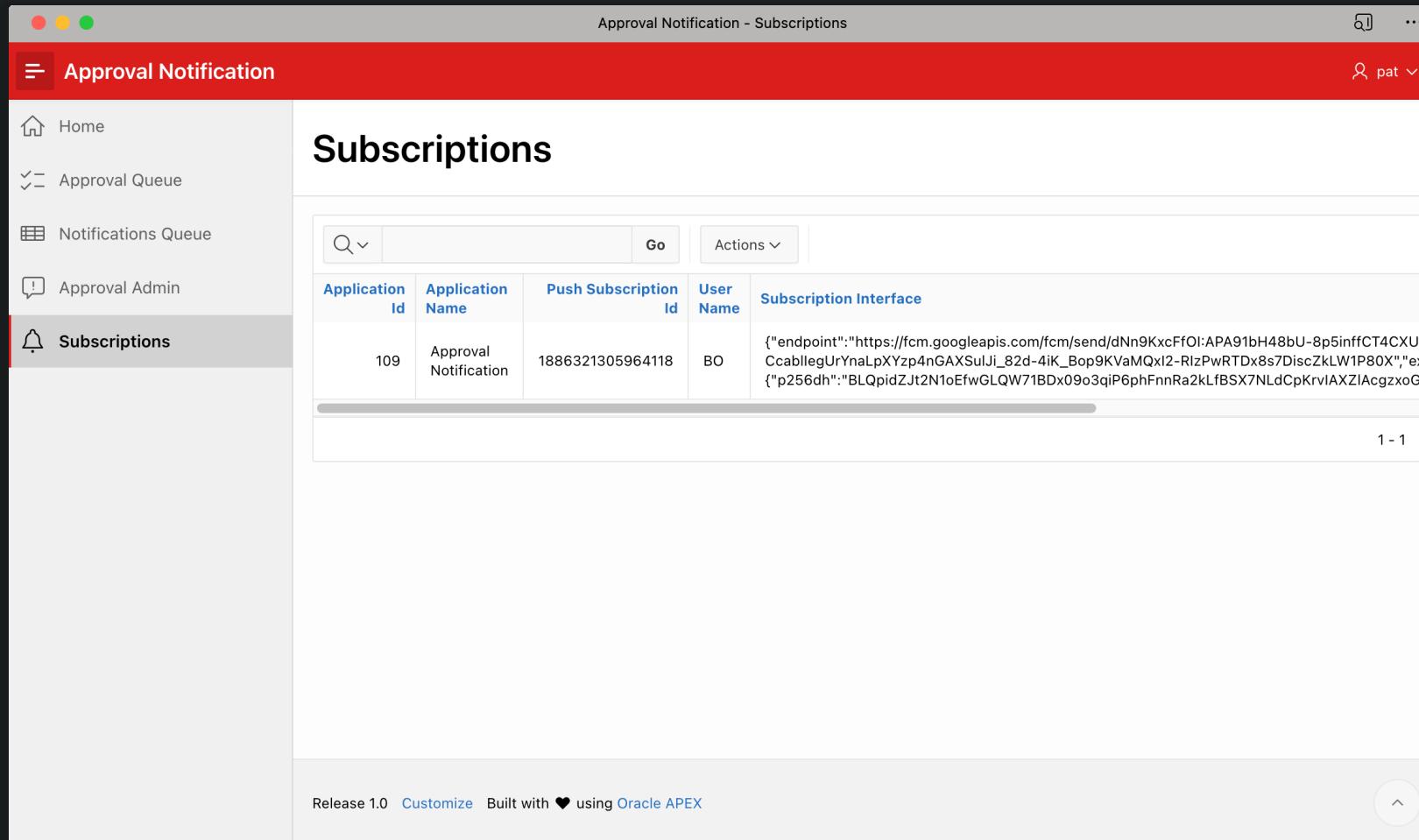
Home Approval Queue Notifications Queue Approval Admin Subscriptions

Subscriptions

Application Id	Application Name	Push Subscription Id	User Name	Subscription Interface
109	Approval Notification	1886321305964118	BO	{"endpoint":"https://fcm.googleapis.com/fcm/send/dNn9KxcFfOj:APA91bH48bU-8p5inffCT4CXU CcablegUrYnaLpXYzp4nGAXSuJi_82d-4iK_Bop9KVaMQxI2-RlzPwRTDx8s7DiscZkLW1P80X","e" {"p256dh":"BLQpidZJt2N1oEfwGLQW71BDx09o3qiP6phFnnRa2kLfBSX7NLdCpKrvIAXZlAcgzxog

1 - 1

Release 1.0 Customize Built with ❤ using Oracle APEX



Push Notifications to Deliver View

APEX_PUSH_NOTIFICATIONS_QUEUE

Approval Notification - Notifications Queue

Approval Notification

Home Approval Queue Notifications Queue Approval Admin Subscriptions

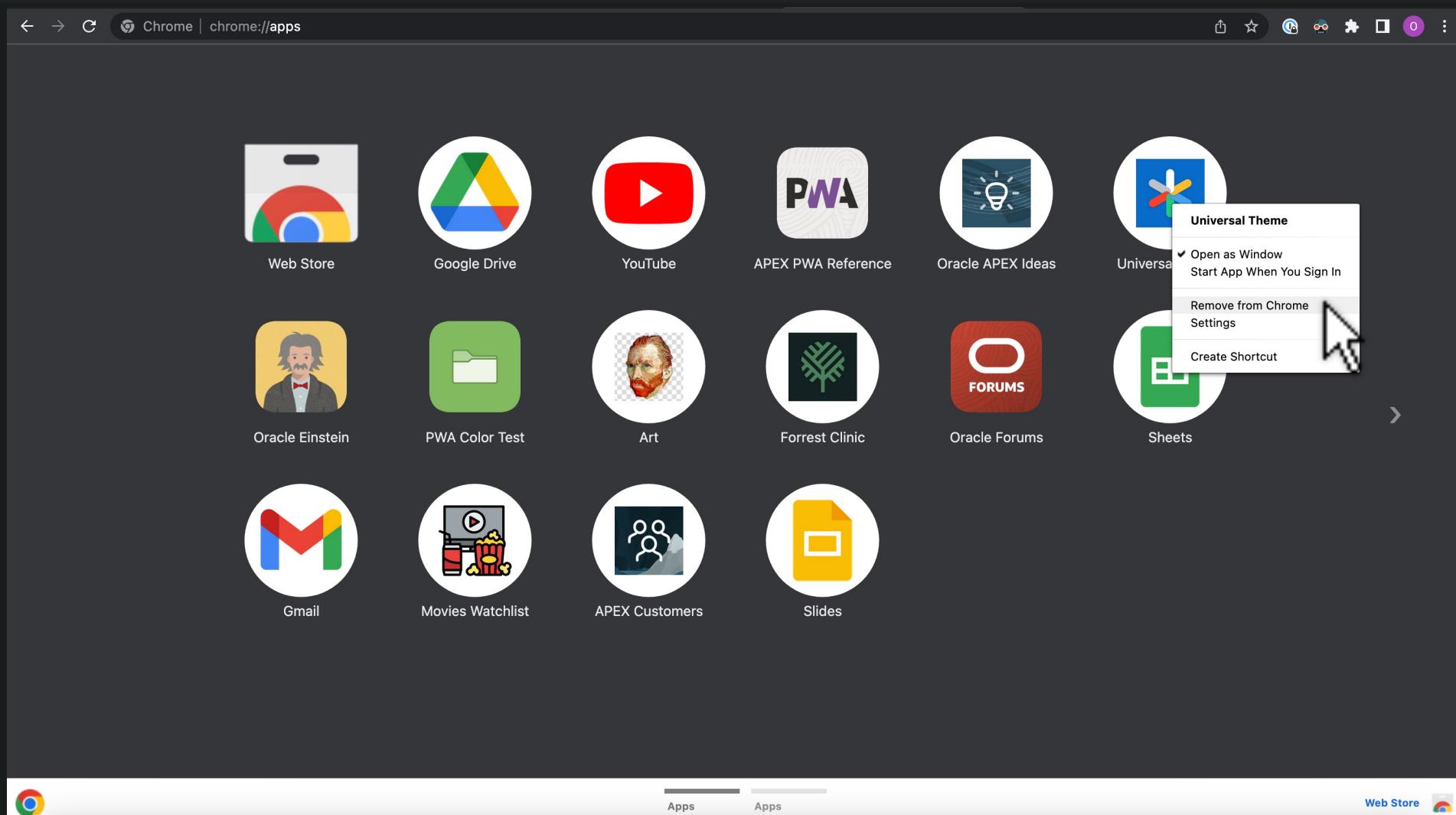
Notifications Queue

Id ↑	Flow Id	Push Subscription Id	Title	Body	Icon Url	Target Url
2492480260810711	109	1886321305964118	Reimbursement Approved	Your reimbursement of \$45.00 from Google Club was approved.		http://localhost:8080/ords/r/demo/approval-notification?p7_id=45&cs=10SP2rFSHp-5RJJ6kiiLvFAopvHr93v2tvHo_lePE0y15oBd10giKpZVW

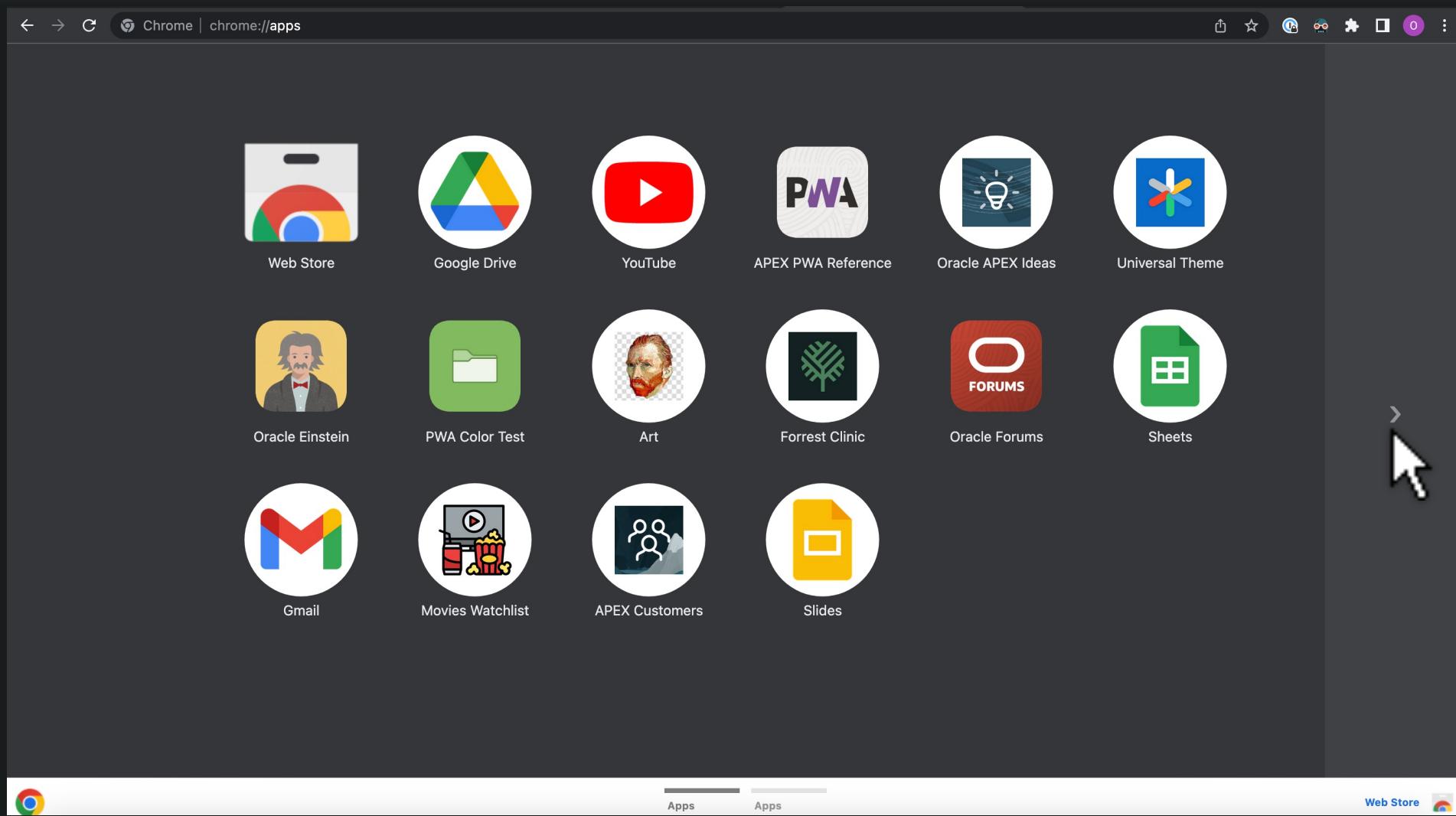
Release 1.0 [Customize](#) Built with ❤ using Oracle APEX



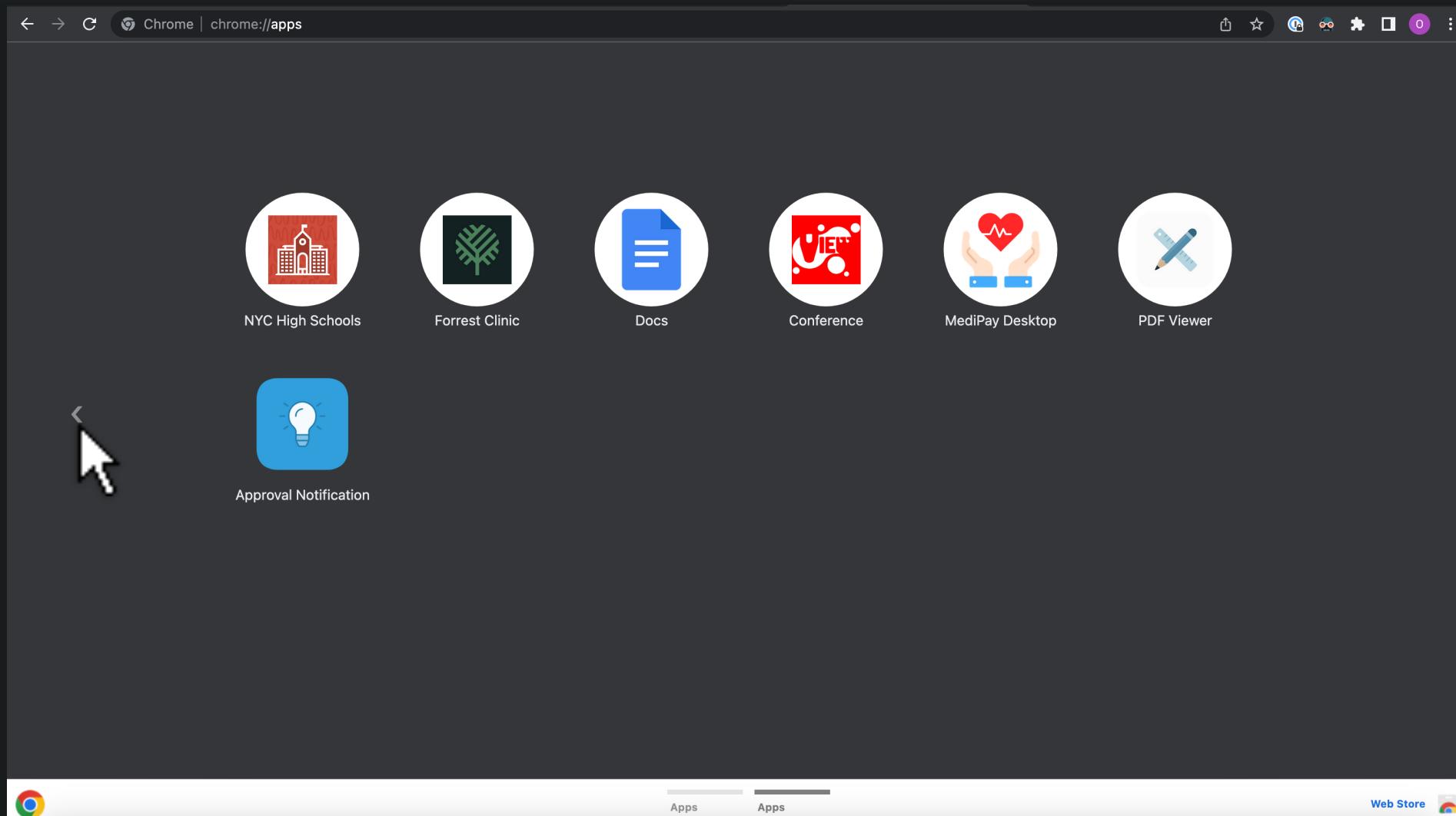
Chrome PWA Apps Management chrome://apps



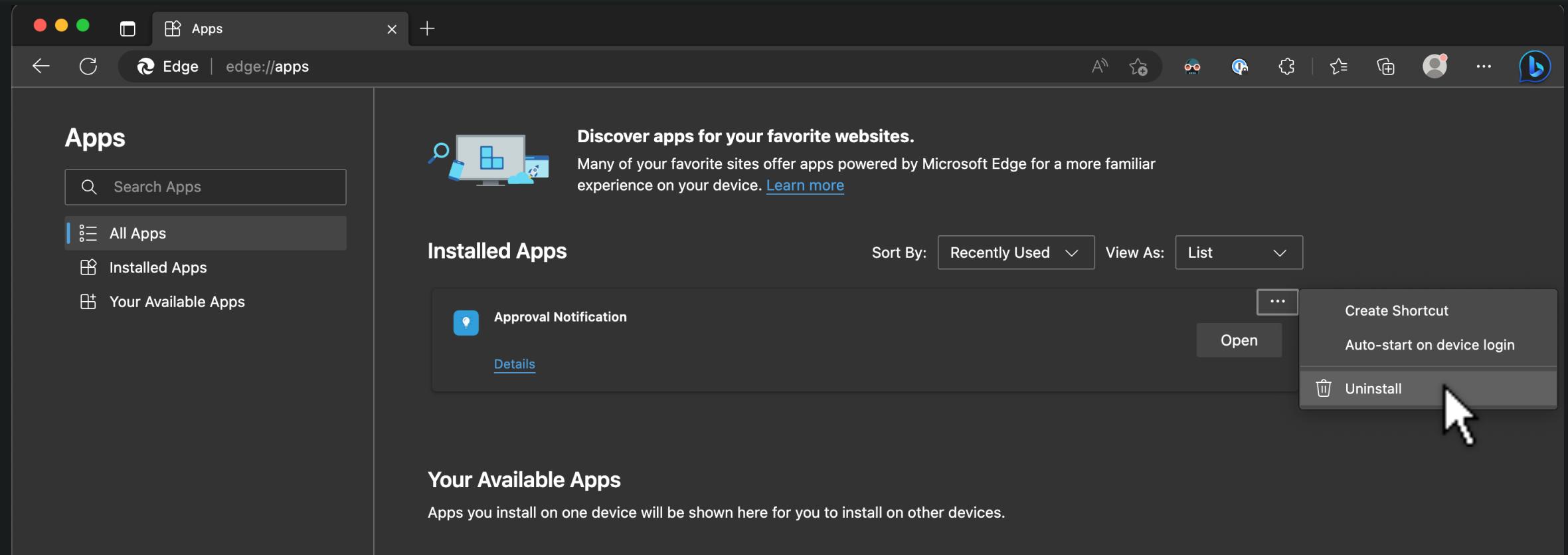
Chrome PWA Apps Management chrome://apps



Chrome PWA Apps Management chrome://apps

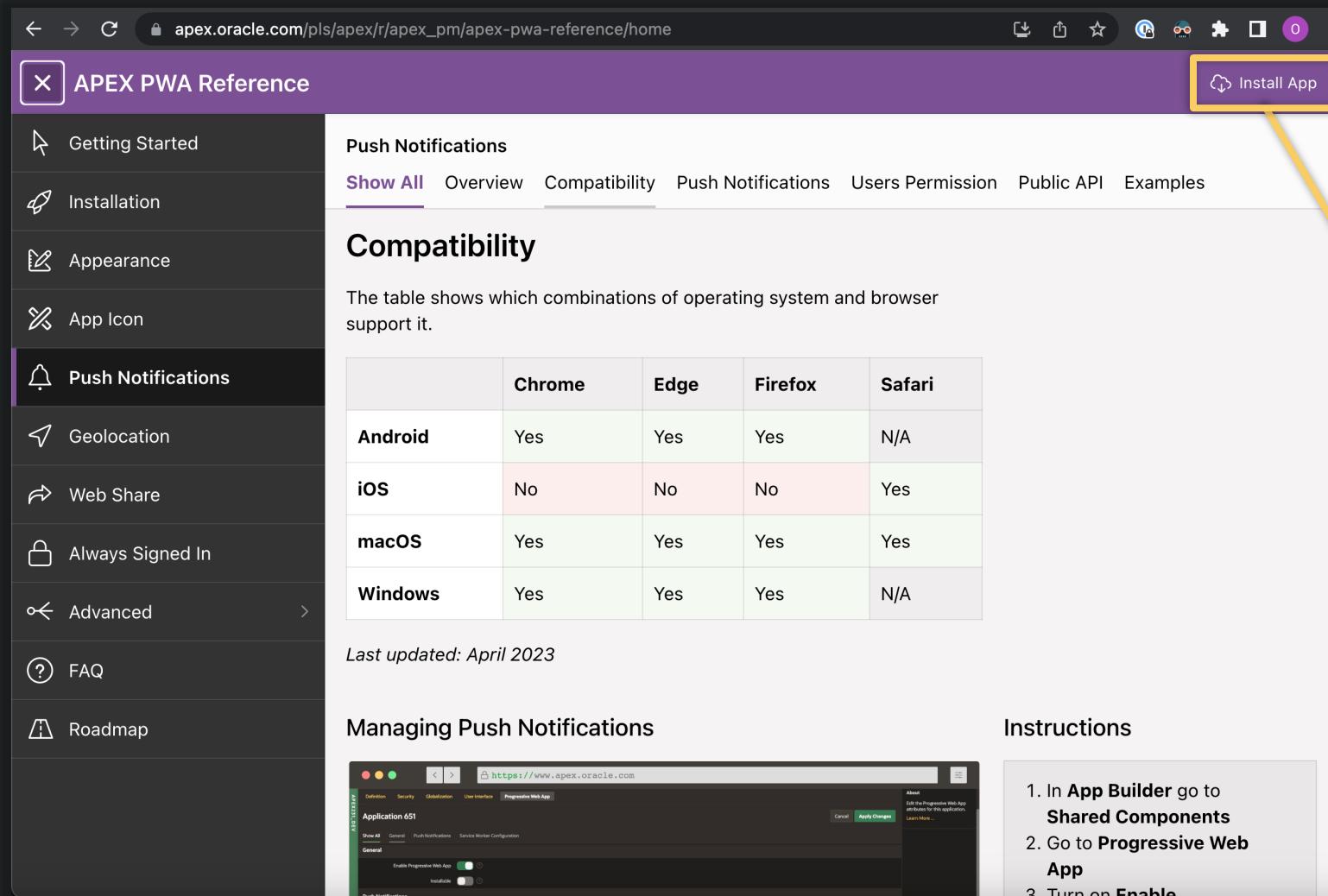


Edge PWA Apps Management `edge://apps`



The screenshot shows the Microsoft Edge PWA Apps Management interface. The title bar reads "Apps" and the address bar shows "edge://apps". The left sidebar has a "Search Apps" input and three categories: "All Apps" (selected), "Installed Apps", and "Your Available Apps". The main content area has a "Discover apps for your favorite websites." section with a "Learn more" link. Below it is the "Installed Apps" section, which is sorted by "Recently Used" and viewed as a "List". A card for "Approval Notification" is shown with "Details" and "Open" buttons. A context menu is open over the "Open" button, with options: "Create Shortcut", "Auto-start on device login", and "Uninstall". A cursor is hovering over the "Uninstall" option. The bottom section is titled "Your Available Apps" with the sub-instruction: "Apps you install on one device will be shown here for you to install on other devices."

PWA Reference App apex.oracle.com/pwa



apex.oracle.com/pls/apex/r/apex_pm/apex-pwa-reference/home

APEX PWA Reference

Push Notifications

Show All Overview Compatibility Push Notifications Users Permission Public API Examples

Compatibility

The table shows which combinations of operating system and browser support it.

	Chrome	Edge	Firefox	Safari
Android	Yes	Yes	Yes	N/A
iOS	No	No	No	Yes
macOS	Yes	Yes	Yes	Yes
Windows	Yes	Yes	Yes	N/A

Last updated: April 2023

Managing Push Notifications



Instructions

1. In **App Builder** go to **Shared Components**
2. Go to **Progressive Web App**
3. Turn on **Enable**

APEX PWA Reference



Universal Theme Reference App apex.oracle.com/ut

Universal Theme

- Getting Started
- Design
- Components
- Icons
- Reference

APEX Universal Theme

About

Universal Theme is a responsive, versatile, and customizable user interface for your APEX apps. It is designed uniquely for APEX to make it easy for developers to build beautiful, modern applications, at any scale, for any purpose, that work on any device.

Getting Started

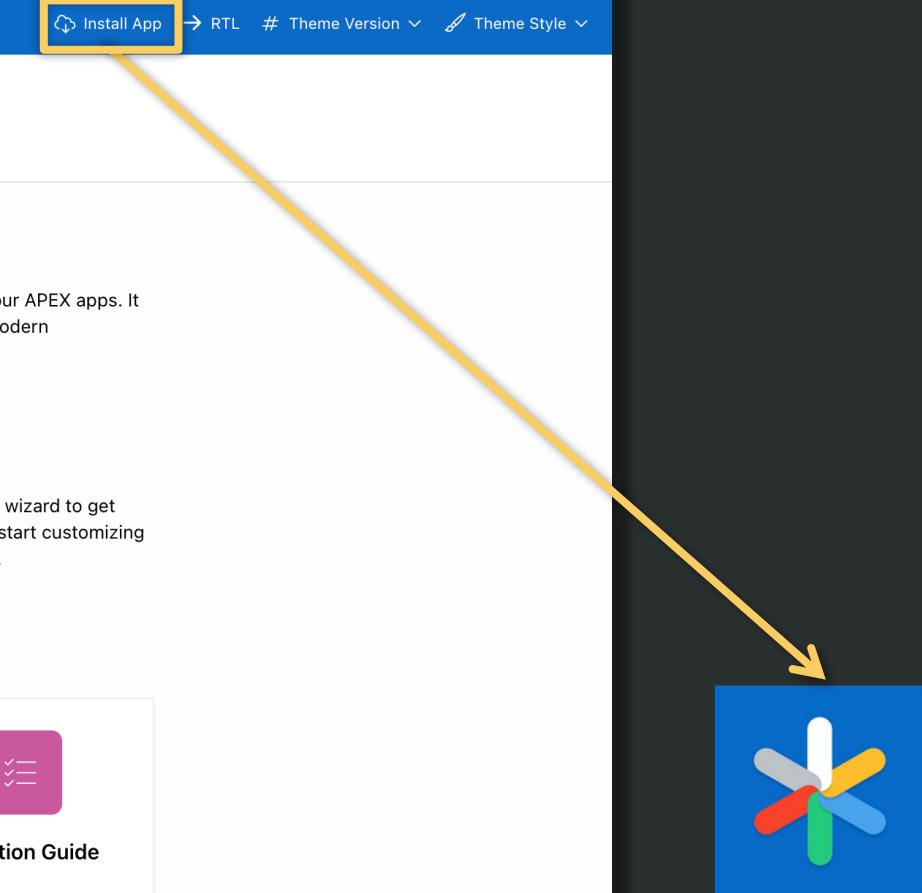
It is easy to get started using Universal Theme. Just follow the Create Application wizard to get something up and running. From here you can start to build out your application, start customizing it using Template Options and Theme Roller, and learn all about it in this very app.

Explore Universal Theme

- Design
- Components
- Migration Guide
- Icons
- Reference

Install App

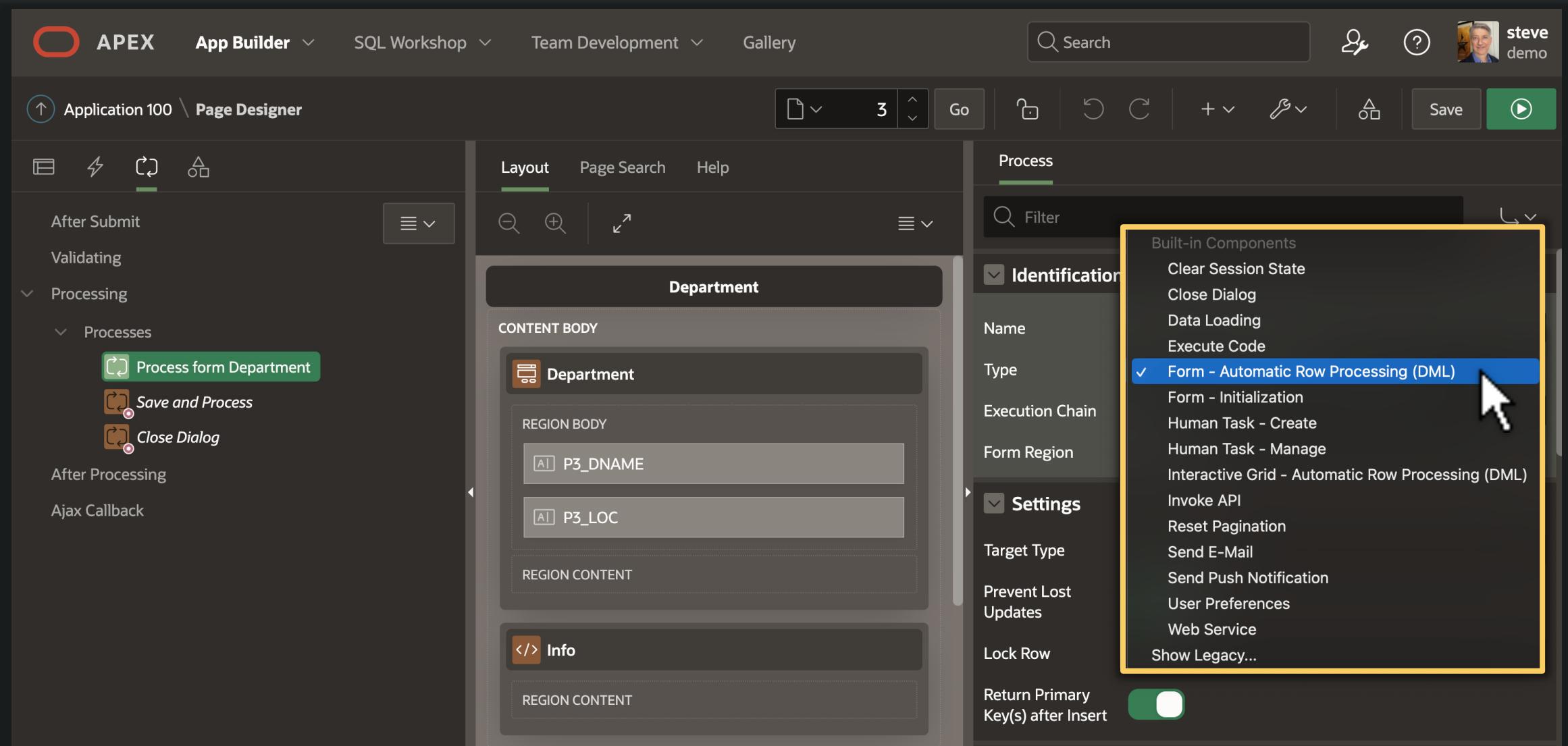
RTL # Theme Version Theme Style



APEX 23.1

Easy Background Processing

APEX Page Processes: Extensible, Declarative Actions



The screenshot shows the Oracle APEX Page Designer interface. The top navigation bar includes links for APEX, App Builder, SQL Workshop, Team Development, and Gallery, along with a search bar and user profile for 'steve demo'. The main area shows an application structure for 'Application 100 \ Page Designer'. On the left, a sidebar lists various processing events: After Submit, Validating, Processing (with sub-options like Processes, Save and Process, Close Dialog, and Form - Automatic Row Processing (DML)), After Processing, and Ajax Callback. The central content area displays a page template for 'Department' with regions for 'CONTENT BODY', 'REGION BODY' (containing input fields for 'P3_DNAME' and 'P3_LOC'), 'REGION CONTENT', and 'REGION CONTENT' for the 'Info' region. The right sidebar is titled 'Process' and shows a list of built-in components. A yellow box highlights the 'Identification' section, which includes 'Form - Automatic Row Processing (DML)', which is also highlighted with a blue selection bar and a mouse cursor. Other listed components include Clear Session State, Close Dialog, Data Loading, Execute Code, Form - Initialization, Human Task - Create, Human Task - Manage, Interactive Grid - Automatic Row Processing (DML), Invoke API, Reset Pagination, Send E-Mail, Send Push Notification, User Preferences, Web Service, and Show Legacy...

APEX Page Processes: Execute in Sequence

The screenshot shows the Oracle APEX Page Designer interface. The top navigation bar includes links for APEX, App Builder, SQL Workshop, Team Development, and Gallery, along with a search bar and user profile for 'steve demo'. The main area is titled 'Application 100 \ Page Designer' and shows a page layout for a 'Department' form. The layout includes a 'CONTENT BODY' with a 'Department' region containing fields for 'P3_DNAME' and 'P3_LOC', and a 'REGION CONTENT' section with an 'Info' region. The 'REGION BODY' section is currently selected. On the left, a sidebar lists various processing events: After Submit, Validating, Processing (with sub-options for Processes, After Processing, and Ajax Callback), and After Processing. A mouse cursor is hovering over the 'Process' button in the toolbar. A context menu is open, showing a list of built-in components. The 'Form - Automatic Row Processing (DML)' option is highlighted with a blue selection bar, indicating it is the current choice. Other options in the menu include Clear Session State, Close Dialog, Data Loading, Execute Code, Form - Initialization, Human Task - Create, Human Task - Manage, Interactive Grid - Automatic Row Processing (DML), Invoke API, Reset Pagination, Send E-Mail, Send Push Notification, User Preferences, Web Service, and Show Legacy... A toggle switch for 'Return Primary Key(s) after Insert' is also visible in the bottom right of the menu.

Application 100 \ Page Designer

Layout Page Search Help

Process

Filter

Identification

- Name
- Type
- Execution Chain
- Form Region

Settings

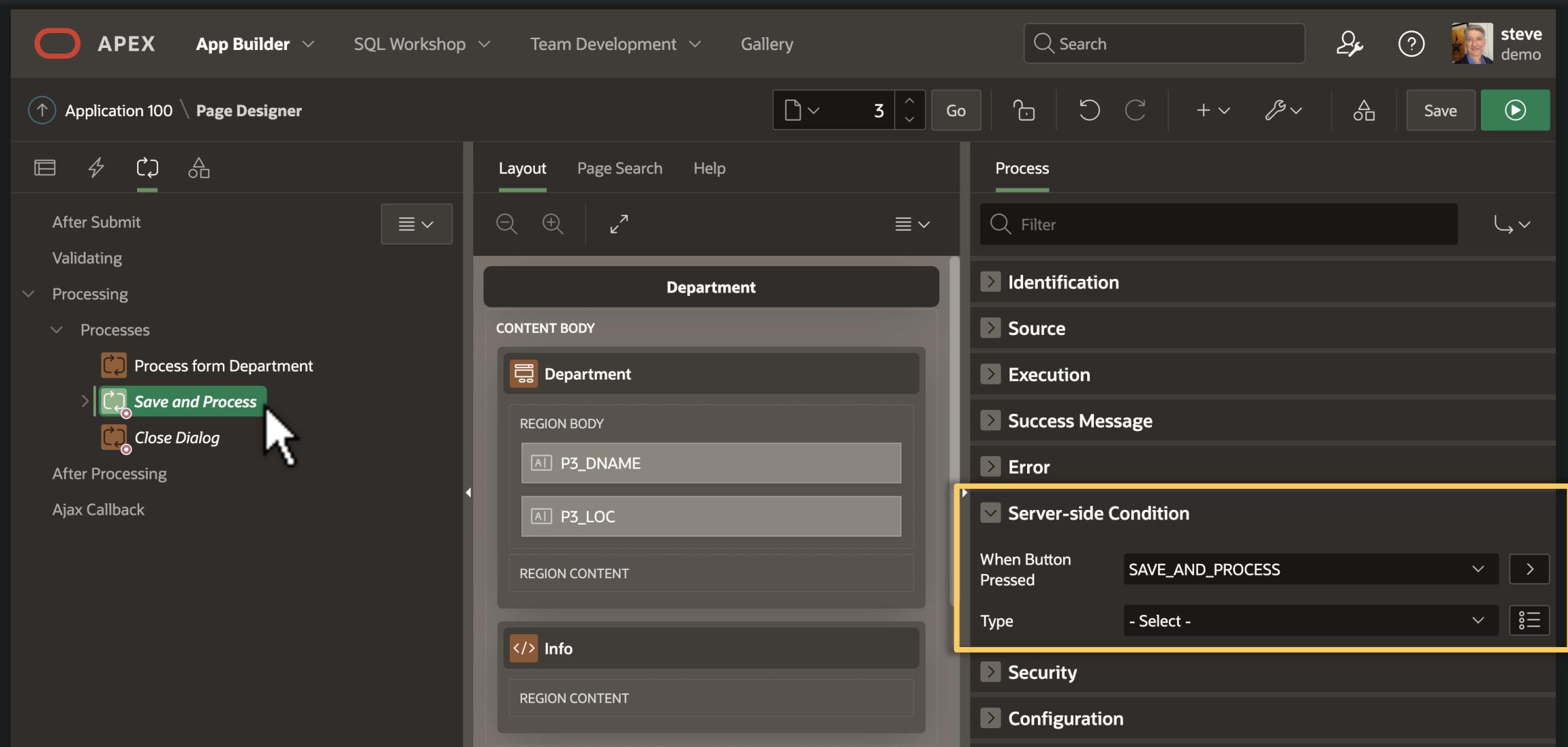
- Target Type
- Prevent Lost Updates
- Lock Row

Return Primary Key(s) after Insert

Built-in Components

- Clear Session State
- Close Dialog
- Data Loading
- Execute Code
- Form - Automatic Row Processing (DML)**
- Form - Initialization
- Human Task - Create
- Human Task - Manage
- Interactive Grid - Automatic Row Processing (DML)
- Invoke API
- Reset Pagination
- Send E-Mail
- Send Push Notification
- User Preferences
- Web Service
- Show Legacy...

APEX Page Processes: Can Be Conditional



The screenshot shows the Oracle APEX App Builder interface. The top navigation bar includes links for APEX, App Builder, SQL Workshop, Team Development, and Gallery, along with a search bar and user profile for 'steve demo'. The main area is titled 'Application 100 \ Page Designer' and shows a 'Department' page with a 'CONTENT BODY' region containing a 'Department' item and two 'REGION BODY' items for 'P3_DNAME' and 'P3_LOC'. The 'REGION CONTENT' and 'Info' regions are also visible. On the left, a sidebar lists 'After Submit', 'Validating', 'Processing' (expanded to show 'Processes' with 'Process form Department', 'Save and Process' (highlighted with a mouse cursor), and 'Close Dialog'), 'After Processing', and 'Ajax Callback'. The right sidebar is titled 'Process' and lists sections for Identification, Source, Execution, Success Message, Error, and Server-side Condition. The 'Server-side Condition' section is highlighted with a yellow box and contains a configuration for 'When Button Pressed' set to 'SAVE_AND_PROCESS' and 'Type' set to '- Select -'.

APEX Page Processes: If Long-Running, User Waits...

Screenshot of the Oracle Application Express (APEX) Page Designer interface, showing the configuration of a page process.

The top navigation bar includes links for APEX, App Builder, SQL Workshop, Team Development, and Gallery, along with a search bar and user profile for "steve demo".

The left sidebar shows the current application structure: Application 100 \ Page Designer. It lists various process categories: After Submit, Validating, Processing, and Processes. The "Save and Process" item under Processes is highlighted with a mouse cursor.

The main content area displays a page layout for "Department". The "CONTENT BODY" region contains a "Department" item and two "REGION BODY" items with input fields for "P3_DNAME" and "P3_LOC". The "REGION CONTENT" and "INFO" regions are also visible.

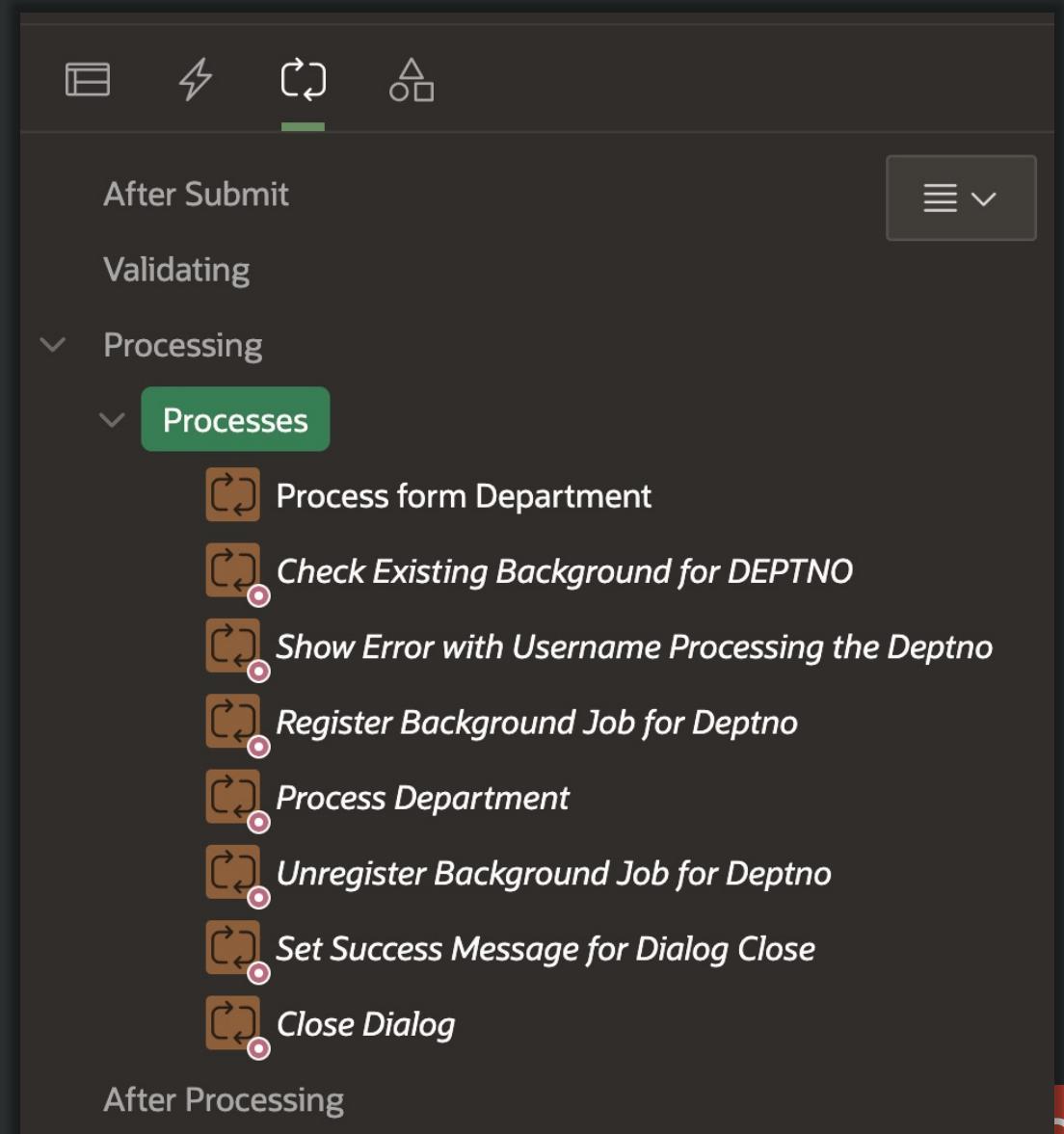
The right sidebar is titled "Process" and contains the configuration for the selected "Save and Process" item. The "Source" section is highlighted with a yellow box and contains the following configuration:

- Location: Local Database
- Language: PL/SQL
- PL/SQL Code: `some_long_running_process;`

A large circular progress indicator with a "WIP" icon is positioned to the right of the configuration area.

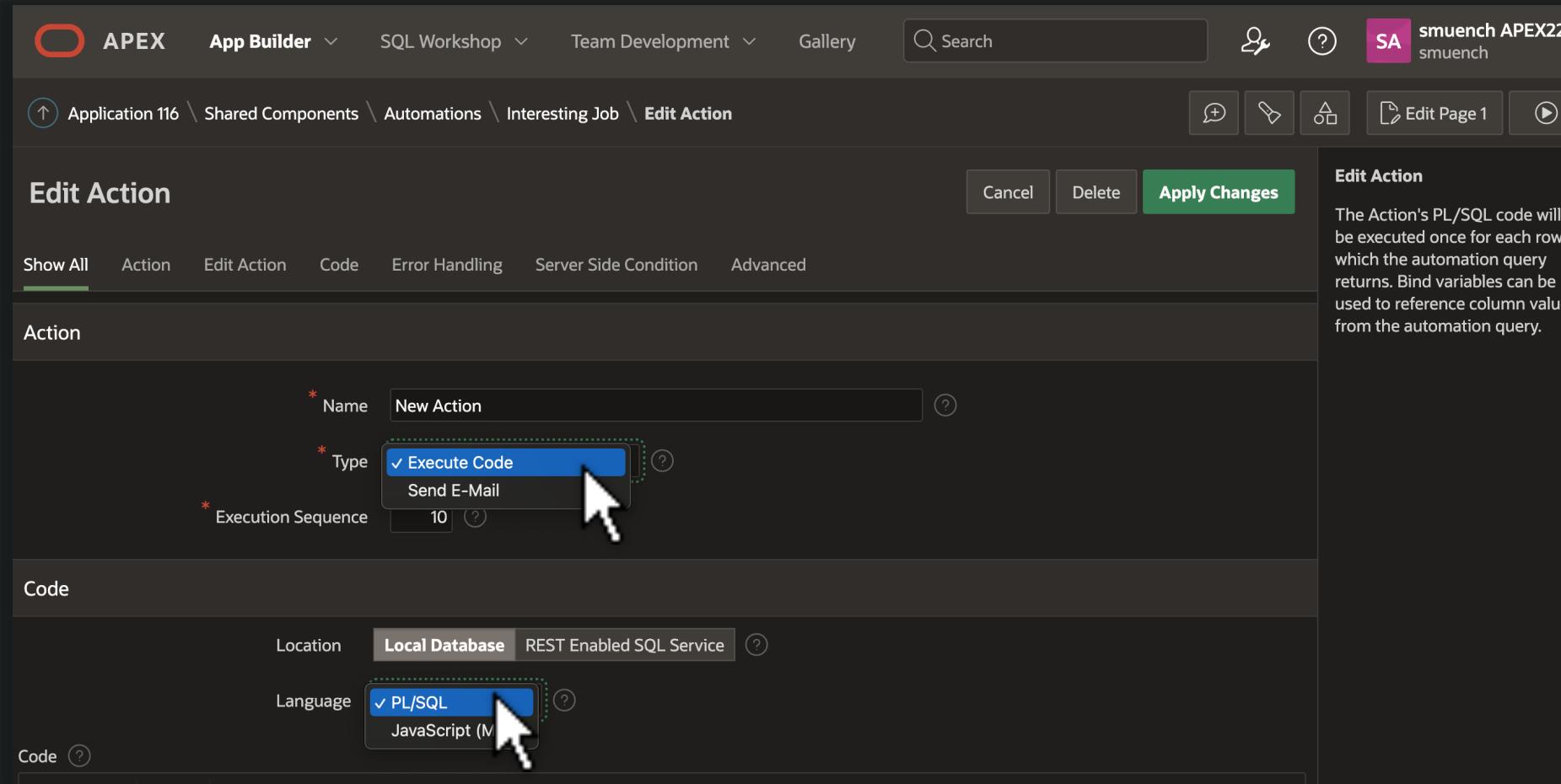
Can We Simplify Development with Page Processes?

- At a glance, the "flow" of a sequence of conditional page processes is not obvious
- Offloading long-running work to background requires Automations



Can We Further Simplify Background Processing?

- APEX Automations simplify running background jobs
- Sending email is declarative, but otherwise you write code



The screenshot shows the Oracle APEX App Builder interface for editing an automation action. The top navigation bar includes links for APEX, App Builder, SQL Workshop, Team Development, and Gallery, along with a search bar and user profile information for 'smuench APEX222'.

The current page path is: Application 116 \ Shared Components \ Automations \ Interesting Job \ Edit Action.

The main content area is titled 'Edit Action' and contains tabs for Show All, Action, Edit Action, Code, Error Handling, Server Side Condition, and Advanced. The 'Action' tab is selected, showing the following fields:

- Name:** New Action
- Type:** Execute Code (selected, highlighted with a blue box and a cursor)
- Send E-Mail** (option listed below Execute Code)
- Execution Sequence:** 10

Below the Action tab, the 'Code' tab is visible, showing the following configuration:

- Location:** Local Database (selected, highlighted with a blue box)
- Language:** PL/SQL (selected, highlighted with a blue box and a cursor)
- JavaScript (M)** (option listed below PL/SQL)

On the right side of the page, there is a sidebar with the title 'Edit Action' and a description: 'The Action's PL/SQL code will be executed once for each row, which the automation query returns. Bind variables can be used to reference column values from the automation query.'

At the bottom right of the page, there is a large orange button with a white 'O' icon.

APEX Page Processes: Innovations

- Group sequence of page processes into a "chain"
- Child procs run only if parent chain's condition true
- Use parent chain's name for additional *flow* clarity
- Optionally set parent chain to run in background
- Any page process types (incl. custom plugins) work
- Allow background process to report progress

23.1 Sample Data Loading: *Background Load* Page

Sample Data Loading

Help steve

Home

Data Loading

CSV Load

Transformation and Lookup

Multiple File Type Load

Background Load

Legacy Data Loading

Manual Data Loading

Administration

Data Loading \ Background Load

Background Load

About this page

If you are loading large datasets, the loading can run into a long running page process. If the instance is set up with a resource limit, you will see the maximum limit has been reached for this type of load. To load large data efficiently, you can run the loading process in the background.

i This page illustrates how to use a process of the **Execution Chain** type to send the Data Loading execution to the background. The status of the background loading operation can be monitored in the **APEX_APPL_PAGE_BG_PROC_STATUS** APEX view. You can also review currently running background executions by clicking **Session** in the **Developer Toolbar** and then viewing **Background Executions**.

Download sample [SalesData.zip](#) file. This page uses **APEX_ZIP** package to unzip the zip file. You can upload either the ZIP or CSV file.

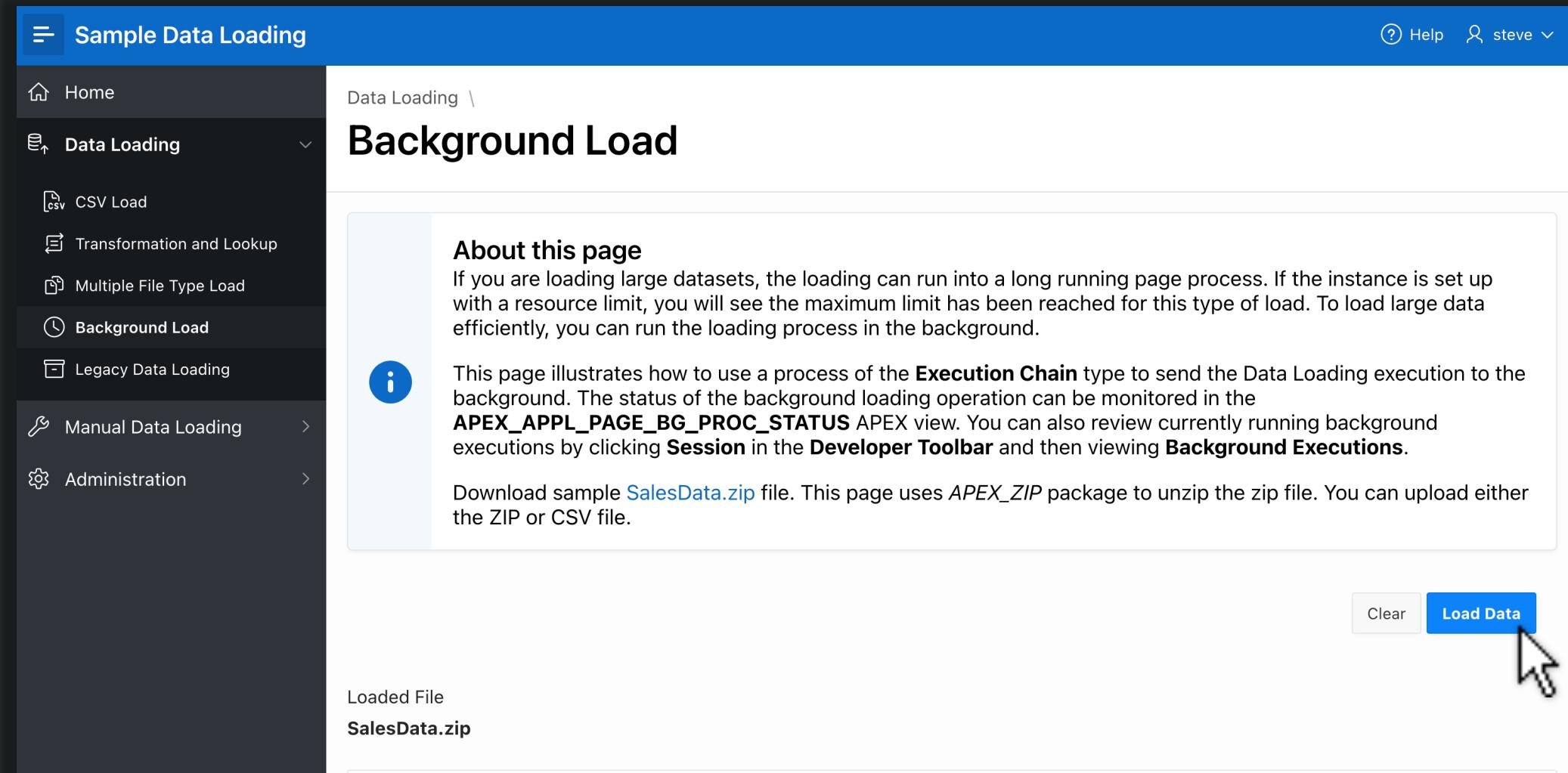
Drag and Drop Sales Data

Supported formats CSV, TXT, ZIP

Choose File



23.1 Sample Data Loading: *Background Load* Page



Sample Data Loading

Help steve

Home

Data Loading

CSV Load

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Download sample [SalesData.zip](#) file. This page uses **APEX_ZIP** package to unzip the zip file. You can upload either the ZIP or CSV file.

Clear Load Data

Loaded File

SalesData.zip

23.1 Sample Data Loading: *Background Load* Page

Sample Data Loading

- Home
- Data Loading
 - CSV Load
 - Transformation and Lookup
 - Multiple File Type Load
 - Background Load
 - Legacy Data Loading
- Manual Data Loading
- Administration

Data Loading \ Background Load \

Load Status

Executing Status

2,380 Rows Processed

Sales Table Contents

Region	Country	Item Type	Sales Channel	Order Priority	Units Sold	Unit Price	Unit Cost	Total Profit	Last Updated
Europe	Hungary	Snacks	Online	O	5813	\$152.58	\$97.44	\$320,528.82	28 seconds ago
Asia	Tajikistan	Baby Food	Offline	L	6401	\$255.28	\$159.42	\$613,599.86	28 seconds ago

✓ Data Loading task kicked off for execution.

Background Load Page: Data Loading Page Process

The screenshot shows the Oracle APEX App Builder interface for a page named "Background Load".

Left Sidebar (Processes):

- After Submit
- Computations: P17_FILE_NAME
- Validating: Is valid file type
- Processing: Processes > Load Data Background
 - Processes: Unpack ZIP Archive, Load Data (highlighted with a yellow arrow), Report Loading Results
- After Processing: Branches > View Load Status
- Ajax Callback: Clear Cache

Page Designer View:

- BREADCRUMB BAR:** Contains a Breadcrumb region.
- BODY:** Contains an About this page region and a Button Bar region with a NEXT button, a CLEAR button, and a LOAD button.
- Right Panel (Process):**

 - Identification:** Name: Load Data, Type: Data Loading (highlighted with a yellow box and arrow), Execution Chain: Load Data Background
 - Settings:**
 - Data Load Definition: Sales Data Load
 - Source Data Type: SQL Query
 - SQL Query:

```
select eba_demo_data_load.get_file_blob from sys.dual
```
 - Page item containing XLSX Sheet Name
 - Processed Row Count Item: P17_PROCESSED_ROWS

Load Data Child Process In Load Data Background Chain

The screenshot shows the Oracle APEX App Builder interface for a page designer. The left sidebar shows a tree of page processes, including 'After Submit', 'Computations' (with a rule for P17_FILE_NAME), 'Validating' (with a validation for 'Is valid file type'), 'Processing' (with a process for 'Load Data Background'), and 'After Processing' (with a branch for 'View Load Status'). The main content area displays a page layout with a 'Background Load' region containing a 'Breadcrumb' bar and an 'About this page' region. The right sidebar is the 'Process' configuration panel for the 'Load Data' process. The 'Identification' section shows the process is named 'Load Data' and is of type 'Data Loading'. The 'Execution Chain' is set to 'Load Data Background', which is highlighted with a yellow box. The 'Settings' section includes 'Data Load Definition' (set to 'Sales Data Load'), 'Source Data Type' (set to 'SQL Query'), and the SQL query: `select eba_demo_data_load.get_file_blob from sys.dual`. The 'Page item containing XLSX Sheet Name' is set to 'P17_FILE_NAME' and the 'Processed Row Count Item' is set to 'P17_PROCESSED_ROWS'. A yellow arrow points from the 'Load Data Background' process in the sidebar to the 'Execution Chain' setting in the configuration panel.

APEX App Builder

Application 102 \ Page Designer

Layout Page Search Help

Process

Identification

Name: Load Data

Type: Data Loading

Execution Chain: Load Data Background

Settings

Data Load Definition: Sales Data Load

Source Data Type: SQL Query

SQL Query: `select eba_demo_data_load.get_file_blob from sys.dual`

Page item containing XLSX Sheet Name: P17_FILE_NAME

Processed Row Count Item: P17_PROCESSED_ROWS

Execution Chain: Load Data Background

Load Data Background

Load Data

Report Loading Results

Clear Cache

View Load Status

Ajax Callback

Background Load

BREADCRUMB BAR

Breadcrumb

REGION CONTENT

About this page

REGION CONTENT

Button Bar

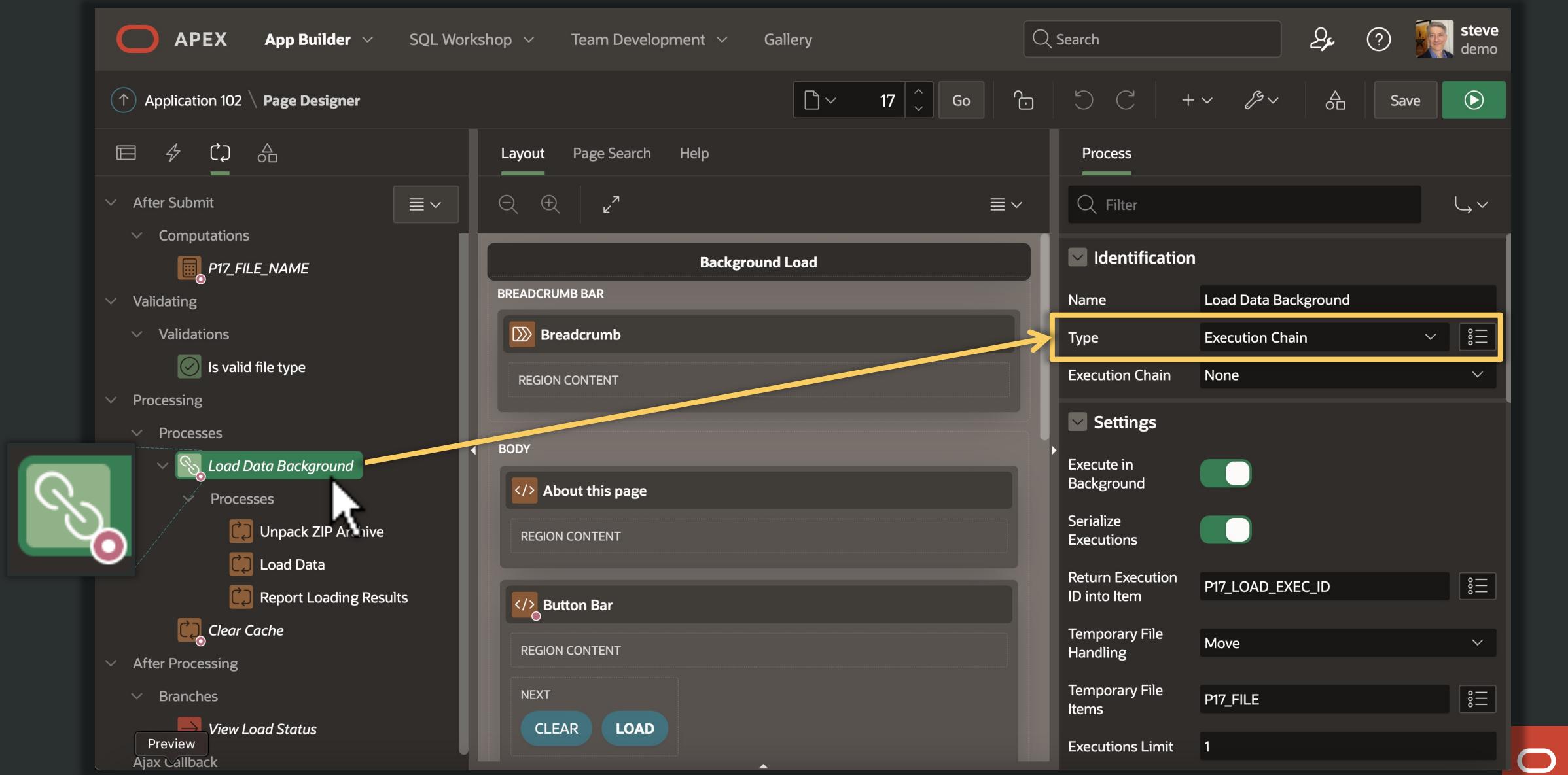
REGION CONTENT

NEXT

CLEAR LOAD

steve demo

Load Data Background is an Execution Chain Type



The screenshot shows the Oracle APEX Page Designer interface. On the left, the page structure is defined with regions: BREADCRUMB BAR, BODY, and BUTTON BAR. The BODY region contains an 'About this page' region and a 'Button Bar' with 'CLEAR' and 'LOAD' buttons. On the right, the 'Process' configuration pane is open for a process named 'Load Data Background'. The 'Type' field is highlighted with a yellow arrow and set to 'Execution Chain'. The 'Execution Chain' dropdown is set to 'None'. The 'Settings' section includes options for 'Execute in Background' (on) and 'Serialize Executions' (on). The 'Temporary File Handling' setting is set to 'Move' and the 'Temporary File Items' setting is set to 'P17_FILE'. The 'Executions Limit' is set to 1. A green icon with a circular arrow and a link symbol is visible on the left side of the interface.

APEX App Builder SQL Workshop Team Development Gallery

Search

Application 102 \ Page Designer

Layout Page Search Help

Process

Identification

Name: Load Data Background

Type: Execution Chain

Execution Chain: None

Settings

Execute in Background: On

Serialize Executions: On

Return Execution ID into Item: P17_LOAD_EXEC_ID

Temporary File Handling: Move

Temporary File Items: P17_FILE

Executions Limit: 1

Load Data Background

Processes

Unpack ZIP Archive

Load Data

Report Loading Results

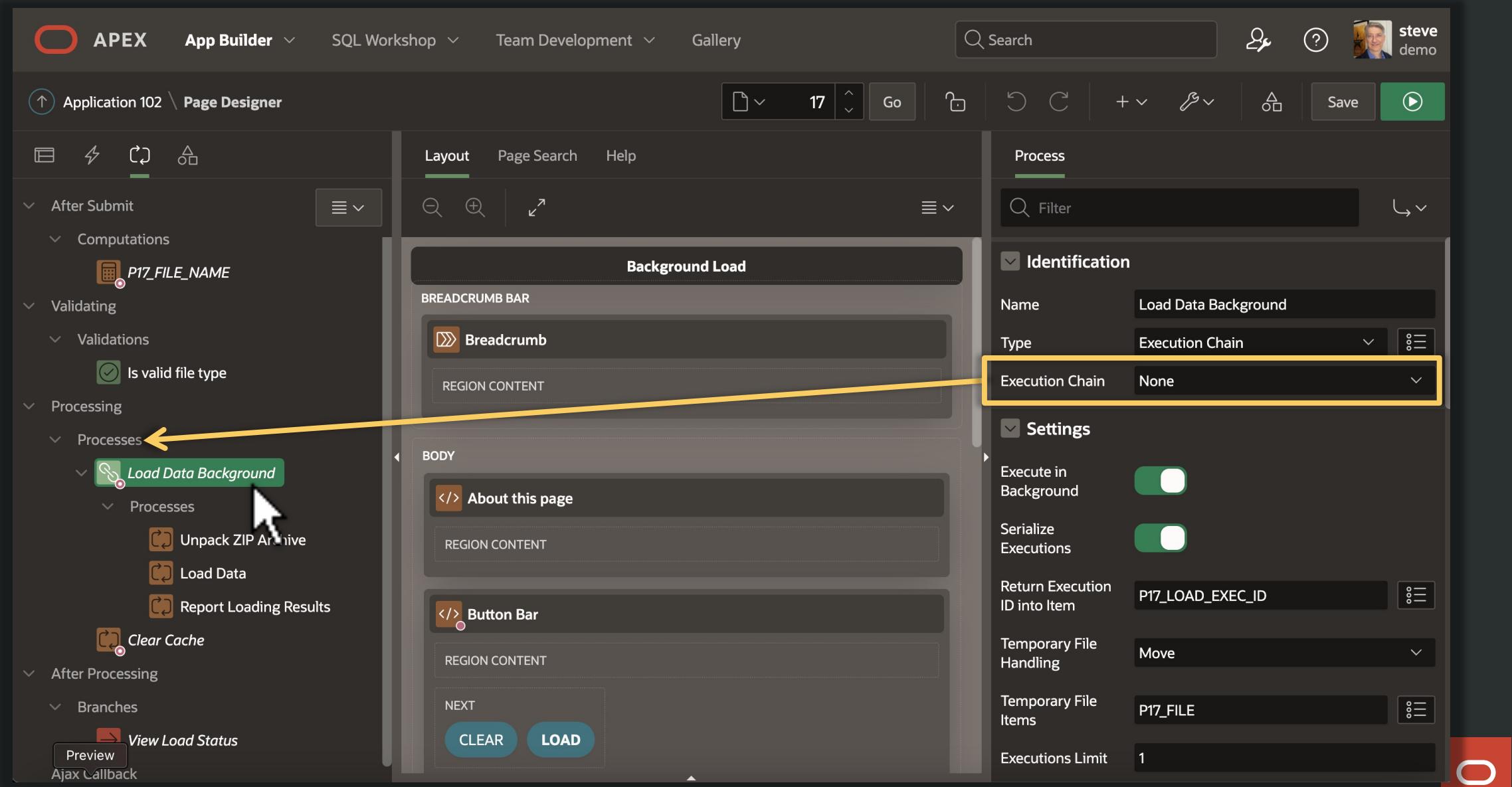
Clear Cache

View Load Status

Preview

Ajax Callback

Load Data Background is a Top-Level Execution Chain



The screenshot shows the Oracle APEX App Builder interface for a page designer. The main area displays a page layout with a 'Background Load' region. The left sidebar shows the page's processing logic, including a 'Processes' section where 'Load Data Background' is selected. The right sidebar shows the configuration for the 'Load Data Background' process, specifically the 'Execution Chain' settings which are highlighted with a yellow box. A yellow arrow points from the 'Load Data Background' process in the sidebar to the 'Execution Chain' field in the configuration sidebar.

Page Layout: Background Load

Page Structure:

- BREADCRUMB BAR
- Breadcrumb
- REGION CONTENT
- BODY
- >About this page
- REGION CONTENT
- Button Bar
- REGION CONTENT
- NEXT
- CLEAR
- LOAD

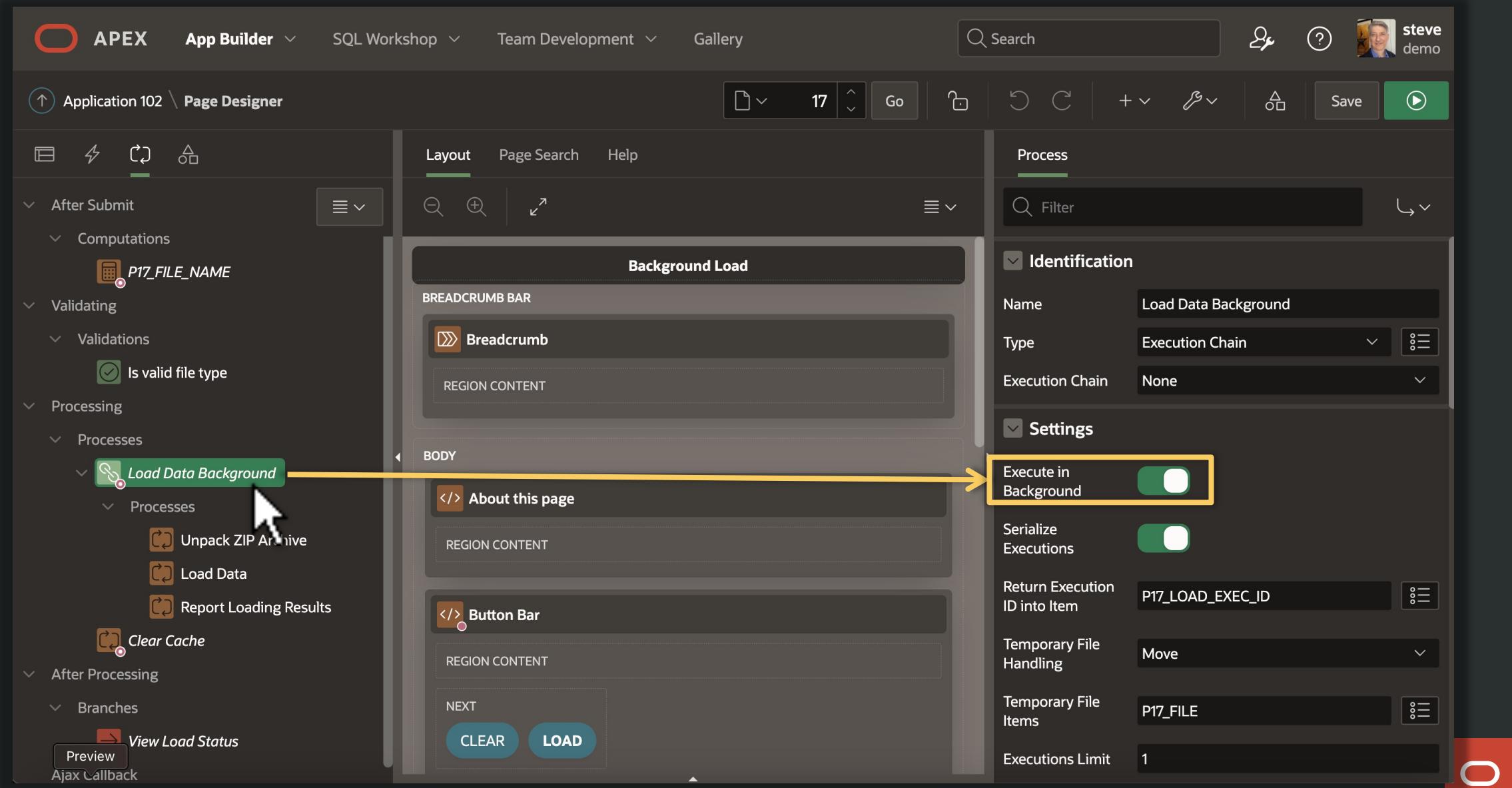
Page Processing:

- After Submit
- Computations: P17_FILE_NAME
- Validating: Is valid file type
- Processing: Processes
 - Load Data Background
 - Unpack ZIP Archive
 - Load Data
 - Report Loading Results
- After Processing
- Branches
- View Load Status
- Preview
- Ajax Callback

Process Configuration:

- Identification:** Name: Load Data Background, Type: Execution Chain
- Execution Chain:** None (highlighted with a yellow box)
- Settings:**
 - Execute in Background: On
 - Serialize Executions: On
 - Return Execution ID into Item: P17_LOAD_EXEC_ID
 - Temporary File Handling: Move
 - Temporary File Items: P17_FILE
 - Executions Limit: 1

Configuring a Chain to Execute in the Background



The screenshot shows the Oracle APEX Page Designer interface. The left sidebar displays the page structure with various regions: Breadcrumb Bar, BODY, and Button Bar. The BODY region contains an 'About this page' section with a 'REGION CONTENT' area. The right sidebar is titled 'Process' and contains the configuration for an 'Execution Chain' named 'Load Data Background'. The 'Settings' section is highlighted with a yellow box, specifically the 'Execute in Background' toggle switch, which is turned on. Other settings include 'Serialize Executions' (on), 'Return Execution ID into Item' (set to 'P17_LOAD_EXEC_ID'), 'Temporary File Handling' (set to 'Move'), 'Temporary File Items' (set to 'P17_FILE'), and 'Executions Limit' (set to '1').

Page Structure (Left Sidebar):

- After Submit
- Computations
- Validating
- Validations
- Processing
- Processes
 - Load Data Background** (highlighted with a yellow box and a cursor)
 - Unpack ZIP Archive
 - Load Data
 - Report Loading Results
- After Processing
- Branches
- View Load Status
- Preview
- Ajax Callback

Page Content (Center):

Background Load

BREADCRUMB BAR

Breadcrumb

REGION CONTENT

BODY

>About this page

REGION CONTENT

Button Bar

REGION CONTENT

NEXT

CLEAR LOAD

Process (Right Sidebar):

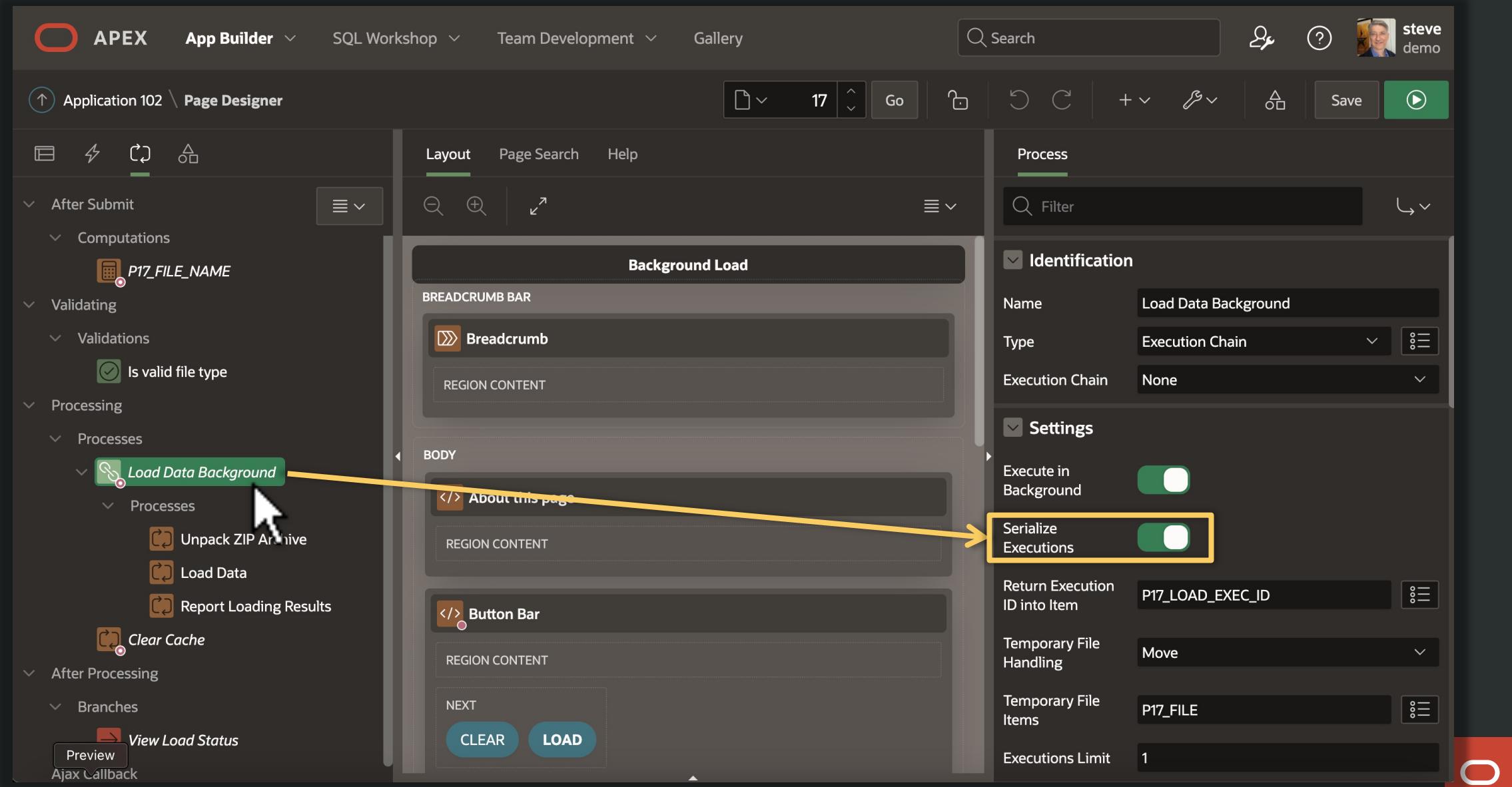
Identification

- Name: Load Data Background
- Type: Execution Chain
- Execution Chain: None

Settings

- Execute in Background: **ON**
- Serialize Executions: **ON**
- Return Execution ID into Item: P17_LOAD_EXEC_ID
- Temporary File Handling: Move
- Temporary File Items: P17_FILE
- Executions Limit: 1

Enforce Single *Instance* of this Execution Chain at a Time



The screenshot shows the Oracle APEX Page Designer interface for Application 102. The left sidebar shows the process flow for the 'Load Data Background' process. A yellow arrow points from the 'Load Data Background' process in the sidebar to the 'Serialize Executions' toggle switch in the 'Settings' section of the right panel. The 'Serialize Executions' switch is turned on, indicated by a green toggle button.

Process Flow (Left Sidebar):

- After Submit
- Computations: P17_FILE_NAME
- Validating: Is valid file type
- Processing: Load Data Background (highlighted with a green box and a yellow arrow)
- Processes: Unpack ZIP Archive, Load Data, Report Loading Results
- Clear Cache
- After Processing: View Load Status

Page Designer (Center):

Background Load

BREADCRUMB BAR: Breadcrumb

BODY: About this page

Button Bar: NEXT, CLEAR, LOAD

Process (Right Panel):

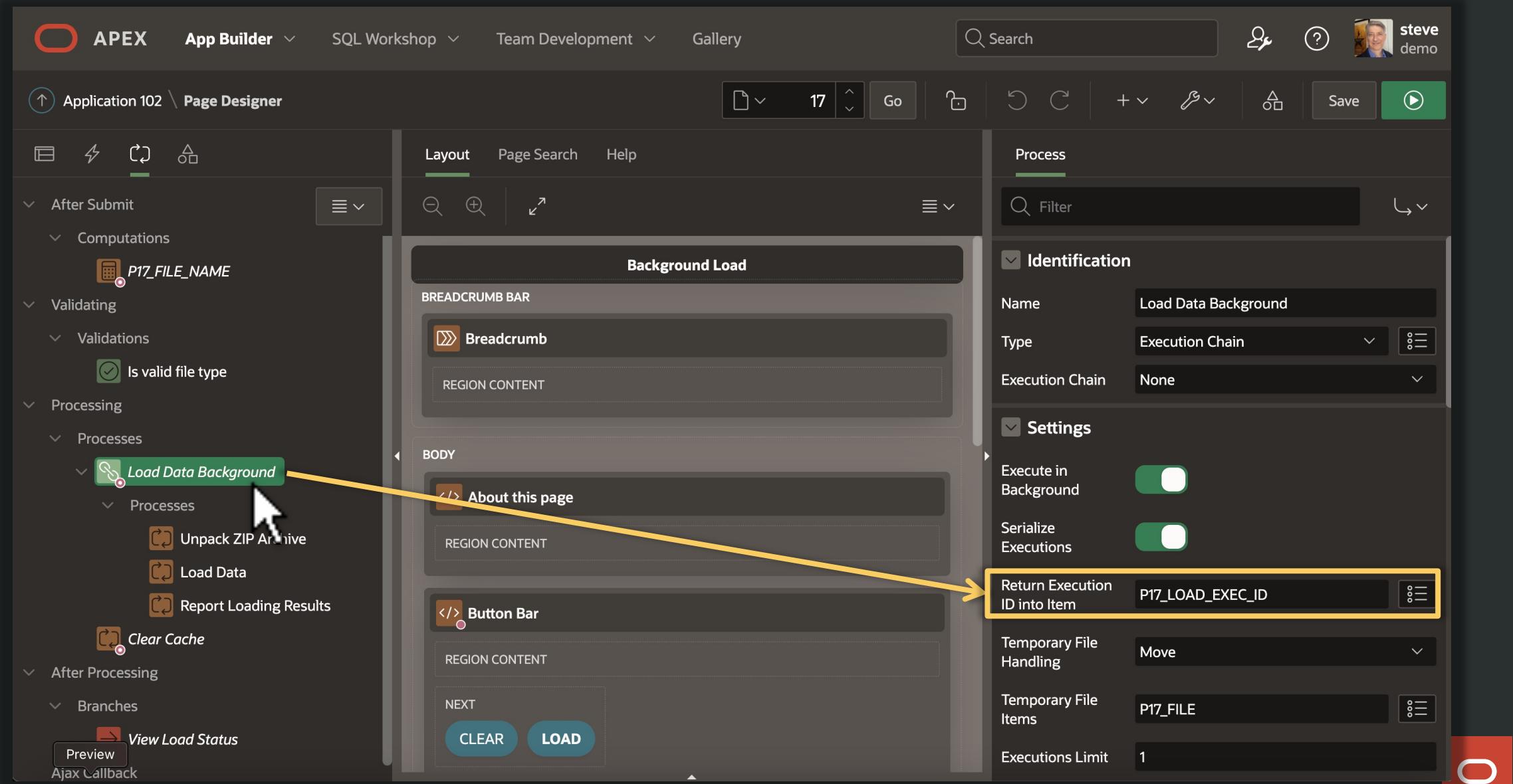
Identification:

- Name: Load Data Background
- Type: Execution Chain
- Execution Chain: None

Settings:

- Execute in Background: On
- Serialize Executions: On (highlighted with a yellow box and a yellow arrow)
- Return Execution ID into Item: P17_LOAD_EXEC_ID
- Temporary File Handling: Move
- Temporary File Items: P17_FILE
- Executions Limit: 1

Storing ID of Background Execution in a Page Item



The screenshot shows the Oracle APEX Page Designer interface. The left sidebar displays various application events and their associated computations and validations. The main content area shows a page layout with a Breadcrumb Bar, a BODY section containing an 'About this page' region, and a Button Bar with 'CLEAR' and 'LOAD' buttons. The right sidebar is titled 'Process' and contains the configuration for an 'Execution Chain' named 'Load Data Background'. The 'Settings' section includes a toggle for 'Execute in Background' (which is on) and a toggle for 'Serialize Executions' (which is on). A yellow arrow points from the 'Load Data Background' process in the sidebar to the 'Return Execution ID into Item' setting in the right sidebar, which is set to 'P17_LOAD_EXEC_ID'. The top navigation bar shows the APEX logo, App Builder, SQL Workshop, Team Development, and Gallery, along with a search bar and user profile for 'steve demo'.

APEX App Builder SQL Workshop Team Development Gallery

Search

steve demo

Application 102 \ Page Designer

Layout Page Search Help

Process

Identification

- Name: Load Data Background
- Type: Execution Chain
- Execution Chain: None

Settings

- Execute in Background:
- Serialize Executions:

Return Execution ID into Item: P17_LOAD_EXEC_ID

Temporary File Handling: Move

Temporary File Items: P17_FILE

Executions Limit: 1

After Submit

Computations: P17_FILE_NAME

Validating: Is valid file type

Processing: Load Data Background

- Processes: Unpack ZIP Archive, Load Data, Report Loading Results

After Processing: Clear Cache, View Load Status

Branches: Preview, Ajax Callback

Background Load

BREADCRUMB BAR

Breadcrumb

REGION CONTENT

BODY

ABOUT THIS PAGE

REGION CONTENT

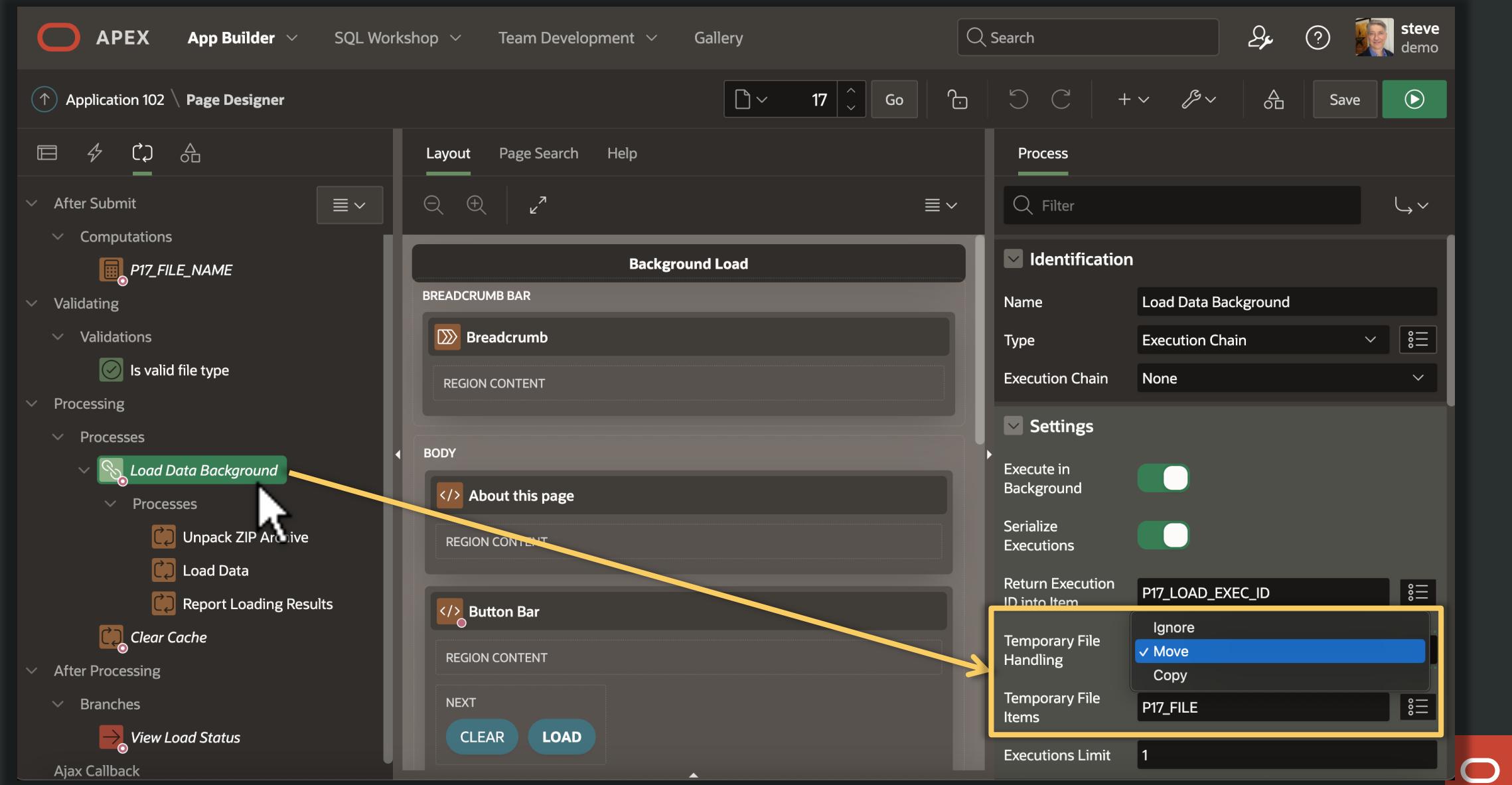
Button Bar

REGION CONTENT

NEXT

CLEAR LOAD

Choose How to Handle Temp Files in Session State Clone



The screenshot shows the Oracle APEX App Builder interface for a page designer. The main area displays a page structure with regions for Breadcrumb Bar, BODY, and Button Bar. The BODY region contains an 'About this page' panel. On the left, the page's logic is visible, including a 'Processes' section with a 'Load Data Background' item. A yellow arrow points from this item to a dropdown menu in the 'Process' panel on the right. The dropdown menu, titled 'Temporary File Handling', contains three options: 'Ignore', 'Move' (which is selected and highlighted in blue), and 'Copy'. The 'Move' option is the target of the yellow arrow.

Page Structure:

- BREADCRUMB BAR:** Contains a **Breadcrumb** region.
- BODY:** Contains an **About this page** region and a **Button Bar** region.

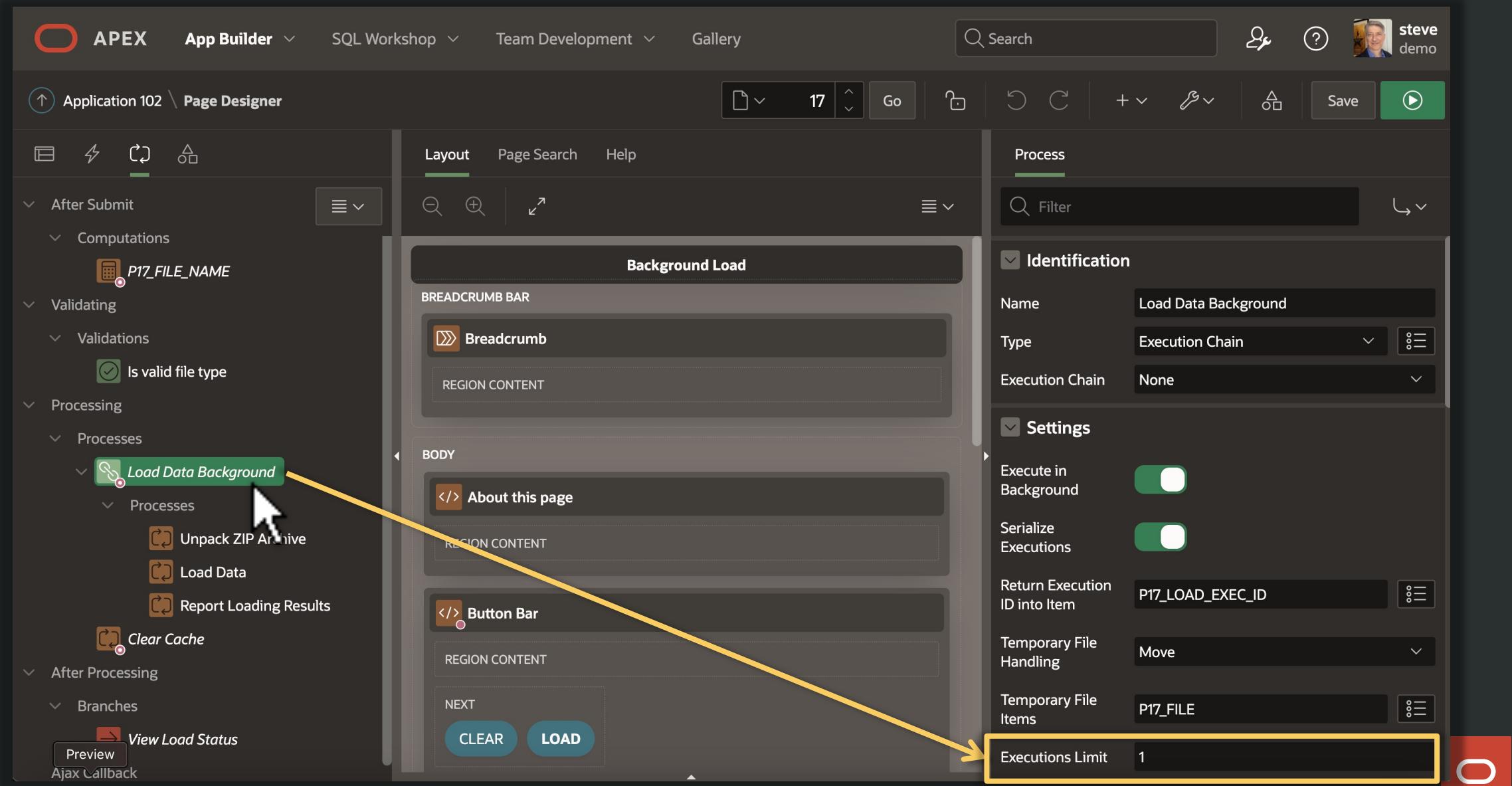
Page Logic (Left Panel):

- After Submit:** Contains a computation for `P17_FILE_NAME`.
- Validating:** Contains a validation for `Is valid file type`.
- Processing:**
 - Processes:** Contains a process named `Load Data Background`.
 - Processes (under Load Data Background):** Contains sub-processes: `Unpack ZIP Archive`, `Load Data`, and `Report Loading Results`.
- After Processing:** Contains a branch to `View Load Status`.

Process Panel (Right Panel):

- Identification:** Name: `Load Data Background`, Type: `Execution Chain`, Execution Chain: `None`.
- Settings:** Execute in Background: `On`, Serialize Executions: `On`.
- Temporary File Handling:** Set to `Move`.
- Temporary File Items:** `P17_FILE`.
- Executions Limit:** `1`.

Impose Per-Session Limit on Background Executions



The screenshot shows the Oracle APEX Page Designer interface for an application. The left sidebar shows various process categories: After Submit, Computations, Validating, Validations, Processing, Processes, After Processing, and Branches. A mouse cursor is hovering over the 'Load Data Background' process under the 'Processes' section. The main content area displays the 'Background Load' process configuration. The 'Identification' section includes the process name 'Load Data Background', type 'Execution Chain', and execution chain 'None'. The 'Settings' section contains the 'Execute in Background' toggle (which is on), 'Serialize Executions' toggle (which is on), and configuration for 'Return Execution ID into Item' (set to 'P17_LOAD_EXEC_ID'). It also includes 'Temporary File Handling' (set to 'Move') and 'Temporary File Items' (set to 'P17_FILE'). A yellow box highlights the 'Executions Limit' field, which is set to '1'. The bottom right corner of the interface has a red 'APEX' button.

Background Load

BREADCRUMB BAR

Breadcrumb

REGION CONTENT

BODY

>About this page

REGION CONTENT

Button Bar

REGION CONTENT

NEXT

CLEAR LOAD

Identification

Name: Load Data Background

Type: Execution Chain

Execution Chain: None

Settings

Execute in Background:

Serialize Executions:

Return Execution ID into Item: P17_LOAD_EXEC_ID

Temporary File Handling: Move

Temporary File Items: P17_FILE

Executions Limit: 1

In Any Execution Chain, Child Processes Run Sequentially

The screenshot shows the Oracle APEX Page Designer interface. The top navigation bar includes links for APEX, App Builder, SQL Workshop, Team Development, and Gallery, along with a search bar and user profile for 'steve demo'.

The main content area displays a page titled 'Background Load' with a breadcrumb bar and a button bar at the bottom. The page structure is as follows:

- BREADCRUMB BAR:** Contains a 'Breadcrumb' item.
- BODY:** Contains an 'About this page' region and a 'Button Bar' region.
- Button Bar:** Contains 'NEXT', 'CLEAR', and 'LOAD' buttons.

The left sidebar shows the execution chain structure:

- After Submit:**
 - Computations:** P17_FILE_NAME
- Validating:**
 - Validations:** Is valid file type
- Processing:**
 - Processes:**
 - Load Data Background** (highlighted with a mouse cursor)
 - Unpack ZIP Archive
 - Load Data
 - Report Loading Results
- After Processing:**
 - Branches:** View Load Status

A yellow arrow points from the 'Load Data Background' process in the sidebar to the 'Load Data' button in the 'Button Bar' region of the page layout.

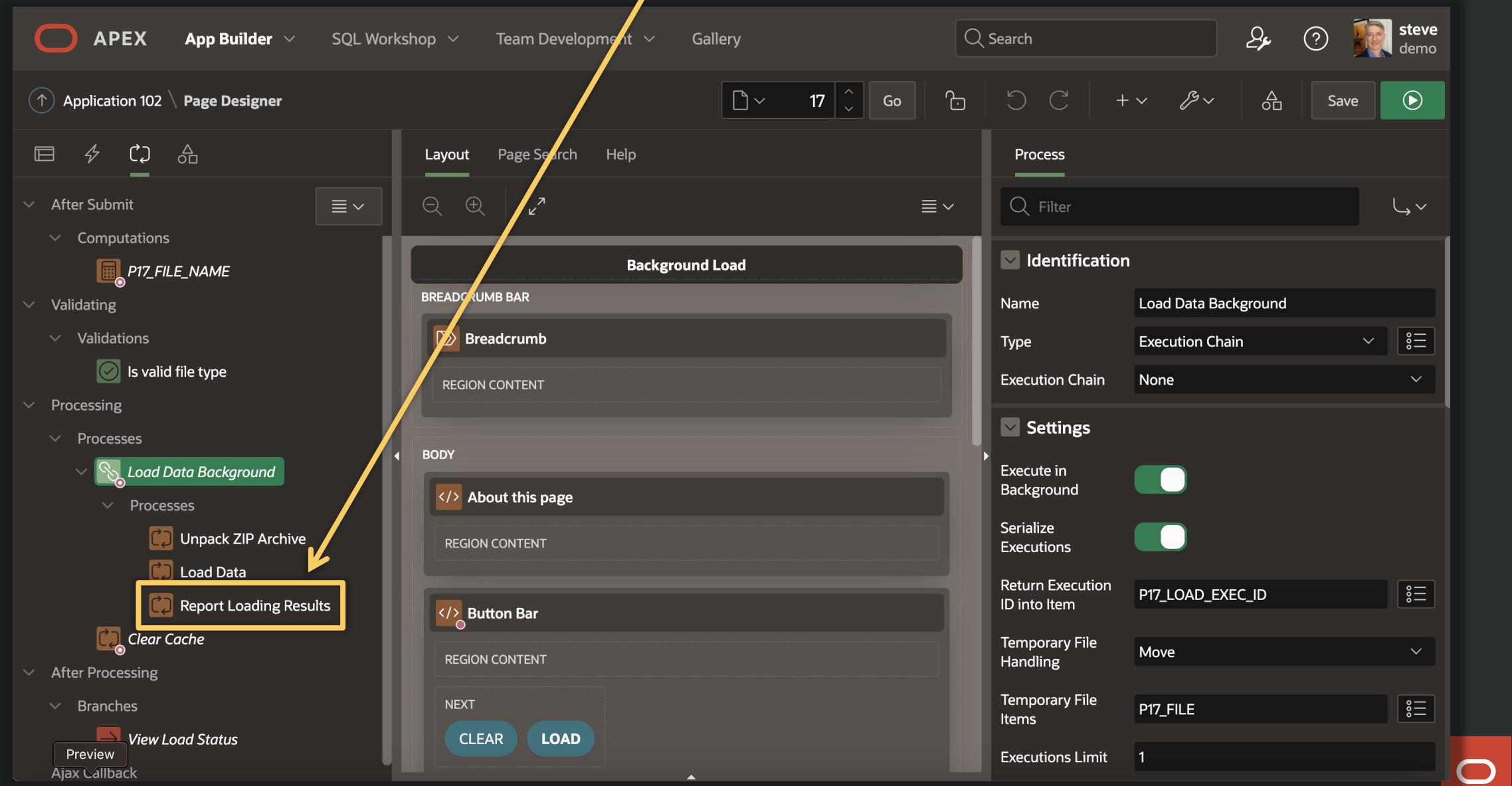
Process Identification:

- Name:** Load Data Background
- Type:** Execution Chain
- Execution Chain:** None

Settings:

- Execute in Background:
- Serialize Executions:
- Return Execution ID into Item: P17_LOAD_EXEC_ID
- Temporary File Handling: Move
- Temporary File Items: P17_FILE
- Executions Limit: 1

So Notification of Completion Can Be Done in the Chain



The screenshot shows the Oracle APEX Page Designer interface. The top navigation bar includes APEX, App Builder, SQL Workshop, Team Development, and Gallery. The search bar contains the placeholder 'Search'. The user profile 'steve demo' is visible on the right.

The left sidebar shows the 'After Submit' section, which includes 'Computations' (with a rule for P17_FILE_NAME), 'Validating' (with a validation for 'Is valid file type'), and 'Processing' (with a process named 'Load Data Background' which contains 'Unpack ZIP Archive', 'Load Data', and 'Report Loading Results'). The 'Report Loading Results' item is highlighted with a yellow box and an arrow pointing to it from the title text.

The central workspace displays a 'Background Load' process. It consists of a 'Breadcrumb Bar' region containing a 'Breadcrumb' item, a 'BODY' region containing an 'About this page' item, and a 'Button Bar' region containing a 'LOAD' button. The 'BODY' region is currently active.

The right sidebar is titled 'Process' and shows the configuration for the 'Load Data Background' execution chain. The 'Identification' section includes the name 'Load Data Background', type 'Execution Chain', and execution chain 'None'. The 'Settings' section includes 'Execute in Background' (on), 'Serialize Executions' (on), 'Return Execution ID into Item' (set to P17_LOAD_EXEC_ID), 'Temporary File Handling' (set to 'Move'), 'Temporary File Items' (set to P17_FILE), and 'Executions Limit' (set to 1).

Session State Cloned for Background Execution Chain

Session 123456



Session State

Name	Value
P1_ID	1234
P1_STATUS	PENDING
P1_RESULT	

Temporary Files



Submit

Session 987654



Session State

Name	Value
P1_ID	1234
P1_STATUS	PENDING
P1_RESULT	

Temporary Files



Ignore

Temporary File Handling

Ignore

Session State Cloned for Background Execution Chain

Session 123456



Session State

Name	Value
P1_ID	1234
P1_STATUS	PENDING
P1_RESULT	

Temporary Files



Submit

Session 987654



Session State

Name	Value
P1_ID	1234
P1_STATUS	PENDING
P1_RESULT	

Temporary Files



Copy



Temporary File Handling

Temporary File Items

Copy

P17_FILE

Session State Cloned for Background Execution Chain

Session 123456



Session State

Name	Value
P1_ID	1234
P1_STATUS	PENDING
P1_RESULT	

Temporary Files



Submit

Session 987654



Session State

Name	Value
P1_ID	1234
P1_STATUS	PENDING
P1_RESULT	

Temporary Files



Move



Temporary File Handling

Temporary File Items

Move

P17_FILE

Background Session State Independent of User Session

Session 123456



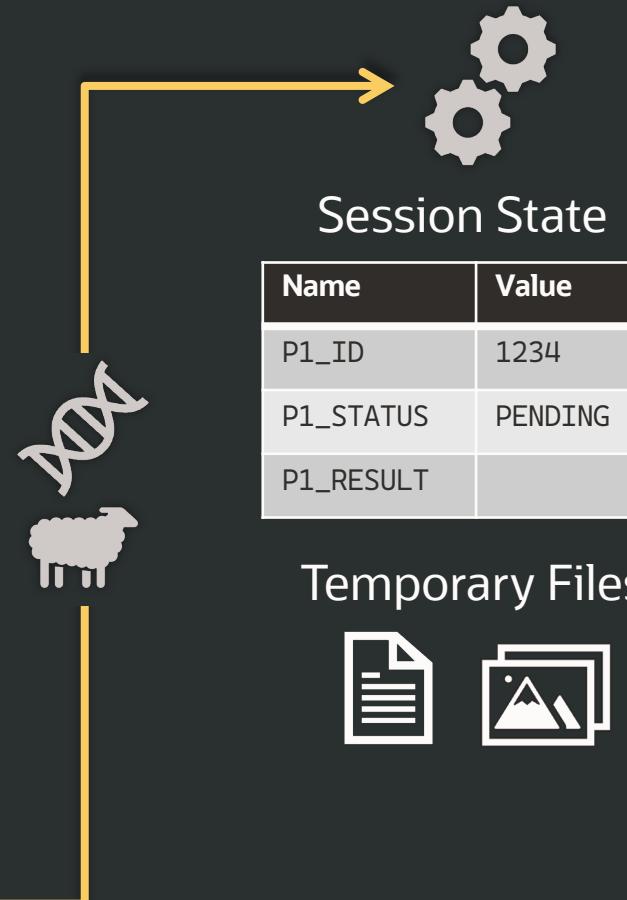
Session State

Name	Value
P1_ID	1234
P1_STATUS	PENDING
P1_RESULT	

Temporary Files



Submit



Session 987654



Session State

Name	Value
P1_ID	1234
P1_STATUS	CONFIRMED
P1_RESULT	21-APR-2023

Temporary Files



Monitoring Available While Background Processes Run

Sample Data Loading

- Home
- Data Loading
 - CSV Load
 - Transformation and Lookup
 - Multiple File Type Load
 - Background Load
 - Legacy Data Loading
- Manual Data Loading
- Administration

Data Loading \ Background Load \

Load Status

Executing Status

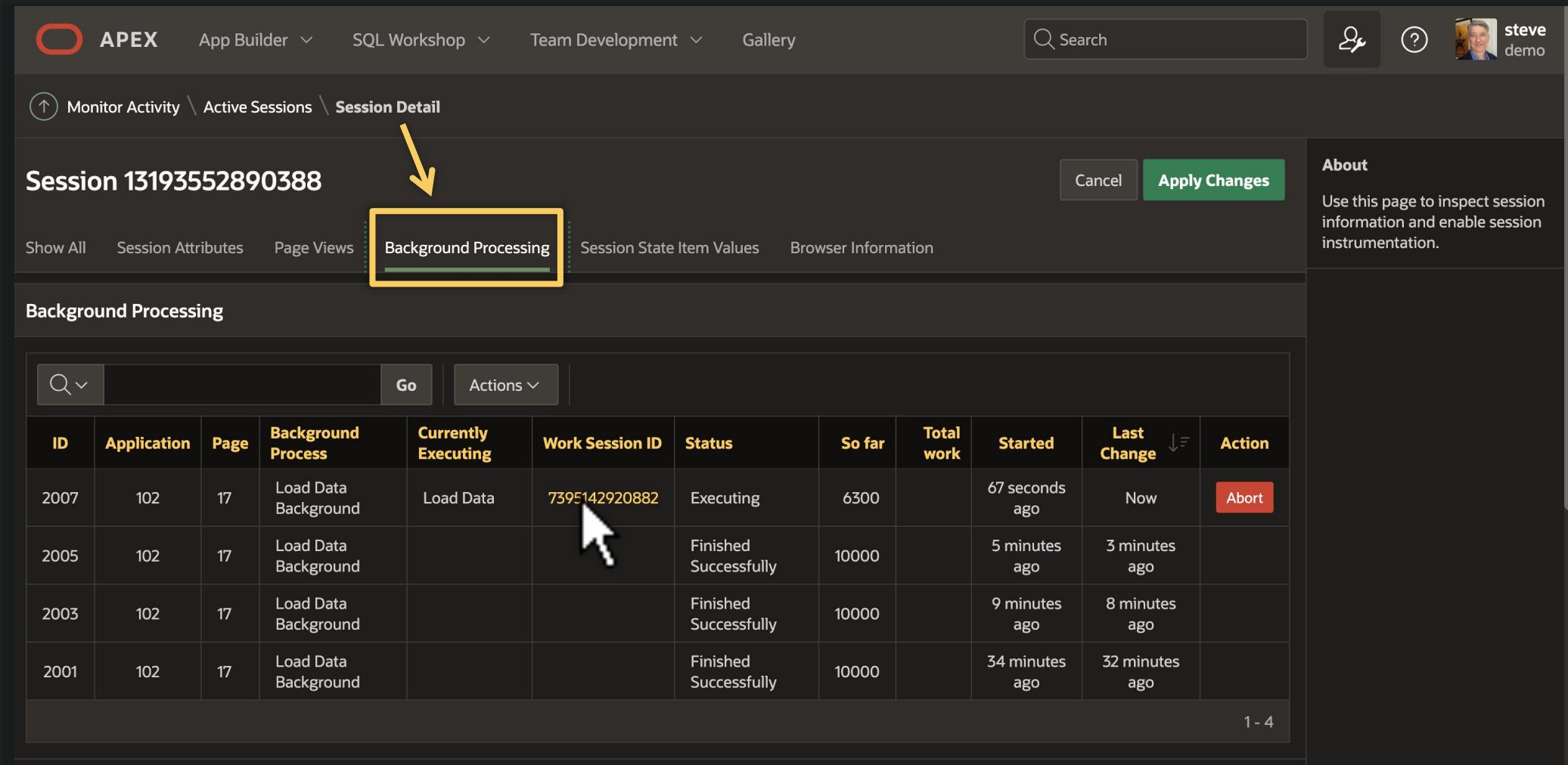
2,380 Rows Processed

Sales Table Contents

Region	Country	Item Type	Sales Channel	Order Priority	Units Sold	Unit Price	Unit Cost	Total Profit	Last Updated
Europe	Hungary	Snacks	Online	O	5813	\$152.58	\$97.44	\$320,528.82	28 seconds ago
Asia	Tajikistan	Baby Food	Offline	L	6401	\$255.28	\$159.42	\$613,599.86	28 seconds ago

✓ Data Loading task kicked off for execution.

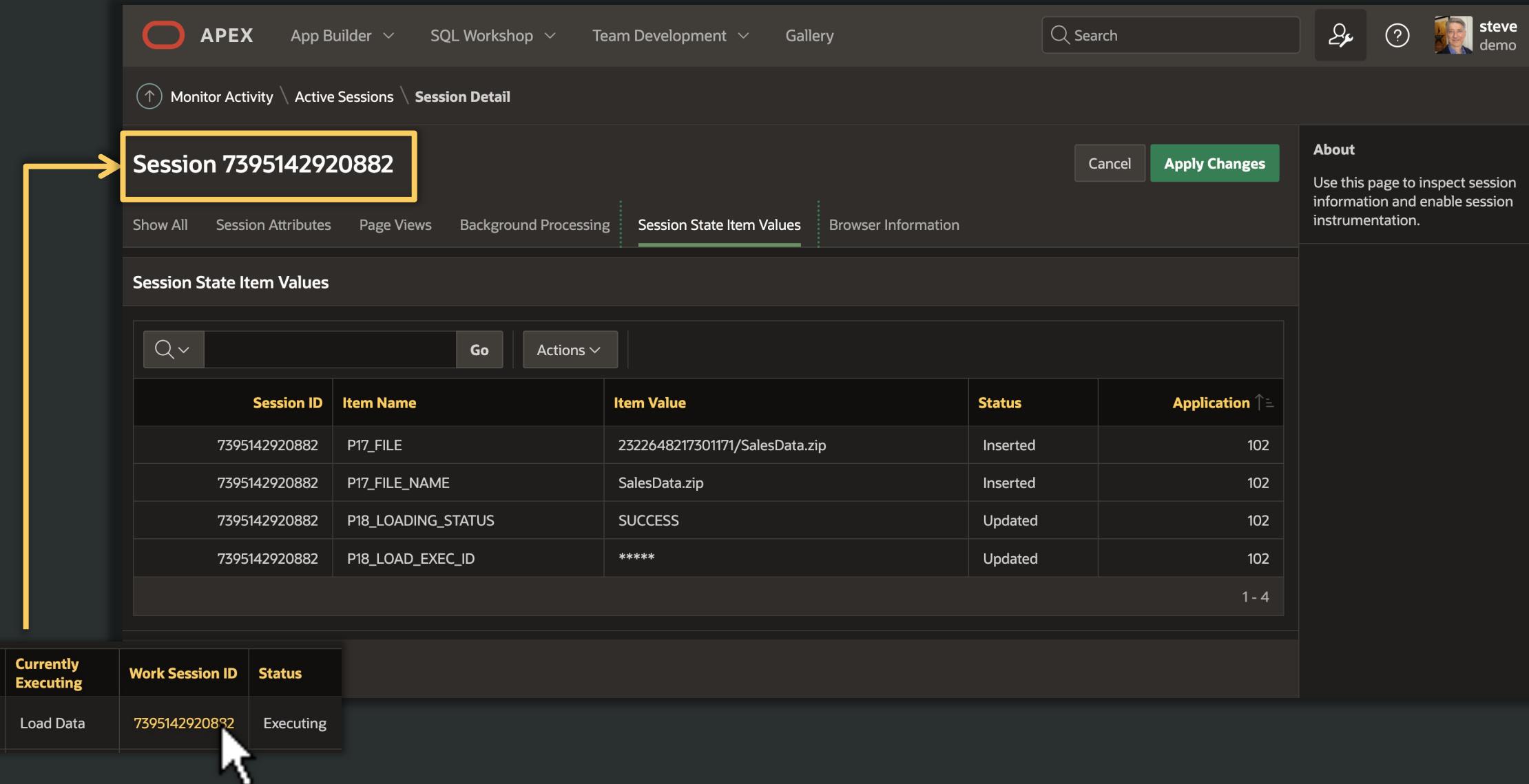
Monitoring Background Processes of an Active Session



The screenshot shows the Oracle APEX Session Detail page for Session 13193552890388. The 'Background Processing' tab is highlighted with a yellow box and an arrow points to it. The page displays a table of background processes, with a cursor hovering over the 'Work Session ID' column of the first row.

ID	Application	Page	Background Process	Currently Executing	Work Session ID	Status	So far	Total work	Started	Last Change	Action
2007	102	17	Load Data Background	Load Data	7395142920882	Executing	6300		67 seconds ago	Now	<button>Abort</button>
2005	102	17	Load Data Background			Finished Successfully	10000		5 minutes ago	3 minutes ago	
2003	102	17	Load Data Background			Finished Successfully	10000		9 minutes ago	8 minutes ago	
2001	102	17	Load Data Background			Finished Successfully	10000		34 minutes ago	32 minutes ago	

Monitoring Session Detail of a Background Process



The screenshot shows the Oracle APEX Session Detail page. The top navigation bar includes links for APEX, App Builder, SQL Workshop, Team Development, and Gallery. A search bar and user profile for 'steve demo' are also present. The breadcrumb navigation shows 'Monitor Activity \ Active Sessions \ Session Detail'. A yellow box highlights the session ID '7395142920882' in the main title area. Below the title, tabs for 'Session State Item Values' (selected), 'Session Attributes', 'Page Views', 'Background Processing', and 'Browser Information' are visible. A 'Cancel' and 'Apply Changes' button are at the top right. The 'Session State Item Values' section contains a table with the following data:

Session ID	Item Name	Item Value	Status	Application
7395142920882	P17_FILE	2322648217301171/SalesData.zip	Inserted	102
7395142920882	P17_FILE_NAME	SalesData.zip	Inserted	102
7395142920882	P18_LOADING_STATUS	SUCCESS	Updated	102
7395142920882	P18_LOAD_EXEC_ID	*****	Updated	102

At the bottom, a table shows 'Currently Executing' tasks: 'Load Data' with session ID '7395142920882' and status 'Executing'. A yellow arrow points from the 'Session ID' in the title to the 'Session ID' in the table at the bottom. A mouse cursor is hovering over the 'Work Session ID' column of the 'Currently Executing' table.

Instance Admin Can See, Monitor, Abort Background Executions

Background Executions

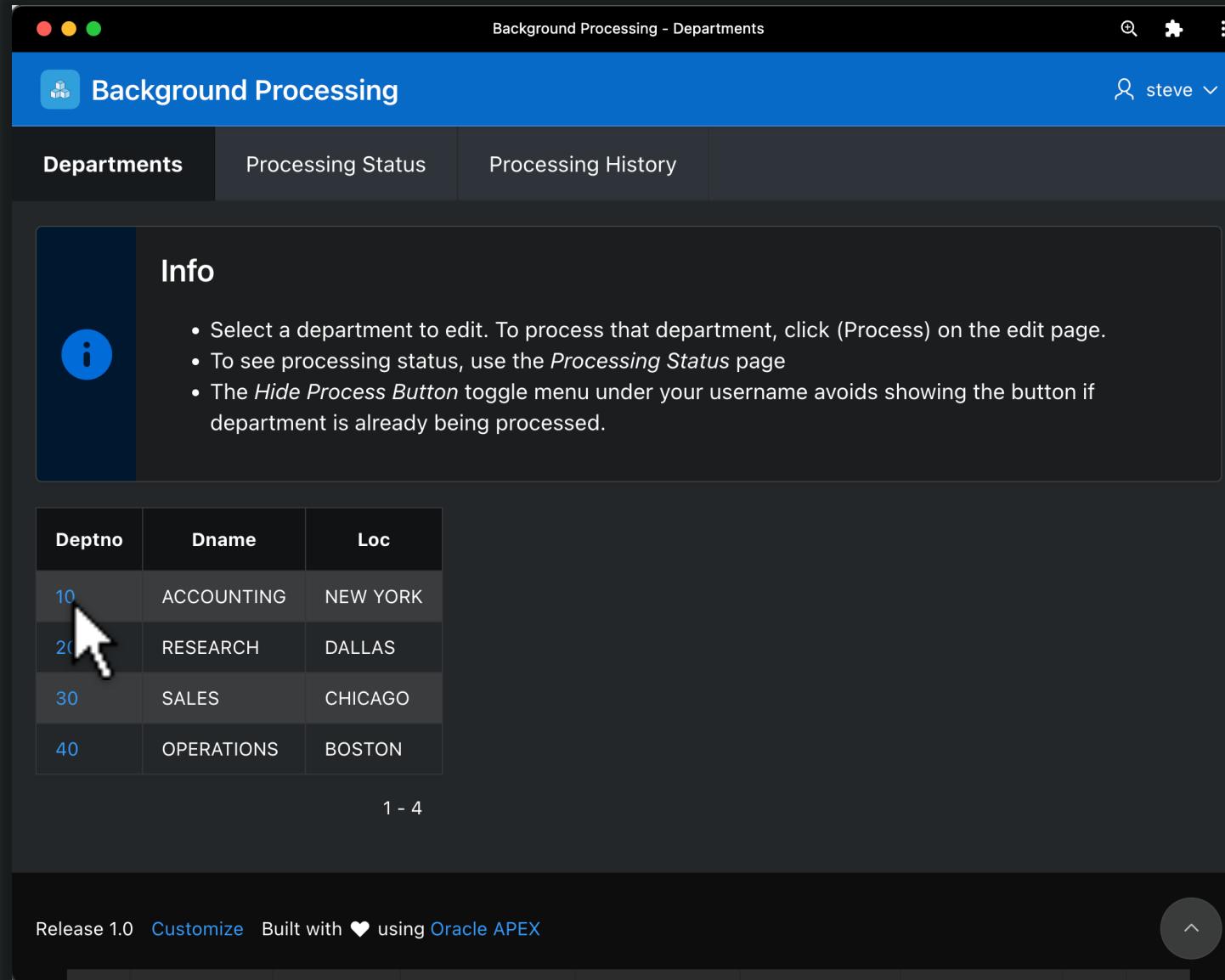
This page lists page process background executions for all workspaces managed by this service.

Running Executions show a button within the **Action** column, which allows to abort this specific execution.

Clicking on the **ID** in the **Application** column will open a dialog, which shows a summary of all background executions for this application, along with a button to abort them all.

Execution ID	Workspace	Application	Page	Background Process	Session ID	Username	Status	Last Change	Action
2005	DEMO	102	17	Load Data Background	13193552890388	STEVE	Executing	Now	Abort
2003	DEMO	102	17	Load Data Background	13193552890388	STEVE	Finished Successfully	3 minutes ago	
2001	DEMO	102	17	Load Data Background	13193552890388	STEVE	Finished Successfully	28 minutes ago	

App Does Long-Running Processing on Departments



Background Processing - Departments

Background Processing

steve

Departments Processing Status Processing History

Info

- Select a department to edit. To process that department, click (Process) on the edit page.
- To see processing status, use the *Processing Status* page
- The *Hide Process Button* toggle menu under your username avoids showing the button if department is already being processed.

Deptno	Dname	Loc
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

1 - 4

Release 1.0 Customize Built with ❤ using Oracle APEX

Steve



User Launches Long-Running Process for a Department

Background Processing - Departments

Background Processing

Department

Dname
ACCOUNTING

Loc
NEW YORK

Info

- Select a department to edit. To process
- To see processing status, use the Process
- The *Hide Process Button* toggle menu under your username -- then submitting a department for processing that is already being processed will show an error message saying what user is already processing it.

Deptno	Dname	Loc
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

1 - 4

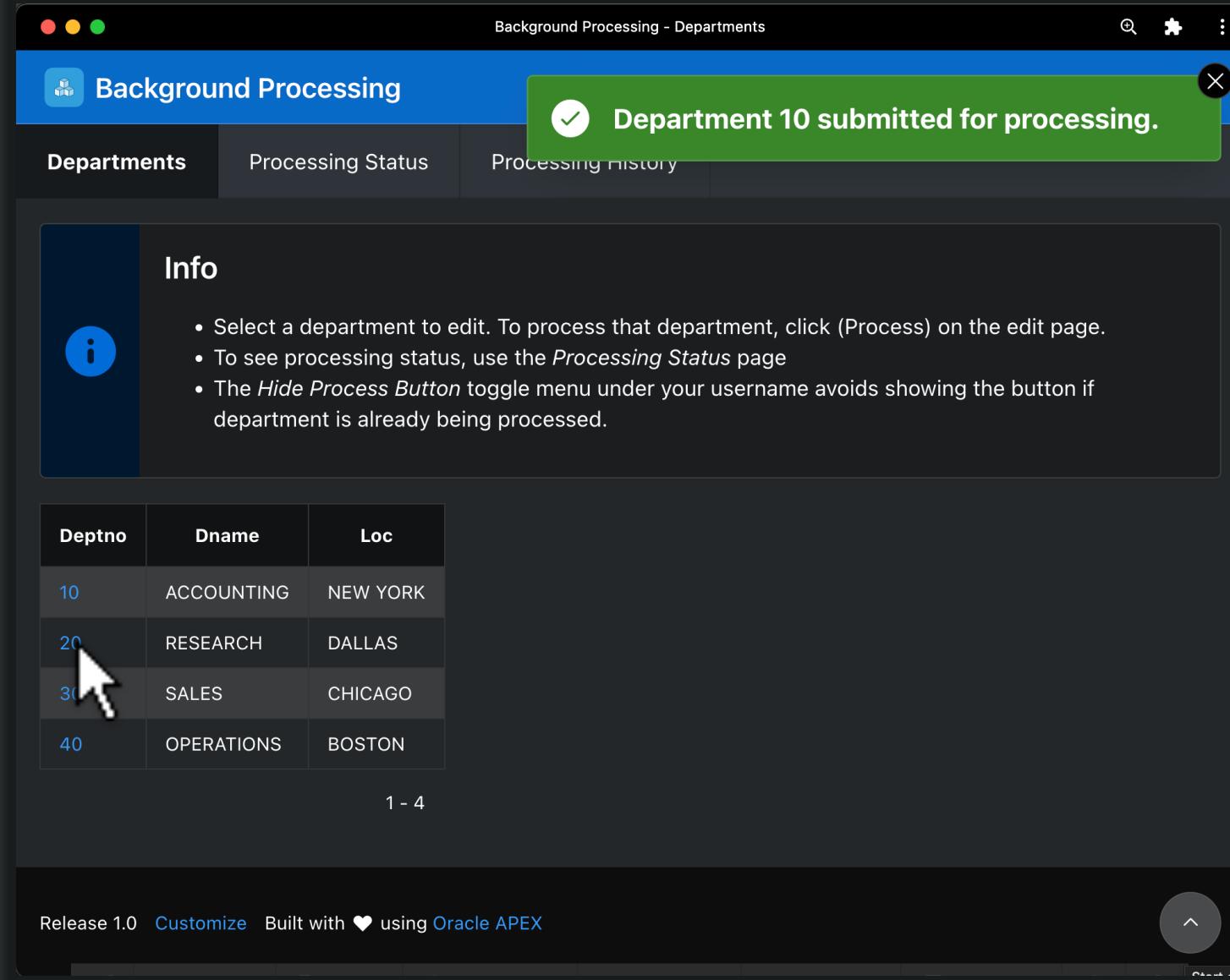
Release 1.0 [Customize](#) Built with ❤ using [Oracle APEX](#)

Cancel Delete [Apply Changes](#) [Process](#)

Steve



User Launches Long-Running Process for a Department



Background Processing - Departments

Background Processing

Departments Processing Status Processing History

Department 10 submitted for processing.

Info

- Select a department to edit. To process that department, click (Process) on the edit page.
- To see processing status, use the *Processing Status* page
- The *Hide Process Button* toggle menu under your username avoids showing the button if department is already being processed.

Deptno	Dname	Loc
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

1 - 4

Release 1.0 [Customize](#) Built with ❤ using Oracle APEX

Steve



User Can Process Multiple Departments

Background Processing - Departments

Background Processing

Department

Dname
RESEARCH

Loc
DALLAS

Info

- Select a department to edit. To process
- To see processing status, use the Process
- The *Hide Process Button* toggle menu under your username -- then submitting a department for processing that is already being processed will show an error message saying what user is already processing it.

Deptno	Dname	Loc
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

1 - 4

Release 1.0 [Customize](#) Built with ❤ using [Oracle APEX](#)

Cancel Delete [Apply Changes](#) [Process](#)

Steve



User Can Process Multiple Departments

Background Processing - Departments

Background Processing

Departments Processing Status Processing History

Department 20 submitted for processing.

Info

- Select a department to edit. To process that department, click (Process) on the edit page.
- To see processing status, use the *Processing Status* page
- The *Hide Process Button* toggle menu under your username avoids showing the button if department is already being processed.

Deptno	Dname	Loc
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

1 - 4

Release 1.0 [Customize](#) Built with ❤ using Oracle APEX

Star

Steve



Users See Progress of Ongoing Background Processing

Background Processing - Processing Status

Background Processing

steve

Username	Deptno	Progress	Progress Bar	Submitted At	Started At	Running Time
STEVE	10	70%	<div style="width: 70%; background-color: red;"></div>	12-APR-2023 19:48:53	12-APR-2023 19:48:54	0h 0m 54s
STEVE	20	30%	<div style="width: 30%; background-color: red;"></div>	12-APR-2023 19:49:13	12-APR-2023 19:49:16	0h 0m 32s

Release 1.0 [Customize](#) Built with ❤ using Oracle APEX



Steve



Users See Progress of Ongoing Background Processing

Background Processing - Processing Status

Background Processing

steve

Username	Deptno	Progress	Progress Bar	Submitted At	Started At	Running Time
STEVE	20	60%	<div style="width: 60%; background-color: red;"></div>	12-APR-2023 19:49:13	12-APR-2023 19:49:16	0h 0m 56s

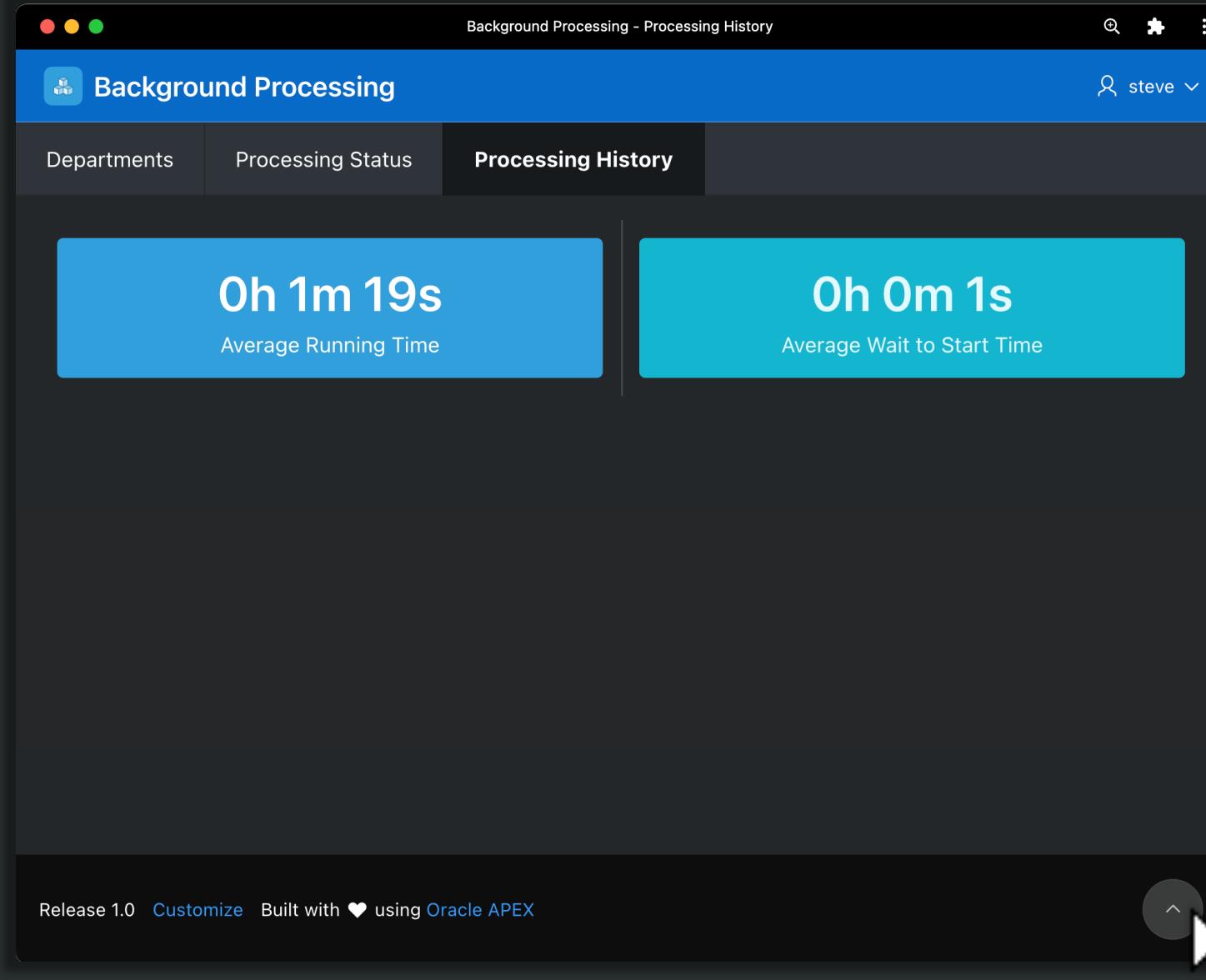
Release 1.0 [Customize](#) Built with ❤ using Oracle APEX



Steve



Users See Average Running & Wait-to-Start Times



The screenshot shows a dark-themed application window titled "Background Processing - Processing History". The window has a blue header bar with the title and a search bar containing "steve". Below the header is a navigation bar with tabs: "Departments", "Processing Status", and "Processing History", with "Processing History" being the active tab. The main content area displays two large, rounded rectangular boxes. The left box is blue and contains the text "0h 1m 19s" in large white font, with "Average Running Time" in smaller white font below it. The right box is teal and contains the text "0h 0m 1s" in large white font, with "Average Wait to Start Time" in smaller white font below it. At the bottom of the window, a footer bar displays "Release 1.0" and "Built with ❤ using Oracle APEX". A cursor arrow is visible, pointing at a circular button with an upward-pointing arrow in the bottom right corner of the window.

Steve



Multiple Users Can Process Long-Running Processes

Background Processing - Processing Status

Background Processing

Departments Processing Status Processing History

Username ↑↓	Deptno	Progress	Progress Bar	Submitted At	Started At	Running Time
PAT	30	10%	<div style="width: 10%;">■</div>	12-APR-2023 19:59:16	12-APR-2023 19:59:19	0h 0m 15s
STEVE	20	40%	<div style="width: 40%;">■■■■■</div>	12-APR-2023 19:58:58	12-APR-2023 19:59:01	0h 0m 33s
STEVE	10	60%	<div style="width: 60%;">■■■■■■</div>	12-APR-2023 19:58:52	12-APR-2023 19:58:54	0h 0m 40s

Release 1.0 Customize Built with ❤ using Oracle APEX

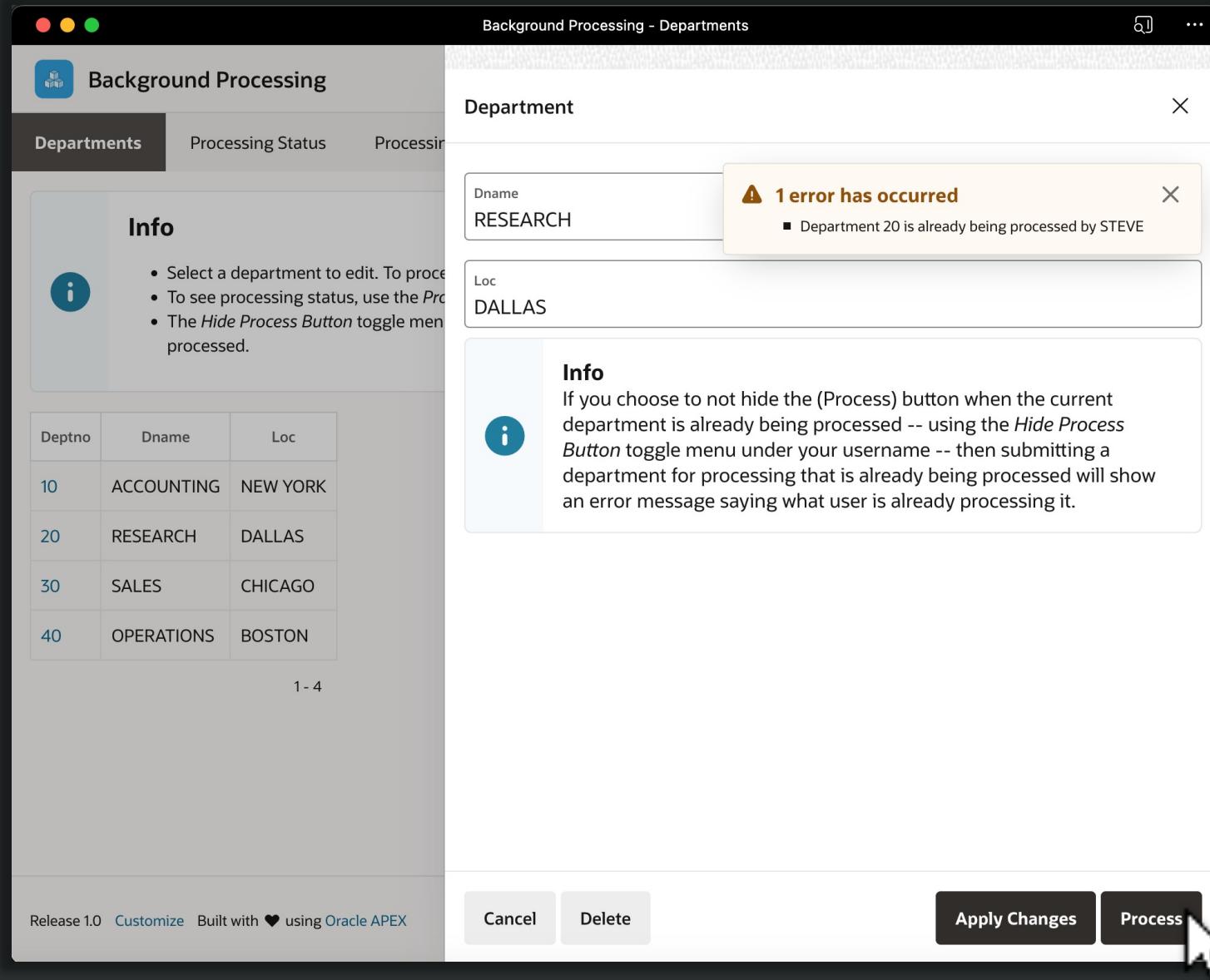


Pat



O

Department Being Processed Can't Be Processed Again



The screenshot shows a web application window titled "Background Processing - Departments". The main content area displays a table of departments with columns: Deptno, Dname, and Loc. The data is as follows:

Deptno	Dname	Loc
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

At the bottom of the main screen, there are buttons for "Cancel", "Delete", "Apply Changes", and "Process". The "Process" button is highlighted with a cursor. A modal window titled "Department" is open, showing an error message: "1 error has occurred" with the sub-message "Department 20 is already being processed by STEVE".

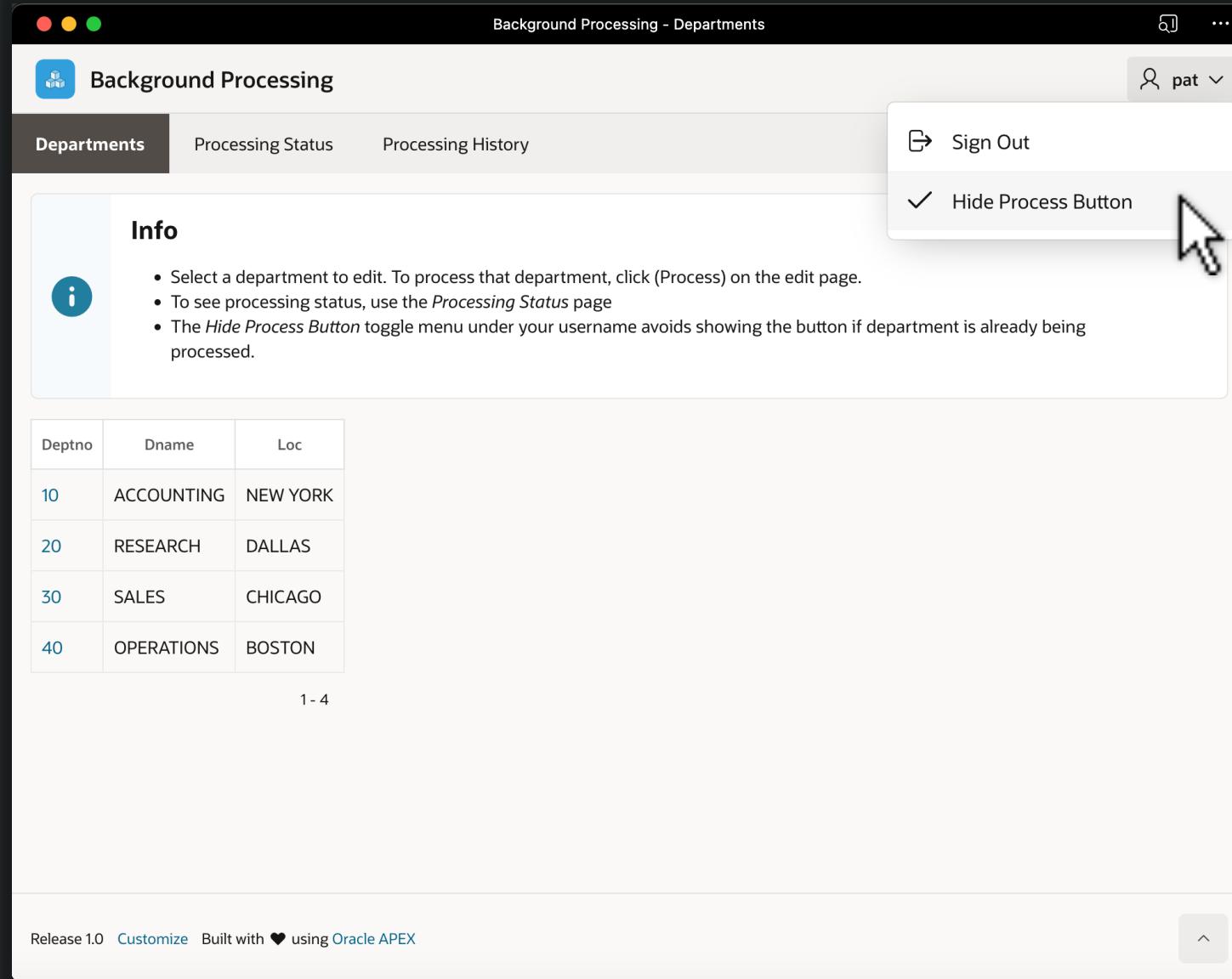
At the bottom of the application window, the text "Release 1.0 Customize Built with ❤ using Oracle APEX" is visible.

Pat



O

We Might Opt to Hide the Process Button in This Case



The screenshot shows a web application titled "Background Processing - Departments". The main menu includes "Background Processing", "Departments" (which is selected), "Processing Status", and "Processing History". The "Info" section contains instructions: "Select a department to edit. To process that department, click (Process) on the edit page. To see processing status, use the *Processing Status* page. The *Hide Process Button* toggle menu under your username avoids showing the button if department is already being processed." A table lists four departments: ACCOUNTING (Deptno 10, Loc NEW YORK), RESEARCH (Deptno 20, Loc DALLAS), SALES (Deptno 30, Loc CHICAGO), and OPERATIONS (Deptno 40, Loc BOSTON). A user profile menu on the right shows "pat" and includes "Sign Out" and "Hide Process Button" (which is checked). The footer indicates "Release 1.0" and "Built with ❤ using Oracle APEX".

Deptno	Dname	Loc
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

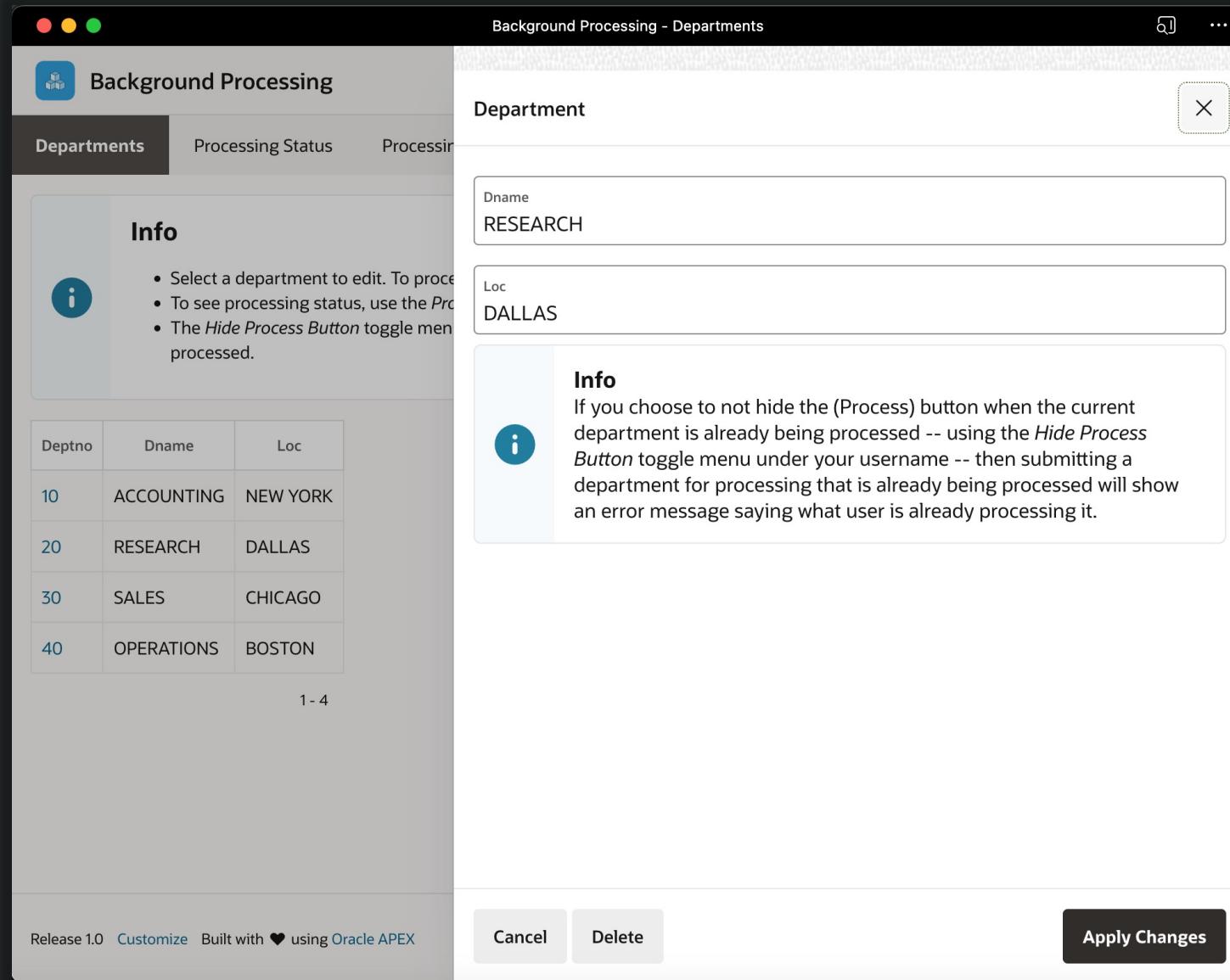
1 - 4

Release 1.0 Customize Built with ❤ using Oracle APEX

Pat



To Prevent the User from Seeing an Error Message



The screenshot shows a web application interface for 'Background Processing - Departments'. The main page has a sidebar with 'Background Processing' and tabs for 'Departments', 'Processing Status', and 'Processing'. The 'Departments' tab is active, showing a table with four rows: 10 ACCOUNTING NEW YORK, 20 RESEARCH DALLAS, 30 SALES CHICAGO, and 40 OPERATIONS BOSTON. An 'Info' box provides instructions for selecting a department to edit and viewing processing status. A modal dialog is open over the table, titled 'Department'. It contains fields for 'Dname' (RESEARCH) and 'Loc' (DALLAS). An 'Info' box within the modal states: 'If you choose to not hide the (Process) button when the current department is already being processed -- using the *Hide Process Button* toggle menu under your username -- then submitting a department for processing that is already being processed will show an error message saying what user is already processing it.'

Background Processing - Departments

Background Processing

Departments Processing Status Processing

Info

- Select a department to edit. To process
- To see processing status, use the *Processing Status* tab
- The *Hide Process Button* toggle menu under your username -- then submitting a department for processing that is already being processed will show an error message saying what user is already processing it.

Deptno	Dname	Loc
10	ACCOUNTING	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIONS	BOSTON

1 - 4

Release 1.0 Customize Built with ❤ using Oracle APEX

Department

Dname
RESEARCH

Loc
DALLAS

Info

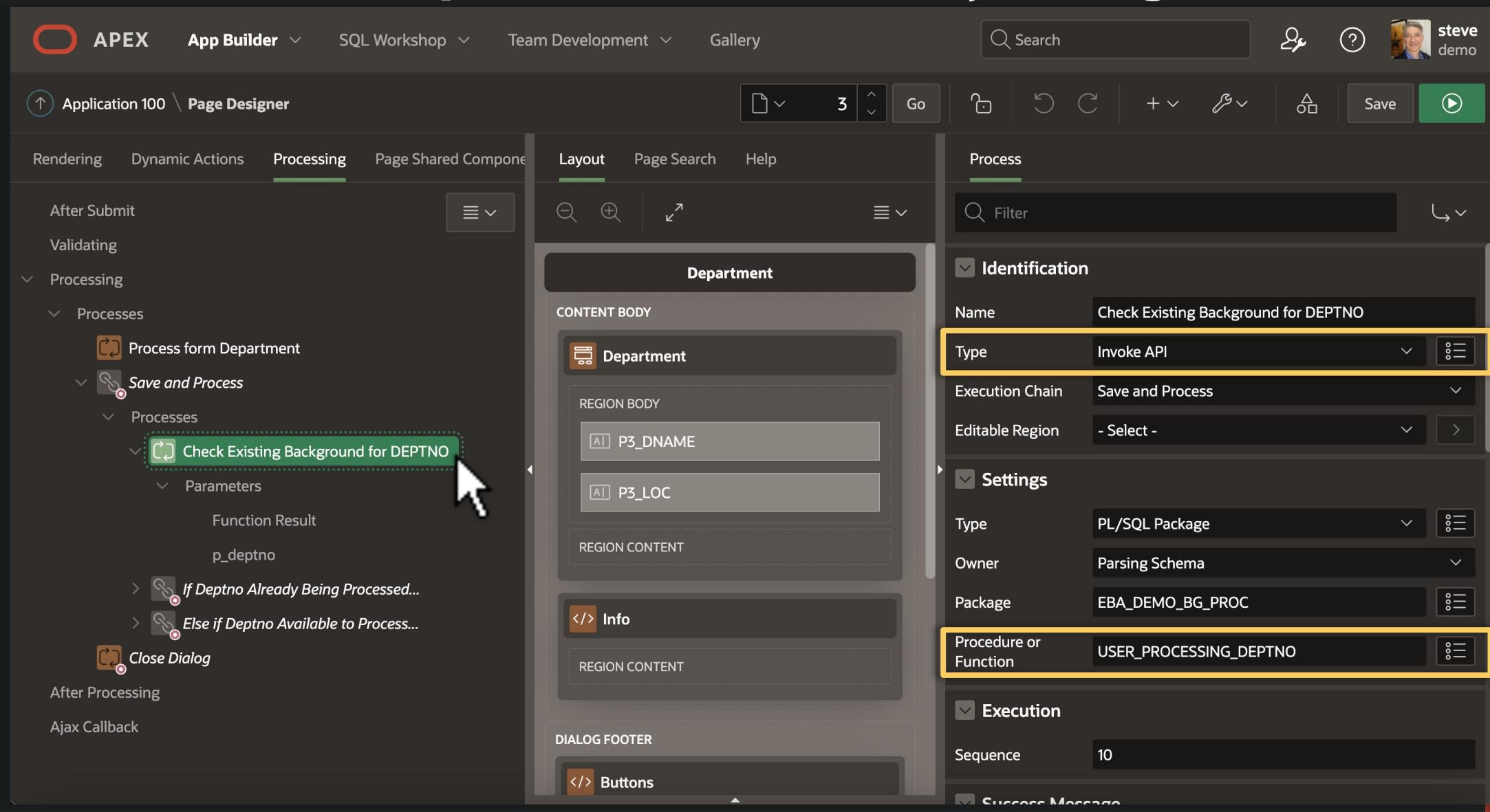
If you choose to not hide the (Process) button when the current department is already being processed -- using the *Hide Process Button* toggle menu under your username -- then submitting a department for processing that is already being processed will show an error message saying what user is already processing it.

Cancel Delete Apply Changes

Pat



First Check if Department is Already Being Processed



The screenshot shows the Oracle APEX App Builder interface for an application named "Application 100". The "Page Designer" tab is selected. The left sidebar shows the "Processing" tab is active, with a list of processes including "Process form Department", "Save and Process", and "Check Existing Background for DEPTNO". The "Check Existing Background for DEPTNO" process is highlighted with a green dashed box and a cursor is hovering over it. The main content area displays the "Department" page with regions for "CONTENT BODY" (containing "Department" and "REGION BODY" with fields "P3_DNAME" and "P3_LOC"), "REGION CONTENT", "INFO" (with "REGION CONTENT"), and "DIALOG FOOTER" (containing "Buttons"). The "Process" panel on the right shows the configuration for this process. The "Identification" section shows the name "Check Existing Background for DEPTNO" and type "Invoke API". The "Settings" section shows the type as "PL/SQL Package", owner as "Parsing Schema", package as "EBA_DEMO_BG_PROC", and procedure/function as "USER_PROCESSING_DEPTNO". The "Execution" section shows a sequence of 10. The "Process" tab is also active in the top navigation bar.

APEX App Builder SQL Workshop Team Development Gallery

Search

steve demo

Application 100 \ Page Designer

Rendering Dynamic Actions Processing Page Shared Components

After Submit

Validating

Processing

Processes

- Process form Department
- Save and Process
- Check Existing Background for DEPTNO
- Parameters
- Function Result
- p_deptno
- If Deptno Already Being Processed...
- Else if Deptno Available to Process...
- Close Dialog

After Processing

Ajax Callback

Layout Page Search Help

Process

Filter

Identification

Name: Check Existing Background for DEPTNO

Type: Invoke API

Execution Chain: Save and Process

Editable Region: - Select -

Settings

Type: PL/SQL Package

Owner: Parsing Schema

Package: EBA_DEMO_BG_PROC

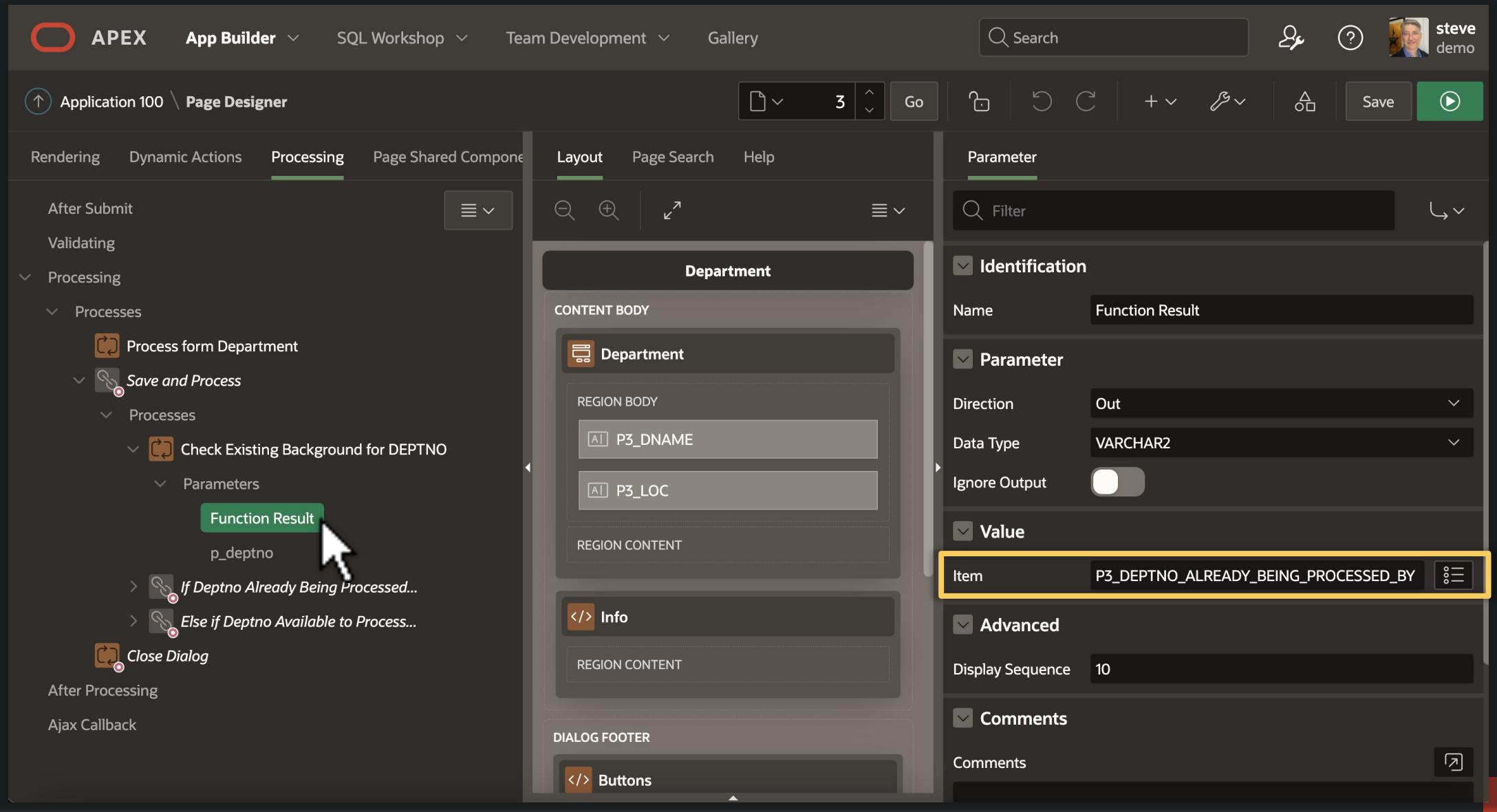
Procedure or Function: USER_PROCESSING_DEPTNO

Execution

Sequence: 10

Success Message

Store the Function Result in a Page Item to Use Later



The screenshot shows the Oracle APEX App Builder interface for an application named "Application 100". The "Page Designer" tab is selected. The "Processing" tab is active in the left sidebar, showing a list of processes. One process, "Save and Process", is expanded, and its "Function Result" item is selected, indicated by a mouse cursor. The "Function Result" item is defined in the "Parameter" section of the right sidebar. It has the following configuration:

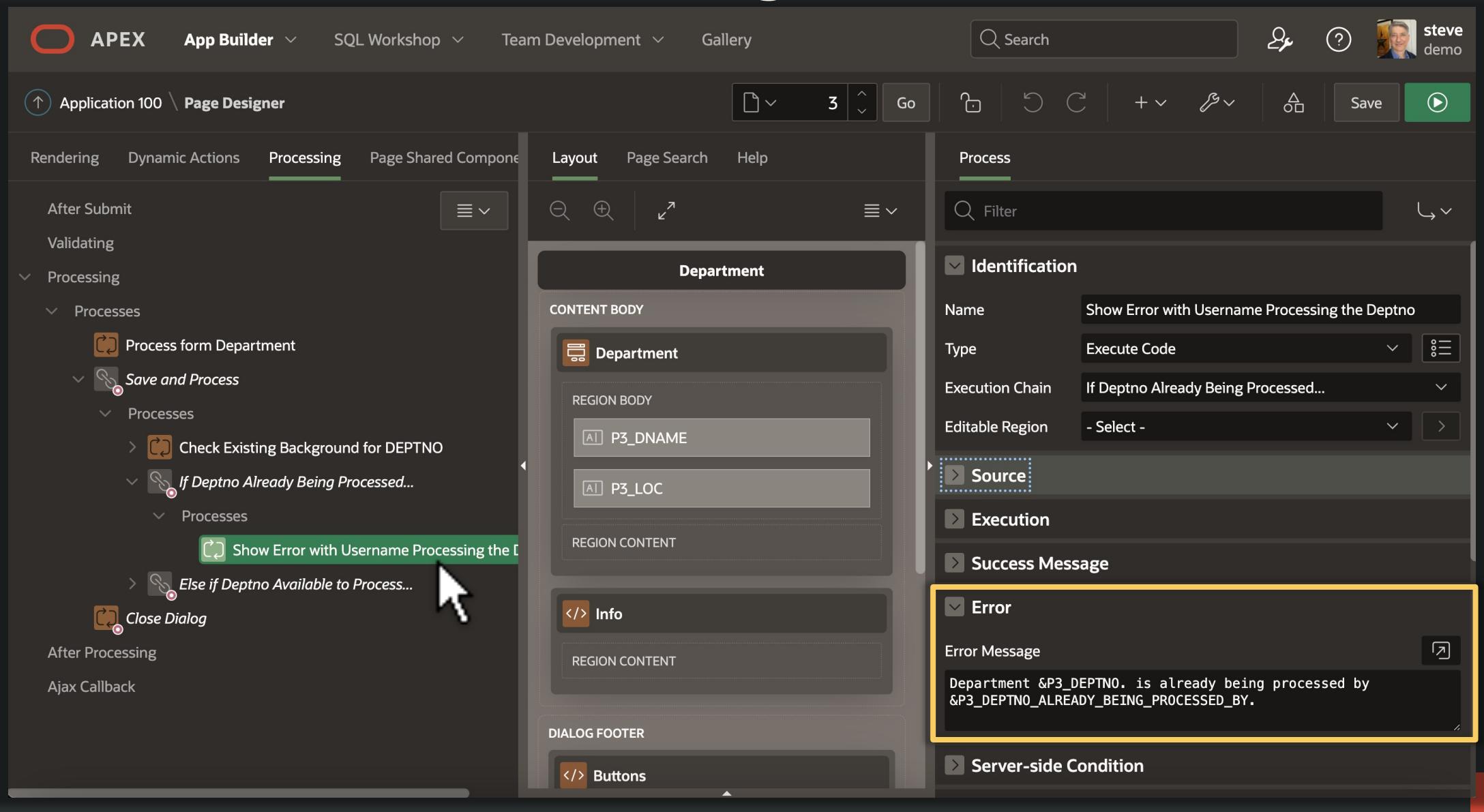
- Name:** Function Result
- Direction:** Out
- Data Type:** VARCHAR2
- Ignore Output:** Off
- Value:** Item: P3_DEPTNO_ALREADY_BEING_PROCESSED_BY
- Advanced:** Display Sequence: 10

If Department is Already Being Processed...

The screenshot shows the Oracle APEX App Builder interface for an application named "Application 100". The "Page Designer" tab is selected. The left sidebar shows the "Processing" tab is active, with a list of processes including "Process form Department", "Save and Process", "Check Existing Background for DEPTNO", "If Deptno Already Being Processed...", "Else if Deptno Available to Process...", "Show Error with Username Processing the [", and "Close Dialog". The "If Deptno Already Being Processed..." item is highlighted with a green box and a cursor is hovering over it. The main content area displays a "Department" page with a "CONTENT BODY" region containing a "Department" item and "REGION BODY" regions for "P3_DNAME" and "P3_LOC". Below this is a "REGION CONTENT" region. The "DIALOG FOOTER" region contains a "Buttons" item. The right sidebar shows the "Process" configuration for the selected process. The "Identification" section includes a name "If Deptno Already Being Processed..." and type "Execution Chain". The "Execution Chain" is set to "Save and Process". The "Server-side Condition" section is highlighted with an orange box and contains the following configuration:

When Button Pressed	- Select -
Type	Item is NOT NULL
Item	P3_DEPTNO_ALREADY_BEING_PROCESSED_BY

Show a Custom Error Message to the User



The screenshot shows the Oracle APEX App Builder interface for an application named "Application 100". The "Page Designer" tab is selected. The left sidebar shows the "Processing" tab is active, with a list of processes including "Process form Department", "Save and Process", "Check Existing Background for DEPTNO", "If Deptno Already Being Processed...", and "Show Error with Username Processing the Deptno". The "Show Error with Username Processing the Deptno" process is highlighted with a green selection bar and a cursor is hovering over it. The main content area displays a "Department" page with a "CONTENT BODY" region containing "Department", "P3_DNAME", and "P3_LOC" fields. Below it is a "REGION CONTENT" section with an "Info" region. The "DIALOG FOOTER" section contains "Buttons". The right sidebar shows the "Process" configuration, specifically the "Identification" section where the process is named "Show Error with Username Processing the Deptno", has an "Execute Code" type, and an execution chain "If Deptno Already Being Processed...". The "Error" section is highlighted with a yellow box and contains the error message: "Department &P3_DEPTNO. is already being processed by &P3_DEPTNO_ALREADY_BEING_PROCESSED_BY.".

APEX App Builder

Application 100 \ Page Designer

Rendering Dynamic Actions Processing Page Shared Components

Layout Page Search Help

Process

Identification

Name: Show Error with Username Processing the Deptno

Type: Execute Code

Execution Chain: If Deptno Already Being Processed...

Editable Region: - Select -

Source

Execution

Success Message

Error

Error Message: Department &P3_DEPTNO. is already being processed by &P3_DEPTNO_ALREADY_BEING_PROCESSED_BY.

Server-side Condition

... Else If Department is Available to Process

The screenshot shows the Oracle APEX App Builder interface for an application named "Application 100". The "Page Designer" tab is selected. The "Processing" tab is active in the left sidebar, showing a tree structure of processes. A process named "Else If Deptno Available to Process..." is selected, highlighted with a green background. This process is an "Execution Chain" named "Save and Process". The "Server-side Condition" for this process is defined as follows:

- When Button Pressed:** - Select -
- Type:** Item is NULL
- Item:** P3_DEPTNO_ALREADY_BEING_PROCESSED_BY

The central area shows a "Department" page with a content body containing a "Department" region with fields P3_DNAME and P3_LOC. Below the content body is an "Info" region. The right sidebar contains tabs for "Identification", "Settings", "Execution", "Success Message", and "Error".

Register the (User,Deptno) in a Custom Tracking Table

The screenshot shows the Oracle APEX App Builder interface for an application named "Application 100". The "Page Designer" tab is active. The "Processing" tab is selected in the left sidebar. The main content area displays a "Department" page with a "CONTENT BODY" region containing "Department", "REGION BODY" with fields "P3_DNAME" and "P3_LOC", and "REGION CONTENT". The "DIALOG FOOTER" region contains "Buttons". The "Process" tab is selected in the top right, showing the "Identification" section with a process named "Register User Processing Department". The "Type" is set to "Invoke API" and the "Procedure or Function" is set to "REGISTER_USER_PROCESSING_DEPTNO". The "Execution" section shows an "Else if Deptno Available to Process..." chain. The "Settings" section shows the "Type" as "PL/SQL Package", "Owner" as "Parsing Schema", and "Package" as "EBA_DEMO_BG_PROC". The "Execution" section also includes "Success Message" and "Error" sections.

APEX App Builder

Application 100 \ Page Designer

Rendering Dynamic Actions Processing Page Shared Components

After Submit

Validating

Processing

Processes

- Process form Department
- Save and Process
- Processes
 - Check Existing Background for DEPTNO
 - If Deptno Already Being Processed...
 - Else if Deptno Available to Process...
 - Processes
 - Register User Processing Department
 - Function Result
 - p_deptno
 - Process Department in Background
 - If Background Process Succeeded...
 - Else If Background Process Failed...

Layout Page Search Help

3 Go

Process

Filter

Identification

Name: Register User Processing Department

Type: Invoke API

Execution Chain: Else if Deptno Available to Process...

Editable Region: - Select -

Settings

Type: PL/SQL Package

Owner: Parsing Schema

Package: EBA_DEMO_BG_PROC

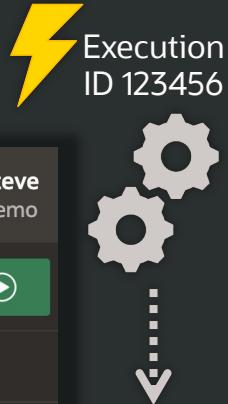
Procedure or Function: REGISTER_USER_PROCESSING_DEPTNO

Execution

Success Message

Error

Next, Process the Department in the Background



Application 100 \ Page Designer

Rendering Dynamic Actions Processing Page Shared Components

Processes

- Process form Department
- Save and Process
 - Processes
 - Check Existing Background for DEPTNO
 - If Deptno Already Being Processed...
 - Else if Deptno Available to Process...
 - Processes
 - Register User Processing Department
 - Process Department in Background
 - Add Execution Id to Work Tracking Row
 - Process Department
 - Unregister Background Job for Deptno
 - If Background Process Succeeded...
 - Else If Background Process Failed...

Layout Page Search Help

Department

CONTENT BODY

- Department
- REGION BODY
 - P3_DNAME
 - P3_LOC
- REGION CONTENT

INFO

REGION CONTENT

DIALOG FOOTER

Buttons

Process

Filter

Identification

Name: Process Department in Background

Type: Execution Chain

Execution Chain: Else if Deptno Available to Process...

Settings

Execute in Background

Serialize Executions

Return Execution ID into Item: P3_EXECUTION_ID

Temporary File Handling: Ignore

Executions Limit

Execution

Save

Close Dialog

After Processing

Search

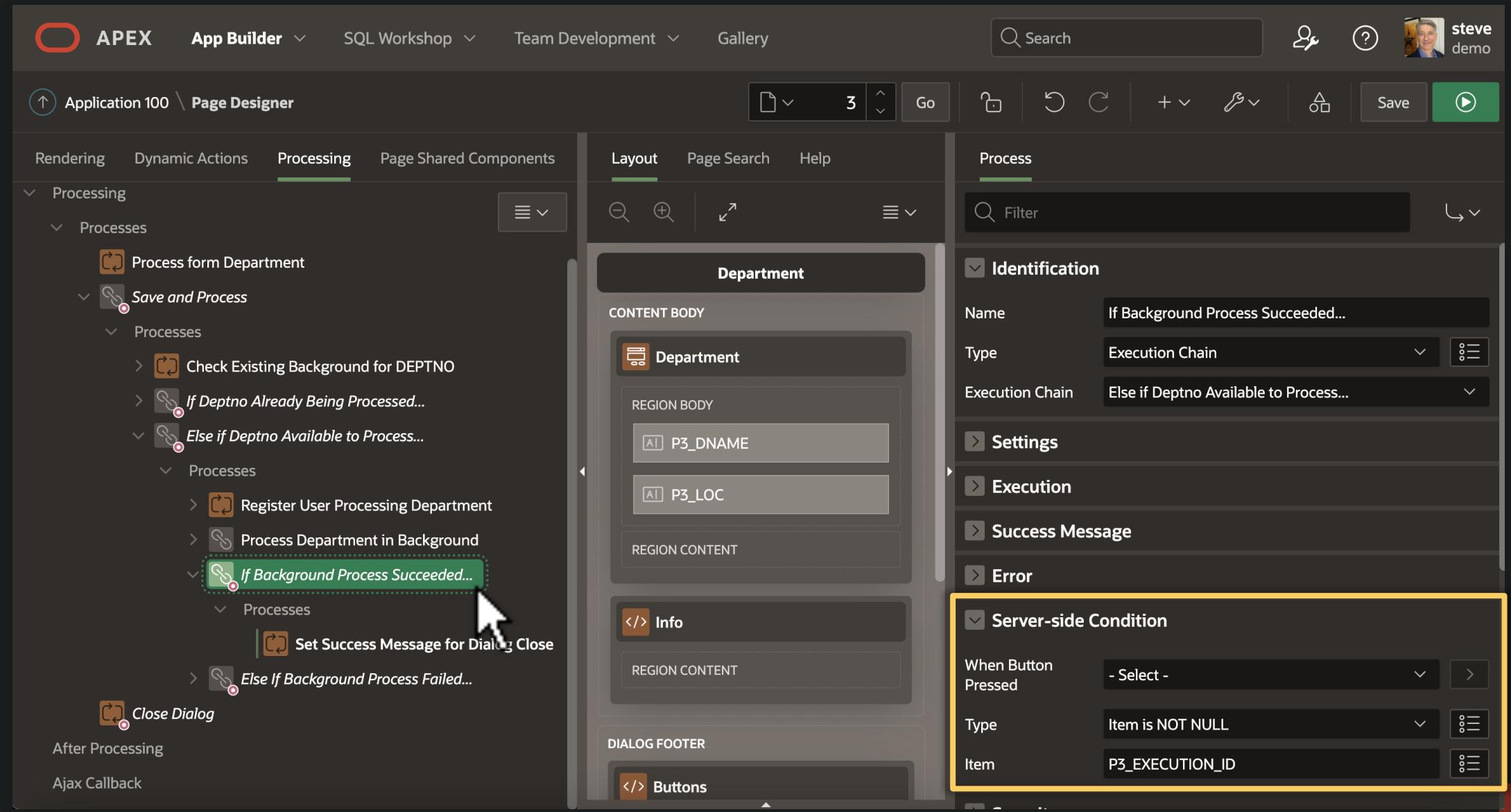
User Profile

Help

Save

Execution

If the Background Execution Started Successfully...



The screenshot shows the Oracle APEX App Builder interface for an application named "Application 100". The "Page Designer" tab is active. The "Processing" tab is selected in the left sidebar, showing a tree structure of processes. A mouse cursor is hovering over a process step named "If Background Process Succeeded...". The "Server-side Condition" section in the process configuration is highlighted with a yellow box. The "Identification" section shows the process is named "If Background Process Succeeded..." and is of type "Execution Chain". The "Execution" section contains an "Else if Deptno Available to Process..." condition. The "Success Message" section is also visible.

Rendering Dynamic Actions Processing Page Shared Components

Application 100 \ Page Designer

Layout Page Search Help

Process

Filter

Identification

Name: If Background Process Succeeded...

Type: Execution Chain

Execution Chain: Else if Deptno Available to Process...

Settings

Execution

Success Message

Error

Server-side Condition

When Button Pressed: - Select -

Type: Item is NOT NULL

Item: P3_EXECUTION_ID

Process

Department

CONTENT BODY

Department

P3_DNAME

P3_LOC

REGION BODY

REGION CONTENT

Info

REGION CONTENT

DIALOG FOOTER

Buttons

After Processing

Ajax Callback

Close Dialog

Save

steve demo

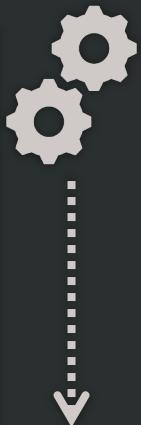


... Set the Success Message to Return to Caller

The screenshot shows the Oracle APEX App Builder interface for 'Application 100 \ Page Designer'. The 'Processing' tab is selected in the left sidebar. A process tree is displayed, with a specific process highlighted: 'Save and Process' -> 'If Deptno Already Being Processed...' -> 'If Background Process Succeeded...' -> 'Set Success Message for Dialog Close'. A cursor is hovering over this highlighted process. The main content area shows a 'Department' page with a 'CONTENT BODY' region containing 'Department', 'P3_DNAME', and 'P3_LOC' items. Below it is an 'Info' region. The 'DIALOG FOOTER' region contains a 'Buttons' item. On the right, the 'Process' configuration pane is open for the 'Set Success Message for Dialog Close' process. The 'Source' tab is selected, showing PL/SQL code:

```
:P3_SUCCESS_MESSAGE := 'Department '||:P3_DEPTNO||' submitted for processing.';
```

 The 'Success Message' tab is also visible. The top right corner of the interface shows a user profile for 'steve demo'.



... Else if Background Process Didn't Start as Expected

Execution
ID 123456

The screenshot shows the Oracle APEX App Builder interface for an application named "Application 100". The "Page Designer" tab is active. The "Processing" tab is selected in the left sidebar. A process tree is displayed, showing a main process "Process form Department" with a sub-process "Save and Process". This leads to a process "Else If Deptno Available to Process..." which contains steps for "Check Existing Background for DEPTNO", "If Deptno Already Being Processed...", and "Else If Background Process Failed...". The "Else If Background Process Failed..." step is highlighted with a green box and a mouse cursor is hovering over it. The "Server-side Condition" for this step is highlighted with a yellow box, showing the following configuration:

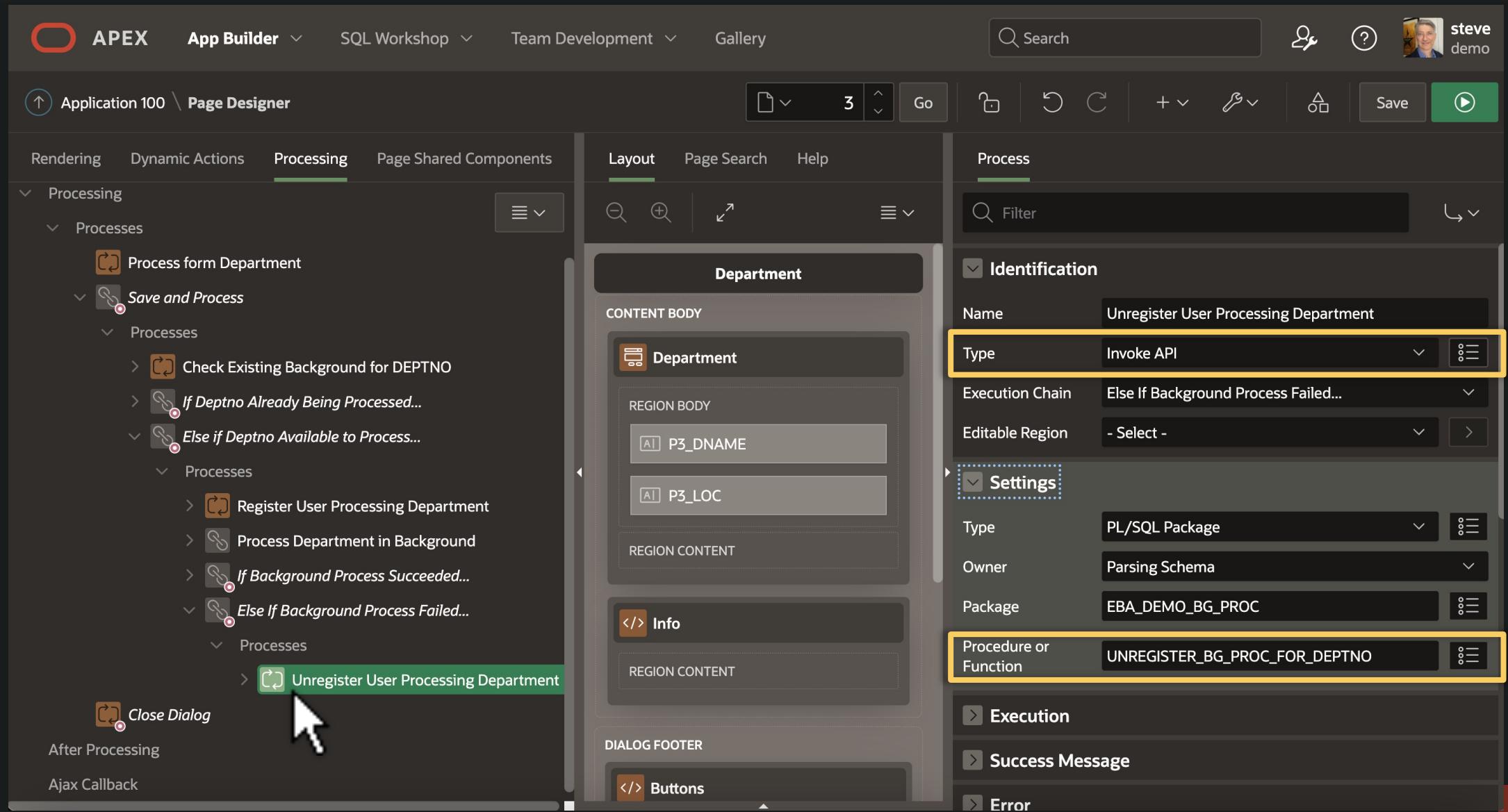
- When Button Pressed: - Select -
- Type: Item is NULL
- Item: P3_EXECUTION_ID

The central area shows the "Department" page with regions for "CONTENT BODY" (containing "Department", "P3_DNAME", and "P3_LOC"), "REGION BODY", "REGION CONTENT", "INFO" (containing "REGION CONTENT"), and "DIALOG FOOTER". The "Buttons" section of the dialog footer is also visible.



Unregister (User,Deptno) from Custom Tracking Table

Execution
ID 123456



Close the Dialog and Return to Calling Page

The screenshot shows the Oracle APEX App Builder interface for an application named "Application 100". The "Page Designer" tab is selected. The "Processing" tab is active in the left sidebar, showing a tree structure of processes. A process named "Process form Department" is expanded, and a "Save and Process" step is selected. This step has a sub-process named "Else if Deptno Available to Process...". Within this sub-process, a "Close Dialog" step is highlighted with a yellow border. The "Buttons" section of the dialog footer for this step is visible, showing a "Close Dialog" button. The "Identification" section of the process configuration shows the step is of type "Close Dialog".

Rendering Dynamic Actions Processing Page Shared Components

Layout Page Search Help

Process

Filter

Identification

Name Close Dialog

Type Close Dialog

Execution Chain None

Settings

Items to Return

Execution

Success Message

Error

Server-side Condition

When Button Pressed - Select -

Type Request is contained in Value

Buttons

Department

CONTENT BODY

Department

REGION BODY

P3_DNAME

P3_LOC

REGION CONTENT

Info

REGION CONTENT

DIALOG FOOTER

Buttons

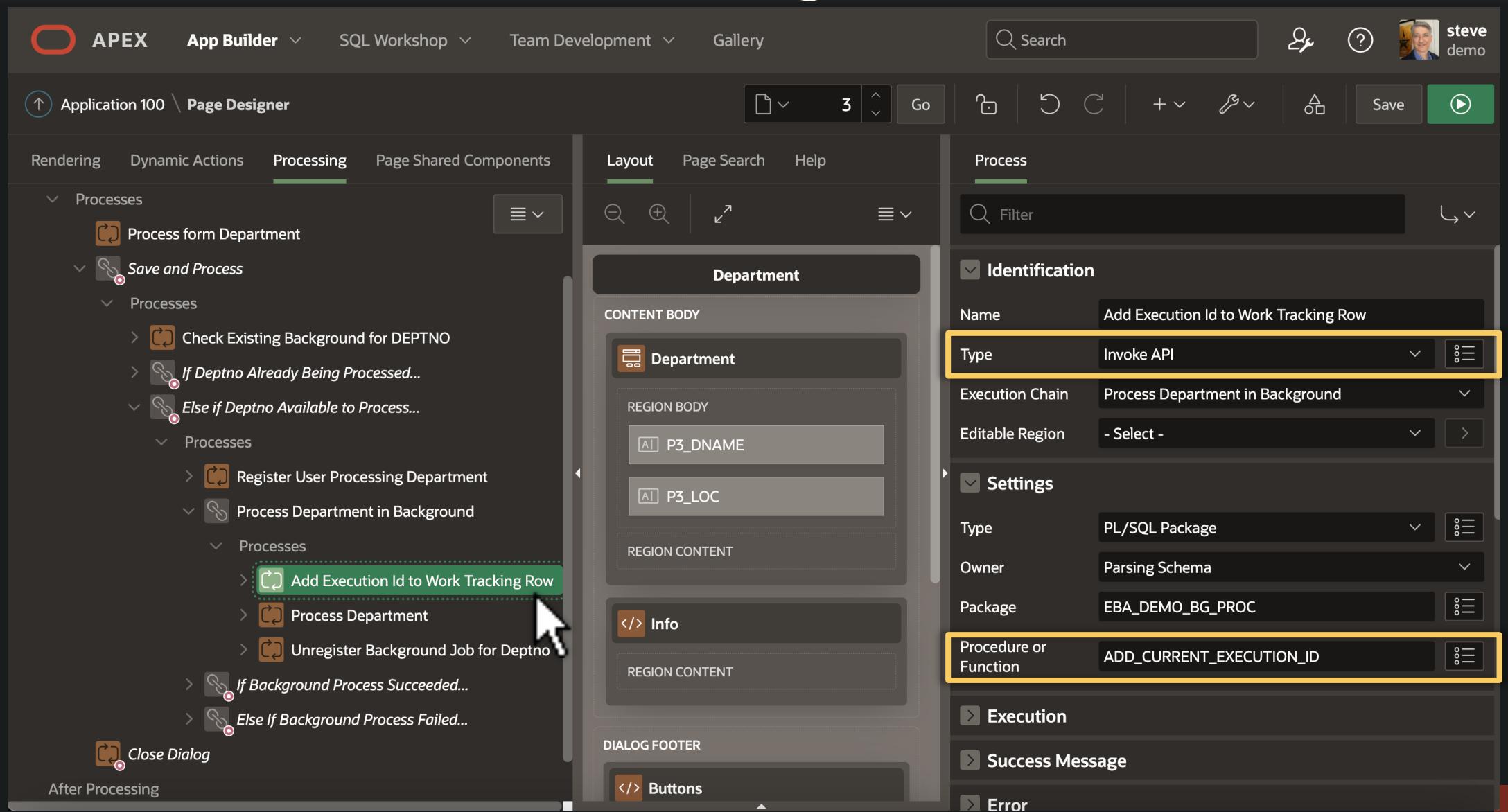
Close Dialog

After Processing

Ajax Callback



Meanwhile, Back in Our Background Process...



The screenshot shows the Oracle APEX App Builder interface for an application named "Application 100". The "Page Designer" tab is selected. The "Processing" tab is active in the left sidebar, showing a tree structure of processes. A process named "Save and Process" is expanded, revealing sub-processes like "Check Existing Background for DEPTNO" and "Else if Deptno Available to Process...". The "Else if Deptno Available to Process..." node has a sub-process named "Process Department in Background", which is also expanded. Inside this, a process named "Add Execution Id to Work Tracking Row" is highlighted with a green dotted selection box and a cursor icon pointing to it. The "Type" field for this process is set to "Invoke API" and the "Execution Chain" is "Process Department in Background". The "Procedure or Function" field contains the PL/SQL code "ADD_CURRENT_EXECUTION_ID". The right side of the screen shows the "Process" configuration panel with tabs for "Identification", "Settings", "Execution", "Success Message", and "Error". The "Identification" tab shows the name "Add Execution Id to Work Tracking Row" and the "Type" "Invoke API". The "Settings" tab shows the "Type" as "PL/SQL Package", "Owner" as "Parsing Schema", and "Package" as "EBA_DEMO_BG_PROC". The "Procedure or Function" field in the "Settings" tab also contains "ADD_CURRENT_EXECUTION_ID". The "Execution" tab is visible at the bottom. The top right corner of the interface shows the user "steve demo" and a profile picture. The top bar also includes links for "APEX", "App Builder", "SQL Workshop", "Team Development", and "Gallery", along with a search bar and user navigation icons.



Add Current Execution Id to Custom Tracking Row

Execution
ID 123456

The screenshot shows the Oracle APEX App Builder interface for a page designer. The top navigation bar includes links for APEX, App Builder, SQL Workshop, Team Development, and Gallery, along with a search bar and user profile for 'steve demo'.

The main area displays the 'Page Designer' for 'Application 100 \ Page Designer'. The 'Processing' tab is selected in the top navigation bar.

The left sidebar shows the process tree under 'Processes' for the 'Save and Process' step. The 'Add Execution Id to Work Tracking Row' step is highlighted with a green dotted line and a cursor icon.

The central content area shows the 'Department' page structure with regions for 'CONTENT BODY', 'REGION BODY', 'REGION CONTENT', 'INFO', and 'DIALOG FOOTER'. The 'Buttons' region is currently empty.

The right sidebar shows the configuration for the 'Add Execution Id to Work Tracking Row' step. The 'Type' is set to 'Invoke API' and the 'Procedure or Function' is set to 'ADD_CURRENT_EXECUTION_ID'. Both of these fields are highlighted with a yellow border.

On the far right, there are two grey gears and a vertical dotted line with a downward arrow, indicating a continuation or next step.

Do the Long-Running Processing of the Department

Application 100 \ Page Designer

Rendering Dynamic Actions Processing Page Shared Components

Processes

- Process form Department
- Save and Process
 - Check Existing Background for DEPTNO
 - If Deptno Already Being Processed...
 - Else if Deptno Available to Process...
 - Processes
 - Register User Processing Department
 - Process Department in Background
 - Processes
 - Add Execution Id to Work Tracking Row
 - Process Department
 - Unregister Background Job for Deptno
 - If Background Process Succeeded...
 - Else If Background Process Failed...

Layout Page Search Help

Process

Filter

Identification

Name: Process Department

Type: Invoke API

Execution Chain: Process Department in Background

Editable Region: - Select -

Settings

Type: PL/SQL Package

Owner: Parsing Schema

Package: EBA_DEMO_BG_PROC

Procedure or Function: PROCESS_DEPTNO

Execution

Success Message

Error

Buttons

Buttons

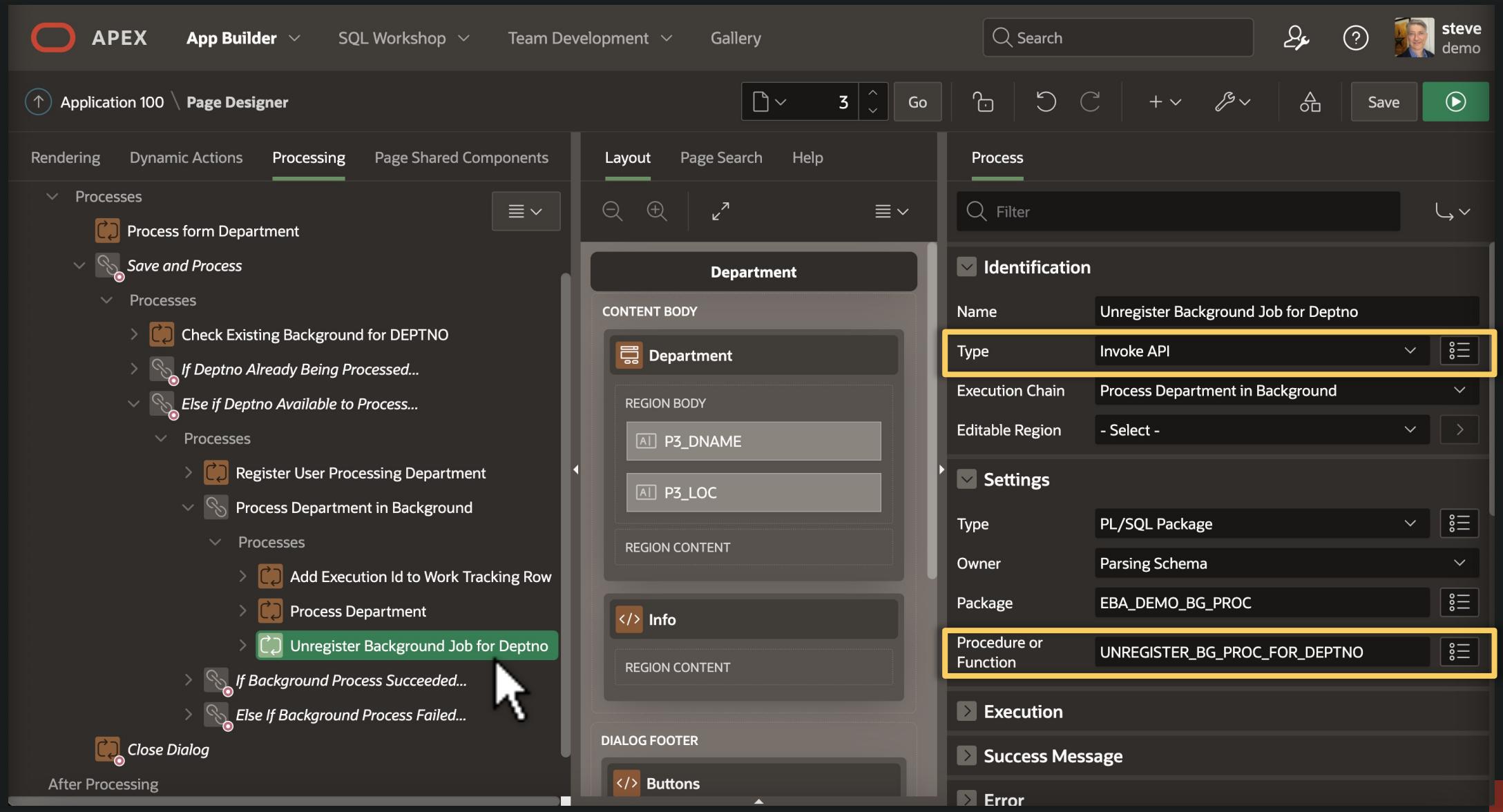
Save

After Processing



Unregister (User,Deptno) from Custom Tracking Table

Execution
ID 123456



Showing Users Progress of Background Processes

localhost:8080/ords/r/demo/background-processing/processing-status?debug=YES&session=1522927933828

Background Processing

steve

Processing Status	Processing History					
Username ↑	Deptno	Progress	Progress Bar	Submitted At	Started At	Running Time
STEVE	30	30%	<div style="width: 30%; background-color: red;"></div>	14-APR-2023 19:17:25	14-APR-2023 19:17:26	0h 0m 31s
STEVE	40	30%	<div style="width: 30%; background-color: red;"></div>	14-APR-2023 19:17:29	14-APR-2023 19:17:32	0h 0m 25s
STEVE	20	50%	<div style="width: 50%; background-color: red;"></div>	14-APR-2023 19:17:21	14-APR-2023 19:17:22	0h 0m 35s
STEVE	10	40%	<div style="width: 40%; background-color: red;"></div>	14-APR-2023 19:17:16	14-APR-2023 19:17:19	0h 0m 38s

EBA_DEMO_BACKGROUND_PROCESSES

ID	USERNAME	DEPTNO	EXECUTION_ID	STARTED_EXECUTION_AT
1	STEVE	20	2002	2023-04-14 19:17:22
2	STEVE	10	1001	2023-04-14 19:17:19
3	STEVE	30	3003	2023-04-14 19:17:26
4	STEVE	40	4004	2023-04-14 19:17:32

Execution ID 3003



Execution ID 1001



Execution ID 4004



Execution ID 2002



Showing Users Progress of Background Processes

localhost:8080/ords/r/demo/background-processing/processing-status?debug=YES&session=1522927933828

Background Processing

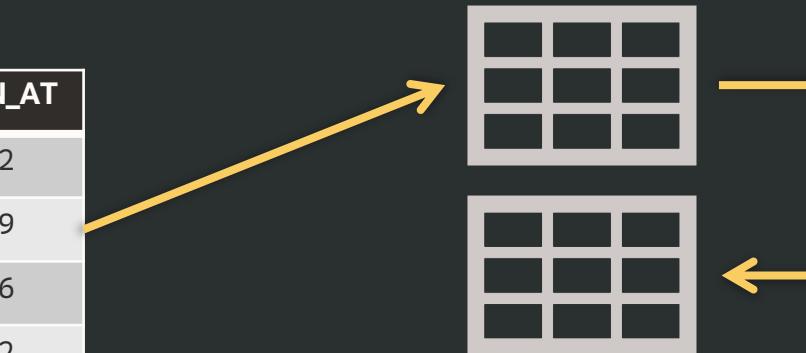
steve

Username	Deptno	Progress	Progress Bar	Submitted At	Started At	Running Time
STEVE	30	30%	<div style="width: 30%; background-color: red;"></div>	14-APR-2023 19:17:25	14-APR-2023 19:17:26	0h 0m 31s
STEVE	40	30%	<div style="width: 30%; background-color: red;"></div>	14-APR-2023 19:17:29	14-APR-2023 19:17:32	0h 0m 25s
STEVE	20	50%	<div style="width: 50%; background-color: red;"></div>	14-APR-2023 19:17:21	14-APR-2023 19:17:22	0h 0m 35s
STEVE	10	40%	<div style="width: 40%; background-color: red;"></div>	14-APR-2023 19:17:16	14-APR-2023 19:17:19	0h 0m 38s

APEX_APPL_PAGE_BG_PROC_STATUS

EBA_DEMO_BACKGROUND PROCESSES

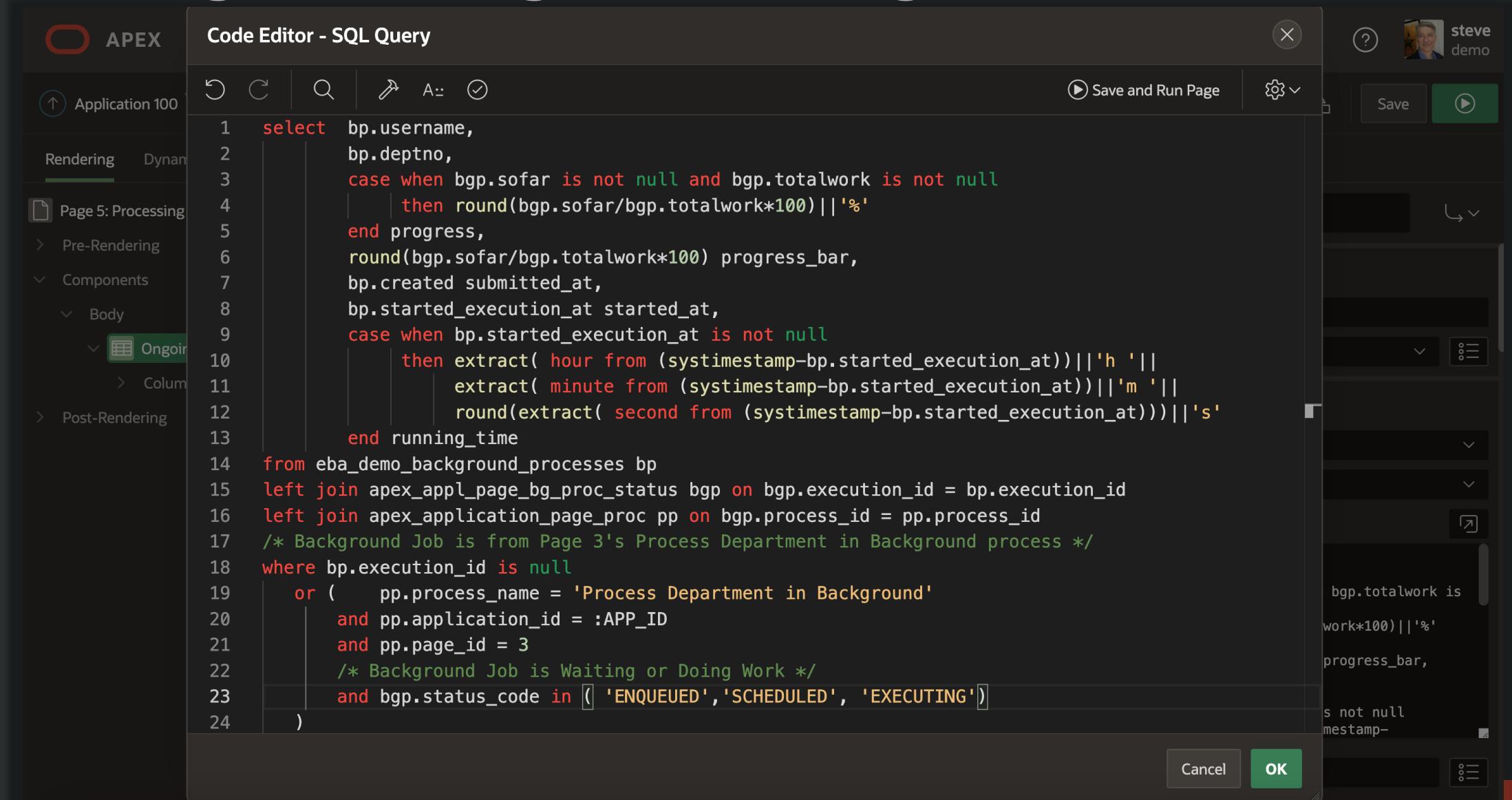
ID	USERNAME	DEPTNO	EXECUTION_ID	STARTED_EXECUTION_AT
1	STEVE	20	2002	2023-04-14 19:17:22
2	STEVE	10	1001	2023-04-14 19:17:19
3	STEVE	30	3003	2023-04-14 19:17:26
4	STEVE	40	4004	2023-04-14 19:17:32



APEX_APPLICATION_PAGE_PROC



Showing Users Progress of Background Processes

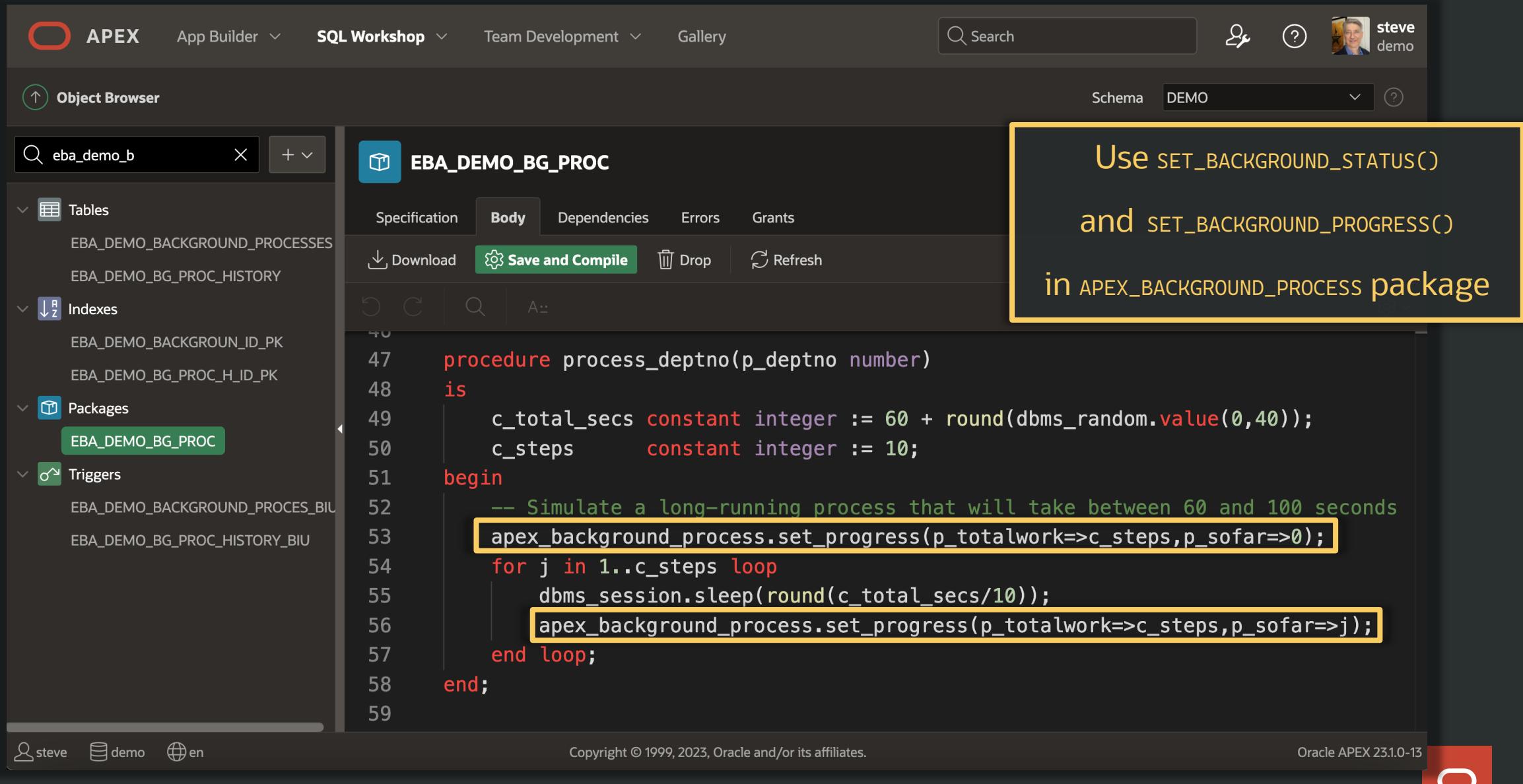


The screenshot shows the Oracle APEX Code Editor with the following details:

- Header:** APEX, Application 100, steve demo
- Toolbar:** Save and Run Page, Save, Run
- Code Editor - SQL Query:**

```
1  select  bp.username,
2        bp.deptno,
3        case when bgp.sofar is not null and bgp.totalwork is not null
4        | | then round(bgp.sofar/bgp.totalwork*100)|| '%'
5        end progress,
6        round(bgp.sofar/bgp.totalwork*100) progress_bar,
7        bp.created submitted_at,
8        bp.started_execution_at started_at,
9        case when bp.started_execution_at is not null
10       | | then extract( hour from (systimestamp-bp.started_execution_at))|| 'h ' ||
11       | | extract( minute from (systimestamp-bp.started_execution_at))|| 'm ' ||
12       | | round(extract( second from (systimestamp-bp.started_execution_at)))|| 's'
13       end running_time
14  from eba_demo_background_processes bp
15  left join apex_appl_page_bg_proc_status bgp on bgp.execution_id = bp.execution_id
16  left join apex_application_page_proc pp on bgp.process_id = pp.process_id
17  /* Background Job is from Page 3's Process Department in Background process */
18  where bp.execution_id is null
19  or (    pp.process_name = 'Process Department in Background'
20    and pp.application_id = :APP_ID
21    and pp.page_id = 3
22  /* Background Job is Waiting or Doing Work */
23  and bgp.status_code in ( 'ENQUEUED', 'SCHEDULED', 'EXECUTING' )
24  )
```
- Left Panel:** Application 100, Page 5: Processing, Pre-Rendering, Components, Body (Ongoing), Columns, Post-Rendering.
- Right Panel:** A sidebar showing the progress calculation logic.

Informing APEX Engine of Progress for BG Process



The screenshot shows the Oracle APEX SQL Workshop interface. The left sidebar shows the Object Browser with a search bar for 'eba_demo_b'. The 'Tables' section lists EBA_DEMO_BACKGROUND PROCESSES and EBA_DEMO_BG_PROC_HISTORY. The 'Indexes' section lists EBA_DEMO_BACKGROUND_ID_PK and EBA_DEMO_BG_PROC_H_ID_PK. The 'Packages' section has 'EBA_DEMO_BG_PROC' selected. The 'Triggers' section lists EBA_DEMO_BACKGROUND PROCES_BIU and EBA_DEMO_BG_PROC_HISTORY_BIU. The main panel shows the code for 'EBA_DEMO_BG_PROC' in the 'Body' tab. A yellow box highlights the following code block:

```
47  procedure process_deptno(p_deptno number)
48  is
49      c_total_secs constant integer := 60 + round(dbms_random.value(0,40));
50      c_steps      constant integer := 10;
51  begin
52      -- Simulate a long-running process that will take between 60 and 100 seconds
53      apex_background_process.set_progress(p_totalwork=>c_steps,p_sofar=>0);
54      for j in 1..c_steps loop
55          dbms_session.sleep(round(c_total_secs/10));
56          apex_background_process.set_progress(p_totalwork=>c_steps,p_sofar=>j);
57      end loop;
58  end;
```

A yellow box also highlights the text: 'Use SET_BACKGROUND_STATUS() and SET_BACKGROUND_PROGRESS() in APEX_BACKGROUND_PROCESS package'.

Schema: DEMO

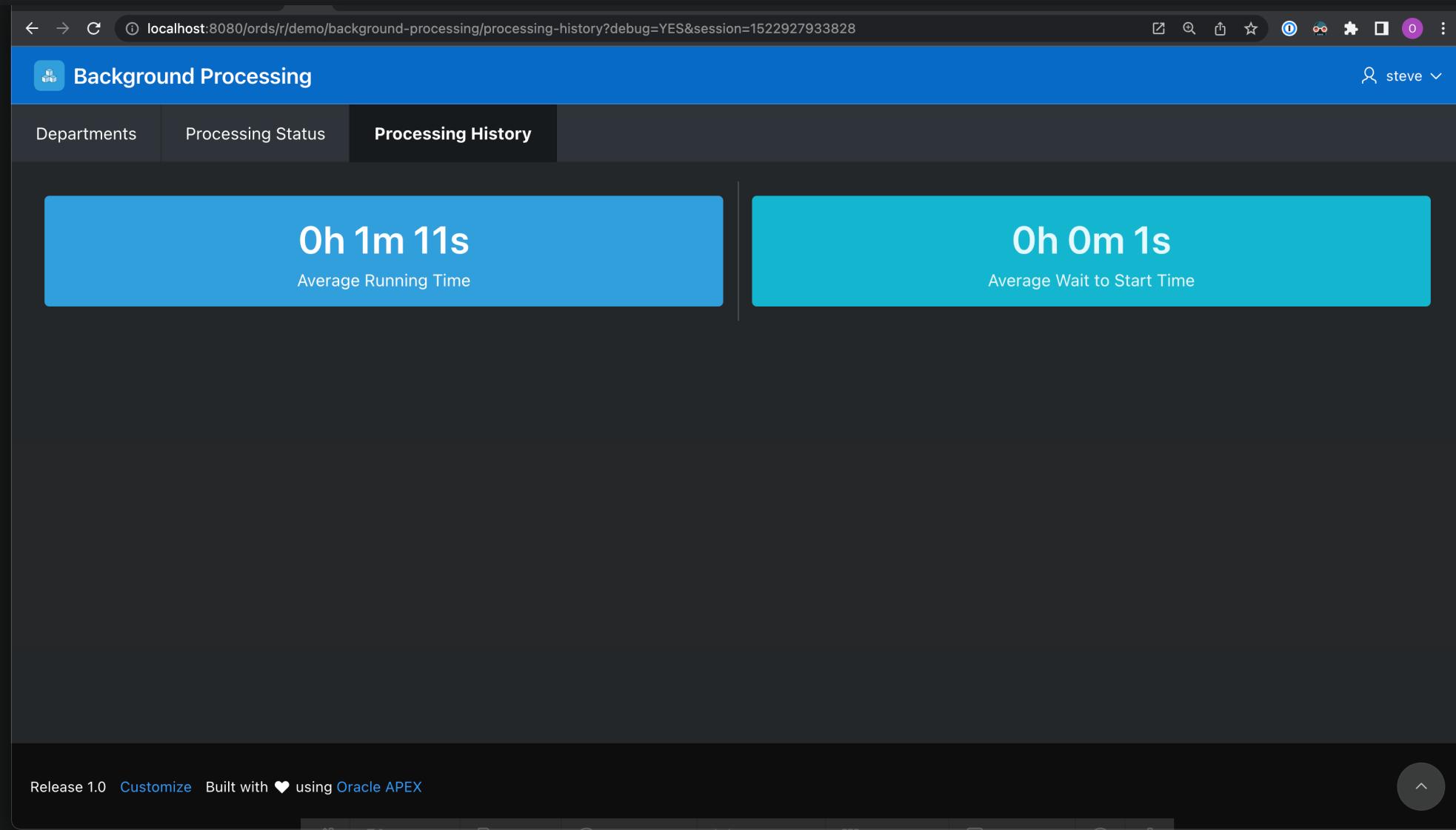
Search: Search

Profile: steve demo

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Oracle APEX 23.1.0-13

Track Run Time and Wait to Start Time to Provide Averages



The screenshot shows a web browser window with the URL `localhost:8080/ords/r/demo/background-processing/processing-history?debug=YES&session=1522927933828`. The page title is "Background Processing". The navigation bar includes links for "Departments", "Processing Status", and "Processing History", with "Processing History" being the active tab. Two large, colored boxes display performance metrics: a blue box on the left shows "0h 1m 11s" as the "Average Running Time" and a cyan box on the right shows "0h 0m 1s" as the "Average Wait to Start Time". The bottom of the page includes a footer with the text "Release 1.0" and "Built with ❤ using Oracle APEX".

localhost:8080/ords/r/demo/background-processing/processing-history?debug=YES&session=1522927933828

Background Processing

steve

Departments Processing Status Processing History

0h 1m 11s

Average Running Time

0h 0m 1s

Average Wait to Start Time

Release 1.0 Customize Built with ❤ using Oracle APEX

Getting Information About Background Processes

```
SQL> DESC APEX_APPL_PAGE_BG_PROC_STATUS
```

Name	Null?	Type
WORKSPACE	NOT NULL	VARCHAR2(255)
WORKSPACE_DISPLAY_NAME		VARCHAR2(4000)
APPLICATION_ID	NOT NULL	NUMBER
APPLICATION_NAME	NOT NULL	VARCHAR2(255)
PAGE_ID	NOT NULL	NUMBER
PAGE_NAME	NOT NULL	VARCHAR2(255)
EXECUTION_ID	NOT NULL	NUMBER
PROCESS_ID	NOT NULL	NUMBER
PROCESS_NAME	NOT NULL	VARCHAR2(255)
SERIAL_EXECUTION		VARCHAR2(3)
CURRENT_PROCESS_ID		NUMBER
CURRENT_PROCESS_NAME		VARCHAR2(255)
CURRENT_PROCESS_SEQUENCE		NUMBER
PROCESS_TYPE_PLUGIN_NAME		VARCHAR2(255)
SESSION_ID		NUMBER
WORKING_SESSION_ID		NUMBER
REQUEST		VARCHAR2(255)
ECID		VARCHAR2(64)
STATUS		VARCHAR2(24)
STATUS_CODE	NOT NULL	VARCHAR2(16)
STATUS_MESSAGE		VARCHAR2(4000)
SOFAR		NUMBER
TOTALWORK		NUMBER
CREATED_ON	NOT NULL	TIMESTAMP(6) WITH TIME ZONE
LAST_UPDATED_ON		TIMESTAMP(6) WITH TIME ZONE

Background
process job
instance



Getting Information About Background Processes

```
SQL> DESC APEX_APPL_PAGE_BG_PROC_STATUS
```

Name	Null?	Type
WORKSPACE	NOT NULL	VARCHAR2(255)
WORKSPACE_DISPLAY_NAME		VARCHAR2(4000)
APPLICATION_ID	NOT NULL	NUMBER
APPLICATION_NAME	NOT NULL	VARCHAR2(255)
PAGE_ID	NOT NULL	NUMBER
PAGE_NAME	NOT NULL	VARCHAR2(255)
EXECUTION_ID	NOT NULL	NUMBER
PROCESS_ID	NOT NULL	NUMBER
PROCESS_NAME	NOT NULL	VARCHAR2(255)
SERIAL_EXECUTION		VARCHAR2(3)
CURRENT_PROCESS_ID		NUMBER
CURRENT_PROCESS_NAME		VARCHAR2(255)
CURRENT_PROCESS_SEQUENCE		NUMBER
PROCESS_TYPE_PLUGIN_NAME		VARCHAR2(255)
SESSION_ID		NUMBER
WORKING_SESSION_ID		NUMBER
REQUEST		VARCHAR2(255)
ECID		VARCHAR2(64)
STATUS		VARCHAR2(24)
STATUS_CODE	NOT NULL	VARCHAR2(16)
STATUS_MESSAGE		VARCHAR2(4000)
SOFAR		NUMBER
TOTALWORK		NUMBER
CREATED_ON	NOT NULL	TIMESTAMP(6) WITH TIME ZONE
LAST_UPDATED_ON		TIMESTAMP(6) WITH TIME ZONE

Which execution chain *definition* is this an instance of?



Getting Information About Background Processes

```
SQL> DESC APEX_APPL_PAGE_BG_PROC_STATUS
```

Name	Null?	Type
WORKSPACE	NOT NULL	VARCHAR2(255)
WORKSPACE_DISPLAY_NAME		VARCHAR2(4000)
APPLICATION_ID	NOT NULL	NUMBER
APPLICATION_NAME	NOT NULL	VARCHAR2(255)
PAGE_ID	NOT NULL	NUMBER
PAGE_NAME	NOT NULL	VARCHAR2(255)
EXECUTION_ID	NOT NULL	NUMBER
PROCESS_ID	NOT NULL	NUMBER
PROCESS_NAME	NOT NULL	VARCHAR2(255)
SERIAL_EXECUTION		VARCHAR2(3)
CURRENT_PROCESS_ID	NUMBER	
CURRENT_PROCESS_NAME		VARCHAR2(255)
CURRENT_PROCESS_SEQUENCE	NUMBER	
PROCESS_TYPE_PLUGIN_NAME		VARCHAR2(255)
SESSION_ID	NUMBER	
WORKING_SESSION_ID	NUMBER	
REQUEST		VARCHAR2(255)
ECID		VARCHAR2(64)
STATUS		VARCHAR2(24)
STATUS_CODE	NOT NULL	VARCHAR2(16)
STATUS_MESSAGE		VARCHAR2(4000)
SOFAR		NUMBER
TOTALWORK		NUMBER
CREATED_ON	NOT NULL	TIMESTAMP(6) WITH TIME ZONE
LAST_UPDATED_ON		TIMESTAMP(6) WITH TIME ZONE

Current child page process
in the chain that's executing
in the background

CURRENT_PROCESS_ID
CURRENT_PROCESS_NAME
CURRENT_PROCESS_SEQUENCE
PROCESS_TYPE_PLUGIN_NAME

Getting Information About Background Processes

```
SQL> DESC APEX_APPL_PAGE_BG_PROC_STATUS
```

Name	Null?	Type
WORKSPACE	NOT NULL	VARCHAR2(255)
WORKSPACE_DISPLAY_NAME		VARCHAR2(4000)
APPLICATION_ID	NOT NULL	NUMBER
APPLICATION_NAME	NOT NULL	VARCHAR2(255)
PAGE_ID	NOT NULL	NUMBER
PAGE_NAME	NOT NULL	VARCHAR2(255)
EXECUTION_ID	NOT NULL	NUMBER
PROCESS_ID	NOT NULL	NUMBER
PROCESS_NAME	NOT NULL	VARCHAR2(255)
SERIAL_EXECUTION		VARCHAR2(3)
CURRENT_PROCESS_ID		NUMBER
CURRENT_PROCESS_NAME		VARCHAR2(255)
CURRENT_PROCESS_SEQUENCE		NUMBER
PROCESS_TYPE_PLUGIN_NAME		VARCHAR2(255)
SESSION_ID		NUMBER
WORKING_SESSION_ID		NUMBER
REQUEST		VARCHAR2(255)
ECID		VARCHAR2(64)
STATUS		VARCHAR2(24)
STATUS_CODE	NOT NULL	VARCHAR2(16)
STATUS_MESSAGE		VARCHAR2(4000)
SOFAR		NUMBER
TOTALWORK		NUMBER
CREATED_ON	NOT NULL	TIMESTAMP(6) WITH TIME ZONE
LAST_UPDATED_ON		TIMESTAMP(6) WITH TIME ZONE

Session *initiating* the execution chain instance background process



Getting Information About Background Processes

```
SQL> DESC APEX_APPL_PAGE_BG_PROC_STATUS
```

Name	Null?	Type
WORKSPACE	NOT NULL	VARCHAR2(255)
WORKSPACE_DISPLAY_NAME		VARCHAR2(4000)
APPLICATION_ID	NOT NULL	NUMBER
APPLICATION_NAME	NOT NULL	VARCHAR2(255)
PAGE_ID	NOT NULL	NUMBER
PAGE_NAME	NOT NULL	VARCHAR2(255)
EXECUTION_ID	NOT NULL	NUMBER
PROCESS_ID	NOT NULL	NUMBER
PROCESS_NAME	NOT NULL	VARCHAR2(255)
SERIAL_EXECUTION		VARCHAR2(3)
CURRENT_PROCESS_ID		NUMBER
CURRENT_PROCESS_NAME		VARCHAR2(255)
CURRENT_PROCESS_SEQUENCE		NUMBER
PROCESS_TYPE_PLUGIN_NAME		VARCHAR2(255)
SESSION_ID		NUMBER
WORKING_SESSION_ID		NUMBER
REQUEST		VARCHAR2(255)
ECID		VARCHAR2(64)
STATUS		VARCHAR2(24)
STATUS_CODE	NOT NULL	VARCHAR2(16)
STATUS_MESSAGE		VARCHAR2(4000)
SOFAR		NUMBER
TOTALWORK		NUMBER
CREATED_ON	NOT NULL	TIMESTAMP(6) WITH TIME ZONE
LAST_UPDATED_ON		TIMESTAMP(6) WITH TIME ZONE

Cloned session used by the execution chain instance background job

→ **WORKING_SESSION_ID**

Getting Information About Background Processes

```
SQL> DESC APEX_APPL_PAGE_BG_PROC_STATUS
```

Status	Status Code
Added to Execution Queue	ENQUEUED
Scheduled for Execution	SCHEDULED
Executing	EXECUTING
Executed Successfully	SUCCESS
Executed with Failure	FAILED
Aborted	ABORTED

Name	Null?	Type
WORKSPACE	NOT NULL	VARCHAR2(255)
WORKSPACE_DISPLAY_NAME		VARCHAR2(4000)
APPLICATION_ID	NOT NULL	NUMBER
APPLICATION_NAME	NOT NULL	VARCHAR2(255)
PAGE_ID	NOT NULL	NUMBER
PAGE_NAME	NOT NULL	VARCHAR2(255)
EXECUTION_ID	NOT NULL	NUMBER
PROCESS_ID	NOT NULL	NUMBER
PROCESS_NAME	NOT NULL	VARCHAR2(255)
SERIAL_EXECUTION		VARCHAR2(3)
CURRENT_PROCESS_ID		NUMBER
CURRENT_PROCESS_NAME		VARCHAR2(255)
CURRENT_PROCESS_SEQUENCE		NUMBER
PROCESS_TYPE_PLUGIN_NAME		VARCHAR2(255)
SESSION_ID		NUMBER
WORKING_SESSION_ID		NUMBER
REQUEST		VARCHAR2(255)
ECID		VARCHAR2(64)
STATUS		VARCHAR2(24)
STATUS_CODE	NOT NULL	VARCHAR2(16)
STATUS_MESSAGE		VARCHAR2(4000)
SOFAR		NUMBER
TOTALWORK		NUMBER
CREATED_ON	NOT NULL	TIMESTAMP(6) WITH TIME ZONE
LAST_UPDATED_ON		TIMESTAMP(6) WITH TIME ZONE

Status of the background process



Getting Information About Background Processes

```
SQL> DESC APEX_APPL_PAGE_BG_PROC_STATUS
```

Name	Null?	Type
WORKSPACE	NOT NULL	VARCHAR2(255)
WORKSPACE_DISPLAY_NAME		VARCHAR2(4000)
APPLICATION_ID	NOT NULL	NUMBER
APPLICATION_NAME	NOT NULL	VARCHAR2(255)
PAGE_ID	NOT NULL	NUMBER
PAGE_NAME	NOT NULL	VARCHAR2(255)
EXECUTION_ID	NOT NULL	NUMBER
PROCESS_ID	NOT NULL	NUMBER
PROCESS_NAME	NOT NULL	VARCHAR2(255)
SERIAL_EXECUTION		VARCHAR2(3)
CURRENT_PROCESS_ID		NUMBER
CURRENT_PROCESS_NAME		VARCHAR2(255)
CURRENT_PROCESS_SEQUENCE		NUMBER
PROCESS_TYPE_PLUGIN_NAME		VARCHAR2(255)
SESSION_ID		NUMBER
WORKING_SESSION_ID		NUMBER
REQUEST		VARCHAR2(255)
ECID		VARCHAR2(64)
STATUS		VARCHAR2(24)
STATUS_CODE	NOT NULL	VARCHAR2(16)
STATUS_MESSAGE		VARCHAR2(4000)
SOFAR		NUMBER
TOTALWORK		NUMBER
CREATED_ON	NOT NULL	TIMESTAMP(6) WITH TIME ZONE
LAST_UPDATED_ON		TIMESTAMP(6) WITH TIME ZONE

Latest progress
as reported by
SET_BACKGROUND_STATUS()
SET_BACKGROUND_PROGRESS()
in
APEX_BACKGROUND_PROCESS
package

STATUS_MESSAGE
SOFAR
TOTALWORK

Throttling Concurrent Background Executions per Application

Application 102 \ Edit Application Definition

Definition Security Globalization User Interface Progressive Web App

Application 102

Cancel Delete Apply Changes

Show All Name Properties Availability Error Handling Global Notification Substitutions Build Options Report Printing Copyright Banner

Properties

Friendly URLs ⓘ

Allow Feedback ⓘ

Logging ⓘ

Debugging ⓘ

Compatibility Mode ⓘ

Application Email From Address ⓘ

Proxy Server

Oracle Text Function

Tokenize Row Search ⓘ

Maximum Background Page Process Jobs ⓘ

Maximum Background Page Process Jobs

Provide the maximum number of scheduler jobs being available for *background execution* of page processes for this application. Only the configured number of jobs will run at the same time, to execute page processes for this application in the background. If the configured maximum amount of scheduler jobs is active, new submitted executions will wait until a job becomes available.

Setting the attribute to zero disables background executions; new submitted executions will stay in *queued* state.

[View Documentation](#)

Throttling Concurrent Background Executions per Workspace

Manage Workspaces \ Existing Workspaces \ Edit Workspace Information

Edit Workspace Information

Cancel **Apply Changes**

Show All Edit Workspace Information Workspace Appearance Login Control Component Availability Session Timeout **Workspace Isolation**

Workspace Isolation

Allow Hostnames ⓘ

Resource Consumer Group ⓘ

Maximum Concurrent Workspace Requests ⓘ

Maximum Concurrent Session Requests ⓘ

Concurrent Session Requests Kill Timeout ⓘ

Maximum Size of Files in Workspace ⓘ

Maximum Email Messages ⓘ

Maximum Web Service Requests ⓘ

Content Cache target size ⓘ

Content Cache maximum entry size ⓘ

Maximum Background Page Process Jobs 4 ⓘ

Provide the maximum number of scheduler jobs being available for background execution of page processes for this workspace (applies to all applications). Only the configured number of jobs will run at the same time to execute page processes in the background. If the configured maximum amount of scheduler jobs is active, new submitted executions will wait until a job becomes available.

Setting the attribute to zero disables background executions; new submitted executions will stay in enqueued state. Leaving the attribute empty leads to the instance default being used, which can be set using the **MAX_PROCESS_SCHEDULER_JOBS_DEFAULT** instance parameter.

[View Documentation](#)

About
Manage selected workspace settings. Use the tasks region below to perform additional actions.

Tasks

- Add Schema >
- Add APEX User >
- View Detailed Report >
- Export Workspace >
- Remove Workspace >

Workspace Information

4

Workspace Users

1

0

Associating Custom Resource Manager Job Class to BG Processes

```
-- Run as SYS or user with APEX_ADMINISTRATOR_ROLE
begin
    apex_instance_admin.set_parameter(
        p_parameter => 'BACKGROUND_PROCESS_JOB_CLASS',
        p_value      => 'CUSTOM_BG_PROC_CLASS'
    );
end;
```

The screenshot shows the 'Instance Settings' page in the Oracle Database Control interface. The 'Background Jobs' tab is selected. A note in the bottom right corner states: 'N.B. This *different* setting (BACKGROUND_JOB_CLASS) affects Automations + REST Sync background process'. An orange box highlights the 'Background Job Class' dropdown, which is set to 'AUTOMATION_RESTSYNC_CLS'. An orange arrow points from this highlighted box to the note.

Manage Instance \ Instance Settings

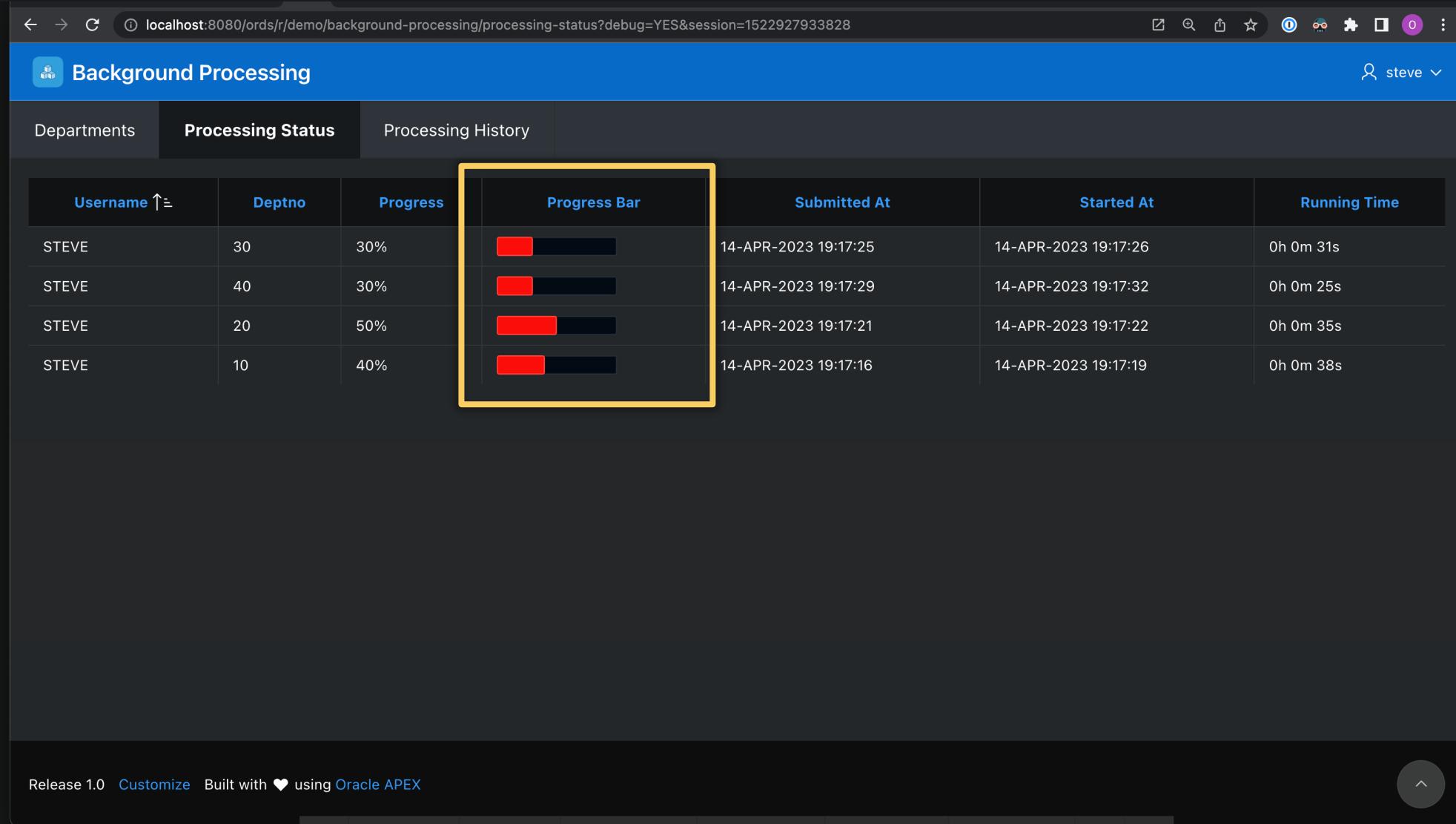
Instance Settings

Background Jobs

Background Job Class: AUTOMATION_RESTSYNC_CLS

N.B. This *different* setting (BACKGROUND_JOB_CLASS) affects Automations + REST Sync background process

Limit ≥ 4 \rightarrow Four Submitted Background Processes Can Run

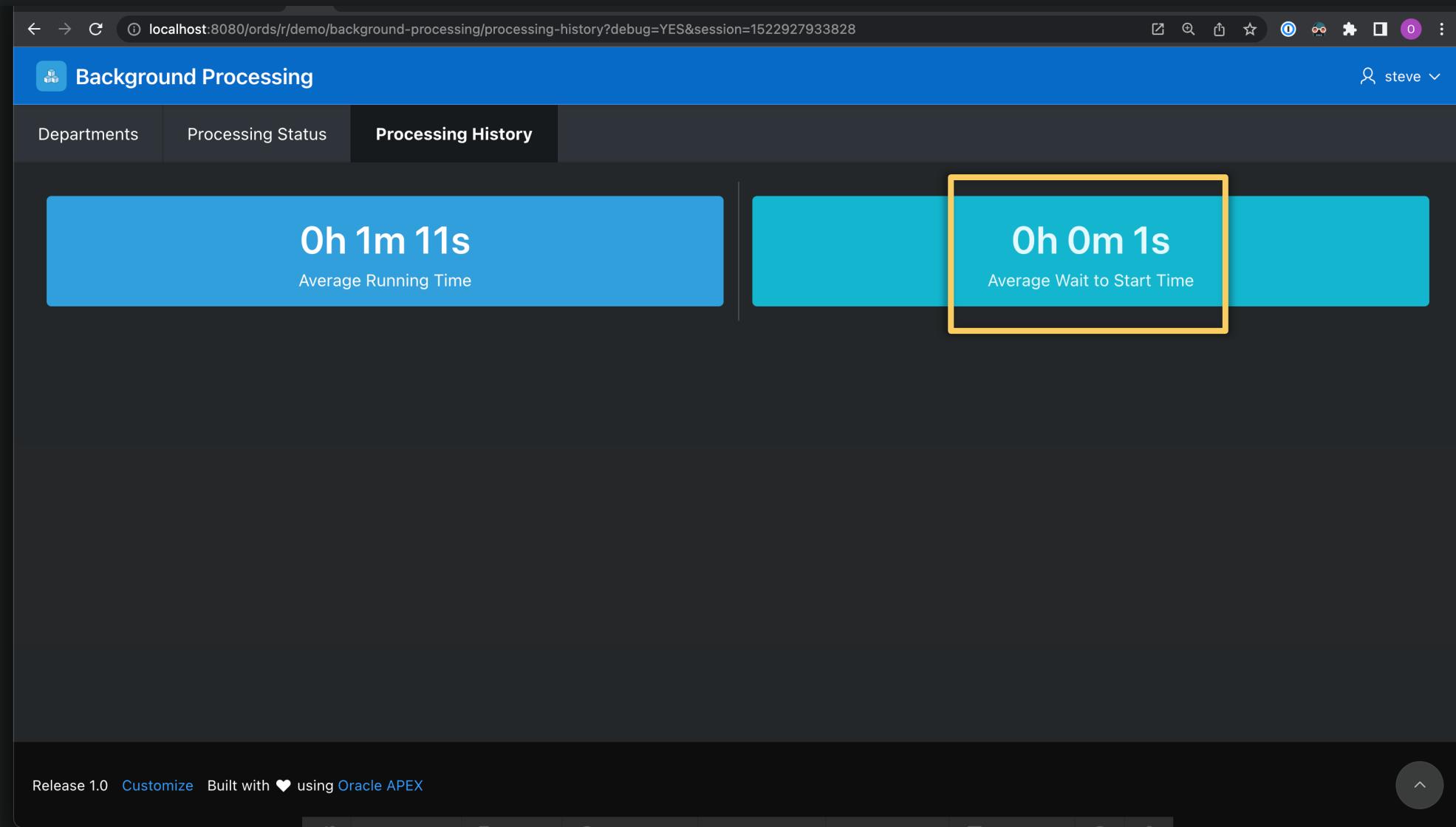


The screenshot shows a web application titled "Background Processing" on a browser. The URL is `localhost:8080/ords/r/demo/background-processing/processing-status?debug=YES&session=1522927933828`. The application interface includes a header with a user icon and the name "steve". The main content area has a table showing four rows of background processing tasks. The table has columns: "Username" (sorted by ascending order), "Deptno", "Progress", "Progress Bar", "Submitted At", "Started At", and "Running Time". Each row represents a task submitted by user STEVE. The "Progress Bar" column is highlighted with a yellow border. The data is as follows:

Username	Deptno	Progress	Progress Bar	Submitted At	Started At	Running Time
STEVE	30	30%	<div style="width: 30%; background-color: red;"></div>	14-APR-2023 19:17:25	14-APR-2023 19:17:26	0h 0m 31s
STEVE	40	30%	<div style="width: 30%; background-color: red;"></div>	14-APR-2023 19:17:29	14-APR-2023 19:17:32	0h 0m 25s
STEVE	20	50%	<div style="width: 50%; background-color: red;"></div>	14-APR-2023 19:17:21	14-APR-2023 19:17:22	0h 0m 35s
STEVE	10	40%	<div style="width: 40%; background-color: red;"></div>	14-APR-2023 19:17:16	14-APR-2023 19:17:19	0h 0m 38s

At the bottom of the page, there is a footer with the text "Release 1.0 Customize Built with ❤ using Oracle APEX".

Limit ≥ 4 \rightarrow Background Processes Start Almost Immediately



Limit = 1 → Only One of Four Submitted BG Procs Runs at a Time

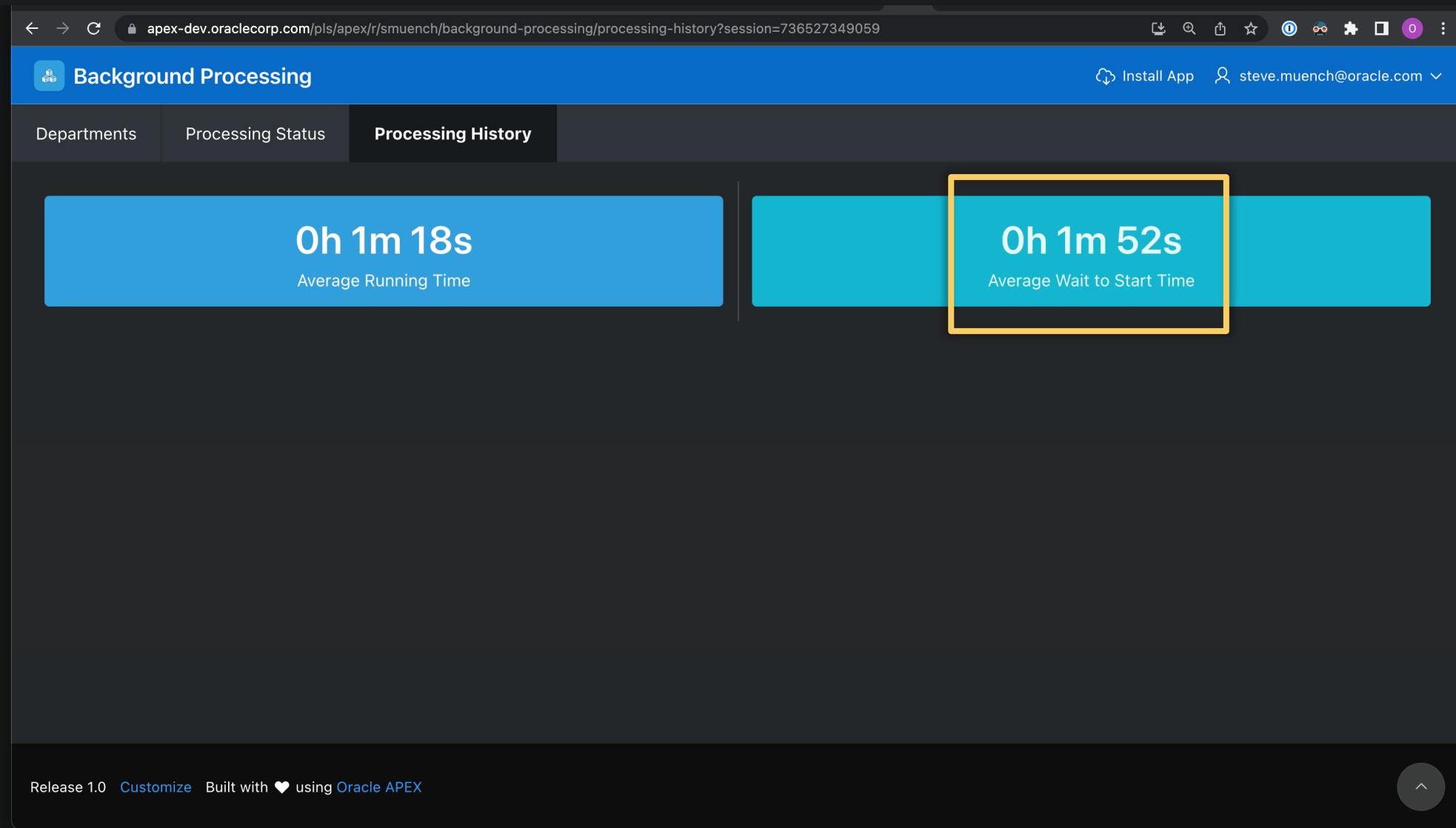
Background Processing

Install App steve.muench@oracle.com

Username	Deptno	Progress	Progress Bar	Submitted At	Started At	Running Time
STEVE.MUENCH@ORACLE.COM	10	30%	<div style="width: 30%; background-color: red;"></div>	14-APR-2023 19:06:46	14-APR-2023 19:06:48	0h 0m 22s
STEVE.MUENCH@ORACLE.COM	30			14-APR-2023 19:06:51		
STEVE.MUENCH@ORACLE.COM	40			14-APR-2023 19:06:55		
STEVE.MUENCH@ORACLE.COM	20			14-APR-2023 19:06:49		

Release 1.0 Customize Built with ❤ using Oracle APEX

Limit = 1 → Background Processes Wait Before Starting to Execute



The screenshot shows a web browser displaying the 'Background Processing' application on the Oracle APEX platform. The URL in the address bar is `apex-dev.oraclecorp.com/pls/apex/r/smuench/background-processing/processing-history?session=736527349059`. The page has a dark theme with blue and cyan highlights. At the top, there are tabs for 'Departments', 'Processing Status', and 'Processing History', with 'Processing History' being the active tab. Below the tabs, there are two large, rounded rectangular boxes. The left box is blue and contains the text '0h 1m 18s' in large white font, with 'Average Running Time' in smaller white font below it. The right box is cyan and contains '0h 1m 52s' in large white font, with 'Average Wait to Start Time' in smaller white font below it. A yellow box highlights the cyan box. At the bottom of the page, there is a footer with the text 'Release 1.0' and 'Built with ❤ using Oracle APEX'.

Background Processing

Departments Processing Status Processing History

0h 1m 18s

Average Running Time

0h 1m 52s

Average Wait to Start Time

Release 1.0 Customize Built with ❤ using Oracle APEX

Anticipating Common Developer Questions

- Can I associate a context value with the background process?
 - Your own table can link execution id to context value
- How long do rows "hang around" in APEX_APPL_PAGE_BG_PROC_STATUS?
 - Until both user and background sessions are cleaned up
- Can an execution chain in the background contain other background chains?
 - Yes

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ā'pěks alpe adria

Thank You! Questions?



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