

ā'pěks alpe adria

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

2021



UC Berkeley, BA Math, Dec 1989

SQL*Forms Support Engineer

Oracle Forms PM

Project Sedona PM

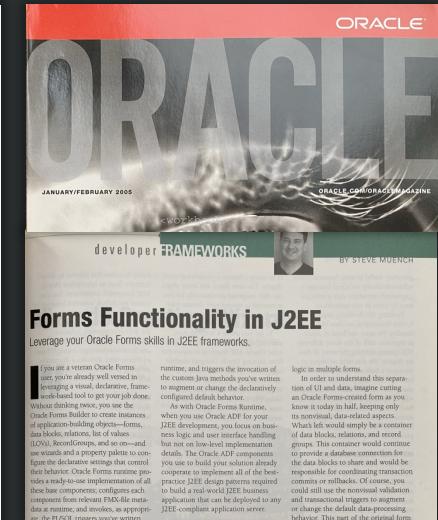
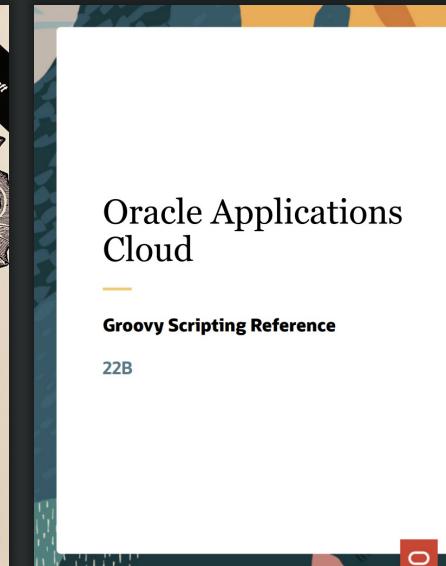
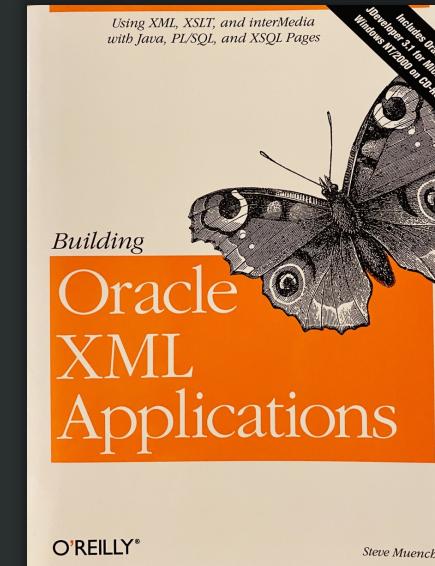
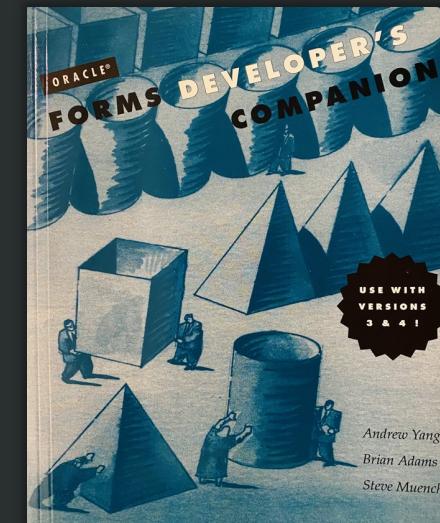
ADF BC PM

OraMag

XML

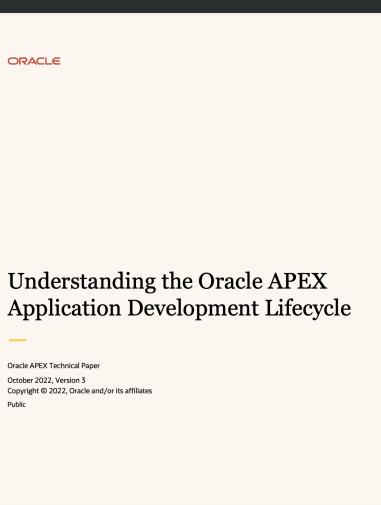
ADF Developer/Architect

Oracle APEX
Architect



logic in multiple forms, and triggers the invocation of the custom Java methods you've written to respond to user input or declaratively configured default behavior. As with Oracle Forms Runtime, when you're building J2EE components, you focus on business logic and user interface handling. You don't have to worry about the form details. The Oracle ADF components you use to build your solution already handle the form details for you. This includes a ready-to-use implementation of all these base components: configures each component with the appropriate data at runtime, and invokes, as appropriate, the PL/SQL trigger you've written.

What's left would simply be a container of data blocks, relations, and record sets. You can then use these to continue to provide a database connection for the data blocks to share and would be able to use the standard J2EE transaction commits or rollbacks. Of course, you could still use the numerous validation and constraint mechanisms to insert or change the default data processing behavior. This part of the original form



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

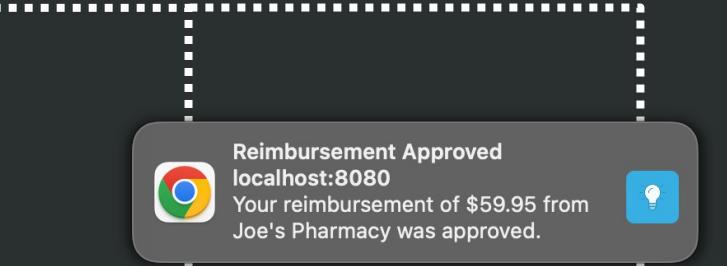
APEX 23.1

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.

The application details are as follows:

- Name:** Amazing APEX App
- Appearance:** Vita, Side Menu

The Pages section shows:

- An **Add Page** button.
- A list of pages: Home (selected) and Blank.
- Buttons for **Edit** and **Home**.

The Features section shows:

- Check All** checkbox.
- Install Progressive Web App**: Enabled (checked).
- Push Notifications**: Enabled (checked). This feature is highlighted with a yellow border and a cursor arrow pointing to its checkbox.
- About Page**: Disabled (unchecked).
- Access Control**: Disabled (unchecked).
- Activity Reporting**: Disabled (unchecked).
- Configuration Options**: Disabled (unchecked).

At the bottom are **Cancel** and **Create Application** buttons.

New User Settings Navigation Bar List Entry

The screenshot shows a mobile application interface. At the top is a blue header bar with the text "Approval Notification". Below it is a white content area with the word "Home" in large black font. In the bottom left corner of this area is a blue circular icon containing a white document icon, next to the text "Manage Reimbursements". At the very bottom of the screen, in a light gray footer bar, is the text "Release 1.0". In the top right corner of the white content area, there is a user profile icon consisting of a person icon and the letters "bo". A small dropdown menu is open from this icon, containing three items: "Install App" (with a cloud icon), "Settings" (with a gear icon), and "Sign Out" (with a sign-out icon). The "Settings" item is highlighted with a yellow rectangle, and a cursor arrow points to its right. The entire application interface is set against a dark background.

Others User Settings In the Future, or Add Your Own

The screenshot shows a mobile application interface. At the top, there's a blue header bar with the text "Approval Notification" and "Settings". To the right of the header is a small blue "X" icon. Below the header, the word "Home" is displayed in large black letters. To the left of "Home" is a circular icon containing a document symbol, and next to it is the text "Manage Reimbursement". On the right side of the screen, there's a blue square with the letters "BE" and below it, the text "bo@example.org". Underneath this, there's a section titled "Push Notifications" which includes a blue circular icon with a white bell symbol and a cursor arrow pointing towards it. The text "Push Notifications" is followed by the subtitle "Configure whether you want to receive push notifications on this device." To the right of this section is a grey button labeled "Off". At the bottom left of the main content area, the text "Release 1.0" is visible. The entire screenshot is framed by a dark grey border.

Approval Notification

Settings

Home

Manage Reimbursement

BE

bo@example.org

Push Notifications

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

Off

Release 1.0

End Users Opt-in on Each Device to Receive Notifications

≡ Approval Notifications

Home

Manage Reimbursement Requests

Release 1.0

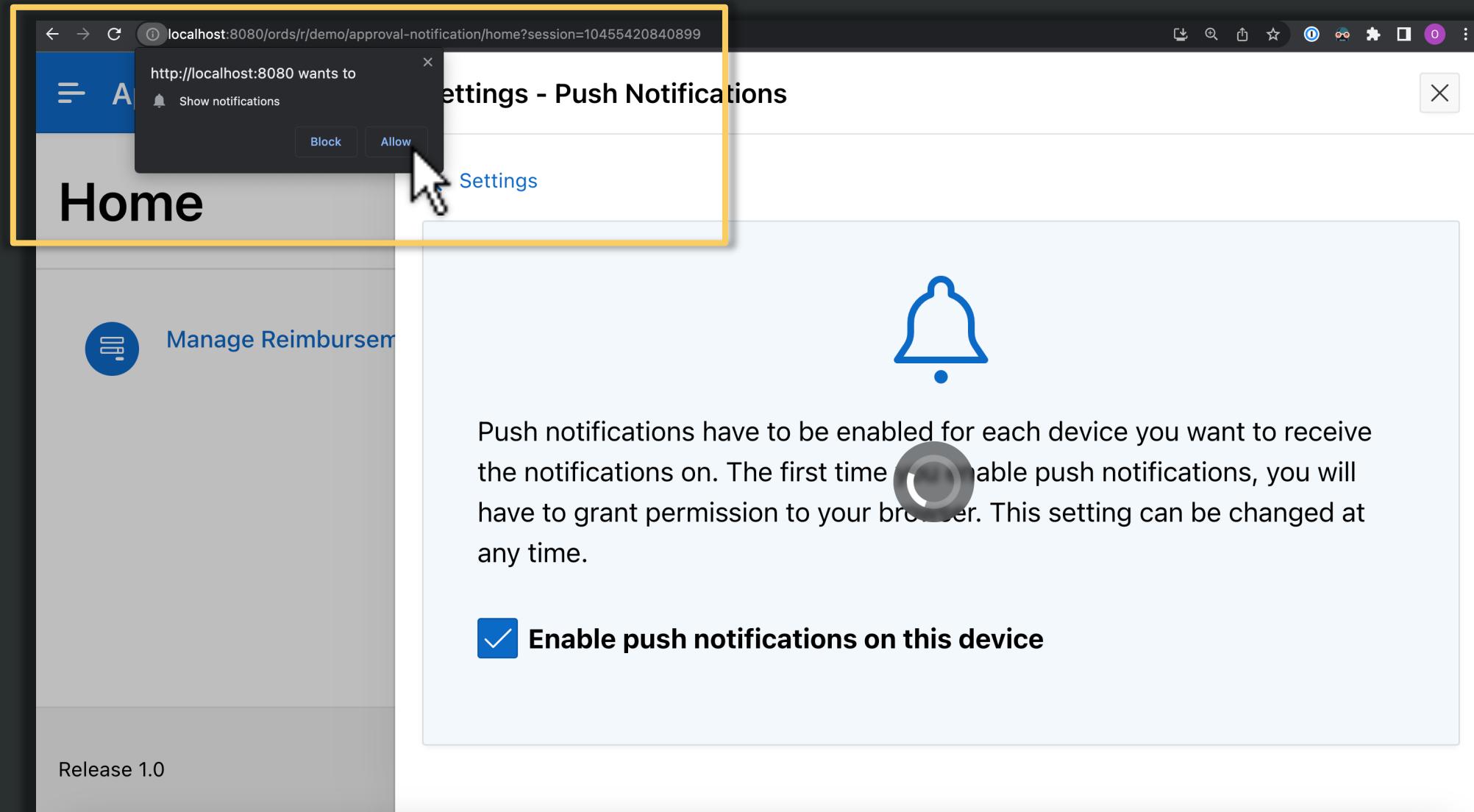
Settings - Push Notifications

< 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

The screenshot shows a web application interface. On the left, there's a sidebar with a blue header containing the text "Approval Notifications". Below this, the word "Home" is prominently displayed in large black font, with a smaller "Manage Reimbursements" link underneath it. A circular icon with a document symbol is also present. At the bottom of the sidebar, the text "Release 1.0" is visible. The main content area has a white background and a title "Settings - Push Notifications". Above the content, there's a navigation bar with a back arrow labeled "Settings" and a close button (an "X"). The main content includes a blue bell icon. Below the icon, a paragraph of text explains the push notification setup process. At the bottom of the content area, there's a button labeled "Enable push notifications on this device" with a checked checkbox icon. This button is highlighted with a yellow rectangular border.

Approval Notifications

Home

Manage Reimbursements

Release 1.0

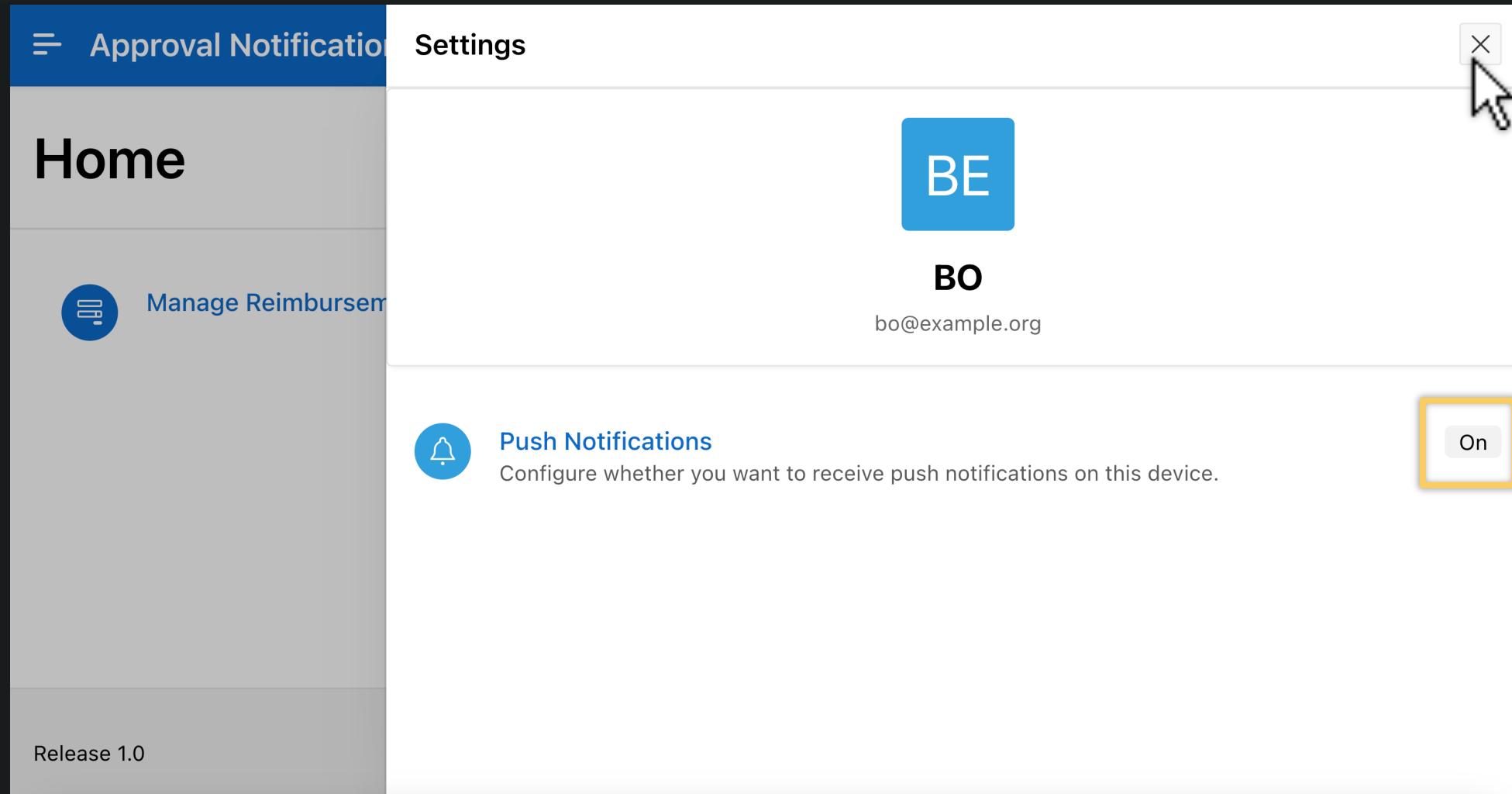
Settings - Push Notifications

< Settings

Enable push notifications on this device



User Remains Subscribed for this App Until They Disable



Imagine an App for Requesting a Reimbursement...

≡ Approval Notification

Install App

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

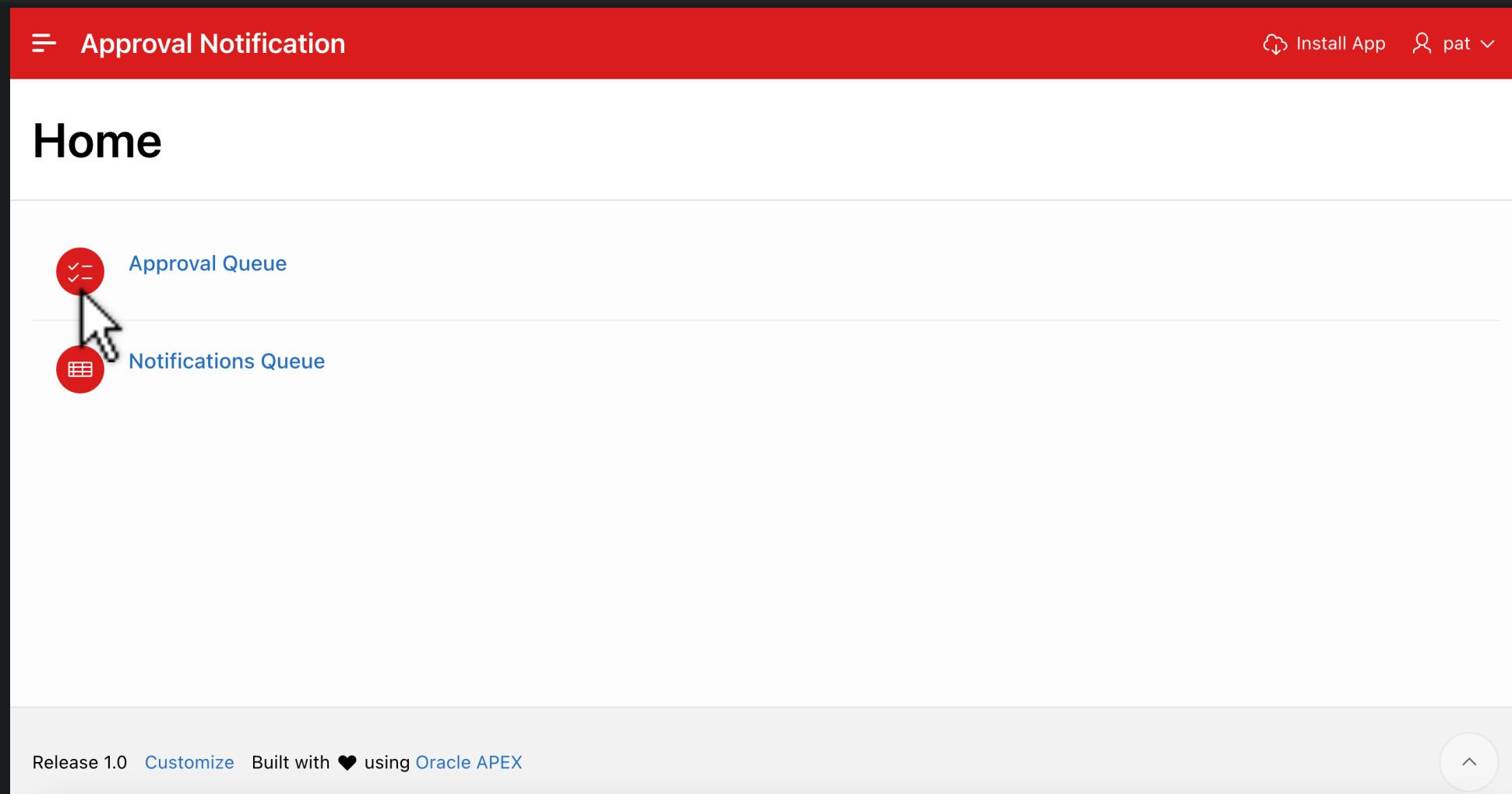
Reimbursement Request History

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

1 - 1



Backoffice Staff Member Approves the Request...



Backoffice Staff Member Approves the Request...

≡ Approval Notification Logout

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


Henry Selick, Director, Wendell & Wild, Netflix   


Rob Minkoff, Director, Paws of Fury: The Legend of Hank, Paramount   


Shannon Tindle, Writer/Director/Executive Producer, Netflix Animation   


Peter Ramsey, Director, We the People (Episode), Netflix Animation, Spider-Man: Into the Spider-verse   


Nora Twomey, Director, My Father's Dragon, Cartoon Saloon, Netflix   


Robert Zemeckis, Director, Pinocchio (2022), Walt Disney   


Chris Williams, Director, The Sea Beast, Netflix   


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


Rob Bredow, Chief Creative Officer, Industrial Light & Magic   


Julien Fournié, C.E.O., Julien Fournié Haute Couture   


Jean Paul Cauvin, C.O.O., Julien Fournié Haute Couture   


Guido Quaroni, Senior Director of Engineering, 3D & Immersive, Adobe   


Ramsey Naito, President, Nickelodeon, Paramount   

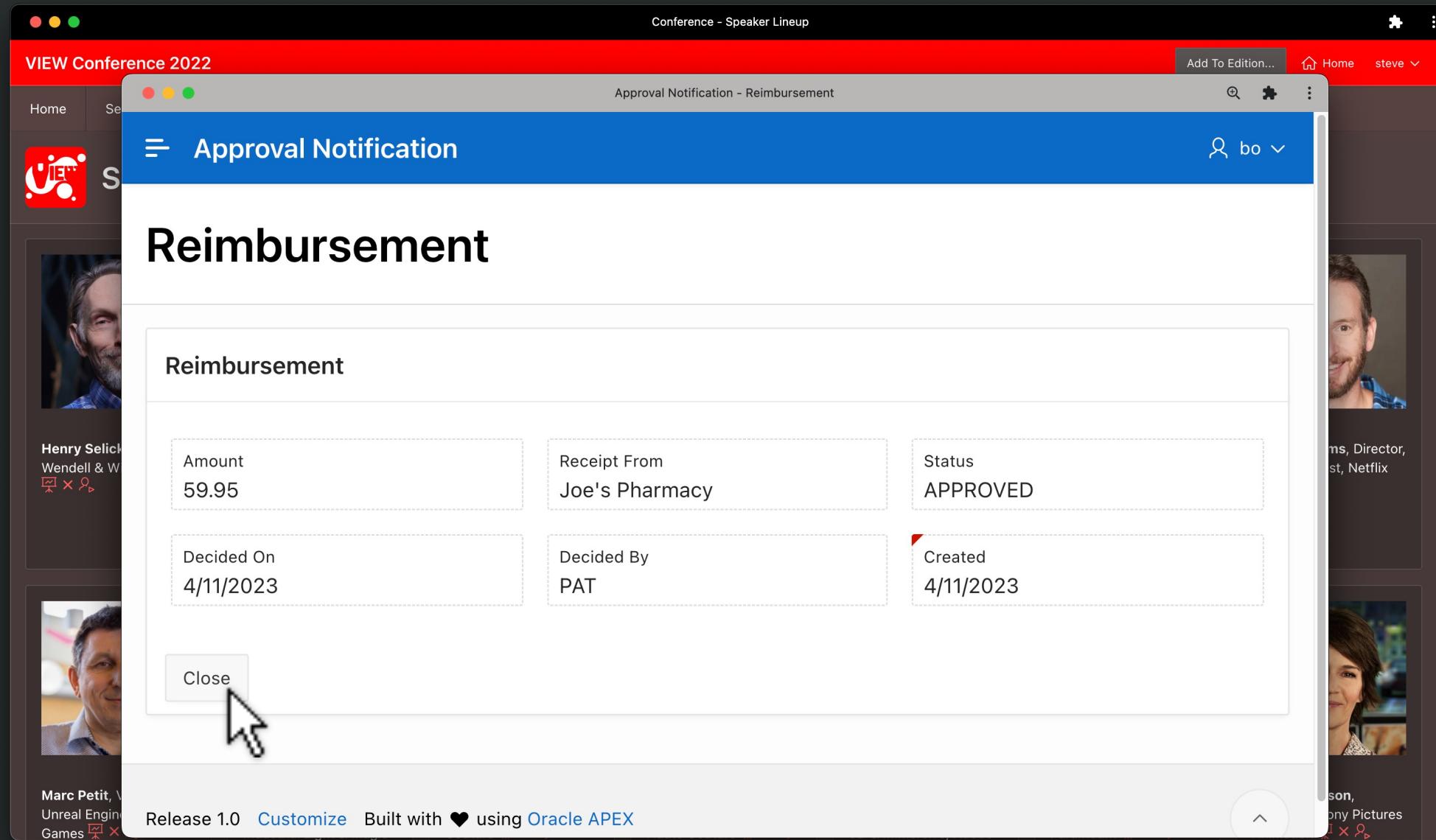

Kristine Belson, President, Sony Pictures Animation   

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

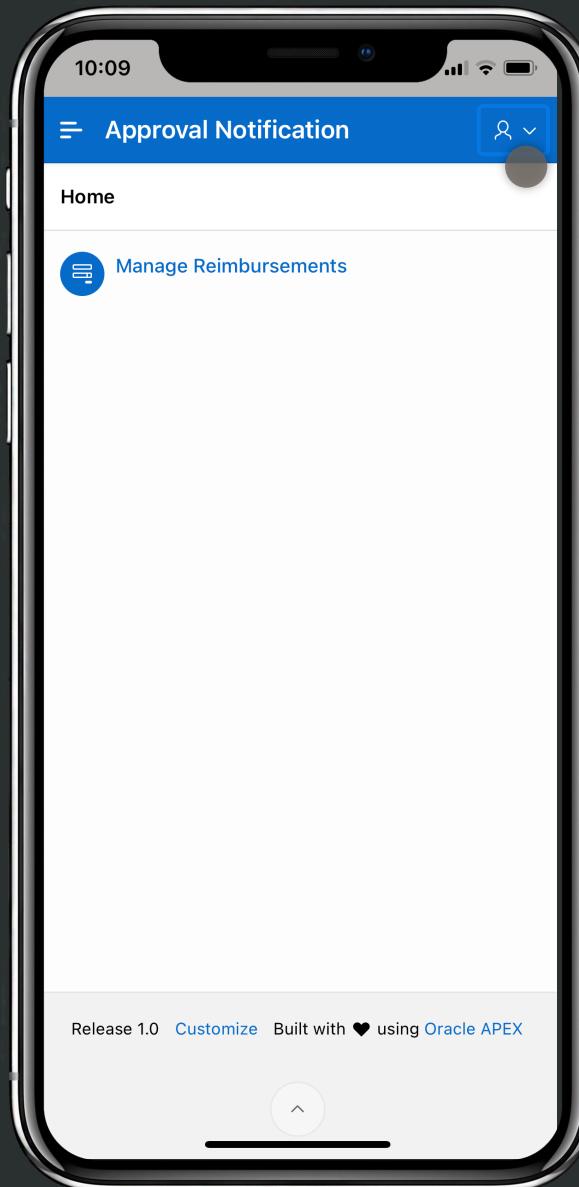


O

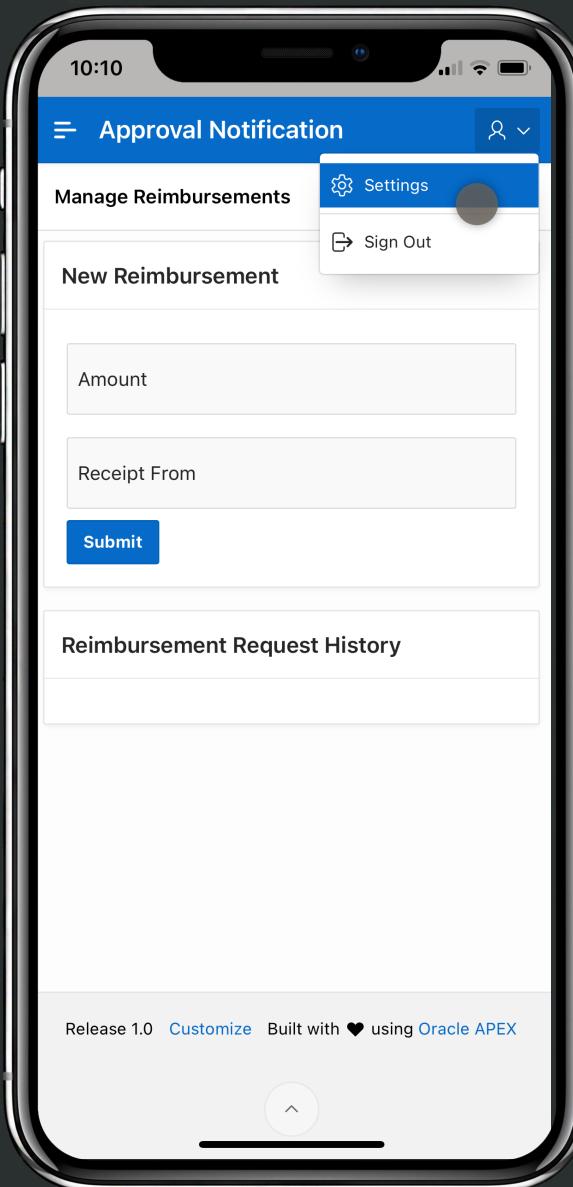
Clicking the Notification Opens App & Shows Detail



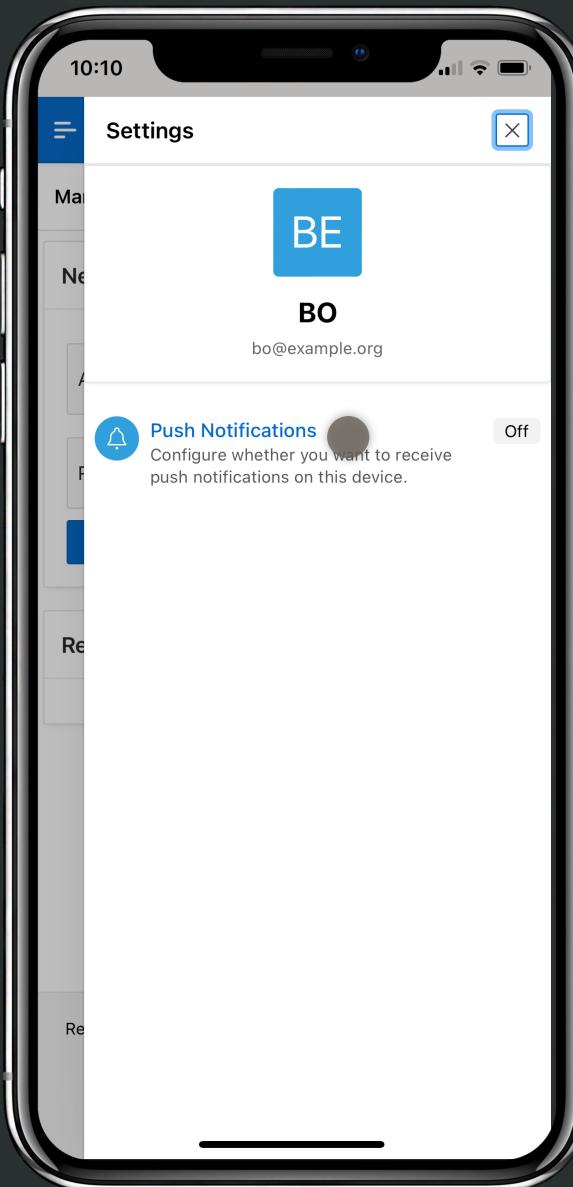
Same APEX App Works as PWA on Mobile Devices



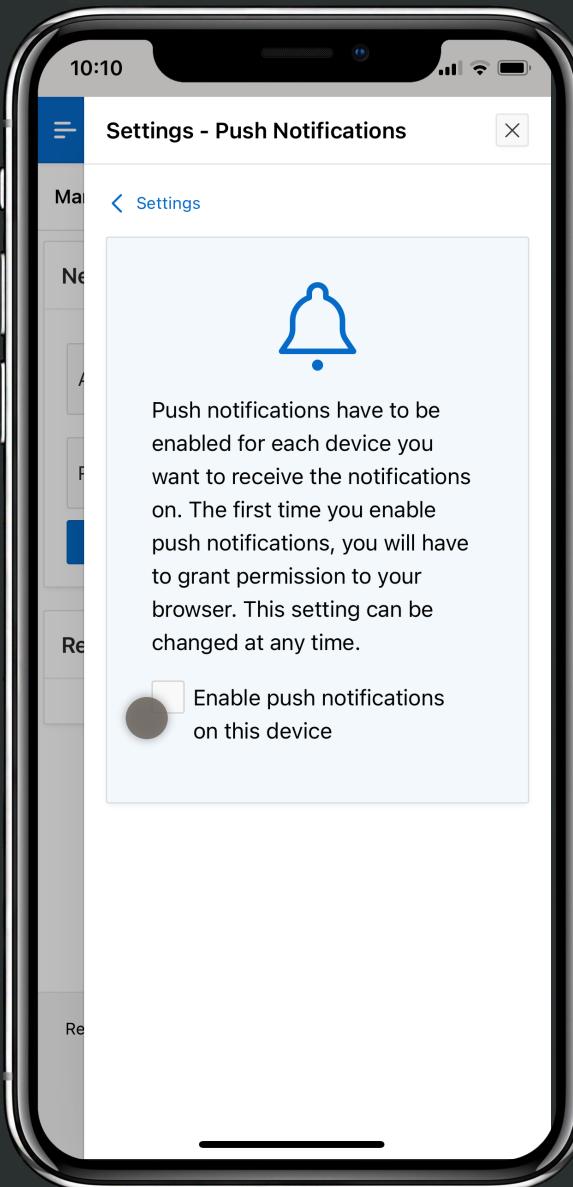
User Has to Opt-in to Push Notifications on Each Device



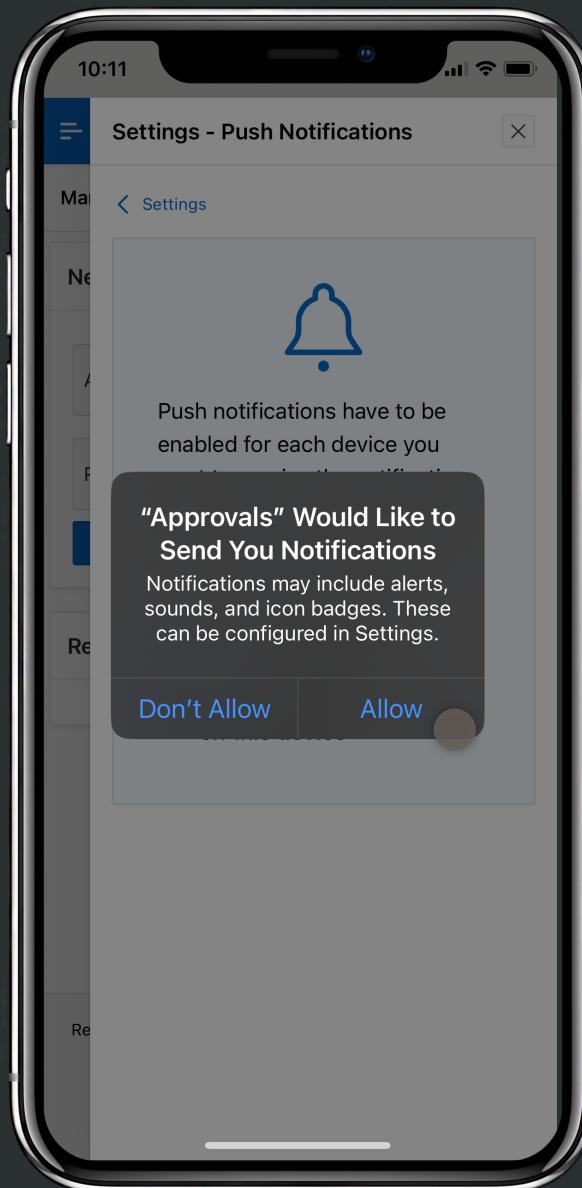
User Has to Opt-in to Push Notifications on Each Device



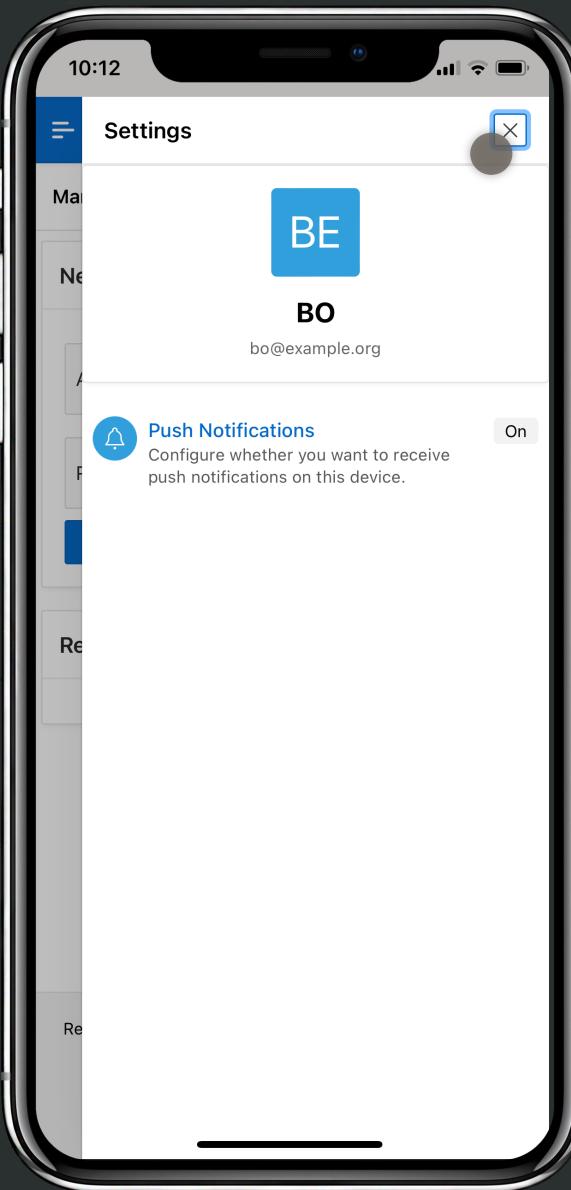
User Has to Opt-in to Push Notifications on Each Device



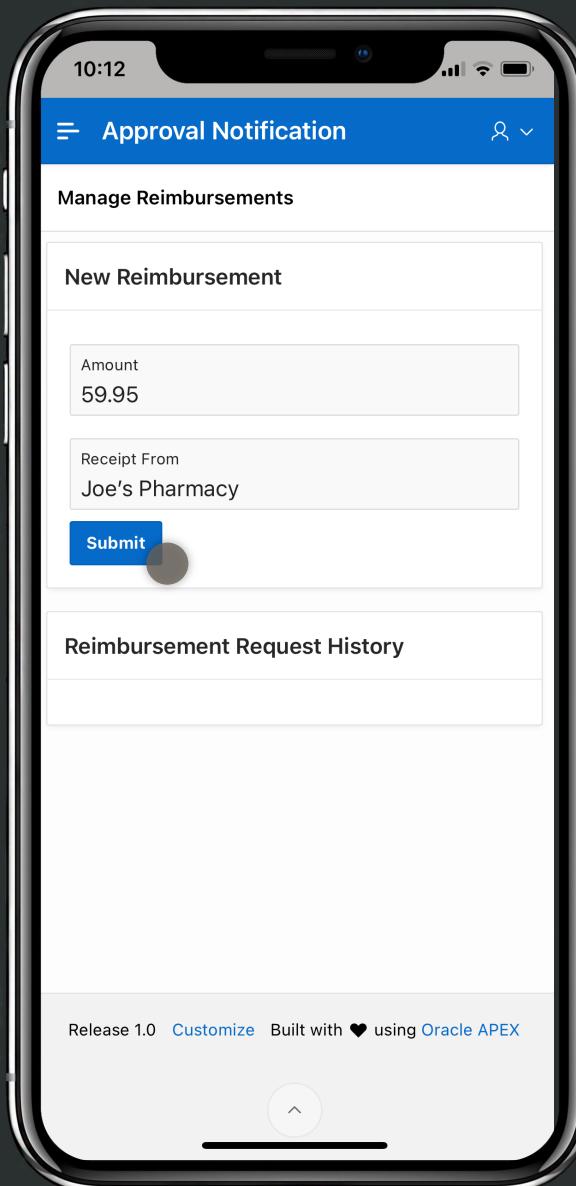
Device Asks User to Allow the Subscription



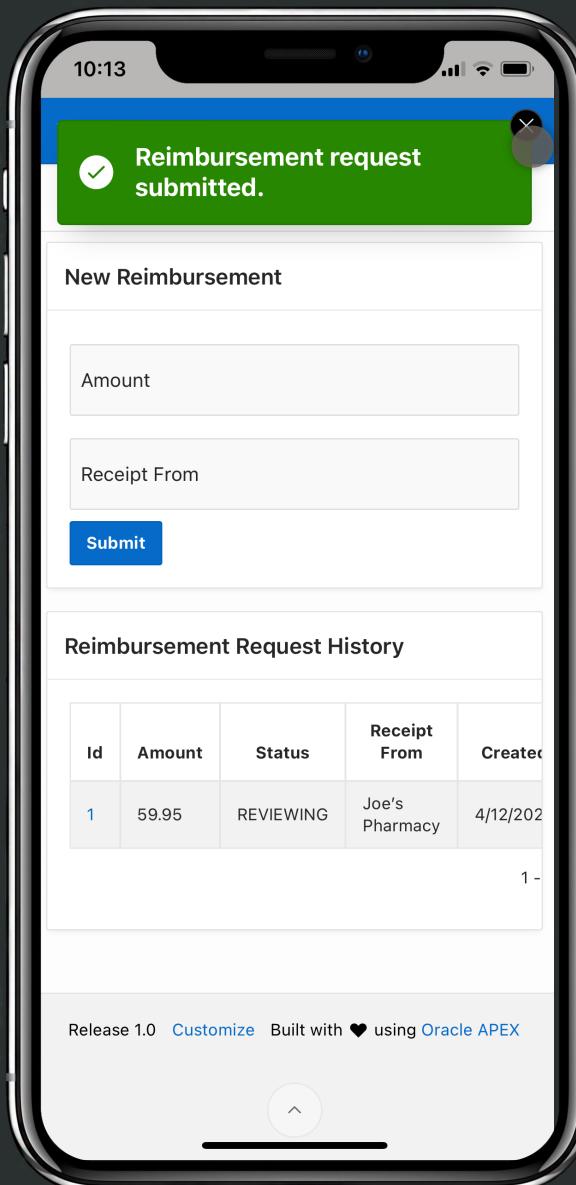
User Remains Subscribed for this App Until They Disable



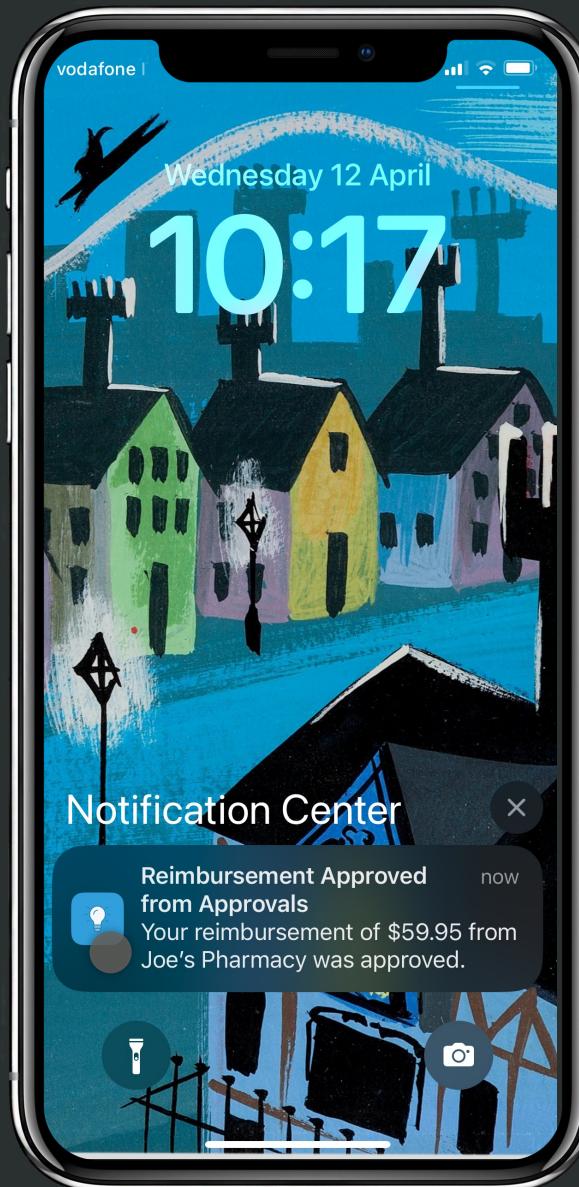
Submitting an Reimbursement Request from iPhone



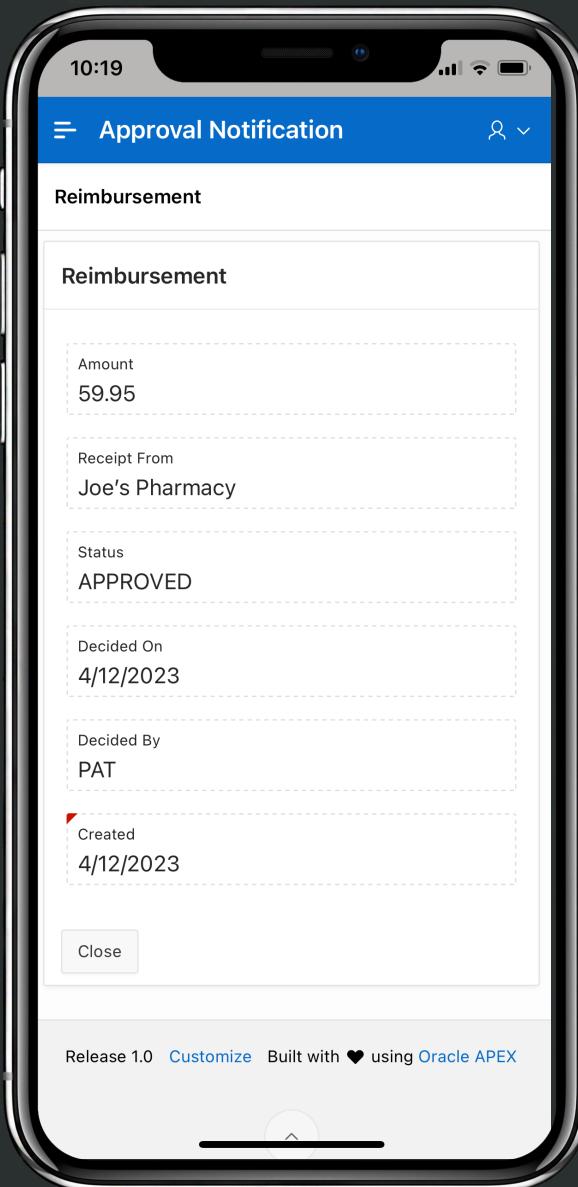
Submitting an Reimbursement Request from iPhone



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 interface for 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 main area is titled 'Application 109 \ Page Designer'.

The left sidebar displays the page structure:

- Pre-Rendering
- Components
 - Breadcrumb Bar
 - Breadcrumb
 - Body
 - P8_CUSTOMER_ID
 - Notify_Customer** (highlighted)
 - P8_ID
 - P8_OUTCOME
 - P8_AMOUNT
 - P8_FROM
- Post-Rendering

The central workspace shows a page titled 'Notify Customer' with a breadcrumb bar and a region labeled 'REGION CONTENT'. The body section contains a text input field for 'P8_CUSTOMER_ID' and a green button labeled 'Notify_Customer'.

The right panel is the 'Button' configuration editor, showing the following details for the 'Notify_Customer' button:

- Identification**: Button Name: Notify_Customer, Label: Notify Customer
- Layout**
- Appearance**: Button Template: Text, Hot: Off, Template Options: Use Template Defaults
- CSS Classes**
- Icon**
- Behavior**: Action: Submit Page, Execute Validations: On

Sending Push Notifications: Page Process

The screenshot shows the Oracle APEX App Builder interface for Application 109, specifically the Page Designer. The left sidebar displays various processing options: After Submit, Validating, Processing (Processes: When Notify Customer Clicked, Processes: Lookup Customer Info, Notify Customer), After Processing, and Ajax Callback. The main area shows a page titled "Notify Customer" with a Breadcrumb Bar and a BODY section containing a P8_CUSTOMER_ID input field and a "Notify_Customer" button. The right sidebar is the "Process" configuration panel. A yellow arrow points from the "Notify Customer" button in the BODY section to the "Type" field in the Process panel, which is set to "Send Push Notification". Other settings in the Process panel include Name: Notify Customer, Execution Chain: When Notify Customer Clicked, and a Settings section with To: &APP_USER., Title: Reimbursement &P8_OUTCOME., and Body: Your reimbursement of &P8_AMOUNT. from &P8_FROM. was &P8_OUTCOME.

APEX App Builder SQL Workshop Team Development Gallery

Search steve demo

Application 109 \ Page Designer

Layout Page Search Help

Process

Identification

Name: Notify Customer

Type: Send Push Notification

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

After Submit

Validating

Processing

Processes

When Notify Customer Clicked

Processes

Lookup Customer Info

Notify Customer

After Processing

Ajax Callback

Breadcrumb

REGION CONTENT

BODY

P8_CUSTOMER_ID

Notify_Customer

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. The current page is 'Task Definitions' under 'Shared Components' for 'Application 223'. The main content area displays a table of Task Definitions, with one row selected: 'Claim Approval'. The table columns are: Name, Subject, Priority, Participants, Parameters, Actions, Last Updated By, and Last Updated On. The 'Claim Approval' row has values: Name = 'Claim Approval', Subject = 'Claim for &AMOUNT. from &RECEIPT_FROM. by &APP_USER.', Priority = 3, Participants = 2, Parameters = 0, Actions = 1, Last Updated By = 'SMUENCH', and Last Updated On = '04/12/2023'. To the right of the table is a sidebar with a 'Task Definitions' summary and a 'Recently Edited' section listing 'Claim Approval'. The bottom of the page includes footer links for smuench, smuench, and en, and copyright information.

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

Copyright © 1999, 2023, Oracle and/or its affiliates.

Oracle APEX 23.1.0-14

Sending Push Notifications: PL/SQL API from Task Def

The screenshot shows the Oracle APEX App Builder interface for creating a Task Definition named "Claim Approval". The "Name" section contains fields for "Name" (Claim Approval) and "Static ID" (CLAIM_APPROVAL). The "Settings" section includes a "Subject" field with the value "Claim for &AMOUNT. from &RECEIPT_FROM. by &APP_USER." and a "Priority" dropdown set to "3-Medium". The "Task Details Page URL" field contains the 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, there is a sidebar with "Task Definitions" documentation, a "Task Definition Participants" section, a "Task Definition Parameters" section, and a "Task Definition Actions" section which lists "Claim", "Complete", "Delegate", and "Update Comment".

APEX App Builder SQL Workshop Team Development Gallery Search smuench

Application 223 \ Shared Components \ Task Definitions \ Claim Approval

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 for editing a task definition 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. The breadcrumb path indicates the current location is Application 223 \ Shared Components \ Task Definitions \ Claim Approval \ Edit Action.

The main content area is titled "Edit Action" and contains tabs for Show All, Action (which is selected), Code, Error Handling, Server Side Condition, and Advanced. On the right side, there is a sidebar with the title "Edit Action" and a descriptive text block:

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.

The "Action" configuration section includes the following fields:

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

A cursor icon is visible at the bottom left, pointing towards the "Code" tab.

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

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 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 ?

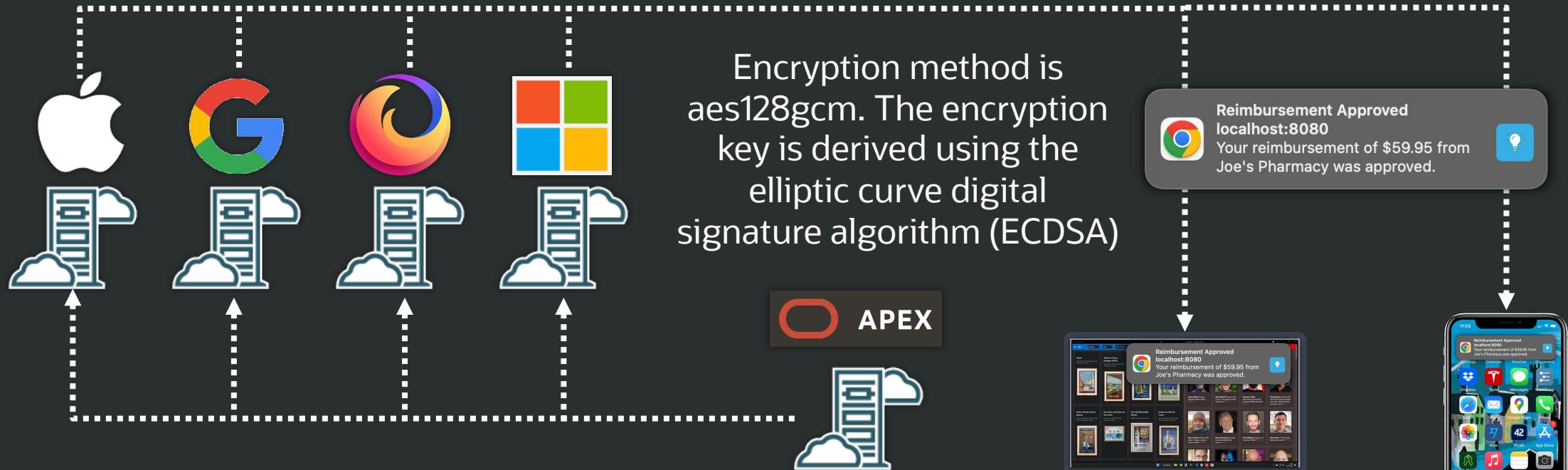
```
1 apex_pwa.send_push_notification(
2     p_user_name  => :CREATED_BY,
3     p_title      => 'Reimbursement '||initcap(:APEX$TASK_OUTCOME),
4     p_body       => 'Your reimbursement of ' || :AMOUNT || ' from ' || :RECEIPT_FROM ||
5                      ' was ' || lower(:APEX$TASK_OUTCOME)||'.',
6     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, the "Enable Push Notifications" toggle switch is highlighted with a yellow box and a cursor pointing at it. A yellow arrow points from the top left towards this highlighted area. The "About" sidebar on the right provides instructions for editing PWA attributes and links to learn more.

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 managing a Progressive Web App. 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 current page is 'Application 101 \ Progressive Web App'.

The main content area displays the 'Progressive Web App' configuration for 'Application 101'. The 'Push Notifications' tab is selected, indicated by a yellow arrow pointing to it from the left. On the right side of the screen, there is an 'About' section with a summary and a 'Learn More ...' link.

In the 'Push Notifications' section, there is a toggle switch labeled 'Enable Push Notifications' which is turned on. Below this, there is a field for 'Credentials' labeled 'App 101 Push Notifications' with a 'Regenerate Credentials' button. At the bottom of the section, there is a button labeled '+ Add Settings Page' which is also highlighted with a yellow box and a cursor icon.

Push Notification Key Pair is New Kind of Credential

The screenshot shows the Oracle APEX workspace interface. 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 current page is 'Workspace Utilities \ Web Credentials \ Create/Edit'. The main content area is titled 'Web Credentials' and contains the following fields:

- Name:** App 109 Push Notifications Credentials
- Static ID:** App_109_Push_Notifications_Credentials
- Authentication Type:** Key Pair (highlighted with a yellow box)
- Public Key:** BJP5JnaFawNZEvs5LexE-Nj8ZcCg_-0phGiKq304vmG1JP9C0IjFam90o0dcE03jiEYpMkcS1YYCjt1lpUSZ8BM
- Private Key:** (Empty text area)
- Verify Private Key:** (Empty text area)

On the right side, there is a sidebar titled 'Web Credentials' with the following description:
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.

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

The screenshot shows the Oracle App Builder interface with the following details:

- Top Navigation:** APEX, App Builder, SQL Workshop, Team Development, Gallery, Search bar, and user profile (steve demo).
- Breadcrumb:** Application 109 \ Progressive Web App.
- Page Header:** Definition, Security, Globalization, User Interface, **Progressive Web App**.
- Section Title:** Application 109.
- Buttons:** Cancel, Apply Changes.
- Submenu:** Show All, General, Installability, **Push Notifications** (highlighted), Service Worker Configuration.
- Push Notifications Section:**
 - Enable Push Notifications:** A toggle switch is turned on.
 - Credentials:** A field labeled "App 109 Push Notifications" contains a link labeled "Regenerate Credentials". This link is highlighted with a yellow box and a cursor arrow pointing to it.
 - Settings Page:** A link labeled "20010. Push Notifications".
 - Contact Email:** An input field.
- 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'. Below the navigation, the breadcrumb path indicates 'Application 109 \ Progressive Web App'. On the left, a sidebar lists tabs for Definition, Security, Globalization, User Interface, and Progressive Web App, with 'Progressive Web App' currently selected. The main content area displays the 'Application 109' configuration page under the 'Push Notifications' tab. It features an 'Enable Push Notifications' toggle switch, a credential input field labeled 'App 109 Push Notifications', a settings page link for '20010. Push Notifications', and a contact email input field. A modal dialog box is overlaid on the page, 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 by a mouse cursor. To the right of the modal, there is an 'About' section with a link to edit attributes and a 'Learn More ...' button.

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

The image displays two screenshots illustrating a push notification issue after regenerating signing keys.

Left Screenshot: A screenshot of the Oracle APEX DevTools interface. The title bar shows "DevTools - apex.oraclecorp.com/pls/apex/r/stevemuench/app...". The main area is titled "Home" and contains a "Manage Reimbursements" button. Below it is a toolbar with icons for refresh, copy, and navigation. A dropdown menu shows "top" and "1 hidden". A search bar contains the letter "v". Under "Default levels", there is a message "3 Issues: 3" followed by a red error message: "Push subscription error: Failed to execute 'subscribe' on 'PushManager': The provided applicationServerKey is not valid." This error message is highlighted with a yellow box.

Right Screenshot: A screenshot of the "Settings - Push Notifications" page. The title bar says "Settings - Push Notifications". A yellow alert box at the top states "1 error has occurred" with the message "This device failed to enable push notifications." A blue bell icon is shown below the alert. The main content area contains the text: "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." Below this is a checkbox labeled "Enable push notifications on this device" which is checked.

Page Footer: The footer includes links for "Release 1.0", "Customize", "Built with ❤ using Oracle APEX", "ORACLE INTERNAL", "App 11143", "Page 20010", "Session", "Debug", "Quick Edit", "Customize", and "Help".

Push Notification Target URL: Open App & Detail Page

The image shows a composite view of a mobile application and a web browser. On the left, a mobile screen displays the 'Conference - Speaker Lineup' app with a red header bar containing the text 'VIEW Conference 2022'. Below the header are navigation tabs for 'Home', 'Sessions', and 'Speaker'. A large button labeled 'Speaker' with a person icon is visible. A yellow callout box contains the text: '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.' At the bottom of the mobile screen is a portrait photo of a man and the caption 'Marc Petit, VP, GM, Unreal Engine, Epic Games'.

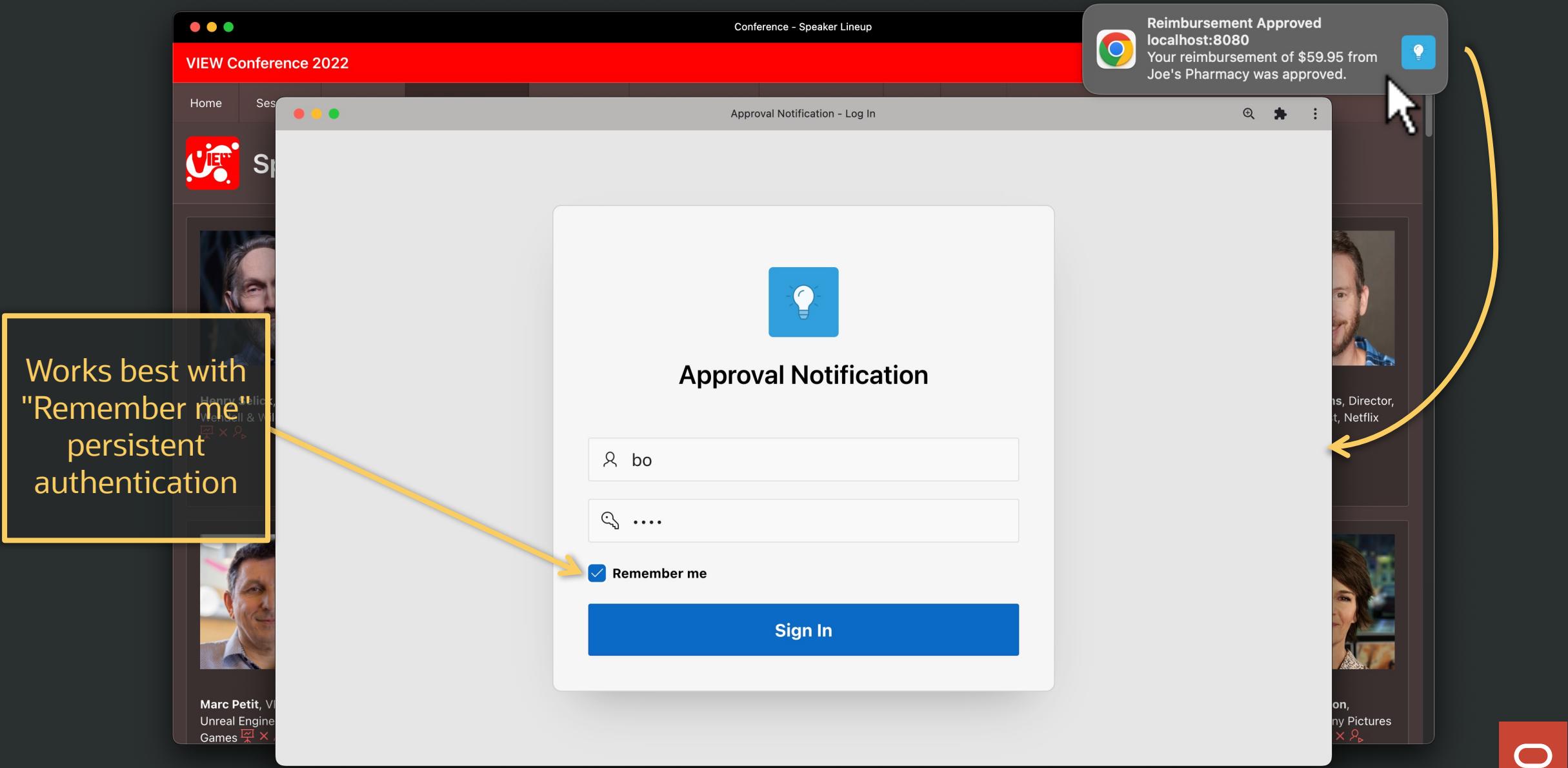
On the right, a desktop browser window titled 'Approval Notification - Reimbursement' is shown. It displays a 'Reimbursement' detail page with the following data:

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

A push notification is overlaid on the browser window. The notification has a dark grey background with white text. It features a Google Chrome icon, the text 'Reimbursement Approved', the URL 'localhost:8080', and the message 'Your reimbursement of \$59.95 from Joe's Pharmacy was approved.' A blue lightbulb icon is in the top right corner. A mouse cursor is hovering over the lightbulb icon. A yellow curved arrow points from the text in the callout box on the mobile screen to the lightbulb icon on the notification.

At the bottom of the image, the footer text reads '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. The top navigation bar includes links for APEX, App Builder, SQL Workshop, Team Development, and Gallery, along with a search bar and user profile icons.

The left sidebar displays the page structure under "Page 7: Reimbursement Notification". It includes sections for Pre-Rendering, Before Header (with branches for "Forward to Reimbursement" and "Forward to Manage"), After Header, Before Regions, Components (with a component named "P7_ID"), Body, and Post-Rendering.

The main content area shows the page layout titled "Reimbursement Notification". The layout consists of a BANNER section with slots for AFTER LOGO, BEFORE NAVIGATION BAR, and AFTER NAVIGATION BAR. Below the banner are sections for TOP NAVIGATION, BREADCRUMB BAR, FULL WIDTH CONTENT, and BODY.

The right sidebar is titled "Page" and contains the "Security" configuration. The "Security" section is expanded, showing the following settings:

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

Below the "Security" section are sections for "Advanced" and "Session Management". The "Session Management" section is expanded, showing the setting "Rejoin Sessions: Enabled for All Sessions".

A yellow box highlights the "Page Access Protection" and "Session Management" sections. A mouse cursor is visible near the bottom right corner of the highlighted area.

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	(?)

Cancel Apply Changes

HTTP Protocol

Conditional Branch to Authenticated Detail Page

The screenshot shows the Oracle APEX App Builder interface for a page named "Page 7: Reimbursement Notification". The left sidebar displays the page structure under "Pre-Rendering" > "Before Header" > "Branches". Two branches are listed: "Forward to Reimbursement" (green icon) and "Forward to Manage" (orange icon). A cursor is hovering over the "Forward to Reimbursement" button. The main content area shows the page layout with sections like BANNER, TOP NAVIGATION, BREADCRUMB BAR, FULL WIDTH CONTENT, and BODY. The right sidebar is titled "Branch" and contains a "Behavior" section. The "Type" dropdown is set to "Page or URL (Redirect)" and the "Target" dropdown is set to "Page 6". Below this is a "Server-side Condition" section. Under "When Button Pressed", a dropdown menu is open with the option "- Select -". A yellow box highlights the "SQL Query" field, which contains the following code:

```
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



APEX instance level

Manage Instance \ Security

Security Settings Authorized URLs

Security

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

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

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

This screenshot shows the Oracle APEX application builder interface. A yellow box highlights the 'APEX application level' in the top navigation bar. Another yellow box highlights the 'Properties' tab under 'Application 109'. A yellow arrow points from the 'Edit Application Definition' link in the top navigation to the 'Properties' section. Within the properties section, a yellow box surrounds the 'Proxy Server' and 'No Proxy Domains' input fields, which contain the values 'company-proxy.example.org' and 'localhost,127.0.0.1,us.example.org' respectively.

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. It contains files like LICENSE.md, README.md, and create_ca_wallet.sh. The README.md file describes the Oracle CA Wallet Creator script, which creates an SSL Wallet with valid root CA certificates. It uses Mozilla's CA Certificate Store. Installation instructions include cloning the repository or downloading the script. Usage instructions show running the script in the directory.



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



Push Notifications Queue

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

Manage Instance

Instance Settings

- Feature Configuration
- Security
- Instance Settings
- Workspace Purge Settings

Manage Meta Data

- Session State
- Mail Queue
- Push Notifications Queue
- Installed Translations
- Interactive Report Subscriptions

Manage Shared Components

- Public Themes

Messages

- Define Environment Banner
- Define Login Message
- Define System Message
- Manage Site-Specific Resources

Self Service Sign Up

About

Use this page to control and set the features and functionality of this Oracle APEX instance.

Learn More ...

Provisioning Mode

Manual

Metrics

3,600

Max Session Idle Time in seconds

Manage Logs and Files



Push Notifications Queue

The screenshot shows the Oracle APEX interface for managing push notifications. The top navigation bar includes links for Manage Requests, Manage Instance, Manage Workspaces, and Monitor Activity, along with user authentication information (AD admin internal). Below the navigation is a breadcrumb trail: Manage Instance > Push Notifications Queue. The main content area displays a table of push notifications. The table has columns: Workspace, Application, User Name, Title, Body, Icon URL, Target URL, Send Attempts, Error Message, and Created On. One row is selected, showing details: DEMO, 109, BO, Reimbursement..., Your reimbursement of \$..., http://localhost:8080/ords/r/dem..., 8, ORA-29024: Certificate validation failure, and 04/11/2023. Action buttons Force Push Queue and Push Queue are visible above the table. A sidebar on the right provides information about the Push Notifications Queue, including links to monitor notifications and push the queue.

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

Installed Translations
Interactive Report Subscriptions
Manage Logs and Files
Self Service Sign Up

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.



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":"BLQpidZJt2N1oEfwtGLQW71BDx09o3qiP6phFnnRa2kLfBSX7NLdCpKrvIAZIAcgzxog

1 - 1

Release 1.0 Customize Built with ❤ using Oracle APEX

The screenshot shows a web-based application interface for managing push notification subscriptions. The title bar indicates the application is for 'Approval Notification' and the specific view is 'Subscriptions'. The left sidebar contains navigation links for Home, Approval Queue, Notifications Queue, Approval Admin, and Subscriptions, with 'Subscriptions' being the active tab. The main content area is titled 'Subscriptions' and displays a single row of data in a table. The table columns are Application Id, Application Name, Push Subscription Id, User Name, and Subscription Interface. The data row shows Application Id 109, Application Name 'Approval Notification', Push Subscription Id 1886321305964118, User Name 'BO', and a JSON-formatted Subscription Interface. The JSON includes an endpoint URL and a p256dh key. A footer at the bottom of the page states 'Release 1.0' and '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

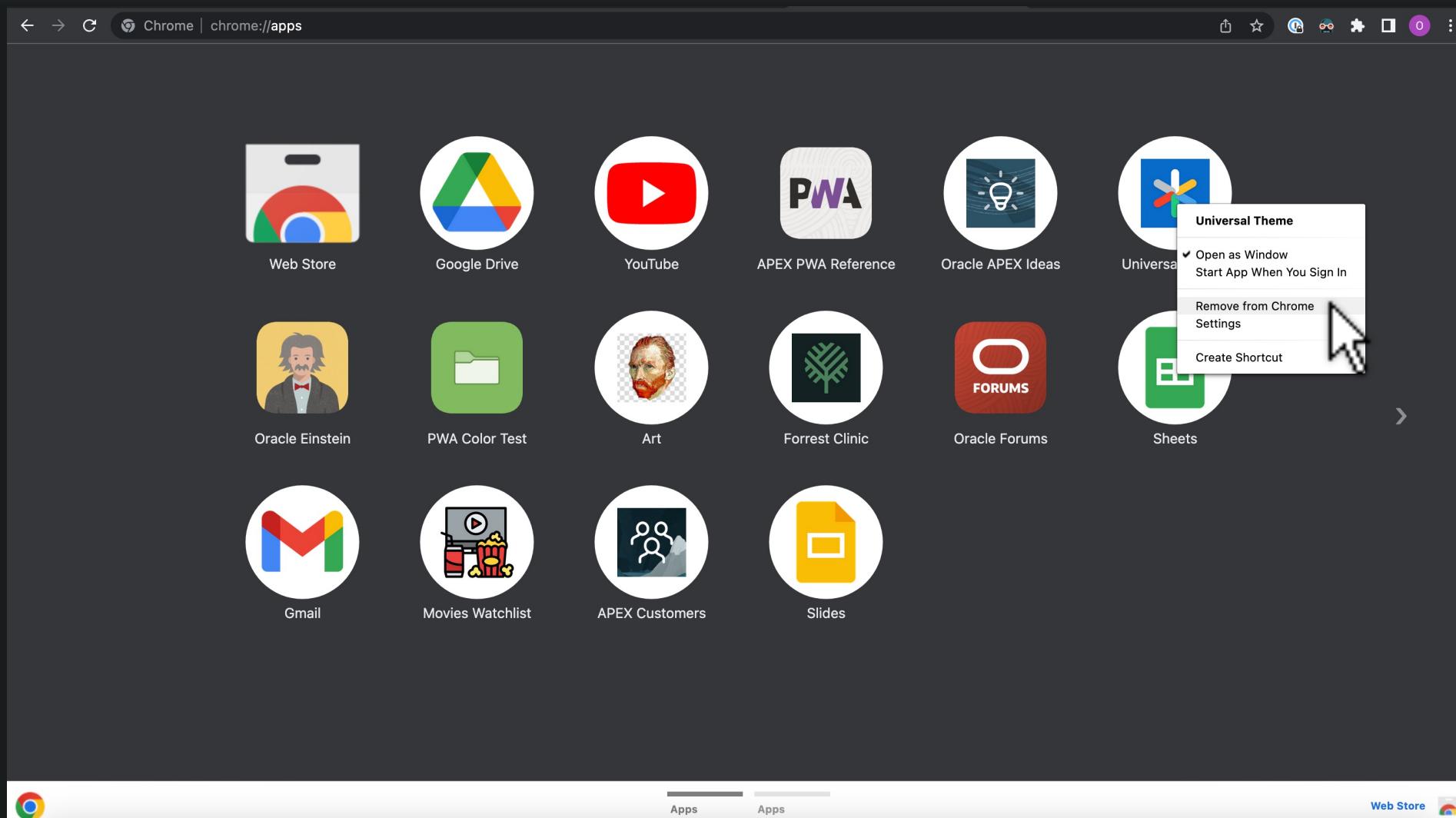
Notifications Queue

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

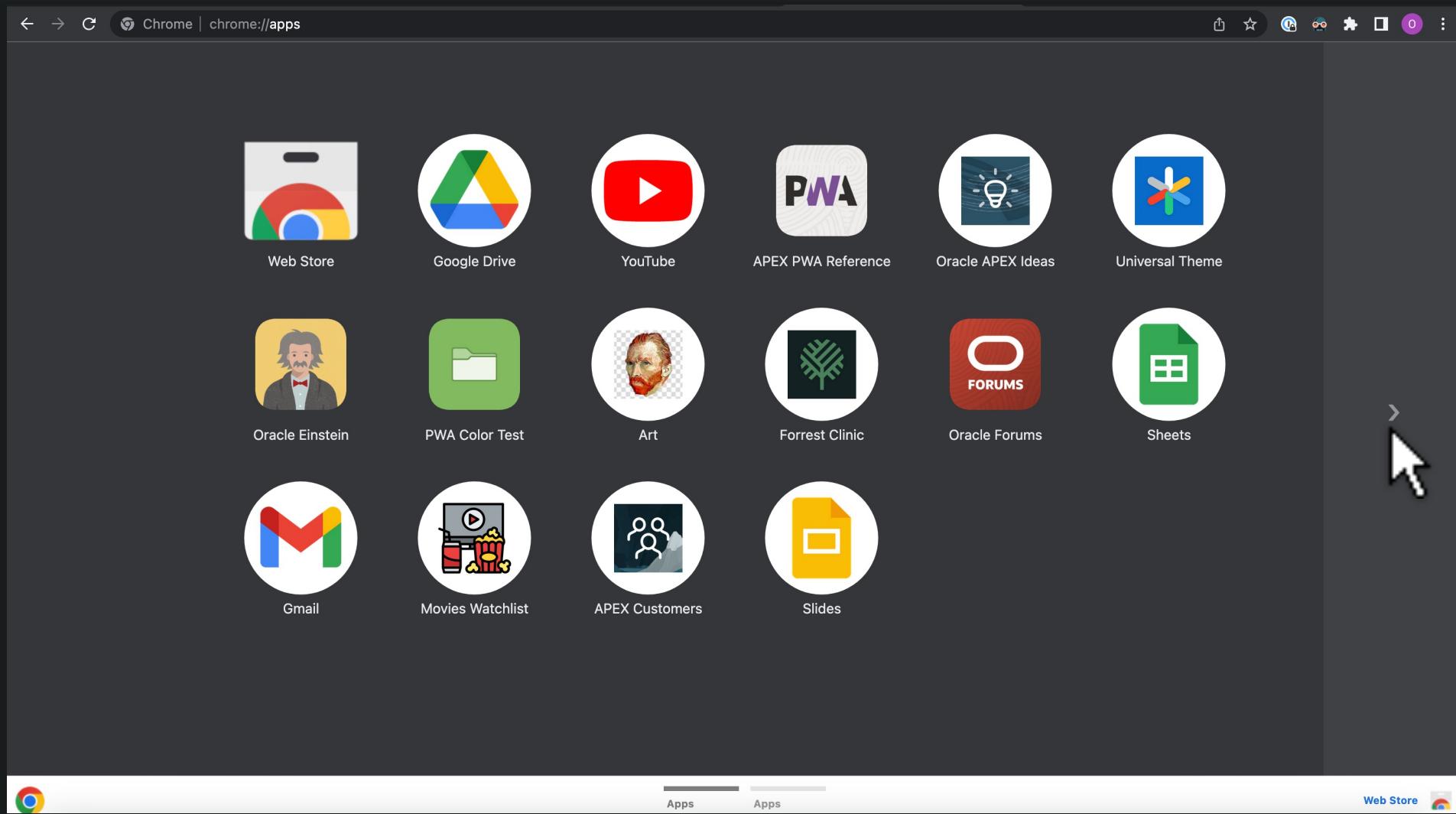
Release 1.0 Customize Built with ❤ using Oracle APEX



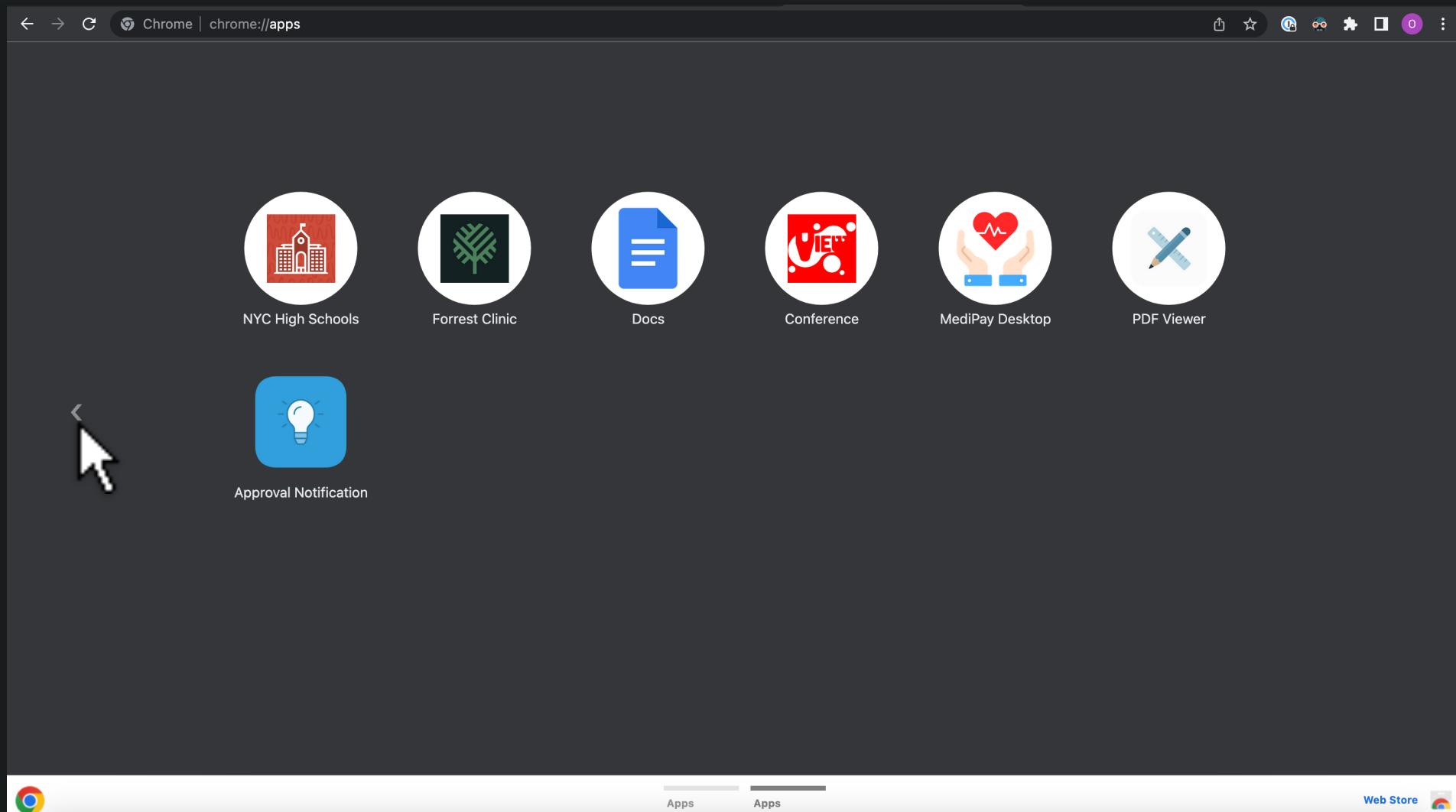
Chrome PWA Apps Management chrome://apps



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 at the URL `edge://apps`. The interface has a dark theme.

Left Sidebar:

- Apps**: The main title.
- Search Apps**: A search bar.
- All Apps**: Selected category.
- Installed Apps**: Category.
- Your Available Apps**: Category.

Right Content Area:

- Discover apps for your favorite websites.**: A section with an icon of a computer monitor and a magnifying glass. It explains that many sites offer apps for Edge and provides a [Learn more](#) link.
- Installed Apps**: A list view showing one item: **Approval Notification**.
- Sort By:** **Recently Used** (selected).
- View As:** **List** (selected).
- Details**: A card for the Approval Notification app, showing its icon and name.
- Actions**: A context menu for the Approval Notification card, with options: **Open**, **... (More)**, **Create Shortcut**, **Auto-start on device login**, and **Uninstall**. The **Uninstall** option is highlighted with a cursor.
- Your Available Apps**: A section for installing apps to other devices.
- Text**: "Apps you install on one device will be shown here for you to install on other devices."

PWA Reference App apex.oracle.com/pwa

The screenshot shows the APEX PWA Reference application interface. On the left, there is a sidebar with various navigation items: Getting Started, Installation, Appearance, App Icon, Push Notifications (which is currently selected and highlighted in purple), Geolocation, Web Share, Always Signed In, Advanced, FAQ, and Roadmap. The main content area has a purple header bar with the title "APEX PWA Reference". Below the header, there is a "Push Notifications" section with tabs: Show All (selected), Overview, Compatibility, Push Notifications, Users Permission, Public API, and Examples. The "Compatibility" section contains a table showing support for different operating systems and browsers:

	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

X 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 ▾

A large yellow arrow points from the "Install App" button to a blue square icon on the right.


Universal Theme

APEX 23.1

Easy Background Processing

APEX Page Processes: Extensible, Declarative Actions

The screenshot shows the Oracle APEX Page Designer interface. On the left, the navigation pane lists various page components like After Submit, Validating, Processing, and Processes. Under Processes, three items are listed: 'Process form Department' (selected), 'Save and Process', and 'Close Dialog'. The main area displays a page template for 'Department' with regions for 'CONTENT BODY', 'REGION BODY', 'REGION CONTENT', and 'REGION CONTENT'. The 'REGION BODY' contains input fields for 'P3_DNAME' and 'P3_LOC'. On the right, the 'Process' configuration panel is open, showing a list of built-in components. The component 'Form - Automatic Row Processing (DML)' is highlighted with a blue selection bar and a mouse cursor pointing at it. Other components listed 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... At the bottom of the process panel, there is a toggle switch for 'Return Primary Key(s) after Insert'.

APEX App Builder SQL Workshop Team Development Gallery

Search

steve demo

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: 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 displays a page titled 'Department' with regions for 'CONTENT BODY', 'REGION BODY', 'REGION CONTENT', and 'REGION CONTENT'. On the left, a sidebar lists various processing events: After Submit, Validating, Processing (with sub-options like Processes, After Processing, Save and Process, Close Dialog, and Ajax Callback), and After Processing. A mouse cursor is hovering over the 'Process' button in the toolbar. A dropdown menu is open under 'Process', showing a list of built-in components. The item 'Form - Automatic Row Processing (DML)' is highlighted with a blue selection bar.

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'.

The left sidebar lists various event handlers: After Submit, Validating, Processing (with a expanded Processes section containing Process form Department, Save and Process, and Close Dialog), After Processing, and Ajax Callback. The 'Save and Process' item is highlighted with a mouse cursor.

The central workspace displays a page titled 'Department' with a content body containing a 'Department' region and two input fields: P3_DNAME and P3_LOC. Below it is a 'REGION CONTENT' section with an 'Info' region.

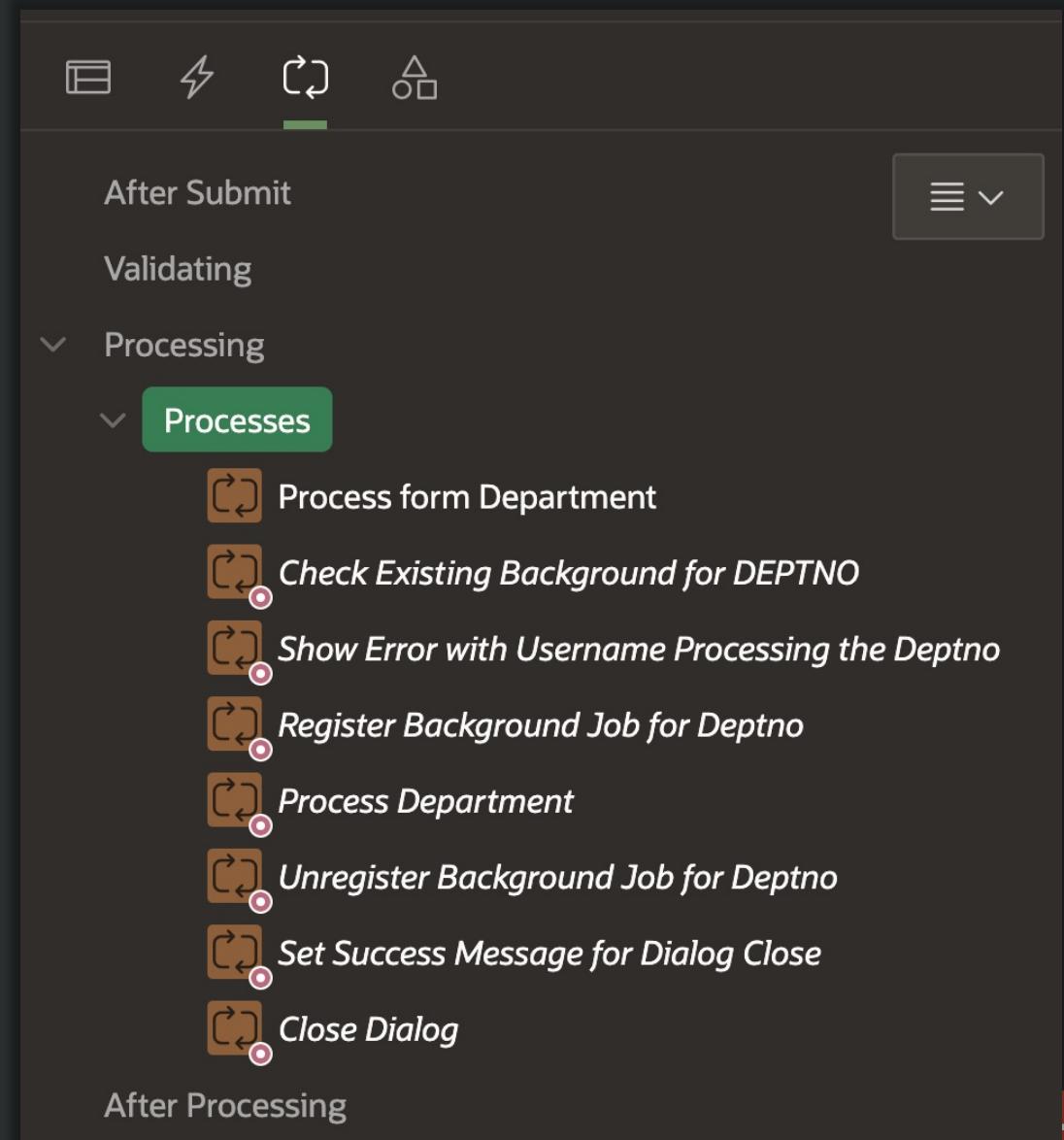
The right sidebar is titled 'Process' and contains a list of process components: Identification, Source, Execution, Success Message, Error, Server-side Condition, Security, and Configuration. The 'Server-side Condition' component is highlighted with a yellow border. Its configuration shows 'When Button Pressed' set to 'SAVE_AND_PROCESS' and 'Type' set to '- Select -'.

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

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 workspace is titled 'Application 100 \ Page Designer' and displays a page titled 'Department'. The page contains a 'CONTENT BODY' region with a 'Department' item and a 'REGION BODY' section containing input fields for 'P3_DNAME' and 'P3_LOC'. Below this is a 'REGION CONTENT' section with an 'Info' item. On the left, a sidebar lists various page processes: 'After Submit', 'Validating', 'Processing' (which is expanded to show 'Processes' like 'Process form Department', 'Save and Process' (highlighted with a mouse cursor), 'Close Dialog', 'After Processing', and 'Ajax Callback'). The right side of the screen shows the 'Process' configuration for the selected 'Save and Process' item. The 'Source' tab is active, showing 'PL/SQL Code' containing the line 'some_long_running_process;'. This code is highlighted with a yellow box. To the right of the code is a circular progress indicator with four green bars. The 'Execution', 'Success Message', 'Error', and 'Server-side Condition' tabs are also visible but inactive.

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. 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. The current page path is Application 116 \ Shared Components \ Automations \ Interesting Job \ Edit Action. On the right, there's 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." Below the sidebar, there are three tabs: "Action" (selected), "Code", and "Error Handling". The "Action" tab contains fields for "Name" (New Action), "Type" (Execute Code selected, with Send E-Mail as an option), and "Execution Sequence" (set to 10). The "Code" tab has sections for "Location" (Local Database selected) and "Language" (PL/SQL selected, with JavaScript (M) as an option). Buttons for "Cancel", "Delete", and "Apply Changes" are located at the top right of the main content area.

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

The screenshot shows the 'Sample Data Loading' application with the 'Background Load' page selected. The left sidebar has a dark theme with white icons and text. The main content area has a light background with a central callout box containing an information icon.

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

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

The screenshot shows a web application interface for 'Sample Data Loading'. The top navigation bar includes a 'Help' link and a user profile for 'steve'. The left sidebar has a 'Data Loading' section with options: CSV Load, Transformation and Lookup, Multiple File Type Load, Background Load (which is selected and highlighted in blue), Legacy Data Loading, Manual Data Loading, and Administration. The main content area is titled 'Background Load' and contains an 'About this page' section with an information icon. It explains that for large datasets, background loading can be used to avoid hitting resource limits. It also describes how to use an execution chain to send the process to the background and monitor it using the APEX_APPL_PAGE_BG_PROC_STATUS view. Below this, instructions are given to download a sample SalesData.zip file and upload it. At the bottom right, there are 'Clear' and 'Load Data' buttons, with a cursor hovering over the 'Load Data' button. The 'Loaded File' section shows 'SalesData.zip'.

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

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.

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.

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 (selected)
- Unpack ZIP Archive
- Load Data (highlighted with a yellow arrow)
- Report Loading Results
- Clear Cache
- After Processing: View Load Status
- Ajax Callback

Center Content Area:

The page content area displays the "Background Load" page structure with sections for BREADCRUMB BAR, BODY, and Button Bar.

Right Sidebar (Process Configuration):

- 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 Application 102, specifically the Page Designer. The page title is "Background Load".

Left Sidebar (Processes):

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

Central Content Area:

- BREADCRUMB BAR: Breadcrumb
- REGION CONTENT
- ABOUT THIS PAGE
- REGION CONTENT
- BUTTON BAR: NEXT, CLEAR, LOAD

Right Panel (Process Configuration):

- Identification:**
 - Name: Load Data
 - Type: Data Loading (highlighted with a dashed green border)
 - Execution Chain: Load Data Background (highlighted with a yellow box)
- 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 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 'NEXT', 'CLEAR', and 'LOAD' buttons. On the right, the 'Process' panel displays a configuration for a process named 'Load Data Background'. The 'Type' dropdown is set to 'Execution Chain', highlighted by a yellow arrow. Other settings include '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'). A green icon with a circular arrow and a link symbol is visible on the far left.

Page Structure:

- BREADCRUMB BAR
- BODY
 - REGION CONTENT
- BUTTON BAR
 - REGION CONTENT

Process Configuration:

Identification

- Name: Load Data Background
- Type: Execution Chain (highlighted)
- 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 is a Top-Level Execution Chain

The screenshot shows the Oracle APEX App Builder interface for a page designer. The left sidebar displays various application processes under categories like After Submit, Computations, Validating, and Processing. A yellow arrow points from the 'Processes' category to the 'Load Data Background' item, which is highlighted with a mouse cursor. The main workspace shows a page layout with a 'Background Load' region containing a breadcrumb bar and a button bar. The right sidebar is titled 'Process' and contains configuration settings for the selected 'Load Data Background' execution chain. A yellow box highlights the 'Execution Chain' section, showing it is set to 'None'. Other settings include '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).

APEX App Builder

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

BREADCRUMB BAR

Breadcrumb

REGION CONTENT

BODY

About this page

REGION CONTENT

Button Bar

REGION CONTENT

NEXT

CLEAR LOAD

After Submit

Computations

P17_FILE_NAME

Validating

Validations

Is valid file type

Processing

Processes

Load Data Background

Unpack ZIP Archive

Load Data

Report Loading Results

Clear Cache

After Processing

Branches

View Load Status

Preview

Ajax Callback

Configuring a Chain to Execute in the Background

The screenshot shows the Oracle APEX App Builder interface for a page designer. On the left, the page structure is defined with regions: BREADCRUMB BAR, BODY, and BUTTON BAR. The BODY region contains an 'About this page' section with a 'REGION CONTENT' area. In the center, the process flow is shown. A process named 'Load Data Background' is highlighted with a yellow arrow pointing from the page structure. This process is part of the 'After Submit' computation and is configured to execute in the background. On the right, the 'Process' panel displays the configuration for this execution chain. The 'Identification' section shows the name 'Load Data Background' and type 'Execution Chain'. The 'Settings' section has a yellow box around 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).

APEX App Builder

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

BREADCRUMB BAR

Breadcrumb

REGION CONTENT

BODY

About this page

REGION CONTENT

Button Bar

REGION CONTENT

NEXT

CLEAR LOAD

After Submit

Computations

P17_FILE_NAME

Validating

Validations

Is valid file type

Processing

Processes

Load Data Background

Unpack ZIP Archive

Load Data

Report Loading Results

Clear Cache

After Processing

Branches

View Load Status

Preview

Ajax Callback

Search

Steve demo

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 displays various process categories like After Submit, Computations, Validating, Processing, and After Processing. The 'Load Data Background' process is selected in the 'Processes' section under 'Processing'. A yellow arrow points from this selection to the 'Serialize Executions' toggle switch in the 'Settings' tab of the right-hand configuration panel. The 'Serialize Executions' switch is currently turned on (green). Other settings visible include 'Execute in Background' (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).

APEX App Builder SQL Workshop Team Development Gallery

Search

Application 102 \ Page Designer

Layout Page Search Help

Process

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: On

Serialize Executions: On (highlighted)

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: Processes

Load Data Background

Unpack ZIP Archive

Load Data

Report Loading Results

Clear Cache

After Processing

Branches

View Load Status

Preview

Ajax Callback

Storing ID of Background Execution in a Page Item

The screenshot shows the Oracle APEX App Builder interface for a page designer. The left sidebar displays various processing logic sections like After Submit, Computations, Validating, Processing, and After Processing. In the Processing section, a process named "Load Data Background" is selected. A yellow arrow points from this selection to the "Return Execution ID into Item" field in the Process panel on the right. The Process panel also shows other settings such as "Execute in Background" and "Serialize Executions". The central workspace shows a page layout with a Breadcrumb Bar, BODY content, and a Button Bar at the bottom.

Process Panel:

- 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

Page Layout:

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

Choose How to Handle Temp Files in Session State Clone

The screenshot shows the Oracle APEX App Builder interface for a page designer. On the left, the navigation pane lists various application events and their associated computations, validations, and processes. A yellow arrow points from the 'Load Data Background' process in the 'Processes' section of the 'After Submit' event to the 'Temporary File Handling' configuration in the 'Settings' tab of the process details.

Navigation Bar: APEX, App Builder, SQL Workshop, Team Development, Gallery, Search, User Profile, Help.

Page Header: Application 102 \ Page Designer, Page Number 17, Go, Lock, Refresh, Plus, Key, Save, Print.

Left Sidebar (Processes):

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

Middle Panel (Page Designer):

Background Load:

- BREADCRUMB BAR: Breadcrumb
- REGION CONTENT

BODY:

- ABOUT THIS PAGE: REGION CONTENT
- BUTTON BAR: REGION CONTENT
 - NEXT
 - CLEAR
 - LOAD

Right Panel (Process Details):

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
 - Ignore
 - Move (selected)
 - Copy
- Temporary File Items: P17_FILE
- Executions Limit: 1

Impose Per-Session Limit on Background Executions

The screenshot shows the Oracle APEX App Builder interface for a page designer. On the left, the page structure is defined with regions: BREADCRUMB BAR, BODY, and BUTTON BAR. The BODY region contains an 'About this page' panel and a 'Button Bar' with 'CLEAR' and 'LOAD' buttons. On the right, the 'Process' tab is selected, showing 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'), and 'Temporary File Items' (set to 'P17_FILE'). A yellow arrow points from the 'Load Data Background' process in the page structure to the 'Executions Limit' field in the settings, which is set to '1'. Another yellow arrow points from the 'CLEAR' button in the BODY region to the 'CLEAR' button in the 'Ajax Callback' section at the bottom.

APEX App Builder

Application 102 \ Page Designer

Layout Page Search Help

Background Load

BREADCRUMB BAR

Breadcrumb

REGION CONTENT

BODY

About this page

REGION CONTENT

Button Bar

REGION CONTENT

NEXT

CLEAR LOAD

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

Ajax Callback

In Any Execution Chain, Child Processes Run Sequentially

The screenshot shows the Oracle APEX App Builder interface. On the left, a sidebar displays 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
 - Ajax Callback
 - Preview

A yellow arrow points from the "Load Data Background" node down to the "Clear Cache" node.

The main workspace shows a page designer with a "Background Load" region. The "Process" panel on the right shows the following configuration for the "Load Data Background" execution chain:

- 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

So Notification of Completion Can Be Done in the Chain

The screenshot shows the Oracle APEX Page Designer interface. On the left, the 'Process' panel displays a sequence of events:

- After Submit: Computation P17_FILE_NAME.
- Validating: Validation 'Is valid file type'.
- Processing:
 - Load Data Background (selected, highlighted with a yellow arrow).
 - Unpack ZIP Archive.
 - Load Data.
 - Report Loading Results (highlighted with a yellow box).
- After Processing: Clear Cache.

The central area shows the page layout with regions: BREADCRUMB BAR, BODY, and BUTTON BAR. The BODY region contains an 'About this page' section and a 'NEXT' button with 'CLEAR' and 'LOAD' buttons.

The right side shows the configuration for the 'Load Data Background' execution chain:

- 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.

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



Session State

Name	Value
P1_ID	1234
P1_STATUS	PENDING
P1_RESULT	

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 a yellow arrow points to it from above. The page displays a table of background processes, with the 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 interface for monitoring session details. 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 breadcrumb path indicates the current location is 'Monitor Activity \ Active Sessions \ Session Detail'. A yellow arrow points to the session ID '7395142920882' in the main title area, which is highlighted with a yellow box. Below the title, there are tabs for Show All, Session Attributes, Page Views, Background Processing, Session State Item Values (which is selected and highlighted with a green dotted line), and Browser Information. On the right side, there is an 'About' section with a brief description of the page's purpose. At the bottom, a table displays session state item values, and a footer table shows the currently executing work session.

Session State Item Values

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

Currently Executing

Currently Executing	Work Session ID	Status
Load Data	7395142920882	Executing

Instance Admin Can See, Monitor, Abort Background Executions

The screenshot shows the Oracle APEX instance administration interface. The top navigation bar includes links for Manage Requests, Manage Instance, Manage Workspaces, and Monitor Activity, along with a help icon and a user account for 'AD admin internal'. The current page is 'Manage Instance \ Session State \ Background Executions'. The main content area displays a table of background executions with columns: Execution ID, Workspace, Application, Page, Background Process, Session ID, Username, Status, Last Change, and Action. Three rows are listed:

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	<button>Abort</button>
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	

A callout box on the right side provides details about the 'Action' column:

- 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.

App Does Long-Running Processing on Departments

The screenshot shows a dark-themed Oracle APEX application window titled "Background Processing - Departments". The header includes a search bar with the placeholder "steve" and a user icon. Below the header, there are three tabs: "Departments" (selected), "Processing Status", and "Processing History".

A modal dialog titled "Info" is open, containing the following text:

- 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.

Below the modal, a table displays department information:

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

At the bottom left of the table area, there is a small navigation indicator "1 - 4".

At the bottom of the application window, the footer reads "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 P
- The *Hide Process Button* toggle me

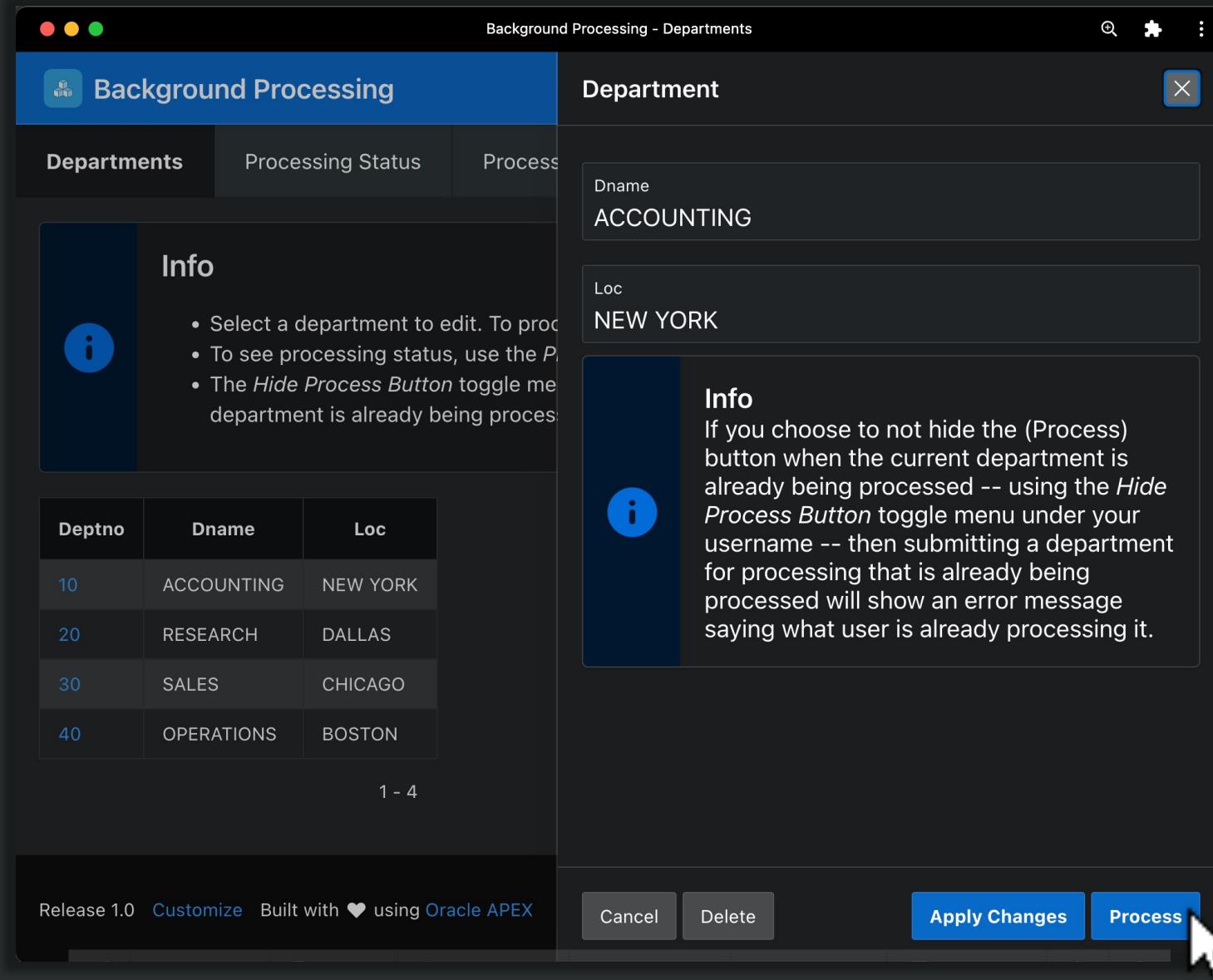
Deptno Dname Loc

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

The screenshot shows a web application window titled "Background Processing - Departments". The main header bar is blue with the title "Background Processing". Below it, there's a navigation bar with tabs: "Departments" (selected), "Processing Status", and "Processing History". A green notification bar at the top right says "Department 10 submitted for processing." with a checkmark icon and a close button.

The main content area has a dark background. On the left, there's a sidebar with a blue info icon and the word "Info". The main content area contains a table with the following data:

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

At the bottom of the table, there's a page number "1 - 4". The footer of the application includes the text "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 P
- The *Hide Process Button* toggle me

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%;">60%</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 Oracle APEX application window titled "Background Processing - Processing History". The header includes a search bar with the placeholder "steve" and a user icon. The main navigation bar has tabs for "Departments", "Processing Status", and "Processing History", with "Processing History" being the active tab. Below the tabs are two large, rounded rectangular boxes. The left box is blue and displays "0h 1m 19s" as the "Average Running Time". The right box is teal and displays "0h 0m 1s" as the "Average Wait to Start Time". At the bottom of the page, there is a footer bar with the text "Release 1.0" and "Built with ❤ using Oracle APEX". On the far right edge of the slide, there is a small circular icon with an upward arrow and a red square icon with a white letter "O".

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



Department Being Processed Can't Be Processed Again

The screenshot shows a web application window titled "Background Processing - Departments". The main menu has tabs for "Departments", "Processing Status", and "Processing". The "Departments" tab is selected, showing a table with four rows of department data:

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

Below the table, a page number "1 - 4" is visible. On the right side of the screen, there is a modal dialog titled "Department" with fields for "Dname" (RESEARCH) and "Loc" (DALLAS). An error message box is displayed, stating "1 error has occurred" with the message "■ Department 20 is already being processed by STEVE". At the bottom of the dialog, there are buttons for "Cancel", "Delete", "Apply Changes", and "Process". The "Process" button is highlighted with a cursor icon.

Release 1.0 Customize Built with ❤ using Oracle APEX

Background Processing - Departments

Department

Dname RESEARCH

Loc DALLAS

1 error has occurred
■ Department 20 is already being processed by STEVE

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 Process

Release 1.0 Customize Built with ❤ using Oracle APEX

Pat



O

We Might Opt to Hide the Process Button in This Case

Background Processing - Departments

Background Processing

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

Pat



O

To Prevent the User from Seeing an Error Message

The screenshot shows a web-based application interface for "Background Processing - Departments". The main menu has tabs for "Departments", "Processing Status", and "Processing". The "Departments" tab is active, displaying a table with four rows of department data:

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

A modal window titled "Department" is open, showing fields for "Dname" (RESEARCH) and "Loc" (DALLAS). Below this, another modal window titled "Info" contains the following text:

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.

At the bottom of the application, there are buttons for "Cancel", "Delete", and "Apply Changes".

Release 1.0 Customize Built with ❤ using Oracle APEX

Pat



O

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 active. On the left, the "Processing" tab is selected, showing a tree view of processes:

- After Submit
- Validating
- Processing
 - Processes
 - Process form Department
 - Save and Process
 - Check Existing Background for DEPTNO (highlighted with a green dashed border)
 - Processes
 - Check Existing Background for DEPTNO (highlighted with a green dashed border)
 - Parameters
 - Function Result
 - p_deptno
 - If Deptno Already Being Processed...
 - Else if Deptno Available to Process...
 - Close Dialog
 - After Processing
 - Ajax Callback

The main content area displays a page titled "Department" with a "CONTENT BODY" region containing "Department", "REGION BODY" with fields "P3_DNAME" and "P3_LOC", and "REGION CONTENT". Below it is an "Info" region with "REGION CONTENT". The "DIALOG FOOTER" region contains a "Buttons" section.

The right side of the screen shows the "Process" configuration for the highlighted process step:

 - Identification**:
 - Name: Check Existing Background for DEPTNO
 - Type: Invoke API (highlighted with a yellow border)
 - 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 (highlighted with a yellow border)
 - 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 current view is the "Page Designer" for a page titled "Department". The "Processing" tab is selected in the top navigation bar.

In the center, the page content displays a form with fields for "P3_DNAME" and "P3_LOC". Below the form, there is an "Info" region and a "Buttons" region at the bottom.

On the right side, the "Parameter" configuration panel is open. It shows a parameter named "Function Result" with the following details:

- Name: Function Result
- Direction: Out
- Data Type: VARCHAR2
- Ignore Output: Off
- Value: Item P3_DEPTNO_ALREADY_BEING_PROCESSED_BY

A yellow box highlights the "Value" field, specifically the "Item P3_DEPTNO_ALREADY_BEING_PROCESSED_BY" entry.

The left sidebar shows the page structure, including sections like "After Submit", "Validating", "Processing", "Processes", and "After Processing". The "Processes" section contains a "Save and Process" step with a sub-process named "Check Existing Background for DEPTNO".

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 active. The left sidebar shows a tree view of "Processing" steps:

- After Submit
- Validating
- Processing
 - Processes
 - Process form Department
 - Save and Process
 - If Deptno Already Being Processed... (highlighted with a green border and a cursor)
 - Processes
 - > Check Existing Background for DEPTNO
 - > If Deptno Available to Process...
 - Show Error with Username Processing the []
 - > Else if Deptno Available to Process...
 - Close Dialog
- After Processing
- Ajax Callback

The main content area displays a page titled "Department" with a "CONTENT BODY" region containing "Department", "P3_DNAME", and "P3_LOC" items. Below it is a "REGION CONTENT" section. The "DIALOG FOOTER" section contains "Buttons". The right sidebar shows the "Process" configuration for the selected step:

- Identification**
 - Name: If Deptno Already Being Processed...
 - Type: Execution Chain
 - Execution Chain: Save and Process
- Settings**
- Execution**
- Success Message**
- Error**
 - Server-side Condition**
 - 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 current page is "Page Designer". The left sidebar shows the navigation tree under "Processing", with a mouse cursor hovering over the "Show Error with Username Processing the Deptno" process step. The main area displays the "Department" page design, which includes a "CONTENT BODY" section with a "Department" region containing fields for "P3_DNAME" and "P3_LOC", and a "REGION CONTENT" section with an "Info" region. The "DIALOG FOOTER" section contains a "Buttons" region. On the right, the "Process" configuration pane is open, showing the "Identification" section with a process named "Show Error with Username Processing the Deptno" of type "Execute Code" triggered by "If Deptno Already Being Processed...". The "Error" section is highlighted with a yellow border and contains the following error message:

Error Message

Department &P3_DEPTNO. is already being processed by &P3_DEPTNO_ALREADY_BEING_PROCESSED_BY.

... 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 active. The left sidebar shows the "Processing" section, which includes "After Submit", "Validating", "Processing", and "Processes". Under "Processes", there is a tree view with the following nodes:

- Process form Department
- Save and Process
 - Check Existing Background for DEPTNO
 - If Deptno Already Being Processed...
 - Else if Deptno Available to Process...
 - Register User Processing Department
 - Process Department in Background
 - If Background Process Succeeded...
 - Else If Background Process Failed...
- Close Dialog
- After Processing
- Ajax Callback

The "Else if Deptno Available to Process..." node is highlighted with a green background. A mouse cursor is hovering over the "Register User Processing Department" link under this node.

The main content area displays a "Department" page with a "CONTENT BODY" region containing "Department", "P3_DNAME", and "P3_LOC" items. Below it is an "Info" region with a "REGION CONTENT" item. The "DIALOG FOOTER" region contains a "Buttons" item.

The right sidebar shows the "Process" configuration for the "Else if Deptno Available to Process..." process. The "Identification" section includes the name "Else if Deptno Available to Process...", type "Execution Chain", and execution chain "Save and Process". The "Server-side Condition" section is highlighted with a yellow border and contains the following settings:

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

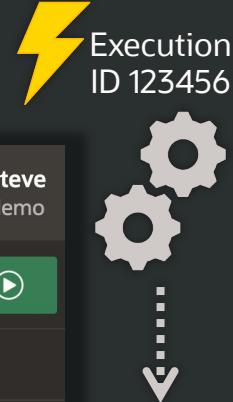
Register the (User,Deptno) in a Custom Tracking Table

The screenshot shows the Oracle APEX App Builder interface for an application named "Application 100". The "Page Designer" tab is active. On the left, the "Processing" tab is selected, showing a tree view of processes. A process named "Save and Process" is expanded, revealing several sub-processes under "Else if Deptno Available to Process...". One of these sub-processes, "Register User Processing Department", is highlighted with a dashed green border and a cursor is hovering over it.

The main content area displays a page titled "Department". The page contains a "CONTENT BODY" section with a "Department" region containing fields for "P3_DNAME" and "P3_LOC". Below this is a "REGION CONTENT" section with an "Info" region. The "DIALOG FOOTER" section contains a "Buttons" region.

On the right, the "Process" configuration pane is open, showing the "Identification" section. The process is named "Register User Processing Department" and is of type "Invoke API". The "Type" field is set to "Else if Deptno Available to Process..." and the "Procedure or Function" field is set to "REGISTER_USER_PROCESSING_DEPTNO". Both of these fields are highlighted with yellow boxes.

Next, Process the Department in the Background



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 left sidebar is titled "Application 100 \ Page Designer" and contains tabs for Rendering, Dynamic Actions, Processing, and Page Shared Components. The "Processing" tab is selected, showing a tree view of processes:

- 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** (highlighted with a green border and cursor)
 - > Add Execution Id to Work Tracking Row
 - > Process Department
 - > Unregister Background Job for Deptno
 - > If Background Process Succeeded...
 - > Else If Background Process Failed...
 - Close Dialog**

The central area displays the "Department" page layout. It includes sections for CONTENT BODY, REGION BODY, REGION CONTENT, and DIALOG FOOTER. The REGION BODY section contains items P3_DNAME and P3_LOC.

The right sidebar is titled "Process" and contains settings for the selected process:

 - 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: [empty]
 - Execution**

If the Background Execution Started Successfully...

The screenshot shows the Oracle APEX App Builder interface for Application 100 under Page Designer. The left sidebar is set to the Processing tab, showing a tree structure of processes. A mouse cursor is hovering over a process named "If Background Process Succeeded..." which is highlighted with a green dashed border. The main workspace displays a page layout for a "Department" page. The right sidebar is open to the "Process" tab, where a specific execution chain is being configured. The "Server-side Condition" section is highlighted with a yellow box and contains the following settings:

When Button Pressed	- Select -
Type	Item is NOT NULL
Item	P3_EXECUTION_ID

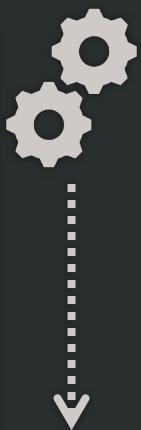


... Set the Success Message to Return to Caller

The screenshot shows the Oracle APEX App Builder interface for Application 100 under Page Designer. The left sidebar shows a tree view of processes, with the 'Set Success Message for Dialog Close' process highlighted. The main area displays a modal dialog titled 'Department' with regions for 'CONTENT BODY' (containing 'Department', 'P3_DNAME', and 'P3_LOC') and 'REGION CONTENT'. The 'DIALOG FOOTER' section contains a 'Buttons' region. On the right, the 'Process' tab is selected, showing the configuration for the 'Set Success Message for Dialog Close' process. The 'Source' tab is active, displaying PL/SQL code:

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

The 'Success Message' tab is also visible below.



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

Execution
ID 123456



APEX App Builder SQL Workshop Team Development Gallery Search steve demo

Application 100 \ Page Designer

Rendering Dynamic Actions Processing Page Shared Components Layout Page Search Help

Process Filter Identification

Name Else If Background Process Failed...
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 NULL
Item P3_EXECUTION_ID

Department

CONTENT BODY

Department

P3_DNAME

P3_LOC

REGION BODY

REGION CONTENT

Info

REGION CONTENT

DIALOG FOOTER

Buttons

Else If Background Process Failed...

Close Dialog

After Processing

Ajax Callback

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

If Background Process Succeeded...

Else If Background Process Failed...

Processes

Unregister User Processing Department

Else If Background Process Failed...

Close Dialog

After Processing

Ajax Callback

Unregister (User,Deptno) from Custom Tracking Table

The screenshot shows the Oracle APEX App Builder interface for Application 100 under the Page Designer tab. The main area displays a process flow for managing department data. On the left, the 'Processing' tab is selected, showing a tree view of processes. A process named 'Unregister User Processing Department' is highlighted at the bottom of the tree. The central area shows a 'Department' page with regions for 'Department', 'REGION BODY' (containing fields P3_DNAME and P3_LOC), and 'REGION CONTENT'. The right side shows the configuration details for this process:

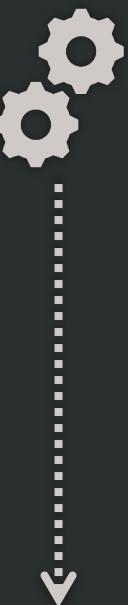
- Identification:** Name: Unregister User Processing Department, Type: Invoke API.
- Settings:** Type: PL/SQL Package, Owner: Parsing Schema, Package: EBA_DEMO_BG_PROC, Procedure or Function: UNREGISTER_BG_PROC_FOR_DEPTNO.
- Execution:** (Details not visible)
- Success Message:** (Details not visible)
- Error:** (Details not visible)

A cursor is hovering over the 'Close Dialog' button at the bottom left of the process tree. The top right corner of the screen features a user profile for 'steve demo' and two large grey gears.

Close the Dialog and Return to Calling Page

The screenshot shows the Oracle APEX App Builder interface for Application 100's Page Designer. The left sidebar is under the 'Processing' tab, showing a tree of processes. A process named 'Save and Process' is selected, which contains several steps including 'Check Existing Background for DEPTNO', 'If Deptno Already Being Processed...', and 'Else if Deptno Available to Process...'. The 'Else if Deptno Available to Process...' step has its own nested processes: 'Register User Processing Department', 'Process Department in Background', 'If Background Process Succeeded...', and 'Else If Background Process Failed...'. The 'Else If Background Process Failed...' step has a final process: 'Unregister User Processing Department'. At the bottom of the sidebar, there are 'After Processing' and 'Ajax Callback' sections.

The main content area displays the 'Department' page layout. It includes a 'CONTENT BODY' section with regions for 'Department' (containing P3_DNAME and P3_LOC), 'REGION BODY', 'REGION CONTENT', and 'DIALOG FOOTER' (containing Buttons). To the right of the page layout is the 'Process' configuration panel. In the 'Identification' section, the 'Name' is 'Close Dialog' and the 'Type' is 'Close Dialog', which is highlighted with a yellow border. The 'Settings' section includes 'Items to Return', 'Execution', 'Success Message', 'Error', and 'Server-side Condition' (with 'When Button Pressed' set to '- Select -'). The 'Type' for the server-side condition is 'Request is contained in Value'.



Meanwhile, Back in Our Background Process...

The screenshot shows the Oracle APEX App Builder interface for Application 100, specifically the Page Designer section. The main area displays a page titled "Department" with regions for "CONTENT BODY" and "REGION BODY" containing fields "P3_DNAME" and "P3_LOC". Below this is a "REGION CONTENT" section and a "DIALOG FOOTER" section with a "Buttons" region.

The left sidebar shows the "Processing" tab selected under "Page Shared Components". Under "Processes", there is a tree structure:

- Process form Department
- Save and Process
 - Check Existing Background for DEPTNO
 - If Deptno Already Being Processed...
 - Else if Deptno Available to Process...
 - Register User Processing Department
 - Process Department in Background
 - Add Execution Id to Work Tracking Row (highlighted with a green dotted border)
 - Process Department
 - Unregister Background Job for Deptno
 - If Background Process Succeeded...
 - Else If Background Process Failed...

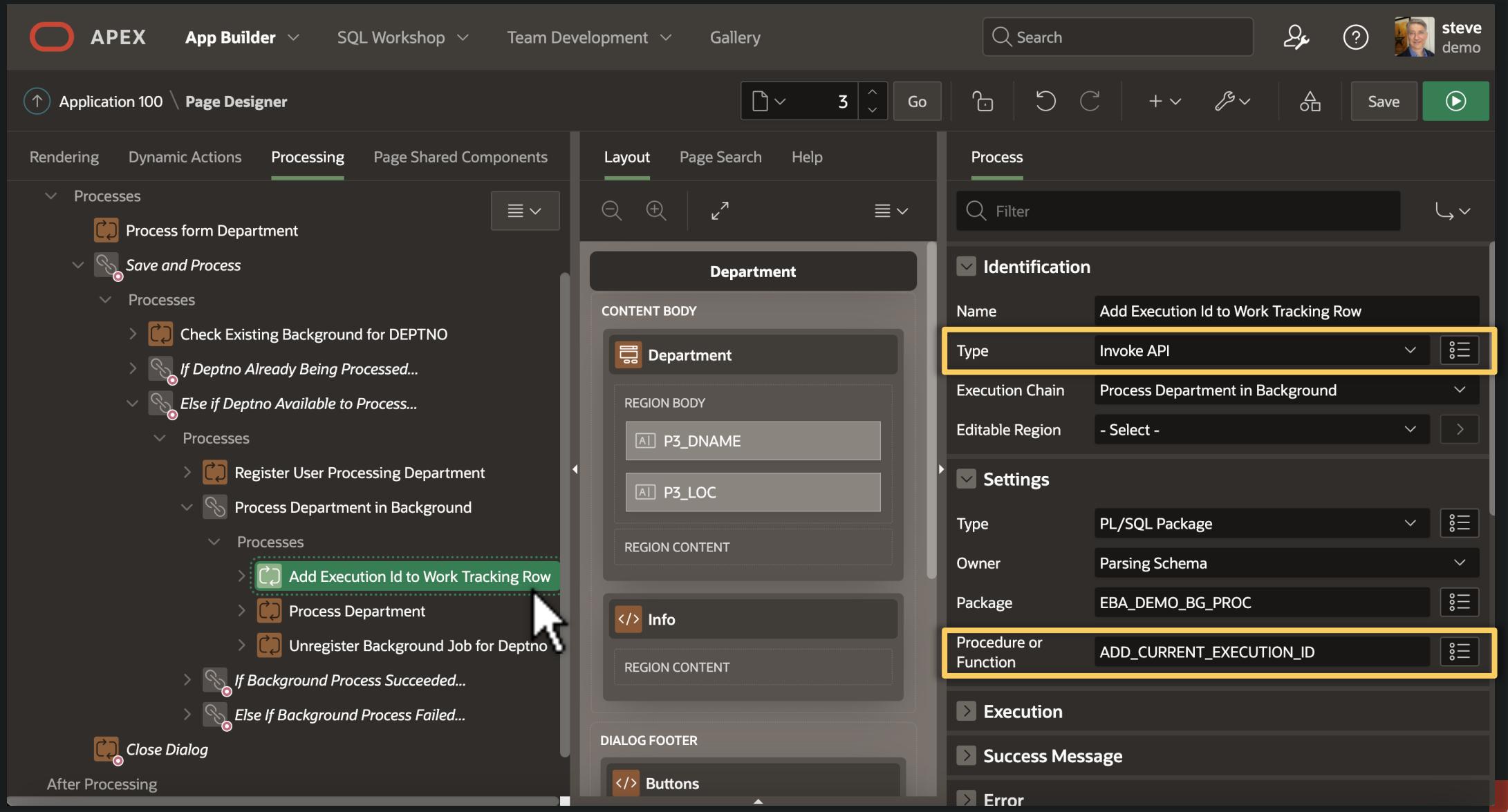
The "Add Execution Id to Work Tracking Row" step is highlighted with a green dotted border. The "Process Department in Background" step is also highlighted with a green dotted border.

The right panel shows the "Process" 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". The "Execution Chain" is set to "Process Department in Background". The "Settings" section shows the PL/SQL Package is "EBA_DEMO_BG_PROC".



Add Current Execution Id to Custom Tracking Row

Execution
ID 123456



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...
 - Registers 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

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

Save

After Processing

Search

steve demo

Unregister (User,Deptno) from Custom Tracking Table

The screenshot shows the Oracle APEX App Builder interface for Application 100 under Page Designer. The main area displays a process flow for managing departmental data. On the left, the 'Processes' tree shows a complex sequence of steps involving 'Save and Process' and 'Invoke API' calls. A mouse cursor is hovering over the 'Unregister Background Job for Deptno' step in the 'Process Department in Background' section. The right side of the screen shows the configuration details for this specific process step, including its name, type (Invoke API), execution chain, settings (PL/SQL Package, Parsing Schema, Package), and procedure/function (UNREGISTER_BG_PROC_FOR_DEPTNO). 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 overall theme is dark with orange and grey accents.

APEX App Builder SQL Workshop Team Development Gallery

Search steve demo

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...
 - 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

DIALOG FOOTER

Buttons

Process

Filter

Identification

Name: Unregister Background Job for Deptno

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: UNREGISTER_BG_PROC_FOR_DEPTNO

Execution

Success Message

Error

Close Dialog

After Processing



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

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

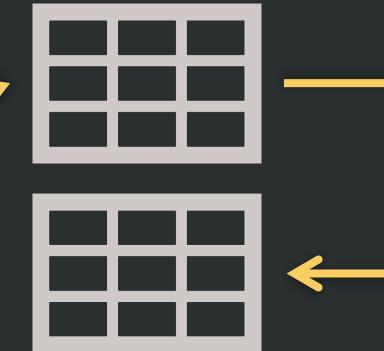
localhost:8080/ords/r/demo/background-processing/processing-status?debug=YES&session=1522927933828

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

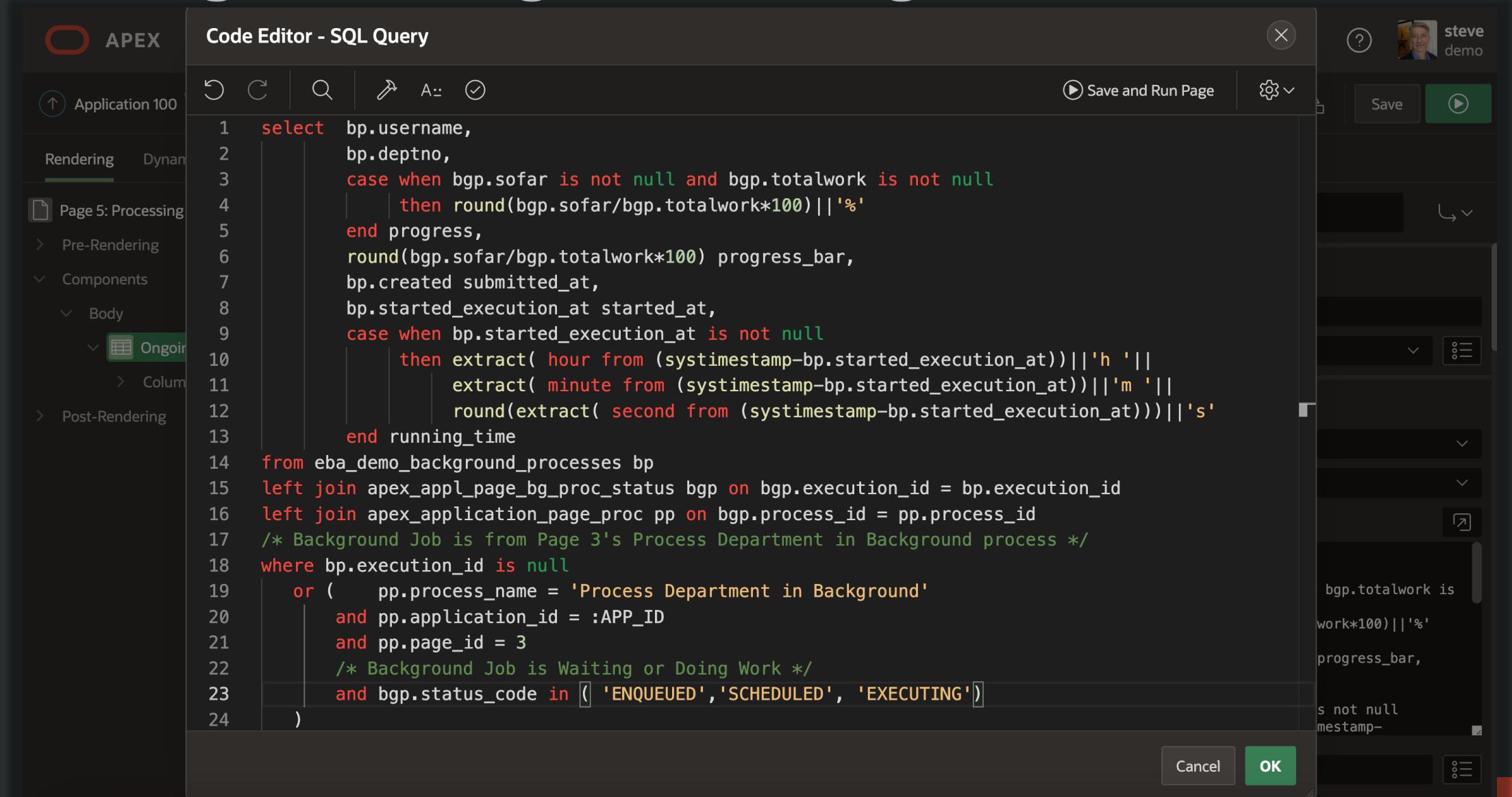
ID	USERNAME	DEPTNO	EXECUTION_ID	STARTED_EXECUTION_AT
1	STEVE	20	2002	2023-04-14 19:17:22
2	STEVE	10	1001	2023-04-14 19:17:19
3	STEVE	30	3003	2023-04-14 19:17:26
4	STEVE	40	4004	2023-04-14 19:17:32



APEX_APPLICATION_PAGE_PROC



Showing Users Progress of Background Processes



The screenshot shows the Oracle APEX Code Editor - SQL Query interface. The code editor contains the following 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 )
```

The sidebar on the left shows the application structure for "Application 100", specifically the "Components" section under "Body" which includes an "Ongoing" item. The top right corner shows the user profile "steve demo".

Informing APEX Engine of Progress for BG Process

The screenshot shows the Oracle APEX SQL Workshop 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 'Object Browser' and shows a search 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, which is highlighted in green. The 'Triggers' section lists EBA_DEMO_BACKGROUND PROCES_BIU and EBA_DEMO_BG_PROC_HISTORY_BIU. The central panel displays the PL/SQL code for the 'process_deptno' procedure:

```
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 callout box highlights the following code block:

```
apex_background_process.set_progress(p_totalwork=>c_steps,p_sofar=>0);
```

Another yellow callout box highlights the following code block:

```
apex_background_process.set_progress(p_totalwork=>c_steps,p_sofar=>j);
```

A large yellow box on the right side of the screen contains the following text:

Use SET_BACKGROUND_STATUS()
and SET_BACKGROUND_PROGRESS()
in APEX_BACKGROUND_PROCESS package

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, rounded rectangular boxes are displayed side-by-side. The left box is blue and contains the text "0h 1m 11s" in white, with "Average Running Time" below it. The right box is teal and contains the text "0h 0m 1s" in white, with "Average Wait to Start Time" below it. At the bottom of the page, there is footer text: "Release 1.0" followed by "Customize" and "Built with ❤ using Oracle APEX".

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

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 ⓘ

Cancel Delete Apply Changes

About
Edit the general application definition.

Tasks
Edit Application Comment >
Unsubscribe Templates >

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](#)

O

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 X

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

O

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' dialog box from the Oracle Database 'Manage Instance' interface. The 'Background Jobs' tab is selected. In the 'Background Job Class' field, the value 'AUTOMATION_RESTSYNC_CLS' is entered. An orange callout box with an arrow points from the text 'N.B. This *different* setting (BACKGROUND_JOB_CLASS) affects Automations + REST Sync background process' to the 'Background Job Class' input field.

Manage Instance \ Instance Settings

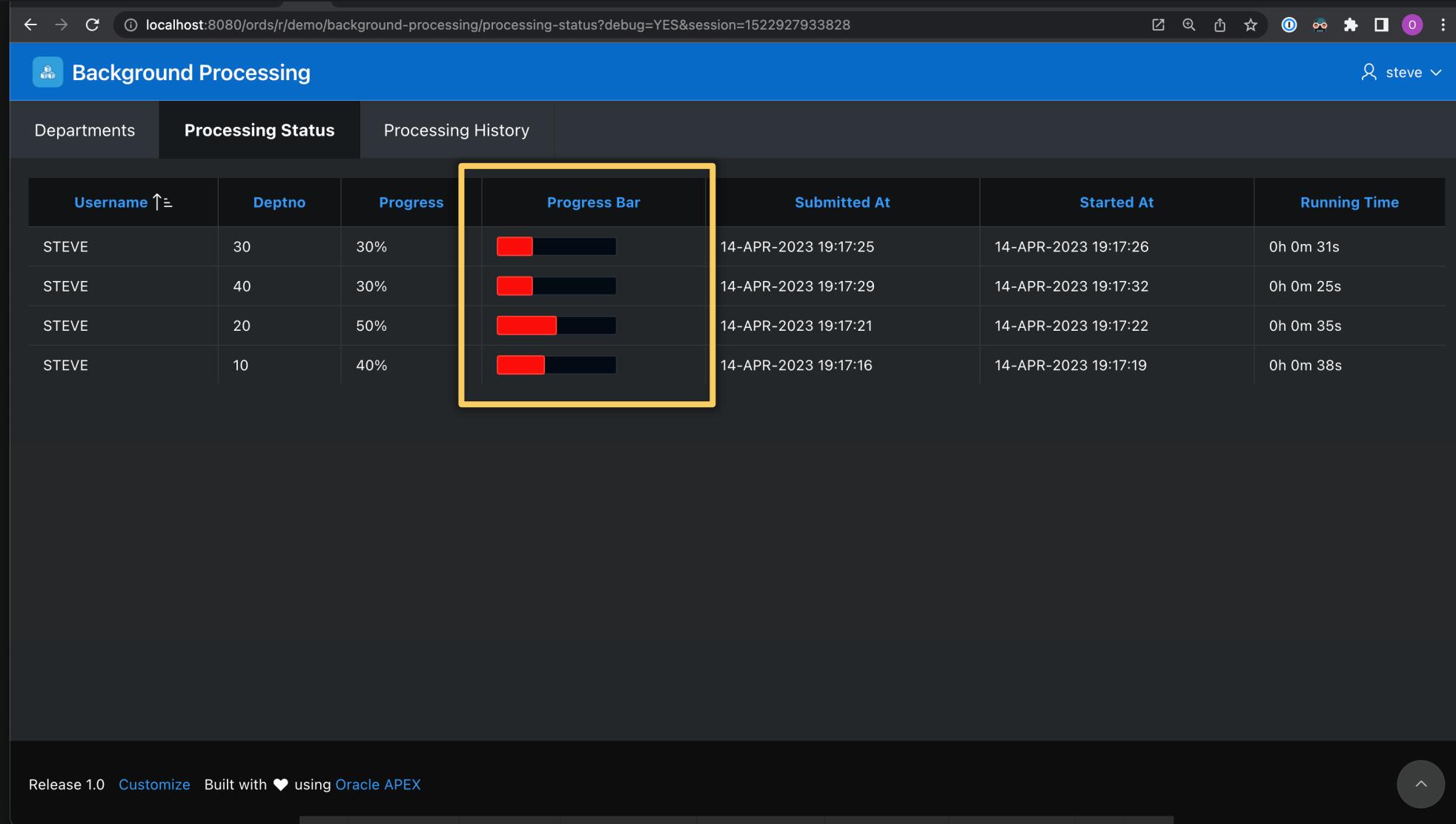
Instance Settings

Background Jobs

Background Job Class AUTOMATION_RESTSYNC_CLS

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

Limit ≥ 4 → Four Submitted Background Processes Can Run

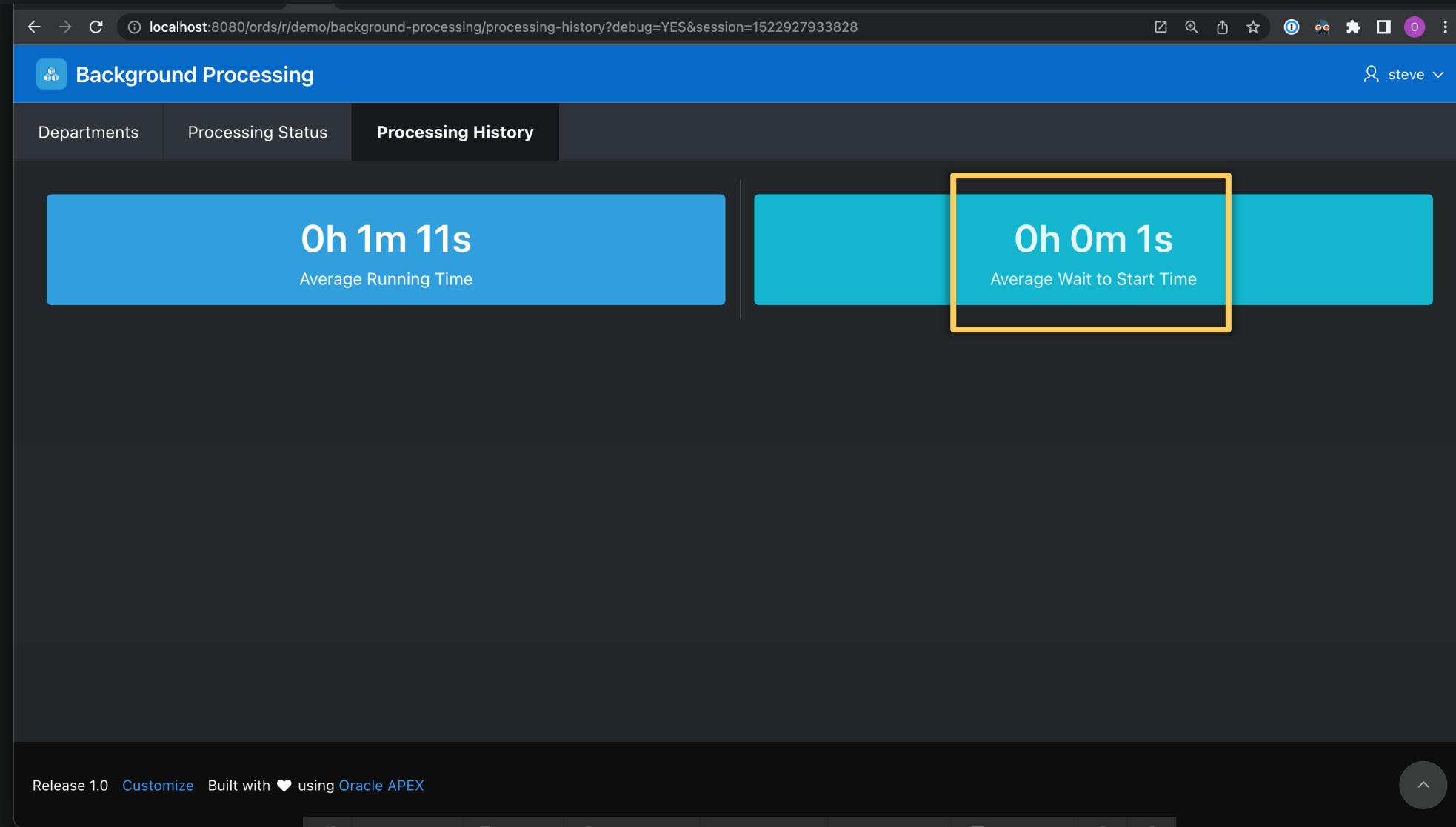


The screenshot shows a web-based application titled "Background Processing" running on a local host. The URL in the browser is `localhost:8080/ords/r/demo/background-processing/processing-status?debug=YES&session=1522927933828`. The interface includes a navigation bar with icons for back, forward, search, and other functions, and a user dropdown set to "steve". The main content area has three tabs: "Departments", "Processing Status" (which is selected), and "Processing History". The "Processing Status" tab displays a table with four rows, each representing a submitted background process. The columns are: Username (STEVE), Deptno (30, 40, 20, 10), Progress (30%, 30%, 50%, 40%), Progress Bar (each row has a progress bar indicating the current status), Submitted At (14-APR-2023 19:17:25, 14-APR-2023 19:17:29, 14-APR-2023 19:17:21, 14-APR-2023 19:17:16), Started At (14-APR-2023 19:17:26, 14-APR-2023 19:17:32, 14-APR-2023 19:17:22, 14-APR-2023 19:17:19), and Running Time (0h 0m 31s, 0h 0m 25s, 0h 0m 35s, 0h 0m 38s). A yellow box highlights the "Progress Bar" column for all four rows. At the bottom of the page, there is a footer with the text "Release 1.0 Customize Built with ❤️ using Oracle APEX".

Username	Deptno	Progress	Progress Bar	Submitted At	Started At	Running Time
STEVE	30	30%		14-APR-2023 19:17:25	14-APR-2023 19:17:26	0h 0m 31s
STEVE	40	30%		14-APR-2023 19:17:29	14-APR-2023 19:17:32	0h 0m 25s
STEVE	20	50%		14-APR-2023 19:17:21	14-APR-2023 19:17:22	0h 0m 35s
STEVE	10	40%		14-APR-2023 19:17:16	14-APR-2023 19:17:19	0h 0m 38s



Limit ≥ 4 \rightarrow Background Processes Start Almost Immediately



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

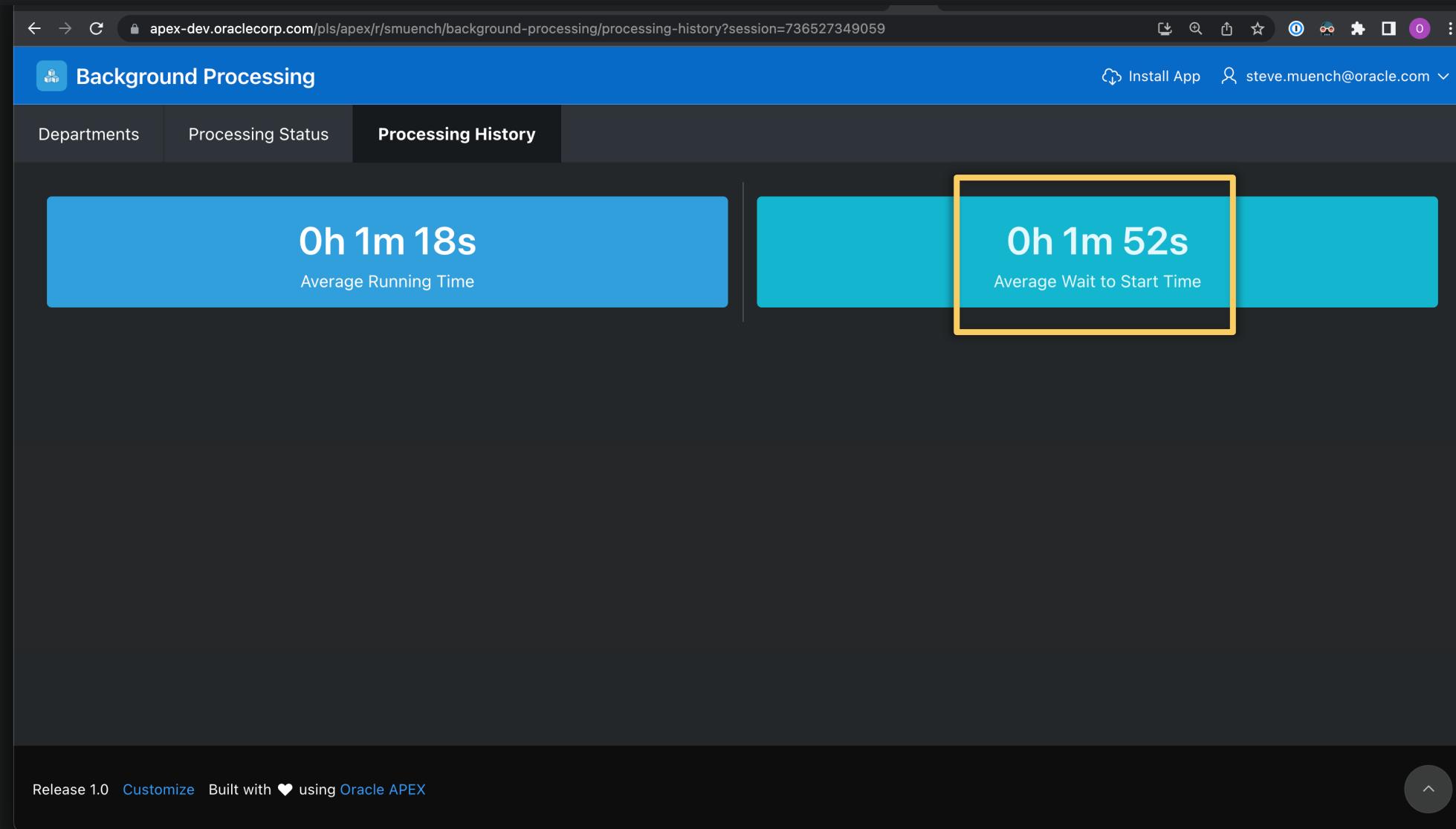
The screenshot shows a web browser window with the URL apex-dev.oraclecorp.com/pls/apex/r/smuench/background-processing/processing-status?session=736527349059. The page title is "Background Processing". The navigation bar includes links for "Install App" and the user "steve.muensch@oracle.com". The main content area has three tabs: "Departments", "Processing Status" (which is selected), and "Processing History". The "Processing Status" tab displays a table with the following data:

Username ↑	Deptno	Progress	Progress Bar	Submitted At	Started At	Running Time
STEVE.MUENCH@ORACLE.COM	10	30%	<div style="width: 30%;"><div style="width: 100%;"> </div></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		

A yellow box highlights the "Progress Bar" column for the first row, which shows a progress bar filled to 30%. The other rows show progress values of 0% for Deptnos 30, 40, and 20.

At the bottom left, the footer text reads "Release 1.0 Customize Built with ❤ using Oracle APEX".

Limit = 1 → Background Processes Wait Before Starting to Execute



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

<https://apex.oracle.com/en/learn/training>

- New training on all key aspects of APEX development
- New videos + extensive hands-on labs
- New learning paths + certifications
 - *Oracle APEX Foundations Associate*
 - *Oracle APEX Developer Professional*

ā'pěks alpe adria

Thank You! Questions?



steve.muench@oracle.com

diveintoapex.com



@stevemuench



@stevemuench@mastodon.online

