

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

UC Berkeley, BA Math, Dec 1989

SQL*Forms Support Engineer

Oracle Forms PM

Project Sedona PM

ADF BC PM

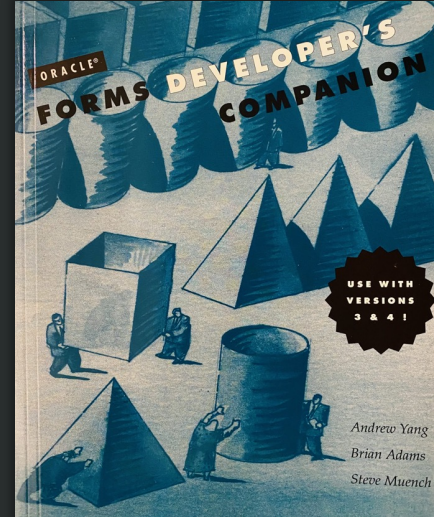
OraMag

XML

ADF Developer/Architect

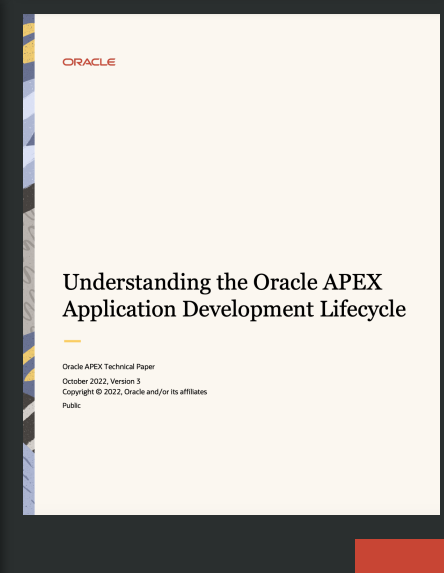
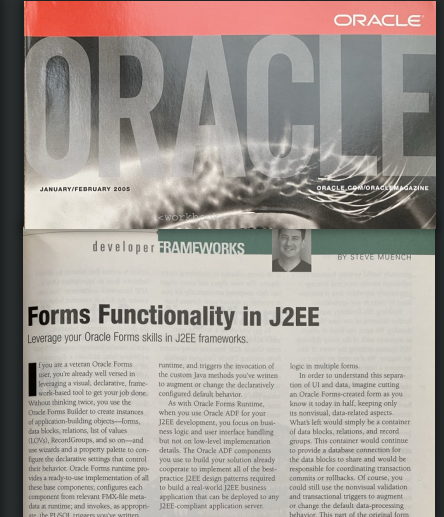
2021

Oracle APEX
Architect



Oracle® Application Development Framework
Developer's Guide For Forms/4GL Developers
10g Release 3 (10.1.3.0)
B25947-01

June 2006



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

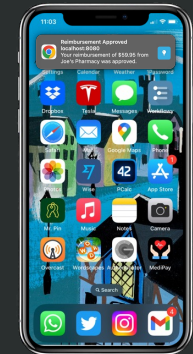
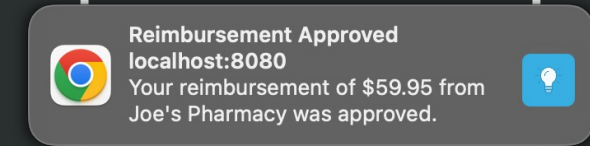
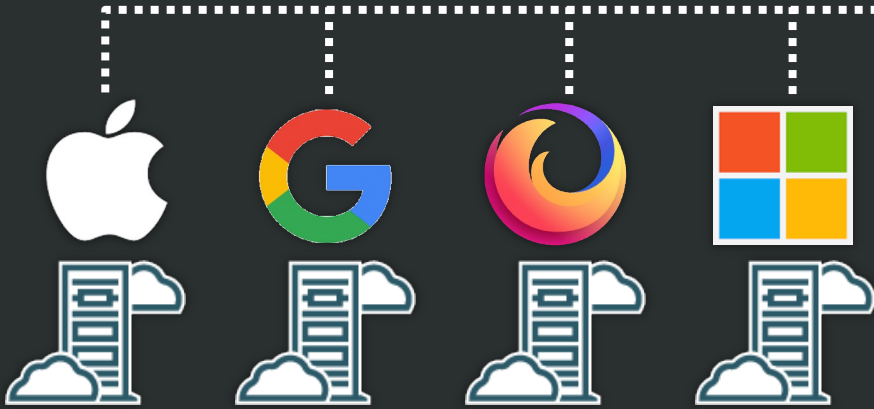
New Feature Highlights in APEX 23.1

- 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

App Builder

SQL Workshop

Team Development

Gallery

ST

steve demo

[View Blueprint](#)

Create an Application

Name

Amazing APEX App

Appearance

Vita, Side Menu

Pages

Add Page

Home

Blank

Edit

Features [Check All](#)

☒

Install Progressive Web App

Give your app the ability to be installed

☒

Push Notifications

Allow users to receive push notifications

☐

About Page

Add about this application page

☐

Access Control

Enable role-based user authorization

☐

Activity Reporting

Include user activity and error reports

☐

Configuration Options

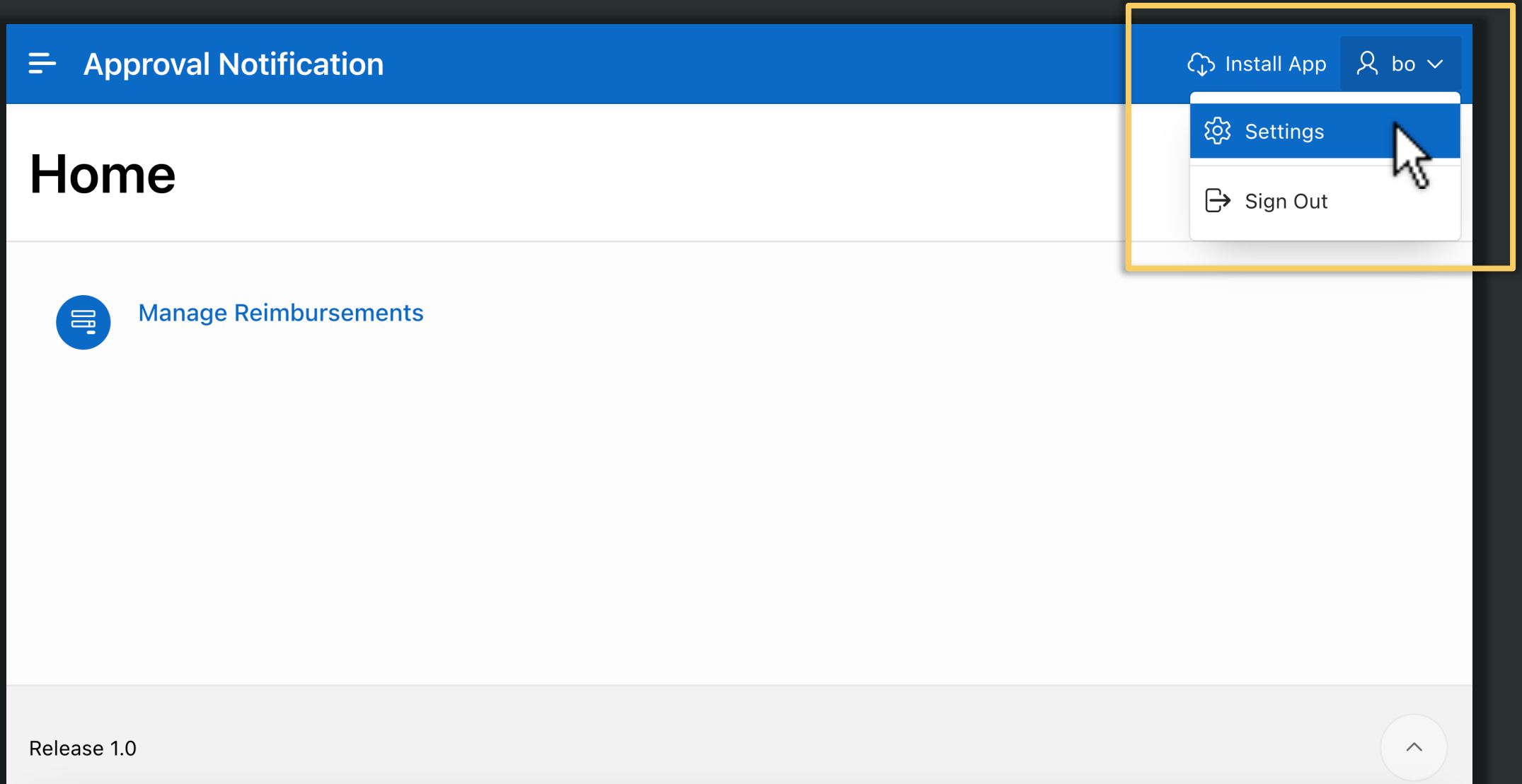
Enable or disable application features

Cancel

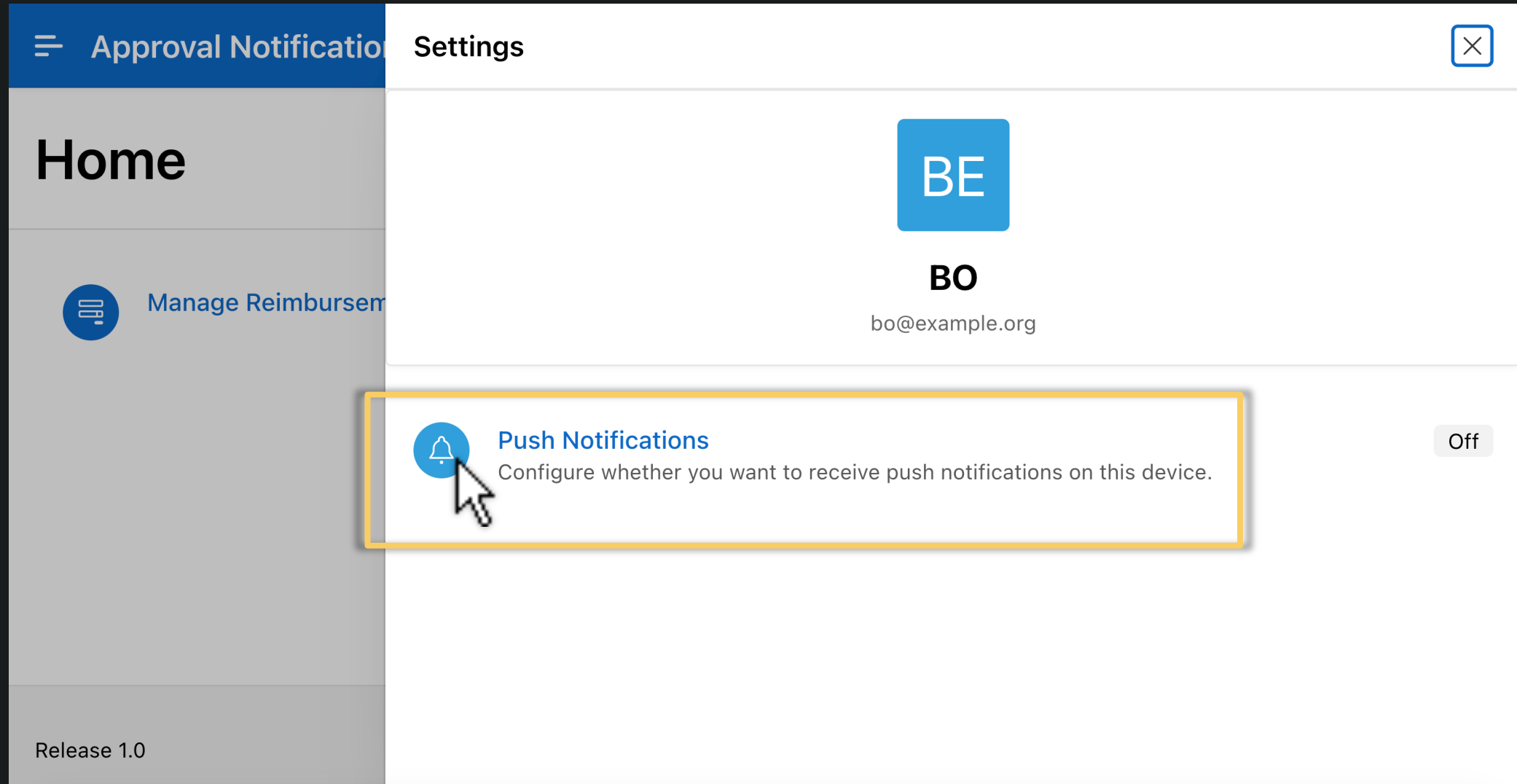
Create Application



New User Settings Navigation Bar List Entry




Others User Settings In the Future, or Add Your Own



End Users Opt-in on Each Device to Receive Notifications

≡ Approval Notification


Home

 Manage Reimbursement

Release 1.0

Settings - Push Notifications

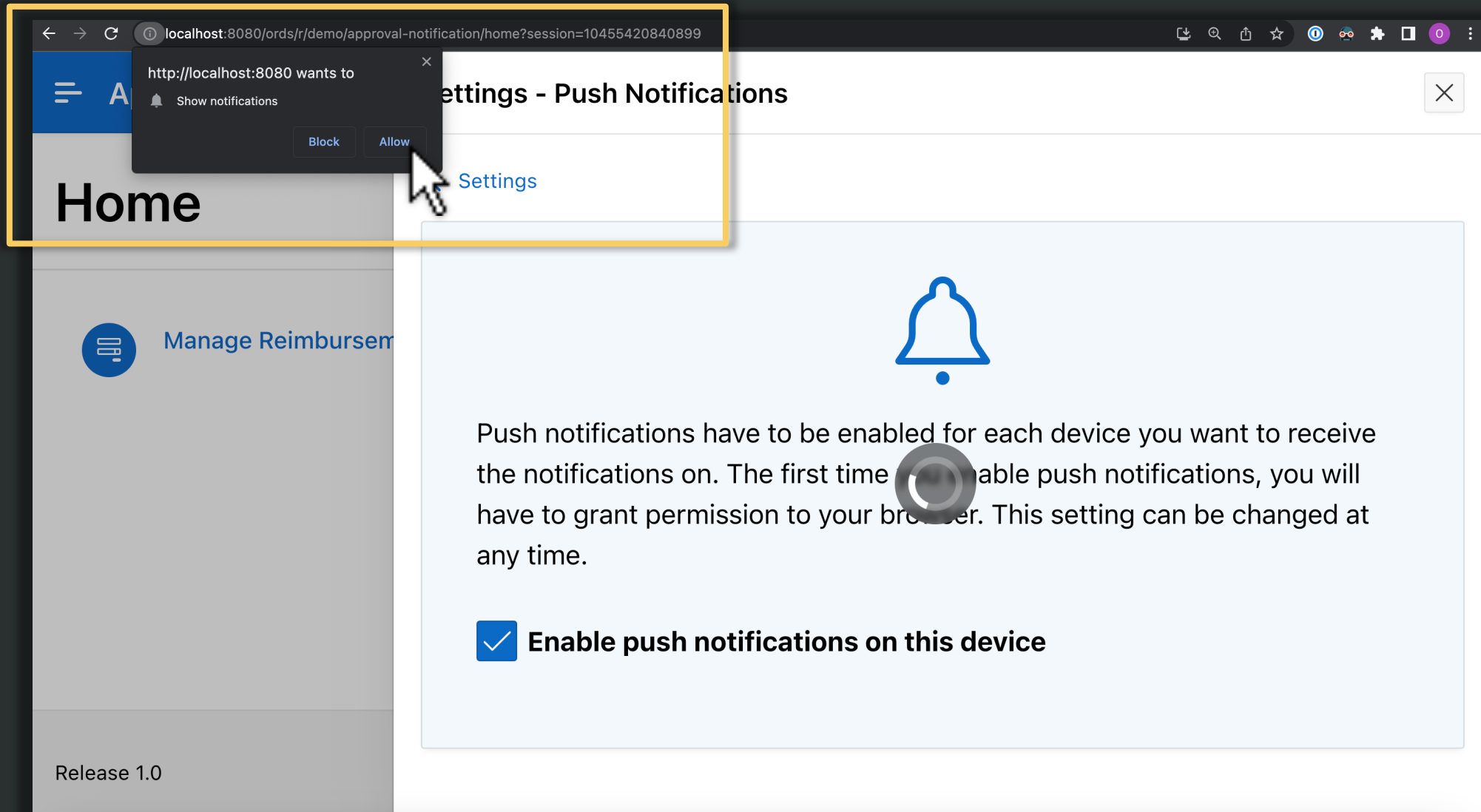
[< Settings](#)



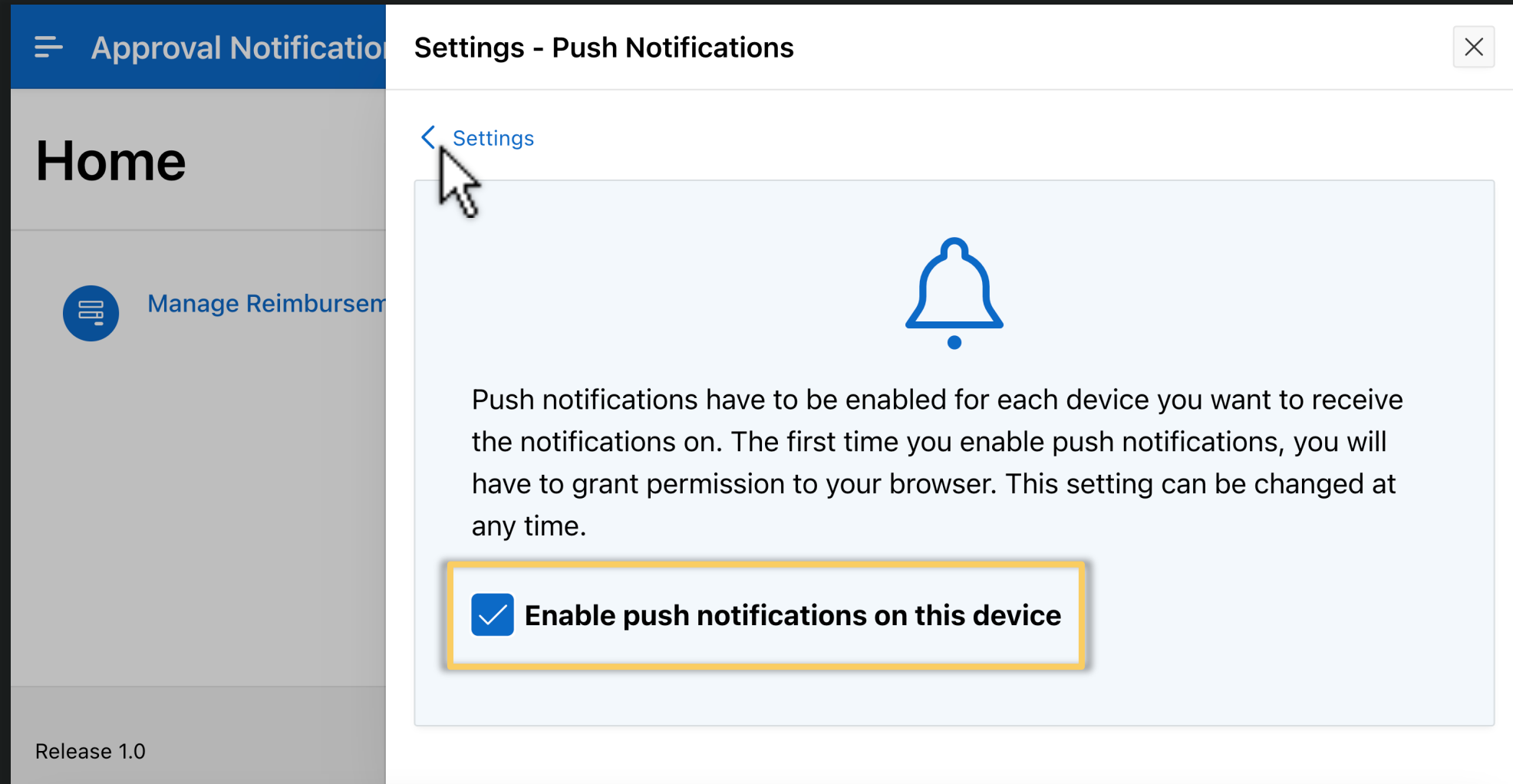
Push notifications have to be enabled for each device you want to receive the notifications on. The first time you enable push notifications, you will have to grant permission to your browser. This setting can be changed at any time.

☐ Enable push notifications on this device

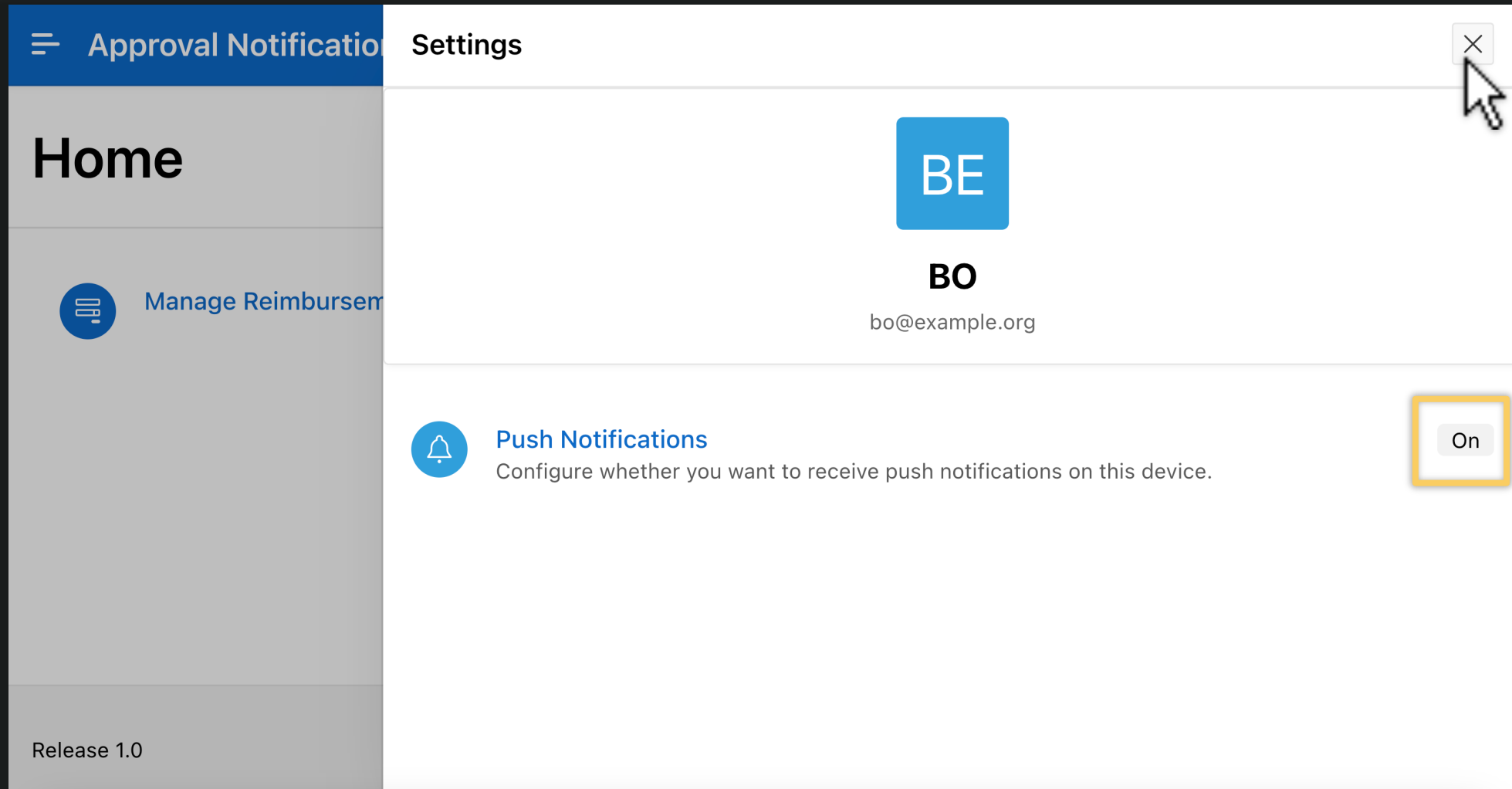
First Time User Must Allow Notifications




User Remains Subscribed for this App Until They Disable





User Remains Subscribed for this App Until They Disable



Imagine an App for Requesting a Reimbursement...

 Approval Notification

Install App  bo 

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

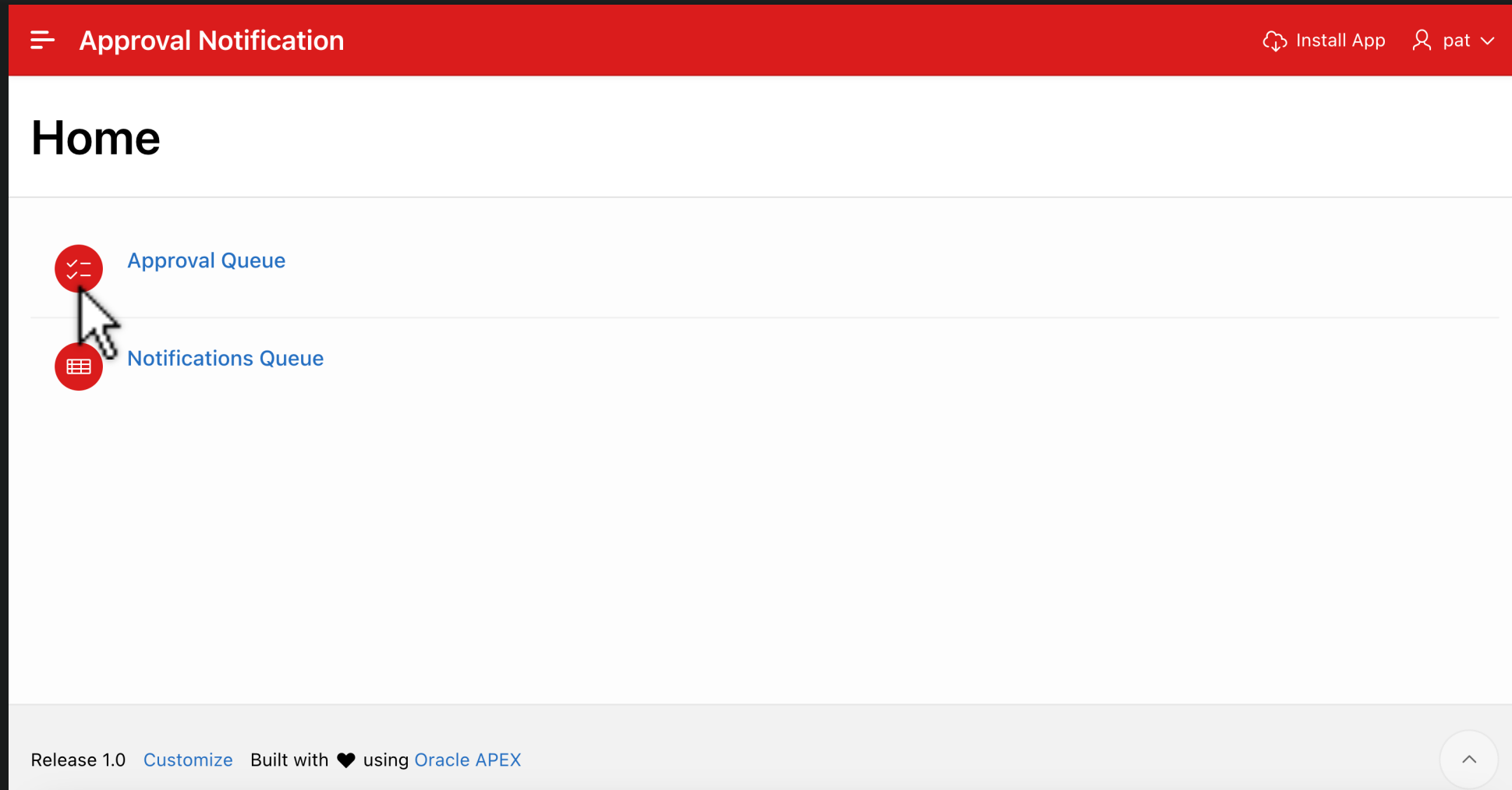
Reimbursement Request History

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

pat

Approval Queue

Search...

Due Date

Show expired tasks

Claim for \$59.95 from Joe's Pharmacy by BO

Claim Approval · Initiated by bo

✓ Approve

✗ Reject

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, Spiderman:
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.




Clicking the Notification Opens App & Shows Detail


Conference - Speaker Lineup

VIEW Conference 2022


Add To Edition... Home steve

Home





Henry Selick
Wendell & W



Marc Petit, V
Unreal Engine
Games

Approval Notification - Reimbursement

Approval Notification

bo

Reimbursement

Reimbursement

Amount
59.95

Receipt From
Joe's Pharmacy

Status
APPROVED

Decided On
4/11/2023

Decided By
PAT

Created
4/11/2023

Close

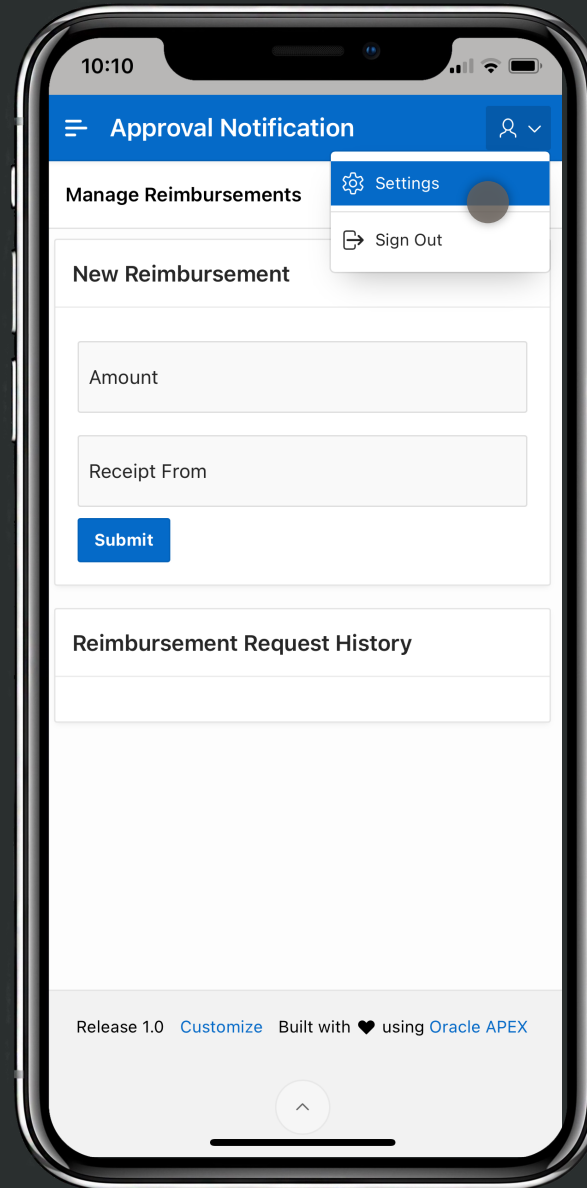
Release 1.0 Customize Built with ♥ using Oracle APEX



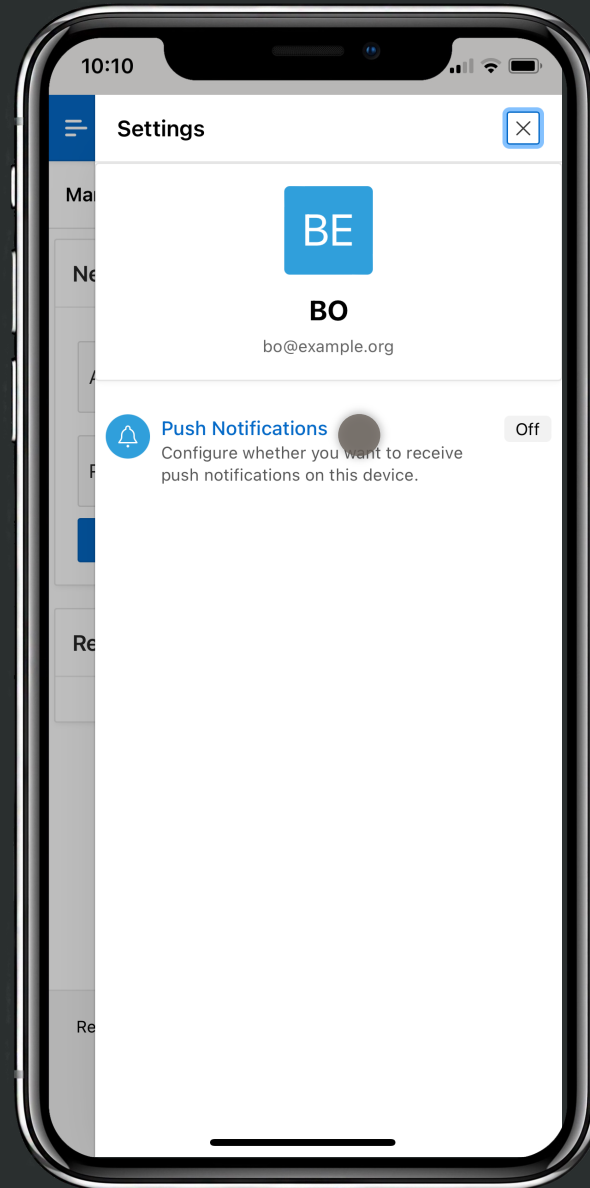
Same APEX App Works as PWA on Mobile Devices



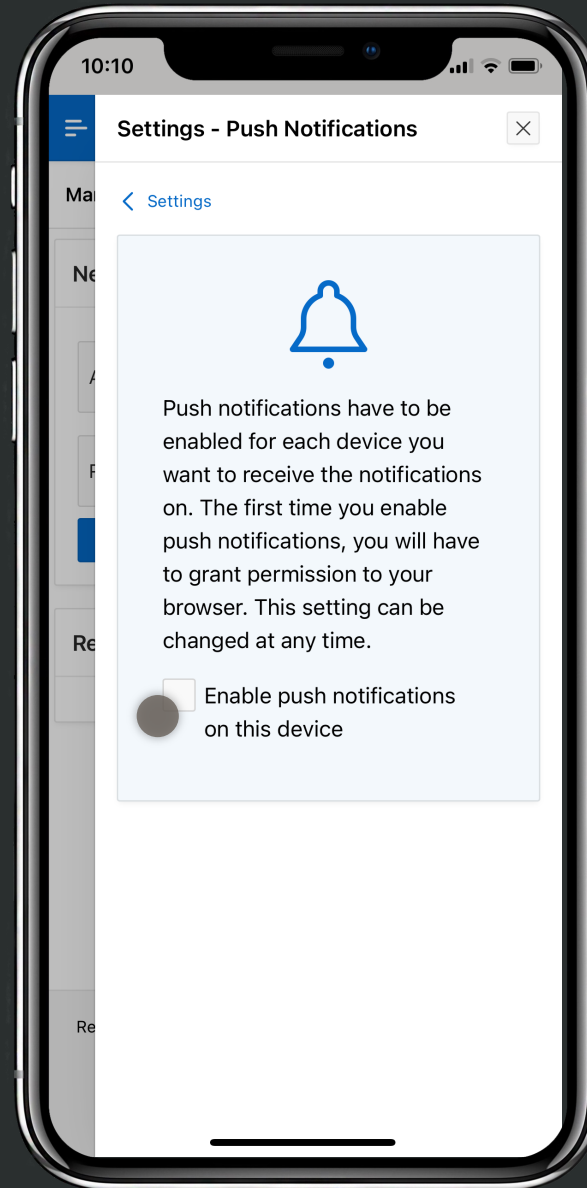
User Has to Opt-in to Push Notifications on Each Device



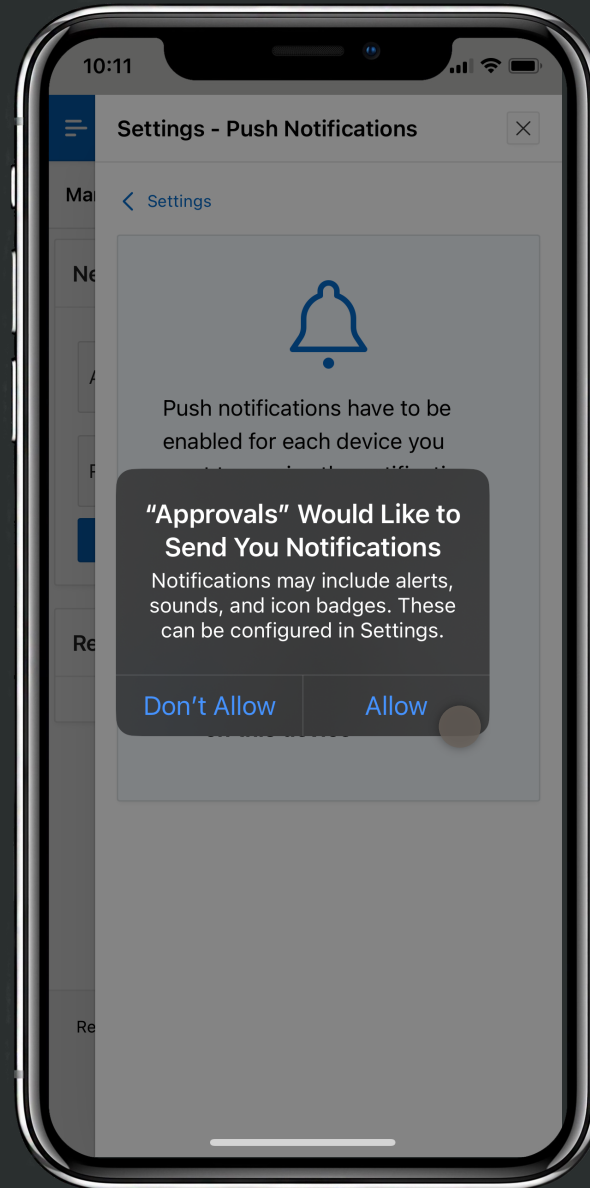
User Has to Opt-in to Push Notifications on Each Device



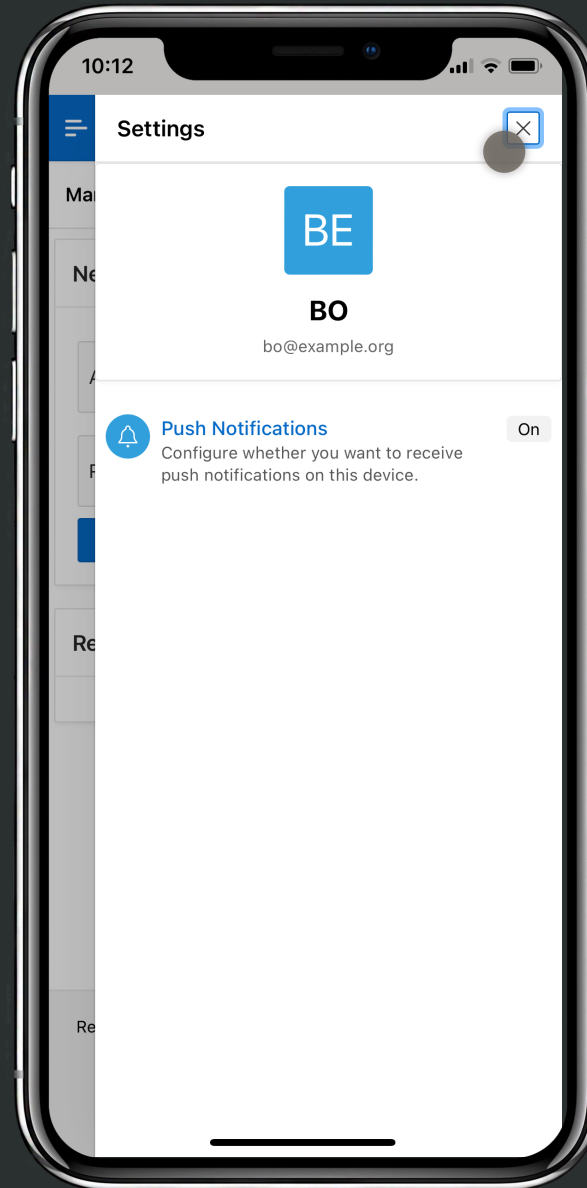
User Has to Opt-in to Push Notifications on Each Device



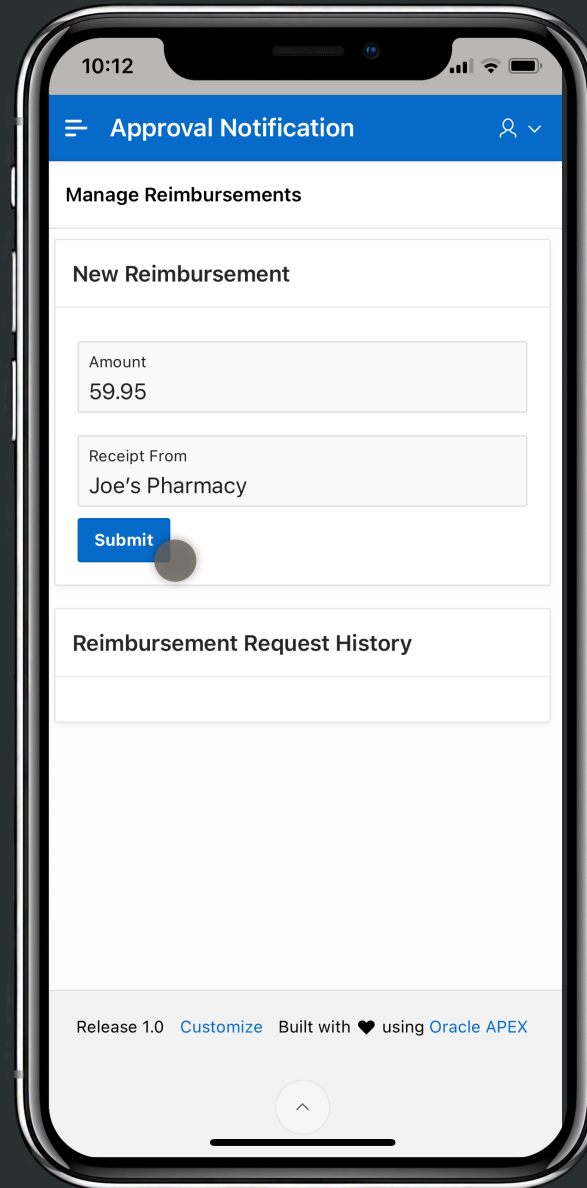
Device Asks User to Allow the Subscription



User Remains Subscribed for this App Until They Disable



Submitting an Reimbursement Request from iPhone



The screenshot shows an iPhone displaying a mobile application interface. At the top, the status bar shows the time 10:12 and signal/battery icons. The app's header is a blue bar with a hamburger menu icon, the text "Approval Notification", and a user profile icon with a dropdown arrow. Below the header is a section titled "Manage Reimbursements". Under this, there is a "New Reimbursement" section. It contains two input fields: "Amount" with the value "59.95" and "Receipt From" with the value "Joe's Pharmacy". Below these fields is a blue "Submit" button. A small grey circle is positioned over the "Submit" button. Below the "New Reimbursement" section is a "Reimbursement Request History" section, which is currently empty. At the bottom of the screen, there is a footer with the text "Release 1.0", a link "Customize", and the text "Built with ❤️ using Oracle APEX". A home indicator bar is visible at the very bottom of the iPhone screen.

10:12

Approval Notification

Manage Reimbursements

New Reimbursement

Amount
59.95

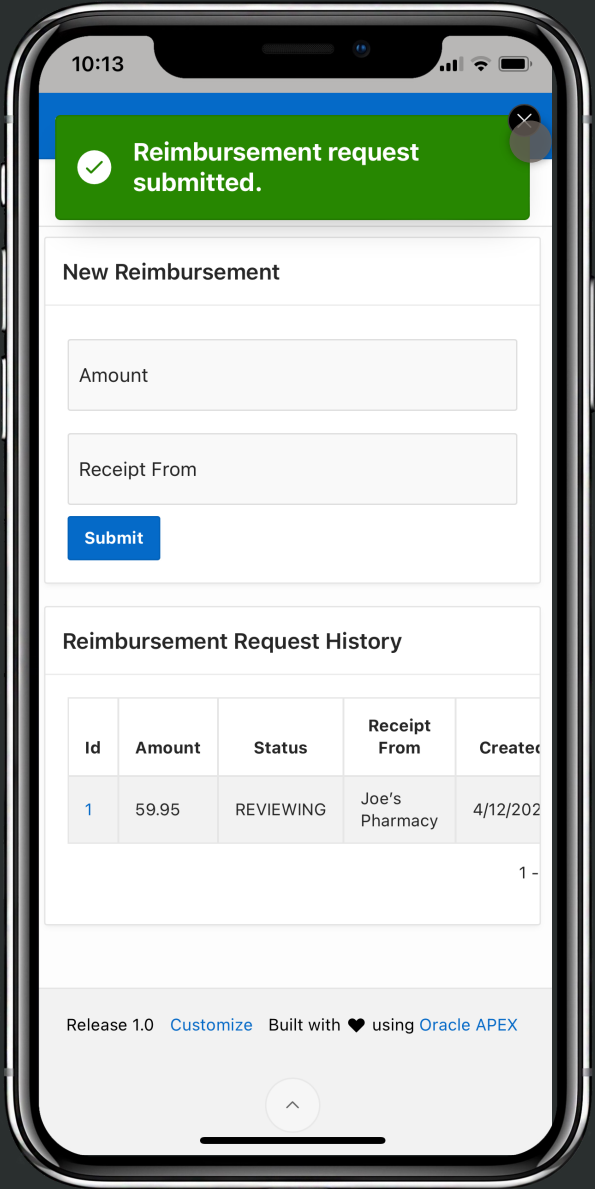
Receipt From
Joe's Pharmacy

Submit

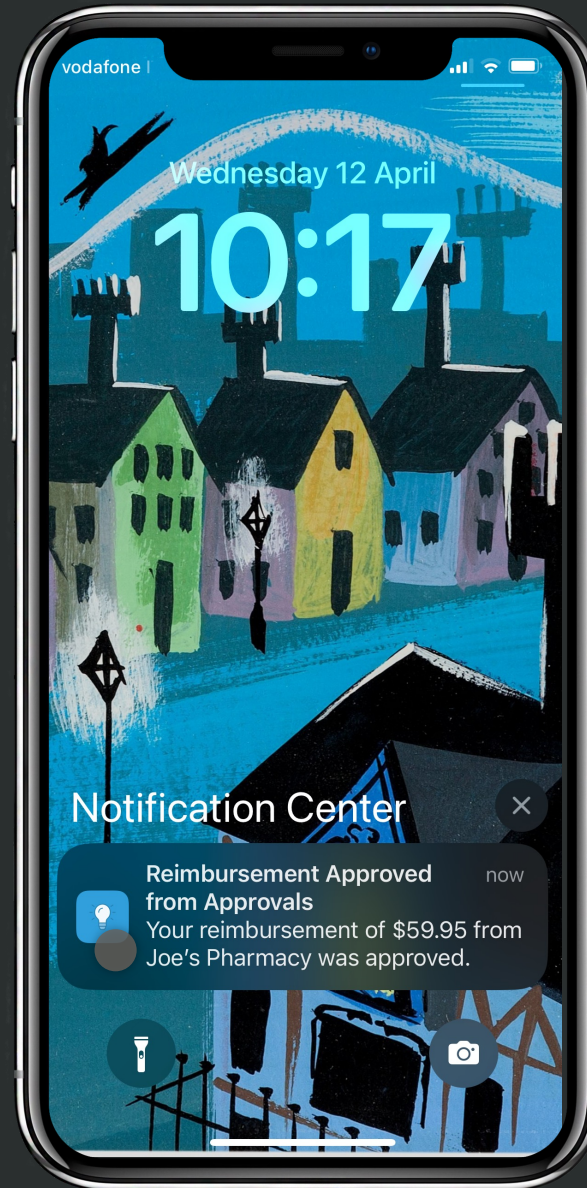
Reimbursement Request History

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

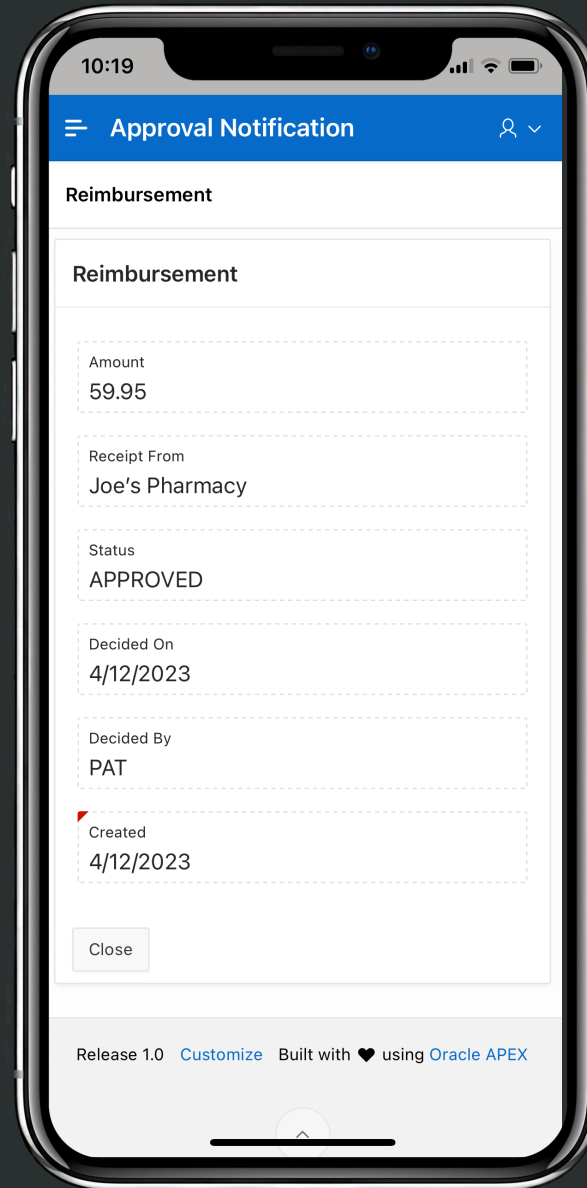
Submitting an Reimbursement Request from iPhone



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 displays the Oracle APEX Page Designer interface for 'Application 109'. The top navigation bar includes 'APEX', 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery'. A search bar and user profile 'steve demo' are also present. The main workspace is titled 'Page Designer' and shows 'Page 8: Notify Customer'.

The left sidebar contains a tree view of the page structure:

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

The central canvas shows the visual layout of the page. It features a 'Notify Customer' section with a breadcrumb bar and a body containing a 'P8_CUSTOMER_ID' field and a green 'Notify_Customer' button.

The right sidebar shows the configuration for the selected 'Notify_Customer' button:

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



Sending Push Notifications: Page Process

The screenshot displays the Oracle APEX Page Designer interface for 'Application 109'. The left sidebar shows the page lifecycle: 'After Submit', 'Validating', 'Processing', and 'After Processing'. Under 'Processing', the process 'When Notify Customer Clicked' is selected, and its sub-process 'Notify Customer' is highlighted with a green dashed border and a mouse cursor. A yellow arrow points from this process to the 'Process' configuration panel on the right. The 'Process' panel shows the 'Identification' section with 'Name' set to 'Notify Customer' and 'Type' set to 'Send Push Notification'. The 'Execution Chain' is 'When Notify Customer Clicked' and the 'Editable Region' is '- Select -'. The 'Settings' section shows 'To' as '&APP_USER.', 'Title' as 'Reimbursement &P8_OUTCOME.', and 'Body' as 'Your reimbursement of &P8_AMOUNT. from &P8_FROM. was &P8_OUTCOME.'. The 'Link Target' is 'Page 7'. The 'Execution' section is also visible. The central canvas shows the 'Notify Customer' process being configured, with a 'Breadcrumb' component and a 'REGION CONTENT' area. The 'BODY' section contains a 'P8_CUSTOMER_ID' field and a 'Notify_Customer' button.



Sending Push Notifications: PL/SQL API from Task Def

APEX

App Builder

SQL Workshop

Team Development

Gallery

Search

smuench

SM

smuench

Application 223

Shared Components

Task Definitions

Edit Page 1

Task Definitions

Utilization

History

Q

Go

Actions

Copy

Create

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

1 - 1

Task Definitions

Task Definitions define the participants, parameters and actions for a task that requires human action - also called the human task.
[Learn More ...](#)

Recently Edited

Claim Approval

smuench

smuench

en

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Oracle APEX 23.1.0-14

Sending Push Notifications: PL/SQL API from Task Def

APEX

App Builder

SQL Workshop

Team Development

Gallery

Search

smuench

smuench

Application 223

Shared Components

Task Definitions

Claim Approval

Cancel

Delete

Apply Changes

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

CancelDeleteApply Changes

Show AllNameSettingsDeadlineParticipantsParametersActionsCommentsLast Updated

Click Add Row to create the first Parameter.

ActionsAdd Action

Search: All Text ColumnsGoActions EditReset

On Event

		Name	Outcome	Execution Sequence ↑	Action Type
On Event: Complete					
<input checked="" type="checkbox"/>	<input type="checkbox"/>		Notify Approve or Reject	10	Execute Code

1 rows selectedTotal 1

Comments

Comments



Sending Push Notifications: PL/SQL API from Task Def

The screenshot shows the APEX 'Edit Action' page for a task definition. The breadcrumb trail is 'Application 223 \ Shared Components \ Task Definitions \ Claim Approval \ Edit Action'. The page title is 'Edit Action'. There are three tabs: 'Show All', 'Action', and 'Code'. The 'Action' tab is selected. The form contains the following fields:

- Name:** Notify Approve or Reject
- Type:** Execute Code
- Execution Sequence:** 10
- On Event:** Complete
- Outcome:** Radio buttons for 'Approved' and 'Rejected'.
- Success Message:** A text area for entering a success message.

Buttons at the top right include 'Cancel', 'Delete', and 'Apply Changes'. A sidebar on the right contains the text: '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.'

At the bottom left, there is a 'Code' tab and a mouse cursor pointing at it.

Sending Push Notifications: PL/SQL API from Task Def

Edit Action

CancelDeleteApply Changes

Show AllActionCodeError HandlingServer Side ConditionAdvanced


Code ?


↶↷🔍A::✓⚙️

```
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

Edit Action

CancelDeleteApply Changes

Show AllActionCodeError HandlingServer Side ConditionAdvanced

Code ?

↶↷🔍A::✔⚙️

```
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
```

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

▶ Examples

Error Handling

Sending Push Notifications: PL/SQL API from Task Def

Edit Action

Cancel

Delete

Apply Changes

Show All

Action

Code

Error Handling

Server Side Condition

Advanced

Code ?

↶

↷

🔍

A: ✓

⚙️

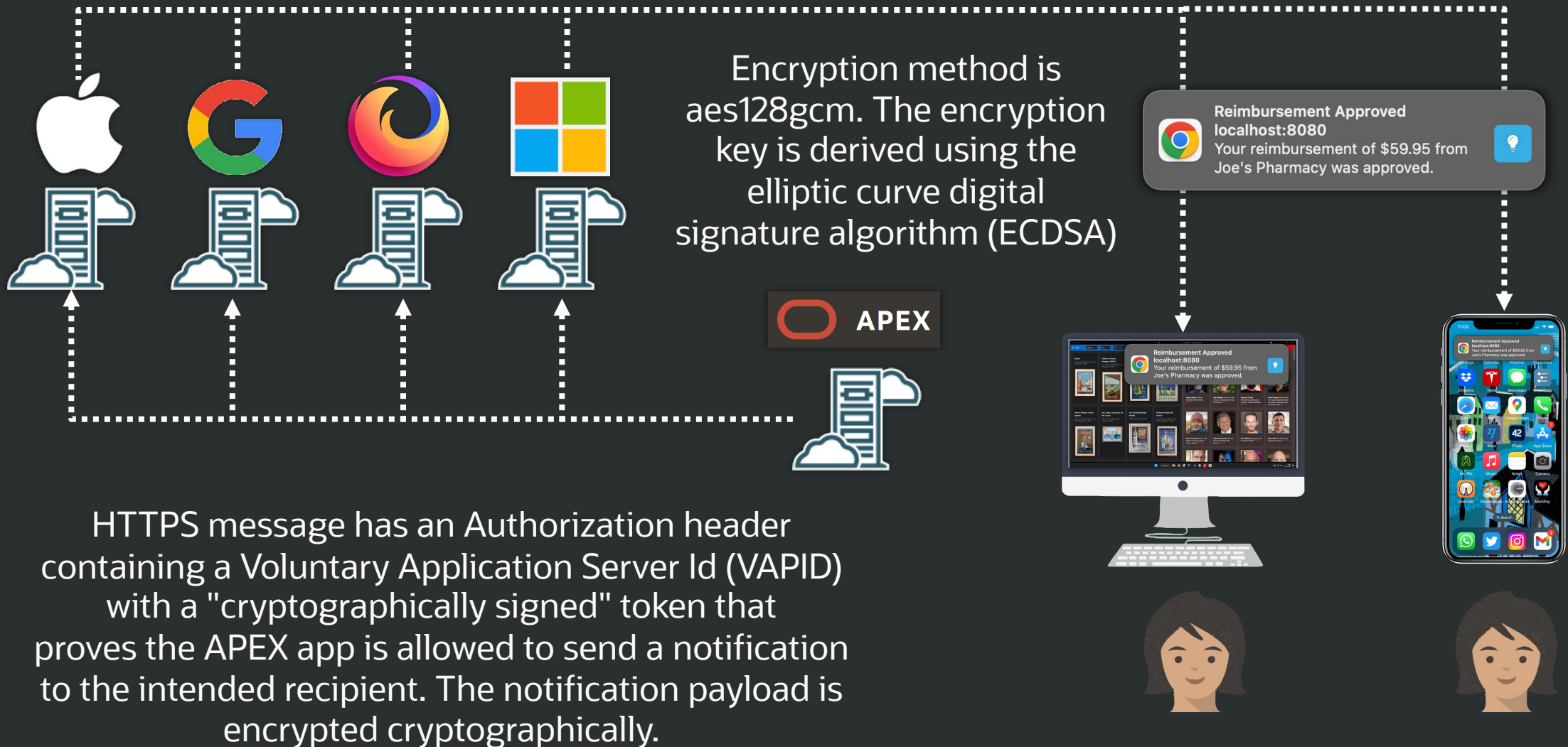
```
1 apex_pwa.send_push_notification(  
2     p_user_name => :CREATED_BY,  
3     p_title      => 'Reimbursement '||initcap(:APEX$TASK_OUTCOME),  
4     p_body       => 'Your reimbursement of ' || :AMOUNT || ' from ' || :RECEIPT_FROM ||  
5     ' was ' || lower(:APEX$TASK_OUTCOME)||'.',  
6     p_target_url => 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



Enabling Push Notifications Support in an Existing App

The screenshot displays the APEX App Builder interface for 'Application 109'. The top navigation bar includes the APEX logo, 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery'. A search bar and user profile 'ST steve demo' are on the right. The main area shows the 'Progressive Web App' configuration tab, with sub-tabs for 'Definition', 'Security', 'Globalization', 'User Interface', and 'Progressive Web App'. The 'Push Notifications' sub-tab is selected, indicated by a yellow arrow. Below the sub-tabs, the 'Push Notifications' section is highlighted with a yellow box. It contains a toggle switch labeled 'Enable Push Notifications' which is currently turned on. To the right of the toggle is a help icon (?). Below the toggle, there is a section for 'Credentials' with a button 'App 109 Push Notifications' and a 'Regenerate Credentials' button. Further down, there is a 'Settings Page' section with the text '20010. Push Notifications' and a help icon (?). At the bottom, there is a 'Contact Email' field with a help icon (?). On the right side of the interface, there is an 'About' section with the text 'Edit the Progressive Web App attributes for this application.' and a 'Learn More ...' link. At the bottom right, there is a red square button with the APEX logo.

APEX App Builder SQL Workshop Team Development Gallery

Application 109 \ Progressive Web App

Definition Security Globalization User Interface Progressive Web App

Application 109

Cancel Apply Changes

Show All General Installability Push Notifications Service Worker Configuration

Push Notifications

Enable Push Notifications ?

* Credentials App 109 Push Notifications Regenerate Credentials

Settings Page 20010. Push Notifications ?

Contact Email ?

About

Edit the Progressive Web App attributes for this application.

Learn More ...

Enabling Push Notifications Settings in an Existing App

The screenshot shows the APEX App Builder interface for 'Application 101' in the 'Progressive Web App' mode. The top navigation bar includes 'APEX', 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery'. A search bar and user profile 'steve demo' are also present. The left sidebar shows tabs for 'Definition', 'Security', 'Globalization', 'User Interface', and 'Progressive Web App'. The 'Progressive Web App' tab is active, and a yellow arrow points to the 'Push Notifications' sub-tab. The 'Push Notifications' section is expanded, showing the 'Enable Push Notifications' toggle (turned on), 'Credentials' (App 101 Push Notifications), and a 'Regenerate Credentials' button. The 'Settings Page' section has a '+ Add Settings Page' button highlighted with a yellow box. The 'Contact Email' field is empty. On the right, an 'About' section provides instructions on editing Progressive Web App attributes.

Application 101

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

Cancel **Apply Changes**

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

Push Notifications

Enable Push Notifications ☒ ?

* Credentials App 101 Push Notifications C Regenerate Credentials ?

Settings Page ? **+ Add Settings Page**

Contact Email ?

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

Push Notification *Key Pair* is New Kind of Credential

APEX

App Builder

SQL Workshop

Team Development

Gallery

Search

?

steve demo

Workspace Utilities

Web Credentials

Create/Edit

Web Credentials

Cancel

Delete

Apply Changes

Attributes

Name

App 109 Push Notifications Credentials

?

Static ID

App_109_Push_Notifications_Credentials

?

Authentication Type

Key Pair

?

Public Key

BJP5JnaFawNZEvs5LexE-
Nj8ZcCg_-0phGiKq304vmGLJP9C0IjFam90o0dcE03jiEYpMkcS1YYCjtilpUSZ8BM

?

Private Key

?

Verify Private Key

?

Web Credentials

Store authentication credentials for external REST services or REST Enabled SQL services.

The Client Secret will be stored encrypted, and it can only be used by Oracle APEX and cannot be retrieved in clear text.

Also, credential information will not be included in application export files. After importing an application into the target workspace, prompts will be displayed to re-enter the credentials.

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

The screenshot shows the APEX App Builder interface. At the top, there's a navigation bar with 'APEX', 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery'. A search bar and user profile 'ST steve demo' are on the right. Below the navigation bar, the breadcrumb 'Application 109 \ Progressive Web App' is shown. The main area has tabs for 'Definition', 'Security', 'Globalization', 'User Interface', and 'Progressive Web App'. The 'Progressive Web App' tab is active, showing 'Application 109' with 'Cancel' and 'Apply Changes' buttons. Below this, there are sub-tabs: 'Show All', 'General', 'Installability', 'Push Notifications' (selected), and 'Service Worker Configuration'. The 'Push Notifications' section includes a toggle for 'Enable Push Notifications' (turned on), a 'Credentials' field with a 'Regenerate Credentials' button (highlighted with a yellow box and a mouse cursor), a 'Settings Page' field with the value '20010. Push Notifications', and a 'Contact Email' field.

Application 109

Cancel Apply Changes

Push Notifications

Enable Push Notifications ☒ ?

* Credentials App 109 Push Notifications

Settings Page 20010. Push Notifications ?

Contact Email ?

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

The screenshot shows the APEX App Builder interface for 'Application 109'. The top navigation bar includes 'APEX', 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery'. A search bar and user profile 'ST steve demo' are on the right. The left sidebar shows tabs for 'Definition', 'Security', 'Globalization', 'User Interface', and 'Progressive Web App'. The main content area is titled 'Application 109' and has tabs for 'Show All', 'General', 'Installability', 'Push Notifications', and 'Service Worker'. The 'Push Notifications' tab is active, showing a toggle for 'Enable Push Notifications' (which is turned on) and a section for 'Credentials' with a value of 'App 109 Push Notifications'. A modal dialog is centered on the screen, asking for confirmation to regenerate the public and private keys. The dialog text states: '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.' The dialog has 'Cancel' and 'Regenerate Credentials' buttons. A mouse cursor is pointing at the 'Regenerate Credentials' button. In the background, the 'Apply Changes' button is visible in the top right of the settings area.

Application 109

Cancel Apply Changes

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

Push Notifications

Enable Push Notifications ☒ ?

* Credentials App 109 Push Notifications ?

Settings Page 20010. Push Notifications ?

Contact Email ?

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.

Cancel Regenerate Credentials

About

Edit the Progressive Web App attributes for this application.

[Learn More ...](#)

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

The screenshot displays an Oracle APEX application interface with a blue header bar labeled "Approval Notification". The main content area is titled "Home" and includes a "Manage Reimbursements" link. A browser DevTools window is open, showing a console error: "Push subscription error: Failed to execute 'subscribe' on 'PushManager': The provided applicationServerKey is not valid." This error message is highlighted with a yellow box. To the right, a "Settings - Push Notifications" dialog is open, featuring a yellow error banner that reads "1 error has occurred" and "This device failed to enable push notifications." Below the banner, a blue bell icon is shown, followed by explanatory 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." At the bottom of the dialog, there is a checked checkbox labeled "Enable push notifications on this device". The footer of the application shows "Release 1.0", a "Customize" link, and a note "Built with ❤️ using Oracle APEX". The bottom status bar includes "ORACLE INTERNAL", "App 11143", "Page 20010", and various utility icons like "Session", "Debug", "Quick Edit", and "Customize".

Push Notification Target URL: Open App & Detail Page

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

The screenshot shows a web browser with two windows. The background window is titled 'Conference - Speaker Lineup' and has a red header with 'VIEW Conference 2022'. The foreground window is titled 'Approval Notification - Reimbursement' and displays a 'Reimbursement' detail page. A push notification is visible in the top right corner of the browser, with a Chrome icon, the text 'Reimbursement Approved localhost:8080', and 'Your reimbursement of \$59.95 from Joe's Pharmacy was approved.' A yellow arrow points from the notification to the 'Status APPROVED' field on the detail page.

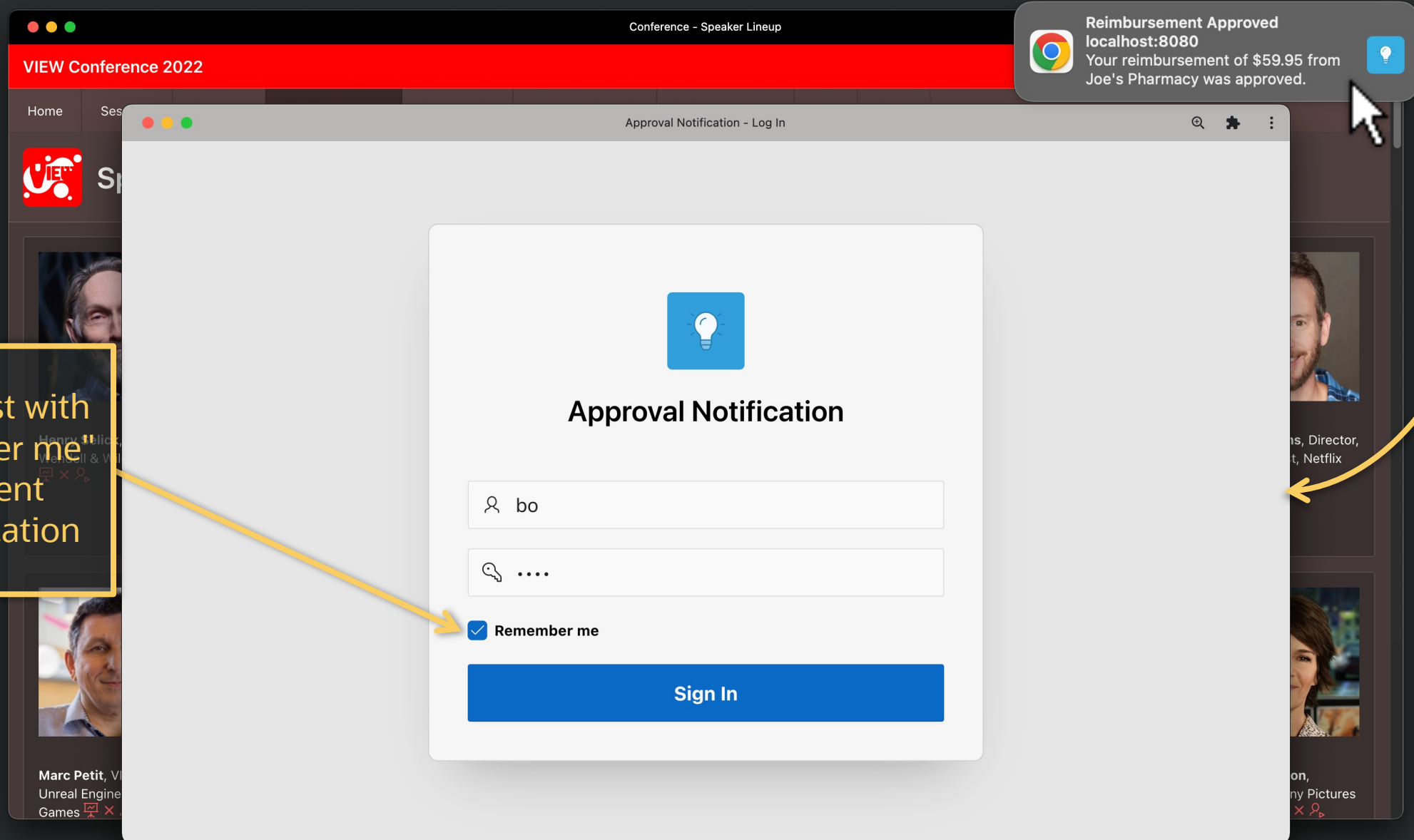
Reimbursement

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

Close

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 displays the APEX App Builder interface for configuring a page. The top navigation bar includes the APEX logo, 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery' tabs, along with a search bar and user profile. The main workspace is titled 'Application 109 \ Page Designer' and shows a page named 'Page 7: Reimbursement Notification'.

The left sidebar contains a tree view of the page structure:

- Pre-Rendering
 - Before Header
 - Branches
 - Forward to Reimbursement
 - Forward to Manage
 - After Header
 - Before Regions
- Components
 - Body
 - P7_ID
- Post-Rendering

The central canvas shows the page layout with regions: BANNER, AFTER LOGO, BEFORE NAVIGATION BAR, AFTER NAVIGATION BAR, TOP NAVIGATION, BREADCRUMB BAR, FULL WIDTH CONTENT, and BODY.

The right sidebar shows the 'Page' properties panel, with the 'Security' section expanded. The 'Security' section includes the following settings:

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

The 'Advanced' section is collapsed, and the 'Session Management' section is expanded, showing the 'Rejoin Sessions' setting set to 'Enabled for All Sessions'.

Yellow arrows point from the 'Page Access Protection' and 'Rejoin Sessions' settings to a red circle in the bottom right corner of the image.

Need to Enable Instance Level Rejoin Sessions

Security Settings

Authorized URLs

Security

Cancel

Apply Changes

Show All

Security

HTTP Protocol

Real Application Security

Session Timeout

Workspace Isolation

Region and Web Service E

Disable Administrator Login

No

?

Disable Workspace Login

No

?

Allow Public File Upload

No

?

Restrict Access by IP Address

?

Instance Proxy

?

Checksum Hash Function

Disabled

?

Rejoin Sessions

Enabled for Public Sessions

✓ Enabled for All Sessions

?

Unhandled Errors

Show Error Page

?

HTTP Protocol



Conditional Branch to Authenticated Detail Page

The screenshot displays the Oracle APEX App Builder interface. The top navigation bar includes the APEX logo, 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery' menus, along with a search bar and user profile. The main workspace is titled 'Application 109 \ Page Designer' and shows a wireframe of 'Page 7: Reimbursement Notification' with regions like BANNER, AFTER LOGO, BEFORE NAVIGATION BAR, AFTER NAVIGATION BAR, TOP NAVIGATION, BREADCRUMB BAR, FULL WIDTH CONTENT, and BODY.

On the left, the 'Page 7: Reimbursement Notification' tree is expanded to 'Pre-Rendering' > 'Branches'. Two branches are listed: 'Forward to Reimbursement' (highlighted with a green background and a mouse cursor) and 'Forward to Manage' (with a red background). The 'Forward to Reimbursement' branch is selected, and its configuration is shown in the right-hand 'Branch' panel.

The 'Branch' panel on the right has the following settings:

- Behavior:** Type is 'Page or URL (Redirect)', Target is 'Page 6'.
- Server-side Condition:** When Button Pressed is '- Select -'. The condition is highlighted with a yellow box and contains the following SQL query:

```
select null
from eba_demo_reimbursement
where id = :P7_ID
and created_by = :APP_USER
```
- Security:** This section is partially visible at the bottom.

If Behind a Firewall, Need to Configure Proxy Server

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



Manage Instance \ Security

Security Settings Authorized URLs

Security

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

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

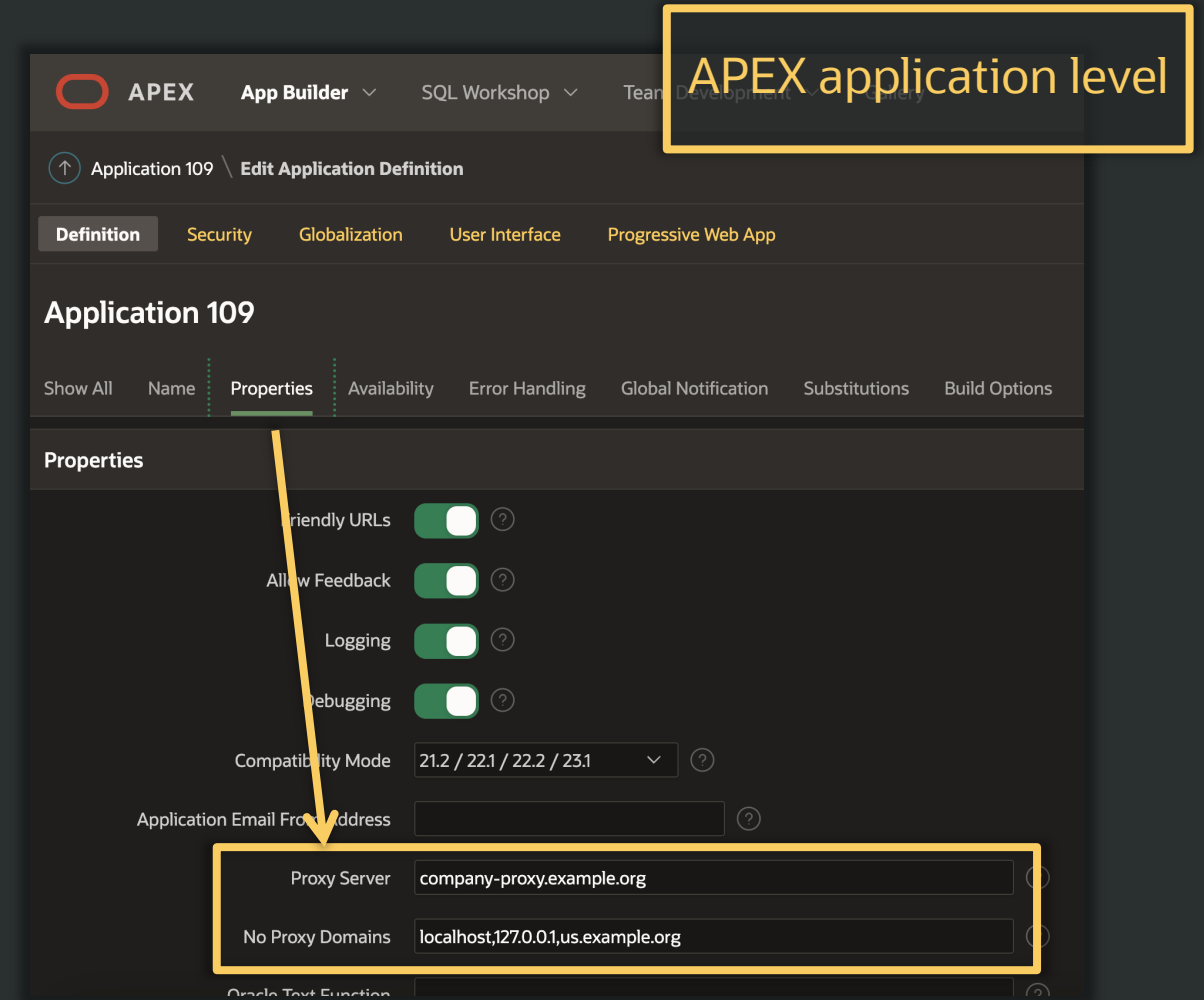
Set Workspace Cookie	Yes	?
Allow Persistent Auth	Yes	?
Persistent Authentication Lifetime Days	30	?
Disable Administrator Login	No	?
Disable Workspace Login	No	?
Allow Public File Upload	No	?
Restrict Access by IP Address		?
Instance Proxy	company-proxy.example.org	?
Instance No Proxy Domains	localhost,127.0.0.1,us.example.org	?

A yellow box highlights the "Instance Proxy" and "Instance No Proxy Domains" fields. A yellow arrow points from the "Security" tab in the top navigation bar to the "Instance Proxy" field.

APEX instance level

If Behind a Firewall, Need to Configure Proxy Server

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



APEX_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	
Title and Copyright Information	
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	
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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

Search or jump to... Pull requests Issues Codespaces Marketplace Explore

Dani3lSun / oracle-ca-wallet-creator Public Watch 7 Fork 4 Star 29

<> Code Issues 1 Pull requests Actions Projects Security Insights

master 1 branch 0 tags Go to file Add file <> Code

Commit	Author	Date	Commits
48eb833	Daniel Hochleitner	on Feb 18, 2020	2 commits

File	Commit	Time
LICENSE.md	initial commit	4 years ago
README.md	initial commit	4 years ago
create_ca_wallet.sh	changed url to certdata2pem.py file --> alpin...	3 years ago

README.md

Oracle CA Wallet Creator

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

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

The script uses CA certificates data from [Mozilla CA Certificate Store](#), which is used by Firefox for example.

Installation

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

Or just download the script here from [GitHub](#)

Usage

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

About

Script to create a Oracle Wallet containing all valid root CA certificates

Readme

MIT license

29 stars

7 watching

4 forks

Report repository

Releases

No releases published

Packages

No packages published

Languages

Shell 100.0%



<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 Logs and Files

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

Push Notifications Queue

APEX

Manage Requests

Manage Instance

Manage Workspaces

Monitor Activity

AD

admin

internal

Manage Instance

Instance Settings

Manage Shared Components

About

APEX

Manage Requests

Manage Instance

Manage Workspaces

Monitor Activity

AD

admin

internal

Manage Instance

Push Notifications Queue

Force Push Queue

Push Queue

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.

Search: All Text Columns

Go

Actions

Save

Reset

<input checked="" type="checkbox"/>		Workspace	Application	User Name	Title	Body	Icon URL	Target URL	Send Attempts	Error Message	Created On
<input checked="" type="checkbox"/>		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

Manage Site-Specific Resources

Self Service Sign Up

Push Notification Subscriptions View

APEX_APPL_PUSH_SUBSCRIPTIONS

Approval Notification - Subscriptions

pat

Home

Approval Queue

Notifications Queue

Approval Admin

Subscriptions

Subscriptions

Q

Go

Actions

Application Id	Application Name	Push Subscription Id	User Name	Subscription Interface
109	Approval Notification	1886321305964118	BO	{"endpoint": "https://fcm.googleapis.com/fcm/send/dNn9KxcFfOI:APA91bH48bU-8p5inffCT4CXUCcabllegUrYnaLpXYzp4nGAXSulJi_82d-4iK_Bop9KVamQxI2-RizPwRTDx8s7DiscZkLW1P80X", "e": {"p256dh": "BLQpidZJt2N1oEfwGLQW71BDx09o3qiP6phFnnRa2kLfBSX7NLdCpKrvIAXZlAcgzxoG

1 - 1

Release 1.0

Customize

Built with

using

Oracle APEX



Push Notifications to Deliver View

APEX_PUSH_NOTIFICATIONS_QUEUE

Approval Notification

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

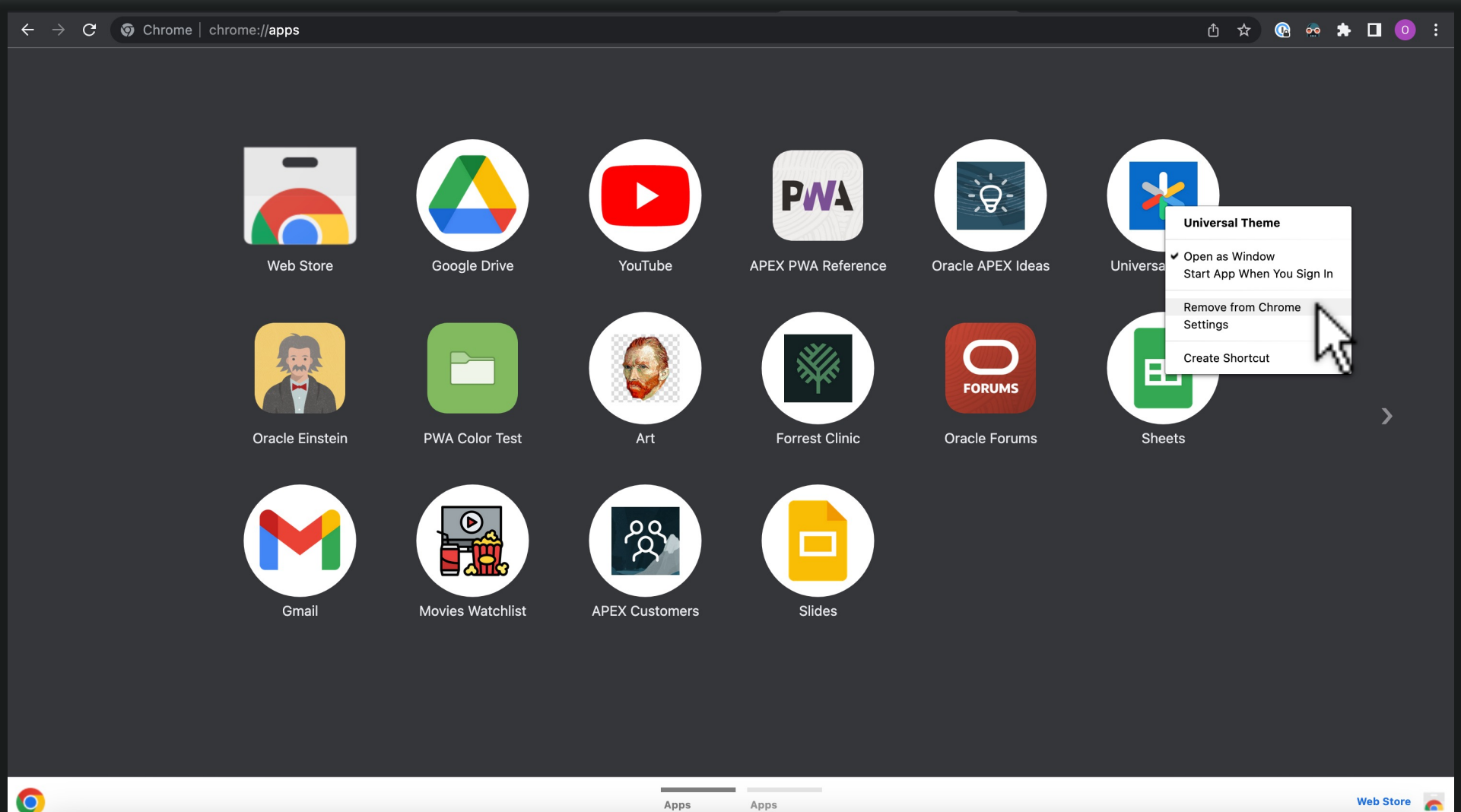
Built with

using

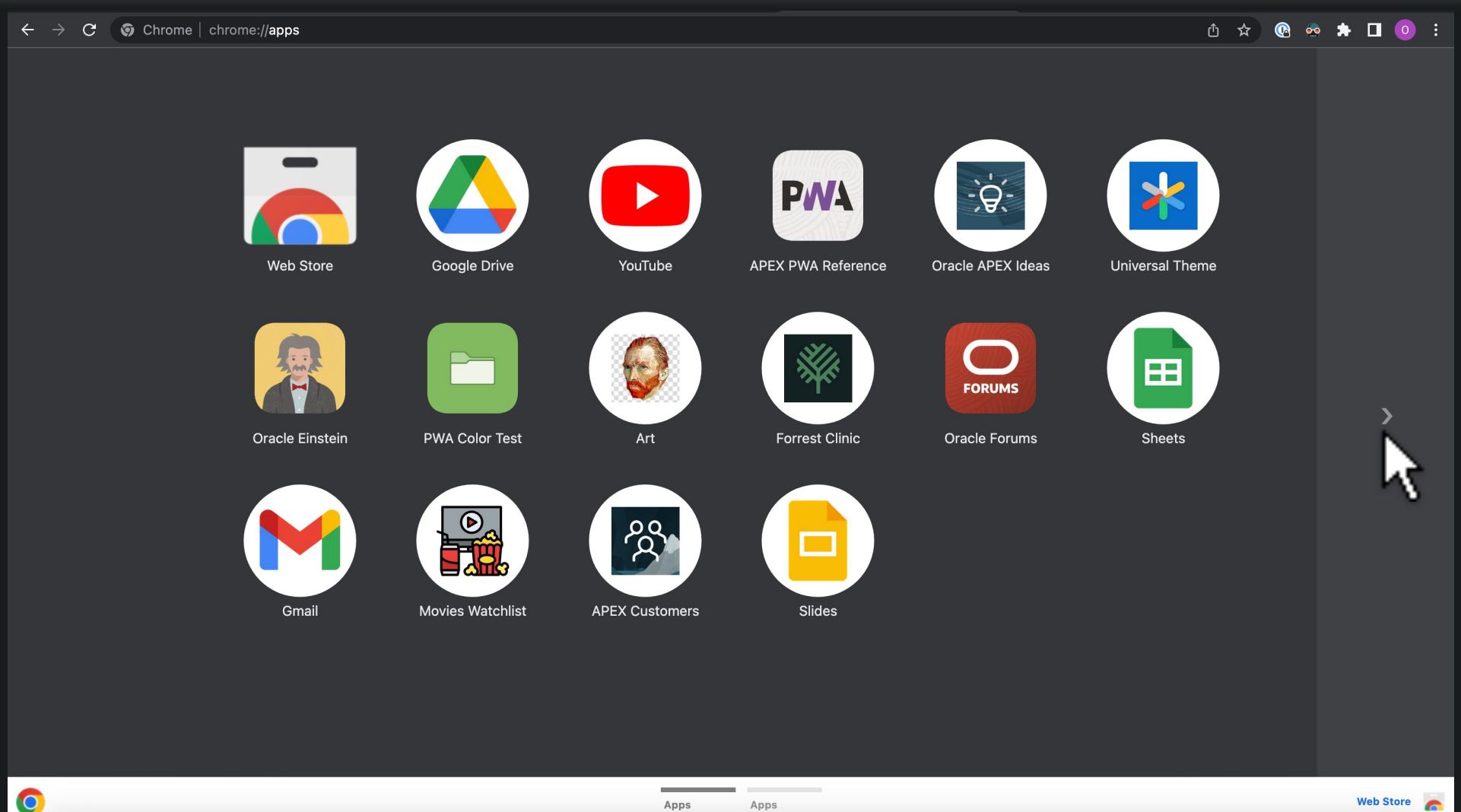
Oracle APEX



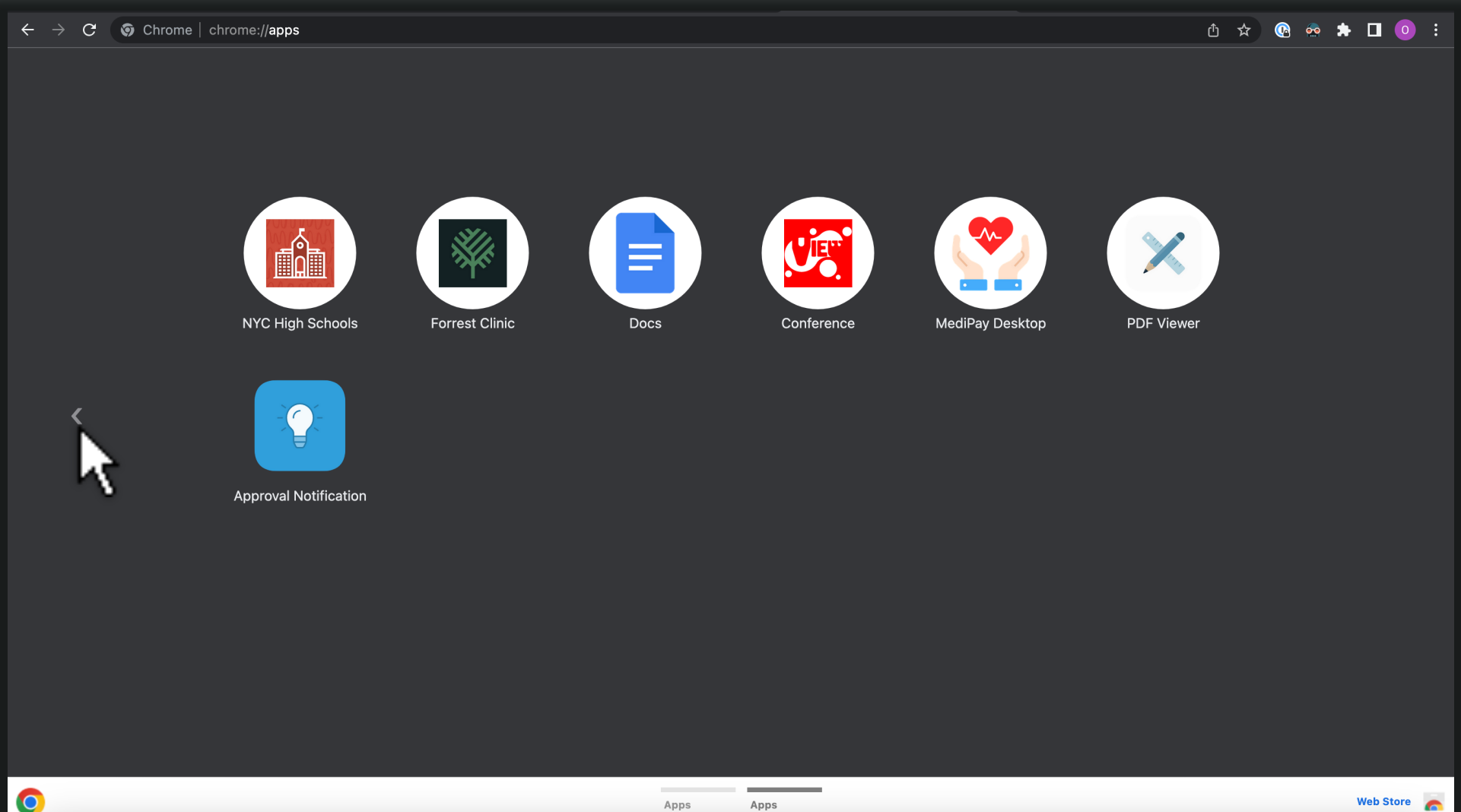
Chrome PWA Apps Management chrome://apps



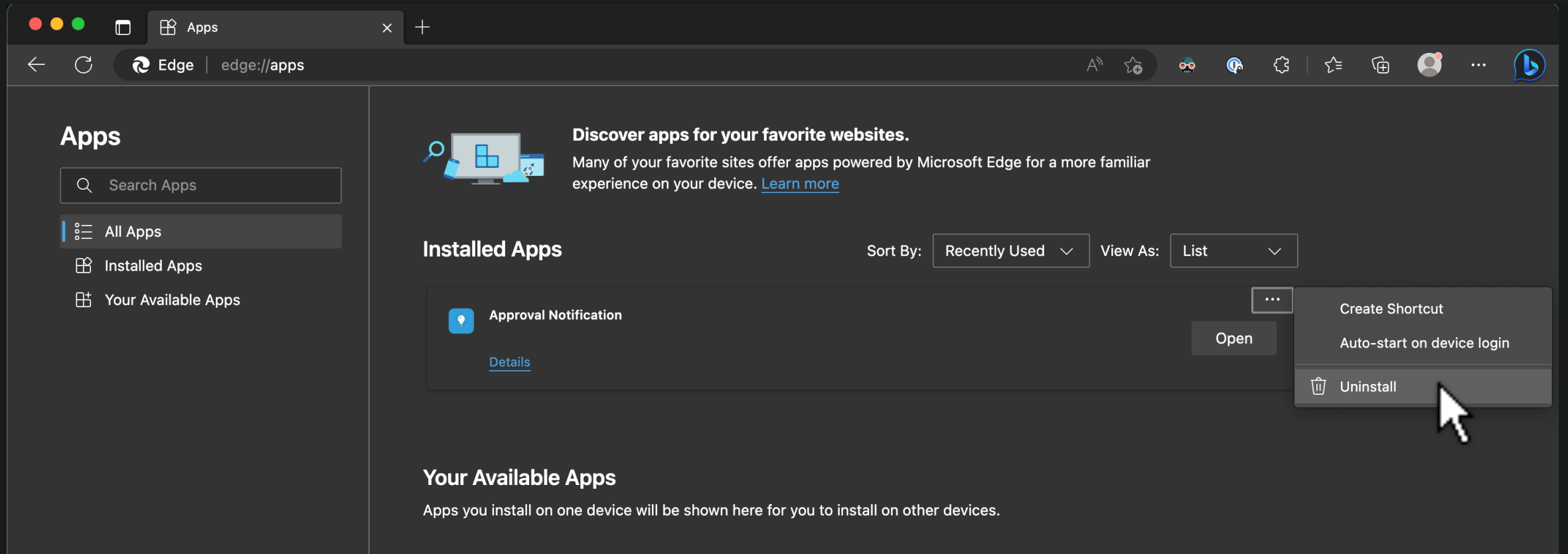
Chrome PWA Apps Management chrome://apps



Chrome PWA Apps Management chrome://apps



Edge PWA Apps Management `edge://apps`



PWA Reference App apex.oracle.com/pwa

APEX PWA Reference

Install App

Getting Started

Installation

Appearance

App Icon

Push Notifications

Geolocation

Web Share

Always Signed In

Advanced

FAQ

Roadmap

Push Notifications

Show All Overview Compatibility Push Notifications Users Permission Public API Examples

Compatibility

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

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

Last updated: April 2023

Managing Push Notifications

Application 651

General

Push Notifications

Service Worker Configuration

General

Enable Progressive Web App

Installable

Push Notifications

Instructions

1. In App Builder go to Shared Components

2. Go to Progressive Web App

3. Turn on Enable

APEX PWA Reference

Universal Theme Reference App apex.oracle.com/ut

Universal Theme


Getting Started

Design

Components

Icons

Reference

 **APEX Universal Theme**


About


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


Getting Started


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


Explore Universal Theme


Design


Components


Migration Guide


Icons

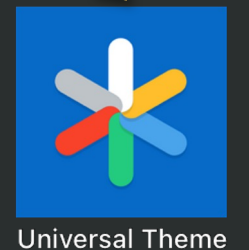

Reference


Install App

RTL

Theme Version

Theme Style

The logo for Universal Theme, featuring a stylized 'X' shape composed of five overlapping colored bars (white, yellow, blue, green, and red) on a blue square background.

The Oracle logo, a white 'O' inside a red square.

APEX 23.1

Easy Background Processing

APEX Page Processes: Extensible, Declarative Actions

The screenshot displays the APEX Page Designer interface for 'Application 100'. The top navigation bar includes 'APEX', 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery'. A search bar and user profile 'steve demo' are also present. The main workspace is divided into three panels: 'Layout', 'Page Search', and 'Help'. The 'Layout' panel shows a 'Department' form with a 'CONTENT BODY' containing a 'Department' region with two input fields, 'P3_DNAME' and 'P3_LOC', and an 'Info' region. The 'Process' panel on the right shows a dropdown menu for 'Built-in Components'. The menu is open, showing a list of actions. The 'Form - Automatic Row Processing (DML)' option is highlighted with a blue bar and a mouse cursor. The 'Settings' section is also visible, showing 'Target Type' and 'Return Primary Key(s) after Insert'.

Navigation Bar: APEX, App Builder, SQL Workshop, Team Development, Gallery, Search, User: steve demo

Page Designer: Application 100 \ Page Designer

Layout Panel: Department, CONTENT BODY, Department, REGION BODY, P3_DNAME, P3_LOC, REGION CONTENT, Info, REGION CONTENT

Process Panel: 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 Menu:

- 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 displays the APEX Page Designer interface for 'Application 100'. The top navigation bar includes 'APEX', 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery'. A search bar and user profile 'steve demo' are also present. The main workspace is divided into three panels: 'Layout', 'Page Search', and 'Help'. The 'Layout' panel shows a 'Department' form with a 'CONTENT BODY' containing a 'Department' region with two input fields, 'P3_DNAME' and 'P3_LOC', and an 'Info' region. The 'Page Search' panel is empty. The 'Help' panel shows a 'Process' configuration for 'Save and Process' with a 'Server-side Condition' set to 'SAVE_AND_PROCESS' when the button is pressed. The 'Process' panel also includes sections for 'Identification', 'Source', 'Execution', 'Success Message', 'Error', 'Security', and 'Configuration'. The 'Server-side Condition' section is highlighted with a yellow box.

Navigation Bar: APEX, App Builder, SQL Workshop, Team Development, Gallery, Search, User: steve demo

Page Designer: Application 100 \ Page Designer

Layout Panel: Department, CONTENT BODY, Department, REGION BODY, P3_DNAME, P3_LOC, REGION CONTENT, Info, REGION CONTENT

Process Panel: Filter, Identification, Source, Execution, Success Message, Error, Server-side Condition (highlighted), Security, Configuration

Server-side Condition Configuration:

- When Button Pressed: SAVE_AND_PROCESS
- Type: - Select -

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

The screenshot displays the APEX Page Designer interface for 'Application 100'. The left sidebar shows the 'Processes' section with a list of processes: 'Process form Department', 'Save and Process', and 'Close Dialog'. A mouse cursor is hovering over the 'Save and Process' item, which is highlighted with a green background. The main workspace shows a 'Department' form with a 'CONTENT BODY' containing two input fields: 'P3_DNAME' and 'P3_LOC'. The right sidebar shows the 'Process' configuration panel, which is divided into sections: 'Identification', 'Execution', 'Success Message', 'Error', and 'Server-side Condition'. The 'Identification' section is expanded, showing 'Source' as the selected type. The 'PL/SQL Code' field contains the text 'some_long_running_process;'. A large, semi-transparent loading spinner is overlaid on the 'PL/SQL Code' field, indicating that the process is long-running and the user is waiting.

APEX App Builder SQL Workshop Team Development Gallery

Application 100 Page Designer

Layout Page Search Help

Department

CONTENT BODY

Department

REGION BODY

P3_DNAME

P3_LOC

REGION CONTENT

Info

REGION CONTENT

Process

Filter

Identification

Source

Location Local Database

Language PL/SQL

PL/SQL Code

some_long_running_process;

Execution

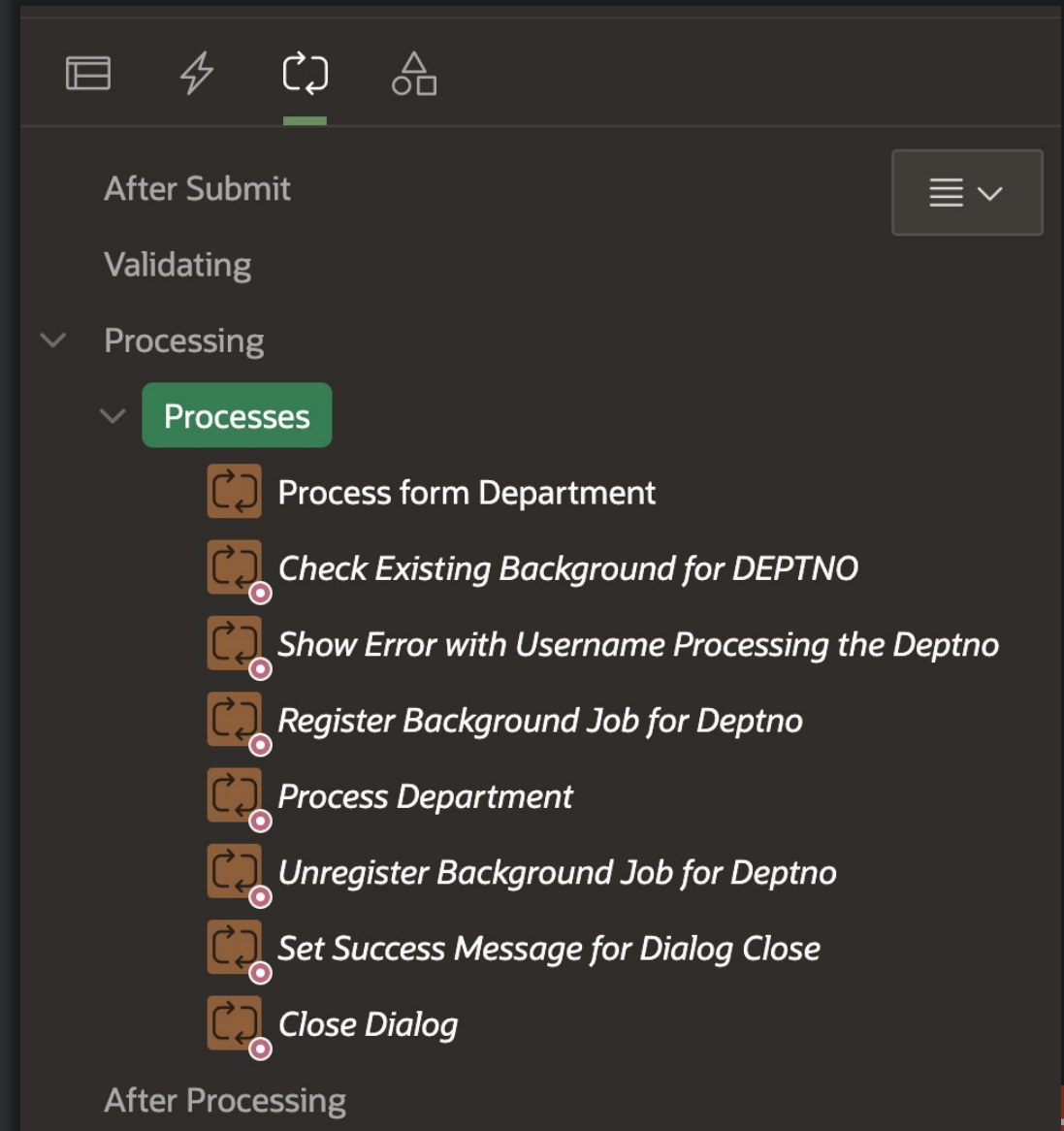
Success Message

Error

Server-side Condition

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

APEX App Builder SQL Workshop Team Development Gallery Search

SA smuench APEX222 smuench

Application 116 \ Shared Components \ Automations \ Interesting Job \ **Edit Action**

Edit Action Cancel Delete **Apply Changes**

Show All Action Edit Action Code Error Handling Server Side Condition Advanced

Action

* Name New Action ?

* Type ☒ Execute Code ?
Send E-Mail

* Execution Sequence 10 ?

Code

Location **Local Database** REST Enabled SQL Service ?

Language ☒ PL/SQL ?
JavaScript (M)

Edit Action

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.

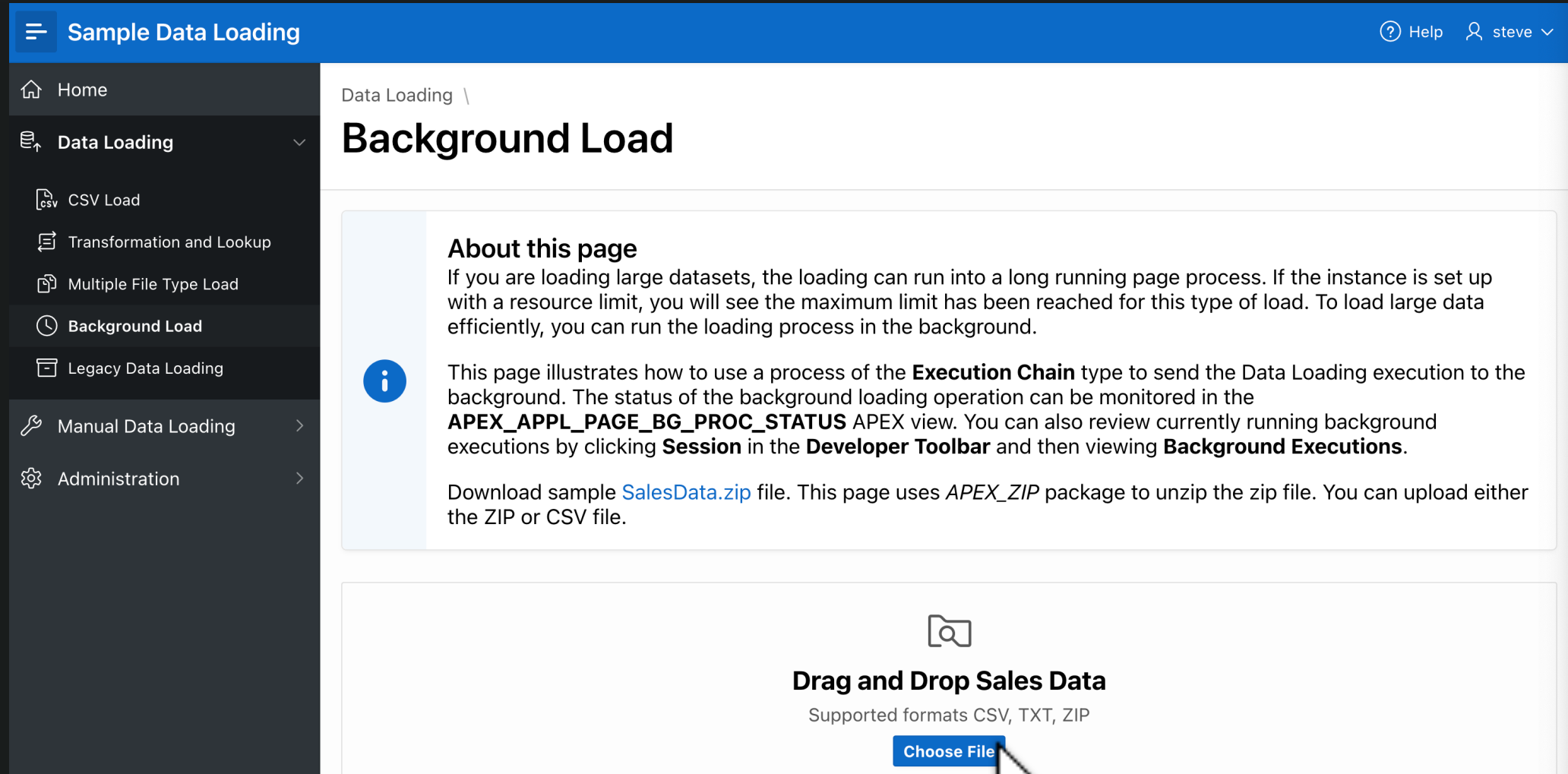
APEX Page Processes: Innovations

- 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

The screenshot displays the APEX Page Designer interface for 'Application 100' in the 'Page Designer' mode. The 'Processing' tab is active, showing a sequence of processes under the 'After Submit' event. The processes are organized into a chain structure, with each process having a chain icon (a square with a circular arrow) next to its name. The chain starts with 'Process form Department', followed by 'Save and Process'. Under 'Save and Process', there is a sub-chain starting with 'Check Existing Background for DEPTNO', followed by 'If Deptno Already Being Processed...', which then branches into 'Show Error with Username Processing the Deptno' and 'Else if Deptno Available to Process...'. The 'Else if Deptno Available to Process...' process has a sub-chain starting with 'Register User Processing Department', followed by 'Process Department in Background' (highlighted with a yellow box). This process has a sub-chain of 'Add Execution Id to Work Tracking Row', 'Process Department', and 'Unregister Background Job for Deptno'. This is followed by 'If Background Process Succeeded...', which has a sub-chain of 'Set Success Message for Dialog Close' and 'Else If Background Process Failed...', which then has a sub-chain of 'Unregister User Processing Department'. The chain ends with 'Close Dialog' under the 'After Processing' event. A callout box on the left shows a close-up of the chain icon.



23.1 Sample Data Loading: *Background Load* Page



The screenshot displays the 'Sample Data Loading' page. The left sidebar contains a navigation menu with the following items: Home, Data Loading (expanded), CSV Load, Transformation and Lookup, Multiple File Type Load, Background Load (selected), Legacy Data Loading, Manual Data Loading, and Administration. The main content area is titled 'Background Load' and includes an information section and a file upload area.

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.



Drag and Drop Sales Data

Supported formats CSV, TXT, ZIP

[Choose File](#)

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

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.

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

Q

Go

Actions

Region	Country	Item Type	Sales Channel	Order Priority	Units Sold	Unit Price	Unit Cost	Total Profit	Last Updated
Europe	Hungary	Snacks	Online		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 displays the APEX App Builder interface for configuring a 'Background Load' page. The interface is divided into three main sections: a left-hand navigation pane, a central canvas, and a right-hand configuration pane.

Left Hand Side (Navigation Pane):

- Application 102 \ Page Designer**
- After Submit**
 - Computations
 - P17_FILE_NAME**
 - Validating
 - Validations
 - Is valid file type**
 - Processing
 - Processes
 - Load Data Background**
 - Processes
 - Load Data** (highlighted with a yellow box and an arrow pointing to the right-hand configuration pane)
 - Unpack ZIP Archive
 - Report Loading Results
 - Clear Cache
 - After Processing
 - Branches
 - View Load Status**

- Ajax Callback

Central Canvas:

- Background Load** (Page Title)
- BREADCRUMB BAR**
 - Breadcrumb** (Page Item)
 - REGION CONTENT
- BODY**
 - About this page** (Page Item)
 - REGION CONTENT
 - Button Bar** (Page Item)
 - REGION CONTENT
 - NEXT
 - CLEAR** (Button)
 - LOAD** (Button)

Right Hand Side (Configuration Pane):

- Process** (Tab)
- Filter** (Search bar)
- Identification**
 - Name: **Load Data**
 - Type: **Data Loading** (highlighted with a yellow box and an arrow pointing from the 'Load Data' process in the left pane)
 - 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: (Empty field)
 - Processed Row Count Item: **P17_PROCESSED_ROWS**

Load Data Child Process In Load Data Background Chain

The screenshot displays the APEX App Builder interface for 'Application 102' in 'Page Designer' mode. The user is 'steve demo'.

Left Panel (Process Flow):

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

Center Panel (Page Layout):

The page layout is titled 'Background Load' and contains three main regions:

- BREADCRUMB BAR:** Contains a 'Breadcrumb' component.
- ABOUT THIS PAGE:** Contains an 'About this page' component.
- BUTTON BAR:** Contains a 'Button Bar' component with 'CLEAR' and 'LOAD' buttons.

Right Panel (Process Configuration):

The 'Process' configuration panel shows the following settings:

- Identification:**
 - Name: Load Data
 - Type: Data Loading
 - Execution Chain:** Load Data Background (highlighted with a yellow box and a yellow arrow pointing from the 'Load Data Background' process in the left panel)
- 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: (empty)
 - Processed Row Count Item: P17_PROCESSED_ROWS

Load Data Background is an Execution Chain Type

APEX

App Builder

SQL Workshop

Team Development

Gallery

Search

Avatar

steve demo

Application 102

Page Designer

17

Go

Save

Layout

Page Search

Help

After Submit

Computations

Validating

Validations

Processing

Processes

After Processing

Branches

P17_FILE_NAME

Is valid file type

Load Data Background

Unpack ZIP Archive

Load Data

Report Loading Results

Clear Cache

View Load Status

Preview

Ajax Callback

Background Load

BREADCRUMB BAR

Breadcrumb

REGION CONTENT

BODY

About this page

REGION CONTENT

Button Bar

REGION CONTENT

NEXT

CLEAR

LOAD

Process

Filter

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

Load Data Background is a Top-Level Execution Chain

The screenshot displays the APEX App Builder interface for 'Application 102' in 'Page Designer' mode. The left sidebar shows a tree view of the application's components, including 'After Submit', 'Computations', 'Validating', 'Validations', 'Processing', 'Processes', and 'After Processing'. The 'Processes' folder is expanded, showing a list of processes: 'Load Data Background', 'Unpack ZIP Archive', 'Load Data', 'Report Loading Results', and 'Clear Cache'. The 'Load Data Background' process is highlighted with a yellow arrow pointing to it.

The main canvas shows the 'Background Load' process configuration. The 'BREADCRUMB BAR' section contains a 'Breadcrumb' component. The 'BODY' section contains two components: 'About this page' and 'Button Bar'. The 'Button Bar' component has a 'NEXT' label and two buttons: 'CLEAR' and 'LOAD'.

The right sidebar shows the 'Process' configuration panel. The 'Identification' section shows the process name as 'Load Data Background' and the type as 'Execution Chain'. The 'Execution Chain' dropdown is set to 'None'. The 'Settings' section shows the following configuration:

- 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

Configuring a Chain to Execute in the Background

The screenshot displays the APEX App Builder interface for configuring a process chain. The top navigation bar includes the APEX logo, 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery' tabs. A search bar and user profile 'steve demo' are also present. The main workspace is titled 'Application 102 \ Page Designer' and contains a 'Background Load' process chain. The left sidebar shows a tree view of the application structure, with 'Load Data Background' selected. The right sidebar shows the 'Process' configuration panel, which is divided into 'Identification' and 'Settings' sections. The 'Execute in Background' toggle is highlighted with a yellow box and a yellow arrow pointing to it from the 'Load Data Background' process in the left sidebar.

Process Configuration:

- 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

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

The screenshot displays the APEX App Builder interface for 'Application 102' in 'Page Designer' mode. The left sidebar shows a tree view of the application components, including 'After Submit', 'Computations', 'Validating', 'Validations', 'Processing', 'Processes', and 'After Processing'. The 'Processes' section is expanded, showing a list of processes: 'Load Data Background', 'Unpack ZIP Archive', 'Load Data', 'Report Loading Results', and 'Clear Cache'. The 'Load Data Background' process is highlighted with a yellow arrow pointing to its settings in the right-hand pane.

The right-hand pane shows the configuration for the 'Load Data Background' process. The 'Identification' section includes the Name 'Load Data Background', Type 'Execution Chain', and Execution Chain 'None'. The 'Settings' section includes the following configurations:

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

The central canvas shows the page layout with a 'Background Load' section containing a 'Breadcrumb' and a 'Button Bar' with 'CLEAR' and 'LOAD' buttons. The bottom of the interface includes a 'Preview' button and an 'Ajax Callback' label.

Storing ID of Background Execution in a Page Item

The screenshot displays the APEX App Builder interface for 'Application 102' in 'Page Designer' mode. The left sidebar shows a tree view of the page components, including 'After Submit', 'Computations', 'Validating', 'Validations', 'Processing', 'Processes', and 'After Processing'. The 'Processes' section is expanded, showing a list of processes: 'Load Data Background', 'Unpack ZIP Archive', 'Load Data', 'Report Loading Results', and 'Clear Cache'. The 'Load Data Background' process is highlighted with a yellow arrow pointing to its configuration panel on the right.

The configuration panel for 'Load Data Background' is titled 'Process' and includes the following settings:

- 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

The main canvas shows the page layout with a 'Background Load' region containing a 'Breadcrumb' and 'REGION CONTENT'. Below this is a 'BODY' region with an 'About this page' section and a 'Button Bar' containing 'CLEAR' and 'LOAD' buttons. The 'LOAD' button is highlighted with a yellow arrow pointing to the 'Return Execution ID into Item' setting in the configuration panel.

Choose How to Handle Temp Files in Session State Clone

The screenshot displays the APEX App Builder interface for 'Application 102' in 'Page Designer' mode. The left sidebar shows a tree view of the application structure, including 'After Submit', 'Computations', 'Validating', 'Validations', 'Processing', 'Processes', and 'After Processing'. The 'Processes' section is expanded, showing a list of processes: 'Load Data Background', 'Unpack ZIP Archive', 'Load Data', 'Report Loading Results', and 'Clear Cache'. A yellow arrow points from the 'Load Data Background' process name to the settings panel on the right.

The settings panel for the 'Load Data Background' process is shown on the right. It includes sections for 'Identification' and 'Settings'. The 'Temporary File Handling' dropdown is highlighted with a yellow box, showing the options: 'Ignore', 'Move' (selected), and 'Copy'. The 'Temporary File Items' field is set to 'P17_FILE'.

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** (selected)
- Temporary File Items: P17_FILE
- Executions Limit: 1

Impose Per-Session Limit on Background Executions

APEX

App Builder

SQL Workshop

Team Development

Gallery

Search

steve demo

Application 102

Page Designer

17

Go

Save

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

Filter

Identification

NameLoad Data Background

TypeExecution Chain

Execution ChainNone

Settings

Execute in Background

Serialize Executions

Return Execution ID into ItemP17_LOAD_EXEC_ID

Temporary File HandlingMove

Temporary File ItemsP17_FILE

Executions Limit1

After Submit

Computations

P17_FILE_NAME

Validating

Validations

Is valid file type

Processing

Processes

Load Data Background

Processes

Unpack ZIP Archive

Load Data

Report Loading Results

Clear Cache

After Processing

Branches

View Load Status

Preview

Ajax Callback

In Any Execution Chain, Child Processes Run Sequentially

APEX

App Builder

SQL Workshop

Team Development

Gallery

Search

steve demo

Application 102 \ Page Designer

17

Go

Save

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

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

Filter

Identification

Name

Load Data Background

Type

Execution Chain

Execution Chain

None

Settings

Execute in Background

Serialize Executions

Return Execution ID into Item

P17_LOAD_EXEC_ID

Temporary File Handling

Move

Temporary File Items

P17_FILE

Executions Limit

1

So Notification of Completion Can Be Done in the Chain

The screenshot displays the APEX App Builder interface for 'Application 102' in 'Page Designer' mode. The left sidebar shows a tree view of the application's components, including 'After Submit', 'Computations', 'Validating', 'Validations', 'Processing', 'Processes', and 'After Processing'. The 'Processes' section is expanded, showing a sequence of steps: 'Load Data Background' (highlighted with a green box), 'Unpack ZIP Archive', 'Load Data', 'Report Loading Results' (highlighted with a yellow box), and 'Clear Cache'. A yellow arrow points from the 'Report Loading Results' step in the tree to the 'Background Load' section in the main canvas. The main canvas shows the 'Background Load' section with a 'BREADCRUMB BAR' containing a 'Breadcrumb' component and a 'REGION CONTENT' area. Below this is the 'BODY' section with an 'About this page' component and a 'Button Bar' containing 'CLEAR' and 'LOAD' buttons. The right sidebar shows the 'Process' configuration for 'Load Data Background', including 'Identification' (Name: Load Data Background, Type: Execution Chain, Execution Chain: None) and 'Settings' (Execute in Background: checked, Serialize Executions: checked, 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 987654



Session State

Name	Value
P1_ID	1234
P1_STATUS	PENDING
P1_RESULT	

Session State

Name	Value
P1_ID	1234
P1_STATUS	PENDING
P1_RESULT	

Temporary Files



Temporary Files



Copy

Submit

Temporary File Handling

Copy

Temporary File Items

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

Move

Temporary File Items

P17_FILE

Background Session State Independent of User Session

Session 123456



Session State

Name	Value
P1_ID	1234
P1_STATUS	PENDING
P1_RESULT	

Temporary Files



Submit

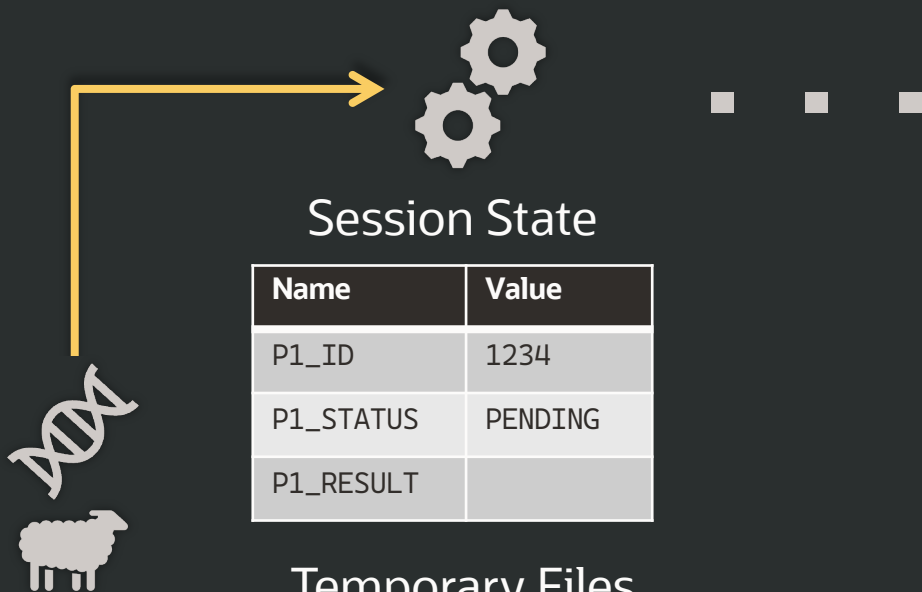
Session 987654



Session State

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

Temporary Files



Monitoring Available While Background Processes Run

Sample Data Loading

Home

Data Loading

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

Manual Data Loading

Administration

Data Loading \ Background Load \

Load Status

Executing

Status

2,380

Rows Processed

Sales Table Contents

Q

Go

Actions

Region	Country	Item Type	Sales Channel	Order Priority	Units Sold	Unit Price	Unit Cost	Total Profit	Last Updated
Europe	Hungary	Snacks	Online		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

APEX

App Builder

SQL Workshop

Team Development

Gallery

Search

steve demo

Monitor Activity

Active Sessions

Session Detail

Session 13193552890388

Cancel

Apply Changes

Show All

Session Attributes

Page Views

Background Processing

Session State Item Values

Browser Information

About

Use this page to inspect session information and enable session instrumentation.

Background Processing

Go

Actions

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	Abort
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	

1 - 4

Monitoring Session Detail of a Background Process

APEX

App Builder
SQL Workshop
Team Development
Gallery

steve demo

Monitor Activity
Active Sessions
Session Detail

Session 7395142920882

Cancel
Apply Changes

Show All
Session Attributes
Page Views
Background Processing
Session State Item Values
Browser Information

Go

Actions

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

1 - 4

About

Use this page to inspect session information and enable session instrumentation.

Work Session ID

Status

Currently Executing	Work Session ID	Status
Load Data	7395142920892	Executing

Instance Admin Can See, Monitor, Abort Background Executions

APEX

Manage Requests ▾

Manage Instance ▾

Manage Workspaces ▾

Monitor Activity ▾

?

AD admin internal

↑ Manage Instance \ Session State \ Background Executions

Q ▾

Go

Actions ▾

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

1 - 3

Background Executions

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

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

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

App Does Long-Running Processing on Departments

Background Processing - Departments

Background Processing

steve

Departments

Processing Status

Processing History

i

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](#)

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Steve



User Launches Long-Running Process for a Department

Background Processing - Departments

Background Processing

Departments

Processing Status

Process

Info

- Select a department to edit. To proc
- To see processing status, use the P
- The *Hide Process Button* toggle me
- department is already being proces

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

1 - 4

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Department

Dname

ACCOUNTING

Loc

NEW YORK

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

Steve



User Launches Long-Running Process for a Department

Background Processing - Departments

Background Processing

Department 10 submitted for processing.

DepartmentsProcessing StatusProcessing 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

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Steve



User Can Process Multiple Departments

Background Processing - Departments

Background Processing

Departments

Processing Status

Process

Info

- Select a department to edit. To proc
- 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

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Department

Dname

RESEARCH

Loc

DALLAS

Info

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

Cancel

Delete

Apply Changes

Process

Steve



User Can Process Multiple Departments

Background Processing - Departments

Background Processing

Department 20 submitted for processing.

Departments

Processing Status

Processing History

i

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

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Star

Steve



Users See Progress of Ongoing Background Processing

Background Processing - Processing Status

Background Processing

steve

Departments

Processing Status

Processing History

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

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Steve



Users See Progress of Ongoing Background Processing

Background Processing - Processing Status

Background Processing

steve

Departments

Processing Status

Processing History

Username ↑	Deptno	Progress	Progress Bar	Submitted At	Started At	Running Time
STEVE	20	60%	<div></div>	12-APR-2023 19:49:13	12-APR-2023 19:49:16	0h 0m 56s

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Users See Average Running & Wait-to-Start Times

Background Processing - Processing History

Background Processing

steve

Departments

Processing Status

Processing History

0h 1m 19s

Average Running Time

0h 0m 1s

Average Wait to Start Time

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Steve



Multiple Users Can Process Long-Running Processes

Background Processing - Processing Status

Background Processing

pat

Departments

Processing Status

Processing History

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

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Pat

Department Being Processed Can't Be Processed Again

Background Processing

DepartmentsProcessing StatusProcessing

Info

- Select a department to edit. To process
- To see processing status, use the *Process*
- The *Hide Process Button* toggle menu

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

1 - 4

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Department

Dname

RESEARCH

Loc

DALLAS

Info

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

Cancel

Delete

Apply Changes

Process

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

Pat



We Might Opt to Hide the Process Button in This Case

Background Processing - Departments

Background Processing

pat

Departments

Processing Status

Processing History

i

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

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^

Sign Out

✓ Hide Process Button

Pat



To Prevent the User from Seeing an Error Message

Background Processing

DepartmentsProcessing StatusProcessing

Info

- Select a department to edit. To process
- To see processing status, use the *Process*
- The *Hide Process Button* toggle menu

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

1 - 4

Release 1.0

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Department

Dname

RESEARCH

Loc

DALLAS

Info

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

Cancel

Delete

Apply Changes

Pat



First Check if Department is Already Being Processed

The screenshot displays the Oracle APEX Page Designer interface. On the left, the 'Processes' list shows a process named 'Check Existing Background for DEPTNO' selected. The main canvas shows a 'Department' form with a 'REGION BODY' containing two input fields: 'P3_DNAME' and 'P3_LOC'. The right-hand pane shows the configuration for the selected process. Under the 'Identification' tab, the 'Name' is 'Check Existing Background for DEPTNO', the 'Type' is 'Invoke API', and the 'Execution Chain' is 'Save and Process'. Under the 'Settings' tab, the 'Type' is 'PL/SQL Package', the 'Owner' is 'Parsing Schema', and the 'Package' is 'EBA_DEMO_BG_PROC'. The 'Procedure or Function' is set to 'USER_PROCESSING_DEPTNO'. The 'Execution' tab shows the 'Sequence' is '10'.



Store the Function Result in a Page Item to Use Later

The screenshot displays the Oracle APEX Page Designer interface for 'Application 100'. The 'Processing' tab is active, showing a process flow. A mouse cursor points to the 'Function Result' parameter under the 'Check Existing Background for DEPTNO' process. The 'Parameter' panel on the right is open, showing the configuration for the 'Function Result' parameter. The 'Item' field is highlighted with a yellow box, showing the value 'P3_DEPTNO_ALREADY_BEING_PROCESSED_BY'.

Page Designer Interface:

- Top Bar:** APEX, App Builder, SQL Workshop, Team Development, Gallery, Search, User (steve demo).
- Left Panel (Processing):**
 - After Submit
 - Validating
 - Processing
 - Processes
 - Process form Department
 - Save and Process
 - Processes
 - Check Existing Background for DEPTNO
 - Parameters
 - Function Result (highlighted)
 - p_deptno
 - If Deptno Already Being Processed...
 - Else if Deptno Available to Process...
 - Close Dialog
 - After Processing
 - Ajax Callback

Parameter Panel (Function Result):

- Identification:** Name: Function Result
- Parameter:** Direction: Out, Data Type: VARCHAR2, Ignore Output: ☐
- Value:** Item: P3_DEPTNO_ALREADY_BEING_PROCESSED_BY (highlighted)
- Advanced:** Display Sequence: 10
- Comments:** Comments:



If Department is Already Being Processed...

The screenshot displays the Oracle APEX Application Builder interface. The top navigation bar includes the APEX logo, 'App Builder', and various tool tabs like 'SQL Workshop', 'Team Development', and 'Gallery'. The main workspace is titled 'Application 100 \ Page Designer'.

The left sidebar shows the 'Processing' tab selected, with a tree view of processes. The process 'If Deptno Already Being Processed...' is highlighted in green, and a mouse cursor points to it. Below it, other processes like 'Check Existing Background for DEPTNO', 'Show Error with Username Processing the...', 'Else if Deptno Available to Process...', and 'Close Dialog' are visible.

The central canvas shows the 'Department' process flow. It includes a 'CONTENT BODY' section with a 'Department' block containing 'REGION BODY' and 'REGION CONTENT' sections. The 'REGION BODY' section contains two items: 'P3_DNAME' and 'P3_LOC'. Below this is an 'Info' block with 'REGION CONTENT'. The 'DIALOG FOOTER' section contains a 'Buttons' block.

The right sidebar shows the 'Process' configuration panel. It includes a 'Filter' search bar, a 'Identification' section with 'Name' (If Deptno Already Being Processed...), 'Type' (Execution Chain), and 'Execution Chain' (Save and Process). Below this are sections for 'Settings', 'Execution', 'Success Message', and 'Error'. The 'Server-side Condition' section is highlighted with a yellow box, showing 'When Button Pressed' (Set to - Select -), 'Type' (Item is NOT NULL), and 'Item' (P3_DEPTNO_ALREADY_BEING_PROCESSED_BY).



Show a Custom Error Message to the User

The screenshot displays the Oracle APEX Page Designer interface for 'Application 100' in 'Page Designer' mode. The top navigation bar includes 'APEX', 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery'. A search bar and user profile 'steve demo' are also present. The left sidebar shows the 'Processing' tab selected, with a tree view of processes. The central canvas shows a 'Department' form with fields 'P3_DNAME' and 'P3_LOC'. The right sidebar shows the 'Process' configuration for 'Show Error with Username Processing the Deptno'. The 'Error' section is highlighted with a yellow box, showing the custom error message: 'Department &P3_DEPTNO. is already being processed by &P3_DEPTNO_ALREADY_BEING_PROCESSED_BY.'.

Navigation Bar: APEX, App Builder, SQL Workshop, Team Development, Gallery, Search, User: steve demo.

Page Designer: Application 100 \ Page Designer, 3, Go, Save, Play.

Processing Tab:

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

Layout Tab:

- Department
- CONTENT BODY
 - Department
 - REGION BODY
 - P3_DNAME
 - P3_LOC
 - REGION CONTENT
 - Info
 - REGION CONTENT
- DIALOG FOOTER
 - Buttons

Process Tab:

- Filter
- Identification
 - Name: Show Error with Username Processing the Deptno
 - Type: Execute Code
 - Execution Chain: If Deptno Already Being Processed...
 - Editable Region: - Select -
- Source
- Execution
- Success Message
- Error (highlighted)
 - Error Message: Department &P3_DEPTNO. is already being processed by &P3_DEPTNO_ALREADY_BEING_PROCESSED_BY.
- Server-side Condition



... Else If Department is Available to Process

The screenshot displays the Oracle APEX App Builder interface for 'Application 100' in 'Page Designer' mode. The top navigation bar includes 'APEX', 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery'. A search bar and user profile 'steve demo' are also present. The left sidebar shows the 'Processing' tab with a tree view of processes. The central canvas shows a 'Department' form with fields 'P3_DNAME' and 'P3_LOC'. The right sidebar shows the configuration for the selected process 'Else if Deptno Available to Process...'.

Process Configuration:

- Identification:**
 - Name: Else if Deptno Available to Process...
 - Type: Execution Chain
 - Execution Chain: Save and Process
- Settings:**
- Execution:**
- Success Message:**
- Error:**
- Server-side Condition:**
 - 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 displays the APEX App Builder interface for configuring a process. The top navigation bar includes 'APEX', 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery'. The main workspace is divided into three panels: the left sidebar, the central canvas, and the right properties panel.

Left Sidebar: Shows the application structure under 'Application 100 \ Page Designer'. The 'Processing' tab is active, displaying a tree of processes. The process 'Register User Processing Department' is highlighted with a green dashed border and a mouse cursor.

Central Canvas: Displays the visual representation of the process. It shows a 'Department' region with a 'CONTENT BODY' containing two input fields: 'P3_DNAME' and 'P3_LOC'. Below these is an 'Info' section and a 'Buttons' section. The 'DIALOG FOOTER' is also visible.

Right Properties Panel: Shows the configuration for the selected process. The 'Identification' section includes:

- Name: Register User Processing Department
- Type: Invoke API
- Execution Chain: Else if Deptno Available to Process...
- Editable Region: - Select -

 The 'Settings' section includes:

- Type: PL/SQL Package
- Owner: Parsing Schema
- Package: EBA_DEMO_BG_PROC
- Procedure or Function: REGISTER_USER_PROCESSING_DEPTNO

 The 'Execution' section is partially visible at the bottom.





Execution
D 123456



... Set the Success Message to Return to Caller

Execution
ID 123456

The screenshot displays the APEX App Builder interface for 'Application 100' in 'Page Designer' mode. The 'Processing' tab is active, showing a tree of processes. The process 'Set Success Message for Dialog Close' is highlighted, and its configuration is shown in the right-hand pane.

Process Configuration:

- Name:** Set Success Message for Dialog Close
- Type:** Execute Code
- Execution Chain:** If Background Process Succeeded...
- Editable Region:** - Select -
- Source:**
 - Location:** Local Database
 - Language:** PL/SQL
 - PL/SQL Code:**

```
:P3_SUCCESS_MESSAGE := 'Department '||:P3_DEPTNO||' submitted for processing.';
```
- Execution:** Success Message

The central canvas shows a 'Department' form with a 'CONTENT BODY' containing a 'Department' region with 'P3_DNAME' and 'P3_LOC' items, and an 'Info' region. The 'DIALOG FOOTER' contains a 'Buttons' region.

The bottom status bar shows the URL: `localhost:8080/ords/#peComponentProperties`.



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

Execution
ID 123456

The screenshot displays the APEX App Builder interface for 'Application 100' in 'Page Designer' mode. The top navigation bar includes 'APEX', 'App Builder', 'SQL Workshop', 'Team Development', and 'Gallery'. A search bar and user profile 'steve demo' are also present. The left sidebar shows a tree view of the application structure under 'Processing' > 'Processes'. The 'Else if Background Process Failed...' process is selected and highlighted in green, with a mouse cursor pointing at it. The central canvas shows the 'Department' page layout with a 'CONTENT BODY' containing a 'Department' region and an 'Info' region. The right sidebar shows the configuration for the selected process. The 'Identification' section shows the process name 'Else If Background Process Failed...', type 'Execution Chain', and execution chain 'Else if Deptno Available to Process...'. The 'Server-side Condition' section is highlighted with a yellow box and contains the following configuration:

Property	Value
When Button Pressed	- Select -
Type	Item is NULL
Item	P3_EXECUTION_ID



Execution
ID 123456



Execution
ID 123456



Execution
ID 123456



Execution
ID 123456



Execution
ID 123456



Execution
ID 123456



Showing Users Progress of Background Processes

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

Background Processing

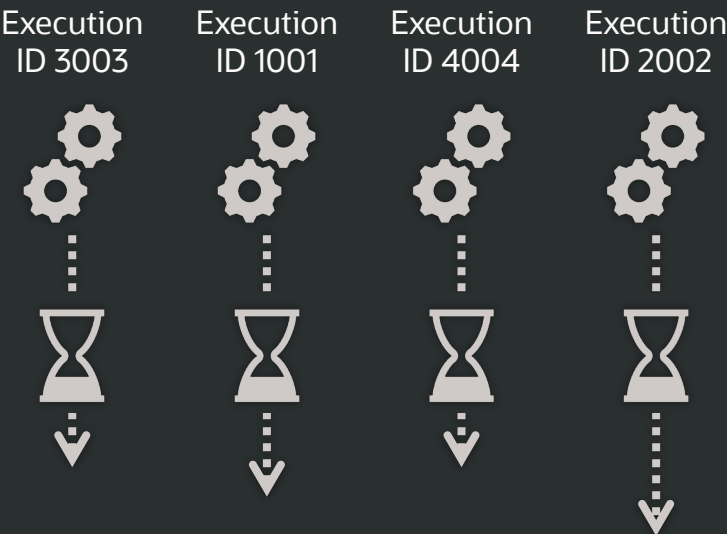
steve

DepartmentsProcessing StatusProcessing History

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



Showing Users Progress of Background Processes

The screenshot shows a web browser at localhost:8080 with an Oracle APEX application. The page title is 'Background Processing'. There are three tabs: 'Departments', 'Processing Status' (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	30	30%	<div><div></div></div>	14-APR-2023 19:17:25	14-APR-2023 19:17:26	0h 0m 31s
STEVE	40	30%	<div><div></div></div>	14-APR-2023 19:17:29	14-APR-2023 19:17:32	0h 0m 25s
STEVE	20	50%	<div><div></div></div>	14-APR-2023 19:17:21	14-APR-2023 19:17:22	0h 0m 35s
STEVE	10	40%	<div><div></div></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

APEX_APPL_PAGE_BG_PROC_STATUS



APEX_APPLICATION_PAGE_PROC

Showing Users Progress of Background Processes

The screenshot shows the APEX Code Editor interface. On the left, the 'Application 100' sidebar is visible with sections for 'Rendering', 'Dynamic', 'Page 5: Processing', 'Pre-Rendering', 'Components', 'Body', 'Ongoing', 'Column', and 'Post-Rendering'. The main area is titled 'Code Editor - SQL Query' and contains an SQL query. The query is designed to select progress information for background processes, including username, department number, progress percentage, and execution time. It uses joins to connect the background process table with the process status and application page process tables. The query filters for processes that are not yet completed or are in the 'ENQUEUED', 'SCHEDULED', or 'EXECUTING' states. The query is as follows:

```
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    )
```

At the bottom right of the code editor, there are 'Cancel' and 'OK' buttons. In the top right corner of the APEX interface, there is a user profile for 'steve demo' and a 'Save and Run Page' button.

Informing APEX Engine of Progress for BG Process

The screenshot shows the Oracle APEX SQL Workshop interface. The top navigation bar includes the APEX logo, App Builder, SQL Workshop, Team Development, and Gallery. A search bar and user profile (steve demo) are on the right. The left sidebar shows the Object Browser with a search for 'eba_demo_b'. The main area displays the 'EBA_DEMO_BG_PROC' package body. The code is as follows:

```
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;
```

Two lines of code are highlighted with yellow boxes: `apex_background_process.set_progress(p_totalwork=>c_steps,p_sofar=>0);` on line 53 and `apex_background_process.set_progress(p_totalwork=>c_steps,p_sofar=>j);` on line 56.

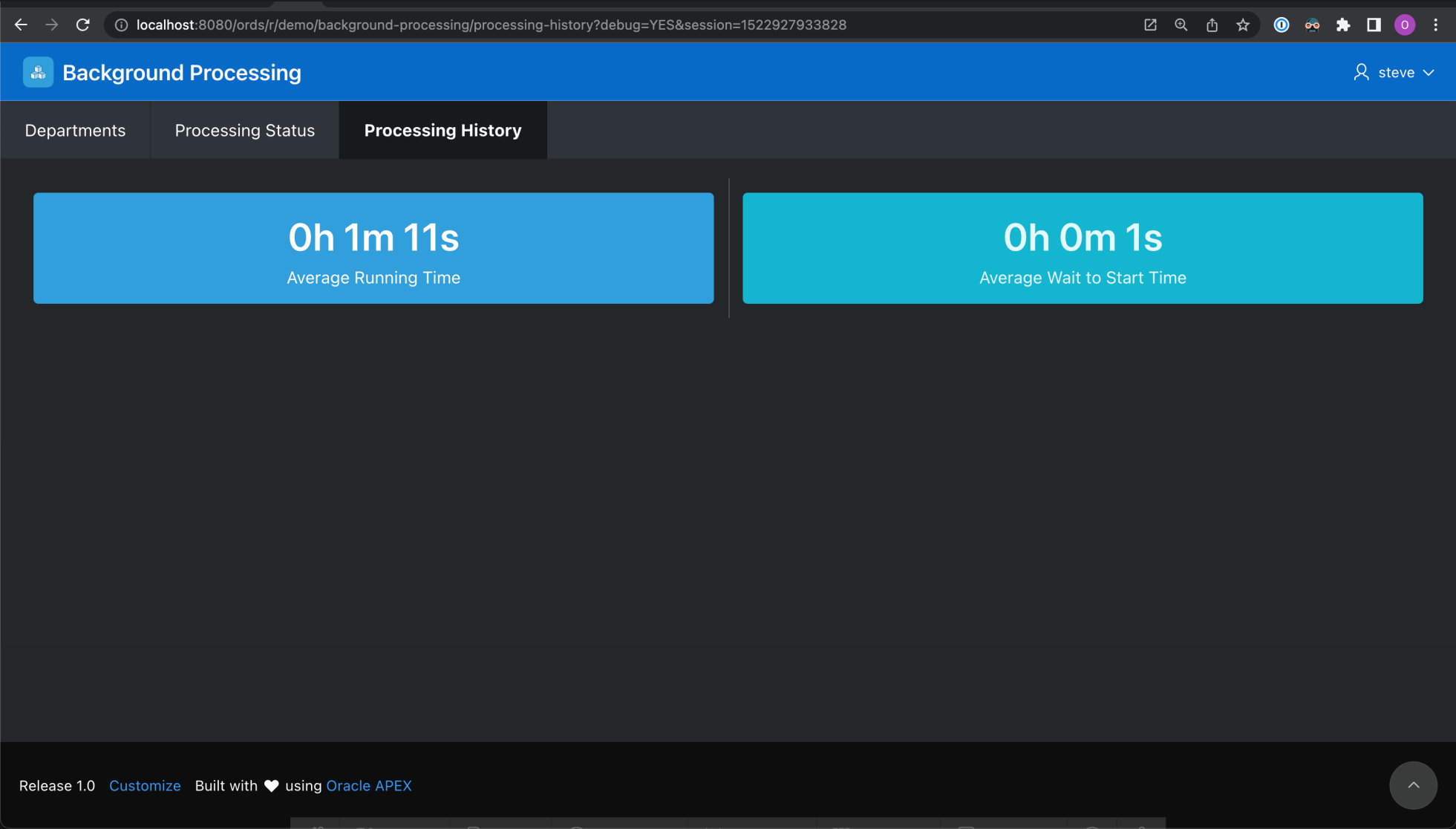
Schema: DEMO

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Use `SET_BACKGROUND_STATUS()`
and `SET_BACKGROUND_PROGRESS()`
in `APEX_BACKGROUND_PROCESS` package



Track Run Time and Wait to Start Time to Provide Averages



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)
SO FAR		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



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

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

Status of the
background process



Getting Information About Background Processes

SQL> DESC APEX_APPL_PAGE_BG_PROC_STATUS

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

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

STATUS_MESSAGE
SOFAR
TOTALWORK



Throttling Concurrent Background Executions per *Application*

Application 102 \ Edit Application Definition

Definition

Security

Globalization

User Interface

Progressive Web App

Application 102

Cancel

Delete

Apply Changes

Show All

Name

Properties

Availability

Error Handling

Global Notification

Substitutions

Build Options

Report Printing

Copyright Banner

Properties

Friendly URLs

Allow Feedback

Logging

Debugging

Compatibility Mode

Application Email From Address

Proxy Server

Oracle Text Function

Tokenize Row Search

Maximum Background Page Process Jobs

About

Tasks

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 *enqueued* state.

View Documentation

Maximum Background Page Process Jobs

2



Throttling Concurrent Background Executions per *Workspace*

Manage Workspaces \ Existing Workspaces \ Edit Workspace Information

Edit Workspace Information

Cancel

Apply Changes

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

Workspace Isolation

Allow Hostnames

Resource Consumer Group

Maximum Concurrent Workspace Requests

Maximum Concurrent Session Requests

Concurrent Session Requests Kill Timeout

Maximum Size of Files in Workspace

Maximum Email Messages

Maximum Web Service Requests

Content Cache target size

Content Cache maximum entry size

Maximum Background Page Process Jobs

?

?

?

?

?

?

?

?

?

4

Maximum Background Page Process Jobs

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

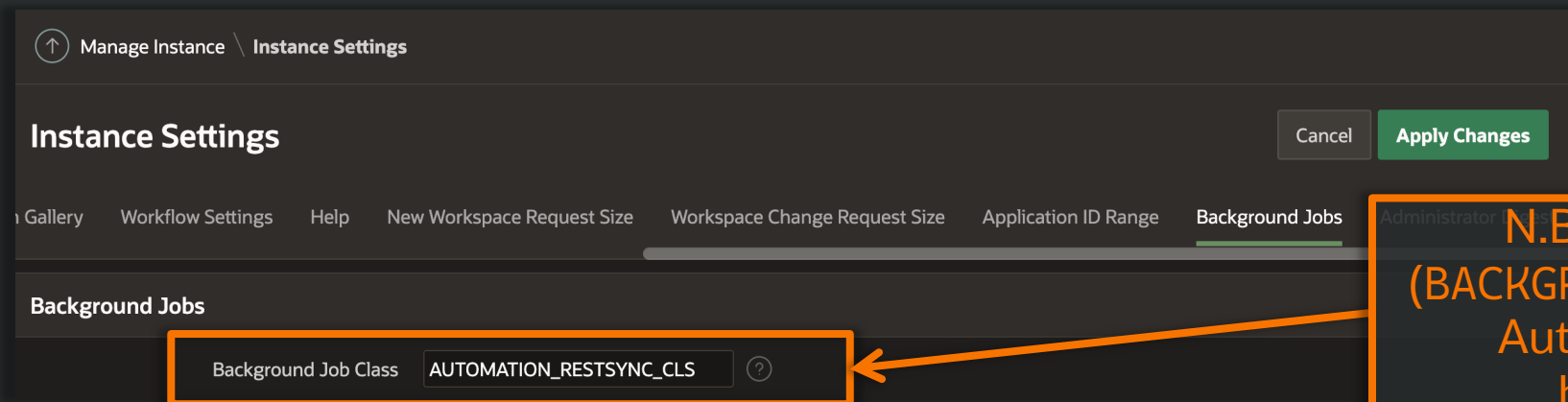
4

Workspace Users

1

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;
```



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

Limit >= 4 → Four Submitted Background Processes Can Run

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

Background Processing

steve

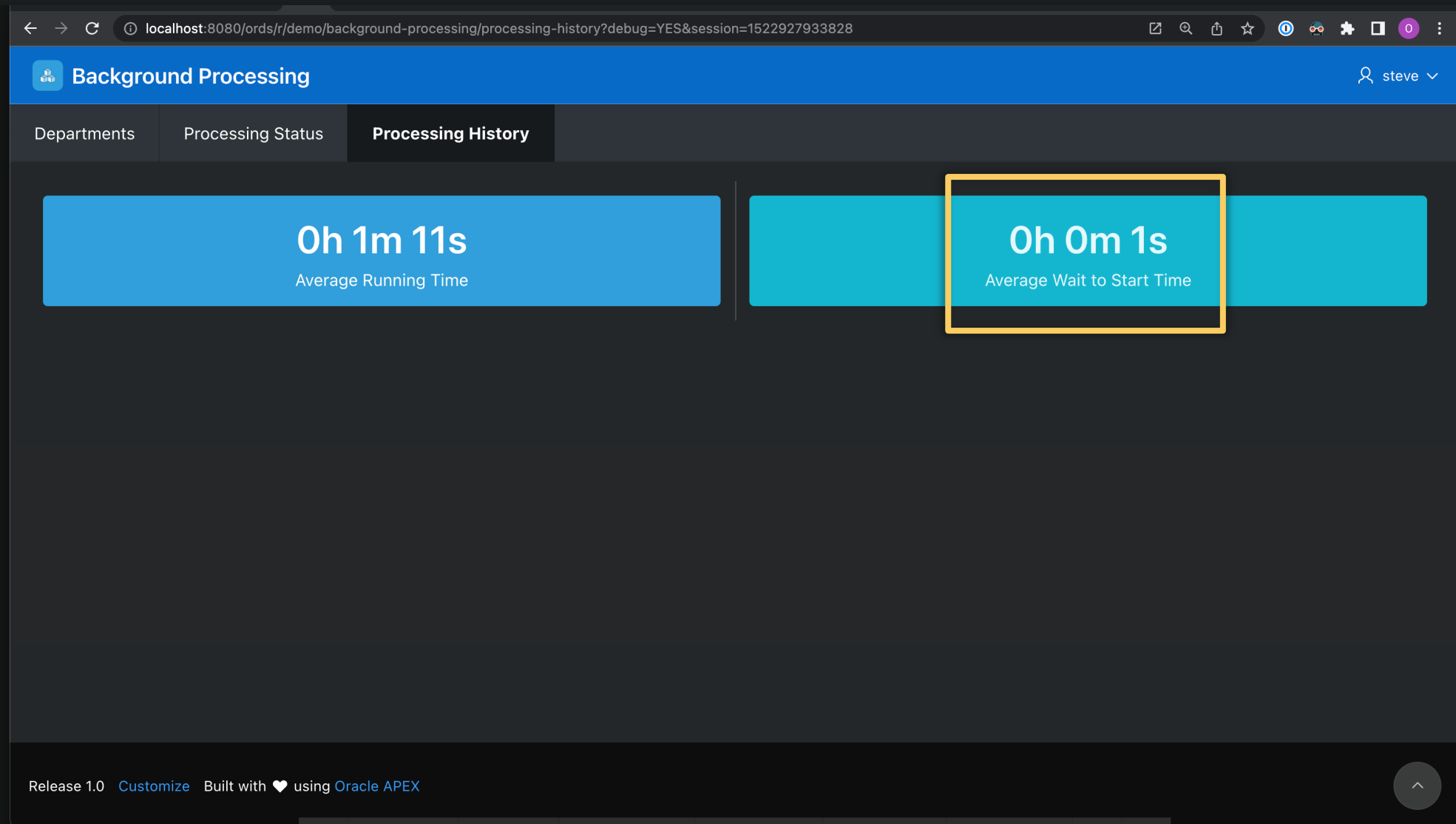
DepartmentsProcessing StatusProcessing History

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

Release 1.0CustomizeBuilt with ♥ using Oracle APEX



Limit $\geq 4 \rightarrow$ Background Processes Start Almost Immediately



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

Background Processing

Install App

steve.muench@oracle.com

Departments

Processing Status

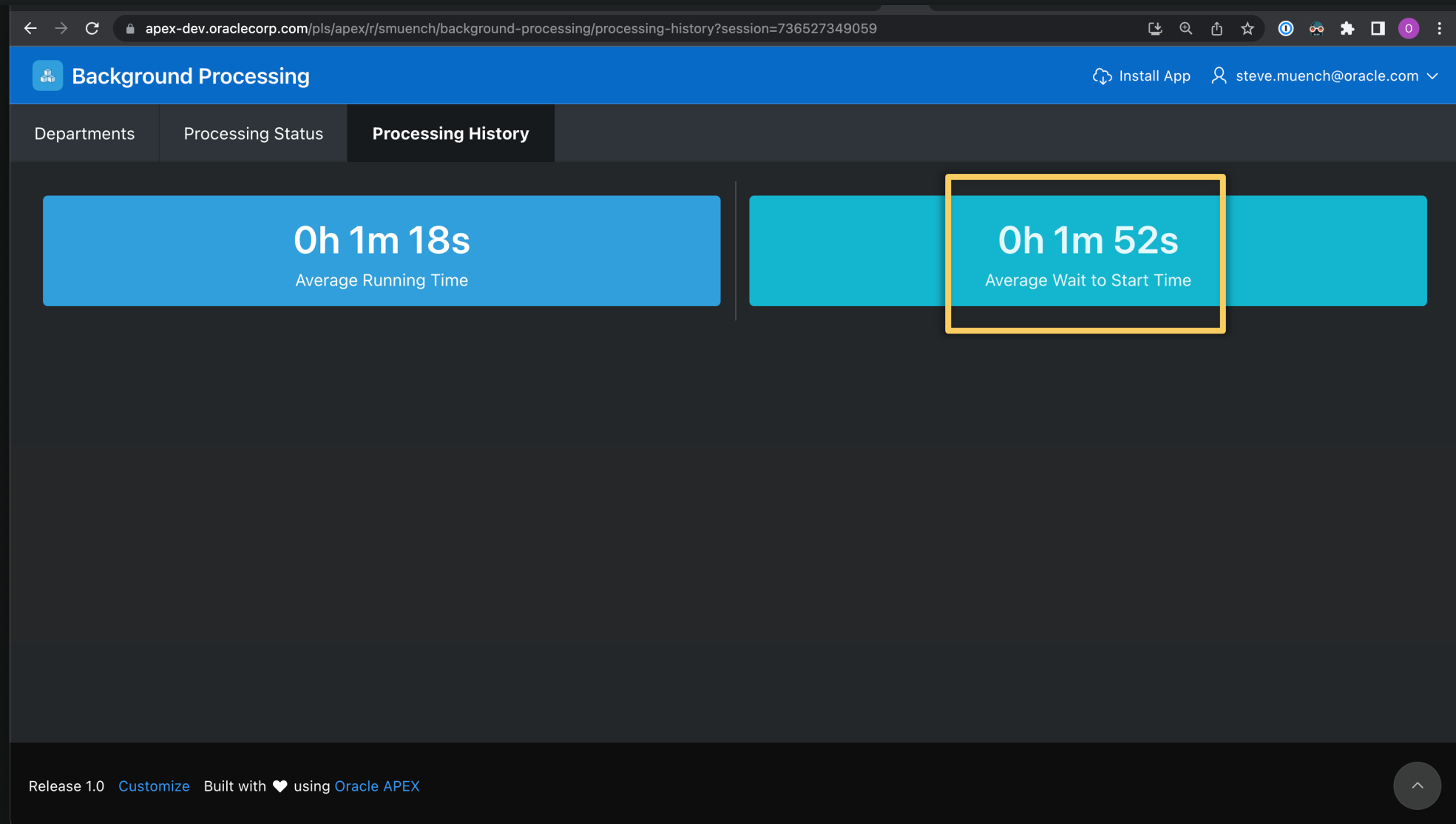
Processing History

Username ↑≡	Deptno	Progress	Progress Bar	Submitted At	Started At	Running Time
STEVE.MUENCH@ORACLE.COM	10	30%	<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		

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>

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ā'pěks alpe adria



Thank You! Questions?



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