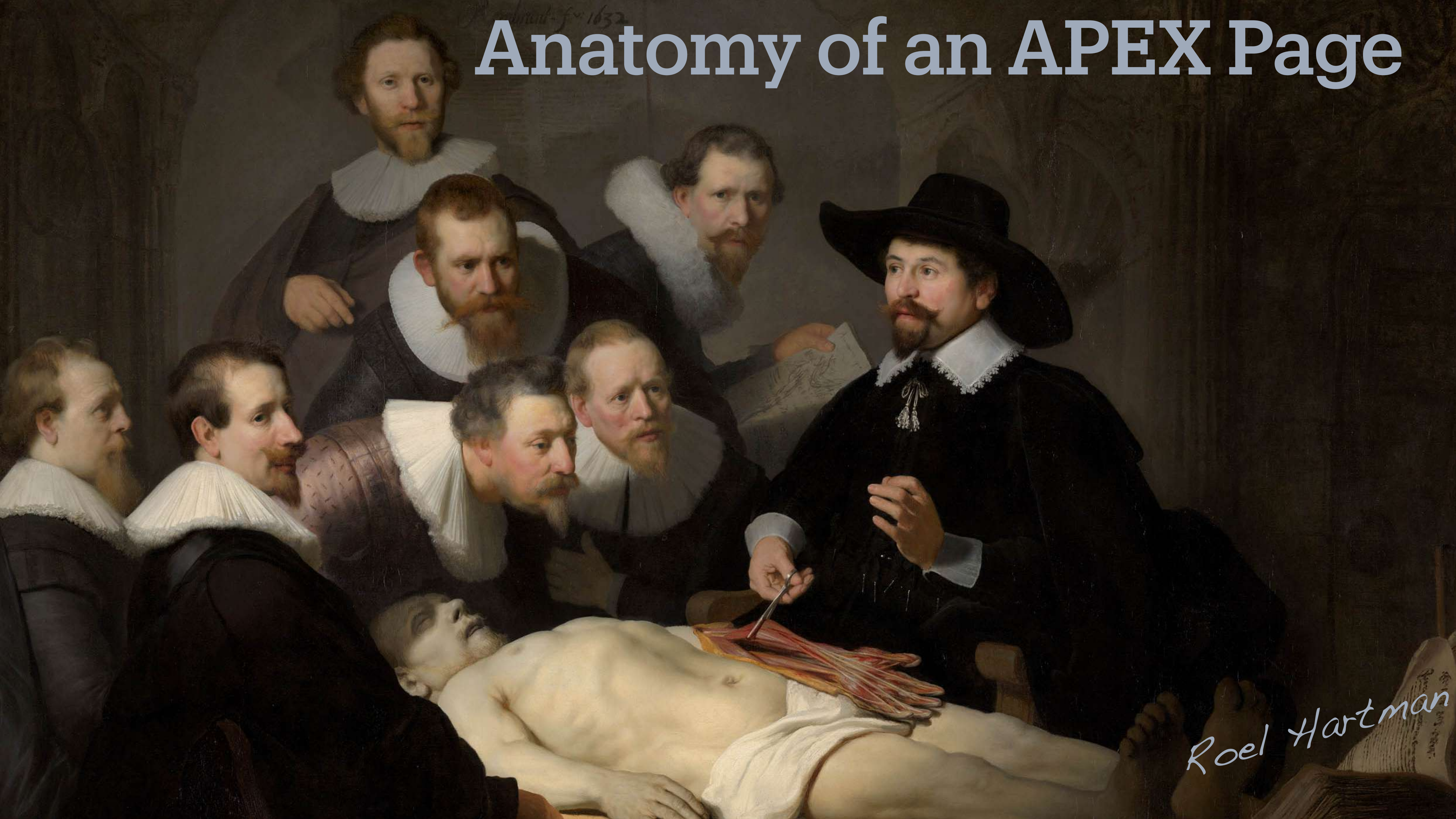


Anatomy of an APEX Page



Roel Hartman



Roel

@apexconsulting.nl

490 followers 176 following 24

- Director of APEX Consulting
- Sr. APEX Developer
- Oracle ACE Director
- Board of NLOUG
- Runner
- The Netherlands





Tech Superstars Unite

Get worldwide recognition as an Oracle ACE



Oracle.com profile page



Swag, certification exam credit & event passes



Exclusive content



Networking events



Your own Oracle cloud account



Travel support



Learn more at:
ace.oracle.com

 [@oracleace](https://twitter.com/oracleace)

 [Linkedin.com/groups/72183](https://www.linkedin.com/groups/72183)

 [@oracleace.bsky.social](https://bsky.app/profile/oracleace.bsky.social)



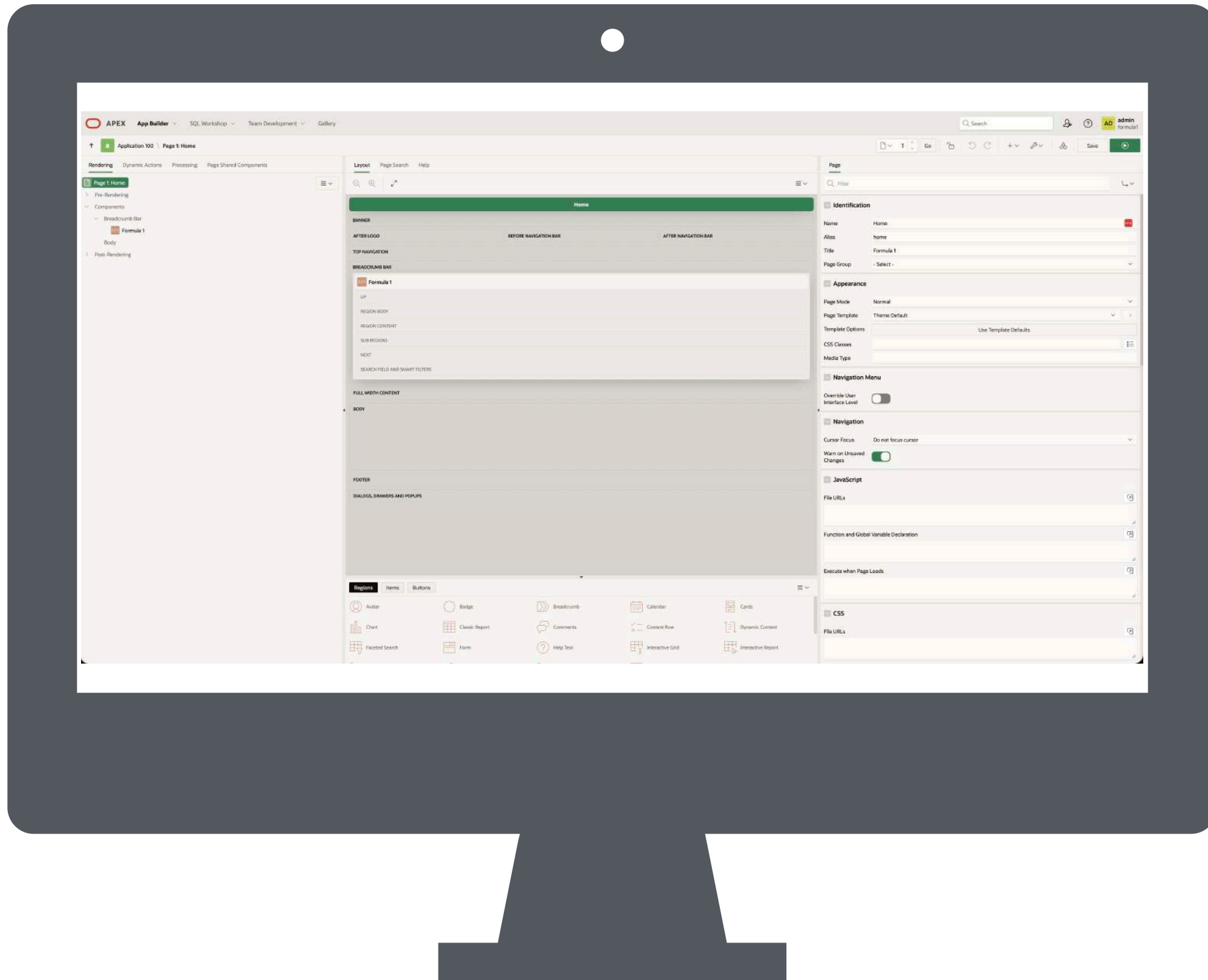
First incision

Client / Server



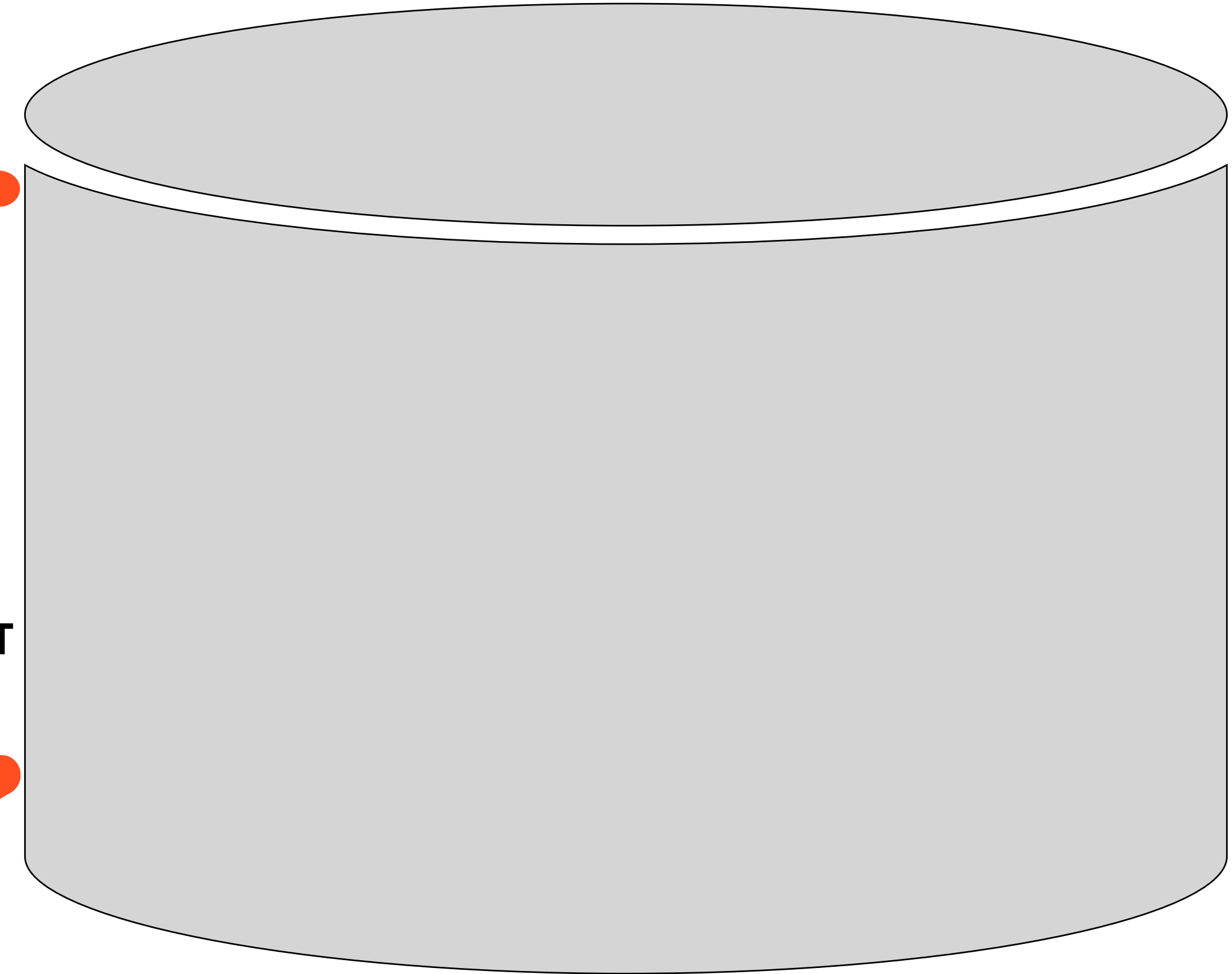
Client / Browser

Server / Database

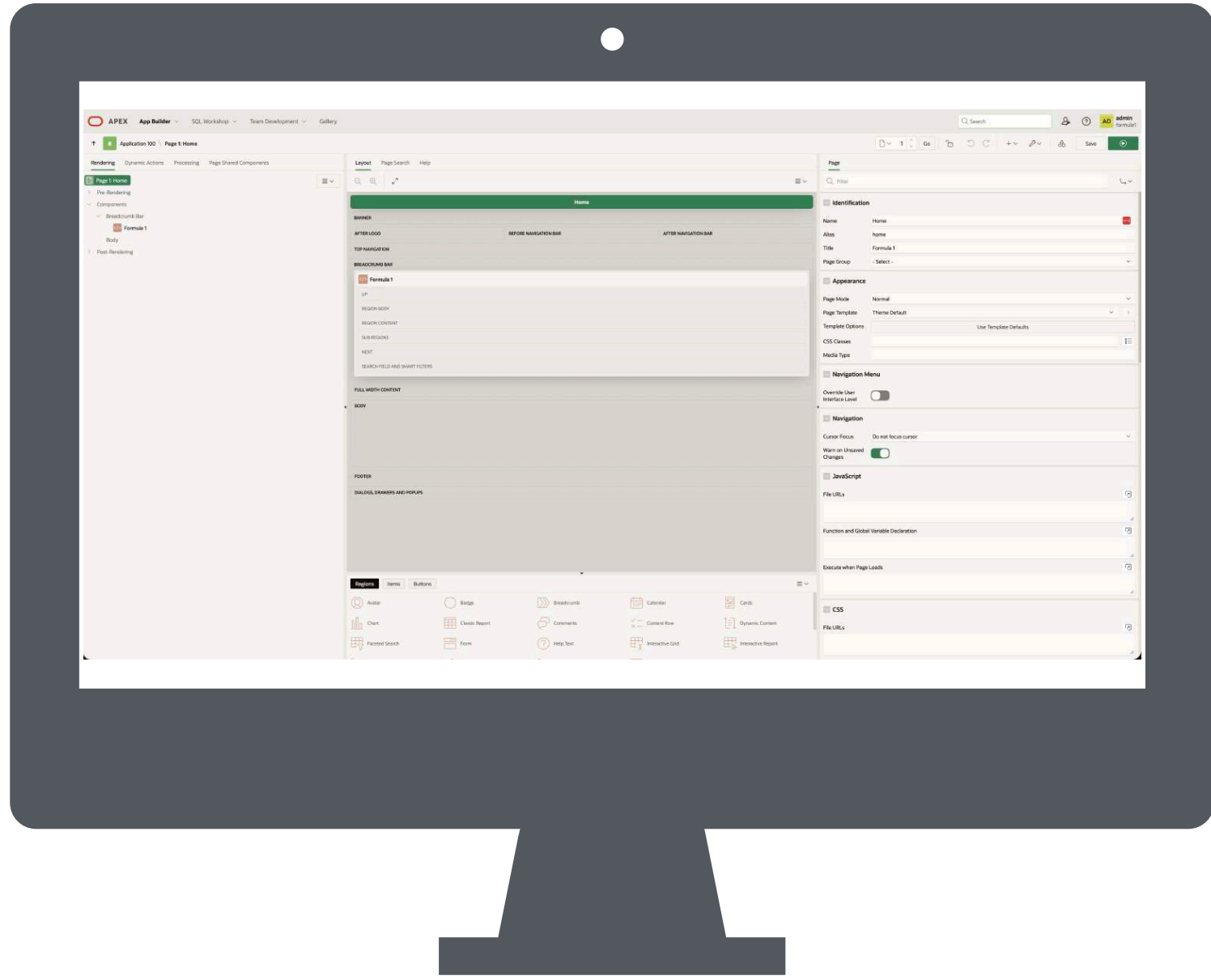


GET

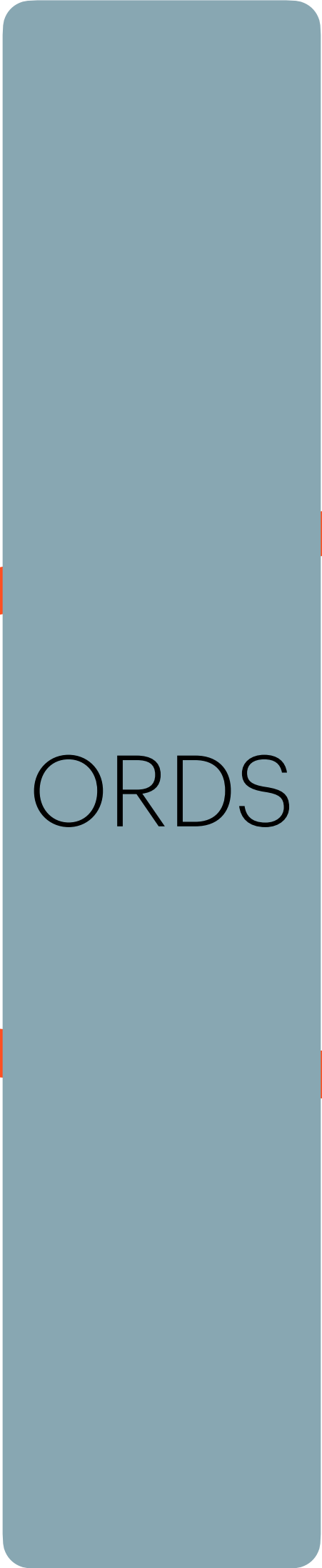
POST



Client / Browser

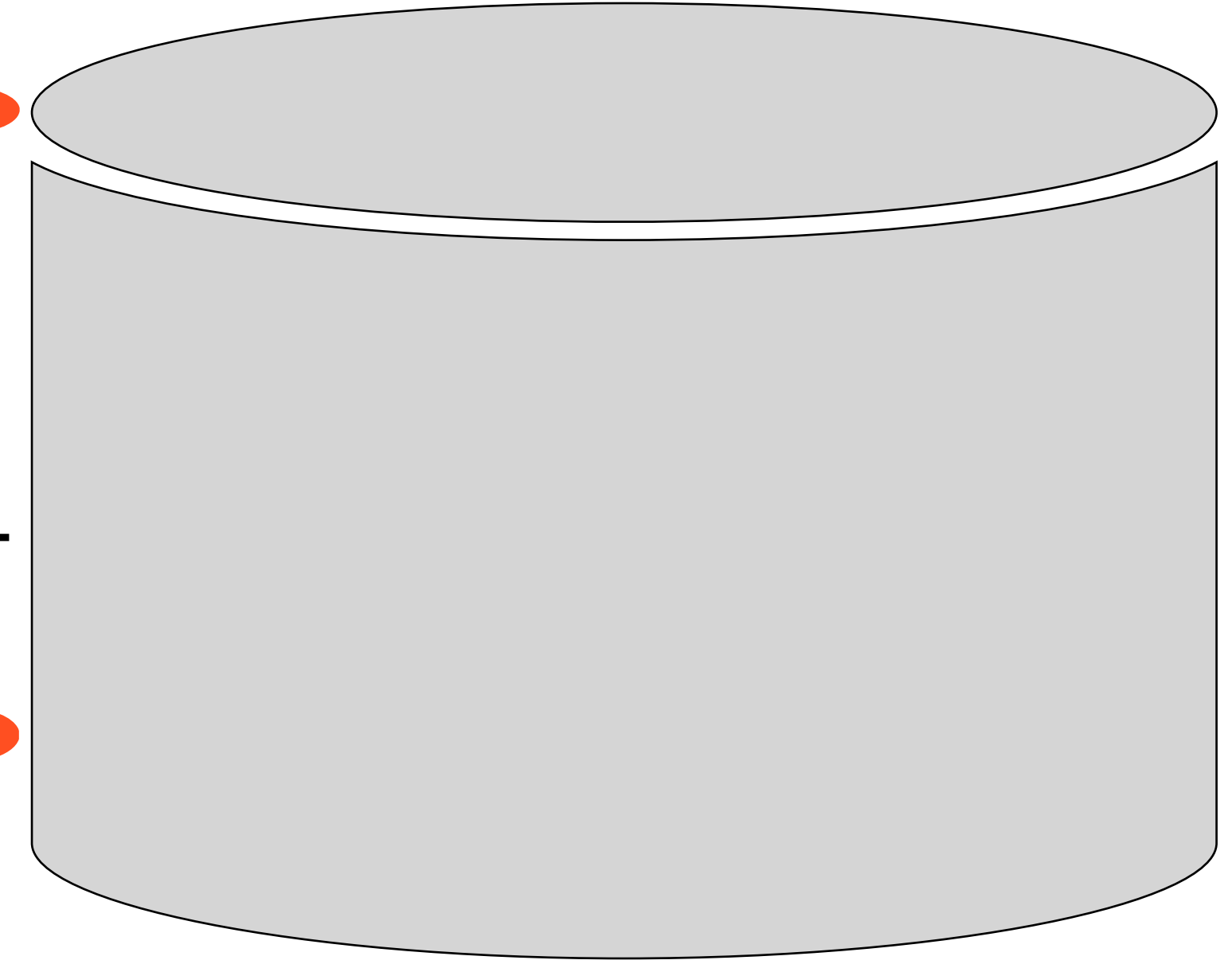


GET

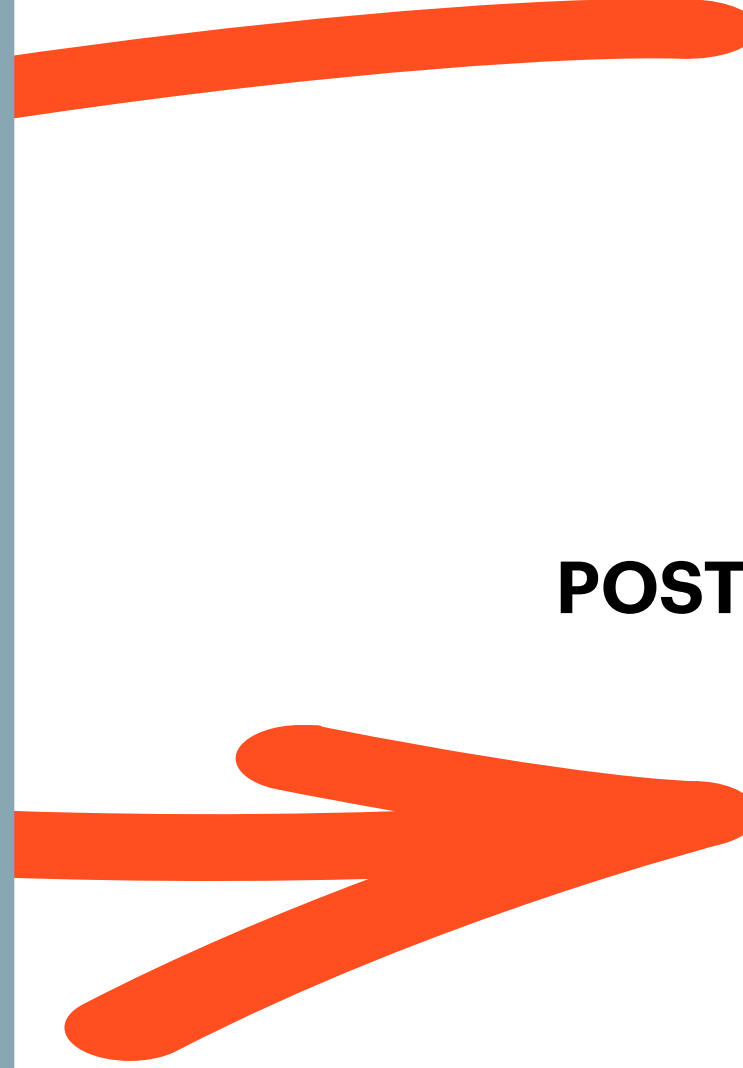


ORDS

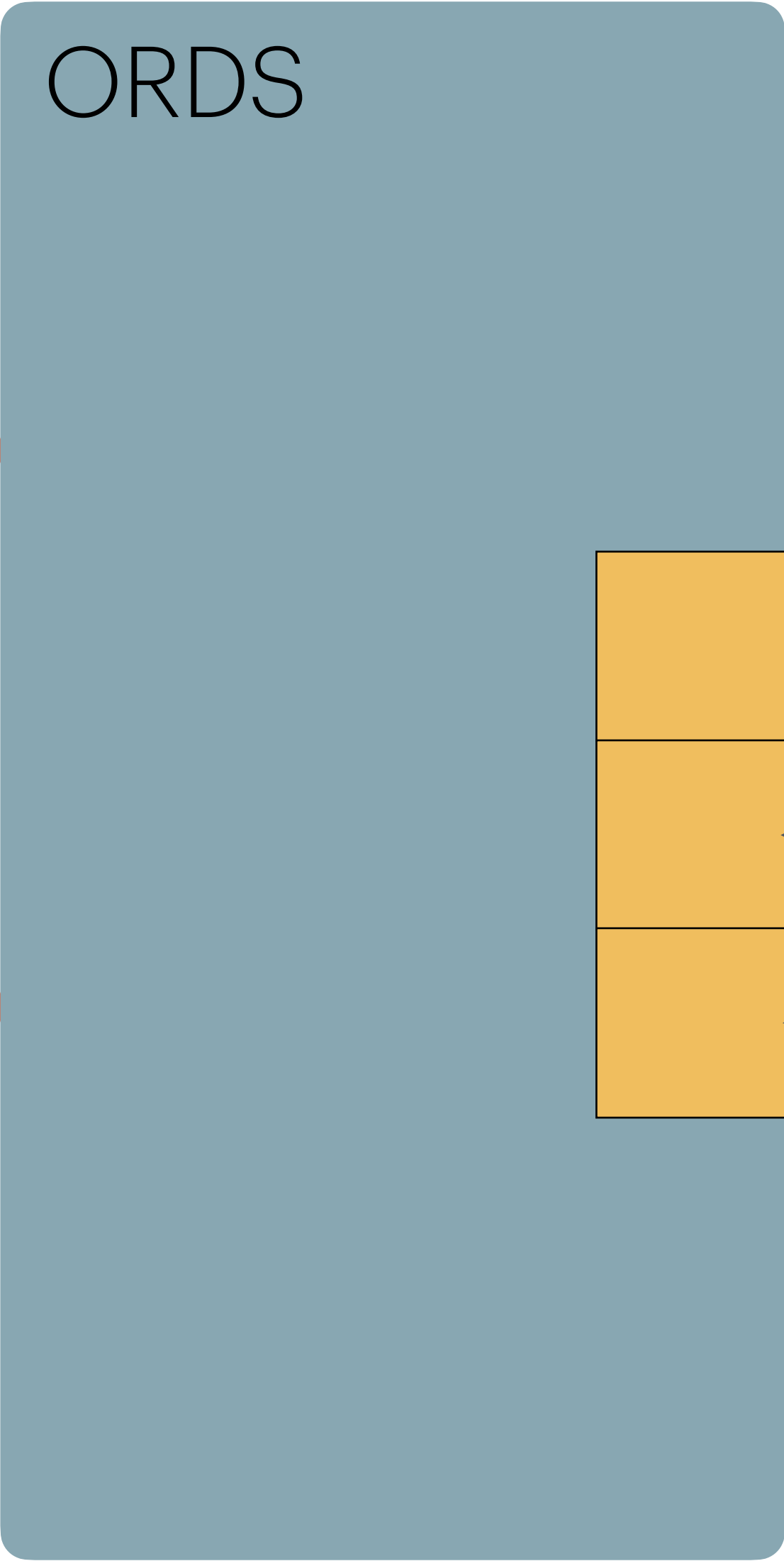
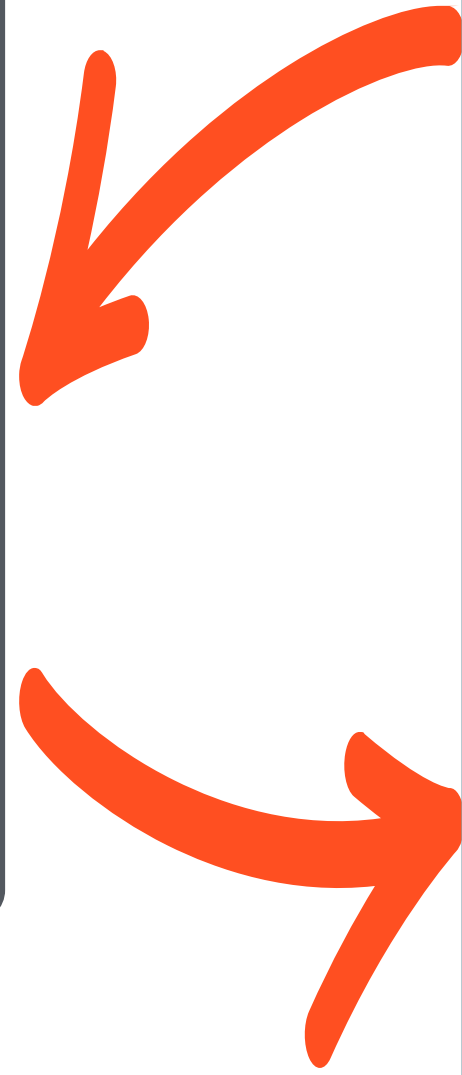
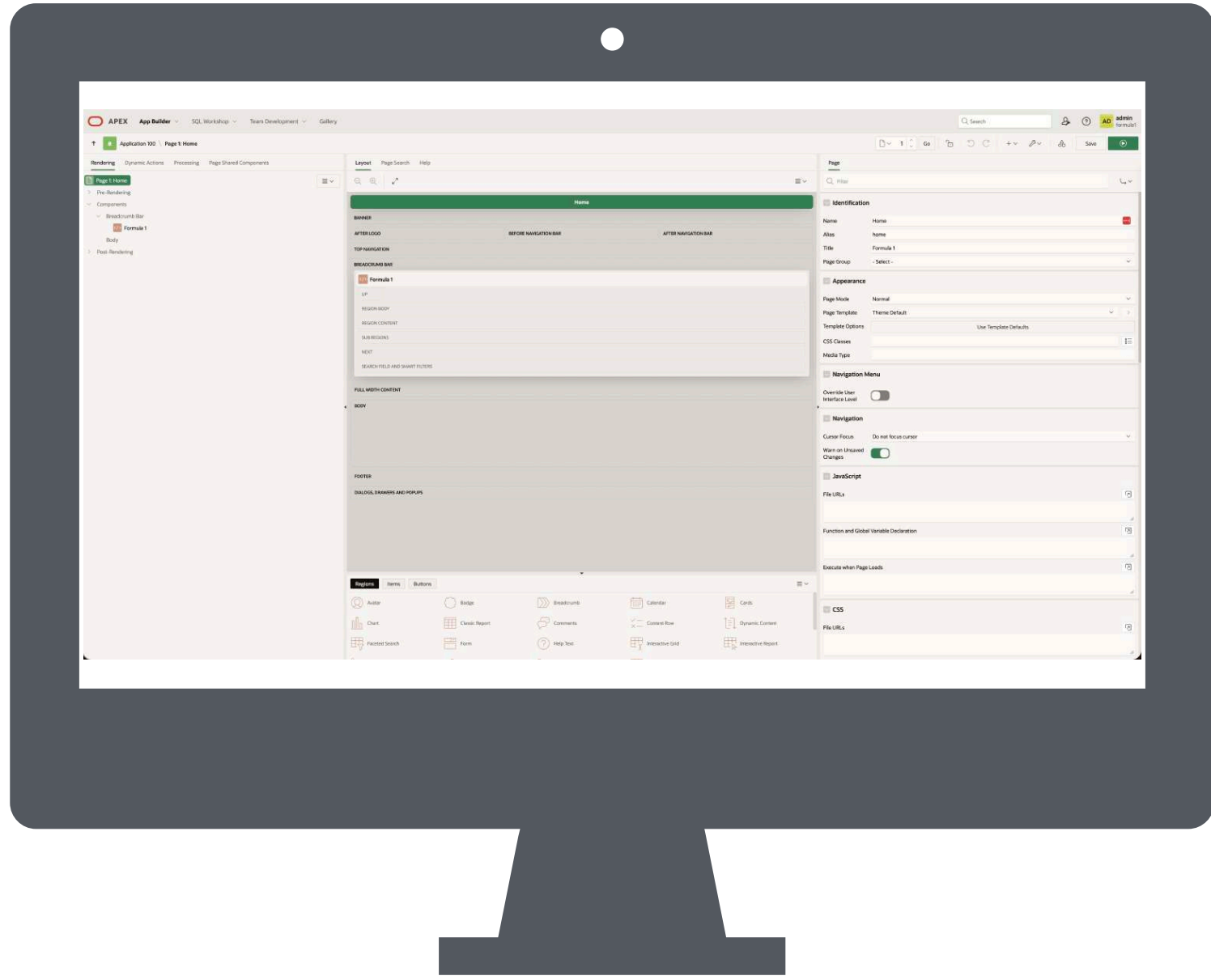
Server / Database



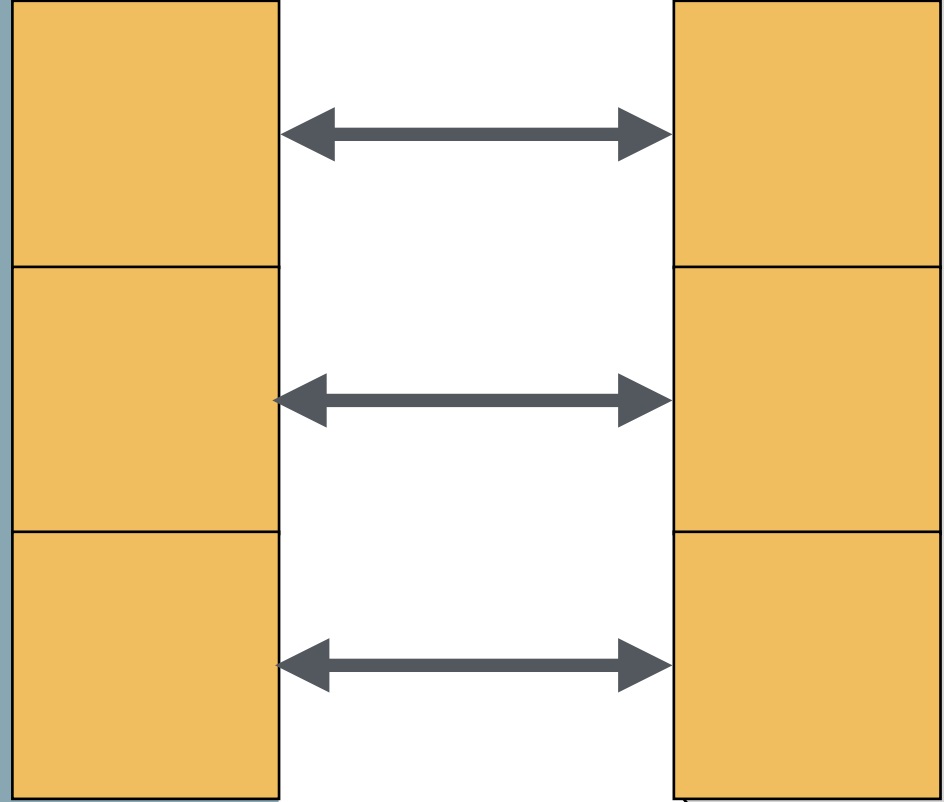
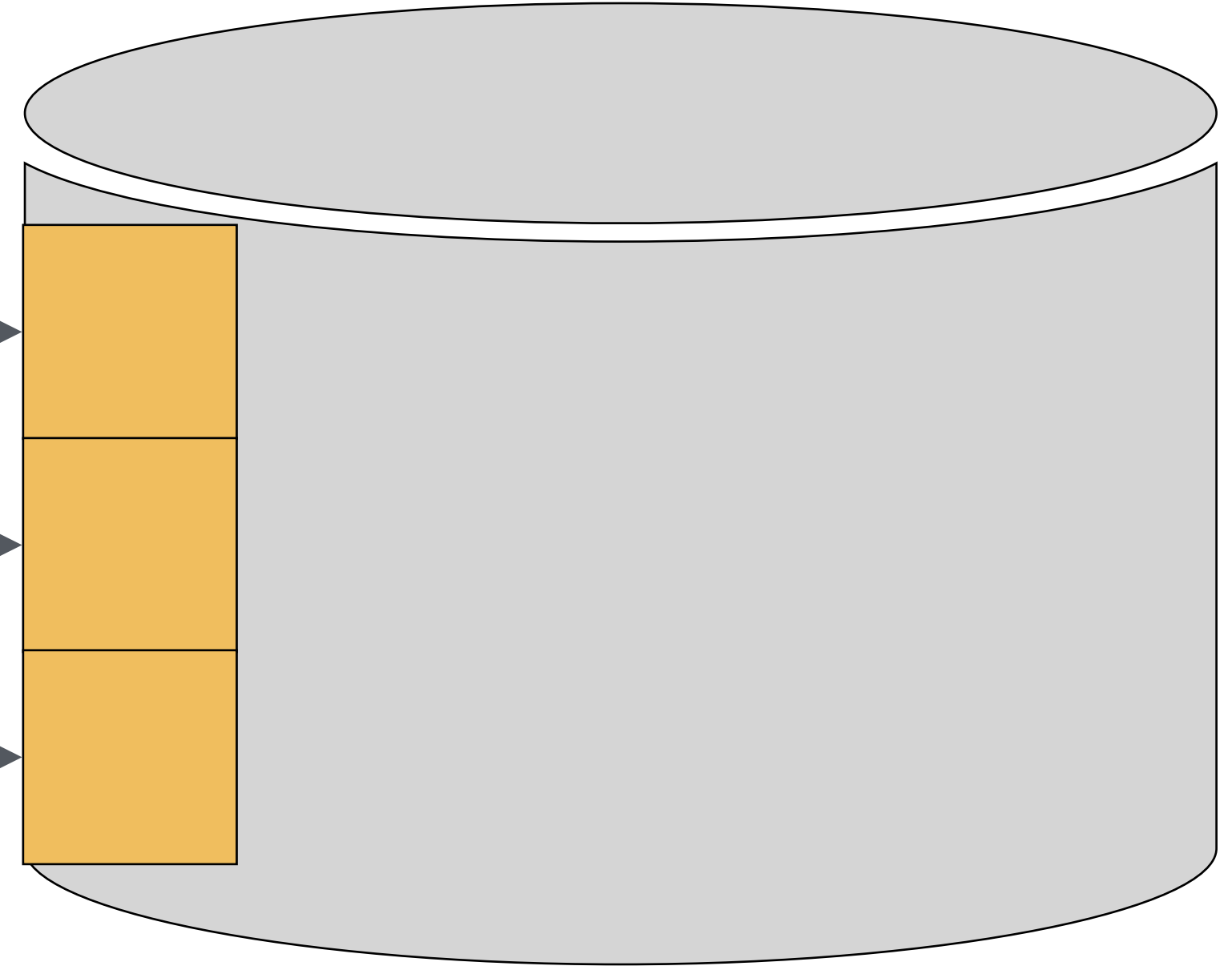
POST



Client / Browser

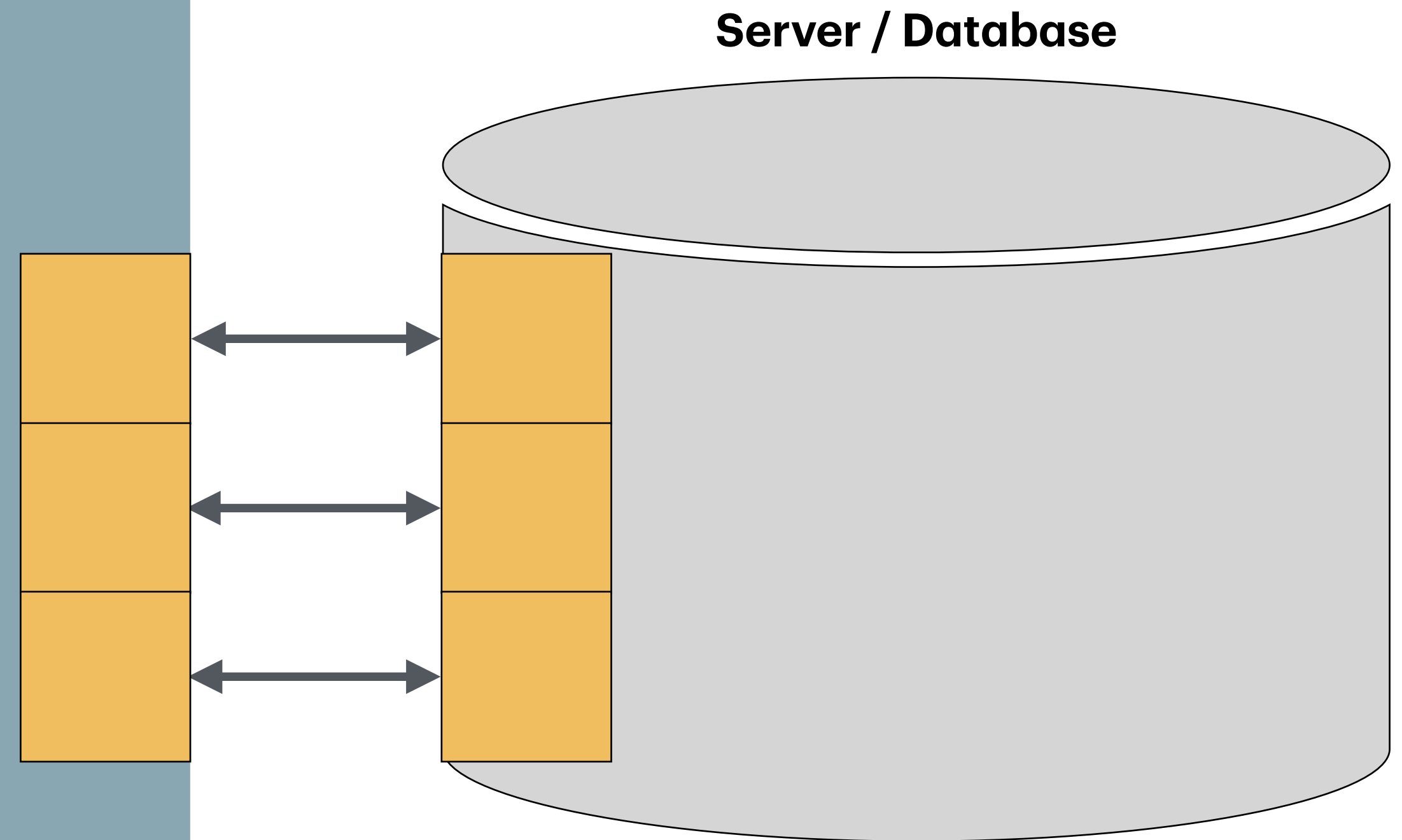


Server / Database



Why ORDS?

- Performance
- Scalability



Client / Browser

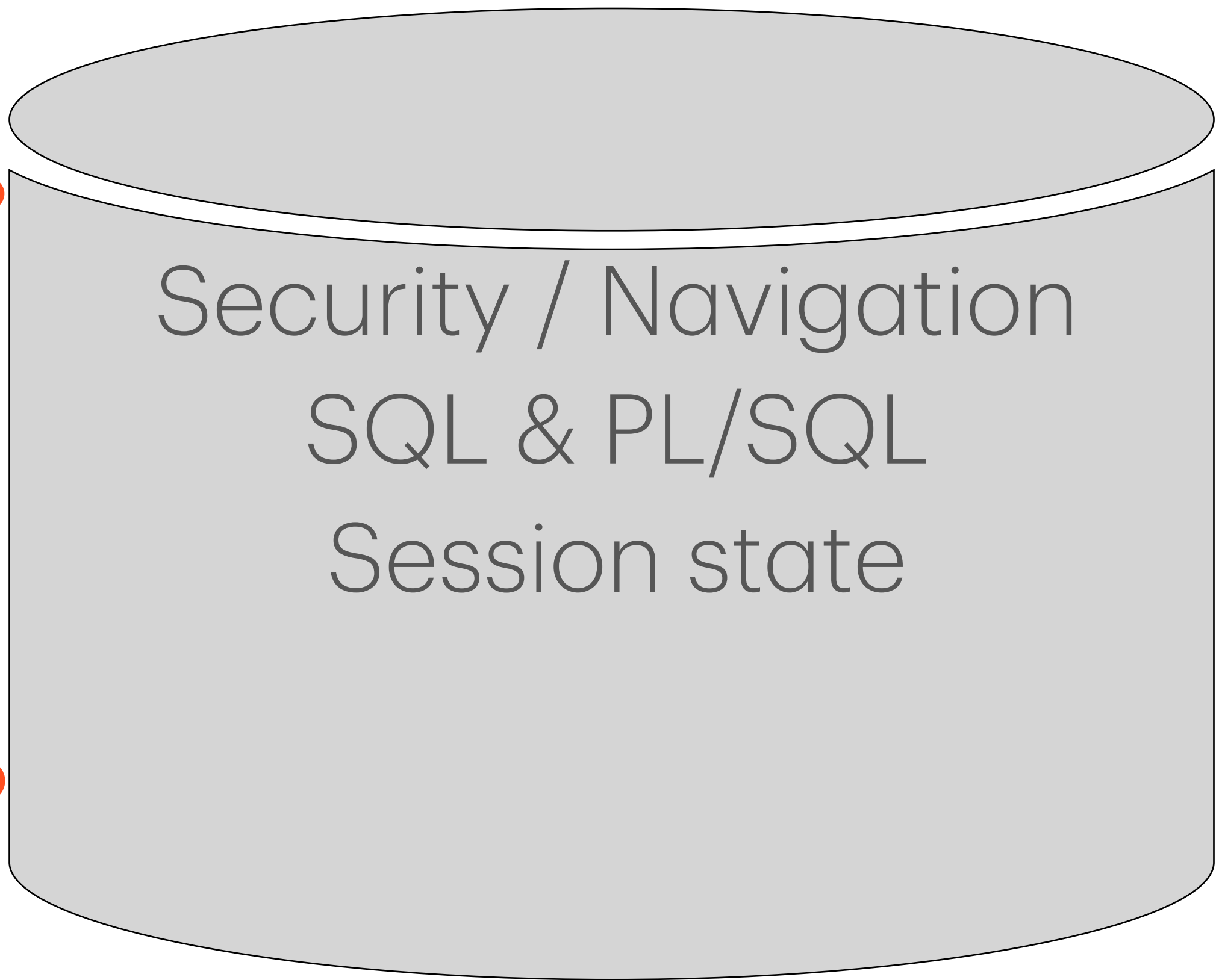
Server / Database



GET



POST



values do not automatically cross this boundary—you must sync them

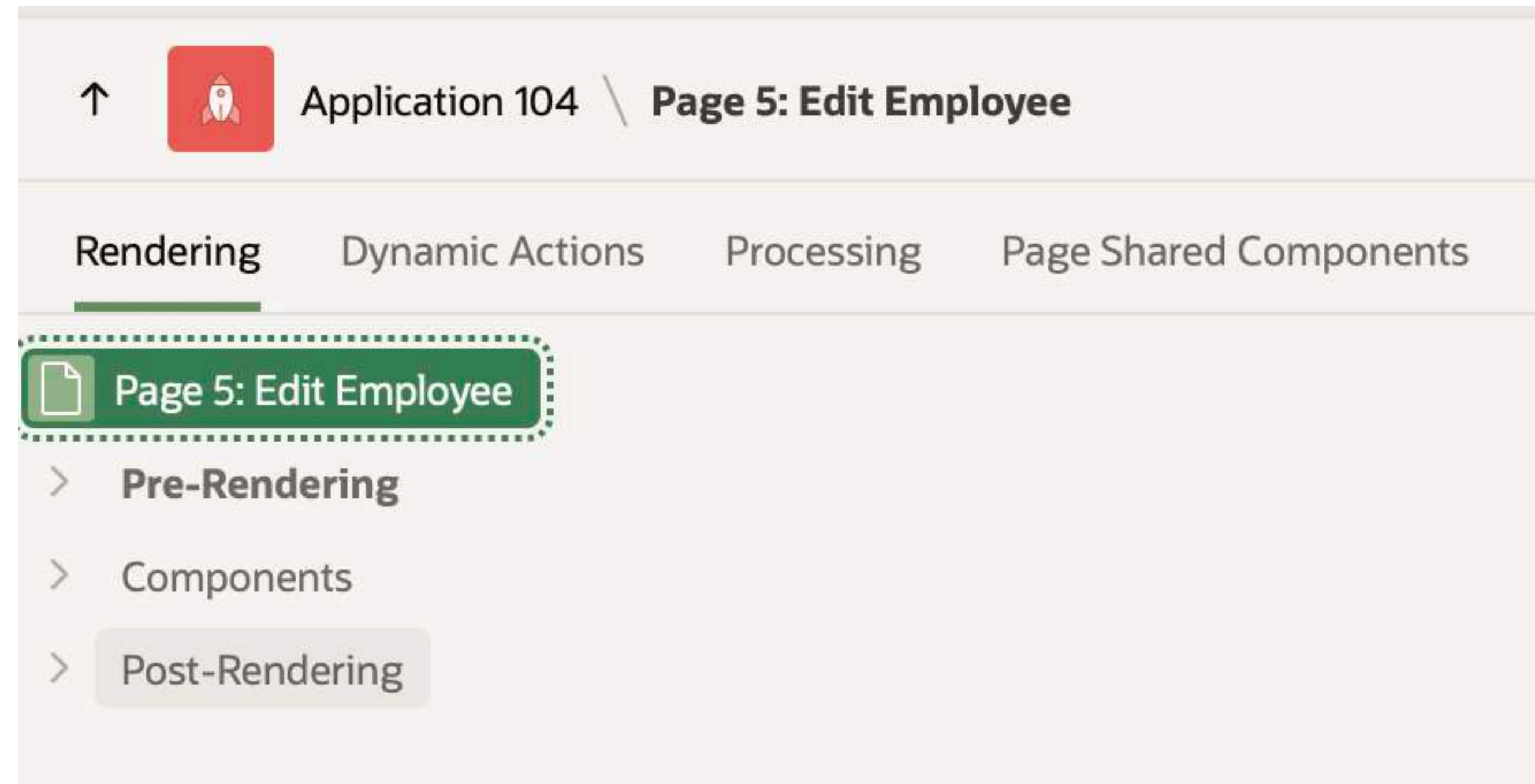


Page Rendering (GET)

Page Rendering (GET)

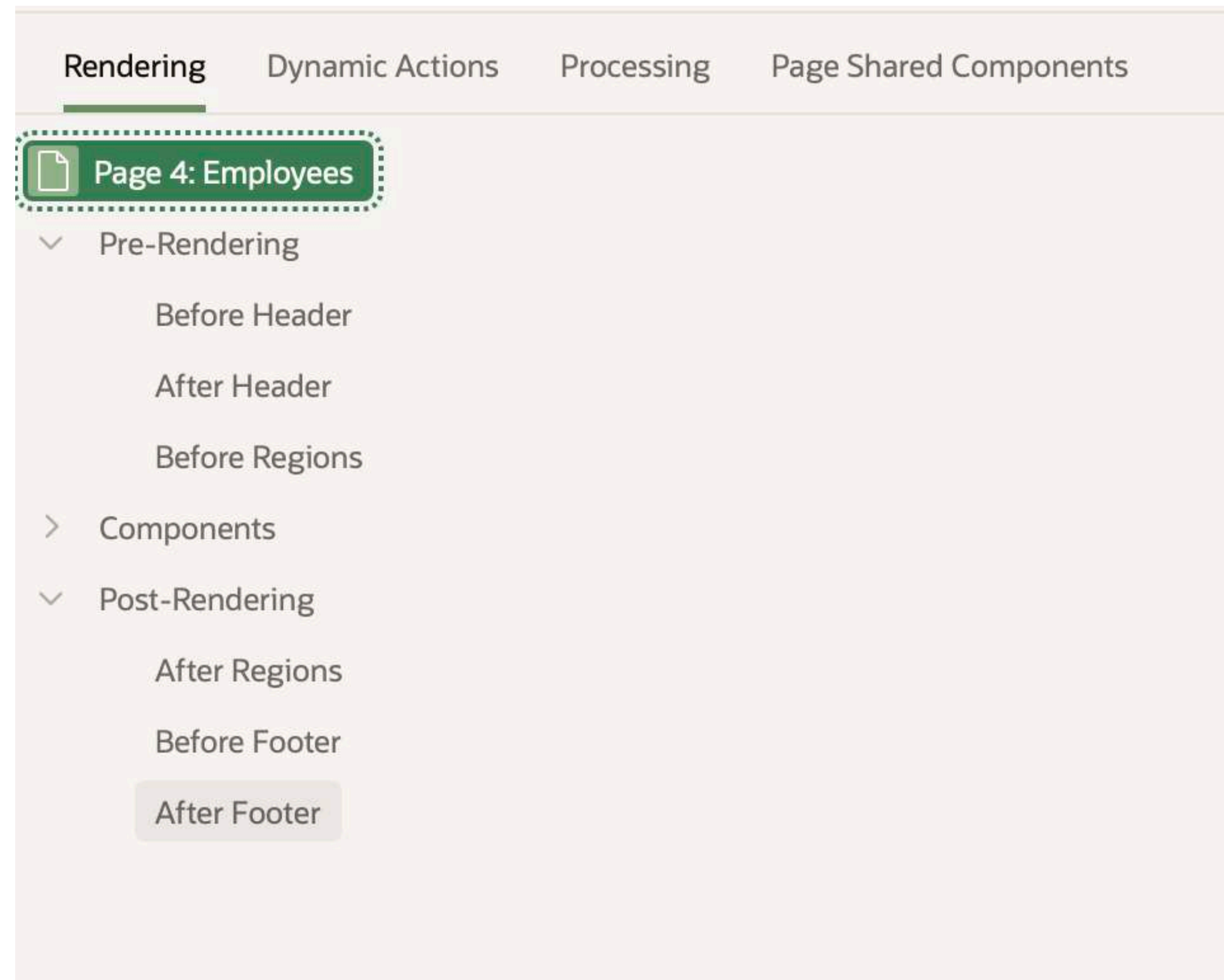
step-by-step

- Pre-Rendering
- Components
- Post-Rendering
- Initializing Dynamic Actions



Page Rendering (GET)

Pre-Rendering



Computations

Processes

(Branches)





Page Rendering (GET)

Pre-Rendering

Pre-Rendering

Before Header

Branches

-  *Redirect to Remote Monitoring View (402) AFTER LOGIN, when has Remote Monitoring Privilege*
-  *Redirect to Safety Contact View (401) when not authorized and is Safety Contact*
-  *Redirect to SAE Reporting View (403) when not authorized and has SAE Access*
-  *Redirect to Remote Monitoring View (402) when not authorized and has Remote Monitoring Privilege*

Computations

 PO_VIEWMODE

After Header

Before Regions

Page Rendering (GET)

step-by-step

- Pre-Rendering
- Components
- Post-Rendering
- Initializing Dynamic Actions

Page Rendering (GET)

Components

- Page Templates
- Region Templates
- etc.
- Replacing substitution strings

u97qxgsuvigv-apex23ai.adb.eu-frankfurt-1.oraclecloudapps.com Employees

Anatomy of an APEX Page

Employees

Go Actions Create

Employee Name	Job	Manager	Hired	Salary	Commission	Deptno
CLARK	MANAGER	KING	6/9/1981	2,450		ACCOUNTING
MILLER	CLERK	CLARK	1/23/1982	1,300		ACCOUNTING
KING	PRESIDENT		11/17/1981	5,000		ACCOUNTING
JONES	MANAGER	KING	4/2/1981	2,975		RESEARCH
SCOTT	ANALYST	JONES	12/9/1982	3,000		RESEARCH
FORD	ANALYST	JONES	12/3/1981	3,000		RESEARCH
ADAMS	CLERK	SCOTT	1/12/1983	1,100		RESEARCH
SMITH	CLERK	FORD	12/17/1980	800		RESEARCH
BLAKE	MANAGER	KING	5/1/1981	2,850		SALES
ALLEN	SALESMAN	BLAKE	2/20/1981	1,600	300	SALES
WARD	SALESMAN	BLAKE	2/22/1981	1,250	500	SALES
MARTIN	SALESMAN	BLAKE	9/28/1981	1,250	1,400	SALES
TURNER	SALESMAN	BLAKE	9/8/1981	1,500	0	SALES
JAMES	CLERK	BLAKE	12/3/1981	950		SALES

1 - 14

Performance

Lazy Loading

Maximum Rows to Process

Web Inspector — bxfu97qxgsuvigv-apex23ai.adb.eu-frankfurt-1.oraclecloudapps.com — employees

Filter Full URL All

Name	Domain	Type	Initiator	Transfer Size	Time
employees	bxfu97qxgsuvig...	document	—	(service worker)	396ms
oj-redwood-notag-min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.04ms
Core.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.04ms
Theme-Standard.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.03ms
font-apex.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.03ms
Core.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.03ms
Vita.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.04ms
desktop_all.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.03ms
www_flow.js_messages	bxfu97qxgsuvig...	js	employee...	(memory)	0.06ms
www_flow.js_dialogs	bxfu97qxgsuvig...	js	employee...	(memory)	0.03ms
theme42.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
widget.interactiveReport.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.04ms
widget.iconList.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
widget.stickyTableHeader.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.03ms
widget.stickyWidget.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
item.Colorpicker.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
devToolbar.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.03ms
require.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
requirejs.jetConfig.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
jetCommonBundle.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
chartBundle.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
widget.treeView.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.04ms
localeElements.js	bxfu97qxgsuvig...	js	require.js:...	(memory)	0.10ms

1 23 50.2 KB 559 B 0 584ms

Web Inspector — bx fu97qxgsvuigv-apex23ai.adb.eu-frankfurt-1.oraclecloudapps.com — employees

[104:4] Employees Employees

Anatomy of an APEX Page

Employees

roel

Search: Go Actions

	Employee Name	Job	Manager	Hired	Salary	Commission	Deptno
	CLARK	MANAGER	KING	6/9/1981	2,450		ACCOUNTING
	MILLER	CLERK	CLARK	1/23/1982	1,300		ACCOUNTING
	KING	PRESIDENT		11/17/1981	5,000		ACCOUNTING
	JONES	MANAGER	KING	4/2/1981	2,975		RESEARCH
	SCOTT	ANALYST	JONES	12/9/1982	3,000		RESEARCH
	FORD	ANALYST	JONES	12/3/1981	3,000		RESEARCH
	ADAMS	CLERK	SCOTT	1/12/1983	1,100		RESEARCH
	SMITH	CLERK	FORD	12/17/1980	800		RESEARCH
	BLAKE	MANAGER	KING	5/1/1981	2,850		SALES
	ALLEN	SALESMAN	BLAKE	2/20/1981	1,600	300	SALES
	WARD	SALESMAN	BLAKE	2/22/1981	1,250	500	SALES
	MARTIN	SALESMAN	BLAKE	9/28/1981	1,250	1,400	SALES
	TURNER	SALESMAN	BLAKE	9/8/1981	1,500	0	SALES
	JAMES	CLERK	BLAKE	12/3/1981	950		SALES

1 - 14

Performance

Lazy Loading

Maximum Rows to Process

Release 1.0

ORACLE DB 23AI App 104 Page 4 Session Debug Quick Edit Customize

Web Inspector — bx fu97qxgsvuigv-apex23ai.adb.eu-frankfurt-1.oraclecloudapps.com — employees




Filter Full URL All






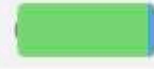















Disable Caches Import Export






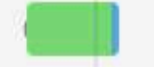








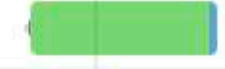


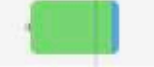





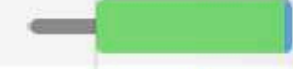















Name	Domain	Type	Initiator	Transfer Size	Time	200.0ms	400.0ms	600.0ms	800.0ms	1000.0ms
employees	bx fu97qxgsvuig...	document	—	(service worker)	242ms					
oj-redwood-notag-min.css	bx fu97qxgsvuig...	css	employee...	(memory)	0.04ms					
Core.min.css	bx fu97qxgsvuig...	css	employee...	(memory)	0.04ms					
Theme-Standard.min.css	bx fu97qxgsvuig...	css	employee...	(memory)	0.04ms					
font-apex.min.css	bx fu97qxgsvuig...	css	employee...	(memory)	0.02ms					
Core.min.css	bx fu97qxgsvuig...	css	employee...	(memory)	0.02ms					
Vita.min.css	bx fu97qxgsvuig...	css	employee...	(memory)	0.03ms					
desktop_all.min.js	bx fu97qxgsvuig...	js	employee...	(memory)	0.03ms					
www_flow.js_messages	bx fu97qxgsvuig...	js	employee...	(memory)	0.06ms					
www_flow.js_dialogs	bx fu97qxgsvuig...	js	employee...	(memory)	0.03ms					
theme42.min.js	bx fu97qxgsvuig...	js	employee...	(memory)	0.02ms					
widget.interactiveReport.min.js	bx fu97qxgsvuig...	js	employee...	(memory)	0.06ms					
widget.iconList.min.js	bx fu97qxgsvuig...	js	employee...	(memory)	0.02ms					
widget.stickyTableHeader.min.js	bx fu97qxgsvuig...	js	employee...	(memory)	0.03ms					
widget.stickyWidget.min.js	bx fu97qxgsvuig...	js	employee...	(memory)	0.02ms					
item.Colorpicker.min.js	bx fu97qxgsvuig...	js	employee...	(memory)	0.03ms					
devToolBar.min.js	bx fu97qxgsvuig...	js	employee...	(memory)	0.02ms					
require.js	bx fu97qxgsvuig...	js	employee...	(memory)	0.02ms					
requirejs.jetConfig.min.js	bx fu97qxgsvuig...	js	employee...	(memory)	0.02ms					
jetCommonBundle.min.js	bx fu97qxgsvuig...	js	employee...	(memory)	0.02ms					
chartBundle.min.js	bx fu97qxgsvuig...	js	employee...	(memory)	0.02ms					
widget.treeView.min.js	bx fu97qxgsvuig...	js	employee...	(memory)	0.02ms					
www_flow.ajax	bx fu97qxgsvuig...	xhr	desktop_...	23.20 KB	431ms					
localeElements.js	bx fu97qxgsvuig...	js	require.js:...	(memory)	0.10ms					

1 24 51.6 KB 23.8 KB 0 452ms

Auto — Page

Name	Domain	Type	Initiator	Transfer Size	Time	500.0ms
 employees	 bxfu97qxgsuvigv-apex23ai.adb...	document	—	(service worker)	476ms	

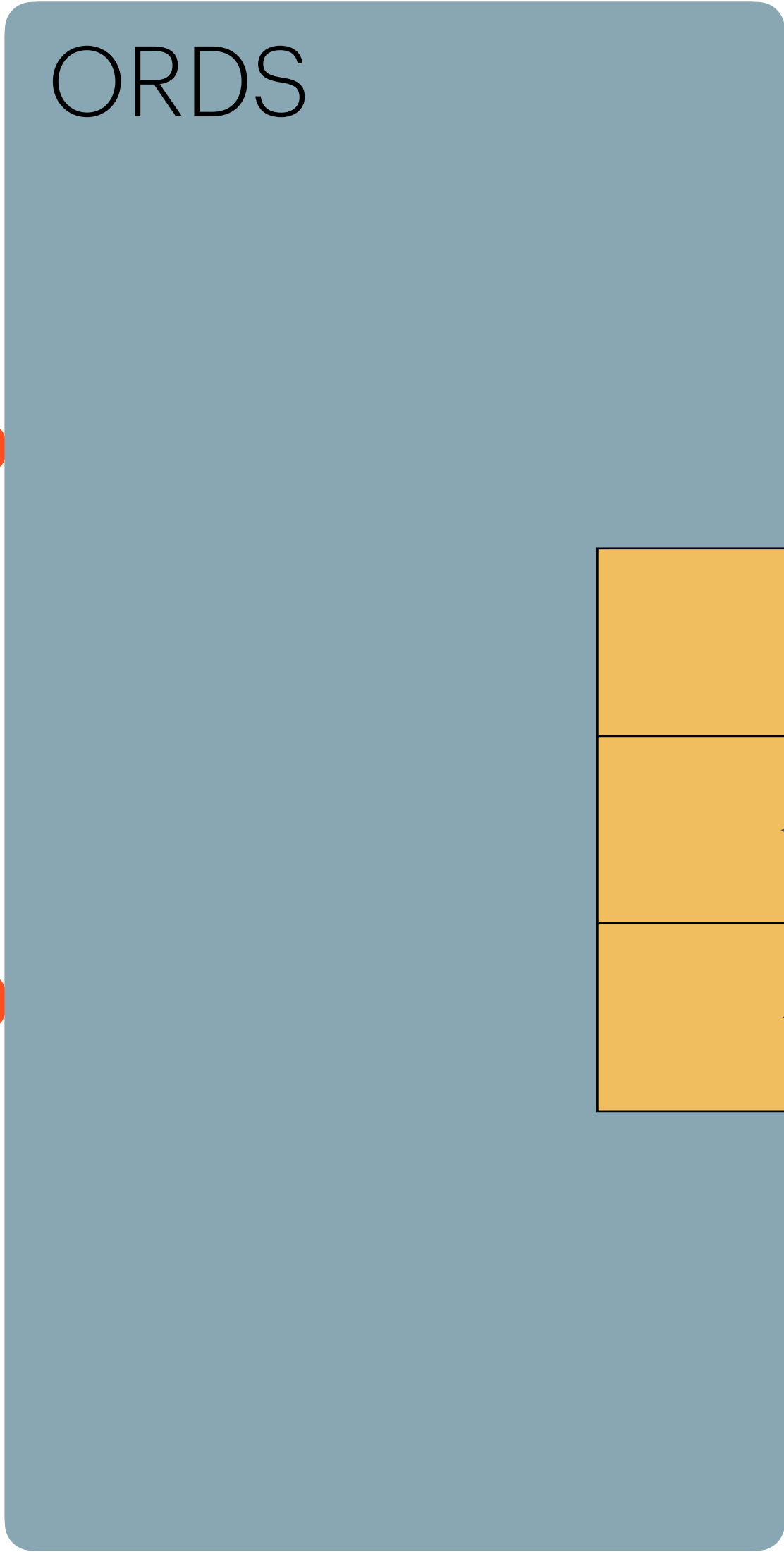
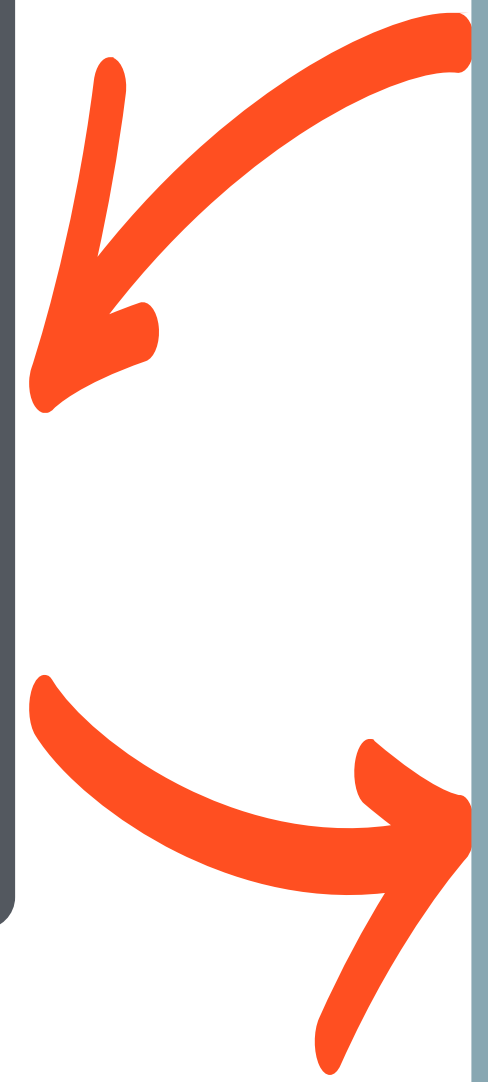
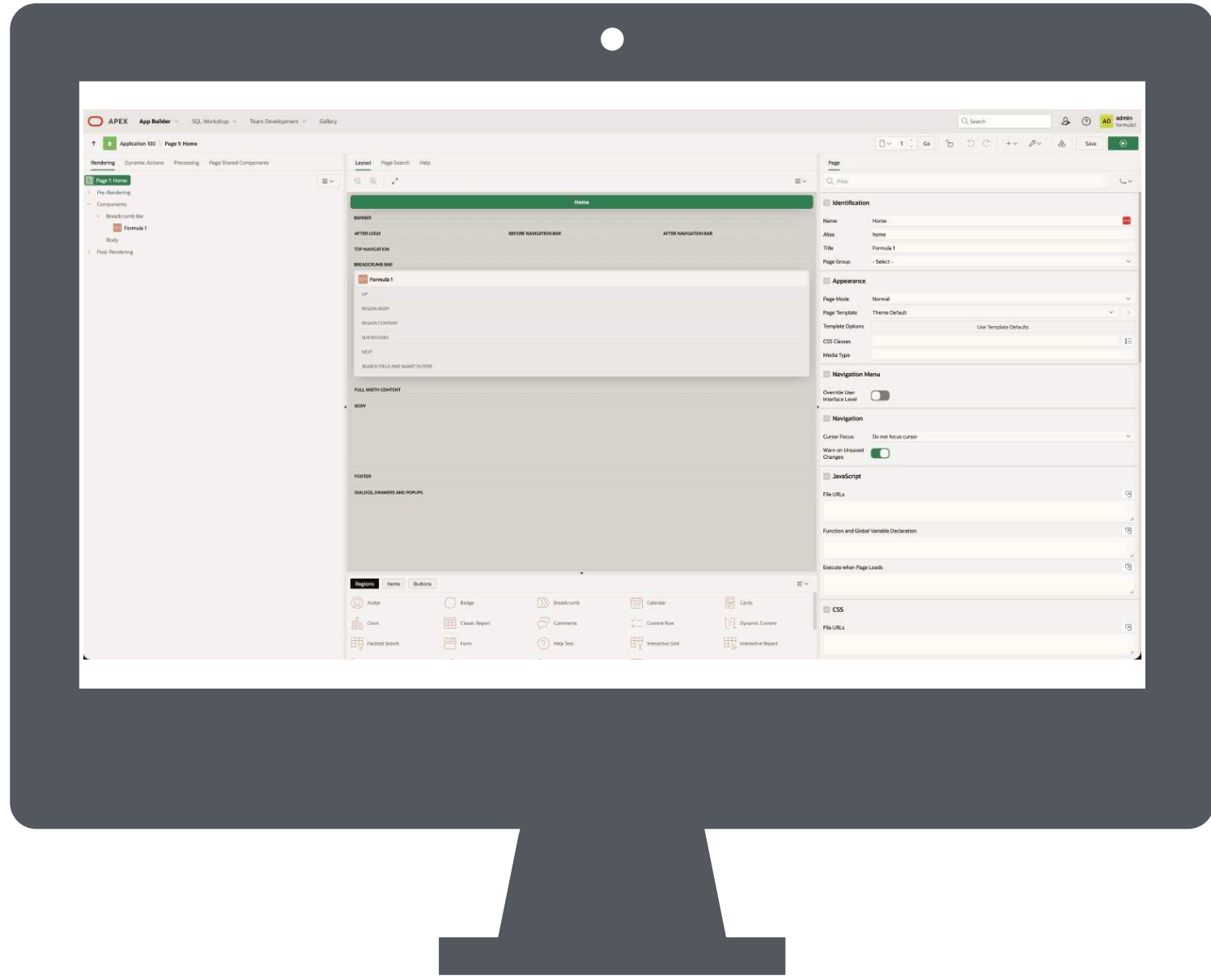
Name	Domain	Type	Initiator	Transfer Size	Time	500.0ms	1000.0ms	^
 employees	 bxfu97qxgsuvigv-apex23ai.adb...	document	—	(service worker)	357ms			
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.10 KB	154ms			
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.10 KB	187ms			
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.10 KB	170ms			
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.11 KB	315ms			
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.16 KB	169ms			
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.16 KB	295ms			

Name	Domain	Type	Initiator	Transfer Size	Time	500.0ms	1000.0ms	1.50s	2.00s	^
 employees	 bxfu97qxgsuvigv-apex23ai.adb...	document	—	(service worker)	465ms					
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.10 KB	175ms					
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.16 KB	191ms					
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.10 KB	145ms					
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.16 KB	370ms					
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.10 KB	177ms					
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.16 KB	167ms					
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.11 KB	522ms					
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.16 KB	350ms					
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.16 KB	365ms					
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.16 KB	340ms					
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.16 KB	346ms					
 wwv_flow.ajax	 bxfu97qxgsuvigv-apex23ai.adb...	xhr	desktop_all.min.js:5:83017	9.16 KB	519ms					

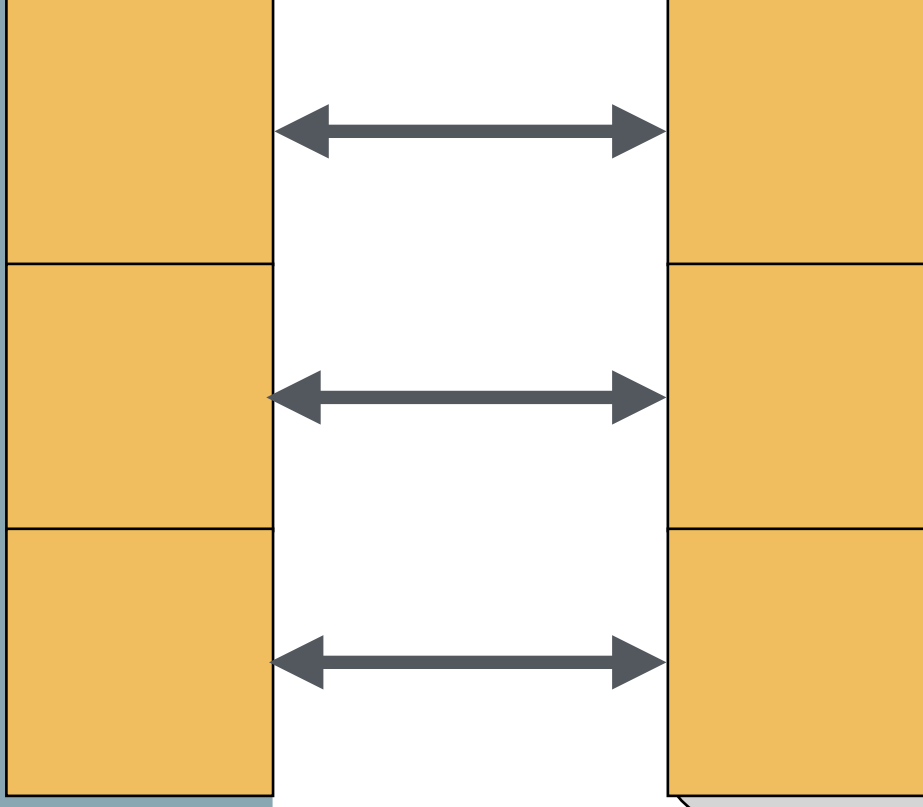
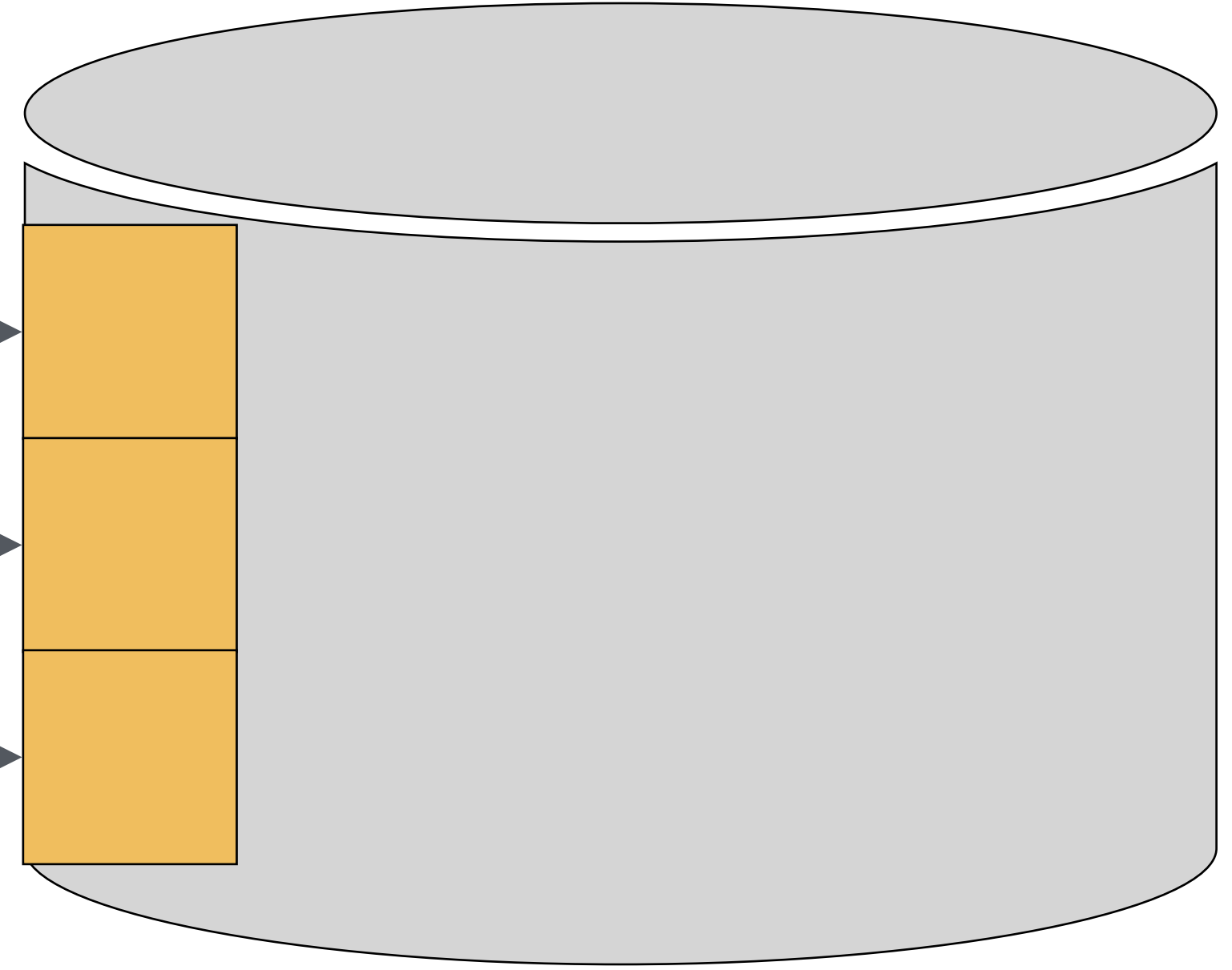
FREE
BEER



Client / Browser



Server / Database



Oracle APEX App Builder interface showing the configuration for a page item named "P4_DEPT". The breadcrumb navigation is: Application 104 > Page 4: Employees > Region Body > P4_DEPT. The "Page Item" configuration panel is open, showing the "Session State" section. The "Storage" dropdown is expanded, showing three options: "Per Request (Memory Only)" (selected), "Per Session (Persistent)", and "Per User (Persistent)".

Session State

Storage

Quick Picks

✓ Per Request (Memory Only)

Per Session (Persistent)

Per User (Persistent)

Oracle APEX App Builder interface showing the configuration for a page item. The breadcrumb navigation is: Application 104 > Page 4: Employees > Page Item.

The configuration panel for the page item includes:

- Identification
- Label
- Settings
- Layout
- Appearance
- Validation
- Advanced
- Source
- Default
- Session State

The Session State dropdown menu is open, showing options:

- Per Request (Memory Only) - Selected
- Per Session (Persistent)
- Per User (Persistent)

Region configuration panel for the 'EMP' table.

Region: Attributes Printing

Filter: []

Source configuration:

- Location: Local Database
- Type: Table / View
- Table Owner: Parsing Schema
- Table Name: EMP
- Include ROWID Column:
- Where Clause: DEPTNO = :P4_DEPT
- Order By Clause: []
- Page Items to Submit: []

Web Inspector - Network tab showing resource loading details for the 'employees' page.

Name	Domain	Type	Initiator	Transfer Size	Time	200.0ms	400.0ms	600.0ms	800.0ms	1000.0ms	1.20s	1.40s
employees	bxfu97qxgsuvig...	document	—	(service worker)	218ms							
oj-redwood-notag-min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.06ms							
Core.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.13ms							
Theme-Standard.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.08ms							
font-apex.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.04ms							
Core.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.06ms							
Vita.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.06ms							
desktop_all.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.06ms							
wwv_flow_js_dialogs	bxfu97qxgsuvig...	js	employee...	(memory)	0.07ms							
theme42.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.04ms							
widget.treeView.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.04ms							
widget.interactiveReport.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.03ms							
widget.iconList.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms							
widget.stickyTableHeader.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms							
widget.stickyWidget.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms							
item.Colorpicker.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms							
devToolBar.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.03ms							
require.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.03ms							
requirejs.jetConfig.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms							
jetCommonBundle.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.01ms							
chartBundle.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms							
apex-5-icon-font.woff2	bxfu97qxgsuvig...	woff2	employee...	(memory)	0.07ms							
wwv_flow_js_messages	bxfu97qxgsuvig...	js	employee...	(memory)	0.14ms							
Font-APEX-Small.woff2	bxfu97qxgsuvig...	woff2	employee...	(service worker)	193ms							
localeElements.js	bxfu97qxgsuvig...	js	require.js...	(memory)	0.34ms							

Web Inspector - Session tab showing session details.

Application: 104 Anatomy of an APEX Page

Session: 16835360101658

User: ROEL

Workspace: 7216690592882915

Browser Language: en

Page Items: Page has no items.

Works once

Oracle APEX App Builder interface for 'Employees' page. The left sidebar shows the component tree with 'Employees' selected. The right pane shows the 'Page Item' configuration for the 'EMP' table.

Page Item Configuration:

- Source: Local Database
- Type: Table / View
- Table Owner: Parsing Schema
- Table Name: EMP
- Include ROWID Column:
- Where Clause: DEPTNO = :P4_DEPT
- Page Items to Submit: P4_DEPT

Region configuration for the 'EMP' table. The 'Source' section is expanded, showing the database connection details and the 'Where Clause'.

Source Configuration:

- Location: Local Database
- Type: Table / View
- Table Owner: Parsing Schema
- Table Name: EMP
- Include ROWID Column:
- Where Clause: DEPTNO = :P4_DEPT

Web Inspector Network tab showing the resource loading for the 'employees' page. The table lists various resources and their load times.

Name	Domain	Type	Initiator	Transfer Size	Time
employees	bxfu97qxgsuvig...	document	—	(service worker)	218ms
oj-redwood-notag-min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.06ms
Core.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.13ms
Theme-Standard.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.08ms
font-apex.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.04ms
Core.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.06ms
Vita.min.css	bxfu97qxgsuvig...	css	employee...	(memory)	0.06ms
desktop_all.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.06ms
wwv_flow.js_dialogs	bxfu97qxgsuvig...	js	employee...	(memory)	0.07ms
theme42.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.04ms
widget.treeView.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.04ms
widget.interactiveReport.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.03ms
widget.iconList.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
widget.stickyTableHeader.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
widget.stickyWidget.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
item.Colorpicker.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
devToolBar.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.03ms
require.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.03ms
requirejs.jetConfig.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
jetCommonBundle.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.01ms
chartBundle.min.js	bxfu97qxgsuvig...	js	employee...	(memory)	0.02ms
apex-5-icon-font.woff2	bxfu97qxgsuvig...	woff2	employee...	(memory)	0.07ms
wwv_flow.js_messages	bxfu97qxgsuvig...	js	employee...	(memory)	0.14ms
Font-APEX-Small.woff2	bxfu97qxgsuvig...	woff2	employee...	(service worker)	193ms
localeElements.js	bxfu97qxgsuvig...	js	require.js...	(memory)	0.34ms

Session information window showing application and session details.

Session Information:

- Application: 104 Anatomy of an APEX Page
- Session: 16835360101658
- User: ROEL
- Workspace: 7216690592882915
- Browser Language: en

Page Items:

Page has no items.

Oracle APEX App Builder interface showing the configuration for a page item. The breadcrumb bar is highlighted in red. The page item configuration is as follows:

- Page Item: Filter
- Identification: Identification
- Label: Label
- Settings: Settings
- Layout: Layout
- Appearance: Appearance
- Validation: Validation
- Advanced: Advanced
- Source: Source
- Default: Default
- Session State: Per Session (Persistent)

Region configuration for the 'Filter' page item. The configuration is as follows:

- Region: Filter
- Attributes: Attributes
- Printing: Printing
- Source:
 - Location: Local Database
 - Type: Table / View
 - Table Owner: Parsing Schema
 - Table Name: EMP
 - Include ROWID Column:
 - Where Clause: DEPTNO = :P4_DEPT
 - Order By Clause:
 - Page Items to Submit:

Web Inspector Network tab showing the resource loading for the 'employees' page. The table below lists the resources and their load times.

Name	Domain	Type	Initiator	Transfer Size	Time
employees	bxfu97qxgsuvigv...	document	—	(service worker)	280ms
oj-redwood-notag-min.css	bxfu97qxgsuvigv...	css	employee...	(memory)	0.04ms
Core.min.css	bxfu97qxgsuvigv...	css	employee...	(memory)	0.05ms
Theme-Standard.min.css	bxfu97qxgsuvigv...	css	employee...	(memory)	0.05ms
font-apex.min.css	bxfu97qxgsuvigv...	css	employee...	(memory)	0.03ms
Core.min.css	bxfu97qxgsuvigv...	css	employee...	(memory)	0.03ms
Vita.min.css	bxfu97qxgsuvigv...	css	employee...	(memory)	0.05ms
desktop_all.min.js	bxfu97qxgsuvigv...	js	employee...	(memory)	0.03ms
www_flow.js_messages	bxfu97qxgsuvigv...	js	employee...	(memory)	0.06ms
www_flow.js_dialogs	bxfu97qxgsuvigv...	js	employee...	(memory)	0.03ms
theme42.min.js	bxfu97qxgsuvigv...	js	employee...	(memory)	0.03ms
widget.interactiveReport.min.js	bxfu97qxgsuvigv...	js	employee...	(memory)	0.05ms
widget.iconList.min.js	bxfu97qxgsuvigv...	js	employee...	(memory)	0.02ms
widget.stickyTableHeader.min.js	bxfu97qxgsuvigv...	js	employee...	(memory)	0.03ms
widget.stickyWidget.min.js	bxfu97qxgsuvigv...	js	employee...	(memory)	0.02ms
item.Colorpicker.min.js	bxfu97qxgsuvigv...	js	employee...	(memory)	0.02ms
devToolBar.min.js	bxfu97qxgsuvigv...	js	employee...	(memory)	0.02ms
require.js	bxfu97qxgsuvigv...	js	employee...	(memory)	0.02ms
requirejs.jetConfig.min.js	bxfu97qxgsuvigv...	js	employee...	(memory)	0.02ms
jetCommonBundle.min.js	bxfu97qxgsuvigv...	js	employee...	(memory)	0.02ms
chartBundle.min.js	bxfu97qxgsuvigv...	js	employee...	(memory)	0.02ms
widget.treeView.min.js	bxfu97qxgsuvigv...	js	employee...	(memory)	0.05ms
localeElements.js	bxfu97qxgsuvigv...	js	require.js:...	(memory)	0.33ms

Session information window showing the current session details and page items.

Application: 104 Anatomy of an APEX Page

Session: 16835360101658

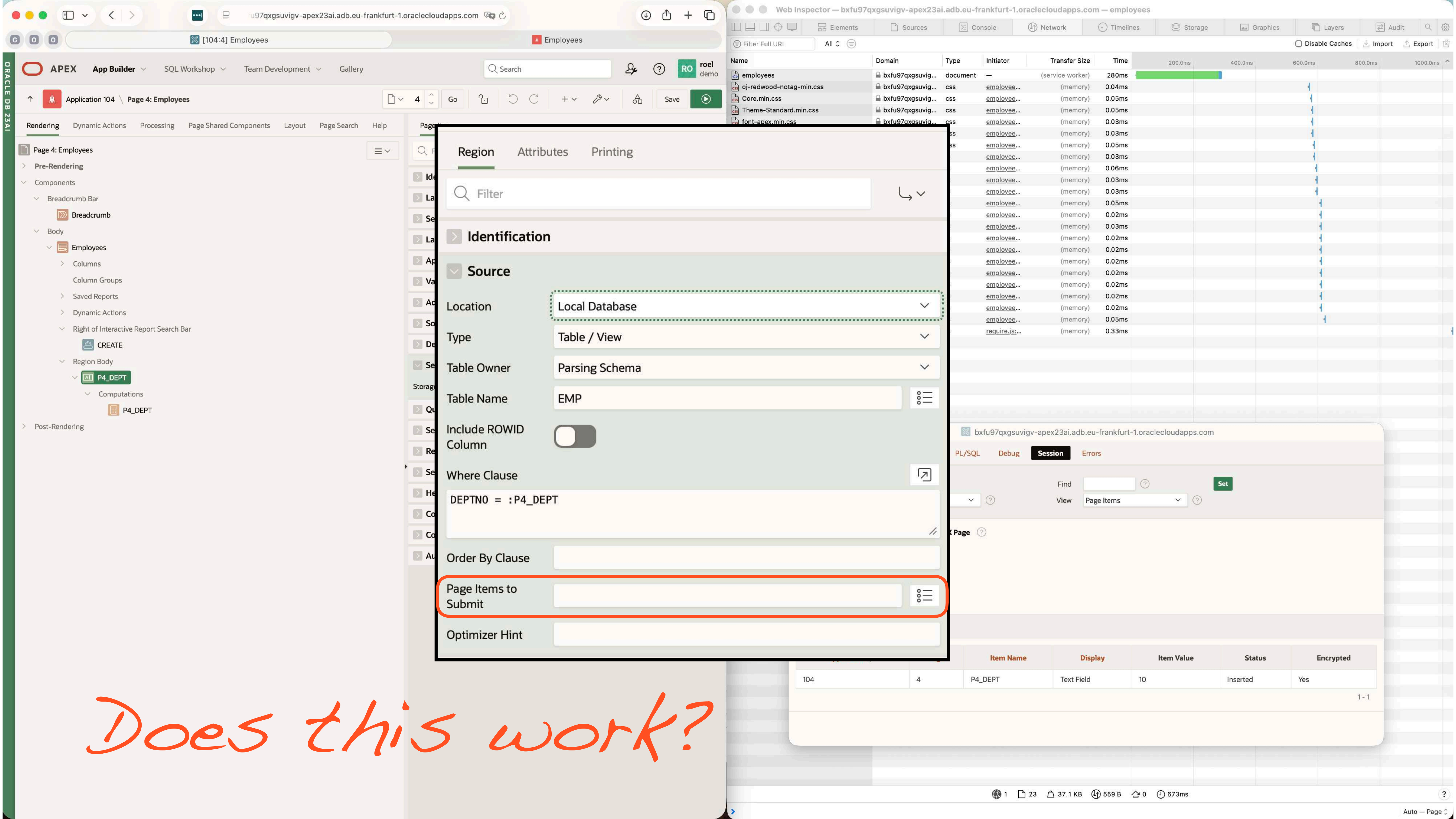
User: ROEL

Workspace: 7216690592882915

Browser Language: en

Page Items:

Application	Page	Item Name	Display	Item Value	Status	Encrypted
104	4	P4_DEPT	Text Field	10	Inserted	Yes



Does this work?

▼ Edit Employee

- ▼ Region Body
 - P5_EMPNO
 - P5_ENAME**
 - > P5_JOB
 - P5_MGR
 - P5_HIREDATE
 - > P5_SAL
 - P5_COMM
 - P5_DEPTNO
- ▼ Dialog Footer
 - ▼ Buttons
 - ▼ Close
 - > CANCEL
 - ▼ Delete

> Settings

> Layout

> Appearance

> Validation

> Advanced

> Source

> Default

▼ Session State

Storage Per Request (Memory Only)

Does this work?

▼ Settings

Language PL/SQL

PL/SQL Code

```
apex_util.set_session_state('P5_ENAME', 'ROEL');|
```

Items to Submit

Items to Return

Settings

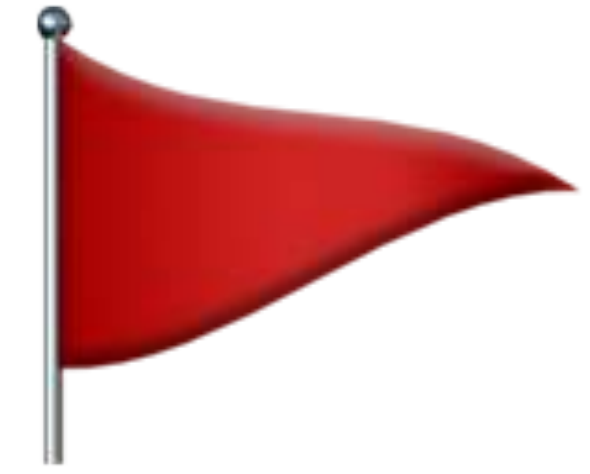
Language PL/SQL

PL/SQL Code

```
null;
```

Items to Submit P5_ENAME,P5_JOB

Items to Return



Does this work?

Page Rendering (GET)

Components

- Lazy Loading
- Session state
 - Per Request (memory only)
 - Per Session (persistent)
- Page Items to Submit

Page Rendering (GET)

step-by-step

- Pre-Rendering
- Components
- Post-Rendering
- Initializing Dynamic Actions

Page Rendering (GET)

Post-Rendering

- (Additional) Computations
- (Additional) Processes

Not widely used - not even in the APEX Builder itself

PROCESS_POINT	COUNT(*)	COMPUTATION_POINT	COUNT(*)
1 On Load - After Footer	4	1 After Footer	8
2 On Load - After Header	190	2 After Header	84
3 On Load - After Regions	2	3 After Region(s)	1
4 On Load - Before Footer	4	4 Before Header	315
5 On Load - Before Header	367	5 Before Region(s)	118
6 On Load - Before Regions	19		

Page Rendering (GET)

step-by-step

- Pre-Rendering
- Components
- Post-Rendering
- Initializing Dynamic Actions

Page Rendering (GET)

Initializing Dynamic Actions

- What JS runs first?

Execute when Page Loads



```
console.log("Execute when Page Loads");
```



Execute when Page Loads



```
console.log("Execute when Page Loads");
```



Identification

Name

On Page Load

Action

Execute JavaScript Code



Settings

Code



```
console.log("On Page Load");
```



Execute when Page Loads



```
console.log("Execute when Page Loads");
```

Identification

Name On Page Load

Action Execute JavaScript Code

Settings

Code

```
console.log("On Page Load");
```

Identification

Name On Change of Region Employees

Action Execute JavaScript Code

Settings

Code

```
console.log("Change")
```

Affected Elements

Execution

Sequence 10

Event Something that "Fires on initialization"

Fire When Event Result Is True

Fire on Initialization

Execute

conso

▼ Ide

Name

Action

▼ Se

Code

conso

▼ Identification

Name

▼ Execution

Sequence

Event Scope

Type

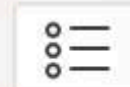
▼ When

Event

Custom Event

Selection Type

JavaScript Expression



Change	javascriptFunction — employees:208:365
On Page Load	javascriptFunction — employees:210:207
Execute when Page Loads	employees:254
Theme42Ready	javascriptFunction — employees:214:242

Actions Fired on Page Load

- Something that "Fires on initialization"
- On Page Load

Depends on "Execution sequence"

Page Rendering (GET)

step-by-step

- Pre-Rendering
- Components
- Post-Rendering
- Initializing Dynamic Actions



Page Submit (POST)

Page Submit (POST)

step-by-step

- Sync posted item values to session state
- After submit
- Validating
- Processing
- After Processing

Page Submit (POST)

Sync posted item values to session state

- Regular items

Edit Employee



Ename
ALLEN

Job
SALESMAN

Mgr
BLAKE



Hiredate
2/20/1981



Sal
1600

Comm
300

Deptno
SALES



Cancel

Delete

Apply Changes

Page Submit (POST)

Sync posted item values to session state

- Regular items
- Display only items

Settings

Format

Based On

Show Line Breaks

Send On Page Submit

Edit Employee



Ename
ALLEN

Job
SALESMAN

Mgr
BLAKE

Hiredate
2/20/1981

Sal
1600

Comm
300

Deptno
SALES

Cancel

Delete

Apply Changes

Page Submit (POST)

Sync posted item values to session state

- Regular items
- Display only items
- Read only items

Edit Employee



Ename
ALLEN

Job
SALESMAN

Mgr
BLAKE



Hiredate
2/20/1981



Sal
1600

Comm
300

Deptno
SALES



Cancel

Delete

Apply Changes

Page Submit (POST)

Sync posted item values to session state

- Regular items
- Display only items
- Read only items
- Disabled items

Advanced

CSS Classes

Custom Attributes

Edit Employee ✕

Ename
ALLEN

Job
SALESMAN

Mgr
BLAKE ▾

Hiredate
2/20/1981 📅

Sal
1600

Comm
300

Deptno
SALES ▾

Page Submit (POST)

Sync posted item values to session state

- Regular items
- Display only items
- Read only items
- Disabled items

Advanced

CSS Classes

Custom Attributes

Edit Employee



Ename
ALLEN

Job
SALESMAN

Mgr
BLAKE

Hiredate
2/20/1981

Sal
1600

Comm
300

Deptno
SALES

Cancel

Delete

Apply Changes

Page Submit (POST)

Sync posted item values to session state

- Regular items
- Display only items
- Read only items
- Disabled items

Identification

Name

Action

Affected Elements

Selection Type

Item(s)

Edit Employee ✕

Ename
ALLEN

Job
SALESMAN

Mgr
BLAKE

Hiredate
2/20/1981

Sal
1600

Comm
300

Deptno
SALES

Cancel Delete **Apply Changes**

Page Submit (POST)

Sync posted item values to session state

- Regular items
- Display only items
- Read only items
- Disabled items

Source

Form Region: Edit Employee

Column: COMM

Data Type: NUMBER

Query Only:

Primary Key:

Edit Employee

Ename: ALLEN

Job: SALESMAN

Mgr: BLAKE

Hiredate: 2/20/1981

Sal: 1600

Comm: 300

Deptno: SALES

Cancel Delete Apply Changes

Page Submit (POST)

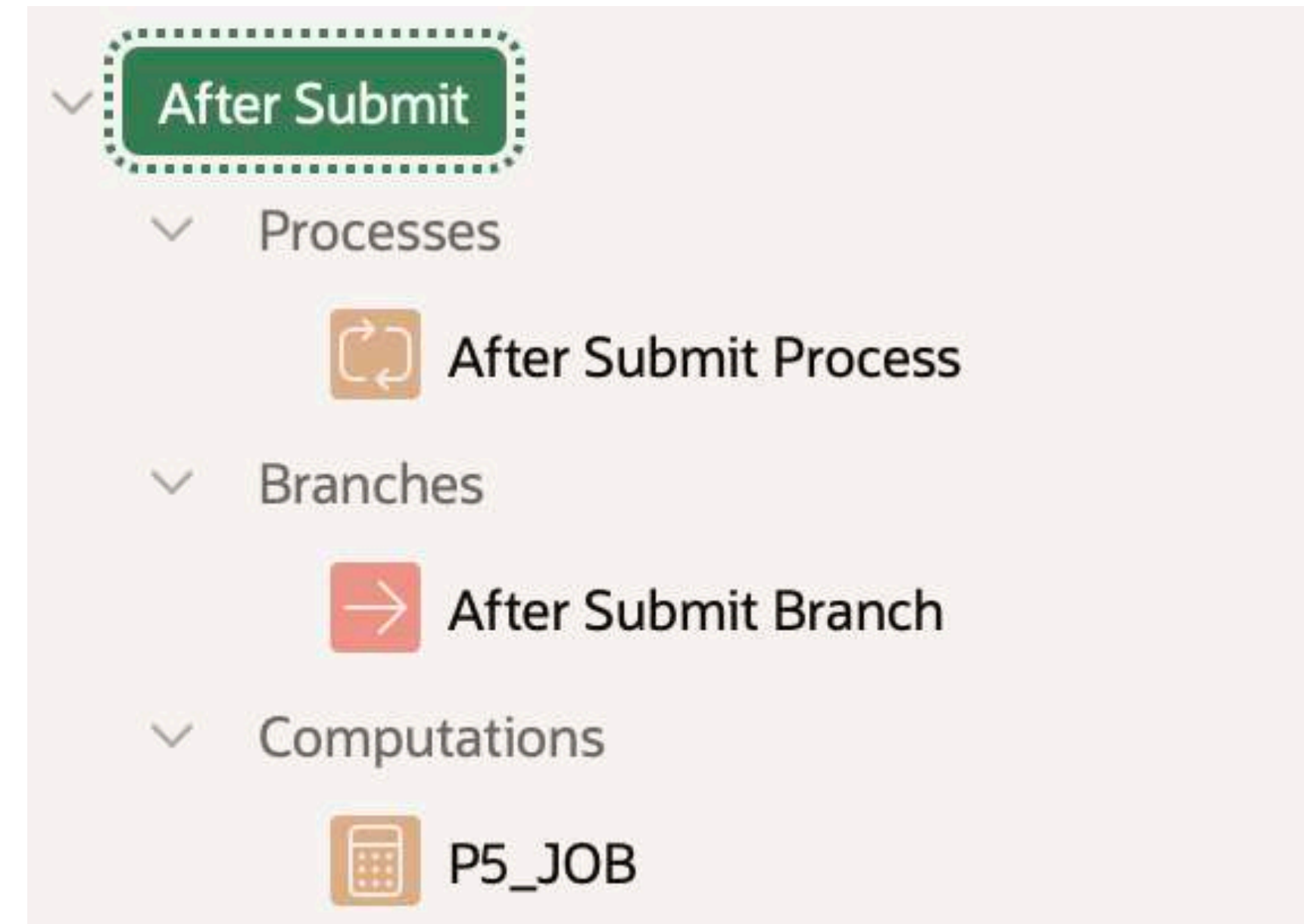
step-by-step

- Sync posted item values to session state
- After submit
- Validating
- Processing
- After Processing

Page Submit (POST)

After submit

- Processes
- Branches
- Computations



Page Submit (POST)

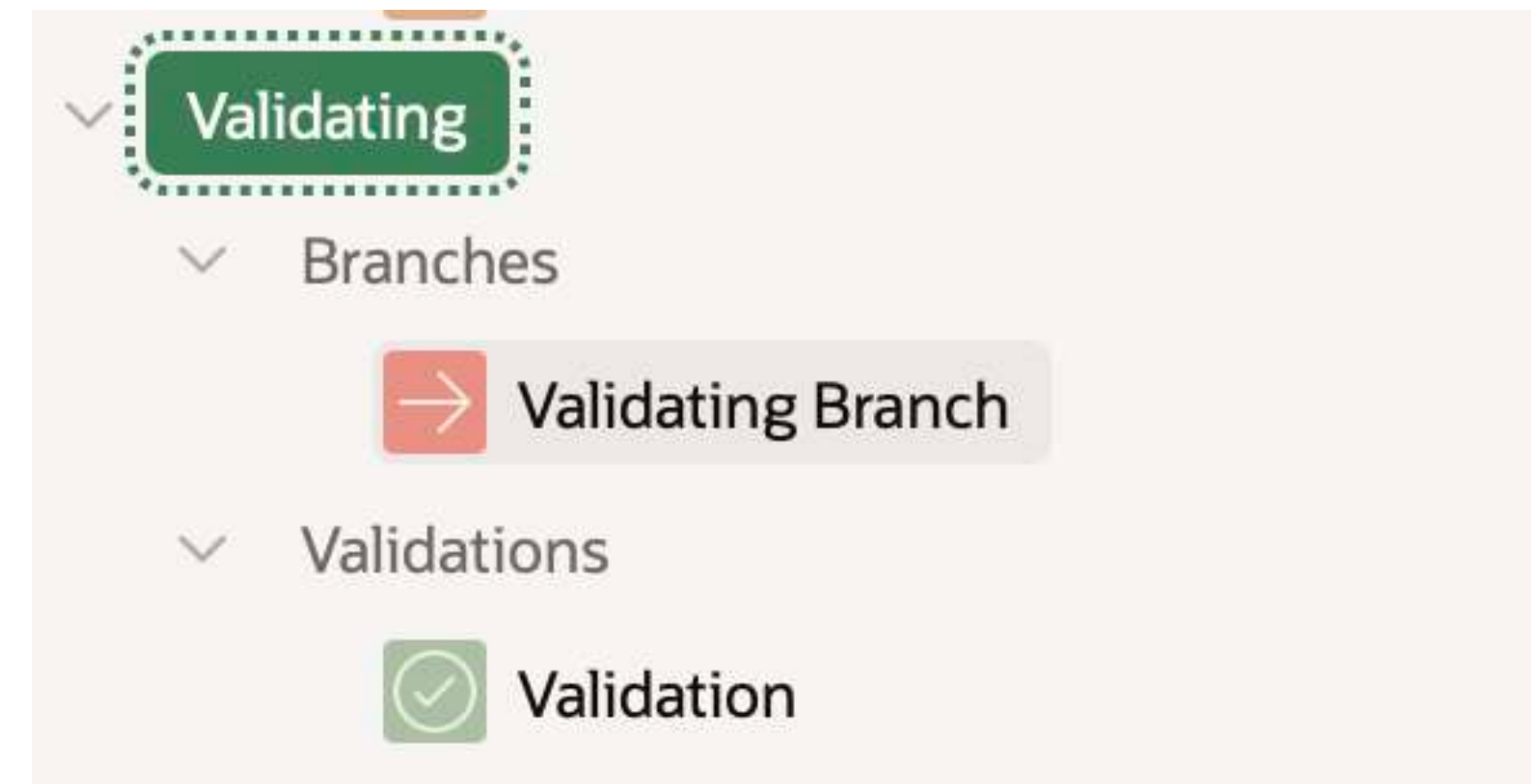
step-by-step

- Sync posted item values to session state
- After submit
- Validating
- Processing
- After Processing

Page Submit (POST)

Validating

- Branches
- Validations



Use validations for business rules, not database constraints.

Page Submit (POST)

step-by-step

- Sync posted item values to session state
- After submit
- Validating
- Processing
- After Processing

Page Submit (POST)

Processing

- Processes



Page Submit (POST)

step-by-step

- Sync posted item values to session state
- After submit
- Validating
- Processing
- After Processing

Page Submit (POST)

After Processing

- Branches

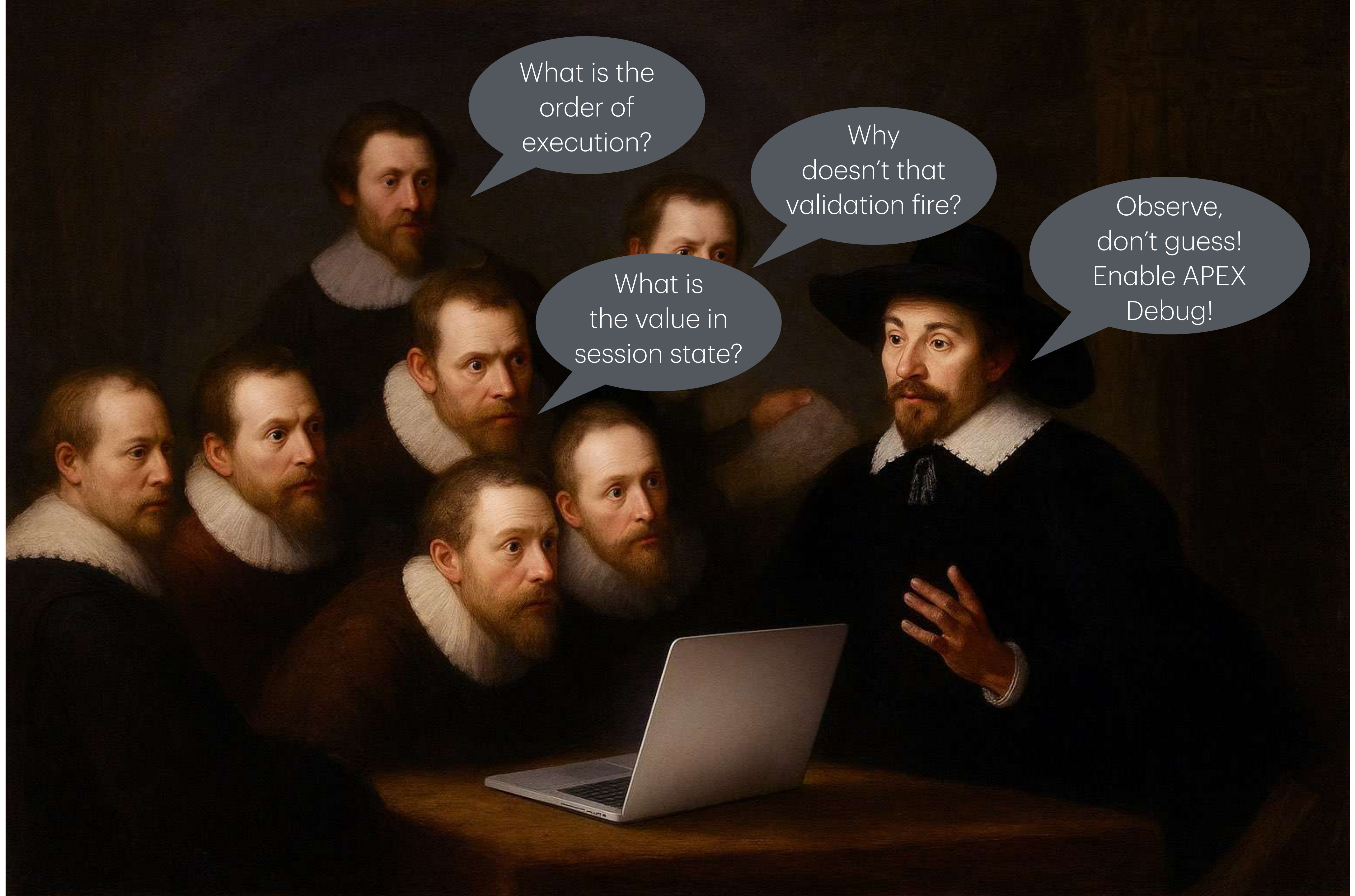


Page Submit (POST)

step-by-step

- Sync posted item values to session state
- After submit
- Validating
- Processing
- After Processing

All in one session, one transaction



What is the order of execution?

Why doesn't that validation fire?

What is the value in session state?

Observe, don't guess!
Enable APEX Debug!

Debug Mode

Debug Mode

step-by-step

- Different levels
- Item values are encrypted

Debug Mode

Different levels



- Usually “info” (default) is good enough

Elapsed	Execution	Message	Level	Graph
0.01474	0.00038	Reset NLS settings	4	
0.01511	0.00129	alter session set NLS_LANGUAGE='AMERICAN' NLS_TERRITORY='AMERICA' NLS_SORT='BINARY' NLS_COMP='BINARY' NLS_CALENDAR='GREGORIAN'	4	
0.01641	0.00200	...NLS: date_format=DD-MON-RR timestamp_format=DD-MON-RR HH.MI.SSXXFF AM timestamp_tz_format=DD-MON-RR HH.MI.SSXXFF AM TZR decimal separator=".", group separator=","	4	
0.01841	0.00016	...Setting session time_zone to +00:00	4	
0.01857	0.01033	R E Q U E S T show	3	
0.02890	0.00156	Language derived from: FLOW_PRIMARY_LANGUAGE, current browser language: en	4	
0.03046	0.00002	alter session set nls_language='AMERICAN' nls_territory='AMERICA'	4	
0.03048	0.00011	...NLS: CSV charset=WE8MSWIN1252	4	
0.03059	0.00152	Setting NLS: NLS_DATE_FORMAT="DS" NLS_TIMESTAMP_FORMAT="DS" NLS_TIMESTAMP_TZ_FORMAT="DS"	4	
0.03211	0.00069	...NLS: date_format=DS timestamp_format=DS timestamp_tz_format=DS decimal separator=".", group separator=","	4	
0.03280	0.00002	...NLS: Language=en	4	
0.03282	0.00442	Application 104, Page Template:	4	
0.03725	0.00228	> APEX_APPLICATION_AUTH Oracle APEX Accounts	3	
0.03953	0.00113	Session State: fetch from database (exact)	4	
0.04066	0.00003	... sentry+verification success	4	
0.04069	0.00082	...Session ID 5169382815748 can be used	4	
0.04151	0.00203	< APEX_APPLICATION_AUTH Oracle APEX Accounts	3	
0.04353	0.00441	...Check for session expiration:	4	
0.04794	0.00081	Session State: P5_EMPNO=>*** (Type difference: Item=VARCHAR2, Value=VARCHAR2)	4	
0.04875	0.00206	Setting NLS: NLS_DATE_FORMAT="DS" NLS_TIMESTAMP_FORMAT="DS" NLS_TIMESTAMP_TZ_FORMAT="DS"	4	
0.05081	0.00150	Branches - point: BEFORE_HEADER	4	
0.05231	0.00919	Fetch application meta data	4	
0.06150	0.00003	Clear cache: request=RP	4	
0.06152	0.01551	...Resetting pagination for page	4	
0.07703	0.00068	Session State: P5_EMPNO=>*** (Type difference: Item=VARCHAR2, Value=VARCHAR2)	4	
0.07771	0.00002	...http header processing	4	
0.07773	0.00074	...set mime type: text/html	4	
0.07848	0.00017	...set additional http headers	4	
0.07864	0.00117	Process point: BEFORE_HEADER	4	
0.07981	0.00281	Processes - point: BEFORE_HEADER	4	
0.08262	0.00004	> APEX_APPLICATION_PAGE_PROCESS Initialize form Edit Employee	3	
0.08266	0.00439	...Process "Initialize form Edit Employee" - Type: NATIVE_FORM_INIT	4	
0.08705	0.00007	Generated Component SQL Query:	4	
0.08712	0.00396	<pre> select i.* from (select "EMPNO","ENAME","JOB","MGR","HIREDATE","SAL","COMM","DEPTNO" from(select /*+ qb_name(apex\$inner) */d."EMPNO",d."ENAME",d."JOB",d."MGR",d."HIREDATE",d."SAL",d."COMM",d."DEPTNO" from(select x.* from "EMP" x)d)i)i where 1=1 and "EMPNO"=:apex\$f1 </pre>	4	

Debug Mode

Different levels

- Usually "info" (default) is good enough
- Full trace provides execution plans

4.21454	1.63083	determining execution plan	9	
5.84536	0.00153	<pre>SQL_ID 2v3d4wd695hf7, child number 0 ----- select i.* from (select "ENAME","EMPNO" from(select /*+ qb_name(apex\$inner) */d."ENAME",d."EMPNO" from(select x.* from "EMP" x)d)i)i where 1=1 order by "ENAME" asc nulls last Plan hash value: 150391907 ----- Id Operation Name Rows Bytes Cost (%CPU) Time ----- 0 SELECT STATEMENT 4 (100) 1 SORT ORDER BY 14 140 4 (25) 00:00:01 2 TABLE ACCESS FULL EMP 14 140 3 (0) 00:00:01 ----- SQL_ID 4svxfj2vkv5ps, child number 29 declare begin begin APEX_240200.wv_flow.route_friendly_url(p_first_segment => :1 , p_path => :2); end; end;</pre> <p>NOTE: cannot fetch plan for SQL_ID: 4svxfj2vkv5ps, CHILD_NUMBER: 29 Please verify value of SQL_ID and CHILD_NUMBER; It could also be that the plan is no longer in cursor cache (check v\$sql_plan)</p>	9	

Debug Mode

step-by-step

- Different levels
- Item values are encrypted

Debug Mode

Item values are encrypted

0.00003	Clear cache: request=RP
0.01551	...Resetting pagination for page
0.00068	Session State: P5_EMPN0=>*** (Type difference: Item=VARCHAR2, Value=VARCHAR2)
0.00002	...http header processing

Security

Authorization Scheme: - Select -

Session State Protection: Checksum Required - Session Level

Store value encrypted in session state:

Restricted Characters: All characters can be saved.

0.05489	0.00002	Clear cache: request=RP
0.05491	0.00228	...Resetting pagination for page
0.05719	0.00077	Session State: P5_EMPN0=>7521 (Type difference: Item=VARCHAR2, Value=VARCHAR2)
0.05797	0.00003	...http header processing

Make sure to switch encryption back on again!



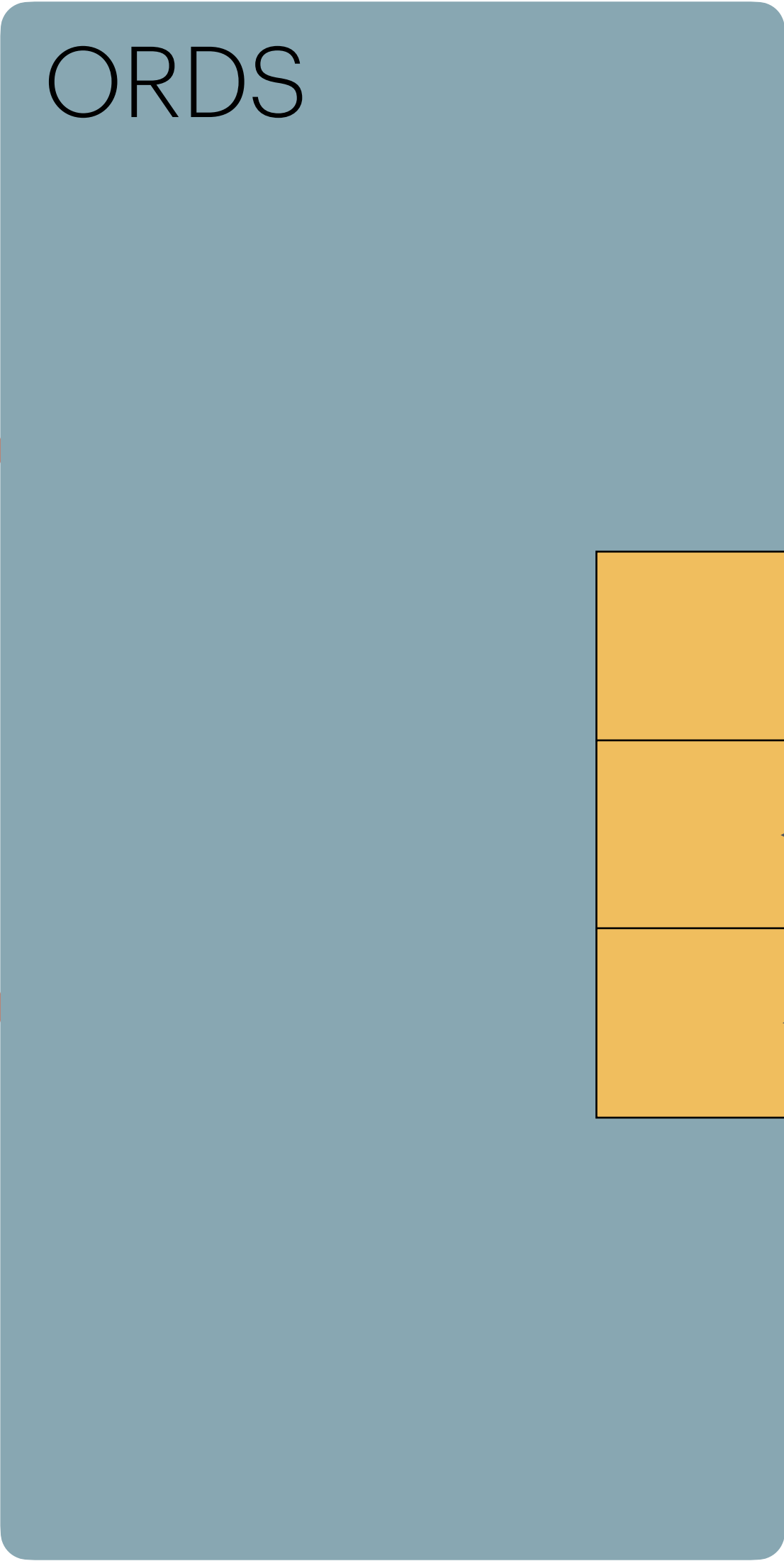
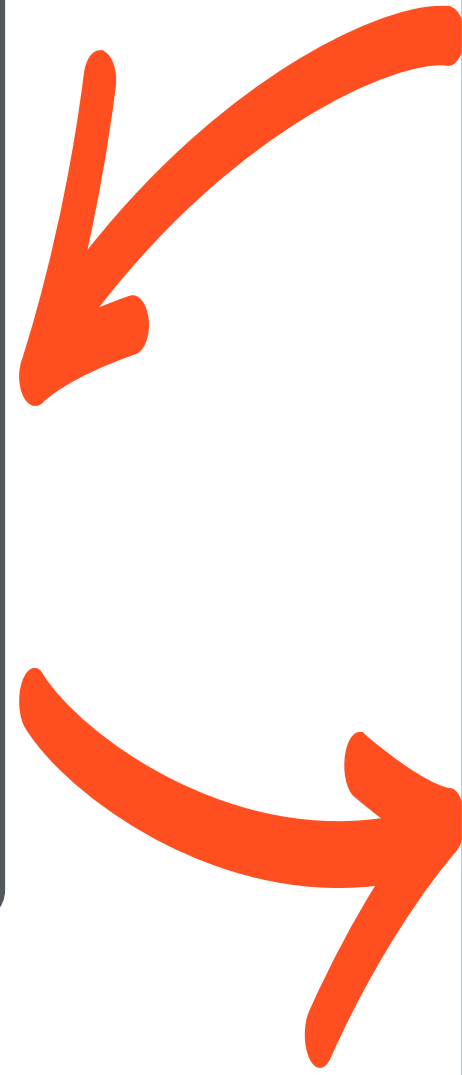
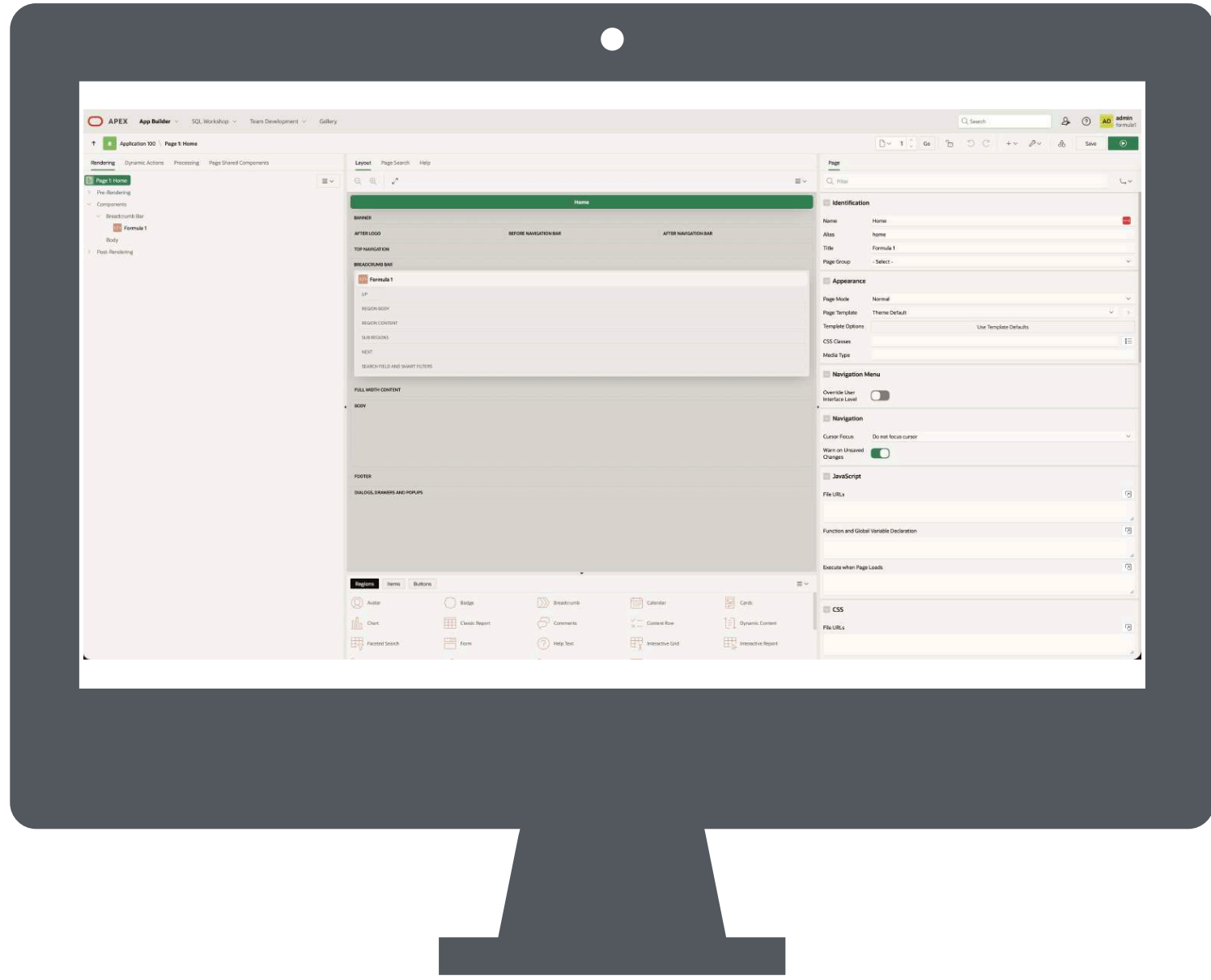
Session State

Session State

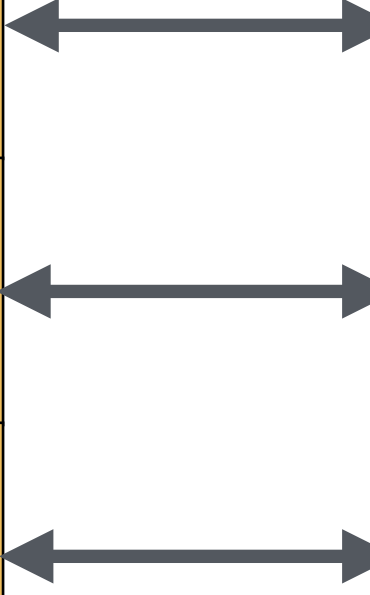
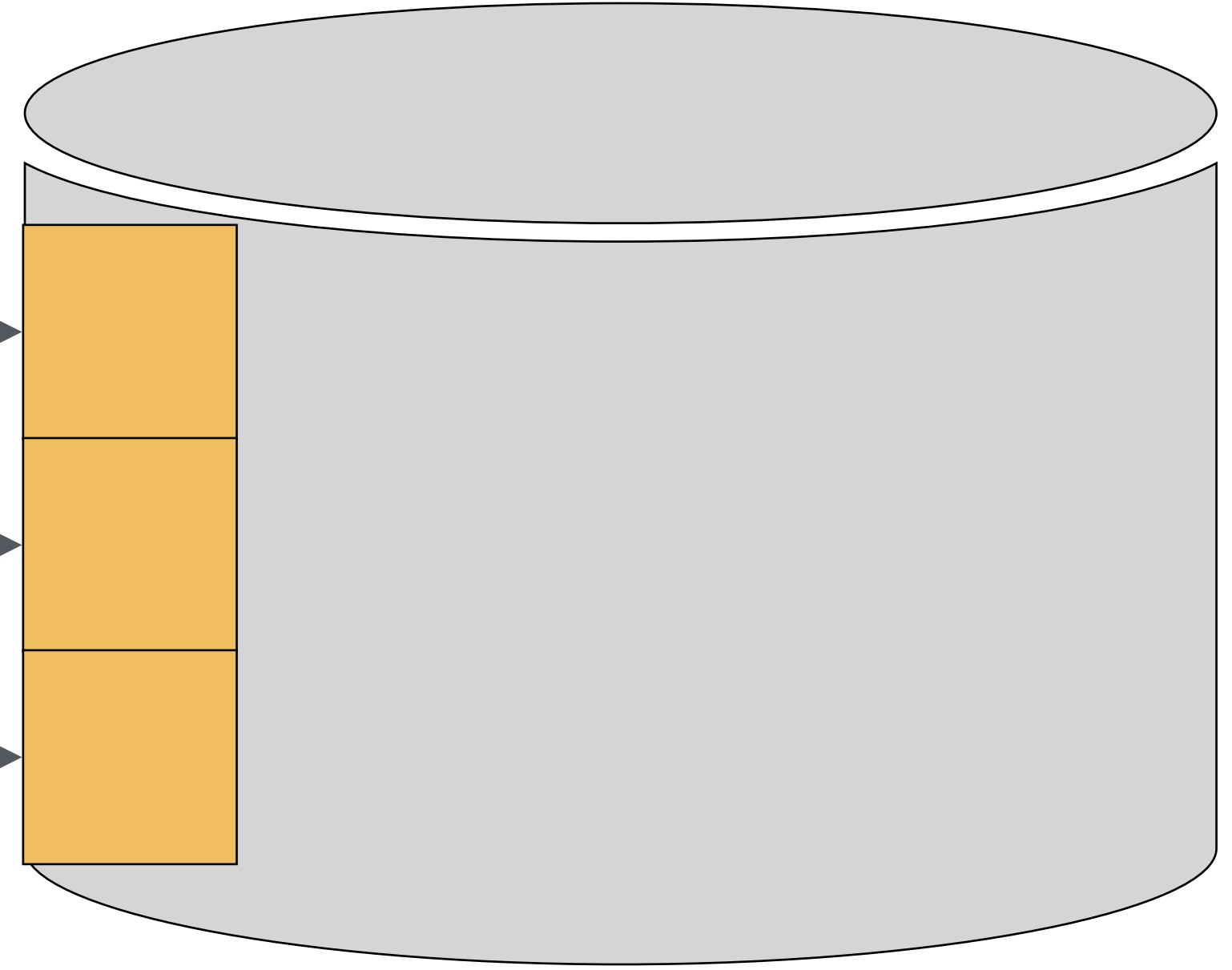
APEX <> Database

- APEX Session
- Database Session

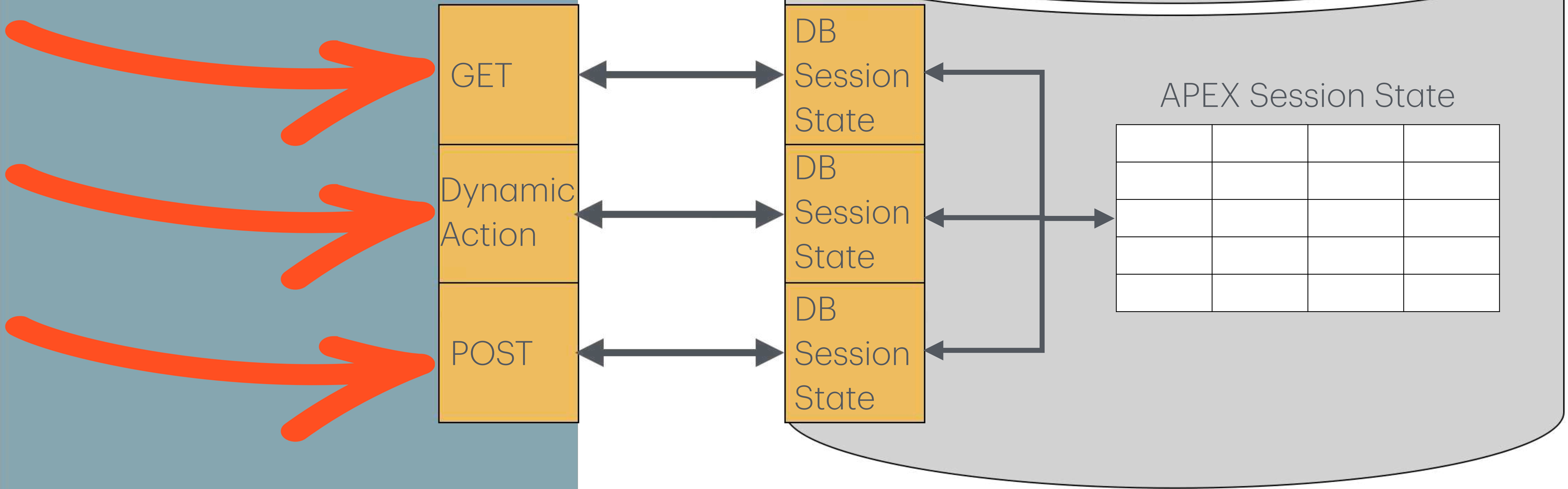
Client / Browser



Server / Database



Server / Database



Session State

APEX <> Database

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

Application 104

Show All Authentication Authorization Session Management Session State Protection Browser Security Database Session Advanced

Database Session

* Parsing Schema ?

MLE Environment ?

Initialization PL/SQL Code

⏪ ⏩ 🔍 A:: ✓ APEX Assistant

Validation successful

```
1 apex_debug.message('Database Session Initialization PL/SQL Code');
```

?

Session State

APEX <> Database

Elapsed	Execution	Message	Level	Graph
0.01170	0.00013	Reset NLS settings	4	
0.01183	0.00109	alter session set NLS_LANGUAGE='AMERICAN' NLS_TERRITORY='AMERICA' NLS_SORT='BINARY' NLS_COMP='BINARY' NLS_CALENDAR='GREGORIAN'	4	
0.01291	0.00193	...NLS: date_format=DD-MON-RR timestamp_format=DD-MON-RR HH.MI.SSXXFF AM timestamp_tz_format=DD-MON-RR HH.MI.SSXXFF AM TZR decimal separator=".", group separator=","	4	
0.01484	0.00019	...Setting session time_zone to +00:00	4	
0.01502	0.01004	R E Q U E S T show	3	
0.02506	0.00167	Language derived from: FLOW_PRIMARY_LANGUAGE, current browser language: en	4	
0.02673	0.00003	alter session set nls_language='AMERICAN' nls_territory='AMERICA'	4	
0.02675	0.00009	...NLS: CSV charset=WE8MSWIN1252	4	
0.02684	0.00171	Setting NLS: NLS_DATE_FORMAT="DS" NLS_TIMESTAMP_FORMAT="DS" NLS_TIMESTAMP_TZ_FORMAT="DS"	4	
0.02855	0.00073	...NLS: date_format=DS timestamp_format=DS timestamp_tz_format=DS decimal separator=".", group separator=","	4	
0.02928	0.00003	...NLS: Language=en	4	
0.02930	0.00440	Application 104, Page Template:	4	
0.03370	0.00225	> APEX_APPLICATION_AUTH Oracle APEX Accounts	3	
0.03595	0.00128	Session State: fetch from database (exact)	4	
0.03722	0.00004	... sentry+verification success	4	
0.03726	0.00083	...Session ID 7245102879106 can be used	4	
0.03809	0.00242	< APEX_APPLICATION_AUTH Oracle APEX Accounts	3	
0.04051	0.00091	...Check for session expiration:	4	
0.04142	0.00819	begin apex_debug.message('Database Session Initialization PL/SQL Code'); end;	4	
0.04961	0.00438	Database Session Initialization PL/SQL Code	4	
0.05399	0.00077	Session State: P5_EMPNO=>7698 (Type difference: Item=VARCHAR2, Value=VARCHAR2)	4	
0.05476	0.00182	Setting NLS: NLS_DATE_FORMAT="DS" NLS_TIMESTAMP_FORMAT="DS" NLS_TIMESTAMP_TZ_FORMAT="DS"	4	

Session State

APEX <> Database

- APEX Session
- Database Session - Initialization PL/SQL Code
 - DBMS_SESSION (context)
 - 'ALTER SESSION ...'
 - Dynamic debugging
 -

Common Mistakes

Common Mistakes

The incomplete list ...

- Confusing Read-only / Display only / Disabled / Query Only items
- Referencing APEX Session State before/without submit
- Relying on accidental process order
- Mixing Dynamic Actions and Page Submits
- Incorrect / competing branches
- Computation overwrote input
- Computed every render; should compute only when NULL / only on create.
- Relying on database session values

Key Takeaways

Key Takeaways

The incomplete list ...

- Think in requests, not screens
- Debug Mode reveals the truth
- APEX follows a predictable, repeatable lifecycle
- APEX Session State is the central nervous system
- Rendering is read-only, processing is for changes
- Validations prevent bad data, processes execute logic
- Branches control flow after successful processing
- Understanding this anatomy prevents you from making common mistakes

Questions?



Roel Hartman