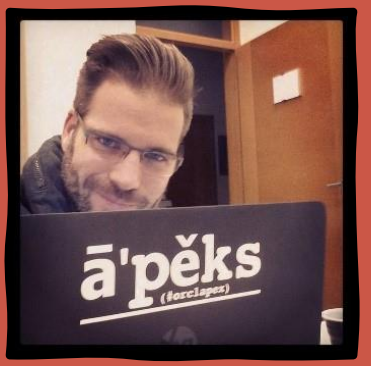
Keep an eye on your **APEX** Applications

hroug '22 Autumn | Jesen

Aleš Kravos, The **RIGHT THING** Solutions

About me

- +15 years experience with Oracle
- Passionate about APEX from 2008 (APEX 3.1)
- Career change in 2019



THE RIGHT THING SOLUTIONS

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Keep an eye on your **APEX** Applications

All application metadata and logs are stored in the **Database**

How are my applications used?

How are the they built?

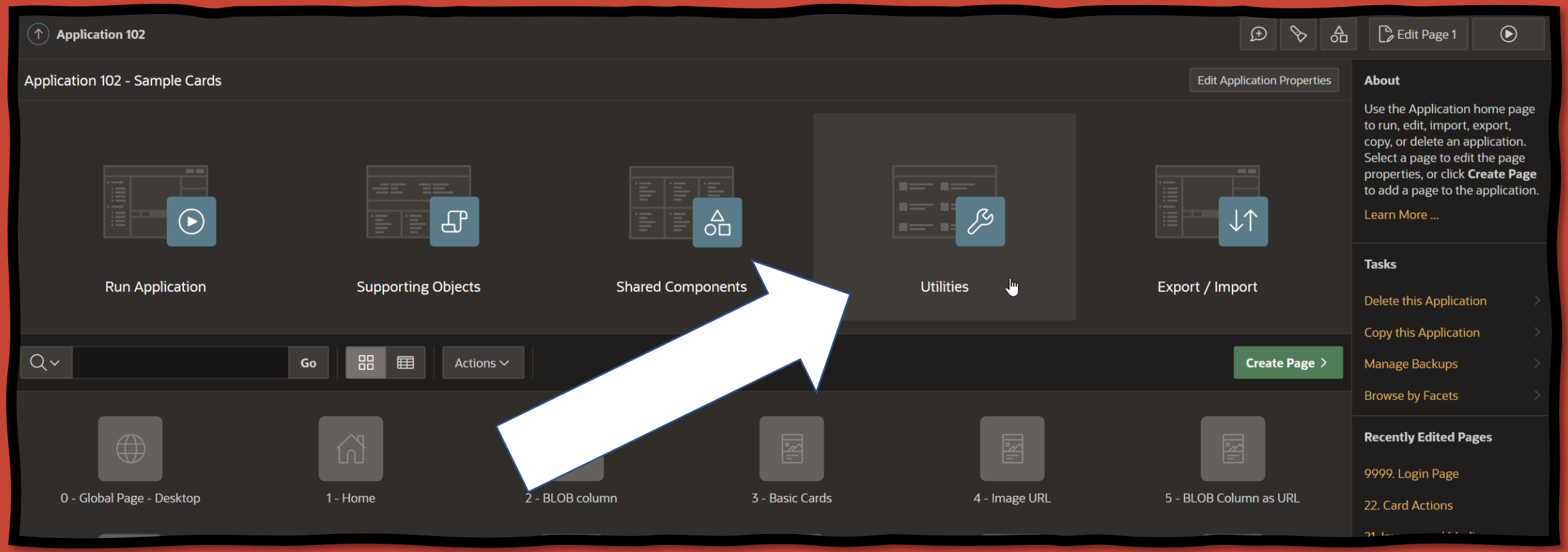
Do they comply with our development standards?

APEX Database Views

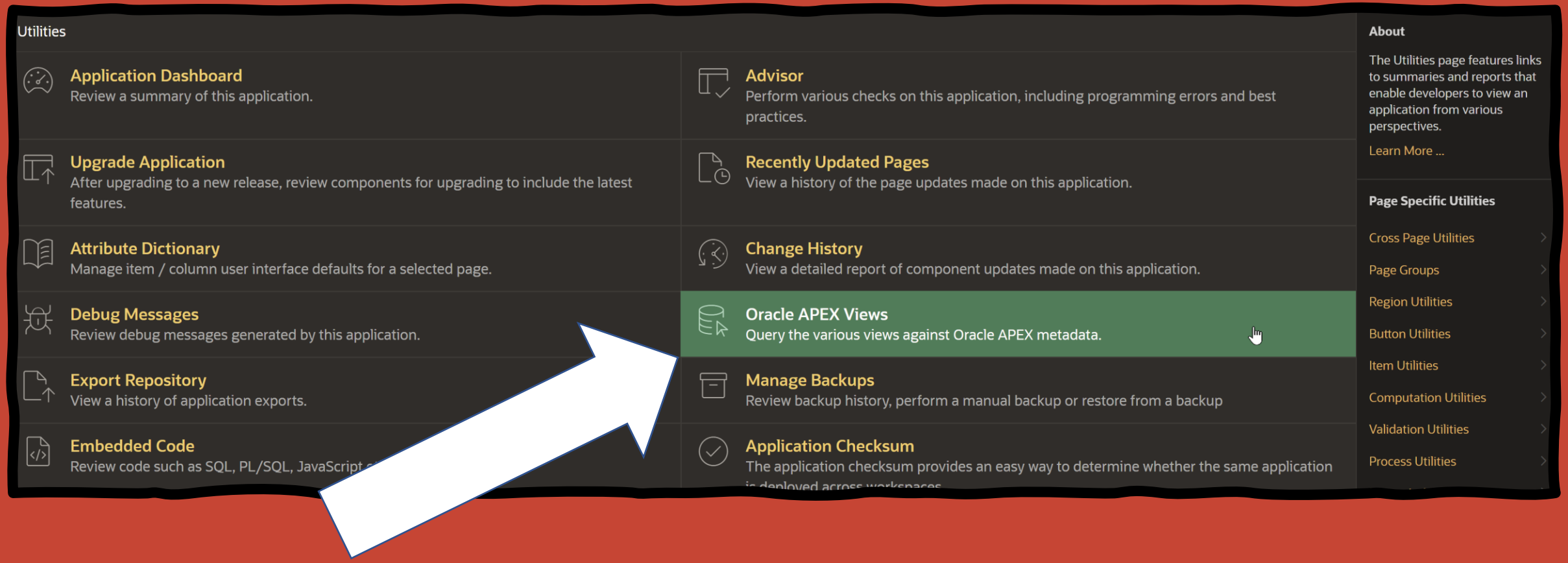
APEX Database Views

- Available from APEX 2.2
- Public
- Hide obsolete data model attributes
- Contain descriptive columns for Foreign keys references
- Contain calculations
- From APEX 3.0 there is an interface to browse trough the views and their content

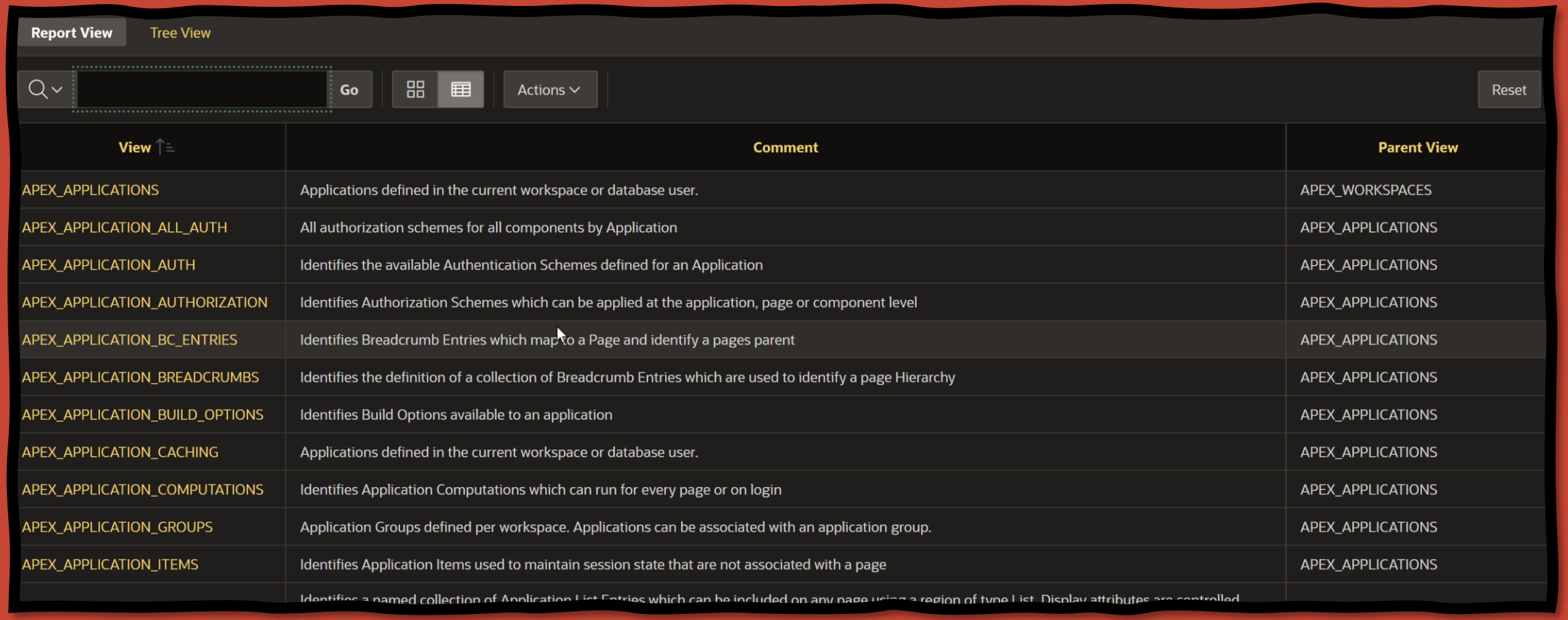
APEX Database Views



APEX Database Views

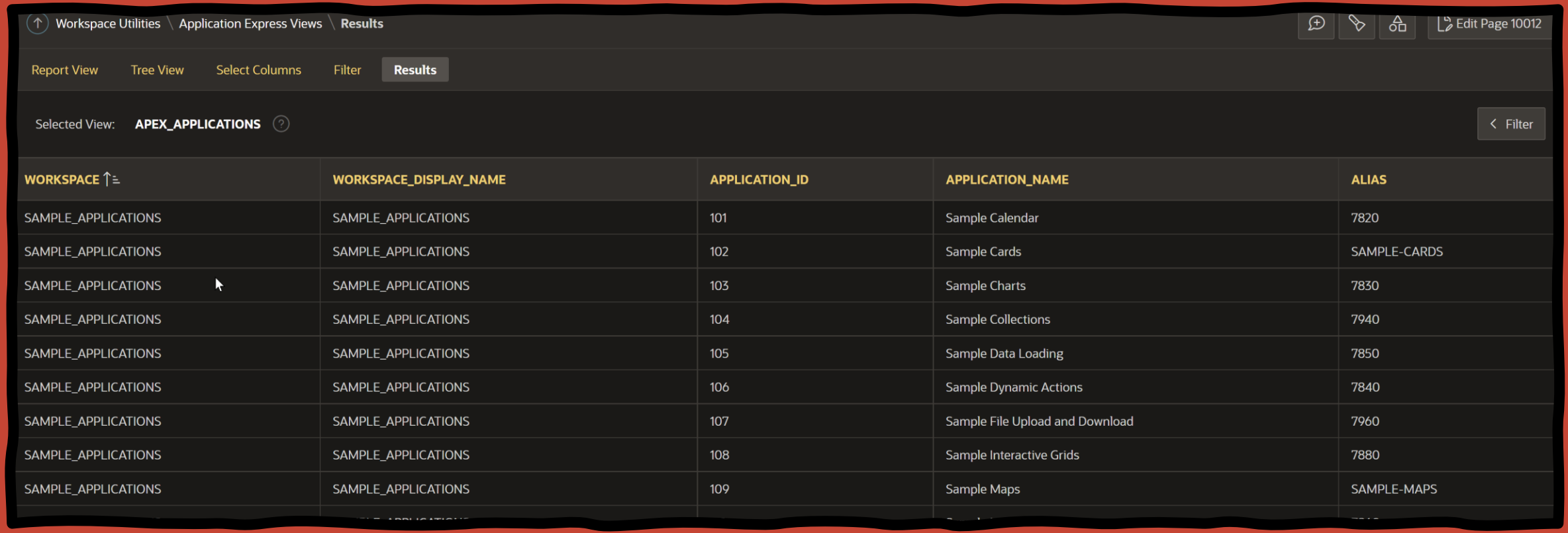


APEX Database Views



View	Comment	Parent View
APEX_APPLICATIONS	Applications defined in the current workspace or database user.	APEX_WORKSPACES
APEX_APPLICATION_ALL_AUTH	All authorization schemes for all components by Application	APEX_APPLICATIONS
APEX_APPLICATION_AUTH	Identifies the available Authentication Schemes defined for an Application	APEX_APPLICATIONS
APEX_APPLICATION_AUTHORIZATION	Identifies Authorization Schemes which can be applied at the application, page or component level	APEX_APPLICATIONS
APEX_APPLICATION_BC_ENTRIES	Identifies Breadcrumb Entries which map to a Page and identify a pages parent	APEX_APPLICATIONS
APEX_APPLICATION_BREADCRUMBS	Identifies the definition of a collection of Breadcrumb Entries which are used to identify a page Hierarchy	APEX_APPLICATIONS
APEX_APPLICATION_BUILD_OPTIONS	Identifies Build Options available to an application	APEX_APPLICATIONS
APEX_APPLICATION_CACHING	Applications defined in the current workspace or database user.	APEX_APPLICATIONS
APEX_APPLICATION_COMPUTATIONS	Identifies Application Computations which can run for every page or on login	APEX_APPLICATIONS
APEX_APPLICATION_GROUPS	Application Groups defined per workspace. Applications can be associated with an application group.	APEX_APPLICATIONS
APEX_APPLICATION_ITEMS	Identifies Application Items used to maintain session state that are not associated with a page	APEX_APPLICATIONS

APEX Database Views



WORKSPACE	WORKSPACE_DISPLAY_NAME	APPLICATION_ID	APPLICATION_NAME	ALIAS
SAMPLE_APPLICATIONS	SAMPLE_APPLICATIONS	101	Sample Calendar	7820
SAMPLE_APPLICATIONS	SAMPLE_APPLICATIONS	102	Sample Cards	SAMPLE-CARDS
SAMPLE_APPLICATIONS	SAMPLE_APPLICATIONS	103	Sample Charts	7830
SAMPLE_APPLICATIONS	SAMPLE_APPLICATIONS	104	Sample Collections	7940
SAMPLE_APPLICATIONS	SAMPLE_APPLICATIONS	105	Sample Data Loading	7850
SAMPLE_APPLICATIONS	SAMPLE_APPLICATIONS	106	Sample Dynamic Actions	7840
SAMPLE_APPLICATIONS	SAMPLE_APPLICATIONS	107	Sample File Upload and Download	7960
SAMPLE_APPLICATIONS	SAMPLE_APPLICATIONS	108	Sample Interactive Grids	7880
SAMPLE_APPLICATIONS	SAMPLE_APPLICATIONS	109	Sample Maps	SAMPLE-MAPS

APEX Database Views

```
select *
  from apex_dictionary;
```

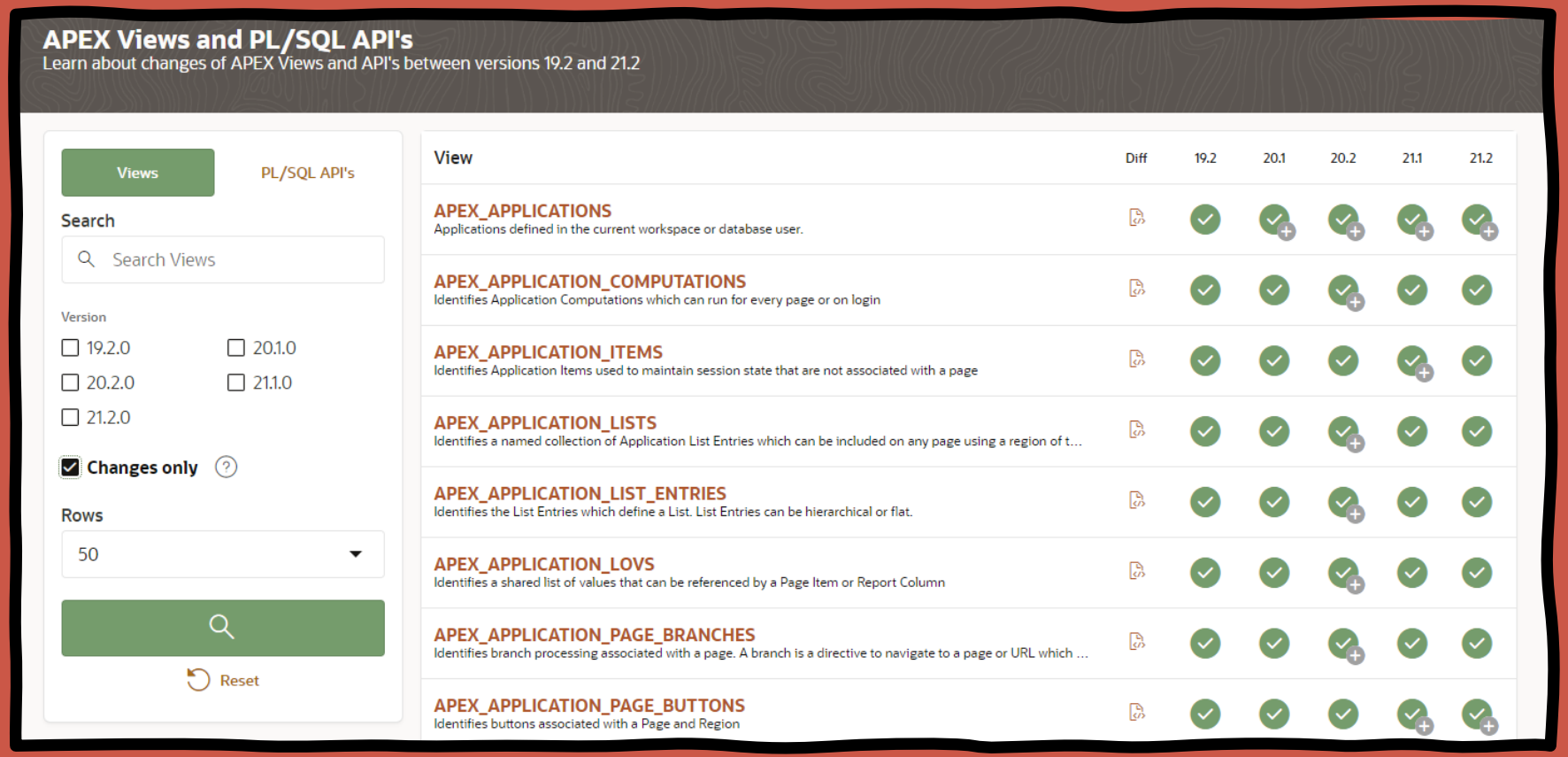
	APEX_VIEW_NAME	COLUMN_ID	COLUMN_NAME	COMMENTS	COMMENT_TYPE	PARENT_VIEW
1	APEX_DEBUG_MESSAGES	0	(null)	Debug messages that were recorded for page views	View	(null)
2	APEX_DEBUG_MESSAGES	1	ID	Unique ID of the message	Column	(null)
3	APEX_DEBUG_MESSAGES	2	PAGE_VIEW_ID	Page View Identifier, which is a unique sequence g...	Column	(null)
4	APEX_DEBUG_MESSAGES	3	MESSAGE_TIMESTAMP	Timestamp in GMT that message was saved	Column	(null)
5	APEX_DEBUG_MESSAGES	4	ELAPSED_TIME	Elapsed time in seconds from the beginning of the ...	Column	(null)
6	APEX_DEBUG_MESSAGES	5	EXECUTION_TIME	Time elapsed between the current and the next debu...	Column	(null)
7	APEX_DEBUG_MESSAGES	6	MESSAGE	Debug message	Column	(null)
8	APEX_DEBUG_MESSAGES	7	APPLICATION_ID	Application Identifier, unique over all workspaces	Column	(null)
9	APEX_DEBUG_MESSAGES	8	PAGE_ID	Page Identifier within the specified application	Column	(null)
10	APEX_DEBUG_MESSAGES	9	SESSION_ID	APEX Session Identifier	Column	(null)
11	APEX_DEBUG_MESSAGES	10	APEX_USER	Username of the user authenticated to the APEX app...	Column	(null)
12	APEX_DEBUG_MESSAGES	11	MESSAGE_LEVEL	Level of debug message, ranging from 1 to 9	Column	(null)
13	APEX_DEBUG_MESSAGES	12	WORKSPACE_ID	Application Express Workspace Identifier, unique o...	Column	(null)
14	APEX_DEBUG_MESSAGES	13	CALL_STACK	PL/SQL call stack where the message was written	Column	(null)

APEX Database Views

```
SELECT apex_view_name
  FROM apex_dictionary
 WHERE column_name = 'AUTHORIZATION_SCHEME';
```

APEX_VIEW_NAME
APEX APPLICATIONS
APEX APPLICATION ALL AUTH
APEX APPLICATION BC ENTRIES
APEX APPLICATION COMPUTATIONS
APEX APPLICATION LIST ENTRIES
APEX APPLICATION NAV BAR
APEX APPLICATION PAGES
APEX APPLICATION PAGE BRANCHES
APEX APPLICATION PAGE COMP
APEX APPLICATION PAGE DA
APEX APPLICATION PAGE DA ACTS
APEX APPLICATION PAGE PROC
APEX APPLICATION PAGE REGIONS
APEX APPLICATION PAGE CHART S
APEX APPLICATION PAGE IR COL
APEX APPLICATION PAGE REG COLS
APEX APPLICATION PAGE RPT COLS
APEX APPL PAGE CARD ACTIONS
APEX APPL PAGE IG COLUMNS
APEX APPL PAGE IG RPTS
APEX APPL PAGE MAP LAYERS
APEX APPLICATION PAGE VAL
APEX APPLICATION PAGE BUTTONS

Changes of APEX Views between APEX versions: https://apexdiff.foex.at/ords/util/r/apex-diff/apex-views



APEX Database Views

How to grant access to data across all Workspaces?

```
grant apex_administrator_read_role
   to [parsing_shema];
```

Monitor application activity

APEX Activity Logs

APEX_WORKSPACE_ACCESS_LOG

Displays all application authentication results and details

WORKSPACE	APPLICATION_ID	USER_NAME	AUTHENTICATION_METHOD	ACCESS_DATE	AUTHENTICATION_RESULT	CUSTOM_STATUS_TEXT
GRALNICA	4500	ANDREJGR	Internal Authentication	30.03.22 09:48:22	AUTH SUCCESS	(null)
NTERNAL	4500	ADMIN	Internal Authentication	30.03.22 09:44:41	AUTH SUCCESS	(null)
TARTER APPLICATIONS	115	ALES	Application Express Accounts	28.03.22 15:25:08	AUTH SUCCESS	(null)
TARTER APPLICATIONS	4500	ALES	Internal Authentication	28.03.22 15:24:47	AUTH SUCCESS	(null)
OACHING TOOL	4500	ALES	Internal Authentication	28.03.22 15:04:05	AUTH UNKNOWN USER	Invalid Login Credentials
OACHING TOOL	4500	ALES	Internal Authentication	28.03.22 15:03:50	AUTH UNKNOWN USER	Invalid Login Credentials
OACHING TOOL	4500	ALES	Internal Authentication	28.03.22 15:03:27	AUTH UNKNOWN USER	Invalid Login Credentials
TARTER APPLICATIONS	120	ALES	Application Express Authen...	25.03.22 12:43:16	AUTH SUCCESS	(null)
TARTER APPLICATIONS	120	ALES	Application Express Authen...	25.03.22 12:43:06	AUTH PASSWORD I...	Invalid Login Credentials
TARTER APPLICATIONS	121	ALES	Application Express Accounts	25.03.22 12:01:43	AUTH SUCCESS	(null)

APEX Activity Logs

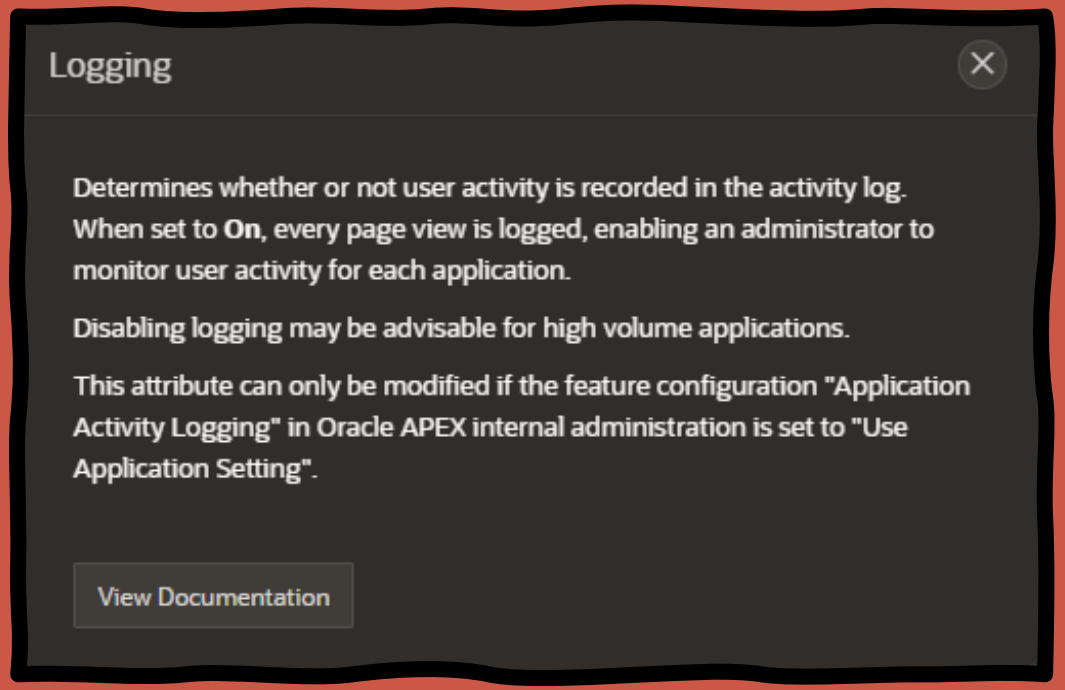
APEX_WORKSPACE_ACTIVITY_LOG

APEX_USER	APEX_SESSION_ID	APPLICATION_ID	PAGE_ID	VIEW_DATE	ELAPSED_TIME	ROWS_QUERIED	PAGE_VIEW_TYPE	REQUEST_VALUE
ZORAN	13417457401618	115	(null)	18.04.22 23:26:59	0,006534	0	Logout	(null)
ZORAN	13417457401618	115	114	18.04.22 23:26:54	0,668657	0	Processing	CREATE
ZORAN	13417457401618	115	145	18.04.22 23:26:54	0,024201	2	Rendering	reset R 18172076288788874245
ZORAN	13417457401618	115	145	18.04.22 23:26:54	0,041663	2	Rendering	reset R 18172076288788874245
ZORAN	13417457401618	115	114	18.04.22 23:26:53	0,034193	0	Processing	FSP SHOW POPUPLOV
ZORAN	13417457401618	115	114	18.04.22 23:26:01	0,039747	0	Rendering	(null)
ZORAN	13417457401618	115	145	18.04.22 23:25:58	0,080528	4	Rendering	(null)
ZORAN	13417457401618	115	56	18.04.22 23:25:56	0,04709	0	Processing	SAVE
ZORAN	13417457401618	115	56	18.04.22 23:25:49	0,157005	0	Rendering	(null)
ZORAN	13417457401618	115	145	18.04.22 23:25:44	0,129205	4	Rendering	(null)
ZORAN	13417457401618	115	55	18.04.22 23:25:41	0,072446	6	Rendering	(null)
ZORAN	13417457401618	115	59	18.04.22 23:25:37	0,153519	(null)	Rendering	(null)
ZORAN	13417457401618	115	101	18.04.22 23:25:35	0,109455	0	Processing	P101 PASSWORD
ANDRAZ	1344560262968	115	(null)	18.04.22 23:25:28	0,00712	0	Logout	(null)
ANDRAZ	1344560262968	115	20	18.04.22 23:25:23	0,088391	0	Rendering	(null)
ANDRAZ	1344560262968	115	18	18.04.22 23:25:18	0,04054	3	Ajax	PLUGIN
ANDRAZ	1344560262968	115	18	18.04.22 23:25:17	0,042717	0	Ajax	PLUGIN
ANDRAZ	1344560262968	115	18	18.04.22 23:25:14	0,082189	16	Rendering	(null)
ANDRAZ	1344560262968	115	150	18.04.22 23:25:05	0,040874	0	Rendering	(null)
ANDRAZ	1344560262968	115	150	18.04.22 23:25:05	0,012545	0	Ajax	PLUGIN
ANDRAZ	1344560262968	115	150	18.04.22 23:25:00	0,147144	0	Processing	CREATE
ANDRAZ	1344560262968	115	50	18.04.22 23:25:00	0,044276	2	Rendering	reset R 18172895750449086173
ANDRAZ	1344560262968	115	150	18.04.22 23:24:53	0,014957	0	Ajax	PLUGIN
ANDRAZ	1344560262968	115	150	18.04.22 23:24:52	0,026765	0	Ajax	(null)
ANDRAZ	1344560262968	115	150	18.04.22 23:24:49	0,078585	0	Rendering	(null)
ANDRAZ	1344560262968	115	150	18.04.22 23:24:49	0,019496	0	Ajax	PLUGIN
ANDRAZ	1344560262968	115	50	18.04.22 23:24:47	0,016572	0	Ajax	PLUGIN

ERROR_MESSAGE	ERROR_ON_COMPONENT_TYPE	ERROR_ON_COMPONENT_NAME	INTERACTIVE_...	IR_SAVED_REPORT_ID	IR_SEARCH
APEX - The checksum com...	WWV FLOW SECURITY	FINAL EXCEPTION HANDLER	(null)	(null)	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	157578...	157578338...	row contains Japan
(null)	(null)	(null)	157578...	157578338...	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	157578...	157578338...	(null)
(null)	(null)	(null)	157578...	157578338...	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	157578...	(null)	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	178089...	178089708...	(null)
(null)	(null)	(null)	178089...	(null)	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	157578...	(null)	(null)
(null)	(null)	(null)	(null)	(null)	(null)
(null)	(null)	(null)	(null)	(null)	(null)

APEX Activity Logs

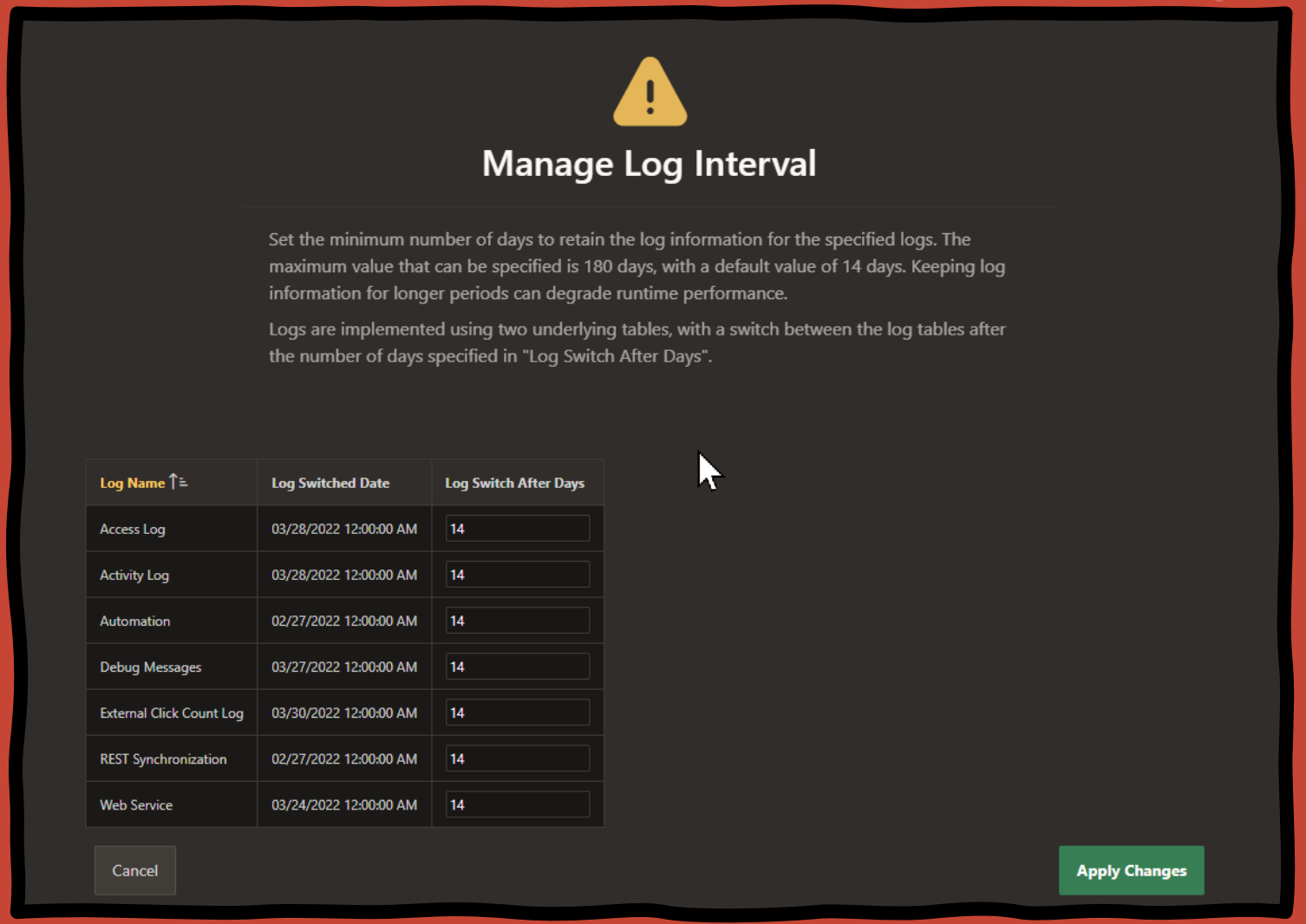
Logging is enabled on application level



APEX Activity Logs

Logs are purged after 14 days by default

Can be extended to maximum of 180 days



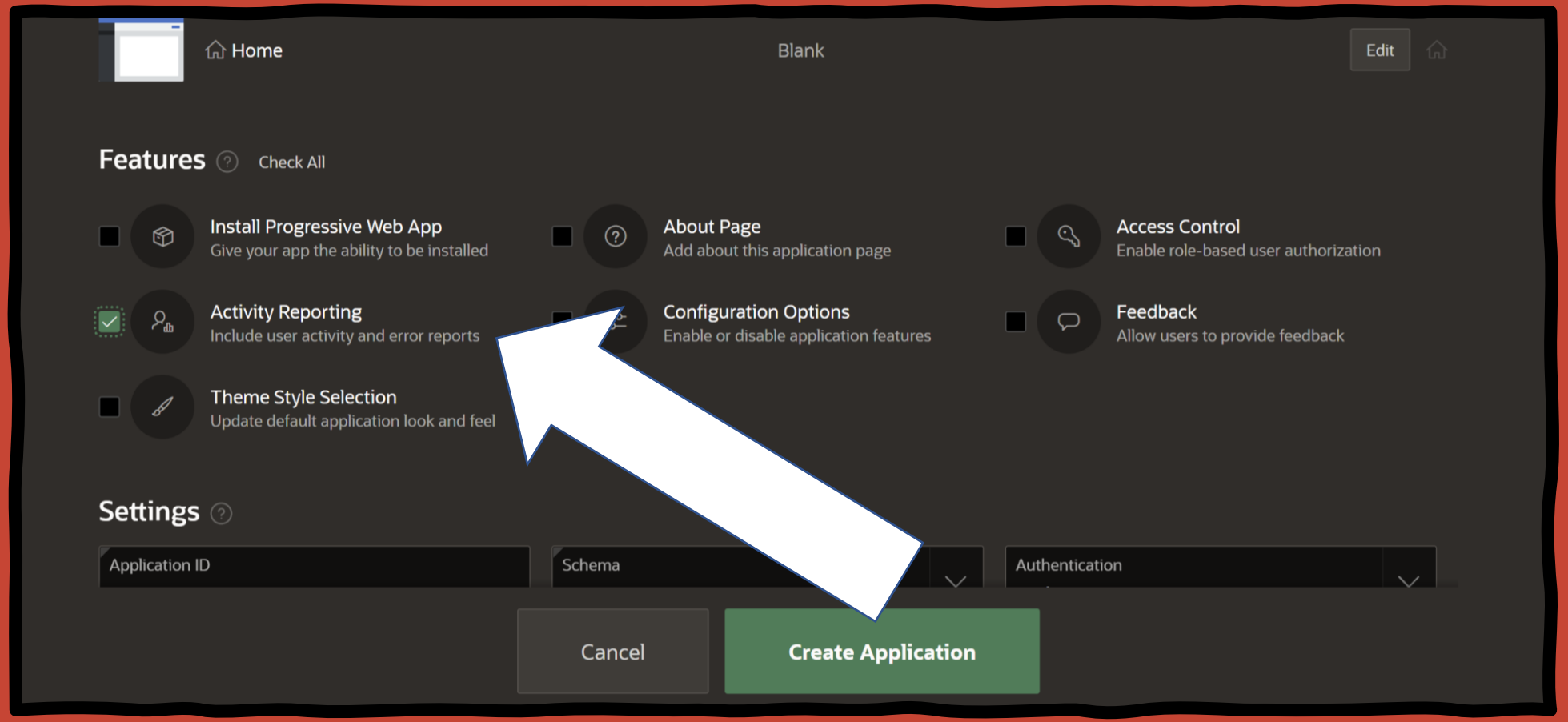
APEX Activity Logs

Use cases:

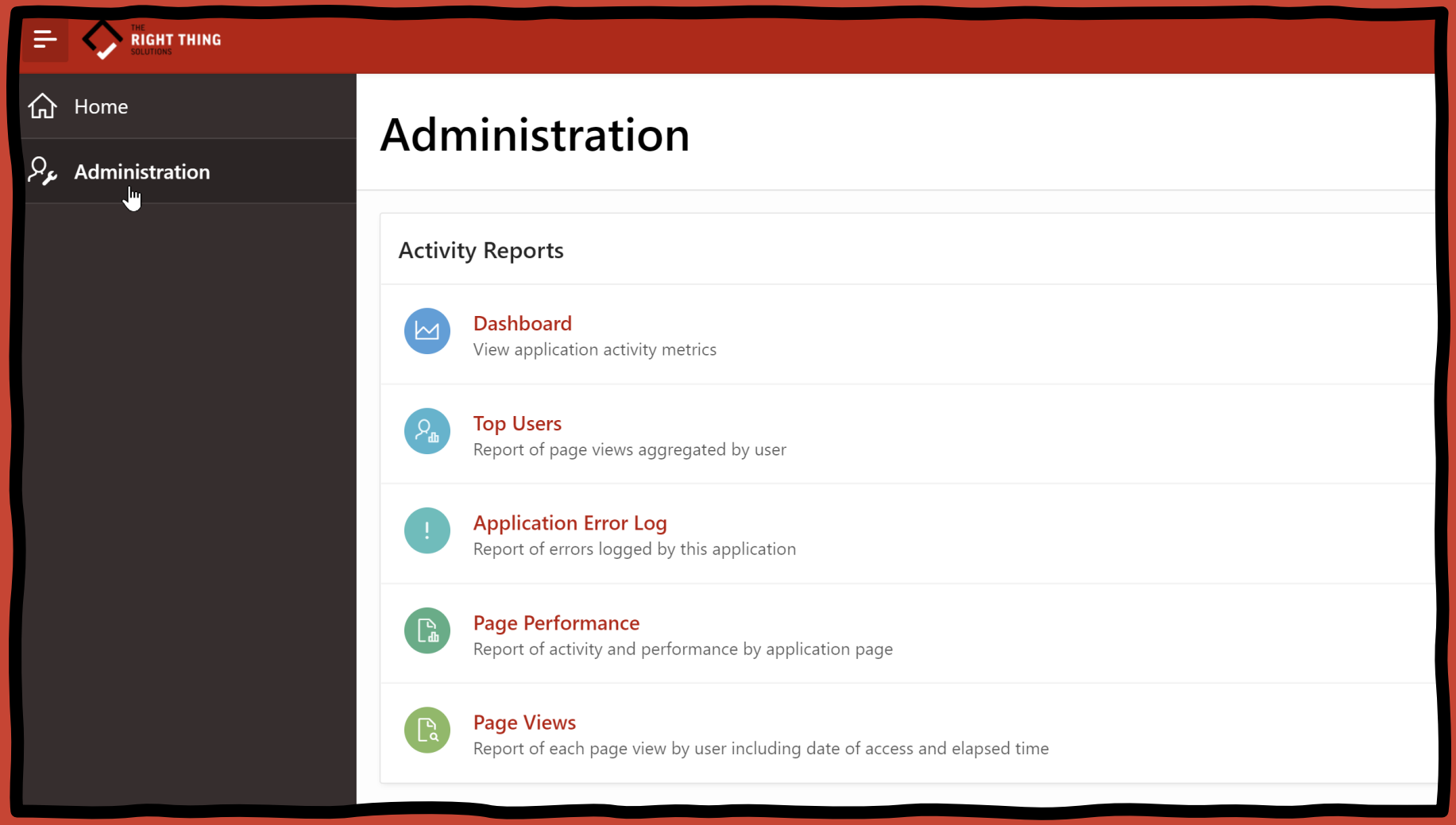
- Build monitoring tools for application administrators
- Analyse user behaviour
- Track page performance
- Monitor errors logs / schedule automatic notification

APEX Activity Logs

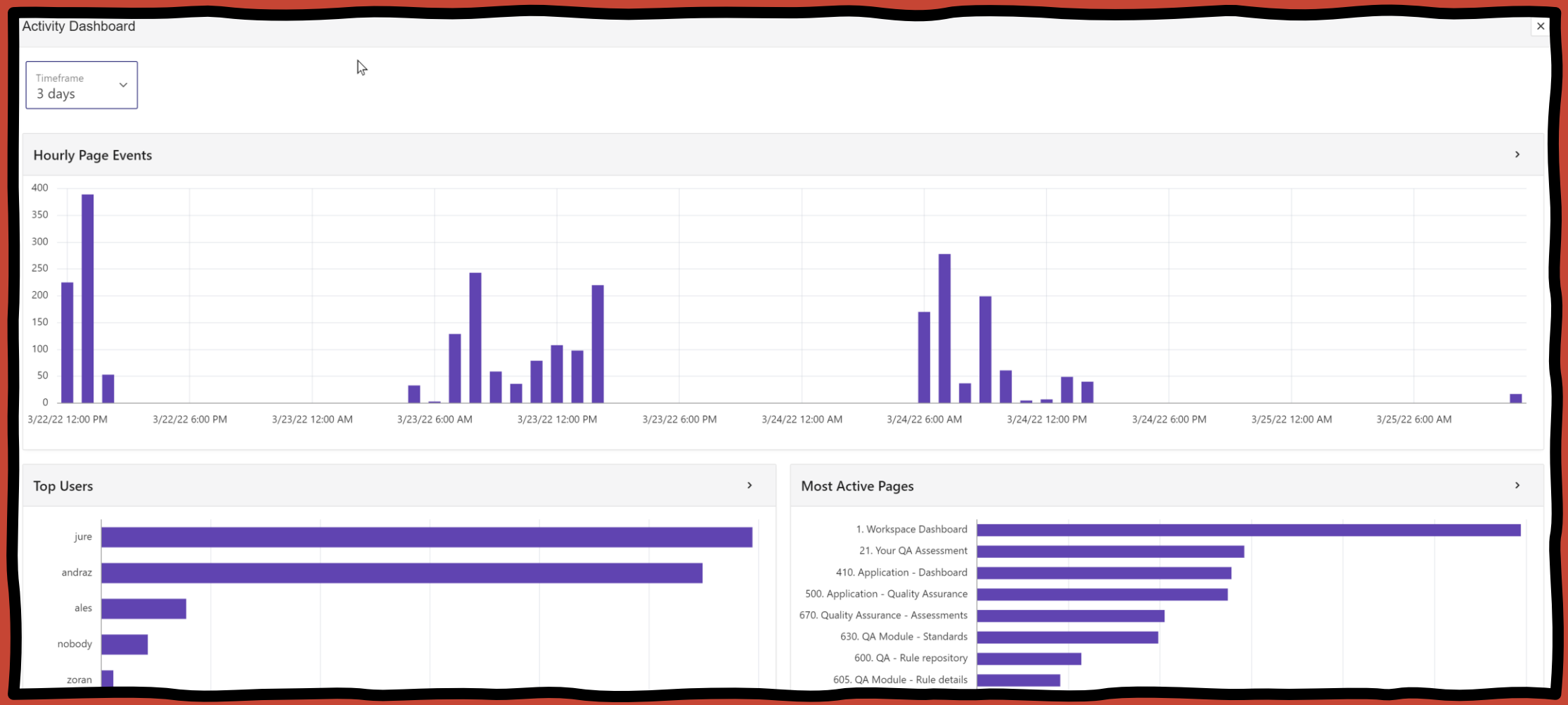
APEX “out of the box” feature



APEX Activity Logs



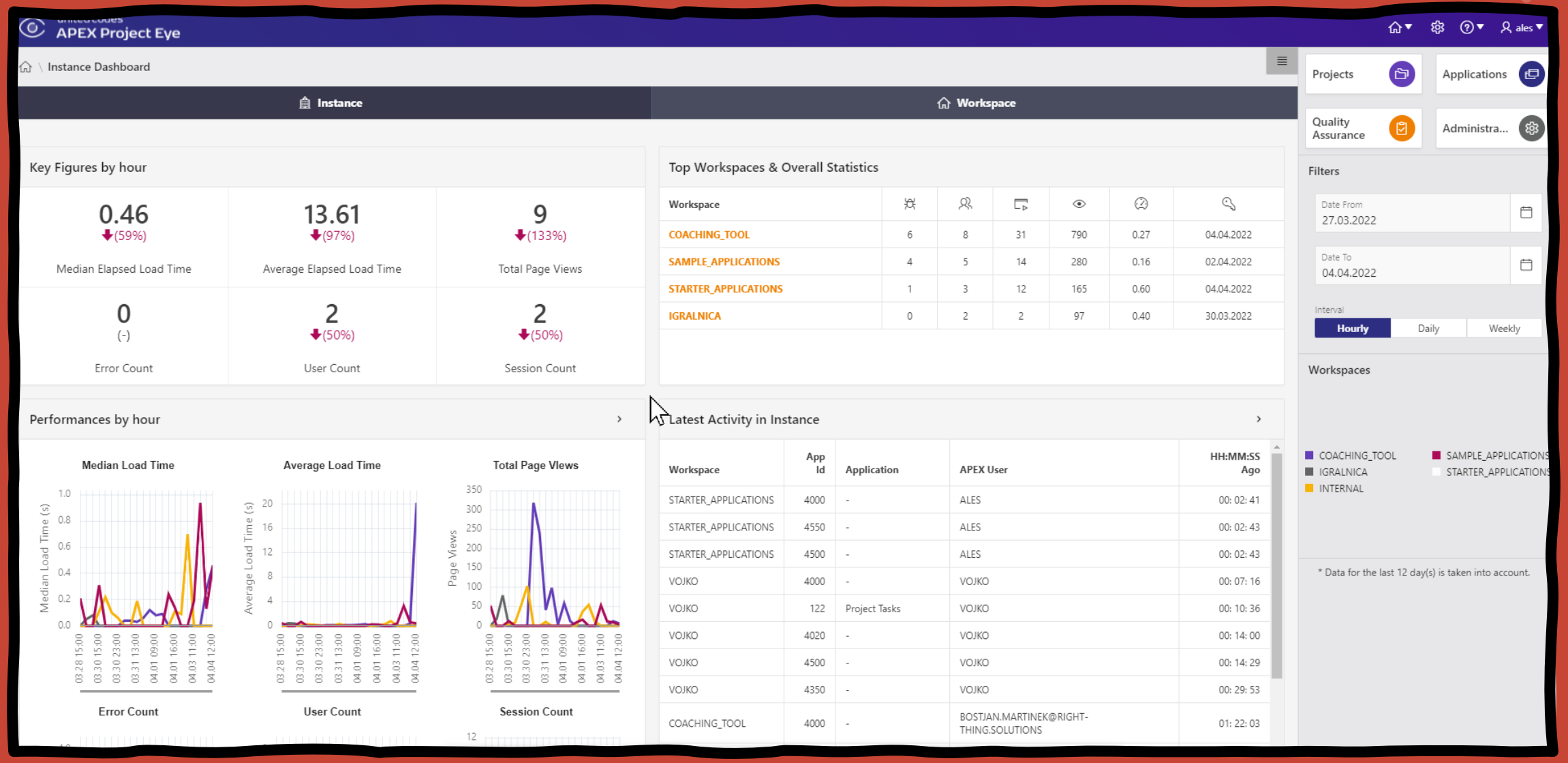
APEX Activity Logs



APEX Project Eye (APE)

https://www.apexprojecteye.com/

APEX Activity Logs



APEX Activity Logs

Top Workspaces & Overall Statistics

Workspace						
COACHING_TOOL	6	8	31	790	0.27	04.04.2022
SAMPLE_APPLICATIONS	4	5	14	280	0.16	02.04.2022
STARTER_APPLICATIONS	1	3	13	168	0.59	04.04.2022
IGRALNICA	0	2	2	97	0.40	30.03.2022
VOJKO	1	2				

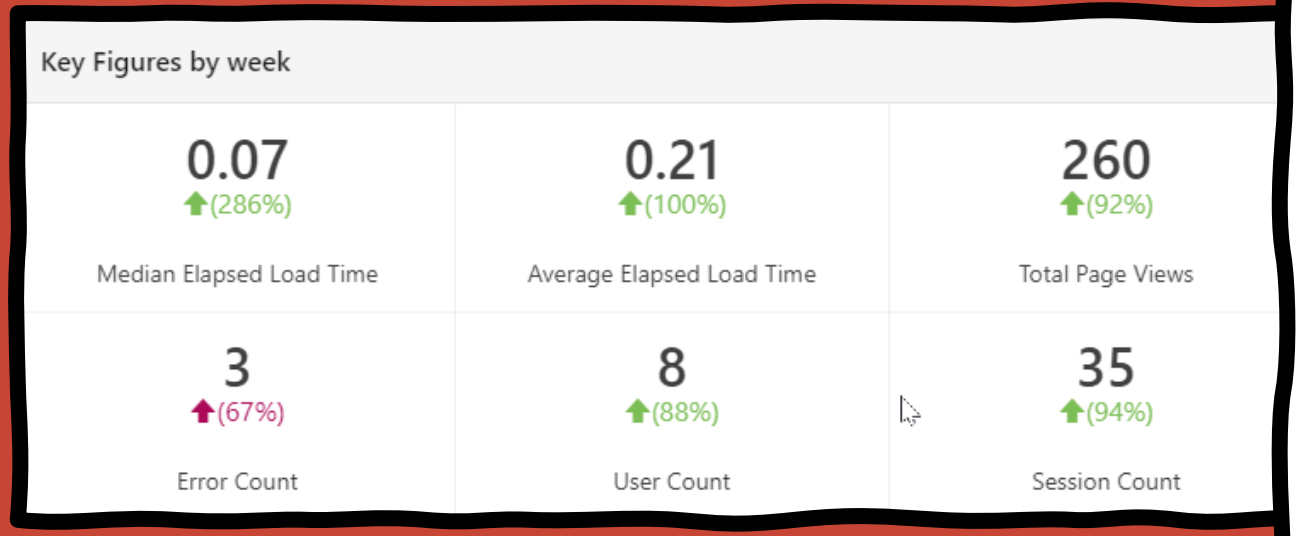
Top Applications & Overall Statistics

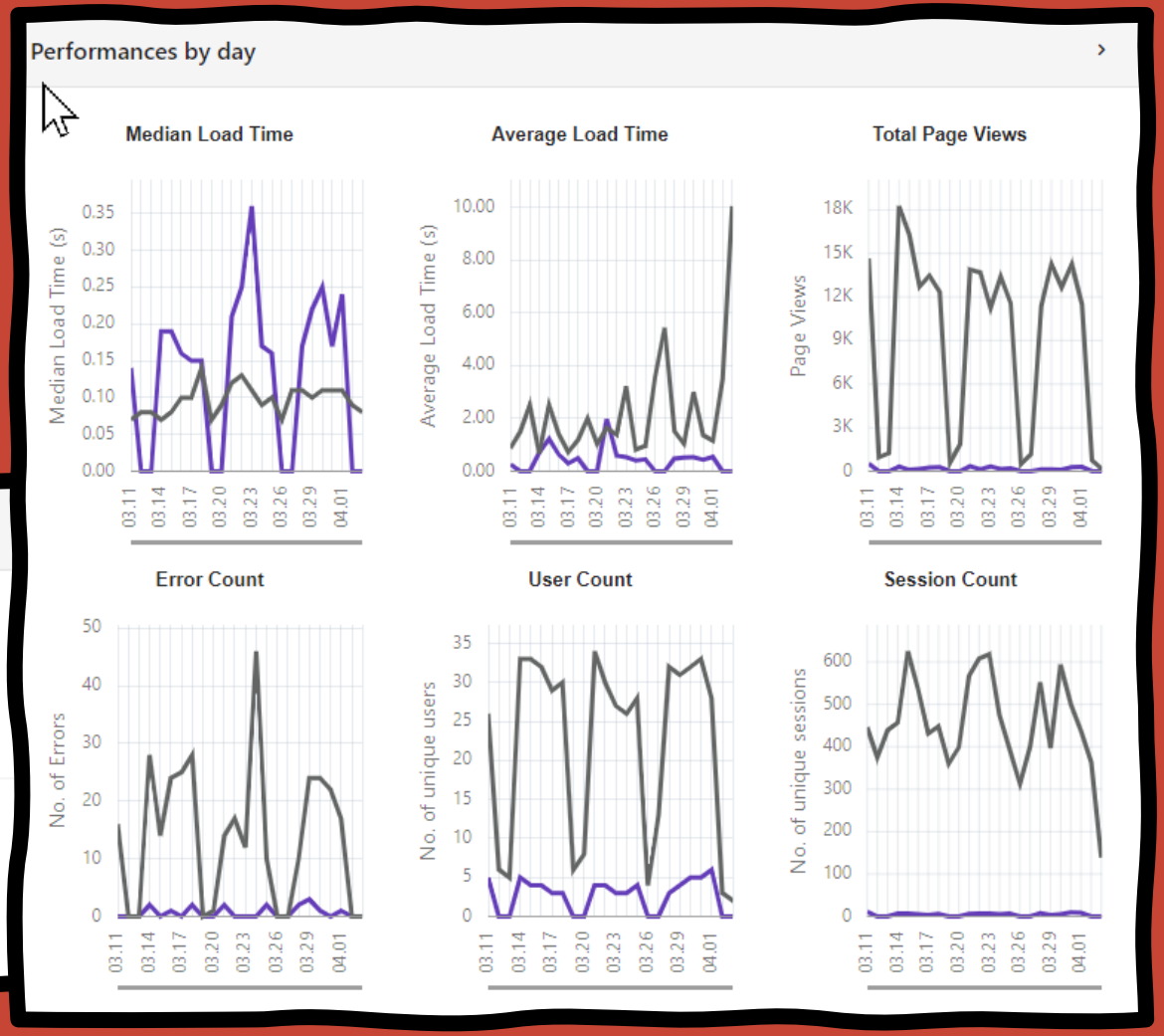
Project	Application						
-	102 - Sample Cards	3	4	7	36	0.07	01.04.2022 16:32
-	109 - Sample Maps	1	2	2	11	0.09	01.04.2022 17:02
-	101 - Sample Calendar	0	1	1	1	0.08	31.03.2022 13:44
-	104 - Sample Collections	0	1	1	1	0.10	01.04.2022 17:01
-	108 - Sample Interactive Grids	0	1	1	1	0.05	30.03.2022 15:38
-	103 - Sample Charts	-	-	-	-	-	-

Summarized overviews

APEX Activity Logs

Key figures and performance trends





APEX Activity Logs

Top Users

User						
ALES	0	2	17	0.42	23.18	05.04.2022 22:47
ALJAZ	0	1	12	0.34	13.92	05.04.2022 22:58
JURE	0	1	3	1.01	17.33	05.04.2022 22:56
ZORAN	0	1	2	0.74	44.5	05.04.2022 22:55

Key Figures by day

0.23 (200%)	0.48 (44%)
Median Elapsed Load Time (s)	Average Elapsed Load Time (s)
30 (93%)	0 (-)
Total Page Views	Error Count
4 (75%)	4 (75%)
User Count	Session Count

Page activity

Interactive reports

Region	Report	Description	View Mode	Status	Type			
Interactive Report Activity	Columns only	Hide views (column_id != 0)	-	Private	Private	.81	44.5	05.04.2022
Interactive Report Activity	Group by parent view	Number of dictionary views grouped by parent	Group_By	Public	Public	.3	38	05.04.2022
Interactive Report Activity	-	-	-	Public	Primary Default	.36	19.5	05.04.2022
Interactive Report Activity	-	-	-	-	-	1.03	51	05.04.2022

APEX Activity Logs

Application / User Activity Matrix

Application Name	Ales	Aljaz	Andraz	Andrej	Bostjan	Jure	Uros	Zoran
Poll	24.03.2022	-	-	-	-	-	-	-
APEX Project Eye (APE) 22.1.1	04.04.2022	-	-	-	-	-	-	-
APEX Alpe Adria	03.04.2022	-	-	-	-	-	-	-
Opportunities	25.03.2022	04.04.2022	-	04.04.2022	-	-	-	04.04.2022
Team Calendar	-	04.04.2022	-	04.04.2022	-	-	-	-
Customers	28.03.2022	-	-	-	-	-	-	-

APEX Activity Logs

```
SELECT
     page_id,
     page_name,
     view_date,
     elapsed_time,
     page_view_type,
     apex_user
FROM apex_workspace_activity_log
ORDER BY view_date DESC;
```

APEX Activity Logs

```
SELECT
    page_id,
    lead(page_id)
    over(partition by apex_session_id
            order by view_date
        )  next_page_id
FROM
    apex_workspace_activity_log;
```

PAGE_ID	NEXT_PAGE_ID
9999	1
2	10000
10000	10012
10000	10010
10000	10013
10012	(null)
1	2
10000	10014
10010	10010
10010	2
10013	10000
10014	10000

APEX Activity Logs

```
SELECT page_id,
       next_page_id,
       COUNT(*)
  FROM (SELECT page_id,
               LEAD(page_id)
               OVER(PARTITION by apex_session_id
                        ORDER by view_date
                    )  next_page_id
          FROM apex_workspace_activity_log
         WHERE application_id = 121)
WHERE page_id != next_page_id
GROUP BY page_id,
         next_page_id;
```

PAGE_ID	NEXT_PAGE_ID	COUN...
9999	1	14
1	2	5
1	10000	5
2	10000	3
10000	10014	2
10000	10011	2
10000	10012	2
10000	1	1

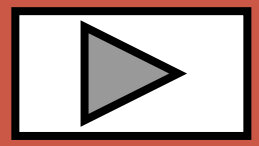
GoJS

A Web Framework for Rapidly Building Interactive Diagrams

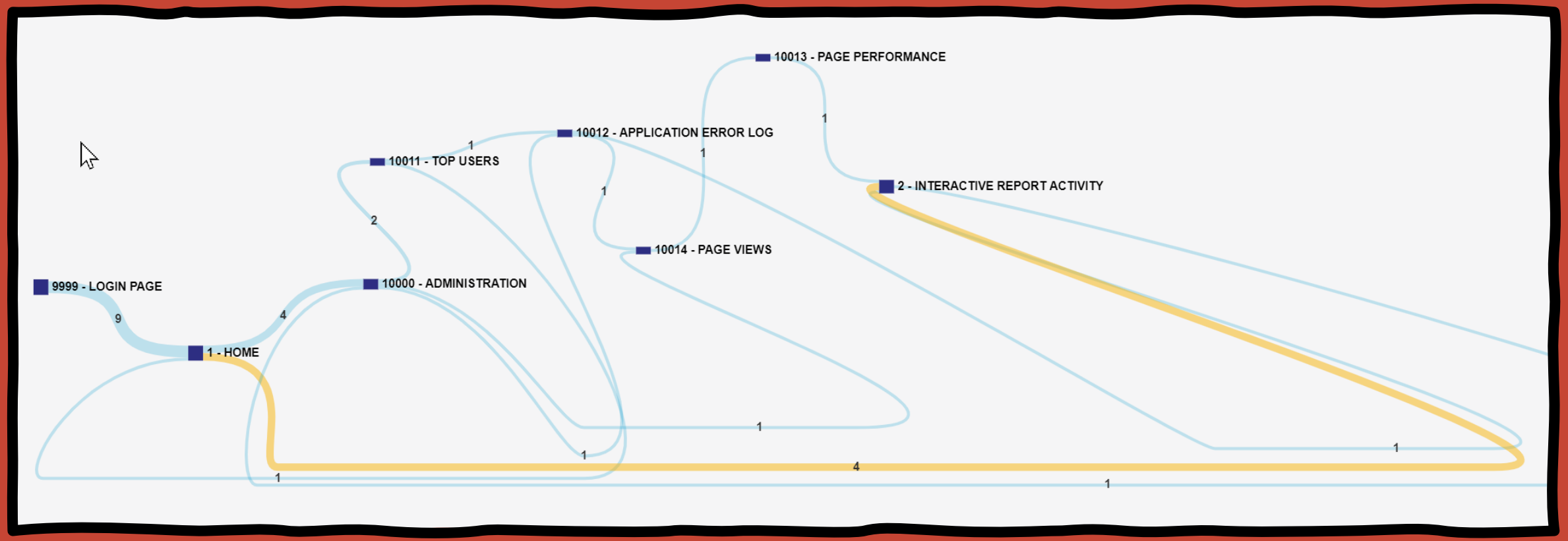
Quality assurance

Demo

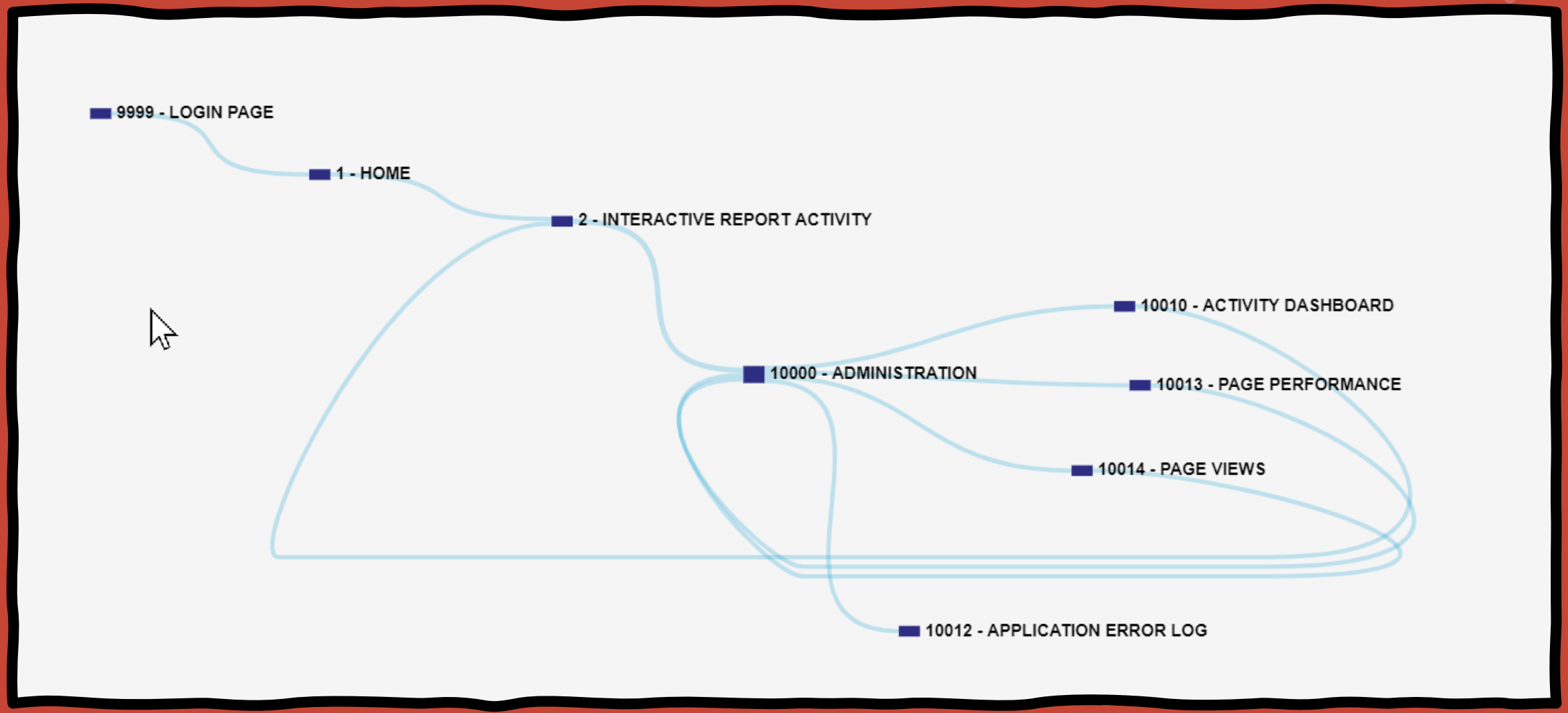
How to view session flow



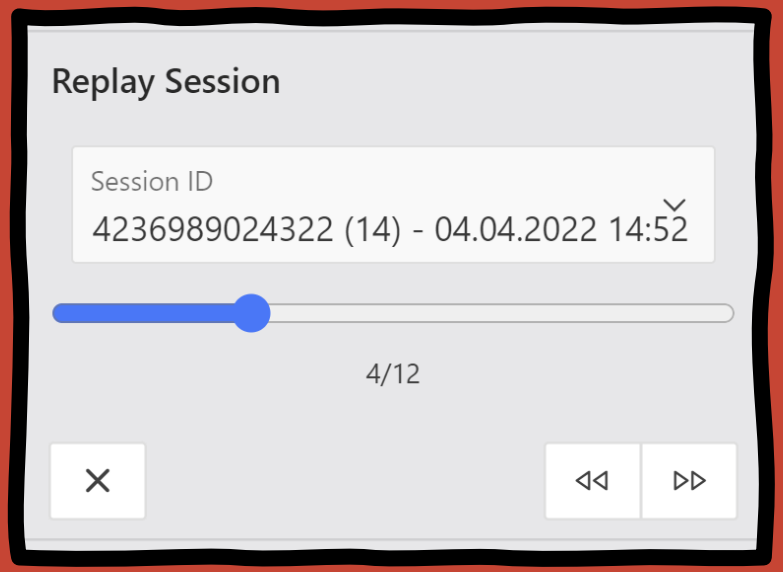
APEX Activity Logs

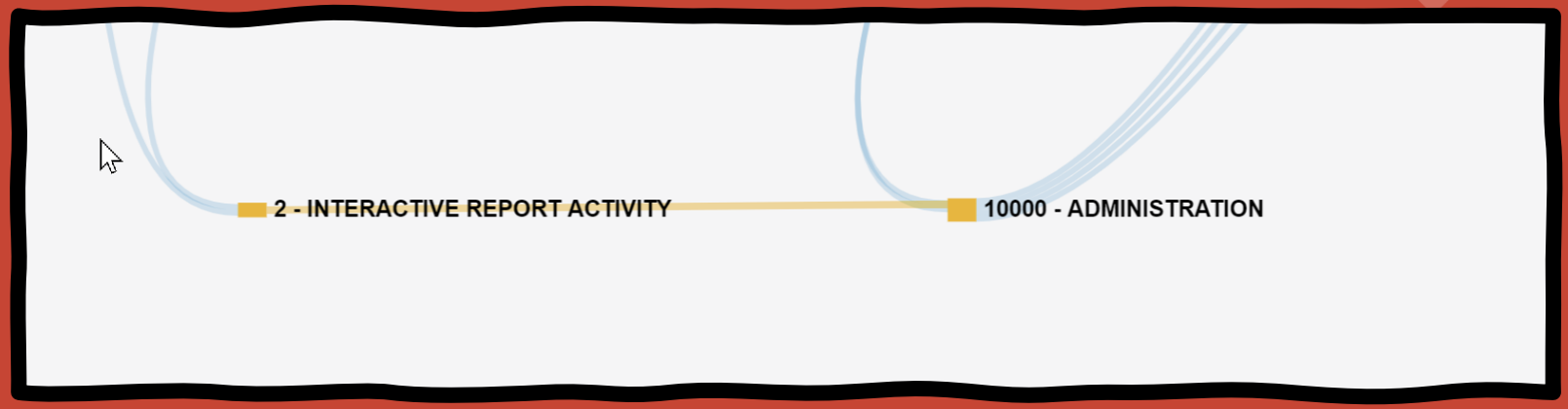


APEX Activity Logs



APEX Activity Logs

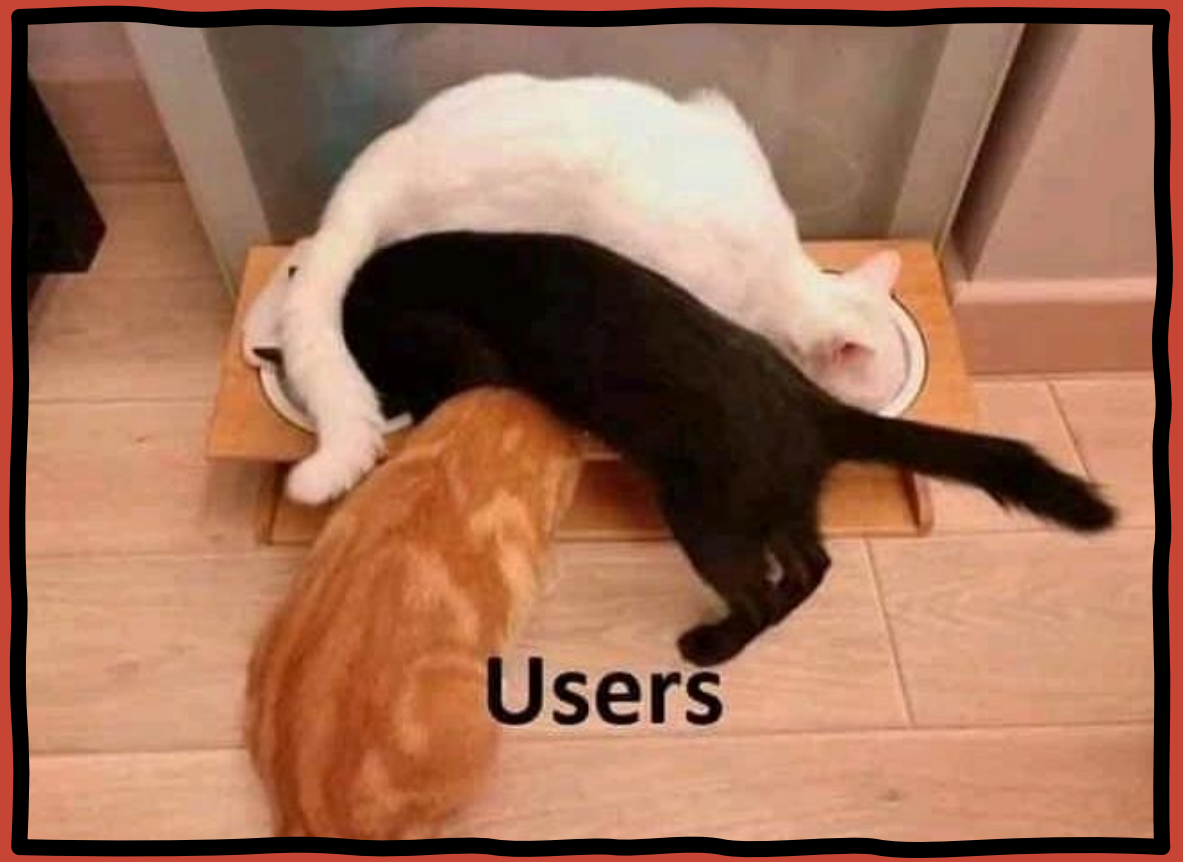




Request Details

View Timestamp	Application ID	Application Name	Page Id	Page Name	Page View Type	Page View Mode	Rows Queried	Elapsed Time	Request Value	Error Message	Error On Component Type	Error On Component Name	Apex User
04-APR-22 02.52.20.863970 PM +03:00	121	APEX Alpe Adria	2	Interactive Report Activity	Rendering	Dynamic	51	1.014466	-	-	-	-	ALES
Report Total:							**51**	**1.01**					

APEX Activity Logs



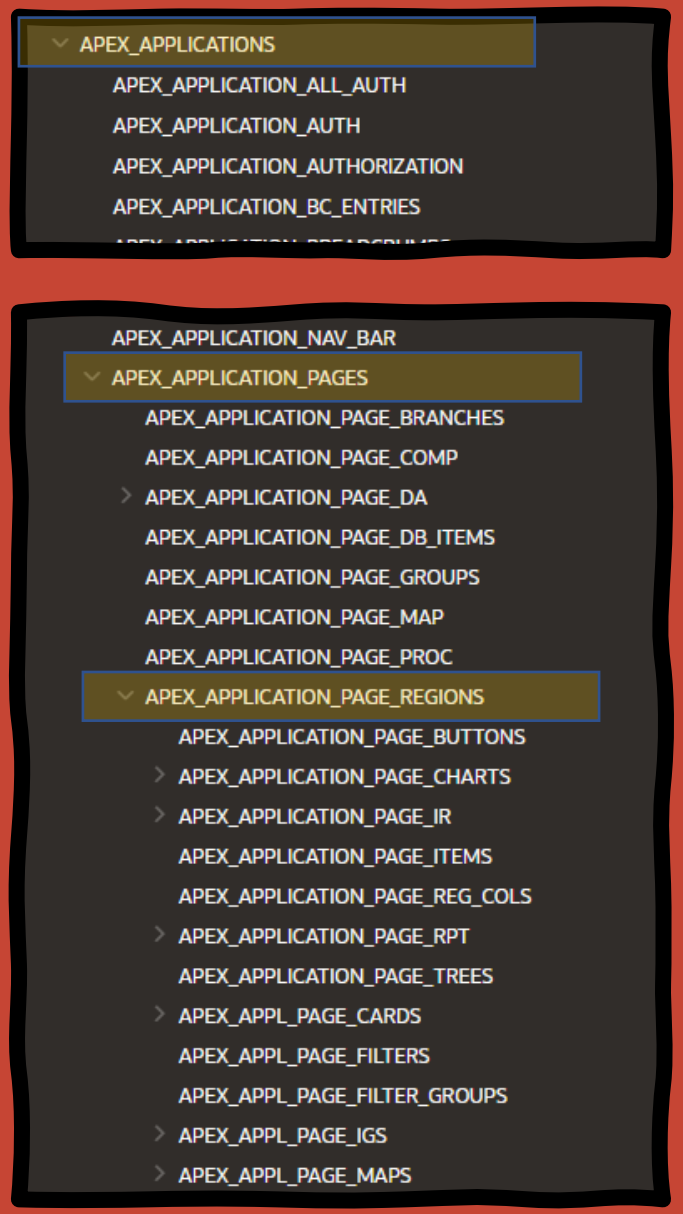
Application metadata

Application metadata

Shared components: APEX_APPLICATION_%

Page components: APEX_APPLICATION_PAGE_%

**Some newer components: APEX_APPL_%*


APEX_APPLICATIONS
APEX_APPLICATION_ALL_AUTH
APEX_APPLICATION_AUTH
APEX_APPLICATION_AUTHORIZATION
APEX_APPLICATION_BC_ENTRIES
APEX_APPLICATION_NAV_BAR
APEX_APPLICATION_PAGES
APEX_APPLICATION_PAGE_BRANCHES
APEX_APPLICATION_PAGE_COMP
APEX_APPLICATION_PAGE_DA
APEX_APPLICATION_PAGE_DB_ITEMS
APEX_APPLICATION_PAGE_GROUPS
APEX_APPLICATION_PAGE_MAP
APEX_APPLICATION_PAGE_PROC
APEX_APPLICATION_PAGE_REGIONS
APEX_APPLICATION_PAGE_BUTTONS
APEX_APPLICATION_PAGE_CHARTS
APEX_APPLICATION_PAGE_IR
APEX_APPLICATION_PAGE_ITEMS
APEX_APPLICATION_PAGE_REG_COLS
APEX_APPLICATION_PAGE_RPT
APEX_APPLICATION_PAGE_TREES
APEX_APPL_PAGE_CARDS
APEX_APPL_PAGE_FILTERS
APEX_APPL_PAGE_FILTER_GROUPS
APEX_APPL_PAGE_IGS
APEX_APPL_PAGE_MAPS

Application metadata

```
select *
  from apex_application_list_entries;
```

LIST_NAME	DISPLAY_SEQUENCE	ENTRY_TEXT	ENTRY_TARGET	ENTRY_IMAGE
Application Navigation	10	Customers [&CUSTOMERS.]	f?p=&APP ID.:59:&SESSION.::&DEBUG.:RP,RIR,CIR:::	fa-home
Application Navigation	20	Dashboard	f?p=&APP ID.:1:&SESSION.::&DEBUG.::::	fa-dial-gauge-cha
Application Navigation	30	Issues	f?p=&APP ID.:134:&SESSION.::&DEBUG.::::	fa-alert
Application Navigation	40	Products [&PRODUCTS.]	f?p=&APP ID.:44:&SESSION.::&DEBUG.::::	fa-archive
Application Navigation	50	Partners	f?p=&APP ID.:115:&SESSION.::&DEBUG.::::	fa-thumbs-o-up
Application Navigation	60	Competitors	f?p=&APP ID.:116:&SESSION.::&DEBUG.::::	fa-emoji-cringe
Application Navigation	70	Contacts [&CONTACTS.]	f?p=&APP ID.:18:&SESSION.::&DEBUG.::::	fa-user
Application Navigation	80	Activities [&ACTIVITIES.]	f?p=&APP ID.:55:&SESSION.::&DEBUG.:RP,RIR,55:::	fa-newspaper-o
Application Navigation	90	Reports	f?p=&APP ID.:17:&SESSION.::&DEBUG.::::	fa-file-text-o
Application Navigation	100	Administration	f?p=&APP ID.:12:&SESSION.::&DEBUG.::::	fa-gear
Application Navigation	110	Categories	f?p=&APP ID.:32:&SESSION.::&DEBUG.:RP:::	(null)
Application Navigation	120	Geographies	f?p=&APP ID.:85:&SESSION.::&DEBUG.::::	(null)
Application Navigation	130	Referenceability	f?p=&APP ID.:86:&SESSION.::&DEBUG.::::	(null)
Application Navigation	140	Products	f?p=&APP ID.:92:&SESSION.::&DEBUG.::::	(null)
Application Navigation	150	Referencability	f?p=&APP ID.:100:&SESSION.::&DEBUG.::::	(null)
Application Navigation	160	Customers	f?p=&APP ID.:1:&SESSION.::&DEBUG.:RP:::	(null)

Application metadata

```
select *
  from apex_application_page_buttons;
```

PAGE_ID	REGION	BUTTON_NAME	LABEL	BUTTON_ACTION	REDIRECT_URL
1	Database Objects	VIEW OBJECTS	View Objects	Redirect to Page in this Application	f?p=&APP ID.:9:&SESSION.::&DEBUG.:RP,9
1	Top 10 tables by size	VIEW TABLES	View Tables	Redirect to Page in this Application	f?p=&APP ID.:10:&SESSION.::&DEBUG.:RP,
1	Mail Queue	VIEW MAIL QUEUE	View Mail Queue	Redirect to Page in this Application	f?p=&APP ID.:11:&SESSION.::&DEBUG.:RP,
1	Mail Log	VIEW MAIL LOG	View Mail Queue	Redirect to Page in this Application	f?p=&APP ID.:12:&SESSION.::&DEBUG.:RP,
1	Application / User Activ...	MATRIX HELP	Matrix Help	Defined by Dynamic Action	(null)
1	Performances <span class...	VIEW PERFORMANCE	View Performance	Redirect to Page in this Application	f?p=&APP ID.:412:&SESSION.::&DEBUG.:RP
1	Latest Activity in Works...	VIEW ACTIVITY	View Activity	Redirect to Page in this Application	f?p=&APP ID.:8:&SESSION.::&DEBUG.:RP,8
1	Database Objects	VIEW INVALID OBJECTS	View Invalid ob...	Redirect to Page in this Application	f?p=&APP ID.:9:&SESSION.::&DEBUG.:RP,9
2	Mail Queue	VIEW MAIL QUEUE	View Mail Queue	Redirect to Page in this Application	f?p=&APP ID.:11:&SESSION.::&DEBUG.:RP,
2	Mail Log	VIEW MAIL LOG	View Mail Log	Redirect to Page in this Application	f?p=&APP ID.:12:&SESSION.::&DEBUG.:RP,
2	Performances <span class...	VIEW PERFORMANCE	View Performance	Redirect to Page in this Application	f?p=&APP ID.:412:&SESSION.::&DEBUG.:RP
2	Latest Activity in Instance	VIEW ACTIVITY	View Activity	Redirect to Page in this Application	f?p=&APP ID.:8:&SESSION.::&DEBUG.:RP,8
2	Database Objects	VIEW INVALID OBJECTS	View Invalid ob...	Redirect to Page in this Application	f?p=&APP ID.:9:&SESSION.::&DEBUG.:RP,9
2	Database Objects	VIEW OBJECTS	View Objects	Redirect to Page in this Application	f?p=&APP ID.:9:&SESSION.::&DEBUG.:RP,9
3	Verify License	GET LICENSE	Get License	Submit Page	(null)
3	Verify License	SAVE LICENSE	Save License	Submit Page	(null)
4	Workspaces	RESET REPORT	Reset	Submit Page	(null)

Application metadata

Use case #1

Understand application page flow

Application metadata

- Branches - apex_application_page_branches.branch_action
- Charts - apex_application_page_chart_s.chart_link
- Application definition - apex_applications.login_url
- Application definition - apex_applications.home_url
- Buttons - apex_application_page_buttons.redirect_url
- List entries - apex_application_list_entries.entry_target
- Breadcrumbs - apex_application_bc_entries.defined_for_page
- IR Reports - apex_application_page_ir.detail_link_target
- Report columns - apex_application_page_ir_col.column_link
- Card actions - apex_appl_page_card_actions.link_target
- Region sources - apex_application_page_regions.region_source
  - apex_page.get_url, apex_util.prepare_url or hardcoded f?p links

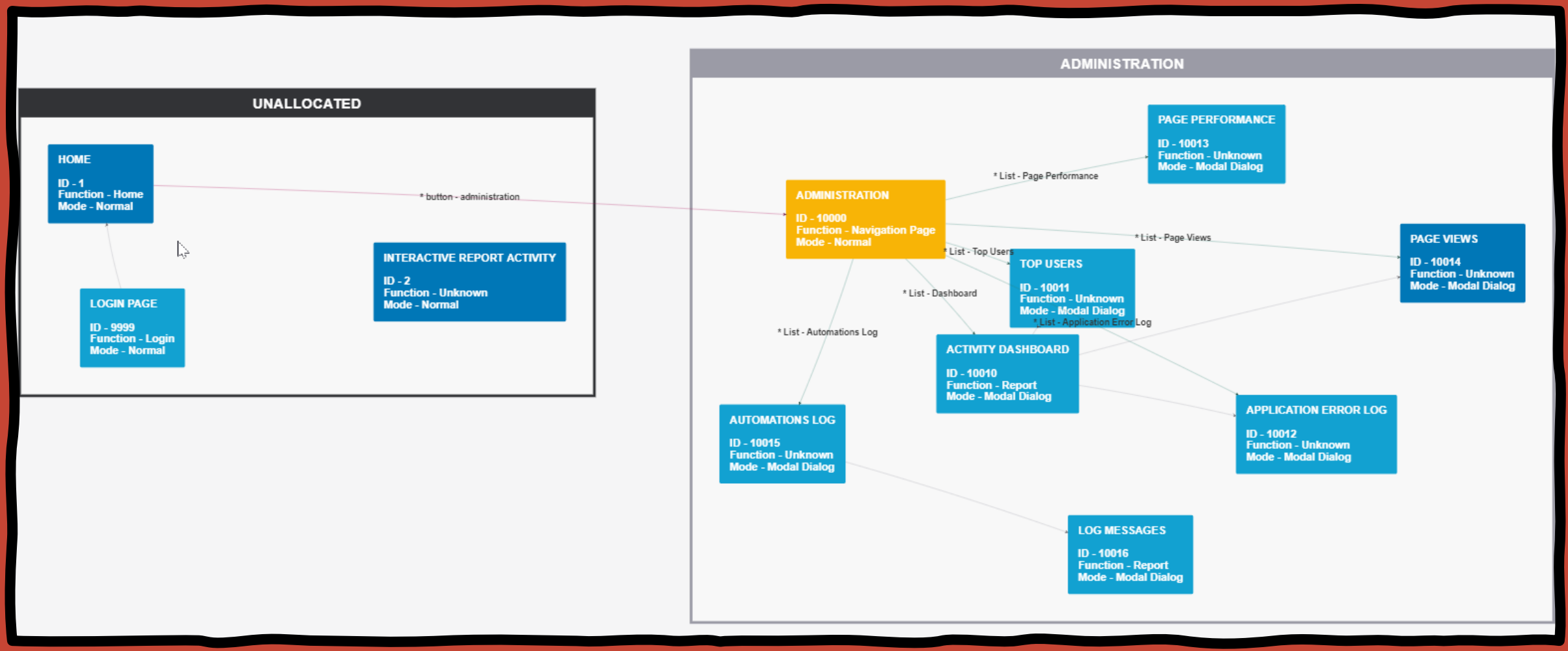
f?p=&APP_ID.:1:&SESSION.::&DEBUG.:::

Aplication metadata

Page From	Page To	Links
59	2	List - Add a New Customer button - add customer
93	2	button - add customer
2	1	Breadcrumb - Customer Details
2	50	branch - after_processing

Inbound and outbound link for an application page

Application metadata



Application metadata

Use case #2

Database object dependencies

Application metadata

```
select page_id,item_name, db_table_name, db_column_name
  from apex_application_page_db_items;
```

PAGE_ID	ITEM_NAME	DB_TABLE_NAME	DB_COLUMN_NAME
2	P2 TOTAL CONTRACT VALUE	EBA CUST CUSTOMERS	TOTAL CONTRACT VALUE
2	P2 ANNUAL RECURRING REVENUE	EBA CUST CUSTOMERS	ANNUAL RECURRING REVENUE
2	P2 CURRENCY	EBA CUST CUSTOMERS	CURRENCY
2	P2 REFERENCABLE	EBA CUST CUSTOMERS	REFERENCABLE
68	P68 INTERNAL CONTACT	EBA CUST PRODUCT USES	INTERNAL CONTACT
68	P68 CUSTOMER CONTACT ID	EBA CUST PRODUCT USES	CUSTOMER CONTACT ID
68	P68 VALID FROM	EBA CUST PRODUCT USES	VALID FROM
68	P68 VALID TO	EBA CUST PRODUCT USES	VALID TO
68	P68 COMMENTS	EBA CUST PRODUCT USES	COMMENTS
133	P133 OPEN YN	EBA CUST ISSUE STATUSES	OPEN YN
68	P68 REFERENCE TYPES	EBA CUST PRODUCT USES	REFERENCE TYPE IDS
68	P68 PRODUCT STATUS ID	EBA CUST PRODUCT USES	REFERENCE STATUS ID
95	P95 STATUS	EBA CUST PRODUCT STATUSES	STATUS
2	P2 LOGO NAME	EBA CUST CUSTOMERS	LOGO NAME

Application metadata

- Application computations - apex_application_computations.computation
- Application processes - apex_application_processes.process
- Dynamic list of values - apex_application_lovs.list_of_values_query
- Region sources - apex_application_page_regions. region_source
- Page processes - apex_application_page_proc.process_source
- Page computations - apex_application_page_comp. computation
- Validations - apex_application_page_val.validation_expression1
- Item sources - apex_application_page_items.item_source
- Dynamic actions - apex_application_page_da_acts.attribute_01
- Server-side conditions, Default values, Read only conditions
- ...

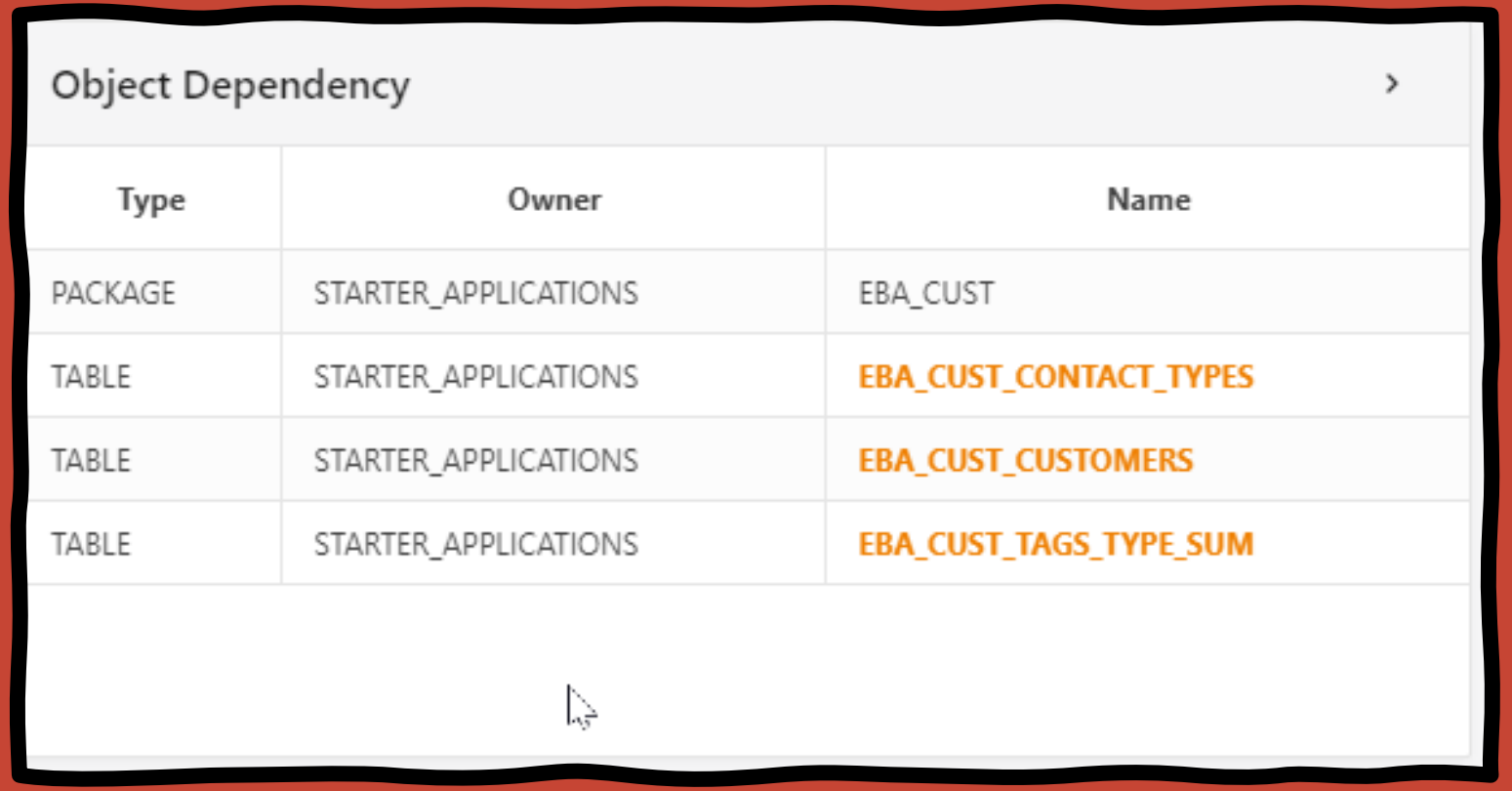
Application metadata

```
select referenced_name,
       referenced_type
  from user_dependencies
 where name = 'DUMMY_TEMPORARY_PROCEDURE' ;
```

REFERENCED_NAME	REFERENCED_TYPE
EBA CUST REF PHASE	TABLE
EBA CUST SALES CHANNEL	TABLE
EBA CUST SAMPLE DATA	PACKAGE
EBA CUST SEQ	SEQUENCE
EBA CUST STATUS	TABLE
EBA CUST TAGS	TABLE
EBA CUST TAGS SUM	TABLE
EBA CUST TAGS TYPE SUM	TABLE
EBA CUST TYPE	TABLE
EBA CUST TZ PREF	TABLE
EBA CUST USERS	TABLE

Application metadata

Referenced database objects on an application page



Application metadata

Database table utilization per application components

Component Dependency

Page	Component Name	Depend Type
1	Recently Updated Customers	Region
1	Customers by Geography	Region
1	Customers by Category	Region
1	P1_CATEGORY	Page Item List of Values
1	Summary	Region
1	Customer Updates	Region

Aplication metadata

Use case #3

Generate technical documentation

3.39. 59 – Competitor Threats

Page help

Manage the list of Competitor Threats that will be available to end-users for selection in the application. Click the Create Competitor Threat button to create a new Competitor Threat. Click the pencil icon next to any existing Competitor Threat to edit that specific threat.
Click the Reset button to reset the interactive report. Click the Actions button to define the number of rows displayed per page, filter, format, download, and/or save the interactive report.

General Information

ID	59
Name	Competitor Threats
Page Group	Administration
Alias	COMPETITOR-THREATS
Page Title	Competitor Threats
Function	Unknown
Template	
Authorization Scheme	
Requires Authentication?	Yes
Session State Protection	Arguments Must Have Checksum
Cache mode	Not Cached
Last modification	10.02.2021

Page Components

Regions	Dynamic Actions	Branches	Processes
1	1	0	0
Validations	**Computations**	**Buttons**	**Items**
0	0	2	0

Object Dependencies

Object Type	Owner	Name	Dependency type	Dependency
PACKAGE	SYS	STANDARD	Region	Competitor Threats
TABLE	DEMO_SHEMA	EBA_SALES_COMPETITOR_THREATS	Region	Competitor Threats
PACKAGE	SYS	SYS_STUB_FOR_PURITY_ANALYSIS	Region	Competitor Threats

1.1.4. EBA_SALES_LEAD_STATUS_CODES

Name	EBA_SALES_LEAD_STATUS_CODES
Type	TABLE
Owner	DEMO_SHEMA
Comment	No comment found for this object

Columns

Name	Type	Comment
ROW_VERSION_NUMBER	NUMBER	
STATUS_CODE	VARCHAR2 (30)	
DISPLAY_ORDER	NUMBER	
ID	NUMBER	
STATUS_DESCRIPTION	VARCHAR2 (4000)	

Constraints

Name	Column	Type
SYS_C0022447	STATUS_CODE	Check constraint
SYS_C0022448	ID	Primary Key

Indexes

Name	Column	Order
EBA_SALES_LEAD_STAT_CDI1	STATUS_CODE	ASC
SYS_C0022448	ID	ASC

Component dependencies

Page ID	Type	Name
100	Region	Open Leads by Status
29	Page Item List of Values	P29_LEAD_STATUS_ID
100	Page Item List of Values	P100_LEAD_STATUSES
	Shared Dynamic List of Values	LEAD CODES
37	Region	Lead Status Codes
19	Region	Leads Grid
19	Region	Leads Cards
19	Region	Leads Report
133	Region	Lead Details
19	Page Item List of Values	P19_STATUS_ID

Object dependencies

Quality assurance

Quality assurance

“Quality is simply conformance to requirements”

- Project management institute

Quality assurance

Example #1 – All non-public pages should be protected with authorizations shemes

```
select *
  from apex_application_pages
 where authorization_scheme is null
   and page_requires_authentication = 'Yes'
```

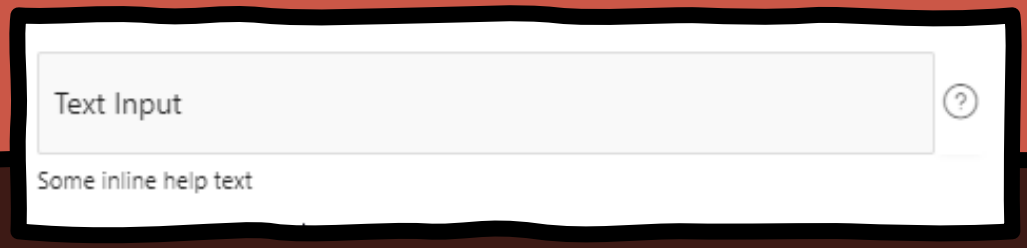
Quality assurance

Example #2 – Consistent SAVE button

```
select *
  from apex_application_page_buttons
 where button_name = 'SAVE'
   and not (label = 'Save'
            and button_is_hot = 'Yes'
            and button_template = 'Text with Icon'
            and icon_css_classes = 'fa-save'
            and display_position_code = 'CREATE')
```

Quality assurance

Example #3 – All page items should have some help text (except hidden items)

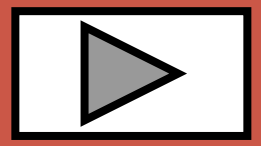



```
select *
  from apex_application_page_items
 where item_help_text is null
   and inline_help_text is null
   and display_as_code != 'NATIVE_HIDDEN'
```

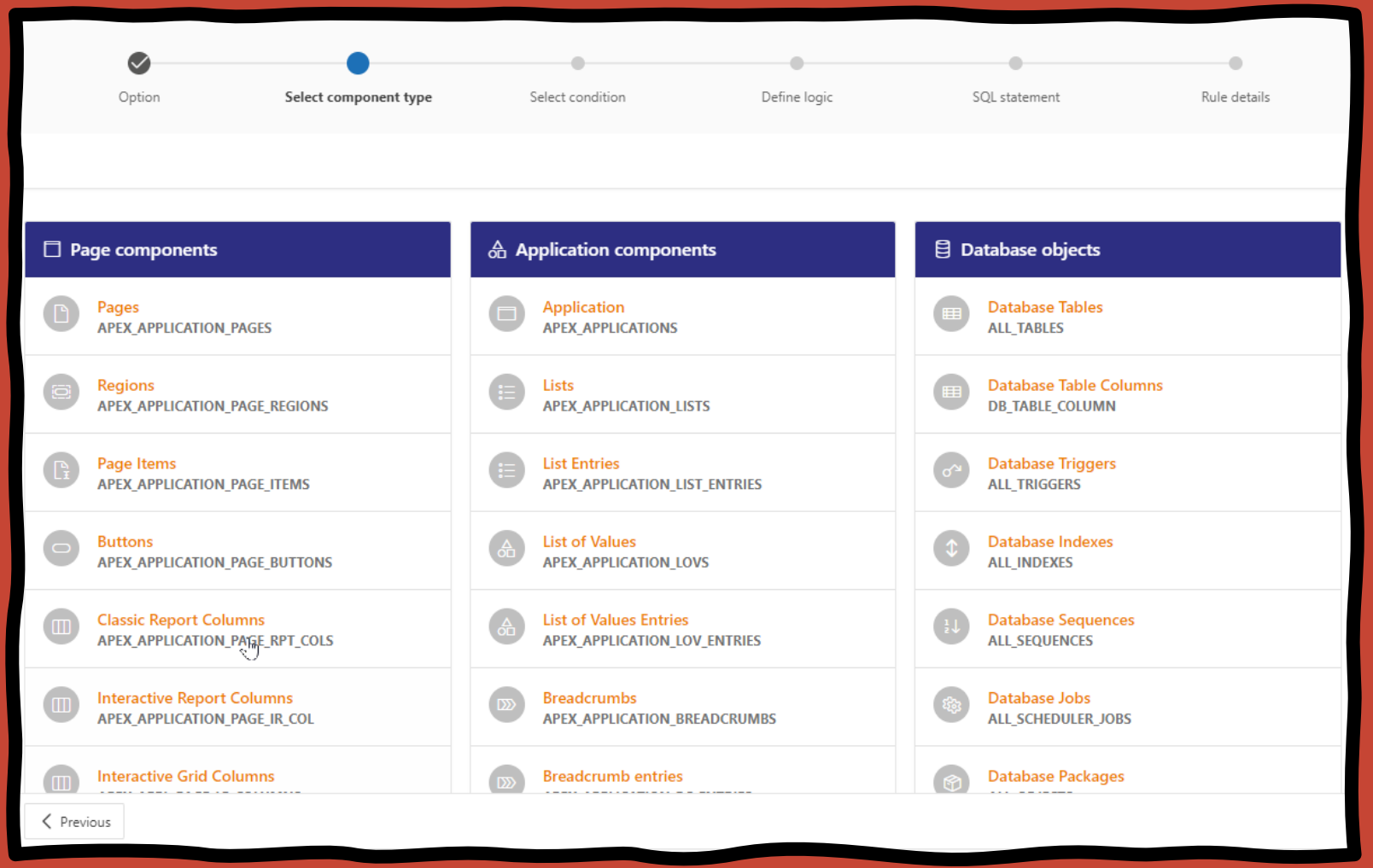
Quality assurance

Demo

How to create quality standards and run quality assesments



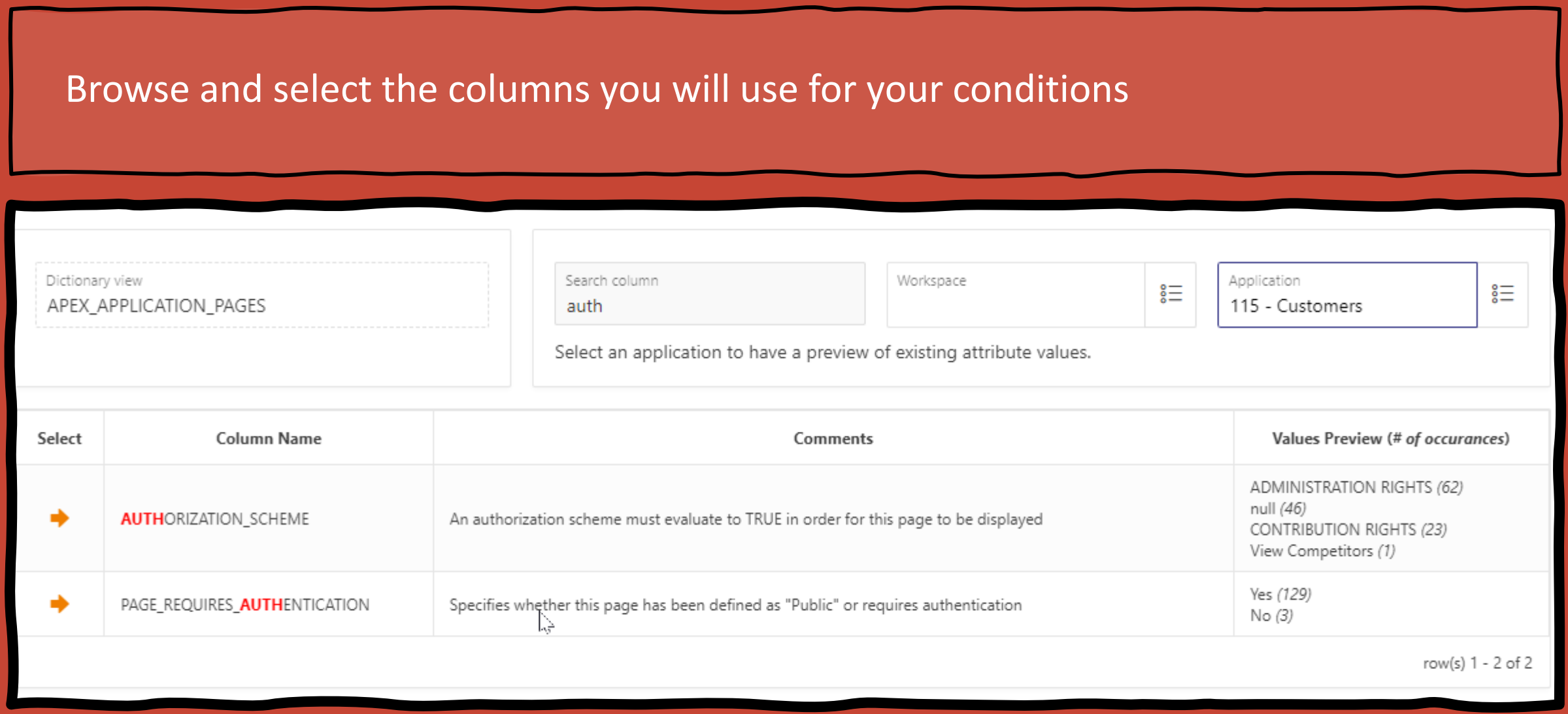
Quality assurance



Select the dictionary view you will base your rule on

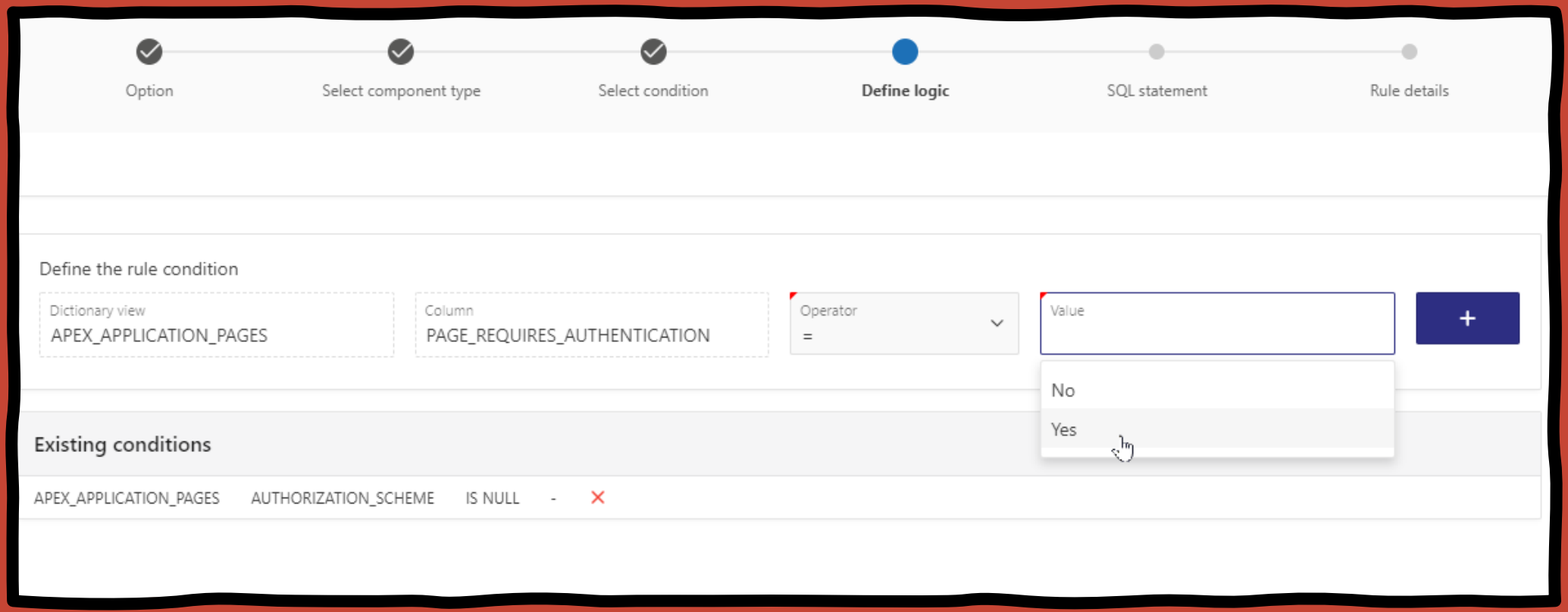
Quality assurance

Browse and select the columns you will use for your conditions



Quality assurance

In a declarative way define the rule logic



Quality assurance

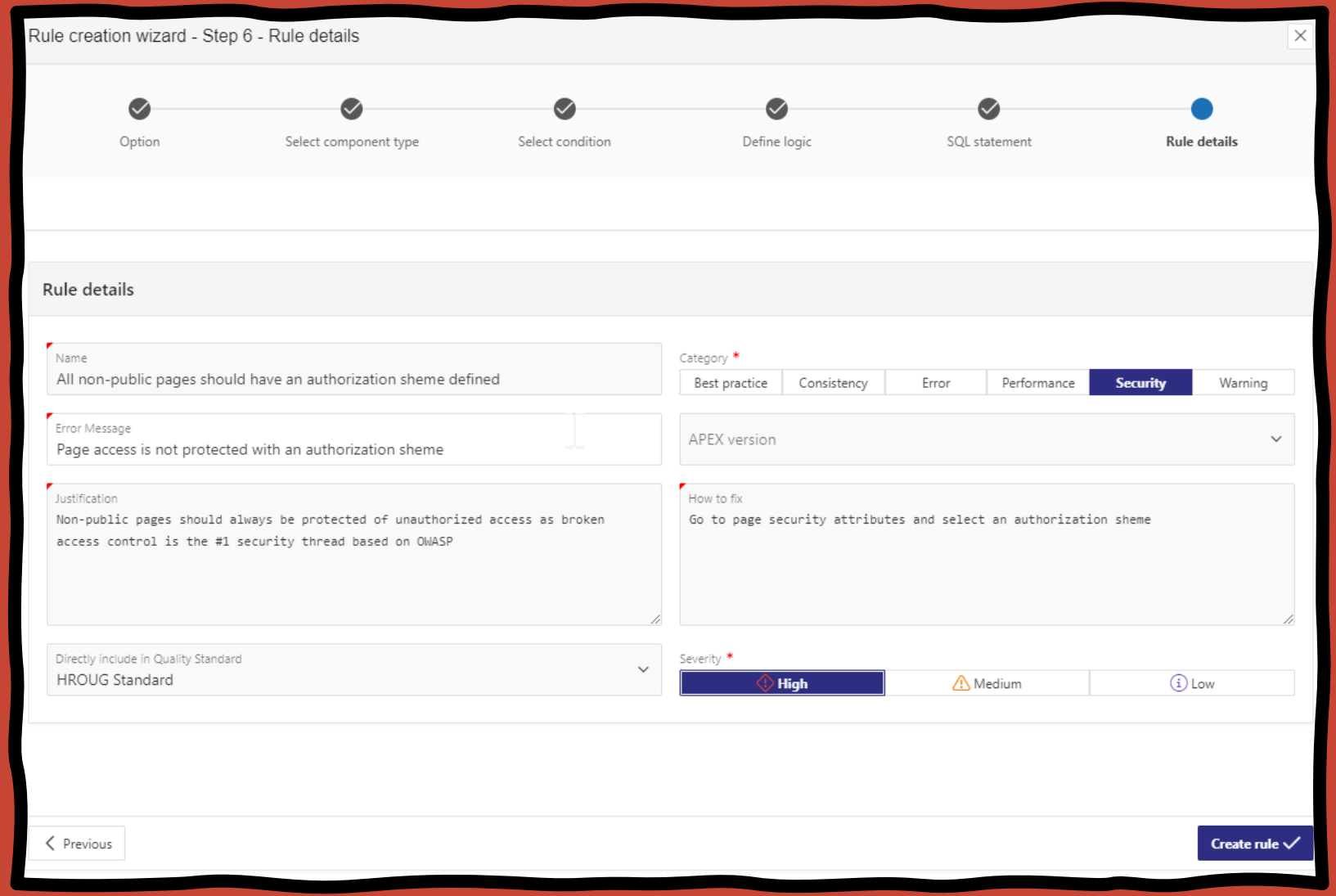
Validate the generated SQL statement

Rule select statement

```
1 SELECT
2       application_id || ':' || page_id as component_id
3  FROM apex_application_pages
4  WHERE page_requires_authentication = 'Yes'
5    AND authorization_scheme IS NULL
6
```

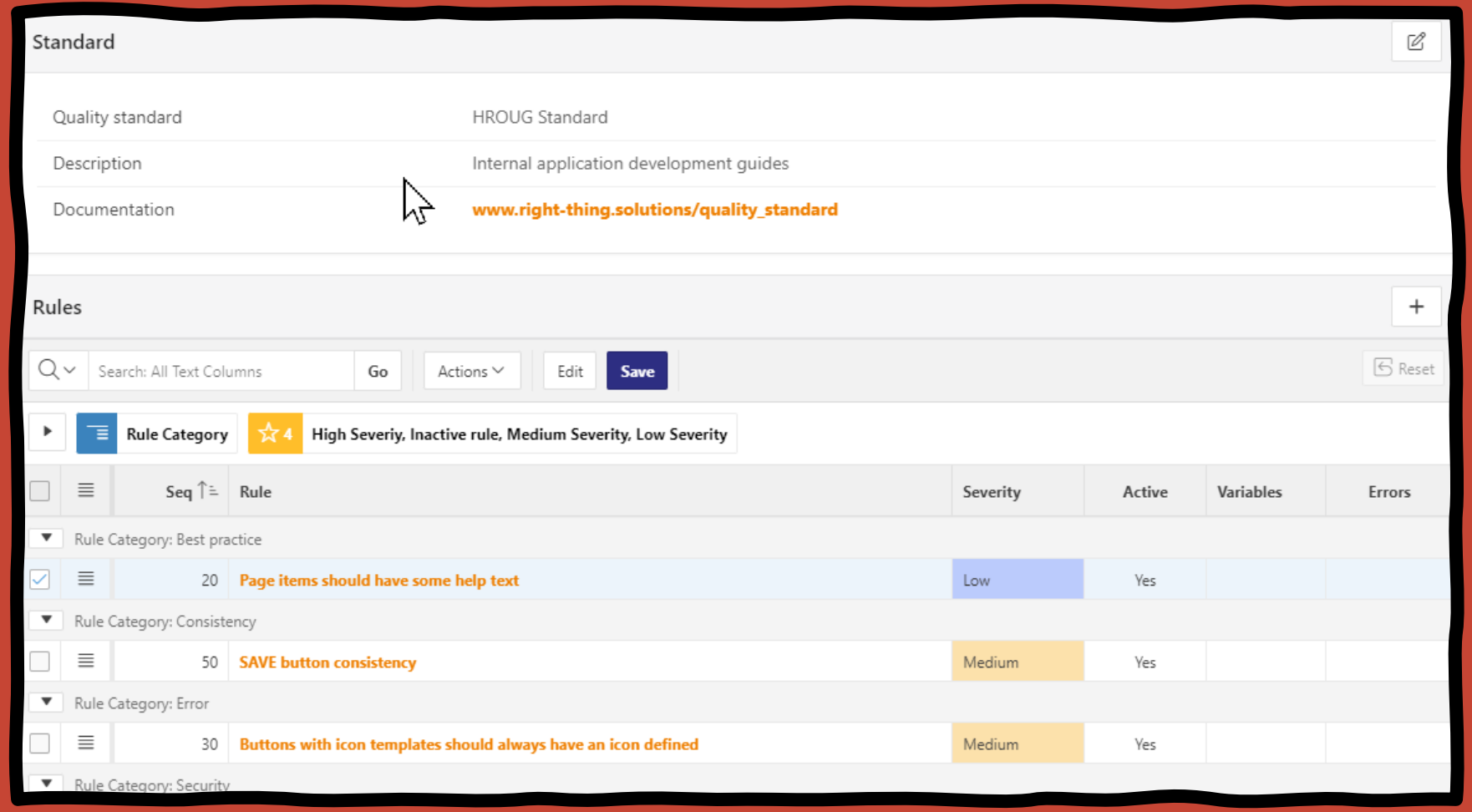
Quality assurance

Define the rule meta-data



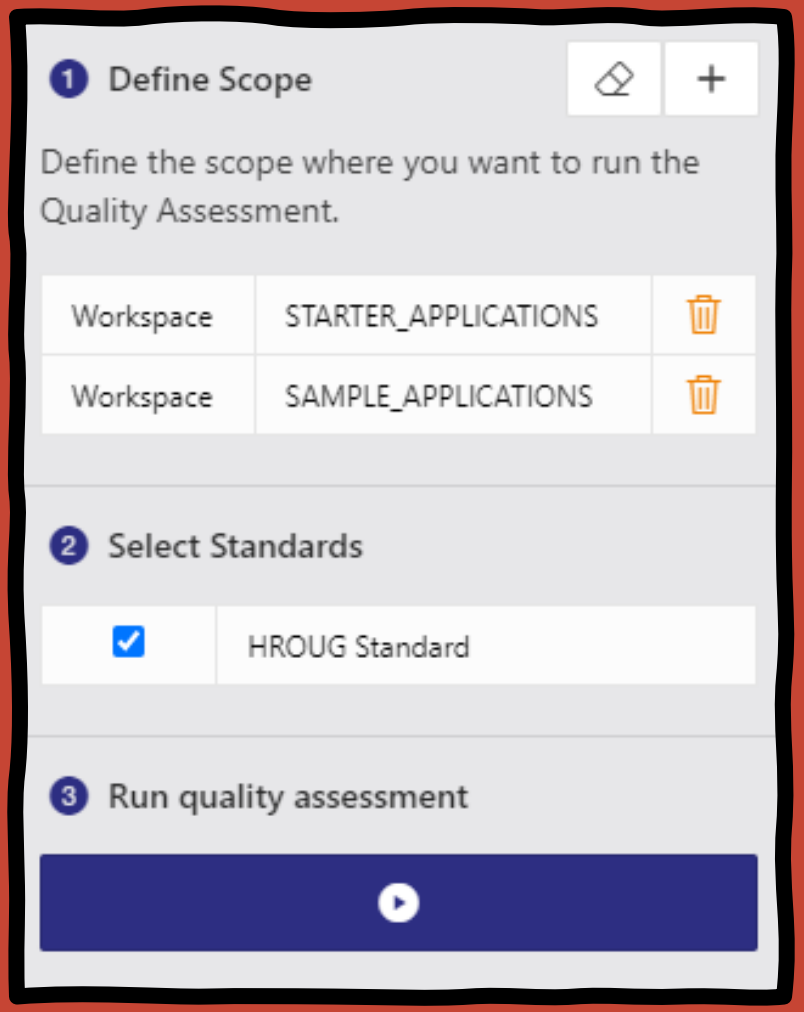
Quality assurance

Add other rules to your Quality Standard



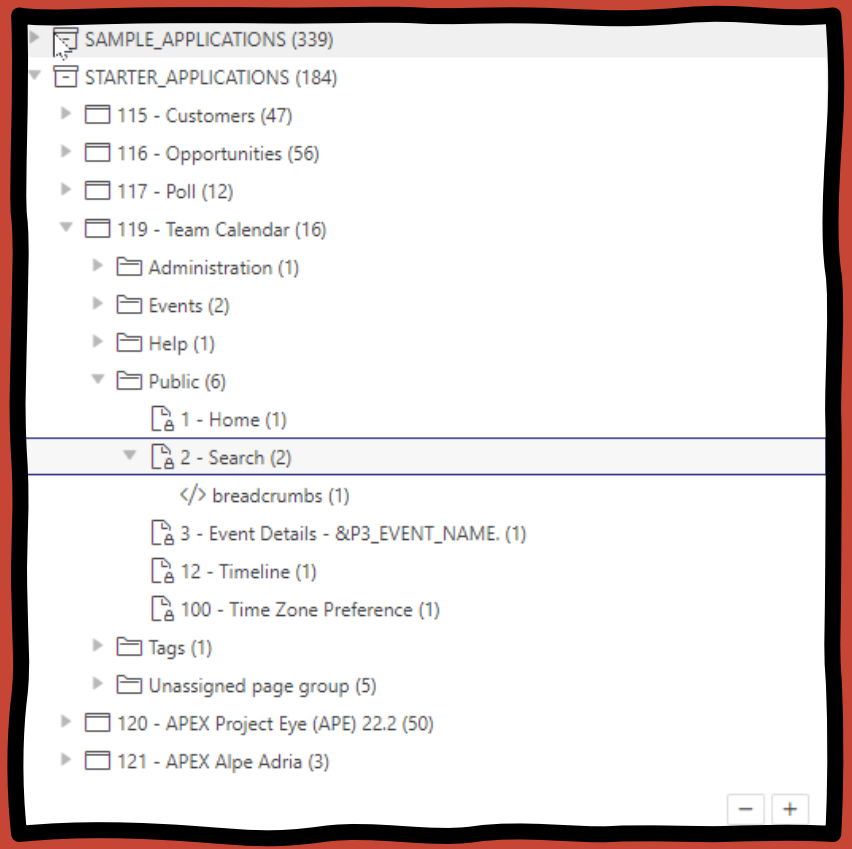
Quality assurance

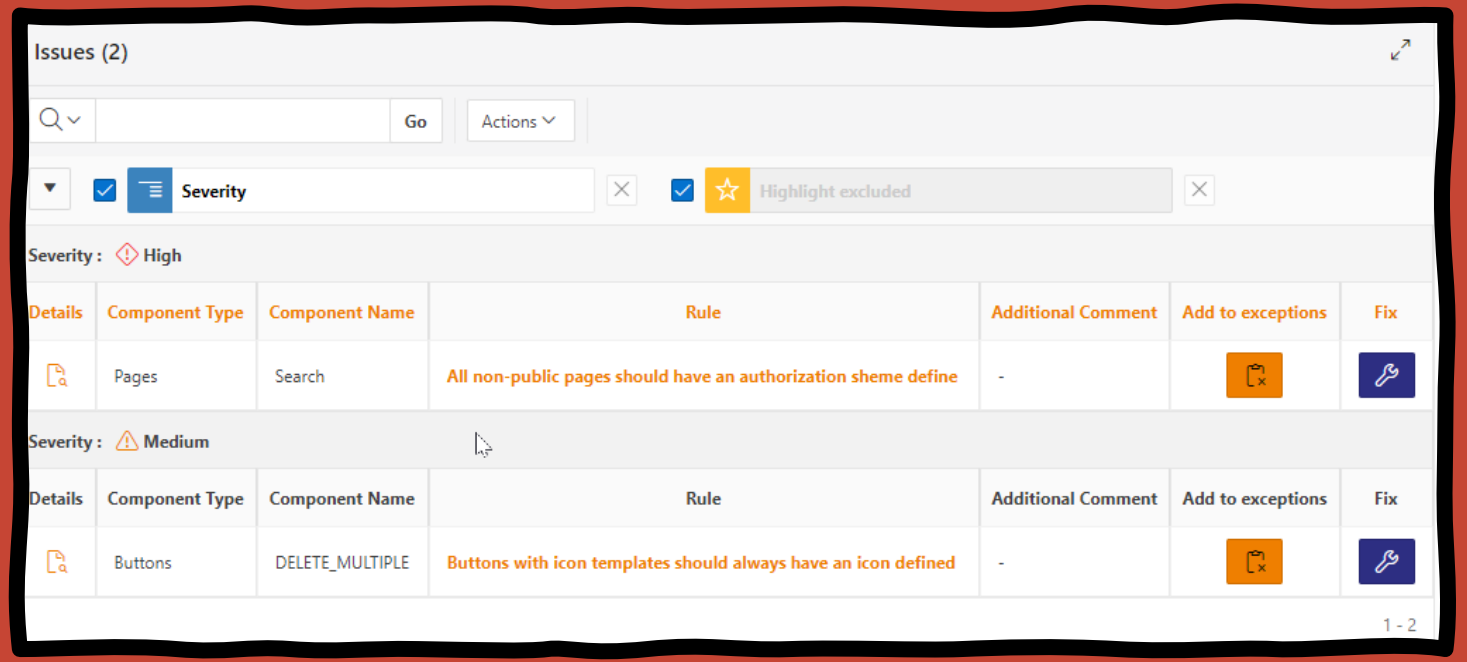
Select where to run your rules



Quality assurance

Analyse the assessment results





APEX Project Eye (APE)

https://www.apexprojecteye.com/

Keep an eye on your APEX Applications

Other community and professional tools:

- Application Standards Tracker (https://github.com/hhudson/code_standard_tracking)
- APEX Sec (https://apexsec.recx.co.uk/)
- APEX Sert (https://github.com/OraOpenSource/apex-sert)
- APEX Visualizer (https://apex.mt-ag.com/en/apex-visualizer)
- Quasto (https://github.com/mt-ag/quasto)

Keep an eye on your **APEX** Applications

ales.kravos@right-thing.solutions