ā'pěks alpe adria

New JSON, Workflow, and Fusion Apps Features in APEX 24.2

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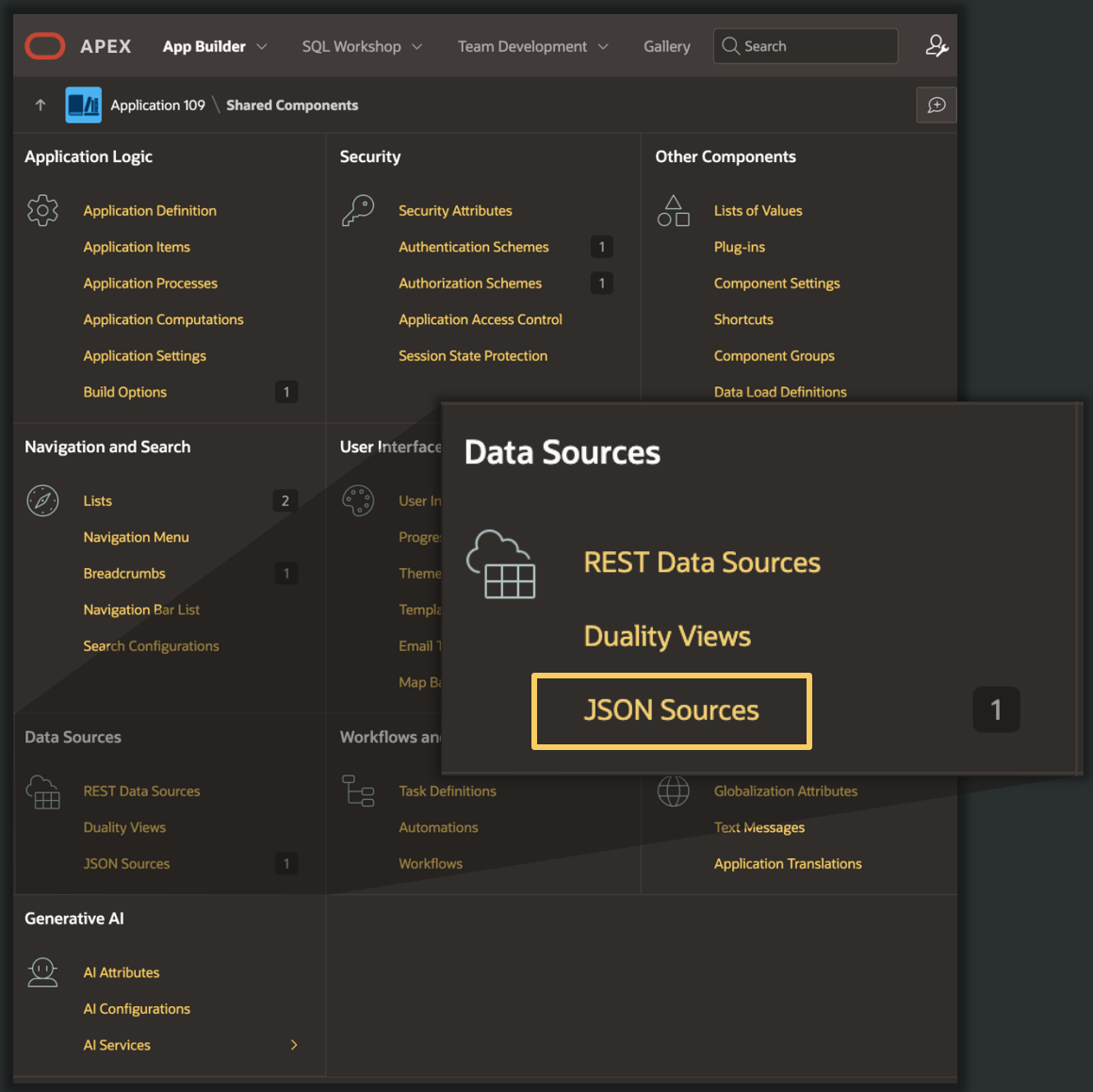
Senior Architect, APEX Dev Team

JSON Sources

JSON Sources

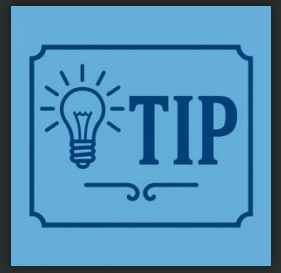
- Use any APEX region to read and write JSON data from:
  - CLOB/BLOB columns in 19c or 23ai
  - JSON columns in 23ai
  - JSON Collection Tables in 23ai

JSON Sources: New Shared Component



JSON Sources vs. REST Data Sources

- JSON Sources work with local JSON
  - Zero-latency data access
- REST Data Sources work with remote JSON
  - Requires network roundtrip(s)



Both use a *Data Profile* to capture metadata letting the APEX engine map JSON collections and properties to columns

JSON Source for JSON in a Column Named DATA


```
{
  "collectionName": "Favorite Animation Books",
  "created": "2025-04-05T08:09:00",
  "books": [
   {
    "title": "The Illusion of Life",
    "publisher": "Disney Editions",
    "authors": [
     {
      "firstName": "Frank",
      "lastName": "Thomas"
     },
     {
      "firstName": "Ollie",
      "lastName": "Johnston"
     }
    ],
    "published": "1995-10-19",
    "ISBN": "978-0786860708",
    "price": 35
   },
   {
    "title": "The Art of Ratatouille",
    "publisher": "Chronicle Books",
    "authors": [
     {
      "firstName": "Brad",
      "lastName": "Bird"
     },
     {
      "firstName": "John",
      "lastName": "Lasseter"
     }
    ],
    "published": "2007-05-03",
    "ISBN": "978-0811858342",
    "price": 32
   }
  ]
}
```


23ai JSON Collection Table

BOOK_COLLECTIONS

DATA

19c / 23ai Table with JSON Column

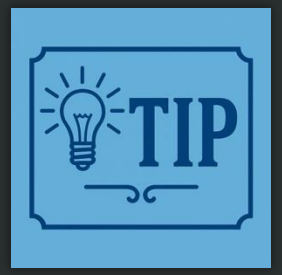
BOOK_COLLECTIONS_TAB

ID	*DATA*	COL_A	…	COL_Z

- BLOB
- CLOB
- JSON

19c

23ai



Using regular table JSON column can have *any* name

JSON Source Data Profile: Root JSON Column


```
{
  "collectionName": "Favorite Animation Books",
  "created": "2025-04-05T08:09:00",
  "books": [
   {
    "title": "The Illusion of Life",
    "publisher": "Disney Editions",
    "authors": [
     {
      "firstName": "Frank",
      "lastName": "Thomas"
     },
     {
      "firstName": "Ollie",
      "lastName": "Johnston"
     }
    ],
    "published": "1995-10-19",
    "ISBN": "978-0786860708",
    "price": 35
   },
   {
    "title": "The Art of Ratatouille",
    "publisher": "Chronicle Books",
    "authors": [
     {
      "firstName": "Brad",
      "lastName": "Bird"
     },
     {
      "firstName": "John",
      "lastName": "Lasseter"
     }
    ],
    "published": "2007-05-03",
    "ISBN": "978-0811858342",
    "price": 32
   }
  ]
}
```


Columns

Resequence Columns | Add Column >

Name	Column Type	Data Type	Selector
DATA	Table	JSON Document	DATA

a Sources using REST

Sequence	Name	Column Type	Data Type	Selector	Primary Key	Visible	Common	Parent Column
0	DATA	Table	JSON Document	DATA	No	Yes	No	
1	C_ID	Data	Varchar2	_id	Yes	Yes	Yes	DATA
2	COLLECTIONNAME	Data	Varchar2	collectionName	No	Yes	Yes	DATA
3	CREATED	Data	Date	created	No	Yes	Yes	DATA
4	BOOKS	Data	Array	books	No	Yes	No	DATA
102	ISBN	Data	Varchar2	ISBN	No	Yes	Yes	BOOKS
103	TITLE	Data	Varchar2	title	No	Yes	Yes	BOOKS
104	PRICE	Data	Number	price	No	Yes	Yes	BOOKS
105	PUBLISHED	Data	Date	published	No	Yes	Yes	BOOKS
106	PUBLISHER	Data	Varchar2	publisher	No	Yes	Yes	BOOKS
107	BOOKS_POS	Data	Number		Yes	Yes	Yes	BOOKS
108	AUTHORS	Data	Array	authors	No	Yes	No	BOOKS
201	LASTNAME	Data	Varchar2	lastName	No	Yes	Yes	AUTHORS
202	FIRSTNAME	Data	Varchar2	firstName	No	Yes	Yes	AUTHORS
203	AUTHORS_POS	Data	Number		Yes	Yes	Yes	AUTHORS

Total 15

JSON Source Data Profile: First Level Properties


```
{
  "collectionName": "Favorite Animation Books",
  "created": "2025-04-05T08:09:00",
  "books": [
   {
    "title": "The Illusion of Life",
    "publisher": "Disney Editions",
    "authors": [
     {
      "firstName": "Frank",
      "lastName": "Thomas"
     },
     {
      "firstName": "Ollie",
      "lastName": "Johnston"
     }
    ],
    "published": "1995-10-19",
    "ISBN": "978-0786860708",
    "price": 35
   },
   {
    "title": "The Art of Ratatouille",
    "publisher": "Chronicle Books",
    "authors": [
     {
      "firstName": "Brad",
      "lastName": "Bird"
     },
     {
      "firstName": "John",
      "lastName": "Lasseter"
     }
    ],
    "published": "2007-05-03",
    "ISBN": "978-0811858342",
    "price": 32
   }
  ]
}
```


Columns

Resequence Columns | Add Column >

JSON Array Indexes used as Primary Keys

The following primary key columns are using a *JSON Array Index* as **Selector**. This can lead to limitations for *multi-row DML* (in components like Interactive Grid), or for Data Sources using REST Enabled SQL.

AUTHORS_POS,BOOKS_POS

Search: All Text Columns | Go | Edit | Add Data Column

Sequence	Name	Column Type	Data Type	Selector	Primary Key	Visible	Common	Parent Column
0	DATA	Table	JSON Document	DATA	No	Yes	No	
1	C_ID	Data	Varchar2	_id	Yes	Yes	Yes	DATA
2	COLLECTIONNAME	Data	Varchar2	collectionName	No	Yes	Yes	DATA
3	CREATED	Data	Date	created	No	Yes	Yes	DATA
4	BOOKS	Data	Array	books	No	Yes	No	DATA
102	ISBN	Data	Varchar2	ISBN	No	Yes	Yes	BOOKS
103	TITLE	Data	Varchar2	title	No	Yes	Yes	BOOKS
104	PRICE	Data	Number	price	No	Yes	Yes	BOOKS
105	PUBLISHED	Data	Date	published	No	Yes	Yes	BOOKS
106	PUBLISHER	Data	Varchar2	publisher	No	Yes	Yes	BOOKS
107	BOOKS_POS	Data	Number		Yes	Yes	Yes	BOOKS
108	AUTHORS	Data	Array	authors	No	Yes	No	BOOKS
201	LASTNAME	Data	Varchar2	lastName	No	Yes	Yes	AUTHORS
202	FIRSTNAME	Data	Varchar2	firstName	No	Yes	Yes	AUTHORS
203	AUTHORS_POS	Data	Number		Yes	Yes	Yes	AUTHORS

Total 15

JSON Source Data Profile: Array Columns New in 24.1


```
{
  "collectionName": "Favorite Animation Books",
  "created": "2025-04-05T08:09:00",
  "books": [
   {
    "title": "The Illusion of Life",
    "publisher": "Disney Editions",
    "authors": [
     {
      "firstName": "Frank",
      "lastName": "Thomas"
     },
     {
      "firstName": "Ollie",
      "lastName": "Johnston"
     }
    ],
    "published": "1995-10-19",
    "ISBN": "978-0786860708",
    "price": 35
   },
   {
    "title": "The Art of Ratatouille",
    "publisher": "Chronicle Books",
    "authors": [
     {
      "firstName": "Brad",
      "lastName": "Bird"
     },
     {
      "firstName": "John",
      "lastName": "Lasseter"
     }
    ],
    "published": "2007-05-03",
    "ISBN": "978-0811858342",
    "price": 32
   }
  ]
}
```


Columns

Resequence Columns | Add Column >

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BOOKS	Data	Array	books

Sequence	Name	Column Type	Data Type	Selector	Primary Key	Visible	Common	Parent Column
0	DATA	Table	JSON Document	DATA	No	Yes	No	
1	C_ID	Data	Varchar2	_id	Yes	Yes	Yes	DATA
2	COLLECTIONNAME	Data	Varchar2	collectionName	No	Yes	Yes	DATA
3	CREATED	Data	Date	created	No	Yes	Yes	DATA
4	BOOKS	Data	Array	books	No	Yes	No	DATA
102	ISBN	Data	Varchar2	ISBN	No	Yes	Yes	BOOKS
103	TITLE	Data	Varchar2	title	No	Yes	Yes	BOOKS
104	PRICE	Data	Number	price	No	Yes	Yes	BOOKS
105	PUBLISHED	Data	Date	published	No	Yes	Yes	BOOKS
106	PUBLISHER	Data	Varchar2	publisher	No	Yes	Yes	BOOKS
107	BOOKS_POS	Data	Number		Yes	Yes	Yes	BOOKS
108	AUTHORS	Data	Array	authors	No	Yes	No	BOOKS
201	LASTNAME	Data	Varchar2	lastName	No	Yes	Yes	AUTHORS
202	FIRSTNAME	Data	Varchar2	firstName	No	Yes	Yes	AUTHORS
203	AUTHORS_POS	Data	Number		Yes	Yes	Yes	AUTHORS

Total 15

JSON Source Data Profile: Array Columns New in 24.1


```
{
  "collectionName": "Favorite Animation Books",
  "created": "2025-04-05T08:09:00",
  "books": [
   {
    "title": "The Illusion of Life",
    "publisher": "Disney Editions",
    "authors": [
     {
      "firstName": "Frank",
      "lastName": "Thomas"
     },
     {
      "firstName": "Ollie",
      "lastName": "Johnston"
     }
    ],
    "published": "1995-10-19",
    "ISBN": "978-0786860708",
    "price": 35
   },
   {
    "title": "The Art of Ratatouille",
    "publisher": "Chronicle Books",
    "authors": [
     {
      "firstName": "Brad",
      "lastName": "Bird"
     },
     {
      "firstName": "John",
      "lastName": "Lasseter"
     }
    ],
    "published": "2007-05-03",
    "ISBN": "978-0811858342",
    "price": 32
   }
  ]
}
```


Columns — Resequence Columns | Add Column >

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AUTHORS_POS,BOOKS_POS

AUTHORS	Data	Array	authors

Sequence	Name	Column Type	Data Type	Selector	Primary Key	Visible	Common	Parent Column
0	DATA	Table	JSON Document	DATA	No	Yes	No	
1	C_ID	Data	Varchar2	_id	Yes	Yes	Yes	DATA
2	COLLECTIONNAME	Data	Varchar2	collectionName	No	Yes	Yes	DATA
3	CREATED	Data	Date	created	No	Yes	Yes	DATA
4	BOOKS	Data	Array	books	No	Yes	No	DATA
102	ISBN	Data	Varchar2	ISBN	No	Yes	Yes	BOOKS
103	TITLE	Data	Varchar2	title	No	Yes	Yes	BOOKS
104	PRICE	Data	Number	price	No	Yes	Yes	BOOKS
105	PUBLISHED	Data	Date	published	No	Yes	Yes	BOOKS
106	PUBLISHER	Data	Varchar2	publisher	No	Yes	Yes	BOOKS
107	BOOKS_POS	Data	Number		Yes	Yes	Yes	BOOKS
108	AUTHORS	Data	Array	authors	No	Yes	No	BOOKS
201	LASTNAME	Data	Varchar2	lastName	No	Yes	Yes	AUTHORS
202	FIRSTNAME	Data	Varchar2	firstName	No	Yes	Yes	AUTHORS
203	AUTHORS_POS	Data	Number		Yes	Yes	Yes	AUTHORS

Total 15

JSON Source Data Profile: Position/Line Number Columns


```
{
  "collectionName": "Favorite Animation Books",
  "created": "2025-04-05T08:09:00",
  "books": [
   {
    "[illegible]": "The Illusion of Life",
    "[illegible]sher": "Disney Editions",
    "authors": [
     {
      "firstName": "Frank",
      "lastName": "Thomas"
     },
     {
      "firstName": "Ollie",
      "lastName": "Johnston"
     }
    ],
    "published": "1995-10-19",
    "ISBN": "978-0786860708",
    "price": 35
   },
   {
    "[illegible]": "The Art of Ratatouille",
    "[illegible]sher": "Chronicle Books",
    "authors": [
     {
      "firstName": "Brad",
      "lastName": "Bird"
     },
     {
      "firstName": "John",
      "lastName": "Lasseter"
     }
    ],
    "published": "2007-05-03",
    "ISBN": "978-0811858342",
    "price": 32
   }
  ]
}
```


1

1

2

2

Columns

Resequence Columns | Add Column >

JSON Array Indexes used as Primary Keys

The following primary key columns are using a *JSON Array Index* as **Selector**. This can lead to limitations for *multi-row DML* (in components like Interactive Grid), or for Data Sources using REST Enabled SQL.

AUTHORS_POS,BOOKS_POS

Search: All Text Columns | Go | Edit | Add Data Column

Sequence	Name	Column Type	Data Type	Selector	Primary Key	Visible	Common	Parent Column
0	DATA	Table	JSON Document	DATA	No	Yes	No	
1	C_ID	Data	Varchar2	_id	Yes	Yes	Yes	DATA
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3	CREATED	Data	Date	created	No	Yes	Yes	DATA
4	BOOKS	Data	Array	books	No	Yes	No	DATA
102	ISBN	Data	Varchar2	ISBN	No	Yes	Yes	BOOKS
103	TITLE	Data	Varchar2	title	No	Yes	Yes	BOOKS
104	PRICE	Data	Number	price	No	Yes	Yes	BOOKS
105	PUBLISHED	Data	Date	published	No	Yes	Yes	BOOKS
106	PUBLISHER	Data	Varchar2	publisher	No	Yes	Yes	BOOKS
107	BOOKS_POS	Data	Number		Yes	Yes	Yes	BOOKS
108	AUTHORS	Data	Array	authors	No	Yes	No	BOOKS
201	LASTNAME	Data	Varchar2	lastName	No	Yes	Yes	AUTHORS
202	FIRSTNAME	Data	Varchar2	firstName	No	Yes	Yes	AUTHORS
203	AUTHORS_POS	Data	Number		Yes	Yes	Yes	AUTHORS

Total 15

JSON Source Data Profile: Primary Key at Each Level


```
{
  "_id": "67EFC25A081831C44C5486DF",
  "collectionName": "Favorite Animation Books",
  "created": "2025-04-05T08:09:00",
  "books": [
    {
      "title": "The Illusion of Life",
      "publisher": "Disney Editions",
      "authors": [
        {
          "firstName": "Frank",
          "lastName": "Thomas"
        },
        {
          "firstName": "Ollie",
          "lastName": "Johnston"
        }
      ],
      "published": "1995-10-19",
      "ISBN": "978-0786860708",
      "price": 35
    },
    {
      "title": "The Art of Ratatouille",
      "publisher": "Chronicle Books",
      "authors": [
        {
          "firstName": "Brad",
          "lastName": "Bird"
        },
        {
          "firstName": "John",
          "lastName": "Lasseter"
        }
      ],
      "published": "2007-05-03",
      "ISBN": "978-0811858342",
      "price": 32
    }
  ]
}
```


Columns — Resequence Columns | Add Column >

JSON Array Indexes used as Primary Keys

The following primary key columns are using a *JSON Array Index* as **Selector**. This can lead to limitations for *multi-row DML* (in components like Interactive Grid), or for Data Sources using REST Enabled SQL.

AUTHORS_POS,BOOKS_POS

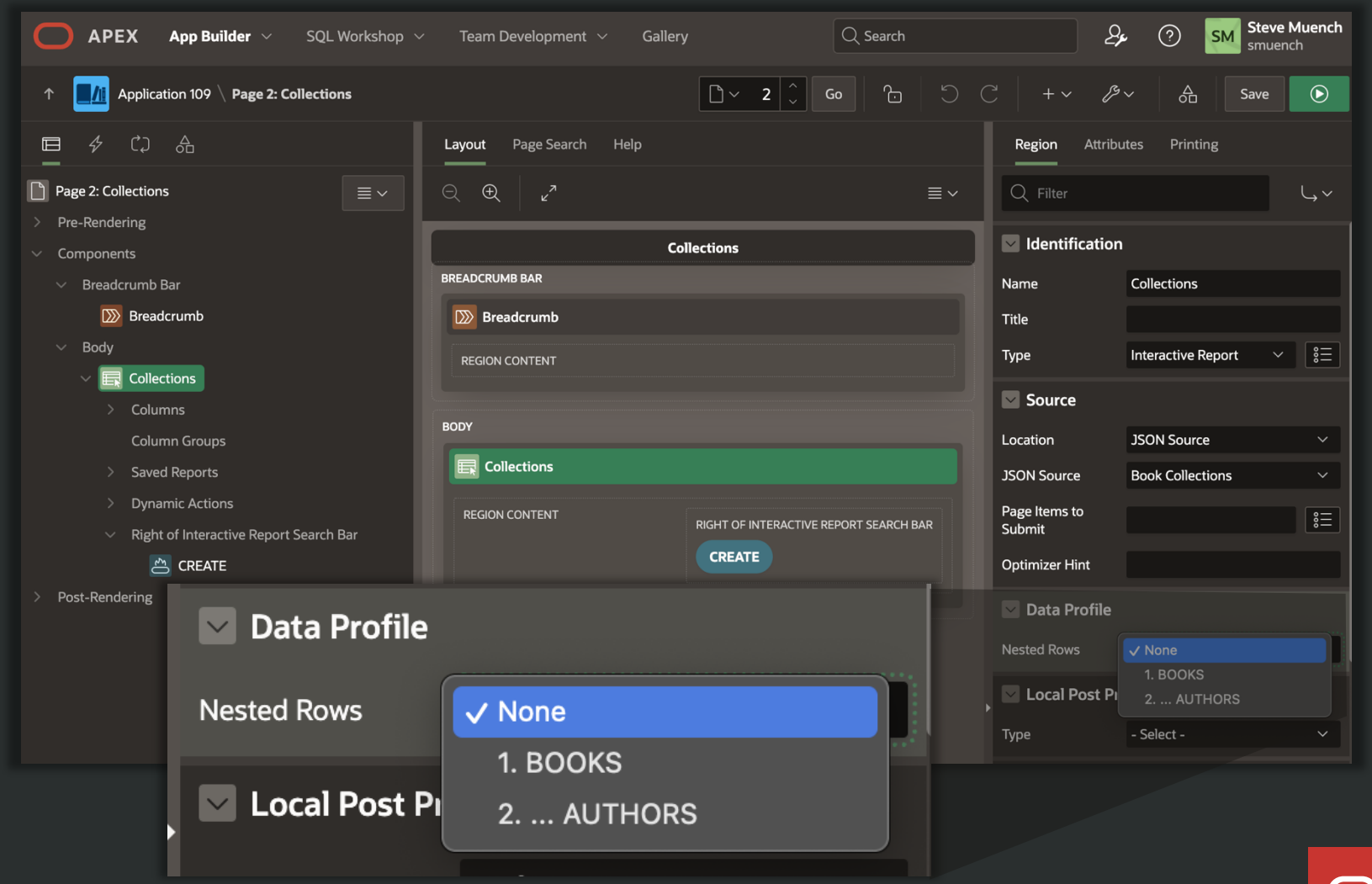
Search: All Text Columns | Go | Edit | Add Data Column

Sequence	Name	Column Type	Data Type	Selector	Primary Key	Visible	Common	Parent Column
0	DATA	Table	JSON Document	DATA	No	Yes	No	
1	C_ID	Data	Varchar2	_id	Yes	Yes	Yes	DATA
2	COLLECTIONNAME	Data	Varchar2	collectionName	No	Yes	Yes	DATA
3	CREATED	Data	Date	created	No	Yes	Yes	DATA
4	BOOKS	Data	Array	books	No	Yes	No	DATA
102	ISBN	Data	Varchar2	ISBN	No	Yes	Yes	BOOKS
103	TITLE	Data	Varchar2	title	No	Yes	Yes	BOOKS
104	PRICE	Data	Number	price	No	Yes	Yes	BOOKS
105	PUBLISHED	Data	Date	published	No	Yes	Yes	BOOKS
106	PUBLISHER	Data	Varchar2	publisher	No	Yes	Yes	BOOKS
107	BOOKS_POS	Data	Number		Yes	Yes	Yes	BOOKS
108	AUTHORS	Data	Array	authors	No	Yes	No	BOOKS
201	LASTNAME	Data	Varchar2	lastName	No	Yes	Yes	AUTHORS
202	FIRSTNAME	Data	Varchar2	firstName	No	Yes	Yes	AUTHORS
203	AUTHORS_POS	Data	Number		Yes	Yes	Yes	AUTHORS

Total 15

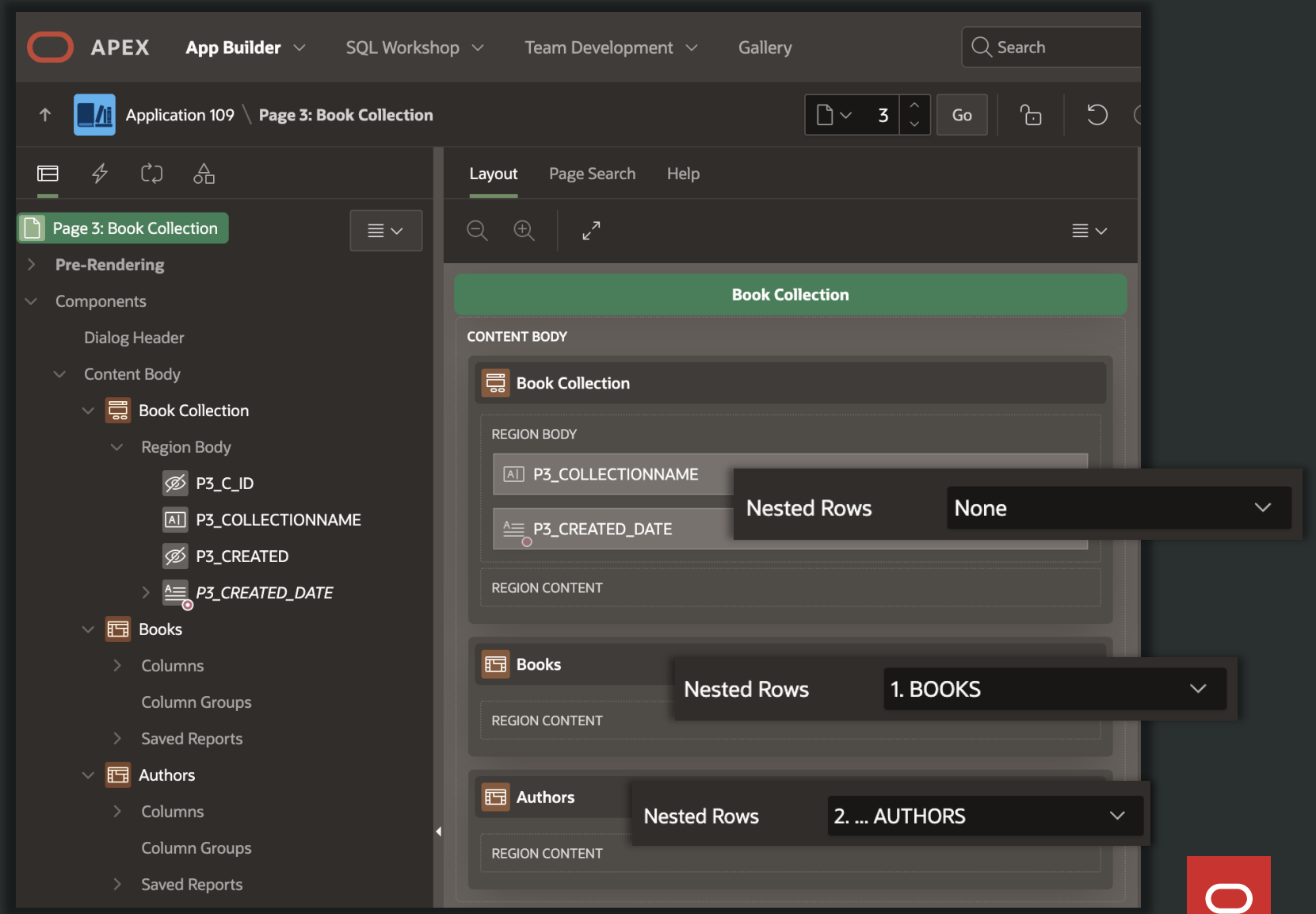
JSON Source: Choosing *Nested Rows* in a Region


```
{
  "_id": "67EFC25A081831C44C5486DF",
  "collectionName": "Favorite Animation Books",
  "created": "2025-04-05T08:09:00",
  "books": [
   {
    "title": "The Illusion of Life",
    "publisher": "Disney Editions",
    "authors": [
     {
      "firstName": "Frank",
      "lastName": "Thomas"
     },
     {
      "firstName": "Ollie",
      "lastName": "Johnston"
     }
    ],
    "published": "1995-10-19",
    "ISBN": "978-0786860708",
    "price": 35
   },
   {
    "title": "The Art of Ratatouille",
    "publisher": "Chronicle Books",
    "authors": [
     {
      "firstName": "Brad",
      "lastName": "Bird"
     },
     {
      "firstName": "John",
      "lastName": "Lasseter"
     }
    ],
    "published": "2007-05-03",
    "ISBN": "978-0811858342",
    "price": 32
   }
  ]
}
```

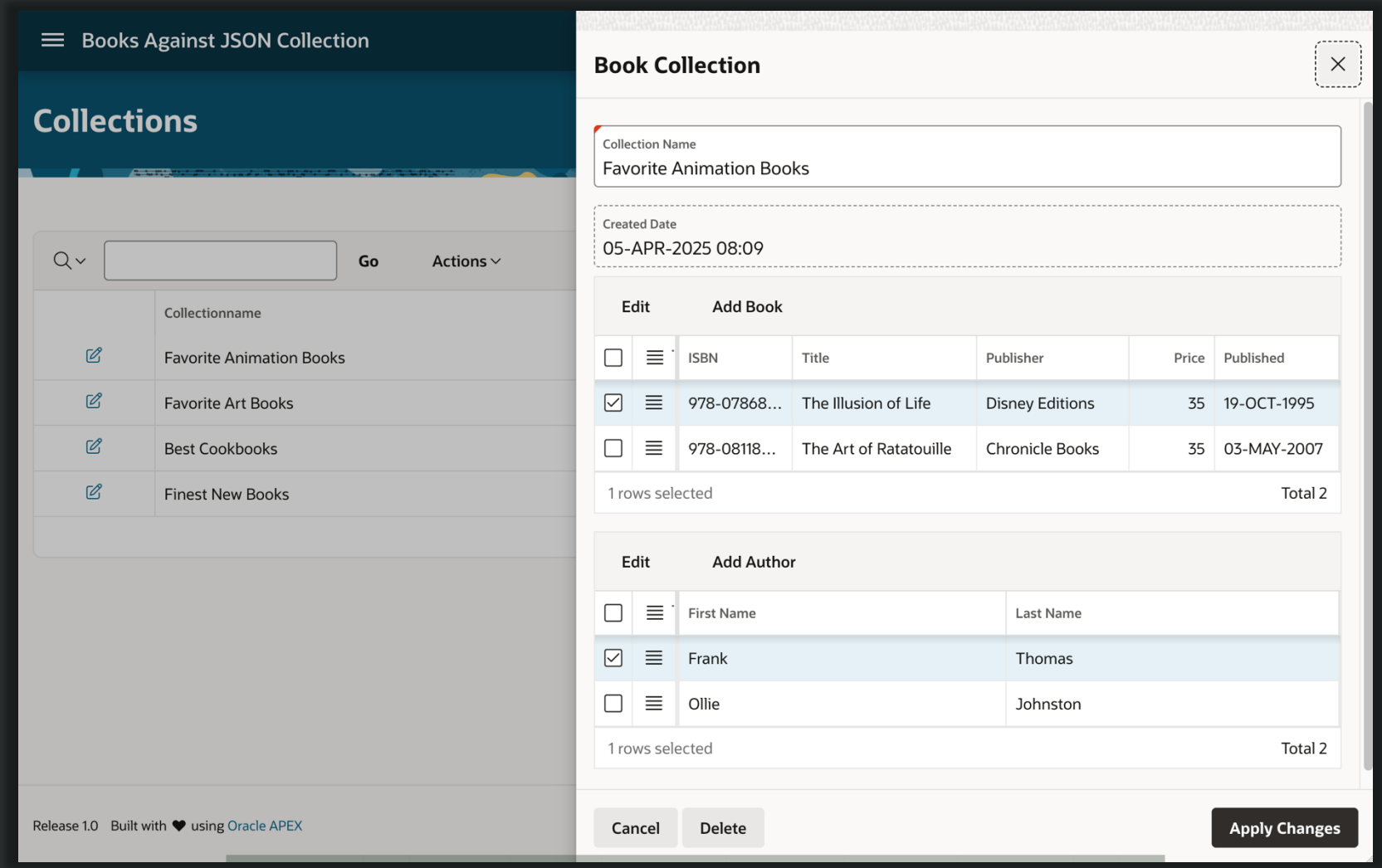
JSON Source: Choosing *Nested Rows* in Multiple Regions


```
{
  "_id": "67EFC25A081831C44C5486DF",
  "collectionName": "Favorite Animation Books",
  "created": "2025-04-05T08:09:00",
  "books": [
   {
    "title": "The Illusion of Life",
    "publisher": "Disney Editions",
    "authors": [
     {
      "firstName": "Frank",
      "lastName": "Thomas"
     },
     {
      "firstName": "Ollie",
      "lastName": "Johnston"
     }
    ],
    "published": "1995-10-19",
    "ISBN": "978-0786860708",
    "price": 35
   },
   {
    "title": "The Art of Ratatouille",
    "publisher": "Chronicle Books",
    "authors": [
     {
      "firstName": "Brad",
      "lastName": "Bird"
     },
     {
      "firstName": "John",
      "lastName": "Lasseter"
     }
    ],
    "published": "2007-05-03",
    "ISBN": "978-0811858342",
    "price": 32
   }
  ]
}
```

JSON Source: Choosing *Nested Rows* in Multiple Regions


```
{
  "_id": "67EFC25A081831C44C5486DF",
  "collectionName": "Favorite Animation Books",
  "created": "2025-04-05T08:09:00",
  "books": [
   {
    "title": "The Illusion of Life",
    "publisher": "Disney Editions",
    "authors": [
     {
      "firstName": "Frank",
      "lastName": "Thomas"
     },
     {
      "firstName": "Ollie",
      "lastName": "Johnston"
     }
    ],
    "published": "1995-10-19",
    "ISBN": "978-0786860708",
    "price": 35
   },
   {
    "title": "The Art of Ratatouille",
    "publisher": "Chronicle Books",
    "authors": [
     {
      "firstName": "Brad",
      "lastName": "Bird"
     },
     {
      "firstName": "John",
      "lastName": "Lasseter"
     }
    ],
    "published": "2007-05-03",
    "ISBN": "978-0811858342",
    "price": 32
   }
  ]
}
```

JSON Source Data Profile

Use Sequence to order array columns into contiguous groups

Columns

Resequence Columns | Add Column >

JSON Array Indexes used as Primary Keys

The following primary key columns are using a *JSON Array Index* as **Selector**. This can lead to limitations for *multi-row DML* (in components like Interactive Grid), or for Data Sources using REST Enabled SQL.

AUTHORS_POS,BOOKS_POS

Search: All Text Columns | Go | Edit | Add Data Column

Sequence	Name	Column Type	Data Type	Selector	Primary Key	Visible	Common	Parent Column
0	DATA	Table	JSON Document	DATA	No	Yes	No	
1	C_ID	Data	Varchar2	_id	Yes	Yes	Yes	DATA
2	COLLECTIONNAME	Data	Varchar2	collectionName	No	Yes	Yes	DATA
3	CREATED	Data	Date	created	No	Yes	Yes	DATA
4	BOOKS	Data	Array	books	No	Yes	No	DATA
102	ISBN	Data	Varchar2	ISBN	No	Yes	Yes	BOOKS
103	TITLE	Data	Varchar2	title	No	Yes	Yes	BOOKS
104	PRICE	Data	Number	price	No	Yes	Yes	BOOKS
105	PUBLISHED	Data	Date	published	No	Yes	Yes	BOOKS
106	PUBLISHER	Data	Varchar2	publisher	No	Yes	Yes	BOOKS
107	BOOKS_POS	Data	Number		Yes	Yes	Yes	BOOKS
108	AUTHORS	Data	Array	authors	No	Yes	No	BOOKS
201	LASTNAME	Data	Varchar2	lastName	No	Yes	Yes	AUTHORS
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203	AUTHORS_POS	Data	Number		Yes	Yes	Yes	AUTHORS

Total 15

for ein 242 [117:3] Browse/Edit JSON Browse/Edit JSON Collections 241 mos loc oci 23ai mai ed

phoenix225302.dev3sub3phx.databasede3phx.oraclevcn.com:9002/ords/r/aaapeks/json-duality-companion/browse-edit-json?p3_resid=04363745464332354...

JSON Duality Companion

Collection Table or Duality View Name: BOOK_COLLECTIONS

Current Document RESID: 04363745464332354130383138333143343443353438364446

smuench

Browse/Edit JSON Duality View and Collection Table Documents

Previous Next *Extended JSON:* OFF Save Delete Add New Duplicate Reread


```
{
  "_id" : "67EFC25A081831C44C5486DF",
  "collectionName" : "Favorite Animation Books",
  "created" : "2025-04-05T08:09:00",
  "books" :
  [
    {
      "title" : "The Illusion of Life",
      "publisher" : "Disney Editions",
      "authors" :
      [
        {
          "firstName" : "Frank",
          "lastName" : "Thomas"
        },
        {
          "firstName" : "Ollie",
          "lastName" : "Johnston"
        }
      ],
      "published" : "1995-10-19",
      "ISBN" : "978-0786860708",
      "price" : 35
    },
    {
      "title" : "The Art of Ratatouille",
      "publisher" : "Chronicle Books",
      "authors" :
      [
        {
```


1.0.5

Triggers on JSON Collection Tables

- They are tables, so triggers work

```
create or replace trigger book_collections_t
before insert on book_collections
for each row
begin
  -- Default created date
  select json_transform(:NEW.DATA,
          set '$.created' = sysdate)
    into :NEW.DATA;
end;
```

Use Case: Editing REST Response Before Sending Back

REST API


```
{"shoppingCart": [
  {"isbn":"1234", "qty": 1},
  {"isbn":"5678", "qty": 2}
]}
```

SESSION_REST_RESPONSES

SESSION_ID	JSON_CLOB
986532123	{"shoppingCart": [{"isbn":"1234", "qty": 1}, {"isbn":"5678", "qty": 2}]}

Use Case: Editing REST Response Before Sending Back

REST API


```
{"shoppingCart": [
 {"isbn":"1234", "qty": 1},
 {"isbn":"5678", "qty": 2}
]}
```

SESSION_REST_RESPONSES

SESSION_ID	JSON_CLOB
986532123	{"shoppingCart": [{"isbn":"1234", "qty": 2}, {"isbn":"5678", "qty": 1}, {"isbn":"4455", "qty": 1}]}

Use Case: Editing REST Response Before Sending Back

REST API

{"shoppingCart": [
 {"isbn":"1234", "qty": 2},
 {"isbn":"5678", "qty": 1},
 {"isbn":"4455", "qty": 1}
]}

{"shoppingCart": [
 {"isbn":"1234", "qty": 1},
 {"isbn":"5678", "qty": 2}
]}

SESSION_REST_RESPONSES

SESSION_ID	JSON_CLOB
986532123	{"shoppingCart": [{"isbn":"1234", "qty": 2}, {"isbn":"5678", "qty": 1}, {"isbn":"4455", "qty": 1}]}

Use Case: JSON Flex Field on a Regular Table

DEPTNO	DNAME	LOC	FLEX

10	ACCOUNTING	NEW YORK	{
			"budget":12345,
			"spendByDate": "2025-04-17",
			"justification":"New marketing campaign"
			}

20	RESEARCH	DALLAS	{
			"budget":5678,
			"spendByDate": "2025-04-29",
			"justification":"Big new discoveries"
			}

99	COMPLIANCE AND MERRIMENT	LUMON	{
			"budget":8844,
			"spendByDate": "2025-04-24",
			"justification":"New tuba and drum"
			}

Use Case: JSON Flex Field on a Regular Table

Data Profile

Cancel | Apply Changes

Columns

Resequence Columns | Add Column >

Search: All Text Columns | Go | Edit | Add Data Column

Sequence	Name	Column Type	Data Type	Selector	Primary Key	Visible	Common	Parent Column
1	DEPTNO	Table	Number	DEPTNO	Yes	Yes	Yes	
2	DNAME	Table	Varchar2	DNAME	No	Yes	Yes	
3	LOC	Table	Varchar2	LOC	No	Yes	Yes	
4	FLEX	Table	JSON Document	FLEX	No	Yes	No	
5	BUDGET	Data	Number	budget	No	Yes	Yes	FLEX
15	SPEND_BY_DATE	Data	Date	spendByDate	No	Yes	Yes	FLEX
25	JUSTIFICATION	Data	Varchar2	justification	No	Yes	Yes	FLEX

Use Case: JSON Flex Field on a Regular Table

Dept with Flex

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Departments Grid

Search: All Text Columns | Go | Actions | Edit | Save | Add Row | Reset

Dname	Loc	Budget	Spend By Date	Justification
ACCOUNTING	NEW YORK	12345	4/17/2025	New marketing campaign
RESEARCH	DALLAS	5678	4/29/2025	Big new discoveries
SALES	CHICAGO	10001	5/27/2025	Use it or lose it, am I right?
OPERATIONS	BOSTON	5005	4/22/2025	Fix the data center roof
COMPLIANCE AND MERRIMENT	LUMON	8844	4/24/2025	New tuba and drum

1 rows selected

Total 5

Use Case: JSON Flex Field on a Regular Table

Dept with Flex

smuench

Departments

Go

Actions

Create

Row text contains 'new'

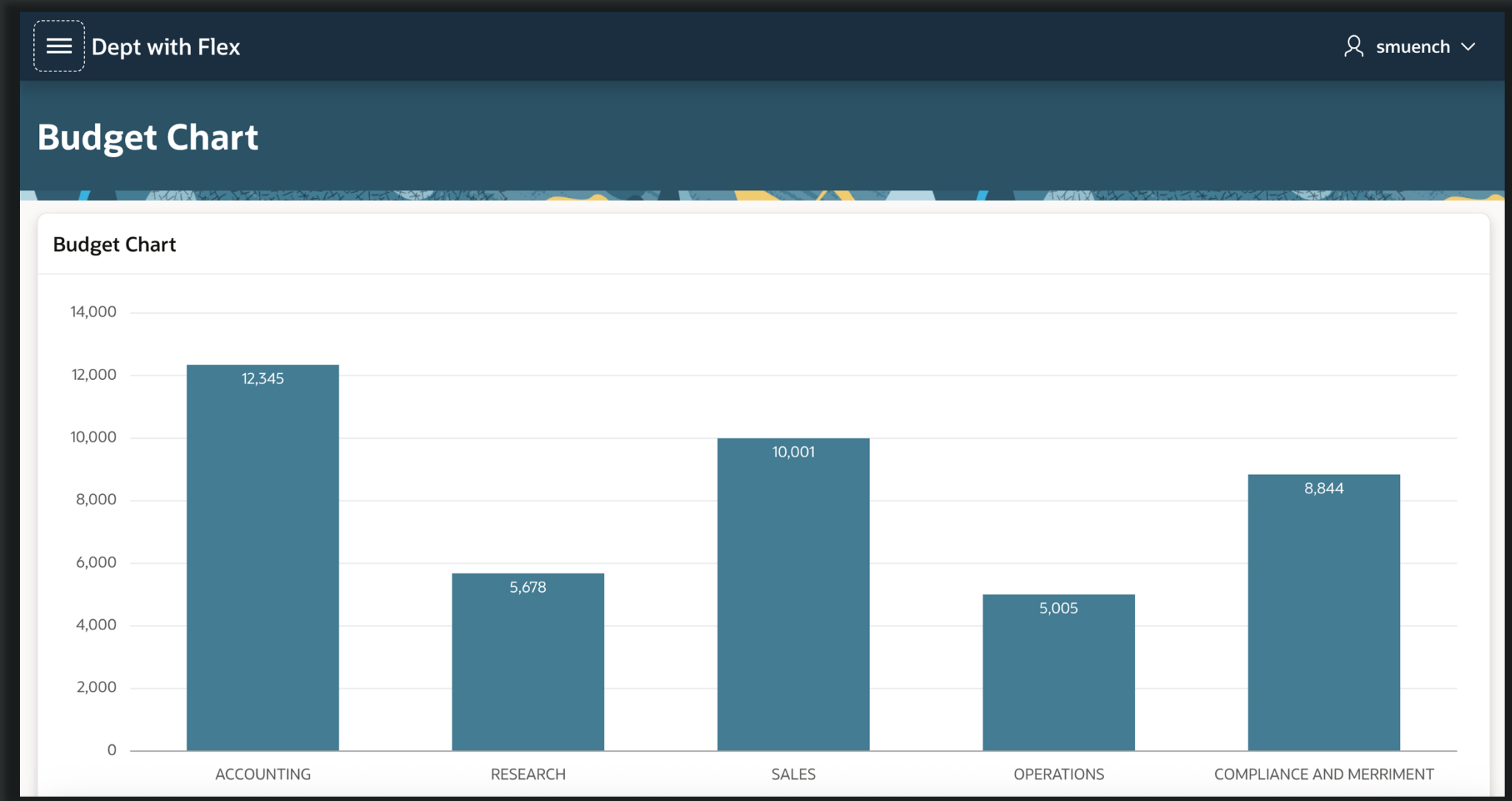
Spend By Date between 07-APR-2025 and 14-MAY-2025

Budget > 9999

Dname	Loc	Budget	Justification	Spend By Date
ACCOUNTING	NEW YORK	12345	New marketing campaign	17-APR-2025
RESEARCH	DALLAS	5678	Big new discoveries	29-APR-2025
COMPLIANCE AND MERRIMENT	LUMON	8844	New tuba and drum	24-APR-2025

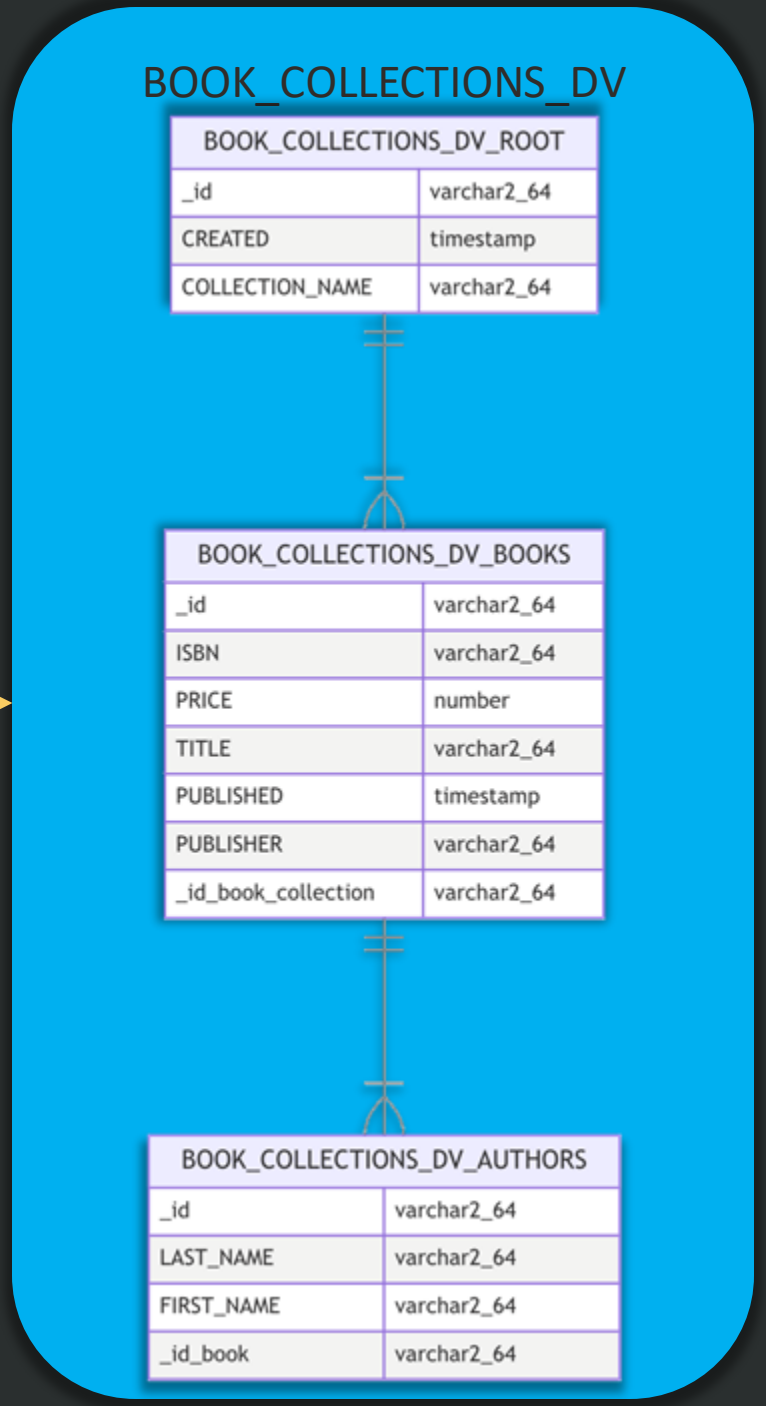
1 - 3

Use Case: JSON Flex Field on a Regular Table



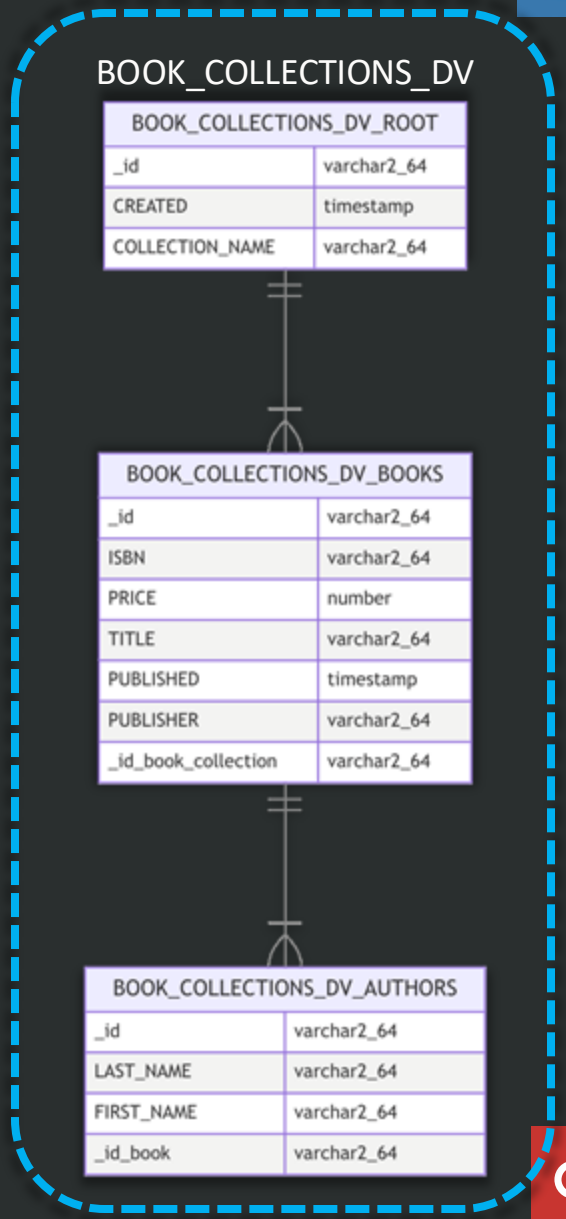
JSON/Relational Duality View


```
{
  "collectionName": "Favorite Animation Books",
  "created": "2025-04-05T08:09:00",
  "books": [
   {
    "title": "The Illusion of Life",
    "publisher": "Disney Editions",
    "authors": [
     {
      "firstName": "Frank",
      "lastName": "Thomas"
     },
     {
      "firstName": "Ollie",
      "lastName": "Johnston"
     }
    ],
    "published": "1995-10-19",
    "ISBN": "978-0786860708",
    "price": 35
   },
   {
    "title": "The Art of Ratatouille",
    "publisher": "Chronicle Books",
    "authors": [
     {
      "firstName": "Brad",
      "lastName": "Bird"
     },
     {
      "firstName": "John",
      "lastName": "Lasseter"
     }
    ],
    "published": "2007-05-03",
    "ISBN": "978-0811858342",
    "price": 32
   }
  ]
}
```

JSON/Relational Duality View DDL Syntax

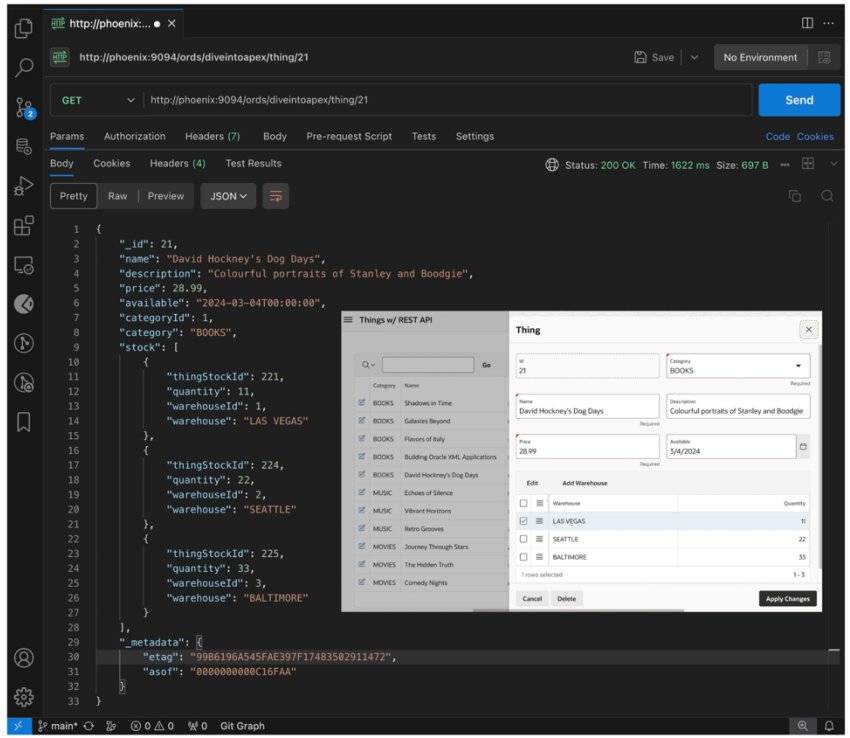
```
create json relational duality view book_collections_dv as
book_collections_dv_root @insert @update @delete
{
  "_id"
  collectionName: collection_name
  created
  books: book_collections_dv_books @insert @update @delete
  {
    "_id"
    isbn
    price
    title
    published
    publisher
    authors: book_collections_dv_authors @insert @update @delete
    {
      "_id"
      lastName: last_name
      firstName: first_name
    }
  }
}
```



Simplifies *Exposing* REST APIs for APEX Developers

APEX

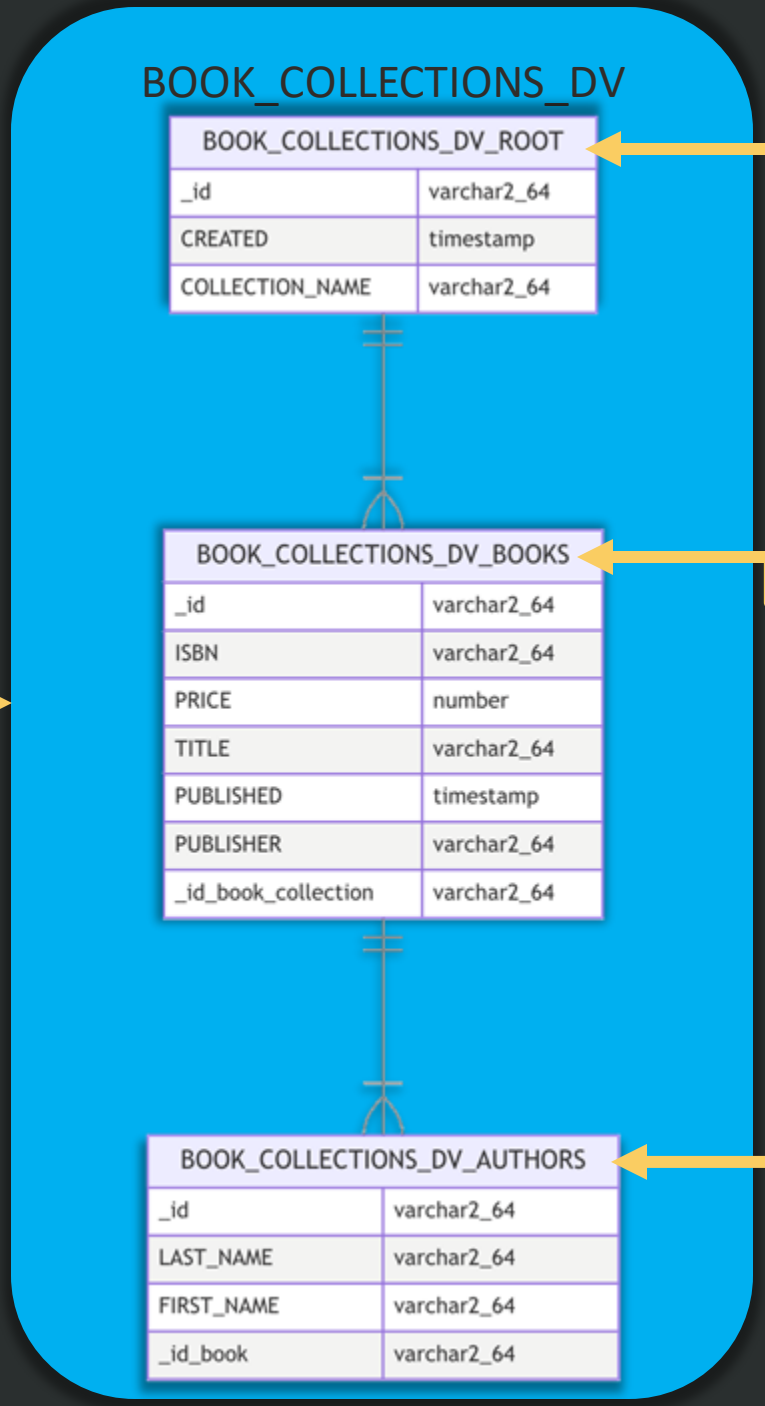
Simplify APEX App REST APIs with JSON Duality Views

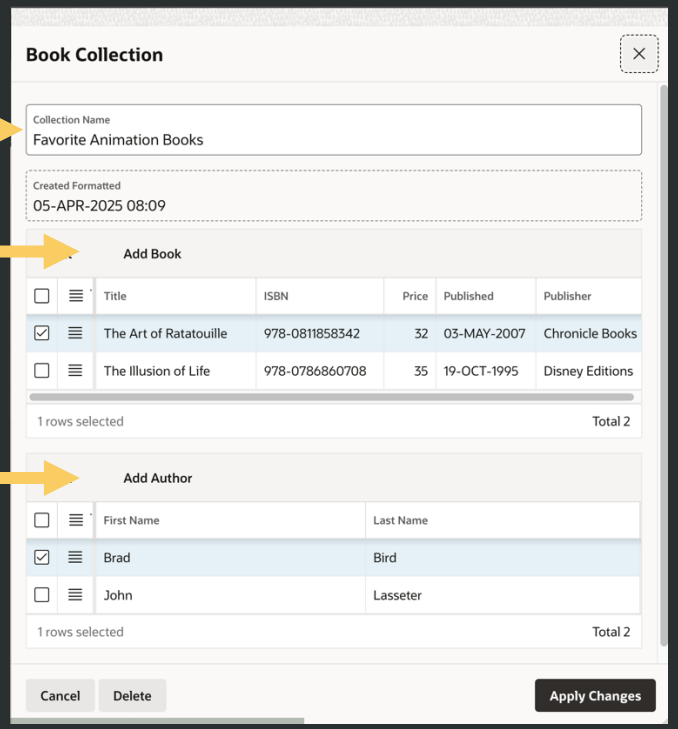


Embracing *Duality*

External Client App


```
{
  "collectionName": "Favorite Animation Books",
  "created": "2025-04-05T08:09:00",
  "books": [
   {
    "title": "The Illusion of Life",
    "publisher": "Disney Editions",
    "authors": [
     {
      "firstName": "Frank",
      "lastName": "Thomas"
     },
     {
      "firstName": "Ollie",
      "lastName": "Johnston"
     }
    ],
    "published": "1995-10-19",
    "ISBN": "978-0786860708",
    "price": 35
   },
   {
    "title": "The Art of Ratatouille",
    "publisher": "Chronicle Books",
    "authors": [
     {
      "firstName": "Brad",
      "lastName": "Bird"
     },
     {
      "firstName": "John",
      "lastName": "Lasseter"
     }
    ],
    "published": "2007-05-03",
    "ISBN": "978-0811858342",
    "price": 32
   }
  ]
}
```

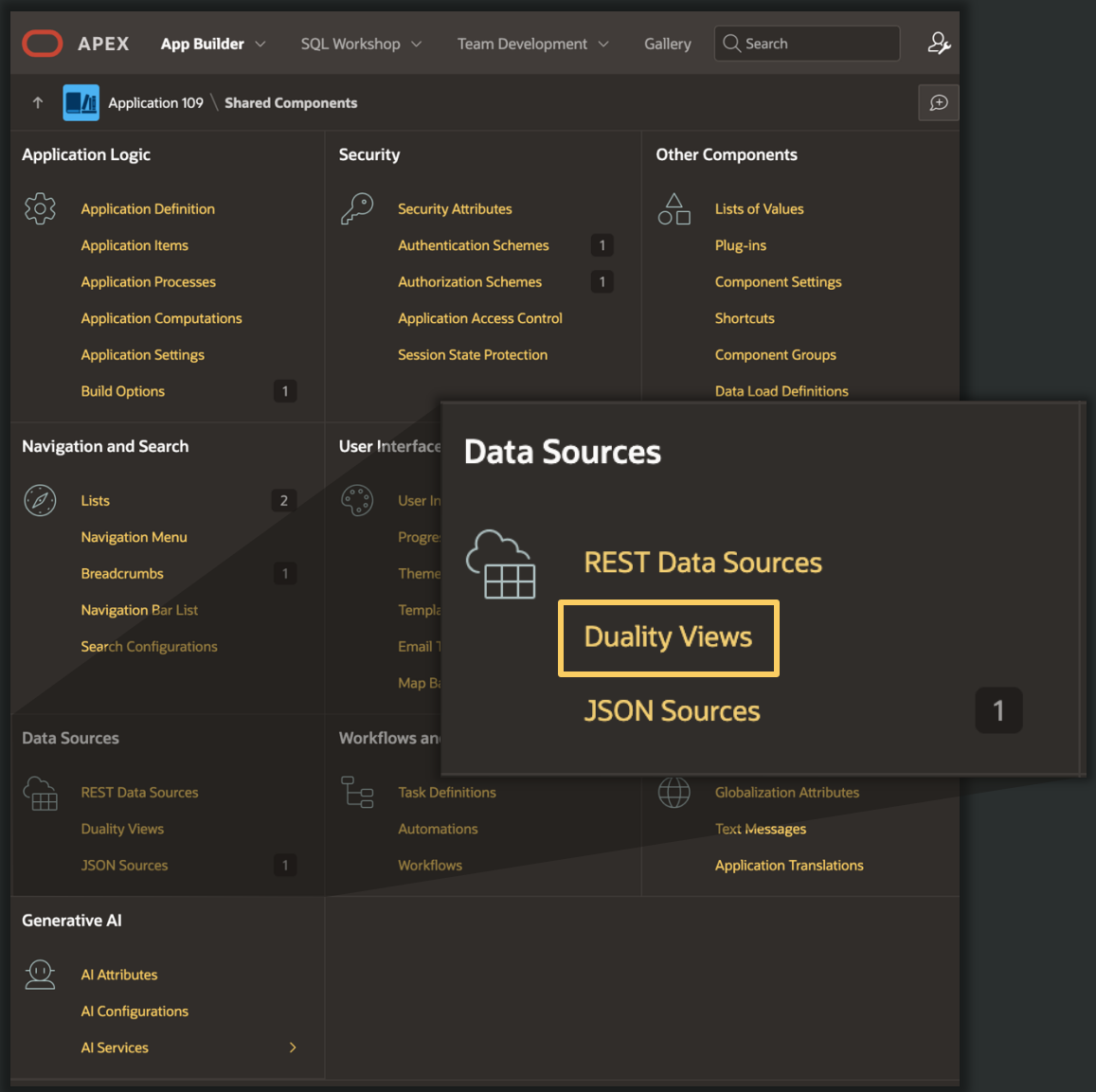


JSON: What's New for 24.2 ?

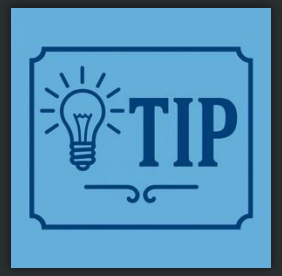
23ai

Directly Use
JSON Duality Views
in Any Region

JSON Duality View: New Shared Component



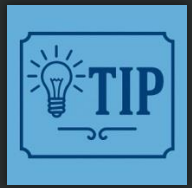
JSON Duality View



Rename _id Columns in Data Profile for Easier Understanding *Before* Building Pages

- _id → ID_1 → COLLECTION_ID
  - _id → ID_1_1 → BOOK_ID
    - _id → ID → AUTHOR_ID

JSON Duality View



Use Sequence to order array columns into contiguous groups

Columns

Resequence Columns | Add Column >

Search: All Text Columns | Go | Edit | Add Data Column

	Sequence...	Name	Column Type	Data Type	Selector	Primary Key	Visible	Common	Parent Column
	1	COLLECTION_ID	Data	Varchar2	_id	Yes	Yes	Yes	
	4	APEX_METADATA_ETAG	Data	Varchar2	_metadata.etag	No	Yes	No	
	5	APEX_METADATA_ASOF	Data	Varchar2	_metadata.asof	No	Yes	No	
	6	CREATED	Data	Timestamp	created	No	Yes	Yes	
	7	COLLECTIONNAME	Data	Varchar2	collectionName	No	Yes	Yes	
	8	BOOKS	Data	Array	books	No	Yes	No	
	101	BOOK_ID	Data	Varchar2	_id	Yes	Yes	Yes	BOOKS
	102	ISBN	Data	Varchar2	ISBN	No	Yes	Yes	BOOKS
	103	PRICE	Data	Number	price	No	Yes	Yes	BOOKS
	104	TITLE	Data	Varchar2	title	No	Yes	Yes	BOOKS
	105	PUBLISHED	Data	Timestamp	published	No	Yes	Yes	BOOKS
	106	PUBLISHER	Data	Varchar2	publisher	No	Yes	Yes	BOOKS
	118	BOOKS_POS	Data	Number		No	Yes	Yes	BOOKS
	119	AUTHORS	Data	Array	authors	No	Yes	No	BOOKS
	201	AUTHOR_ID	Data	Varchar2	_id	Yes	Yes	Yes	AUTHORS
	202	FIRSTNAME	Data	Varchar2	firstName	No	Yes	Yes	AUTHORS
	203	LASTNAME	Data	Varchar2	lastName	No	Yes	Yes	AUTHORS
	204	AUTHORS_POS	Data	Number		No	Yes	Yes	AUTHORS

Total 18

JSON Duality View

Duality View always (and only) has a single column named **DATA** so no need to record the JSON column name

Columns

Resequence Columns | Add Column >

Search: All Text Columns | Go | Edit | Add Data Column

No "Table" Column Type

	Sequence...	Name	Column Type	Data Type	Selector	Primary Key	Visible	Common	Parent Column
	1	COLLECTION_ID	Data	Varchar2	_id	Yes	Yes	Yes	
	4	APEX_METADATA_ETAG	Data	Varchar2	_metadata.etag	No	Yes	No	
	5	APEX_METADATA_ASOF	Data	Varchar2	_metadata.asof	No	Yes	No	
	6	CREATED	Data	Timestamp	created	No	Yes	Yes	
	7	COLLECTIONNAME	Data	Varchar2	collectionName	No	Yes	Yes	
	8	BOOKS	Data	Array	books	No	Yes	No	
	101	BOOK_ID	Data	Varchar2	_id	Yes	Yes	Yes	BOOKS
	102	ISBN	Data	Varchar2	ISBN	No	Yes	Yes	BOOKS
	103	PRICE	Data	Number	price	No	Yes	Yes	BOOKS
	104	TITLE	Data	Varchar2	title	No	Yes	Yes	BOOKS
	105	PUBLISHED	Data	Timestamp	published	No	Yes	Yes	BOOKS
	106	PUBLISHER	Data	Varchar2	publisher	No	Yes	Yes	BOOKS
	118	BOOKS_POS	Data	Number		No	Yes	Yes	BOOKS
	119	AUTHORS	Data	Array	authors	No	Yes	No	BOOKS
	201	AUTHOR_ID	Data	Varchar2	_id	Yes	Yes	Yes	AUTHORS
	202	FIRSTNAME	Data	Varchar2	firstName	No	Yes	Yes	AUTHORS
	203	LASTNAME	Data	Varchar2	lastName	No	Yes	Yes	AUTHORS
	204	AUTHORS_POS	Data	Number		No	Yes	Yes	AUTHORS

Total 18

No Parent for Top-Level Properties

JSON Source & Duality View Editable Page Tips (1 of 2)

- Root Primary key _id needs to be Query Only to get database-level default
  - But in ***child*** regions it needs to ***NOT*** be Query Only to be assignable
- First level nested collection needs *Local Post-Processing* WHERE filter
  - *PARENT_ID* = :P1_ID and *ABC*_POS is not null
- For second and subsequent master/detail child grid:
  - *ABC*_POS is not null

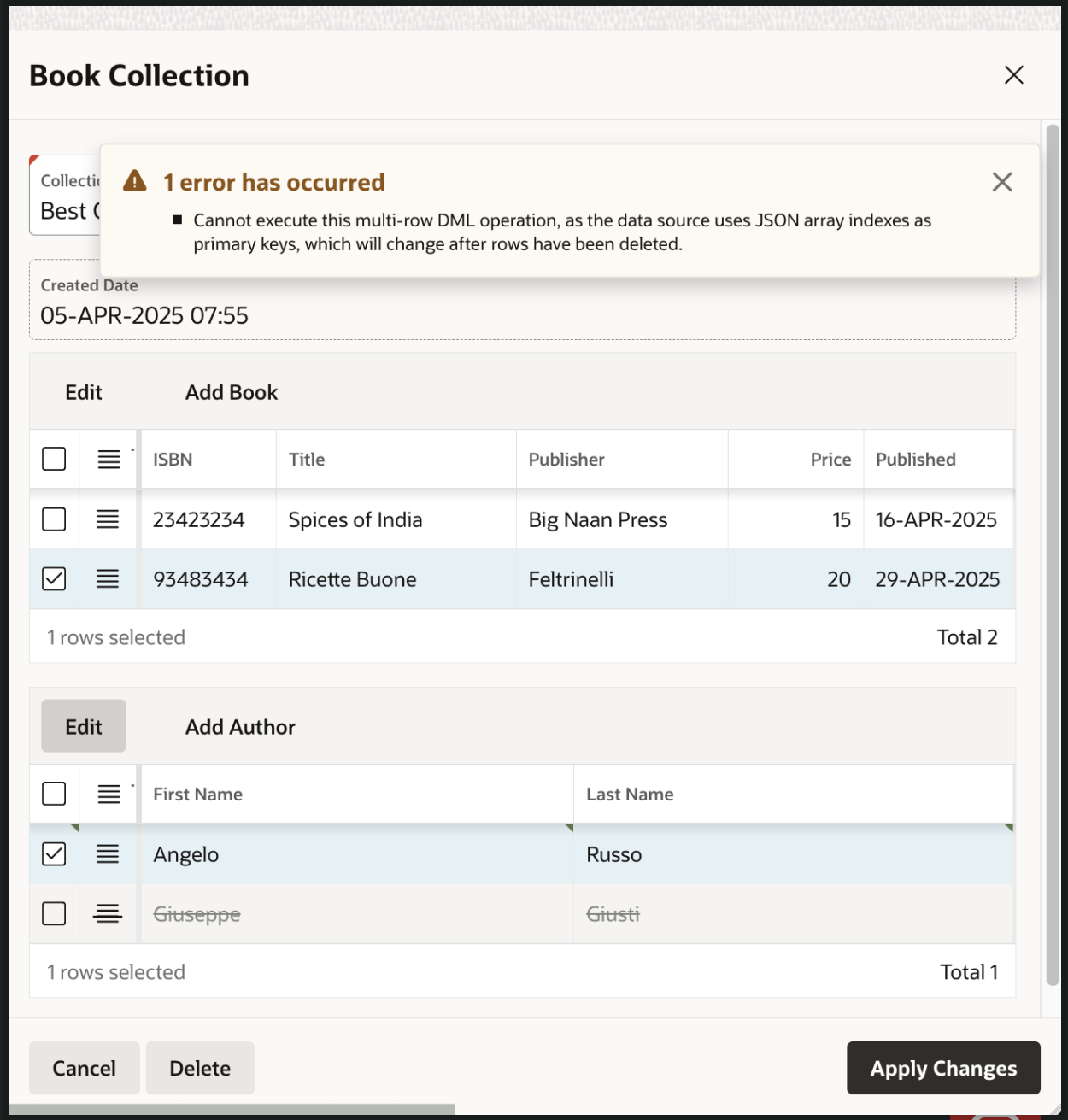
JSON Source & Duality View Editable Page Tips (2 of 2)

- For child collections:
  - Use position attribute as child PK (with some grid DML limitations)
  - Or, introduce unique key attribute
  - Page Process (*Editable Region* = Grid Region) to Assign Root Parent Id

```
:ROOT_PK_COL := :P1_ID;
```

Grid DML Limitations Using Array Position as Primary Key

- Works fine, unless end-user edits may cause position to ***change***
- Only inserts and updates at a given "level" ?
- Problematic use cases:
  - More than one delete
  - One delete and some updates

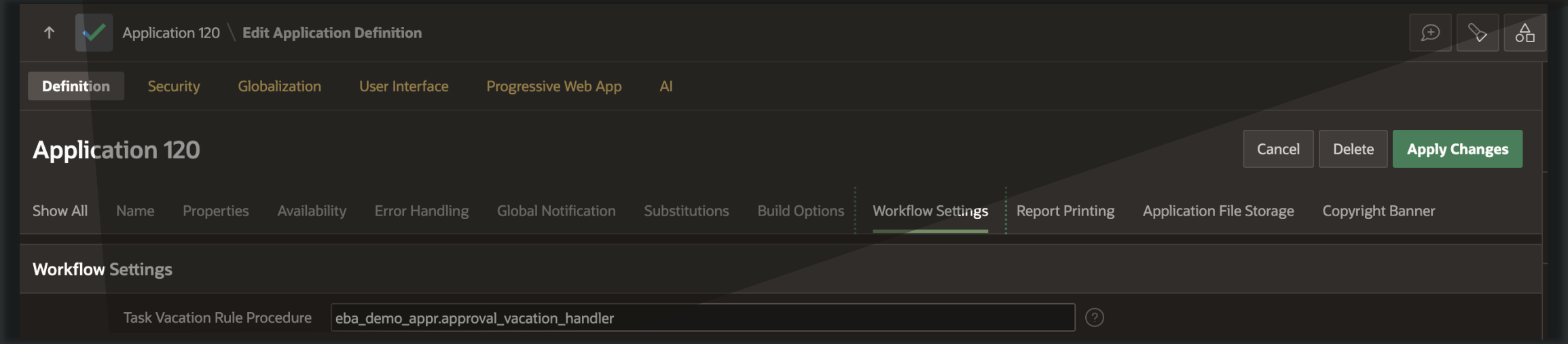


Vacation Assignment Handling

APEX Workflow: Vacation Assignment Handling

```
procedure my_vacation_rule (
  p_param  in  apex_approval.t_vacation_rule_input,
  p_result out apex_approval.t_vacation_rule_output );
```

Task Vacation Rule Procedure | eba_demo_appr.approval_vacation_handler



Set application-wide handler in App Definition

APEX Workflow: Vacation Assignment Handling

```
procedure my_vacation_rule (
  p_param  in  apex_approval.t_vacation_rule_input,
  p_result out apex_approval.t_vacation_rule_output );
```

Vacation Rule Procedure | eba_demo_appr.appraisal_vp_review_handler

Application 120 \ Shared Components \ Task Definitions \ Appraisal - VP Review

Task Definition: Appraisal - VP Review

Cancel | Delete | Apply Changes

Show All | Name | Settings | Deadline | Participants | Parameters | Actions | Comments | Last Updated

Participants

Vacation Rule Procedure: eba_demo_appr.appraisal_vp_review_handler

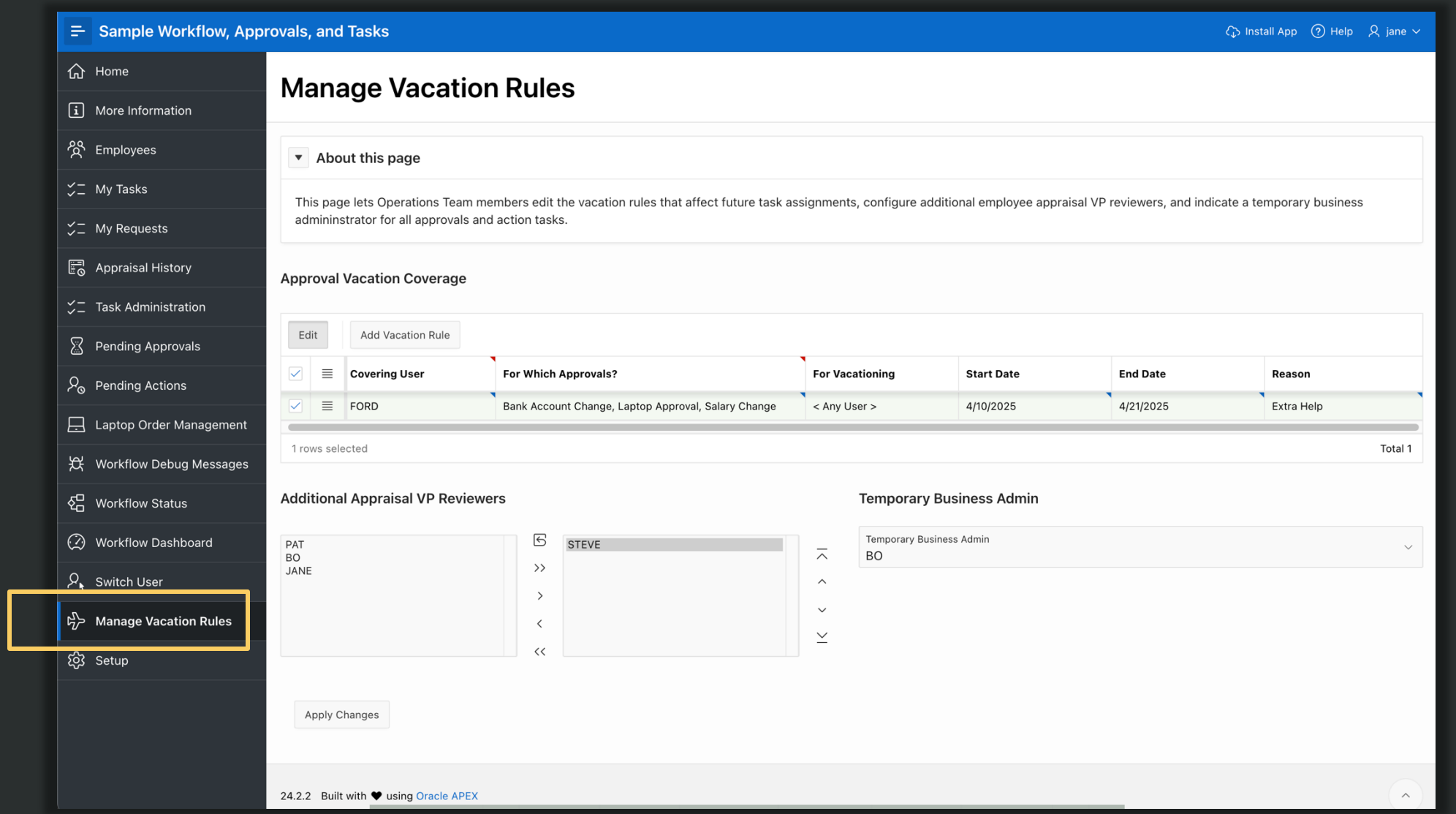
Search: All Text Columns | Go | Edit | Add Row | Reset

Participant Type	Value Type	Value
Business Administrator	Static	PAT
Potential Owner	Expression	:P_VP_USERNAME

Total 2

Specifying handler at Task Definition level overrides app-level setting if both are configured

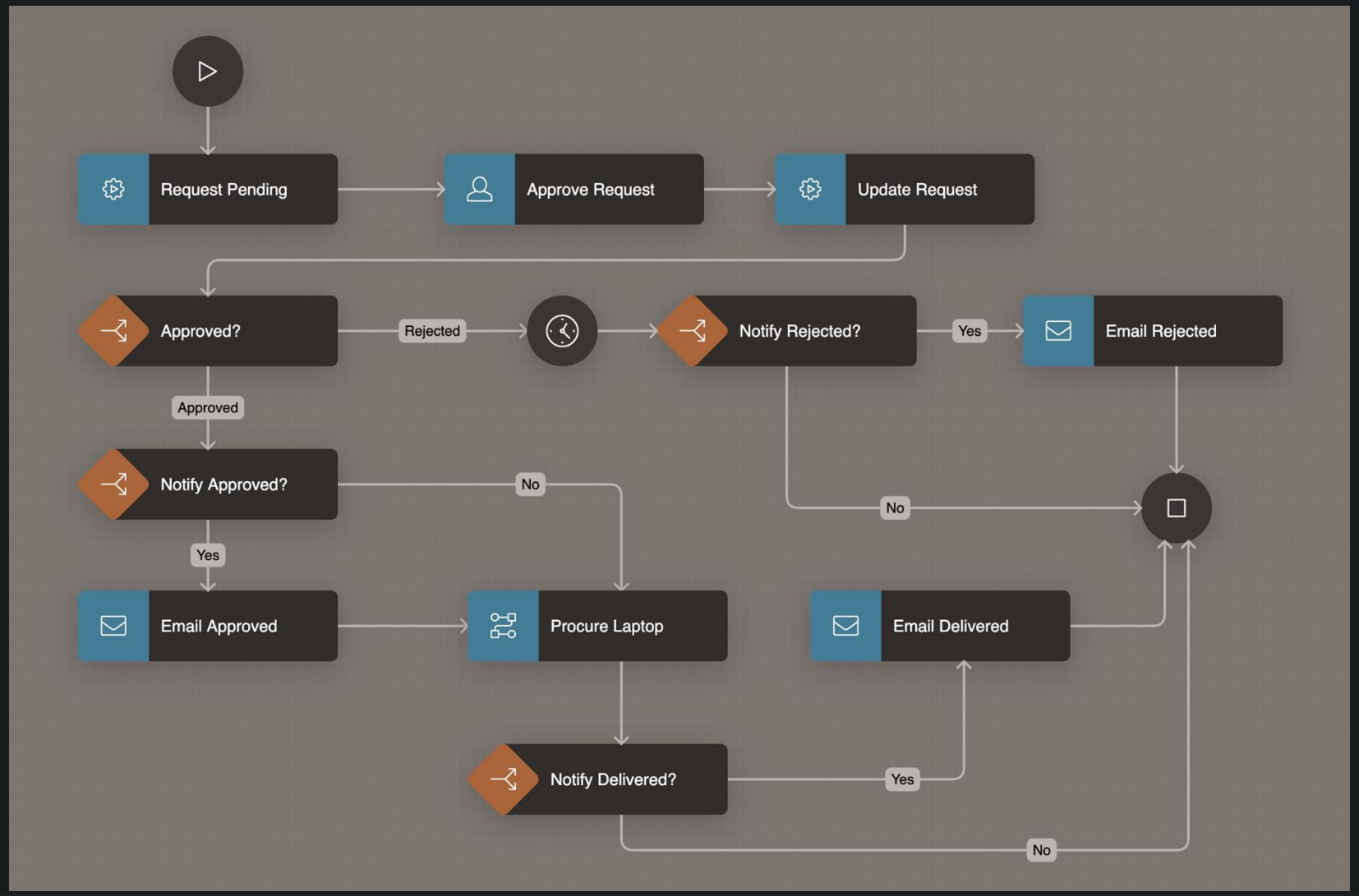
APEX Workflow: Vacation Assignment Handling



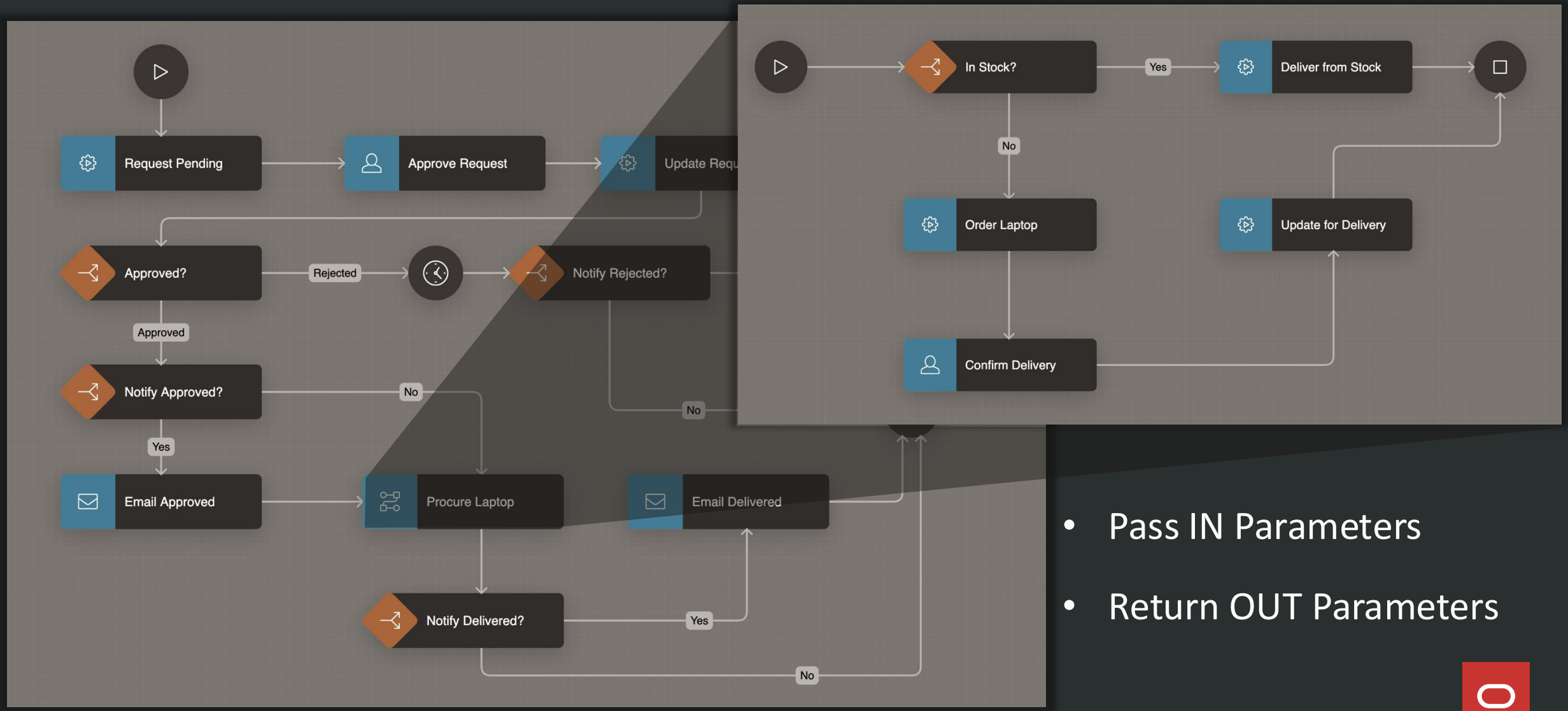
APEX Workflow: What's New for 24.2 ?

Invoke Workflows
Like "Subroutines"

APEX Workflow: Invoke Another Workflow

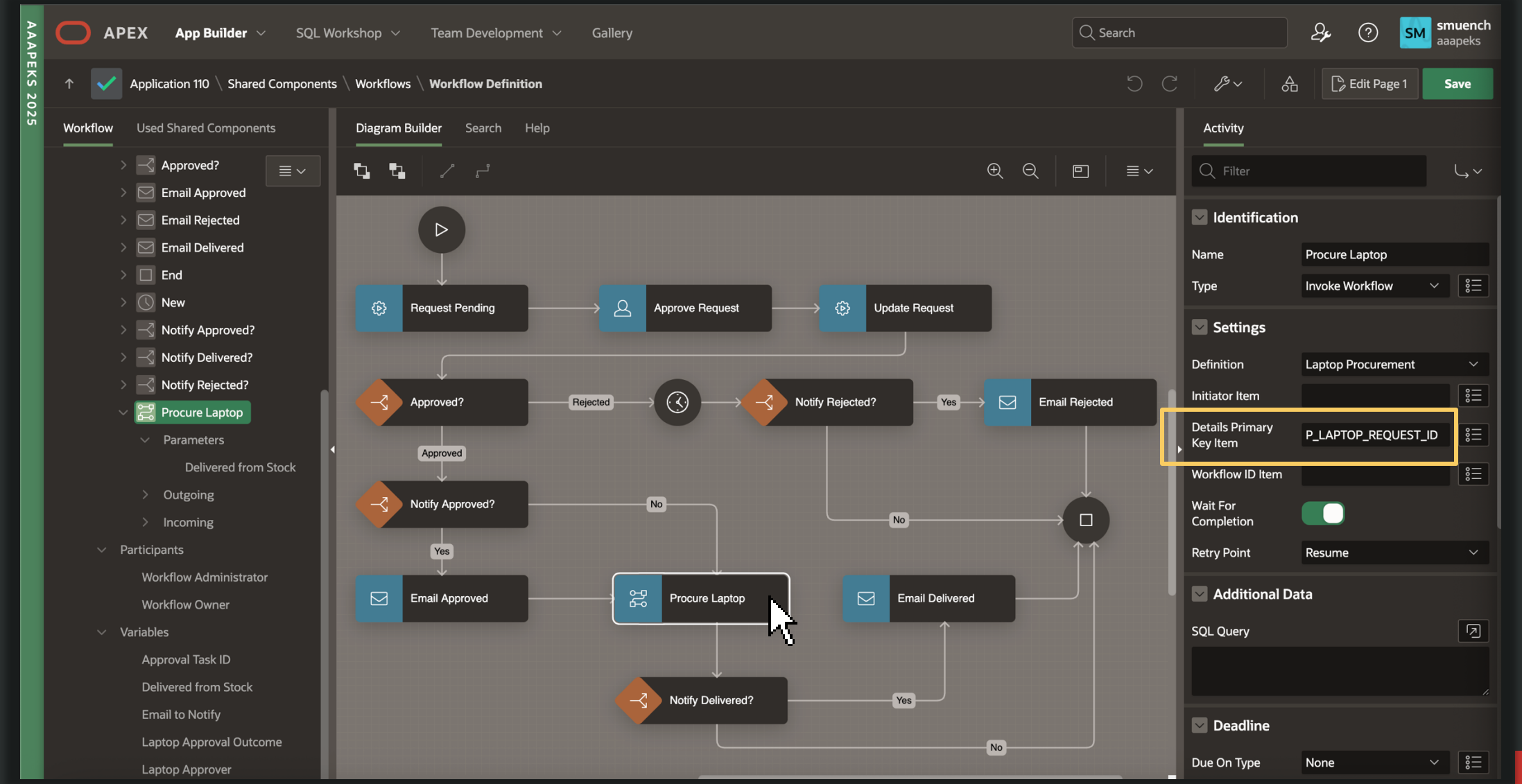


APEX Workflow: Invoke Another Workflow

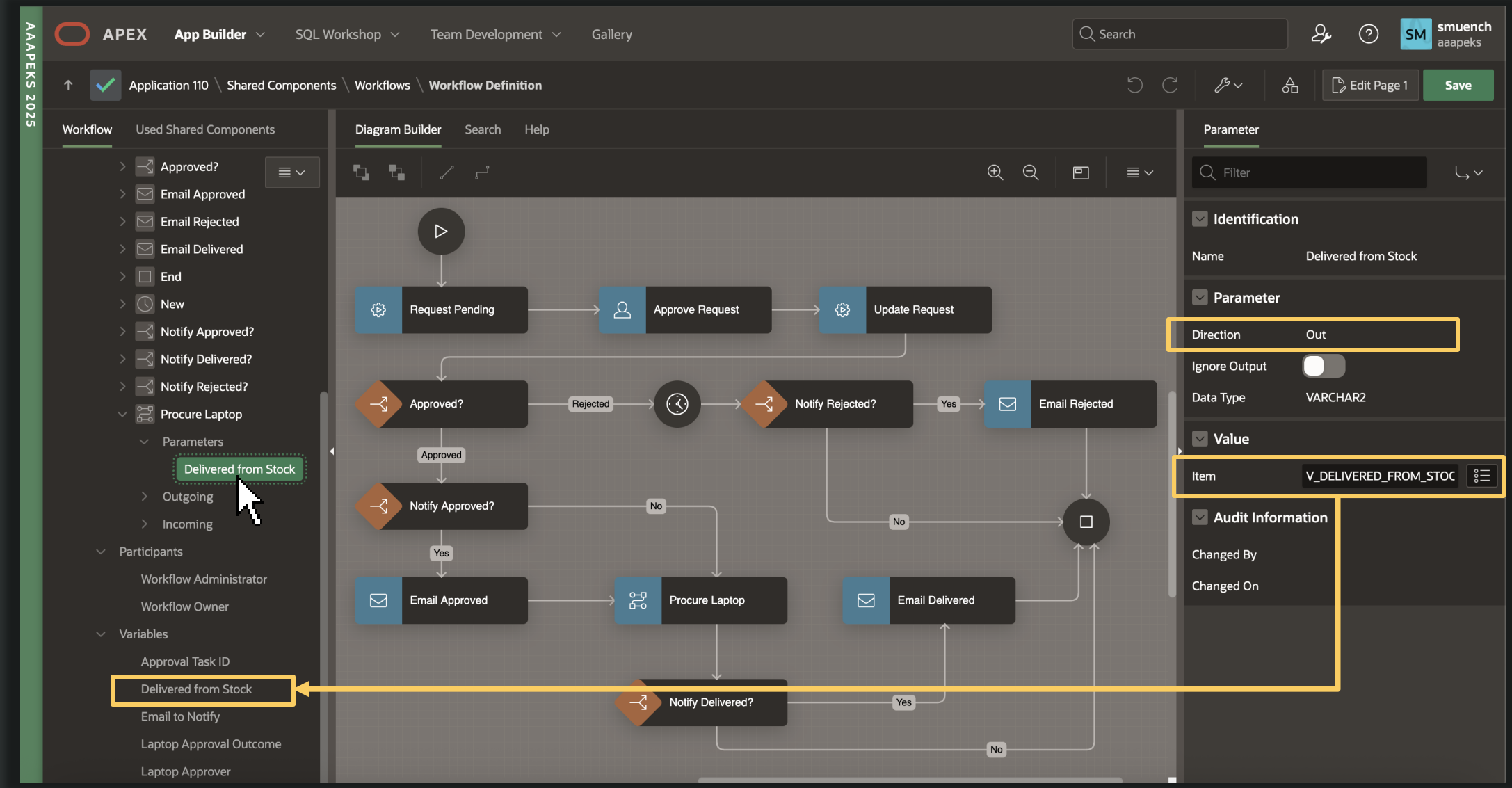


- Pass IN Parameters
- Return OUT Parameters

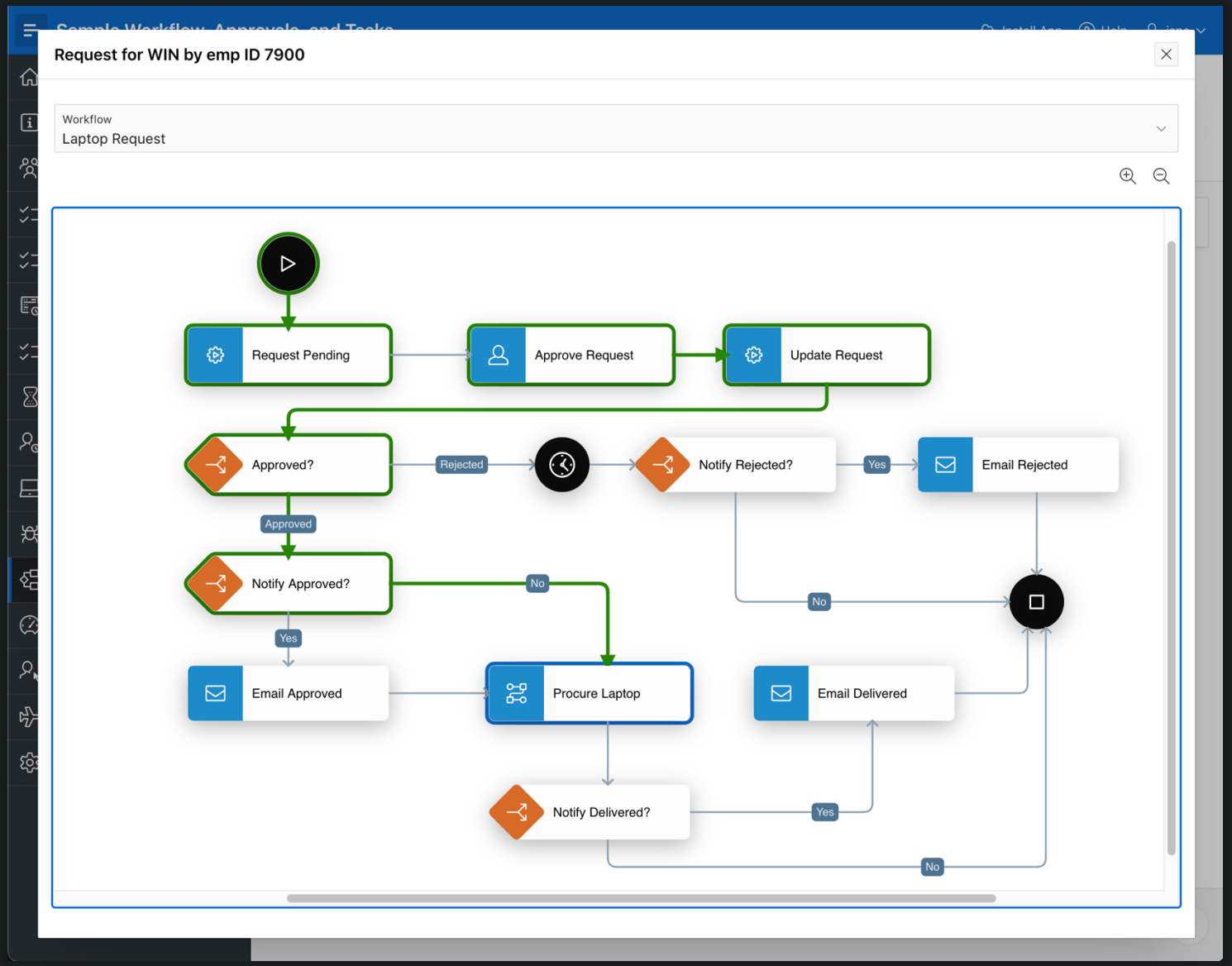
APEX Workflow: Passing in Details Primary Key



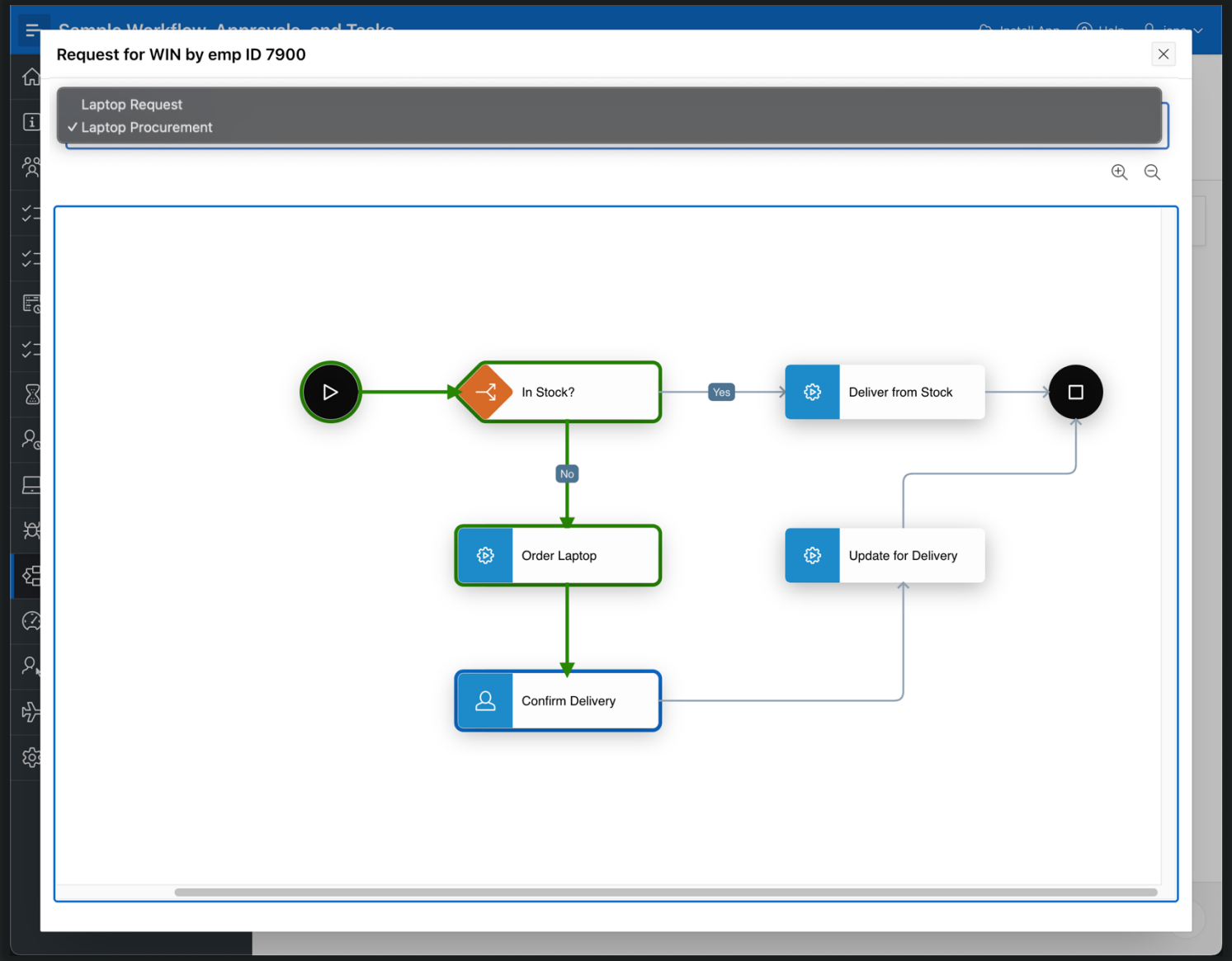
APEX Workflow: Configuring IN/OUT Parameters



APEX Workflow: Invoked Workflow in the Diagram Region



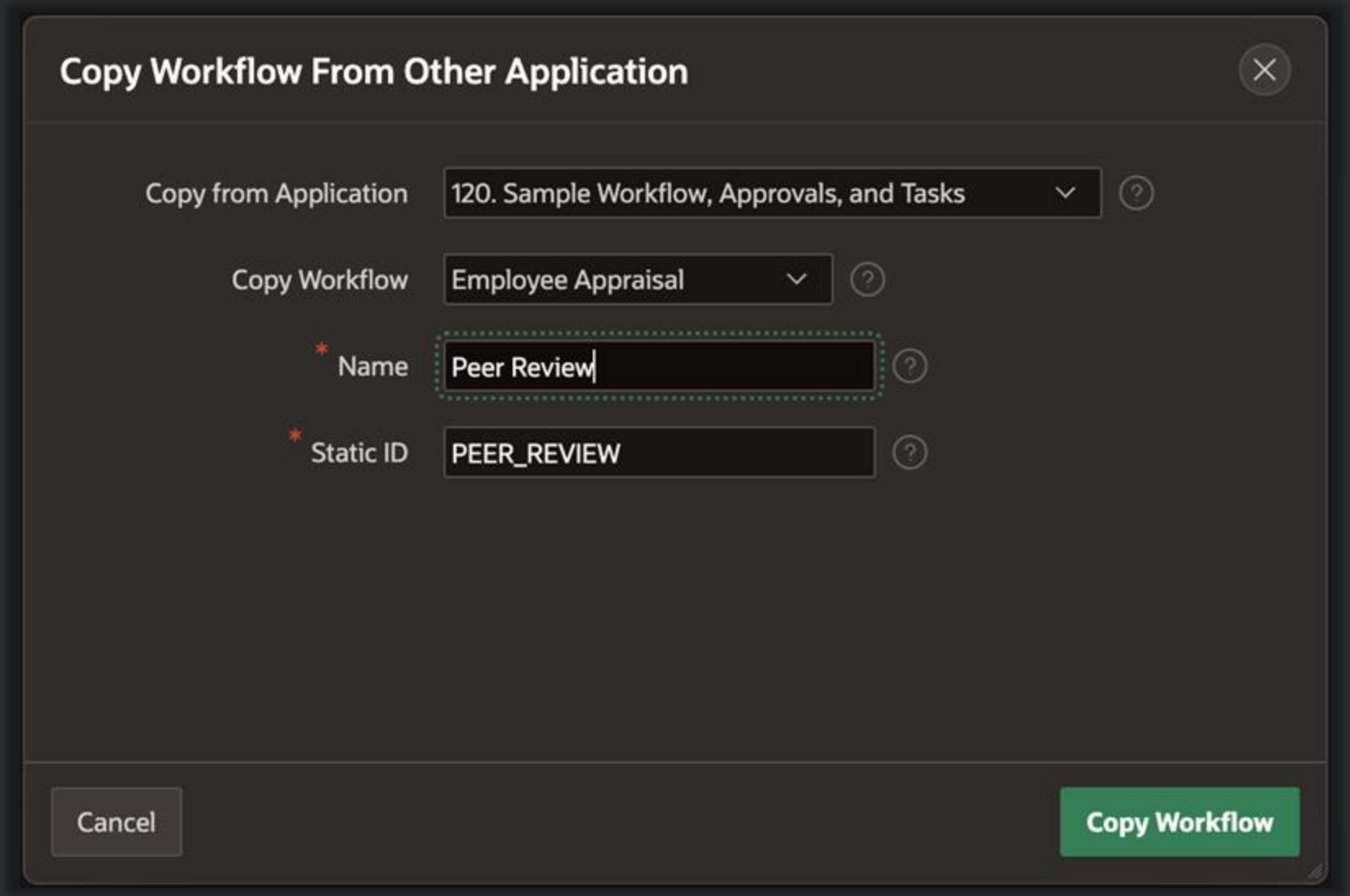
APEX Workflow: Invoked Workflow in the Diagram Region



APEX Workflow: What's New for 24.2 ?

Developer
Quality of Life
Improvements

APEX Workflow: Copy Workflow



APEX Workflow: Utilization Report Enhancements

- Email Templates
- Task Definitions
- REST Data Sources

Application 120 \ Shared Components \ Email Templates

Email Templates | Utilization | History

Go | Actions | Reset | Create Email Template

Name	Subject	Supports Template Directives	Static Identifier	Copy
Job Change Notification	Job Change for #P_ENAME# Completed	Yes	JOB_CHANGE_NOTIFICATION	
Laptop Delivered Notification	#P_LAPTOP_TYPE# Laptop for #P_ENAME# Completed	Yes	LAPTOP_DELIVERED_NOTIFICATION	

1 - 2

Application 120 \ Shared Components \ Task Definitions \ Utilization

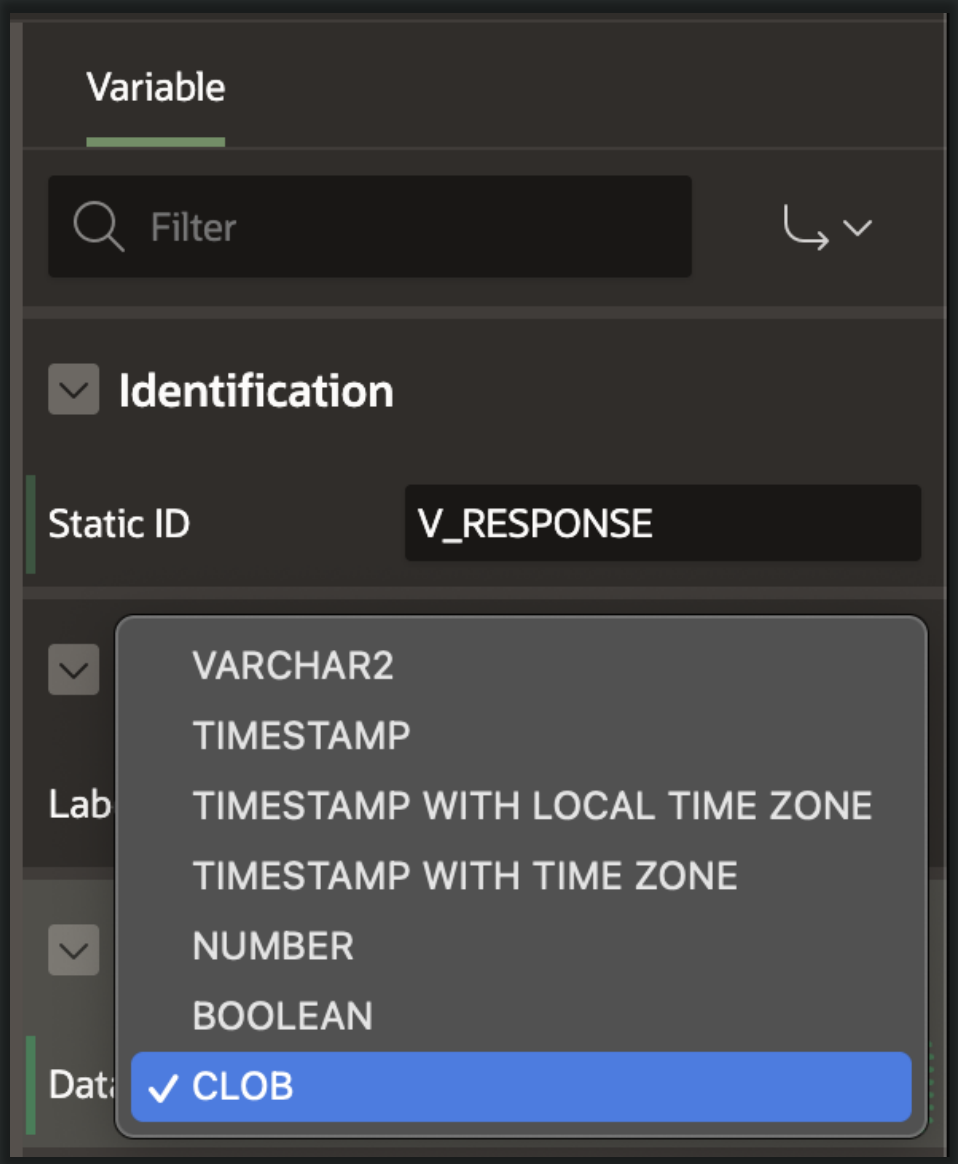
Task Definitions | Utilization | History

Go | Actions

Task Definition Name	Component Type	Component Name	References
Salary Change	Page Process	Submit Task	Page 4 - Request Salary Change
Job Change	Page Process	Submit Task	Page 7 - Request Job Change
Bank Account Change	Page Process	Submit Task	Page 28 - Request Bank Account Change
Laptop Delivered	Workflow Activity	Laptop Procurement - Confirm Delivery	Workflow - Laptop Procurement
Laptop Approval	Workflow Activity	Laptop Request - Approve Request	Workflow - Laptop Request
Appraisal - Employee Input	Workflow Activity	Employee Appraisal - Self-Evaluation	Workflow - Employee Appraisal
Appraisal - Manager Input	Workflow Activity	Employee Appraisal - Manager Appraisal	Workflow - Employee Appraisal
Appraisal - VP Review	Workflow Activity	Employee Appraisal - VP Review	Workflow - Employee Appraisal

1 - 8

APEX Workflow: CLOB Parameter & Version Variables



First Class Support for Fusion Apps Extensions

Simplify Extending Fusion Applications

- Discover all operations for any Fusion Apps Business Object REST API
- Use with all APEX regions
- Work against a FA sandbox to iterate APEX UI for pending BO extensions
- Delegate filtering, sorting, and bulk ops to FA REST endpoint
- Select only required data & get total row count
- See validation errors from FA business objects like regular APEX errors
- Build parent/child lists and QBE screens w/ filter params

Building Fusion Apps Extensions: CRM *Leads* Data Source

APEX | App Builder | SQL Workshop | Team Development | Gallery | Search | SM Steve Muench fusion

Application 103 \ Shared Components \ REST Data Sources \ **Leads** | Edit Page 1

REST Data Source

Delete | Apply Changes

Show All | REST Data Source | Settings | Authentication | Data Profile | Operations | Parameters | Subscription | Advanced

REST Data Source

* Name	Leads
* REST Data Source Type	Oracle Cloud Applications (SaaS) REST Service
* Remote Server	FA_REST
Base URL	**https://fa-enyd-pintlabfadev.fa.ocs.oc-test.com/**
* URL Path Prefix	crmRestApi/resources/latest/leads

Settings

Use Batch DML?	Yes
Root Resource Name	leads
Use Total Results?	No
Use Pagination?	Yes

Authentication

Credentials	Credentials for Leads
Authentication Server	- Select -

REST Data Sources

REST Data Sources act as a reference to one or multiple external web services. A REST Data Source can contain one or many **Operations** which are the references to a concrete external web service. Configurations at the top level are shared across all operations.

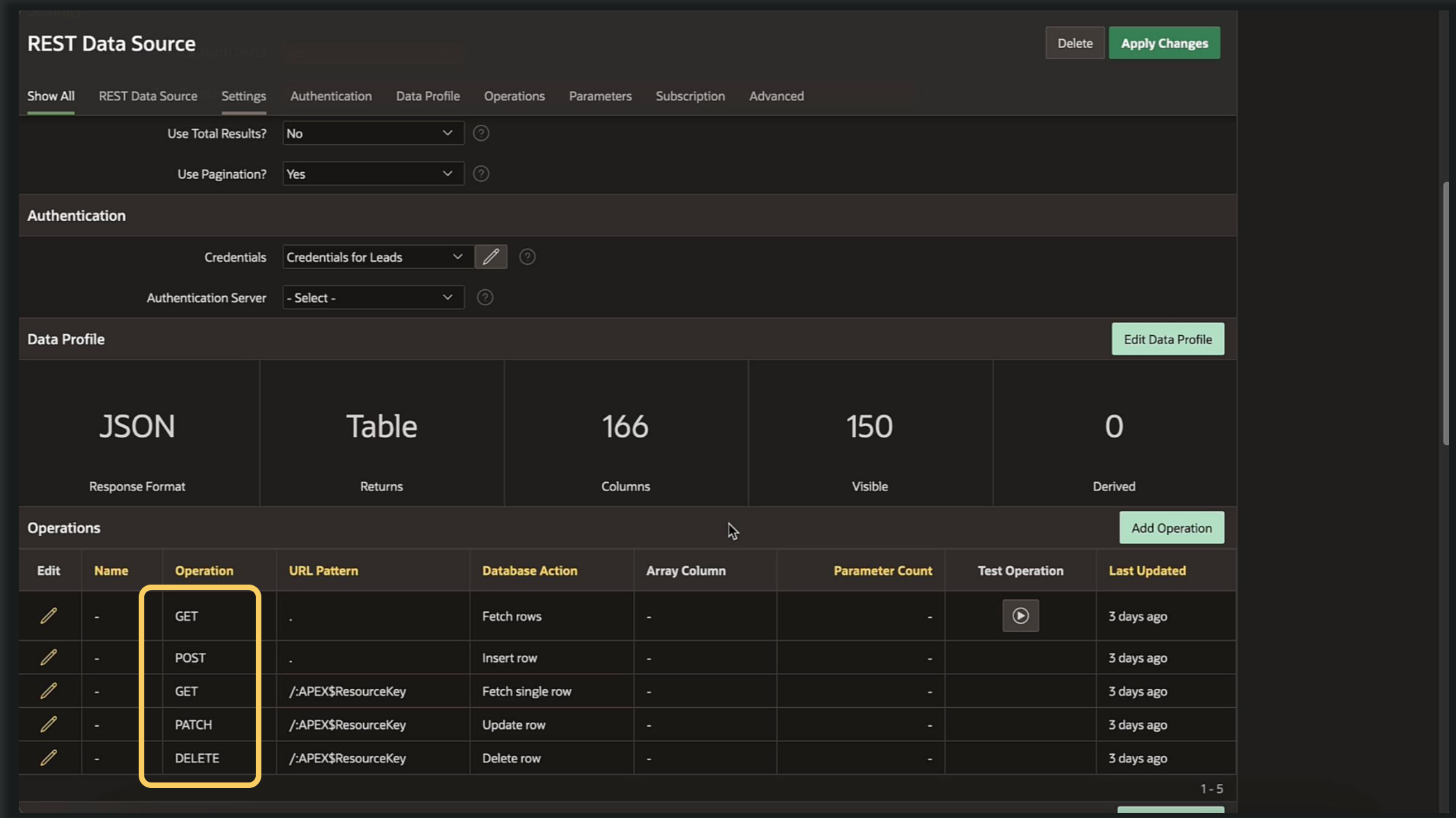
Stay on page

Learn More ...

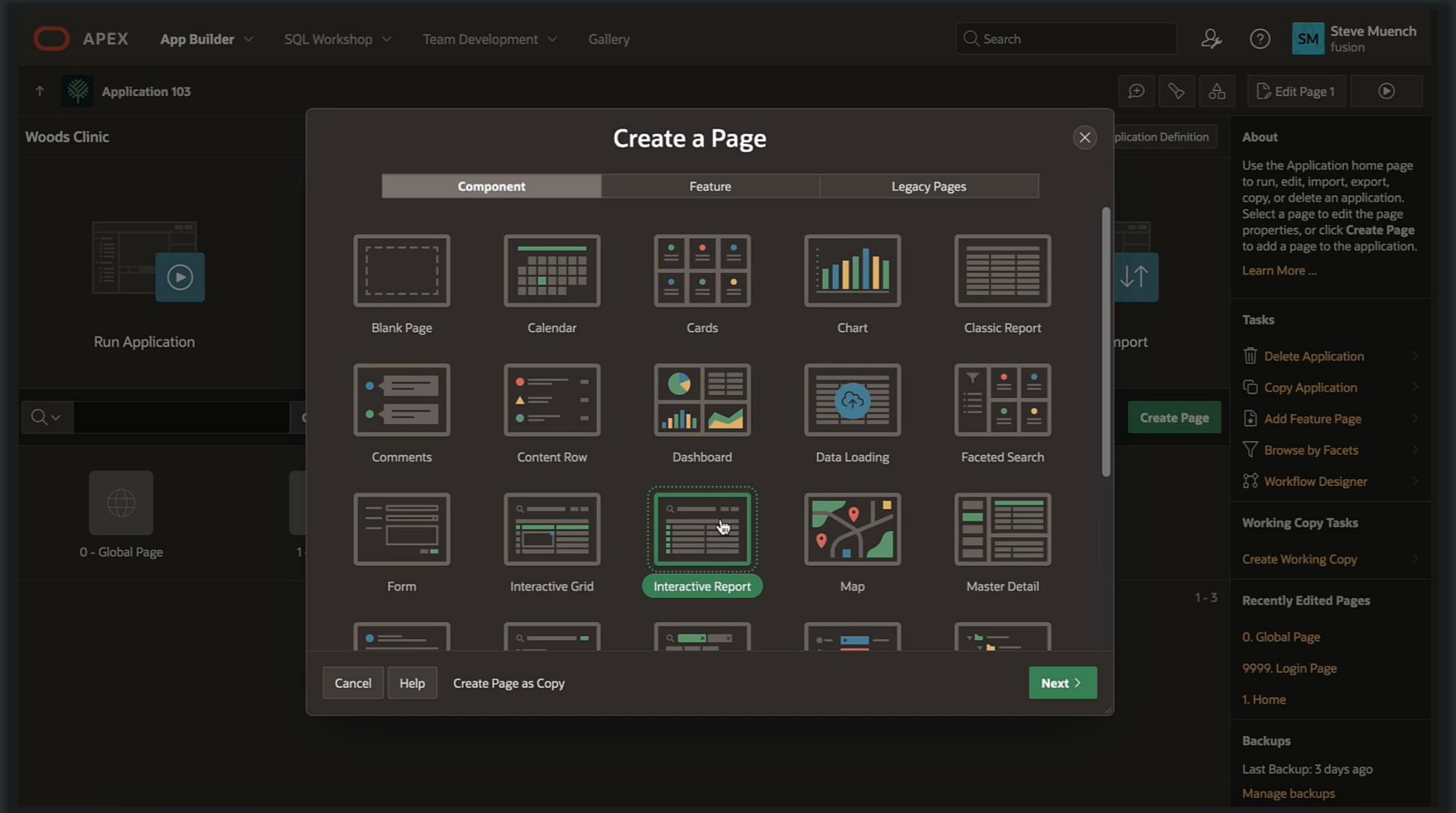
Manage Synchronization

REST Source Catalogs

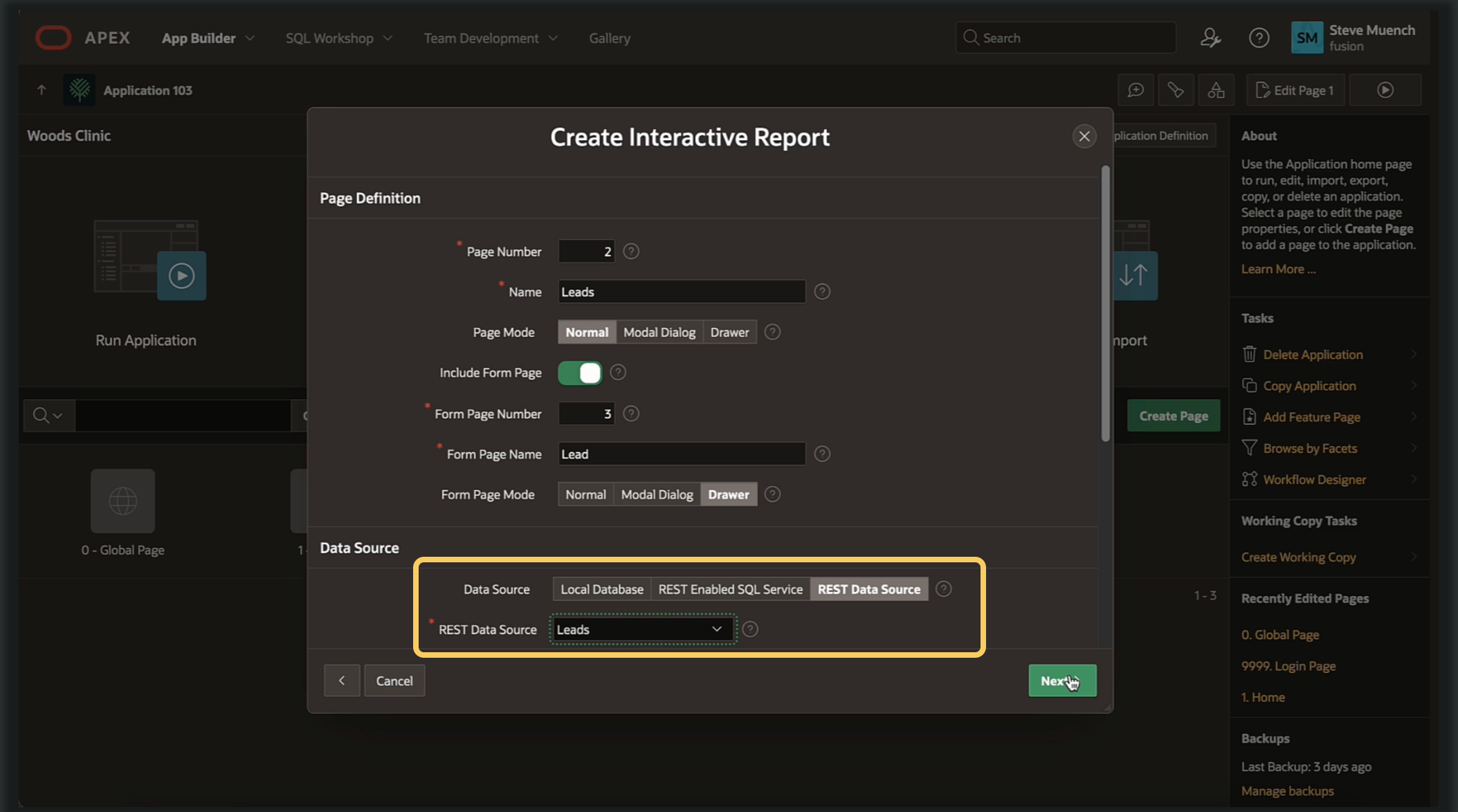
Building Fusion Apps Extensions: All CRUD Operations



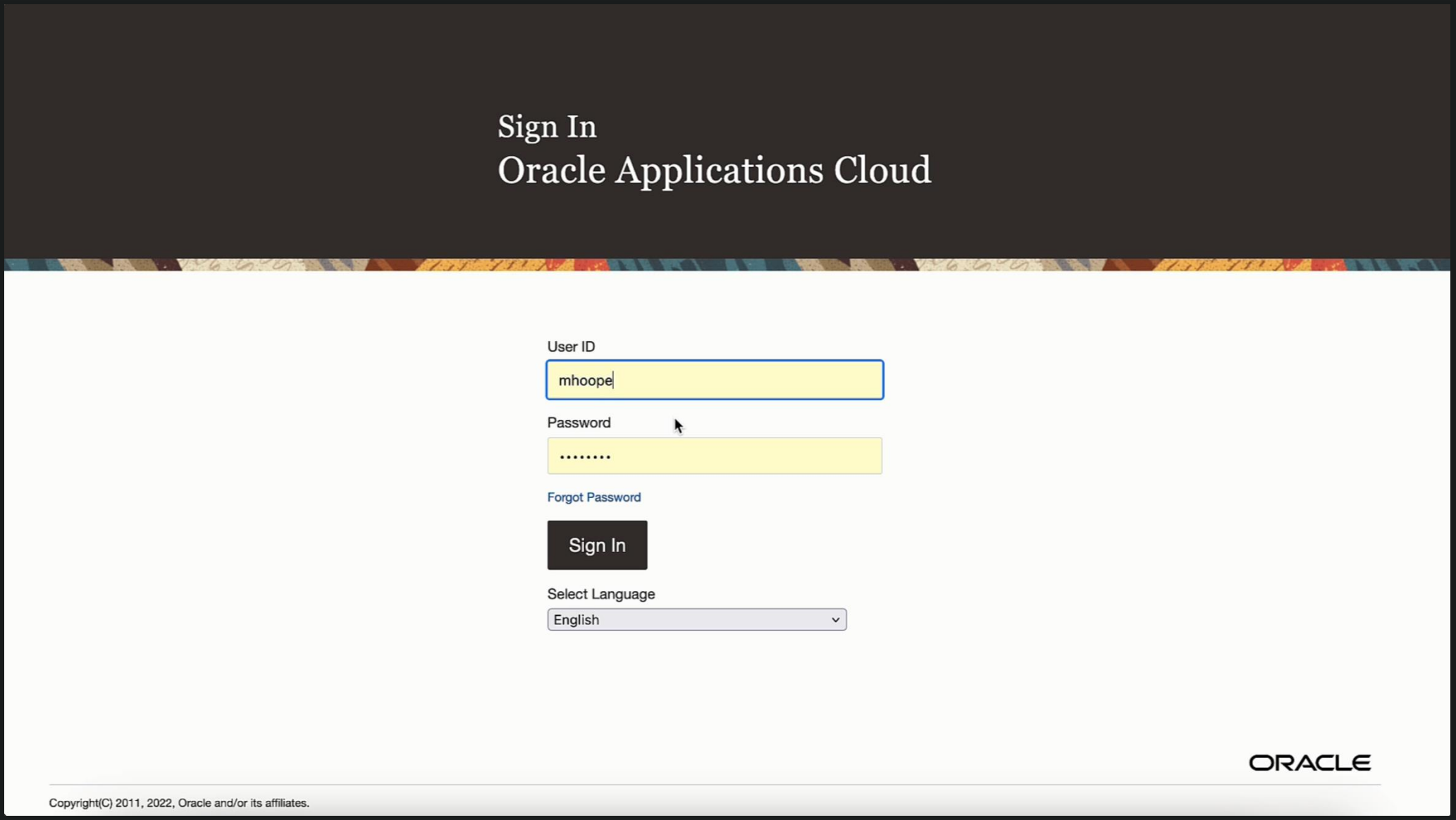
Building Fusion Apps Extensions: Easy as Using Tables



Building Fusion Apps Extensions: Easy as Using Tables



Building Fusion Apps Extensions: Integrates with FA SSO



Building Fusion Apps Extensions: Works Just Like a Table

Woods Clinic

mhoope (direct)

Leads

Go Actions Create

Name	Recordset	Leadnumber	Ownerpartyname	Statuscode	Rank	Sourcecode	Customerpartyname	Productgroupname	Inventoryit
Sept29Lead46		CDRM_206		UNQUALIFIED					
Sept29Lead47		CDRM_207		UNQUALIFIED					
Sept29Lead48		CDRM_208		UNQUALIFIED					
Sept29Lead49		CDRM_209		UNQUALIFIED					
Sept29Lead50		CDRM_210		UNQUALIFIED					
Sept29Lead1		CDRM_2042		QUALIFIED					
QTPLeadAuto346201204947476812		CDRM_14	Baker,Chris	QUALIFIED			A. C. Networks (Olympia, US)	Vision Catalog	
Sept29Lead2		CDRM_2043		UNQUALIFIED					
Sept29Lead3		CDRM_2044		UNQUALIFIED					
Sept29Lead4		CDRM_2045		UNQUALIFIED					
a1		300100005481493	Gabrielle Lee	QUALIFIED			Norway (MOLDE, NO)		DG150-50 Server

Building Fusion Apps Extensions: Works Just Like a Table

Woods Clinic

mhoope (direct)

Leads

Go

Actions

Create

Row text contains 'vision'

Name	Recordset	Leadnumber	Ownerpartyname	Statuscode	Rank	Sourcecode	Customerpartyname	Productgroupname	Inventoryitemdescription	Creationdate	Regi
ELQENGSALES_491136861		CDRM_95948	Matt Hooper	UNQUALIFIED			ELQENGACC_491136861_1 (New York, US)	Vision Catalog		4/20/2023	
ELQENGSALES_2015197825		CDRM_96906	Matt Hooper	UNQUALIFIED			ELQENGACC_2015197825_1 (New York, US)	Vision Catalog		4/23/2023	

1 - 2

lease 1.0

Building Fusion Apps Extensions: Works Just Like a Table

Woods Clinic

Leads

Go Actions

Row text contains 'vision'

Name	Recordset	Leadnumber	Ownerpartyname	Statuscode	Rank
ELQENGSALES_491136861		CDRM_95948	Matt Hooper	UNQUALIFIED	
ELQENGSALES_2015197825		CDRM_96906	Matt Hooper	UNQUALIFIED	

Lead

Name
ELQENGSALES_491136861

Recordset

Leadnumber
CDRM_95948

Ownerpartyname
Matt Hooper

Statuscode
UNQUALIFIED

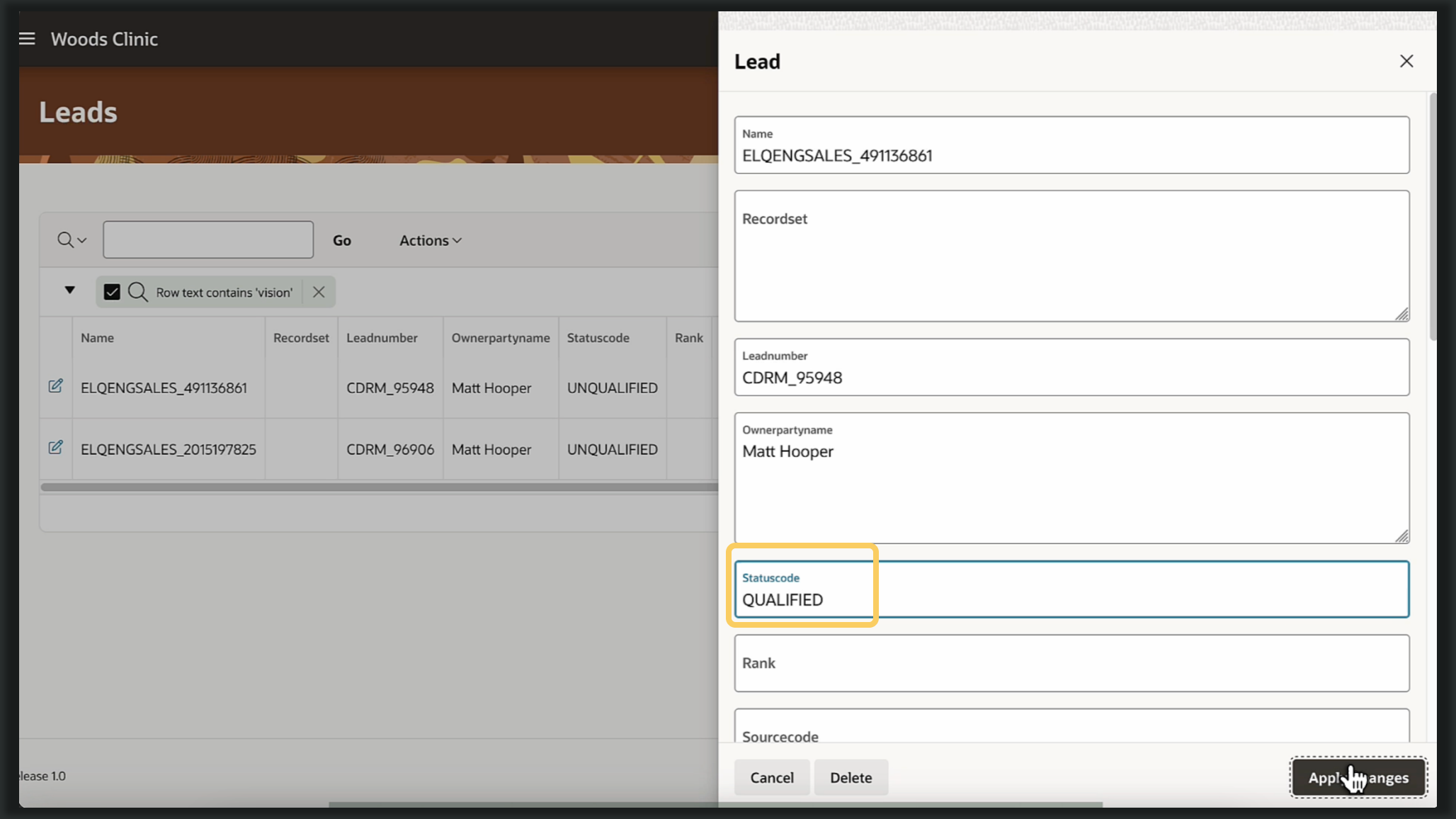
Rank

Sourcecode

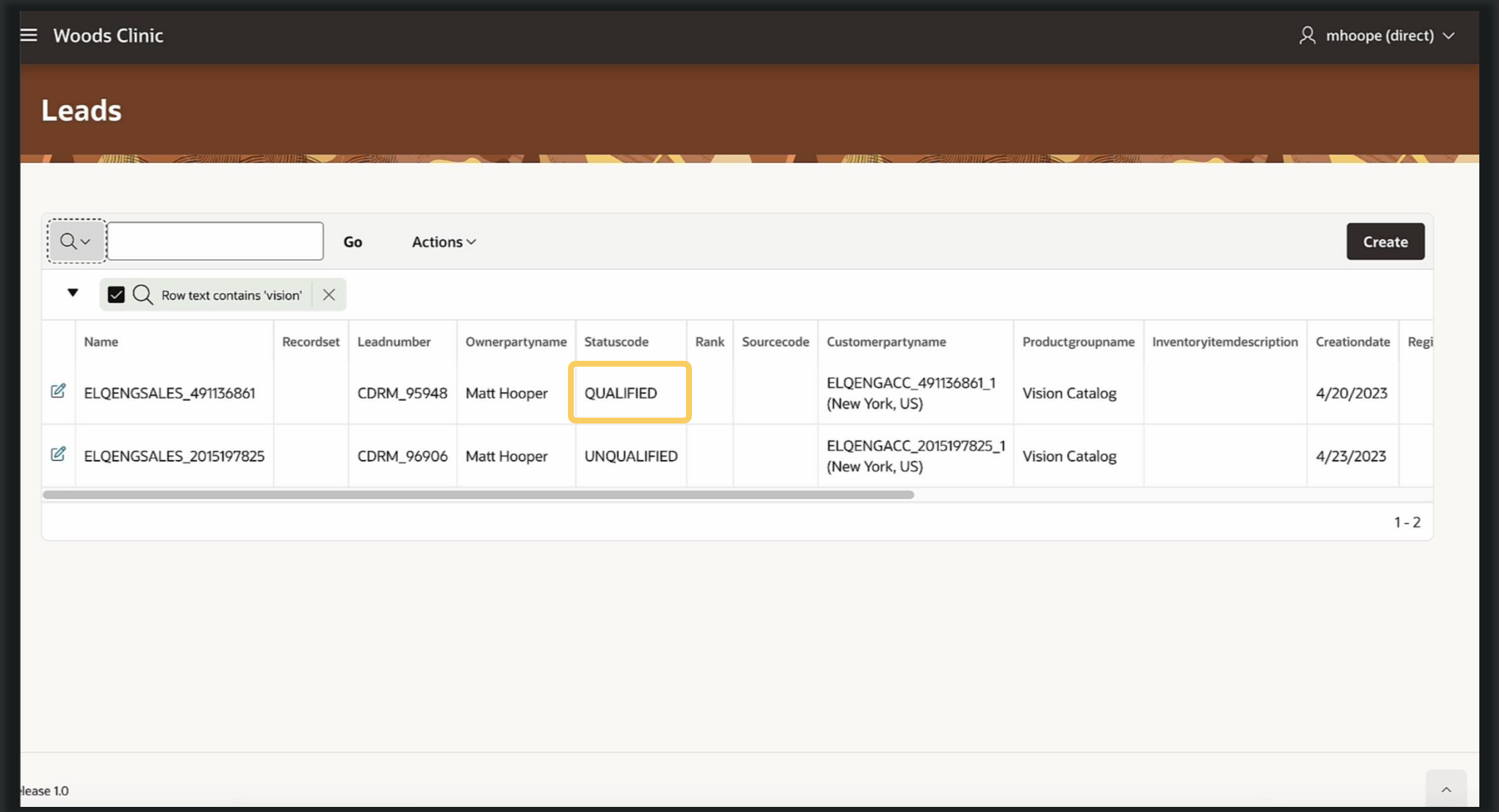
Cancel Delete Apply Changes

lease 1.0

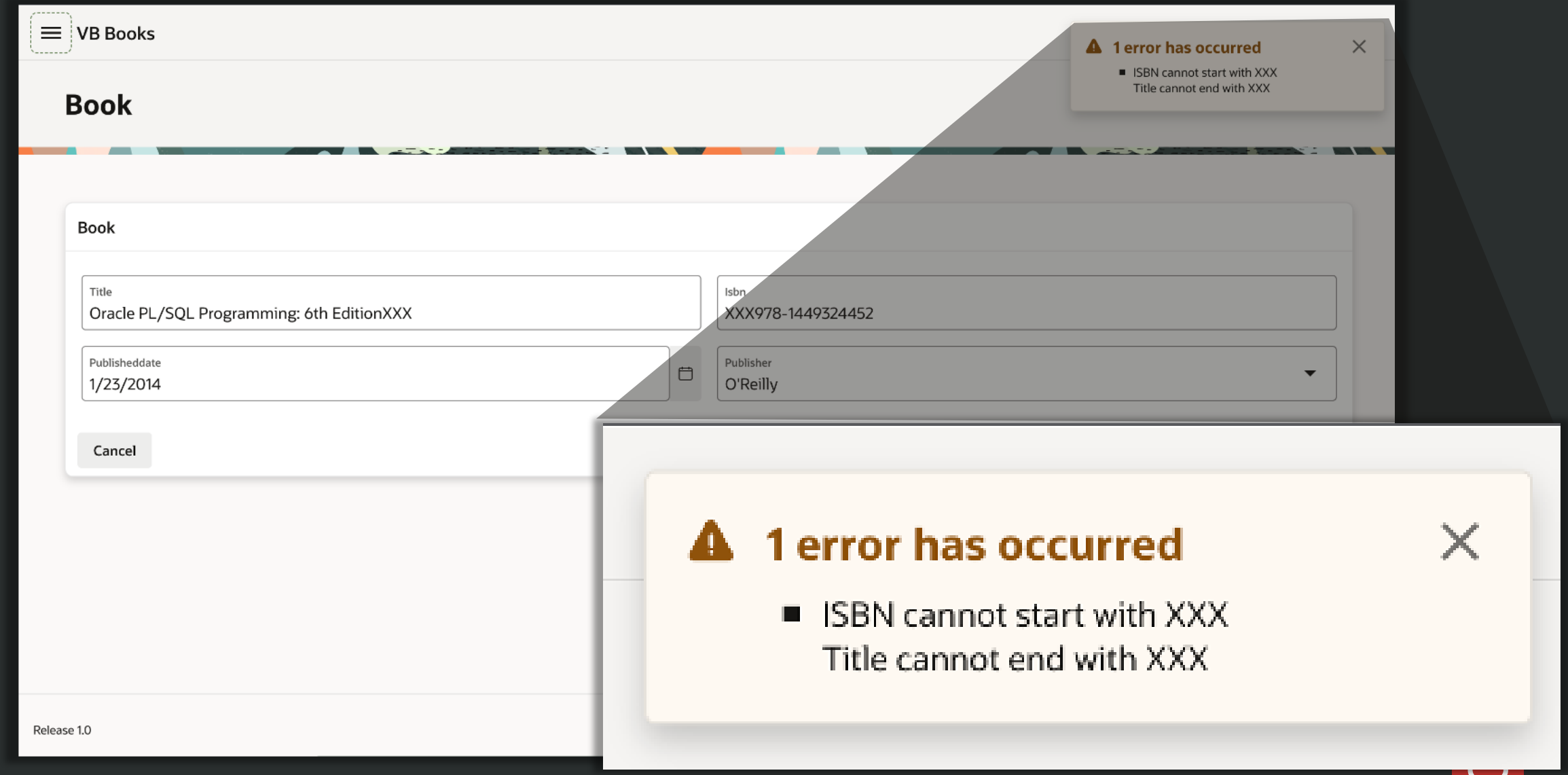
Building Fusion Apps Extensions: Works Just Like a Table



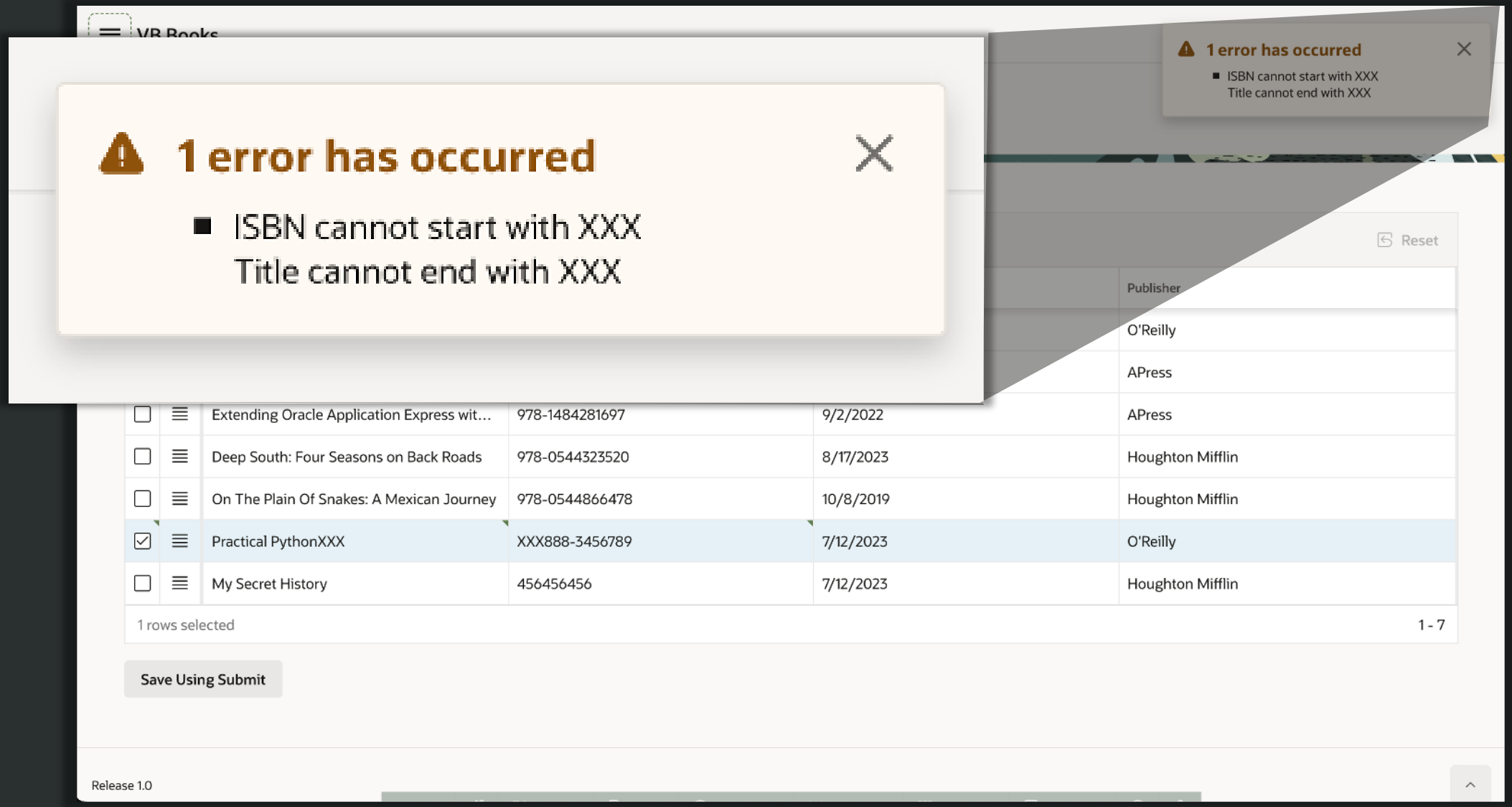
Building Fusion Apps Extensions: Works Just Like a Table



Building Fusion Apps Extensions: Errors Surface Naturally



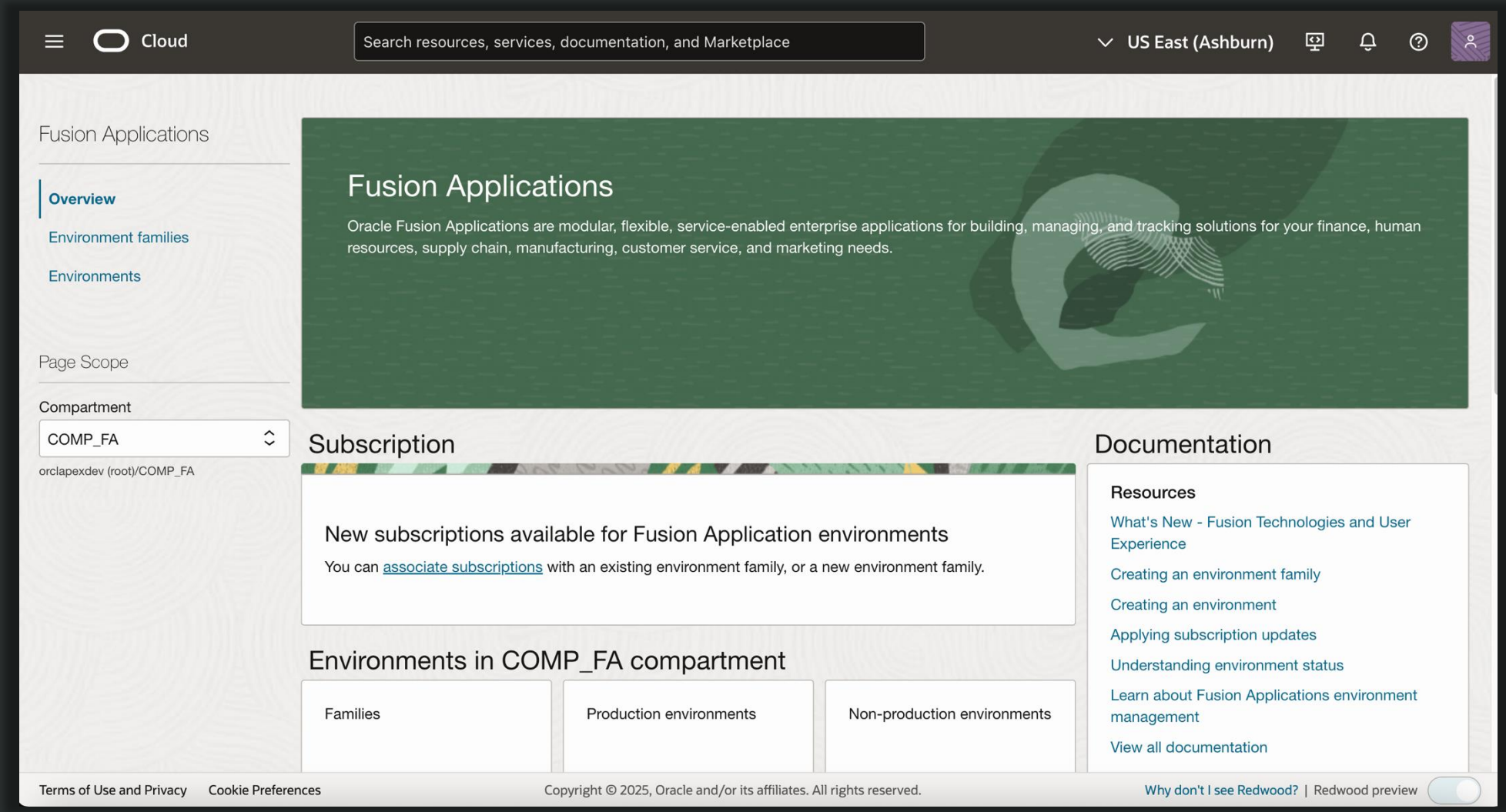
Building Fusion Apps Extensions: Errors Surface Naturally



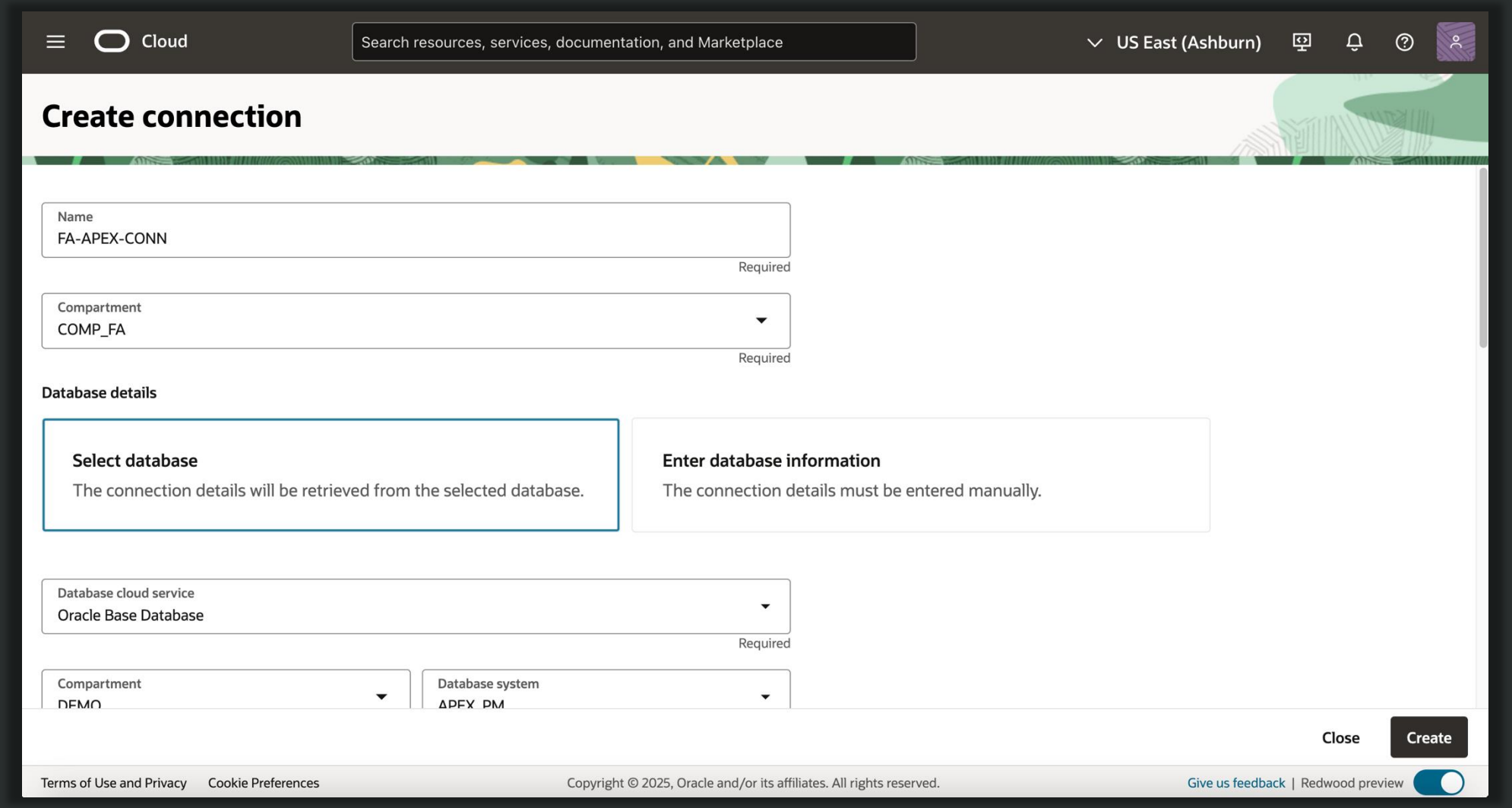
Fusion Apps Extensions: What's New for 24.2 ?

Dramatically
Simpler
Setup

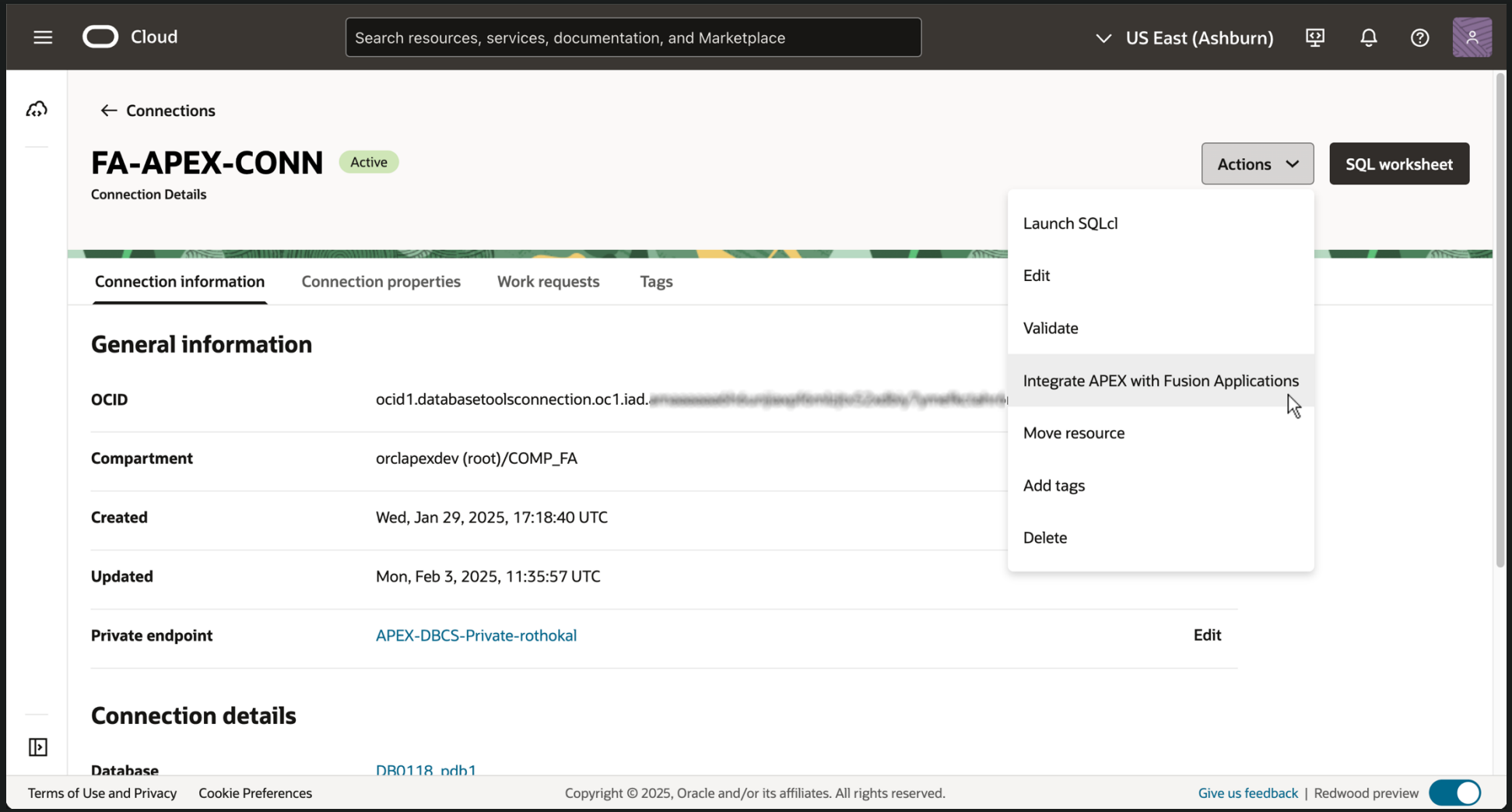
Fusion Apps Extensions: Define Connection to APEX DB



Fusion Apps Extensions: Define Connection to APEX DB



Fusion Apps Extensions: Integrate with Fusion Apps



Fusion Apps Extensions: One Click Integration

Cloud

Search resources, services, documentation, and Marketplace

US West (Phoenix)

Database Tools » Connections » Connection Details

DBC

ACTIVE

APEX Fusion Cor

SQL worksheet

>_ Launch

Connection information

OCID: ...dxs44q Show Copy

Compartment: secondfaaaspr

Created: Mon, Jan 6, 2025, 17

Updated: Mon, Jan 6, 2025, 17

Private endpoint: *None* Edit

Resources

Connection properties

Work requests

Connection prop

Add connection properties

Name

0 selected

Integrate APEX with Fusion Applications

AKME-DEV

Fusion Applications environment details

System name: IANYQY-DEV1

Public URL: [redacted]

Integrated domain URL: [redacted]

Integrated application name

APEX_FA_INTEGRATION_APPLICATION

APEX instance URL

[redacted]/ords/apex

Integration details

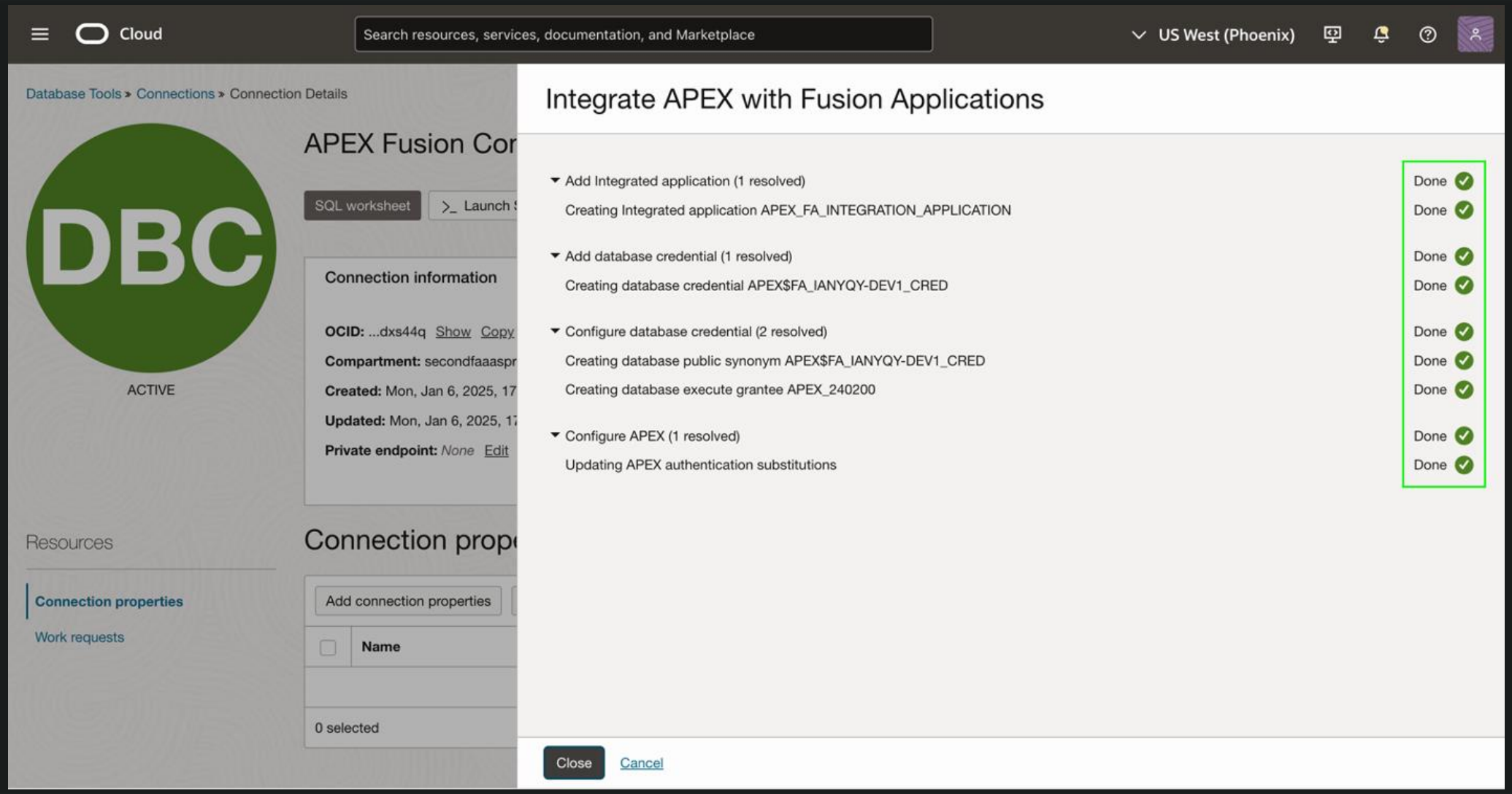
Database credential name: APEX$FA_IANYQY-DEV1_CRED

APEX authentication substitution keys:

- **FA_IANYQY-DEV1_DISCOVERY_URL:** [redacted].identity.oraclecloud.com:443/.well-known/openid-configuration
- **FA_IANYQY-DEV1_OAUTH_SCOPE:** [redacted]

Integrate Cancel

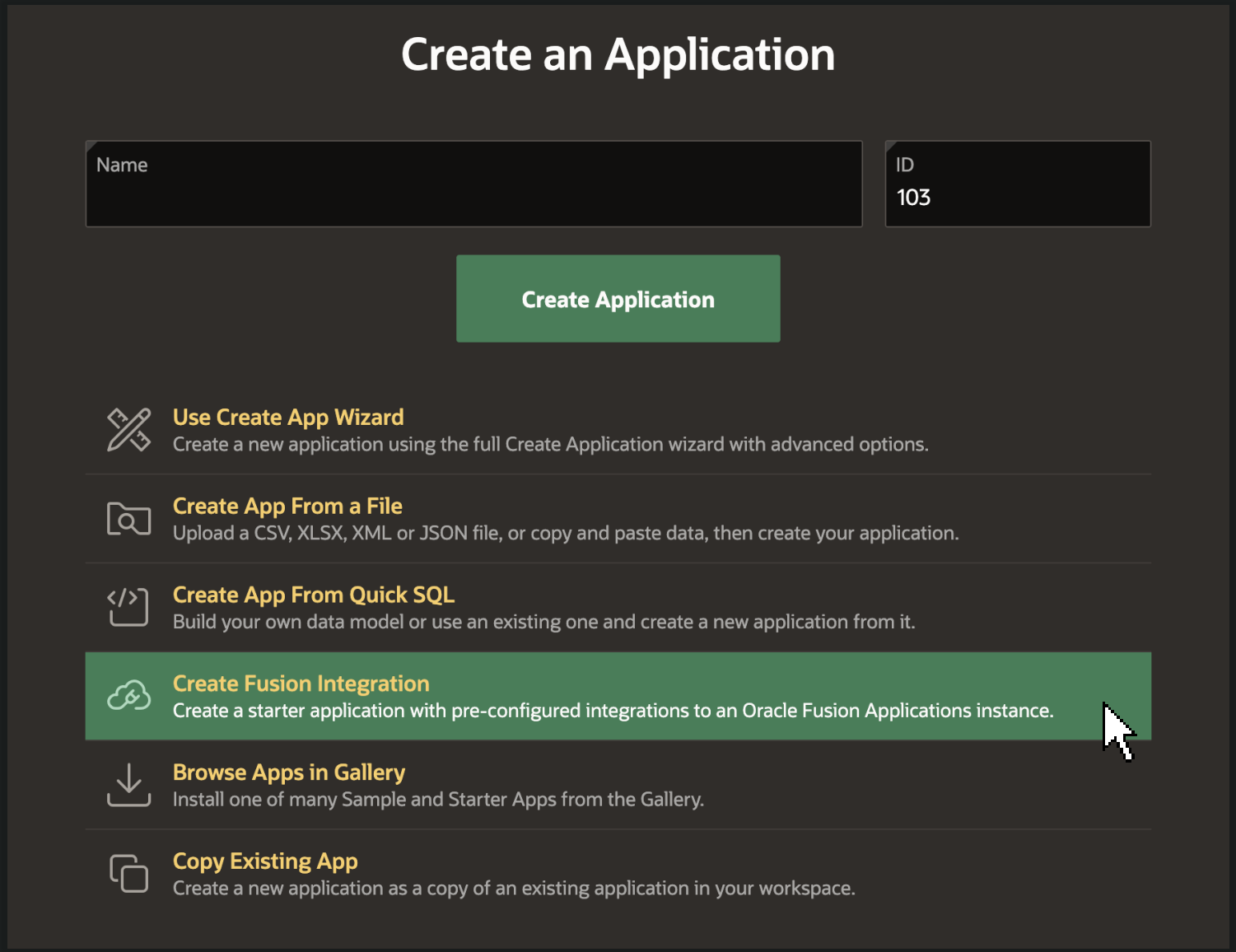
Building Fusion Apps Extensions: One Click Integration



What Does OCI Console Wizard Do for FA Instance *ABC*?

- Creates a *Confidential App* in your Fusion IDCS
- Creates database credential APEX$FA_*ABC*_CRED in the APEX database
- Grants privileges on DB credential to APEX engine schema (e.g. APEX_240200)
- Configures substitution strings used by *Social Sign-In* Authentication
  - FA_*ABC*_DISCOVERY_URL
  - FA_*ABC*_OAUTH_SCOPE

Fusion Integration Wizard



Fusion Integration Wizard

Create Fusion Integration

This utility will create a starter application pre-configured to integrate with an Oracle Fusion Applications instance according to the setup performed by the Database Tools Fusion Integration Wizard. Learn more ...

Configuration Options

* Fusion Instance Name: CPDBDYHJB-TEST
* Base URL for REST APIs: https://cpdbdyhjb-test.fusionappspreprod.ocs.oc-test.com/fscmUI/faces/FuseOve
API Status: **200 - OK**

Advanced Settings

* Application Name: My New Fusion App
* Application Alias: MY-NEW-FUSION-APP
* Application ID: 106

Create Application

What Does the Fusion Integration Wizard Create?

- New APEX app
- Web Credential delegating to the FA DB credential created by OCI wizard
- Properly Configured Social Sign-in Authentication Scheme
- Remote Server APEX_FA_*ABC*_REST_APIS
- *HCM Self Details* "Who Am I" REST Data Source
- Home page with Classic Report Using *HCM Self Details* REST Data Source

Fusion Integration: Initial "Who Am I" REST Data Source

REST Data Source

Show All | REST Data Source | Settings | Authentication | Data Profile | Operations | Parameters | Subscription | Advanced

REST Data Source

* Name	HCM Self Details
* REST Data Source Type	Oracle Cloud Applications (SaaS) REST Service
* Remote Server	APEX_FA_CPDBDYHJB-TEST_REST_APIS
Base URL	**https://cpdbdyhjb-test.fusionappspreprod.ocs.oc-test.com/**
* URL Path Prefix	hcmRestApi/resources/latest/selfDetails

Remote Server Created by Fusion Integration

Settings

Use Batch DML	Yes
Root Resource Name	selfDetails
Use Total Results	No
Use Pagination	Yes

Authentication

Credentials	APEX_FA_CPDBDYHJB-TEST_DBMS_CRED

Web Credential Created by Fusion Integration

Fusion Integration: Authentication Scheme

Authentication Scheme

Show All | Name | Subscription | Settings | Source | Session Not Valid | Login Processing | Post-Logout URL | Session Sharing

Name

* Name: APEX_FA_CPDBDYHJB-TEST_OAUTH

* Scheme Type: Social Sign-In

Subscription

Subscribed from

This is the "master" copy of this authentication scheme.

There are no subscribers to this authentication scheme.

Settings

Credential Store: APEX_FA_CPDBDYHJB-TEST_DBMS_CRED

Authentication Provider: OpenID Connect Provider

* Discovery URL: #FA_CPDBDYHJB-TEST_DISCOVERY_URL#

* Scope: profile,email,offline_access,#FA_CPDBDYHJB-TEST_OAUTH_SCOPE#

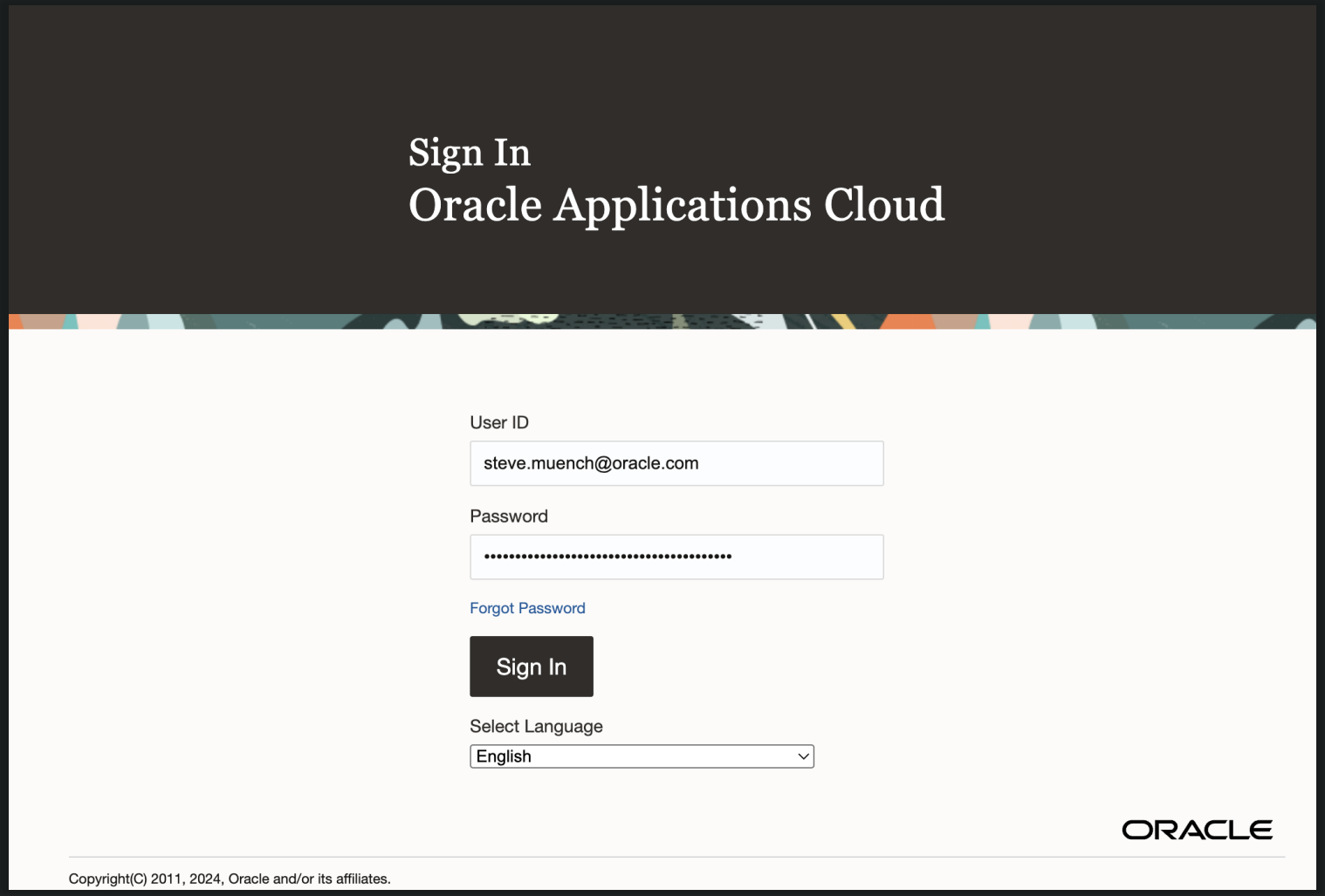
Authentication URI Parameters:

* Username: #sub#

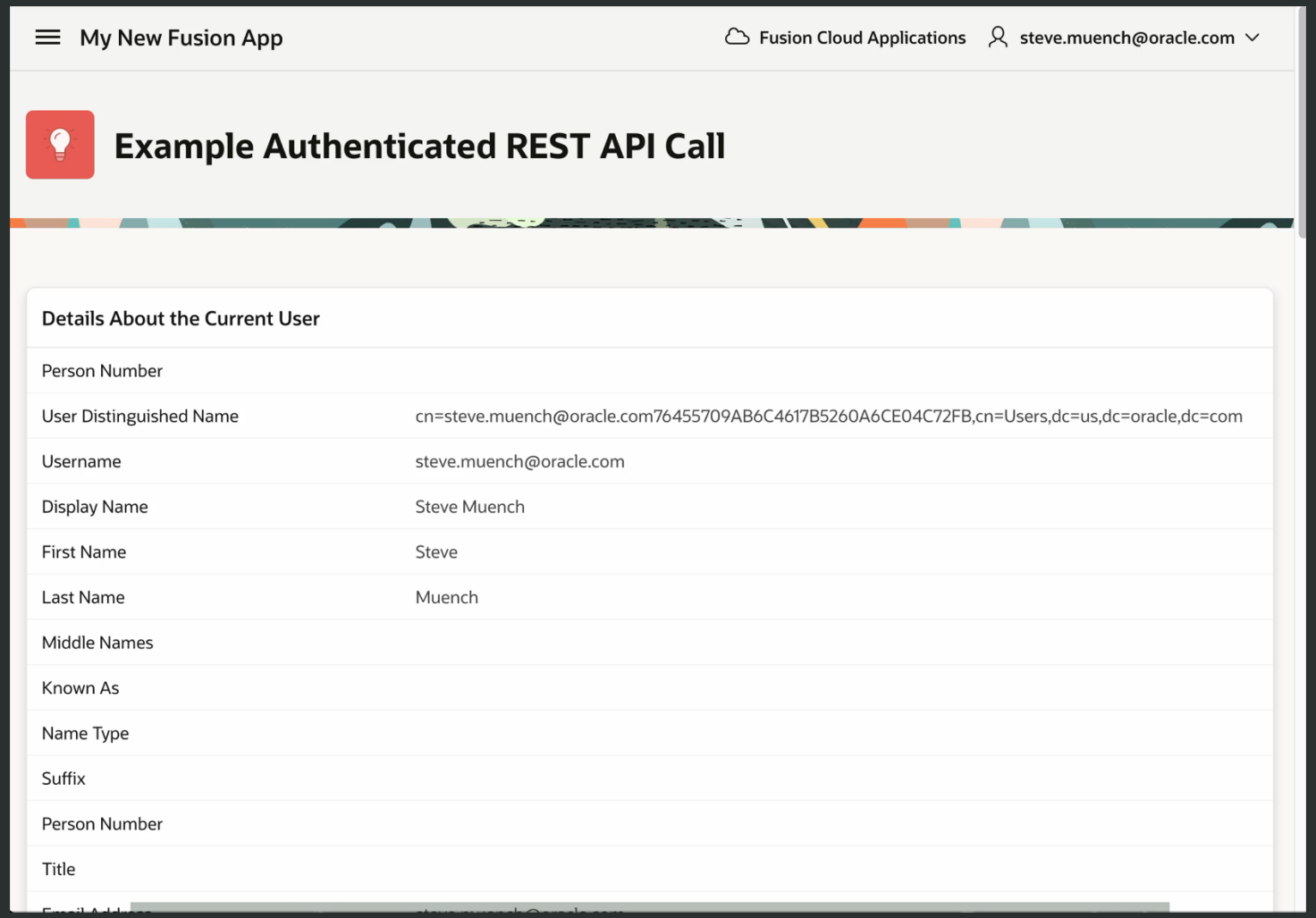
Web Credential Created by Fusion Integration

Substitution Strings Added by Fusion Integration Wizard in OCI Console

Fusion Integration: Running the App, Fusion SSO Appears



Fusion Integration: First REST Data Source Working



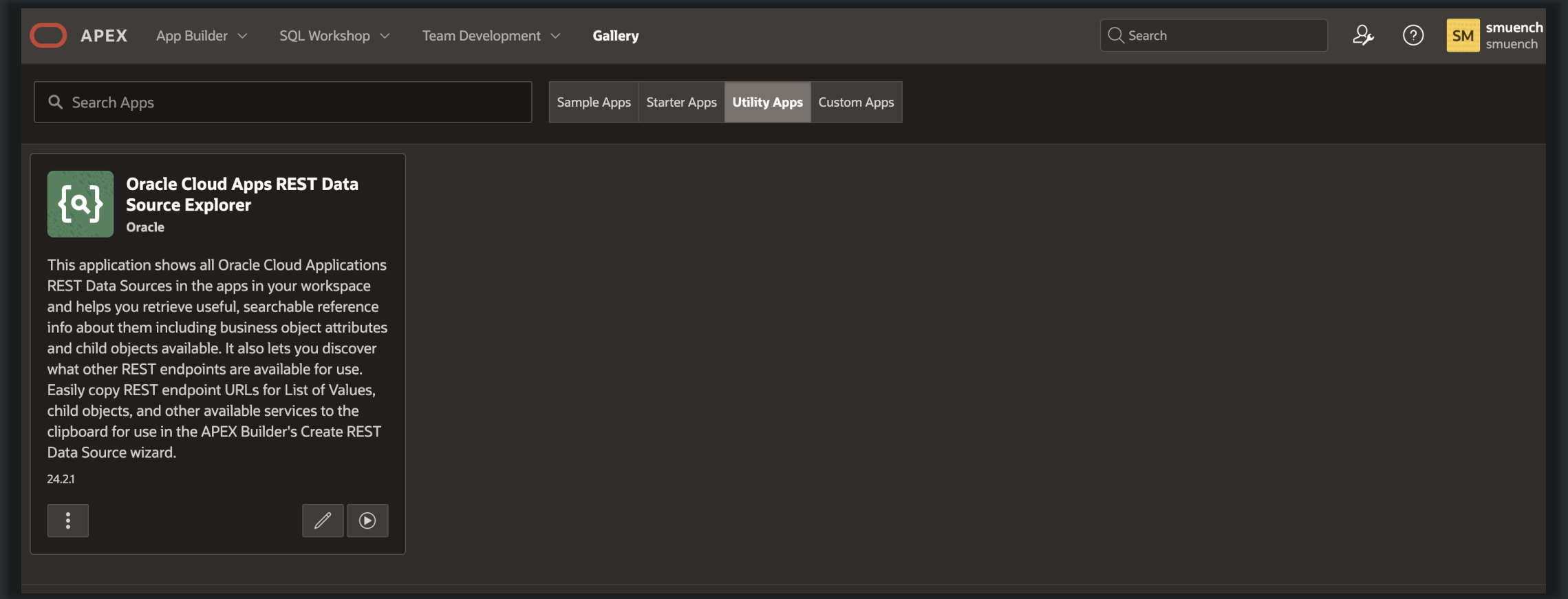
Authenticated User Securely Propagated to Every REST API Call

Important for Fusion Data Security

Creating New Fusion REST Data Sources in the Builder

- APEX Builder uses *runtime-acquired* authentication token
  1. *First* run app to acquire token
  2. *Then* create REST Data Sources in APEX Builder
  3. After an hour, token may expire. Return to step 1.
- Check Fusion Apps REST API documentation for required roles

Oracle Cloud Apps Data Source Explorer



Oracle Cloud Apps Data Source Explorer

Oracle Cloud Apps Data Source Explorer - Service Details: Leads

Show Only Visible Attributes | Install App | smuench

Attributes | Child Objects

Go | 1. Primary Report | Actions

Attribute Name	Type	Label	Description	LOV Endpoint	Preferred UI	Queryable?	Required?	Defaulted?	Editable?	Remote PK?	Custom?	Only Operators?
Name	string(250)	Lead Name	Lead Name used for identifying the lead.			Y	Y	N	Y	N	N	
RecordSet	string	Record Set			Select List	Y	N	N	N	N	N	
LeadNumber	string(30)	Lead Number	User friendly unique identifier for a lead.			Y	N	Y	On Create	N	N	
OwnerPartyName	string(360)	Owner	Name associated with the owner of this sales lead.		Popup LOV	Y	N	N	Y	N	N	
StatusCode	string(30)	Status	Pre-defined code used to indicate the status of a lead.		Select List	Y	N	N	Y	N	N	
Rank	string(30)	Rank	Rank associated with this sales lead.		Select List	Y	N	N	Y	N	N	
SourceCode	string(30)	Source Code	Marketing source code associated with this sales lead.		Popup LOV	Y	N	N	Y	N	N	
CustomerPartyName	string(360)	Account Name	Name of the customer.			Y	N	N	Y	N	N	
ProductGroupName	string(250)	Product Group	Name of the product group associated with a lead.		Popup LOV	Y	N	N	Y	N	N	
InventoryItemDescription	string(240)	Product Item	The description of the product added to a lead.		Popup LOV	N	N	N	Y	N	N	
CreationDate	datetime	Creation Date	Indicates the date and time when this record is created.		Date Picker	Y	Y	N	N	N	N	
RegistrationNumber	string(120)	Registration Number	Registration number of the sales lead. This unique identifier is generated when the sales lead is approved. This is a deal specific attribute.			Y	N	N	Y	N	N	

Oracle Cloud Apps Data Source Explorer

Oracle Cloud Apps Data Source Explorer - REST Data Sources

Install App smuench

Endpoints In Use | All Endpoints | Background Progress

Go | Actions | Refresh List | Refresh Catalog In Background

Row text contains 'forecast' | Base Url

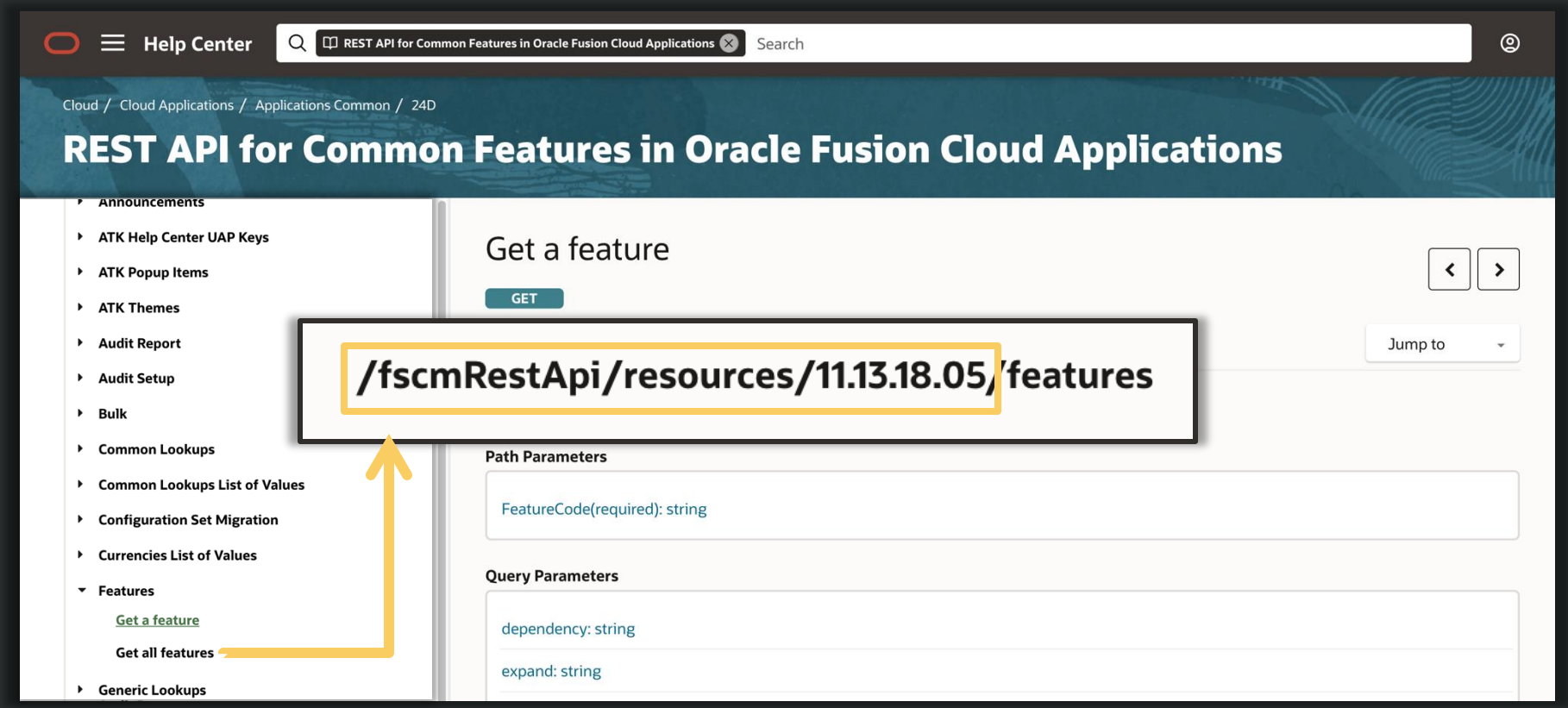
Base Url: https://fa-exgs-saasfademo1.ds-fa.oraclepdemos.com:443/crmRestApi/resources/11.13.18.05

Endpoint URL	Resource Name	Title
	salesForecastAdjustments	Sales Forecast Adjustments
	salesForecastDimensions	Sales Forecast Dimensions
	salesForecastMetricSourceItems	Sales Forecast Metric Source Items
	salesForecastMetricSources	Sales Forecast Metric Sources
	salesForecastMetrics	Sales Forecasts Metrics
	salesForecastParams	Sales Forecast Parameters
	salesForecastParticipants	Sales Forecast Participants
	salesForecastPeriods	Sales Forecast Periods
	salesForecastQuotas	Sales Forecast Quotas
	territoryForecasts	Forecast Territory Hierarchy

1 - 10

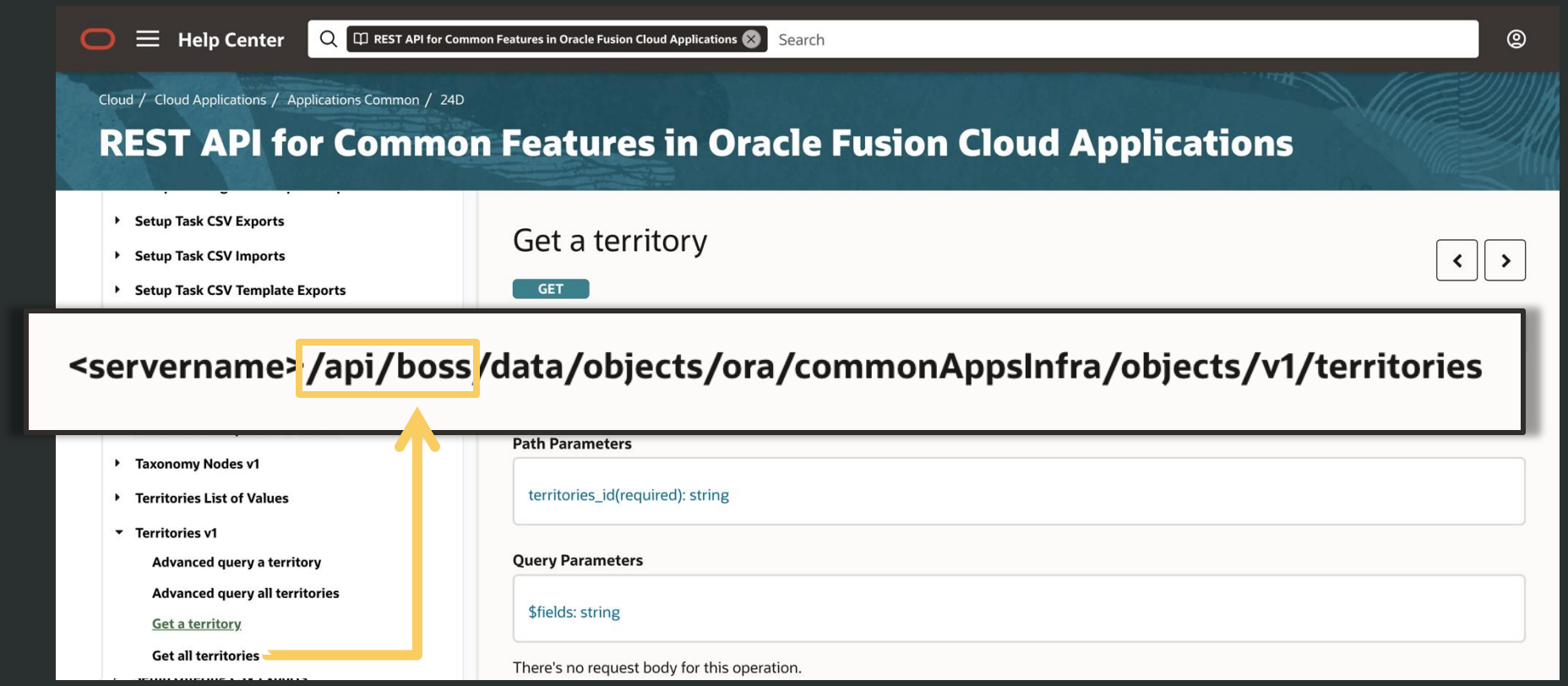
Most Fusion REST APIs Use *Oracle ADF*

- Workhorse FA business component framework used since 1998
- Recognize from URL `/xxxRestApi/resources/11.13.18.05`



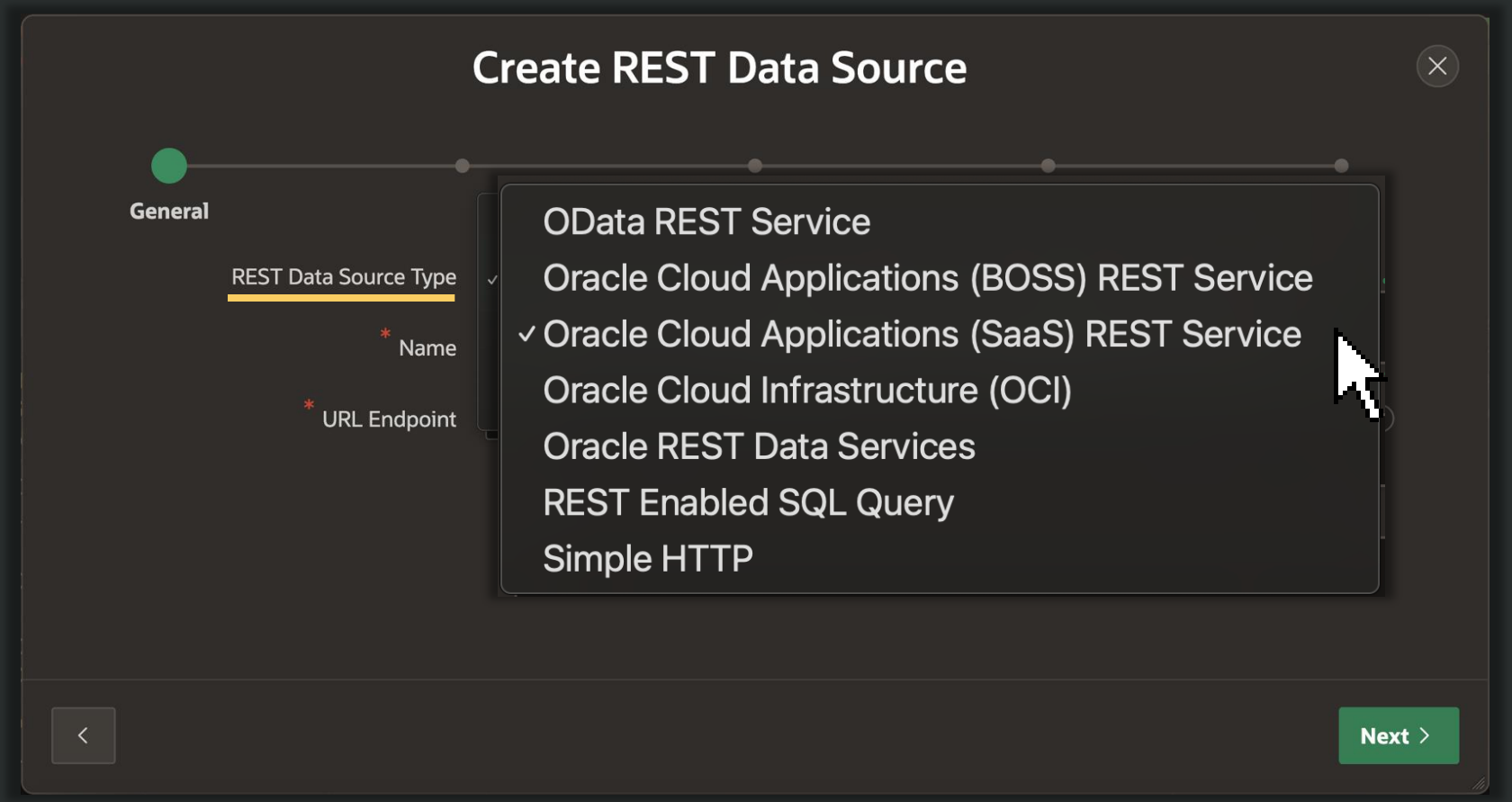
Newest Fusion REST APIs Use *Business Object Service*

- Alternative implementation approach for newest endpoints
- Recognize from URL `/api/boss`



APEX 24.2 Lets You Work Easily with Either

- *Oracle Cloud Apps (SaaS)* for `/xxxRestApi/resources/11.13.18.05/*`
- *Oracle Cloud Apps (BOSS)* for `/api/boss/*`



Fusion Roles Authorization: Use Custom Code for Groups

Application 106 \ Edit Security Attributes

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

Application 106

Cancel | Apply Changes

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

Authorization

Define Authorization Schemes >

Application authorization schemes control access to all pages within an application. Unauthorized access to the application, regardless of which page is requested, will cause an error page to be displayed.

Authorization Scheme: - No application authorization required -

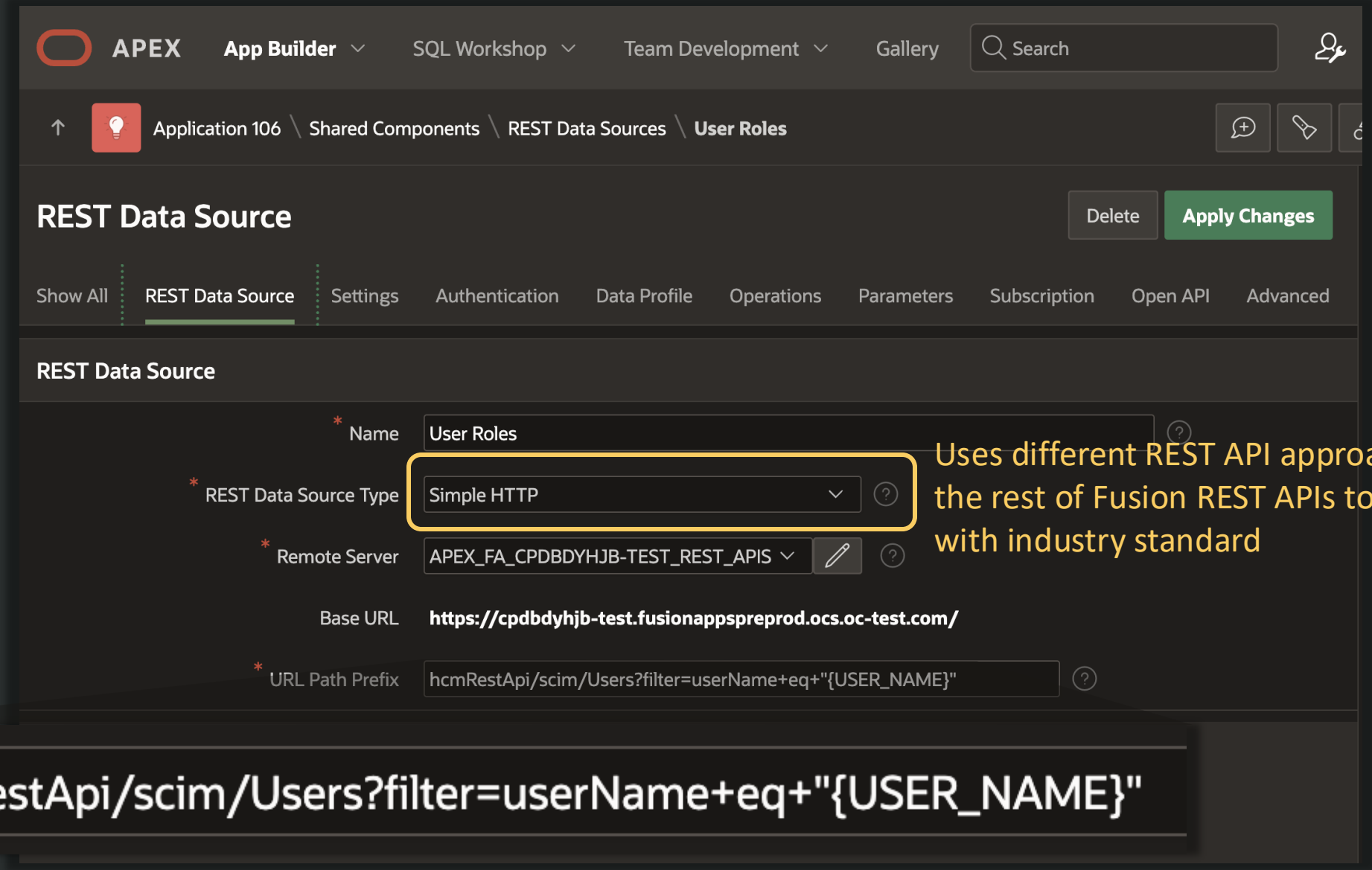
Run on Public Pages

Run on Background Job

Source for Role or Group Schemes:
- Access Control User Role Assignments
- Authentication Scheme
- ✓ Custom Code

System for Cross-domain Identity Management

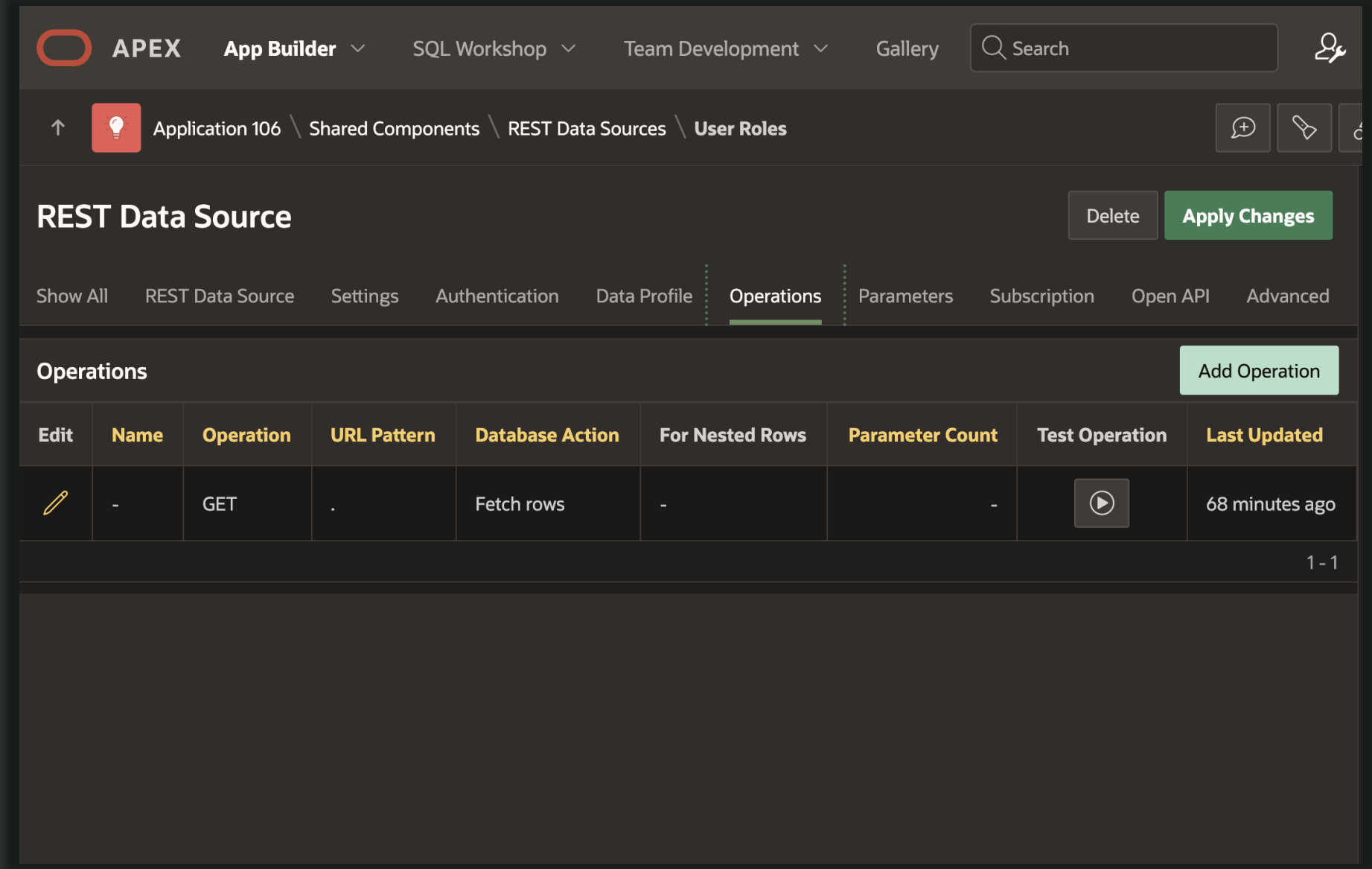
Fusion Roles Authorization: *SCIM Users* REST Data Source



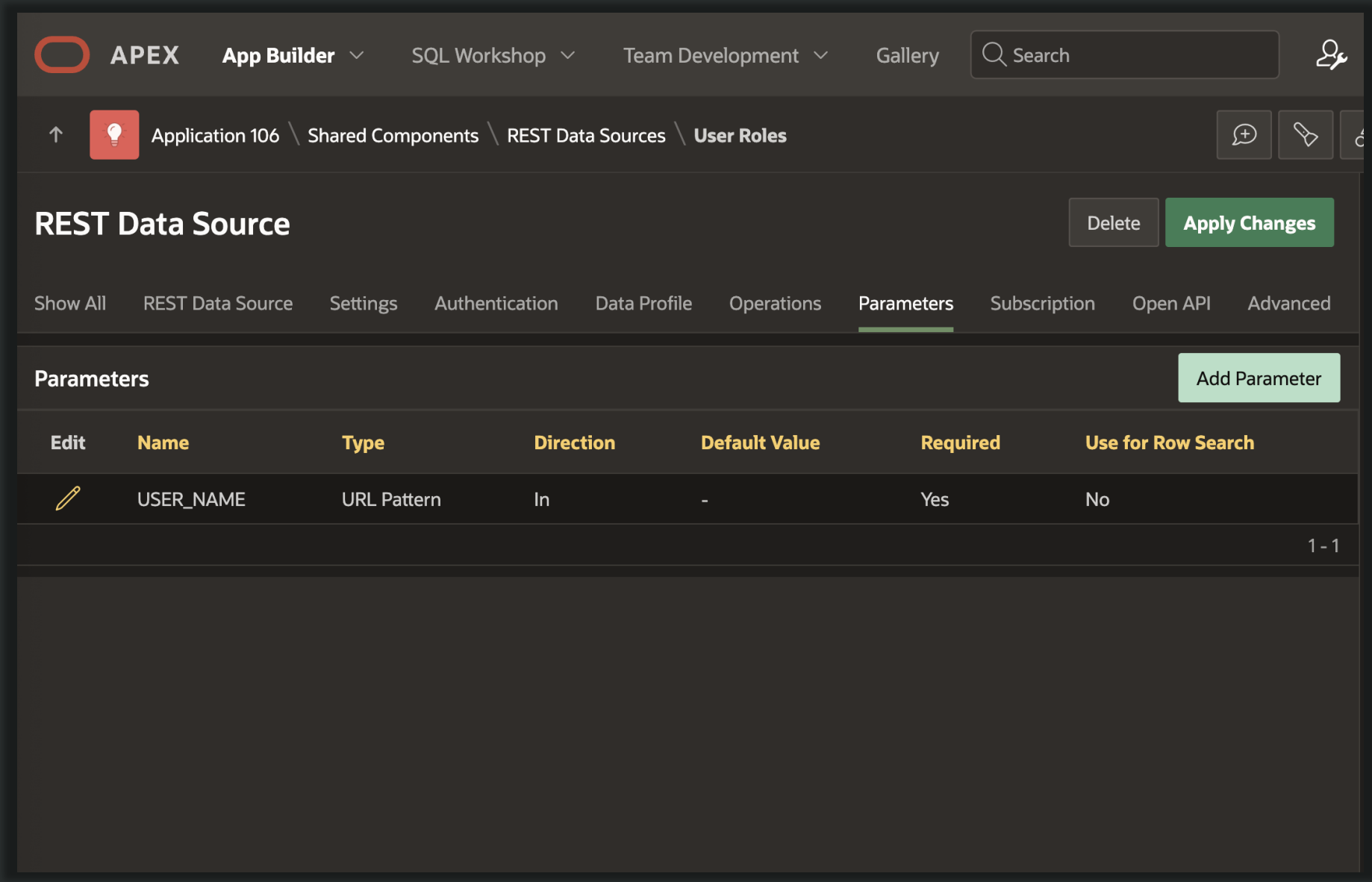
Uses different REST API approach than the rest of Fusion REST APIs to comply with industry standard

hcmRestApi/scim/Users?filter=userName+eq+"{USER_NAME}"

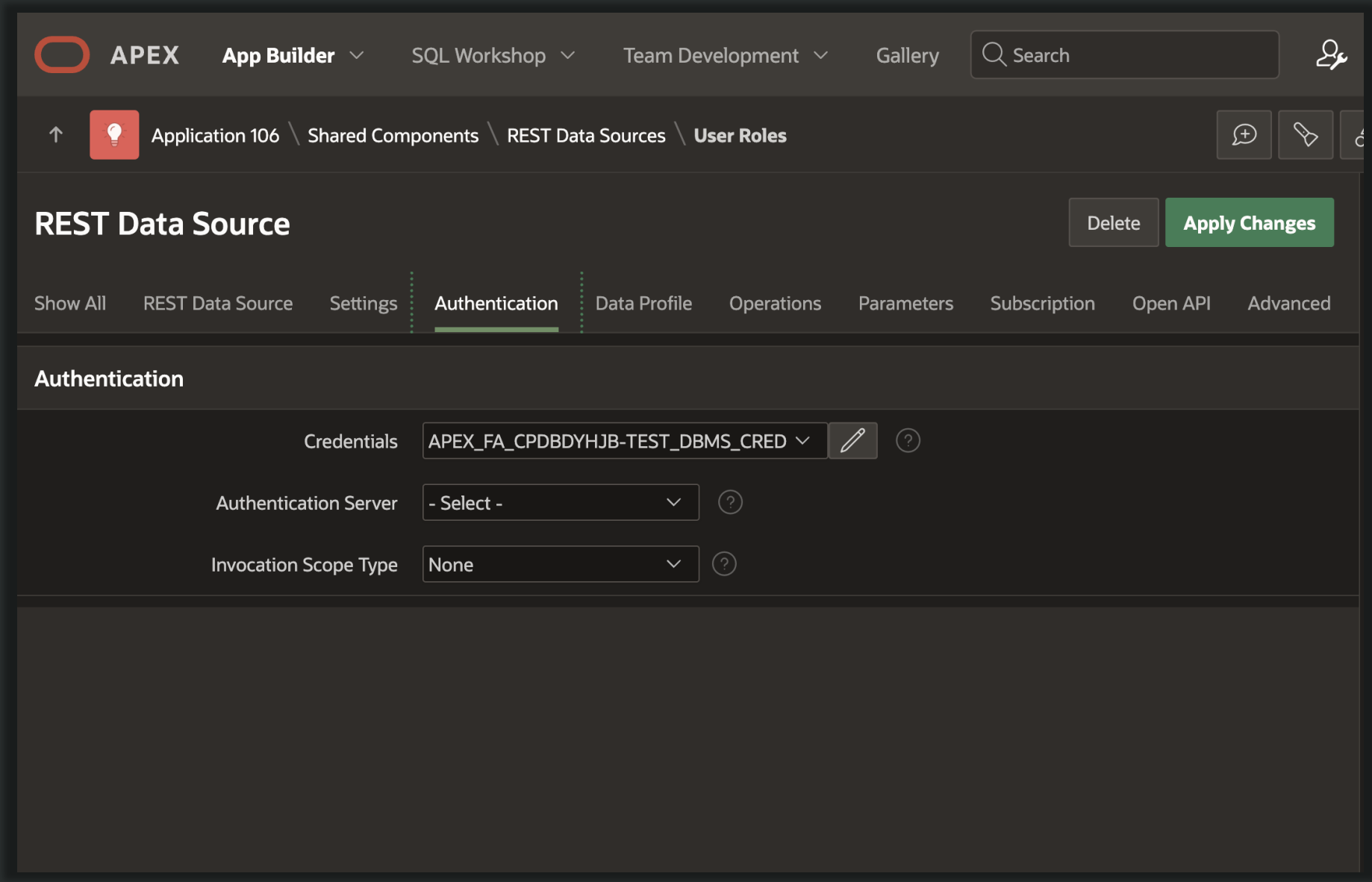
Fusion Roles Authorization: Single GET Operation



Fusion Roles Authorization: USER_NAME URL Pattern Param



Fusion Roles Authorization: Same Credential



Fusion Roles Authorization: Resources.roles Selector

Data Profile

Cancel | Apply Changes

Show All | Settings | Columns | Rediscovery | Advanced

Settings

* Name: User Roles

* Format: JSON

Row Selector: Resources.roles

Contains Single Row

Columns

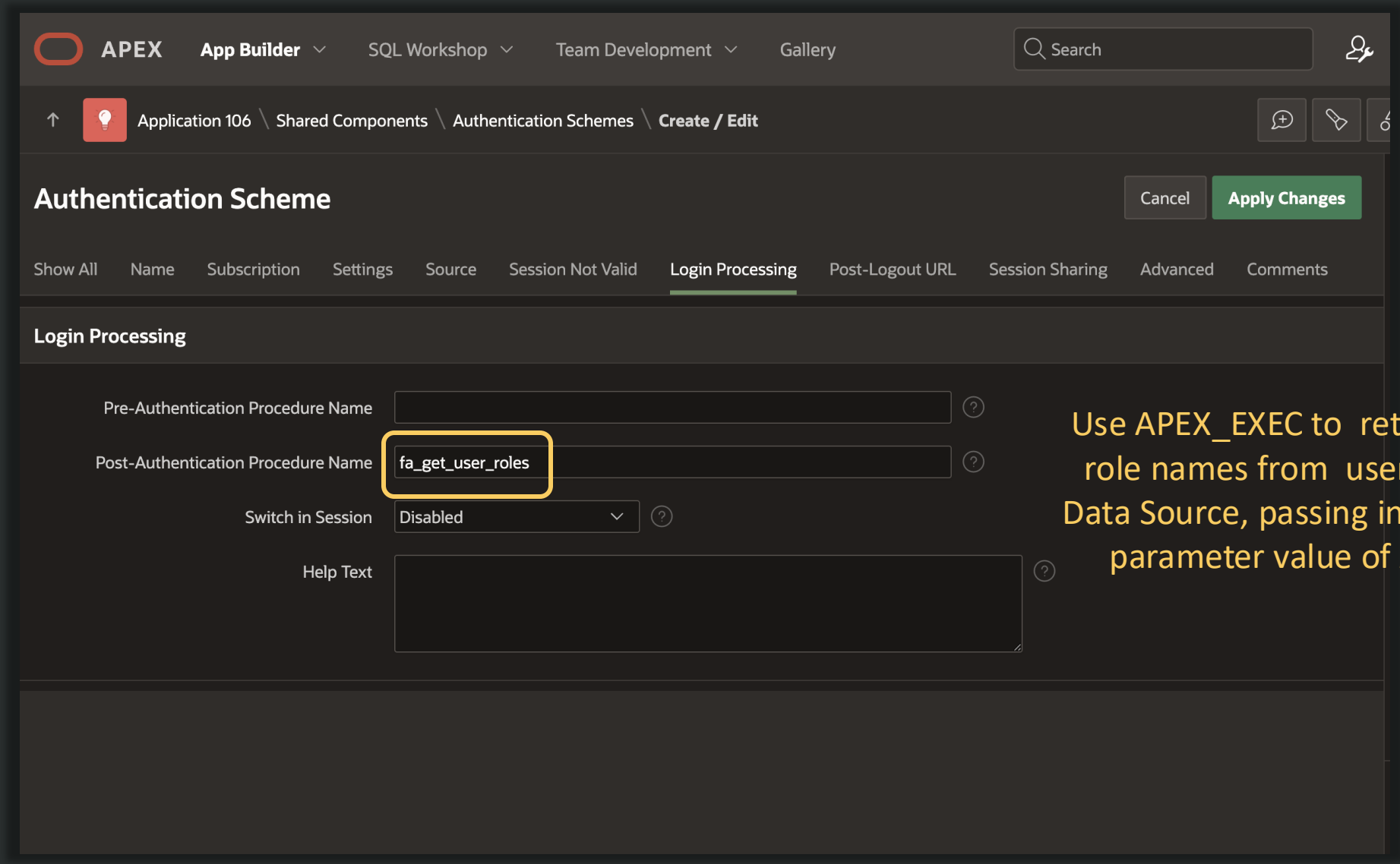
Resequence Columns | Add Column >

Search: All Text Columns | Go | Edit | Add Data Column

	Sequence...	Name	Column Ty	Data Type.	Selector	Primary Ke	Visible	Common...	Parent Co
	1	ID	Data	Varchar2	id	No	Yes	Yes	
	2	VALUE	Data	Varchar2	value	No	Yes	Yes	
	3	DESCRIPTION	Data	Varchar2	descript...	No	Yes	Yes	
	4	DISPLAYNAME	Data	Varchar2	display...	No	Yes	Yes	

VALUE column holds role name using value selector

Fusion Roles Authorization: Get Roles in Post-Auth Proc



Use APEX_EXEC to retrieve distinct role names from user_roles REST Data Source, passing in USER_NAME parameter value of APP_USER

Fusion Roles Authorization: Get Roles in Post-Auth Proc

```
procedure fa_get_user_roles is
   l_params  apex_exec.t_parameters;
   l_context apex_exec.t_context;
   l_groups  apex_t_varchar2 := apex_t_varchar2();
   l_group   varchar2(4000);
begin
   -- Set USER_NAME param to current user name
   apex_exec.add_parameter( l_params, 'USER_NAME', v('APP_USER' ) );
   l_context := apex_exec.open_rest_source_query(
      p_static_id  => 'user_roles',
      p_max_rows   => 1000,  -- May need to increase!
      p_parameters => l_params);
   -- Collect distinct role names
   while apex_exec.next_row( l_context ) loop
      l_group := apex_exec.get_varchar2( l_context, 'VALUE' );
      if l_group not member of l_groups then
         apex_string.push(l_groups, l_group);
      end if;
   end loop;
   -- Set the dynamic groups
   apex_authorization.enable_dynamic_groups(l_groups);
   apex_exec.close( l_context );
exception
    when others then
      apex_exec.close( l_context );
      raise;
end fa_get_user_roles;
```

Use APEX_EXEC to retrieve distinct role names from user_roles REST Data Source, passing in USER_NAME parameter value of APP_USER

Enable dynamically retrieved roles as dynamic groups

Fusion Roles Authorization: Get Roles in Post-Auth Proc

APEX | App Builder | SQL Workshop | Team Development | Gallery | Search

Application 106 \ Shared Components \ Authorization Schemes \ Edit

Authorization Scheme

Cancel | Delete | Apply Changes

Show All | Name | Subscription | Authorization Scheme | Evaluation Point | Advanced | Comments

Name

Application: **106 My New Fusion App**

* Name: HR Specialist

Subscription

Subscribed from

This is the "master" copy of this authorization scheme.

No authorization schemes subscribe to this authorization scheme.

Authorization Scheme

* Scheme Type: Is In Role or Group

Type: Custom

* Name(s): ORA_HUMAN_RESOURCE_SPECIALIST_JOB

Identify error message displayed when scheme violated: You need to be a HR Specialist to use this

Define custom-type *Is In Role or Group* Authorization Schemes as needed

Useful Post-Auth Procedure Debugging Tip

```
procedure your_post_auth_procedure is
  -- Your existing declarations
  procedure debug_dump_json
  is
    l_json_clob clob;
    pragma autonomous_transaction;
  begin
    apex_json.initialize_clob_output;
    apex_json.write( p_values => apex_json.g_values );
    l_json_clob := apex_json.get_clob_output;
    insert into post_auth_debug(json_clob) values (l_json_clob);
    apex_json.free_output;
    commit;
  end debug_dump_json;
begin
  debug_dump_json;
  -- Your existing logic
end fa_get_user_roles;
```

Parsed JSON structure
the APEX engine received from
authentication provider

Write out JSON CLOB to:
- a table, or
- CLOB-typed hidden page zero item
That you create for debugging purposes

Extending Oracle Fusion Cloud Apps Suite w/ Oracle APEX

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Extending Oracle Fusion Cloud Applications Suite using Oracle APEX

Oracle APEX Technical Paper

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