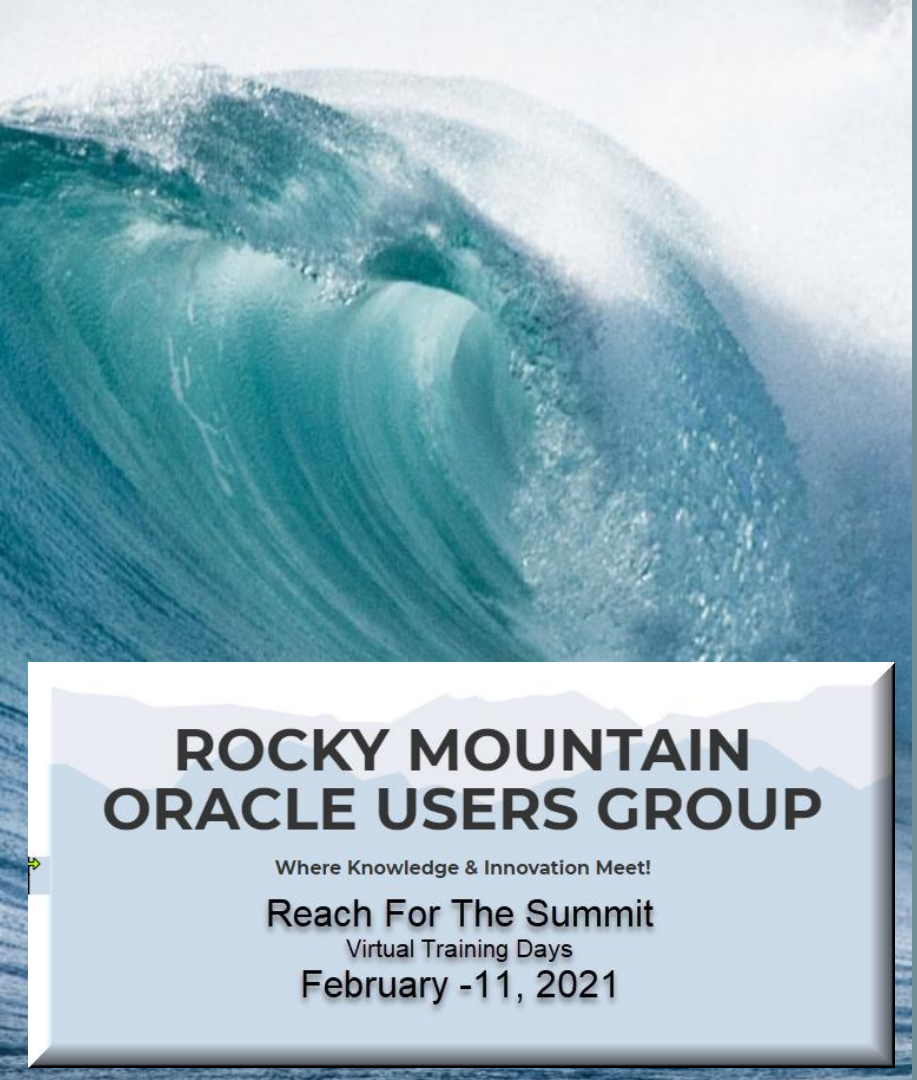

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Virtual Training Days

February -11, 2021

APEX Tips and Tune Up

Karen Cannell
kcannell@thtechnology.com
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@thtechnology

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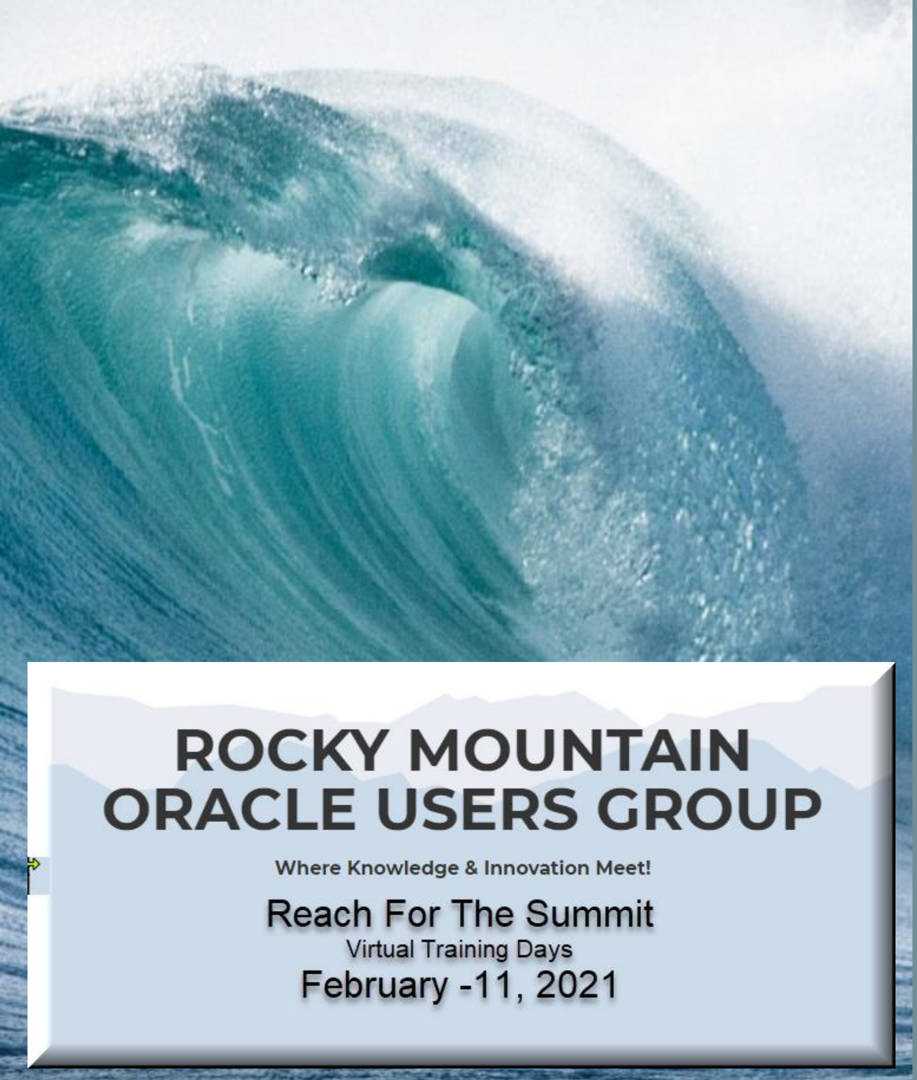

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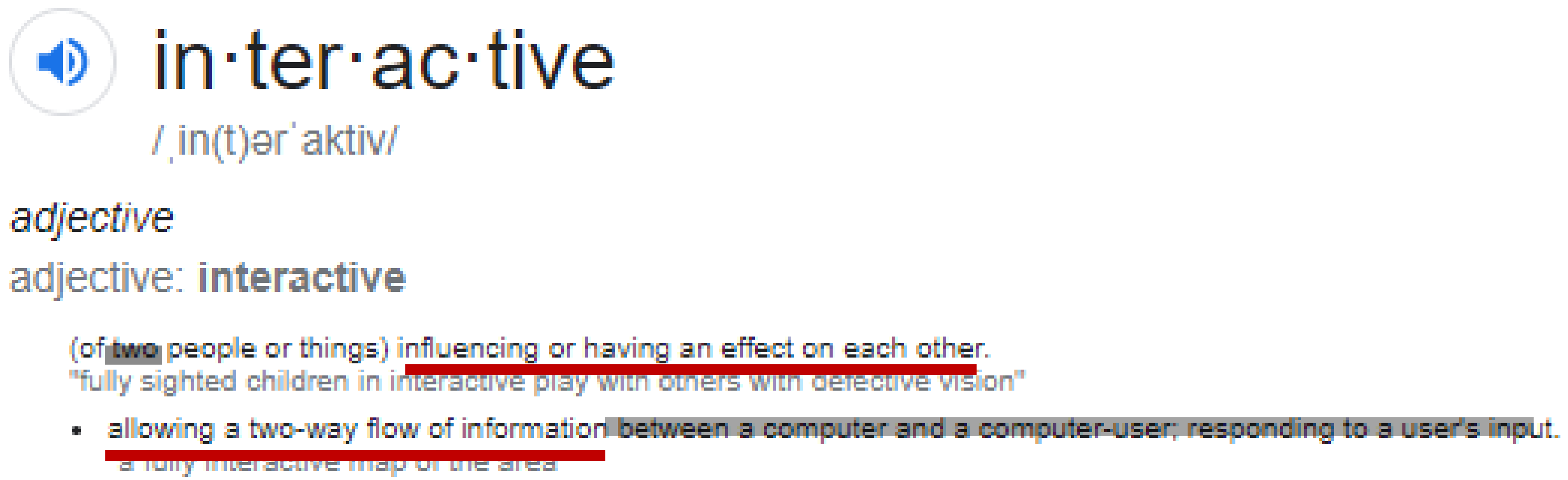
A Collection of Tips and How-to's for Building Better APEX Apps

Karen Cannell
kcannell@thtechnology.com
TH TECHNOLOGY
@thtechnology

APEX Tips and Tune Up

- Part 1: General Suggestions
- Part 2: Validations
- Part 3: Standards in Practce



in·ter·ac·tive

/ˌin(t)ərˈaktiv/

adjective

adjective: **interactive**

(of two people or things) influencing or having an effect on each other.
"fully sighted children in interactive play with others with defective vision"

- allowing a two-way flow of information between a computer and a computer-user; responding to a user's input.
  "a fully interactive map of the area"

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About Me ...

- TH TECHNOLOGY – Oracle Consulting Services, APEX Focus
- Mechanical/SW Engineer - Analyzed, designed, developed, converted, upgraded, enhanced legacy & Oracle database applications for 30+ Years
- Web/APEX applications for Govt, Medical, Engineering, Fisheries since HTMLDB
- ODTUG Vice President, Editor Emeritus, Technical Journal
- APress Author
- Oracle ACE Director

IOUG

Expert Oracle Application Express

Apress

TH Technology

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#StaySafe
#FlattenTheCurve
#StayVigilant

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About You …

- APEX Experience?
- APEX Versions?
- Grid Experience?
- JavaScript Experts?

- 0 to Many Yrs
- 5.1 and Higher
- Fair to Middlin'
- Not Exactly

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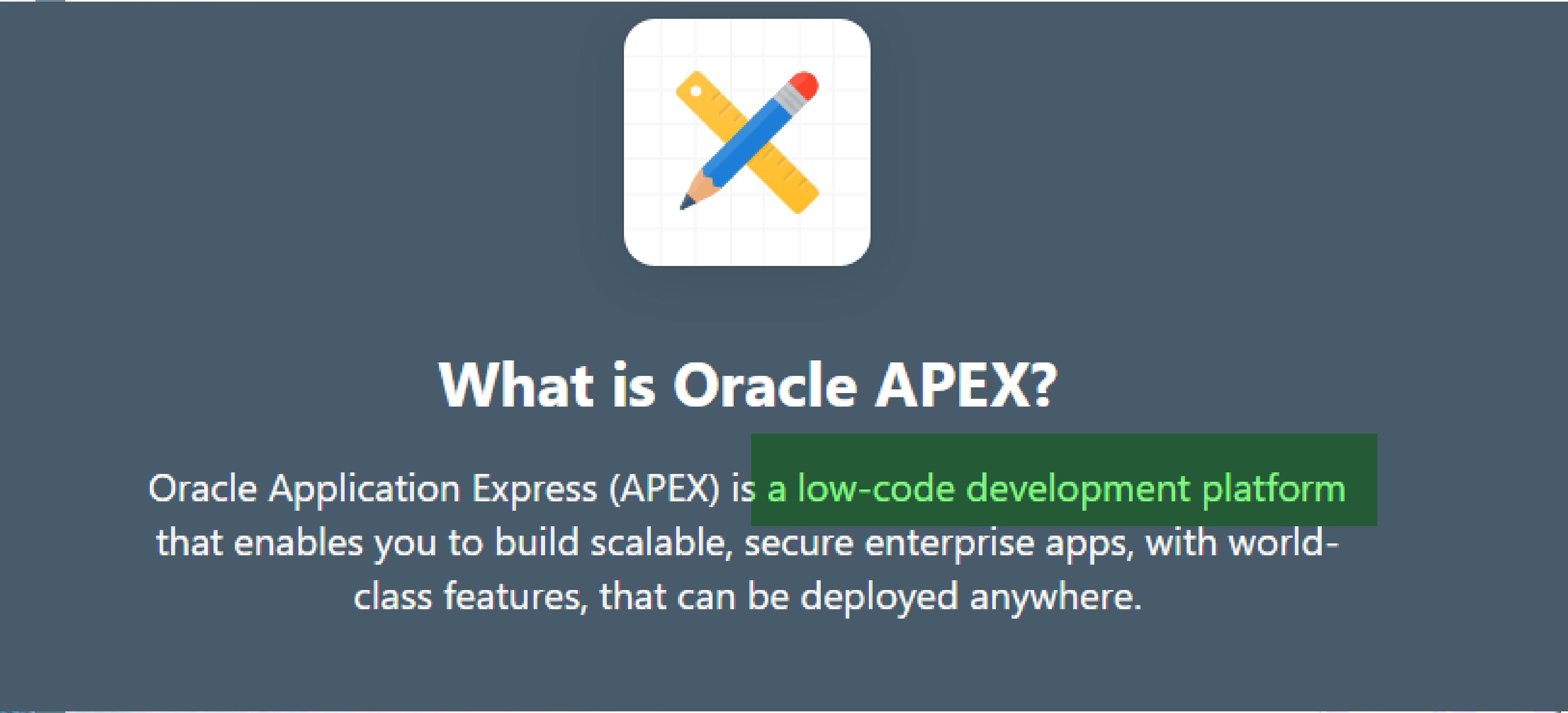
General APEX Suggestions

Know Your Tool

Use Your Tool



What is Oracle APEX?

Oracle Application Express (APEX) is a low-code development platform that enables you to build scalable, secure enterprise apps, with world-class features, that can be deployed anywhere.

“Low Code” vs No Code

- Generate 100%
  → No Code

- Generate then Customize
  → Low Code

Let APEX Work For You

- Wizards
  - App, Page, Form/Report, Master/Detail …
- Layout, Templates
- Security
- Validations
- Utilities

Ex: Form and Report on a Table/View…

- The Wizard Builds:
  - Pages
  - Interactive Report
  - Navigation Buttons and Branches
  - Fetch Process
  - Form Items, w Validations
  - DML Process
  - Menu Item

Know Your Version

- Read the Release Notes

Do Your Homework: Learn

- APEX Office Hours
- apex.oracle.com
- Conferences, User Groups
- apex.world

Have A Plan

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- Have A Data Model
- Have a Page Flow
- Have a Security Plan

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"It's APEX, I Don't Need a Data Model"

- Yes, You Do

  Consider: Forms, Reports, Master-Detail

- Performance
  - Slow Query is Magnified in APEX
- No Time? Quick SQL

Quick SQL Exercise

- One w Keys
- One w/o Keys

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- Master-Detail Exercise
  - With PK/FK
  - Without PL/FK

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- Forms Region
  - With PK
  - Without PK
  - Generate List w Modal
    - Add Close Dialog DA

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Quick SQL Exercise

- Know Your Tool
- Use Your Tool
- Check Your Work → Test and Validate

- Have A Data Model
- **Have a Page Flow**
- Have A Security Plan

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"The APEX Menu is All I Need"

- Sometimes …
- Can You Users Do Their Job With No/Minimal Documentation?
- Is It Intuitive?

- Have A Data Model
- Have a Page Flow
- **Have a Security Plan**

"Security, APEX Does That For Me"

- Nope.
  - APEX Helps .. Developer Needs to Do the Work
- Bind Variables
  - Example Queries good and bad
- Checksums
- APEX_UTIL.PREPARE_URL for URLs
- Authentication Schemes, Authorizations

Security is ON YOU

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Build Smart

- Best Practices
- Standards
- Validations

"All My Code Should Be In My App"

- Separate Business Logic from Presentation Logic
- Use the Oracle Database ★
  - Packages
- Theme Roller

"Standards, APEX Handles That For Me"

- Nope.

Validations

- Client, Server, Database
- Cover All Fronts

Developer Responsibility

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Don't Reinvent the Wheel

- Use What APEX Has to Offer, First
  - Wizards, Templates, Utilities
  - APEX Interactive Reports and Grids
  - APEX Form Region
  - Theme Roller for UI Customization

Know APEX, Use APEX

~Break ~

APEX Validations

Why Validate?

Data Quality

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Why Validate?

- Data Quality
- Prevent SQL Injection
- User Experience
  - Faster Response for User
  - Preserve Client State

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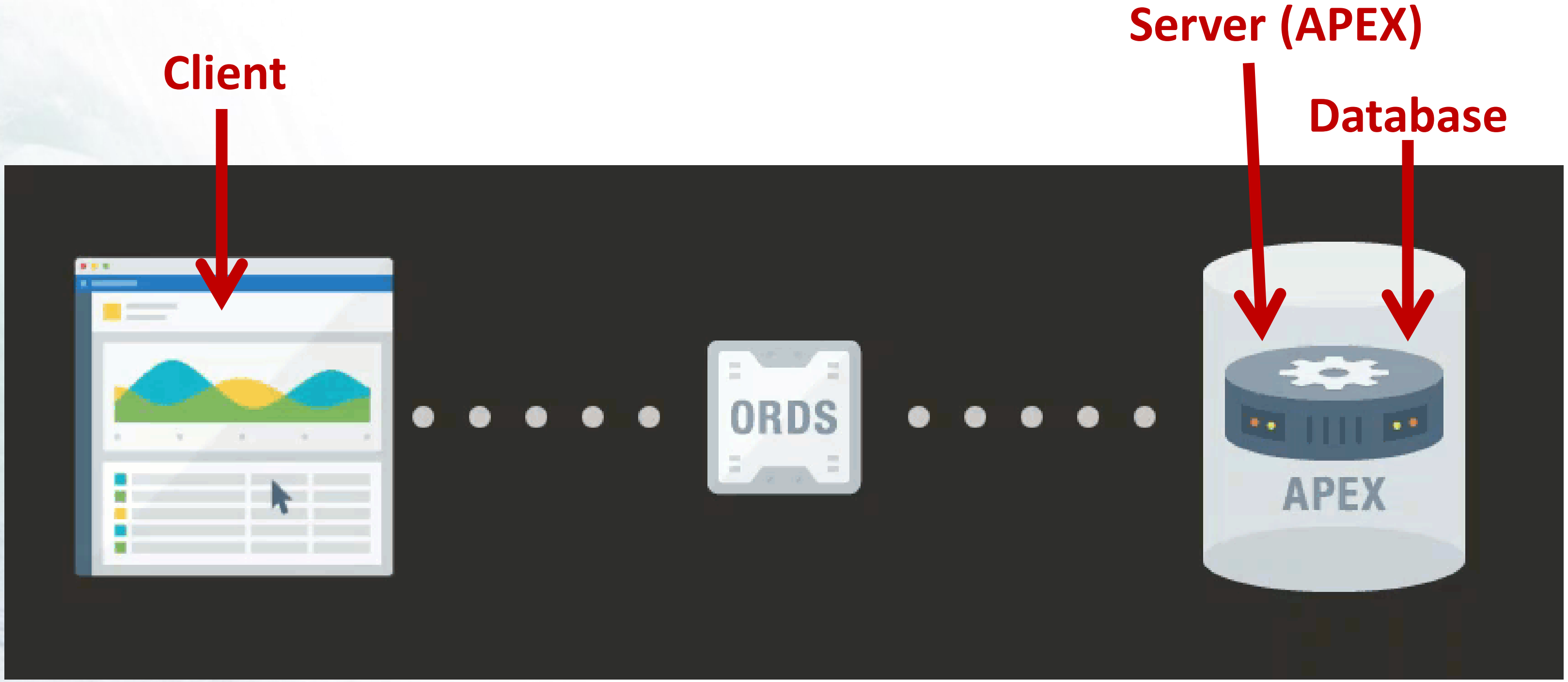
Where Validate?

1. Database
   - Data Types
   - Keys
   - Constraints
2. Server – On Submit
3. Client – Upon Entry

Use Your Database!

APEX Architecture



from apex.oracle.com/platform/architecture

What Are Validations?

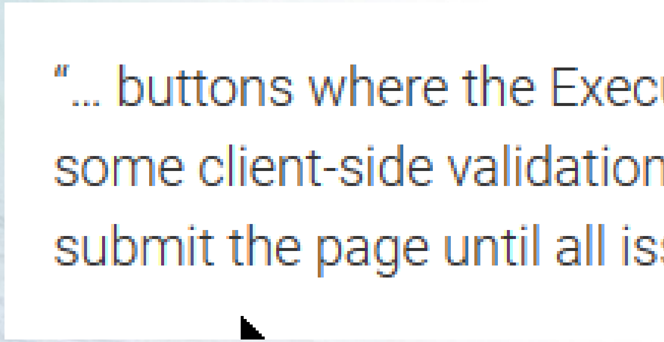
What Are APEX Validations?

Data Checks **In Your APEX App**

- Page Item
- Page (Multiple Page Items)
- Column
- Row (Multiple Columns)

APEX Client-Side Validation

- Compatibility Mode 5.1+



"… buttons where the Execute Validations attribute is set to Yes also perform some client-side validations (such as item required checks) and will not submit the page until all issues are fixed"

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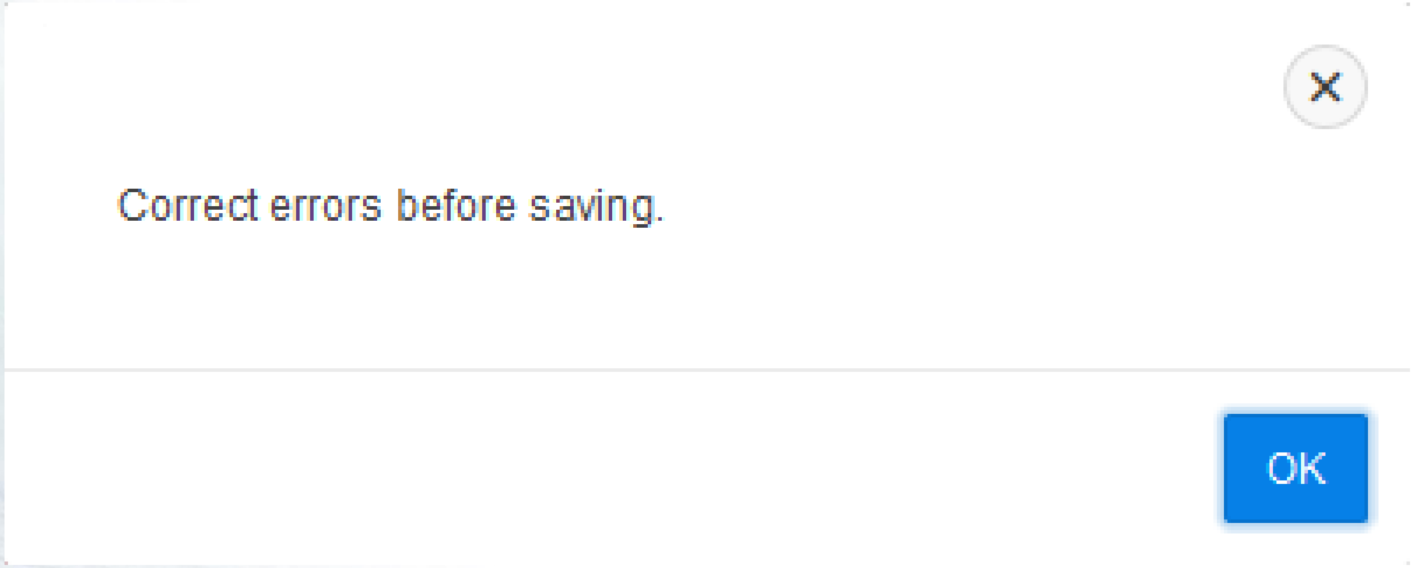
APEX Client-Side Validation



Correct errors before saving.

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Validation / Validity JS APIs

- apex.page.validate
- apex.page.submit({validate:true;});
- apex.page.comfirm({validate:true;})
- apex.item getValidity
- apex.item.setCustomValidity
- apex.message

Demo:
Very Simple Item Validations

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Lots of Validation Options

- Example: “Required”
  - Value Required Attribute (Client)
  - Required Template (Client)
  - Item Not Null Validation (Server)
  - Dynamic Action, JS (Client)

Use Simplest (Declarative) First

Where You Validate Matters

- Client Side
  - Feedback *Before* Submit
  - A Few Declarative Settings
  - Dynamic Actions
- Server Side
  - Feedback *After* Submit
  - Lots of Declarative Options

Use Both!

How You Submit Matters

- Submit
- Dynamic Action → Submit Page
- apex.submit()
- apex.page.submit ({validate:true;})

← **Doesn't Fire Client Side**

Know the Difference

Be Consistent

Don't Leave Holes

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How You Say It Matters

- Default Error Messages
- data-valid-message
- setCustomValidity
- apex.message

Be Informative

Be Consistent!

Where You Say It Matters

- Inline
- Inline and Notification
- Notification
- Error Page

Be Informative

Be Consistent!

Declarative Validations

Do It Declaratively First …

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Declarative Validations (Easy) Stuff…

- Item Types
  - Text, Number, Date Picker
    - Minimum, Maximum, Format
  - Select List, Popup LOV, Shuttle, Radio Group
- Text Subtypes
  - Email
  - Phone
  - URL

Use the Declarative (Easy) Stuff…

- Value Required
- Templates
  - Required
  - Optional
- SubTypes
  - More Work Required …

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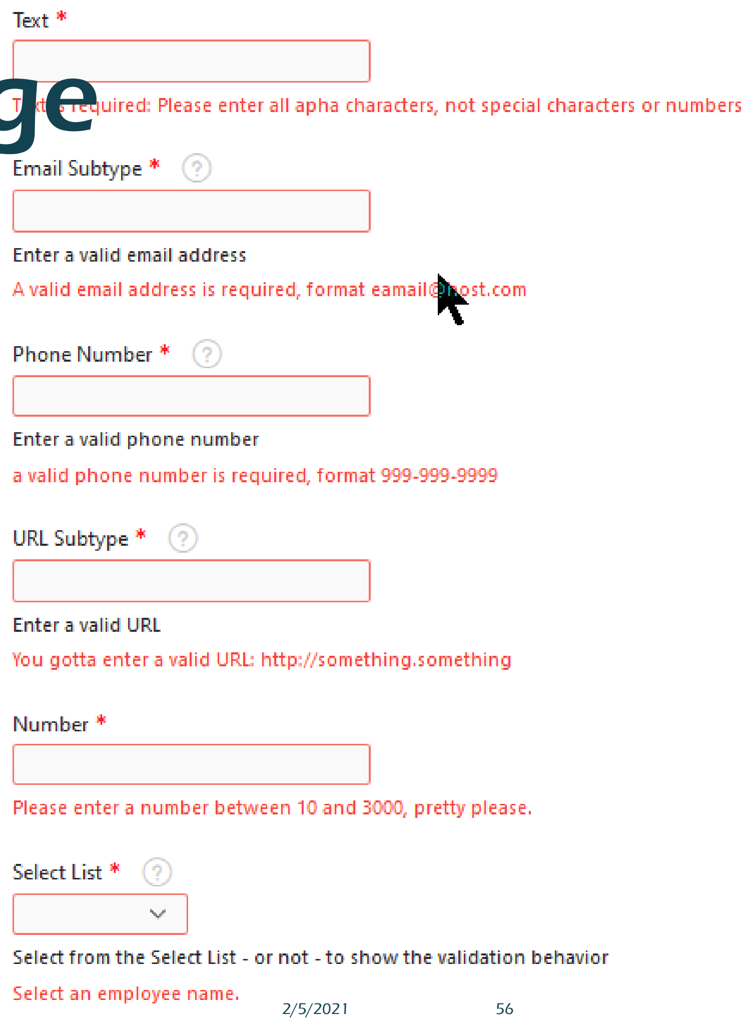
data-valid-message

- Use to Enter a Custom Error Message
  - Instead of "Please fill in <value>."



Text *

Text is required: Please enter all apha characters, not special characters or numbers

Email Subtype *

Enter a valid email address

A valid email address is required, format eamail@host.com

Phone Number *

Enter a valid phone number

a valid phone number is required, format 999-999-9999

URL Subtype *

Enter a valid URL

You gotta enter a valid URL: http://something.something

Number *

Please enter a number between 10 and 3000, pretty please.

Select List *

Select from the Select List - or not - to show the validation behavior

Select an employee name.

Use Conditions to Control When ...

- Validations – (Server Side)
  - Server Side Conditions
  - Client Side Conditions
- Dynamic Actions (Client Side)
  - Server Side Conditions
  - Client Side Conditions

Server-Side Validations

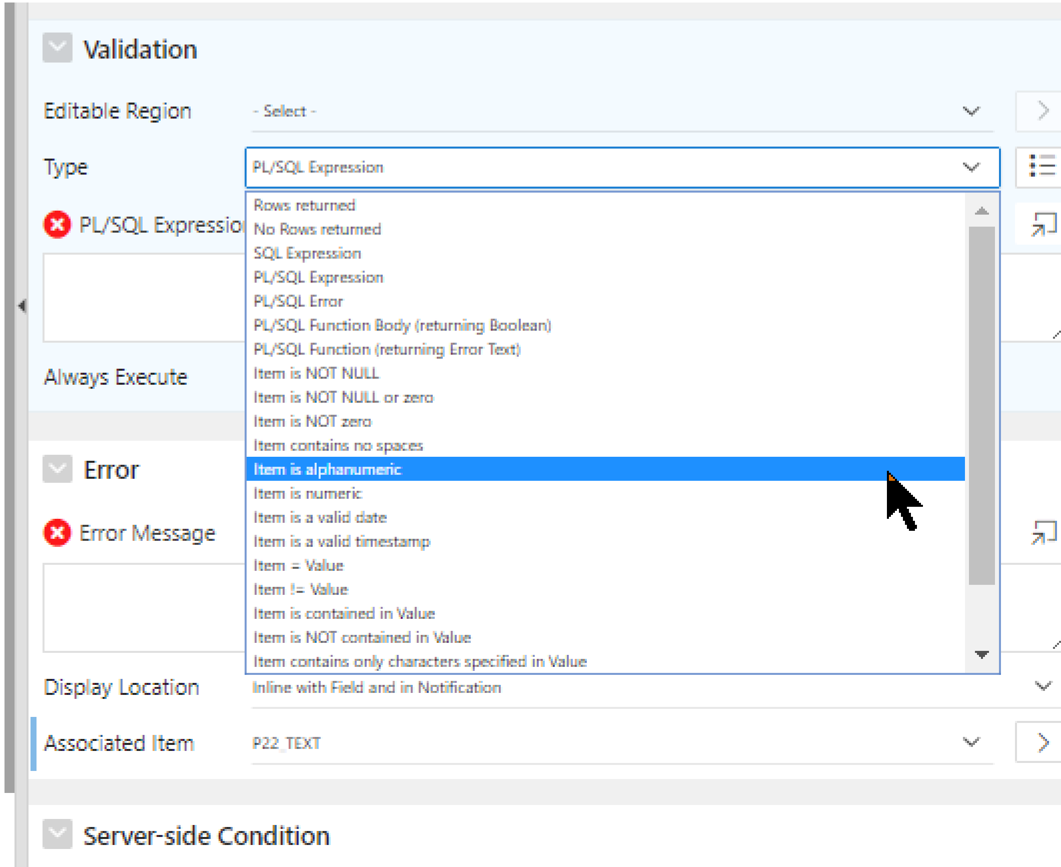
Our Standard APEX Validations …

Server Side Validations

- Fire On Submit
  - IF all Client Side Validations are OK
- Many Declarative Types
- Many Declarative Conditions

Creating a Server-Side Validation

- Simple Page Item
- Many Validation Types!


Validation

Editable Region - Select -

Type PL/SQL Expression

PL/SQL Expressio

Always Execute

Rows returned
No Rows returned
SQL Expression
PL/SQL Expression
PL/SQL Error
PL/SQL Function Body (returning Boolean)
PL/SQL Function (returning Error Text)
Item is NOT NULL
Item is NOT NULL or zero
Item is NOT zero
Item contains no spaces
Item is alphanumeric
Item is numeric
Item is a valid date
Item is a valid timestamp
Item = Value
Item != Value
Item is contained in Value
Item is NOT contained in Value
Item contains only characters specified in Value

Error

Error Message

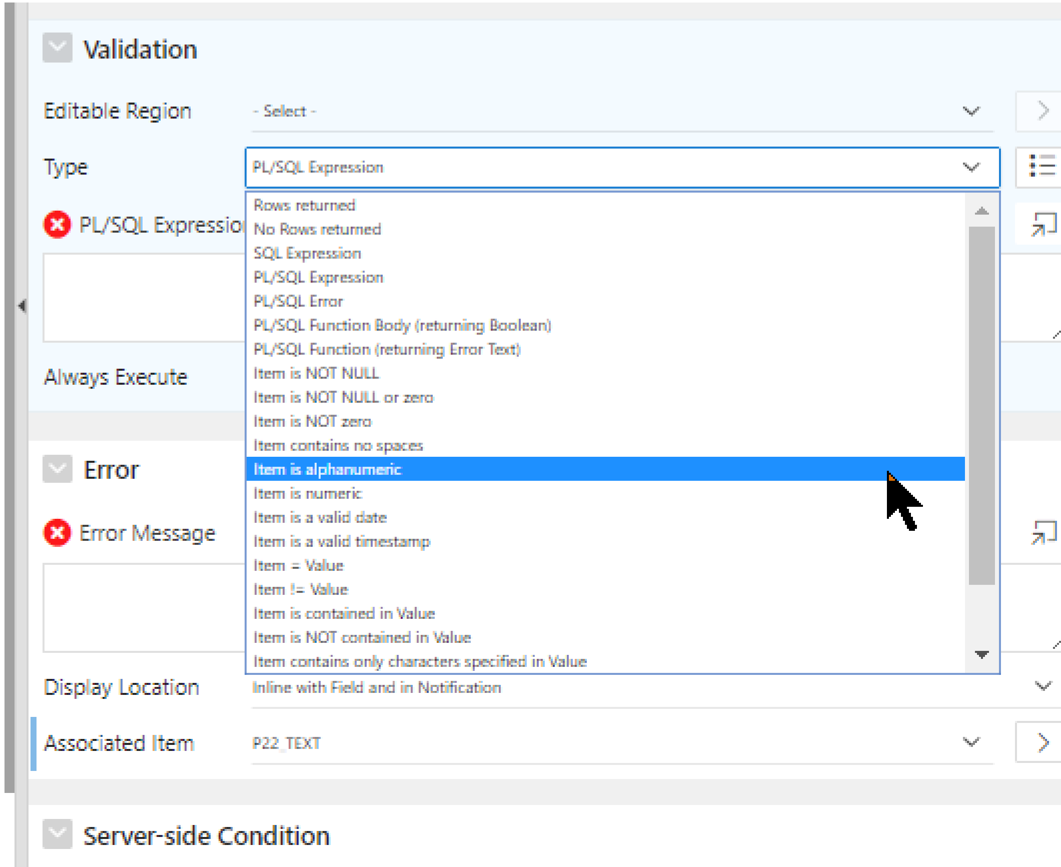
Display Location Inline with Field and in Notification

Associated Item P22_TEXT

Server-side Condition

Creating a Server-Side Validation

- Use Declarative Types First
- PLSQL Expression, Function, etc. Last



Validation

Editable Region - Select -

Type PL/SQL Expression

PL/SQL Expression

Always Execute

Rows returned
No Rows returned
SQL Expression
PL/SQL Expression
PL/SQL Error
PL/SQL Function Body (returning Boolean)
PL/SQL Function (returning Error Text)
Item is NOT NULL
Item is NOT NULL or zero
Item is NOT zero
Item contains no spaces
Item is alphanumeric
Item is numeric
Item is a valid date
Item is a valid timestamp
Item = Value
Item != Value
Item is contained in Value
Item is NOT contained in Value
Item contains only characters specified in Value

Error

Error Message

Display Location Inline with Field and in Notification

Associated Item P22_TEXT

Server-side Condition

Validation Conditions

- Server-Side, When Button Pressed
- Server-Side, Condition
- Client Side, JS Expression

Use The Conditions!
→ Simplify Your Validation Code

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Use The Validation Attributes

- Sequence
- Editable Region (If Validating Item in a Grid)
- Type
- Always Execute

Validation: Error Attributes

- Error Message – Your Consistent Error Message
- Display Location
  - Inline w Field and In Notification
  - Inline w Field
  - Inline in Notification
  - On Error Page
- Associated Item

Client-Side Validations

via Declarative Settings and Dynamic Actions …

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Client Side Validations

- Declarative
  - Required
  - HTML5
- Dynamic Action
  - Execute JavaScript

Validate via Dynamic Actions

- On Change vs. On Lose Focus
  - vs Your Requirements
- Use Conditions on the Dynamic Actions

Improve the Message

Use the JS APIs to Tailor the Message and Be Consistent

Use the Documented JS APIs

- apex.oracle.com/api → JavaScript APIs
  - apex.item
  - apex.message
  - apex.model
  - Interactive Grid APIs

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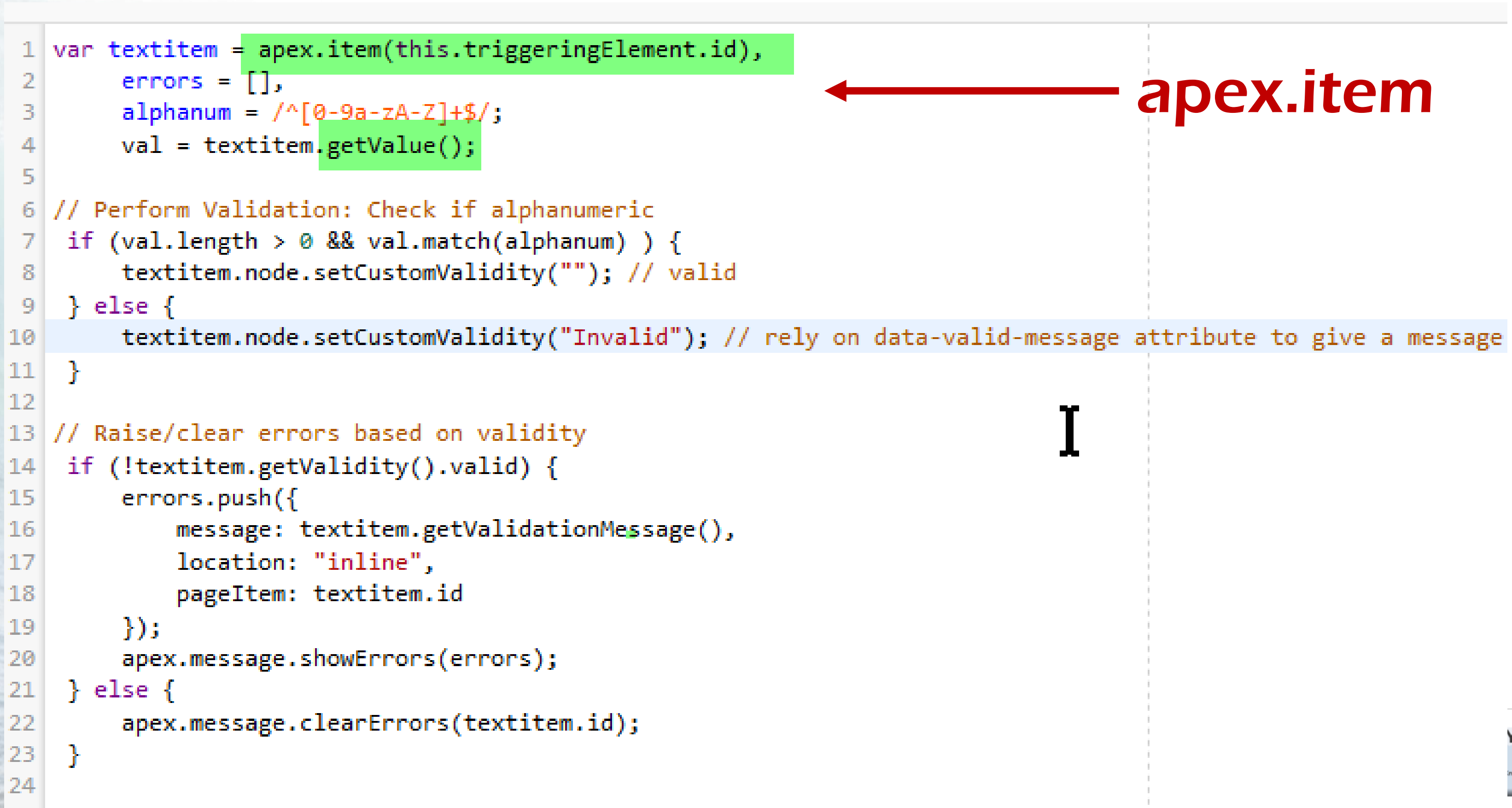
Example JS Validate



```
var textitem = apex.item(this.triggeringElement.id),
     errors = [],
     alphanum = /^[0-9a-zA-Z]+$/;
     val = textitem.getValue();

// Perform Validation: Check if alphanumeric
 if (val.length > 0 && val.match(alphanum) ) {
     textitem.node.setCustomValidity(""); // valid
 } else {
     textitem.node.setCustomValidity("Invalid"); // rely on data-valid-message attribute to give a message
 }

// Raise/clear errors based on validity
 if (!textitem.getValidity().valid) {
     errors.push({
         message: textitem.getValidationMessage(),
         location: "inline",
         pageItem: textitem.id
     });
     apex.message.showErrors(errors);
 } else {
     apex.message.clearErrors(textitem.id);
 }
```

apex.item

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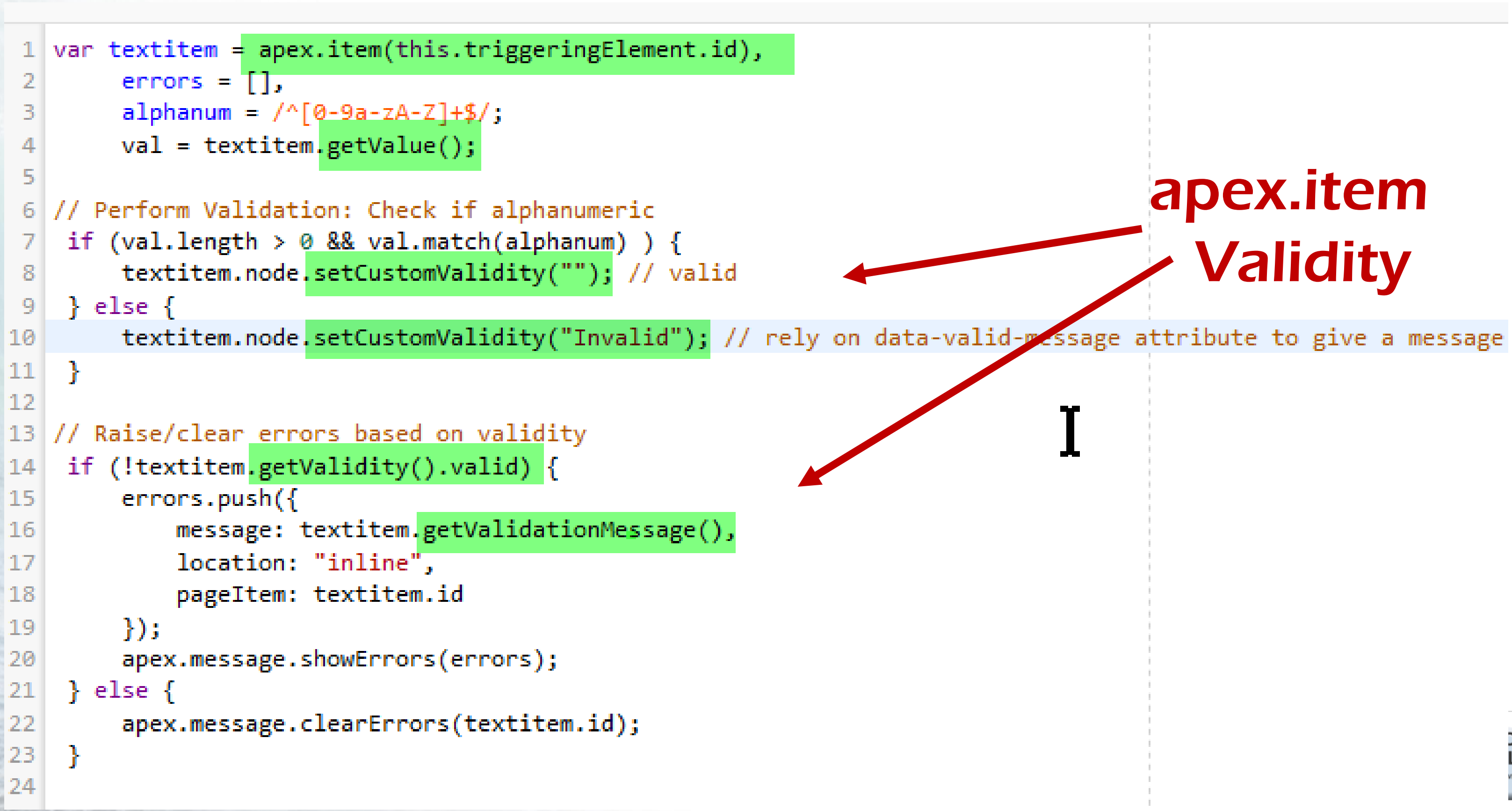
Example JS Validate



```
var textitem = apex.item(this.triggeringElement.id),
     errors = [],
     alphanum = /^[0-9a-zA-Z]+$/;
     val = textitem.getValue();

// Perform Validation: Check if alphanumeric
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 if (!textitem.getValidity().valid) {
     errors.push({
         message: textitem.getValidationMessage(),
         location: "inline",
         pageItem: textitem.id
     });
     apex.message.showErrors(errors);
 } else {
     apex.message.clearErrors(textitem.id);
 }
```
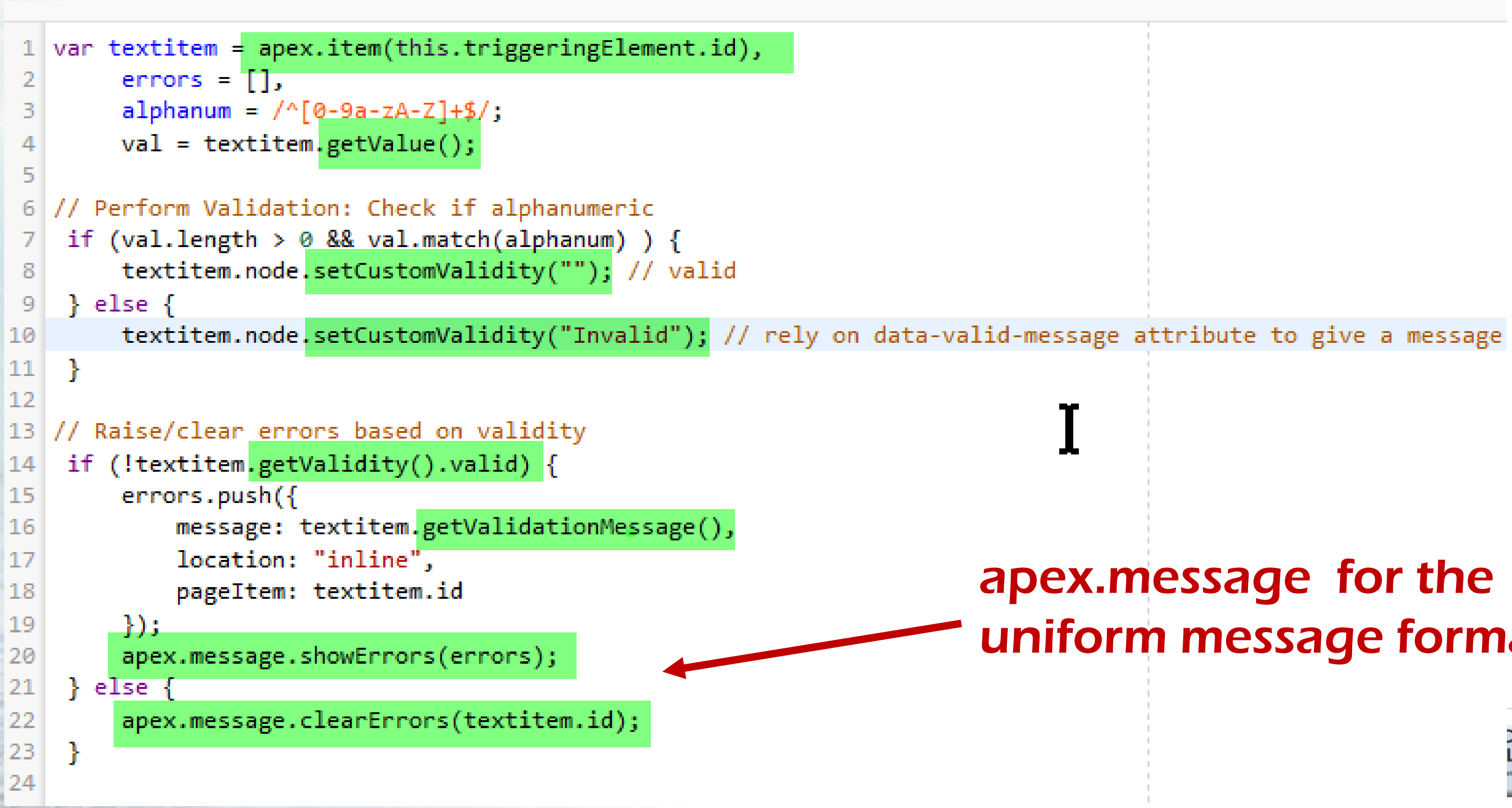

Example JS Validate



```
var textitem = apex.item(this.triggeringElement.id),
     errors = [],
     alphanum = /^[0-9a-zA-Z]+$/;
     val = textitem.getValue();

// Perform Validation: Check if alphanumeric
 if (val.length > 0 && val.match(alphanum) ) {
     textitem.node.setCustomValidity(""); // valid
 } else {
     textitem.node.setCustomValidity("Invalid"); // rely on data-valid-message attribute to give a message
 }

// Raise/clear errors based on validity
 if (!textitem.getValidity().valid) {
     errors.push({
         message: textitem.getValidationMessage(),
         location: "inline",
         pageItem: textitem.id
     });
     apex.message.showErrors(errors);
 } else {
     apex.message.clearErrors(textitem.id);
 }

```

apex.message for the uniform message format

Validation in Interactive Grids

Apply the Same Server-Side/Client Side Strategy …

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In General

- Each Column Is An Item
- Validations and Dynamic Actions Work the Same as Page Items
- :COLUMN_NAME Bind Reference

The Same Stuff Applies!

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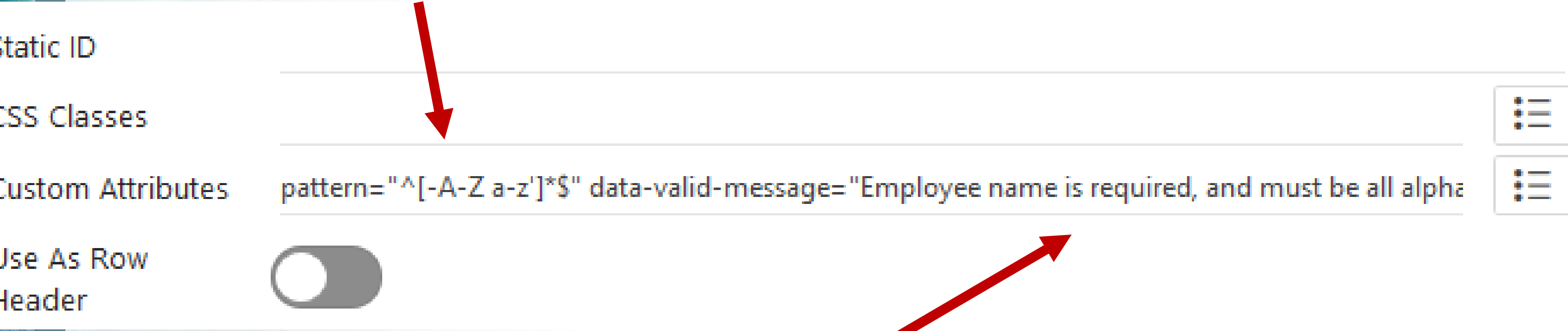
Grid Validation - EName

- EName Must Be Alpha



tatic ID	
SS Classes	
ustom Attributes	pattern="^[-A-Z a-z']*$" data-valid-message="Employee name is required, and must be all alpha
se As Row Header	

- Custom Message

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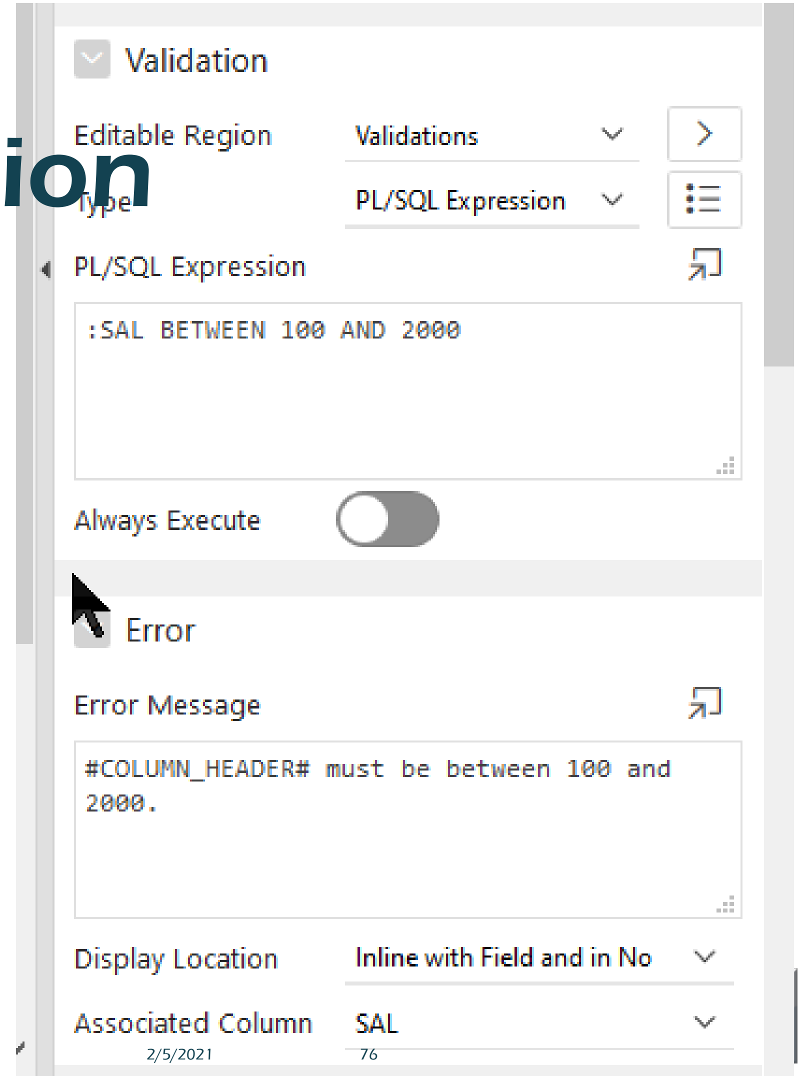
Example Grid Validation

- Server-Side

Salary Between 100 and 2000


Validation

Editable Region: Validations

Type: PL/SQL Expression

PL/SQL Expression

```
:SAL BETWEEN 100 AND 2000
```

Always Execute

Error

Error Message

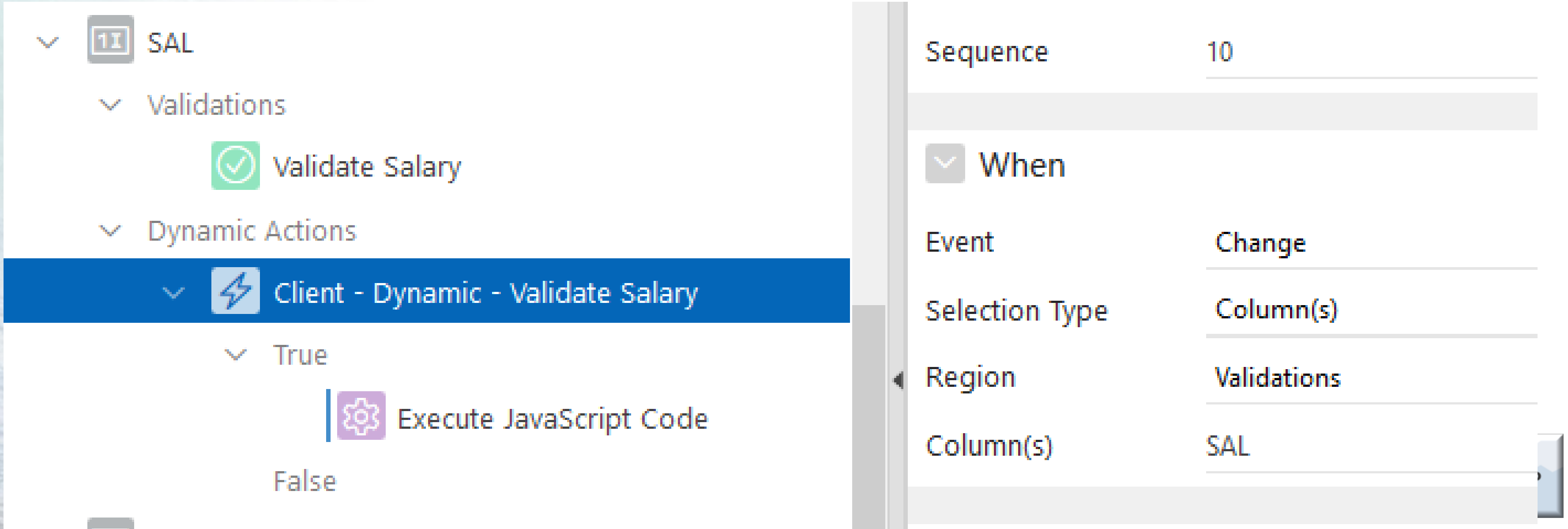
```
#COLUMN_HEADER# must be between 100 and 2000.
```

Display Location: Inline with Field and in No

Associated Column: SAL

Client-Side Grid Validation - Item

- Dynamic Action
  - On Change



SAL
Validations
Validate Salary
Dynamic Actions
Client - Dynamic - Validate Salary
True
Execute JavaScript Code
False

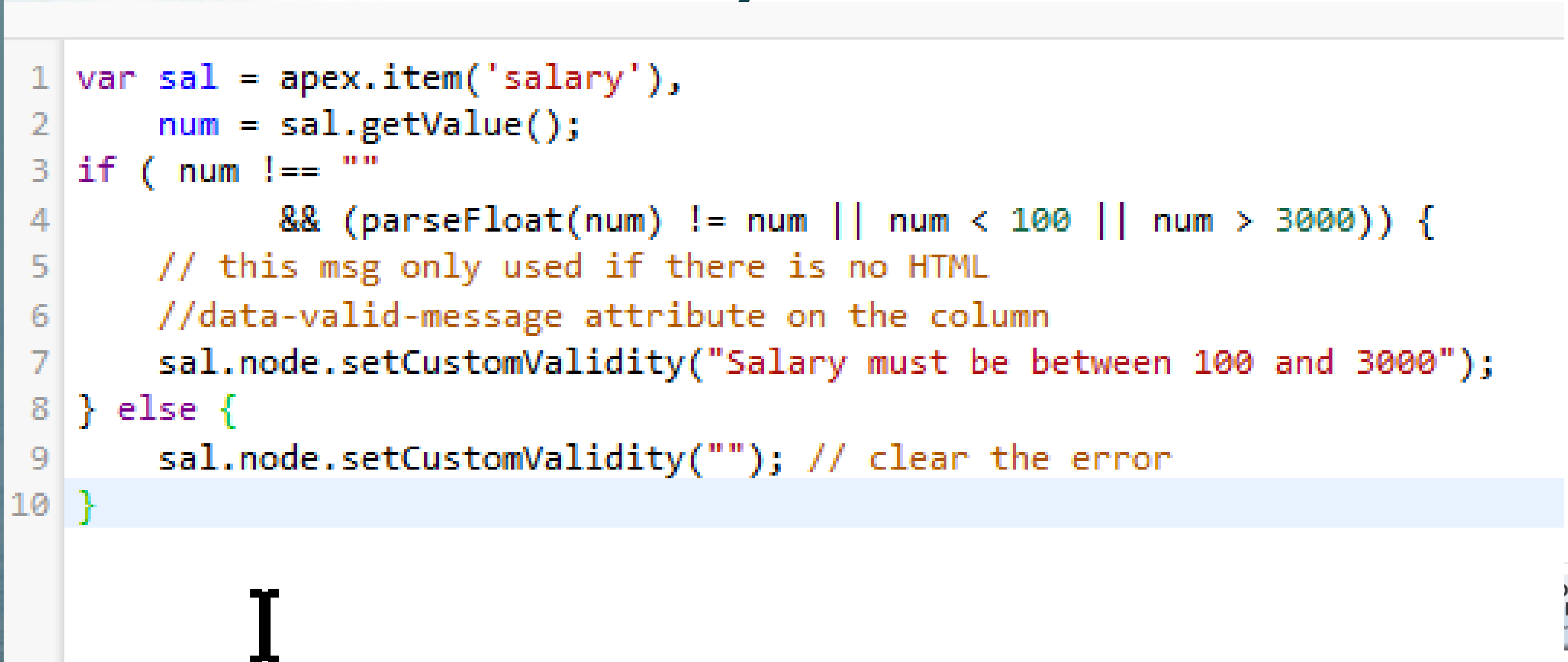
Sequence	10

When

Event	Change
Selection Type	Column(s)
Region	Validations
Column(s)	SAL

Grid Validation - Salary

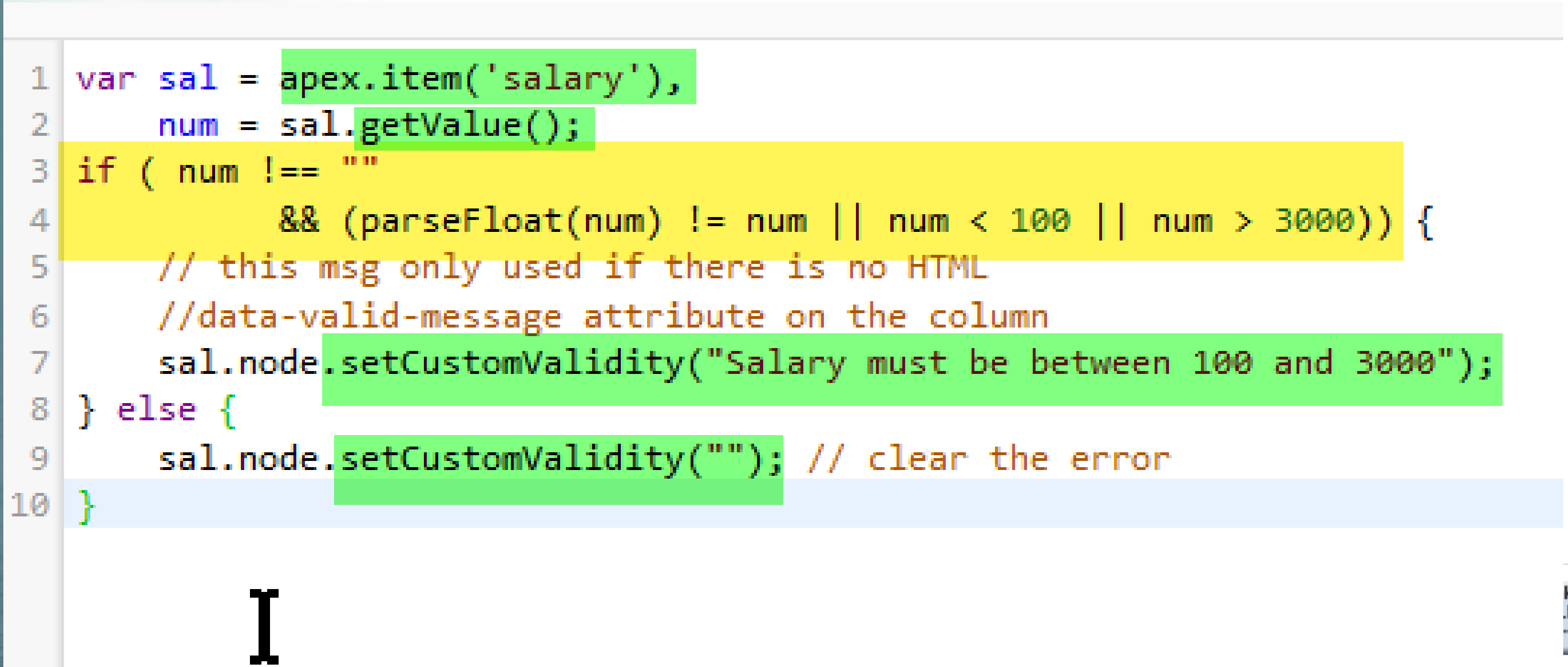
- Client-Side Salary Betw100 and 3000



```
var sal = apex.item('salary'),
    num = sal.getValue();
if ( num !== ""
        && (parseFloat(num) != num || num < 100 || num > 3000)) {
    // this msg only used if there is no HTML
    //data-valid-message attribute on the column
    sal.node.setCustomValidity("Salary must be between 100 and 3000");
} else {
    sal.node.setCustomValidity(""); // clear the error
}
```

Grid Validation – Dyn Action Salary

- Salary Betw100 and 3000



```
var sal = apex.item('salary'),
    num = sal.getValue();
if ( num !== ""
         && (parseFloat(num) != num || num < 100 || num > 3000)) {
    // this msg only used if there is no HTML
    //data-valid-message attribute on the column
    sal.node.setCustomValidity("Salary must be between 100 and 3000");
} else {
    sal.node.setCustomValidity(""); // clear the error
}
```

Demo: Interactive Grid Validations

Basic Interactive Grid Validations

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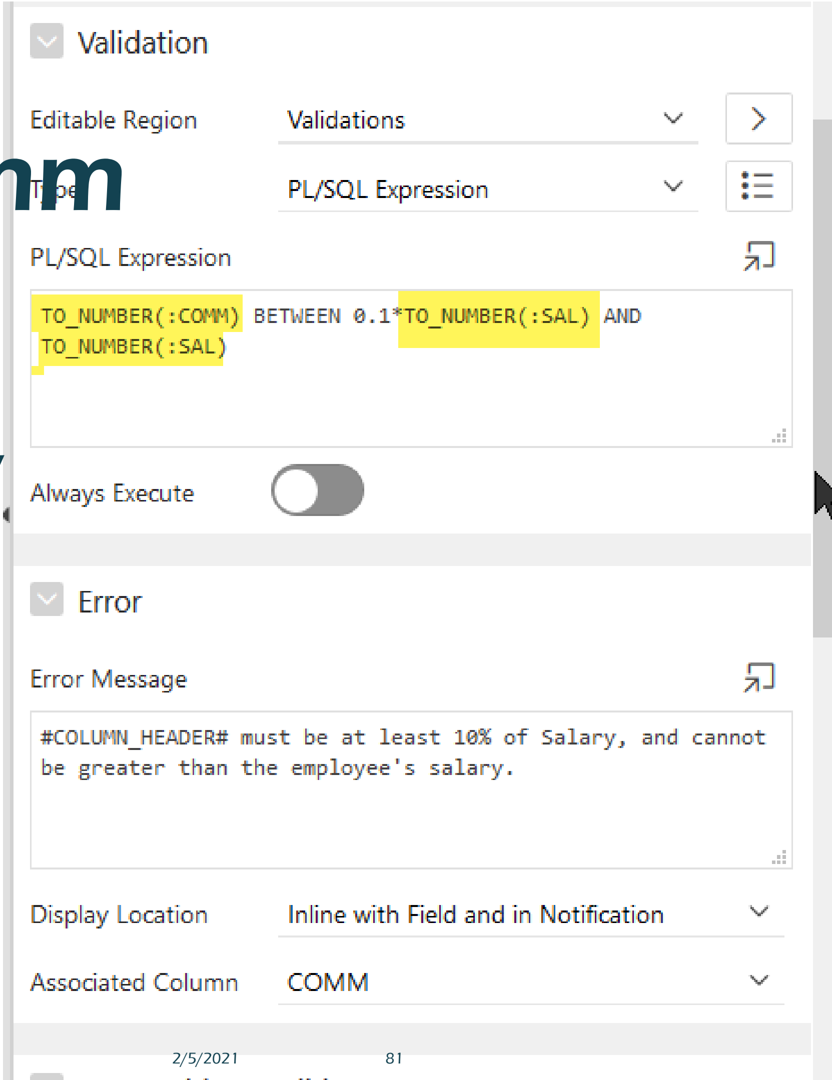
Grid Validation - Comm

- Server-Side - Row

Between 10% of Salary and Not > Salary



Editable Region: Validations

Type: PL/SQL Expression

PL/SQL Expression

```
TO_NUMBER(:COMM) BETWEEN 0.1*TO_NUMBER(:SAL) AND
TO_NUMBER(:SAL)
```

Always Execute: Off

Error Message

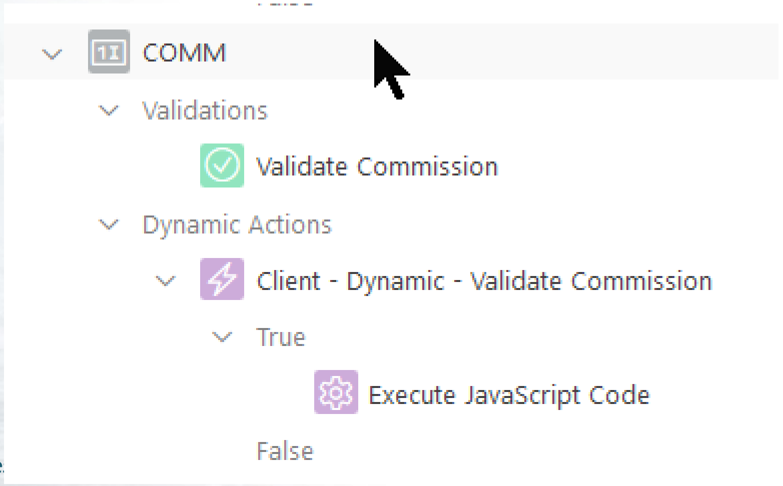
```
#COLUMN_HEADER# must be at least 10% of Salary, and cannot
be greater than the employee's salary.
```

Display Location: Inline with Field and in Notification

Associated Column: COMM

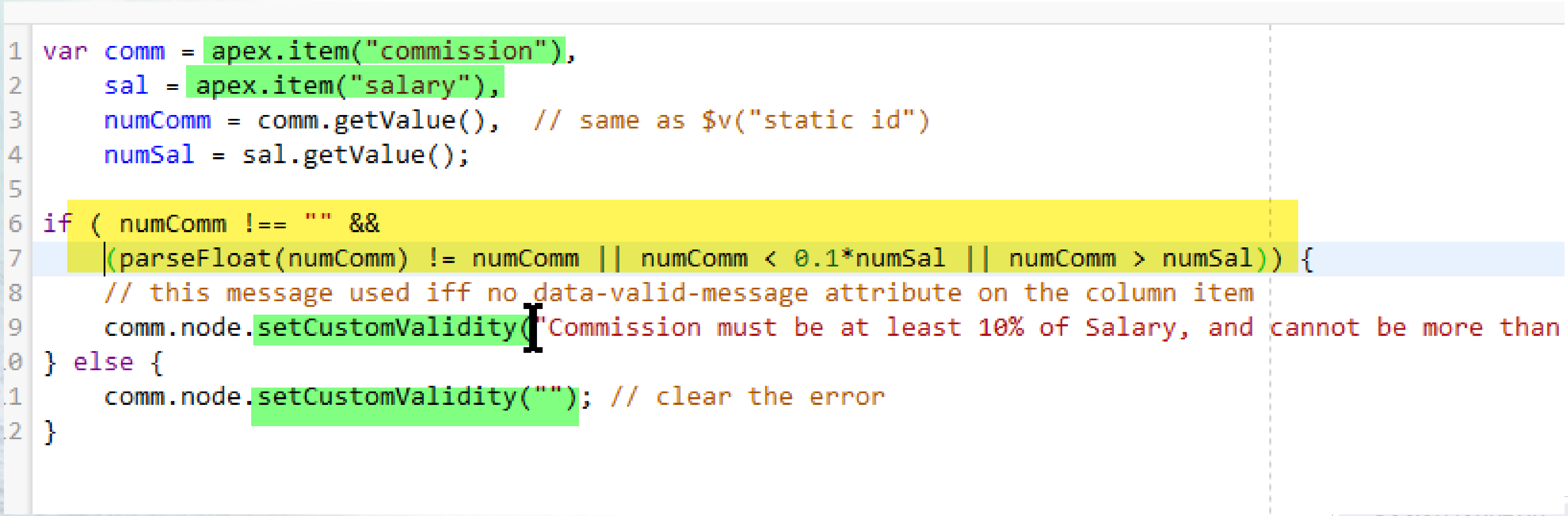
Grid Validation – Client Side -Row

- Dynamic Action
  - On Change
    - Execute JavaScript


COMM
Validations
Validate Commission
Dynamic Actions
Client - Dynamic - Validate Commission
True
Execute JavaScript Code
False

Grid Validation – DA - Commission

- 10% Sal < Commission < Salary



```
var comm = apex.item("commission"),
    sal = apex.item("salary"),
    numComm = comm.getValue(),  // same as $v("static id")
    numSal = sal.getValue();

if ( numComm !== "" &&
    (parseFloat(numComm) != numComm || numComm < 0.1*numSal || numComm > numSal)) {
    // this message used iff no data-valid-message attribute on the column item
    comm.node.setCustomValidity("Commission must be at least 10% of Salary, and cannot be more than
} else {
    comm.node.setCustomValidity(""); // clear the error
}
```

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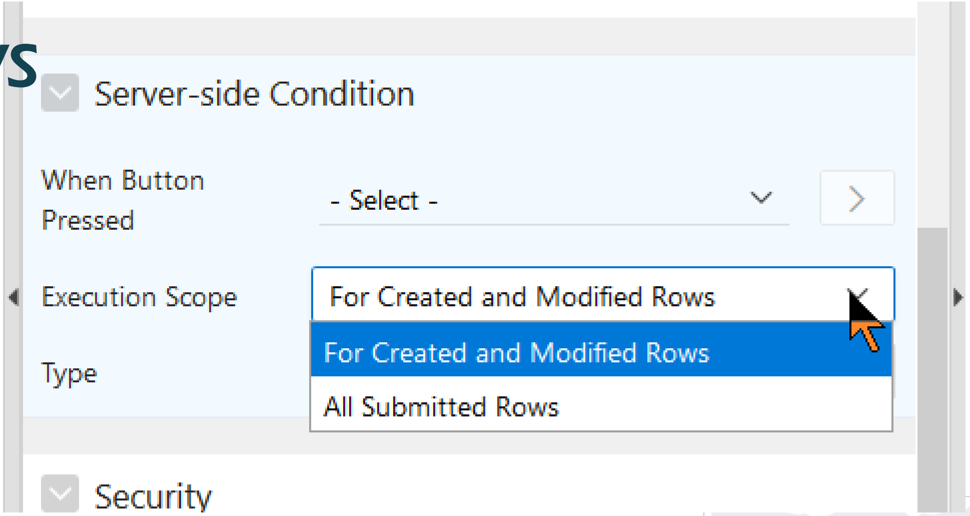
Why Did My Grid Validation Not Fire?

- Grid Validation Settings
  - Created and Modified Rows
  - All Submitted Rows

"Submitted Rows" … Not All Rows Get Submitted!


Server-side Condition

When Button Pressed: - Select -

Execution Scope: For Created and Modified Rows

General Validation Strategy

Cover All the Bases …

General APEX Validation Strategy

- Do It Declaratively First
- Create Server Side
- Create Client Side
- Be Consistent !
  - Same Validations
  - Same Informative Messages
  - Help Gives Same Messages

More Validations == More Testing

- Check for Requirements
  - Is All Validated That Should Be?
- Check Everything Fires When It Should
  - Validation Holes?
- Check User Experience

Validations ~ Summary

- Database Design – Final Data Check
- Server Side – Final App Check
- Client Side – Immediate Feedback

Take The Time to

Secure All Fronts!

Some APEX Validations Homework …

APEX Validations ~ Homework

- References
- Sample DB App
- Sample Grids App
- IG Cookbook
- Grids – Learn the APIs
- Know What Fires When and Why
- Adjust the Samples For Your Requirements

Learn More!

- Sample, Productivity Applications
- APEX Video Training
- apex.world
- apex.oracle.com

~Break ~

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Standards

Why Standardize?

- User Experience
- User Sanity (Your Reputation)
- Developer Development and Maintenance
- Developer Sanity

Standardize: User Experience

- Item, Column Names, Types, Order, Size
- Layouts, Toolbar Configuration
- Button Names, Placement, Actions
  - "Add Row" vs "Add Employee"
  - Text vs Icons vs Both
- Pagination, # Rows Displayed, Shading

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Standardize: Developer Experience

- No Guessing
- No Reinventing the Wheel
- Directions
- Common Code Base, Settings
- Use Your JavaScript Experts

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Standardize

1. Have Standards
2. Use Your Standards
3. **Share** Configuration Settings, Code
4. **Really** Use Your Standards

Let's Focus …

STANDARDIZE
Your
Interactive Grids

Why ~ How ~ Best Practices

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What is Oracle APEX?

Oracle Application Express (APEX) is a low-code development platform that enables you to build scalable, secure enterprise apps, with world-class features, that can be deployed anywhere.

Interactive Grid Customization
Leaves
LOW CODE
Behind …

So … **Standardize**

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ANY ~~Interactive Grid~~ Customization Leaves LOW CODE Behind

So … **Standardize**

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Interactive Grid

(Interactive Report or Tabular Form)

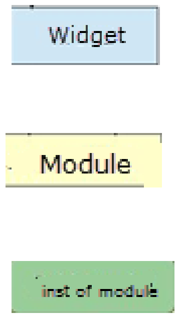
+ <All the Features You Ever Wanted>

(Thank You APEX Team!)

____

Interactive Grid

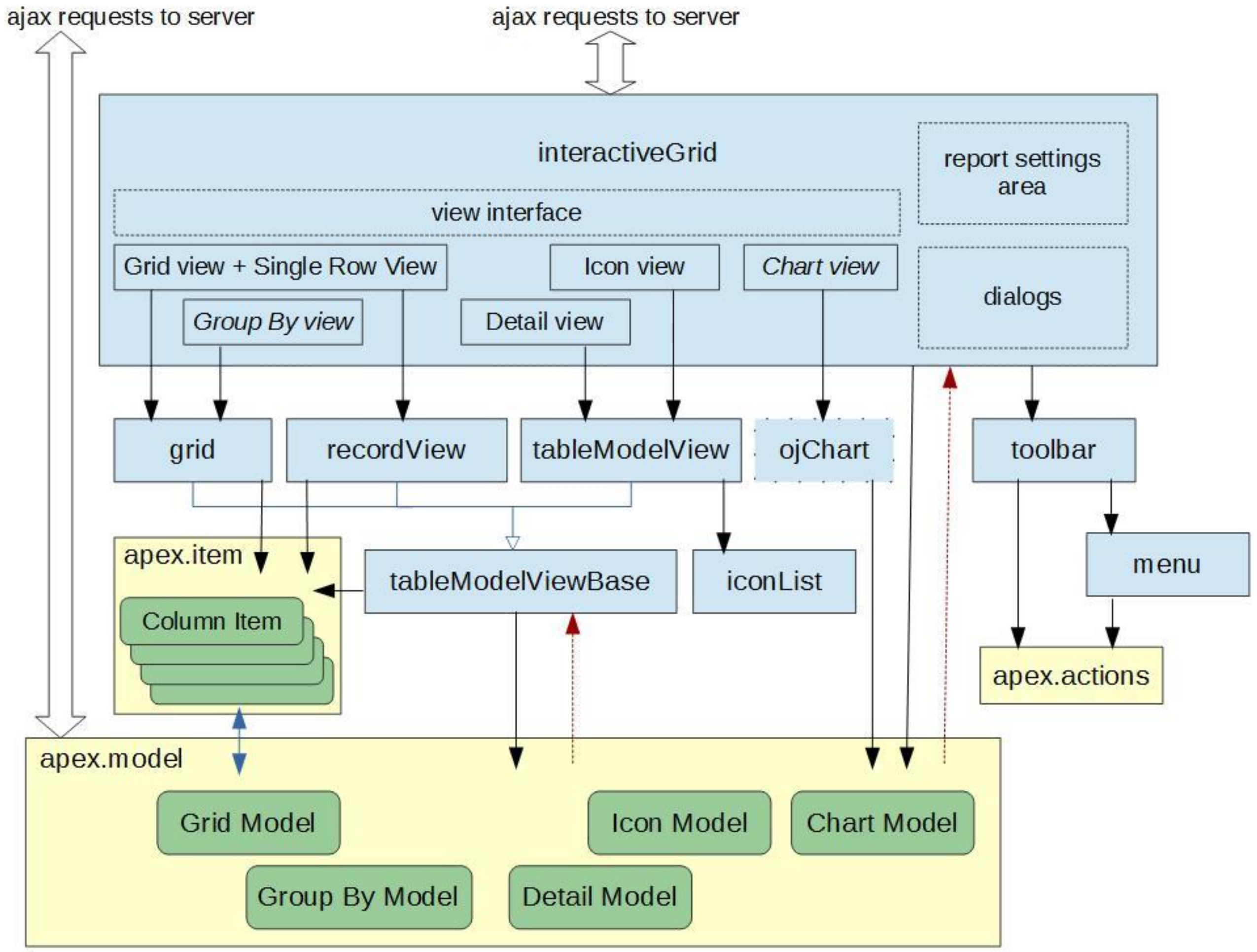
IGrid Architecture



[Interactive Grid – Under the Hood](http://hardlikesoftware.com/weblog/2016/06/08/interactive-grid-under-the-hood/)

J Snyders

http://hardlikesoftware.com/weblog/2016/06/08/interactive-grid-under-the-hood/


ajax requests to server
ajax requests to server
interactiveGrid
report settings area
view interface
Grid view + Single Row View
Icon view
Chart view
Group By view
Detail view
dialogs
grid
recordView
tableModelView
ojChart
toolbar
menu
apex.item
Column Item
tableModelViewBase
iconList
apex.actions
apex.model
Grid Model
Icon Model
Chart Model
Group By Model
Detail Model

Settings and Configurations

- Do It Declaratively First

LOW CODE

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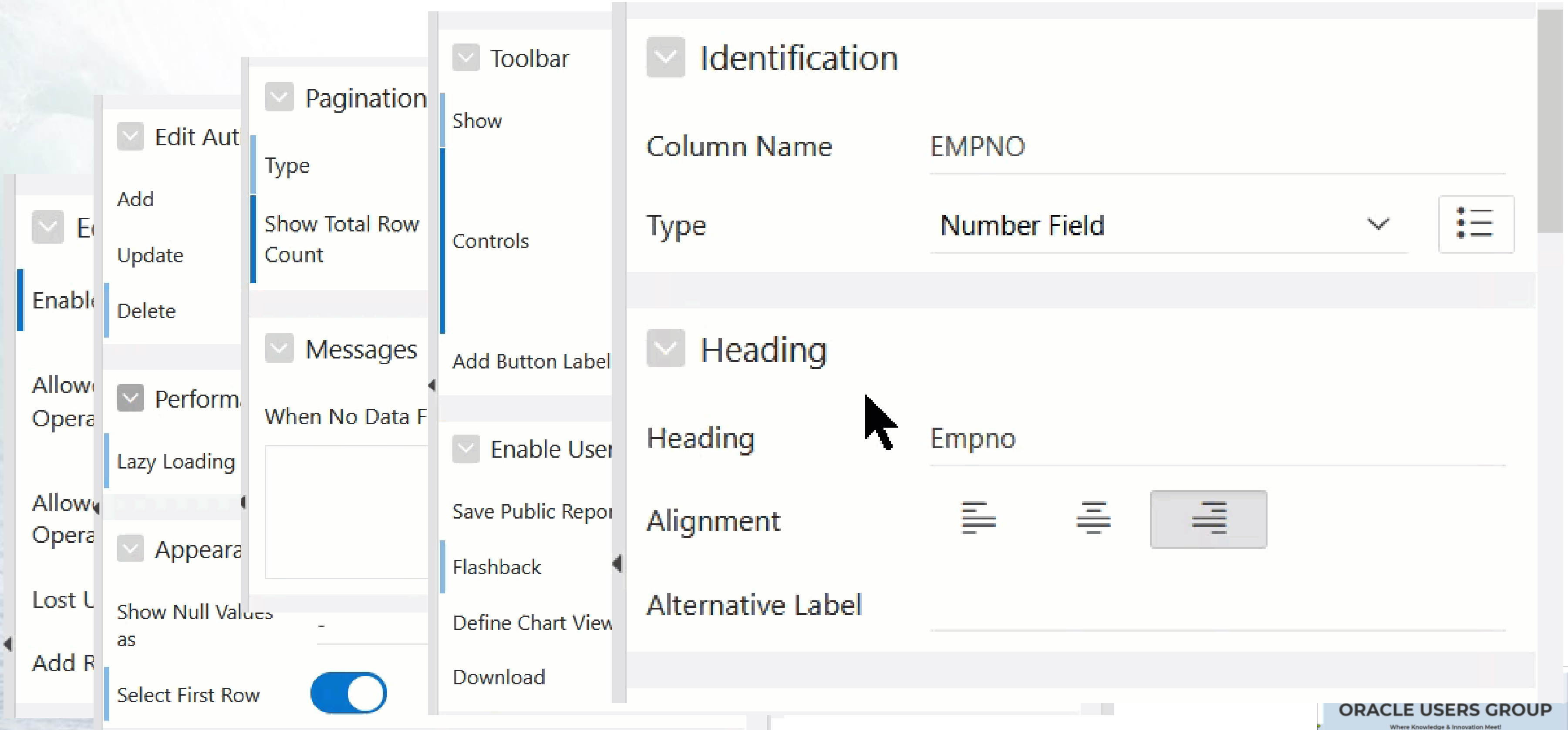
Lots of Declarative Settings



E
Enabl
Allow
Opera
Allow
Opera
Lost U
Add R

Edit Aut
Add
Update
Delete
Perform
Lazy Loading
Appeara
Show Null Values as -
Select First Row

Pagination
Type
Show Total Row Count
Messages
When No Data F

Toolbar
Show
Controls
Add Button Label
Enable User
Save Public Repor
Flashback
Define Chart View
Download

Identification

Column Name	EMPNO
Type	Number Field

Heading

Heading	Empno
Alignment	
Alternative Label	

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Not All is Declarative …

- Turn Column Header Off
- Add/Remove Toolbar Buttons /Actions
- Add/Remove Action Menu Options

Not All is Declarative …

- Turn Column Header Off
  - Code in Column Advanced → JavaScript
- Add/Remove Toolbar Buttons /Actions
  - Code in Grid Advanced → JavaScript
- Add/Remove Action Menu Options
  - Code in Page Advanced → JavaScript

Most Grids are a Combination

- Declarative
- Customizations

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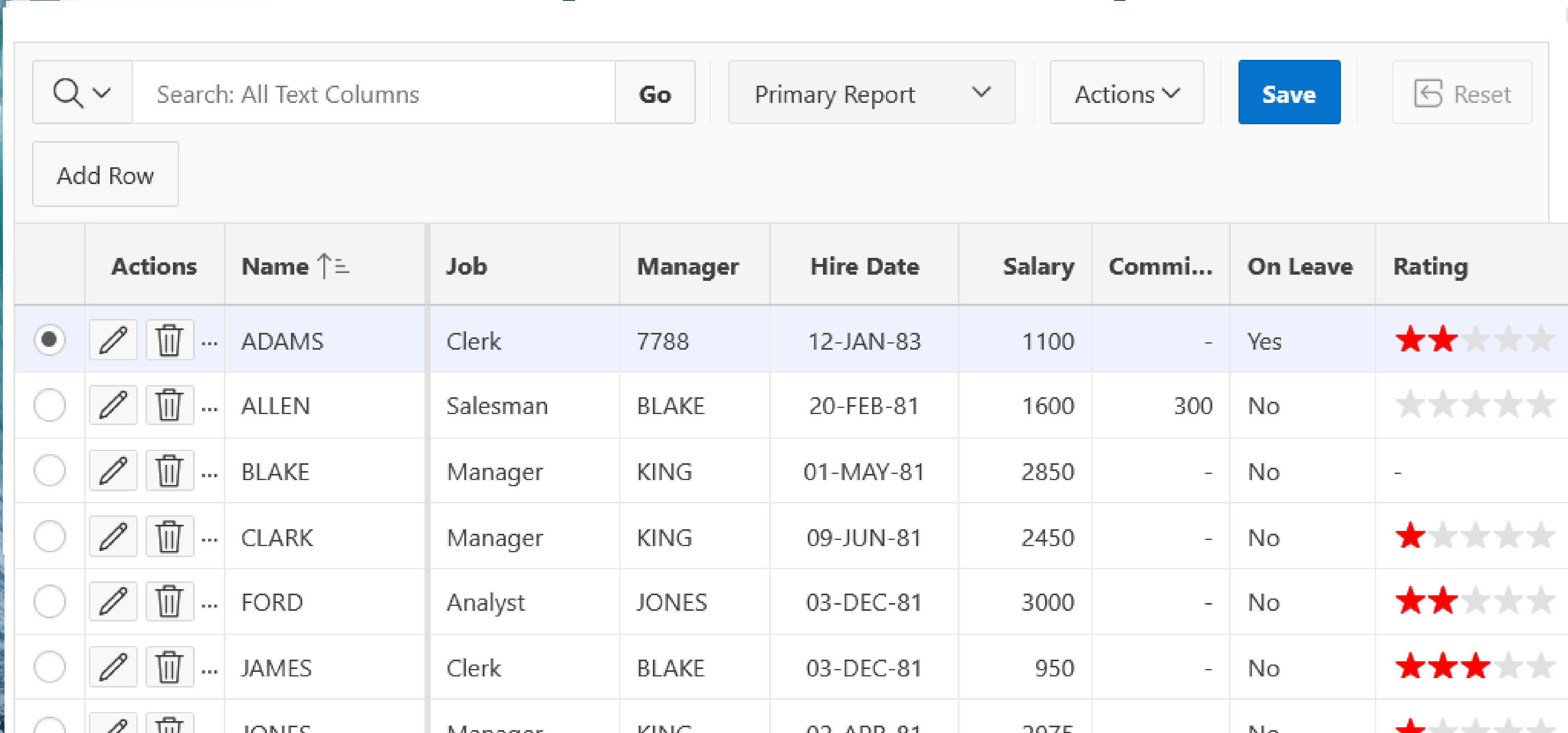
TH TECHNOLOGY

Grid Configuration Examples



	Actions	Name	Job	Manager	Hire Date	Salary	Commi...	On Leave	Rating
●	...	ADAMS	Clerk	7788	12-JAN-83	1100	-	Yes	★★☆☆☆
○	...	ALLEN	Salesman	BLAKE	20-FEB-81	1600	300	No	☆☆☆☆☆
○	...	BLAKE	Manager	KING	01-MAY-81	2850	-	No	-
○	...	CLARK	Manager	KING	09-JUN-81	2450	-	No	★☆☆☆☆
○	...	FORD	Analyst	JONES	03-DEC-81	3000	-	No	★★☆☆☆
○	...	JAMES	Clerk	BLAKE	03-DEC-81	950	-	No	★★★☆☆
○	...	JONES	Manager	KING	02-APR-81	2975	-	No	★☆☆☆☆

Grid Customization Examples

- We can customize Grid columns to behave like these …

Consider …

- 5 Developers ➔ 5 Different Grids
- 5 Developers, Same App

  ➔ 5 Different Grids

COMMUNICATE

SHARE

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Consider ...

- 1 Developer, 5 Days
  ➔ 5 Different Grids
- 1 Developer, 5 Apps
  ➔ 5 Different Grids

STANDARDS ...

SLEEP or COFFEE or SANITY

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Mixed Up Application Examples

- Different Grid Appearance
- Different Grid Functions
- Different Column Names, Order, Size
- Different Pagination
- Different Edit Modes, Validations, Messages

W/O Standards, Stuff Happens

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Grid Standards

- Features
  - Buttons, Pagination, Actions, Shortcuts
  - Views: Chart, GB, Icon, Detail
- Template
- Column
  - Name, Format, Alignment, Order

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How to Standardize Grids

- Cheat Sheet of Grid Settings, Config
- Build One and Copy/Duplicate
- Build a Plugin
- Use a Plugin*
- Use a Common Configuration File

Let's Take A Look ...

Do It Declaratively First

… but Be Careful w Declarative in Combo w Customizations

(Don't Hang Yourself)

- Example of Declaratively Turning Off Edit, Save button
- Custom Code to Limit Buttons

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- Example of Column Heading Settings
- Custom Code for 3 types of settings, mix of declarative and code
- Freeze vs noHeaderActivate and Sort
- noReorder

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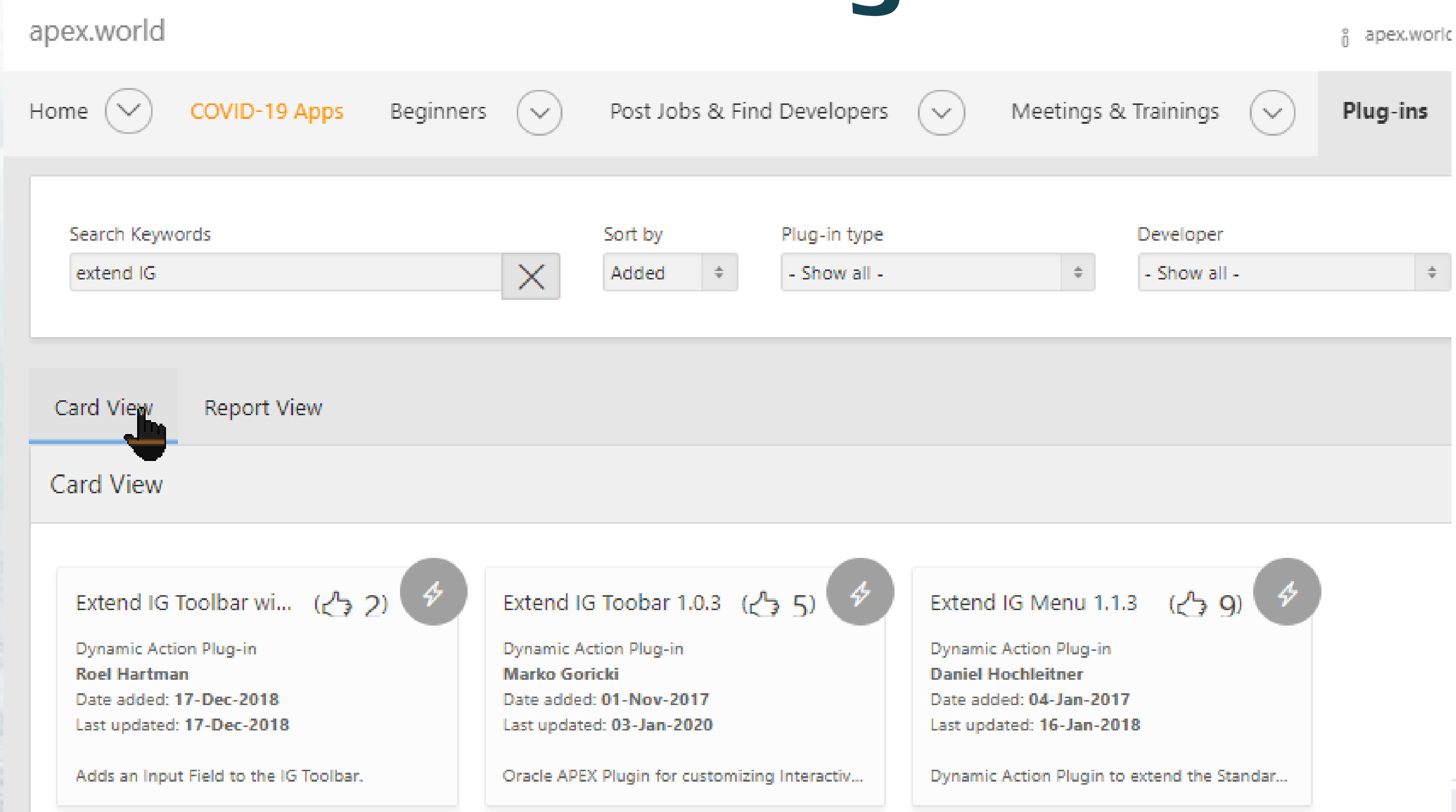
There's A Plugin for That ...

There's A Few Plugins Now…



apex.world

apex.world

Home | COVID-19 Apps | Beginners | Post Jobs & Find Developers | Meetings & Trainings | Plug-ins

Search Keywords	Sort by	Plug-in type	Developer
extend IG	Added	- Show all -	- Show all -

Card View | Report View

Card View

Extend IG Toolbar wi… (2)
Dynamic Action Plug-in
Roel Hartman
Date added: **17-Dec-2018**
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Adds an Input Field to the IG Toolbar.

Extend IG Toobar 1.0.3 (5)
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Dynamic Action Plugin to extend the Standar…

- Using A Plugin **Does NOT Standardize !**
- Just Makes It Easier (Less Code) to Customize …

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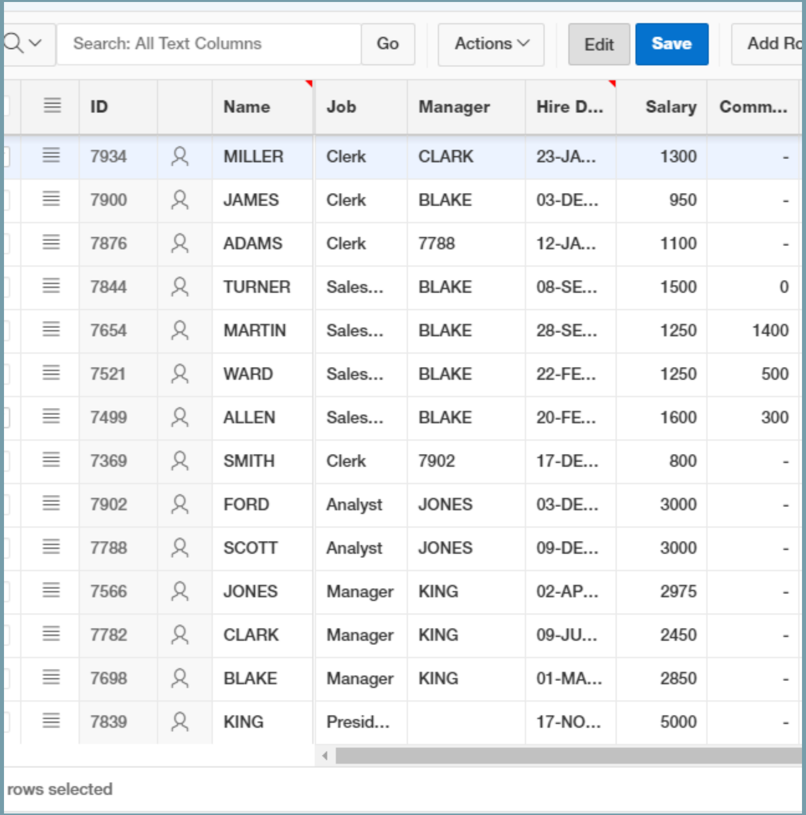
Standards

Meet the JavaScript APIs



ID		Name	Job	Manager	Hire D...	Salary	Comm...
7934		MILLER	Clerk	CLARK	23-JA...	1300	-
7900		JAMES	Clerk	BLAKE	03-DE...	950	-
7876		ADAMS	Clerk	7788	12-JA...	1100	-
7844		TURNER	Sales...	BLAKE	08-SE...	1500	0
7654		MARTIN	Sales...	BLAKE	28-SE...	1250	1400
7521		WARD	Sales...	BLAKE	22-FE...	1250	500
7499		ALLEN	Sales...	BLAKE	20-FE...	1600	300
7369		SMITH	Clerk	7902	17-DE...	800	-
7902		FORD	Analyst	JONES	03-DE...	3000	-
7788		SCOTT	Analyst	JONES	09-DE...	3000	-
7566		JONES	Manager	KING	02-AP...	2975	-
7782		CLARK	Manager	KING	09-JU...	2450	-
7698		BLAKE	Manager	KING	01-MA...	2850	-
7839		KING	Presid...		17-NO...	5000	-

rows selected

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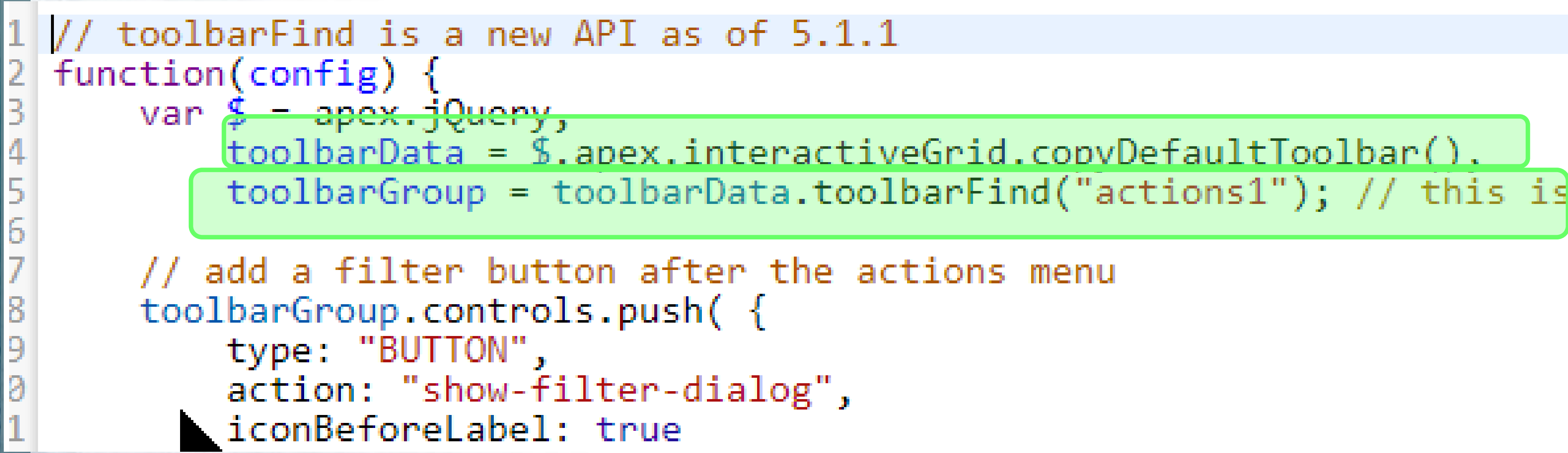
Documented APIs

- APEX 18.1+
- Documented == **Supported**

https://apex.oracle.com/api

#39 JavaScript APIs

interactiveGrid - Customizations



```
// toolbarFind is a new API as of 5.1.1
function(config) {
    var $ = apex.jQuery,
        toolbarData = $.apex.interactiveGrid.copyDefaultToolbar(),
        toolbarGroup = toolbarData.toolbarFind("actions1"); // this is

    // add a filter button after the actions menu
    toolbarGroup.controls.push( {
        type: "BUTTON",
        action: "show-filter-dialog",
        iconBeforeLabel: true
```

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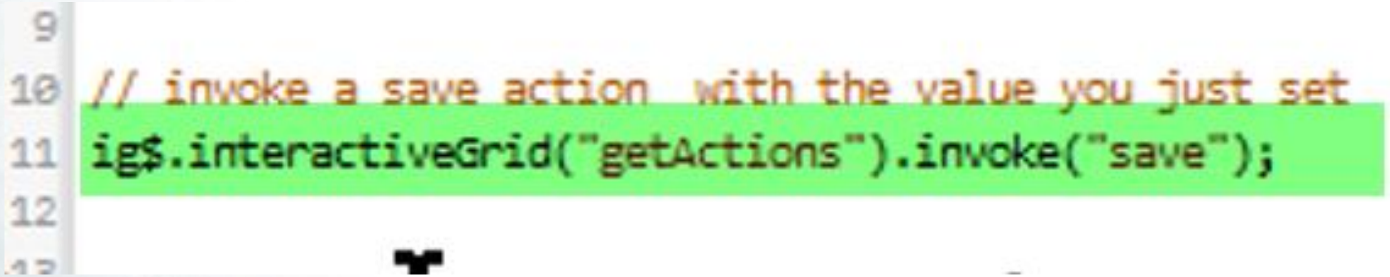
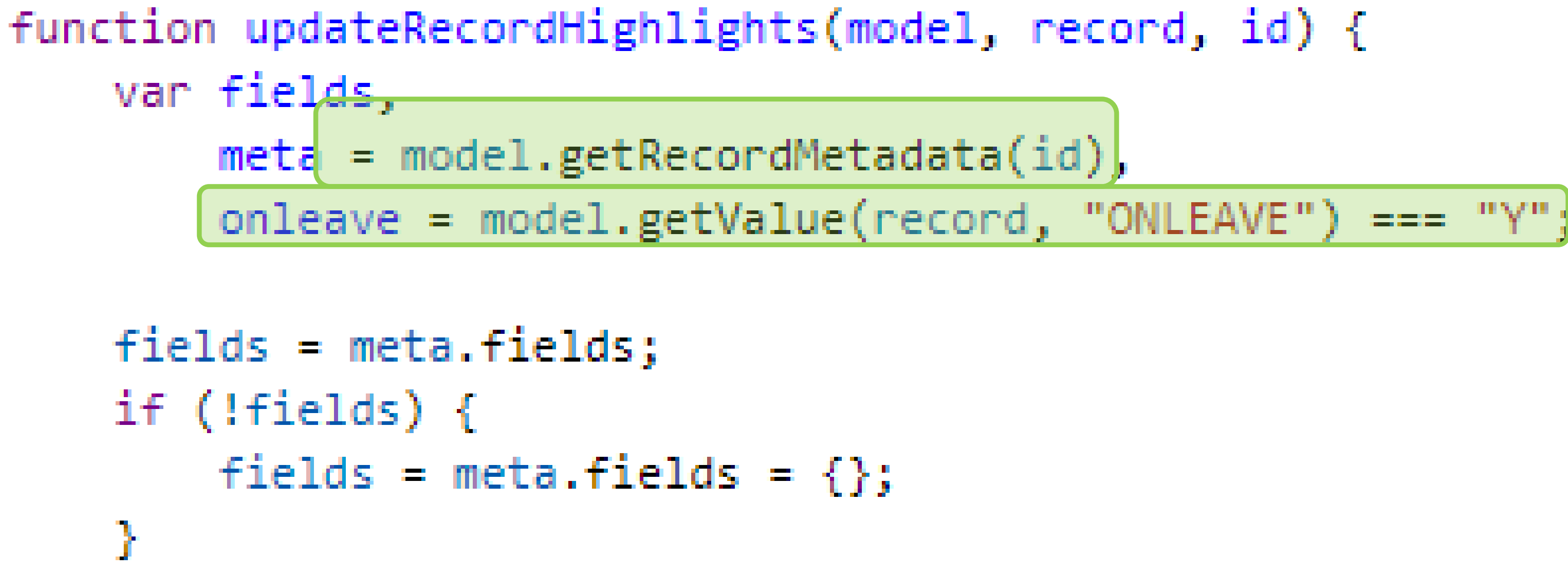
interactiveGrid – Save



```
// invoke a save action  with the value you just set
ig$.interactiveGrid("getActions").invoke("save");
```

model When Accessing Data



```
function updateRecordHighlights(model, record, id) {
    var fields,
        meta = model.getRecordMetadata(id),
        onleave = model.getValue(record, "ONLEAVE") === "Y";

    fields = meta.fields;
    if (!fields) {
        fields = meta.fields = {};
    }
```

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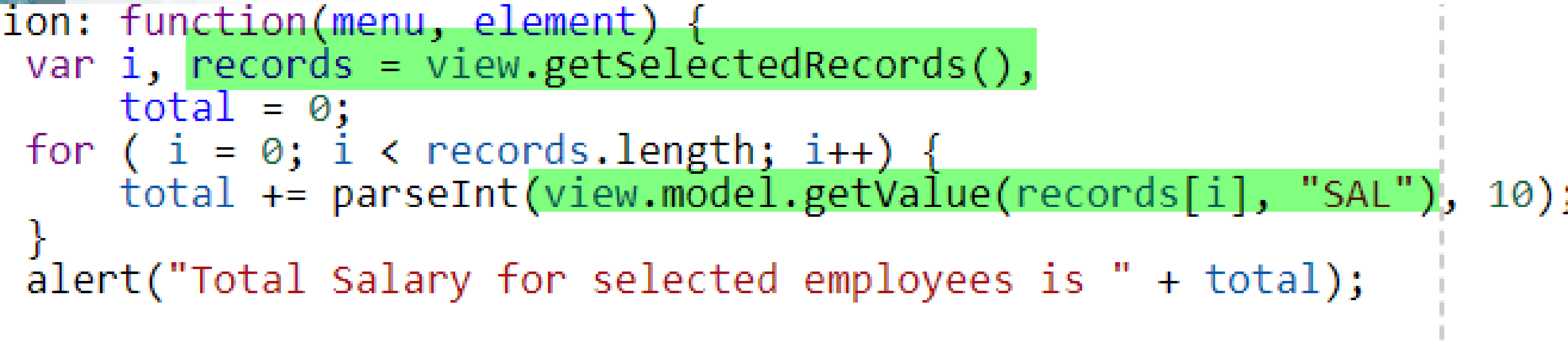
Access the Model …



```
ion: function(menu, element) {
 var i, records = view.getSelectedRecords(),
        total = 0;
 for ( i = 0; i < records.length; i++) {
        total += parseInt(view.model.getValue(records[i], "SAL"), 10);
 }
 alert("Total Salary for selected employees is " + total);
```

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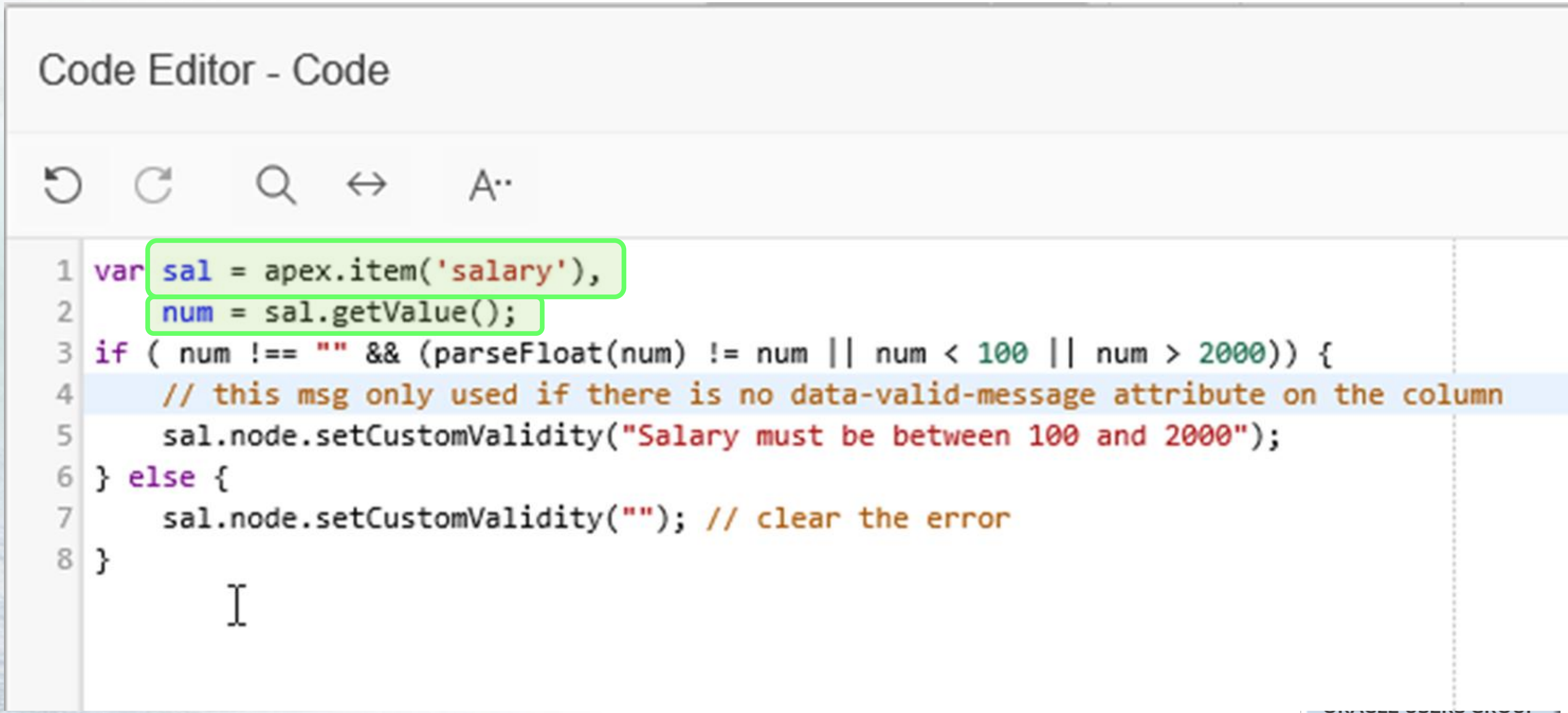
apex.item in Dyn Action Validations



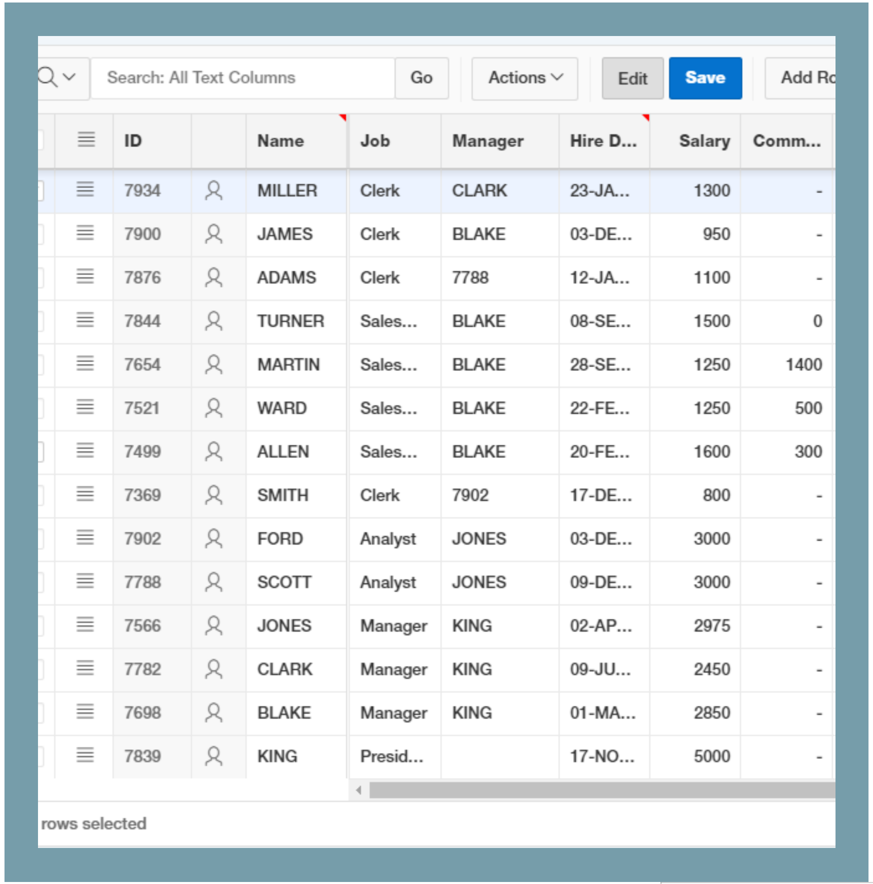
Code Editor - Code

```
var sal = apex.item('salary'),
    num = sal.getValue();
if ( num !== "" && (parseFloat(num) != num || num < 100 || num > 2000)) {
    // this msg only used if there is no data-valid-message attribute on the column
    sal.node.setCustomValidity("Salary must be between 100 and 2000");
} else {
    sal.node.setCustomValidity(""); // clear the error
}
```

Standards

Grid Customizations

for Menus, Toolbars and More



	ID		Name	Job	Manager	Hire D...	Salary	Comm...
≡	7934		MILLER	Clerk	CLARK	23-JA...	1300	-
≡	7900		JAMES	Clerk	BLAKE	03-DE...	950	-
≡	7876		ADAMS	Clerk	7788	12-JA...	1100	-
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≡	7782		CLARK	Manager	KING	09-JU...	2450	-
≡	7698		BLAKE	Manager	KING	01-MA...	2850	-
≡	7839		KING	Presid...		17-NO...	5000	-

rows selected

Customizations

- ***Advanced → JavaScript Code***
  - Grid → Grid Menus
  - Column → Column Menu

    (Most of the Time…)

- Read Documented APIs to Learn What is Possible
- Read Hardlikesoftware.com
- Study IG Cookbook App

No Longer PL/SQL Collections ~ Now JavaScript

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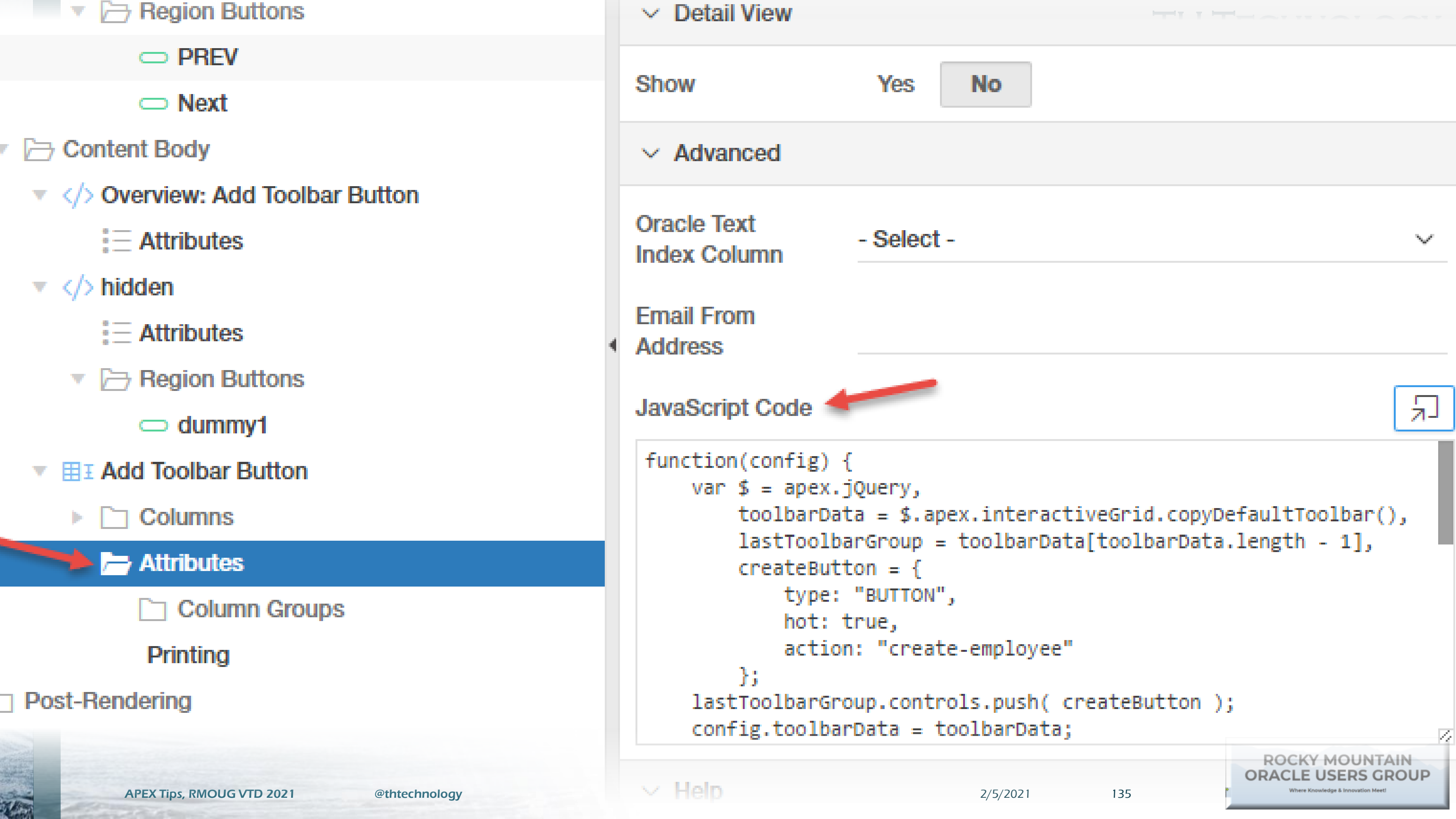

Show Yes [✓ No]

Oracle Text Index Column: - Select -

Email From Address

JavaScript Code

```
function(config) {
    var $ = apex.jQuery,
        toolbarData = $.apex.interactiveGrid.copyDefaultToolbar(),
        lastToolbarGroup = toolbarData[toolbarData.length - 1],
        createButton = {
            type: "BUTTON",
            hot: true,
            action: "create-employee"
        };
    lastToolbarGroup.controls.push( createButton );
    config.toolbarData = toolbarData;
```

Customization Examples

- Change Toolbar
- Change Column Heading Menu
- Change RowAction Menu
- Change Toolbar Actions Menu
- Standardize w "Global" Settings

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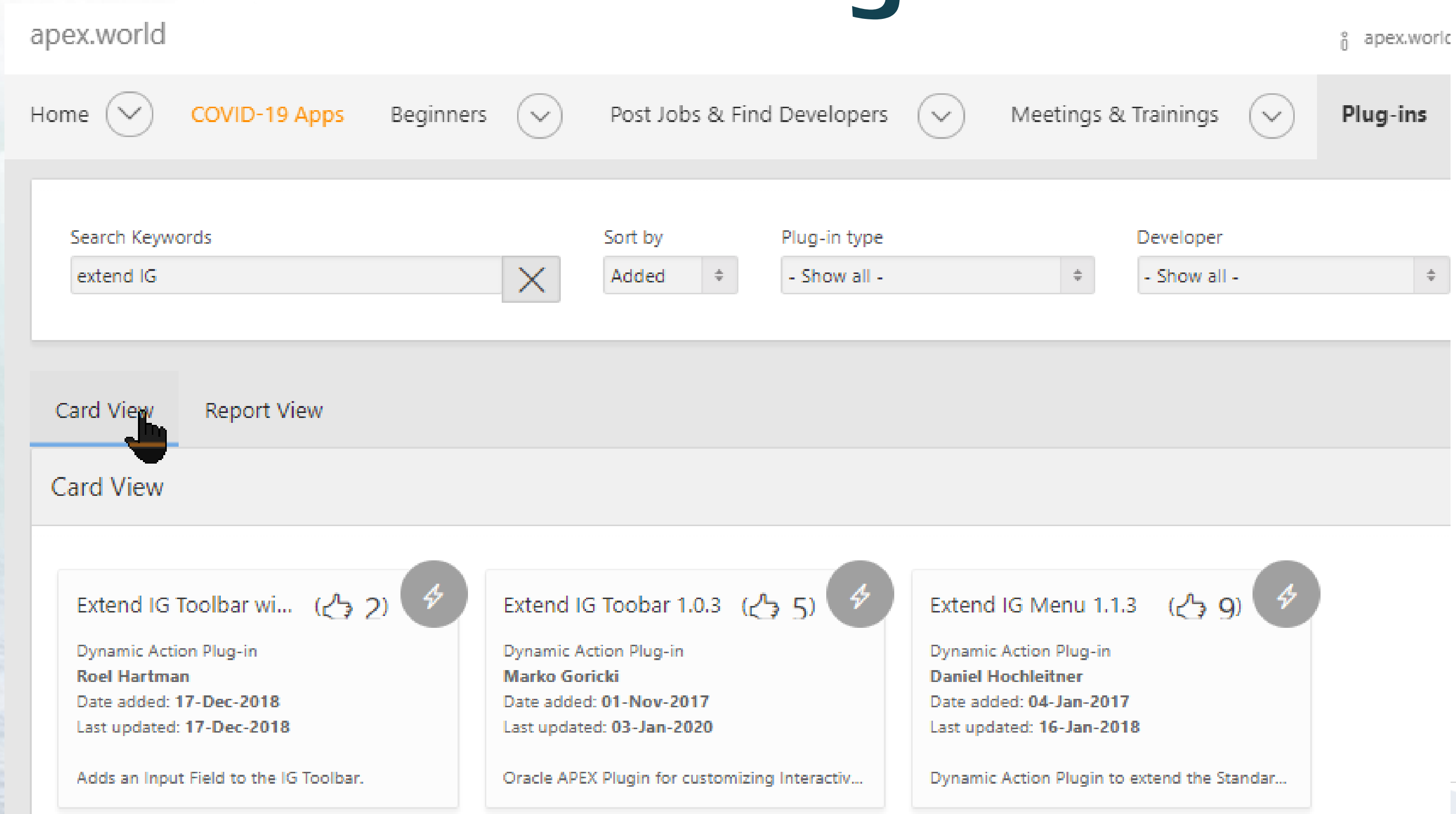
There's A Few Plugins Now…



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apex.world

Home | COVID-19 Apps | Beginners | Post Jobs & Find Developers | Meetings & Trainings | Plug-ins

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extend IG	Added	- Show all -	- Show all -

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Card View

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- Using A Plugin **Does NOT Standardize !**
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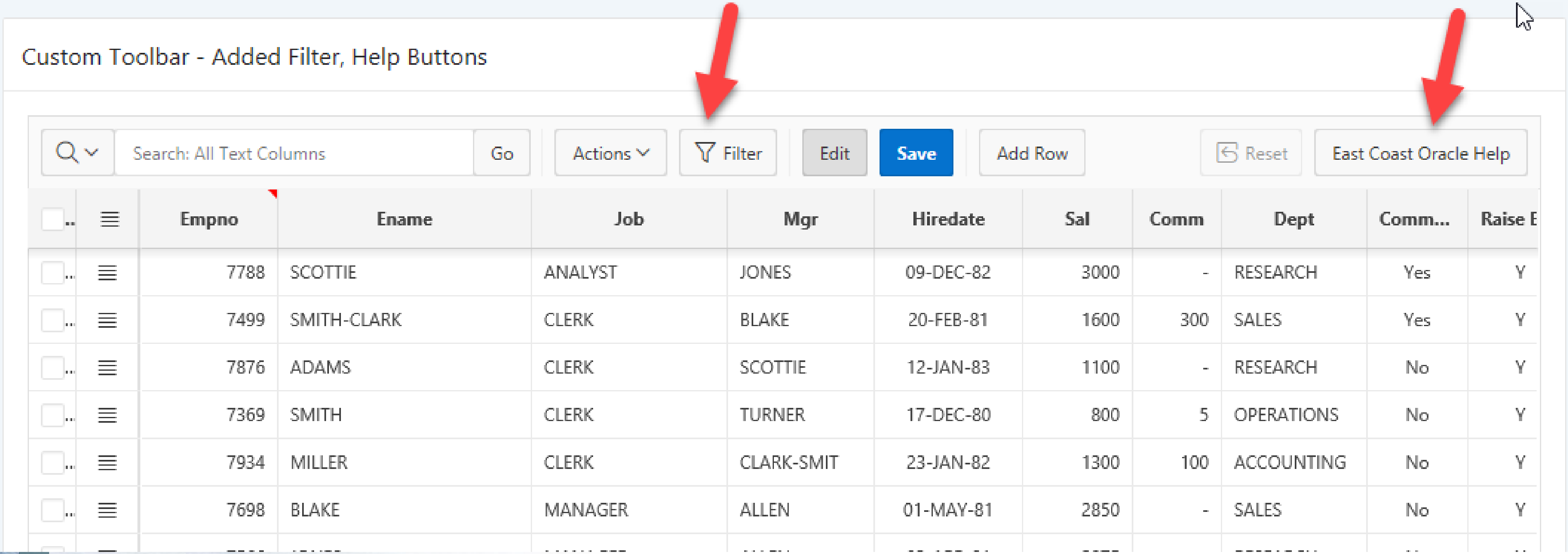
Change Toolbar


Custom Toolbar - Added Filter, Help Buttons

		Empno	Ename	Job	Mgr	Hiredate	Sal	Comm	Dept	Comm...	Raise E
		7788	SCOTTIE	ANALYST	JONES	09-DEC-82	3000	-	RESEARCH	Yes	Y
		7499	SMITH-CLARK	CLERK	BLAKE	20-FEB-81	1600	300	SALES	Yes	Y
		7876	ADAMS	CLERK	SCOTTIE	12-JAN-83	1100	-	RESEARCH	No	Y
		7369	SMITH	CLERK	TURNER	17-DEC-80	800	5	OPERATIONS	No	Y
		7934	MILLER	CLERK	CLARK-SMIT	23-JAN-82	1300	100	ACCOUNTING	No	Y
		7698	BLAKE	MANAGER	ALLEN	01-MAY-81	2850	-	SALES	No	Y

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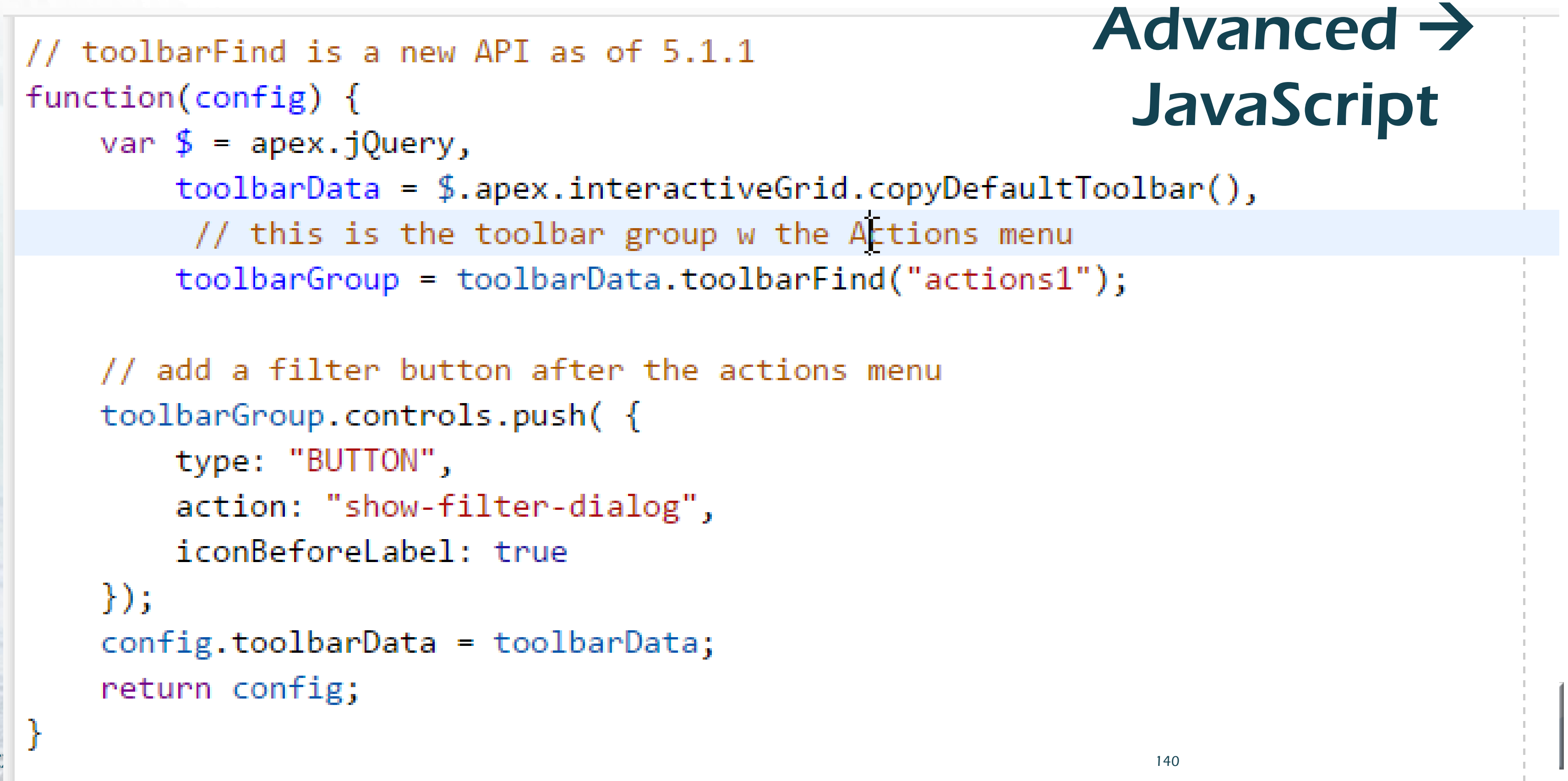
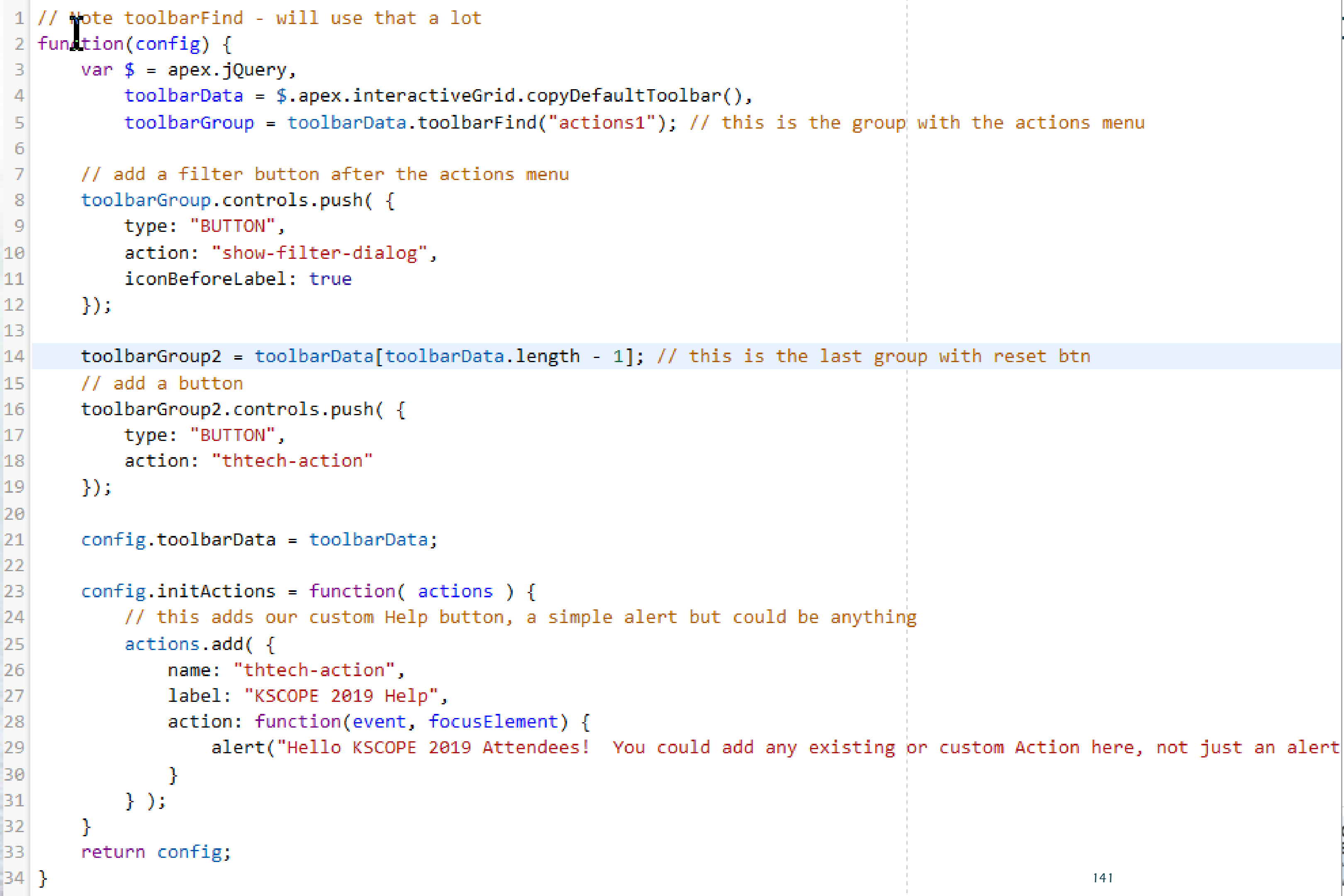
Change Toolbar

Goes in Grid Advanced → JavaScript

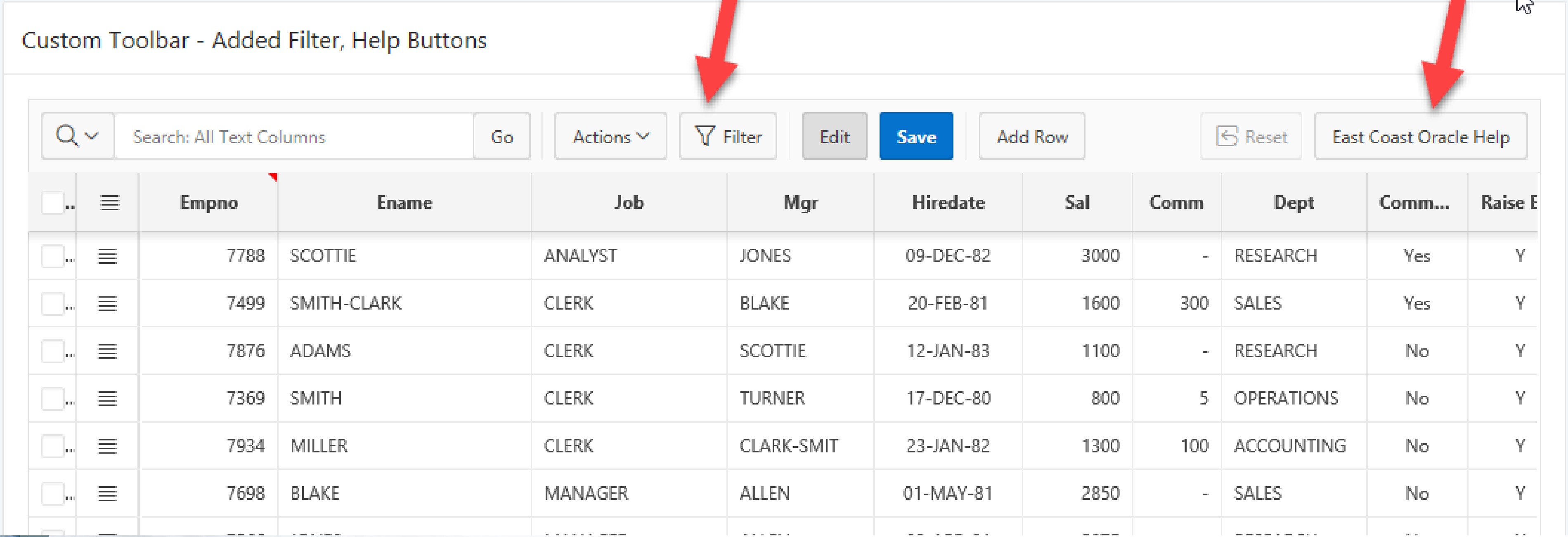


```
// toolbarFind is a new API as of 5.1.1
function(config) {
    var $ = apex.jQuery,
        toolbarData = $.apex.interactiveGrid.copyDefaultToolbar(),
         // this is the toolbar group w the Actions menu
        toolbarGroup = toolbarData.toolbarFind("actions1");

    // add a filter button after the actions menu
    toolbarGroup.controls.push( {
        type: "BUTTON",
        action: "show-filter-dialog",
        iconBeforeLabel: true
    });
    config.toolbarData = toolbarData;
    return config;
}
```



```
// Note toolbarFind - will use that a lot
function(config) {
    var $ = apex.jQuery,
        toolbarData = $.apex.interactiveGrid.copyDefaultToolbar(),
        toolbarGroup = toolbarData.toolbarFind("actions1"); // this is the group with the actions menu

    // add a filter button after the actions menu
    toolbarGroup.controls.push( {
        type: "BUTTON",
        action: "show-filter-dialog",
        iconBeforeLabel: true
    });

    toolbarGroup2 = toolbarData[toolbarData.length - 1]; // this is the last group with reset btn
    // add a button
    toolbarGroup2.controls.push( {
        type: "BUTTON",
        action: "thtech-action"
    });

    config.toolbarData = toolbarData;

    config.initActions = function( actions ) {
        // this adds our custom Help button, a simple alert but could be anything
        actions.add( {
            name: "thtech-action",
            label: "KSCOPE 2019 Help",
            action: function(event, focusElement) {
                alert("Hello KSCOPE 2019 Attendees!  You could add any existing or custom Action here, not just an alert
            }
        } );
    }
    return config;
}
```

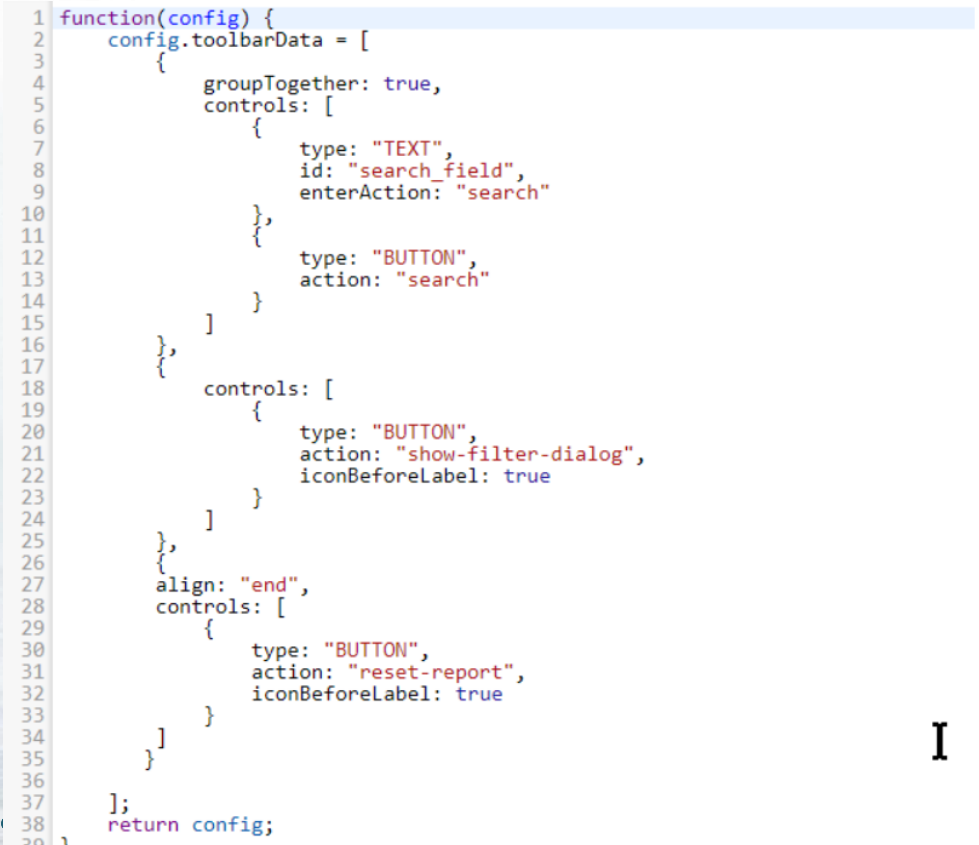
Change Toolbar



Custom Toolbar - Added Filter, Help Buttons

Empno	Ename	Job	Mgr	Hiredate	Sal	Comm	Dept	Comm...	Raise E
7788	SCOTTIE	ANALYST	JONES	09-DEC-82	3000	-	RESEARCH	Yes	Y
7499	SMITH-CLARK	CLERK	BLAKE	20-FEB-81	1600	300	SALES	Yes	Y
7876	ADAMS	CLERK	SCOTTIE	12-JAN-83	1100	-	RESEARCH	No	Y
7369	SMITH	CLERK	TURNER	17-DEC-80	800	5	OPERATIONS	No	Y
7934	MILLER	CLERK	CLARK-SMIT	23-JAN-82	1300	100	ACCOUNTING	No	Y
7698	BLAKE	MANAGER	ALLEN	01-MAY-81	2850	-	SALES	No	Y

Replace Toolbar Code



```
function(config) {
    config.toolbarData = [
        {
            groupTogether: true,
            controls: [
                {
                    type: "TEXT",
                    id: "search_field",
                    enterAction: "search"
                },
                {
                    type: "BUTTON",
                    action: "search"
                }
            ]
        },
        {
            controls: [
                {
                    type: "BUTTON",
                    action: "show-filter-dialog",
                    iconBeforeLabel: true
                }
            ]
        },
        {
        align: "end",
        controls: [
            {
                type: "BUTTON",
                action: "reset-report",
                iconBeforeLabel: true
            }
        ]
       }

    ];
    return config;
```

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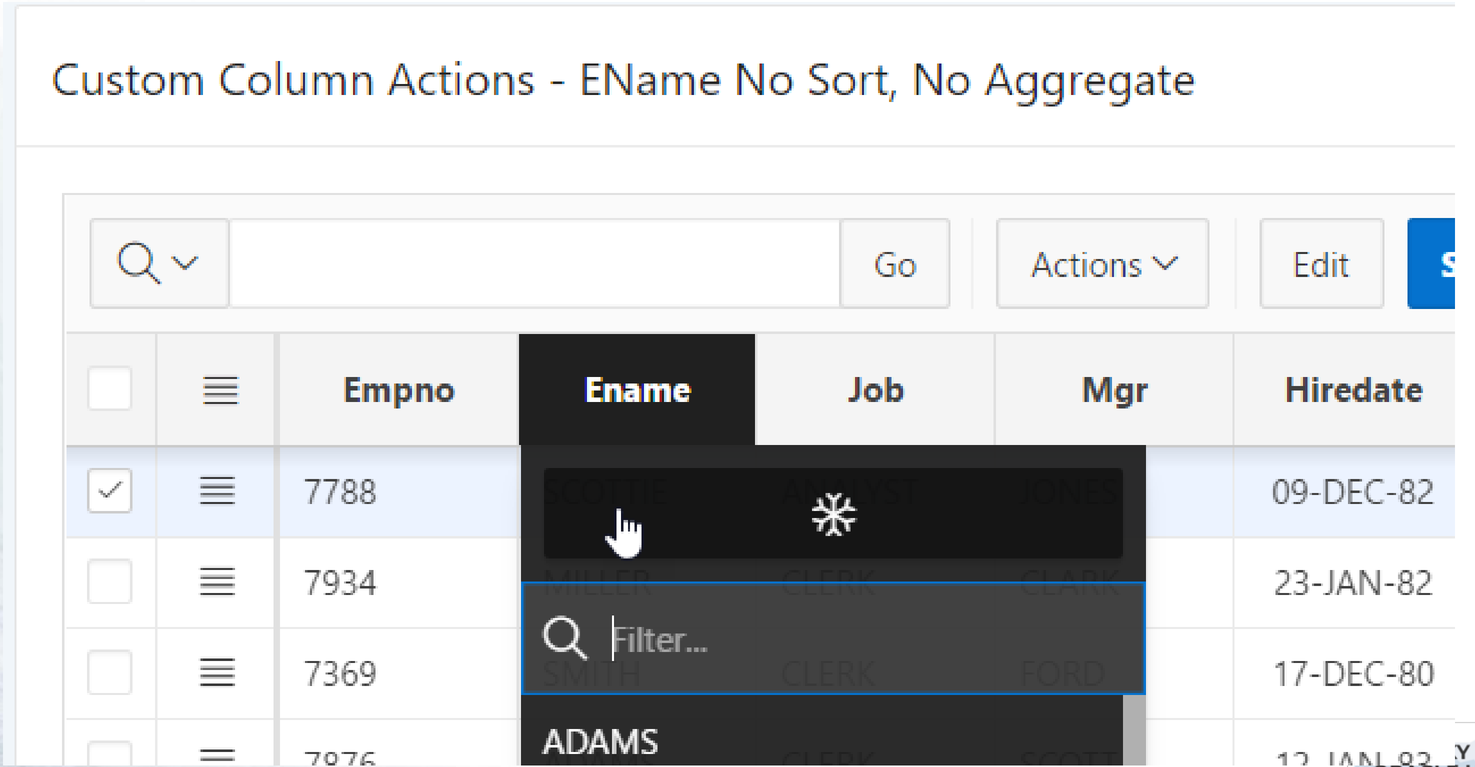
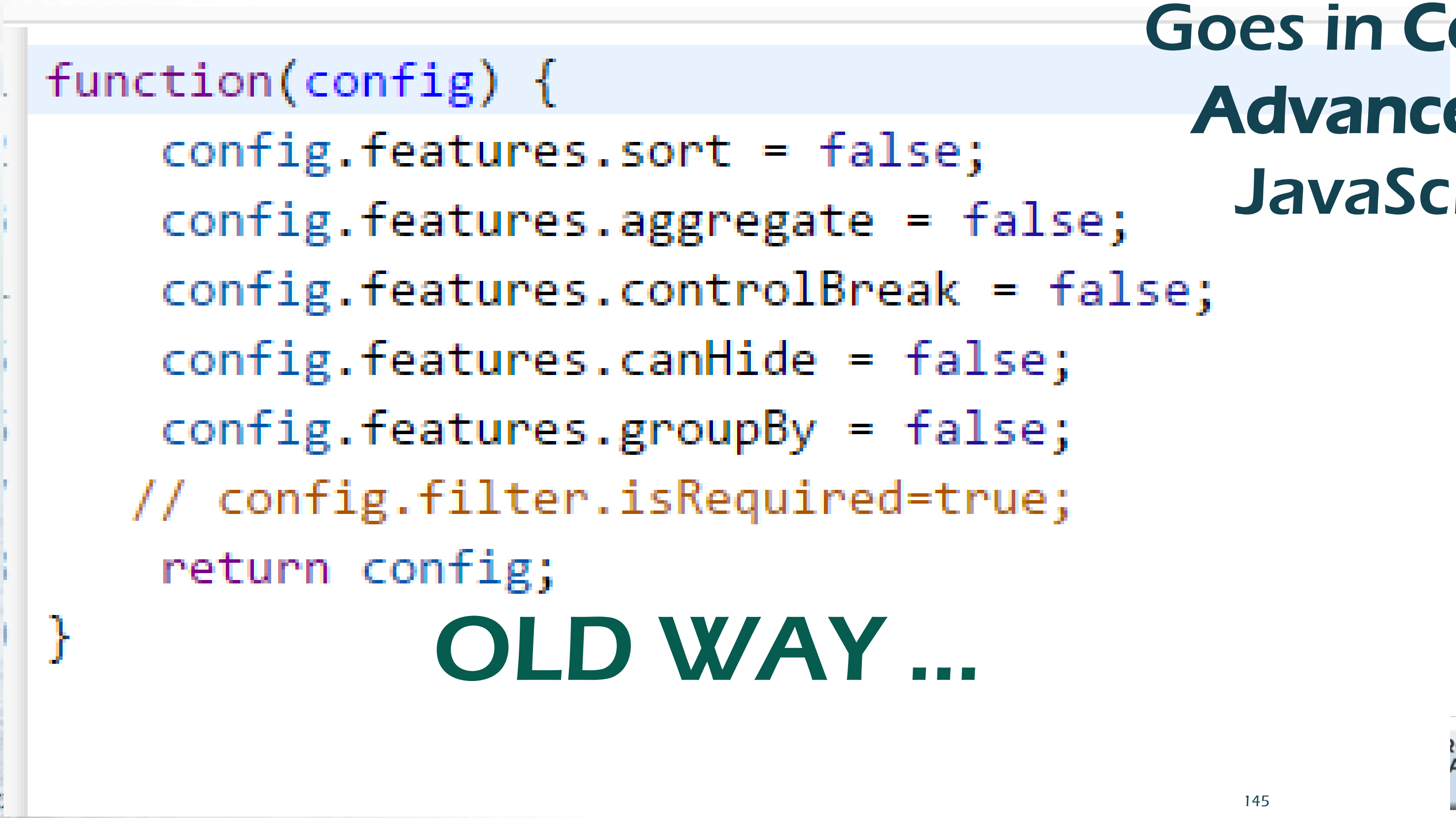
Change Column Heading Menu


Custom Column Actions - EName No Sort, No Aggregate

Change Column Heading Menu



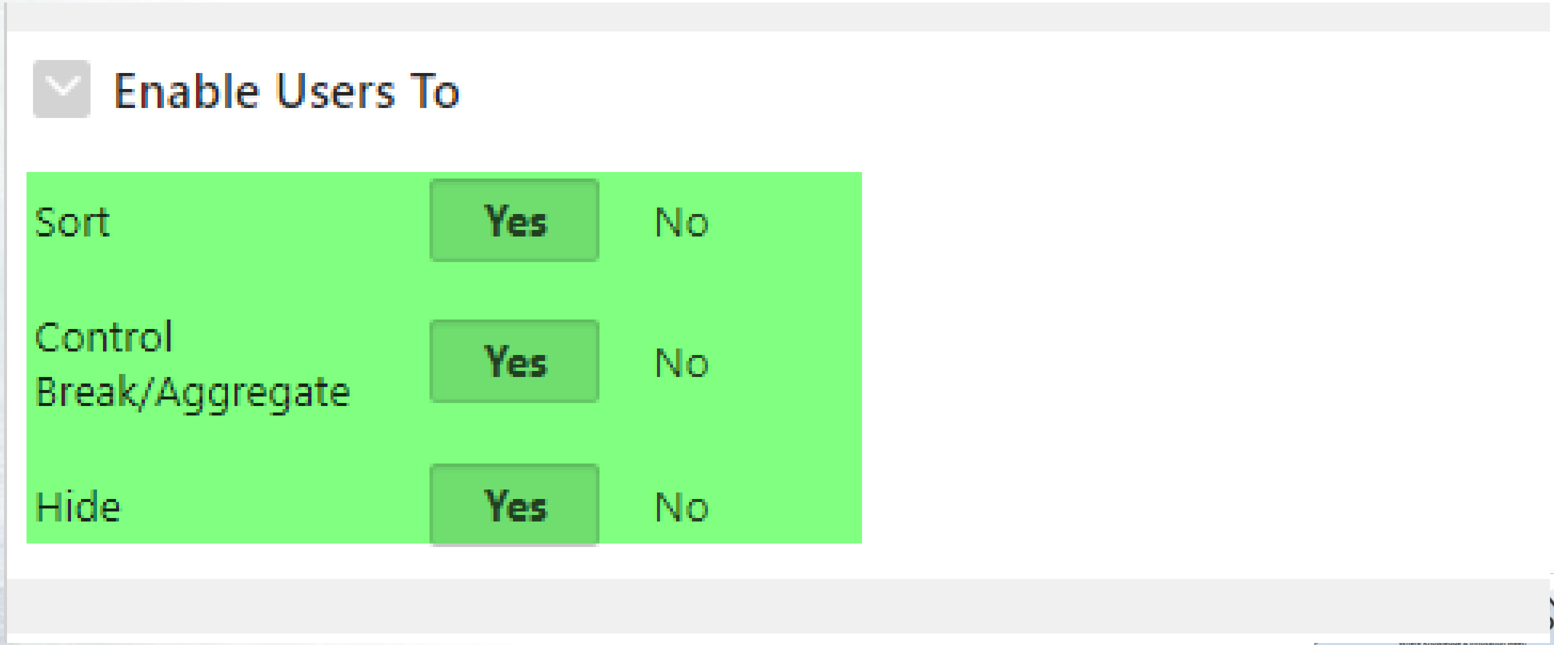
```
function(config) {
    config.features.sort = false;
    config.features.aggregate = false;
    config.features.controlBreak = false;
    config.features.canHide = false;
    config.features.groupBy = false;
  // config.filter.isRequired=true;
    return config;
}
```

Goes in Column Advanced → JavaScript

OLD WAY …

Change Column Heading Menu

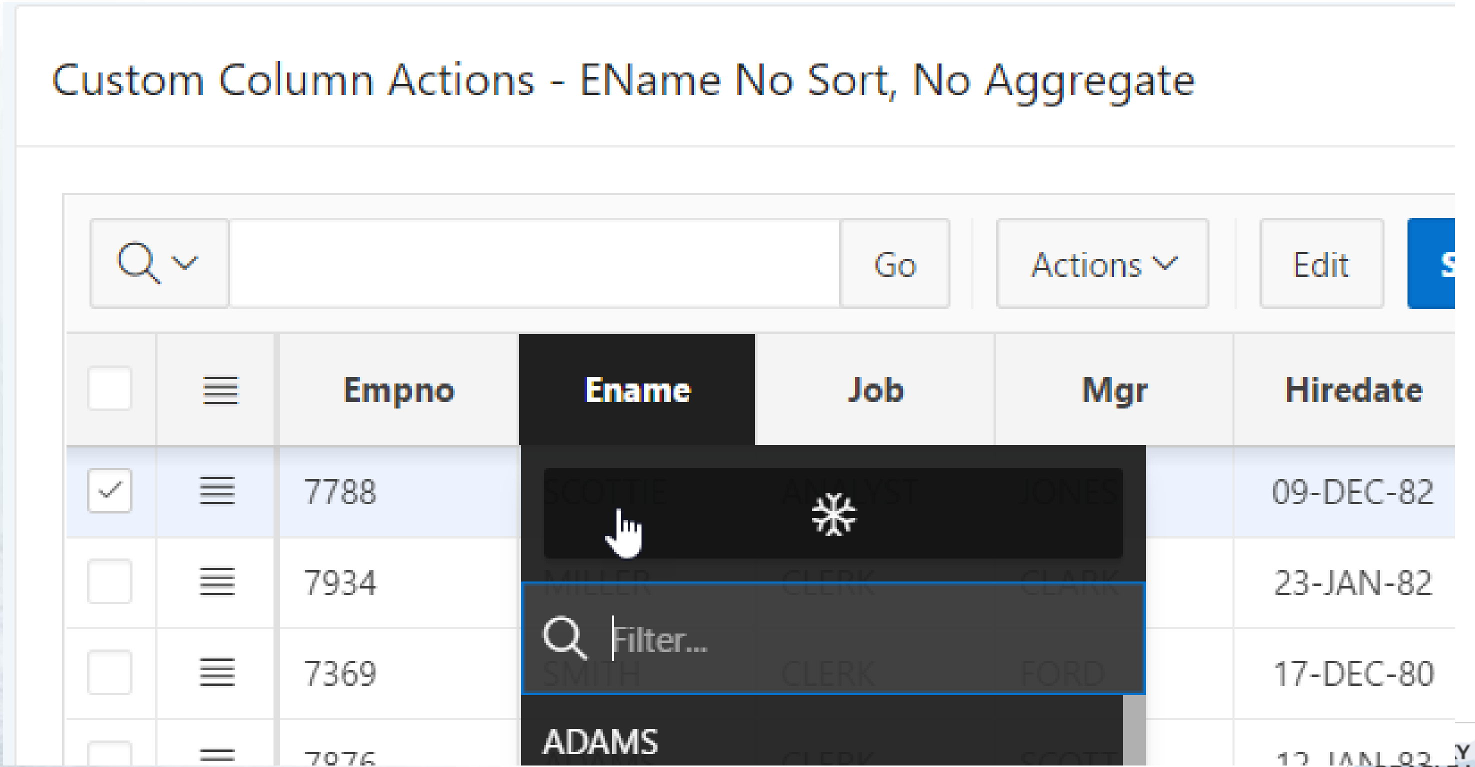
- Wait! Now Declarative … Mostly



Enable Users To

Sort	[✓ Yes]	No
Control Break/Aggregate	[✓ Yes]	No
Hide	[✓ Yes]	No

Change Column Heading Menu

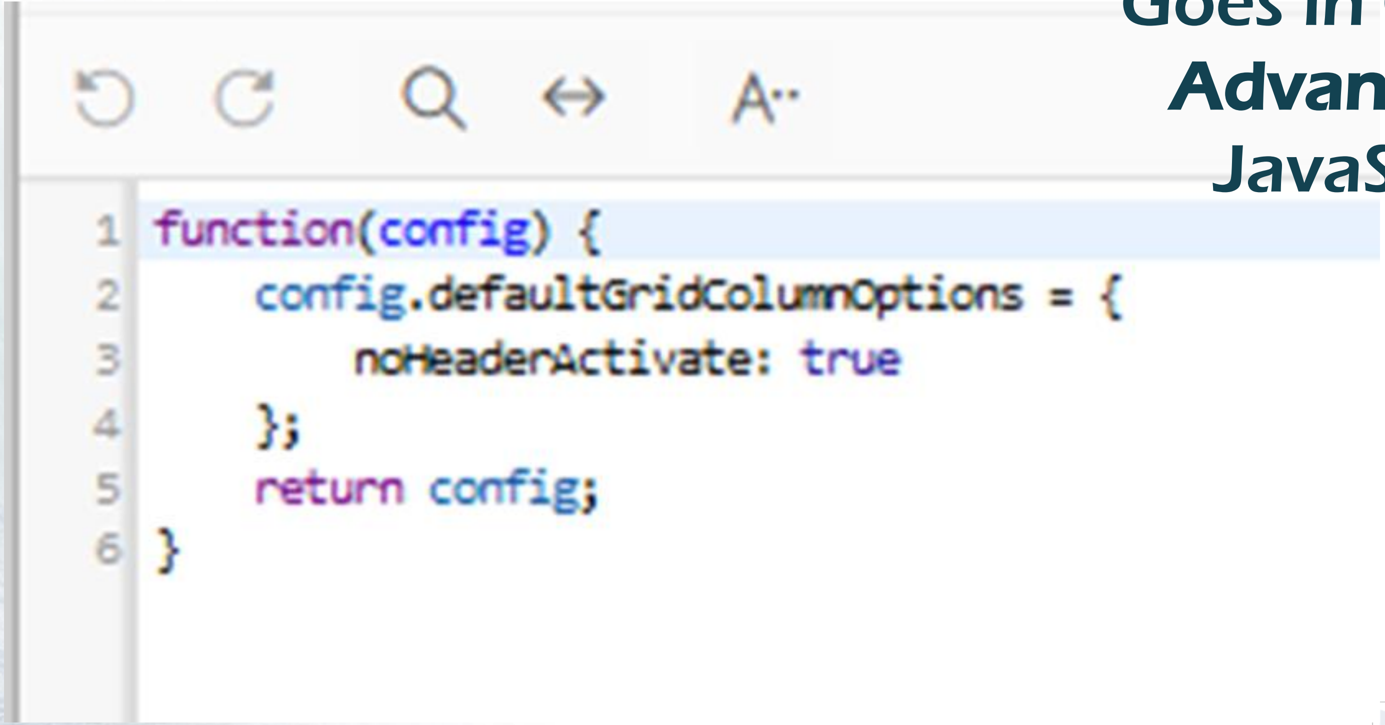


Custom Column Actions - EName No Sort, No Aggregate

	Empno	Ename	Job	Mgr	Hiredate
✓	7788				09-DEC-82
	7934				23-JAN-82
	7369				17-DEC-80

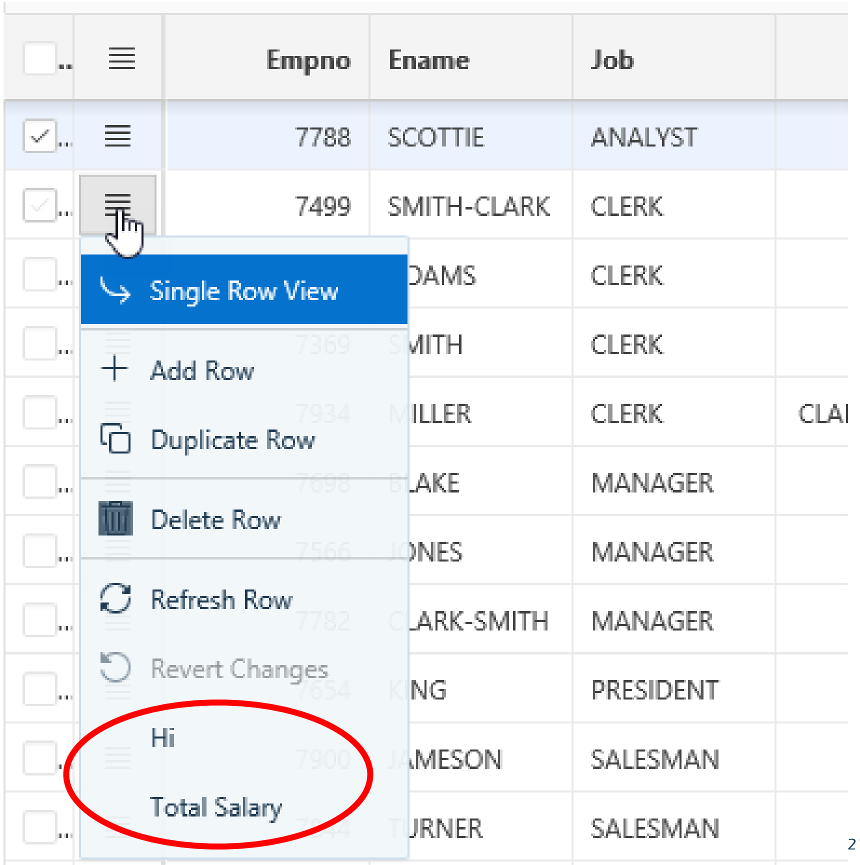
Change Column Heading Menu

Goes in Column Advanced → JavaScript



```
function(config) {
    config.defaultGridColumnOptions = {
        noHeaderActivate: true
    };
    return config;
}
```

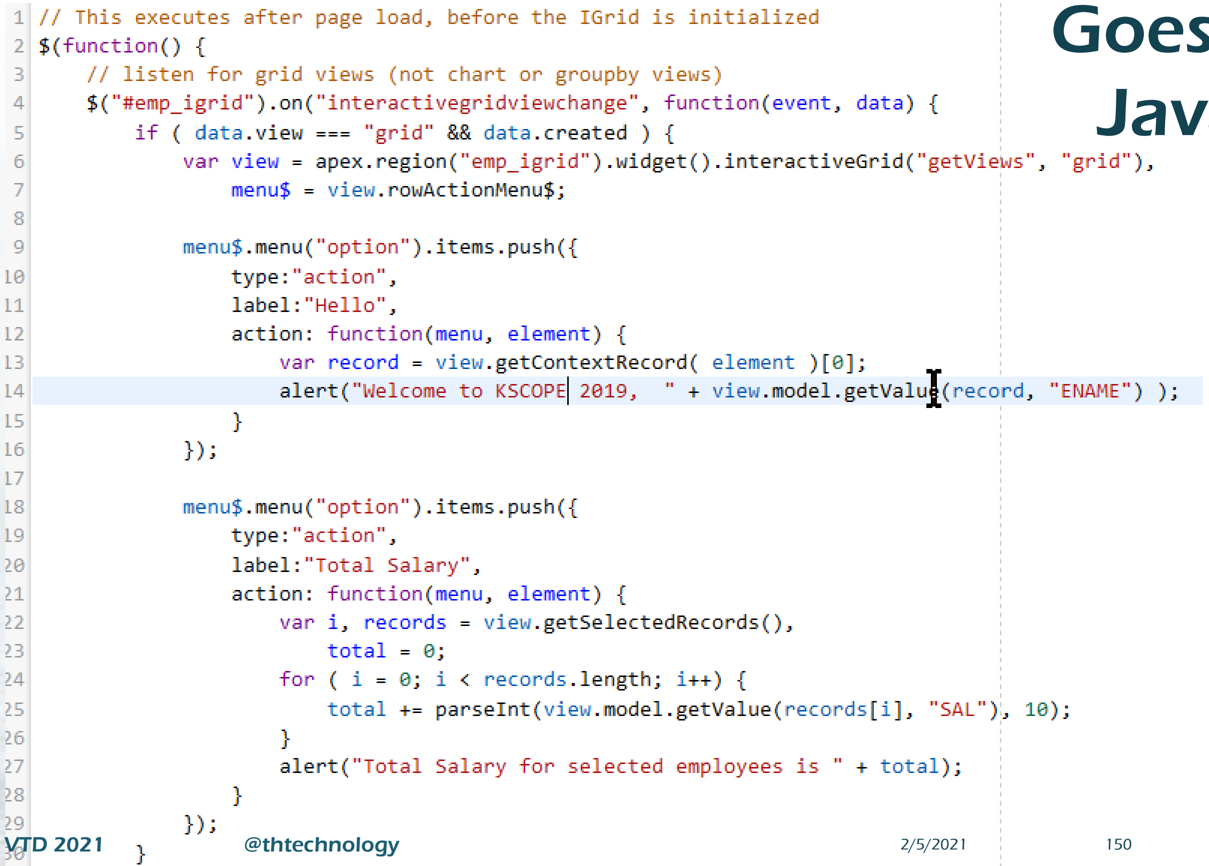
Change RowAction Menu



Empno	Ename	Job	
7788	SCOTTIE	ANALYST	
7499	SMITH-CLARK	CLERK	
	DAMS	CLERK	
7369	SMITH	CLERK	
7934	MILLER	CLERK	CLAI
7698	BLAKE	MANAGER	
7566	JONES	MANAGER	
7782	CLARK-SMITH	MANAGER	
7654	KING	PRESIDENT	
7900	JAMESON	SALESMAN	
7844	TURNER	SALESMAN	

Change RowAction Menu

Goes in Page JavaScript

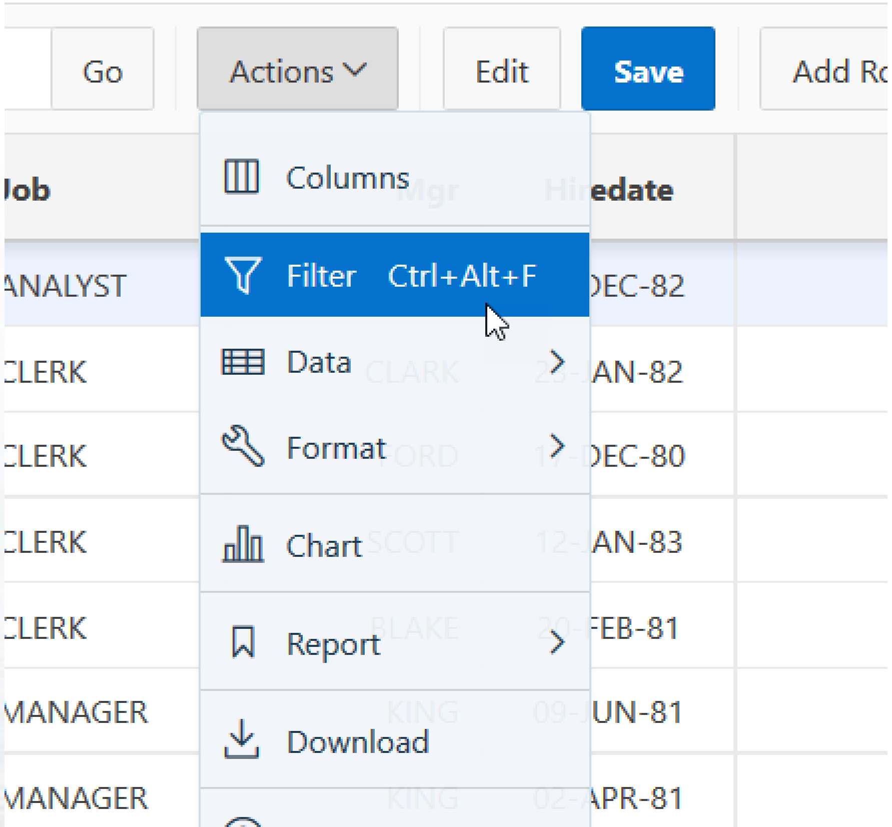


```
// This executes after page load, before the IGrid is initialized
$(function() {
    // listen for grid views (not chart or groupby views)
    $("#emp_igrid").on("interactivegridviewchange", function(event, data) {
        if ( data.view === "grid" && data.created ) {
            var view = apex.region("emp_igrid").widget().interactiveGrid("getViews", "grid"),
                menu$ = view.rowActionMenu$;

            menu$.menu("option").items.push({
                type:"action",
                label:"Hello",
                action: function(menu, element) {
                    var record = view.getContextRecord( element )[0];
                    alert("Welcome to KSCOPE 2019,  " + view.model.getValue(record, "ENAME") );
                }
            });

            menu$.menu("option").items.push({
                type:"action",
                label:"Total Salary",
                action: function(menu, element) {
                    var i, records = view.getSelectedRecords(),
                        total = 0;
                    for ( i = 0; i < records.length; i++) {
                        total += parseInt(view.model.getValue(records[i], "SAL"), 10);
                    }
                    alert("Total Salary for selected employees is " + total);
                }
            });
    }
```

Change Toolbar Actions Menu



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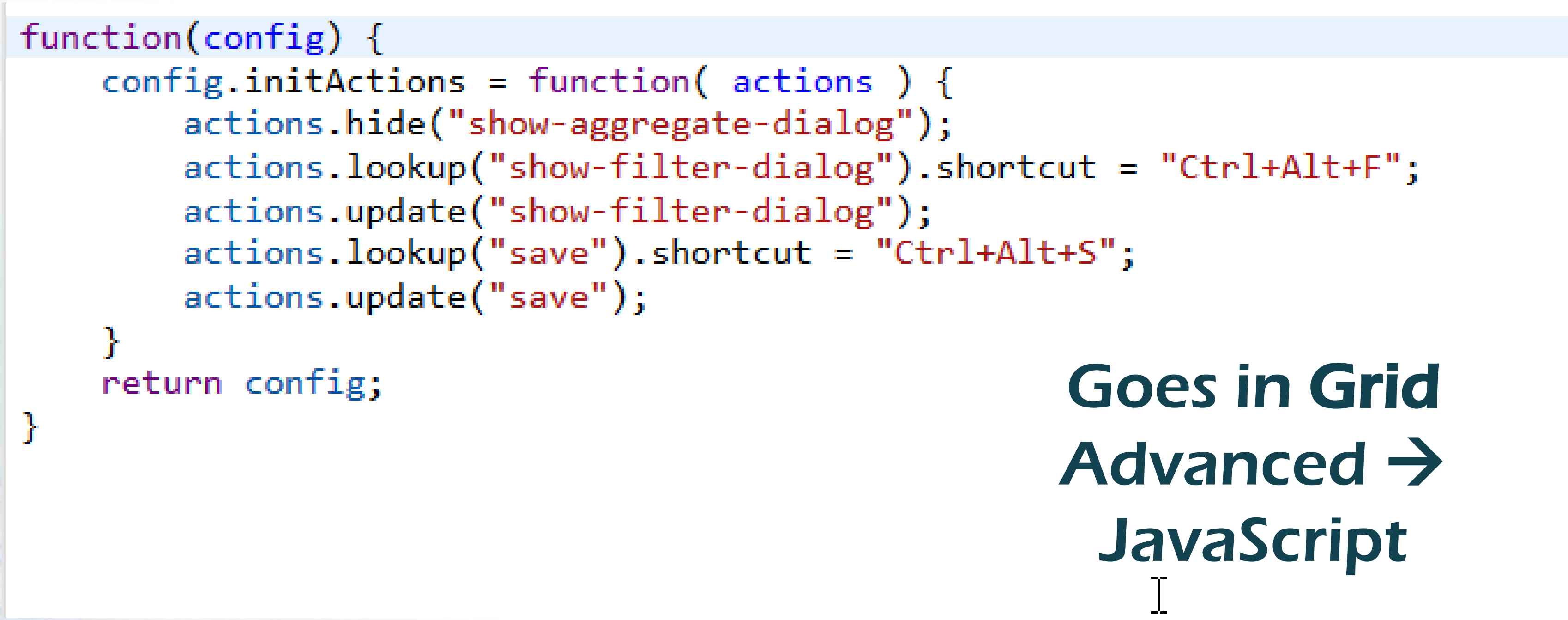
Change Toolbar Actions Menu



```
function(config) {
    config.initActions = function( actions ) {
        actions.hide("show-aggregate-dialog");
        actions.lookup("show-filter-dialog").shortcut = "Ctrl+Alt+F";
        actions.update("show-filter-dialog");
        actions.lookup("save").shortcut = "Ctrl+Alt+S";
        actions.update("save");
    }
    return config;
}
```

Goes in Grid Advanced → JavaScript

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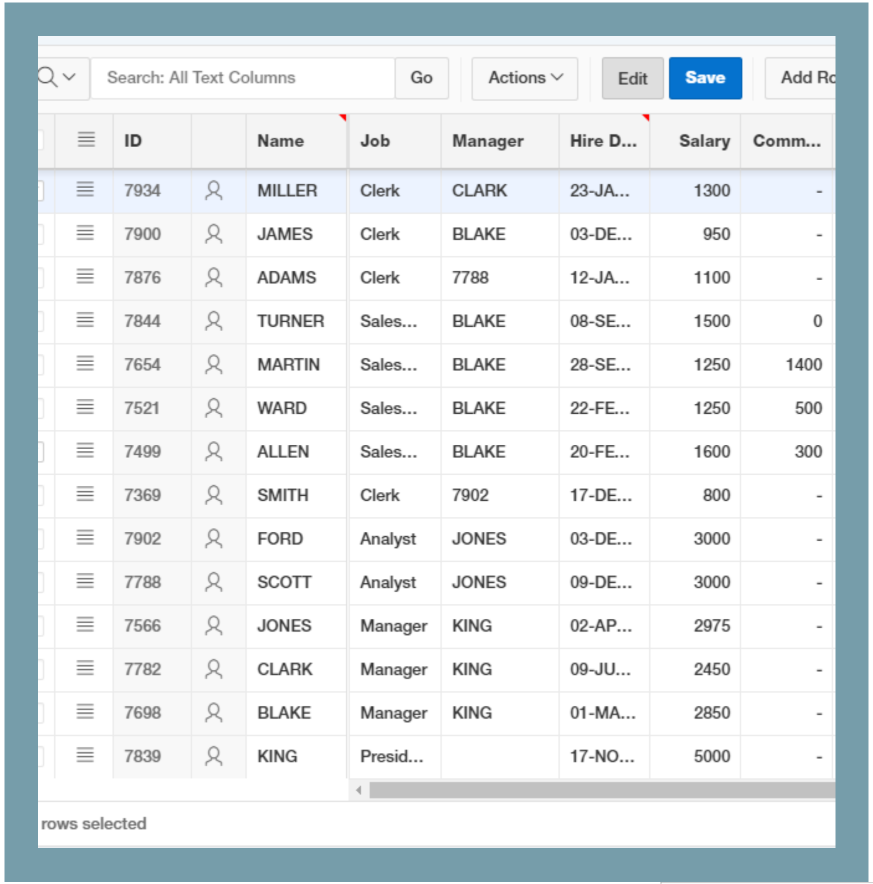
Standards

Use a Standards File

Customizations Across Applications



	ID		Name	Job	Manager	Hire D...	Salary	Comm...
≡	7934		MILLER	Clerk	CLARK	23-JA...	1300	-
≡	7900		JAMES	Clerk	BLAKE	03-DE...	950	-
≡	7876		ADAMS	Clerk	7788	12-JA...	1100	-
≡	7844		TURNER	Sales...	BLAKE	08-SE...	1500	0
≡	7654		MARTIN	Sales...	BLAKE	28-SE...	1250	1400
≡	7521		WARD	Sales...	BLAKE	22-FE...	1250	500
≡	7499		ALLEN	Sales...	BLAKE	20-FE...	1600	300
≡	7369		SMITH	Clerk	7902	17-DE...	800	-
≡	7902		FORD	Analyst	JONES	03-DE...	3000	-
≡	7788		SCOTT	Analyst	JONES	09-DE...	3000	-
≡	7566		JONES	Manager	KING	02-AP...	2975	-
≡	7782		CLARK	Manager	KING	09-JU...	2450	-
≡	7698		BLAKE	Manager	KING	01-MA...	2850	-
≡	7839		KING	Presid...		17-NO...	5000	-

rows selected

Standardize via "Global" Settings

- JS Function in JS File
- Include File
- Reference JS Function in Advanced → JavaScript Code
- Add Classes on Grids

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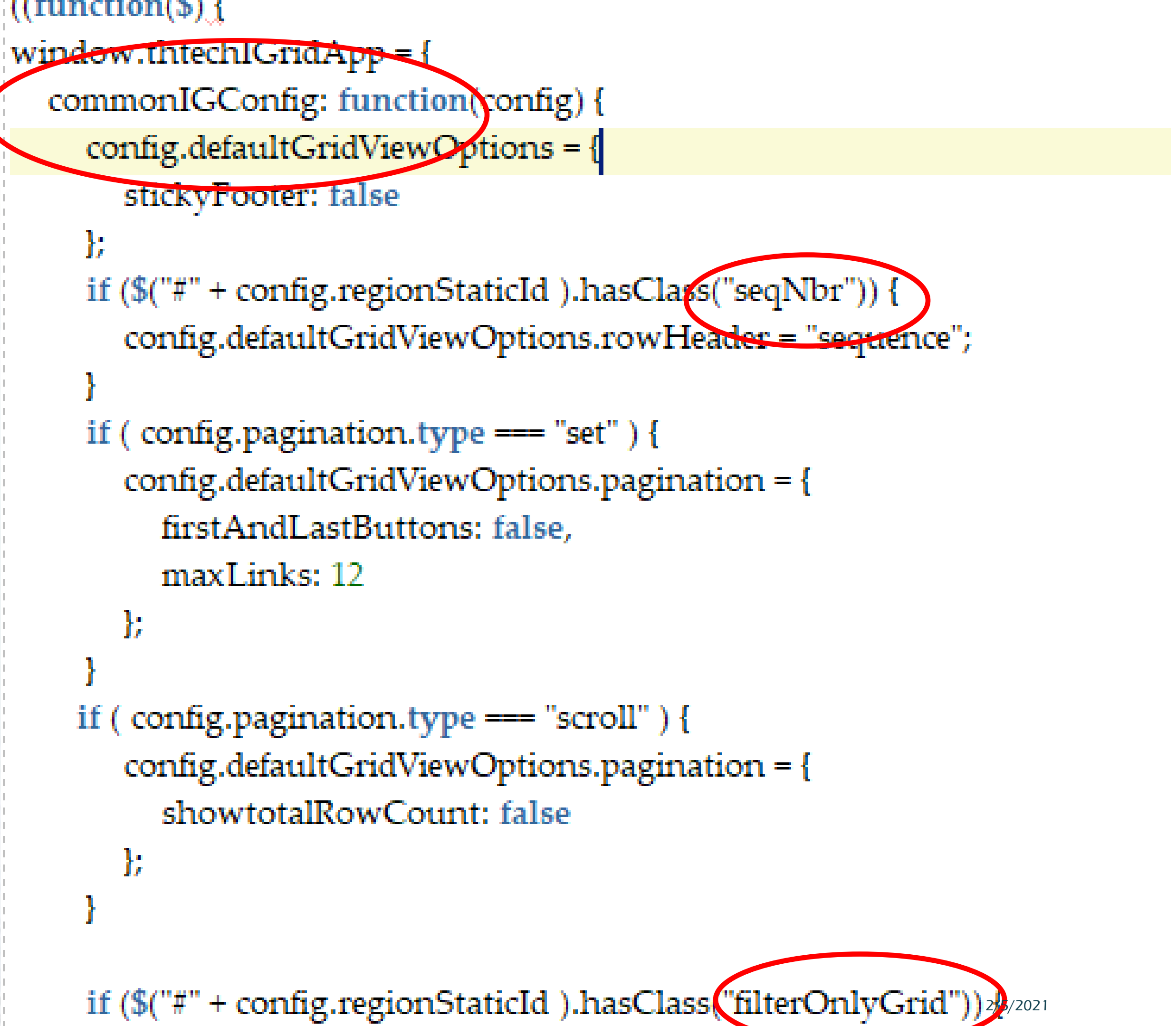

```
((function($) {
window.thtechIGridApp = {
    commonIGConfig: function(config) {
        config.defaultGridViewOptions = {
            stickyFooter: false
        };
        if ($("#" + config.regionStaticId ).hasClass("seqNbr")) {
            config.defaultGridViewOptions.rowHeader = "sequence";
        }
        if ( config.pagination.type === "set" ) {
            config.defaultGridViewOptions.pagination = {
                firstAndLastButtons: false,
                maxLinks: 12
            };
        }
        if ( config.pagination.type === "scroll" ) {
            config.defaultGridViewOptions.pagination = {
                showtotalRowCount: false
            };
        }

        if ($("#" + config.regionStaticId ).hasClass("filterOnlyGrid")) {
```

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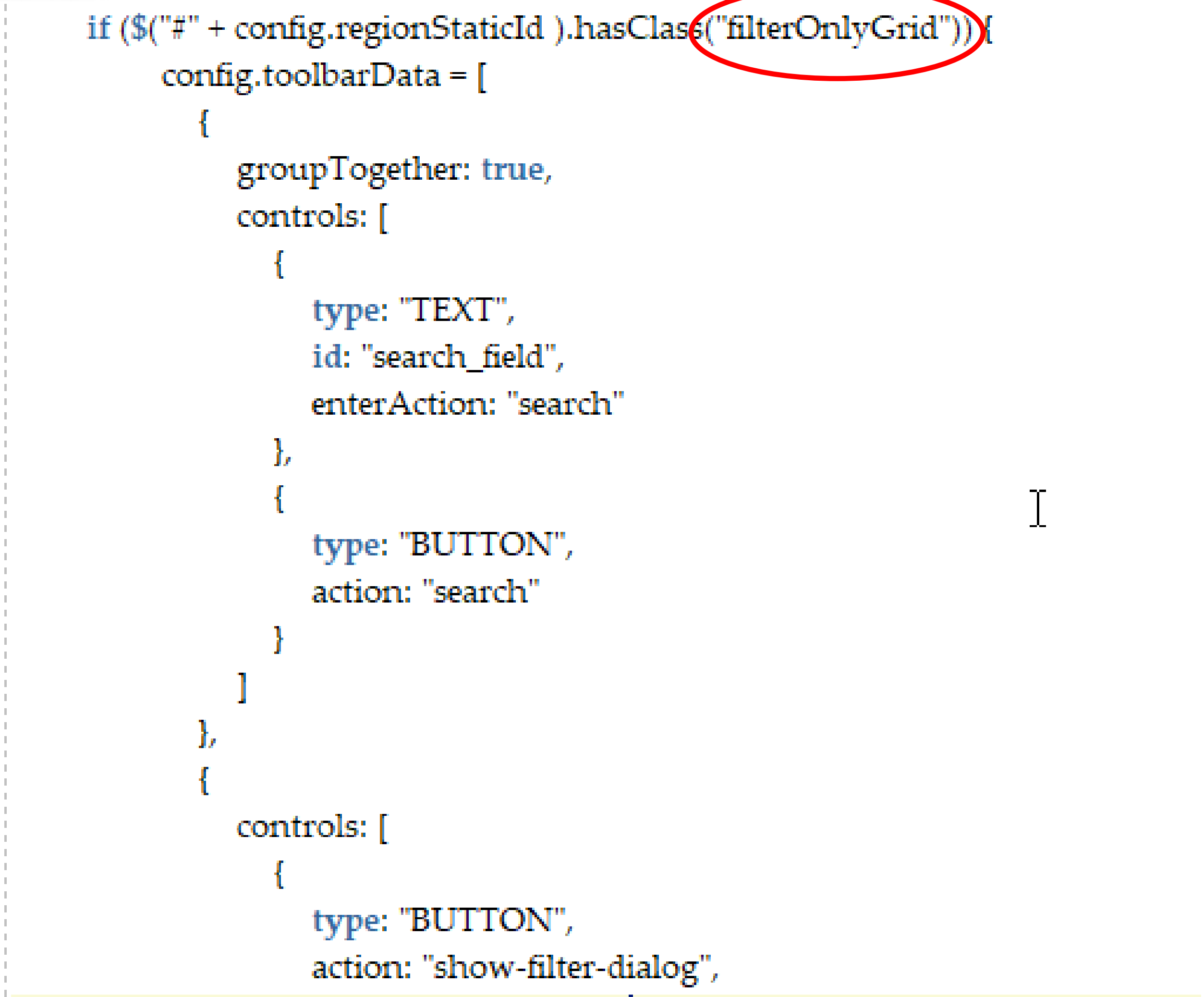
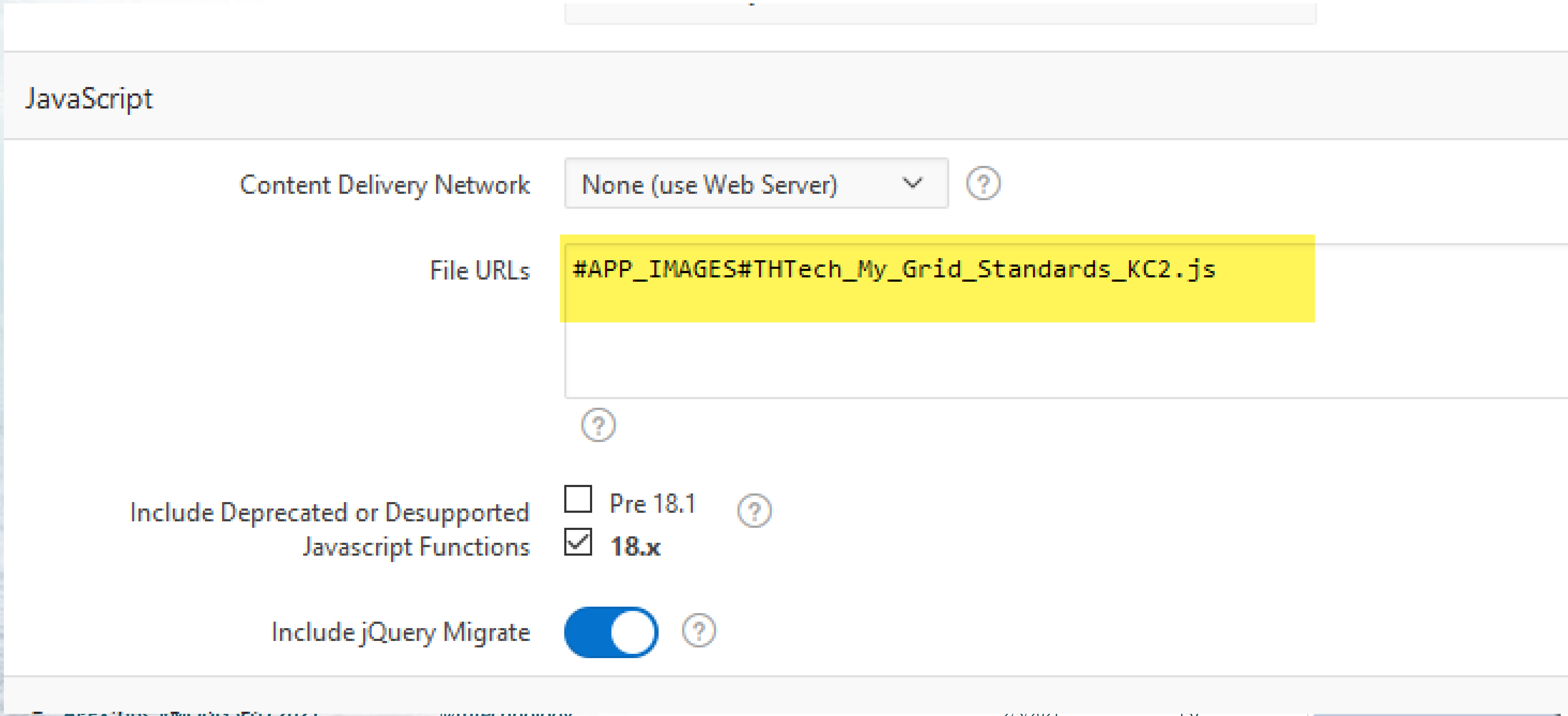


```
if ($("#" + config.regionStaticId ).hasClass("filterOnlyGrid")){
    config.toolbarData = [
      {
        groupTogether: true,
        controls: [
          {
            type: "TEXT",
            id: "search_field",
            enterAction: "search"
          },
          {
            type: "BUTTON",
            action: "search"
          }
        ]
      },
      {
        controls: [
          {
            type: "BUTTON",
            action: "show-filter-dialog",
```

TH TECHNOLOGY



JavaScript

Content Delivery Network: None (use Web Server)

File URLs:

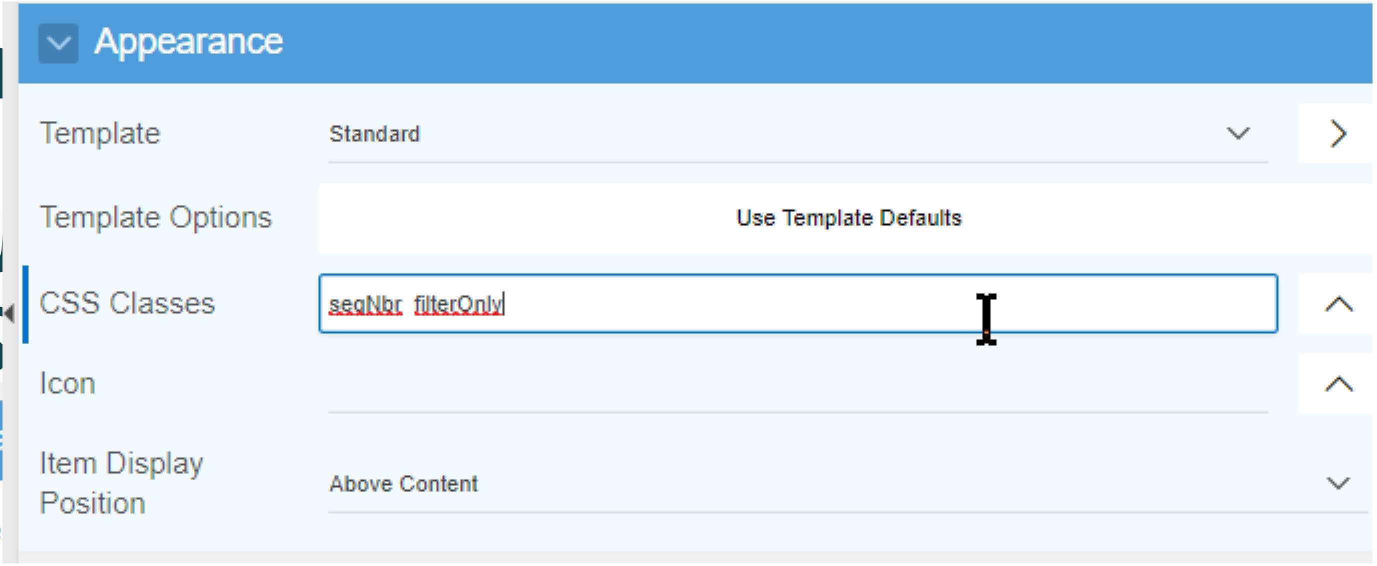
```
#APP_IMAGES#THTech_My_Grid_Standards_KC2.js
```

Include Deprecated or Desupported Javascript Functions: ☐ Pre 18.1 ☑ 18.x

Include jQuery Migrate: On

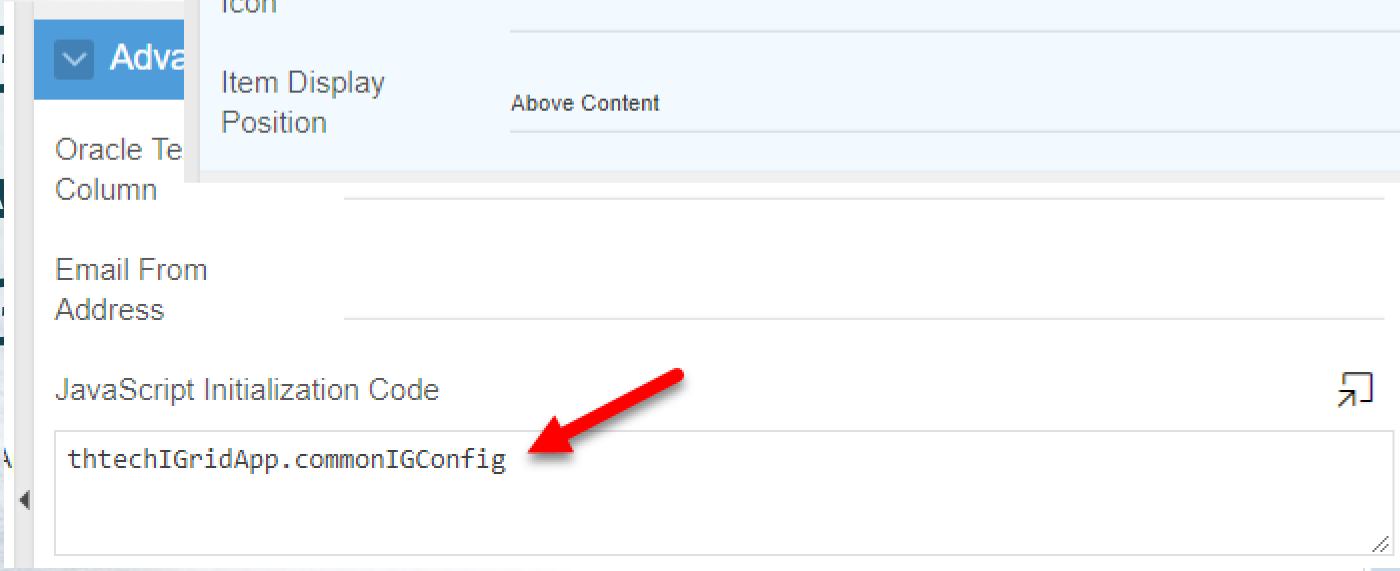
Globa

- Add J JavaS G
- A ne G



Appearance

Template	Standard
Template Options	Use Template Defaults
CSS Classes	seqNbr filterOnly
Icon	
Item Display Position	Above Content



Adva

Oracle Te Column	
Email From Address	

JavaScript Initialization Code

```
thtechIGridApp.commonIGConfig
```

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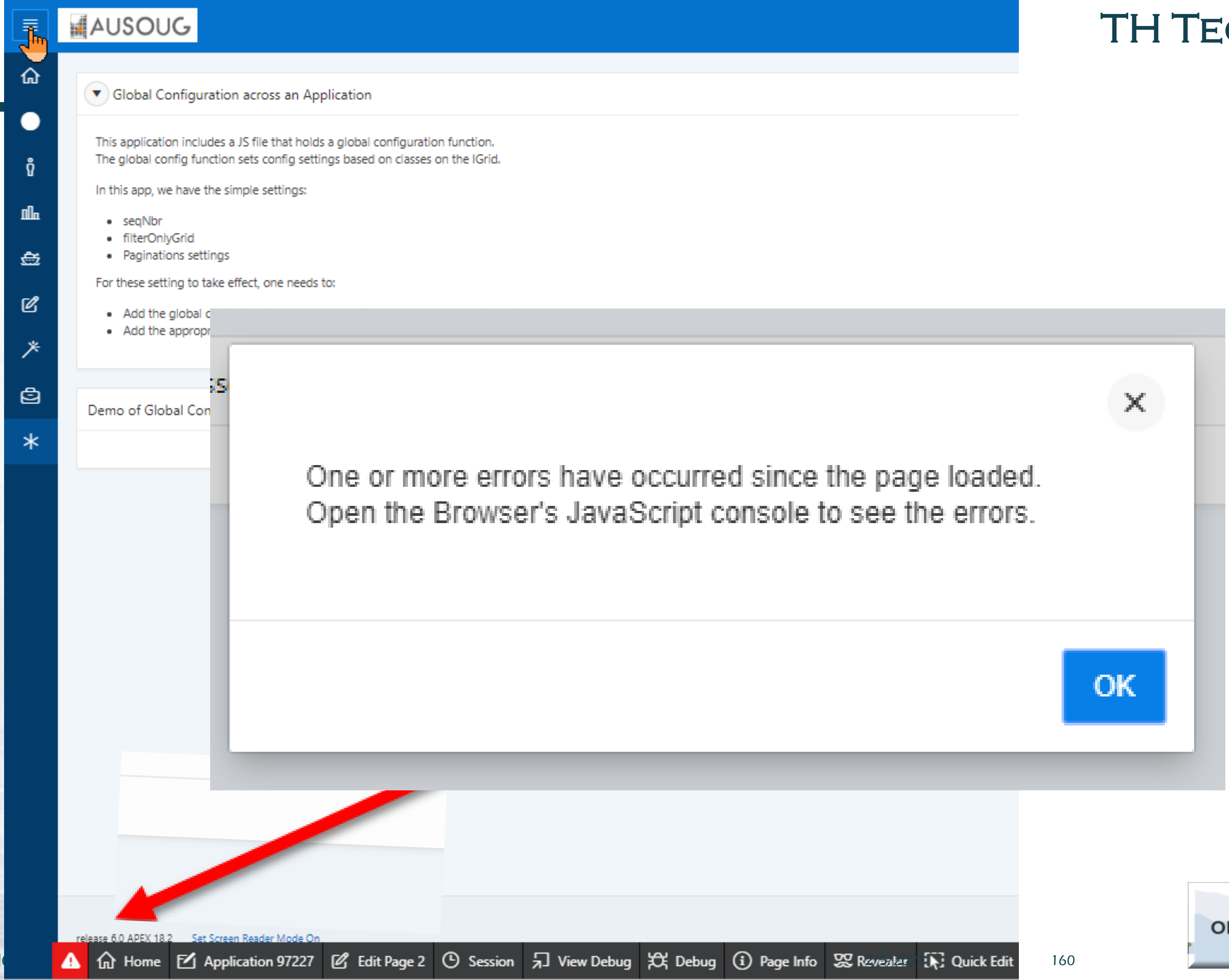
If T



Global Configuration across an Application

This application includes a JS file that holds a global configuration function.
The global config function sets config settings based on classes on the IGrid.

In this app, we have the simple settings:

- seqNbr
- filterOnlyGrid
- Paginations settings

For these setting to take effect, one needs to:

- Add the global c
- Add the appropr

Demo of Global Con

One or more errors have occurred since the page loaded.
Open the Browser's JavaScript console to see the errors.

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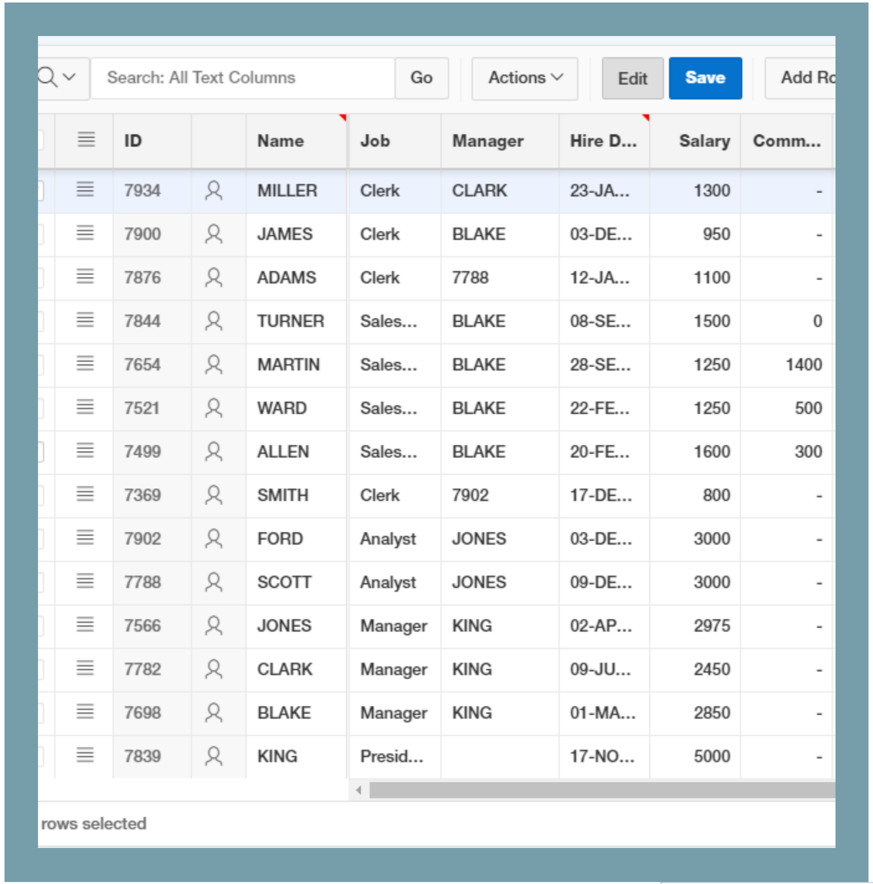
Standards

Best Practices

Recommendations for Adding JavaScript to APEX Applications


Search: All Text Columns

ID	Name	Job	Manager	Hire D...	Salary	Comm...
7934	MILLER	Clerk	CLARK	23-JA...	1300	-
7900	JAMES	Clerk	BLAKE	03-DE...	950	-
7876	ADAMS	Clerk	7788	12-JA...	1100	-
7844	TURNER	Sales...	BLAKE	08-SE...	1500	0
7654	MARTIN	Sales...	BLAKE	28-SE...	1250	1400
7521	WARD	Sales...	BLAKE	22-FE...	1250	500
7499	ALLEN	Sales...	BLAKE	20-FE...	1600	300
7369	SMITH	Clerk	7902	17-DE...	800	-
7902	FORD	Analyst	JONES	03-DE...	3000	-
7788	SCOTT	Analyst	JONES	09-DE...	3000	-
7566	JONES	Manager	KING	02-AP...	2975	-
7782	CLARK	Manager	KING	09-JU...	2450	-
7698	BLAKE	Manager	KING	01-MA...	2850	-
7839	KING	Presid...		17-NO...	5000	-

rows selected

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Adding JS to APEX

Follow the Usual Best Practices:

- Put Bulk of Code in JS Files
- Minify
- Read More in the Introduction to the JS API doc:

Adding JavaScript to an Application Express application
https://docs.oracle.com/en/database/oracle/application-express/19.1/aexjs/index.html

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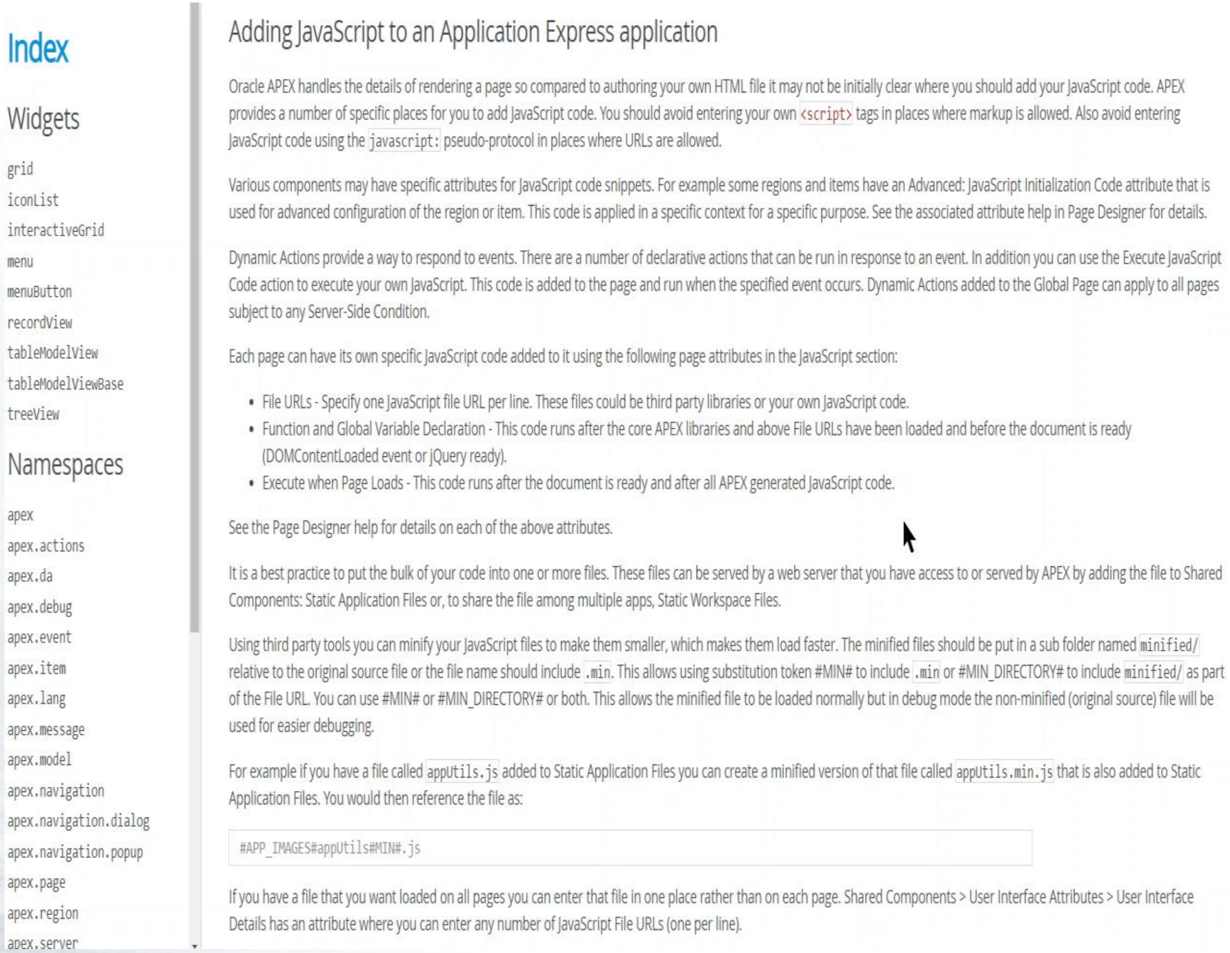

Index

Widgets

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tableModelViewBase
treeView

Namespaces

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apex.da
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apex.event
apex.item
apex.lang
apex.message
apex.model
apex.navigation
apex.navigation.dialog
apex.navigation.popup
apex.page
apex.region
apex.server

Adding JavaScript to an Application Express application

Oracle APEX handles the details of rendering a page so compared to authoring your own HTML file it may not be initially clear where you should add your JavaScript code. APEX provides a number of specific places for you to add JavaScript code. You should avoid entering your own `<script>` tags in places where markup is allowed. Also avoid entering JavaScript code using the `javascript:` pseudo-protocol in places where URLs are allowed.

Various components may have specific attributes for JavaScript code snippets. For example some regions and items have an Advanced: JavaScript Initialization Code attribute that is used for advanced configuration of the region or item. This code is applied in a specific context for a specific purpose. See the associated attribute help in Page Designer for details.

Dynamic Actions provide a way to respond to events. There are a number of declarative actions that can be run in response to an event. In addition you can use the Execute JavaScript Code action to execute your own JavaScript. This code is added to the page and run when the specified event occurs. Dynamic Actions added to the Global Page can apply to all pages subject to any Server-Side Condition.

Each page can have its own specific JavaScript code added to it using the following page attributes in the JavaScript section:

- File URLs - Specify one JavaScript file URL per line. These files could be third party libraries or your own JavaScript code.
- Function and Global Variable Declaration - This code runs after the core APEX libraries and above File URLs have been loaded and before the document is ready (DOMContentLoaded event or jQuery ready).
- Execute when Page Loads - This code runs after the document is ready and after all APEX generated JavaScript code.

See the Page Designer help for details on each of the above attributes.

It is a best practice to put the bulk of your code into one or more files. These files can be served by a web server that you have access to or served by APEX by adding the file to Shared Components: Static Application Files or, to share the file among multiple apps, Static Workspace Files.

Using third party tools you can minify your JavaScript files to make them smaller, which makes them load faster. The minified files should be put in a sub folder named `minified/` relative to the original source file or the file name should include `.min`. This allows using substitution token #MIN# to include `.min` or #MIN_DIRECTORY# to include `minified/` as part of the File URL. You can use #MIN# or #MIN_DIRECTORY# or both. This allows the minified file to be loaded normally but in debug mode the non-minified (original source) file will be used for easier debugging.

For example if you have a file called `appUtils.js` added to Static Application Files you can create a minified version of that file called `appUtils.min.js` that is also added to Static Application Files. You would then reference the file as:

```
#APP_IMAGES#appUtils#MIN#.js
```

If you have a file that you want loaded on all pages you can enter that file in one place rather than on each page. Shared Components > User Interface Attributes > User Interface Details has an attribute where you can enter any number of JavaScript File URLs (one per line).

Standardize Your Grids

- Have Standards
- Apply Common Settings, Configurations
- Use Copy/Duplicate and/or Plugins
- Use a Standard Global Configuration File, Function and Classes

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Standardize Your APEX Development

- Have Standards. Use Them.
- Apply Common Settings, Configurations
- Use Templates
- Use Copy/Duplicate and/or Plugins
- Use Standard Global Configuration File, Function and Classes Where Possible

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Standardize

Stay Sane

Keep Your Users Happy

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Know Your Tool
Use Your Tool

Know Your Tool

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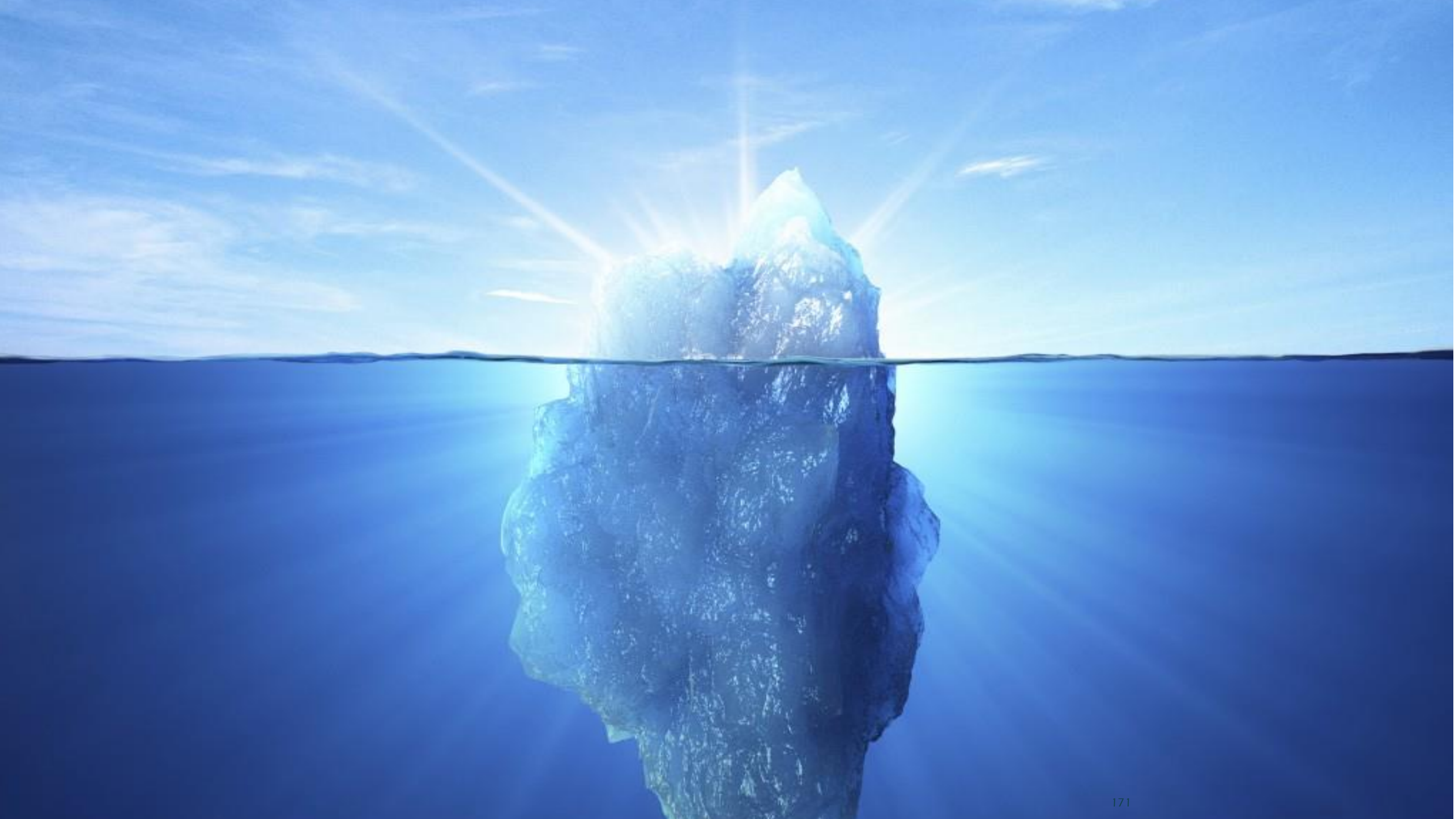

Grid Challenge
Homework

- Sample Interactive Grid App
- IG Cookbook
  http://www.hardlikesoftware.com
- Read the APIs (coffee!!)
- Read the JS Widget Code
  <apex_install_dir>/images/libraries/apex

PLAY

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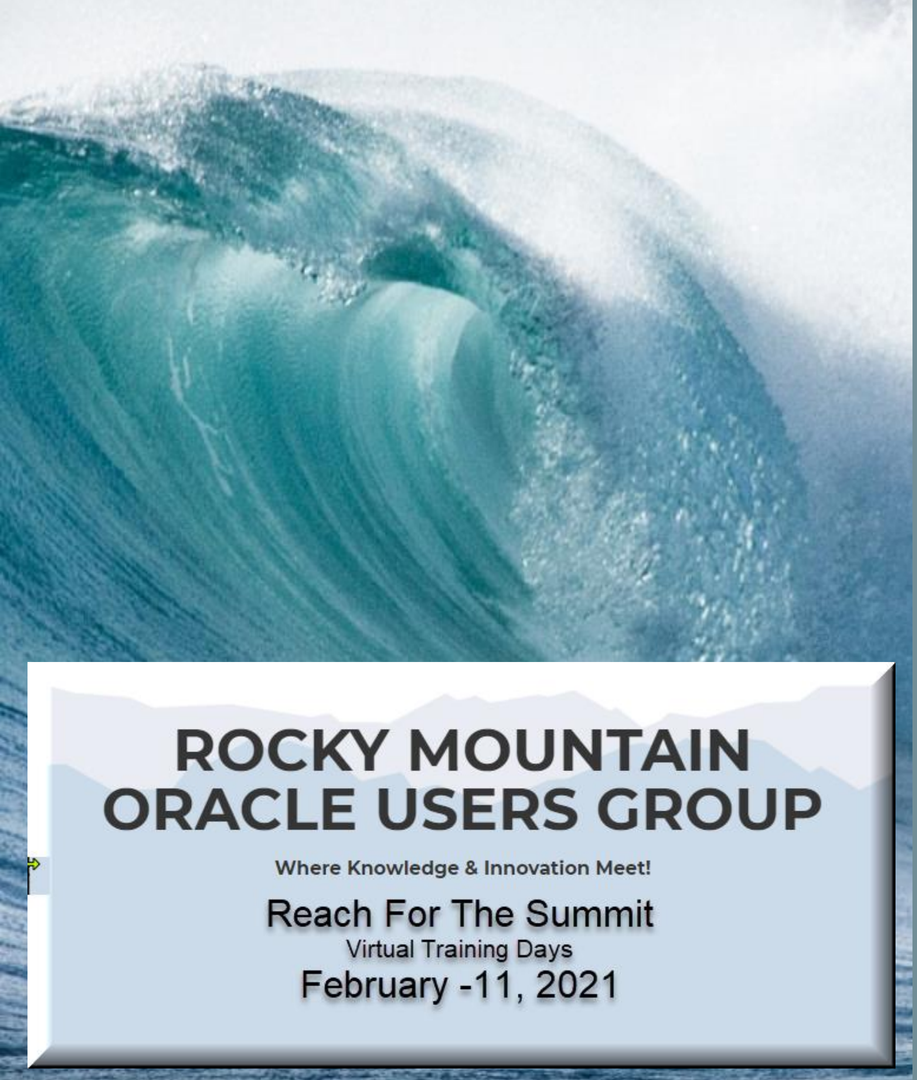

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Reach For The Summit

Virtual Training Days

February -11, 2021

Questions?
Thank You

Email for Demo Apps, Slides

Karen Cannell
kcannell@thtechnology.com
@thtechnology

Presentation Resources

- Validations App
- Sample Grids App

Validations Resources

- Oracle APEX Documentation

  https://docs.oracle.com/en/database/oracle/application-express/20.2/htmdb/validating-user-input-in-forms.html#GUID-8BA81FD5-E138-494D-9F8E-35D5A370E31A

- J Snyders, Client Side Validation

  https://hardlikesoftware.com/weblog/2017/05/10/apex-client-side-validation/

- M Mulvaney Client Side Validation

  https://explorer.co.uk/client-side-validations/

- M Mulvaney Grid Validations

  https://explorer.co.uk/the-numerous-options-for-apex-18-1-interactive-grid-validations/

- Translate Client Side Messages

  http://apexbyg.blogspot.com/2017/02/apex-51-translate-html5-client-side.html

Grids Resources

- APEX JavaScript Reference

  https://docs.oracle.com/en/database/oracle/application-express/19.1/aexjs/index.html
- Sample Interactive Grids

  APEX 19.1+ Sample Application, Editing section
- Interactive Grid Cookbook, 19.1

  http://hardlikesoftware.com/weblog/2019/03/30/apex-ig-cookbook-update-for-19-1/
- Architecture: Interactive Grids Under the Hood

  http://hardlikesoftware.com/weblog/2016/06/08/interactive-grid-under-the-hood/
- More on Grids: How to Hack Interactive Grids, Parts I thru IV
  http://hardlikesoftware.com/weblog/2017/01/18/how-to-hack-apex-interactive-grid-part-1/

Grids Resources, cont'd

- APEX Client-Side Validation
  http://hardlikesoftware.com/weblog/2017/05/10/apex-client-side-validation/#more-615
- Interactive Grid Extend Toolbar Plugin
  https://github.com/mgoricki/apex-plugin-extend-ig-toolbar

Shortcut to APEX JavaScript APIs:

apex.oracle.com/api
#39 JavaScript APIs
follow the link

Where to Put JS Files

- https://www.talkapex.com/2017/01/how-to-reference-javsscript-and-css-files-for-entire-application/js-storage.gif

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