

Front-End Web Technologies for Geospatial Developers

A. Davis (they/them)

Nate Bedortha (he/him)

```
<arcgis-map zoom="4" center="-118,34">
  <arcgis-search position="top-right" />
</arcgis-map>
```

```
view.goTo({
  center: [-126, 49]
})
.catch(function(error) {
  if (error.name != "AbortError") {
    console.error(error);
  }
});
```

First, some JavaScript

Promises
async/await
Events

```
view.goTo({  
    center: [-126, 49]  
})  
.catch(function(error) {  
    if (error.name != "AbortError") {  
        console.error(error);  
    }  
});
```

```
queryParameters =  
QueryParameters().apply {  
    whereClause = "price > 200"  
}  
viewModelScope.launch {
```

Promises

The eventual completion (or failure) of an async operation - and its resulting value

Chainable

Error handling with `.catch()`

```
queryFeatures({ url: featureServiceUrl, where: "Status = 'Active'" })
  .then(layer => normalizeSiteData(layer))
  .then(sites => filterResults(sites))
  .catch(error => {
    console.log(error)
  });

```

async/await



```
document.addEventListener("calciteInputChange", async (event) => {
  const address = { singleLine: event.target.value };
  const serviceUrl =
    "https://geocode.arcgis.com/arcgis/rest/services/World/GeocodeServer";

  try {
    const locations = await addressToLocations(serviceUrl, { address });
    // Do something with the data from the resolved promise
  } catch (error) {
    console.log(error)
  }
});
```

Created on top of the Promise object

Async: returns a promise

Await: used inside sync function to get the promise's result

Simplifies syntax (no chaining)

Error handling? try/catch statement

Events



```
const button = document.getElementById("thatButton");
button.addEventListener("click", (e) => {
  console.log(`#${e.target.id} was clicked!`);

document.addEventListener("calciteChipGroupSelect", (e) => {
  const filters = e.target.selectedItems.map((selected) =>
selected.value);
  // do something with this new array of selected values
});
```

Emitted by HTML elements

Event listeners can be attached to document, DOM nodes

Calcite components uses
CustomEvents

CustomEvents behave similarly to native browser events

Calcite Design System

Calcite Components

```
view.goTo({  
    center: [-126, 49]  
})  
.catch(function(error) {  
    if (error.name != "AbortError") {  
        console.error(error);  
    }  
});
```

```
queryParameters =  
QueryParameters().apply {  
    whereClause = "price > 200"  
}  
viewModelScope.launch {
```

Web components

Custom elements
Slots
Shadow DOM

```
view.goTo({  
    center: [-126, 49]  
})  
.catch(function(error) {  
    if (error.name != "AbortError") {  
        console.error(error);  
    }  
});
```

```
queryParameters =  
QueryParameters().apply {  
    whereClause = "price > 200"  
}  
viewModelScope.launch {
```

Custom Elements



```
<calcite-chip value="vegetables">  
  Vegetables  
</calcite-chip>
```

HTML elements with custom behavior

Inherit from native HTML elements.

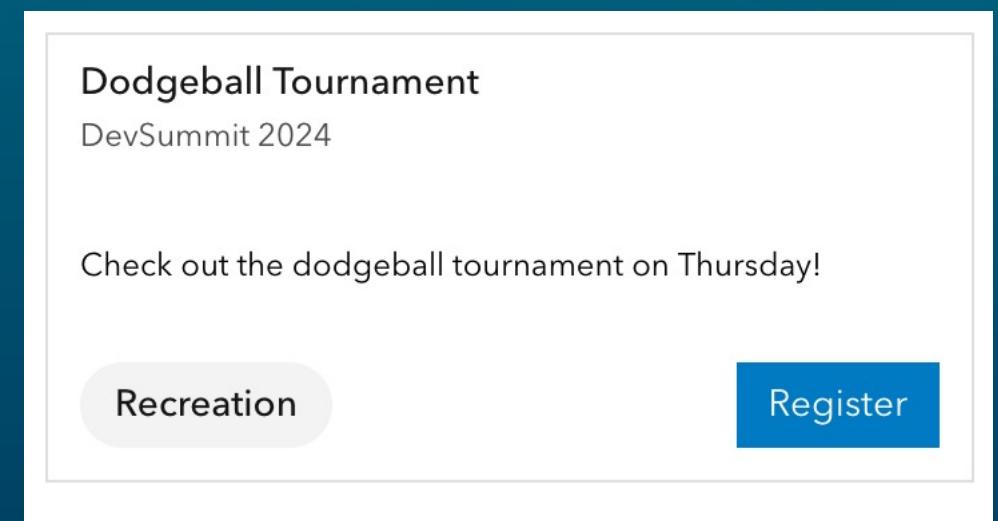
CustomElementRegistry & whenDefined()

Slots



```
<calcite-card>  
  <h4 slot="title">Dodgeball Tournament</h4>  
  <p slot="description">DevSummit 2024</p>  
  <p>Come play dodgeball!</p>  
  <div slot="footer-start">  
    <calcite-chip>Recreation</calcite-chip>  
  </div>  
  <div slot="footer-end">  
    <calcite-button>Register</calcite-button>  
  </div>  
</calcite-card>
```

Placeholder elements within web components



Shadow DOM

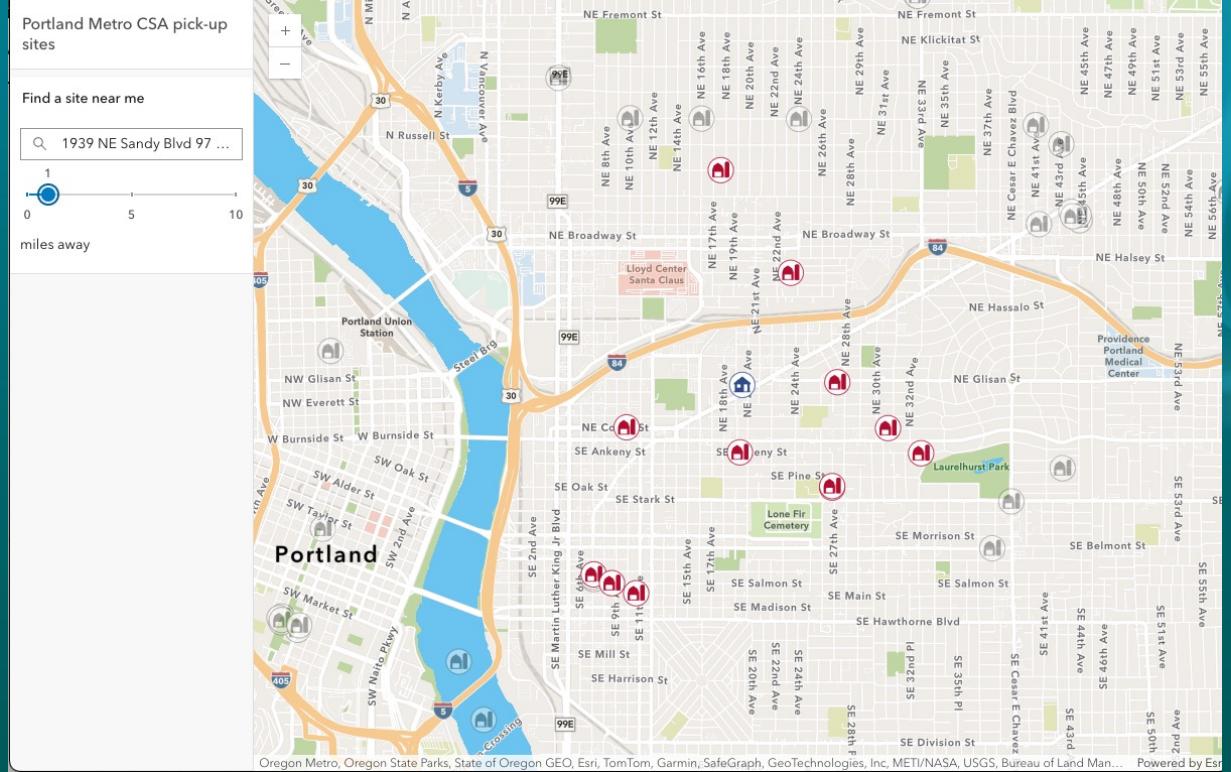
The Document Object Model (DOM) represents the page (document) as a tree of nodes and objects.

Shadow DOM allows hidden DOM trees to be attached to elements in the regular DOM

Enables encapsulation of custom elements.



CSA pick-up sites: Map Demo



```
view.goTo({
  center: [-126, 49]
})
.catch(function(error) {
  if (error.name != "AbortError") {
    console.error(error);
  }
});
```

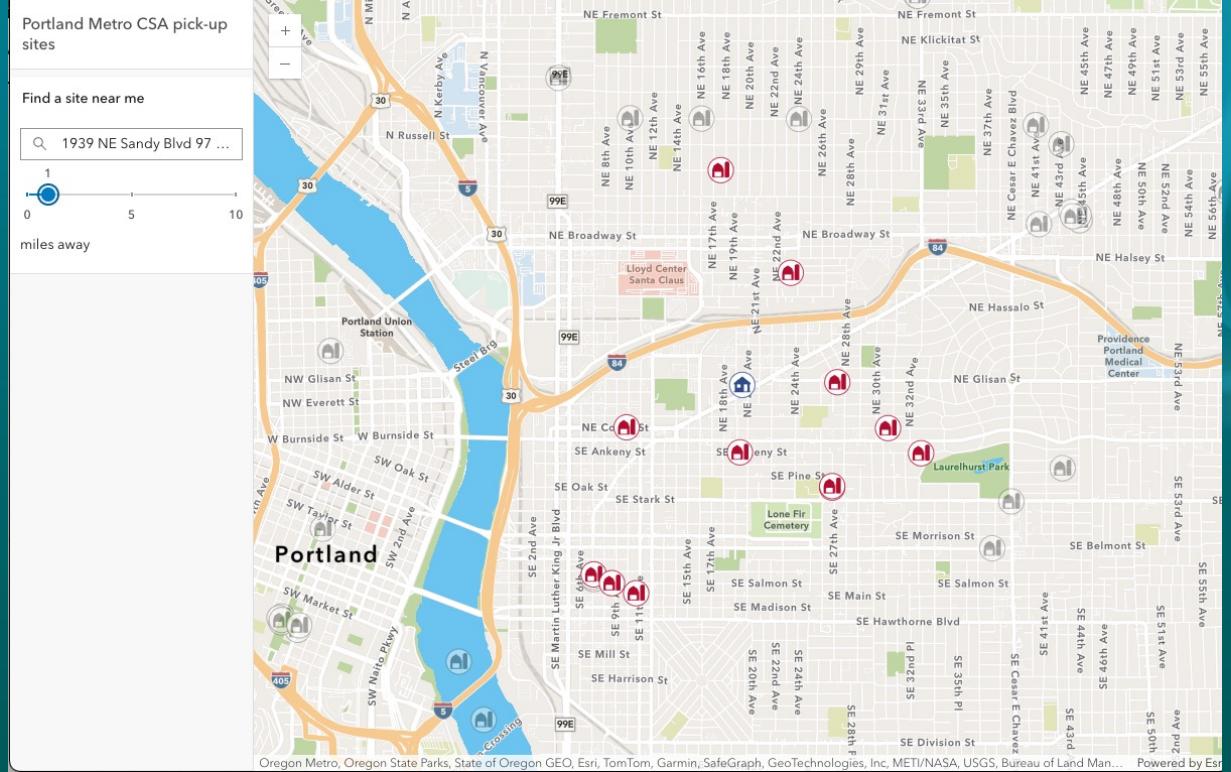
```
queryParameters =
  queryParameters().apply {
    whereClause = "price > 200"
}
viewModelScope.launch {
```

WE'RE FROM PORTLAND

OF COURSE WE SUPPORT COMMUNITY AGRICULTURE



CSA pick-up sites: Map Demo



```
view.goTo({
  center: [-126, 49]
})
.catch(function(error) {
  if (error.name != "AbortError") {
    console.error(error);
  }
});
```

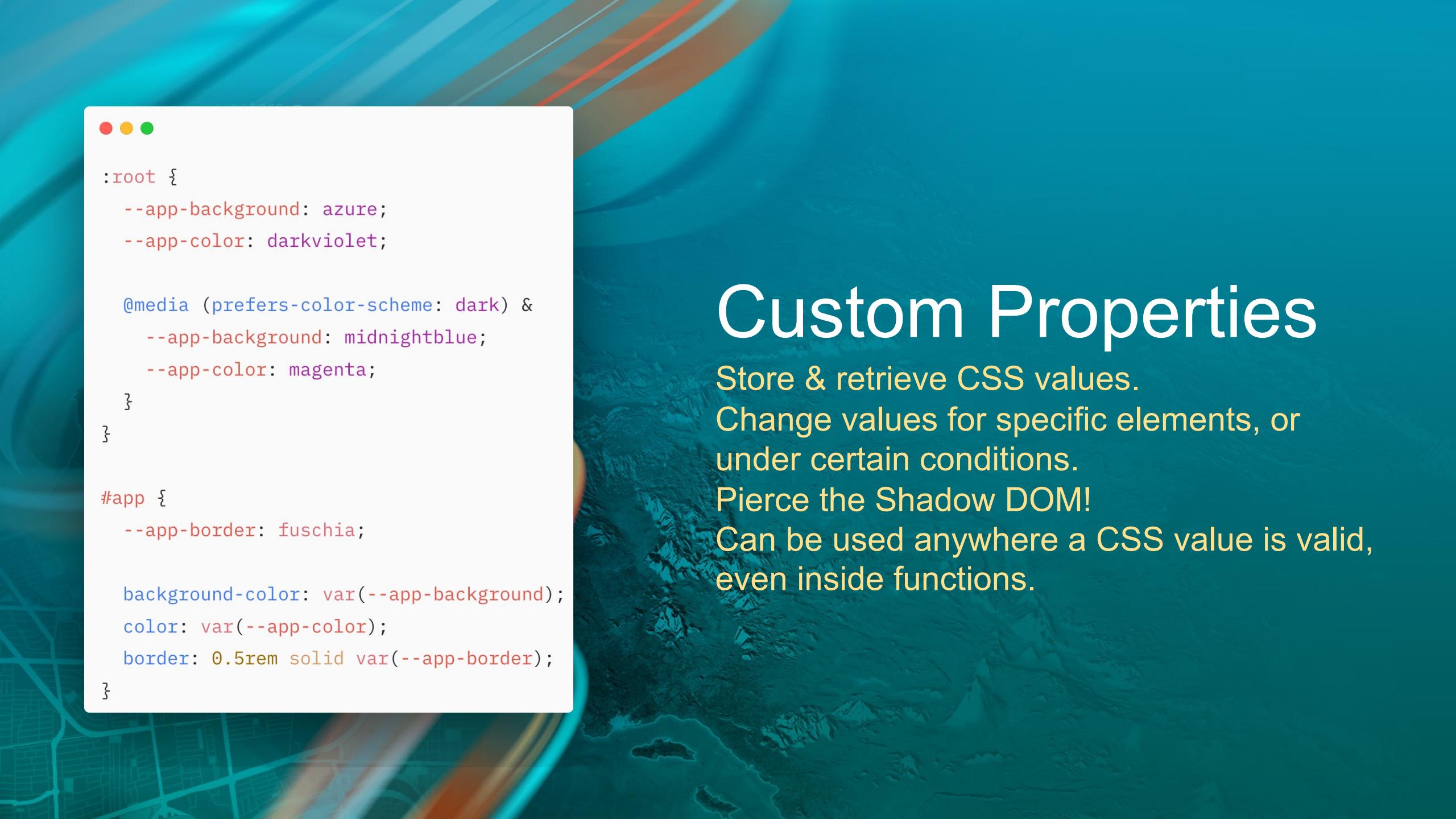
```
queryParameters =
  queryParameters().apply {
    whereClause = "price > 200"
}
viewModelScope.launch {
```

CSS

Cascading Style Sheets

```
view.goTo({  
    center: [-126, 49]  
})  
.catch(function(error) {  
    if (error.name != "AbortError") {  
        console.error(error);  
    }  
});
```

```
queryParameters =  
QueryParameters().apply {  
    whereClause = "price > 200"  
}  
viewModelScope.launch {
```



```
:root {  
  --app-background: azure;  
  --app-color: darkviolet;  
  
  @media (prefers-color-scheme: dark) &  
    --app-background: midnightblue;  
    --app-color: magenta;  
}  
  
#app {  
  --app-border: fuschia;  
  
  background-color: var(--app-background);  
  color: var(--app-color);  
  border: 0.5rem solid var(--app-border);  
}
```

Custom Properties

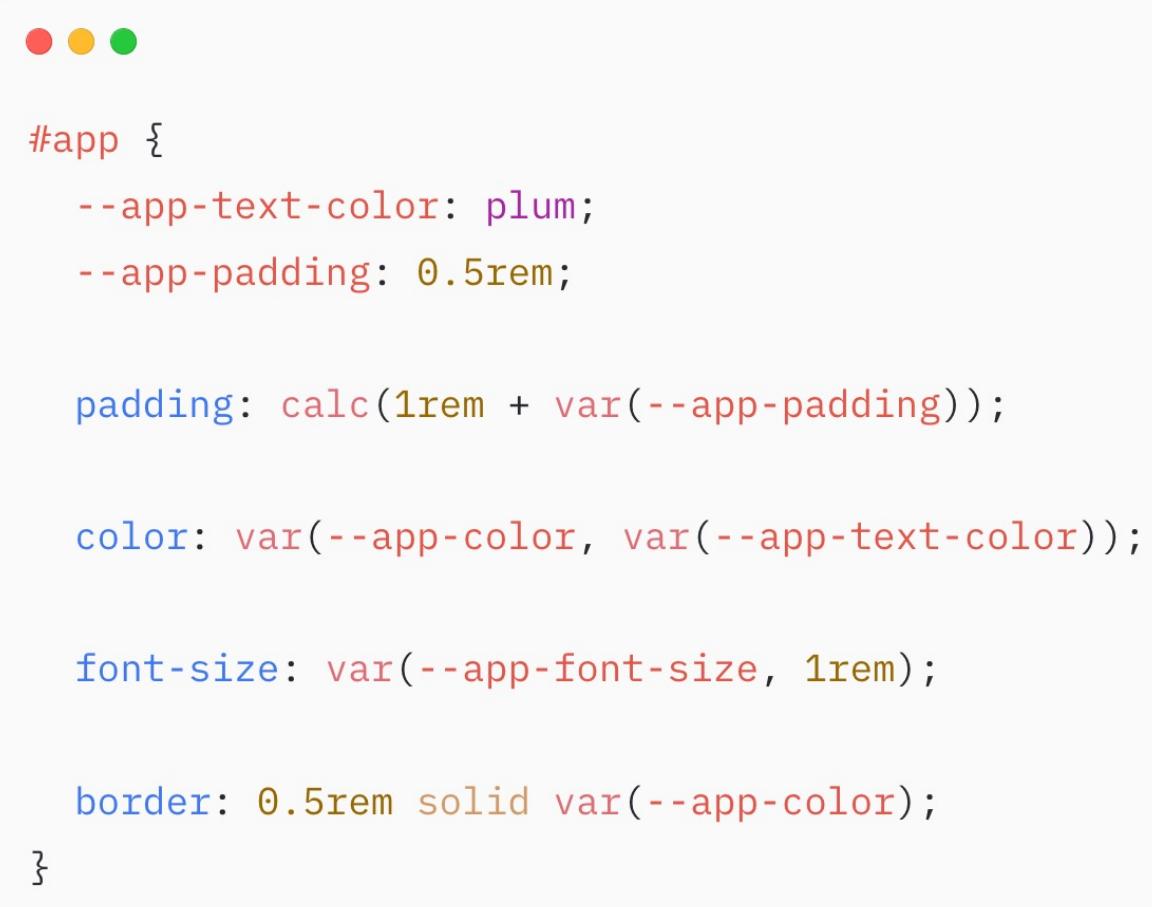
Store & retrieve CSS values.

Change values for specific elements, or under certain conditions.

Pierce the Shadow DOM!

Can be used anywhere a CSS value is valid, even inside functions.

```
    queryParameters =  
      queryParameters().apply {  
        ...  
        = "device > 200"
```



```
#app {  
  --app-text-color: plum;  
  --app-padding: 0.5rem;  
  
  padding: calc(1rem + var(--app-padding));  
  
  color: var(--app-color, var(--app-text-color));  
  
  font-size: var(--app-font-size, 1rem);  
  
  border: 0.5rem solid var(--app-color);  
}
```

var()

Output the value of a named custom property.

Valid in any part of a value, including functions like calc(). A fallback will be used if the custom property is invalid; this could be another var().

ArcGIS REST JS

developers.arcgis.com/arcgis-rest-js

```
view.goTo({  
    center: [-126, 49]  
})  
.catch(function(error) {  
    if (error.name != "AbortError") {  
        console.error(error);  
    }  
});
```

```
queryParameters =  
QueryParameters().apply {  
    whereClause = "price > 200"  
}  
viewModelScope.launch {
```

CSA pick-up sites: List demo

47th Avenue Farm 6632 SE 47th Ave, 97206 One of Portland's oldest urban farms, we have been growing for our CSA members & local award winning restaurants for over 20 years. We grow over 200 varieties of crops and offer a Summer & Winter Share so you'll eat well all year round.	Cully Neighborhood Farm 5555 NE Sumner St Portland, OR 97218 Cully Neighborhood Farm is a one acre urban farm in Northeast Portland that grows a diversity of mixed vegetables and herbs since 2010. We use sustainable and ecological growing methods to bring delicious produce varieties to CSA members.	Full Farm CSA 1803 SW Park Ave, Portland, 97201 Personally crafted, full diet CSA. Members pick the price that's right for them and customize their box each week to create a well-rounded, seasonal diet all year-round! Choose from Organic and Seasonal Vegetables, Fruits, Herbs and Nuts, Grassfed and Pasture Raised Meats, Eggs and Raw Dairy, Heirloom Grains and Beans, Flowers, Honey, Bread, Pasta and Locally Roasted Coffee.	Flying Coyote Farm 6520 NE Wygant Flying Coyote Farm is a Certified Organic and Biodynamic farm located in Sandy, Oregon. For us growing food is an essential and radical act that leads to healthier communities, land, and people. Come eat at our table and taste the difference!
Full Cellar Farm 7716 SE 66TH AVE Full Cellar Farm is all about choice! This weekly vegetable CSA is sized for households of 2-3 adults and lets members choose which items they would like to receive each week. All of our produce is sustainably grown in Gresham.	Full Cellar Farm 243 SE 78th Ave, Portland 97215 Full Cellar Farm is all about choice! This weekly vegetable CSA is sized for households of 2-3 adults and lets members choose which items they would like to receive each week. All of our produce is sustainably grown in Gresham.	Full Cellar Farm 346 SE 27TH AVE Full Cellar Farm is all about choice! This weekly vegetable CSA is sized for households of 2-3 adults and lets members choose which items they would like to receive each week. All of our produce is sustainably grown in Gresham.	Full Plate Farm 4226 SE Pine, Portland 97214 Full Plate Farm is located on a gentle slope among oaks and firs in Ridgefield, Washington, 18 miles north of Portland. The farm specializes in winter produce and offers a seasonal bi-weekly CSA share that includes an abundance of root vegetables, winter greens, squash, leeks, garlic and herbs, among other delicious winter vegetables.
Full Plate Farm 721 NW 9th Ave, Portland 97209	Full Plate Farm 8818 SW Becker Dr, Portland 97223	Full Plate Farm 1033 SE Main St #1	Full Plate Farm NE 9th and Mason St

```
view.goTo({
  center: [-126, 49]
})
.catch(function(error) {
  if (error.name != "AbortError") {
    console.error(error);
  }
});
```

```
queryParameters = QueryParameters().apply {
  whereClause = "price > 200"
}
viewModelScope.launch {
```

Browser Developer Tools

Inspector
Network
Responsive Mode

```
view.goTo({  
    center: [-126, 49]  
})  
.catch(function(error) {  
    if (error.name != "AbortError") {  
        console.error(error);  
    }  
});
```

```
queryParameters =  
QueryParameters().apply {  
    whereClause = "price > 200"  
}  
viewModelScope.launch {
```

```
queryParameters =  
queryParameters().apply {  
    if (use = "price > 200"  
}  
viewModelScope.launch {
```

The screenshot shows a web browser window displaying the "Mapping APIs and location services" page. On the left, there's a sidebar with navigation links like "Overview", "Key features", "Get started", "Location services", "APIs", "Tutorials", and various sub-links for maps, data hosting, visualization, places, geocoding, routing, data enrichment, spatial analysis, content management, offline, security, authentication, deployment, and migration. The main content area has sections for "ArcGIS location services", "Where to start", "Topics", "Tutorials", "Next steps", "Got documentation feedback?", "Take this short survey", "How-to video", and "ArcGIS location services guides overview". A modal dialog titled "GET STARTED LOCATION SERVICES" is visible. On the right, the browser's developer tools are open, specifically the "Inspector" tab. It shows the DOM structure of the page, with the main content area highlighted. Below the DOM tree, the "Layout" tab displays the box model for the selected element, showing dimensions of 179.1x822, margins, borders, and padding. The "Computed" tab shows the final CSS properties applied to the element.

Inspector

Show grid and flex layouts.
Modify CSS properties and values.
Edit element pseudo-classes.
Visualize box model layout.

```
queryParameters =  
queryParameters().apply {  
    value = "price > 200"  
}  
viewModelScope.launch {
```

Mapping APIs and location services

Find page...
Get started
Location services
APIs
Tutorials
Maps
Data hosting
Visualization
Places
Geocoding
Routing
Introduction
Pause and directions

Highland Yucaipa San Gorgonio Pass San Bernardino National Forest
Perris Hemet Agua Caliente Rancho Mirage Indio
Driving Time Leave now Save Save As
Topics Tutorials Services API support Tools
Was this page helpful? Yes No

Turn-by-turn directions and a route displayed for two or more locations using a widget and the routing service
Loma Linda University, UC Riverside, County of Riverside, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, and others. Powered by Esri

Inspector Console Debugger Network Style Editor Performance Accessibility Application axeDevTools Components Profiler
Filter URLs
Status Method Domain File Initiator Type Transferred Size 0 ms 1.37 min
200 GET basemaps-api.arcgis.com 44.pb?token=AAPK9250e700411749c9b0f45c5c54662124eGi6gpLH6WTEpl4rw0r6Vt 4.28-63 (fetch)
200 GET basemaps-api.arcgis.com 45.pb?token=AAPK9250e700411749c9b0f45c5c54662124eGi6gpLH6WTEpl4rw0r6Vt 4.28-63 (fetch)
200 GET basemaps-api.arcgis.com 90.pb?token=AAPK9250e700411749c9b0f45c5c54662124eGi6gpLH6WTEpl4rw0r6Vt 4.28-63 (fetch)
200 GET basemaps-api.arcgis.com 89.pb?token=AAPK9250e700411749c9b0f45c5c54662124eGi6gpLH6WTEpl4rw0r6Vt 4.28-63 (fetch)
200 GET basemaps-api.arcgis.com 88.pb?token=AAPK9250e700411749c9b0f45c5c54662124eGi6gpLH6WTEpl4rw0r6Vt 4.28-63 (fetch)
200 GET basemaps-api.arcgis.com 90.pb?token=AAPK9250e700411749c9b0f45c5c54662124eGi6gpLH6WTEpl4rw0r6Vt 4.28-63 (fetch)
200 GET js.arcgis.com 89.pb?token=AAPK9250e700411749c9b0f45c5c54662124eGi6gpLH6WTEpl4rw0r6Vt 4.28-63 (fetch)
200 GET js.arcgis.com libtess.wasm libtess.js:17 (fetch)
200 GET basemaps-api.arcgis.com RRnfhFnknn-AAPK9250e700411749c9b0f45c5c54662124eGi6gpLH6WTEpl4rw0r6Vt 4.28-63 (fetch)
111 requests 3.64 MB / 1.30 MB transferred | Finish: 4.87 min | DOMContentLoaded: 285 ms | load: 1.69 s

Network

Troubleshoot slow resources.
Inspect http responses.
Modify http request parameters.

```
queryParameters =  
queryParameters().apply {  
    clause = "price > 200"  
}  
viewModelScope.launch {
```

Mapping APIs and location service

Nearby search

Show table of contents

Product support: ArcGIS Platform, ArcGIS Online, ArcGIS Enterprise

Filter by category: Dining and Drinking

Search text (optional): bar

E.g. bar, coffee, cafe

Radius (meters): 500

Enable paging (20 Places returned)

Search for places in New York using a category filter, and radius

HTML code (partial):

```
<div class="first:::mt-0 last:::mb-0 contents" style="--calcite-ui-icon-color:currentColor"> contents  
<div class="calcite-uiclick-block fill-color-icon align-middle" style="margin:0 4px 4px 0; width:"16" height:"16" viewBox="0 0 16 16"></div>  
<br class="calcite-uiclick-select-text underline-decoration-brand-decoration-dashed-decoration-from-front underline-offset:-4" disable="pointer"="false" aria-controls="calcite-popupver-3adde162-6734-c626-9ead-1448a4f982e" aria-expanded="false">ArcGIS Platform</br> [event]  
<svg class="calcite-uiclick-select-text underline-decoration-brand-decoration-dashed-decoration-from-front underline-offset:-4" disable="pointer"="false" aria-controls="calcite-popupver-08195e85-48ac-36de-a015-353593baef84" aria-expanded="false">ArcGIS Online</br> [event]  
<svg class="calcite-uiclick-select-text underline-decoration-brand-decoration-dashed-decoration-from-front underline-offset:-4" disable="pointer"="false" aria-controls="calcite-popupver-fdbaa85fc-3721-5a51-4cc1-d5e8b94ae85" aria-expanded="false">ArcGIS Enterprise</br> [event]
```

Search results:

- Bar (1)
- Bar (2)
- Bar (3)
- Bar (4)
- Bar (5)
- Bar (6)
- Bar (7)
- Bar (8)
- Bar (9)
- Bar (10)
- Bar (11)
- Bar (12)
- Bar (13)
- Bar (14)
- Bar (15)
- Bar (16)
- Bar (17)
- Bar (18)
- Bar (19)
- Bar (20)

Responsive Mode

Simulate viewport dimensions.
Test @media queries.
Find fluid layout problems.

Resources

Demo code and more resources: github.com/araedavis/esri-dev-summit-2024

ArcGIS Developers documentation: developers.arcgis.com/documentation

MDN web docs
developer.mozilla.org

Can I Use
caniuse.com

Frontend Masters
frontendmasters.com/guides

Modern CSS Solutions
moderncss.dev

JavaScript 30
javascript30.com

Grid by Example
gridbyexample.com

Other Sessions to at Dev Summit

To name just a few!

- Building Web Apps with ArcGIS Maps SDK for JavaScript and Calcite Design System

Wednesday, Mar 13 • 1:00 PM • Primrose B

- Build Accessible Web Apps with ArcGIS Maps SDK for JavaScript and Calcite Design System

Wednesday, Mar 13 • 4:00 PM • Primrose CD

- Building Web Apps with Calcite Design System and React

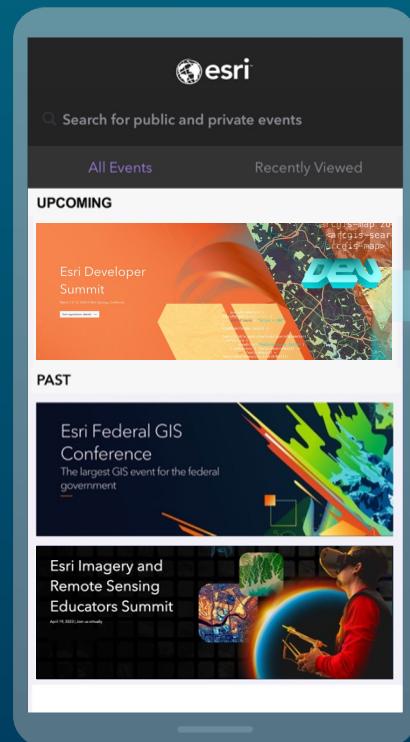
Thursday, Mar 14 • 10:30 AM • Demo Theater 1

- Building Apps with ArcGIS Maps SDK for JavaScript Components

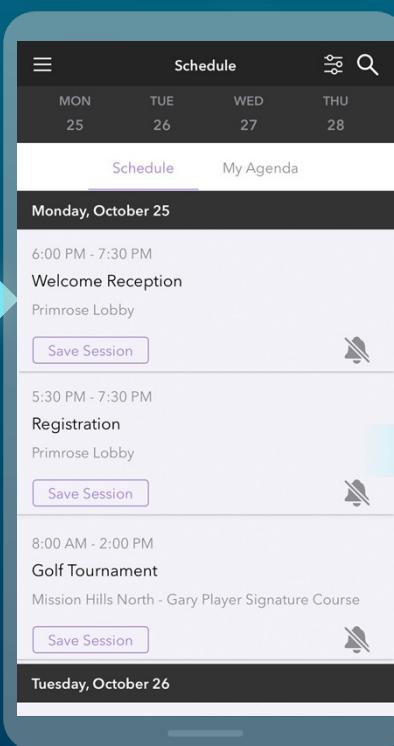
Thursday, Mar 14 • 1:00 PM • Primrose CD

Please Share Your Feedback in the App

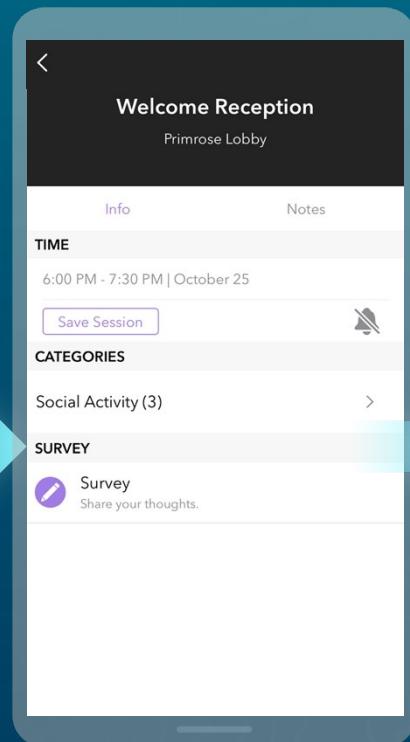
Download the Esri Events app and find your event



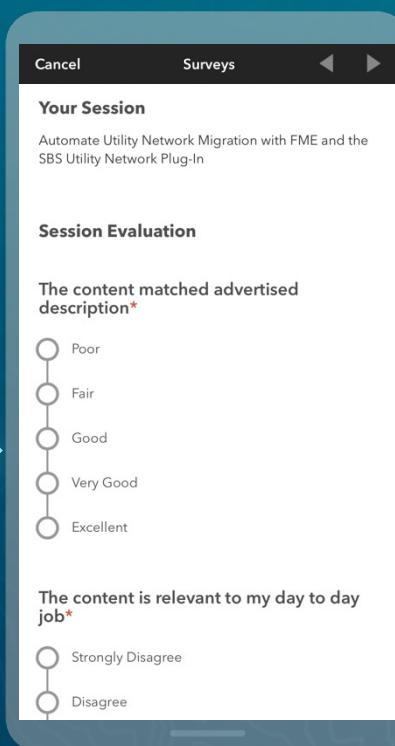
Select the session you attended



Scroll down to "Survey"



Log in to access the survey



Connect With Us On Social

And Join the Conversation Using #EsriDevSummit2024

-  twitter.com/EsriDevs #EsriDevSummit2024
-  twitter.com/EsriDevEvents
-  youtube.com/c/EsriDevelopers
-  links.esri.com/DevVideos
-  github.com/Esri
-  github.com/EsriDevSummit
-  links.esri.com/EsriDevCommunity

```
<arcgis-map zoom="4" center="-118,34" />  
  
view.goTo({  
  center: [-126, 49]  
})  
.catch(function(error) {  
  if (error.name != "AbortError") {  
    console.error(error);  
  }  
});
```

```
// show the compass and pass the  
mapRotation state data  
Compass(rotation = mapRotation)  
    // reset the ComposableMapView's viewpoint  
rotation to point north using the  
mapViewModel  
    mapViewModel.setViewpointRotation(0.0)  
}
```



esri®

THE
SCIENCE
OF
WHERE®

```
const layerList = new LayerList({  
    view: view  
});  
  
// Add widget to the top right corner  
// of the view  
view.ui.add(layerList, "top-right")  
  
<arcgis-map zoom="4" center="-118,34"
```