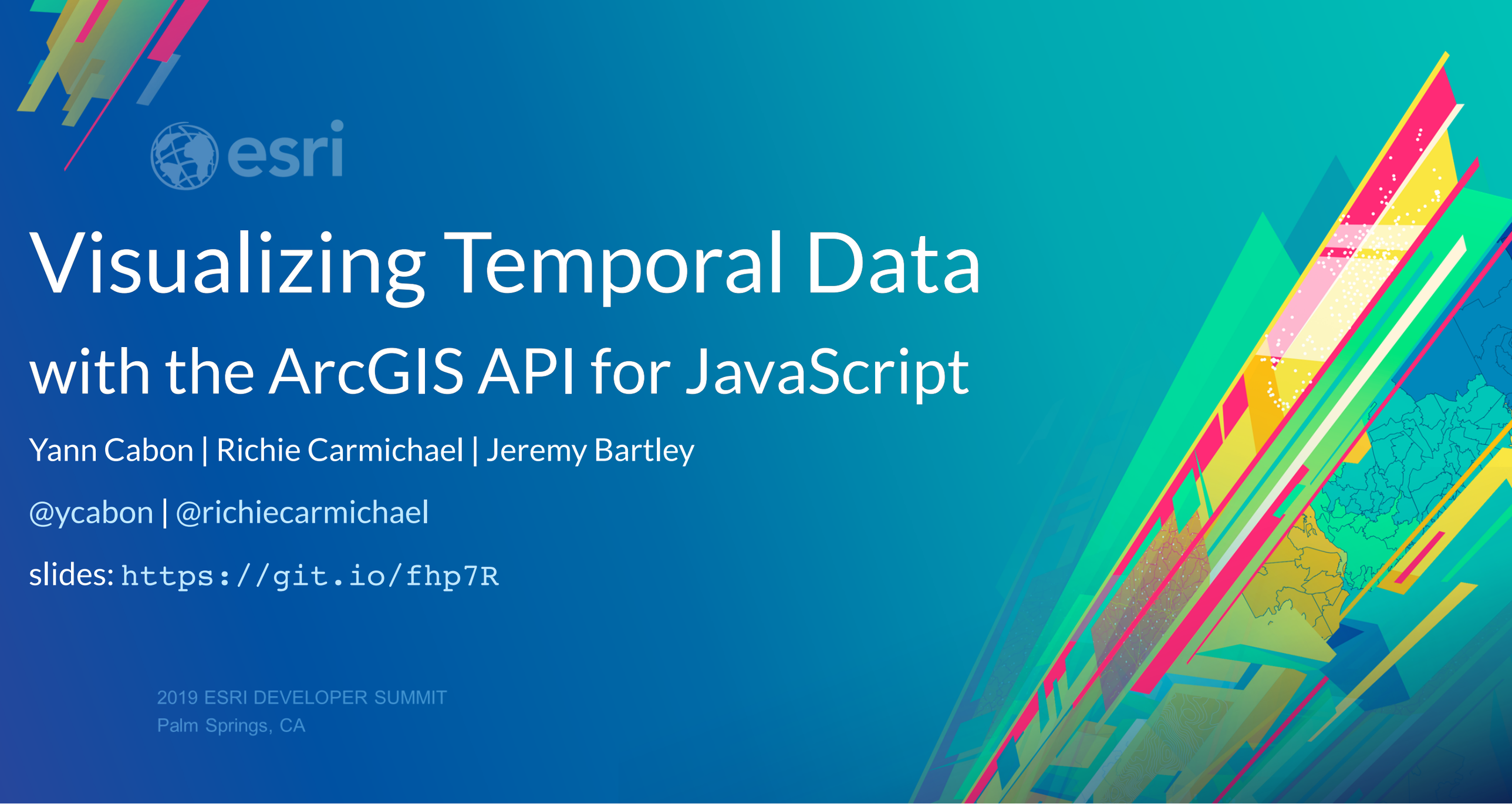

Visualizing Temporal Data

with the ArcGIS API for JavaScript

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slides: `https://git.io/fhp7R`

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Palm Springs, CA

Agenda

- Time support in the JS API
- New APIs in 4.11
- Visualizing time using Arcade
- Visualizing time using Visual Variables

Time support in 4.x - Roadmap

- What do we ship in 4.11:
  - Time metadata
    - TimeInfo
    - TimeExtent
  - Server-side queries
  - Client-side queries
  - Client-side filtering (display)
- Next
  - Image layers: TileLayer, MapImageLayer, ImageryLayer
  - New TimeSlider widget

Time Metadata

```
var featureLayer = new FeatureLayer({
    url: "https://sampleserver6.arcgisonline.com/arcgis/rest/services/Earthquakes_Since1970/FeatureServer/0"
});
featureLayer.load().then(function(){
    var timeInfo = featureLayer.timeInfo;

    console.log(`
        Start Field: ${timeInfo.startField}       // date_
        End Field:   ${timeInfo.endField}         // null
        Time Extent:
            Start:   ${timeInfo.timeExtent.start} // Sat Jan 03 1970 16:00:00 GMT-0800 (Pacific Standard Time)
            End:     ${timeInfo.timeExtent.end}   // Wed May 27 2009 17:00:00 GMT-0700 (Pacific Daylight Time)
    `);
});
```

TimeInfo

Name	Type	Summary
cumulative	Boolean	If true renders all historic data.
declaredClass	String	The name of the class.
endField	String	The name of the field containing the end time information.
startField	String	The name of the field containing the start time information.
timeExtent	TimeExtent	The time extent of all data in the layer.
useTime	Boolean	Indicates if the layer should be time enabled.

- Temporal properties intended by the service publisher.
- Used by the API for building queries and other widgets.

TimeExtent

Name	Type	Summary
`end`	`Date`	The end time of the time extent.
`start`	`Date`	The start time of the time extent.

- Used by TimeInfo metadata and Query to describe a period of time.

Server-side queries

```
var query = {
  timeExtent: {
    start: new Date(2000, 0, 1),
    end: new Date(2007, 0, 1)
  },
  where: "mag >= 5"
};
featureLayerQuake.queryFeatureCount(query).then(function(count){
  console.log(`${count} quakes found.`);  // e.g. 9235 quakes found.
});
```

- *timeExtent* added to Query
- Layers must be *time enabled*
- *Tip:* Use the developer dashboard to retroactively time-enabled layers

More server-side queries

```
FeatureLayer.queryExtent()
FeatureLayer.queryFeatureCount()
FeatureLayer.queryFeatures()
FeatureLayer.queryObjectIds()
```

Client-side queries

demo

```
view.on("pointer-move", function(event){
    if (!quakeView) { return; }
    event.stopPropagation();

    const query = featureLayerQuake.createQuery();
    query.timeExtent = {
        start: startTime,
        end: endTime
    };
    query.geometry = view.toMap(event);
    query.distance = 500;
    query.units = "kilometers";
    query.returnQueryGeometry = true;

    quakeView.queryFeatures(query).then(function(results) {
```

Client-side queries

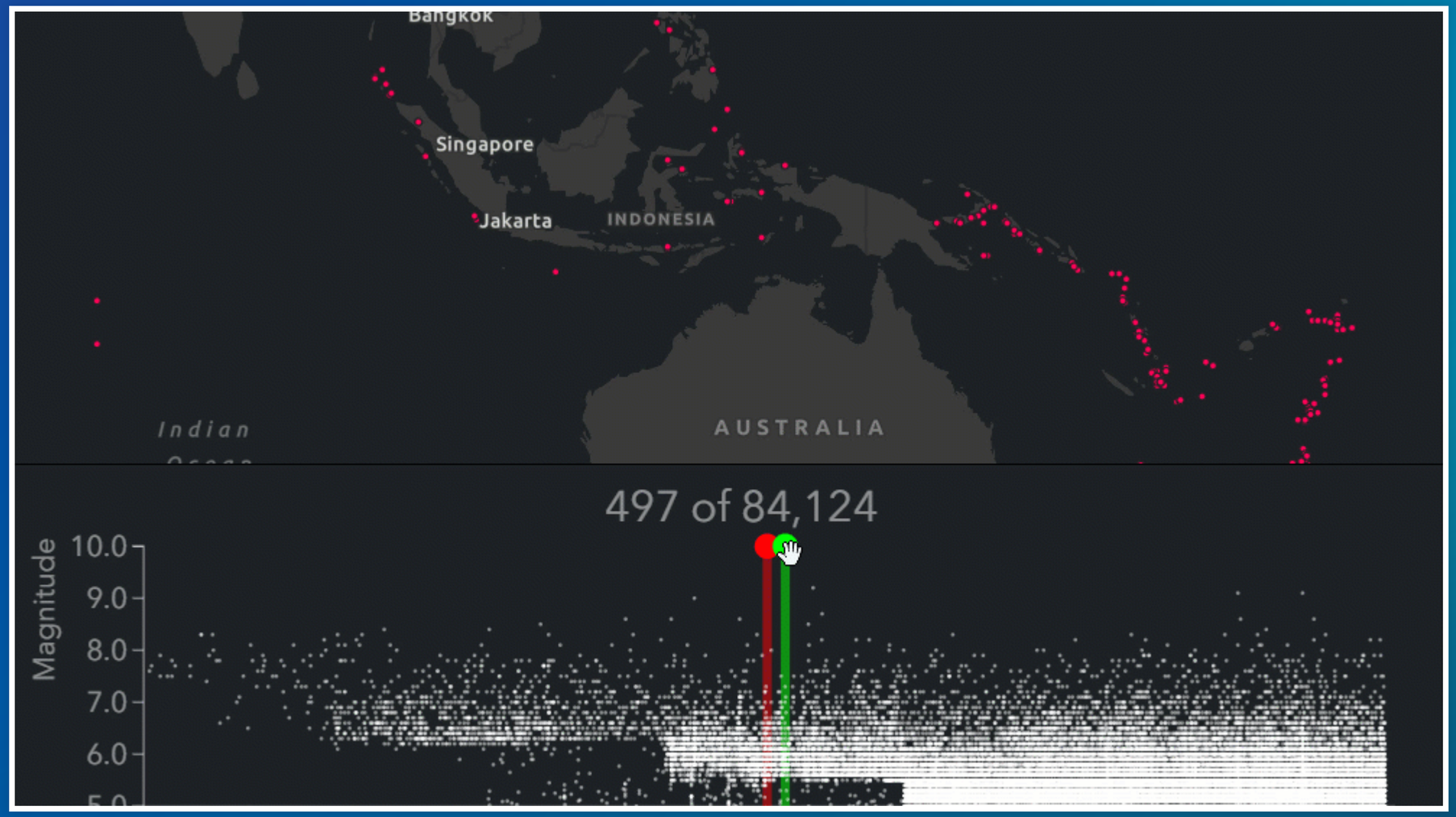
```
FeatureLayerView.queryExtent()
FeatureLayerView.queryFeatureCount()
FeatureLayerView.queryFeatures()
FeatureLayerView.queryObjectIds()
```

Client-side queries - tips

```
view.whenLayerView(featureLayerQuake).then(function(layerView){
    layerView.watch("updating", function(value){
        if (!value){
            // Finished updating
        }
    });
});
```

- Wait for content to be downloaded
- Geometry is generalized
- Restrict queries to information in visual extent

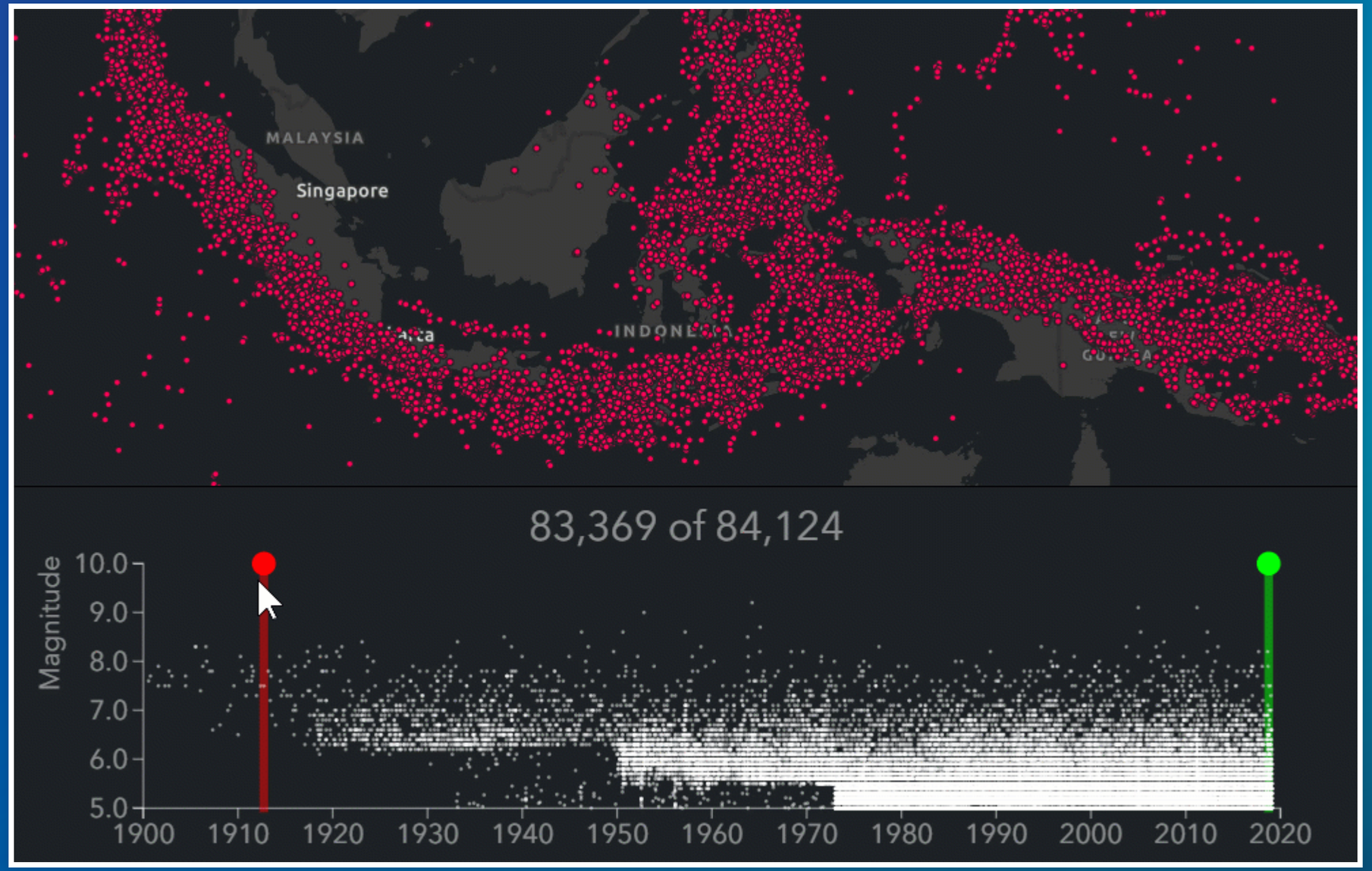
Client-side filtering



Enabling client-side filtering

```
var quakeView = null;
view.whenLayerView(featureLayerQuake).then(function(layerView){
    quakeView = layerView;
});
```

```
function updateMapView(startDate, endDate) {
    quakeView.filter = {
        where: "mag >= 5",
        timeExtent: {
            start: startDate,
            end: endDate
        }
    };
}
```


MALAYSIA
Singapore
83,369 of 84,124
Magnitude
10.0
9.0
8.0
7.0
6.0
5.0
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020

Filtering with effects

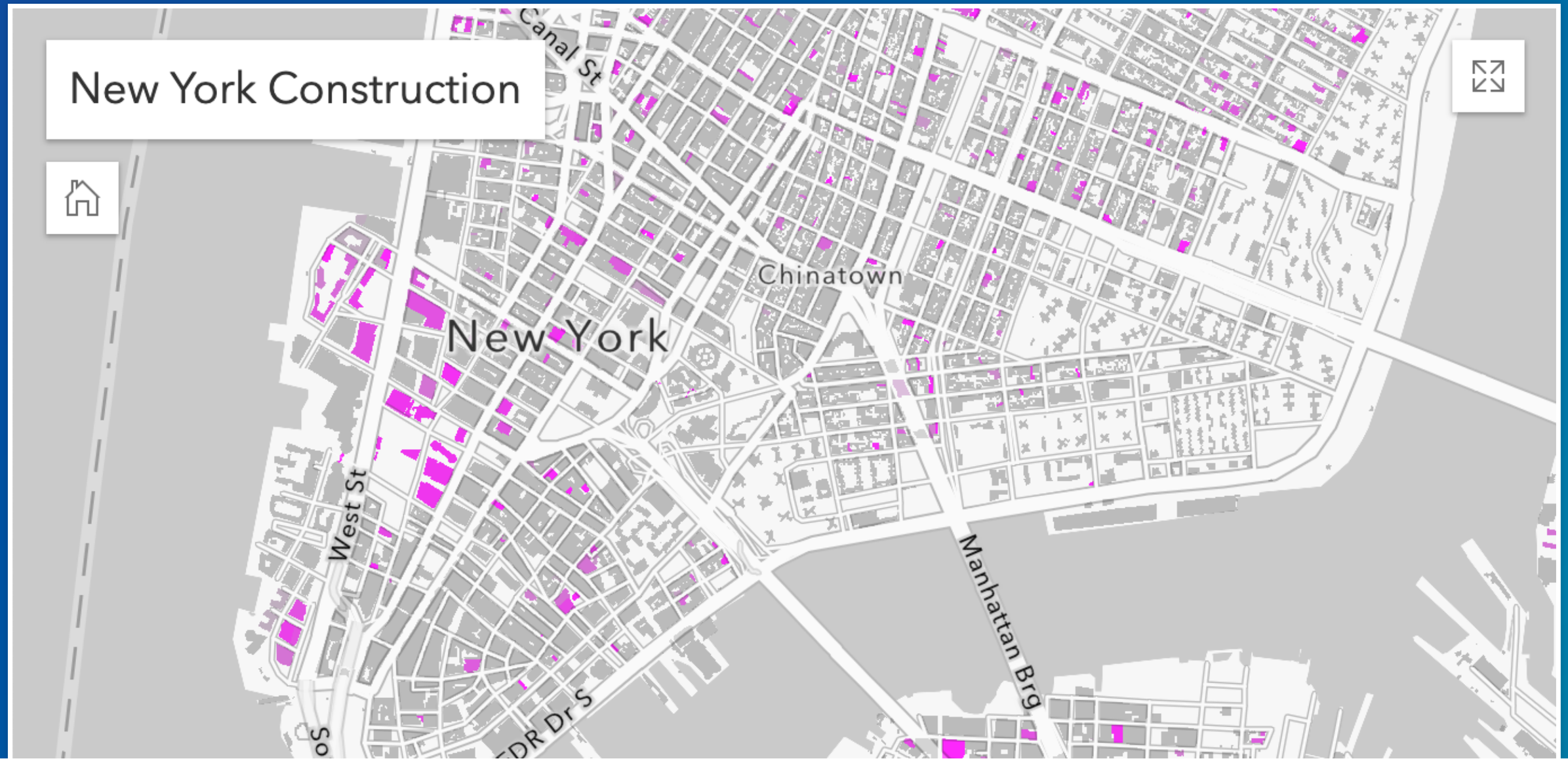
```
function updateMapView(startDate, endDate) {
    quakeView.effect = {
        filter: {
            where: "mag >= 5",
            timeExtent: {
                start: startDate,
                end: endDate
            }
        },
        includedEffect: null,
        excludedEffect: "saturate(0%) opacity(25%)"
    };
}
```

Supported effects

```
brightness(0.4);
contrast(200%);
grayscale(50%);
hue-rotate(90deg);
invert(75%);
opacity(25%);
saturate(30%);
sepia(60%);
```

Visualizing time using Arcade: Color earthquakes by age

Visualizing time using Visual Variables



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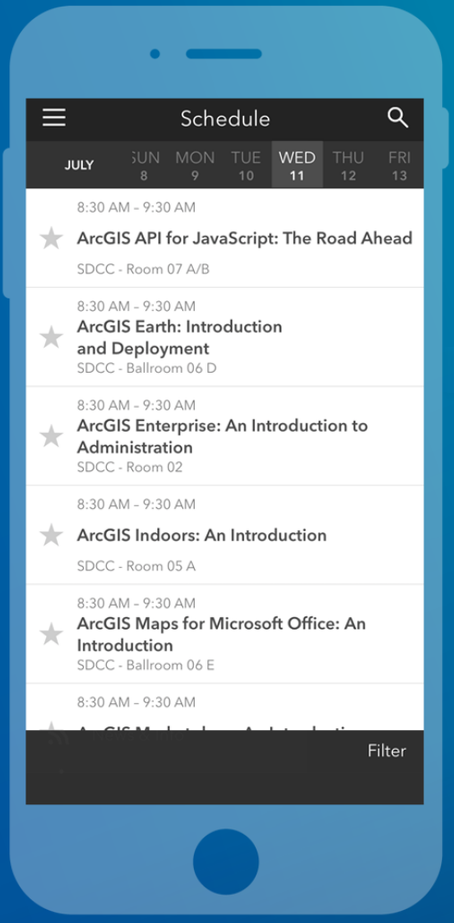
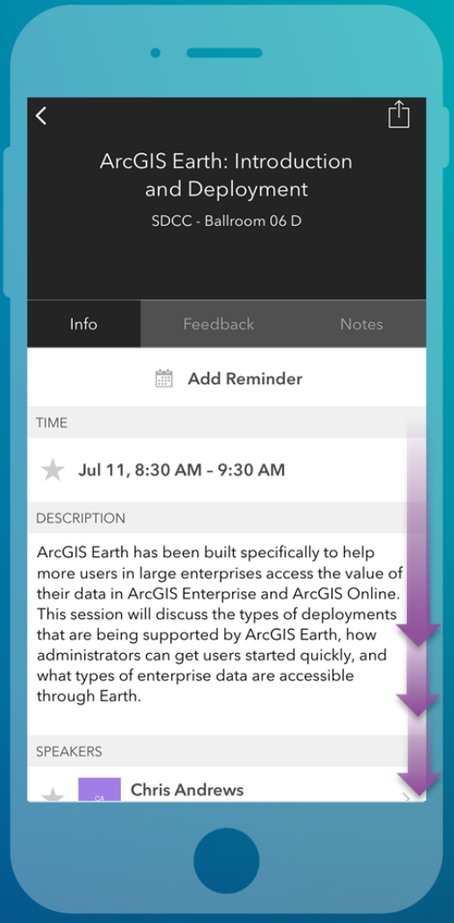
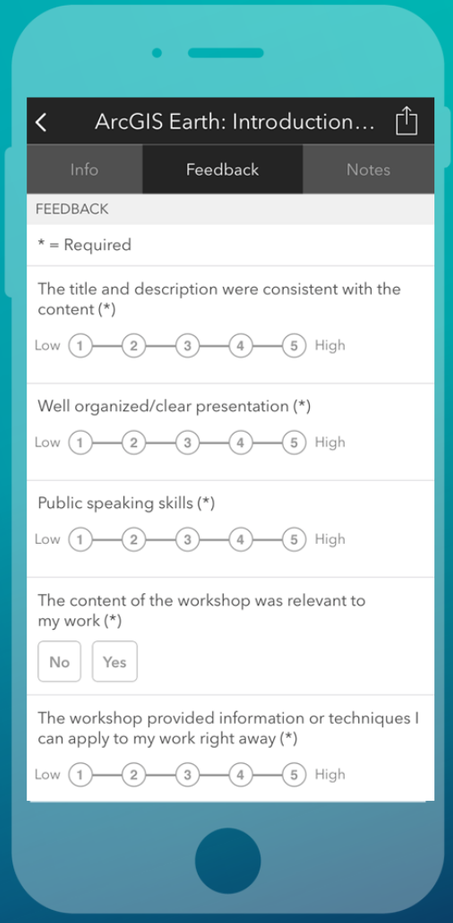


Scroll down to find the feedback section



Complete answers and select “Submit”