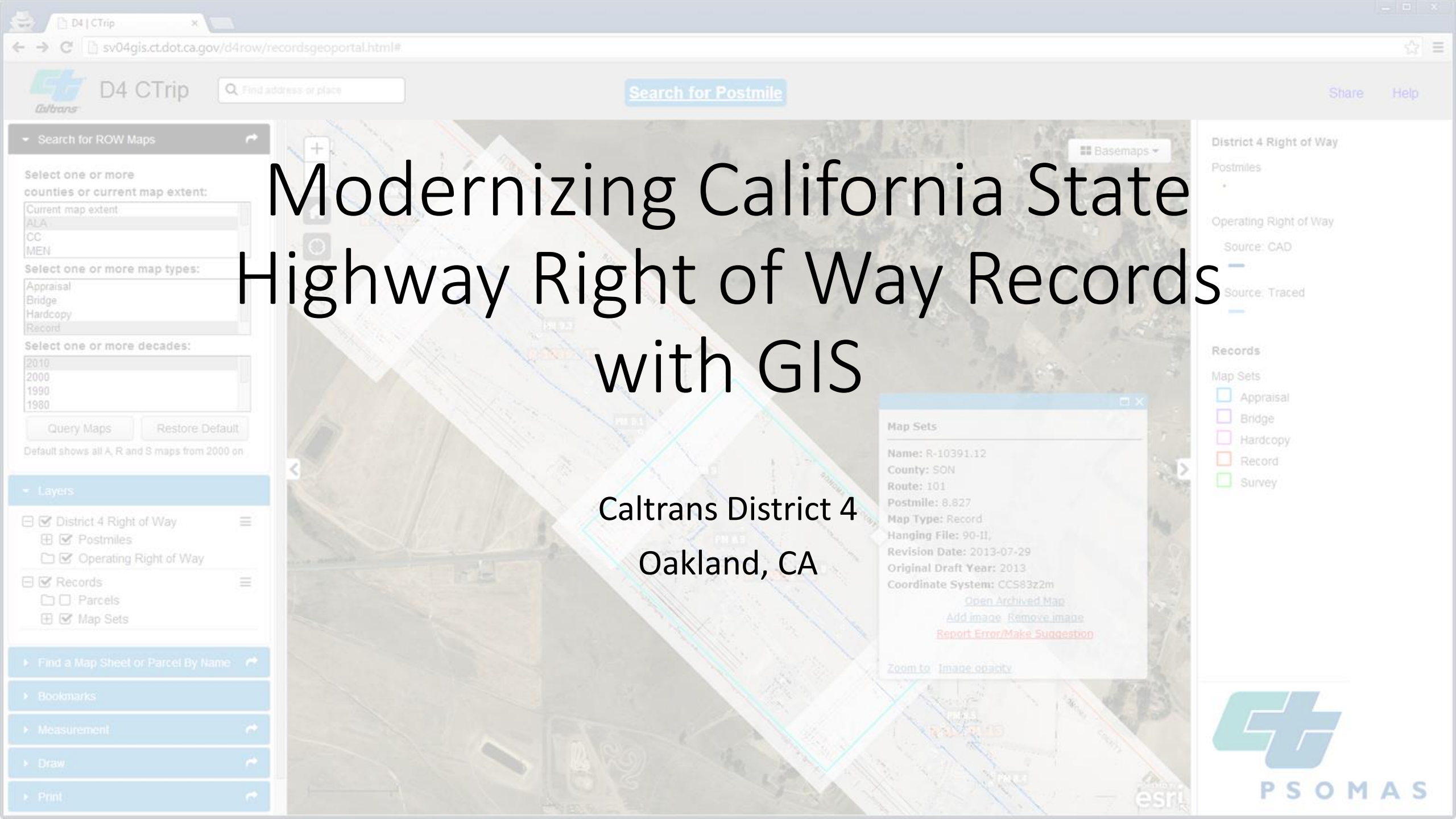


Modernizing California State Highway Right of Way Records with GIS

Caltrans District 4
Oakland, CA



About Us

- Kirsten Lawrence (GISP), Senior Geospatial Analyst on staff augmentation contract with Caltrans District 4. 15+ years of experience with geospatial data and technologies.
- Chris Urkofsky (PLS), Senior Transportation Surveyor and Manager of District 4 Right of Way Records GIS Branch. 25+ years with Caltrans.



The Beginning...

- Thousands of paper Right of Way Maps
- Accessible via hanging files in the District's Records Department
- Staff librarian needed to help with most map related requests



Challenges

- Thousands and thousands of Right of Way maps
- Layers of geographically overlapping maps
- Maps reflect adjacent property and street boundaries from the 1950's, 60's,70's...
- Errors, omissions, discrepancies between maps difficult to detect

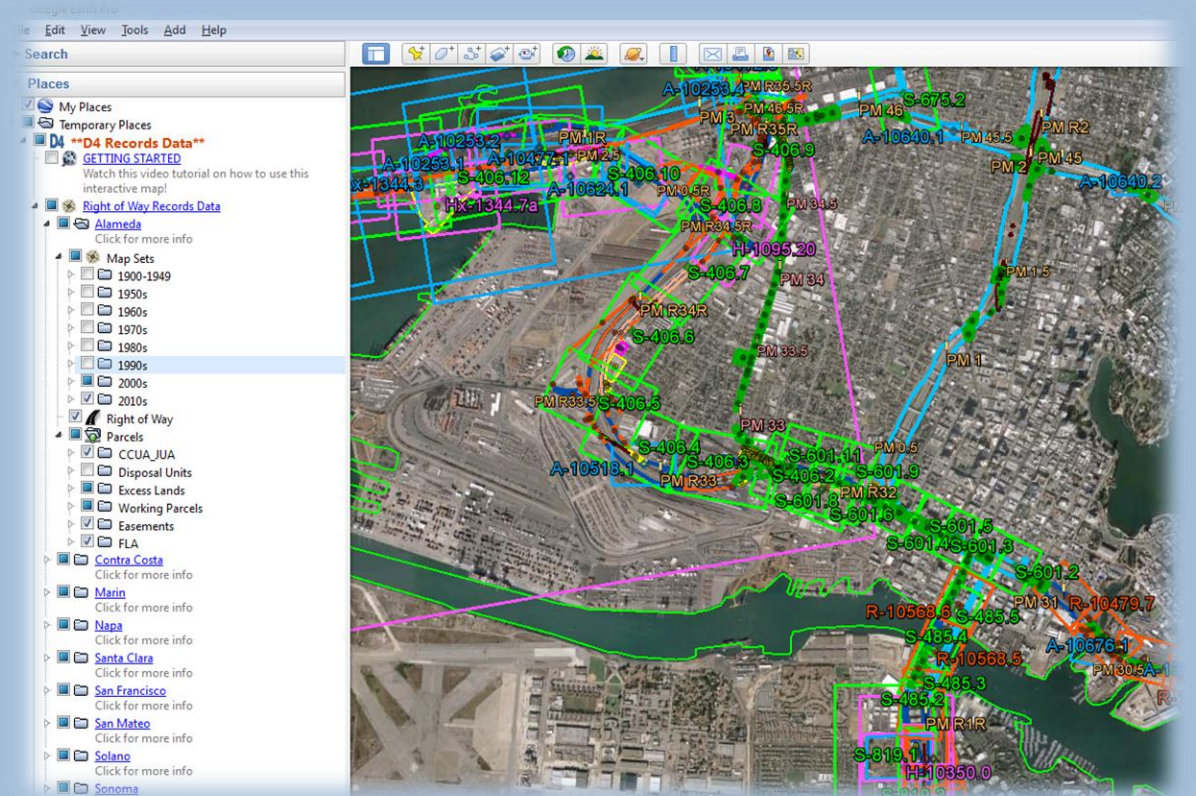


??????



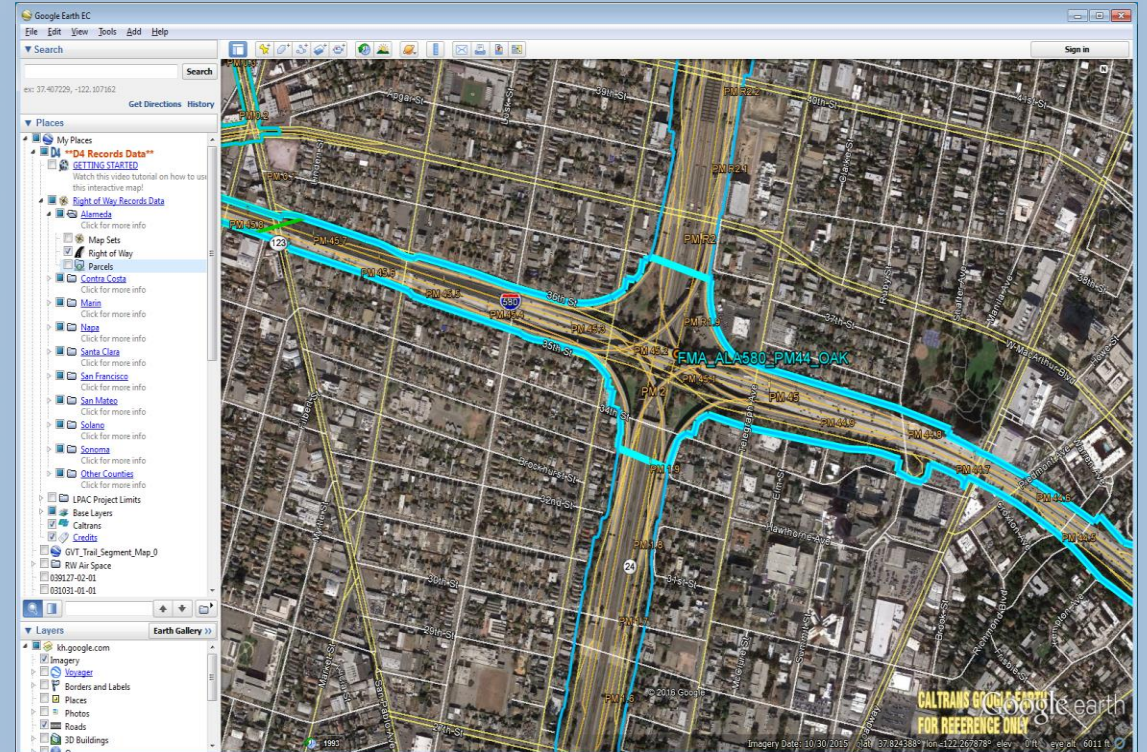
Entering the Digital Age - first steps towards greater accessibility...

- Maps were scanned and metadata captured, and stored on file server in tif and sid format
- Images georeferenced leveraging CAD & GIS tools
- Georeferenced map images indexed to footprints and served through Google Earth
- Right of Way and parcel data sets created from CAD data and georeferenced map sets



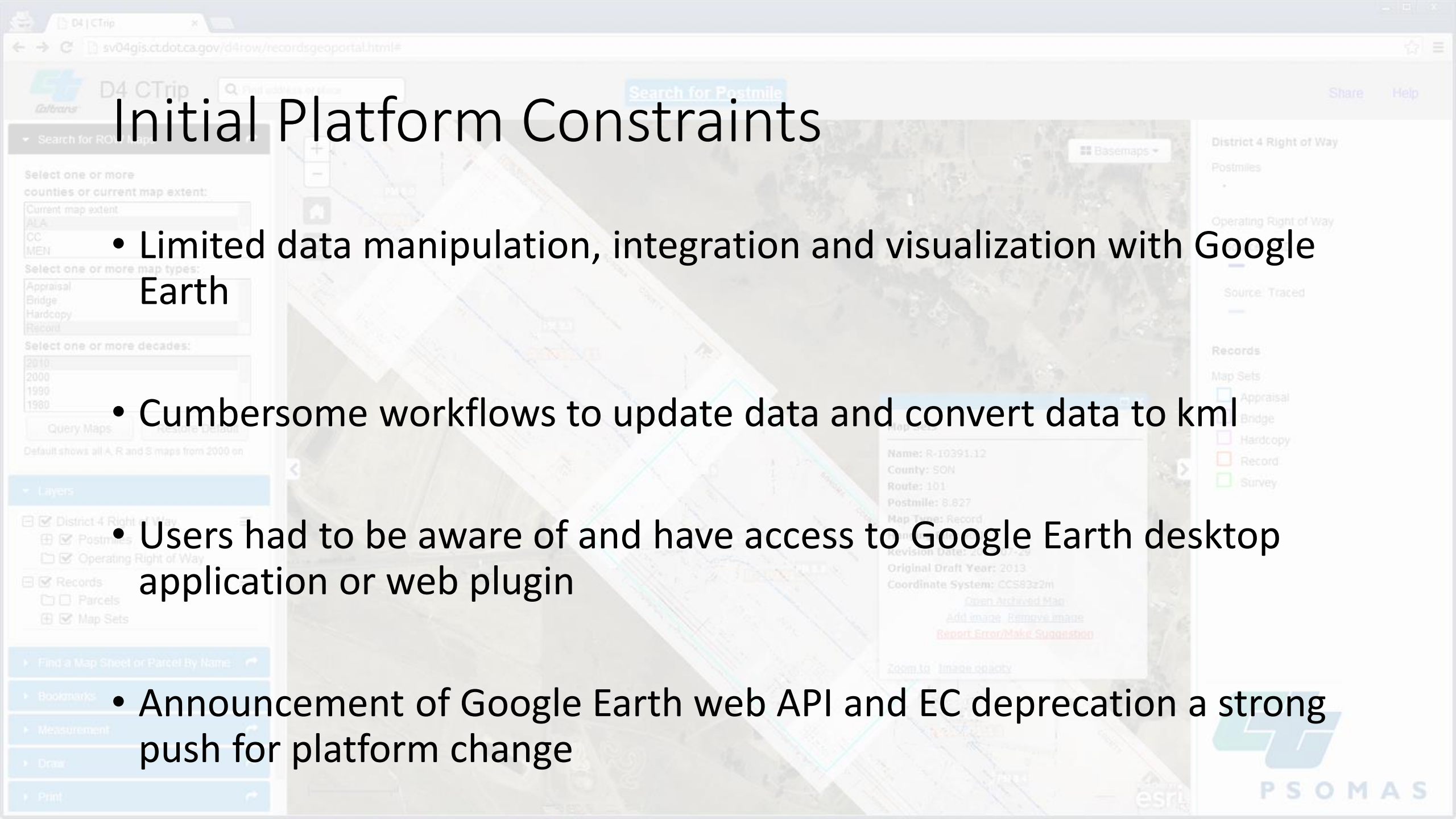
R/W Geospatial Data Life Cycle Established

- New R/W mapping georeferenced and CAD vector data used to modify Right of Way and parcel layers
- R/W and parcel layers used to create subset features: Maintenance, Coop and Freeway Agreement extents, excess land, air space, local agency and utility parcels
- Data served internally within Google Earth desktop client; shared with external partners via GE web API pages



Initial Platform Constraints

- Limited data manipulation, integration and visualization with Google Earth
- Cumbersome workflows to update data and convert data to kml
- Users had to be aware of and have access to Google Earth desktop application or web plugin
- Announcement of Google Earth web API and EC deprecation a strong push for platform change



A Streamlined Approach - Overview

- Establishment of PostgreSQL geodatabase to store Right of Way related data
- Daily updates to Right of Way maps and parcels managed by scheduled Python scripts
- Data is published to ArcGIS server services and accessed by internal users via CTrip (Caltrans Records Information Portal)
- Data is also published nightly to ArcGIS Online and accessible to the public via a web app created using AGO's web app builder

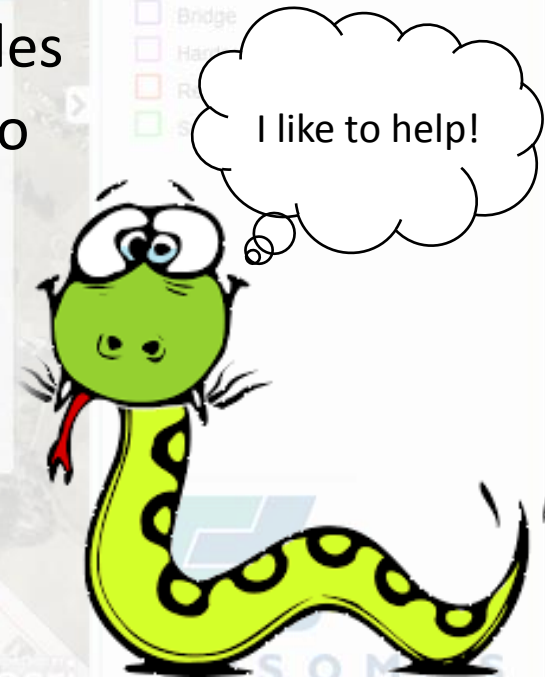
Data Updates

- Master table manages Right of Way map information; new records are added for new maps and outdated maps set as superseded
- Right of Way parcels are managed in a multiuser versioned database
- Python is used to:
 - Filter for active maps; a column provides file location links to georeferenced images
 - Iterate over image file directories and add new images to mosaic dataset
 - Delete images from mosaic dataset that are no longer active



Data Updates

- Python is used to (continued):
 - Join filtered table to footprints for viewing attributes in web apps
 - Add and calculate additional footprint attribute values
 - Recalculate postmiles for updated footprints
 - Perform some parcel updates with the joining of extraneous tables
 - Upload related documents to web servers, which can be linked to from features
- Additional automation with more python scripting in the works



CTrip and CMV

- CTrip was developed using the CMV (Configurable Map Viewer) framework
- CMV is open-source and built on ArcGIS Javascript API
- CMV is easily configurable, comes with several useful core widgets, and has a growing library of user contributed widgets. The next release will allow for incorporation of ESRI Web App Builder widgets
- The District has customized the template and is using it for all web mapping applications
- For more info on CMV: <https://github.com/cmv/cmv-app>

Serving Georeferenced Right of Way Maps

- Our ArcGIS Server deployment is configured with the Image Server extension
- Active maps (~20,000) in a range of coordinate systems, many of which overlap, are managed within a Mosaic Dataset
- Mosaic Dataset is published to an image service, and consumed in CTrip

Viewing Map Images

- The mosaic rule lock-raster method is used in CTrip to allow the user to choose which images they want to see

```
addImageFunc = lang.hitch(this, function (event) {
    feature = this.map.infoWindow.getSelectedFeature();
    popupContent = parseInt(feature.attributes.is_oid);

    if (isNaN(popupContent)) {
        alert('Cannot add image for selected feature.');
```

```
    }
}

else {
    imageInt = imageInt + 1;
    imageID = "Image" + popupContent;
    var arr = [popupContent];
    var imgParams = new ImageServiceParameters();
    imgParams.noData = 0;
    var mr = new MosaicRule();
    mr.method = MosaicRule.METHOD_LOCKRASTER;
    mr.lockRasterIds = arr;
    imgParams.mosaicRule = mr;

    var rwImageService = "http://sv04gis:6080/arcgis/rest/services/ROW/ROWmaps/ImageServer";
    imageServiceLayer = new ArcGISImageServiceLayer(rwImageService, {
        id: imageID,
        imageServiceParameters: imgParams,
        opacity: 0.75
    });
    this.map.addLayer(imageServiceLayer);
}

on(transparencyLink, 'click', lang.hitch(this, function() {
    opacityFeature = this.map.infoWindow.getSelectedFeature();
    opacityPopContent = parseInt(opacityFeature.attributes.is_oid);
    opacityLayer = "Image" + opacityPopContent;
    currentLayer = this.map.getLayer(opacityLayer);

    if (typeof(currentLayer) === 'undefined') {
        //alert("There is no image in the map associated with this feature.");
    }

    else {
        dijit.popup.open({
            popup: myTooltipDialog,
            around: transparencyLink
        });
        var newValue = currentLayer.opacity;
        imageSlider._setValueAttr(newValue);
    }
}));
});
});
```

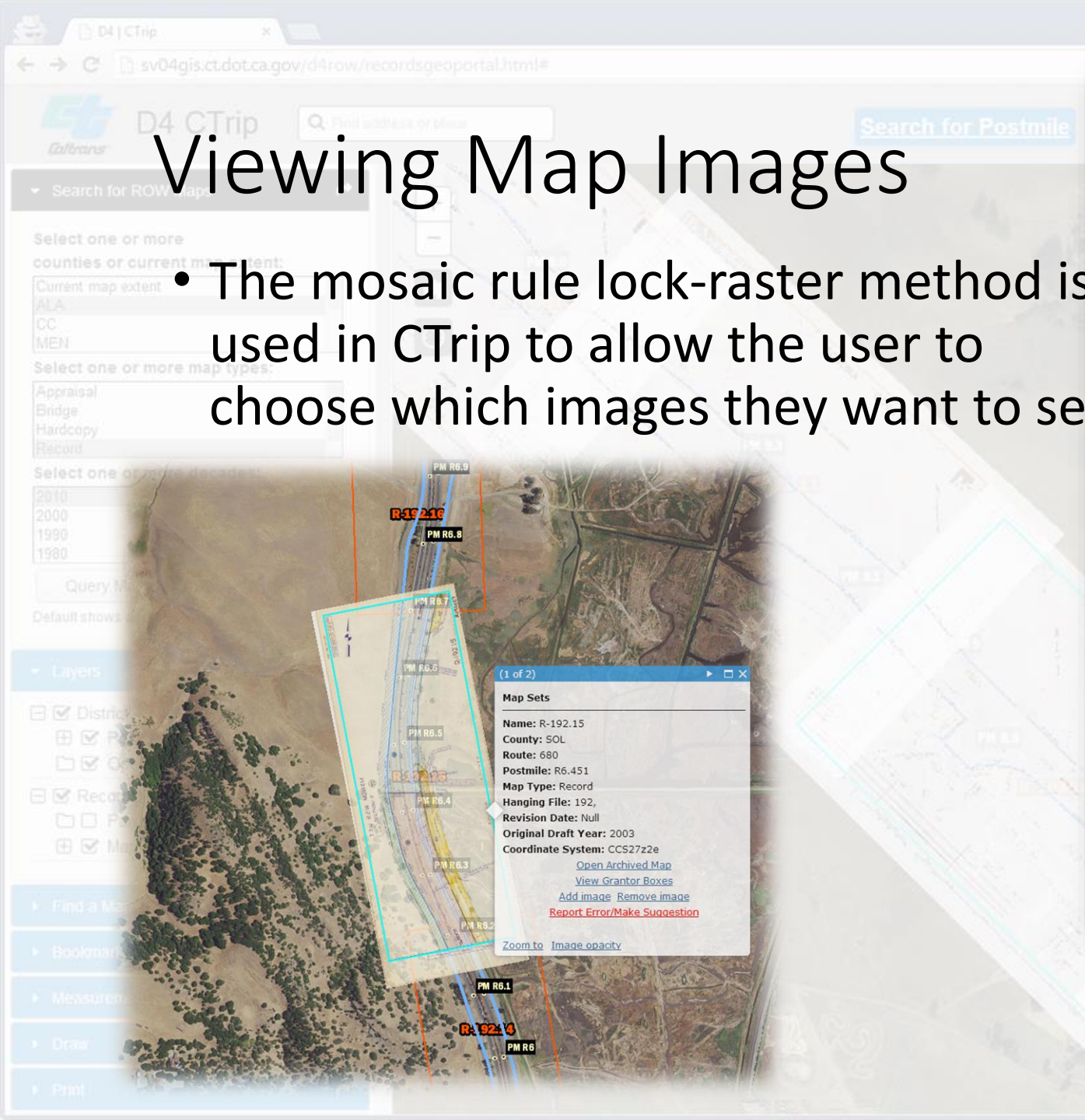


Image Transparency

- A horizontal slider is added to a link on the info window to allow the user to adjust image transparency

```
addImageFunc = lang.hitch(this, function (event) {
    feature = this.map.infoWindow.getSelectedFeature();
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    if (isNaN(popupContent)) {
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    }
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    imageInt = imageInt + 1;
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    var arr = [popupContent];
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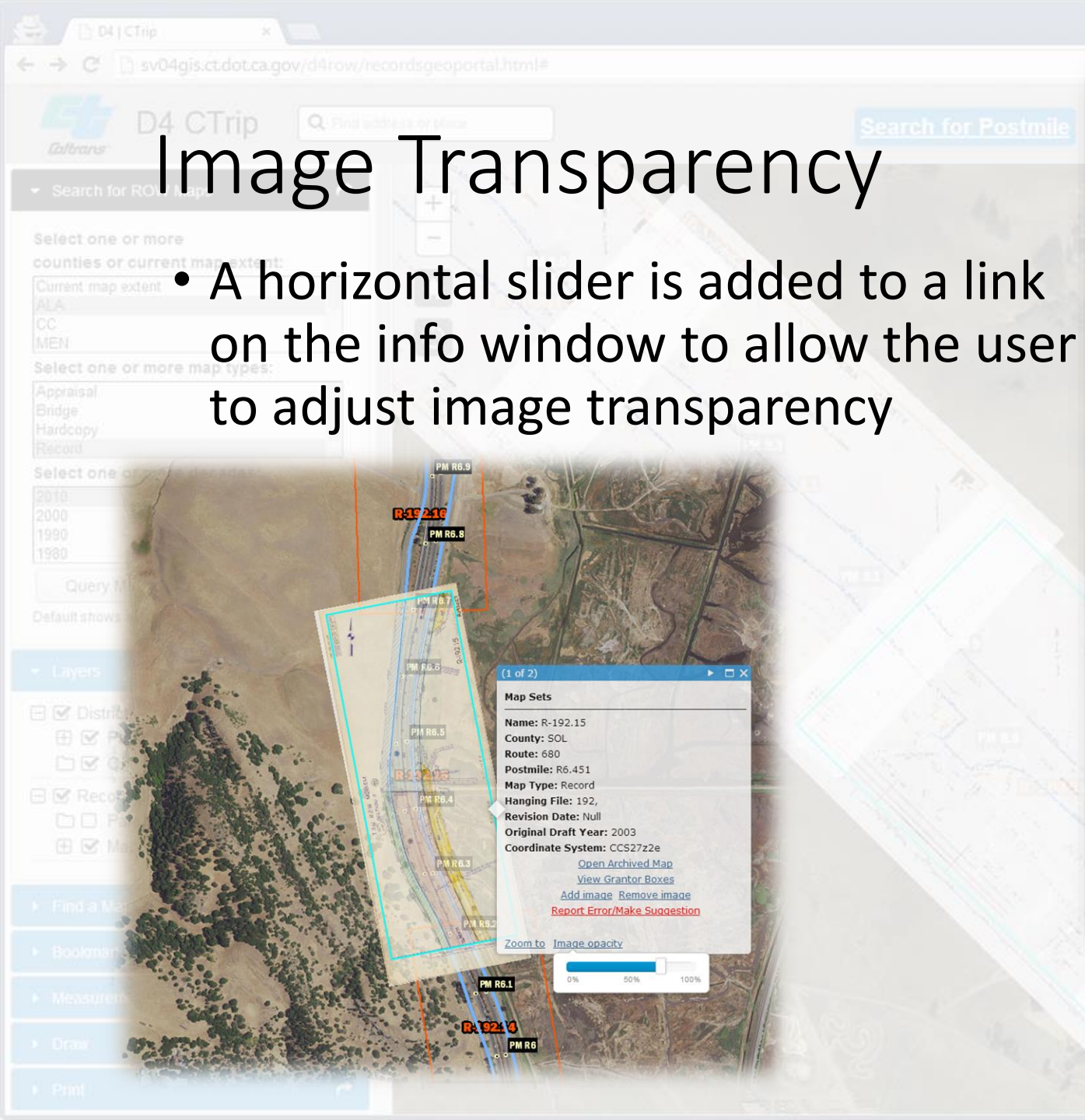
});

on(transparencyLink, 'click', lang.hitch(this, function() {
    opacityFeature = this.map.infoWindow.getSelectedFeature();
    opacityPopContent = parseInt(opacityFeature.attributes.is_oid);
    opacityLayer = "Image" + opacityPopContent;
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    else {
        dijit.popup.open({
            popup: myTooltipDialog,
            around: transparencyLink
        });
        var newValue = currentLayer.opacity;
        imageSlider._setValueAttr(newValue);
    }
}


});
```



Maps on Demand


- Maps on Demand is a public facing version of CTrip developed using AGO Web App Builder
- Similar to CTrip, but currently only provides access to PDFs of the Right of Way maps
- You can view our Maps on Demand page here:
<http://arcg.is/1S4B8zF>

Help



[Launch Site Demo Video](#)

Welcome to the Caltrans D4 Right of Way Maps Web App! Map locations are represented by the rectangular bounding boxes you see displayed in the map frame. Maps are grouped by decade; 2010, 2000, 1990...

To prevent confusion, only map boundaries from 2000 and later are turned on by default. You can view maps from earlier decades by toggling the checkboxes in the Layer List widget. 

To find Right of Way maps:

1. Type an address in the space labeled 'Search for Location' in the upper left corner of this page
2. Or, simply use your mouse to pan and zoom to the location you're interested in.
3. Select a map bounding box and Click on the 'Open Archive Map' link in the popup window.

If it is the responsibility of the user to determine whether his/her browser is compatible with this system, Caltrans internal trials indicate that the following browsers may be compatible: IE 9 and higher, Firefox, Chrome, Safari, iOS Safari.

Maps on Demand – Updating Feature Layers

- Python script run nightly to update hosted feature layers
- Helpful ESRI blog tells you all you need to know to perform the updates, and has a download link for the code: <https://blogs.esri.com/esri/arcgis/2014/01/24/updating-your-hosted-feature-service-for-10-2/>
- Modify the settings.ini with values specific to your service

```
[FS_INFO]
SERVICENAME = MyMapService
MXD = D:\nightly_updates\maps\MyMap.mxd
TAGS = points, dots, places
DESCRIPTION = This is the description text
MAXRECORDS = 5000

[FS_SHARE]
SHARE = True
EVERYONE = true
ORG = true
GROUPS = None

[AGOL]
USER = user_name
PASS = pass word1
```

The service name must match an existing service you own.

Set SHARE to True or False. If False, the remaining values are not used. EVERYONE and ORG can be set to true or false, while GROUPS is a comma separated list of group IDs.

Your ArcGIS.com credentials.

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Looking ahead...

- Continued development of Right of Way related data and services
- Continued streamlining of data update workflows
- Scaling up infrastructure as the user base grows
- Improvements to CTrip functionality
 - ArcGIS JS API 4x version of CMV will soon be released, giving us 3D capabilities
 - Development on new widgets for querying and displaying data



Questions?

For more information:

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christopher.urkofsky@dot.ca.gov

<http://www.dot.ca.gov/dist4/rightofway/esms/records/records.htm>

