Improving Access to GIS Data With Targeted Web Apps

Joyce Green, City of Norman

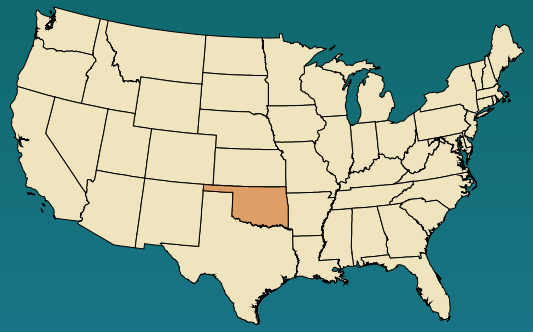
John McIntosh, City of Norman

Improving Access to GIS Data with Targeted Web Apps

- Background
- Objective
- Development Environment
- Development Strategy
- Challenges
- Current Status
- Future Plans

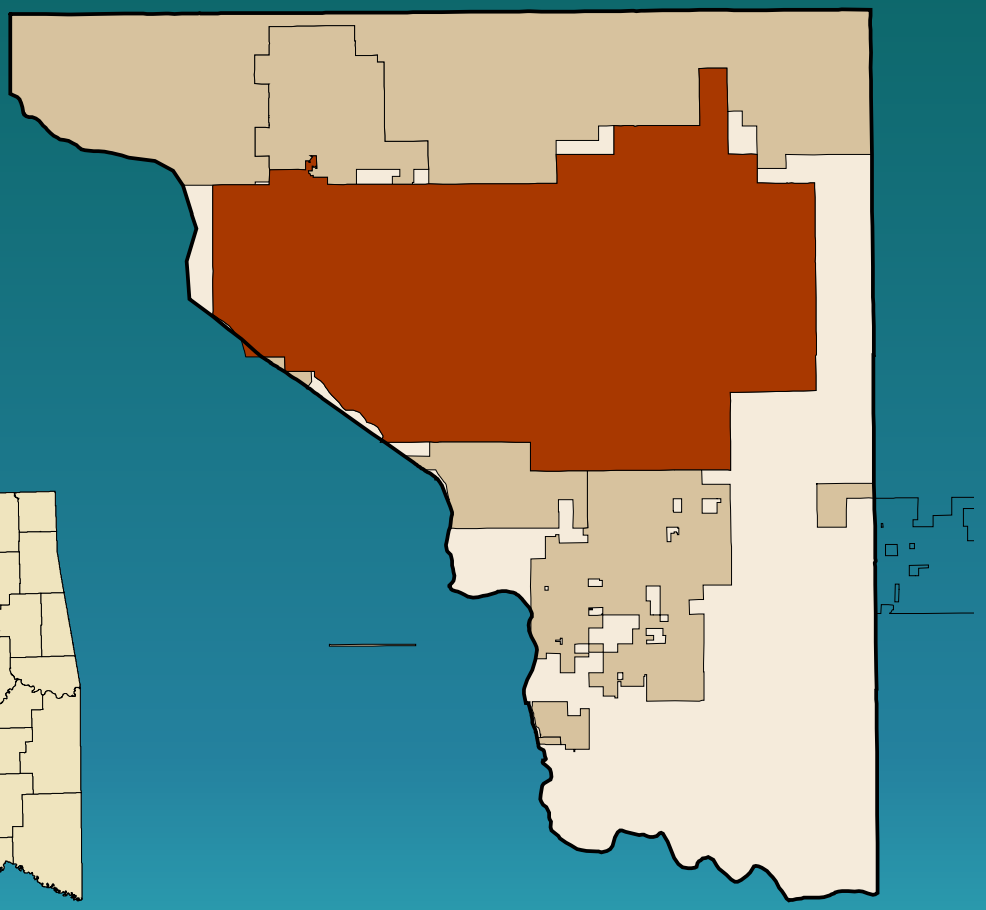
The Setting…

Oklahoma in USA…



Cleveland County in Oklahoma…

Norman in Cleveland County…



The Setting

- Third largest city in Oklahoma
  - Land Area ~ 189 Square Miles
  - Population ~ 115,000
  - Home of the University of Oklahoma
  - ESRI User Since 1992

GIS Profile – Beginning of Project

- Version of ArcGIS before project: 9.2
- Enterprise ArcSDE for SQL Server
- External web apps: ArcIMS
- No internal web apps
- Number of ArcGIS Desktop users: 80+
- Third party applications: 2
  - Cityworks by Azteca
  - CrimeView by Omega

Project Objective

- Provide easy to use targeted web apps to access GIS data
  - Replicate business practices in web browser
  - Minimize the number of ArcGIS Desktop installs
  - Maximize the number of users of GIS data
  - Minimize the amount of training required

Development Environment - System Overview

- Two Systems
  - ArcGIS Production Server
    - Internal use only
    - Supports:
      - Desktop users
      - Web maps to support City business practices
      - Third party applications
  - DMZ
    - External
    - Not linked to production server
    - Supports
      - Externally facing web maps
      - External access to City GIS data through map services

Development Environment - System Architecture

- Servers – VMware vSphere
  - Production
    - ArcGIS Server Enterprise 10.1 and IIS
      - Windows Server 2008 R2 Datacenter
      - 8GB RAM,
      - 80GB hard drive
    - Database Server ArcSDE on SQL Server 2008
      - Windows Server 2008 R2 Datacenter
      - 8GB RAM,
      - 80GB & 800GB hard drives
  - DMZ
    - ArcGIS Server Workgroup, IIS, and Sequel Express database
      - Windows Server 2008 R2 Datacenter
      - 12GB RAM
      - 80GB, 500GB, 600GB hard drives

Development Environment: Platform

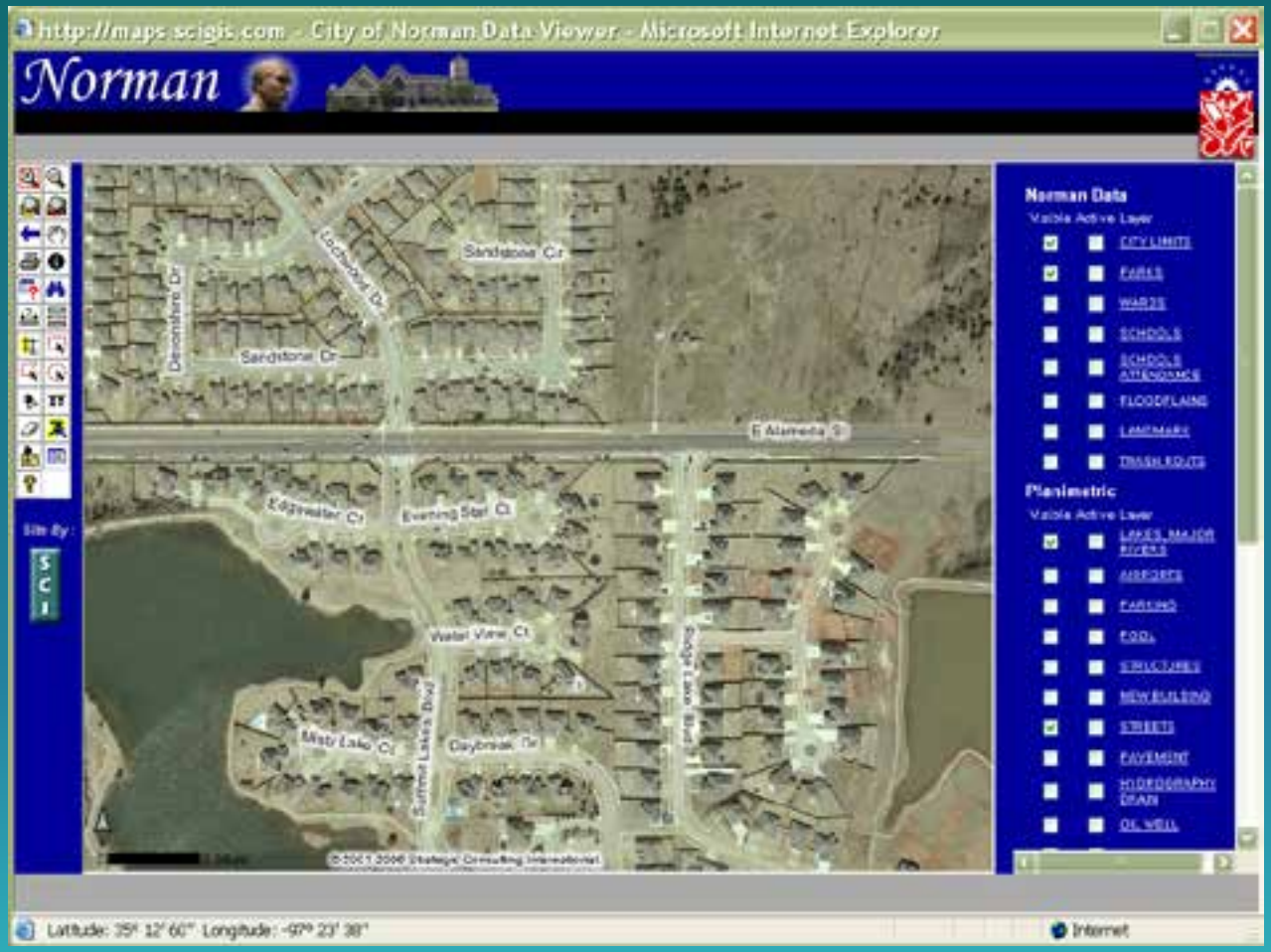
- ArcGIS API for Javascript
  - Started with version 3.5 and “legacy” style coding
  - Now using version 3.9 with the AMD style coding
- Use ESRI hosted APIs for both versions
- Other libraries
  - Shp-write
    - Javascript library to read and write shapefiles
  - JSZip
    - Javascript library to read, write and edit zipfiles
  - XLSX
    - Javascript library to read, write and edit Excel (xlsx) files

Development Strategy

- Server initialization
  - ESRI Jumpstart
    - Installed software
    - Assisted with initial services
    - Gave advice on data loading
  - IT Department
    - Built servers
    - Set up domain
  - Third party vendor
    - Upgraded Cityworks software from desktop to server
- Application Development
    - In-house by GIS staff

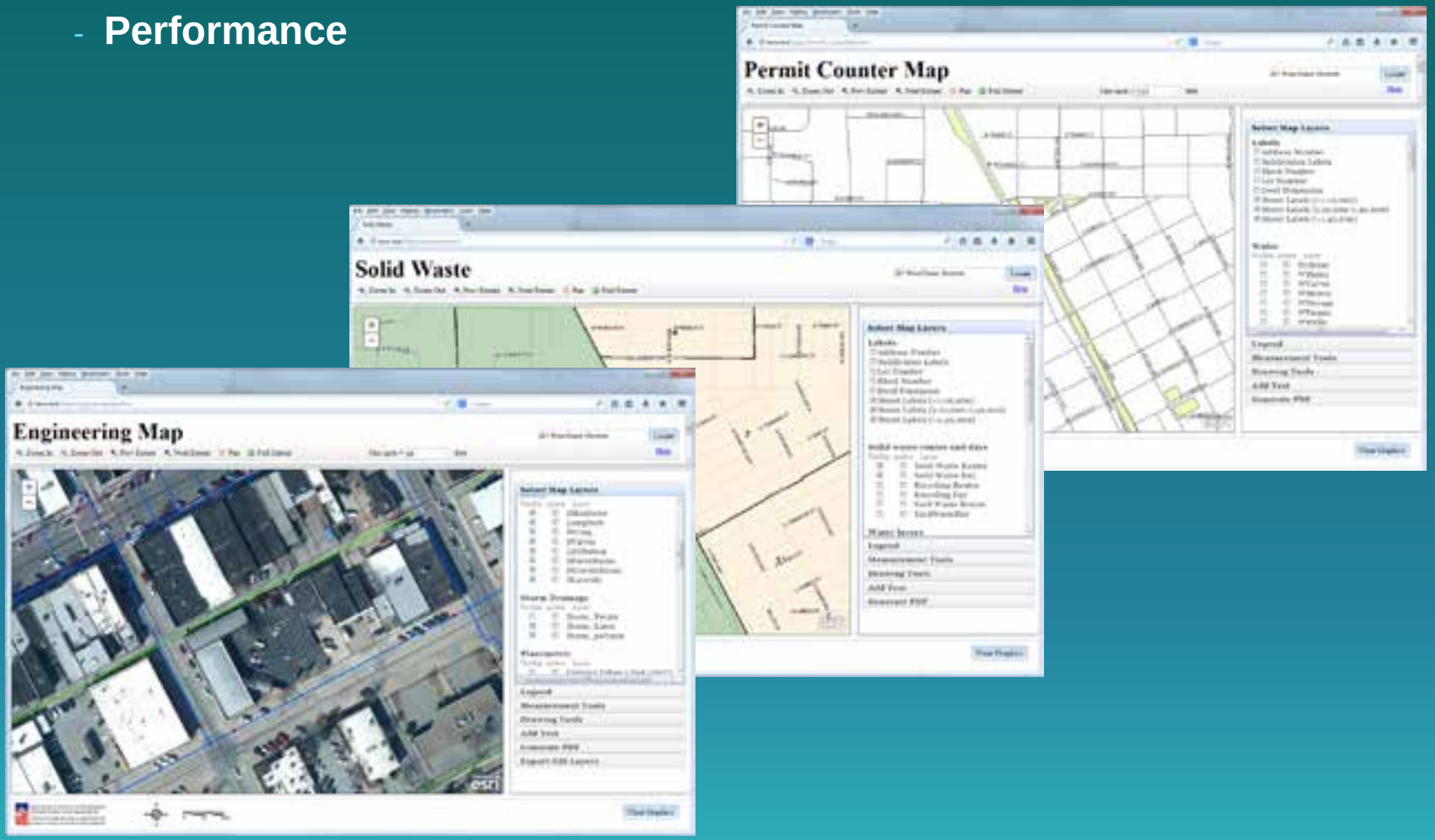
Application Development

- **Design considerations**
  - **Customer expectations**



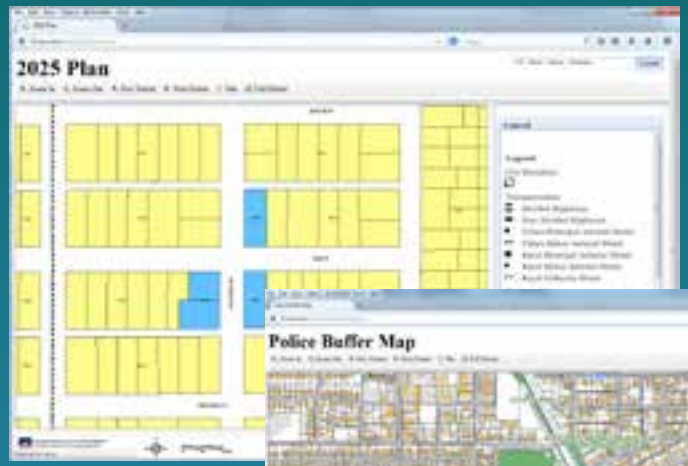
Application Development

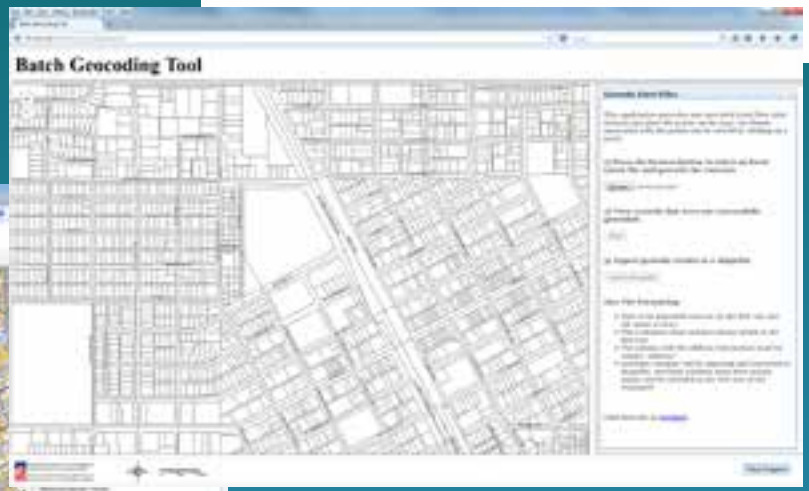
- Design Considerations
  - Business practices of workgroups
  - Performance



Application Development

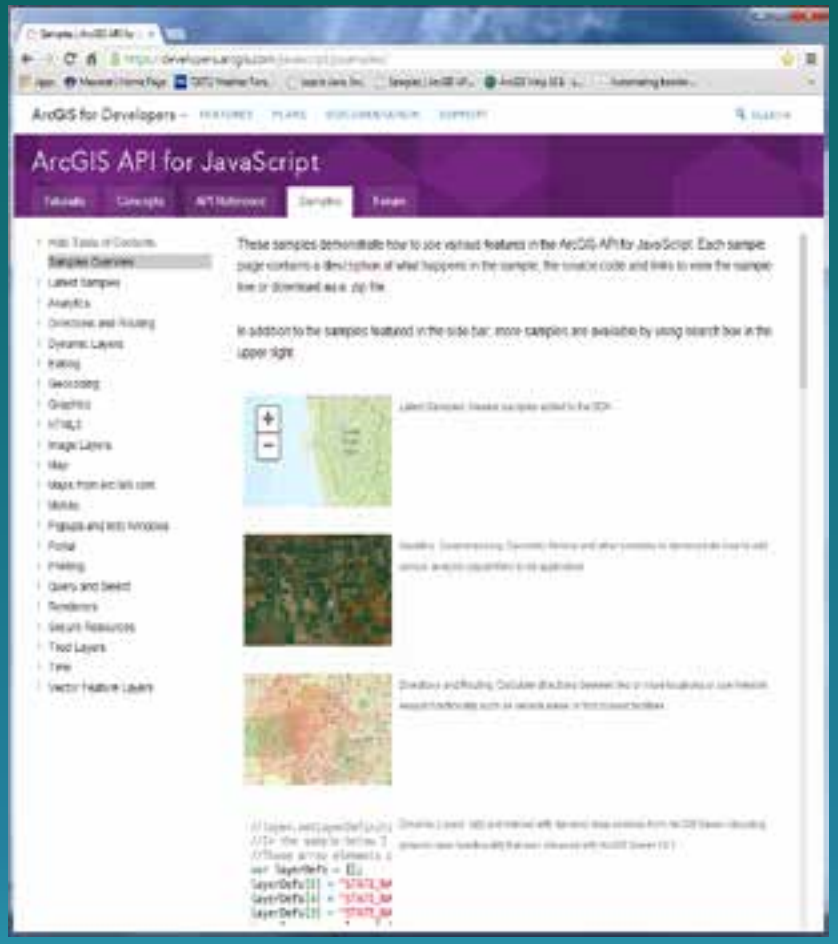
- Design considerations
  - Focused tasks





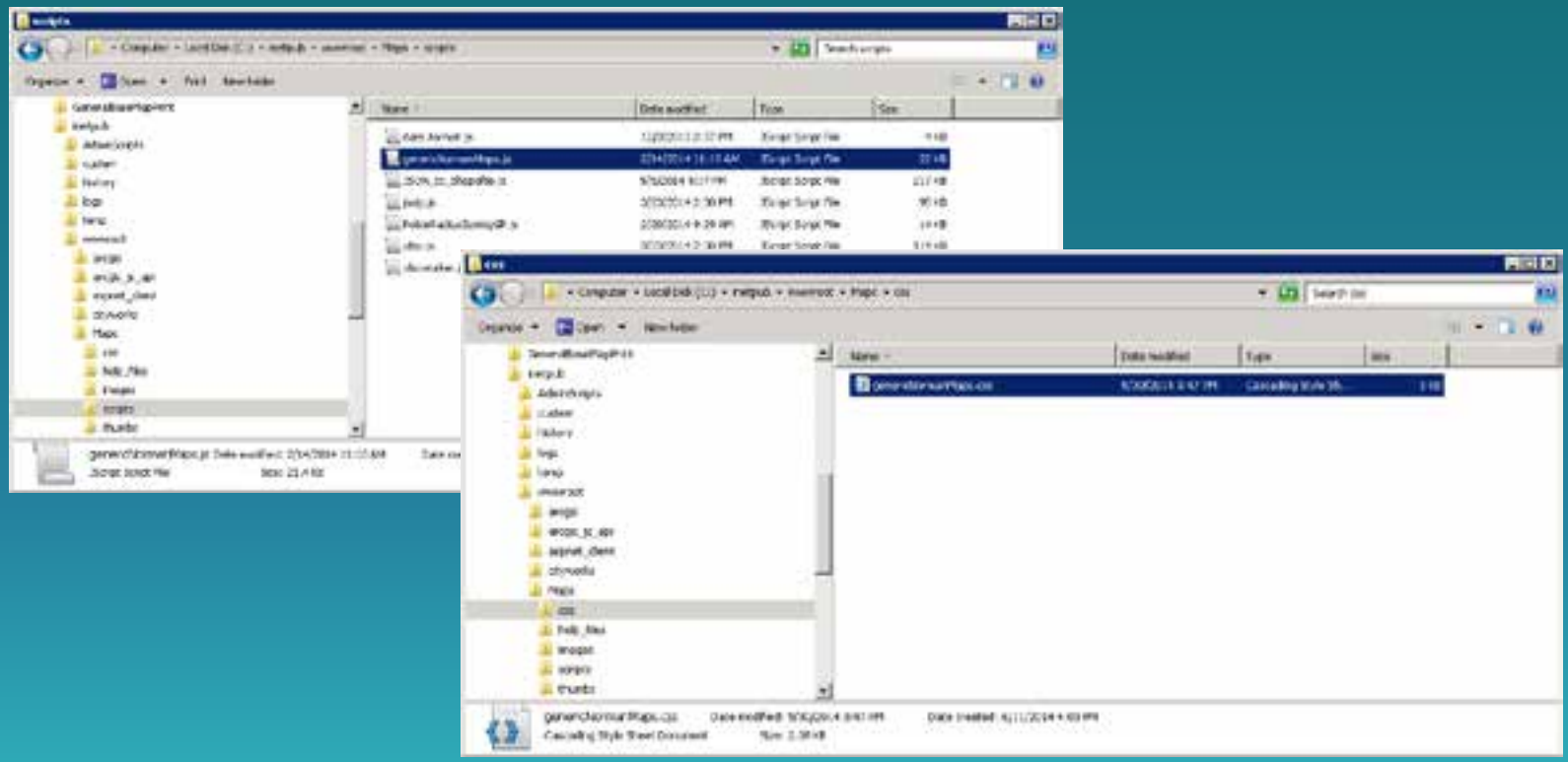
Application Development

- Approach
  - Learn by example
    - Forums
    - ArcGIS API for JavaScript
- Bluefish Editor
  - Javascript development
  - Open source
  - Used by IT department
- IDLE Editor
  - Python scripts



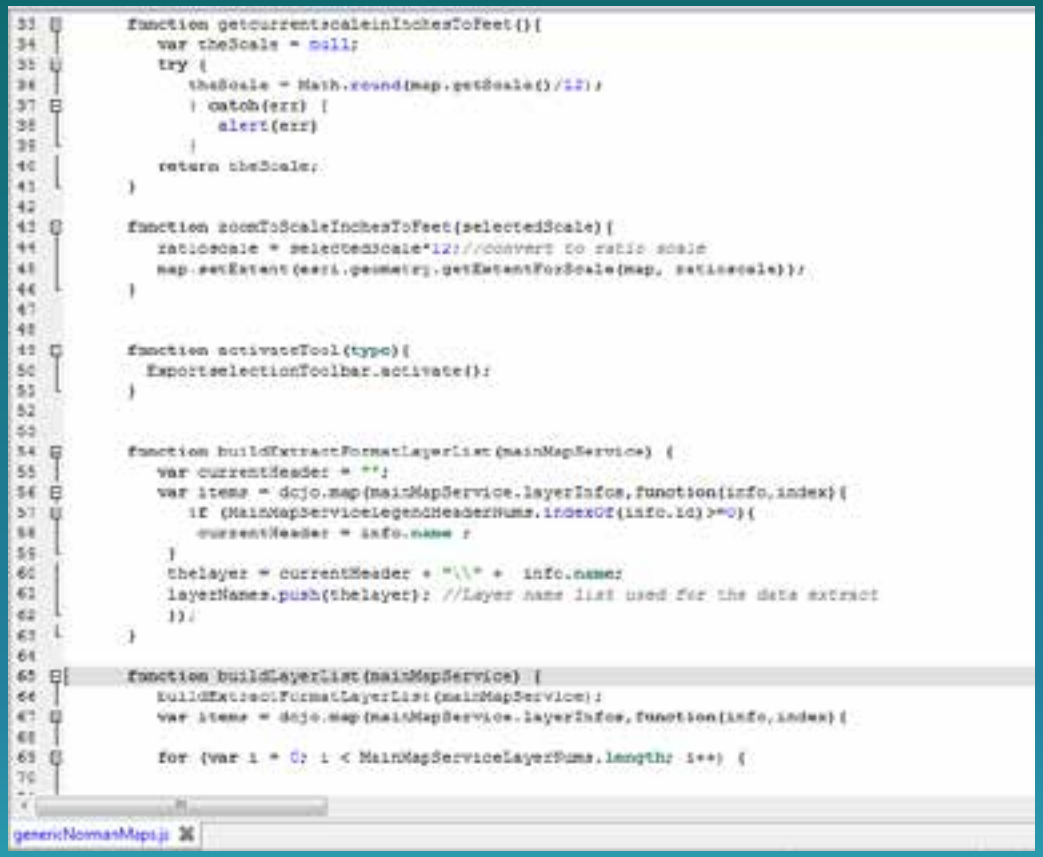
Application Development

- **Modular design**
  - **Shared css**
  - **Shared JavaScript functions**



Application Development

- **Example of generic JavaScript functions**



```
function getcurrentscaleinInchesToFeet(){
   var theScale = null;
   try {
      theScale = Math.round(map.getScale()/12);
      } catch(err) {
         alert(err)
      }
   return theScale;
}

function zoomToScaleInchesToFeet(selectedScale){
   ratioScale = selectedScale*12;//convert to ratio scale
   map.setExtent(esri.geometry.getExtentForScale(map, ratioScale));
}


function activateTool(type){
  ExportselectionToolbar.activate();
}


function buildExtractFormatLayerList(mainMapService) {
   var currentHeader = "";
   var items = dojo.map(mainMapService.layerInfos,function(info,index){
      if (MainMapServiceLegendHeaderNums.indexOf(info.id)>=0){
       currentHeader = info.name ;
      }
      thelayer = currentHeader + "\\" +  info.name;
      layerNames.push(thelayer); //Layer name list used for the data extract
      });
}

function buildLayerList(mainMapService) {
   buildExtractFormatLayerList(mainMapService);
   var items = dojo.map(mainMapService.layerInfos,function(info,index){

   for (var i = 0; i < MainMapServiceLayerNums.length; i++) {
```

genericNomanMaps.js

Application Development

- Services built on geoprocessing tasks
  - Extract and export data
  - High quality printing
  - Export webmap
- Customized from ESRI tutorials and models
  - Clip and ship
  - Advanced high-quality web map printing/exporting

Application Development

- **HTML**
  - **Designed for easy editing and customization.**
  - **User defined parameters as variables at top**

```
28        ////////////////////////////////////////////////////////////////////////
29        //Define map services and layers to be used
30        ////////////////////////////////////////////////////////////////////////
31
32        var mainMapServiceURL = "http://terra:6080/arcgis/rest/services/ServicesForWeb/PermitCounter_web/MapServer";
33        var printServiceUrl = "http://terra:6080/arcgis/rest/services/ServicesForWeb/ExportWebMap/GPServer/Export%20Web
34        var locatorServiceURL = "http://terra:6080/arcgis/rest/services/CompositeAddressLocator/GeocodeServer";
35        var geometryServiceURL = "http://terra:6080/arcgis/rest/services/Utilities/Geometry/GeometryServer";
36        var dataextractionServiceURL = "http://terra:6080/arcgis/rest/services/ServicesForWeb/ExtractDataTask_web/GPSer
37
38        var printTemplateName = "CurrentPlanning";
39
40        var imageLayerInfoArray = [
41            ["2013-Citywide","http://maps.normanok.gov/arcgis/rest/services/AerialPhoto2013/ImageServer"],
42            ["2010-Citywide","http://maps.normanok.gov/arcgis/rest/services/AerialPhoto2010/ImageServer"],
43            ["2007-Urban","http://maps.normanok.gov/arcgis/rest/services/imagery/AerialPhotoHalfFt2007/ImageServer"],
44            ["2005-Urban","http://maps.normanok.gov/arcgis/rest/services/imagery/AerialPhotoHalf2005/ImageServer"],
45            ["2001-Urban","http://maps.normanok.gov/arcgis/rest/services/imagery/AerialPhotoOneFt2001/ImageServer"],
46            ["1997-Urban","http://maps.normanok.gov/arcgis/rest/services/imagery/AerialPhotoOneFt1997/ImageServer"],
47            ["2007-Rural","http://maps.normanok.gov/arcgis/rest/services/imagery/AerialPhotoOneFt2007/ImageServer"],
48            ["2005-Rural","http://maps.normanok.gov/arcgis/rest/services/imagery/AerialPhotoOneFt2005/ImageServer"],
49            ["2001-Rural","http://maps.normanok.gov/arcgis/rest/services/imagery/AerialPhotoTwoFt2001/ImageServer"],
50            ["1997-Rural","http://maps.normanok.gov/arcgis/rest/services/imagery/AerialPhotoTwoFt1997/ImageServer"]
51            ];
52
53
54        var MainMapServiceLayerNums = [15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,
55        var MainMapServiceLegendHeaderNums = [15,23,32,37,48,61,65,78];
56        var AnnotationLayerNums = [1,3,5,7,9,10,11,14];
57        var annotationVisible = [10,11,14];//visible at startup
58
59
60        var extractSpatialReference = {"wkid":2913};
61        var loadingImage = "images/working.gif";
62
63
64        var initialScale=600;//feet to inch
```

Challenges

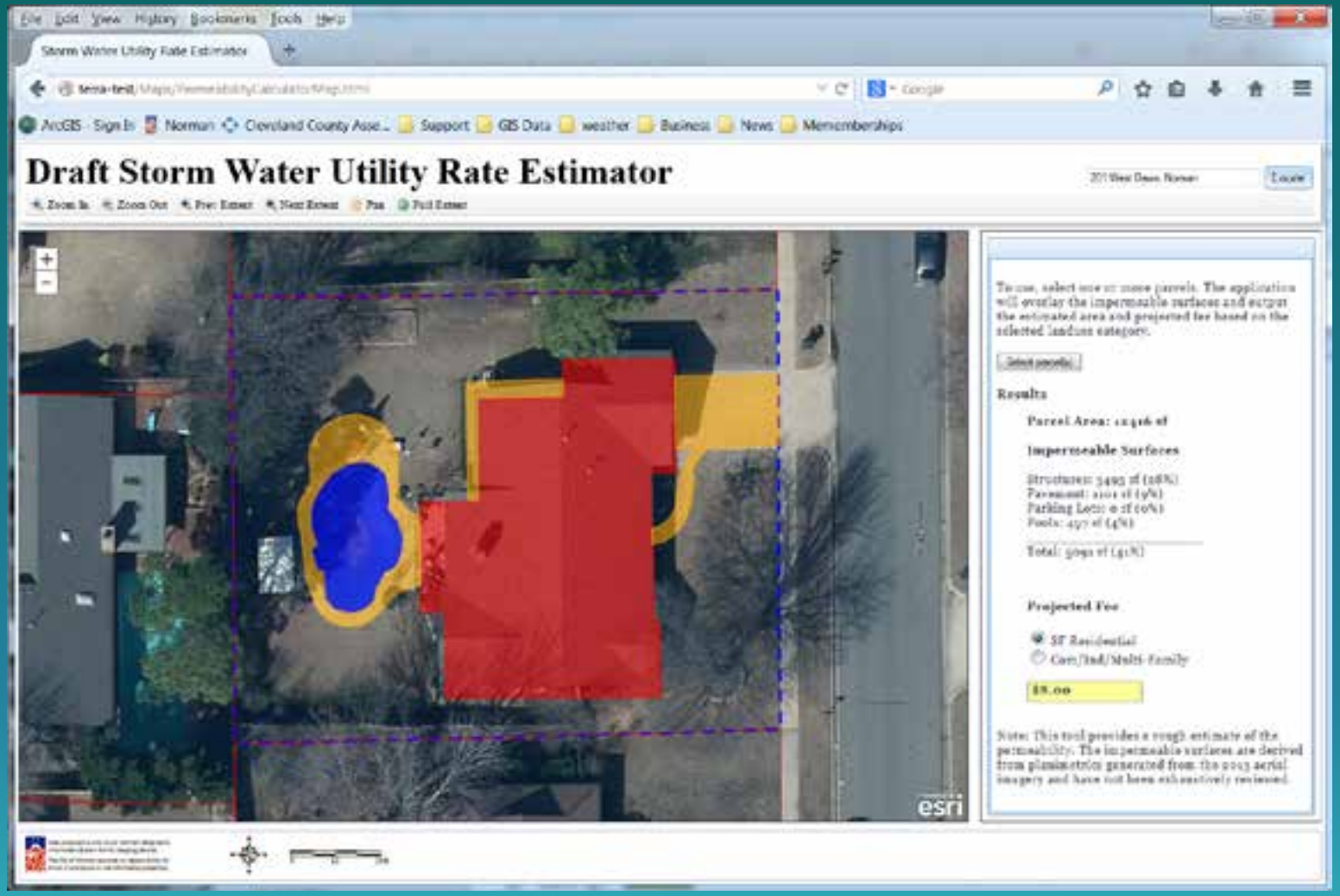
- Asynchronous processes
- Syntax changes between legacy and AMD JavaScript APIs
- Designing modular services
- System performance

Challenges - Asynchronous Processes

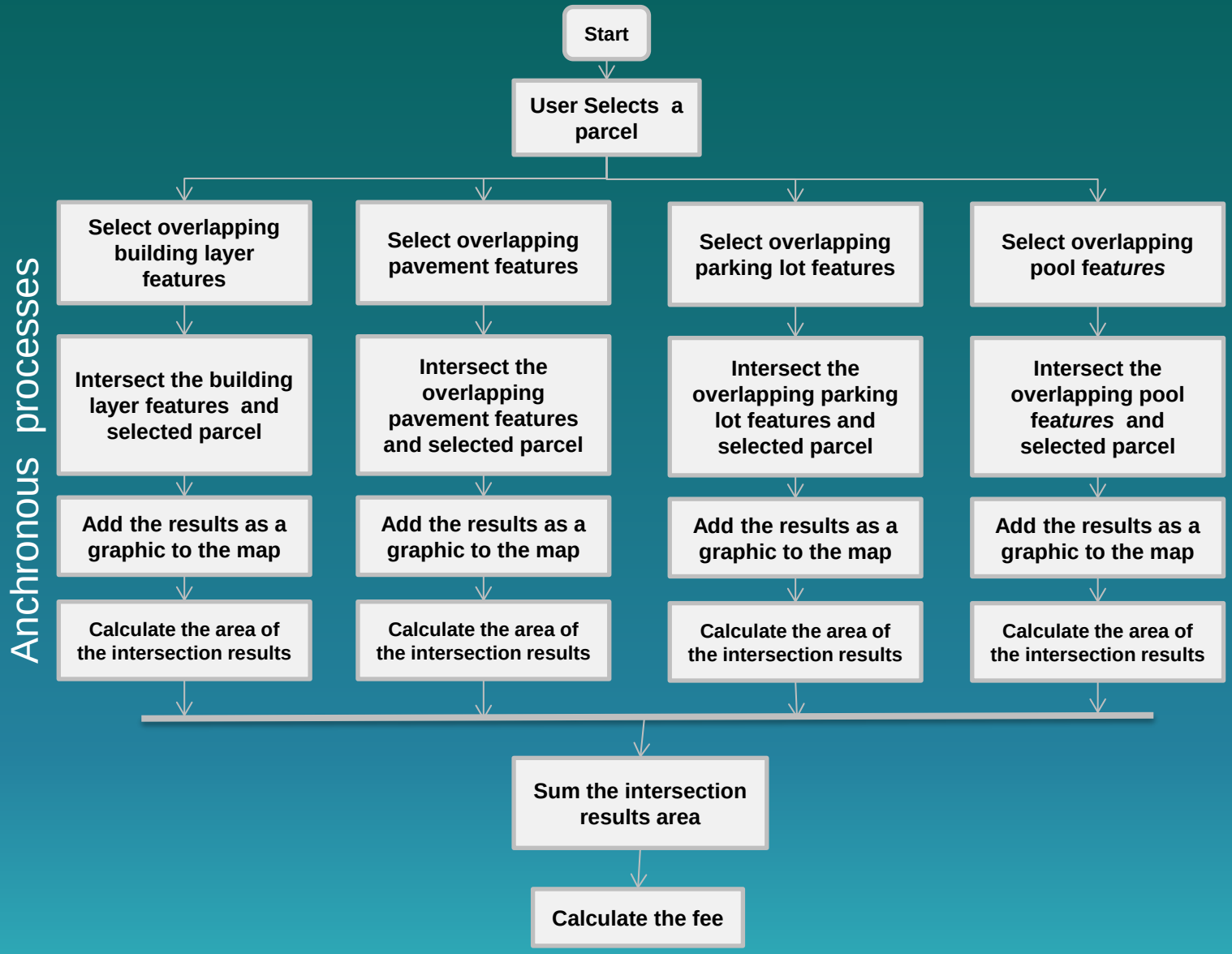
- **Combining asynchronous processes**
  - **An example – An application to estimate proposed fees stormwater fees based on the amount of impermeable surfaces on a parcel**

  - **General Steps**
    1. **User selects parcel**
    2. **Overlapping features from a building layer, a pavement layer, a parking lot layer and a pool layer are selected**
    3. **The selected features are intersected with the selected parcel**
    4. **The impermeable area and fee are calculated when the intersections of all layers are finished**

Challenges - Asynchronous Processes

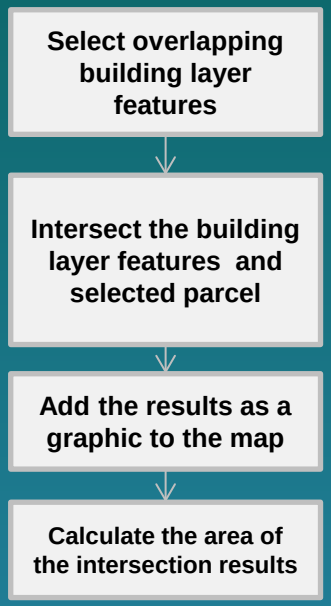


Challenges - Asynchronous Processes



Challenges - Asynchronous Processes

- Each selection/intersection/area calculation consists of asynchronous processes
- ESRI processes contain callbacks which allow the process to occur synchronously for each feature type




```
buildingLayer.selectFeatures(selectQuery, FeatureLayer.SELECTION_NEW);
buildingLayer.on("selection-complete",  function(){
        //Do something here..
}
```

Challenges - Asynchronous Processes

- **How to delay the final calculation until the processes for each feature type are completed?**
- **We use dojo deferred lists**

```
doParkingIntersectionTask = new Deferred();
doPoolIntersectionTask = new Deferred();

deferred = all([getParcelAreasTask,
                doBuildingIntersectionTask,
                doPavementIntersectionTask,
                doParkingIntersectionTask,
                doPoolIntersectionTask]);
```

Challenges - Asynchronous Processes

- **Add a resolve statement for the functions used to calculate the areas for each of the feature types**

```
getParcelAreasTask.resolve(newArea);
```

- **Add a deferred.then function.**

```
deferred.then(function() {

        //Code to do the calculations and display the results..

}// deferred.then(function() {
```

Challenges - Legacy and AMD Syntax Differences

- ArcGIS API after 3.4 written in AMD style
  - ESRI recommends AMD style although “legacy” is still supported
  - Update requires more than simple cut-and-paste
    - Dependencies are defined differently
    - Other syntax differences

Challenges - Legacy and AMD Syntax Differences

- **Loading Dependencies**

“Legacy”

```
dojo.require("esri.map");
dojo.require("esri.tasks.locator");

function init(){
	//code here..
}
```

“AMD”

```
require(["esri/map","esri/tasks/locator",…],
	function (map, Locator,…) {
		//code here..
	});
```

Challenges - Legacy and AMD Syntax Differences

- **connect vs .on for functions with callbacks**

“Legacy”

```
locator = new esri.tasks.Locator(locatorServiceURL);
dojo.connect(locator, "onAddressToLocationsComplete", showLocationResults);
```

“AMD”

```
locator = new Locator(locatorServiceURL);
locator.on("address-to-locations-complete", showLocationResults);
```

Challenges – Modular Services

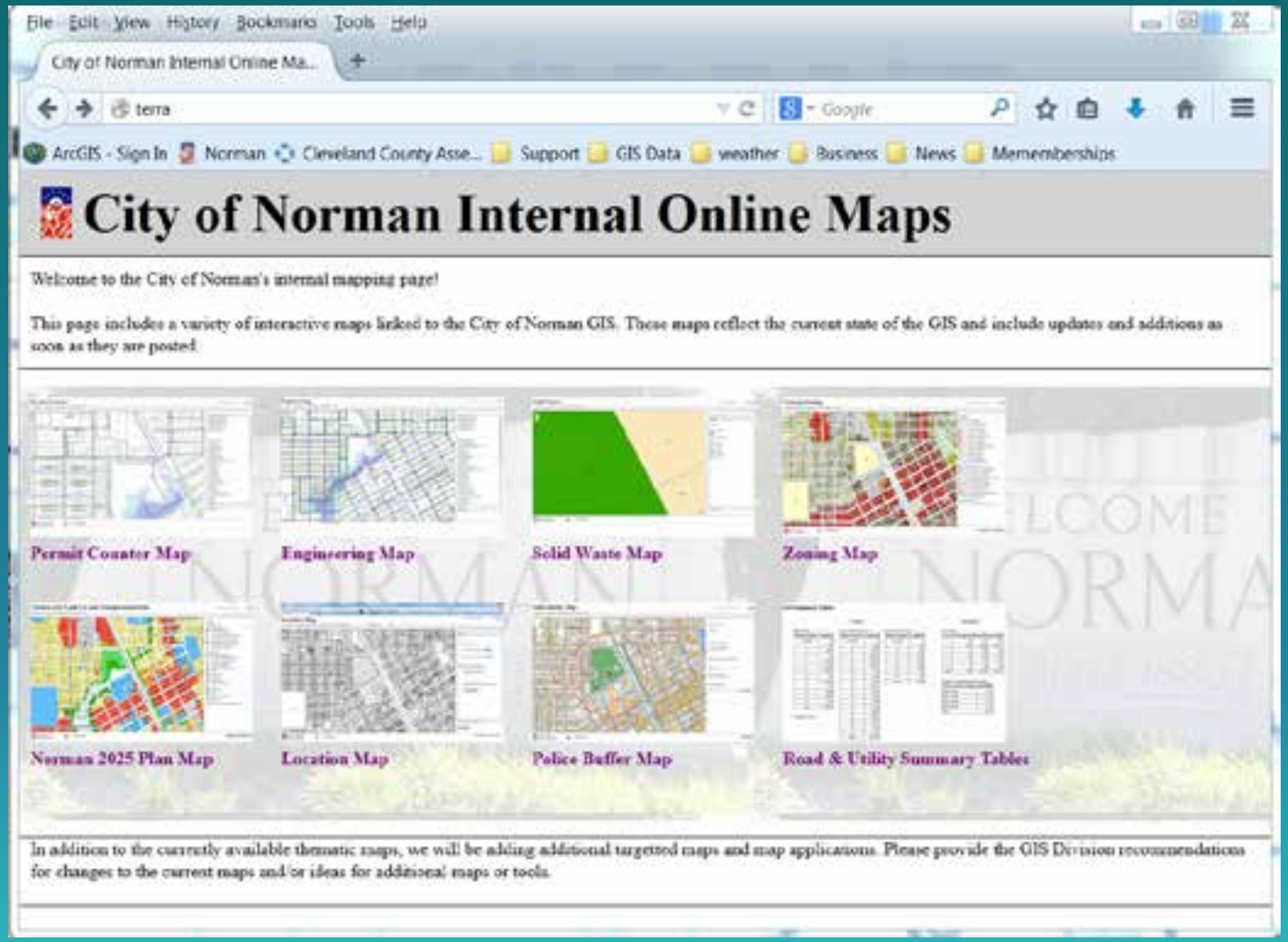
- Used working units MXDs for initial map services
  - Resulted in data being published multiple times
  - Easy to deploy, but degrades performance
- Need to redesign Apps to use modular services

Challenges – System Performance

- Monitor to determine where bottleneck is in system
- Add RAM
- Add additional machines to site

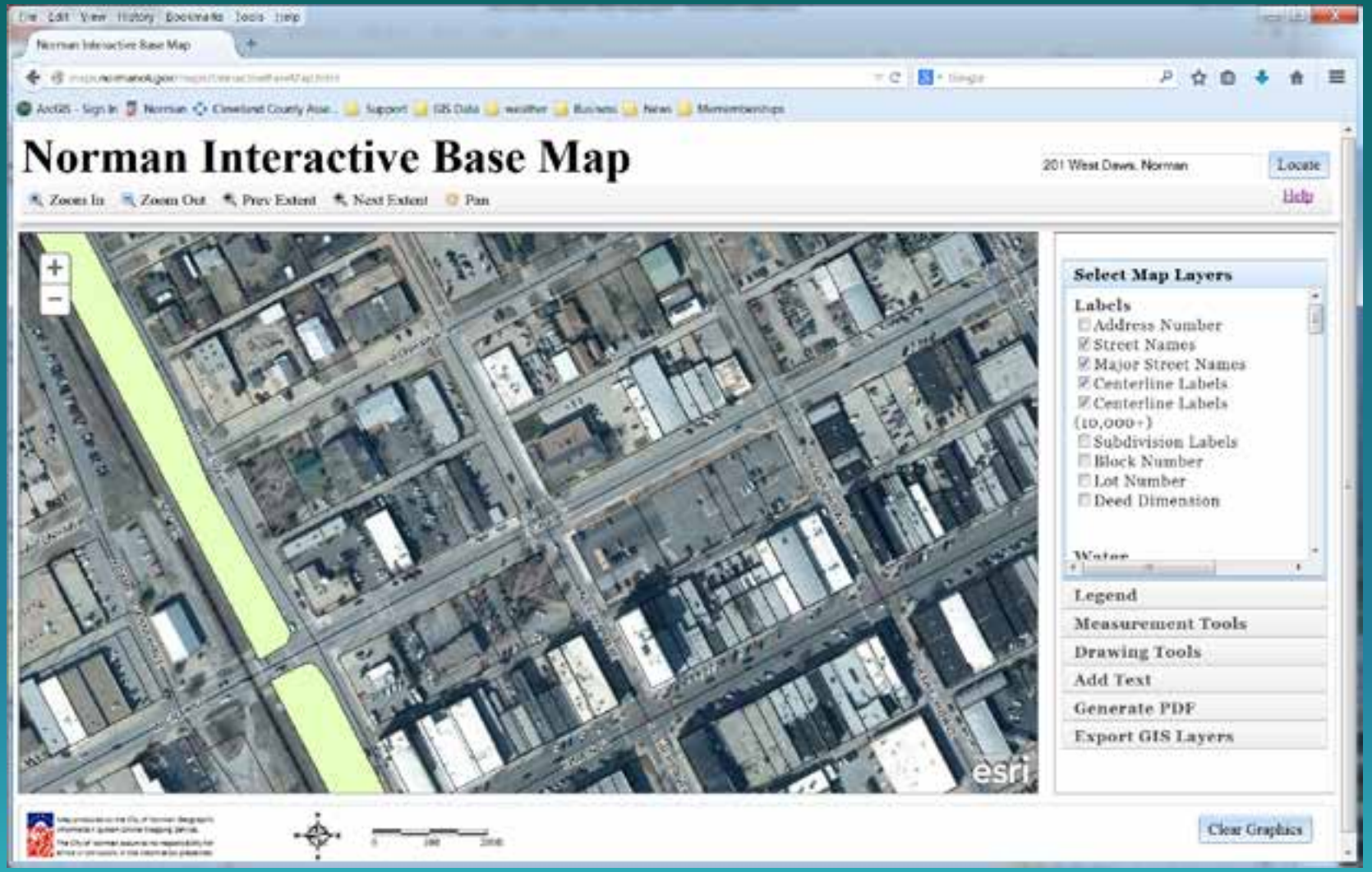
Current Status

- **Eight services deployed internally**



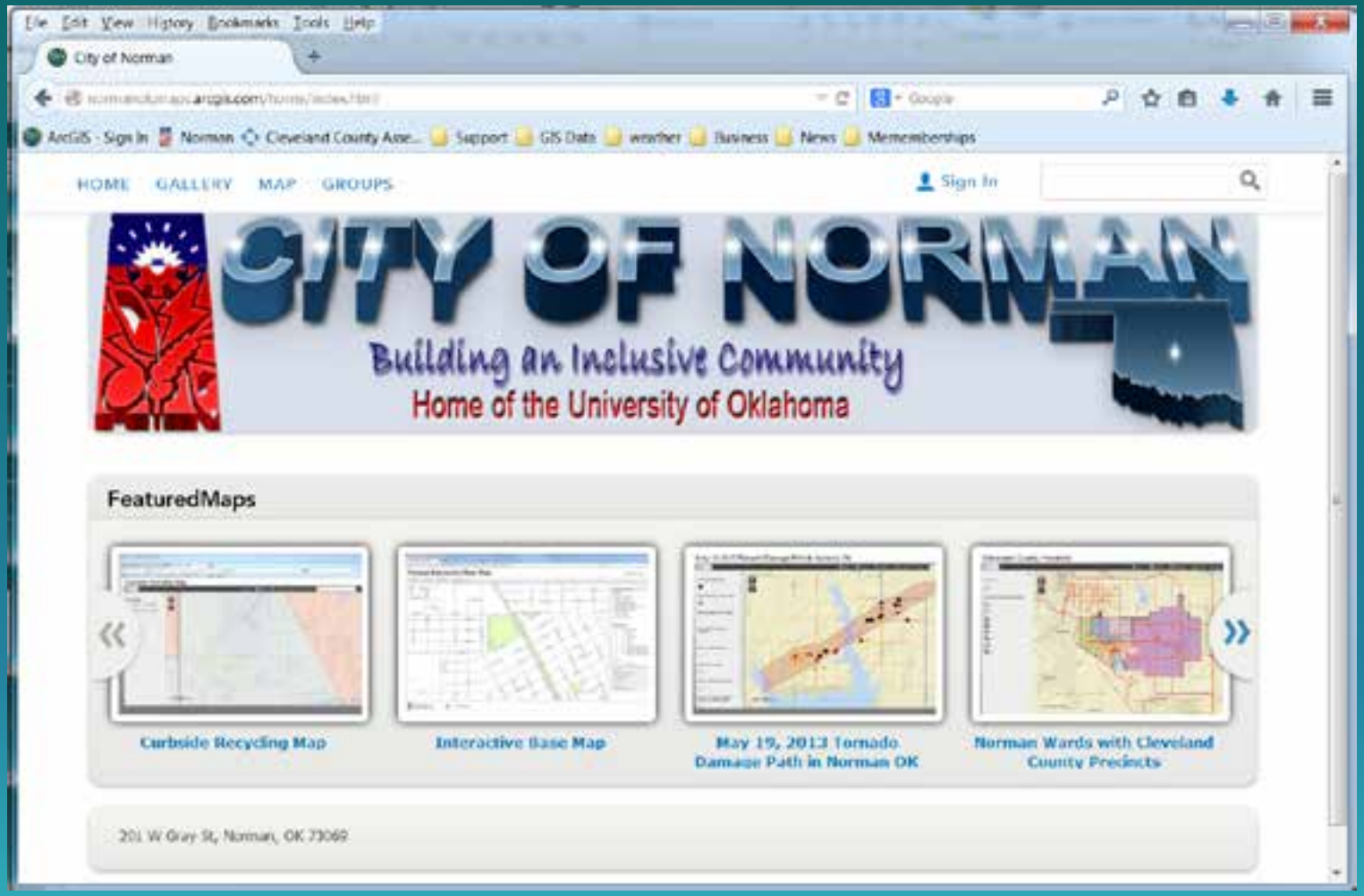
Current Status

- One application deployed externally



Current Status

- **Four maps deployed on ArcGIS Online**



Current Status - GIS Profile

- Version of ArcGIS before project: 10.1
- External web apps: ArcGIS Server for Workgroups 10.1
- Enterprise Database: ArcSDE 10.1 for SQL Server
- Internal web apps: ArcGIS Server 10.1 Enterprise
  - Permit Counter
  - Engineering
  - Solid Waste
  - Police Special Operations
- Number of ArcGIS Desktop users: 16
- Third party applications: 3
  - Cityworks by Azteca
  - CrimeView by Omega
  - New World Systems

Future Plans

- Upgrade to 10.2.1 or latest version that works with third party apps in October 2014
- Deploy more external applications
- Deploy mobile apps
- Make greater use of ArcGIS Online

Demo & Questions

Contact information:
Joyce.Green@NormanOK.gov
John.McIntosh@NormanOK.gov

Website:
http://maps.normanok.gov/index.html
ArcGIS Online site:
http://normanok.maps.arcgis.com/home/index.html