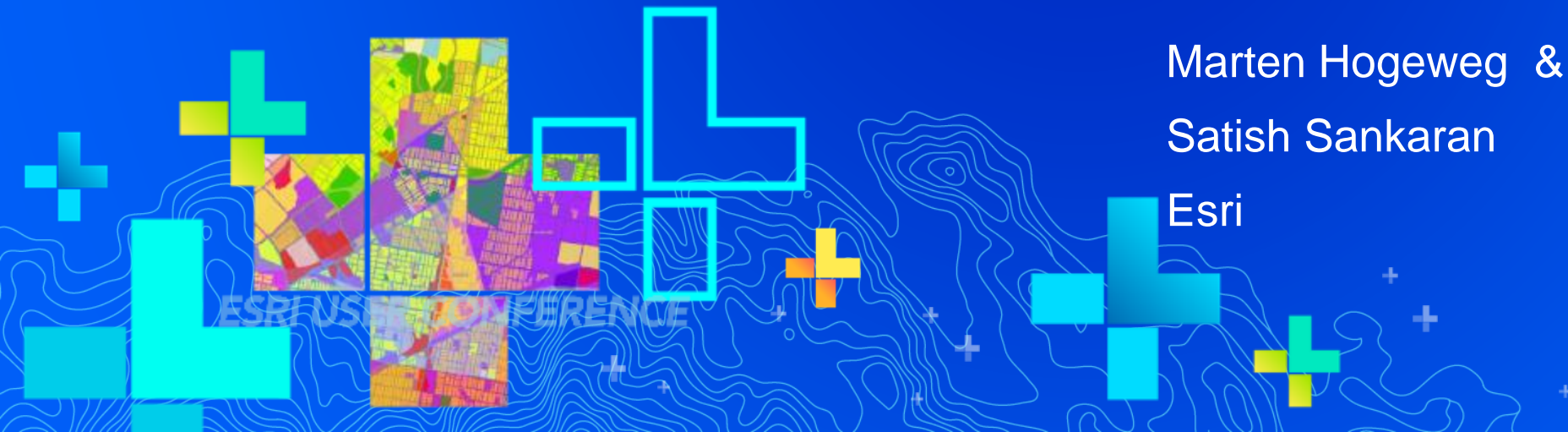


# Data and System Interoperability with ArcGIS

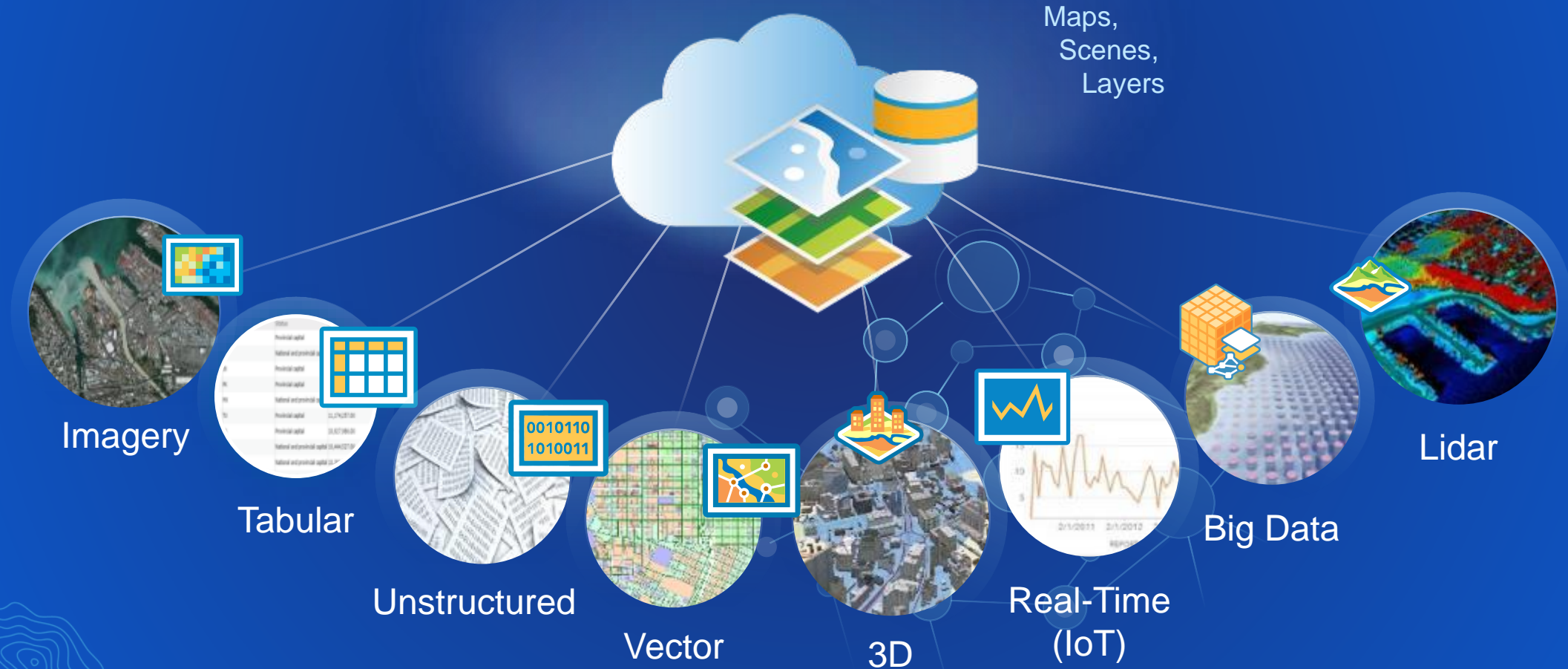
Marten Hogeweg &  
Satish Sankaran

Esri



# Integrating External Data

Creating a common language



# Common Database Connections Supported in ArcGIS

## User Managed Databases with direct connections

- SQL Server
- PostgreSQL
- SQLite
- Oracle
- SAP plus Netezza
- SAP Hana
- DB2
- Informix
- Teradata
- Dameng

## Cloud Data store locations

- [Amazon Simple Storage Service \(S3\)](#)
- [Microsoft Azure Blob storage](#)
- [Microsoft Azure Data Lake storage\\*](#)  
Big data file shares only
- [Alibaba Cloud Object Storage Service \(OSS\)\\*](#) cannot be used for big data file shares.
- [Huawei Object Storage Service \(OBS\)\\*](#)  
cannot be used for big data file shares.

## Other Ingest Resources

- **Registered Big Data stores:**
  - File share
  - HDFS
  - Hive

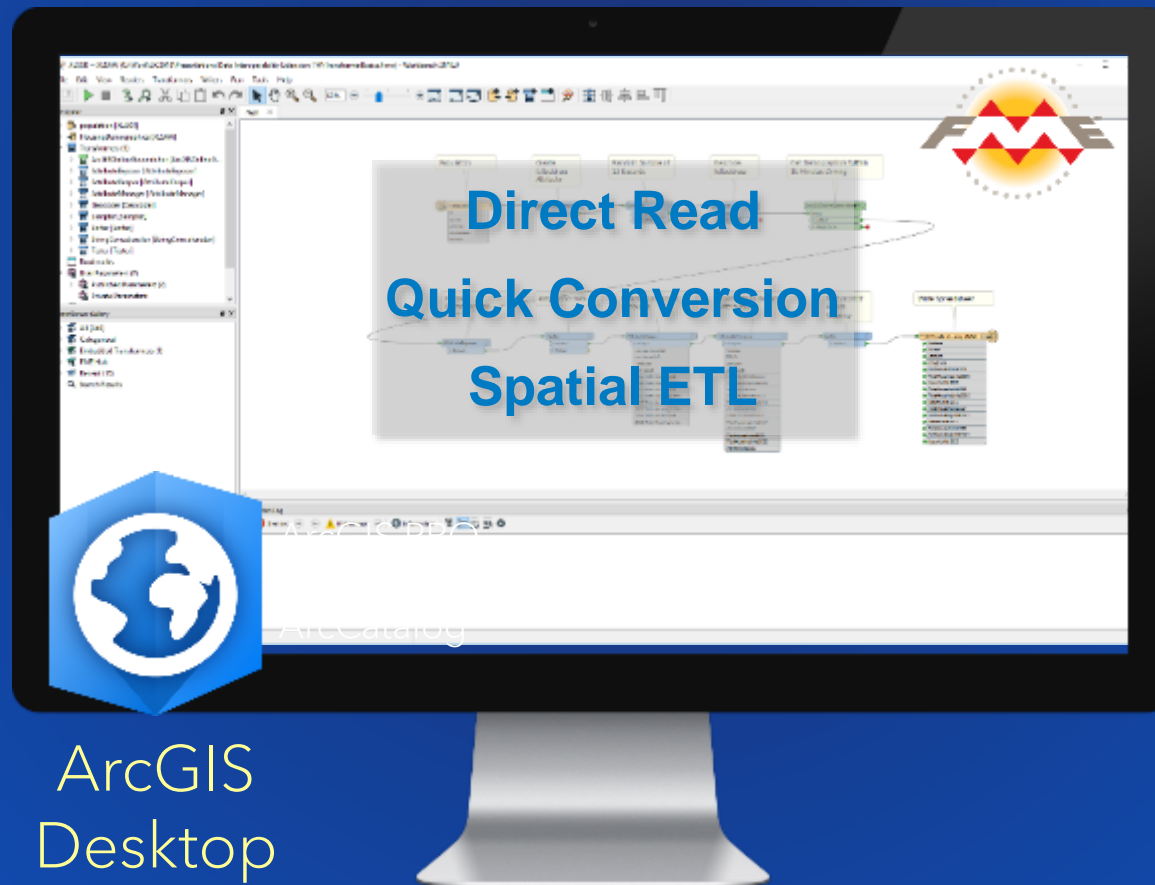
\* Support Starting at Enterprise 10.6.1+

# ETL using Data Interoperability Extension

## Extract from

- File
- DB Connection
- API

## Transform



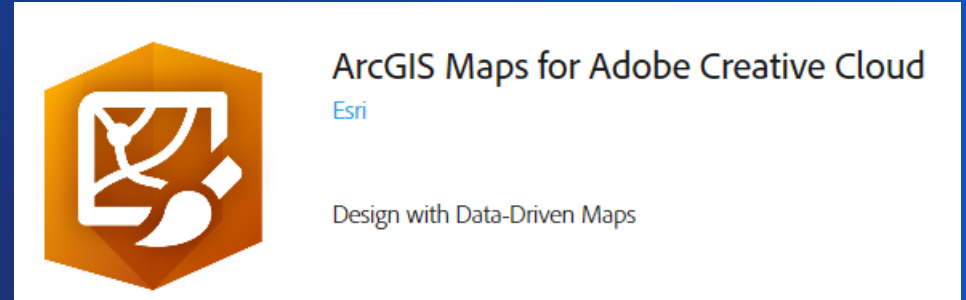
ArcGIS  
Desktop

## Load



ArcGIS  
Online

# Direct Integration



## Autodesk & Esri

Global leaders partnering to drive the integration of spatial intelligence and 3D design model information. Connecting The Science of Where to Make Anything.

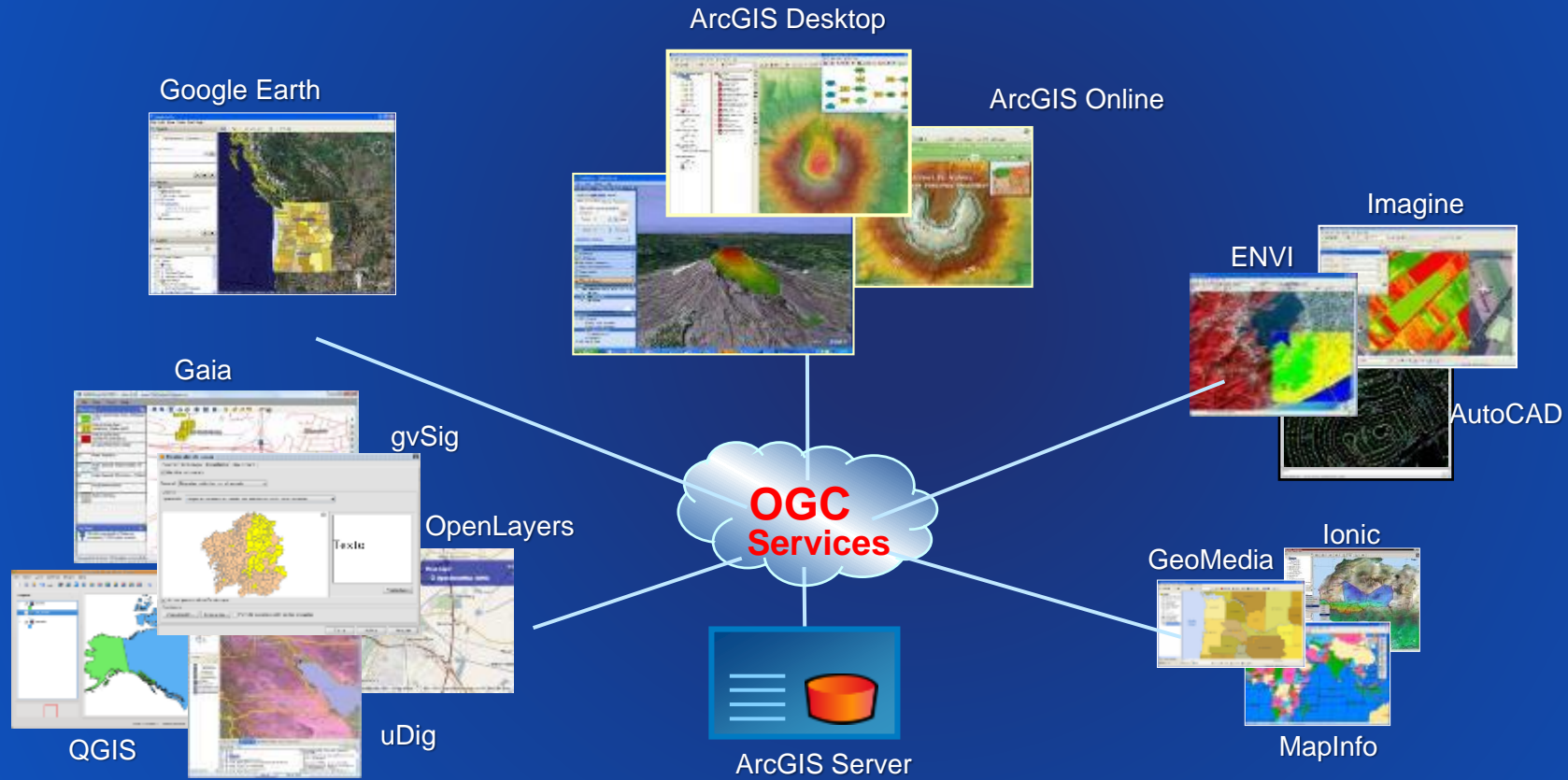


# Sharing using Web Services

Effectively and freely sharing your derivative work



# Interoperable Geospatial Web Services





## Certified and Implementing Products

[Register now or update your product listing](#)

[Help](#)

Standard:

Product Provider:

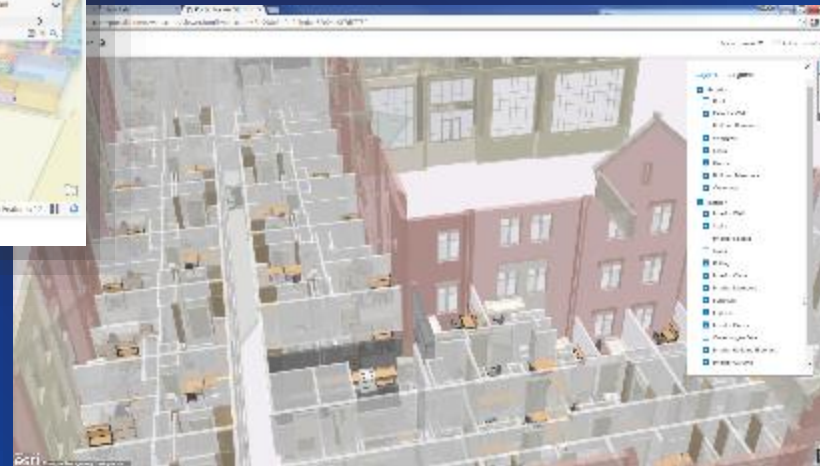
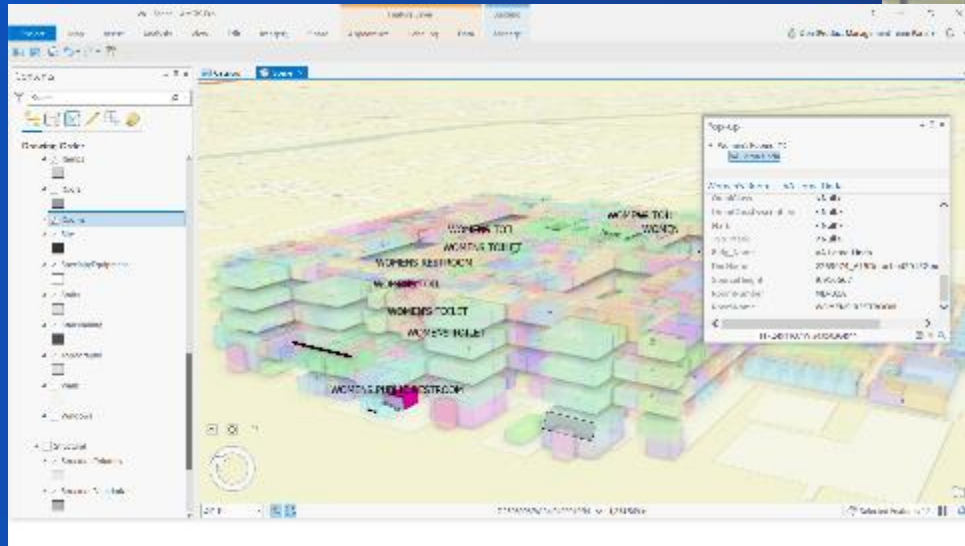
**Compliant Products Only**  **Reference Implementations Only**  **All Implementations**

Found 1 organization with 133 products with 338 standard implementations, 338 of which are currently compliant, and 0 are reference implementations

ESRI		Top ▲
ArcGIS 8.1 <a href="#">↗</a>	Sankaran, Satish	Registered: 2001-06-21
<input checked="" type="checkbox"/> Simple Features Implementation Specification for OLE/COM 1.1		Certified: 2001-06-21
ArcGIS 10.3 for Server <a href="#">↗</a>	Satish Sankaran	Registered: 2014-11-11
<input checked="" type="checkbox"/> Web Coverage Service (WCS) Implementation Specification (Corrigendum) 1.0.0		Certified: 2015-01-06
<input checked="" type="checkbox"/> Web Coverage Service (WCS) Implementation Specification Corrigendum 1.1.1.1		Certified: 2015-01-06
<input checked="" type="checkbox"/> Web Map Service (WMS) Implementation Specification 1.3.0		Certified: 2015-01-06
<input checked="" type="checkbox"/> Web Feature Service 1.0.0		Certified: 2015-01-06
<input checked="" type="checkbox"/> Web Map Service 1.1.1		Certified: 2015-01-06
ArcGIS 10.3 for Server - Informix Spatial Types and Functions <a href="#">↗</a>	Satish Sankaran	Registered: 2015-01-05



# Working with BIM Data

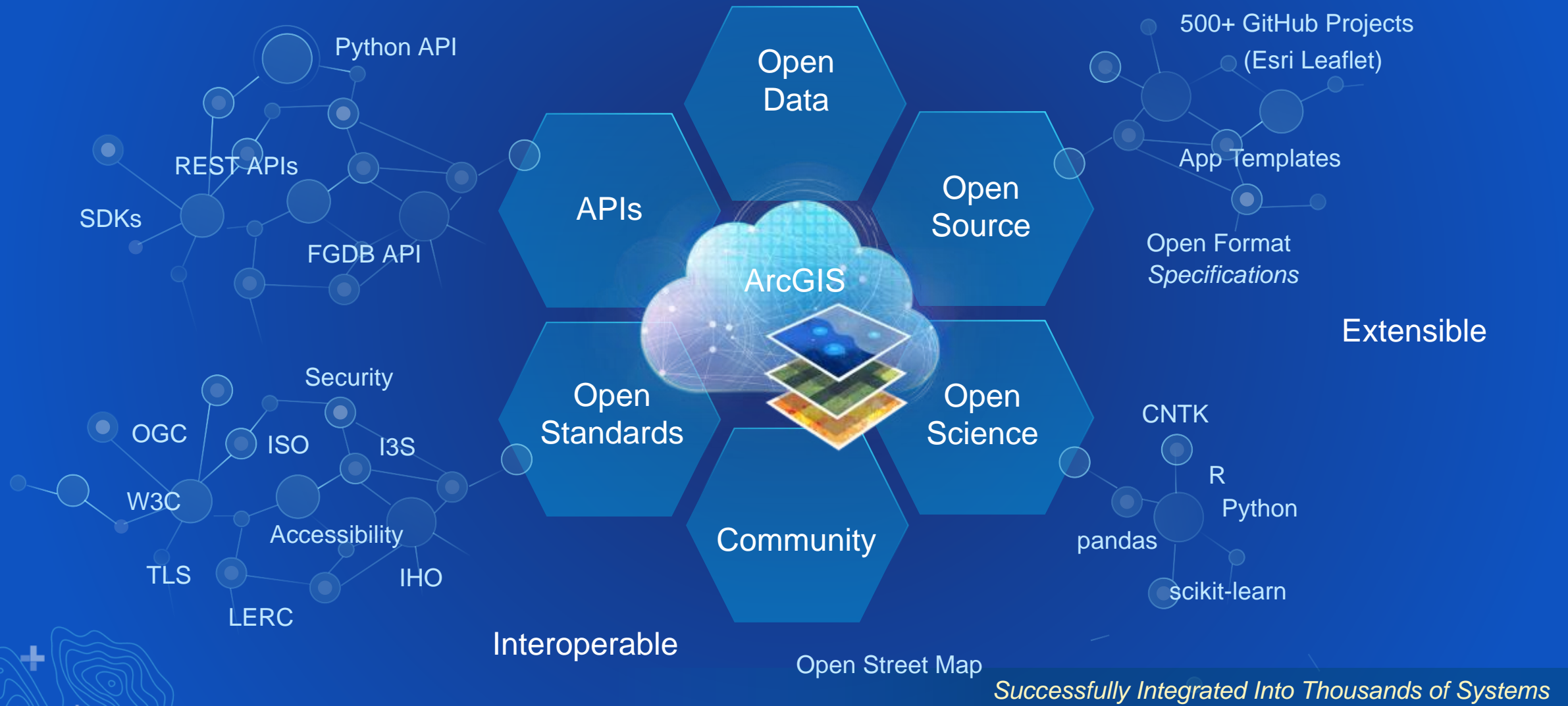


- Access IFC files using the *ArcGIS Data Interoperability Extension*
- Directly read Revit files in *ArcGIS Pro*
- Share effectively with stakeholders in *Building Scene Layer (BSL)*

# Open Platform



# Enterprises need Open Platforms

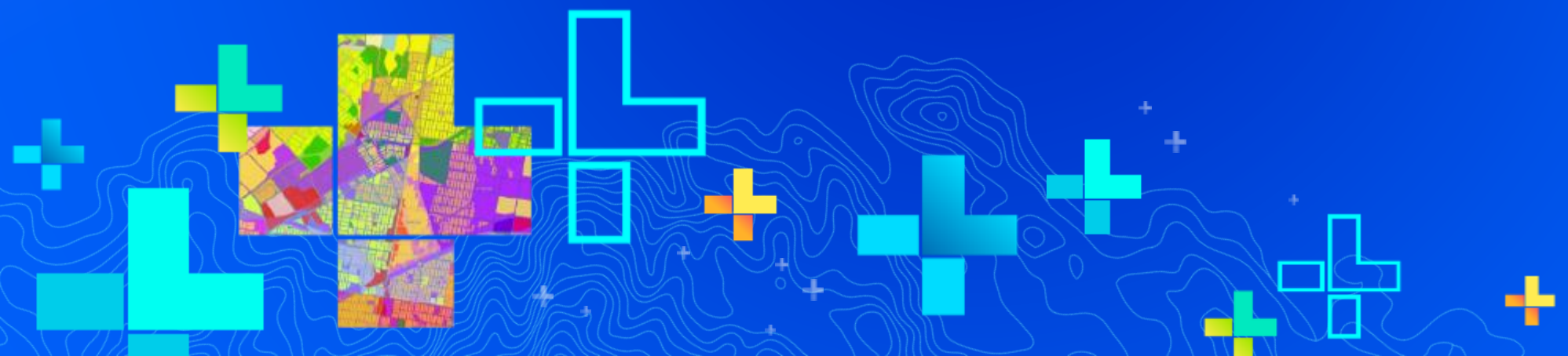




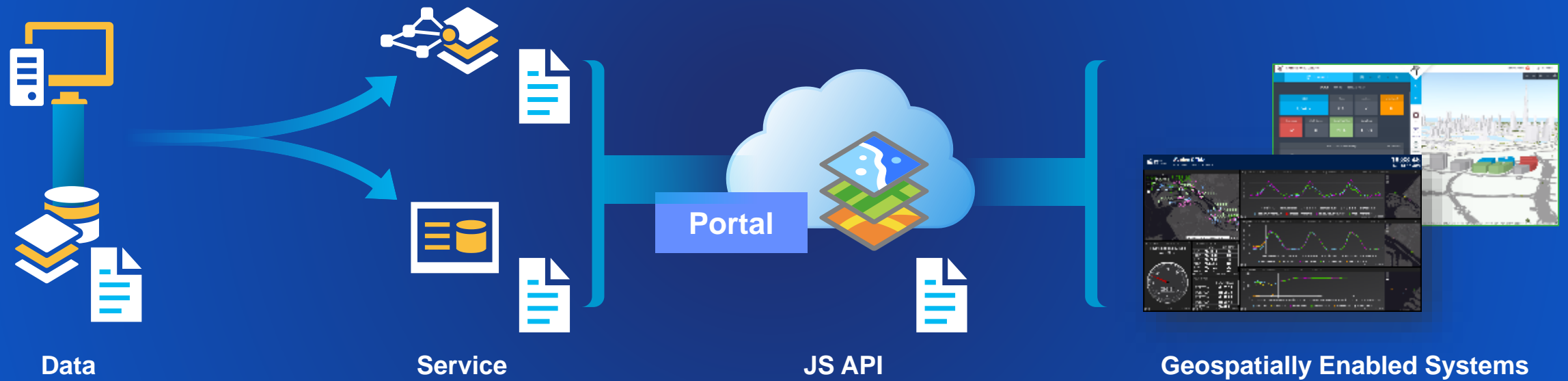
# Interoperability in ArcGIS

Demos

SEE  
WHAT  
OTHERS  
CAN'T



# Interoperability in ArcGIS

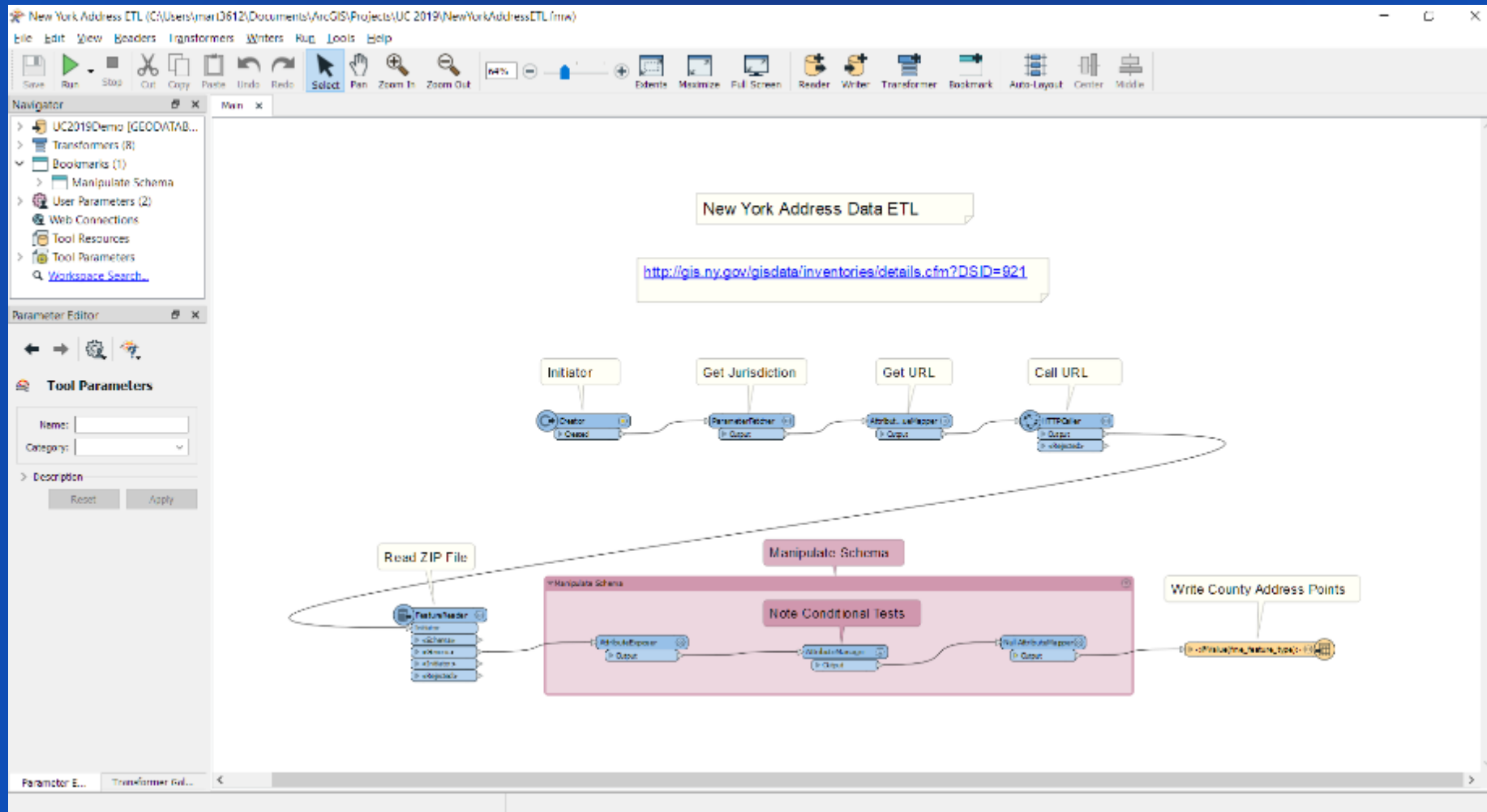




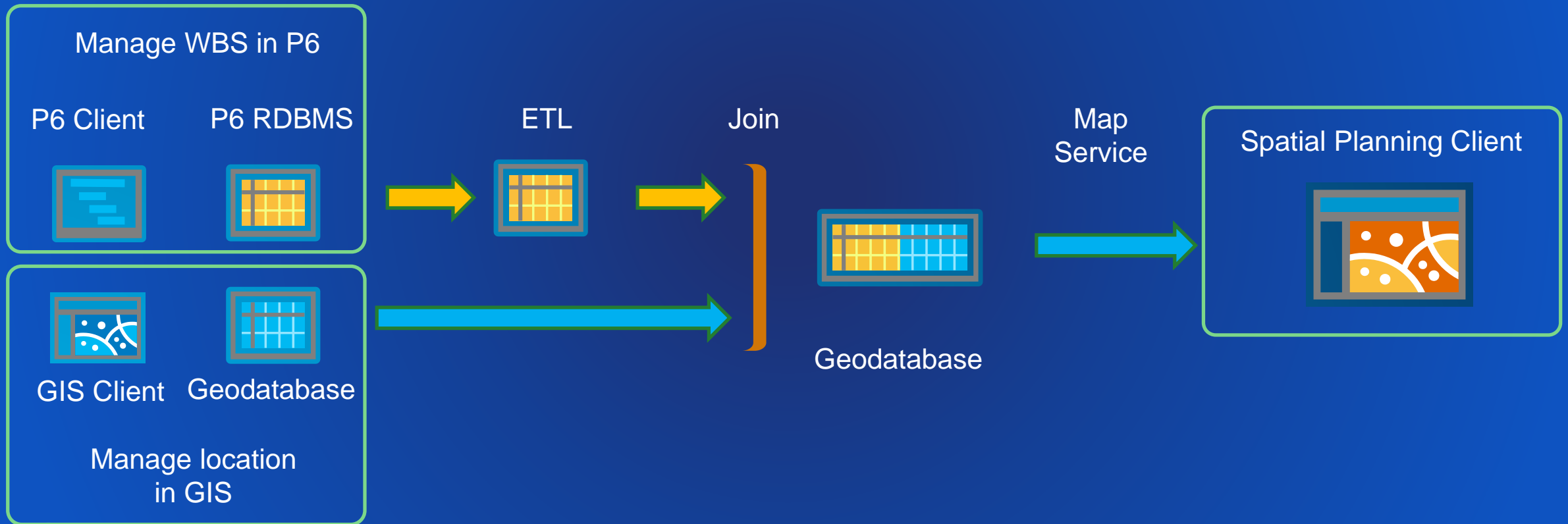
# Data Interoperability



# ArcGIS Pro Data Interoperability Extension



# Make Project Schedules Location Aware







# Service Interoperability



# Publish as Hosted Service with OGC WFS

The screenshot shows the ArcGIS Online web map viewer interface. The browser address bar displays the URL: <https://sdi.maps.arcgis.com/home/webmap/viewer.html?useExisting=1&layers=f1f632fb2f0b4721966...>

The map title is "Address Points Seneca". The interface includes a search bar with the text "Find address or place", a "Contents" panel on the left showing "AddressPoints Seneca" and "Topographic", and a toolbar with various map navigation and analysis tools.

A popup window titled "AddressPoints\_Seneca: Seneca" is open over a selected address point. It displays the following details:

- NYSAddressPointID: SENE012342
- CountyID: [blank]
- NYStreetID: 437,575,187
- AddressNumber: 1030
- PreDirectional: [blank]
- PreType: [blank]
- StreetName: Middle Black Brook
- PostType: Rd
- PostDirectional: [blank]
- SubAddress: [blank]
- Building: [blank]

At the bottom of the popup, there are links for "Zoom to" and "Get Directions".

Below the map, a table titled "AddressPoints Seneca (Features: 16852, Selected: 1)" displays the following data:

NYSAddressPointID	CountyID	NYStreetID	AddressNumber	PreDirectional	PreType	StreetName
SENE005998		437,575,187	1052			Middle f
SENE005999		437,575,187	1062			Middle L

The bottom of the interface includes a footer with links: "Trust Center", "Contact Esri", "Report Abuse", and "Contact Us".

# Publish as INSPIRE View/Download Service

The screenshot displays the ArcGIS Enterprise web interface. The browser address bar shows the URL: <https://msr13612.esri.com/portal/home/webmap/views.html?useExisting=1>. The page title is "My Map". The interface includes a navigation menu with "Home" and "My Map", and a search bar for "Find address or place".

The main map area shows a topographic view of the Mediterranean region, including countries like France, Italy, Greece, and others. A popup window titled "INSPIRE View Service" is open over the map. The popup displays the following information:

- INSPIRE View Service**
- FeatureInfoCollection - layer name: '4'**
- objectid mapped featureid featureid mappingname\_code
- 1 15 1 1

The popup also includes a "Zoom to" button and a scale bar at the bottom left of the map area.

# Catalog Services – CSW

```
https://gptogc.esri.com/csw/RhG...
https://gptogc.esri.com/csw/RhGlohBHzSBKt1MS?request=GetCapabilities&serv...

<csw:Capabilities version="2.0.2" xmlns:csw="http://www.opengis.net/cat/csw/2.0.2" xmlns:gml="http://www.opengis.net/gml"
xmlns:ogc="http://www.opengis.net/ogc" xmlns:ows="http://www.opengis.net/ows" xmlns:xlink="http://www.w3.org/1999/xlink">
  <ows:ServiceIdentification>
    <ows:Title>ArcGIS Online CSW 0.0.1</ows:Title>
    <ows:Abstract>CSW interface to ArcGIS Online</ows:Abstract>
    <ows:Keywords>
      <ows:Keyword>ArcGIS Online</ows:Keyword>
      <ows:Keyword>Esri</ows:Keyword>
    </ows:Keywords>

    <ows:ServiceType>CSW</ows:ServiceType>
    <ows:ServiceTypeVersion>2.0.2</ows:ServiceTypeVersion>
    <ows:Fees>none</ows:Fees>

    <ows:AccessConstraints>demo</ows:AccessConstraints>
  </ows:ServiceIdentification>

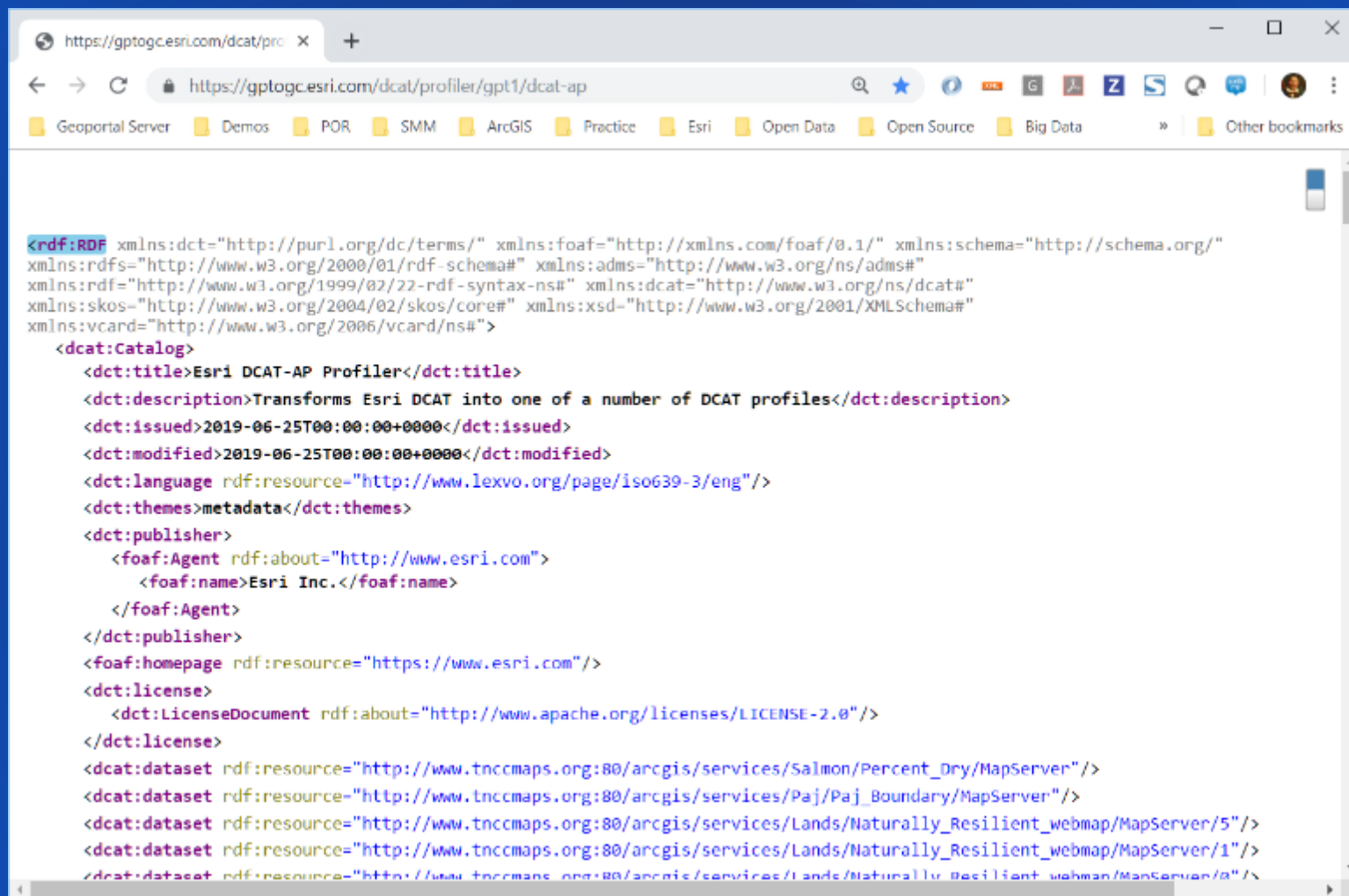
  <ows:ServiceProvider>
    <ows:ProviderName>Esri Inc. name</ows:ProviderName>

    <ows:ProviderSite xlink:href="http://www.esri.com"/>
    <ows:ServiceContact>
      <ows:IndividualName>Marten Hogeweg</ows:IndividualName>

      <ows:PositionName>Product Manager Esri Geoportal Server</ows:PositionName>
      <ows:ContactInfo>
        <ows:Phone>
          <ows:Voice>+1 (909) 793-2853</ows:Voice>
        </ows:Phone>
      </ows:ContactInfo>
    </ows:ServiceContact>
  </ows:ServiceProvider>
</csw:Capabilities>
```

<https://gptogc.esri.com/csw/RhGlohBHzSBKt1MS?request=GetCapabilities&service=CSW&version=2.0.2>

# Catalog Services – DCAT

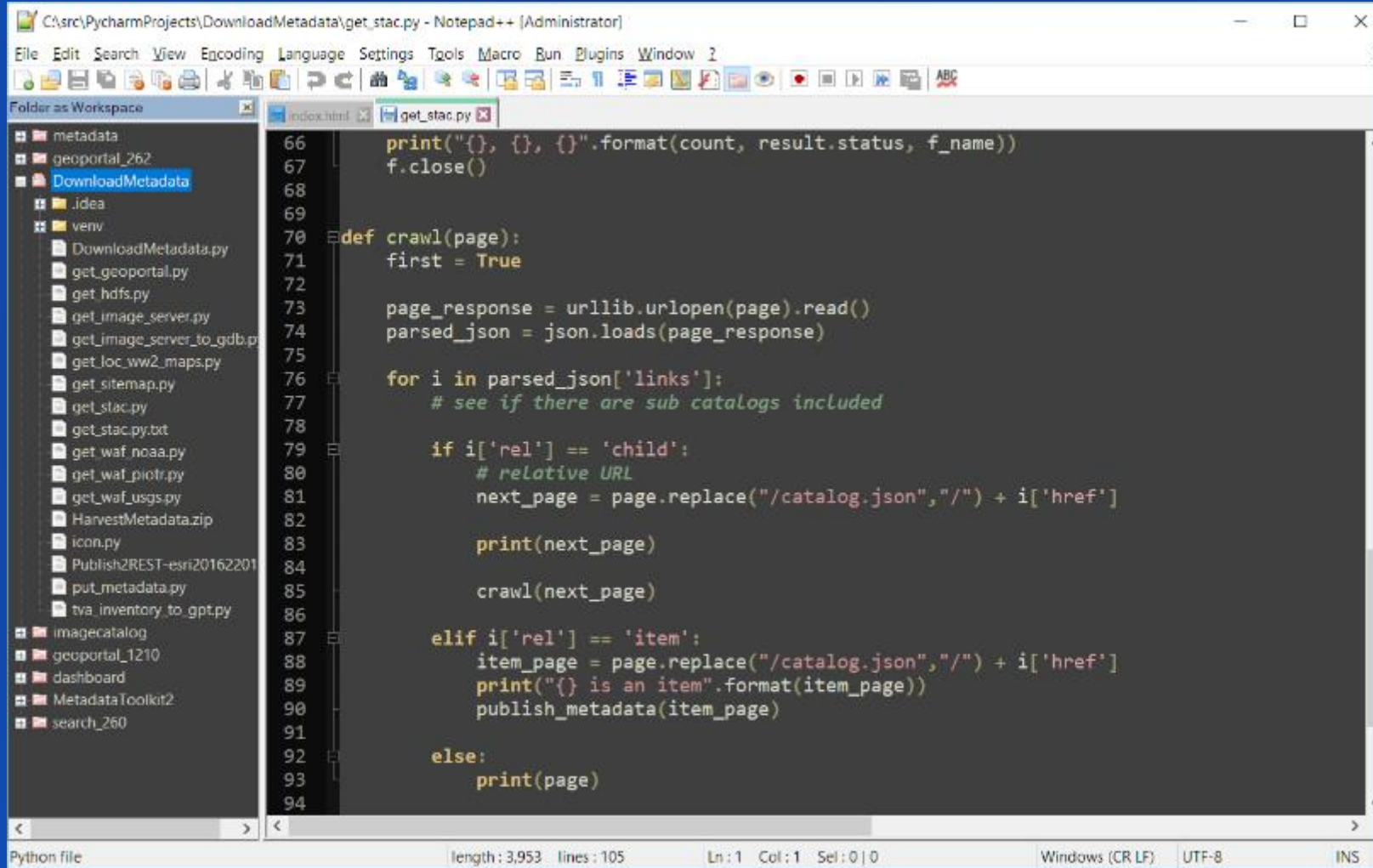


The screenshot shows a web browser window with the address bar displaying `https://gptogc.esri.com/dcat/profiler/gpt1/dcat-ap`. The browser's bookmark bar includes items like 'Geoportal Server', 'Demos', 'POR', 'SMM', 'ArcGIS', 'Practice', 'Esri', 'Open Data', 'Open Source', 'Big Data', and 'Other bookmarks'. The main content area displays an RDF/XML document. The document starts with a namespace declaration for `<rdf:RDF>` and includes various namespaces such as `xmlns:dct`, `xmlns:foaf`, `xmlns:schema`, `xmlns:rdfs`, `xmlns:adms`, `xmlns:rdf`, `xmlns:dcat`, `xmlns:skos`, and `xmlns:vcad`. The root element is `<dcat:Catalog>`, which contains several child elements: `<dct:title>` (Esri DCAT-AP Profiler), `<dct:description>` (Transforms Esri DCAT into one of a number of DCAT profiles), `<dct:issued>` (2019-06-25T00:00:00+0000), `<dct:modified>` (2019-06-25T00:00:00+0000), `<dct:language>` (rdf:resource="http://www.lexvo.org/page/iso639-3/eng"/>), `<dct:themes>` (metadata), `<dct:publisher>` (foaf:Agent with name Esri Inc. and homepage https://www.esri.com/), `<dct:license>` (dct:LicenseDocument with resource http://www.apache.org/licenses/LICENSE-2.0/), and a list of `<dcat:dataset>` elements pointing to various ArcGIS services.

```
<rdf:RDF xmlns:dct="http://purl.org/dc/terms/" xmlns:foaf="http://xmlns.com/foaf/0.1/" xmlns:schema="http://schema.org/"
xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#" xmlns:adms="http://www.w3.org/ns/adms#"
xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns:dcat="http://www.w3.org/ns/dcat#"
xmlns:skos="http://www.w3.org/2004/02/skos/core#" xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
xmlns:vcad="http://www.w3.org/2006/vcard/ns#"
  <dcat:Catalog>
    <dct:title>Esri DCAT-AP Profiler</dct:title>
    <dct:description>Transforms Esri DCAT into one of a number of DCAT profiles</dct:description>
    <dct:issued>2019-06-25T00:00:00+0000</dct:issued>
    <dct:modified>2019-06-25T00:00:00+0000</dct:modified>
    <dct:language rdf:resource="http://www.lexvo.org/page/iso639-3/eng"/>
    <dct:themes>metadata</dct:themes>
    <dct:publisher>
      <foaf:Agent rdf:about="http://www.esri.com">
        <foaf:name>Esri Inc.</foaf:name>
      </foaf:Agent>
    </dct:publisher>
    <foaf:homepage rdf:resource="https://www.esri.com"/>
    <dct:license>
      <dct:LicenseDocument rdf:about="http://www.apache.org/licenses/LICENSE-2.0"/>
    </dct:license>
    <dcat:dataset rdf:resource="http://www.tnccmaps.org:80/arcgis/services/Salmon/Percent_Dry/MapServer"/>
    <dcat:dataset rdf:resource="http://www.tnccmaps.org:80/arcgis/services/Paj/Paj_Boundary/MapServer"/>
    <dcat:dataset rdf:resource="http://www.tnccmaps.org:80/arcgis/services/Lands/Naturally_Resilient_webmap/MapServer/5"/>
    <dcat:dataset rdf:resource="http://www.tnccmaps.org:80/arcgis/services/Lands/Naturally_Resilient_webmap/MapServer/1"/>
    <dcat:dataset rdf:resource="http://www.tnccmaps.org:80/arcgis/services/Lands/Naturally_Resilient_webmap/MapServer/0"/>
```

<https://gptogc.esri.com/dcat/profiler/gpt1/dcat-ap>

# Catalog Services – Spatio-Temporal Access Catalog (STAC)



```
66 print("{}; {}, {}".format(count, result.status, f_name))
67 f.close()
68
69
70 def crawl(page):
71     first = True
72
73     page_response = urllib.urlopen(page).read()
74     parsed_json = json.loads(page_response)
75
76     for i in parsed_json['links']:
77         # see if there are sub catalogs included
78
79         if i['rel'] == 'child':
80             # relative URL
81             next_page = page.replace("/catalog.json", "/") + i['href']
82
83             print(next_page)
84
85             crawl(next_page)
86
87         elif i['rel'] == 'item':
88             item_page = page.replace("/catalog.json", "/") + i['href']
89             print("{} is an item".format(item_page))
90             publish_metadata(item_page)
91
92         else:
93             print(page)
94
```

<http://gptogc.esri.com/stac/catalog/52484b28322542ce97cff79046978f9e/catalog.json>

# Catalog Services – Spatio-Temporal Access Catalog (STAC)

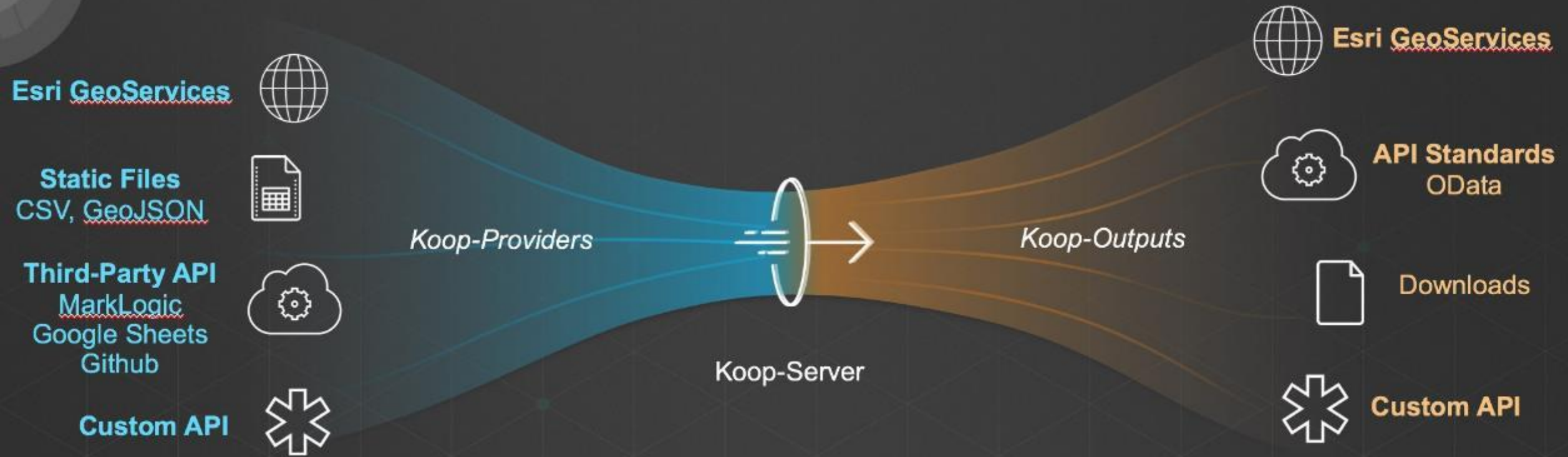
The screenshot displays the Esri Image Catalog web interface. The browser address bar shows the URL <http://mart3612.esri.com/imagecatalog/#>. The page features a navigation bar with 'Search', 'Map', and 'About' links, and a 'Sign In' button. The main content area is divided into three sections:

- Map:** A map of the world with a search box and zoom controls. The current view is centered on North America.
- Filters:** A sidebar on the left with expandable sections for 'Dataset', 'Acquisition Date', 'Cloud Cover', 'Sun Azimuth', 'Sun Zenith', 'Sensor Zenith', 'Accuracy', 'Day Of Year', and 'Year'. The 'Dataset' filter is currently expanded to show 'landsat-8-l1 (STAC) (15452)'.
- Results:** A list of search results for 'landsat-8-l1 (STAC)'. The results are sorted by relevance and show 15,452 items. The first five results are visible, each with a thumbnail image and a 'JSON Link' button. The results are:
  - LC80101172017007LGN00 (2019-06-07 admin)
  - LC80101172017023LGN00 (2019-06-07 admin)
  - LC80101172017039LGN00 (2019-06-07 admin)
  - LC80101172017055LGN00 (2019-06-07 admin)
  - LC80101172013332LGN00 (2017-06-07 admin)

At the bottom right of the results section, there are links for 'ATOM', 'CSW', 'JSON', 'CSV', 'KML', 'RSS', and 'WEB'.

<http://mart3612.esri.com/imagecatalog/#>

# Koop



Integrating Data from Any Source

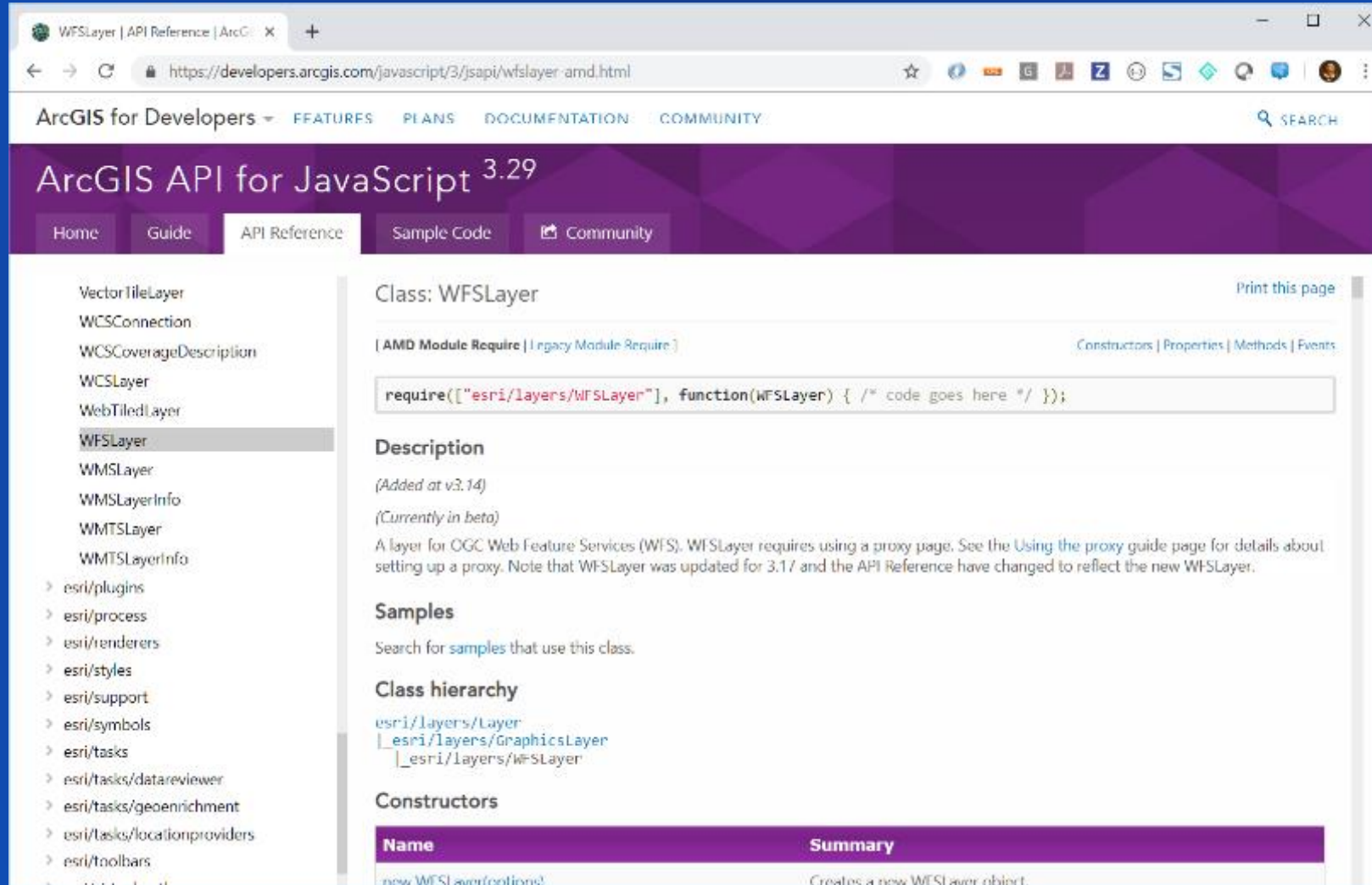




# JS API Interoperability



# JS API Interoperability 3.x



The screenshot shows the ArcGIS API for JavaScript 3.29 API Reference page for the `WFSLayer` class. The page is titled "Class: WFSLayer" and includes a navigation menu on the left with options like Home, Guide, API Reference, Sample Code, and Community. The main content area displays the class name, a code snippet for the AMD module require, a description, and a class hierarchy diagram.

Class: WFSLayer [Print this page](#)

[ AMD Module Require ] [ Legacy Module Require ] [Constructors](#) | [Properties](#) | [Methods](#) | [Events](#)

```
require(["esri/layers/WFSLayer"], function(WFSLayer) { /* code goes here */ });
```

### Description

(Added at v3.14)  
(Currently in beta)

A layer for OGC Web Feature Services (WFS), WFSLayer requires using a proxy page. See the [Using the proxy](#) guide page for details about setting up a proxy. Note that WFSLayer was updated for 3.17 and the API Reference have changed to reflect the new WFSLayer.

### Samples

Search for [samples](#) that use this class.

### Class hierarchy

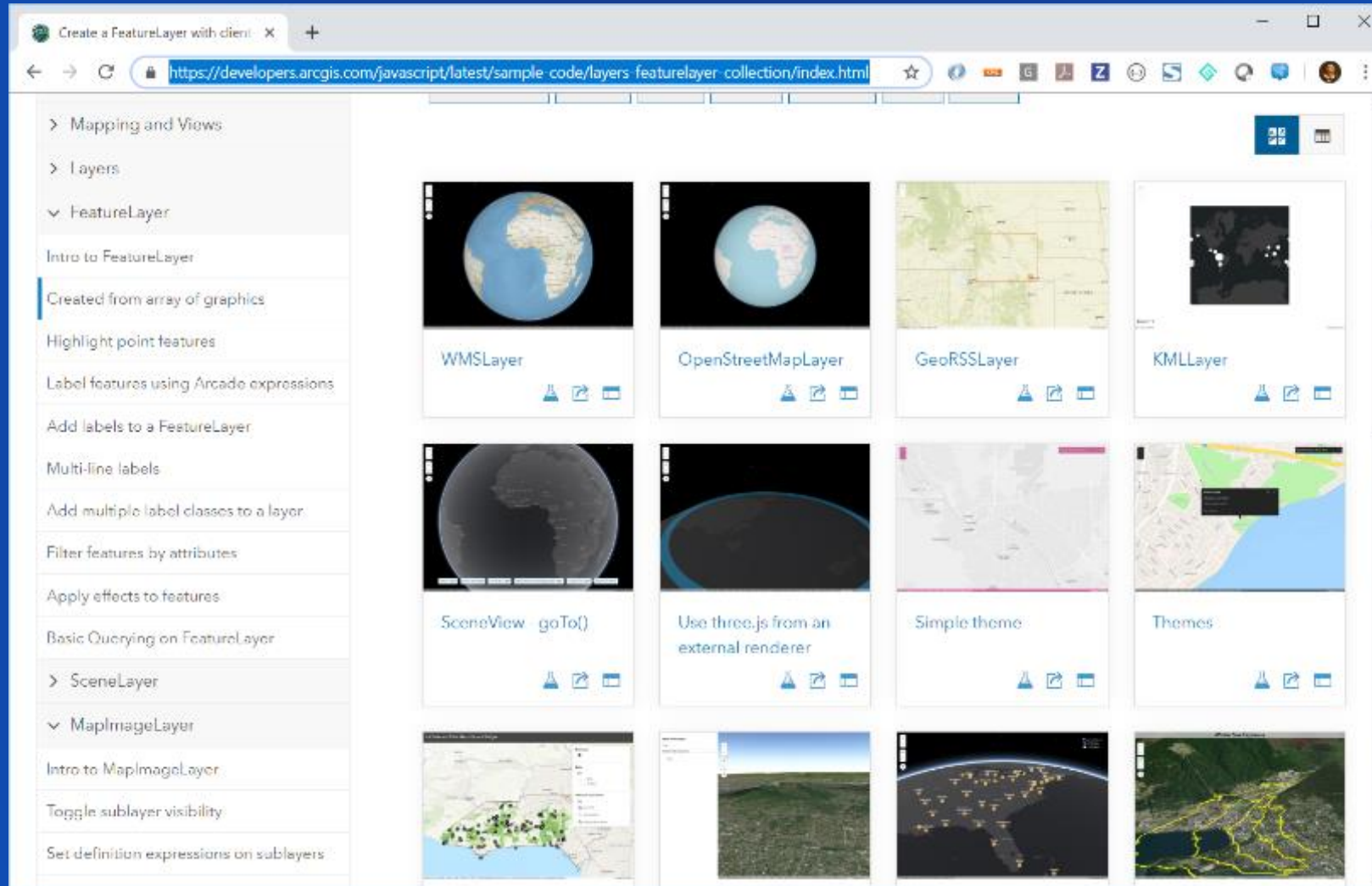
```
esri/layers/Layer
├─ esri/layers/GraphicsLayer
└─ esri/layers/WFSLayer
```

### Constructors

Name	Summary
<code>new WFSLayer(options)</code>	Creates a new WFSLayer object.

<https://developers.arcgis.com/javascript/3/jsapi/wfslayer-amd.html>

# JS API Interoperability 4.x



<https://developers.arcgis.com/javascript/latest/sample-code/layers-featurelayer-collection/index.html>



# Geospatially Enabled Systems

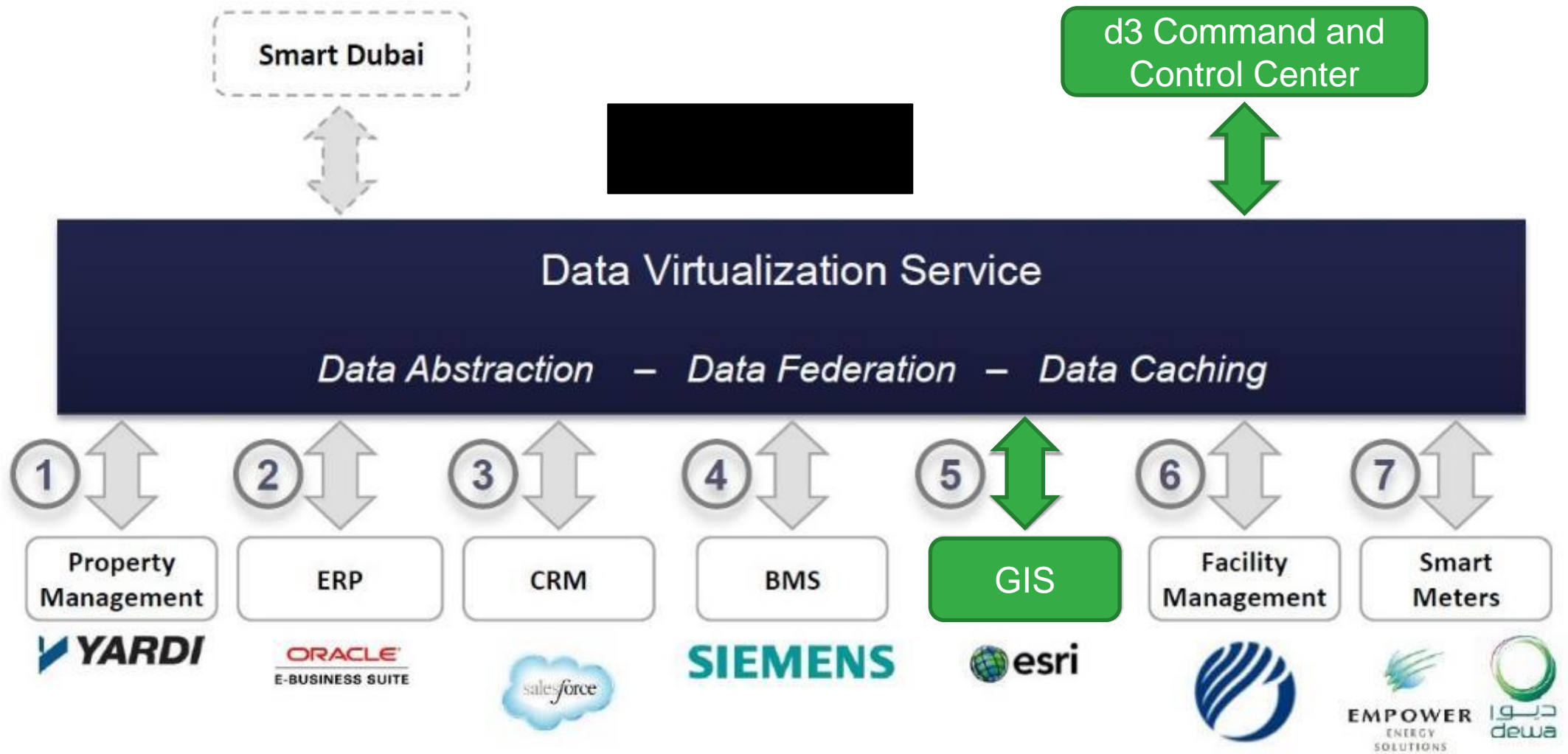




**Dubai Design District**

DUBAI  
DESIGN  
DISTRICT  
d3

# D3 Data Visualization Component



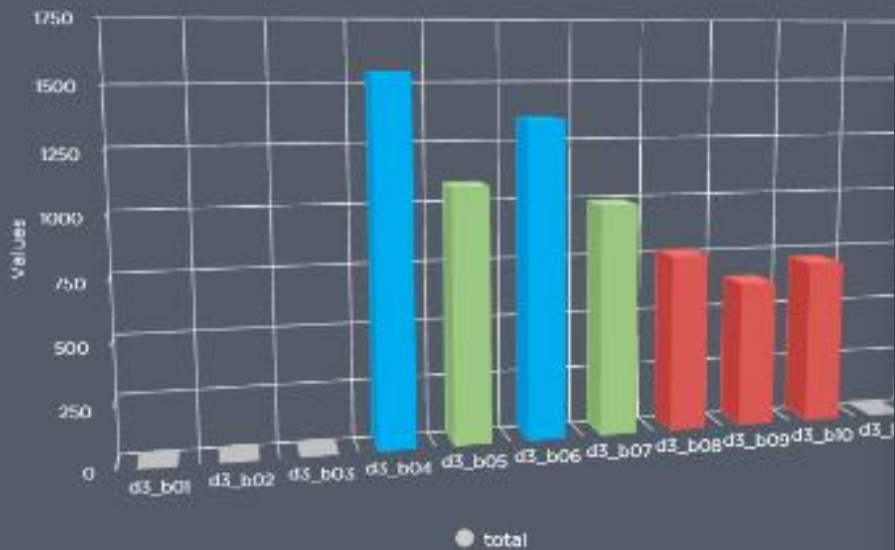
DISTRICT

STATUS TRENDS PERFORMANCE

Total	Open	Assigned	Unassigned
1,543	84	2	0
Suspended	Work Started	Completed SLA	Completed
82	0	264	1,158

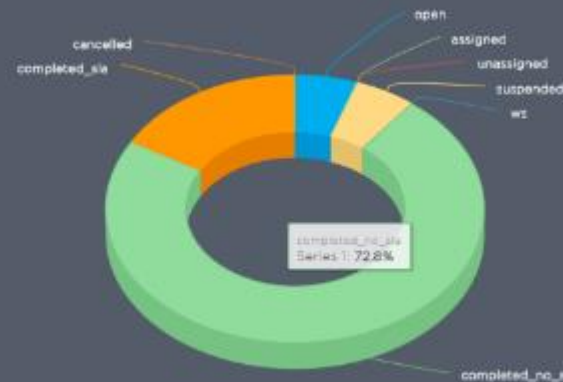
Work Orders by Building

Visualize

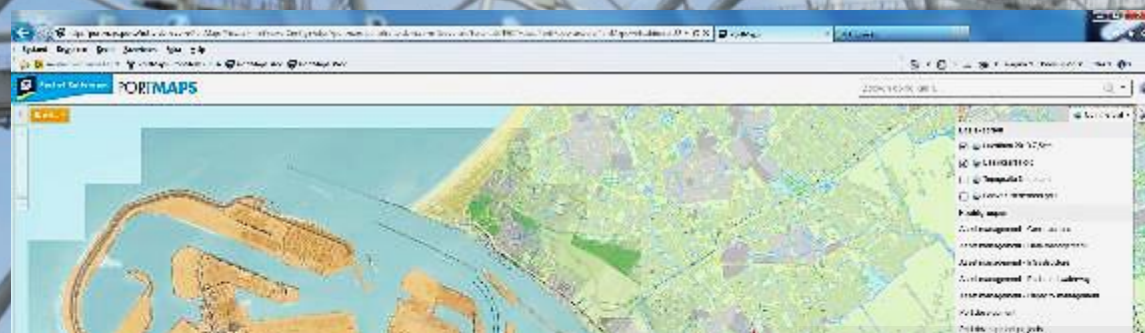


- OPS
- ENERGY
- TENANT

Work Orders by Status



# Port of Rotterdam



Asset Management

Modalities

Maritime

Geodesign

3D Port

Harbor Master

