

REST Service Inventory Project: Best Practices & Lessons Learned

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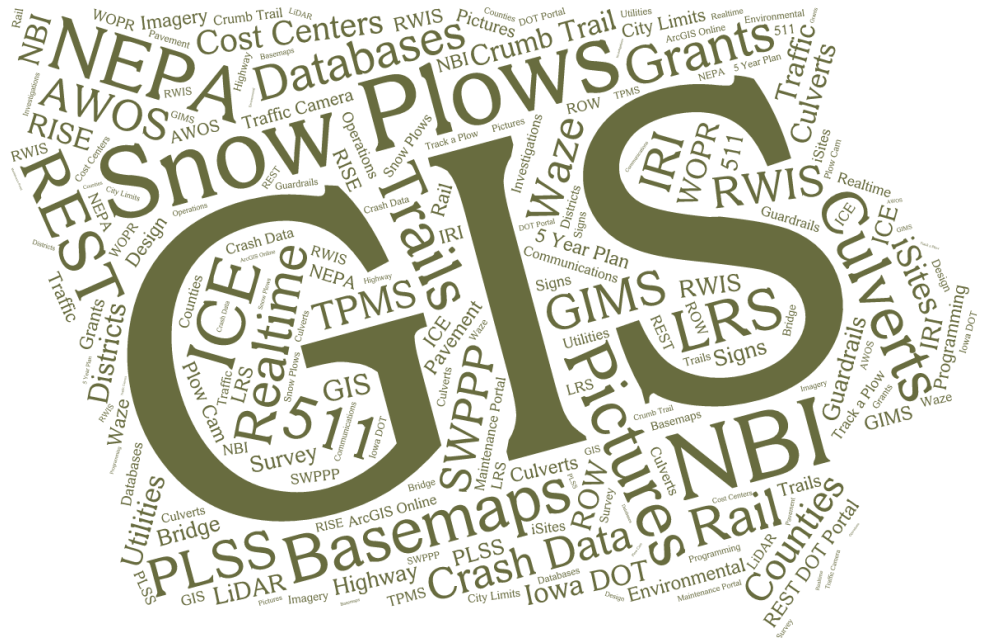
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The Problem:

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- Ineffective change management plan
- REST services were slow and unresponsive

Existing REST Services

- 256 REST services
- 1052 Data Layers

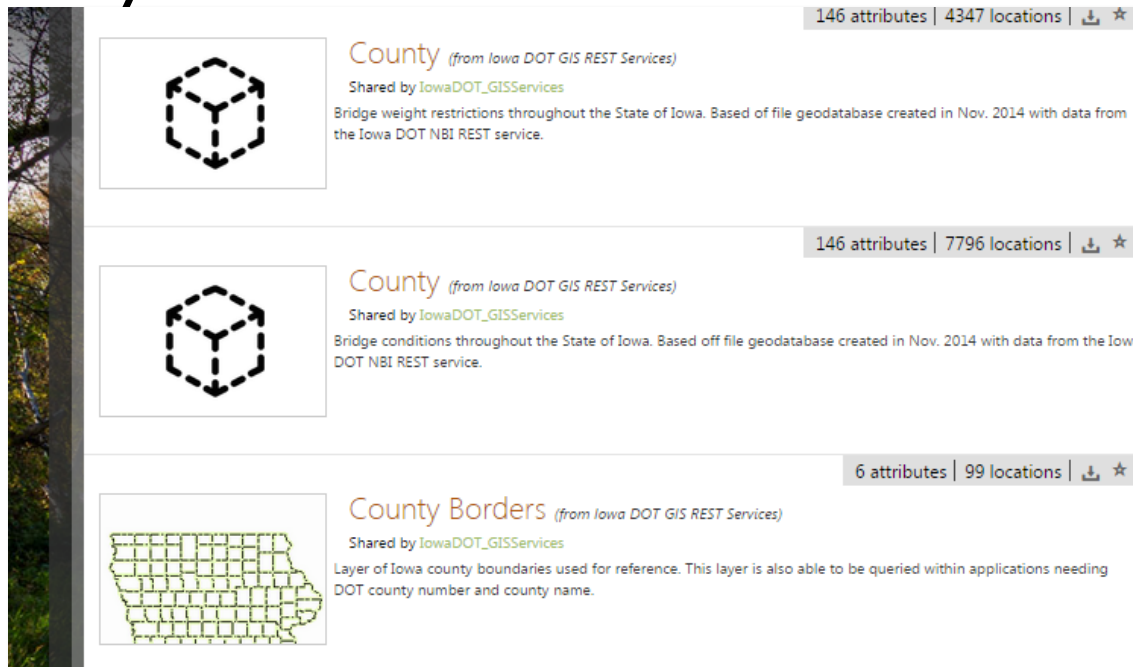


Open Data Conundrum

The screenshot shows the Iowa DOT Open Data Map Portal. At the top, it says "OPEN DATA MAP PORTAL" and "MANAGING IOWA'S TRANSPORTATION INFRASTRUCTURE" next to the "IOWA DOT" logo. A navigation bar includes a "DATA HOME" button and a search bar labeled "Search for open data". Below the search bar is a section titled "EXPLORE OPEN DATA" with a grid of nine categories: OPERATIONS, CRASH, BOUNDARY AND REFERENCE, CLASSIFICATIONS, IMPROVEMENTS, INVENTORY, AVIATION, TRANSIT, and RAIL. To the right of this grid is an "INTERACTIVE MAP PORTAL" featuring a map of Iowa with location markers for Moline, Des Moines, and other cities. Below the map are buttons for "GEOSPATIAL HOME" and "IOWA DOT". At the bottom right, there is a license notice: "All data is licensed under a CC ATTRIBUTION-SHAREALIKE 2.0 GENERIC LICENSE. SEE IOWA DOT'S GIS DATA TERMS OF USE" and Creative Commons icons for Attribution (BY) and ShareAlike (SA).

Open Data Conundrum

- New Open Data Portal was initially setup with all public services and we noticed we had a lot of duplicate layers



The screenshot displays a list of data layers from an Open Data Portal. On the left, a vertical strip shows a photograph of trees. The main content area lists three 'County' layers and one 'County Borders' layer, each with a unique icon and descriptive text.

| Layer Name | Source | Attributes | Locations |
|----------------|---------------------------------|------------|-----------|
| County | from Iowa DOT GIS REST Services | 146 | 4347 |
| County | from Iowa DOT GIS REST Services | 146 | 7796 |
| County Borders | from Iowa DOT GIS REST Services | 6 | 99 |

County (from Iowa DOT GIS REST Services)
Shared by IowaDOT_GISServices
Bridge weight restrictions throughout the State of Iowa. Based of file geodatabase created in Nov. 2014 with data from the Iowa DOT NBI REST service.

County (from Iowa DOT GIS REST Services)
Shared by IowaDOT_GISServices
Bridge conditions throughout the State of Iowa. Based off file geodatabase created in Nov. 2014 with data from the Iowa DOT NBI REST service.

County Borders (from Iowa DOT GIS REST Services)
Shared by IowaDOT_GISServices
Layer of Iowa county boundaries used for reference. This layer is also able to be queried within applications needing DOT county number and county name.

Incomplete List of REST SMEs

- No one had a complete list of who owned the data or why the REST service was stood up



Incomplete List of REST SMEs

- No one had a complete list of who owned the data or why the REST service was stood up
- Missing/incomplete metadata



Unknown Internal Uses

- An effective Change Management Plan needs to have a complete list of which agency applications (web & desktop) consume which REST services



Unknown External Uses

- Impossible to know all external uses, but agency should have some knowledge of who is using services



Unresponsive/Slow Services

- Iowa DOT had a Database Centric, Software Neutral approach to geospatial data

Unresponsive/Slow Services

- Iowa DOT had a Database Centric, Software Neutral approach to geospatial data
- Oracle Spatial database tables were not effectively tuned/managed to provide level of responsiveness needed

Inventory Process

Interviews

In-person with
REST & Data SME's

Will provide pre-
interview list of
questions for
preparation

Survey Monkey For
External
Customers

- Ran Python scripts against ArcServer to get basic information about all the REST services
- Conducted over 30 interviews in 40 days
- Setup Survey Monkey, promoted it via Iowa Geographic Information Council (IGIC) list serve

Inventory Process

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Survey Monkey For
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Customers

- Description of Service
- What software uses it? (Esri, Microstation, Geomedia, Web App, VB, etc.)
- What office(s) use the REST service?
- What is the future of the REST service?
- How often is REST service updated, if any?
- Is the REST service a one-off or an offshoot of another service?
- Data source (Oracle vs. FGDB)
 - What's the authoritative data source?
- If more than one REST service exists, which one is authoritative?
- If multiple layers within MXD, explain reasoning.

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Compile Data

Create database
of compiled data

Create/Update
continuity
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Recipe for Success

Develop a 'Recipe
for Success' for
each service to
improve
performance and
stability



- **Improve performance & stability**
- **What we'll look at:**
 - **Data source**
 - **MXD structure**
 - **Symbology**
 - **Attribute setup**
 - **Service settings**
 - **Adherence to REST Publishing Guidelines**
 - **Architecture changes if needed**

Inventory Process

Interviews In-person with REST & Data SME's
Will provide pre-interview list of questions for preparation

Survey Monkey For External Customers

Compile Data Create database of compiled data
Create/Update continuity documentation

Recipe for Success Develop a 'Recipe for Success' for each service to improve performance and stability

Change Plan Develop master plan to make fundamental changes to REST service structure as needed

Deliverables for Project

- **Database of all REST endpoints provided by Iowa DOT**
 - **Public/Secured REST Services**
 - **Public ArcGIS Online feature services & feature collections**
- **Completed metadata and continuity documentation**
- **Confirmed 'Authoritative' data sources and services**
- **Unique 'Recipe for Success' for each REST service and AGOL feature server/feature collection**

Best Practices

- If part of Esri's Enterprise Advantage Program (EAP), use credits for an 'ArcServer Health Check'
- Avoid multiple-layered symbology
- If possible, different data types in a single REST service
- Tune database tables to optimize speed and performance
- Yes, FGDB are faster, but you can't use them for Feature Services
- Use Materialized Views if suitable

Best Practices

- **When new REST services are requested, have a mini kick-off meeting with data and REST SME to discuss purpose and need for new service**
- **Keep a database or list of REST services with key information**
- **Keep your metadata up to date**
- **Establish REST service publishing guidelines for your REST service publishers**
- **Enforce those guidelines!**
- **Use some type of REST publishing tracking software**

Best Practices for AGOL

- **Look at using feature collections vs. feature services**
- **Disable editing when possible especially for linear data**
- **Don't use filtering**

Final Outcome of Inventory

- We stood up new ArcServer architecture. We have 2 sites: Public vs. Secured.
 - Public has 2 clusters (standard availability vs. high availability) with 2 servers each
 - Secured has 1 cluster with 2 servers
- We stood up new Oracle instance and allowed SDE to control the entire structure
- Use ST geometry vs. SDO geometry
- We were able to eliminate over 100 services
- As of today, we've stood up 192 services of which 86 new services (mainly feature services)
- Iowa DOT's Open Data Portal fully functional

Data Transfer Process

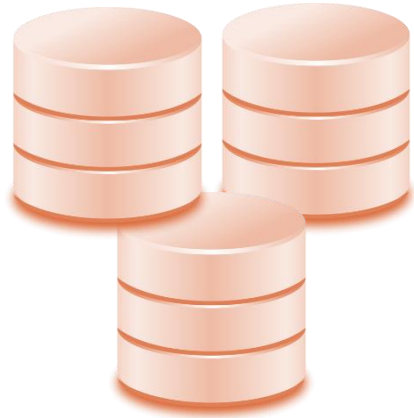
**REST SERVICE
SCHEMA**



**EDITABLE
SCHEMA**



**AUTHORITATIVE
DATABASE
(ORACLE & SQL)**



Track Publishing Status

The screenshot displays a Trello board for tracking the publishing status of REST services. The board is organized into several columns, each representing a different project or task area. Each card within a column lists a specific task, its progress (indicated by a green checkmark and a fraction), and its due date. The tasks are consistent across columns, such as 'REST Service SME', 'Data SME', 'Public Access? Locked down by AD Group?', 'Data Update Frequency', 'REST Service Update Frequency', 'REST Service Purpose', 'FGDB Requirements for TGIS', 'MXD Requirements For Publishing to DEV', 'PGIS Database Setup & FME Job Setup', 'MXD Requirements for Publishing to Production', and 'REST Service Catalog/Database Updated'. The board interface includes a search bar, a 'Boards' tab, and a 'Team Visible' indicator.

| Column | Task | Progress | Due Date |
|---|---|----------|----------|
| REST Publishing to DEFCON Template | REST Service SME | 1/1 | 0/1 |
| | Data SME | 1/1 | 0/1 |
| | Public Access? Locked down by AD Group? | 1/1 | 0/1 |
| | Data Update Frequency | 1/1 | 0/1 |
| | REST Service Update Frequency | 1/1 | 0/1 |
| | REST Service Purpose | 1/1 | 0/1 |
| | FGDB Requirements for TGIS | 1/1 | 0/28 |
| | MXD Requirements For Publishing to DEV | 1/1 | 0/28 |
| | PGIS Database Setup & FME Job Setup | 1/1 | 0/3 |
| | MXD Requirements for Publishing to Production | 1/1 | 0/21 |
| REST Service Catalog/Database Updated | 1/1 | 0/21 | |
| Adopt-a-Highway (AAH) REST Service | REST Service SME | 1/1 | 0/1 |
| | Data SME | 1/1 | 0/1 |
| | Public Access? Locked down by AD Group? | 1/1 | 0/1 |
| | Data Update Frequency | 1/1 | 0/1 |
| | REST Service Update Frequency | 1/1 | 0/1 |
| | REST Service Purpose | 1/1 | 0/1 |
| | FGDB Requirements for TGIS | 1/1 | 0/28 |
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| | MXD Requirements for Publishing to Production | 1/1 | 0/21 |
| REST Service Catalog/Database Updated | 1/1 | 0/21 | |
| 5-Year Plan | REST Service SME | 1/1 | 0/1 |
| | Data SME | 1/1 | 0/1 |
| | Public Access? Locked down by AD Group? | 1/1 | 0/1 |
| | Data Update Frequency | 1/1 | 0/1 |
| | REST Service Update Frequency | 1/1 | 0/1 |
| | REST Service Purpose | 1/1 | 0/1 |
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| REST Service Catalog/Database Updated | 1/1 | 0/21 | |
| Transit System Map | REST Service SME | 1/1 | 0/1 |
| | Data SME | 1/1 | 0/1 |
| | Public Access? Locked down by AD Group? | 1/1 | 0/1 |
| | Data Update Frequency | 1/1 | 0/1 |
| | REST Service Update Frequency | 1/1 | 0/1 |
| | REST Service Purpose | 1/1 | 0/1 |
| | FGDB Requirements for TGIS | 1/1 | 0/28 |
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| | MXD Requirements for Publishing to Production | 1/1 | 0/21 |
| REST Service Catalog/Database Updated | 1/1 | 0/21 | |
| Pavement Management - PMIS and ROADWARE | REST Service SME | 1/1 | 0/1 |
| | Data SME | 1/1 | 0/1 |
| | Public Access? Locked down by AD Group? | 1/1 | 0/1 |
| | Data Update Frequency | 1/1 | 0/1 |
| | REST Service Update Frequency | 1/1 | 0/1 |
| | REST Service Purpose | 1/1 | 0/1 |
| | FGDB Requirements for TGIS | 1/1 | 0/28 |
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| | PGIS Database Setup & FME Job Setup | 1/1 | 0/3 |
| | MXD Requirements for Publishing to Production | 1/1 | 0/21 |
| REST Service Catalog/Database Updated | 1/1 | 0/21 | |
| Exevision REST Service Changes | REST Service SME | 1/1 | 0/1 |
| | Data SME | 1/1 | 0/1 |
| | Public Access? Locked down by AD Group? | 1/1 | 0/1 |
| | Data Update Frequency | 1/1 | 0/1 |
| | REST Service Update Frequency | 1/1 | 0/1 |
| | REST Service Purpose | 1/1 | 0/1 |
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Most REST services will be powered by PGIS. In order to set that standard, we are asking that Data SME's work with REST Service SME's to export their data from Oracle to a FGDB and set it up so that it meets the items listed below.

Requirements for FGDB - REST SME & Data SME [Delete...](#)

0%

- Data Field Types are appropriate
- Human-Readable Field Aliases
- Domain Values are used (if applicable)
- Domain Field Types should only be Long Integer or Text Field Types
- Domains are used more than once where applicable
- Code Values and Description Values were not just duplicated
- Subtypes are used where applicable
- X,Y,Z Resolution set to 0.000005
- All feature classes have 'Z' enabled (elevation) whether there's elevation data to be entered or not
- Polyline geometry type feature classes have 'M' (direction) enabled
- No joins or related tables will be allowed to be published. All feature classes/tables should be flattened out in FGDB
- SHAPE.AREA field has alias of: "Area (SqM)"
- SHAPE.LENGTH field has alias of: "Length (Meter)" for lines. For polygons, set the alias to: "Perimeter (Meter)"
- All data is in LRS Lambert
- ISO 19139 Metadata Standard is Used
- Metadata Overview Section: 'Summary' filled out
- Metadata Overview Section: 'Description' filled out
- Metadata Overview Section: 'Credits' filled out
- Metadata Overview Section: 'Tags' filled out
- Metadata Overview Section: 'Use Limitations' filled out (if applicable)
- Metadata Resources Section: 'Points of Contact' filled out. Must only use Office ID, no individuals, email or phone numbers
- Metadata Resources Section: 'Maintenance' filled out listing update frequency for the data
- Metadata Resources Section: 'Fields' - A definition for each field must be filled out.
- Metadata cannot reference any internal database, database schema, database table/view, file path, etc.

 Members

 Labels

 Checklist

 Due Date

 Attachment

Actions

 Move

 Copy

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What's left

- **Finalize searchable database of REST services**
- **Stand up new Roads and Highways REST services**

Questions?

Mark McCart – mark.mccart@dot.iowa.gov

- **Check out the cool geospatial products Iowa Dot has:**
 - gis.iowadot.gov
 - public.iowadot.opendata.arcgis.com