ArcGIS Enterprise: Best Practices for Layers and Service Types

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Agenda

• Introduction and concepts
• Technical foundation
• GIS services - concepts
• GIS services - types
• Web maps & layers
• Summary

PLEASE NOTE

This is a nuanced and always evolving topic. Information presented in this session is current as of July 2019 and ArcGIS Enterprise 10.7.1. Technical details, available options, guidance, and best practices differ from version to version … important to stay current!
Introduction & Concepts

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Conceptual components

Users

ArcGIS Products

Example

Data

Storage

Functionality

Information Model

User Experience

Apps

Portal

GIS Servers

Data Stores

Storm Viewer App

Storm Map

Storm Services

Storm Dataset

010100
100100
110100
100100
000101
Initial considerations

- **Audience** - Where are they? What is their device? What is their ability?
- **Capabilities** - requisite functionality
- **Performance** - End user app / back office system
- **Scalability** - up or out
- **Reliability** - SLAs
- **Security** - Access to content, authorization to functionality, protecting back office
Examples

- Supporting a public facing, highly available, power outage app
- Supporting an internal facing, intermittently connected, field collection app
Approach

1. Focus on business
2. Start with the end (consumer), build bottom up (data)
3. Align/select technology accordingly
4. Adjust over time - be agile!
Technical Foundation

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Conceptual components

Users

User Experience
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Storm Viewer App
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Example

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Technical introduction

• Publication Clients
  - ArcGIS Pro = Modern Web GIS publishing client (*supports new capabilities, e.g. Vector Tiles*)
  - ArcMap = Traditional GIS publishing client

• Publication & Management Models
  - Hosted Services = ArcGIS-managed (*ArcGIS manages services & data, User via portal*)
  - Traditional Services = User-managed (*User manages data directly*)

• Data Stores
  - ArcGIS Data Store = Storage for ArcGIS-managed data (*supports relational, scenes, and observations*)
  - Registered Data Stores = Enterprise data sources used by reference (*and managed by user*)
    - File based like file geodatabases or in traditional RDBMS such as enterprise geodatabases based on Oracle, SQL Server, PostgreSQL, etc.
Key concepts

- Features vs. map images
- Tiles
- Caching
- Generalization
Features vs. map images

Map Images

- **Client**
  - Request
  - extent: {...}
  - imageSize: {...}
  - format: {...}
  - Response
  - Map Image (JPG, PNG)

- **Server**

- **Client-side rendering**
- Standard (small) payload size
- Limited client experience & interactivity

Features

- **Client**
  - Request
  - geometry: {...}
  - where: {...}
  - outFields: {...}
  - Response
  - Features (JSON)

- **Server**

- **Client-side rendering**
- Variable (small-to-large) payload size
- Rich client experience & interactivity
Tiles

• Tile Content
  - Raster
  - Vector

• Benefits
  - Parallelization (*client and/or server*)
  - Caching ...
Caching

Client

Browser Caching
(in-memory)

Server

- Pre-Create Cache
- Cache On-Demand

File Store
Blob Store
Generalization

- Types
  - Douglas-Peucker \((\text{Point Remove})\)
  - Quantization
  - More … \((\text{see help})\)

- Approaches
  - Pre-generalize features
  - Generalize on-demand

- Benefits include:
  - Performance \((\text{processing / bandwidth})\)
Types of GIS Services

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Types of services

- Map Services (Dynamic)
- Map Services (Tiled)
- Vector Tile Services
- Feature Services
- Image Services
- Scene Services
- Stream Services

- Geocode Services
- Version Management Services
- Geometry Services
- Geoprocessing Services
- Network Analyst Services
- Geodata Services
- Workflow Manager, Maritime, Schematics …
Map Service (Dynamic)

- Powers the Map Image Layer
- ArcGIS Enterprise only
- User managed data only (not hosted)
- Key Capabilities
  - Server-side rendering
  - Supports dynamic layers & rendering
  - Supports identify & query
  - Supports OGC standards* (WMS)
  - New at 10.7: support for shared instances
  - New at 10.7.1: support for dynamic feature binning with ArcGIS Pro 2.4

The failsafe option for complex, dynamic data … especially on constrained networks
Map Service (Tiled or Cached)

- Powers the Tiled Layer
- ArcGIS Online & ArcGIS Enterprise
- ArcGIS or User managed data
- Key Capabilities
  - Server-side rendering
  - Cached using tiles (pre-create or on-demand)
  - Supports taking data offline
  - Supports OGC standards* (WMTS)

Proven option for complex, static data with high performance needs
Vector Tile Service

- Powers the Tiled Layer 🍍
- ArcGIS Online & ArcGIS Enterprise
- ArcGIS managed data only
- Key Capabilities
  - Client-side rendering
  - Cached using tiles *(pre-create only)*
  - Pre-generalizes features, clips to tile
  - Visualization only, no identify or query
  - Supports taking data offline

*The new kid on the block … great alternative to tiled map services and, in some cases, feature services*
Vector Tile Service

Supports overzooming & indexed tiling scheme
Map Services & Vector Tile Services

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Feature Service

Client

Request

(geometry:{...}
where:{...}
outFields:{...} ...)

Response

Features (JSON)

query

Feature Service
Feature Service

- Powers the Feature Layer & Table
- ArcGIS Online & ArcGIS Enterprise
- ArcGIS or User managed
- Key Capabilities
  - Client-side rendering
  - Supports identify and query
  - Supports generalization (on-demand)
  - Supports editing
  - Supports taking data offline
  - Supports some OGC standards* (WFS)
  - **New at 10.6.1**: optimized geometry format (quantization)
  - **New at 10.7.1**: optimized transport format (pbf)

*Current standard for dynamic, operational layers & editing
Feature Services: Tiling & Quantization

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Feature Service

- **Massive** performance benefits realized by using **ArcGIS Enterprise 10.6.1+** along with **JS API 3.24+** and **JS API 4.7+**
  - Faster processing on the server
  - Significantly smaller payloads transferred over the network because of quantization generalization support
  - Faster rendering in particularly web clients
    (note: JS APIs pre-3.27 and pre-4.9 may require explicit opt-in to WebGL rendering)

- **ArcGIS Pro 2.2+** and the **Enterprise portal map viewer** (from 10.6.1+) makes use of this feature natively

- **Additional** performance improvements beginning at **10.7.1** for services published from **ArcGIS Pro** because of use of pbf transport format instead of JSON
Feature Service (server) vs. Feature Layer (client)

Web Map

Feature Layer (a type of Web Layer)

More or less the equivalent of a read-only feature layer

Does not support:
- Editing
- Offline Sync
Web Maps & Layers

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Overview of the geoinformation model

ArcGIS geoinformation model

Web Layers
Web Maps
Web Scenes

Imagery
Tabular
Vector
3D
Real-Time (IoT)
Big Data
Lidar
In practice

Operational (Web) Layers
- definitionExpression:
- renderer:
- popupInfo:

Basemap
- baseLayers:
- referenceLayers:
- initialExtent:

Map Properties
- background:
- bookmarks:
- version:
In practice

1. Get Information Product

2. Send request to GIS service & apply properties
In practice
In practice
In practice

- **Portal**
  - Active Wells
  - Proposed Wells
  - Wells by Status

- **GIS Server**
  - Wells

- **Data Store**
  - Wells
Smart Mapping - Beautiful Map-Making, Made Easy
Putting It All Together

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Example #1

Content: Imagery Basemap w/ Weather

Use Case: Web-based Visualization
Example #2

Content: Street Map w/ Utility Data
Use Case: Field mapping (offline)
Publication strategy

Driven by business & IT requirements
- Use case, and user “tolerance”
- Data type & update frequency
- Network bandwidth
- Client device
- Compute speed

Your options include …
- GIS service type selection
- Caching
- Generalization
- Making use of web map styling features

Performance matters now more than ever
Publication strategy

1. Focus on business

2. Start with the end (consumer), build bottom up (data)
   Understand users & use cases
   Gather requirements (business & IT)

3. Align/Select technology accordingly
   • Inventory data & architecture
   • Design data stores & access
   • Design GIS services
   • Design geoinformation model

4. Adjust over time - be agile!
   Monitor!
Key takeaways

- Good publication strategies ensure that appropriate content is delivered to consumers in a well performing, scalable, reliable, and secure manner.
- Take a “Business First” approach, focusing on the consumer.
- Leverage ArcGIS Pro as your primary publishing application.
- Focus and emphasis needs to be placed on the ArcGIS geoinformation model—web maps and layers provide often overlooked capabilities.
- Trends towards Feature and Vector Tile services offer new technical opportunities, but requires considering target client capabilities and server-side version.
- Publication is a nuanced and evolving topic that requires research and planning. Do your homework!
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