ArcGIS Enterprise: Best Practices for Layers and Service Types

Witt Mathot

Philip Heede

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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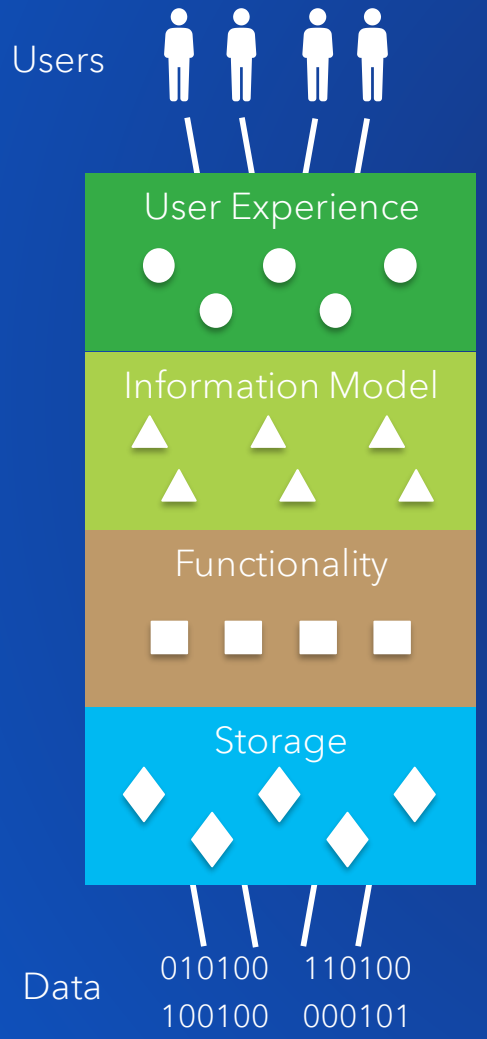
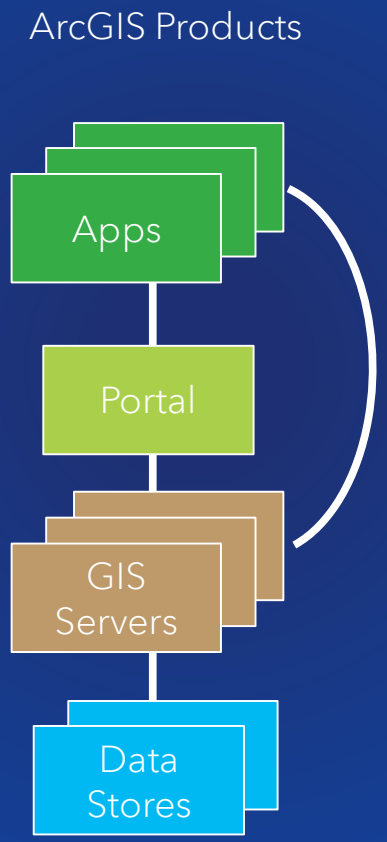
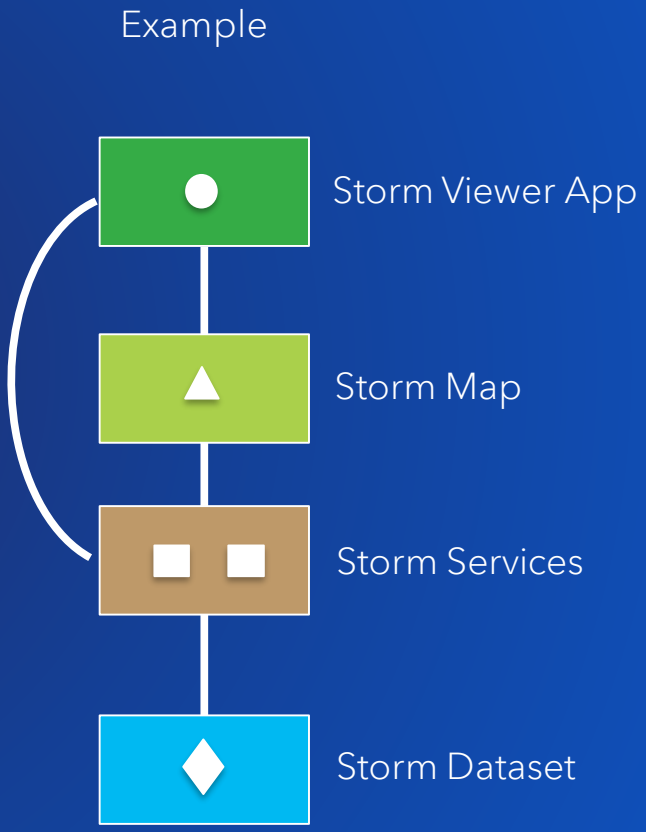
Conceptual components







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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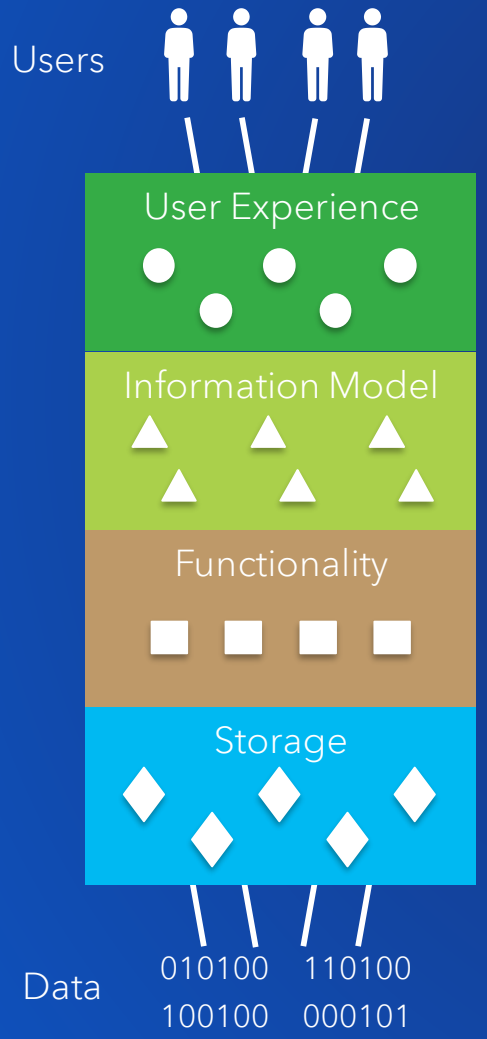
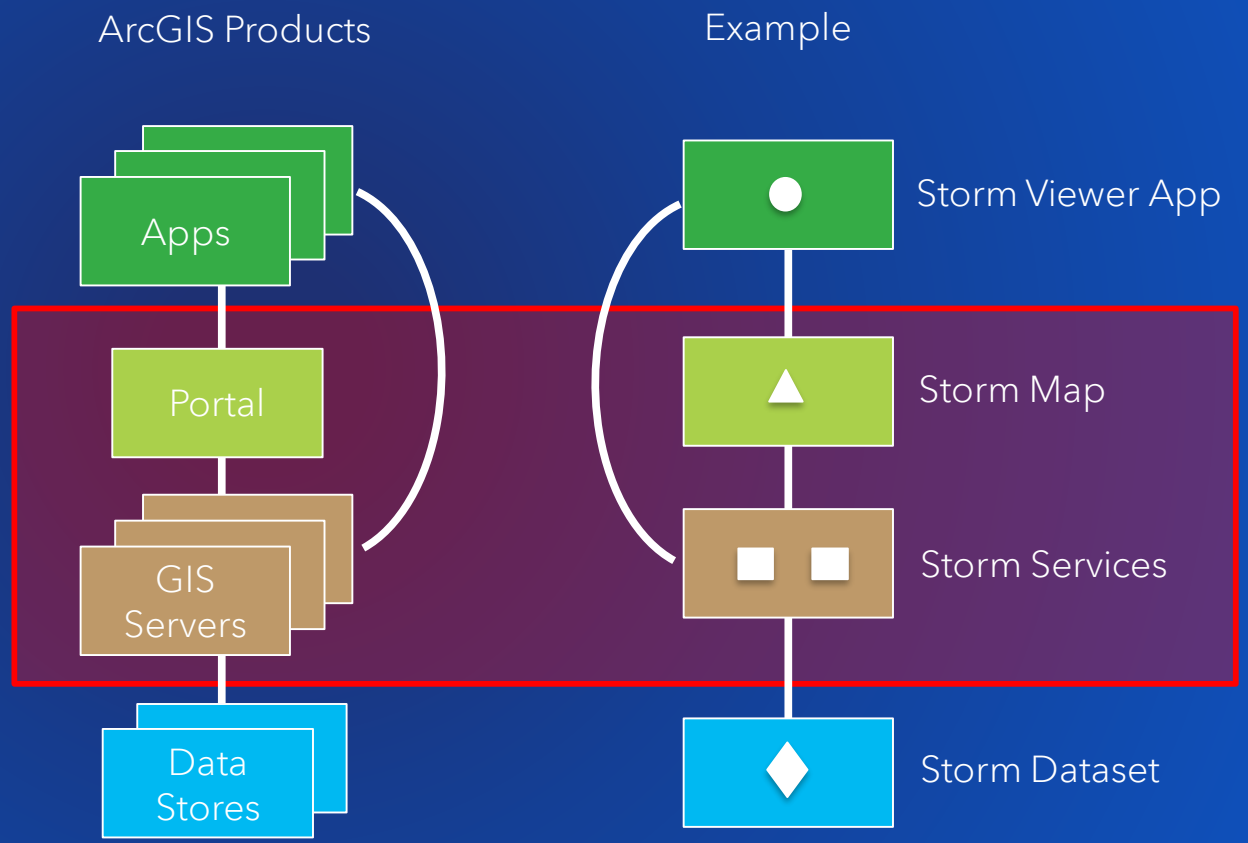
Conceptual components





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)*

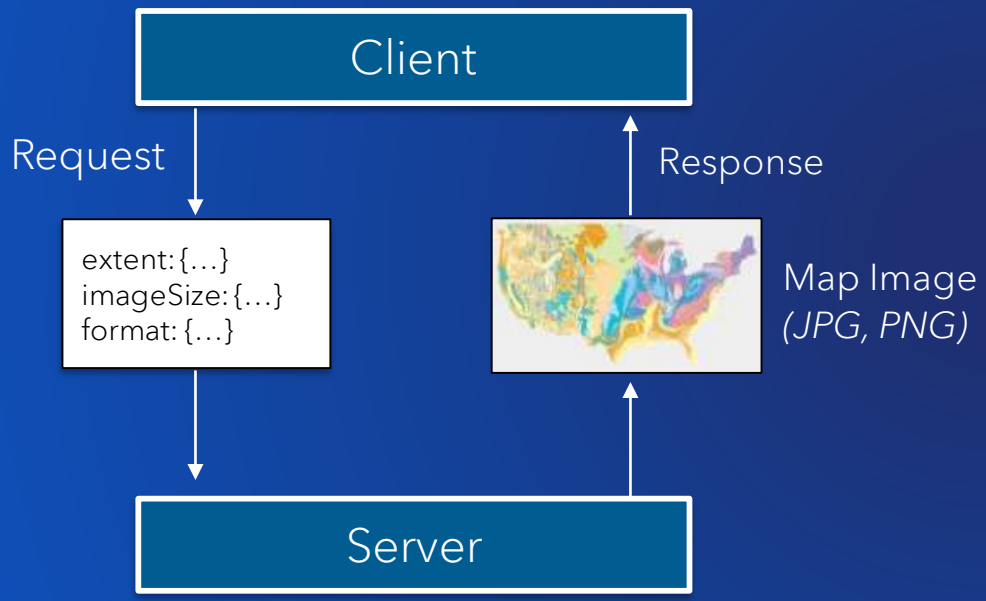
- Data Stores
  - ArcGIS Data Store = Storage for ArcGIS-managed data *(supports relational, scenes, and observations)*
  - Registered Data Stores = Enterprise data sources used by reference *(and managed by user)*
    - File based like file geodatabases or in traditional RDBMS such as enterprise geodatabases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

Key concepts

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

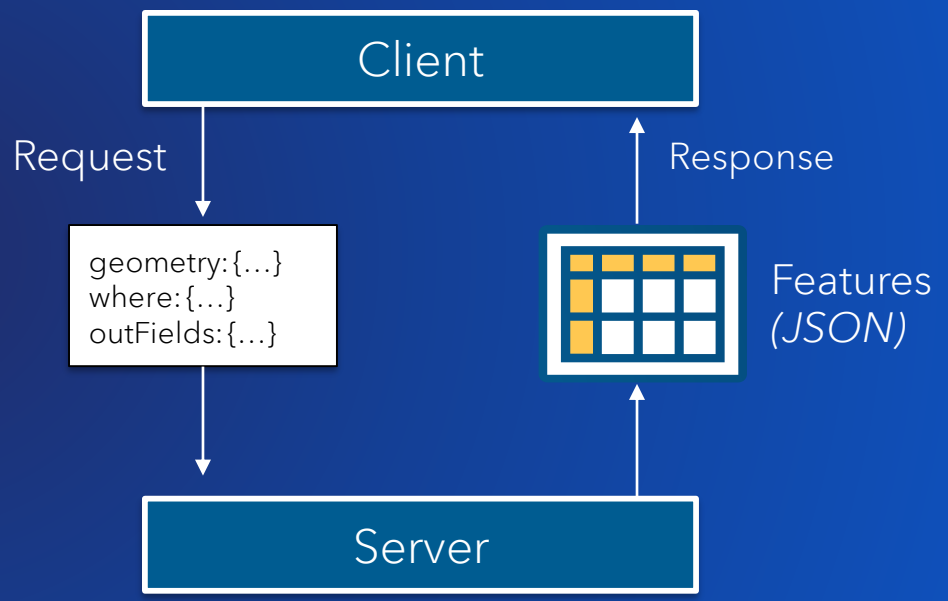
Features vs. map images

Map Images



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

Features



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

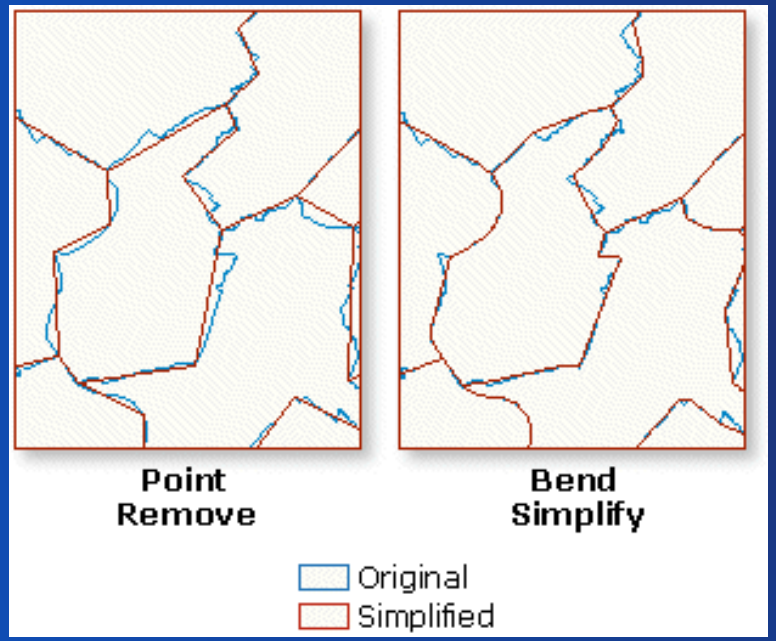
Tiles

- Tile Content
  - Raster
  - Vector
- Benefits
  - Parallelization *(client and/or server)*
  - Caching …

Caching

- Pre-Create Cache
- Cache On-Demand

Generalization



- Types
  - Douglas-Peucker *(Point Remove)*
  - Quantization
  - More … *(see help)*
- Approaches
  - Pre-generalize features
  - Generalize on-demand
- Benefits include:
  - Performance *(processing / bandwidth)*

Types of GIS Services

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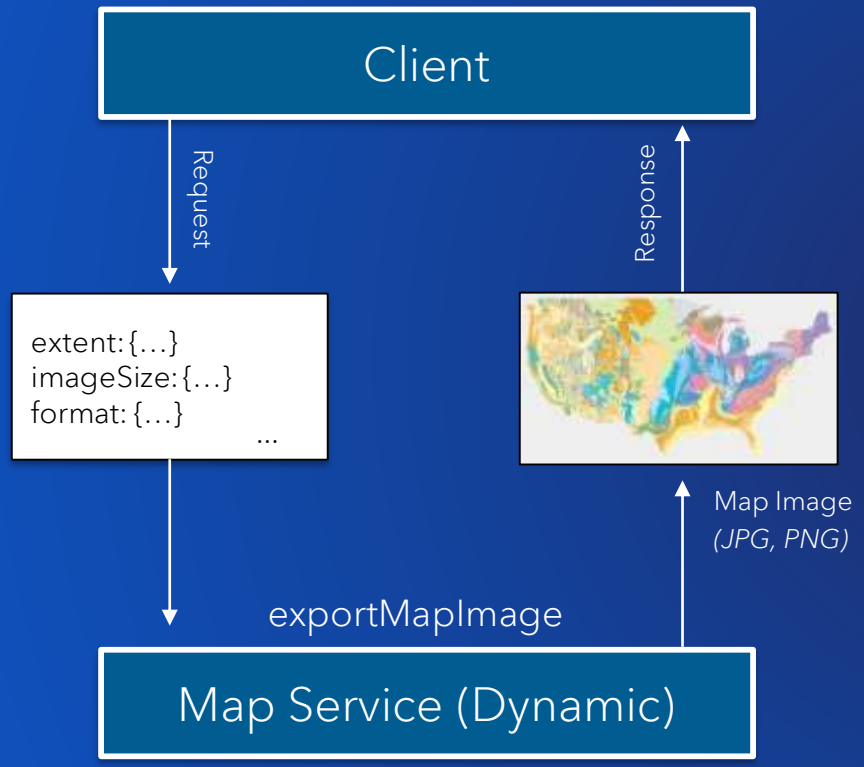
Types of services

- 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 …

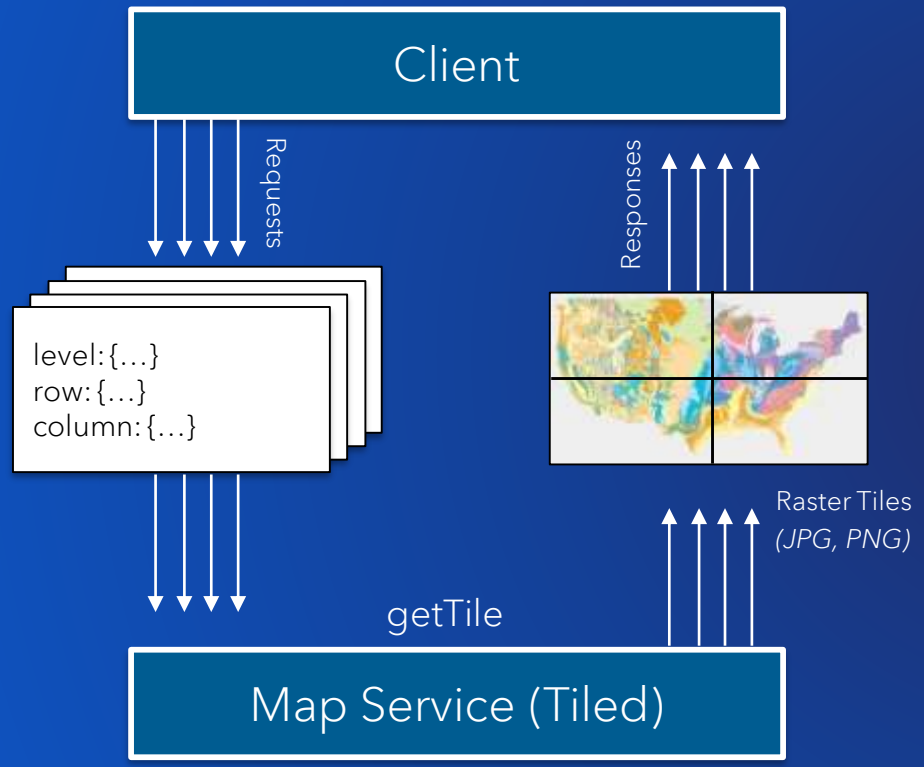
Map Service (Dynamic)



- 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

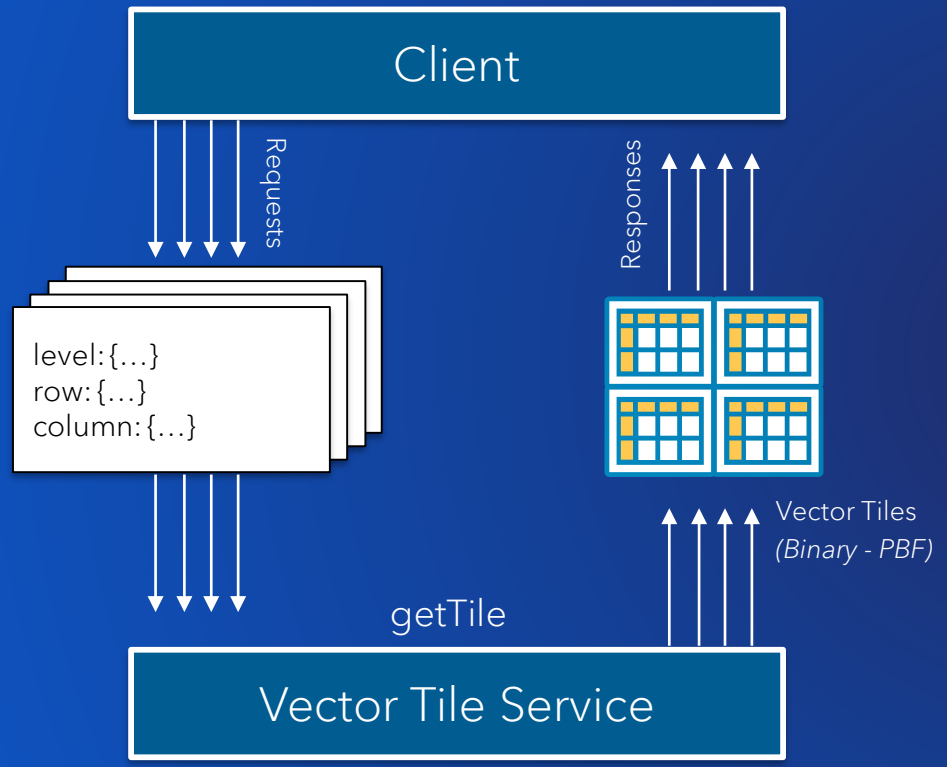
Map Service (Tiled or Cached)



- 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

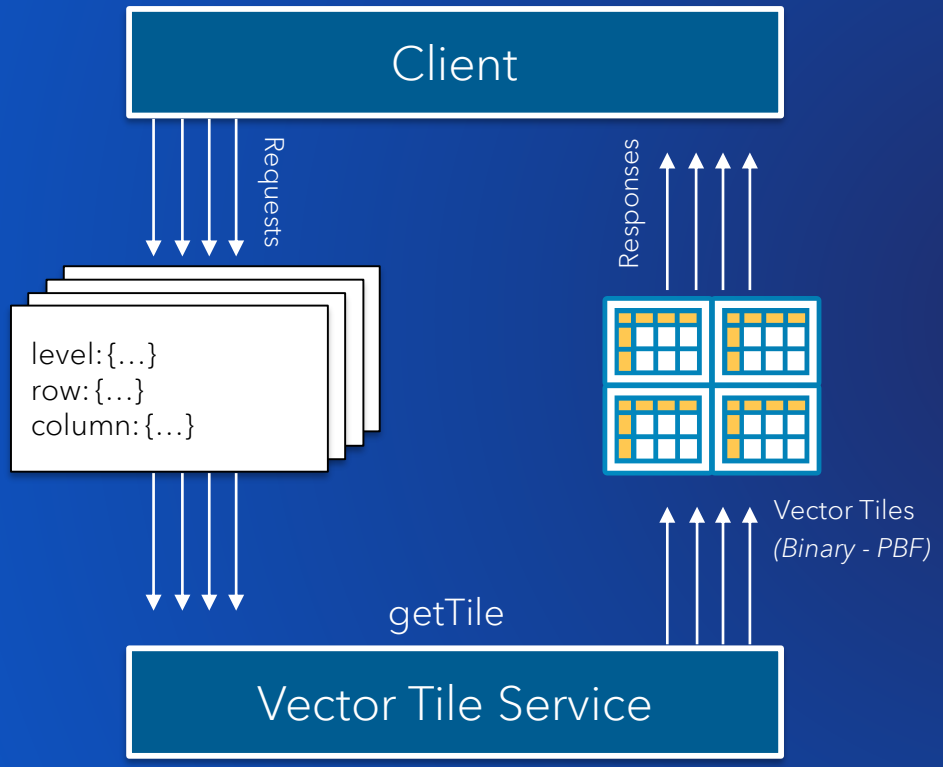
Vector Tile Service



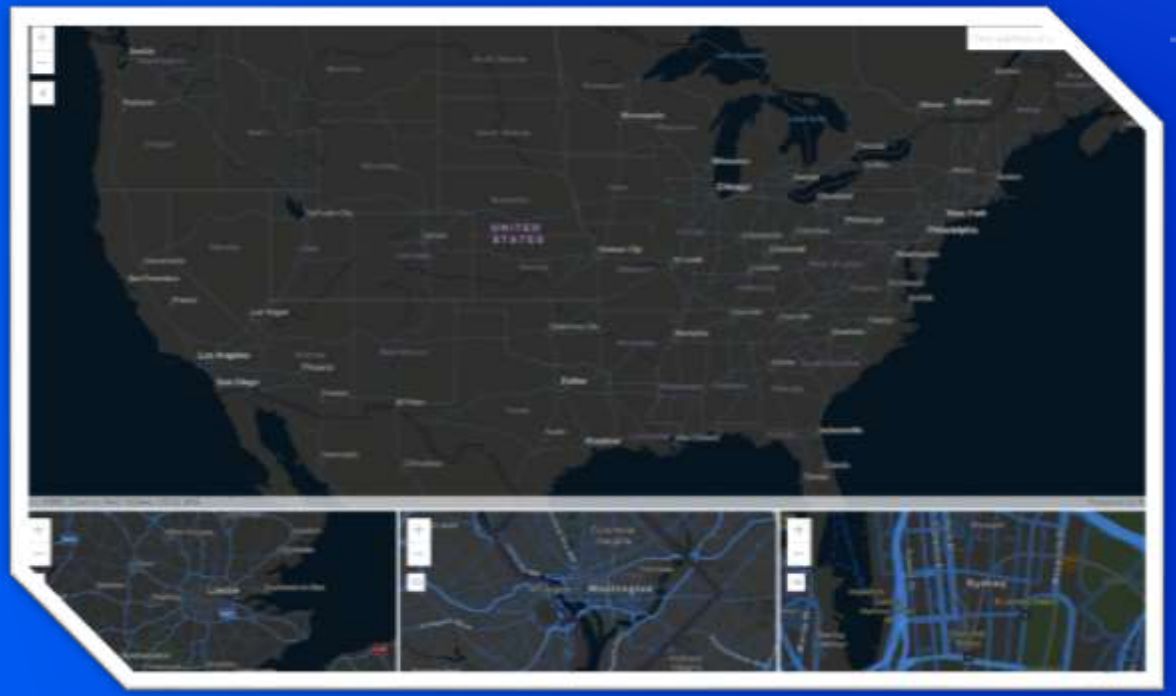
- Powers the Tiled Layer
- ArcGIS Online & ArcGIS Enterprise
- ArcGIS managed data only
- Key Capabilities
  - Client-side rendering
  - Cached using tiles *(pre-create only)*
  - Pre-generalizes features, clips to tile
  - Visualization only, no identify or query
  - Supports taking data offline

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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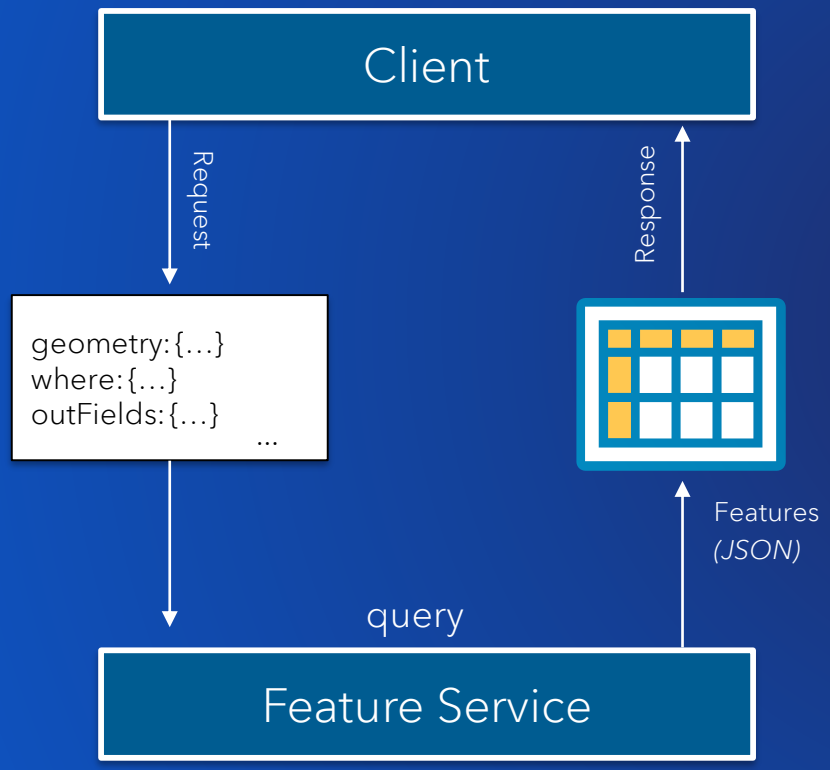
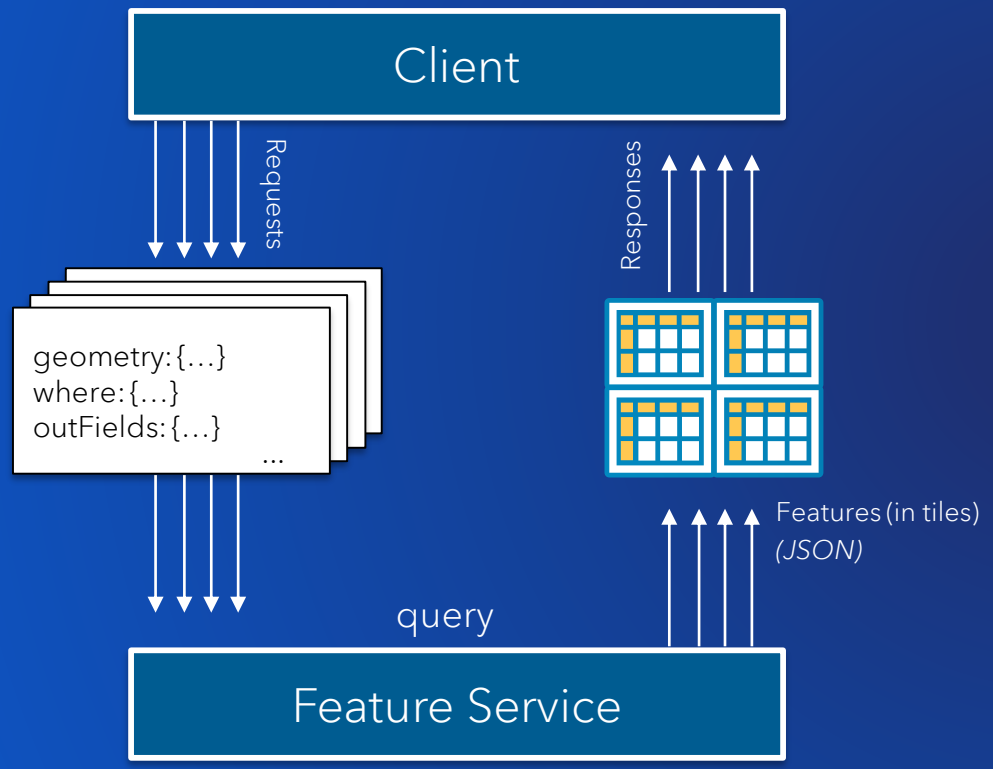
Feature Service

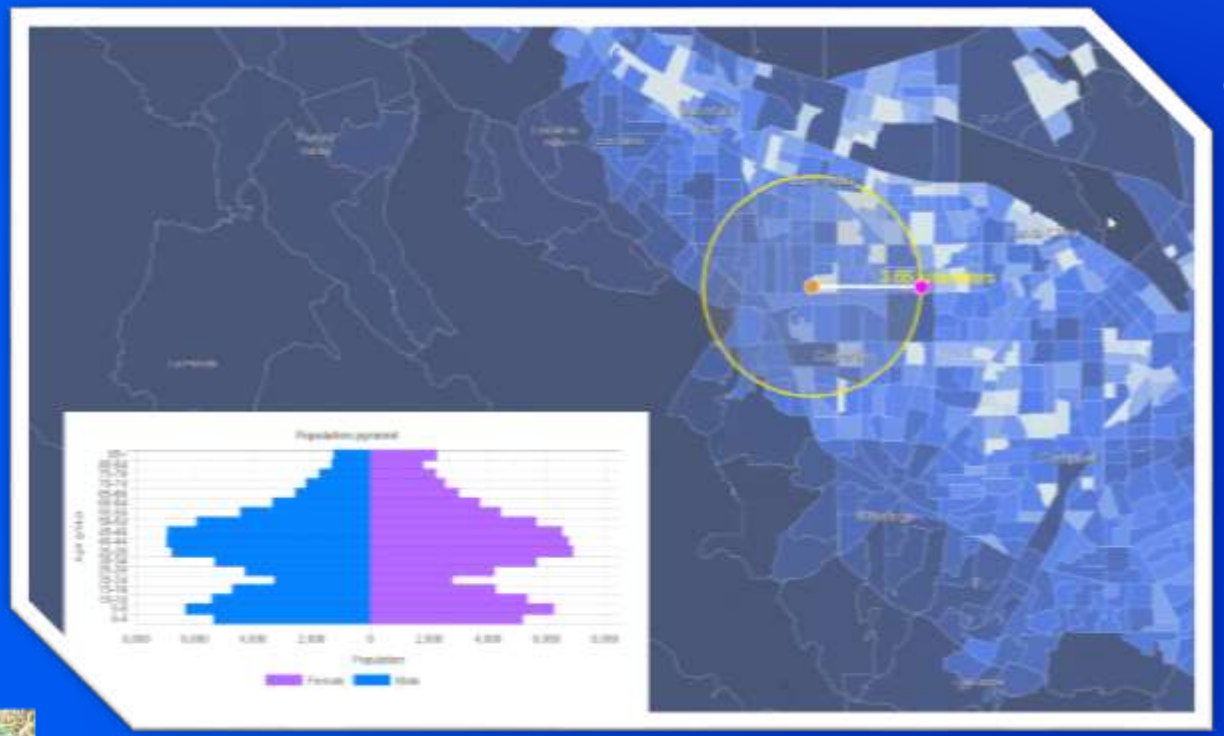


Feature Service



- 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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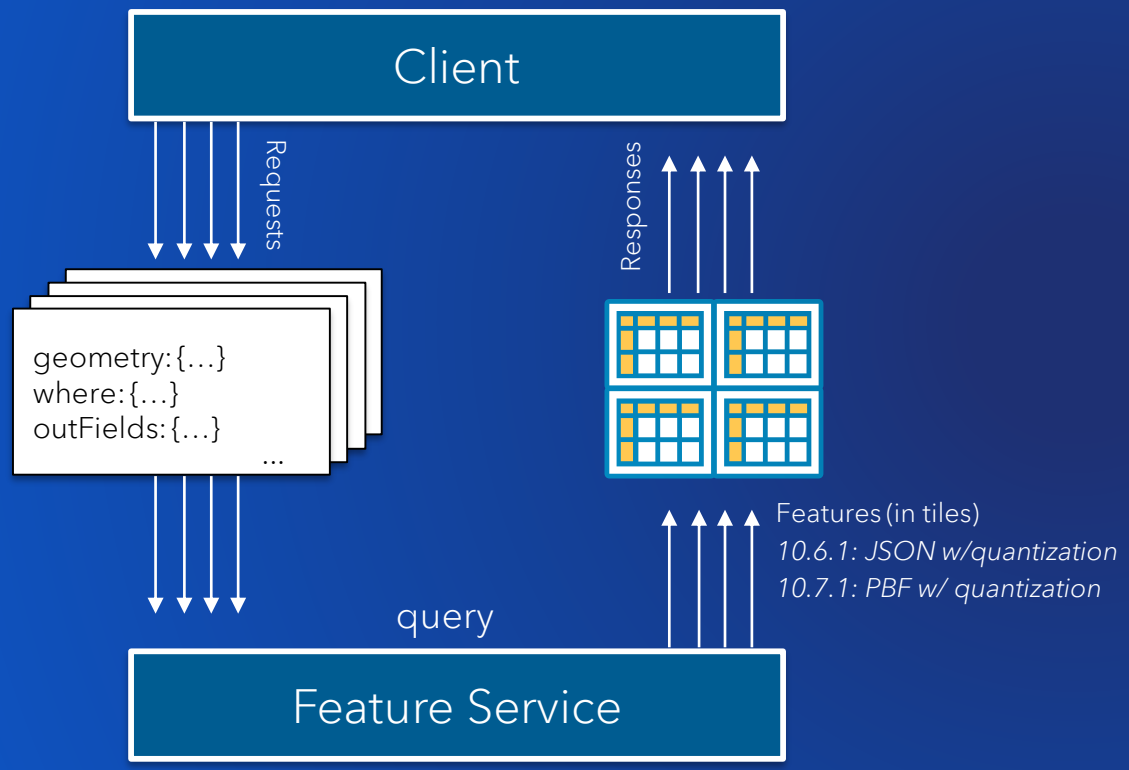
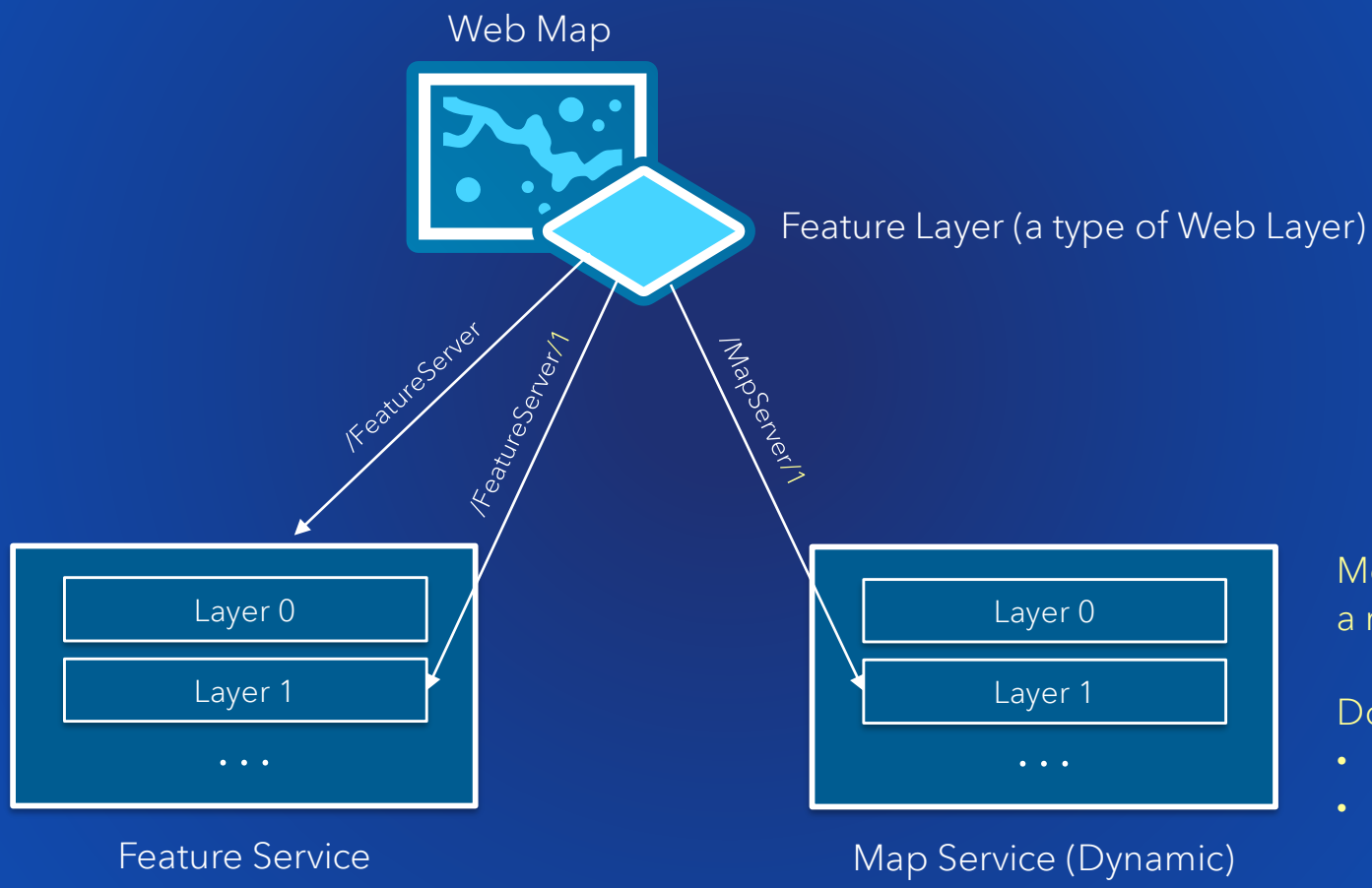
Feature Service



- *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)



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

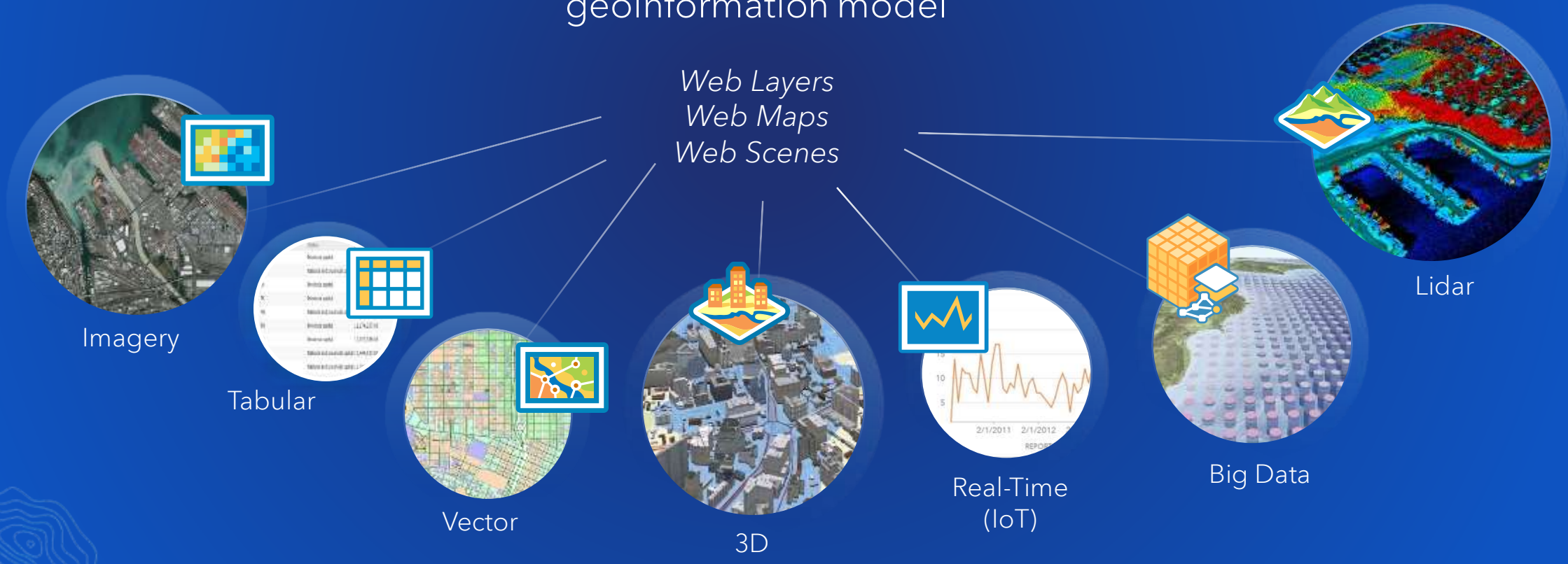
Does not support:

- *Editing*
- *Offline Sync*

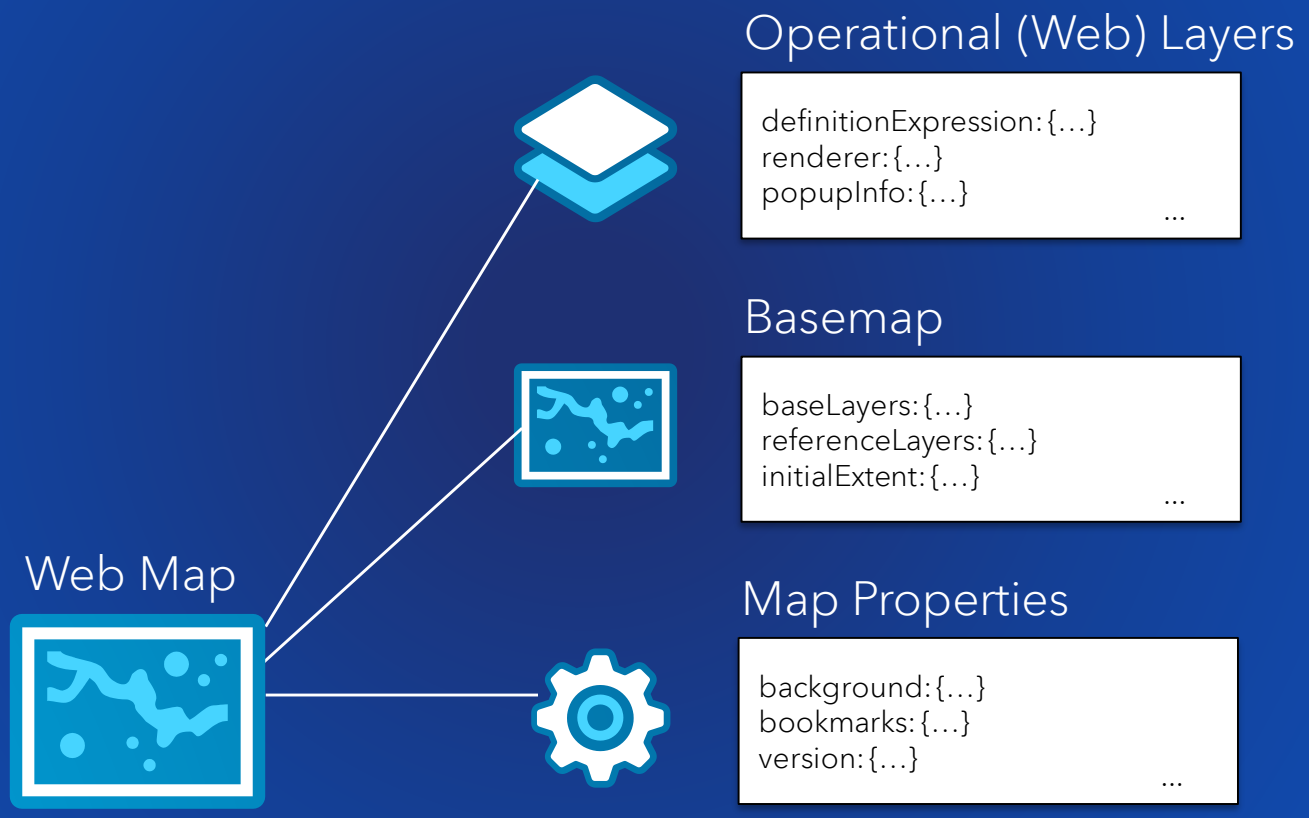
Web Maps & Layers

Philip Heede

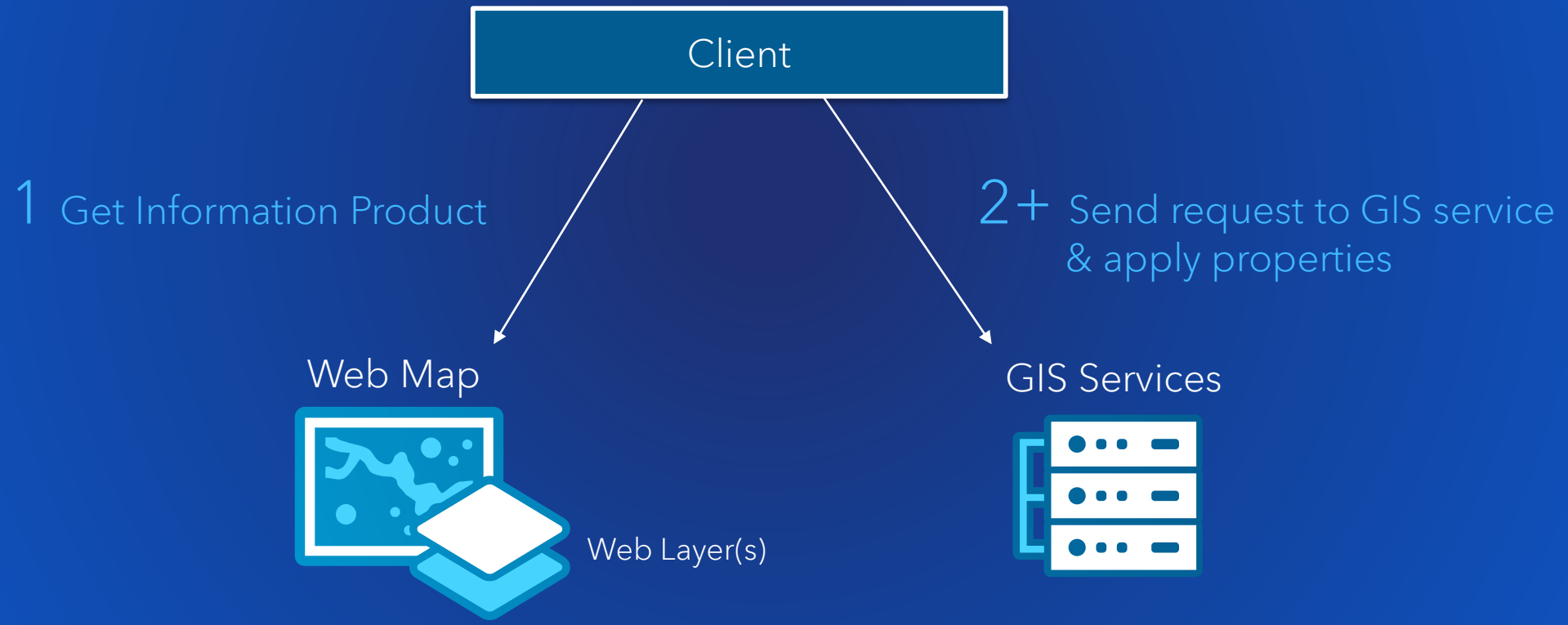
Overview of the geoinformation model



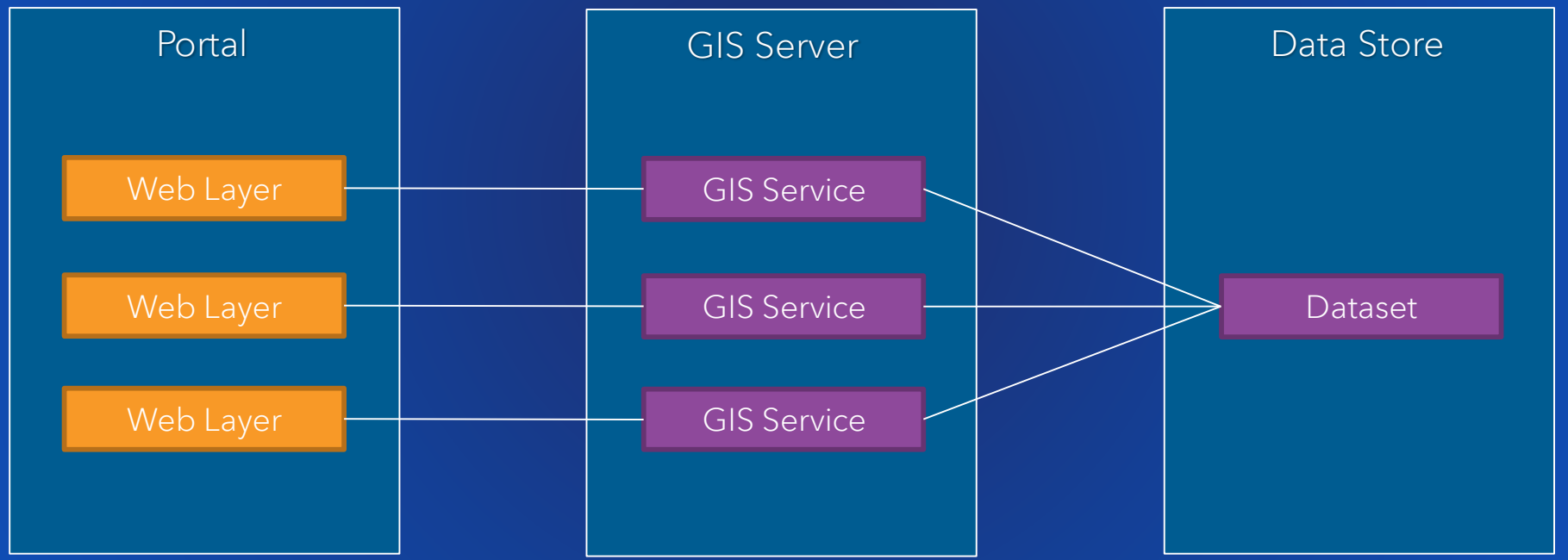
In practice


Operational (Web) Layers
definitionExpression: {…}
renderer: {…}
popupInfo: {…}
...
Basemap
baseLayers: {…}
referenceLayers: {…}
initialExtent: {…}
...
Web Map
Map Properties
background: {…}
bookmarks: {…}
version: {…}
...

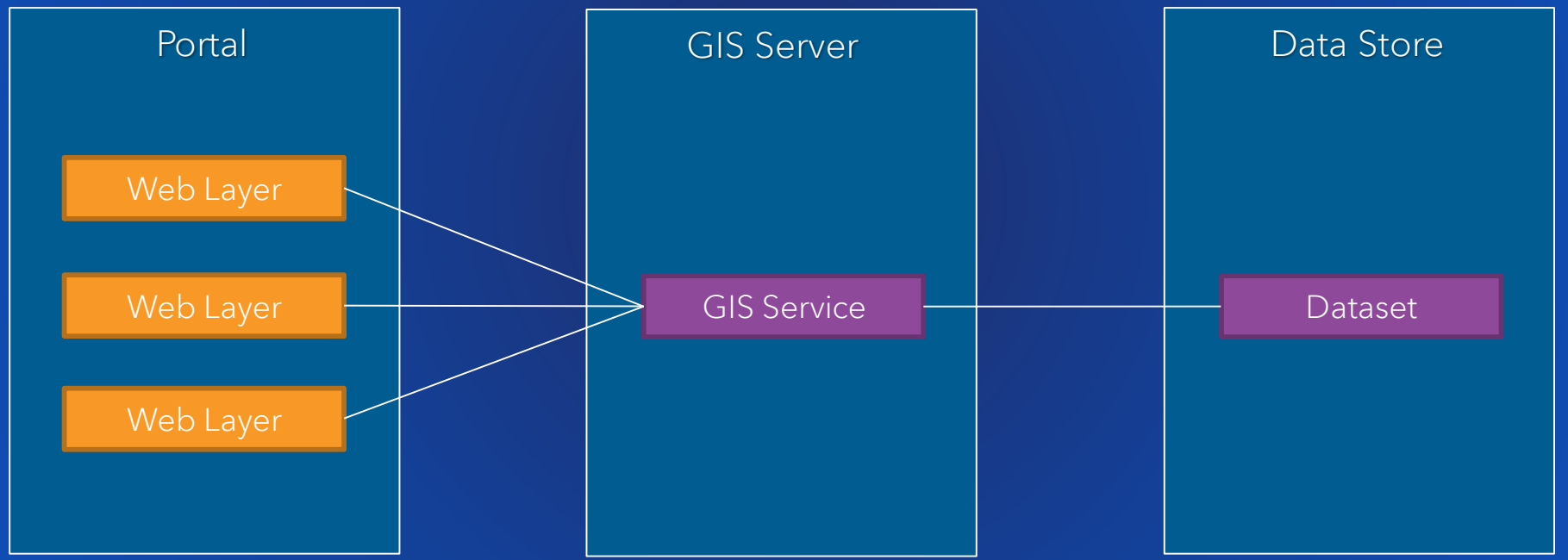
In practice


Client
1 Get Information Product
2+ Send request to GIS service & apply properties
Web Map
Web Layer(s)
GIS Services

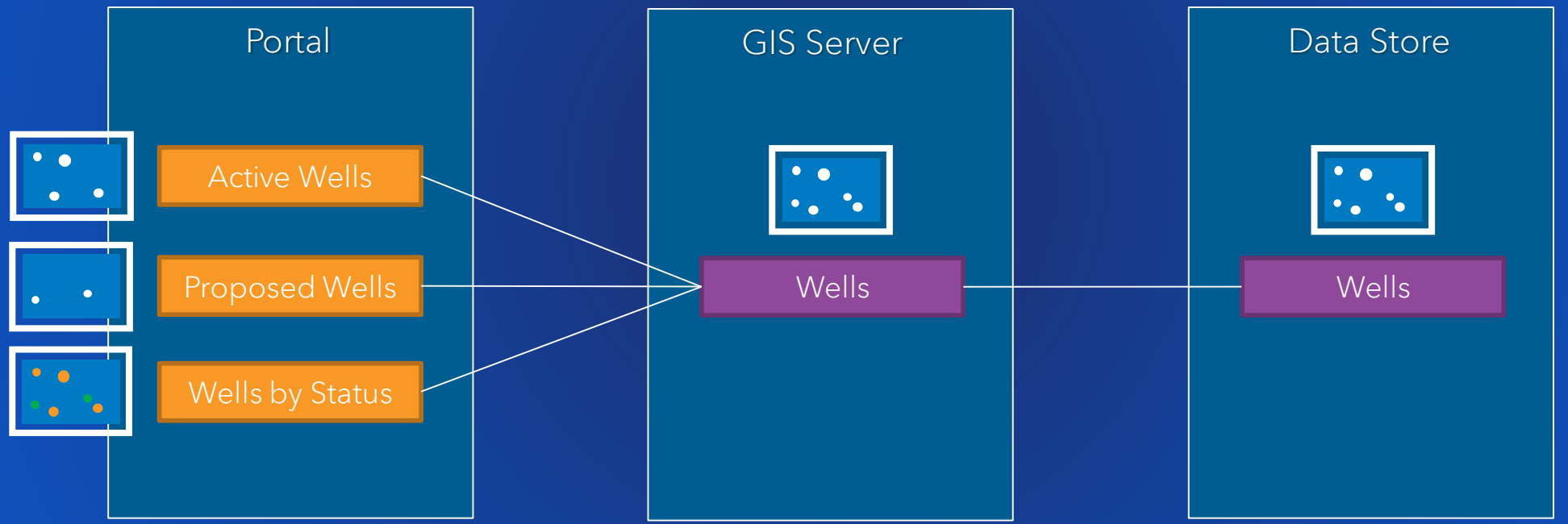
In practice


Portal
Web Layer
Web Layer
Web Layer
GIS Server
GIS Service
GIS Service
GIS Service
Data Store
Dataset

In practice


Portal
Web Layer
Web Layer
Web Layer
GIS Server
GIS Service
Data Store
Dataset

In practice


Portal
Active Wells
Proposed Wells
Wells by Status
GIS Server
Wells
Data Store
Wells

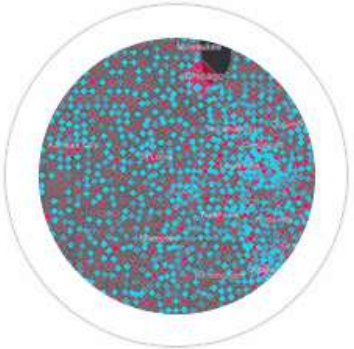
Smart Mapping – Beautiful Map-Making, Made Easy

Heat Map

Color Map

Size Map

Point Map


Color and Size Map

Time Map

Arcade Expression Map

Predominance Map

Putting It All Together

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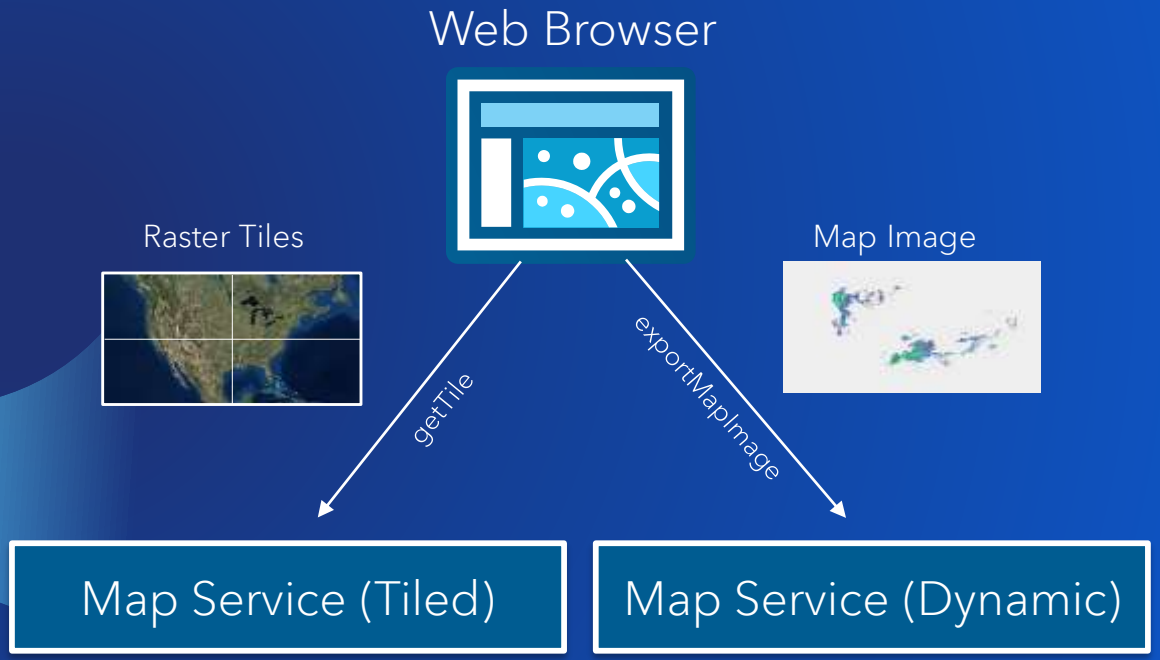
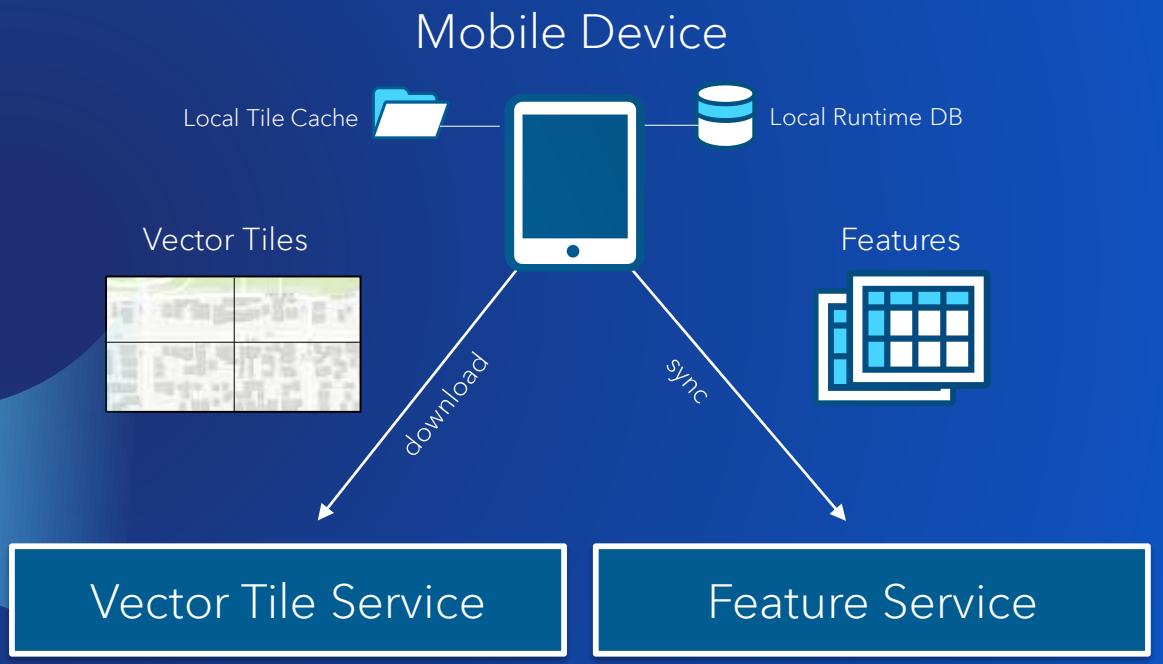
Example #1

Content: Imagery Basemap w/ Weather
Use Case: Web-based Visualization



Example #2

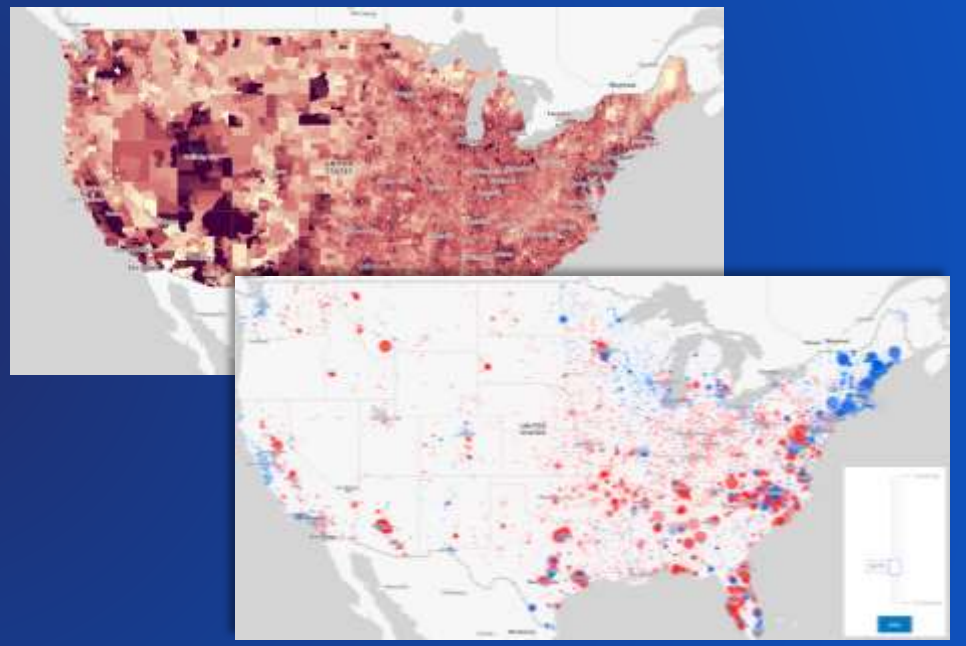
Content: Street Map w/ Utility Data
Use Case: Field mapping *(offline)*



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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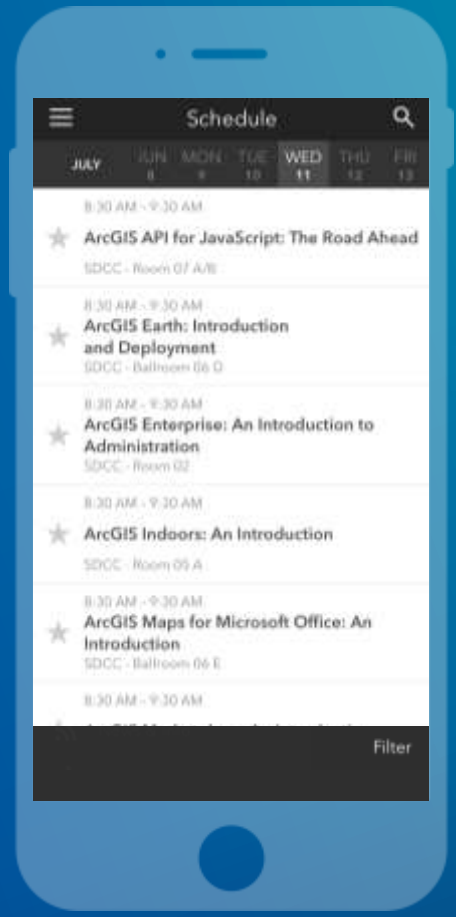
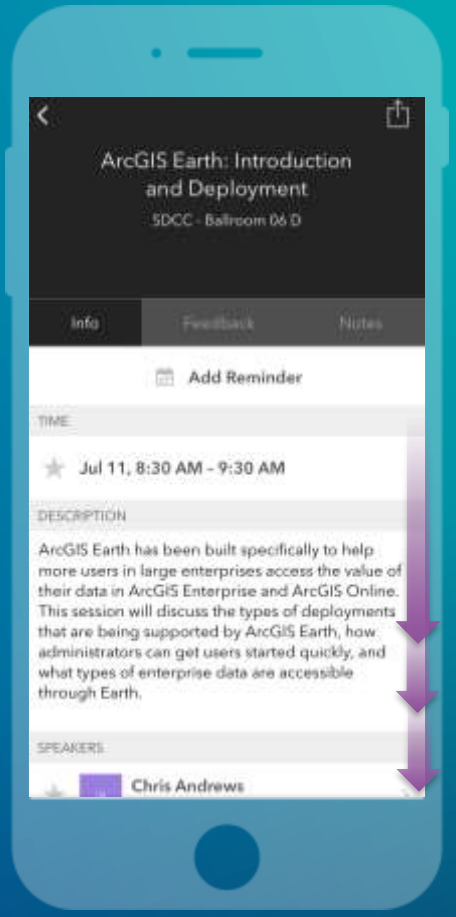
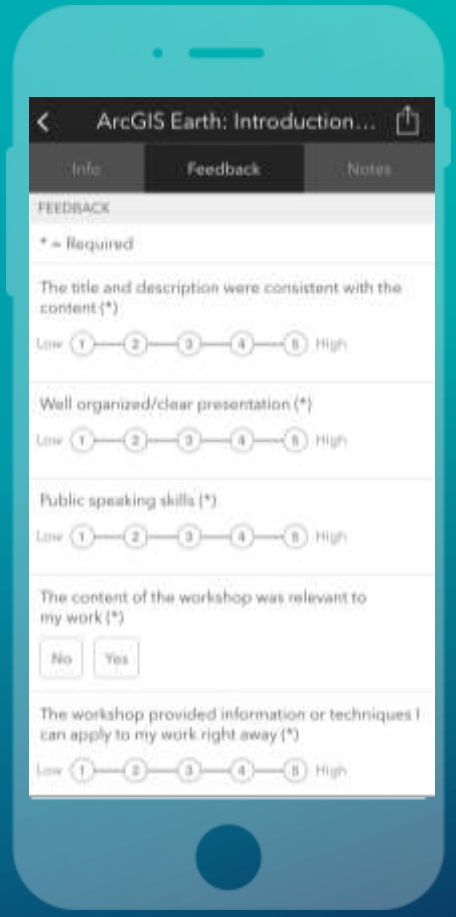


Scroll down to find the feedback section



Complete answers and select “Submit”



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