



GISPO

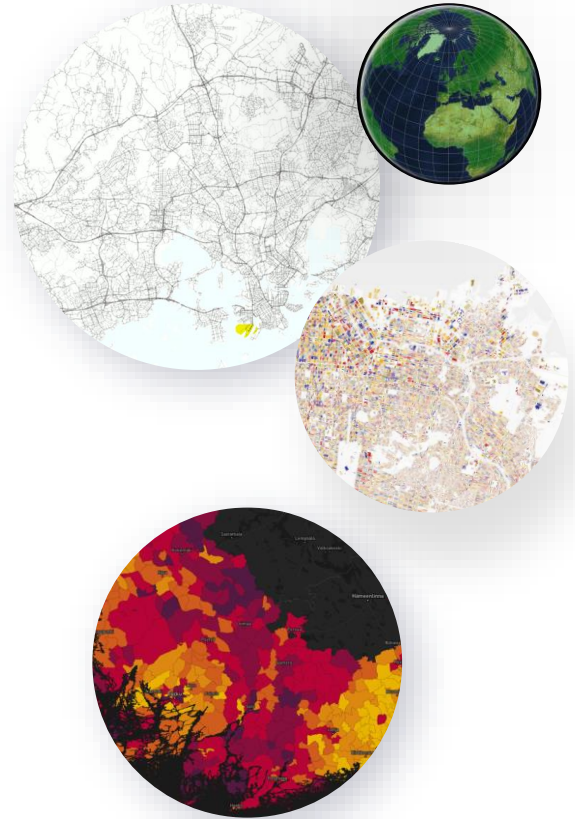
# **Building an Enterprise GIS with Open Source Software**

Baltic GIT Conference, 9.6.2023

Pekka Sarkola - Gispo Oy

# Gispo Ltd.

- Founded in 2012
  - 20+ employees
- **We consult** our customers on how to utilize FOSS4G solutions and open data efficiently
- **We develop** software
  - QGIS plugins and QGIS core
- **We train** our customers in GIS – 100+ organizations and 1000+ people
- **We support** our customers who use FOSS4G
- Open source advocate and capacity building with open source





We support our customers so that they can gain competitive advantage with FOSS4G (Free and Open Source Software for Geospatial) and Open Data.

We support the development and usage of open source and open data and act as an open source advocate.



# **Enterprise GIS**



# Enterprise GIS

***BIG** thing to sold  
by **KEY** account managers  
to **BIG** customers  
with **BIG** amount of €£\$'s*

By unidentified head of BIG GIS company



# Enterprise system

*Enterprise software, also known as enterprise application software (EAS), is computer software used to **satisfy the needs of an organization rather than individual users.***

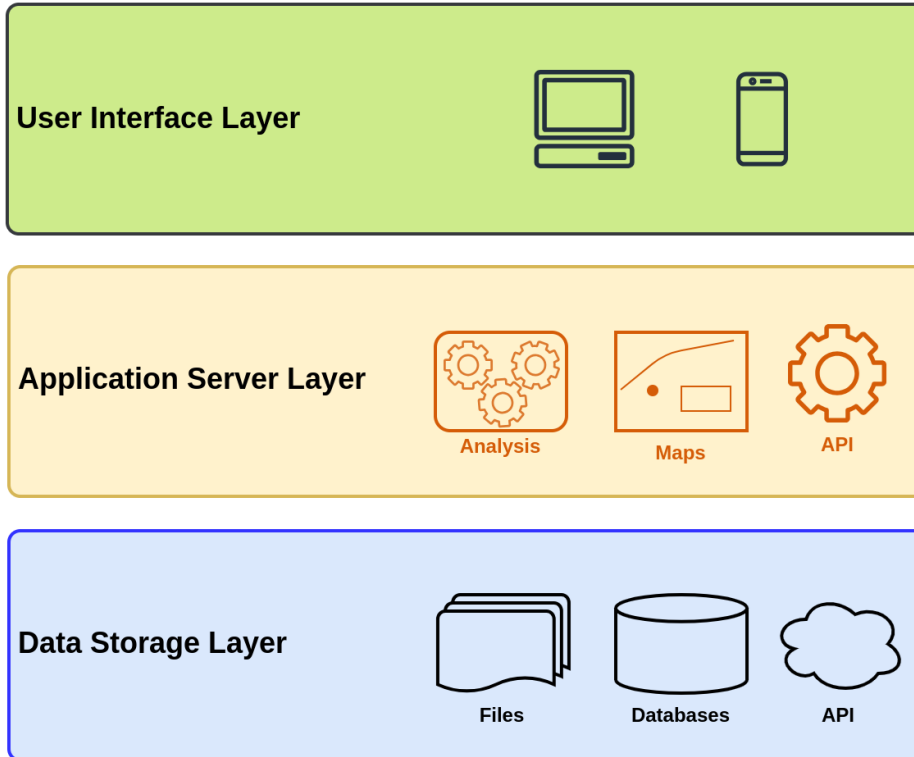
*Enterprise software is an integral part of a (computer-based) information system; a collection of such software is called an **enterprise system.***



# Enterprise GIS

- Organisation wide collection of interoperable GIS softwares to manage and process geospatial information
- Not one desktop
- If one person is leaving, process won't stop
- Focusing rather to organizations process than projects
  - Project will start and end, have limited resources (time, money, people)
  - Processes are vital to organizations to fulfill their commitments

# Architecture of Enterprise GIS





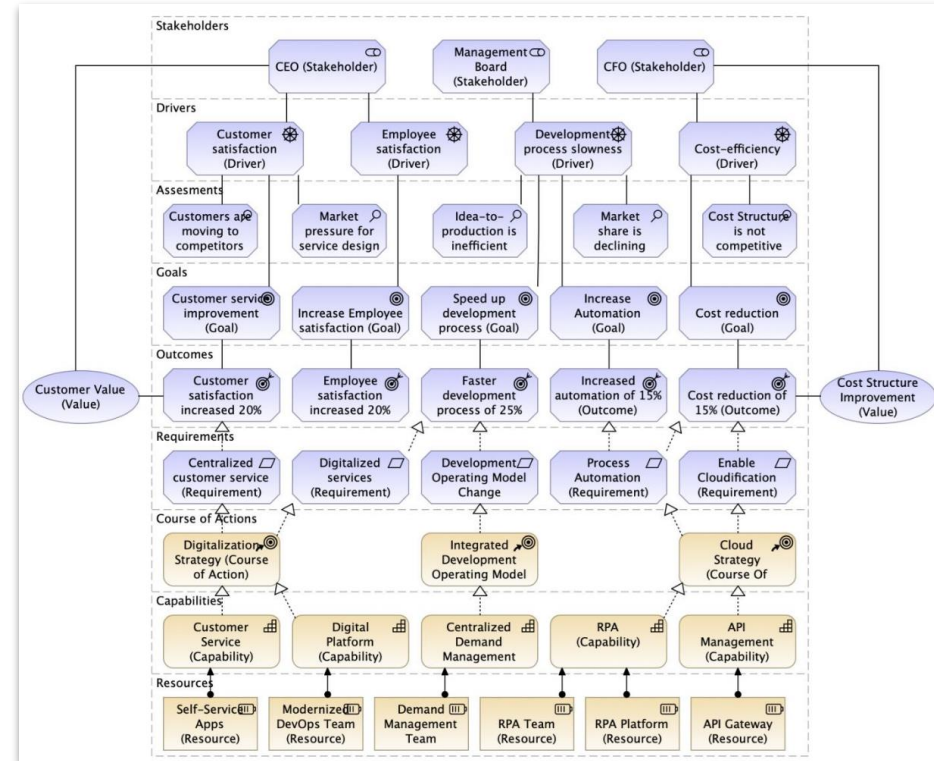


# How to build Enterprise GIS?

- Start with principles of the Enterprise architecture
- First step
  - Check if your organisation has already defined Enterprise architecture
  - If yes or no, you will have a long path to go
- Enterprise GIS architecture is part of organisation's Enterprise architecture.
- However, sometimes GIS people should show the path

# Enterprise architecture

- Very complex concept to cover in this presentation
- Not technology design tool
- Discussion “tool” between business owners and IT people
- Documentation tool
- Tools
  - Archimate (open source)
  - Also commercial tools available



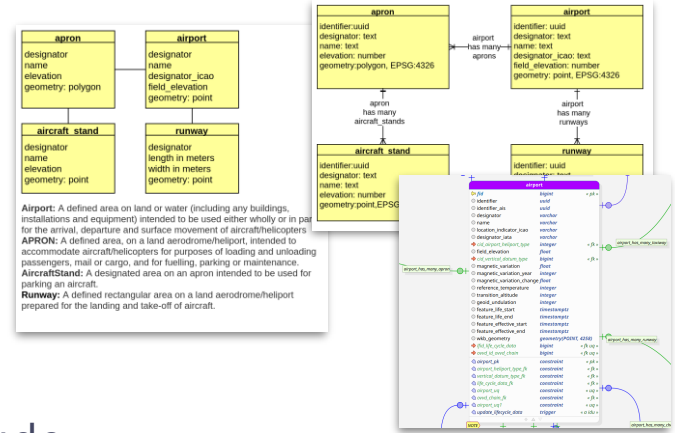


# Where to start Enterprise GIS architecture?

- Description of the current processes
  - Process owners and actors
  - Goals of the processes
  - Outcome of the processes
- After describing the processes
  - Are processes good enough? Should we simplify them?
  - Does current IT (GIS) systems support our processes?
- Who will describe the processes?
  - You: internal actor has strengths and weaknesses
  - Consultant: “Fire is a good farmhand, but a bad master”

# Data Architecture in Enterprise GIS

- Define and document the followings:
  - Conceptual data model
  - Logical data model
  - Physical data model
- Data architecture description should include also external datasets
  - Very few GIS systems does not include any external datasets
  - Are you using external dataset via API or do you download copy of the dataset?
  - How often you update dataset?





# Application Server Architecture in Enterprise GIS

- Typical GIS Application servers services are:
  - Map APIs (WMS, WMTS)
  - Data APIs (WFS, WFS-T, WCS, OGC API Features)
  - Geoprocessing services (like routing, geocoding)
  - Web Map applications
- Describe internal services to implement
- Describe external services to use
  - Make also vulnerability analysis of external services: how long we can continue our processes without external services?



# User Interface Layer in Enterprise GIS

- This is what end-users will see, all other parts will serve this layer
- Different solutions for different use cases:
  - Desktop Application
  - Web application (both desktop and mobile usage)
  - Mobile Application (online and offline usage)
- If you have only one (1) user interface, your system is **not** Enterprise GIS



# Fast lane for Enterprise GIS

1. Describe processes
2. Design data layer
  - a. Create data models (conceptual, logical, physical)
  - b. Define external data sources
3. Design application server layer
  - a. Design internal services
  - b. Define external API services
4. Design User Interface layer
  - a. What tool to whom to do what?

***Then iterate through 2-3 times!***

A grayscale map of a city, likely London, showing a dense network of streets and buildings. The map is oriented with North at the top. A white, jagged, torn-paper-like border runs along the bottom edge of the image. The text "FOSS4G software" is centered over the map.

# **FOSS4G software**



# FOSS4G software

- Free and Open Source software for Geospatial
  - Wide definition: “Any GIS software with Open Source license”
- OSGeo Project software
  - FOSS4G software which has pass [Open Source Geospatial Foundation Incubation process](#)
  - OSGeo standards for professional governance and development
  - OSGeo donations and annual budget
- Choosing right software is always tricky task
  - Learn, test and analyse in your environment and for your processes
  - Communicate with other FOSS4G users: local or industry
  - Deploy PoC (Proof-of-Concept) system



# Open Source GIS Stack

Desktop Mobile	GIS Server	Database	Front End and Libraries
     	 <b>GeoServer</b>  <b>MapStore 2</b>   <b>GeoNode</b>   <b>QGIS SERVER</b>  <b>Lizmap</b>   <b>MapServer</b> <small>open source web mapping</small>	 <b>PostGIS</b>   <b>PostgreSQL</b>     <b>Spatialite</b>	 <b>OpenLayers</b>   <b>Leaflet</b>   <b>CESIUM</b>   <b>GDAL</b>   <b>GeoTools</b>   <b>ORFEO ToolBox</b>  <b>cnnes</b> <small>CENTRE NATIONAL D'ETUDES SPATIALES</small>

FOSS4G: Free Open Source Software for Geospatial



# **Enterprise GIS with FOSS4G**

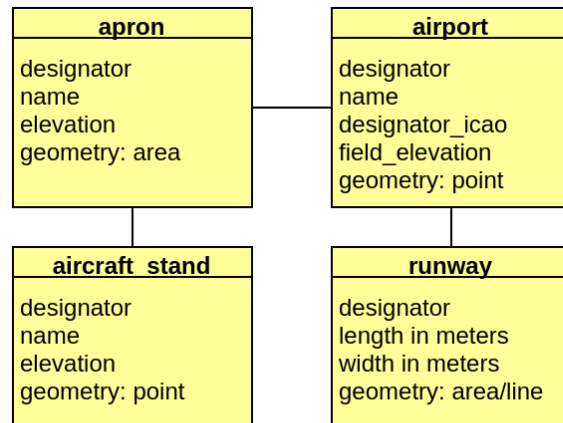
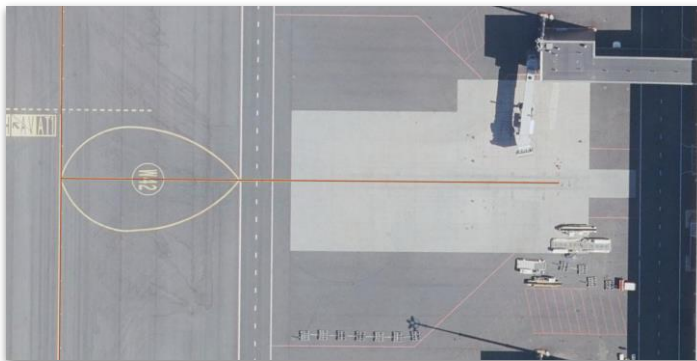


# Steps to create Enterprise GIS with FOSS4G

- Describe processes
  - Not technology dependant
- Design data model for your own data
  - Only physical data model is technology dependent
  - PostgreSQL/PostGIS is your database selection
- Choose FOSS4G software
  - Application server
  - Desktop application
  - Mobile application

# Conceptual data model

- Basic information
- Terminology
- Made with domain experts
- Tools
  - Your selected tool



**Airport:** A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft/helicopters

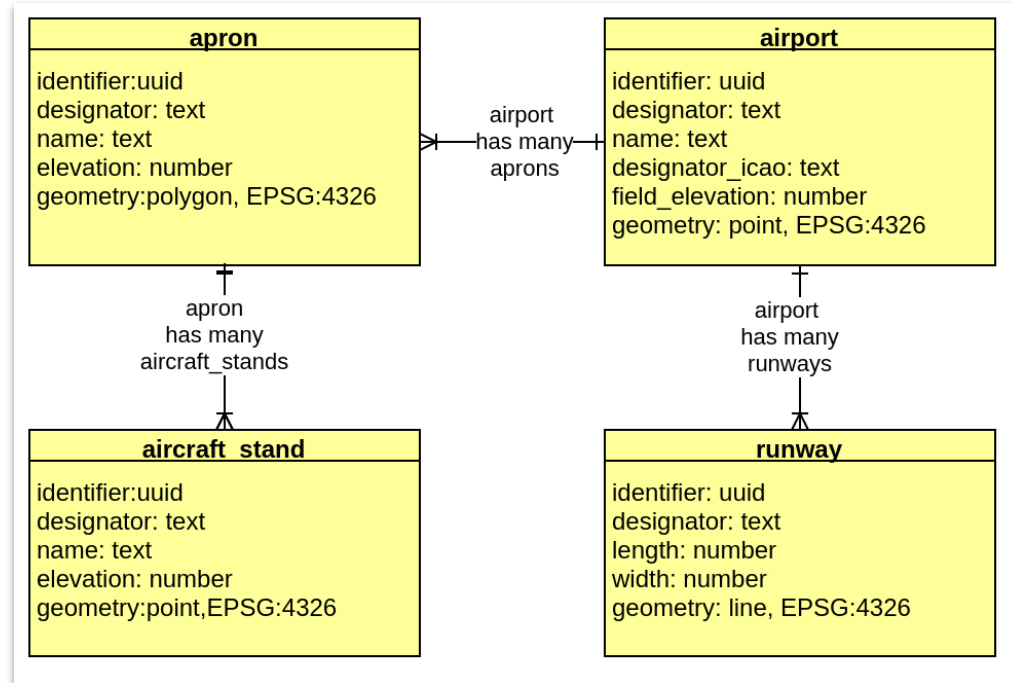
**APRON:** A defined area, on a land aerodrome/heliport, intended to accommodate aircraft/helicopters for purposes of loading and unloading passengers, mail or cargo, and for fuelling, parking or maintenance.

**AircraftStand:** A designated area on an apron intended to be used for parking an aircraft.

**Runway:** A defined rectangular area on a land aerodrome/heliport prepared for the landing and take-off of aircraft.

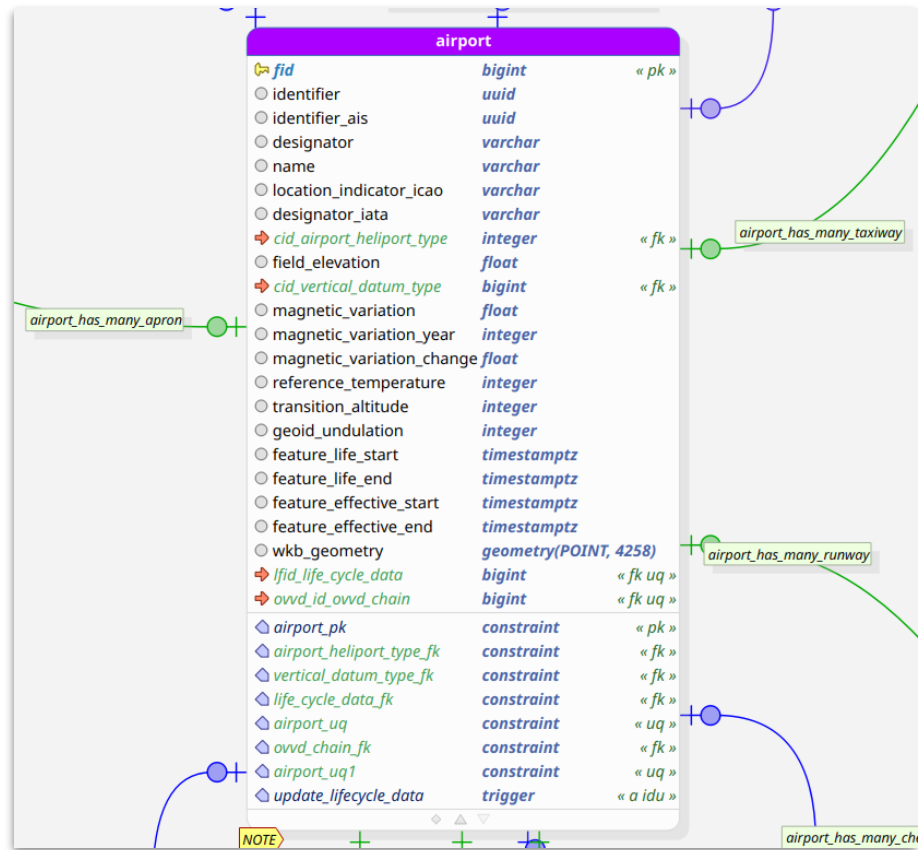
# Logical data model

- More information
- Include already information about data types and relations
- Tools
  - Archimate
  - DB design tool



# Physical data model

- Technical implementation
- Technology dependant
- Remember also data access rules!
- Tools
  - [pgModeler](#) (PostgreSQL, open source)
  - Commercial tools





# Application server selection

- What is your IT infrastructure?
  - Operating systems: Windows, Linux
  - On-premises or cloud (AWS, Azure, Google)
- What features do you need?
  - Only API's or full WebGIS capabilities?
  - Viewing services (aka Web Map?)
  - Editing geospatial information?
  - Dashboards, geostories?

## GIS Server



MapStore 2



QGIS  
SERVER





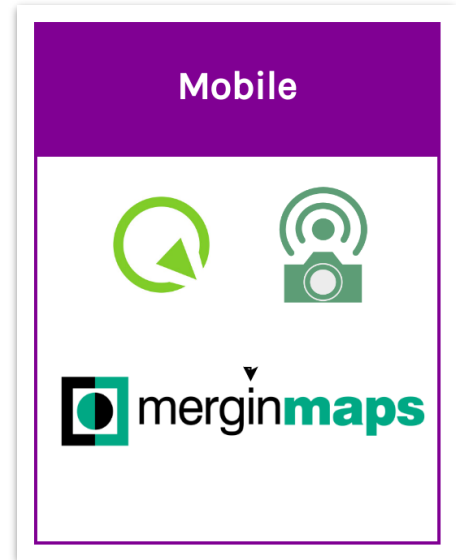
# Desktop application

- What is your supported operating system?
  - Windows, iOS, Linux (Ubuntu, Arch)
- What features you need?
  - Editing environment
  - Analysis tools
- Does your users know already some GIS desktop applications?



# Mobile applications

- What do you want to do with Mobile app?
  - Viewing data in the field
  - Edit data in the field
  - Data collection in the field
- Is using ad-hoc or part of the process?
- Can you install software or just using the browser?
- Online or offline usage?
  - What is mobile network coverage in your area?





# **Some FOSS4G architectures**

# Small municipality

## User Interface Layer

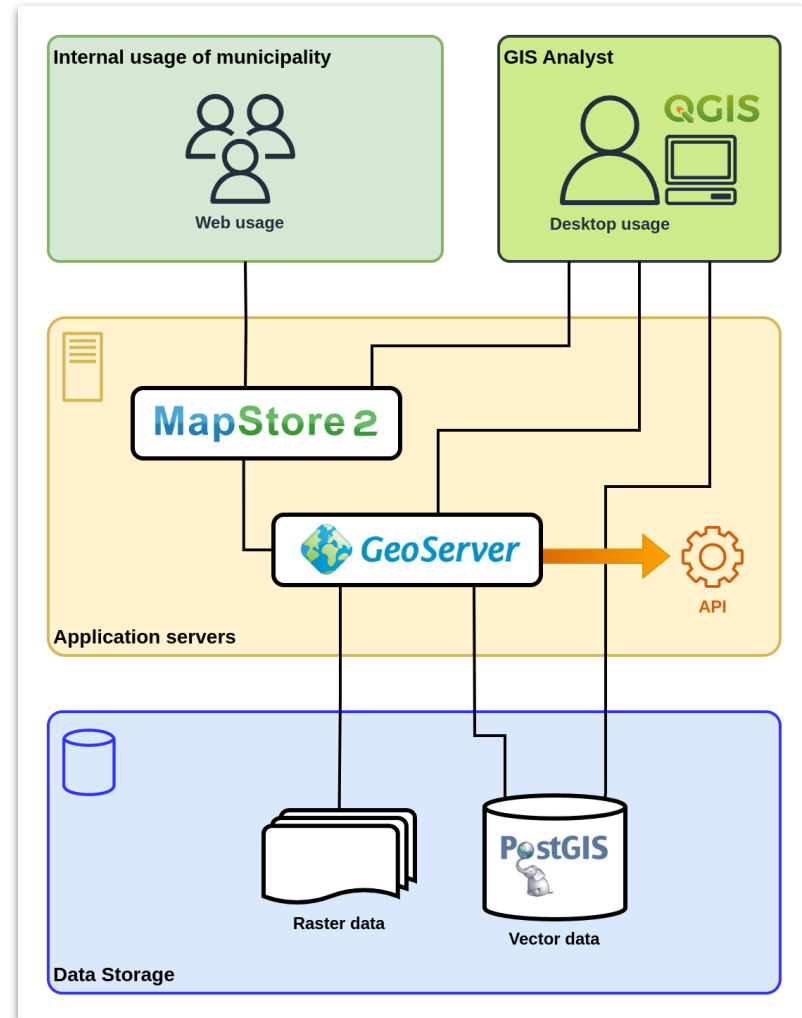
- Web Map for all
- QGIS desktop for GIS analysts

## Application Server Layer

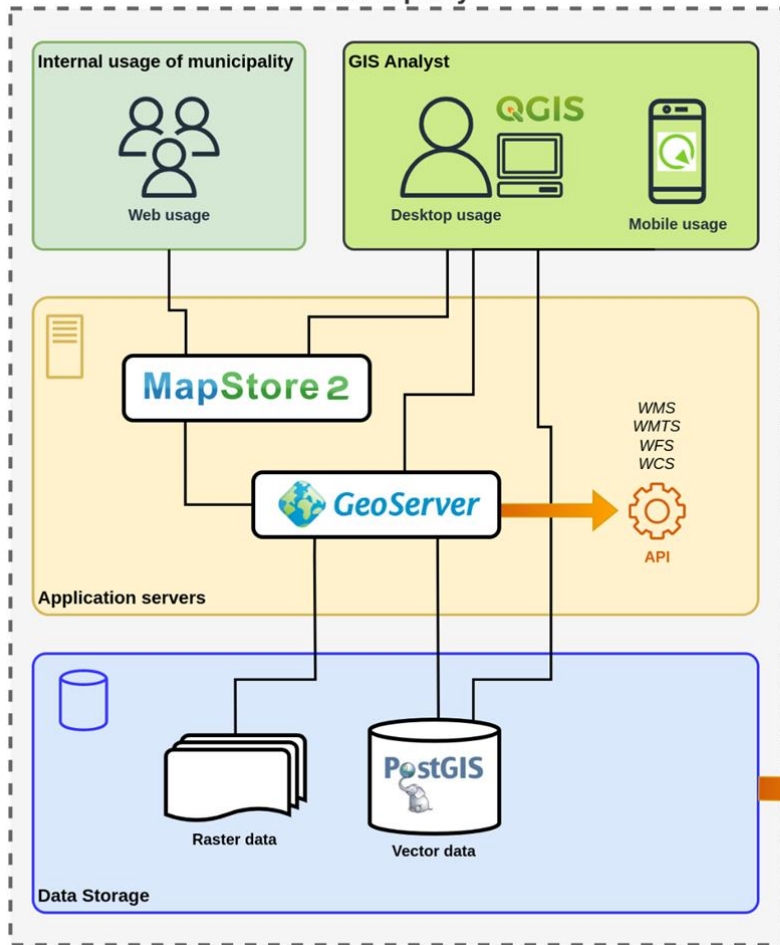
- Mapstore2 for web mapping
- Geoserver for GIS APIs

## Data Storage Layer

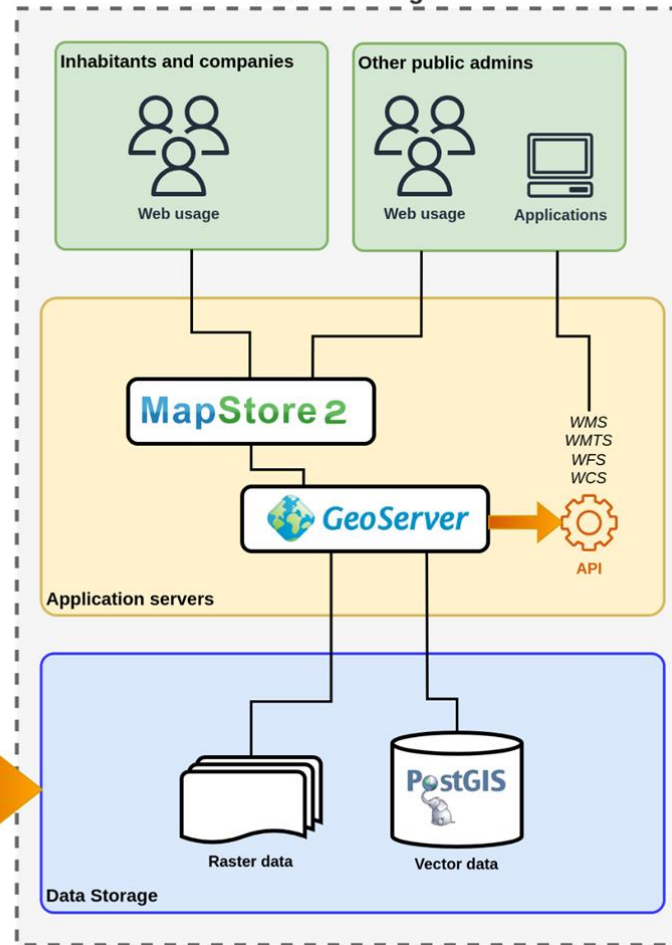
- Raster data as files (imagery and raster maps)
- Vector data to PostGIS

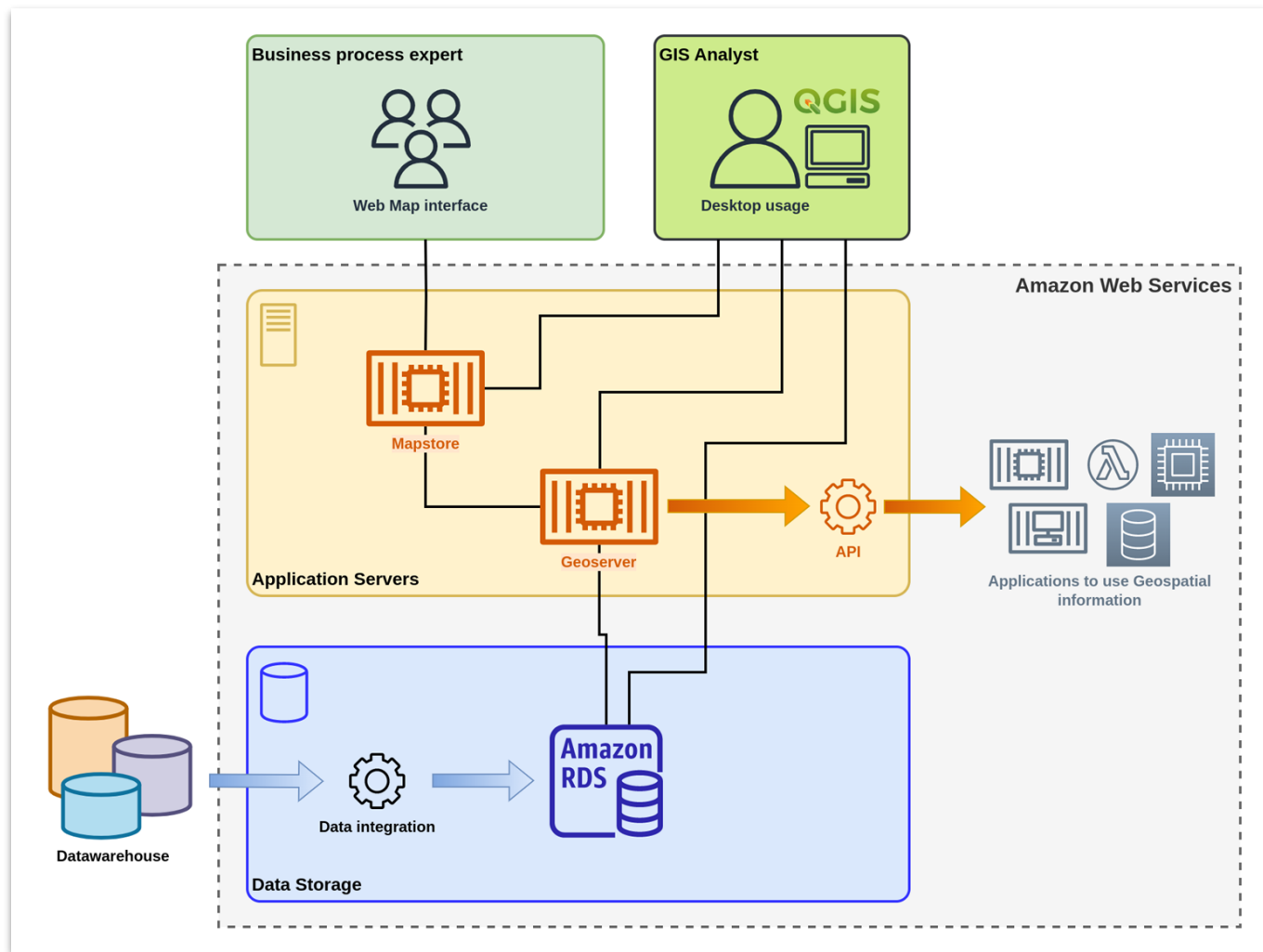


## Municipality



## External usage







# Enterprise GIS with FOSS4G

- Affordable solution for all size of organizations
- Freedom of action, digital sovereignty
  - You make decision, how you use the software
  - Avoid vendor lock
    - By whom you can buy related services: training, consultation, development
  - Cost management
    - How much you will pay next year? And year after?
- “Code is law”
- Have fun and join the FOSS4G community!

# Questions?

## Contact information

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