

Local SDI Dehradun

3.2(a):Technology and Standards for Geospatial Workflow



Course details:
M.Tech. in RS and GIS
Semester II
Module III



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Scientist SF
GID, IIRS, ISRO



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1

Introduction

We discuss in brief about SDI



Part one



SDI is framework for



Effective collection



Integration



Discovery



Sharing



Delivery



Utilization

The important points that needs to be kept in mind



Resulting in

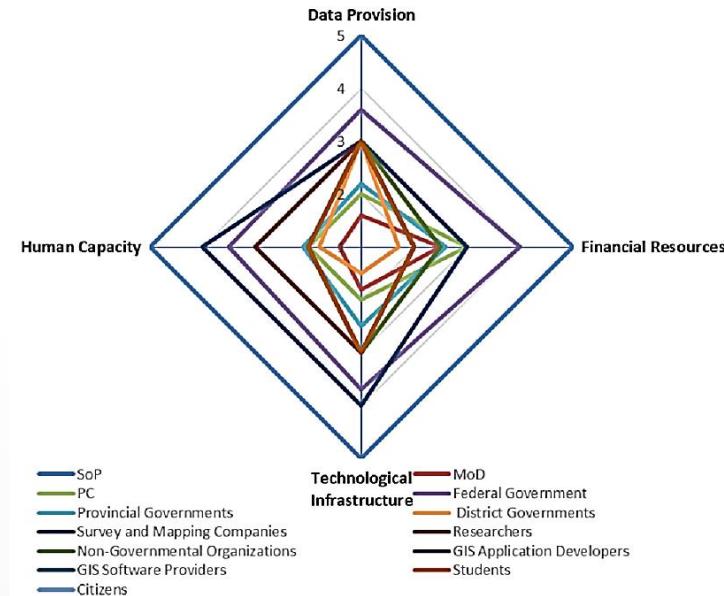


How?

There will be increased awareness
in the use of geospatial data for the
global community

Whom?

Cooperation between decision-
makers and stake-holders



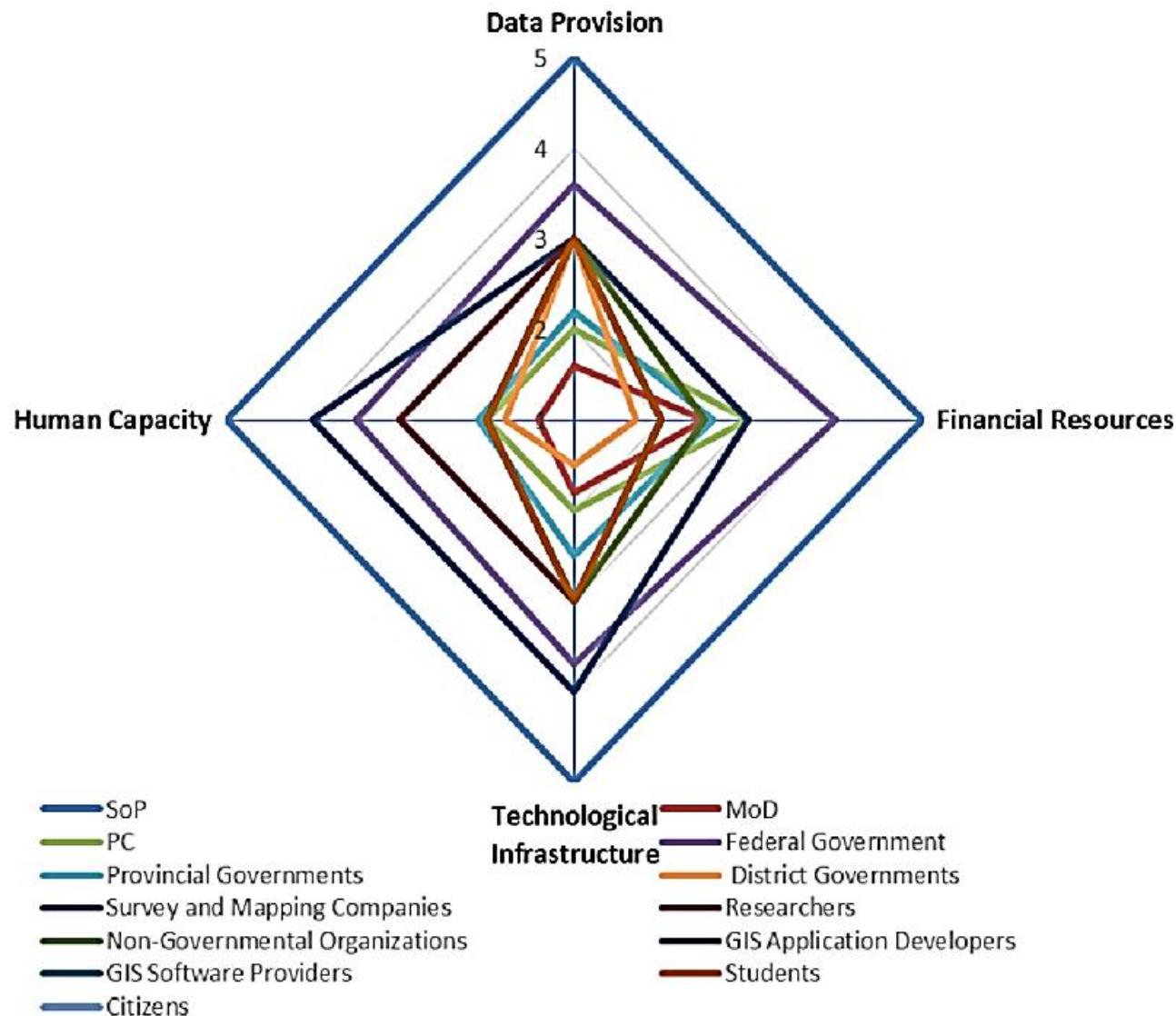


Fig: National spatial data infrastructure stake holder diagram of Pakistan



Benefits of SDI

01

Removes duplication
It reduces duplication by centralized data repository, standardization and interoperability

02

Improves quality
It maintains quality by producing comprehensive metadata, regular updates and maintenance and various quality control measures.

03

Reduces cost
Elimination of redundant data collection, efficient resource allocation and reduced IT resource infrastructure cost.

04

Establishes partnership
It provides policy and legal framework, data sharing agreements, collaborative platforms and tools, governance structures and community building





SDI of Dehradun



No active SDI

Creating an SDI for Dehradun district is necessary as it serves as an educational hub, tourism gateway, business center, administrative significance, military presence and good climatic conditions. The following things must be kept in mind while preparing an SDI.



Standards

Various OGC and metadata standards



Data

Multisource and multi type data



Resources

Various softwares and good hardwares



Fig: Chakrata ©Aashu Punetha

02

Objectives

This section describes what we want to do.



Part two



To create local SDI for Dehradun
for services

WMTS and interoperability

User can see multiple data
tiled over one another.

WFS/WCS

Web feature service for
retrieval and manipulation
of geographic features



Data download

User can download data
already uploaded in the
server

WMS

Web map service for
generating georeferenced
map images

WPS

Web processing service
geospatial processes

03

Materials used

Listing all the resources used



Part three



2

Separate computers were used



✓ PC 1

- AMD Ryzen 7 5800H with Radeon Graphics 3.20 GHz
- Nvidia RTX 3060 Laptop GPU
- 16 GB RAM
- 1 TB SSD (with roughly 260 GB Free space)

✓ PC 2

- Intel Core i9 10850K CPU 20cores at 3.60 GHz
- Intel UHD Graphics (Integrated)
- 16 GB RAM
- 250 GB SSD + 1TB HDD



Software used

Various softwares are used

Some softwares are proprietary some are open source





GeoNetwork
open source



Windows 11

Primary operating system



Java 8

Programming environment



Geonetwork

Metadata cataloguing system



Elastic search

Searching the catalogue



Geoserver

For web processing



Apache tomcat

Web server



Camunda

BPMN diagram



Draw io

UML diagrams



Overleaf

To create reports in LaTeX



TMUX

Terminal multiplexer



Adobe photoshop

Graphics editing



VS code

Text editor



Data from various sources were used

- Survey of India Shapefile for Dehradun Villages (Product Code OVSF/-/10).
- LISS-3 and LISS-4 Earth Observation Multi-spectral Data from Bhoomidhi (GeoTIFF format available)
- 20 different types of Dehradun district shape files of position data
- 10 different types of raster DEM of Dehradun district
- Landsat thermal raster data
- Hydro-Shed data prepared by Bernhard Lenard
- Total monthly precipitation netCDF4 data 2023
- Total relative humidity monthly netCDF4 data 2023
- Sentinel 2 LULC data
- Global canopy height
- Geology 2M, geomorphology 250K, geochemistry from Bhukosh



The idea was to create an SDI with most of the data that can be found.

4

Methodology

We discuss the methodology and workflow of the SDI



Part four



Methodology contents

4 Diagrams are there





Methodology 1



Use case UML diagram

It tells you how users interact with the system to get their work done.



Primary actor

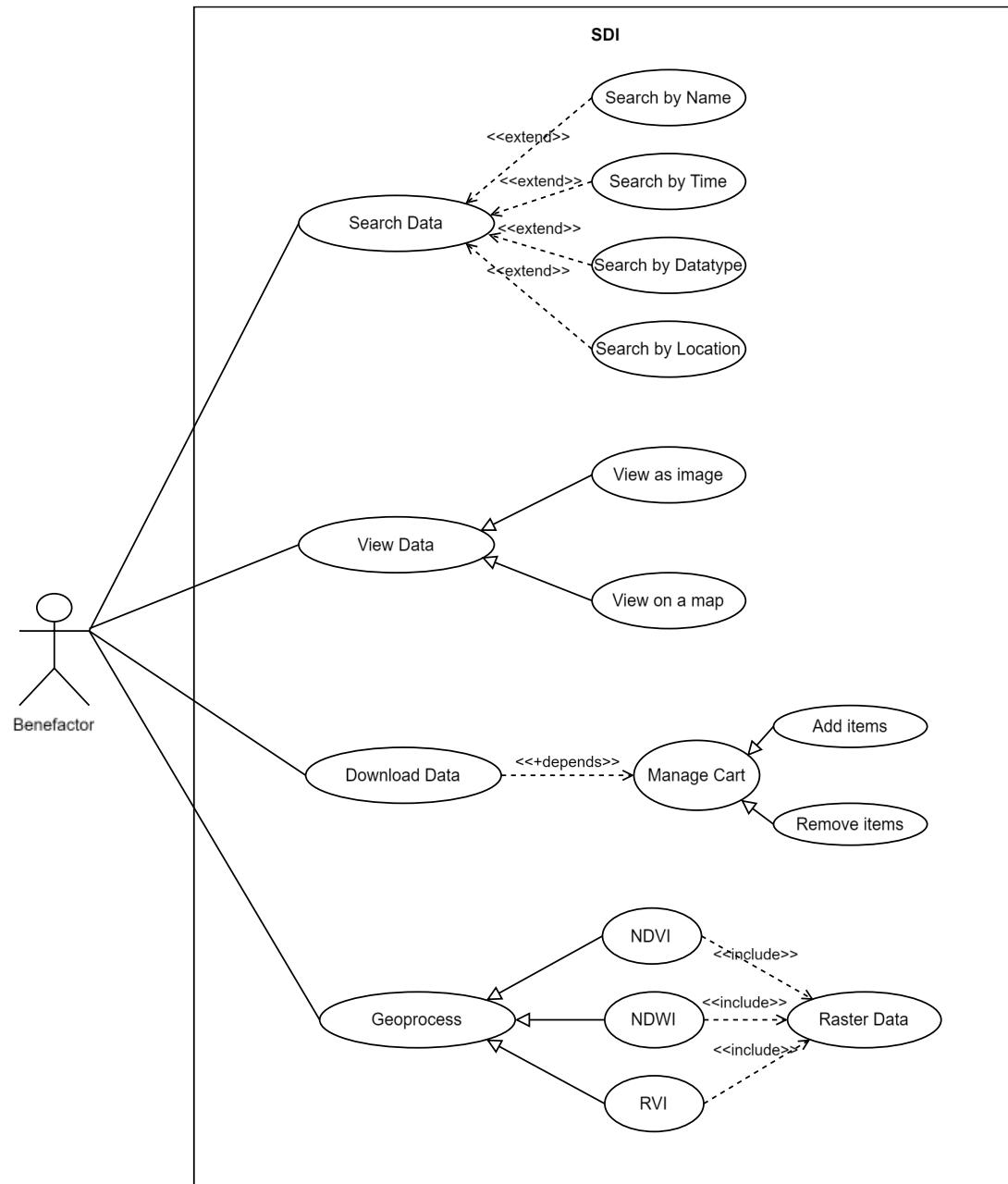
The user is the primary actor.



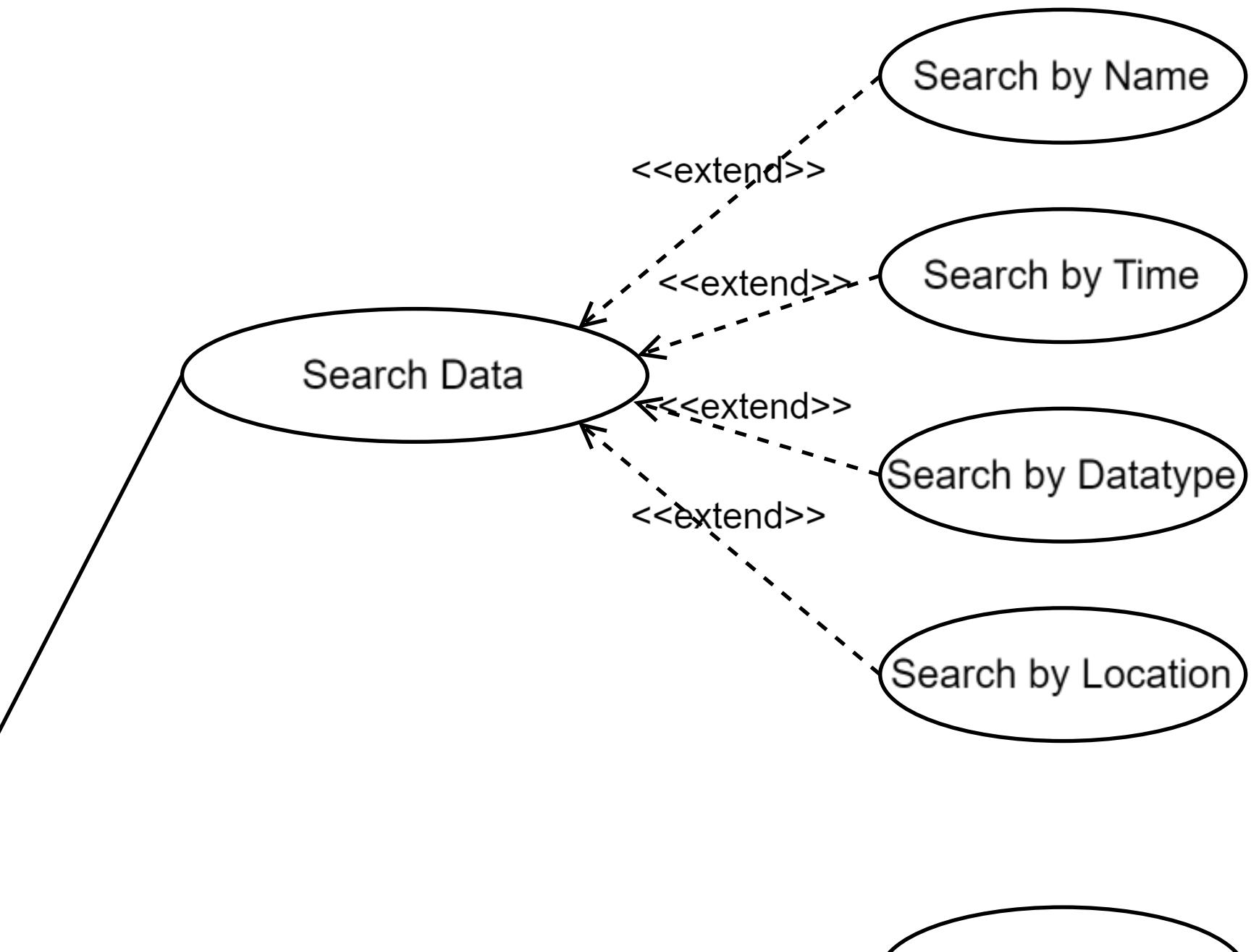
Secondary actor

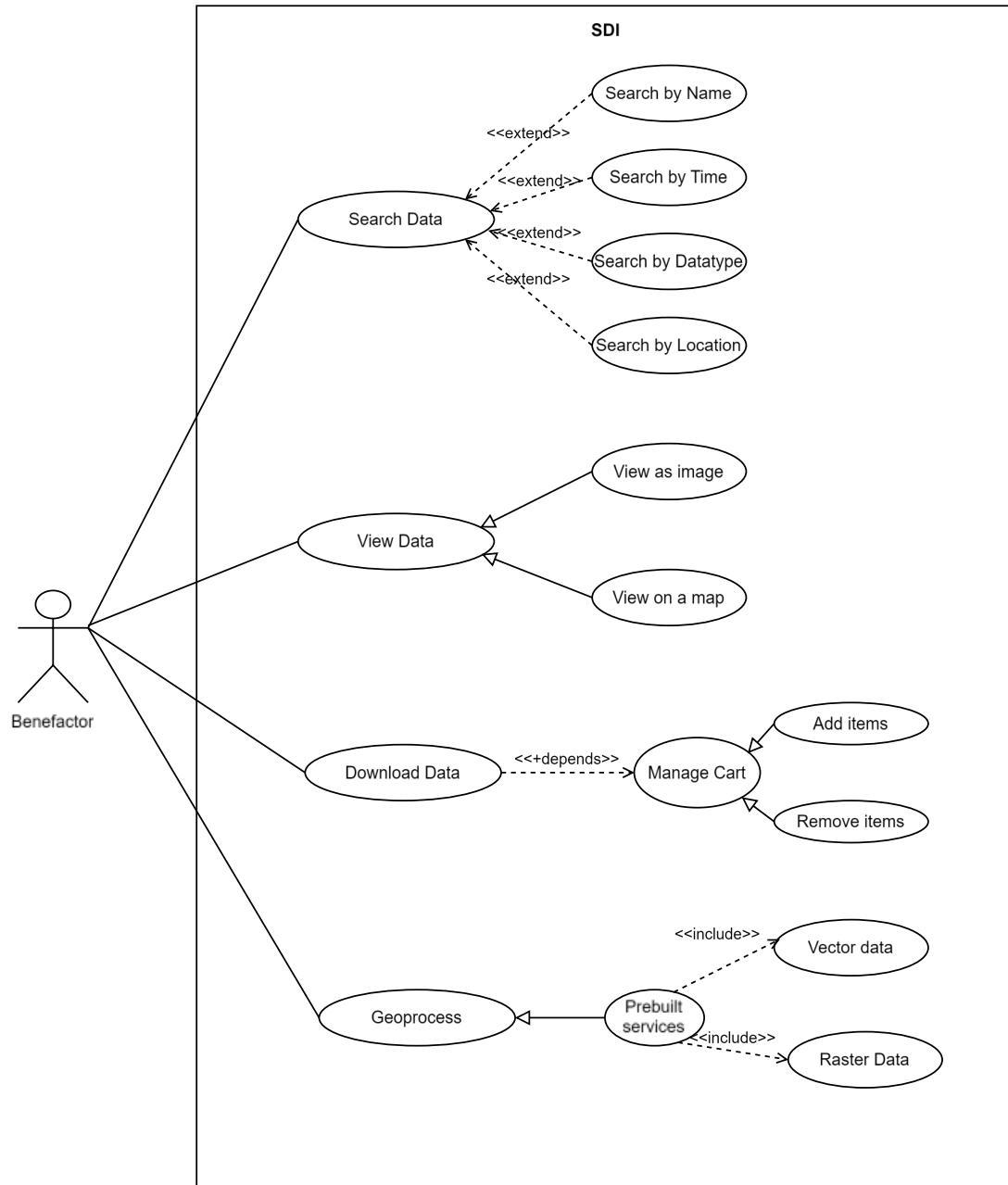
There are no secondary actors.

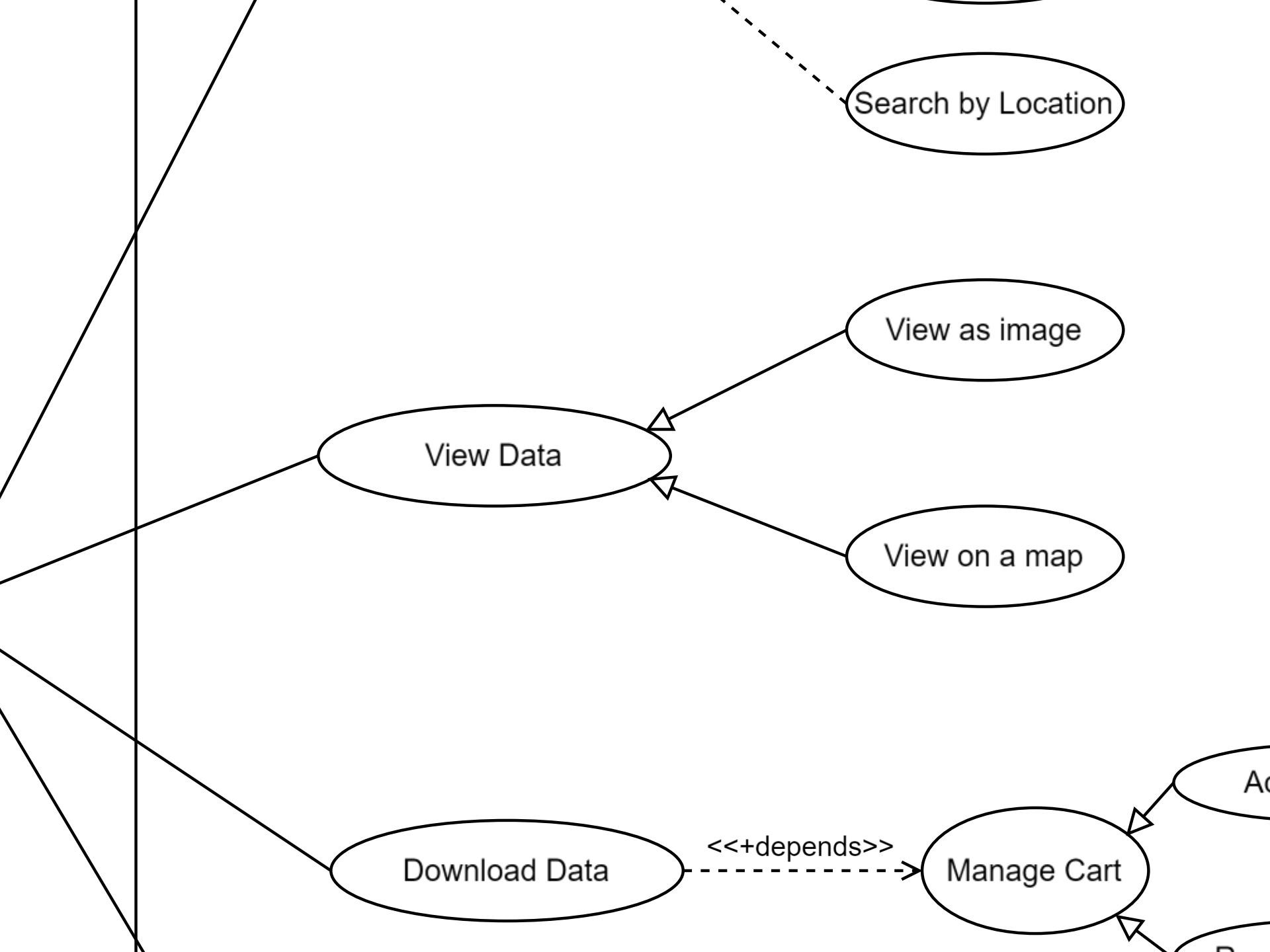




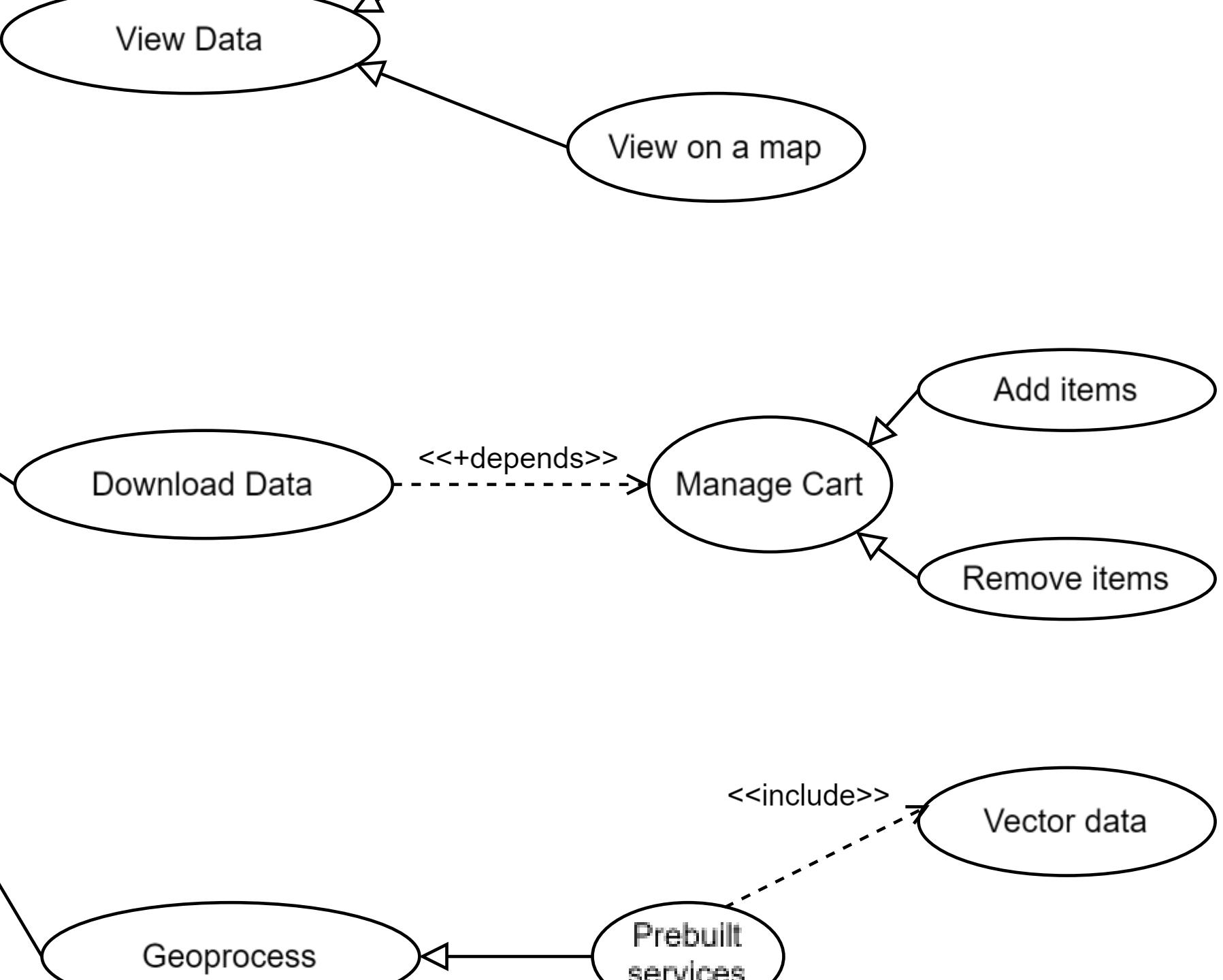
SDI



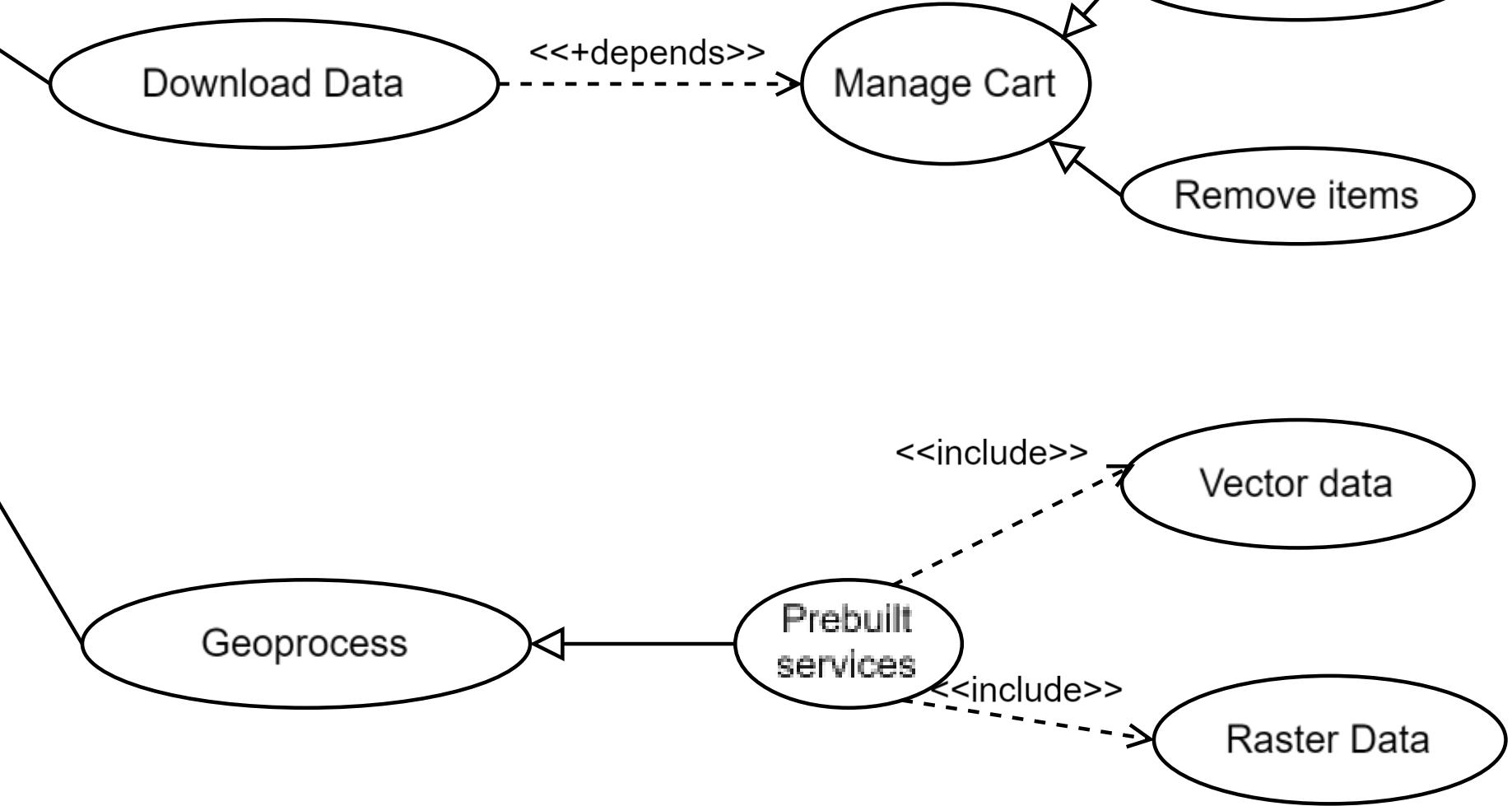


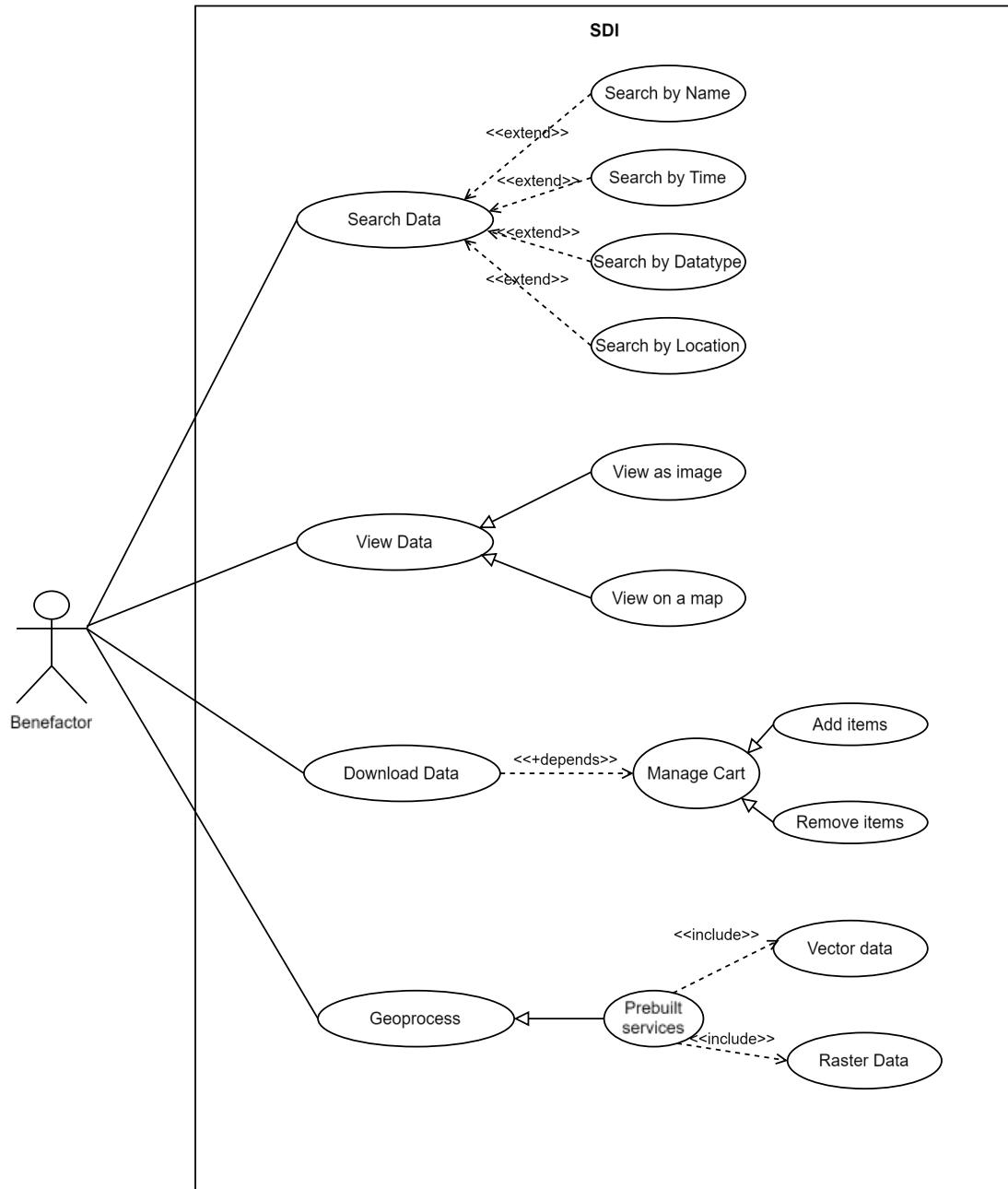














Methodology 2



Component UML diagram

It tells you how users interact with the system to get their work done.



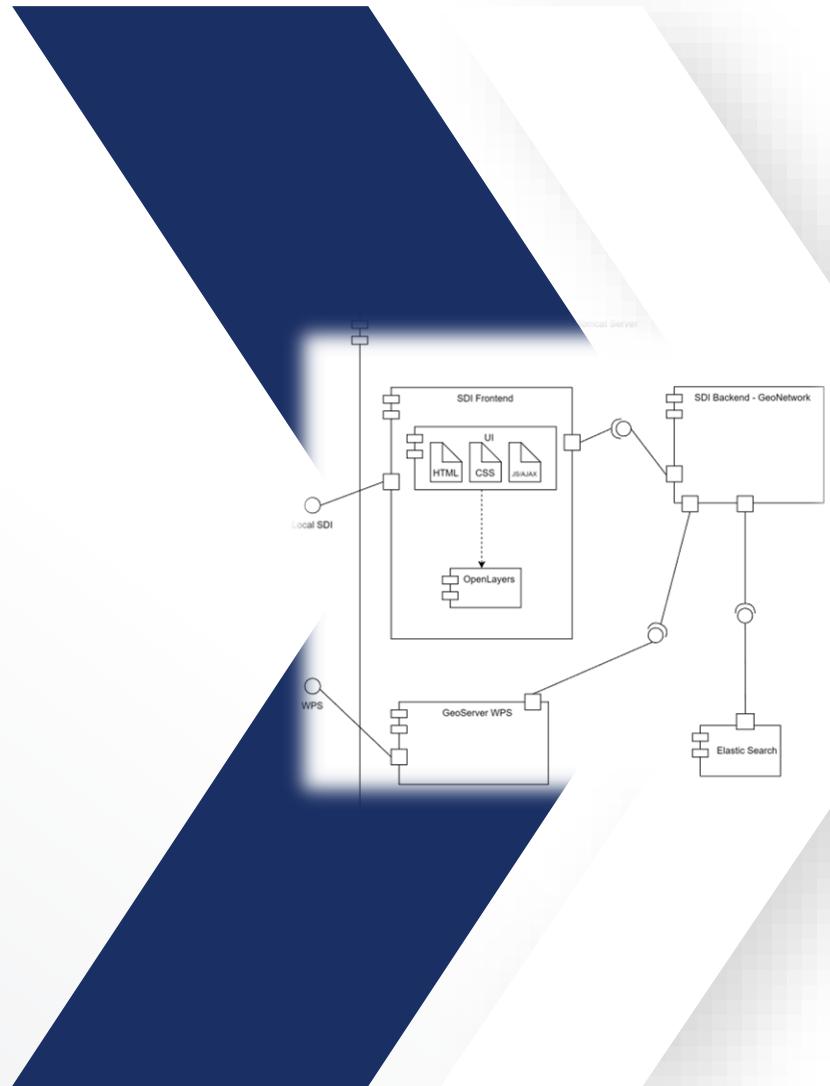
Primary component

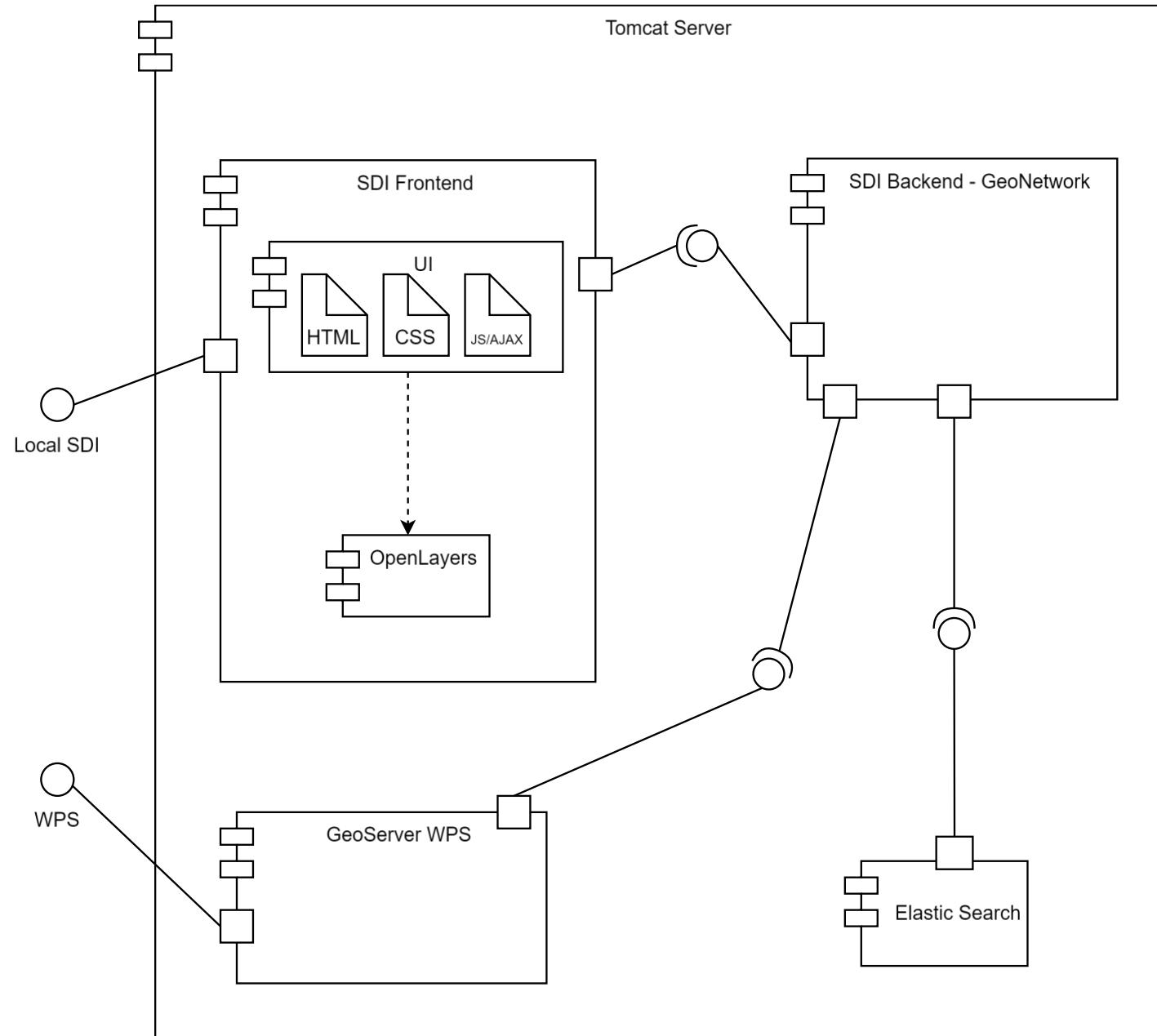
Tomcat server

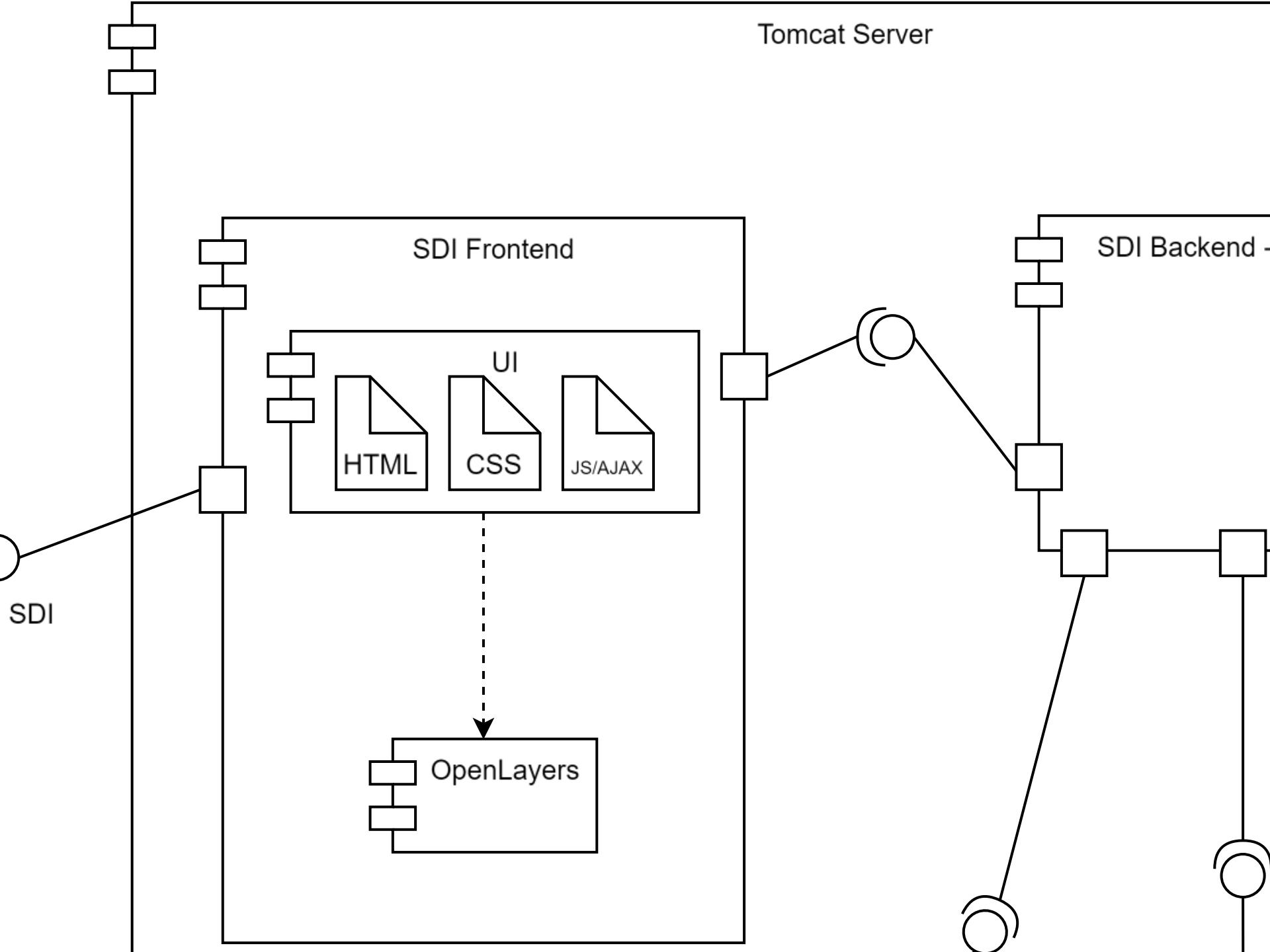


Dependencies

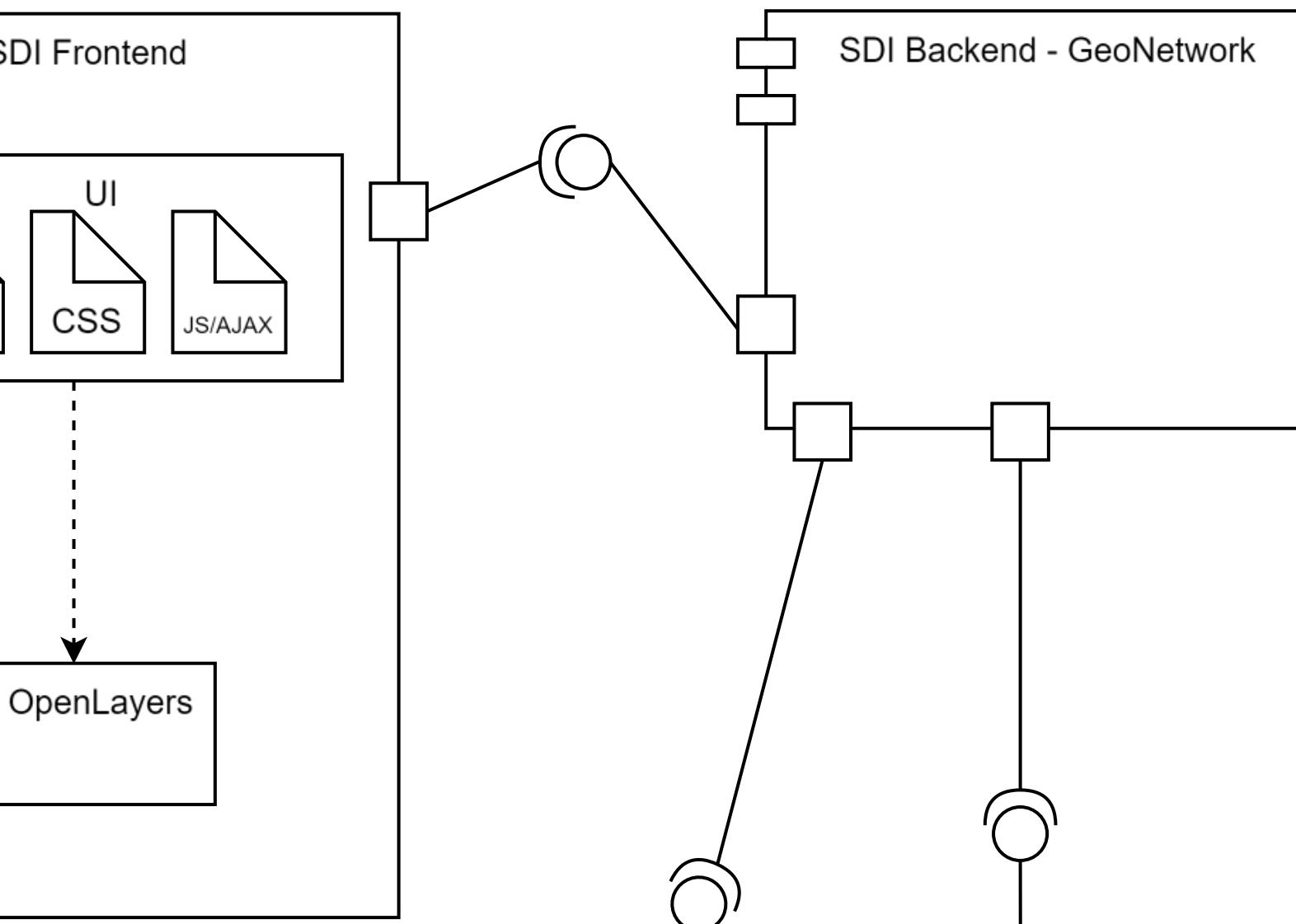
Front end, back end, elastic search, geo server

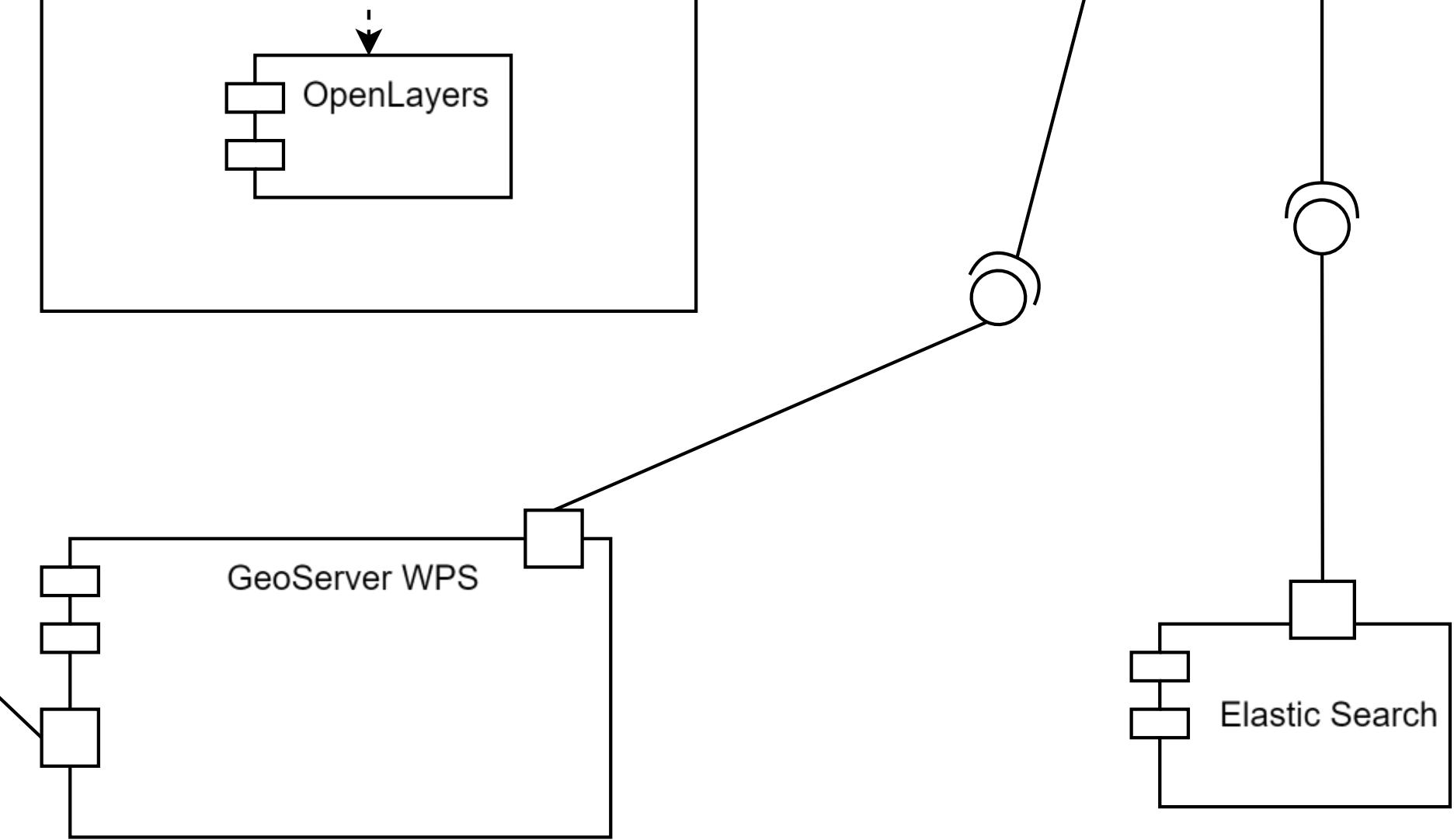


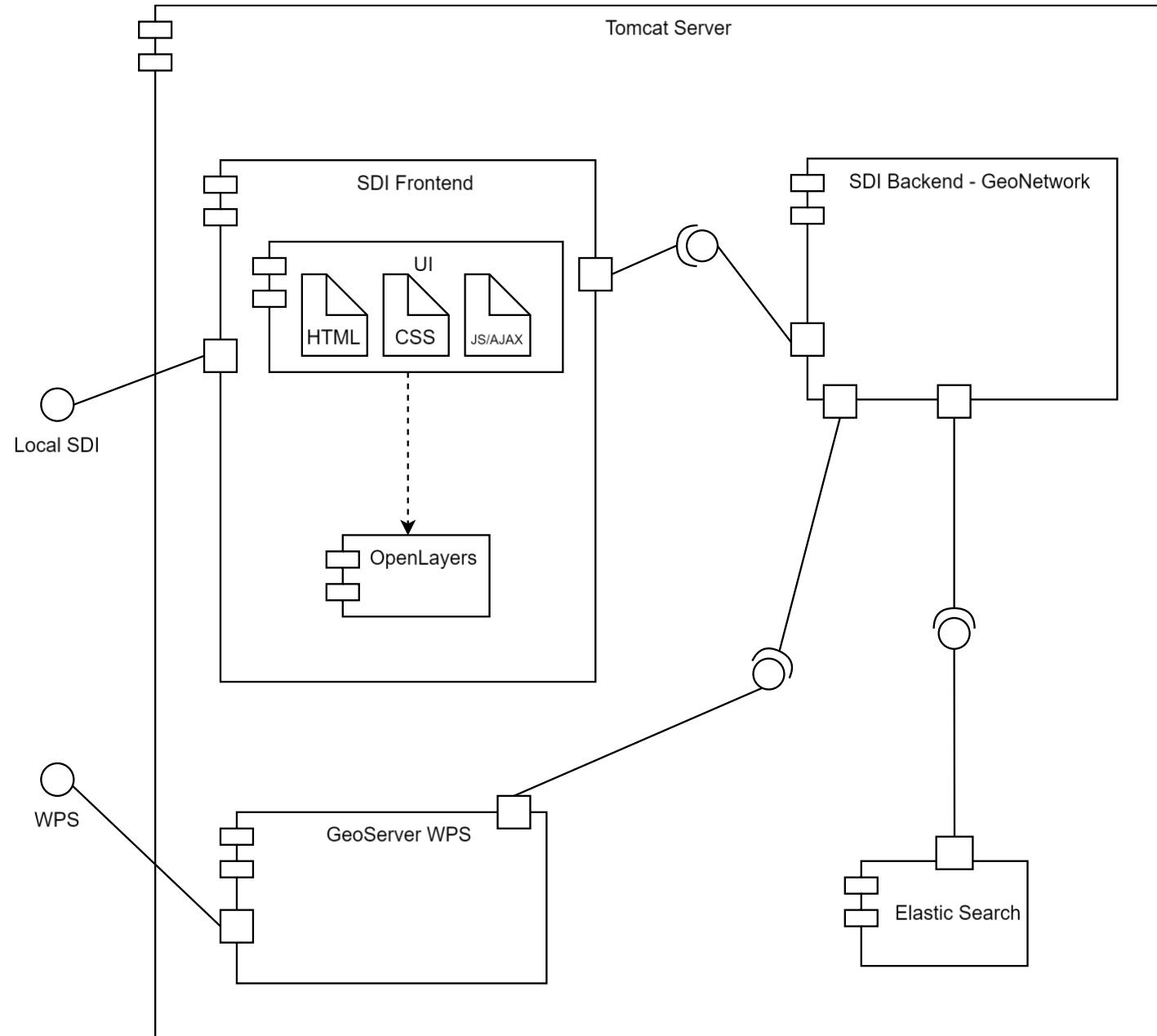




Tomcat Server







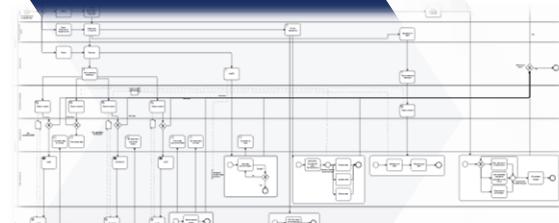


Methodology 3



BPMN workflow diagram

It tells you how users interact with the system to get their work done.



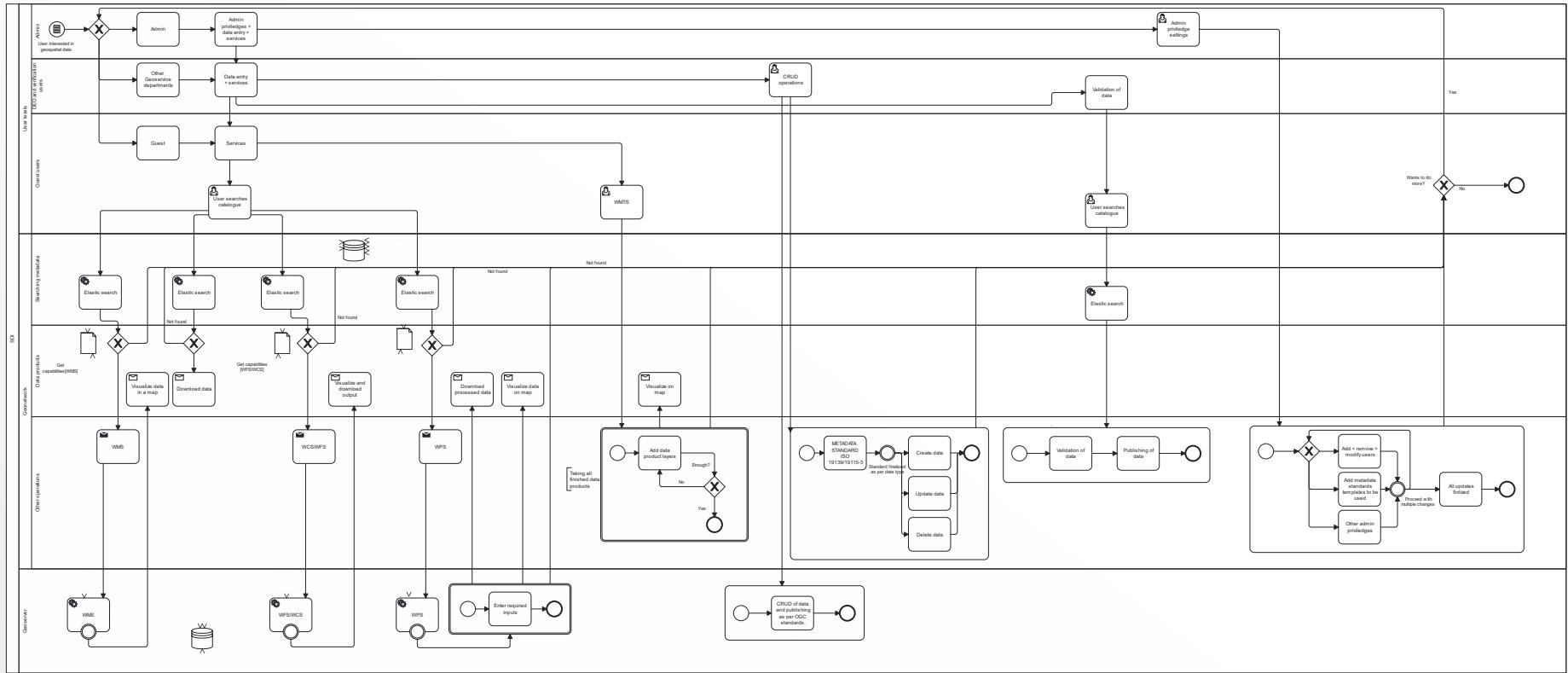
Start

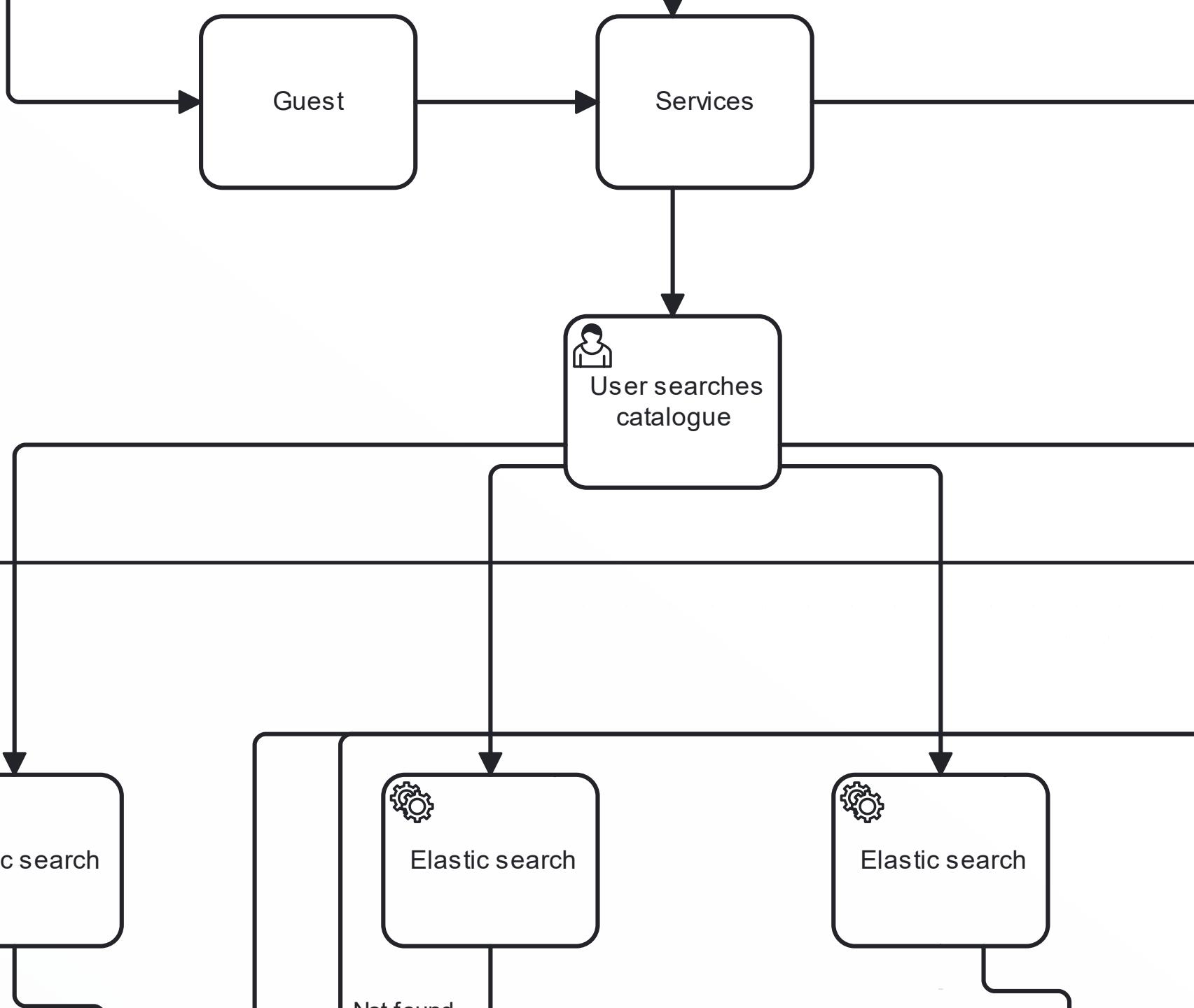
Conditional users like admin, DEO and guests

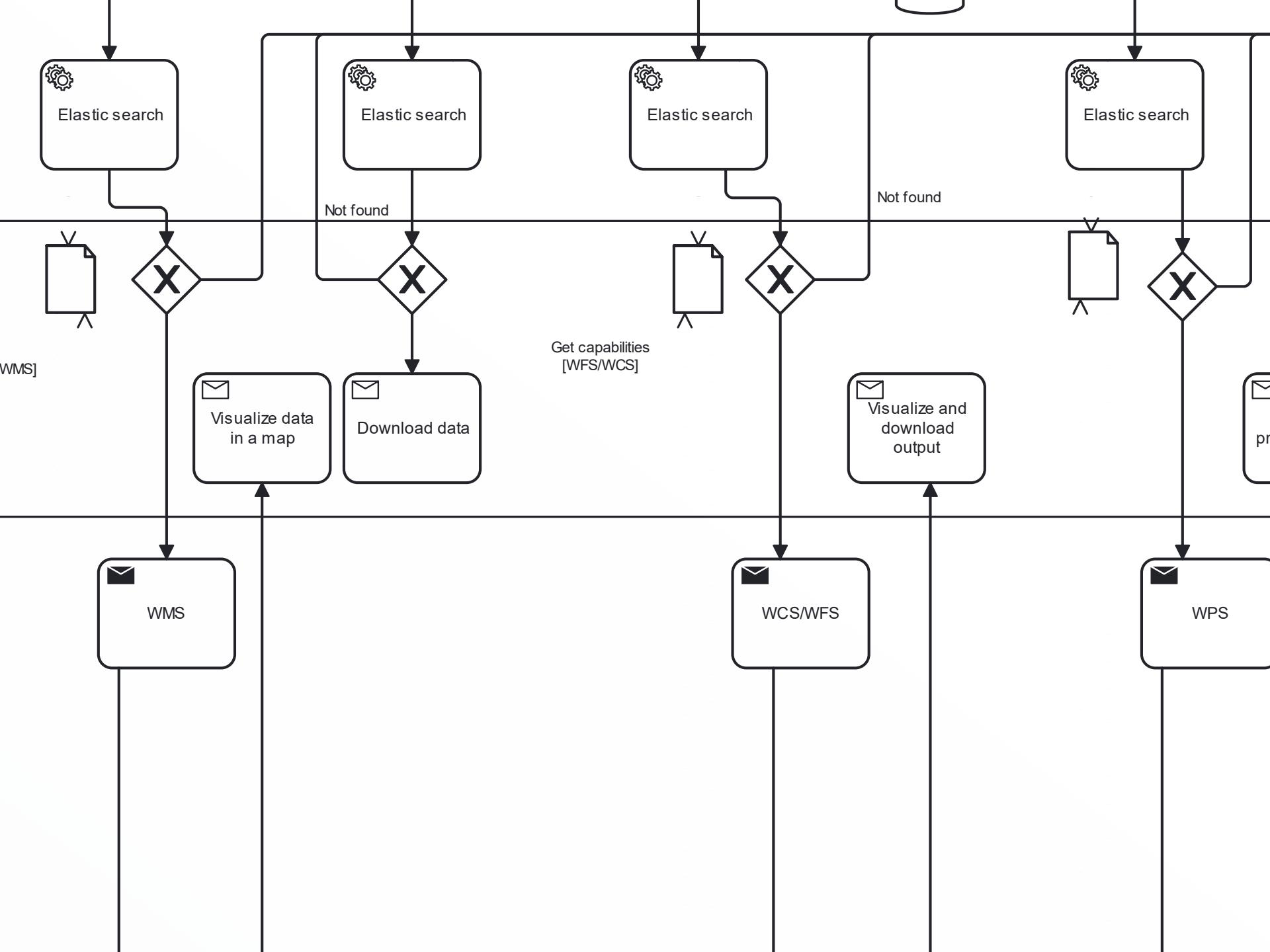


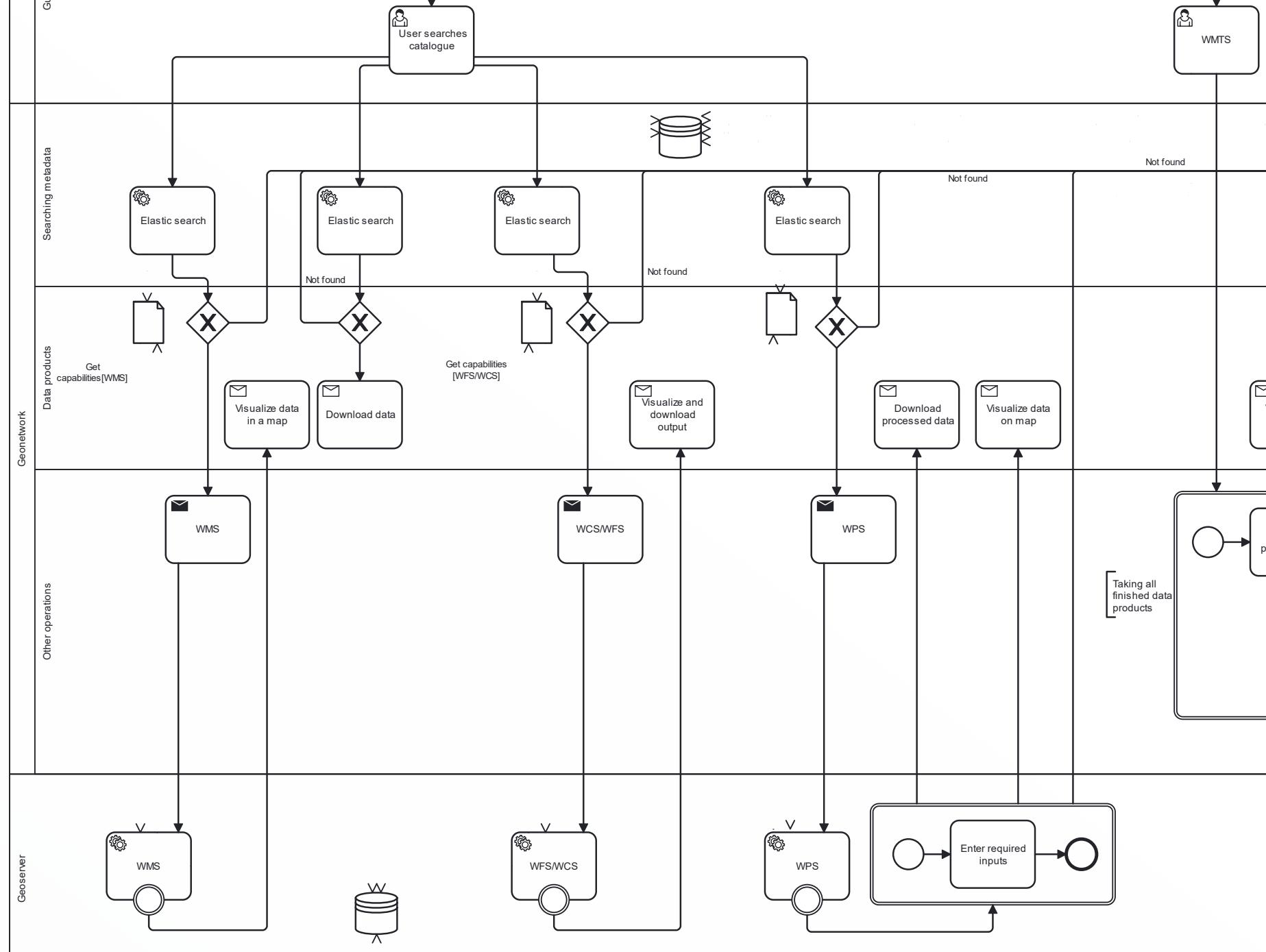
Sections

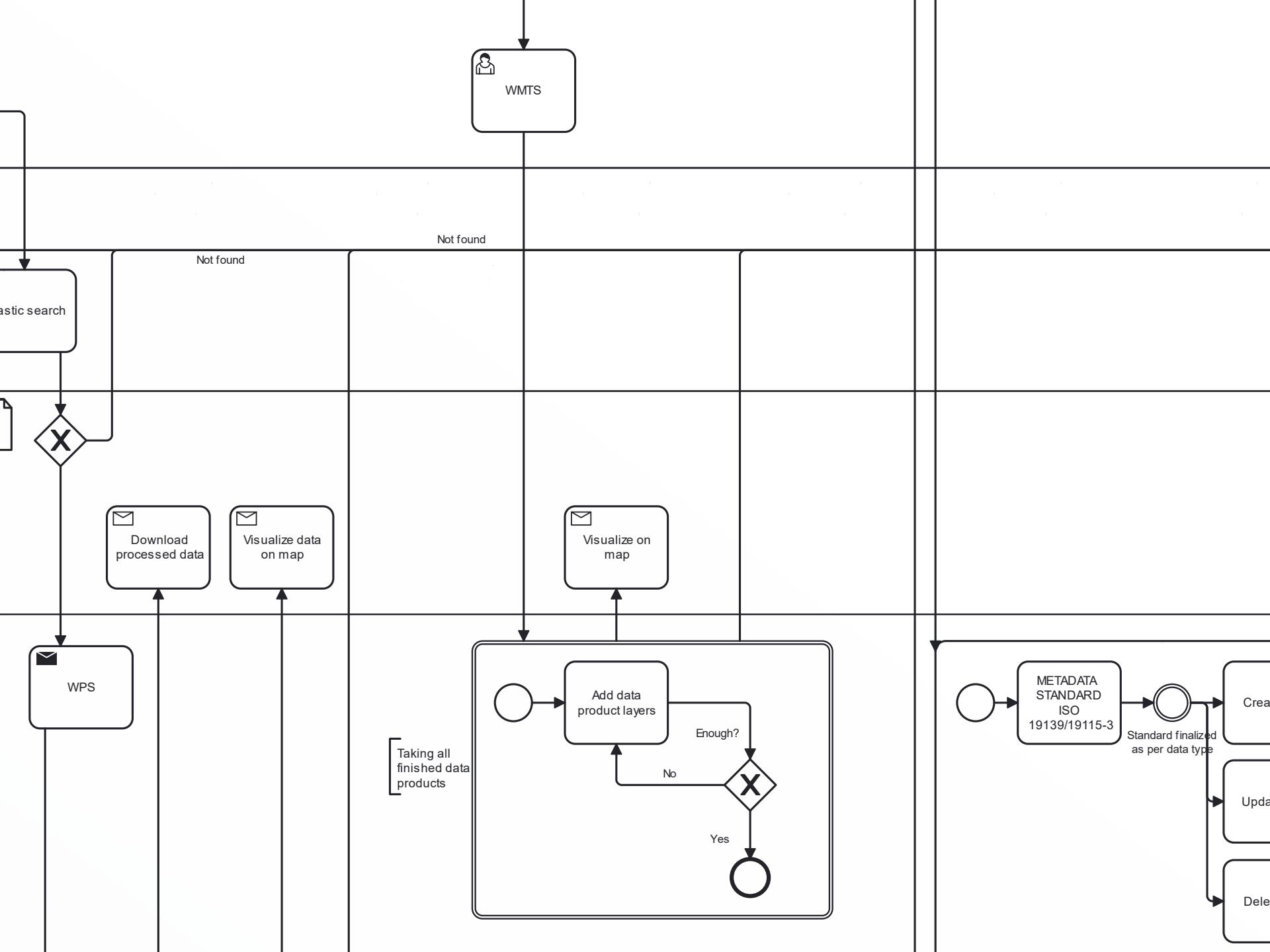
User access, Geonetwork, Geoserver

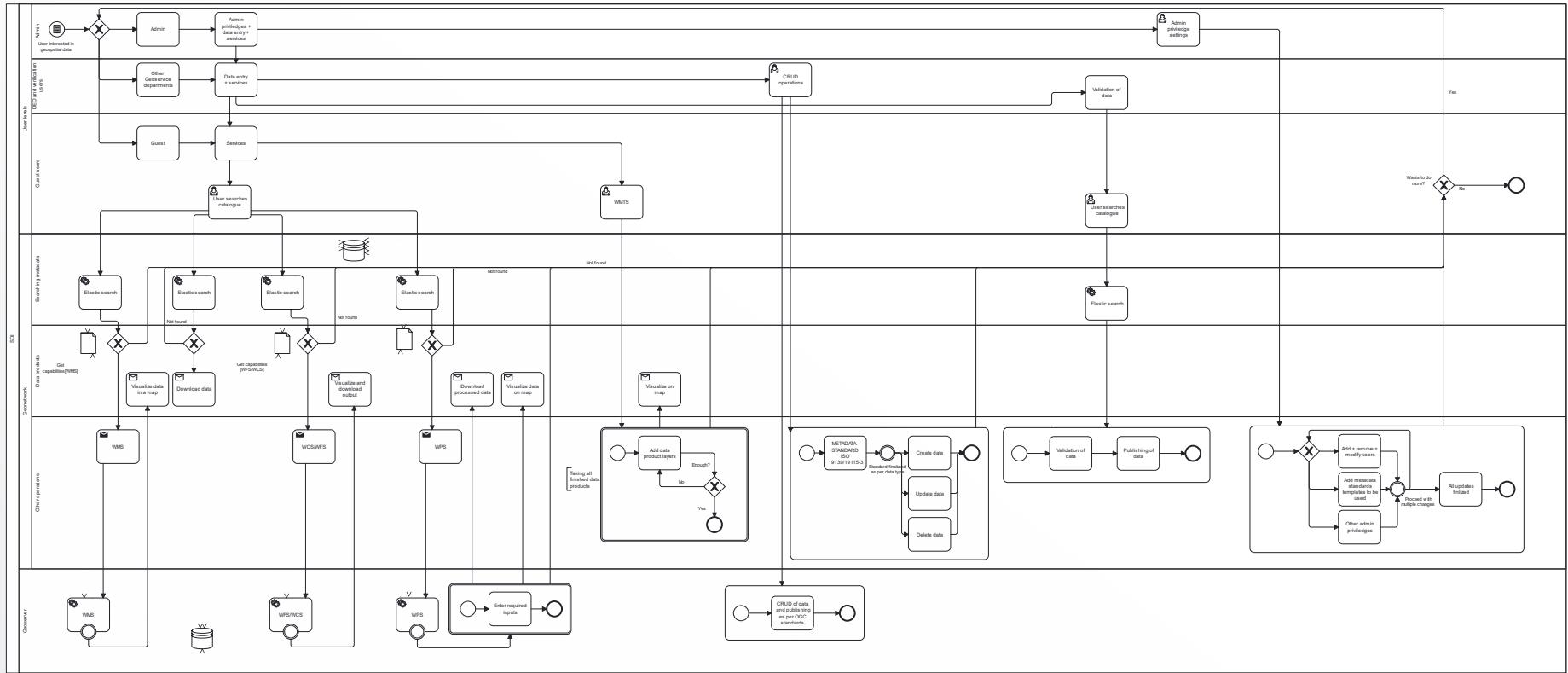


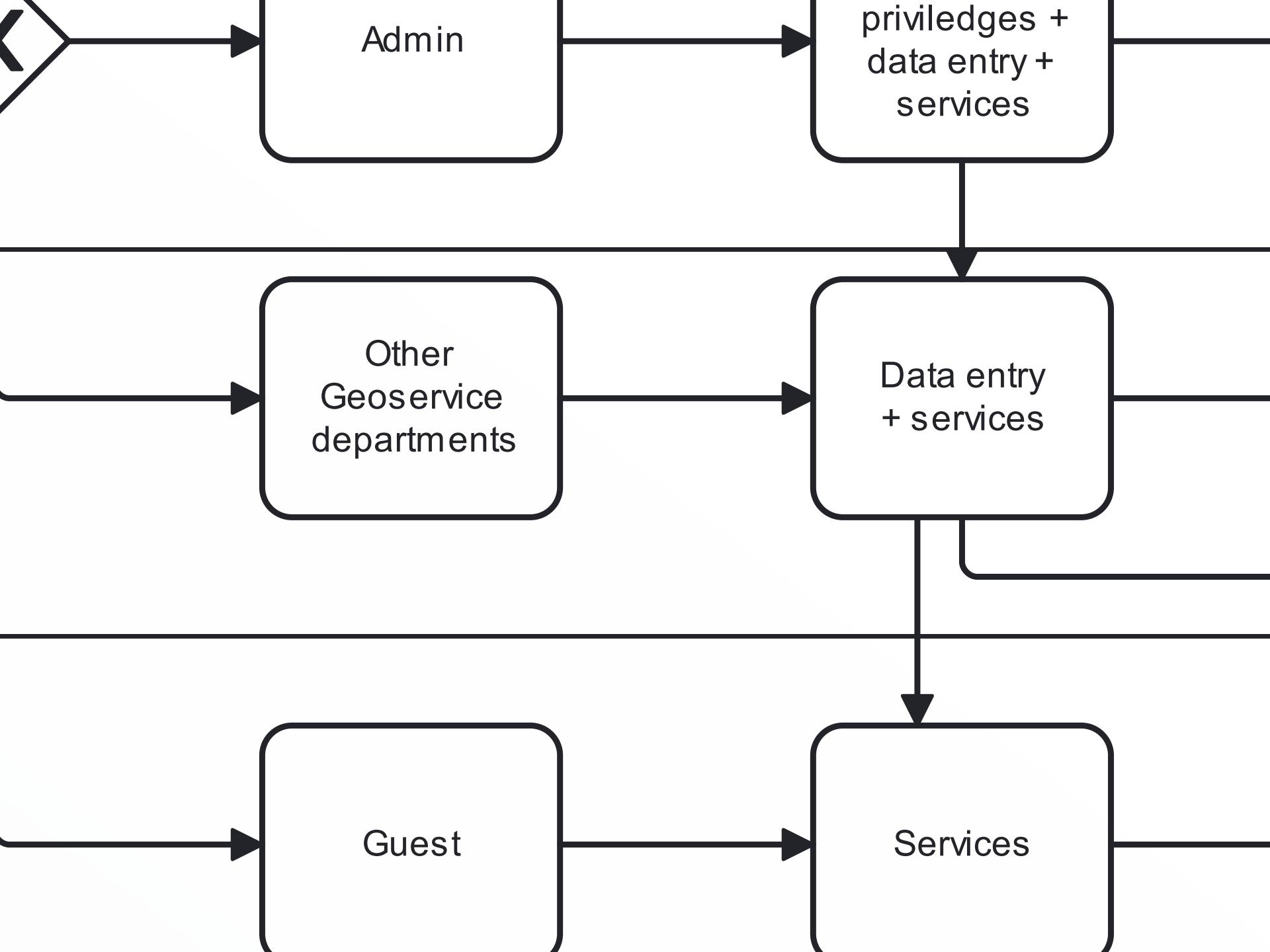


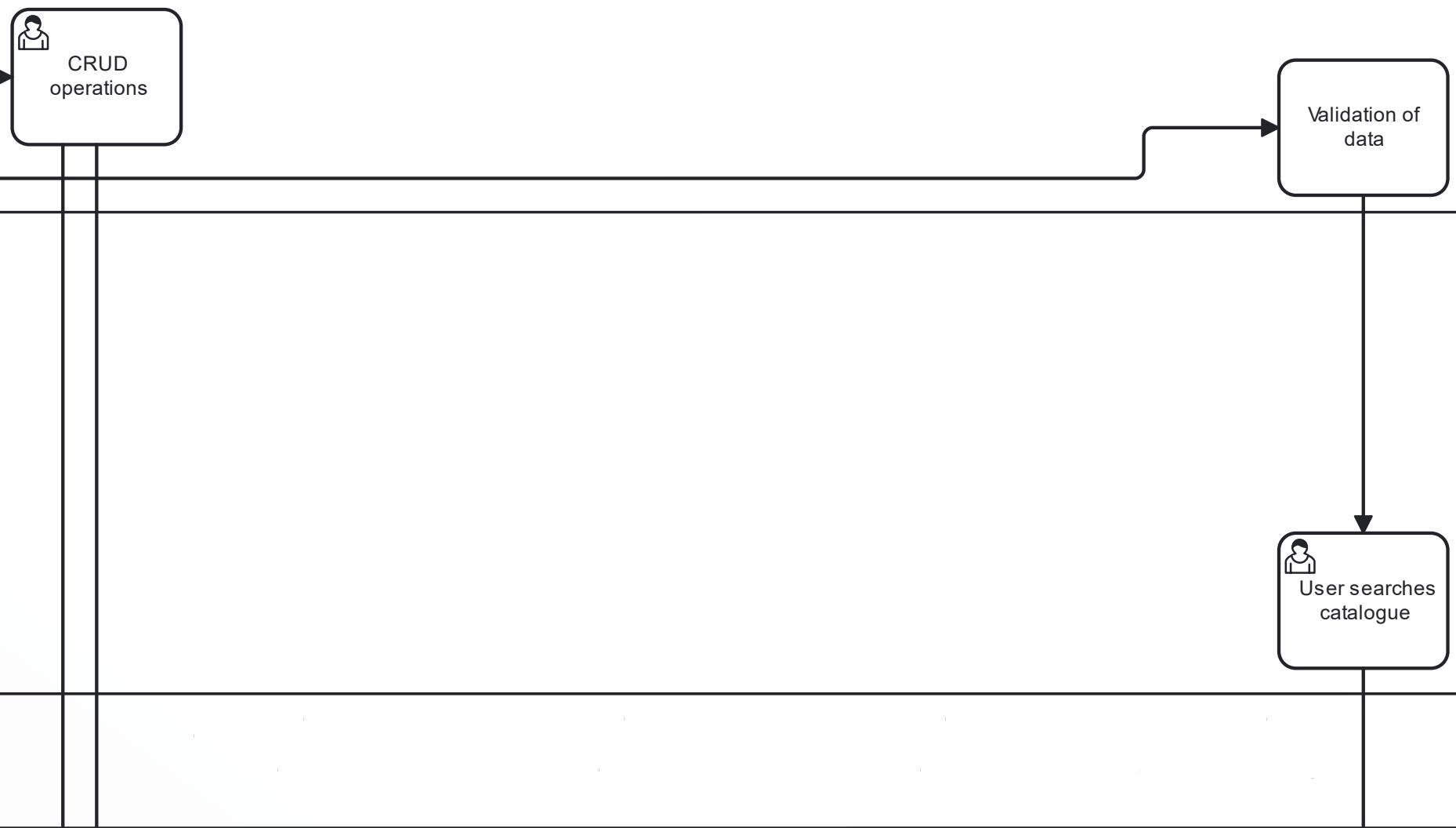


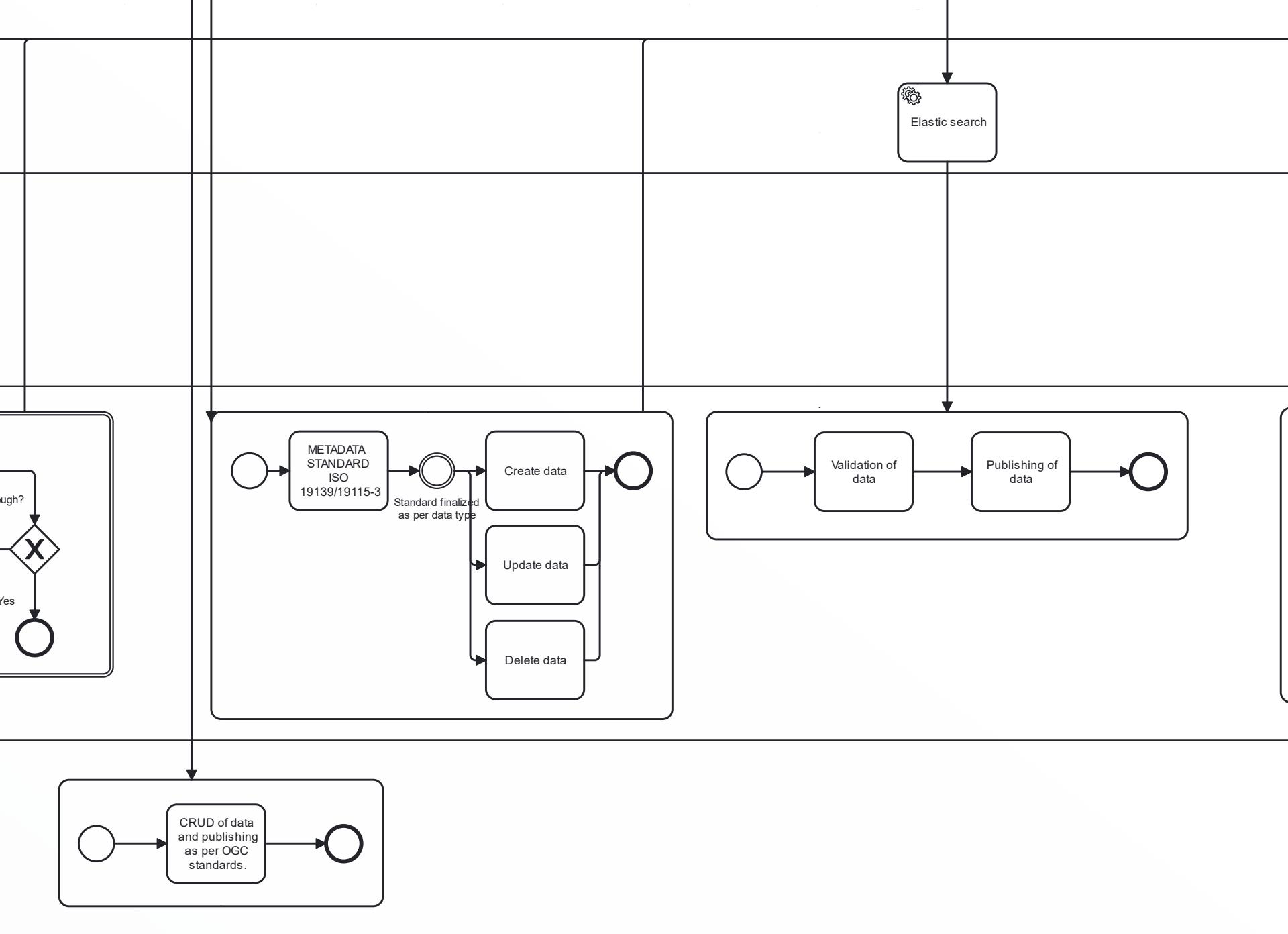


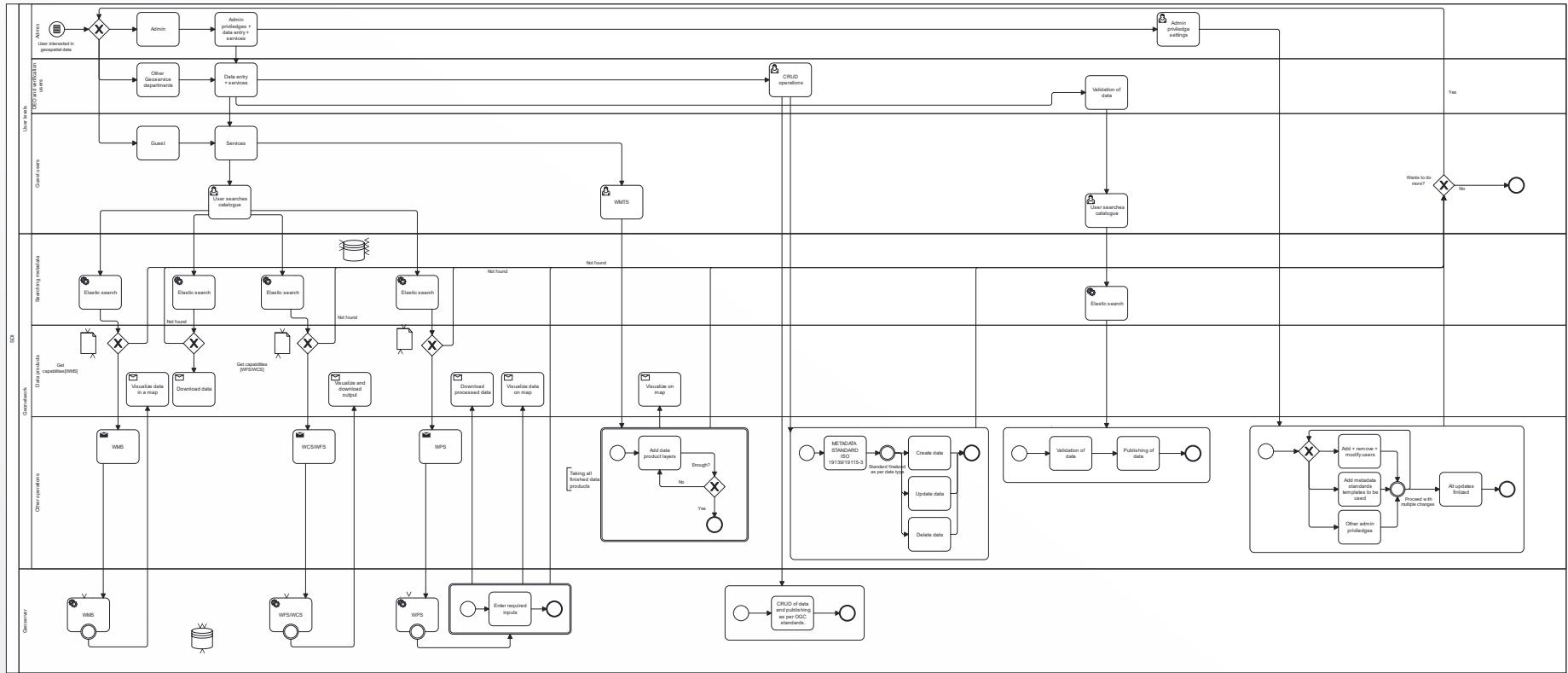


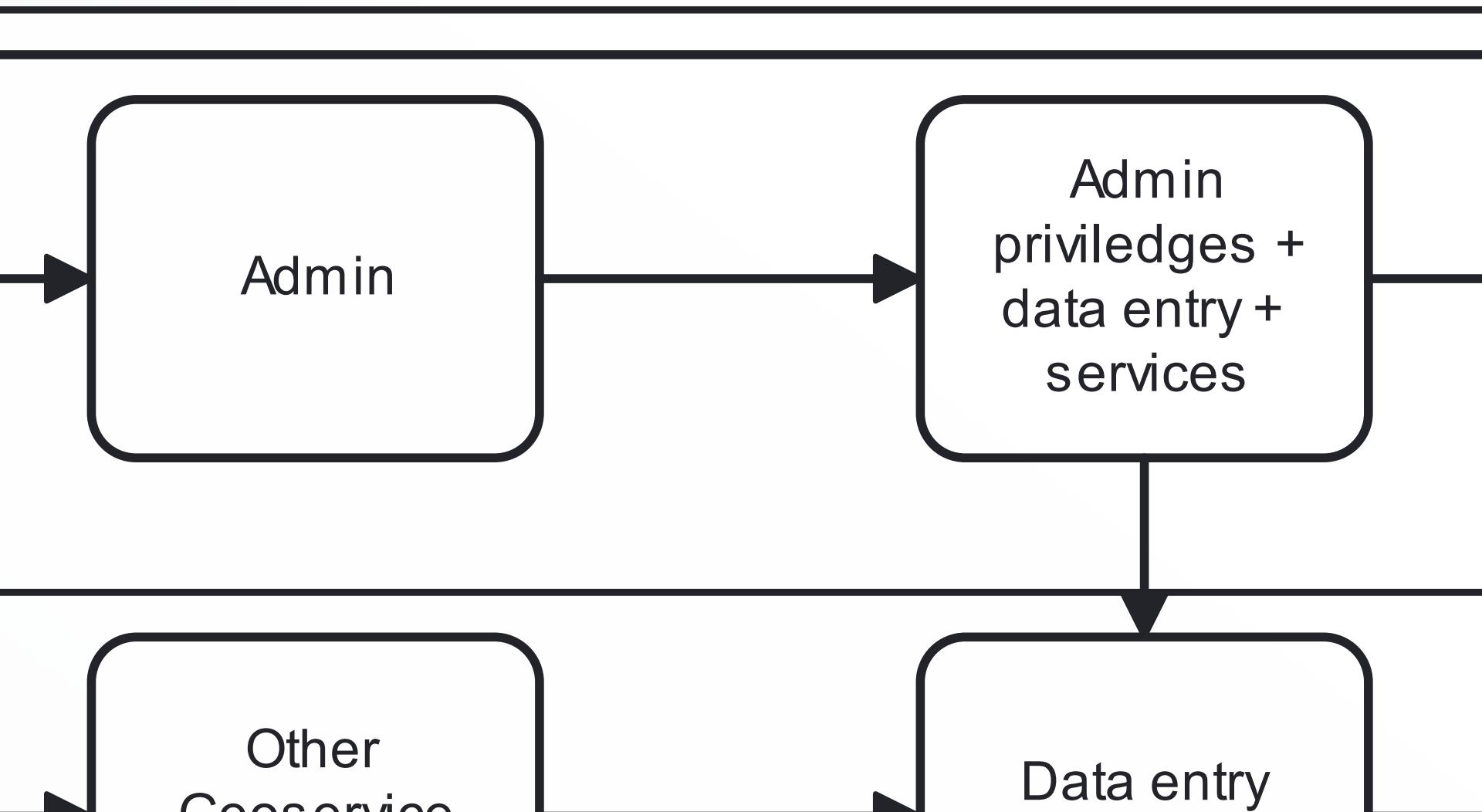






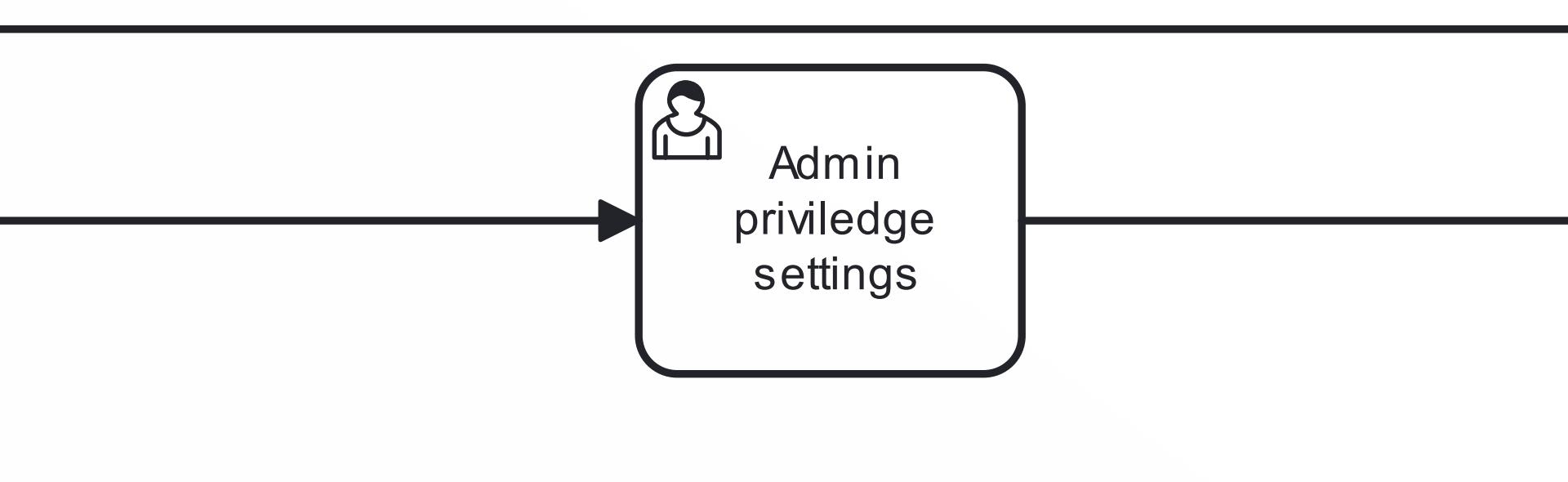


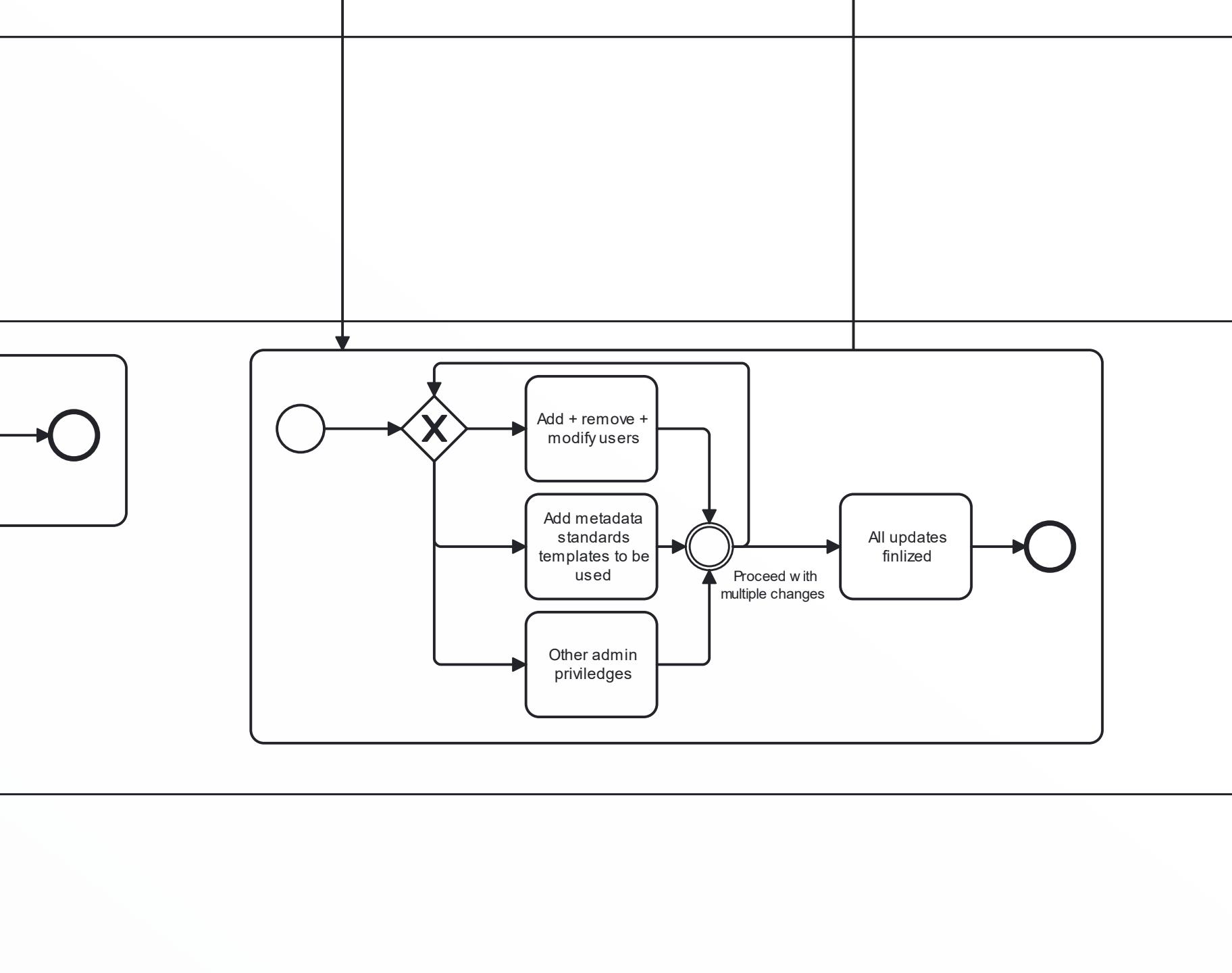


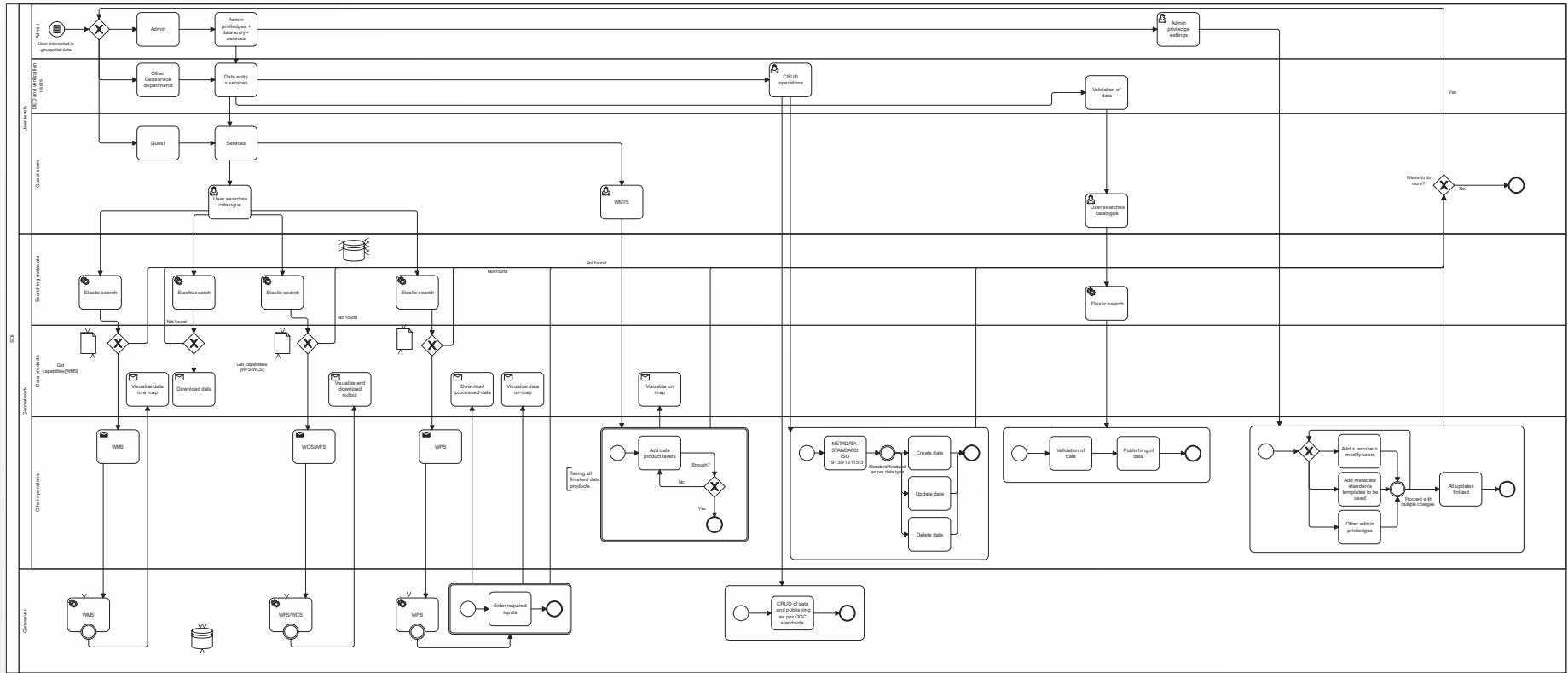




Admin
priviledge
settings









Methodology 4



SDI installation

It describes the ways in which the SDI is installed



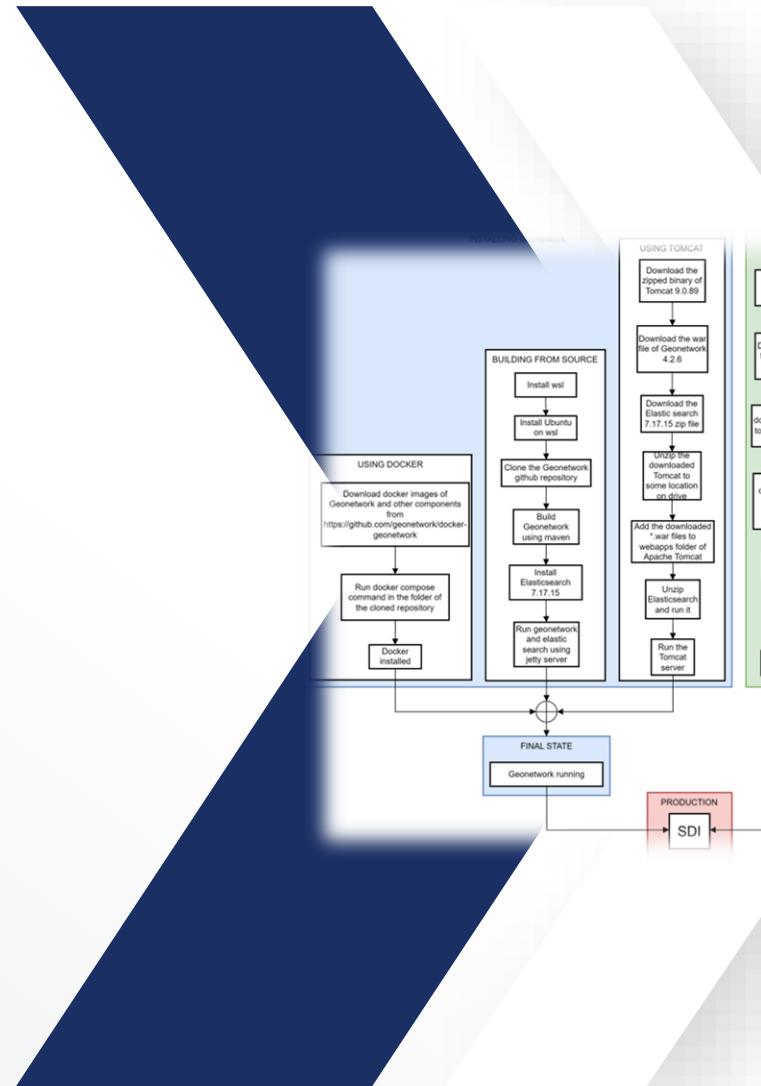
Geonetwork

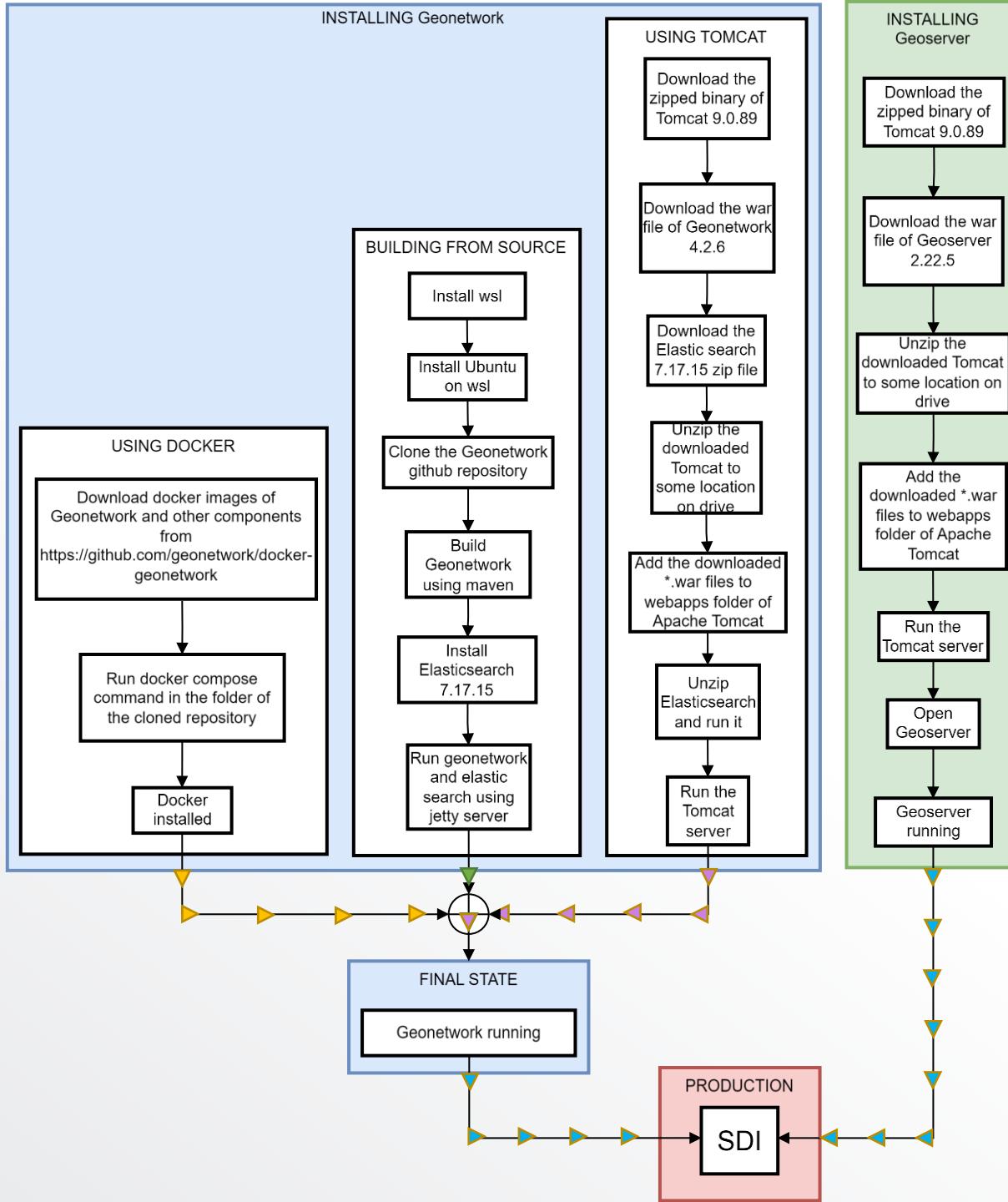
Installing Geonetwork by three process



Geoserver

Installing Geoserver by one process





5

Result and discussion

The results are discussed here



Part five



Metadata

Geospatial metadata standard

Metadata data standards are ISO 19115, FGDC(Federal Geographic Data Committee) and the International Standard Dublin core



ISO 19115

The most accepted International standard.



ISO 19139

XML schema of 19115. It provides WMS only.



ISO 19115-3

We have used this standard as it clubs all OGC standards.





Result 1

Browse by

INSPIRE themes Topic

Type of resources

Dataset Service

3 1

Directory of spatial files — Geo WCS reference — GeoServer 2...

admin admin Your session will expire in 1 hour.

Administrator

3 Results < >

Resource	Description	Status
Dehradun Village Boundary Shapefile	The shapefile of the Village boundaries in Dehradun District	IIRS Completed
Shapefile		IIRS On going

SEARCH RESULT IN GEONETWORK

It displays the image thumbnails

The result is based on the user access levels.

On clicking the search results more options of OGC come up.

Browse by

INSPIRE themes

Topic

Type of resources



Dataset

3



Service

1



Result 1

Browse by

INSPIRE themes Topic

Type of resources

Dataset Service

3 1

Directory of spatial files — Geo WCS reference — GeoServer 2... | +

IIRS Admission Portal F SSP NEET G-meet Gemini Z Zoom K India Open Tickets J... information

admin admin ADMINISTRATOR Your session will expire in 1 hour

3 Results < >

Dehradun Village Boundary Shapefile

The shapefile of the Village boundaries in Dehradun District

IIRS Completed

IIRS On going

SEARCH RESULT IN GEONETWORK

It displays the image thumbnails

The result is based on the user access levels.

On clicking the search results more options of OGC come up.

x | How do I move a file in Python? x | Directory of spatial files — Geo... x | WCS reference — GeoServer 2.2 x | +

log.search#/search

F W G D P S IIRS Admission Portal F SSP NEET G-meet Gemini Zoom India Open Tickets ... information theory... All Bookmarks

tap Contribute Admin console admin admin ADMINISTRATOR Your session will expire in 94s. Save your work! English

Search ... x Q

Sorted by relevancy

DEM Data for Dehradun District

Digital Elevation Model of Dehradun produced by Shuttle Radar Topography Mission, 30m resolution

IIRS

Completed

Dehradun Village Boundary Shapefile

The shapefile of the Village boundaries in Dehradun District

IIRS

Completed

Shapefiles related to Dehradun

Shapefiles that have importance to the context of Dehradun. There are multiple shapefiles available, including LULC classes, Roads, building footprints etc for Dehradun.

IIRS

On going



Browse by

INSPIRE themes Topic

Type of resources

Dataset Service

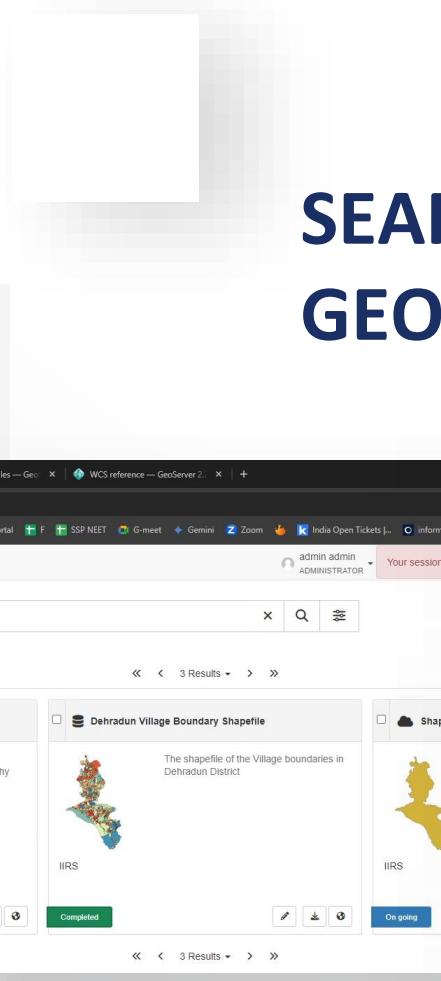
3 1

Dehradun Village Boundary Shapefile

The shapefile of the Village boundaries in Dehradun District

IIRS IIRS

Completed On going



SEARCH RESULT IN GEONETWORK

It displays the image thumbnails

The result is based on the user access levels.

On clicking the search results more options of OGC come up.



Results 2



It is used to store data.



View and edit geospatial data.

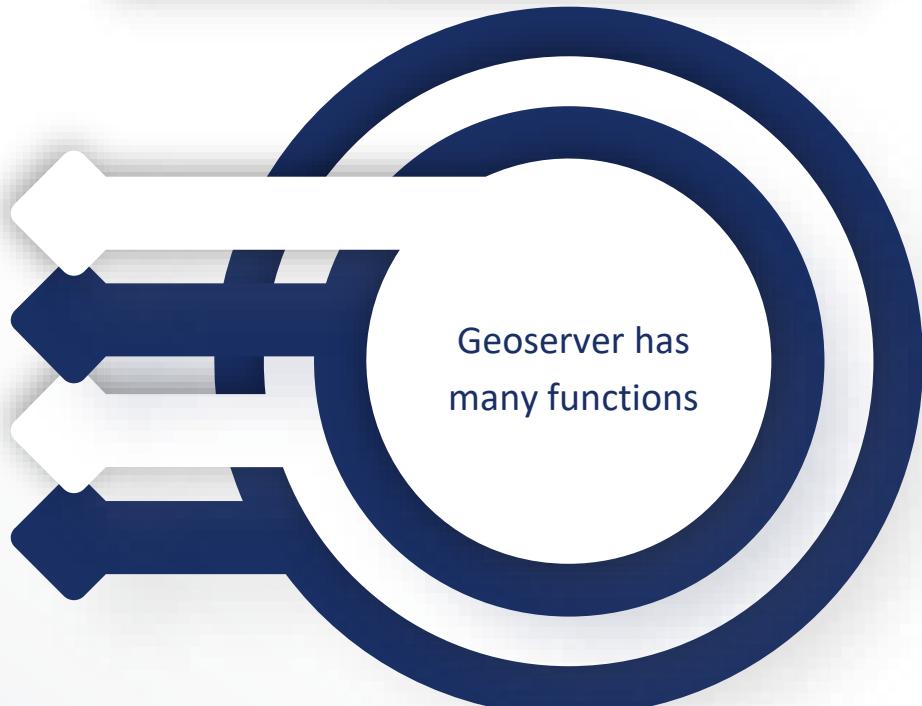


We can create all the OGC services and link them.



It gives REST API.

Geoserver



Geoserver has
many functions



Result 2

Geospatial data

All contents uploaded in
Geoserver are listed below

Vector data

Formats added are shapefiles

Raster data

Formats added are geoTIFF



Logged in as admin.

Layer Preview

List of all layers configured in GeoServer and provides previews in various formats for each.

<< << 1 2 >> >> Results 1 to 25 (out of 49 items)

Search

Type	Title	Name	Common Formats	All Formats
	DDN_raster	DDNRaster:DDN_raster	OpenLayers KML	AtomPub GIF GeoRSS GeoTiff GeoTiff 8-bits JPEG JPEG-PNG JPEG-PNG8 KML (compressed) KML (network link) KML (plain) OpenLayers OpenLayers 2 OpenLayers 3 PDF PNG PNG 8-bit SVG Tiff Tiff 8-bits
	Dehra area religious	DDN:Dehra area religious	OpenLayers GML KML	
	Dehra build	DDN:Dehra build	OpenLayers GML KML	
	Dehra bus station	DDN:Dehra bus station	OpenLayers GML KML	
	Dehra habi	DDN:Dehra habi	OpenLayers GML KML	
	Dehra lulc	DDN:Dehra lulc	OpenLayers GML KML	
	Dehra parking	DDN:Dehra parking	OpenLayers GML KML	
	Dehra point village	DDN:Dehra point village	OpenLayers GML KML	
	Dehra road	DDN:Dehra road	OpenLayers GML KML	
	Dehra traffic signal	DDN:Dehra traffic signal	OpenLayers GML KML	
	Dehra water	DDN:Dehra water	OpenLayers GML KML	
	Dehra waterways	DDN:Dehra waterways	OpenLayers GML KML	
	dehra area amenities	DDN:dehra area amenities	OpenLayers GML KML	
	dehra districts	DDN:dehra districts	OpenLayers GML KML	
	dehra peak	DDN:dehra peak	OpenLayers GML KML	
	dehra point religious	DDN:dehra point religious	OpenLayers GML KML	
	dehra point service	DDN:dehra point service	OpenLayers GML KML	
	dehra rail	DDN:dehra rail	OpenLayers GML KML	



Result 3

WMS

Web map service or WMS serves geospatial images that are georeferenced. Some formats are given here

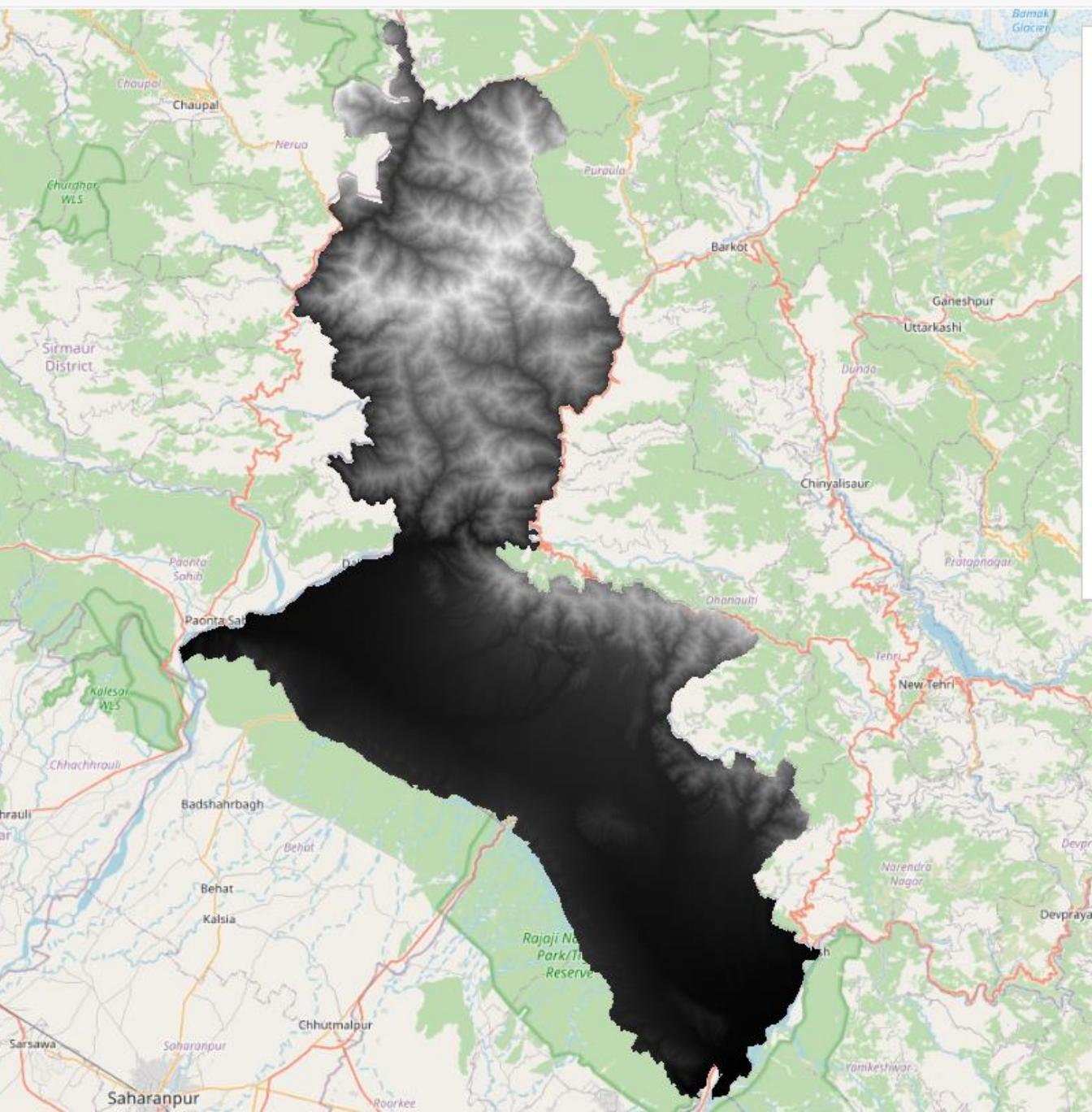
JPEG

GIF

PNG

PDF

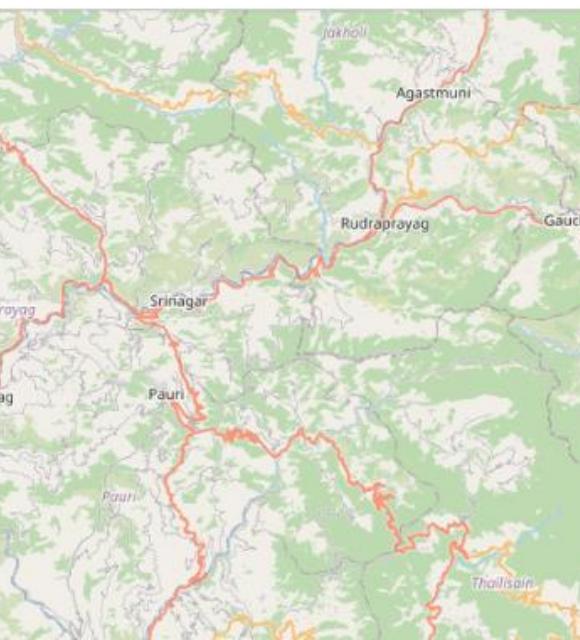




Manage layers

- DEM SRTM 30
- Dehra area religious

[Default map](#)





Result 3

WFS and WCS



WFS

Web Feature service for vectors.



WCS

Web coverage service for rasters.

Download

 WFS	DDN:Dehra area religious Dehra area religious Choose a data format to download: Download DDN:Dehra area religious ▾
 WFS	DDN:Dehra build Dehra build Choose a data format to download: Download DDN:Dehra build ▾
 WFS	DDN:Dehra lulc Dehra lulc Choose a data format to download: Download DDN:Dehra lulc ▾
 WFS	DDN:Dehra road Dehra road Choose a data format to download: Download DDN:Dehra road ▾

API

DDN

WMS

Download

DDN:Dehra area religious

Dehra area religious

Choose a data format to download:

[Download DDN:Dehra area religious ▾](#)

DDN:Dehra build

Dehra build

Choose a data format to download:

[Download DDN:Dehra build ▾](#)

DDN:Dehra lulc

Dehra lulc

Choose a data format to download:

[Download DDN:Dehra lulc ▾](#)

DDN:Dehra road

Dehra road

Choose a data format to download:

[Download DDN:Dehra road ▾](#)

Download

WCS DDNRaster:DDN_raster DDN_raster

Publication 12-06-2024 Place World Language English Coordinate reference system WGS 1984

Update frequency As needed Theme Dehradun Raster Categories Other information resources

Add to map

Location

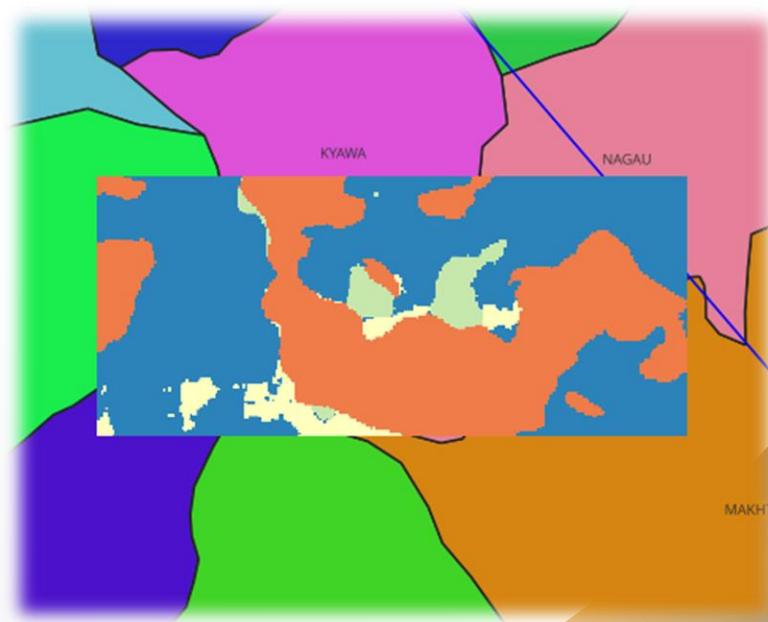
You can download the data by clicking and save it in your system.

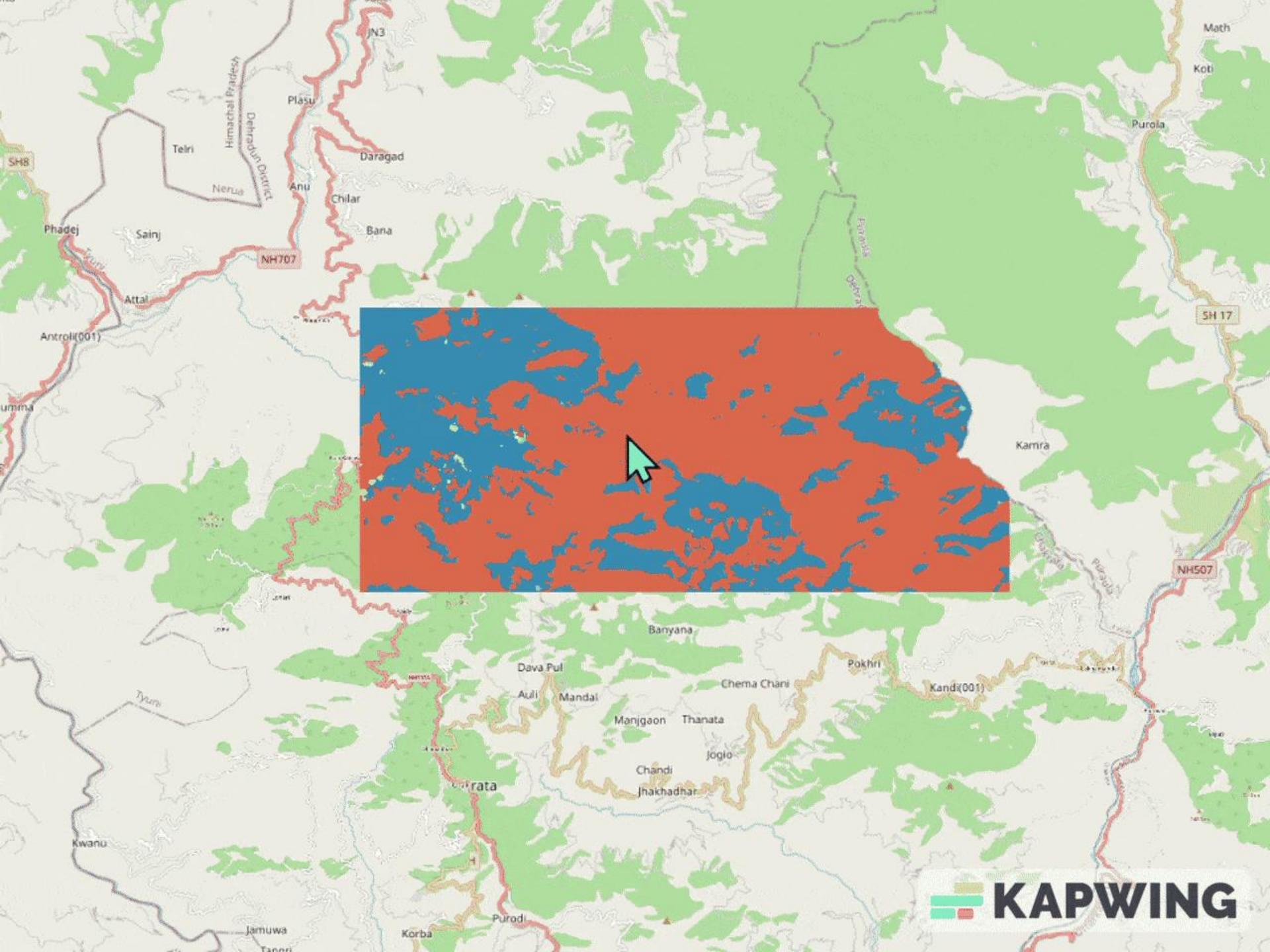


Result 4

WMTS

Web Map Tile Service is a tiling service designed by OGC standards that creates pyramid layers for the rendered image. We can see a lulc pyramid tile by side.







Result 5

Interoperability



Tile 1
Base OSM



OSM is the default base layer.



WMS 2
Raster



We have used the SRTM 30m DEM image



WMS 3
Vector



We have put Dehradun LULC shape file image.



WMS 4
Vector



Dehradun hydroshed river network shapefile image.

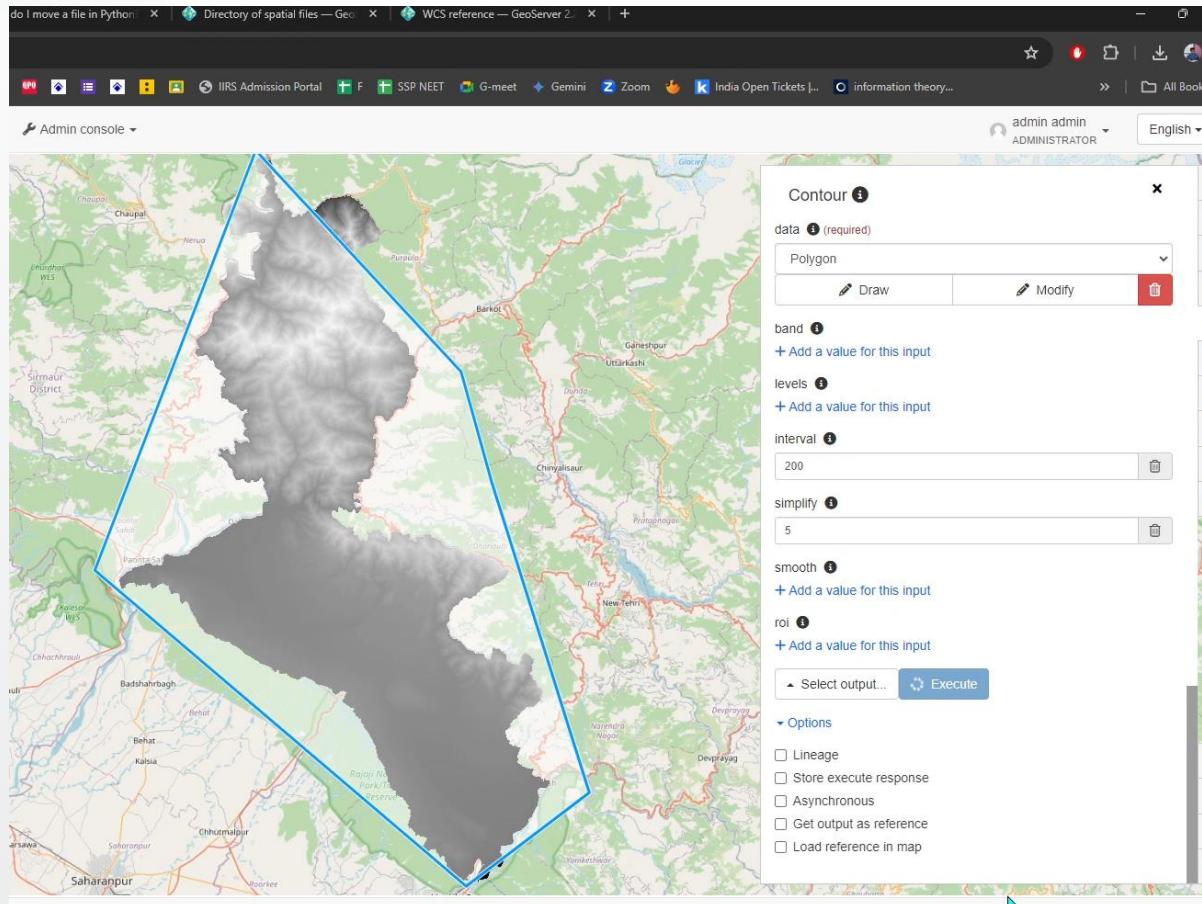


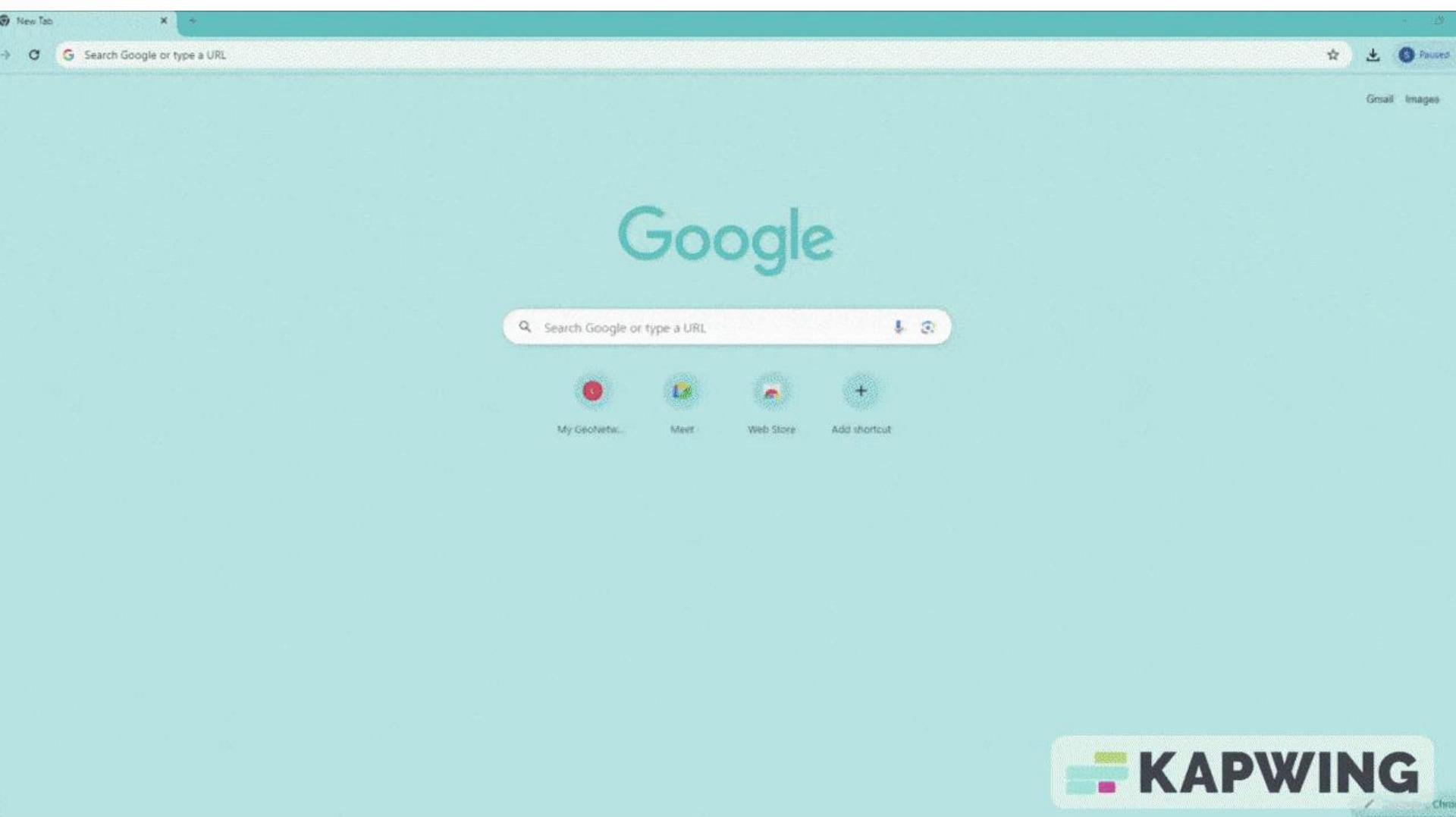


Result 6

WPS

Web Processing Service provides some geoprocess as a web service.





6

Acknowledgement

Lets acknowledge the benefactors



Part six



Acknowledgements

Mr. Kapil Oberoi

Scientist SF for constant guidance on everything.



Avijnan Das

M.Tech. MASD for data.



Nilkamal Konra

M.Tech. ASD for data



Prajakta Mali

M.Tech.URSD for Turnitin plagiarism report.



Dr Kamal Pandey

Scientist SE for technological exploration



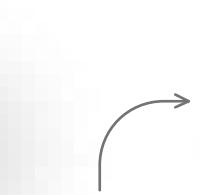
Parthiv Narayan

M.Tech. FED for data.



Nilay Dey

M.Tech WRD for data



7

Contributions

Both of us have worked tirelessly...



Part seven



Contribution



Contribution	Percentage Contribution (approx.)	
	Advaith	Sudikin
Literature Review	40	60
Technology Exploration	60	40
Studying Metadata	40	60
UML Diagram	40	60
Data Exploration	60	40
BPMN Diagram	60	40
Software Exploration	60	40
Data Collection	40	60
Data Entry	60	40
Report Writing	50	50
Presentation Creation	40	60
Testing	50	50



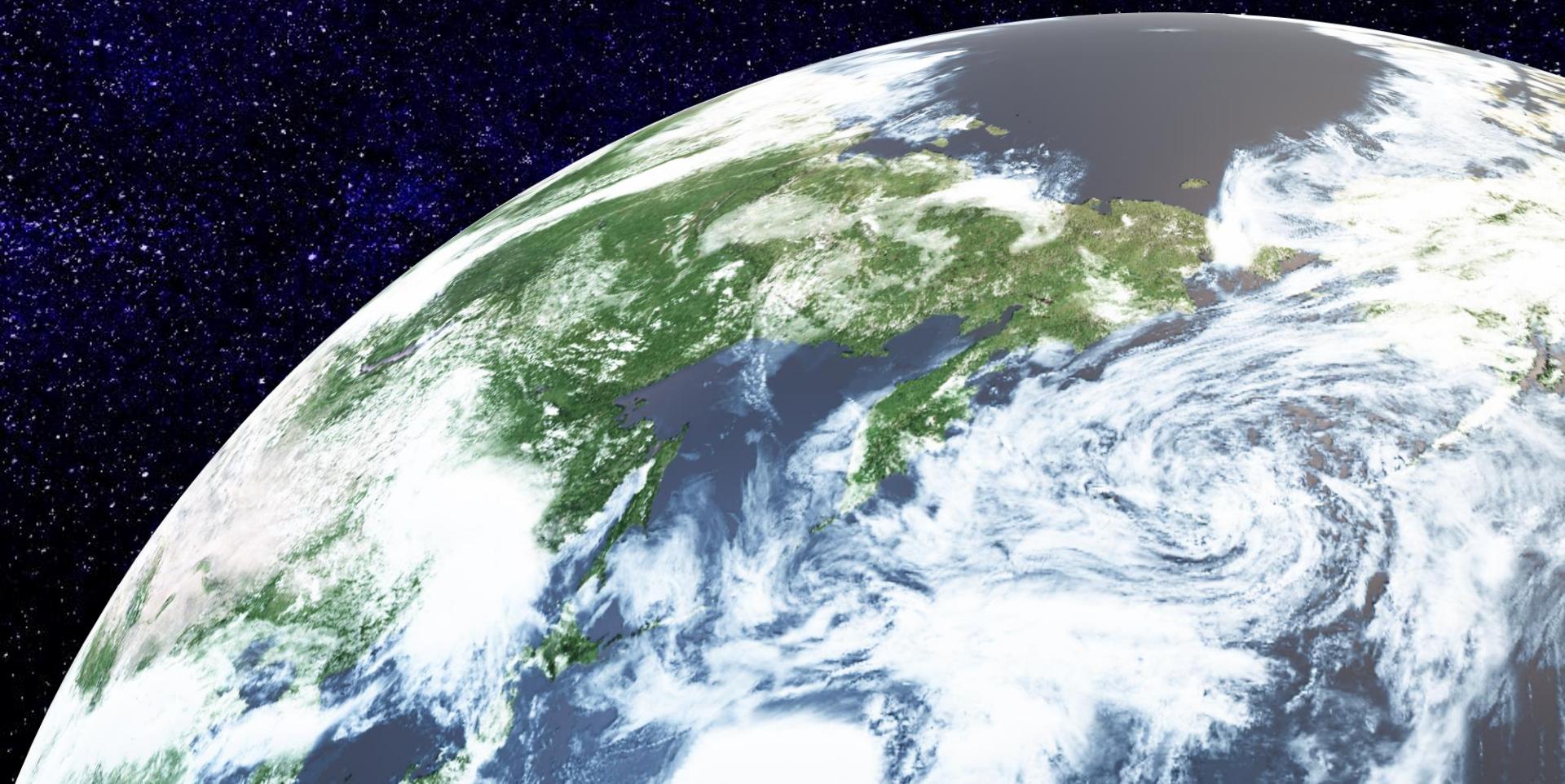
The image shows a full view of Earth from space. The planet is tilted slightly, revealing its blue oceans, green continents, and white clouds. It is set against a dark, star-filled background.

So, any questions?

A detailed satellite image of Earth, centered on the continent of Africa. The image shows the African continent in its entirety, along with parts of Europe, Asia, and the Atlantic and Indian Oceans. The landmasses are depicted in various shades of brown, green, and blue, representing different vegetation types and terrain. The oceans are a deep blue, with white and light blue areas indicating cloud cover and wave patterns. The image is set against a dark, star-filled background of space.

Ask away

Its time for some
Q and A



THANK YOU