Open Source GIS

Opportunities Abound

About Me

- Jacob Mark
- Intern, Geographic Information Office
- Why am I here?

Contents

- Defining Open Source
- Widening Use

5 minute Break

- FOSS4G
- GIS Platforms
- First Steps

- **Defining Open Source**
- Widening Use
- FOSS4G
- GIS Tasks with Open Source
- First Steps

What is Proprietary Software?

- All Software Dev → problem-solving
- **Goal**: Make Money → Selling Licenses
- **How**: differentiation + restrictions of redistribution
- Vendors call the shots
- limited transparency – “black box”
- **Continuity:** Trust and reputation → brand quality

License Agreement Cartoon

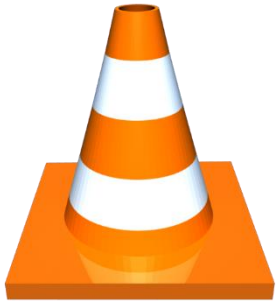
What is Free & Open Source Software?

- **GOAL**: stable software that solves problems
- Users call the shots

  → Needs of user (customer) take priority
- Transparency → improvement & customization
- **Continuity:** Intrinsic Motivation

COPYING – short cartoon

Familiar Software



7zip

VirtualBox

redhat

$2 Billion A Year revenue

THE APACHE SOFTWARE FOUNDATION

What does “Free” Mean?

Licensing as Key to Open Source

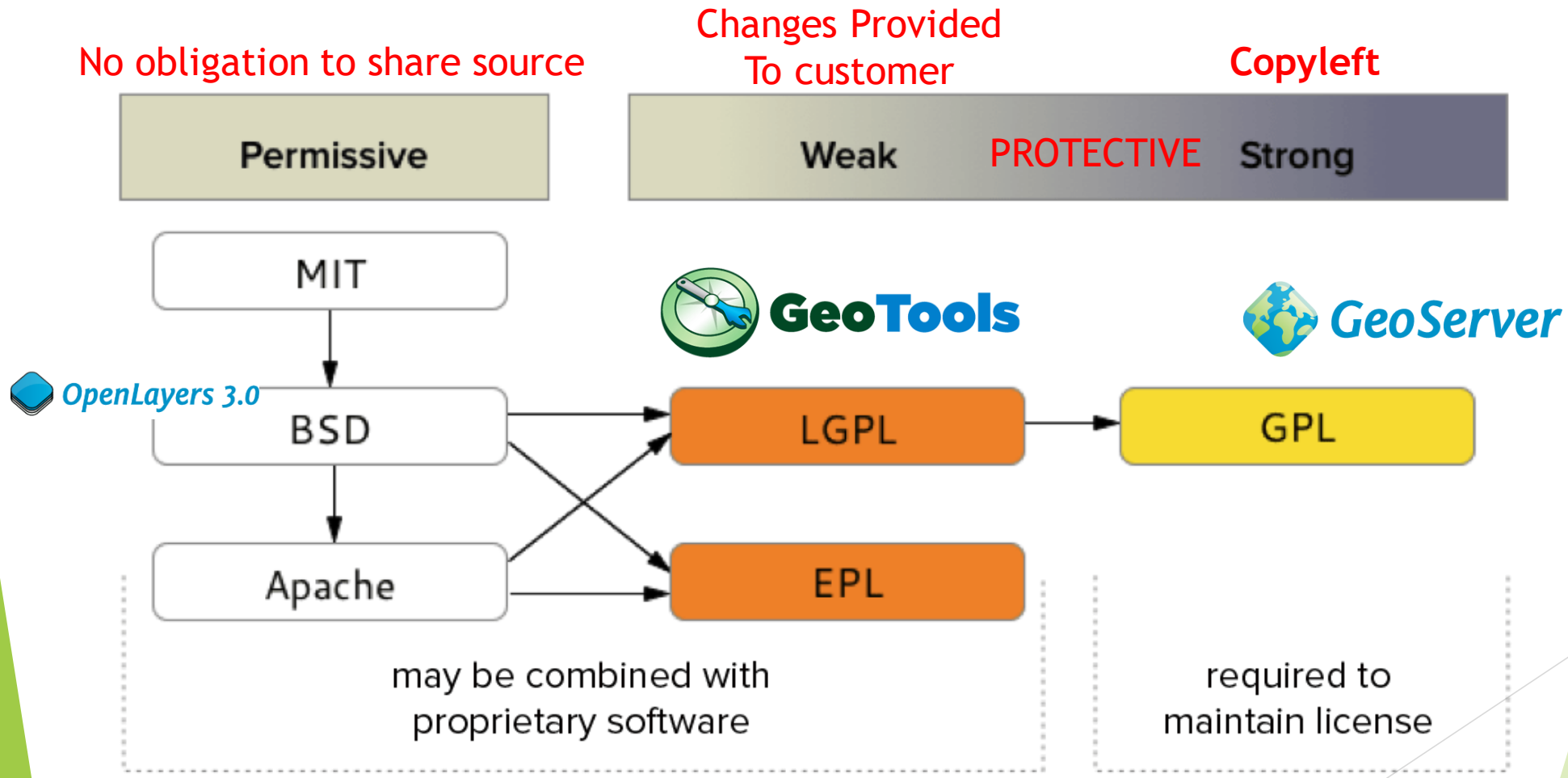
Open Source Software Licensing

License – giving **rights of use** to users

Like Free Speech, not Free Drink

- **FREE** TO STUDY, CUSTOMIZE, TWEAK
- **FREE** TO RUN THE PROGRAM HOWEVER YOU'D LIKE
- **FREE** TO REDISTRIBUTE ORIGINAL OR MODIFIED
- One you have it, you're in **control**.

Open Source Licensing Types

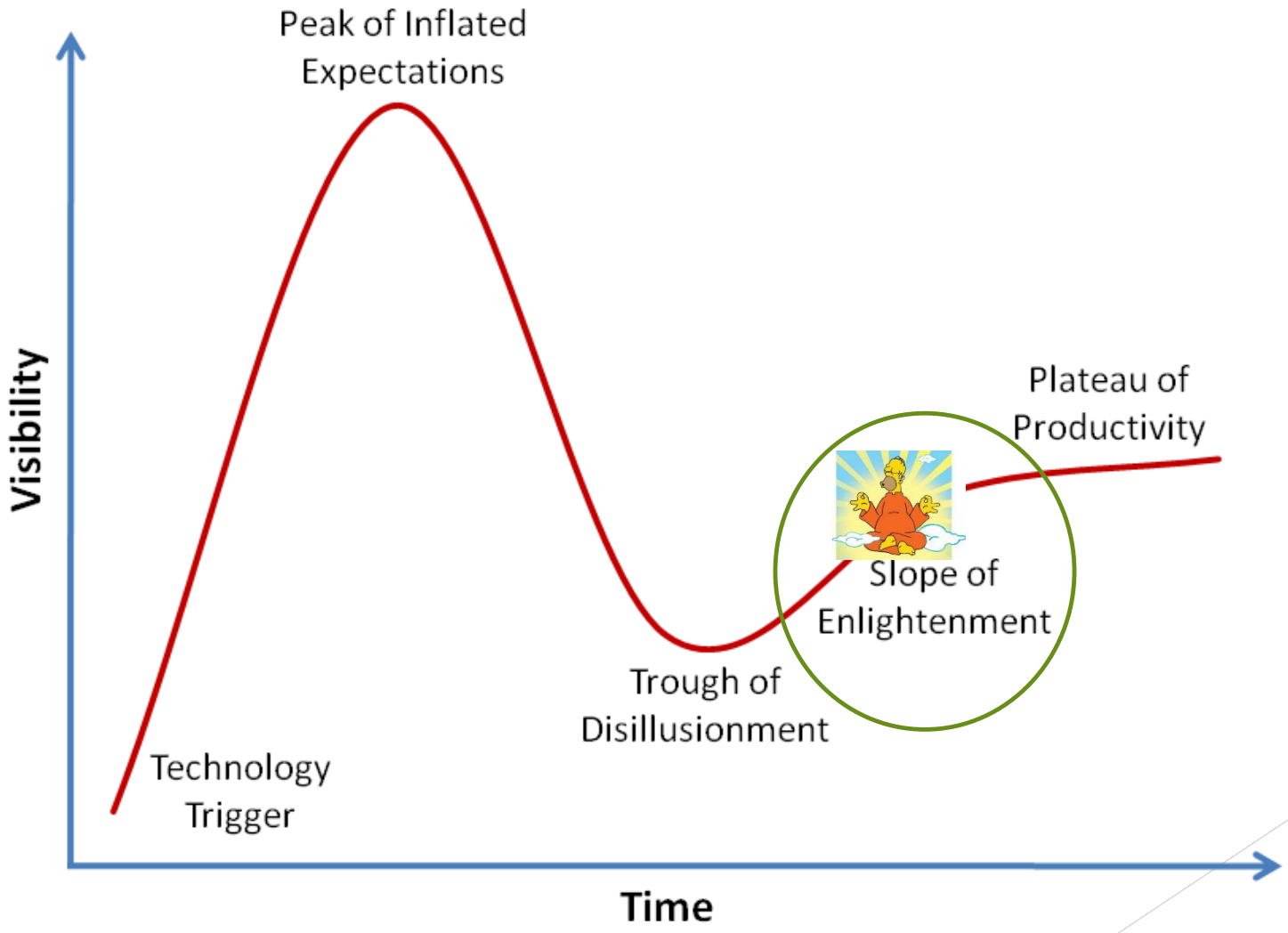


Who Invests in It?

- **Commercial Businesses**
  - Sponsor & Contributors
  - **Where it is directly profitable**
  - Once software is mature
- **Public Administrations**
  - **To prevent vendor lock-in**
  - Development teams; software creation
- **Community-Driven Non-Profit Organizations**
  - Fills the gaps; **can take on risk**

- Defining Open Source
- **Widening Use**
- FOSS4G
- GIS Platforms
- First Steps

Gartner Hype Cycle



Department of Defense code.mil

"CLARIFYING GUIDANCE REGARDING OPEN SOURCE SOFTWARE" (2009)

- "In almost all cases, OSS meets the definition of 'commercial computer software' and shall be given appropriate statutory preference"
- "Since OSS typically does not have a per-seat licensing cost, it can provide a **cost advantage** in situations where many copies of the software may be required, and can **mitigate risk of cost growth** due to licensing in situations where the total number of users may not be known in advance."
- **"ULTIMATELY, THE SOFTWARE THAT BEST MEETS THE NEEDS AND MISSION OF THE DEPARTMENT SHOULD BE USED, REGARDLESS OF WHETHER THE SOFTWARE IS OPEN SOURCE."**

Other Feds

- **OMB: "Technology Neutrality" Jan 2011**
  "In… developing requirements and planning acquisitions for software… agencies should analyze alternatives that include proprietary, open source, and mixed source technologies"
- **DoN**:"DoN commands will treat OSS as COTS [commercial off the shelf] when it meets the definition of a commercial item…

Closer to “Home”

- **Robert Cardillo, Director:**

  “succeeding in open source” = his “bumper sticker”

- **Chris Rasmussen, Public Open Source Software Development Lead**

  “…convert the agency into a more open-source research organization…

  “The reason that we started open-sourcing our tools on GitHub is because we have every interest in growing high-quality software, just like everybody else.” (2015)

New Hampshire – "Live Free or Die" State

HB 418 | Signed by Governor 2012

*I. For **all** software acquisitions, each state agency, in consultation with the department of information technology, shall:*

*(a) Consider whether proprietary **or open source** software offers the most cost effective software solution for the agency, based on consideration of all associated acquisition, support, maintenance, and training costs; …*

(d) Avoid the acquisition of products that do not comply with open standards for **interoperability** or data storage;

Companies Rely On Open Source…

Employee Awards

Microsoft

Former Microsoft CEO (2001) : "Linux is a cancer"

Current Microsoft CEO (2014): "Microsoft Loves Linux"

2016 – announced it is joining forces with Linux

Why? … cloud-based trends

(A Linux world – clouds, supercomputers, servers)

Goldman Sachs

- *Don Duet*, Head of Technology Division

  "Open source has really dramatically changed in the last several years… open source is now fully permeated in just about everything that we do from a technology perspective."

- Consider open-source products first when evaluating new technologies

- Director of Software Development at Amazon Web Services: “We view open source as a companion to AWS's business model”
- But **Poor** code sharing history

facebook

- Github = **350** projects
- Provides code on business operations
- *James Pierce, Open Source Chief*: "we only open source **the projects that we're using in production**….

  It allows us to innovate faster …

  it allows us to recruit and retain talented engineers …

  and it helps accelerate the industry as a whole.
- **PHILOSOPHY: Develop Product →Open Code → Others Use → Users improve → Better Product**

2011 Survey (451 Group)

- 450 executives from both IT organizations and vendors that create software
- 56% - more than half of all software purchases made in the next five years will be based on open source projects

Which means that in 2017…

- elimination of vendor lock-ins and increased flexibility were just as important drivers for open source adoption as cost

2016 - The Tenth Annual Future of Open Source Survey

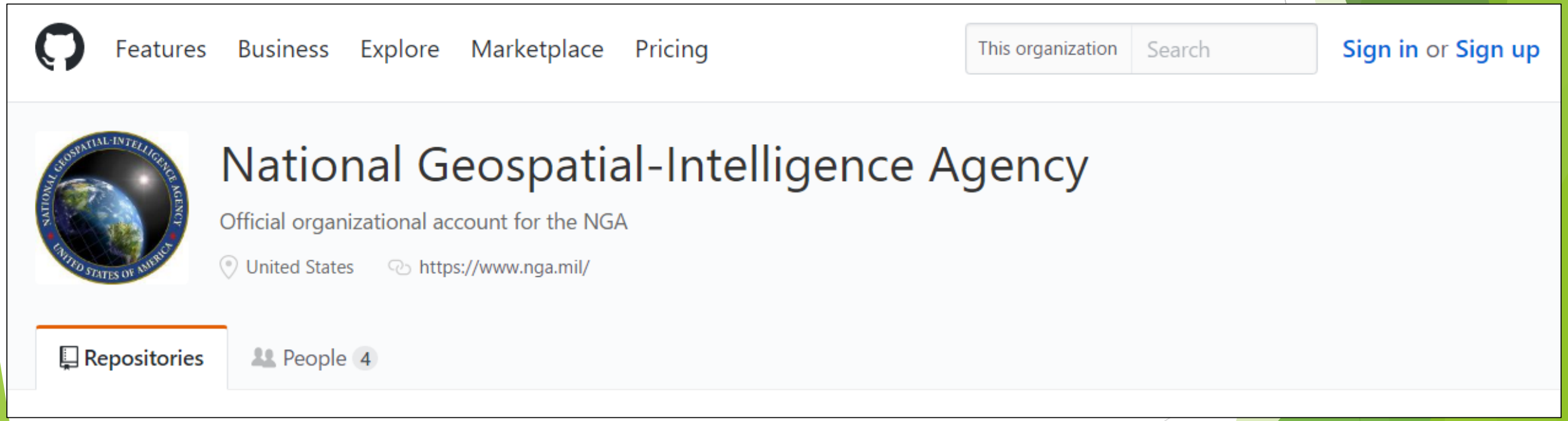
- Black Duck - 1,300 respondents
- 90% rely on open source for improved efficiency, innovation, and interoperability
- 65% of companies contribute to projects.
- 59 %participate to gain competitive edge.

Is it safe?

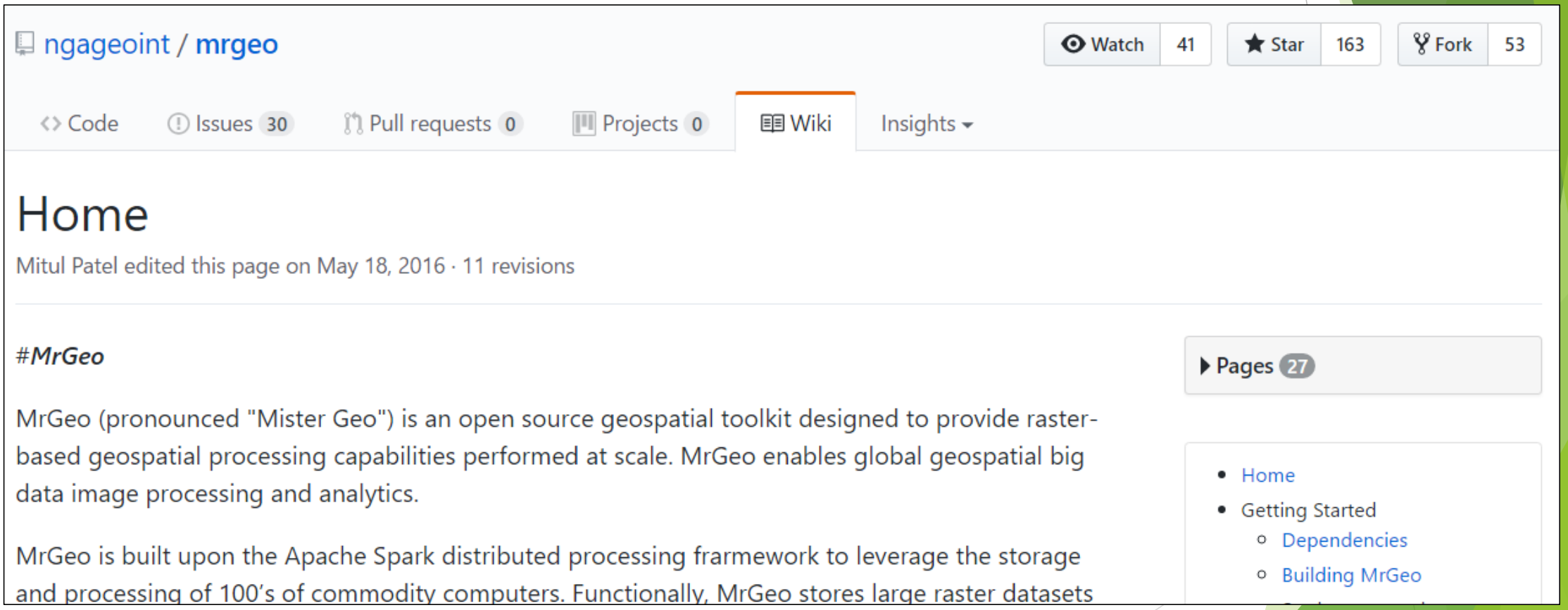
- **Secrecy = Security?** *"Take our word for it…"*
  - —System security should not depend on the secrecy of the implementation or its components. **- NIST Guide to General Server Security**
- **Bruce Schneier** – *"Public security is always more secure than proprietary security… open source isn't just a business model; it's smart engineering practice"*
- **Security By Design** – ex: InterBase Database Back Door
- **Distributed Source Aids Detection**
- **MORE EYES in MANY places / "THE SCRUTINY OF MANY"**
- **Undetected subversion very unlikely**
- **DOD… "THE CONTINUOUS AND BROAD PEER-REVIEW ENABLED BY PUBLICLY AVAILABLE SOURCE CODE SUPPORTS SOFTWARE RELIABILITY AND SECURITY EFFORTS THROUGH THE IDENTIFICATION AND ELIMINATION OF DEFECTS THAT MIGHT OTHERWISE GO UNRECOGNIZED BY A MORE LIMITED CORE DEVELOPMENT TEAM…[INSPECTION ORGANIZATION, 'GATEKEEPERS']**

GitHub

- Where it’s all made and passed around and tweaked



MrGeo

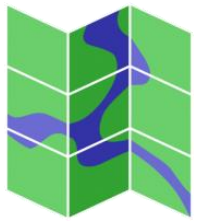

ngageoint / mrgeo
Watch 41
Star 163
Fork 53
Code
Issues 30
Pull requests 0
Projects 0
Wiki
Insights
Home
Mitul Patel edited this page on May 18, 2016 · 11 revisions
#MrGeo
MrGeo (pronounced "Mister Geo") is an open source geospatial toolkit designed to provide raster-based geospatial processing capabilities performed at scale. MrGeo enables global geospatial big data image processing and analytics.
MrGeo is built upon the Apache Spark distributed processing frarmework to leverage the storage and processing of 100's of commodity computers. Functionally, MrGeo stores large raster datasets
Pages 27
Home
Getting Started
Dependencies
Building MrGeo

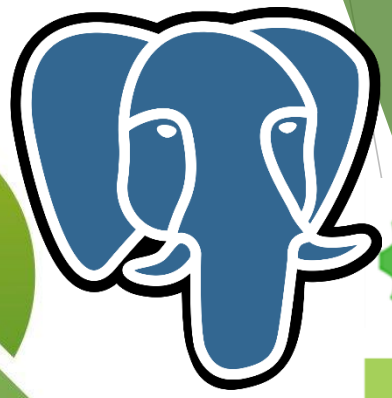
5 Minute Break!

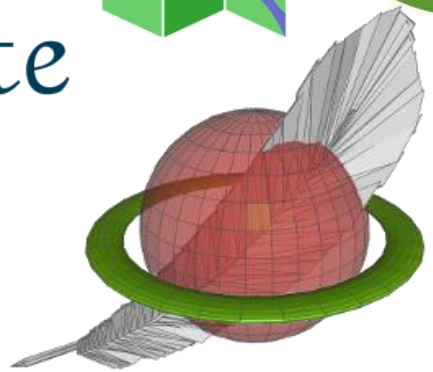
- Defining Open Source
- Widening Use
- **FOSS4G**
- GIS Platforms
- First Steps

What is Open Source GIS?

The question you've been waiting for…







The CityGML Database
3D City DB

Roots

- **1978**: Map Overlay & Statistical System (MOSS)

  Department of Interior – 1st broadly deployed GIS

- **1982**: Geographic resource Analysis Support System (GRASS)

  US Army Corps of Engineers – land management/env. Planning

- **1990**: File Format Operability Period

  Open Geospatial Consortium – WMS, WTS, etc

- **Now** – Age of Toolmaking

  OSGEO: Open Source Geospatial Foundation

OGC®

Making location count.

Open Standards

GML

KML

Web Map Service

Web Map Tile Service

Web Processing Service

Web Feature Service

…many more

- **Mission**: Support and promote the highest quality Open Source Geospatial Software
- Promote **Standards** for interoperability
- Inter-project **communication/collaboration** (robust international Network)
- QA/QC – **OSGEO Incubator** (licensing, documentation, openness, processes/functionality, oversight)

3Liz
SUN GIS
NORTH ROAD
Lutra CONSULTING
OSLAN
CartoExpert
OPENGIS ch
ANDROID · [Q]GIS · WEB
GKG
dms
simply spatial
gis3w
SOLTIG
GBD
camptocamp
INNOVATIVE SOLUTIONS BY OPEN SOURCE EXPERTS
KARTTAKESKUS
Soluciones en Tecnologías de Información Geográfica
NEXTGIS
natural GIS
norBIT
Gaia3D
The GeoSpatial Company
AGX
ENGAGING EXPERIENCE
SOURCEPOLE
TAXUS IT
INNOVATION
BIRD'S EYE VIEW GIS
Boundless
Faunalia
ASTUN TECHNOLOGY
itOpen
Open Solutions for the Net Age
ZUIDT
terrestris
KARTOZA
OPEN SOURCE GEOSPATIAL SOLUTIONS
ngnuity
thinkWhere
NRGS
livio stump
GIS support & beratung
35
Registered
Providers
COMMERCIAL SUPPORT
Getting more professional
https://www.qgis.org/en/site/forusers/commercial_support.html

Why Use It?

- Interoperability
- Vendor lock-in (get a hold on it)
- Budget Friendly
  - Remember: Not Free, but “Free”
- **Scale-free**
- Encourages COMPETITION
- Accelerates Innovation
- GitHub - empower citizens to improve government functions

- Defining Open Source
- Widening Use
- FOSS4G
- **GIS Platforms**
- First Steps

GIS Platforms

- User Interface **Desktop**
- User Interface **Browser**
- User Interface **Portal**
- Spatially-Enabled Database
- Application Server
- Software as a Service – Cloud Computin

USER INTERFACE
DESKTOP

License: GNU GPL

- Friendly GUI
- Vector & Raster analysis

  → 100 + supported formats
- Spatial Data Management – Oracle Spatial, PostgreSQL, SQLite, Microsoft SQL Server
- Import & Publish Map Services
- Python Scripting
- 700+ Plugins – flexible scale
- +GRASS & SAGA algorithms (400+)

Use Example

- NSA Plug-Ins

  latlontools

- Financial Times

  Graphics Team

USER INTERFACE
BROWSER

OpenLayers 3.0

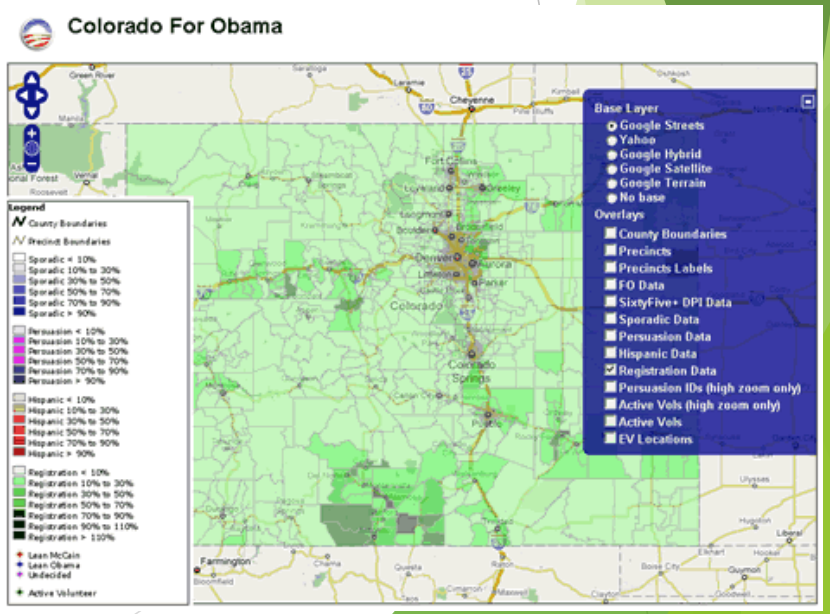
OpenLayers 3.0

License: Free BSD

- Web-mapping Platform in JavaScript
- Tiled Web Map (many little images)
- Powerful API
- Flexible Interface/Controls
- Customize with CSS3 & JS
- **Formats**: GeoRSS, KML, GML, GeoJSON, WMS, & WFS

Use Example

- *Obama for America Campaign*
  - Used with PostGIS to view geocoded voter records



USER INTERFACE
PORTAL

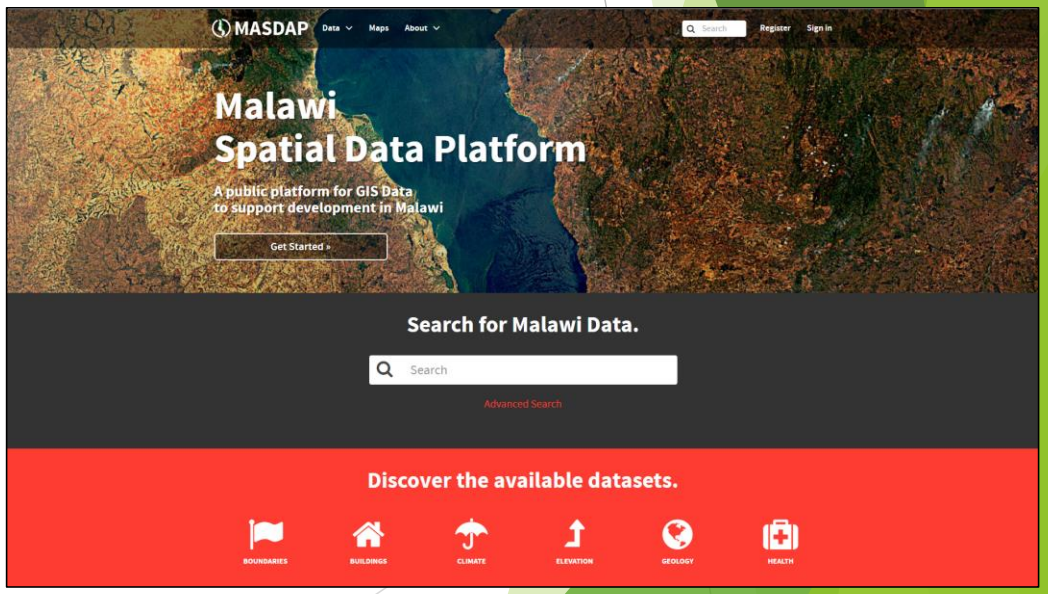
GeoNode

License: GNU GPL

- Content Management System
- Create, Edit, style, aggregate maps & layers
- Sharing, Collaboration
  - SOCIAL NETWORK FEEL
- Metadata Entry & Catalogue
- Rating/Comments from users
- Geoserver Integration – security & permissions

Use Example

- Malawi Department of Surveys



Application Server

GeoServer

License: GNU GPL

- Serves maps & data to standard clients (Browsers, Desktop Programs)
- Published via standards (WMS, WPS, etc.)
- Browser-based management interface
- Many vector & raster formats
- ArcSDE Plugin + More extensions

Use Example

- *MassGIS* + Boundless

SPATIALLY-ENABLED DATABASE

ORACLE®

License: GNU GPL

- Adds geographic object support to PostgreSQL database
- Back-end spatial database for GIS
- Full topology support
- Raster support
- Networks & Routing
- 3D surfaces
- MORE

Use Example

- *Plenario – U of Chicago*
  http://plenar.io/

Software as a Service (SaaS)

"On demand software"

CARTO

ArcGIS Online

CARTO

License: Carto End User License Agreement

- GIS & Web-Mapping Tools in a Web browser
- Location Intelligence
- “Freemium” – free to a certain size (credits)
- Accepts Multiple Formats
- Built on PostGIS/PostgreSQL
- **CartoBuilder**: manage, analze, edit data; build custom maps; SQL queries
- **CartoEngine**: APIs/libraries for building custom maps & visualization interfaces

Use Example

- Spotify

Location-based musical data for cities around the world

Music Map of the World

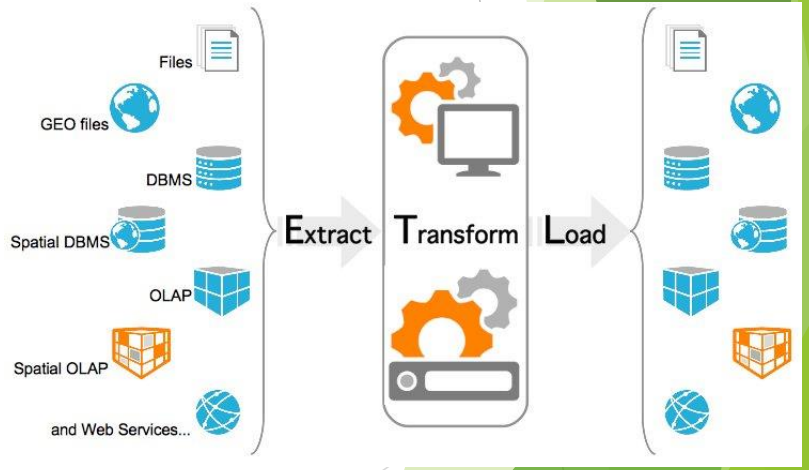
Data Integration Tools

GeoKettle
Open Source Spatial ETL

Compare: FME's Spatial ETL

- **Extract** data from sources
- **Transform** data to correct errors, tidy-up, change structure, standardize
- **Load** data into a target DBMS, GIS file, or web service

- Automates repetitive processing w/o code
- Migrate data between databases
- Convert between data formats
- Ex: transform a folder of shapefiles into PostGIS tables



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Limitations & Obstacles

- Fear/Reservations– **PERCEPTION**
- Knowledge Gap – what new skills/know-how will it take?
- Asset-Specific Investments
- Vendor & Technology Lock-In - "We're too deep in ESRI"
- Change Difficulties – "But it has always been this way"
- Time Limitations – *"We already don't have enough time to troubleshoot existing platforms, much less deploy new ones!"*

Future – Hybrid - Practicality

- **NO REPLACING ESRI**
- But: most of what ESRI products can do, can be done with open source tools
- The 80/20 Rule for COTS: 80% of Users Use 20% of Functionality
- Who can do the same thing with Open Source tools?
- Rethink license distribution
- Take advantage of & explore **INTEROPERABILITY**
- Start small: project-based, w/ interested folks
- KEEP AN OPEN MIND

Hybrid Model - Straight from ESRI

*"Deciding between open source and ArcGIS is not an either/or question. ESRI encourages users to choose a **hybrid model**, a combination of open source and closed source technology, **based on their needs**."*

– ArcNews, Spring 2011

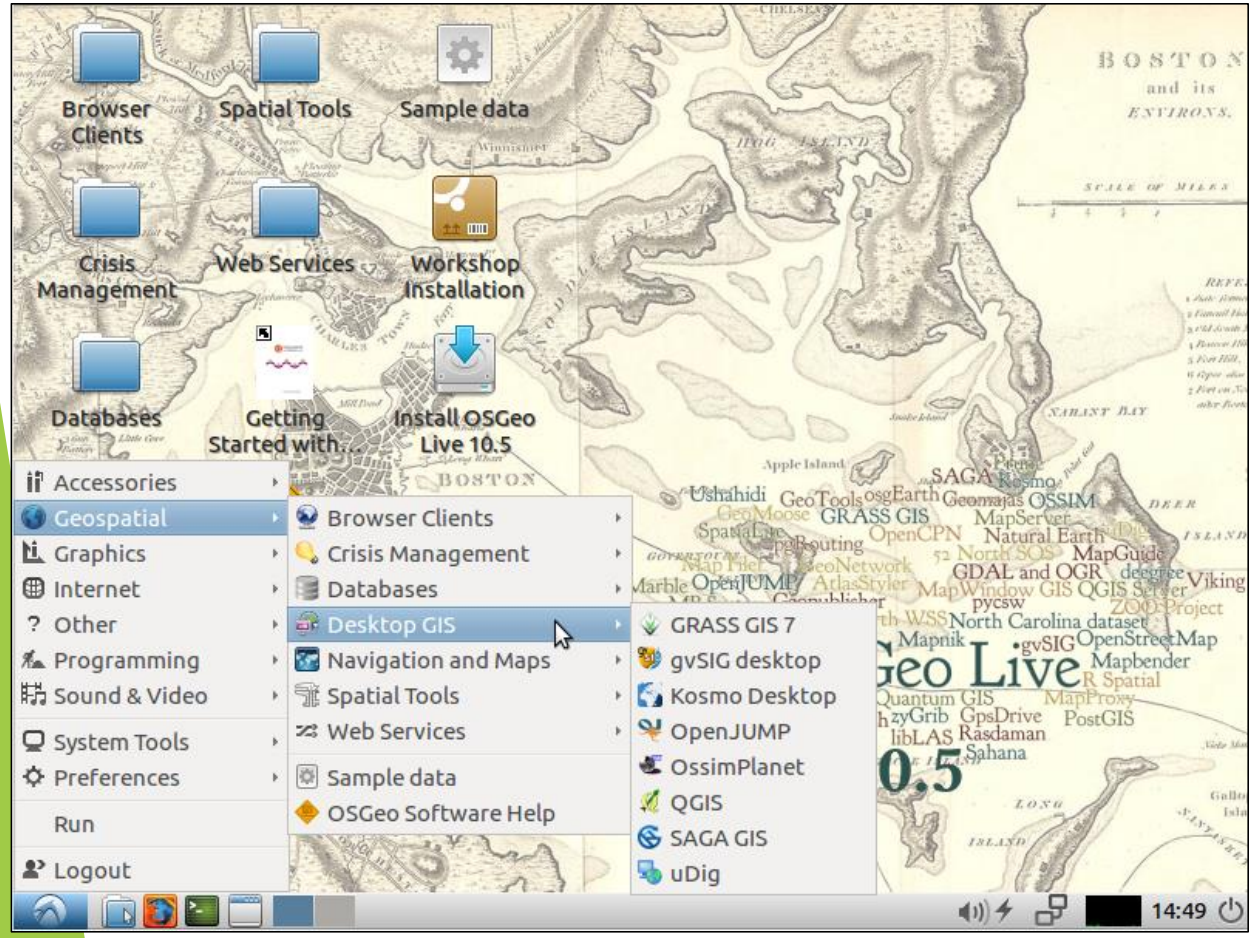
Boundless – A Good Choice

- Commercial support for Open Source GIS
- Specialty in *Hybrid Infrastructure*

HEADLINE: National Geospatial-Intelligence Agency Awards Boundless with $36M Contract
(April 18, 2017)

OSGEO Live - Play & Learn Risk-Free!

- Lubuntu OS build with 50+ open source geospatial applications
- Freely distributed, duplicated and passed around



- Don't have to install a thing!
- sample datasets + documentation
- Quickstart guides for all applications
- Deployment: DVD, USB, Virtual Machine

DEMO – *A Healthy Relationship*

OpenLayers 3.0

Education/Resources

PowerPoint Slides

myshare.in.gov/gis

Resource Guide

jacobsgisportfolio.wordpress.com