The Fellowship of the Data

Source:myblogs.pw

Sev Leonard
sev@thedatascout.com
gizm0_0

Ways to play

- View the presentation at **http://tinyurl.com/j6xpkvu**
- Follow along with the Jupyter notebooks on Github
  - https://github.com/gizm00/pycon2016
  - Notebooks directory will have the labs
- Run tutorial locally in Jupyter – see Github for required libs
  - Need to use CsvStorage object (more on this later)
  - Form scraping will not run
- Run Docker tutorial container - same caveats as local run
- Run Docker LAMP stack and tutorial container

Set the timer! 45min

Greetings! About me

- My pronoun.is/he
- 11 years in PDX
- 1st PyCon!
- Software and “data science” consultant
- Likes mangoes, outside, cats

The Data Scout

Your guide in the information wilderness

Class info

- Tutorial content & setup instructions: https://github.com/gizm00/pycon2016

- HTTP requests, MYSQL storage are handled by the pycon2016_lamp Docker container
  - You will be able to run most of the tutorial without this if it is giving you grief

- Tutorial is based on data source mocks

About the tutorial

- Based on data gathering and organization techniques used for www.campnear.me

Source:artistthinks.wordpress.com

Tutorial topics

- Mostly lab (Jupyter notebook) based
- Data gathering topics:
  - Working with APIs
  - Scraping webpages
  - Navigating forms
- OOD topics:
  - Creating uniform interfaces through abstraction
  - Extending classes
  - Encapsulating methods, data

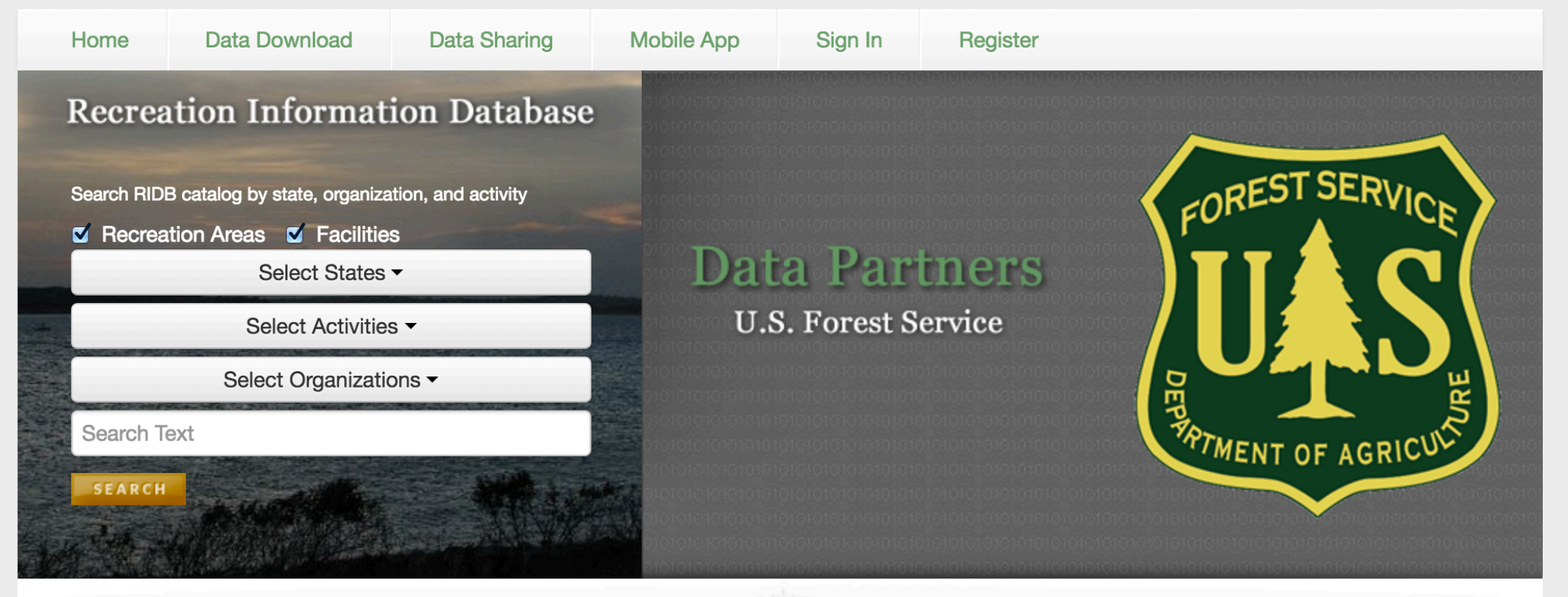
Agenda

1. Overview of data sources, best practices for web data, and design techniques
2. Labs
    1. Getting data from an API
    2. Creating objects for storing and extracting data
    3. Scraping web pages
    4. Creating objects for scraping data
    5. Navigating forms
    6. Using the scraper object for reservation info
    7. Creating objects to merge data
    8. The One Pipeline

There and back again – a journey

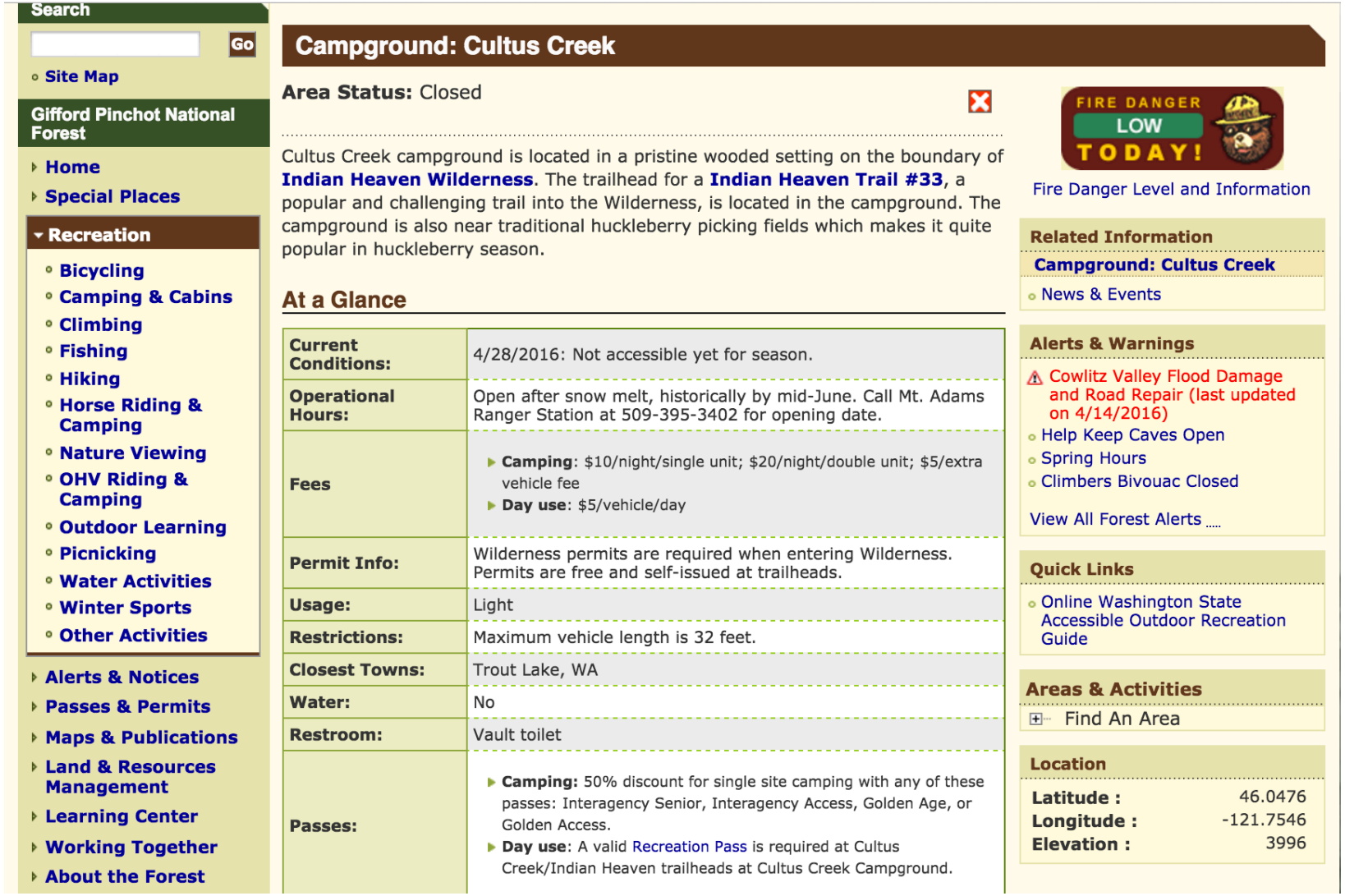
Image source: knightleyemma.com

Recreation Information Database - RIDB



ridb.recreation.gov

US Forest Service Websites



Search

Go

Site Map

Gifford Pinchot National Forest

- Home
- Special Places
- Recreation
  - Bicycling
  - Camping & Cabins
  - Climbing
  - Fishing
  - Hiking
  - Horse Riding & Camping
  - Nature Viewing
  - OHV Riding & Camping
  - Outdoor Learning
  - Picnicking
  - Water Activities
  - Winter Sports
  - Other Activities
- Alerts & Notices
- Passes & Permits
- Maps & Publications
- Land & Resources Management
- Learning Center
- Working Together
- About the Forest

Campground: Cultus Creek

Area Status: Closed

Cultus Creek campground is located in a pristine wooded setting on the boundary of **Indian Heaven Wilderness**. The trailhead for a **Indian Heaven Trail #33**, a popular and challenging trail into the Wilderness, is located in the campground. The campground is also near traditional huckleberry picking fields which makes it quite popular in huckleberry season.

At a Glance

Current Conditions:	4/28/2016: Not accessible yet for season.
Operational Hours:	Open after snow melt, historically by mid-June. Call Mt. Adams Ranger Station at 509-395-3402 for opening date.
Fees	**Camping**: $10/night/single unit; $20/night/double unit; $5/extra vehicle fee **Day use**: $5/vehicle/day
Permit Info:	Wilderness permits are required when entering Wilderness. Permits are free and self-issued at trailheads.
Usage:	Light
Restrictions:	Maximum vehicle length is 32 feet.
Closest Towns:	Trout Lake, WA
Water:	No
Restroom:	Vault toilet
Passes:	**Camping:** 50% discount for single site camping with any of these passes: Interagency Senior, Interagency Access, Golden Age, or Golden Access. **Day use**: A valid Recreation Pass is required at Cultus Creek/Indian Heaven trailheads at Cultus Creek Campground.

FIRE DANGER LOW TODAY!

Fire Danger Level and Information

Related Information

Campground: Cultus Creek

- News & Events

Alerts & Warnings

- Cowlitz Valley Flood Damage and Road Repair (last updated on 4/14/2016)
- Help Keep Caves Open
- Spring Hours
- Climbers Bivouac Closed

View All Forest Alerts .....

Quick Links

- Online Washington State Accessible Outdoor Recreation Guide

Areas & Activities

Find An Area

Location

Latitude :	46.0476
Longitude :	-121.7546
Elevation :	3996

Recreation.gov

Find Sites [x]

Availability

Arrival Date

Departure Date

Not Flexible

Loop

Any Loop

Site #

Attention: Travelers to the central Oregon Coast in the summer of 2016 should be aware that road construction on US20 near Eddyville will result in delays and nighttime closures. Detour routes on to OR34 and OR18 will be posted. Check Tripcheck.com before travelling in this area.

Find Other Facilities

CAPE PERPETUA, OR

part of Siuslaw National Forest, *US Forest Service*

Like 19

Status: Open through Sun Sep 04 2016 Season Dates

Tidy data principles

1. Each variable is a column
2. Each observation is a row
3. Each type of observational unit is a table

Source: Wickham 2014 http://www.jstatsoft.org/v59/i10/paper

Observation: campground
Variables: lat/long, name, website, etc
Observational unit – data source (RIDB, USFS, recreation.gov)

Web data best practices

Source:kaiju.wikidot.com

1. Web data is ephemeral

Source:lotr.wikia.com

Format, availability, access requirements can change at any time

2. Just because you can get the data…

You may use the APIs if your Application is designed to help LinkedIn members be more productive and successful.

You may not use the APIs if your Application: exceeds a reasonable amount of API calls; relies fundamentally on the APIs; stores more than a LinkedIn member's profile data; or is used for hiring, marketing or selling.

1.4 Eligibility Criteria

Here is the eligibility criteria to determine if you may use the APIs pursuant to these Terms:

You may use our APIs if:

1. you are developing an Application designed to help LinkedIn members be more productive and successful across the web; for example, by augmenting their profile and professional brand in an Application for publishing, discussing and sharing content with like-minded professionals.
2. your Application is NOT expected to: have more than 250,000 lifetime members; make more than 500,000 daily calls to an API; make more than 500,000 lifetime people search calls to an API; or serve greater than 1 million daily plugin impressions.
3. your Application DOES NOT rely on access to the APIs as a fundamental aspect of your business.
4. your Application WILL NOT store or export any data from LinkedIn other than the LinkedIn Profile Data for the LinkedIn member that requested the data. "**Profile Data**" means the name, photo, headline, contact information, experience, education, summary, and location of a LinkedIn member. Profile Data excludes connections, network updates, job listings, groups, companies, and any other content.

https://developer.linkedin.com/legal/api-terms-of-use

Source:realitysandwich.com

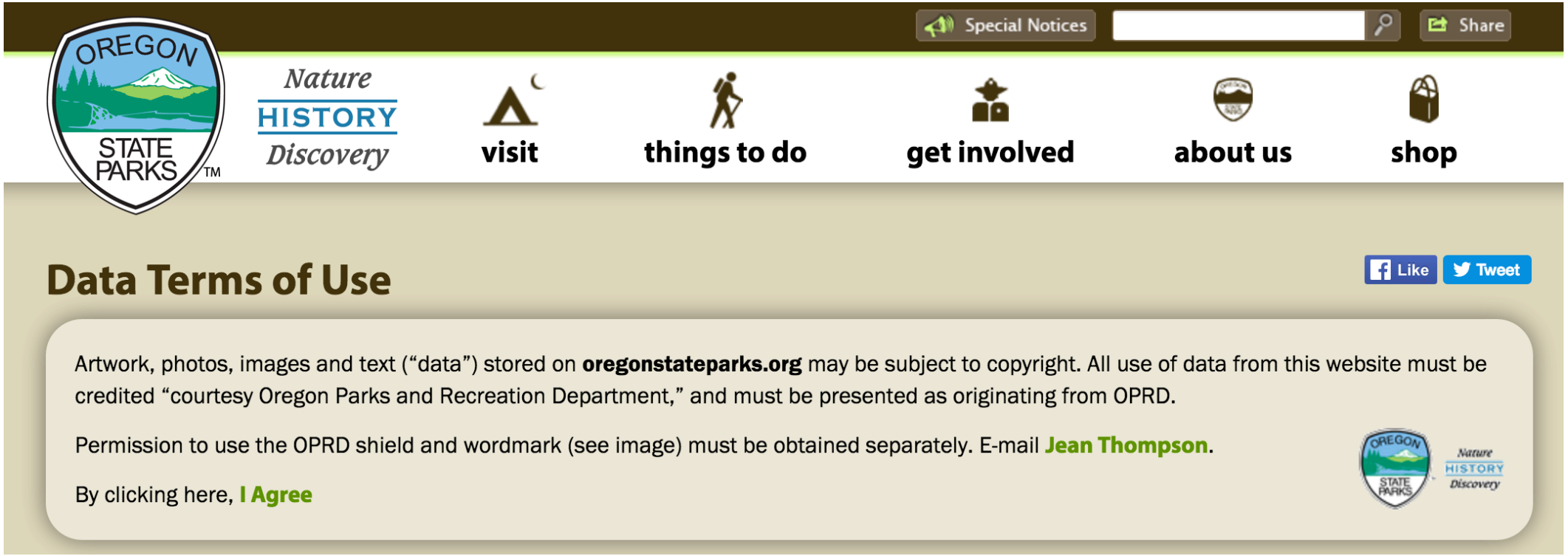
… doesn’t mean you can use it

A group of researchers has released a data set on nearly 70,000 users of the online dating site OkCupid. The data dump breaks the cardinal rule of social science research ethics: It took identifiable personal data without permission.

http://www.vox.com/2016/5/12/11666116/70000-okcupid-users-data-release

Source:doblu.com

3. Terms of Use - attribute properly



Source:oregonstateparks.org

4. Be aware of rate limits, server loading

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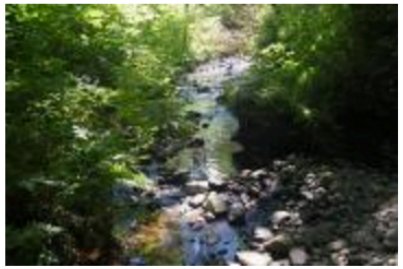


Like 19

Status: Open through Sun Sep 04 2016 Season Dates

Source:lotr.wikia.com

The data in Recreation.gov is provided for free - there is no cost to use it, and no need to contact us before incorporating Recreation.gov data into your system. (In exchange, we encourage you to provide a link to Recreation.gov and acknowledge credit, such as *Data Source: Recreation.gov*)

Web data summary

- Highly dynamic!
  - Structure of webpages
  - Access / permissions
  - API versions, output formats, parameters, rate limits
- May not be there tomorrow
- Potential to be blocked for excessive scraping or API abuse

Object Oriented Programming

- Class-based design

```python
# Base Data class for extracting information from a datasource
import pandas as pd

class Data():

    def __init__(self, name):
        self.name = name
        self.df = pd.DataFrame()

    def extract(self):
```

- SOLID principles
  - Classes should do one job
  - Instead of modifying existing classes, extend through sub classes
  - Class dependencies should be abstract, not concrete*

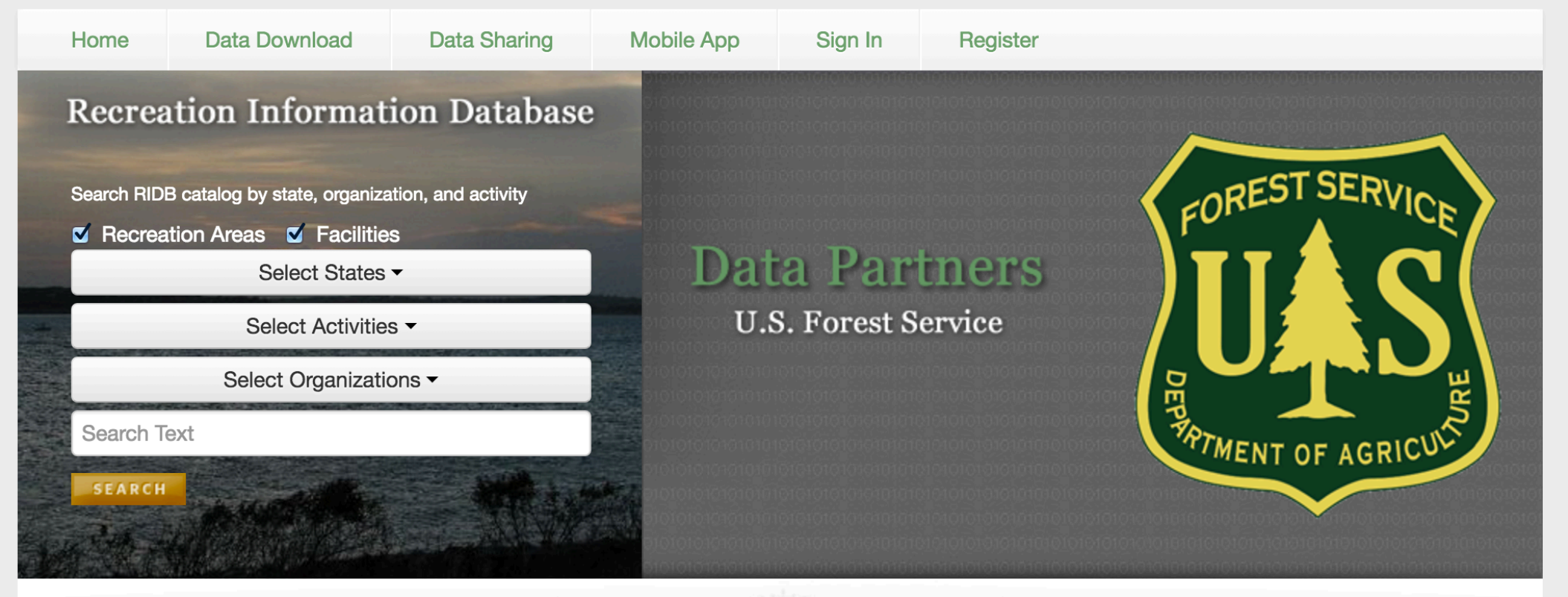
* Abstract base classes are not Pythonic, but are used in this tutorial for teaching purposes

Read more about SOLID: https://scotch.io/bar-talk/s-o-l-i-d-the-first-five-principles-of-object-oriented-design

How can object oriented design help?

- Encapsulate properties that are likely to change
  - API endpoints, parameters, etc
- Build on abstractions to allow flexibility
  - Consistent interfaces for Data objects, regardless of source
- Extend existing classes to accommodate changes
  - Create WebScraper objects that can be extended
- Create testable, maintainable structures

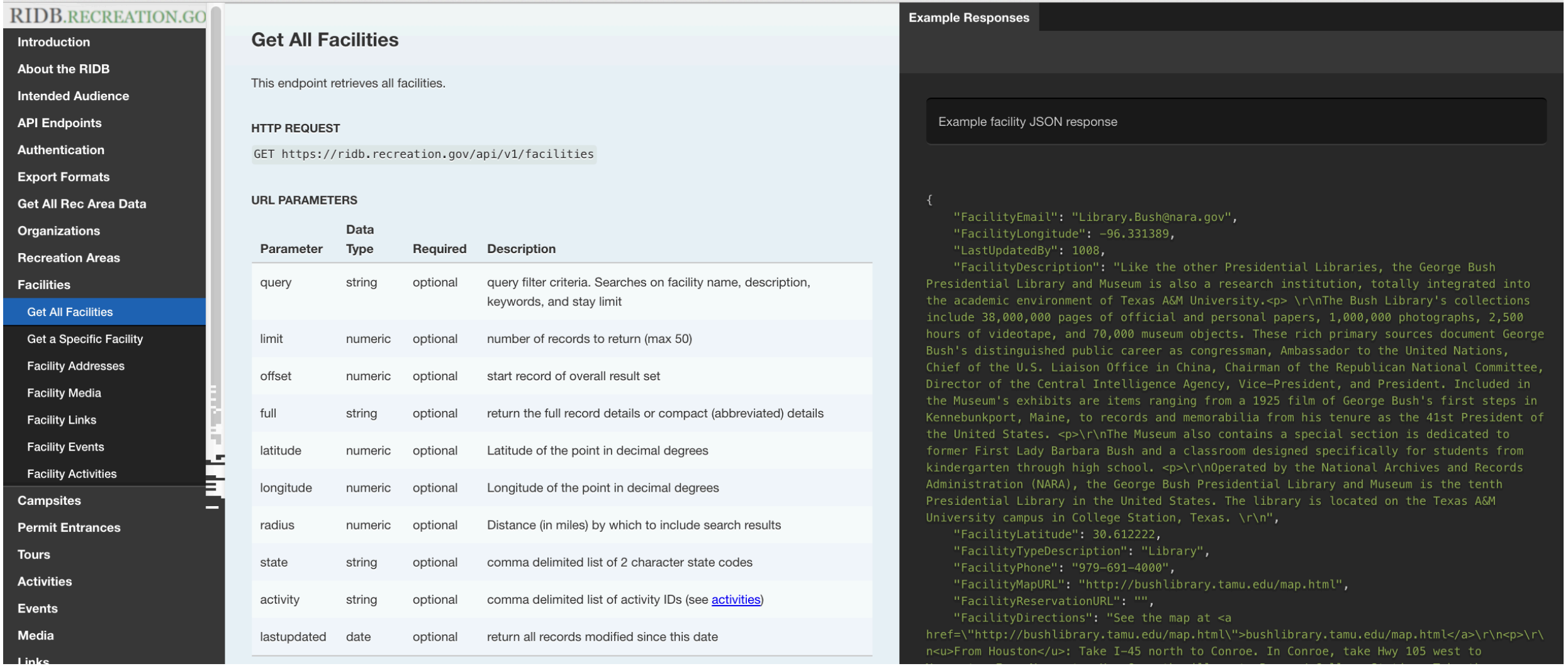
RIDB API



ridb.recreation.gov

RIDB API Documentation

http://usda.github.io/RIDB

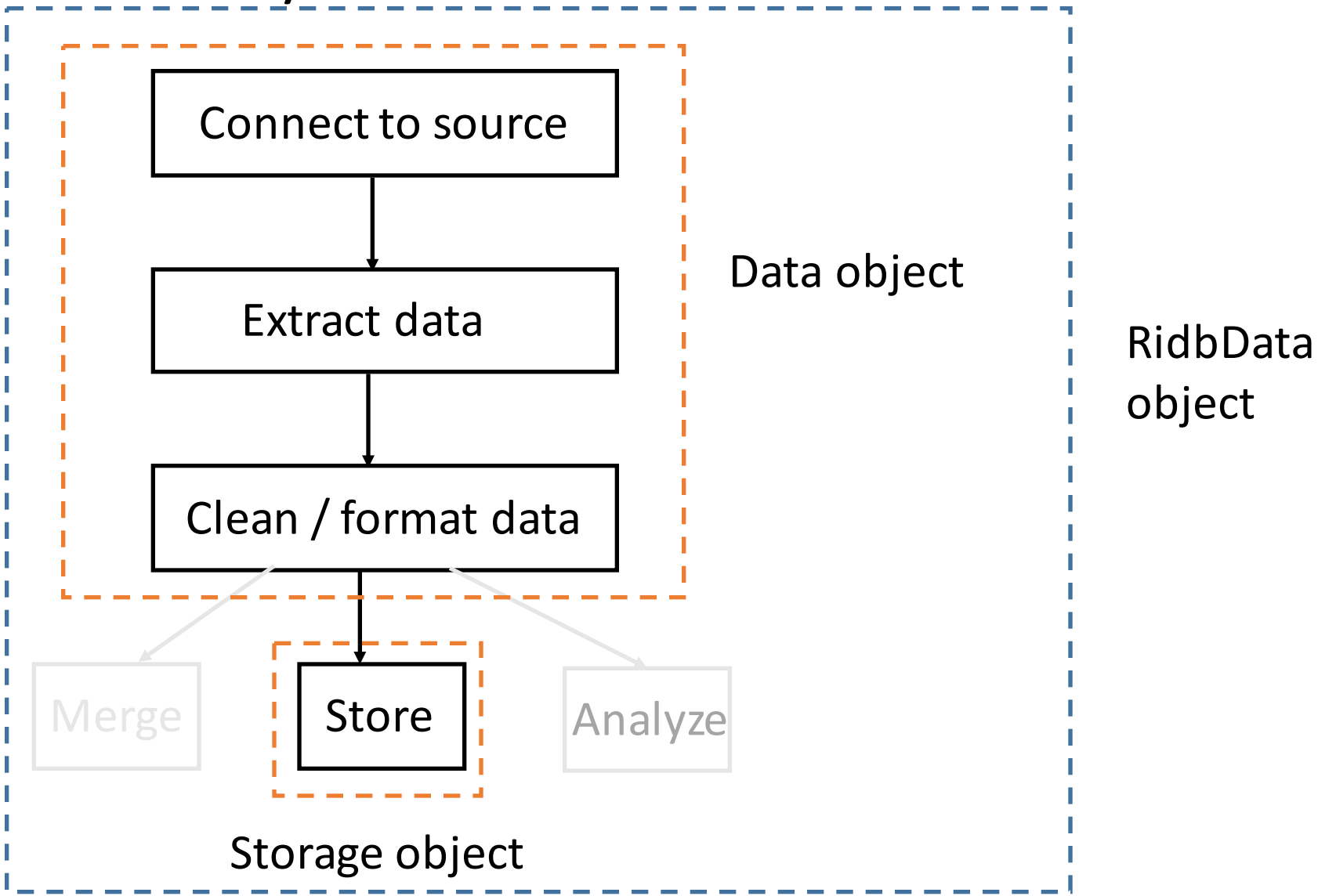


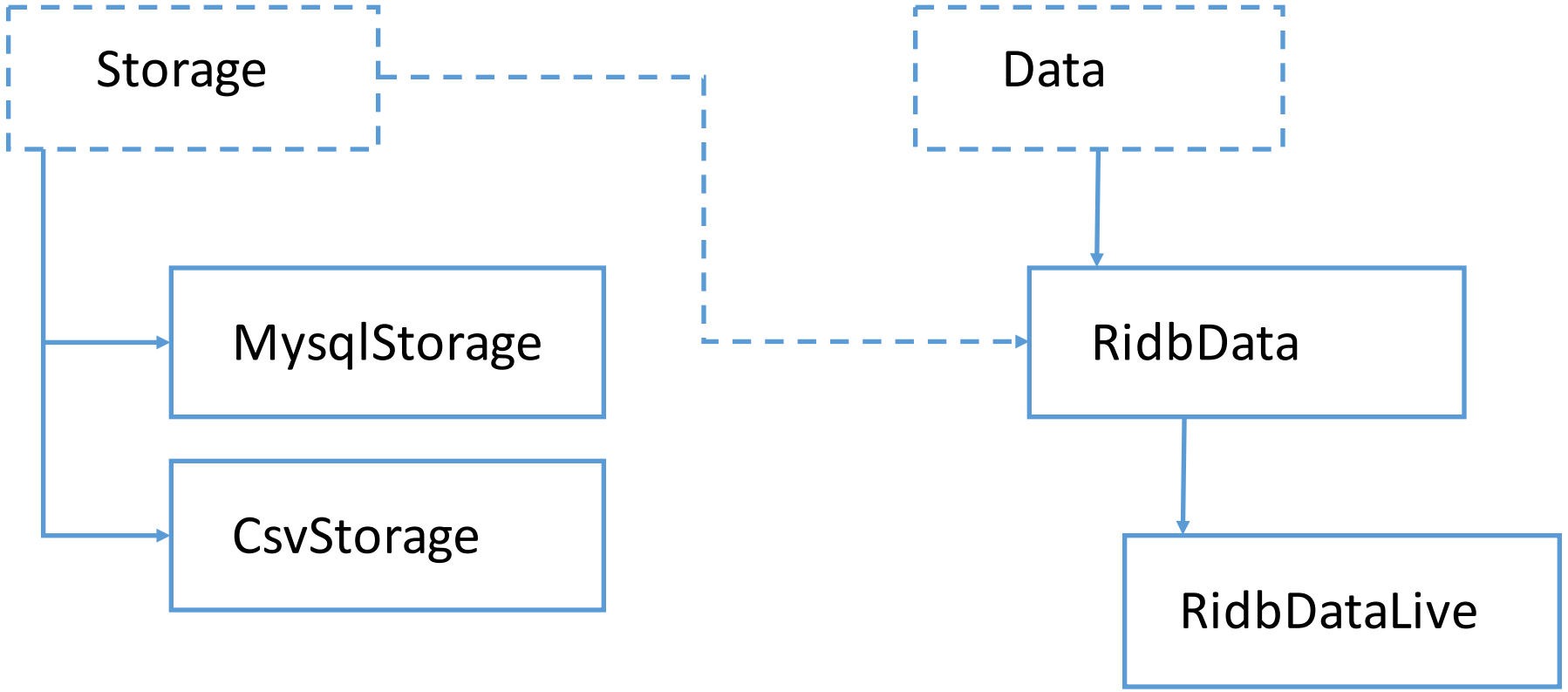
RIDB data notes

- Only has campgrounds that can be reserved – no first come, first serve
- Missing reservation URLs
- Lat / Longs not guaranteed to be accurate

Lab 1 & 2

Lab 1 & 2 summary




Storage
Data
MysqlStorage
RidbData
CsvStorage
RidbDataLive

USFS Website scraping

USFS Data

- No API
- Links are discovered through scraping (already done)
- Pages are fairly uniform!

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Quick Links
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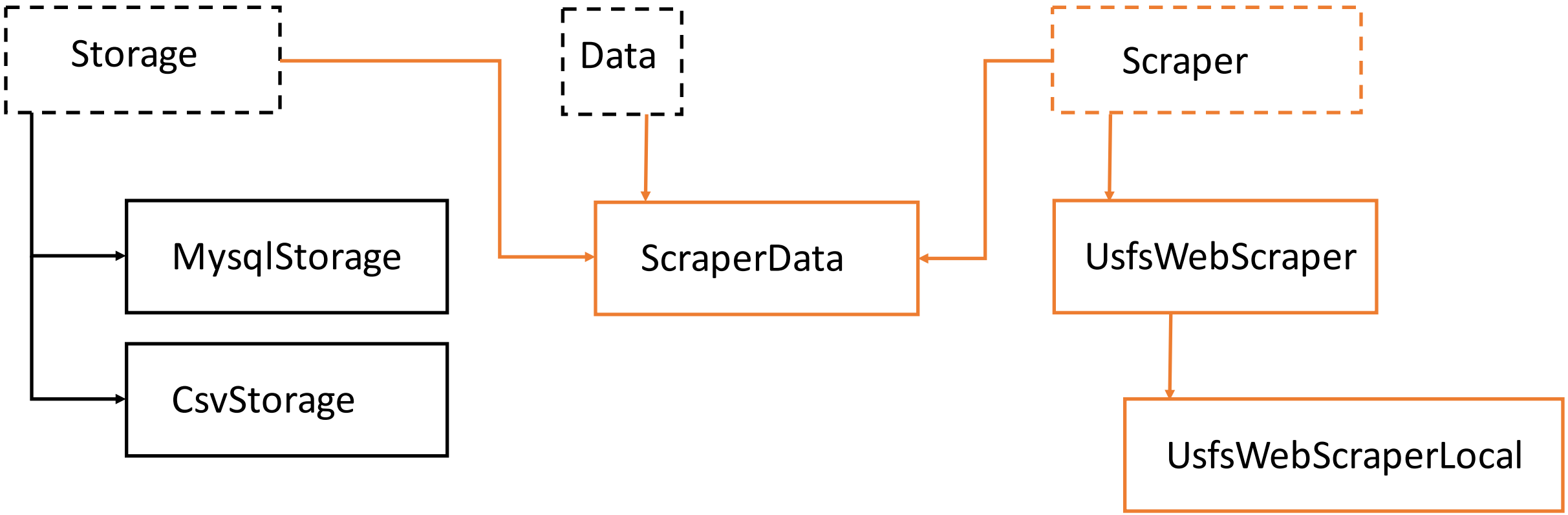
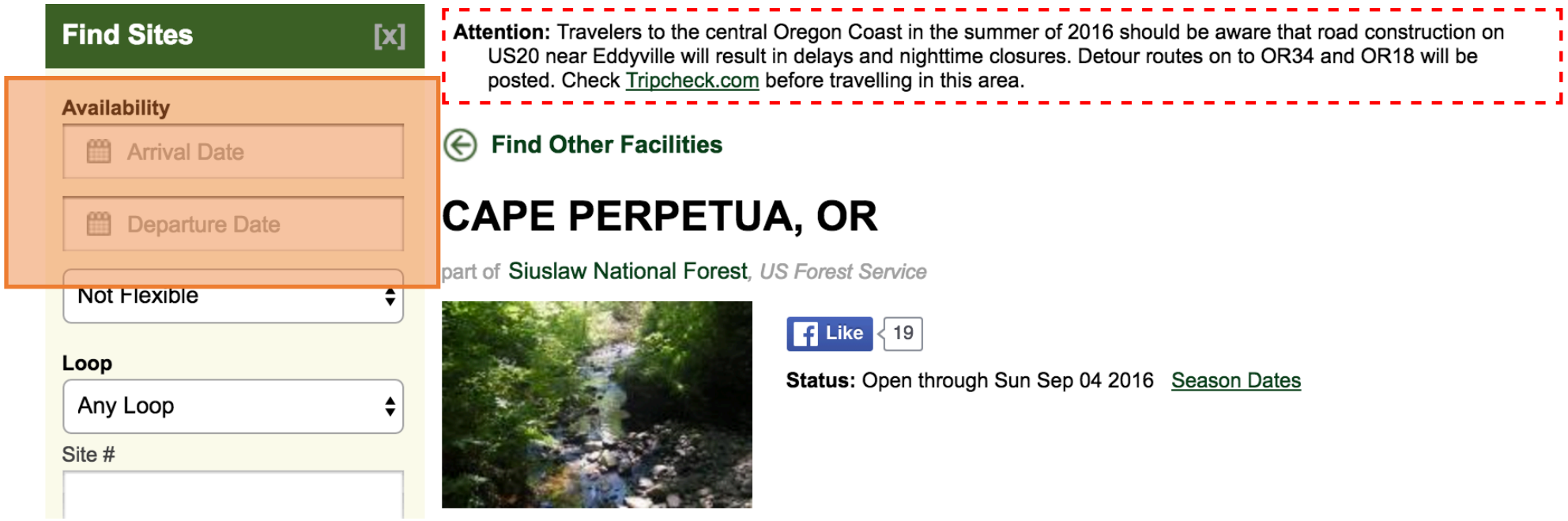
Lab 3 & 4

Saving tutorials with OOD!

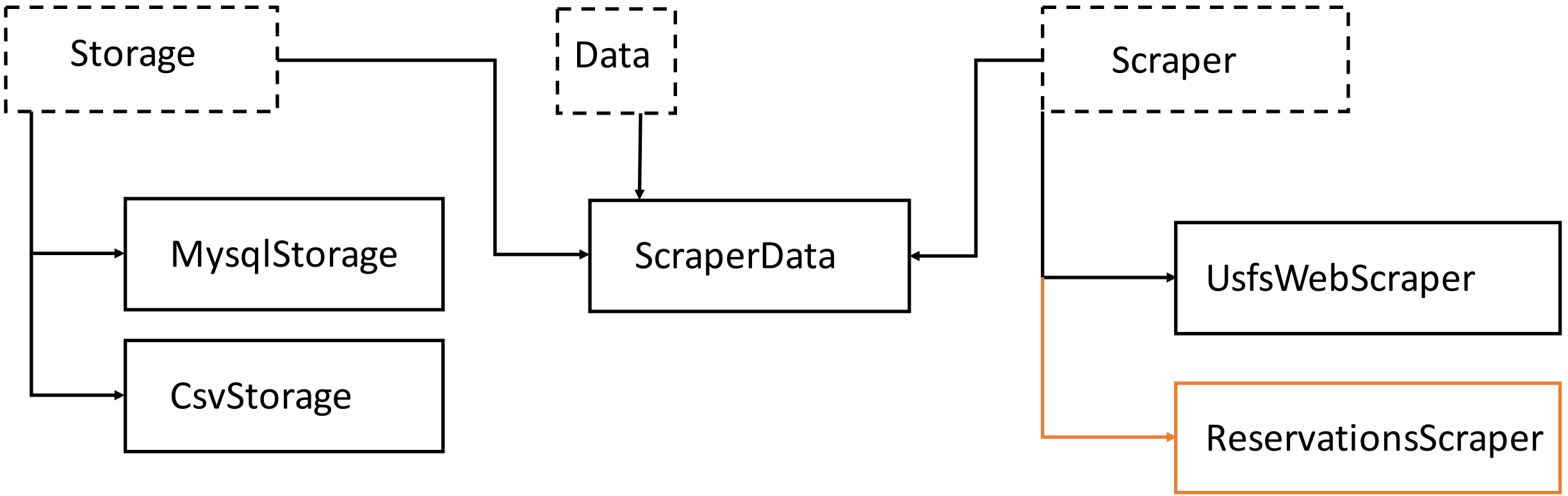


Recreation.gov reservation scraping



Lab 5 & 6

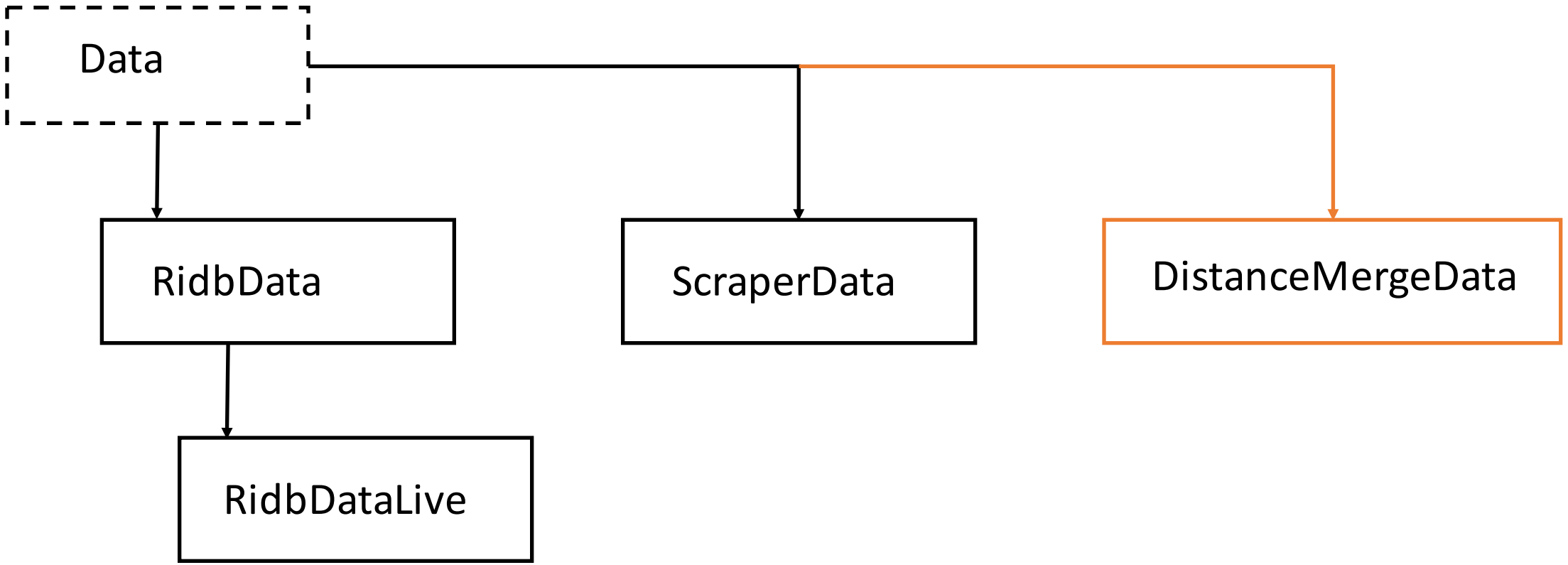
Lab 5 & 6 objects



Merging all the data – Lab 7

- Data merge is based on Lat/Long
  - But remember, lat/longs are frequently not correct!
  - Some error
  - Merge / join will be based on the distance between campgrounds being below a certain threshold

Lab 7 objects



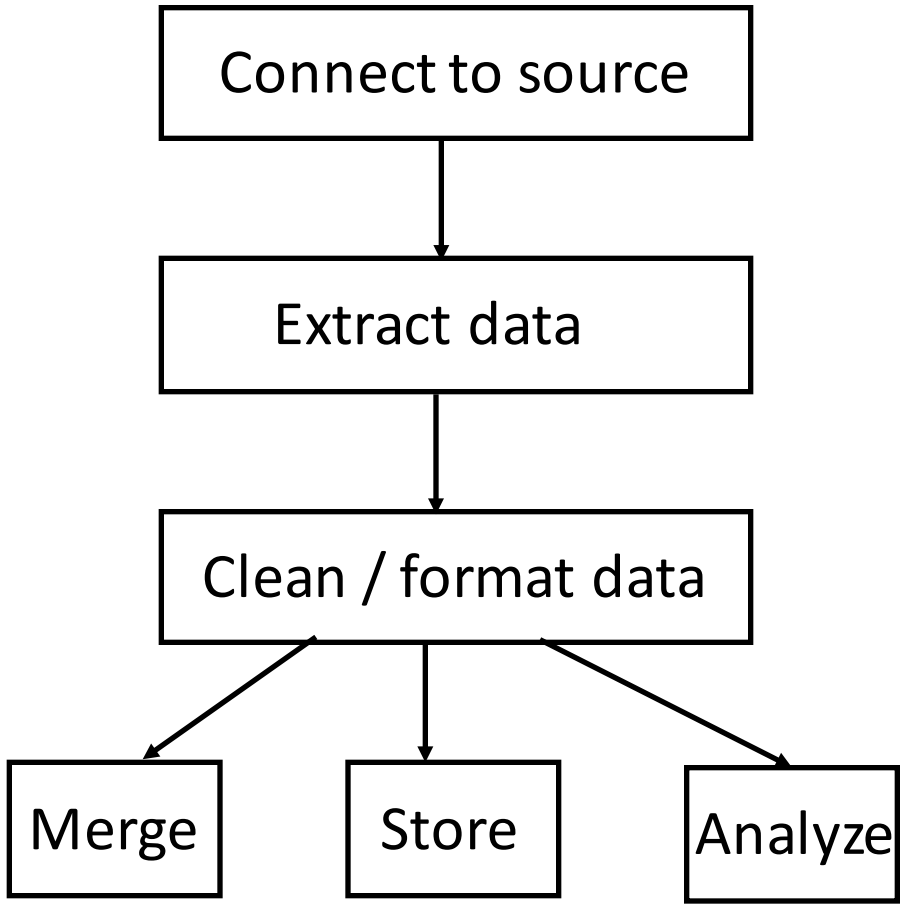
Lab 8 - The One Pipeline

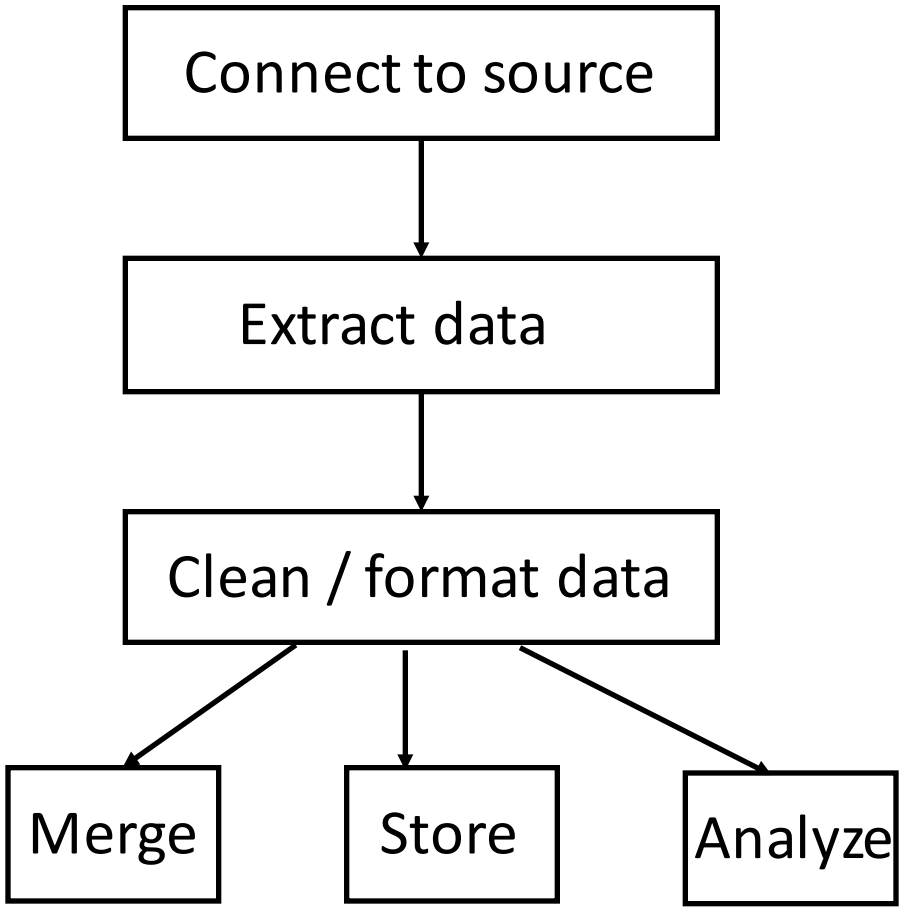
Thanks!

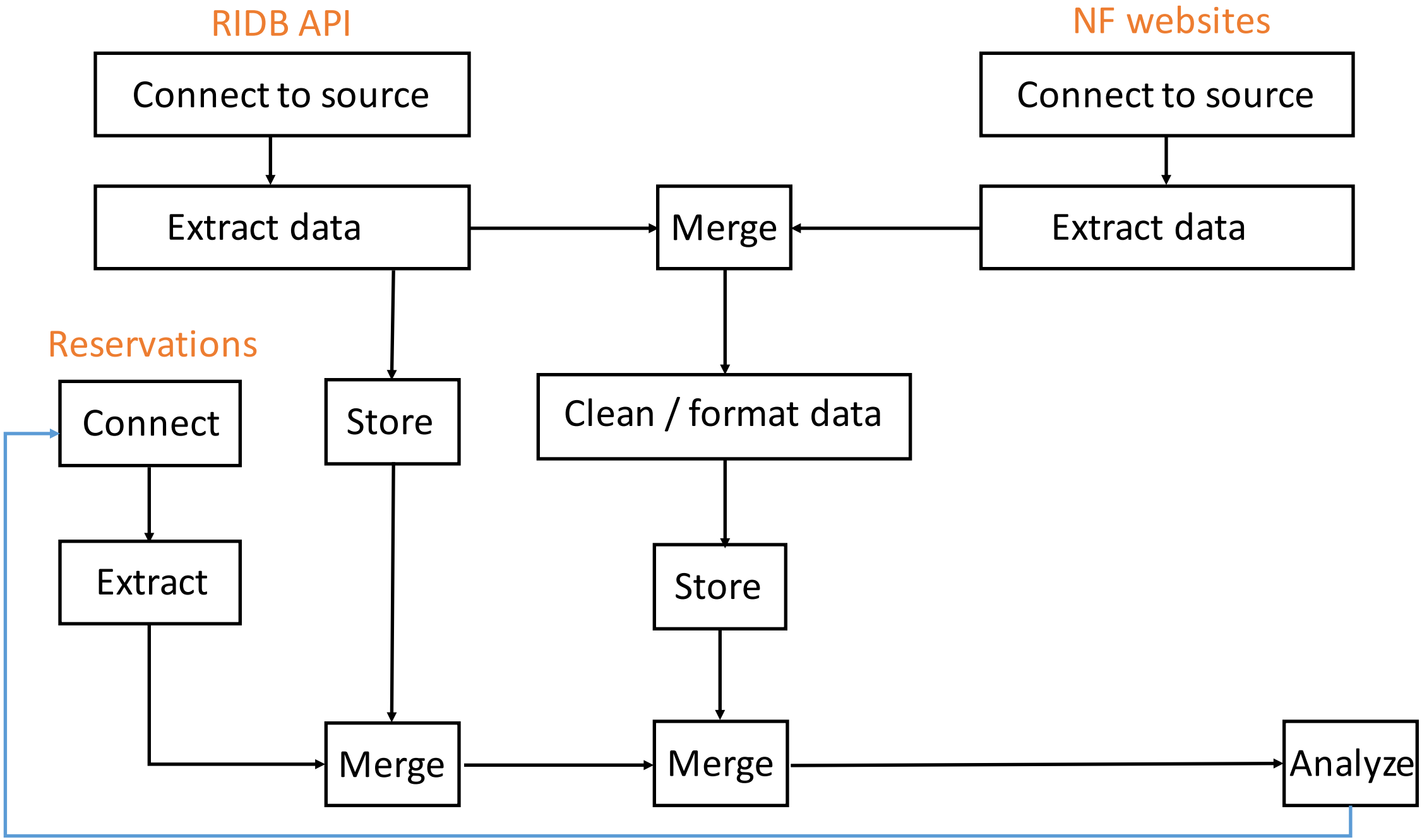
Image source:lotr.wikia.com

Backup

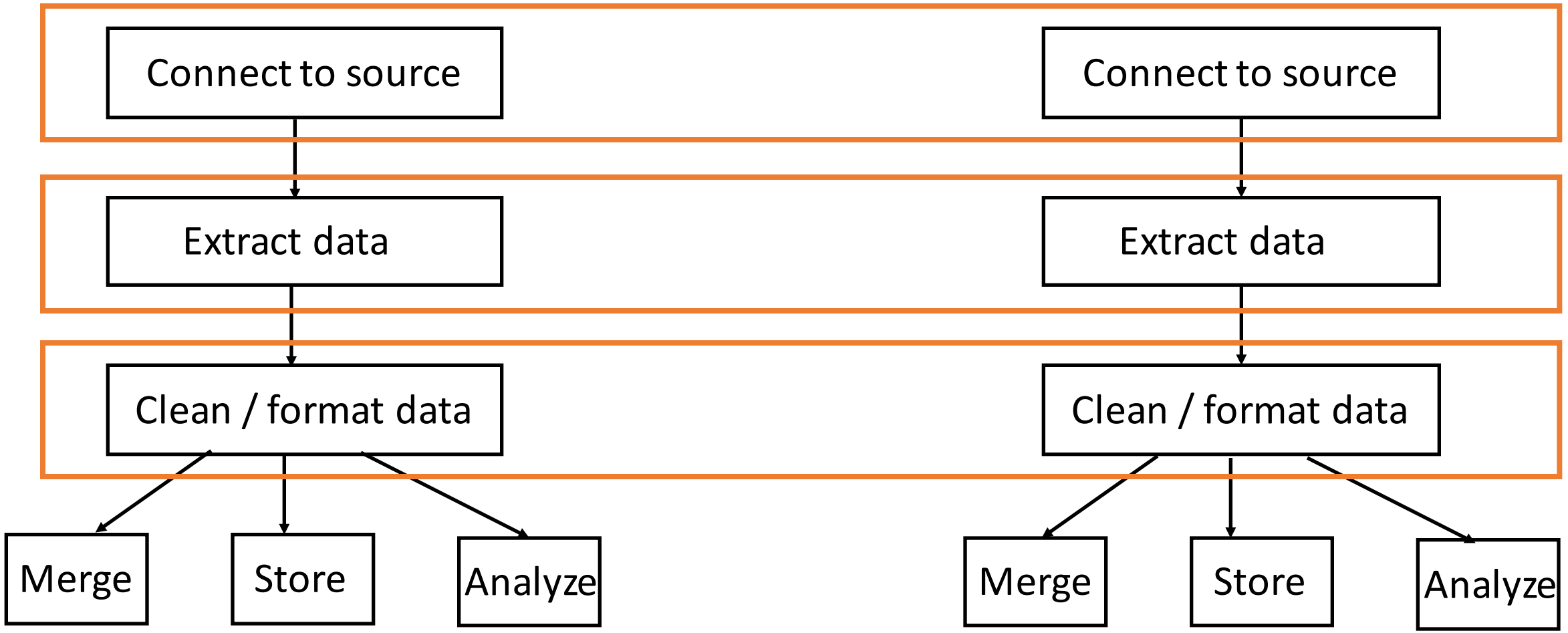
The ideal data pipeline






RIDB API
Connect to source
Extract data
NF websites
Connect to source
Extract data
Merge
Reservations
Connect
Extract
Store
Clean / format data
Store
Merge
Merge
Analyze

Look across


Connect to source
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Extract data
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Clean / format data
Clean / format data
Merge
Store
Analyze
Merge
Store
Analyze