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# Wrapping an Image Server in Proxy and Cache Blankets

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# Wrapping an Image Server in Proxy and Cache Blankets



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**Code4Lib Midwest, 2016**  
Graham Hukill, Wayne State University



## SIGN THE PLEDGE

"I pledge not to support and encourage the illegal pet trade in slow lorises. I will not 'share' or 'like' any video or photo that shows a slow loris being kept as a pet and, where possible, I will 'comment' directing people to the [International Animal Rescue slow loris rescue information page](#) to help expose the truth and end the suffering."

\*Name:

\*Email:

**SIGN PLEDGE\***



# What is Loris?

- IIIF compliant, python based Image Server
- [Github page](#)

"Loris is an implementation of the [IIIF Image API 2.0](#)."



# What is IIIF?



- "International Image Interoperability Framework"
- [Suite of APIs](#) for interacting with IIIF compliant image servers
  - [Image API](#)
  - Presentation API
  - Search API

## Structure:

```
{scheme}://{server}/{prefix}/{identifier}/{region}/{size}/{rotation}/{quality}.{format}
```

## Example:

```
http://www.example.org/image-service/abcd1234/full/full/0/default.jpg
```

## Real Image Example:

```
http://digital.library.wayne.edu/loris/fedora:wayne:CFAIEB01c493%7CEB01c493_JP2/full/full/0/default.jpg
```

## Real Info Example:

```
http://digital.library.wayne.edu/loris/fedora:wayne:CFAIEB01c493%7CEB01c493_JP2/info.json
```

# Proxy

```
      :+:/`
    :---+ss00+!.`
  `~:+sssossys000000+/-`
  `:oyso++00000+///+00ss+`
  :ssyy/-`  ..  ..:/+0SS0:
`/ssyo:      `~+:0SS+`
+ss0+:      `//SSS+
.sss00`      `0+SSS:
/syso+      `~`+00SS+
ssy00+      ..//00SSSS
0SS0+0.      `+//00YS00
:ysyo+0.      `/+0S0S:
`+SSSS00:`  ``.-`.-`  `~000SSS+`
` 0SSS0///-.-:.`  ::.  `~.:+000SSS0`
  `+sossyo++0++::///:/+000SSSS+`
  -0SSSSSS+00+S0SS00S0SSSSSS0-
  ./0SSSSSYSSSSSSSSSS0/.
  `~:+s0syssyo+!.`

<-- Ouroboros says hissss -->
```

Python Middleware

# Cache



[Varnish HTTP Cache](#)

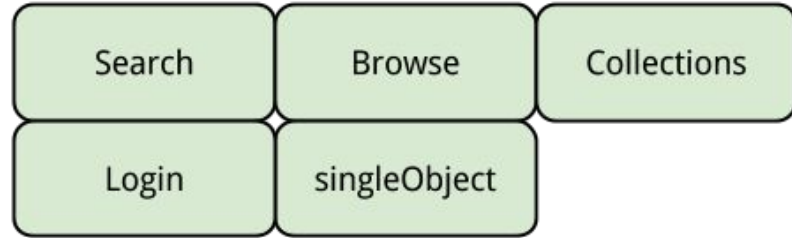
# Proxy

```
      ::+:/`
      :----:+ss00+:.`
      `-,+sssossys000000+/-`
      `:oysyo++00000+///+ooss+-`
      :ssyy/-` .. .. :./+osso:
`/ssyo:                `+:+oss+`
+ss0+:                  `//sss+
.sss00`                 `o+sss:
/syso+                  `+ooss+
ssy00+                  .. /oossss
osso+o.                 `+//ooys00
:ysyo+o.                `/+oos0s:
+ssss00:` .. -` .. -` -oosSS+`
`osss0//-.--:.` .. :.` :.+oosSS0`
`+sossyo++o++::///:/+oosssoss+`
-oosssss+oo+sosss0osssssso-
./ossssssyysssssssso/.
`-:+sossyssyo+:.

<-- Ouroboros says hissss -->
```

Python Middleware

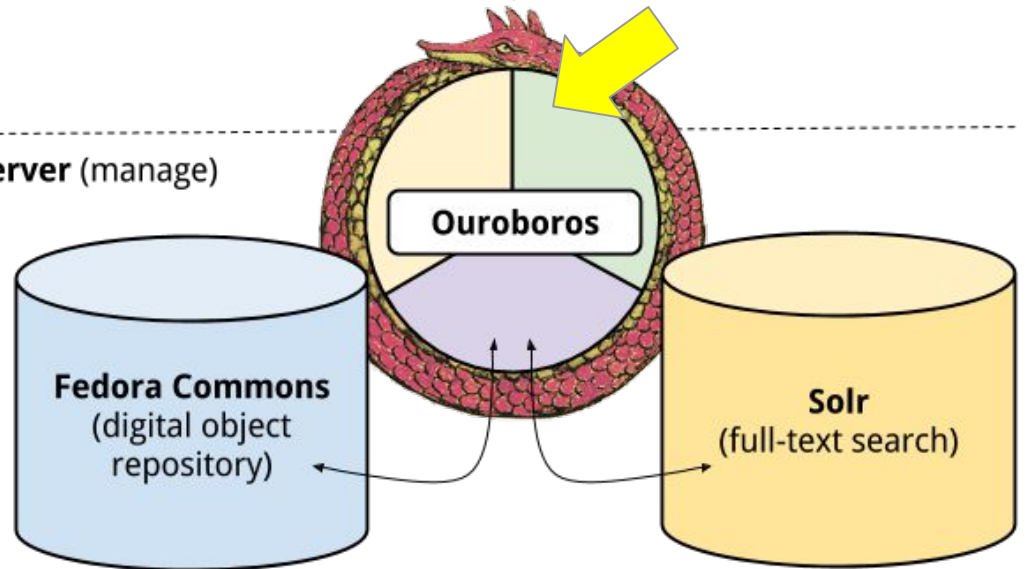
## HTML / PHP/ JS / CSS Front-End



Client

Server (public)

Server (manage)



# Proxy: why?

- More control of image delivery pipeline
- Improve security and reliability of Loris
- Prepare for access challenges / opportunities in the future





# Loris Proxy

Use [Python "IIIFImageClient" class](#)

(Pulled directly from [Emory University's Readux](#), with some additions)

- accept an IIIF image request
- parse the components
- **do things...**
- reconstitute IIIF URL
- make request to Loris
- stream back bits to client

# Loris Proxy

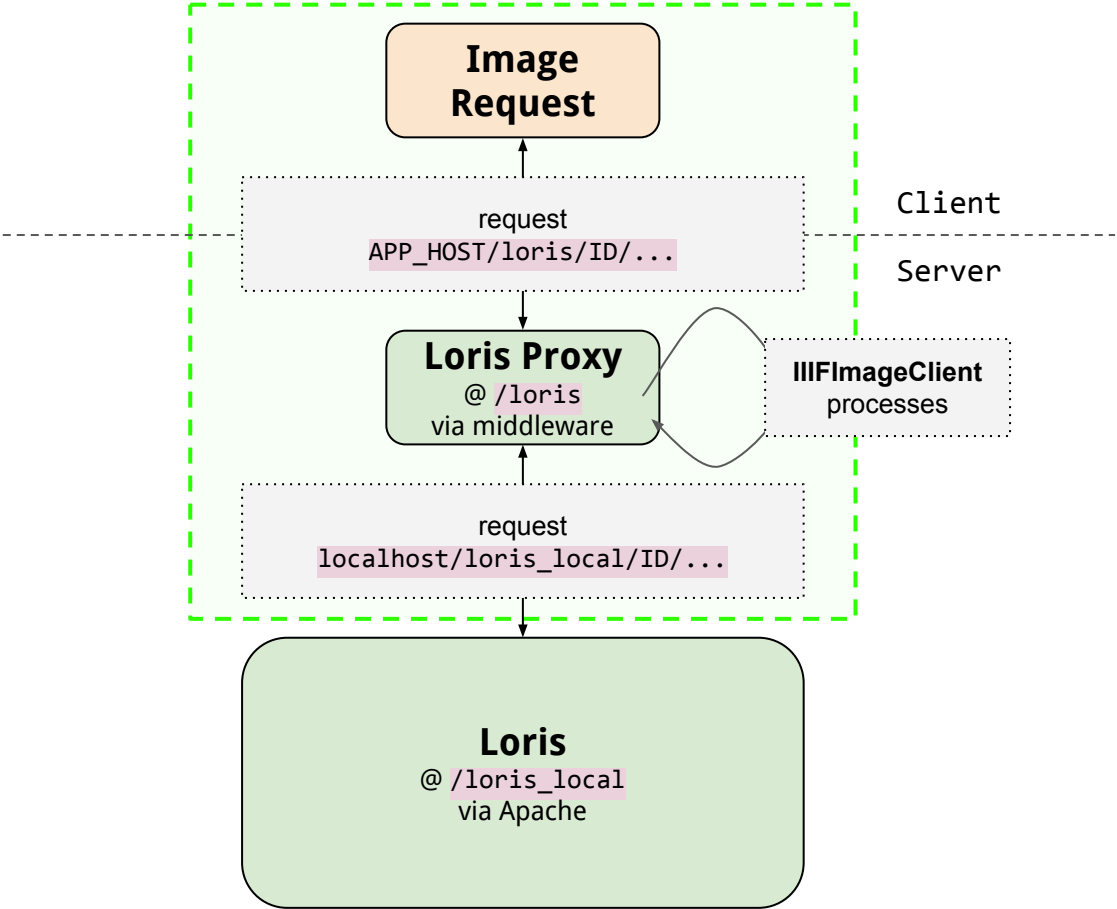
## IIIFImageClient Python Class

Example IIIF image request:

```
http://digital.library.wayne.edu/loris  
/fedora:wayne:CFAIEB01c493%7CEB01c493_JP2  
/full  
/full  
/0  
/default  
.jpg
```

```
def __init__(self, api_endpoint=None, image_id=None, region=None,  
             size=None, rotation=None, quality=None, format=None):  
    self.image_options = self.image_defaults.copy()  
    if api_endpoint is not None:  
        self.api_endpoint = api_endpoint  
    if image_id is not None:  
        self.image_id = image_id  
    if region is not None:  
        self.image_options['region'] = region  
    if size is not None:  
        self.image_options['size'] = size  
    if rotation is not None:  
        self.image_options['rotation'] = rotation  
    if quality is not None:  
        self.image_options['quality'] = quality  
    if format is not None:  
        self.image_options['format'] = format
```

# Proxy for Loris



## e.g. Resizing

- Collections Stakeholders want to limit resolution of outgoing images to 700 px
- Not true for all collections, based on RDF relationship in Fedora



[Digital Dress Collection](#)



[Detroit News Collection](#)

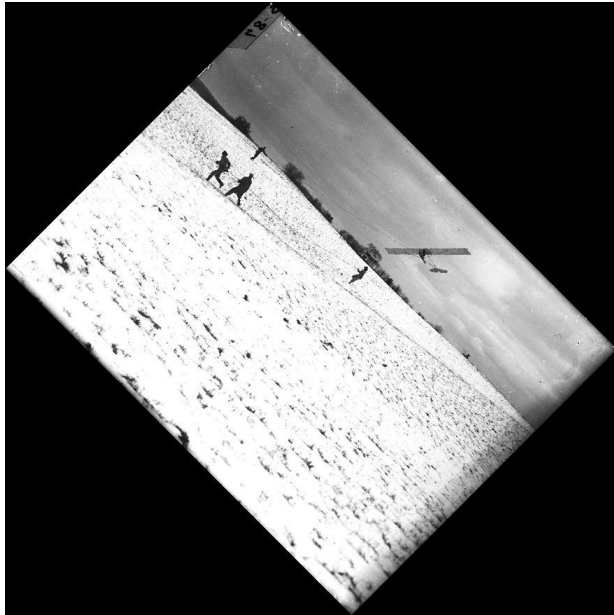
## e.g. Rotation / Mirroring

- Some images are scanned horizontally flipped (mirrored), or rotated
- Maybe don't want to / can't edit the original?
- Add RDF relationships at datastream level that instruct Loris Proxy to adjust

### RDF Relationships

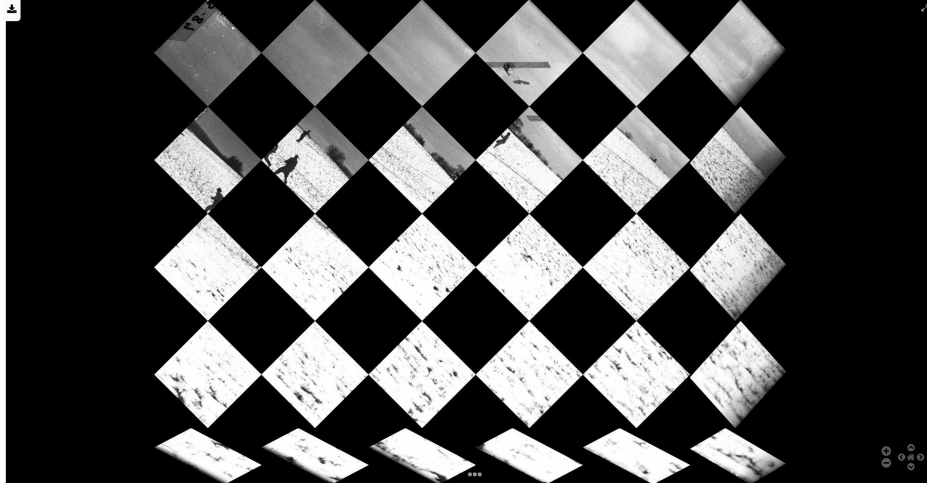
```
<wayne:vmc4617/vmc4617_JP2> <fedora-rels-int:needsRotation> "45" .  
<wayne:vmc10132/vmc10132_JP2> <fedora-rels-int:needsRotation> "!" .
```

e.g. Rotation / Mirroring

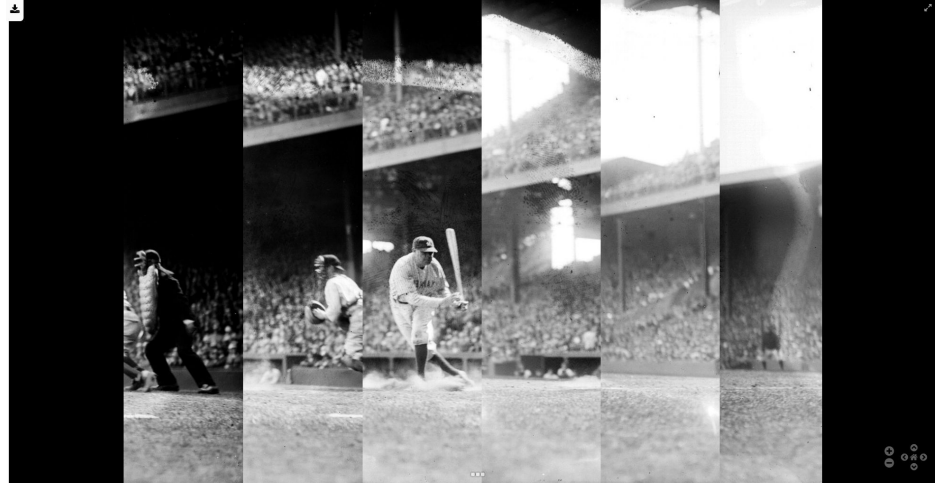


# e.g. Rotation / Mirroring

Aero; Gliders; Wildwood Farm; 1928; Jutting Ship



Ruth, George Herman "Babe". -Baseball. -Action, 1928 - 1929. -Batting



# Cache

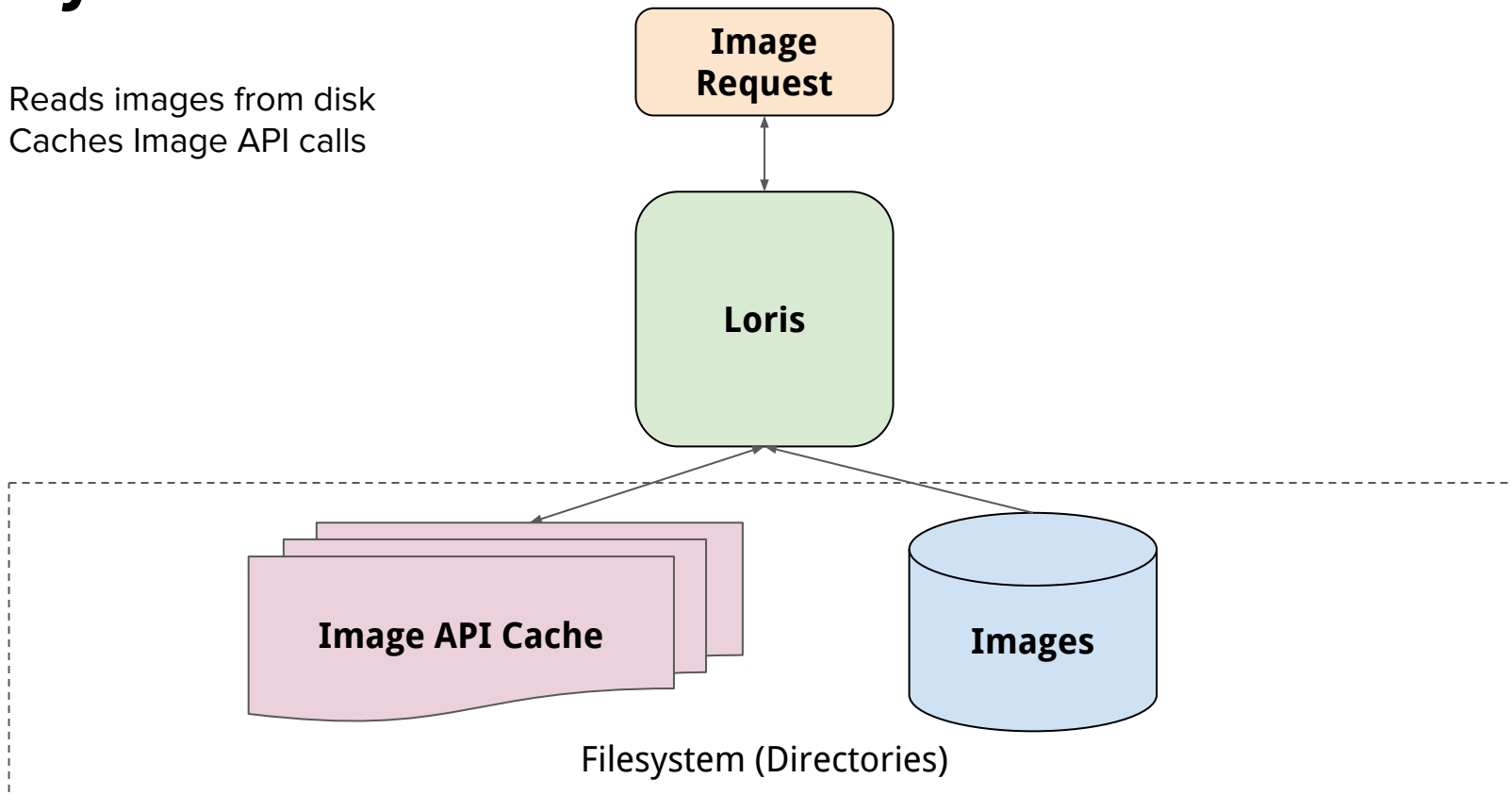


[Varnish HTTP Cache](#)



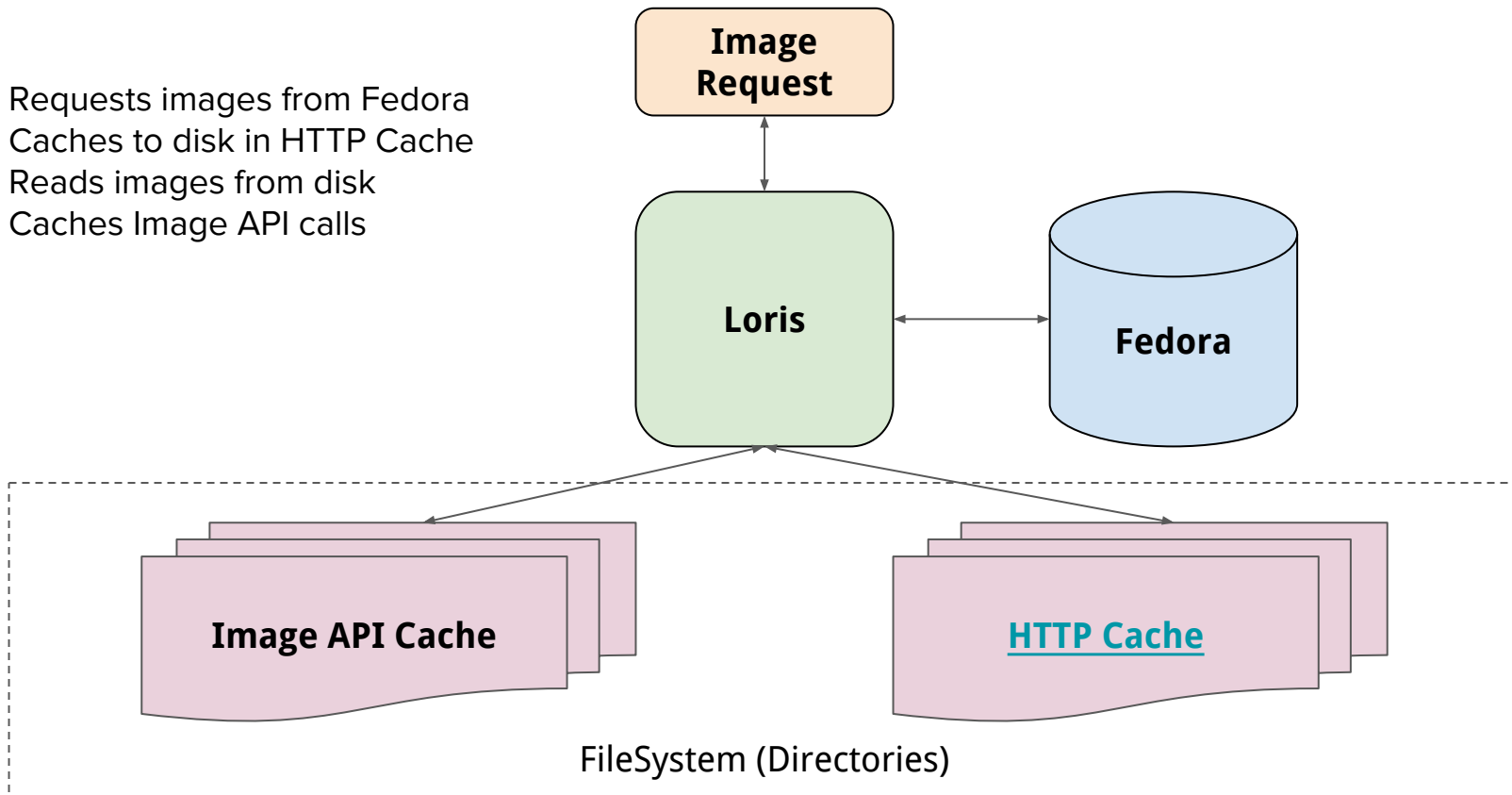
# Default Loris Cache: Filesystem

1. Reads images from disk
2. Caches Image API calls



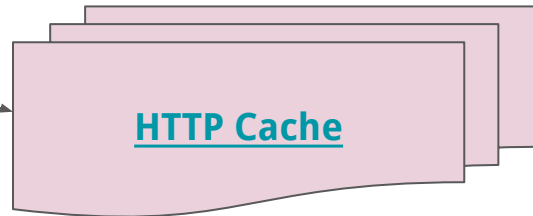
# Default Loris Cache: HTTP

1. Requests images from Fedora
2. Caches to disk in HTTP Cache
3. Reads images from disk
4. Caches Image API calls



**If** Python can treat URLs as file-like objects (e.g. [StringIO](#)), and Loris is written in Python...

...**why** can't Loris treat Fedora URLs as file-like objects and serve them without the additional caching layer?

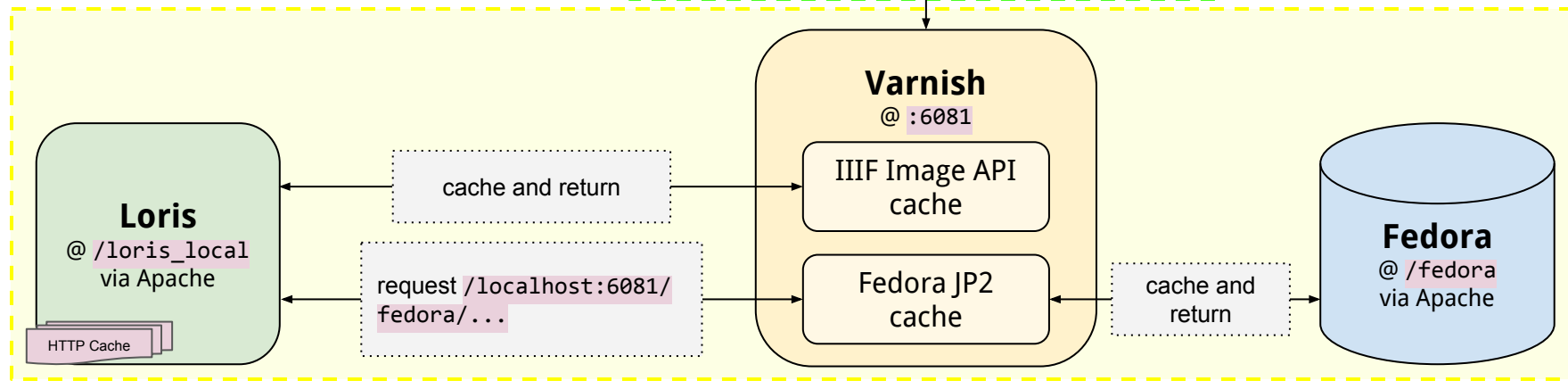
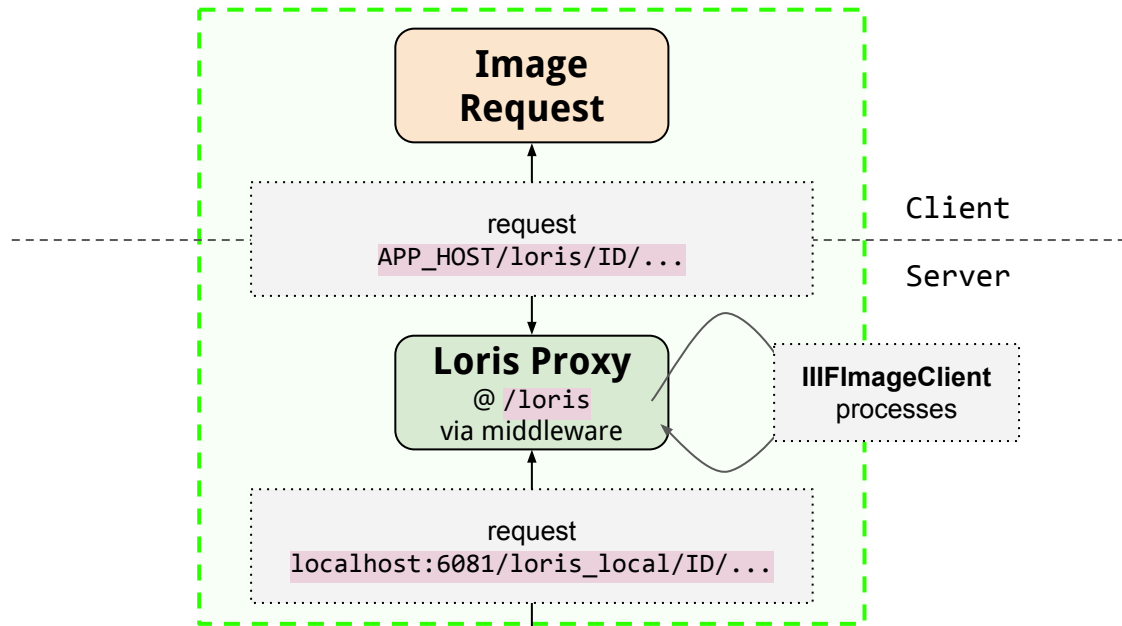


# Cache: why?

- Improve image delivery speed
- Reduce strain on Fedora
- Simpler cache cleaning and maintenance



# Cache with Varnish

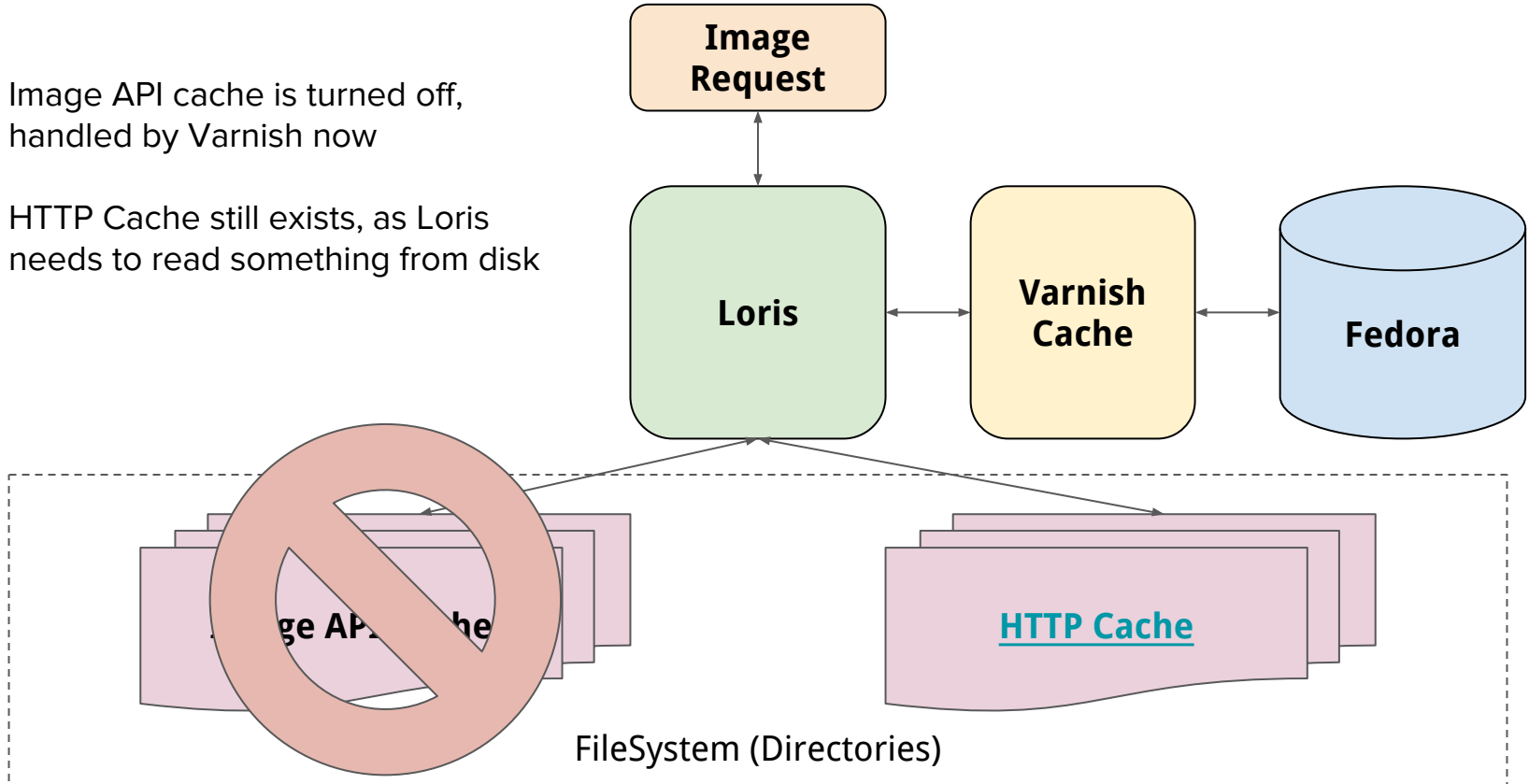


"I could have sworn we updated that..."

- Sometimes resources are updated, moved, etc.
- Need to remove specific objects
- Created methods in middleware for that

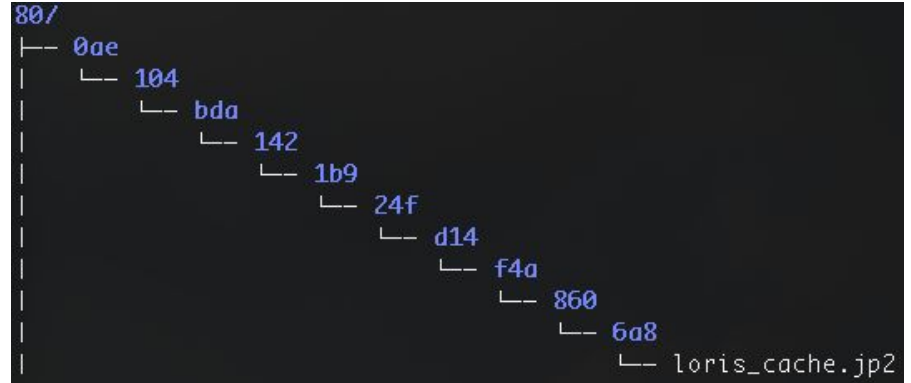
# Default Loris Cache

- Image API cache is turned off, handled by Varnish now
- HTTP Cache still exists, as Loris needs to read something from disk



# Cache Clearing

1. Remove cached object from Loris based on IIIF URL identifier



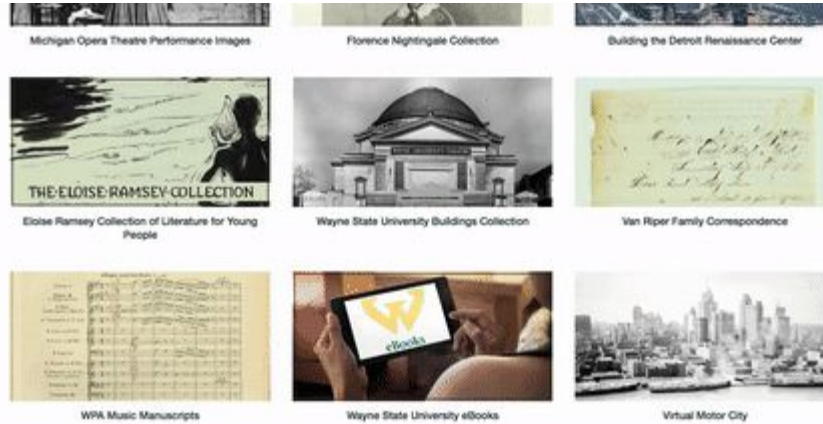
2. "Ban" URLs that contain the digital object PID in Varnish

```
'varnishadm -S /home/ouroboros/varnish_secret -T localhost:6082 "ban req.url ~ %s"' % self.pid
```

3. Voila!



# Loading Collection tiles (no cache)



# Loading Collection tiles (with cache)



Michigan Opera Theatre Performance Images



Florence Nightingale Collection



Building the Detroit Renaissance Center



Eloise Ramsey Collection of Literature for Young People



Wayne State University Buildings Collection



Van Riper Family Correspondence



WPA Music Manuscripts



Wayne State University eBooks



Virtual Motor City

# Loading Single Image (no cache)



Michigan, Cities; Grosse Pointe Woods; municipal bldg.

Michigan, Cities; Hamburg

Michigan, Cities; Grosse Pointe Woods.

Michigan, Cities; Hamtramck; Aerial view. Reservoir.

Michigan, Cities; Hamtramck; Aerial view. Reservoir.

• 821 822 823 824 825 **826** 827 828 829 830 •

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# Loading Single Image (with cache)



The image displays a grid of six thumbnails, each with a small image and a caption below it. The thumbnails are arranged in two columns and three rows. The first row contains three thumbnails: a building, a street scene, and a road. The second row contains three thumbnails: an aerial view of a city, an aerial view of a reservoir, and another aerial view of a city. Below the grid is a pagination bar with numbers 821 through 830, with 826 highlighted. At the bottom of the page, there is a copyright notice and a footer with links for 'Library', 'Feedback', 'Privacy', and 'Accessibility'.

Michigan, Cities; Grosse Pointe Woods, municipal bldg.

Michigan, Cities; Hamburg

Michigan, Cities; Grosse Pointe Woods

Michigan, Cities; Hamtramck, Aerial view. Reservoir.

Michigan, Cities; Hamtramck, Aerial view. Reservoir.

Michigan, Cities; Hamtramck, Aerial view. Reservoir.

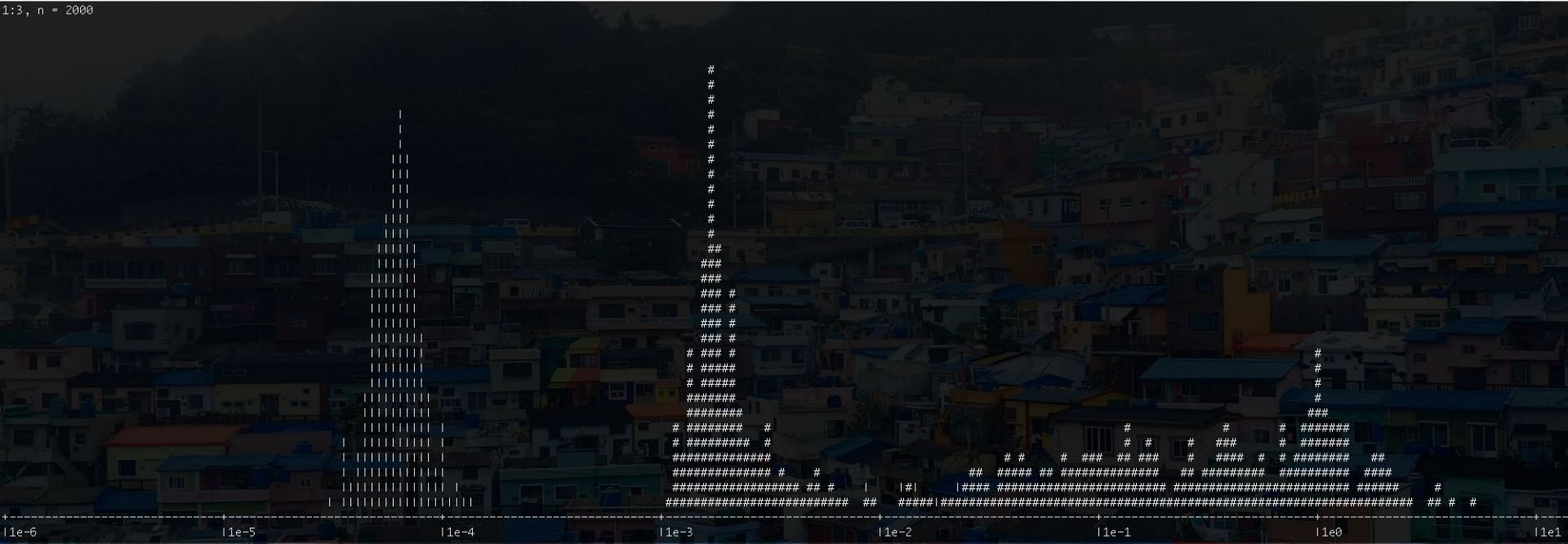
• 821 822 823 824 825 **826** 827 828 829 830 •

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# Varnish "hits" and "misses"

1:3, n = 2000



# Some numbers

	avg. seconds
Loris IIIF <b>OFF</b> , Loris HTTP <b>ON</b> , Varnish for IIIF <b>ON</b> , Varnish for Fedora <b>ON</b>	0.053
Loris IIIF <b>OFF</b> , Loris HTTP <b>ON</b> , Varnish for IIIF <b>OFF</b> , Varnish for Fedora <b>OFF</b>	0.244
Loris IIIF <b>OFF</b> , Loris HTTP <b>ON</b> , Varnish for IIIF <b>OFF</b> , Varnish for Fedora <b>ON</b>	0.256
Loris IIIF <b>OFF</b> , Loris HTTP <b>OFF</b> , Varnish for IIIF <b>OFF</b> , Varnish for Fedora <b>OFF</b>	0.353
Loris IIIF <b>ON</b> , Loris HTTP <b>ON</b> , Varnish for IIIF <b>OFF</b> , Varnish for Fedora <b>OFF</b>	0.118

**Thanks!**  
**Code4Lib Midwest, 2016**  
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