

# MIGRATING INTERNET ARCHIVE TO KUBERNETES

KUBECON 2018 - SEATTLE, WA

@tracey\_pooh  
@dvanduzer

2018 December 13

 for keyboard shortcuts

<https://github.com/traceypooh/slides>



Kubernetes  
or Bust!

# EVER COMING SOON!



# INTRO TO ARCHIVE.ORG

- 300B+ web pages **WayBack Machine**
- 15M books lendable
- 4M videos
- 4M audio & concerts
- 3M images
- 200K software items & emulation



Secure | <https://web.archive.org/web/1...>

<http://www.apple.com:80/> Go OCT DEC APR  
1995 1996 1998 About this capture

**56,250 captures**  
22 Oct 1996 – 27 Oct 2017

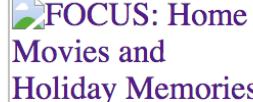
Product Information  
Customer Support  
Technology & Research  
Developer World  
Groups & Interests  
Resources Online  
About Apple

**Apple Sites**  
Asia  
Australia  
Belgium  
Canada  
Chile  
Denmark

Go

Home Page Archives

  
**HAVE WE GOT A GIFT FOR YOU!**  
Apple Offers Holiday Rebates on Performas.

  
**FOCUS: Home Movies and Holiday Memories**

  
**A Holiday Message to Customers from COO Marco Landi**

  
**What's Hot**

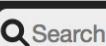
**Power Mac Rebates**  
Apple offers [mail-in rebates](#) of up to \$450 for Power Macintosh 7600 or 8500 computers purchased between Dec. 9 and Jan. 19. Rebate coupons are available from dealers or via fax -- call 1-800-262-0329.

**Prepared for the Millennium**  
When 1999 rolls to 2000, many computer systems will fail, but not the Apple Macintosh. [Find out why](#) the Mac will handle dates in the 21st Century and beyond.

**Open Transport 1.1.2**  
Get transported to new heights with [Open Transport 1.1.2](#), which offers improved networking performance and reliability.

**Enhanced Virtual Reality**  
Apple and Silicon Graphics [have announced an agreement](#) designed to enhance networked, interactive 3D content and applications via high-performance, high-quality Virtual Reality Modeling Language (VRML) 2.0 browsing.





The title page features a decorative border at the top. Inside the border, it says 'CHILDREN'S BOOK COLLECTION' and 'LIBRARY OF THE UNIVERSITY OF CALIFORNIA LOS ANGELES'. Below the border, the title 'GOODY TWO-SHOES.' is written in a large, bold, serif font. A small number '1b.25' is handwritten in the top left corner of the page.

**FARMER MEANWELL** was at one time a very rich man. He owned large fields, and had fine flocks of sheep, and plenty of money. But all at once his good fortune seemed to desert him. Year after year his crops failed, his sheep died off, and he was obliged to borrow money to pay his rent and the wages of those who worked on the farm.

At last he had to sell his farm, but even this did not bring him in money enough to pay his debts, and he was worse off than ever.

Among those who had lent money to Farmer Meanwell were Sir Thomas Gripe, and a Farmer named Graspall.

Sir Thomas was a very rich man indeed, and Farmer Graspall had more money than he could possibly use. But they were both very greedy and covetous, and particularly hard on those who owed them anything. Farmer Graspall abused Farmer Meanwell and called him all sorts of dreadful names; but the rich Sir Thomas Gripe was more cruel still, and wanted the poor debtor shut up in jail.

So poor Farmer Meanwell had to hasten from the place where he had lived for so many years, in order to get out of the way of these greedy men.

He went to the next village, taking his wife and his two little children with him. But though he was free from Gripe and Graspall she was not free from trouble and care.

He soon fell ill, and when he found himself unable to get

GOODY TWO-SHOES.

food and clothes for his family, he grew worse and worse and soon died.

His wife could not bear the loss of her husband, whom she loved so dearly, and in a few days she was dead.

The two orphan children seemed to be left entirely alone in the world, with no one to look after them, or care for them, but their Heavenly Father.

They trotted around hand in hand, and the poorer they became the more they clung to each other. Poor, ragged, and hungry enough they were!

Tommy had two shoes, but Margery went barefoot. They had nothing to eat but the berries that grew in the woods, and the scraps they could get from the poor people in the village, and at night they slept in barns or under hay-stacks.

Their rich relations were too proud to notice them. But Mr. Smith, the clergyman of the village where the children were born, was not that sort of a man. A rich relation came to visit him—a kind-hearted gentleman—and the clergyman told him all about Tommy and Margery. The kind gentleman pitied them, and ordered Margery a pair of shoes and gave Mr. Smith money to buy her some clothes, which she needed sadly. As for Tommy he said he would take him off to sea with him and make him a sailor. After a few days, the gentleman said he must go to London and would take Tommy with him, and sad was the parting between the two children.

Poor Margery was very lonely indeed, without her brother, and might have cried herself sick but for the new shoes that were brought home to her.

They turned her thoughts from her grief; and as soon as



## Goody Two-Shoes



Edit



Manage



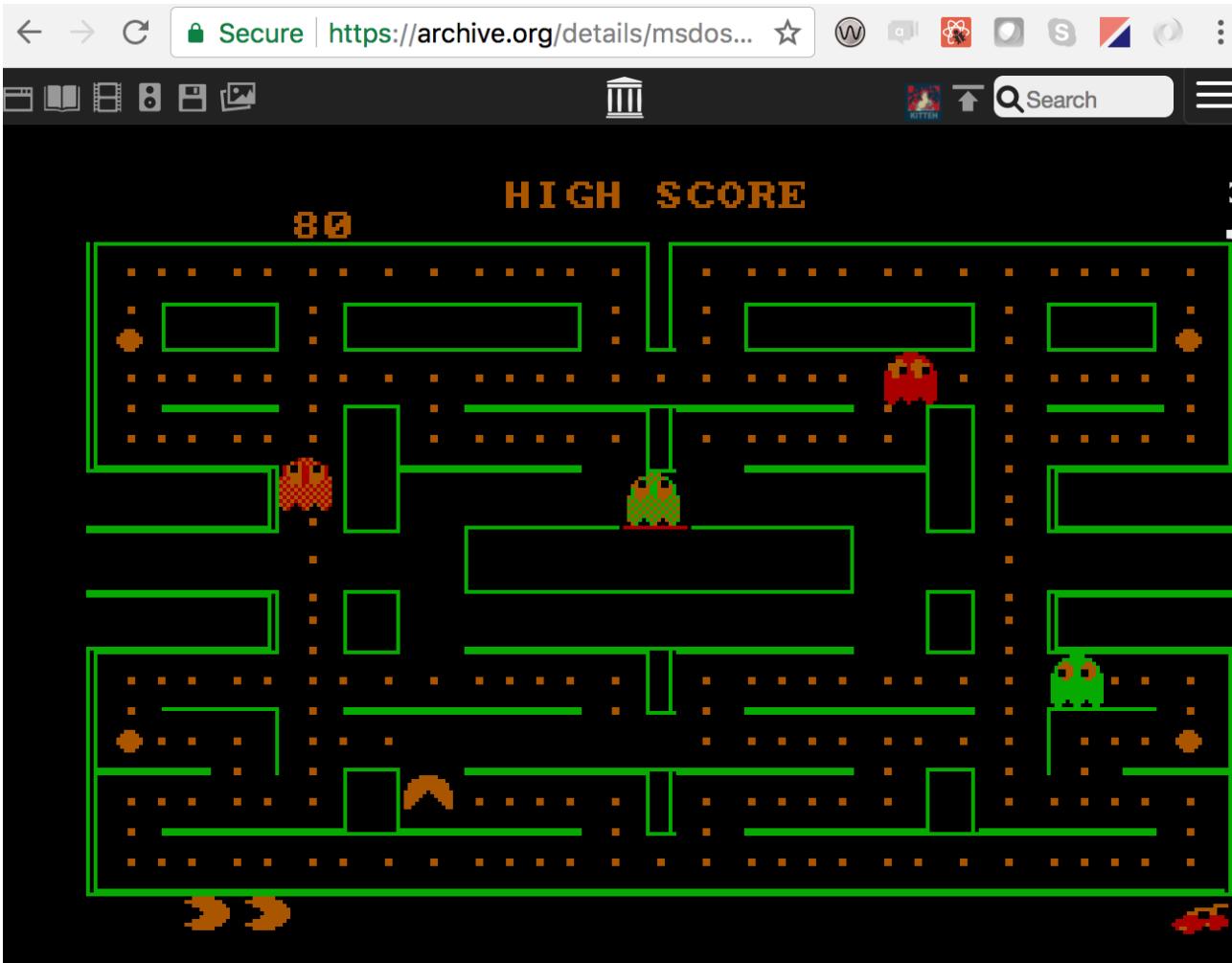
History Book view Barcode

Publication date c1888

Topics Brothers and sisters, Orphans, Conduct of life, Education

Digitized by Internet Archive in 2011 with funding from Google





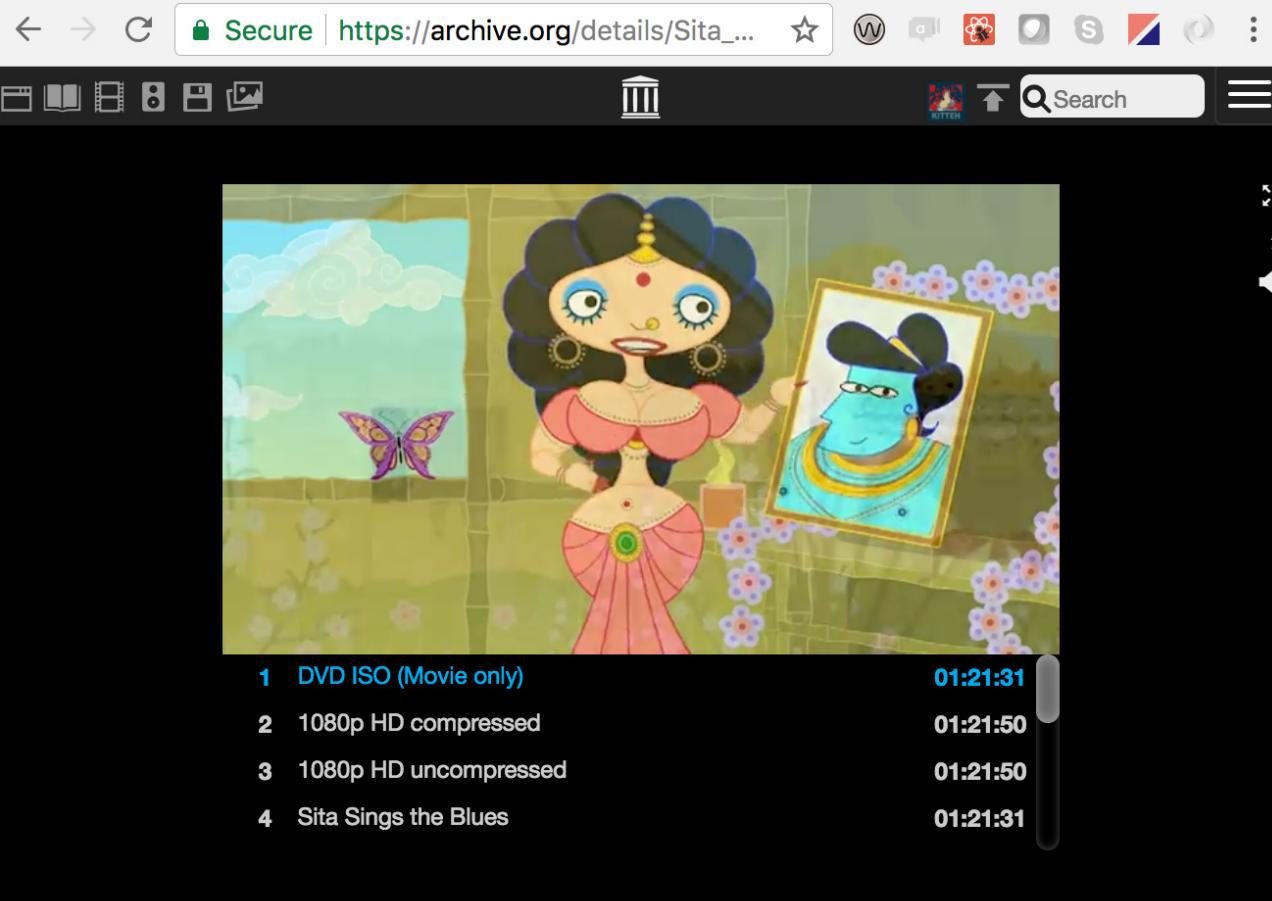
## Pac-Man

[Edit](#) [Manage](#) [History](#) [Barcode](#)

by [Namco Limited](#)

Publication date [1983](#)





## Sita Sings the Blues

 Edit  Manage  History  Barcode

by [Nina Paley](#)

Publication date 2008

Usage CC0 1.0 Universal 

# LIBRARY!

- Absolute browser Privacy
  - no personal data or IP addresses extracted
- Validation & nontampering
  - keep original versions with 2+ checksums and logs

```
<file name="commute.mp4" source="derivative">
<title>commute</title>
<format>h.264</format>
<original>commute.avi</original>
<md5>ff17ed66e7db5693dd208dd6ac488ff8</md5>
<mtime>1325973601</mtime>
<size>11919082</size>
<crc32>ad1df03a</crc32>
<sha1>e9f9de8379cd25653d487ab30d198fc61a050091</sha1>
<length>115.61</length>
<height>480</height>
<width>640</width>
</file>
```



# TIMELINE / EVOLUTION

Month	Progress
2014/11	<b>docker</b> for audio fingerprints - controversial
2015/10	<b>MozFest</b> OpenNews <b>docker</b> talk mind blown
2016/8	switched <b>.mp3 / .mp4</b> generation to <b>docker</b>
2017/6	IA Engr. Presentation
2018/6	IA Engr. Special Topic talk
2018/7	<b>GitLab 'Auto DevOps'</b> Changes Everything - Dev & Ops Harmony - Confessions of a middle child

# TIMELINE / EVOLUTION

Month	Moves into GitLab Auto DevOps Kubernetes
2018/8	archive.org main repo CI/ <b>test</b> migrated
2018/9	archive.org full pipelines, website 'review apps'
2018/10	bookscan webapps
2018/12	dweb.me (archive.org decentralized)

# WHERE WE ARE

- rapidly moving webapps to k8
  - archive.org website ready
  - bookscanning and mgmt webapps
  - dweb.me
- AWS-like (webapps) k8 ✓
- EC2-like (processing) k8 ✓
- GitLab managed registry ✓

.. BUT!

- still more comfortable w/ block-device storage than torrented pieces for entire data Archives
  - eg: S3 => K8 or o/w -- seems anxiety++

# AVOID BAD BLOOD





# LOGJAM BREAKTHROUGHS

- david (ops-heavy history) + tracey (dev-heavy history) teamup (end of 2017)
- GitLab advertises **with Kubernetes** July/2018
- **already using** 'on premise' **GitLab** for repos w/ ssh-key user accounts .org-wide

# WORK TOWARDS COMMON GOALS

## Devs & Ops



WWW-NAME (BESPOKE) - V-  
REVIEW APPS (GITLAB + K8)

webapps quick development at archive.org

# WWW-TRACEY.ARCHIVE.ORG

- ssh 'bastion' with homedirs
- NFS /home/ automounts throughout cluster
- edit:
  - emacs/vi on (linux) bastion
  - laptop editors with sftp / rsync-over-ssh on [ save ]
- nginx virtual hosts
  - <https://archive.org> => /petabox/www/ .. (production)
  - <https://www-NAME.archive.org> =>  
[/home/NAME/petabox/www/ ..](/home/NAME/petabox/www/) (dev)

# WWW-NAME.ARCHIVE.ORG ISSUES

- single 'dest' (multiple branches tricky)
- ssh keys and access
- NFS /home/ dirs

# K8 + AUTO DEVOPS 'REVIEW APPS'

- contractors can work/test full site
  - w/o ssh keys/access
  - 12h timezone shift OK
    - no staff/approval need - **game changer!**
- git branches => 'review apps' consistent/update over time
- **kre8/branch-sync-edit.sh**
  - 'copy file change to pod on save' fast script
  - webapp instant f/b w/o full push and CI/CD

# CRAWLING CASE STUDY

# ANATOMY OF ARCHIVAL CRAWLING

1. Start with a list of websites
2. Fetch all those URLs
3. Extract Hyperlinks from all the fetched content
  - Now you have a list of websites again
  - Which you can Fetch and Extract and...
4. Serialize captures into WARC (Web Archive) format
5. Persist to permanent item storage

# HERITRIX

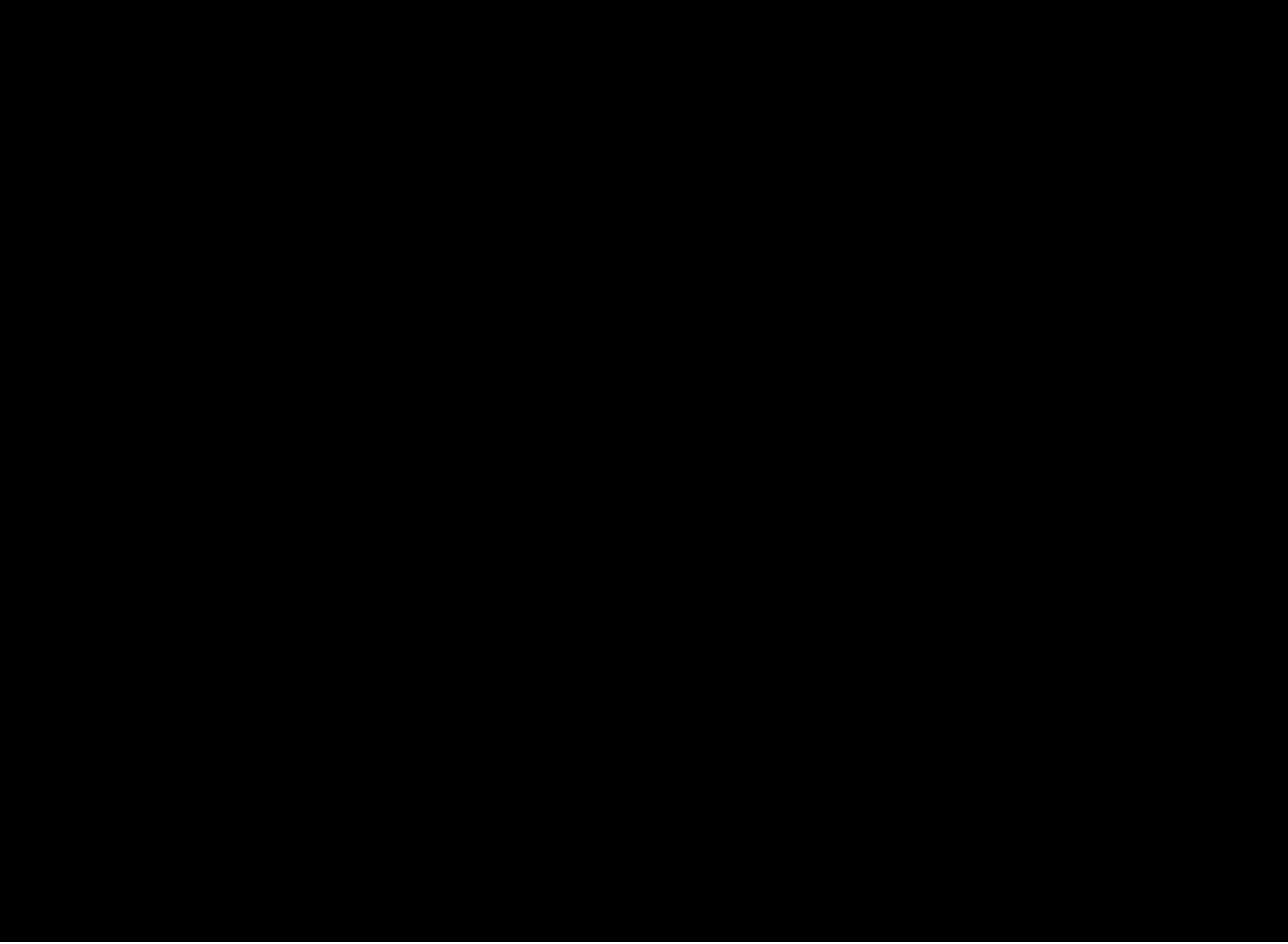
- open source Java crawler developed at IA
- very good at pipelining these stages
- but, single machine operation

# CRAWLHQ

- distributed frontier management
- multiple Heritrix instances share single URL deduplication queue

# REWRITING CRAWLHQ AS DEMO OF K8S AUTO-SCALING

- Kafka partitions for work queue
- FoundationDB for hashes of seen URLs
- 38,000 lines of code is now 73 lines of Python
- throughput scales automatically with GitLab **REPLICAS** variable



# MONOREPO SPEED++

- 4.8G tree => 6GB .. 9GB docker images
- **test** phase **first** = faster (when possible)
- takeover git mgmt
  - naive **git clone** every CI/CD phase = nonstarter
- build/test code in same tree
  - **RUN . .** move git tree up to head of master first
  - **RUN . .** reinvoke build script (now at master);
    - move git tree pointer back to **\$COMMIT**

# MONOREPO.GIT

- **\$FETCH** either:
  - master:master
  - master:master my-awesome-branch:ca6745
- **\$CHECKOUT** either:
  - master or my-awesome-branch (head) or ca6745
- **git shallow clone**
  - (docker image basis; recut weekly or so; baseline image used in each phase)

# MONOREPO.GIT

- `git checkout --detach`
  - avoid tangle with git tree state
- `git fetch -depth 1 -f -origin $FETCH`
  - git 'advertised' commits
  - omnibus `gitconfig[ 'system' ] = { "uploadpack" => [ "allowReachableSHA1InWant = true" ] }`
- `git checkout -f $CHECKOUT`
  - reset HEAD pointer to state in `origin's` branch/commit
  - (makes concept of branch/commit now same as origin's)
- `build` pull from prior branch's build saved in registry

BECAUSE WE HAVE **THIS** GUY AND YOU DON'T



**Mark Sullivan** Web Archiving Software Engineer

Mark joined the Archive in August 2016 to help Arc of the Archive, with new data transfer tools. He graduated from the University of Michigan with a Bachelor's of Computer Engineering and occasionally dreams of expressive computers, and

^ git pro

# 'ON PREM' K8 CLUSTER FROM SCRATCH

- <https://gitlab.com/internetarchive/kre8>



- shows/uses GitLab 'Auto DevOps' CI/CD end-to-end
- need 1+ VM w/ ssh access and sudo
  - (ubuntu based so far)
- uses **kubeadm**
- coworker can try out - low commitment

# TOP TIPS

- **POSTGRES\_ENABLED=false** CI/CD var
  - avoids extra (unused!) PV per branch/deploy
- can use simple **localstorage** for 1 (tainted) or 2-node k8 clusters
- periodically: remove old replicaset, trim registry
- GitLab API for last master **test** phase status
  - 'OK to push live?'

# LOADBALANCER VS INGRESS FOR ALT PORTS

- `kubectl expose -n kube-system deployment/production -  
-type=LoadBalancer --name=porter`
- `kubectl patch -n kube-system svc/porter -p='{"spec":  
{"externalIPs": [ "'${K8_INGRESS_IP}'" ]}}'`

# MULTILINGUAL AND AGNOSTIC

- docker allows many langs/platforms/OS easily
- docker / stateless apps coax into doing things **the right way**
- forces rebuildable recipes / less 'named pets'





THE END