

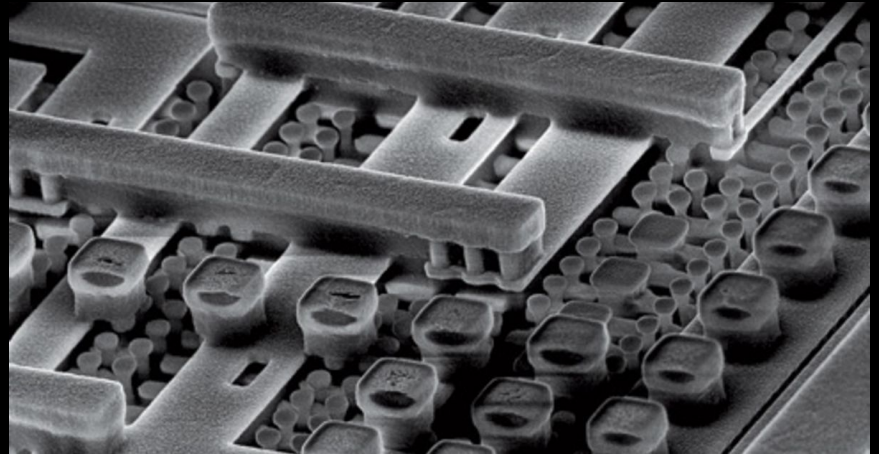
# Collaborative Infrastructure for Digital Preservation

Corey Davis

Digital Preservation Coordinator, COPPUL

BCNET 2019

# What is digital preservation?



It depends...

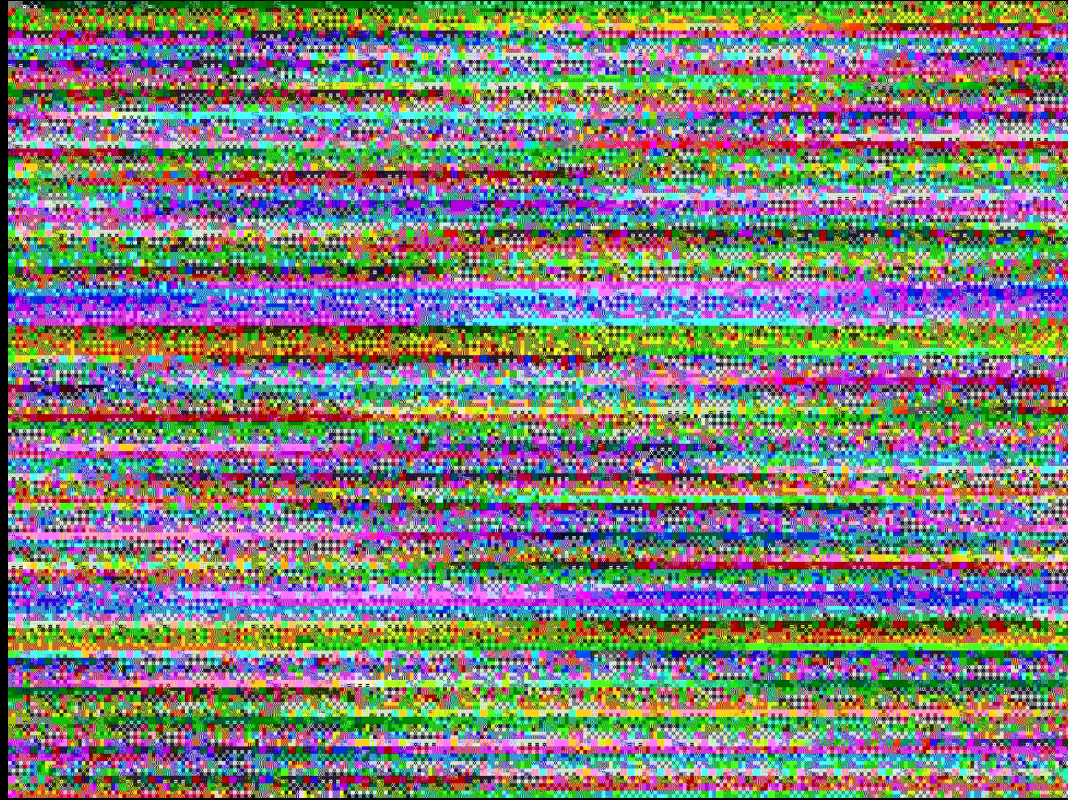


“[W]hile the cave paintings in Lascaux are an incredible 20,000 years old, it isn’t clear whether digitized images of that art—or any digital art created today—will last 20 years, let alone 20,000.”

Vint Cerf



Bitstreams are not intelligible without the data formats, applications, operating systems, and hardware environments to interpret them.



“Traditionally, preserving things meant keeping them unchanged; however our digital environment has fundamentally changed our concept of preservation requirements. If we hold on to digital information without modifications, accessing the information will become increasingly difficult, if not impossible.”

Chen, S. S. (2001). The paradox of digital preservation. *Computer*, 34(3), 24-28.

Digital  
preservation is  
about ensuring  
access to  
digital  
materials in the  
future



“Digital preservation involves planning, resource allocation, and application of preservation methods and technologies, and it combines policies, strategies and actions to ensure access to content, regardless of the challenges of media failure and technological change.”

Wikipedia, *Digital Preservation*



“Digital preservation involves **planning**, resource allocation, and application of preservation methods and technologies, and it combines policies, strategies and actions to ensure access to content, regardless of the challenges of media failure and technological change.”

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Wikipedia, *Digital Preservation*



Digital preservation

≠

Backup and disaster  
recovery

“Many aspects that go into backing up data for current use are similar to aspects of digital preservation work, but the near-term concerns of being able to restore data are significantly different from the long-term issues related to ensuring access to content in the future.”

Trevor Owen, Library of Congress

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Trevor Owen, Library of Congress

Digital preservation is  
not primarily a technical  
problem



# Digital preservation involves...

- Planning
- Resource allocation
- Application of preservation methods and technologies

By way of illustration, a story...



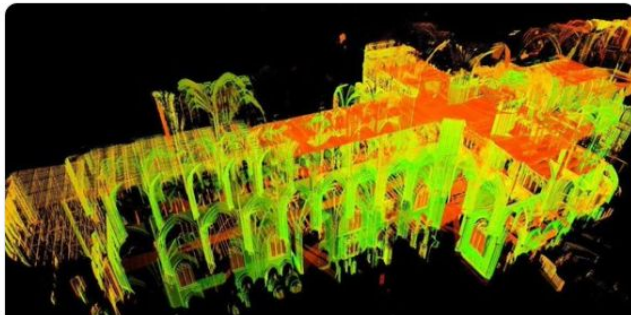


The Telegraph

@Telegraph

Follow

The man who scanned Notre-Dame: Could Andrew Tallon's work help rebuild the cathedral?



**The man who scanned Notre-Dame: Could Andrew Tallon's work help rebuild ...**

As the smoke curled away from Notre-Dame cathedral and into the dusk that fell on Paris on Monday night, social media lit up in shared grief.

[telegraph.co.uk](https://telegraph.co.uk)

12:45 PM - 16 Apr 2019

13 Retweets 30 Likes



2



13



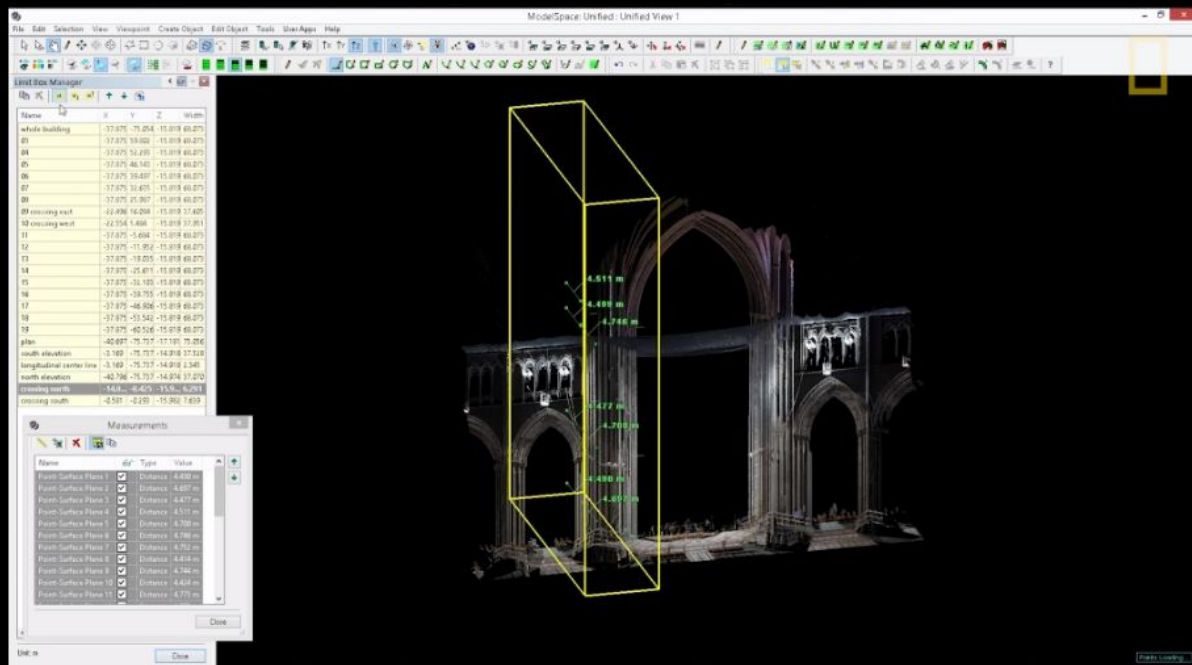
30





# Historian uses lasers to unlock mysteries of Gothic cathedrals

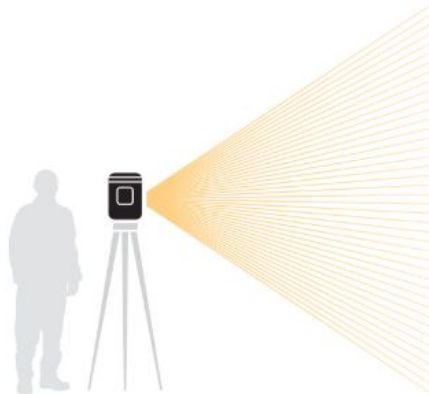
A tech-savvy art historian uses lasers to understand how medieval builders constructed their architectural masterpieces.



## Graphic: Peering Inside a Cathedral

Art historian Andrew Tallon is using laser scanning technology to discover anomalies in the structure of cathedrals such as Notre-Dame in Paris. Here's how it's done.

A tripod-mounted laser collected data by scanning more than 50 locations in and around Notre-Dame.



Point Cloud

Photo Wrapping

Wire Frame

Rendered Model



### Point Cloud

The data are stitched together to form a "point cloud" containing more than a billion points, revealing structural concerns that otherwise would be hard to detect.



## This site can't be reached

**gothicstructure.org** took too long to respond.

Try:

- Checking the connection
- [Checking the proxy and the firewall](#)
- [Running Windows Network Diagnostics](#)

ERR\_CONNECTION\_TIMED\_OUT

Reload

Details



**Medieval Architecture**



**Medieval Sculptures**



**Structures**



**Top Construction Projects**



**Medieval Weapons**



**Medieval Names**



**medieval Gothic architecture**

Related links:

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[Structures](#)

https://web.archive.org/web/20150823040640/http://gothicstructure.org/projects/paris.html



http://gothicstructure.org/projects/paris.html

[9 captures](#)

13 Feb 2015 - 12 Mar 2017

web.archive.org says

Error loading panorama XML

OK

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## The cathedral of Paris

« The cathedral of Bourges  
↔ projects  
Sculpture photography »

[Virtual visit in spherical panoramic photographs](#)

# Paris, Cathédrale Notre-Dame

[Images](#)[360° Panoramas](#)[Stereoscopic Images](#)[Laserscan Images](#)[Gigapixel Images](#)[A Brief Tour](#)

## PLAN

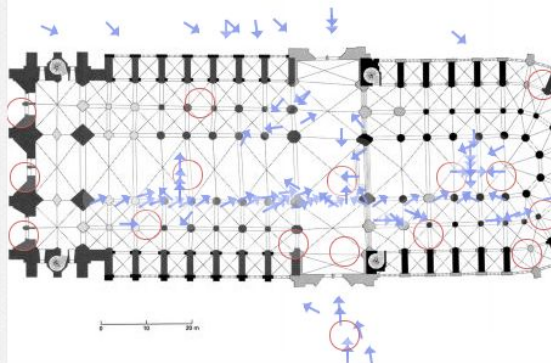
## ELEVATION

## HISTORY

## CHRONOLOGY

Construction of the Gothic cathedral was part of a massive rearrangement of the urban topography of the east end of the Ile de la Cité. The new cathedral was located substantially to the east of the old principal church, S-Etienne, opening a new space for the parvis to which a new east-west road, the Rue neuve Notre-Dame provided access. The Hôtel Dieu was relocated to the south west of the cathedral and construction broke beyond the limits of the old Roman wall with a new bishop's palace to the south and the new Gothic choir to the east.

### The Floorplan: Images & Panoramas

[Expand plan viewer](#)[Image](#)[360° Panorama](#)

Google

Map data ©2019 Google, ORION-ME Terms of Use

### All the Buildings

- [Albi, Cathédrale Sainte-Cécile](#)
- [Alençon, Église Notre-Dame](#)
- [Amiens, Cathédrale Notre-Dame](#)
- [Angers, Cathédrale Saint-Maurice](#)
- [Angers, Église Saint-Serge](#)
- [Arcueil, Église Saint-Denis](#)
- [Auffay, Collégiale Notre-Dame](#)
- [Autun, Cathédrale Saint-Lazare](#)
- [Auxerre, Cathédrale Saint-Étienne](#)
- [Auxerre, Église Saint-Eusèbe](#)
- [Auxerre, Église Saint-Germain](#)



## Paris, Cathédrale Notre-Dame

Laserscan Images *are not available for this building.*



© [Media Center for Art History](#), Columbia University & [Art Department](#), Vassar College /// [Stephen Murray](#), [Andrew Tallon](#), & Rory O'Neill /// Made Possible by [The Mellon Foundation](#) /// [Feedback](#)



# Paris, Cathédrale Notre-Dame

Images

360° Panoramas

Stereoscopic Images

Laserscan Images

Gigapixel Images

A Brief Tour



PLAN

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The Floorplan: Images &amp; Panoramas



Expand plan viewer



Image



360° Panorama



## Oops! Something went wrong.

This page didn't load Google Maps correctly. See the JavaScript console for technical details.

All the Buildings

Albi, Cathédrale Sainte-Cécile

Alençon, Église Notre-Dame

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Angers, Cathédrale Saint-Maurice

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Auxerre, Cathédrale Saint-Étienne

Auxerre, Église Saint-Eusèbe

Auxerre, Église Saint-Germain

MAPPING GOTHIC FRANCE



About

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## Paris, Cathédrale Notre-Dame

### Not found

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### Not found

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# Obituary: Prof. Andrew J. Tallon, 1969-2018

by SAH News | Dec 06, 2018

**Professor Andrew J. Tallon**, died Friday, November 16, 2018. Professor Tallon was born on March 12, 1969 in Louvain, Belgium, the son of Andrew F. Tallon and Mary Beth Tallon Vander Vennet. He was educated at Princeton and Columbia Universities, and joined the faculty at Vassar College in the Department of Art in 2007 teaching medieval art, architecture and pre-modern acoustics. He received a Ph.D. from Columbia University with distinction, M.A. from the University of Paris-Sorbonne, and B.A. with highest honors from Princeton University.

**Andrew Tallon** was esteemed worldwide as an innovative scholar of French Gothic art and architecture, one who introduced new digital techniques to the analysis and re-creation of the spatial archaeology of medieval buildings. In all his work, he was an inspired and generous educator who brought the past to life in vivid and meaningful ways. His second book (in progress) is entitled *The Structure of Gothic*. His first, *Notre-Dame de Paris*, was coauthored in French with Dany Sandron and published in 2013; an English edition is under contract with the University of Pennsylvania Press. He received research funding through a grant from the Samuel Kress Foundation for a study of the cathedral of Bourges and a five-year grant from the Andrew Mellon Foundation for the web-based project Mapping Gothic. His research was featured in an Emmy-nominated PBS | Nova production, *Building the Great Cathedrals*, which has regularly aired nationally since 2010, the Arte documentary *Les cathédrales dévoilées*, which first aired in Europe in 2011, in a 2013 edition of *Des racines et des ailes* on France 3, and on National Geographic as part of the Innovators series. **Tallon** was a former director of the International Center of Medieval Art and of AVISTA, and was co-founder and a director of the US-based charitable association the Friends of Notre-Dame.



Vassar College ✓

@vassarcollege

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## Posts

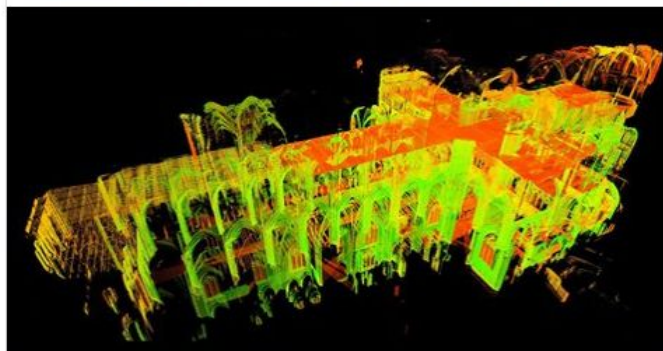


Vassar College

21 hrs · 🌐

Today's tragedy in Paris brings to mind the amazing work of the late Professor Andrew Tallon, who used his incredible skills to digitally map the interior of Notre Dame Cathedral.

<https://www.google.com/.../150622-andrew-tallon-notre-dame-ca...>



NEWS.NATIONALGEOGRAPHIC.COM

**Historian Uses Lasers to Unlock Mysteries of Gothic Cathedrals**

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📅 Page created - December 2012

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The @TheAtlantic examines the importance of the 3D laser data from the late Andrew Tallon, Associate Professor of Art, for the Notre Dame Cathedral rebuilding process.

#NotreDameCathedralFire



**The Images That Could Help Rebuild Notre Dame Cathedral**

And the young, brilliant professor who made them before he died

[theatlantic.com](https://theatlantic.com)

5:11 AM - 16 Apr 2019

35 Retweets 58 Likes



1



35



58



# The Images That Could Help Rebuild Notre-Dame Cathedral

And the young, brilliant professor who made them before he died

ALEXIS C. MADRIGAL 6:00 AM ET



PHILIPPE WOJAZER / REUTERS

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SIDNEY FUSSELL



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ALEXIS C. MADRIGAL



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TAYLOR LORENZ



### Recruiting Women to Online Dating Was a Challenge

DAVID KUSHNER





But as the cathedral officials and architectural authorities in France and around the world begin to consider what to do, they will come looking for the laser-data files that Tallon created. Blaer estimated that, despite the high resolution of the scans and panoramic photographs, the files would be roughly a terabyte, small enough to fit on a single hard drive, but unlikely to be stored in the cloud. All those data now exist on a single disk, a tiny portal into the past, which is sitting somewhere on Earth. Blaer thought it might be in the hands of Tallon's students at Vassar. But Ochsendorf thought the data were most likely with the rest of Tallon's archive, in the possession of his widow, Marie, who held Andrew in her arms as he died.

# Digital preservation involves...

- Planning
- Resource allocation
- Application of preservation methods and technologies

# Planning

Did the funding agency require a Data Management Plan (DMP) that specified requirements related to metadata, long-term storage, and preservation?

Was there a partnership with the library to provision repository services for project data and publications? What about a domain-based repository?

“By identifying [an] archive early in the project, the data can be formatted, transformed, and documented appropriately to meet the requirements of the archive.” [https://en.wikipedia.org/wiki/Data\\_management\\_plan](https://en.wikipedia.org/wiki/Data_management_plan)

# Resource allocation

Did the funding agency allocate resources for DMP?

What kind of policy is in place on campus for storage for 1Tb+ of research data, especially after project funding ends?

Does the University have dedicated Research Data Management staff with outreach and liaison responsibilities?

# Application of preservation methods and technologies

Is there more than one copy of the data in different locations?

Is there appropriate metadata (including a data dictionary)?

What are the dependencies associated with the data (proprietary formats and software) that may need to be mitigated over time?

# Council of Prairie and Pacific University Libraries

- 22 university libraries in Western Canada representing 400,000+ students and faculty
- Focus on consortial acquisition of electronic resources (ejournals, ebooks, etc.)

# Council of Prairie and Pacific University Libraries

“...leverage our collective expertise, resources, and influence, increasing capacity and infrastructure, to enhance learning, teaching, student experiences, and research at our institutions...” <https://coppul.ca/about-us>



# COPPUL Digital Stewardship Network (CDSN)

CDSN builds capacity for digital preservation at COPPUL member institutions. We help our members preserve, manage, and provide access to unique digital collections by:

- Offering a world-class suite of technology, infrastructure, and services
- Creating a vibrant community of practice
- Increasing awareness among a wide range of stakeholders
- Offering educational and professional development opportunities
- Collaborating with allied organizations across Canada and the world

# PKP

PUBLIC  
KNOWLEDGE  
PROJECT



## BCELN

BRITISH COLUMBIA  
ELECTRONIC LIBRARY NETWORK

# CRKN RCDR

Canadian Research Knowledge Network  
Réseau canadien de documentation pour la recherche



# CARL ABRC

CANADIAN ASSOCIATION OF RESEARCH LIBRARIES  
ASSOCIATION DES BIBLIOTHÈQUES DE RECHERCHE DU CANADA

# portage

SERVICES PARTAGÉS POUR LES DONNÉES DE RECHERCHE  
SHARED STEWARDSHIP OF RESEARCH DATA



# Scholars Portal

A Service of the Ontario Council of University Libraries

# NDSA

# OCUL

Ontario Council of  
University Libraries



A focus on collaborations, community-led efforts, open-source tools, and not-for-profit service providers...

Provide the components needed to assemble an end-to-end preservation infrastructure, where members decide what components to use...

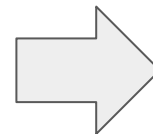
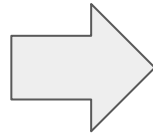
# Repositories



# Preservation processing



# Preservation storage



# Preservation storage services

- Stores standard AIPs w/ preservation-specific metadata
- **Independently administered copies** (no single point of failure)
- **Disperse content across several institutions or jurisdictions** to address large-scale political and/or economic threats and/or environmental threats
- Hardware diversity
- Polling and repair mechanisms to detect and fix damaged or destroyed content

# A preservation storage service...

- Undertakes **long-term planning** that explicitly looks beyond the life of a particular institution
- Has **governance mechanisms** to address both short-term and long-term threats, including financial sustainability and succession planning
- Looks beyond a **single institution or technological platform**, and works with other preservation initiatives to align infrastructure

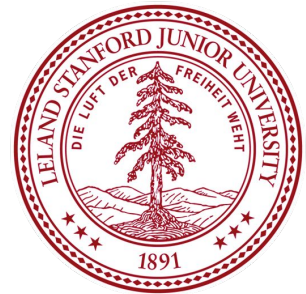


# What is LOCKSS?

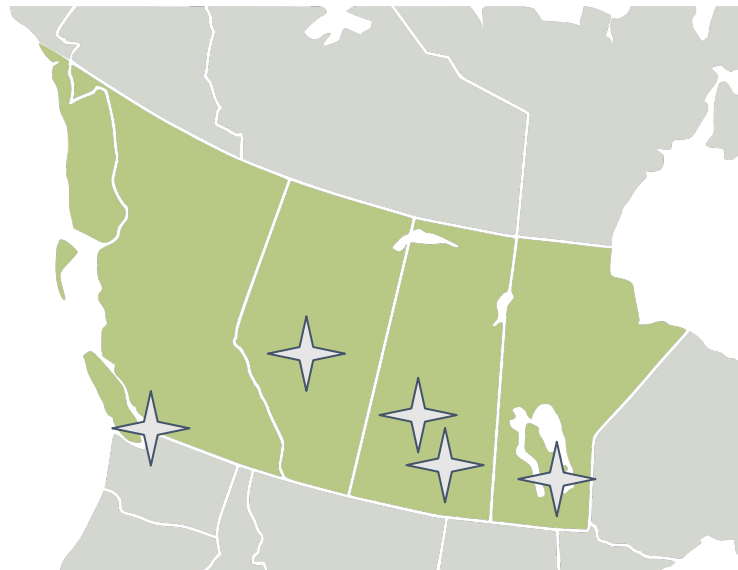
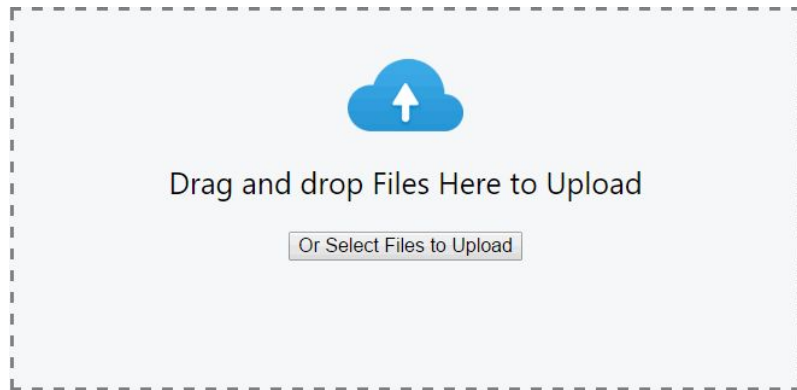
- An open-source, library-led digital preservation system built on the principle that “lots of copies keep stuff safe”
- Through a LOCKSS distributed network, libraries cooperate with one another to ensure their preserved content remains authentic and authoritative over the long term

WestVault

24 h (2,293.3 km) via Trans-Canada Hwy/BC-1 E



# Preservation storage as-a-service



# Costs

\$2000/yr per Tb for 5 independent copies across Western Canada, all hosted on non-commercial infrastructure

Support from Stanford Libraries (via the LOCKSS Alliance) and annual retainer for technical support provided by SFU

# Some issues

“...larger data volumes present unavoidable trade-offs between preserving less content at a higher replication factor or more content at a lower replication factor.”

<https://www.lockss.org/blog/scaling-lockss>

“Local systems for managing content did not have a built-in “export to DPN” function and this presented a problem of how to prepare and move the content for deposit into DPN.” <https://osf.io/3p9jq/download>

# Next steps

What might a national preservation storage infrastructure look like?

How do we help build capacity at member institutions?

The background of the slide is a dark blue field filled with vertical columns of glowing blue and white characters, primarily '0's and '1's, which appear to be falling or scrolling downwards, creating a 'digital rain' or 'Matrix' effect. The characters are slightly blurred and have a soft glow, giving a sense of motion and depth.

# Thanks!

[corey@coppul.ca](mailto:corey@coppul.ca)