Big Data and Libraries

2016 IFLA Data in Libraries Satellite Conference

Sayeed Choudhury

DataConservancy

Data Conservancy (DC)

- One of five awards through US National Science Foundation's (NSF) DataNet program
- $10 million award to build national-scale data infrastructure
- Growing community of partners focused on data curation
- Culmination of over a decade of experience with Sloan Digital Sky Survey (SDSS) data

Levels of Services and Curation for High Functioning Data

G. Sayeed Choudhury[1], Carole L. Palmer[2], Karen S. Baker[2], Timothy DiLauro[1]

[1] Sheridan Libraries, Johns Hopkins University

[2] Center for Informatics Research in Science & Scholarship
Graduate School of Library & Information Science, University of Illinois, Urbana-Champaign

The Sheridan Library
~
Johns Hopkins
University Libraries

GRADUATE SCHOOL OF LIBRARY AND
INFORMATION SCIENCE
The iSchool at Illinois
CIRSS
Center for Informatics Research in Science & Scholarship

Introduction

The growing volume and variety of data brings new demands and opportunities. This conceptual model represents levels of data repository services and the cumulative nature of curation.

The Data Management Stack model integrates contributions from two groups within the Data Conservancy Initiative (http://dataconservancy.org):

- The Technical team and Data Management Services team at Johns Hopkins University, focused on designing and implementing systems (Choudhury & Hanisch, 2009; Mayernik et al, 2012)
- The Data Practices team at the University of Illinois, focused on social studies of data curation (Palmer et al., 2011; Weber et al, 2012).

The Model

The model represents four levels of activity and capacity shown in the center panel. It builds on definitions offered by Lord and Macdonald (2004). Today, the use of these terms, together with the notion of data stewardship (NAP, 2009), is fluid and inconsistent. Caution is advised in applying these concepts (BRTF, 2010).

Progress with Shared Vocabulary

The Stack Model has proven useful for communicating with researchers who often use terms such as **storage**, **archiving**, **preservation** and **curation** interchangeably.

The model contributes to building a shared vocabulary by making evident

- connections and dependencies among levels of services
- ramifications of repository choices made by researchers

Data Management Layers

Layers	Characteristics	Implication for PI	Implication relative to NSF
Curation	• Adding value throughout life-cycle	• Feature Extraction • New query capabilities • Cross-disciplinary	• Competitive advantage • New opportunities
Preservation	• Ensuring that data can be fully used and interpreted	• Ability to use own data in the future (e.g. 5 yrs) • Data sharing	• Satisfies NSF needs across directorates
Archiving	• Data protection including fixity, identifiers	• Provides identifiers for sharing, references, etc.	• Could satisfy most NSF requirements
Storage	• Bits on disk, tape, cloud, etc. • Backup and restore	• Responsible for: • Restore • Sharing • Staffing	• Could be enough for now but not near-term future

Acknowledgements

National Science Foundation

DataConservancy

Thanks to other contributing team members Barbara Pralle, David Fearon, Betsy Gunia, Ruth Duerr, Tiffany Chao, Nicholas Weber, and Cheryl Thompson. This research was supported by the National Science Foundation DataNet award OCI-0830976 and IMLS award #RE-02-10-0004-10.

INSTITUTE of Museum and Library SERVICES

Data Curation Education In Research Centers
DCERC

The Stack

Increasing layers of support and functionality; each level depends on the level below. (Choudhury, 2009).

- **Storage**: lowest service; basic physical storage with backup and restore services.
- **Archive**: following BRTF, "activities that enable long-term retention of digital materials"; DC focus on data protection through replication, fixity, and identifiers.
- **Preservation**: providing enough representation information, context, metadata, fixity, etc. to support use and interpretation by agents other than the original data producer.
- **Curation**: processes that add value to foster discovery and reuse.

The curation level identifies a range of services, enabling use for purposes not necessarily envisioned by the data producers.

References

BRTF (2010). Blue Ribbon Task Force Report on Sustainable Economics for a Digital Planet: Ensuring Long-Term Access to Digital Information by the Blue Ribbon Task Force on Sustainable Digital Preservation and Access. http://brtf.sdsc.edu/biblio/BRTF_Final_Report.pdf

Choudhury, S. and R. Hanisch (2009). The Data Conservancy: Building a Sustainable System for Interdisciplinary Scientific Data Curation and Preservation.

Lord, P., A. MacDonald, et al. (2004). From data deluge to data curation. Proceedings of the UK e-Science All Hands Meeting, Nottingham.

Mayernik, M.S., G.S. Choudhury, T. DiLauro, E. Metsger, B. Pralie, M. Rippin, R. Duerr, (2012). The Data Conservancy Instance: Infrastructure and Organizational Services for Research Data Curation. D-Lib 18(9/10).

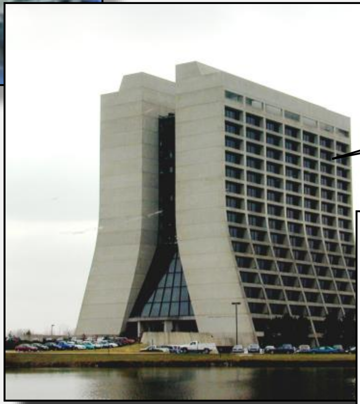
Palmer, C.L., N.M. Weber, and M.H. Cragin (2011). The Analytic Potential of Scientific Data: Understanding Re-use Value Proceedings of the American Society of Information Science and Technology. ASIST 2011.

Weber, N., K.S. Baker, A. Thomer, T. Chao, and C. Palmer (2012). Value and Context in Data Use: Domain Analysis Revisted. Proceedings of the American Society of Information Science and Technology. ASIST 2012, Baltimore, Maryland.

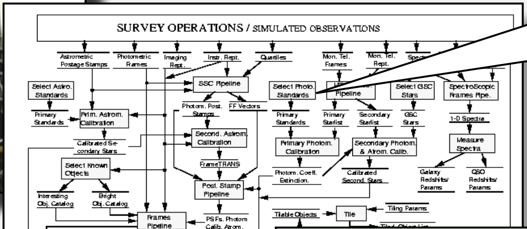
IDCC January 2013

Data Flow (Levels of Data)

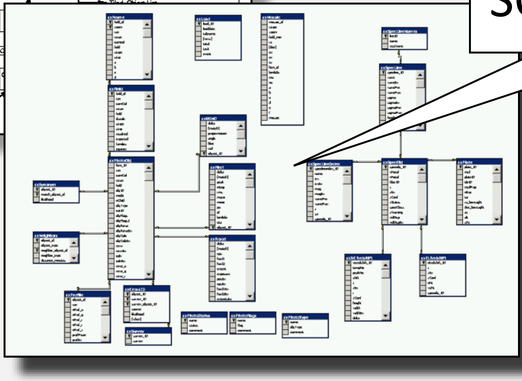
Pixel data collected by telescope



Sent to Fermilab for processing



Beowulf Cluster produces catalog



Loaded in a SQL database

“Big Data”

- What is Big Data?
- There are definitions based on the “V’s” of Big Data (e.g., volume, velocity, variety)
- For me, if a community’s ability to deal with data is overwhelmed, it’s “Big Data” – it’s more about “M’s” (methods or lack thereof) than “V’s”
- What is clear is that it’s different from “spreadsheet science” (or long-tail science) with one important commonality

How can we do more with data?

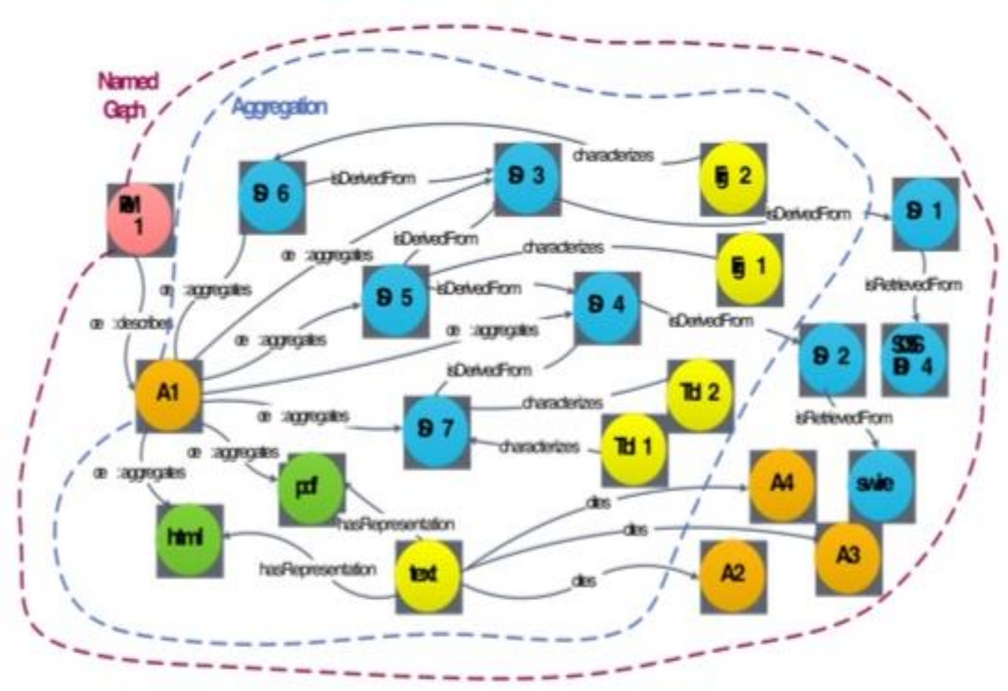
- Focus on interpretation, consequences and control
- No doubt that others (e.g., corporations) have greater control of their data, but they seem to offer a greater array of integrated services
- They have different mechanisms for handling (or not) privacy concerns

Key Message for Libraries

- Given the scale, complexity and distribution of data combined with unprecedented clever, computing…

…No single institution will have the capacity to build all encompassing data infrastructure

Building the article graph



- Graph-based view of connections among publications, data, agents, and their properties
- Many-to-many relationships rather than one-to-one view of current systems
- Tracking and preservation of these connections through the scholarly communications cycle

RMap

It’s Already Happened…

- Think of the number of third party services already in use, ranging from Google Drive to Amazon Web Services, which are becoming part of NIH commons

- The future’s already here…it’s just not very evenly distributed – William Gibson

Acknowledgements

- Alex Szalay for Levels of Data slide
- NSF Award OCI-0830976
- Alfred P. Sloan Foundation
- Sheridan Libraries and JHU financial support
- http://dataconservancy.org
- https://rmap-project.atlassian.net