MESUR: overview and lessons learned

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Usage data has arrived.

Value of usage data/statistics is undeniable:

- Business intelligence
- Scholarly assessment
- Monitoring of scholarly trends
- Enhanced end-user services

Production chain:

- Recording
- Aggregation
- Analysis

Challenges and opportunities at all links in chain.

1. Recording: requirements, data models, standardization
2. Aggregation: standards, sampling, ownership
3. Analysis: frequentist (usage statistics) vs. structural (usage data), dependent on (1) and (2)

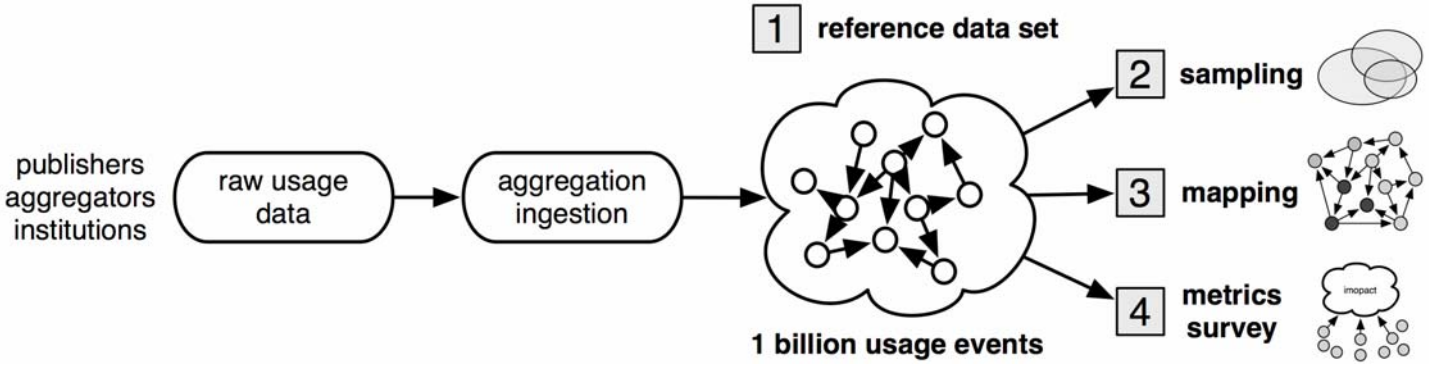
The MESUR project.

“The Andrew W. Mellon Foundation has awarded a grant to Los Alamos National Laboratory (LANL) in support of a **two-year project** that will **investigate metrics** derived from the network-based **usage** of scholarly information. The Digital Library Research & Prototyping Team of the LANL Research Library will carry out the project.
The project's major objective is **enriching** the toolkit used for the assessment of the impact of scholarly communication items, and hence of scholars, with **metrics that derive from usage data**.”

MESUR: A scientific approach to scholarly assessment

Investigate validity of usage data and usage-based metrics

1. **Exploring many possibilities, many facets of impact: Not selling 1 metric!**
2. Cross-validation: compare to existing, accepted **journal**-focused metrics and data
3. Explorative approach: not top-down, bottom-up exploration
4. Focus on
    1. Usage **data**, not usage statistics
    2. **Network** metrics, not descriptive statistics



How to obtain 1,000,000,000 usage events?

Politely asked selected publishers, aggregators and institutional consortia for usage data.

Agreements achieved throughout 2006-2007. Stringent privacy requirements.

1. Publishers: Six major international publishers
2. Aggregators: Four significant international aggregators
3. Institutions: Four large USA-based university consortia

Present scale of the MESUR DB:

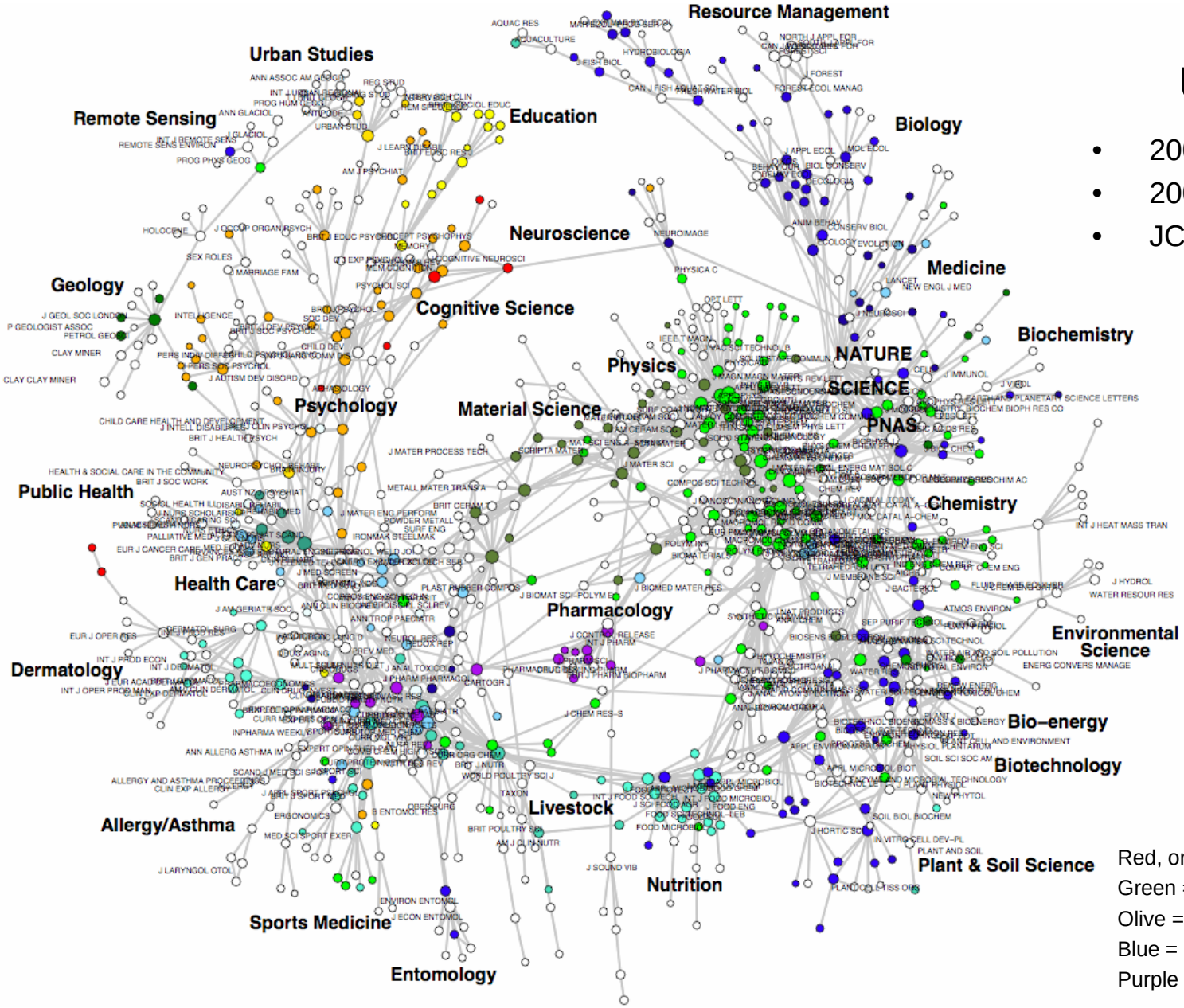
- +-1,000,000,000 usage events and +500,000,000 citations
- 2002-2007, but mostly 2006
- > 50M documents
- +- 100,000 serials (incl. newspapers, magazines,…)
- COUNTER reports from 2 publishers for nearly 2,000 institutions

MESUR's usage data

Requirements:

- Article level usage events
- Fields: session ID, date/time, document ID and/or metadata, request type
- Note difference with COUNTER-like usage statistics: sequence or clickstream is preserved!

```
2007, 9, 1, 0, 0, 1 CFA    cffoe   A172080.N1.Vanderbilt.Edu       unknown AST    A      1996SPIE.2828..64S    http://foe.edu/abs/199
2007   9     1     0     0     1     CFA    cffoe   210.94.41.89    unknown PHY    A      2007ApPhL.90a2120C    http://foe.edu/abs/2
2007   9     1     0     0     1     CFA    cffoe   24-196-228-125.dhcp.gwnt.ga.charter.com unknown AST    A      2000ASPC.213.3
2007   9     1     0     0     4     CFA    cffoe   163.152.35.114  4700387eae     PHY    A      1993WRR..29.133S      http://foe.edu/
20079     1     0     0     6     CFA    cffoe   pd9e980fc.dip0.t-ipconnect.de  45f0c69881     AST    X      2007AN..328.841H      htt
2007   9     1     0     0     1     CFA    cffoe   A172080.N1.Vanderbilt.Edu       unknown AST    A      1996SPIE.2828..64S    http
```



Usage map

- 200M usage events
- 2006 usage only
- JCR journals (+-7600)

Red, orange= psych, cogn
Green = phys, chem
Olive = material science
Blue = biology
Purple = pharma

Digital Library Research & Prototyping Team
Research Library, Los Alamos National Laboratory
@ JISC workshop, Humboldt U. zu Berlin, 2008

Examples of **usage network** rankings

2004 Impact Factor

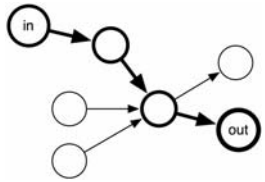
	value	journal
1	49.794	CANCER
2	47.400	ANNU REV IMMUNOL
3	44.016	NEW ENGL J MED
4	33.456	ANNU REV BIOCHEM
5	31.694	NAT REV CANCER

Pagerank

	value	journal
1	0.0016	SCIENCE
2	0.0015	NATURE
3	0.0013	PNAS
4	0.0010	LNCS
5	0.0008	J BIOL CHEM

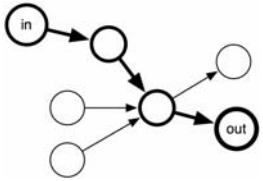
betweenness

	value	journal
1	0.035	SCIENCE
2	0.032	NATURE
3	0.020	PNAS
4	0.017	LNCS
5	0.006	LANCET



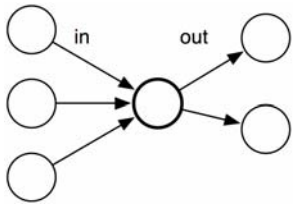
Closeness

	value	journal
1	0.670	SCIENCE
2	0.665	NATURE
3	0.644	PNAS
4	0.591	LNCS
5	0.587	BIOCHEM BIOPH RES CO



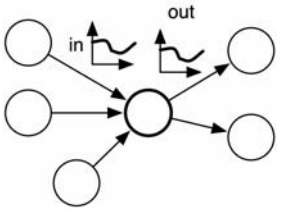
In-Degree

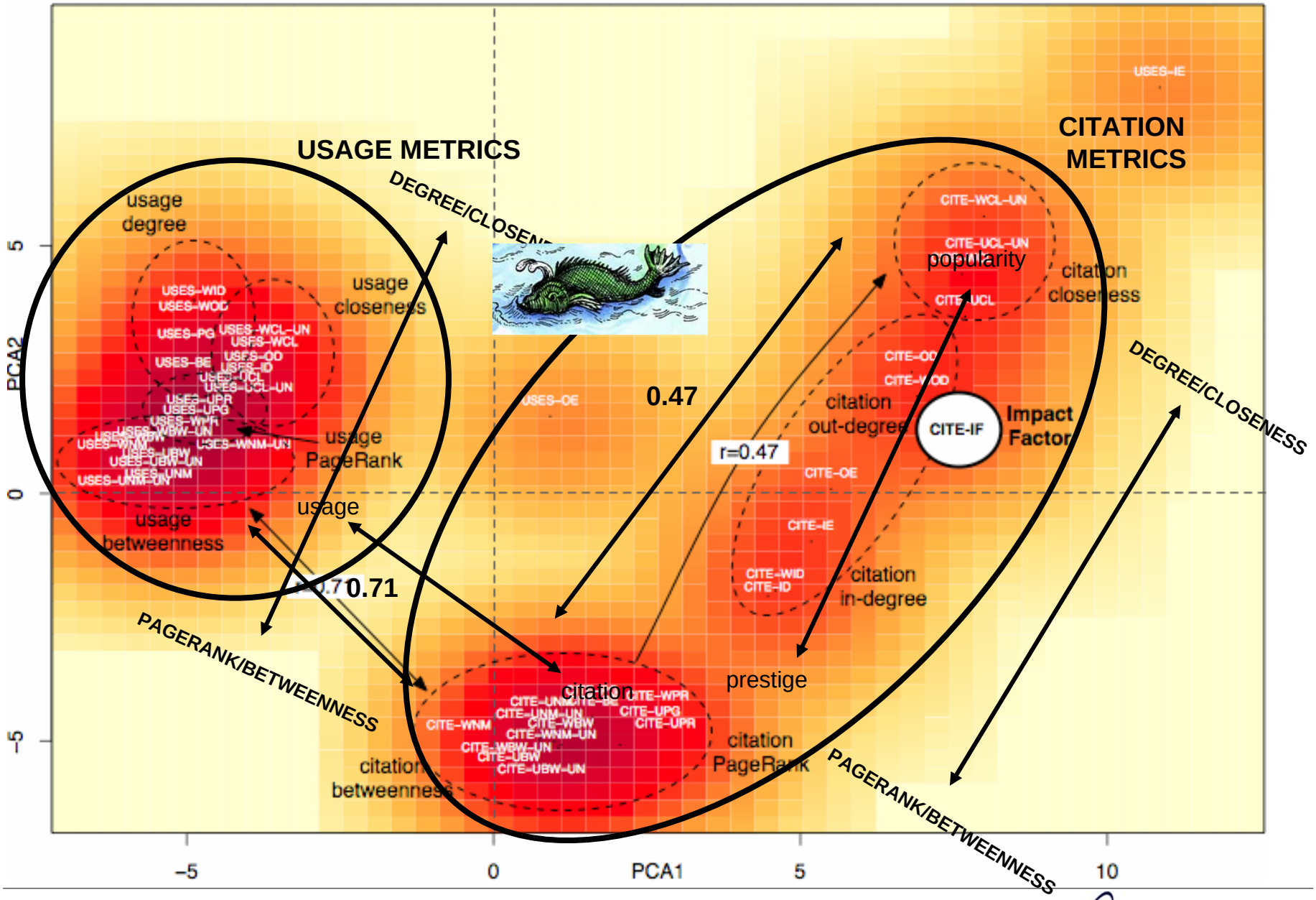
	value	journal
1	4195	SCIENCE
2	4019	NATURE
3	3562	PNAS
4	2438	J BIOL CHEM
5	2432	LNCS



In-degree entropy

	Value	journal
1	9.364	MED HYPOTHESES
2	9.152	PNAS
3	9.027	LIFE SCI
4	8.939	LANCET
5	8.858	INT J BIOCHEM CELL B




USAGE METRICS
CITATION METRICS
usage degree
usage closeness
usage PageRank
usage betweenness
usage
DEGREE/CLOSENESS
PAGERANK/BETWEENNESS
0.47
0.71
r=0.47
popularity
citation closeness
citation out-degree
CITE-IF
Impact Factor
citation in-degree
prestige
citation PageRank
citation betweenness
citation
DEGREE/CLOSENESS
PAGERANK/BETWEENNESS
PCA1
PCA2
-5
0
5
10

COUNTER reports: information loss

From: **www.niso.org/presentations/MEC06-03-Shepherd.pdf**

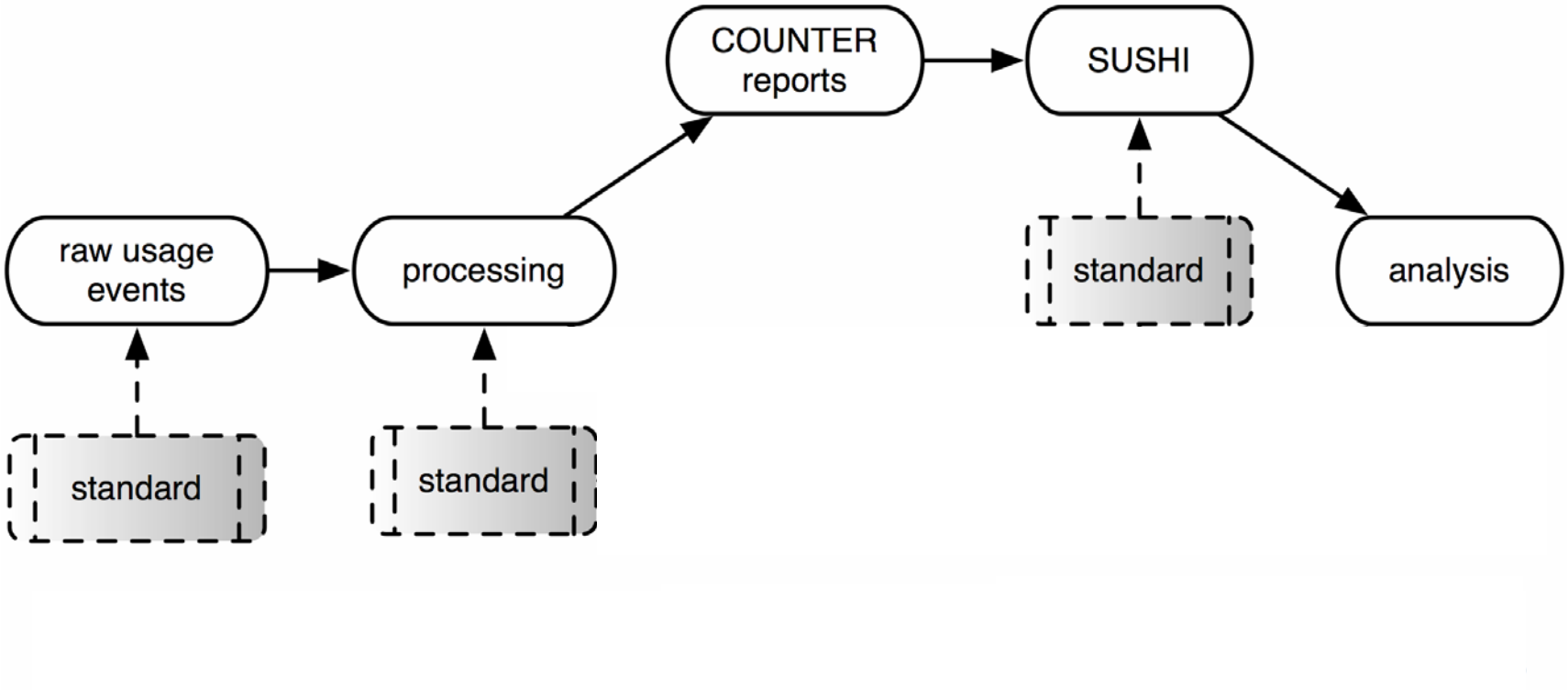
QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

50 years of network science:

- Mapping
- Social network metrics

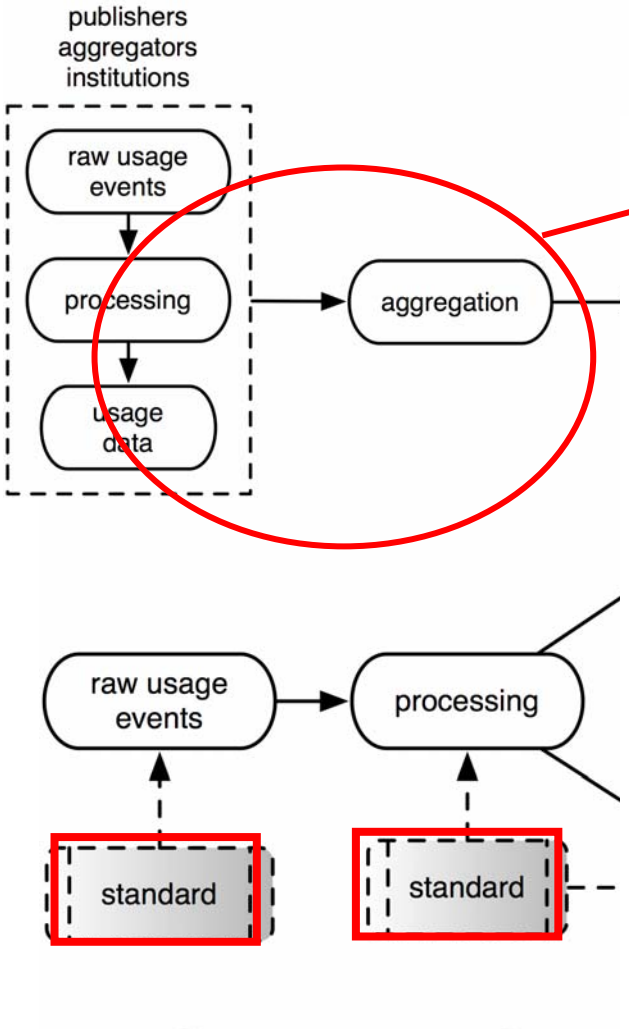
1. **Event ID:** distinguish usage events ?
2. **Referent ID:** DOI, SICI, metadata
3. **User/Session ID:** define groups of events related by user?
4. **Date and time ID:** identify data and time of event
5. **Request types**: identiby type of request issued by user

We have COUNTER/SUSHI. How about the aggregation of item-level usage data?



If there is value in aggregating COUNTER and other reports, there is considerable value in aggregating item-level usage data.

We need a standardized representation framework for item-level usage data.



MESUR: Ad hoc parsing is highly problematic

- field semantics
- field relations
- various data models

Framework objectives:

1. Minimize data loss:
    1. Preserve event info
    2. Preserve sequence info
    3. Preserve document metadata
2. **"realistic"**: scalability and granularity.
3. Apply to variety of usage data, i.e. **no inherent bias** towards specific type of usage data

Requirements for usage data representation framework.

Needs to minimally represent following concepts:

1. **Event ID:** distinguish usage events
2. **Referent ID:** DOI, SICI, metadata
3. **User/Session ID:** define groups of events related by user
4. **Date and time ID:** identify data and time of event
5. **Request types**: identiby type of request issued by user

Implications

1. **Sequence**: session ID and date/time preserves sequence
2. **Privacy:** session ID groups events not by user ID
3. **Request types:** filter on types of usage

Aggregating item-level usage data requires standardized aggregation framework.

Standardization objectives similar to work done for COUNTER and SUSHI:

1. **Serialization (~COUNTER):**
   - standard to serialize usage data
   - Suitable for large-scale, open aggregation
   - Event provenance and identification
2. **Transfer protocol (~SUSHI):**
   - Communication of usage data between log archive and aggregator
   - Allow open aggregation across stakeholders in scholarly community
3. **Privacy standard:**
   - Standards need to address privacy concerns
   - Should allow emergence of trusted intermediaries: aggregation ecology

LANL has made proposals based on community standards

OpenURL ContextObject to represent usage data

Event information:
*** event datetime**
*** globally unique event ID**

Referent
*** identifier**
*** metadata**

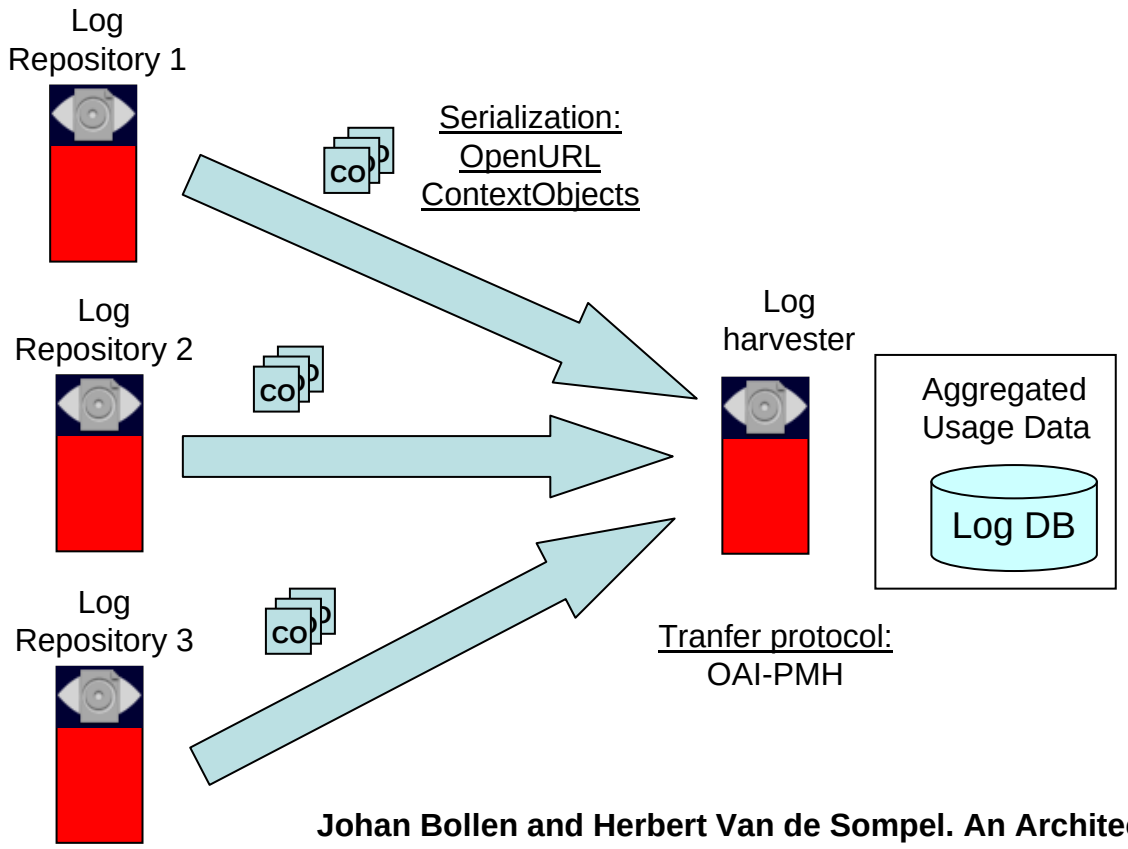
Requester
*** User or user proxy: IP, session, …**

ServiceType

Resolver:
*** identifier of linking server**

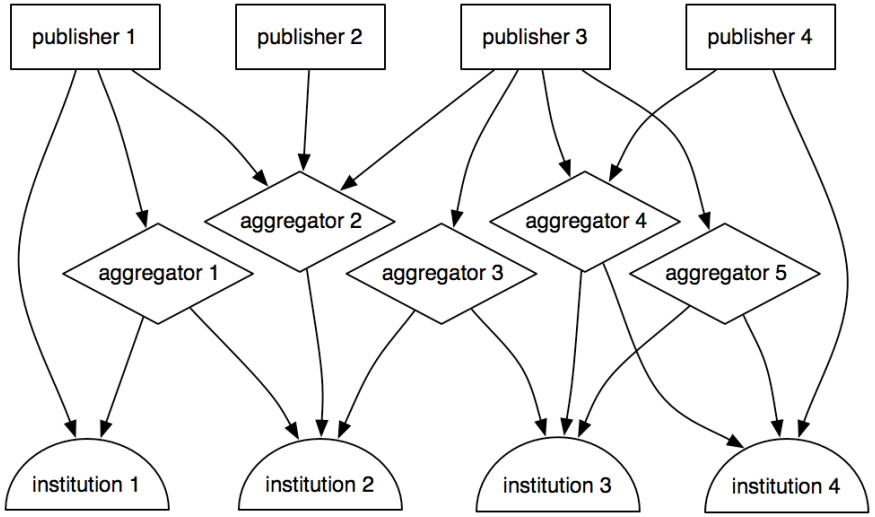
```
<?xml version="1.0" encoding="UTF-8"?>
<ctx:context-object
 timestamp="2005-06-01T10:22:33Z" …
 identifier="urn:UUID:58f202ac-22cf-11d1-b12d-002035b29062" …>
…
<ctx:referent>
 <ctx:identifier>info:pmid/12572533</ctx:identifier>
 <ctx:metadata-by-val>
  <ctx:format>info:ofi/fmt:xml:xsd:journal</ctx:format>
  <ctx:metadata>
   <jou:journal xmlns:jou="info:ofi/fmt:xml:xsd:journal"> …
   <jou:atitle>Isolation of common receptor for coxsackie B …
   <jou:jtitle>Science</jou:jtitle>
…
</ctx:referent>
…
 <ctx:requester>
   <ctx:identifier>urn:ip:63.236.2.100</ctx:identifier>
 </ctx:requester>
…
 <ctx:service-type>
  …
  <full-text>yes</full-text>
  …
 </ctx:service-type>
 …
  Resolver…
  Referrer…
  ….
</ctx:context-object>
```

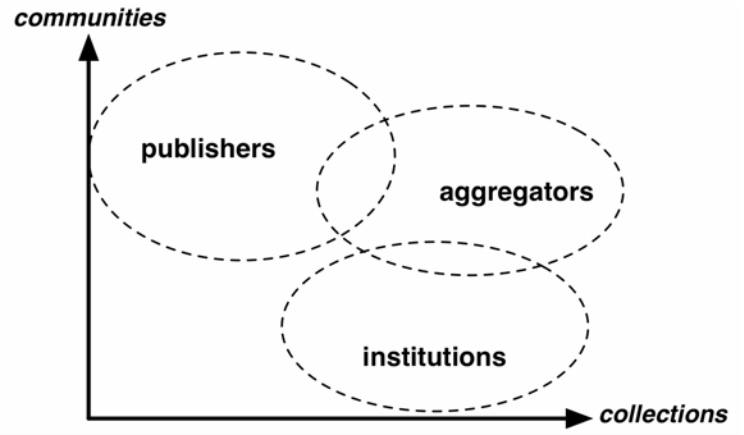
Aggregation framework: existing standards



Johan Bollen and Herbert Van de Sompel. An Architecture for the aggregation and analysis of scholarly usage data. In Joint Conference on Digital Libraries (JCDL2006), pages 298-307, June 2006.

Related to sampling, ownership and copyright:





Main players:

- **Individual institutions**
- **Aggregators**
- **Publishers**

Each represent different, and possibly overlapping, samples of the scholarly community.

Institutions:

- Institutional communities
- Many collections

Aggregators:

- Many communities
- Many collections

Publishers:

- Many communities
- Publisher collection

Some relevant publications.

Johan Bollen, Herbert Van de Sompel, and Marko A. Rodriguez. **Towards usage-based impact metrics: first results from the MESUR project.** In Proceedings of the Joint Conference on Digital Libraries, Pittsburgh, June 2008

Marko A. Rodriguez, Johan Bollen and Herbert Van de Sompel. **A Practical Ontology for the Large-Scale Modeling of Scholarly Artifacts and their Usage,** In Proceedings of the Joint Conference on Digital Libraries, Vancouver, June 2007

Johan Bollen and Herbert Van de Sompel. **Usage Impact Factor: the effects of sample characteristics on usage-based impact metrics.** (cs.DL/0610154)

Johan Bollen and Herbert Van de Sompel. **An architecture for the aggregation and analysis of scholarly usage data.** In Joint Conference on Digital Libraries (JCDL2006), pages 298-307, June 2006.

Johan Bollen and Herbert Van de Sompel. **Mapping the structure of science through usage.** Scientometrics, 69(2), 2006.

Johan Bollen, Marko A. Rodriguez, and Herbert Van de Sompel. **Journal status.** Scientometrics, 69(3), December 2006 (arxiv.org:cs.DL/0601030)

Johan Bollen, Herbert Van de Sompel, Joan Smith, and Rick Luce. **Toward alternative metrics of journal impact: a comparison of download and citation data.** Information Processing and Management, 41(6):1419-1440, 2005.