Good, Better, and Best Practice

The Experience of the E-MELD Project

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Good, Better, and Best Practice

- Part 1: Toward Enduring Resources (Dry)
- Part 2: Toward Interoperable Resources (Simons)
- And in the spirit of PAuLA, TITUS, and LAMUS, we provide some

AIDS:

Acronyms **I**n **D**ubious **S**hapes

E-MELD

Electronic Metastructure for Endangered Languages Documentation

- 5 year NSF project
- Goal: To aid in
  - …the preservation of endangered languages data, and
  - …the development of infrastructure for electronic archives

Source of E-MELD Recommendations

- Working groups of language engineers and documentary linguists
- At 5 E-MELD workshops:
  - 2001: The Need for Standards
  - 2002: Lexicons
  - 2003: Texts
  - 2004: Databases
  - 2005: Ontologies in Linguistic Annotation

E-MELD 2006

- "Digital Tools and Standards: The State of the Art"
- June 20-22, Lansing, MI
- /emeld.org/workshop/2006/
- **Please join us!**

E-MELD Vision of Digital Language Resources

- **Preservable:** formats are not vulnerable to physical decay or obsolescence of hardware & software
- **Intelligible:** content is easily understood by future scholars
  - "We don't want to create another Rosetta Stone" (Whalen, 2003)
- **Accessible:** distributed resources are easily discovered and accessed
- **Interoperable:** documentation created by different scholars is easily searched, compared, and reused.

Initial Emphasis: the role of

The Individual Linguist
The E-MELD School of Best Practices in Digital Language Documentation http://emeld.org/school/
Ask-An-Expert http://emeld.org/school/ask-expert/

E-MELD Recommendations of Best Practice:

The Individual Linguist	
Text	Make an archive copy in .txt file format. Use Unicode Use XML markup Link terminology to an ontology
Audio	Use .wav, .aiff, .au format Don't edit or convert archival copy
Video	Record audio separately from video Save an uncompressed copy if possible
Image	Scan at 600 dpi Archive in .tiff, .gif (B&W) formats

However, experience has shown . . .

- Not realistic to expect best practice from every individual linguist :
  - Lack of tools
  - Lack of training
    - "I can't even spell XML"
  - Standards immature, e.g. GOLD ontology
  - Lack of time & money

The Task of: Preserving digital language resources

- Not the responsibility of the Linguist alone.
  - Must be shared with Archive & Service
- Recommended practices can be ranked on a scale:
  - Good: an acceptable minimum
  - Better: attainable & should be promoted
  - Best: essential to the final vision, but not always attainable now.
- Definition of the scale differs for different stakeholders

But in general . . .

Practices are	if they ensure:
Good	Preservation
	Intelligibility
Better	Access
Best	Interoperability

Responsibility Differs

great
moderate
small

	Preservation	Intelligibility	Access	Interoperability
Linguist	moderate	great	small	small
Archive	great	moderate	great	moderate
Service	small	small	moderate	great

For Individual Linguists

GOOD	Preservation	Put the resource in an enduring file format
	Intelligibility	Document the content
BETTER	Access	Create an archive-ready collection and deposit it with an archive
BEST	Interoperability	Format to facilitate automatic processing

Good practice for the Linguist:
Preservation of the format

An enduring file format is one that offers **LOTS**:

- **L**ossless
- **O**pen
- **T**ransparent
- **S**upported by multiple vendors

(Gary Simons, LSA 2004)

Lossless

- No content should be lost through compression
- Uncompressed file formats (lossless):
  - Audio: .wav, .aiff, .au (pcm)
  - Images: .tiff, .bmp
  - Video: .avi (depends on codec), rtv
  - Text: .txt, html, xml
- Compressed but lossless:
  - Audio: .ale (Apple Lossless Encoding)
  - Images: .gif (black & white only)
  - Video: jpeg2000 (new - 1:10 ratio)
  - Text: .zip

OPEN

- Prefer a file format whose specification is publicly available, i.e., "Open standard."
  - Exs: html, XML, pdf, rtf
- Information in proprietary file formats will be lost when the vender ceases to support the software

OPEN (cont.)

- "Open standard" is different from "open source," i.e., software whose source code is publicly available
  - Exs: Open Office, Mozilla Thunderbird
  - Open source software usually creates files in open standards. And proprietary software usually doesn't (though there are exceptions, e.g. Adobe pdf).
  - But for longterm intelligibility, open standards are more important than open source software

Transparent

- Format requires no special knowledge or algorithm to interpret
- One-to-one correspondence between the numerical values and the information they represent, e.g.
  - Plain text: one-to-one correspondence between numbers & characters
  - PCM codec (.wav, .aiff, cdda): One-to-one correspondence between the numbers & the amplitudes of the sound wave

Transparent (cont.)

- Plain text can be read by any program that handles text
- PCM files can be processed by any program that handles audio
- By contrast .zip and mp3 files require implementation of a complex algorithm to restore the original correspondences

Support by multiple vendors

- Makes a file format less likely to fall victim to hardware and software obsolescence.
- Is encouraged by use of open standards:
  - If a file format is open, anyone can create programs that handle it
    - Not necessary to reverse engineer the format or purchase the specification from the developer
    - So program development is less costly

Good Practice for the Linguist:
Preserving the Content

- So longterm preservation of the file format requires LOTS.
- But, for longterm intelligibility, the linguist must do even **MORE:**
- **Document** the:
  - **M**arkup
  - **O**ccasion
  - **R**ubrics
  - **E**ncodings

Intelligibility:
Document the Markup

- Document all **markup**, whether
  - Presentational: make explicit the information encoded in the formatting
    - Bolding indicates “headword”
  - Punctuational:
    - “A semi-colon separates the different senses of a word”
  - Descriptive:
    - “<pos> stands for ‘part of speech’

Intelligibility: Document the Markup

- *Recommendation:* for the archival form, use descriptive markup, not presentational
  - Descriptive markup is content-based
  - Presentational markup merely records the format.
- Many different presentational formats can be created from a single archival form, if the archival copy has descriptive markup.

Intelligibility: Document the Occasion

- Record the
  - Time & place
  - Type of speech event
  - Participants
  - Language(s)
- Write descriptive metadata: OLAC or IMDI

Intelligibility: Document the Rubrics

- Abbreviations: list every abbreviation and what it stands for
- Terminology: define the concepts used in the language description
  - "Absolutive refers to "an unpossessed noun" in Uto-Aztecan.
- Glossing rules:
  - "A tilde represents reduplication"

Intelligibility: Document the Encoding

- Encoding:
  - Identify the base character set
    - Example: ISO 8859-1, CJK
  - Document every non-standard character used
  - Or use Unicode (recommended)
    - Unambiguous standard
    - Promotes interoperability
  - With Unicode, document every character placed in the Private Use Area.

Intelligibility: Standards

- reduce individual effort & facilitate interoperability
- Markup > XML
- Occasion > OLAC Standardized vocabularies:
  - OLAC Discourse Type Vocabulary
  - OLAC Language Vocabulary (ISO 636-3)
  - OLAC Linguistic Subject Vocabulary
  - OLAC Linguistic Type Vocabulary
  - OLAC Role Vocabulary
- Rubrics > GOLD, Leipzig Glossing Rules
- Encoding > Unicode

Better Practice: Promote Discovery & Access

- Deposit the resource in an archive
- A file with **LOTS MORE** should be stored in an archive that offers **MUCH:**
  - **M**igration
  - **U**ser access
  - **C**ataloging
  - **H**arboring

Archive Recommendations:
Offer MUCH:

- **M**igration to new storage media and formats as technologies change
- **U**ser access within the bounds of IPR. Digital archives should provide more than local access (e.g., URLs) even if not interoperable with other archives.
- **C**ataloging: resources organized, metadata made available
- **H**arboring: resources conserved in a safe environment

Scale of Practices for Archives

GOOD	Preservation	If needed, transfer to a format with LOTS Migration to new media & file formats as technology changes Retention of technology where "look & feel" important
	Intelligibility	Retention of metadata & creation if missing
BETTER	Access	Public availability of metadata IPR agreements with time limits URL's for resources (also enables shallow interoperability)
BEST	Interoperability	On to Gary's presentation….

Good, Better, and Best Practice

Part 2:
Toward Interoperating Resources

Gary F. Simons

SIL International

E-MELD End Vision

- The digital products of the linguistics community's efforts to document endangered languages:
  - Will endure far into the future
  - Will be found and used by any who have an interest in the documented languages
  - Will enable our knowledge about the world's languages to be combined and searched to an unprecedented degree

The interoperation problem

- Once the resources that linguists create are being preserved for the future in a host of archives:
  - How can potential users ever find the resources they are interested in?
  - How can users search the combined work of different linguists, especially when they have used different markup or terminology?
- Solutions require archives and resources to interoperate.

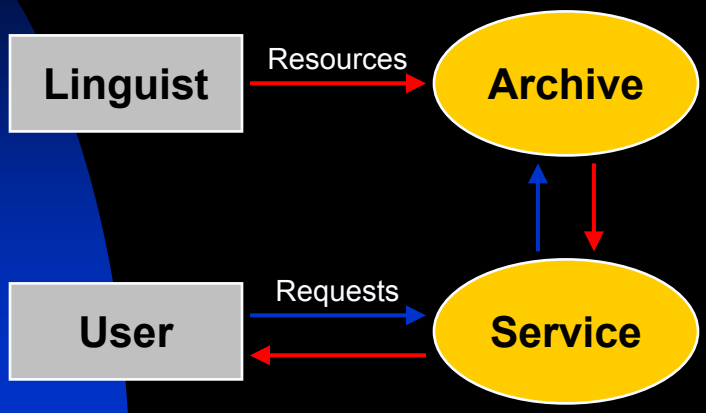
Services to the rescue

- The user can't solve these problems—there are too many archives to visit.
- An archive can't solve these problems—all the other archives have to be included.
- A service can solve the problems—
  - An automated system that supports inter-operation among all participating archives.
  - Provides a single point of entry for users.
  - Developed and maintained by an institution.

The key players

User	A person who wants to use language resources
Linguist	A person who creates language resources
Archive	An institution that curates language resources
Service	An institution that makes language resources interoperate

The big picture



Two kinds of interoperation

- Shallow interoperation
  - Based on the surface content of plain text
  - Generic to all problem domains
  - Based on the ubiquitous HTTP infrastructure
- Deep interoperation
  - Based on underlying concepts and structures
  - Built for a specific problem domain
  - Requires a domain-specific infrastructure (e.g. protocols, markup, controlled vocabularies)

Supporting shallow interoperation

- Such services already exist: e.g., Google
- If an archive exposes its catalog as web pages, it will have shallow interoperation at the level of metadata.
- If an archive provides web links to resource content, it will have shallow interoperation at the level of data content.
- Easy for the archive to do and easy for the user to use.

So what's the problem?

- Lots of noise
  - The words used to formulate the query have many irrelevant senses. E.g.
    - Ega is the name of a language
    - It is also an acronym with unrelated meaning
- Lots of drop out
  - The target concept may be in the text as a word different from the one in the query. E.g.
    - Synonyms; Alternate names

An example of shallow search

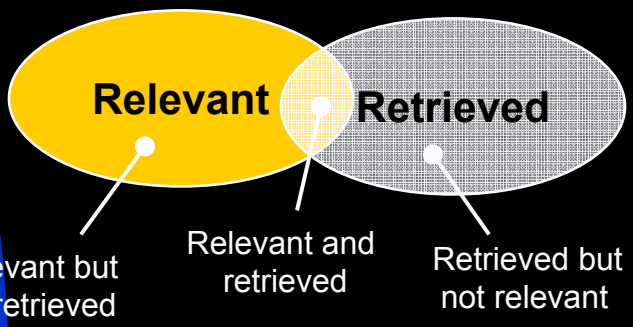
- Using Google to look for an Ega dictionary
- Try: Ega dictionary (120,000 hits)
  - Enhanced Graphics Adapter, Enterprise Grid Alliance
  - 19: E-MELD School of Best Practice: Ega Lexicon
  - 92: Endangered Language Foundation
- Try: Ega lexicon (24,500 hits)
  - 1: E-MELD School of Best Practice: Ega Lexicon
  - 2: Ega Web Archive (at Bielefeld)
  - Next 98 hits include 4 that refer to the language

An example of deep search

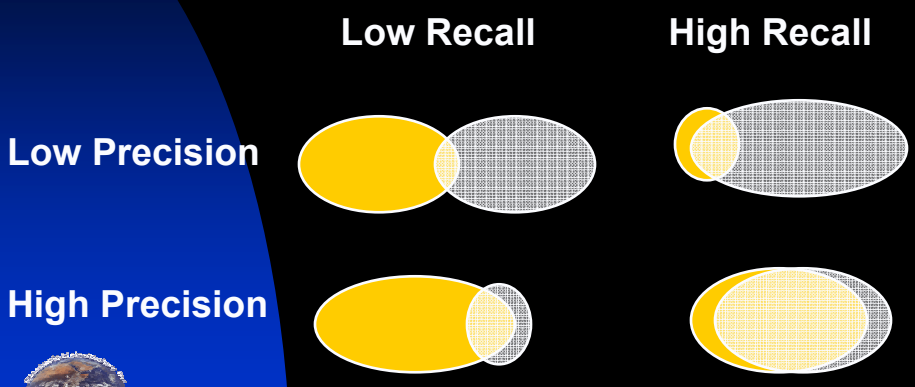
- Using OLAC to look for an Ega dictionary
  - Open Language Archives Community
  - Uses controlled vocabulary to identify language
  - Uses controlled vocabulary for linguistic types
- Language code='ega' and Type='lexicon' (6 hits)
  - All are relevant items from U Bielefeld Language Archive
  - Typescript, recording and transcripts of word lists
  - Data files: Shoebox, XML, CSV

Recall and precision

- Recall: Proportion of relevant that is retrieved
- Precision: Proportion of retrieved that is relevant



Relevant vs. Retrieved



Improving recall and precision

- Improve recall for linguistic searches by:
  - Making more materials accessible to Google
  - Putting more keywords in metadata of HTML head
- Improve precision for linguistic searches by:
  - Encoding resources with controlled vocabularies that have been adopted by the domain community
  - Building domain-specific services
    - To keep high recall, archives must make all their resources accessible to domain-specific services

Evaluation scale:

Levels of practice for archives

- Bad: Does not do MUCH
- Good: Does do MUCH
- Better: And supports shallow interoperation
  - To increase recall in generic services
- Best: And supports deep interoperation
  - To increase precision via domain services

Supporting deep interoperation

- An archive supports deep interoperation if:
  - Its resources use XML markup so that machines may interpret their contents
  - The XML encoding uses domain-specific controlled vocabularies
  - It implements the protocol of a domain-specific service so that the service can access its deep resources

Nine shades from Good to Best

- An archive actually picks a value for both:
  - Kind of support for interoperation of metadata
    - None: There is no online catalog
    - Shallow: The catalog is available as web pages
    - Deep: The catalog is in domain-specific XML
  - Kind of support for interoperation of full data
    - None: There are no online resources
    - Shallow: The resources are available as web pages
    - Deep: The resources are in domain-specific XML

Best practice:
Vocabularies recommended by E-MELD

- Use ISO 639-3 codes to identify languages
  - http://www.sil.org/iso639-3/
  - Ethnologue codes plus Linguist List codes
- Use Dublin Core with OLAC extensions for descriptive metadata
  - http://www.language-archives.org/
- Use GOLD (General Ontology for Linguistic Description) for linguistic terms and concepts
  - http://www.linguistics-ontology.org/

Dimensions of service

- For all services:
  - Closed vs. Open
  - Generic vs. Domain specific
- Further dimensions for domain-specific services:
  - Metadata vs. Full content
  - Precision-supplied vs. Precision-added

Good and Better in services

- The second is better than the first:
  - Closed vs. Open
    - Only people inside the service know how to place new resources into the service., vs.
    - The specifications for entering the service are published and people outside the service can meet those specs.
  - Generic vs. Domain specific
    - Supports domain-neutral shallow interoperation, vs.
    - Supports domain-specific deep interoperation.
- Examples
  - Google: Open and Generic
  - Typology projects: Closed and Domain-specific

Dimensions of the Best

- Services that are Open + Domain-specific vary in:
  - Scope
    - The service operates over metadata, vs.
    - The service operates over a focused aspect of full content.
  - Source of precision
    - The depth is encoded in the form provided by archives, vs.
    - The depth is mined from shallow resources.
- Examples
  1. OLAC: Metadata and Precision-supplied
  2. Metaschema experiments: Data and Precision-supplied
  3. ODIN: Data and Precision-added

1. Open Language Archives Community

- An open standard for metadata and protocol for harvesting: www.language-archives.org
- 34 institutions now participate by contributing to a pooled catalog of language resources
- As part of E-MELD, Linguist List has developed a search service over that catalog:

http://www.LinguistList.org/olac/

What the archive supplies

```
- <olac:olac xsi:schemaLocation="http://www.language-archives.org/OLAC/1.0/
  http://www.language-archives.org/OLAC/1.0/olac.xsd
  http://purl.org/dc/elements/1.1/
  http://www.language-archives.org/OLAC/1.0/dc.xsd http://purl.org/dc/terms/
  http://www.language-archives.org/OLAC/1.0/dcterms.xsd">
    <title>Ega lexicon (Gbery)</title>
    <creator>Gbery, Eddy Aime</creator>
    <creator>Baze, Lucien</creator>
    <subject xsi:type="olac:language" olac:code="ega"/>
    <description>Ega lexicon in Shoebox format</description>
    <publisher>unpublished</publisher>
    <contributor>Lindenlaub, Juliane</contributor>
    <date>2003-03</date>
    <type xsi:type="olac:linguistic-type" olac:code="lexicon"/>
    <format>shoebox</format>
    <language xsi:type="olac:language" olac:code="fra"/>
    <language xsi:type="olac:language" olac:code="ega"/>
    <language xsi:type="olac:language" olac:code="eng"/>
    <language xsi:type="olac:language" olac:code="deu"/>
    <coverage>Cote d'Ivoire</coverage>
  </olac:olac>
```


What the service reports

THE LINGUIST LIST — Eastern Michigan University • Wayne State University

People & Organizations ❖ Jobs ❖ Calls & Conferences ❖ Publications ❖ Language Resources ❖ Text & Computer Tools ❖ Teaching & Learning ❖ Mailing Lists ❖ Search

Document Information

General Description:

Title: Ega lexicon (Gbery)
Archive: U Bielefeld Language Archive
Archive URL: http://www.spectrum.uni-bielefeld.de/langdoc/
Creator(s): Gbery, Eddy Aime
Baze, Lucien
Description: Ega lexicon in Shoebox format
Contributor(s): Lindenlaub, Juliane
Date: 2003-03
Coverage: Cote d'Ivoire
Format: shoebox
Language: French [fra]
Ega [ega]
English [eng]

2. The metaschema experiments:
Based on E-MELD founding principles

- The inaugural EMELD workshop (2001) easily reached consensus on three points:
  - XML descriptive markup provides the best format for the interchange and archiving of endangered language data.
  - No single schema for XML markup can be imposed on all language resources.
  - Linguists need to be able to perform queries across multiple resources.

A fundamental problem

- How to interoperate across resources when:
  - Those resources use different markup schemas
  - The linguists have used different terminology in their analysis and description
- The EMELD solution is based on GOLD:
  - General Ontology for Linguistic Description
  - Use a shared ontology of linguistic concepts as the basis for interoperation across disparate markup and terminologies

Converting from Markup to Meaning

- markup schema
  - A formal definition (as with XML DTD or XML Schema) of the vocabulary and syntax of markup for a class of source documents.
- semantic schema
  - A formal definition (as with RDF Schema or OWL) of the concepts in a particular domain.
- metaschema
  - A formal definition of how the elements and attributes of a markup schema are interpreted in terms of the concepts of a semantic schema.

A sample Hopi lexical entry

```
<Lexeme id="L28">
  <Head><Headword>
     <OrthographicForm>na('at)</OrthographicForm>
  </Headword></Head>
  <POS>
    <Feature name="cat">n</Feature>
    <Feature name="type">poss</Feature>
  </POS>
  <Sense><Gloss>
       <OrthographicForm>father. The term is applied to
         one's natural father.</OrthographicForm>
  </Gloss></Sense>
</Lexeme>
```

A metaschema fragment

```
<interpret markup="Lexeme">
  <resource concept="gold:LinguisticSign"/>
</interpret>
<interpret markup="Head">
  <property concept="gold:form">
    <resource concept="gold:PhonologicalUnit“/>
  </property>
</interpret>
<interpret markup="OrthographicForm">
   <literal concept="gold:orthographicRepresentation"/>
</interpret>
```


The interoperable interpretation

```
<gold:LinguisticSign rdf:about="#element(L28)">
  <gold:form>
    <gold:PhonologicalUnit>
      <gold:orthographicRepresentation>na('at)</gold:orthographicRepresentation>
    </gold:PhonologicalUnit>
  </gold:form>
  <gold:meaning>
    <gold:SemanticUnit>
      <gold:definition>father. The term is applied to one's natural
        father,</gold:definition>
    </gold:SemanticUnit>
  </gold:meaning>
  <gold:grammar>
    <gold:GrammaticalUnit>
      <gold:hasPartOfSpeech rdf:resource="&gold;Noun" />
      <gold:hasFeature rdf:resource="&gold;InalienablyPossessed" />
    </gold:GrammaticalUnit>
  </gold:grammar>
</gold:LinguisticSign>
```

Best practice opens the playing field

- Linguist achieves best practice
  - Deposits resource in XML descriptive markup
- Archive achieves best practice
  - Supports access to that resource
- Service achieves best practice
  - Supports an open protocol on a focused data type
- Analyst can then bridge the interoperation gap
  - Analyst creates and archives a metaschema
  - Service harvests original resource + metaschema

Results to date

- Proof of concept on a small scale using Sesame (an open-source RDF database):
  1. Lexicons from 3 languages
  2. Interlinear texts from 7 languages
- See papers by Simons *et al.* at emeld.org
  - Project Documents
  - 2004 Workshop Proceedings
  - 2005 Workshop Proceedings

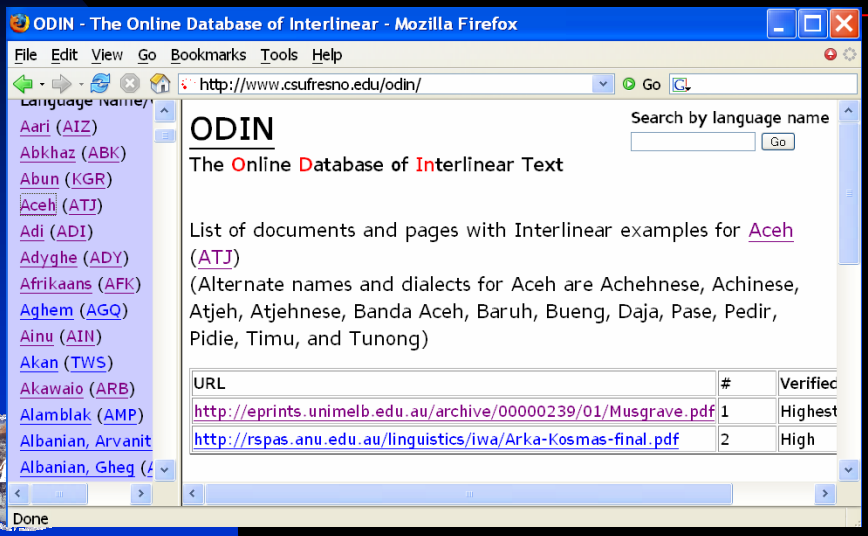
3. Mining the depths of shallow resources

- The service widely harvests shallow resources
  - E.g. through web crawling or Google API
  - Uses domain knowledge to add precision
- The service can serve at two levels:
  - Direct service to users who use it to access the harvested shallow resources
  - Indirect service through other services by implementing a best-practice (domain-specific) metadata provider

ODIN: Online Database of Interlinear Text

- See paper by Will Lewis at emeld.org
  - 2003 Workshop Proceedings
- Methodology
  - Seed Google search with abbreviations used in glossing
  - Keep URL if content has instances of text-gloss-translation
  - Use Ethnologue names data to propose language identify
- Service currently reports:
  - 22,263 instances of Interlinear Glossed Text examples
  - from 540 different languages
  - in 1,257 different linguistic documents

What the user sees



What another service sees

```
- <olac:olac>
    <dc:title>Interlinear Glossed Text for Aceh</dc:title>
    <dc:creator>Lewis, William</dc:creator>
    <dc:subject xsi:type="olac:language" olac:code="x-sil-ATJ">
    Aceh</dc:subject>
  - <dc:description>
      A listing of Web resources containing Interlinear Glossed Text for
      the language Aceh: 2 document(s), 3 instance(s) of interlinear text.
    </dc:description>
    <dc:publisher>California State University, Fresno, ODIN
    project</dc:publisher>
    <dc:date>2005-02-02</dc:date>
  - <dc:identifier>
      http://www.csufresno.edu/odin/igt_urls.php?lang=ATJ
    </dc:identifier>
  </olac:olac>
```

Services in a word

- Services give the linguist **POWER.**
- The best services offer:
  - **P**recision
  - **O**penness
  - **W**eb harvesting
  - **E**nrichment
  - **R**each

The elements of POWER

- Precision
  - Precision through domain-specific standards.
- Openness
  - Anyone can implement the supporting protocol.
- Web harvesting
  - Harvesting resources from around the Internet.
- Enrichment
  - Adding precision to resources born shallow.
- Reach
  - Searching resources from everywhere at once.

Conclusion: Toward best practice

- Digital language archiving holds the potential of unparalleled access to information, but only if:
  - Linguists do LOTS MORE to ensure that the resources they create endure far into the future.
  - Archives do MUCH to ensure the preservation of those resources.
  - Services give users POWER to retrieve everything that is relevant (and only what is relevant).
  - The linguistics community embraces the domain-specific standards that support interoperation.