Online Speech and Language Resources

Saturday, 31st May 2014

Presenters:

Dieter van Uytvanck, Max-Planck Institute of Psycholinguistics Nijmegen

Christoph Draxler, Ludwig-Maximilian University Munich

Thomas Eckart, University of Leipzig

Daniel Jettka, University of Hamburg

Tutorial Programme

08:45-09:00 Registration

09:00-10:30 Session Resource and Tool Creation

Metadata (Dieter van Uytvanck)
Web Services (Christoph Draxler)

10:30-11:00 Coffee break

11:00-12:30 Session Online access to Resources

Persistent Identifiers (Thomas Eckart)
Repositories (Daniel Jettka)

Tutorial Outline

Research and development in speech and language technology are facing a fundamental paradigm shift. More and more speech and language resources, tools and even entire workflows are becoming accessible online in the context of the emerging research infrastructures.

In this tutorial, leading experts in the field of speech and language resources will discuss both opportunities and challenges of online resources. They will present state of the art technology for metadata, web services, persistent identifiers, and human and machine readable online repositories. Showcases and real world applications will illustrate how these technologies can be put into use.

The target audience of the tutorial are professionals from speech and language technology development, research and higher education.

The tutorial consists of four presentations organised in two sessions. Each session consists of presentations and live demos of online resources and services.

Resource and Tool Creation

Metadata describes speech and language corpora, tools and other linguistic resources so that they can be indexed. A metadata schema must fulfil contradicting requirements: it must be sufficiently precise to adequately describe a resource, but it must be general enough to cover the wide variety of existing resource types; it must be stable for long-term access, but it must be easily adaptable to new types of resources or technical developments; it must be fine-grained to capture the relevant details of a resource, but at the same time efficient and easy to use by humans and automated processes. Finally, a metadata schema should be as theory-neutral as possible with respect to the primary resources to allow for broad application across disciplines.

Web services are increasingly becoming popular in speech and language processing. Many tools have been freely available for years, but the efforts and technical expertise needed to install or run them locally prevented their wide adoption. Webservices offer an elegant solution: a tool runs on a server, and remote clients, e.g. web browsers, standalone annotation tools or application programs, access and exploit these services via the net.

In the tutorial, we present a component-based and self-describing metadata schema built on the foundation of agreed standards and terminology in the field and show how tools can be used to generate metadata descriptions with minimum effort. Furthermore, the design and implementation of webservices, and their description with metadata, is presented in some detail; as a case study, the automatic speech segmentation system of the BAS will be used.

Persistent Identifiers and Repositories

Speech and language resources, as well as tools and processing workflows, evolve over time. *Persistent identifiers* provide a way of assigning a unique and immutable identifier to a specific version of a resource, and they may be used to refer to this resource independently of its physical storage location or means of access.

Repositories provide controlled access to language and speech resources and services both to humans, e.g. via a browser, as well as to automated processes, e.g. search engines or harvesters. Repositories require a minimum set of metadata, a flexible and powerful storage management, and access authorization, amongst other features. Although there exist software packages with repository functionality, they require considerable technical expertise to maintain.

In the tutorial, we present the alternative schemes for obtaining and maintaining persistent identifiers. Furthermore, we discuss the far-reaching consequences - including the benefits - of providing persistent identifiers for one's own resources, with a special focus on versioning and long-term storage. With respect to repositories we give an overview of existing software solutions including the integration of repositories and content management systems, and discuss in some detail the technical aspects of querying and harvesting language and speech repositories. As a case study, we will present the repository and services of the CLARIN-D centre Leipzig.

Tutorial Presenters

Christoph Draxler, Bavarian Archive for Speech Signals, LMU Munich, head of the corpus and tools group. He has developed a number of speech tools, e.g. SpeechRecorder, WebTranscribe, and percy, and he was responsible for the collection of several large-scale speech databases, e.g. SpeechDat II and SpeechDat-Car (German), Ph@ttSessionz, VOYS

Thomas Eckart, Natural Language Processing Group, University of Leipzig, research associate. After graduating in Computer Science at the University of Leipzig he worked in projects on the creation and usage of large written language resources in computer linguistics, Digital Humanities and in infrastructure projects. His research interests are methods for quality assurance of textual resources and the interpretation of component-based metadata. He is co-developer of the Virtual Language Observatory (VLO).

Daniel Jettka, Hamburger Zentrum für Sprachkorpora, Hamburg, research associate. After studying General and Computational Linguistics, Text Technology, and Social Sciences at Universität Bielefeld/Germany and Trinity College Dublin/Ireland he joined the HZSK in early 2012. He worked on the implementation of the HZSK Repository for Spoken Language Corpora, and created webservices for the conversion and visualization of transcription formats. His main research interests include Text Technology, Corpus Linguistics, Research Infrastructures, XML Technologies, and Data Visualization.

Dieter van Uytvanck, Max-Planck-Institute of Psycholinguistics,Nijmegen, is a research infrastructure specialist at The Language Archive. He graduated in Informatics (Ghent University) and Language and Speech technology (Radboud University Nijmegen) and has been involved in technical infrastructure building for LRT purposes since 2008.

Susanne Haaf, Berlin-Brandenburgische Akademie der Wissenschaften, and *Thomas Kisler*, Bavarian Archive for Speech Signals, contributed substantially to the material presented in this tutorial.

Acknowledgements

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Links

BAS Web Services: http://clarin.phonetik.uni-muenchen.de/BASWebServices

CLARIN Centre Registry: http://centerregistry-clarin.esc.rzg.mpg.de/

CLARIN CMDI: http://clarin.eu/cmdi

CLARIN-D Federated Content Search: http://weblicht.sfs.uni-tuebingen.de/Aggregator/

CLARIN Persistent Identifiers: https://www.clarin.eu/content/goals-and-requirements-pid-systems

CLARIN on Repositories: https://www.clarin.eu/content/repositories

CLARIN XSLT stylesheets for converting CMDI: http://www.clarin.eu/faq-page/274

ESFRI Working Group about Digital Repositories:
ftp://ftp.cordis.europa.eu/pub/esfri/docs/digital_repositories_working_group.pdf

Fedora Commons: http://www.fedora-commons.org

Handle System: http://www.handle.net/hs_manual/server_manual_1.html - SEC1

Islandora Project: http://islandora.ca/

ISOcat Registry: http://www.isocat.org

OAI-PMH: http://www.openarchives.org/pmh/

Shibboleth: https://shibboleth.net/

Virtual Language Observatory: http://catalog.clarin.eu/vlo/

Online Speech and Language Resources

Metadata: specification, creation and use

Susanne Haaf (BBAW)
Dieter Van Uytvanck (CLARIN ERIC)

Overview

- Introduction and definition
- Traditional metadata
- Component metadata
- Data categories
- The big picture
- In practice:
  - Building components
  - Using components

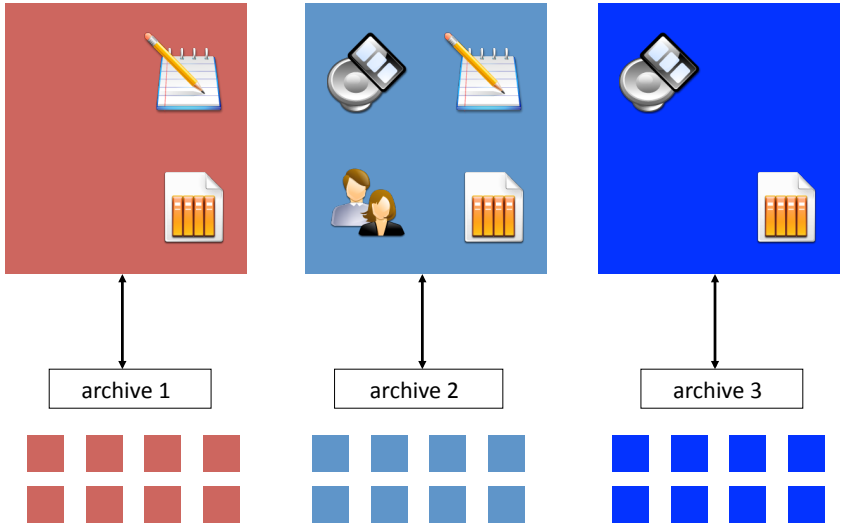
Metadata?

- Data about data
- More exactly: **structured** data about data
  - Not just prose (although that can be a part)
  - But keyword/value type of data:
    - Name = “Nordic Syntax Database”,
    - Languages = “Danish, Faeroese, Icelandic, Norwegian, Swedish”
- Used for:
  - Resource discovery / accessing
  - Management

Metadata?

- In this context: description of language resources and tools
  - for human consumption
  - for machine processing
- Different levels of description (granularity):
  - complete corpora, e.g. Brown Corpus.
  - subcorpora or corpus components, e.g. all Flemish recordings in the Spoken Corpus Dutch
  - (recording) sessions, e.g. the recording of a dialogue (sound file + transcript)
  - individual resources, e.g. a text file

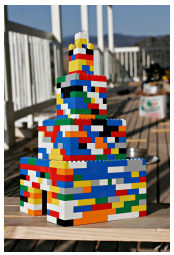
Traditional Metadata



Traditional Metadata: problems

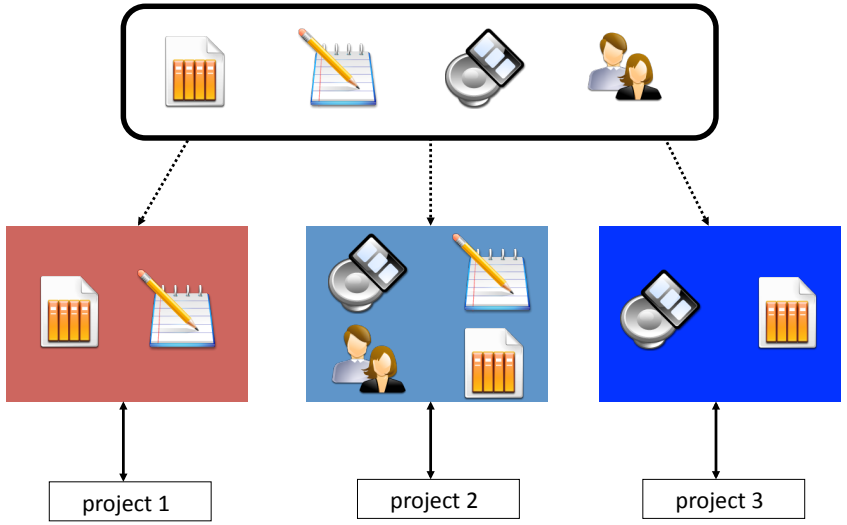
- Lack of flexibility
  - Too many fields...
  - ... but the one you are looking for is missing
- Lack of interoperability
  - My metadata does not work with your infrastructure
  - Vocabularies (and their semantics) often problematic:
    - Nederland? Netherlands? The Netherlands? Holland? NL?
    - community-specific terminology

Component Metadata



- Metadata infrastructure based on a "Component Metadata Model"
- Aims
  - Flexibility
    - Researcher can specify her/his needs
    - Offer ready-made metadata components
    - Allow creation of new metadata components needed
  - Interoperability built-in
  - Complete Infrastructure: software for editing, harvesting, exploitation
  - Compatibility with existing frameworks

Component Metadata



Some terminology (1)

- **Element** = atomic unit (a “field”) – e.g. recording date
- **Instance** = one metadata description – e.g. myresource.cmdi
- **Schema** = technical (formal) grammar describing a profile – e.g. olac.xsd

Some terminology (2)

Metadata **Component**: An aggregation of metadata elements and other components aimed at describing a specific aspect of a resource.

Reusable building block

Metadata **Profile**: An aggregation of metadata components and elements that can be used to create metadata descriptions. The profile is used to describe all relevant aspects of a resource or collection.

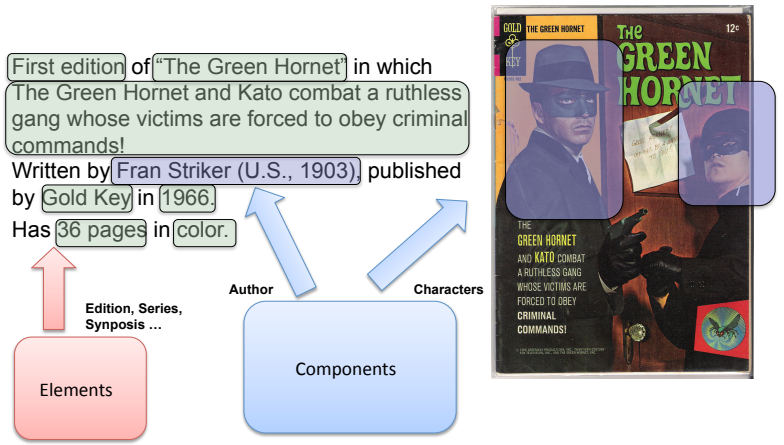
Blueprint for metadata description of a resource

Example Profile

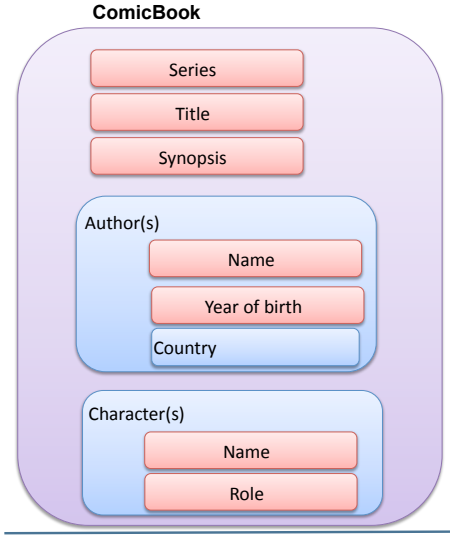
- Goal: Create metadata for a comic book resource

Source: Archive.org

Comic book: Resource



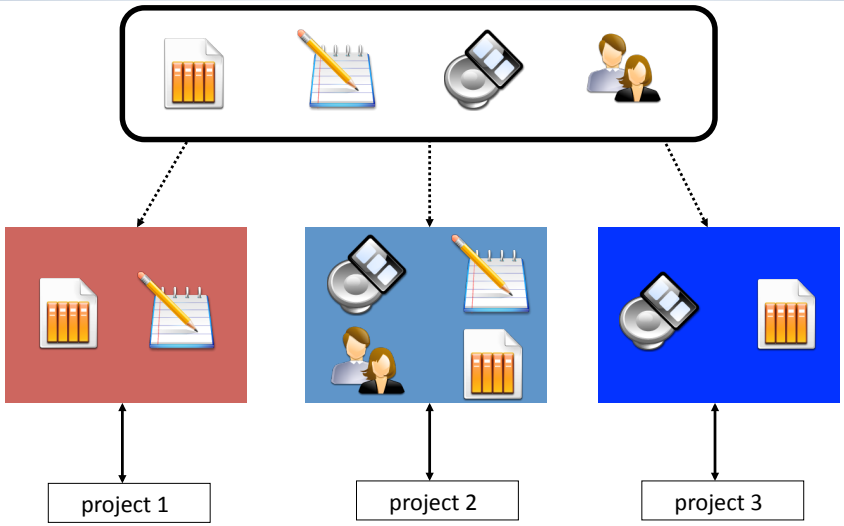
Comic book: Profile



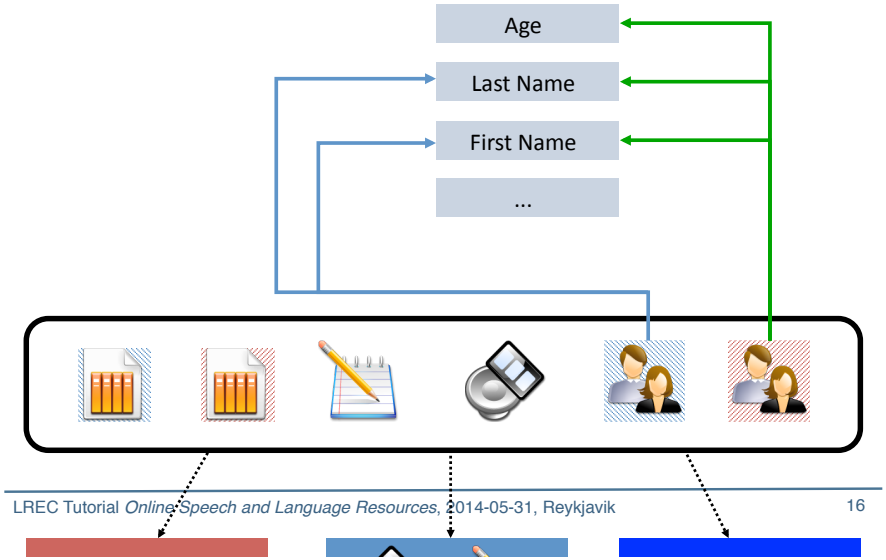
A close look at a CMDI file

- A toy example: http://hdl.handle.net/1839/00-DOCS.CLARIN.EU-102
- A corpus description: http://hdl.handle.net/1839/00-DOCS.CLARIN.EU-103

Data Categories



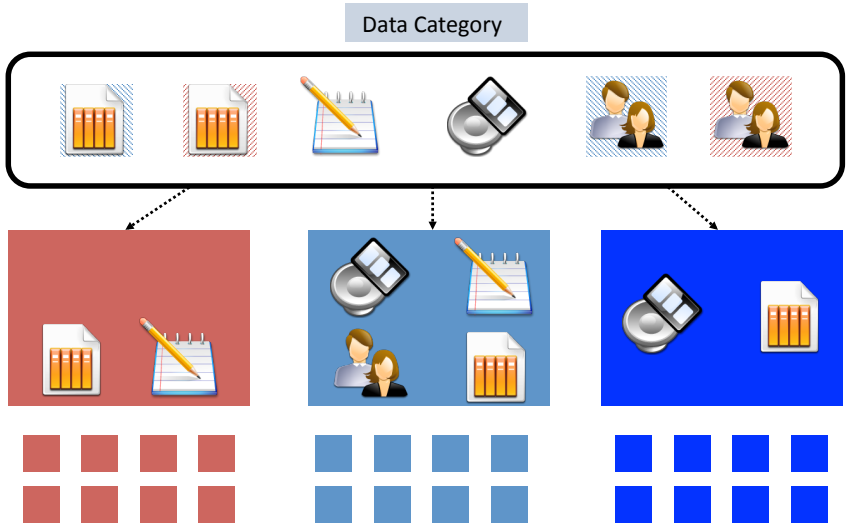
Data Categories



Data categories in practice

- A data category provides a definition for a CMDI element (or component)
  - to avoid ambiguity
  - to enable semantic mapping
- Data categories are stored in the ISOcat registry: http://www.isocat.org
- The Component Registry is connected to ISOcat
- Metadata browsing applications (like the VLO) are using these definitions

The big picture



Process overview

- Check the Component registry:
  - Any profile that fits your needs?
  - If not:
    - Any component that fits your needs?
    - If not:
      - Create your own component!
      - Looking for a data category that is not there?
        - Create a new data category!
    - Combine components together in a profile

Metadata creation

- Manually:
  - Arbil or your XML-editor
  - Select the profile/XSD that suits your needs
  - Create metadata instances
- Automatically: via e.g. a web service or script
- Conversion:
  - plenty of XSLT stylesheets available: http://www.clarin.eu/faq-page/274
  - DC/OLAC, TEI header, MetaShare, IMDI, MODS, Paradisec

What is out there?

- More than 20 Language Resource repositories are using CMDI: http://centres.clarin.eu/
- About 560.000 metadata records: http://clarin.eu/vlo
- About 150 profiles and 860 components: http://catalog.clarin.eu/ds/ComponentRegistry
- About 1100 metadata data categories: http://www.isocat.org/

Compatible software

- repositories (Fedora, Dspace, LAT) & processing and creation tools – see http://clarin.eu/cmdi
- exploration & searching:
  - facet-supported full-text search: VLO – http://clarin.eu/vlo
  - hierarchical browsing + fine-grained search: YAMS – http://clarin.eu/yams

Conclusions

- Component metadata ensures **flexibility** while maintaining technical and semantic **interoperability**
- It comes with out-of-the-box **conversion** methods for existing schemas
- There is a whole **software** stack available for the production and usage of CMDI
- More information: http://clarin.eu/cmdi

Persistent Identifiers

Using Handles for Identification and Retrieval of Linguistic Resources

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Agenda

1) Motivation
2) Potential Criteria
3) Existing Approaches & Evaluation
4) Persistent Identifiers and Granularity in the Handle System
5) Demo Handle System/EPIC API
6) Usage in CLARIN
   - 6.1) referenced objects
   - 6.2) content negotiation
   - 6.3) versioning
7) Examples
   - 7.1) CLARIN Centre Leipzig
   - 7.2) Demo Resource Access & Retrieval in CLARIN

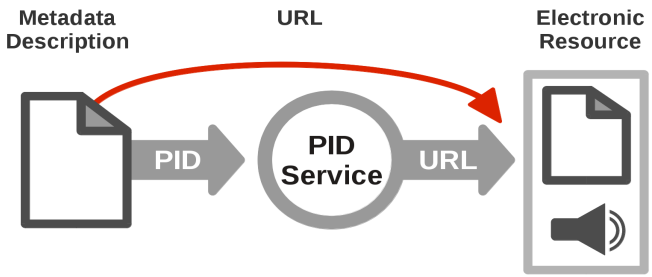
Motivation 1

- Long-term preservation and availability of resources
- Long-term availability vs. short-lived URLs (“Link rot“)
- Reference to a resource independent of its physical storage location or means of access
- *Persistent Identifiers (PIDs) can be treated as the incarnation of the resources and not as one of their many copies that may exist.*

Motivation 2

General approach:

- Additional layer on top of resource locators



Criteria 1

- Persistence and Uniqueness
- Contexts of References
  - Resolving in different contexts (web-sites, papers etc.)
  - Allows rewriting into URL
- Resources Granularity
  - Supporting reference to collections & fragments
  - Versioning

Persistent and unique Identifiers (Daan Broeder, Malte Dreyer, Marc Kemps-Snijders, Andreas Witt, Marc Kupietz, Peter Wittenburg, 2009, http://hdl.handle.net/1839/00-DOCS.CLARIN.EU-30)

Criteria 2

- Copies
  - Loadbalancing
  - Long-term archiving
- Compatibility and Standards
  - Compatibility to URI standard of IETF
- Additional Information
  - Allows descriptive metadata

Criteria 3

- (No) Semantics
- Fragment Addressing
  - Resolution supports Fragment Identifier
  - “Pass-through“ mechanism
- Performance/Robustness/Availability
  - Resolution as potential bottleneck
  - Redundancy/Caching mechanisms
  - Long term support

Criteria 4

- Security
  - Authorization for write access
- Independence/Openness
  - Influence on policies
  - Open and free software
- Costs
  - No correlation to number of issued PIDs

Approaches

- Uniform Resource Name **URN**
- **Handle** System
- Digital Object Identifier **DOI**
  - Uses Handle System
- Archival Resource Key **ARK**
- …

Approaches

Criteria	*URN*[1]	*Handle*	*DOI*	*ARK*
General	+	+	+	+
Copies	-	+	+	+
Standards	+	+	+	+
Additional Data	-	+	o	+
Semantics	o	+	+	+
Fragments	-	+	+	+
Performance/Robustness	-	+	+	-
Security	+	+	+	-
Independence	-	o	-	o
Spreading	-	o	+	-
Costs	+	o	-	+

[1] Specific resolver

Persistent and unique Identifiers (Daan Broeder, Malte Dreyer, Marc Kemps-Snijders, Andreas Witt, Marc Kupietz, Peter Wittenburg, 2009, http://hdl.handle.net/1839/00-DOCS.CLARIN.EU-30)

Handle System – Introduction

- General-purpose identifier resol-ution system
  - Foundation for DOI
- Developed by the *Corporation for National Research Initatives* (CNRI)
- Syntax: *PREFIX/SUFFIX*
  - PREFIX: Naming authority (→ Resolver)
  - SUFFIX: Local name

Handle System – Introduction

- Distributed architecture

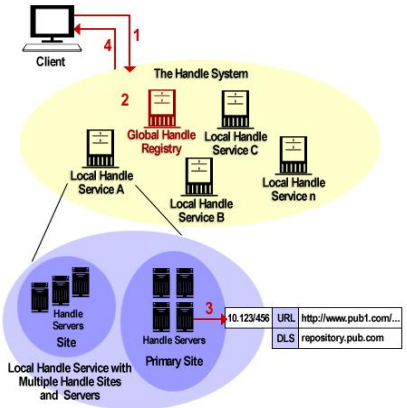


Figure 2 - Handle System Architecture & Operation

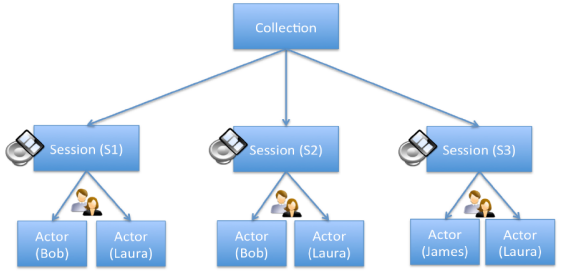
http://www.handle.net/hs_manual/server_manual_2.html

Handle System – Introduction

- Example:
  - European Persistent Identifier Consortium (EPIC)
  - Handle: 11022/0000-0000-2099-F
    - hdl:11022/0000-0000-2099-F
  - Resolver:
    - http://hdl.handle.net
    - http://hdl.handle.net/11022/0000-0000-2099-F

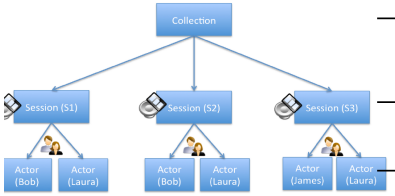
Persistent Identifier and Granularity

- Most resources are structured
- PIDs may reflect structure
- For many resources this could mean a very large amount of PIDs



Handle System – Part/Fragment Identifier

- Syntax: Prefix/Suffix@*PART_IDENTIFIER*
- Part Identifier without predefined structure
- Example:



	Solution 1	*Solution 2*
→	11022/0000-1111-F	11022/0000-1111-F
→	11022/0000-2222-F	11022/0000-2222-F
→	11022/0000-3333-F	11022/0000-2222-F@ActorLaura
	10 PIDs	4 PIDs

Handle System – Part/Fragment Identifier

- Full responsibility of the PID's owner
- More examples
  - Offset in audio/video files

    11022/0000-1111-F@offset=3:00
  - Display hints

    11022/0000-1111-F@version=html
  - ...

ample:

*?ID 11858/00-229C-0000-0001-B06F-3@**type=dataprovider&id=2***
vill be rewritten to

1858/00-229C-0000-0001-B06F-3?***type=dataprovider&id=2***

- Creating new PIDs vs. Part Identifiers
- Rules of thumb:
  - New **PID**, when
    - Associated with “complete” content
    - Resource is “autonomous”
    - Should be citable on its own
  - **Part Identifier**, especially when
    - Only used in larger context

Demo *API EPIC*

EPIC
European Persistent Identifier Consortium

Demo *API EPIC*

http://handle.gwdg.de:8080/pidservice/ (v1)

GWDG GWDG Handle Service GWDG

GWDG PID Handle Service

View Handle

PID / Handle:
jump to proxy view of data
jump via proxy to resource
jump directly to metadata
view XML instead of HTML (no effect for 'jump')
Enter PID (Handle) above and View Handle

Demo *API EPIC – Creation of new Handle*

Create Basic Handle

URL: http://lrec2014.lrec-conf.org/media/filer_public/2013/12/23/t11-tutorialoutline.pdf
Suffix: (user defined, optional)
Confirm in XML: (default: HTML)
Enter URL above and Create Basic Handle

Create Verbose Handle

Demo *API EPIC – Creation of new Handle*

New PID Handle created:

11858/00-229C-0000-0023-682A-B

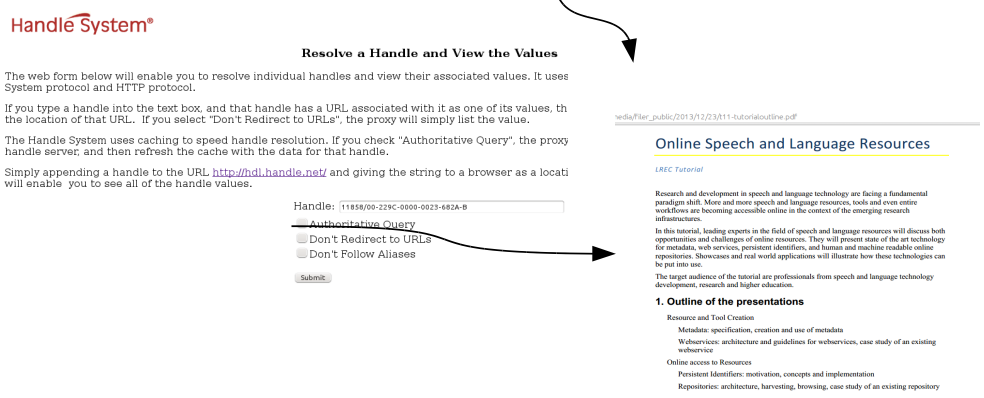
User details

User:	229C
Institute:	229C
Contact:	email: clarin@informatik.uni-leipzig.de
Can create PID:	yes
Can update PID:	yes

[Back to input form]

Demo *API EPIC*

http://hdl.handle.net/ (Handle Resolver)
http://hdl.handle.net/11858/00-229C-0000-0023-682A-B?noredirect
http://hdl.handle.net/11858/00-229C-0000-0023-682A-B



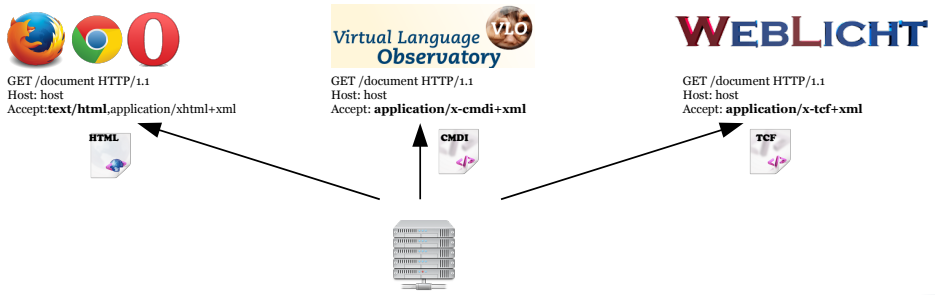
- *It is recommended to all (potential) CLARIN centers to get acquainted with the requirements and solutions for creating and maintaining PIDs.*
- *We recommend taking care of the PID requirements in all CLARIN related software developments.*
- *We recommend establishing a CLARIN PID service that is independent of any commercial business model.*

CLARIN Recommendations – Linked Objects

- Centres need to associate PIDs with their metadata records
- Non-metadata files should receive a PID or a PID in combination with a part identifier, if these files:
  - are accessible via internet
  - are considered to be stable by the data provider
  - are considered to be worth to be accessed directly (not via metadata records) by the data provider

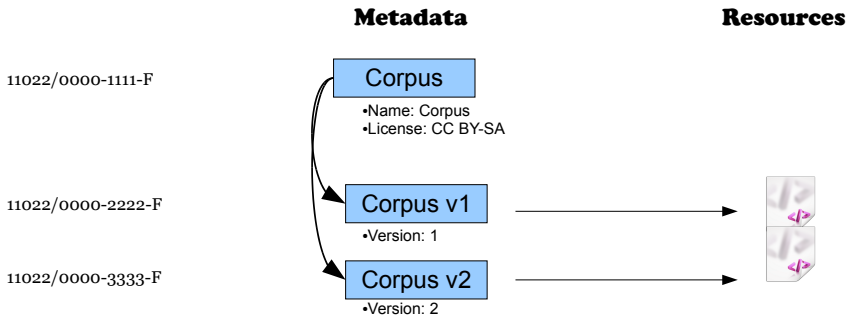
CLARIN Recommendations – Content Negotiation

- PIDs should be suitable for both human and machine interpretation
- Webservices make use of HTTP-accept header



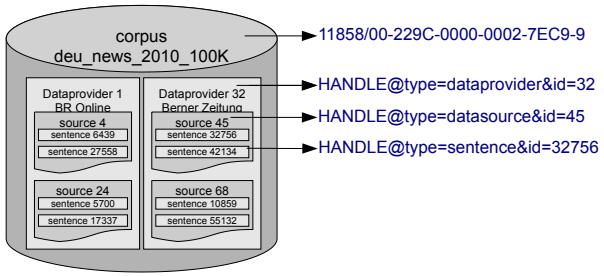
CLARIN Recommendations – Versioning

- Resources evolve over time
  - Problem: long-term accessibility
  - Changes in published resource require new PID
  - Compromise: identifier for general resource and each version of this resource

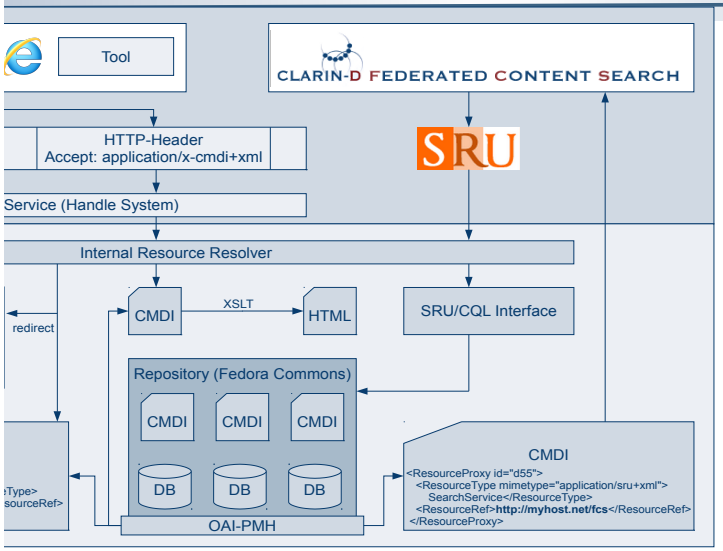


Example: CLARIN-D Centre Leipzig

- Corpus structure & PIDs
  - Data Provider
    - Data Source (=Document)
      - Sentence



Example: CLARIN-D Centre Leipzig



CLARIN Walkthrough

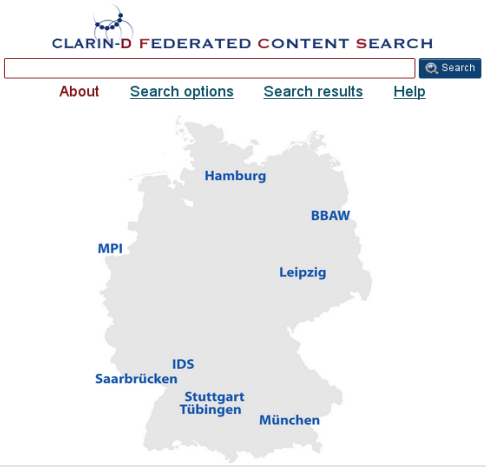
Demo *Persistent Identifier in the CLARIN infrastructure*

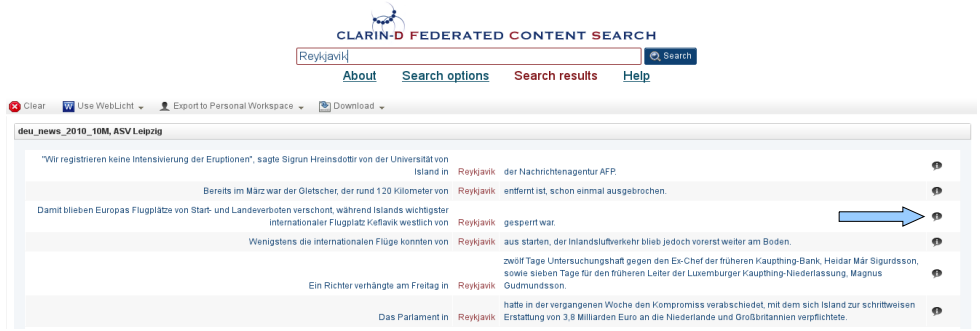
CLARIN Walkthrough

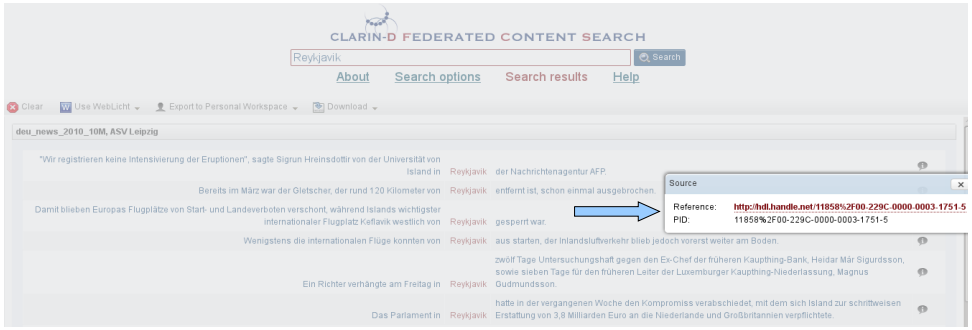
Metadata Search *Virtual Language Observatory* (http://catalog.clarin.eu)

CLARIN Walkthrough

Federated Content Search
(http://weblicht.sfs.uni-tuebingen.de/Aggregator)







- Language resource management -- identification and sustainable access (ISO 24619:2011)
- Persistent Identifiers in CLARIN
  - https://www.clarin.eu/content/goals-and-requirements-pid-systems
- EPIC
  - http://www.pidconsortium.eu

Pers

EPIC
European Persistent Identifier Consortium

Summary

- Persistent Identifiers are long-lasting references (in contrast to URLs) and can form a basis for a stable resource infrastructure
- Several systems exist (Handle, DOI, ARK, URN, PURL …), all with different features
- Usage of PIDs: clear policy and maintenance efforts
- Your institution may already have a policy about using PIDs

Web Services

Architecture and Examples

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Agenda

- Web Services Definition
- Approaches to Web Services
  - Technology
- Discussion
- Requirements and Commitment
- Web Service Examples
- Chaining

W3C Definition

- A Web Service is a software system
  - designed to support *interoperable* machine-to-machine interaction
  - over a *network*.
- Its interface is *described* in a machine-processable format.
- Other systems interact with the Web service in a manner prescribed by its description using *messages*
  - typically conveyed using http
  - with a *serialization* in conjunction with other Web-related standards.

Approaches

- REST-compliant Web services
  - manipulate XML representations of Web resources using a uniform set of stateless operations
  - e.g. crowdsourcing, online shopping,…
- Other Web services
  - perform arbitrary operations
  - e.g. cloud computing, server-based processing,…

Common concepts

- URIs identify resources
  - Uniform Resource Identifier
  - `scheme:hier-part[?query][#fragment]`
- W3C protocols define operations
  - http
    - hyper text transfer protocol
  - SOAP
    - network protocol for remote procedure calls
    - using XML-formatted messages

Technology

- REST – Representational State Transfer
  - resource-oriented *architectural style*
  - based on stateless http methods
    - get, post, put, delete
  - and serialized resource representations

REST style

- 4 http methods mapped to 4 database operations

Operation	Create	Read/ Retrieve	Update	Delete/ Destroy
http	POST	GET	PUT	DELETE
SQL	CREATE	SELECT	UPDATE	DELETE

- XML representation of resources
  - increasingly, JSON is used

Web Services: Pros

- User view
  - immediate and easy access
  - no need for local software installation
  - always newest version
  - take advantage of provider's processing power
- Provider view
  - full control of runtime environment (software, hardware)
  - easy monitoring, logging
  - immediate availability of updates
  - set the service up once, use it everywhere
    - → with [rd]ecent browser

Discussion: Cons

- User view
  - only one version available
  - network access necessary
  - processing speed dependent on server
  - data has to be given away
- Provider view
  - immediate availability of updates
  - single point of failure
  - difficult to estimate usage (amount, regularity)

SOA Advantages

- Loosely coupled functionalities
- Service providers are only responsible for the service and software
  - they know and
  - they need anyway
- Modular setup, easy to be reused
- Well-specified interfaces
  - WADL, CMDI, etc.

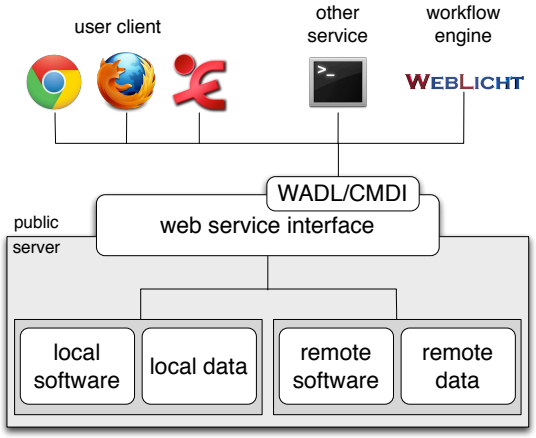
Summary

- In practice
  - most users want a system that simply works
  - humanities researchers should not be burdened with the installation of software
  - increased use of laptops → servers more suited for number/text crunching
- New opportunities
  - web services promise access to rich set of software the researcher might not have otherwise

Requirements & Commitment

- A web service provider must have
  - a *service* suitable for online usage
- plus
  - developer(s)
    - to create and maintain the web service(s)
  - administrator
    - to keep it up and running
  - servers that are accessible
    - 24/7 with (very) low downtime
    - over a longer time-frame (years)

Web Service Architecture

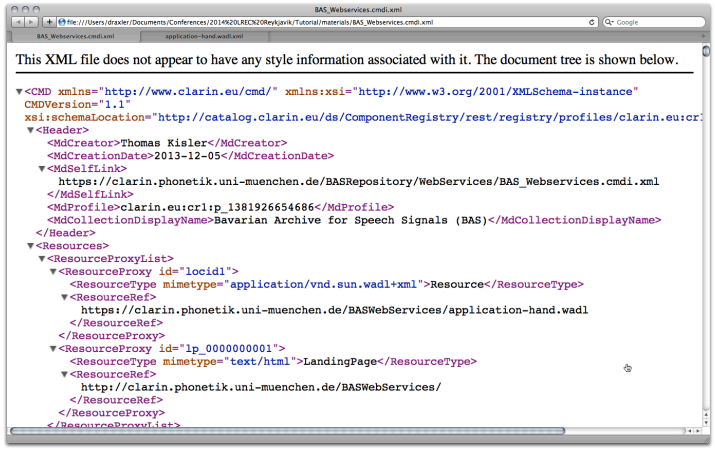


Web Service Description

- WSDL & WADL
  - Web Service Description Language
  - Web Application Description Language
  - *technical* description
- CMDI – Component Meta Data Infrastructure
  - *semantic* description of web services
  - well-defined reusable building blocks
  - flexible framework

WADL example

CMDI Example



Web Services in CLARIN

- Distributed centres provide resources and services
  - currently, existing tools are being converted to web services
  - mostly RPC using RESTful style
- Single sign-on and authentication
- Workflow engines to chain web services
  - Tool Chain Format ensures compatibility

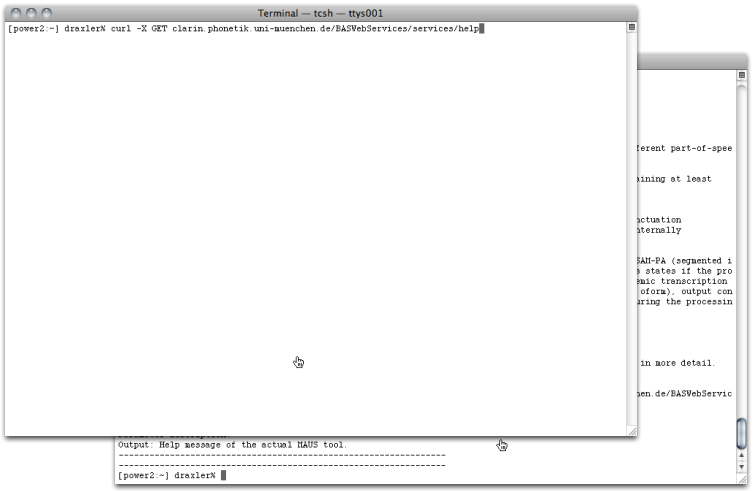
CLARIN web services

- Virtual Language Observatory lists services
  - `www.clarin.eu/content/virtual-language-observatory`
- Linguistic tools
  - stemmer, parser
  - tree-bank explorer
- Speech technology
  - text-to-Speech
  - automatic segmentation and labeling
- Visualization, format converters…

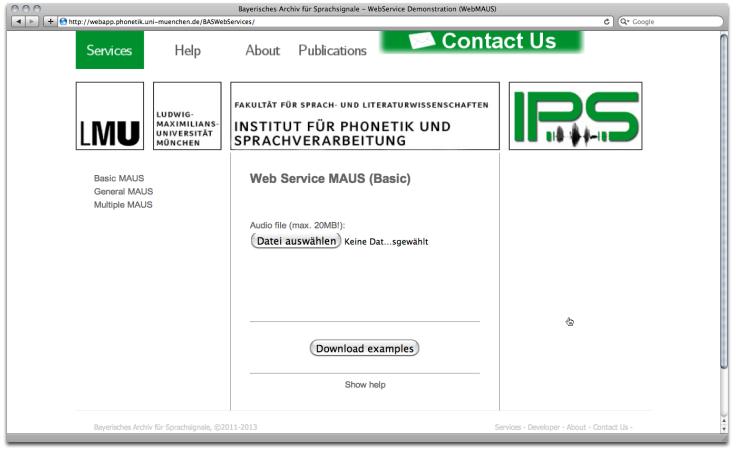
Examples

- BAS Web Services help
  - online help function
    - `curl -X GET clarin.phonetik.uni-muenchen.de/BASWebServices/services/help`
- BAS WebMAUS
  - automatic phonemic segmentation and labelling
- HZSK transcription format converter
  - convert annotation files

Example BAS help function

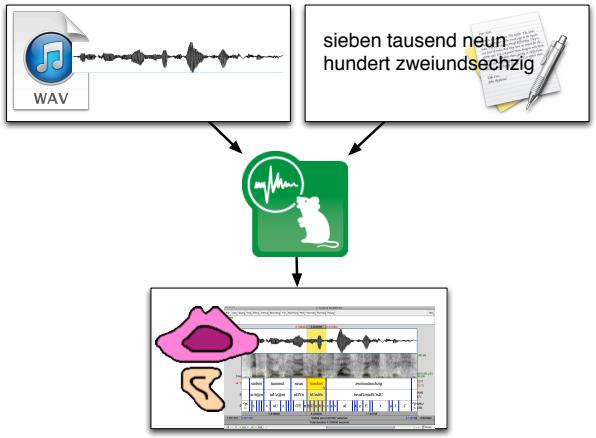


WebMAUS



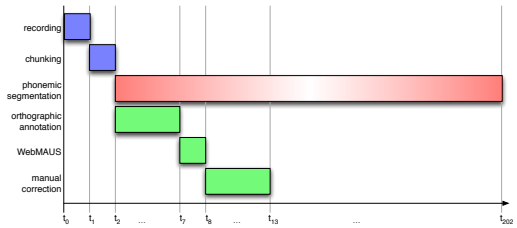
clarin.phonetik.uni-muenchen.de/BASWebServices

WebMAUS

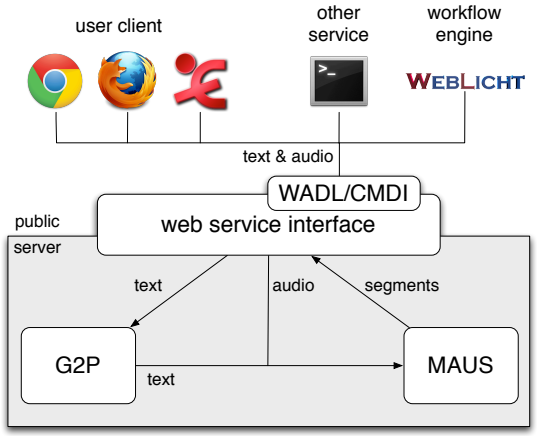


WebMAUS

- Substantial speedup of workflow
- Less qualified work needed
- Easy to use
  - GUI in browser
  - comfortable multi-file options



WebMAUS

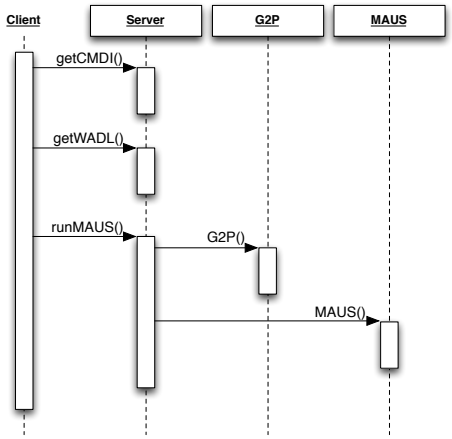


WebMAUS in Terminal

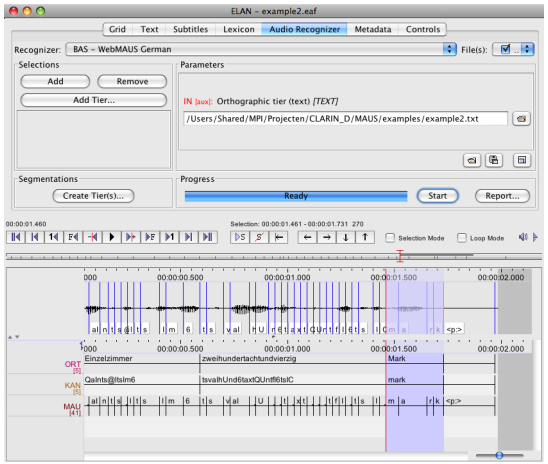
- curl -v -X POST -H 'content-type: multipart/form-data'
  -F SIGNAL=@German.wav
  -F STARTWORD=0
  -F TEXT=@German.txt
  'http://clarin.phonetik.uni-muenchen.de/BASWebServices/services/runMAUSBasic'

- <WebServiceResponseLink>
  <success>true</success>
  <downloadLink>
  http://clarin.phonetik.uni-muenchen.de:80/…/German.TextGrid
  </downloadLink>
  <output>
  /usr/local/bin/maus OUTFORMAT=TextGrid
  …
  OUT=/usr/share/…/German.TextGrid
  …
  </output>
  <warnings></warnings>
  </WebServiceResponseLink>

WebMAUS sequence diagram



WebMAUS in ELAN

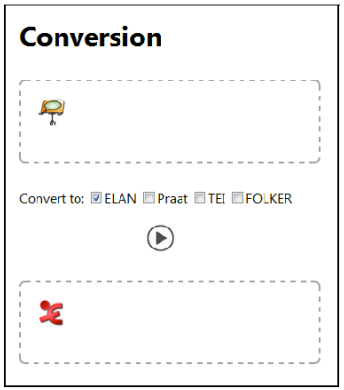


Transcription Format Converter

Webservice for conversion of transcription formats

Sample call:

```
wget --post-file=input.exb
--header='Content-Type:
text/exb+xml' "http://virt-
fedora.multilingua.uni-
hamburg.de:8080/converter/reso
urces/convertExb?to=eaf" -O
output.eaf
```

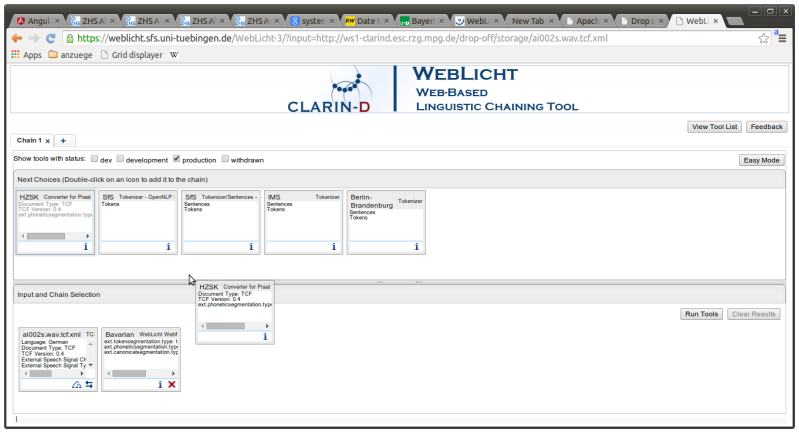


Tool Chaining

- Enhance workflow by chaining services
  - output of one service is input to the next
- Web service chains
  - not restricted to local software
  - alternative services may be explored
  - automated processing becomes feasible

WebLicht

- Web Licht
  - automatic orchestration and execution environment
  - incremental annotation of corpora
- Service Oriented Architecture
  - web interface for interactive access
  - based on Text Corpus Format (TCF)



Summary

- Web services will change the way researchers work
  - access to services without software installation
  - more and bigger data
- Service providers need to prepare
  - convert tools to services
  - long-term commitment is mandatory

Repositories

Online Speech and Language Resources, Tutorial

Daniel Jettka, daniel.jettka@uni-hamburg.de
Hamburger Zentrum für Sprachkorpora, Universität Hamburg

Agenda

1. Introduction
   - What is a digital repository?
   - Existing repository solutions
2. The Fedora repository system
   - Data storage, long-term accessibility, version management, access control, interfaces, Islandora software framework
3. Repositories in CLARIN
   - Federated login, federated content search, metadata harvesting, assessment
   - Repository demo: ASV Uni Leipzig, HZSK Uni Hamburg

What is a digital repository?

Motivation: long-term storage and availability of digital resources

Bob Kahn: “repository is a network accessible storage to store objects for later access”

JISC: A digital repository is a managed, persistent way of making research, learning and teaching content with continuing value discoverable and accessible. Repositories can be subject or institutional in their focus. Putting content into an institutional repository enables staff and institutions to manage and preserve it, and therefore derive maximum value from it. A repository can support research, learning, and administrative processes.

(Wittenburg, 2011)

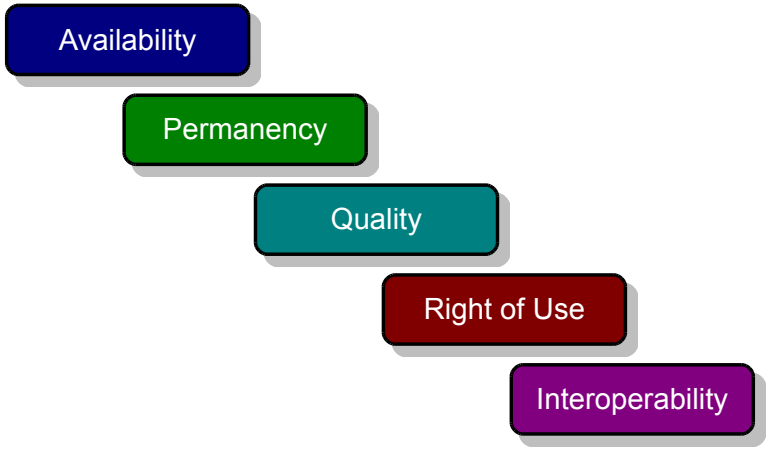
What is a digital repository?

Motivation: long-term storage and availability of digital resources

Forrester Research: Knowledge workers spend 40% of their time trying to find information and 70% of that time is spent recreating information that cannot be found. A digital repository offering refined categorisation and search tools that help locate information quickly provides quantifiable savings in terms of time and resources.

(Wittenburg, 2011)

ESFRI: key objectives



(cf. ESFRI Position Paper, 2009)

Existing repository solutions

Ready-made solutions (often no application logic):

D-SPACE, ePrints, eSciDoc, LAMUS

Toolkits:

Fedora

Grid and database solutions:

IRODS, MySQL, Postgres, Xbase, eXist, etc

commercial solutions:

ORACLE etc, CMS, ArchivalWare, DigiTool, VITAL

(cf. Wittenburg, 2011)

Comparisons

- UNESCO (2014): Digital Commons, DSpace, EPrints, Fedora, Islandora
- Kökörčený/Bodnárová (2010): CDS Invenio, DSpace, EPrints, Fedora, Greenstone
- Marill/Luczak (2009): DAITSS, DSpace, EPrints, Fedora, Greenstone, Keystone DLS, ArchivalWare, CONTENTdm, DigiTool, VITAL

The Fedora repository system

Fedora Commons

- Flexible Extensible Digital Object Repository Architecture
- Free, open-source, community project
- Use of open standards and protocols:
  - DC, RDF, XACML, XML
  - OAI-PMH, LDAP
  - SOAP & REST web services
- Foundation for building variety of information management schemes for different use cases – not full solution for specific use case

(cf. Zastrow/Dima, 2011)

https://wiki.duraspace.org/display/FEDORA37/Getting+Started+with+Fedora

Fedora Commons

Prerequisites:

- Java SE Development Kit (JDK)
- Database (MySQL, Oracle, PostgreSQL, or Microsoft SQL Server)
- Application Server (any that implements Servlet 2.5/JSP 2.1 or higher; included: Tomcat)
- (Maven 2: for building from source)

https://wiki.duraspace.org/display/FEDORA37/Installation+and+Configuration

Fedora Commons

- Storage of any sort of digital content in any format (e.g. documents, videos, images, metadata)
- Storage of relationships between content items

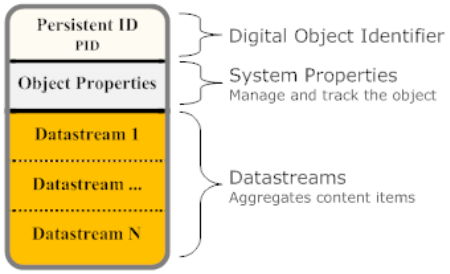
Also possible:

- Storage of metadata and relationships for content which is held by another organization or system

https://wiki.duraspace.org/display/FEDORACREATE/Tutorial+1+-+Introduction+to+Fedora

Fedora Commons

Fedora Digital Object Model



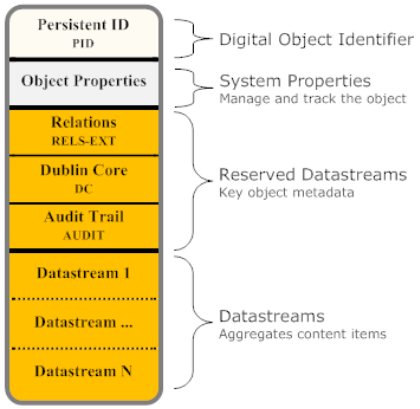
Four types of Digitals Objects:

- Data Object
- Service Definition Object
- Service Deployment Object
- Content Model Object

https://wiki.duraspace.org/display/FEDORA37/Fedora+Digital+Object+Model

Fedora Commons

Datastreams



https://wiki.duraspace.org/display/FEDORA37/Fedora+Digital+Object+Model

Data storage & versioning

Fedora's archival and preservation capabilities include:

- XML for Fedora objects (preserved at ingest, during storage, and at export)
- Object to Object Relationships: can be stored via metadata included in objects (RDF) → hierarchical relationships for related objects
- Content Versioning & event history: audit trail of objects (optional)
- Support of date-time stamped requests

Access control

Authentication

- Basic: list of users in fedora-users.xml
- LDAP
- Java Authentication and Authorization Service (JAAS)

Authorization

- Simple servlet container authentication – can do everything
- Basic access roles authorizations – mapping onto preconfigured roles
- XACML policies

(cf. Zastrow/Dima, 2011)
https://wiki.duraspace.org/pages/viewpage.action?pageId=28181276

OAI-PMH

Open Archives Initiative Protocol for Metadata Harvesting:

- Low-barrier mechanism for repository interoperability
- Data Providers: repositories that expose structured metadata via OAI-PMH, e.g. CLARIN repositories - CMDI
- Service Providers: make OAI-PMH service requests to harvest that metadata, e.g. Virtual Language Observatory

- OAI-PMH: set of six verbs or services invoked within HTTP (GetRecord, Identify, ListIdentifiers, ListMetadataFormats, ListRecords, ListSets)

http://www.openarchives.org/pmh/

Fedora OAI Provider

Fedora OAI Provider Service:

- Based on Proai
- Supports any metadata format available through the Fedora repository via a datastream or dissemination
- Supports sets that are expressed as RDF relationships in digital objects' RELS-EXT datastreams
- Runs as webapp in any servlet container, acting as web service client to Fedora
- Caches content of the Fedora disseminations and datastreams intended to be exposed as OAI records

http://fedora-commons.org/download/2.2/services/oaiprovider/doc/

User web interface

Fedora

Repository Information View

Repository Name: Fedora Repository

Base URL:	http://localhost:8080/fedora
Version:	3.4.2
PID Namespace:	changeme
PID Delimiter:	:
Sample PID:	changeme:100
Retain PID Namespace:	*
OAI Namespace:	http://www.corpora.uni-hamburg.de
OAI Delimiter:	:
Sample OAI Identifier:	oai:http://www.corpora.uni-hamburg.de:changeme:100
Sample Search URL:	http://localhost:8080/fedora/objects
Sample Access URL:	http://localhost:8080/fedora/objects/demo:5
Sample OAI URL:	http://localhost:8080/fedora/oai?verb=Identify
Admin Email:	bob@example.org
Admin Email:	sally@example.org

User web interface

Fedora Repository

Find Objects

Fields to display:

pid, label, state, ownerId, cDate, mDate, dcmDate, title, creator, subject, description, publisher, contributor, date, type, format, identifier, source, language, relation, coverage, rights

Search all fields for phrase: demo help

Or search specific field(s): help

Maximum Results: 20

Search

pid	title
col:demo	EXMARaLDA Demo corpus
cmdi:demo	Corpus Metadata Demo Corpus (cmdi)
col:demo_meta	Metadata for EXMARaLDA Demo Corpus

User web interface

Fedora Digital Object

Object Profile View

Version Date: current

View the Datastreams List for this Object

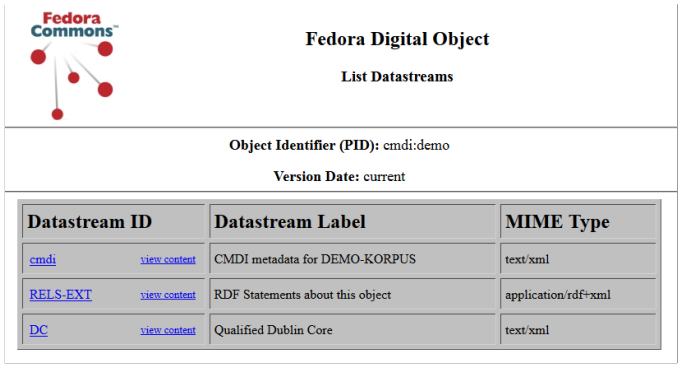
View the Methods List for this Object

View the Version History for this Object

View the XML Representation of this Object

Object Identifier (PID):	cmdi:demo
Object Label:	Corpus Metadata Demo Corpus (cmdi)
Object Content Model(s):	info:fedora/cmdi:cmodel info:fedora/fedora-system:FedoraObject-3.0
Object Creation Date:	2013-03-08T15:48:13.335Z
Object Last Modified:	2013-11-18T13:37:13.575Z
Object Owner Identifier:	
Object State:	A

User web interface



Fedora Digital Object

List Datastreams

Object Identifier (PID): cmdi:demo

Version Date: current

Datastream ID		Datastream Label	MIME Type
cmdi	view content	CMDI metadata for DEMO-KORPUS	text/xml
RELS-EXT	view content	RDF Statements about this object	application/rdf+xml
DC	view content	Qualified Dublin Core	text/xml

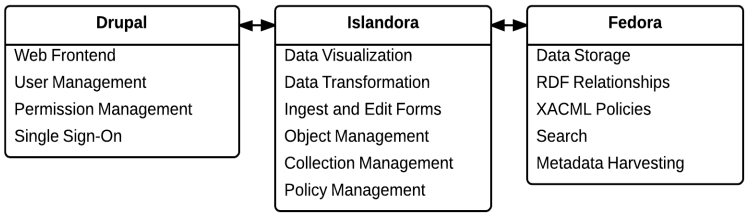
Fedora Commons: Summary

+	-
Stable and approved in many projects	Setup, data modelling, training of repository managers can become time-consuming
Flexible way of storing data	No user friendly interface (→ eSciDoc, DSpace)
Everything on board or can be added (PID handling, OAI-PMH)	Can only be used for storing file-based data: no access to databases
Extensive programming API in RESTstyle	

http://www.clarin.eu/sites/default/files/zastrow-fedora.pdf

Islandora

- Open-source software framework
- Focus on collaborative management, and discovery of digital assets using a best-practices framework
- Built on the basis of Drupal, Fedora, and Solr



http://islandora.ca/

Islandora

- Support for any file type (via Fedora repository system)
- Multi-language and functionality support via Drupal
- Modular Solution Pack framework for defining specific data models and associated behaviors (e.g. for audio, PDF, images, books)
- Formbuilder module for the creation of a data-entry/editing form for any XML schema

Islandora

- Support for semantic ontologies and the creation of relationships between objects
- Flexible faceted search driven by Apache Solr
- Micro service-based workflows for automating the transformation of assets
- Editorial workflows for approving submissions to the repository

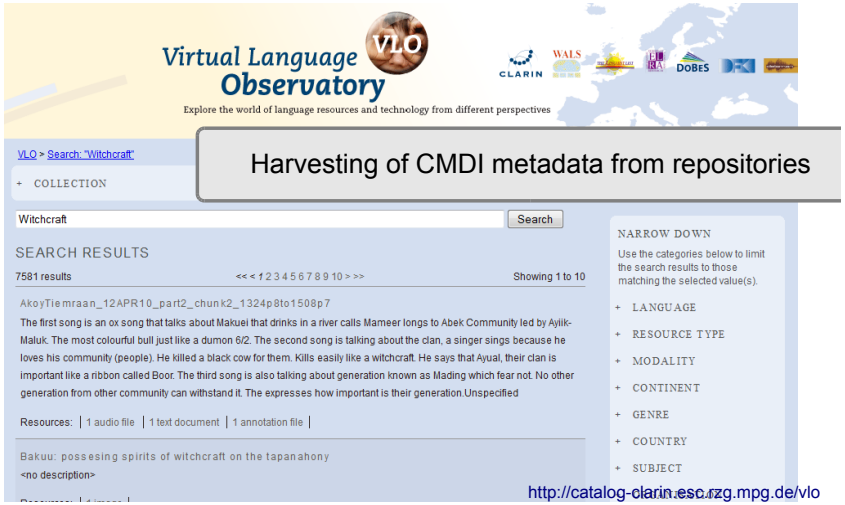
Intermediate conclusion

„Ultimately, the institution must evaluate its collections, technical expertise, and research distribution strategy in order to choose the platform that will best support its research goals“ (UNESCO, 2014)

- In many cases it might make sense to integrate data into existing repositories
- CLARIN centres have competences in several areas & have well-defined policies to host data
- Overview of centres and basic technology: http://centerregistry-clarin.esc.rzg.mpg.de/

Features of CLARIN repositories

Metadata harvesting

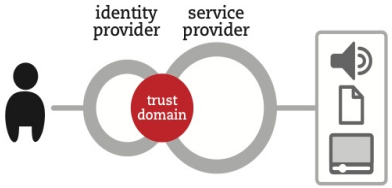


Harvesting of CMDI metadata from repositories

http://catalog-clarin.esc.rzg.mpg.de/vlo

Federated Login

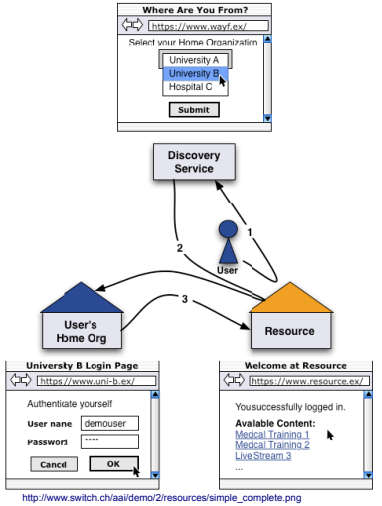
- Goal: easier access to password-protected resources for academic users
- academic users should be able to login with their existing institutional credentials



- user stores from universities and academic institutions ("Identity Providers") are connected to password-protected web applications ("Service Providers") - connection based on mutual trust

http://www.clarin.eu/node/3788

Single Sign-On



http://www.switch.ch/aai/demo/2/resources/simple_complete.png

Shibboleth

Single sign-on solution, mainly used for web-application security

based on SAML; session used to manage authentication state

software components are implementation of the SAML protocols and bindings

(cf. Elbers, 2011)
https://shibboleth.net/

Federated Content Search

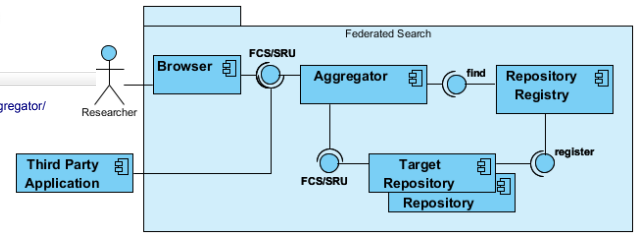
SRU Search/Retrieval via URL
SRU (the protocol)
CQL (query language)
ZeeRex (service description)

- standard XML-based protocol for search queries, utilizing CQL - Contextual Query Language (a standard syntax for representing queries)
- three main operations: Explain, Scan, SearchRetrieve
- extension of SRU/CQL-protocol as common harmonized interface (lingua franca) that individual repositories willing to join the federated search have to implement
- individual repositories implement FCS-interface as „endpoints“

http://www.loc.gov/standards/sru/

Federated Content Search

http://weblicht.sfs.uni-tuebingen.de/Aggregator/



https://www.clarin.eu/content/federated-content-search

Data seal of approval

http://www.datasealofapproval.org

Part of CLARIN centre assessment procedure

CLARIN CENTRE B

Samples of CLARIN repositories

ASV Automatische Sprachverarbeitung

CLARIN-D

GEFÖRDERT VOM Bundesministerium für Bildung und Forschung

Repository *CLARIN-D Centre Leipzig*

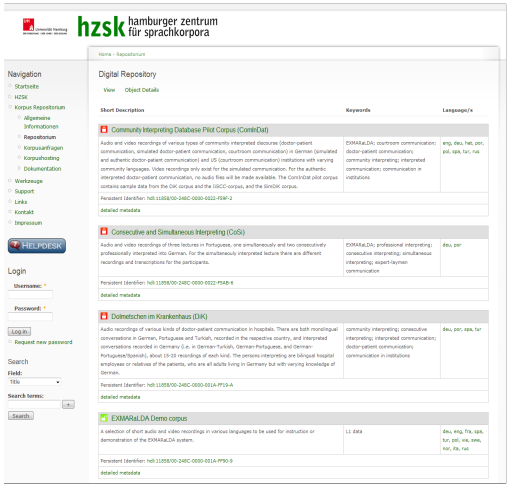
Introduction to the Repository

The *CLARIN-D repository* at the University of Leipzig offers longterm preservation of digital resources, along with their descriptive metadata. The mission of the repository is to ensure the availability and longterm preservation of resources, to preserve knowledge gained in research, to aid the transfer of knowledge into new contexts, and to integrate new methods and resources into university curricula.

CLARIN-D is developing a digital infrastructure for language-centred research in the social sciences and humanities. The main function of the CLARIN-D service centres is to provide relevant, useful data and tools in an integrated, interoperable and scalable way. CLARIN-D will roll the infrastructure out in close collaboration with expert scholars in the humanities and social sciences, to ensure that it meets the needs of users in a systematic and easily accessible way. Integration of the repository into the national CLARIN-D and international CLARIN infrastructures gives it wide exposure, increasing the likelihood that the resources will be used and further developed beyond the lifetime of the projects in which they were developed.

Among the resources currently available in the Leipzig repository are a set of corpora of the Leipzig Corpora Collection (LCC), based on newspaper, Wikipedia and Web text. Furthermore several REST-based webservices are provided for a variety of different NLP-relevant tasks.

http://clarin.informatik.uni-leipzig.de/repo/



https://www.corpora.uni-hamburg.de/repository

Recapitulation

(1) Digital repositories

Purpose, key objectives, existing solutions

(2) The Fedora repository system

Features, interfaces, pros & cons, Islandora as front-end

(3) Repositories in CLARIN

Metadata harvesting, federated login, federated search, assessment

Repository demo: ASV/University Leipzig, HZSK/University Hamburg

References

Elbers, W. (2011). *Shibboleth @ the MPI*. Presentation at CLARIN-D Tutorial, AAI and PIDs, MPI for Psycholinguistics, Nijmegen, 08.09.2011.

ESFRI Position Paper (2009). *ESFRI Working Group about Digital Repositories.*

Kökörčený, M. & Bodnárová, A. (2010). Comparison of digital libraries systems. In *DNCOCO'10 Proceedings of the 9th WSEAS international conference on Advances in data networks, communications, computers*, pp. 97-100.

Marill, J. L. & Luczak, E. C. (2009).
Evaluation of Digital Repository Software at the National Library of Medicine. In *D-Lib Magazine*, Vol. 15, No. 5/6.

UNESCO (2014). *Institutional Repository Software Comparison.* Open Access to Scientific Information Knowledge Societies Division.

Wittenburg, P. (2011). *Repositories – an overview.* Presentation at CLARIN-D Tutorial, Repositories, MPI for Psycholinguistics, Nijmegen, 07.09.2011.

Zastrow, T. & Dima, E. (2011). *Fedora Commons.* Presentation at CLARIN-D Tutorial, Repositories, MPI for Psycholinguistics, Nijmegen, 07.09.2011.