ÖAW AUSTRIAN ACADEMY OF SCIENCES

OREA Institute for Oriental and European Archaeology

Developing an archaeological data archive at the Austrian Academy of Sciences: the ‘A puzzle in 4D’ project

Edeltraud Aspöck, Gerald Hiebel, Matej Ďurčo

OREA Institut für Orientalische und Europäische Archäologie

acdh austrian centre for digital humanities

ARIADNE www.ariadne-infrastructure.eu

ÖAW

Project & Aims

A puzzle in 4D:

digital preservation and reconstruction of an Egyptian palace

Digital long-term preservation of ressources from Austrian excavations at Tell el Daba (Egypt)

- Funding: Austrian Academy of Sciences digital long-term preservation program (ÖAW/ACDH Digital Humanities) & ARIADNE (FP7-313193)
- February 2015 – January 2020
- OREA & ACDH (Austrian Academy of Sciences)
- **Case study to develop archaeology data archive at the Austrian Academy of Sciences**

Cooperations with:

- Ludwig Boltzmann Institute ArchPro
- Chicago University
- Österreichisches Archäologisches Institut, Grabung Tell el Dab‘a
- Archaeology Data Service
- PIN Scri - Polo Universitario "Città di Prato"

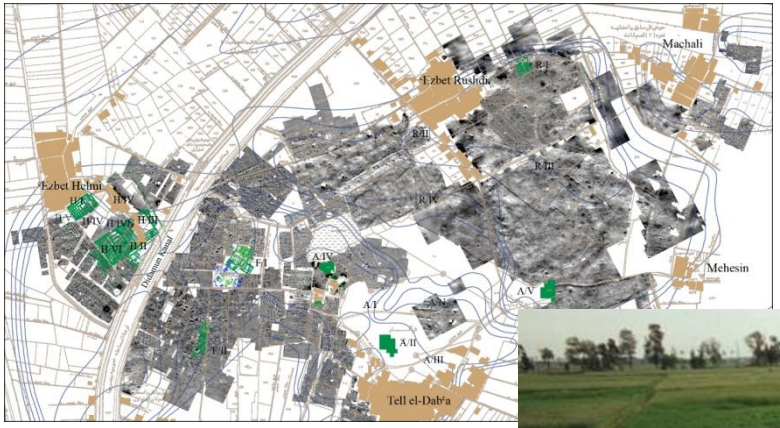
Tell el Daba (TED)

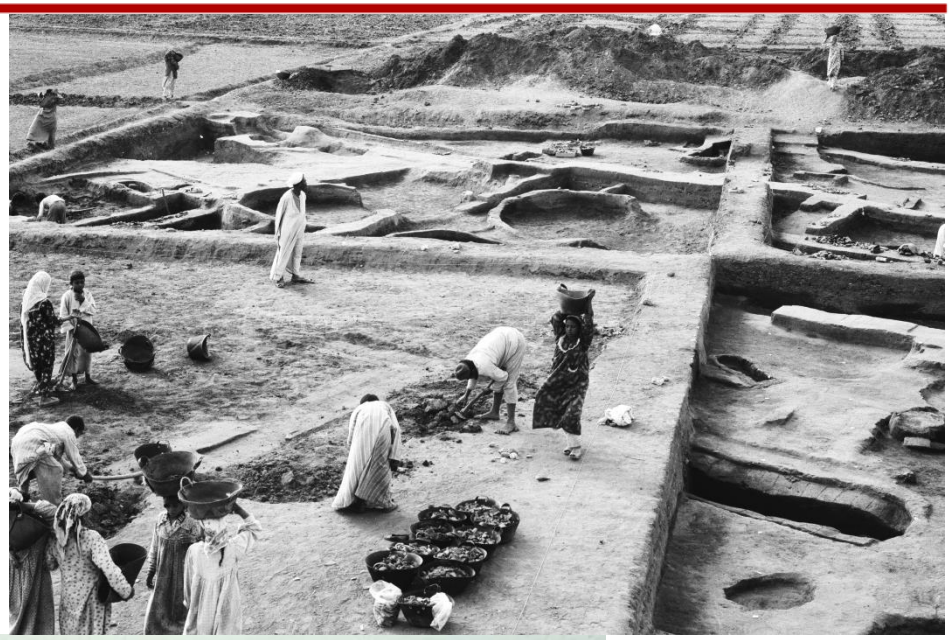
- 12th – 18th Dynasty (early second millenium BC)
- Wealthy society with contacts to eastern Mediterranean and Minoan culture

TED wall painting depicting bull leapers

Excavation

- Since 1966
- 8 excavation areas
- 88 fieldwork campaigns

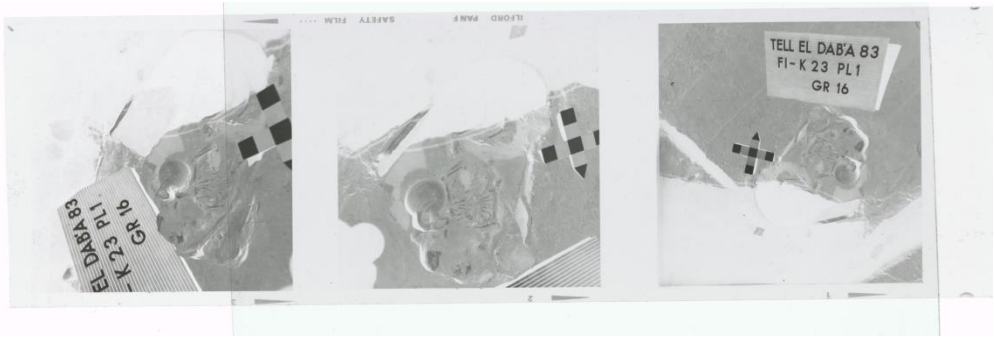




ANALOGUE documentation

Photos

- 15 000 photos
- 200 000 photo negatives
  of which 1/3 are 6x6 negatives
- 45 000 slides



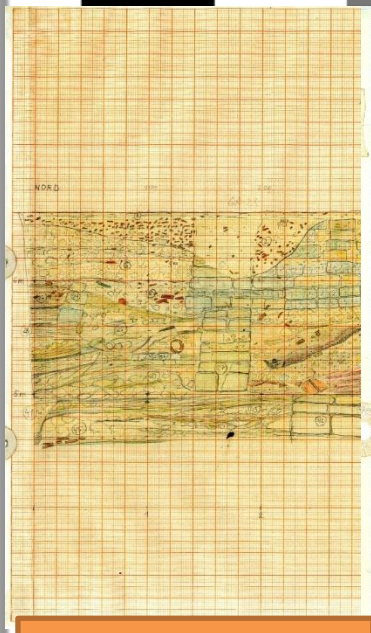
Drawings

- find drawings: 15 200 pencil on cardboard
  + 8000 ink on cardboard
- 35 000 field drawings (plana, sections, details): colour pencils on millimeter paper
- 4500 plans, nearly all DIN A2 or A1: ink on tracing paper

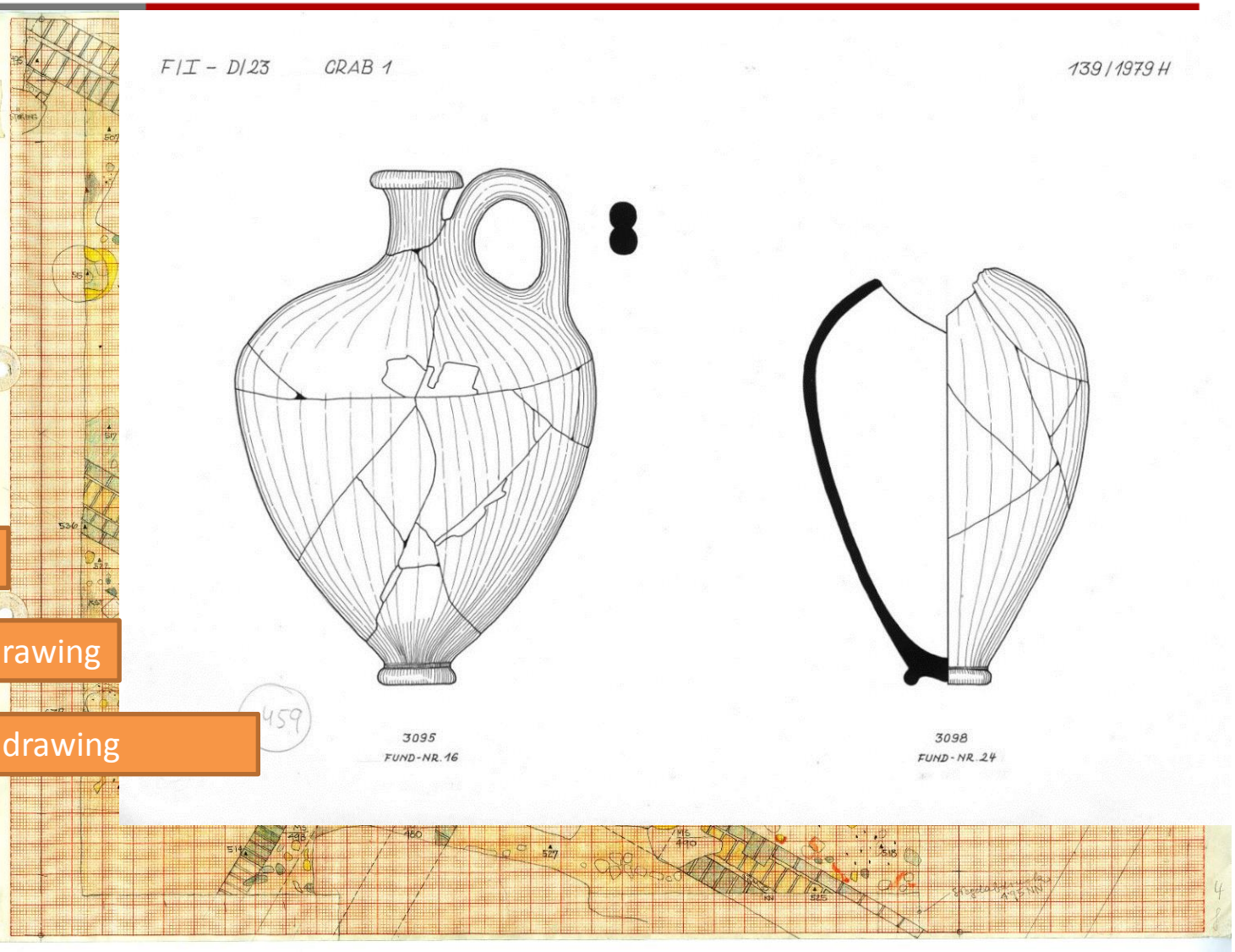
Written documentation

- 5 folders of excavation protocols - 300 pages each
- Lists, find cards, etc.

ANALOGUE resources



Profile drawing



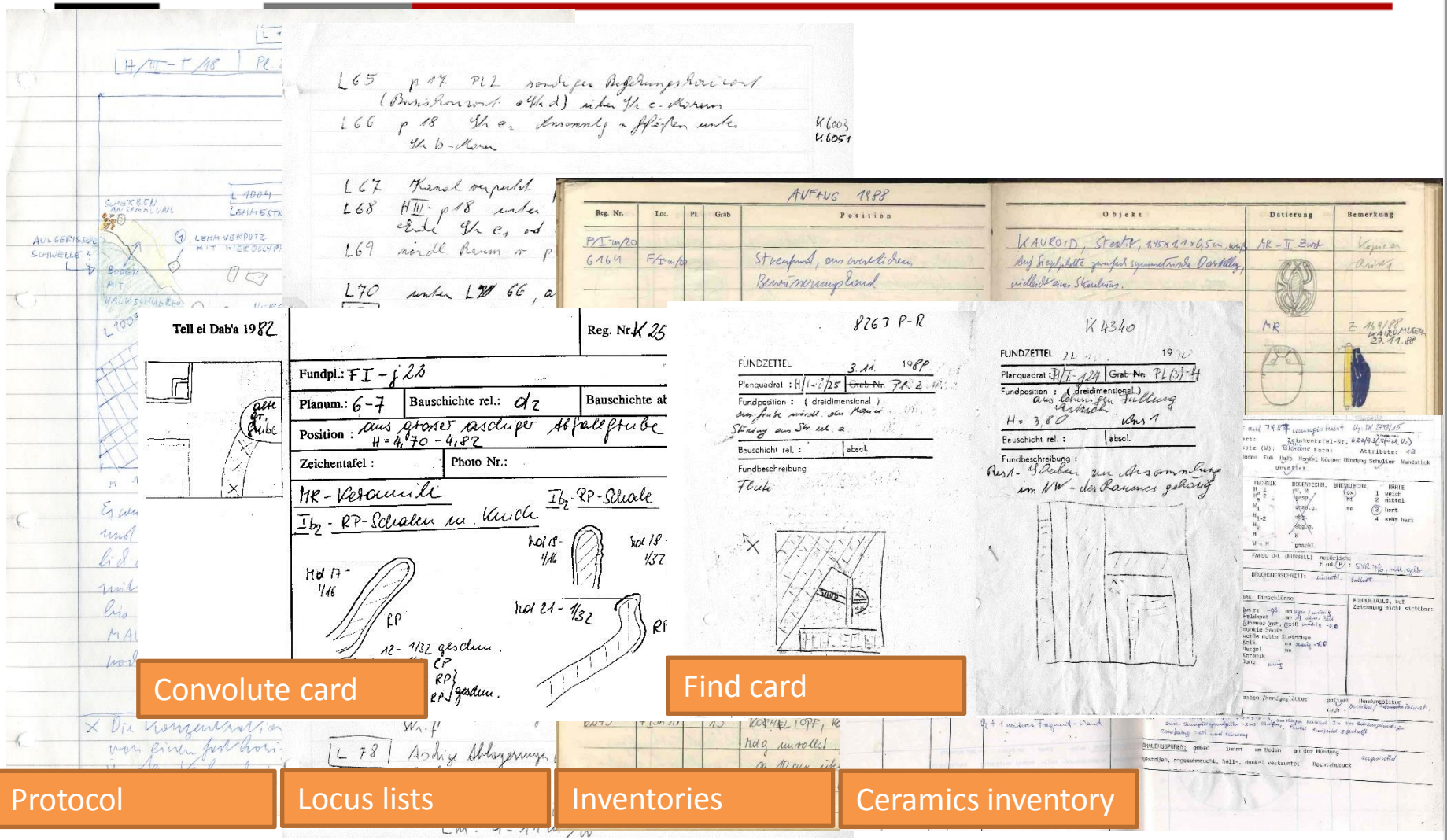
Ground plan drawing

Find drawing

ÖAW AUSTRIAN ACADEMY OF SCIENCES

OREA Institute for Oriental and European Archaeology

ANALOGUE resources



Convolute card

Find card

Protocol

Locus lists

Inventories

Ceramics inventory

DIGITAL resources

Photos

- Photos: field- and finds-photos, since 2007

Drawings

- AutoCAD Plans: fieldplans of some areas digitized
- Scans of finds drawings, since 2011 complete, before only occasionally

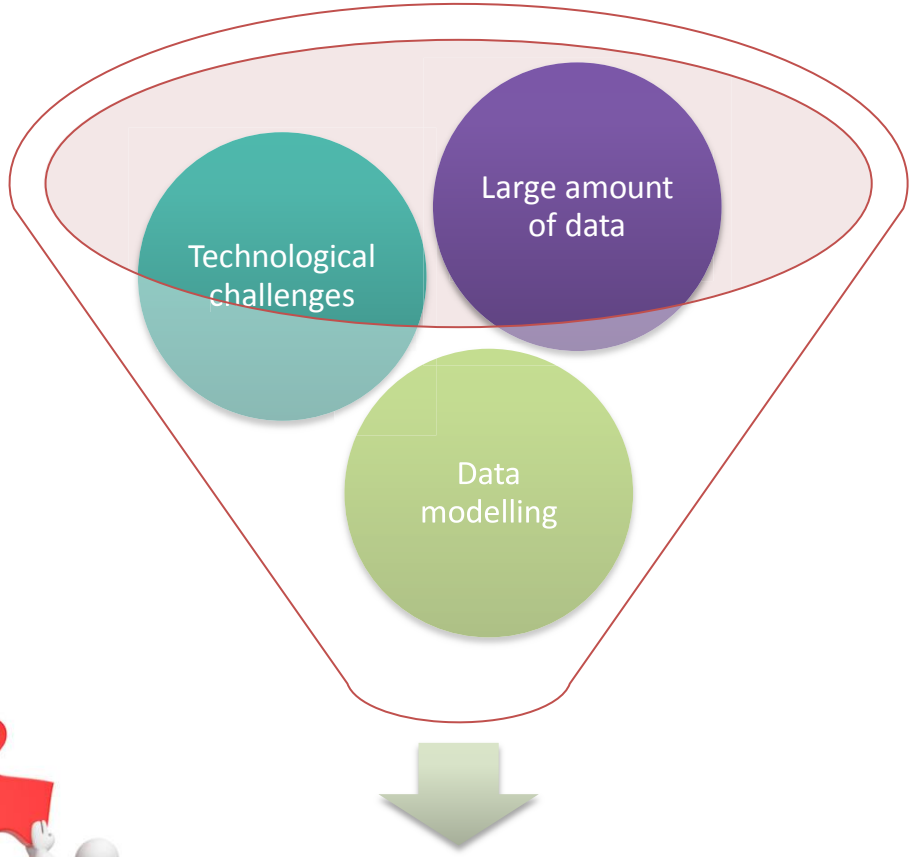
Written documentation

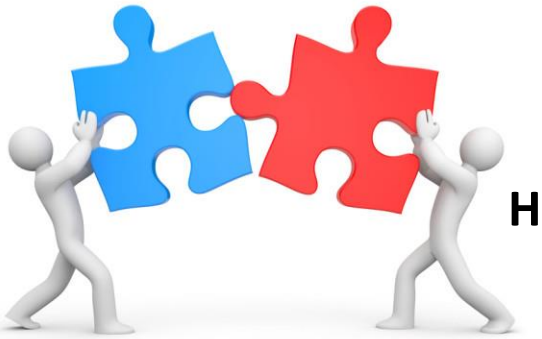
- TED Documentation access database, since 2007 (protocol-, locus- &wall lists)
- Scans of inventories of Pottery and small finds (complete)

Other

- Databases: wall painting fragments, stone tools, human remains, animal bones, botanic remains, seals
- Spreadsheets: C14 measurements
- Geophysical surveys (geo-magnetic and geo-physics)
- GPS-plans
- Various maps
- Illustrator files: reconstruction drawings

Challenges

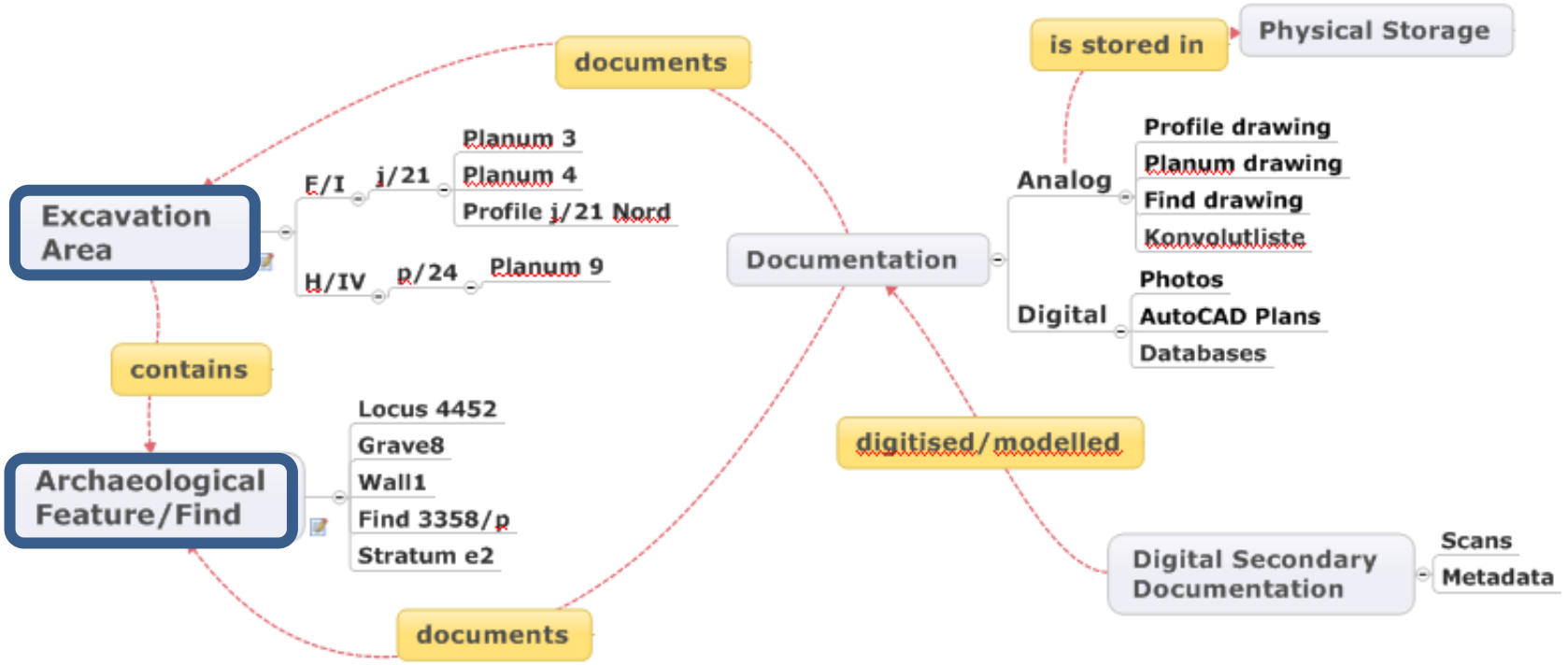




Homogeneous documentation

Data model: CIDOC CRM

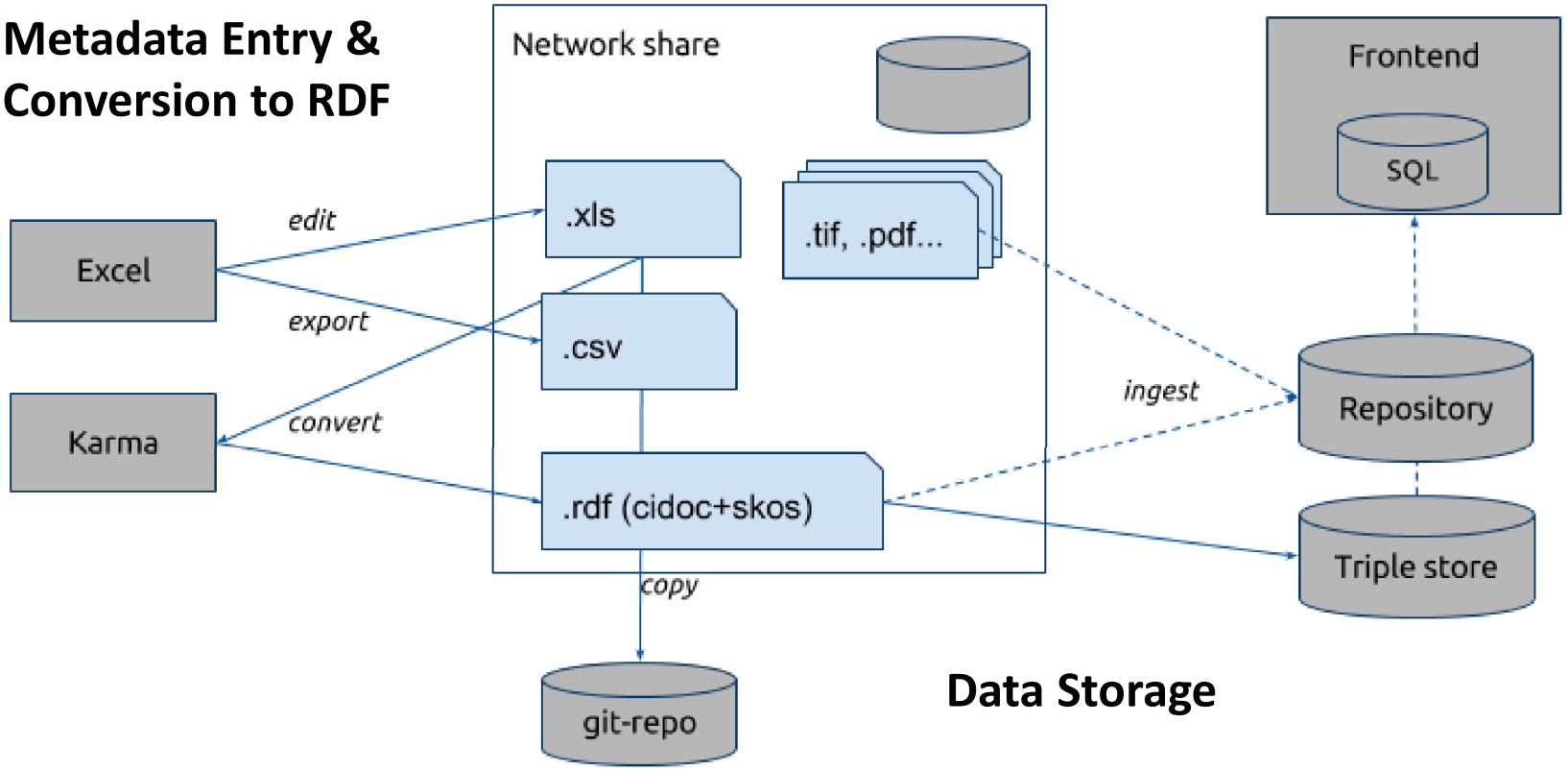
- **What questions do we want to answer with our Metadata?**
  - All documents of a specific **excavation area –** or **archaeological feature/find types** (grave, wall , vase, ….) – or specific **archaeological features/finds** (e.g. grave 5 in area Area F/1)
  - All **archaeological features/finds** of a specific **type** in an **excavation area** (all graves in area F/1)



Architecture

Metadata & Document Retrieval

Metadata Entry & Conversion to RDF

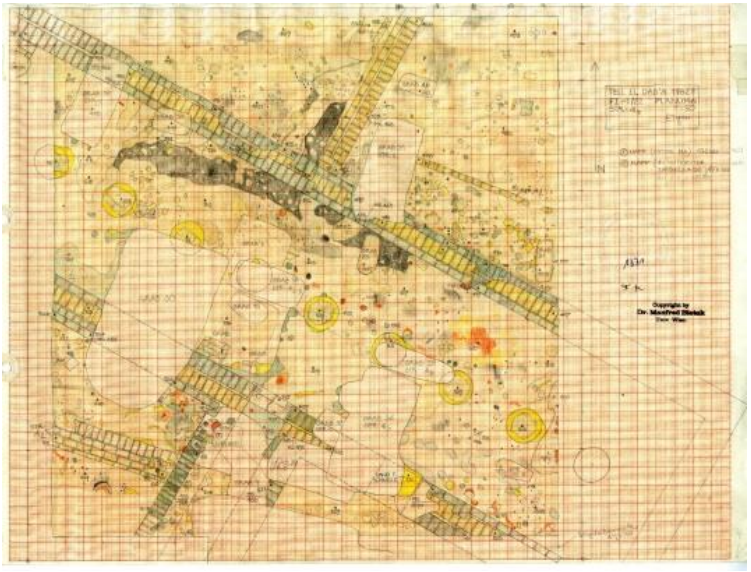


Data Storage

Metadata entry

Excel Sheets

- Excel with macros to allow 1:n relations
- Controlled vocabularies (Identifiers & Terms)
- Field drawings, photos
- Identifiers, hierarchies, terms for Excavation Areas
- Identifiers & terms Archaeological Features/Finds

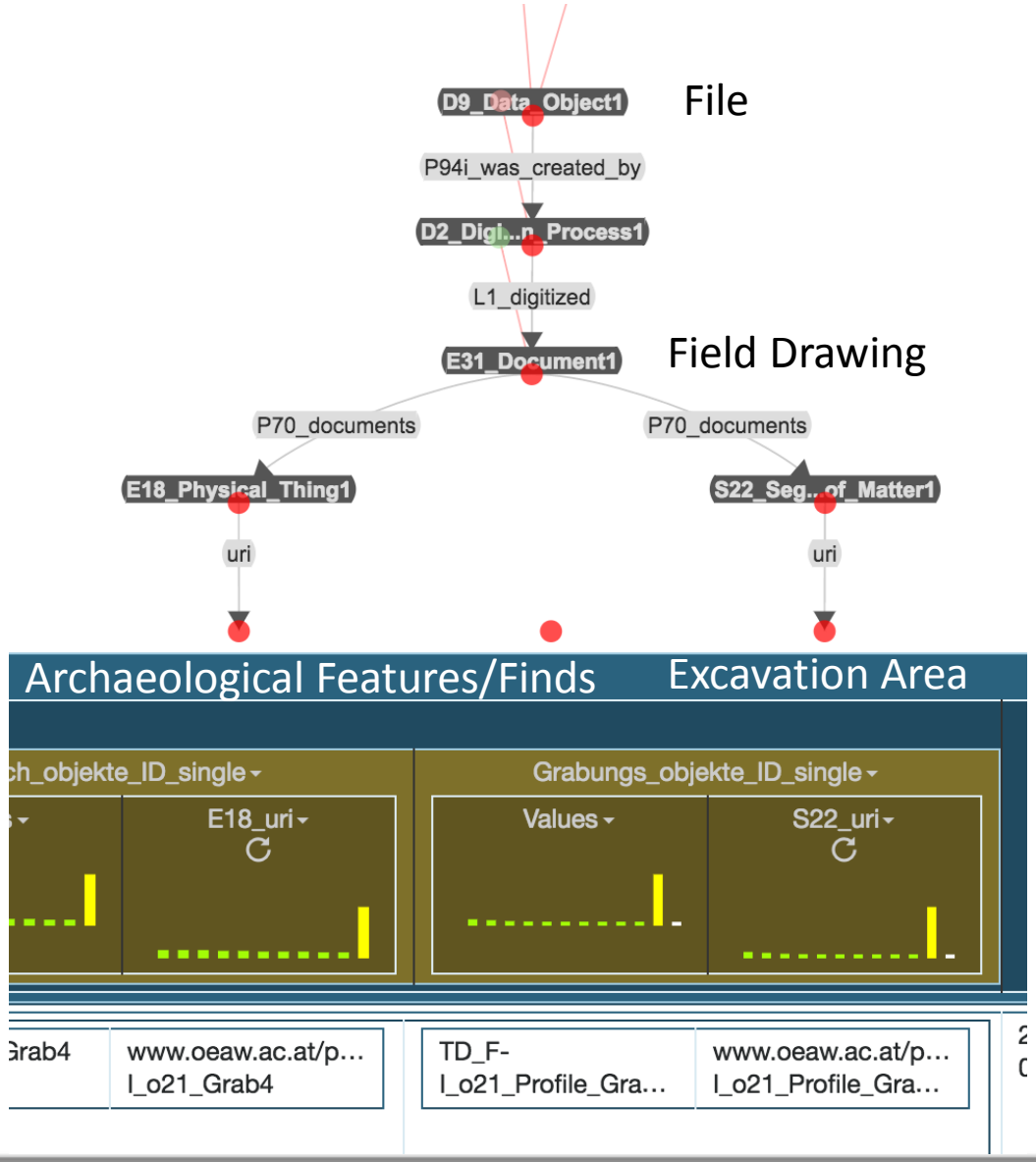


Filename	Document_ID	Excavation_area_ID	Arch_object_ ID
TD_FZ_1030__TD_F-I_j	TD_FZ_1030		TD_F-I_j21_Grab4
TD_FZ_1029__TD_F-I_j	TD_FZ_1029	TD_F-I_j21_Planum2_1979|TD_F-I	TD_F-I_j21_Grab8
TD_FZ_1070__TD_F-I_j	TD_FZ_1070	TD_F-I_j21_Planum2_1979|TD_F-I	TD_F-I_j21_Grab8
TD_FZ_1083__TD_F-I_j	TD_FZ_1083	TD_F-I_j21_Planum2_1979|TD_F-I	TD_F-I_j21_Grab8
TD_FZ_1071__TD_F-I_j	TD_FZ_1071	TD_F-I_j21_Planum3_1980	TD_F-I_j21_Grab9|TD_F-

ÖAW AUSTRIAN ACADEMY OF SCIENCES | OREA Institute for Oriental and European Archaeology

Metadata conversion/storage

- Transform Excel to RDF (Karma tool)
- Integrate data of different sources (Field Drawings, Fotos, Controlled Vocabularies, Archiving System,…)
- Ingest into **triple store** and/or to the **repository**



Metadata querying

Simple querying to

- test data model
- test triple store implementation
- make quality control

Queries like:

- All documents for an **excavation areas** (e.g. Site TD, Area F/1, SQUARE j/21)
- All documents for an **archaeological feature/find type** (e.g. grave, wall, vase,...)
- All documents for an **archaeological feature/find** (e.g. grave 5 and walls in Site TD - Area F/1 - SQUARE j/21 - Planum 3)

Possible workflows

a) Denormalize data from Triple Store through SPARQL Query -> import to Excel

-> Use Excel filter functions for the queries

b) Query directly in Triple Store via SPARQL (with predefined queries)

c) Simple web application allowing browsing and search
working on a snapshot of the data from triple store

Repository - Fedora

Data model of Fedora

- Major change in data model between Fedora 3 and 4
- Implements LDP (Linked Data Platform - W3C recommendation)
- Everything is a Resource either a Container or Binary (with payload)
- All properties are modelled as RDF triples (stored in underlying triple store)
- Only triples for fedora-resources are allowed
  (i.e. subject of a triple has to be a fedora:Resource)

Functionality (See also Features list,especially External Content)

- Restful API on Resource URIs (Paths)
- (Create/Read/Update/Delete) = LDP
- Tombstones (Deleted resources keep their PATHS)
- Versioning (/fcr:versions) and Memento to come
- Authorization - WebACL
- Atomic Batch Operations = TX (start/do stuff --> commit/rollback)
- No native user interface (Islandora port is being worked on)

Frontend?

- **Arches**
  - 3.0 major problems getting it running
  - 4.0 promised early 2017

- **DEFC** – python/django-based application for collecting data on Sites and Finds

- **Thin client on top of**
  a) triple store's SPARQL-endpoint
  b) Fedora REST-API

- **Thin client with own persistence layer**
  - with snapshot of the metadata from triple store
  - fetching content for viewing from the repository on the fly
  - optimized for browsing and searching

ÖAW AUSTRIAN ACADEMY OF SCIENCES

OREA Institute for Oriental and European Archaeology

UI prototype (django-based)

Document id

Filter

Document filename

Filter

Document name

Filter

Doucment type

Filter

Areal

Filter

Planquadrat

i20

Filter

Planum

Filter

Archobject

F-I_i20_Grab6 (Grab (ted:grab))
F-I_i20_Grab7 (Grab (ted:grab))
F-I_i20_Grab9 (Grab (ted:grab))
F-I_Grab_AO4DPuzzle13 (Grab (ted:grab))

Filter

Digobject

Planum1_1979H (Planum (ted:planum))
Planum1+Grab11_1979H (Planum (ted:planu
Planum7-8_1979 (Planum (ted:planum))
Planum7_1979 (Planum (ted:planum))

Filter

Filter

URI	Document Type
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1353_26A	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1353_27A	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1353_28A	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1353_29A	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1353_30A	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1353_31A	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1354_17	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1354_22	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1354_23	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1353_10A	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1354_12	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1354_13	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1354_14	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1354_15	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_SWdig_1354_16	Detailfoto (ted:detailfoto)
http://www.oeaw.ac.at/puzzle4d/E31/TD_FZ_963	Feldzeichnung (ted:feldzeichnung)
http://www.oeaw.ac.at/puzzle4d/E31/TD_FZ_974	Feldzeichnung (ted:feldzeichnung)
http://www.oeaw.ac.at/puzzle4d/E31/TD_FZ_1014	Feldzeichnung (ted:feldzeichnung)
http://www.oeaw.ac.at/puzzle4d/E31/TD_FZ_961	Feldzeichnung (ted:feldzeichnung)
http://www.oeaw.ac.at/puzzle4d/E31/TD_FZ_965	Feldzeichnung (ted:feldzeichnung)
http://www.oeaw.ac.at/puzzle4d/E31/TD_FZ_966	Feldzeichnung (ted:feldzeichnung)
http://www.oeaw.ac.at/puzzle4d/E31/TD_FZ_967	Feldzeichnung (ted:feldzeichnung)
http://www.oeaw.ac.at/puzzle4d/E31/TD_FZ_970	Feldzeichnung (ted:feldzeichnung)
http://www.oeaw.ac.at/puzzle4d/E31/TD_FZ_972	Feldzeichnung (ted:feldzeichnung)
http://www.oeaw.ac.at/puzzle4d/E31/TD_FZ_973	Feldzeichnung (ted:feldzeichnung)

Next Page 1 of 2 25 of 30 documents

Next Steps

- Quality control
- Evaluate data entry methodology (Excel files; test other tools)
- Analysis and modelling of remaining resources
- Monitoring of digitisation workflow for selection/prioritisation of resources to digitise
- Test archiving and metadata storage interface
- Develop front end user interface (open access, web interface)

Thank you for your attention!