A Tajik Extension of the Multilingual Information Extraction System ZENON

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Outline

1. Introduction
2. The Multilingual ZENON System
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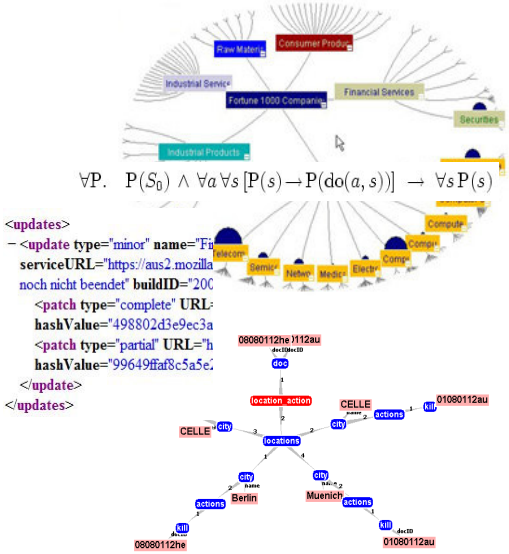
4. Conclusion, References

1. Introduction

?

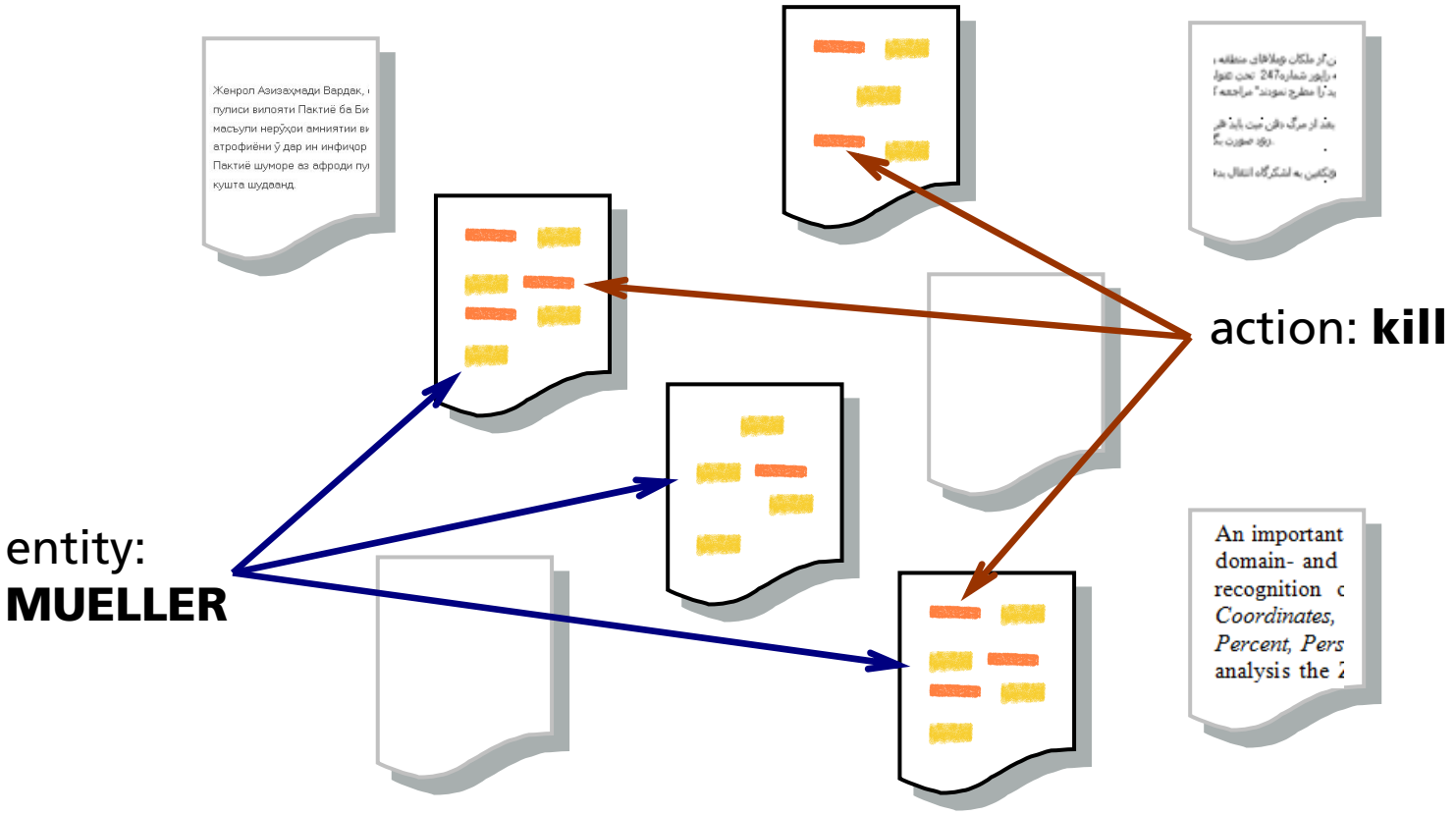
Extract knowledge



- Military relevant knowledge is available in different languages, formats and media.
- How to get the knowledge out of documents or audio files coded in different languages? How can we increase productivity of the intelligence analyst

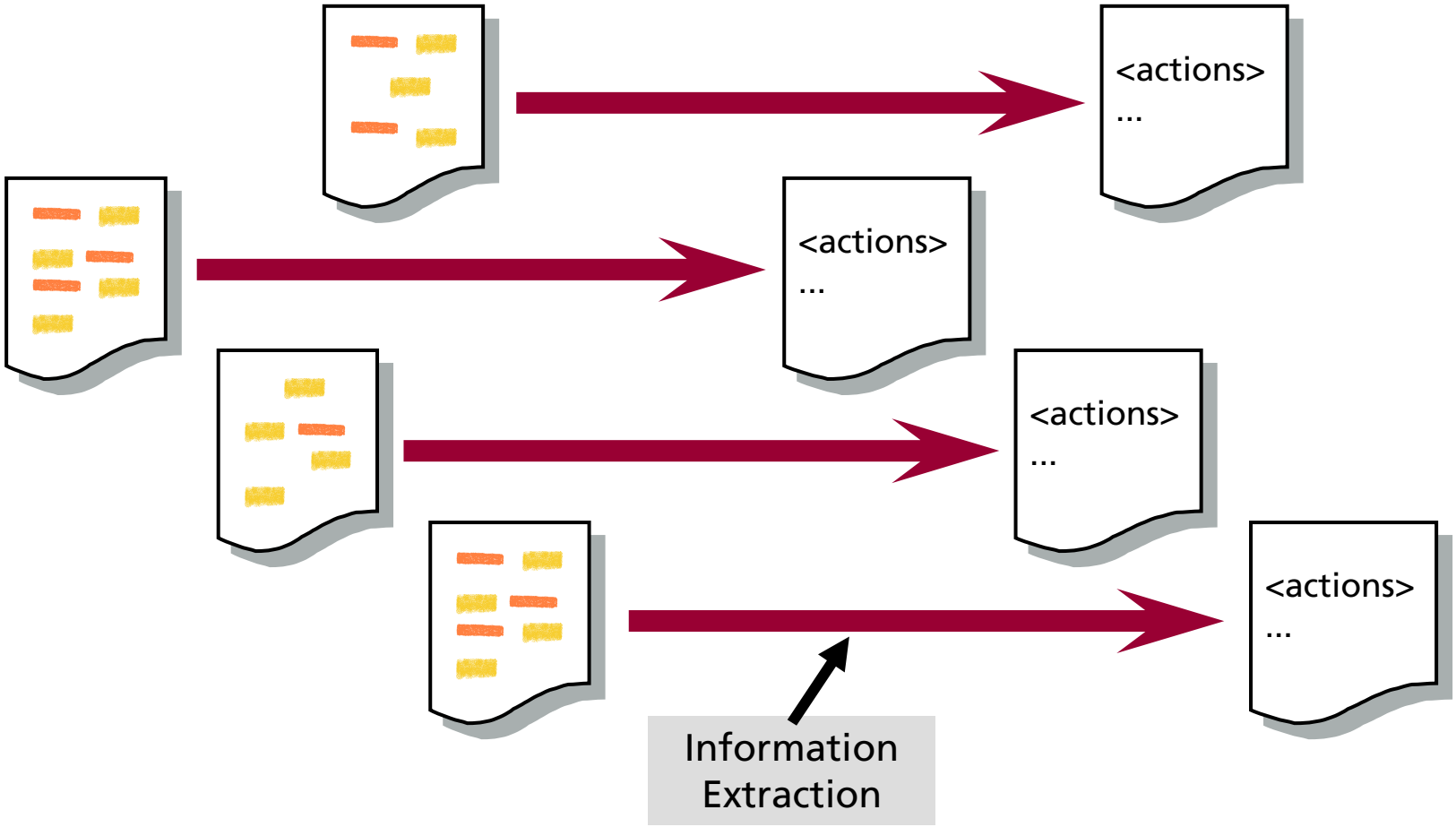
2. The Multilingual ZENON System - I

The knowledge about actions and entities is distributed over many reports.



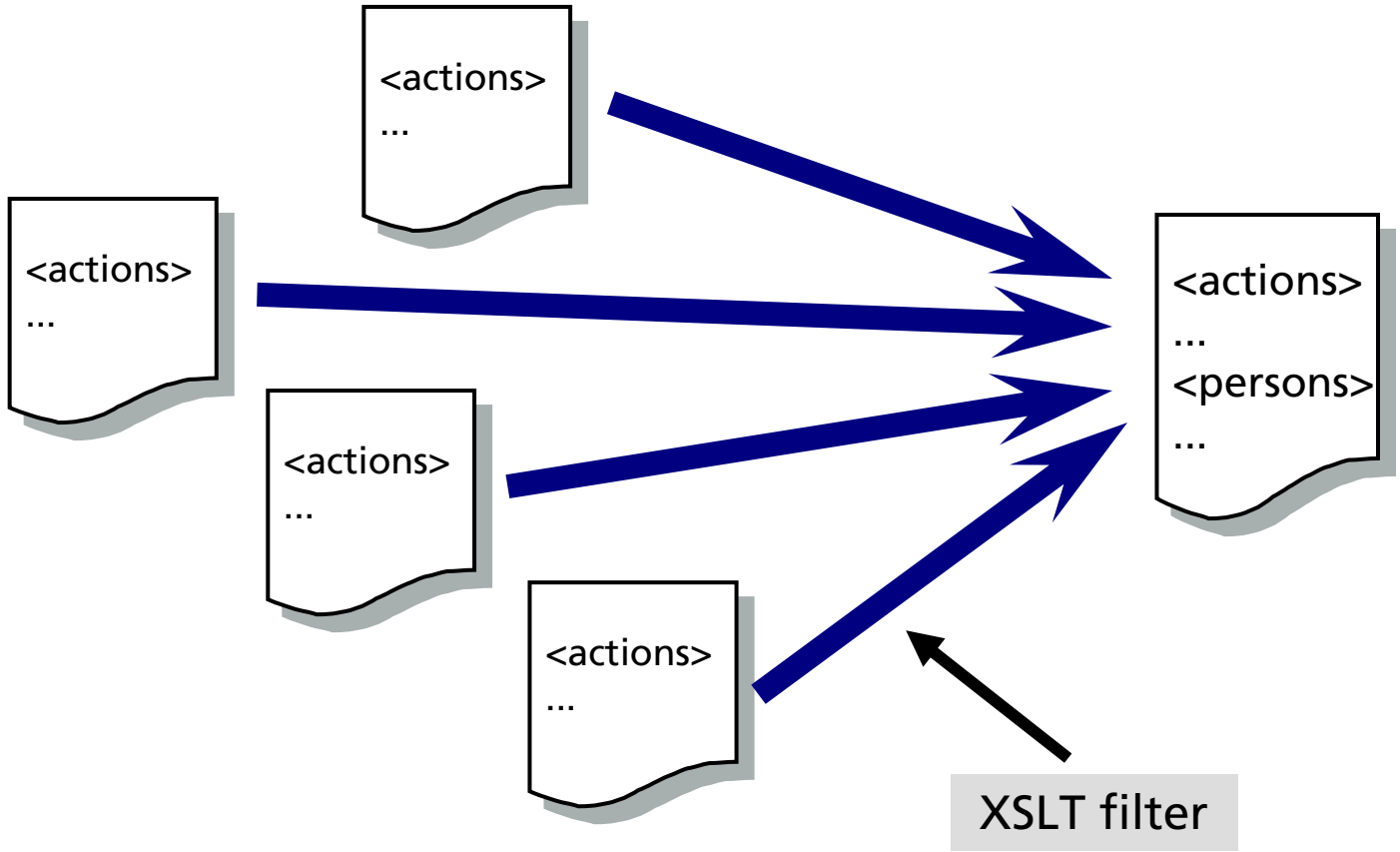
2. The Multilingual ZENON System - II

1.) The knowledge is automatically extracted and formally represented, ...

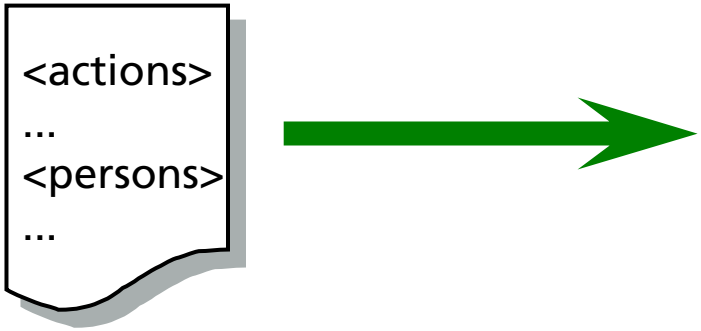


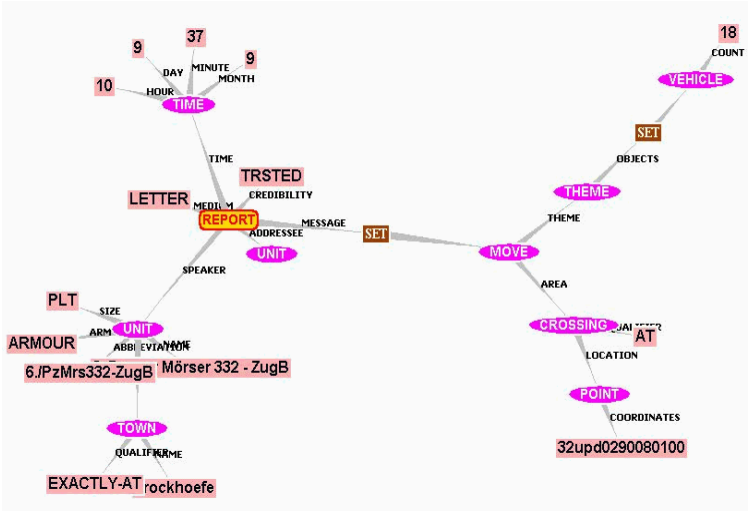
2. The Multilingual ZENON System - III

2.) ... then analysis-specifically combined, and...



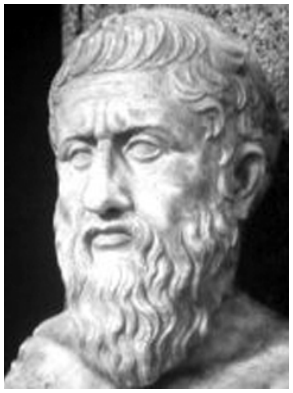
3.) ... and graphically presented.





2. The Multilingual ZENON System - V

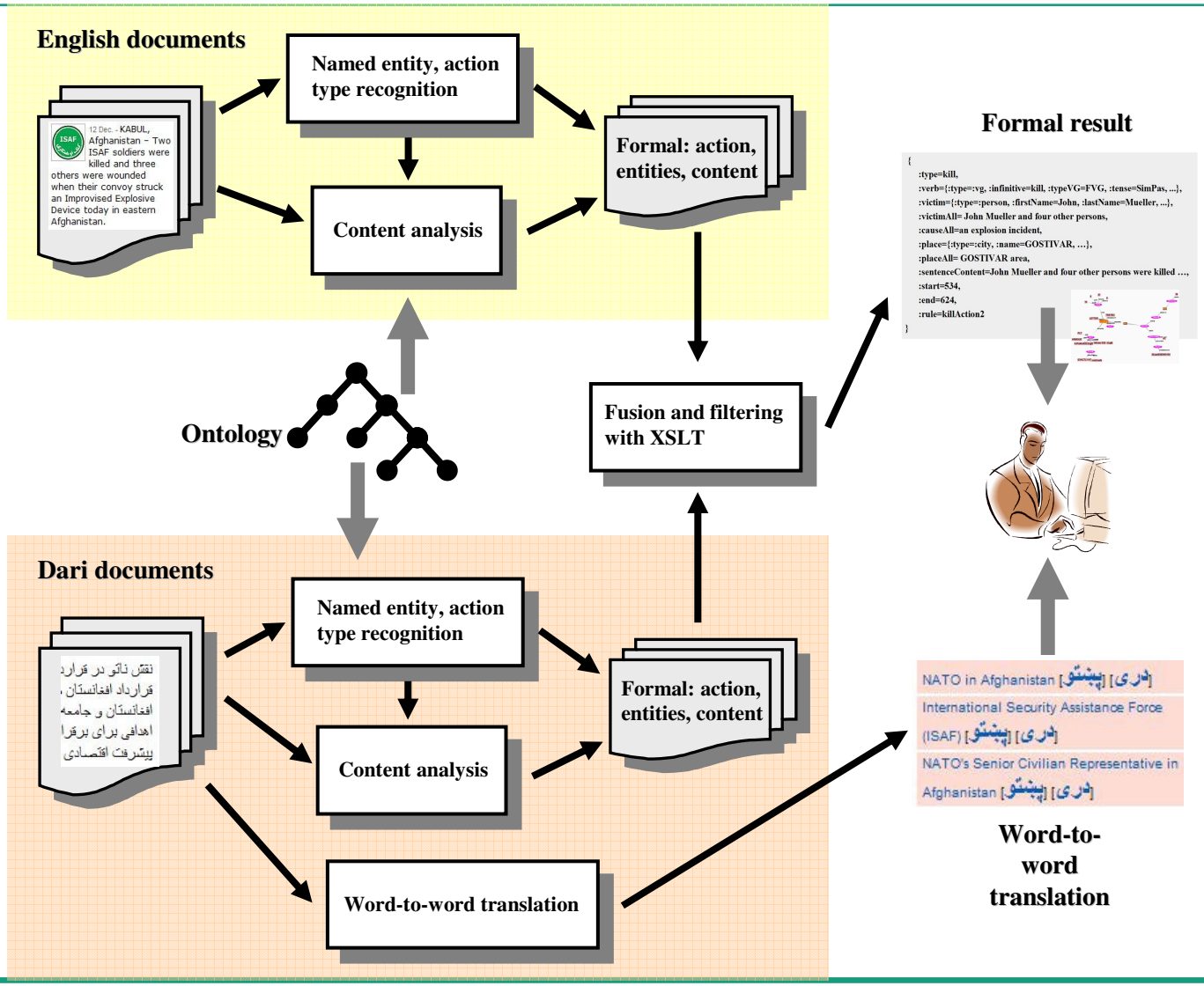
- Multilingual information extraction with the ZENON system, research prototype – not an operational system
- The information about the actions and named entities are identified from each sentence and the content of the sentences are formally represented in typed feature structures.



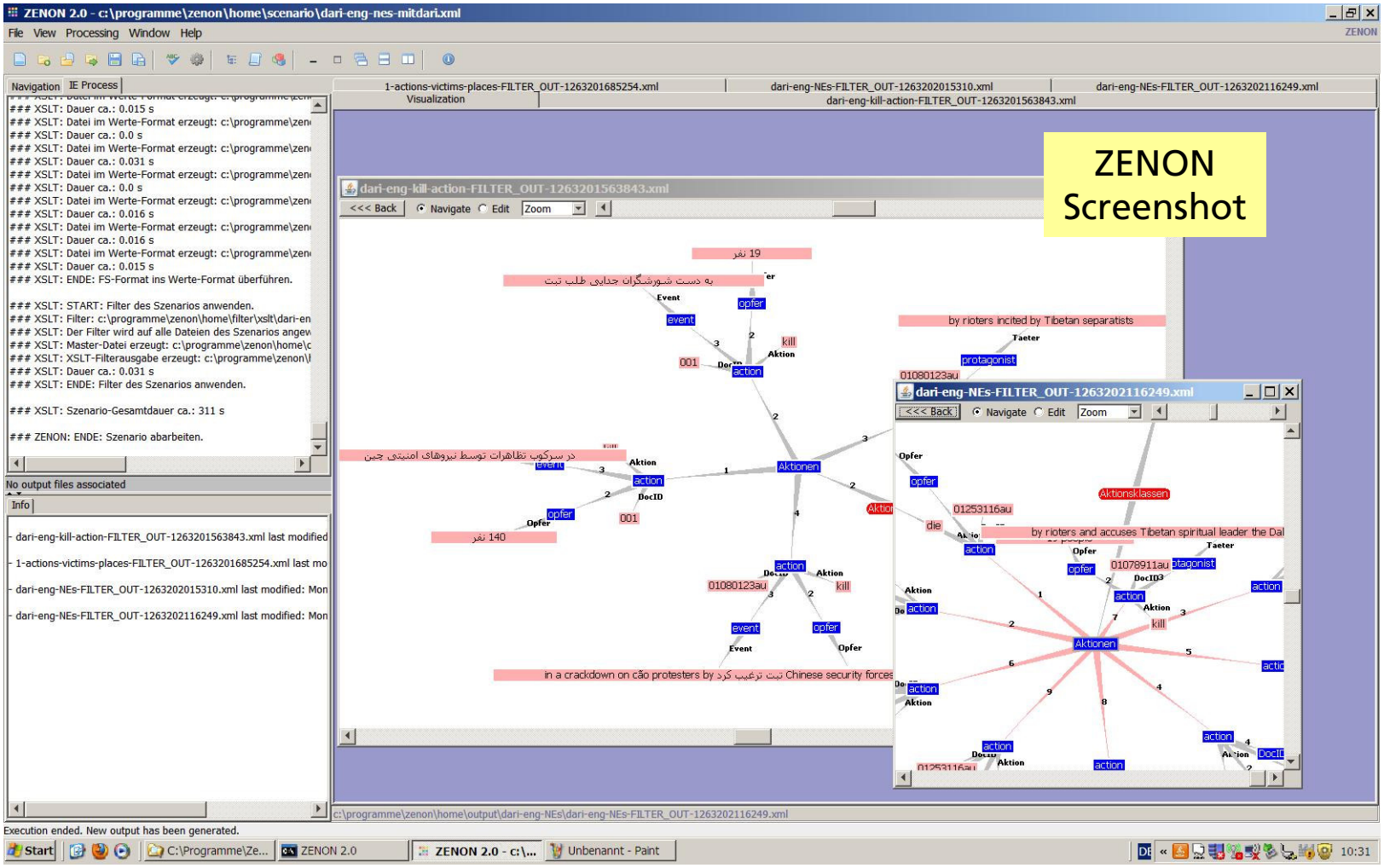
Zenon of Citium
336 BC - 264 BC

- These structures can be combined and presented in a graphically navigatable *Entity-Action-Network*.
- (Partial) information extraction from English HUMINT reports from the KFOR deployment, Dari texts, and Tajik texts.
- Also: a word-to-word-translation to further support the analyst.
- GATE: "is one of the most widely used human language processing systems in the world.", "comprises an architecture, framework (or SDK) and graphical development environment ...", University of Sheffield since 1995

2. The Multilingual ZENON System - VI



2. The Multilingual ZENON System - VII



3. The Multilingual Tajik Extension - I

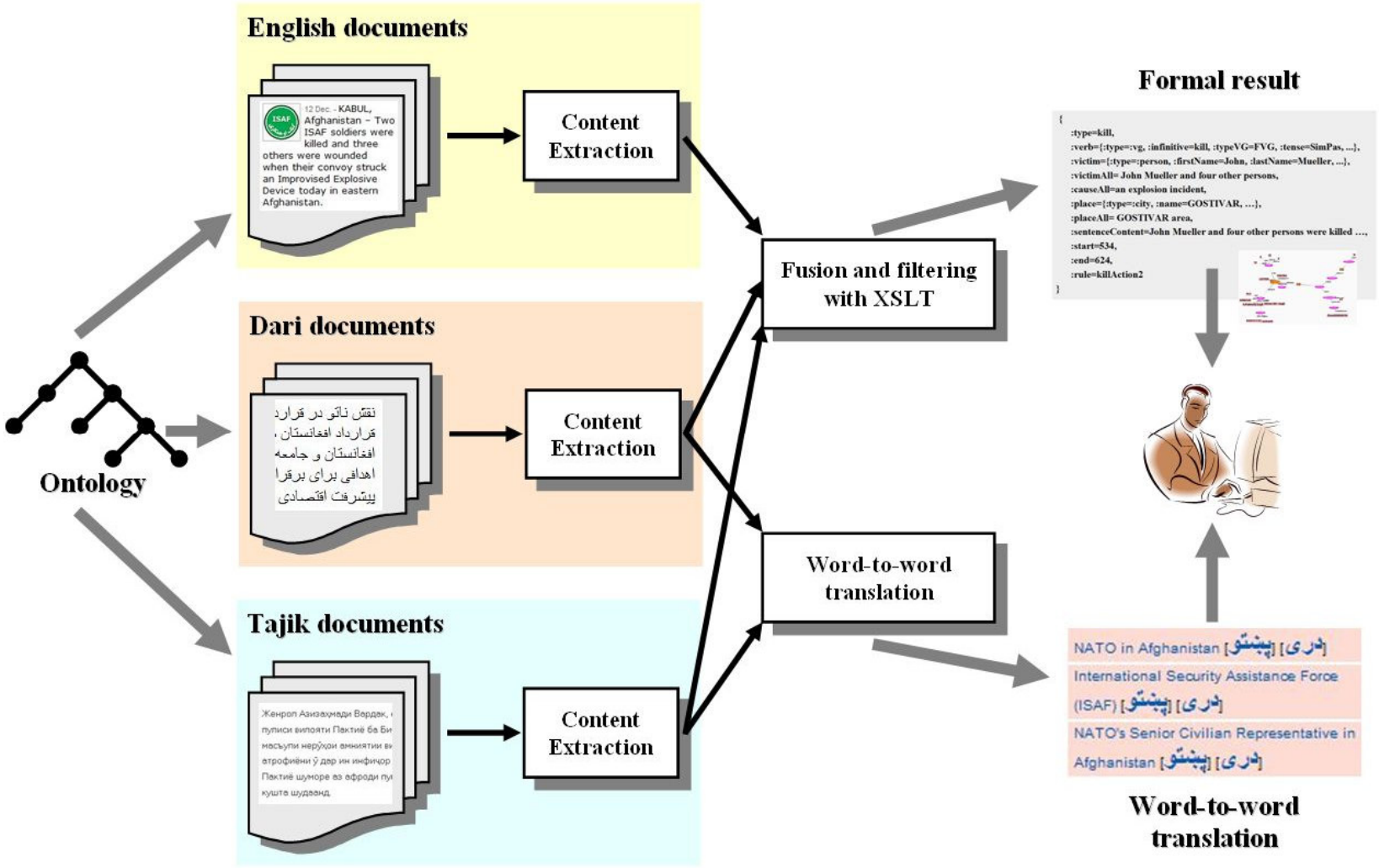
- The Tajik language (Tajik Persian,тоҷикӣ) is a modern version of Persian spoken in Central Asia.
- Most speakers: in Tajikistan, Uzbekistan
- Tajik is the official language of Tajikistan
- A member of the Indo-European language family.
- The word order of Tajik is Subject-Object-Verb.
- The Tajik Persian grammar is almost identical to the classical Persian grammar (and the grammar of modern varieties such as Iranian Persian).
- Tajik is written in the Cyrillic alphabet.

Женрол Азизаҳмади Вардак, і
пулиси вилояти Пактиё ба Би
масъули неруҳои амниятии ви
атрофиёни ӯ дар ин инфиҷор
Пактиё шуморе аз афроди пу
кушта шудаанд.

3. The Multilingual Tajik Extension - II

- The ZENON research system will be extended by natural language processing functionality for *Tajik* texts.
- With the Tajik extension of the ZENON system it is possible to fuse information from sources written in the three different languages.
- The GATE module was already implemented, but it is not yet integrated into the overall system.
- Functionalities:
  - formal descriptions of named entities
  - formal descriptions of verbs
  - a word-to-word translation for the analyst (like the Dari module).
- Note: no combination of NEs and verbs at the moment (no assignment of semantic roles)

3. The Multilingual Tajik Extension - III



3. The Multilingual Tajik Extension - IV

- How the Tajik module was developed:
  - Documents were available in Tajik with their English and Russian translations
  - A broad collection of linguistically annotated Tajik texts (corpora) is not currently available.
  - Statistically-based machine learning methods are therefore not usable
  - The classical rule-based approach is used.
- Components of the Tajik module:
  - Tajik Tokenizer, Tajik Sentence Splitter, Gazetteer lists
  - Tajik NE Transducers
  - Tajik VP-Chunker
  - word-to-word translation into German

3. The Multilingual Tajik Extension - V

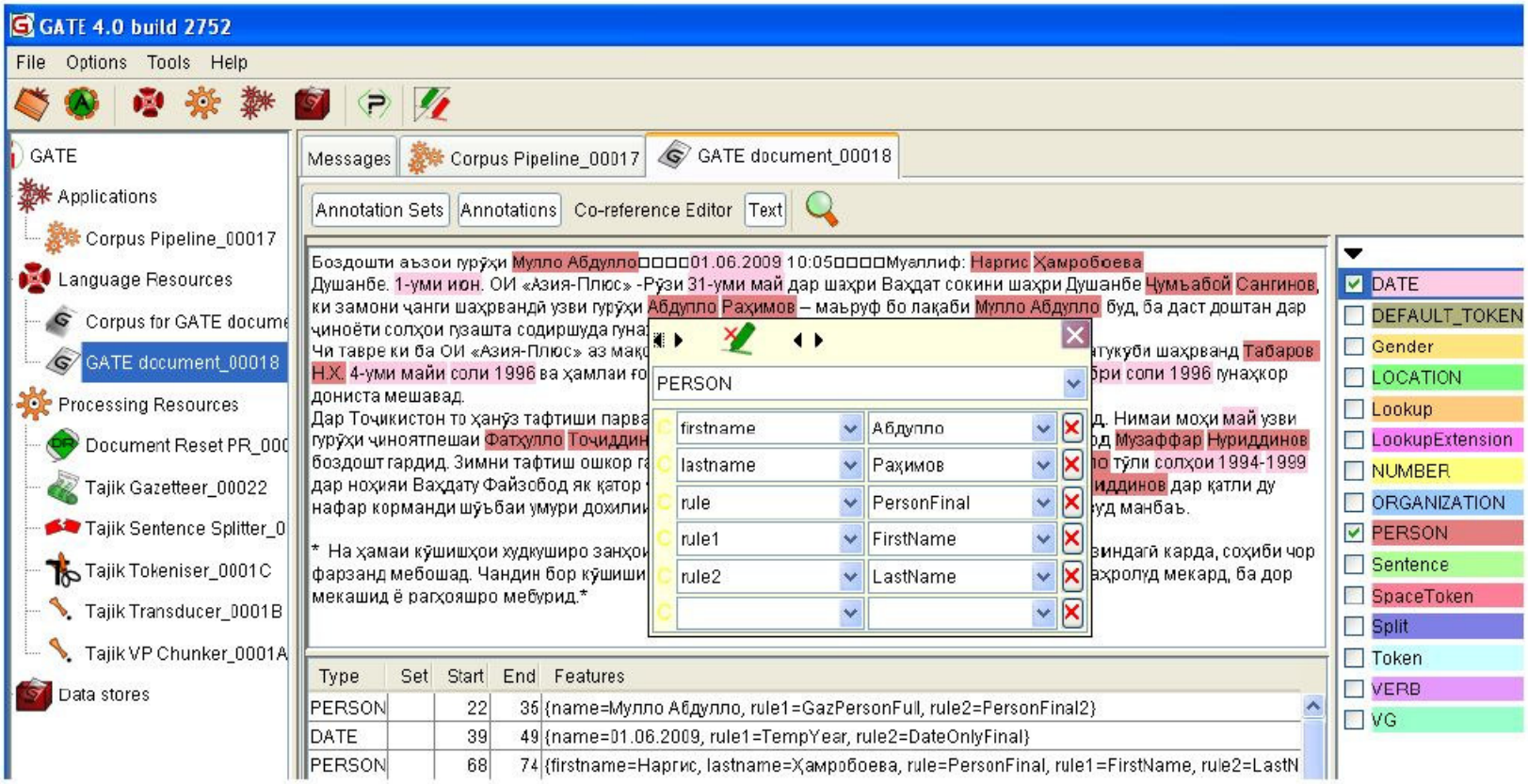
- The *Tajik Tokenizer* and the *Tajik Sentence Splitter* are nearly identical to similar GATE components for the English language.
- The *Tajik Gazetteer* is used to identify names, as the basis for named entity recognition.
- All Gazetteer lists together contain about 2,100 entries (also some Gazetteer lists with English names)
- Gazetteer types with the number of entries:

city_tg.lst (41)	mountain.lst (19)	person_full.lst (38)
city_world.lst (60)	name_all_male.lst (98)	pers_pron.lst (14)
country.lst (197)	name_all_female.lst (92)	person_relig.lst (11)
country_adj.lst (4)	name_tg_male.lst (526)	provinz.lst (21)
date_key.lst (12)	name_tg_female.lst (318)	region.lst (16)
day.lst (16)	number_letters.lst (156)	river.lst (40)
determiner.lst (8)	ordinal.lst (58)	sea.lst (17)
jobtitle.lst (98)	organization.lst (34)	time_unit.lst (5)
ministry.lst (15)	org_base.lst (96)	title.lst (20)
money.lst (9)	org_mil.lst (10)	title_female.lst (2)
month.lst (24)	org_terr.lst (53)	

3. The Multilingual Tajik Extension - VI

- Based on the recognition of the Gazetteer list entries the named entities (NE) are identified with the help of the *Tajik NE Transducers*.
- These JAPE grammars generate new annotations that are used in subsequent processing steps, e.g. PERSON{firstname=Hamrokhon}
- Implemented NE types: *City, CommonOrg, Country, Date, GovernmentOrg, MilitaryOrg, Money, Person, Number, Gender, Jobtitle, Province, Region, TerroristOrg*.
- All types have various features which are also determined during the recognition process (e.g., *firstname*, *lastname*, *rule*).

3. The Multilingual Tajik Extension - VII



- Named entity recognition of type Person and Date

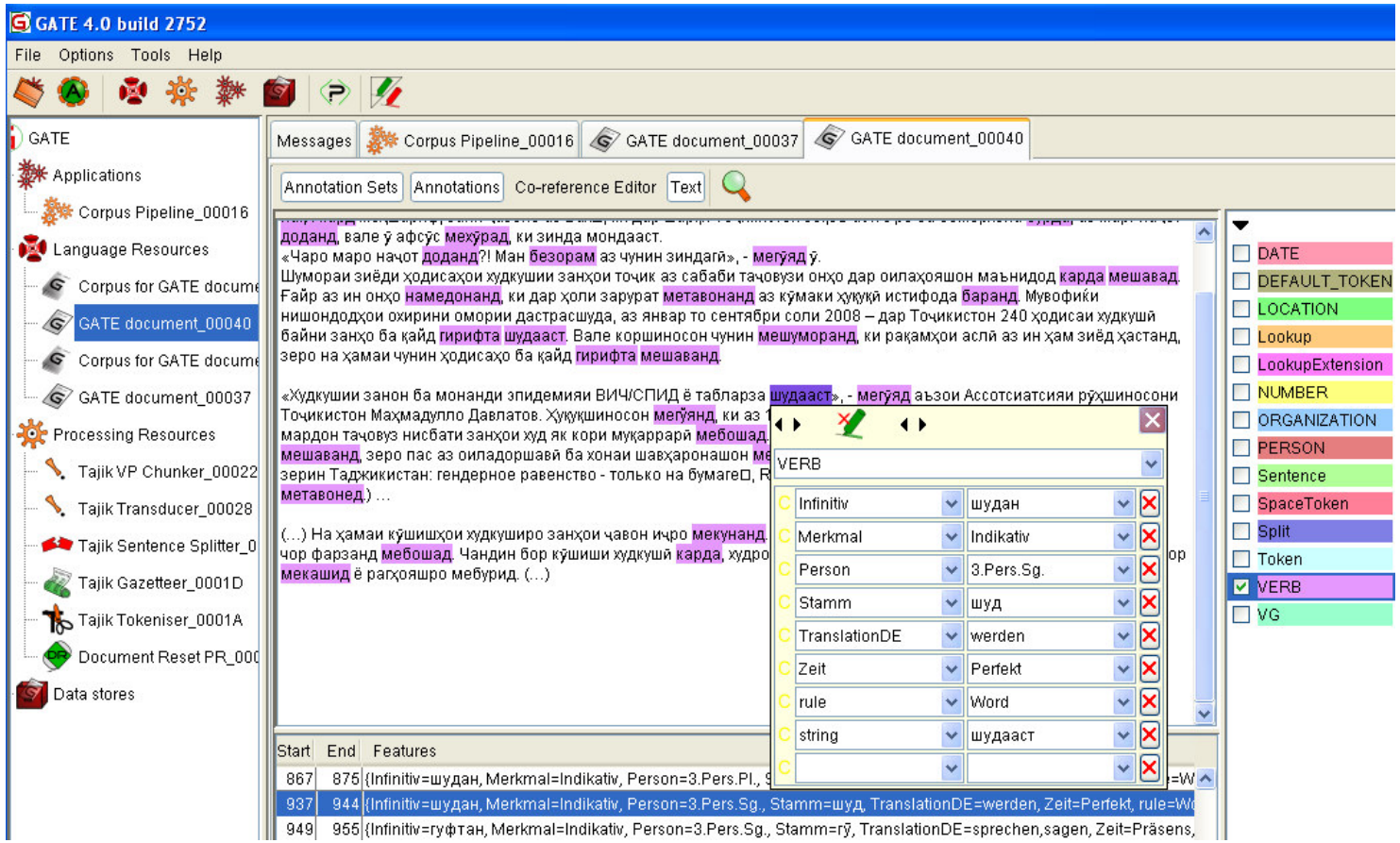
3. The Multilingual Tajik Extension - VIII

- The verbal phrases must be analyzed as a basis for the identification of the action.
- The *Tajik VP-Chunker* implements through JAPE rules the analysis of finite (present, past tense, perfect, past perfect) and non-finite verb phrases, participles, adverbs and negations (partial morphological analysis).
- Four full-form lexica for Tajik verbs
  - present-participle forms
  - past-participle forms
  - past-participle forms for compound verb phrases
  - compound verb phrases forms in past tense

3. The Multilingual Tajik Extension - IX

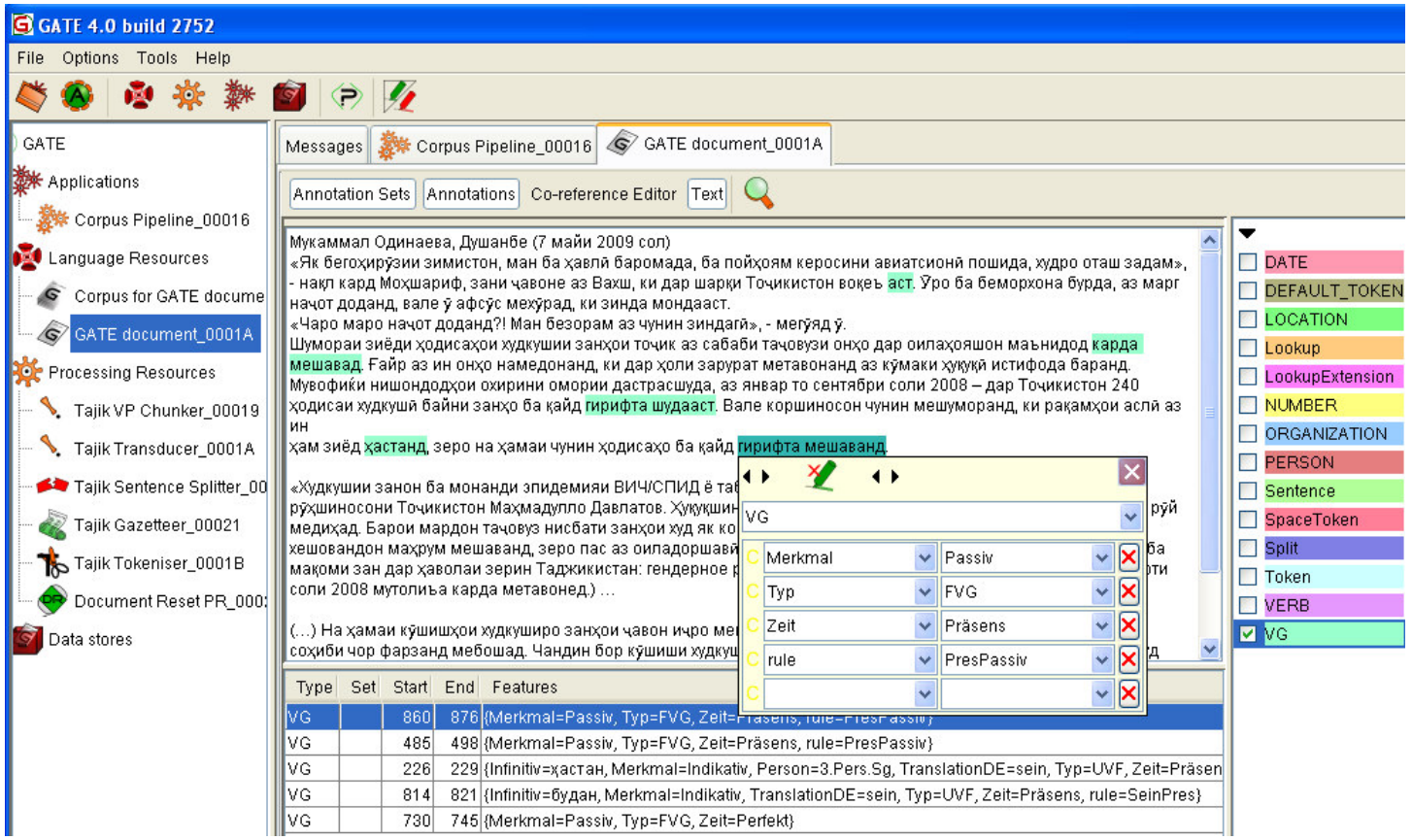
- To identify the number, infinitive and the verb stem the approach of word stemming was used.
- The result of the analysis of simple verbs is stored in the annotation type *Verb*. Different features contain the recognized information:
  - infinitive (“Infinitiv”),
  - mood (“Merkmal”)
  - person (“Person”),
  - stem (“Stamm”),
  - translation of the infinitive (“TranslationDE”),
  - tense (“Zeit”),
  - rule,
  - string.

3. The Multilingual Tajik Extension - X



- Verb annotations

3. The Multilingual Tajik Extension - XI



- Annotations of compound verb phrases (annotation type *VG*).

3. The Multilingual Tajik Extension - XII

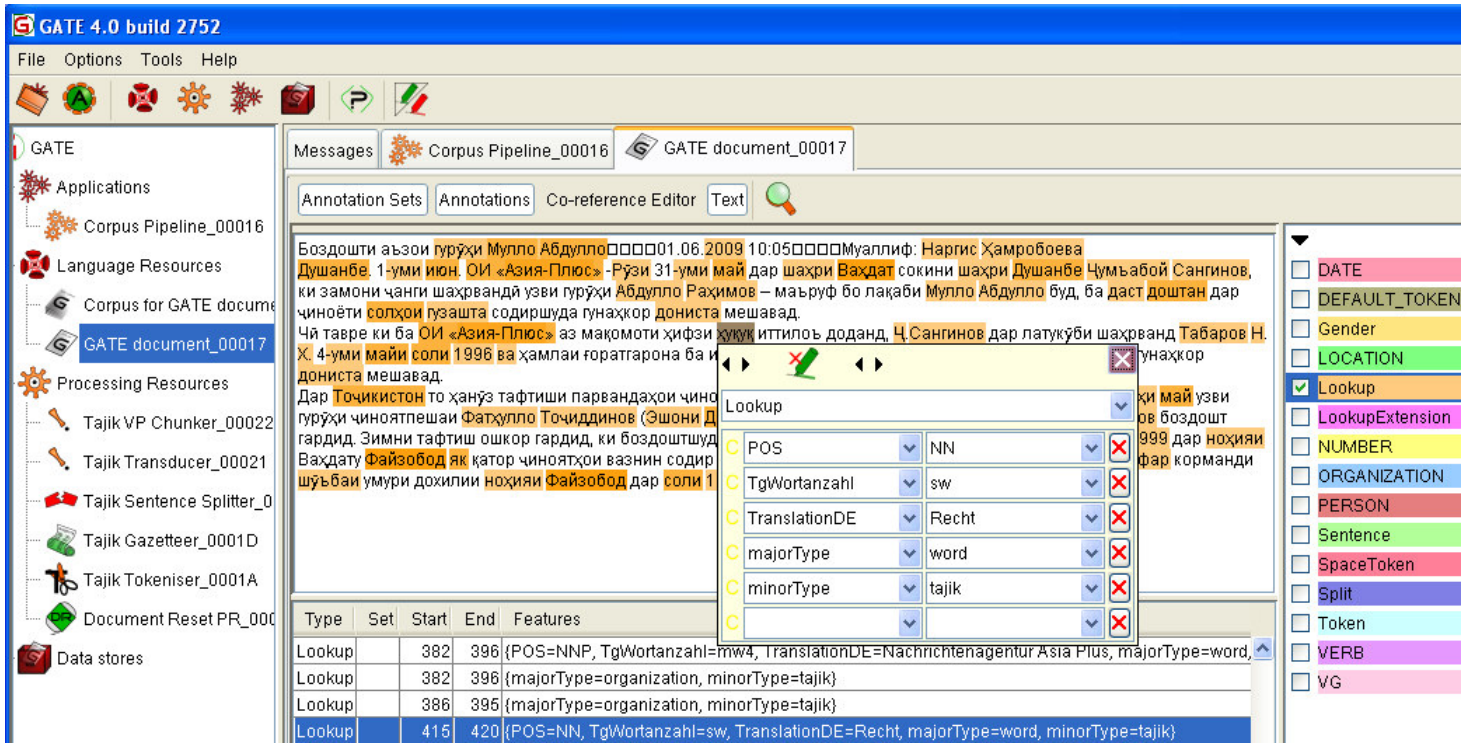
- Also a translation submodule to give a rough word-to-word translation into German.
- This is an additional support for the analyst to decide whether a high-quality translation from a human translator should be created.
- No online Tajik-German dictionary was freely available. Therefore a simple dictionary with 1,300 entries was created manually.
- For each entry this is available:
  - Tajik lemma,
  - Tajik part-of-speech (POS),
  - Number of words in Tajik ("TgWortanzahl") with values "sw" (single word) or "mwX" (multiple words with X words),
  - German translation ("TranslationDE").

3. The Multilingual Tajik Extension - XIII

Арабистони Саъудӣ:POS=NNP:TgWortanzahl=mw2:TranslationDE=Saudi Arabien
Артиллерист:POS=NN:TgWortanzahl=sw:TranslationDE=Artillerist
Аскари савора:POS=NN:TgWortanzahl=mw2:TranslationDE=Kavallerist
Аскар:POS=NN:TgWortanzahl=sw:TranslationDE=Soldat
Астронавт:POS=NN:TgWortanzahl=sw:TranslationDE=Astronaut
Астроном:POS=NN:TgWortanzahl=sw:TranslationDE=Astronom
Афгонистон:POS=NNP:TgWortanzahl=sw:TranslationDE=Afganistan
Афсар:POS=NN:TgWortanzahl=sw:TranslationDE=Offizier
Афғонистон:POS=NNP:TgWortanzahl=sw:TranslationDE=Afganistan
Ашт:POS=NNP:TgWortanzahl=sw:TranslationDE=Ascht
Балҷувон:POS=NNP:TgWortanzahl=sw:TranslationDE=Baldschuvon
Баҳри:POS=NN:TgWortanzahl=sw:TranslationDE=Meer
Баҳрнавард:POS=NN:TgWortanzahl=sw:TranslationDE=Matrose

- Dictionary entries

3. The Multilingual Tajik Extension - XIV



- The dictionary is implemented as a Gazetteer list.
- Lookup annotations with word-to-word translations.

4. Conclusion

- In this presentation, we presented the functionality to perform information extraction for Tajik texts in the multilingual ZENON system.
- We expect that systems like ZENON will increase productivity of the intelligence analyst. He might analyze and combine information even from texts written in languages the analyst does not understand.
- Possible improvements
  - greater coverage of grammatical phenomena of Tajik
  - realize the recognition of action types and the combination of actions with their semantic roles
  - larger dictionary, independent translation system, deeper integration
- A more general problem is to get the same coverage of linguistic data (e.g., dictionaries, grammars) and functionality (e.g., POS tagger, morphology analyzer) for rare languages (like Dari and Tajik).

4. References

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Thank you for your attention!

Questions?