Automatic Report Processing

Dr. Ulrich Schade
FGAN-FKIE
Neuenahrer Straße 20
53343 Wachtberg-Werthhoven
GERMANY

Preliminary Remarks

With respect to forces, NCW demands

- clear and consistent understanding of command intent,
- shared situational awareness,
- competence at all levels of the force,
- trust (in subordinates, superiors, peers, information, and equipment)

cf. Alberts & Hayes (2003): *Power to the Edge*

Preliminary Remarks

The same holds for the IT-systems. NCW demands:

- **adaptability** to command intent,
- **interoperability** (to achieve shared awareness),
- **competence**,
- **reliability**.

To show:
IT-systems need **ontological** components
to answer these demands.

Structure of the Talk

- Preliminary Remarks
- SOKRATES: A Report Processing System
- Examples
- Benefits

The SOKRATES-System for Report Processing

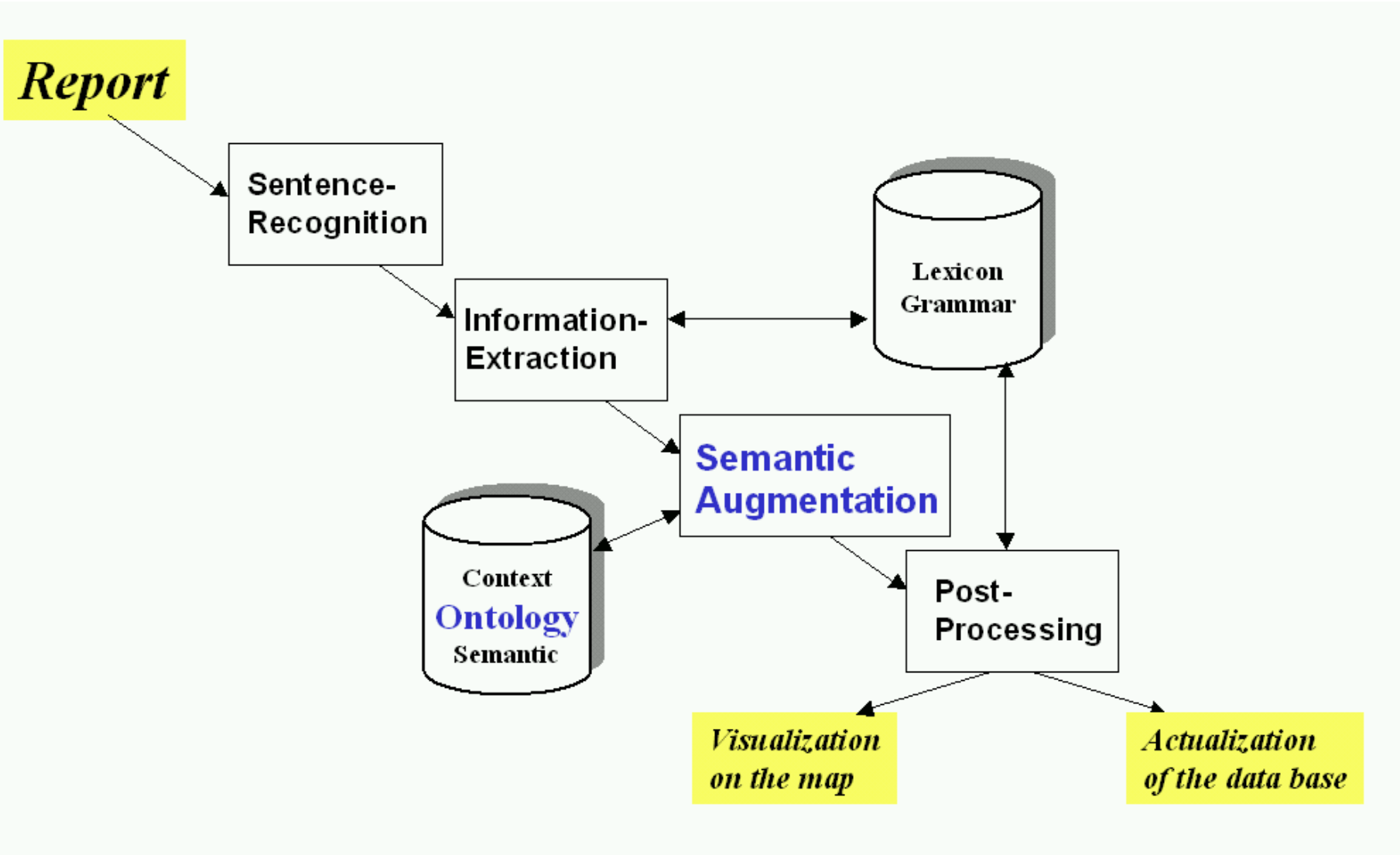
Input: reports written in natural language

- *Five hostile battle tanks approaching.*
- *Five Bradyland howitzers moving from Nederveert to Helmond via Someren.*
- *Arrived at 31UFT785235 .*

Output:

- visualization of the report's content on a map
- insertion of the content into a C2IEDM data base

The SOKRATES-System for Report Processing



The SOKRATES-System for Report Processing

Information Extraction

transforms the report into a formal representation.

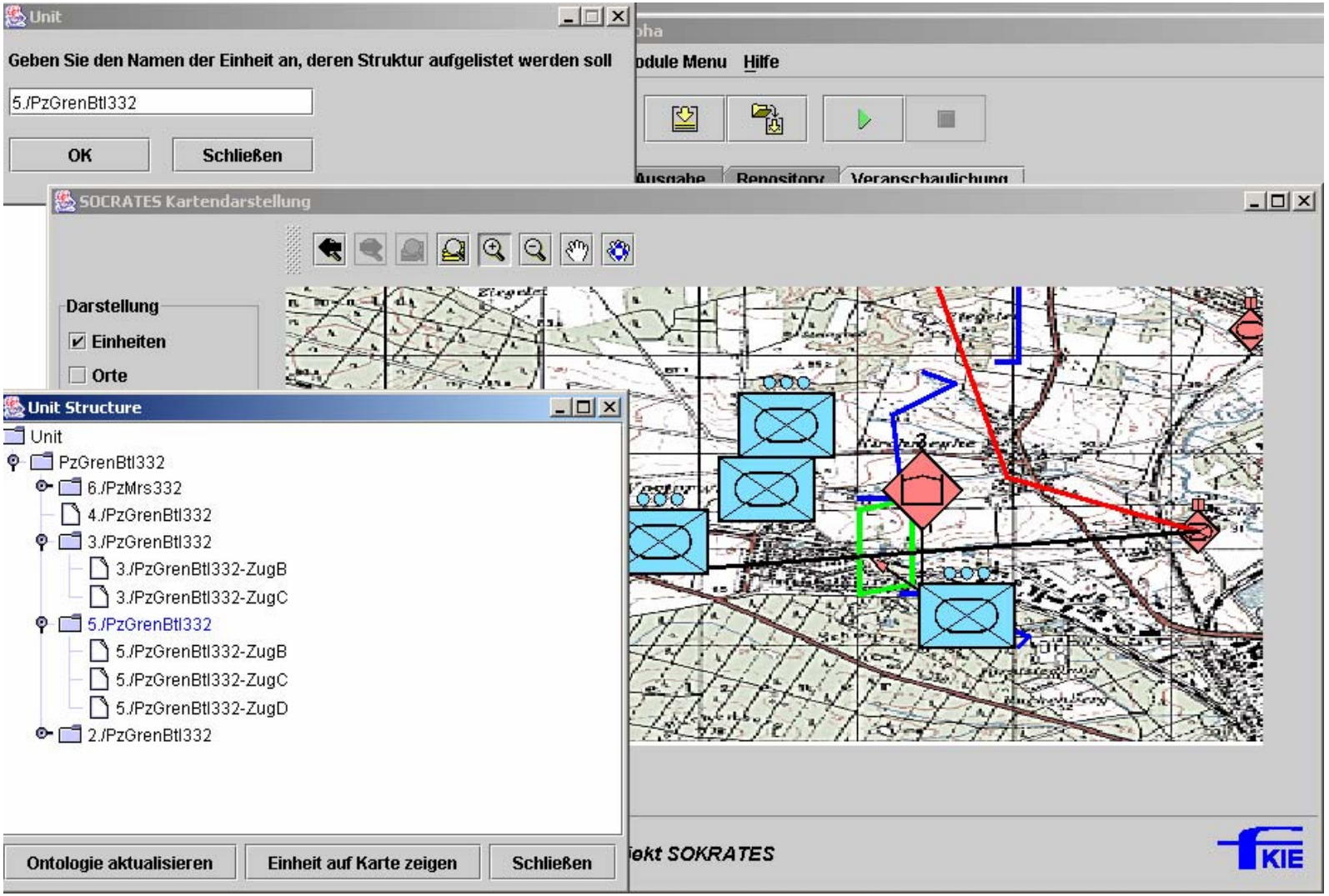
Semantic Augmentation

adds to the representation
by ontological exploitation of knowledge.

Post-Processing

visualizes the resulting content on a map and
stores the resulting content in a C2IEDM data base.

The SOKRATES-System for Report Processing

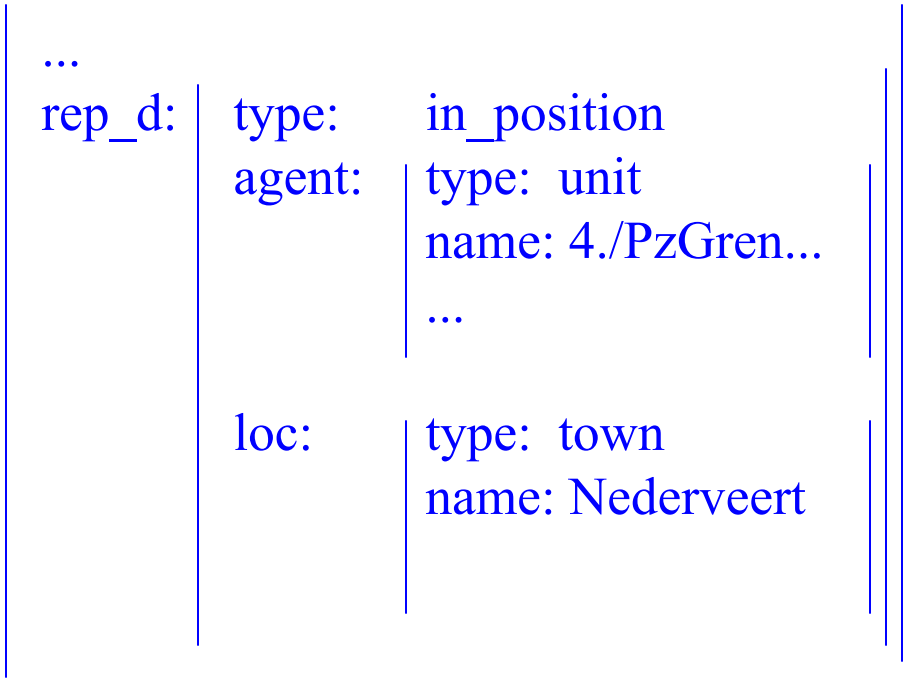


The SOKRATES-System for Report Processing

Information Extraction

transforms the **report** into a **formal representation**.

051218ZSEP04
by 4./PzGrenBtl332-Zug C:
Standing at Nederveert



The SOKRATES-System for Report Processing

type:	report		
sender:	type:	unit	
	name:	4./PzGrenBtl332-Zug C	
	size:	PLT	
reporting_datetime:	type:	datetime	
	year:	2004	
	month:	9	
	day:	5	
	hour:	12	
	minute:	18	
reporting_data:	type:	in_position	
	agent:	type:	unit
		name:	4./PzGrenBtl332-Zug C
		size:	PLT
	location:	type:	town
		name:	Nederveert
	qualifier:	exactly_at	

The SOKRATES-System for Report Processing

Semantic Augmentation

adds to the representation by ontological exploitation of knowledge to allow for post-processing.

051218ZSEP04
by 4./PzGrenBtl332-Zug C:
Standing at Nederveert

...		
rep_d:	type:	in_position
	agent:	type: unit
		name: 4./PzGren...
		...
	loc:	type: town
		name: Nederveert
		latitude: 5.753
		longitude: 51.284

Ontology

Gruber (1993): "*An ontology is an **explicit** specification of a **shared conceptualization***."

explicit:

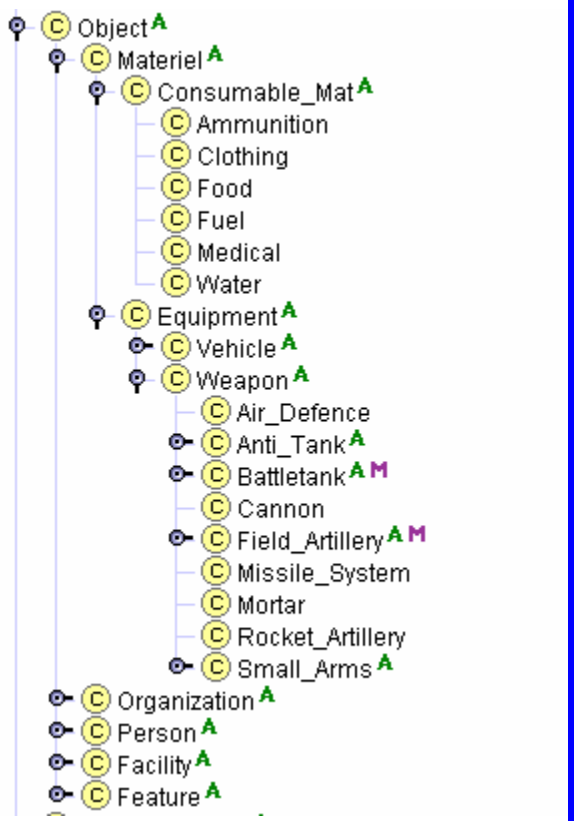
Everything the system has to know must be represented in the system.

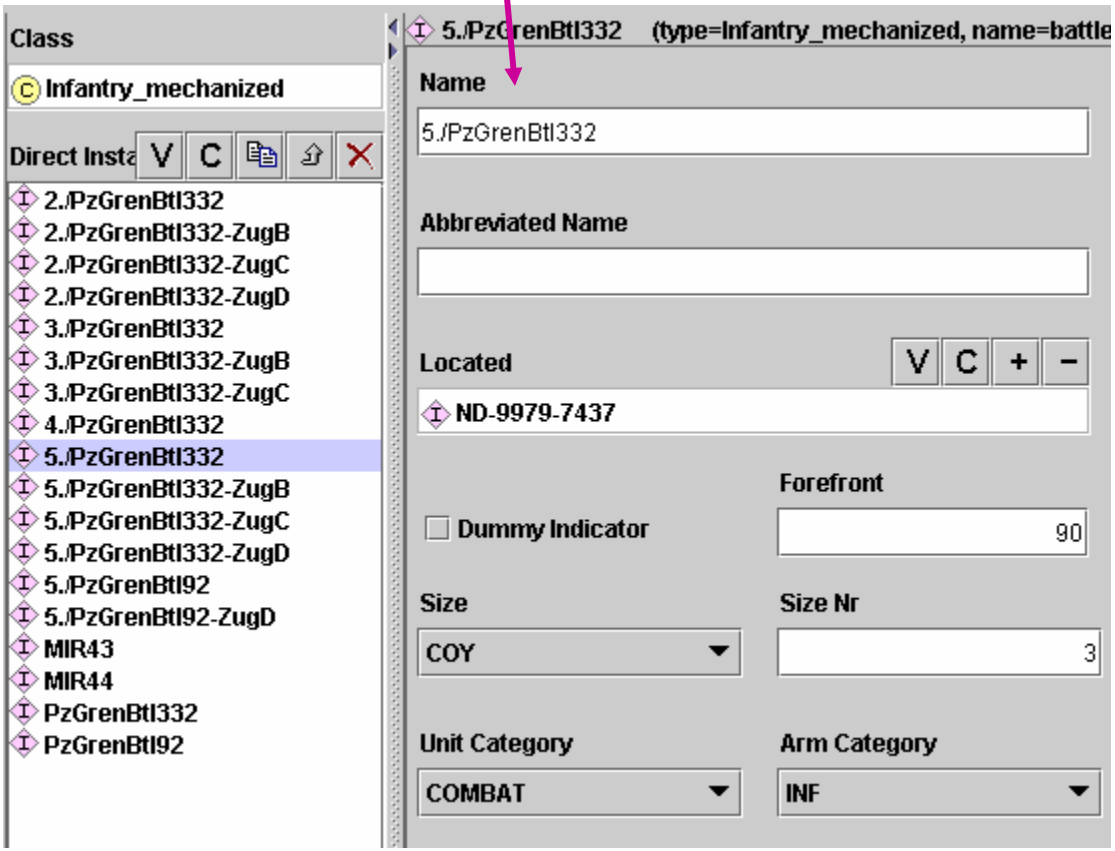
shared conceptualization:

In particular, even the information human beings do **not** communicate (since it is self-evident for us) has to be represented.

Ontology

ontology = taxonomy + associated attribute-value pairs + rules

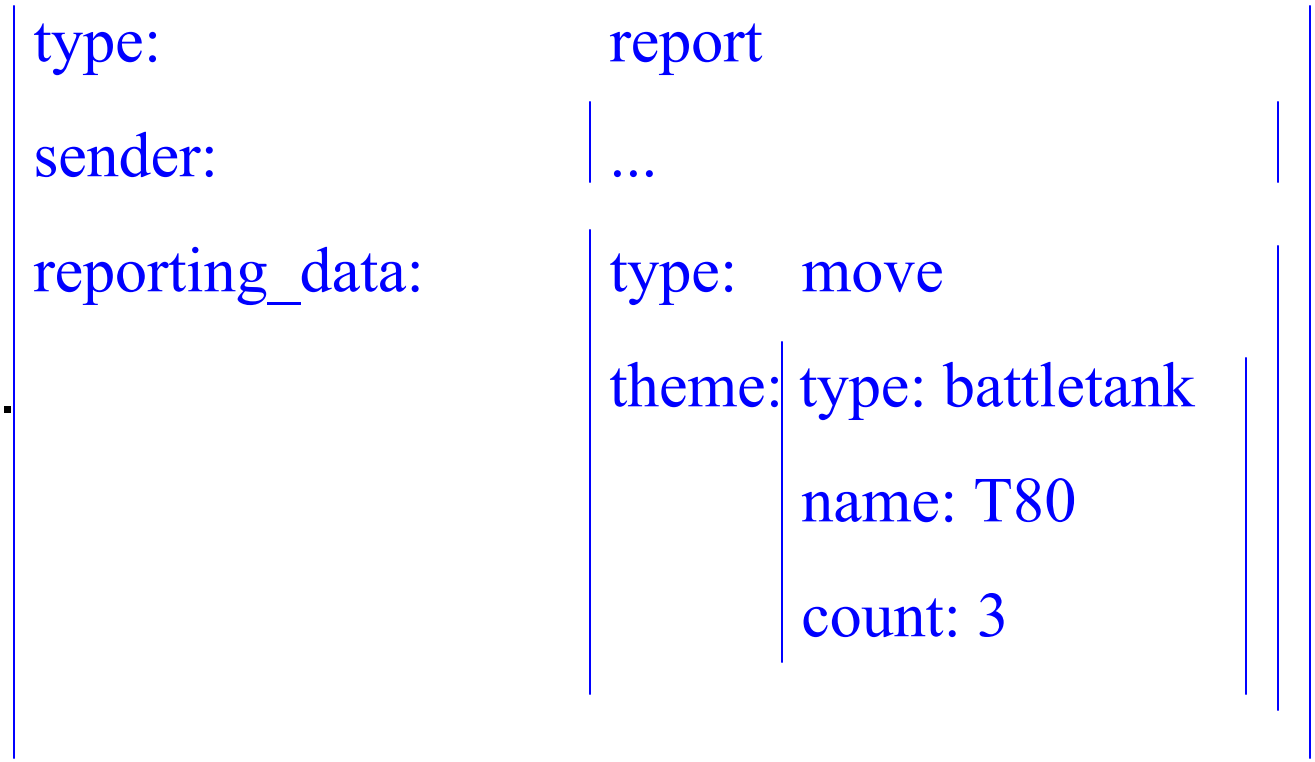




Example

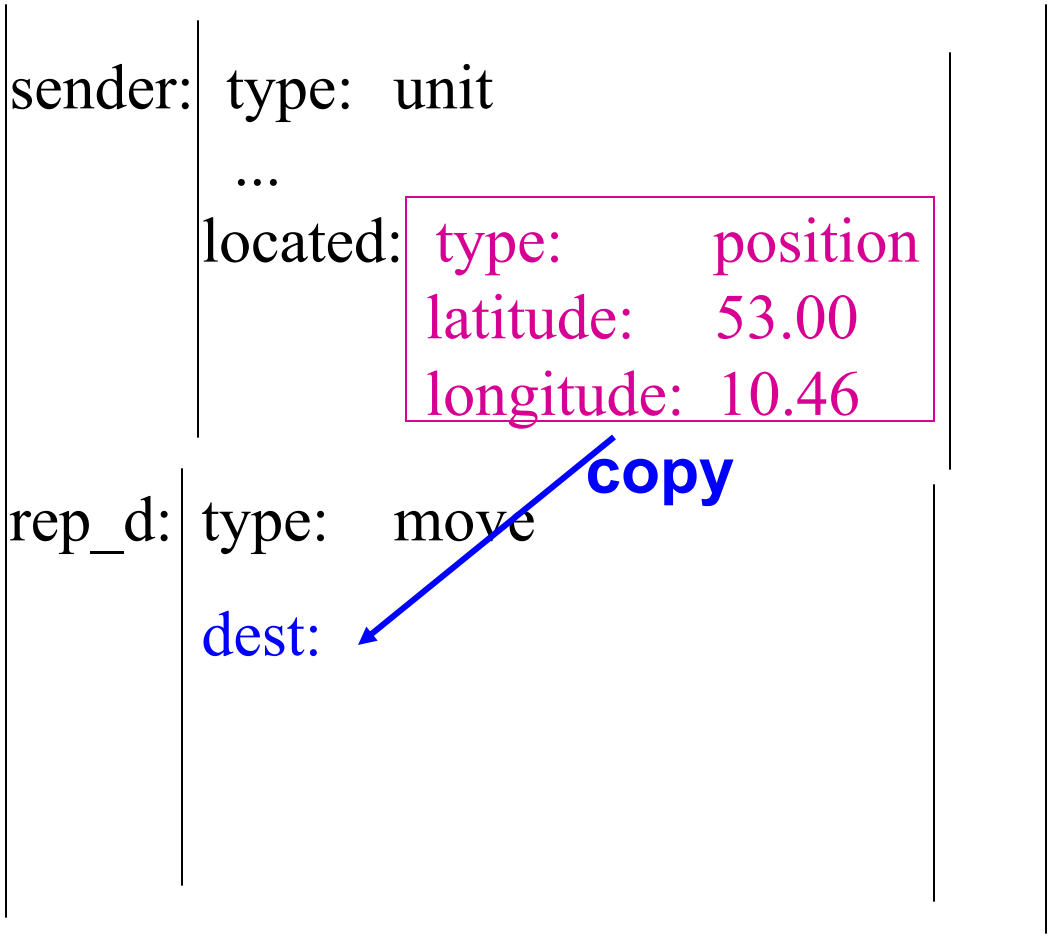
Platoon B: *3 hostile T80 approaching*.

Information Extraction transforms **report** into **formal representation**.



Example

Platoon B:
3 hostile T80 approaching.



Semantic Augmentation
adds to the representation
(here: adding of
the move's destination).

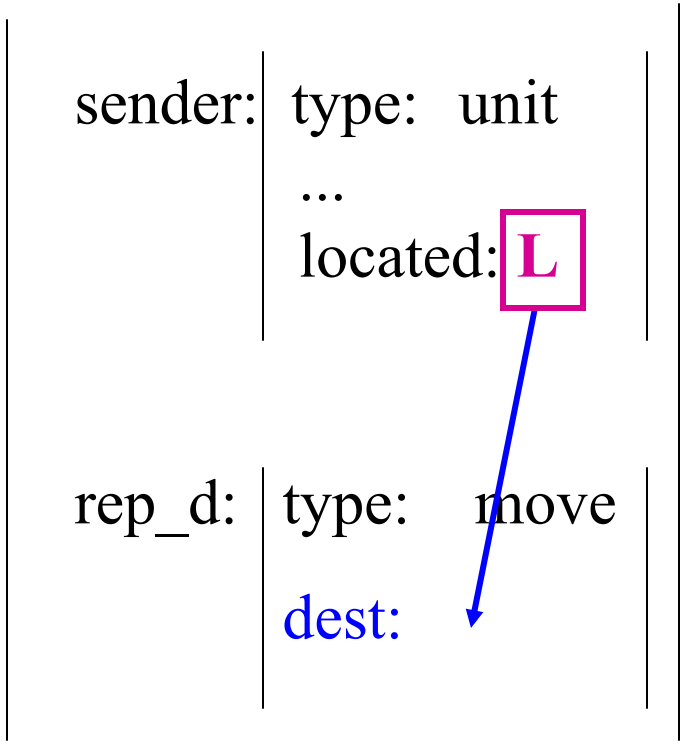
Example

ontological rule:

set_value(M,[rep_d,dest],**L**):-

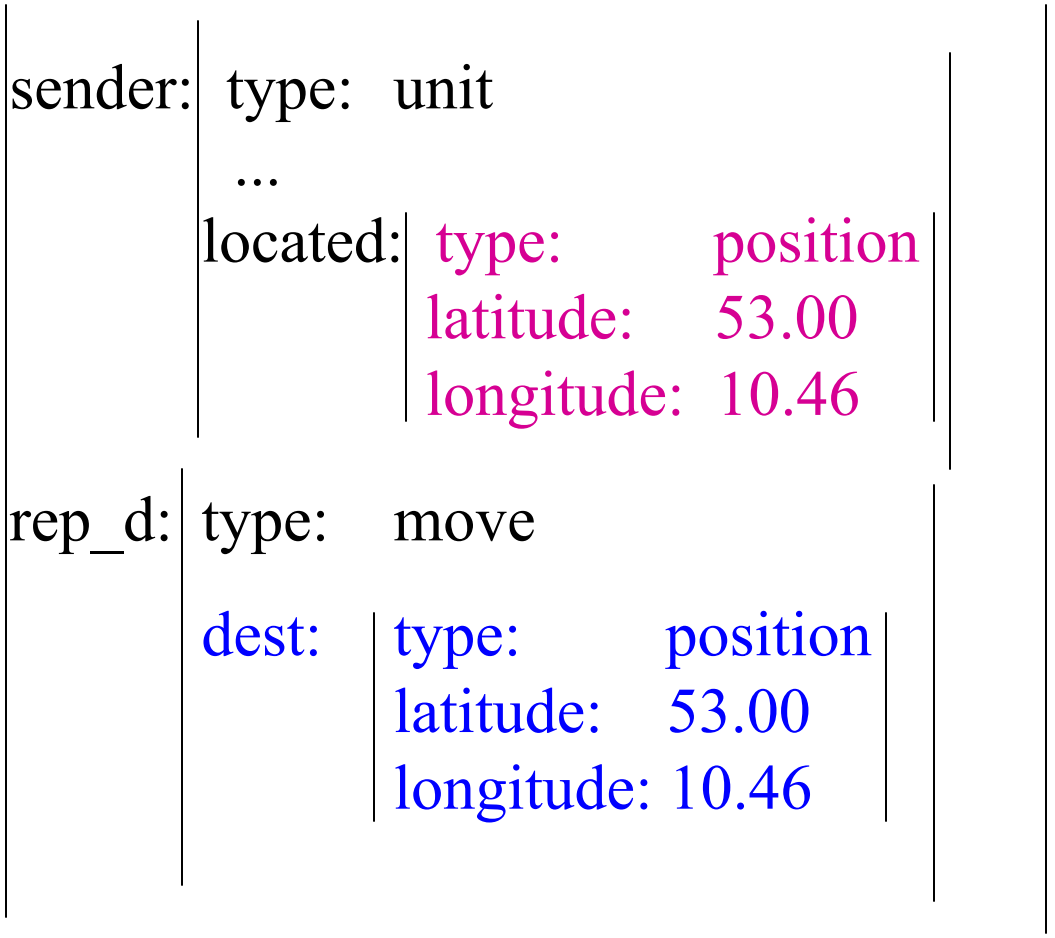
get_value(M,[rep_d,type],move),
get_value(M,[rep_d,subcat],approach),
get_value(M,[rep_d,agent,hostility],hostile),
get_value(M,[sender,located],**L**).

matrix path value



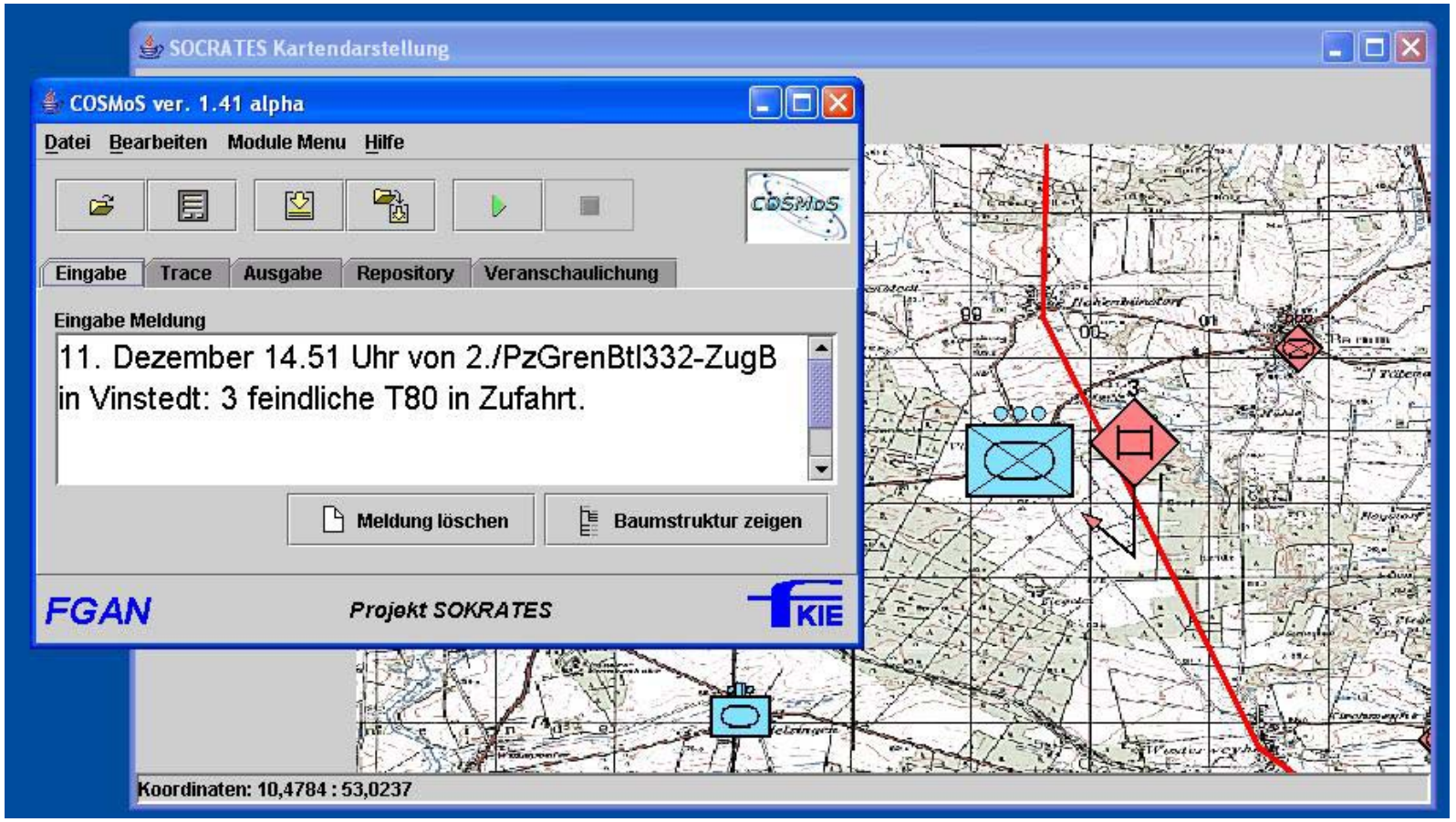
Example

Platoon B:
3 hostile T80 approaching.



Semantic Augmentation
adds to the representation
(here: adding of
the move's destination).

Example



Platoon B: *3 hostile T80 approaching.*

Additional Remark

Some ontological processes (semantic augmentations) are **facultative**, e.g., the processes which infer

- a unit's type
- its subtype
- its size
- its affiliation

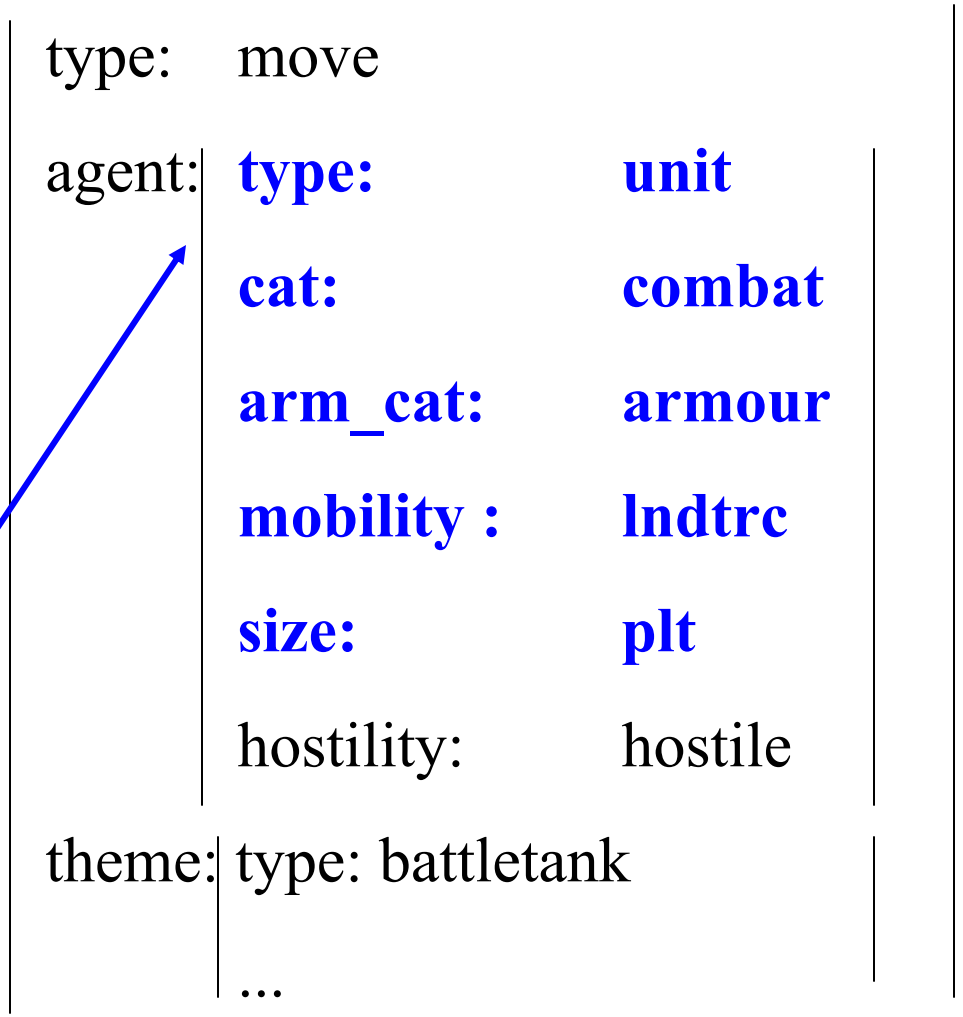
from the type and the number of equipment reported.

These processes can be activated or shut down to **adjust** the system **to situational requirements** as well as to the needs and to the style of its operator.

Example

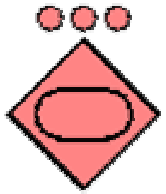
Platoon B:
3 hostile T80 approaching.

Semantic Augmentation adds to the representation (here unit determination).



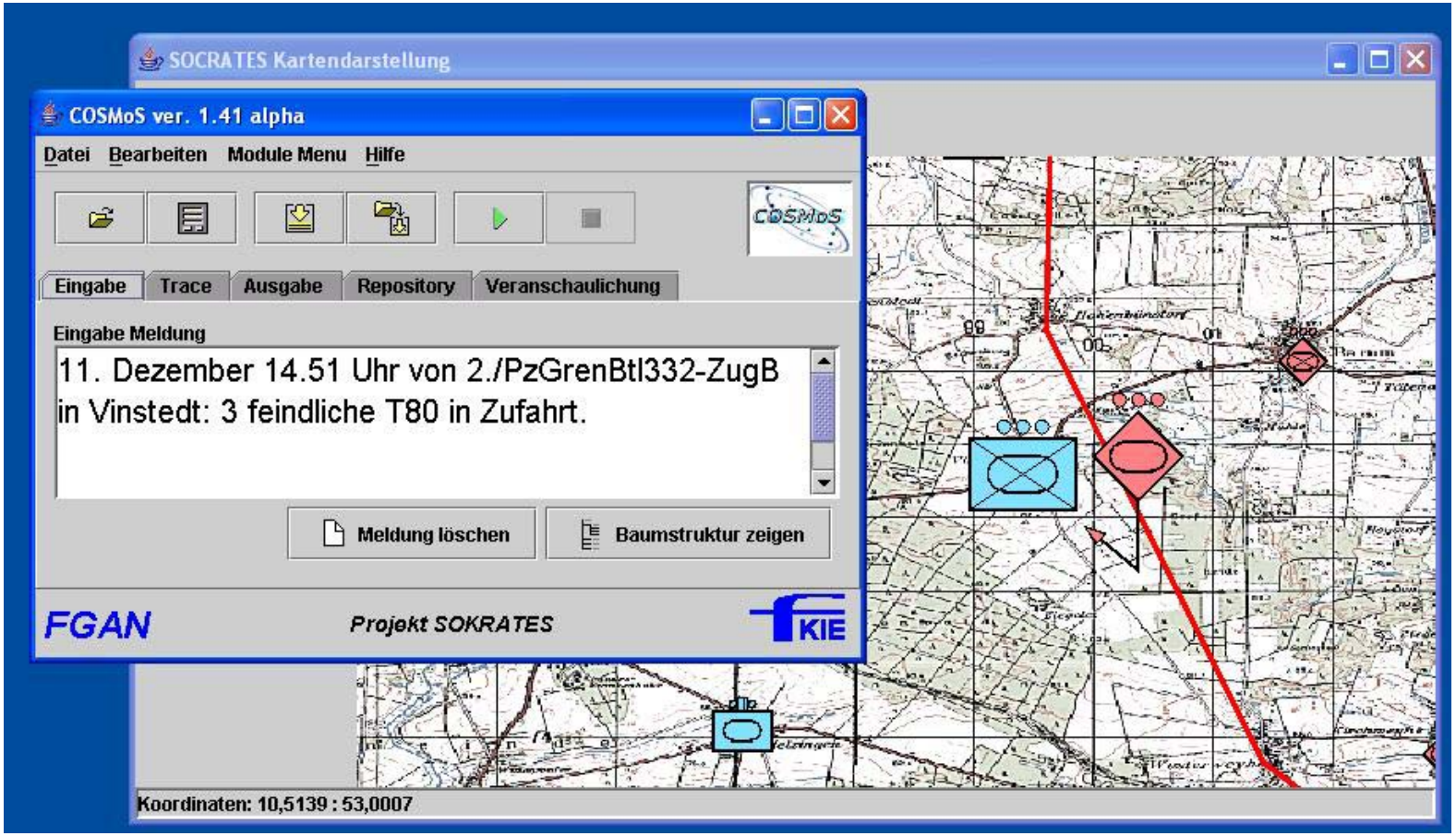
Example

Platoon B:
3 hostile T80 approaching.



reporting_data:	type:	move
	agent:	type: unit
		cat: combat
		arm_cat: armour
		mobility : lndtrc
		size: plt
		hostility: hostile
	theme:	type: battletank
		...

Example



Platoon B: *3 hostile T80 approaching.*

Benefits

The system is **modular** by itself:

- It may run on a distributed environment,
  e.g., the data base interaction module together with the data base.

- Its modules can be substituted easily,
  e.g., German IE-module ⇔ English IE-module.

It can be used as a module in C2 information systems.

Benefits

The system can be **adjusted** as required

- to the needs and to the style of the operator
- to situational demands
  (the more reports coming in the more automaticity)

Benefits

The system enhances **interoperability** towards the **semantic level** (Alberts & Hayes: “the cognitive level”)

- *by transforming natural language*
  - ➢ *into APP-6A conform map*
  - ➢ *into C2IEDM data base entries*

- *by analyzing the data with respect to their semantics*

This is only possible by using **ontological** means.

Benefits

Modularity and Adjustability
add to **AGILITY**, especially to **Resilience** and **Adaptation**;

INTEROPERABILITY stands for itself.