The Prague Dependency Treebank and Valency Annotation (part 4)

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Prague Dependency Treebank
Deep syntax & valency (part 4)

- Valency in the PDT
  - Valency lexicon for PDT
  - General valency lexicon
- Valency in deep vs. surface syntax
  - Links between the layers w.r.t. valency
- Valency and word sense
  - Sense-disambiguated occurrences:
    - Links from data to the lexicon
- Valency in translation, text generation

Definition of Valency

- Ability (“desire”) of words (verbs, nouns, adjectives) to combine themselves with other units of meaning
- Properties of valency:
  - Specific for every word meaning (in general)
    - leave: *sb left sth for sb* vs. *sb left from somewhere*
    - same as in PropBank *leave.02* vs. *leave.01*
  - Typically strongly correlates with surface form
    - morphological case (~ ending), preposition+case, ...
  - ~~Semantic constraints~~ are very dangerous

Structure of Valency

- word (lemma)
  - word sense group 1
    - valency frame:
      - $slot_1$ $slot_2$ $slot_3$
    - surface expression
  - word sense group 2
    - ...

vyměnit (*to replace*)

vyměnit$_1$

ACT PAT EFF

Nom. Acc. za+Acc.

vyměnit$_2$

...

The Valency Lexicon PDT-VALLEX

- Valency frames
  - each verb, some nouns, adjectives
- Basic set prepared in advance, annotators add entries on-the-go, checking and approval process follows (consistency)
- VALLEX
  - more detailed and complex annotation of valency
  - Žabokrtský, Lopatková (2005), VALLEX 1.0
  - All about valency: http://ufal.ms.mff.cuni.cz/~semecky/vallex/

PDT-VALLEX Entry

- dosáhnout: *“to reach”, “to get [sb to do sth]”*
- browser/user-formatted example:

*** dosáhnout**

ACT(.1) PAT(.2,.4) v-w714f1 **Used:** 272x

dosáhnout určité úrovně

mzda d. v tomto oboru 80 tisíc

d. pokročilého věku

ACT(.1) PAT(.2,*aby*[.v]) ?ORIG(*na-1*[.6],*od-1*[.2]) v-w714f2 **Used:** 7x

dosáhl na něm slibu

dosáhli na sobě slibu

ACT(.1) DPHR(*svůj-1*.2) v-w714f3 **Used:** 2x

dosáhl svého

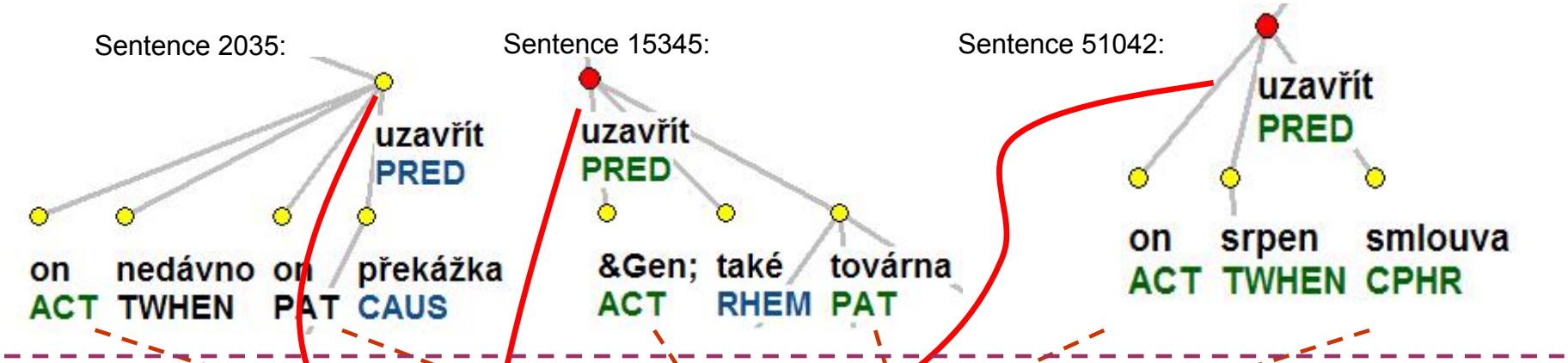
ACT(.1) DIR3(*) v-w714f4 **Used:** 2x

dosáhl na strop

rukou.MEANS

Corpus <-> Valency Lexicon

- Corpus:



- Lexicon:

ENTRY: uzavřít

vf_1: ACT(.1) CPHR({smlouva}.4)

ex: u. dohodu *(close a contract)*

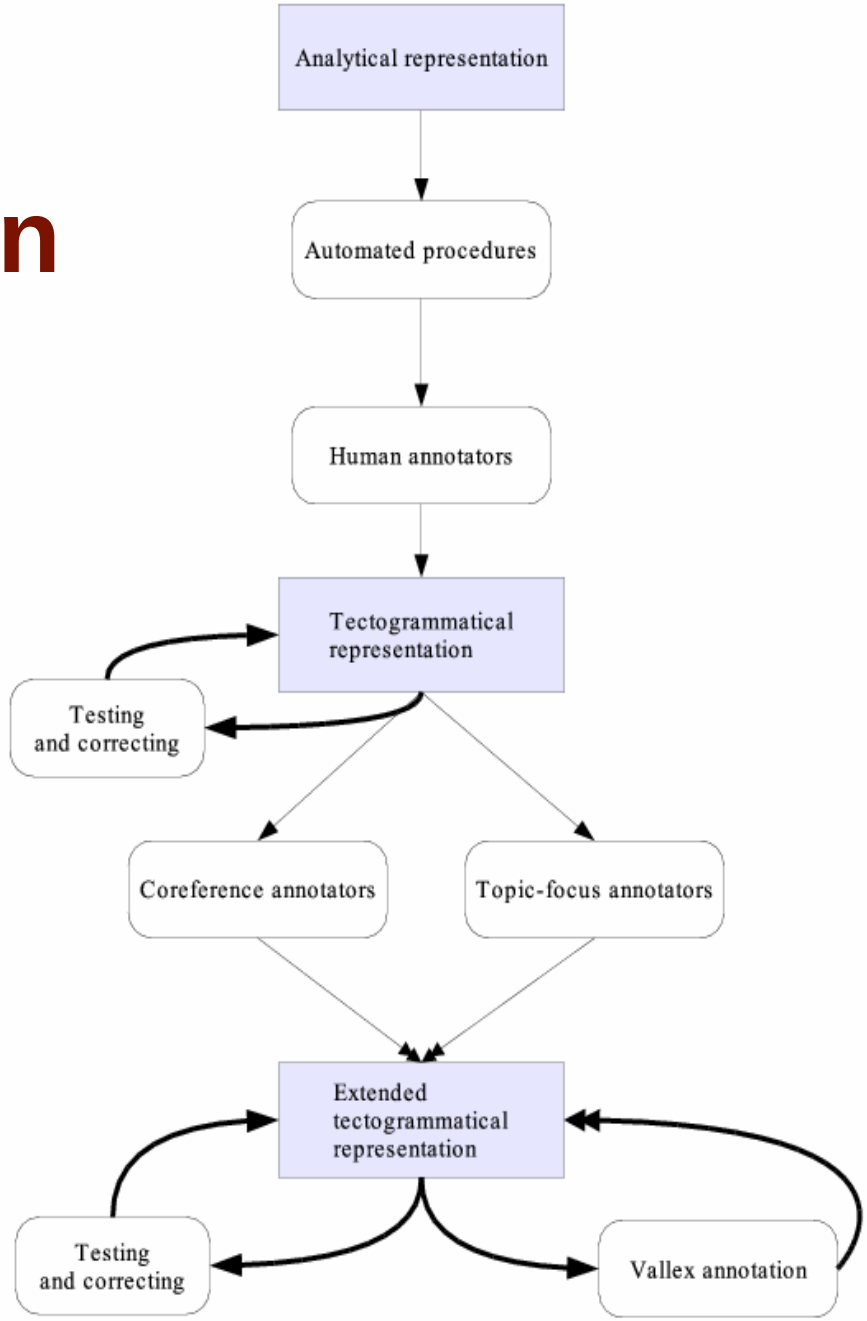
vf_2: ACT(.1) PAT(.4)

ex.: u. pokoj *(close a room, house)*

The Annotation Process

- 4 sublayers
  - work on structure first, rest in parallel
- Structure
  - automatic preprocessing - programmed conversion from analytical layer annotation
- Grammatemes
  - mostly automatically (based on lower layers' annotation), manual checking, corrections
- Cross-sublayer/cross-layer checking
  - partly automatic, then manual

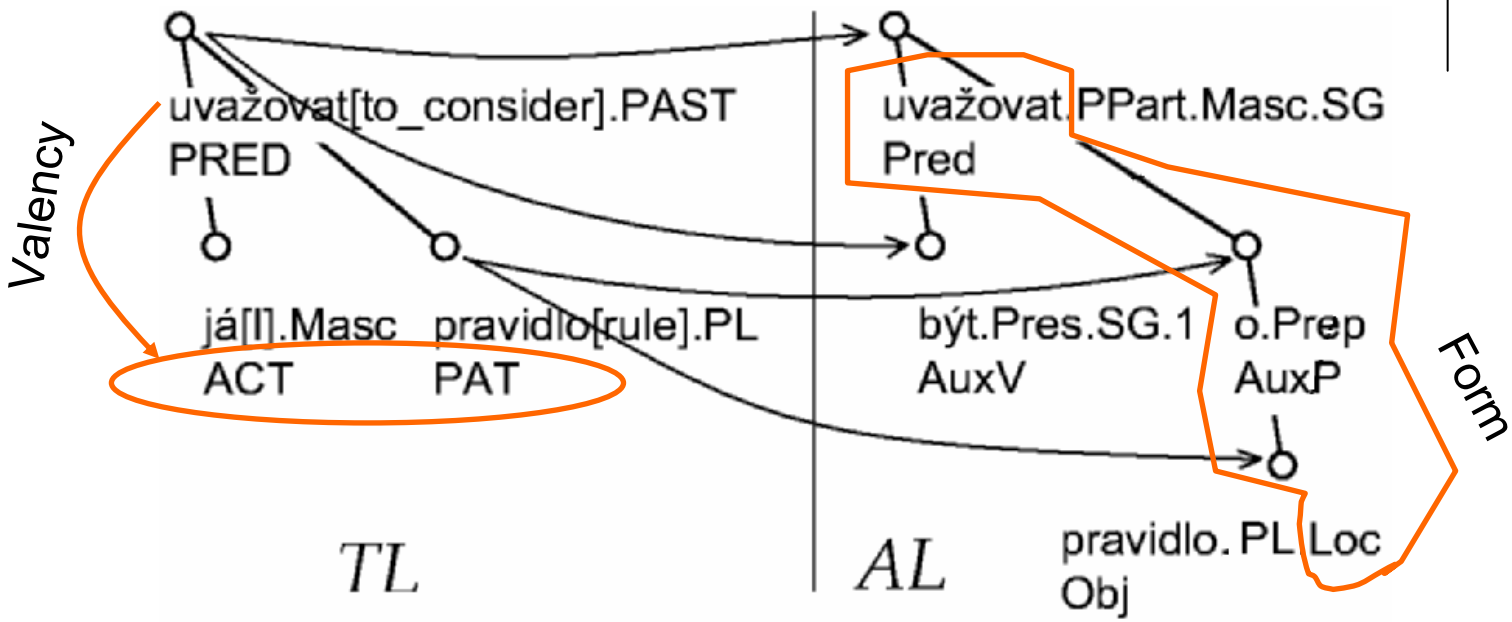
The Annotation Process Scheme



Valency & Tectogrammatical Annotation

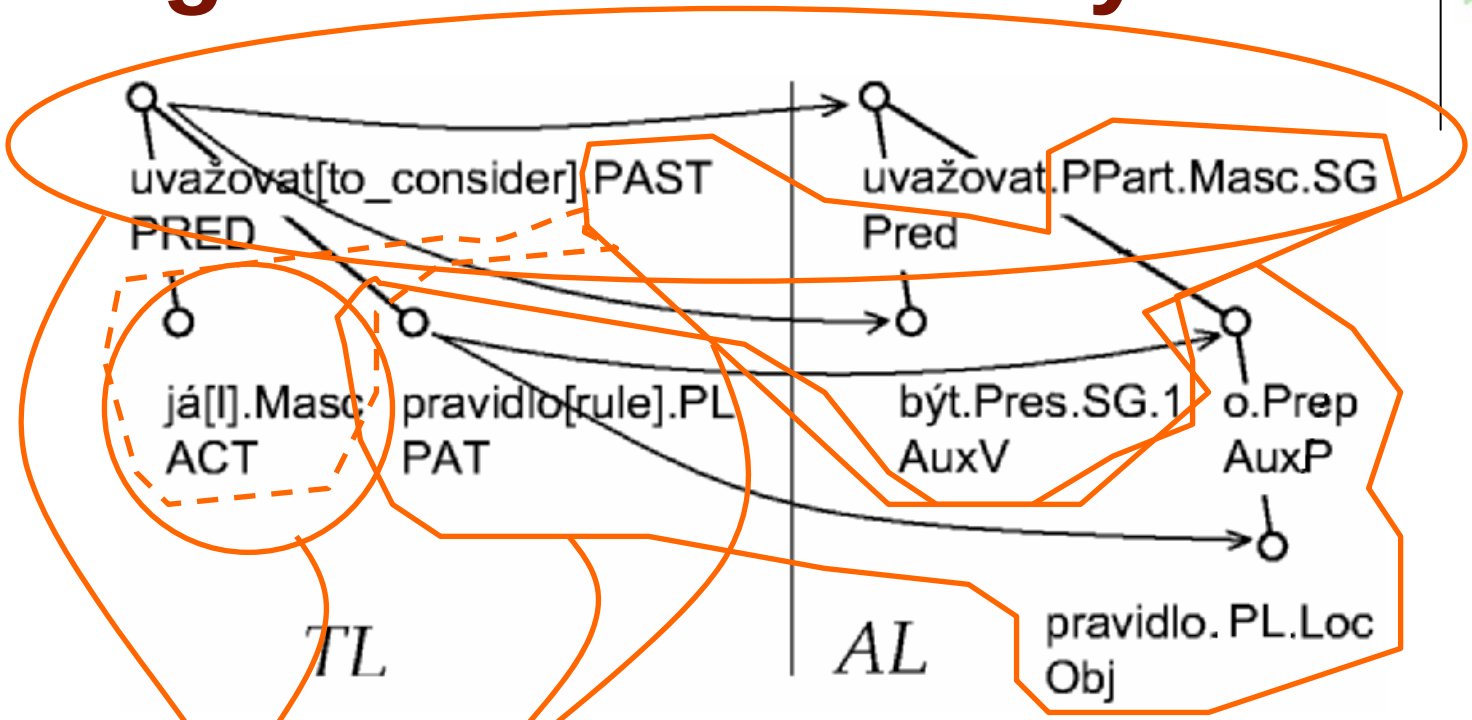
- Valency and...
  - (surface) form
- Annotation tools
  - TrEd
    - structural annotation
    - valency lexicon integration
- Search
  - TrEd, Netgraph

Valency & Form



lemma (AL): uvažovat
ACT: surface ellipsis, node disappears
PAT: preposition ‘o’ and a locative case

Tectogrammatical / Analytical



uvažovat – uvažovat
PAST / já.Masc – PPart.Masc.SG(Pred) / být.Pres.SG.1(AuxV)
pravidlo.PL.PAT – o.Prep(AuxP) / pravidlo.PL.Loc(Obj)
já - 0

?

CONTEXT NEEDED

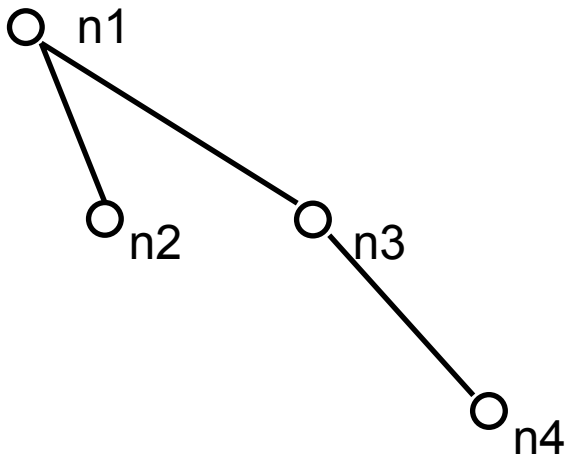
from another sentence: pravidlo.PL.PAT – pravidlo.PL.Acc(Obj)

Valency & Form

- Valency frame:
  - (per each sense of word)
  - (obligatory) modifiers ↔ functors
  - functor → form
- Simplest case:
  - surface form of a functor: particular case
  - Ex.: ACT in nominative (<u>he</u> says)
  - Ex.: PAT in accusative (she sees <u>him</u>)
- ... but it is not always so simple (as we have already seen)!

Valency & Form: Constraints

- Tree structure:



- (Sets of) Constraints:
  - n1: lemma=uvažovat mode=active
  - n2: case=Nom afun=Sb
  - n3: lemma=o afun=AuxP
  - n4: case=Loc afun=Obj

(General) Valency Lexicon Entries

Entry	Sense #	Frame #	Valency Optinality		Form alternatives
1	1	1	ACT PAT		 $\{c_i\}$  $\{c_i\}$
	2	2	ACT PAT LOC		 $\{c_i\}$  $\{c_i\}$
		3	ACT PAT DIR3		 $\{c_i\}$
	3	4	ACT PAT		 $\{c_i\}$  $\{c_i\}$
2	1	1	ACT		 $\{c_i\}$
	2	2	ACT INTT		 $\{c_i\}$  $\{c_i\}$
3	1	1	ACT PAT		 $\{c_i\}$  $\{c_i\}$
	2	2	ACT PAT		 $\{c_i\}$  $\{c_i\}$

Valency Lexicon Simplification

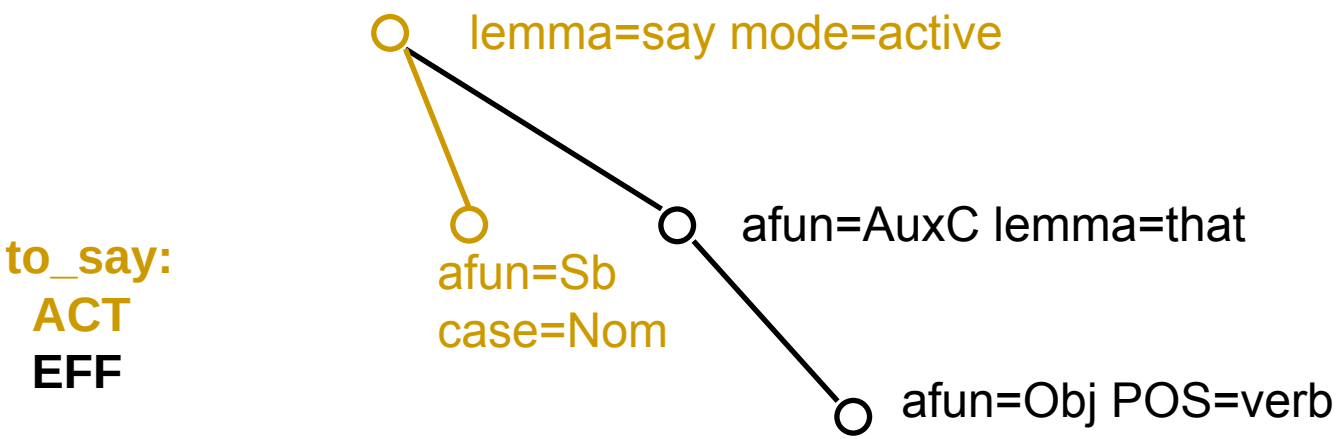
- Independent form for each slot of a particular valency frame
  - ACT, PAT, ...: own constraint, not a global one
- $\text{Functor}_{\text{oblig./opt.}} \quad \leftrightarrow \quad \text{constraints}_{\text{Functor}}$
- Ex.:
  - lemma1 ACT(Nom.) PAT(o+6) (to consider a rule)
  - lemma2 ACT(Nom.) PAT(4) (create a rule)
- Standard “transformations” of frame form
  - passivization, reflexivization, ...

Example: Valency & Form

- Simple 1:1:
  - ex.: create: ACT(Nom) PAT(Acc)
  - verb in infinitive: INTT(Inf)
  - subordinate clause: PAT(verb)
  - class of words with generic verbs: CPHR({class})
  - no constraint: (often) LOC, TWHEN
    - general constraint for a given functor applies
  - ...more!

Example: Valency & Form

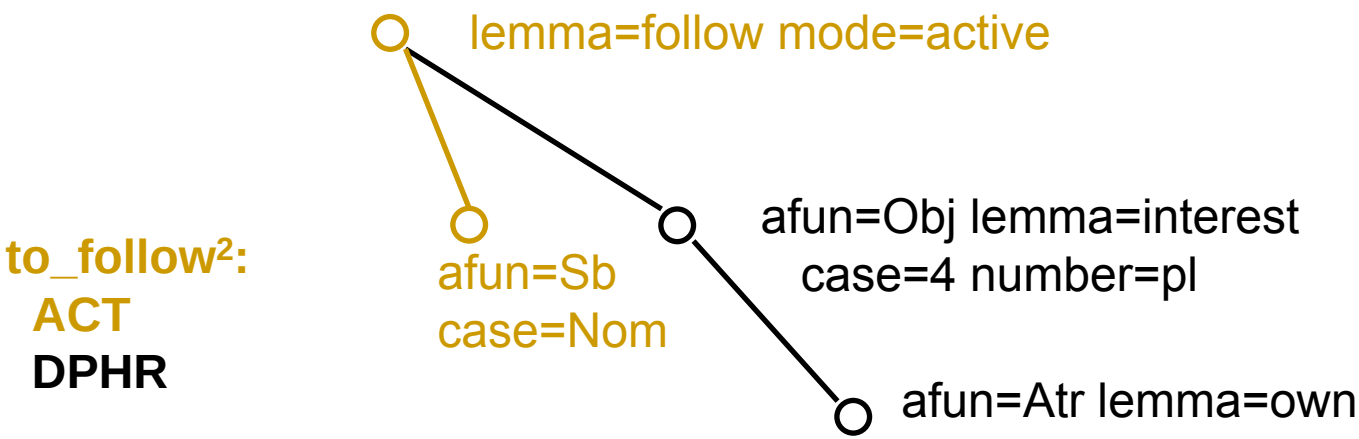
- 1:2
  - relative clause



- linear representation: EFF(that[.v])

Example: Valency & Form

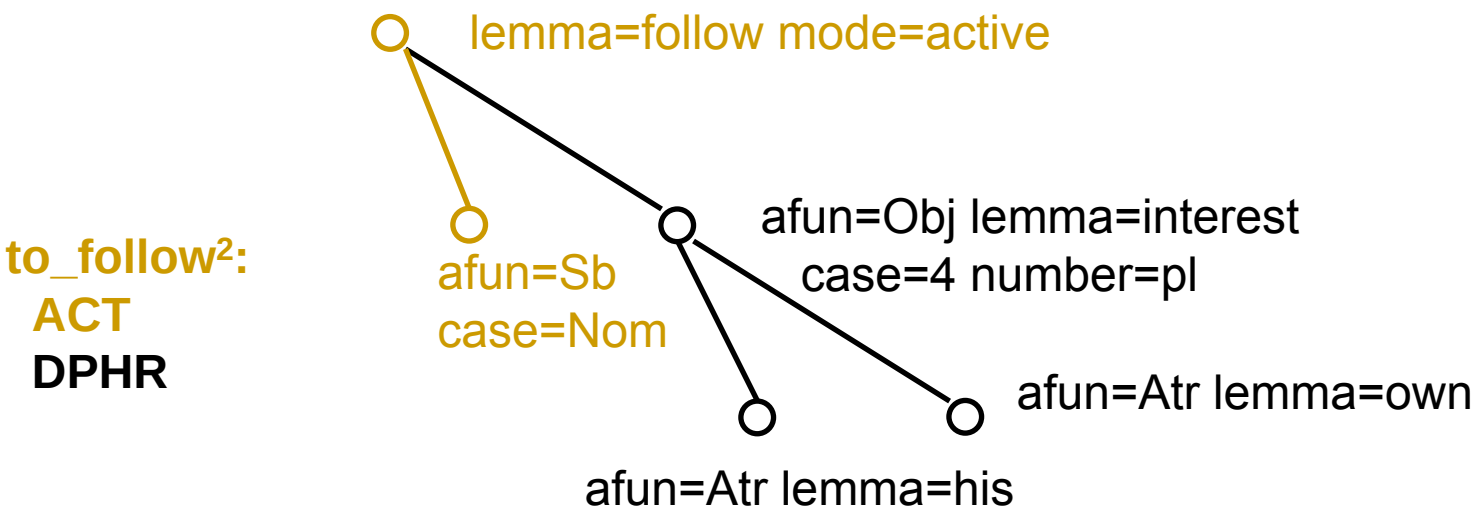
- 1:2
  - idomatic phrase



- linear representation: DPHR(interest.P4[own.#])

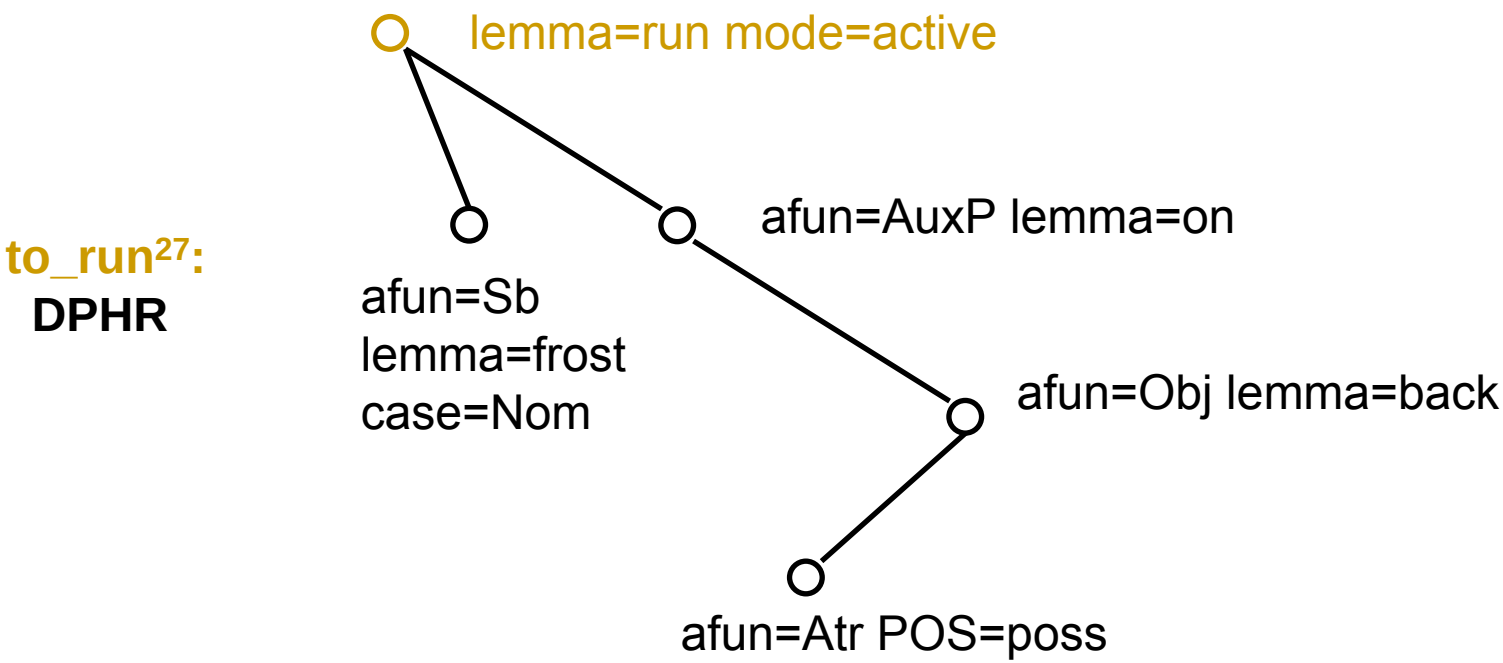
Example: Valency & Form

- 1:3
  - idomatic phrase



Example: Valency & Form

- 1:4
  - idomatic phrase



Valency and Translation

- leave:
  - leave-1
    - to leave [from] somewhere
  - leave-2
    - to leave sth for sb
- Translating (from English into Czech):
  - which equivalent to chose?
    - nechat vs. odjet/opustit
  - which prepositions, cases, ... to use?
    - accusative vs. “z” (*“from”*) with genitive vs. ...?

Valency and Translation

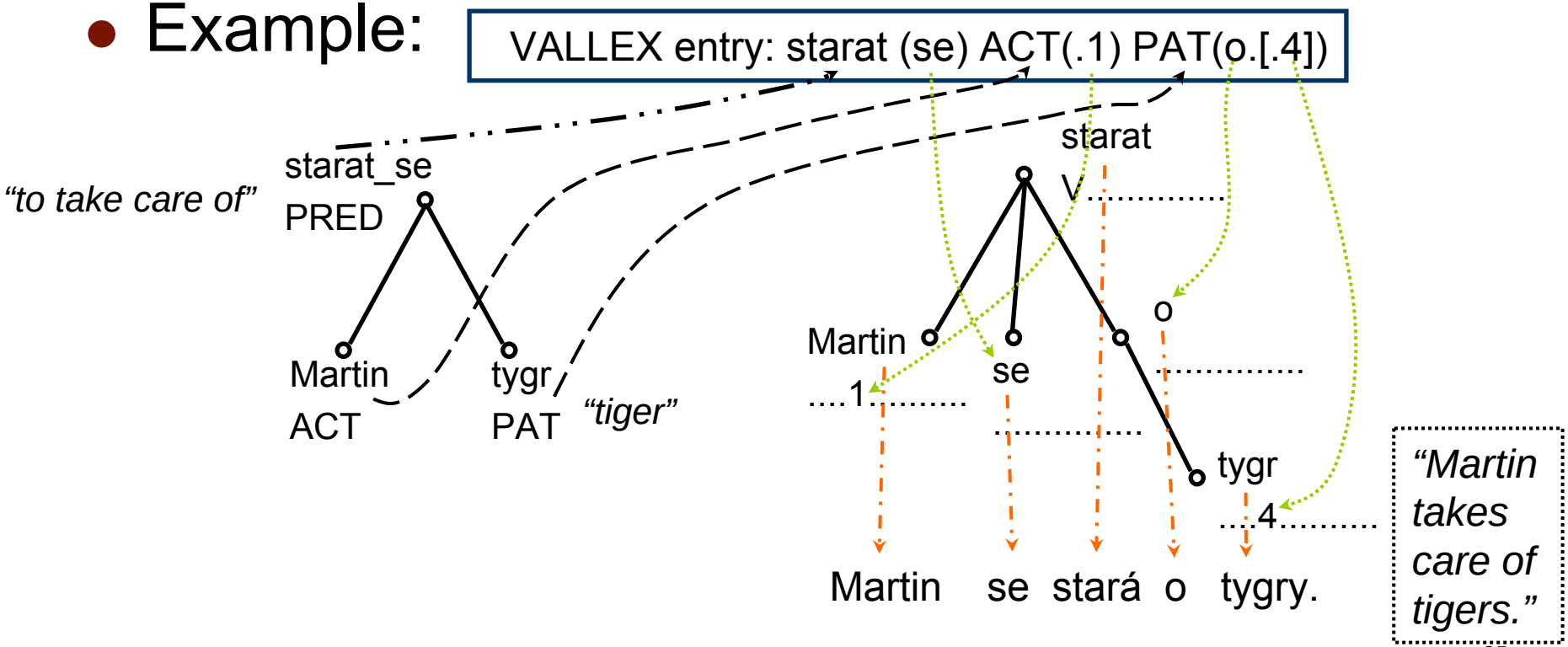
- leave-1 ⟷ nechat-3
  - ACT() PAT() LOC() ACT(.1) PAT(.4) LOC()
- leave-2 odjet-1
  - ACT() DIR1(from.) ACT(.1) DIR1(z.[.2])

Valency and Text Generation

- Tectogrammatical Representation
  - has *all* the information to (re)generate the surface form of the sentence:
    - in a “generalized” form
    - non-redundant (almost... but for generation, it is o.k.)
  - ...except the links to a-layer, however
    - links used only for *training* [statistical models for] parsing/generation modules
    - not present when e.g. doing text planning, translation, ...
  - valency dictionary: form of “learned” knowledge

Valency and Text Generation

- Using valency for...
  - ...getting the correct (lemma, tag) of verb arguments
- Example:



Tectogrammatical Annotation Tools

- Manual annotation
  - 4 groups of annotators ~ 4 sublayers
  - Special graphical tool (TrEd)
    - Customizable graphical tree editor
- Preprocessing
  - Data from analytical layer, preprocessed
  - Online dependency function preassignment

The [Manual] Annotation Tool

- Perl/PerlTk based, platform-independent
  - Linux, Windows 95/98/2000, Solaris, ...
- Perl as the “macro” language
  - “unlimited” online processing capability
- Flexibility for interactive checking
  - split screen, graphical “diff” function
- Customization, printing, “plugins”, ...
- !! See also J. Stepanek’s lecture / tools

The “TrEd” Tree Editor

- Graphical tool

  TrEd

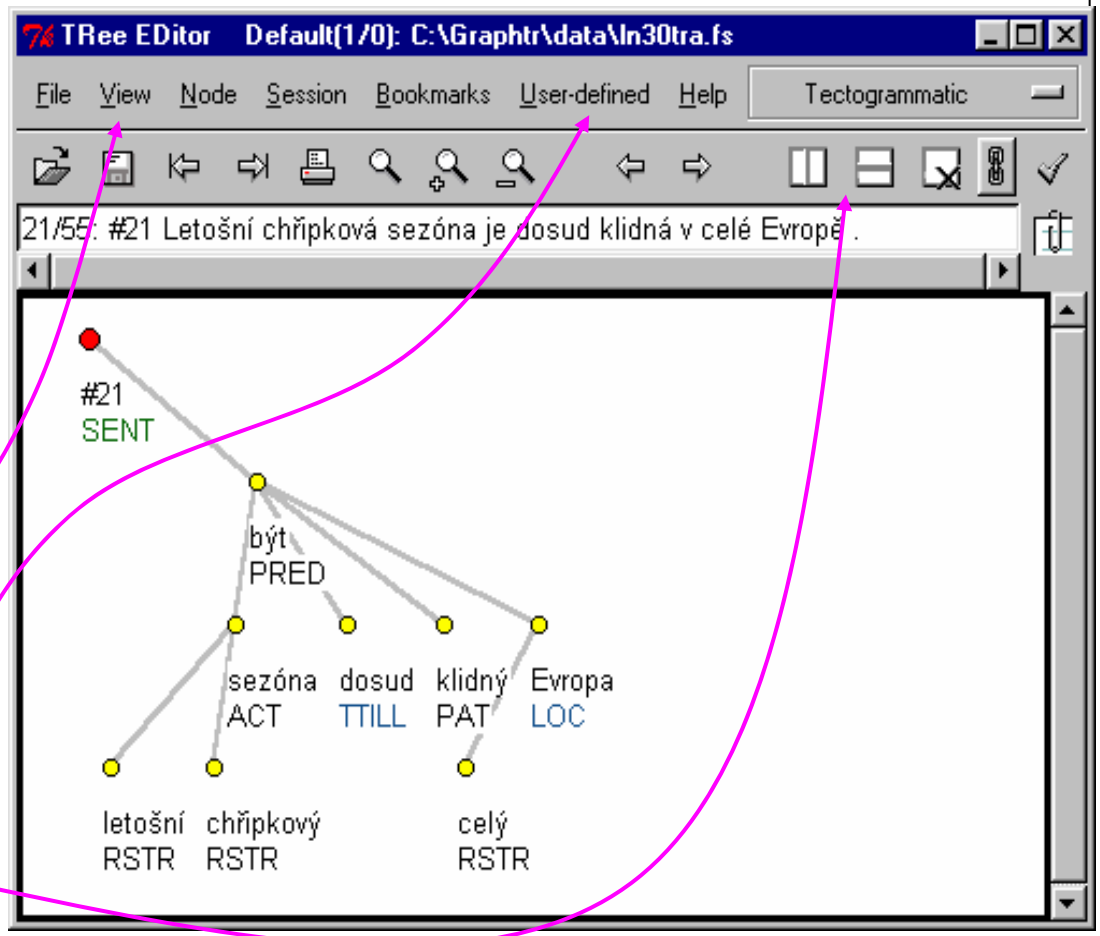
- Main screen:

Original sentence:
[This year’s flu season is still quiet in Europe.]

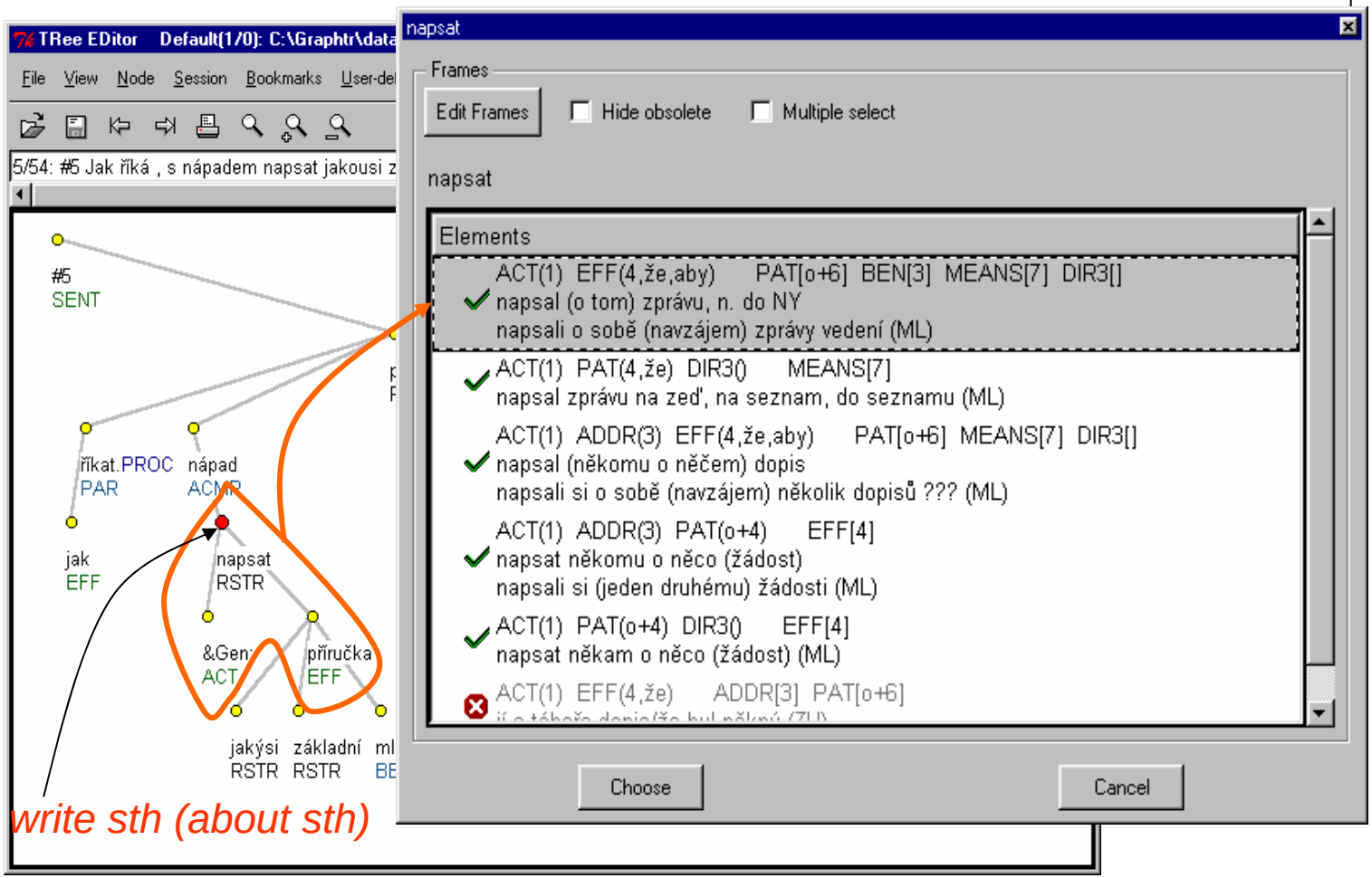
Editing window customization

Run a macro

Multiwindow editing/compare

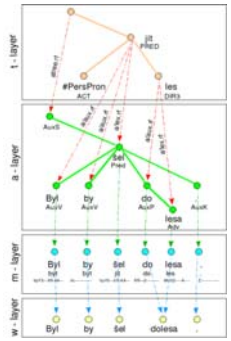


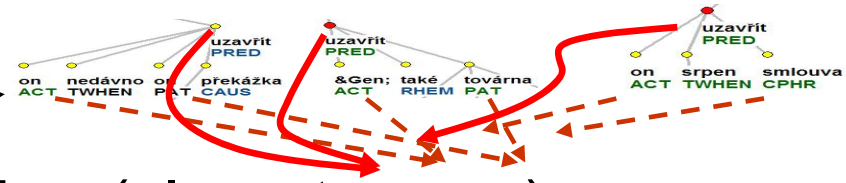
Valency Lexicon in TrEd



to write sth (about sth)

Annotating the Links





- Stand-off annotation principles
  - Links to another layer
  - Links to lexicon
- Minimal work on link annotation (close to zero)
- Macro commands in TrEd
  - transparently keeps track of merged nodes, splits, etc., and adapts links correspondingly.
- Result:
  - almost no extra work
  - final check after annotators do the last pass

The “Old” PDT 1.0

- Morphology (1.8MW) & Surface syntax (1.5MW)
- SGML format (csts.dtd) + compact “FS”
- Mixed (single-file) annotation
  - 7 attributes + dependency
- TrEd (graphical viewer/editor), NetGraph (search capability)
  - simple visualization

What's New in PDT 2.0

- Tectogrammatical layer (0.8MW)
  - 39 node attributes + dependency
  - valency dictionary (PDT-VALLEX)
- XML stand-off annotation ("PML", 4 layers)
- New data division (train/dtest/etest)
  - added morphological annotation to all data
  - corrections of PDT 1.0 files (morphology, syntax)
- Improved tools:
  - TrEd, btred/ntred (batch tree corpus processing)
    - new features, better visualization

Tectogrammatical attributes I

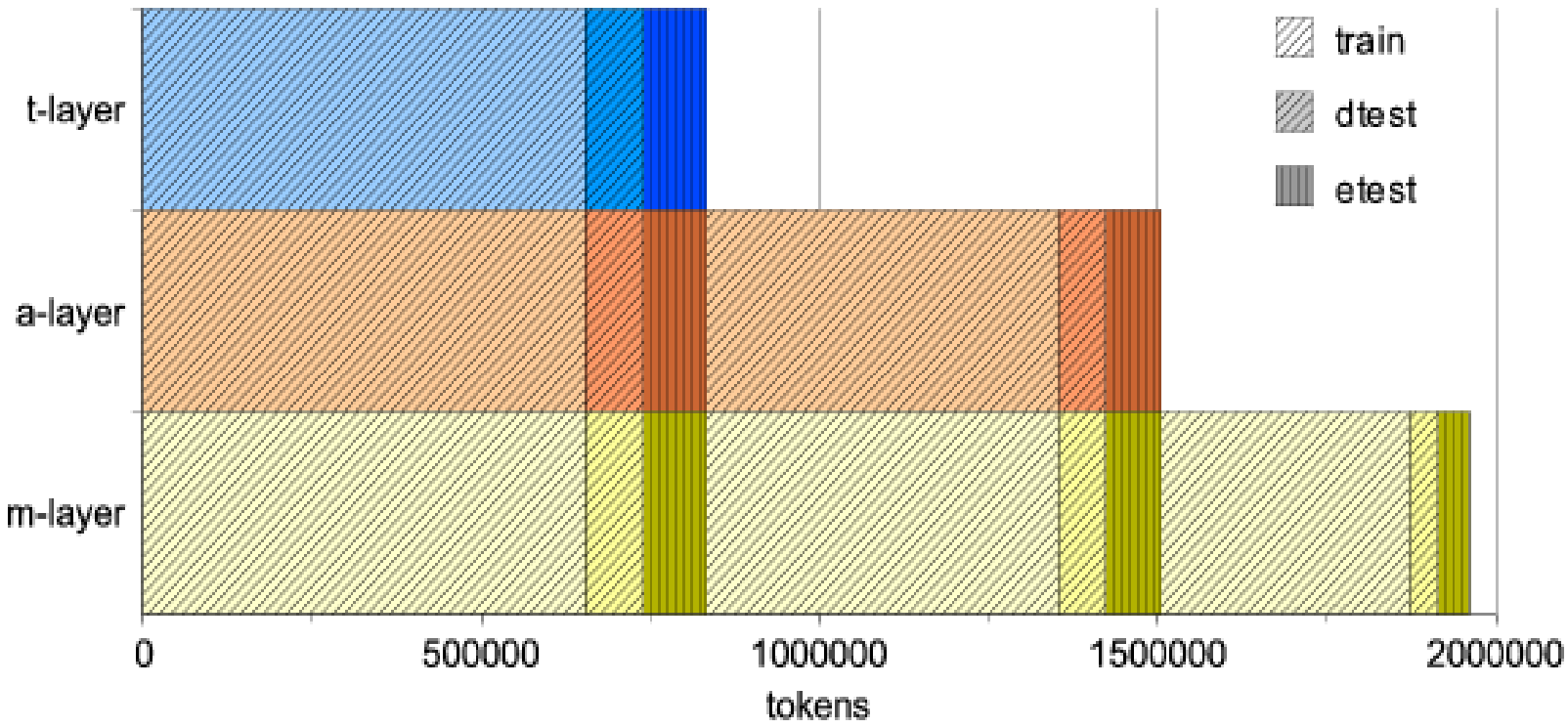
- node typing
  - complex, coap, qcomplex, root, atom, ...
- functor, subfunctor
  - TWHEN: TWHEN.basic, TWHEN.before
- is_member, is_generated, is_parenthesis, is_dsp_root, is_state, quot_type, ...
- grammatemes (16):
  - aspect, degcmp, deontmod, sempos, tense, indeftype, politeness, person, ...

Tectogrammatical attributes II

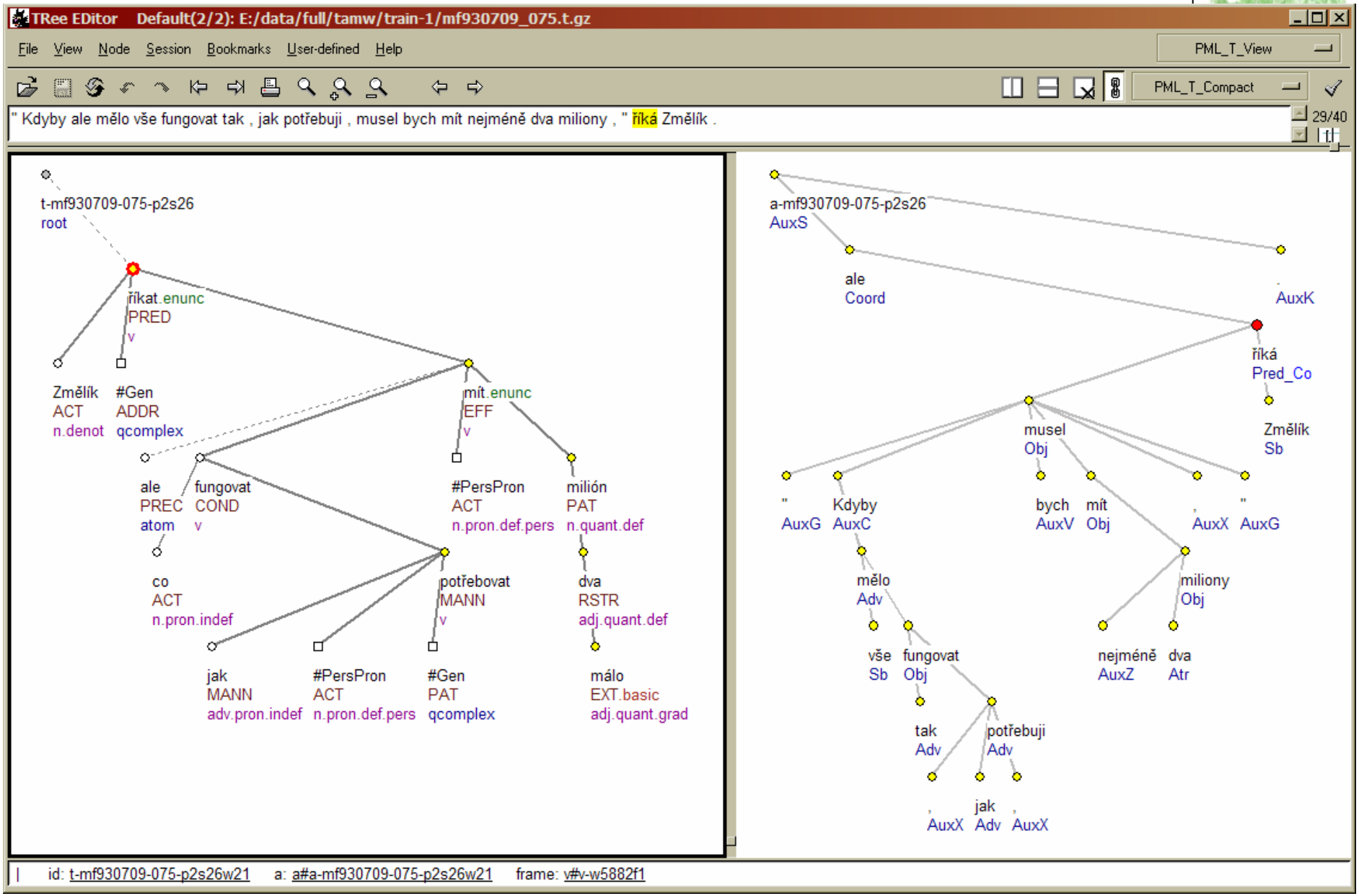
- topic/focus:
  - tfa, deepord
- valency: t_lemma, val_frame.rf
- bookkeeping: id
- coref_gram.rf, coref_text.rf, compl.rf
  - reference to TR node, type of coreference
- sentmod
- Linking to analytical layer
  - a.lex.rf (“main” anal. node), a.aux.rf (others)

PDT 2.0: The Data

- Data sizes



TrEd


TRee EDitor Default(2/2): E:/data/full/tamw/train-1/mf930709_075.t.gz
File View Node Session Bookmarks User-defined Help
PML_T_View
PML_T_Compact
" Kdyby ale mělo vše fungovat tak , jak potřebuji , musel bych mít nejméně dva miliony , " říká Změlík .
29/40
t-mf930709-075-p2s26
root
říkat.enunc
PRED
v
Změlík
ACT
n.denot
#Gen
ADDR
qcomplex
mít.enunc
EFF
v
ale
PREC
atom
fungovat
COND
v
#PersPron
ACT
n.pron.def.pers
milión
PAT
n.quant.def
co
ACT
n.pron.indef
potřebovat
MANN
v
dva
RSTR
adj.quant.def
jak
MANN
adv.pron.indef
#PersPron
ACT
n.pron.def.pers
#Gen
PAT
qcomplex
málo
EXT.basic
adj.quant.grad
a-mf930709-075-p2s26
AuxS
ale
Coord
.
AuxK
říká
Pred_Co
musel
Obj
Změlík
Sb
"
AuxG
Kdyby
AuxC
bych
AuxV
mít
Obj
,
AuxX
"
AuxG
mělo
Adv
miliony
Obj
vše
Sb
fungovat
Obj
nejméně
AuxZ
dva
Atr
tak
Adv
potřebuji
Adv
,
AuxX
jak
Adv
,
AuxX
id: t-mf930709-075-p2s26w21
a: a#a-mf930709-075-p2s26w21
frame: v#v-w5882f1

Using the Results (t-layer)

- Preliminary!
  - PDT 2.0 published July 2006
  - 50k sentences for training (t-layer)
- Functor assignment
  - > 80% accuracy on manually annotated structure
- Tectogrammatical parser
  - Part of the “toolchain” (run_all, see p. 5, p. 7, J. Štěpánek)
- Coreference
  - preliminary results: > 80%
- Valency
  - frame assignment > 70%

To take home...

- What is PDT
  - Dependency-based treebank project
    - Czech (other languages in the works)
  - ~ 1mil. words
    - sufficient size for ML experiments
  - 4 layers of annotation
    - token, morphology, syntax, deep syntax/semantics++)
    - independent and full information at all levels, but...
    - interlinked (for the development of parsers/generators)
  - Valency dictionary integrated (links from data)

Some (more) pointers

- http://ufal.mff.cuni.cz/pdt2.0
  - Current version of PDT, all three levels, 1.9/1.5/0.8 Mw
- http://ufal.mff.cuni.cz/REST/CAC/CAC.html
  - The Czech Academic Corpus, v 1.0
- http://www.ldc.upenn.edu
  - LDC2001T10 (PDT v1.0), LDC2004T23 (PADT 1.0), LDC2004T25 (PCEDT 1.0)
- http://www.clsp.jhu.edu: Workshop 2002
  - Using TL for MT Generation