

Integrating a Natural Language Message Pre-Processor with UIMA

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NL Message Preprocessing with UIMA

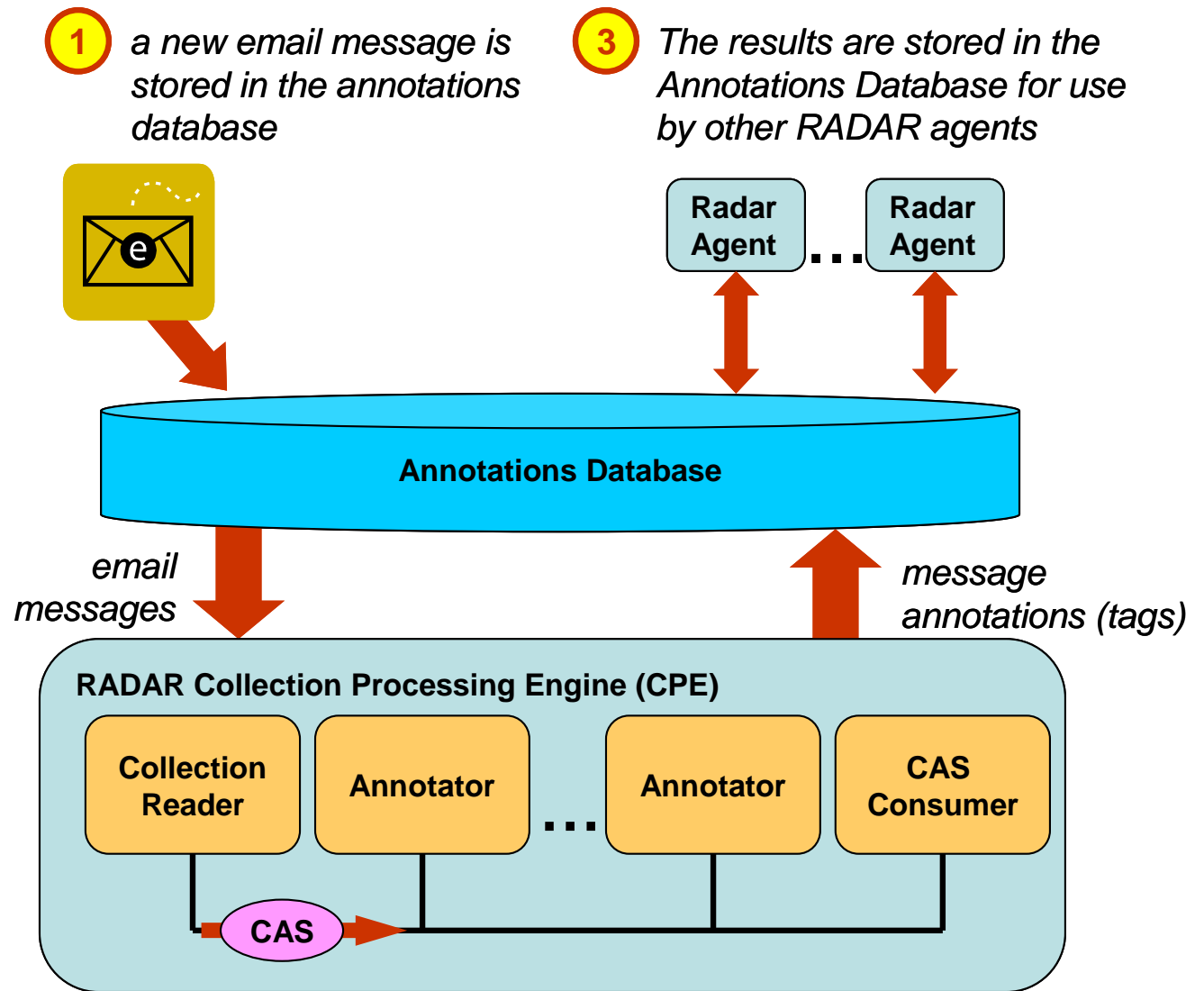
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Project Context

- RADAR: Goal is to help desktop user
 - Personal Assistant that Learns (PAL)
 - Test environment: conference planning
 - Primary input: email messages!
- Requirements include:
 - Preprocessing of email messages
 - Segmentation, typo correction, etc.
 - Syntactic parsing
 - General and domain-specific semantic interpretation
 - Domain-specific task request extraction
 - Original content preserved



The RADAR CPE



- 1 a new email message is stored in the annotations database
- 2 A UIMA Collection Processing Engine is invoked. Stand-off annotations (tags) are created to capture the system's understanding of the email.
- 3 The results are stored in the Annotations Database for use by other RADAR agents



Radar Annotator implementation

- Three varieties of implementation:
 - MinorThird toolkit (William Cohen)
 - Java code
 - Client/server (primarily for legacy and external vendor software) with UIMA wrapper for client



Radar Annotators: list

- In order:
 - Collection Reader
 - Email Opening
 - Conexor parser
 - Temporal Expr.
 - F-Structure
 - GFrame
 - DFrame
- Last:
 - CAS Consumer
- In between:
 - Task
 - RADAR Person
 - SCONE Semantics
 - Person Name
 - SCONE Implicit
 - Space Request
 - Typo



Example Document

Email Opening

The screenshot shows a software window titled "Annotation Results for doc2 in /tmp/xcas". The main text area contains an email from Jonathan Robertson, Program Committee Chair. The email text is as follows:

Blake,

They are really doing it. I won't even try to justify it. But it is not quite as bad as it could have been -- the technology folks claim all they need is Wednesday and Thursday. Please begin right away to move all of the sessions that need moving. And thank you very much for agreeing to fill in for Blake during this critical juncture. The loss of the UC means we have a lot of work to do and your assistance is greatly appreciated.

Our primary mission is to find replacement rooms for all of the Wednesday and Thursday sessions and events currently scheduled in the University Center.

We've been told there may be suitable rooms in Stever Hall. We have arranged access to the University's conference planning web portal so you can make the necessary vendor changes. I have also arranged to have Blake's original conference schedule to be provided in the native Space Time Planner format. It should be on your computer already.

I have been informed that the materials from your crash course in conference planning are also on your computer. We have allotted \$12,000 to make the necessary changes. If you can do the job in less, it would be greatly appreciated.

Thanks again and sorry about the terrible news.

Jonathan Robertson, Program Committee Chair

Annotations in the text include: "Blake," (green), "Wednesday and Thursday" (green), "Blake's" (green), "allotted" (pink), and "Jonathan Robertson, Program Committee Chair" (green).

The right-hand pane, titled "Click In Text to See Annotation Detail", shows a tree view of annotations:

- Annotations
 - TypoAnnotation
 - TypoAnnotation ("allotted")
 - begin = 1069
 - end = 1076
 - Typo = allotted
 - Suggestions = [balloted, allotted, alloved, allowed]

The bottom of the window features a "Legend" section with several checkboxes and buttons:

- ConexorP...
- ConexorS...
- ConexorT...
- Documen...
- FStructure
- Minorthir...
- RadarPers...
- TypoAnn...

Buttons at the bottom include "Select All", "Deselect All", and "Hide Unselected".

Time Expression

Typo Annotation

RADAR Person

Sample Annotations: TempEx

String	Offset	Length
of the summer	73	13
This summer	175	11
three days	359	10
1 week	493	6
Starting May 10)	774	16
July 4	1971	6
INDEPENDENCE DAY	1939	16



Sample Annotations: Typo

String	Offset	Length	Value
teh	60	3	the, eh,...
brousing	20	8	rousing, browsing
bris	16	4	...brisk...
midle	36	5	middle,...
infor	117	5	inform,...
committe	83	8	committed
fed	286	3	fled



Sample Annotations: DFrame

String	Offset	Len	Value
Which room is the first event in?	14	33	((dframe ... (subj ((POS N) (attr ((POS NUM) (function attr) (ortho first) (root first) ...



Sample Annotations: BriefingReq

String	Offset	Len	Value
I need a progress report on yesterday NOW	0	43	<node id="request1172260778347" ... </node>
please send me a campus map soon. --chian	0	44	<node id="request1172261238858" ... </node>



%	Time(ms)	s/doc	Annotator
65.27	5310311	21.24	DFrame
24.60	2001145	8.00	GFrame
Expensive rule-based computations (structural transformation rules and KB lookups)			ADAR Person
			SCONE Sem.
			Temporal Expr.
1.03	83563	0.33	Person Name
0.71	57742	0.23	SCONE Impl.
0.54	44187	0.18	F-Structure
0.18	14889	0.06	Email Opening
0.17	13513	0.05	SpaceRequest
0.17	13445	0.05	Conexor
0.07	5835	0.02	Typo
0.06	4746	0.02	CAS Consumer
0.03	2725	0.01	Collection Reader
0.03	2415	0.01	Task
100.00	8136349	32.55	Entire Pipeline

[sample: 250 randomly selected messages]

7. Add domain semantics

6. Add general semantics

Label known person names

Domain KB interpretation

4. Add anchored time labels

Label any person name

Add domain KB features

5. Label grammatical roles

2. Label salutations in email

Label space requests

3. Segmentation, parsing

Label typo fixes

8. Write to ADB

1. Read from ADB

Label task requests

**Annotator
Run-Time**



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Sample Annotator Precision

Annotator	% Correct	% Partly Correct
Vendor Order Annotator	100%	--
Task Annotator	73%	77%
Person Name Annotator	76%	85%
Space Request Annotator	64%	79%

[sample: 50 randomly selected messages]

Since the RADAR context is machine assistance in a human task, these should also be correlated with their effect on human task performance (currently assessed end-to-end for full system).



Cost of Adoption

- 1.5 months FTE to wrap and integrate 15 NLP components (programmer already familiar with UIMA)



Issues/Future Work

- Better robustness/decoupling
 - Require standard service interfaces for NLP components
 - Wrap as UIMA-EE (UIMA-AS) services
- Better transparency
 - Hard to tell whether a service is dead or just working hard
 - Need better logging/communication with services
- Better speed
 - Optimize rule-based engines
 - Provide multiple service instances for time-consuming services



Questions?



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