Bachelor‘s Thesis: Conceptualization and Implementation of a Rule-based Workbench for Textual Pattern Annotation

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Administrative Setup

- Title: **Conceptualization and Implementation of a Rule-based Workbench for Textual Pattern Annotation**

- Start: 15.08.2017
- End: 15.12.2017
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Rule-based Text Annotation

- Annotations are metadata for a span of text
- Rules consist of patterns and actions
- Patterns are RegEx like formulations for sequences of annotations

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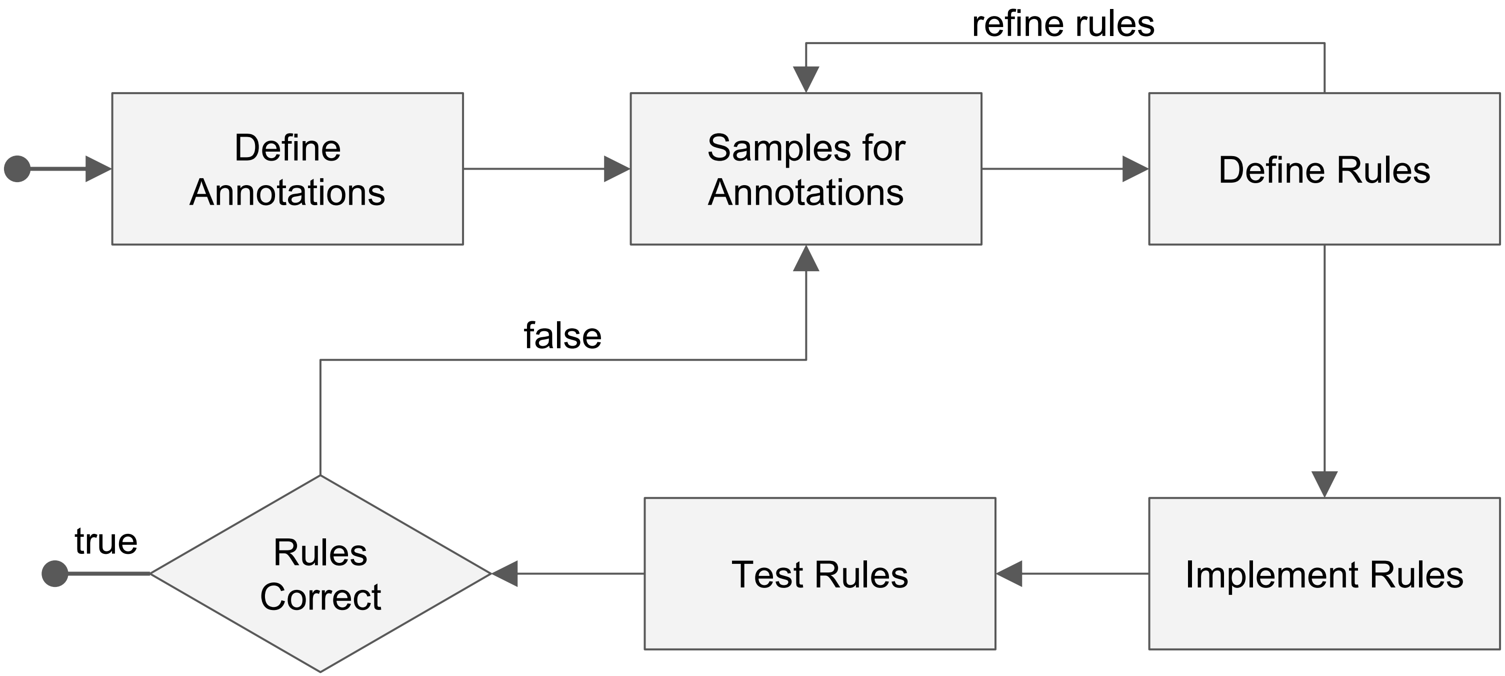
Ein Produkt hat einen Fehler, wenn...

Motivation

Rule-based text annotation is still useful in times of machine learning:

- Predictable results
- Easy and fast to implement
- Incorporation of domain knowledge
- Creation of training sets

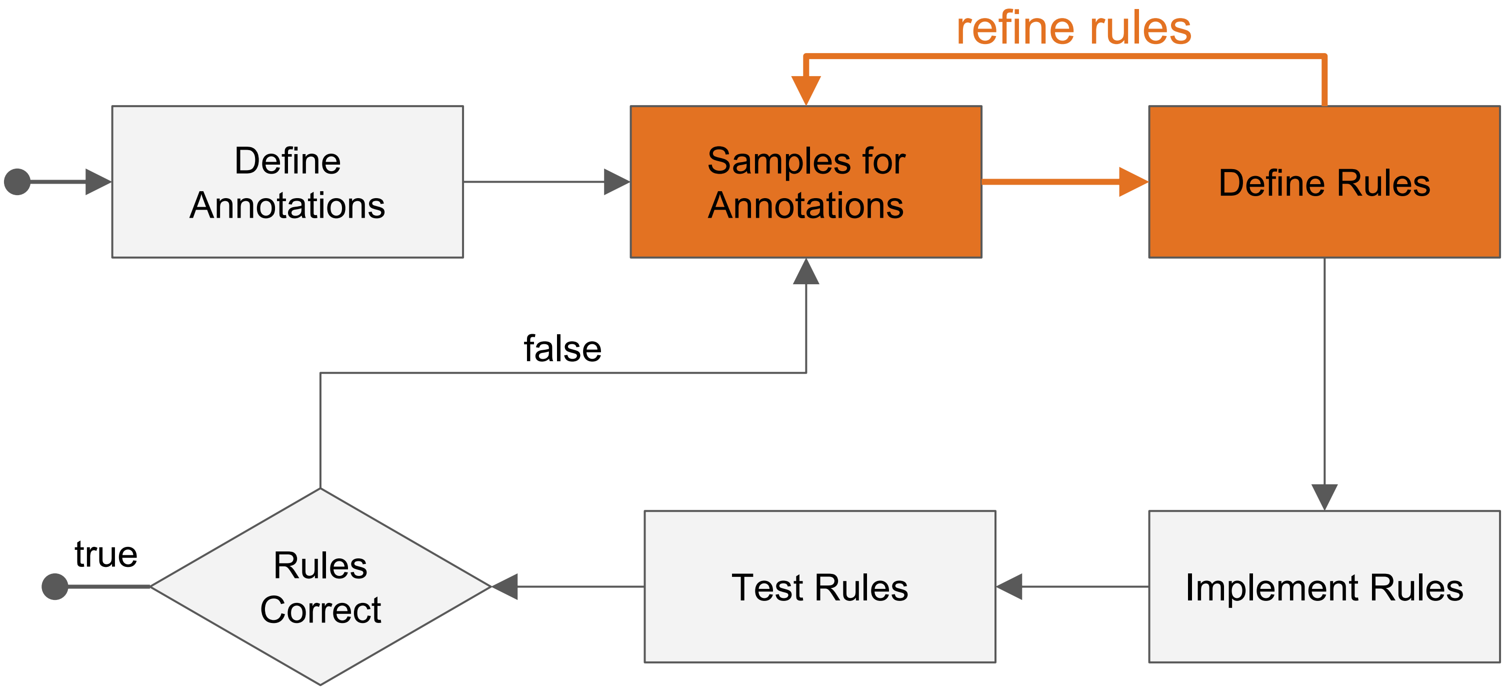
Current workflow



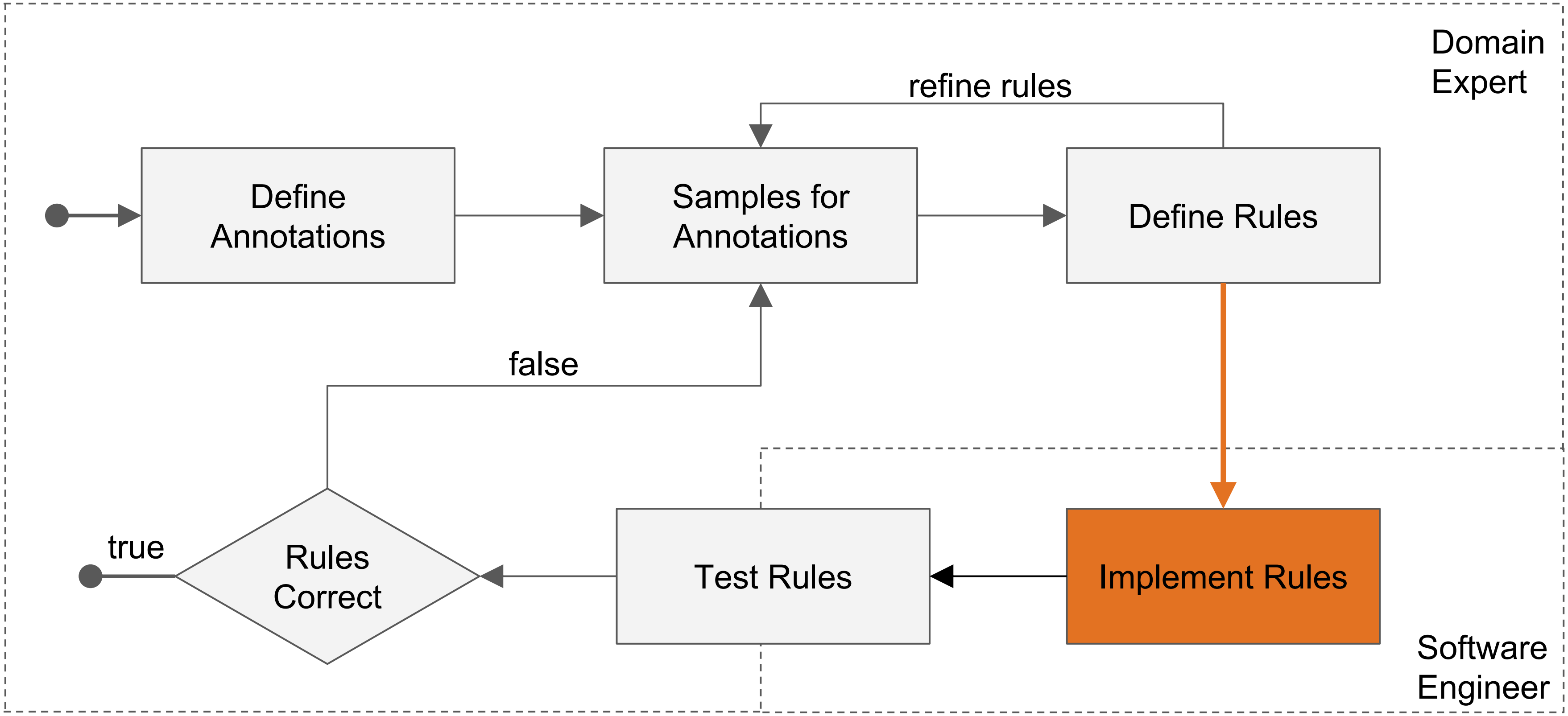
Status Quo

	GATE / JAPE IDE	UIMA / UIMA Ruta IDE
Conceptualization	X	X
Implementation	✓	✓
Testing	✓	✓
Embeddable IDE	X	X
Doesn't require technical knowledge	X	X

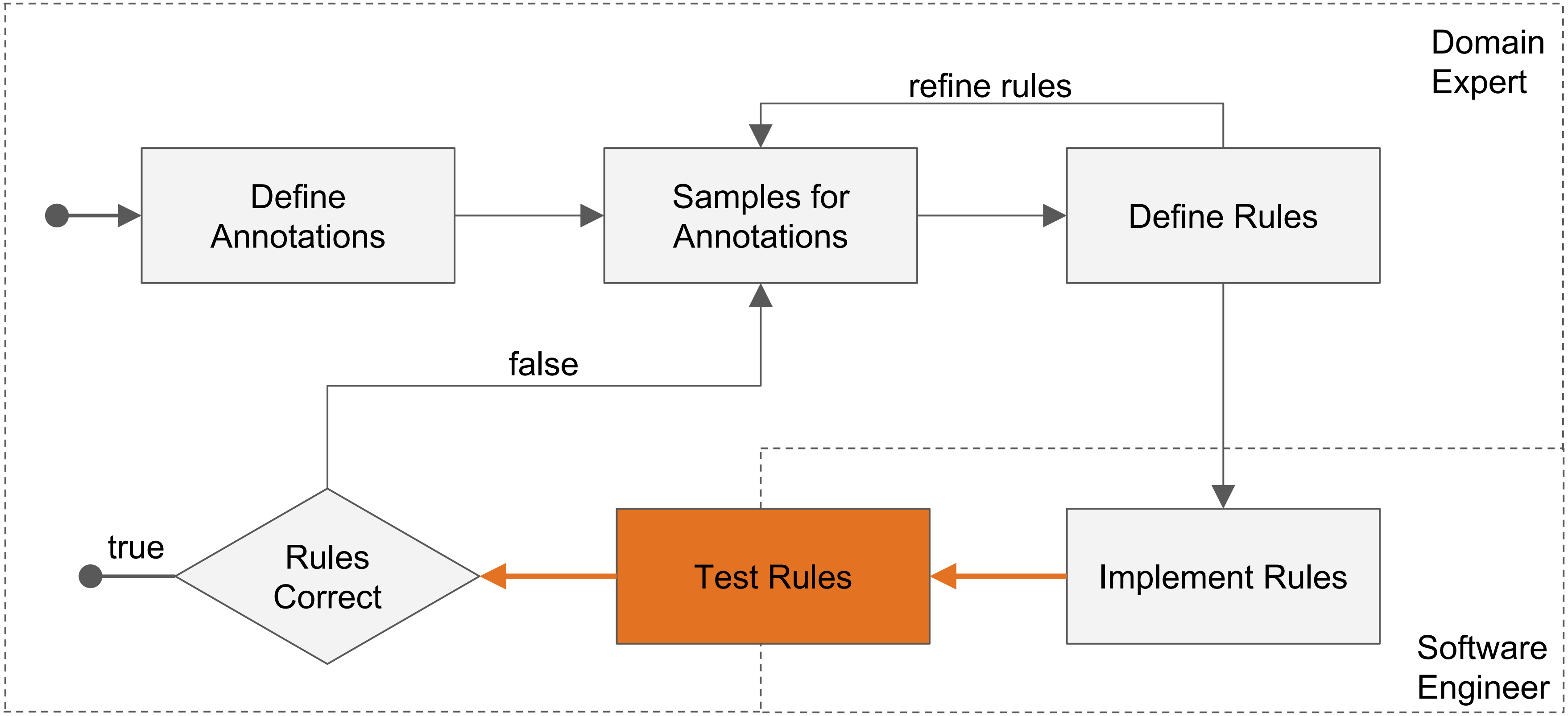
Manual Collection of Samples



Implementation Requires Communication

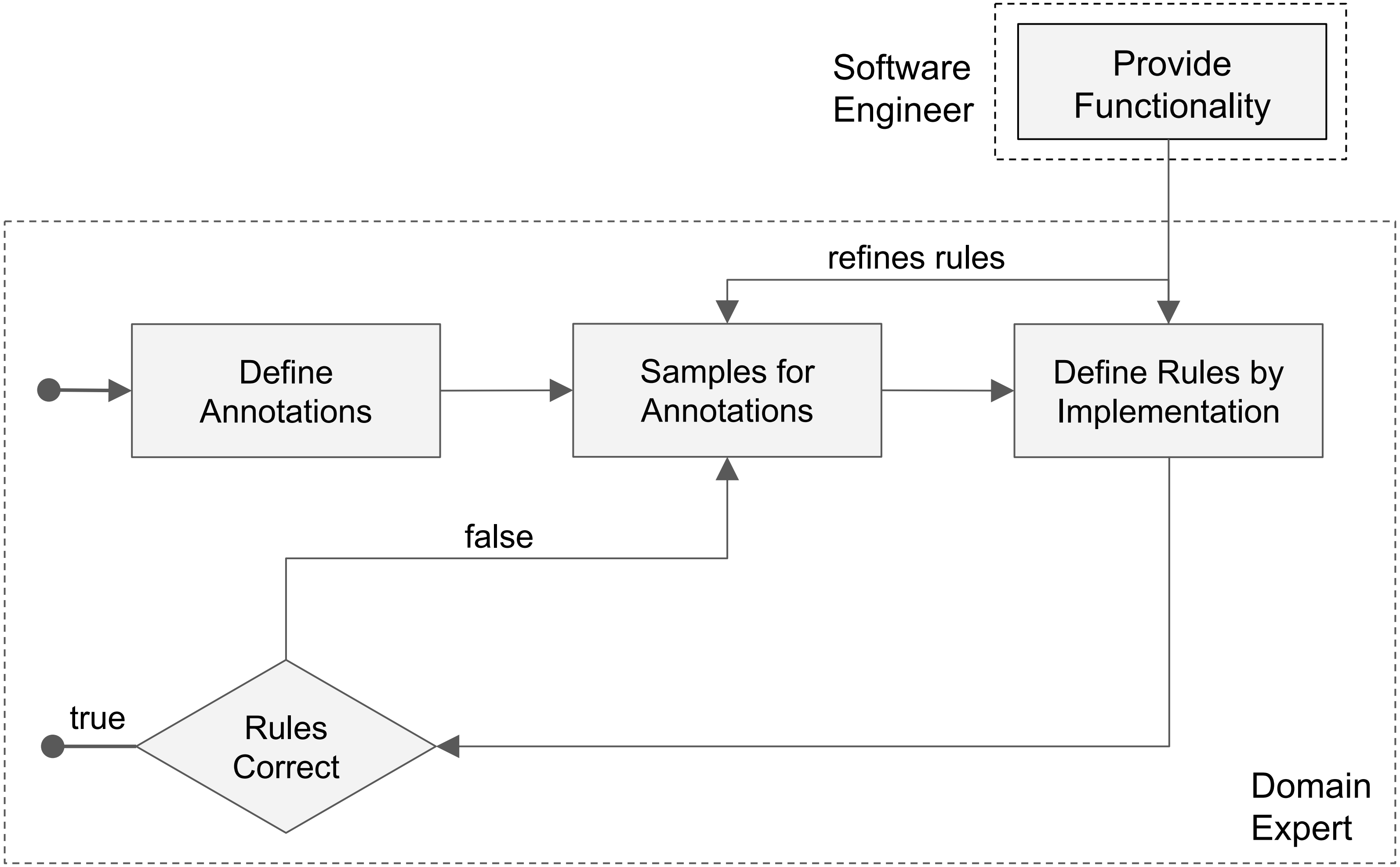


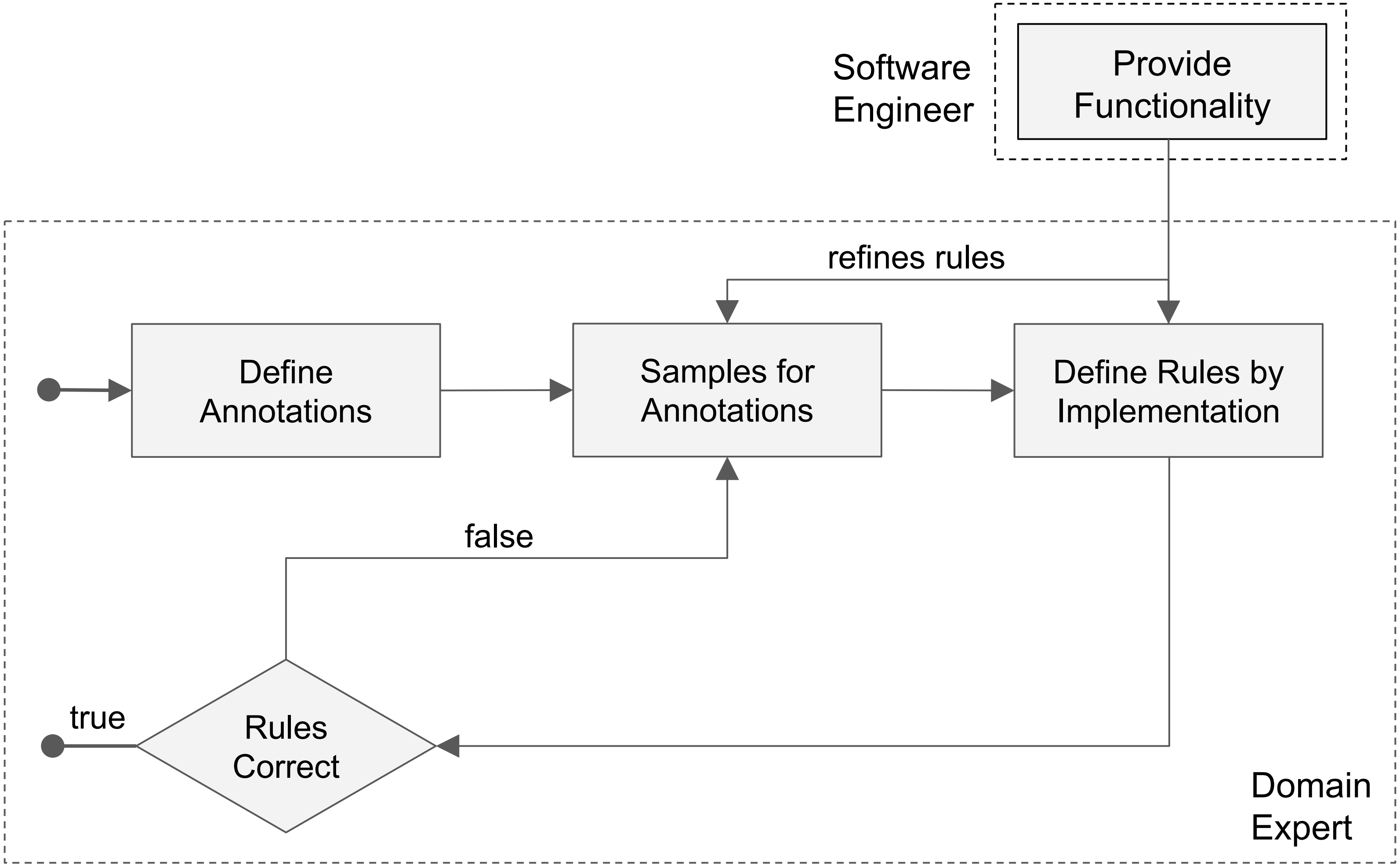
Testing Needs To Be Synchronized



Problem Statement

- Rule-based text annotation
- Current environments do not cover complete development process
- Unsuitable for non-technical domain experts
- No focus on interdisciplinary collaboration of domain experts and SE


Software Engineer
Provide Functionality
refines rules
Define Annotations
Samples for Annotations
Define Rules by Implementation
false
true
Rules Correct
Domain Expert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Solution

- Dedicated user interfaces for the conceptualization of rules
    - Sample collection by text highlighting
    - Remove immediate need for SE
- Support rule implementation
    - Different approaches to rule editors
    - Automatic rule learning
    - …
- Automate manual tasks like testing

Research Questions

- What are the concrete **phases** in rule development?
- How can we **support** this development process?
- Which **existing technologies** can be integrated?
- How can we **separate concerns**?

Questions

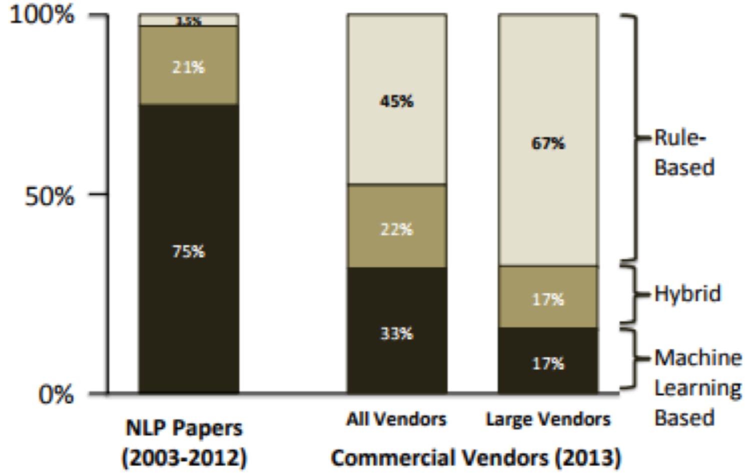
References

Figure p. 19: Chiticariu, Laura, Yunyao Li, and Frederick R. Reiss. "Rule-based information extraction is dead! long live rule-based information extraction systems!." EMNLP. No. October. 2013.

```
Phase: UrlPre
Input:  Token SpaceToken
Options: control = appelt

Rule: Urlpre

( (({Token.string == "http"} |
  {Token.string == "ftp"})
 {Token.string == ":"}
 {Token.string == "/"}
        {Token.string == "/"}
       ) |
({Token.string == "www"}
        {Token.string == "."}
       )
):urlpre
-->
:urlpre.UrlPre = {rule = "UrlPre"}
```

```
WORDLIST FirstNameList = 'FirstNames.txt';
DECLARE FirstName, FirstNameInitial, Name, NameListPart;

Document{-> MARKFAST(FirstName, FirstNameList)};

DECLARE NameLinker;
W{REGEXP("and", false) -> MARK(NameLinker)};
COMMA{ -> MARK(NameLinker)};
SPECIAL{REGEXP("&") -> MARK(NameLinker)};

CW{REGEXP(".") -> MARK(FirstNameInitial,1,2)} PERIOD;

FirstName+ FirstNameInitial* CW{-> MARK(Name, 1, 2, 3)};
FirstNameInitial+{-PARTOF(Name)} CW{-> MARK(Name, 1, 2, 3)};
CW{-PARTOF(Name), -REGEXP(".")} COMMA? FirstNameInitial+{-> MARK(Name, 1, 2, 3)};
```

Implementations of Entity Extraction


Rule-Based
Hybrid
Machine Learning Based
NLP Papers (2003-2012)
All Vendors
Large Vendors
Commercial Vendors (2013)