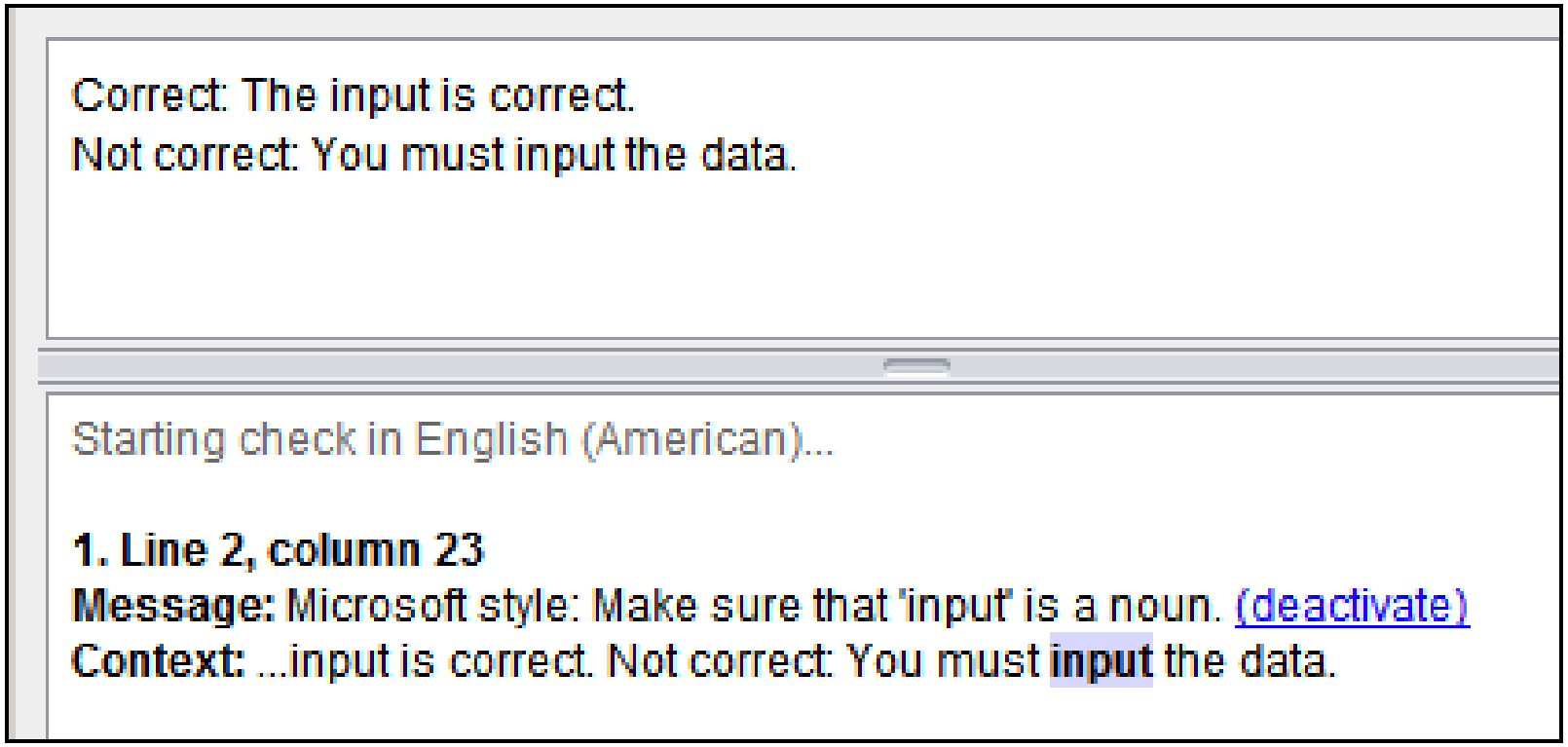
Patterns in language for POS disambiguation in a style checker



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What this presentation is about

A lookup tool is not sufficient

LanguageTool: customizable structure

Finding misused terms: structure of a grammar rule

Part of speech disambiguation:
nouns, verbs, adjectives

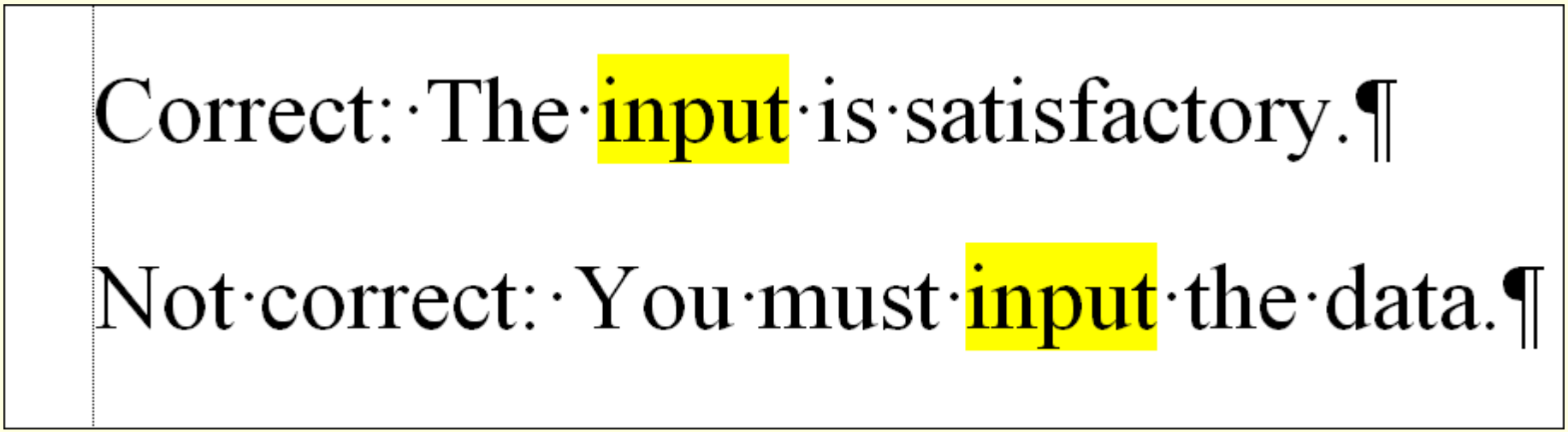
Some difficult problems

How good are the rules?

Demonstration

Questions: interrupt and at the end

A lookup tool is not sufficient



The lookup tool has limits:

- Slow (5 minutes to check a 50-page document)
- No explanation of problem
- No linguistic intelligence.

LT is open-source proofreading software

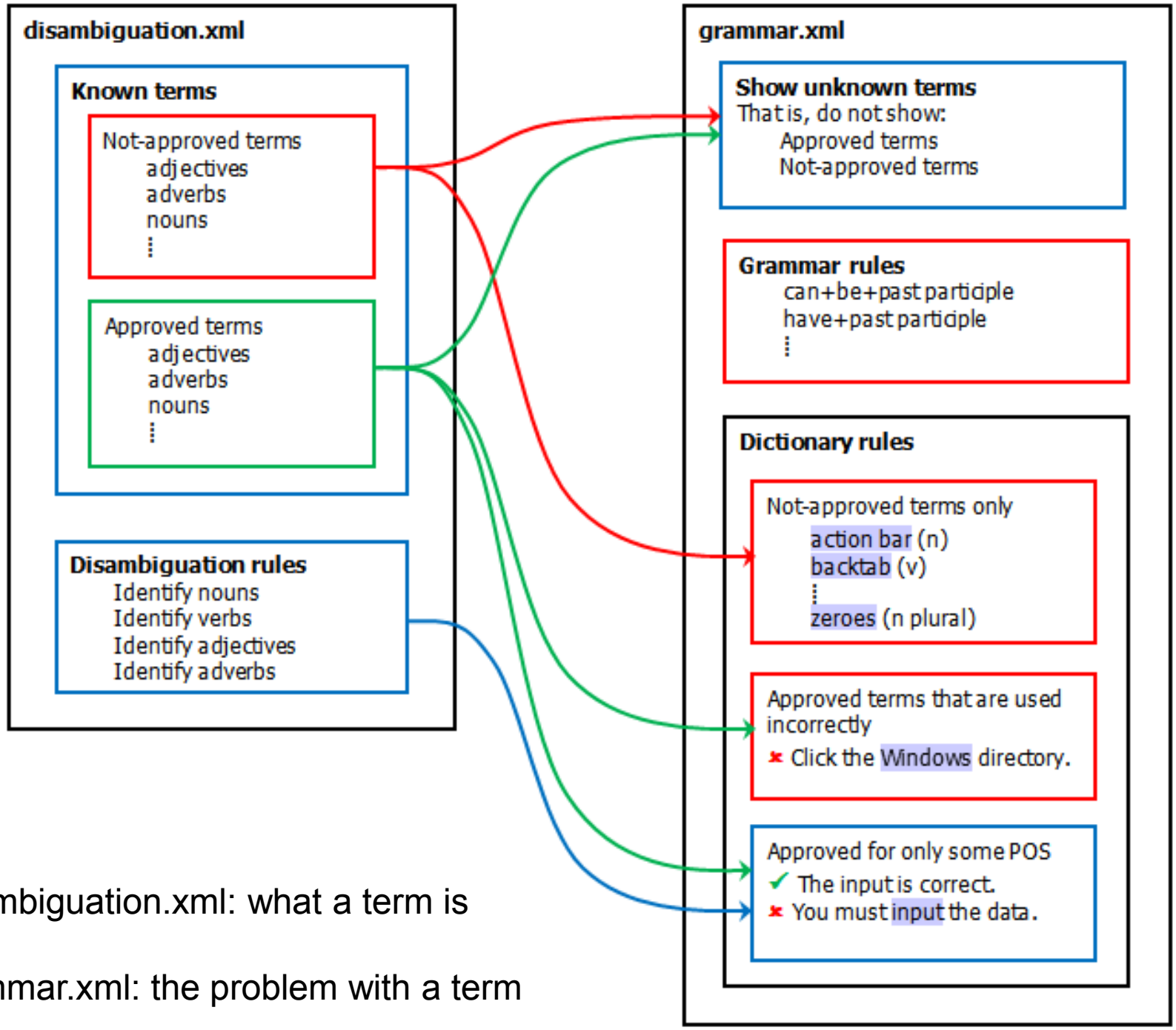
LanguageTool: www.languagetool.org.

LT is fully customizable.

LT has rules for style and for grammar.

Can embed LT into other software.

Term checker uses LT: www.simplified-english.co.uk.



Disambiguation.xml: what a term is

Grammar.xml: the problem with a term

The structure of a grammar rule

```
<rule id="MS_POS_INPUT" name="Microsoft, noun approved: input">
  <pattern>
    <token>input<exception postag="IS_NOUN"/></token>
  </pattern>
  <message>Microsoft. Make sure that '<match no="1"/>' is a noun.</message>
  <example type="incorrect"><marker>Input</marker> the data.</example>
  <example type="incorrect">If you <marker>input</marker> the data...</example>
  <example type="correct">The <marker>input</marker> was correct.</example>
</rule>
```

The alternative method is not good

1) `<token>input<exception postag="IS_NOUN"/></token>`

2) `<token postag="IS_VERB">input</token>`

Disambiguation is not 100% accurate.

Primary design decision: no false negatives.

Option 2 is not safe.

Alternative: www.acrolinx.com/checking.html.

Typical types of conflict in MMoS

Approved	Not approved	Example
verb	noun	install
noun	verb	input
adjective	verb	checked

Grammarians use language patterns to parse text.

Simple POS disambiguation for nouns (1)

In 'an + X + was', X is a noun.

Use sets of simple patterns to disambiguate.

General or specific rules:

- Specific: The X was; The X is; Some X takes
- General: MODIFIER + X + VERB

Trade-off:

- Specific: not practical
- General: need fewer rules, but sometimes get disambiguation errors.

Simple POS disambiguation for nouns (2)

Microsoft style: Use 'input' as a noun.

- ✗ You must **input** the data.

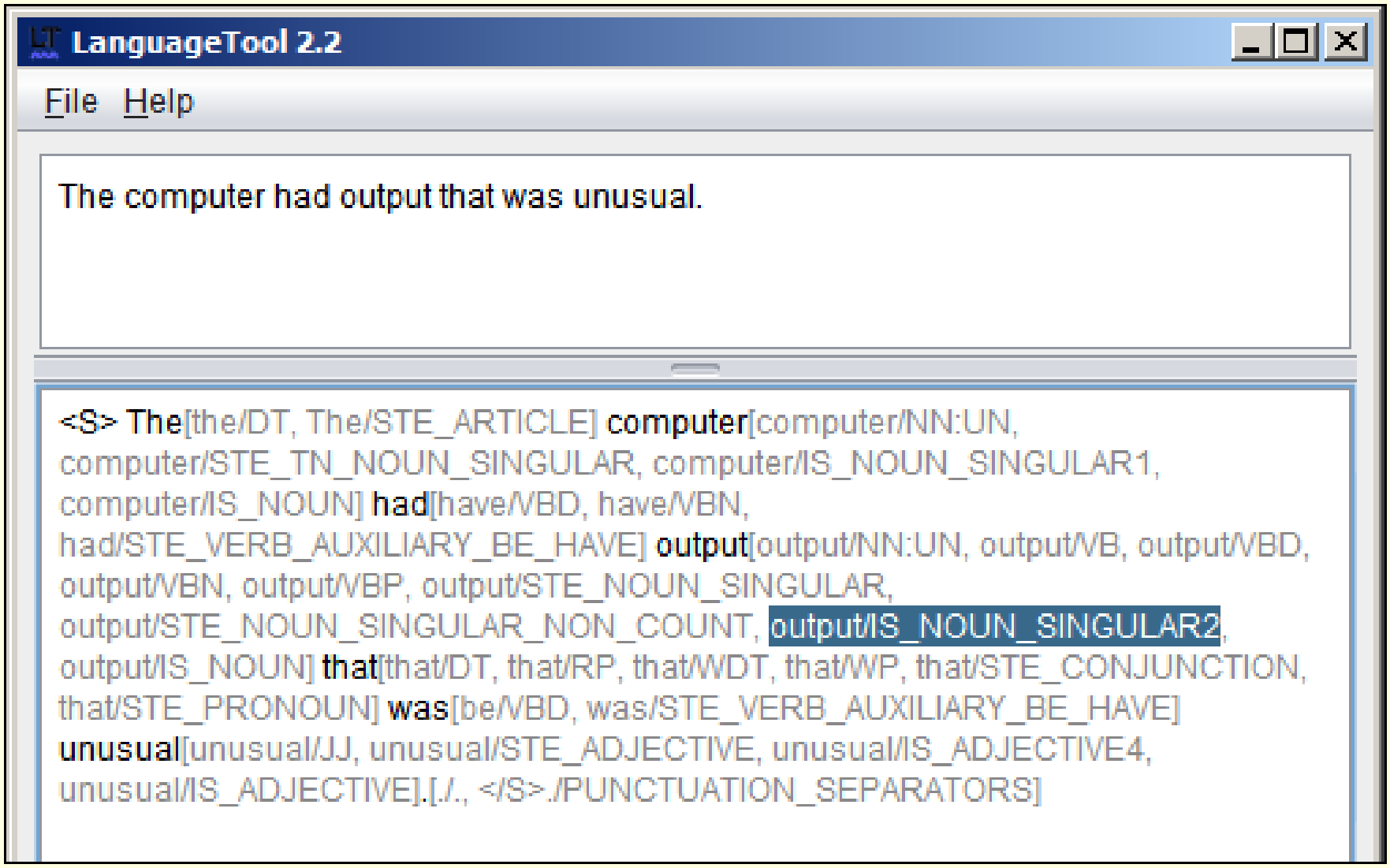
- ✓ The computer had **input** that was unusual.
- ✓ The device had **inputs** that were unusual.

Rule: HAVE + NOUN SINGULAR NON-COUNT + THAT|WHICH

Rule: HAVE + NOUN PLURAL + THAT|WHICH

Rules are in groups for nouns, adjectives, verbs.

Example of postags in LT



Simple POS disambiguation for verbs

Microsoft style: Use 'install' as a verb:

- ✘ If the **install** was a problem...
- ✓ You must **install** all the...
- ✓ You must never **install** all the...

If X can be used as a verb, then in 'must + X',
X is a verb.

General rule: MODAL AUXILIARY VERB + X.

If a counter-example exists, then 3 options:

- Re-write the rule for better disambiguation.
- Make X an exception to the rule.
- Do nothing.

Simple POS disambiguation for adjectives

Microsoft style: Use 'checked' as an adjective:

- ✘ If you **checked** the box...
- ✓ If the **checked** command is...

In 'ARTICLE + X + NOUN', X is an adjective.

A difficult problem: noun or verb?

Noun cluster: plastic bucket, fire engine, oil sample

Sub-pattern:

NOUN SINGULAR + NOUN PLURAL + END OF SENTENCE

Is the last word a noun or a verb?

• Use the metal covers.	Noun
• The device analyses the oil samples.	Noun
• The alarm covers.	Noun
• The alarm sounds.	Ambiguous
• The oil system leaks.	Ambiguous
• The electrical equipment sparks.	Ambiguous

What pattern identifies the nouns?

A difficult problem: noun or verb?

For the previous sub-pattern, if a word can be both a noun and a verb AND

- If the verb is transitive only, the word is a noun.
- If the verb is intransitive, the POS is ambiguous.

Transitive = has an object:

The metal covers the hole.

Intransitive = does not have an object:

She laughs.

Some verbs are both transitive and intransitive:

- Transitive: The heat melted the snow.
- Intransitive: The snow melted.

Some text is always ambiguous

Microsoft style avoids the passive voice.

- ✘ The wire **was disconnected** by the technician.
- ✘ The wire **was disconnected** quickly.
- ? The wire **was disconnected**.
  - Passive voice?
  - Adjective *disconnected* describes the wire? (Compare, "The wire was **dirty**.")

Real-world knowledge:

- The water **was drunk**. (Passive voice)
- The waiter was **drunk**. (Adjective)

How good are the rules?

Context is important:

- Winemaker: **The must** is contaminated.
- Informal: Warm clothes are **a must** in cold weather.

Term checker:

- Approximately 150 sentences a second
- Approximately 6% false positives for STE rules.

Demonstration: Microsoft examples.

Questions

Questions?

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