LANGUAGE OF LANGUAGES

www.languageoflanguages.org

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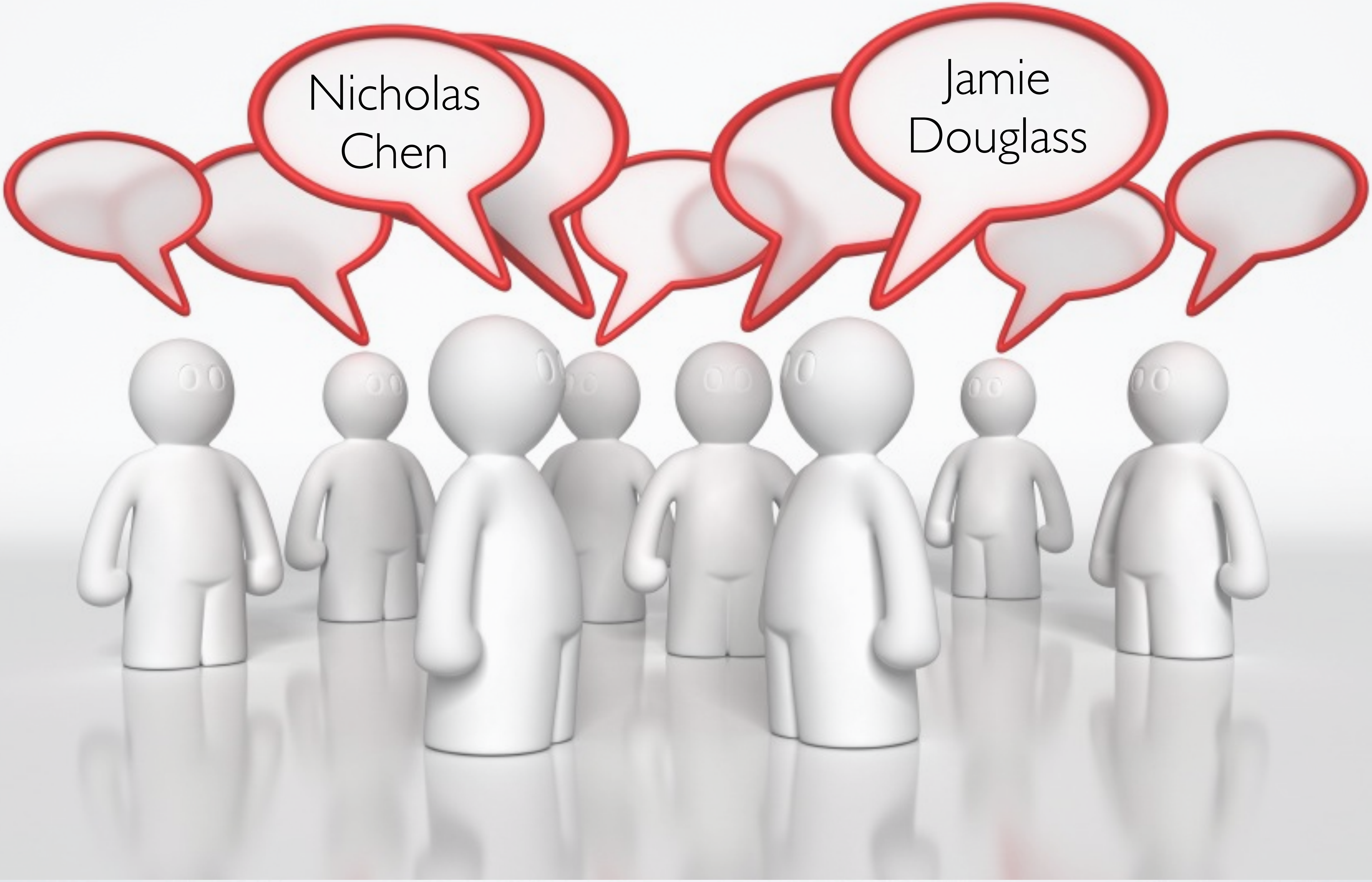

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Fortran

Lisp

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Lisp

Cobol

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Lua
PHP
FSharp
Scala
Java
Groovy
Javascript
CSharp
Prolog
Haskell
Fortran
Perl
Octave
Bash
Go
Clojure
Lisp
Python
Ruby
C++
Objective-C
JRuby
Nasm
Erlang
Jython
Ocaml
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LANGUAGES TYPICALLY USED

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Models

Matlab	Modelica
Simulink	...

LANGUAGES TYPICALLY USED

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Simulink	...

Architecture	
AADL	SysML
UML	...

LANGUAGES TYPICALLY USED

Models		Architecture		Software	
Matlab	Modelica	AADL	SysML	C/C++	Fortran
Simulink	...	UML	...	Java	...

LANGUAGES TYPICALLY USED

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Matlab	Modelica
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SPECIALIZED DOMAINS

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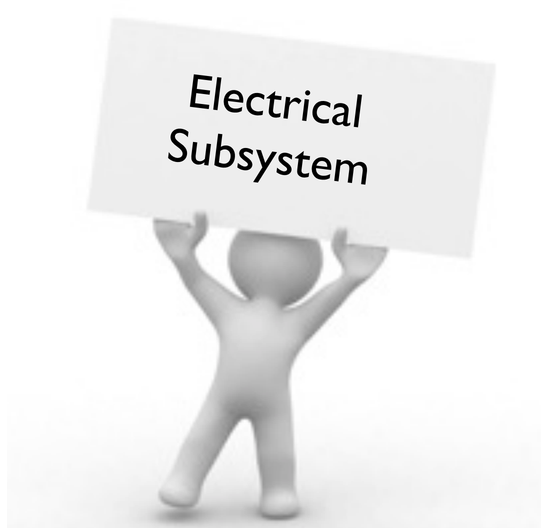

SPECIALIZED DOMAINS

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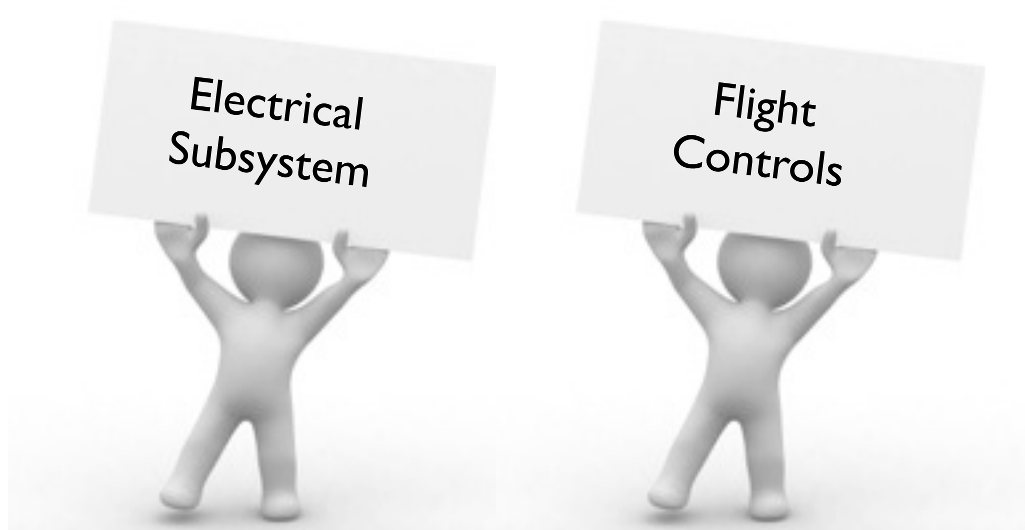

SPECIALIZED DOMAINS

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EXAMPLE MODEL

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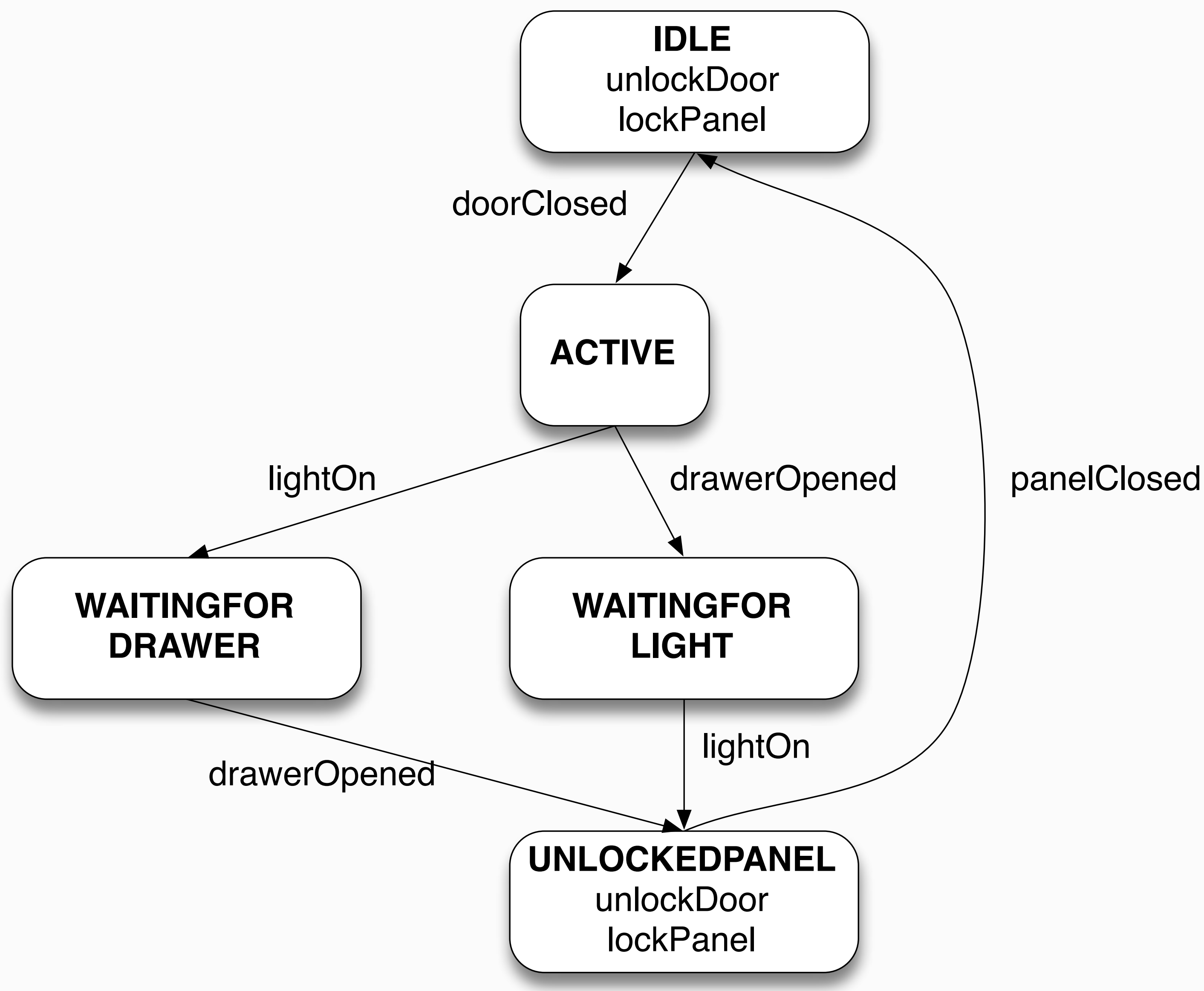

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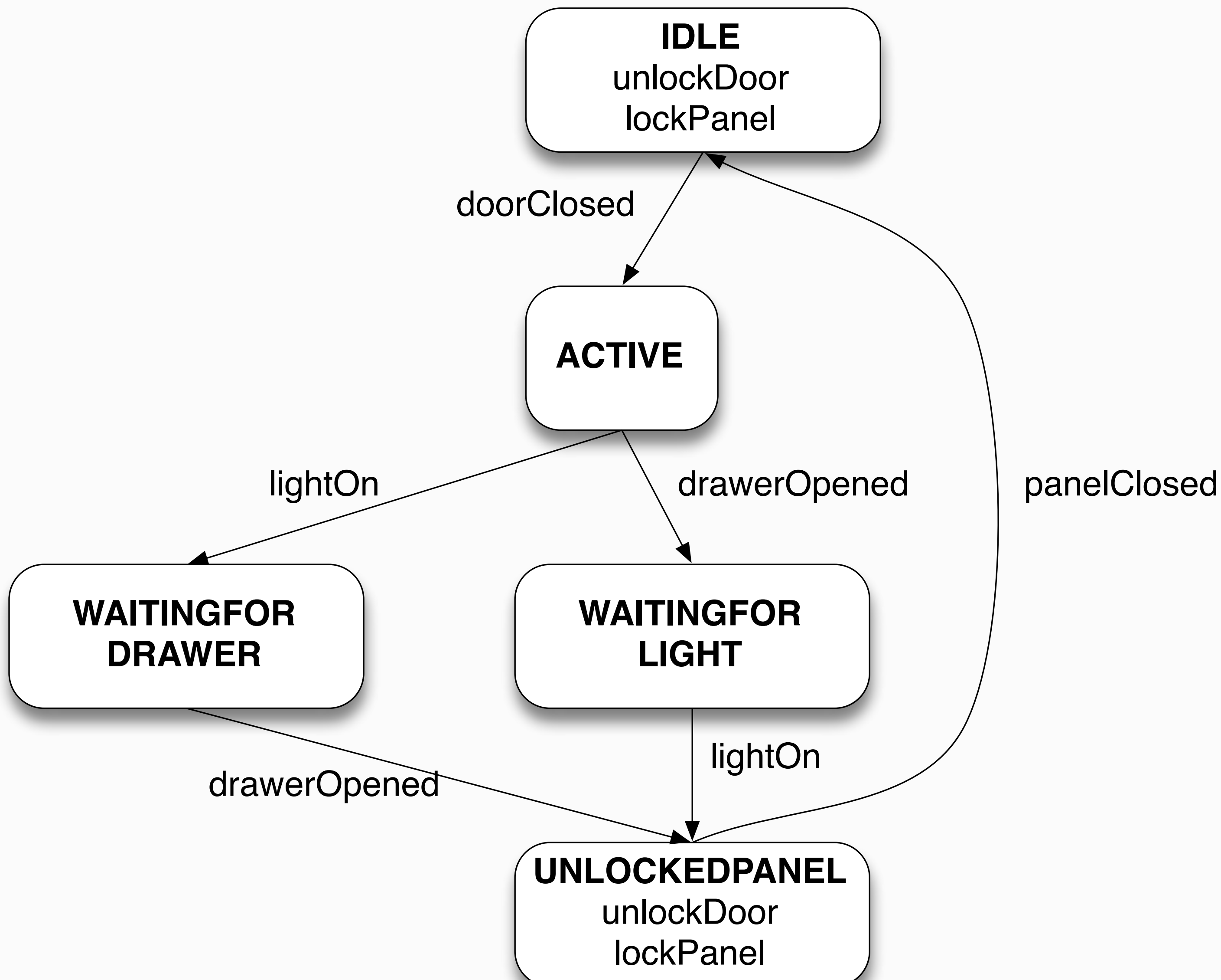
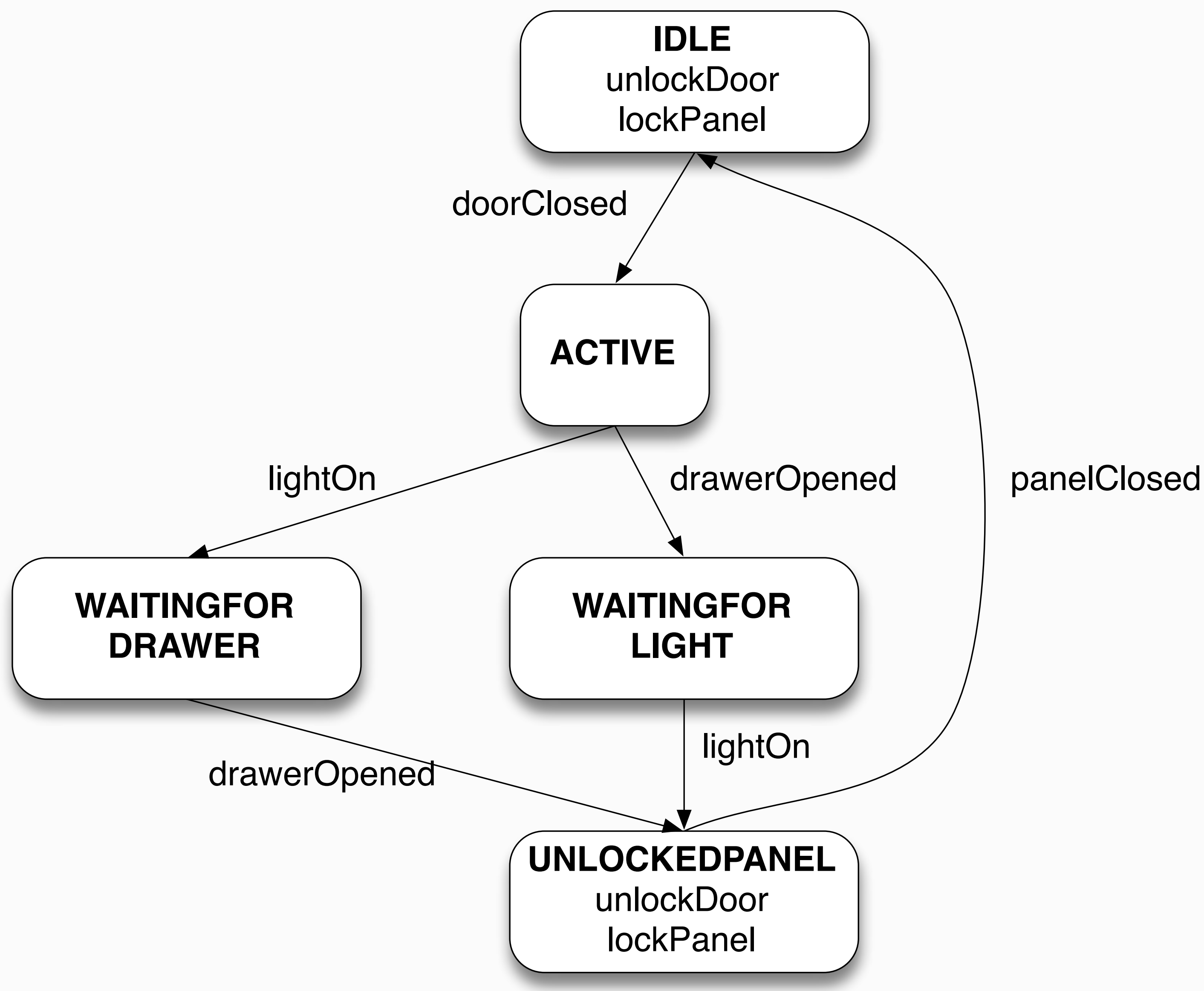


FOR THE PROGRAMMER



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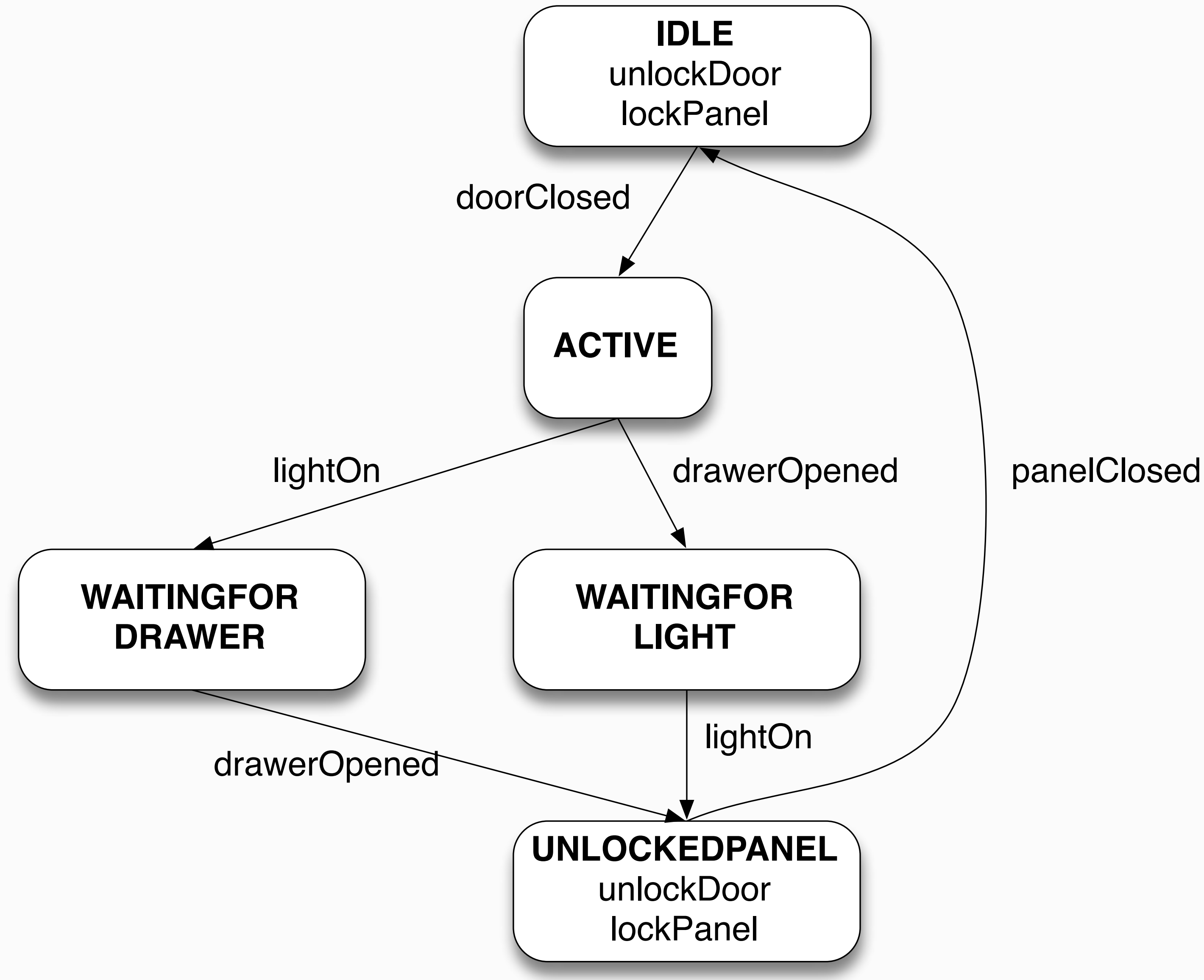

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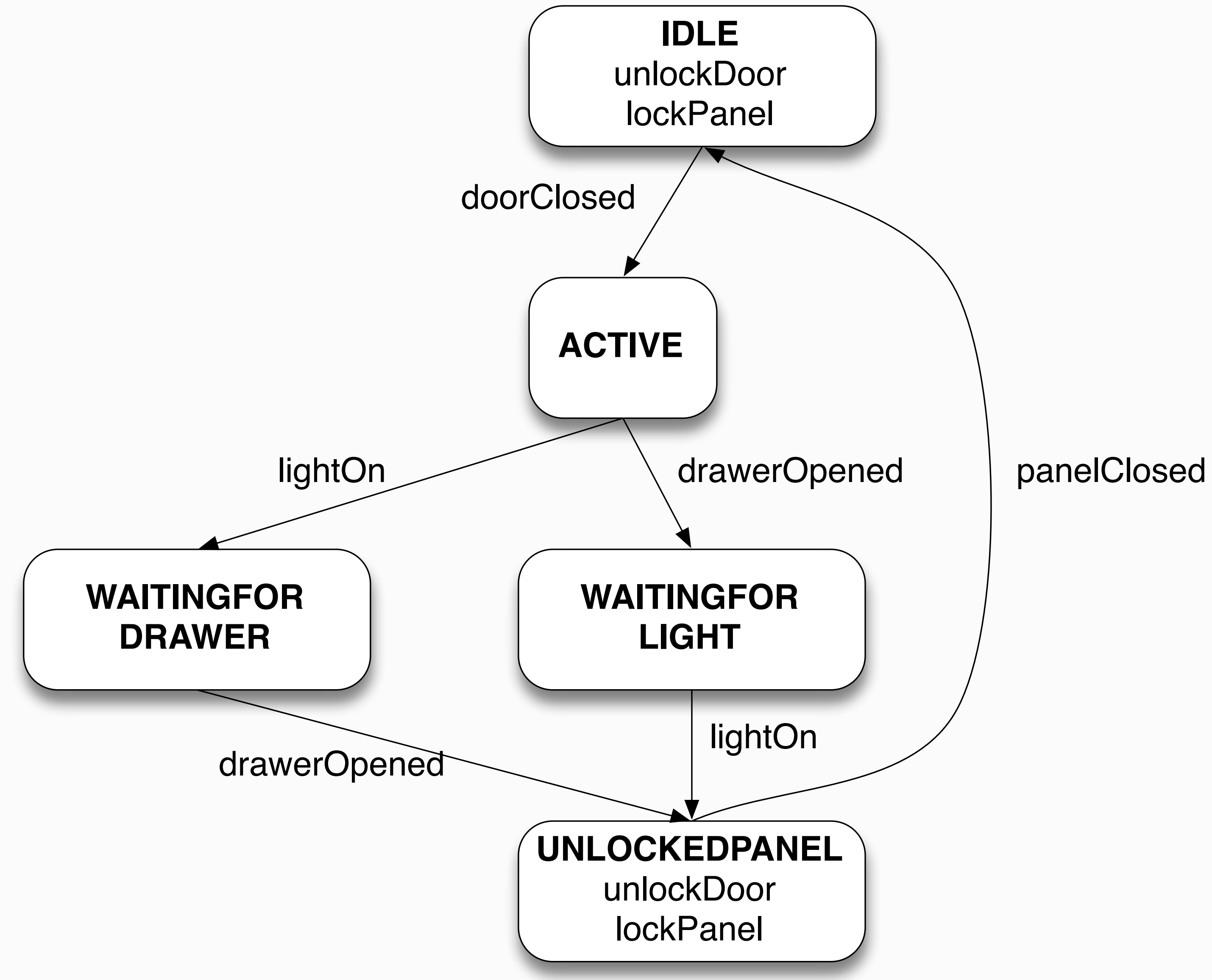

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commands
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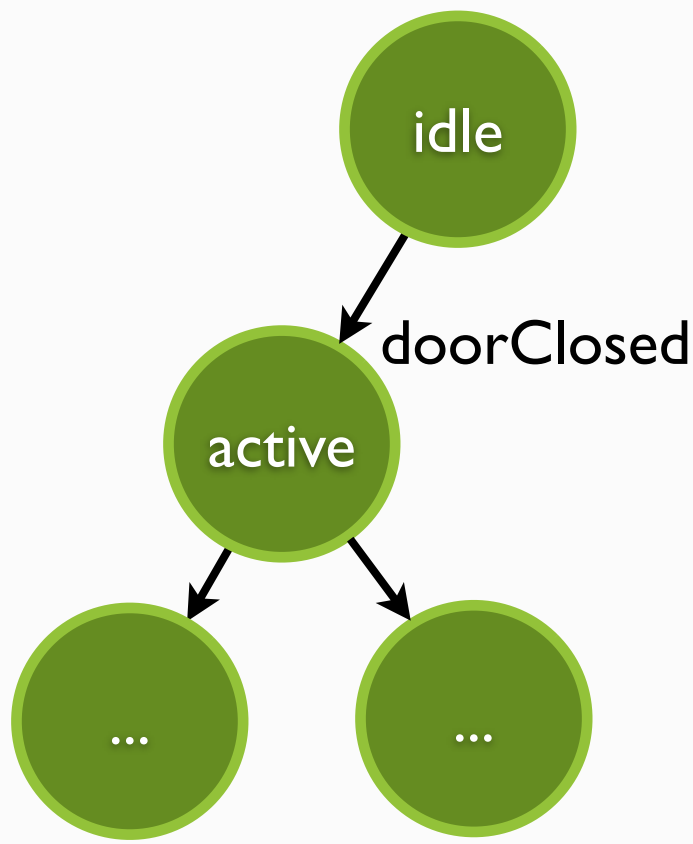


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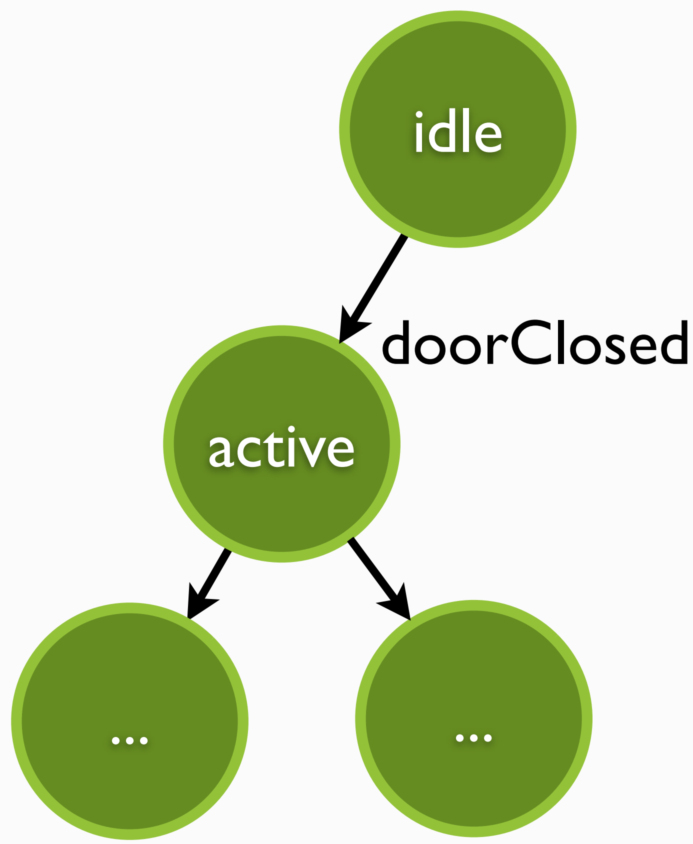


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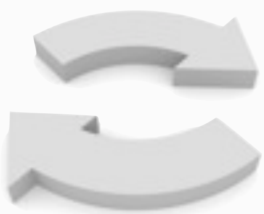

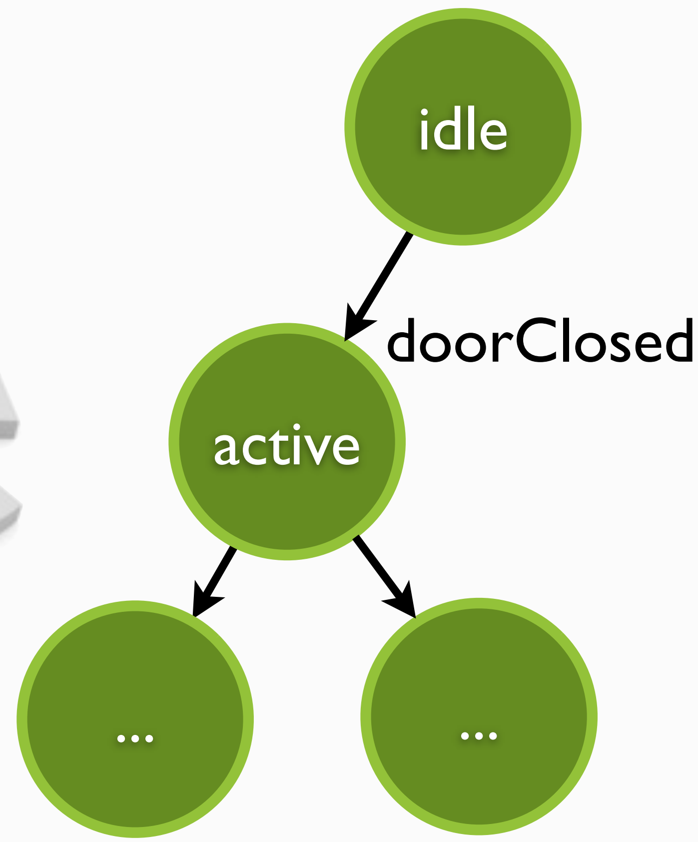


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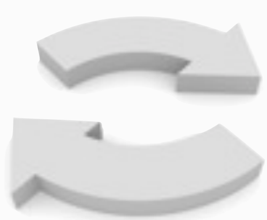

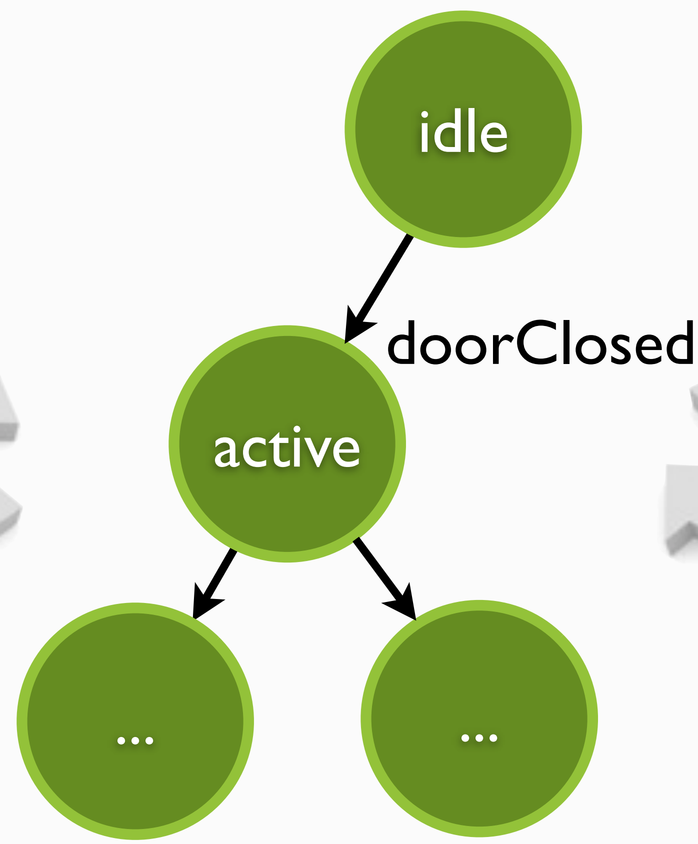

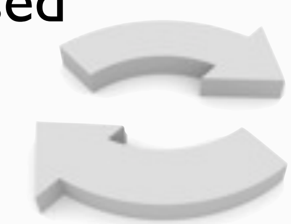

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LANGUAGE OF LANGUAGES

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Experimental language workbench that *embraces* the use of multiple notations (textual and graphical)

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Experimental language workbench that *embraces* the use of multiple notations (textual and graphical) *for flexible development*

LANGUAGE OF LANGUAGES

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Language Workbench: IDE for *convenient* language experimentation (creating, editing, translating)

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Language Workbench: IDE for *convenient* language experimentation (creating, editing, translating)

ROADMAP

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- Support a mix of textual and graphical languages.
- Support parsing as well as projecting
- Minimal paradigm with Language Elements, Concepts, Language Definitions.
- Support for outline, syntax coloring, code completion, etc
- Support for language debugging
- Web based app (like lively kernel)
- Community repository of Concepts for *plug-n-play*
- Fine-grained version control based on concepts
- Meta-circularity: LoLs is implemented in LoLs

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SMALL TASTE

SMALL TASTE

SMALL TASTE

- Calculation

SMALL TASTE

- Calculation
- Western Math

SMALL TASTE

- Calculation
- Western Math
- Roman Numerals

SMALL TASTE

- Calculation
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- Roman Numerals
- Stack Machine

HOW IT WORKS

Concepts

CALCULATOR EXAMPLE

$$3 + 4$$

CALCULATOR EXAMPLE

❶ Numbers

$$3 + 4$$

CALCULATOR EXAMPLE

❶ Numbers
❷ Addition

$$3 + 4$$

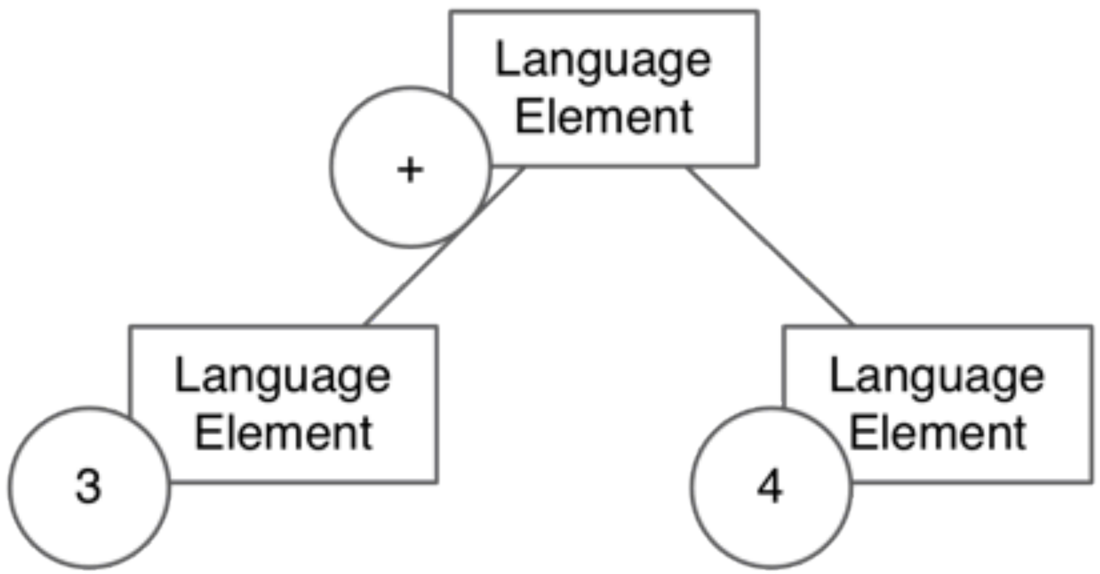
$$3 + 4$$

3 + 4

Parse!

TREE REPRESENTATION

Language Element Tree (LET)



TREE REPRESENTATION

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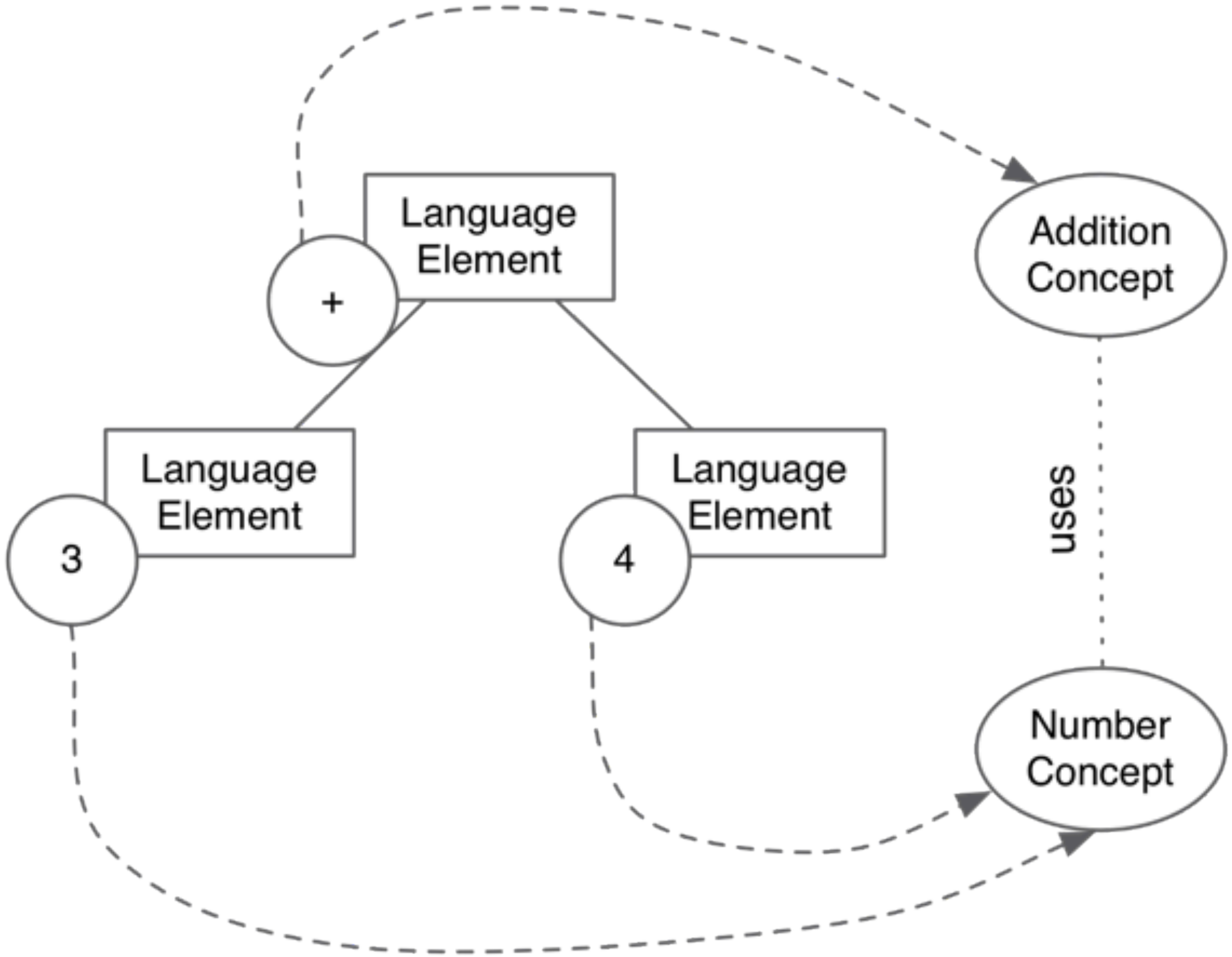
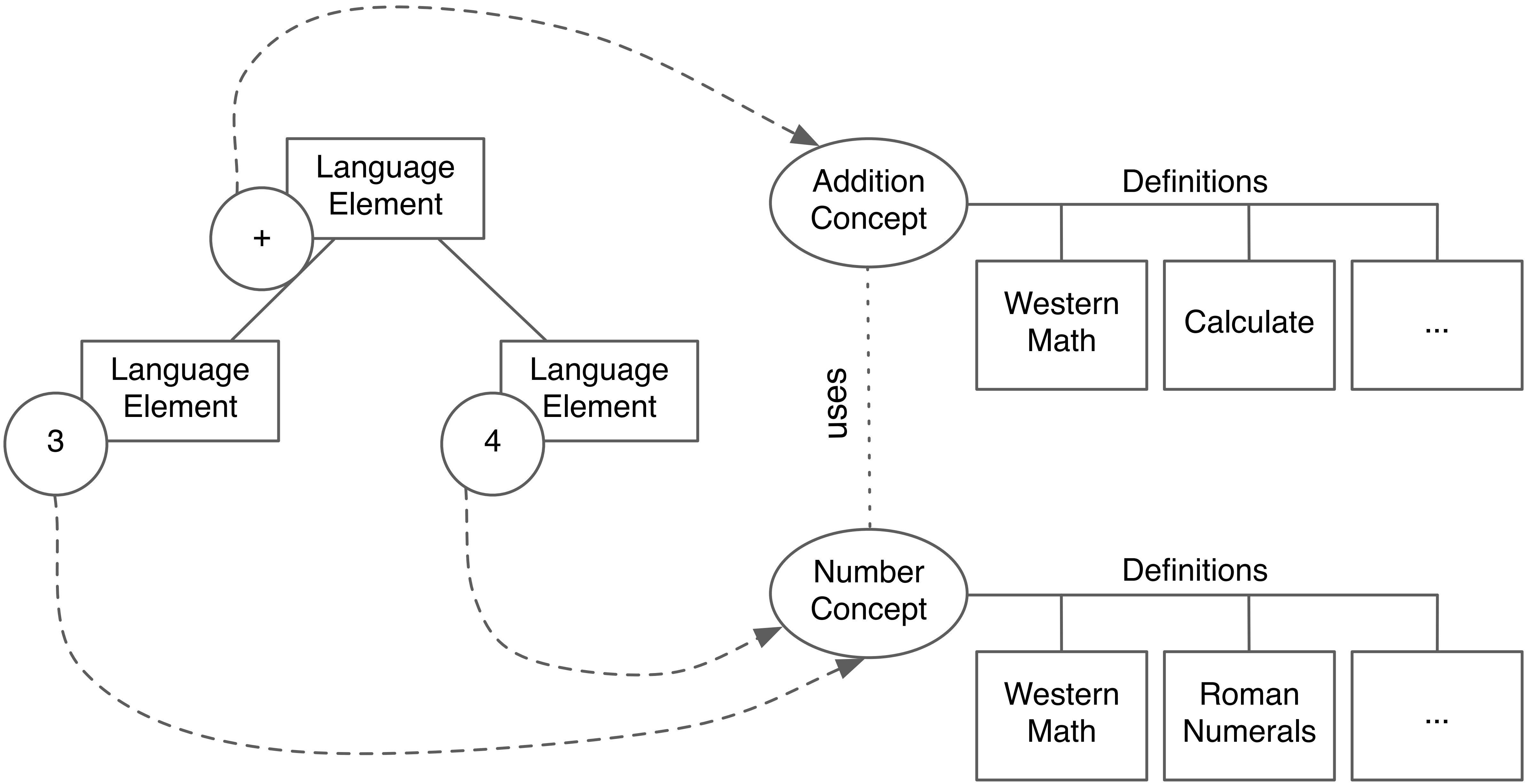
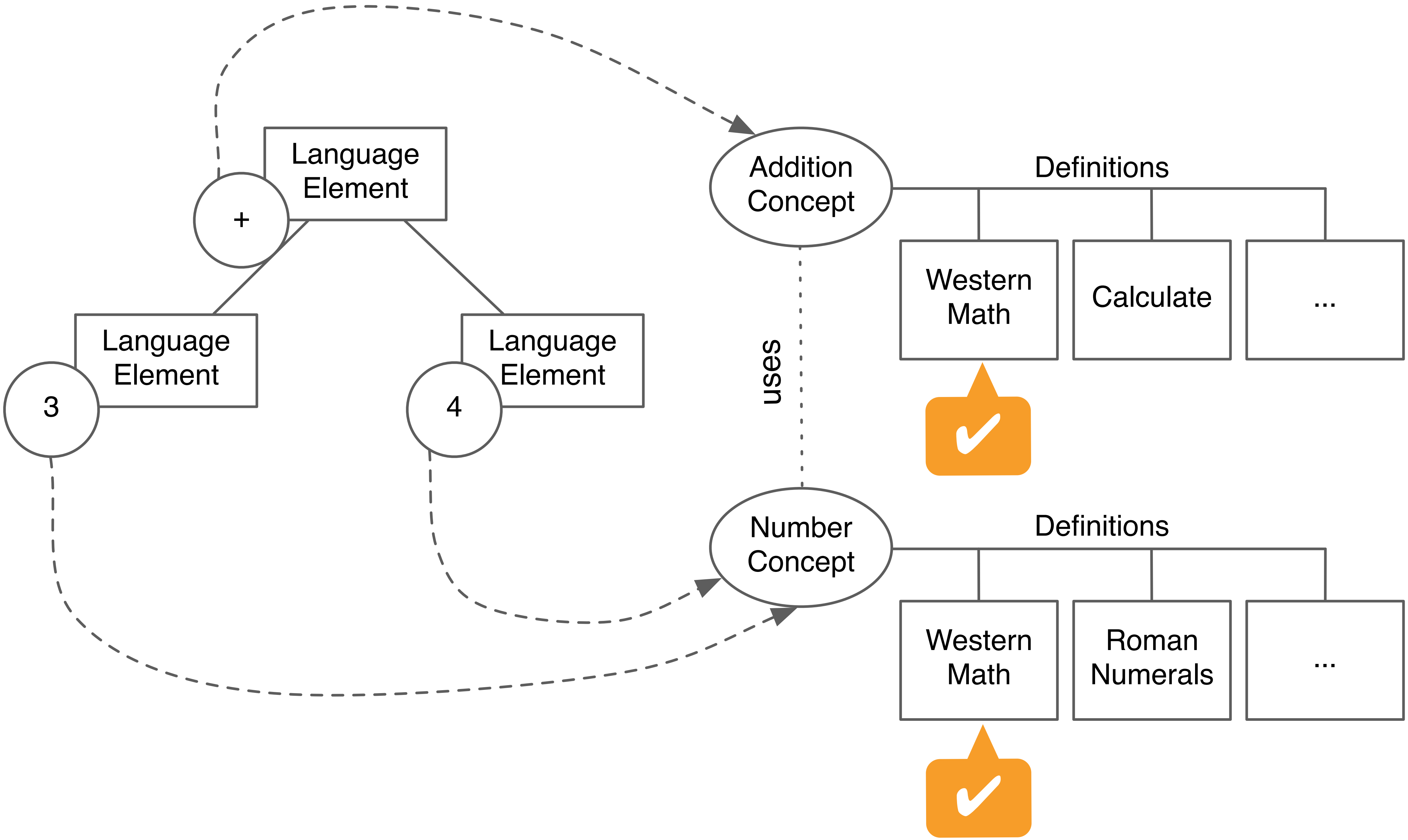


ATTACH CONCEPTS



ATTACH DEFINITIONS



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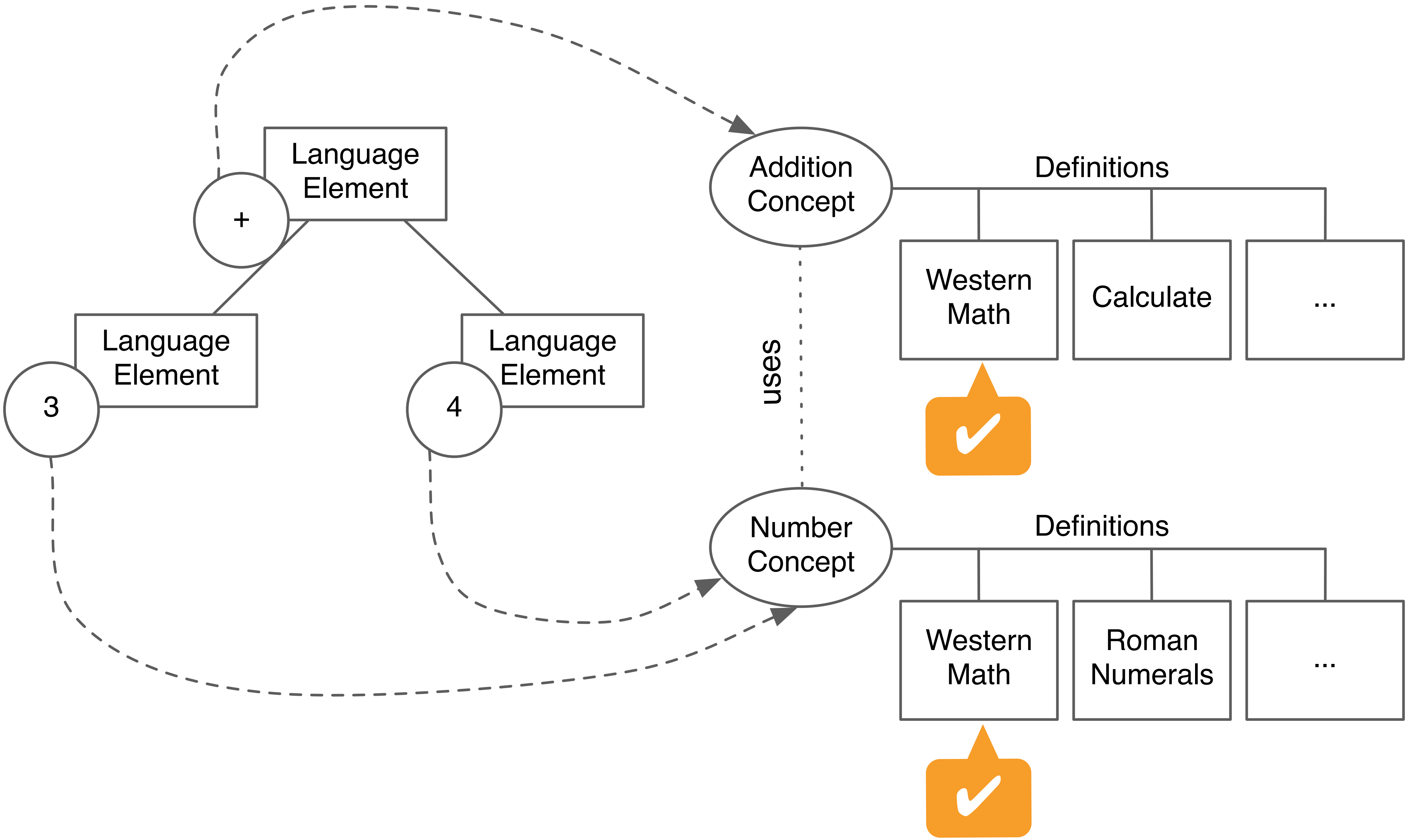
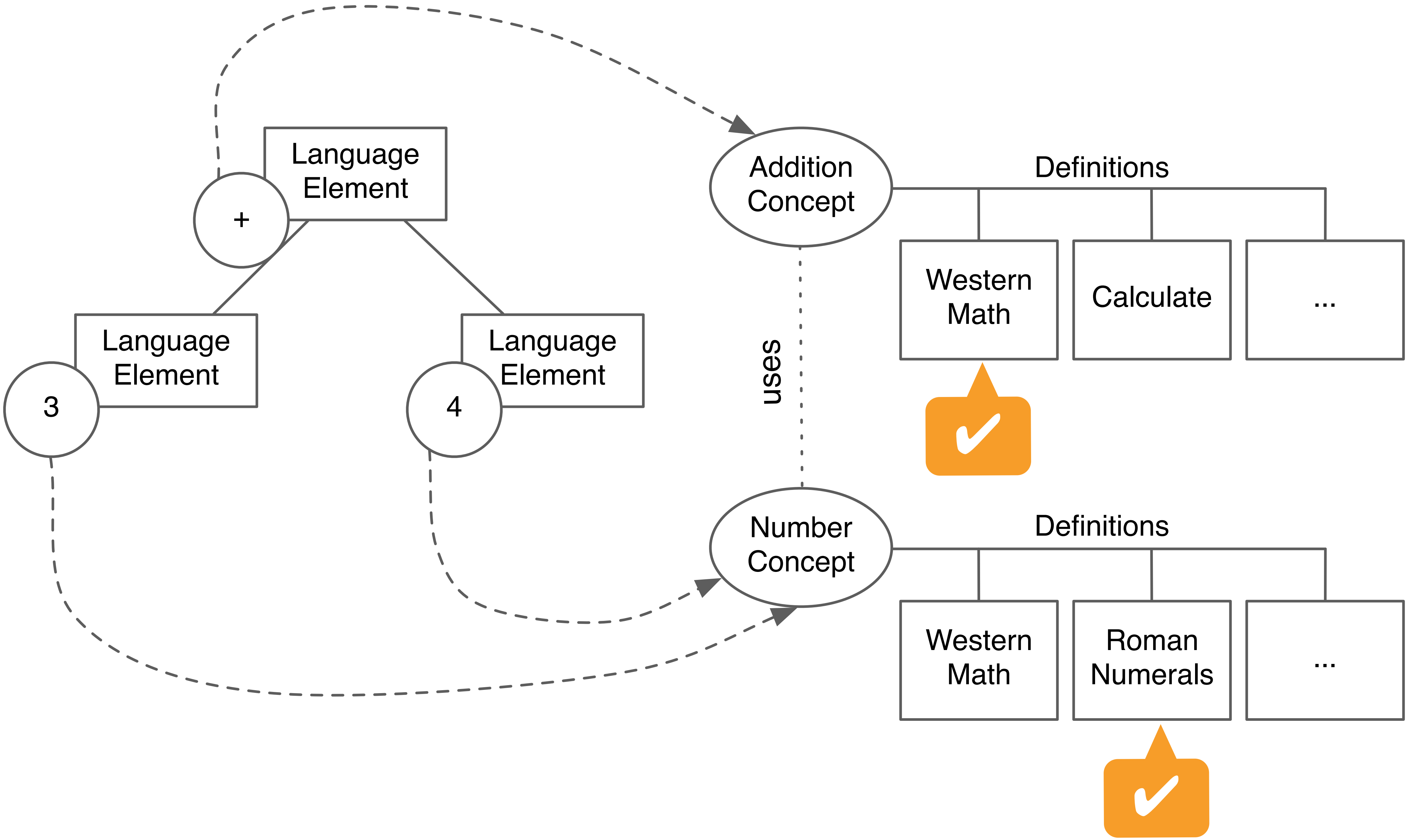


SWITCH DEFINITIONS



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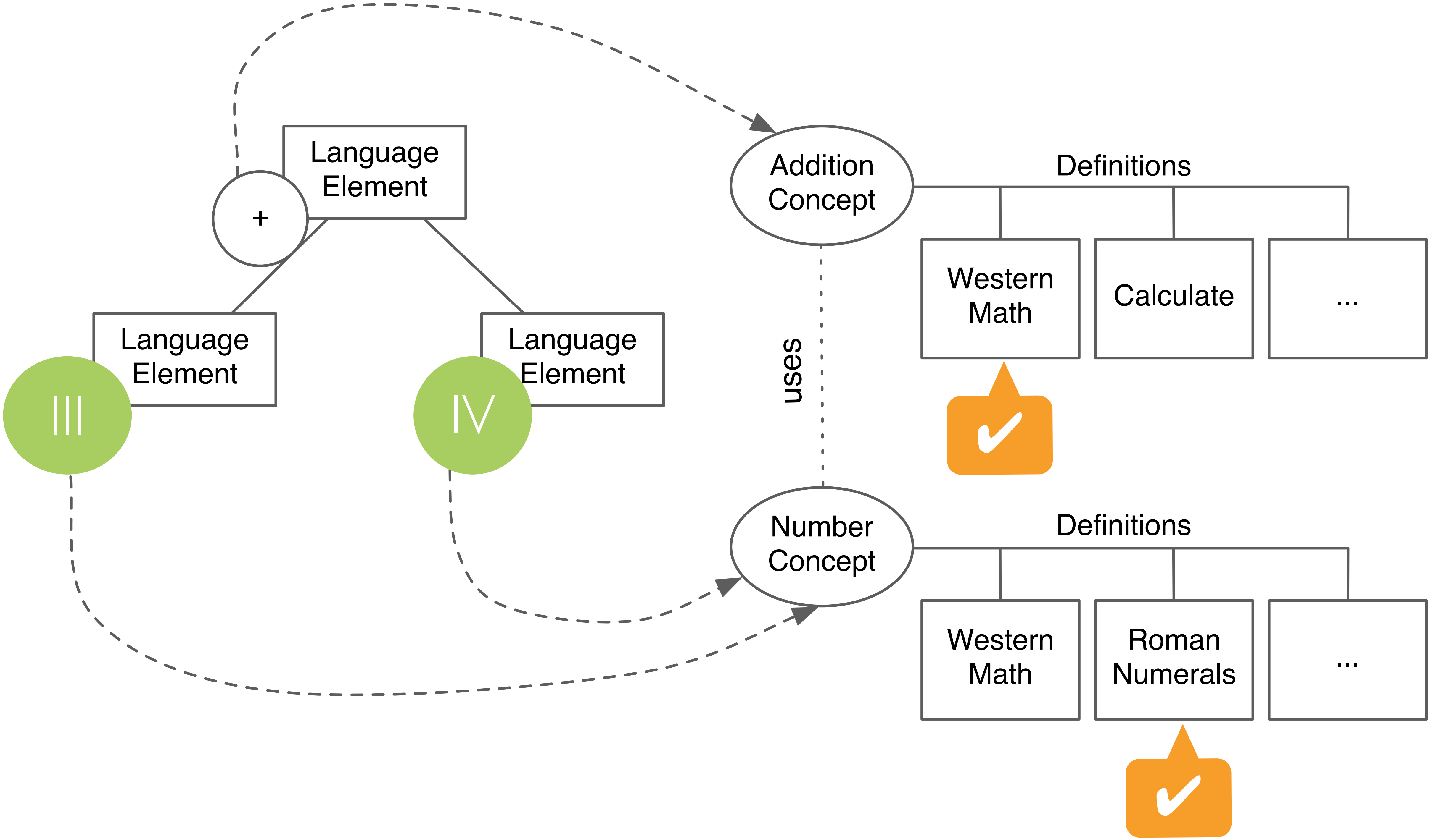

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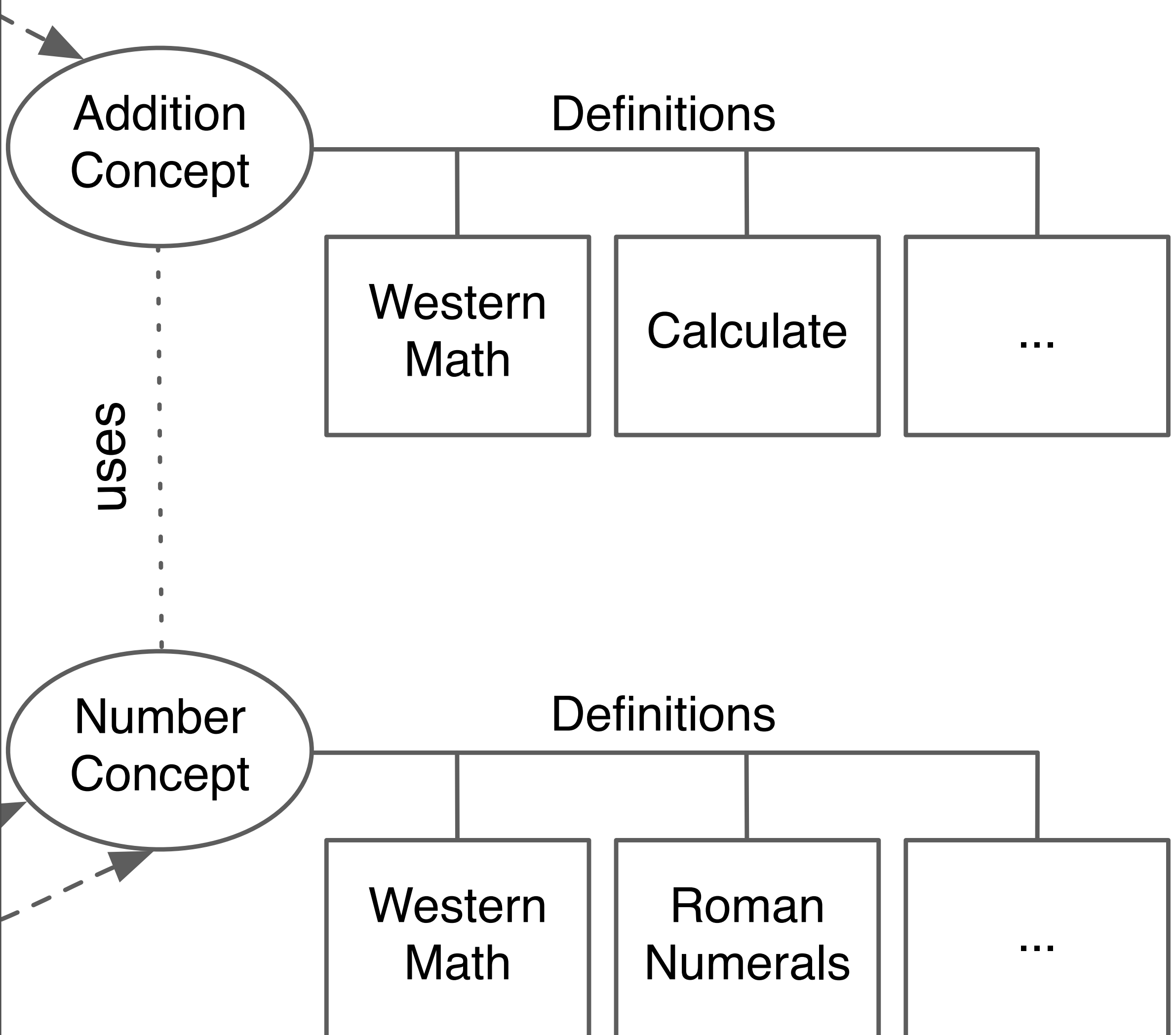
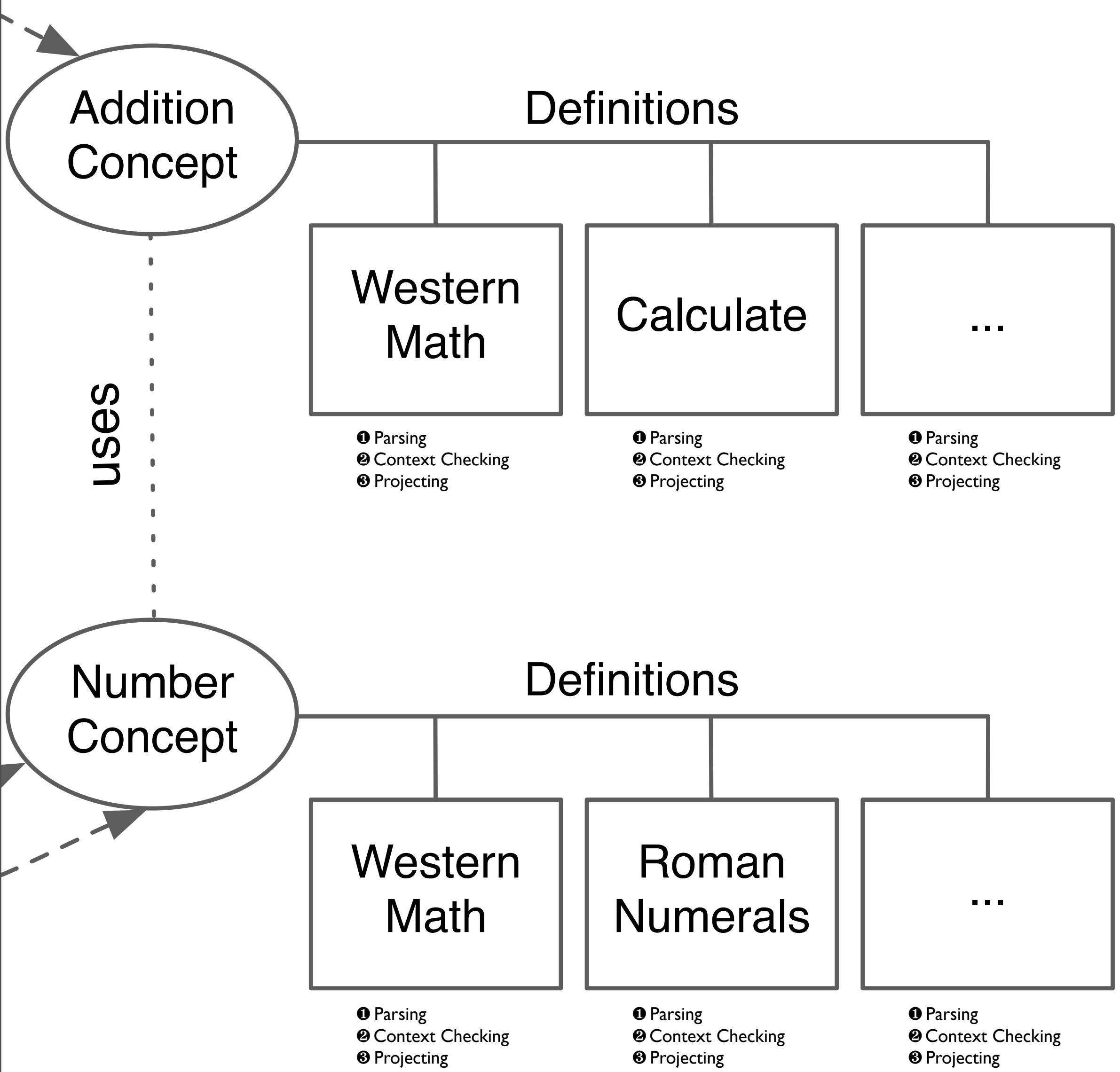
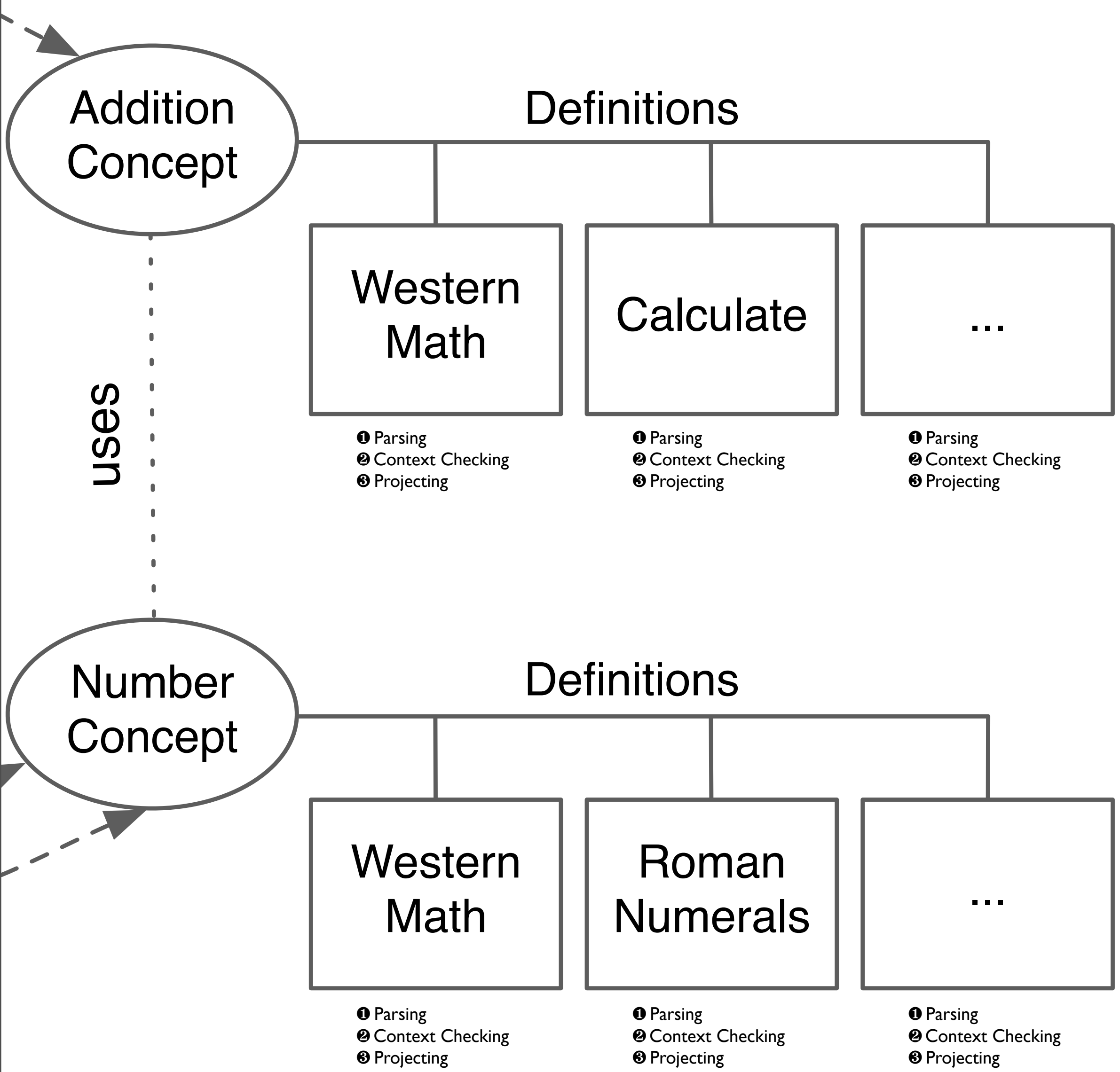


LANGUAGE DEFINITIONS



LANGUAGE DEFINITIONS

❶Parsing
❷Context Checking
❸Projecting



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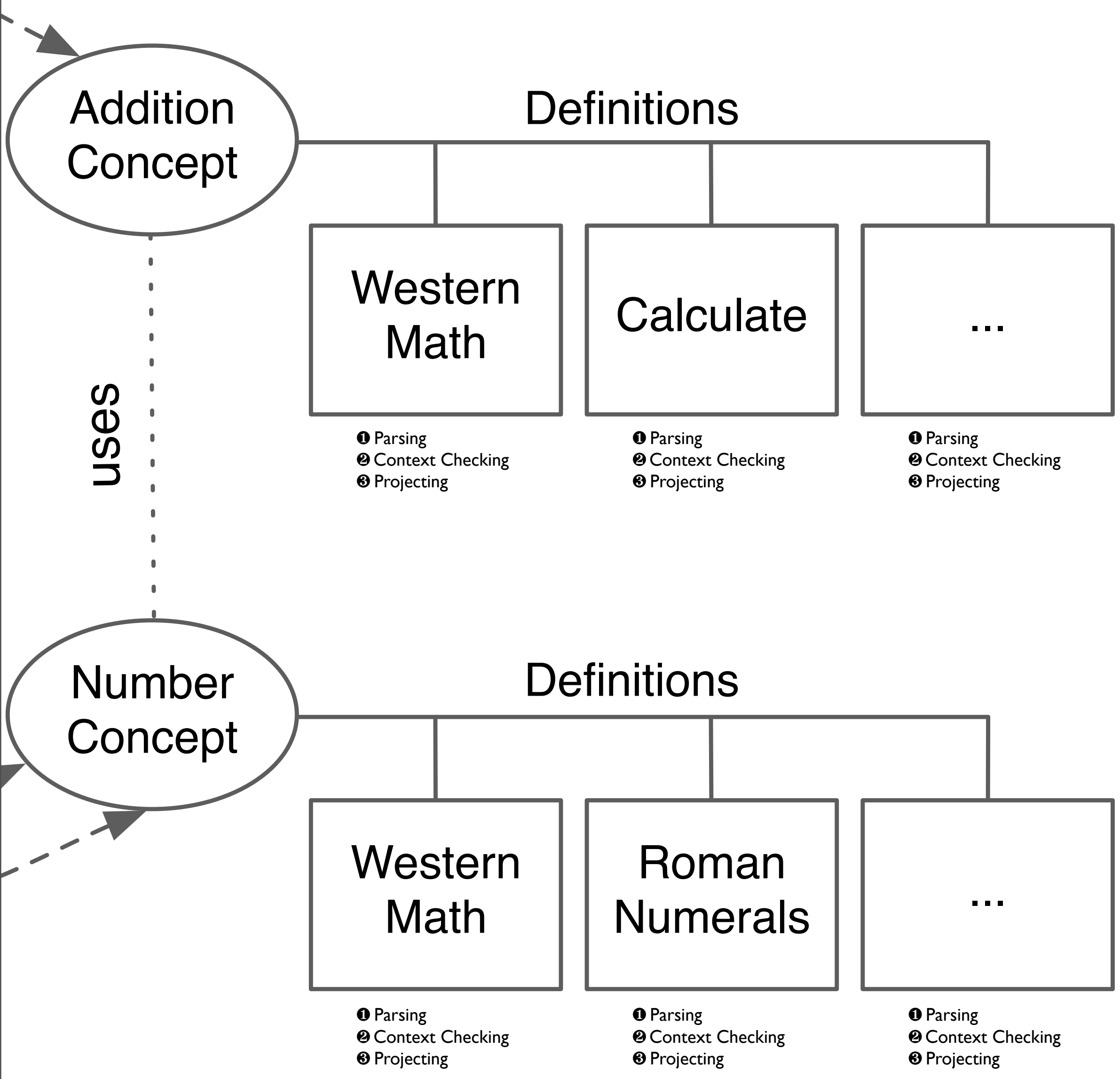

3+4

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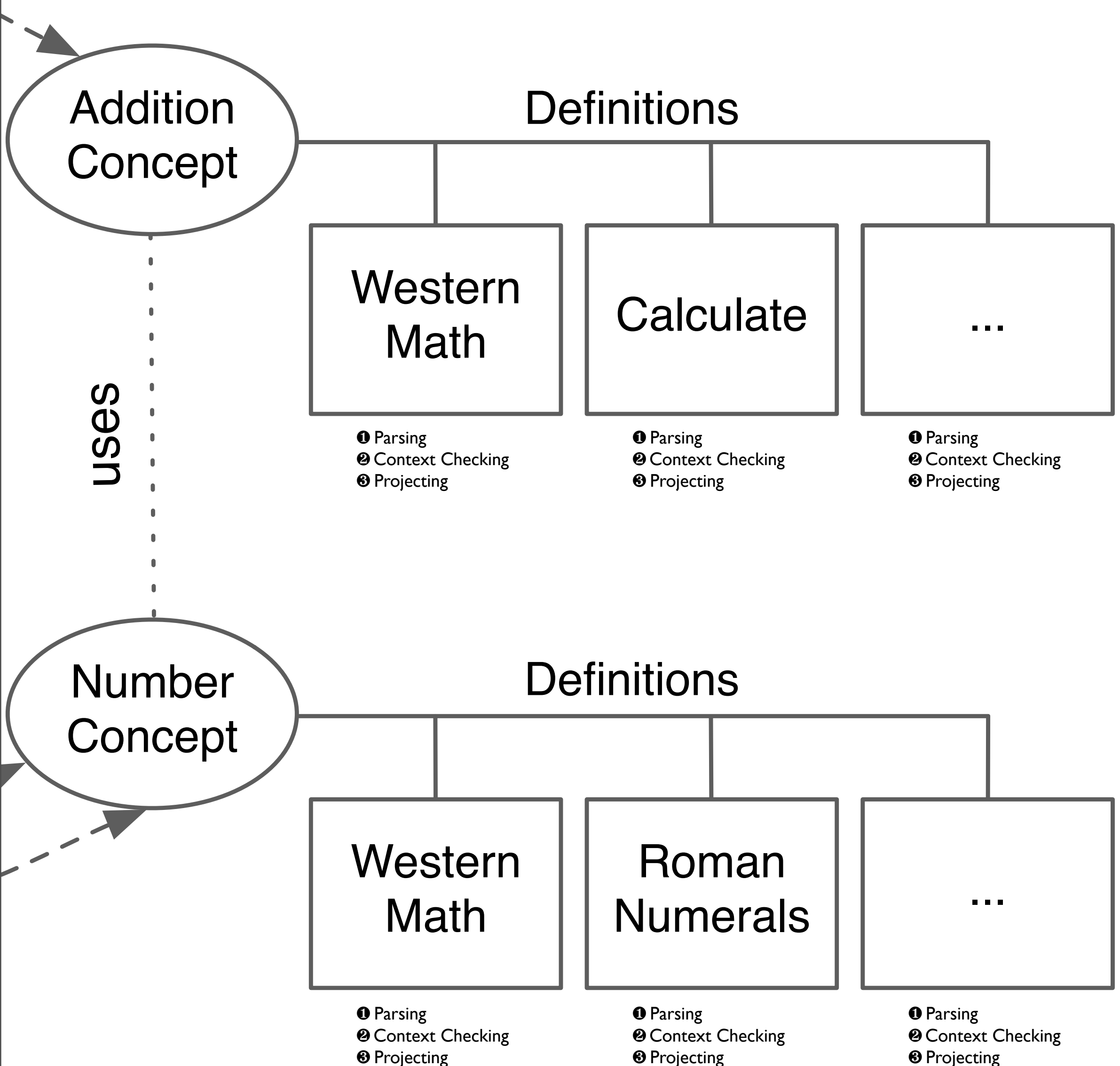

3+4 →

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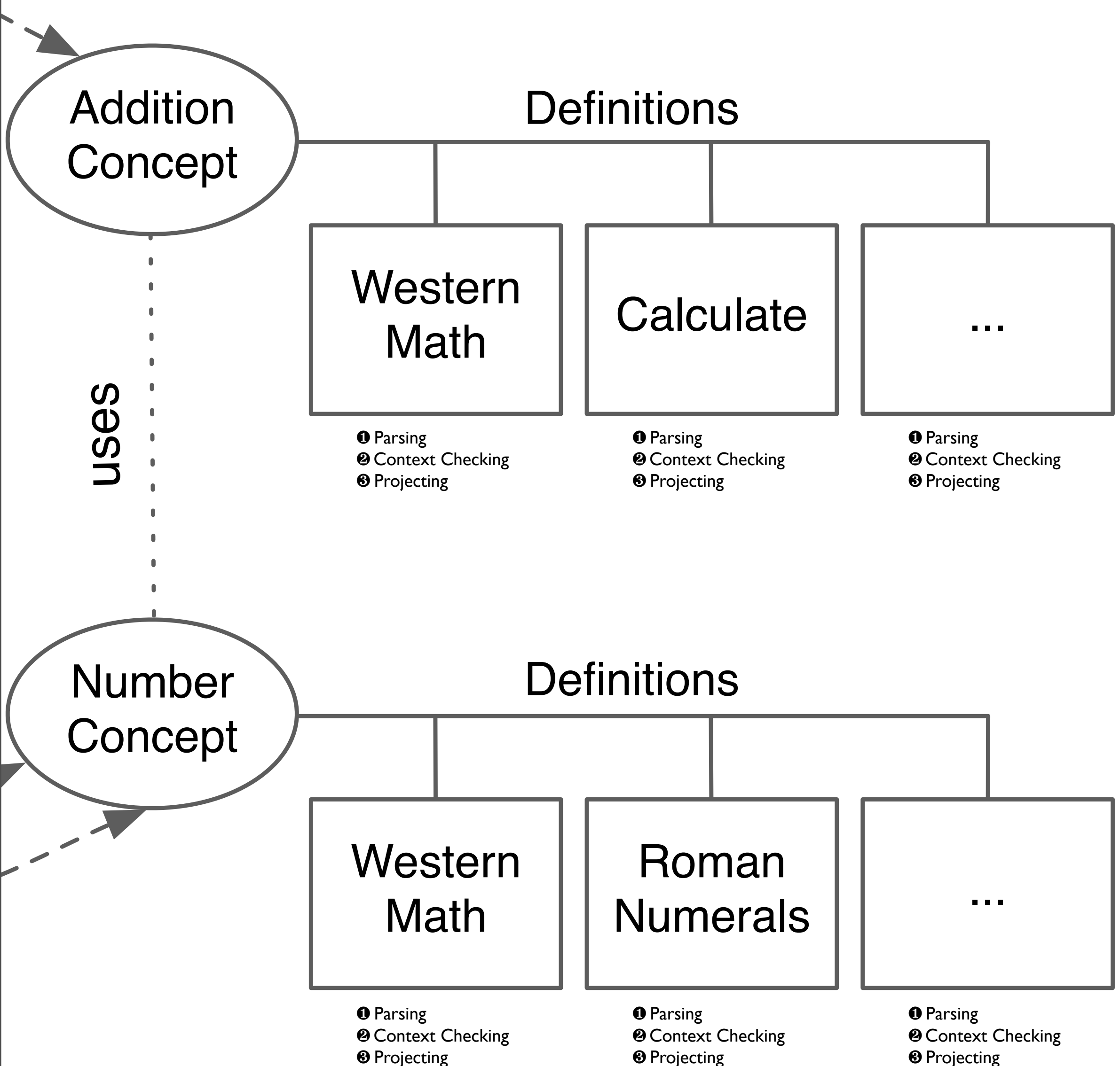

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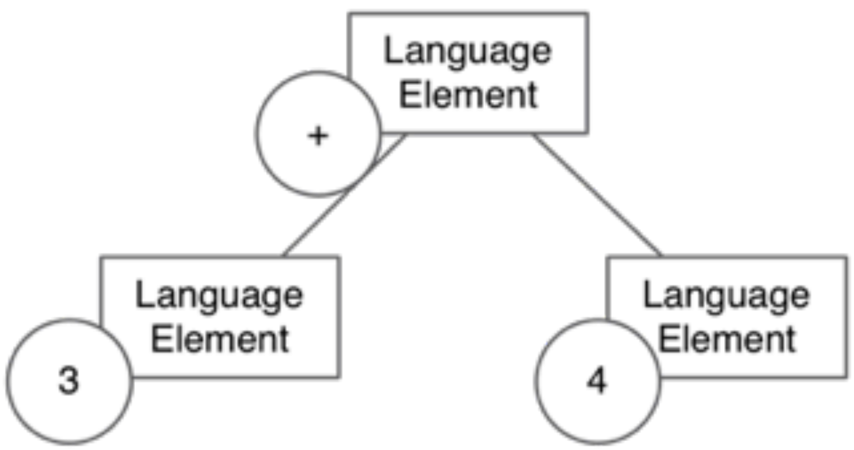

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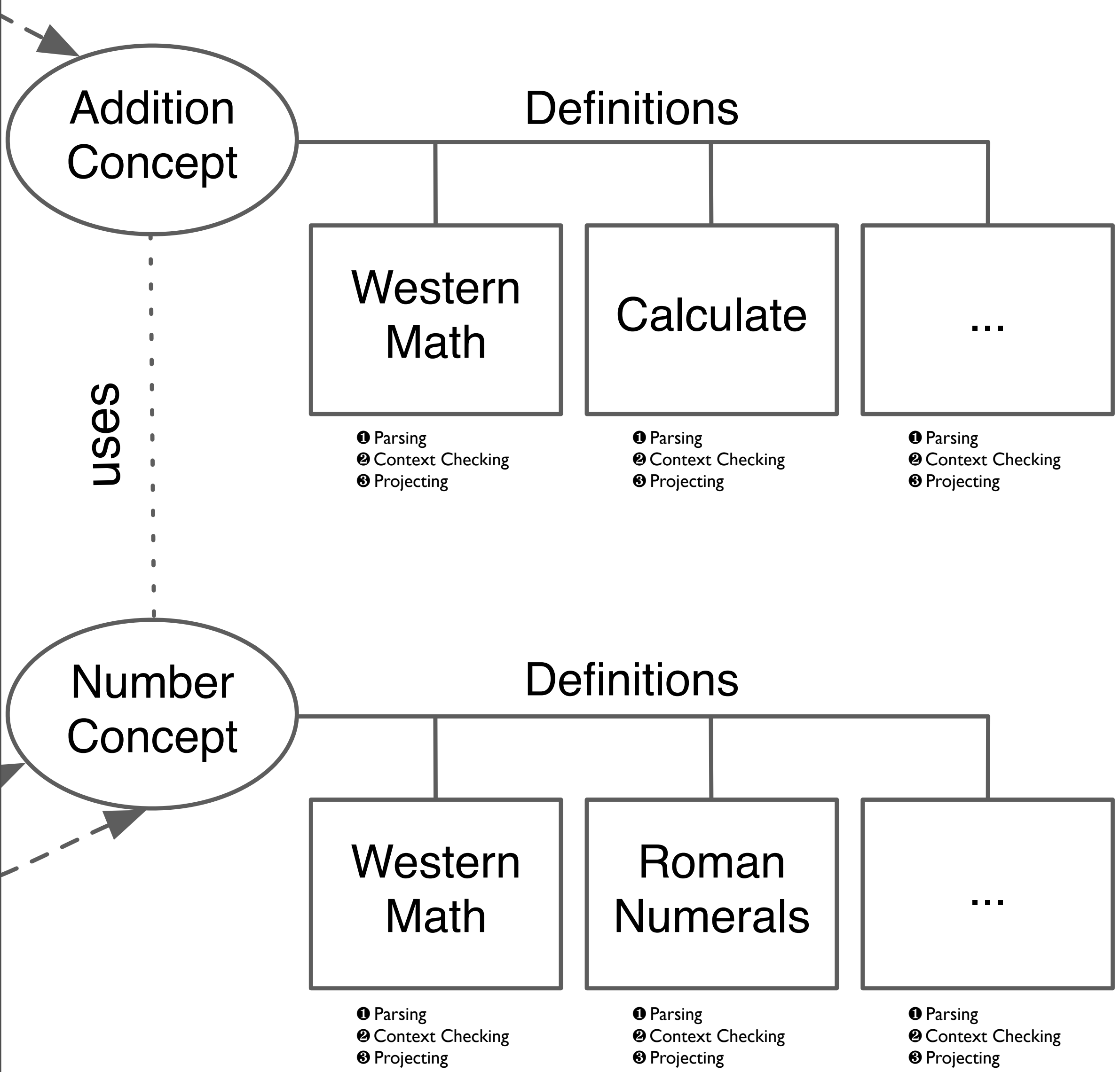

❶ Parsing
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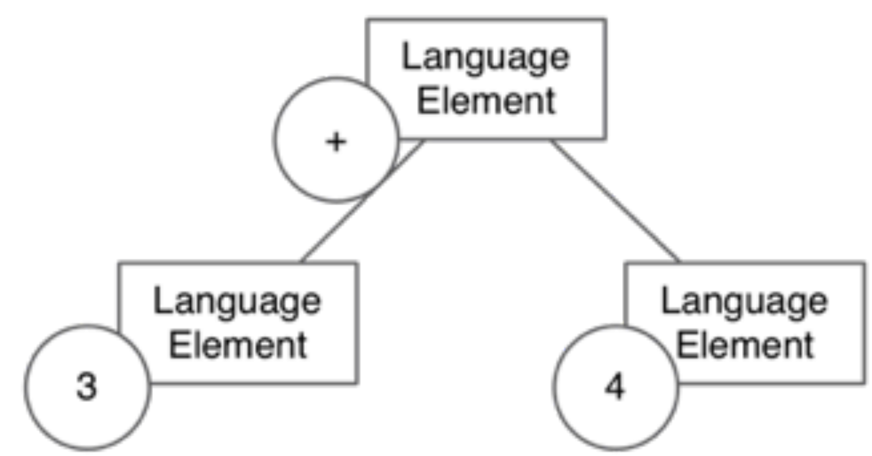
```
Addition ← term:t '+' factor:f {t,f}
```

3+4 →



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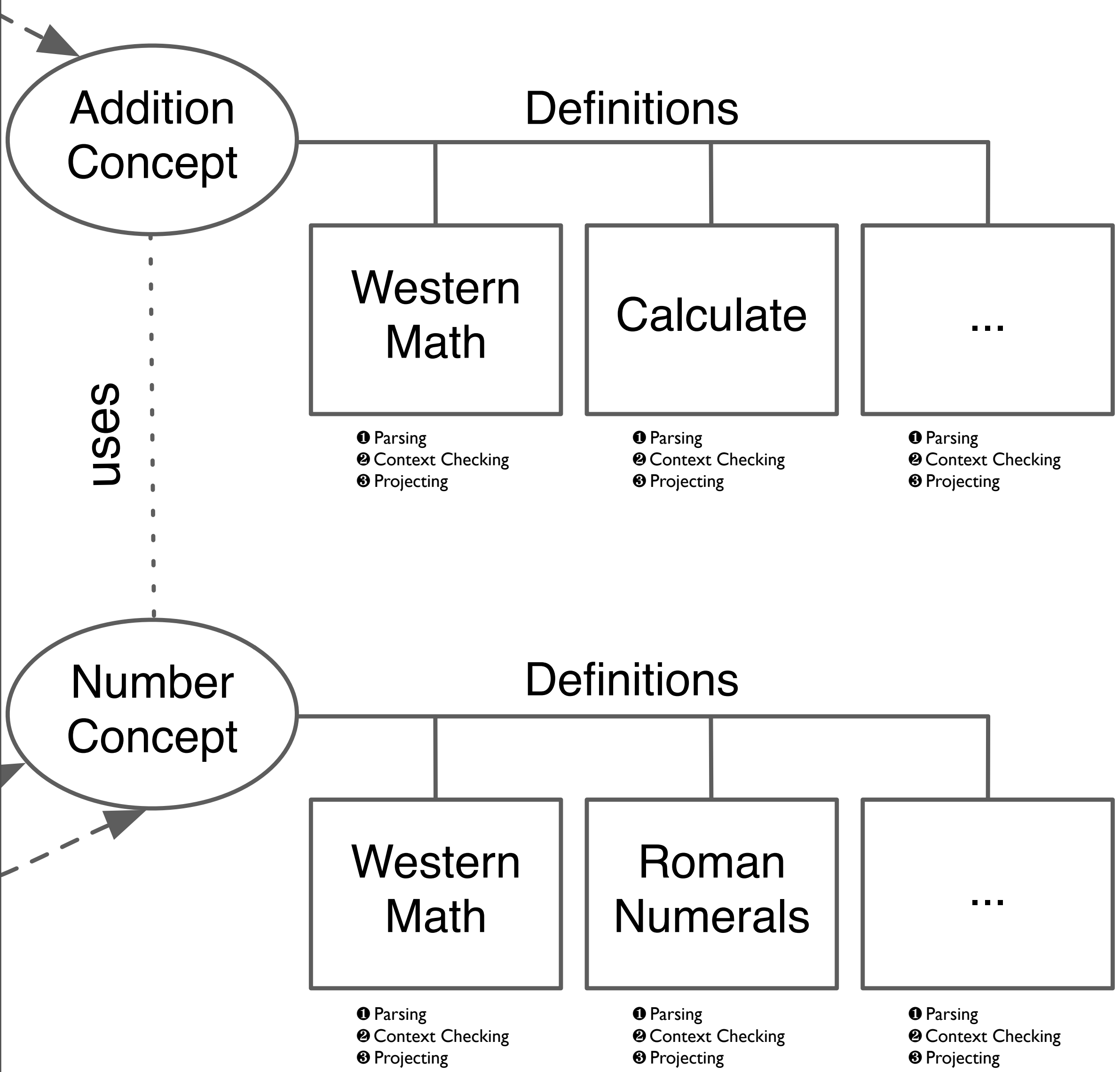

❶Parsing
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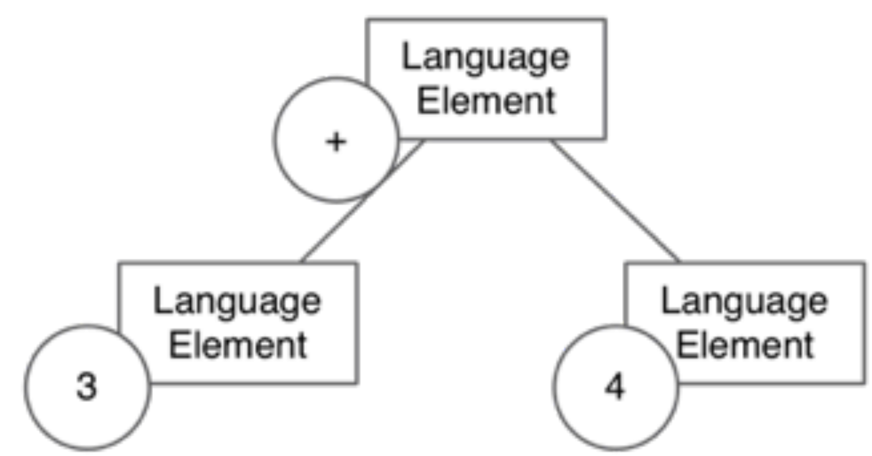
```
^self an: [t := self apply: #term]
n: [self a: $+]
n: [f := self apply: #factor]
n: [self le: {t. f}]
```

3+4 →



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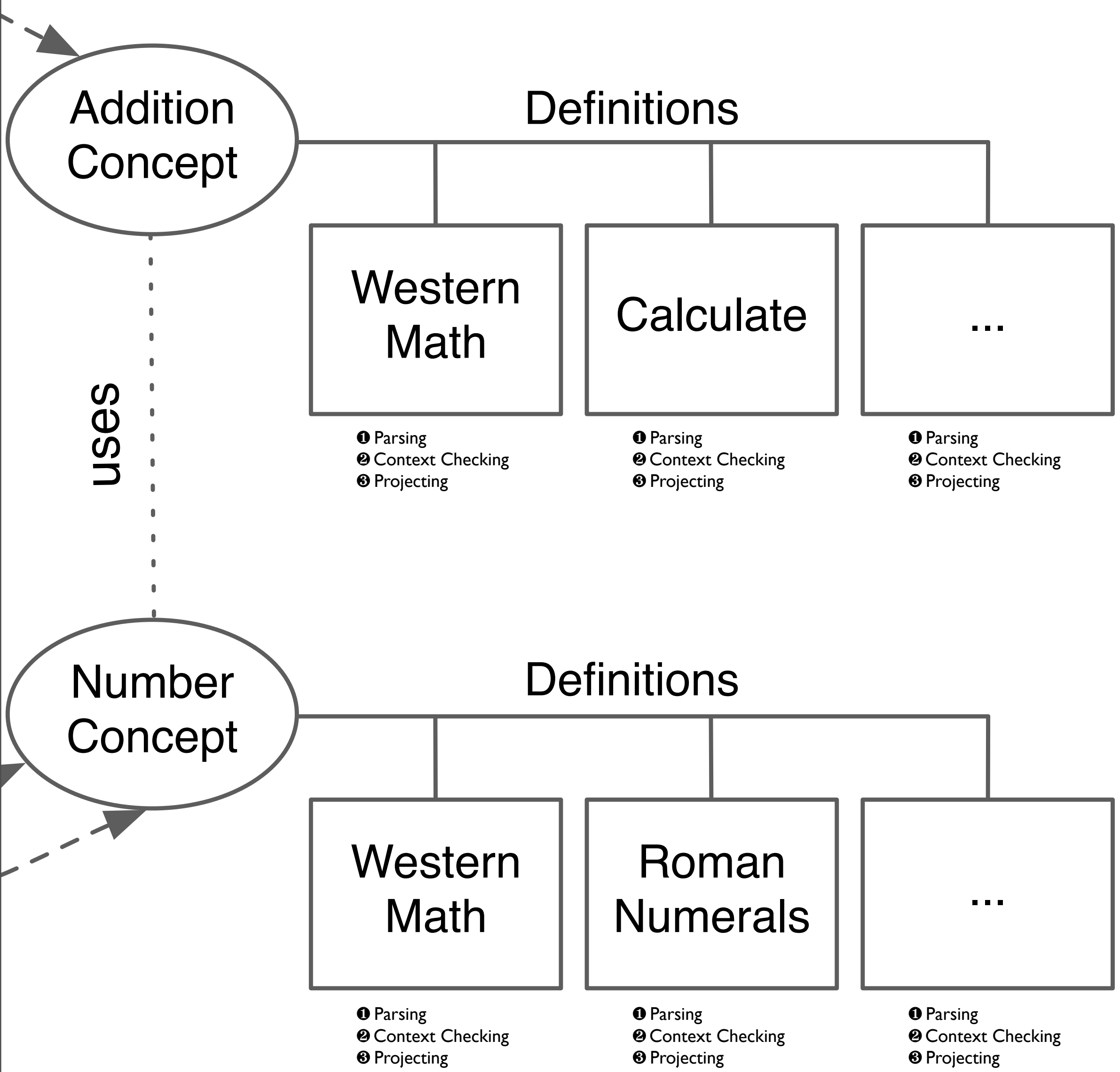

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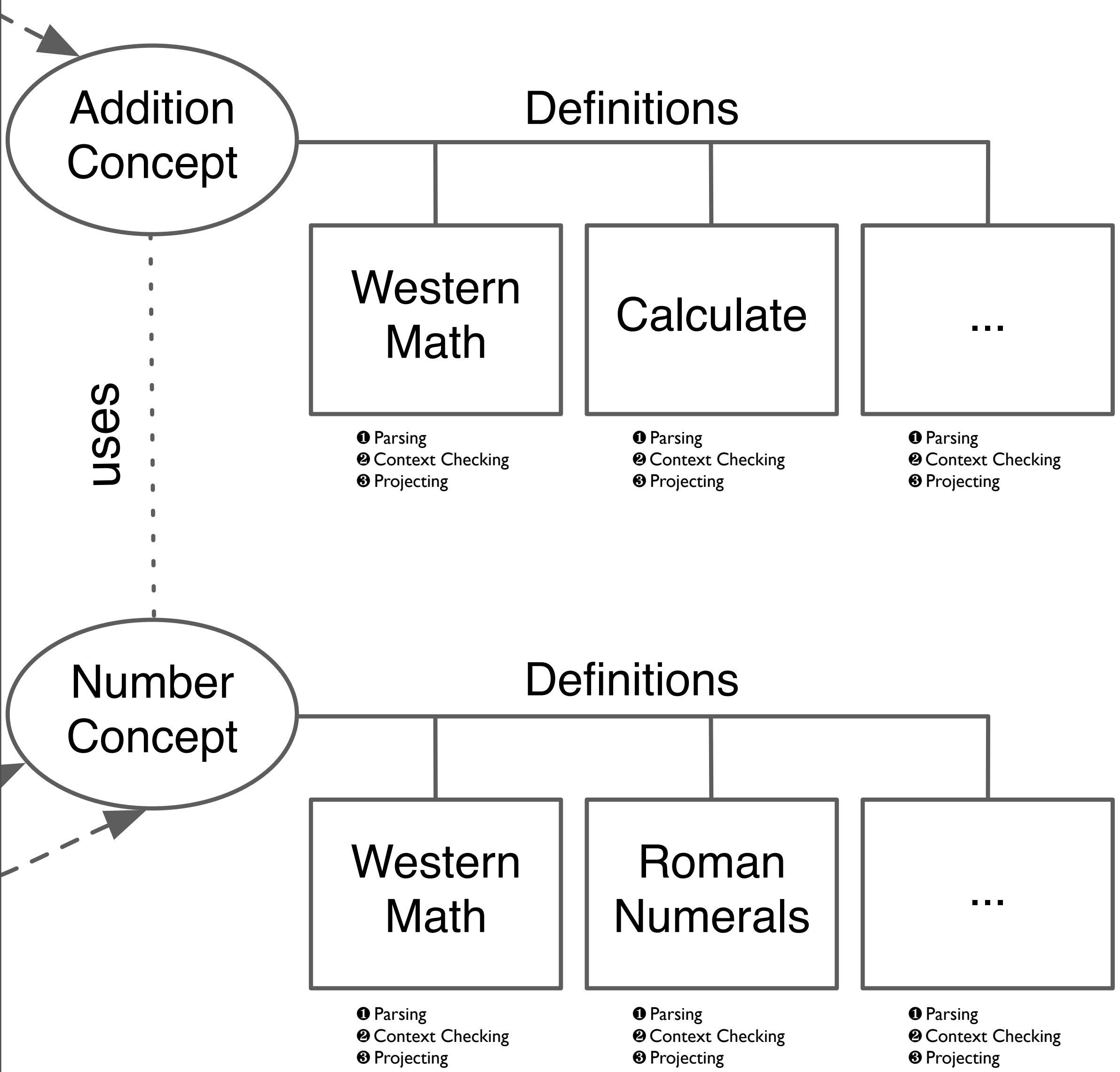

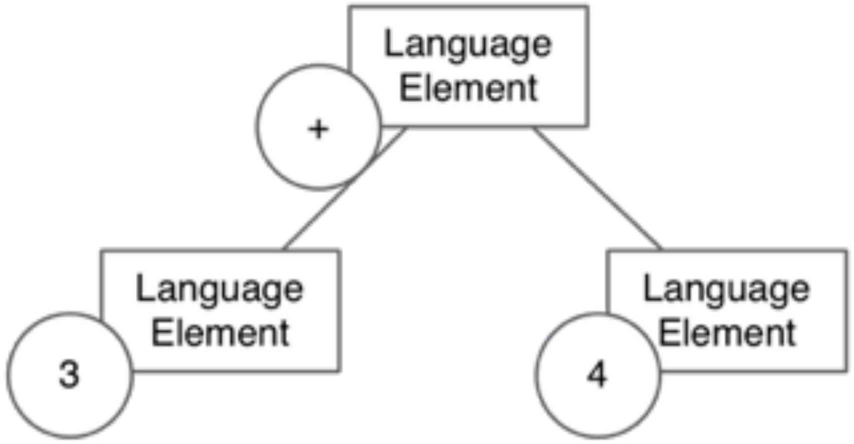

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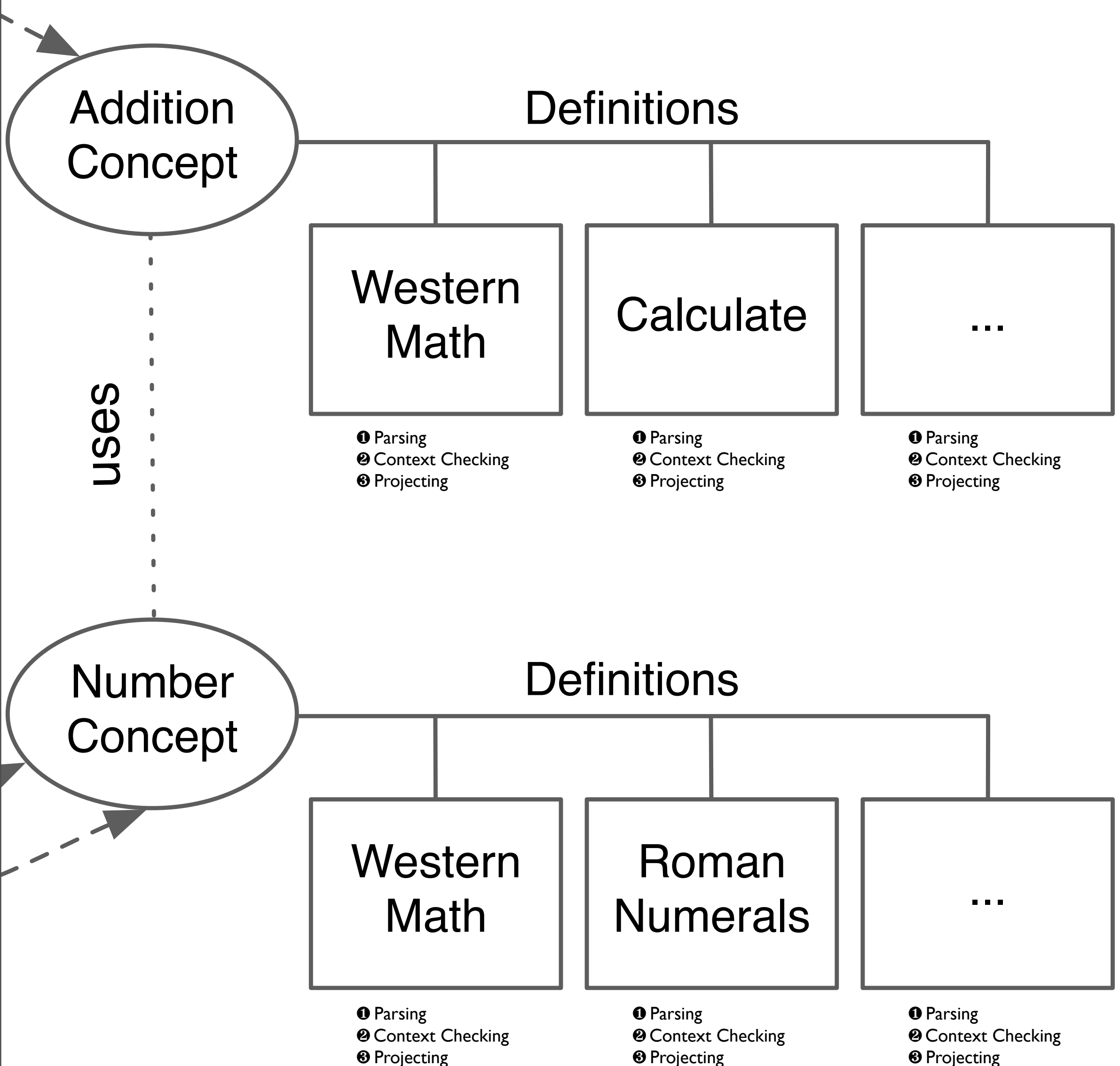

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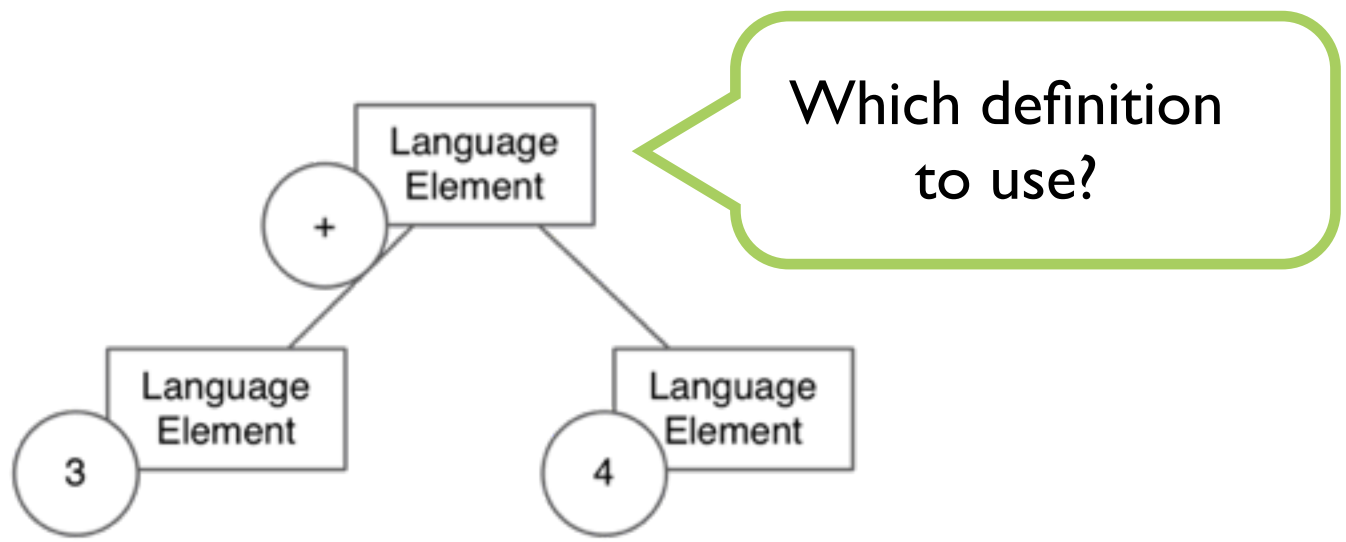

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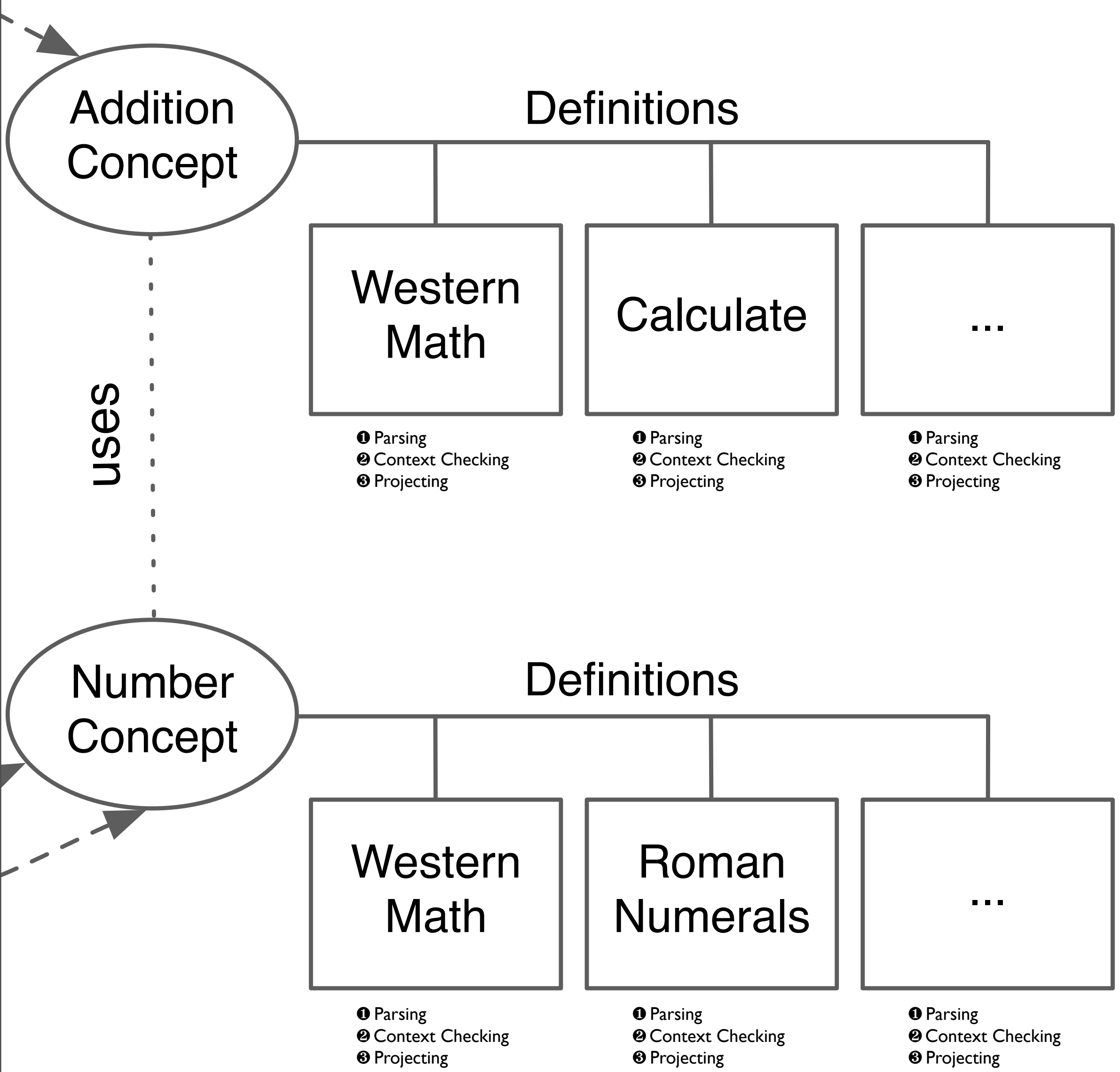
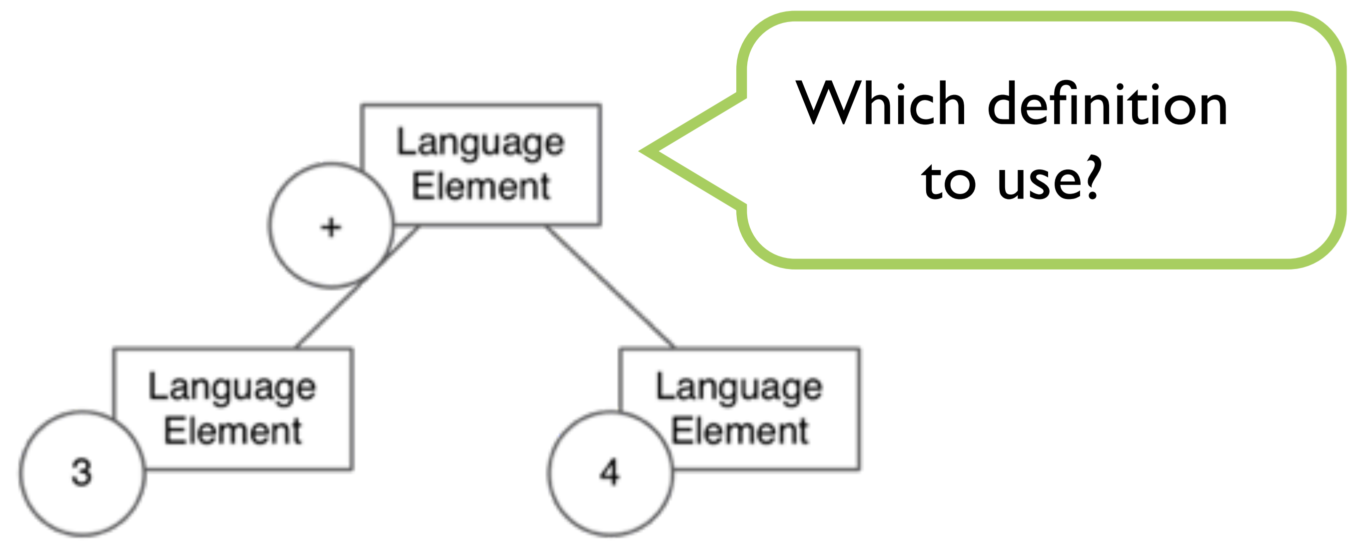


❶Parsing

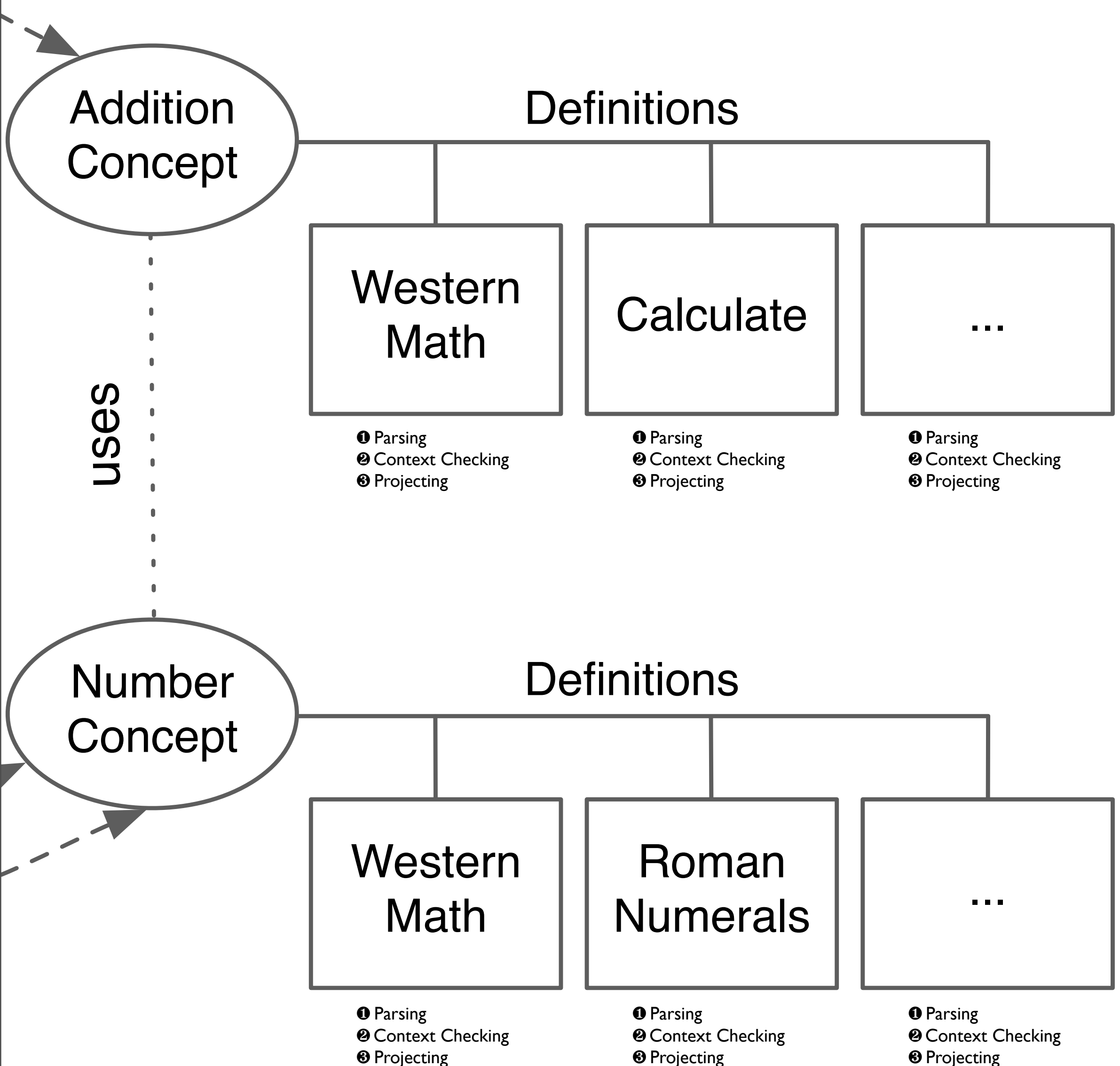
❷**Context Checking**

❸Projecting

```
^self language = 'Western Math'
```



LANGUAGE DEFINITIONS

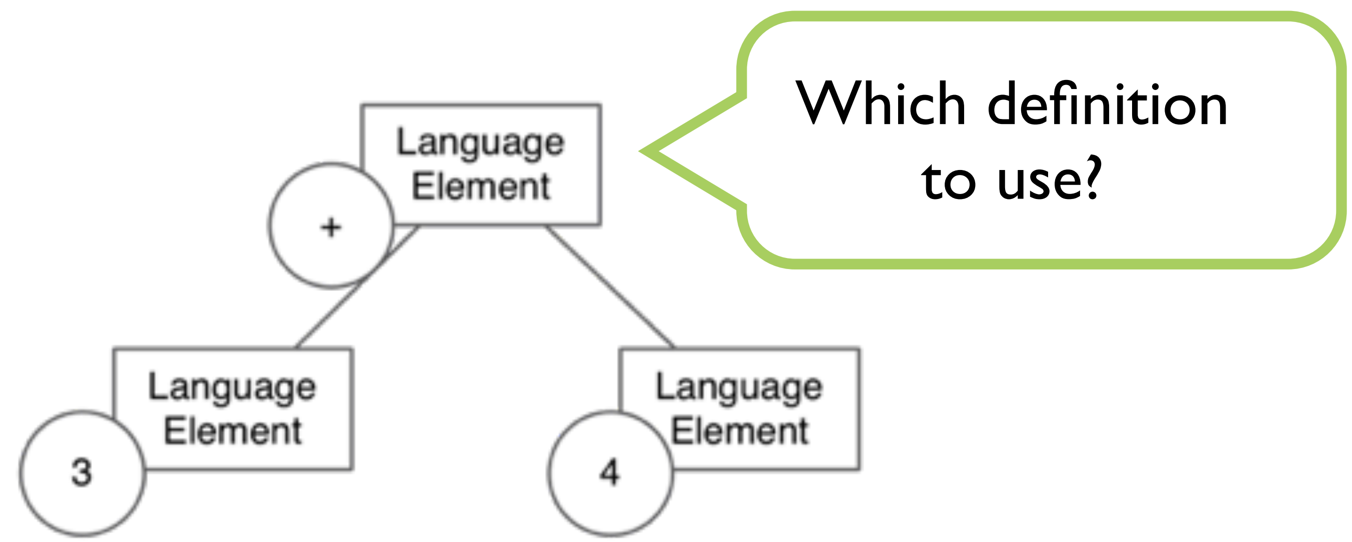


❶ Parsing

❷ Context Checking

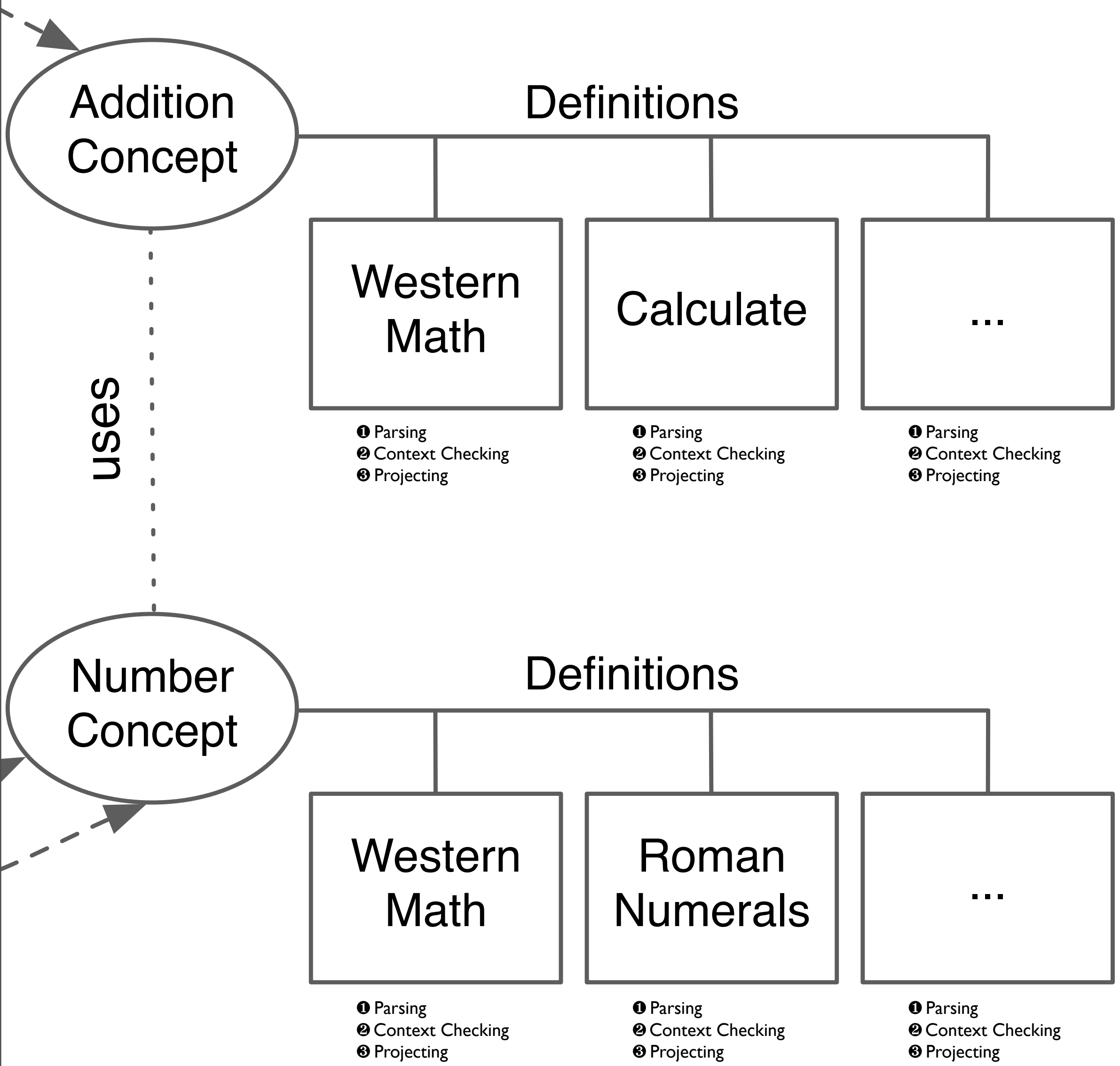
❸ Projecting

```
^self language = 'Western Math'
^self child1 value = 1
```

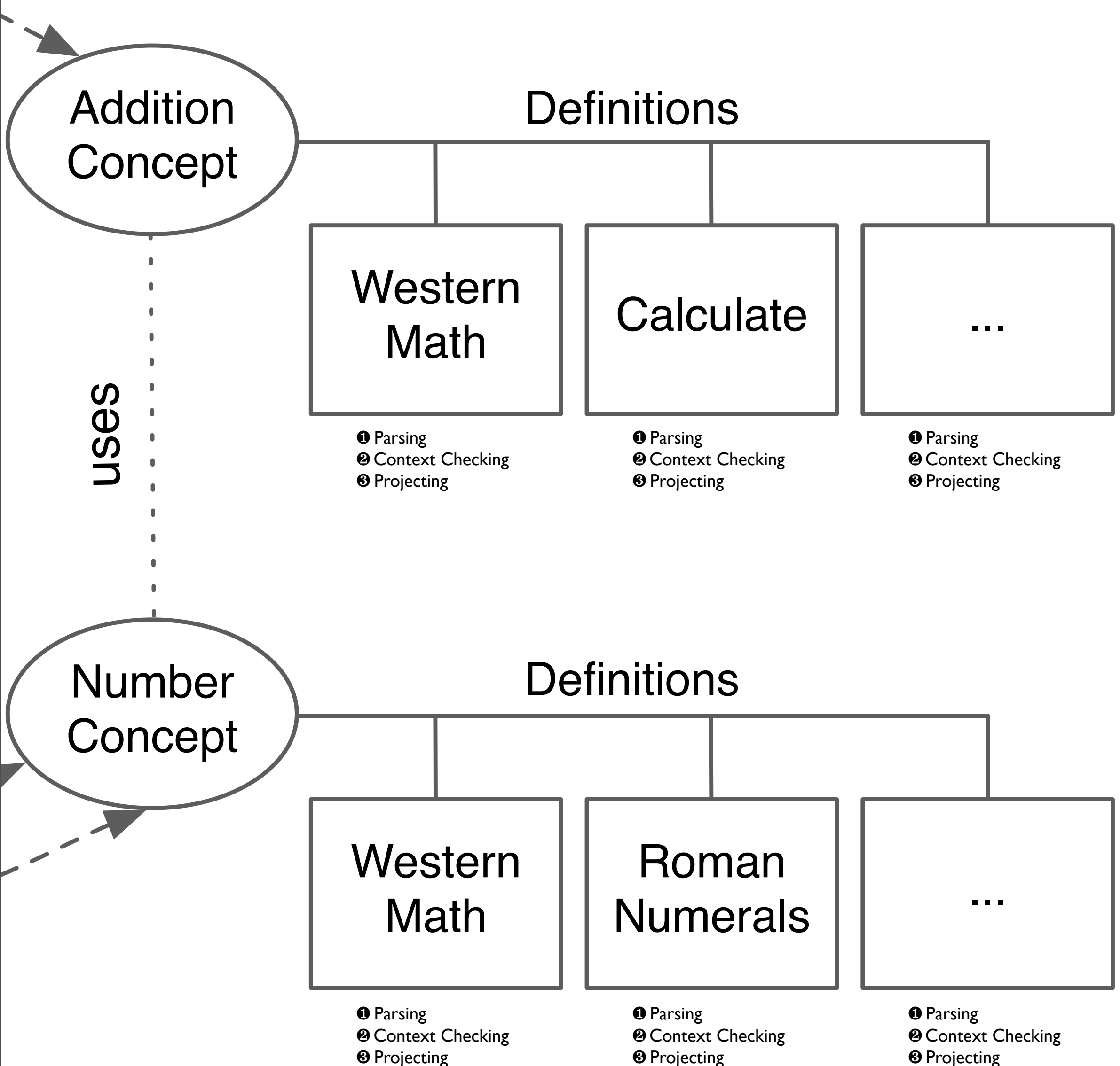


LANGUAGE DEFINITIONS

❶Parsing
❷Context Checking
❸Projecting



LANGUAGE DEFINITIONS



❶Parsing
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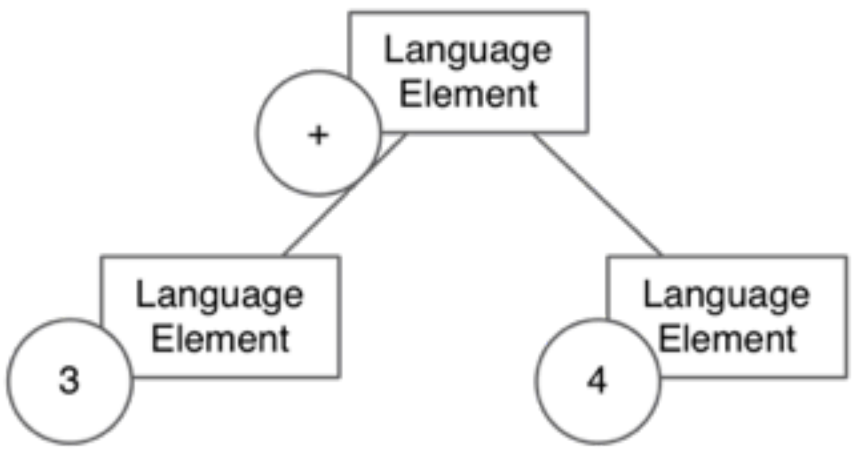
❸Projecting



LANGUAGE DEFINITIONS

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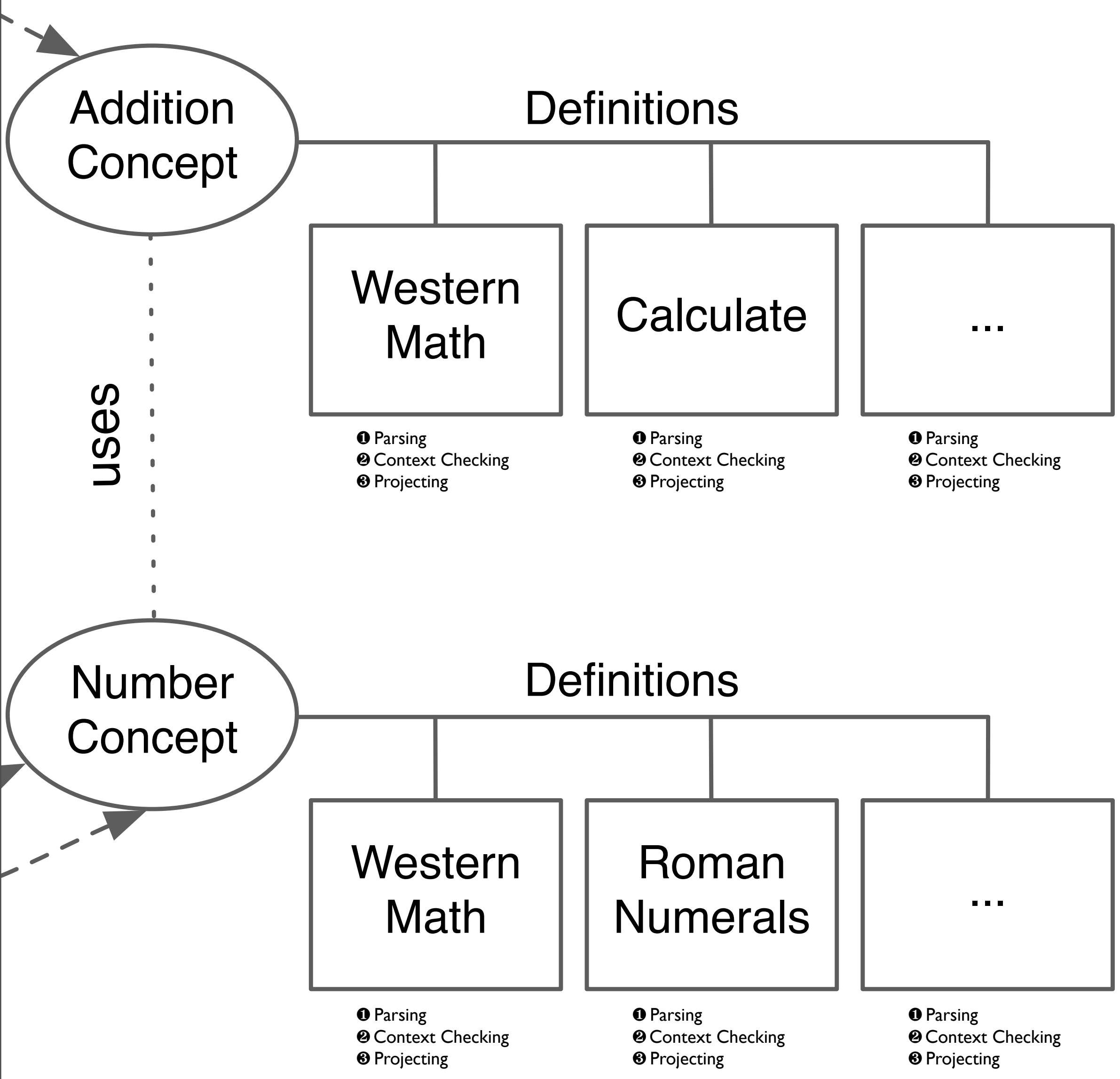

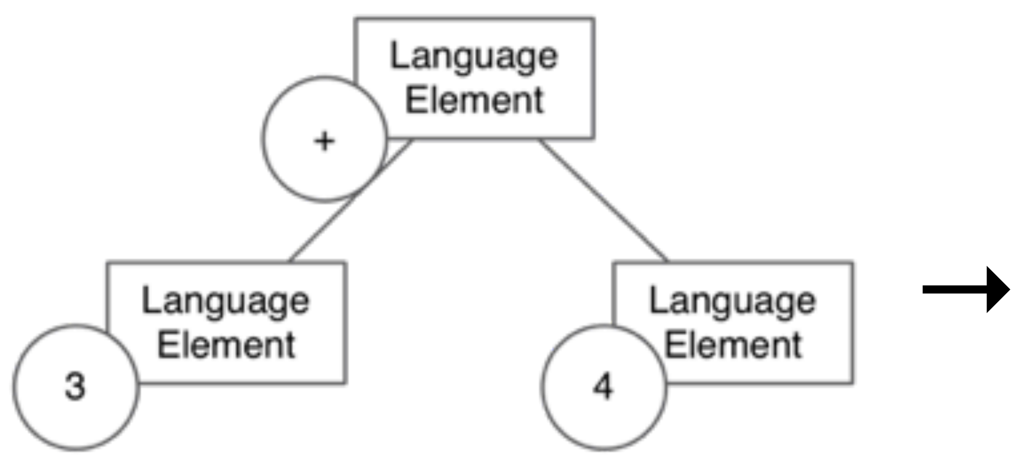

LANGUAGE DEFINITIONS

❶Parsing
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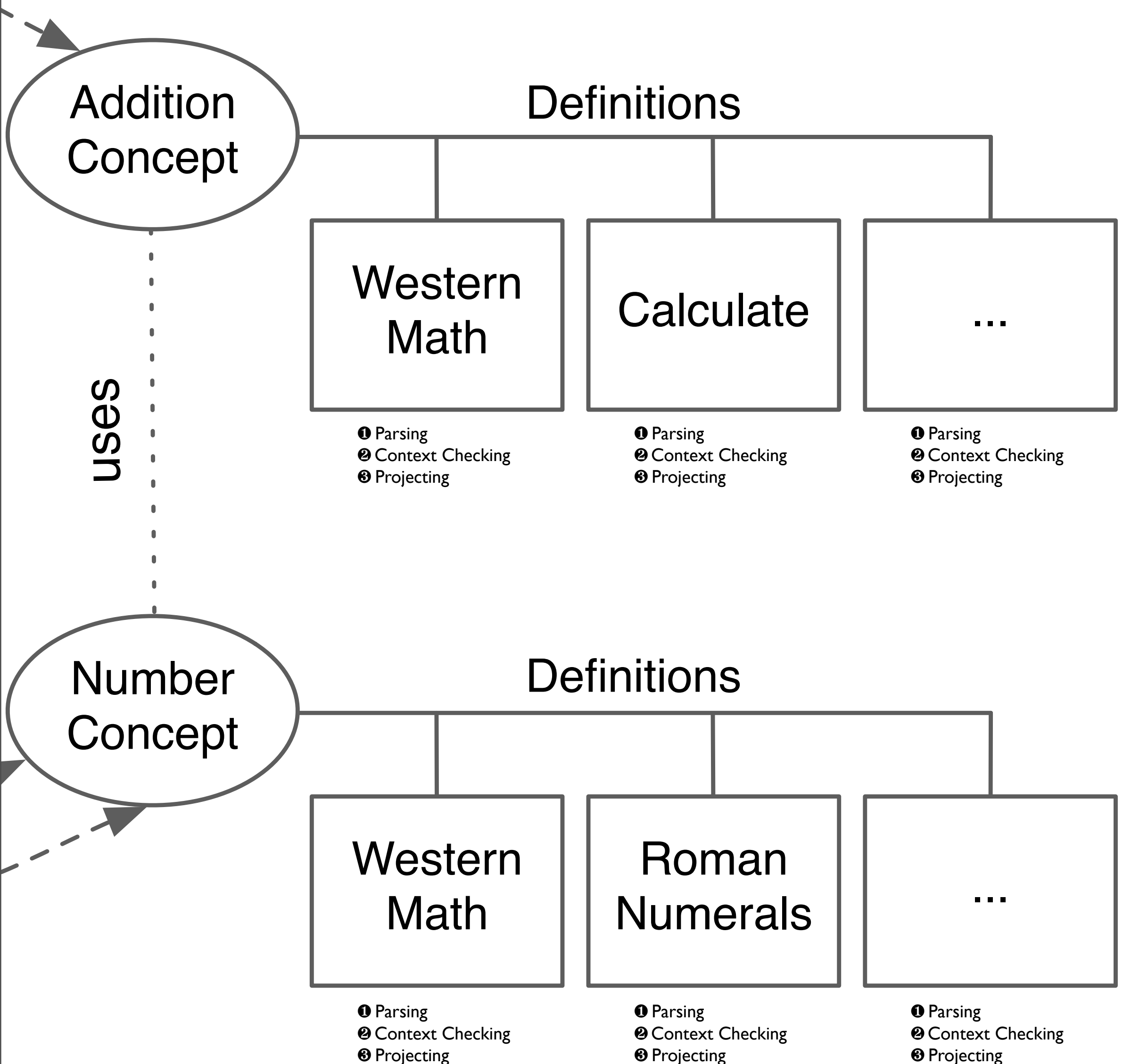
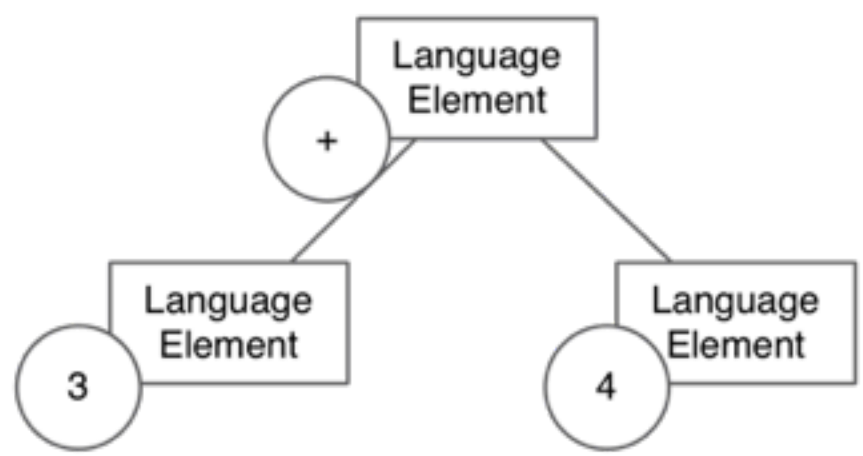




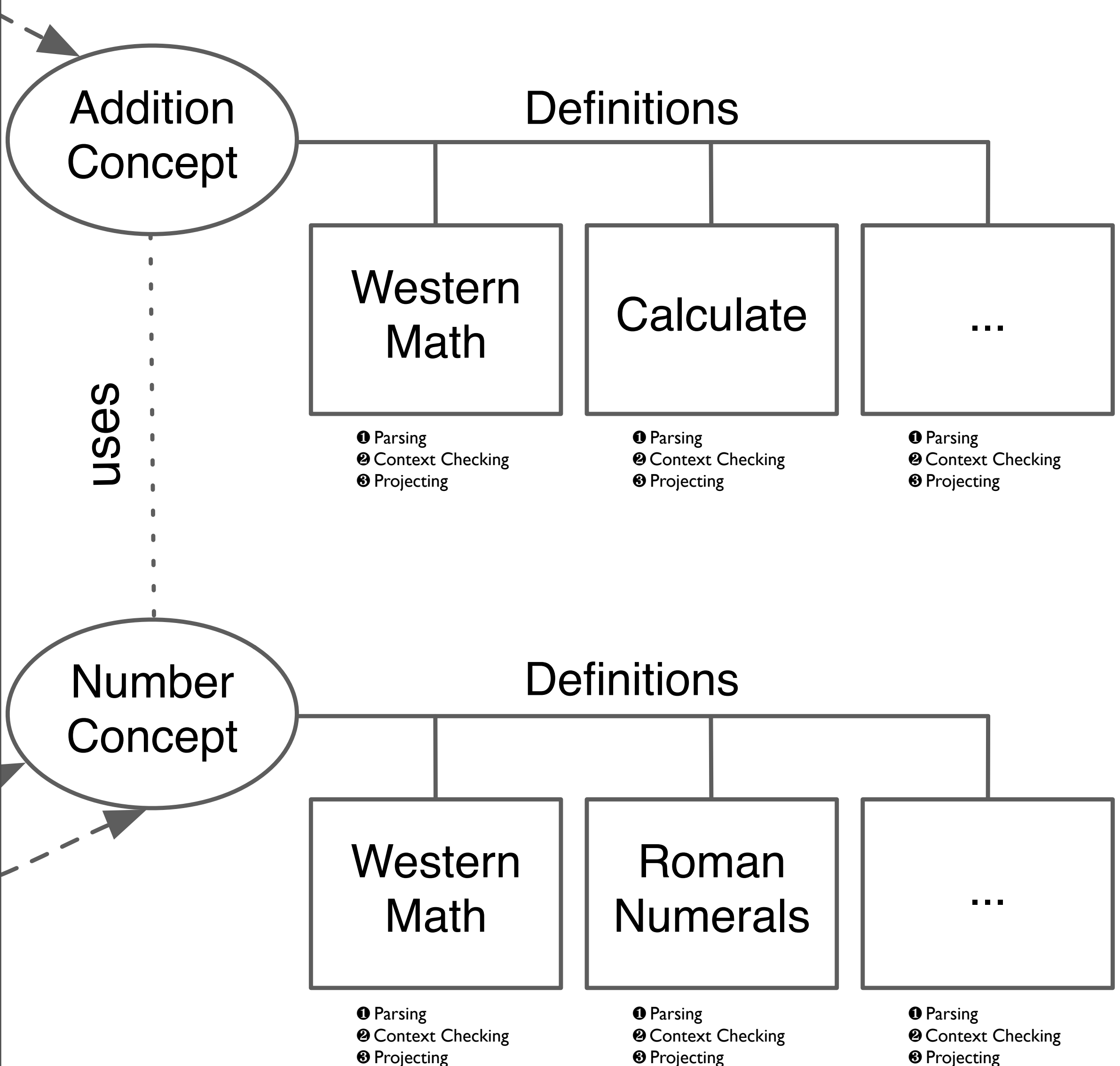
→ 3 + 4

LANGUAGE DEFINITIONS

❶Parsing

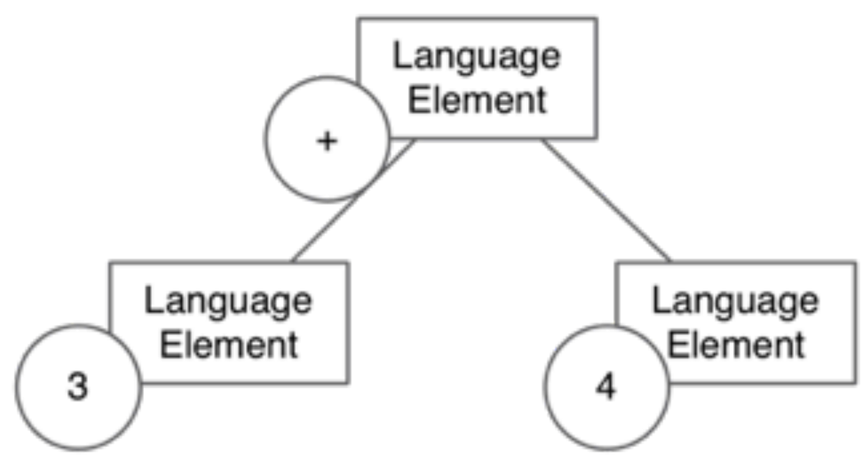
❷Context Checking

❸Projecting



Projectional pattern form

```
^{self lp1. $+ asText allBold. self lp2}
```



→ 3 **+** 4

LANGUAGE DEFINITIONS

QUICK TOUR

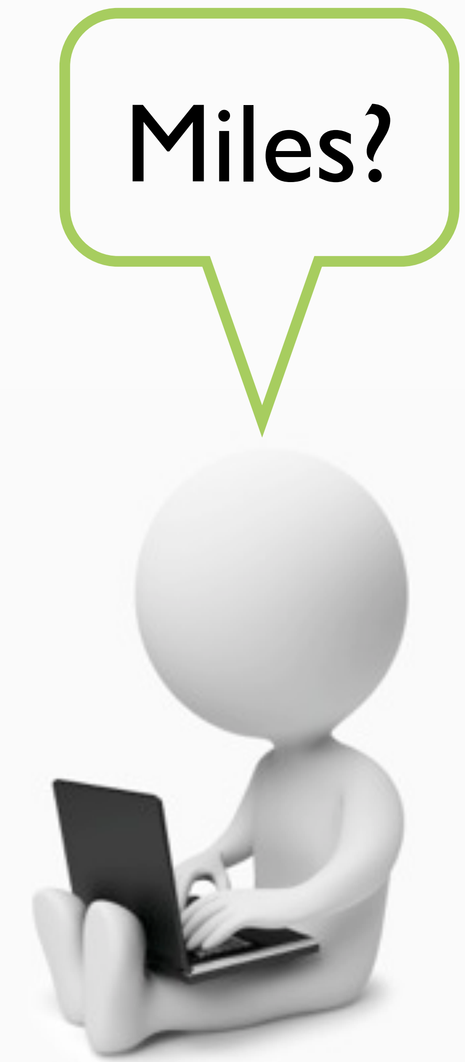
ACCOMMODATING CHANGE

ACCOMMODATING CHANGE

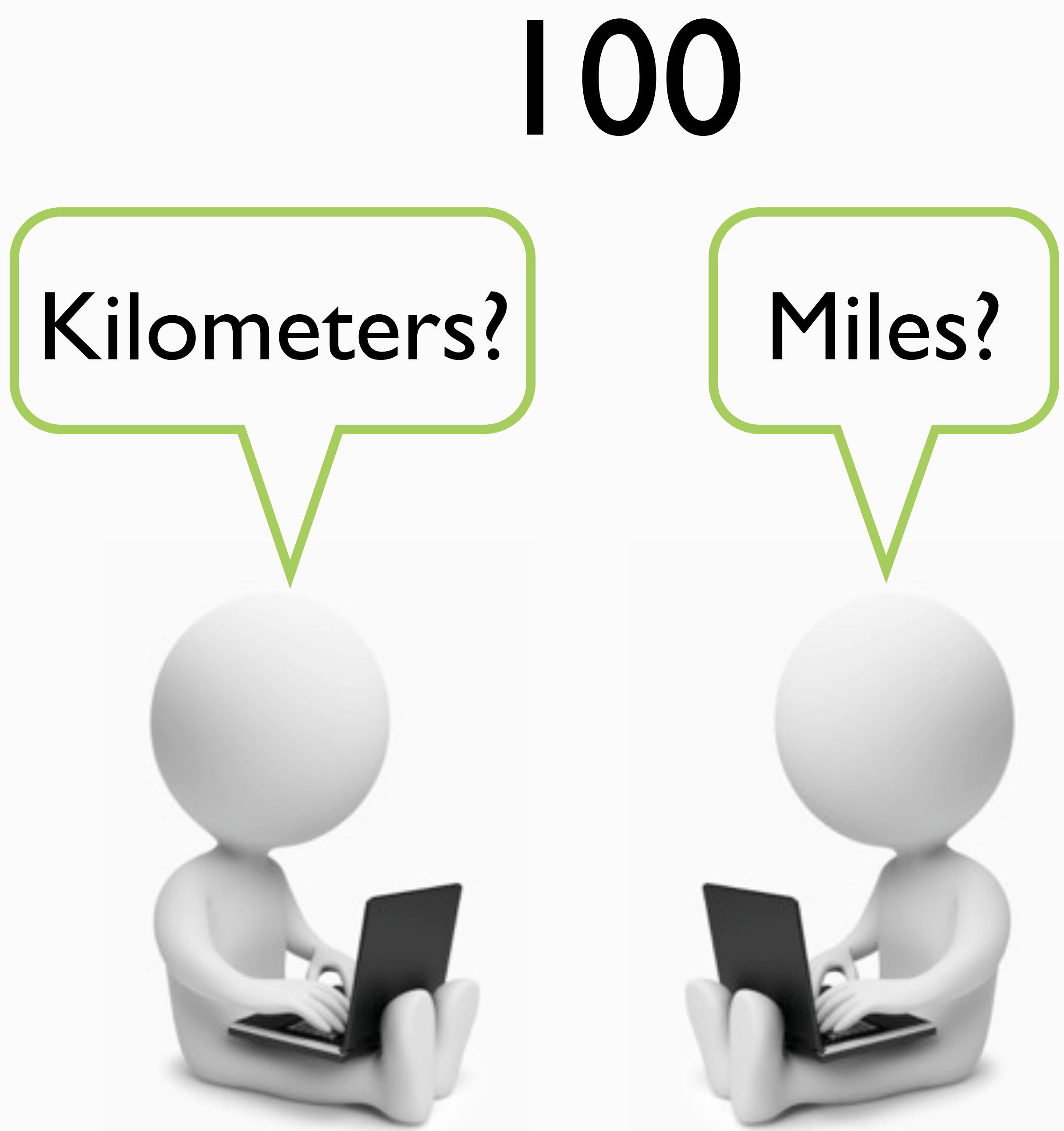
100

ACCOMMODATING CHANGE

100



ACCOMMODATING CHANGE



LANGUAGE OF LANGUAGES APPROACH

LANGUAGE OF LANGUAGES APPROACH

100

LANGUAGE OF LANGUAGES APPROACH

100

Number Concept

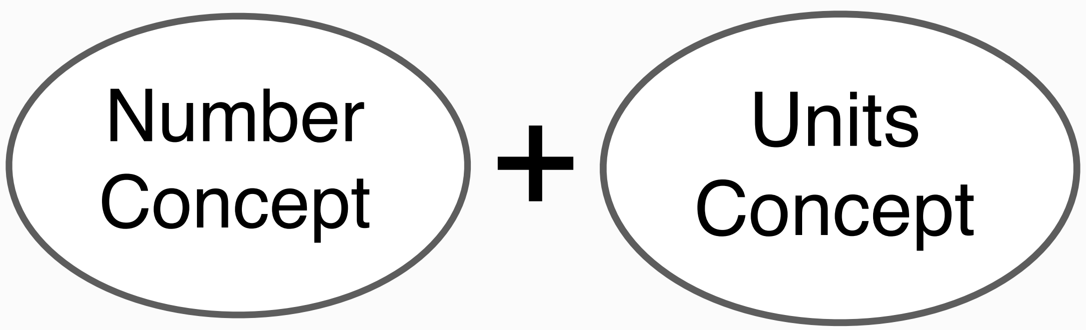
LANGUAGE OF LANGUAGES APPROACH

100

Number Concept +

LANGUAGE OF LANGUAGES APPROACH

100



UNITS DEMO

FUTURE WORK

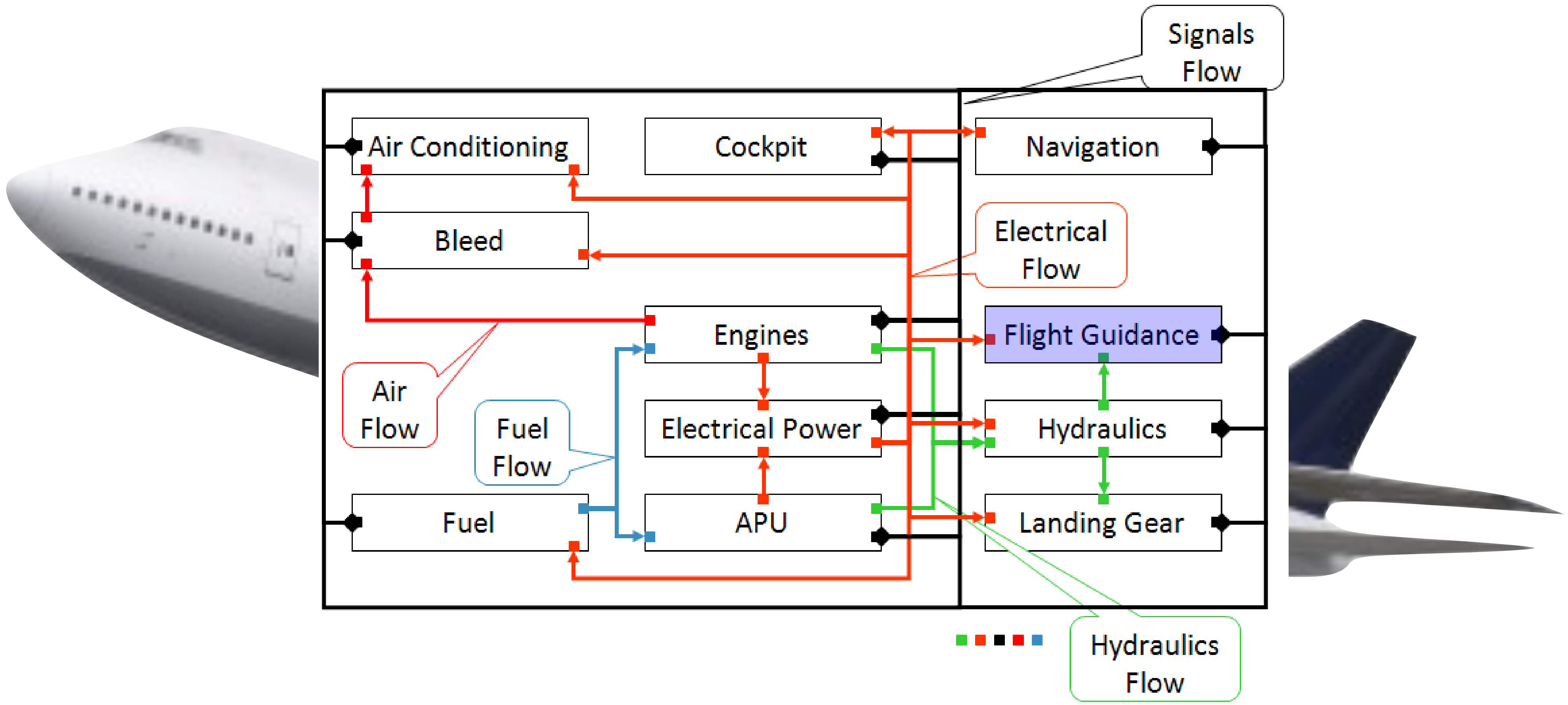
FUTURE WORK

Handle different notations within one domain

Models

Matlab	Modelica
Simulink	...

FUTURE WORK



Models

Matlab | Modelica
Simulink | ...

Architecture

AADL | SysML
UML | ...

Software

C/C++ | Fortran
Java | ...

FUTURE WORK

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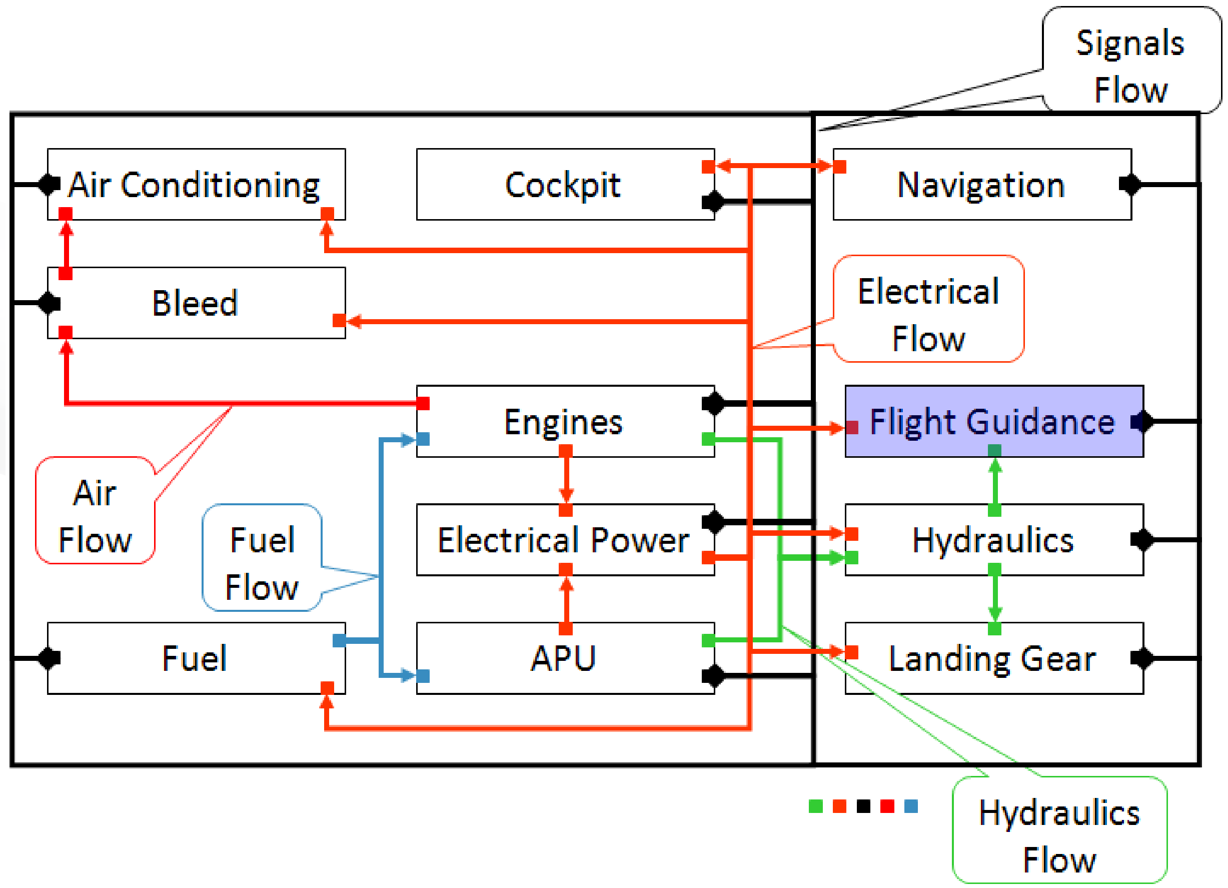

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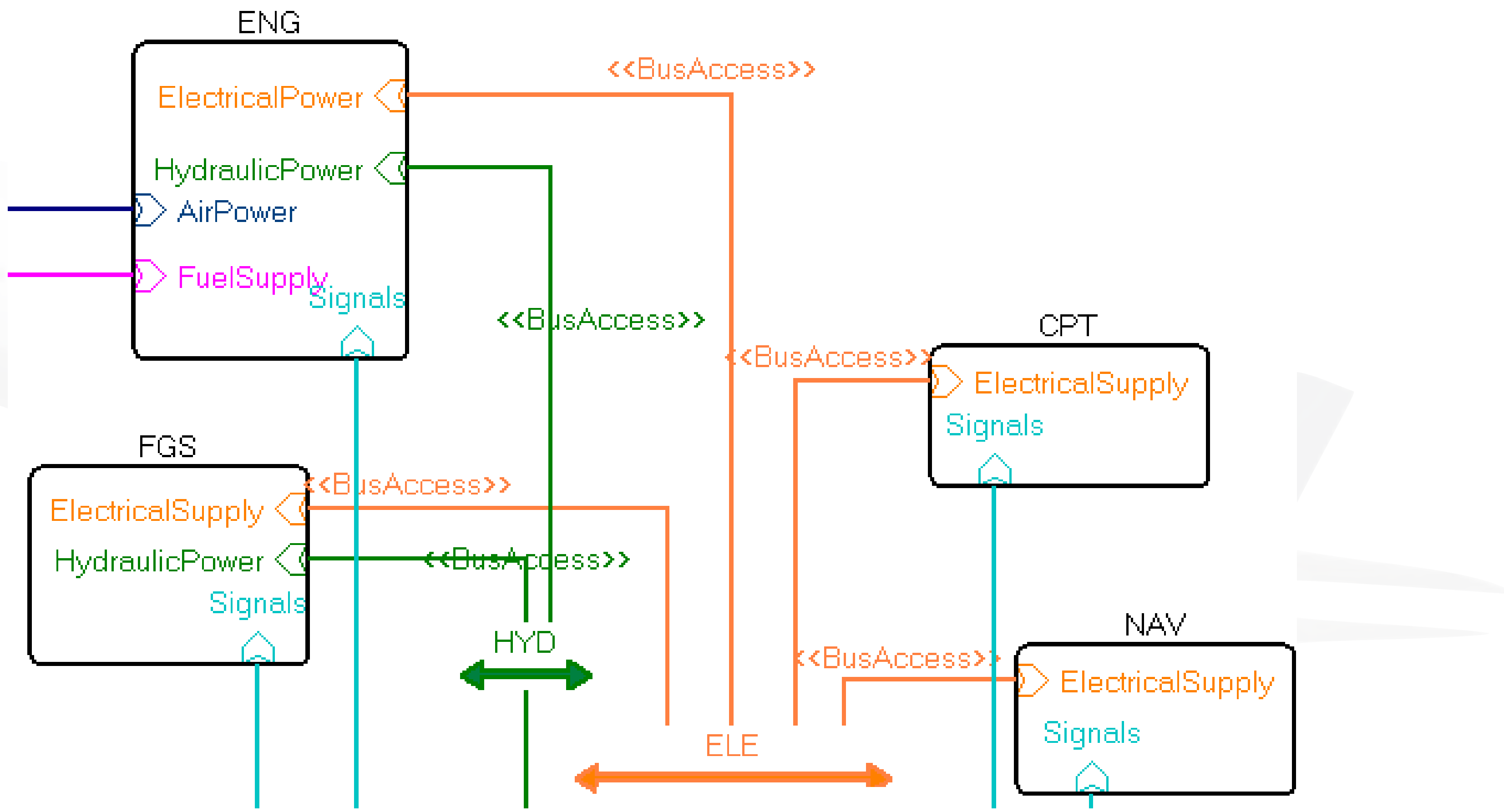

Models

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- Modelica
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Architecture

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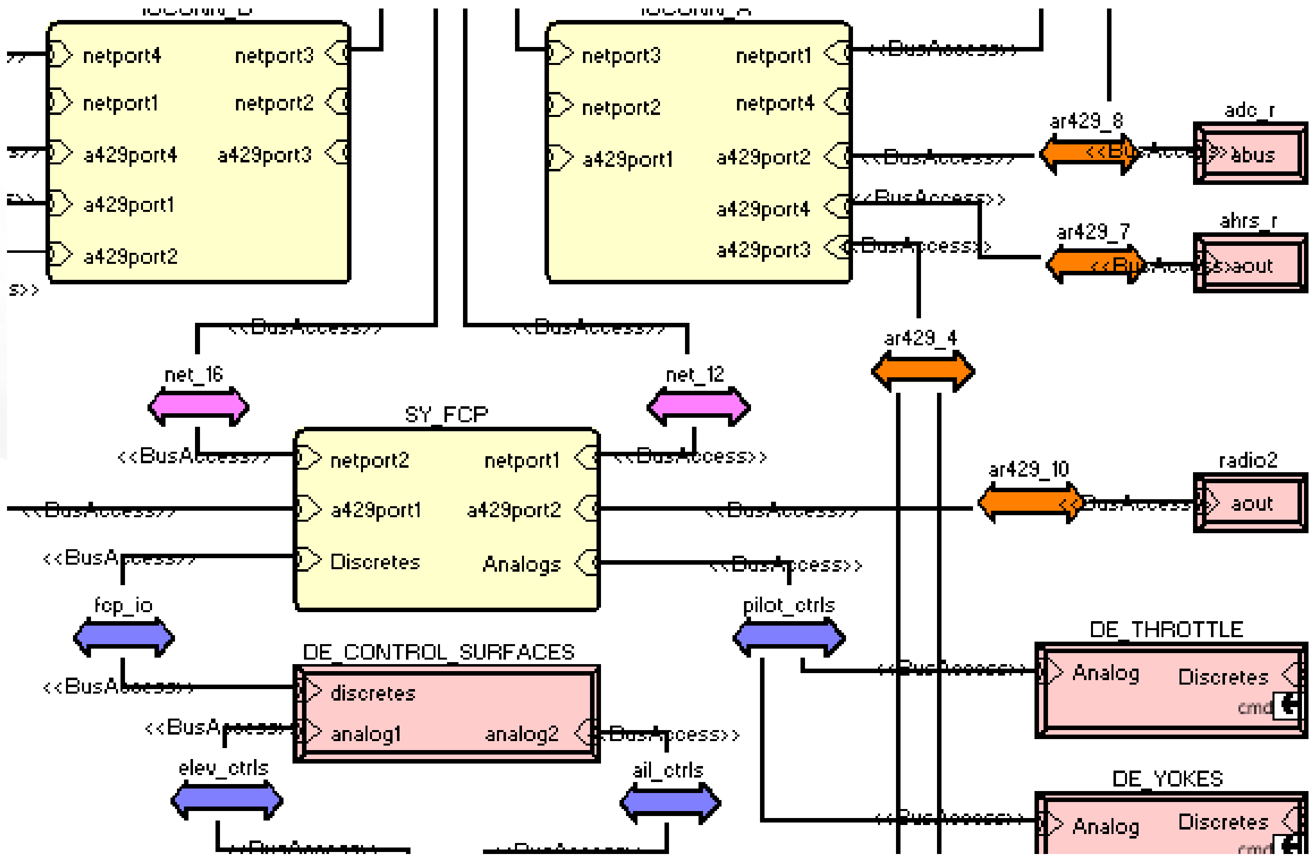
FUTURE WORK



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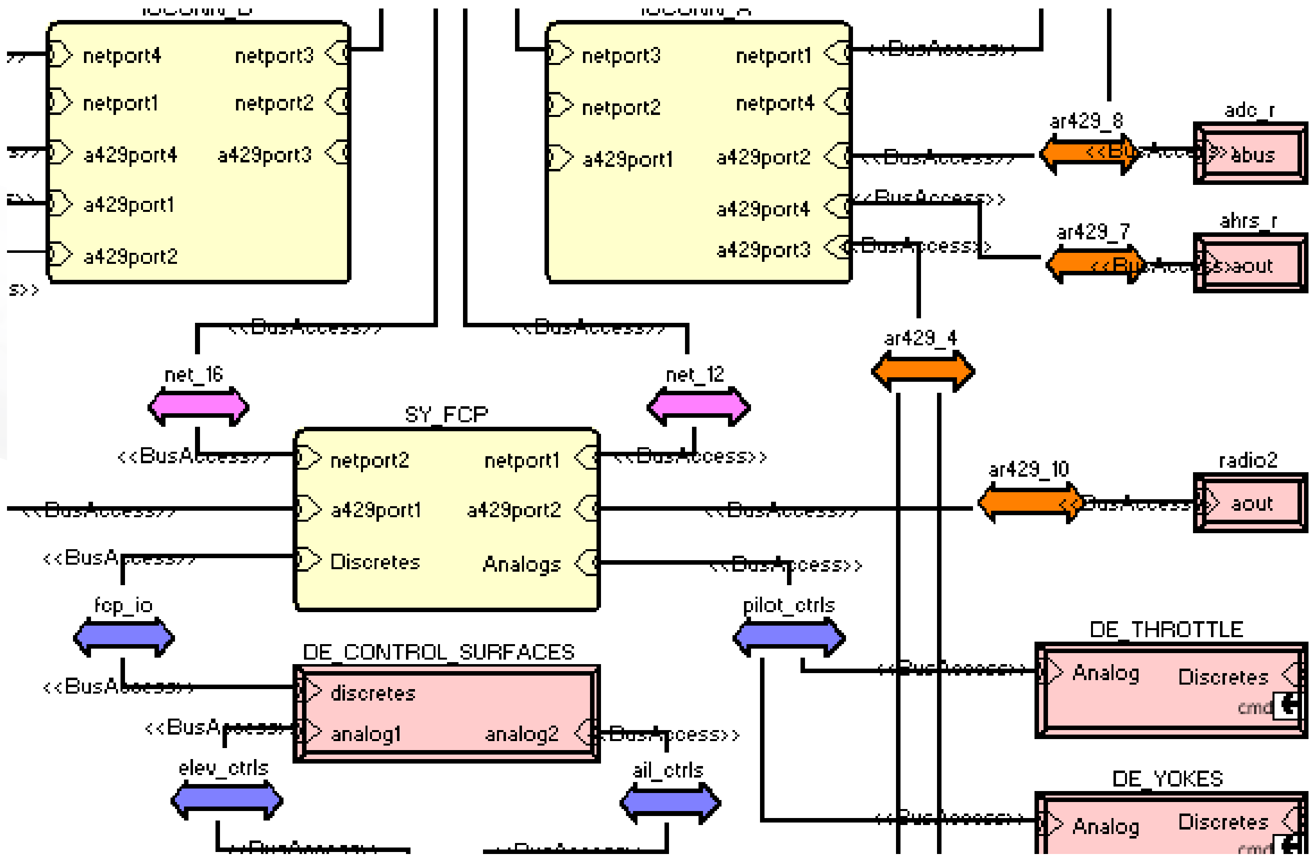

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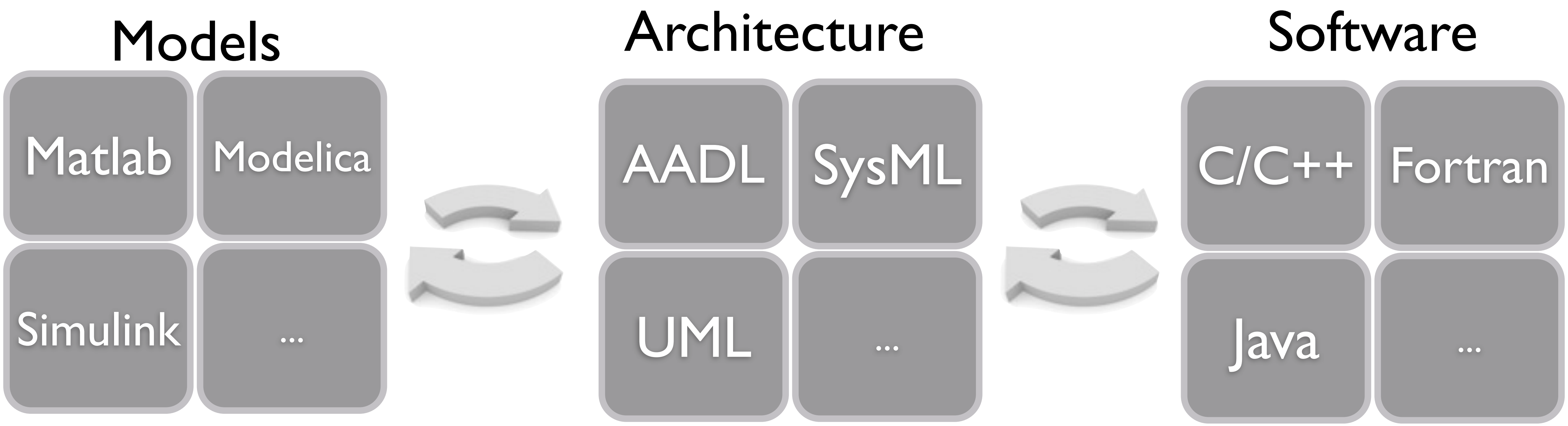
Models
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Simulink
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FUTURE WORK

Models

Matlab	Modelica
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FUTURE WORK

Systems Architecture Virtual Integration

Models

- Matlab
- Modelica
- Simulink
- ...

Architecture

- AADL
- SysML
- UML
- ...

Software

- C/C++
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- Java
- ...

STATE MACHINE EXAMPLE

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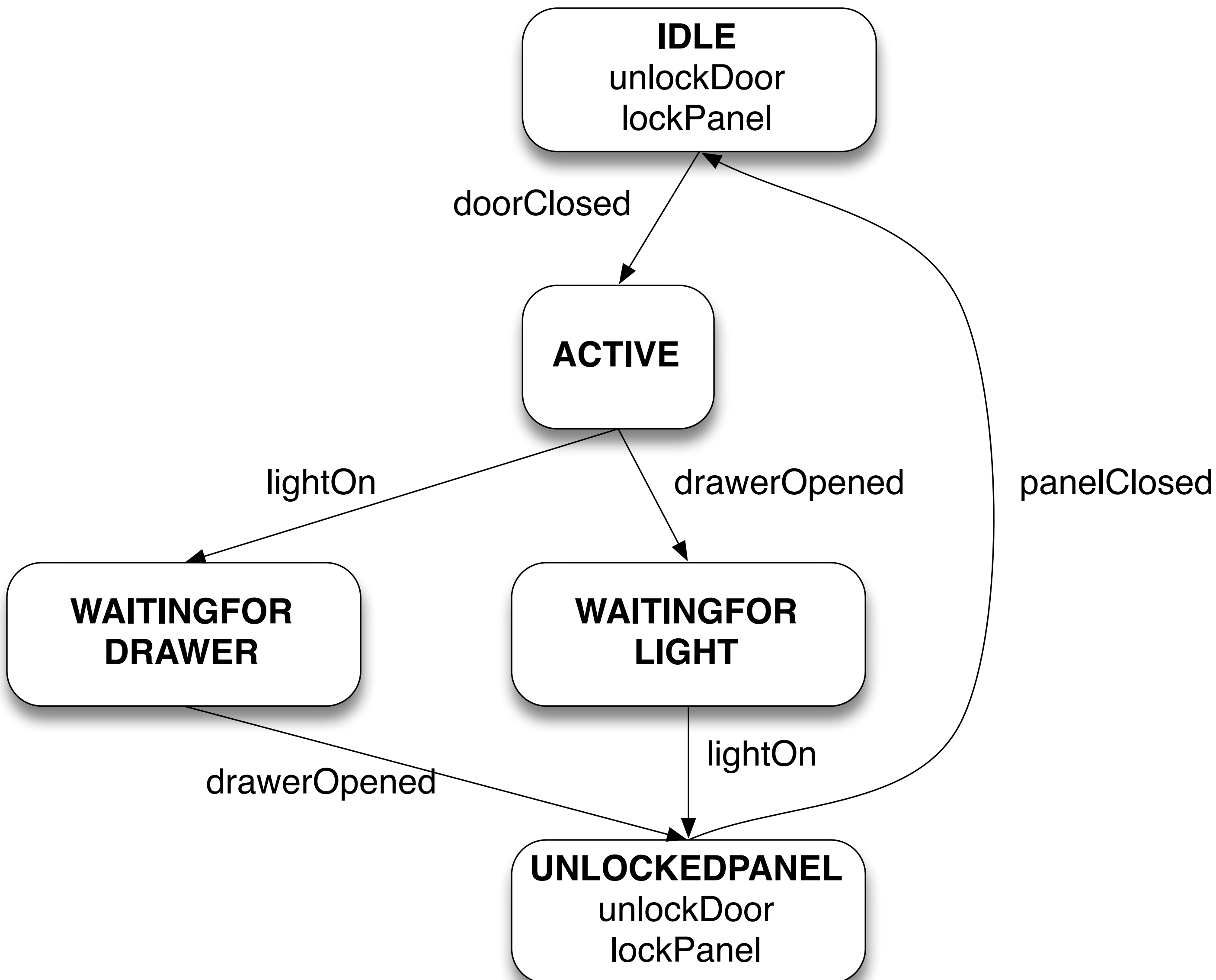
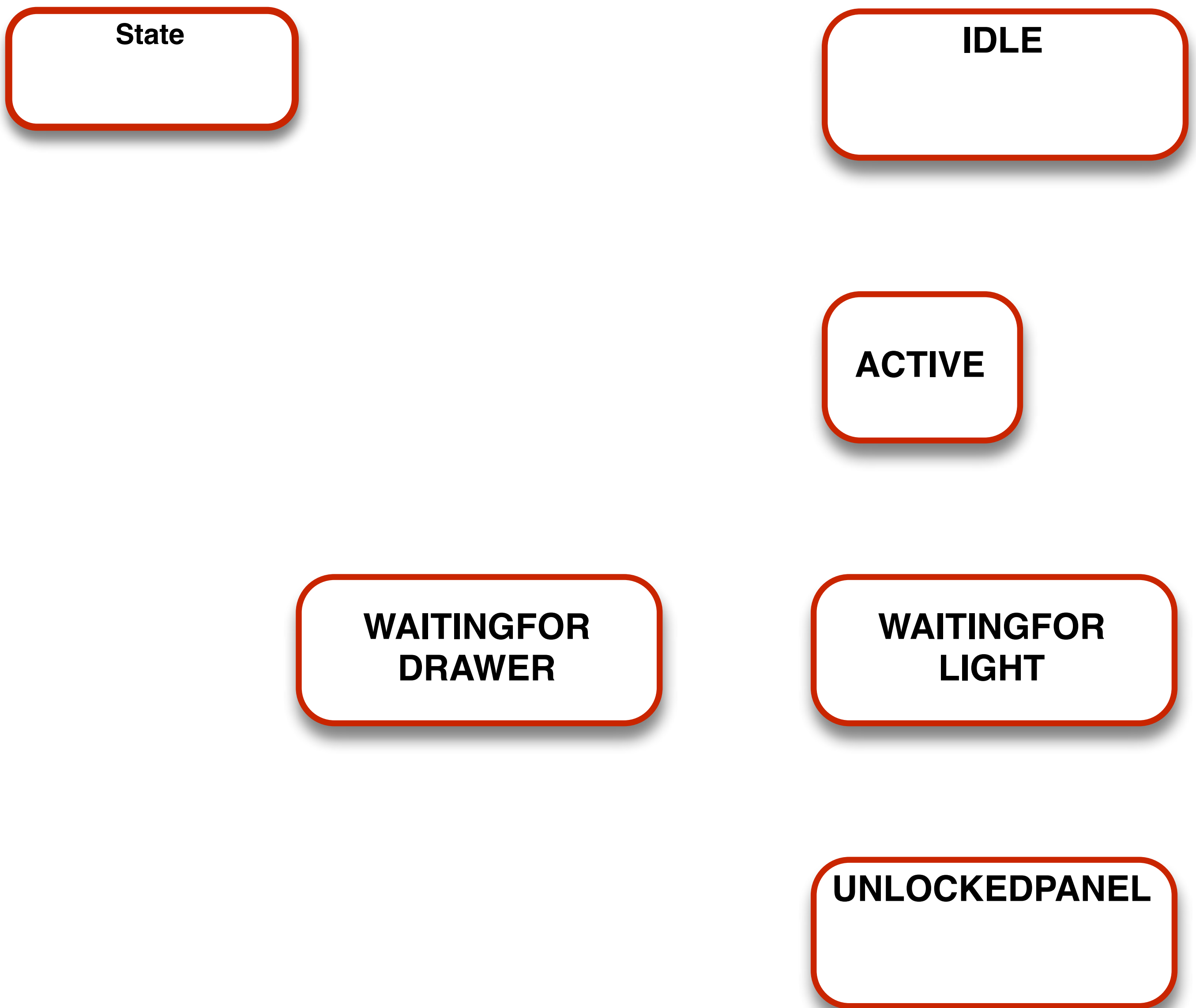


DECOMPOSE INTO CONCEPTS

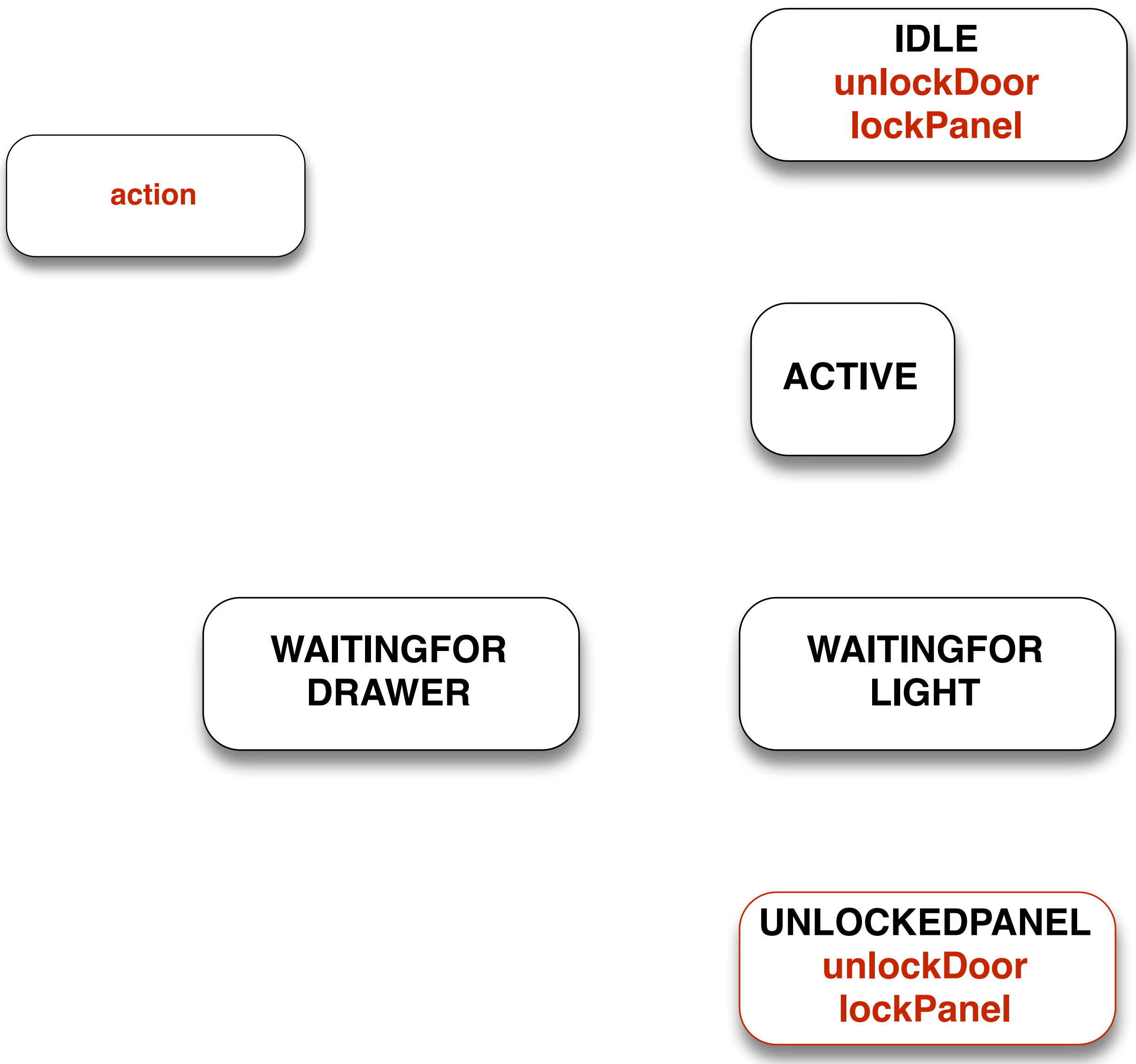
❶ State



DECOMPOSE INTO CONCEPTS

❶ State

❷ Actions



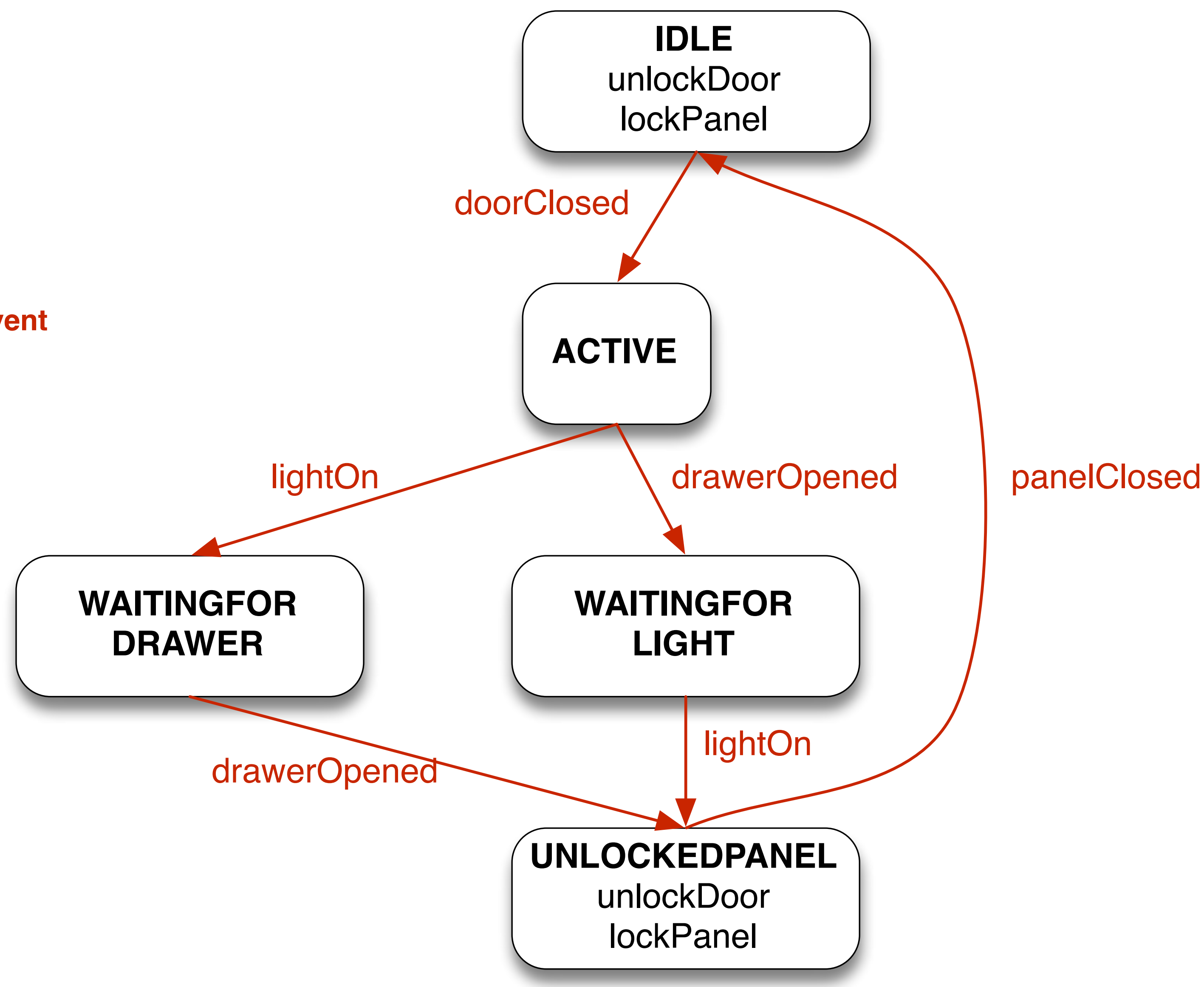
DECOMPOSE INTO CONCEPTS

❶ State

❷ Actions

❸ Transitions

event



UNIFY CONCEPTS

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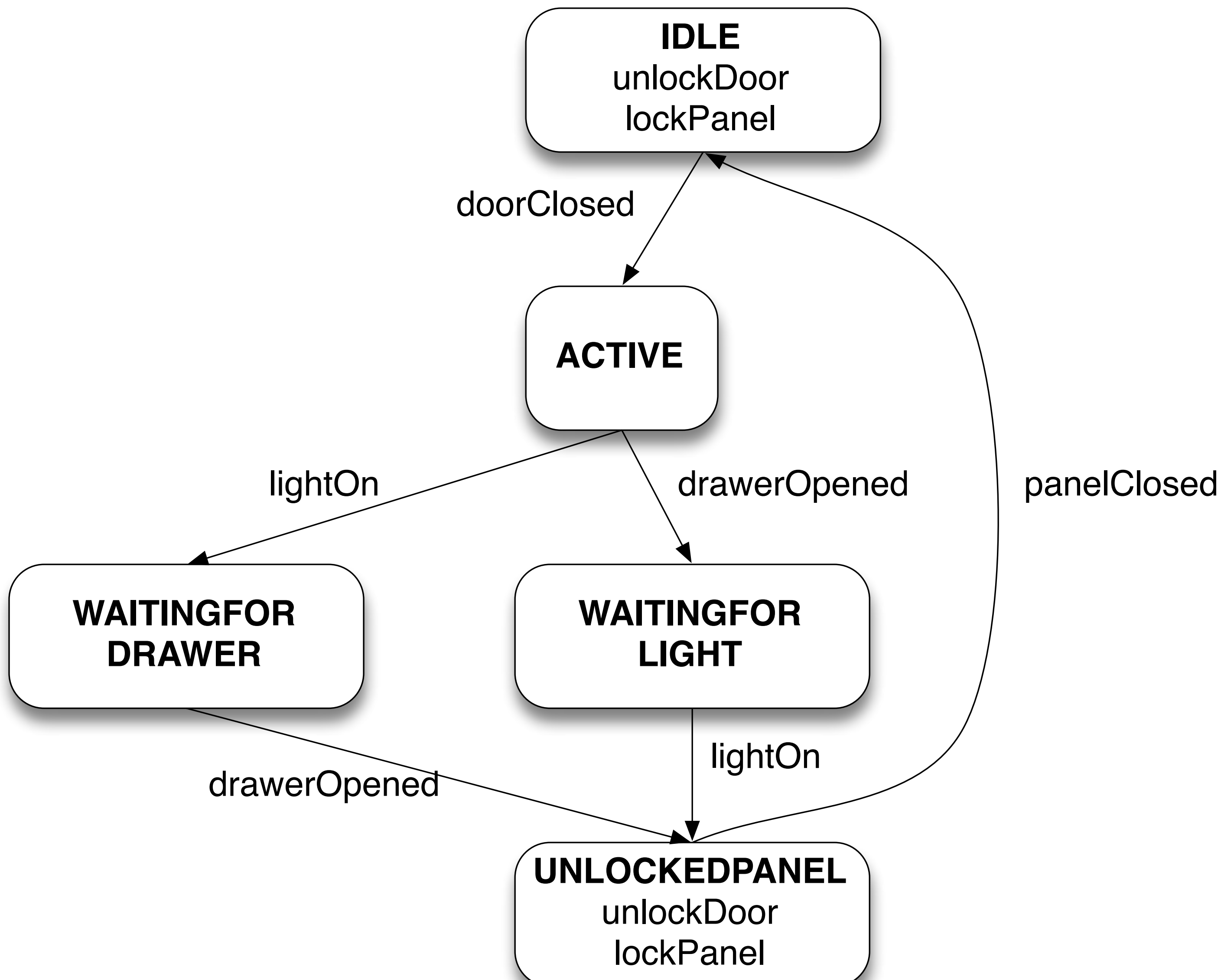

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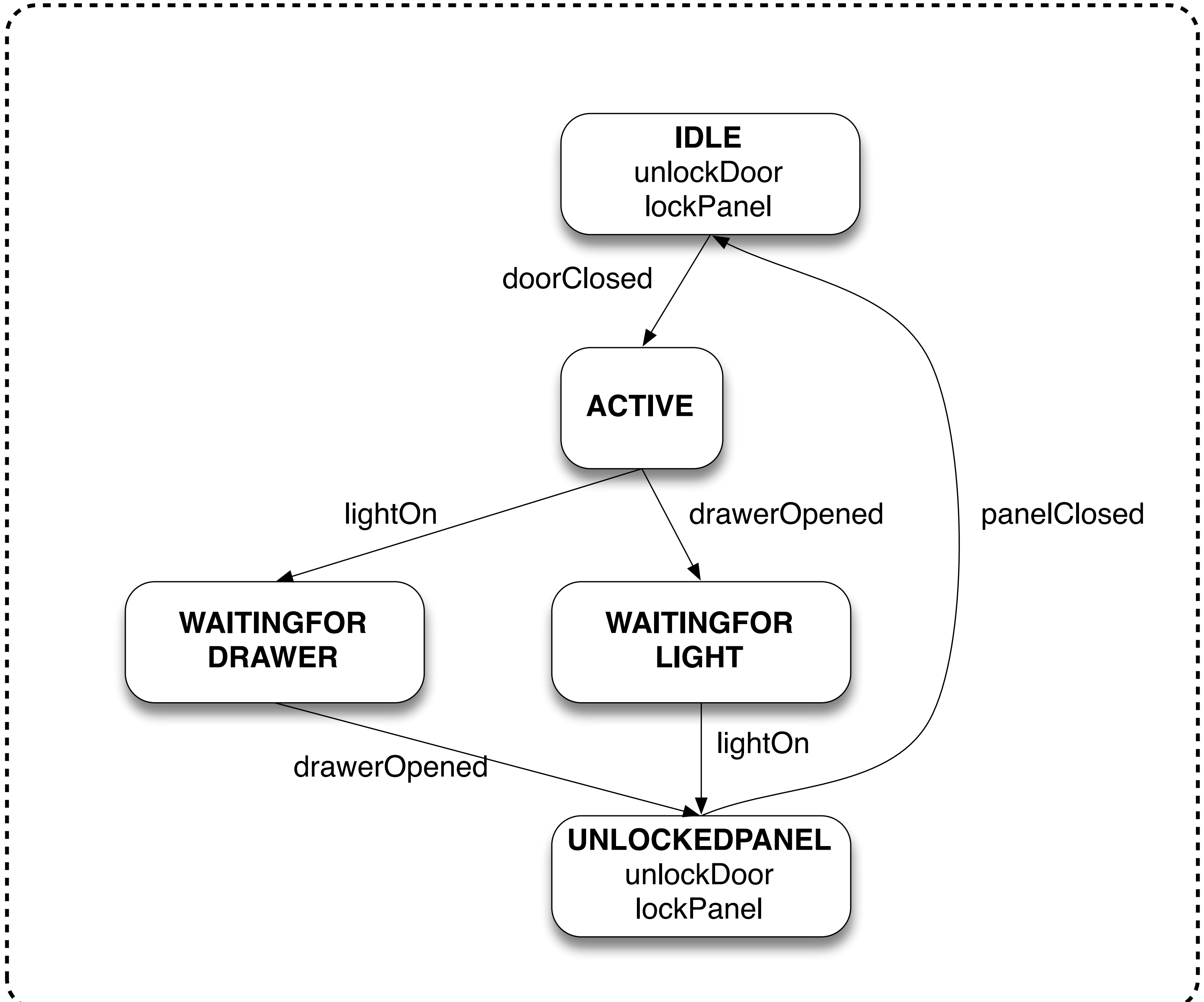

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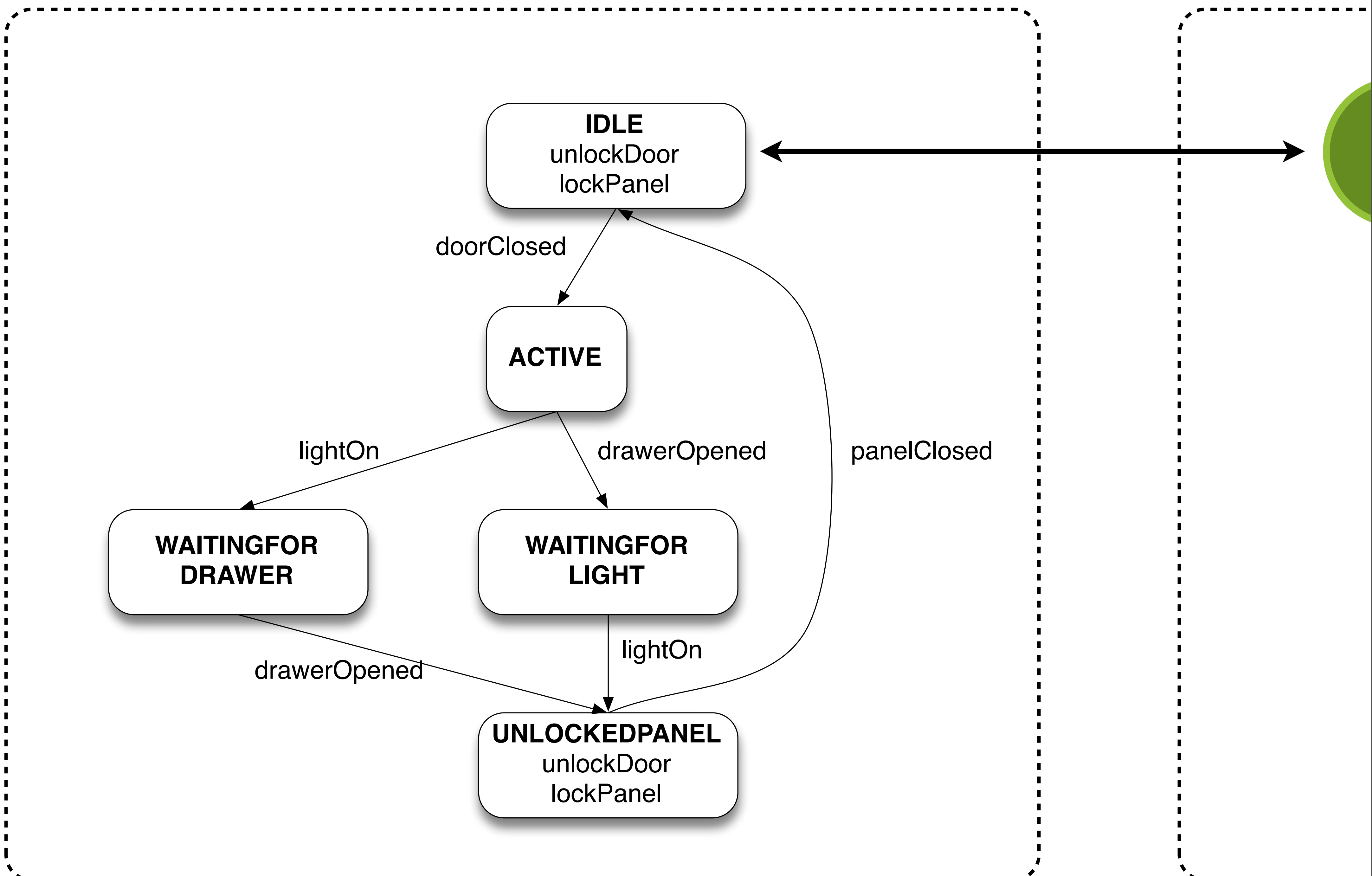

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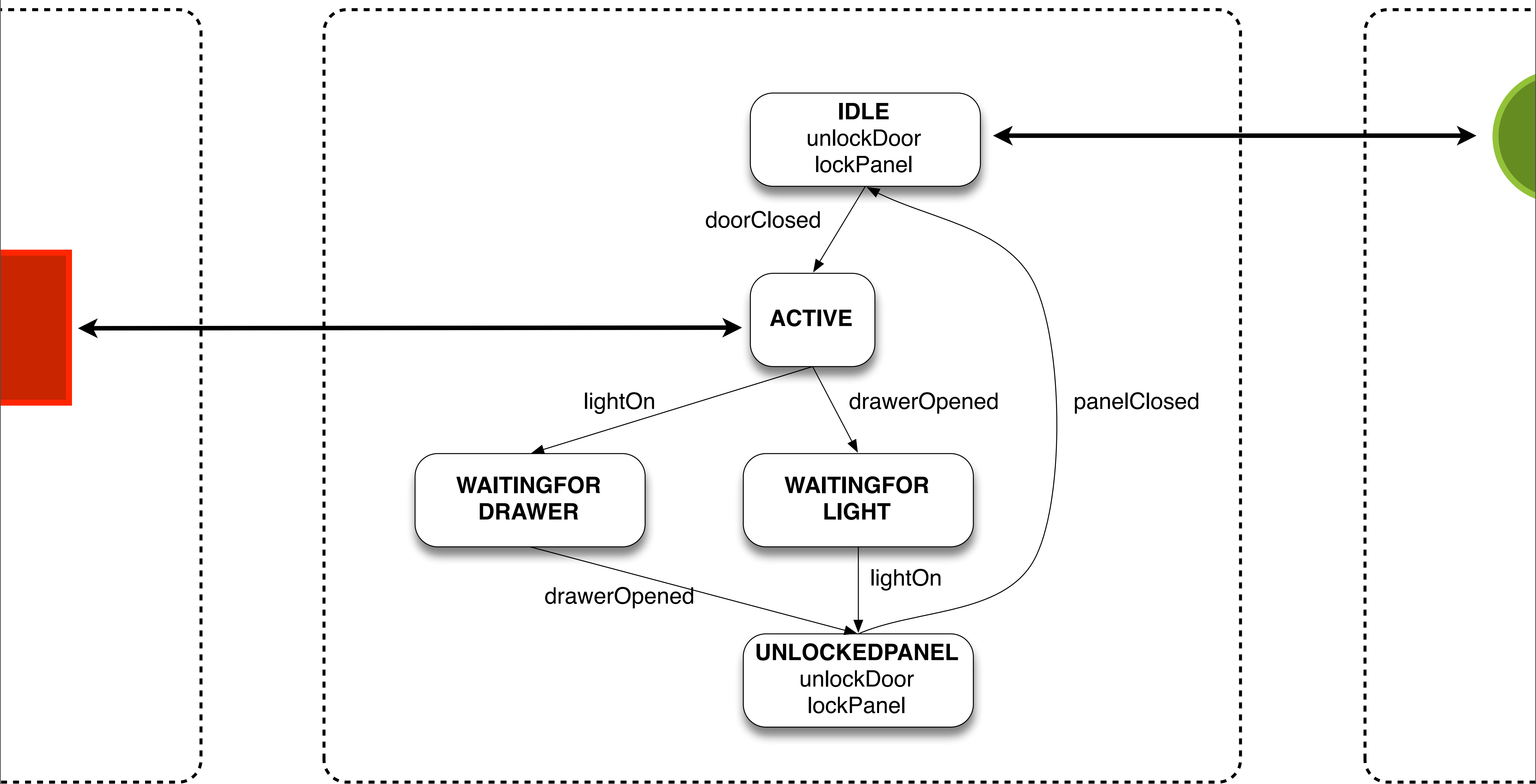

CONCLUSIONS

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- Language of Languages: An experimental language workbench that unifies concepts expressed across different notations

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- Contact Jamie Douglass (jamie.douglass@boeing.com) or Nicholas Chen (nchen@illinois.edu)