

# IceDust in Spooofax

## A Language Engineering Case Study

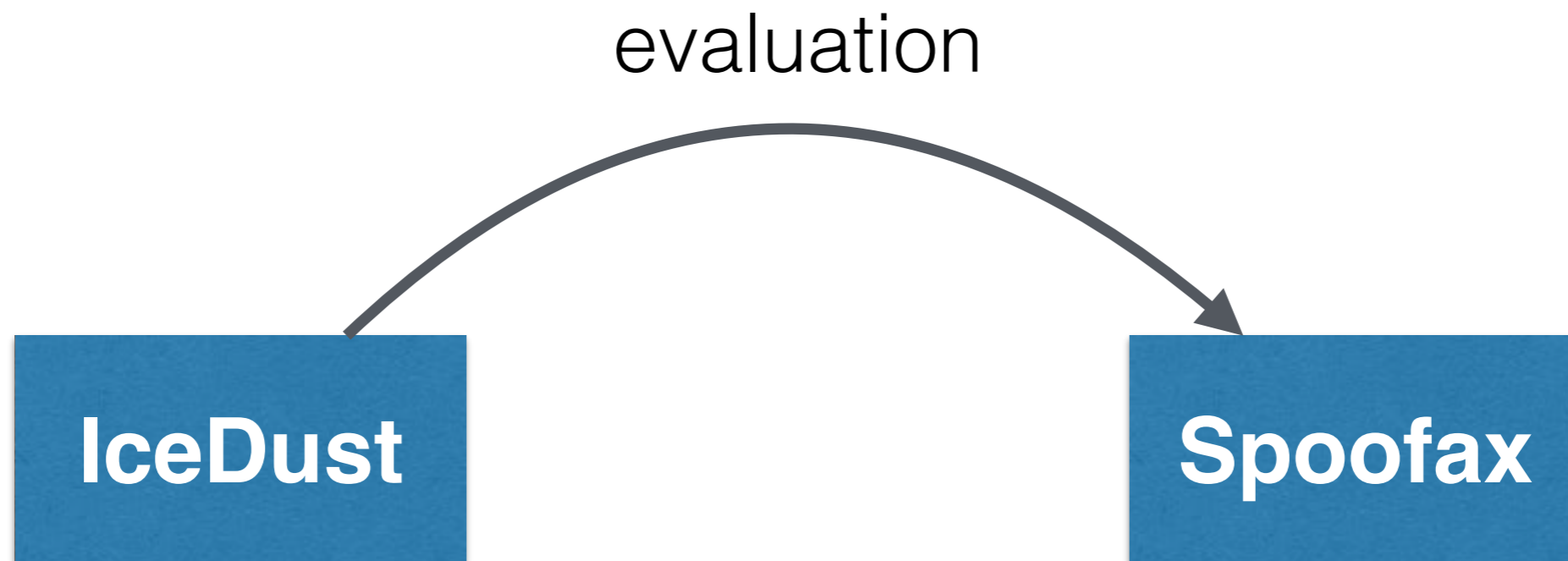
LangDevCon 2018

Daco C. Harkes

**IceDust**

powered by

**Spoofax**



# Spooifax, the good, the bad, and the ugly



# Spooifax, the good, and the research questions



**IceDust**

**Spoofax**



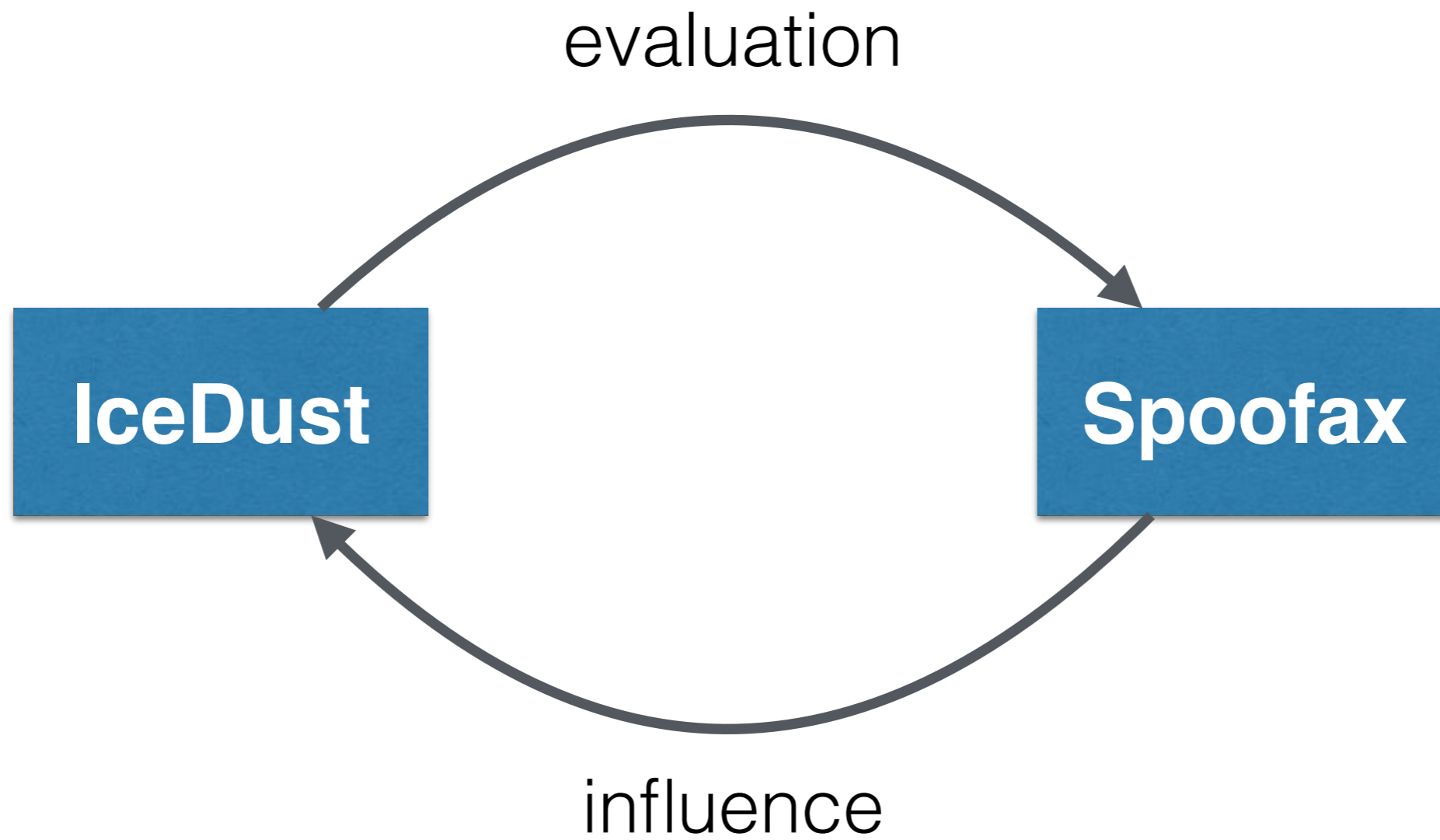
influence

IceDust

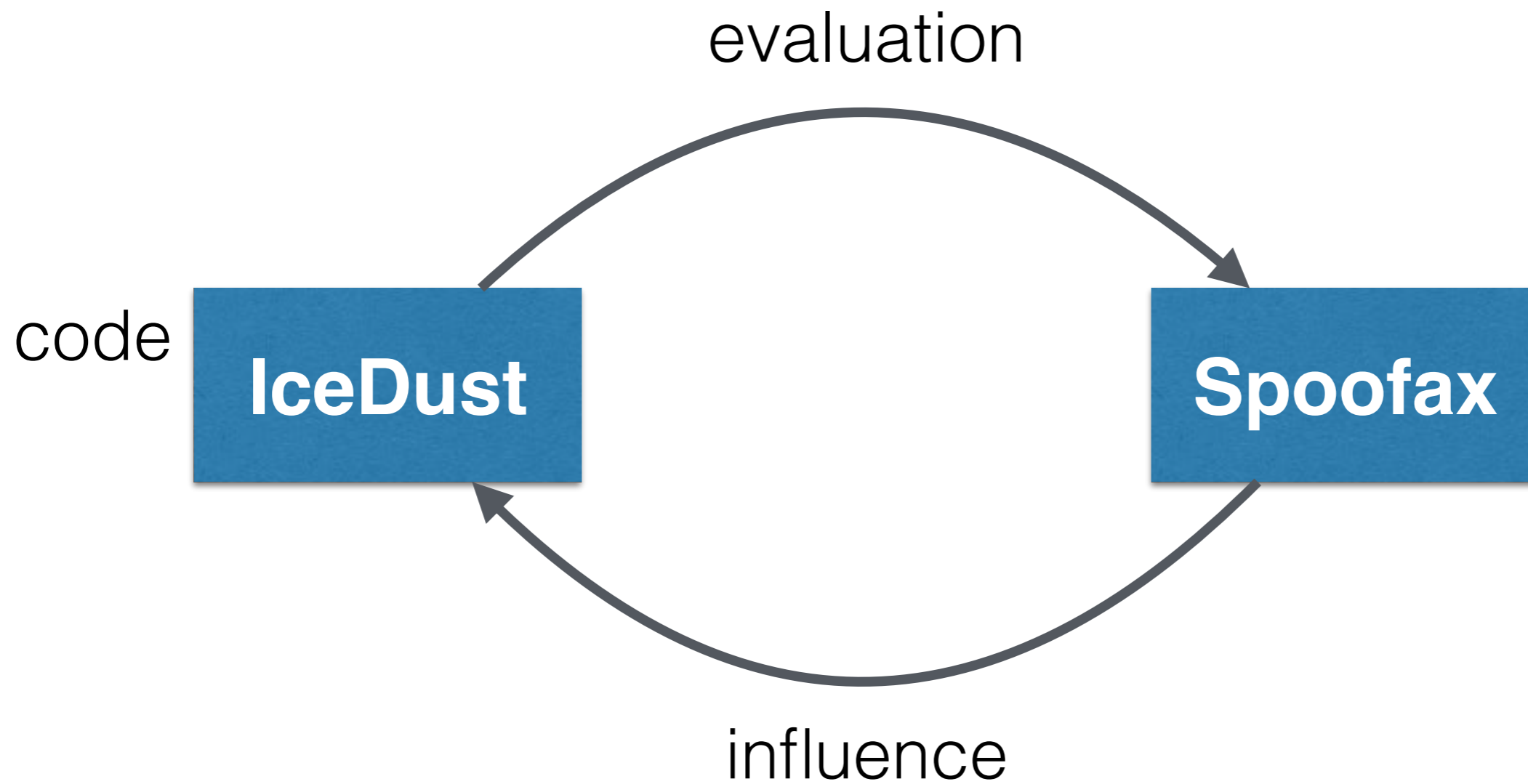
Spoofax

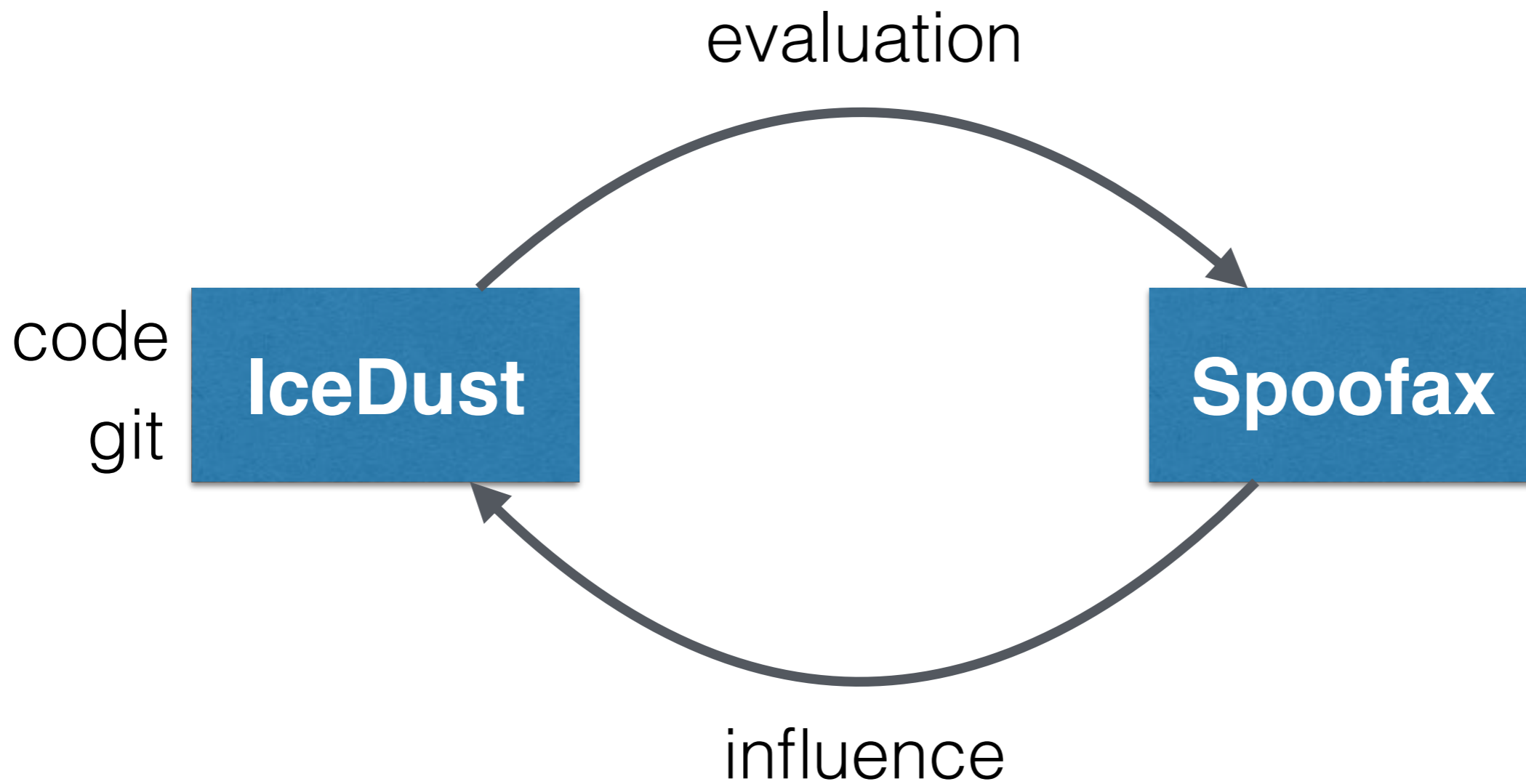


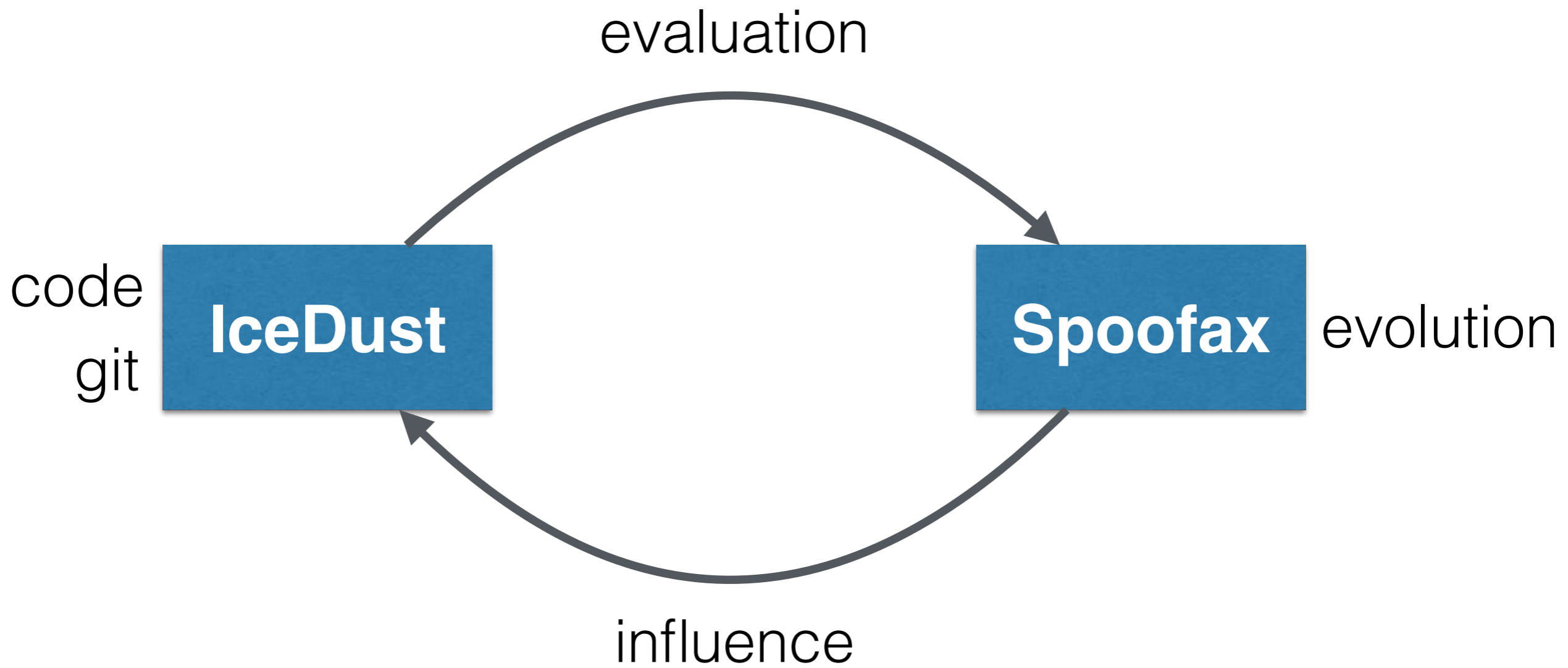
How **meta-languages**  
**shape DSLs**











**IceDust**

# IceDust

4 years

30 000 LOC

2 000 commits

10 contributors

```
entity Submission {
```

```
}
```

```
entity Assignment {
```

```
}
```

```
entity Submission {  
    pass      : Boolean  
    grade     : Float?  
  
}
```

```
entity Assignment {  
    avgGrade : Float?  
  
}
```

```
entity Submission {  
    pass      : Boolean  
    grade     : Float?  
  
}
```

```
entity Assignment {  
    avgGrade : Float?  
  
}
```

```
relation Assignment.parent      ? <-> * Assignment.children
```



```
entity Submission {  
  pass      : Boolean  
  grade     : Float?  
}
```

```
entity Assignment {  
  avgGrade : Float?  
}
```

```
relation Assignment.parent
```

```
? <-> * Assignment.children
```

?	[0,1]
1	[1,1]
*	[0,n)
+	[1,n)

```
entity Submission {
  pass      : Boolean
  grade     : Float?
}
```

```
entity Assignment {
  avgGrade : Float?
}
```

?	[0,1]
1	[1,1]
*	[0,n)
+	[1,n)

```
relation Assignment.parent      ? <-> * Assignment.children
relation Submission.assignment 1 <-> * Assignment.submissions
```

```
entity Submission {
  pass      : Boolean
  grade     : Float?
}
```

```
entity Assignment {
  avgGrade : Float?
}
```

?	[0,1]
1	[1,1]
*	[0,n)
+	[1,n)

```
relation Assignment.parent      ? <-> * Assignment.children
relation Submission.assignment  1 <-> * Assignment.submissions
relation Submission.parent    ? <-> * Submission.children
```

```
entity Submission {  
  pass      : Boolean = grade >= 5.5 <+ false  
  grade     : Float?  
  
}
```

```
entity Assignment {  
  avgGrade : Float?  
  
}
```

```
relation Assignment.parent      ? <-> * Assignment.children  
relation Submission.assignment 1 <-> * Assignment.submissions  
relation Submission.parent     ? <-> * Submission.children
```

```
entity Submission {
  pass      : Boolean = grade >= 5.5 <+ false
  grade     : Float?  = if(conj(children.pass))
                    avg(children.grade)
}
```

```
entity Assignment {
  avgGrade : Float?
}
```

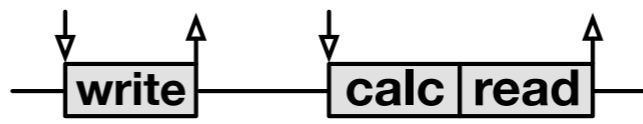
```
relation Assignment.parent      ? <-> * Assignment.children
relation Submission.assignment  1 <-> * Assignment.submissions
relation Submission.parent      ? <-> * Submission.children
```

```
entity Submission {
  pass      : Boolean = grade >= 5.5 <+ false
  grade     : Float?  = if(conj(children.pass))
                    avg(children.grade)
}
```

```
entity Assignment {
  avgGrade : Float? = avg(submissions.grade)
}
```

```
relation Assignment.parent      ? <-> * Assignment.children
relation Submission.assignment  1 <-> * Assignment.submissions
relation Submission.parent      ? <-> * Submission.children
```





**Getter**



**course** : *Assignment*  
avgGrade = ...

average depends on 25000 grades

**courseBob** : *Submission*

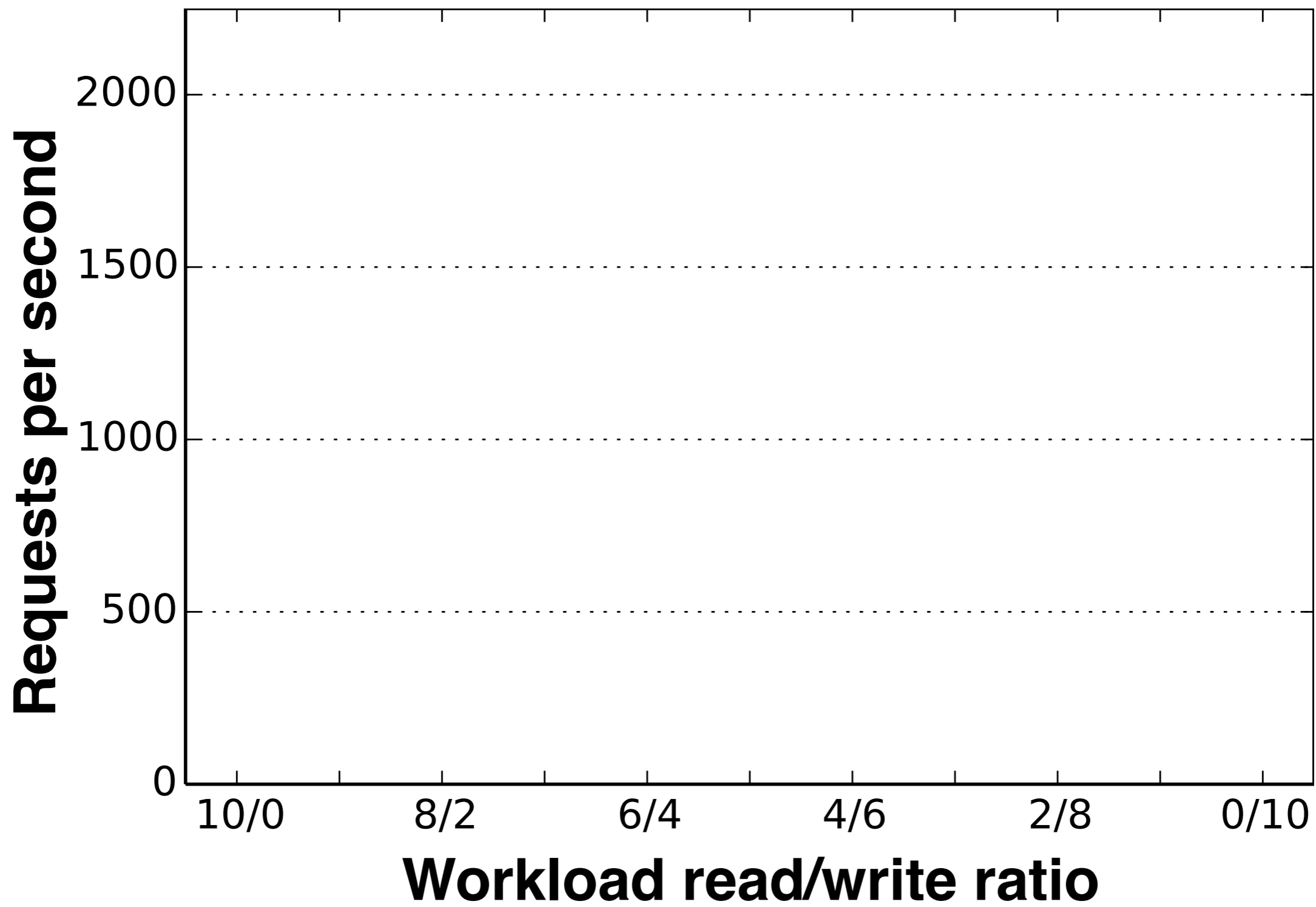
x250

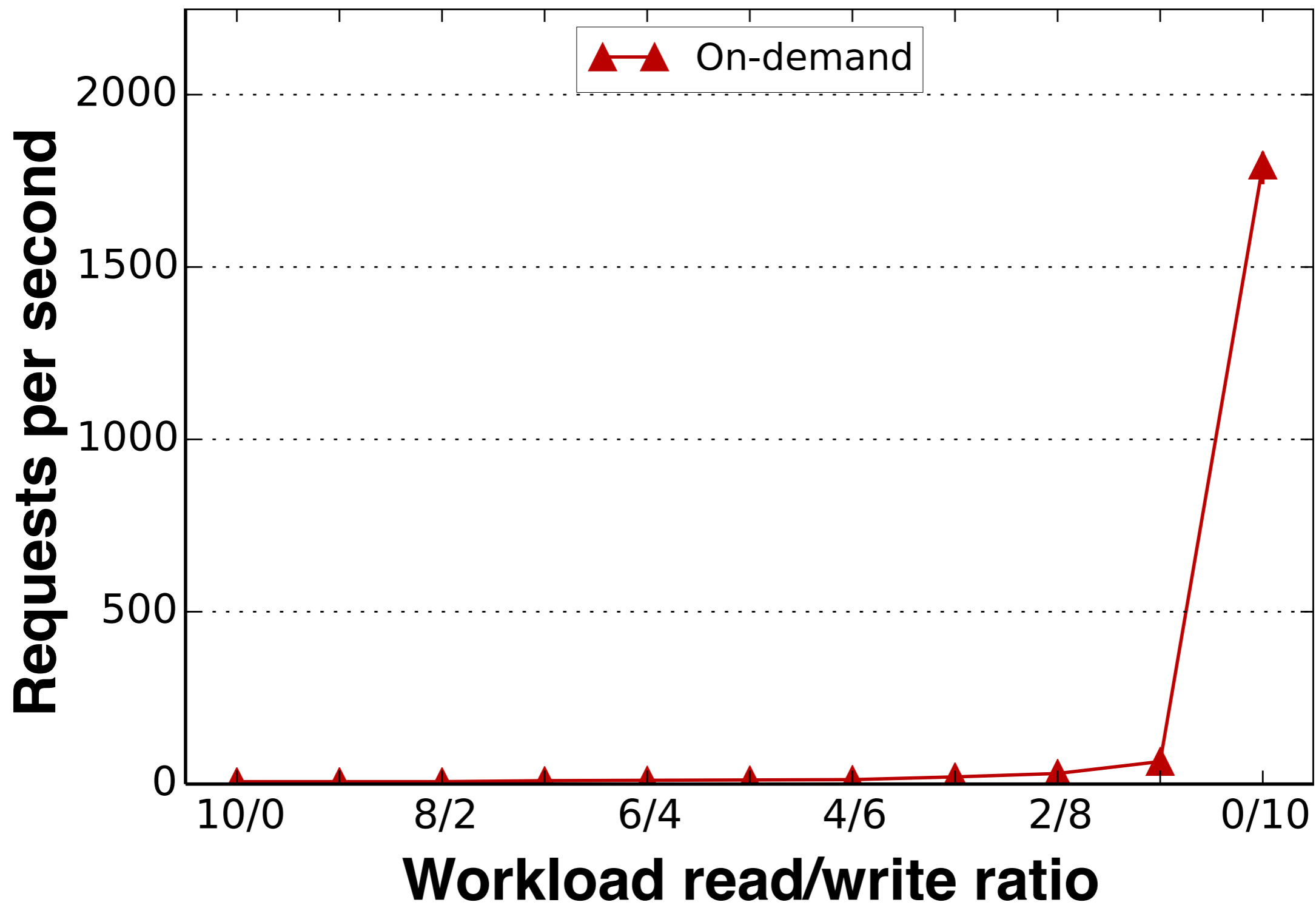
**lab1Bob** : *Submission*

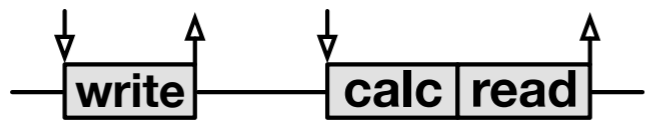
x10

**lab11Bob** : *Submission*

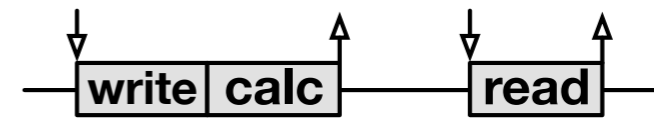
x10



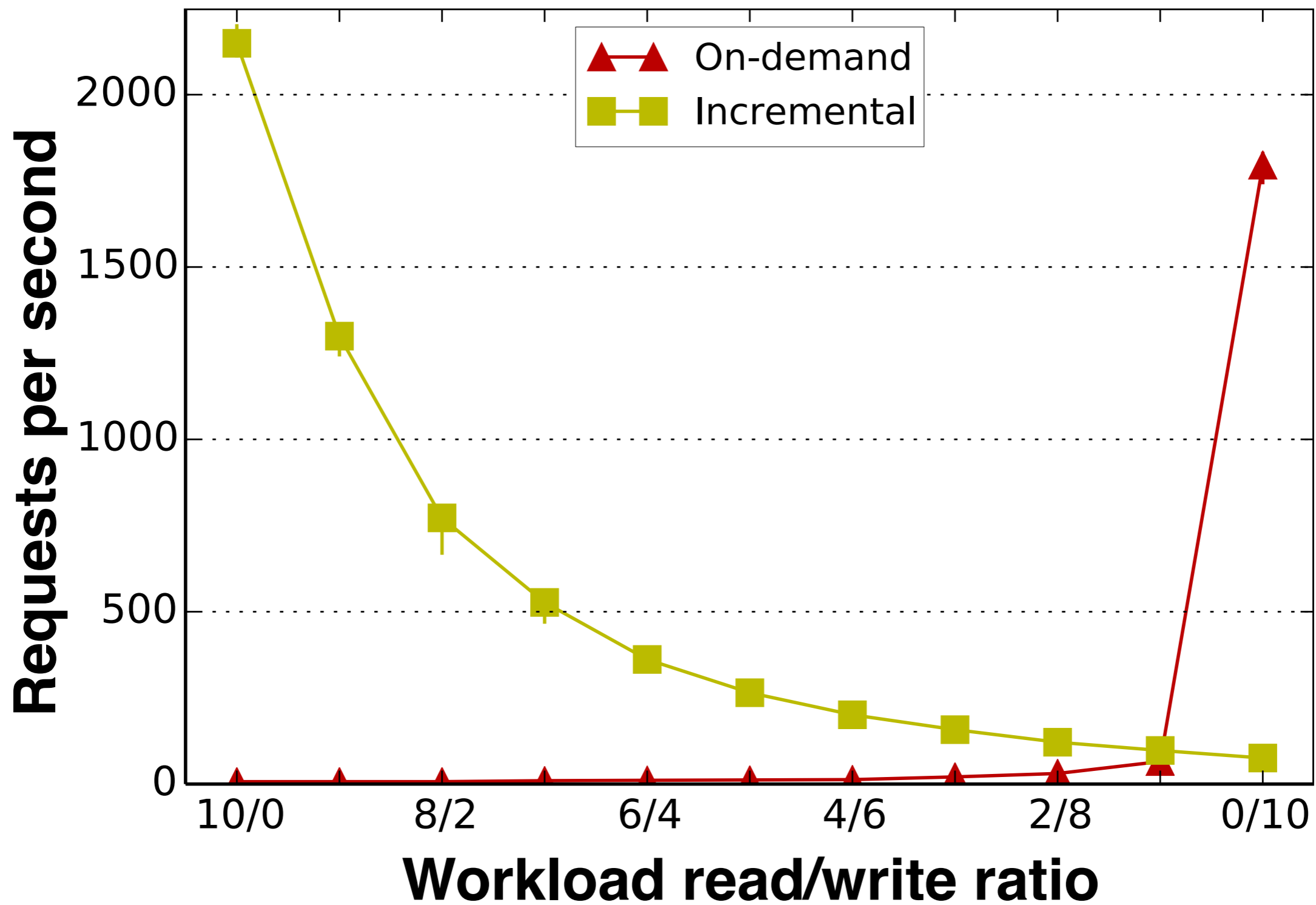


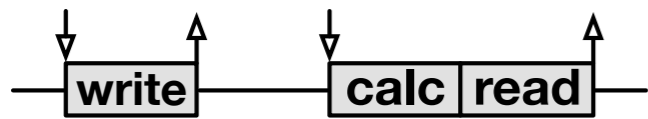


**On-demand Calculation  
(getter)**

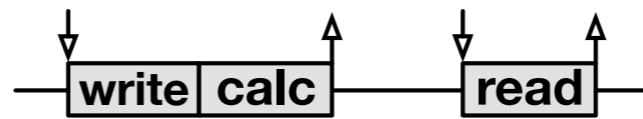


**Incremental Calculation  
(cached)**

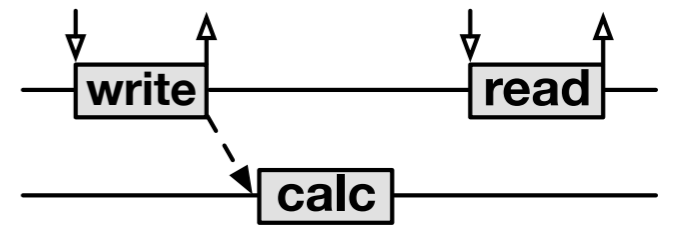




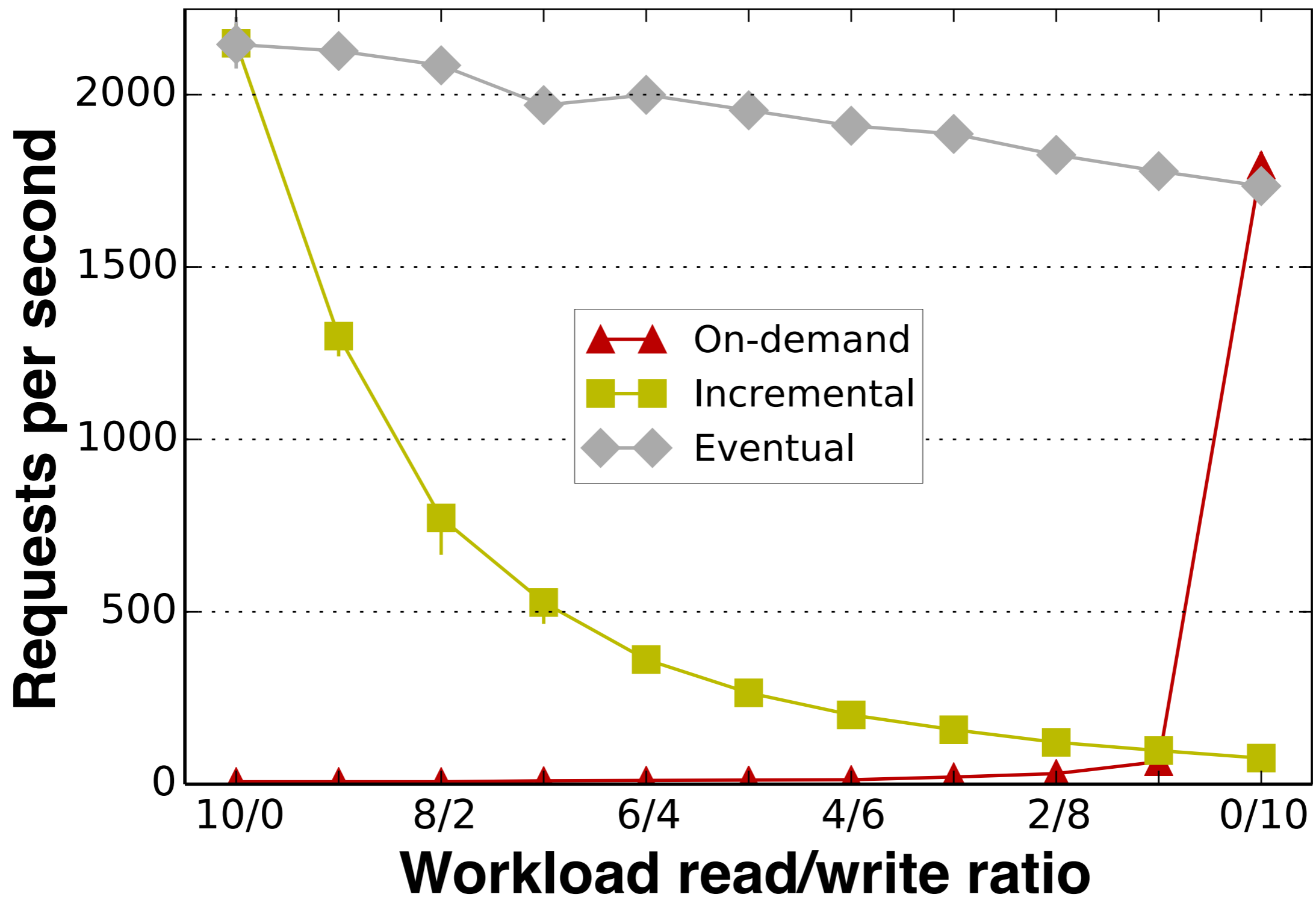
**On-demand**

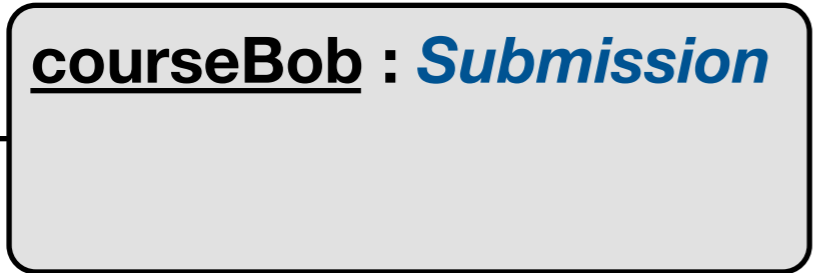
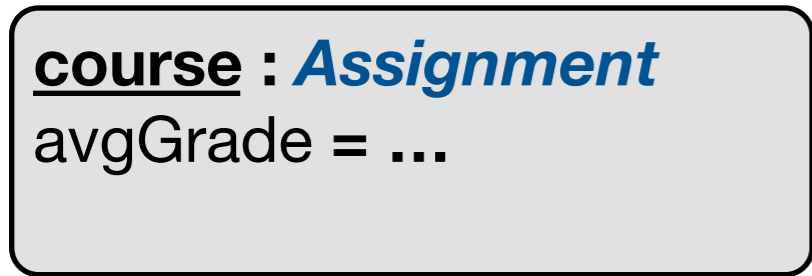


**Incremental**



**Eventual**





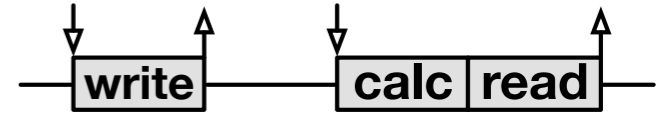
x250



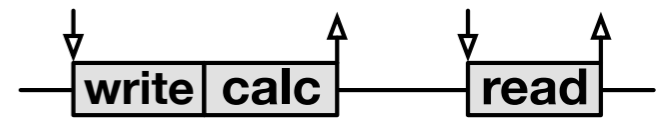
x10



x10

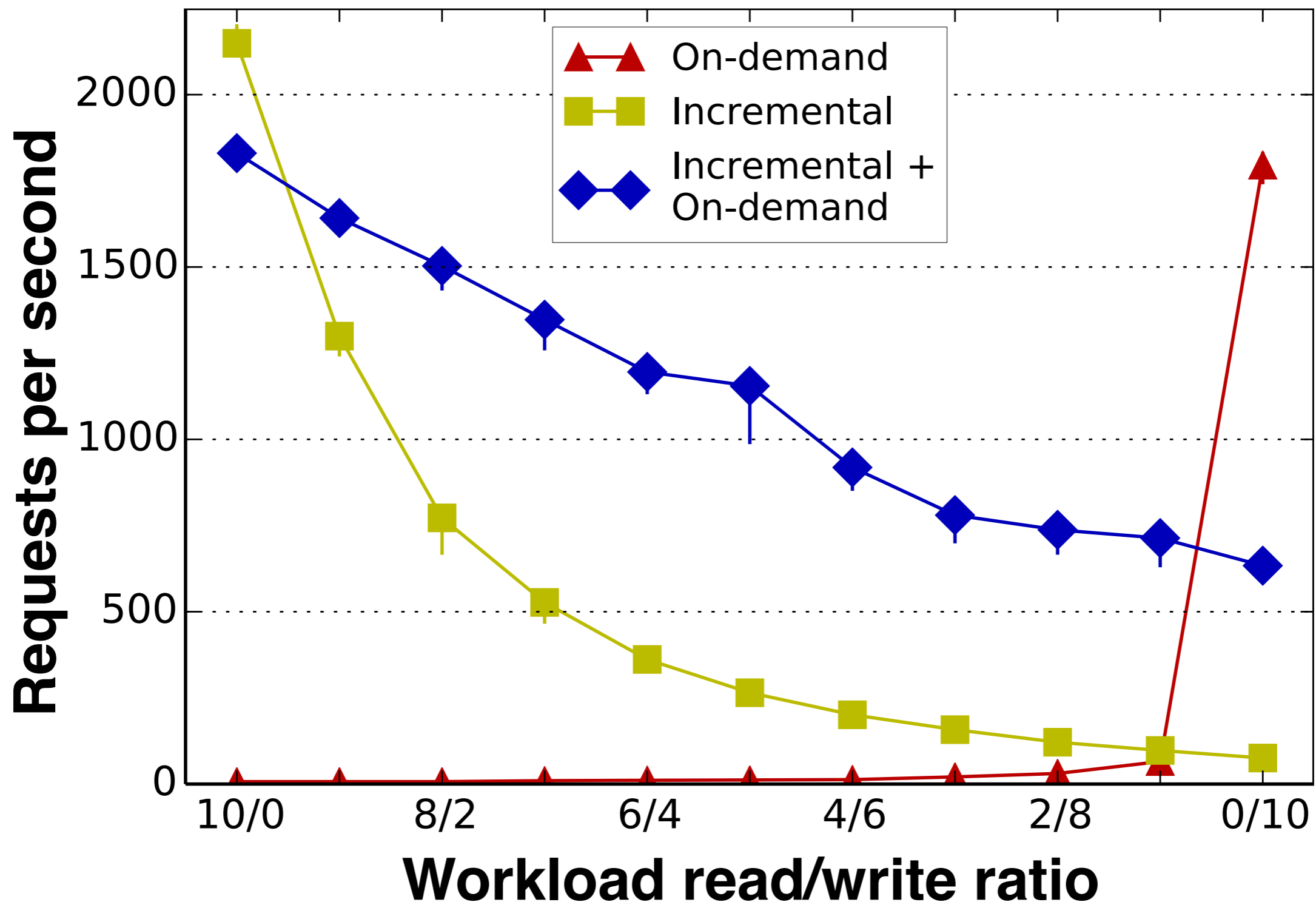


**On-demand**



**Incremental**





**IceDust**

implemented in

**Spoofax**

**Parse**



**Desugar**



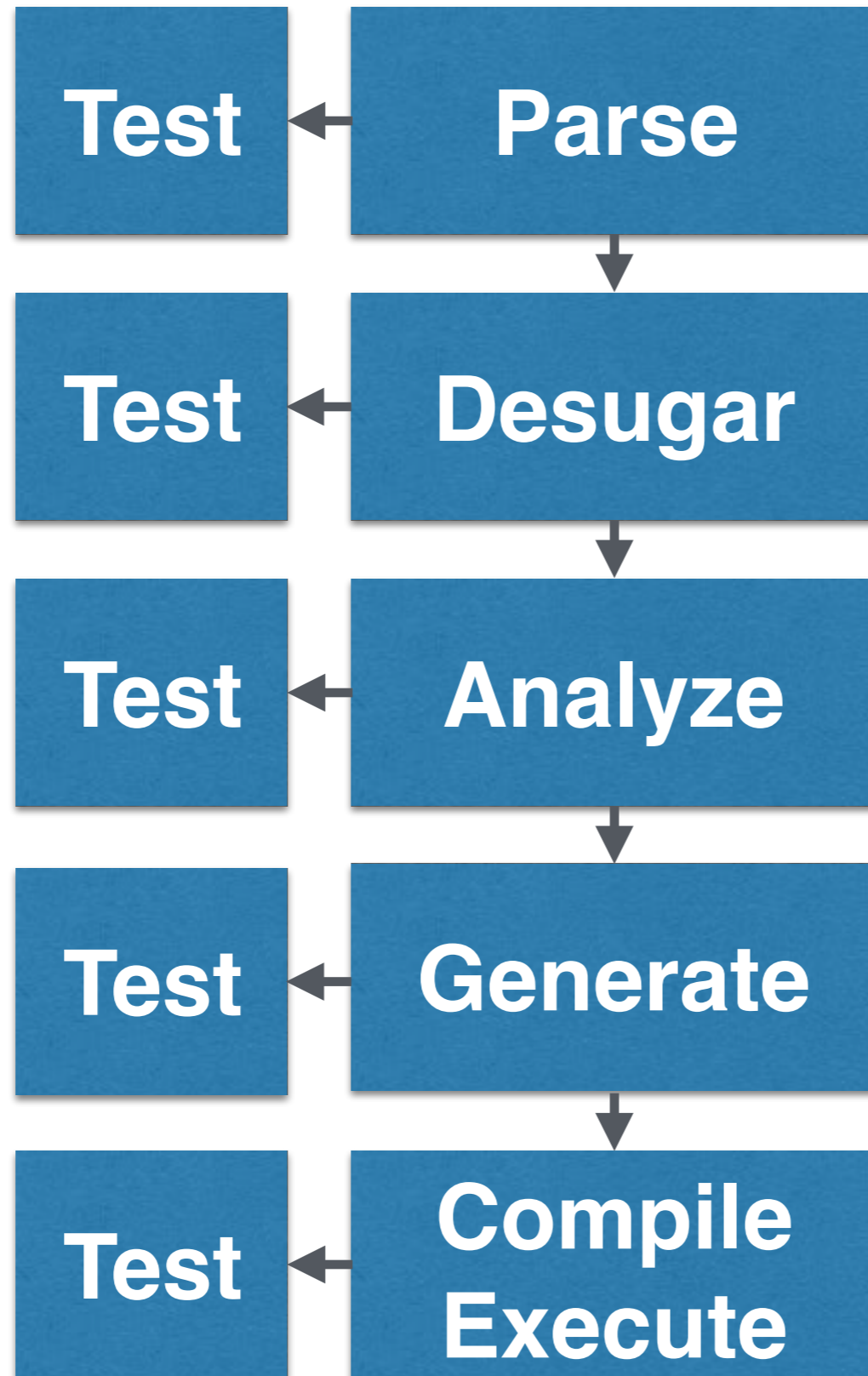
**Analyze**

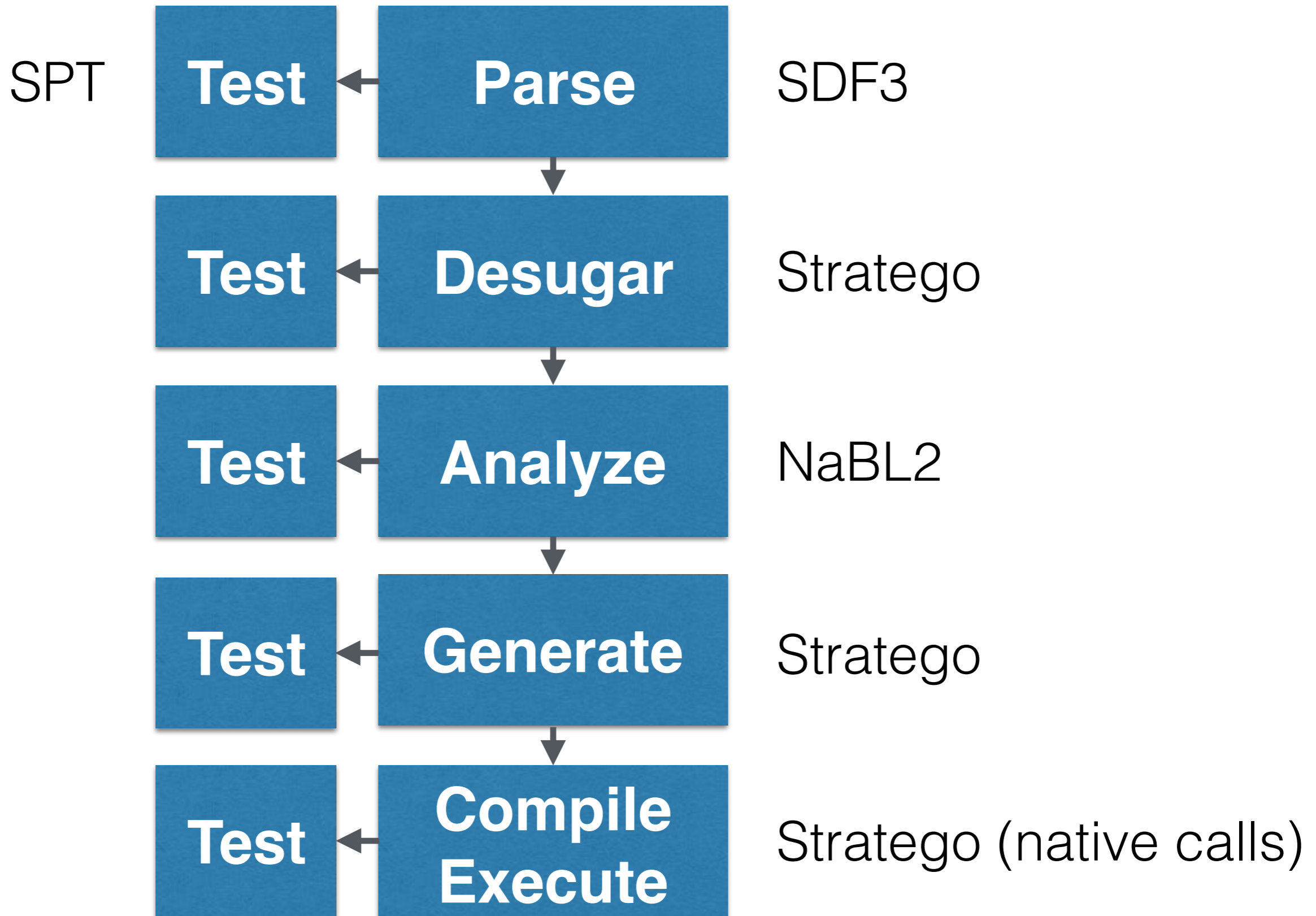


**Generate**



**Compile  
Execute**





SPT

**Test**

**Parse**

SDF3

**Test**

**Desugar**

Stratego

**Test**

**Analyze**

NaBL2

**Test**

**Analyze (2)**

Stratego

**Test**

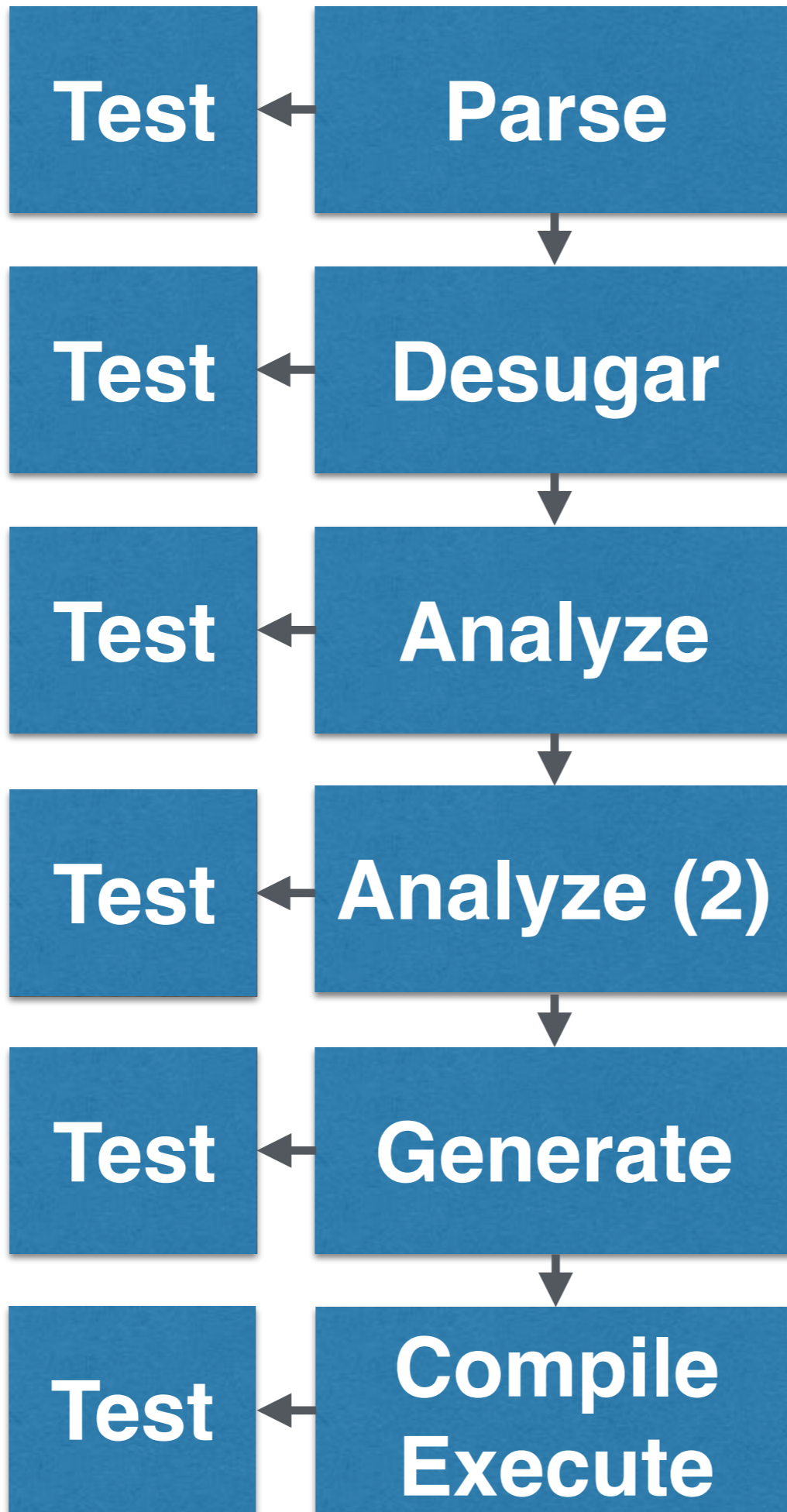
**Generate**

Stratego

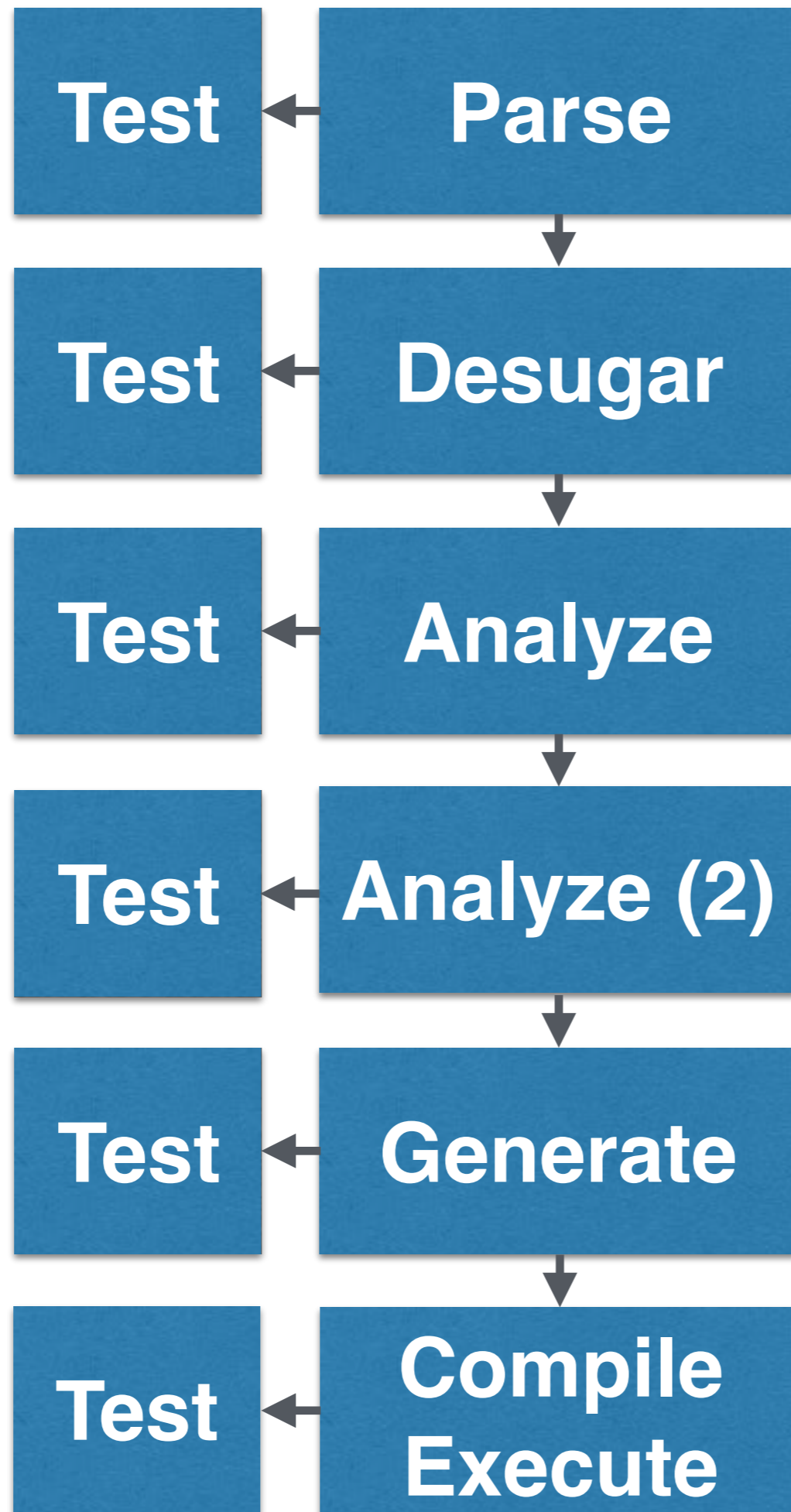
**Test**

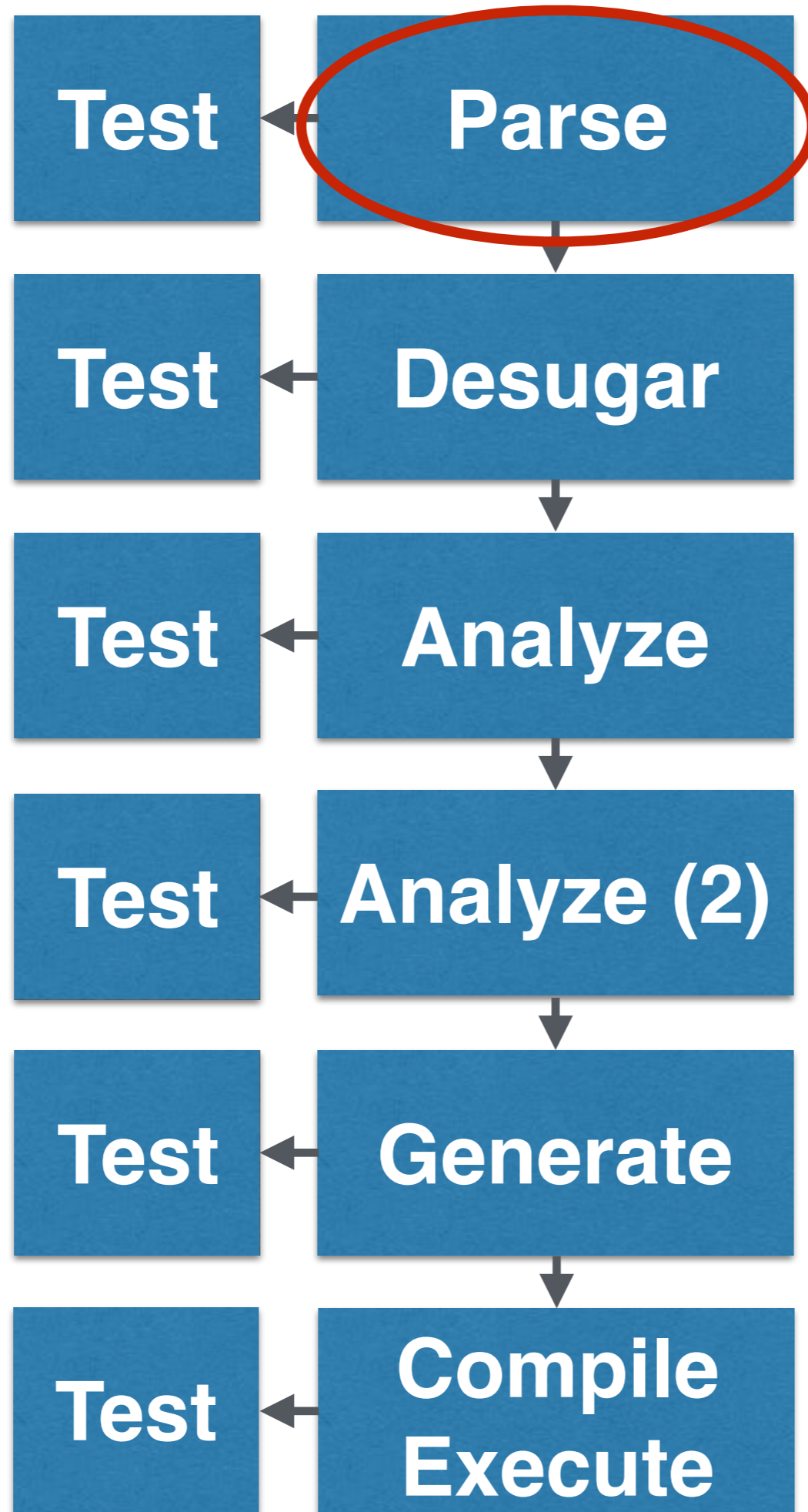
**Compile  
Execute**

Stratego (native calls)

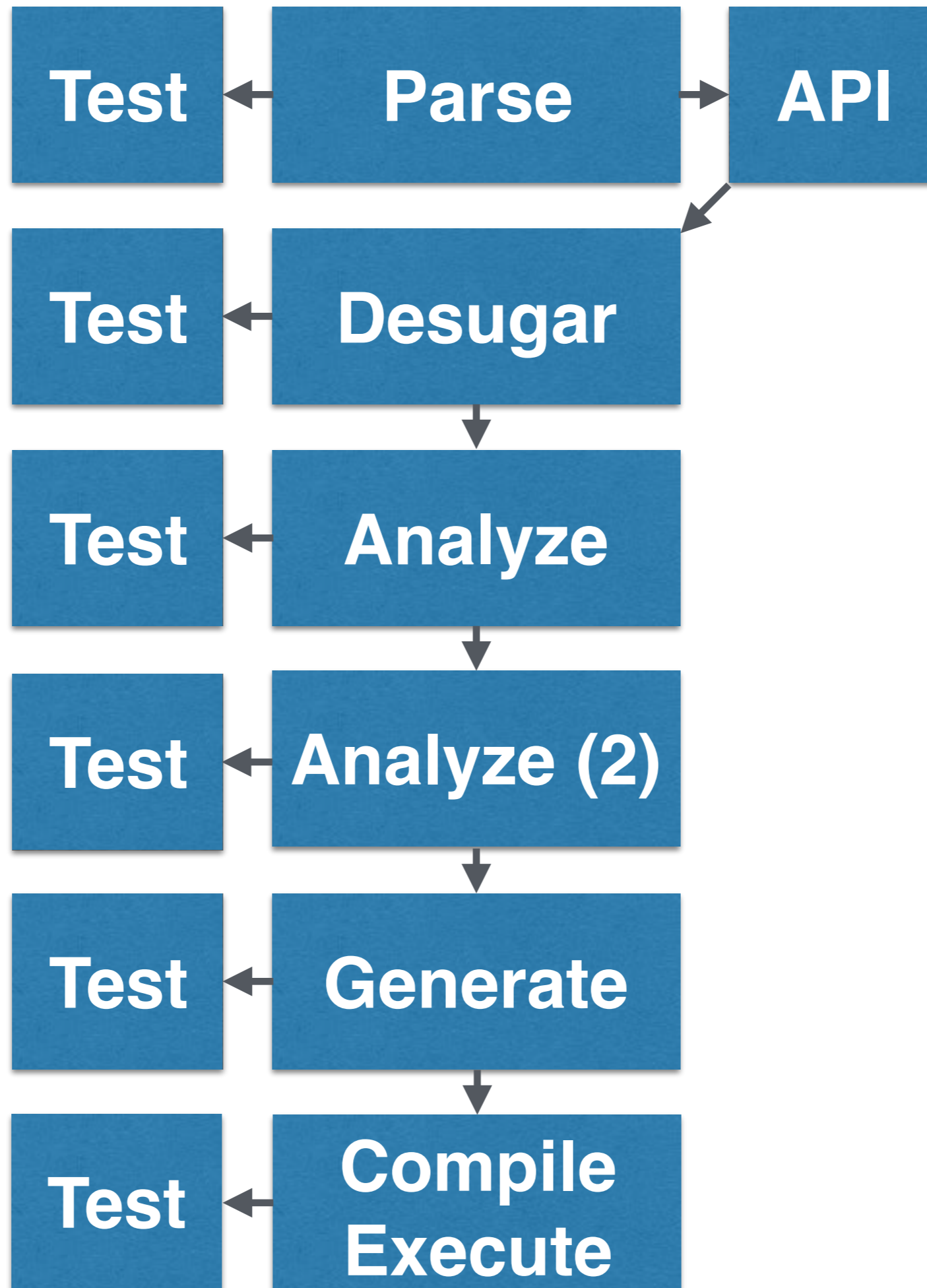


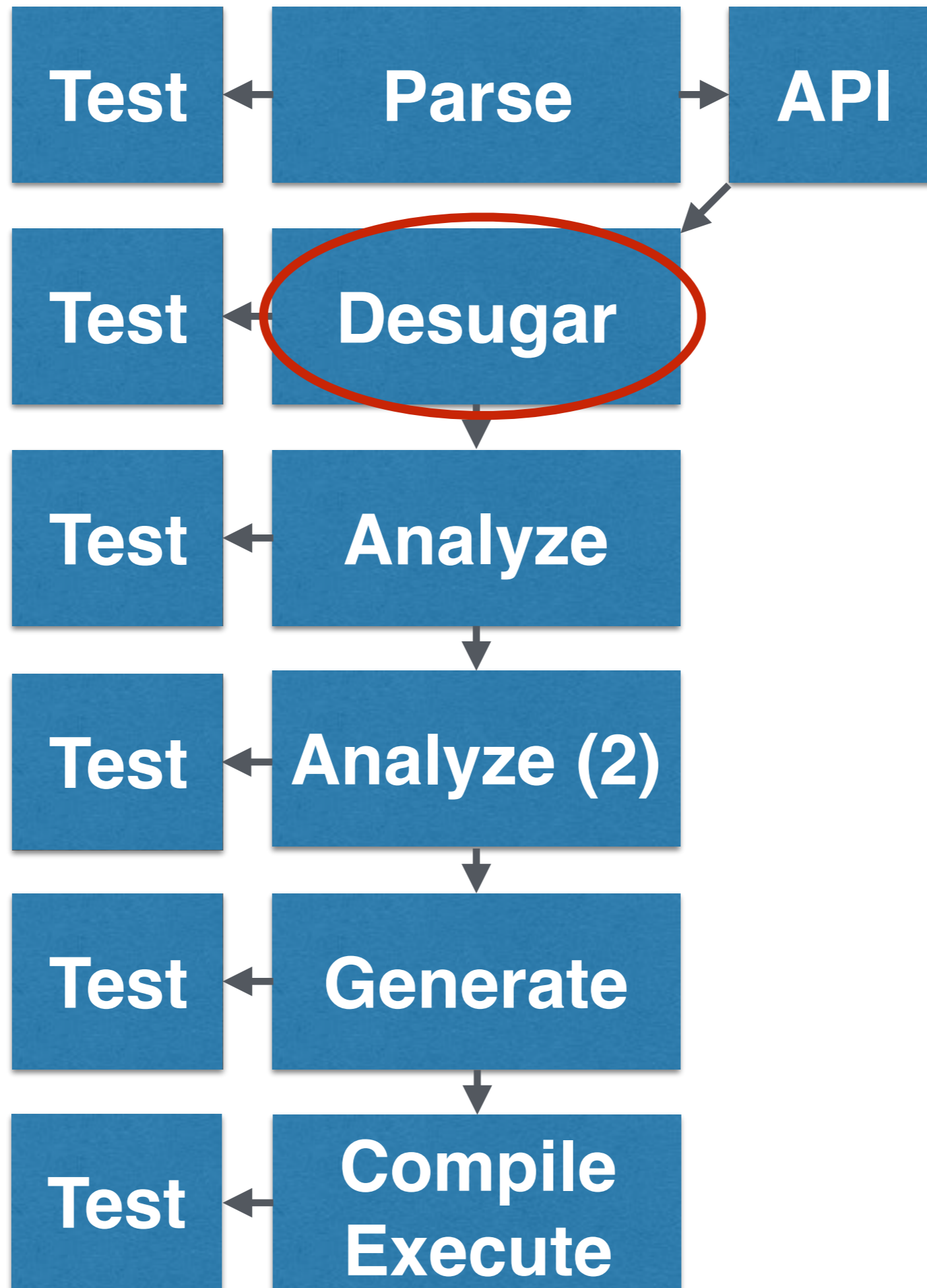


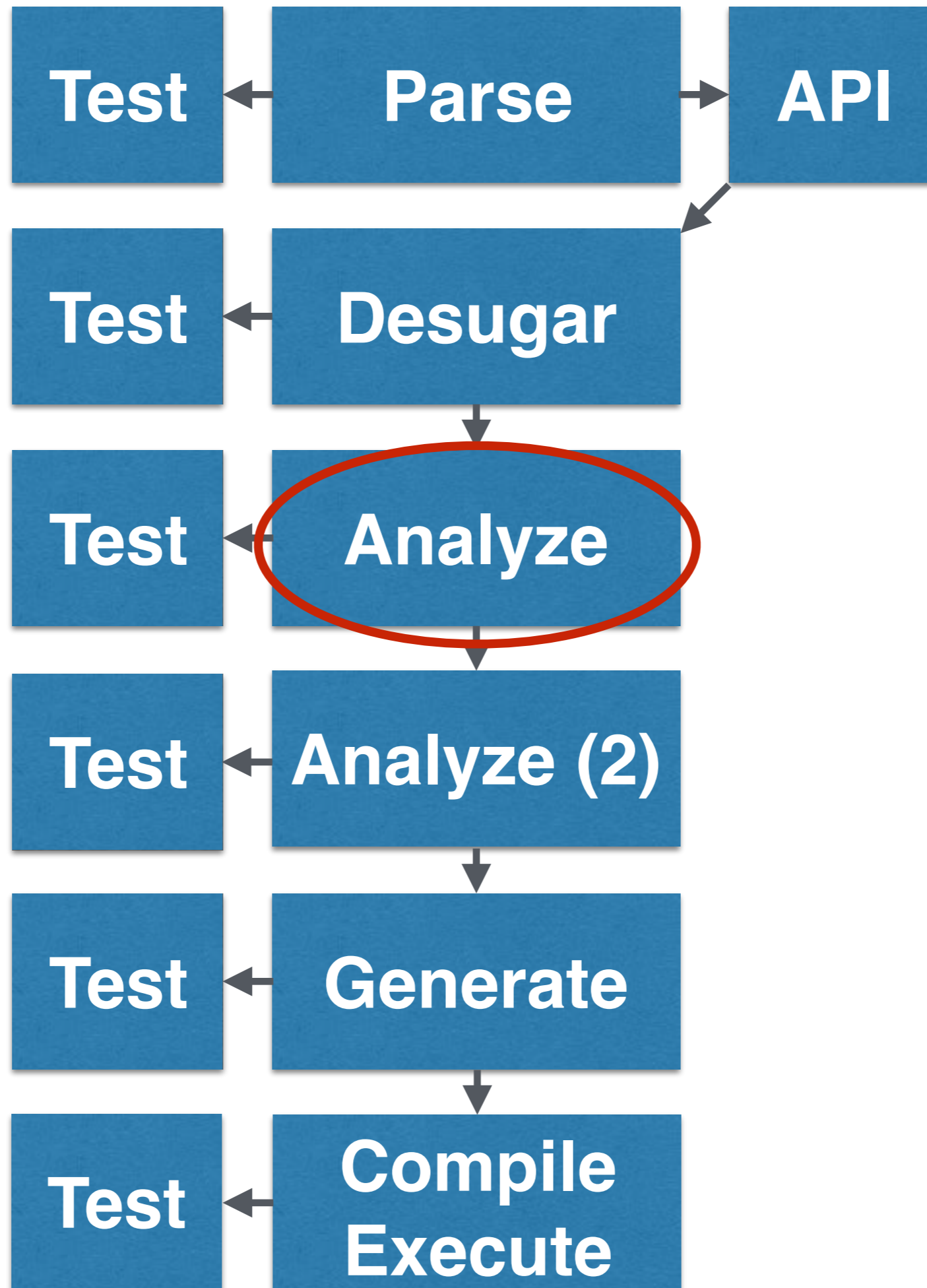


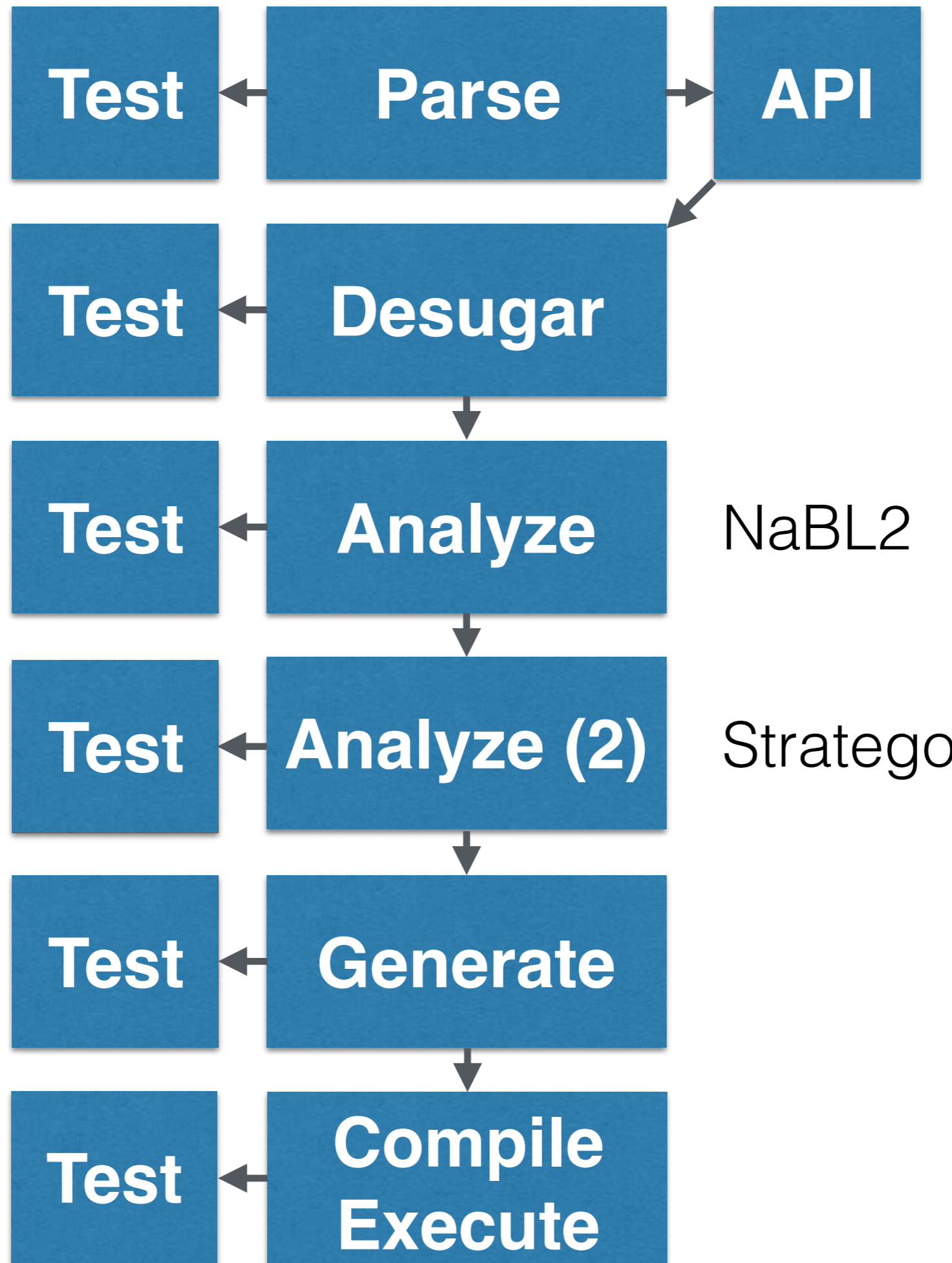




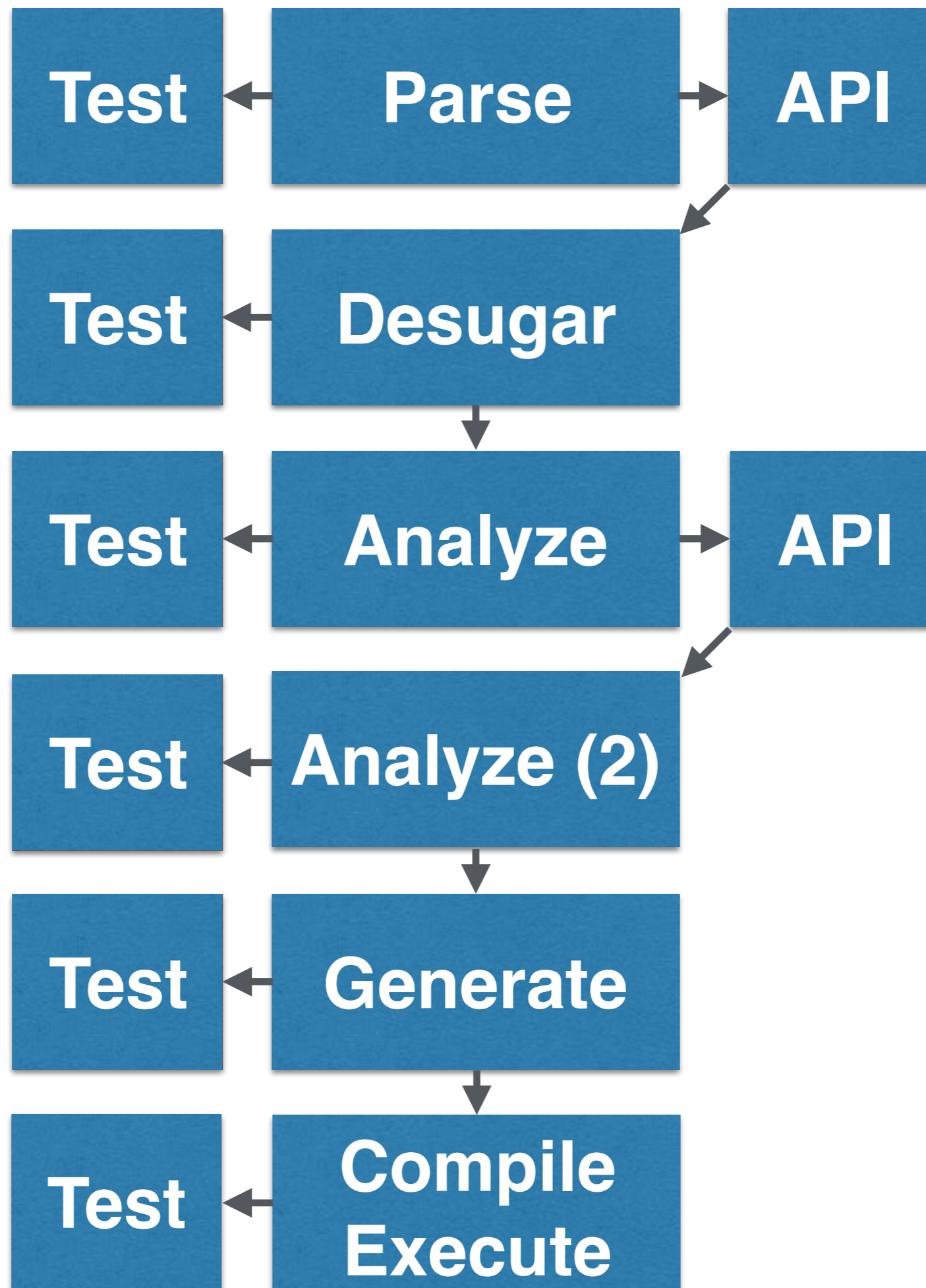


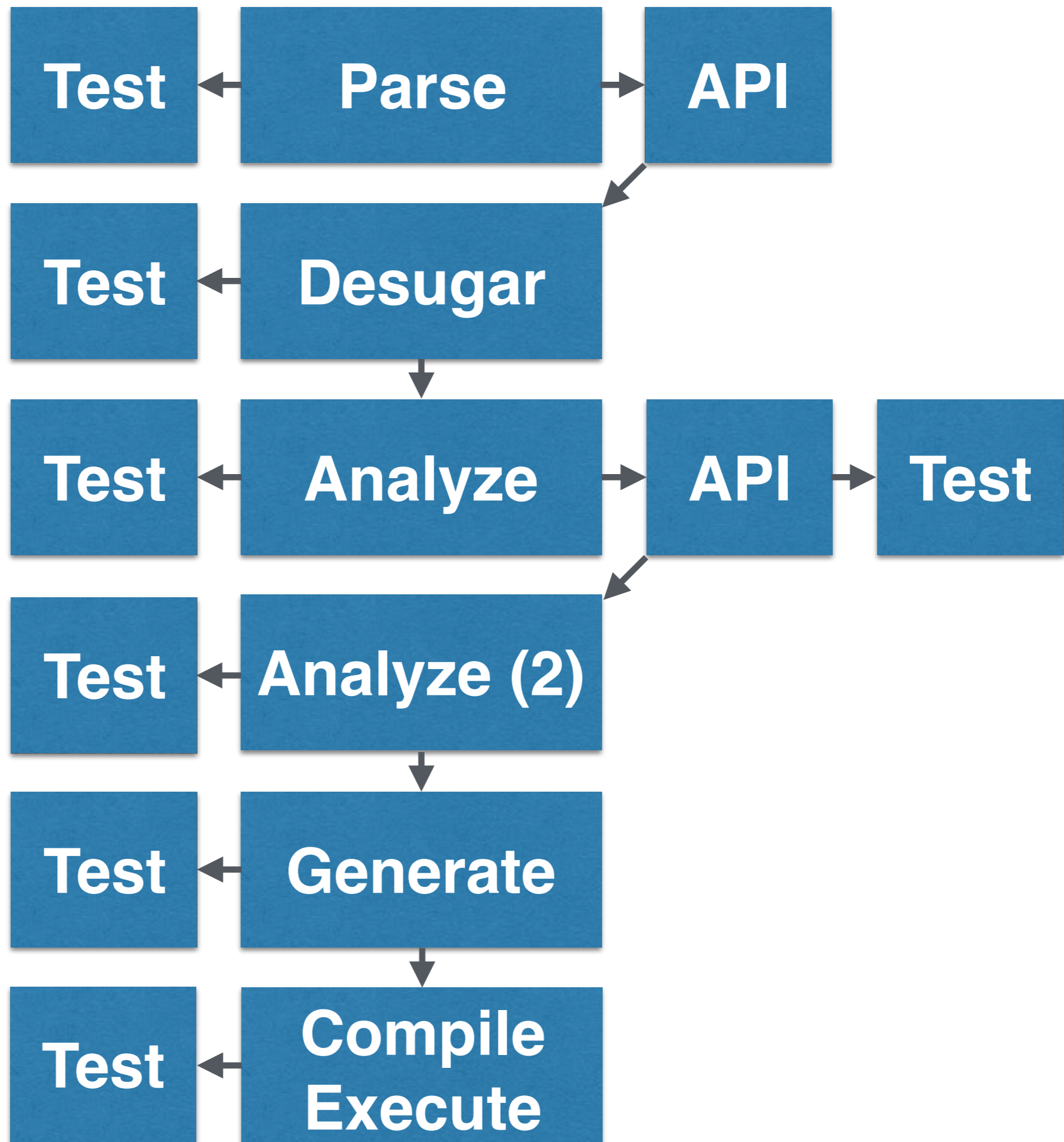


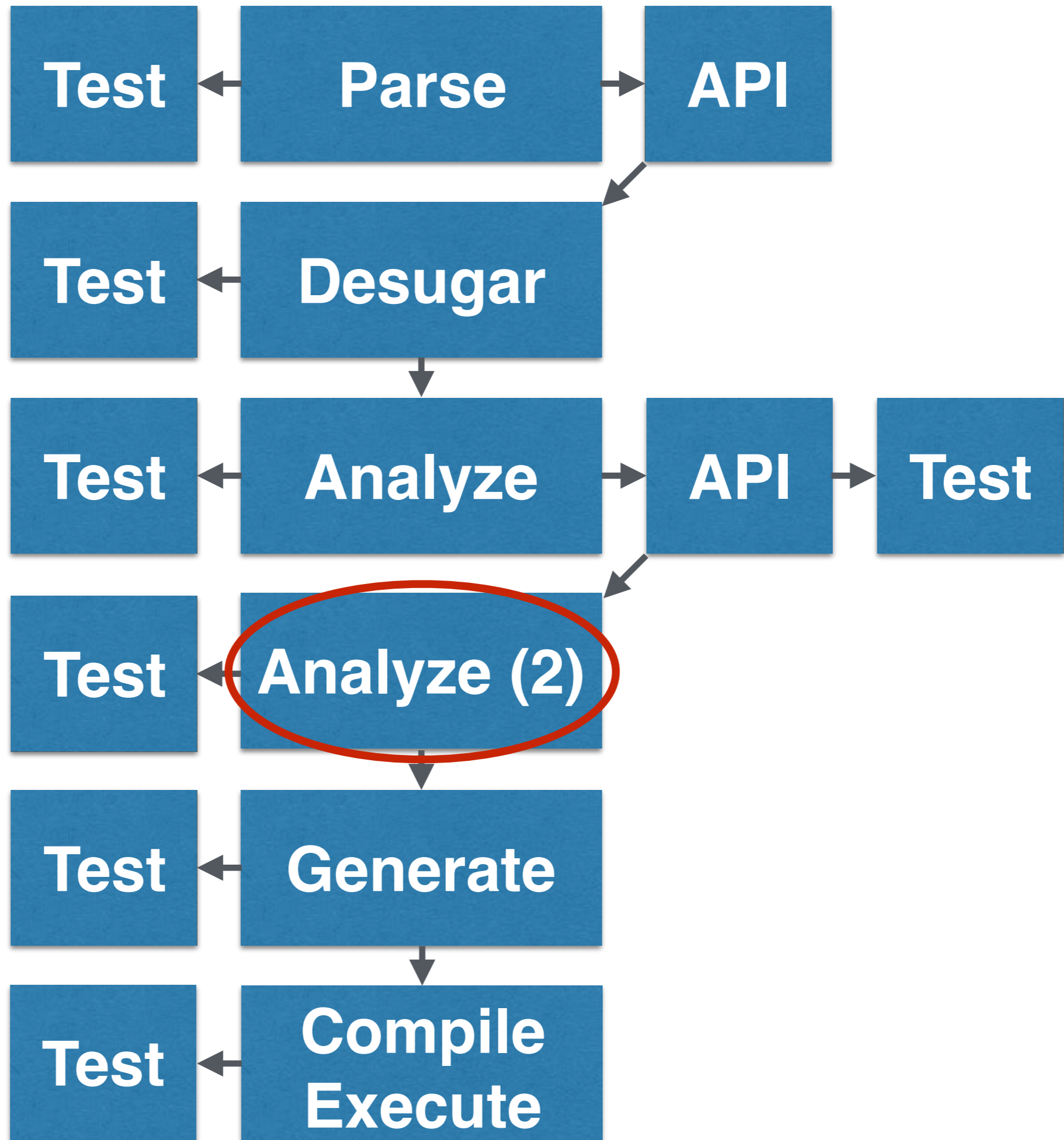


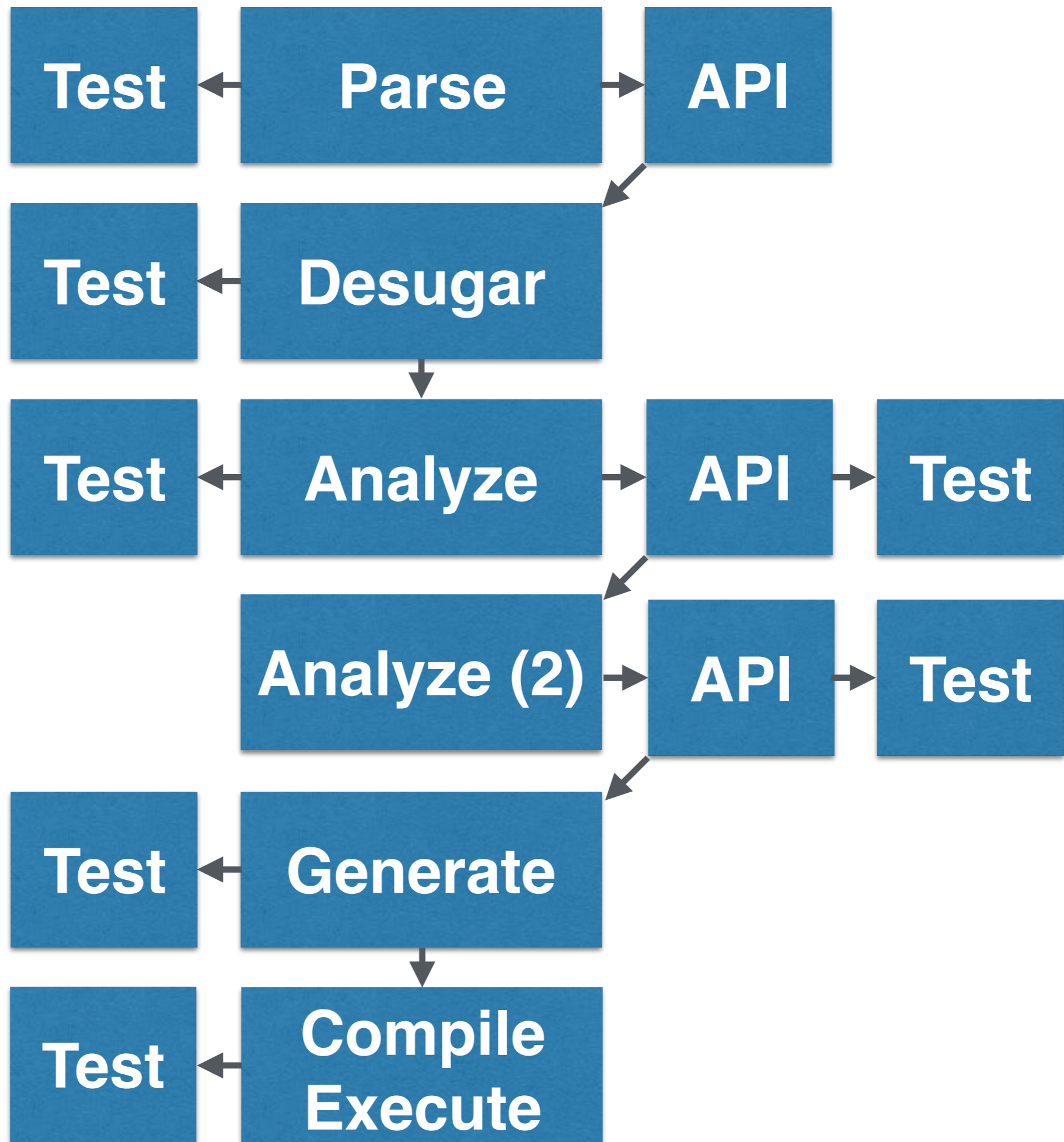




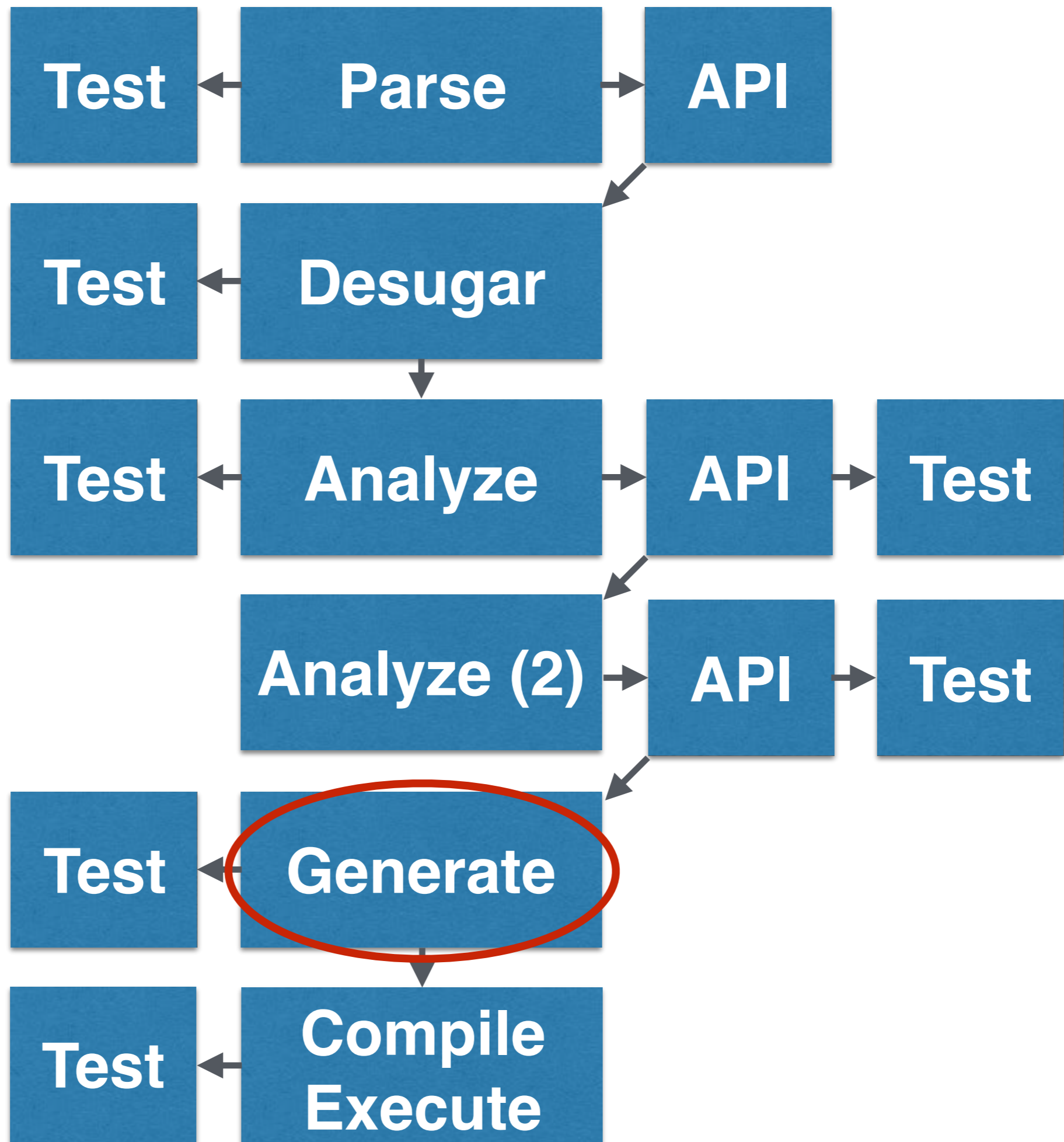


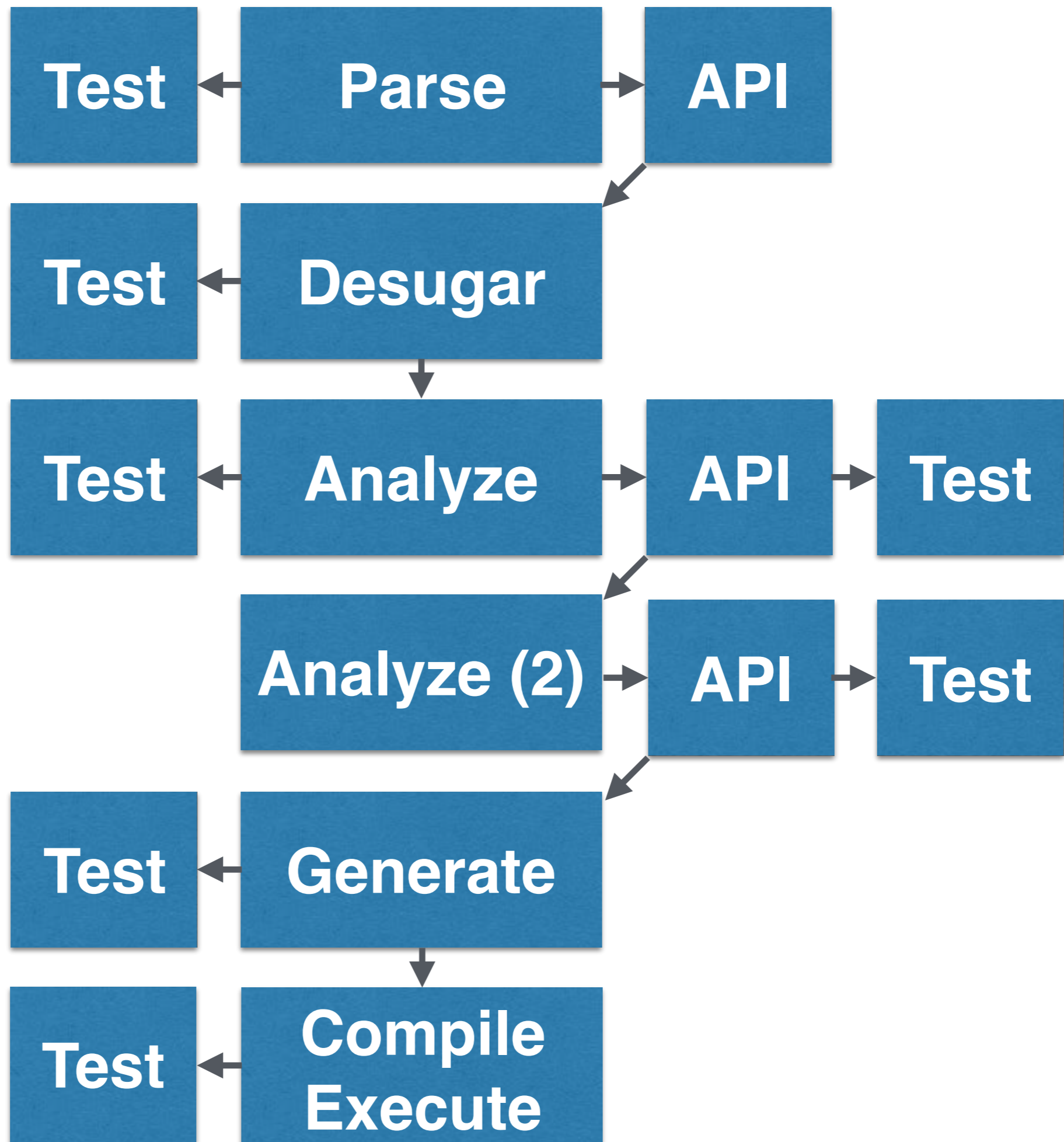


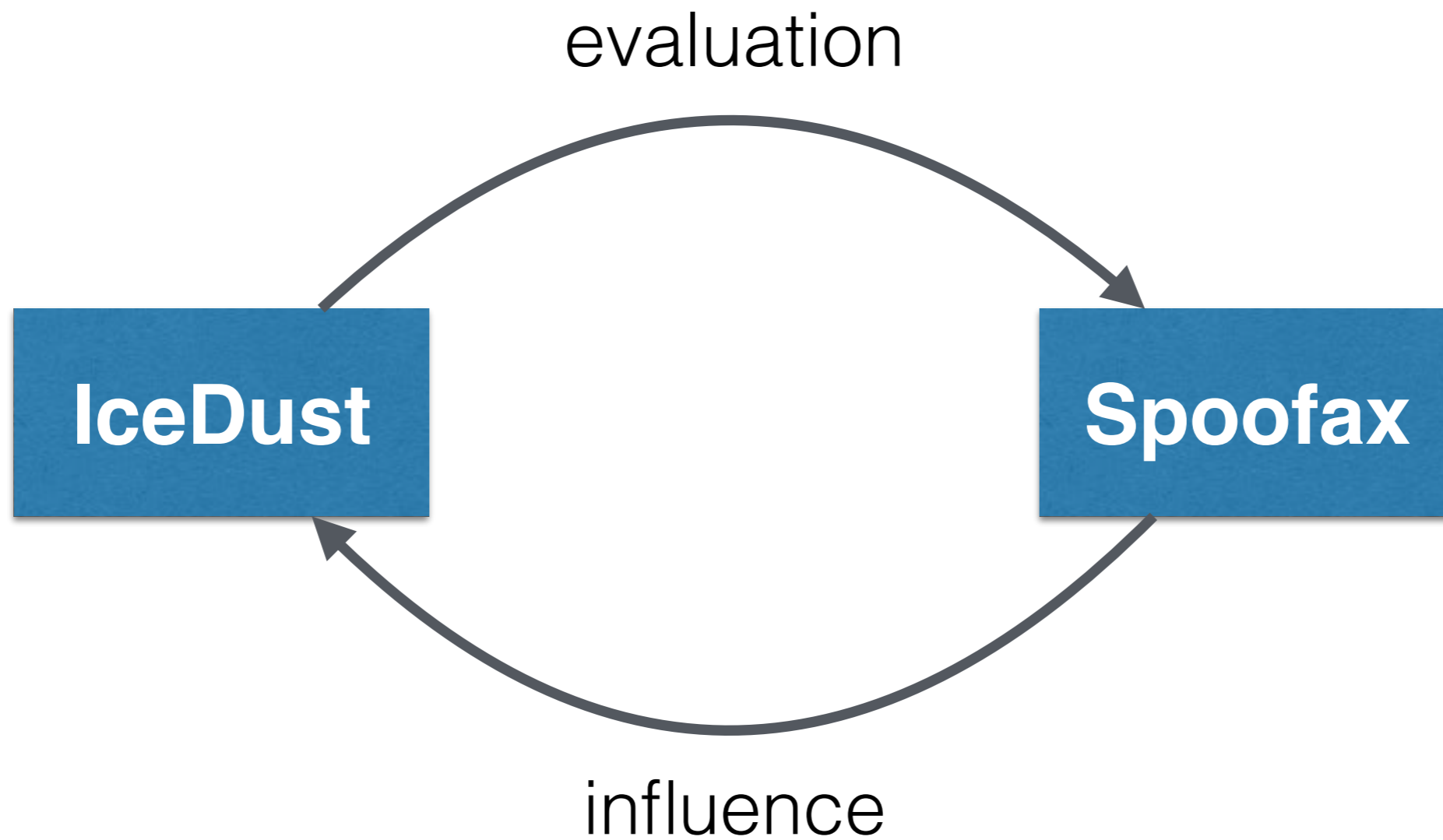




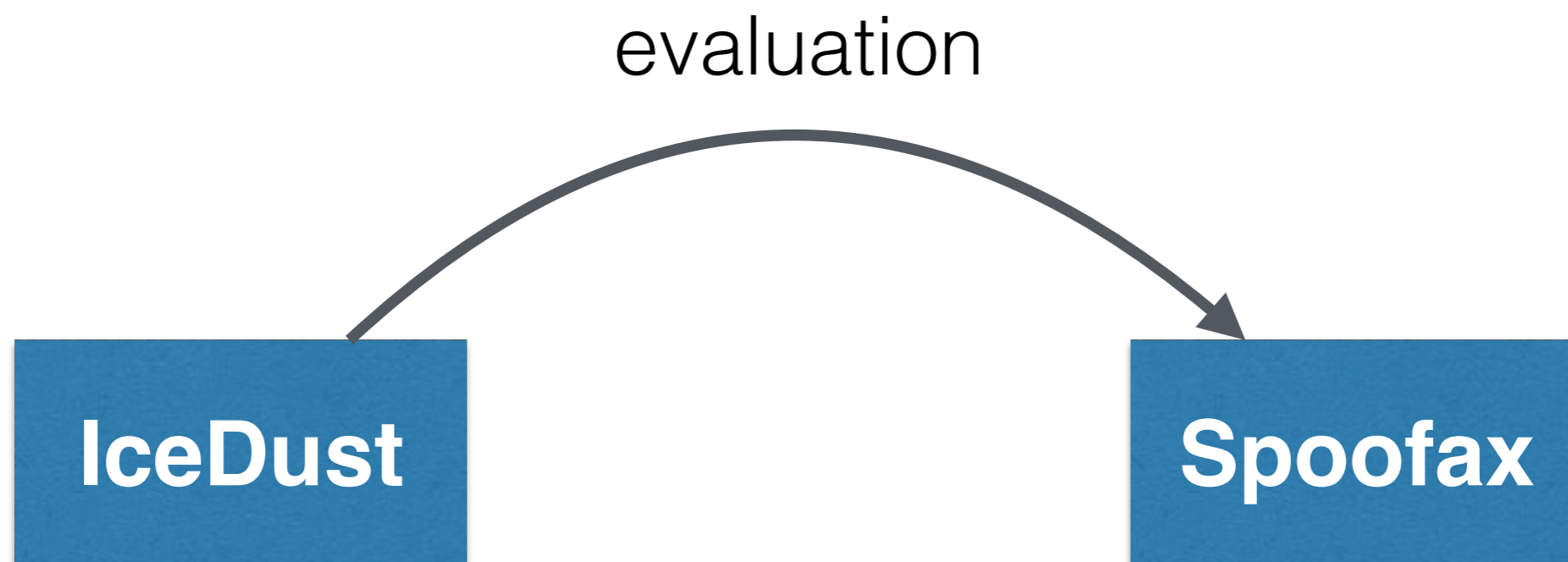








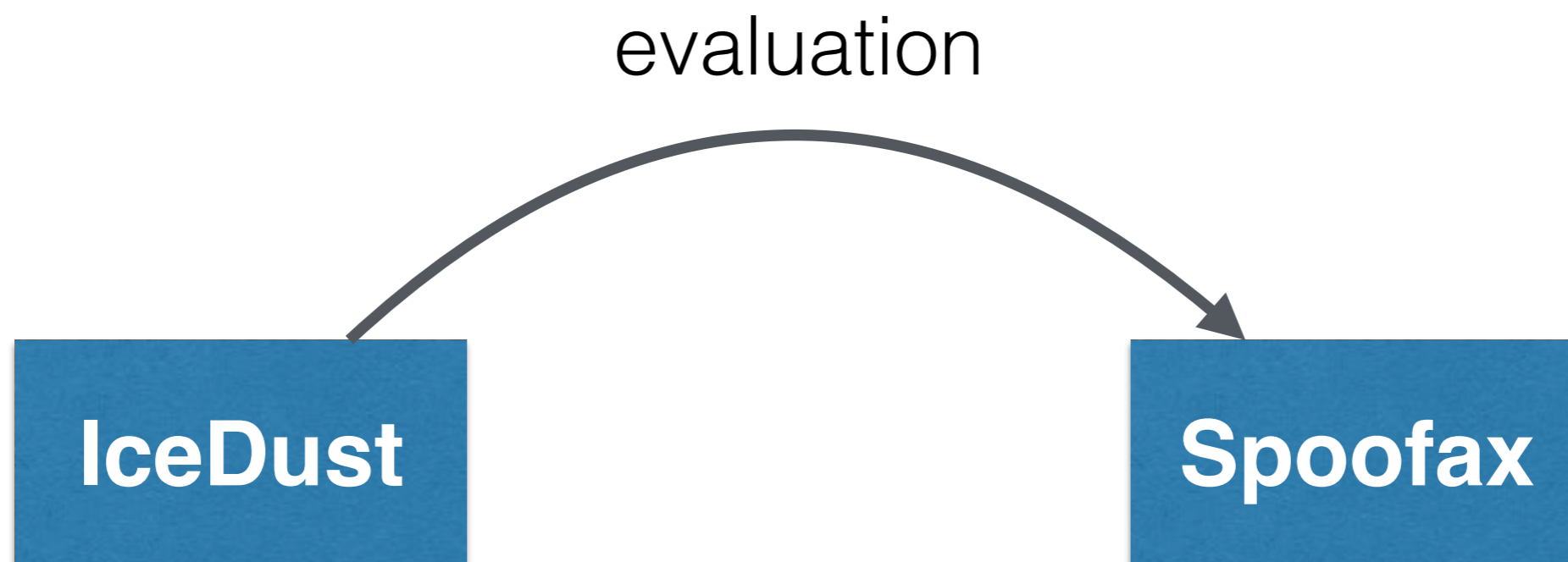
Spoofax is awesome  
if you want to do something that fits inside the meta-DSLs



RQ 1: graceful degradation if desired behavior fits not in DSL

RQ 2: integration of (external) DSLs

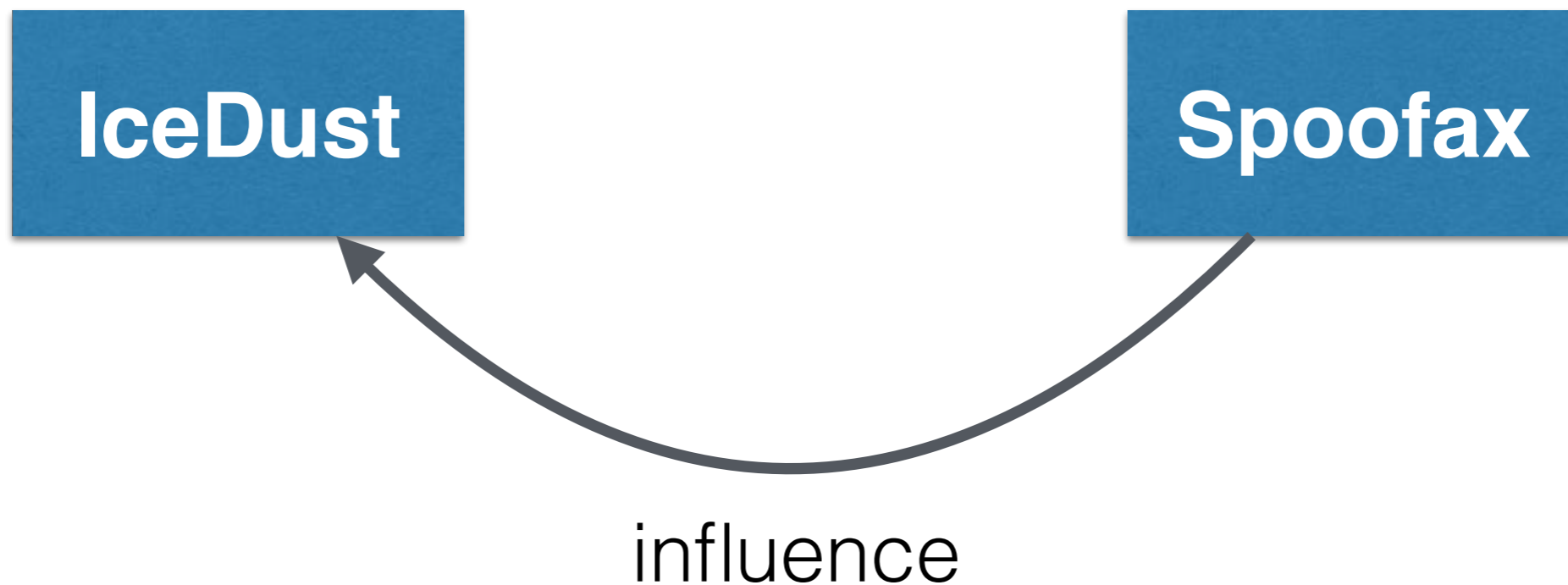
RQ 3: types for Stratego (e.g. generic traversal)



Direction of development

Timing of development

Sanity of development



# IceDust in Spooofax

## A Language Engineering Case Study

LangDevCon 2018

Daco C. Harkes