Unipycation

A Case Study in Cross-Language Tracing

Edd Barrett

Carl Friedrich Bolz

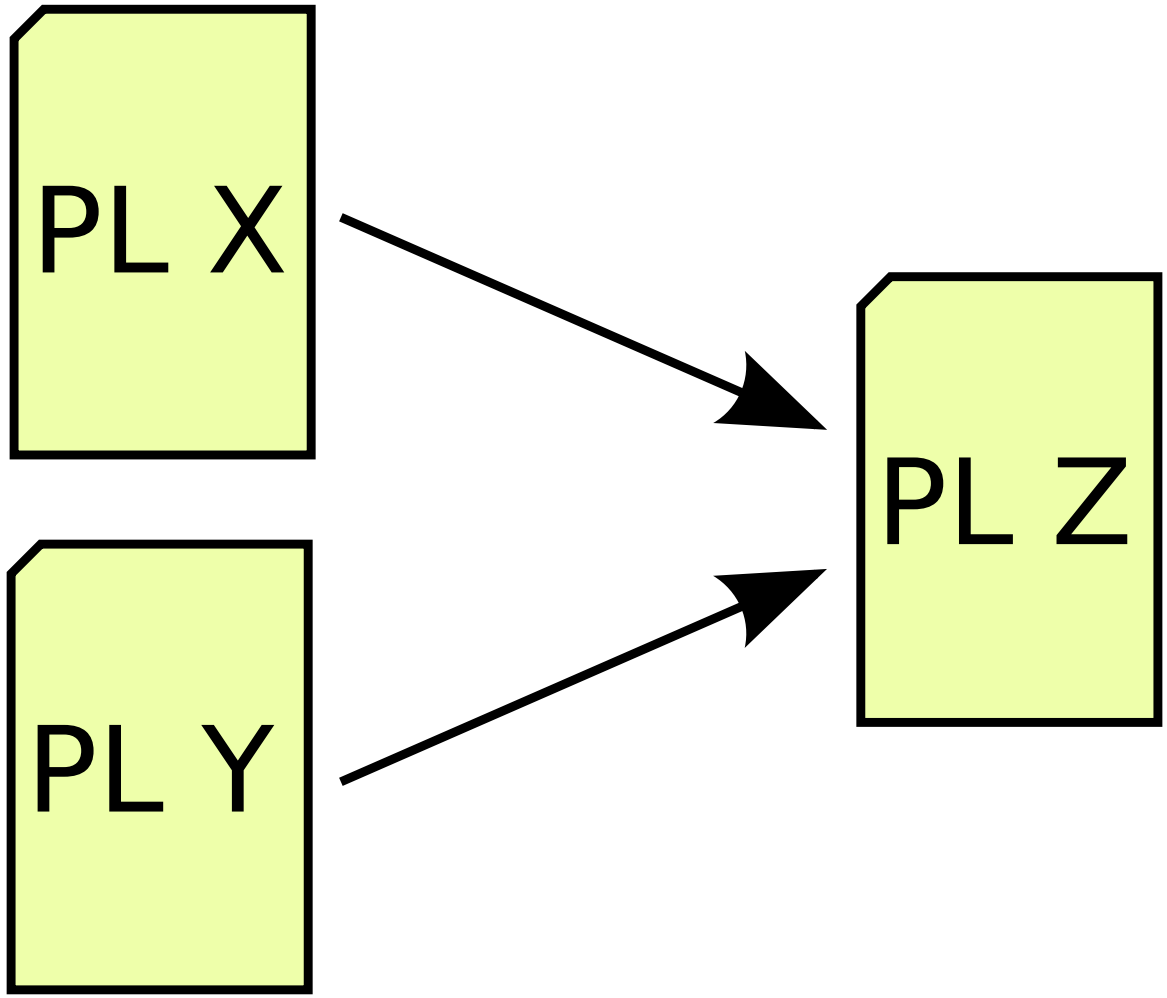
Laurence Tratt

King's College London

Software Development Team

2013-10-28

Language Composition



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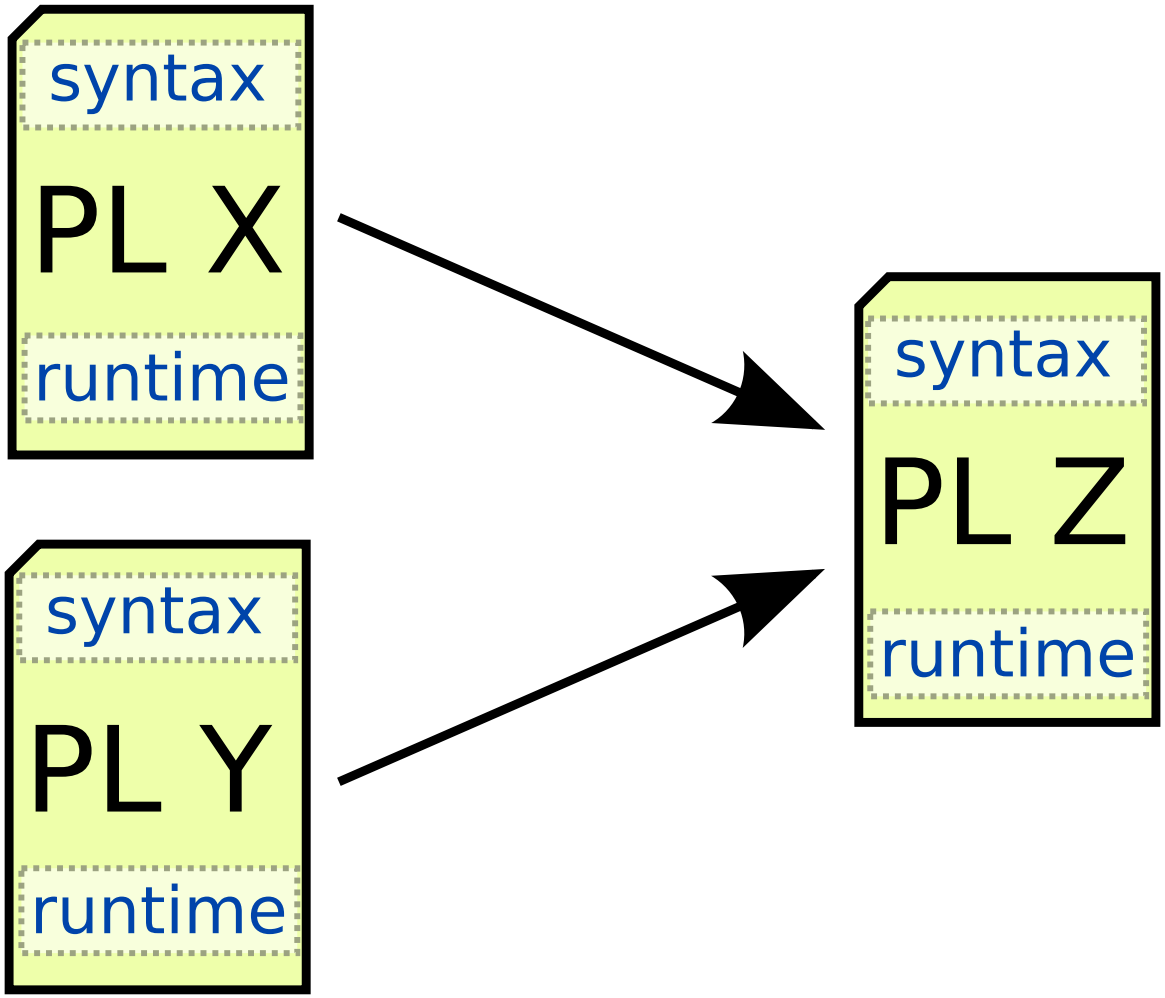

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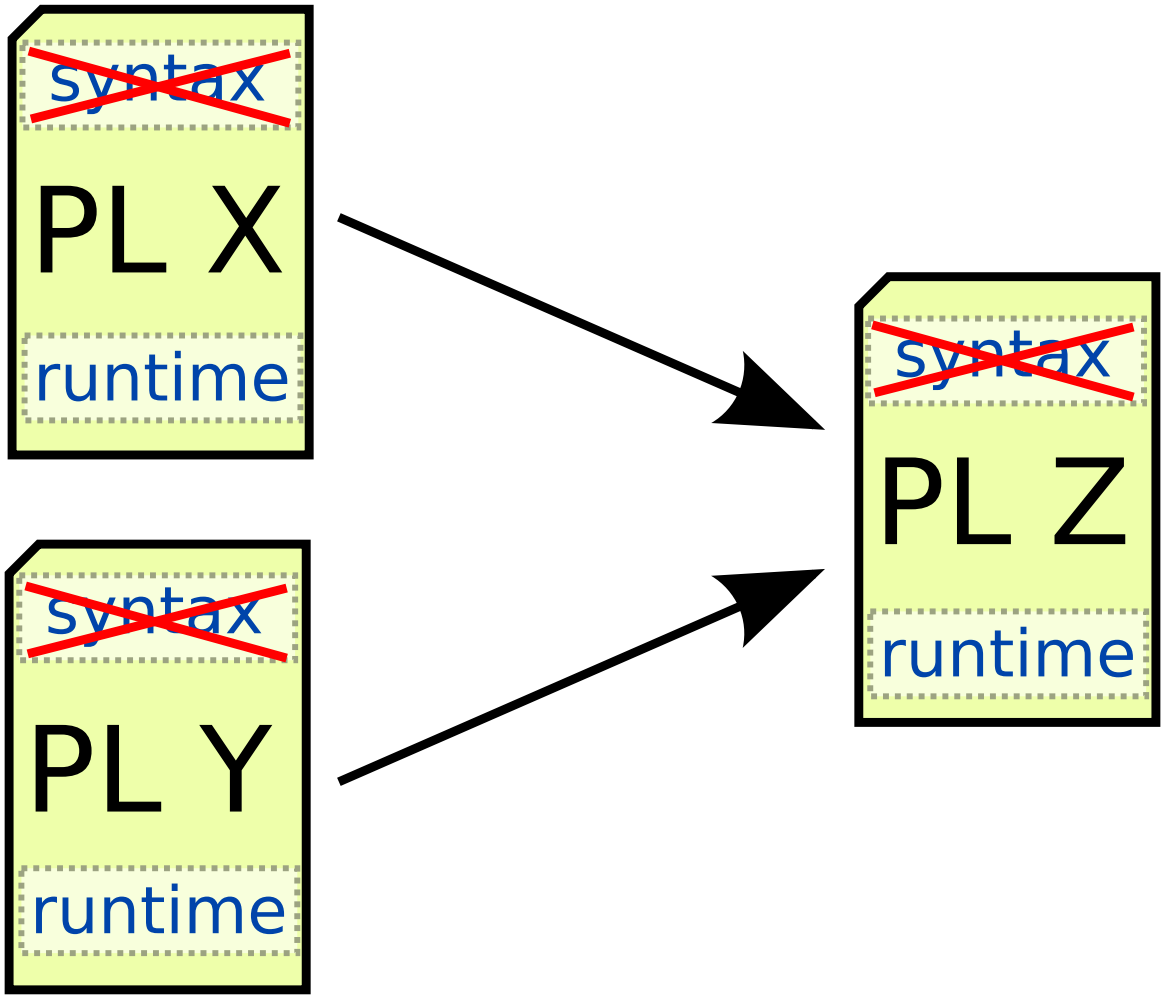
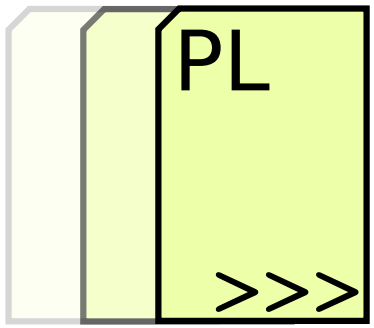
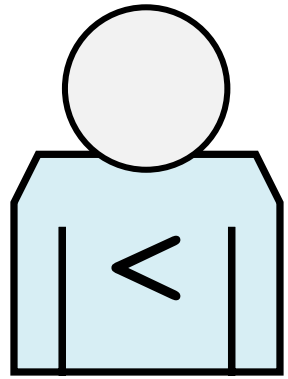


Requirements



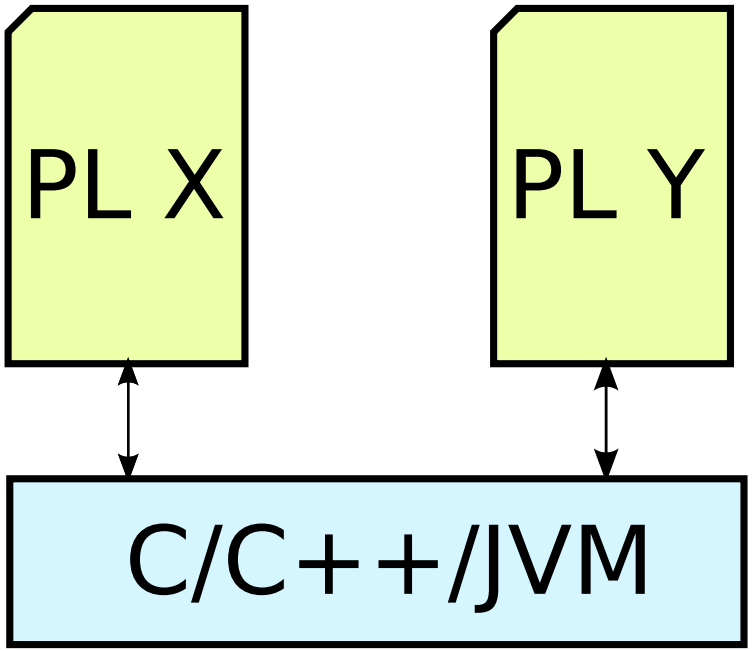


Fast

Less effort

Current runtime composition techniques?

Traditional Approaches



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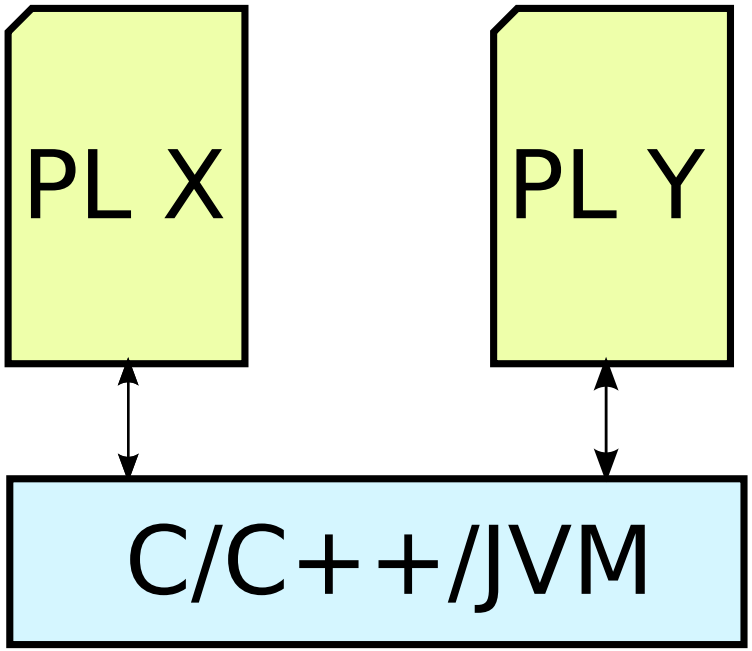

C/C++

- Can build fast VMs.
- $>$ Development effort.

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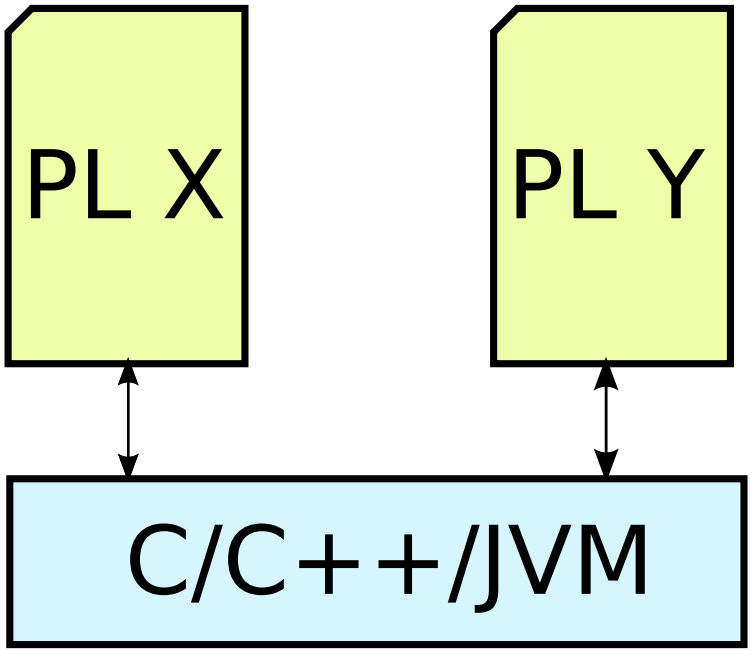

C/C++

- Can build fast VMs.
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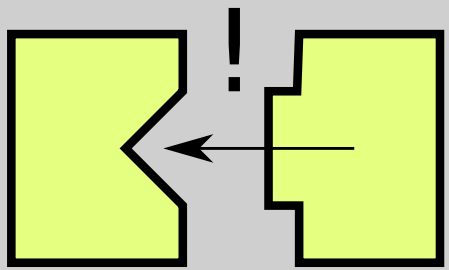
JVM

- $<$ Development effort.
- “Semantic mismatch”.



Hypothesis:

Meta-tracing may overcome these issues.

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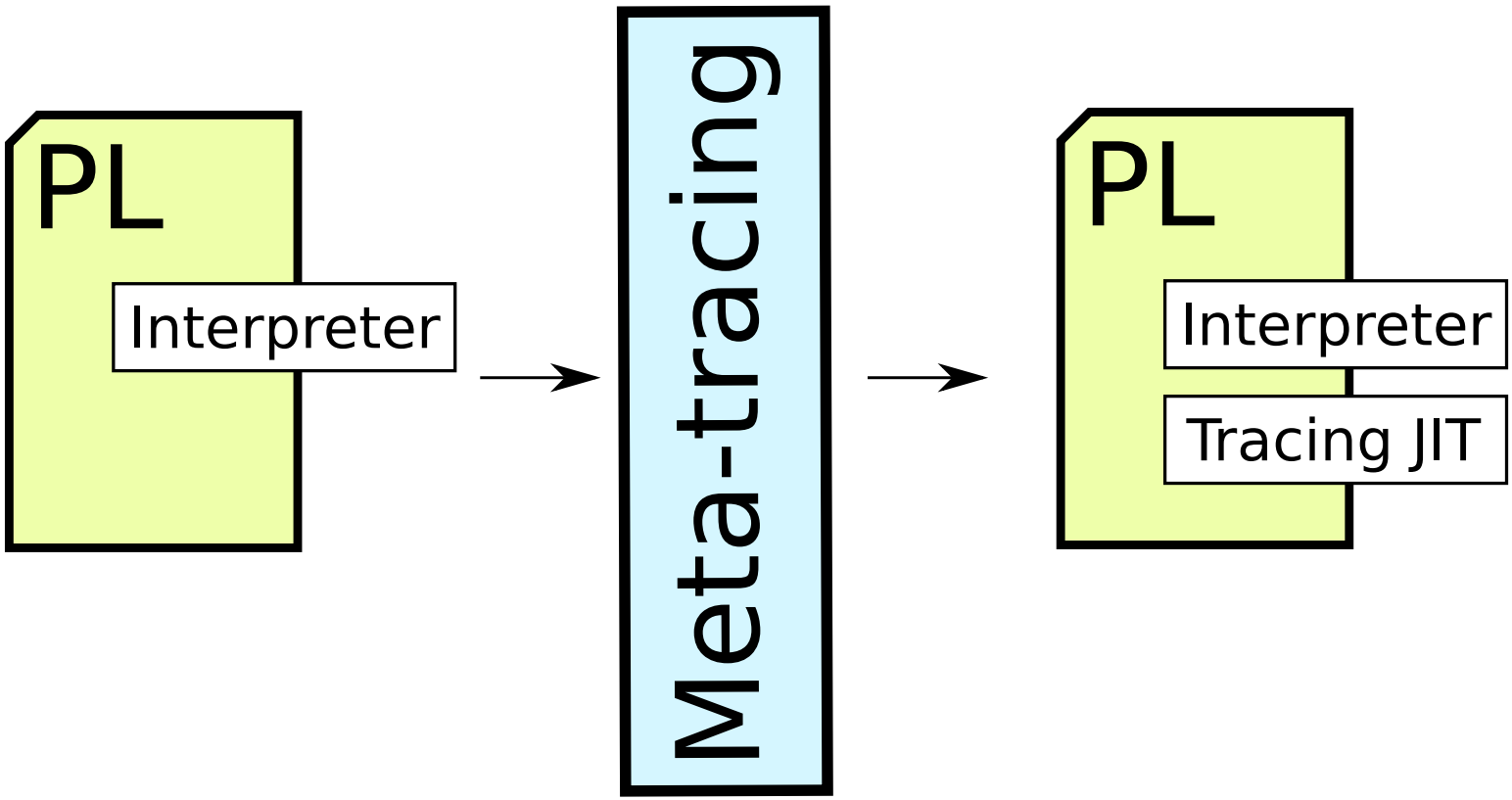
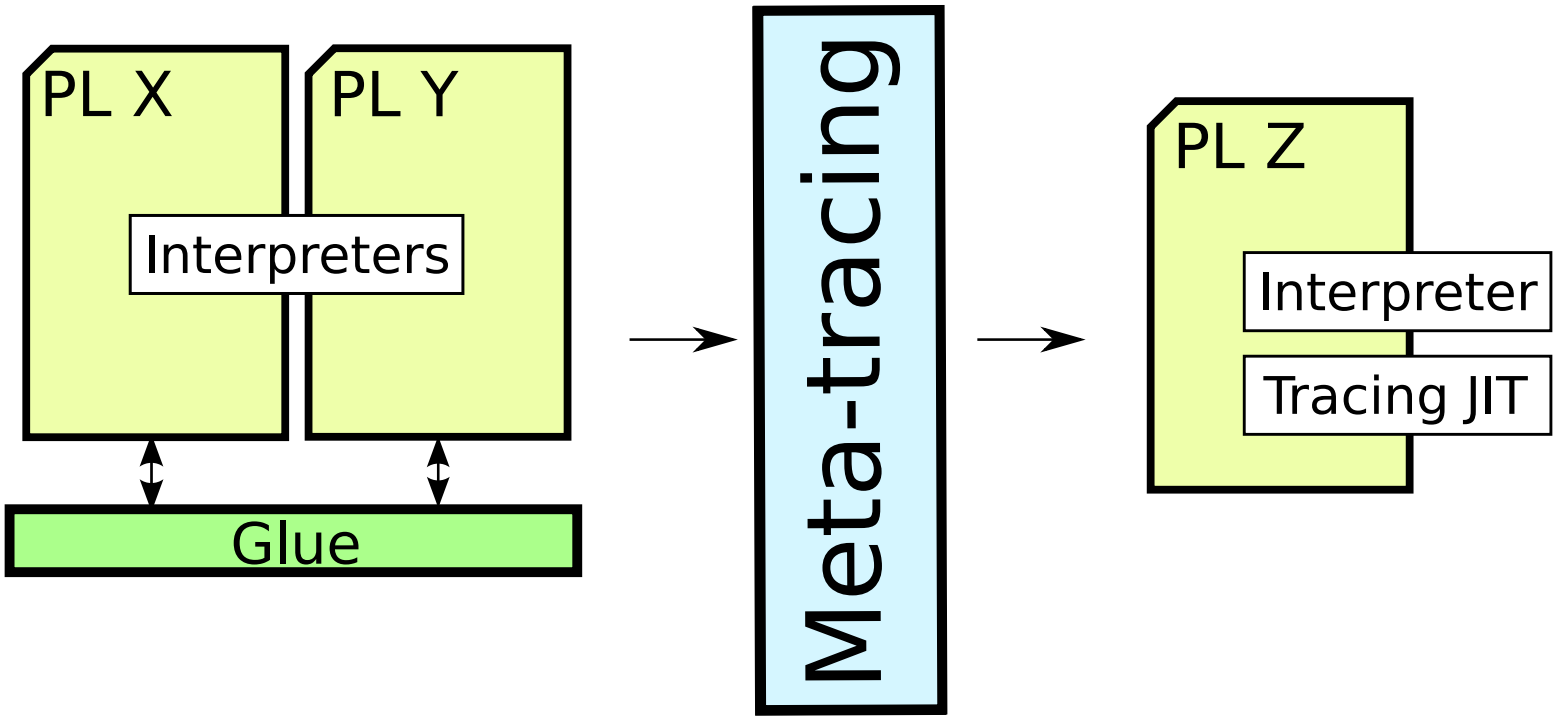
Meta-tracing may overcome these issues.

- Tracer for free.
  - Cross-language tracing.
- Little engineering effort.

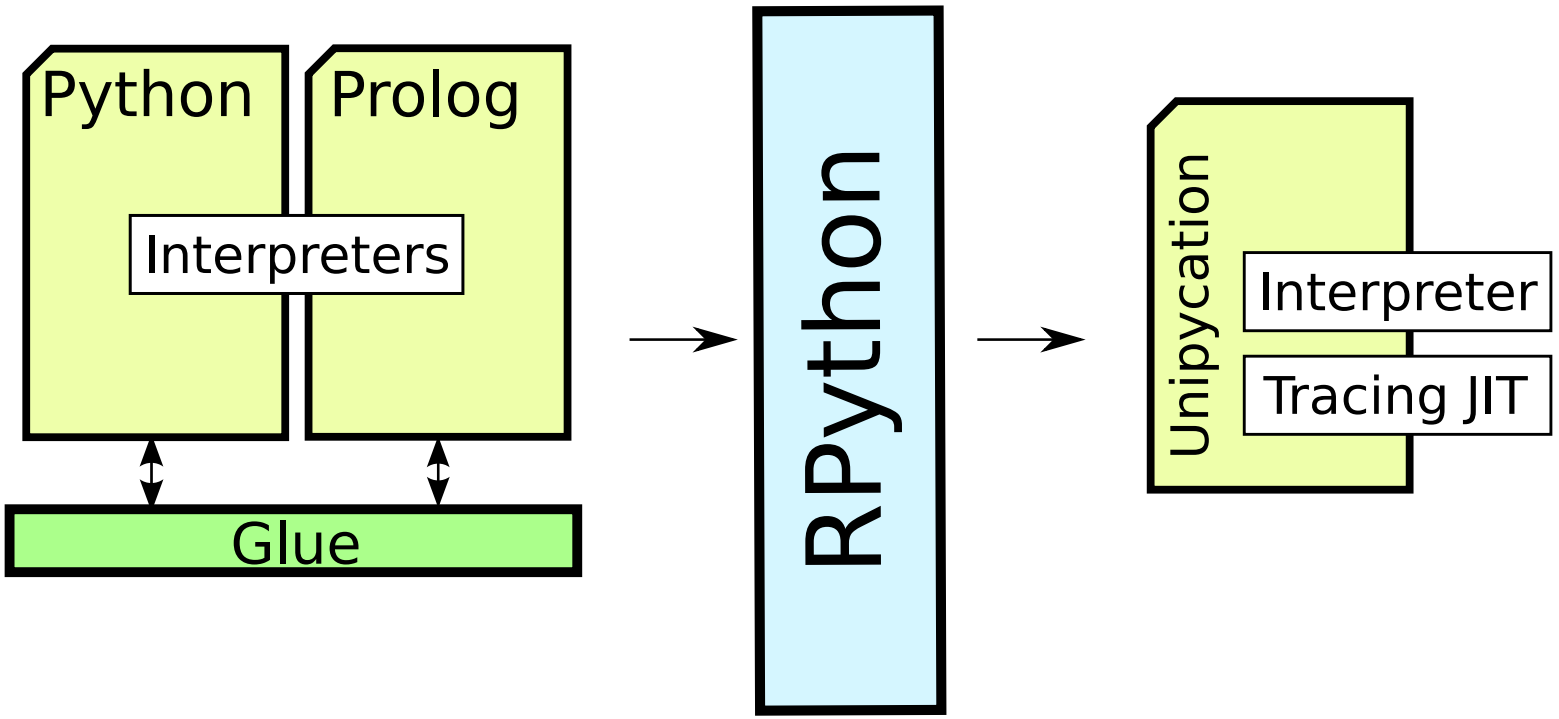
Meta-tracing



Meta-tracing



Unipycation



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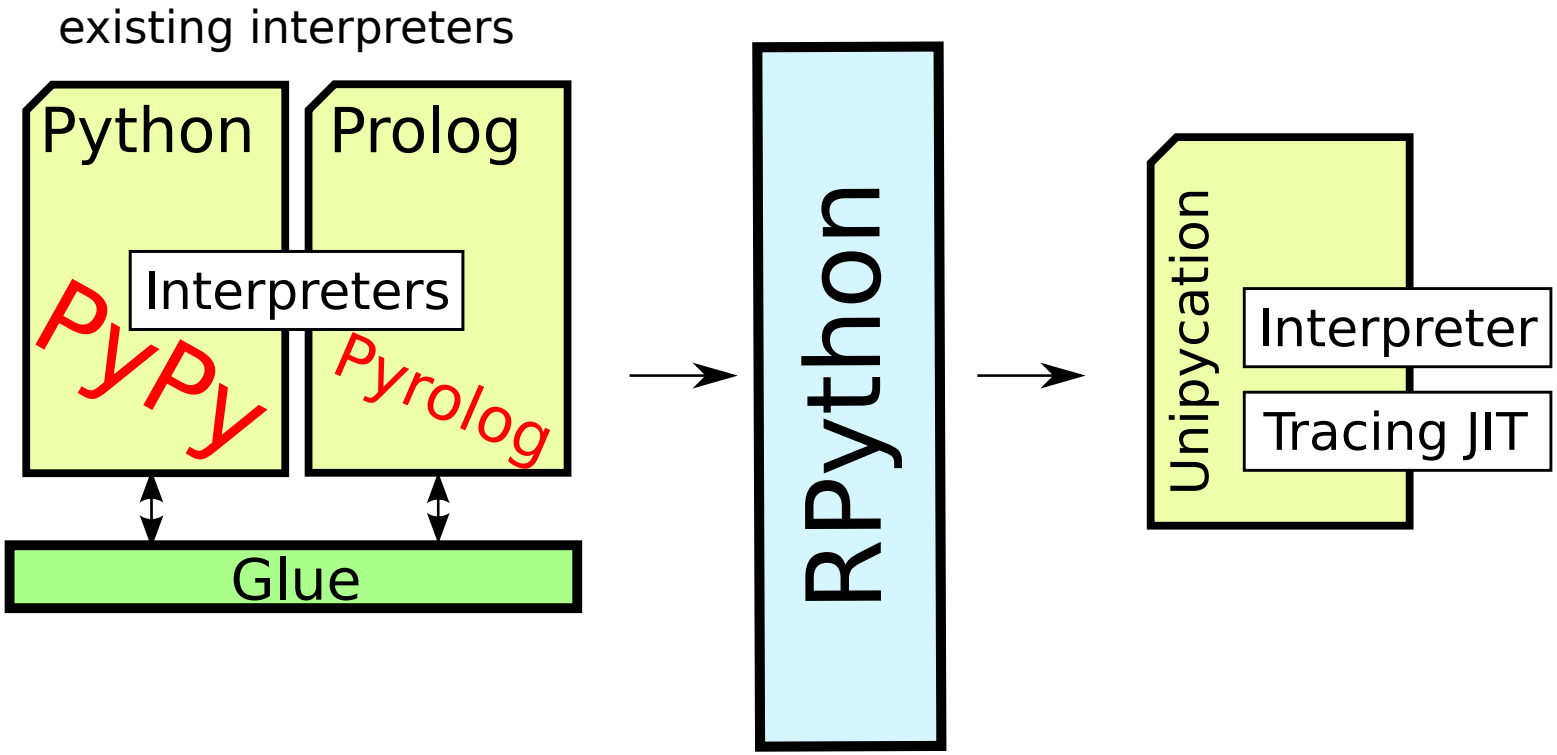

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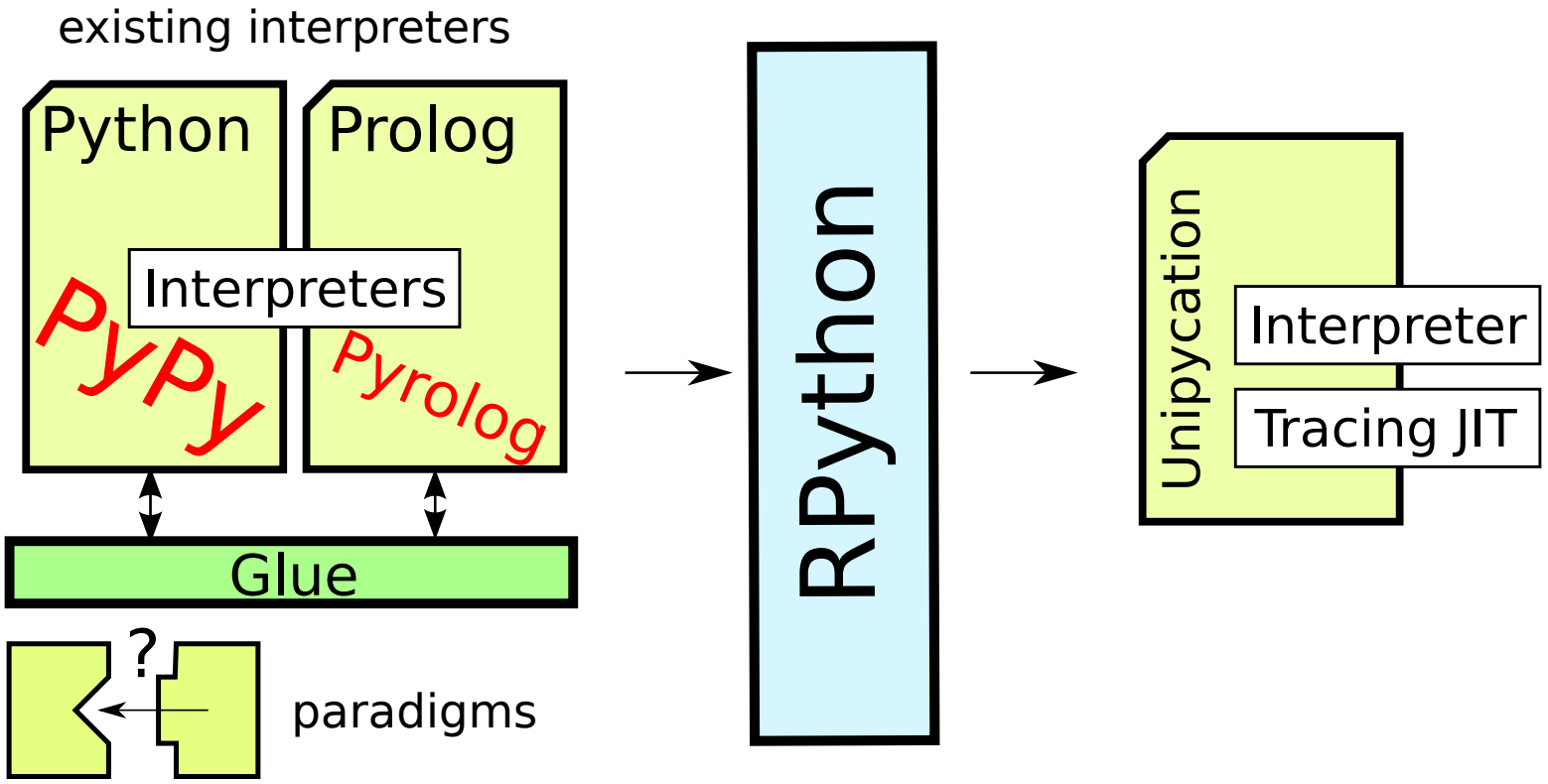
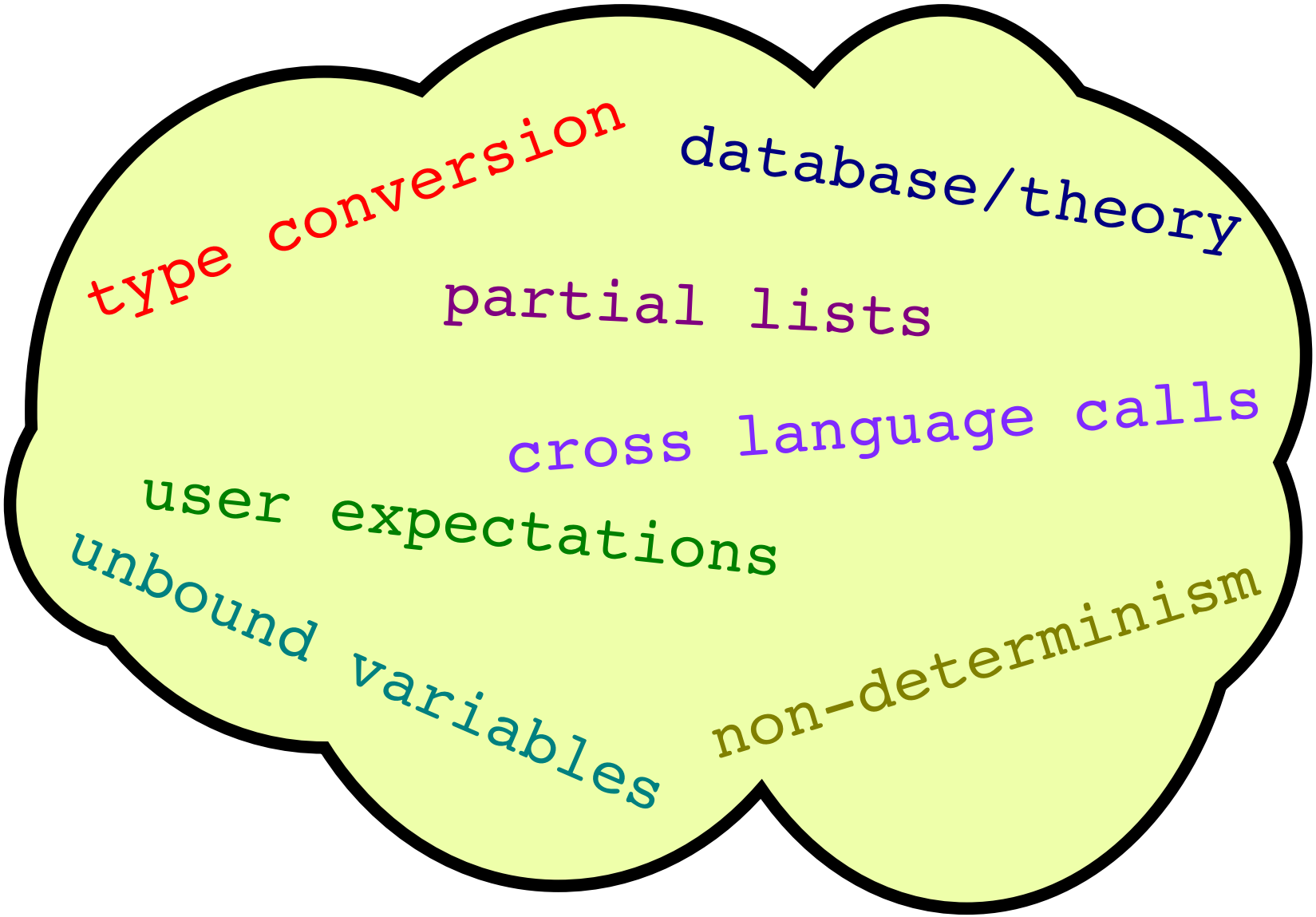
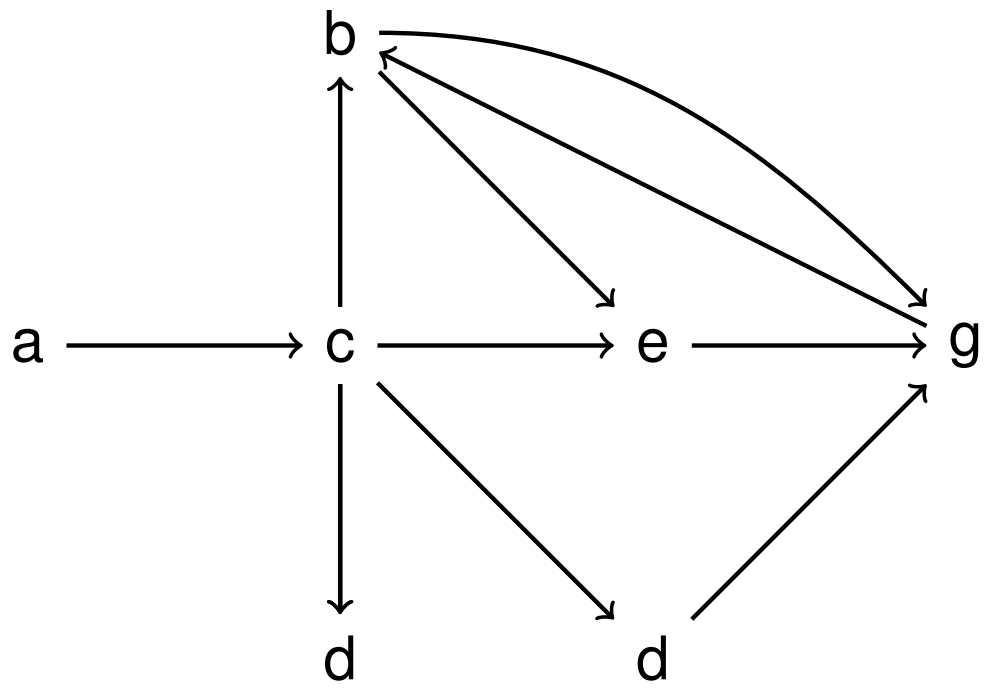


Design Considerations



Example: Underground/Metro System



Where can I get to from ’b’ via at most 4 nodes and how?

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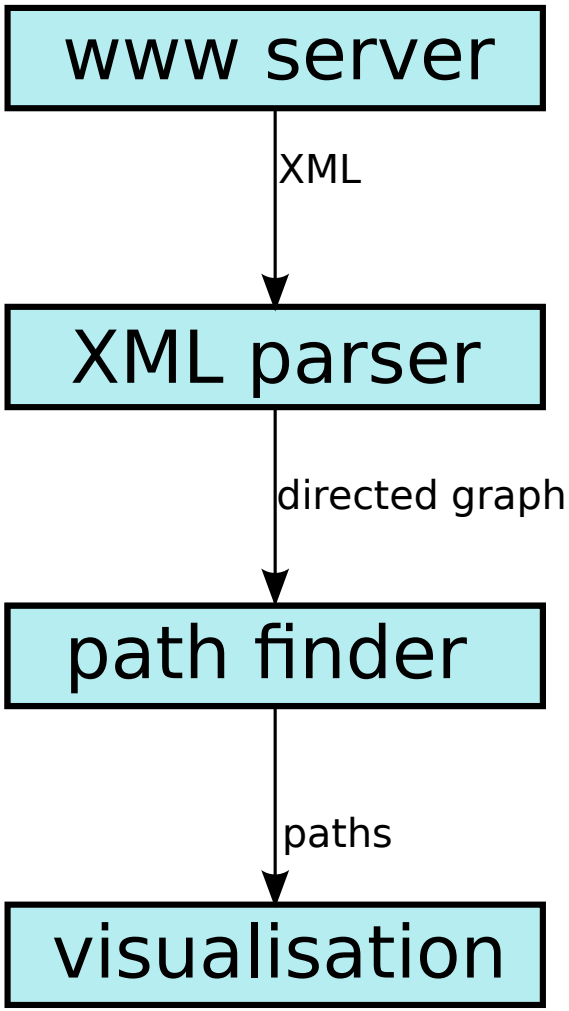

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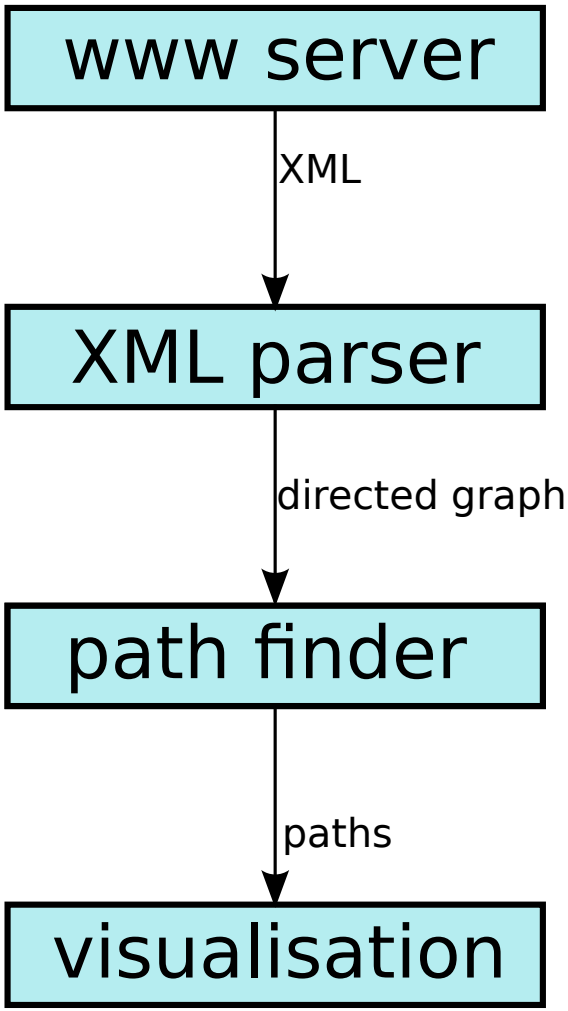


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<edge src="a" dest="b" />
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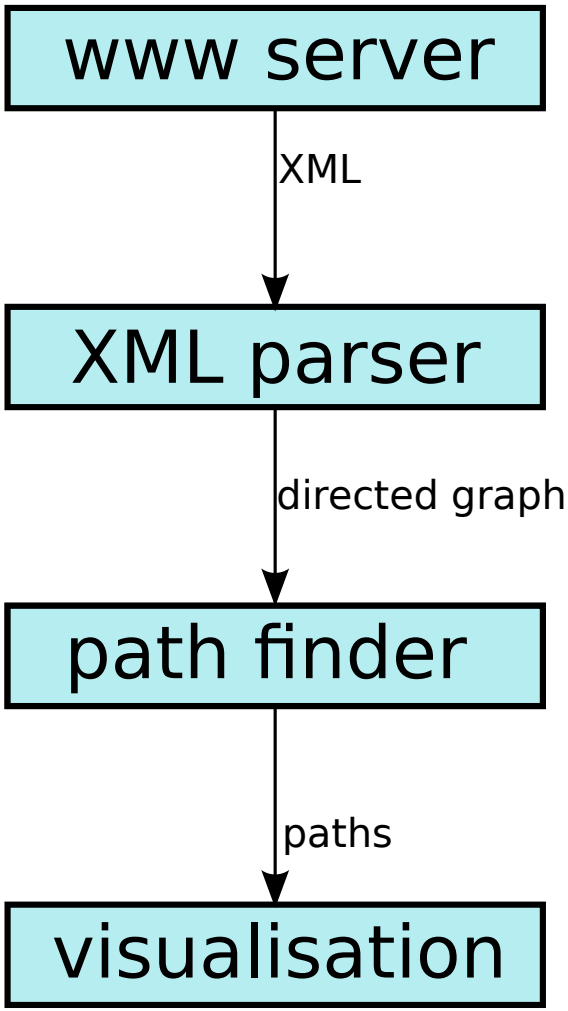


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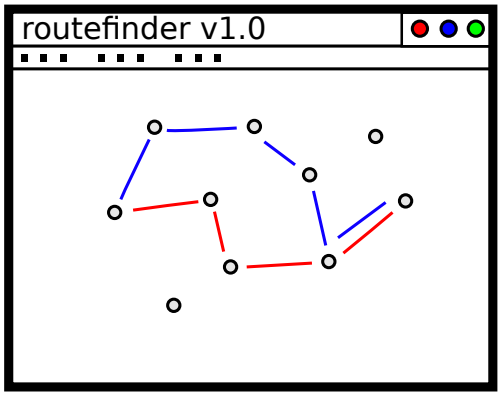

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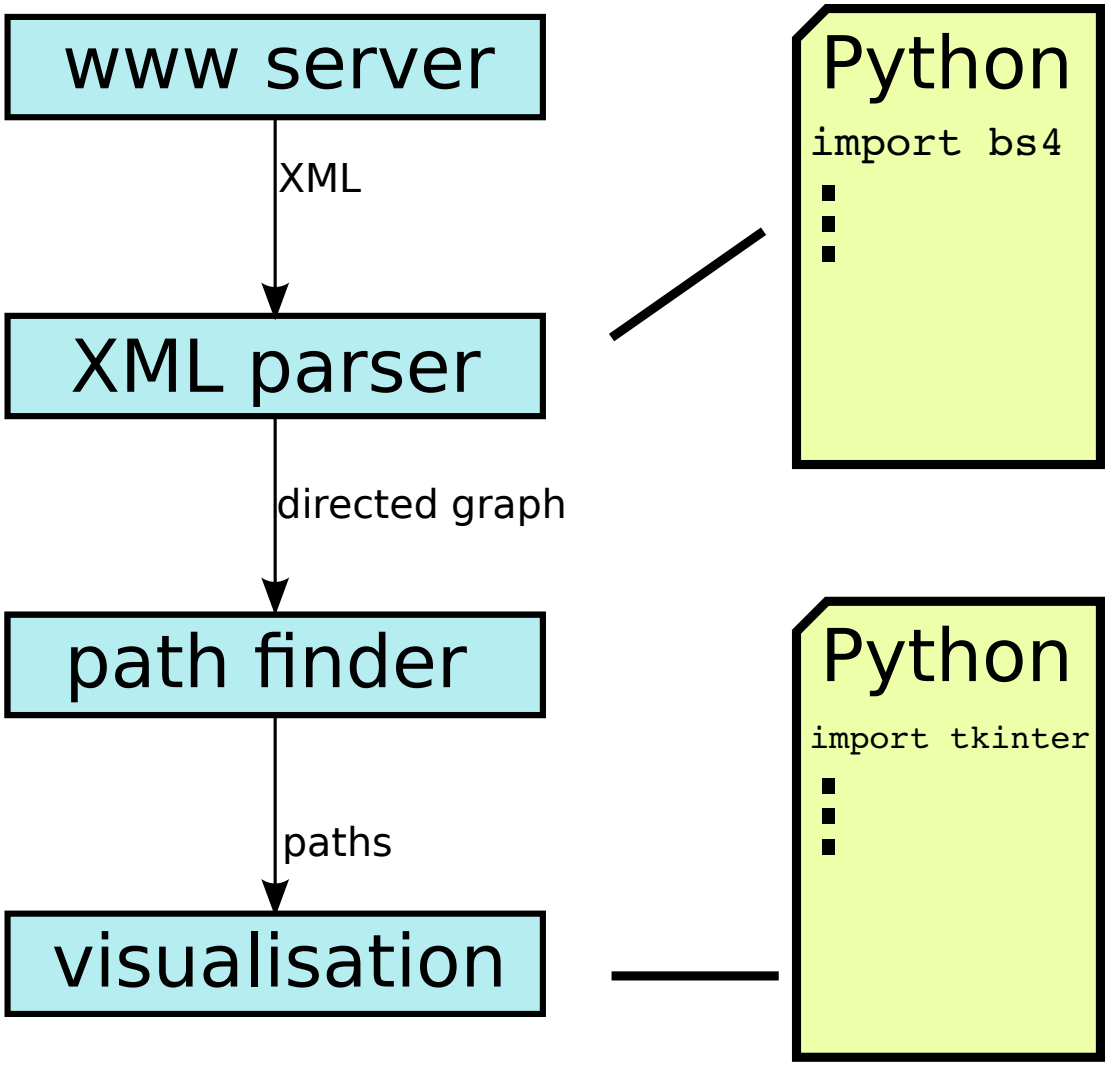

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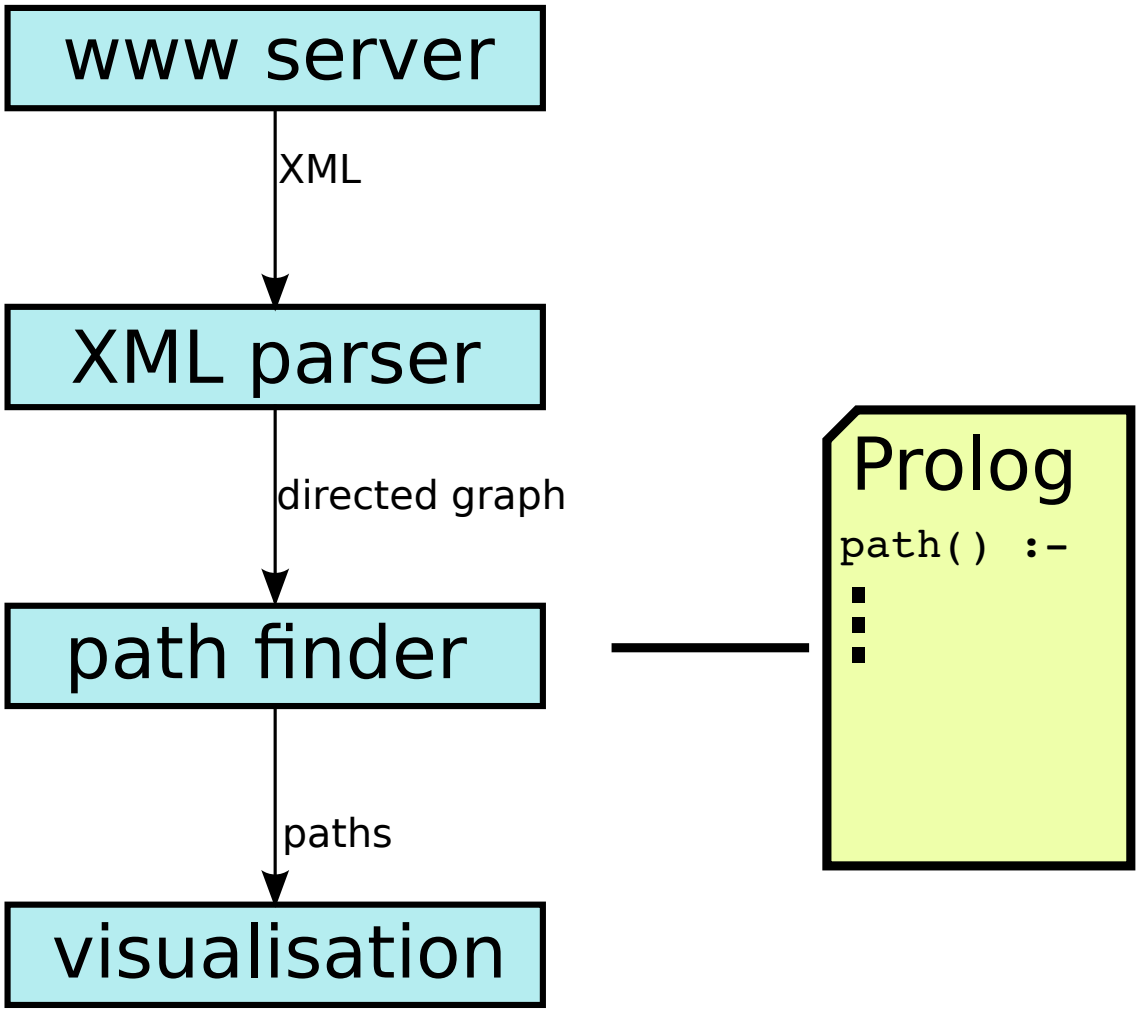

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import bs4, uni, tkinter

# ...code for parsing would be here

edges = { node : sucessors(node) for node in ... }
# e.g. edges = {
#     "a" : ["b", "c"],
#     "b" : ["e", "h"],
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# }

# prolog helper
def get_edges(src_node):
    return iter(edges[src_node])
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        From = To.
    path(From, To, MaxLen, [From|Nodes], Len) :-
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        edge(From, Next),
        path(Next, To, MaxLen, Nodes, Len+1).
    edge(a, c).
    edge(c, b).
    edge(c, d).
    edge(d, e).
    edge(e, b).
    edge(e, g).
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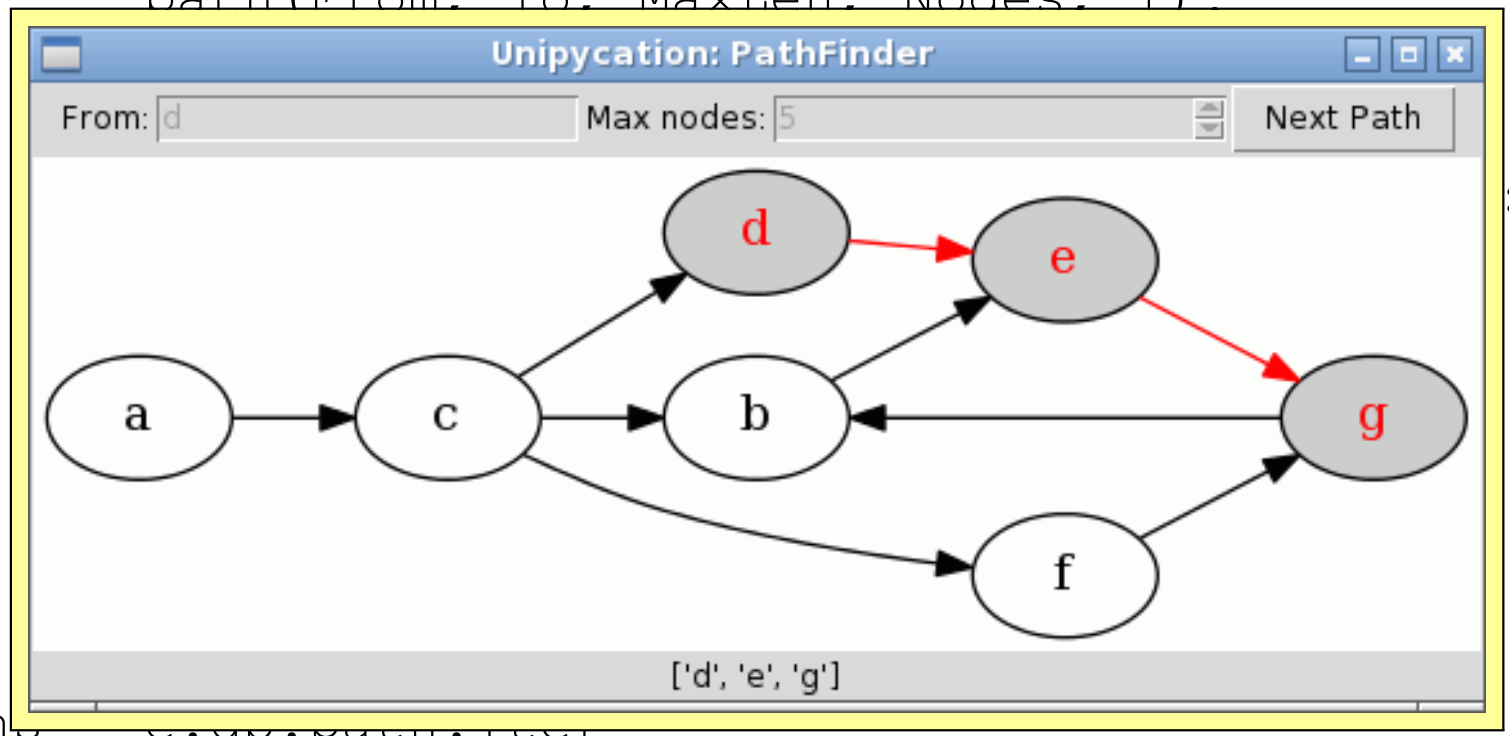
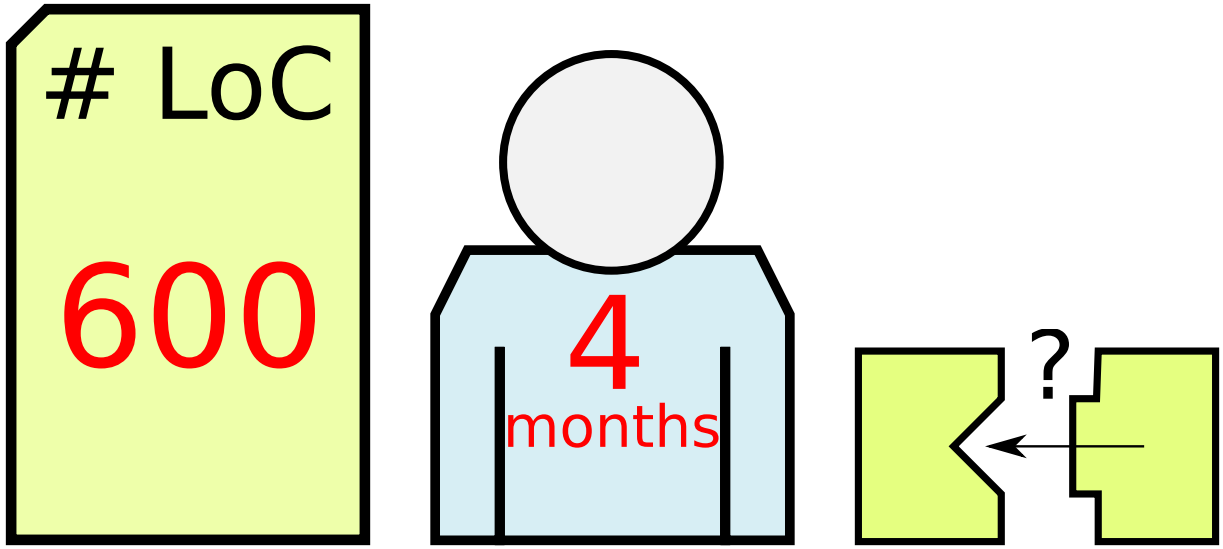


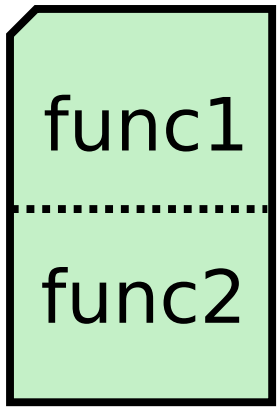
Development Effort

How much effort was our composition?

Development Effort

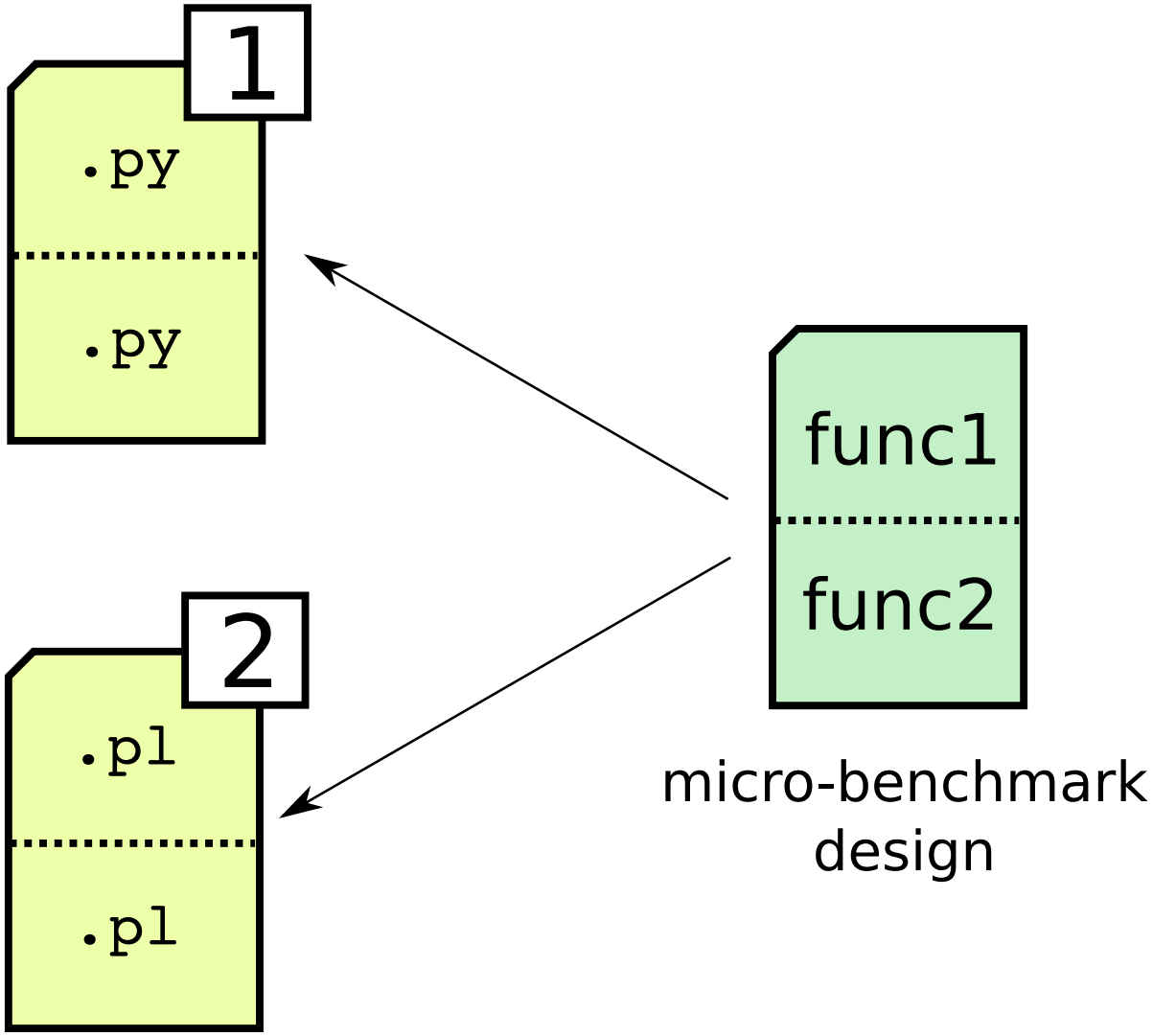


Experimental Methodology



micro-benchmark
design

Experimental Methodology



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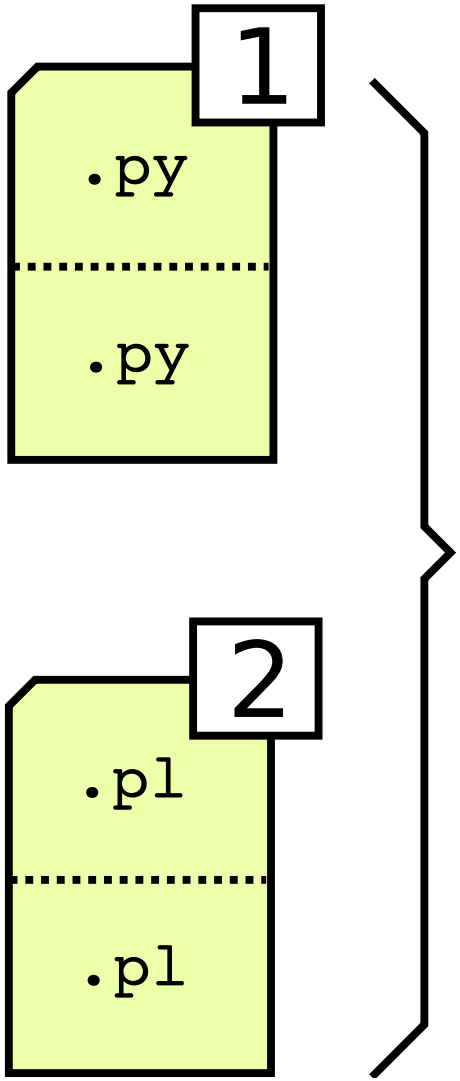
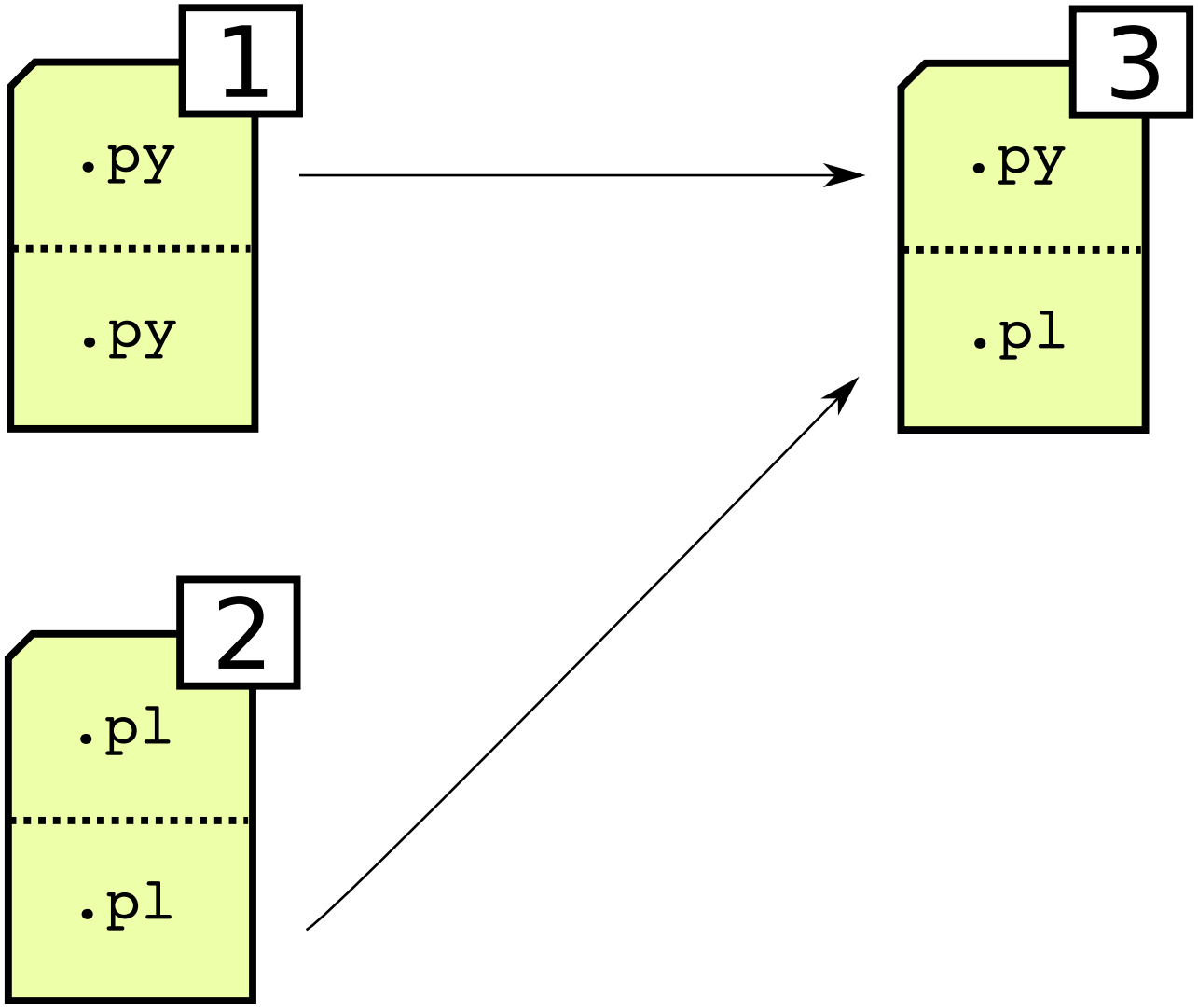


Baseline measurements

Experimental Methodology



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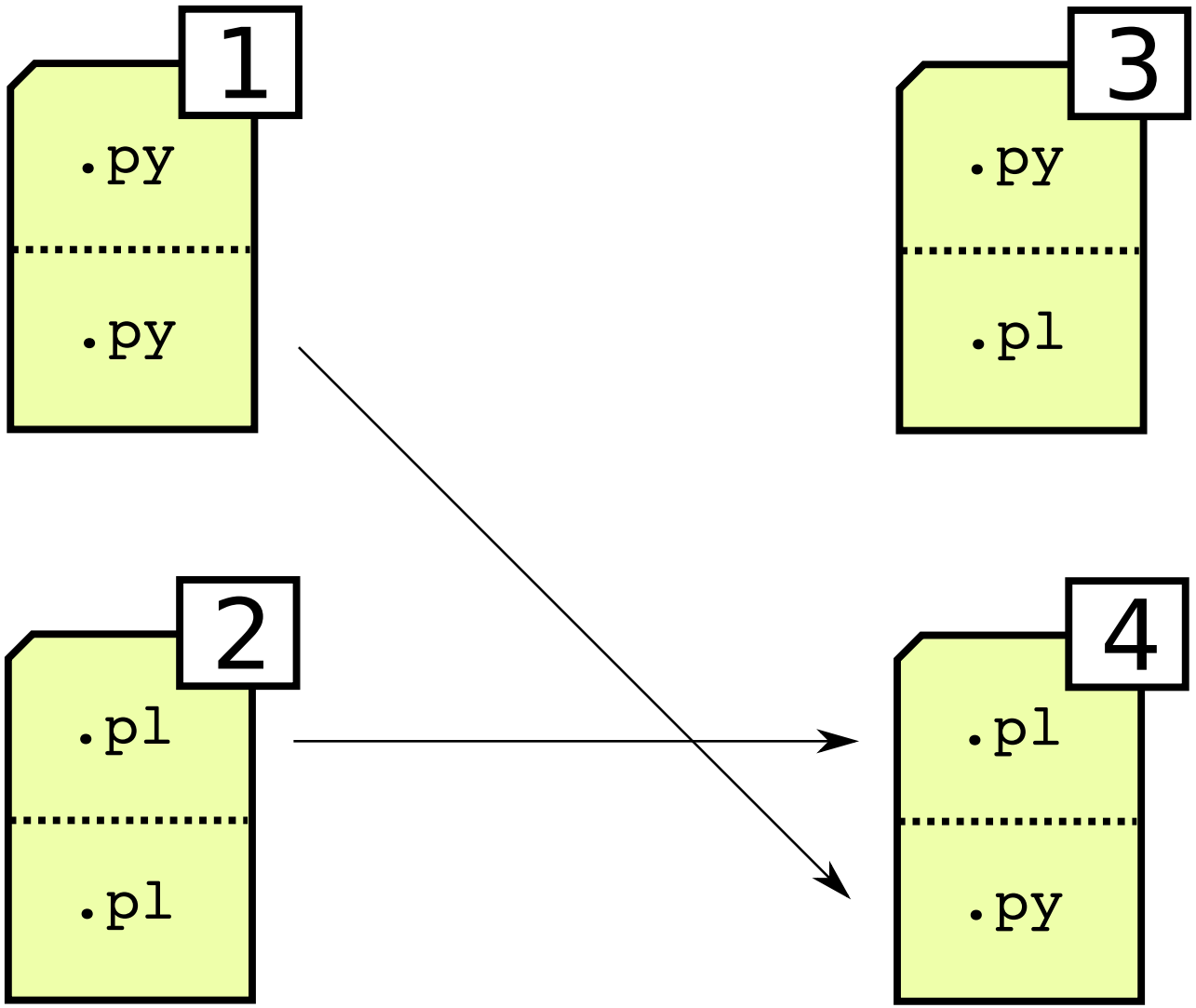

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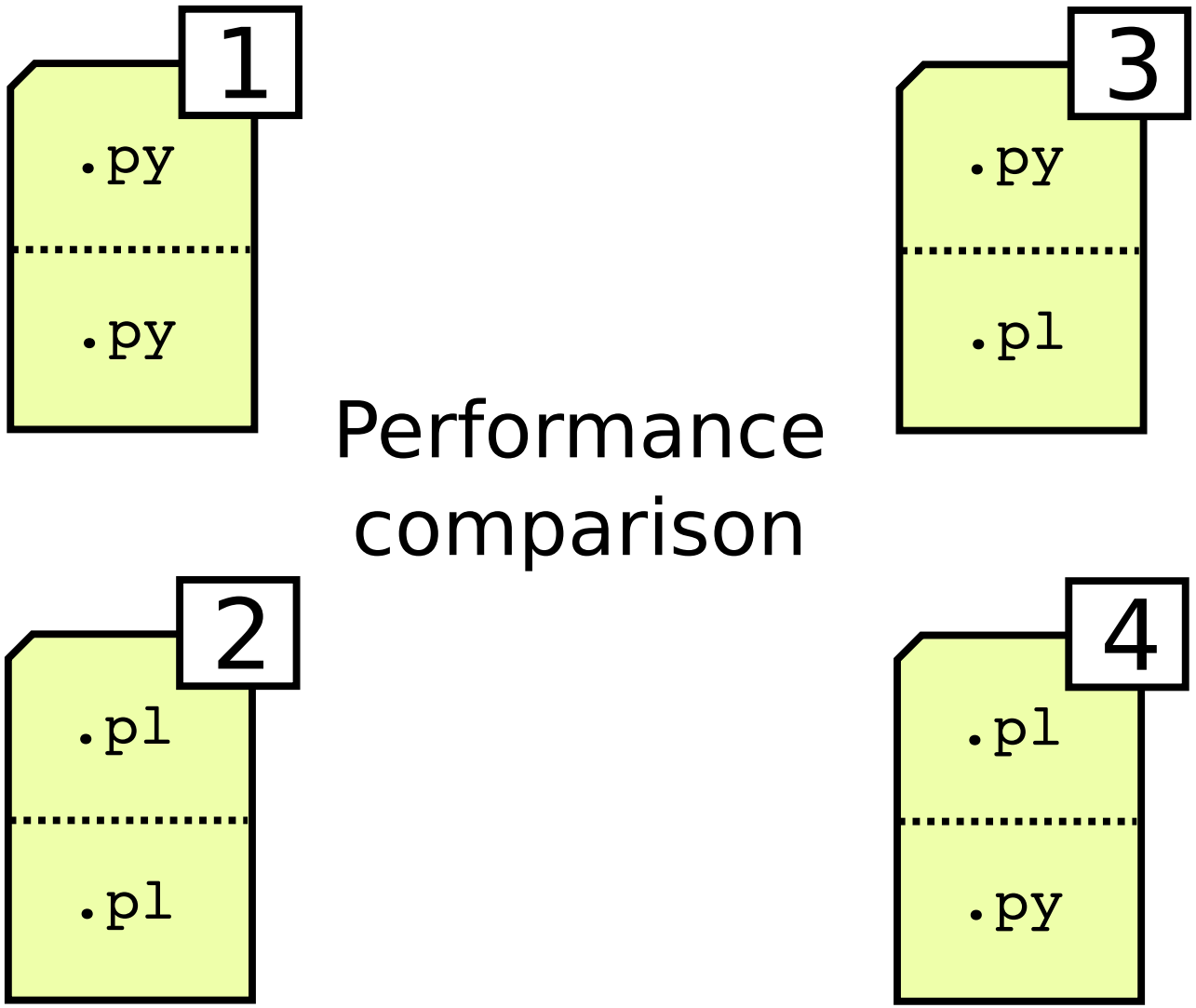

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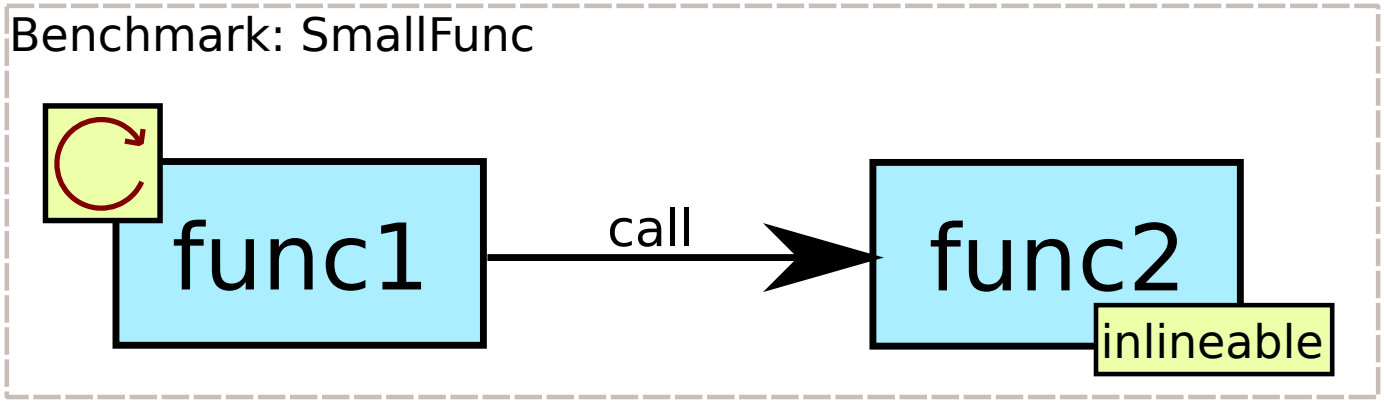

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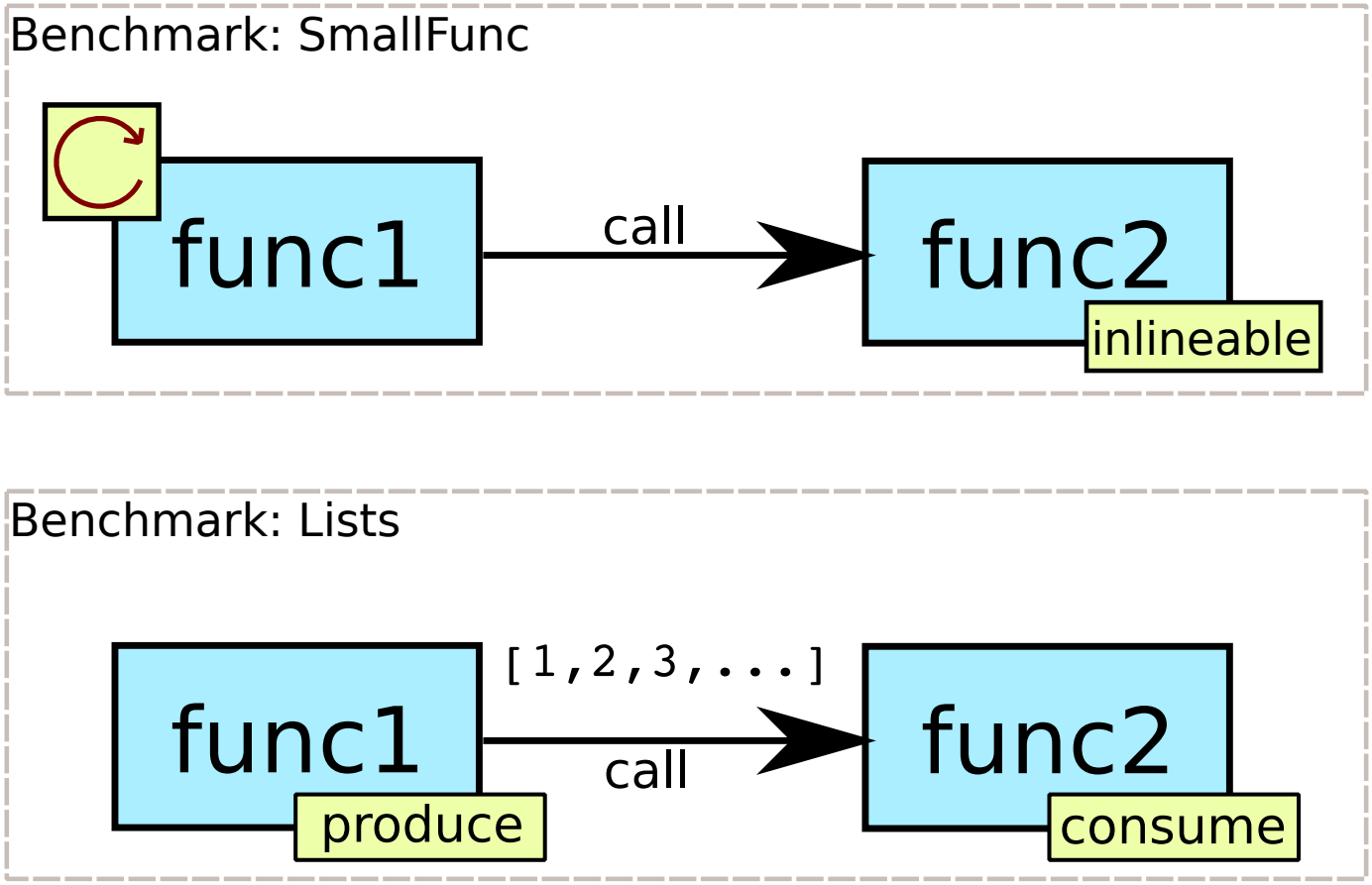
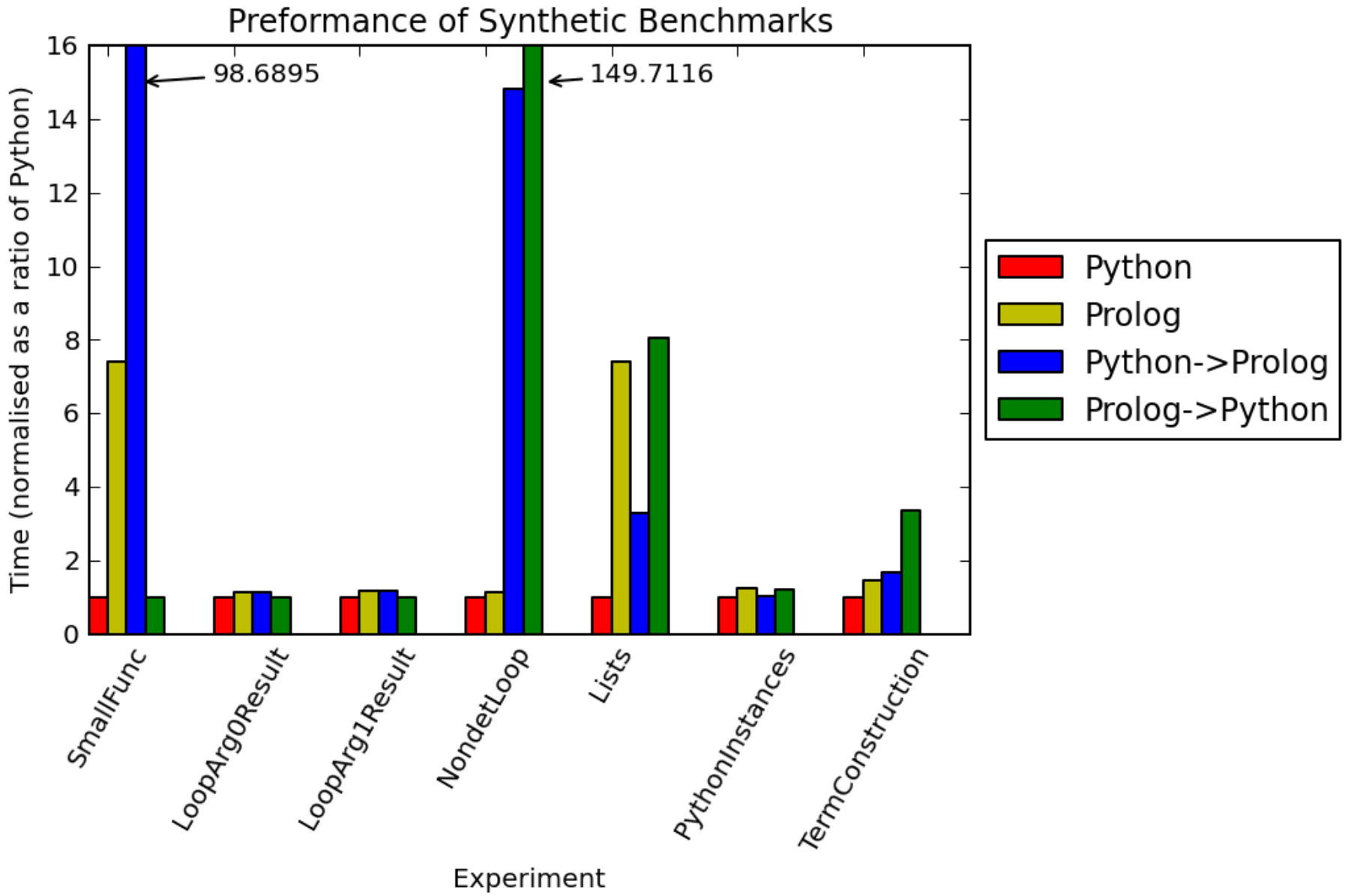


Experimental Evaluation



In Summary

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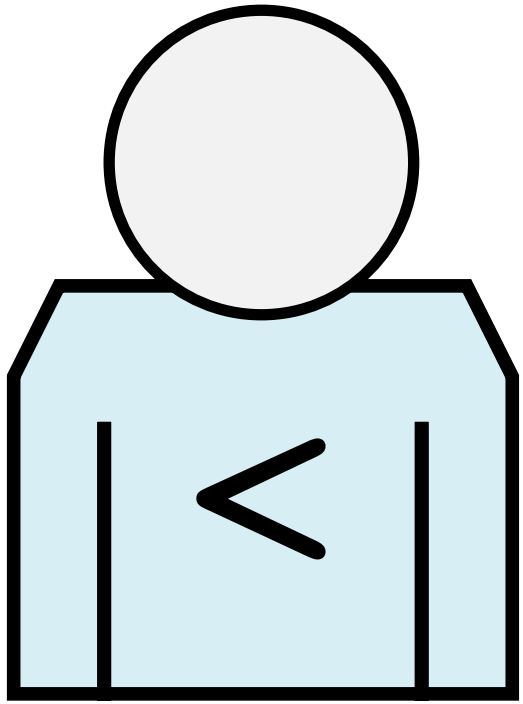

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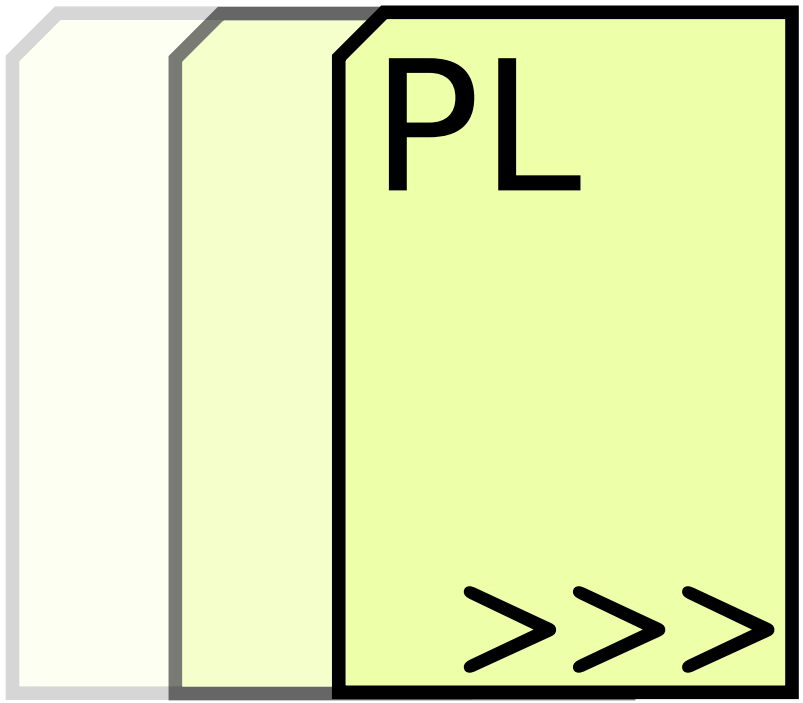

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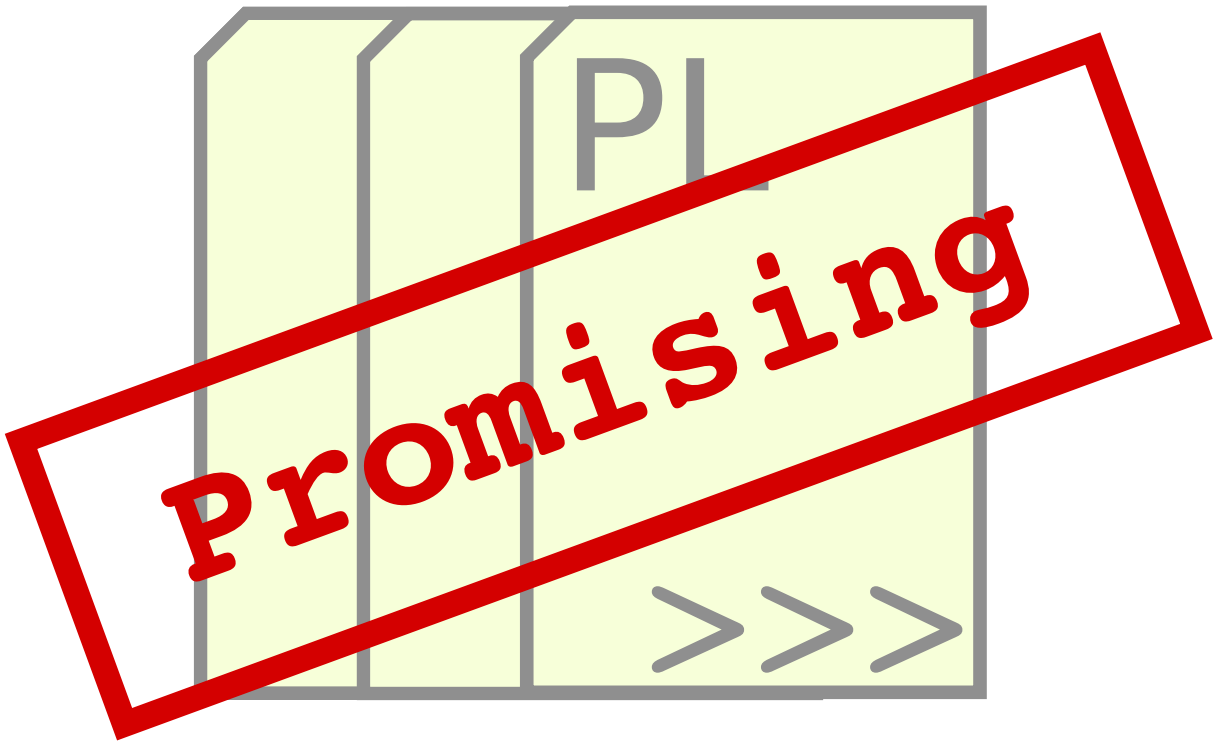
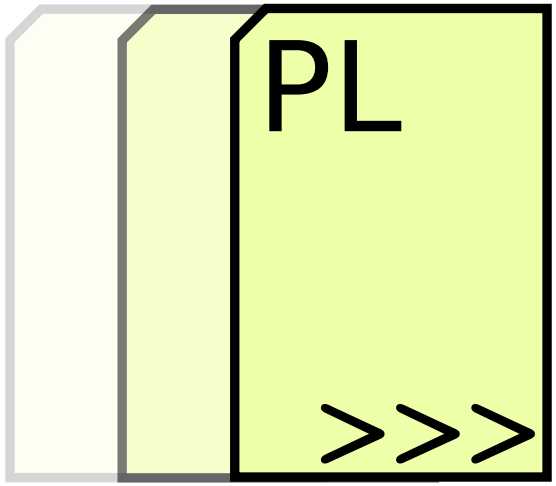
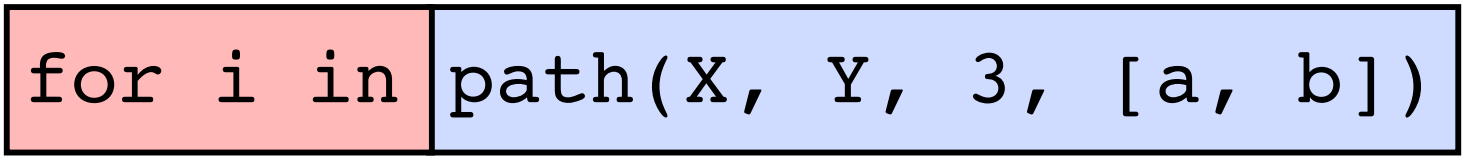


What is next?

Future Work

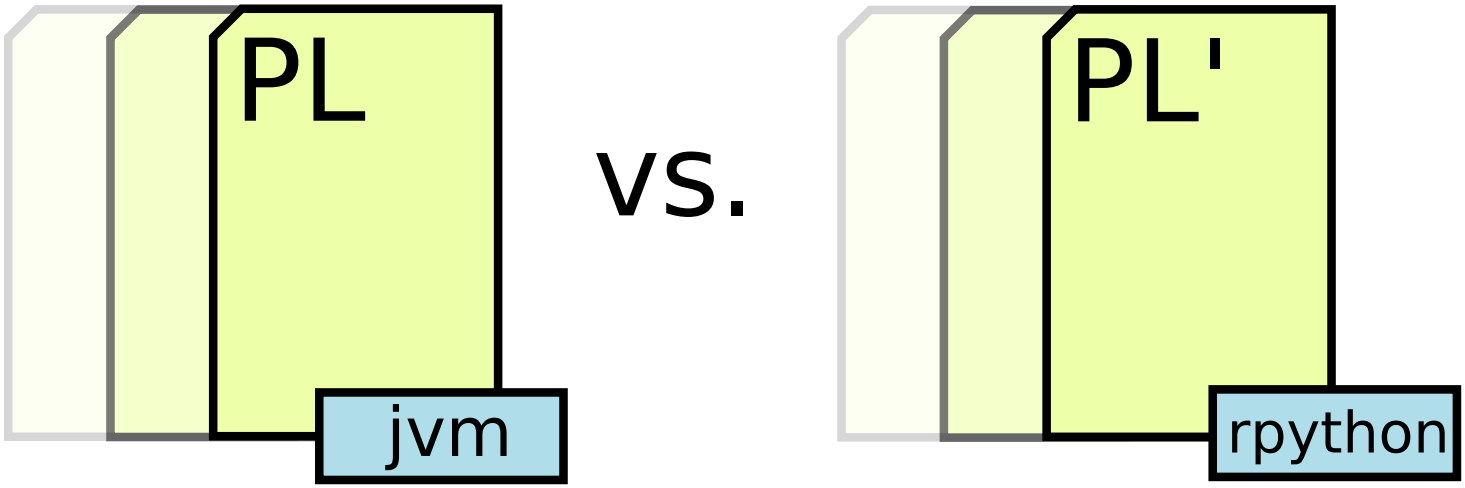


Faster

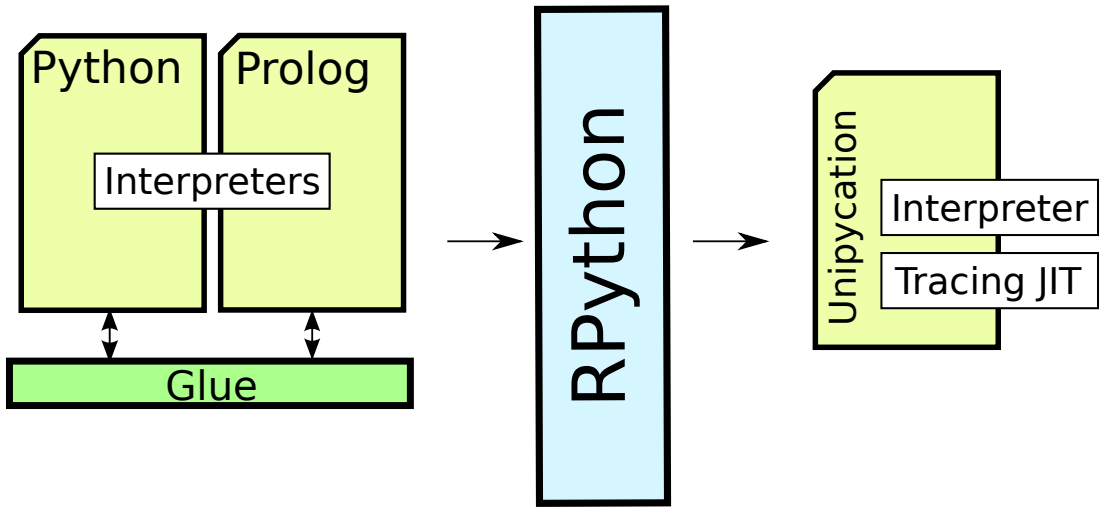


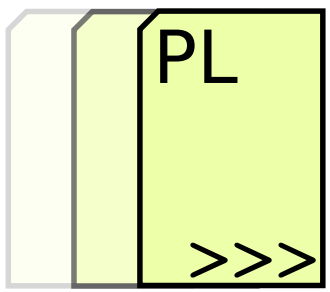
Syntax

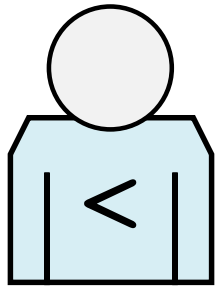
Future Work



Demo/Question Time







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