DYALOG
Eastbourne 2026

Behind the Curtain
The Creation of a New Operator



Silas Poulson

Silas Poulson

- Interpreter developer
- 4 years
- Behind o_



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Composition operators

- Beside (Compose) ∘
- Over Ö
- Atop ⍥
- Behind ⍤







Behind



- `f ∘ g`
- `X f ∘ g Y ↔ (f X) g Y`
- `f ∘ g Y ↔ (f Y) g Y`



```
X f∘g Y ↔ (f X) g Y
      3⍕∘,' things'
3 things
      (⍕3),' things'
3 things
      'We have ',3⍕∘,' things'
We have 3 things
```

```
f∘g Y ←→ (f Y) g Y

      3∘≤∘≠ 3 1 4 1 5
3 4 5
     (3≤ 3 1 4 1 5)≠ 3 1 4 1 5
3 4 5
      1 0 1 0 1≠3 1 4 1 5
3 4 5
```

```
X f∘g Y
```

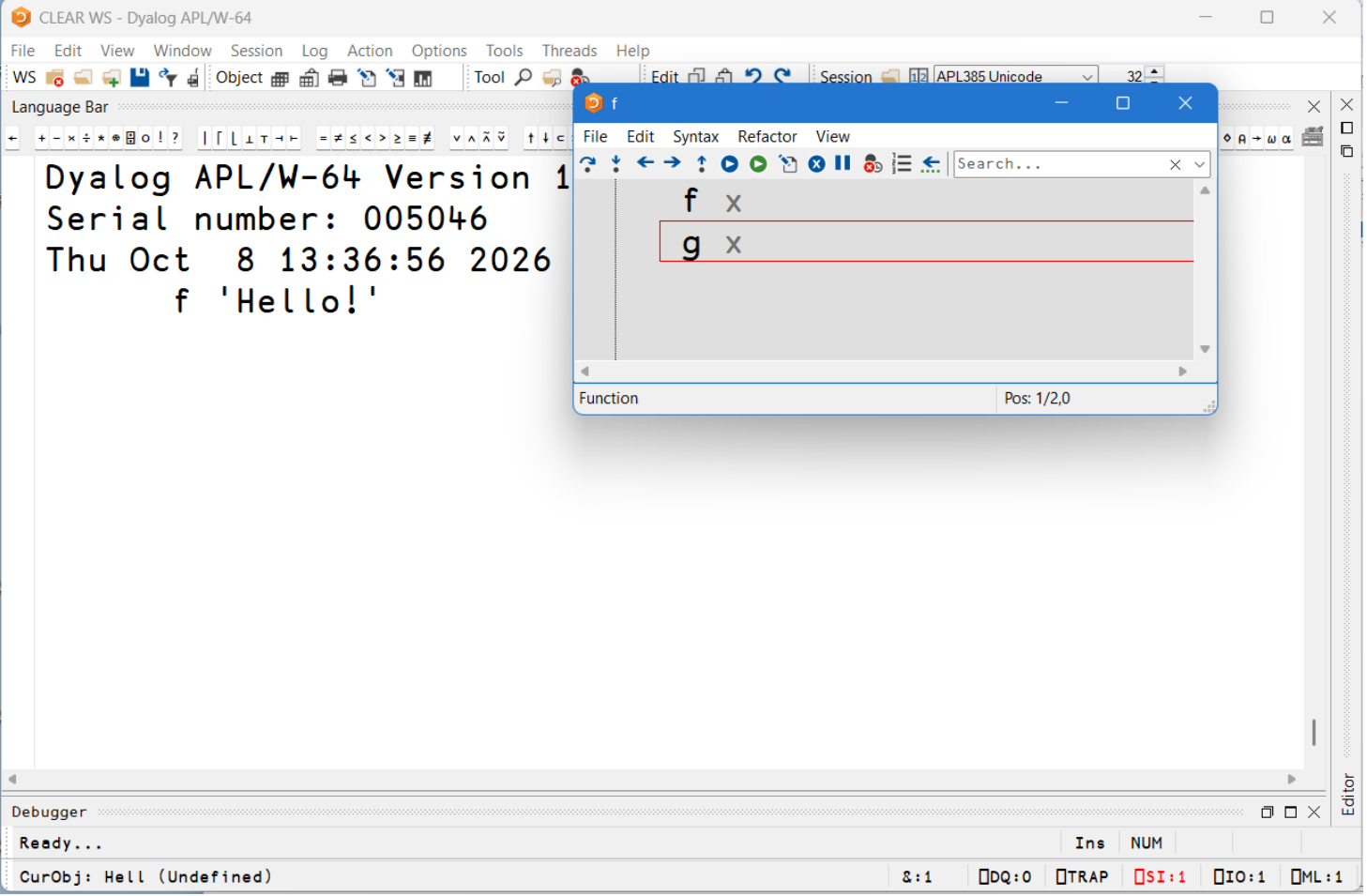
```
      2-∘↑'DYALOG'
OG
      (-2)↑'DYALOG'
OG
      2(↑,-∘↑)'DYALOG'
DYOG
      (2↑'DYALOG'),(-2)↑'DYALOG'
DYOG
```

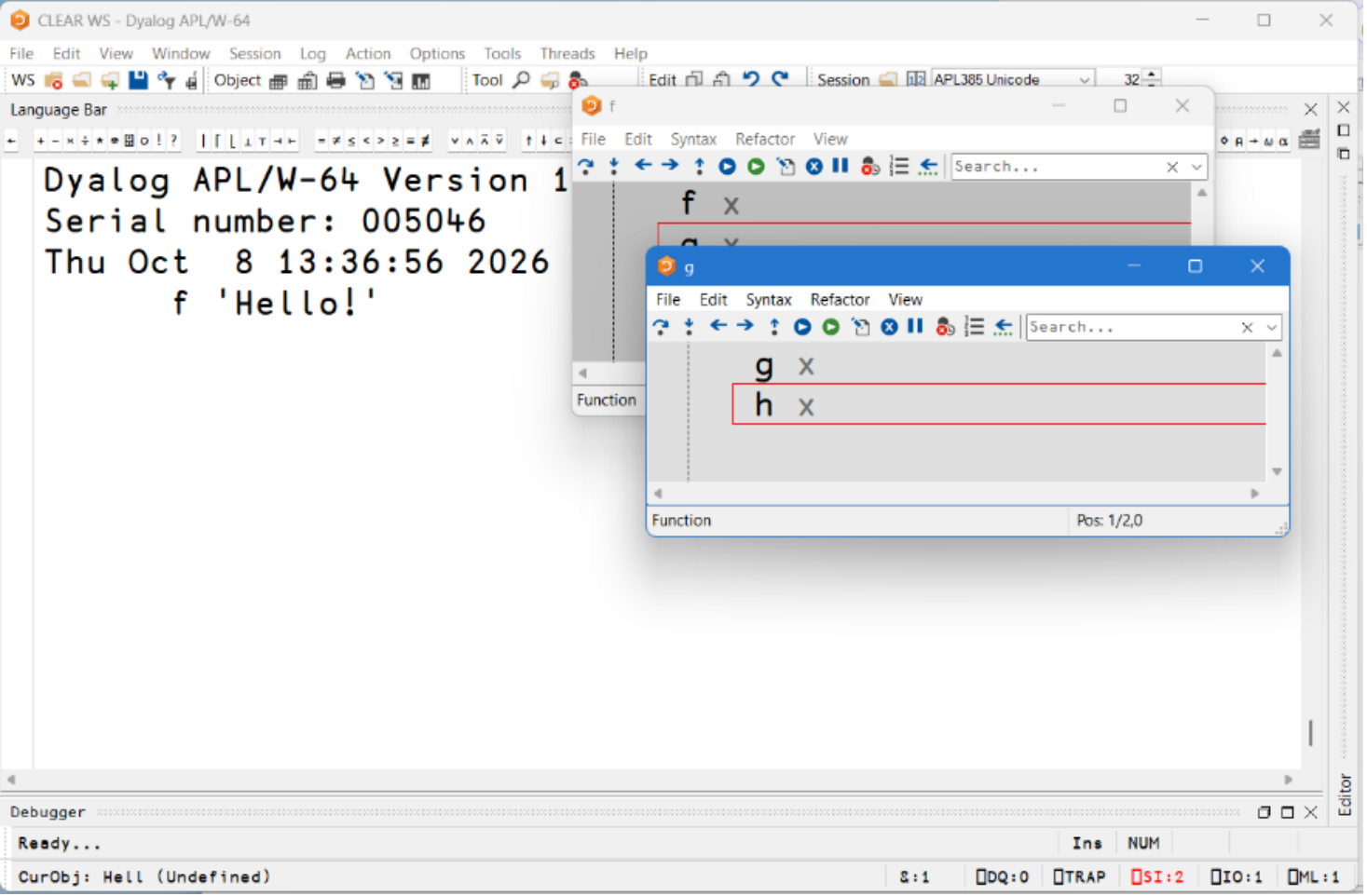
DYALOG
Eastbourne 2026

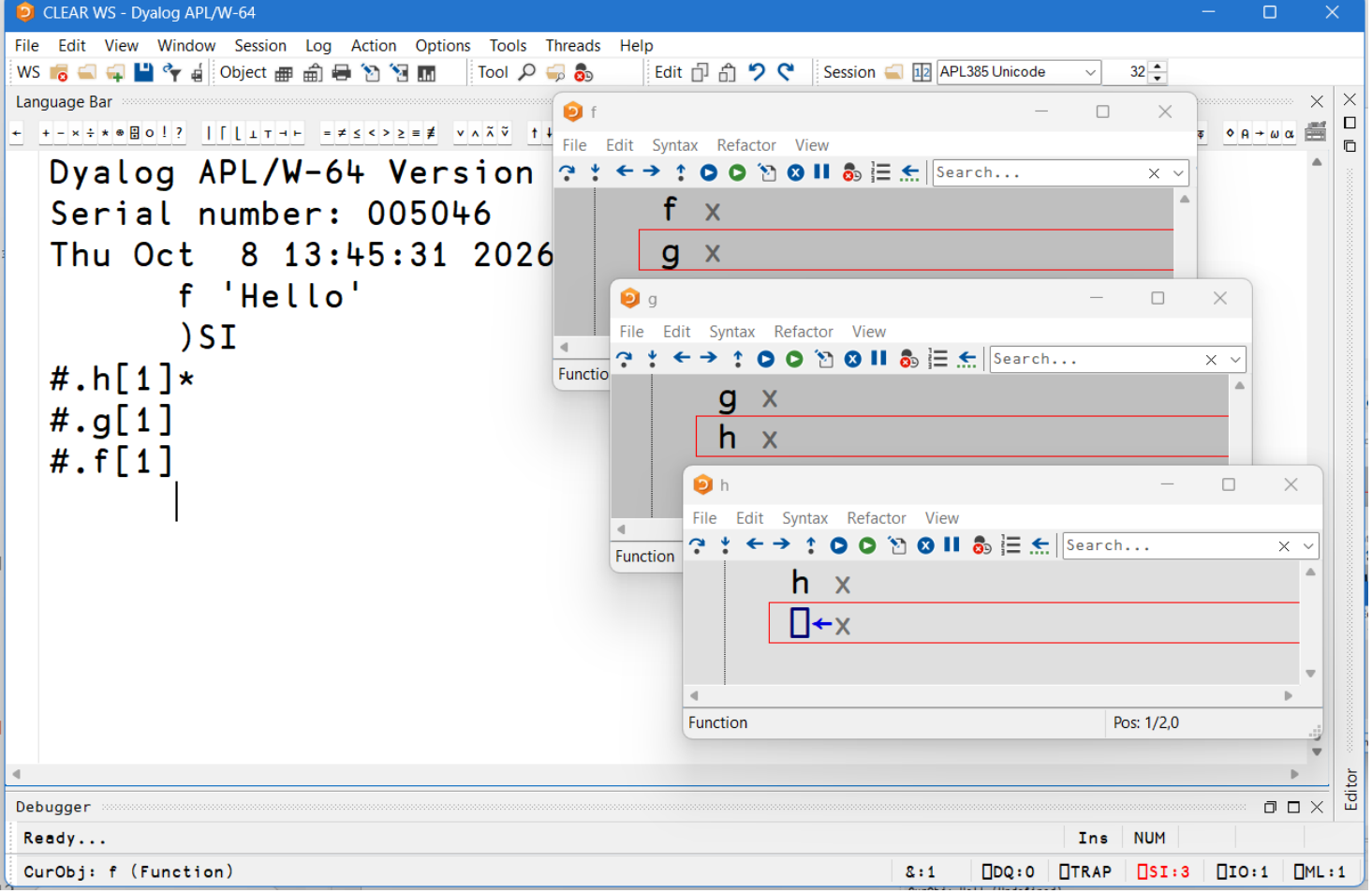
Behind the Curtain
The Creation of a New Operator



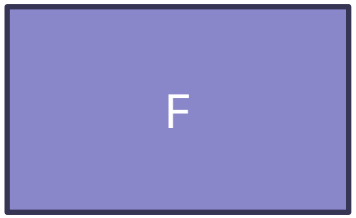
Silas Poulson


CLEAR WS - Dyalog APL/W-64
File Edit View Window Session Log Action Options Tools Threads Help
WS Object Tool Edit Session APL385 Unicode 32
Language Bar
Dyalog APL/W-64 Version 1
Serial number: 005046
Thu Oct 8 13:36:56 2026
f 'Hello!'
f
File Edit Syntax Refactor View
Search...
f x
g x
Function
Pos: 1/2,0
Debugger
Ready...
Ins NUM
CurObj: Hell (Undefined)
&:1 DQ:0 TRAP SI:1 IO:1 ML:1
Editor

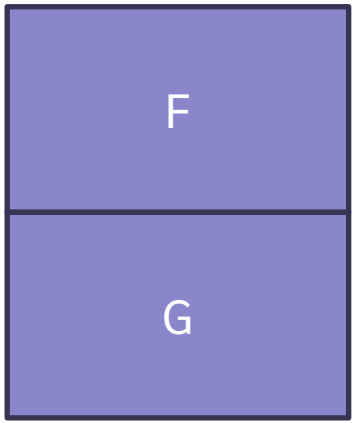

CLEAR WS - Dyalog APL/W-64
File Edit View Window Session Log Action Options Tools Threads Help
WS Object Tool Edit Session APL385 Unicode 32
Language Bar
Dyalog APL/W-64 Version 1
Serial number: 005046
Thu Oct 8 13:36:56 2026
f 'Hello!'
f
File Edit Syntax Refactor View
Search...
f x
Function
g
File Edit Syntax Refactor View
Search...
g x
h x
Function
Pos: 1/2,0
Debugger
Ready...
Ins NUM
CurObj: Hell (Undefined)
&:1 DQ:0 TRAP SI:2 IO:1 ML:1
Editor


CLEAR WS - Dyalog APL/W-64
File Edit View Window Session Log Action Options Tools Threads Help
Language Bar
Dyalog APL/W-64 Version
Serial number: 005046
Thu Oct 8 13:45:31 2026
f 'Hello'
)SI
#.h[1]*
#.g[1]
#.f[1]
f
g
h
Function
Pos: 1/2,0
Debugger
Ready...
CurObj: f (Function)
Editor

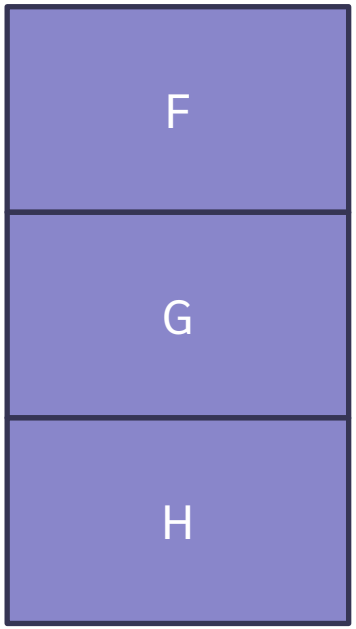
Function calls



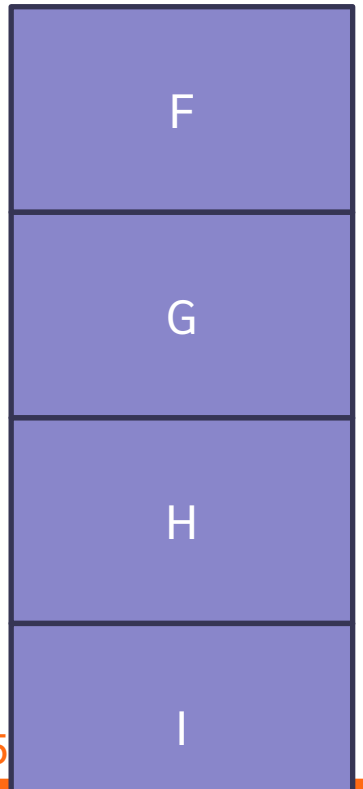
Function calls



Function calls

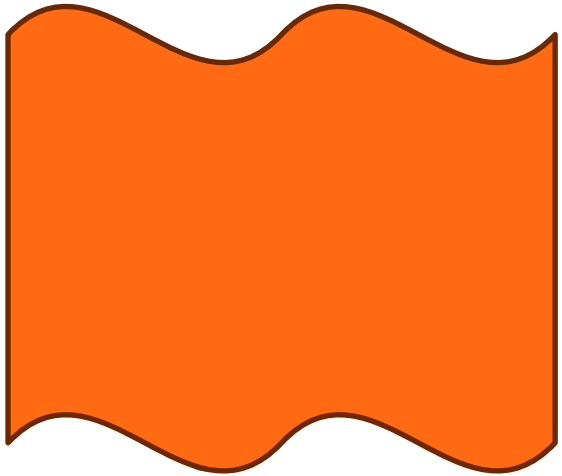


Function calls



WSFULL

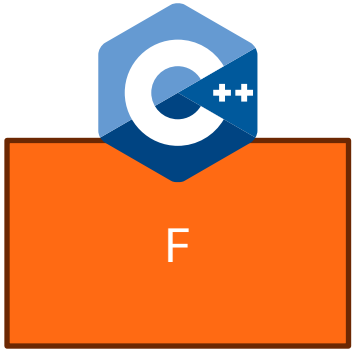




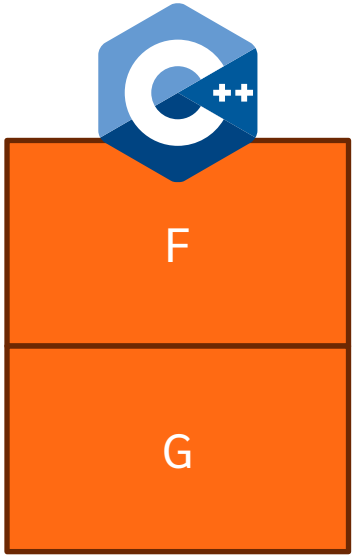




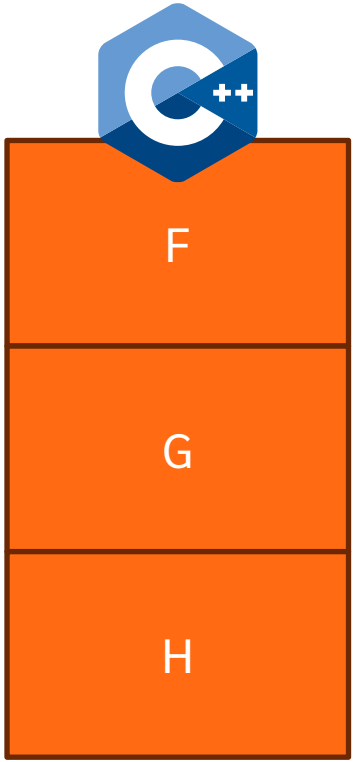
Function calls



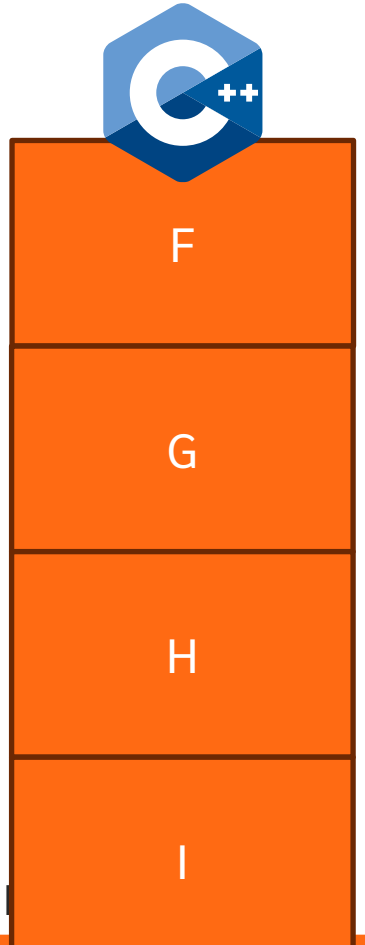
Function calls



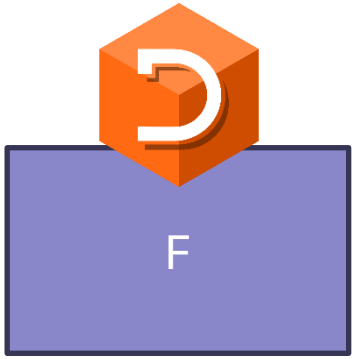
Function calls



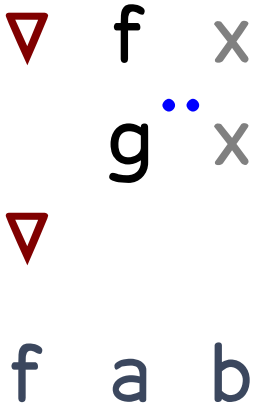
Function calls

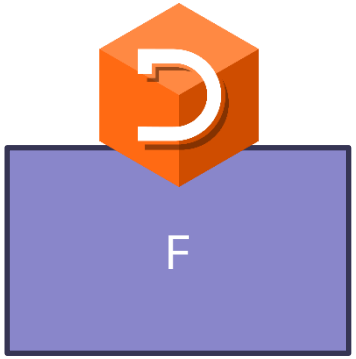


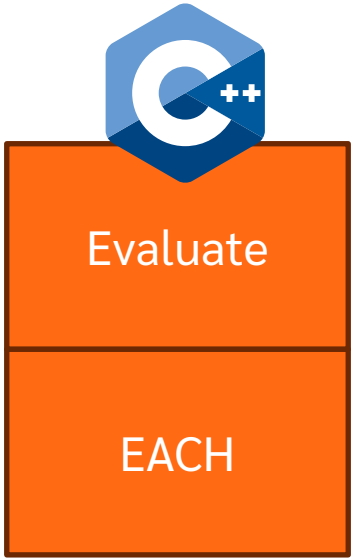
CRASH!

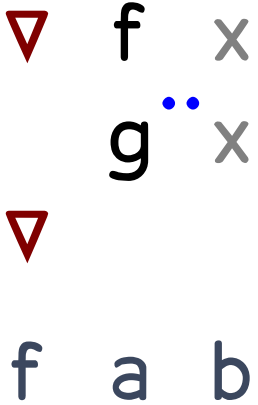

F

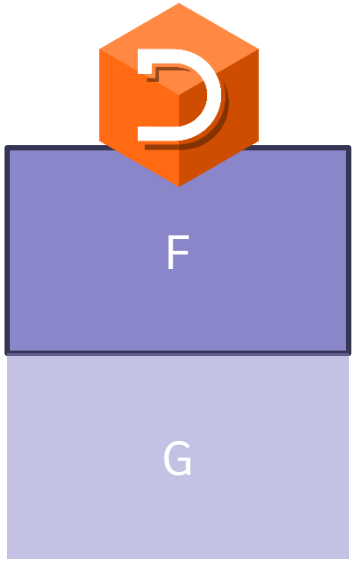

Evaluate

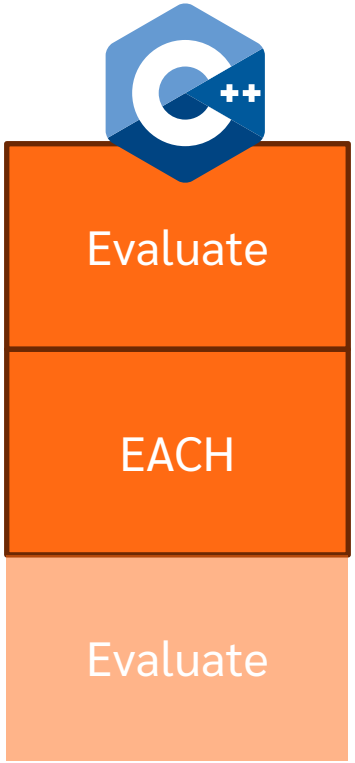

∇ f x
g x
∇
f a b


F

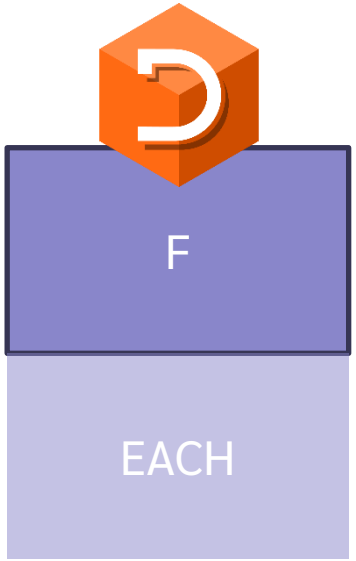

Evaluate
EACH


f x
g x
f a b

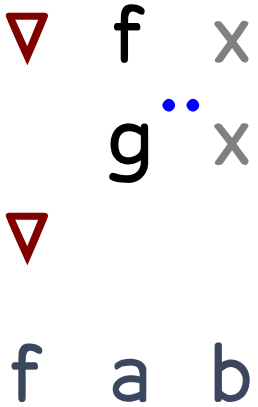


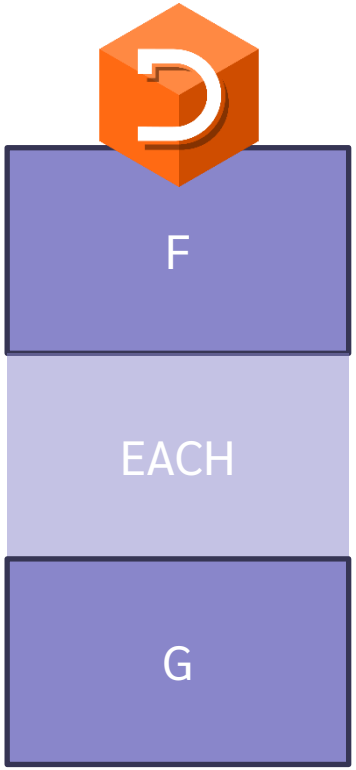


$$\nabla\, f\ x$$
$$g\ x$$
$$\nabla$$
$$f\ a\ b$$

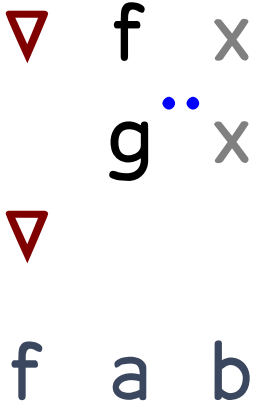

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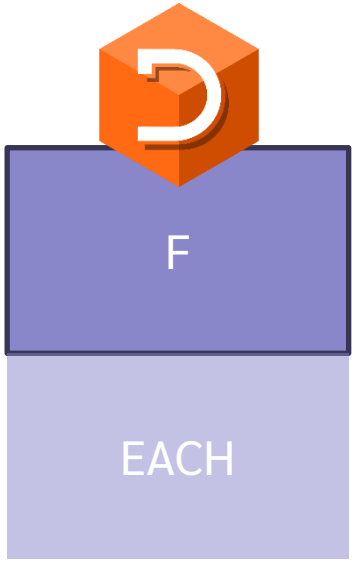

Evaluate


f x
g x
f a b

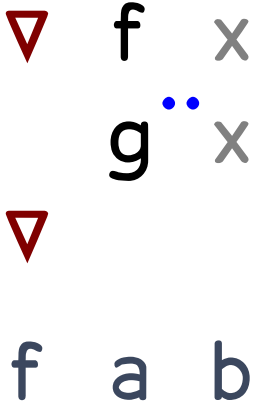

F
EACH
G

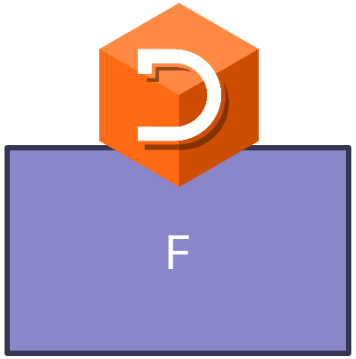

Evaluate

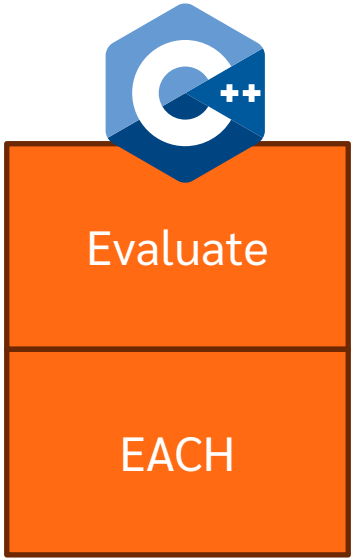

f x
g x
f a b

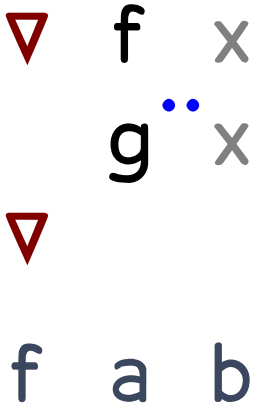

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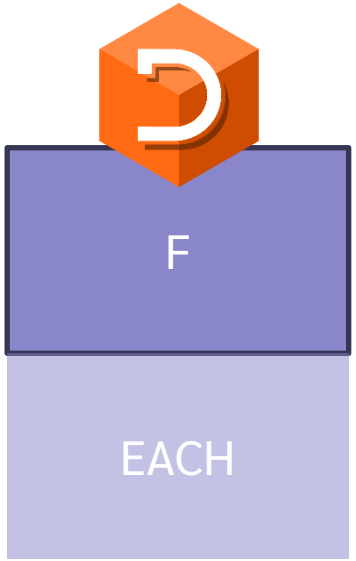

Evaluate


f x
g x
f a b

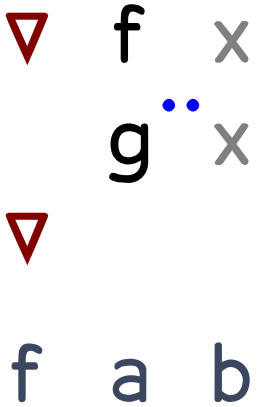

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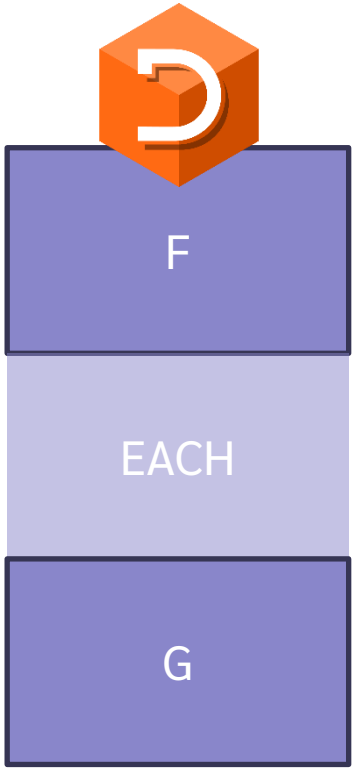

Evaluate
EACH


f x
g x
f a b

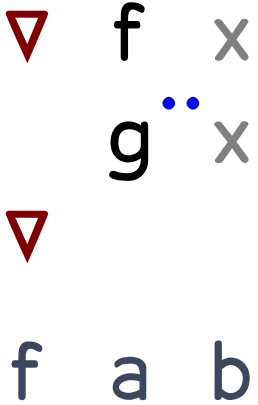

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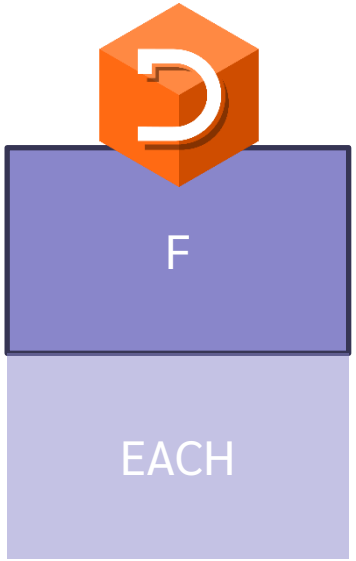

Evaluate


f x
g x
f a b

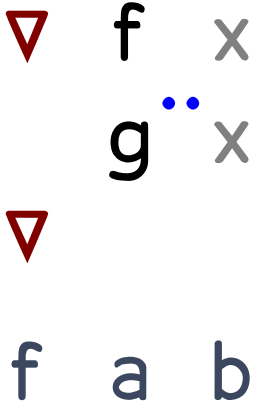

F
EACH
G

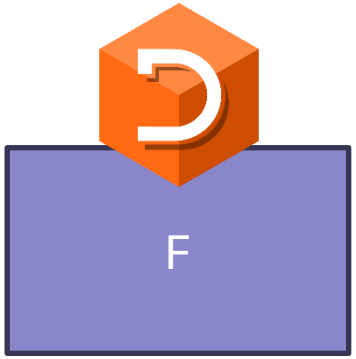

Evaluate

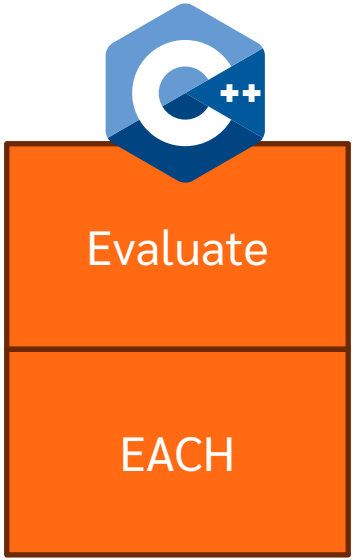

f x
g x
f a b

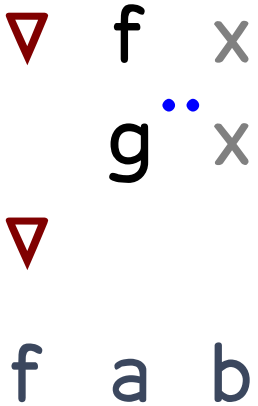

F
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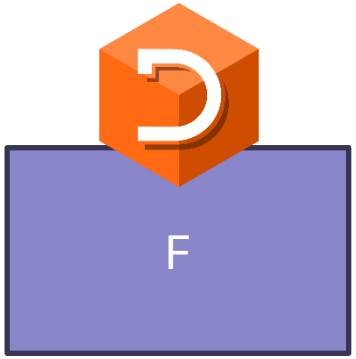

Evaluate


f x
g x
f a b

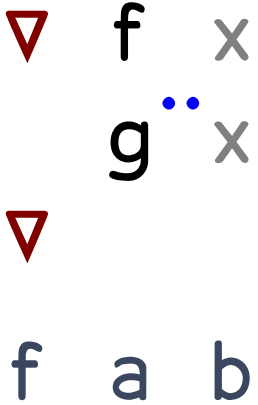

F


Evaluate
EACH


∇ f x
g x
∇
f a b

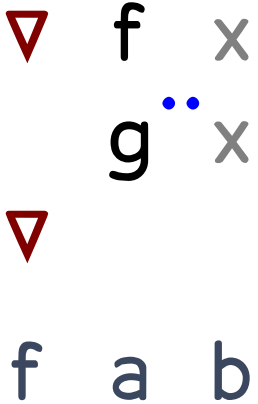

F


Evaluate


f x
g x
f a b





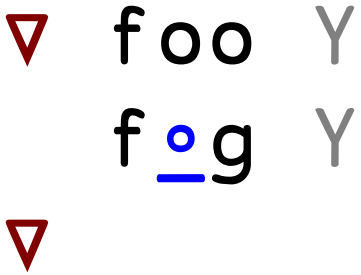

f x
g x
f a b

Behind

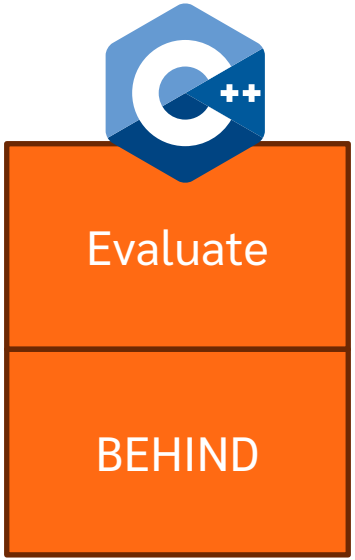
- `f ∘ g`
- `X f ∘ g Y ←→ (f X) g Y`
- `f ∘ g Y ←→ (f Y) g Y`

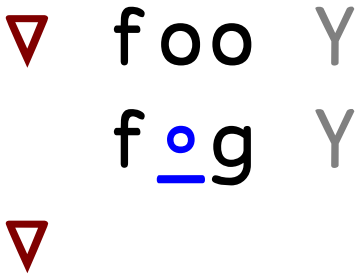

FOO

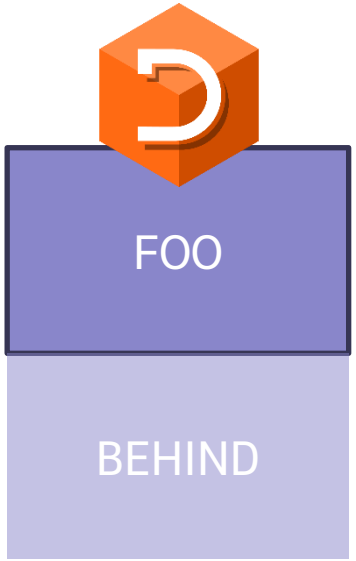

Evaluate


foo
fog

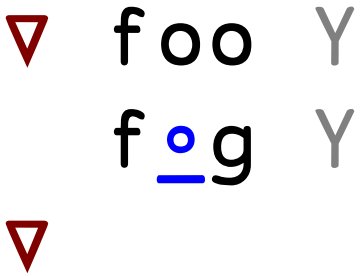

FOO

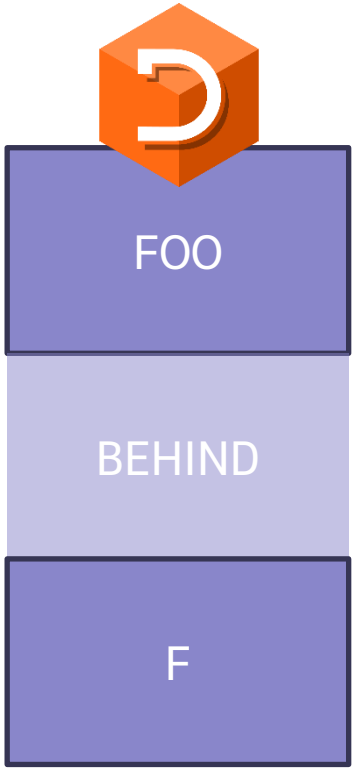

Evaluate
BEHIND


foo Y
fog Y

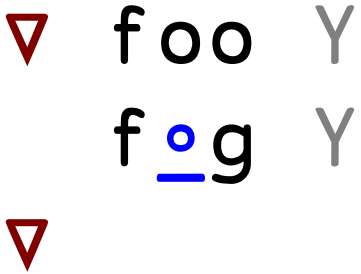

FOO
BEHIND

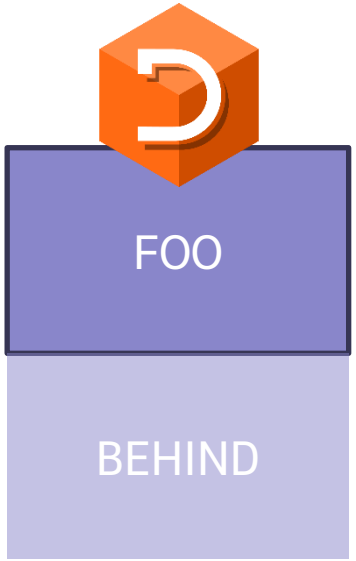

Evaluate


foo
fog

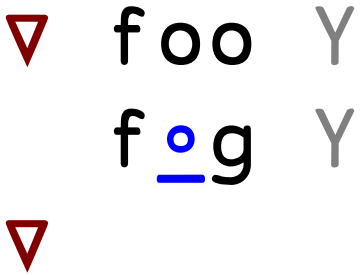

FOO
BEHIND
F


Evaluate

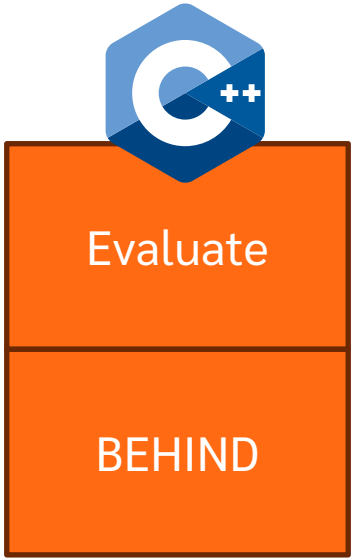

foo
fog

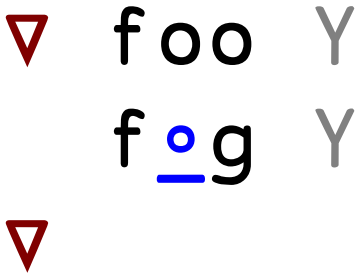

FOO
BEHIND

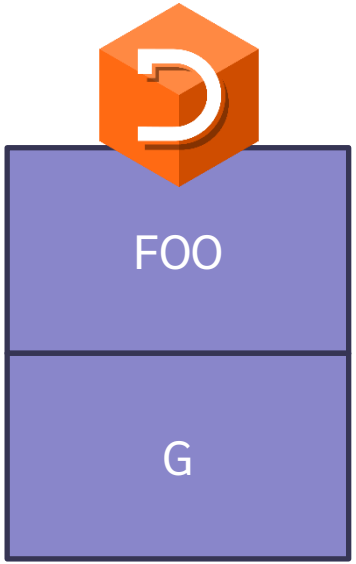

Evaluate


foo
fog

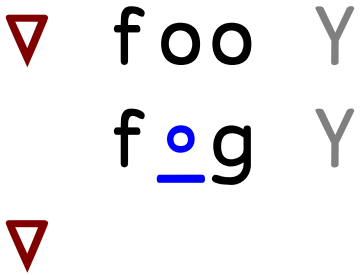

FOO


Evaluate
BEHIND


foo
fog

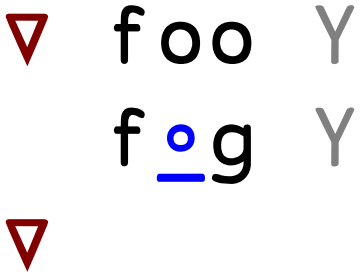

FOO
G


Evaluate


foo
fog

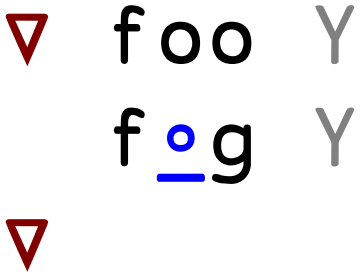

FOO


Evaluate


foo
fog






foo
fog

Summary

- Behind (⍥)
  - `f⍥g Y ←→ (f Y) g Y`
  - `X f⍥g Y ←→ (f X) g Y`
- Operators store state on the SI stack