WebKit JavaScript JIT with LLVM

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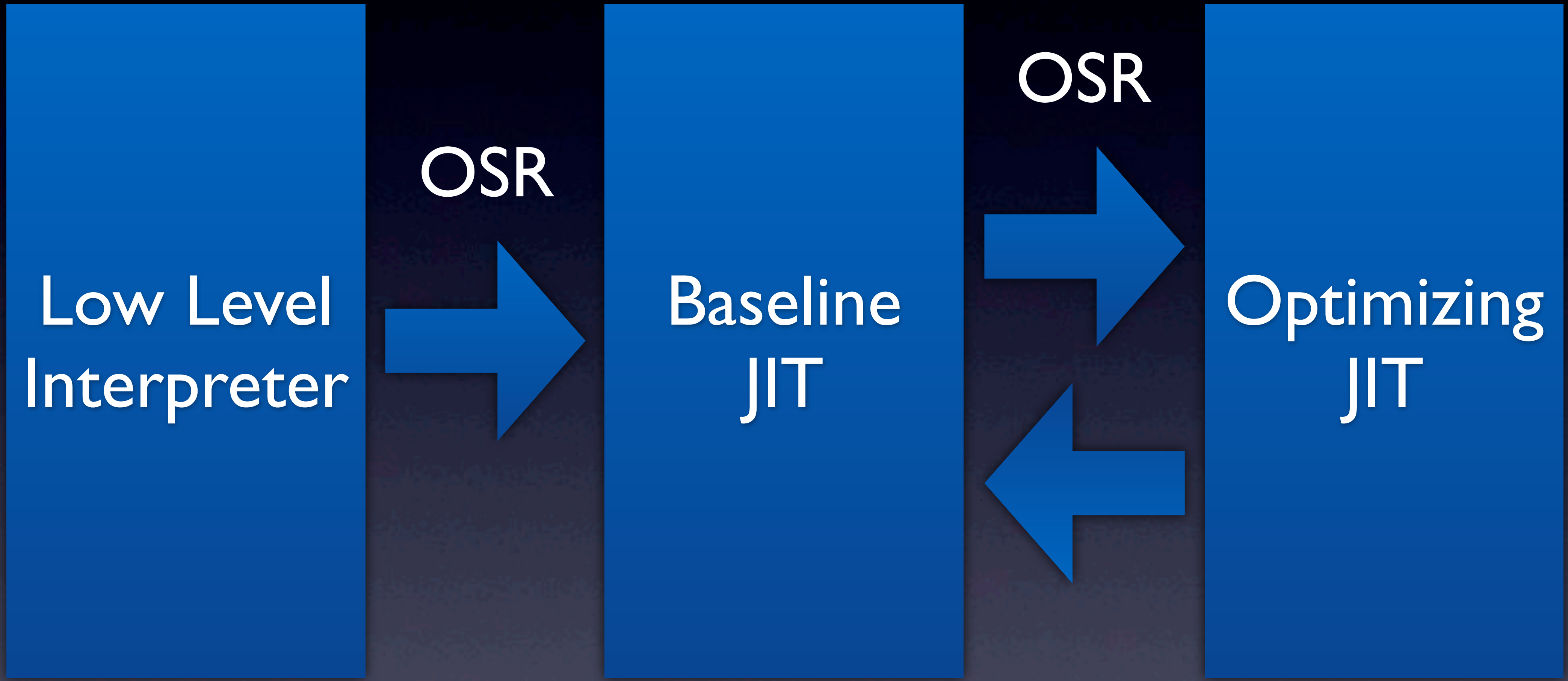
Apple

WebKit

WebKit JavaScript



Low Level Interpreter

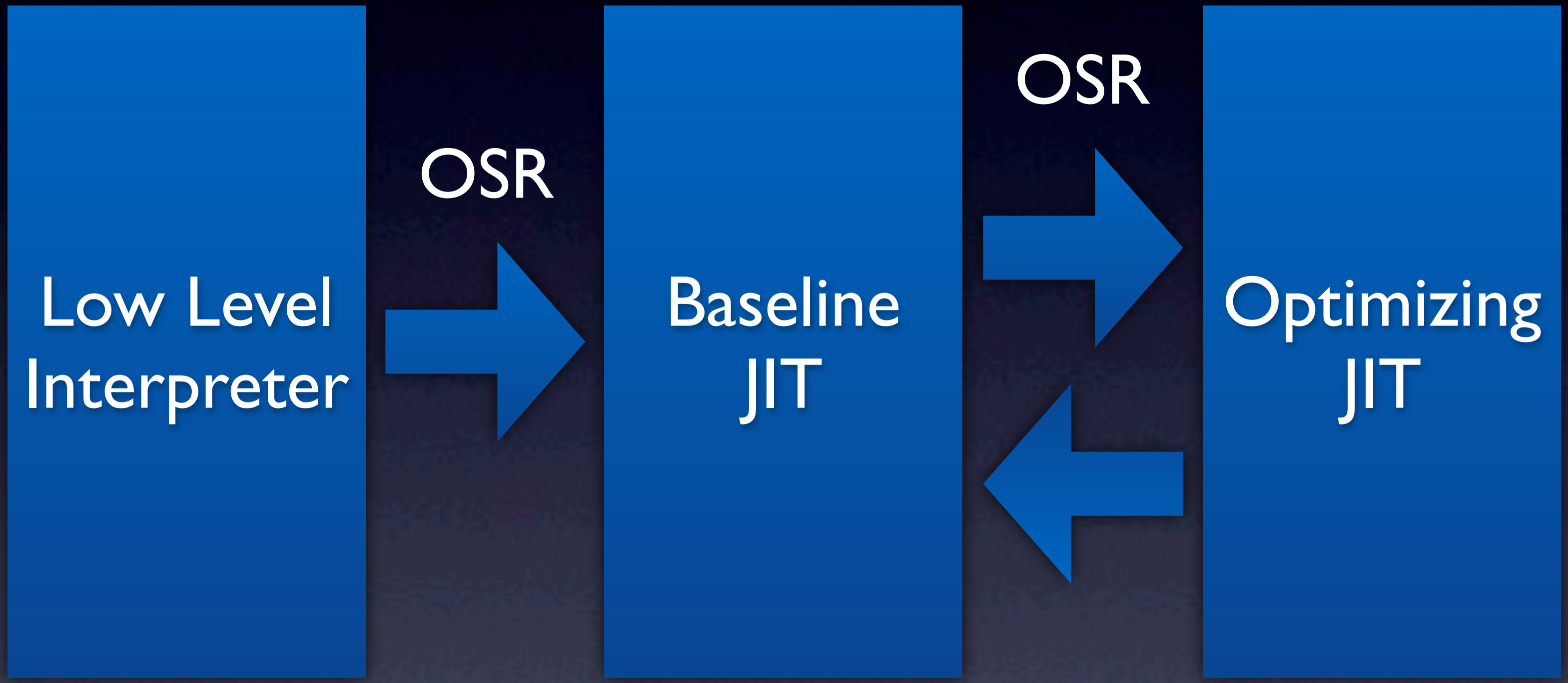
OSR

Baseline JIT

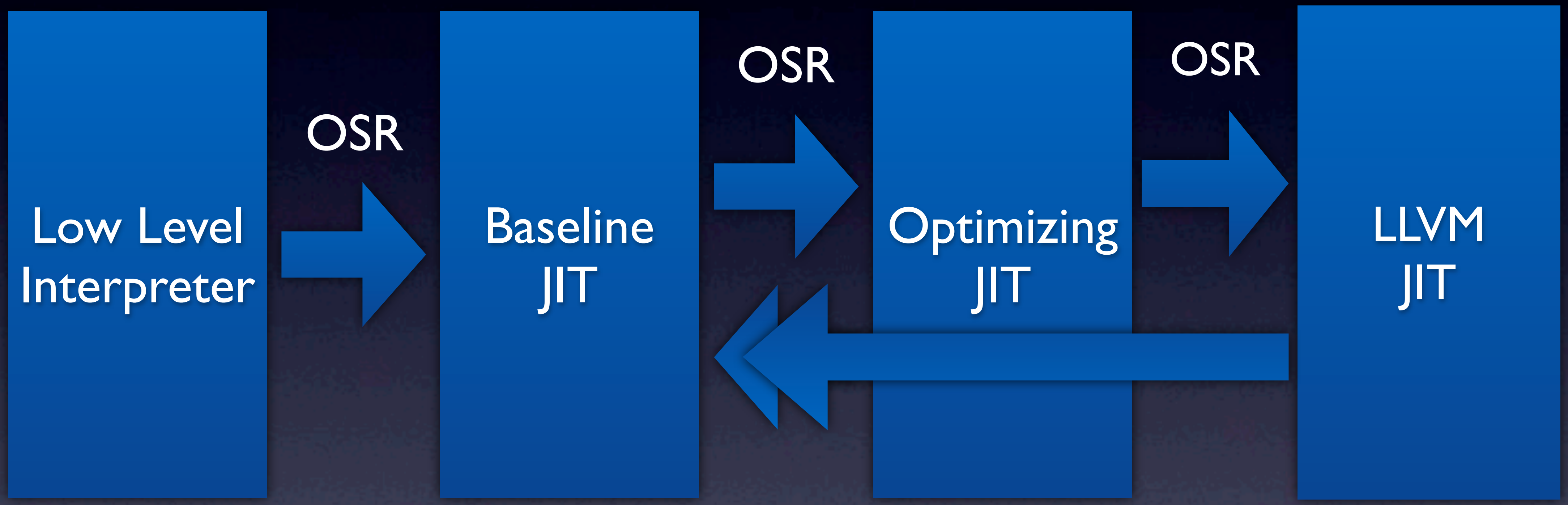
OSR

Optimizing JIT

WebKit JavaScript



WebKit JavaScript



Low Level Interpreter

OSR

Baseline JIT

OSR

Optimizing JIT

OSR

LLVM JIT

Goals

- Generate fast code
- Real world JavaScript
- Compile the hottest functions

- Deoptimization
- Inline caches
- Stronger typing

• Deoptimization	*stackmap*
• Inline caches	*patchpoint*
• Stronger typing	*TBAA on calls*

```
var x = o.f;
```

```
cmpl $0xd1e7beef, 4(%rax)
jne Lslow
movq 8(%rax), %rax
movq 0(%rax), %rax
```

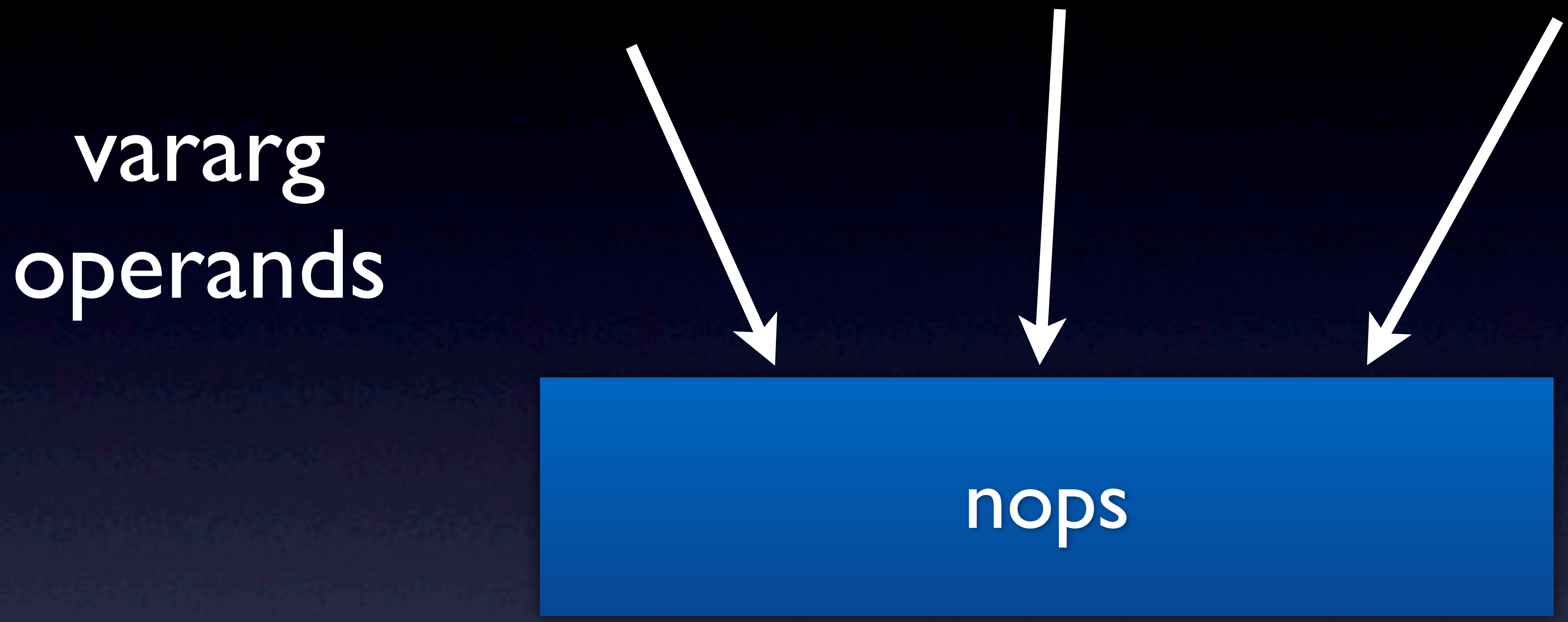
```
cmpl $42, 4(%rax)
jne Lslow
leaq 8(%rax), %rax
movq 8(%rax), %rax
```

```
cmpl $53, 4(%rax)
jne Lslow
movq 8(%rax), %rax
movq -16(%rax), %rax
```

```
jmp Lstub
<garbage>
```

- Self-modifying code
- Arbitrary effects
- Critical for performance

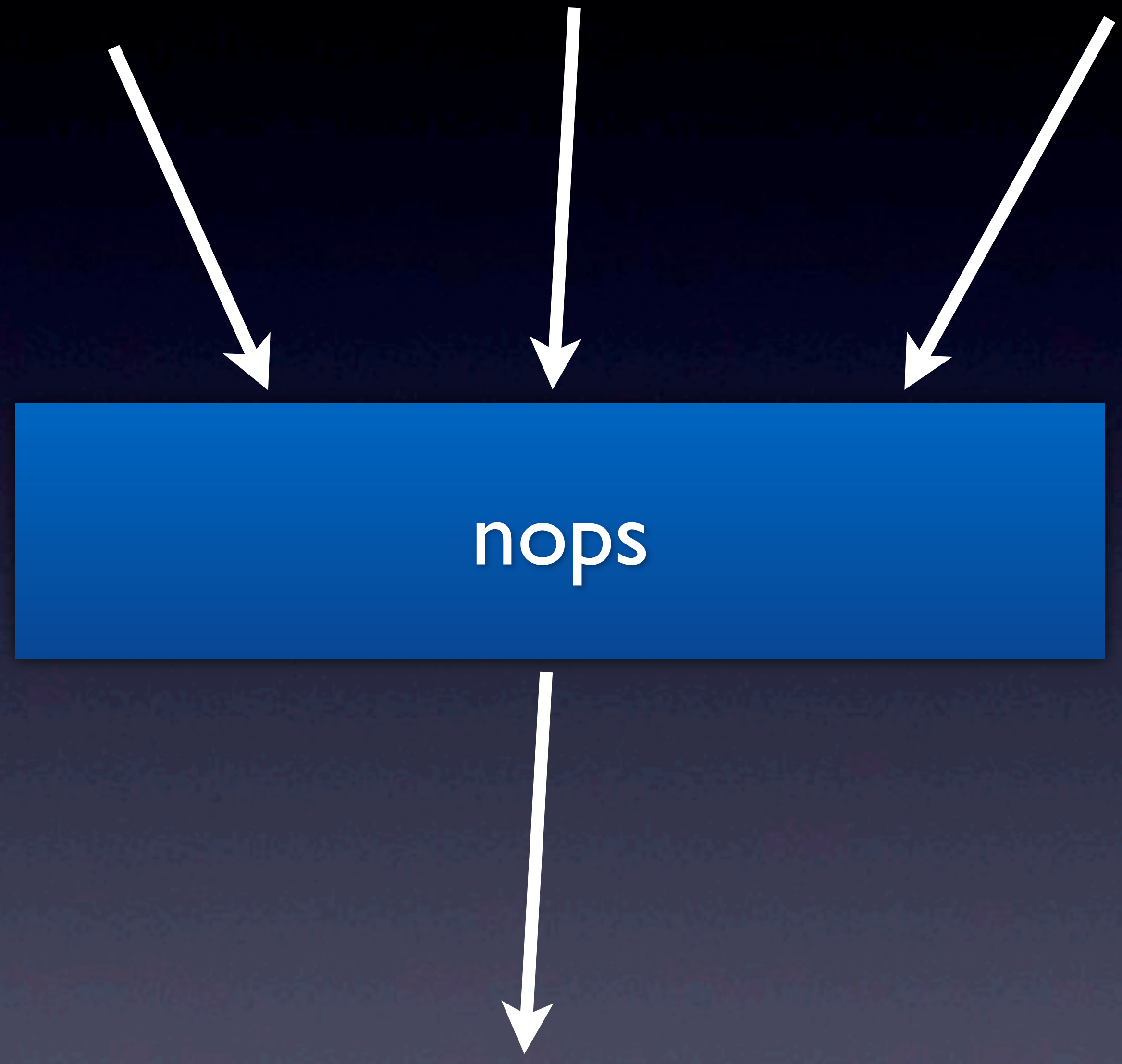
nops



vararg
operands

nops

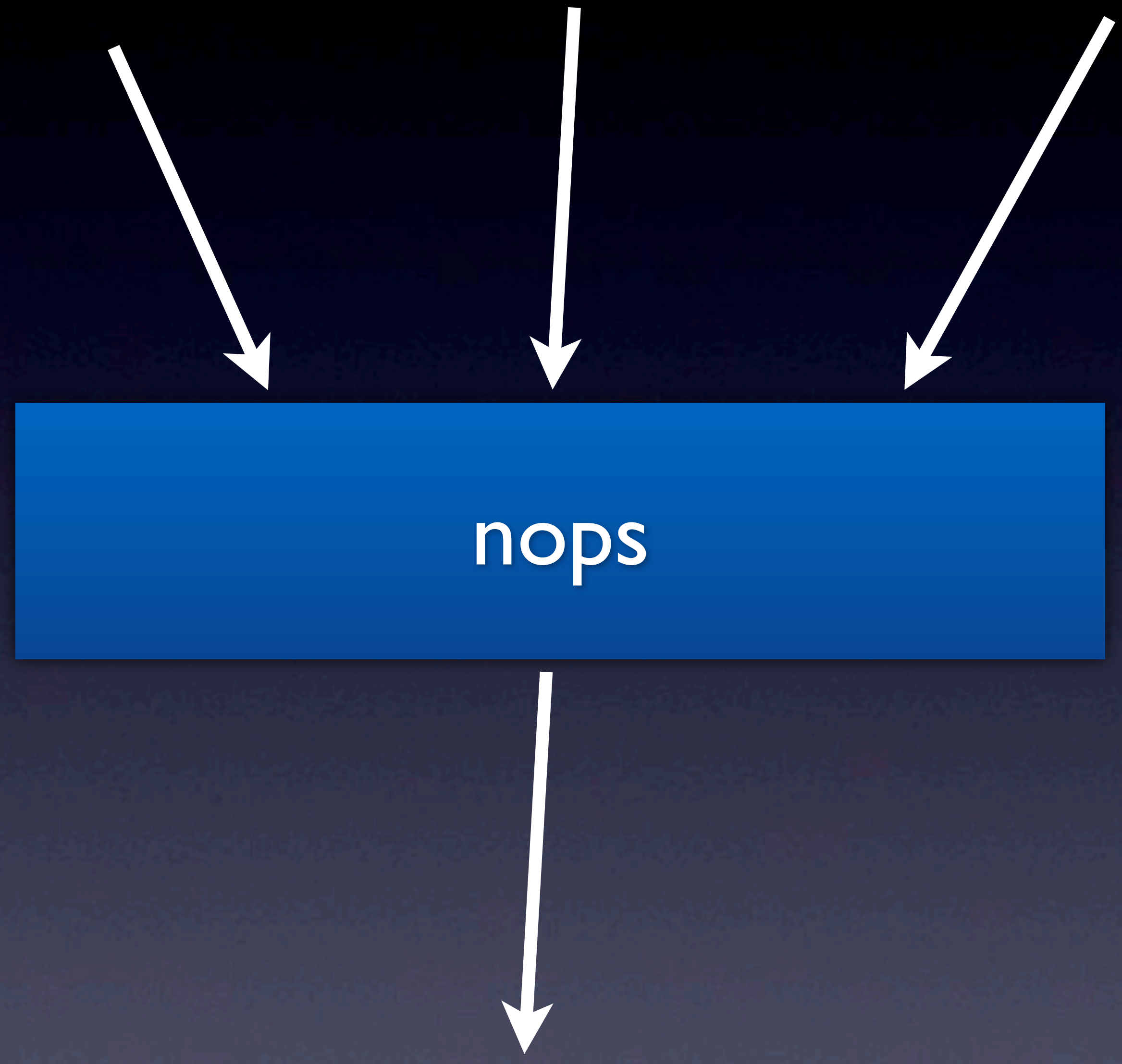
vararg
operands



nops

optional result

vararg
operands

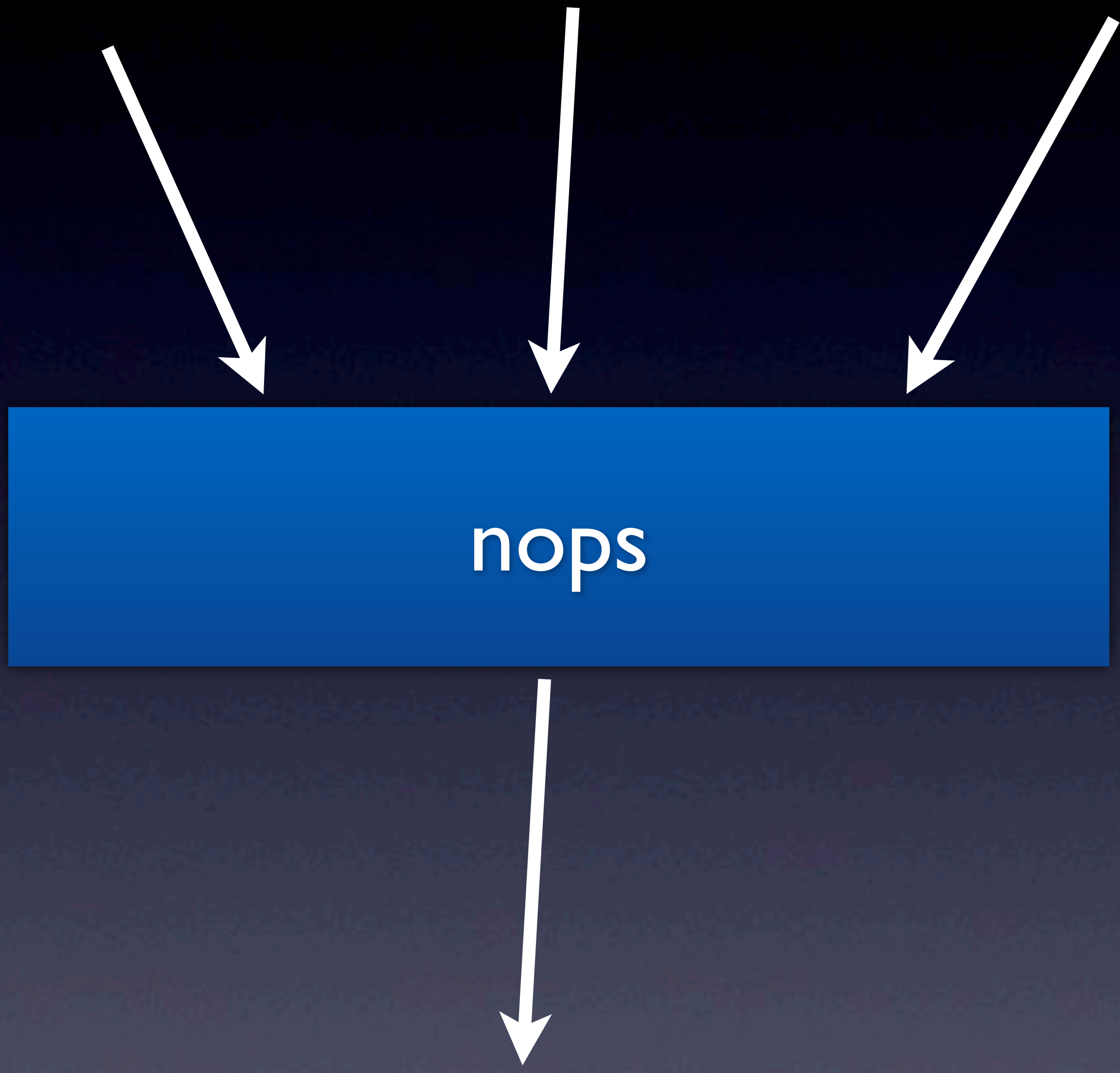


nops

call-like
effects

optional result

vararg operands



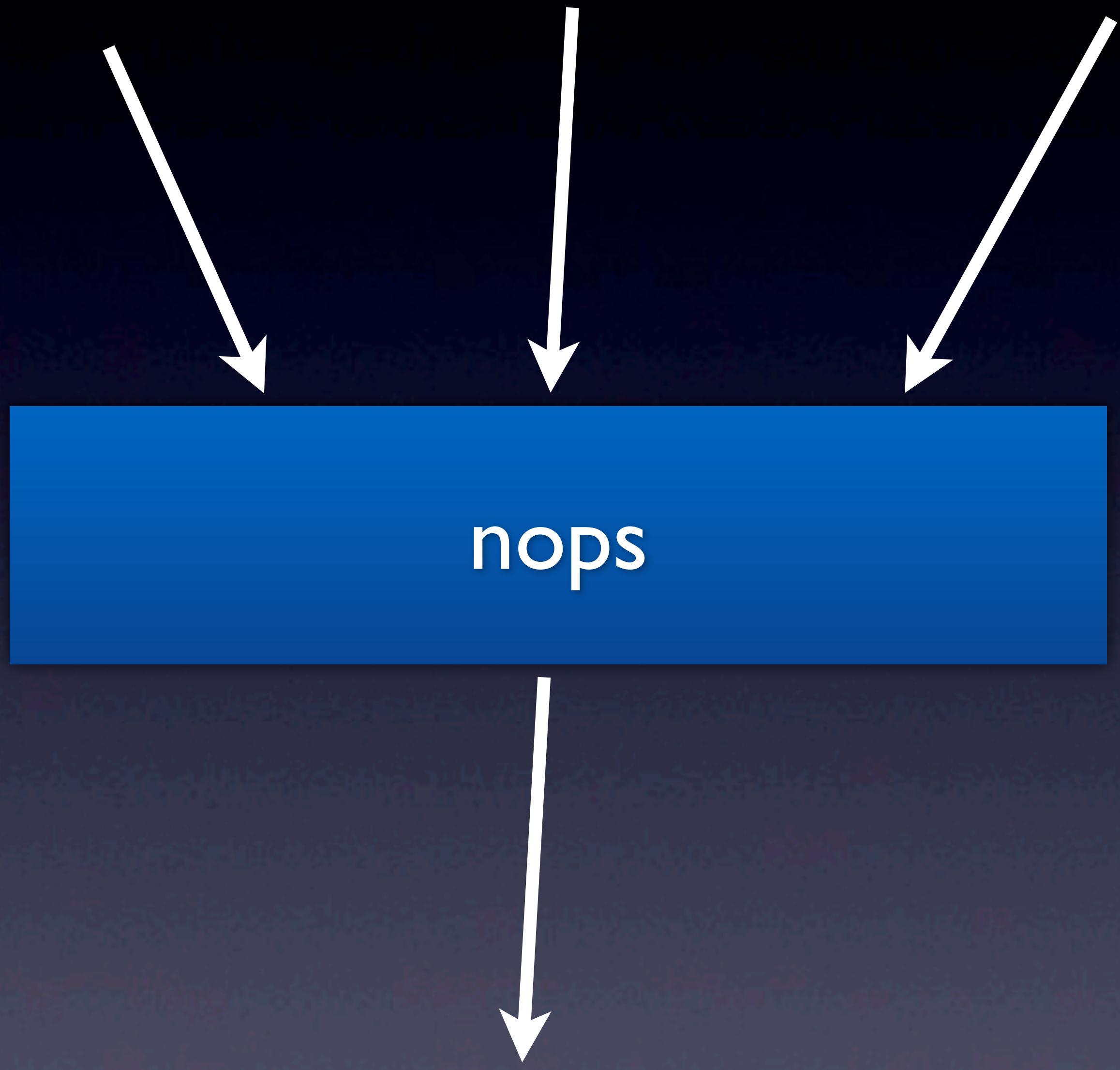
nops

Side-channel reports code offset and register state

call-like effects

optional result

Patchpoint



vararg operands

nops

call-like effects

Side-channel reports code offset and register state

optional result

• Deoptimization	*stackmap*
• Inline caches	*patchpoint*
• Stronger typing	*TBAA on calls*