ORC experiments

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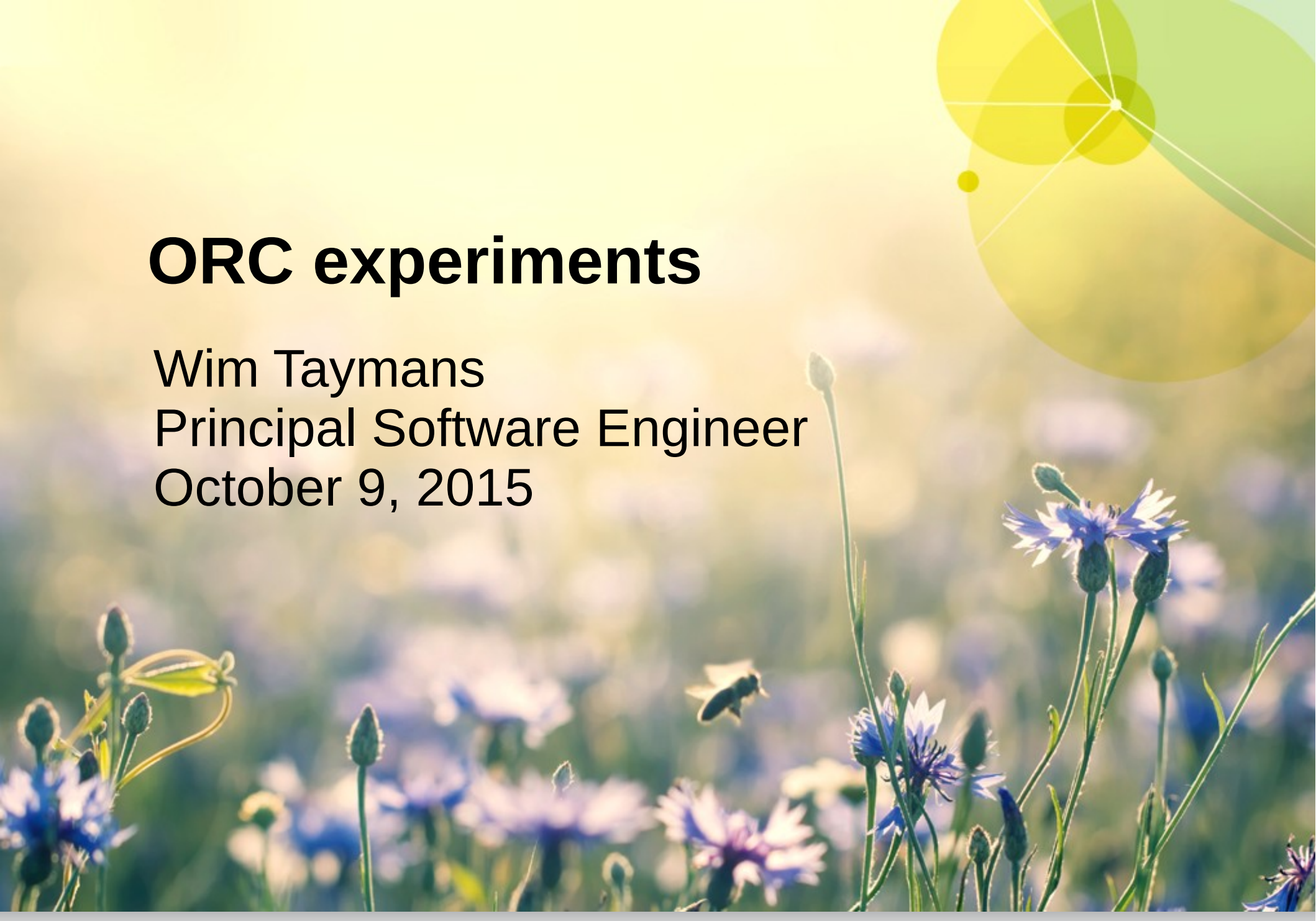

ORC… but what?

- Language and tools for describing and executing low-level computations on modern CPUs

ORC… the language

```
.function test_orc_muladd
.dest 4 d1 guint32
.source 4 s1 guint16
.source 4 s2 guint16
.temp 8 q1
.temp 8 q2
.temp 4 l1
.temp 4 l2

x2 convswl q1, s1
x2 convswl q2, s2
x2 mulll q1, q1, q2
select0ql l1, q1
select1ql l2, q1
addl d1, l1, l2
```

ORC… direct translation

```
.function test_orc_muladd
.dest 4 d1 guint32
.source 4 s1 guint16
.source 4 s2 guint16
.temp 8 q1
.temp 8 q2
.temp 4 l1
.temp 4 l2

x2 convswl q1, s1
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x2 mulll q1, q1, q2
select0ql l1, q1
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addl d1, l1, l2
```
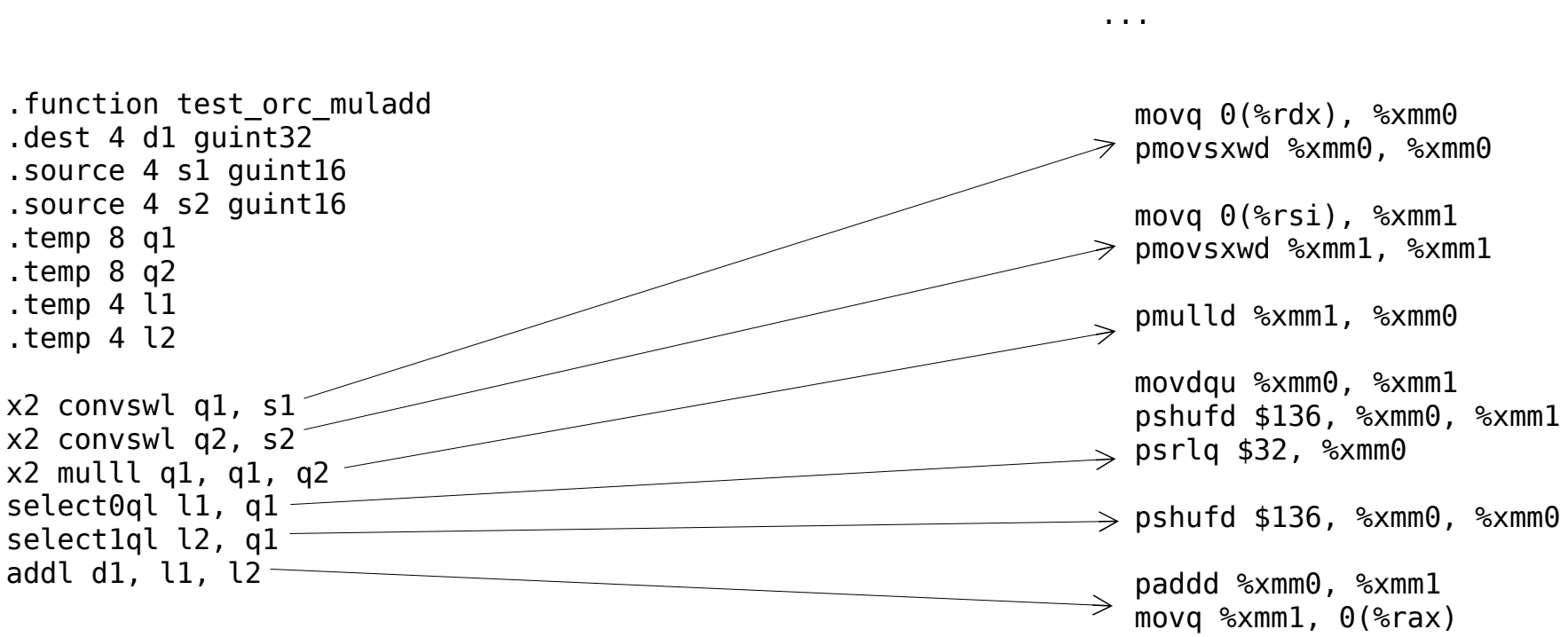



```
...

movq 0(%rdx), %xmm0
pmovsxwd %xmm0, %xmm0

movq 0(%rsi), %xmm1
pmovsxwd %xmm1, %xmm1

pmulld %xmm1, %xmm0

movdqu %xmm0, %xmm1
pshufd $136, %xmm0, %xmm1
psrlq $32, %xmm0

pshufd $136, %xmm0, %xmm0

paddd %xmm0, %xmm1
movq %xmm1, 0(%rax)
```

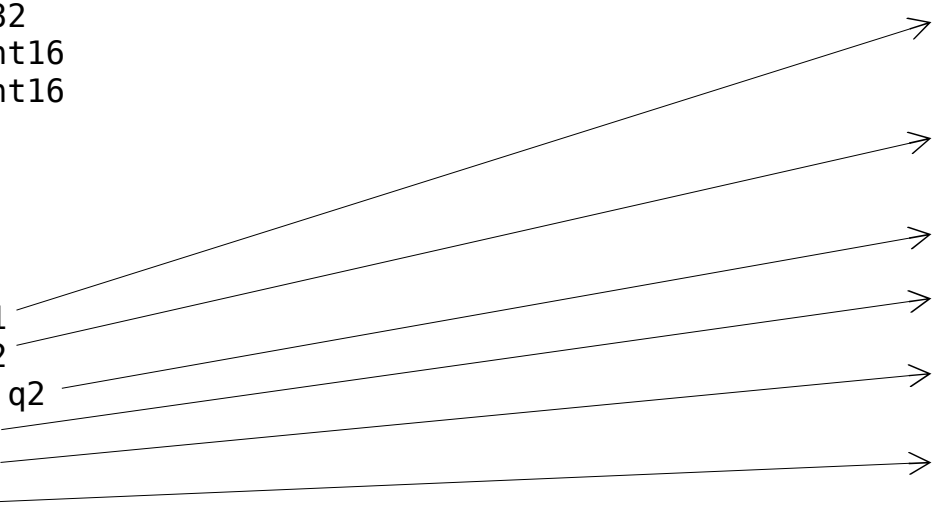
ORC… or better..

```
.function test_orc_muladd
.dest 4 d1 guint32
.source 4 s1 guint16
.source 4 s2 guint16
.temp 8 q1
.temp 8 q2
.temp 4 l1
.temp 4 l2

x2 convswl q1, s1
x2 convswl q2, s2
x2 mulll q1, q1, q2
select0ql l1, q1
select1ql l2, q1
addl d1, l1, l2
```

```
...

movq 0(%rdx), %xmm0
movq 0(%rsi), %xmm1
pmaddwd %xmm1, %xmm0
movq %xmm0, 0(%rax)
```

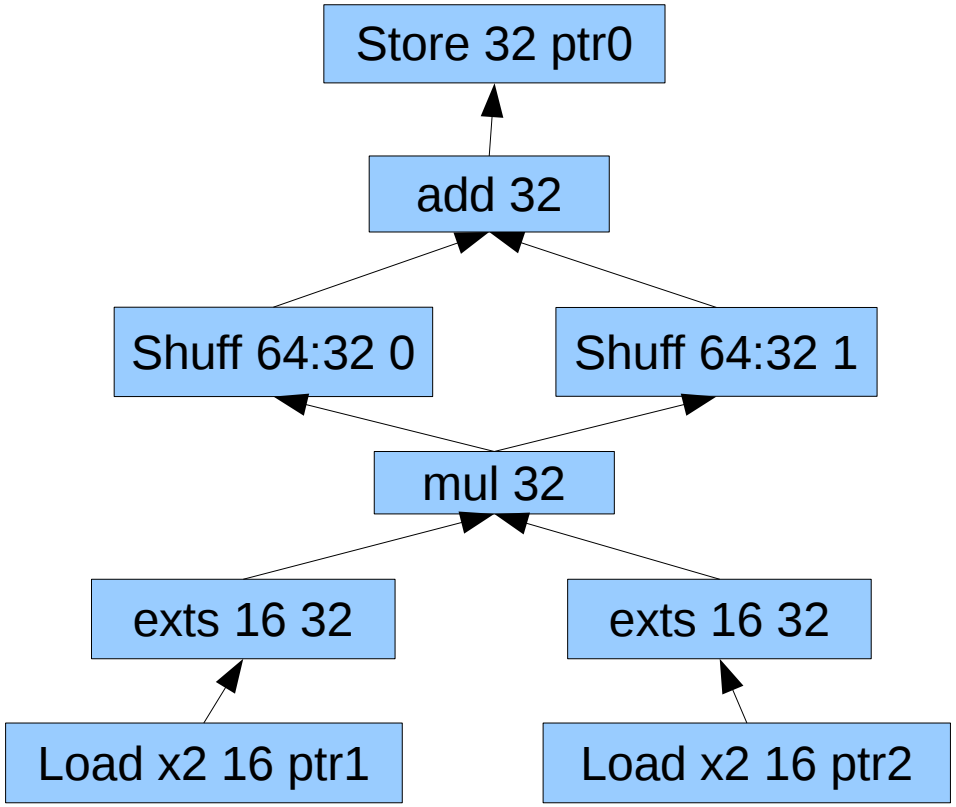
ORC... IR

```
.function test_orc_muladd
.dest 4 d1 guint32
.source 4 s1 guint16
.source 4 s2 guint16
.temp 8 q1
.temp 8 q2
.temp 4 l1
.temp 4 l2

x2 convswl q1, s1
x2 convswl q2, s2
x2 mulll q1, q1, q2
select0ql l1, q1
select1ql l2, q1
addl d1, l1, l2
```

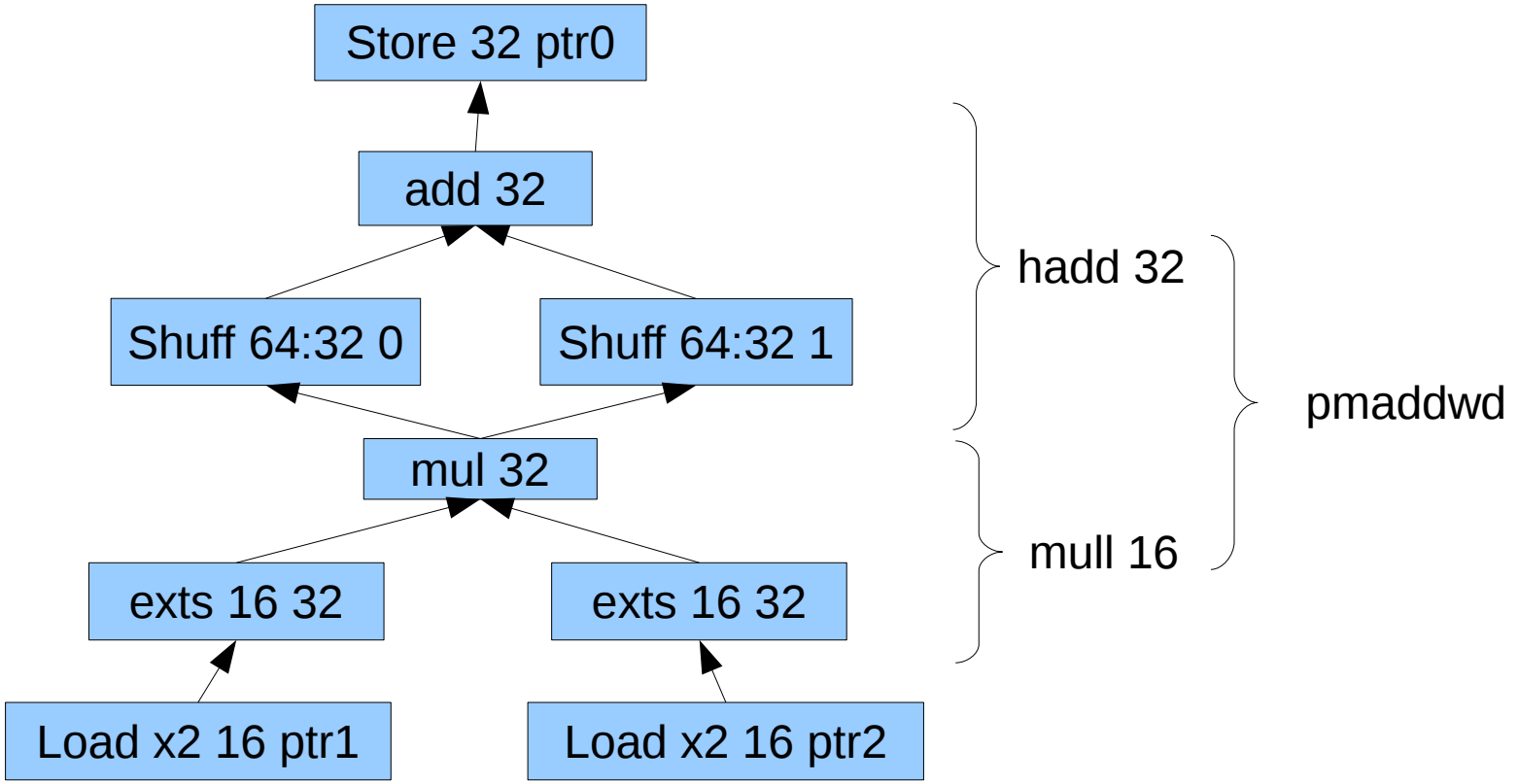


```
...

t0 = load x2 16 ptr1
t1 = exts 16 t0 32          # x2

t2 = load x2 16 ptr2
t3 = exts 16 t2 32          # x2

t4 = mul 32 t1 t3           # x2

t5 = shuff 64:32 t4 t4 c0   # x1

t6 = shuff 64:32 t4 t4 c1   # x1

t7 = add 32 t5 t6           # x1
store 32 t7 ptr0            # x1
```

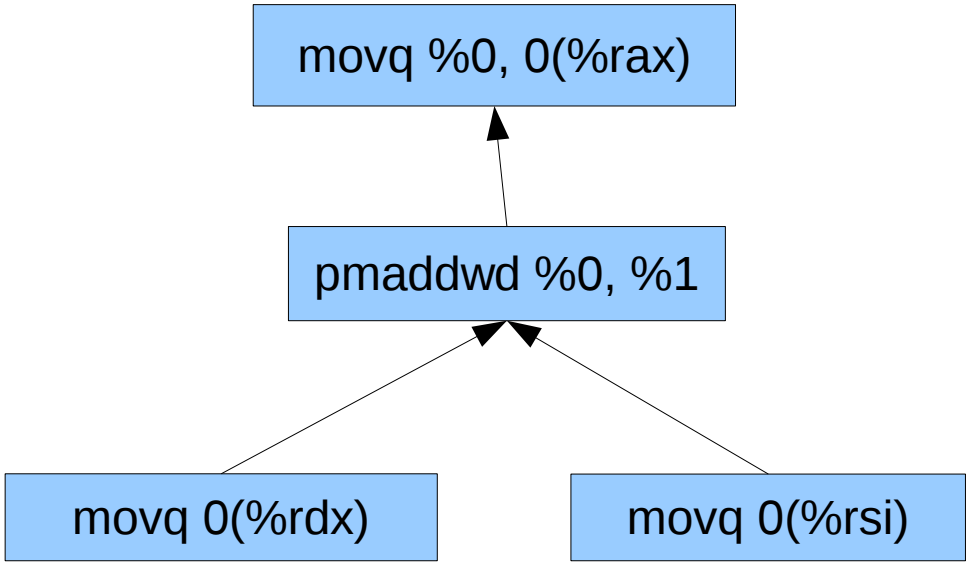
ORC… IR as tree



ORC… instruction selection



ORC… machine instruction tree



ORC… status

- Nice experiment
  - C backend compiles backup code 30% faster
  - x86 prototype backend generates much better code
- It's a lot of work
- Really would like to reuse (and improve) something existing...
  - LLVM
  - Libgccjit


http://cgit.freedesktop.org/~wtay/orc/log/?h=orc-0.5