

Integer Vector Optimizations and "Usual Arithmetic Conversions"

Stephen Rogers

Martin O'Riordan

Usual Arithmetic Conversions (UACs)

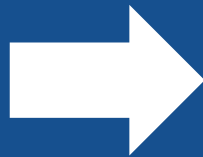
```
char a, b, c;  
// ...  
c = a + b;  
// ...
```



```
%0 = load i8, i8* @a, align 1  
%conv0 = sext i8 %0 to i32  
%1 = load i8, i8* @b, align 1  
%conv1 = sext i8 %1 to i32  
%add = add nsw i32 %conv0, %conv1  
%conv2 = trunc i32 %add to i8  
store i8 %conv2, i8* @c, align 1
```

UAC Optimization

```
%0 = load i8, i8* @a, align 1
%conv0 = sext i8 %0 to i32
%1 = load i8, i8* @b, align 1
%conv1 = sext i8 %1 to i32
%add = add nsw i32 %conv0, %conv1
%conv2 = trunc i32 %add to i8
store i8 %conv2, i8* @c, align 1
```



```
%0 = load i8, i8* @a, align 1
%1 = load i8, i8* @b, align 1
%2 = add i8 %1, %0
store i8 %2, i8* @c, align 1
```

Performance Impact

- 2 tests are more than 2X slower
- 7 are more than 10% slower
- 35 are more than 5% slower
- 52 are more than 5% faster
- 82 are more than 10% faster
- 22 are more than 2X faster
- 17 are more than 5X faster
- 2 are more than 10X faster
- 1 is more than 20X faster
- 2 are more than 30X faster