

Limiting the bottom byte of an XMM register and clearing the other bytes

devblogs.microsoft.com/oldnewthing/20150112-00

January 12, 2015



Raymond Chen

Suppose you have a value in an XMM register and you want to limit the bottom byte to a particular value *and* set all the other bytes to zero. (Yes, I needed to do this.)

One way to do this is to apply the two steps in sequence:

```
; value to truncate/limit is in xmm0

; First, zero out the top 15 bytes
    pslldq  xmm0, 15
    psrldq  xmm0, 15

; Now limit the bottom byte to N
    mov     al, N
    movd   xmm1, eax
    pminub xmm0, xmm1
```

But you can do it all in one step by realizing that $\min(x, 0) = 0$ for all unsigned values x .

```
; value to truncate/limit is in xmm0
    mov     eax, N
    movd   xmm1, eax
    pminub xmm0, xmm1
```

In pictures:

xmm0	xmm1	xmm0
?	min 0	= 0
?	min 0	= 0
?	min 0	= 0
?	min 0	= 0

?	min	0	=	0
?	min	0	=	0
?	min	0	=	0
?	min	0	=	0
?	min	0	=	0
?	min	0	=	0
?	min	0	=	0
?	min	0	=	0
?	min	0	=	0
?	min	0	=	0
?	min	0	=	0
x	min	N	=	min(x, N)

In intrinsics:

```
__m128i min_low_byte_and_set_upper_bytes_to_zero(__m128i x, uint8_t N)
{
    return _mm_min_epi8(x, _mm_cvtsi32_si128(N));
}
```

Raymond Chen

Follow

