Meltdown and Spectre Samples

Written in Assembly

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Contents

1 Introduction

1.1 Overview

TBD

1.2 Nasm

TBD

5 ⟨*preamble* 5⟩≡ (9a)

```
bits 64
      global _start
```

2 Cache Access Timing

3 Detect Cache Access Time

TBD

9a ⟨*cachetiming.asm* 9a⟩≡

```
⟨preamble 5⟩

⟨cachetiming-data 9b⟩

section .text
_start:
⟨quit 15b⟩

⟨utilities 15a⟩
```

TBD

9b ⟨*cachetiming-data* 9b⟩≡ (9a)

```
section .bss
     measures: resq 2048
     padding:  resb 4096
     align 4096
     data:     times 257 resb 4096
```

4 Read Array via Cache Access Time

TBD

5 Signals

5.1 Detecting Signals

TBD

5.2 Handling Signals

TBD

6 Utilities

6.1 Introduction

TBD

15a ⟨*utilities* 15a⟩≡ (9a)
⟨*print* 15c⟩

6.2 Quit Program

TBD

15b ⟨*quit* 15b⟩≡ (9a)
```
        xor         RDI,RDI
        mov         RAX,60
        syscall
```
Uses RAX and RDI.

6.3 Printing Text

The routine _print prints a null-terminated string to the terminal (stdout). The only argument passed in to the routine (in RDI) is the address of the string to print.

So first we start with clearing AL (setting it to null) and saving the address of the string to RSI. We're using RSI because we later need the address to calculate the length of the string and also RSI is the register that we need to use for the string address in the systemcall.

15c ⟨*print* 15c⟩≡ (15a) 16a▷
```
  _print:
        xor         AL,AL
        mov         RSI,RDI
```
Uses AL, RDI, and RSI.

Next we search for the terminating `null` ('\0') character. For this we use the instruction `scasb` (scan string byte) which compares the byte at the pointer `[RDI]` with the value in `AL` and sets the flags accordingly. When the byte at `[RDI]` is the value of `AL` the the next instruction (`je`) jumps to the given target (`.found0` in this case). Else the next instruction will be executed (jumping back to the start of this fragment).

`scasb` additionally increments `RDI` so that we go through the string until `\0` is found.

16a ⟨*print* 15c⟩+≡ (15a) ◁15c 16b▷

```
.next_char:
    scasb
    je      .found0
    jmp     .next_char
.found0:
```

After we have found the string termination we calculate the number of bytes that the string has. For this we copy the value of the last byte read (which is in `RDI`) to `RDX` and subtract the start of the string (which we saved to `RSI`).

Now we have the address of the string in `RSI` and the length of the string in `RDX` which are the 2nd and 3rd argument in a systemcall. The 1st argument (in `RDI`) to the systemcall is the file descriptor (`1` is stdout). Additionally the number of the systemcall (`1`) is passed in `RAX`. The systemcall (`syscall`) now prints `RDX` bytes from `RSI` to the file descriptor `RDI`.

16b ⟨*print* 15c⟩+≡ (15a) ◁16a 16c▷

```
    mov     RDX,RDI
    sub     RDX,RSI
    mov     RAX,1
    mov     RDI,1
    syscall
```

Uses `RAX`, `RDI`, `RDX`, and `RSI`.

Now that we are done and can return to the caller.

16c ⟨*print* 15c⟩+≡ (15a) ◁16b

```
    ret
```

6.4 Printing Numbers

TBD