#include <stdio.h>

**int** **main**(**int** argc, **char** \*\*argv)

{

**char** buf[8]; *// buffer for eight characters*

printf("Enter name: ");

gets(buf); *// read from stdio (sensitive function!)*

printf("%s\n", buf); *// print out data stored in buf*

**return** 0; *// 0 as return value*

}

Run the code a second time (from the command window this can be achieved by entering ./bufoverflow on the command line). This time, enter a string of 10 or more characters.

**What happens?**

The console printed an error saying:

\*\*\* stack smashing detected \*\*\*: <unknown> terminated

**What does the output message mean?**

The GCC compiler adds protection variables called canaries (Stack Canaries 2022). Canary variables have a known value stored in them. When a string (in this case, the user input) causes a buffer overflow (Styger, Stack canaries with GCC: Checking for stack overflow at runtime 2019), it corrupts the canary variable value, which would result in a SIGABRT (Signal Abort) error and terminates the application. (Program error signals 2022 geeksforgeeks)

Canary variables are designed to protect against stack/buffer overflow. In the GCC compiler, a programmer may disable this protection; however, if they do and they attempt to access memory outside the array, it would result in a segmentation fault error. A segmentation fault is caused when a programmer attempts to access an illegal memory location. (Indiana University 2021)

References:

G. Lettieri (2022) Stack Canaries. Available at: <https://lettieri.iet.unipi.it/hacking/canaries.pdf>.

Styger, E. (2019) *Stack canaries with GCC: Checking for stack overflow at runtime*, *MCU on Eclipse*. Available at: https://mcuoneclipse.com/2019/09/28/stack-canaries-with-gcc-checking-for-stack-overflow-at-runtime/ (Accessed: November 16, 2022).

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*Indiana University* (2021) *Indiana University Knowledge Base*. Available at: https://kb.iu.edu/d/aqsj (Accessed: November 16, 2022).