**Scenario - Division by Zero Crash Investigation in C**

**Scenario / Summary**  
Investigated and fixed a division by zero crash in C. The program attempted to divide array elements by a variable set to zero. GDB was used to locate the faulting line, and defensive programming techniques were applied to prevent runtime crashes.

**Problem Description**  
The program iterated through an array of integers and divided each element by a divisor that was mistakenly initialized to zero. Division by zero causes a runtime crash or undefined behavior, which is critical to catch before production deployment.

**Tools & Languages**

* Language: C
* Debugging Tools: GDB

**Initial (Buggy) Code**

#include <stdio.h>

int main() {

int numbers[5] = {10, 20, 30, 40, 50};

int divisor = 0; // oops, dividing by zero!

for (int i = 0; i < 5; i++) {

int result = numbers[i] / divisor; // crash happens here

printf("numbers[%d] / %d = %d\n", i, divisor, result);

}

return 0;

}

**Issue Detected**

* Program crashed immediately upon execution due to division by zero.
* GDB pinpointed the fault at the division statement.
* The divisor variable was not validated before use.

**Fixed Code**

#include <stdio.h>

int main() {

int numbers[5] = {10, 20, 30, 40, 50};

int divisor = 2; // fixed: non-zero divisor

if (divisor == 0) {

printf("Error: Cannot divide by zero.\n");

return 1; // exit early

}

for (int i = 0; i < 5; i++) {

int result = numbers[i] / divisor;

printf("numbers[%d] / %d = %d\n", i, divisor, result);

}

return 0;

}

**Outcome / Validation**

* Program now executes safely:

numbers[0] / 2 = 5

numbers[1] / 2 = 10

numbers[2] / 2 = 15

numbers[3] / 2 = 20

numbers[4] / 2 = 25

* No runtime crash occurs, and input validation prevents divide-by-zero errors.

**Lessons Learned**

* Always validate input or variables used in division.
* Division by zero is a critical runtime error in C.
* GDB is invaluable for locating the exact line causing crashes.
* Defensive programming prevents simple but severe runtime bugs.