



BULLETPROOF CODE: STRING → NUMBER CONVERSIONS

Part I



DATA INPUT ERROR: TYPE MISMATCH

- ANSI requires that correct programs always behave the same on all systems
- Incorrect programs have no guarantee
- If the user enters data whose type does not match the input type
 - Input will not be interpreted correctly
 - Program will often fail – perhaps crash
 - Program results may be inconsistent



SIMPLE PROGRAM

```
int main()
{
    int input;
    cout << "Please enter an integer: ";
    cin >> input;

    cout << input;

    return 0;
}
```



ENTERING A STRING WHERE AN int IS EXPECTED

```
D:\>bulletproof
```

```
Please enter an integer: hello
```

```
4194048
```

```
D:\>
```

```
D:\>bulletproof
```

```
Please enter an integer: hello
```

```
2096640
```

```
D:\>
```



BULLETPROOF CODE

- Does NOT crash
- Catches the input error
- Displays a diagnostic
- Gracefully terminates the program or allows the user to reenter the data



ALL DATA MAY BE REPRESENTED AS A STRING

- Bulletproof code reads all input as a string
- Verifies the input data has the correct format
 - Regular expression (RE) – beyond the scope of this course
 - Character-by-character tests (can be difficult)
- Verified data is converted from a string to the expected type



DATA INPUT AND CONVERSION: C++ STRING CLASS

```
int main()
{
    string    input;
    cout << "Please enter an integer: ";
    getline(cin, input);

    for (size_t i = 0; i < input.length(); i++)
        if (! isdigit(input[i]))
        {
            cerr << "Invalid integer: " << input << endl;
            exit(1);
        }
    cout << stoi(input) << endl;
    return 0;
}
```



DATA INPUT AND CONVERSION: C-STRINGS

```
int main()
{
    char    input[100];
    cout << "Please enter an integer: ";
    cin.getline(input, 100);

    for (size_t i = 0; i < strlen(input); i++)
        if (! isdigit(input[i]))
        {
            cerr << "Invalid integer: " << input << endl;
            exit(1);
        }
    cout << atoi(input) << endl;
    return 0;
}
```




PROGRAM BEHAVIOR

CORRECT INPUT

```
D:\>bulletproof  
Please enter an integer: 123  
123
```

INCORRECT INPUT

```
D:\>bulletproof  
Please enter an integer: hello  
Invalid integer: hello
```