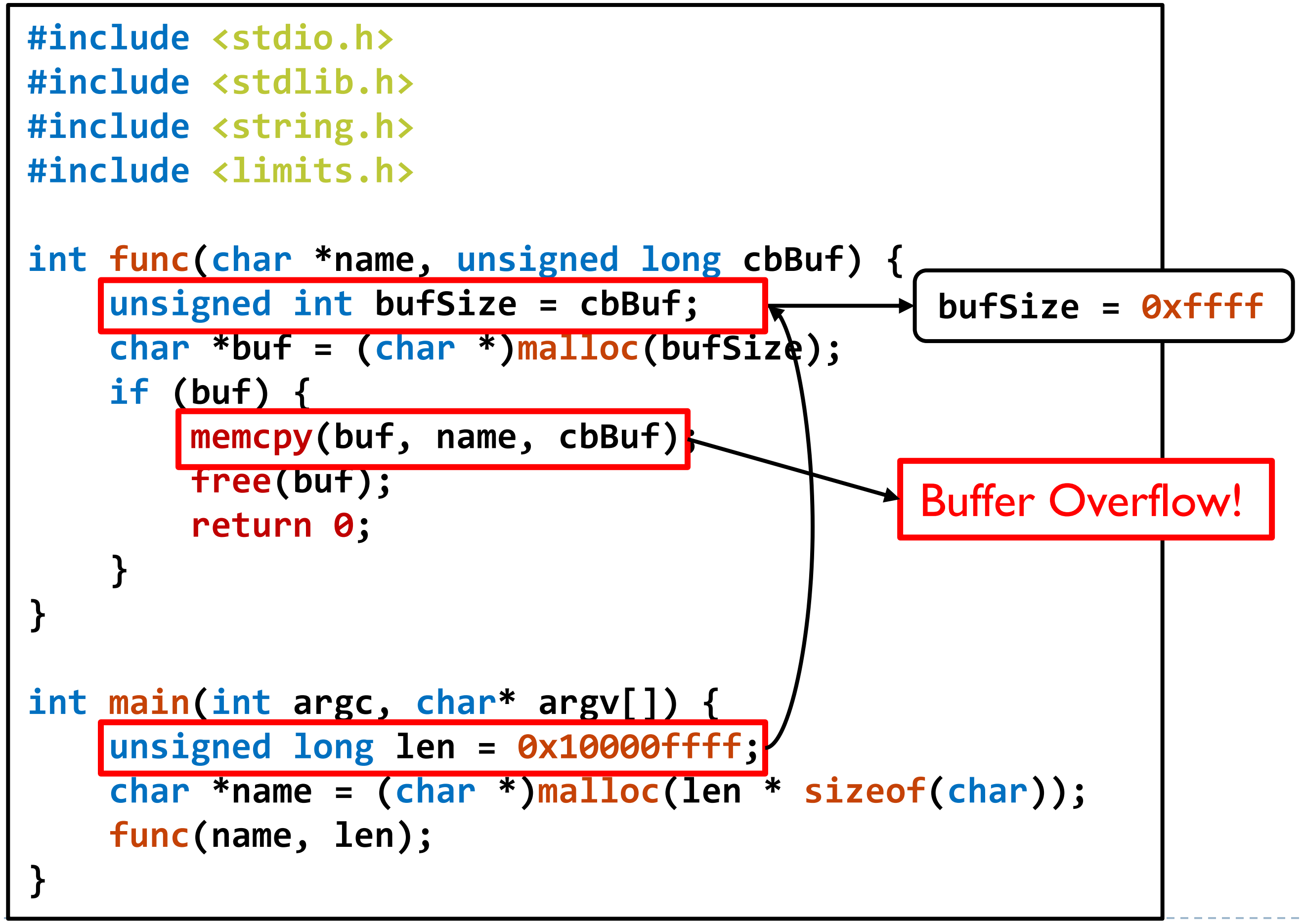
Example 2: Truncation Errors

Incorrect type conversion could lead to integer overflows, and then buffer overflow.



```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <limits.h>

int func(char *name, unsigned long cbBuf) {
    unsigned int bufSize = cbBuf;
    char *buf = (char *)malloc(bufSize);
    if (buf) {
        memcpy(buf, name, cbBuf);
        free(buf);
        return 0;
    }
}

int main(int argc, char* argv[]) {
    unsigned long len = 0x10000ffff;
    char *name = (char *)malloc(len * sizeof(char));
    func(name, len);
}
```

How to Fix Integer Overflow Vulnerability

Be more careful about all the possible consequences of vulnerable operations.

Better length checking

```
if (len1 + len2 + 1 <= sizeof(buf))
```

```
if (len1 <= sizeof(buf) &&
    len2 <= sizeof(buf) &&
    (len1 + len2 + 1 <= sizeof(buf)))
```

Safe type conversion:

- Widening conversion: convert from a type of smaller size to that of larger size.

Outline

- Format String Vulnerabilities
- Integer Overflow Vulnerabilities
- **Scripting Vulnerabilities**

Scripting Vulnerabilities

Scripting languages

- Construct commands (scripts) from predefined code fragments and user input at runtime
- Script is then passed to another software component where it is executed.
- It is viewed as a domain-specific language for a particular environment.
- It is referred to as very high-level programming languages
- Example:
  - Bash, PowerShell, Perl, PHP, Python, Tcl, Safe-Tcl, JavaScript

Vulnerabilities

- An attacker can hide additional commands in the user input.
- The system will execute the malicious command without any awareness

Example 1: Command Injection

Consider a server running the following command

- `system`: takes a string as input, spawns shell, and executes the string as command in the shell.

```
void display_file(char* filename) {
  char cmd[512];
  snprintf(cmd, sizeof(cmd), “cat %s”, filename);
  system(cmd);
}
```

Normal case:

- A client sets `filename`=hello.txt

```
cat hello.txt
```

Compromised Input:

- The attacker sets `filename` = hello.txt; rm –rf /
- The command becomes:

```
cat hello.txt; rm -rf /
```

- After displaying file, all files the script has permission to delete are deleted!