

Engineering Code Obfuscation

ISSISP 2017 - Tamperproofing

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What

is

Tamperproofing?

Bob wants to modify the program binary so that it does something different than we want:

- remove functionality (license check)
- change data (password, cryptographic key)
- add functionality (print, save game)

Tamperproofing the code makes it stop working if Bob changes as little as a byte of the binary!

Tamperproofing has to do two things:

1. detect tampering
2. respond to tampering

Essentially:

```
if (tampering-detected())  
    respond-to-tampering()
```

but this is too unstealthy!

```
int foo() {  
    ... ..  
}
```

Detect
tampering

```
int main () {
```

```
if (foo-has-changed-in-any-way())
```

- ◆ *crash the program*
- ◆ *phone home*
- ◆ *refuse to run*
- ◆ *run slower*
- ◆ *make wrong results*

Respond
to tampering

```
foo();
```

```
}
```

```
int hash (addr_t addr,int words) {
    int h = *addr;
    for(int i=1; i<words; i++) {
        addr++;
        h ^= *addr;
    }
    return h;
}
```

```
int foo() {
    ... ..
}
```

Detect tampering

```
int main () {
```

```
    if (hash(foo,1000) != 0x4C49F346)
```

- ◆ *crash the program*
- ◆ *phone home*
- ◆ *refuse to run*
- ◆ *run slower*
- ◆ *make wrong results*

```
    foo();
```

```
}
```

Respond to tampering

```
int foo () {  
    if (today > "Aug 17,2016") {  
        printf("License expired!");  
        abort;  
    }  
}
```

```
check(){  
    if (hash(foo) != 42)  
        abort()  
}
```



```
int foo() {  
    ... ..  
}
```



```
int foo_copy() {  
    ... ..  
}
```

Checker 1

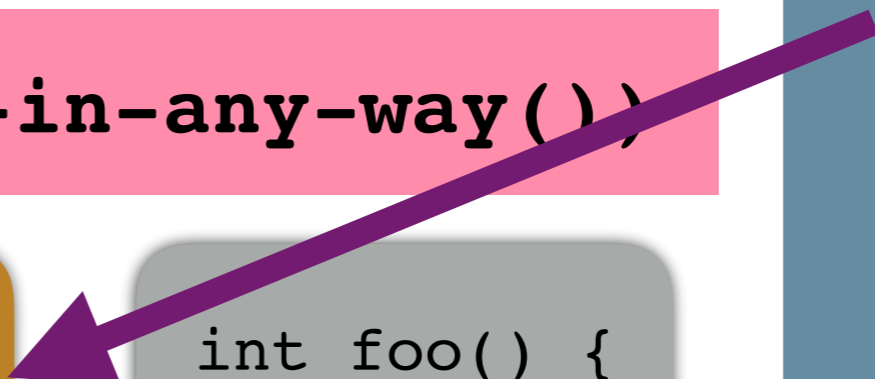
```
if (foo-has-changed-in-any-way())
```

copy

```
int foo_copy() {  
    ... ..  
}
```

```
int foo() {  
    ... ..  
}
```

Repair foo!!!



Repair
Checker 1!



Checker 2

```
if (foo-checker1-changed())
```

copy

Checker1_copy

Checker1

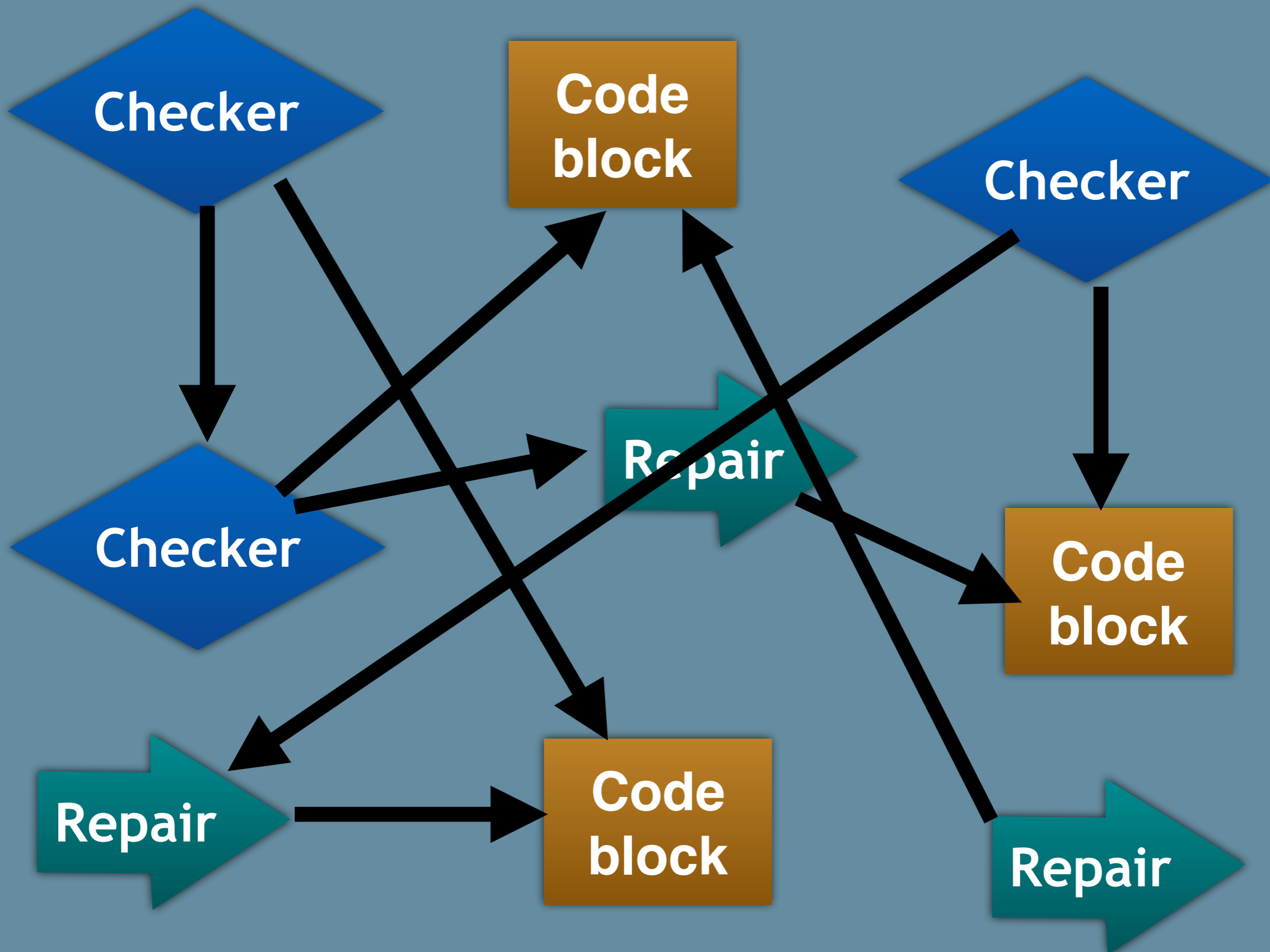
Checker 1

```
if (foo-has-changed-in-any-way())
```

copy

```
int foo_copy() {  
    ... ..  
}
```

```
int foo() {  
    ... ..  
}
```



```
uint32 Skypes_hash_function () {  
    addr_t addr =(addr_t)((uint32)addr ^ (uint32)addr);  
    addr = (addr_t)((uint32) addr + 0 x688E5C);  
    uint32 hash = 0x320E83 ^ 0x1C4C4 ;  
    int bound = hash + 0 xFFCC5AFD ;
```

```
do {  
    uint32 data =*((addr_t)((uint32)addr + 0x10));  
    goto b1; asm volatile (". byte 0x19"); b1:  
    hash = hash ⊕ data ; addr -= 1; bound --;  
} while (bound !=0);
```

```
goto b2;  
    asm volatile (".byte 0x73");  
b2:  
goto b3;  
    asm volatile (".word 0xC8528417,...");  
b3:  
hash -= 0x4C49F346; return hash;
```

```
}
```

Questions?

