ISP RAS

Improving Hybrid Fuzzing Using Debug Information

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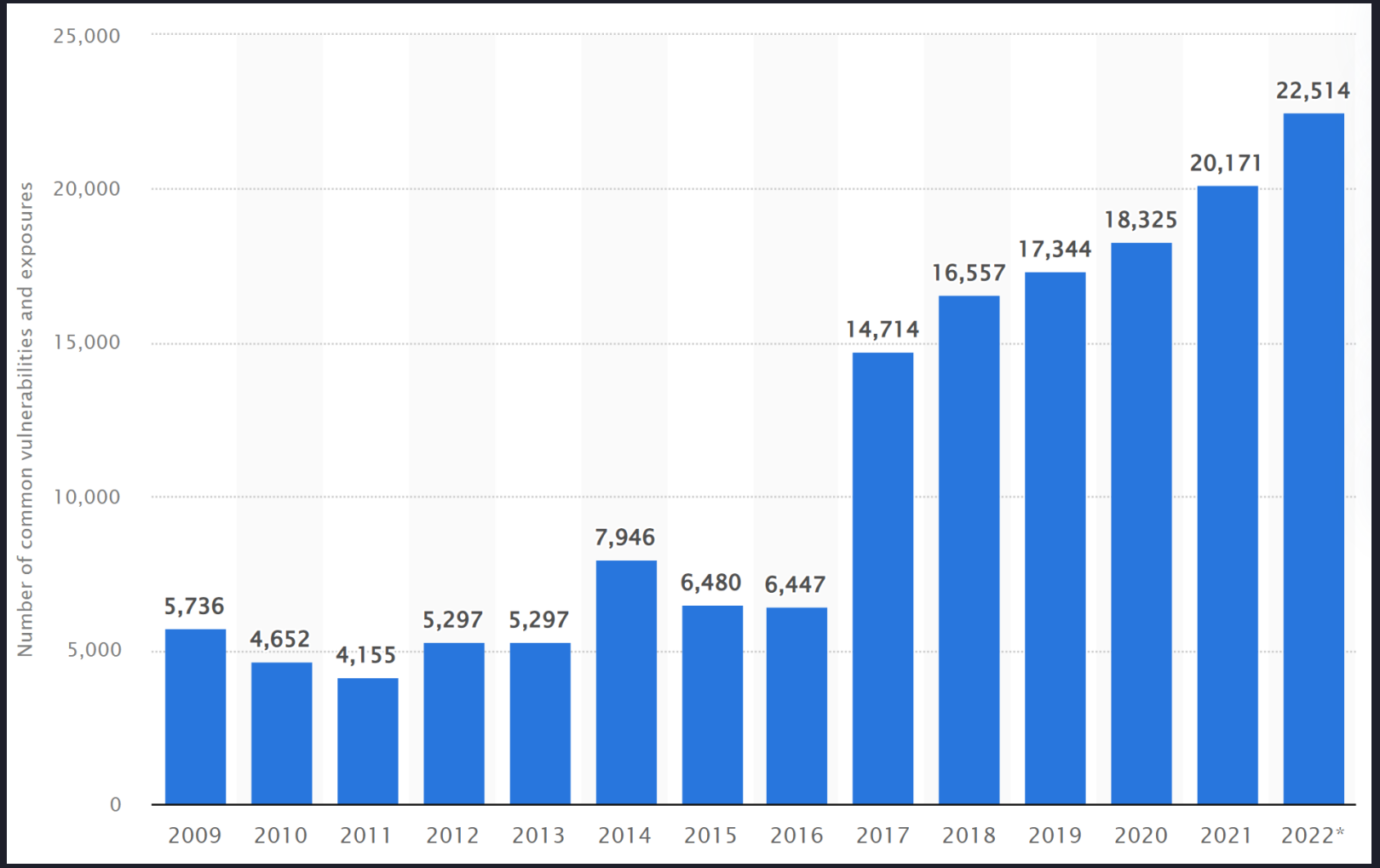
Plan

1. Software Vulnerabilities
2. Dynamic Analysis – Hybrid Fuzzing
3. The Problem – Symbolic Execution Limitations
4. Proposed solution
5. Results
6. Conclusion

Software Vulnerabilities



Software Vulnerabilities

Hybrid Fuzzing

```
void vuln(int key) {
    if (key * 0x142a2d == 0xdeadbeef) {
        error();
    }
}
```

Hybrid Fuzzing

```
void vuln(int SYM_VAR) {
    if (SYM_VAR * 0x142a2d == 0xdeadbeef) {
        error();
    }
}
```

```
SYM_VAR = 0xdeadbeef / 0x142a2d
```

```
SYM_VAR = 0xb0b
```

Hybrid Fuzzing

```
vuln(0xb0b)
```

The Problem

```
1. uint16_t crc_ibm_table[256] = {
2.     0x0000, 0xc0c1, 0xc181, 0x0140, ...
3. };
4.
5. uint16_t crc_ibm_byte(uint16_t crc, const uint8_t c)
6. {
7.     uint8_t sym_idx = (crc ^ c) & 0xFF;
8.     return crc_ibm_table[sym_idx] ^ (crc >> 8);
9. }
10.
11. if (crc_ibm_byte(0, buf[0]) == 0x1337) {
12.     error();
13. }
```

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The Problem. Existing Methods.

- A Survey of Symbolic Execution Techniques
- Sydr
- Mayhem
- …

Proposed Solution

Let’s use debug information!

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```

Proposed Solution

```
crc_ibm_table[sym_idx];
```

```
Solve(sym_idx > len(crc_ibm_table)?)
```

Results

1. The method has already been implemented as a part of the Sydr tool, and a number of preliminary experiments are in progress
2. The proposed method makes it possible to find new classes of errors (local/global out-of-bounds accesses)

Thanks for listening

Questions?

References

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