# Stack-use-after-scope detector in AddressSanitizer

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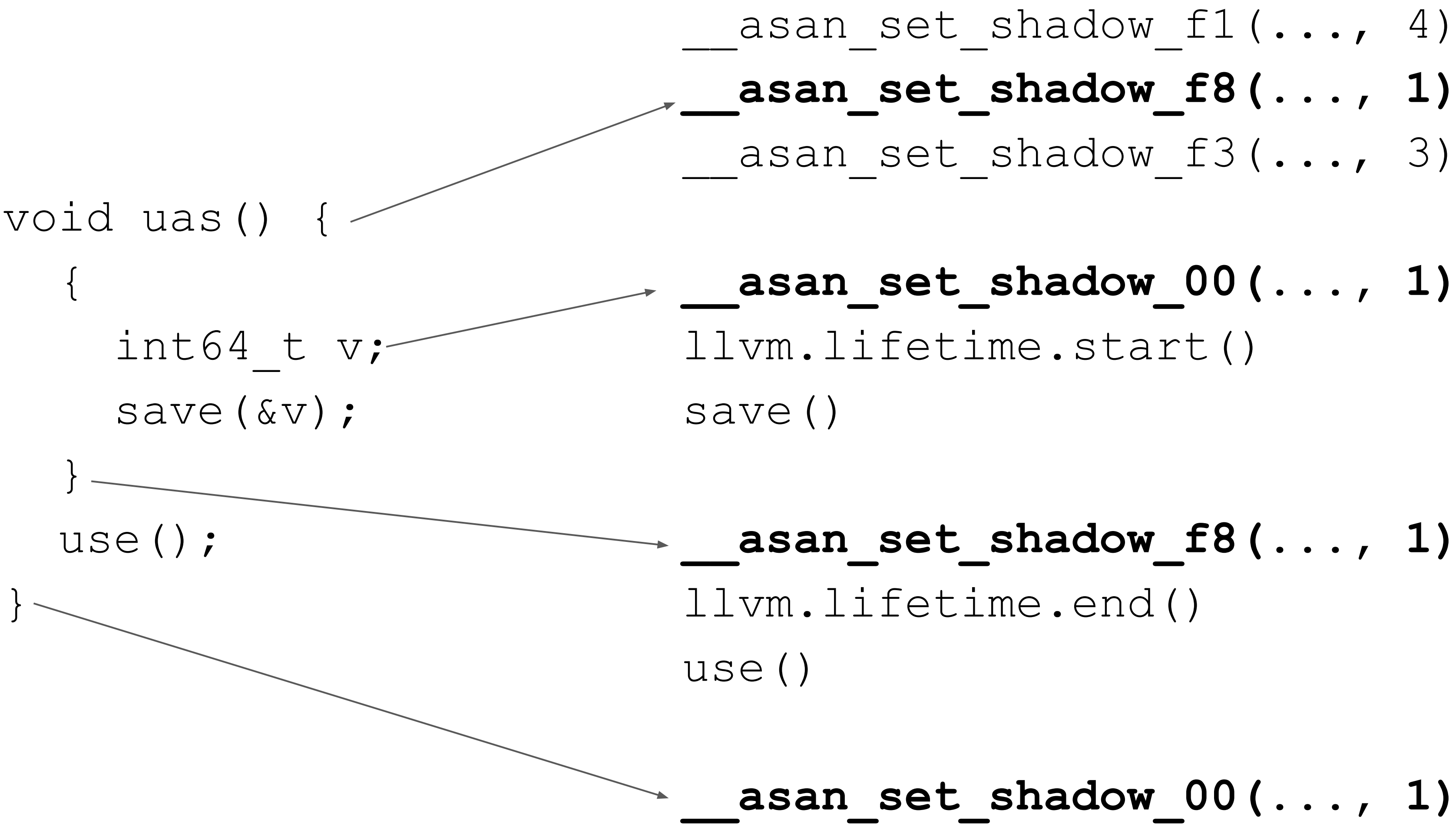
# Trivial example

```
void save(int64_t* p);
void use();

void uas() {
  {
    int64_t v;
    save(&v);
  }
  use();
}
```

# Instrumentation



```
void uas() {
  {
    int64_t v;
    save(&v);
  }
  use();
}
```

```
__asan_set_shadow_f1(..., 4)
__asan_set_shadow_f8(..., 1)
__asan_set_shadow_f3(..., 3)

__asan_set_shadow_00(..., 1)
llvm.lifetime.start()
save()

__asan_set_shadow_f8(..., 1)
llvm.lifetime.end()
use()

__asan_set_shadow_00(..., 1)
```

# Usage

```
clang++ -g -fsanitize=address \
-fsanitize-address-use-after-scope t.cpp -o test
./test
==ERROR: AddressSanitizer:stack-use-after-scope on...
WRITE of size 8 at 0x7ffc02d05b00 thread T0
    #0 0x515e40 in use() /tmp/test.cpp:8:17
...
Address 0x7ffc02d05b00 is located in stack of thread
T0 at offset 32 in frame
    #0 0x515e6f in use_after_scope() /tmp/test.cpp:10
  This frame has 1 object(s):
    [32, 40) 'v:12' <== ... inside this variable
```

# Destructors

```
struct A {
  void Init(const int* v) { p = v; }
  ~A() { std::cout << *p; }
  const int* p;
};

// 50% of all bugs
void uas_in_destructor() {
  A a;
  int v = 5;
  a.Init(&v);
}
```

# Temporaries

```
struct A {
  A(const int& v) {
    p = &v;
  }
  void print() {
    std::cout << *p;
  }
  const int* p;
};
```

```
// 20% of all bugs
void explicit_temp() {
  A a(5);
  a.print();
}

// 5% of bugs
void temp_from_conversion() {
  double v = 5;
  A a(v);
  a.print();
}
```

# Temporary lifetime extension

```
const int& fn(const int& arg) {
  return arg;
}

// 5% of bugs
void extend() {
  const int& v = fn(5);
  std::cout << v;
}
```

# Simple one

```
// 15% of all bugs
void out(bool c) {
  int* p;
  if (c) {
    int v = 3;
    p = &v;
  }
  std::cout << *p;
}
```