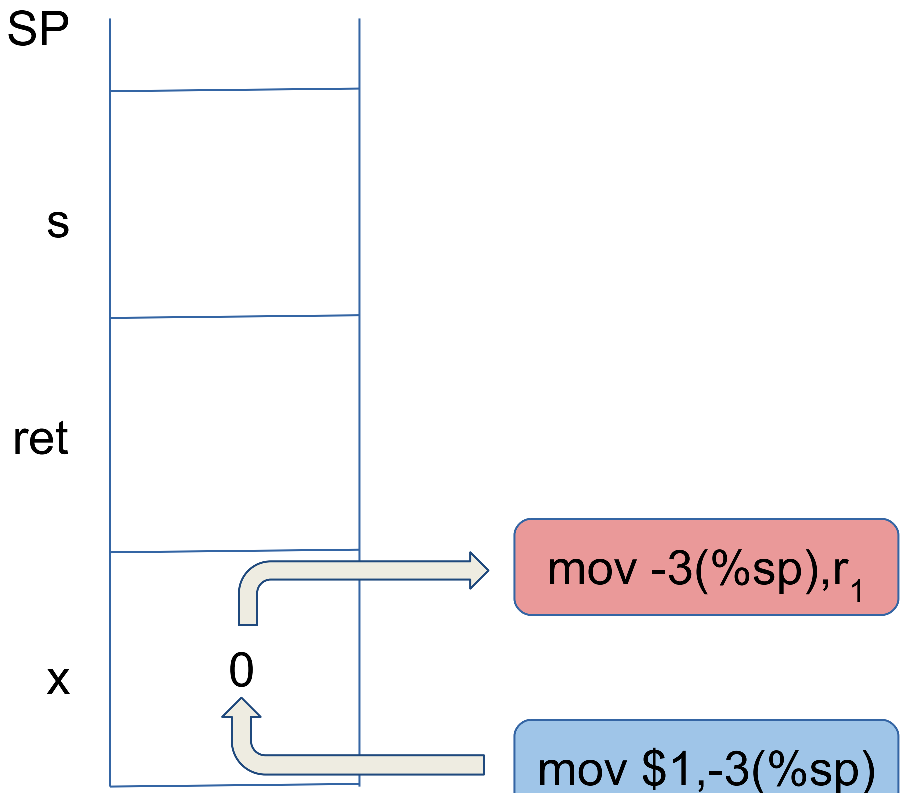
Security Properties for Stack Safety

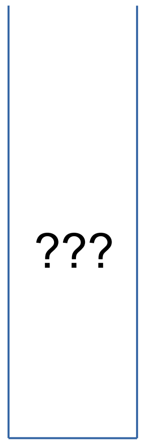
We know stack un-safety when we see it

```
g() {
    int s;
    s = *(&s-2);
    *(&s-2) = 1;
}
f() {
    int x = 0;
    g();
    assert(x==0);
}
```

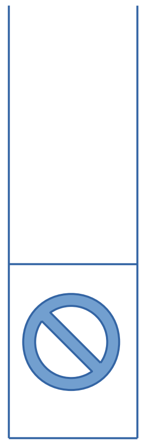


Lets define it as a security property

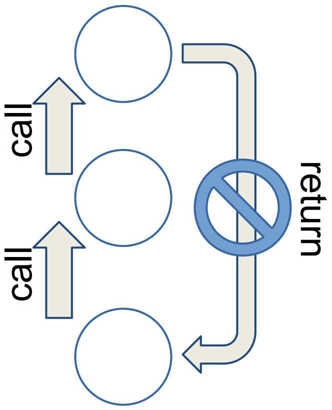
Confidentiality



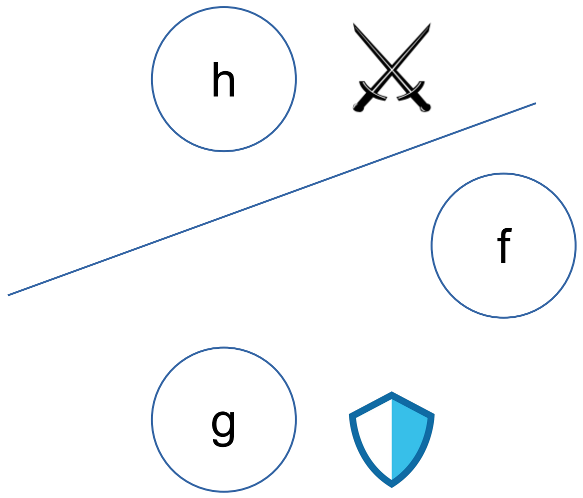
Integrity

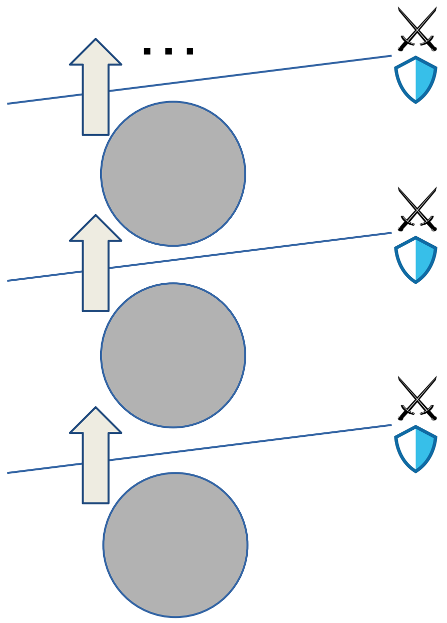


Well-bracketedness



Every Caller Deserves Stack Safety





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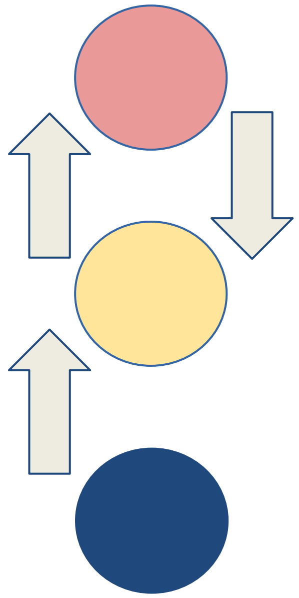
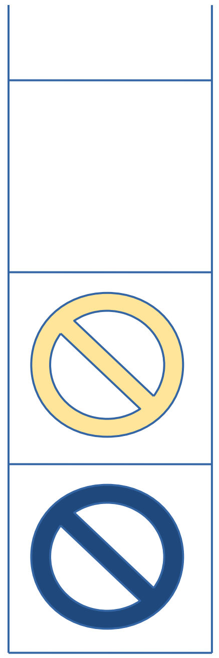
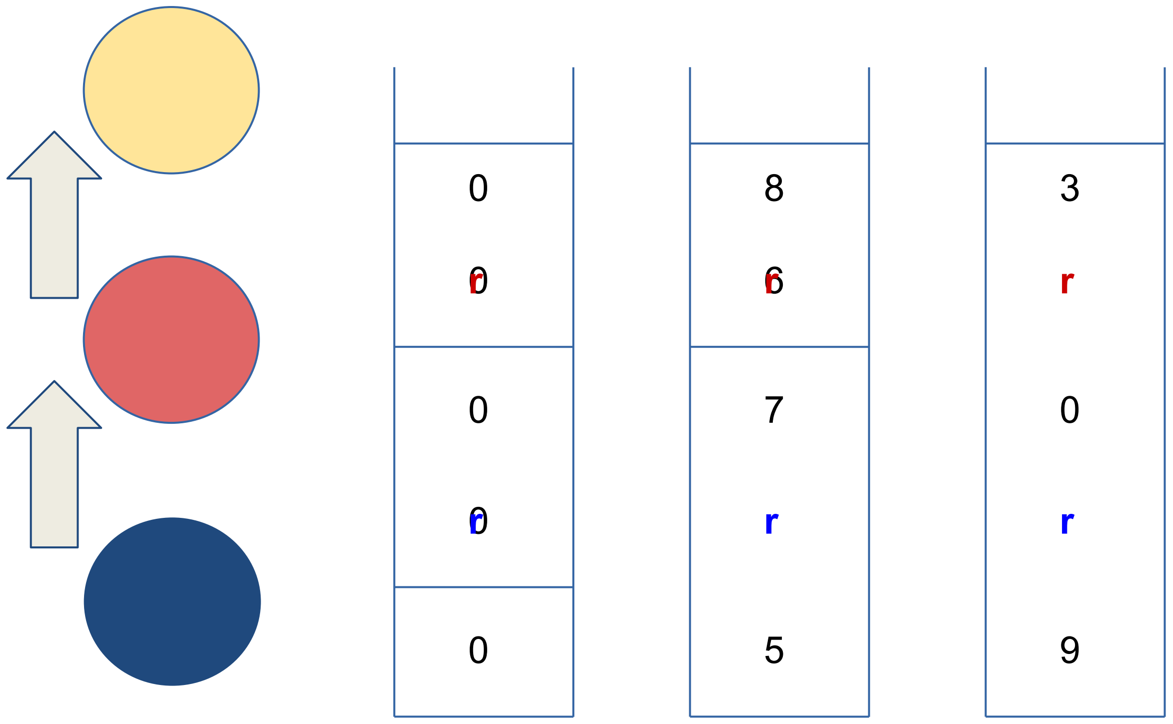




Confidentiality is non-interference

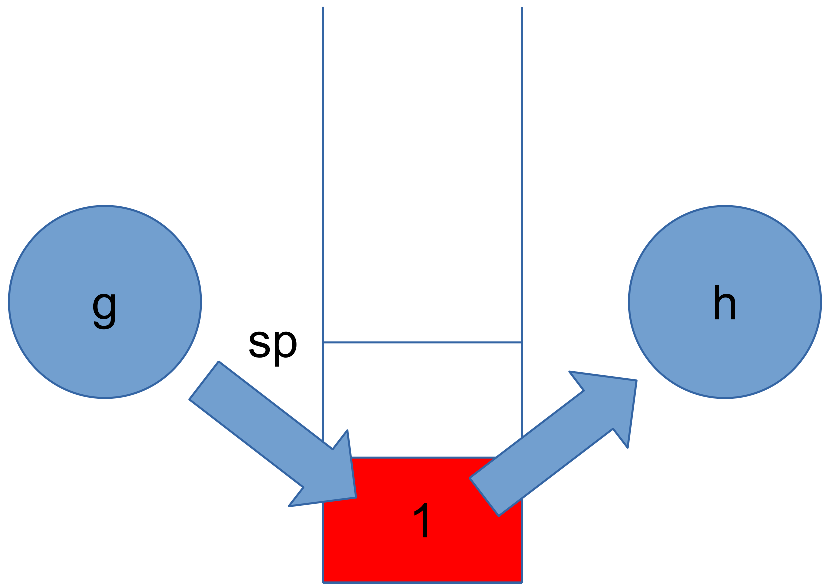


Testing

- Randomized property based testing with Quickchick
- Tested Roessler and DeHon’s “depth isolation” micro-policy successfully
- Roessler and Dehon’s “lazy tagging” fails tests as expected

Lazy Tagging Leaks

```
f() {
    int x = 0;
    g();
    h();
}
g() {
    int s;
    *(&s - 2) = 1;
}
h() {
    int s;
    s = *(&s - 2);
}
```



Additional Features

- Call-by-reference and stack-allocated call-by-value
- Simple coroutine model
- Observational property variants

Ongoing and Future Work

- Testing Cheri-esque capability models
- Expanding tests to handle arguments, observational properties
- Low-level separation logic

See our preprint – link