ExecVus

Alexandru Totolici

What? Why? How?

a way to visualize control-flow in software execution

What? Why? How?

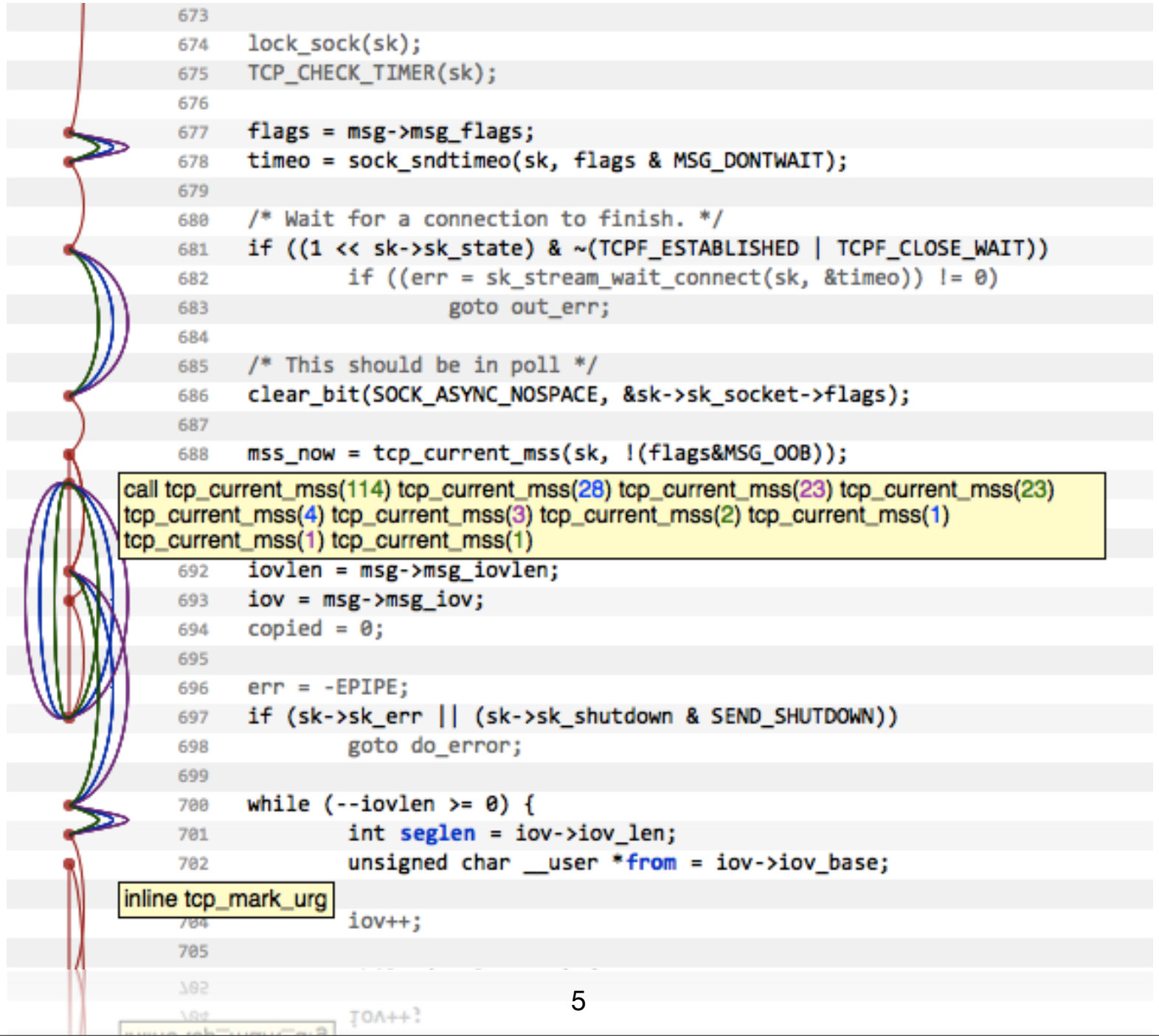
underlying data collected by Tralfamadore

http://tralfamadore.cs.ubc.ca/

What? Why? How?

existing visualization…

What? Why? How?

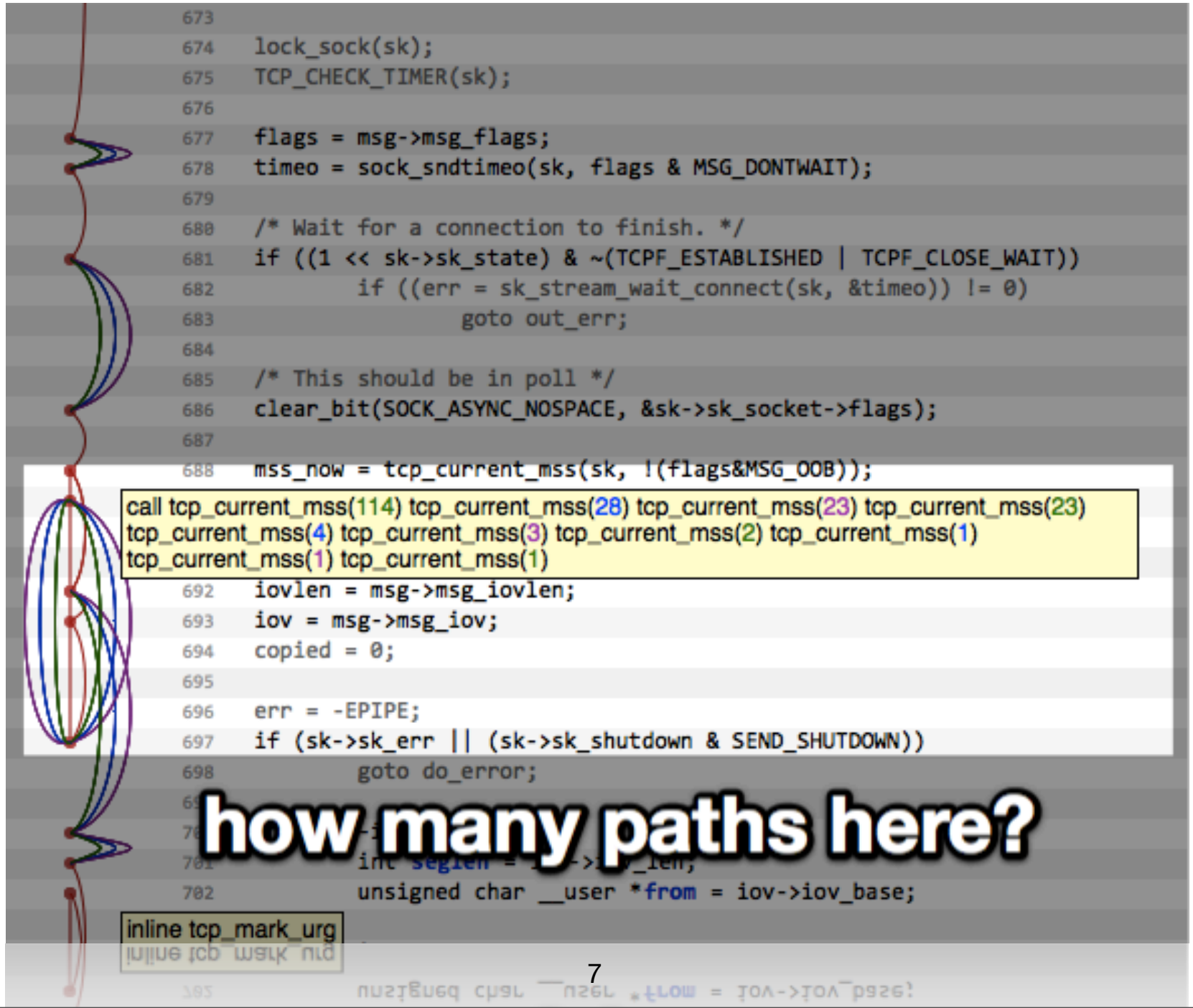

673
674 lock_sock(sk);
675 TCP_CHECK_TIMER(sk);
676
677 flags = msg->msg_flags;
678 timeo = sock_sndtimeo(sk, flags & MSG_DONTWAIT);
679
680 /* Wait for a connection to finish. */
681 if ((1 << sk->sk_state) & ~(TCPF_ESTABLISHED | TCPF_CLOSE_WAIT))
682 if ((err = sk_stream_wait_connect(sk, &timeo)) != 0)
683 goto out_err;
684
685 /* This should be in poll */
686 clear_bit(SOCK_ASYNC_NOSPACE, &sk->sk_socket->flags);
687
688 mss_now = tcp_current_mss(sk, !(flags&MSG_OOB));
call tcp_current_mss(114) tcp_current_mss(28) tcp_current_mss(23) tcp_current_mss(23)
tcp_current_mss(4) tcp_current_mss(3) tcp_current_mss(2) tcp_current_mss(1)
tcp_current_mss(1) tcp_current_mss(1)
692 iovlen = msg->msg_iovlen;
693 iov = msg->msg_iov;
694 copied = 0;
695
696 err = -EPIPE;
697 if (sk->sk_err || (sk->sk_shutdown & SEND_SHUTDOWN))
698 goto do_error;
699
700 while (--iovlen >= 0) {
701 int seglen = iov->iov_len;
702 unsigned char __user *from = iov->iov_base;
inline tcp_mark_urg
iov++;
705

What? Why? How?

but:

occlusion (of paths)

What? Why? How?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how many paths here?
702 unsigned char __user *from = iov->iov_base;
inline tcp_mark_urg

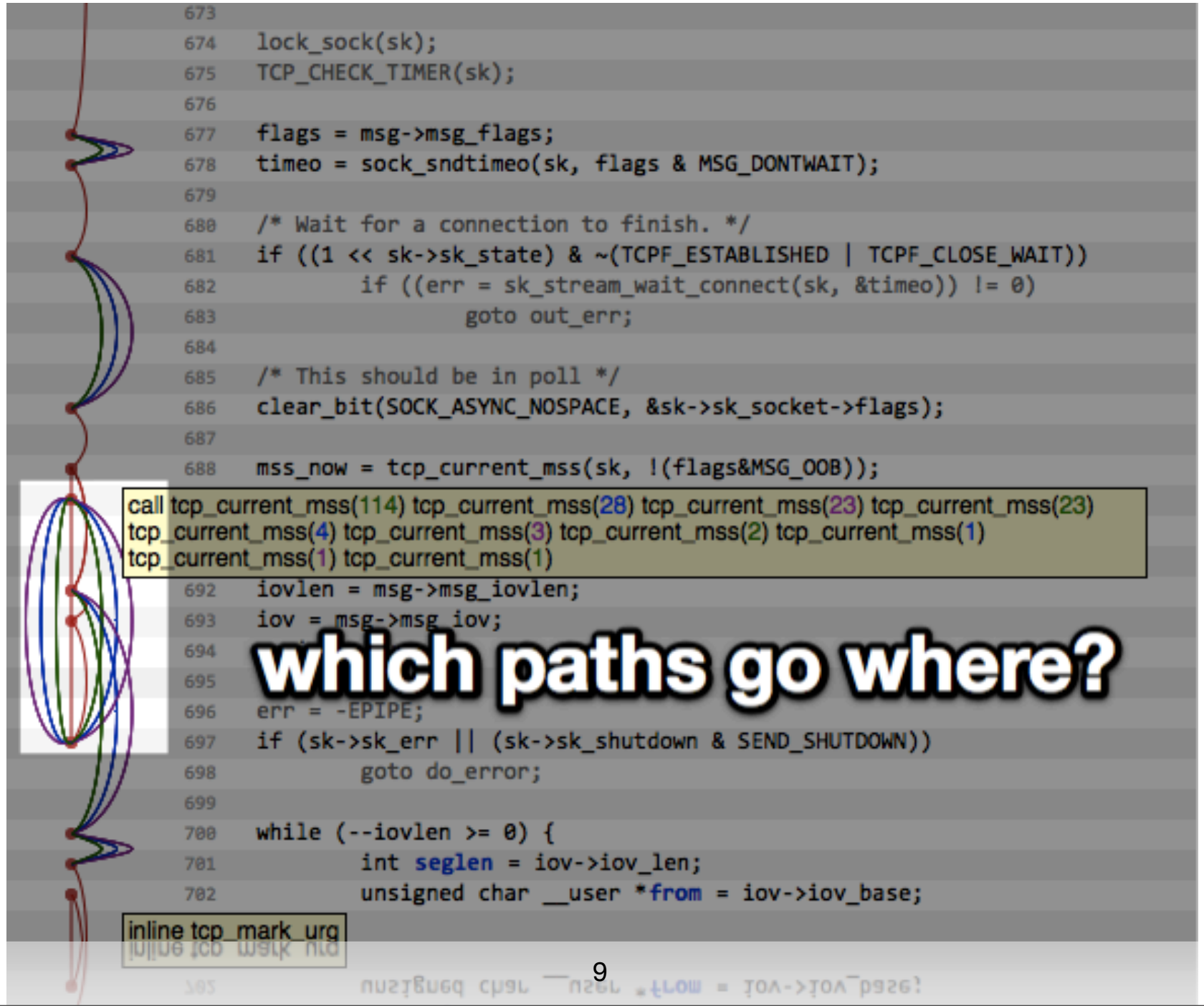
What? Why? How?

but:

occlusion (of paths)

selection (of flow)

What? Why? How?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inline tcp_mark_urg
which paths go where?

What? Why? How?

but:

- occlusion (of paths)
- selection (of flow)
- location (in execution)

What? **Why?** How?

control-flow is non-trivial to “see”

What? **Why?** How?

scenario 1: debug

What? **Why?** How?

scenario 2: malware

What? Why? **How?**

code collapse

What? Why? **How?**

code reordering

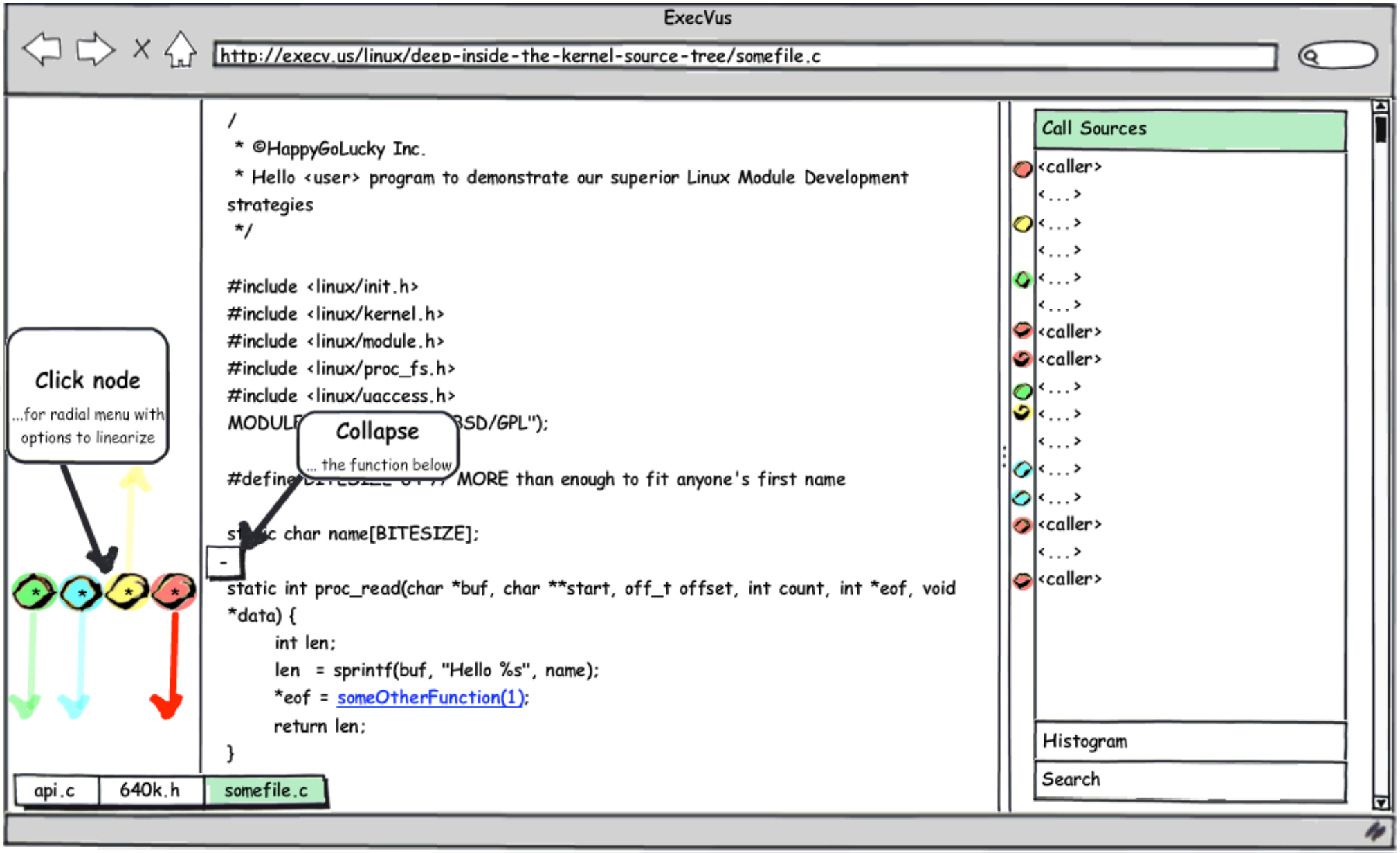
What? Why? **How?**

improve selection of execution path

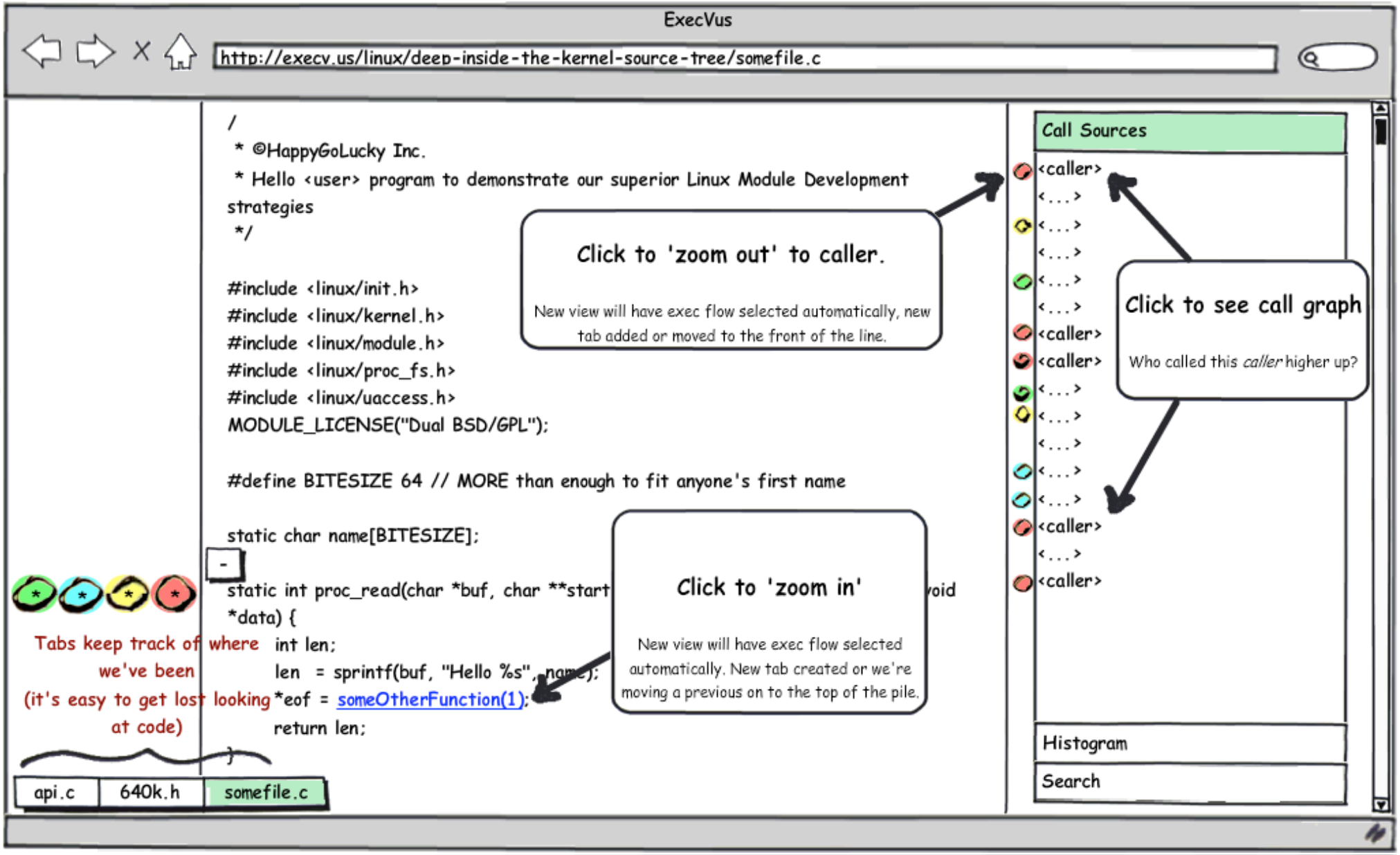
What? Why? **How?**

“zoom” in and out (in the control-flow)

What? Why? **How?**


ExecVus
http://execv.us/linux/deep-inside-the-kernel-source-tree/somefile.c
/
* ©HappyGoLucky Inc.
* Hello <user> program to demonstrate our superior Linux Module Development strategies
*/
#include <linux/init.h>
#include <linux/kernel.h>
#include <linux/module.h>
#include <linux/proc_fs.h>
#include <linux/uaccess.h>
Collapse
... the function below
MORE than enough to fit anyone's first name
char name[BITESIZE];
static int proc_read(char *buf, char **start, off_t offset, int count, int *eof, void *data) {
int len;
len = sprintf(buf, "Hello %s", name);
*eof = someOtherFunction(1);
return len;
}
Click node
...for radial menu with options to linearize
api.c
640k.h
somefile.c
Call Sources
<caller>
<...>
Histogram
Search

What? Why? **How?**


ExecVus
http://execv.us/linux/deep-inside-the-kernel-source-tree/somefile.c
/
* ©HappyGoLucky Inc.
* Hello <user> program to demonstrate our superior Linux Module Development strategies
*/
#include <linux/init.h>
#include <linux/kernel.h>
#include <linux/module.h>
#include <linux/proc_fs.h>
#include <linux/uaccess.h>
MODULE_LICENSE("Dual BSD/GPL");
#define BITESIZE 64 // MORE than enough to fit anyone's first name
static char name[BITESIZE];
static int proc_read(char *buf, char **start
*data) {
int len;
len = sprintf(buf, "Hello %s", name);
*eof = someOtherFunction(1);
return len;
}
void
Click to 'zoom out' to caller.
New view will have exec flow selected automatically, new tab added or moved to the front of the line.
Click to 'zoom in'
New view will have exec flow selected automatically. New tab created or we're moving a previous on to the top of the pile.
Tabs keep track of where we've been (it's easy to get lost looking at code)
api.c
640k.h
somefile.c
Call Sources
<caller>
<...>
Click to see call graph
Who called this caller higher up?
Histogram
Search

What? Why? **How?**

Mercurial, jQuery, Python, Cappuccino