

Stratoshark

... a new kid on the block!



SYN-bit
deep traffic analysis

Sake Blok

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- Relational therapist for computer systems
 - Solve {application,network,performance}-issues by looking at the communication between systems
- Member Wireshark core-team since 2007
- Started SYN-bit in 2010
 - Application and Network troubleshooting
 - Protocol and packet analysis
 - Training (Wireshark, TCP, TLS)
- Wireshark Certified Analyst (WCA) #1 🎉





SYN-bit
deep traffic analysis

Application and network troubleshooting

Protocol and packet analysis

Training (Wireshark, TCP, SSL)

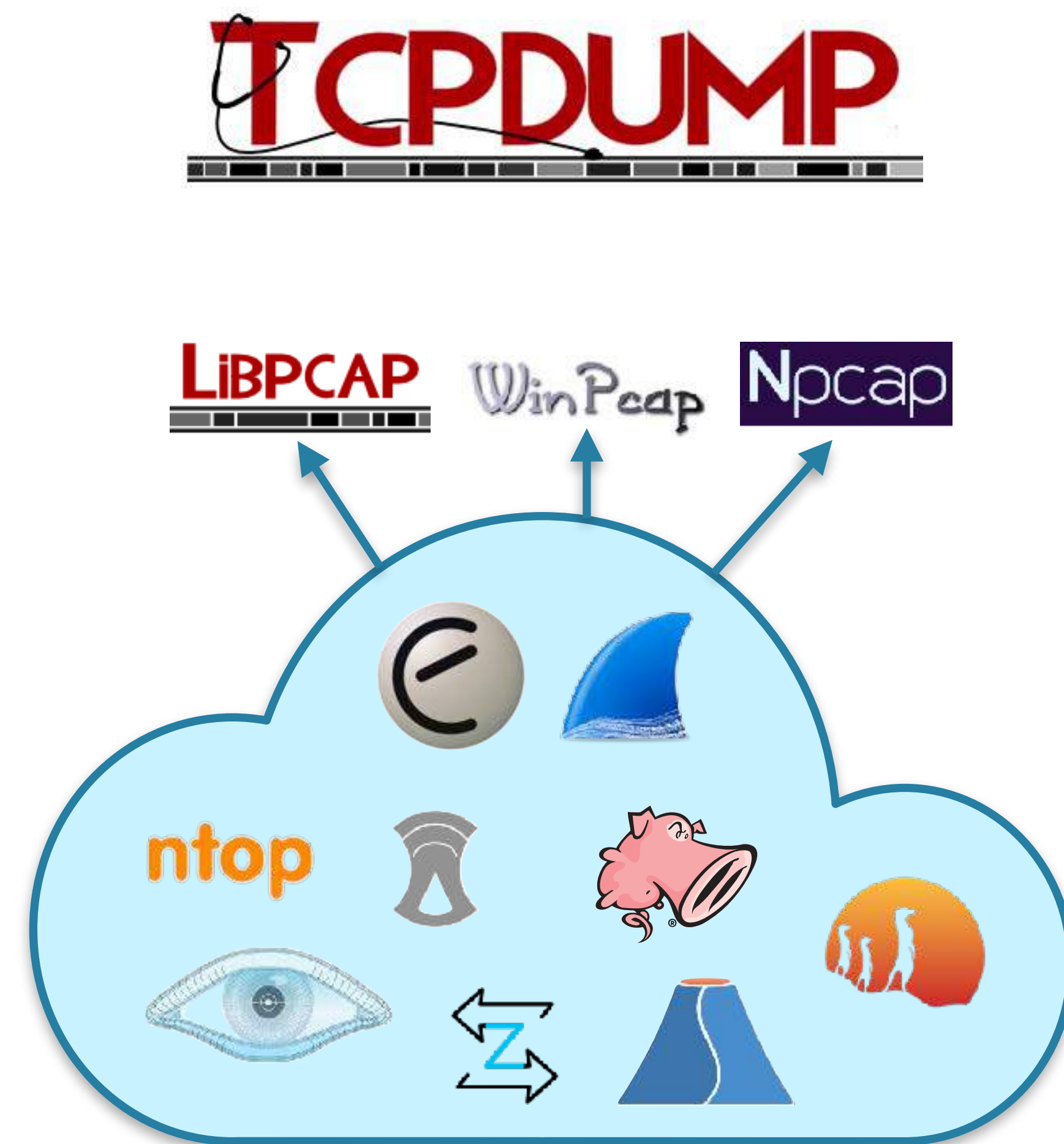
www.SYN-bit.nl



A little history of packet capturing



- 1988: tcpdump
 - Van Jacobsen, Sally Floyd, Vern Paxton, Steve McCanne
 - Lawrence Berkely Laboratory
- 1994: libpcap becomes separate library
- 1998: Ethereal
- 1999: WinPcap
 - Development stopped in 2018
- 2006: Wireshark
- 2013: Npcap
 - Replaces WinPcap in Wireshark Installer



Challenges with packets?

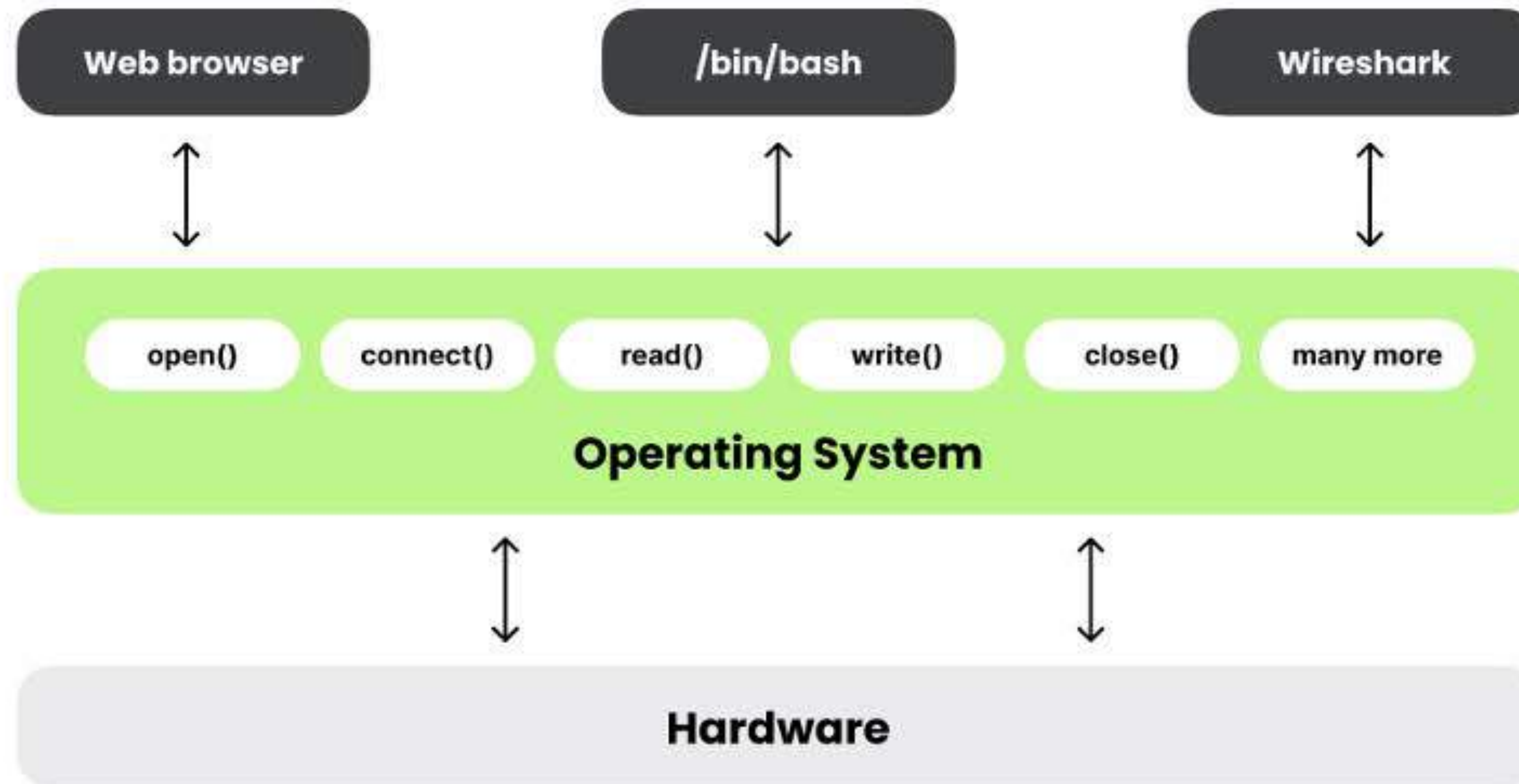


- Access to packets more and more challenging, especially in cloud environments
- Encryption is more widespread and decryption not always possible
- Containers and kubernetes make workloads more volatile
- What if we could dig into system calls instead?



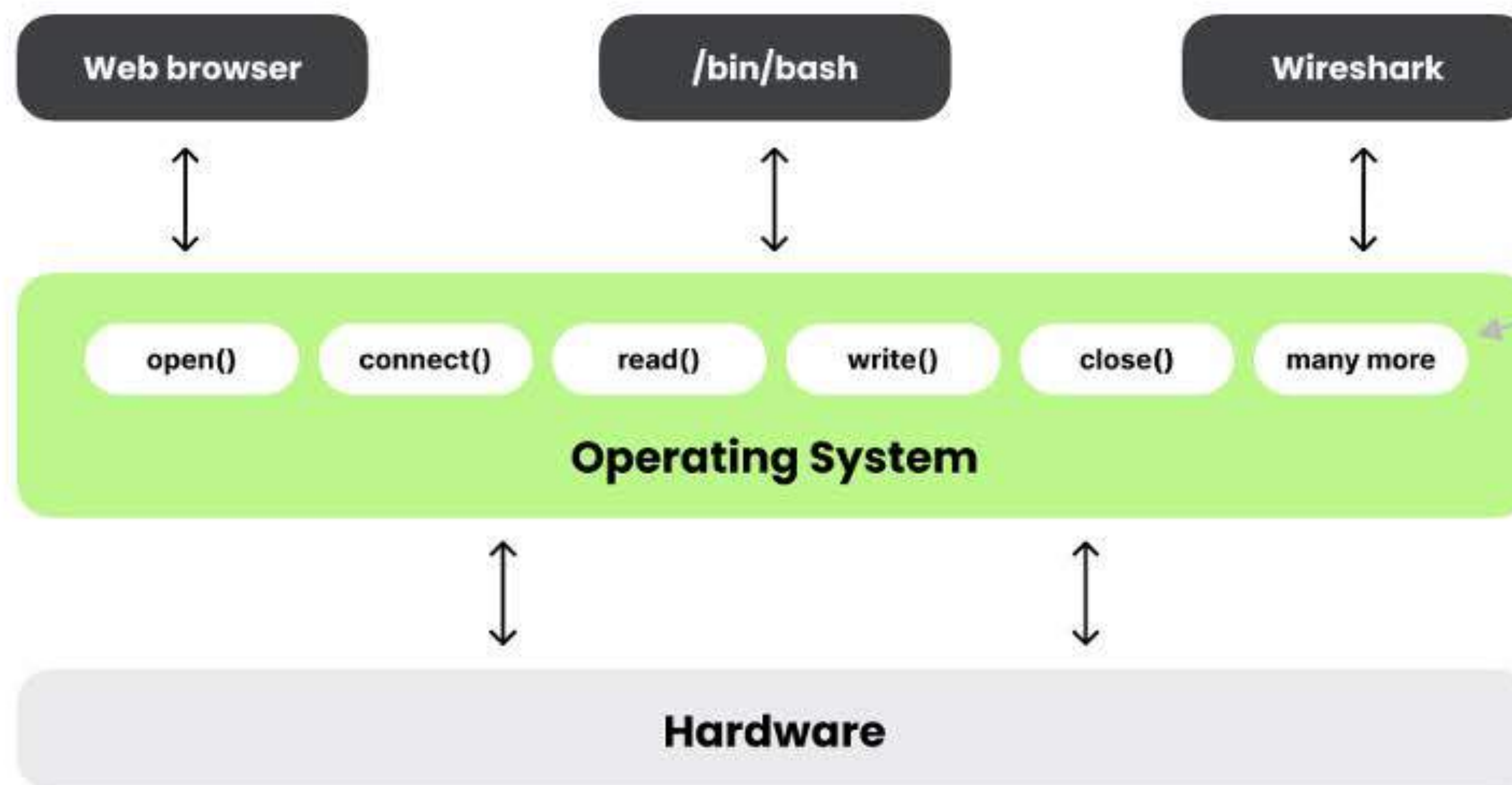


What are system calls?



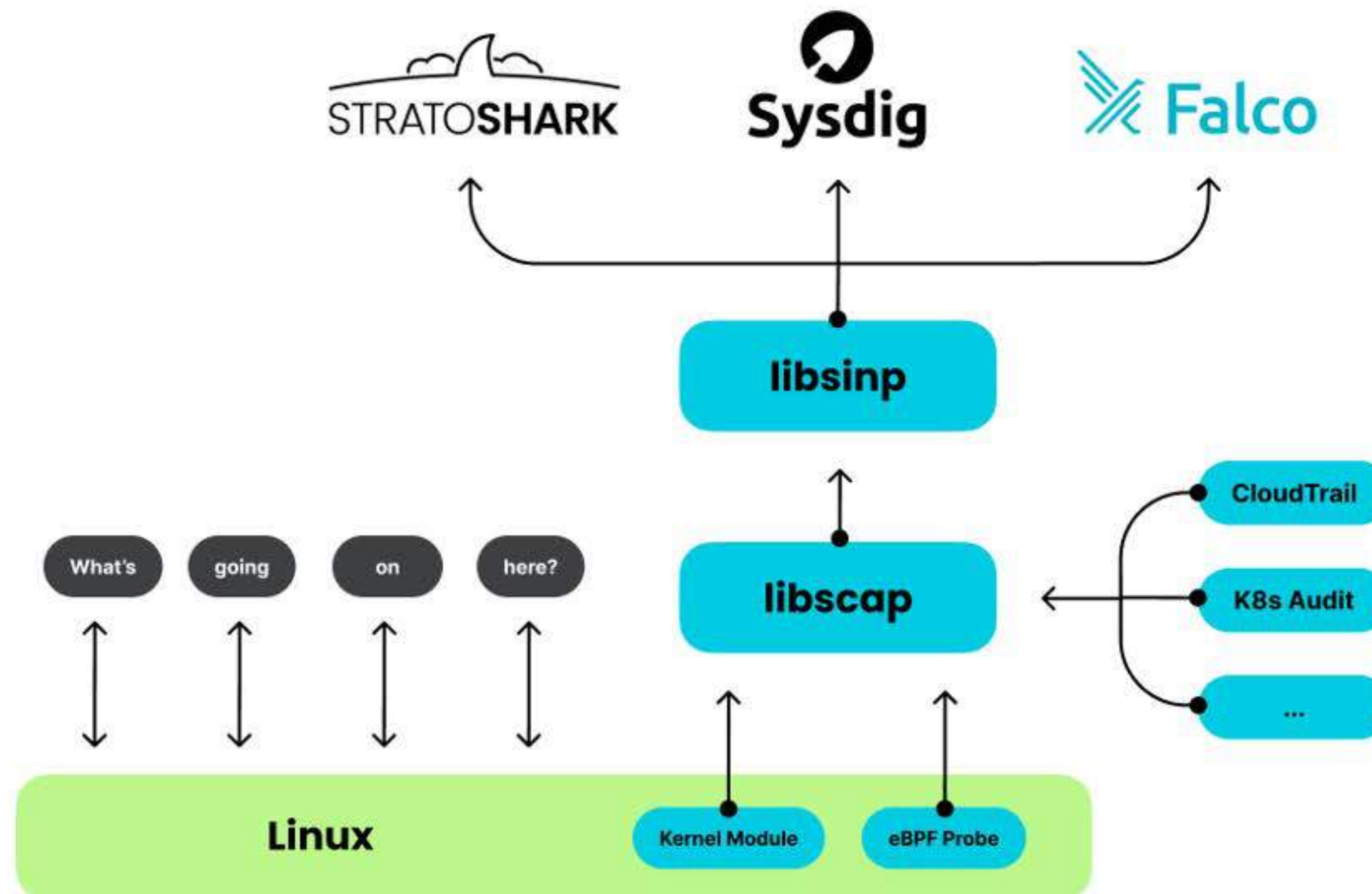


Capturing system calls?





libscap/libsinp usage very similar to using libpcap

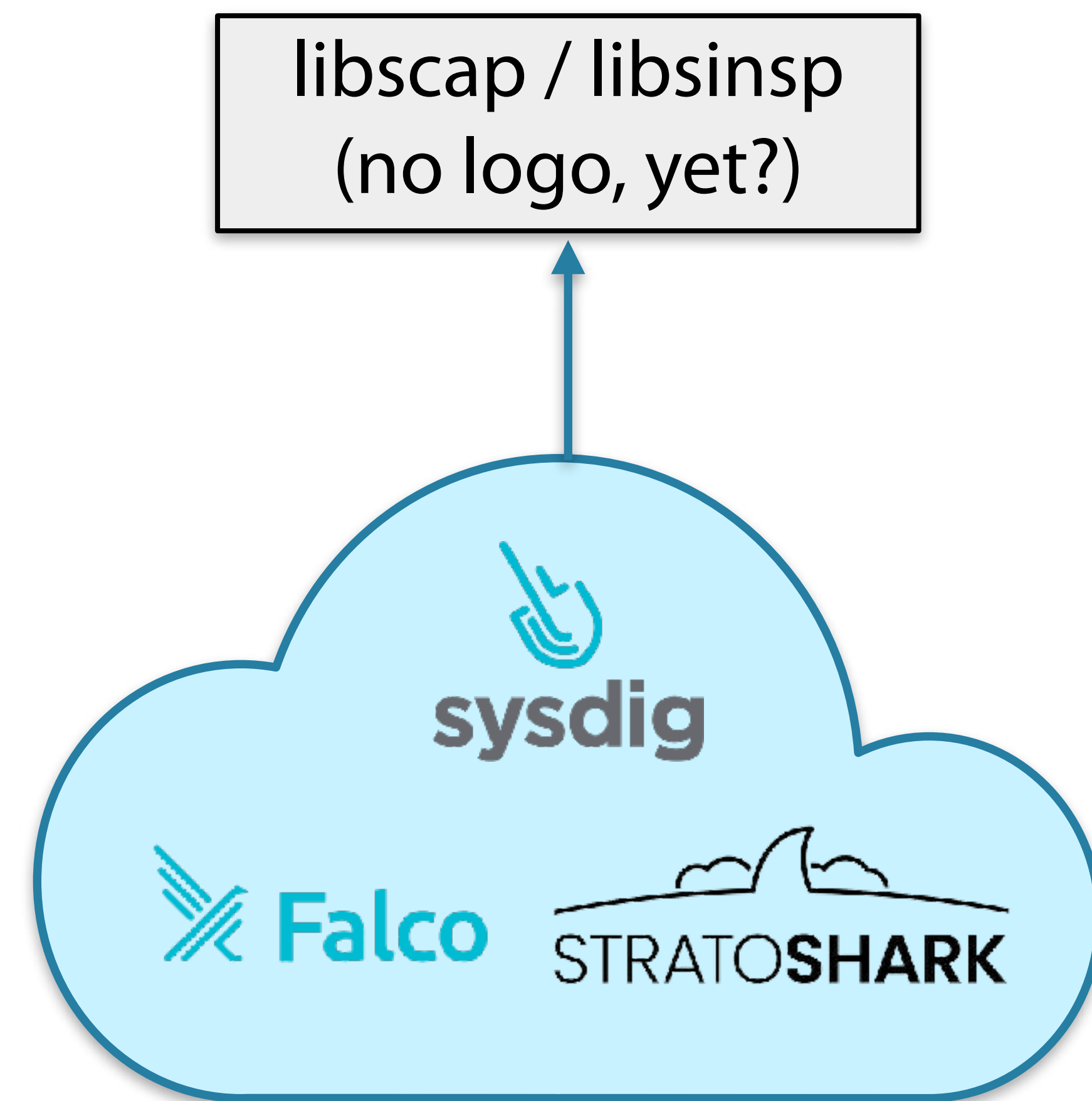




A little history of syscall capturing



- 2014: sysdig
 - Loris Degioanni (who also started WinPcap)
- 2016: Falco
 - 2018: Falco handed over to CNCF, graduates in 2024
 - <https://github.com/falcosecurity/falco>
- 2021: libscap/libinsp handed over to the CNCF
 - <https://github.com/falcosecurity/libscap>
- 2021: Add plugin infrastructure to falco libs
 - Makes ingesting cloud logging possible (like AWS cloudtrail)
- 2025: Stratoshark
 - Gerald Combs (who also started Wireshark)
 - <https://gitlab.com/wireshark/wireshark/-/tree/master/ui/stratoshark>

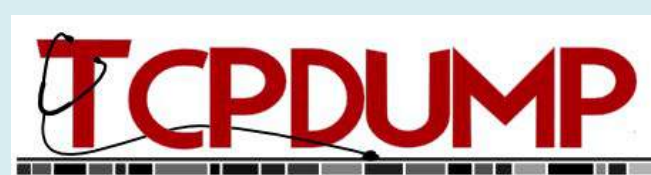




Similarities...



network packet domain



cli capture/viewer



gui capture/viewer



intrusion detection



shared libraries

system call domain



cli capture/viewer



gui capture/viewer



intrusion detection

libscap / libsinsp

shared libraries


```
beheer@docker-macbook:~$ timeout 1 sudo sysdig
18 17:26:38.319058248 1 sysdig (175349.175349) > switch next=0 pgft_maj=0 pgft_min=1043 vm_size=282380 vm_rss=15176 vm_swap=0
19 17:26:38.319130574 1 <NA> (<NA>.0) > switch next=175349(sysdig) pgft_maj=0 pgft_min=0 vm_size=0 vm_rss=0 vm_swap=0
40 17:26:38.319211982 1 sysdig (175349.175349) > switch next=0 pgft_maj=0 pgft_min=1047 vm_size=282380 vm_rss=15176 vm_swap=0
41 17:26:38.319214149 0 <NA> (<NA>.0) > switch next=174903 pgft_maj=0 pgft_min=0 vm_size=0 vm_rss=0 vm_swap=0
42 17:26:38.319221690 0 <NA> (<NA>.174903) > switch next=0 pgft_maj=0 pgft_min=0 vm_size=0 vm_rss=0 vm_swap=0
43 17:26:38.319233397 1 <NA> (<NA>.0) > switch next=175347(sudo) pgft_maj=0 pgft_min=0 vm_size=0 vm_rss=0 vm_swap=0
44 17:26:38.319239230 1 sudo (175347.175347) < ppoll res=1 fds=11:u0 3:p0 9:f1 8:f0
45 17:26:38.319247187 1 sudo (175347.175347) > rt_sigaction
46 17:26:38.319247520 1 sudo (175347.175347) < rt_sigaction
47 17:26:38.319248104 1 sudo (175347.175347) > read fd=9(<f>/dev/ptmx) size=65536
48 17:26:38.319252937 1 sudo (175347.175347) < read res=324 data=18 17:26:38.319058248 1 .[01;32msysdig.[00m (. [01;36m175349.[00m.175349) > .[01; fd=9(<f>/dev/ptmx) size=65536
[...]
```

```
259719 17:26:38.500757839 0 sshd (145515.145515) > rt_sigprocmask
259720 17:26:38.500757922 0 sshd (145515.145515) < rt_sigprocmask
259722 17:26:38.500758256 0 sshd (145515.145515) > read fd=10(<f>/dev/ptmx) size=32768
259723 17:26:38.500759172 0 sshd (145515.145515) < read res=2048 data=68681 17:26:38.365054879 0 .[01;32msudo.[00m (. [01;36m175347.[00m.175347) < .[01 fd=10(<f>/dev/ptmx) size=32768
259725 17:26:38.500760922 0 sshd (145515.145515) > switch next=174904 pgft_maj=7 pgft_min=1414 vm_size=20160 vm_rss=6352 vm_swap=408
259729 17:26:38.500763380 0 <NA> (<NA>.174904) > switch next=145515(sshd) pgft_maj=0 pgft_min=0 vm_size=0 vm_rss=0 vm_swap=0
259730 17:26:38.500764172 0 sshd (145515.145515) > getrandom
beheer@docker-macbook:~$
```

```
beheer@docker-macbook:~$ timeout 1 sudo sysdig -w 1sec.scap
beheer@docker-macbook:~$ sysdig -r 1sec.scap | wc -l
1022
beheer@docker-macbook:~$
beheer@docker-macbook:~$
```




DEMO SYSDIG



- All the features of Wireshark... but for system calls
 - extensive filtering
 - filter buttons
 - expanding details
 - configuration profiles for easy switching
 - io graphs
 - etc
- Runs on Windows/MacOS/Linux
- Maintained by the Wireshark Foundation

<https://www.pexels.com/photo/purple-neon-light-signage-3960381/>





- Capture local system calls
- Analyze scap files
- Capture system calls from remote Linux system over SSH
- *Use falco plugins to ingest (cloud) logging*

- Analyze scap files made remotely with sysdig/Stratoshark
- Capture system calls from remote Linux system over SSH
- **Not possible yet(!) to capture local system calls**
- *Use falco plugins to ingest (cloud) logging into Stratoshark*

evt.category == "file"								
No.	Time	Event name	Dir	Proc Name	PID	TID	FD	FD Name
221	2.92748125	access	>	curl	919	919		
222	2.927485431	access	<	curl	919	919		
223	2.927492187	operat	>	curl	919	919	-1	
224	2.927494813	operat	<	curl	919	919	1	/etc/ld.so.cache
225	2.927496166	newstatat	>	curl	919	919		
226	2.927496549	newstatat	<	curl	919	919	-1	/etc/ld.so.cache
229	2.9274962428	close	>	curl	919	919	1	/etc/ld.so.cache
230	2.9274963914	close	>	curl	919	919	1	/etc/ld.so.cache
231	2.9274971366	operat	>	curl	919	919	1	
232	2.9274976937	socket	>	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.1
233	2.9274977194	read	>	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.1
234	2.9274980823	read	<	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.1
235	2.9274980834	newstatat	>	curl	919	919		
236	2.9274982666	newstatat	<	curl	919	919	-1	/lib/x86_64-linux-gnu/libc.so.1
237	2.92749727442	close	>	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.1
238	2.92749727951	close	>	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.1
239	2.92749731185	operat	>	curl	919	919	-1	
240	2.92749737601	operat	<	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.1
241	2.92749737601	read	>	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.1
242	2.92749737601	read	<	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.1
251	2.9274984074	newstatat	>	curl	919	919		
252	2.92749842663	newstatat	<	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.1
253	2.92749737724	close	>	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.1
262	2.927498101	close	<	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.1
263	2.9274980704	operat	>	curl	919	919	-1	
264	2.92749721405	operat	<	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.6
265	2.92749721211	read	>	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.6
266	2.92749724214	read	<	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.6
267	2.92749724726	pread	>	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.6
268	2.92749725446	pread	<	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.6
269	2.92749726505	newstatat	>	curl	919	919		
270	2.92749728222	newstatat	<	curl	919	919	-1	/lib/x86_64-linux-gnu/libc.so.6
271	2.92749728863	pread	>	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.6
272	2.92749721118	pread	<	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.6
283	2.92749734796	close	>	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.6
284	2.927497355104	close	>	curl	919	919	1	/lib/x86_64-linux-gnu/libc.so.6
285	2.92749737162	operat	>	curl	919	919	-1	
286	2.92749737552	socket	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
287	2.92749737554	read	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
288	2.92749728456	read	<	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
289	2.92749729487	newstatat	>	curl	919	919		
290	2.927497284525	newstatat	<	curl	919	919	-1	/lib/x86_64-linux-gnu/libhttp2.so.1
299	2.92749736257	close	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
300	2.92749736587	close	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
301	2.92749739102	operat	>	curl	919	919	-1	
302	2.92749734421	operat	<	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
303	2.92749734703	read	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
304	2.927325734	read	<	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
305	2.927326236	newstatat	>	curl	919	919		
306	2.927327616	newstatat	<	curl	919	919	-1	/lib/x86_64-linux-gnu/libhttp2.so.1
315	2.927339757	close	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
316	2.927339618	close	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
317	2.927339122	operat	>	curl	919	919	-1	
318	2.927336336	operat	<	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
319	2.927366421	read	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
320	2.927367401	read	<	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
321	2.927367834	newstatat	>	curl	919	919		
322	2.927369166	newstatat	<	curl	919	919	-1	/lib/x86_64-linux-gnu/libhttp2.so.1
325	2.927408374	close	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
326	2.927408548	close	<	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
327	2.927409004	operat	>	curl	919	919	-1	
328	2.927405423	operat	<	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
329	2.927404222	read	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
340	2.927407627	read	<	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
341	2.927408044	newstatat	>	curl	919	919		
342	2.927409141	newstatat	<	curl	919	919	-1	/lib/x86_64-linux-gnu/libhttp2.so.1
351	2.927452243	close	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
352	2.927452711	close	<	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
353	2.927454527	operat	>	curl	919	919	-1	
354	2.927458885	operat	<	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
355	2.927459646	read	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
356	2.927461105	read	<	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
357	2.927461638	newstatat	>	curl	919	919		
358	2.927462953	newstatat	<	curl	919	919	-1	/lib/x86_64-linux-gnu/libhttp2.so.1
367	2.927469322	close	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
368	2.927469587	close	<	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1
369	2.927493121	operat	>	curl	919	919	-1	
370	2.927493451	socket	>	curl	919	919	1	/lib/x86_64-linux-gnu/libhttp2.so.1



Drilling down...



sysdig.thread_id == 145515											
No.	Time	Event name	Dir	Proc Name	PID	TID	FD	FD Name	Container Name	Arguments	Info
33097	6.990955325	ppoll	<	sshd	145515	145515			host	res=1 f...	ppoll
33098	6.990976448	rt_sigp...	>	sshd	145515	145515			host		rt_sigproc
33099	6.990978990	rt_sigp...	<	sshd	145515	145515			host		rt_sigproc
33100	6.991001112	read	>	sshd	145515	145515	4	10.211....	host	fd=4(<4...	read, fd=4
sysdig.thread_id == 145515 and evt.category=="file"											
No.	Time	Event name	Dir	Proc Name	PID	TID	FD	FD Name	Container Name	Arguments	Info
33108	6.991140515	write	>	sshd	145515	145515	7	/dev/pt...	host	fd=7(<f...	write, fd=
33109	6.991198717	write	<	sshd	145515	145515	7	/dev/pt...	host	res=1 d...	write
33111	6.991204466	ioctl	>	sshd	145515	145515	7	/dev/pt...	host	fd=7(<f...	ioctl
33112	6.991218090	ioctl	<	sshd	145515	145515	7	/dev/pt...	host	res=0	ioctl
sysdig.thread_id == 145515 and evt.category=="file" and evt.is_io==1											
No.	Time	Event name	Dir	Proc Name	PID	TID	FD	FD Name	Container Name	Arguments	Info
33108	6.991140515	write	>	sshd	145515	145515	7	/dev/pt...	host	fd=7(<f...	write, fd=
33109	6.991198717	write	<	sshd	145515	145515	7	/dev/pt...	host	res=1 d...	write
33133	6.991360992	read	>	sshd	145515	145515	10	/dev/pt...	host	fd=10(<...	read, fd=1
33134	6.991364117	read	<	sshd	145515	145515	10	/dev/pt...	host	res=1 d...	read
33648	7.107583628	write	>	sshd	145515	145515	7	/dev/pt...	host	fd=7(<f...	write, fd=
33649	7.107610542	write	<	sshd	145515	145515	7	/dev/pt...	host	res=1 d...	write
33674	7.107807272	read	>	sshd	145515	145515	10	/dev/pt...	host	fd=10(<...	read, fd=1
33675	7.107810438	read	<	sshd	145515	145515	10	/dev/pt...	host	res=1 d...	read
34411	7.264266258	write	>	sshd	145515	145515	7	/dev/pt...	host	fd=7(<f...	write, fd=
34412	7.264291214	write	<	sshd	145515	145515	7	/dev/pt...	host	res=1 d...	write
34438	7.264622763	read	>	sshd	145515	145515	10	/dev/pt...	host	fd=10(<...	read, fd=1
34439	7.264626262	read	<	sshd	145515	145515	10	/dev/pt...	host	res=1 d...	read
35339	7.450885424	write	>	sshd	145515	145515	7	/dev/pt...	host	fd=7(<f...	write, fd=
35340	7.450904756	write	<	sshd	145515	145515	7	/dev/pt...	host	res=1 d...	write
35365	7.451074113	read	>	sshd	145515	145515	10	/dev/pt...	host	fd=10(<...	read, fd=1
35366	7.451077488	read	<	sshd	145515	145515	10	/dev/pt...	host	res=1 d...	read
35994	7.590342289	write	>	sshd	145515	145515	7	/dev/pt...	host	fd=7(<f...	write, fd=
35995	7.590374411	write	<	sshd	145515	145515	7	/dev/pt...	host	res=1 d...	write
36020	7.590673255	read	>	sshd	145515	145515	10	/dev/pt...	host	fd=10(<...	read, fd=1



Mixing categories...



sysdig.thread_id == 145515 and evt.category in {"net", "file"} and not sysdig.event_name=="ioctl"														Cmd	File	Network	Misc
No.	Time	Event name	Dir	Proc Name	PID	TID	FD	FD Name	Container Name	Arguments	Info						
33100	6.991001112	read	>	sshd	145515	145515	4	10.211....	host	fd=4(<4...	read, fd=4						
33101	6.991032692	read	<	sshd	145515	145515	4	10.211....	host	res=36 ...	read						
33108	6.991140515	write	>	sshd	145515	145515	7	/dev/pt...	host	fd=7(<f...	write, fd=						
33109	6.991198717	write	<	sshd	145515	145515	7	/dev/pt...	host	res=1 d...	write						
33133	6.991360992	read	>	sshd	145515	145515	10	/dev/pt...	host	fd=10(<...	read, fd=1						
33134	6.991364117	read	<	sshd	145515	145515	10	/dev/pt...	host	res=1 d...	read						
33143	6.991390447	write	>	sshd	145515	145515	4	10.211....	host	fd=4(<4...	write, fd=						
33144	6.991494187	write	<	sshd	145515	145515	4	10.211....	host	res=36 ...	write						
33640	7.107499512	read	>	sshd	145515	145515	4	10.211....	host	fd=4(<4...	read, fd=4						
33641	7.107518510	read	<	sshd	145515	145515	4	10.211....	host	res=36 ...	read						
33648	7.107583628	write	>	sshd	145515	145515	7	/dev/pt...	host	fd=7(<f...	write, fd=						
33649	7.107610542	write	<	sshd	145515	145515	7	/dev/pt...	host	res=1 d...	write						
33674	7.107807272	read	>	sshd	145515	145515	10	/dev/pt...	host	fd=10(<...	read, fd=1						
33675	7.107810438	read	<	sshd	145515	145515	10	/dev/pt...	host	res=1 d...	read						
33684	7.107833936	write	>	sshd	145515	145515	4	10.211....	host	fd=4(<4...	write, fd=						
33685	7.107897429	write	<	sshd	145515	145515	4	10.211....	host	res=36 ...	write						
34403	7.264201723	read	>	sshd	145515	145515	4	10.211....	host	fd=4(<4...	read, fd=4						
34404	7.264221221	read	<	sshd	145515	145515	4	10.211....	host	res=36 ...	read						
34411	7.264266258	write	>	sshd	145515	145515	7	/dev/pt...	host	fd=7(<f...	write, fd=						



Combining processes...



(sysdig.thread_id in { 145515,145516} and evt.category in {"file"}) && evt.is_io==1													+	Cmd	File	Network	Misc
No.	Time	Event name	Dir	Proc Name	PID	TID	FD	FD Name	Container Name	Arguments	Info						
33108	6.991140515	write	>	sshd	145515	145515	7	/dev/ptmx	host	fd=7(<f...	write,						
33109	6.991198717	write	<	sshd	145515	145515	7	/dev/ptmx	host	res=1 d...	write						
33119	6.991254420	read	>	bash	145516	145516	0	/dev/pts/0	host	fd=0(<f...	read,						
33120	6.991263210	read	<	bash	145516	145516	0	/dev/pts/0	host	res=1 d...	read						
33123	6.991312705	write	>	bash	145516	145516	2	/dev/pts/0	host	fd=2(<f...	write,						
33124	6.991321871	write	<	bash	145516	145516	2	/dev/pts/0	host	res=1 d...	write						
33133	6.991360992	read	>	sshd	145515	145515	10	/dev/ptmx	host	fd=10(<...	read,						
33134	6.991364117	read	<	sshd	145515	145515	10	/dev/ptmx	host	res=1 d...	read						
33648	7.107583628	write	>	sshd	145515	145515	7	/dev/ptmx	host	fd=7(<f...	write,						
33649	7.107610542	write	<	sshd	145515	145515	7	/dev/ptmx	host	res=1 d...	write						
33660	7.107696325	read	>	bash	145516	145516	0	/dev/pts/0	host	fd=0(<f...	read,						
33661	7.107706074	read	<	bash	145516	145516	0	/dev/pts/0	host	res=1 d...	read						
33664	7.107755902	write	>	bash	145516	145516	2	/dev/pts/0	host	fd=2(<f...	write,						
33665	7.107766734	write	<	bash	145516	145516	2	/dev/pts/0	host	res=1 d...	write						
33674	7.107807272	read	>	sshd	145515	145515	10	/dev/ptmx	host	fd=10(<...	read,						
33675	7.107810438	read	<	sshd	145515	145515	10	/dev/ptmx	host	res=1 d...	read						
34411	7.264266258	write	>	sshd	145515	145515	7	/dev/ptmx	host	fd=7(<f...	write,						
34412	7.264291214	write	<	sshd	145515	145515	7	/dev/ptmx	host	res=1 d...	write						
34423	7.264425700	read	>	bash	145516	145516	0	/dev/pts/0	host	fd=0(<f...	read,						
34424	7.264437500	read	<	bash	145516	145516	0	/dev/pts/0	host	res=1 d...	read						



Workaround for the container name



Capturing from SSH remote syscall capture: sshdig

proc.name in {"apache2", "httpd", "mysqld"}

Title: "container" Type: Custom Fields: thread.cgroups[28-35] Occurrence: 0 Display as: Values Cancel OK

No.	Time	Delta	Container Name	"container"	Proc Name	D	Event name	PID	TID	PPID	FD
6476	1.194945447	0.000002250		ec6a9207	apache2	>	pselect6	170207	170207	1	
6477	1.194949572	0.000004125		ec6a9207	apache2	>	switch	170207	170207	1	
8780	1.694098208	0.499148636		9afe7ba6	apache2	<	pselect6	170324	170324	170250	
8781	1.694107666	0.000009458		9afe7ba6	apache2	>	wait4	170324	170324	170250	
8782	1.694111249	0.000003583		9afe7ba6	apache2	<	wait4	170324	170324	170250	
8783	1.694112499	0.000001250		9afe7ba6	apache2	>	times	170324	170324	170250	
8784	1.694116998	0.000004499		9afe7ba6	apache2	<	times	170324	170324	170250	
8785	1.694118123	0.000001125		9afe7ba6	apache2	>	pselect6	170324	170324	170250	
8786	1.694122498	0.000004375		9afe7ba6	apache2	>	switch	170324	170324	170250	
11202	2.194484509	0.500362011		3f43ef36	httpd	<	pselect6	170082	170082	170016	
11205	2.194518589	0.000034080		3f43ef36	httpd	>	wait4	170082	170082	170016	

Current Thread CPU Time: 0

Thread Cgroups [...]: cpuset=/system.slice/docker-3f43ef36055417afaf2895871e49334b893100b69e2e83e54a72bbcc111a2f43.scop

Threads: 1

Children: 0

Standard Input fd type: file

Standard Output fd type: pipe

Standard Error fd type: pipe

Standard Input fd name: /dev/null

Standard Output fd name: pipe:[166691]

Standard Error fd name: pipe:[166692]

Process Ancestors

User Information

All cgroups the thread belongs to, aggregated into a single string. (thread.cgroups)

Events: 75113 · Displayed: 336 (0.4%) · Dropped: 0 (0.0%) Profile: SYN-bit



Setting up sshdig...



Stratoshark - Interface Options: SSH remote syscall capture: sshdig

Server Authentication Capture Debug

Remote SSH server address

Remote SSH server port

Server Authentication Capture Debug

Remote SSH server username

Remote SSH server password

Path to SSH private key ...

SSH key passphrase

ProxyCommand

☐ Support SHA-1 keys (deprecated)

Server Authentication Capture Debug

Remote capture command selection ☒ sysdig

Other: ☐ Other:

Remote capture command

Gain capture privilege on the remote machine ☐ none ☒ sudo

doas ☐ doas

Privileged user name for sudo or doas

Events to capture

☒ Use eBPF





... with passwordless sudo!



```
beheer@docker-macbook: /etc/sudoers.d — ssh beheer@docker-macbook — bash — 80...
beheer@docker-macbook:~$ grep sudo /etc/group
sudo:x:27:beheer
beheer@docker-macbook:~$ cd /etc/sudoers.d/
beheer@docker-macbook:/etc/sudoers.d$ cat sysdig
cat: sysdig: Permission denied
beheer@docker-macbook:/etc/sudoers.d$ sudo cat sysdig
#
# This file MUST be edited with the 'visudo' command as root.
#
# Please consider adding local content in /etc/sudoers.d/ instead of
# directly modifying this file.
#
# See the man page for details on how to write a sudoers file.
#
# Allow members of group sudo to execute sudo sysdig without password
%sudo  ALL=(ALL) NOPASSWD: /usr/bin/sysdig
# See sudoers(5) for more information on "@include" directives:
beheer@docker-macbook:/etc/sudoers.d$
```

Capturing from SSH remote syscall capture: sshdig

No.	Time	Delta	Container Name	PPID	PID	TID	Proc Name	D	Event name	FD	FD Name	Arguments	Info
58379	12.2001965...	0.000010937	host	178899	178900	178900	sysdig	>	switch			next=0 pgft_maj=26 pgft...	switch
58380	12.2009129...	0.000714426				0		>	switch			next=178900(sysdig) pgft...	switch
58381	12.2009253...	0.000012374	host	178899	178900	178900	sysdig	>	switch			next=0 pgft_maj=26 pgft...	switch
58382	12.2016017...	0.000676472				0		>	switch			next=178900(sysdig) pgft...	switch
58383	12.2016132...	0.000011415	host	178899	178900	178900	sysdig	>	switch			next=0 pgft_maj=26 pgft...	switch
58384	12.2023342...	0.000721009				0		>	switch			next=178900(sysdig) pgft...	switch



System calls are boring (by themselves)



```
int openat(int dirfd, const char *pathname, int flags, mode_t mode);
```




But a lot more fun when enriched with metadata



- On start, libscap collects system state
 - containers, users, groups, processes, file descriptors, etc
- During capturing, libsinsp updates tables
 - So always a mirror of the system state available
 - Makes filtering on all kinds of information possible
 - Enables the inclusion of metadata in output (falco)
- Stratoshark shows system call data and all metadata



<https://reef-aquarium-store.com/dardanus-pedunculatus-anemone-hermit-crab>



Enriched data in stratoshark



```
> System Event 3429: 50 bytes
> Sysdig Event
  CPU ID: 1
  Thread ID: 176811
  Event length: 50
  Number of parameters: 4
  Event type: openat (306)
  Parameter lengths: 08000000004000400
    Parameter length: 8
    Parameter length: 0
    Parameter length: 4
    Parameter length: 4
  dirfd: -100
  name:
  flags: 4097
  mode: 0
  Event name: openat

Event Information
Event Arguments
Process Information
Process Ancestors
File Descriptor Information
Container Information
User Information
  User ID: 1000
  User Name: beheer
  Home Directory: /home/beheer
  Shell: /bin/bash
  Login User ID: 1000
  Login User Name: beheer
Group Information
  Group ID: 1000
  Group Name: beheer
```

system call, captured by libscap

use Thread ID to look up metadata

Add metadata to event

Context	Metadata	Field classes
Operating system	Processes and threads File descriptors Users and groups Network interfaces	proc, thread, fd, fdlist, user, group
Container	ID and name Type Image name Privileged Mount points Health checks	container
Kubernetes	Namespace Pod ReplicationController Service ReplicaSet Deployment	k8s

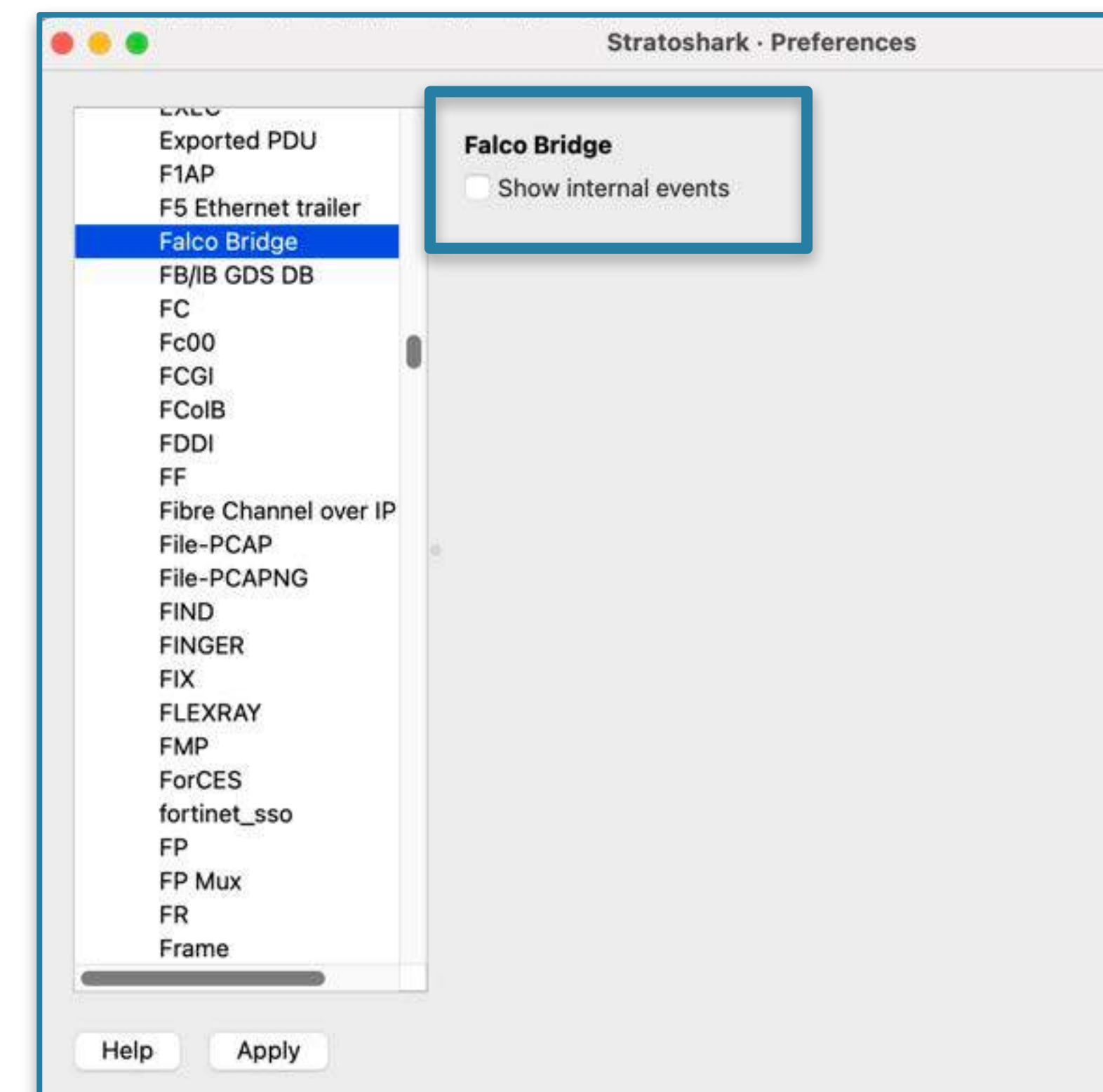


Missing events...



Apply a display filter ... <%%/>												
No.	Time	Delta	Container Name	"container"	Proc Name	D	Event name	PID	TID	PPID	FD	F
298	0.000444954	0.000000000		a8d1f262	ib_log_fi...	>	switch	170088	0	170020		
299	0.000445413	0.000000459	host	ice/sess	sysdig	>	switch	178900	178900	178899		
300	0.000450662	0.000005249	host	ice/sess	sshd	<	ppoll	178898	178898	178892		
301	0.000455786	0.000005124	host	ice/sess	sshd	>	rt_sigproc...	178898	178898	178892		
302	0.000456161	0.000000375	host	ice/sess	sshd	<	rt_sigproc...	178898	178898	178892		
303	0.000469743	0.000013582	host	ice/sess	sshd	>	brk	178898	178898	178892		
304	0.000472326	0.000002583	host	ice/sess	sshd	<	brk	178898	178898	178892		
305	0.000499615	0.000027289	host	ice/sess	sshd	>	read	178898	178898	178892	10	p
306	0.000507489	0.000007874	host	ice/sess	sshd	<	read	178898	178898	178892	10	p
307	0.000522405	0.000014916				>	switch		0			
308	0.000528362	0.000005957	host	ice/sess	sysdig	>	switch	178900	178900	178899		
309	0.000567775	0.000039413	host	ice/sess	sshd	>	getrandom	178898	178898	178892		

Apply a display filter ... <%%/>												
No.	Time	Delta	Container Name	"container"	Proc Name	D	Event name	PID	TID	PPID	FD	F
33436	6.902383004	0.000671598				>	switch			0		
33437	6.902410209	0.000027205	host	ice/sess	sysdig	>	switch	178900	178900	178899		
33438	6.903111720	0.000701511				>	switch			0		
33439	6.903120761	0.000009041	host	ice/sess	sysdig	>	switch	178900	178900	178899		
33440	6.903826688	0.000705927				>	switch			0		
33572	6.908457794	0.004631106				>	switch			0		
33573	6.908473209	0.000015415				>	switch			14		
33574	6.912152246	0.003679037				>	switch			0		
33575	6.912160495	0.000008249		a8d1f262	ib_log_fi...	<	futex	170088	170614	170020		
33576	6.912169952	0.000009457		a8d1f262	ib_log_fi...	>	futex	170088	170614	170020		
33577	6.912171786	0.000001834		a8d1f262	ib_log_fi...	<	futex	170088	170614	170020		
33578	6.912185867	0.000014081		a8d1f262	ib_log_fi...	>	futex	170088	170614	170020		



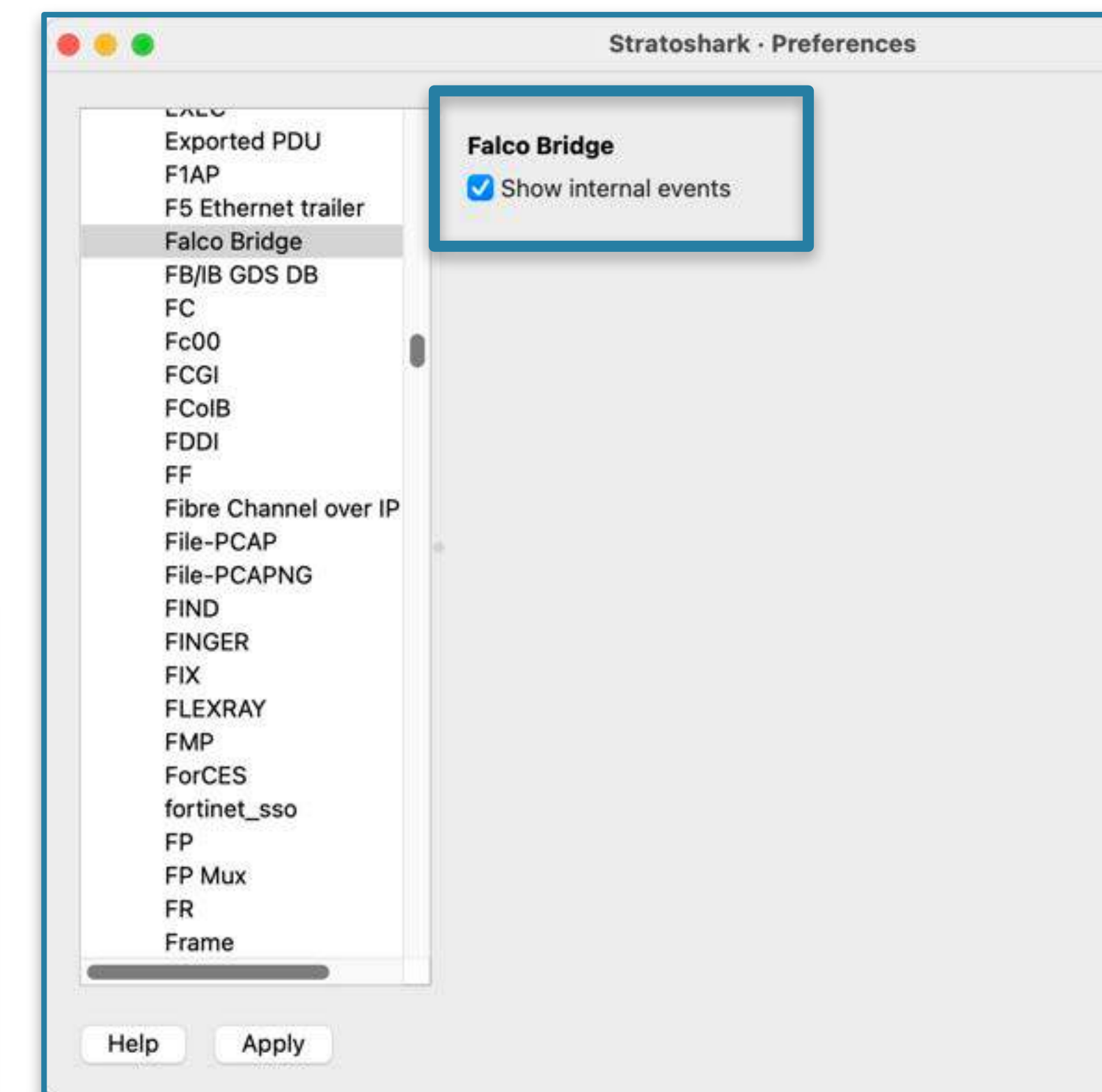


... are actually the metadata!



Apply a display filter ... <#>/>

No.	Time	Delta	Con	"cont	Pro	D	Event name	PID	TID	PPID	FD	FD Nar	Argument	Info
1	0.000000000	0.000000000					container							container [Internal event]
2	0.000000000	0.000000000					container							container [Internal event]
3	0.000000000	0.000000000					container							container [Internal event]
4	0.000000000	0.000000000					container							container [Internal event]
5	0.000000000	0.000000000					useradded							useradded [Internal event]
6	0.000000000	0.000000000					useradded							useradded [Internal event]
7	0.000000000	0.000000000					useradded							useradded [Internal event]
8	0.000000000	0.000000000					useradded							useradded [Internal event]
9	0.000000000	0.000000000					useradded							useradded [Internal event]
10	0.000000000	0.000000000					useradded							useradded [Internal event]
11	0.000000000	0.000000000					useradded							useradded [Internal event]
12	0.000000000	0.000000000					useradded							useradded [Internal event]
13	0.000000000	0.000000000					useradded							useradded [Internal event]



Apply a display filter ... <#>/>

No.	Time	Delta	Con	"cont	Pro	D	Event name	PID	TID	PPID	FD	FD Nar	Argument	Info
33437	6.902410205	0.000000000	h...	ic...	s...	>	switch	1...	17...	17...			next=...	switch
33438	6.903111720	0.000701511					switch			0			next=...	switch
33439	6.903120761	0.000009041	h...	ic...	s...	>	switch	1...	17...	17...			next=...	switch
33440	6.903826688	0.000705927				>	switch			0			next=...	switch
33441	6.903826688	0.000000000					procinfo							procinfo [Internal event]
33442	6.903826688	0.000000000					procinfo							procinfo [Internal event]
33443	6.903826688	0.000000000					procinfo							procinfo [Internal event]
33444	6.903826688	0.000000000					procinfo							procinfo [Internal event]
33445	6.903826688	0.000000000					procinfo							procinfo [Internal event]
33446	6.903826688	0.000000000					procinfo							procinfo [Internal event]
33447	6.903826688	0.000000000					procinfo							procinfo [Internal event]
33448	6.903826688	0.000000000					procinfo							procinfo [Internal event]
33449	6.903826688	0.000000000					procinfo							procinfo [Internal event]



What is this 'scap' file format?



- It's actually just pcapng...
- ...but with different block types
- packet data and event data can be in the same file (mergcap works), but Stratoshark crashes on the file (bug?)
- Difficult to make a profile that shows both packets and events in a clean way though...

0x00000201	Sysdig Machine Info Block
0x00000202	Sysdig Process Info Block, version 1
0x00000203	Sysdig FD List Block
0x00000204	Sysdig Event Block
0x00000205	Sysdig Interface List Block
0x00000206	Sysdig User List Block
0x00000207	Sysdig Process Info Block, version 2
0x00000208	Sysdig Event Block with flags
0x00000209	Sysdig Process Info Block, version 3
0x00000210	Sysdig Process Info Block, version 4
0x00000211	Sysdig Process Info Block, version 5
0x00000212	Sysdig Process Info Block, version 6
0x00000213	Sysdig Process Info Block, version 7



DEMO STRATOSHARK



Managing expectations...



- Stratoshark has just been born^W released...
... so still in its early stage!
- Thus a bit rough on the edges (bugs...)
 - mergecap of pcapng and scap for instance
 - no container.name in Stratoshark (apparently a falco libs bug)
 - ~~File -> Export Specified Events... does not work correctly (use sysdig instead!)~~
- New (community) development will bring new features
 - Just like how Wireshark developed over time (25+ years by now!)

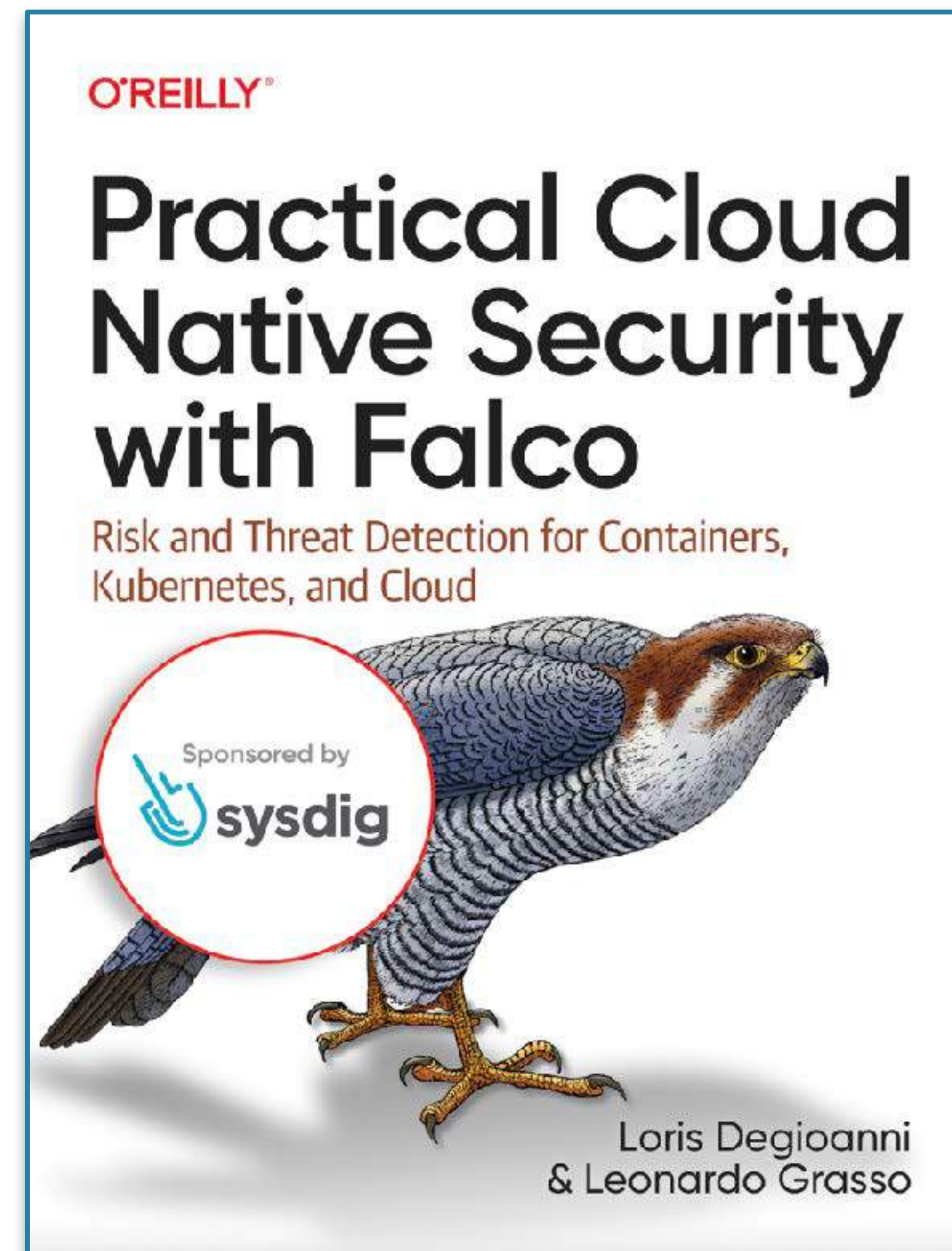
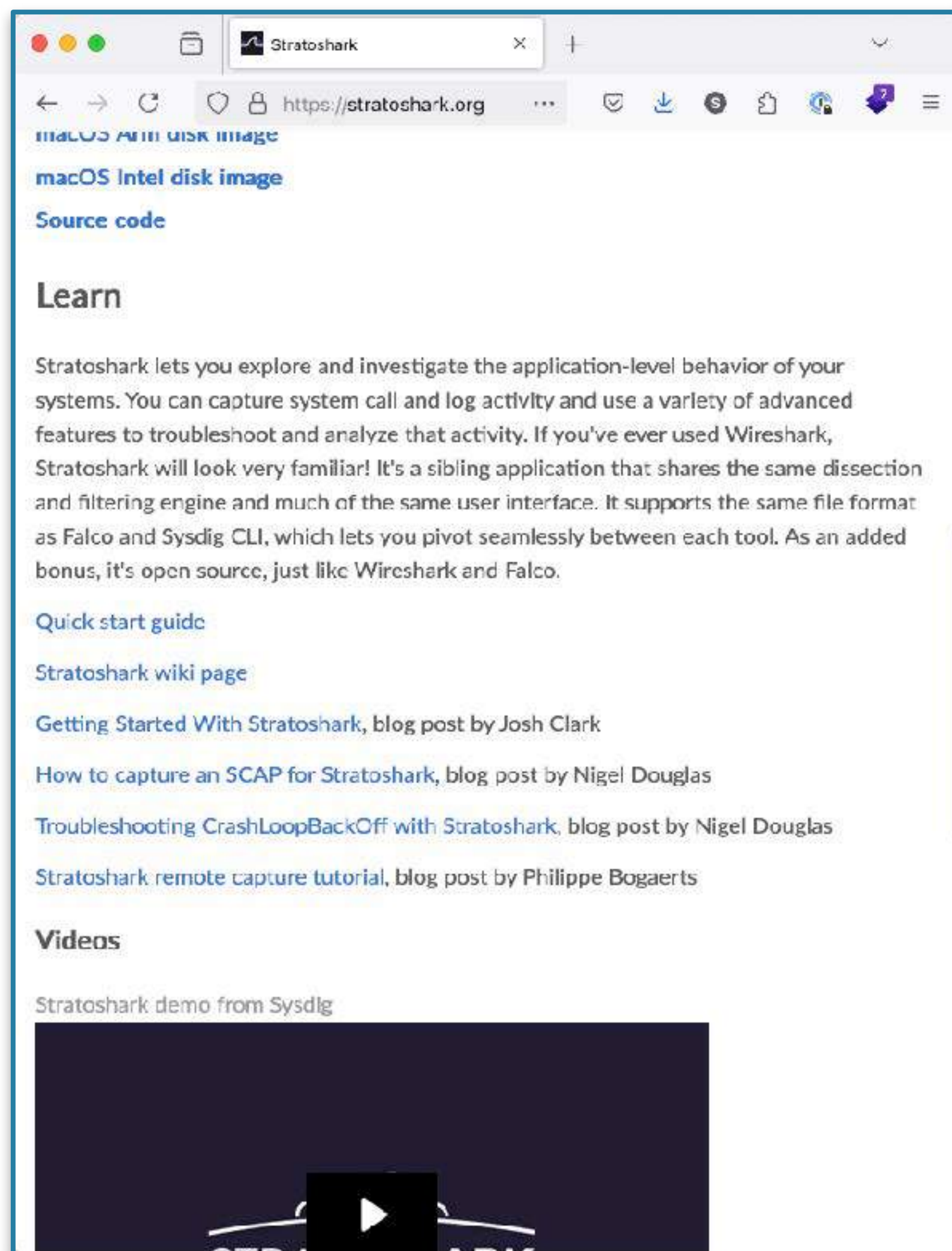


<https://www.flickr.com/photos/verbeeldingskr8/28895969942>





Further learning...





... and of course tomorrow:



Tales of a System Call Spelunker - Using sysdig and Stratoshark to examine system internals

 .ical

06-18, 15:00–17:15 (US/Eastern), Grand Ballroom Salons A-D  

With the recent release of Stratoshark, we finally have a familiar tool that helps us understand how the internals of servers and operating systems function. This talk will walk through some basic examples of how to set up and run sysdig to gather system call captures, and how to use Stratoshark to gain a deeper understanding of what runs on our networks.

From this talk, expect:

- Detailed sysdig and Stratoshark capture information
- Examples showing how packet data from Wireshark shows up in a Stratoshark capture
- Examples of real life troubleshooting with Stratoshark



[Josh Clark](#)

Josh has both academic and real-world experience in the world of protocol analysis. He holds an M.S. degree in Computer Engineering with a focus in network engineering and has spent the past 8 years designing, troubleshooting, and optimizing networks and applications.



Feedback:



(or through the online
conference agenda)

Still questions?
sake.blok@SYN-bit.nl

