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Guider: Linux Tracing Using Python

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<https://github.com/iipeace/guider>

[ln/iipeace](#)



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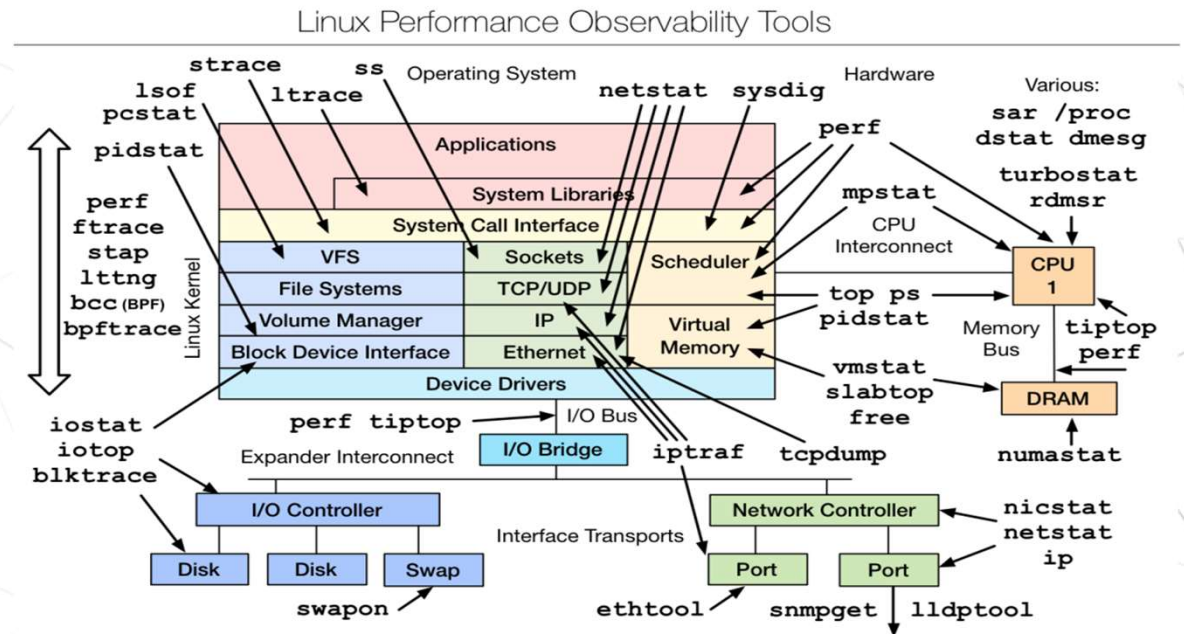
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- Tracing
- Demo



Introduction

- Tools
 - Monitoring
 - Profiling
 - Tracing





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Introduction

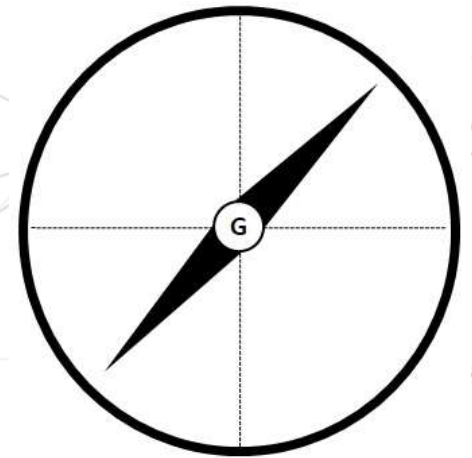
- Python
 - Productivity
 - Easy to use
 - Diverse packages
 - Language binding





Guider

- Guider: Runtime Performance Analyzer
 - Monitors, Profiles, Traces, Visualizes
 - Resources, Tasks, Functions
- Open Source
 - GPLv2
 - <https://github.com/iipeace/guider>
 - PIP, OE support
 - # pip install guider





Guider

- Requirement
 - No build, No install, No config, No restart
 - Python (≥ 2.7)
- Platform
 - Linux
 - Android
 - macOS (limited)
 - Windows (limited)





Guider

- Monitoring resource

```
[Top Info] [Time: 4729350.140] [Inter: 1.0] [Ctxt: 459222] [Life: +0/-0] [IRQ: 26756] [Core: 40] [Task: 553/756] [Load: 0/0/0] [RAM: 125.7G] [Swap: 8.0G]
[N0-DMA > diff: 0 / free: 15.5M / high: 32.0K / low: 20.0K / managed: 15.5M / min: 8.0K / present: 15.6M / spanned: 16.0M ]
[N0-DMA32 > diff: 0 / free: 1.9G / high: 4.6M / low: 2.8M / managed: 1.9G / min: 956.0K / present: 1.9G / spanned: 4.0G ]
[N0-Device > diff: 0 / free: 0 / high: 0 / low: 0 / managed: 0 / min: 0 / present: 0 / spanned: 0 ]
[N0-Movable > diff: 0 / free: 0 / high: 0 / low: 0 / managed: 0 / min: 0 / present: 0 / spanned: 0 ]
[N0-Normal > diff: -7.6M / free: 99.0G / high: 318.7M / low: 191.9M / managed: 123.9G / min: 65.1M / present: 126.0G / spanned: 126.0G ]
[IRQ > LOC: 18,929 / TIMER: 8,294 / SCHED: 7,594 / RES: 6,836 / RCU: 807 / CAL: 458 / 39: 10 / NET_RX: 10 / 16: 5 / HI: 5 / 40: 1 ]
[Cycle: 7.0G / Inst: 3.6G / IPC: 0.51 / CacheMiss : 9.9M(30%) / BrcMiss: 14.8M(1%) / Clk: 39.0G / MinFlt: 828 / MajFlt: 0]
```

ID	CPU(Usr/Ker/Blk/IRQ)	MemAvl(Per/	User/	Cache/	Kern)	Swap(Per/ In/Out)	PgRclm	BlkRW	NrFlt	Blk	NrSIRQ	PgMlk	PgDirt	Network																																																																	
Total	9 % (1/ 6/ 0/ 0)	126396 (98/	375/	24856/	223)	0 (0/ 0/ 0)	0/0	0/0	0	0	17214	6771	35	1K/0																																																																	
Core/0	100 % (0 /100/ 0 / 0)	Core/1	0 % (0 / 0 / 0 / 0)	Core/2	0 % (0 / 0 / 0 / 0)	Core/3	0 % (0 / 0 / 0 / 0)	Core/4	0 % (0 / 0 / 0 / 0)	Core/5	0 % (0 / 0 / 0 / 0)	Core/6	0 % (0 / 0 / 0 / 0)	Core/7	0 % (0 / 0 / 0 / 0)	Core/8	72 % (0 /71 / 0 / 0)	Core/9	0 % (0 / 0 / 0 / 0)	Core/10	15 % (0 /14 / 0 / 0)	Core/11	0 % (0 / 0 / 0 / 0)	Core/12	100 % (57 /43 / 0 / 0)	Core/13	0 % (0 / 0 / 0 / 0)	Core/14	0 % (0 / 0 / 0 / 0)	Core/15	0 % (0 / 0 / 0 / 0)	Core/16	32 % (0 /31 / 0 / 0)	Core/17	3 % (1 / 1 / 0 / 0)	Core/18	0 % (0 / 0 / 0 / 0)	Core/19	0 % (0 / 0 / 0 / 0)	Core/20	0 % (0 / 0 / 0 / 0)	Core/21	0 % (0 / 0 / 0 / 0)	Core/22	0 % (0 / 0 / 0 / 0)	Core/23	0 % (0 / 0 / 0 / 0)	Core/24	0 % (0 / 0 / 0 / 0)	Core/25	0 % (0 / 0 / 0 / 0)	Core/26	0 % (0 / 0 / 0 / 0)	Core/27	0 % (0 / 0 / 0 / 0)	Core/28	0 % (0 / 0 / 0 / 0)	Core/29	0 % (0 / 0 / 0 / 0)	Core/30	0 % (0 / 0 / 0 / 0)	Core/31	0 % (0 / 0 / 0 / 0)	Core/32	0 % (0 / 0 / 0 / 0)	Core/33	0 % (0 / 0 / 0 / 0)	Core/34	0 % (0 / 0 / 0 / 0)	Core/35	0 % (0 / 0 / 0 / 0)	Core/36	0 % (0 / 0 / 0 / 0)	Core/37	0 % (0 / 0 / 0 / 0)	Core/38	0 % (0 / 0 / 0 / 0)	Core/39	0 % (0 / 0 / 0 / 0)

DEV	BUSY	AVQ	READ	WRITE	FREE(	DIFF)	USAGE	TOTAL	NrAVF	FS	MountPoint	<Option>
/dev/sda2	0%	0	0	0	608.0M(	0)	37%	975.0M	63.7K	ext4	/boot	<ro,relatime>
/dev/sda1	0%	0	0	0	503.0M(	0)	1%	510.0M	0	vfat	/boot/efi	<rw,relatime>



Guider

- Monitoring task

Network		Receive					Transfer				
Dev	IP	Size	Packet	Error	Drop	Multicast	Size	Packet	Error	Drop	Multicast
docker0	172.17.0.1	0	0	0	0	0	0	0	0	0	0
enp7s0		4.0K	19	0	0	1	652	6	0	0	0
lo	127.0.0.1	0	0	0	0	0	0	0	0	0	0
[TOTAL]		4.0K	19	0	0	1	652	6	0	0	0

Process (	PID/	PPID/	Nr/ Pri)	CPU(Usr/Ker/Dly)	VSS(RSS/Txt/Shr/Swp)	Blk(RD/ WR/NrFlt)	SID	USER	FD	LifeTime	Parent
screen (	5453/	1/	1/C 0)	99(57/ 42/ -)	11(7/ 0/ 2/ 0)	0(0/ 0/ 0)	5453	-	64	54d:05:34	systemd(1)
			MEM(STACK/1)	VSS: 132.0K / RSS: 116.0K / PSS: 116.0K / SWAP:		0 / HUGE: 0 / LOCK: 0 / SDRT: 0 / PDRT: 116.0K					
			MEM(FILE/12)	VSS: 6.2M / RSS: 2.5M / PSS: 405.0K / SWAP:		0 / HUGE: 0 / LOCK: 0 / SDRT: 0 / PDRT: 132.0K					
			MEM(ETC/3)	VSS: 20.0K / RSS: 4.0K / PSS: 0 / SWAP:		0 / HUGE: 0 / LOCK: 0 / SDRT: 0 / PDRT: 0					
			MEM(ANON/11)	VSS: 5.3M / RSS: 5.1M / PSS: 5.1M / SWAP:		0 / HUGE: 0 / LOCK: 0 / SDRT: 0 / PDRT: 5.1M					
			MEM(SUM)	VmPeak: 11.6M, VmHWM: 7.8M, VmData: 5.4M, HugetlbPages: 0, RssAnon: 5.4M, RssFile: 2.4M, RssShmem: 0							
yes (848357/806199/	1/C 0)			99(0/ 99/ -)	5(0/ 0/ 0/ 0)	0(0/ 0/ 0)	5454	-	64	00:00:03	vi(806199)
			MEM(STACK/1)	VSS: 132.0K / RSS: 12.0K / PSS: 12.0K / SWAP:		0 / HUGE: 0 / LOCK: 0 / SDRT: 0 / PDRT: 12.0K					
			MEM(FILE/4)	VSS: 5.0M / RSS: 1.7M / PSS: 100.0K / SWAP:		0 / HUGE: 0 / LOCK: 0 / SDRT: 0 / PDRT: 40.0K					
			MEM(ETC/3)	VSS: 20.0K / RSS: 4.0K / PSS: 0 / SWAP:		0 / HUGE: 0 / LOCK: 0 / SDRT: 0 / PDRT: 0					
			MEM(ANON/3)	VSS: 160.0K / RSS: 44.0K / PSS: 44.0K / SWAP:		0 / HUGE: 0 / LOCK: 0 / SDRT: 0 / PDRT: 44.0K					
			MEM(SUM)	VmPeak: 5.3M, VmHWM: 520.0K, VmData: 180.0K, HugetlbPages: 0, RssAnon: 64.0K, RssFile: 456.0K, RssShmem: 0							
kworker/u80:3+ (848358/	2/	1/C 0)		81(0/ 81/ -)	0(0/ 0/ -/ -)	0(0/ 0/ 0)	-	-	-	00:00:01	kthreadd(2)



Guider

- Monitoring function

[illegible]



Guider

- Monitoring syscall

```
[Top Syscall Info] [Time: 4730368.320] [Interval: 1.001] [Samples: 2,390] [CPU: 2%] [a.out(848373): 5%(U0%+S5%)/2M] [guider(848372): 93%/49M]
```

Usage	Function	<Elapsed>
-------	----------	-----------

```
40.0% | openat <Cnt: 955, Tot: 0.000000, Avg: 0.000000, Max: 0.000000, Err: 955>
```

```
50.1% | <- open@GLIBC_2.2.5[/usr/lib/x86_64-linux-gnu/libc-2.31.so] <- printPeace2[/home/peacelee/test/a.out]
```

```
<- printPeace[/home/peacelee/test/a.out] <- main[/home/peacelee/test/a.out]
```

```
<- __libc_start_main@GLIBC_2.2.5[/usr/lib/x86_64-linux-gnu/libc-2.31.so] <- _start[/home/peacelee/test/a.out] <Cnt: 478>
```

```
49.9% | <- open@GLIBC_2.2.5[/usr/lib/x86_64-linux-gnu/libc-2.31.so]
```

[illegible]

```
<- printPeace2[/home/peacelee/test/a.out] <- printPeace[/home/peacelee/test/a.out] <- main[/home/peacelee/test/a.out]
```

```
<- libc start main@GLIBC 2.2.5[/usr/lib/x86_64-linux-gnu/libc-2.31.so] <- start[/home/peacelee/test/a.out] <Cnt: 477>
```

```
20.0% | read <Cnt: 478, Tot: 0.000000, Avg: 0.000000, Max: 0.000000, Err: 478>
```

```
100.0% | <- read@GLIBC 2.26[/usr/lib/x86_64-linux-gnu/libc-2.31.so]
```

[illegible]

```
<- printPeace2[/home/peacelee/test/a.out] <- printPeace[/home/peacelee/test/a.out] <- main[/home/peacelee/test/a.out]
```

```
<- libc start main@GLIBC 2.2.5[/usr/lib/x86_64-linux-gnu/libc-2.31.so] <- start[/home/peacelee/test/a.out] <Cnt: 478>
```

```
20.0% | close <Cnt: 478, Tot: 0.000000, Avg: 0.000000, Max: 0.000000, Err: 478>
```

```
100.0% |  <- close@GLIBC 2.4[/usr/lib/x86_64-linux-gnu/libc-2.31.so]
```

[illegible]

```
<- printPeace2[/home/peacelee/test/a.out] <- printPeace[/home/peacelee/test/a.out] <- main[/home/peacelee/test/a.out]
```

```
<- libc start main@GLIBC 2.2.5[/usr/lib/x86_64-linux-gnu/libc-2.31.so] <- start[/home/peacelee/test/a.out] <Cnt: 478>
```




- Profiling resource
 - CPU
 - Memory
 - Block
 - Network
 - Storage

Guider

[Top Summary Info]

IDX	Interval	CPU	Avl/User/Cache	BlkRW	Blk	SWAP
1	START - 4790198.480	1	126417/359/24947	0/0	0	0
2	4790198.480 - 4790199.510	1	126412/361/24948	0/0	0	0
3	4790199.510 - 4790200.530	1	126411/362/24948	0/0	0	0
4	4790200.530 - 4790201.560	1	126416/361/24948	0/0	0	0
5	4790201.560 - 4790202.590	1	126416/361/24948	0/0	0	0
6	4790202.590 - 4790203.610	1	126416/361/24948	0/0	0	0
7	4790203.610 - 4790204.640	1	126416/361/24948	0/0	0	0
8	4790204.640 - 4790205.660	1	126416/361/24948	0/0	0	0

[Top Storage Info] (Unit: %)

Device	Busy/Read/Write/Free	1	2
		6	7
sda2	0.0/0/0/0	0/0/0/0 0/0/0/0	0/0/0/0 0/0/0/0
sda1	0.0/0/0/0	0/0/0/0 0/0/0/0	0/0/0/0 0/0/0/0

[Top Network Info] (Unit: %)

Device	Read/Write	1	2
		6	7
docker0	0/0	0/0 0/0	0/0 0/0
enp7s0	30K/55K	9K/32K 2K/0	6K/17K 2K/0



Guider

- Profiling task
 - CPU
 - Delay
 - VSS
 - RSS
 - Block

[Top CPU Info] (Unit: %) (New: +) (Die: -)

COMM (	PID/	PPID/	Nr/ Pri)	Min/Avg/Max/Tot		1	2	3	4	5	6
[CPU/AVG] (	-/	-/	-/ -)	1/1.0/1/8		1	1	1	1	1	1
guider (	875512/	5462/	1/C 0)	1/1.9/3/15		2	2	3	2	1	2
*find (	875514/	875513/	1/C 0)	2/0.5/2/4		+2	2	0	0	0	0
screen (	5453/	1/	1/C 0)	1/0.1/1/1		1	0	0	0	0	0
sshd (	875485/	875349/	1/C 0)	1/0.1/1/1		1	0	0	0	0	0

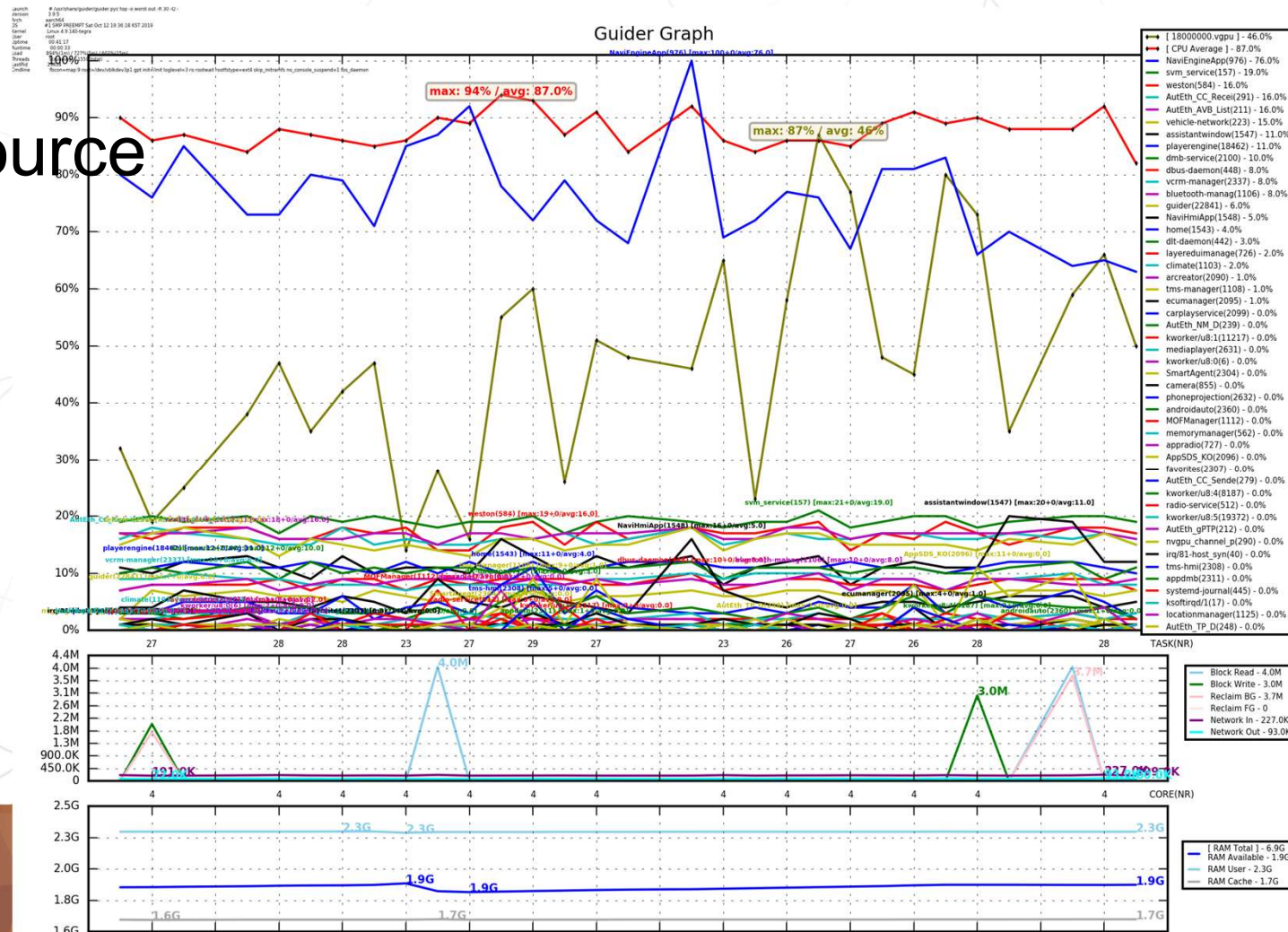
[Top VSS Info] (Unit: MB) (Change: ^)

COMM (	PID/	PPID/	Nr/ Pri)	Max		1	2	3	4	5	6	7	8
[FREE/MIN] (	-/	-/	-/ -)	126411		126417	126412	126411	126416	126416	126416	126416	126416
guider^(	875512/	5462/	1/C 0)	46		45	46	46	46	46	46	46	46
sshd (	875485/	875349/	1/C 0)	13		13	13	13	13	13	13	13	13
screen (	5453/	1/	1/C 0)	11		11	11	11	11	11	11	11	11
*find (	875514/	875513/	1/C 0)	8		8	8	8	8	8	8	8	8



Guider

- Visualizing resource
 - SVG format
 - Responsive
 - CPU
 - Memory
 - Block
 - Network

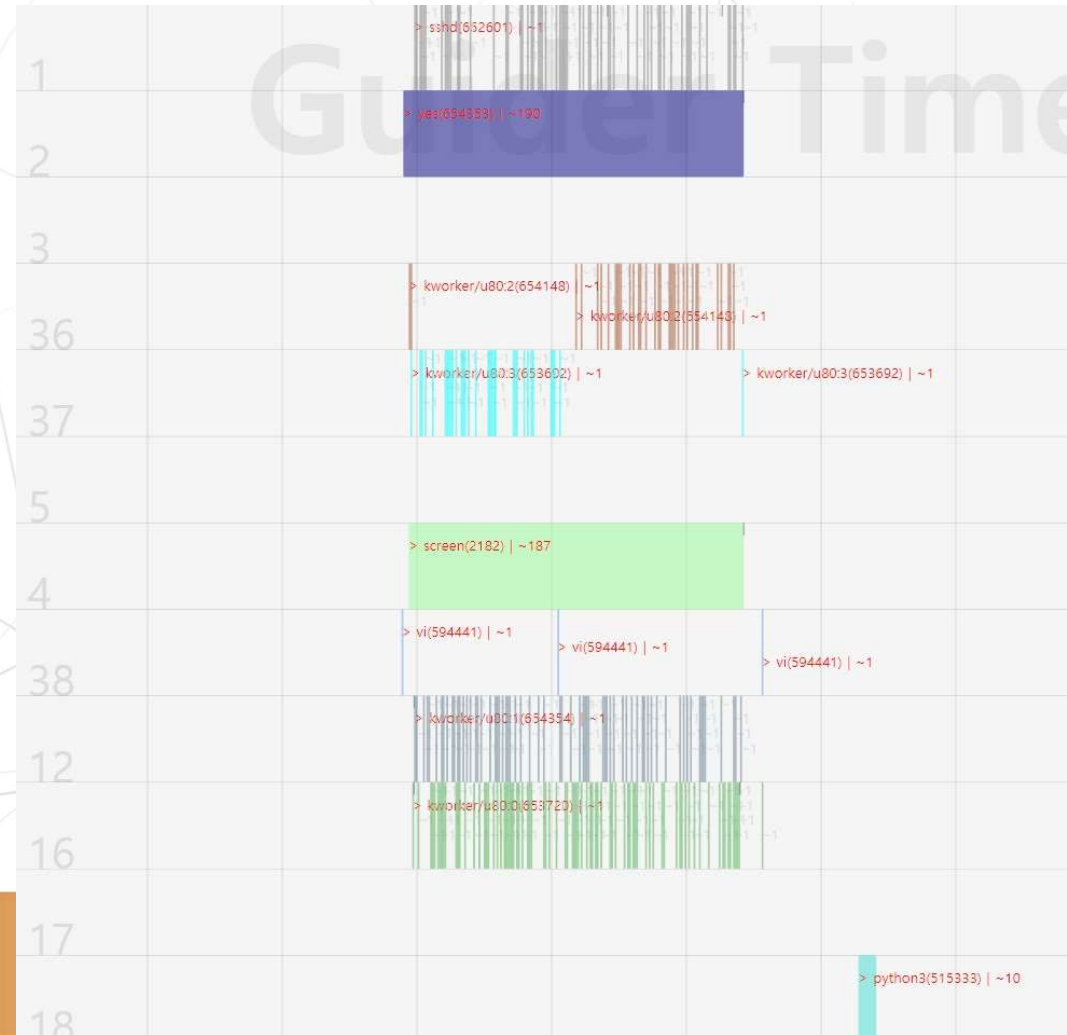




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- Visualizing scheduling
 - SVG format
 - Responsive
 - Timeslice
 - Preemption
 - Blocking

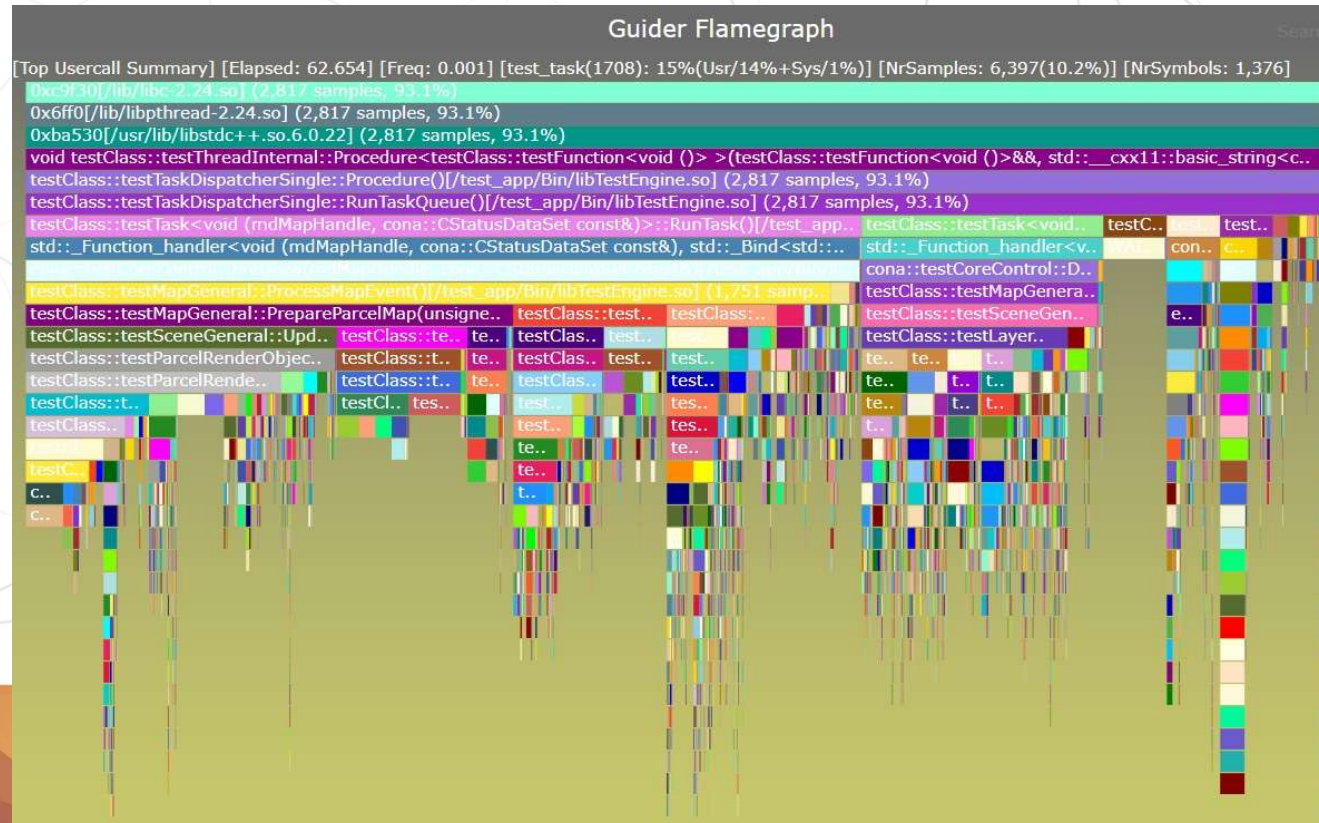
Guider





Guider

- Visualizing callstack
 - SVG format
 - Responsive
 - CPU
 - Blocking
 - Leak
 - Syscall
 - Function





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Tracing

- Features
 - Function
 - C, C++, Rust, Go, ...
 - Java, Node.js
 - Python
 - Syscall
 - Signal
 - I/O



Tracing

- How to start tracing?
 - Start with the target program
 - guider [CMD] [PATH]
 - # guider btrace ./a.out
 - # guider btrace ls
 - Attach to the target task
 - guider [CMD] -g [COMM|TID]
 - # guider btrace -g a.out
 - # guider btrace -g 12313
 - Print call stack
 - guider [CMD] ... -H

[TRACE]			
	btrace	<Function>	(Linux)
	leaktrace	<Leak>	(Linux)
	pytrace	<Python>	(Linux)
	sigtrace	<Signal>	(Linux)
	strace	<Syscall>	(Linux)
	utrace	<Function>	(Linux)



Tracing

- Function (C, C++, Rust, Go, ...)
 - # guider **btrace** -g go -H
 - Trace all function calls for all threads named go

```
runtime.goexit/0x453581 [/home/peacelee/test/go]
runtime.main/0x42b14e [/home/peacelee/test/go]
main.main/0x48cf39 [/home/peacelee/test/go]
fmt.Fprintln/0x48677b [/home/peacelee/test/go]
os.(*File).Write/0x482907 [/home/peacelee/test/go]
internal/poll.(*FD).Write/0x4822fc [/home/peacelee/test/go]
0.000672 go(919368) internal/poll.(*FD).writeUnlock/0x4818e0(0x1,0x0,0x0,0x0,0x0,0x0) [/home/peacelee/test/go]
0.010595 go(919367) runtime.unlock/0x409810(0x0,0x0,0x0,0xc00009bf30,0x26,0xc00009bf38) [/home/peacelee/test/go]
0.010606 go(919367) runtime.usleep/0x454eb0(0x0,0x11bf48c46887a2,0x0,0xc00009bf30,0x26,0xc00009bf38) [/home/peacelee/test/go]
0.000682 go(919368) internal/poll.(*fdMutex).rwunlock/0x481740(0x1,0x0,0x0,0x0,0x0,0x0) [/home/peacelee/test/go]
0.000693 go(919368) runtime.deferreturn/0x428d20(0xc,0x80000000000,0xc0000f006c,0x0,0x4,0xfffff80000000001) [/home/peacelee/test/go]
0.000704 go(919368) fmt.(*pp).free/0x486400(0xc0000ee008,0x0,0xb,0x0,0x4,0xfffff80000000001) [/home/peacelee/test/go]
0.000715 go(919368) sync.(*Pool).Put/0x465920(0xc0000ee008,0x0,0xb,0x0,0x4,0xfffff80000000001) [/home/peacelee/test/go]
0.000726 go(919368) sync.(*Pool).pin/0x465d00(0xc0000ee008,0x0,0xb,0x0,0x4,0xfffff80000000001) [/home/peacelee/test/go]
0.000736 go(919368) sync.runtime_procPin/0x436e10(0xc0000ee008,0x0,0xb,0x0,0x4,0xfffff80000000001) [/home/peacelee/test/go]
0.000747 go(919368) sync.runtime_procUnpin/0x436e40(0xc0000ee008,0x0,0x0,0x0,0x4,0xfffff80000000001) [/home/peacelee/test/go]
0.000758 go(919368) runtime.convT64/0x408f30(0xc0000ee008,0x0,0x0,0x0,0x4,0xfffff80000000001) [/home/peacelee/test/go]
0.000769 go(919368) runtime.mallocgc/0x40ac10(0xc0000ee008,0x0,0x0,0x0,0x4,0xfffff80000000001) [/home/peacelee/test/go]
0.000780 go(919368) runtime.publicationBarrier/0x452da0(0x8,0x0,0x7fe5ba55d008,0xc000366770,0x49f1c0,0xfffff80000000001) [/home/peacelee/test/go]
0.000790 go(919368) fmt.Fprintln/0x4866f0(0x8,0x4db5e0,0x4d9fe0,0xc000366770,0x49f1c0,0xfffff80000000001) [/home/peacelee/test/go]
```



Tracing

- Function (C, C++, Rust, Go, ...)
 - # guider btrace -g go -H -a -c “syscall.Syscall*”
 - Trace “syscall.Syscall” calls for all threads named go

```
runtime.goexit/0x453581 [/home/peacelee/test/go]
runtime.main/0x42b14e [/home/peacelee/test/go]
main.main/0x48cf39 [/home/peacelee/test/go]
fmt.Fprintln/0x48677b [/home/peacelee/test/go]
os.(*File).Write/0x482907 [/home/peacelee/test/go]
internal/poll.(*FD).Write/0x482151 [/home/peacelee/test/go]
syscall.write/0x4809ba [/home/peacelee/test/go]
0.013286 go(919455)      syscall.Syscall/0x480d10(0xc000446090,0xc0000a80c0,0x1,0x11,0xc000446090,0xb) [/home/peacelee/test/go]
runtime.goexit/0x453581 [/home/peacelee/test/go]
runtime.main/0x42b14e [/home/peacelee/test/go]
main.main/0x48cf39 [/home/peacelee/test/go]
fmt.Fprintln/0x48677b [/home/peacelee/test/go]
os.(*File).Write/0x482907 [/home/peacelee/test/go]
internal/poll.(*FD).Write/0x482151 [/home/peacelee/test/go]
syscall.write/0x4809ba [/home/peacelee/test/go]
0.013298 go(919455)      syscall.Syscall/0x480d10(0xc000446090,0xc0000a80c0,0x1,0x11,0xc000446090,0xb) [/home/peacelee/test/go]
```



Tracing

- Function (C, C++, Rust, Go, ...)
 - Call command
 - When target functions called
 - Show, Manipulate
 - Args, Mem, Env
 - Control
 - Thread, Flow
 - Inject
 - Lib, Code

Commands:

```
acc      print accumulation stat [NAME:VAR|REG|VAL]
check    check values [VAR|ADDR|REG:OP(EQ/DF/INC/BT
condexit exit if tracing was started
dist     print distribution stat [NAME:VAR|REG|VAL]
dump     dump specific memory range to a file [NAME
exec     execute command [CMD]
exit     exit
filter   print only filtered context [VAR|ADDR|REG:
getarg   print specific registers [REGS]
getenv   print specific environment variable [VAR]
getret   print return value [CMD]
jump     jump to specific function with specific ar
kill     terminate target
load     load specific library [PATH]
log      print specific message [MESSAGE]
map      print memory map
print    print context [VAR]
pyfile   execute specific python file [PATH:SYNC]
pystr    execute python code [CODE:SYNC]
rdmem    print specific memory or register [VAR|ADD
repeat   call again repeatedly [CNT]
ret      return specific value immediately [VAL]
save     save previous value [VAR]
setarg   change value for specific register [REG#VA
setenv   change specific environment variable [VAR:
setret   change return value [VAL:CMD]
sleep    sleep for seconds [SEC]
start    start printing all functions
stop     pause tracing
syscall  call a syscall [FUNC#ARGS]
thread   create a new thread
usercall call a specific function [FUNC#ARGS]
wrmem    change specific memory or register [VAR|AD
```



Tracing

- Function (C, C++, Rust, Go, ...)
 - # guider btrace “yes ABCD” -H -a -c “write|rdmem:1”
 - Trace “write” calls from “yes ABCD” command
 - Read the memory value pointed to by the 1st argument

```
0x27e0/0x55ff1646c80e [/usr/bin/yes]
  __libc_start_main@GLIBC_2.2.5/0x7f5ea53230b3 [/usr/lib/x86_64-linux-gnu/libc-2.31.so]
    0x2580/0x55ff1646c78e [/usr/bin/yes]
      0x2cf0/0x55ff1646cd36 [/usr/bin/yes]
        0x4c40/0x55ff1646ec6e [/usr/bin/yes]
0.024323      write/0x7f5ea540d1d0(0x1,0x55ff16ddc440,0x1ffe) [/usr/lib/x86_64-linux-gnu/libc-2.31.so]
[  rdmem] 0x55ff16ddc440: 'ABCD\nABCD\nABCD\nABCD\nABCD\nABCD\nAB' (32byte)
```



Tracing

- Function (Java, Node.js)
 - # guider btrace -g node -H -q JITSYM
 - Support JIT-compiled symbol resolution
 - Requirement
 - Run node.js with `--perf-basic-prof-only-functions` option
 - Run java with perf-map-agent



Tracing

```

lib_c_start_main@GLIBC_2.2.5/0x7f0012aca0b3 [/usr/lib/x86_64-linux-gnu/libc-2.31.so]
main/0x40117e [/usr/bin/node]
node::Start(int, char**)/0x7f00131ef676 [/usr/lib/x86_64-linux-gnu/libnode.so.64]
node::Start(v8::Isolate*, node::IsolateData*, std::vector<std::__cxx11::basic_string<char, std::char_traits<char>, std::allocator<char>>>>/0x7f00131e7f0a [/usr/lib/x86_64-linux-gnu/libnode.so.64]
node::LoadEnvironment(node::Environment*)/0x7f00131e4b10 [/usr/lib/x86_64-linux-gnu/libnode.so.64]
v8::Function::Call(v8::Local<v8::Context>, v8::Local<v8::Value>*)/0x7f001344809e [/usr/lib/x86_64-linux-gnu/libnode.so.64]
v8::internal::Execution::Call(v8::internal::Isolate*, v8::internal::Handle<v8::Object>, v8::internal::Handle<v8::ScriptOrModule>*)/0xab0720/0x7f0013768762 [/usr/lib/x86_64-linux-gnu/libnode.so.64]
0xab0110/0x7f001376824e [/usr/lib/x86_64-linux-gnu/libnode.so.64]
JIT/0x1a739f863ea1 [JIT]
Builtin:JSEntryTrampoline/0x1a739f79bd8f [JIT]
Builtin:InterpreterEntryTrampoline/0x1a739f79ec12 [JIT]
Builtin:InterpreterEntryTrampoline/0x1a739f79ec12 [JIT]
Builtin:InterpreterEntryTrampoline/0x1a739f79ec12 [JIT]
Builtin:InterpreterEntryTrampoline/0x1a739f79ec12 [JIT]
Builtin:InterpreterEntryTrampoline/0x1a739f79ec12 [JIT]
Builtin:InterpreterEntryTrampoline/0x1a739f79ec12 [JIT]
Builtin:InterpreterEntryTrampoline/0x1a739f79ec12 [JIT]
LazyCompile:* /home/peacelee/test/test.js:1/0x1a739f8f7cf1 [JIT]
JIT/0x1a739f8f7a81 [JIT]
0x630d40/0x7f00132e8fb0 [/usr/lib/x86_64-linux-gnu/libnode.so.64]
v8::Function::Call(v8::Local<v8::Context>, v8::Local<v8::Value>*, int, v8::Local<v8::Value>*)/0xab0720/0x7f0013768762 [/usr/lib/x86_64-linux-gnu/libnode.so.64]
0xab0110/0x7f001376824e [/usr/lib/x86_64-linux-gnu/libnode.so.64]
JIT/0x1a739f863ea1 [JIT]
Builtin:JSEntryTrampoline/0x1a739f79bd8f [JIT]
Builtin:ArgumentsAdaptorTrampoline/0x1a739f7971e3 [JIT]
LazyCompile:*log console.js:199/0x1a739f8f3411 [JIT]
LazyCompile:*writeOrBuffer _stream_writable.js:365/0x1a739f8f558e [JIT]
LazyCompile:*onwriteStateUpdate _stream_writable.js:443/0x1a739f8f7e4 [JIT]
LazyCompile:*needFinish _stream_writable.js:609/0x1a739f8f7e4 [JIT]
LazyCompile:*getDefaultTriggerAsyncId internal/async_hooks.js:270 [JIT]

```



Tracing

- Function (Python)
 - # guider **pytrace** -g iotop -H
 - Trace all method calls for all threads named iotop

```
<module> [/usr/sbin/iotop:6]
  main [/usr/lib/python3/dist-packages/iotop/ui.py:680]
    <lambda> [/usr/lib/python3/dist-packages/iotop/ui.py:727]
      run_iotop [/usr/lib/python3/dist-packages/iotop/ui.py:615]
        wrapper [/usr/lib/python3.8/curses/__init__.py:63]
          run_iotop_window [/usr/lib/python3/dist-packages/iotop/ui.py:601]
            run [/usr/lib/python3/dist-packages/iotop/ui.py:180]
              resize [/usr/lib/python3/dist-packages/iotop/ui.py:177]
              refresh_processes [/usr/lib/python3/dist-packages/iotop/data.py:459]
              update_process_counts [/usr/lib/python3/dist-packages/iotop/data.py:437]
              list_tgids [/usr/lib/python3/dist-packages/iotop/data.py:404]
              get_process [/usr/lib/python3/dist-packages/iotop/data.py:393]
              is_monitored [/usr/lib/python3/dist-packages/iotop/data.py:263]
              list_tids [/usr/lib/python3/dist-packages/iotop/data.py:423]
              get_thread [/usr/lib/python3/dist-packages/iotop/data.py:353]
              get_single_task_stats [/usr/lib/python3/dist-packages/iotop/data.py:158]
              send [/usr/lib/python3/dist-packages/iotop/netlink.py:210]
              send [/usr/lib/python3/dist-packages/iotop/netlink.py:238]
              _nl_send [/usr/lib/python3/dist-packages/iotop/netlink.py:25]

0.510658 iotop(917437)
0.510688 iotop(917437)
0.511301 iotop(917437)
0.511340 iotop(917437)
0.520806 iotop(917437)
0.520826 iotop(917437)
0.520846 iotop(917437)
0.520866 iotop(917437)
0.520885 iotop(917437)
0.520903 iotop(917437)
0.520926 iotop(917437)
0.520945 iotop(917437)
```




Tracing

- Syscall
 - # guider **strace -g node -H -q JITSYM**
 - Trace all syscalls with JIT symbols for running node

```
0.030115 node(1072393) write(1>/dev/null, 0x17b73e0, 0x2)
<- write@GLIBC_2.28[/usr/lib/x86_64-linux-gnu/libpthread-2.31.so] <- 0x13250[/usr/lib/x86_64-linux-gnu/libuv.so.1.0.0]
<- uv_fs_write[/usr/lib/x86_64-linux-gnu/libuv.so.1.0.0] <- 0x573090[/usr/lib/x86_64-linux-gnu/libnode.so.64] <- JIT[JIT]
<- LazyCompile:*writeSync fs.js:551[JIT] <- Builtin:ArgumentsAdaptorTrampoline[JIT]
<- LazyCompile:*writeOrBuffer _stream_writable.js:365[JIT] <- LazyCompile:*log console.js:199[JIT]
<- Builtin:ArgumentsAdaptorTrampoline[JIT] <- Builtin:JSEntryTrampoline[JIT] <- JIT[JIT]
<- 0xab0110[/usr/lib/x86_64-linux-gnu/libnode.so.64] <- 0xab0720[/usr/lib/x86_64-linux-gnu/libnode.so.64]
<- v8::internal::Execution::Call(v8::internal::Isolate*, v8::internal::Handle<v8::internal::Object>, v8::internal::Handle<v8::internal::Object>, v8::internal::Handle<v8::internal::Object>)[/usr/lib/x86_64-linux-gnu/libnode.so.64]
<- v8::Function::Call(v8::Local<v8::Context>, v8::Local<v8::Value>, int, v8::Local<v8::Value>*)[/usr/lib/x86_64-linux-gnu/libnode.so.64]
<- 0x630d40[/usr/lib/x86_64-linux-gnu/libnode.so.64] <- JIT[JIT] <- LazyCompile:* /home/peacelee/test/test.js:1[JIT]
<- Builtin:InterpreterEntryTrampoline[JIT] <- Builtin:JSEntryTrampoline[JIT] * 8 <- JIT[JIT]
<- 0xab0110[/usr/lib/x86_64-linux-gnu/libnode.so.64] <- 0xab0720[/usr/lib/x86_64-linux-gnu/libnode.so.64]
<- v8::internal::Execution::Call(v8::internal::Isolate*, v8::internal::Handle<v8::internal::Object>, v8::internal::Handle<v8::internal::Object>, v8::internal::Handle<v8::internal::Object>)[/usr/lib/x86_64-linux-gnu/libnode.so.64]
<- v8::Function::Call(v8::Local<v8::Context>, v8::Local<v8::Value>, int, v8::Local<v8::Value>*)[/usr/lib/x86_64-linux-gnu/libnode.so.64]
<- 0x52cae0[/usr/lib/x86_64-linux-gnu/libnode.so.64]
<- node::LoadEnvironment(node::Environment*)[/usr/lib/x86_64-linux-gnu/libnode.so.64]
<- node::Start(v8::Isolate*, node::IsolateData*, std::vector<std::cxx11::basic_string<char, std::char_traits<char>, std::allocator<char>>>)[/usr/lib/x86_64-linux-gnu/libnode.so.64]
<- node::Start(int, char**) [/usr/lib/x86_64-linux-gnu/libnode.so.64]
= 2(0x2) [0.000038]
```



Tracing

- Syscall
 - # guider **strace** -g iotop -H -q PYSTACK
 - Trace all syscalls with python stack for running iotop

```
0.421049 iotop(988525) sendto(5>socket:[4281212], 0x7f0bc8e8f690, 0x1c, 0x0, 0x0, 0x0)
<- send[/usr/lib/python3/dist-packages/iotop/netlink.py] <- get_single_task_stats[/usr/lib/python3/dist-packages/iotop/data.py]
<- update_process_counts[/usr/lib/python3/dist-packages/iotop/data.py]
<- refresh_processes[/usr/lib/python3/dist-packages/iotop/data.py] <- run[/usr/lib/python3/dist-packages/iotop/ui.py]
<- run_iotop_window[/usr/lib/python3/dist-packages/iotop/ui.py] <- wrapper[/usr/lib/python3.8/curses/__init__.py]
<- run_iotop[/usr/lib/python3/dist-packages/iotop/ui.py] <- <lambda>[/usr/lib/python3/dist-packages/iotop/ui.py]
<- main[/usr/lib/python3/dist-packages/iotop/ui.py] <- <module>[/usr/sbin/iotop]
= 28(0x1c) [0.000061]
0.421130 iotop(988525) recvfrom(5>socket:[4281212], 0xf17cc0, 0x4000, 0x0, 0x7ffe217869a0, 0x7ffe2178696c)
<- recv[/usr/lib/python3/dist-packages/iotop/netlink.py] <- recv[/usr/lib/python3/dist-packages/iotop/genetlink.py]
<- get_single_task_stats[/usr/lib/python3/dist-packages/iotop/data.py]
<- update_process_counts[/usr/lib/python3/dist-packages/iotop/data.py]
<- refresh_processes[/usr/lib/python3/dist-packages/iotop/data.py] <- run[/usr/lib/python3/dist-packages/iotop/ui.py]
<- run_iotop_window[/usr/lib/python3/dist-packages/iotop/ui.py] <- wrapper[/usr/lib/python3.8/curses/__init__.py]
<- run_iotop[/usr/lib/python3/dist-packages/iotop/ui.py] <- <lambda>[/usr/lib/python3/dist-packages/iotop/ui.py]
<- main[/usr/lib/python3/dist-packages/iotop/ui.py] <- <module>[/usr/sbin/iotop] = 380(0x17c) [0.000009]
```



Tracing

- Signal
 - # guider **sigtrace** “/home/peacelee/signal” -a
 - Trace all signals for “/home/peacelee/signal” command

```
0.001272 signal(945388) [SIGUSR1] {si_code=SI_USER si_pid=signal(945388), si_uid=0}
0.001286 signal(945388) [SIGUSR2] {si_code=SI_USER si_pid=signal(945388), si_uid=0}
0.001299 signal(945388) [SIGRT6 ] {si_code=SI_USER si_pid=signal(945388), si_uid=0}
0.001312 signal(945388) [SIGUSR1] {si_code=SI_USER si_pid=signal(945388), si_uid=0}
0.001326 signal(945388) [SIGUSR2] {si_code=SI_USER si_pid=signal(945388), si_uid=0}
0.001339 signal(945388) [SIGRT7 ] {si_code=SI_USER si_pid=signal(945388), si_uid=0}
0.001353 signal(945388) [SIGUSR1] {si_code=SI_USER si_pid=signal(945388), si_uid=0}
0.001372 signal(945388) [SIGUSR2] {si_code=SI_USER si_pid=signal(945388), si_uid=0}
0.001391 signal(945388) [SIGRT8 ] {si_code=SI_USER si_pid=signal(945388), si_uid=0}
2.006127 signal(945389) [SIGSEGV] {si_code=SEGV_MAPERR si_addr=0x4d2}

2.234035 +++ exited signal(945389) with 139 +++
2.226852 signal(945388) [SIGCHLD] {si_code=CLD_DUMPED si_pid=945389, si_uid=0, si_status=SIGSEGV si_utime=0, si_stime=0}
2.226926 signal(945388) [SIGUSR1] {si_code=SI_USER si_pid=signal(945388), si_uid=0}
2.226943 signal(945388) [SIGUSR2] {si_code=SI_USER si_pid=signal(945388), si_uid=0}
2.226953 signal(945388) [SIGRT9 ] {si_code=SI_USER si_pid=signal(945388), si_uid=0}
2.226962 signal(945388) [SIGUSR1] {si_code=SI_USER si_pid=signal(945388), si_uid=0}
2.226972 signal(945388) [SIGSEGV] {si_code=SEGV_MAPERR si_addr=0x4d2}

2.456611 +++ exited signal(945388) with 139 +++
```



Tracing

- Signal
 - # guider sigtrace “/home/peacelee/signal” -H
 - Trace all signals for “/home/peacelee/signal” command

```
2.219161 signal(921323) [SIGUSR1] {si_code=SI_USER si_pid=921323, si_uid=0}
=====
Backtrace Info [signal(921323)]
=====
0x7fe9d6f4655b(kill@GLIBC_2.2.5)[/usr/lib/x86_64-linux-gnu/libc-2.31.so]
0x55b64296e334(main)[/home/peacelee/test/signal]
0x7fe9d6f270b3(__libc_start_main@GLIBC_2.2.5)[/usr/lib/x86_64-linux-gnu/libc-2.31.so]
0x55b64296e18e(_start)[/home/peacelee/test/signal]
=====
2.219237 signal(921323) [SIGSEGV] {si_code=SEGV_MAPERR si_addr=0x4d2}
=====
Backtrace Info [signal(921323)]
=====
0x55b64296e33e(main)[/home/peacelee/test/signal]
0x7fe9d6f270b3(__libc_start_main@GLIBC_2.2.5)[/usr/lib/x86_64-linux-gnu/libc-2.31.so]
0x55b64296e18e(_start)[/home/peacelee/test/signal]
=====
```



Tracing

- I/O
 - # guider **iorec** -s guider.dat
 - # guider **report** guider.dat -a -q CONVINODE
 - Report all I/O events

```
[Thread Info] [ Elapsed: 13.808 ] [ Start: 5219100.988 ] [ ActiveThread: 16 ] [ ContextSwitch: 0 ] [ LogSize: 10.5M ] (Un
```

Thread Info				CPU Info				SCHED Info				BLOCK Info			
Name(	TID/	PID)	LF	Usage(	%)	Prmt	Latc	Pri	IRQ	Yld	Lose	Steal	Mig	Read(MB/ Cnt)	Write(MB)
[TOTAL]					-(	-)		-	-	-	-	-	-	0.90(45/2407)	0.00(100)
# Hot: 17															
guider(932159/	-----)	ND		-(	-)		-	-	-	-	-	-	-	0.00(0/ 78)	0.00(100)
find(932162/	-----)	ND		-(	-)		-	-	-	-	-	-	-	0.87(45/2335)	0.00(0)
vi(923548/923548)				-(	-)		-	-	-	-	-	-	-	0.01(0/ 418)	0.00(0)
guider(932158/	-----)	ND		-(	-)		-	-	-	-	-	-	-	0.01(0/ 146)	0.00(0)
stty(932160/	-----)	ND		-(	-)		-	-	-	-	-	-	-	0.00(0/ 76)	0.00(0)
cron(1215/ 1215)				-(	-)		-	-	-	-	-	-	-	0.00(0/ 2)	0.00(0)



Tracing

- I/O

[Thread Block Info] (Unit: NR)							
ID	OPT	NrDev	TOTAL [ACCESS]	SEQUENTIAL (COUNT)	FS	PATH	
TOTAL	READ	8:3	47.7M	27.5M(57.6)	-	/dev/sda3	
			[4K - 7K]	12,019			
			[8K - 15K]	1			
			[16K - 31K]	10			
			[32K - 63K]	3			
			[64K - 127K]	4			
			[128K - 255K]	1			
		253:0	47.7M	27.5M(57.6)	ext4	/ <rw,relatime>	
			[4K - 7K]	12,019			
			[8K - 15K]	1			
			[16K - 31K]	10			
			[32K - 63K]	3			
			[64K - 127K]	4			
			[128K - 255K]	1			
	WRITE	253:0	100.1M	100.0M(99.9)	ext4	/ <rw,relatime>	
			[4K - 7K]	25,618			
		8:3	40.0K	36.0K(90.0)	-	/dev/sda3	
			[4K - 7K]	10			
guider(932159)	READ	8:3	232.0K	128.0K(55.2)	-	/dev/sda3	
			[4K - 7K]	37			
			[32K - 63K]	2			
		253:0	232.0K	128.0K(55.2)	ext4	/ <rw,relatime>	
			[4K - 7K]	37			
			[32K - 63K]	2			
	WRITE	253:0	100.0M	100.0M(100.0)	ext4	/ <rw,relatime>	
			[4K - 7K]	25,600			



Tracing

- I/O

[Thread FS Info] (Unit: NR)

ID	OPT	NrDev	INODE	Size	FS PATH
TOTAL	WRITE	253:0	24520358 0	100.0M	ext4 / <rw,relatime> /home/peacelee/guider/guider/TEST[100.0M]
				100.0M	
				100.0M	
				32.0K	
	READ	0:3	0	147.7M	? ?
				46.9M	
guider(932159)	WRITE	253:0	24520358	46.9M	ext4 / <rw,relatime> /home/peacelee/guider/guider/TEST[100.0M]
				100.8M	
				100.0M	
				100.0M	
	READ	0:3	0	147.7M	? ?
				46.9M	
	WRITE	253:0	24520358	100.2M	ext4 / <rw,relatime> /home/peacelee/guider/guider/TEST[100.0M]
				148.0K	
				148.0K	
				100.1M	
	READ	0:3	0	100.0M	ext4 / <rw,relatime> /home/peacelee/guider/guider/TEST[100.0M]
				100.0M	



Tracing

- I/O

[Thread FS History] (Type: Read) (Unit: Byte)

Time	Task	Dev	Inode	Offset	Size	Path
6.096	guider(932159)	253:0	24520358	0	65536	/home/peacelee/guider/guider/TEST[100.0M]
6.097	guider(932159)	253:0	24520358	65536	237568	/home/peacelee/guider/guider/TEST[100.0M]
6.098	guider(932159)	253:0	24520358	303104	249856	/home/peacelee/guider/guider/TEST[100.0M]
6.099	guider(932159)	253:0	24520358	552960	249856	/home/peacelee/guider/guider/TEST[100.0M]
6.100	guider(932159)	253:0	24520358	802816	249856	/home/peacelee/guider/guider/TEST[100.0M]
6.101	guider(932159)	253:0	24520358	1052672	241664	/home/peacelee/guider/guider/TEST[100.0M]
6.102	guider(932159)	253:0	24520358	1294336	249856	/home/peacelee/guider/guider/TEST[100.0M]
6.103	guider(932159)	253:0	24520358	1544192	249856	/home/peacelee/guider/guider/TEST[100.0M]
6.104	guider(932159)	253:0	24520358	1794048	253952	/home/peacelee/guider/guider/TEST[100.0M]
6.105	guider(932159)	253:0	24520358	2048000	241664	/home/peacelee/guider/guider/TEST[100.0M]
6.106	guider(932159)	253:0	24520358	2289664	249856	/home/peacelee/guider/guider/TEST[100.0M]
6.107	guider(932159)	253:0	24520358	2539520	249856	/home/peacelee/guider/guider/TEST[100.0M]
6.108	guider(932159)	253:0	24520358	2789376	249856	/home/peacelee/guider/guider/TEST[100.0M]
6.109	guider(932159)	253:0	24520358	3039232	442368	/home/peacelee/guider/guider/TEST[100.0M]
6.110	guider(932159)	253:0	24520358	3481600	581632	/home/peacelee/guider/guider/TEST[100.0M]
6.111	guider(932159)	253:0	24520358	4063232	577536	/home/peacelee/guider/guider/TEST[100.0M]
6.112	guider(932159)	253:0	24520358	4640768	585728	/home/peacelee/guider/guider/TEST[100.0M]
6.113	guider(932159)	253:0	24520358	5226496	573440	/home/peacelee/guider/guider/TEST[100.0M]
6.114	guider(932159)	253:0	24520358	5799936	585728	/home/peacelee/guider/guider/TEST[100.0M]
6.115	guider(932159)	253:0	24520358	6385664	581632	/home/peacelee/guider/guider/TEST[100.0M]



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Demo

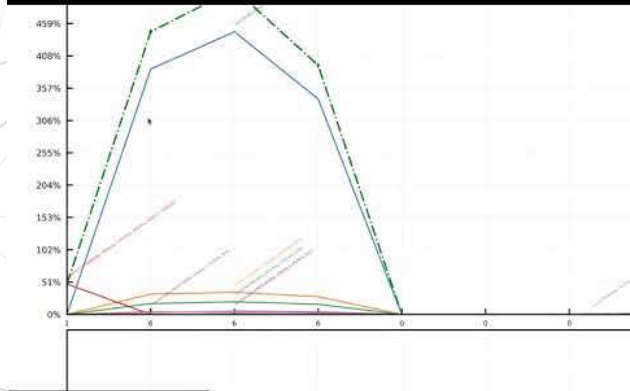
- Install, Help, Commands
- Monitoring
 - System, Task, Syscall, Function
- Profiling
 - System, Task
- Tracing
 - Syscall, Function
- Visualizing
 - Perf Graph, Timeline Chart, Flame Graph



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Demo

<https://www.youtube.com/watch?v=AF0WSqsBQiw>





Guider

Question?

- <https://github.com/iipeace/guider/blob/master/README.md>
- <https://github.com/iipeace/issues>
- iipeace5@gmail.com