

What did exist before?
oooooo

How does it work?
oooooooooooo

What are the findings?
oooooooooooooooooooo

What is the Conclusion?
oooooo

Measuring Performance on OpenBSD

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What did exist before?

How does it work?
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What are the findings?
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What is the Conclusion? ooooooo

Agenda

- 1 What did exist before?
 - 2 How does it work?
 - 3 What are the findings?
 - 4 What is the Conclusion?

What did exist before?



How does it work?



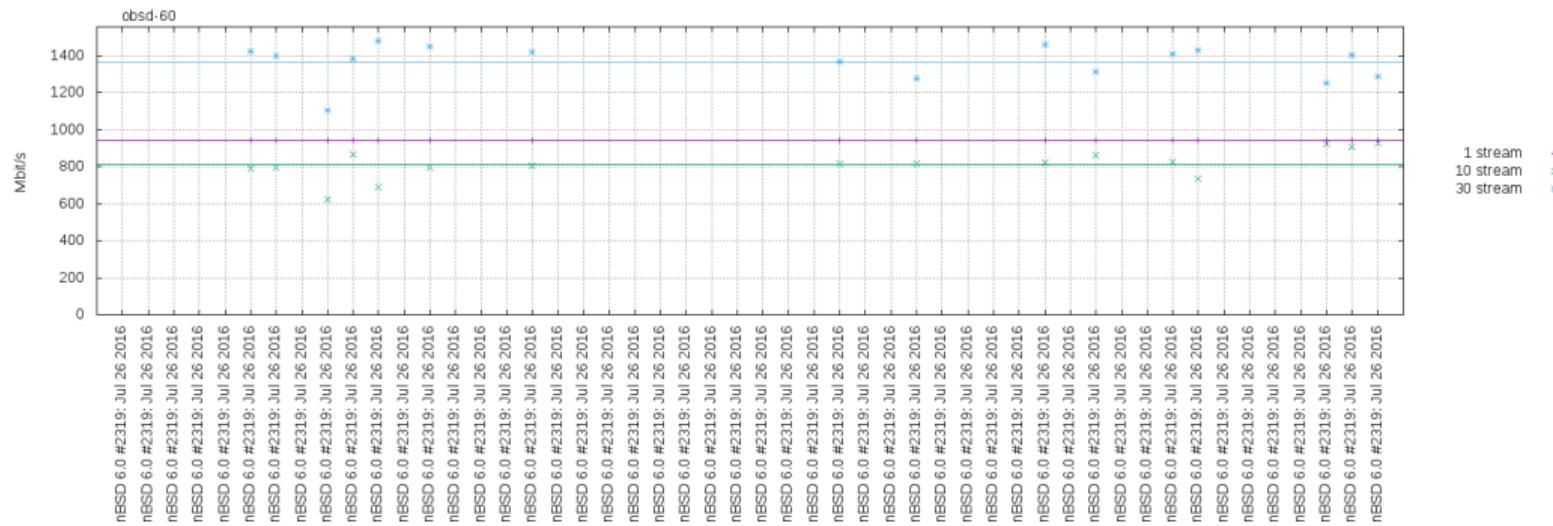
What are the findings?



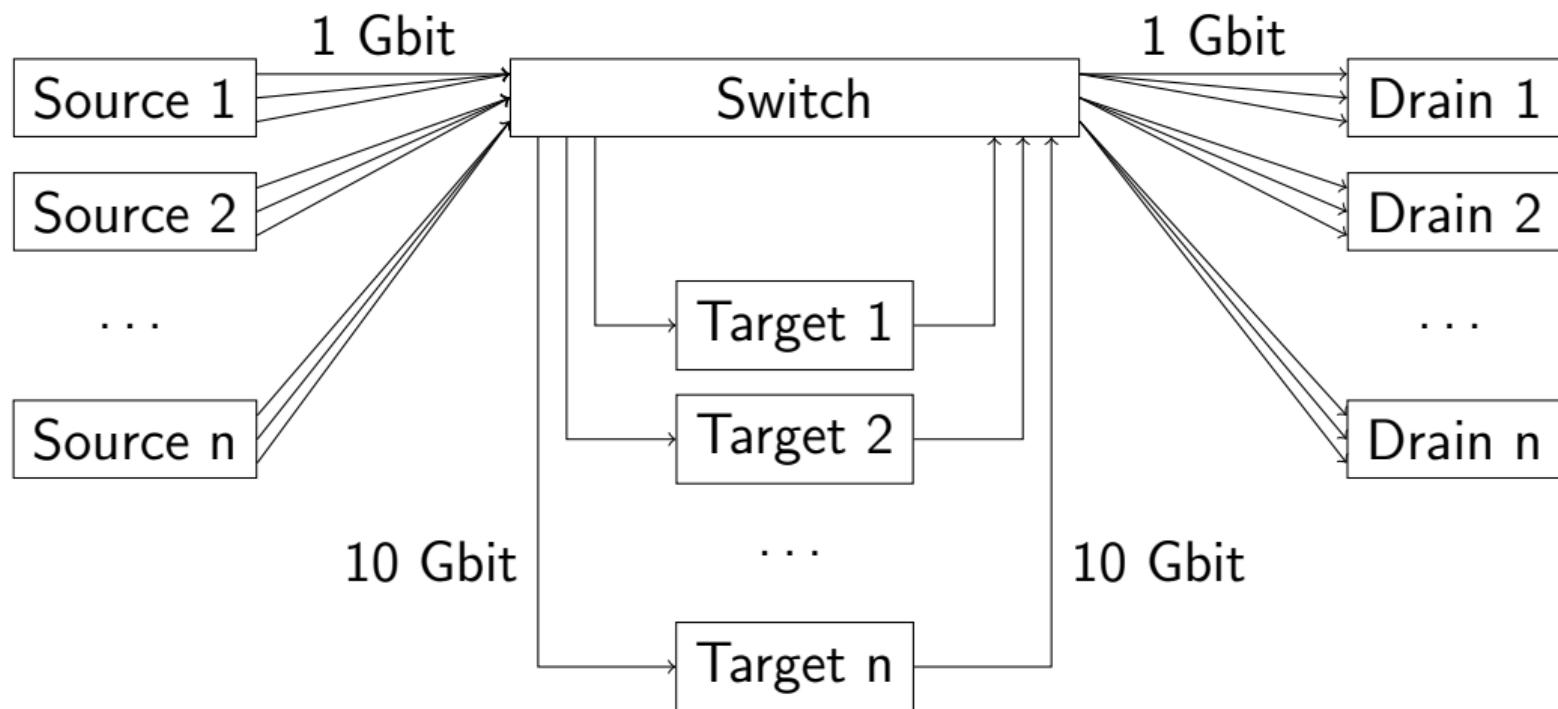
What is the Conclusion?



genua Firewall Testbed HPF



Multi User, Multi Purpose Hardware Setup



What did exist before?

How does it work? oooooooooooo

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Performance Hardware Design



Existing Regression Tests

OpenBSD regress all test results

created at 2019-04-17T21:03:24Z

test run info

Regression History for i386

history



OpenBSD regress ot1 test results

	created at 2019-04-18T05:40:39Z											
	test run info											
pass rate	97%	96%	96%	97%	98%	97%	98%	98%	98%	98%	98%	98%
run at date	2019-04-18	2019-04-16	2019-04-15	2019-04-13	2019-04-11	2019-04-10	2019-04-09	2019-04-08	2019-04-06	2019-04-06	2019-04-04	
machine build	snapshot	snapshot	snapshot	snapshot	snapshot	snapshot	snapshot	snapshot	snapshot	snapshot	custom	
architecture	i386	i386	i386	i386	i386	i386	i386	i386	i386	i386	i386	
misc/posixtestsuite	NOTERM	NOTERM	NOTERM	NOTERM	NOTERM	NOTERM	NOTERM	NOTERM	NOTERM	NOTERM	NOTERM	
lib/libcrypt	FAIL	FAIL	FAIL	PASS								
gnu/egcs/gcc-bounds	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	
gnu/egcs/gcc-builtins	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	FAIL	
sys/net/pf_divert	FAIL	PASS	FAIL	FAIL	PASS	FAIL	PASS	PASS	PASS	PASS	PASS	
sys/netinet/frag	FAIL	PASS	FAIL	PASS	FAIL	PASS	FAIL	PASS	PASS	PASS	PASS	
lib/libc	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
lib/libbm	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
usr.sbin/ospfd	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
sys/net/piflow	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
lib/libpthread	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
usr.bin/bc	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	
sys/kern/flock	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	
bin/ed	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	
lib/libsndio	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	
sys/arch/amd64	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	
sys/arch/hppa	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	
sys/arch/m88k	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	
sys/arch/sparc64	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	
sys/dev/kcov	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	SKIP	

severity



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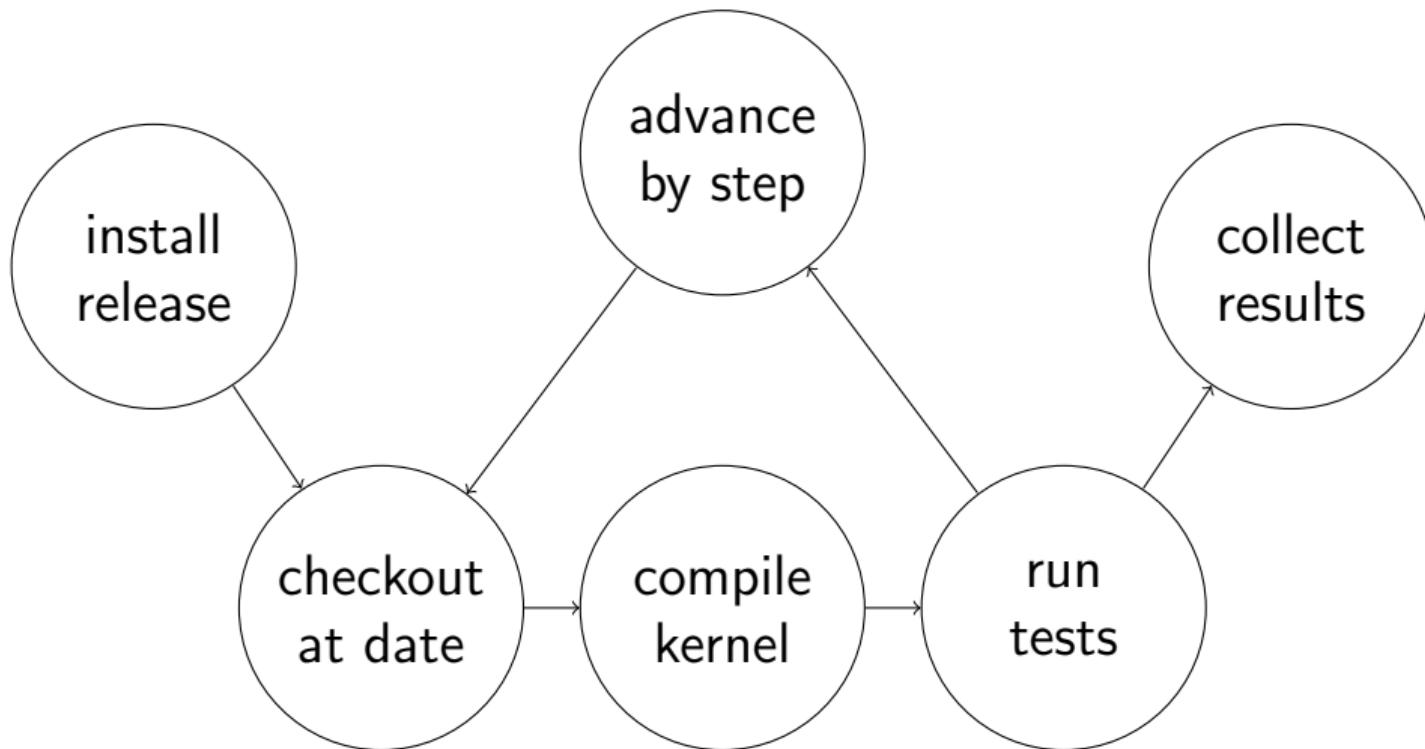
What are the findings?
oooooooooooooooooooo

What is the Conclusion?
oooooo

Performance Goals

- history
- reproducible
- details available
- drill down
- automatic

Performance History



Performance Tests Overview

run history

run detail

test command

OpenBSD perform all test results

run date

install version

cvs checkout steps

2019-04-25	2019-04-24	2019-04-20	2019-04-18	2019-04-17	2019-03-30	2019-03-23	2019-03-20	2019-03-20
o12/8	o14/4	o14/4	o12/8	o14/4	o14/4	o14/4	o14/4	o14/4
6.5/install	6.4/install							
2019-04-16	2018-10-11	2019-04-13	2018-10-11	2019-03-30	2019-03-23	2019-03-16	2018-10-11	2018-10-11
2019-04-17	2018-11-16	2019-04-20	2018-11-13	2019-04-13	2019-03-30	2019-03-23	2018-10-15	2018-10-15
9/3hour	37/1day	8/1day	34/1day	15/1day	8/1day	8/1day	5/1day	5/1day
5/reorder	5/reorder	5/reorder	5/keep	5/reorder	5/reorder	5/reorder	10/reorder	10/reboot
iperf3_-c10.3.0.33_-w1m_-t10	NOEXIT	PASS						
iperf3_-c10.3.0.33_-w1m_-t10_-R	NOEXIT	PASS						
tcpbench_-S1000000_-t10_10.3.0.33	FAIL	PASS						
tcpbench_-S1000000_-t10_n100_10.3.0.33	FAIL	PASS						
iperf3_-c10.3.0.33_-u_-b10G_-w1m_-t10	NOEXIT	PASS						
iperf3_-c10.3.0.33_-u_-b10G_-w1m_-t10_-R	NOEXIT	PASS						
iperf3_-c10.3.2.35_-w1m_-t10	PASS							
iperf3_-c10.3.2.35_-w1m_-t10_-R	PASS							
tcpbench_-S1000000_-t10_10.3.2.35	PASS							
tcpbench_-S1000000_-t10_n100_10.3.2.35	PASS							
iperf3_-c10.3.2.35_-u_-b0_-w1m_-t10	PASS							
iperf3_-c10.3.2.35_-u_-b0_-w1m_-t10_-R	PASS							
iperf3_-c10.3.2.35_-u_-b10G_-w1m_-t10	PASS							
iperf3_-c10.3.2.35_-u_-b10G_-w1m_-t10_-R	PASS							
time_-lp_make_-CGENERIC.MP_-j4_-s	PASS							
time_-lp_make_-CGENERIC.MP_-j8_-s	PASS							
time_-lp_fs_mark_-dfs_mark_-DB_-N16_-n256_-t8	PASS							

Performance Run at Date

run and
install log

average
numbers

unstable
results

OpenBSD perform 2019-02-04 test results

created at	2019-04-26T02:37:12Z	checkout date	2017-10-04	kernel commits	2017-10-11	build quirks	2017-10-18	2017-10-25	2017-11-01	2017-11-08	2017-11-15	2017-11-22	2017-11-29
run at	2019-02-04T15:10:35Z	log		version	version	version	version	version	version	version	version	version	version
run test host with cpu cores	ot12/8	cvs checkout	2017-10-04	build info	build info	build info	build info	build info	build info	build info	build info	build info	build info
machine release setup	6.2/install.info	machine	2017-10-11	version	version	version	version	version	version	version	version	version	version
steps	20/4weeks	kernel build		cvslog/42	cvslog/48	cvslog/49	cvslog/35	cvslog/46	cvslog/32	cvslog/46	cvslog/49	cvslog/48	cvslog/49
cvs checkout		kernel commits		quirks/A,B,C		quirks/D		quirks/E		quirks/F			
machine		build quirks		repetitions	5/reorder	5/reorder	5/reorder	5/reorder	5/reorder	5/reorder	5/reorder	5/reorder	5/reorder
kernel build		repetitions		iperf3_c10.3.0.33_w1m_t10	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
kernel commits		iperf3_c10.3.0.33_w1m_t10		sender	4070000000	3990000000	4040000000	3990000000	3980000000	3930000000	4020000000	3930000000	3890000000
build quirks		sender		receiver	4070000000	3990000000	4040000000	3990000000	3980000000	3930000000	4020000000	3930000000	3890000000
repetitions		receiver		iperf3_c10.3.0.33_w1m_t10_R	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
iperf3_c10.3.0.33_w1m_t10		iperf3_c10.3.0.33_w1m_t10_R		sender	4090000000	4000000000	4090000000	4180000000	4040000000	4010000000	3970000000	3970000000	3990000000
sender		sender		receiver	4090000000	4000000000	4090000000	4180000000	4040000000	4010000000	3970000000	3970000000	3990000000
receiver		receiver		tcpbench_S1000000_t10_10.3.0.33	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
tcpbench_S1000000_t10_10.3.0.33		tcpbench_S1000000_t10_n100_10.3.0.33		sender	4046336625	3988681500	3997288125	3454885875	3957848500	3873461875	3943817875	3842013250	3838678000
sender		sender		tcpbench_S1000000_t10_n100_10.3.0.33	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
tcpbench_S1000000_t10_n100_10.3.0.33		tcpbench_S1000000_t10_n100_10.3.0.33		sender	4108316125	3980434125	4002707125	398519875	3939937625	3923031875	3945349500	3863565375	3877594000
sender		sender		iperf3_c10.3.0.33_u_b10G_w1m_t10	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
iperf3_c10.3.0.33_u_b10G_w1m_t10_R		iperf3_c10.3.0.33_u_b10G_w1m_t10_R		iperf3_c10.3.0.33_u_b10G_w1m_t10_R	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
iperf3_c10.3.0.33_u_b10G_w1m_t10_R		time_lp_make_CGENERIC_MP_J8_s		time_lp_make_CGENERIC_MP_J8_s	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

Performance Repeat at CVS Checkout

reboot log

single result

repeat count outlier standard deviation

OpenBSD perform 2019-02-04 cvs 2017-10-18 test results									
repeat	000	001	002	003	004	reorder info	reorder info	reorder info	reorder info
created at	2019-04-26T02:37:12Z					unit	mean	minimum	maximum
run at	2019-02-04T15:10:35Z					bits/sec	3466000000	1600000000	4040000000
test host with cpu cores	ot12/8						935427175.145131	0.26988663342504	
cvs checkout at	2017-10-18T00:00:00Z							0.26988663342508	
repetitions	5/reorder info								
repeat machine	iperf3_-c10.3.0.33_-w1m_-t10								
sender	PASS	PASS	PASS	PASS	PASS	unit	mean	minimum	maximum
receiver	PASS	PASS	PASS	PASS	PASS	bits/sec	3466000000	1600000000	4040000000
iperf3_-c10.3.0.33_-w1m_-t10_-R	iperf3_-c10.3.0.33_-w1m_-t10_-R						935427175.145131	0.26988663342504	
sender	PASS	PASS	PASS	PASS	PASS				
receiver	PASS	PASS	PASS	PASS	PASS				
tcpbench_-S1000000_-t10_-n100_-10.3.0.33	tcpbench_-S1000000_-t10_-n100_-10.3.0.33								
sender	PASS	PASS	PASS	PASS	PASS	unit	mean	minimum	maximum
tcpbench_-S1000000_-t10_-n100_-10.3.0.33	3930249750	397288125	380971075	1602793875	3846738625	bits/sec	349756225	1602793875	3997288125
sender	PASS	PASS	PASS	PASS	PASS				
iperf3_-c10.3.0.33_-u_-b10G_-w1m_-t10	iperf3_-c10.3.0.33_-u_-b10G_-w1m_-t10								
sender	PASS	PASS	PASS	PASS	PASS	unit	mean	minimum	maximum
iperf3_-c10.3.0.33_-u_-b10G_-w1m_-t10_-R	iperf3_-c10.3.0.33_-u_-b10G_-w1m_-t10_-R					bits/sec	3486461610	1595932875	4002707125
time_-lp_make_-CGENERIC.MP_-j0_-s	time_-lp_make_-CGENERIC.MP_-j0_-s								
real	87.10	85.02	85.78	86.42	84.98	sec	85.86	84.98	87.10
user	351.41	353.88	350.53	352.83	350.17	sec	351.764	350.17	353.88
sys	177.12	172.14	178.46	180.00	176.90	sec	176.924	172.14	180.00
time_-lp_fs_mark_-dfs_mark_-D8_-N16_-n256_-t8	time_-lp_fs_mark_-dfs_mark_-D8_-N16_-n256_-t8								
files	146.0	146.7	146.4	148.9	142.6	1/sec	146.12	142.6	148.9

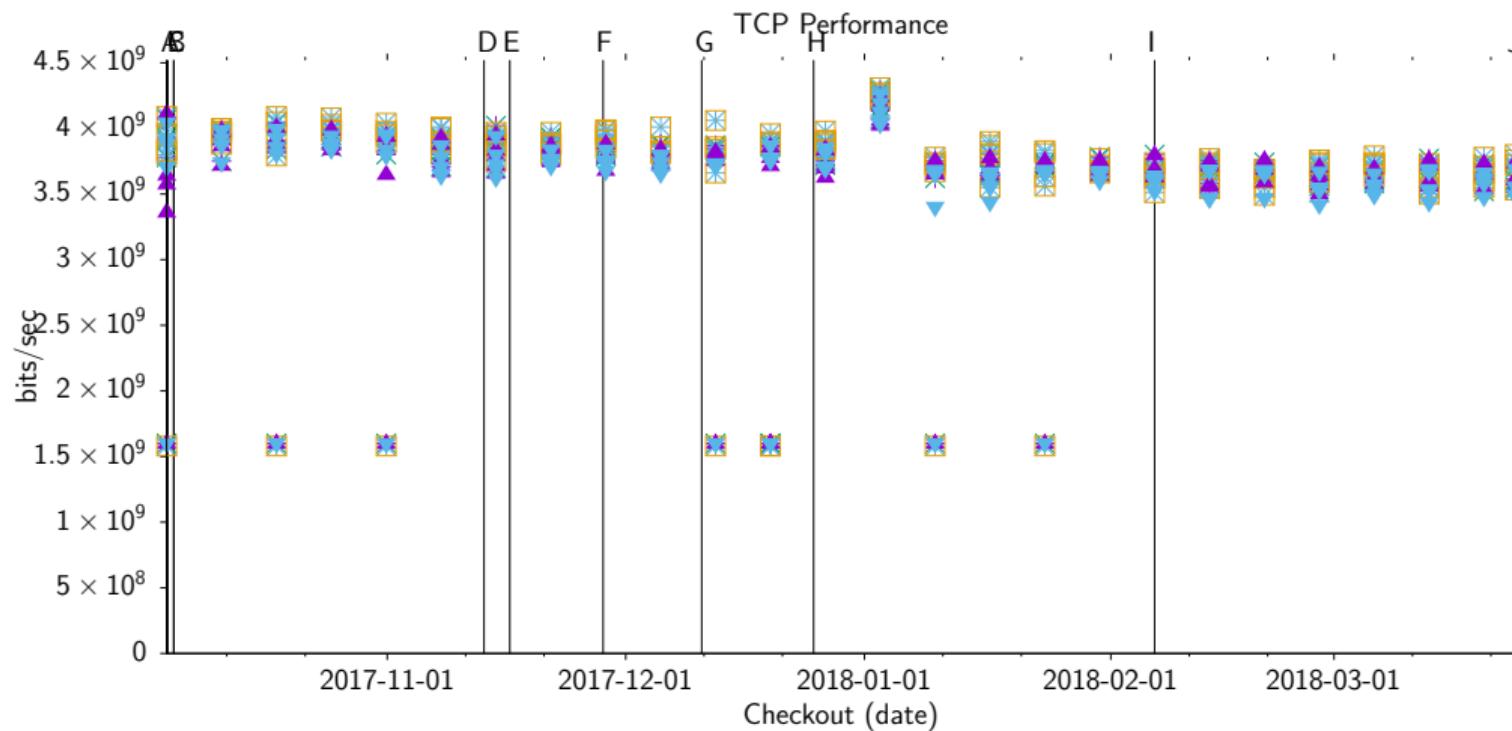
What did exist before?
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How does it work?
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What are the findings?
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What is the Conclusion?
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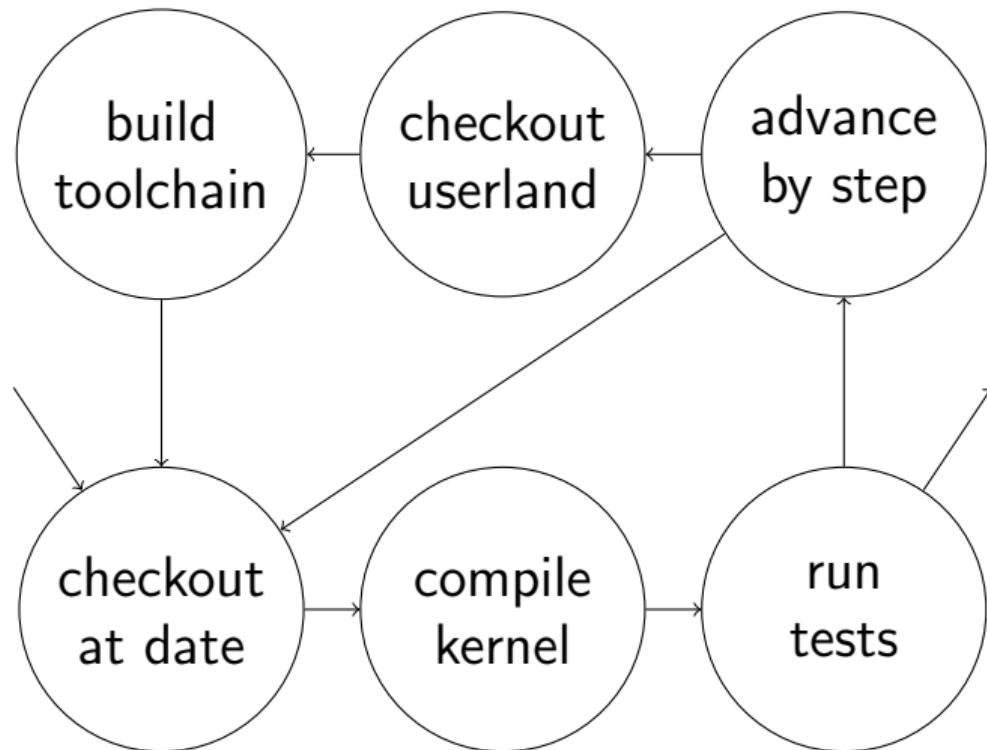
Weekly from 6.2 to 6.3



Quirks from 6.2 to 6.3

- A OpenBSD/amd64 6.2 release
- B fix cvs vendor branch checkout
- C clang update LLVM to 5.0.0
- D pfctl pf packet rate matching
- E move kernel source file dwiic.c
- F pfctl pf divert type
- G sysctl struct vfsconf
- H clang update LLVM to 5.0.1
- I pfctl pf synccookies
- J OpenBSD/amd64 6.3 release

Build Quirks



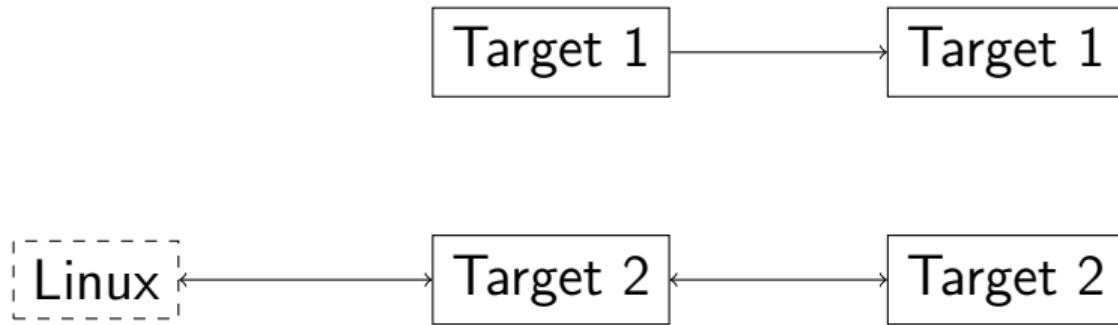
What did exist before?
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How does it work?
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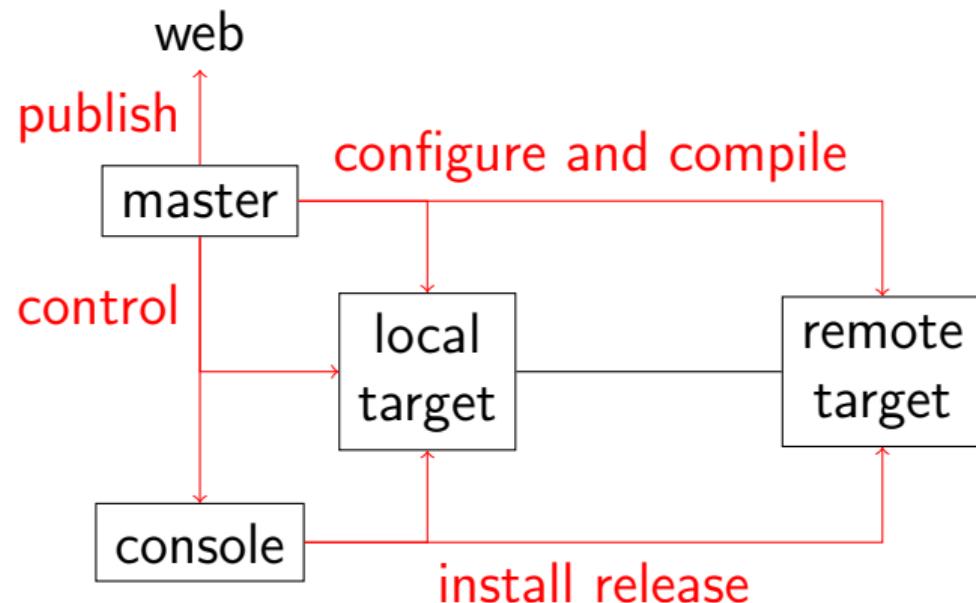
What are the findings?
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What is the Conclusion?
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Performance Hardware



Performance Master



What did exist before?
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How does it work?
oooooooooooo

What are the findings?
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What is the Conclusion?
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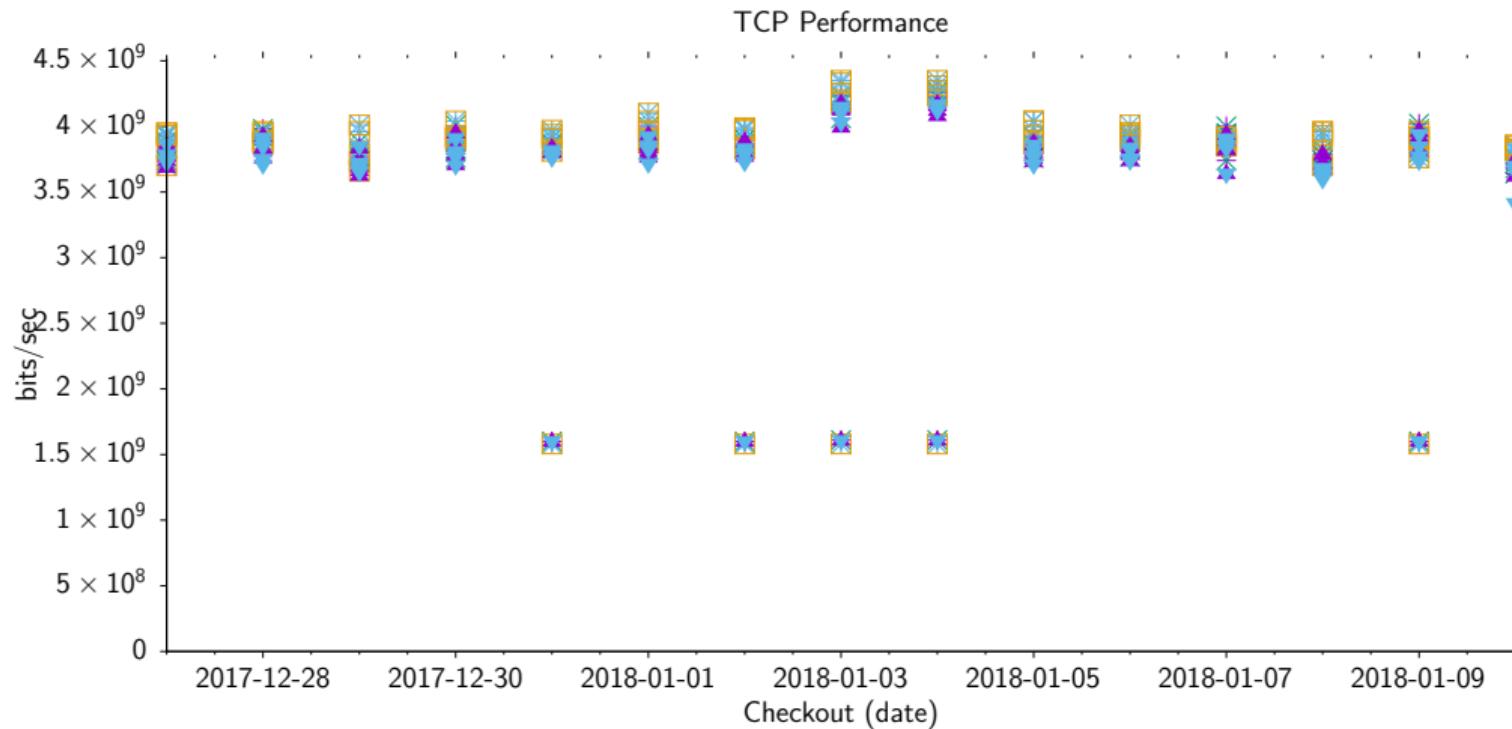
What did exist before?
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How does it work?
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What are the findings?
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What is the Conclusion?
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Drilldown from Week to Days



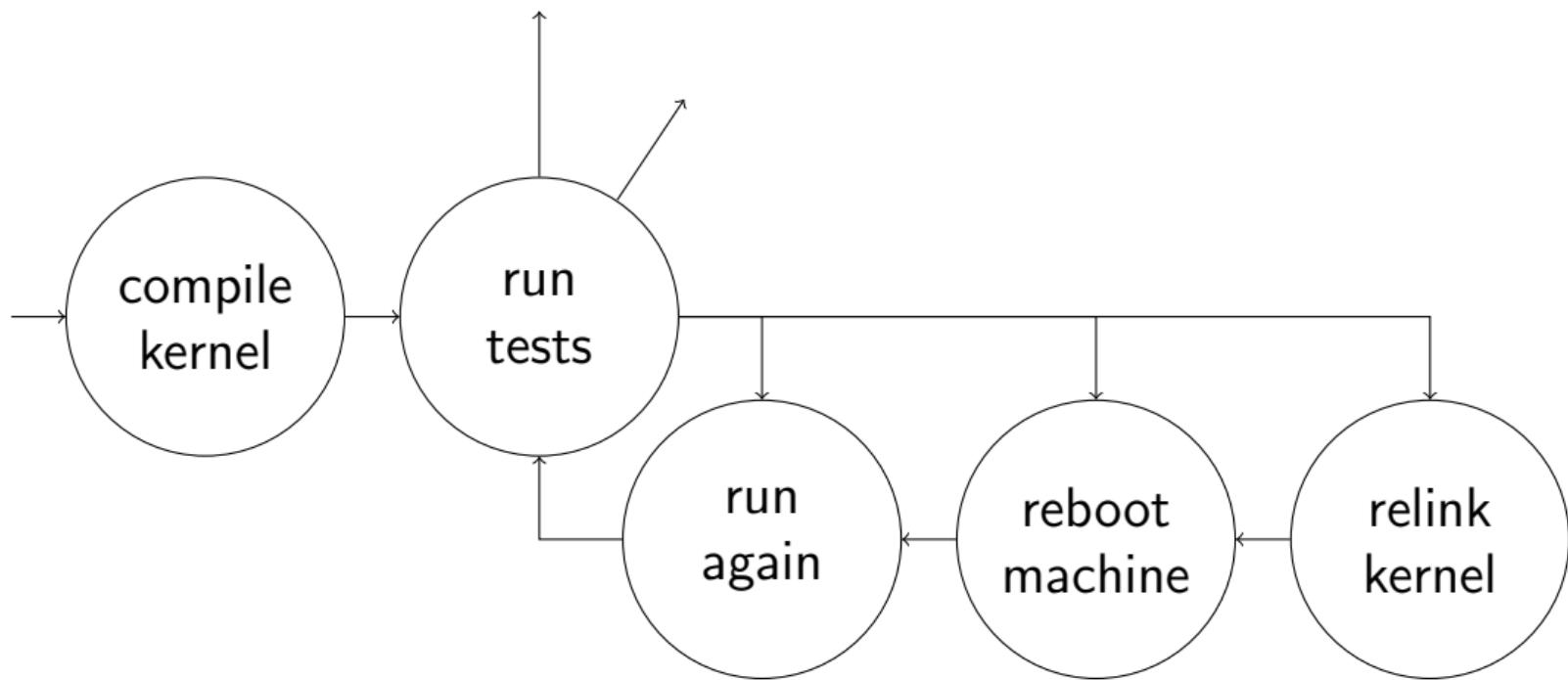
What did exist before?
oooooo

How does it work?
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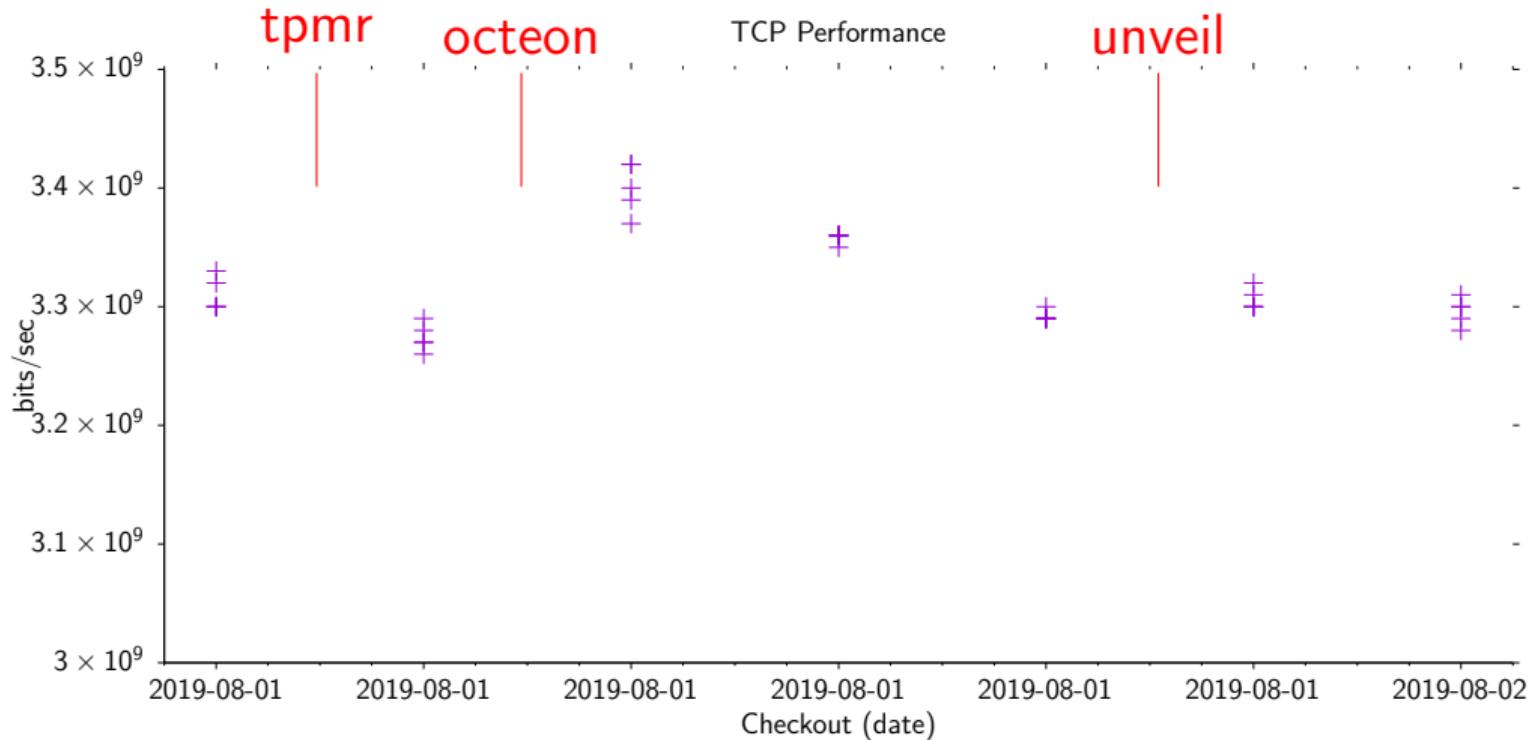
What are the findings?
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What is the Conclusion?
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Reproduce and Reboot



6.5, 1 Day, 5 Tests, Keep Machine Running



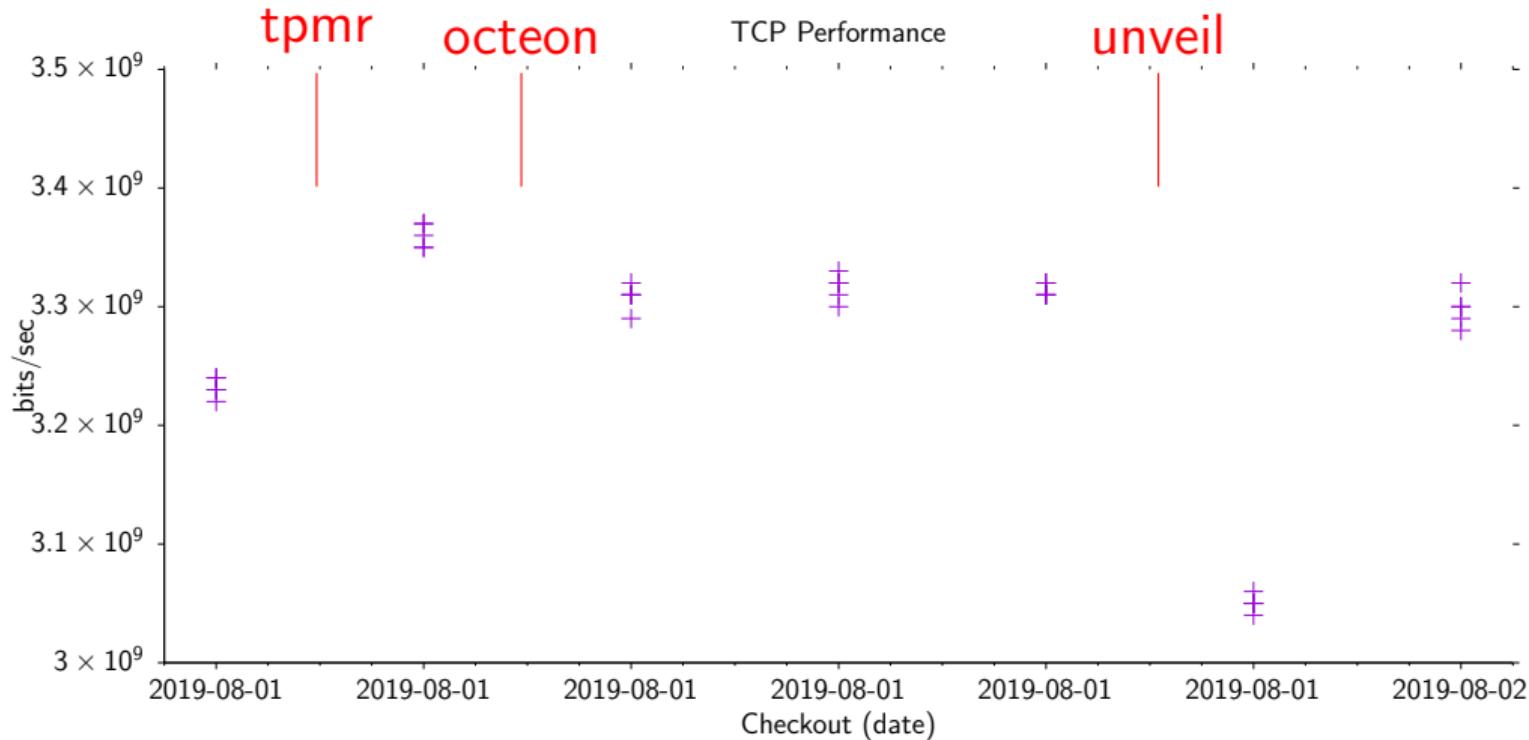
What did exist before?
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How does it work?
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What are the findings?
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What is the Conclusion?
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6.5, 1 Day, 5 Tests, Reboot Machine



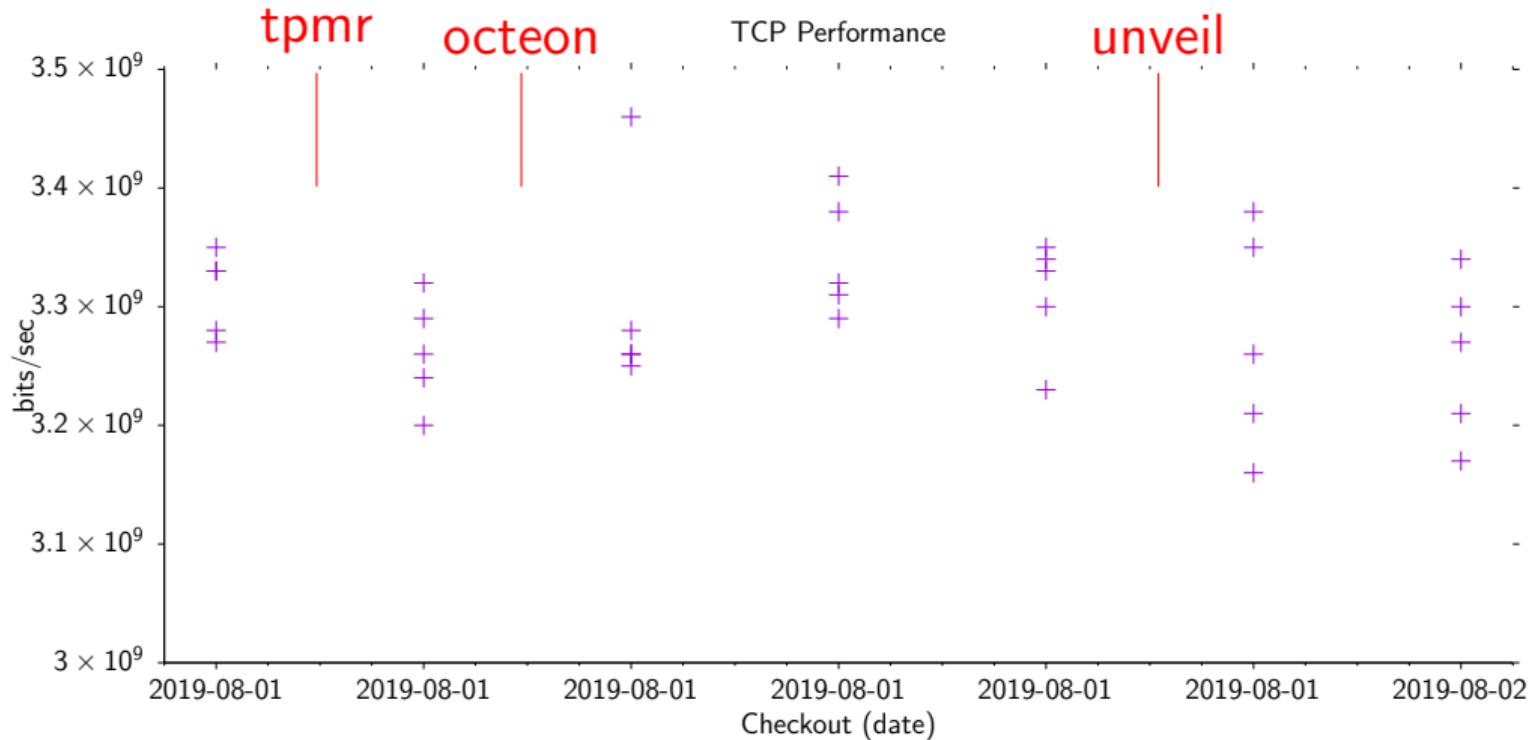
What did exist before?
oooooooo

How does it work?
oooooooooooo

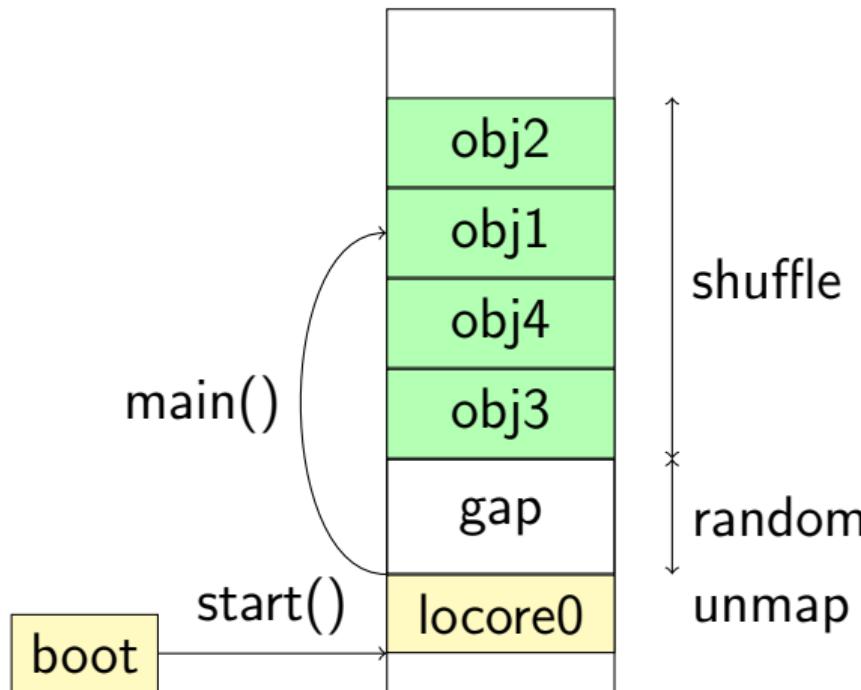
What are the findings?
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What is the Conclusion?
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6.5, 1 Day, 5 Tests, Link and Reorder Kernel



KARL Kernel Address Randomized Link



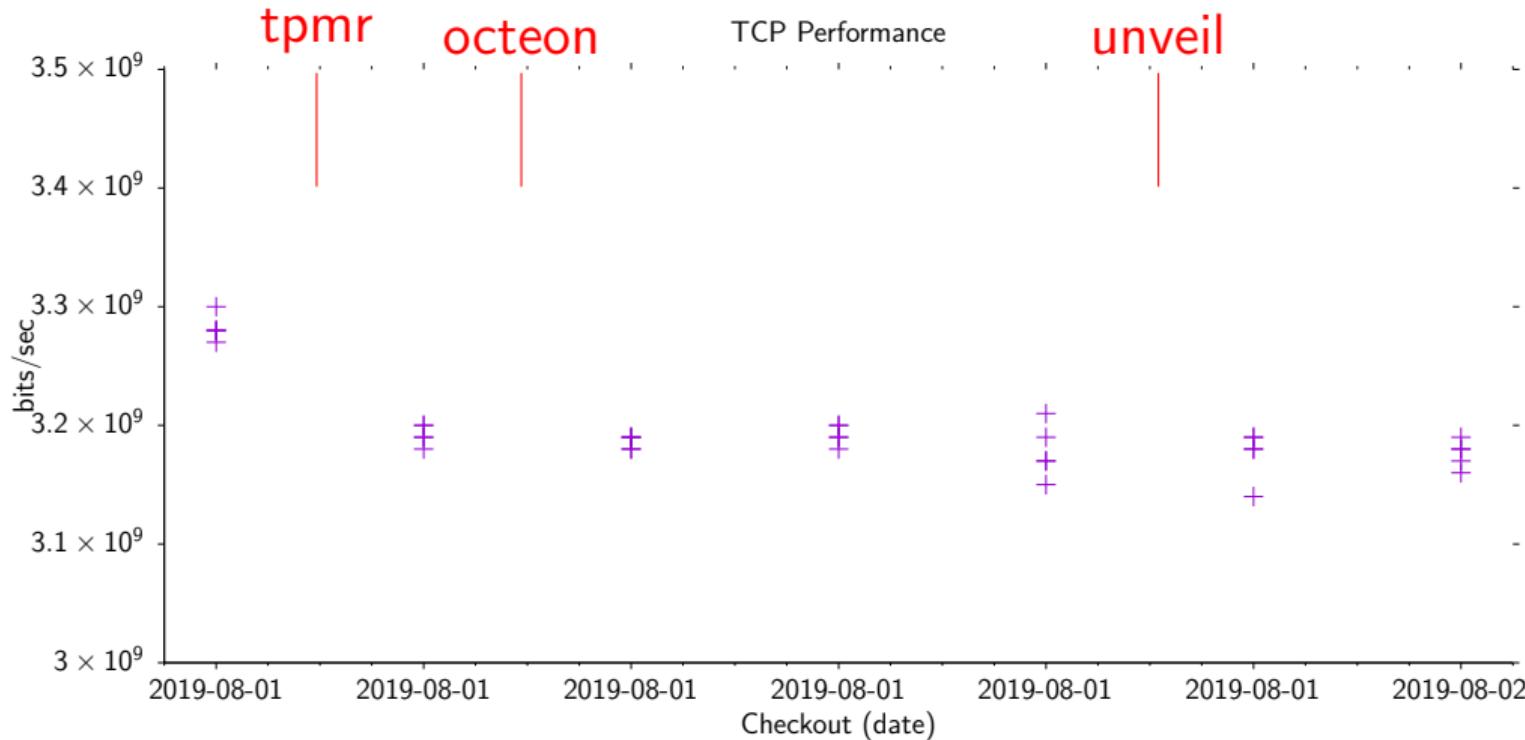
What did exist before?
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How does it work?
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What are the findings?
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What is the Conclusion?
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6.5, 1 Day, 5 Tests, Sort Objects, Fixed Gap



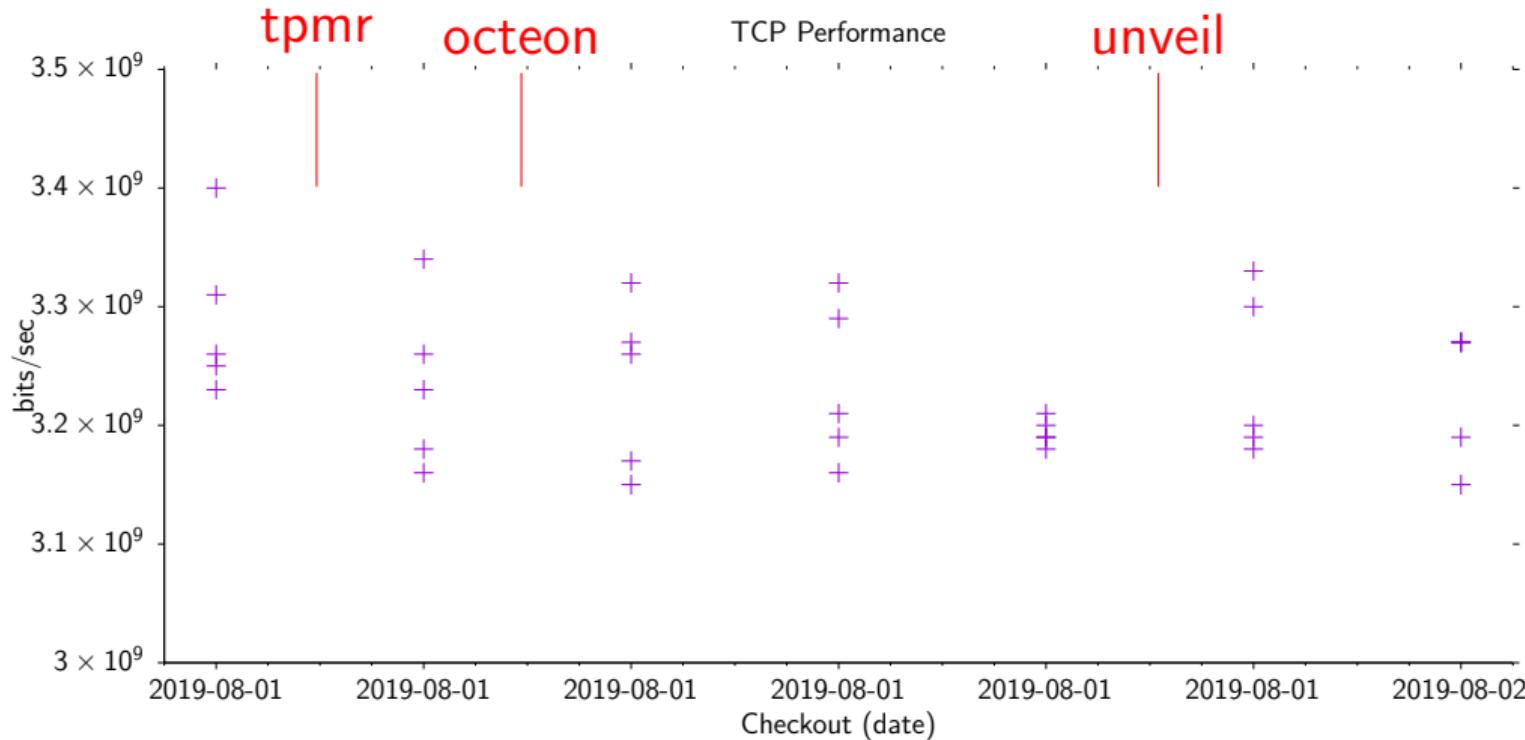
What did exist before?
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How does it work?
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What are the findings?
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What is the Conclusion?
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6.5, 1 Day, 5 Tests, Sort Objects, Random Gap



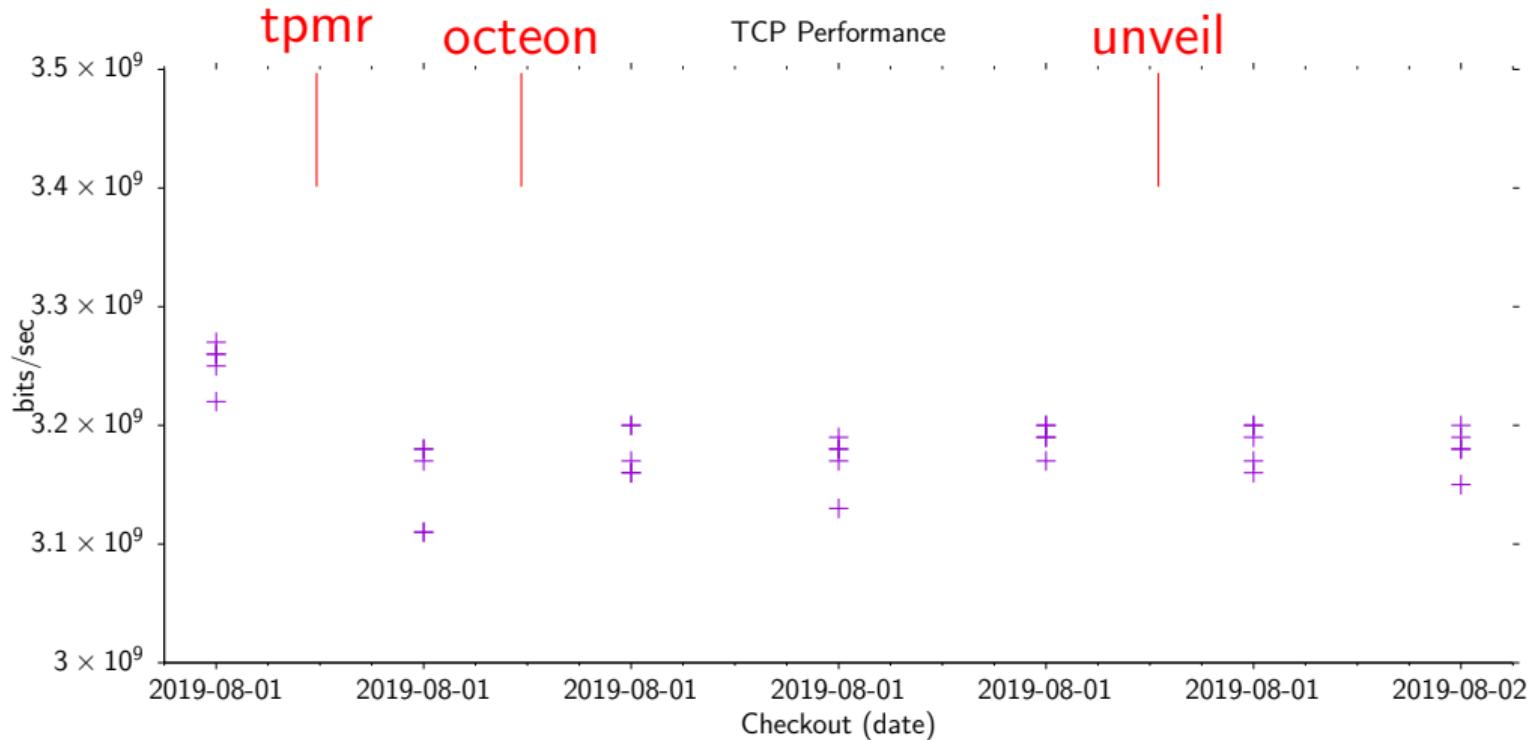
What did exist before?
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How does it work?
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What are the findings?
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What is the Conclusion?
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6.5, 1 Day, 5 Tests, Align Sorted Objects, Fixed Gap



What did exist before?
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Kernel Symbol Table

nm bsd, diff, diffstat

	sort	align
unveil	+169	+13
	-169	-13
tpmr	+25997	+28731
	-25983	-28717

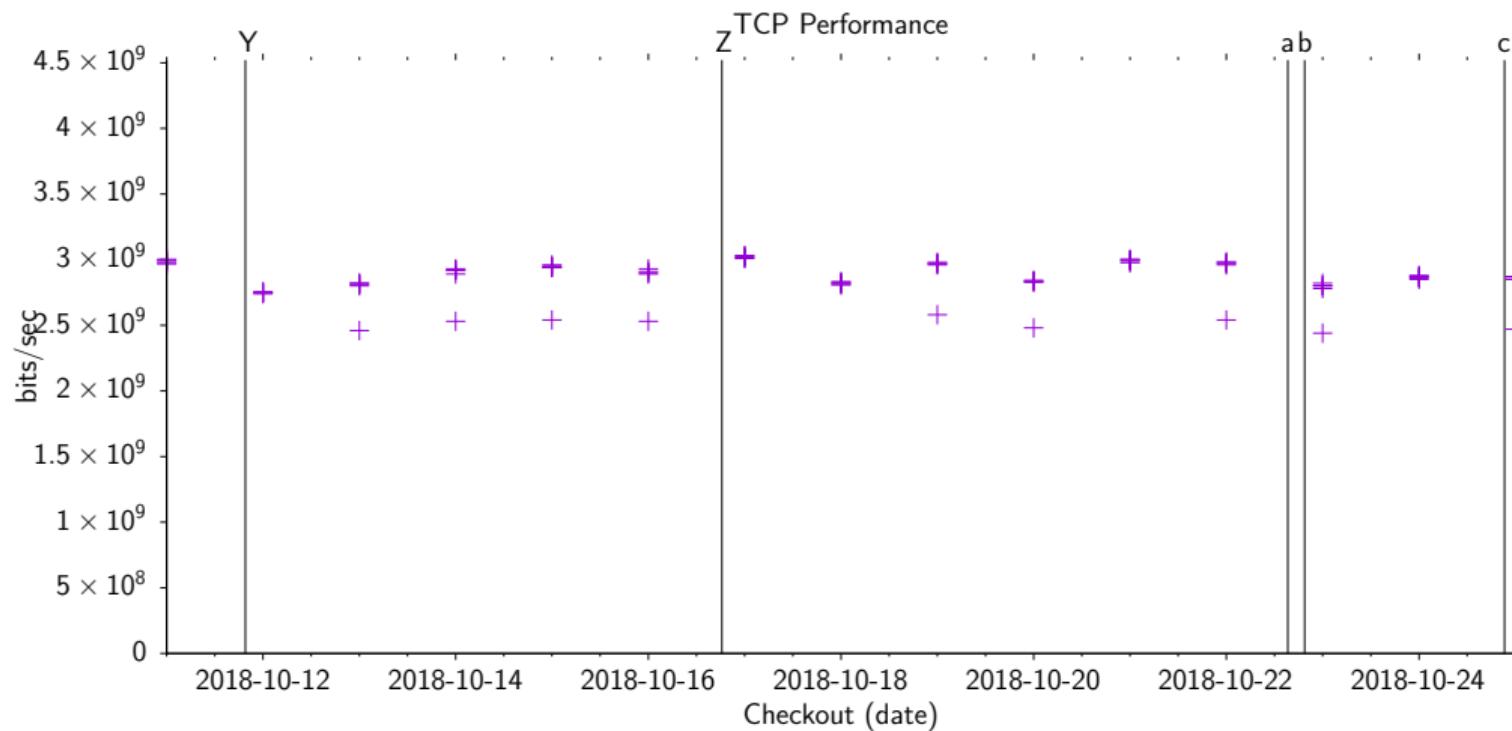
What did exist before?
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What is the Conclusion?
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6.4, 15 Days, 5 Tests, 2 CPU Sockets, Keep running



2 CPU Sockets, Repeat, Keep running

OpenBSD perform 2019-04-30 cvs 2018-10-13 test results

created at	2019-05-01T10:15:32Z									
run at	2019-04-30T19:11:10Z									
test host with cpu cores ot12/8										
cvs checkout at	2018-10-13T00:00:00Z									
repetitions	5/keep info									
repeat	000	001	002	003	004					
machine	keep	keep	keep	keep	keep					
iperf3_-c10.3.0.33_-w1m_-t10	PASS	PASS	PASS	PASS	PASS	unit	mean	minimum	maximum	deviation
sender	2800000000	2460000000	2610000000	2820000000	2810000000	bits/sec	2742000000	2460000000	2820000000	141194900.757782
receiver	2750000000	2420000000	2770000000	2760000000	2760000000	bits/sec	2692000000	2420000000	2770000000	136146979.40094
iperf3_-c10.3.0.33_-w1m_-t10_-R	PASS	PASS	PASS	PASS	PASS	unit	mean	minimum	maximum	deviation
sender	2840000000	2800000000	2840000000	2840000000	2830000000	bits/sec	2830000000	2800000000	2840000000	15491933.3848297
receiver	2890000000	2850000000	2890000000	2890000000	2880000000	bits/sec	2880000000	2850000000	2890000000	15491933.3848297
tcpbench_-S1000000_-t10_10.3.0.33	PASS	PASS	PASS	PASS	PASS	unit	mean	minimum	maximum	deviation
sender	2689773625	2389946000	2693565750	2690709125	2691350750	bits/sec	2631069050	2389946000	2693565750	120567998.88778
tcpbench_-S1000000_-t10_-n100_10.3.0.33	PASS	PASS	PASS	PASS	PASS	unit	mean	minimum	maximum	deviation
sender	2765055760	2450020625	258966375	2758764750	2764942000	bits/sec	2699549900	2450020625	2765055750	124794806.118369
iperf3_-c10.3.0.33_-u_-b10G_-w1m_-t10	PASS	PASS	PASS	PASS	PASS	unit	mean	minimum	maximum	deviation
sender	1180000000	1200000000	1170000000	1170000000	1180000000	bits/sec	1164000000	1200000000	1180000000	22449944.3206436
receiver	1160000000	1100000000	1150000000	1150000000	1150000000	bits/sec	1142000000	1100000000	1160000000	21354156.5040626
iperf3_-c10.3.0.33_-u_-b10G_-w1m_-t10_-R	PASS	PASS	PASS	PASS	PASS	unit	mean	minimum	maximum	deviation
sender	1230000000	1230000000	1230000000	1230000000	1230000000	bits/sec	1228000000	1220000000	1230000000	4000000
receiver	1230000000	1230000000	1230000000	1230000000	1240000000	bits/sec	1230000000	1240000000	1230000000	6324555.32033676
time_-lp_make_-CGENERIC.MP_-j8_-s	PASS	PASS	PASS	PASS	PASS	unit	mean	minimum	maximum	deviation
real	127.16	124.89	125.81	124.68	126.15	sec	125.738	124.68	127.16	0.898385218044017
user	433.74	432.79	432.72	433.14	434.53	sec	433.384	432.72	434.53	0.67724736987306
sys	392.39	395.47	394.06	393.57	394.87	sec	394.072	392.39	395.47	1.0651272244811
time_-lp_fs_mark_-dfs_mark_-D8_-N16_-n256_-t8	PASS	PASS	PASS	PASS	PASS	unit	mean	minimum	maximum	deviation
files	148.7	157.4	153.1	154.4	160.9	1/sec	154.9	148.7	160.9	4.10316950661316

second cycle

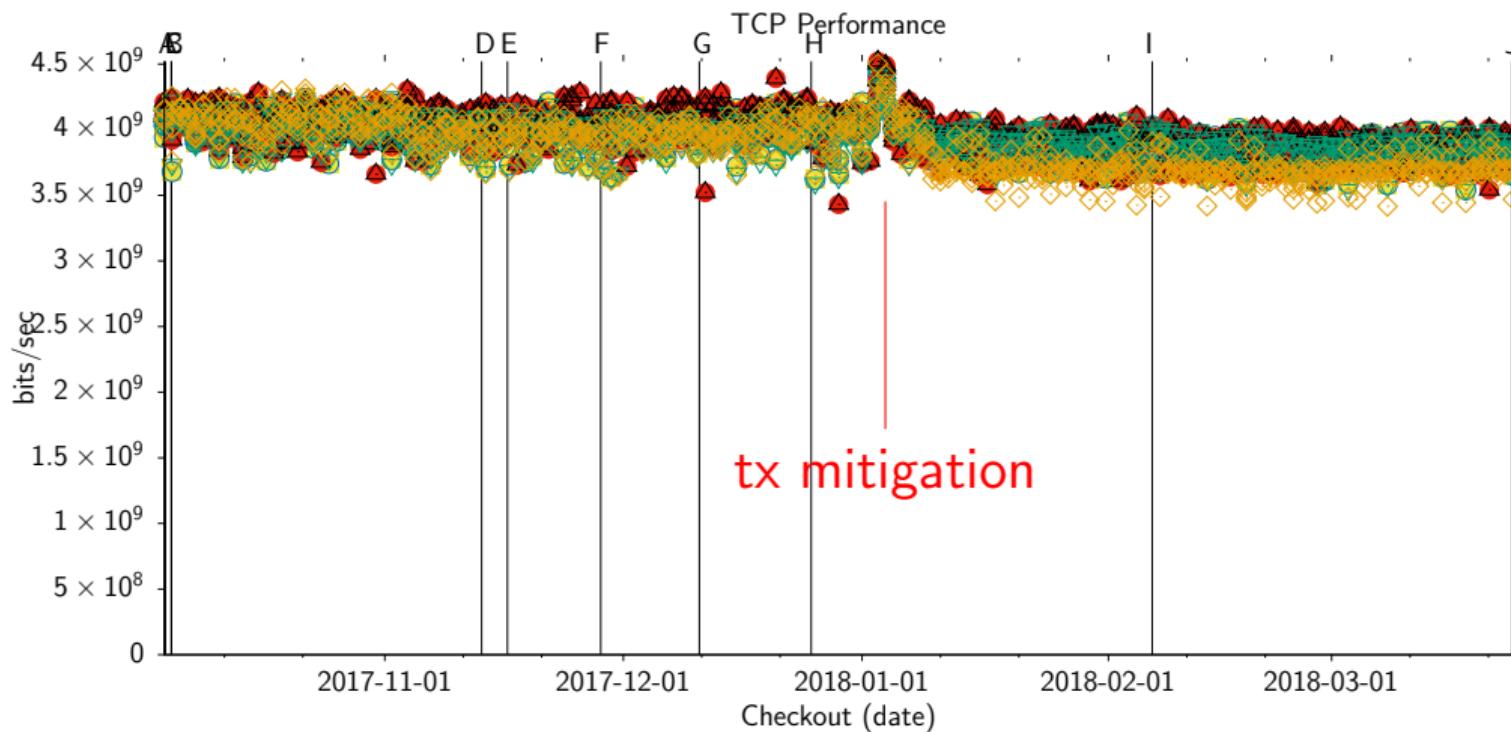
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from 6.2 to 6.3, 173 Days, Reorder



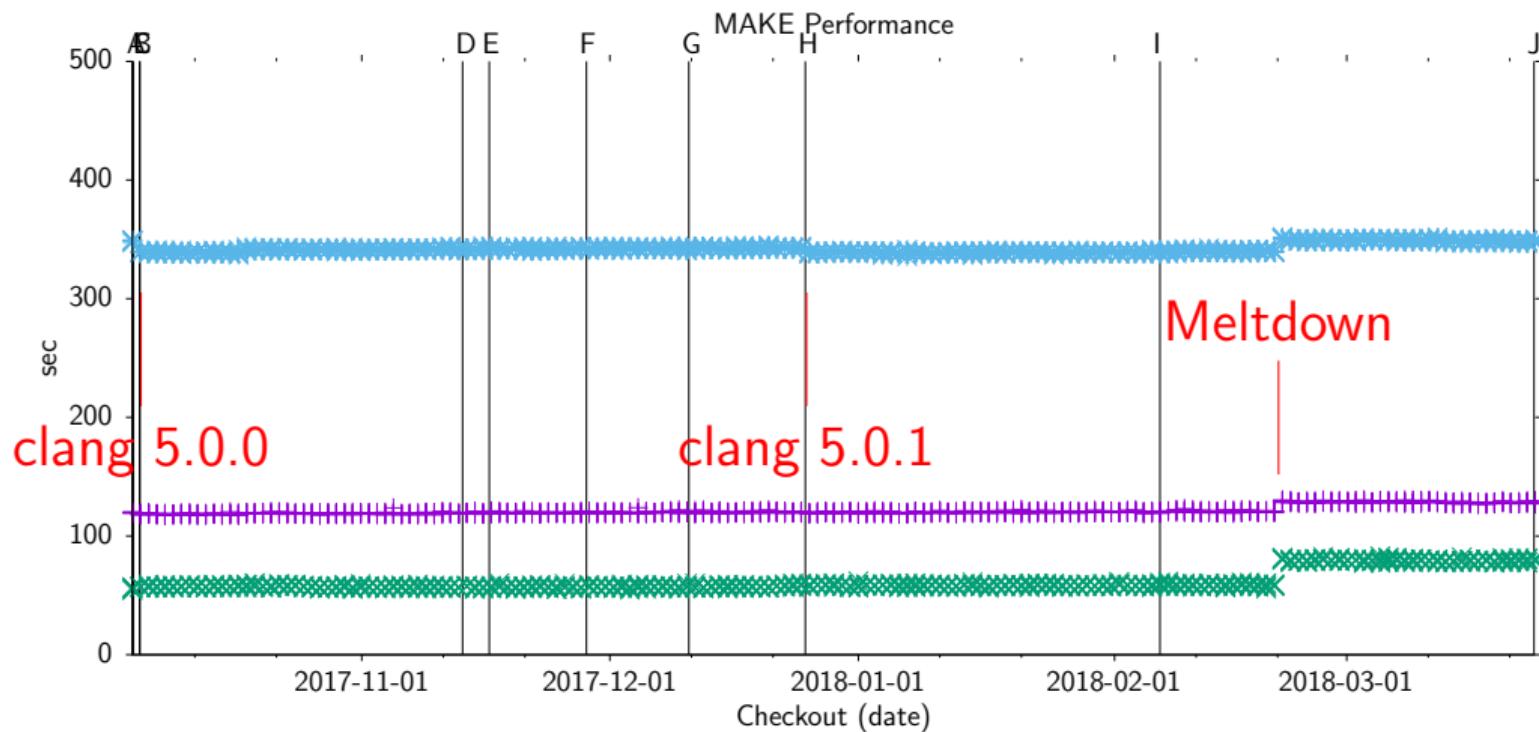
What did exist before?
oooooooo

How does it work?
oooooooooooo

What are the findings?
oooooooooooo●oooooooo

What is the Conclusion?
oooooo

from 6.2 to 6.3, 173 Days, Make Kernel



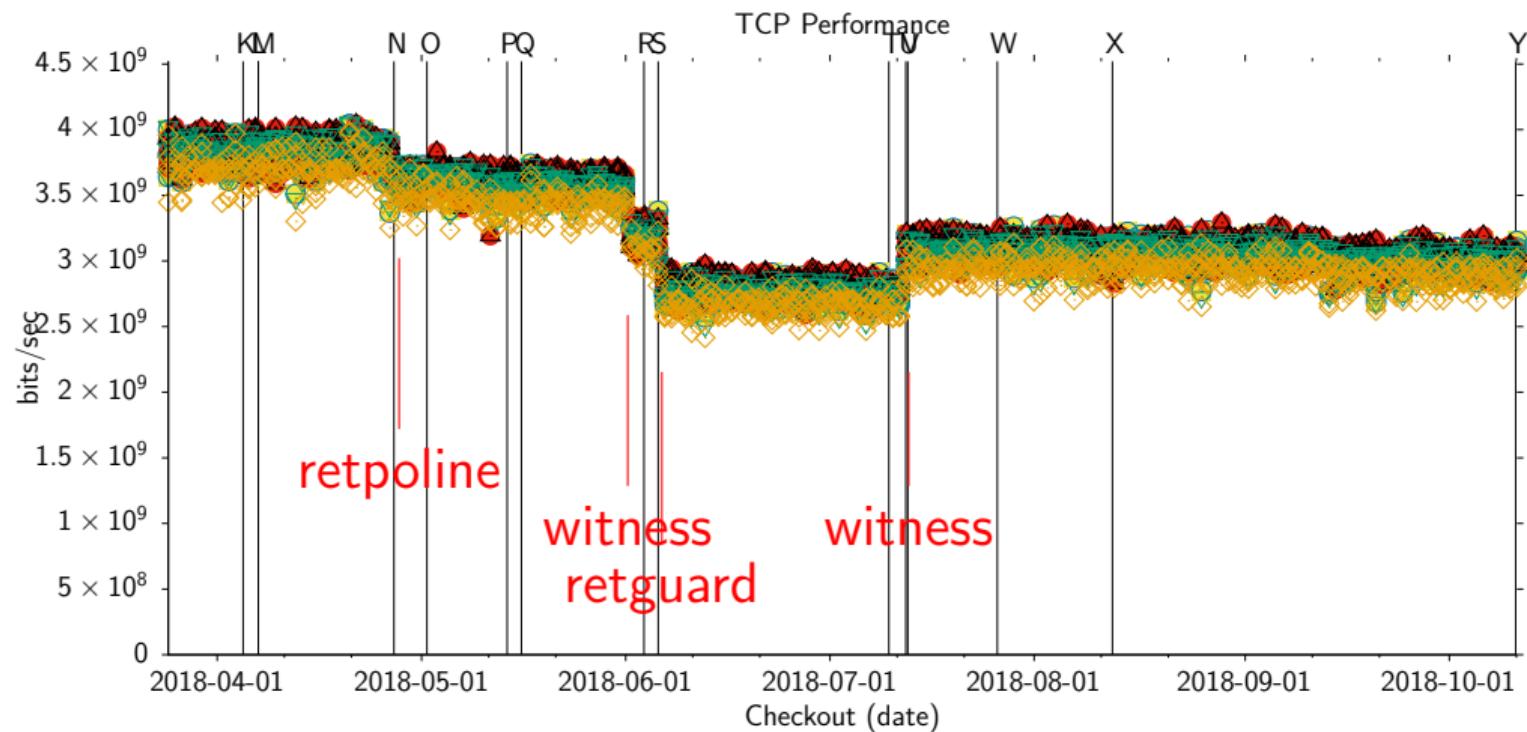
What did exist before?
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How does it work?
oooooooooooo

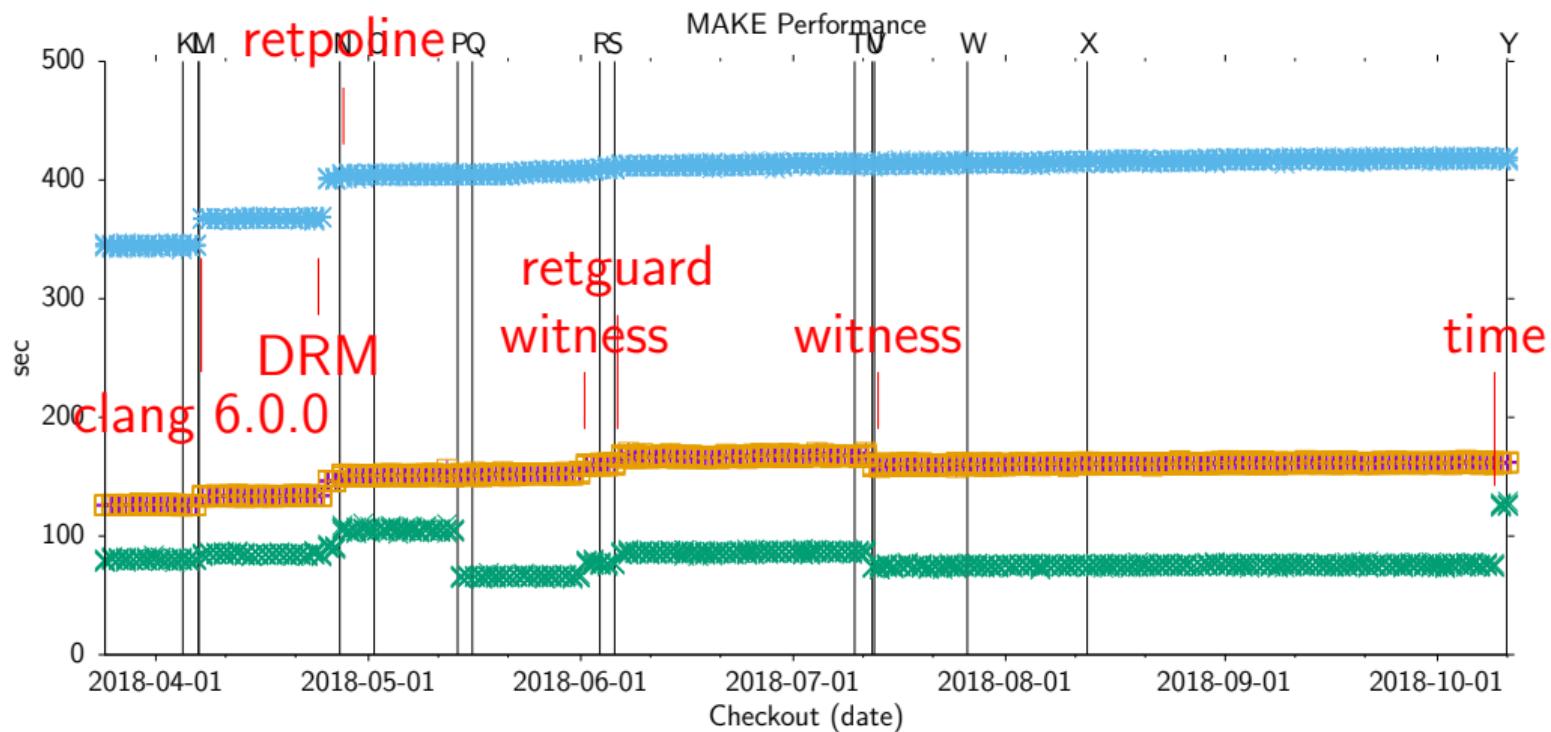
What are the findings?
oooooooooooo●oooooooo

What is the Conclusion?
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from 6.3 to 6.4, 202 Days, Reorder



from 6.3 to 6.4, 202 Days, Reorder



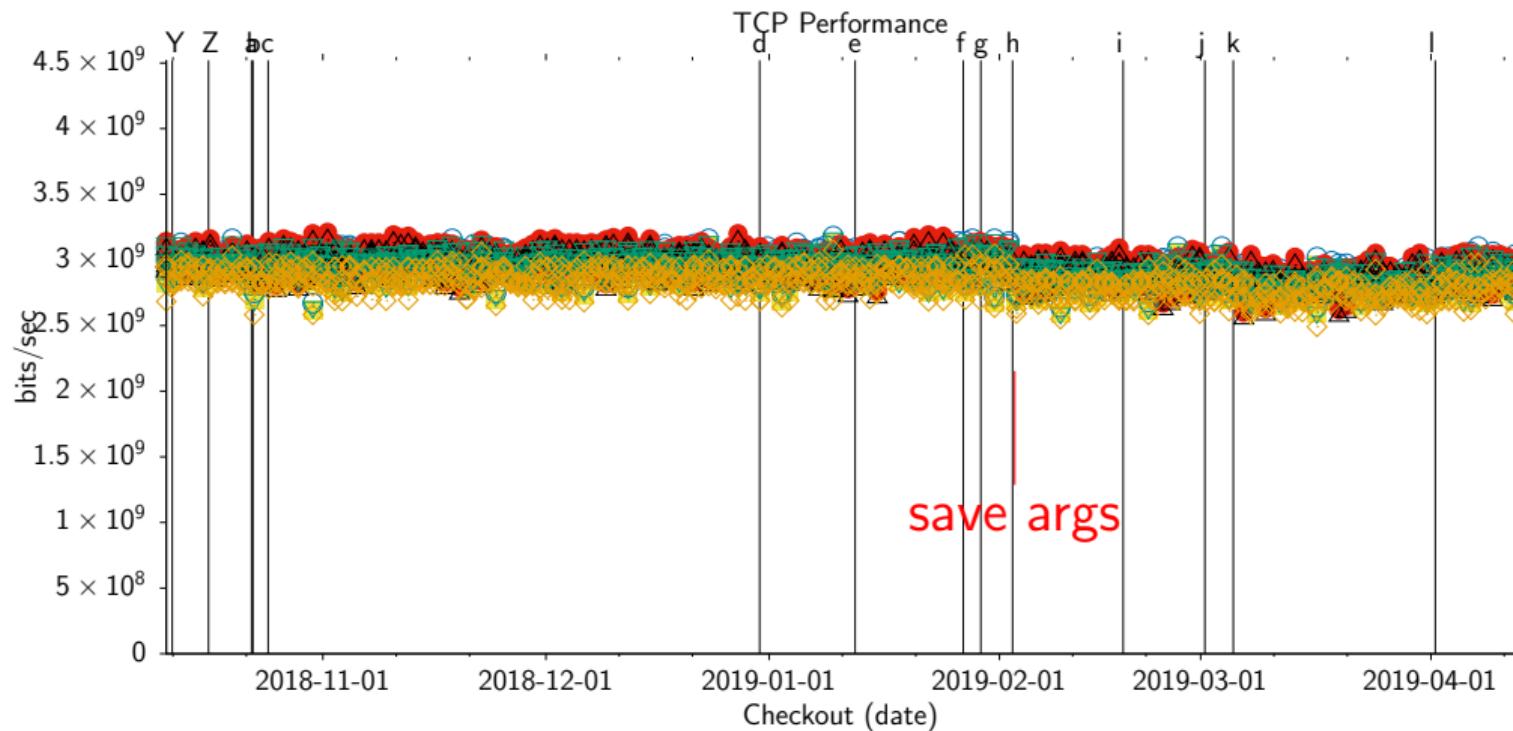
What did exist before?
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How does it work?
oooooooooooo

What are the findings?
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What is the Conclusion?
oooooo

from 6.4 to 6.5, 185 Days, Reorder



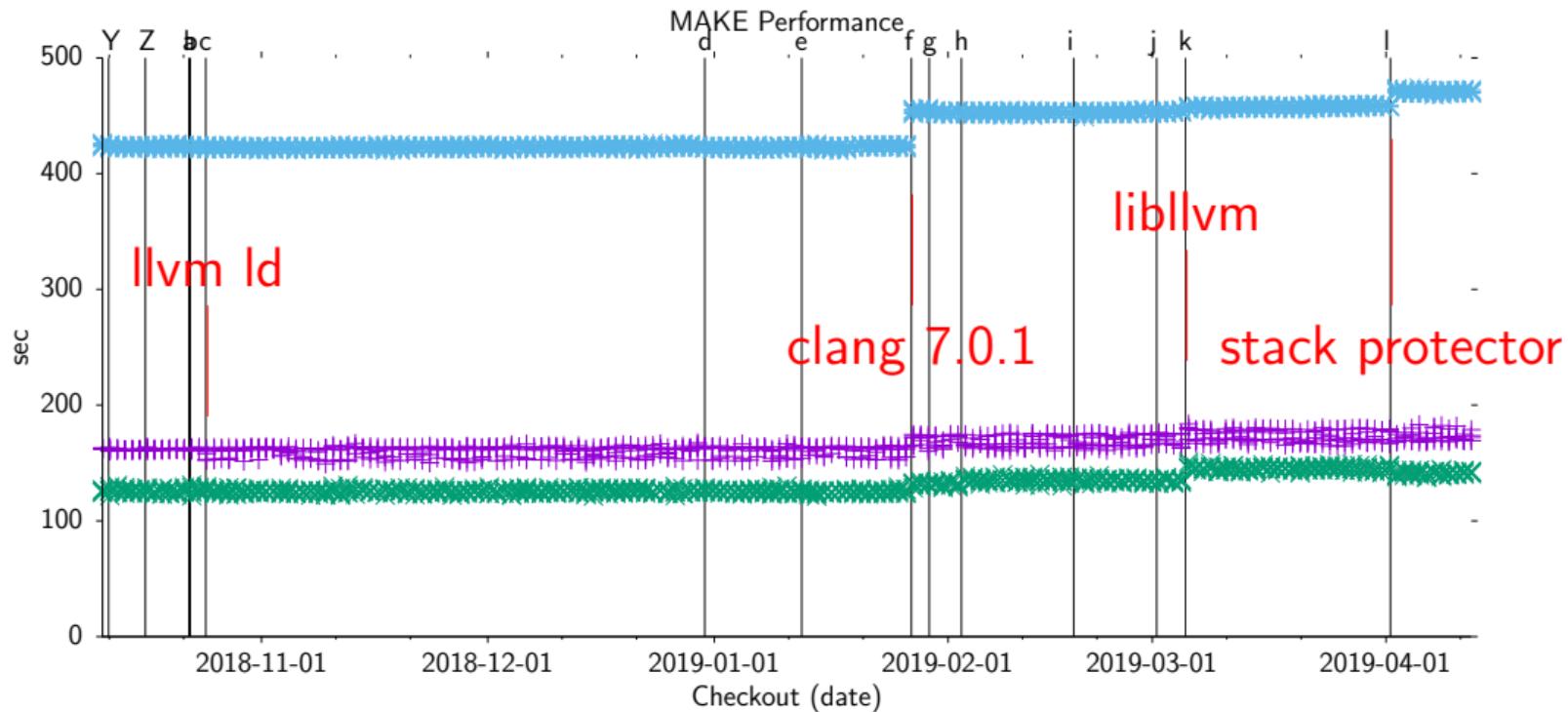
What did exist before?
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How does it work?
oooooooooooo

What are the findings?
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What is the Conclusion?
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from 6.4 to 6.5, 185 Days, Make Kernel



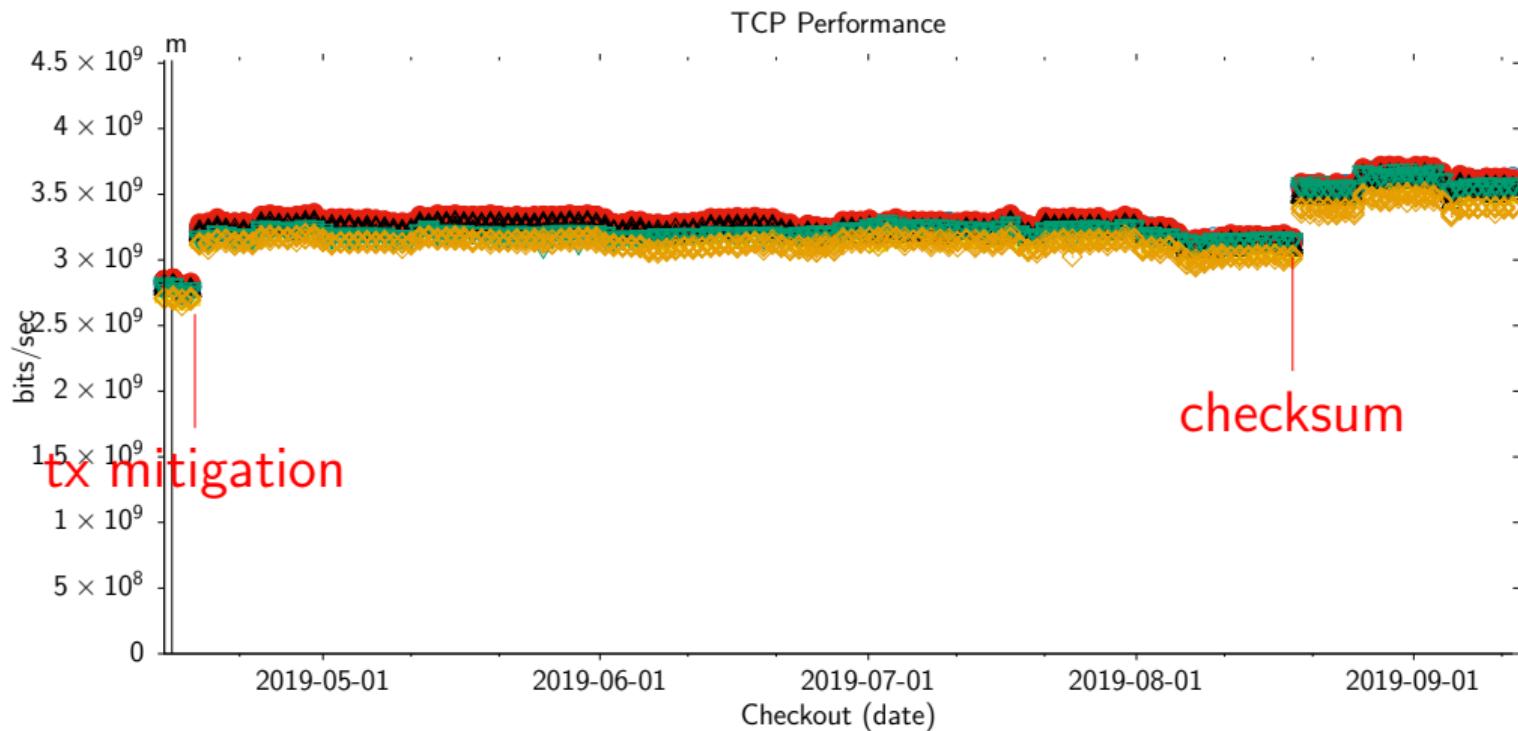
What did exist before?
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How does it work?
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What are the findings?
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What is the Conclusion?
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from 6.5, 154 Days, Align



OpenBSD CVS Log

created 2019-04-20T18:30:24Z

begin 2019-04-16T00:00:00Z

end 2019-04-17T00:00:00Z

path src/sys

commits 8

date 2019-04-16T04:04:19Z

author dlg

files src/sys/net/if.c [log](#) [diff](#) [annotate](#)

src/sys/net/if_var.h [log](#) [diff](#) [annotate](#)

src/sys/net/ifq.c [log](#) [diff](#) [annotate](#)

src/sys/net/ifq.h [log](#) [diff](#) [annotate](#)

message have another go at tx mitigation

the idea is to call the hardware transmit routine less since in a lot of cases posting a producer ring update to the chip is (very) expensive. it's better to do it for several packets instead of each packet, hence calling this tx mitigation.

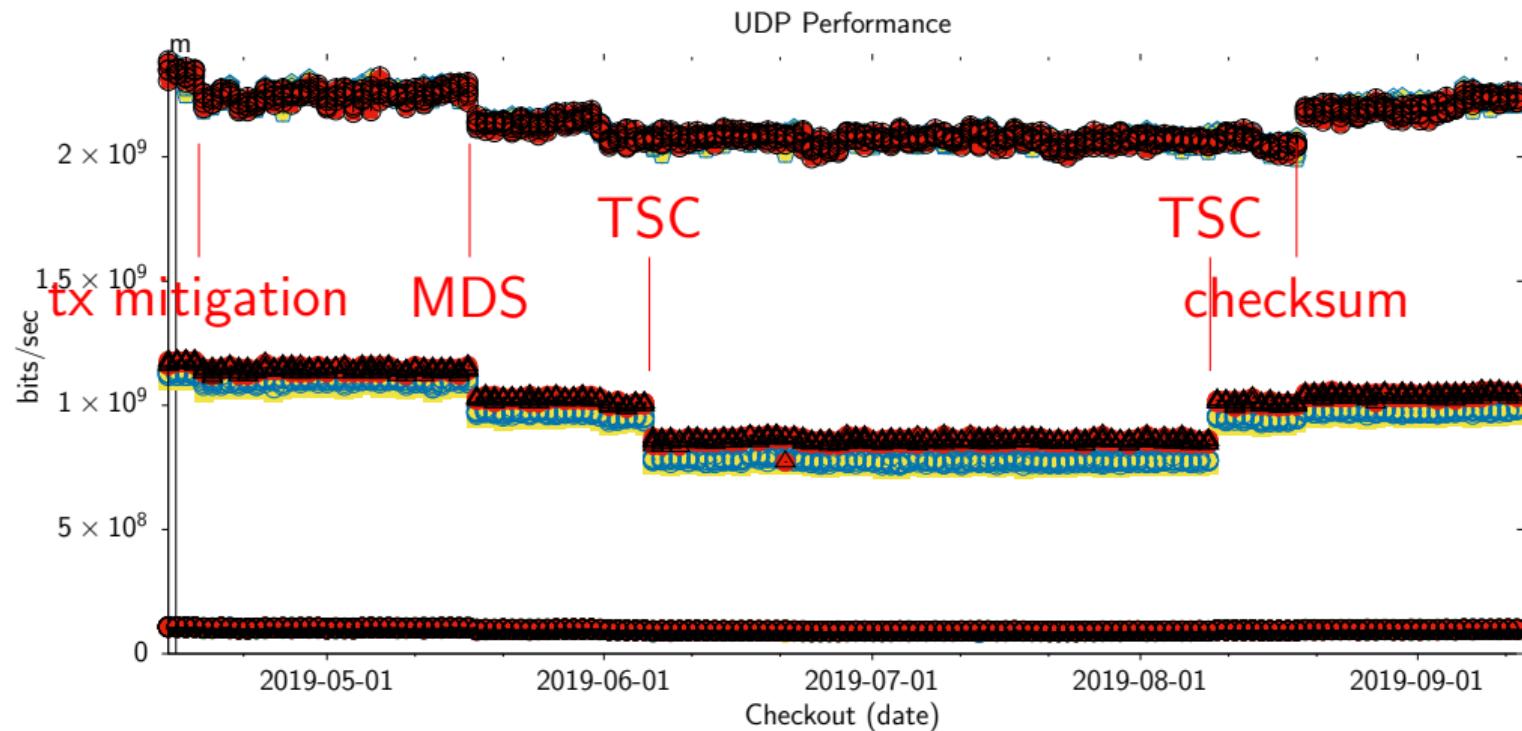
What did exist before?
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How does it work?
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What are the findings?
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What is the Conclusion?
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UDP Throughput, from 6.5, 154 Days, Align



UDP and Timecounter

iperf3

timecounter	UDP Mbits
tsc	924
acpihp0	739
acpitimer0	395
i8254	306

What did exist before?
oooooo

How does it work?
oooooooooooo

What are the findings?
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What is the Conclusion?
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iperf3 UDP

send packet in iperf3 loop

- 1 write
- 2 gettimeofday
- 1 select
- 2 gettimeofday

What did exist before?
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How does it work?
oooooooooooo

What are the findings?
oooooooooooooooooooo

What is the Conclusion?
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Agenda

- 1 What did exist before?
- 2 How does it work?
- 3 What are the findings?
- 4 What is the Conclusion?

What did exist before?
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How does it work?
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What are the findings?
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What is the Conclusion?
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Insights

- measuring sucks
- multi socket CPUs suck
- reproducing is hard
- do not trust your numbers
- keep it stupid simple

What did exist before?
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How does it work?
oooooooooooo

What are the findings?
oooooooooooooooooooo

What is the Conclusion?
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Future Ideas

- forwarding throughput
- Linux client and server
- testing patches
- historic releases
- file system performance

What did exist before?
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How does it work?
oooooooooooo

What are the findings?
oooooooooooooooooooo

What is the Conclusion?
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Thanks

- Jan Klemkow for Hardware Administration
- Moritz Buhl for Visualization
- genua for Hosting and Worktime

What did exist before?
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How does it work?
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What are the findings?
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What is the Conclusion?
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Links

- <http://bluhm.genua.de/>
- <http://bluhm.genua.de/regress/results/regress.html>
- <http://bluhm.genua.de/perform/results/perform.html>
- <http://bluhm.genua.de/perform/results/gnuplot/test.data>
- <https://github.com/bluhm/regress-all>
- <https://github.com/bluhm/udpbench>
- <https://github.com/younix/testmaster>
- <https://github.com/bluhm/talk-perform>

What did exist before?
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How does it work?
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Questions

