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C 言語の OSS Project における Macro 変数利用の調査

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表 1 利用したコンパイル option

option	出力内容	呼び方
なし	Clone 後の Project	Original Project

表 2 Target projects

id	projectName	summary	commitHash
1	zstd	Compression library (v1.5.1)	791626dfb92acf4a3d3ba034263
2	radare2	Reverse engineering framework (5.5.4)	1703da75e247871e6fa22d33085
3	nginx	HTTP and reverse proxy server (1.21.5)	3a7d332aef234d394e5fa2722cc
4	mimikatz	Windows penetration test tool (2.2.0-20210810-2)	7f02230226b04591f9685e74b6e
5	goaccess	Real-time web log analyzer (v1.5.4)	72876319542c2575a05627ab6b9
6	micropython	Programming language interpreter (v1.17)	7c54b6428058a236b8a48c93c25
7	bcc	BPF (Berkeley Package Filter) creation tool (v0.23.0)	67f59ee80fc5deedaacba1436d5
8	Nuklear	Cross-platform GUI library (4.9.5)	3e91905e82c3cad01435d4a8a6c
9	nnn	Terminal file manager (v4.4)	65eddf7b9f02f685145005a8ff
10	timescaledb	Time-series SQL database (2.5.1)	a2530ab5f251ba9680d2c27049
11	hashcat	Password recovery utility (6.2.5)	fe1d3f95bb1d3235e8973bd95f9
12	nginx-rtmp-module	nginx media streaming server module (v1.2.2)	23e1873aa62acb58b7881eed2a5
13	qmkFirmware	Keyboard firmware (0.15.13)	7c186ebb974b4bbadbb74a7610
14	tengine	Web server (extended from nginx) (2.3.3)	ae3ff4619d133ff15d6dad4b8fab
15	twemproxy	KVS proxy (0.5.0)	894d78378c0720642184e5bbfcb
16	ish	iOS Linux shell (1.2.3)	f5dabd67f6bb46f93b4c591a9fb
17	skynet	Online game framework (v1.5.0)	38e5b1ca1ca4c0ea37df17984f4
18	robotjs	Desktop automation library (v0.6.0)	99021d82cea1fe15f6a3cc1ae0c
19	brothli	Compression library (v1.0.9)	e61745a6b7add50d380cfd7d388
20	tig	Text-mode git interface (2.5.5)	72187884af29085691698868ff2
21	kcp	Protocol implementation (1.7)	38e0c9366e4a72c749ff0bcd91
22	reactos	Operating system (0.4.14)	9963bba88bdca8516369b9814a
23	openwrt	Operating system (v21.02.1)	b4d7885af70a42df7577157b96f

表 3 Target project files

projectName	cFiles	hFiles	allFiles	targetRate
radare2	1257	631	4445	0.4247469066366704
ish	108	108	461	0.4685466377440347
goaccess	35	35	119	0.5882352941176471
brotli	33	60	369	0.25203252032520324
nnn	2	8	113	0.08849557522123894
nginx	230	113	499	0.687374749498998

表 4 C file loc

projectName	sum	fileNum	average
radare2	730700	1257	581.304693715195
ish	24033	108	222.52777777777777
goaccess	31494	35	899.8285714285714
brotli	21035	33	637.4242424242424
nnn	8843	2	4421.5
nginx	190635	230	828.8478260869565

表 5 s per files

fileId	id	macroCnt	name	path	pr
2664	1704	1704	sqlite3.c	project/mimikatz/modules/sqlite3.c	
648	510	510	riscvopc.c	project/radare2/libr/asm/arch/riscv/riscvopc.c	
1035	396	396	elf.c	project/radare2/libr/bin/format/elf/elf.c	
936	324	324	dwarf.c	project/radare2/libr/bin/dwarf.c	
4744	263	263	nnn.c	project/nnn/src/nnn.c	
577	175	175	mipsdis.c	project/radare2/libr/asm/arch/mips/gnu/mipsdis.c	
1568	160	160	dwarf_process.c	project/radare2/libr/anal/dwarf_process.c	
2268	134	134	ngx_http_upstream.c	project/nginx/src/http/ngx_http_upstream.c	
581	134	134	tricoredis.c	project/radare2/libr/asm/arch/tricore/gnu/tricoredis.c	
2267	132	132	ngx_http_core_module.c	project/nginx/src/http/ngx_http_core_module.c	
1157	116	116	apprentice.c	project/radare2/libr/magic/apprentice.c	
946	114	114	pe.c	project/radare2/libr/bin/format/pe/pe.c	
1380	111	111	tccgen.c	project/radare2/libr/parse/c/tccgen.c	
448	107	107	xtensamodules.c	project/radare2/libr/asm/arch/xtensa/gnu/xtensamodules.c	
1581	106	106	flirt.c	project/radare2/libr/anal/flirt.c	
2699	97	97	sqlite3.h	project/mimikatz/modules/sqlite3.h	
23455	96	96	tty.c	project/ish/fs/tty.c	
822	95	95	core_java.c	project/radare2/libr/core/p/core_java.c	
552	93	93	ppcopc.c	project/radare2/libr/asm/arch/ppc/gnu/ppcopc.c	
23484	90	90	errno.c	project/ish/kernel/errno.c	

表 6 available macro count per files

fileId	id	macroCnt	name	path
2454	15806	15806	ngx_event_openssl.h	project/nginx/src/event/ngx_event_openssl.h
2340	15067	15067	ngx_http_perl_module.c	project/nginx/src/http/modules/perl/ngx/_http_perl_module.c
2341	15065	15065	ngx_http_perl_module.h	project/nginx/src/http/modules/perl/ngx_http_perl_module.h
1684	9308	9308	debug_native.c	project/radare2/libr/debug/p/debug_native.c
1734	9028	9028	xnu_debug.c	project/radare2/libr/debug/p/native/xnu/xnu_debug.c
1132	8139	8139	bin_write_elf64.c	project/radare2/libr/bin/p/bin_write_elf64.c
1113	8138	8138	bin_write_elf.c	project/radare2/libr/bin/p/bin_write_elf.c
1033	8138	8138	elf64.c	project/radare2/libr/bin/format/elf/elf64.c
1035	8137	8137	elf.c	project/radare2/libr/bin/format/elf/elf.c
1084	8134	8134	bin_elf64.c	project/radare2/libr/bin/p/bin_elf64.c
1128	8133	8133	bin_elf.c	project/radare2/libr/bin/p/bin_elf.c
1088	8133	8133	bin_cgc.c	project/radare2/libr/bin/p/bin_cgc.c
1028	8110	8110	elf64_write.c	project/radare2/libr/bin/format/elf/elf64_write.c
1034	8109	8109	elf_write.c	project/radare2/libr/bin/format/elf/elf_write.c
772	7976	7976	rtr.c	project/radare2/libr/core/rtr.c
1424	7833	7833	io_debug.c	project/radare2/libr/io/p/io_debug.c
2664	7187	7187	sqlite3.c	project/mimikatz/modules/sqlite3.c
786	7169	7169	cmd.c	project/radare2/libr/core/cmd.c
818	7109	7109	cmd_debug.c	project/radare2/libr/core/cmd_debug.c
690	6692	6692	asm_mips_gnu.c	project/radare2/libr/asm/p/asm_mips_gnu.c

表 7 defined macro per file info

project name	file num	total macro num	mean	median	variance	stdev
radare2	1727	18233334	10557.8078	12120.0	35507115.7811	5958.7848
ish	167	1044081	6251.982	4920.0	13587137.078	3686.073
goaccess	39	231507	5936.08	6084.0	6312854.44	2512.54
brotli	88	249933	2840.15	3066.0	1129785.3	1062.91
nnn	9	48759	5417.67	3936.0	21012238.0	4583.91
nginx	339	5685477	16771.319	17274.0	21603574.585	4647.965

表 8 available macro per file info

project name	file num	total macro num	mean	median	variance	stdev
radare2	1727	18094797	10477.5895	12018.0	34960922.1564	5912.7762
ish	167	1040994	6233.497	4914.0	13486450.408	3672.39
goaccess	39	229971	5896.69	6012.0	6196606.96	2489.3
brotli	88	247320	2810.45	3054.0	1088557.77	1043.34
nnn	9	48672	5408.0	3930.0	20910397.5	4572.79
nginx	339	5639307	16635.124	17124.0	21325319.985	4617.935

表 9 whole macro per file info

project name	file num	total macro num	mean	median	variance	stdev
radare2	1727	18233334	10557.8078	12120.0	35507115.7811	5958.7848
ish	167	1044081	6251.982	4920.0	13587137.078	3686.073
goaccess	39	231507	5936.08	6084.0	6312854.44	2512.54
brotli	88	249933	2840.15	3066.0	1129785.3	1062.91
nnn	9	48759	5417.67	3936.0	21012238.0	4583.91
nginx	339	5685477	16771.319	17274.0	21603574.585	4647.965

表 10 used macro per file info

project name	file num	total macro num	mean	median	variance	stdev
radare2	1339	49584	37.0306	21.0	5619.0805	74.9605
ish	121	5166	42.694	21.0	3193.464	56.511
goaccess	30	1395	46.5	21.0	2829.57	53.19
brotli	62	945	15.24	6.0	436.51	20.89
nnn	3	834	278.0	33.0	195951.0	442.66
nginx	271	16977	62.646	48.0	3812.874	61.748