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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)	791626dfb92acf4a3d3ba0342630
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)	67f59ee80fcf5deedaacba1436d9
8	Nuklear	Cross-platform GUI library (4.9.5)	3e91905e82c3cad01435d4a8a66
9	nnn	Terminal file manager (v4.4)	65eddfe7b9f02f685145005a8ffc
10	timescaledb	Time-series SQL database (2.5.1)	a2530ab5f251ba9680d2c270496
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)	7c186ebb974b4bbadbb74a7610b
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)	38e5b1ca1ca4c0ea37df17984f4b
18	robotjs	Desktop automation library (v0.6.0)	99021d82cea1fe15f6a3cc1ae0c1
19	brotli	Compression library (v1.0.9)	e61745a6b7add50d380cfd7d388
20	tig	Text-mode git interface (2.5.5)	72187884af29085691698868ff2
21	kcp	Protocol implementation (1.7)	38e0c9366e4a72c749ff0bcdf91
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　defined macro per file info

project name	file num	variaty of macro num	mean	median	variance	stdev
radare2	957	20020	27.421	4.0	17174.409	131.051
nginx	178	1489	10.618	3.0	338.283	18.392
goaccess	19	389	21.79	4.0	3023.51	54.99
nnn	9	4193	467.2	10.0	1505941.7	1227.2
ish	116	1543	15.302	3.0	1444.717	38.009
brotli	69	330	7.35	2.0	259.41	16.11

表 6　available macro per file info

project name	file num	variaty of macro num	mean	median	variance	stdev
radare2	1727	30105	3492.5298	4006.0	3884546.9063	1970.9254
nginx	339	26256	5545.041	5708.0	2369479.998	1539.312
goaccess	39	4181	1965.56	2004.0	688511.88	829.77
nnn	9	9324	1802.7	1310.0	2323377.5	1524.3
ish	167	9064	2077.832	1638.0	1498494.49	1224.13
brotli	88	2336	936.82	1018.0	120950.86	347.78

表 7　whole macro per file info

project name	file num	variaty of macro num	mean	median	variance	stdev
radare2	1727	30411	3519.2693	4040.0	3945235.0868	1986.2616
nginx	339	26331	5590.44	5758.0	2400397.176	1549.322
goaccess	39	4207	1978.69	2028.0	701428.27	837.51
nnn	9	9348	1805.9	1312.0	2334693.1	1528.0
ish	167	9152	2083.994	1640.0	1509681.898	1228.691
brotli	88	2432	946.72	1022.0	125531.7	354.3

表 8　used macro per file info

project name	file num	variaty of macro num	mean	median	variance	stdev
radare2	1339	6183	12.344	7.0	624.342	24.987
nginx	271	1006	20.882	16.0	423.653	20.583
goaccess	30	304	15.5	7.0	314.4	17.73
nnn	3	270	92.7	11.0	21772.3	147.6
ish	121	828	14.23	7.0	354.83	18.84
brotli	62	129	5.08	2.0	48.5	6.96

表 9　frequcncy of macro use file in each project

project name	file num	target file num	rate
radare2	1888	1339	0.7092
nginx	343	271	0.7901
goaccess	70	30	0.4286
nnn	10	3	0.3
ish	216	121	0.5602
brotli	93	62	0.6667

表 10　appearance of define directive in each project

project name	file num	target file num	rate
radare2	1888	957	0.5069
nginx	343	178	0.519
goaccess	70	19	0.2714
nnn	10	9	0.9
ish	216	116	0.537
brotli	93	69	0.7419