

CHANNEL 分配情况

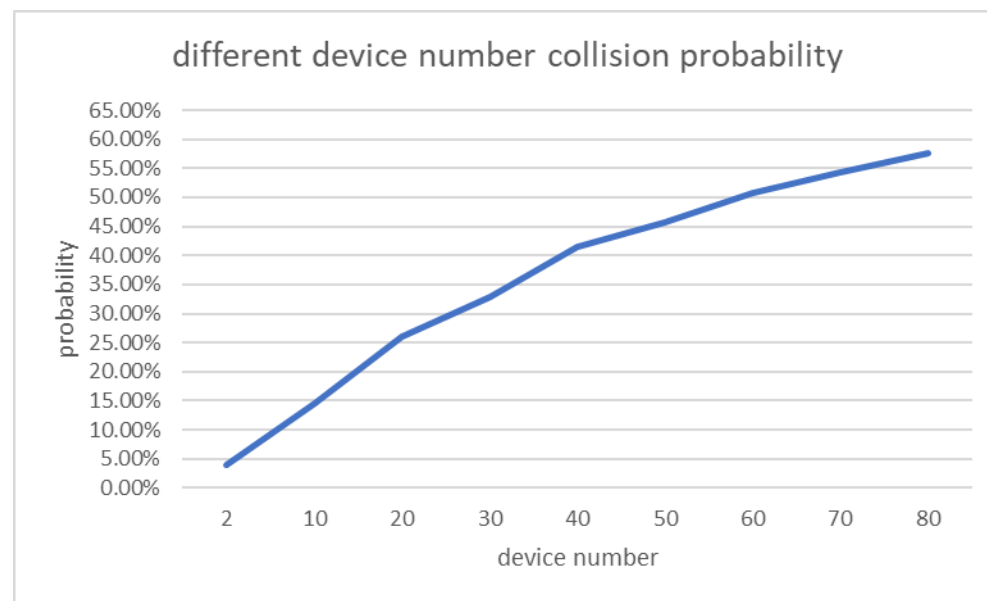
Channel 0~55 for (all device*0.3)

Channel 56~79 for (all device*0.7)

(1)

```
maxhsu@Max-Hsu: /mnt/c/Users/Max-Hsu/Desktop/homework/wireless/hw1$ ./HW1
100
alarm
device: 2 after: 100 sec total collision:7798 total hop:200928 probability: 0.038810
```

(2)



(3)(a)如果是 bad channel 選擇附近的 channel 旁邊通常還是 bad channel，所以沒有甚麼差別

```
maxhsu@Max-Hsu: /mnt/c/Users/Max-Hsu/Desktop/homework/wireless/hw3/hw3-1$ ./HW3-1
Marking bad channel 0.100000 device: 40 after: 1 sec total collision:15941 total hop:38877 probability: 0.410037
method1 bad_channel 0.100000 device: 40 after: 1 sec total collision:16523 total hop:39491 probability: 0.418399
Marking bad channel 0.200000 device: 40 after: 1 sec total collision:16058 total hop:38441 probability: 0.417731
method1 bad_channel 0.200000 device: 40 after: 1 sec total collision:15428 total hop:37476 probability: 0.411677
Marking bad channel 0.300000 device: 40 after: 1 sec total collision:16735 total hop:40562 probability: 0.412578
method1 bad_channel 0.300000 device: 40 after: 1 sec total collision:15328 total hop:38487 probability: 0.398264
Marking bad channel 0.400000 device: 40 after: 1 sec total collision:14457 total hop:35577 probability: 0.406358
method1 bad_channel 0.400000 device: 40 after: 1 sec total collision:13626 total hop:32438 probability: 0.420063
Marking bad channel 0.500000 device: 40 after: 1 sec total collision:15050 total hop:37483 probability: 0.401515
method1 bad_channel 0.500000 device: 40 after: 1 sec total collision:17131 total hop:36501 probability: 0.469330
Marking bad channel 0.600000 device: 40 after: 1 sec total collision:16585 total hop:40530 probability: 0.409203
method1 bad_channel 0.600000 device: 40 after: 1 sec total collision:15293 total hop:36470 probability: 0.419331
Marking bad channel 0.700000 device: 40 after: 1 sec total collision:15254 total hop:37473 probability: 0.407066
method1 bad_channel 0.700000 device: 40 after: 1 sec total collision:15659 total hop:39479 probability: 0.396641
Marking bad channel 0.800000 device: 40 after: 1 sec total collision:16640 total hop:40285 probability: 0.413057
method1 bad_channel 0.800000 device: 40 after: 1 sec total collision:16190 total hop:40546 probability: 0.399300
Marking bad channel 0.900000 device: 40 after: 1 sec total collision:15863 total hop:38973 probability: 0.407025
method1 bad_channel 0.900000 device: 40 after: 1 sec total collision:16723 total hop:40336 probability: 0.414592
```

Marking	bad channel	0.100000	device: 80	after: 1 sec	total collision:45191	total hop:78896	probability: 0.572792
method1	bad_channel	0.100000	device: 80	after: 1 sec	total collision:45239	total hop:79003	probability: 0.572624
Marking	bad channel	0.200000	device: 80	after: 1 sec	total collision:44778	total hop:77972	probability: 0.574283
method1	bad_channel	0.200000	device: 80	after: 1 sec	total collision:43876	total hop:76905	probability: 0.570522
Marking	bad channel	0.300000	device: 80	after: 1 sec	total collision:42828	total hop:74548	probability: 0.574502
method1	bad_channel	0.300000	device: 80	after: 1 sec	total collision:45105	total hop:76962	probability: 0.586068
Marking	bad channel	0.400000	device: 80	after: 1 sec	total collision:44904	total hop:78270	probability: 0.573706
method1	bad_channel	0.400000	device: 80	after: 1 sec	total collision:45510	total hop:77743	probability: 0.585390
Marking	bad channel	0.500000	device: 80	after: 1 sec	total collision:44617	total hop:77918	probability: 0.572615
method1	bad_channel	0.500000	device: 80	after: 1 sec	total collision:45034	total hop:77073	probability: 0.584303
Marking	bad channel	0.600000	device: 80	after: 1 sec	total collision:43127	total hop:75725	probability: 0.569521
method1	bad_channel	0.600000	device: 80	after: 1 sec	total collision:45485	total hop:77708	probability: 0.585332
Marking	bad channel	0.700000	device: 80	after: 1 sec	total collision:42683	total hop:77242	probability: 0.552588
method1	bad_channel	0.700000	device: 80	after: 1 sec	total collision:45949	total hop:78328	probability: 0.586623
Marking	bad channel	0.800000	device: 80	after: 1 sec	total collision:44664	total hop:78197	probability: 0.571173
method1	bad_channel	0.800000	device: 80	after: 1 sec	total collision:43857	total hop:76781	probability: 0.571196
Marking	bad channel	0.900000	device: 80	after: 1 sec	total collision:44892	total hop:77866	probability: 0.576529
method1	bad_channel	0.900000	device: 80	after: 1 sec	total collision:44428	total hop:77587	probability: 0.572622

(3)(b)如果是 bad channel 選擇離該 channel 最遠的，0~39 會選 79，40~79 會選 0 造成更大的 collision

Maxhsu@Max-Hsu: /mnt/c/Users/Max-Hsu/Desktop/homework/wireless/hw3/hw3-2\$./hw3-2							
Marking	bad channel	0.100000	device: 40	after: 1 sec	total collision:15704	total hop:37903	probability: 0.414321
method2	bad_channel	0.100000	device: 40	after: 1 sec	total collision:15567	total hop:37970	probability: 0.409982
Marking	bad channel	0.200000	device: 40	after: 1 sec	total collision:15392	total hop:37613	probability: 0.409220
method2	bad_channel	0.200000	device: 40	after: 1 sec	total collision:23206	total hop:34948	probability: 0.664015
Marking	bad channel	0.300000	device: 40	after: 1 sec	total collision:14276	total hop:35278	probability: 0.404671
method2	bad_channel	0.300000	device: 40	after: 1 sec	total collision:26172	total hop:37089	probability: 0.705654
Marking	bad channel	0.400000	device: 40	after: 1 sec	total collision:15829	total hop:38213	probability: 0.414231
method2	bad_channel	0.400000	device: 40	after: 1 sec	total collision:27738	total hop:39060	probability: 0.710138
Marking	bad channel	0.500000	device: 40	after: 1 sec	total collision:14496	total hop:34617	probability: 0.418754
method2	bad_channel	0.500000	device: 40	after: 1 sec	total collision:25751	total hop:37124	probability: 0.693648
Marking	bad channel	0.600000	device: 40	after: 1 sec	total collision:15516	total hop:38273	probability: 0.405403
method2	bad_channel	0.600000	device: 40	after: 1 sec	total collision:14952	total hop:36756	probability: 0.406791
Marking	bad channel	0.700000	device: 40	after: 1 sec	total collision:15937	total hop:39043	probability: 0.408191
method2	bad_channel	0.700000	device: 40	after: 1 sec	total collision:15743	total hop:38149	probability: 0.412671
Marking	bad channel	0.800000	device: 40	after: 1 sec	total collision:15785	total hop:38033	probability: 0.415034
method2	bad_channel	0.800000	device: 40	after: 1 sec	total collision:15158	total hop:36360	probability: 0.416887
Marking	bad channel	0.900000	device: 40	after: 1 sec	total collision:14686	total hop:37036	probability: 0.396533
method2	bad_channel	0.900000	device: 40	after: 1 sec	total collision:15620	total hop:37175	probability: 0.420175

Marking	bad channel	0.100000	device: 80	after: 1 sec	total collision:42263	total hop:74237	probability: 0.569298
method2	bad_channel	0.100000	device: 80	after: 1 sec	total collision:44599	total hop:77628	probability: 0.574522
Marking	bad channel	0.200000	device: 80	after: 1 sec	total collision:42002	total hop:74658	probability: 0.562592
method2	bad_channel	0.200000	device: 80	after: 1 sec	total collision:41906	total hop:73087	probability: 0.573371
Marking	bad channel	0.300000	device: 80	after: 1 sec	total collision:41952	total hop:73339	probability: 0.572029
method2	bad_channel	0.300000	device: 80	after: 1 sec	total collision:42614	total hop:74427	probability: 0.572561
Marking	bad channel	0.400000	device: 80	after: 1 sec	total collision:43373	total hop:75738	probability: 0.572672
method2	bad_channel	0.400000	device: 80	after: 1 sec	total collision:57984	total hop:76053	probability: 0.762416
Marking	bad channel	0.500000	device: 80	after: 1 sec	total collision:44071	total hop:77218	probability: 0.570735
method2	bad_channel	0.500000	device: 80	after: 1 sec	total collision:57025	total hop:74454	probability: 0.765909
Marking	bad channel	0.600000	device: 80	after: 1 sec	total collision:42277	total hop:73857	probability: 0.572417
method2	bad_channel	0.600000	device: 80	after: 1 sec	total collision:57466	total hop:76158	probability: 0.754563
Marking	bad channel	0.700000	device: 80	after: 1 sec	total collision:43483	total hop:75350	probability: 0.577080
method2	bad_channel	0.700000	device: 80	after: 1 sec	total collision:45520	total hop:72791	probability: 0.625352
Marking	bad channel	0.800000	device: 80	after: 1 sec	total collision:42730	total hop:74515	probability: 0.573442
method2	bad_channel	0.800000	device: 80	after: 1 sec	total collision:42556	total hop:74266	probability: 0.573021
Marking	bad channel	0.900000	device: 80	after: 1 sec	total collision:41946	total hop:74645	probability: 0.561940
method2	bad_channel	0.900000	device: 80	after: 1 sec	total collision:42273	total hop:74892	probability: 0.564453

(3)(c)當全部 channel 被標注成 bad channel 時狀況與原本一樣

```
1 bcr:13996483335040 after 529 1022 ✖
2 bcr:139964968601344 after 542 1024 ✖
3 bcr:139964824880896 after 561 1021 ✖
4 bcl:139964714977024 after 155 1021 ✖
5 bcl:139964723431168 after 165 1019 ✖
6 bcr:139964782610176 after 539 1022 ✖
7 bcr:139964791064320 after 539 1022 ✖
8 bcr:139964960147200 after 499 1023 ✖
9 bcr:139964858697472 after 533 1023 ✖
10 bcr:139964850243328 after 546 1022 ✖
11 bcl:139964655798016 after 170 1018 ✖
12 bcr:139964816426752 after 514 1022 ✖
13 bcr:139964951693056 after 546 1021 ✖
14 bcr:139964892514048 after 535 1022 ✖
15 bcl:139964647343872 after 182 1021 ✖
16 bcr:139964977055488 after 526 1026 ✖
17 bcr:139964917876480 after 571 1024 ✖
18 bcr:139964926330624 after 526 1022 ✖
19 bcl:139964689614592 after 166 1020 ✖
20 bcr:139964867151616 after 538 1023 ✖
21 bcl:139964681160448 after 146 1020 ✖
22 bcr:139964757247744 after 542 1021 ✖
23 bcr:139964884059904 after 541 1024 ✖
24 bcl:139964672706304 after 152 1021 ✖
25 bcl:139964698068736 after 153 1020 ✖
26 bcr:139964748793600 after 541 1022 ✖
27 bcr:139964909422336 after 540 1023 ✖
28 bcr:139964900968192 after 527 1021 ✖
29 bcr:139964765701888 after 523 1022 ✖
30 bcr:139964934704768 after 537 1025 ✖
31 bcr:139964875605760 after 544 1020 ✖
32 bcr:139964841789184 after 543 1023 ✖
33 bcl:139964740339456 after 153 1020 ✖
34 bcl:139964706522880 after 168 1021 ✖
35 bcl:139964731885312 after 176 1022 ✖
36 bcr:139964799518464 after 542 1022 ✖
37 bcl:139964664252160 after 153 1018 ✖
38 bcr:139964943238912 after 571 1025 ✖
39 bcr:139964807972608 after 519 1022 ✖
40 bcr:139964774156032 after 524 1022 ✖
41 Marking bad channel 0.100000 device: 40 ... after: 1 sec → total collision:15316 → total hop:37805 → probability: 0.405132
42 clean 0 ,bad 80✖
43 cr:139964875605760 after 472 912 ✖
44 cr:139964850243328 after 479 910 ✖
45 cr:139964977055488 after 486 912 ✖
46 cr:139964833335040 after 481 910 ✖
47 cl:139964706522880 after 149 908 ✖
48 cr:139964655798016 after 429 913 ✖
49 cr:139964884059904 after 472 912 ✖
50 cr:139964892514048 after 481 908 ✖
51 cl:139964740339456 after 136 909 ✖
52 cr:139964858697472 after 477 910 ✖
53 cr:139964664252160 after 466 912 ✖
54 cr:139964824880896 after 489 910 ✖
55 cl:139964774156032 after 151 912 ✖
56 cr:139964934784768 after 494 913 ✖
57 cr:139964926330624 after 481 910 ✖
58 cr:139964807972608 after 503 910 ✖
59 cr:139964951693056 after 509 913 ✖
60 cl:139964748793600 after 151 908 ✖
61 cl:139964681160448 after 122 904 ✖
62 cr:139964841789184 after 475 910 ✖
63 cr:139964647343872 after 481 916 ✖
64 cr:139964782610176 after 495 907 ✖
65 cl:139964765701888 after 163 909 ✖
66 cr:139964791064320 after 479 907 ✖
67 cr:139964968601344 after 459 913 ✖
68 cr:139964917876480 after 490 913 ✖
69 cl:139964723431168 after 141 906 ✖
70 cr:139964909422336 after 482 912 ✖
71 cl:139964731885312 after 129 907 ✖
72 cr:139964799518464 after 476 909 ✖
73 cr:139964816426752 after 471 910 ✖
74 cr:139964943238912 after 473 915 ✖
75 cl:139964689614592 after 141 905 ✖
76 cr:139964900968192 after 480 912 ✖
77 cr:139964960147200 after 461 913 ✖
78 cl:139964698068736 after 137 909 ✖
79 cr:139964672706304 after 444 911 ✖
80 cr:139964867151616 after 494 911 ✖
81 cl:139964757247744 after 154 906 ✖
82 cl:139964714977024 after 145 904 ✖
83 method3 bad_channel 0.100000 device: 40 ... after: 1 sec → total collision:14626 → total hop:35489 → probability: 0.412128
84 ✖
85 bcl:139964765701888 after 153 989 ✖
86 bcl:139964655798016 after 145 995 ✖
87 bcl:139964731885312 after 169 988 ✖
88 bcr:139964833335040 after 467 988 ✖
```


當有一部份被 mark 成 bad channel 時，該 channel 會尋找 clean channel，
與 clean channel 搶頻道，使得 channel 分配均等

```
86 bcl:139964655798016 after 145 995 1000
87 bcl:139964731885312 after 169 988 1000
88 bcr:139964833335040 after 497 989 1000
89 bcr:139964689614592 after 533 1000 1000
90 bcr:139964867151616 after 514 994 1000
91 bcl:139964647343872 after 139 992 1000
92 bcl:139964740339456 after 153 986 1000
93 bcl:139964672706304 after 164 987 1000
94 bcr:139964824880896 after 515 995 1000
95 bcr:139964807972608 after 525 990 1000
96 bcr:139964943238912 after 492 993 1000
97 bcr:139964816426752 after 523 994 1000
98 bcr:139964884059904 after 536 999 1000
99 bcr:139964968601344 after 522 994 1000
100 bcr:139964841789184 after 547 988 1000
101 bcl:139964714977024 after 161 990 1000
102 bcr:139964934784768 after 522 995 1000
103 bcr:139964900968192 after 552 994 1000
104 bcl:139964723431168 after 174 991 1000
105 bcr:139964951693056 after 511 999 1000
106 bcr:139964917876480 after 503 997 1000
107 bcl:139964774156032 after 161 985 1000
108 bcl:139964664252160 after 156 990 1000
109 bcl:139964748793600 after 179 993 1000
110 bcr:139964875605760 after 512 989 1000
111 bcr:139964799518464 after 507 988 1000
112 bcr:139964782610176 after 524 993 1000
113 bcr:139964960147200 after 512 1005 1000
114 bcr:139964681160448 after 529 995 1000
115 bcr:139964892514048 after 504 998 1000
116 bcr:139964858697472 after 528 998 1000
117 bcr:139964909422336 after 529 990 1000
118 bcr:139964791064320 after 536 998 1000
119 bcr:139964850243328 after 547 995 1000
120 bcr:139964926330624 after 529 997 1000
121 bcl:139964757247744 after 166 996 1000
122 bcr:139964706522880 after 522 998 1000
123 bcr:139964698068736 after 516 1006 1000
124 bcr:139964977055488 after 508 991 1000
125 Marking bad channel 0.200000 device: 40 after: 1 sec -> total collision:16362 -> total hop:38758 -> probability: 0.422158
126 clean 56 ,bad 24
127 cr:139964960147200 after 404 1008 1000
128 cr:139964977055488 after 411 996 1000
129 cr:139964799518464 after 427 1003 1000
130 cr:139964951693056 after 387 1012 1000
```

```
128 cr:139964977055488 after 411 996 1000
129 cr:139964799518464 after 427 1003 1000
130 cr:139964951693056 after 387 1012 1000
131 cr:139964672706304 after 416 1006 1000
132 cr:139964655798016 after 425 1003 1000
133 cr:139964850243328 after 398 1011 1000
134 cl:139964689614592 after 401 1009 1000
135 cl:139964731885312 after 398 1001 1000
136 cl:139964774156032 after 421 1003 1000
137 cr:139964884059904 after 428 1008 1000
138 cr:139964664252160 after 421 1010 1000
139 cr:139964926330624 after 408 1010 1000
140 cr:139964934784768 after 428 1005 1000
141 cr:139964647343872 after 404 1003 1000
142 cr:139964782610176 after 412 1009 1000
143 cr:139964816426752 after 434 1006 1000
144 cl:139964681160448 after 391 1004 1000
145 cl:139964740339456 after 380 1000 1000
146 cr:139964909422336 after 397 1003 1000
147 cr:139964892514048 after 367 1009 1000
148 cl:139964723431168 after 383 1010 1000
149 cl:139964698068736 after 381 1000 1000
150 cl:139964748793600 after 393 1007 1000
151 cr:139964900968192 after 425 1001 1000
152 cl:139964714977024 after 430 1006 1000
153 cl:139964706522880 after 400 1002 1000
154 cr:139964858697472 after 411 1011 1000
155 cl:139964765701888 after 381 1004 1000
156 cr:139964943238912 after 397 1003 1000
157 cr:139964824880896 after 421 1011 1000
158 cl:139964757247744 after 408 1008 1000
159 cr:139964807972608 after 391 1002 1000
160 cr:139964867151616 after 405 1003 1000
161 cr:139964833335040 after 382 1004 1000
162 cr:139964917876480 after 393 1014 1000
163 cr:139964841789184 after 389 1000 1000
164 cr:139964875605760 after 429 1000 1000
165 cr:139964968601344 after 397 1004 1000
166 cr:139964791064320 after 408 1009 1000
167 method3 bad_channel 0.200000 device: 40 after: 1 sec -> total collision:15795 -> total hop:39206 -> probability: 0.402872
168
169 bcr:139964900968192 after 503 976 1000
170 bcr:139964833335040 after 516 979 1000
171 bcl:139964672706304 after 160 975 1000
172 bcr:139964807972608 after 516 974 1000
```

當全部的 channel 被 mark 成 clean 時與原本的情況一樣

```
591 bcr:139964698068736 after 474 898 OK
592 bcr:139964841789184 after 459 899 OK
593 bcr:139964799518464 after 461 902 OK
594 bcr:139964917876480 after 497 901 OK
595 bcl:139964647343872 after 151 896 OK
596 bcr:139964934784768 after 476 902 OK
597 bcr:139964977055488 after 454 901 OK
598 bcl:139964655798016 after 151 894 OK
599 bcr:139964850243328 after 480 899 OK
600 bcr:139964968601344 after 453 904 OK
601 bcl:139964672706304 after 138 896 OK
602 bcr:139964681160448 after 479 902 OK
603 bcr:139964960147200 after 462 902 OK
604 bcr:139964943238912 after 436 902 OK
605 bcr:139964884059904 after 454 901 OK
606 bcr:139964807972608 after 451 902 OK
607 bcl:139964748793600 after 138 898 OK
608 bcr:139964875605760 after 445 902 OK
609 bcr:139964782610176 after 470 899 OK
610 bcr:139964867151616 after 486 898 OK
611 bcl:139964731885312 after 134 900 OK
612 bcl:139964765701888 after 140 901 OK
613 bcl:139964740339456 after 131 902 OK
614 bcr:139964909422336 after 477 903 OK
615 bcr:139964791064320 after 466 898 OK
616 bcr:139964833335040 after 489 900 OK
617 bcl:139964774156032 after 145 897 OK
618 bcl:139964723431168 after 124 897 OK
619 bcl:139964664252160 after 152 899 OK
620 bcr:139964824880896 after 473 898 OK
621 bcr:139964892514048 after 470 898 OK
622 bcl:139964714977024 after 153 896 OK
623 bcl:139964757247744 after 145 897 OK
624 bcr:139964926330624 after 489 900 OK
625 bcr:139964951693056 after 489 900 OK
626 bcr:139964816426752 after 482 900 OK
627 bcr:139964858697472 after 483 897 OK
628 bcr:139964706522880 after 473 902 OK
629 Marking bad channel 0.800000 device: 40 .. after: 1 sec -> total collision:14408 -> total hop:35987 -> probability: 0.400367
630 clean 80 .. bad 0 OK
631 cr:139964943238912 after 487 912 OK
632 cl:139964774156032 after 155 913 OK
633 cr:139964884059904 after 503 913 OK
```

```
634 cl:139964689614592 after 149 911 OK
635 cr:139964655798016 after 461 916 OK
636 bcr:139964968601344 after 448 914 OK
637 cr:139964850243328 after 480 914 OK
638 cr:139964858697472 after 484 915 OK
639 cr:139964824880896 after 479 913 OK
640 cr:139964892514048 after 472 913 OK
641 cr:139964977055488 after 485 914 OK
642 cr:139964841789184 after 501 913 OK
643 cl:139964681160448 after 133 910 OK
644 cl:139964757247744 after 143 913 OK
645 cl:139964706522880 after 125 910 OK
646 cr:139964926330624 after 478 914 OK
647 cr:139964900968192 after 461 912 OK
648 cl:139964740339456 after 136 911 OK
649 cr:139964934784768 after 489 915 OK
650 cr:139964816426752 after 451 914 OK
651 cl:139964714977024 after 153 910 OK
652 cl:139964748793600 after 148 912 OK
653 cr:139964960147200 after 476 914 OK
654 cr:139964875605760 after 457 913 OK
655 cr:139964664252160 after 495 914 OK
656 cl:139964698068736 after 150 912 OK
657 cr:139964917876480 after 456 916 OK
658 cr:139964799518464 after 475 911 OK
659 cl:139964731885312 after 156 912 OK
660 cr:139964672706304 after 477 915 OK
661 cr:139964791064320 after 487 914 OK
662 cr:139964951693056 after 472 914 OK
663 cl:139964765701888 after 150 913 OK
664 cr:139964833335040 after 469 912 OK
665 cr:139964867151616 after 472 913 OK
666 cr:139964782610176 after 471 910 OK
667 cr:139964909422336 after 490 915 OK
668 cr:139964647343872 after 493 916 OK
669 cl:139964723431168 after 136 912 OK
670 cr:139964807972608 after 498 911 OK
671 method3 bad_channel 0.800000 device: 40 .. after: 1 sec -> total collision:14014 -> total hop:33780 -> probability: 0.414861
672 OK
673 bcl:139964664252160 after 150 940 OK
674 bcl:139964774156032 after 131 944 OK
675 bcr:139964824880896 after 500 941 OK
676 bcl:139964655798016 after 188 942 OK
677 bcr:139964850243328 after 492 942 OK
678 bcr:139964791064320 after 466 942 OK
```

(3)(d) 當全部都被 mark 成 bad channel 時，沒有 clean channel 可以選，結果與原本相同

```
1 bcr:140164381411072 after 551 1017 FA
2 bcr:140164415227648 after 521 1016 FA
3 bcr:140164457498368 after 540 1016 FA
4 bcr:140164465952512 after 511 1019 FA
5 bcr:140164525131520 after 559 1019 FA
6 bcl:140164263053056 after 165 1015 FA
7 bcr:140164339140352 after 505 1017 FA
8 bcl:140164288415488 after 159 1016 FA
9 bcr:140164533585664 after 548 1021 FA
10 bcr:140164542039808 after 529 1021 FA
11 bcr:140164449044224 after 536 1017 FA
12 bcr:140164389865216 after 551 1017 FA
13 bcl:140164279961344 after 155 1014 FA
14 bcr:140164372956928 after 571 1017 FA
15 bcr:140164398319360 after 524 1018 FA
16 bcl:140164246144768 after 187 1017 FA
17 bcr:140164432135936 after 513 1018 FA
18 bcl:140164305323776 after 175 1018 FA
19 bcr:140164516677376 after 537 1018 FA
20 bcr:140164499769088 after 532 1020 FA
21 bcr:140164364502784 after 540 1017 FA
22 bcr:140164491314944 after 528 1018 FA
23 bcr:140164347594496 after 508 1015 FA
24 bcr:140164330686208 after 547 1016 FA
25 bcr:140164508223232 after 530 1021 FA
26 bcl:140164212328192 after 165 1014 FA
27 bcl:140164237690624 after 137 1014 FA
28 bcr:140164440590080 after 519 1019 FA
29 bcl:140164296869632 after 146 1018 FA
30 bcr:140164406773504 after 519 1019 FA
31 bcr:140164474406656 after 543 1020 FA
32 bcl:140164271507200 after 189 1015 FA
33 bcr:140164423681792 after 510 1017 FA
34 bcr:140164482860800 after 542 1019 FA
35 bcl:140164220782336 after 144 1014 FA
36 bcr:140164322232064 after 550 1016 FA
37 bcr:140164356048640 after 556 1017 FA
38 bcr:140164313777920 after 538 1014 FA
39 bcl:140164229236480 after 187 1015 FA
40 bcl:140164254598912 after 181 1012 FA
41 Marking bad channel 0.100000 device: 40 after: 1 sec → total collision:16639 → total hop:38652 → probability: 0.430482
42 clean -0 ,bad 80 FA
43 cr:140164482860800 after 537 999 FA
44 cl:140164330686208 after 165 996 FA
45 cr:140164516677376 after 502 999 FA
46 cr:140164499769088 after 510 1000 FA
47 cr:140164423681792 after 503 997 FA
48 cr:140164212328192 after 520 1002 FA
49 cl:140164322232064 after 156 994 FA
50 cr:140164415227648 after 499 997 FA
51 cl:140164246144768 after 165 992 FA
52 cl:140164296869632 after 159 995 FA
53 cr:140164237690624 after 518 1000 FA
54 cr:140164542039808 after 518 1001 FA
55 cl:140164313777920 after 153 996 FA
56 cr:140164381411072 after 503 996 FA
57 cr:140164372956928 after 521 997 FA
58 cr:140164457498368 after 507 999 FA
59 cr:140164398319360 after 508 998 FA
60 cr:140164533585664 after 511 1001 FA
61 cr:140164356048640 after 515 995 FA
62 cr:140164432135936 after 521 998 FA
63 cr:140164220782336 after 531 1001 FA
64 cl:140164288415488 after 159 994 FA
65 cl:140164263053056 after 150 993 FA
66 cr:140164508223232 after 514 1000 FA
67 cr:140164525131520 after 519 1000 FA
68 cl:140164254598912 after 171 993 FA
69 cr:140164389865216 after 524 997 FA
70 cr:140164474406656 after 506 998 FA
71 cr:140164449044224 after 525 998 FA
72 cr:140164465952512 after 518 1000 FA
73 cr:140164229236480 after 538 1001 FA
74 cr:140164491314944 after 527 1000 FA
75 cl:140164339140352 after 182 996 FA
76 cr:140164347594496 after 528 996 FA
77 cr:140164406773504 after 522 998 FA
78 cl:140164279961344 after 140 994 FA
79 cr:140164364502784 after 549 997 FA
80 cl:140164305323776 after 165 995 FA
81 cl:140164271507200 after 176 994 FA
82 cr:140164440590080 after 508 998 FA
83 method4 bad_channel 0.100000 device: 40 after: 1 sec → total collision:15936 → total hop:38896 → probability: 0.409708
84 FA
85 bcr:140164364502784 after 536 989 FA
86 bcr:140164440590080 after 535 989 FA
87 bcl:140164220782336 after 161 985 FA
88 bcr:140164432135936 after 510 989 FA
```

當有部分被 mark 成 clean channel 時，全部的 device 會用 clean channel 去搶資源，可使全 collision 機率降低，但原先使用 clean channel 的 device 可能會遇到更多的碰撞

```
86 bcr:140164440590080 after 535 989 100
87 bcl:140164220782336 after 161 985 100
88 bcr:140164432135936 after 510 989 100
89 bcl:140164305323776 after 157 985 100
90 bcr:140164482860800 after 506 992 100
91 bcl:140164296869632 after 169 988 100
92 bcr:140164263053056 after 511 992 100
93 bcr:140164491314944 after 507 992 100
94 bcr:140164457498368 after 498 991 100
95 bcr:140164406773504 after 537 988 100
96 bcr:140164508223232 after 528 991 100
97 bcr:140164465952512 after 505 991 100
98 bcr:140164423681792 after 491 989 100
99 bcl:140164322232064 after 152 989 100
100 bcr:140164542039808 after 504 993 100
101 bcr:140164246144768 after 510 993 100
102 bcl:140164237690624 after 140 984 100
103 bcr:140164372956928 after 499 988 100
104 bcr:140164415227648 after 507 990 100
105 bcr:140164381411072 after 510 989 100
106 bcl:140164339140352 after 166 987 100
107 bcr:140164474406656 after 505 990 100
108 bcr:140164398319360 after 533 990 100
109 bcr:140164271507200 after 540 993 100
110 bcr:140164254598912 after 505 992 100
111 bcr:140164499769088 after 509 991 100
112 bcr:140164525131520 after 534 993 100
113 bcr:140164533585664 after 535 992 100
114 bcl:140164279961344 after 151 985 100
115 bcl:140164229236480 after 160 986 100
116 bcl:140164330686208 after 144 987 100
117 bcr:140164356048640 after 520 989 100
118 bcr:140164516677376 after 506 992 100
119 bcl:140164313777920 after 159 986 100
120 bcr:140164389865216 after 471 989 100
121 bcr:140164347594496 after 513 987 100
122 bcr:140164449044224 after 562 992 100
123 bcl:140164288415488 after 174 987 100
124 bcl:140164212328192 after 164 986 100
125 Marking bad channel 0.200000 device: 40 ... after: 1 sec -> total collision:16167 -> total hop:38586 -> probability: 0.418986
126 clean 54 ,bad 26 100
127 cr:140164533585664 after 126 988 100
128 cl:140164296869632 after 180 982 100
129 cr:140164398319360 after 125 985 100
130 cr:140164212328192 after 135 988 100
131 cr:140164229236480 after 133 988 100
132 cl:140164263053056 after 154 982 100
133 cl:140164313777920 after 179 985 100
134 cr:140164364502784 after 118 985 100
135 cl:140164339140352 after 197 985 100
136 cr:140164372956928 after 138 984 100
137 cr:140164491314944 after 138 988 100
138 cr:140164381411072 after 138 985 100
139 cr:140164542039808 after 164 990 100
140 cr:140164482860800 after 159 988 100
141 cl:140164271507200 after 176 983 100
142 cr:140164474406656 after 150 988 100
143 cr:140164432135936 after 156 986 100
144 cr:140164440590080 after 135 986 100
145 cr:140164457498368 after 135 988 100
146 cl:140164322232064 after 174 985 100
147 cr:140164415227648 after 157 986 100
148 cr:140164389865216 after 128 985 100
149 cr:140164237690624 after 148 990 100
150 cr:140164220782336 after 127 989 100
151 cl:140164254598912 after 170 982 100
152 cr:140164499769088 after 140 988 100
153 cr:140164508223232 after 130 988 100
154 cl:140164305323776 after 178 983 100
155 cr:140164423681792 after 119 986 100
156 cl:140164288415488 after 191 984 100
157 cl:140164330686208 after 166 984 100
158 cr:140164465952512 after 140 987 100
159 cl:140164279961344 after 183 984 100
160 cr:140164406773504 after 119 986 100
161 cl:140164246144768 after 182 982 100
162 cr:140164356048640 after 138 986 100
163 cr:140164347594496 after 155 984 100
164 cr:140164516677376 after 139 988 100
165 cr:140164449044224 after 142 987 100
166 cr:140164525131520 after 122 988 100
167 method4 bad_channel 0.200000 device: 40 ... after: 1 sec -> total collision:5679 -> total hop:38454 -> probability: 0.147683 100
168 100
169 bcr:140164372956928 after 500 1011 100
170 bcr:140164356048640 after 491 1010 100
```



```
336 PS
337 bcr:140164271507200 after 540 995 PS
338 bcr:140164542039808 after 517 994 PS
339 bcl:140164296869632 after 152 989 PS
340 bcl:140164237690624 after 168 988 PS
341 bcl:140164229236480 after 191 989 PS
342 bcr:140164398319360 after 508 992 PS
343 bcr:140164406773504 after 528 992 PS
344 bcr:140164372956928 after 483 991 PS
345 bcr:140164364502784 after 515 990 PS
346 bcr:140164432135936 after 532 993 PS
347 bcr:140164499769088 after 522 994 PS
348 bcr:140164347594496 after 535 991 PS
349 bcr:140164525131520 after 537 994 PS
350 bcr:140164457498368 after 531 992 PS
351 bcr:140164491314944 after 520 993 PS
352 bcl:140164330686208 after 149 989 PS
353 bcr:140164246144768 after 486 996 PS
354 bcr:140164533585664 after 500 995 PS
355 bcl:140164339140352 after 160 989 PS
356 bcr:140164482608000 after 499 993 PS
357 bcr:140164356048640 after 523 990 PS
358 bcr:140164381411072 after 516 991 PS
359 bcr:140164474406656 after 506 993 PS
360 bcr:140164465952512 after 507 993 PS
361 bcl:140164220782336 after 141 988 PS
362 bcr:140164449044224 after 518 992 PS
363 bcr:140164508223232 after 508 994 PS
364 bcl:140164212328192 after 148 988 PS
365 bcr:14016438965216 after 513 991 PS
366 bcr:140164254598912 after 507 995 PS
367 bcr:140164516677376 after 505 995 PS
368 bcr:140164440590080 after 521 993 PS
369 bcl:140164305323776 after 152 990 PS
370 bcl:140164288415488 after 146 988 PS
371 bcr:140164415227648 after 521 992 PS
372 bcl:140164322232064 after 160 989 PS
373 bcr:140164423681792 after 518 993 PS
374 bcl:140164279961344 after 164 989 PS
375 bcr:140164263053056 after 522 994 PS
376 bcl:140164313777920 after 153 989 PS
377 Marking bad channel 0.500000 device: 40 ... after: 1 sec -> total collision:15471 -> total hop:36694 -> probability: 0.421622
378 clean 58 ,bad 22PS
379 cr:140164423681792 after 124 1012 PS
380 cr:140164212328192 after 122 1016 PS
381 cl:140164254598912 after 186 1008 PS
382 cr:140164415227648 after 167 1011 PS
383 cl:140164288415488 after 175 1009 PS
384 cr:140164381411072 after 133 1010 PS
385 cr:140164533585664 after 156 1014 PS
386 cl:140164271507200 after 196 1009 PS
387 cl:140164322232064 after 190 1010 PS
388 cl:140164339140352 after 178 1009 PS
389 cr:140164440590080 after 145 1013 PS
390 cr:140164364502784 after 113 1010 PS
391 cr:140164398319360 after 138 1011 PS
392 cr:140164542039808 after 142 1015 PS
393 cl:140164263053056 after 202 1010 PS
394 cr:140164491314944 after 168 1014 PS
395 cr:140164347594496 after 138 1011 PS
396 cr:140164356048640 after 139 1012 PS
397 cr:140164508223232 after 148 1016 PS
398 cr:140164499769088 after 158 1016 PS
399 cr:140164516677376 after 156 1016 PS
400 cr:140164406773504 after 150 1014 PS
401 cr:140164525131520 after 120 1014 PS
402 cl:140164279961344 after 184 1010 PS
403 cr:14016438965216 after 151 1014 PS
404 cr:140164220782336 after 162 1016 PS
405 cl:140164313777920 after 189 1010 PS
406 cl:140164296869632 after 176 1013 PS
407 cl:140164330686208 after 193 1011 PS
408 cr:140164237690624 after 145 1015 PS
409 cr:140164457498368 after 144 1016 PS
410 cr:140164474406656 after 136 1014 PS
411 cr:140164229236480 after 149 1015 PS
412 cl:140164246144768 after 187 1010 PS
413 cr:140164465952512 after 151 1014 PS
414 cr:140164449044224 after 130 1014 PS
415 cl:140164305323776 after 169 1011 PS
416 cr:140164372956928 after 139 1013 PS
417 cr:140164482608000 after 114 1014 PS
418 cr:140164432135936 after 153 1014 PS
419 method4 bad channel 0.500000 device: 40 ... after: 1 sec -> total collision:5582 -> total hop:37471 -> probability: 0.148969PS
420 PS
421 bcr:140164372956928 after 519 1011 PS
422 bcr:140164415227648 after 531 1012 PS
```


當全部都被 mark 成 clean channel 時每個 device 可在 80 channel 中搶資源，也使 collision probability 降低

```
504 OK
505 bcr:140164246144768 after 503 1005 OK
506 bcr:140164263053056 after 513 1004 OK
507 bcr:140164406773504 after 542 1000 OK
508 bcr:140164449044224 after 512 1000 OK
509 bcl:140164305323776 after 152 999 OK
510 bcr:140164499769088 after 513 1004 OK
511 bcr:140164542039808 after 495 1004 OK
512 bcr:140164491314944 after 502 1002 OK
513 bcr:140164271507200 after 498 1002 OK
514 bcr:140164364502784 after 510 1001 OK
515 bcr:140164372956928 after 500 1001 OK
516 bcr:14016423681792 after 509 1000 OK
517 bcl:140164296869632 after 150 999 OK
518 bcr:140164347594496 after 521 997 OK
519 bcl:140164229236480 after 177 997 OK
520 bcr:140164389865216 after 535 998 OK
521 bcl:140164220782336 after 153 995 OK
522 bcr:140164482860800 after 518 1001 OK
523 bcl:140164212328192 after 140 996 OK
524 bcl:140164237690624 after 145 997 OK
525 bcr:140164516677376 after 533 1002 OK
526 bcr:140164474406656 after 550 1003 OK
527 bcl:140164288415488 after 161 998 OK
528 bcl:140164279961344 after 176 997 OK
529 bcr:140164533585664 after 557 1004 OK
530 bcr:140164432135936 after 506 1003 OK
531 bcr:140164525131520 after 505 1002 OK
532 bcl:140164313777920 after 165 997 OK
533 bcr:140164398319360 after 541 1000 OK
534 bcr:140164254598912 after 503 1004 OK
535 bcr:140164457498368 after 517 1001 OK
536 bcr:140164440590080 after 544 1002 OK
537 bcr:140164415227648 after 537 999 OK
538 bcr:140164465952512 after 513 1004 OK
539 bcl:140164339140352 after 165 998 OK
540 bcl:140164322232064 after 167 998 OK
541 bcr:140164356048640 after 527 999 OK
542 bcr:140164508223232 after 550 1003 OK
543 bcl:140164330686208 after 147 999 OK
544 bcr:140164381411072 after 531 998 OK
545 Marking bad channel 0.700000 device: 40 ... after: 1 sec → total collision:15980 → total hop:40013 → probability: 0.399370
546 clean 80 ,bad OK
547 cr:140164415227648 after 185 1012 OK
548 cr:140164491314944 after 214 1015 OK
549 cr:140164474406656 after 198 1015 OK
550 cl:140164263053056 after 124 1010 OK
551 cr:140164381411072 after 197 1012 OK
552 cl:140164330686208 after 137 1011 OK
553 cr:14016423681792 after 201 1013 OK
554 cr:140164212328192 after 170 1016 OK
555 cl:140164339140352 after 146 1010 OK
556 cr:140164542039808 after 184 1015 OK
557 cr:140164356048640 after 206 1011 OK
558 cl:140164279961344 after 136 1010 OK
559 cr:140164499769088 after 187 1015 OK
560 cl:140164246144768 after 144 1009 OK
561 cr:140164508223232 after 177 1015 OK
562 cl:140164271507200 after 150 1010 OK
563 cl:140164322232064 after 154 1011 OK
564 cr:140164237690624 after 200 1016 OK
565 cr:140164347594496 after 192 1012 OK
566 cr:140164372956928 after 155 1012 OK
567 cr:140164406773504 after 180 1013 OK
568 cr:140164457498368 after 188 1014 OK
569 cr:140164482860800 after 187 1017 OK
570 cr:140164364502784 after 174 1012 OK
571 cr:140164525131520 after 198 1016 OK
572 cr:140164229236480 after 183 1017 OK
573 cl:140164288415488 after 137 1011 OK
574 cr:140164220782336 after 164 1016 OK
575 cr:140164516677376 after 196 1016 OK
576 cl:140164305323776 after 125 1011 OK
577 cl:140164296869632 after 115 1011 OK
578 cr:140164313777920 after 120 1011 OK
579 cr:140164432135936 after 207 1014 OK
580 cr:140164398319360 after 195 1013 OK
581 cr:140164389865216 after 195 1013 OK
582 cr:140164465952512 after 187 1015 OK
583 cl:140164254598912 after 133 1010 OK
584 cr:140164449044224 after 191 1015 OK
585 cr:140164440590080 after 171 1014 OK
586 cr:140164533585664 after 185 1016 OK
587 method4 bad channel 0.700000 device: 40 ... after: 1 sec → total collision:6888 → total hop:40525 → probability: 0.169969OK
588 OK
589 bcr:140164279656000 after 532 1011 OK
590
```

(4)(a) bad channel value 設定為全部的碰撞/全部的跳頻

與 3(a)沒有太大的差異，只有 mark 的更精確，可使壅擠頻道被 mark

```
maxhsu@Max-Hsu: /mnt/c:/Users/Max-Hsu/Desktop/homework/wireless/hw4/hw4$ ./HW4-1
Marking bad channel 0.409315 device: 40 after: 1 sec total collision:16136 total hop:39422 probability: 0.409315
method1 bad_channel 0.409315 device: 40 after: 1 sec total collision:16447 total hop:39289 probability: 0.418616
Marking bad channel 0.572422 device: 80 after: 1 sec total collision:45286 total hop:79113 probability: 0.572422
method1 bad_channel 0.572422 device: 80 after: 1 sec total collision:46068 total hop:79077 probability: 0.582571
```

(4)(b) bad channel value 設定為全部的碰撞/全部的跳頻

與 3(b)沒有太大的差異，只有 mark 的更精確，可使壅擠頻道被 mark

```
maxhsu@Max-Hsu: /mnt/c:/Users/Max-Hsu/Desktop/homework/wireless/hw4/hw4-2$ ./HW4-2
Marking bad channel 0.401780 device: 40 after: 1 sec total collision:14493 total hop:36072 probability: 0.401780
method1 bad_channel 0.401780 device: 40 after: 1 sec total collision:28572 total hop:40570 probability: 0.704264
Marking bad channel 0.573193 device: 80 after: 1 sec total collision:44920 total hop:78368 probability: 0.573193
method1 bad_channel 0.573193 device: 80 after: 1 sec total collision:60055 total hop:78550 probability: 0.764545
```