**Rexxig’s Big Book of Scaling**

Python simulator takes inputs of weapon stats (damage range and speed), AP, crit chance, hit rating and weapon skill. The simulator runs a 100s patchwork style fight. The simulator takes 0.1 second time steps and casts abilities based on conditional statements. It will auto attack based on the weapon speed and does take into account flurry. It will generate rage based on the post mitigation damage. It will cast bloodthirst if you have 30 rage and BT is not on CD. Whirlwind will be cast if you have greater than 50 rage and WW is not on cool down. These abilities will not be cast during execute phase. It will roll WF on MH, WW, EXE and BT hits. It will roll HoJ procs on all hits including WF and OH hits. Additionally, crusader will be rolled for each as well. Heroic strike will be queued if you have greater than 30 rage and it will cause all OH attacks to not miss if you are at the soft cap. The execute phase was set to 12 seconds for a 100 second fight. In this phase, only execute will be cast. Deathwish is used for the last 30 seconds of the fight. The simulation takes into account the standard build for fury DPS.

A sample simulation was done to compare with other programs. Python gave 567 DPS for my current gear Guybrush’s sim gave 576 DPS for a 100s fight with 307 WS, 7 Hit and crit with HoJ and WF. The DPS sheet on the warrior discord has been giving me some circular logic errors recently so I did not compare. Comparing the average casts and such my simulator gets 1 more execute in during a 100s fight due to the much lower usage of HS (21 casts GB and 15 casts python).

|  |  |  |
| --- | --- | --- |
|  | Guy | Python |
| MH | 147.78 | 192.39 |
| OH | 105.57 | 110.44 |
| BT | 102.00 | 92.64 |
| HS | 137.03 | 89.85 |
| EXE | 54.5 | 62.61 |
| WW | 28.67 | 18.80 |
| Total | 575.56 | 566.74 |

The simulator in python allows for multiple runs to be performed with different inputs to look at DPS scaling with different variables such as hit, crit, WS and AP. In total, I ran ~4.5 million simulations to look at this scaling. I ran simulations where AP and either hit or crit were changed leading to 900 different combinations per simulation set. Two different weapon sets were used in the simulations (Crul/ZH for 307 skill and Crul/FB for 305). The average DPS produced through 1000 simulations per each conditions has a 1-3 DPS error. The results look like this when plotted in a contour.

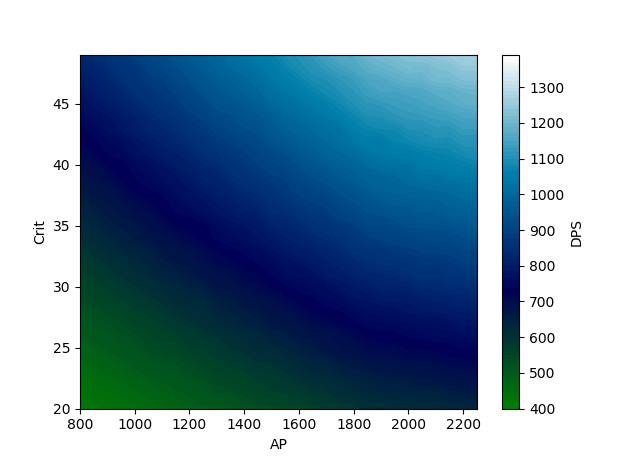


Figure 1: difference in DPS with different crit and AP values holding hit at 7% and WS at 307.

I broke this into smaller slices to take the partial derivative with respect to scaling variable. In this case, that would be holding AP and Hit constant and plotting DPS vs Crit and taking the slope of that line. Figure 2 shows how DPS changes with crit at different AP values. Additionally, the slope appears to change at 40 crit which is the soft cap in this case. This is to be expected as at this point white hits can no longer crit and only yellow hits can benefit from crit. The soft crit cap can be moved by having more hit as an example this would be 41 with 8 hit. Two fits were performed in this case to look at dps changes below crit cap and above crit cap.

Figure 2: DPS scaling with crit at 800 and 2250 AP.

The DPS scaling with crit at 7% hit is shown in table 1.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DPS/Crit Scaling | | | | |
|  | 305 WS | | 307 WS | |
| AP | Before Cap | After Cap | Before Cap | After cap |
| 800 | 8.2 | 3.1 | 8.2 | 3.2 |
| 850 | 8.4 | 2.9 | 8.5 | 3.7 |
| 900 | 8.7 | 3.7 | 8.7 | 3.5 |
| 950 | 8.9 | 3.3 | 9.0 | 3.2 |
| 1000 | 9.3 | 3.2 | 9.2 | 4.1 |
| 1050 | 9.5 | 3.8 | 9.4 | 3.8 |
| 1100 | 9.7 | 4.1 | 9.6 | 3.9 |
| 1150 | 9.8 | 4.3 | 9.9 | 4.8 |
| 1200 | 10.1 | 4.0 | 10.2 | 4.7 |
| 1250 | 10.5 | 4.8 | 10.5 | 4.9 |
| 1300 | 10.6 | 4.4 | 10.8 | 4.5 |
| 1350 | 10.9 | 4.7 | 11.0 | 5.1 |
| 1400 | 11.3 | 5.0 | 11.1 | 5.1 |
| 1450 | 11.5 | 5.1 | 11.5 | 5.5 |
| 1500 | 11.6 | 5.4 | 11.6 | 5.2 |
| 1550 | 12.0 | 5.3 | 11.9 | 5.5 |
| 1600 | 12.1 | 5.5 | 12.2 | 5.6 |
| 1650 | 12.3 | 5.3 | 12.3 | 5.7 |
| 1700 | 12.6 | 5.8 | 12.7 | 5.9 |
| 1750 | 13.0 | 5.8 | 12.9 | 6.4 |
| 1800 | 13.1 | 6.0 | 13.1 | 5.8 |
| 1850 | 13.3 | 6.5 | 13.3 | 6.7 |
| 1900 | 13.6 | 6.3 | 13.5 | 7.0 |
| 1950 | 13.8 | 5.9 | 13.8 | 6.8 |
| 2000 | 13.8 | 6.6 | 14.1 | 6.2 |
| 2050 | 14.1 | 6.3 | 14.2 | 7.1 |
| 2100 | 14.4 | 6.8 | 14.4 | 7.0 |
| 2150 | 14.6 | 7.4 | 14.5 | 6.7 |
| 2200 | 14.8 | 7.0 | 14.8 | 7.7 |
| 2250 | 15.0 | 7.4 | 15.0 | 7.4 |

Table 2: DPS/AP scaling at different crit values.

|  |  |  |
| --- | --- | --- |
| DPS/AP Scaling | | |
| Crit | 307 WS | 305 WS |
| 20 | 0.25 | 0.25 |
| 21 | 0.26 | 0.25 |
| 22 | 0.26 | 0.26 |
| 23 | 0.27 | 0.26 |
| 24 | 0.27 | 0.27 |
| 25 | 0.28 | 0.27 |
| 26 | 0.28 | 0.28 |
| 27 | 0.29 | 0.28 |
| 28 | 0.29 | 0.29 |
| 29 | 0.30 | 0.29 |
| 30 | 0.30 | 0.30 |
| 31 | 0.31 | 0.30 |
| 32 | 0.31 | 0.31 |
| 33 | 0.32 | 0.31 |
| 34 | 0.32 | 0.32 |
| 35 | 0.33 | 0.32 |
| 36 | 0.33 | 0.33 |
| 37 | 0.33 | 0.33 |
| 38 | 0.34 | 0.33 |
| 39 | 0.34 | 0.34 |
| 40 | 0.35 | 0.34 |
| 41 | 0.35 | 0.35 |
| 42 | 0.36 | 0.35 |
| 43 | 0.36 | 0.35 |
| 44 | 0.36 | 0.36 |
| 45 | 0.36 | 0.36 |
| 46 | 0.37 | 0.36 |
| 47 | 0.37 | 0.36 |
| 48 | 0.37 | 0.37 |
| 49 | 0.37 | 0.37 |

Table 2 shows the worth of a single point of AP at different crit values.

Similarly, the worth of hit can be determined at different AP and crit values. These simulations can be done by holding crit constant and changing AP and hit. Figure 3 shows DPS vs hit for 40% crit chance. DPS changes non-linearly with hit showing high growth below the hit cap of 6% and diminishing returns above hit cap. The scaling was broken up as the worth of hit below and above hit cap. Interestingly, hit shows high worth below hit cap across all simulations as expected, but the scaling of the hit after cap is far less sensitive as being worth 4-6 DPS regardless of crit or AP. The worth of hit is a bit more complicated as it will change your crit cap and make some of your crit that is passed the soft cap worth more DPS. As shown in figure 3, hit performs very well passed the soft cap as it is increasing the crit cap at 50% crit %. Looking between two weapon sets and WS values not much changed in terms of scaling. The Crul/ZH 307 weapon skill performs better in terms of raw DPS, but the scaling is similar between the two configurations. Furthermore, the Crul/ZH results are directly applicable to DW with edgemasters for races without innate weapon skill.

Figure 3: DPS scaling with hit at 40 and 50% crit, 2250 AP and 307 weapon skill.

Table3: DPS scaling of hit at 20, 30, 40 and 50% crit with ZH above and below the soft hit cap.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DPS/Hit Scaling | | | | | | | | |
|  | 25 Crit | | 30 Crit | | 40 Crit | | 50 Crit | |
| AP | Before Cap | After Cap | Before Cap | After Cap | Before Cap | After Cap | Before Cap | After Cap |
| 800 | 4.8 | 4.1 | 5.2 | 3.8 | 10.5 | 4.0 | 11.2 | 9.2 |
| 850 | 5.4 | 3.7 | 5.3 | 3.8 | 10.8 | 4.2 | 11.4 | 9.2 |
| 900 | 5.9 | 3.7 | 6.0 | 3.8 | 11.3 | 4.2 | 11.8 | 9.1 |
| 950 | 5.2 | 4.0 | 5.8 | 3.9 | 11.1 | 4.2 | 11.8 | 9.3 |
| 1000 | 5.6 | 4.0 | 5.9 | 4.0 | 11.8 | 3.9 | 12.3 | 10.1 |
| 1050 | 5.6 | 4.3 | 6.3 | 4.3 | 11.4 | 4.2 | 12.3 | 10.2 |
| 1100 | 6.4 | 4.4 | 6.4 | 4.6 | 11.9 | 4.7 | 12.7 | 10.2 |
| 1150 | 6.5 | 4.6 | 6.1 | 4.5 | 12.4 | 4.9 | 13.1 | 10.1 |
| 1200 | 5.9 | 4.3 | 6.0 | 4.8 | 12.8 | 4.1 | 13.1 | 10.5 |
| 1250 | 6.0 | 4.1 | 6.0 | 4.1 | 12.9 | 4.5 | 13.1 | 10.6 |
| 1300 | 6.8 | 4.4 | 7.0 | 4.6 | 13.1 | 4.8 | 13.7 | 10.7 |
| 1350 | 7.0 | 4.3 | 7.4 | 4.8 | 13.5 | 5.1 | 13.8 | 10.7 |
| 1400 | 6.4 | 4.4 | 7.1 | 4.4 | 13.5 | 4.6 | 14.5 | 10.7 |
| 1450 | 6.4 | 4.7 | 6.9 | 4.8 | 13.6 | 5.1 | 14.4 | 10.5 |
| 1500 | 8.1 | 4.7 | 7.3 | 4.9 | 13.3 | 4.4 | 14.4 | 11.0 |
| 1550 | 7.3 | 5.0 | 7.0 | 4.4 | 14.8 | 4.8 | 14.4 | 10.9 |
| 1600 | 7.4 | 5.2 | 7.7 | 5.1 | 14.4 | 4.3 | 15.3 | 10.7 |
| 1650 | 7.6 | 4.5 | 7.4 | 5.0 | 14.3 | 4.7 | 14.5 | 10.9 |
| 1700 | 7.9 | 5.1 | 7.8 | 4.7 | 14.5 | 4.4 | 15.4 | 11.1 |
| 1750 | 7.9 | 5.4 | 7.7 | 4.5 | 15.8 | 4.6 | 16.2 | 10.5 |
| 1800 | 7.5 | 4.9 | 8.3 | 4.7 | 14.9 | 5.1 | 16.3 | 11.2 |
| 1850 | 8.5 | 5.2 | 8.6 | 5.4 | 15.8 | 5.4 | 16.4 | 11.3 |
| 1900 | 8.5 | 5.0 | 7.8 | 5.7 | 15.9 | 4.8 | 15.9 | 11.5 |
| 1950 | 8.2 | 5.0 | 9.0 | 5.2 | 14.9 | 4.9 | 16.5 | 11.7 |
| 2000 | 8.4 | 5.3 | 9.3 | 5.1 | 15.6 | 5.1 | 16.9 | 11.3 |
| 2050 | 8.1 | 5.0 | 8.4 | 5.6 | 15.2 | 5.0 | 16.1 | 11.2 |
| 2100 | 8.4 | 4.7 | 9.1 | 6.1 | 16.1 | 5.5 | 17.1 | 11.3 |
| 2150 | 8.3 | 5.3 | 10.0 | 4.9 | 16.4 | 5.0 | 17.4 | 11.1 |
| 2200 | 8.8 | 5.4 | 9.2 | 5.2 | 15.3 | 4.7 | 17.8 | 11.2 |
| 2250 | 8.4 | 5.4 | 9.5 | 5.6 | 16.8 | 5.0 | 17.2 | 11.9 |

Table 4: AP scaling for 20, 30, 40% crit at different hit values and different weapon sets.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DPS/AP Scaling | | | | |
| Hit | 25 Crit | 30 Crit | 40 Crit | 50 Crit |
| 0 | 0.26 | 0.28 | 0.32 | 0.35 |
| 1 | 0.26 | 0.29 | 0.33 | 0.36 |
| 2 | 0.27 | 0.29 | 0.33 | 0.36 |
| 3 | 0.27 | 0.29 | 0.34 | 0.36 |
| 4 | 0.27 | 0.30 | 0.34 | 0.37 |
| 5 | 0.27 | 0.30 | 0.34 | 0.37 |
| 6 | 0.28 | 0.30 | 0.35 | 0.38 |
| 7 | 0.28 | 0.30 | 0.35 | 0.38 |
| 8 | 0.28 | 0.30 | 0.35 | 0.38 |
| 9 | 0.28 | 0.30 | 0.35 | 0.38 |
| 10 | 0.28 | 0.30 | 0.35 | 0.38 |
| 11 | 0.28 | 0.31 | 0.35 | 0.38 |
| 12 | 0.28 | 0.31 | 0.35 | 0.38 |
| 13 | 0.29 | 0.31 | 0.35 | 0.39 |
| 14 | 0.28 | 0.31 | 0.35 | 0.39 |

Understanding the worth of a stat in comparison in AP can be easily calculated from the results in the table. Let’s say you have 1450 AP and 30 crit at 6% hit, your DPS/AP is 0.3, DPS/Hit is 4.8 and DPS/crit is 11. These numbers can be divided through by the DPS/AP to give AP/Hit and AP/Crit. In this case, AP/Hit is 16 and AP/crit is 37.