Proposal to Allow* all Emulators (and Virtual Console Releases) for SMW Speedrunning
8-5-17

Currently, SNES9x v1.52 and lower is banned for supposedly running fast, and zSNES is banned for supposedly having quicker load times. I haven't actually seen any data to support these claims, only heard people say it. A while back I made a video (https://www.youtube.com/watch?v=nWKqy3xWPpo) that actually showed that zSNES and SNES9x v1.51 ran slow, and Bizhawk (bSNES) runs at a proper speed. Nothing was done to update the rules because it involved allowing zSNES, which people hate on for the meme. (Don't get me wrong, it's a bad emulator, but it works for most things.)

So, I went ahead and timed out a bunch of emulators and virtual console releases to get an idea of their framerates and load times (in an SMW context). You can view that spreadsheet here: https://docs.google.com/spreadsheets/d/1ZwK0KEknOq_jQvh03ffABc0TQ3rg6xkNGBs-ZPOwGBQ/edit?usp=sharing

On the left side is the framerate of each system. For the SNES and VC releases, I used the known framerate of the consoles (the 3DS is an estimate, if someone can get a more accurate value for that, that would be great). For the emulators, I timed how long it took to time up in YI2. I timed this to be 16646 frames using bSNES, so I know this is accurate. Once I found the frames and the time elapsed, the frame rate was calculated by dividing frames by time (frames per second). Using a base 11 Exit time of 36000 frames (~10:00), column G shows how many seconds each system loses in a run for running slower than the SNES, which happens to run the fastest.

In the middle is the load frame counts for each level in 11 Exit for each system. **A load frame is considered to be a solid black screen (F-blank or brightness=0), and the screen that says "MARIO START" (for simplicity).** The consoles were analyzed by making a video recording and counting the frames in the video. (Not entirely accurate, but it's pretty close. I would like to get 60fps footage at some point.) zSNES and no$sns were also analyzed this way because they don't have a frame-advance feature (that actually works). The rest of the emulators were analyzed by frame-advancing through the load and counting that way. In this case, the frame rate is considered to be the same as what the emulator runs at normally. Using a base 11 Exit time of 36000 frames (~10:00), column AM shows how many seconds each system loses/gains in a run for having a different load time. VC, zSNES, and SNES9x v1.43 have quicker loads, while everything else has slower loads.

On the right, we combine both the framerate and load time differences. Column AN shows how many seconds are lost in an 11 Exit run of ~10:00 and column AO shows an approximation for a 96 Exit run of ~1:30:00. The time for 96 Exit was made by extrapolating the 11 Exit time, so it might not be entirely accurate, but it gives a better sense of scale.

Basically, everything runs slower than the SNES console except zSNES, which gains about 2 milliseconds over the course of an entire 11 Exit run. I think this advantage is insignificant and isn't worth banning the emulator for. A lot of people play on zSNES since it was a really popular emulator back in the day, and many of the people that play on it don't realize how bad it is until they get told after they submit a run with it "hey zSNES is banned because it sucks."

From the data I collected, I feel like the best answer to "what emulator should I use" is: BizHawk if your computer can handle it, SNES9x if it can't. Isnes is a viable option but it's a pain to setup and use. SNES9x v1.51 is good and doesn't run as slowly as v1.54. BizHawk is great except it takes a lot of computing power to run the Compatibility core, and the Performance core isn't accurate enough to perform the quick cloud glitch.

*Which brings me to my next point, cloud. VC works differently under the hood so the quick cloud item swap doesn't work. zSNES, no$sns, SNES9x v1.43, and bSNES Performance don't emulate the open bus mechanics properly either. Allowing all emulators would mean opening up the possibility to perform a glitch that relies on the emulators' inaccuracies to save time. This is why I additionally propose that these emulators are banned for that specific (sub)category. VC is an official re-release of the game, so I say that is fair game, but I am open to opinions on that front. (Hey we're still working on rewriting the rules for 0 Exit, heh.)

In conclusion, all VC and emulators provide no significant time advantage to the original SNES release of SMW, so **I propose all VC and emulators to be allowed on the leaderboards**. The one exception would be for categories that rely on specific hardware quirks of the SNES that are not emulated properly. This would include 0 Exit and 11 Exit cloud. Here is a fancy chart:

	New (Out of date as of 8-6-17)	
System	**0 Exit, 11 Exit cloud**	**All other categories**
SNES	✓	✓
WiiVC, 3DSVC, WiiUVC	✓	✓
ZSNES	✗	✓
no$sns	✗	✓
SNES9x v1.4x and lower	✗	✓
SNES9x v1.5x and higher	✓	✓

bSNES Compatibility (BizHawk, Isnes)	✓	✓
bSNES Performance (BizHawk)	✗	✓

UPDATE 8-6-17

At first I considered lag to be similar to load times, since they both rely on how quickly the system executes code relative to how often the screen refreshes. So if the load time is quick, surely it also lags less because execution is faster than normal, right? Wrong, apparently. I double-checked with zSNES first and it turns out that emulator lags like crazy. So I timed lag on all systems by measuring the time it took for Mario to fall down the vertical room in Sunken Ghost Ship (an infamously laggy room). Then the amount of lag was calculated by subtracting out the known time of Mario falling that far with no lag (1155 frames) taking into account the different framerate. The average amount of lag frames on console for that room is 114, and the average amount of lag frames during an 11 Exit run is 620, so using those two numbers we can calculate about how much time is lost due to the difference in lag frames.

Turns out this lag is different enough and more substantial than I initially thought. zSNES, which I first thought runs slightly fast, is actually the slowest emulator now. And the opposite is the case for SNES9x v1.4x, which now runs way faster than console. I haven't timed VC yet because I don't have direct access to those releases, but I will fill in the spreadsheet when I can. With this new information, I think it's easy for me to conclude that SNES9x v1.4x and lower should be banned because it runs 0.72% faster than console, and is an outdated version of the emulator. New chart:

	Old		**New**	
System	**0 Exit, 11 Exit cloud**	**All other categories**	**0 Exit, 11 Exit cloud**	**All other categories**
SNES	✓	✓	✓	✓
WiiVC, 3DSVC, WiiUVC	✓	✓	✓	✓
ZSNES	✗	✓	✗	✓
no$sns	✗	✓	✗	✓
SNES9x v1.4x and lower	✗	✓	✗	✗
SNES9x v1.5x and higher	✓	✓	✓	✓

bSNES Compatibility (BizHawk, Isnes)	✓	✓	✓	✓
bSNES Performance (BizHawk)	✗	✓	✗	✓

UPDATE 10-15-17

I finally got access to an SNES Classic and was able to time it. I have filled in the spreadsheet that is linked above with the new console, and have concluded that it runs slightly slow, so it is legitimate for speedruns of the game. The cloud glitch does not execute accurately, but since it is an official release of the game, it shall remain legal for 0 Exit and 11 Exit cloud runs until further notice. More research will need to be done in this regard (not by me since I don't own one). All the other consoles remain unchanged.

	New	
System	**0 Exit, 11 Exit cloud**	**All other categories**
SNES Classic	✓	✓

UPDATE 03-22-22

A bit late to officially document it, but the Nintendo Switch Online SNES and SFC applications are valid for all SMW speedruns. The app reportedly uses the same emulation system as the SNES Classic, so everything that applies to it applies to the NSO releases of SMW as well.

A few people have asked about the emulator Mesen-S, and after using it for a while, I can conclude that it is legitimate for all speedruns as well. It has its inaccuracies, but they don't provide any particular advantage (similar to SNES9x).

	New	
System	**0 Exit, 11 Exit cloud**	**All other categories**
Nintendo Switch Online	✓	✓
Mesen-S	✓	✓