ZimaBoard 2 Retro Gaming Box

Many people like to use modern computers to emulate systems from their youth. Sometimes it to play old favourites, others do it to play games that never made it to their country due to licensing, or just lack of demand, and others like the fact that you can easily get every game for a machine, when in your youth finances and availability mean you could never have many games.

Tetris is a great example, it exists on almost every gaming platform after about 1988, you may want to try all the versions that exist.   There was a great deal of controversy over how it got to be licenced as the in-pack game for the GameBoy, which is why there are so many variants, as no one was sure who licensed what, and licenses were sold to many companies, many of who really didn't have the rights to create a version, however it was the hottest game of the time, everyone wanted to play it, and there was money to be made in making versions. I'd highly recommend you read The Tetris Effect by Dan Ackerman or watch the 2023 file Tetris to understand this.

PacMan is another example, originally called Puckman in Japan, it was renamed in the west as it was thought youths may change the P to a F , leaving the arcade machine with a less family friendly game. There are a large number of spin offs, Ms PacMan, PacMan Jr and so on to try.

For whatever reason it's now relatively easy to create a Retro game station in your home. This is one way to do this and show how it performs.

ZimaBoard2 Specifications:

Note this testing was done on an engineering sample, and while unlikely there may be minor changes to the initial production version.   IceWhale may also need to change the specification from this depending on component supply and cost issues.

This test is using the eMMC onboard, in most cases people would use a SATA SSD but this was to test the hardware as is.

CPU	N150
RAM	8GB
Storage	32GB
Video	Intel Embedded

Note: Whie ZB2 has no sound output hardware i.e. no 3.5'' sound jack its quite capable of generating sound and outputting it over the HDMI cable.

The onboard eMMC was used, despite it being too small for real worlds use (see later) to show how this works out of the box.

Tools Used:

- **PRE PRODUCTION – ENGIONEERING SAMPLE** - ZimaBoard 2 **832** Sample
- Rufus - The Reliable USB Formatting Utility - Version 4.7 (Build 2231)
    - To get around the hardware requirements only Rufus was set to remove the need for 4GB RAM, Secure Boot and TPM 2.0.
- Ubuntu-24.04.2-desktop-amd64.iso
- Generic USB Flash drive (32GB –recognised as a generic Silicon Motion device)

Process:

Rufus was used to image the Ubuntu install to the USB, the USB set was run by triggering a onetime boot from USB.

The install ran as expected with Ubuntu being installed to the eMMC taking 10 to 20 minutes. A Standard install was done with the extra software / codecs being selected.

The installation of the Emulation station software was done via these instructions: https://retropie.org.uk/docs/Debian/.

The RetroPie installer was setup to download and install emulators possible, As the intention was to test different generation of hardware on the ZimaBoard 2.

This proceeded as expected but took longer, maybe an hour.   How much of this is processing time and how much was the downloading of files needed for each emulator was not recorded.

As the author had one to hand the setup was configured to use a wired Xbox 360 controller.

Emulation station comes with some basic demos. Due to the copyright nature of game ROMS is does not ship with any. It is down to the reader to obtain ROMS to use and determined any legality. While a great many Game ROMS are available on the internet, and many may well be abandonware, much is not. Many of the games are made by companies who still exist today, Bandai Namco, Nintendo, Sega, Neo-Geo. Others such as Atari and Coleco do not exist in their original form, but the assets have been bought by others and copyright may be owned by others.

Once a suitable set of ROMS was sourced for testing they were copied into the relevant folder. Typically, this is **/home/retropie/roms/$CONSOLE** where $CONSOLE is the name of the system.

Results

This testing was not meant to be exhaustive of every possible system, but to run through at least one of the major consoles of most generations and see how ZB2 would perform. The display resolution of modern monitors is much bigger than console of old, and as such some letterbox, or windowing was expected.   This can be altered but for testing it was left as it just to see how the emulation worked.

As expected for a CPU of this speed the ZimaBoard 2 is easily capable of being used as a retro game station. In some respect it is worth considering if this is a waste, RetroPie runs well on a Raspberry Pi 3 /4 /5 and the extra CPU grunt of the ZB2 is not really needed.

It's worth pointing out that this stage the user can't install every ROM they can find, at least not on stock ZimaBlade. Depending on the generation of the console and the storage method these files may be small or large: See the following section table for details, however simply put the eMMC is not large and installing everything will result in a filling the drive. It's not uncommon for people to have large collections of ROM that are multi-terabyte is size so require external storage.

Appendix 1 – Considerations for a Home Arcage ? Consoem, emulation station

Nor every game will work as is, some may work, some may not, and some will need settings changed. It's also worth understanding some of the background about arcade machine, early consoles and how these ROMS have been sourced as that may affect how you set up or use such an emulator.

Early arcade machines had very few standards, and were made by any means possible, so there may be very little in terms of consistency. If you purchased an early arcade machine, it was usually handmade, the cabinet hand wired and if you wished to change it the only option was to change the entire unit. Around 1990 there was a standardisation to a system called JAMMA, that unified the input/output connectors for power, joysticks, buttons, video and sound, but there was still no standard for the hardware the arcade board ran.

Some companies such as Sega did try and use common motherboards, on their Arcade Motherboards, mainly for cost reasons, but even then, a common motherboard may only be common across a half dozen (or less) arcade machines. Even across "common" motherboard there may be different BIOS revisions with some games only running correctly on a certain BIOS level. This was not a problem at the time, the PCB was supplied as a unit but can be in emulation.

Some home computer games will only run on certain hardware, for example a game of the ZX spectrum may only work on the 16K and not the 48K version. In most cases this is handed by the emulation software seamlessly but can sometimes be a cause of issues.

Finally, there are very few "official" sources for ROMS, most have been dumped by enthusiasts, and while they are usually good, some may not work.

Many of these issues are usually down to problem with the game you wish to run, and not the emulation program or hardware per se.

Console generations

Broadly speaking there have been nine generation of home console, Emulation tends to cover the early generation as seventh generation onwards (Xbox 360, PS3, Wii) is still available as hardware and the games still in copyright, In addition 7th Generation console moved to disk based media, usually DVD with copy protection and encryption, Breaking such protection would add further technical and legal complications and of course the storage needed for a game rises significantly over the prior cartridge based media.

Arcade Games

Because there was no standard there is not a standard game size, typically they are under 5MB, with older games being much less. That said the laserdisc-based games such as Dragons Lair, have a relatively small code section, but worked by overlaying the gameplay on a pregenerated laser disk sourced image. Dragons Lair is an on rails game, and can be beaten in 12 minutes, but the game has more video that just the story (mainly the fail/death animations) with it running to around 30 minutes of animation stored on the disk. As the laserdisc video was very high quality for the time, then a single game can be in the gigabyte range due to the size of the video files.

As mentioned previously many games had changes for the destination country. This may be a relatively simple programming chance, such as a name change, or minor language localisation (colour in the UK , color in the US), or in some cases significant changes. Western Gun in the east is a simple cowboy themed shooting game where the payer could travel the entire screen, but in the west the game was re-written as Gun Fight, player was stylised as a "good guy" shooting an Outlaw, graphics were bigger, and the player were limited to one side of the screen to appear to eh wester audience.

As a result, there are many games that exist in multiple forms, with only minor difference, however many people collect all of the version for "completeness", after all most of these ROMS are relatively small comparted to modern storage capacities.

Home Computers

The majority of home computer emulated in Retro Pie are the device seen around the mid 1980's, the era pf the ZX Spectrum and Commodore 64. The either used tape or cartridge-based media, however they were limited by the memory on the device. These generally had 16/48/64 or even 128 KB of memory, and that limited game size, although some games would play one level and then required you load the next level to get around memory size limitation.

Appendix 2 – Frame rates in testing

Console generation

Generation	Example systems	Game Media	Notes
1st generation	Pong,	Inbuilt, occasionally Cart	Usually dedicated on 1 game, any extra games are variation on the same theme. These are a typically moving dot on a screen game.
2nd generation	Atari 2600, Intellivision, Coleco Vision, Magnavox Odyssey	Carts 8Kb/16KB cartridges, up to 64KB	The start of the design where the game code is on the cart and the processing done by the console.
3rd generation	NES, Sega Master System Atari 7800	Cart 128KB/ 256KB cartridges up to 1024KB	
4th generation	Sega Genesis/ MegaDrive, SNES,NeoGeo	Cart 4/8MB, Neo Geo was much bigger up to 100MB	Neo Geo was the first attempt to put real arcade level hardware in the home
5th generation	Atari Jaguar / N64	Cart based 2/4MB Up to 64 MB	Last of the cartridge based generations
6th generation	3DO / Saturn, PlayStation	CD Disk based so up to 640MB	
6th generation	Dreamcast, GameCube, PS2, Xbox	DVD disk based so up to 4.3GB	GameCube used Mini DVD.

Testing

Consoles

System/ game tested	Frame rate	Notes
Pong,	N/A	Not tested
Atari 2600, Klax	50	50 /60 HZ Is normal depending on intended territory, 50 is usually USA/Japan, 60 Hz most other places
NES	60	
Atari 7800 Klax	60	
Sega Genesis/ MegaDrive, - - Sonic the Hedgehog	60	
SNES, The Addams Family – Pugsley's Scavenger Hunt	60	
Sega 32 X – Knuckles Chaotix 32x	60	
Dreamcast – Crazy Taxi	60	Dropped to 25 in places during attract mode, but was still smooth, maybe the game is set to lower frames in attract mode

Other systems

Name	Game tested	Frame rate
Atari Lynx	Blue Thunder,	60
Arcade (Mame)	1942	60
	720 Degrees	60
Sinclair ZX Spectrum	Jet Set Willy	50
Amiga	Addams Family	Not shown Game not full Screen
Commodore 64	Defender	Not shown, assumed 50Hz
Game Gear	Alien Syndrome	60Hz