I'd love to see some of the early single board systems re-created like:

Intel 4004 based SIM-4
Prolog PLS-401A 4004 based or later 4040 based version
Original 8060 SC/MP board

- Gary

Some other CPU's worth consideration for a SBC project are:-

TMS9900 / TMS9995
or
NS32016 / NS32CG16V

regards

David

David,

I would love to do an NS32016 system -- but ...

The prices people want to get for some of those old chips are outrageous. What about s/w?

--John
Hi John,

Agreed, some sellers are charging silly money for this CPU but there are here and there some sellers selling at a more reasonable price, I think I paid about UK £20 for my 10Mhz plastic version from the following ebay seller in the UK.

http://www.ebay.co.uk/itm/NS32016N10S-SemiConductor-Case-DIP
48-Make-NSC-/401092301731?hash=item5d62f6d3a3:g:tXwAAOSwvFZW 8A6t

But that may not be the way to go as the original CPU would also need the addition of the TCU timing chip (NS32201) which itself can be a bit expensive the NS32CG16 on the other hand (developed for laser printers) may be a better option, It’s a PLCC package and has the TCU chip built in.

The NS32CG16 seems to be available in limited quantity (74 showing on stock) from an Ebay seller in Israel (Arihav Ltd)
The 10Mhz version is available for about UK £10 (claiming 74 available)
http://www.ebay.co.uk/itm/1pc-NS32CG16V-10-PLCC-68-32BIT-CPU
-INTGR-TCU-OBSCLETE-NS32CG16V-15-/121130500647?hash=item1c3
3f0c227:g:mMsAAOSw-7RVDqHG

They also have a 16Mhz version but only 32 available.

Maybe a board based along the lines of one of the NS32CG16 Indel AG boards shown here may be possible.
http://cpu-ns32k.net/Indel.html

As for software I believe that Minix was ported to the NS32016 by a guy named Bruce Culbertson (HP Labs) but due to timescale (1990) information seems to be a little scarce, I suspect that there may be more in news group archives as this is where his NS32016 SBC design was released. What appears to be an archive of his released design is linked below.


I have a partially completed KiCad diagram of Culbertsons NS32016 board manually built up from the netlist he published, but again time is the enemy and clearly more research is needed.

Best Regards

David Fry
Subject: Re: What new retrobrew projects are people interested in?
Posted by borutk on Mon, 05 Jun 2017 07:31:04 GMT
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I would like a rebuild of expanded COSMAC ELF with CDP1802, something like Spare Time Gizmos ELF2000, but integrated with pixie graphics and disk io on one board, maybe also 80col display.

Best regards,

Bo/

Subject: Re: What new retrobrew projects are people interested in?
Posted by lowen on Mon, 05 Jun 2017 13:20:40 GMT
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Well, my own experience with reviving the CPU280 project tells me that people sometimes are interested in what was 'unobtainium' during their own early years in computers. I know that's why I've gone through the process of reviving the CPU280 build, once I found sources for all the parts. 'Legendary' CPUs such as the Z280, where there was so much promise but such an underwhelming delivery are interesting; but, then again, I've been excited about the Z280 since it was known as the Z800 and the TRS-80 Model 4 non-gate-array board had extra holes and logic to use the 8-bit bus version of the Z800, 32+ years ago. TMS9900 is another such chip, where the promise of 16-bits was severely hampered by the implementation.

Personally, if I had more disposable income and time, I would probably try John's KISS-68030 as a next step. The Z280 is equivalent in power to an 8086 for most things, and it's related to the Z80. I have more x86 machines than I can shake a stick at already, and the only reason I can think of to build an x86 is to compare its performance to the CPU280, but I can do that with the NEC V20 in my Tandy 1400LT. 68K, on the other hand, is interesting, and I might even think about building an SBC workalike to the Tandy 6000, but with the hardware pieces I want to add, and then hack Xenix to work on it.....

If the chips were available, an iAPX432 might be neat. A System/370 would be really cool.

Barring that, a DEC J11 or F11 hobbyist-buildable SBC might be fun, but using a bus that people already have, either ISA or ECB or maybe S-100. While I think Multibus is a great architecture, at some point having too many diverging projects that aren't able to leverage existing investment in peripheral boards, backplanes, and enclosures is going to dilute interest. One of the great things about the original 'N8VEM' Z80 board was the use of a semi-standard bus that isn't terribly expensive to implement on a hobbyist board.

ECB, even with its quirks and nonstandard extensions, was an excellent choice, but it is more excellent for a Z80 than for other chips (even the CPU280, which runs the Z280 chip, needs special logic to interface to the Z80-ish ECB due to the design using the 16-bit Z-BUS mode of the Z280; but Tilmann's solution to getting an I/O-port only fully Mode2-compatible ECB from a Z-BUS
Z280 is neat).

At some point, there is a delicate balance between chip availability and the ability for the hobbyist to work with the chips. We are at the inflection point with the Z280, where apparently a whole lot of the chips have become available, but I wouldn't count on long-term availability. The eZ80 is very available and would be a neat chip for a very capable SBC, but the packaging of that chip presents significant challenges to the hobbyist. PLCC-84 is the largest through-hole capable SMT package I know of, and that is a significant limitation. EDIT: PGA is normally through-hole, but once you go to the staggered PGA of the Pentium trace routing becomes devilishly difficult at the socket with anything less than 4 or 6 layers.

At the moment, the Z80 family is my main interest; I already know how to program the Z80, and I don't have time at the moment to learn a whole new architecture.

IMHO, YMMV, etc.

Subject: Re: What new retrobrew projects are people interested in?
Posted by jcoffman on Mon, 05 Jun 2017 14:32:59 GMT
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David,

I build an S-100 system using the NS32016 w/ TCU, MMU, FPU, ICU. This was many years ago, and the size of SRAM chips at the time was 32K x 8 max. Later, I purchased a used OPUS board with the NS32532 & NS32382. I did a little playing with both boards, including an assembler which first ran on an Apple II, later on a PC/AT. Sometime later, while fooling around with LCC 3.1, I had a full-blown C-compiler running. The limited memory of the old S-100 system kept me from ever doing very much with the boards.

Your link to the info pages on all the chips has proved most helpful.

--John

Subject: Re: What new retrobrew projects are people interested in?
Posted by Andrew B on Mon, 05 Jun 2017 17:12:09 GMT
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Quote:Barring that, a DEC J11 or F11 hobbyist-buildable SBC might be fun, but using a bus that people already have, either ISA or ECB or maybe S-100

http://www.s100computers.com/My%20System%20Pages/PDP11%20Board/PDP11%20Board.htm

John M. is working on a 'PDP-11 support board' as well.
Software is still pending, these are very new cards.

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Mon, 05 Jun 2017 18:47:58 GMT

jcoffman wrote on Sun, 04 June 2017 20:19 David,

I would love to do an NS32016 system -- but ...

The prices people want to get for some of those old chips are outrageous. What about s/w?

--John

Hi John
I think there are versions of NetBSD and Minix for the NS32016.

Subject: Re: What new retrobrew projects are people interested in?
Posted by plasmo on Tue, 06 Jun 2017 00:52:02 GMT

When I start working in 1978, the flight computer was a homebrew AMD2901 bit slice processor. We've just moved on to 68000, but I had a glimpse of the hand drawn schematics, manual layout pc boards, microcode written on paper and software development on PDP-11. It all seemed so heroic. Anyone working on bit-slice processor?

Subject: Re: What new retrobrew projects are people interested in?
Posted by dgf1966 on Tue, 06 Jun 2017 08:49:07 GMT

John,

Out of interest I raised a parts enquiry with UTSource for pricing and availability of some NS32CG series embedded processors. I asked specifically about the NS32CG16V-15 (15Mhz) and the NS32CG160V series, of the 4 models I enquired about they only seem to be able to supply the NS32CG160V-25 (25Mhz) processor for USD $6.67 for 1 unit.

The NS32CG160V might be a little too embedded for your liking as it has TCU, ICU, DMA...
onboard
all in a 84 pin PLCC package. Datasheet can be found online, see what you think!

Best regards

David

File Attachments
1) NS32CG Enquiry.jpg, downloaded 199 times

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Tue, 06 Jun 2017 10:34:58 GMT
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http://www.thefullwiki.org/PC532

The wiki article claims the PC532 is well documented and schematics are available. I've not seen any schematics but maybe its time for a vintage PC532 reboot. Possibly a scaled down version with IDE and a couple of serial ports instead of dual SCSI and 8 serial ports.

Subject: Re: What new retrobrew projects are people interested in?
Posted by dgf1966 on Tue, 06 Jun 2017 10:51:27 GMT
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Andrew,

There is a link to Schematics and PAL files at the bottom of this web page.

http://cpu-ns32k.net/PC532.html

Regards

David

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Tue, 06 Jun 2017 11:25:28 GMT
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Hi, Thanks.

I was searching around on the site and it also includes Gerber files. In theory at least someone could go build boards with any PCB production house.
Subject: Re: What new retrobrew projects are people interested in?
Posted by jcoffman on Tue, 06 Jun 2017 15:53:23 GMT

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David,

Boy that price is aggressive! IMHO, NS32CG160V is a great choice for all the included peripherals in the PLCC84 package. I would pair it with an NS32181, the second generation FPU.

--John

Subject: Re: What new retrobrew projects are people interested in?
Posted by dgf1966 on Tue, 06 Jun 2017 16:50:53 GMT

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John,

Yep, I thought it was a good price and will add one or two to my next order for future use.

I'm going to forward another price enquiry for the NS32181 and also the NS32532 as suggested by Andrew, are there any other chips to add to the enquiry ??

Regards

David

Subject: Re: What new retrobrew projects are people interested in?
Posted by rwiker on Tue, 06 Jun 2017 17:12:48 GMT

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If the 32532 is too expensive, it might be possible to include an FPGA loaded up with the "32632"; see http://cpu-ns32k.net/Overview.html.

Still occasionally kicking myself for letting my PC532 go, around 15 years back.

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Tue, 06 Jun 2017 18:30:22 GMT

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The Gerbers are still available on the website. It would probably cost around $200 for another 5 PCBs.
Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Tue, 06 Jun 2017 18:32:49 GMT

jcoffman wrote on Tue, 06 June 2017 11:53

David,

Boy that price is aggressive! IMHO, NS32CG160V is a great choice for all the included peripherals in the PLCC84 package. I would pair it with an NS32181, the second generation FPU.

--John

Yes, good price but will it run PC532 NetBSD or are there differences? Embedding peripherals can introduce incompatibilities (i.e. 80186)

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Tue, 06 Jun 2017 18:35:01 GMT

plasmo wrote on Mon, 05 June 2017 20:52

When I start working in 1978, the flight computer was a homebrew AMD2901 bit slice processor. We've just moved on to 68000, but I had a glimpse of the hand drawn schematics, manual layout pc boards, microcode written on paper and software development on PDP-11. It all seemed so heroic. Anyone working on bit-slice processor?

There are people are still using AMD29Ks as incredible as that seems.

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Tue, 06 Jun 2017 18:43:30 GMT

The PC532 is a neat design but will only appeal to the most dedicated and wealthy hobbyists. It is a large 6 layer PCB with many expensive chips (NS32532, NS support chips, 2 different SCSI hosts, etc.)

Is there anything left of the old PC532 mailing list/community? There may be others out there who'd like an opportunity for renewed hardware development.

What would be ideal is a less expensive design using a smaller 2 or 4 layer PCB, CPU with integrated support chips, CPLD or FPGA for glue logic, etc. while retaining software compatibility.

Subject: Re: What new retrobrew projects are people interested in?
Posted by lowen on Tue, 06 Jun 2017 18:49:51 GMT

Page 8 of 43 ---- Generated from RetroBrew Computers Forum
Udo's cpu-ns32k.net site also lists his PC532E, which collapses the support chips into an FPGA; the board looks to be eurocard-sized. There is also the FPGA-only M32632 on OpenCores done by Udo.

Subject: Re: What new retrobrew projects are people interested in?
Posted by dgf1966 on Tue, 06 Jun 2017 19:05:46 GMT
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I personally would prefer where possible to retain the original IC's whether it be CPU or support chips in whatever project develops out of this thread.
Don't get me wrong, FPGA solutions do have their place in situations where chips are either unavailable, too expensive, or reproducing an architecture that was never available as an IC but at the end of the day it's hardware emulation.

If the option exists to use the real thing then that's what Retro means to me...

Just my 10 cents

Regards

David

Subject: Re: What new retrobrew projects are people interested in?
Posted by lowen on Tue, 06 Jun 2017 19:25:31 GMT
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dgf1966 wrote on Tue, 06 June 2017 15:05I personally would prefer where possible to retain the original IC's whether it be CPU or support chips in whatever project develops out of this thread....
If the option exists to use the real thing then that's what Retro means to me...

Oh, I don't disagree; that's why I would want to use a real Z280 in my running CPU280 even if a 'less-bugful' version existed for an FPGA. Although it would be really nice to have a VHDL or Verilog Z280 running, or even an emulator of the Z280. But there is a certain atmosphere when running the old silicon, when it's available.
Hi, I haven't seen the schematic up close yet only just the web images of the PC532 finished boards. It doesn't look too challenging from a PCB board development perspective.

The trade off is either expensive hardware and use the off the shelf NetBSD, Minix, etc. or less expensive hardware and large effort on software with obsolete/non-existent tools.

The former makes more sense to me as you could take an early version to production almost immediately using the Gerbers followed up by a KiCAD free version at a later date.

Getting a large enough group with "critical mass" of sustained interest is the really tough part and I've had very little success recently.

Subject: Re: What new retrobrew projects are people interested in?
Posted by dgf1966 on Tue, 06 Jun 2017 20:15:35 GMT

Andrew,

As you have already pointed out the PC532 is a 'high end' expensive project, that in itself may dissuade some especially when there are at the moment so many unknowns on the software, toolchain side.

The cheaper solution (NS32CG160) on the other hand might serve as a useful springboard to engage more people with the NS32k CPU whilst the software side of things is worked out and skills developed allowing the PC532 to follow on later.

Time will tell which route will prove the most popular ..... 

regards

David

Subject: Re: What new retrobrew projects are people interested in?
Posted by jcoffman on Tue, 06 Jun 2017 20:30:19 GMT

dgf1966 wrote on Tue, 06 June 2017 09:50John,

Yep, I thought it was a good price and will add one or two to my next order for future use.

I'm going to forward another price enquiry for the NS32181 and also the NS32532 as suggested by Andrew, are there any other chips to add to the enquiry ??
I have many of the other 32000 chips @ 10mhz. Rich has a major supply of the NS32202 ICU's, since they are used on the MF/PIC board, which he hosts.

I already have a '532 and '381, which I would cannibalize from my old Opus board. Let me know if you are able to order the 32181 & CG160 together. I'd like a set or two.

--John

Subject: Re: What new retrobrew projects are people interested in?
Posted by jcoffman on Tue, 06 Jun 2017 20:39:03 GMT
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dgf1966 wrote on Tue, 06 June 2017 13:15Andrew,

The cheaper solution (NS32CG160) on the other hand might serve as a useful springboard to engage more people with the NS32k CPU whilst the software side of things is worked out and skills developed allowing the PC532 to follow on later.

David

Sounds a bit like the ECB MC68000 evolution. The MC68008 on the Mini-M68k was easy to interface to the RetroBrew bus, and was for me a springboard for learning about the 68000 architecture. The next step up was going to be the MC68020, but when Will insisted on an MMU, and I found out that the MC68030 had the same size footprint as the 68020, the choice to go to the '030 was obvious. Both boards can run the same CP/M-68, but Will's port of Linux to the 68030 is crackerjack.

I'd stay away from the NS32532 for the moment. The high integration CG160 gets my strong vote.

--John

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Tue, 06 Jun 2017 22:42:34 GMT
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Hi John
What is your plan for an OS? Thanks, Andrew Lynch
lynchaj wrote on Tue, 06 June 2017 15:42
Hi John
What is your plan for an OS? Thanks, Andrew Lynch

REF: NS32000, I assume

Ay, there's the rub. Is there source for NetBSD? This sounded the most promising from what I've read on this thread.

--John

Hi
Yes, there is a NetBSD port although it was pulled from the main distribution in 2008. The source is still available though all the way up to its final days.

http://www.netbsd.org/ports/pc532/faq.html

You might want to contact the owner of this website if you are thinking of an NS32x16 project. He seems pretty interested in anything related to it

http://cpu-ns32k.net/Impressum.html

Does someone have a link for the PC532 Gerbers? I saw them somewhere but now I can't find them again. ARGH!

Subject: Re: What new retrobrew projects are people interested in?
jcoffman wrote on Tue, 06 June 2017 20:21
REF: NS32000, I assume

Ay, there's the rub. Is there source for NetBSD? This sounded the most promising from what I've read on this thread.

--John

It looks like NetBSD 4.0 is the last version which supports NS32K. The source tree is still available on the NetBSD archive as far as I can tell.

The good thing about the NS32CG160 is it is very inexpensive. Also there are good datasheets and application notes which would make an initial test board relatively easy to build with only about 2 dozen parts. Expanding it to run NetBSD would almost certainly require interfacing DRAM though.

File Attachments
1) 1975.pdf, downloaded 152 times
2) 154048.pdf, downloaded 192 times

Another possibility for an OS, although rather unlikely, would be to port the CP/M-68K C sources over to NS32CG160. I believe the CP/M-68K sources have been ported to other architectures before for this purpose. It would not be a simple task for sure but it might be easier than wrangling with NetBSD. Adding a serial port, 1-2 MB of SRAM, and an IDE interface to the NS32CG160 design in the application notes may be sufficient to get a simple CP/M-NS32K system running. Obviously it would require some kind of NS32K monitor to get started though.

https://groups.google.com/forum/#!topic/comp.os.cpm/RUi6iyNy LmI

I am willing to help out on any NS32K design if it comes to pass.

Am I right that NS32K is little endian like Intel but uses memory mapped IO like Motorola? The
sample schematic is vaguely Intel-like similar to an 8086 but without an IO address space.

If so, you could reuse the 8086 maximum mode SBC memory and IO partitions with some minor modifications. I'd keep the serial port and IDE and ditch the rest of the IO for an initial test board.

---

Subject: Re: What new retrobrew projects are people interested in?
Posted by lowen on Wed, 07 Jun 2017 14:06:44 GMT

RE: NS32K OS:

NetBSD is a known system and extremely well documented. Whole books have been written on its design and implementation (the 'Daemon Book', aka 'The Design and Implementation of the 4.3BSD UNIX Operating System,' is one such book, and a pretty clear read (yes, I have a copy, but I'm not going to pretend to understand it all!)).

This might be a porting target for Fuzix.

CP/M-68K ported might also be interesting as a tool to learn the chip.

Andrew L, the gerbers are in the file et532-pcb.tar.gz in the FTP directory on nic.funet.fi; you'll want to browse around that whole tree! EDIT/CORRECTION: As pointed out downthread, the gerbers here are for the Ethernet card; my error.

---

Subject: Re: What new retrobrew projects are people interested in?
Posted by jcoffman on Wed, 07 Jun 2017 14:20:15 GMT

lynchaj wrote on Wed, 07 June 2017 04:42

Another possibility for an OS, although rather unlikely, would be to port the CP/M-68K C sources over to NS32CG160. I believe the CP/M-68K sources have been ported to other architectures before for this purpose. It would not be a simple task for sure but it might be easier than wrangling with NetBSD. Adding a serial port, 1-2 MB of SRAM, and an IDE interface to the NS32CG160 design in the application notes may be sufficient to get a simple CP/M-NS32K system running. Obviously it would require some kind of NS32K monitor to get started though.

https://groups.google.com/forum/#!topic/comp.os.cpm/RUIgiyNy LmI

I am willing to help out on any NS32K design if it comes to pass.

CP/M-68 is largely written in 'C' for the big-endian 68000; the NS32000 series is little endian, like Intel and Zilog. CP/M-68 comes with good documentation on the BIOS calls needed to run it. This is a major plus.
CP/M-68 was first brought up on the Mini-M68k, and I can testify that it was a relatively easy port from the C-dialect in which it is written to the GCC/68000 cross-compiler. That was several years ago, and I must say I don't really remember how much attention the source pays to "endian-ness". It must pay quite a bit, because the file-system it implements is compatible with Zilog CP/M up to their 8mb limit. CP/M-68 supports much larger partitions, to 512mb, if I remember correctly.

Has GCC ever supported the NS32000 opcodes? I truly do not know.

--John

Subject: Re: What new retrobrew projects are people interested in?
Posted by jcoffman on Wed, 07 Jun 2017 14:22:32 GMT
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Iowen wrote on Wed, 07 June 2017 07:06: RE: NS32K OS:

CP/M-68K ported might also be interesting as a tool to learn the chip.

AMEN to this observation.

--John

Subject: Re: What new retrobrew projects are people interested in?
Posted by jcoffman on Wed, 07 Jun 2017 14:25:49 GMT
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Point of Information:

The NS32000 series uses a "module table" in the lowest 64K of memory. The "module-call" mechanism, I thought, was unique to the NS32k until something like that appeared in the Motorola MC68020 chip, only to disappear in the MC68030 and later chips. National stuck with this mechanism throughout the NS32000 series evolution.

--John

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Wed, 07 Jun 2017 14:26:44 GMT
jcoffman wrote on Wed, 07 June 2017 10:20

CP/M-68 is largely written in 'C' for the big-endian 68000; the NS32000 series is little endian, like Intel and Zilog. CP/M-68 comes with good documentation on the BIOS calls needed to run it. This is a major plus.

CP/M-68 was first brought up on the Mini-M68k, and I can testify that it was a relatively easy port from the C-dialect in which it is written to the GCC/68000 cross-compiler. That was several years ago, and I must say I don't really remember how much attention the source pays to "endian-ness". It must pay quite a bit, because the file-system it implements is compatible with Zilog CP/M up to their 8mb limit. CP/M-68 supports much larger partitions, to 512mb, if I remember correctly.

Has GCC ever supported the NS32000 opcodes? I truly do not know.

--John

I don't think CP/M-68K has been ported to NS32K AFAIK although as I understand it the CP/M-68K source code has been ported to several other CPUs including ARM and others -- possibly even i386.

PS, according to this article on comp.os.cpm, there was a CP/M-68K, CP/M-Z8K, and a CP/M-16K (same as NS32K prior to renaming).

https://groups.google.com/forum/#!search/CP$2FM-16K%7Csort:relevance/comp.os.cpm/QV31cIBSe4c/veROMrKDkFAJ

Our examination of the history of CP/M is not yet finished, however. In early 1983, Digital Research continued to improve on the original version and to expand CP/M to other central processors. Versions of CP/M for 68000 CPUs, Z8000 CPUs, and 16000 CPUs (called CP/M-68K, CP/M-Z8K, and CP/M-16K, respectively) are now available.

---

Subject: Re: What new retrobrew projects are people interested in?
Posted by lowen on Wed, 07 Jun 2017 14:40:26 GMT

jcoffman wrote on Wed, 07 June 2017 10:20...

Has GCC ever supported the NS32000 opcodes? I truly do not know.
OK, changing the topic to some of the other project ideas.

Regarding the TMS9995 16-bit CPU and the Yamaha V9938 video display processor has there ever been an open source/free OS written for this particular hardware configuration?

I have been a fan of the V9938/V9958 VDP but know very little about the TMS9995 CPU.

Looks like someone has already done a project very similar

Andrew,

Take a look at the following website, It is a repository for a magazine published kit based computer called the Cortex.
It was apparently designed by the UK Texas Instruments engineers around the time of the Texas TI99/4
the design was published by Electronics Today International magazine in the UK and marketed by a company called Powertran.
The resources on the site include the Basic and Fig Forth ROMS, Disk operating system images etc...

http://www.powertrancortex.com/index.html
Parts query update,

UTSource are not able to supply either the NS32181 or NS32532 (please see attached)

There are a couple of sources for the NS32181V-25, maybe more out there

http://www.newyorksemi.com/index_part_en_NS32181V-25.phtml

And there are 9 x 20Mhz units on Ebay at the moment.

http://www.ebay.com/itm/NATIONAL-NS32181V-20-64-Pin-PLCC-Integrated-Circuit-New-Quantity-1-/371553421528?hash=item56824f48d8:g:CesAAOSwQYZWvs77

Regards

David

File Attachments
1) NS32181 Enquiry.jpg, downloaded 200 times

lowen wrote on Wed, 07 June 2017 10:06:

RE: NS32K OS:

NetBSD is a known system and extremely well documented. Whole books have been written on its design and implementation (the 'Daemon Book', aka 'The Design and Implementation of the 4.3BSD UNIX Operating System,' is one such book, and a pretty clear read (yes, I have a copy, but I'm not going to pretend to understand it all!)).

This might be a porting target for Fuzix.
CP/M-68K ported might also be interesting as a tool to learn the chip.

Andrew L, the gerbers are in the file et532-pcb.tar.gz in the FTP directory on nic.funet.fi; you'll want to browse around that whole tree!

Hi, some quick browsing around on the NetBSD website indicates there is an old PC532 mailing list with a very few messages on it. Also there is install notes for NetBSD 1.5.3 which also appears to be the last working version. So installing NetBSD will be a significant challenge to say the least. It is an exercise in forensic software recovery. Not impossible but difficult.

ftp://ftp.netbsd.org/pub/NetBSD-archive/NetBSD-1.5.3/pc532/INSTALL.html

BTW, I am looking for the Gerbers to the PC532 motherboard itself. The ET532 is an Ethernet adapter which mounts on the PC532 motherboard so I don't think those Gerbers are the ones I am looking for. If anyone can access the sites on the NetBSD PC532 page and report back if they can locate the Gerbers for the motherboard that would be great.

http://www.netbsd.org/ports/pc532/faq.html

This site is described on NetBSD has having the Gerbers but no luck.

ftp://ftp.isy.liu.se/pub/32k/PC532/

---

Subject: Re: What new retrobrew projects are people interested in?
Posted by dgf1966 on Thu, 08 Jun 2017 12:22:39 GMT

Hi Andrew,

I went looking for the PC532 Gerbers a couple of years ago and never found them. The internet archive Wayback Machine is the only way I have found to see the contents of ftp://ftp.isy.liu.se/pub but unfortunately it didn't cache deep enough into the directory tree to be of any use.

It may be just a case of transferring the schematics into a multi sheet KiCad project and performing a new lay out in ATX format, AT format cases are hard to come by now anyway.

Regards

David

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Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Thu, 08 Jun 2017 13:52:31 GMT

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dgf1966 wrote on Thu, 08 June 2017 08:22
Hi Andrew,

I went looking for the PC532 Gerbers a couple of years ago and never found them. The internet archive Wayback Machine is the only way I have found to see the contents of ftp://ftp.isy.liu.se/pub but unfortunately it didn't cache deep enough into the directory tree to be of any use.

It may be just a case of transferring the schematics into a multi sheet KiCad project and performing a new lay out in ATX format, AT format cases are hard to come by now anyway.

Regards

David

Hi, I am asking around to various PC532 personalities to see if anyone has the original Gerbers. The only real benefit of the PC532 Gerbers is it would allow for immediate production of the existing boards assuming enough people wanted them to make it worthwhile. For a longer term solution I agree 100% with you that the design should to be recaptured in KiCAD and new up to date production files made available. I don't think it would be a big investment to recapture the schematic in KiCAD although I am sure it would require several new custom parts in the libraries. No new footprints though and that's a big benefit.

The more pressing issue now is whether there is enough will to pursue a PC532 vintage design or a redesigned board. There are only a few people who might be interested in pursuing a NS32K design AFAIK. I get the sense from John he is more interested in a redesigned board using the NS32CG160V and I can see his point from a cost perspective. Building a derivative of the design in the NS application note would be a much smaller PCB and use fewer components.

Regarding the original Gerbers, have you explored all the links on the NetBSD FAQ page? I've tried but most seem to go nowhere or dead links. I've read the original PC532 effort produced around 200 boards. I wonder if there is any surviving remnant of that original group. Maybe a mailing list or forum squirreled away somewhere we don't know about? If we could tap into that group of motivated enthusiasts maybe it would stand a chance.

Thanks, Andrew Lynch

Subject: Re: What new retrobrew projects are people interested in?
Posted by dgf1966 on Thu, 08 Jun 2017 14:24:19 GMT

I think I've viewed most of the links on the NetBSD FAQ page, as you say most of them are dead, even when you plug the dead FTP links into 'Wayback Machine’ it still doesn't help as the directory tree only seems to go about 2 levels deep from the pub folder.
Your best bet for PC532 gerbers may be to contact the owner of cpu-ns32k.net, his email address is under the 'Imprint' tab.

wrt. GNU toolchain, did you see the link to Alexanders Voropay's wiki on the cpu-ns32k website? http://cpu-ns32k.net/GnuTool.html

As to a show of hands on chips/board direction, I am leaning towards the NS32CG160V at the moment as I believe that there may be value in the discovery process of starting off with a simpler spec and building up to a revamp of the PC532 a bit further down the road.

Regards

David

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Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Thu, 08 Jun 2017 15:51:54 GMT

Yes, I am in email contact with Udo from CPU-NS32K.net and he doesn't have the Gerbers either. Probably they are squirreled away with the original group of PC532 enthusiasts but there has been so much "link rot" that it will be difficult if not impossible to find them.

It is a very good sign and it makes me optimistic that the GNU toolchain can still support NS32K even if it isn't the latest version. Here is the catch-22 though if we build a new smaller NS32CG160V board. Yes, it will be smaller, cheaper, faster and probably better all around. However, it likely won't be compatible with the last NetBSD distribution (1.5.3) to support PC532. So to get the only large open source/free OS (NetBSD) to run on the new board would be to port it and substantially modify it at the same time. That's a big hill to climb.

The alternative is to build a "clone" of the PC532 which would allow running NetBSD largely unmodified but it would cost a lot of money and time to get it working (full size ATX board 100+ square inches, 6 layer PCB, $$) assuming the released PC532 schematic is not full of errors. From a software perspective it might make sense to build the PC532 clone first & get it running with NetBSD (a huge undertaking) and then migrate to a smaller, faster, cheaper NS32CG160 board.

Possibly the middle ground is to build a smaller, cheaper, faster board with the NS32CG160 and port a lightweight OS to it like CP/M-32K from the CP/M-68K sources. Not a trivial undertaking either but probably far less than attempting with NetBSD. The big unknown is how compatible the NS32CG160 is with the NS32532 and its peripheral chipset. If the two are wildly different it would make a NetBSD port and modification a whole bunch more difficult.

Regardless of what path we pick (if any) I'll support it with a PCB in KiCAD. If we've learned anything from the Gryphon and derivatives is people generally don't want big integrated boards due to complexity and expense. PC532 isn't all that integrated but it is a big complicated board
and faces the same challenges. People are real enthusiastic about it initially but when it comes to actually working on it they just sort of fade away. I think a lot of hobbyists just want to go directly to production quality boards in one big step but that's not how it works. On some of the more complicated S-100 boards (80386, 68K, etc.) John and I build several (5 or more) versions of prototypes before anything even worked at all and some never did like S-100 SVGA. And S-100 is essentially a modular approach!

So whatever we come up with (if anything) we have to be realistic about what the community will support.

Subject: Re: What new retrobrew projects are people interested in?
Posted by yoda on Thu, 08 Jun 2017 16:23:52 GMT

I think a revamped board is the way to go. Whether NetBSD is possible - it is probably not anymore work than it takes for Linux on 680xx boards. If there was an original port for the PC532 it is probably more of changing addresses and not including devices that were originally there. As long as there is a GNU tool chain then a lot is possible - there are a lot of embedded OSes like RTEMS and others that are possibilities. The big thing is to verify that a tool chain can be built. Old versions of GCC are not always friendly to build as a cross compiler using modern compilers. The real question is there enough interest of people that can write code and debug a bringup. I have found that is the most important question. I have seen from the Gryphon and Xagdin boards that while there seems to be a fleeting interest, I don't see a lot of progress from users to do bring up and debug so it makes me less enthusiastic to continue except for my own personal interest which puts in on a slower schedule as it competes with other projects. If there is interest in the NS32xx board, I would be interested in bringup of a board as well but it would have to be a serious interest as for me it would be more of an initial learning curve as I have much more knowledge in the 68xxx world.

Dave

Subject: Re: What new retrobrew projects are people interested in?
Posted by lowen on Thu, 08 Jun 2017 16:28:14 GMT

lynchaj wrote on Thu, 08 June 2017 06:54

Andrew L, the gerbers are in the file et532-pcb.tar.gz in the FTP directory on nic.funct.fi; you'll want to browse around that whole tree!

BTW, I am looking for the Gerbers to the PC532 motherboard itself. The ET532 is an Ethernet adapter which mounts on the PC532 motherboard so I don't think those Gerbers are the ones I am looking for. If anyone can access the sites on the NetBSD PC532 page and report back if they can locate the Gerbers for the motherboard that would be great. ...
Ooops, sorry about that. I edited my post to reflect the error.

lynchaj wrote on Thu, 08 June 2017 11:51...I think a lot of hobbyists just want to go directly to production quality boards in one big step but that's not how it works.

This is one area where I had a great advantage with the CPU280: the existing gerbers were available, and the layout was already well-tested. This is also a great advantage to the P112 kit, as it is well-tested, and is pretty much guaranteed to work out-of-the-box. But going through all the steps, from not-quite-working and unstable prototypes through a finished and tested board has its allure.

Quote: On some of the more complicated S-100 boards (80386, 68K, etc. John and I build several (5 or more) versions of prototypes before anything even worked at all and some never did like S-100 SVGA. And S-100 is essentially a modular approach!

So whatever we come up with (if anything) we have to be realistic about what the community will support.

While I'm pretty new in this community, I will just say that what I am able to do has a lot to do with the amount of financial investment required. A project like the CPU280 is within my means; these newer projects such as the 486SBC or this NS32K design is probably not, since it's going to cost quite a bit more. The original Z80 SBC was great because it was relatively simple and inexpensive; this also goes for John's Z180 Mark IV.

Subject: Re: What new retrobrew projects are people interested in?
Posted by dgf1966 on Thu, 08 Jun 2017 18:30:59 GMT

Andrew & Dave,

I'd be the first to admit that I'm not familiar with the NS32k CPU or its instruction set, I'm not familiar with NetBSD, I've never used the GNU toolchain and I haven't programmed in C for years. My strengths are in Z80 So the learning curve for me would be massive, more so than with the 486 SBC board that I have also put myself forward for, which brings me to a point that I would not be able to give 100% focus to both projects at the same time.

If the NS32k project gains enough interest end becomes a reality then It would be my preference to go with the NS32k track and take a more laid back (slower) approach to the 486 SBC. I've not heard from the other three 486 SBC build members to gauge their priority of the project, both project require serious time input.

How many hands are there up for the NS32k ??

Regards
My opinion as of right now (pending new information) is a smaller revamped PC532 board using the core chipset of the PC532 (NS32532, NS32202, & NS32381) with some modernization. Convert the eight 30 pin SIMMs to one 72 pin SIMM. Replace the four NS DUARTs (2681/2692) to either a single DUART or a couple of 16550s. Possibly consolidate the multiple PALs into a CPLD. Replace the two SCSI hosts with IDE and drop the pseudo SCSI expansion bus. Those changes would probably cut the PCB size about in half.

Personally, I would like to see NetBSD as a primary design goal which means we require an MMU. The NS32532 has an MMU built in. The NS32CG160 does not include an MMU *may* be able to interface to an NS32382 MMU or maybe not -- I have no idea. Either way though we are looking at a fairly large board. I think with this new information it pushes me over to the NS32532 as the preferred design solution.

2.11BSD can run without an MMU; a modern port of 2.11BSD to PIC32 is available, called RetroBSD. Perhaps the existing NetBSD PC532 port pieces could be adapted to 2.11BSD? But that's probably more work than interfacing an MMU to the MMU-less NS32K would be.

Thanks Andrew. Sounds good but I would like to see a real DRAM controller working before tackling DRAM on this as there are too many unknowns that you have presented. That is why I am going to hold judgement until bringup of Alderaan which is still a long ways off as Jackalope is
on the bench at the moment. Once it clears or at least I get basic stuff working I can't spend a lot of time on Alderaan. I am hardly getting to spend much time on Jackalope (maybe a breakthrough if I can find time and motivation to work on it). We need a good stable test bench for DRAM before a lot of these projects can go forward. I looked at a few designs and I (we) should be able to get something to work. I prefer a design in verilog and not flip flops as it will be more portable and easier to move to other CPLDs or eventually even to an FPGA that has other things like video, etc in it.

Subject: Re: What new retrobrew projects are people interested in?
Posted by dgf1966 on Thu, 08 Jun 2017 19:38:42 GMT
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Andrew,

I've just been reading the datasheets for the MMU and NS32CG series CPU. The MMU is configured via a slave CPU interface using 6 CPU instructions LMR,SMR,RDVAL,WRVAL,MOVSUI, & MOVUSI
The CG series CPU's do not have there instructions in their instruction set so the use of a MMU with the NS32CG160 is not possible.

Regards

David

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Thu, 08 Jun 2017 20:46:44 GMT
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Sounds like without an MMU or possibility to interface to one, the NS32CG160 is a dead end. Now we know why NS described it as for embedded controller designs. They rarely need an MMU.

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Thu, 08 Jun 2017 20:48:48 GMT
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NS advertised the NS32532 as designed to work with the DP8422 series DRAM controllers. I think taking the NS32532 to 64MB DRAM is possible using the existing part from the Gryphon design. Possibly more with a CPLD DRAM controller. For NetBSD though 64MB would be quite a lot.

Subject: Re: What new retrobrew projects are people interested in?
What are people's thoughts on the PC532E? It appears to be an SBC even though it has a DIN 41612 connector. It is apparently a specialty bus for IDE, power, etc.

http://cpu-ns32k.net/PC532E.html

The size is small and uses mostly recent parts. Probably the EDA files are available since the author is still around and active. Certainly much less expensive than recreating the original PC532 board.

I think the next question should be what is the pricing and availability of the NS32532 and NS32381. Without these chips you could potentially end up with a PCB containing two FPGA's and a stick of memory which whilst it would be functionally equivalent, it isn't quite what was originally intended....

I can't find either chip anywhere. Maybe they show up occasionally on ebay.

Whilst looking around for the NS32CG160 I noticed that the NS32532 and NS32381 show up here:-

http://parts.trutronics.com/?part=NS32532&Submit1=Search

http://parts.trutronics.com/?part=NS32381&Submit1=Search

and here:-


Subject: Re: What new retrobrew projects are people interested in?
Posted by dgf1966 on Fri, 09 Jun 2017 12:33:43 GMT

Oh, and also here:-

http://www.newyorksemi.com/index_index_en.phtml

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Fri, 09 Jun 2017 12:59:29 GMT

I contacted Mr. Julian Stacey at Berklix and received this very helpful answer. I am pursuing a contact with Mr. Bernd Kopriva to hopefully obtain the original PC532 Gerber files. If/when received I'll post those so they can return to general availability. Note, I removed all the personal email addresses so these people don't get spammed to death as result of helping us out. I have retained the original message if anyone needs/wants it.
Hi, Reference:
> From: Andrew Lynch <>
> Date: Thu, 8 Jun 2017 21:13:49 +0000 (UTC)

Andrew Lynch wrote:
> I am a vintage computer hobbyist interested in the PC532 project.
> Do you have copies of the Gerber files for PCB replication?
Hi,
Feel free to forward this.
Anything PC532 & ET532 I have you are welcome to. But Bernd cc'd should have a copy of all lv've got, & he'll be more motivated.

Resources:
http://www.berklix.com/~jhs/txt/pc532.html
Mail lists:
cc'd:
... & dlr@ = Dave Rand
http://www.bungi.com/pc532/

port-pc532@netbsd.org
http://netbsd.org/mailinglists/#port-pc532
that netbsd list has stopped far as I recall,
check with majordomo@, & see archive
http://mail-index.netbsd.org/port-pc532/2008/01/09/msg000000.html

I used to have gerbers (so prob still do) cos I debugged & repaired broken mid layer traces affected by a solder iron over heated through plated hole on a friend's board. George Scolaro was author of the gerbers.

For the ET532 ethernet extra board I had not just gerbers, but also photo plot film ready produce PCBs, but I never got further. Bernd K has it all.

> If so, would you please post them or send me a link to their location?
> 
> Thanks, Andrew Lynch
> 
> PS, we are discussing possibilities for retrocomputer projects and considering some NS32xxx related projects. You are welcome to participate and share your ideas & experience.
> 
> https://www.retrobrewcomputers.org/forum/index.php?t=msg&th=185&start=0&

I looked, I'll link to it, I also noted

> jcoffman October 2015
> I would love to do an NS32016 system -- but ...
> The prices people want to get for some of those old chips are outrageous. What about s/w?

I prefer to avoid web forum interfaces & use mail & mail lists, but you could mention there:

I still have a few 32016 chips about I think, true vintage about 1982 or maybe 1983 from memory.
PS if mail fails one day from me to you, it probably won't be because I'm too busy or not responding, but because yours is a yahoo address, & yahoo may be rejecting me, yahoo is a problematic ISP, no abuse@ , SPF etc

Cheers,
Julian

--
Julian Stacey, Computer Consultant, BSD Linux Unix Systems Engineer

Reply below, Prefix '>'. Plain text, No .doc, base64, HTML, quoted-printable.


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Subject: Re: What new retrobrew projects are people interested in?
Posted by adx on Sun, 11 Jun 2017 15:38:38 GMT

If there's serious interest in reviving NetBSD for the NS32K I can look into the tool chain. The older gnu tools can take some finessing to build cross compilers, but I have notes stretching back to 2000 on doing it for various incarnations. The one nice thing is that once you get it working it should be fine to crosscompile on any recent system.

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Mon, 12 Jun 2017 16:54:08 GMT

dgf1966 wrote on Thu, 08 June 2017 14:30
If the NS32k project gains enough interest and becomes a reality then it would be my preference to go with the NS32k track and take a more laid back (slower) approach to the 486 SBC. I've not heard from the other three 486 SBC build members to gauge their priority of the project, both project require serious time input.

How many hands are there up for the NS32k??

Regards

David

At this point I see only a very small number of people interested in a NS32K project and it seems the best & most viable of the ideas floated in this thread so far IMO.
I am working with Julian Stacey to recover the original PC532 Gerbers but if that proves unsuccessful the only alternatives are to either recreate the PC532 from the schematic (assuming it is correct -- along with a major revamp) or find some other complete NS32016 circuit. Both of those last two options represent an enormous investment to build a schematic, a PCB layout, get it fabricated, at least one build and test cycle of large expensive (100+ sq inches, 6 layer) PCBs and parts, NetBSD software forensics & modification and getting an obsolete tool chain functioning again.

It makes the Linux-SBC project pale in comparison which is itself a complicated project. I think the chances of success for an NS32K project are somewhere between slim and none. I know I am not inclined to spend weeks working on a project which I am sure there is very little, if any, chance for success.

I wish there was better news but I think the NS32K is just too far gone to recover.

Andrew Lynch

Subject: Re: What new retrobrew projects are people interested in?
Posted by dgf1966 on Mon, 12 Jun 2017 19:15:29 GMT

Andrew,

how about looking at the other suggestions,

Bo suggested a "rebuild of expanded COSMAC ELF with CDP1802"
Maybe a fully updated ELF design with Netronics ELF compatible expansion slots ?

or maybe take a look at the TMS9900 /TMS9995 option ?

Subject: Re: What new retrobrew projects are people interested in?
Posted by gkaufman on Mon, 12 Jun 2017 19:51:14 GMT

For a "simple" project, any interest in the SC/MP?
http://www.dos4ever.com/SCMP/SCMP.html

or a Kenbak:
http://bitsavers.org/pdf/kenbak
Andrew,

I tracked the gerbers down here:

http://www.nic.funet.fi/pub/misc/pc532/

under the hardware-docs folder, but they are not in gerber format RS-294X that the gerber viewer on EasyEDA can understand. They are in the old RS-294D format. I used an eval of gerbview to plot the layers and took a screen capture of it.

Not sure how to get it converted to RS-294X, but at least we have something.

Dave

File Attachments
1) ET532.JPG, downloaded 535 times

Gary, i still have one INS8060 somewhere, so i would be interested in a simple SC/MP board, running NIBL basic.

In my view both SC/MP and CDP1802 would be a step further back in time from Z80/6809 systems.
SC/MP is rather simple with a small amount of existing software, but still interesting for historical reason.
ELF has a pretty large amount of existing software including a disk OS.

Bo/

Hi Dave
Thanks, that board (ET532) is a source of great confusion. The ET532 is a peripheral board for
Ethernet and serial port which plugs into the PC532 mainboard. It's the PC532 mainboard Gerbers I am searching for but can't find.

Apparently the PC532 Gerbers used to be online but a few years ago the last source dropped off and they disappeared. My suggestion is for people to ask around on various vintage computer forums and see if they can find someone with the PC532 Gerbers stored away somewhere. I think CCTALK would be a good spot and I've already asked on vintage-computer.com forums. There are probably other places too.

Thanks for looking though and the information on the Gerber format. That is yet another unexpected twist. Even if we find the PC532 Gerbers the old format preclude replication. I assume there is some method to convert them?

Thanks, Andrew Lynch

PS, another place for NS32K fans is the old usenet group "comp.sys.nsc.32k". Google groups won't let me post there but I suspect someone with a different usenet reader maybe able to post.

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Tue, 13 Jun 2017 11:57:23 GMT

dgf1966 wrote on Mon, 12 June 2017 15:15:

Andrew,

how about looking at the other suggestions,

Bo suggested a "rebuild of expanded COSMAC ELF with CDP1802"
Maybe a fully updated ELF design with Netronics ELF compatible expansion slots?

or maybe take a look at the TMS9900 /TMS9995 option?

I've looked into the suggestions for the SC/MP and the COSMAC ELF but those both seem to be going further back in history into the pre-Z80 days. Also they appear to be relatively straightforward projects so I'll leave them to people looking for a place to start.

What I'd like to work on is more advanced 16 bit or 32 bit designs. Earlier there was some great progress on 68K machines but that seems to have ceased or at least gone into a deep stasis mode.

Also I looked into the TMS9995 including the link to powertrancortex. Is that a free/open source project? I am not familiar with it and the website didn't help much.

The NS32K idea captured my attention but it seems to have too many insurmountable problems.

I have to say the 486 Linux SBC project is looking more appealing all the time. It represents where I'd really like to go... full 32 bit, built in MMU, built in FPU, tons of pre-existing free/open source software, lots of commonly available peripherals. Many people familiar with the design
and software. I guess I am seeing why the PC/AT architecture came to such dominance in the 1990s in a whole new light.

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Tue, 13 Jun 2017 12:25:38 GMT

Now what *would* be an interesting project is a NetBSD port to the new Microchip PIC32MZ DA microcontroller.

Full 32 bit ISA with MMU and built in 32 MB DRAM plus a 2D GPU for graphics. Available in a 176 pin LQFP package. Appears to be about $20 in single chip quantities.


Basically its a single microcontroller chip to run NetBSD. Something similar has already been done with a slightly older Microchip PIC32 with LiteBSD.

However the addition of more program & data memory and 32MB DDR2 SDRAM for the GPU really open up the possibilities.

I think it might be close enough that a NetBSD port is possible. If so, this would represent a very low cost single chip implementation.

Very interesting project so say the least.

Subject: Re: What new retrobrew projects are people interested in?
Posted by dgf1966 on Tue, 13 Jun 2017 12:41:36 GMT

Andrew,

The Powertran Cortex was originally published as a kit project in Electronics Today International magazine in 1982.
The homepage of the linked website gives the story behind the machine, as to it open/free source status I'm not sure,
(both ETI and Powertran Cybernetics are no longer trading) but there seems to be plenty of info on a Google search to suggest there may be an active interest.

The website http://www.powertrancortex.com/index.html is the core repository for information on this machine
and there is plenty of documentation on the document tab including the full magazine construction
articles, user magazines and more.
so I'm not sure what you mean about the site not being helpfull ??

I suggested this machine as I have an interest in early (magazine) kit based computers, it seems well supported and i have some of the IC's to hand,  
But reviewing some of your recent project announcements it would seem (as you have confirmed) that your interest lies in the higher end more complex 16 & 32 bit projects.  
These higher end projects may not be everyone's cup of tea for a number of reasons, complexity, cost, prototype status, parts availability ... It might be better for now to just run with the 486 Linux SBC and the 8086 MaxMode boards and see where they go.

Best regards
David

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Subject: Re: What new retrobrew projects are people interested in?  
Posted by lynchaj on Tue, 13 Jun 2017 13:35:24 GMT  
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I'll have to give the powertrancortex another more thorough look tonight. You are probably right though, the Linux-SBC and 8086 Maximum Mode SBC are enough to keep me busy.

I'll keep an eye on the new Microchip PIC32MZ DA & related though...

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Subject: Re: What new retrobrew projects are people interested in?  
Posted by davetypeguy on Tue, 13 Jun 2017 21:38:03 GMT  
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What about the NS32GX32 processors? They are basically the NS32532 without the virtual memory support with a few added instructions. They came in 20, 25 and 30MHz speeds and are housed in a plastic PGA case. I put in an inquiry at utsource for the NS32GX32ANU-30 just to see what the cost would be, but there are six of the NS32GX32ANU-25 parts on eBay for $25 each. It lacks the MMU portion of the 32532, but can address 4GB of uniform memory space. It doesn't have the LMR, SMR, RDVAL or WRVAL operations, but does have MOBSUi and MOBUSi, so I don't know if an MMU could be interfaced or not. Apparently the CERES-3 workstation was based on this chip.

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Subject: Re: What new retrobrew projects are people interested in?  
Posted by davetypeguy on Tue, 13 Jun 2017 21:43:03 GMT  
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Here is a link to the description of the hardware of the Ceres-3:

And I am attaching the datasheet in case anyone is interested.

File Attachments
1) NS32GX32datasheet.PDF, downloaded 155 times

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Tue, 13 Jun 2017 22:51:59 GMT
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Here is a simple NS32016 circuit which could be modified to include an NS32082 MMU (per the datasheet). There is a link to the schematic at the bottom. It is very simple and has only a chip or two more than a basic NS32008 circuit.

http://cpu-ns32k.net/Gary.html

If there is to be an NS32K circuit it really has to include an MMU. According to Udo, the NS32K embedded controllers lack the interface to the MMU and can't be modified to accept the MMU. Without the MMU sophisticated operating systems like *BSD, Linux, Un*x, etc. are not possible unless you got to extremely early versions like BSD 2.11 or specialty embedded systems like uCLinux. I'd argue that a computer without an MMU cannot run a BSD or Linux like OS because there is no VM or memory protection which is essential for any modern OS.

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Wed, 14 Jun 2017 11:54:40 GMT
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Can anyone post to comp.sys.nsc.32K or is the USENET group permanently closed? The last message is from 2008 and Google Groups will not allow new postings (for me at least).

https://groups.google.com/forum/#!forum/comp.sys.nsc.32k

If there are any NS32K veteran survivors they *might* still be there. Unlikely but possible.

Would someone with a non-Google Groups USENET reader try posting a test message to see if the group is still alive?

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Wed, 14 Jun 2017 12:27:59 GMT
View Forum Message <> Reply to Message

lynchaj wrote on Tue, 13 June 2017 18:51:Here is a simple NS32016 circuit which could be
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Not that this approach will be pain-free though, since we don't even have a simple monitor for NS32K AFAIK. So maybe somebody has an NS32K monitor or one would have to be written from scratch and any sort of simple program loader OS (like a port of CP/M-68K, assuming that's possible for NS32K) would also have to be done largely by hand.

Even a simple circuit is a major undertaking because so much of the hobbyist NS32K support infrastructure has atrophied away or never existed. Maybe "Gary" has some kind of ROM monitor from the original build but it sounds like it wasn't completed.

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**Subject: Re: What new retrobrew projects are people interested in?**  
**Posted by lowen on Wed, 14 Jun 2017 12:56:05 GMT**  

 lynchaj wrote on Wed, 14 June 2017 08:27... since we don't even have a simple monitor for NS32K AFAIK. So maybe somebody has an NS32K monitor or one would have to be written from scratch and any sort of simple program loader OS (like a port of CP/M-68K, assuming that's possible for NS32K) would also have to be done largely by hand.

Even a simple circuit is a major undertaking because so much of the hobbyist NS32K support infrastructure has atrophied away or never existed. Maybe "Gary" has some kind of ROM monitor from the original build but it sounds like it wasn't completed.

Is Bruce Culbertson's work useful as a starting point? There seems to be some code, mostly C with some assembler pieces, in that tree at ftp://nic.funet.fi/pub/misc/pc532/Culbertson/. I'm not sure how complete it is, but from the looks of it hex boot images seem to have been built.

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**Subject: Re: What new retrobrew projects are people interested in?**  
**Posted by lynchaj on Wed, 14 Jun 2017 14:06:27 GMT**  

I think the Bruce Culbertson material is meant for the PC532

or maybe not. Is there a schematic or PCB information regarding the Culbertson design? I see a
Subject: Re: What new retrobrew projects are people interested in?
Posted by yoda on Wed, 14 Jun 2017 14:34:48 GMT
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lynchaj wrote on Wed, 14 June 2017 07:27

Here is a simple NS32016 circuit which could be modified to include an NS32082 MMU (per the datasheet). There is a link to the schematic at the bottom. It is very simple and has only a chip or two more than a basic NS32008 circuit.

http://cpu-ns32k.net/Gary.html

If there is to be an NS32K circuit it really has to include an MMU. According to Udo, the NS32K embedded controllers lack the interface to the MMU and can't be modified to accept the MMU. Without the MMU sophisticated operating systems like *BSD, Linux, Un*x, etc. are not possible unless you got to extremely early versions like BSD 2.11 or specialty embedded systems like uCLinux. I'd argue that a computer without an MMU cannot run a BSD or Linux like OS because there is no VM or memory protection which is essential for any modern OS.

Not that this approach will be pain-free though, since we don't even have a simple monitor for NS32K AFAIK. So maybe somebody has an NS32K monitor or one would have to be written from scratch and any sort of simple program loader OS (like a port of CP/M-68K, assuming that's possible for NS32K) would also have to be done largely by hand.

Even a simple circuit is a major undertaking because so much of the hobbyist NS32K support infrastructure has atrophied away or never existed. Maybe "Gary" has some kind of ROM monitor from the original build but it sounds like it wasn't completed.

I did a quick look and it looks like gcc 2.95 was the last version to have NS32K support so it is probably possible to resurrect a gnu tool chain cross compiler for NS32K. A monitor would not be difficult as I already have a nice visual monitor for 68XXX which is almost entirely written in C. The trick probably would be getting newlib C compiled on that old of a tool chain.

Dave

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Subject: Re: What new retrobrew projects are people interested in?
Posted by lowen on Wed, 14 Jun 2017 15:18:08 GMT
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lynchaj wrote on Wed, 14 June 2017 10:06

I think the Bruce Culbertson material is meant for the PC532

or maybe not. Is there a schematic or PCB information regarding the Culbertson design? I see a netlist
Since Bruce wire-wrapped his board, the netlist is the key documentation, and there wouldn't be any PCB documentation. A schematic can be derived from the netlist, which appears to be complete. I haven't played with KiCAD enough to know if an import from a plain-text netlist is possible.

Subject: Re: What new retrobrew projects are people interested in?
Posted by dgf1966 on Wed, 14 Jun 2017 15:37:43 GMT
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I started to transfer the Culbertson netlist into KiCad some while ago, i'm about 50% through the list and still needs considerable work to finish off.

I have never found any corrections to the netlist so it should be good.

David

Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Wed, 14 Jun 2017 16:09:09 GMT
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There are netlist and partlist files posted in the directory. By cross referencing you should able to duplicate something similar to the original design. It does not capture PCB layout though but that might not be a big issue. I assume they used a 4 or 6 layer PCB though. ~50 chips is a pretty big board.

Would you please post a PDF of what you've done so far?

Subject: Re: What new retrobrew projects are people interested in?
Posted by lowen on Wed, 14 Jun 2017 16:25:29 GMT
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lynchaj wrote on Wed, 14 June 2017 12:09... ~50 chips is a pretty big board....

Especially for wire-wrapped construction. Although I have several wire-wrapped boards here from various research projects; I have a couple of full-size ISA wire-wrapped expansion cards that have about 70 chips between the two boards (together the two boards were used as a very fast 32-bit ALU for a specialized radio receiver system). The boards aren't super-crowded, and would probably support 50 14-16 pin DIPs each. So 50 chips could fit on a Multibus card easily enough, and wire-wrapped multibus isn't rare (uncommon, but not rare).

For comparison, the Reh CPU280 packs 32 chips on a standard 100x160mm ECB eurocard, and it's tight.
I'd estimate ~50 chips plus other components would probably fit on an A sized (8.5"x11") PCB assuming its not too densely packed. For trace routing purposes you want to keep it a little loose so the autorouter can solve without making a terrible mess.

I confess I wasn't aware the Culberson-32016 is completely separate from PC532. However if David is 50% through the net list in KiCAD then that's probably the way to go. Just finish it off and layout a PCB. Not that building a schematic from a netlist is going to be fun but it would be mostly repetitive drudge work.

I think Udo at CPU-NS32K.NET has KiCAD part libraries for the NS32016 and related chips. That might help speed up making the NS parts since those almost certainly would require custom footprints.

Andrew,

I'll do one better, I've uploaded the KiCad project folder.

Please excuse the roughness of the diagram, I was a relative newbie with KiCad when I did this (about 18 months ago) and at the time I was just interested in transferring the netlist to some kind of schematic.

With further time investment to complete the diagram and migrate it to a multisheet schematic it could be the basis of a Culbertson NS32k rework.

From memory, some aspects of the netlist look very similar to the application note diagrams in the National Semiconductor documentation, especially around the DRAM memory area. My intention was to drop the dynamic RAM part of the schematic and use SRAM instead.

Take a look and pick out the bones

David

File Attachments
1) KiCad Partial NS32k.zi_, downloaded 84 times
My suggestion is to implement the circuit as close to the original as possible before attempting to make changes. Especially with PALs there are a lot of non-obvious & hidden dependencies. Once the basic circuit is known to work then consider making changes and simplifications.

Just my $0.02

Julian Stacey (Berklix) started a PC532 mailing list. He is one of the PC532 originals from "back in the day" and is helping with the re-archiving of recovered PC532 materials.

A new list PC532 has been created

pc532@mailman.berklix.org

http://mailman.berklix.org/mailman/listinfo/pc532

Andrew,

Take a look at the attached application note for a '10Mhz No Wait States NS32016 System' This is simpler than the Culbertson board in that it has no SCSI, no DMA chip, no floppy controller, and it uses SRAM memory which could be expanded with modern chips to several MB.

Regards

David

File Attachments
1) NS32000_AN-404.pdf, downloaded 128 times
Subject: Re: What new retrobrew projects are people interested in?
Posted by lynchaj on Mon, 19 Jun 2017 11:08:09 GMT
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At long last, the PC532 Gerbers (maybe):

@Alan, would you please do your Gerber conversion magic on these files and post the result.
Thanks, Andrew Lynch

File Attachments
1) Gerber.tar.gz, downloaded 126 times

Subject: Re: What new retrobrew projects are people interested in?
Posted by lowen on Mon, 19 Jun 2017 13:41:20 GMT
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These gerbers load ok in the KiCAD gerbview, but they do throw an error about unknown size (RS274D or somesuch). These are the droids you're looking for.

Subject: Re: What new retrobrew projects are people interested in?
Posted by davetypeguy on Mon, 19 Jun 2017 16:27:38 GMT
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They appear to be the correct gerbers, but they are RS274D files and lack the associated apertature report file. However, it appears that the missing info is available in http://www.nic.funet.fi/pub/misc/pc532/hardware-docs/pcbinfo in the files 532.txt and 532info.txt.

Subject: Re: What new retrobrew projects are people interested in?
Posted by davetypeguy on Mon, 19 Jun 2017 23:23:51 GMT
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OK, I used the GerbView software to see if the aperature file info would work and it does indeed. I don't know how to deal with the drill files and don't own a license to do the conversion to RS274X, but here is the gerber set minus drill holes:

Hopefully someone more knowledgeable than I can convert these to a form that can be made into real pcbs.

File Attachments
1) 532Gerbers.JPG, downloaded 401 times
Subject: Re: What new retrobrew projects are people interested in?
Posted by plasmo on Tue, 20 Jun 2017 02:12:43 GMT

gerbv lets you export files in RS-274X format, so that part is straightforward.

Looking into 532DRL.GBR, it is a Gerber plot of the drill drawings, but all I see is drill targets without the associated drill letters as described in the file, 532info.txt. I don't think there are sufficient information in 532DRL.GBR to restore a drill file. What you really needed is an Excellon drill file.

BTW the drills are not correctly aligned with the rest of the files.

Below is the header file I extracted from 532.txt and prepended to the gerber files. Is that same as yours?

```plaintext
%MOIN*%
%FSLAX23Y23*%
%IPPOS*%
%ADD10C,0.0100*%
%ADD11C,0.0100*%
%ADD12C,0.0120*%
%ADD13C,0.0250*%
%ADD14C,0.0500*%
%ADD15C,0.0750*%
%ADD16C,0.1000*%
%ADD17C,0.0620*%
%ADD18C,0.0620*%
%ADD19R,0.0620X0.0620*%
%ADD20C,0.0750*%
%ADD21R,0.0750X0.0750*%
%ADD22C,0.0500*%
%ADD23C,0.0550*%
%ADD24C,0.0800*%
%ADD25C,0.0850*%
%ADD26C,0.0900*%
%ADD27C,0.1000*%
%ADD28C,0.1250*%
%ADD29C,0.1500*%
%ADD70C,0.0700*%
%ADD71R,0.0700X0.0700*%
%ADD72R,0.0100X0.0100*%
%ADD73C,0.1000*%
```