

An Interview with...

Jens Schoenfeld
Of Individual Computers

In this special preview of his interview in Total Amiga issue 25, Jens Schoenfeld of Individual Computers talks exclusively to Total Amiga's Magnus Johnson about Clone-A, an Amiga chipset replacement project.



Could you start by introducing yourself to those of our readers who may not know who you are, and to those who do and want to know more about you?

My name is Jens Schönfeld, and I'm the founder and owner of "Individual Computers". I'm the man behind things like the Graffiti video card, the Buddha IDE controller, the Catweasel floppy controller and multiple other expansions for the Amiga. Top-sellers were the X-Surf networking card and the IDE-fix (and "Express") adapter.

For how long has Individual Computers existed, and how many people are involved?

When I started in 1994, there were no plans to expand the company. However, I knew that I was really bad at software, so that had to be done externally. I always hired contract workers to do software, or turned to the "big names" of the Amiga, for example Oliver Kastl who did the IDE-fix and the Buddha software. Since January 2006, I have hired two programmers to do the main software work. I'm even in talks with a third programmer, because I have projects in the works that require a lot of manpower. I do want to continue support for the older projects, such as the Catweasel, so the only alternative is to create more jobs.

For how long do you think you will be able to dedicate your time and capabilities to Amiga development?

Amiga is making less than a quarter of my revenue at the moment, but it's constant business. I guess that I could continue infinitely, because I still have a lot of ideas that I never turned into products. However, business is not the main reason why I dedicate a lot of time to the Amiga. Amiga is a philosophy that other computers lack, a lot of concepts of the Amiga OS and the Amiga hardware are either missing, or have bad replications on today's mainstream computers. I must admit that I do my main work (CAD, emails and OpenOffice) with an x86 machine, but it's always fun to turn on the Amiga. The fun has been spoiled lately by people in public discussion forums, so I took a break: I accepted contract work that will keep me busy for

"The goal is to create a cycle-exact Amiga chipset replica with today's technology."

another two to three months, but I'm sure that I'll do more Amiga work after that.

You are scheduled as a speaker at AmiWest this year, what will you be talking about and demonstrating there?

When I last spoke at AmiWest in summer 2004, it was a very technical speech. Way too technical for a banquet speech where people are waiting for food! I'm preparing something entertaining with less tech-talk. There are some funny details and stories that happen during development and usually stay behind the scenes. I don't want to reveal too much, it shall be a surprise – also to those who can only watch the AmiWest show online. I'd like to encourage everyone to really attend the show, AmiWest was always big fun, I've always had a great time

with the members of the American Amiga community.

How come you're so committed to the Amiga and the C-64 markets? It can't really be all about the money, now can it?

That's right, the money is a secondary reason to put so much time into products that only sell a few hundred units. There are multiple other reasons – I grew up with these machines, and it's fun to squeeze out ever more from them. It's a challenge to solve hardware problems with today's technology. It might seem easy with the possibilities we have today, but the challenge is to make it worthwhile, even with the high production cost and low quantities.

Like I said earlier, it's got to be fun, and fun doesn't only mean money, but also doing it for a community that appreciates the work, and getting attention for

accomplishing things that others thought were impossible. I've made a lot of friends through my business over the years, and I always enjoy going to Amiga shows. The show itself is mostly work, but the party-and-going-out part after the shows makes up for that. That's where I got to know really interesting people that I think can only be found in the Amiga community. I wouldn't like to do the same in a grey PC market where it's all about huge quantities and anonymous sales.

Being one of the most active hardware developers on the Amiga market today, with a great track record and all your talent, have you ever considered developing a "next generation" Amiga motherboard?

I actually did, yes, but that would require two big developments

Fact File

Name
Jens Schönfeld
Location
Aachen, Germany
Web Site
<http://www.ami.ga>
E-mail
jens@schoenfeld.de

that I don't have in my portfolio yet: A fast CPU design and the Amiga chipset. To me, an Amiga needs at least an OCS/ECS compatible chipset, otherwise it doesn't really feel like an Amiga. I'd have lots of peripherals to put on the board, and surely a lot of ideas to add a lot of value without increasing the price to astronomical regions. However, the way to such a board is long and expensive, so I never really started it – until about a year ago.

Are you currently working on anything new, as of yet undisclosed? And, would you care to share? I promise to keep it between you, me, and a few hundred readers.

I'm working on two flickerfixers, one for the Amiga that will output a 75Hz picture for PAL screens, and another for the C64, because I keep losing 15kHz C64-compatible monitors. Both products will most probably not be finished this year.

Since we agreed that this interview is not published before October 2006, I can also share the biggest project with you: I'm working on the Amiga chipset, together with Oliver Achten, the developer of the MMC64 and now the main developer of our new project. He's one of the two guys that I have hired since January of this year, and we started the plans and preparations for this project in late October of 2005. The goal is to create a cycle-exact Amiga chipset replica with today's technology. Oliver and I are

going to demonstrate the prototype at this year's AmiWest show. The demonstration will be something that the visitors can influence: I'd like to encourage people to bring their favourite disks with them and try them in our computer. Any game, demo or program, just bring the disk - the computer has 2MB chipmem and a 68000 processor. Let me emphasise again that we are not selecting the kind of software that will be demonstrated - we will be completely unprepared for the kind of programs people bring. We just want to demonstrate that if it runs on an A500, it will run on our chipset.

The current name of the project is "Clone-A". We're replacing each chip of an Amiga 500 bit by bit. At this point, Denise, Gary, Paula and the CIAs are completely removed and replaced by small FPGA boards. It's pretty certain that we won't

a faster blitter, a daughter card for whatever mainboard that you can buy today and many other things. I'd also be open to a cooperation with someone who wants to turn this chipset into a toy like the C64DTV. A portable Amiga that runs for many hours on a cellphone battery is definitely within reach.

Could you elaborate a bit about the different approaches between "Clone-A" and the Minimig?

Dennis took the UAE source and the description of the chipset registers to make a forward-engineered Amiga-compatible chipset. This is not necessarily a bad move, but like I said, our approach leaves no room for mistakes, while he has much more freedom for a similar, but not exactly-the-same implementation. Before we take the next step of implementing a part of a chip, we do extensive

"I'd like to encourage people to bring their favourite disks with them (to AmiWest) and try them in our (Clone-A) computer."

have a finished Agnus at AmiWest, but we already have a very good idea of what's inside, because we have reverse-engineered the inter-chip communication, where large parts of Agnus need to be known.

Our approach to a re-implementation of the chipset is surely one that takes the longest, compared to the full implementation "from scratch" that Dennis van Weeren did for his Minimig. There's also NatAmi that tries a full re-implementation based on documentation. Oliver and I are going the most complicated route, but being able to work with any combination of the real chipset and our FPGA-replacements leaves no room for mistakes. We have no other chance than to be 100% correct, and everytime we're fixing a bug, we discover that the fix actually produces a smaller design. It's really amazing what Jay Miner and his colleagues crammed into about 20.000 transistors per chip!

I really have no idea when I can turn this chipset into a product, but it gives a lot of possibilities. You can think of a new classic Amiga board, an extended chipset with more chipmem and

reverse-engineering, for example by writing test-programs and doing measurements on the chips with a logic analyzer while the programs are running. We're also doing really strange things to find out what the inner workings of the chips are, for example programming them in a way that you're not supposed to.

How many man-hours have gone into bringing it to its current state, and how much more time do you expect will be required before you have something finished-ish?

We never counted the hours, but the combined manpower is easily 2000 hours, given the fact that we're both not working full-time on the project, and that an average working-year has 2000 working hours. I'd say that we need another 300 hours to bring Agnus to a state where it can be considered cycle-exact.

It's really hard to tell how much work has gone into the project, because I have put a lot of knowledge into it that I gathered way before the start of Clone-A. I once did an add-on for a TV studio that wanted to have a special Genlock interface: They did not only want to mask between the computer-picture

Clone-A Chips



8372 Agnus



Denise



5719 Gary board, markings indicate that this board also autostarts Denise, Paula and the CIAs.



This single FPGA implements both of the Amiga's Complex Interface Adaptor (CIA) chips.

and the TV picture, but they wanted to define a transparency for every colour that the Amiga displays. I was only able to do that with an almost complete implementation of the Denise bitmap-logic, so I already had good knowledge about Denise back in 1995. Then Oliver did further research for his implementation of Denise, which has many features that haven't been discovered yet – not even by emulators. The next thing is the part of Paula that controls the disk drive; there's a lot of Catweasel knowledge that I explained to Oliver, and he implemented the floppy part in record time. That's another big advantage we have: we're a real team, while the other projects are made by single people.

So, let's just get this straight, the Clone-A will basically be a complete miniature-A500, 100% hardware compatible, that can be offered in any configuration you might want an A500 in today? A500-in-a-joystick, A500-in-a-desktop-case, A500-in-a-handheld-device, etcetera?

Anything that involves an Amiga-on-a-chip (such as the joystick or the handheld) requires huge investments that I can't do alone. However, our approach – compared to the forward-engineering approach that Dennis does – produces the smaller design, so in the end, ours is better-suited to be produced as a chip. If there is an investor out there that wants an Amiga on a chip, Oliver and I can offer the smallest and therefore cheapest design with the positive side-effect that it's cycle-accurate.

The one product that I'd like to make and that I can surely do with the (financial) possibilities I have is an Amiga on a mini-ITX board.



Clone-A development chips mounted on adaptor boards in place of the custom chips of an A500 motherboard. By developing this way, the Clone-A chipset will be extremely close to the original Amiga chipset.

Does it come with an IDE interface and a built-in RF-modulator? And would there, by any chance, be Catweasel technology doing the floppy controlling?

I'd say that the mini-ITX Amiga should have everything that a classic Amiga user has today: Halfway decent CPU (at least an 030), IDE, floppy that works with normal 1.44Mb drives and a PC keyboard and mouse connector. The monitor should be VGA, not an RF modulator. There's a good demand for A1200 boards, but the supply is limited and the prices are high. One thing that my mini-ITX board will surely have is an A1200 CPU slot, so people can continue to use their accelerators. However, anything that I'm dreaming of here should be taken as what it is: Speculation. I don't know what the final specs will be, nothing is written in stone yet.

How will it be marketed and sold? What will the first revision be able to do, and what can be expected from

future revisions? Will there some day be a "Clone-B" emulating the AGA chipset?

AGA does not add very much to the design size. Since the blitter and the complete Paula chip stayed the same, we're only talking about 27 instead of 25 DMA channels and a local bus performance upgrade by a factor of four. That's something we can easily accomplish with the type of memory and the logic chips that we're using. Remember that we're talking about a machine that was up-to-date in 1985. According to Moore's law, AGA performance should have been reached 36 months later in 1988. We are using FPGA technology of the year 2006, where talking to 133MHz SD-Ram is no trouble at all.

If a new revision would at some point be released, would the original Clone-A be upgradable by a quick reflash of the FPGAs?

Yes, like I said earlier [in the full interview]. I'll try to keep all my future hardware re-configurable.

Will it come with an "AmigaOS and ROM"-licence, making it a complete A500/2000 once you add the basic peripherals? Or could it be bundled with "Amiga Forever"?

That's something I'm currently discussing with Bill McEwen. There are more options, because there are multiple authors who made kickstart-replacements for the Amiga1000 back in the days, and I managed to dig up two of those authors. However, a license directly from Amiga Inc. is the most desirable option. With the long time before we have to come up with a solution to the software/OS question, I'm absolutely sure that we'll find a way in time.

Have you been in discussion with anyone else about turning this into any specific type of mass-market product?

Sure, but no written agreement has been signed yet, so I would not like to give their names here.

I don't expect that it's reasonable for all the good boys and girls out there to expect Santa to bring them one of these this year?

No chance, sorry. Like I said, Agnus still needs a lot of work, and after that, we still have to implement a 68000 processor into an FPGA before an Amiga-on-a-chip can be made. I even doubt that Santa will make it in 2007, but you never know. The worst thing that can happen to a hardware design is that the news about the prototype is spread too soon. If Minimig and NatAmi would not exist, I would not demonstrate Clone-A at AmiWest this year, but wait until the first product with the results of the work is ready to ship. Most people don't realize that a working prototype only makes maybe 30% of a finished product.



Read an extended version of this interview in

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