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UPDATE –
Dendou Oni Supercomputing Research Project

Ever since I last posted the initial report, I have been digging up the suitable parts to throw together the board – it was a very largely artistic matter. I had to pick the best parts to pair with Propeller II chips with – like XMOS, Inc.'s XS1-G4 chipsets – to give Propeller II chips some upper hands, as well as finding the right RAMs (has to be somewhat larger than what's of HUB SRAM so it can suspend some gnarly threads to do something real important first then do this one) – I always have had to except the realistic computing environments that those microcontrollers will face.

And, it was real difficult – I had to smack my head on the wall for a bit... Then I realized that this supercomputer is meant to be built for research purposes that any of peoples here on Parallax Forums may eventually want their numbers crunched in the short time – why? Simple, because there are two things some peoples like Humanoido have been telling me that it is an impressive feat: The ultimate goal of having up to 1,024 Propeller II chips in a system chassis (or in a server rack), and gradually (SLOWLY), there are some serious academies at Parallax Forums that MAY be interested in using it via Internet.

However, there are some drawbacks that almost forced me to give up... Money is always an issue, and there are not very much motives. Snaps! Oh well. At least I decided to stay with this computer hardware. Oh yea, and to have some patience and a stress ball in a hand when “tacking” those tiny SMD parts, such as RAMs (I will not use EEPROMs and/or flash due to its limited rewritable cycles), and some fistful of logics and MEMS clock generators onto the boards and shove it into repurposed Infrared toaster oven to get them soldered. That's a very tedious tasks as I do not have a X-ray machine to check the quality of BGA solders on the soldered boards so it's basically a “spray and pray” moment.

After soldering all of the goodies, then what? Lot of quality assurance tests. It's so I don't upset some would-be users out there. Afterward, burn all individual Ferroelectric RAMs (FRAMs) or Magnetoresistive RAMs (MRAMs) linked to all of the accompanying CPUs (Propeller II and XS1) with the bootable firmwares (with small Operating System kernels so they can deal with NMI/IRQ requests themselves).

What parts? I already have been deliberating about that for a while...

Since I don't trust the oscillator crystals for several reasons; Thermal drifts (they're made of VERY THIN resonant electromechanical ceramics – heats can and always affect the resonating frequency), shock toleration (WAY TOO THIN TO STAND SHOCKS ABOVE 10G), and frequency pulse stability (PPM – stability of the generated clock pulses over times, such as within few minutes up to ten years – depending on the products / projects), I decided to go with MEMS (Microelectrical - Mechanical Systems) clock generators since it's very clear from the datasheets that is for that particular parts such as SiTime Si8002 stand-alone MEMS resonators: They can attain the clock stability for a very long time since it's NOT affected by the system-wide temperature fluctuations and shocks. The failure autopsy of the Texas Instruments' DMD (Digital Micromirror Devices) have clearly proven that the MEMS hardwares are very reliable.

Having picked the best clock generators for this system, I am still deciding on what RAMs (DDR or SDRAM) to use with the whole processing hardware... It has to be fast enough, yet acceptable for use with Propeller II chips and XMOS XS1-G4 chips altogether, and has to be a bit larger but not to overwhelm the accompanying CPU and the pipeline bus downloading threads into – it has to be able to empty and refill as rapidly as possible. Why not SRAMs? I wish, if not for the heart-palpating price tags on larger capacity SRAMs... (Why so? It's the price of transistors already etched on-die – One bit of RAM cell contains six transistors. So here goes: 4MB SRAM as an example - 33,554,432 bits (32 Megabits) equates to 4,194,304 bytes (4 Megabytes) which means there are 201,326,592 transistors in the entire RAM cells. That's a lot! No wonder they're so expensive...)

However, the reliability of the semiconductors are no joke. I take it pretty seriously, since it would be the workhorse, so it need to be able to survive anything, aside from stupidity. So I have to take my time thinking about the presented factors such as the failure rates (EEPROM ranks the worst as it only got 10,000 rewrites before completely failing – OTP ranks the second – it's basically the UV EPROM in plastic package – I had to actually erase some of mine using the “borrowed” X-ray machine. Still, it's tricky since you would never know if you left it there too long – too much exposures in X-ray emissions will result in latch-gate transistors being cooked way too well done – rendering the whole EPROM totally useless. Even then, we just have to learn how to tell if just a pinch of salts is too much...) before really think about applying it in the final design.

Speaking of design, I also knew that I will have to tackle few things in the long runs. FCC and JIS standards for the management of radio frequency inferences (RFI) of the computing devices (I don't want to deal with those so-called “Radio Cops” - they're real strict) should be emphasized without ruining the chance of thermal transference from the CPUs' packages/dices to the heatsink block.

Thermal management is even much important for the computer of this magnitude of computing powers (system-wise), even critical for XS1-G4. (Why didn't XMOS make 'em into lidded FCBGA-512 instead of PBGA-512??? Oh well, we cannot have everything. BTW, I have heard that when running, it's as hot as an ancient NVIDIA Riva TNT2 GPU – which would be enough to warrant the use of a bigger heatsink for all 16 XS1-G4 chips to get rid of all the fiery heats.)

And, while it seems like a good entry for Propeller II wish-list, I would like them to be soldered and molded into TFBGA-144 (or TFBGA-132) package so I would be able to stuff as much Propeller II chips as I can, and as long as the designs of the custom PCB allows.

And as far as for the power supply and storage, I have decided to go with what we put in our ATX computer cases so it's even easier to upgrade and to replace if any particular parts fail. SATA is still very attractive since with this option, I would be able to put in 6 terabytes hard drive in Dendou Oni by the time it's done, and probably put in DVD+RW and/or BD-RE (Blu-ray Disc Rewritable) burners for easy data exchanges/backups.

So, there are so much unexplored seas in this project, so it will have to be explored in the near future. There are going to be much work on it soon. See ya!
(P.S. I will be writing up more reports as the work progresses!!!)