

Minutes of Balloon Developers Meeting 24th November 2006

Meeting at Toby Churchill Ltd (TCL) in Over.

Present:

- David Bisset (chairing), iTechnic Ltd
- Steve Wiseman,
- Laurie van Someren, Aleph One.
- Wookey, Aleph One.
- Colin Tuckley, Aleph One.
- Chris Jones, Martin-Jones Technology Ltd
- Peter Long, Cambridge University Engineering Department (CUED)
- Paul Fiddler, CUED
- John Drake, TCL
- Jim Rayner, BeyondVoice Ltd
- Nick Bane, CE Computing/TCL
- Stephen Affende
- David Mason, TCL
- Jonathan McDowell
- Neel Shearer, TCL
- Toby Churchill, TCL
- David Collison, TCL
- Mike Bayley, Barric Ltd
- Simon Bayley, Barric Ltd
- Jenny Hopkins, TCL

Agenda:

General Items

- Commercialisation Plans.
- Marketing.
- Current state of Balloon3.
- Production plans, variants, finance.
- Application project status.
- Open Hardware License.

Technical Items

- Progress against Actions.
- Constructing Distributions.
- Kernel Modules.
- Kernels - 2.4 and 2.6 update. Which versions to support. Pushing into mainline.
- Linux Developments (EABI, RT-Linux etc).
- Add-on boards, what and how
- Hardware details: FPC options, boxes/mounting.
- Bootloaders - Bootldr vs. linux boot.
- JTAG tools - status.
- Toolchains (software and FPGA).

General Items

Commercialisation Plans.

The meeting started with an announcement from Toby Churchill that Toby Churchill Ltd is setting up a new company to exploit the commercial opportunities offered by the Balloon board, that the company will be a wholly owned subsidiary of Toby Churchill Ltd. The company would be run by Toby Churchill as Chairman, David Collison as Finance Director, who is also Finance Director of TCL, and David Bisset as Managing Director.

David Bisset said that the new company would organise the design and manufacture of Balloon boards and handle marketing, sales and distribution. The company would be based at Over so that it can share facilities with TCL.

Marketing.

With the launch of the new company marketing will be one of the main activities it must tackle. LvS suggested joining the Cambridge Network as a way of getting the Balloon board know in the local area, he offered to guide this process as an existing member.

Wookey suggested Linuxdevices.com as a means of publicising Balloon.

Peter L has extensive contacts through CUED and significant early interest is being generated from the MDP (Multidisciplinary Design Project). <http://www-mdp.eng.cam.ac.uk/> Links with the CMI (Cambridge MIT Institute) may also yield interest in the US. There was an invitation from CUED to write an article for Eureka to publicise Balloon to the University Community, however we would need to be ready with advertising material to respond to any surge in interest.

Farnell has been approached to act as a distributor, with the possibility of Newark replicating in the US.

Wookey and others suggested that the Embedded Systems Show should be tried again although this should be done with some care. Wookey also expressed that the main difficulty was finding the small and very small companies that would be most interested in Balloon.

Mike B said that Barric was currently planning to use TCL and Balloon in its advertising and that with the formation of the new company this should be included.

Current state of Balloon3.

David B said it was important to compare where we were now to where we were at the last meeting 6 months ago, then we had only 3 boards working at a very early stage.

The current state is that a batch of 20 P2 build have been completed, and 20 E1 build. These are now in service with CUED and developers and no serious problems have been reported. E1 is a respin of the PCB (version 3.21) with all known bugs found in version 3.1 fixed. It has three working RAM banks and 2K page size NANDS.

Known issues are RoSH compliance, USB client connect/disconnect detection, Compact Flash on CPLD variants doesn't appear to work and there is an issue with JTAG chains

on the FPGA variant due to power control on the FPGA. These will all be fixed at the next respin due Q1 07. At which point B3 will be ready for full production.

RoSH compliance requires an alternative NOR part to be fitted, a review of all parts for RoSH compliance, and a possible change of RS232 converter device as this is believed not to have been made compliant by Maxim.

The single sided build has one 0402 resistor on the underside which needs to be moved to the top side to allow complete one side assembly.

From a software point of view Linux kernel 2.6.16.5 currently works on B3 and B2 (apart from USB). Although a number of patches need to be posted upstream. The build is now Using OpenEmbedded soft-float build, the hard-float build is currently broken.

Production. Plans, variants, finance.

David C outlined the operation of the new company which will organise production and plans to have boards available for sale by Q2 07. TCL will fund the new company but it will have to become self-sustaining.

David B said that currently three variants were planned:

- A FPGA build which maximised the capability of the board.
- A low cost single-sided CPLD with one bank of ram.
- A CPLD build with increased RAM and NAND plus CF and bus expansion.

Chris J suggested that we should not lose sight of the fact that it is possible to produce a version of Balloon 3 that has no CPLD and only NOR flash. It was generally felt this was a good idea.

***Action:** David B to investigate costs and get a suitable development board made for testing.*

Other outstanding build issues relate to the amount of RAM and NAND on each of the three builds. Currently the Full FPGA build will have 3 banks of RAM and four 2G NANDs.

There is also the option to upgrade the FPGA fitted. The E1 builds have XC3S1000 parts fitted but XC3S1500 or XC3S2000 parts could be fitted.

Application project status.

Stephen Affende said that he had only found balloon by accident but that it was a good basis for the development of an entertainment system he was building. Jim concurred that it was a great development platform.

Peter L reported on a number of developments at CUED:

- PDA touch screen was now well on its way with the high quality VGA screen and the touch screen working and a preliminary port of OPIE.
- A project was under way to use the SAMOSA bus for High speed Capture.
- A number of R&D projects in CUED were looking at the Balloon board as a possible solution.
- There are plans to use it in a UAV.
- Work on interfacing the Zigbee modules is now well under way with a demonstrator.
- Balloons are now being successfully used in Undergraduate teaching with more courses looking at using them.

Colin said he was considering using one to demonstrate Linux at Local computer fairs

David M stated that TCL would be using the Balloon 3 in its products once they were on stream.

Open Hardware License.

David B presented the first draft of the Balloon Open Hardware License (BOHL) he pointed out that the reason no hardware schematics had yet been released was because we needed to agree on the format of the license in order to protect the designers, manufacturers, distributors and users. This was then discussed.

The license uses the concept of a "Design Group" who have access to the "Design Files" to protect the unity of a design while allowing full access to the hardware information and manufacturing files.

The license is intended as a general purpose open hardware license applicable to all forms of hardware made using an open design process.

Action: *David B to update the License with respect to the comments made and re-issue it for broad approval.*

Action: *Stephen A to communicate the next version of the BOHL to a US based lawyer colleague for comment.*

David B said that as the new company was going to be governed by the conditions in the BOHL it was prudent for the company to have the BOHL approved by its lawyers in the UK and that this would take place once the Designers had given broad agreement to the text of the license. Barric also agreed to examine the License from the point of view of a manufacturer.

Technical Items

Progress against Actions from previous Meeting.

The progress against actions from the previous meeting were reviewed.

Action: *Wookey/Nick/Laurence/James will arrange to merge the trees and get definitive spares tree on balloonboard.org*

Husaberg rsync's to balloon-board.org , every night. 2.6.18 generally agreed to be the version to aim at for release. Progress towards single definitive tree still required.

Action: *James (or anyone) - do script to diff tree and generate sparse tree of changed files. Wiki page documenting branches would be good too.*

Some investigation and approval for the use of Quilt to aid this process. Some modularisation of the patches completed. Still some work to do.

Action: *Paul to post their patches (RTAI) so we can put them on the site in case anyone wants to refer to them. (Low priority)*

Complete, though port not working but will act as a pointer for others should this be needed. Nick B reported that there are indications that RT-Linux will move into the main kernel some time next year.

Action: *Lennert/Wookey/Nick/Laurence/Colin - After merging trees kernel team will ask lennert Buytenhek to help prepare, review and submit patches to mainline.*

Some patches pushed up to main line, work still needed to get all patches pushed through. Mechanism for achieving this now better understood.

Action: *Wookey/Colin: Detail toolchain choices in docs and put toolchain packages/tarballs on the site.*

Tarballs now available.

Action: *James/Laurence - put their bootloader on balloonbaord.org and add info to wiki.*

Not Done

Action: *James to provide Colin with software/links (Linux based Xilinx package)*

No longer necessary Linux tools now available directly from Xilinx web site.

Action: *Colin to test and incorporate to bbl*

No longer needed

Action: *Dave/Nick/Wookey/Colin - merge bootldr versions and get one that does everything into balloonbaord.org SVN*

There is now a working branch that works for B2 & B3 and variants but still needs gcc 2.95 to compile. Tip is still broken.

Action: *Dave - upload bflash stuff.*

Done with release of P2 builds. Still broken for B2.

Action: *Colin - integrate with bbl*

Stalled until bflash fixed for B2 as scripts need to be cross platform.

Action: *Wookey - put DaveB in touch with OpenJTAG people.*

Done. Interesting developments but nothing that can be used on Balloon as yet.

Action: *DaveB/James - Work out if co-operation is appropriate and what to do next if so. report back.*

Done

Action: *Dave - supply VHDL for balloon3 logic.*

Done with P2 release.

Action: *Dave/Steve - publish schematic and Netlist (This will happen at the next main build)*

Stalled on agreement on Balloon License

Action: *Dave - propose a couple of default build options.*

Builds to date are full FPGA build, Full CPLD build, Single Side CPLD build suitable as low cost option.

Action: *Everyone - tell Chris what you want in terms of add-ons.*

On going.

Action: *SteveW - supply protel design/schematics for backplane and board base design, so people have a starting point for special-purpose add-on boards.*

Not Done task transferred to David B.

Action: *Chris/Dave write a hardware developers page for the Wiki/Web*

Fuller hardware documentation as PDF's issued with P2/E1, but still needs Wiki pointers.

Action: *Wookey - Move irc server to somewhere more reliable than Aleph One.*

Done.

Action: *Wookey - Give everyone at this meeting who doesn't have one a login: daveb, peter, stevew, james, lwithers, nickb, jimr*

Done.

Action: *Wookey/Nick - put up an nfs-root tarball suitable for development.*

Done.

Action: *Wookey/Colin/Jim - Examine alternatives and choose/configure something to be a default.*

OpenEmbedded now adopted as the means of building distributions.

Constructing Distributions.

There is a real issue surrounding how we construct distributions and how we snapshot these for distribution particularly with respect to fulfilling the requirements of the GPL in the preservation of source code for a distribution.

Considerable investigation has now been carried out by Nick B, Jim and Wookey and they have concluded that OpenEmbedded provides the only real solution to these particular problems. An OE distribution has been constructed.

Wookey raised the issue that we should do a daily "build and burn" cycle in order to ensure that problems with the build caused by new checkins are caught early in the development cycle. This will require a machine dedicated to building located where developers can access it.

Action: *Jim Nick Wookey to investigate feasibility of Open Embedded building etc. and of snapshot and freezing distributions.*

Action: *David B to investigate where a machine could be put carry out daily builds.*

Wookey said that Quilt, a tool for managing patches, looked like a good option for managing the application of kernel patches. There was a discussion about how this would integrate with SVN. The general impression was that the need to modularise patches did not match well with checking source into SVN. It was generally agreed that in order to feed patches into the mainline kernel we would need to submit these as specific patches rather than monolithic lumps of change across the whole kernel tree. It was agreed that Quilt was the right way to manage this process. However the right interaction between the use of SVN to record individual file changes and the use of Quilt to manage patch sets was unclear.

Action: *Wookey, Nick and Jonathan to interact to merge the kernels.*

Action: *Wookey Jonathan M to come up with a process for modifying and recording Kernel changes that covers the use of SVN and Quilt.*

Kernel Modules.

There needs to be agreement as to what modules are built into the kernel and what is supplied in the distribution.

It was generally agreed that only modules directly required to run the hardware should be included in the kernel, and that there should be no restrictions on what is included in the distribution.

However David B expressed a desire to detail hardware that had been tested with Balloon, particularly USB and CF cards so that a recommended set of devices could be assembled. Steve W suggested that the new company might like to sell these as accessories.

The issue of how a board would be able to recognise what hardware it had was raised and it was pointed out that the FPGA/CPLD contained a version bit pattern that had the capacity to code options but that kernels/bootldr needed to interpret this and pass suitable identification strings at boot time.

Kernels - 2.4 and 2.6 update. Which versions to support. Pushing into mainline.

It was generally agreed that we need to be working towards 2.6.18 as the common kernel on which we base a first public release of Balloon 3. There is a certain amount of work still to do to complete this. Notably:

- Client USB is still broken on Balloon 2.
- ALSA drivers and sound support.
- Operation of CF slot under CPLD is unproven.

Action: *Jonathan M agreed to investigate making NOR accessible from Linux. This will have implications for the creation of a Linux based Boot loader and for the supporting of a NOR only machine.*

Wookey pointed out that Bugzilla is up and defined and working so that bug reports can be filed on line.

Linux Developments (EABI, RT-Linux etc).

EABI:

The main issue is the move to EABI. There was general agreement that Balloon 3 should ship with an EABI port of the Kernel to avoid problems converting later. However it was not clear that all the components needed will be ready in time. In particular toolchains have been a blockage although other ARM distributions (Symbian and Nokia 770) are EABI compliant. Jonathan also pointed out that Angstrom was also EABI.

Action: *Nick B to try an EABI build and see what happens.*

Java:

Nick reported that SUN had announced that Java would be available under GPL2 and that this was good news for the Balloon project. Both TCL and CUED have an interest in generating Java based applications. It was pointed out that other ARM based Java ports have not had much development attention and so are only just starting to work in Q4 06, it was felt that this might be a useful step in the right direction.

Action: *Paul to try current SUN Java in a Balloon context.*

Memory Banks:

It was pointed out that there is an issue with the three memory banks on the Balloon 3 board in that only two are available because of the fact that they are not at consecutive addresses and the kernel expects to sit at a particular address. Few ARM based Linux implementations seem to offer more than 128M of RAM. Balloon 3 is now working in "Large Memory Model" and so in theory could offer up to 0.75G of RAM in three banks. However the current limitations on memory handling limit this to 512Meg.

It was also pointed out that it is impossible for a single kernel to be compatible with both small and large memory models.

Action Chris and Nick would document the memory model problems and pass this to Wookey to pass upwards to enquire about possible solutions. Also to investigate other ARM implementations that might have the same problem or might have solved it.

Action Wookey to ask the question on the list and examine *iyonix* code, and *thecus* code.

Memory Timing:

Steve W pointed out that the memory on Balloon 3 was currently running at 50% speed due to some registers needing tuning on the PXA.

Action: *David B and Chris J to investigate and fix.*

Add-on boards, what and how

Various add-on boards are being produced including Zigbee modules and Analogue capture cards.

Action: *David B to produce a blank schematic as a starter for producing backplane boards.*

Airship:

Steve W announced his latest Balloon related project was to be called Airship this is a cheap processor board with the same footprint as Balloon and which would subsume the functions currently carried by the CUED breakout board while adding further functions. A brief current technical outline is as follows:

200Mhz arm9 (cirrus). 9302/3. embedded, no display. ethernet, poe, ac97 sound, ram, rom, funky IO via parallax propeller chips, SPI, USB2 master. QFP so can be hand soldered by the skilled. Possibly a 4 layer board for low cost, same size as Balloon.

There is a Linux port that is available for the Cirrus CPU the only area of uncertainty is Linux based support for the Propeller device. It was agreed that this should be investigated. David B said that Airship would be taken on by the new company once it was developed.

Hardware details: FPC options, boxes/mounting.

It was pointed out that Balloon 3 needs some breakout boards to allow solderable connections to the connectors which are currently mostly FFC on 0.5mm pitch.

Action: *David B to produce an FFC breakout card to allow connections from FFC's to be connected to solderable connectors compatible with Balloon 2.*

Bootloaders - Bootldr vs. linux boot.

There is currently a branch in SVN that contains a bootldr that works with both Balloon 2 and Balloon 3 and both variants of Balloon 3 (CPLD and FPGA). However this can only be compiled under gcc 2.95 which is now very out of date. Attempts to convert this to gcc 3 have so far failed to make working code.

Action: *Colin to, once again, try and bring `bootldr` up to gcc 3 or even gcc 4.*

The issue of using Linux as the boot loader was raised and it was suggested that Open Embedded may provide a way forward to producing a cut down version suitable for use

as a boot loader provided boot speed issues can be addressed as fast on times are important to Balloon users.

Wookey pointed out that the Consumer Electronics Linux Forum has worked in fast boot mechanisms. Other boot loaders such as BLOB were also mentioned however the usual barrier to using these is the provision of a YAFFS port.

Action: *Jim / Nick to examine a Linux boot loader solution.*

JTAG tools - status.

Although a Balloon 3 version of the `bflash` tool has been released with the P2 build it is not yet compatible with Balloon 2. There is no reason for this not to happen.

Action: *David B to get `bflash` working for Balloon 2.*

Toolchains (software and FPGA).

There was some discussion about the provision of on-line FPGA or toolchain builders however it was generally felt that these would not currently be of benefit to the community. Although some documentation was needed to hand hold through the building of the FPGA code under Linux.

Concluding Remarks

David B concluded by thanking all those present for attending and pointing out the good progress that has been made in the past 6 months, and the hope that the new company would stimulate new applications and opportunities over the next 6 months.

Thanks go to TCL for providing lunch and accommodation for the meeting.

Another meeting was agreed for 6 months time.

Friday 25th May is set as a date for people's diaries.