

THE THIRD WAY: GPL DISTRIBUTION FROM THE HARDWARE MANUFACTURER

KEEPING AN EYE ON THE COST-BENEFIT RATIO

By *Claus Gindhart*, The leader of the Linux development team at Kontron Modular Computers

In-house General Public License (GPL) adaptations are – along with commercial Linux distributions – an alternative to gain complete, royalty-free access to the source code. This can, however, be both time- and cost-consuming. Kontron is now offering a third alternative alongside its BSP support for operating systems which are subject to licensing terms: Kontron's in-house Linux GPL distribution is tailor-made to suit the needs of automation platforms.

Open Source is often regarded as a free-of-charge solution; at the first glance, a land of plenty for software developers where there is a never-ending pool of modules and the source code can be adapted to meet any requirements and built into one's own applications. Predominantly it is Linux users who profit from Open Source modules, but also in other operating systems and even in the board-firmware, Open Source has made its

contributions of GPL installations are definitely worth looking into, as they influence the costs per unit and ensure long availability and full access to the source code. Users, who prefer to concentrate on the development of the application without having to think about the stability and functionality of the underlying Linux environment, are recommended to use a commercial Linux distribution which offers the necessary support.

Embedded Linux Distribution, which is compiled exclusively using Open Source modules. It can therefore be used for the supported hardware and is royalty-free. This Embedded Linux Distribution is available, for example, for the Kontron ThinkIO-Duo DIN rail PC and for the PowerPC- and Arm/XScale-based boards. It is based on the OSADL Linux kernel which is real-time capable and contains a Linux file system, a Cross Compiler Toolchain, a board driver and libraries for Kontron specific HW features along with further tools which can be downloaded, plus extensive user manuals. On top of this, Kontron offers support for Open Source virtualization solutions, like the KVM/Qemu virtualisation, which offers very good performance features on Intel® Core™2 Duo boards. This is rounded off with a performance package, for example with tools for BIOS version updates and other board firmware under GPL, to mention only a few Open Source solutions. This puts Kontron in the position to offer an increasing number of solutions to its customers which are totally free from software licensing issues.

To be able to offer such solutions, an extensive amount of work is involved on Kontron's part and this is then fed back to the community: For example, Kontron is contributing to the further development and improvement of Open Source products. Reference contributions include the system monitor (MAX6650) for the Linux kernel (kernel.org), an IPMI tool (sourceforge.net) or work carried out in the Flash-ROM project (coreboot.org) – to name just a few examples. And as Kontron continually employs the latest components for its boards and systems, it often discovers bugs in Open Source device drivers and kernel implementations and passes on the fixes directly to the chip manufacturers. This results in an intensive contact to the developers working at component manufacturers like Intel®, AMD,



debut with the BIOS successor EFI. There is a catch though: In most cases the source code has to be adapted which means that costs for development have to be budgeted. The costs for individual Open Source operating system adaptations only pay off, if the quantity of units is large enough to allow the higher initial development costs to be transferred to the number of units sold. If this break-even is attainable, in-house develop-

With this, a faster time-to-market can be achieved. For example, Kontron offers support for all Linux distributions which are relevant to the embedded market, including WindRiver Linux, Redhat Enterprise or also SUSE Linux Enterprise. An alternative to the two solutions "build or buy" in the Open Source or Royalty Free environment are distributions from hardware manufacturers. As an example, Kontron offers its own

Freescale, Silicon Motion or Hilscher. These examples demonstrate that Open Source development is not necessarily an inexpensive matter. Kontron's customers have to carefully consider these issues when using their own dedicated hardware. If an OEM customer concentrates primarily on software applications, he has to nevertheless ensure that he can provide solutions with his GPL installation on a lasting basis. Projects, executed on the customer's own initiative, can be expensive and time-consuming. A possible alternative is a GPL installation from the hardware manufacturer. Due to the fact that Kontron, as the leading manufacturer of embedded computer hardware, will continue to support Open Source, as the corresponding demand is there, customers can be sure that developments will always be pressed ahead with. Every new integration in further customer projects means the development of new solutions which other customers and members of the Open Source community can profit from. The comparably high number of customers thus supports the basic development of individual platforms without having to pay for each adjustment. Consequently, the current solution developed around the ThinkIO-Duo will be available in other form factors in future, as the distribution does not have to undergo massive changes and the kernel and the chipset work can, for example, be reused. It is, however, not Kontron's aim to try and compete with professional Linux and RTOS distributions. It is purely an alternative that can be offered for mainstream applications. In no way will all the functions of a commercial distribution be covered or fulfilled. This approach does, though, show a way in which Open Source can be increasingly brought to the OEM customer via the hardware supplier which in turn means that system maintenance can be carried out more efficiently in the long term. Distributions from hardware manufacturers can also alleviate implementation work, for example, if license manage-

ment under GPL is used.

To protect its customers from infringing on license regulations when applying the Open Source software, which the Free Software Foundation would penalize, BSP libraries with details of Kontron's boards' hardware functionality for user applications are made available e.g. at the LGPG (Library- or Lesser-GPL). The LGPL allows the application engineer to link up to the library and still keep his application protected. Furthermore,

```
Global BSP configuration script (c) 2007 Kontron Modular Computers
-----
BSP system type configuration
-----
Please choose one of the supported system types
(1) thinkiod
(2) thinkiop
Board or system name [please_specify]: 1
Loading values for thinkiod
-----
BSP feature configuration
-----
Feature toggles
n) Netx fieldbus controller      : yes
i) IO board due to Kontron IOC standard : yes
k) Wago K-Bus interface         : yes
2) Ethernet port eth2           : yes
b) Bonding for eth0/eth1        : yes
r) Additional RTC chip (8564) on SMBUS : yes
v) Vlan tools (brctl, tunctl)    : yes
q) KVM/QEMU virtual machine support : yes
x) store settings and exit
choice prompt = n i k 2 b r v q s x
Your choice:
```

Kontron informs its customers at a very early stage about the pitfalls of Open Source licenses and offers, e.g. in cooperation with the OSADL solution, approaches for circumnavigating problematic issues. For example: If a HW manufacturer provides a Board Support Package to a customer under GPL and the customer incorporates this SW package in his own application, then the so-called "viral effect" of the GPL applies, that means the whole application is so to speak "infected" by the GPL virus and falls into the GPL category. For a customer who didn't know this as he had not been informed about the boundary conditions of GPL by his HW manufacturer, this can be a catastrophe, especially if he already has his devices out in the market.

A new technology is now up and coming in the market which acts as an isolation layer between Open Source and proprietary software: virtualization. In an Open Source operating system, virtualization allows a

proprietary operating system (Windows) to run as a guest in the virtual machine. In this guest operating system, any number of proprietary programmes can be run. Communication between the proprietary guest and the Open Source host is carried out via virtual networks. Kontron has also carried out a lot of research and development work in these areas and will offer such a solution in the Open Source Linux BSP for the ThinkIO-Duo. Virtualization can be activated when the BSP runs on the system with a multi-core CPU. This is just one of many possibilities. It can be concluded that: Extensive know-how in Open Source and GPL is a decisive factor alongside the actual development work to be carried out. Manufacturers such as Kontron have profound know-how which customers can refer to and platforms which offer mature software support. GPL distributions from hardware manufacturers are gaining significance within Open Source projects as an alternative to in-house development and commercial distribution.

Checklist for BSPs with Open Source

All BSPs, which contain Open Source packages, should observe the following points, as the supplier of the BSP should actively ensure that the user never runs into problems with the Open Source license:

The applied Open Source license should be documented in all SW manuals.

Every software package, which contains Open Source modules, should be delivered with the complete source code.

Even in the sources, the licenses should be documented in the headers.

Modifications, improvements and bug fixes in Open Source packages should be made available to the community and comply with Open Source Coding Conventions. ■

Claus Gindhart

Kontron Modular Computers

claus.gindhart@kontron-modular.com

Spoilt for choice

"Each operating system has its own specific advantages, which in turn means there are overlapping boundaries when choosing the right system. In the case of Windows, Linux and RTOS, at the moment the boundaries look like this: If you are dependent on the latest technology from hardware component manufacturers, who see the majority of their products in the Windows environment, and if time-to-market is all important, then you're better off in the world of Windows. That's the situation with the latest graphic solutions.

But things are happening in this area too. For example with the Intel® Atom™ processors, Intel® puts Linux on par with Microsoft. If it's about real-time, Linux cannot fulfil all the features that an RTOS like VxWorks offers. That argument is valid for real-time requirements and also concerning the footprint of the operating system. If, however, you don't want to do without Open Source, there are alternatives offered there too."

Norbert Hauser
Vice President Marketing, Kontron

