Open Source Automation Development Lab (OSADL) eG

Linux real-time: New stable release available – but next one depends on more support from industrial users

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November 18, 2014. The Open Source Automation Development Lab (OSADL), an international consortium to support the use of Open Source software in the industry, has successfully completed the release procedure of the so-called "Latest Stable" real-time Linux kernel. This especially applies to the products and services of OSADL member companies

- AMD, Intel and Texas Instruments for processors and controllers,
- Eltec, Kontron and Phytec for computer boards and modules,
- IMMS, Linutronix/Elbe, Pengutronix/Ptxdist, Sysgo/Elinos, Windriver/Yocto for board support packages,

and to other members' industrial systems that all are under continuous test at the OSADL QA Farm. However, when a subsequent release will become available depends on more support from industrial users.

What was deemed impossible, is reality now

Some time ago, the available RTOS kernels had to be retrofitted whenever a new technology such as an advanced processor design or a faster communication protocol became available. The tremendous efforts required for such retrofits led to the idea that it would be much easier to turn a general-purpose operating system into a real-time operating system than to repeatedly equip all RTOS kernels with the new technologies – a task, however, that rather was a redesign than a mere extension due to core technologies affecting the overall system. Most operating system experts were convinced that it was completely impossible to render an operating system real-time capable as an afterthought. But the Open Source way to develop Linux made it possible which is confirmed by a large number of OSADL QA Farm systems running the newly released "Latest Stable" Linux 3.12-

(The image file is provided separately)

Figure: Sequential latency plots of 100 million test cycles each resulting in a total of 80 billion cycles wihout any latency outlier.

based real-time kernel: Even during a one-year measurement with a wide variety of load scenarios, a minimum latency without any outliers was achieved as exemplified in the Figure.

Developing robust technology is only the first step – other must follow

The fact that a number of selected Linux kernel versions can be equipped with real-time does by far not mean that the stock Linux kernel provides real-time now. Although about 90% of the original real-time patches made it into the mainline kernel, the remaining parts still wait to be streamlined and merged. And even when all patches will be upstreamed, continuous maintenance of real-time aspects in the context of the mainline kernel will be needed.

How to resume provision of real-time Linux and tackle future maintenance?

Formerly real-time Linux development support was driven by specific needs resulting in funding being unstable. Independent continuous funding and support of real-time Linux, however, is the core mission of the Open Source Automation Development Lab (OSADL). It was founded as a member organization to take care of Open Source software for the industry and, thus, should follow in the footsteps of the former supporters. Fortunately, OSADL has grown to nearly 50 member companies and is able to shoulder from its current budget about half of the required funding to resume maintenance and provision of the real-time patches. The other half must be provided by new members and external contributors. Long-term stability though requires more than mere maintenance of the status quo; the community of real-time Linux users, therefore, additionally needs to put together the funding for mainlining the remaining out-of-tree patches. This upstream submission should be started as early as possible, since even the smallest piece of code that can be merged into mainline will reduce the required maintenance of the patches. Should all code of the current patches be upstreamed to mainline one day, it is the declared goal of OSADL to provide the funding of the remaining maintenance on a long-term basis without depending on external help.

There are many ways to contribute

The most evident step to contribute is, of course, to join OSADL as a member. In addition, OSADL has created in close collaboration with its members and other interested parties a number of ways how to help:

- Temporary upgrade of the OSADL membership level, e.g. from bronze to gold, if applicable
- Commissioning of individual work packages of real-time software components
- Conclusion of a Service Level Agreement
- Individually tailored funding

Given the fact that the real-time patches are used in numerous commercial industrial products, there is hope that a sufficient number of manufacturers and vendors can be motivated to join in and help an up to now successful project stay so in the future. Considering how little the requested contribution is, using real-time Linux still mostly is a free ride.

About the Open Source Automation Development Lab (OSADL):

The Open Source Automation Development Lab (OSADL) started its activities in summer 2006 and is organizing since then the development of Open Source software to be used for industrial production and in industrial products. Among others, OSADL is acting as a "purchase community" of Open Source software, i.e. membership fees are used to develop Open Source software projects that the majority of the members is requesting for or agreeing to. In addition, OSADL provides support with practical and commercial aspects of using Open Source software in the industry. This includes subexhibitor booths at relevant trade fairs, seminars and workshops, legal assessments and collaboration with academia. Current OSADL software projects focus on real-time and safety-critical Linux, real-time Ethernet and other special drivers for the Linux mainline kernel as well as virtualization and development tools.

The OSADL member companies employ altogether more than 100,000 people, generate a sales volume of more than 100 billion euros and are machine companies, manufacturers of automation hardware and software, semiconductor companies, Open Source software service providers and user associations.

More information at: www.osadl.org

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