



Open Source Automation Development Lab (OSADL) eG

OSADL Launches Real-Time Linux Quality Assurance
Farm
www.osadl.org



OSADL announces on-line availability of its real-time Linux quality assurance farm at osadl.org/QA

Real-time Linux

Linux is not only a general-purpose operating system, it also offers dedicated features such as real-time determinism. This made it possible to use Linux in high-quality audio and video recording and even in the automation industry. In addition, real-time enabled Linux has helped to investigate, localize and fix a number of difficult-to-find kernel problems and contributed to improve the multiprocessing performance of Linux. Making the Linux kernel real-time compliant was not a single step but required a fairly large number of individual components i) to let the scheduler react in time irrespective of the number of waiting tasks, ii) to prevent priority inversion, iii) to make the kernel and IRQ handlers preemptible, iv) to make waiting loops interruptible and v) to provide high-resolution timers - to name just a few. With these and all other real-time components not mentioned here enabled, Linux is a regular real-time operating system (RTOS) providing a similar performance as other RTOSes but with a much broader hardware support and unique features such as 64-bit, multiprocessing and virtualization.

Why quality assurance?

Making a particular software feature available is one thing – maintaining, supporting, servicing and warranting it is something else. The Open Source development model of Linux is very good at the former but, due to its nature, less good at the latter. Since automation and other industries rely on tested and guaranteed performance specifications and real-time Linux always was one of the most important projects of the Open Source Automation Development Lab (OSADL), it was only normal that OSADL decided to run an appropriate real-time test farm. Its goal is to provide realistic performance data of a wide variety of Linux-based real-time systems that are stressed under simulated production conditions. As of November 2010, the OSADL real-time QA farm contains x86, PowerPC, ARM, and MIPS processors, some of them as 32 and 64 bit variant and x86 systems as uniprocessor and multiprocessor systems. Combined and individual wakeup and timer latency are monitored continuously. In addition, every six hours, a six-hour run of the `cyclictest` real-time test tool with a total of 10^8 single measurements is performed to create latency histograms. Initially, the test is running under idle conditions for two hours; during the remaining four hours, a defined memory, I/O, network and file system load scenario is created. The QA farm is connected to the OSADL Web server via a direct link that is used to display the test results on-line.

The continuously monitored data are updated every five minutes and the latency histogram plots twice a day.

All system data on-line

In addition to the latency data, profiles of every system are available on-line. They contain vendor and product details of the mainboard, the processor and, if any, PCI controllers in place. In addition, kernel boot arguments and, most importantly, the complete kernel configuration is given. The goal of making all of this information available is to support developers who want to reproduce the OSADL QA farm data at their place. The profiles are updated in time should the kernel be upgraded or any of the configuration items be modified.

"Latest Stable" real-time Linux

The OSADL QA farm is now an important part of the "Latest Stable" real-time Linux project. This project defines a particular version of the real-time Linux kernel that is considered to be ready for production purposes. A kernel version is not labeled "Latest Stable", unless it runs on all systems of the QA farm and provides the required stability and expected real-time performance.

Real-time Ethernet

Two of the systems are equipped with an additional Ethernet adapter connected to each other via a cross-over cable. They are running a UDP network server and client and, thus, form the generic implementation of a real-time Ethernet link. The user-space server and client application and the related IRQ handlers are pinned to the same CPU and set to real-time priority. The performance of this link is determined continuously, during four-hour periods twice a day, and the resulting round-trip time plots are made available on-line as well. Two other systems are equipped with PCI communication cards that can run a variety of different real-time Ethernet protocols as master and slave (CIFX 50-RE and CIFX 50-RE +ML, Hilscher, Hattersheim, Germany). These cards are repeatedly loaded with various real-time Ethernet firmware, and round-trip time and other performance data are gained.

The future

In the near future, more computer systems with more and other processors and controllers, and more and other industrial subsystems will be added and tested continuously.

The OSADL QA farm at this year's SPS/IPC/Drives in Nuremberg, Germany
More details and background information about the QA farm will be available at the OSADL booth in hall 8, no. 509 (November 23 to 25, 2010).

About 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 for automation companies and for the industry in general. Among others, OSADL is acting as a "purchase community" of Open Source software, i.e. the membership fees are used to delegate the development of 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, I/O framework, real-time Ethernet and other special drivers for the Linux mainline kernel as well as virtualization and migration to Linux.

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: <http://www.osadl.org/>

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