LivEPICS: AN EPICS LINUX LIVE CD NAGIOS EQUIPPED

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Abstract

EPICS distributions – analogous to a Linux distribution, are collections of EPICS [1] software that have been proven to work together. It is much quicker to download and install a distribution than it would be to obtain all of the individual pieces and install them separately. LivEPICS (© copyright under GNU General Public License) [2] distribution contains binaries from EPICS Base, various extensions, and source code.

INTRODUCTION

EPICS is a software tool-kit originally developed at Los Alamos National Laboratory and Argonne National Laboratory for the control of accelerators and large experiments. Since the version R3.14.1, released in 2002, EPICS was ported to different hardware and software environments and now it is available for many kinds of processors and operating systems.

Despite the installation of EPICS is usually done by a well proven set of automatic procedures, its configuration is not always straightforward for a beginner. To help a new user to get familiar with EPICS tools without installing them on the hard disk, we developed a Linux based live CD that includes most of the EPICS features.

LivEPICS is a bootable CD, which contains a pre-configured EPICS development environment. After booting, the user can access all the utilities required to create a simple control application; at the end of the session he can save his application on a USB mass storage device.

The first release was delivered in 2005 and obtained good feedback from the EPICS collaboration. Therefore, we decided to create a second release which was completely rebuilt using a different Linux distribution (Fedora Core 5). This second release contains interesting documents for use by students undertaking EPICS training. The desktop is based on KDE 3.5, with OpenOffice 2.0. Students can use the Firefox personal toolbar folder to access a large number of offline documents. The documents explain in detail the use of the base and extensions software available. The CD contains: EPICS base 3.14.9, Asyn 4.6, VDCT 2.5, Probe 1.1.4.0, Alarm Handler 1.2.20 and MEDM 3.0.4beta7.

EPICS BASICS

The basic idea underlying EPICS [1] architecture is the implementation of a software bus. Process variables are declared, through a graphic tool, as records of a real time data base. The record properties define the method by which the record is processed: usually, a record is associated to a particular hardware device and processing a record means to call a device driver that acquires the variable and writes it in the data base. Record processing is realized by a software module named IOC. Once a variable is stored in the data base it can be accessed by multiple clients through a network infrastructure called Channel Access. Provided the device support for the hardware already exists, a control system can be designed and tested with no need of writing program code.

The toolkit includes a lot of utilities: i.e. the Motif Editor and Display Manager to generate graphic panels, the Alarm Handler, the Data Archiver, the Channel Access Probe and many interfaces to make available the data base variables to non-Epics applications.

LIVEPICS FEATURES

The first release was delivered in 2005 and obtained good feedback from the EPICS collaboration. Therefore, we decided to create a second release which was completely rebuilt using a different Linux distribution (Fedora Core 5). This second release contains interesting documents requested by EPICS community for use by students undertaking class course, introductory documents and manuals: Application Developer Guide, IOC Application Building, Record Reference Manual, Channel Access Manual, Channel Access Protocol, State Notation Language Manual.

The desktop is based on KDE 3.5, with OpenOffice 2.0. Students can use the Firefox personal toolbar folder to access a large number of offline documents. The documents explain in detail the use of the base and extensions software available. The CD contains: EPICS base 3.14.9, Asyn 4.6, VDCT 2.5, Probe 1.1.4.0, Alarm Handler 1.2.20 and MEDM 3.0.4beta7.

LivEPICS has the complete functionality to develop a small control system, but it is mainly intended for training classes or to monitor and supervise an EPICS network.

The goal of LivEPICS is:

- Allows using EPICS without installation on the hard disk.
- Automatic setup of environment variables to compile and test new applications from scratch.
- Includes the basic tools (MEDM, VDCT, etc.) with the related documentation.

The iocBaseApplication (the utility that creates the directory structure necessary to develop an application) can be launched immediately after the boot. The OPI tool included in the CD is MEDM (Motif Editor and Display Manager), the alarm manager is AH (Alarm Handler) while the IOC database configuration tool is VDCT [3] (provided by Cosylab). The Channel Access Probe is available to test the status of a record on the network. Asyn and MSI packages allow creating device support applications and medium-sized EPICS DataBases. The CD includes the following documents: Application Developer Guide, IOC Application Building, Record Reference Manual, Channel Access Manual, Channel Access Protocol, and State Notation Language Manual.

ADIOS PROJECT

After deciding on customizing a Linux Fedora Core [3] live CD, we analyzed available live CDs, such as: Basilisk, Berry, BLAG, and Cosmogonia. However, we decided to use ADIOS [4], since it offers good detailed documentation and a number of good network tools. Unfortunately the CD size has constricted us and we have removed parts of interesting tools, which can be included in the next release on DVD.

The primary design of the ADIOS live CD project was to provide students with virtual machines and networks that could be used at home without having to install Linux onto to a set of PCs. The ability to save and restore files to USB devices has made live CDs very popular with educational organizations who desire students to learn how to use new software. In addition the CD can be saved to the hard drive (usually an NTFS filesystem). This has the benefit of running faster, using less space than a full installation and freeing the CD drive, thus allowing files to be saved to CD.

The latest version of ADIOS, based on Fedora Core 6, is available as a live DVD. It includes more networking tools, software development tools such as Eclipse and many science and mathematical tools such as Blender 3D CAM. The DVD version also has over two gigabytes of supporting documentation.

The ADIOS image is built using its own kernel with support for compressed filesystems (squashfs), copy-on-write technology (unionfs), virtual machines (User Mode Linux skas) and wireless networking (ndiswrappers).

NAGIOS

Nagios is a configurable service monitor designed to inform you of network problems before your clients, end-users or managers do. It has been designed to run under Linux, but works fine under most *NIX variants as well. The monitoring daemon runs intermittent checks on hosts and services you specify using external "plugins" which return status information to Nagios. When problems are encountered, the daemon can send notifications out to administrative contacts in a variety of different ways (email, instant message, SMS, etc.). Current status information, historical logs, and reports can all be accessed via a web browser. The positive feedback received from the collaboration after the first release has motivated us to prepare a second version. This one is more user-friendly and contains an updated Linux distribution.

LivEPICS contains a Nagios server pre-configured to monitor the standard Epics “example” application. It shows how the check_caget plugin [6] can be used to monitor the process variable and how to set up the necessary service to Nagios. This minimal configuration can be adjusted to suit various needs by modifying the set up files in /etc/nagios.

COFFEE

To make possible a hands-on EPICS training using the hardware available on all PCs, a Coffee application has been included in the /home/adios. The name comes from an old how-to paper [7] where it is described how to “make a coffee” using Linux. With this application we can make a coffee using EPICS that means reading and writing to and from the PC standard parallel port. This solution helps to demonstrate how EPICS works from the field level to the graphical user interface.

CONCLUSIONS

The positive feedback received from the EPICS collaboration after the first release has motivated us to make a second version. This one is more user-friendly and contains an updated Linux distribution. The usage of ADIOS has saved a lot of time in developing the CD and has opened a new and interesting collaboration opportunity.

REFERENCES

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