Software Development Kit for Multicore Acceleration
Version 3.0

Installation Guide
Version 3.0
DRAFT

SC33-8323-03

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Version 3.0

IBM

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Note

Before using this information and the product it supports, read the information in "Notices" on page 79.

Third Edition (September 2007)

This edition applies to the Early Release version 3.0 (program number 5724-S84) of the Software Development Kit for Multicore Acceleration and to all subsequent releases and modifications until otherwise indicated in new editions.

This edition replaces SC33-8323-02.

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About this publication

This is an introduction to the Cell Broadband Engine (Cell BE) Software Development Kit for Multicore Acceleration (SDK) version 3.0.

Note: This early release SDK will be refreshed on October 19th with a final 3.0 release that includes an option for IBM® warranted support. This early release version requires Fedora 7. The final release will add support for RHEL 5.1 and any references to RHEL 5.1 in this book can be ignored for now.

The SDK is a complete package of tools that help you create applications for hardware platforms built on Cell Broadband Engine Architecture such as the IBM BladeCenter QS21. The SDK is composed of runtime tools such as the Linux® kernel, development tools, software libraries and frameworks, performance tools, a Full System Simulator, and example source files, all of which fully support the capabilities of the Cell Broadband Engine Architecture.

Packages containing code derived from GPL or LGPL open source software such as GCC are located on the BSC Web site: http://www.bsc.es/projects/deepcomputing/linuxoncell/.

A single integrated installation based on the open source tool *YUM* installs both IBM and BSC open source components. The SDK is available for download from the IBM developerWorks® Cell BE resource center at http://www-128.ibm.com/developerworks/power/cell/. This book describes the details of installing both a prerequisite Linux operating system and the SDK for supported platforms. If you are an experienced user, jump to Chapter 3, “Quick start guide,” on page 5.

Chapter 1. Introduction

New in this release

This release of the SDK contains a number of significant enhancements over previous versions of the SDK and completely replaces those SDK versions.

These enhancements include:

- New installation process based on YUM
- Addition of PPU and SPU Fortran compiler
- Addition of PPU-only GNU Ada compiler
- Minor enhancements to XL C/C++ compiler
- Addition of single-source XL C/C++ compiler
- All compilers now generate code that is compliant with the SPE Stall App. Note. See http://www.ibm.com/chips/techlib/techlib.nsf/techdocs/C59.
- GCC toolchain enhancements:
  - GCC C/C++ compilers support infix operations on vector data types
  - GCC support of additional PPU VMX intrinsics
  - GCC performance enhancements
  - Link time estimation of SPU stack consumption
  - Transparent SPE embedding
  - SPE function descriptor support for embedded executables
  - Additional POSIX API support in the SPE runtime library
  - Addition of SPE direct access of PPE address space using `__ea` qualified data types. This feature is supported by the GCC C++ compiler only.
  - Combined debugger enhancements
- Restructuring of examples and demonstration source code; addition of more examples
- Addition of DaCS and DaCS for Hybrid-x86 programming model
- Major enhancements to ALF framework and addition of ALF for Hybrid-x86
- Complete implementation of SIMDMath library
- Addition of BLAS Linear Algebra library
- Addition of FFT Library
- Addition of SPU virtual clock and timer services
- Addition of Performance and Debug Tracing tool (PDT and PDTR)
- Updates to Cell Performance Counter, OProfile and FDPR-Pro performance tools
- Addition of Hybrid performance tooling
- Performance enhancements to the Full System Simulator
- Updated Full System Simulator sysroot to Fedora 7

Related products

You can use these products together with the SDK components. They provide you with additional capability.

Here is a list of related products and where to get them:

- XL C/C++ dual-source compilers available from IBM at http://www-306.ibm.com/software/awdtools/ccompilers/
- XL Fortran dual-source compilers available from IBM at http://www.ibm.com/software/awdtools/fortran/
- Visual Performance Analyzer (VPA) available from alphaWorks® at http://www.alphaworks.ibm.com/tech/vpa

Supported platforms

Cell Broadband Engine Architecture applications can be developed on these Fedora 7 platforms:

- X86
- X86_64
- 64-bit PowerPC® (PPC64)
- IBM BladeCenter QS20
- IBM BladeCenter QS21

For specific requirements, see "Hardware prerequisites" on page 3.

Licenses

The source code and binaries that are part of the total SDK package are distributed with different licenses.

The packages on the BSC Web site are generally open source and use either:

- The General Public license (GPL)

  `http://www.gnu.org/copyleft/gpl.html`
- Lesser General Public license (LGPL)

  `http://www.gnu.org/licenses/licenses.html#LGPL`

If you are not familiar with these licenses, visit the Free Software Foundation (FSF) for more information.

The packages included on the ISO image from developerWorks have an IBM Early Release license, number *L-SGAN-74ZQ4U*. See: http://www14.software.ibm.com/cgi-bin/weblap/lap.pl?la_formnum=&li_formnum=L-SGAN-74ZQ4U&title=IBM%20SDK%20for%20Multicore%20Acceleration

Chapter 2. SDK prerequisites

Hardware prerequisites

The SDK has specific hardware requirements. The following table shows the recommended minimum configuration for each hardware platform.

Table 1. Hardware prerequisites

System	Recommended minimum configuration
x86 or x86-64	2GHz Pentium® 4 processor
PowerPC	64-bit PPC with a clock speed of 1.42 GHz. 32-bit PPC platforms are not supported.
BladeCenter QS20	Revision 31 or greater and minimum firmware level of QA-06.14.0-0F (7.21). See "Checking the firmware version" on page 7
BladeCenter QS21	Minimum hardware firmware level of QB-01.08.0-00

All systems must have:

- Hard disk space: 5 GB (minimum) to install the source package and the accompanying development tools
- 1 GB RAM (minimum) on the host system

Note: If you use the Full System Simulator, the minimum amount of RAM installed must be twice the amount of simulated memory. For example, to simulate a system with 512 MB of RAM, the host system must have at least 1 GB of RAM installed.

Software prerequisites

The SDK requires Fedora 7, which must be installed before you install the SDK. See Chapter 4, "Operating system installation," on page 7 for information about how to install Linux.

To install the SDK, see Chapter 3, "Quick start guide," on page 5, or Chapter 6, "Installing and uninstalling the SDK," on page 33 for full details.

SELinux

The SELinux policy files that are included in the Fedora 7 base distribution prevent *spufs* from loading correctly on boot. To install the SDK, you must either turn off SELinux or update the `selinux-policy` and `selinux-policy-targeted` RPMs to the latest version. The preferred method is to update the RPMs. To update, type the following commands as root:

```
yum update selinux-policy selinux-policy-targeted
```

expat

The DaCS for Hybrid-x86 daemon for both X86_64 and the BladeCenter QS20 and BladeCenter QS21 platforms requires the *expat* XML parsing library. Install expat by typing the following command as root:

```
yum install expat
```

SDK utility software dependencies

The SDK requires the packages *rsync*, *sed*, *TCL*, and *wget*.

To install these dependencies, type the following command as root:

```
yum install rsync sed tcl wget
```

Chapter 3. Quick start guide

This is a brief overview of installation tasks for experienced readers who are eager to get started. You must have a supported operating system installed and have satisfied the hardware and software prerequisites. Many details are skipped. If an issue arises during the quick start installation process, consult the additional material provided in the relevant chapters of this guide for help.

Note: If you are unfamiliar with the terms or procedures in this section, see Chapter 6, "Installing and uninstalling the SDK," on page 33.

The installation process consists of these steps:
1. Choose a product set appropriate for your operating system and environment.
2. Download the cell-install rpm and the corresponding product set ISO images.
3. Prepare for installation
4. Install the SDK Installer
5. Start the SDK installation
6. Do post-installation configuration

Choose a product set

A product set is a formal grouping of SDK RPMs for a specific environment and operating system. See "Choose a product set" on page 33 to determine the corresponding ISO images to download.

Download the SDK files

Follow the instructions located in "Download the SDK files" on page 35. An installation requires the cell-install RPM and one or more ISO images that contain the SDK.

Prepare for installation

Prepare your system for installation by following these steps:
1. Uninstall any old versions of the SDK. See "Uninstalling the SDK" on page 46.
2. If necessary, install Fedora 7. See Chapter 4, "Operating system installation," on page 7.
3. Verify that your BladeCenter QS20 or BladeCenter QS21 is at the right firmware level. See "Hardware prerequisites" on page 3.
4. Stop the YUM updates daemon:
   ```
   /etc/init.d/yum-updatesd stop
   ```
5. Some SDK packages have open source versions which must be removed before installing the SDK. These packages are numactl, numactl-devel, blas, blas-debuginfo, blas-devel, oprofile and oprofile-debuginfo. See "Prepare for installation" on page 35.

Note: If you previously added `exclude` clauses to the /etc/yum.conf file, temporarily remove the clauses to ensure that these RPMs are installed by YUM.

Install the SDK Installer

Install the downloaded cell-install RPM by typing the following command as root:

```
rpm -ivh cell-install-3.0.0-0.0.noarch.rpm
```

Start the SDK install

Install the SDK by typing the following command as root:

```
/opt/cell/cellsdk --iso /tmp/cellsdkiso install
```

In this example, `/tmp/cellsdkiso` is the directory that contains the downloaded ISO images and the cell-install RPM.

Do post-install configuration

After the SDK is installed, you can install optional SDK components. Type the following command to see a list of RPMs available for your operating system and platform:

```
/opt/cell/cellsdk verify
```

See "SDK component descriptions" on page 23 for more information about the contents of the SDK and "RPMs by component" on page 28 for a complete list of RPMs in the SDK.

If you are installing on an IBM BladeCenter QS20 or BladeCenter QS21, add exclude clauses to the /etc/yum.conf file to prevent YUM from upgrading these packages to a later version that is not supported by the SDK. The following is an example:

```
exclude=blas kernel numactl oprofile
```

Chapter 4. Operating system installation

This topic provides detailed information about how to install an operating system on supported hardware.

Installing Fedora 7 Linux

This topic describes how to install Fedora 7 Linux.

Before you install the SDK, install a supported operating system.

The following sections describe how to install Fedora 7 Linux:
- "Installing Fedora 7 on an X86, X86_64, or PPC64 machine"

Installing Fedora 7 on an X86, X86_64, or PPC64 machine

This topic describes how to install Fedora 7 on an X86, X86_64, or PPC64 machine.

If you have a suitable workstation or server (see "Hardware prerequisites" on page 3), you can install Fedora 7 Linux from the installation media or downloaded files. Follow the instructions located at the following Web site: http://docs.fedoraproject.org/install-guide/f7/en_US/.

After you install Fedora 7, install the required prerequisite packages. See "Software prerequisites" on page 3.

Now proceed to "Default SDK installation" on page 33.

BladeCenter QS20 specifics

This topic describes how to install Fedora 7 on the BladeCenter QS20.

The following chapters give specific details::
- "Managing a BladeCenter QS20"
- "Installing Fedora 7 Linux on a BladeCenter QS20" on page 9

Managing a BladeCenter QS20

This topic describes how to manage a BladeCenter QS20.

The following chapters describe how to check the firmware version, boot, shut down, and restart a BladeCenter QS20:
- "Checking the firmware version"
- "Checking which firmware bank was booted" on page 8
- "Booting a BladeCenter QS20" on page 8
- "Recovering from a bad firmware boot" on page 8
- "Shutting down and restarting the BladeCenter QS20" on page 9

Checking the firmware version

This topic describes how to check the firmware version.

To check the firmware version, do one of the following:

1. Access the BladeCenter® Management Module.
2. Click **Monitors** → **Firmware VPD**. The **Blade Server Firmware VPD** window contains the build identifier, release, and revision.

or:

From the Linux command line, run the command

```
for file in `ls /proc/device-tree/openprom/*bank*`; do echo $file;
cat $file; echo; echo; done
```

The following sample output shows that the blade has been booted from the temporary firmware bank, which contains version 6.14.E of the firmware.

```
/proc/device-tree/openprom/ibm,fw-bank
T
/proc/device-tree/openprom/ibm,fw-perm-bank
CB1FW614E       , 06-26-2006 22:52
/proc/device-tree/openprom/ibm,fw-temp-bank
CB1FW614E       , 06-26-2006 22:52
```

If you want to download newer firmware for the BladeCenter QS20, access the following Web site: http://www-304.ibm.com/jct01004c/systems/support/supportsite.wss/docdisplay?lndocid=MIGR-66645&brandind=5000020

Checking which firmware bank was booted

This topic describes how to check which firmware bank was booted.

To check if the TEMP or PERM firmware was booted, type the following command:

```
cat /proc/device-tree/openprom/ibm,fw-bank
```

A **T** indicates a boot from the temporary bank and a **P** from the permanent bank.

Booting a BladeCenter QS20

This topic describes how to boot a BladeCenter QS20.

To boot a BladeCenter QS20, do the following:

1. Open the BladeCenter Management Module.
2. Set the appropriate boot device (network, hard disk) for the BladeCenter QS20 by selecting **Blade Tasks** → **Configuration** → **Boot Sequence**.
3. Power on the BladeCenter QS20 by selecting **Blade Tasks** → **Power/Restart** → checkmark the blade → **Power On Blade**.

Note:

- The boot process of the BladeCenter QS20 can only be monitored with a serial console (115200,N,1,8, no handshake) connected to the serial port on the front bezel of the BladeCenter QS20.
- Use a null-modem cable to connect to the serial port.
- To force the BladeCenter QS20 into the OpenFirmware prompt, press **s** on the serial console during the early stages of the boot process.

Recovering from a bad firmware boot

If Linux does not boot with the temporary firmware level, connect a console to the BladeCenter QS20 serial port and reboot using the Management Module.

At the console, stop the firmware boot (press **s** on the console) and type on the console the following command to set the firmware to the permanent side:

```
# 0 set-flashside
```

Next, reject the temporary firmware (which copies the permanent firmware to the temporary location) by typing:

```
# update_flash -r
```

Then type the following command to set the firmware back to the temporary side:

```
 # 1 set-flashside
```

and reboot the BladeCenter.

Shutting down and restarting the BladeCenter QS20

This topic describes how to shut down and restart a BladeCenter QS20.

Always shutdown and restart a BladeCenter QS20 that has been booted to the Linux prompt with one of the following commands from a Linux shell on the BladeCenter QS20:

```
shutdown -g0 -i0 -y
halt
reboot
shutdown -r now
```

Do not use the Blade Center Management Module to power down or restart the Blade (using **Blade Tasks** → **Power/Restart** → checkmark the blade → **Power Off Blade / Restart Blade**) as this can result in a damaged file system: the Blade Center will power off the BladeCenter QS20 without first notifying the operating system.

Installing Fedora 7 Linux on a BladeCenter QS20

This section describes how to install Fedora 7 for PPC64 on a BladeCenter QS20.

Preparing your BladeCenter QS20

If your BladeCenter QS20 comes with InfiniBand option(s) already installed, unplug the PCI-Express cable(s) on the board side or uninstall the InfiniBand option(s), then install the OS and the patched kernel, then refit the PCI-Express cable(s) or reinstall the InfiniBand option(s).

Fedora 7 installation overview

The installation consists of the following steps:

1. Set up a netboot environment.
2. Set up a net install environment.
3. Perform a manual installation.

The Fedora 7 installation process starts by booting a kernel with the install `initrd` from the network device (this is the only supported installation method on a BladeCenter QS20.) The init process `/sbin/init` starts `/sbin/loader` prompts you for the installation language and installation method. For a network installation, the loader also configures the network and queries the parameter for the install server, before it downloads the secondary stage image `Fedora/base/stage2.img` from the install server. After mounting the disk image, loader passes control to the Python script `anaconda`.

The Anaconda installer is the main installation program for Fedora 7 and it performs the remaining steps of the installation, either manually through configuration screens or automatically using the `kickstart` configuration file. This includes downloading all RPMs, which are selected for installation from the install server.

The network installation environment

Note:

1. The IP addresses used in the examples below are for illustrative purposes only. Use IP addresses allocated to your network.
2. During installation, you are prompted for the directory containing the Fedora 7 installation files. The illustrations below show `/fedoratree` as the source containing the installation files. Change this to the path containing your installation files.

For the remainder of this document, it is assumed that you have the following environment:

- A BladeCenter QS20 (10.32.5.11). This is the installation target.
- A DHCP/BOOTP server (10.32.0.1).
- An install server (10.32.0.1) running a TFTP server, with the installation source. This server must also be able to run Fedora 7 if the installation material requires modification.
- An NFS, HTTP or FTP server (10.64.0.31) with the installation source.

The NFS/HTTP/FTP server can reside on the same server as the DHCP/BOOTP/TFTP server.

Figure 1 on page 11 shows a typical network installation environment.

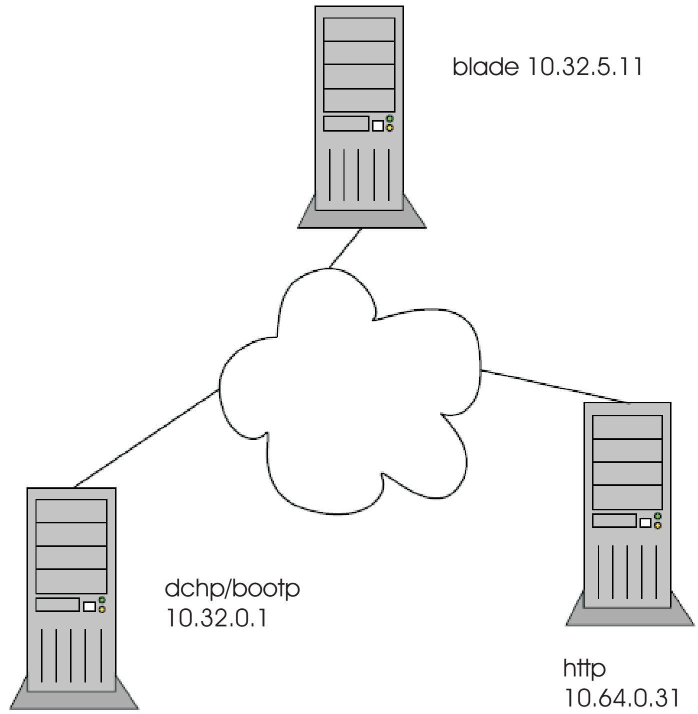


Figure 1. The network installation environment

Setting up a netboot environment

Copy the netboot image /srv/repos/p/F7/images/netboot/ppc64.img file to the /tftpboot directory of the TFTP/BOOTP server and make sure that it matches the respective entry in /etc/dhcpd.conf. For example:

```
host somehostname {
   option host-name  "somehost.localdomain.com";
   hardware ethernet 00:20:9f:12:0f:19;
   fixed-address 10.3.5.11;
   filename "ppc64.img";
   next-server 10.32.0.1;
}
```

Setting up a network installation environment

Fedora 7 is installed over the network using TFTP and NFS, or FTP.

Installing Fedora 7

To install Fedora 7, do the following:

1. Either insert a new hard disk into the BladeCenter QS20, or overwrite an existing hard disk with an existing Linux.
2. Connect the BladeCenter QS20 to a serial console (115200,N,1,8, no handshake) and boot it to the firmware prompt.
3. To start the installation, enter the following:

   ```
   > netboot vnc console=hvc0
   ```
4. Select the language you would like to use for the installation.

```
Welcome to Fedora
+---------+ Choose a Language +---------+
|                                       |
|  What language would you like to use  |
|  during the installation process?     |
|                                       |
|        Catalan                        |
|        Chinese(Simplified)            |
|        Chinese(Traditional)           |
|        Croatian                       |
|        Czech                          |
|        Danish                         |
|        Dutch                          |
|     >  English                        |
|                                       |
|                 +----+                |
|                 | OK |                |
|                 +----+                |
|                                       |
|                                       |
+---------------------------------------+
```

5. Select the media type that contains the installation packages.

```
+------+ Installation Method +------+
|                                   |
|  What type of media contains the  |
|  packages to be installed?        |
|                                   |
|             Local CDROM           |
|             Hard drive            |
|             NFS image             |
|           > FTP                   |
|             HTTP                  |
|                                   |
|      +----+         +------+      |
|      | OK |         | Back |      |
|      +----+         +------+      |
|                                   |
|                                   |
+-----------------------------------+
```

6. Select the network device. Unless you have a second switch installed in your BladeCenter QS20 chassis, you select `eth0`.

```
+---------- Networking Device -----------+
|                                        |
|  You have multiple network devices on  |
|  this system. Which would you like to  |
|  install through?                      |
|                                        |
|   > eth0 - Unknown device 102f:01b3    |
|     eth1 - Unknown device 102f:01b3    |
|                                        |
|       +----+           +------+        |
|       | OK |           | Back |        |
|       +----+           +------+        |
|                                        |
|                                        |
+----------------------------------------+
```

7. Select how you wish to configure the network device. Because you have booted from DHCP, it is easiest to leave it set to DHCP. To do this, make sure that **Use dynamic IP configuration (BOOTP/DHCP)** is selected. Fedora 7 determines the host name and domain from the dhcp/bootp server.

```
+--------------------+ Configure TCP/IP +---------------------+
|                                                             |
|        [*] Use dynamic IP configuration (BOOTP/DHCP)        |
|        [*] Enable IPv4 support                              |
|        [ ] Enable IPv6 support                              |
|                                                             |
|            +----+                       +------+            |
|            | OK |                       | Back |            |
|            +----+                       +------+            |
|                                                             |
|                                                             |
+-------------------------------------------------------------+
```

8. Enter the network site name and the path where you installed your media during the server setup:

```
+-----------------+ HTTP Setup +-------------------+
|                                                  |
| Please enter the following information:          |
|                                                  |
|     o the name or IP number of your FTP server   |
|     o the directory on that server containing    |
|       Fedora Core for your architecture          |
|                                                  |
|   FTP site name:    10.32.0.1_______________     |
|                                                  |
|   Fedora core directory: /fedoratree____________|
|                                                  |
|  [*] Use non-anonymous ftp                       |
|                                                  |
|         +----+                 +------+          |
|         | OK |                 | Back |          |
|         +----+                 +------+          |
|                                                  |
|                                                  |
+--------------------------------------------------+
```

9. Enter an FTP account name and password.

```
+----------------  Further FTP Setup  --------------+
|                                                    |
| If you are using non anonymous ftp, enter the      |
| account name and password you wish to use below.   |
|                                                    |
|      Account name:  userid__________________       |
|      Password:      password_________________       |
|                                                    |
|          +----+                 +------+           |
|          | OK |                 | Back |           |
|          +----+                 +------+           |
|                                                    |
|                                                    |
+----------------------------------------------------+
```

10. The following is displayed:

```
+----------------------------------------------------------------------+
| Running anaconda, the Fedora Core system installer - please wait...  |
| Framebuffer ioctl failed. Exiting.                                   |
| Probing for video card:   Unable to probe                            |
| Probing for monitor type:   Unknown monitor                          |
| Probing for mouse type:   No – mouse                                 |
| No video hardware found, assuming headless                           |
| Starting VNC...                                                      |
|                                                                      |
```

```
| WARNING!!! VNC server running with NO PASSWORD!                    |
| You can use the vncpassword=<password> boot option                 |
| if you would like to secure the server.                            |
|                                                                    |
| The VNC server is now running.                                     |
| Please connect to 10.32.5.11:1 to begin the install...             |
|                                                                    |
| Press <enter> for a shell                                          |
| Starting graphical installation...                                 |
+--------------------------------------------------------------------+
```

11. Start a VNC session on another computer in the network. At the command prompt of that computer enter `vncviewer <target IP>`, where `<target IP>:<vnc session="">, </vnc>` is the address of the BladeCenter QS20 being installed, for example, 10.32.5.11:1. Continue the installation process from the computer running the vncviewer session, not the BladeCenter QS20 where the installation process is actually taking place.

Rebooting the BladeCenter QS20:

When the installation is complete, reboot the system from the installation screen. The Fedora 7 kernel does not support all of the features of SDK 3.0 and should be replaced with the kernel with SDK 3.0 (see "Software prerequisites" on page 3). A final reboot after the install ensures that the BladeCenter QS20 is using the SDK kernel.

Configuring YUM (if required):

This topic describes how to configure YUM on the BladeCenter QS20.

If required, configure the `/etc/yum.conf` file so that it points to the HTTP server. You must change the `baseurl` entry:

```
[main]
  cachedir=/var/cache/yum
  debuglevel=2
  logfile=/var/log/yum.log
  pkgpolicy=newest
  distroverpkg=redhat-release
  tolerant=1
  exactarch=1
  retries=20
  obsoletes=1
  gpgcheck=0

# PUT YOUR REPOS HERE OR IN separate files named file.repo
# in /etc/yum.repos.d

/etc/yum.repos.d/fedora-core.repo

[base]
name=Fedora Core $releasever - $basearch - Base
#baseurl=http://download.fedora.redhat.com/pub/fedora/linux/ \
 core/$releasever/$basearch/os/
baseurl=http://10.64.0.31/                  <<<< modify baseurl here
mirrorlist=http://fedora.redhat.com/download/mirrors/fedora-core-$releasever
enabled=1
gpgcheck=0
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-fedora
```

BladeCenter QS21 Specifics

These are specifics about installing Linux on the BladeCenter QS21.

Creating a Linux network installation for BladeCenter QS21

Fedora 7 does not directly support an installation to an NFS-mounted disk. You must create an initial installation on disk. From this initial installation on disk you can create a network installation that can be used by the BladeCenter QS21.

The BladeCenter QS21 does not provide on-board disk space. If SAS-attached storage is available to your BladeCenter QS21, you can install on a SAS disk. Alternatively, you can use any 64-bit POWER-based system with sufficient local disk space for your initial installation.

Figure 2 illustrates the main steps for creating a network installation for BladeCenter QS21.

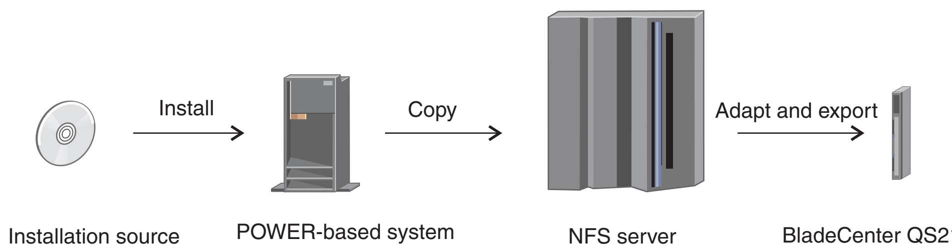


Figure 2. Overview of the network installation procedure

First you install Linux on the local disk space of a 64-bit POWER-based system. You then copy the resulting root file system to a Network File System (NFS) server where you make it network-bootable and adapt it to the specifics of an individual blade server.

See http://fedoraproject.org/wiki/StatelessLinuxCreateClientImage for general information about installing Linux on diskless systems.

This section describes how you can create a network installation for a single blade server. You can create multiple copies of this first installation and adapt each copy for use by a different blade server. See http://www.ibm.com/alphaworks/tech/dim/ for a description of a tooled approach of managing root file systems and boot kernels for numerous blade servers.

Requirements

This topic describes the resources you require for setting up a net-boot environment for BladeCenter QS21.

All of the following resources must be configured and connected through an Ethernet network.

BladeCenter QS21
: You need one or more BladeCenter QS21 blade servers installed in a BladeCenter H unit.

POWER-based installation system
: You need a 64-bit POWER-based system that is supported by Fedora 7 and has enough disk space for the installation.

NFS server
: You need an NFS exported directory for each blade server that you want to

boot from the network. This directory is to hold the root file system for the blade server. The NFS server can but need not run on the installation system.

TFTP server
You need a Trivial File Transfer Protocol (TFTP) exported directory that is to hold the zImage for booting the blade server. A zImage contains a boot kernel and a suitable initial RAM disk. You need different zImages for different kernels but blade servers that run the same kernel and same NFS root can all boot using the same zImage. The TFTP server can but need not run on the installation system.

DHCP server
You need a Dynamic Host Configuration Protocol (DHCP) server that supports the Bootstrap Protocol (BOOTP) and has a DHCP configuration for each blade server. BOOTP maps the blade servers to the zImage on the TFTP server. The DHCP server can but need not run on the installation system.

Figure 3 shows a sample setup where the initial Linux installation is performed on one system, the NFS server and TFTP server run on a second system, and the DHCP server runs on a third system.

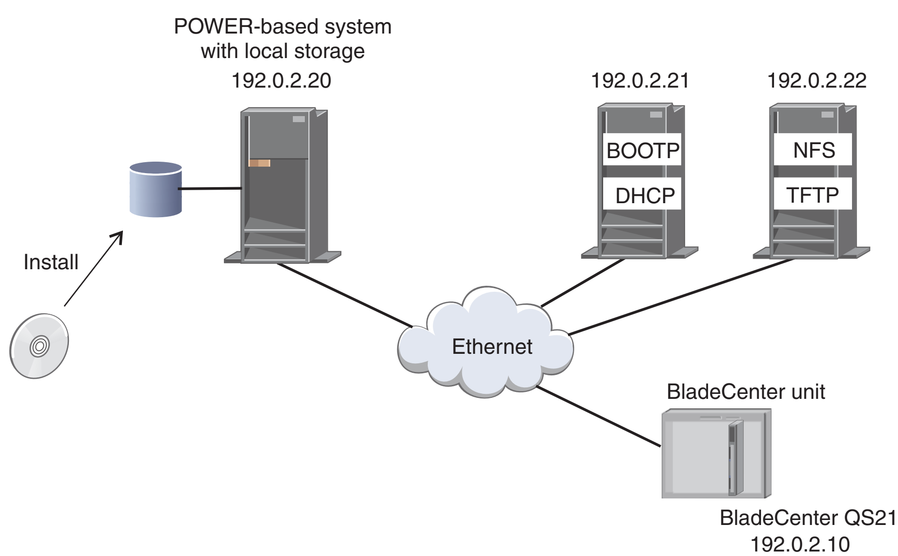


Figure 3. Sample setup with three systems

The examples in the procedures that follow are based on the sample setup of Figure 3.

How the network boot process works

This topic provides an overview of the network boot process.

Figure 4 on page 17 summarizes the flow of information during the network boot process. The file names and IP addresses in the diagram correspond to the examples used in the topics that describe the setup steps.

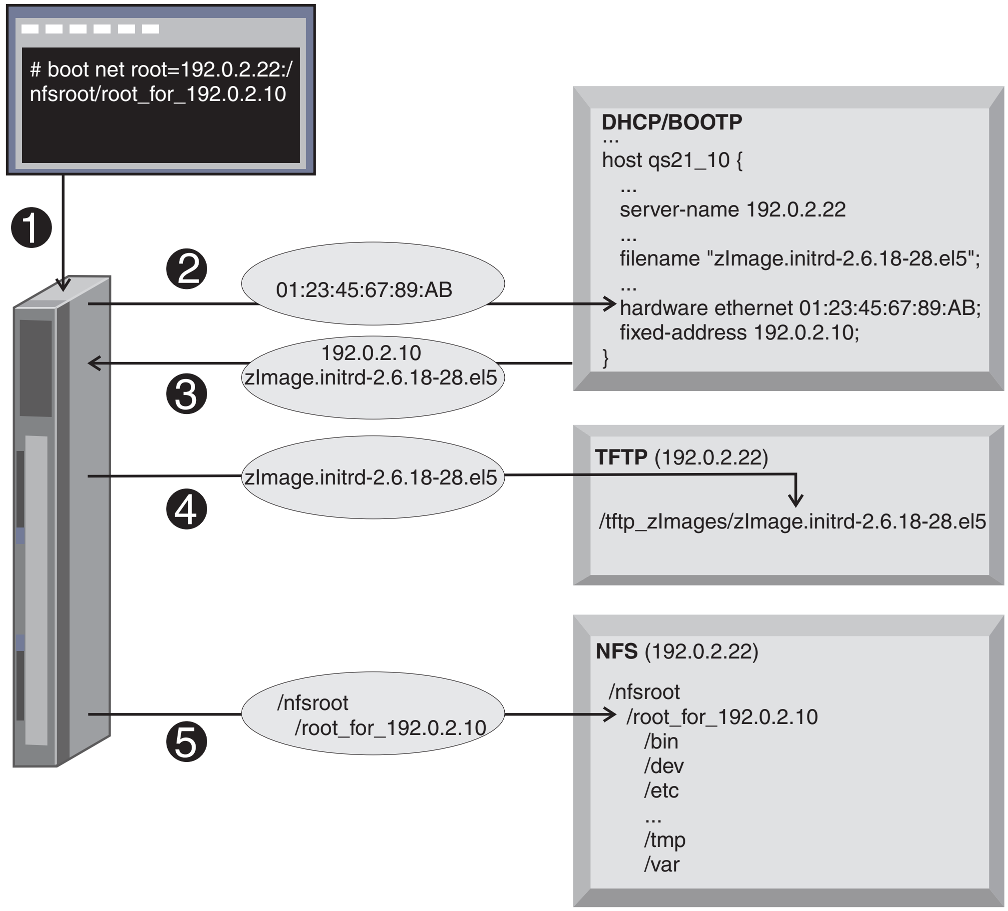


Figure 4. Network boot process

1. The network boot command is issued from the Slimline Open Firmware command prompt. The command includes the location of the root file system on the NFS server. For example,

   ```
   boot net root=192.0.0.22:/nfsroot/root_for_192.0.2.10 rw ip=dchp
   ```
2. The blade server broadcasts its MAC address.
3. BOOTP on the DHCP server uses the MAC address to locate the DHCP configuration for the blade server. The DHCP server returns the IP address of the blade server and the name of the zImage to be used for booting the blade server.
4. The blade server uses the `server-name` attribute in the DHCP configuration to find the TFTP server and loads the zImage.
5. The BladeCenter server uses the information from the boot command to locate the root file system on the NFS server.

Steps for creating a network installation for BladeCenter QS21

Perform these main steps to set up your network installation.

1. Install Linux on a POWER-based system.
2. Set up a zImage with NFS support.
3. Set up the root file system on the network.
4. Boot from the network.

Step 1: Installing Linux on a POWER-based system:

Install Fedora 7 as usual.

Perform the following steps to install Linux:
1. Obtain an installation CD/DVD or an ISO image of Fedora 7.
2. Perform the installation as usual. See the documentation that is provided with your distribution for details.

Step 2: Setting up a zImage with NFS support:

You need to create a zImage with an initial RAM disk that supports booting from NFS.

Perform the following steps to create a zImage:
1. Download the zImage from the BSC Web site. The full URL is: http://www.bsc.es/projects/deepcomputing/linuxoncell/cellsimulator/sdk3.0earlyRel/zImage.initrd-2.6.22-5.20070821bsc
2. Copy the zImage to the exported TFTP directory on the TFTP server. For example, assuming that the exported TFTP directory is called `tftp_zImages` and mounted as `/mnt/tftp_zImages` enter:
   ```
   cp /boot/zImage.initrd-2.6.18-28.el5 \
      /mnt/tftp_zImages/zImage.initrd-2.6.18-28.el5
   ```

Step 3: Setting up the root file system on the network:

Copy the root file system to the NFS server and make some changes to adapt it to an individual blade server.

Perform the following steps to deploy your root file system on the NFS server:
1. On the POWER-based installation system, enable SSH logins by changing the entry `SELINUX='enforcing'` in `/etc/selinux/config` to `SELINUX='permissive'`.
2. Copy the root file system to the NFS directory and exclude /initrd, /proc, and /sys. For example, by entering a command of this form on a command prompt on the NFS server:
   ```
   # rsync -avp -e ssh -x --exclude /initd --exclude /proc --exclude /sys \
      root@<POWER-server>:/ /<NFS-dir>
   ```
   where <*NFS-dir*> is the directory to which you want to copy the root file system. For example, enter:
   ```
   # rsync -avp -e ssh -x --exclude /initd --exclude /proc --exclude /sys \
      root@192.0.2.20:/ /nfsroot/root_for_192.0.2.10
   ```
3. Make the following changes to the copy of the root file system on the NFS server.
   - Change the first line in `/etc/fstab` so that it specifies your NFS directory as the location of the root file system. For example, change line
     ```
     /dev/VolGroup00/LogVol00 /                      ext3    defaults        1 1
     ```
     to read
     ```
     192.0.2.22:/nfsroot/root_for_192.0.2.10 /       nfs     tcp,nolock      1 1
     ```
   - Change the host name in `/etc/hosts` and `/etc/sysconfig/network` to the host name of your BladeCenter QS21.
   - Remove `/dev/VolGroup00/LogVol01 swap` from `/etc/fstab`.

You now have a root file system in place for your BladeCenter QS21.

Tip: By copying this root file system to another directory on your NFS server you can easily create the root file system for further BladeCenter servers. After creating a copy you need to change the host name to that of the respective BladeCenter server.

Step 4: Booting from the network:

You are now ready to boot your BladeCenter QS21 from the network.

1. Ensure that the DHCP server has a DHCP configuration entry for your BladeCenter QS21. The entry must assign an IP address to the BladeCenter server and include the `filename` keyword to specify the name of the zImage to be used for booting.
2. Select **Network** as the first device of the boot sequence for your BladeCenter. Make this change in the Management Module of the BladeCenter. Next, boot the system.

Finishing the Linux installation

At this point you have Fedora 7 installed, rebooted, and running on your system.

A default Linux system might not have all of the packages required to install the SDK. To install these packages, follow the instructions in "Software prerequisites" on page 3.

If you want to understand the components that make up the SDK, and optional components you can install, see Chapter 5, "SDK components," on page 21.

Now proceed to Chapter 6, "Installing and uninstalling the SDK," on page 33.

Chapter 5. SDK components

The topic describes the components of the SDK and how they are packaged. Use this information to understand what gets installed and how to configure the installation for your own specific purposes.

SDK target platforms

The SDK can be installed on different target platforms. The development (build) platforms for cross compilation of CBEA code are X86 and X86_64 machines. The native development platforms are 64-bit PowerPC and CBEA-compliant machines. There are essentially only two execution platforms which are either CBEA hardware or the Full System Simulator when available. Note that the Simulator can also be run on CBEA hardware as a debugging aid. Executables built on any development platform should run on any execution platform using the same Operating System.

The following table summarizes the development and execution platforms available for Fedora 7:

Table 2. Fedora 7 platforms

Development plaform	CBEA execution platform (BladeCenter QS20 or BladeCenter QS21)	Full System Simulator execution platform
X86		✓
X86_64		✓
PPC64		✓
CBEA	✓	✓

SDK directories

The SDK installs files into a number of different directories depending on the host platform and the type of file. This section describes the SDK standards for directories to help you understand where to find the parts of the SDK and how to best use the SDK development environment.

The root directory for the SDK is /opt/cell. Most of the SDK files are in this directory. There are three exceptions:

- **/usr** is used for level 2 and level 4 components (not prototype code) and follows the Linux file hierarchy standard. In some cases, subdirectories are used to store individual components under include, lib or lib64.
- **/opt/ibm/systemsim-cell** contains the IBM Full System Simulator for Cell Broadband Engine Architecture.
- **/opt/ibmcmp** contains the XL C/C++ or Fortran single-source compilers.

There are three main directories under /opt/cell:

- **sdk** - contains the SDK files

- **sysroot** - contains a *fakeroot* used for cross compilation on X86 and X86_64 architecture systems. There are directories under the /opt/cell/sysroot directory that mirror either a native host system (such as /usr) or mirror the SDK /opt/cell/sdk directory.
- **toolchain** - contains the GCC toolchain.

Under the /opt/cell/sdk directory are various subdirectories for parts of the SDK:
- **docs** - contains the SDK documentation
- **prototype** - contains level 1 components. This is a separate directory to clearly distinguish those parts of the SDK that might change in a future release. Subdirectories of /opt/cell/sdk/prototype are similar to peer directories, for example there are doc, src, and usr directories below this directory.
- **src** - contains source code such as examples
- **usr** - contains host-based tools

RPMs

The SDK is distributed as a set of Red Hat Package Manager (RPM) files that can be installed on the target platform. The list of available RPMs that can be installed depends on the host Linux operating system, the target hardware platform, and the options chosen by the user when installing the SDK. The SDK also depends on a number of RPMs provided by the base Linux operating system.

The SDK RPMs follow typical RPM naming conventions including version and revision, and standard name suffixes such as *-devel* for development code and *-debuginfo* for GDB debugging data. The SDK includes additional conventions that make is easier to identify what the RPM is used for. The following table details these conventions:

Table 3. RPM naming conventions

Convention	Explanation
RPM version number	For IBM-owned code the version number is always 3.0 or 3.0.0 to reflect this version of the SDK
-source suffix	The RPM contains source code, typically used for examples built using the SDK rather than rpmbuild which uses a SRPM (src.rpm)
-cross-devel suffix	The RPM contains development code for a cross-build environment (X86 or X86_64) rather than a native one
-trace suffix	The RPM contains libraries that have been enabled for the IBM Performance and Debugging Tool (PDT)
-hybrid suffix	The RPM contains libraries that are used in a hybrid runtime environment where the host is an X86_64 platform and the accelerator is a CBEA platform
cell- prefix	The RPM is oriented for CBEA platforms and can be used to differentiate the RPM from a standard implementation
ppu- prefix	The RPM contains a PPU-only library
spu- preifx	The RPM contains a SPU-only library

The SDK RPMs also use a number of different RPM targets. They are listed in the following table:

Table 4. SDK target platforms

Architecture/Platform	Explanation
PPC, PPC64	A CBEA application can be either 32-bit or 64-bit. Regular PowerPC platforms are treated as native for CBEA code only for development. Execution of this code still needs either a CBEA -compliant hardware platform or the Full System Simulator.
i386, i686 (X86)	This is native code that executes on a 32-bit X86 platform.
X86_64	This native code only executes on a 64-bit X86 platform and is used for the hybrid programming model.
noarch	*noarch* is generally used to indicate an architecture-neutral RPM. For the SDK, noarch has the additional meaning that the RPM contains PPC or PPC64 target code that is to be installed on an X86 or X86_64 system for cross compilation. The noarch target is used so that the file will install without complaints from rpm or YUM.
src	The source code for some SDK components are available as SRPMs (src.rpm).

SDK component descriptions

The SDK can be divided into components each of which is at a particular level of development, meaning that some are prototype code and others have been fully tested and are warranted by IBM with the appropriate purchased license.

The following table details the component development levels:

Table 5. Component development levels

Development level	Description
1	Prototype-level code where there is no guarantee that the features and API will not change in a future release. IBM is particularly interested in customer feedback about this component.
2	Beta-level code that is stable.
3	Product-level code that is stable. However the function, which is typically example code, is provided on an as-is basis and might not be maintained or upgraded by IBM
4	Product-level code that is stable and has been fully tested. This code is also warranted on certain platforms and is fully supported by IBM through standard support channels.

The following table provides the list of SDK components with license, development level, and functional descriptions:

Table 6. SDK component list

Component	Level	License	Description
ALF	4	IBM	Accelerator Library and Framework (ALF) provides for ease of use in multi-core computing by simplifying the data distribution and work queue management for multiple tasks.The host is the PPU and the SPUs are the accelerators.
ALF for Hybrid-x86	1	IBM	This version of ALF is directed toward a hybrid computing environment with an X86_64 host and CBEA hardware accelerators.

Table 6. SDK component list (continued)

Component	Level	License	Description
BLAS	4	IBM	BLAS library for single and double precision linear algebra functions.
Cell Performance Counter	2	IBM	The cell-perf-counter (cpc) tool is used for setting up and using the hardware performance counters in the Cell BE processor. These counters allow you to see how many times certain hardware events occur, which is useful if you are analyzing the performance of software running on a Cell BE system.
Crash SPU Commands	*	GPL	Crash extension with specific commands for analyzing Cell Broadband Engine Architecture SPU run control state.
DaCS	4	IBM	Data Communication and Synchronization (DaCS) library contains functions for process management, data movement, data and process synchronization, topology features (such as the group concept), and error handling. DaCS is used only on CBEA hardware.
DaCS for Hybrid-x86	4	IBM	Data Communication and Synchronization (DaCS) library contains functions for process management, data movement, data and process synchronization, topology features (such as the group concept), and error handling. DaCS for Hybrid-x86 is used between a X86_64 host and CBEA hardware.
Documentation	4	IBM	Documentation consists of man pages, PDFs, and README files in individual directories. The PDFs for the SDK are installed into directories under the /opt/cell/sdk/docs directory.
Examples	3	IBM	This component contains example code including example libraries, demos, and a tutorial.
FDPR-Pro	4	IBM	The Feedback-directed post-link program optimization tool allows you to instrument a program, run the instrumented version to collect its profile, and create a semantically-equivalent optimized version using that profile.
GCC Toolchain	4	GPL	The GNU Toolchain packages provide a full development tool chain (GCC compiler, assembler, linker, debugger, binary utilities, and runtime library) to generate and debug code for the Cell BE PPE and SPE processor cores. The toolchain is provided both as native version running on Cell Broadband Engine Architecture and other PowerPC Linux systems, and as a cross-toolchain hosted on X86 or X86_64 Linux systems. See the *SDK 3.0 Programmer's Guide* for more information on how to use the GNU Toolchain.
Hybrid Performance Tools	1	IBM	These tools are designed to assist in using a number of the performance tools in a hybrid system that uses more than one processor architecture in the design. In particular the Cell Broadband Engine is used as an accelerator for a host system with a different architecture.
IDE	4	IBM	Eclipse-based integrated development environment for the SDK.

Table 6. SDK component list (continued)

Component	Level	License	Description
Kernel	*	GPL	Operating System kernel with Cell Broadband Engine Architecture support.
LibFFT	1	IBM	This library handles a wide range of 1D and 2D Fast Fourier Transforms.
LibSPE/LibSPE2	*	LGPL	Low level library that defines the user space API to program for Cell Broadband Engine Architecture applications.
MASS Library	4	IBM	The Mathematical Acceleration Subsystem (MASS) consists of libraries of mathematical intrinsic functions, which are tuned specifically for optimum performance on the Cell BE processor. Currently the 32-bit, 64-bit PPU, and SPU libraries are supported.
netpbm	*	GPL	This graphics bitmap library is used by the Julia example. A cross-devel version is provided in the SDK to facilitate use on X86 and X86_64 platforms.
numactl	*	LGPL	A library for tuning Non-Uniform Memory Access (NUMA) machines.
OProfile	*	GPL	OProfile is a tool for profiling user and kernel level code. It uses the hardware performance counters to sample the program counter every *N* events.
PDT	4	IBM	The Performance Debugging Tool (PDT) provides the ability to trace events of interest during the application execution, and record relevant data related to these events from the SPEs and PPE and the Opteron.
PDTR	4	IBM	`pdtr` is a command line tool that reads and post-processes PDT traces. See the man page for usage information.
Random Number Library	1	IBM	A random number generator library suitable for simulation.
SIMDMath	4	IBM	A math library that takes advantage of the Single Instruction, Multiple Data (SIMD) instructions in CBEA compliant hardware.
Simulator	2	IBM	A full system simulation infrastructure and tools for the Cell Broadband Engine™ processor.
SPU-Isolation	1	IBM	SPU-Isolation provides a build and runtime environment for signing and encrypting SPE applications.
SPU-Timer	1	IBM	The SPU timer library provides virtual clock and timer services for SPU applications.
SPU-Timing Tool	2	IBM	The SPU static timing tool *spu_timing* annotates an SPU assembly file with scheduling, timing, and instruction issue estimates assuming a straight, linear execution of the program.
Sysroot Image	*	GPL/ LGPL	The system root image for the Full System Simulator is a file that contains a disk image of Fedora 7 files, libraries and binaries that can be used within the simulator.

Table 6. SDK component list (continued)

Component	Level	License	Description
XL C/C++	2	IBM	The IBM XL C/C++ Alpha Edition for Multicore Acceleration for Linux, V 0.9 is an advanced, high-performance cross compiler that is tuned for the Cell Broadband Engine Architecture and allows users to compile and link both PPU and SPU code segments with a single compiler invocation.

Notes about the table:

1. The following components are provided for Fedora 7 only either as a convenience or to ensure correct functionality of a dependent component:
   - Netbpm cross-devel package
   - Numactl. Fedora 7 does not have a version that works correctly on CBEA hardware.
2. For the SDK, components that are at level 3 or 4 are installed by default except for the IDE, Crash SPU commands, PDT, and PDTR which are optional. Components that are at level 1 or 2 are optional. RPMs that have the *-trace* or *-debuginfo* suffixes are also optional and not installed by default.
3. GPL and LGPL open source components have a development level marked with an asterisk (*). These RPMs are not directly supported by IBM but have been tested with Fedora 7 and the SDK.

YUM groups

YUM provides the ability to group RPMs together to facilitate installing a number of RPMs simultaneously and for categorization in the Pirut GUI.

The following groups are defined in the YUM metadata files in the file /opt/cell/yum-repos:

- Cell Runtime Environment
- Cell Development Libraries
- Cell Development Tools
- Cell Performance Tools
- Cell Programming Examples
- Cell Simulator

The *Cell Runtime Environment* group contains the RPMs that are only needed for runtime execution of Cell BE applications. It does not contain any development libraries, tools or example code. This group is installed, updated or uninstalled when you pass the --runtime option to the `cellsdk` script.

You can use the following YUM group commands to find out which RPMs are in a group and which groups are already installed:

- `groupinstall group1 [group2] [...]`
- `groupupdate group1 [group2] [...]`
- `grouplist [hidden]`
- `groupremove group1 [group2] [...]`
- `groupinfo group1 [...]`

You can display these groups using Pirut, or by using the `cellsdk` script with the --gui option.

The following is a table of each component and the YUM group that contains its RPMs. In general, components are typically only defined in one group. One exception is that a *Cell Development Library* that has a runtime RPM, then that RPM is in the *Cell Runtime Environment* group. Also if a *Cell Development Library* includes example code then that example code RPM is in the *Cell Programming Examples* group.

Table 7. YUM group for SDK each component

Component	**YUM group**
ALF	Cell Development Libraries
ALF for Hybrid-x86	Cell Development Libraries
BLAS	Cell Development Libraries
Cell Performance Counter	Cell Performance Tools
Crash SPU Commands	Cell Runtime Environment
DaCS	Cell Development Libraries
DaCS for Hybrid-x86	Cell Development Libraries
Documentation	Cell Development Libraries
Examples	Cell Programming Examples
FDPR-Pro	Cell Performance Tools
GCC Toolchain	Cell Development Tools
Hybrid Performance Tools	Cell Performance Tools
IDE	Cell Development Tools
Kernel	Cell Runtime Environment
LibFFT	Cell Development Libraries
LibSPE/LibSPE2	Cell Development Libraries
MASS Library	Cell Development Libraries
netpbm	Cell Development Libraries
numactl	Cell Development Libraries
OProfile	Cell Performance Tools
PDT	Cell Performance Tools
PDTR	Cell Performance Tools
Random Number Library	Cell Development Libraries
SIMDMath	Cell Development Libraries
Simulator	Cell Simulator
SPU-Isolation	Cell Development Libraries
SPU-Timer	Cell Development Libraries
SPU-Timing Tool	Cell Performance Tools
Sysroot Image	Cell Simulator
XL C/C++	Cell Development Tools

After installing the SDK you might want to install, update or uninstall components or even individual RPMs in the SDK. You can install an RPM such as *alf-hybrid-devel* by typing the following command:

```
yum install alf-hybrid-devel
```

YUM uses its repository information to ensure that you can only install the correct RPM on each platform. Some RPMs are only available with a target platform of X86_64 because they are needed for building X86_64 code using a host-based compiler such as GCC. The SDK contains several hybrid programming model libraries and performance tools.

For information about the individual RPMs per component, see "RPMs by component."

RPMs by component

This topic provides information about the list of RPMs for each component of the SDK.

YUM defines the install type of an RPM as follows:

Table 8. YUM installation choices

Option	Result
m (mandatory)	The group will not install if any mandatory RPMs are missing. Mandatory RPMs are not displayed in Pirut.
d (default)	Installed by default. Automatically selected in Pirut.
o (optional)	Does not install automatically. Must be selected in Pirut or individually installed from the command line.

The following are examples of how to select and install the RPMs for an optional component:

- If you are interested in working with Monte Carlo simulations, install the Random Number Generator library. This component is optional and has development packages for both native and cross compilation. If you are developing code on a X86 machine, the following command installs the Random Number library:

  ```
  yum install libmc-rand-cross-devel
  ```

  Because this component is listed as level 1 (prototype code) in "RPMs by component," the development headers and libraries are installed into the /opt/cell/sdk/prototype/src/usr directory. For cross compilation, this directory is prefixed by the cross directory /opt/cell/sysroot. The example code is placed in the /opt/cell/sdk/prototype/src/examples directory. See "SDK directories" on page 21 for more information.
- If you are interested in developing applications using the ALF programming model but in a hybrid host-accelerator environment, install the optional ALF for Hybrid-x86 component. This component has both runtime and development RPMs. The runtime RPMs are needed on an X86_64 machine for the host and a BladeCenter QS20 or BladeCenter QS21 for the accelerator.

To develop applications on the X86_64 machine, the requisite development RPMs are needed, include the examples. Because ALF for Hybrid-x86 depends on ALF for Cell BE, YUM will install those dependencies if they are not already installed.

Therefore, on the X86_64 machine issue the following command:

```
yum install alf-hybrid alf-hybrid-devel alf-hybrid-cross-devel \
   alf-hybrid-examples-source
```

On a BladeCenter QS20 or BladeCenter QS21, type the following command:

```
yum install alf-hybrid
```

You might also want to install the ALF man pages that are provided in the *alfman* RPM.

Note: ALF for Hybrid-x86 depends on DaCS for Hybrid-x86 which should be configured after installation. See Chapter 7, "DaCS for Hybrid-x86 configuration," on page 51.

The following table lists every RPM name by component and install type. Use this information to select additional RPMs that you want to install or uninstall.

Table 9. RPMs by component

Component	**RPM Name**	**Install Type**
ALF	alf	Default
ALF	alf-cross-devel	Default
ALF	alf-debuginfo	Optional
ALF	alf-devel	Default
ALF	alf-examples-source	Default
ALF	alf-trace	Optional
ALF	alf-trace-devel	Optional
ALF for Hybrid-x86	alf-hybrid	Optional
ALF for Hybrid-x86	alf-hybrid-cross-devel	Optional
ALF for Hybrid-x86	alf-hybrid-devel	Optional
ALF for Hybrid-x86	alf-hybrid-examples-source	Optional
ALF for Hybrid-x86	alf-hybrid-trace	Optional
ALF for Hybrid-x86	alf-hybrid-trace-devel	Optional
BLAS	blas	Default
BLAS	blas-cross-devel	Default
BLAS	blas-devel	Default
Cell Performance Counter	cellperfctr-tools	Optional
Crash SPU Commands	crash-spu-commands	Optional
Crash SPU Commands	crash-spu-commands-debuginfo	Optional
DaCS	dacs	Default
DaCS	dacs-cross-devel	Default
DaCS	dacs-debuginfo	Optional
DaCS	dacs-devel	Default

Table 9. RPMs by component (continued)

Component	RPM Name	Install Type
DaCS	dacs-trace	Optional
DaCS	dacs-trace-devel	Optional
DaCS for Hybrid-x86	dacs-hybrid	Optional
DaCS for Hybrid-x86	dacs-hybrid-cross-devel	Optional
DaCS for Hybrid-x86	dacs-hybrid-devel	Optional
DaCS for Hybrid-x86	dacs-hybrid-trace	Optional
DaCS for Hybrid-x86	dacs-hybrid-trace-devel	Optional
Documentation	alfman	Default
Documentation	cell-documentation	Default
Documentation	dacsman	Default
Documentation	libspe2man	Default
Documentation	simdman	Default
Examples	cell-buildutils	Default
Examples	cell-compliance-tests	Optional
Examples	cell-compliance-tests-cross	Optional
Examples	cell-compliance-tests-source	Optional
Examples	cell-demos	Default
Examples	cell-demos-cross	Default
Examples	cell-demos-source	Default
Examples	cell-examples	Default
Examples	cell-examples-cross	Default
Examples	cell-examples-source	Default
Examples	cell-libs	Default
Examples	cell-libs-cross	Default
Examples	cell-libs-cross-devel	Default
Examples	cell-libs-devel	Default
Examples	cell-libs-source	Default
Examples	cell-tutorial	Default
Examples	cell-tutorial-cross	Default
Examples	cell-tutorial-source	Default
FDPR-Pro	fdprpro	Optional
GCC Toolchain	ppu-binutils	Default
GCC Toolchain	ppu-binutils-debuginfo	Optional
GCC Toolchain	ppu-gcc	Default
GCC Toolchain	ppu-gcc-c++	Default
GCC Toolchain	ppu-gcc-debuginfo	Optional
GCC Toolchain	ppu-gcc-fortran	Optional
GCC Toolchain	ppu-gcc-gnat	Optional
GCC Toolchain	ppu-gdb	Default
GCC Toolchain	ppu-gdb-debuginfo	Optional

Table 9. RPMs by component (continued)

Component	RPM Name	Install Type
GCC Toolchain	ppu-sysroot	Default
GCC Toolchain	ppu-sysroot64	Default
GCC Toolchain	spu-binutils	Default
GCC Toolchain	spu-binutils-debuginfo	Optional
GCC Toolchain	spu-gcc	Default
GCC Toolchain	spu-gcc-c++	Default
GCC Toolchain	spu-gcc-debuginfo	Optional
GCC Toolchain	spu-gcc-fortran	Optional
GCC Toolchain	spu-gdb	Default
GCC Toolchain	spu-gdb-debuginfo	Optional
GCC Toolchain	spu-newlib	Default
GCC Toolchain	spu-newlib-debuginfo	Optional
GCC Toolchain	spu-tools	Optional
GCC Toolchain	spu-tools-debuginfo	Optional
Hybrid Performance Tools	cell-perf-hybrid-tools	Optional
IDE	alf-ide-template	Optional
IDE	cellide	Optional
Kernel	kernel	Mandatory
Kernel	kernel-debuginfo	Optional
LibFFT	libfft	Optional
LibFFT	libfft-cross-devel	Optional
LibFFT	libfft-devel	Optional
LibFFT	libfft-examples-source	Optional
LibSPE/LibSPE2	elfspe2	Mandatory
LibSPE/LibSPE2	libspe	Mandatory
LibSPE/LibSPE2	libspe2	Mandatory
LibSPE/LibSPE2	libspe2-adabinding-devel	Optional
LibSPE/LibSPE2	libspe2-cross-devel	Default
LibSPE/LibSPE2	libspe2-debuginfo	Optional
LibSPE/LibSPE2	libspe2-devel	Default
LibSPE/LibSPE2	libspe-debuginfo	Optional
MASS Library	mass-cross-devel	Default
MASS Library	ppu-mass-devel	Default
MASS Library	spu-mass-devel	Default
netpbm	netpbm-cross-devel	Default
numactl	numactl	Default
numactl	numactl-cross-devel	Default
numactl	numactl-devel	Default
OProfile	oprofile	Default

Table 9. RPMs by component (continued)

Component	RPM Name	Install Type
PDT	pdt	Optional
PDT	pdt-cross-devel	Optional
PDT	pdt-devel	Optional
PDT	pdt-module	Optional
PDT	trace-cross-devel	Optional
PDT	trace-devel	Optional
PDTR	pdtr	Optional
Random Number Library	libmc-rand-cross-devel	Optional
Random Number Library	libmc-rand-devel	Optional
SIMDMath	ppu-simdmath	Default
SIMDMath	ppu-simdmath-devel	Default
SIMDMath	simdmath-cross-devel	Default
SIMDMath	simdmath-debuginfo	Optional
SIMDMath	spu-simdmath-devel	Default
Simulator	systemsim-cell	Default
SPU-Isolation	cell-spu-isolation-cross-devel	Optional
SPU-Isolation	cell-spu-isolation-devel	Optional
SPU-Isolation	cell-spu-isolation-emulated-samples	Optional
SPU-Isolation	cell-spu-isolation-loader	Optional
SPU-Isolation	cell-spu-isolation-loader-cross	Optional
SPU-Isolation	cell-spu-isolation-tool	Optional
SPU-Isolation	cell-spu-isolation-tool-source	Optional
SPU-Timer	spu-timer-cross-devel	Optional
SPU-Timer	spu-timer-devel	Optional
SPU-Timing Tool	cell-spu-timing	Optional
Sysroot Image	sysroot_image	Default
XL C/C++	cell-xlc-ssc-cmp	Optional
XL C/C++	cell-xlc-ssc-lib	Optional
XL C/C++	cell-xlc-ssc-omp	Optional
XL C/C++	cell-xlc-ssc-rte	Optional
XL C/C++	cell-xlc-ssc-rte-lnk	Optional

Chapter 6. Installing and uninstalling the SDK

This topic describes how to add and remove the SDK from your system.

Default SDK installation

This topic describes the steps to perform a default installation of the SDK.

Follow these steps to install the SDK:
1. "Choose a product set"
2. "Download the SDK files" on page 35
3. "Prepare for installation" on page 35
4. "Install the SDK Installer" on page 36
5. "Start the SDK installation" on page 36
6. Do "Post-install configuration" on page 37

These steps assume you have already installed a supported Linux operating system and have satisfied the prerequisites listed in Chapter 2, "SDK prerequisites," on page 3.

Choose a product set

A product set is a formal grouping of RPMs that compose the SDK. It is further defined as a YUM repository for a specific environment and operating system. Some product sets are packaged as ISO images to distribute the SDK. The YUM repository for each product set is installed and then enabled or disabled as part of installing the *cell-install* RPM.

Product sets are categorized as follows:

Table 10. Product set group descriptors

Descriptor	Options	Rationale
Distributor	IBM or BSC	All GPL or LGPL code is distributed by BSC and is in separate products set from the IBM owned code that is distributed using ISO images from either developerWorks or Passport Advantage.
Operating system	Fedora 7	The SDK requires different product sets for each supported Operating System.
License	Warranted product, unwarranted product or early release.	The license is used for example to distribute early release components in a separate product set from other components.

Product sets with *Open* in the name are not downloadable as an ISO image but are accessed directly by YUM from a directory on the BSC Web site. The product sets without *Open* in the name are distributed as ISO images that you can download from the developerWorks or Passport Advantage Web sites. For example, the ISO for the Devel-Fedora product set is named CellSDK-Devel-Fedora-3.0.0.0.0.iso.

There are subdirectories on an ISO image for each target platform that contains files linked back to a common RPMs subdirectory on the ISO image.

SRPMs are also available either on the BSC Web site or on the ISO images. These SRPMs must be installed manually using the rpm command and are not installed by YUM.

The following table lists the components in each Fedora 7 product set:

Table 11. Fedora 7 product set component details

Component	License	Devel-Fedora	Open-Fedora
ALF	IBM	✓	
ALF for Hybrid-x86	IBM	✓	
BLAS	IBM	✓	
Cell Performance Counter	IBM	✓	
Crash SPU Commands	GPL		✓
DaCS	IBM	✓	
DaCS for Hybrid-x86	IBM	✓	
Documentation	IBM	✓	
Examples	IBM	✓	
FDPR-Pro	IBM	✓	
GCC Toolchain	GPL		✓
Hybrid Performance Tools	IBM	✓	
IDE	IBM	✓	
Kernel	GPL		✓
LibFFT	IBM	✓	
LibSPE/LibSPE2	LGPL		✓
MASS Library	IBM	✓	
netpbm	GPL		✓
numactl	LGPL		✓
OProfile	GPL		✓
PDT	IBM	✓	
PDTR	IBM	✓	
Random Number Library	IBM	✓	
SIMDMath	IBM	✓	
Simulator	IBM	✓	
SPU-Isolation	IBM	✓	
SPU-Timer	IBM	✓	
SPU-Timing Tool	IBM	✓	
Sysroot Image	GPL/LGPL		✓
XL C/C++	IBM	✓	

Download the SDK files

This topic describes how to download the SDK files needed for installation.

The Barcelona Supercomputing Center (BSC) Web site provides access to the GPL and LGPL open source components of the SDK as RPM packages. The SDK installation program automatically downloads most of these RPMs so that it is not necessary for you to manually download them to install the SDK.

The developerWorks Web site and the Passport Advantage Web site provide the IBM-licensed code and its documentation as ISO images. Passport Advantage is an IBM Web site that gives information about software maintenance, product upgrades and technical support under a single, common set of agreements, processes and tools.

To download the SDK perform the following steps:

1. Create a temporary directory for the images and the cell-install RPM by typing the following commands:
```
mkdir -p /tmp/cellsdkiso
cd /tmp/cellsdkiso
```
2. Download the cell-install RPM from developerWorks or Passport Advantage Web site and place it into the /tmp/cellsdkiso directory that you created in the previous step.
3. Download the ISO images into the same directory.

Here are the choices for ISO images:

Table 12. ISO images for Fedora 7

Product set	ISO name	Location
IBM-licensed early release SDK code for Fedora 7	*CellSDK-Devel-Fedora_3.0.0.0.0.iso*	http://www-128.ibm.com/developerworks/power/cell/downloads.html

You can verify the integrity of the files using the md5sum command. Checksums are provided on the download Web page.

Prepare for installation

This topic will help you prepare your system for installation of the SDK.

Prepare your system by following these steps:

1. If necessary, install or upgrade your operating system. See Chapter 4, “Operating system installation,” on page 7.
2. Verify that your BladeCenter QS20 or BladeCenter QS21 has the right firmware level. See “Hardware prerequisites” on page 3.
3. The YUM updater daemon must not be running when installing the SDK. To see if it is running, type the following command:
```
/etc/init.d/yum-updatesd status
```
If the command returns a result similar to:
```
# /etc/init.d/yum-updatesd status
yum-updatesd (pid 12260) is running...
```

then type the command:

```
/etc/init.d/yum-updatesd stop
```

You will see a result similar to:

```
# /etc/init.d/yum-updatesd stop
Stopping yum-updatesd:                                [  OK  ]
```

Later in the installation process you will restart the daemon.

4. Some SDK packages have open source versions which must be removed before installing the SDK version. These packages are numactl, numactl-devel, blas, blas-debuginfo, blas-devel, oprofile and oprofile-debuginfo. The easiest way to uninstall these packages is to use RPM with the --no-deps –allmatches options. The following example removes all of these packages:

   ```
   rpm -e --nodeps --allmatches numactl numactl-devel blas blas-debuginfo \
     blas-devel oprofile oprofile-debuginfo
   ```

   Note: If you previously added exclude clauses to the /etc/yum.conf file for these packages, temporarily remove the clauses to ensure that these RPMs are installed for the SDK.
5. If you have installed an older version of the SDK, you must remove it before you can install this version. See “Uninstalling the SDK” on page 46.

Install the SDK Installer

This topic shows you how to install the SDK Installer.

The SDK Installer requires the *tcl* package. If it is not installed on your system, type the following command:

```
yum install tcl
```

To install the SDK, first install the SDK Installer which is provided by the *cell-install* RPM package. The naming convention for this file is `cell-install-<rel>-<ver>.noarch.rpm`, where `<rel>` represents the release, and `<ver>` represents the version.

To install the this RPM, type for example the following command:

```
rpm -ivh cell-install-3.0.0.0.0.noarch.rpm
```

Note: You cannot use YUM to install this RPM because it is not part of any YUM repository.

Start the SDK installation

This topic describes how to install the SDK. The cellsdk script is a *wrapper* around YUM. Install the SDK by following these steps:

1. Use the cellsdk script to install the SDK.
   - If you installing from an ISO image, type:

     ```
     cd /opt/cell
     ./cellsdk --iso /tmp/cellsdkiso install
     ```
   - If you are installing from a local server (see “Setting up a YUM server for the SDK” on page 48) type:

     ```
      cd /opt/cell
     ./cellsdk install
     ```

Note: You can pass the `--gui` flag to cellsdk to install the SDK using a GUI. See "Installing the SDK using the Pirut GUI" on page 39.

2. Read the SDK licenses.

   There are several licenses that you must agree to. First are the GPL and LGPL licenses. Answer '**yes**' to the license question if you agree to the license terms. The second is the IBM license agreement for early release (ILAER). Follow the on-screen menu to agree to the license. This IBM license is installed into the /opt/cell/license file for later reference.
3. Answer the license question, then YUM will install the RPM files.

   Answer '**y**' to the package install question from YUM. The installation will proceed. If you do not agree to the license terms, the installation will stop.

See Appendix B, "cellsdk script SDK installation example," on page 59 for an example of installing the SDK.

Post-install configuration

After the SDK is installed, finish the installation and configure your system to use the SDK.

Preventing automatic updates from overwriting SDK components

If you are installing on an IBM BladeCenter QS20 or BladeCenter QS21, add the following clause to the /etc/yum.conf file in the `[Main]` section to prevent a YUM update from overwriting the SDK versions of these runtime RPMs:

```
exclude=blas kernel numactl oprofile
```

In the future, the YUM update daemon might attempt to update SDK packages with a version not enhanced for the SDK. The exclude line will prevent this from occurring.

Note: If you exclude packages from regular updates, YUM will not automatically update it when new versions become available. If new versions containing security updates or bug fixes are released, you must manually update the RPM.

Installing the Linux Kernel

If you are installing Fedora 7 on BladeCenter hardware, the kernel must be manually installed. First, download the kernel from the Barcelona Supercomputing Center Web site. The kernel RPM URL is http://www.bsc.es/projects/deepcomputing/linuxoncell/cellsimulator/sdk3.0earlyRel/kernel-2.6.22-5.20070821bsc.ppc64.rpm

Next, install the kernel by typing for example the following command:

```
rpm -ivh --force kernel-2.6.22-5.20070821bsc.ppc64.rpm
```

You must reboot to activate the new kernel.

Installing OProfile

If you are installing on IBM BladeCenter hardware, the SDK version of OProfile must be manually installed. First download the version of OProfile enhanced for the SDK from the Barcelona Supercomputing Center Web site. The OProfile URL is http://www.bsc.es/projects/deepcomputing/linuxoncell/cellsimulator/sdk3.0earlyRel/oprofile-0.9.3-4bsc.ppc.rpm. Install this version of OProfile by typing the following commands as root:

```
rpm -e --nodeps oprofile
rpm -ivh oprofile-0.9.3-4bsc.ppc.rpm
```

Installing BLAS

If you do not want to use the BLAS (Basic Linear Algebra Subprograms) libraries, you can disregard this prerequisite. If you are installing on the IBM BladeCenter QS20 or BladeCenter QS21, you must manually install the BLAS library that is optimized for Cell BE.

Next, install the BLAS libraries optimized for the SDK as follows.

1. Mount the ISO image. The following command is an example. Substitute the name of the ISO image that corresponds to the product set you are installing.
   ```
   mount -o loop CellSDK-Devel-Fedora_3.0.0.0.iso /mnt
   cd /mnt/rpms
   ```
2. Install the RPMs that correspond to the product set you are installing, for example.
   ```
   rpm -ivh blas-3.0-6.ppc.rpm
   rpm -ivh blas-3.0-6.ppc64.rpm
   ```
3. For development on POWER™ architecture machines, including the BladeCenter QS20 and BladeCenter QS21, install the following RPMs:
   ```
   rpm -ivh blas-devel-3.0-6.ppc.rpm
   rpm -ivh blas-devel-3.0-6.ppc64.rpm
   ```
4. For development on X86 and X86_64 architecture machines, install the following RPM:
   ```
   rpm -ivh blas-cross-devel-3.0-6.ppc.rpm
   ```
5. Unmount the ISO image typing the following commands:
   ```
   cd /
   umount /mnt
   ```

Adding SDK components

After the SDK is installed, you can install optional packages. Type the following command as root to see a list of packages that are already installed or are available for you to install:

```
/opt/cell/cellsdk verify
```

See Chapter 5, "SDK components," on page 21 for more information about the contents of the SDK. See "RPMs by component" on page 28 for a list of RPMs that can be installed.

DaCS for Hybrid-x86

If you installed the DaCS for Hybrid-x86 or the ALF for Hybrid-x86 component, see Chapter 7, "DaCS for Hybrid-x86 configuration," on page 51.

The SPU-Isolation RPMs

If you have installed the SPU-Isolation RPMs then you should build the isolation tool, See "Building the SPU-Isolation component" on page 47 for more details.

The Eclipse IDE

If you have installed the Eclipse IDE RPM, see "Configuring the Eclipse IDE" on page 47 for how to complete the install for the IDE.

Restarting automatic updates

Finally, start the YUM updates daemon by typing the following command as root:

```
/etc/init.d/yum-updatesd  start
```

Installing the SDK using the Pirut GUI

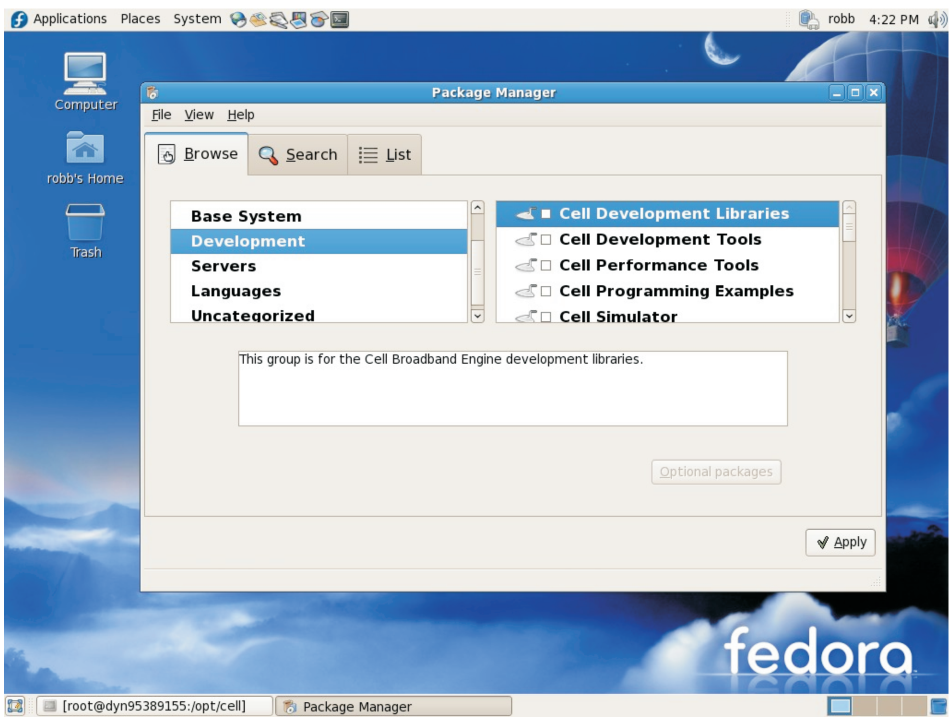
You can install the SDK using the Pirut graphical package manager.

Following the procedure in "Start the SDK installation" on page 36, pass the -g or –gui option to the cellsdk script to launch Pirut. For example, to install from an ISO image using Pirut, type the following commands as root:

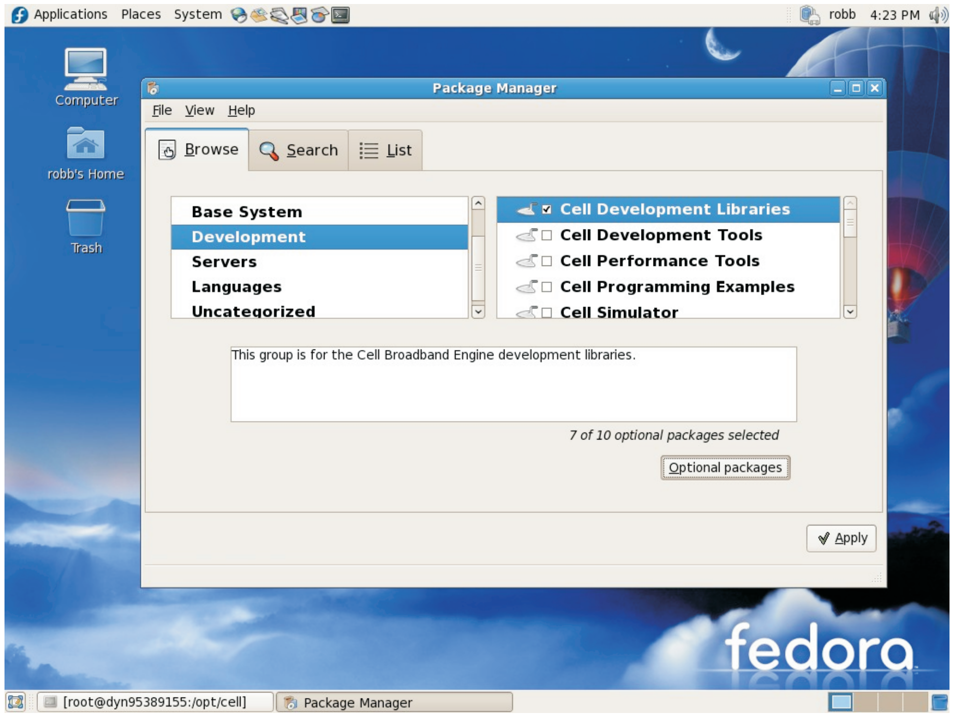
```
cd /opt/cell
cellsdk --gui --iso /tmp/cellsdkiso install
```

The following screens are demonstrated on a Fedora 7 X86 system.

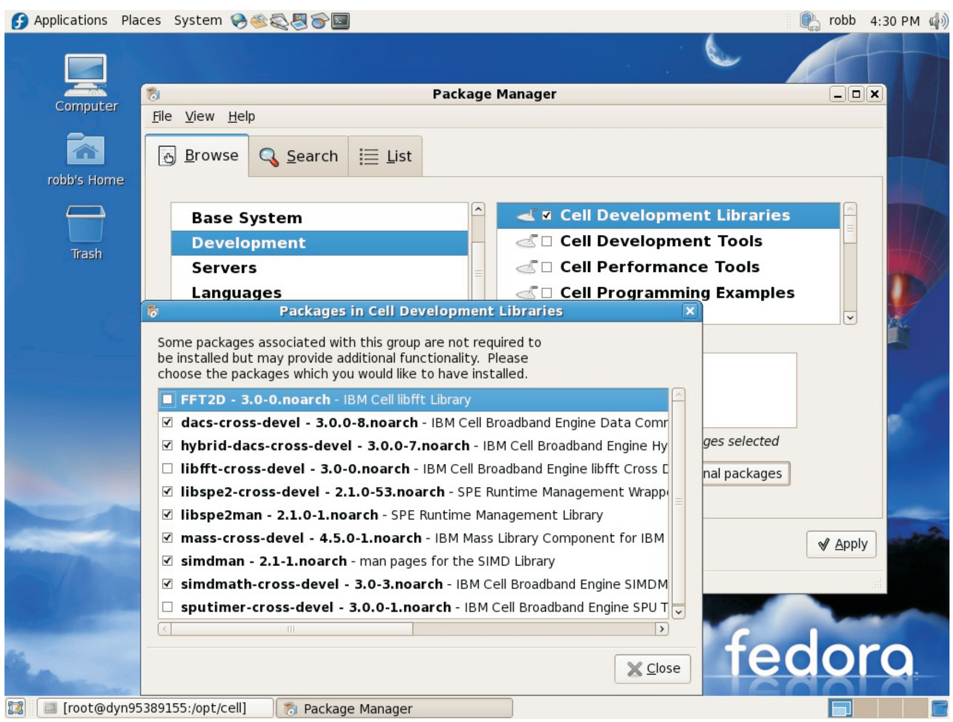
1. This is the first screen you see after starting Pirut. It shows some of the YUM groups defined for the SDK:



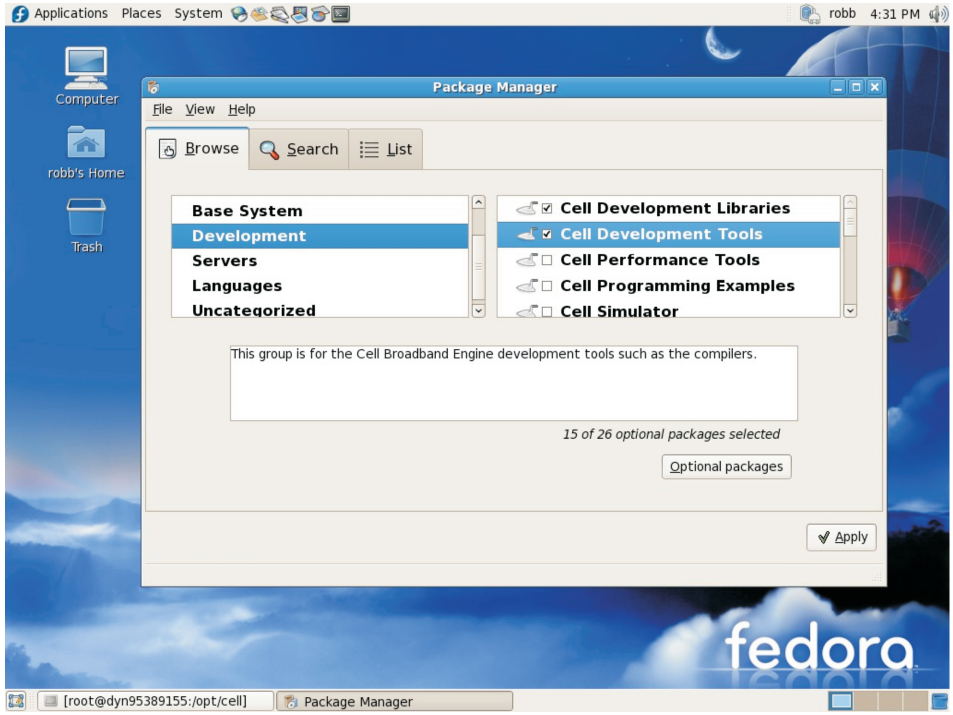
2. Tick the checkbox for *Cell Development Libraries* to have the default Cell Development Libraries installed:



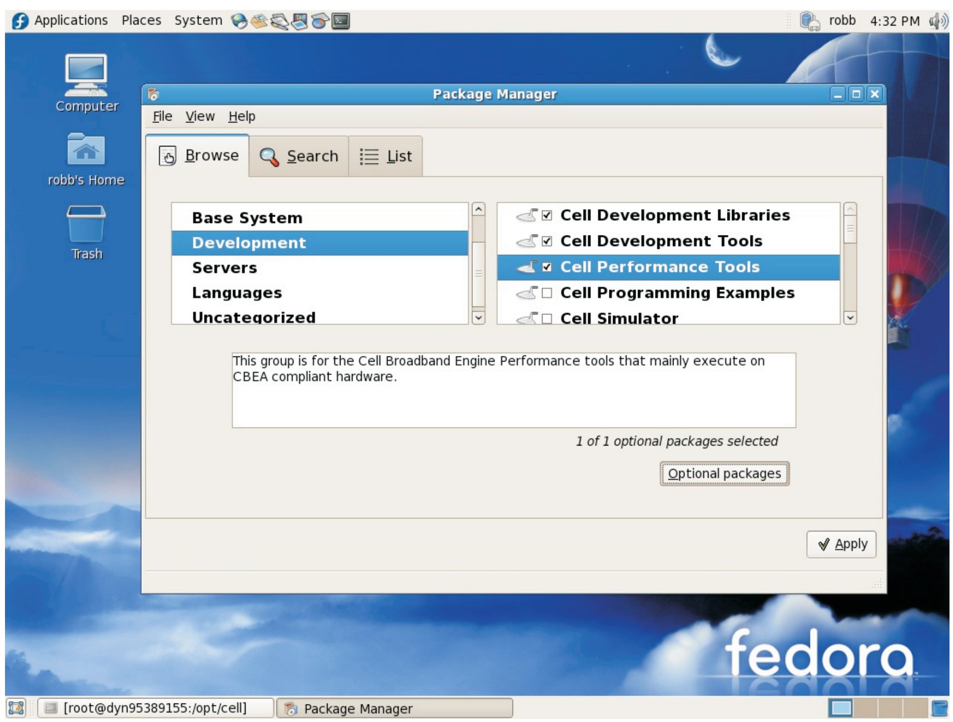
3. Click on *Optional Packages* and make your selection to add or remove individual RPMs:



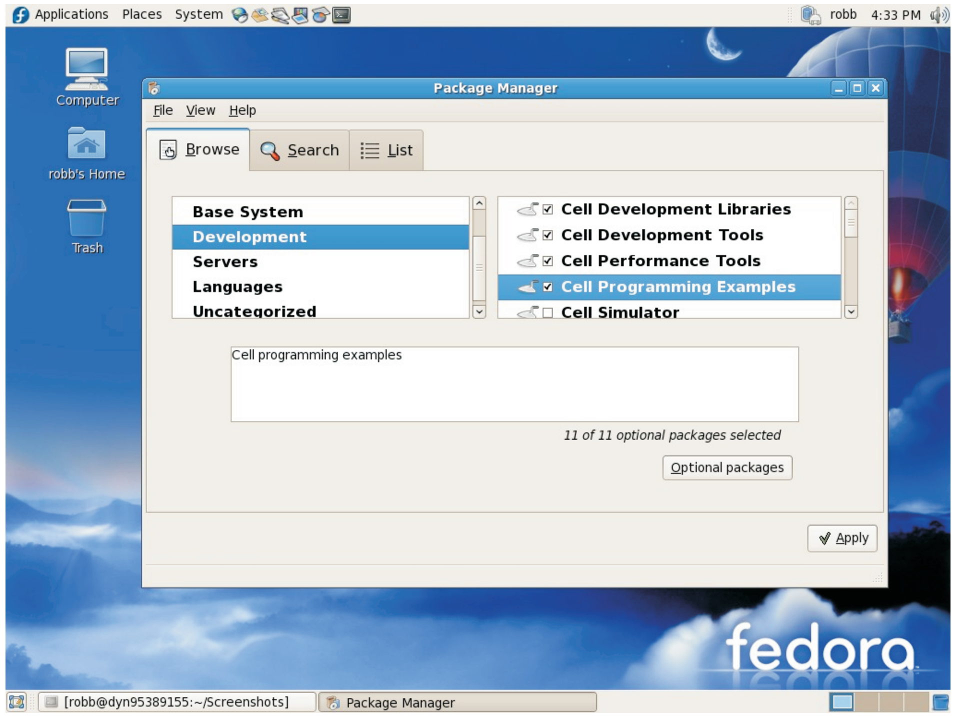
4. Tick the checkbox for *Cell Development Tools* to have the default Cell Development Tools installed:



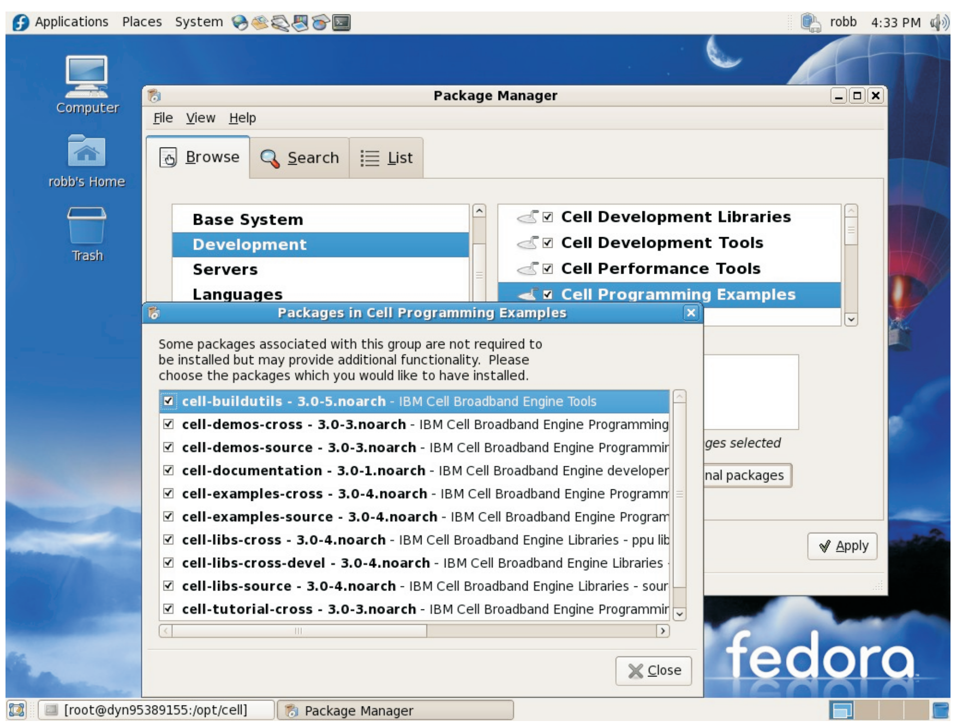
5. Tick the checkbox for *Cell Performance Tools* to have the default Cell Performance Tools installed:



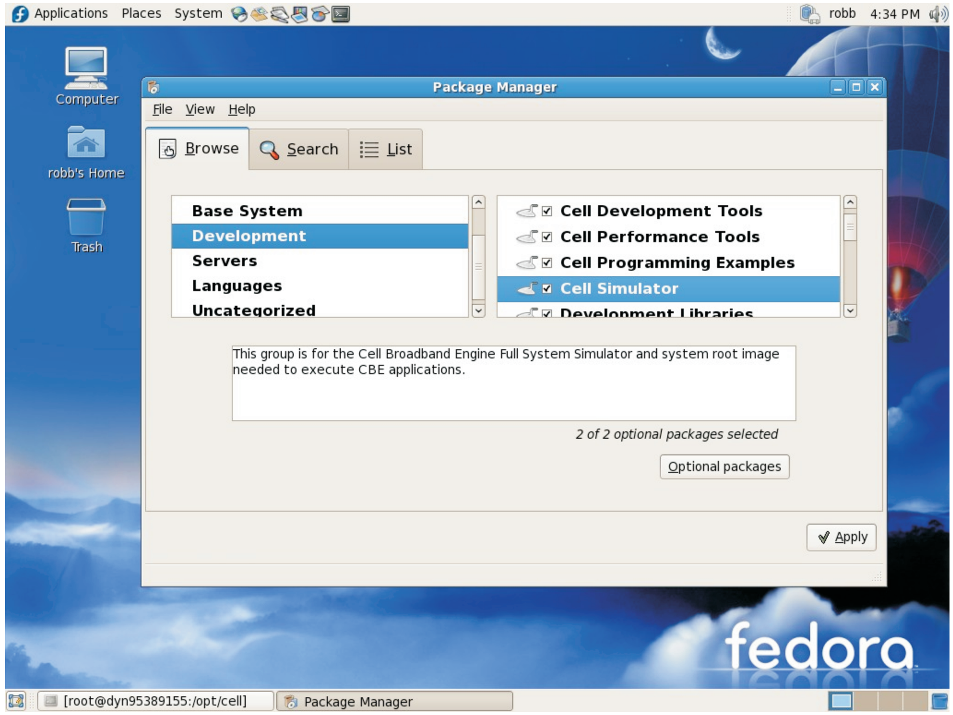
6. Tick the checkbox for *Cell Programming Examples* to have the default Cell Programming Examples installed:



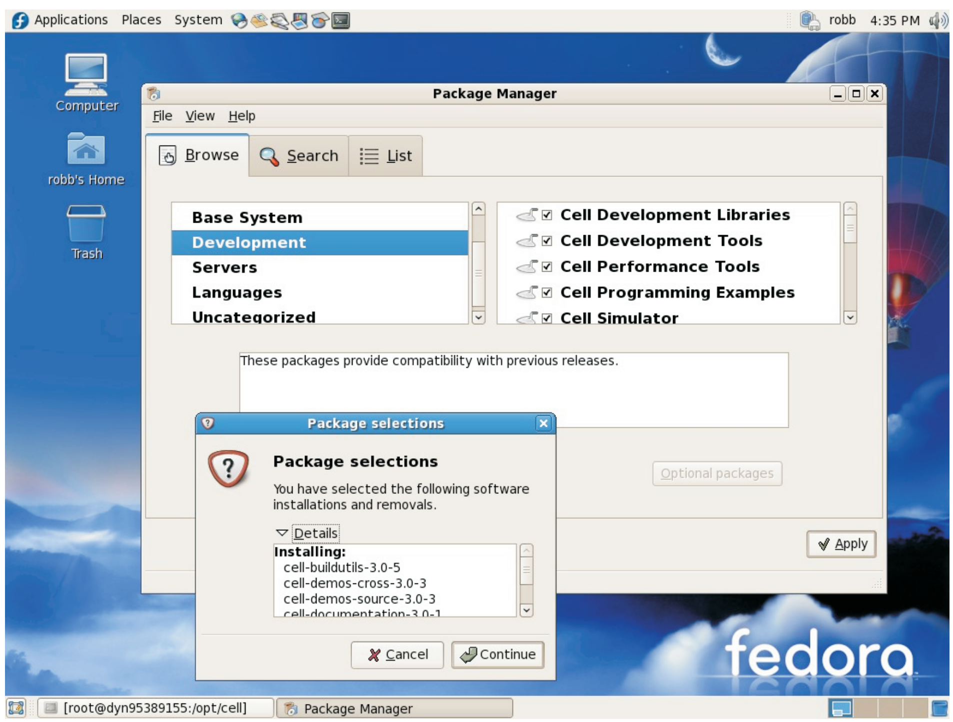
7. Click on *Optional Packages* and make your selection to add or remove RPMs:



8. Tick the checkbox for *Cell Simulator* to install the Full System Simulator and the Fedora 7 sysroot image:

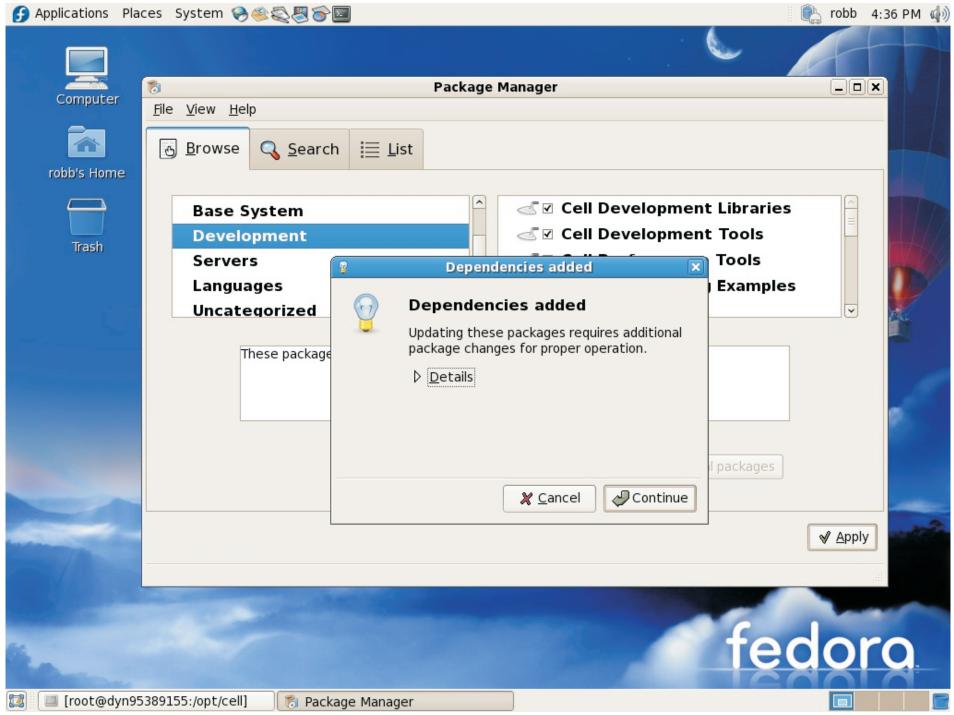


9. Click the *Apply* button. The *Package Selections* window appears:



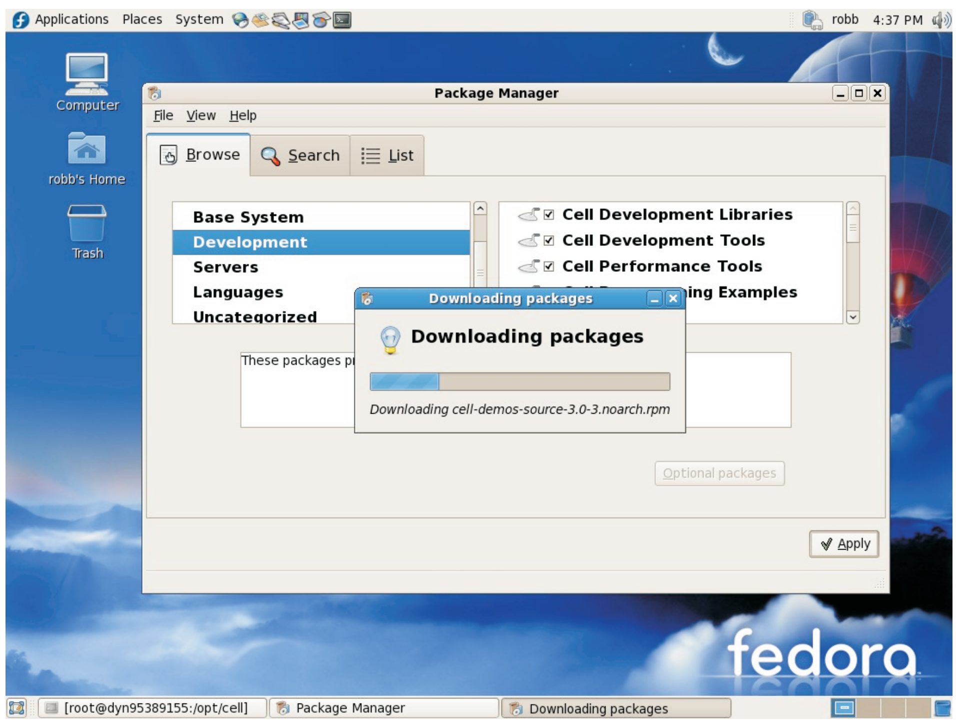
Click the *Continue* button to install the selected SDK packages.

10. Pirut will automatically calculate any required dependencies for the SDK. If dependencies are found, Pirut will display a window similar to:

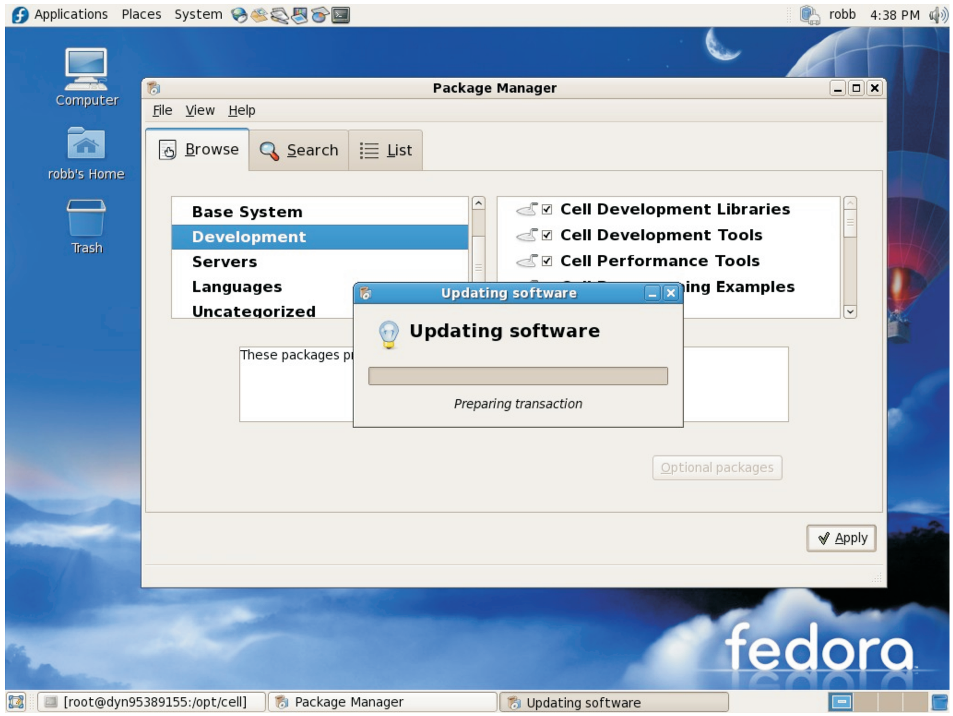


Press the *Details* selector if you want to see individual dependencies. Next, press *Continue*.

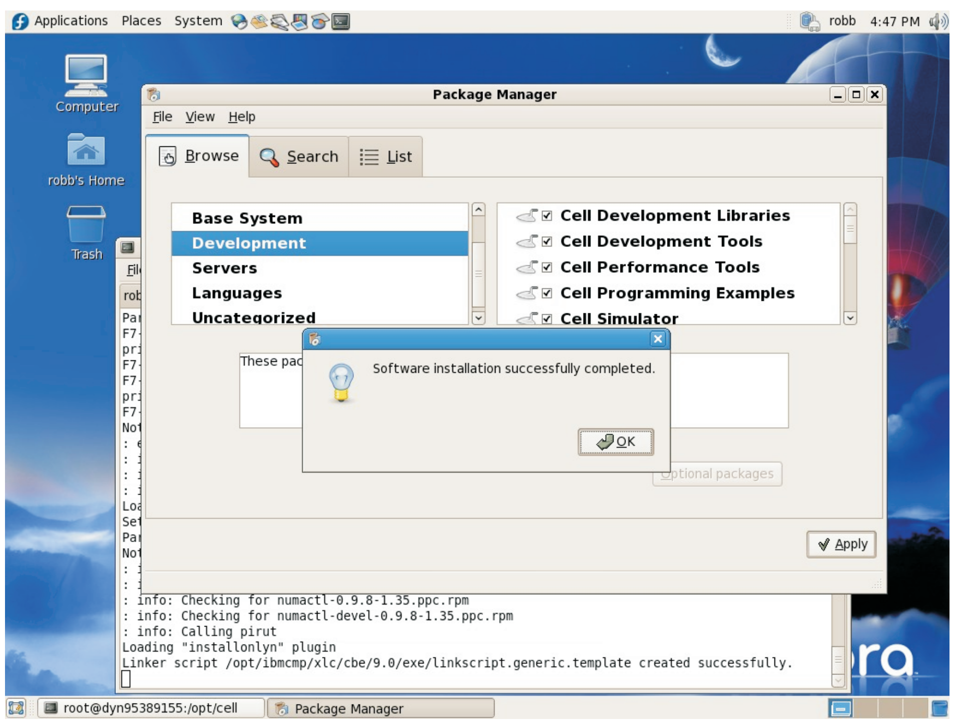
11. Pirut displays the *Downloading packages* window:



12. After Pirut finishes downloading necessary files, it displays the *Updating software* window:



13. When the installation finishes, Pirut displays the *Installation success* window:



Click *OK*.

After you have installed the SDK, close Pirut.

The cellsdk script

This topics explains the cellsdk script in detail and its available options.

The cellsdk script is used to install, update or uninstall the SDK. This script is a wrapper with most of the work done by YUM-based tools.

cellsdk script options

When called without options or parameters, the cellsdk script displays an option list. The following is an example:

```
Usage: cellsdk [OPTIONS] [--iso ISO_DIR] TASK
        ISO_DIR is the directory where cellsdk iso's have been downloaded.
          If not specified, network or cdrom install is assumed.
        TASK is one of install, update, uninstall, verify

The main tasks are:
    install:    ./cellsdk [--gui] install      (starts pirut or yum)
    update:     ./cellsdk [--gui] update       (starts pup or yum)
    uninstall:  ./cellsdk [--gui] uninstall    (starts pirut or yum)
    verify:     ./cellsdk verify               (lists RPMs installed)
The cellsdk script uses the YUM-based tools as follows:
    no flags    starts yum using groupinstall
    --gui       start up pirut (install, uninstall) or pup (update). The gui
                tools take no arguments, so --gui prohibits using --runtime
                or --auto.
    --runtime   only uses the YUM group Cell Runtime Environment
    --auto      starts yum using the -y (yes to everything) flag
```

cellsdk script verify

The verify option lists the SDK RPMs installed or available to be installed on your system.

Pass the verify option to the cellsdk script to list the SDK RPMs installed on your system. For an example of the output produced by verify, see Appendix C, "cellsdk script SDK verify example," on page 67.

Uninstalling the SDK

The following topics describe how to uninstall specific versions of the SDK.

Uninstalling SDK version 2.1

This topic describes how to uninstall SDK version 2.1.

If you previously installed version 2.1 of the SDK from IBM alphaWorks, save any files you need from the /opt/ibm/cell-sdk directory. Then, uninstall the SDK by typing the following commands as the user root:

1. `/opt/ibm/cell-sdk/prototype/cellsdk uninstall`
2. `rm -rf /opt/ibm/systemsim-cell`
3. `rm -rf /opt/ibm/cell-sdk`
4. `rm -rf /opt/cell`
5. `rm -rf /opt/ibmcmp`
6. `umount /mnt/cellsdk`
7. `rmdir /mnt/cellsdk`

Uninstalling SDK version 3.0

This topic describes how to uninstall SDK version 3.0.

If you installed version 3.0 of the SDK using the instructions in this book, first save any files you need from the /opt/cell directory and the /opt/ibm/systemsim directory. Then, uninstall the SDK by following these steps:

1. Uninstall the SDK RPMs using YUM. Use the uninstall option of the cellsdk script for example `./cellsdk uninstall`.

   For an example, see Appendix D, "cellsdk script SDK uninstallation example," on page 71. Answer **'y'** when asked by YUM to uninstall the packages.

   After YUM has uninstalled all of the SDK RPMs, there are a series of questions about how much cleanup you want to do for other directories used by the SDK. To perform a full uninstall, answer **'y'** to all questions.
2. Uninstall the SDK Installer RPM using RPM.
   a. Type the following command:
   ```
   rpm -e cell-install
   ```
3. Clean up the YUM cache.
   a. Type the following commands:
   ```
   yum clean all
   rm -rf /var/cache/yum/F7*
   ```
4. Clean up the YUM configuration.
   a. Remove the SDK exclude clause added to the /etc/yum.conf file. See "Preventing automatic updates from overwriting SDK components" on page 37.
5. Uninstall the Eclipse IDE.
   a. Start Eclipse
   b. Click **Help -> Software Updates -> Manage Configuration**
   c. Click **Cell IDE feature**
   d. Click the right mouse button
   e. From the popup menu, click **disable**
   f. Click **uninstall**

Building the SPU-Isolation component

This topic describes the procedures to perform after installing the SPU Isolation component.

After you have installed the optional SPU-Isolation component, you can finish the installation by building the spu-isolated-app tool and example code using these steps:

1. Run the make command to build and install the *spu-isolated-app* tool. Type the following commands as the user root:
   ```
   # cd /opt/cell/sdk/prototype/usr/src/spu-isolated-app/
   # make
   ```
2. Build the samples by typing the following commands as the user root:
   ```
   # cd /opt/cell/sdk/prototype/src/examples/isolation/
   # make
   ```

Configuring the Eclipse IDE

This topic describes how to finish the installation of the Eclipse IDE.

If you have installed the optional Eclipse IDE component, you should finish the installation by following these steps:

1. Install Java™ *1.4* from IBM (http://w3.hursley.ibm.com/java/) or Sun (http://java.sun.com/ javase/downloads/index.html).
   a. The default Java VM (GCJ) that comes installed with Fedora 7 is not sufficient.
   b. If you have a PPC64 system, you must install and use a 32bit Java runtime environment, because Eclipse for PPC is compiled for the 32-bit architecture.
   c. Update JAVA_HOME and PATH. For example:
      ```
      JAVA_HOME=/usr/java/j2sdk1.4.2_13/jre
      PATH=$PATH:$JAVA_HOME/bin
      ```
   d. To change your PATH variable, edit the file `.bash_profile` located in your home directory, for example: `/home/user/.bash_profile`.
2. Install Eclipse version 3.2.x. Eclipse can be downloaded from http://www.eclipse.org/. Since version 3.2 is not the latest version, download this version by following the menu prompts: **DOWNLOADS (on top) -> By Project (left) -> Eclipse Platform (center)** .
3. Install the CDT version 3.1 plug-ins. CDT is the Eclipse C/C++ Development Tools project. It is a C/C++ IDE that also serves as a platform for others to provide tools for C/C++ developers. You can download CDT from http://www.eclipse.org/cdt/downloads.php.
4. Install the SDK Eclipse IDE for plug-ins using the update manager:
   a. In Eclipse, click **Help** → **Software Updates** → **Find and Install...**
   b. Click **Search for new features to install**, click **Next**.
   c. Click **New Local Site...**
   d. Go to `/opt/cell/ide`.
   e. Select **com.ibm.celldt.update**, and click **OK**.
   f. Click **Finish** and follow the on-screen instructions.
5. Install the ALF IDE template package by typing the following command:
   ```
   yum install alf-ide-template
   ```
6. Restart your system to make sure all settings take effect.

For more information about the IDE, see the Eclipse IDE help topic. To access the IDE help, in Eclipse click: **Help** → **Help Contents** → **IDE for Cell Broadband Engine SDK**.

Setting up a YUM server for the SDK

This topic is for advanced users who want to set up a local YUM server. A YUM server allows multiple users to access the SDK files without having to download them from the Barcelona Supercomputing Center Web site or use the ISO images. A YUM server is useful if your company has a firewall that prevents direct access to the Internet.

Follow these steps to set up a local YUM server.

1. Install an HTTP server and preferably enable FTP access to a directory for downloading the RPMs.
2. Create a directory for the SDK files on the server. For example,
   ```
   [root@myserver]# mkdir /var/www/sdk30
   [root@myserver]# cd /var/www/sdk30
   ```

   Create the sdk30 directory below the directory (in this example `/var/www/`) that your web server uses to serve files. In the following instructions, it is assumed that the directory created by the previous step is sdk30. Substitute the actual directory name created by the preceding command in subsequent examples.

3. Copy all the files from the source material, for example the ISO images and the BSC Web site, to the sdk30 directory.
4. Create updated SDK YUM *repo* files which you have edited to point to the internal server by setting the `baseurl` paths. For example, the /etc/yum.repos.d/cellsdk-f7.repo file might contain the following:

```
baseurl=file:///opt/cell/yum-repos/F7-Trial/x86 ftp://w3.myserver.com/sdk30
baseurl=file:///opt/cell/yum-repos/F7-Open/x86 ftp://w3.myserver.com/sdk30
```

   Note: Different protocols can be used to retrieve the files from the server including FTP, HTTP or a local file directory on your own system.
5. Decide how to distribute these new repo files to your users. A simple option is to instruct them to install the cell-install RPM and then overwrite the repo files in the /etc/yum.repos.d directory with the new versions.

You can keep a local copy of the RPMs on your system and use the localinstall or localupdate YUM options. The advantage of this approach is that YUM manages the dependencies and uses the configured repositories to resolve dependencies. The following is an example using the localinstall command:

```
yum localinstall /tmp/sdk30/spu-gcc-fortran-4.1.1-*.i686.rpm
```

Troubleshooting the SDK installation

This topic describes what to do if things go wrong when using the `cellsdk` script.

YUM continues to install the SDK packages even if some of the RPMs were not completely downloaded from the BSC Web site. The failure messages from YUM do not clearly state this failure. To verify if all files were installed correctly, type the command:

```
./cellsdk verify
```

In the list output by this command, verify that all default RPMs were installed. If they were not, retype the `./cellsdk install` command. YUM will attempt to download any required RPMs that were not downloaded during a past attempt to install the SDK. YUM resumes the download process from the previous failure point.

Sometimes YUM operates incorrectly. It writes files in /var/cache/yum, and sometimes these no longer reflect the correct state of the command. If this happens, type the command:

```
yum clean metadata
```

This will remove the incorrect status files.

There are other options to YUM that are useful to use if things go wrong. If the previous command did not restore correct operation of YUM, try typing the command:

```
yum clean all
```

This will remove additional state files, and might cause the YUM installation process to succeed on the next invocation.

If the preceding commands do not restore correct operation of the YUM installation process, manually remove the cached state files. To do this, type the following command:

```
rm -rf /var/cache/yum
```

To see more information about YUM, set the options:

```
debuglevel=10
errorlevel=10
```

in /etc/yum.conf. You an get an equivalent result by adding the string **-d 10 -e 10** to any YUM command.

You can specify the flags **-v** for verbose output, or **-vv** for very verbose output when typing the `cellsdk` script. YUM writes a log to /var/log/yum.log. The `cellsdk` install script writes a log to /var/log/cellsdk/cellsdk.log. Looking at these files might provide helpful information about what went wrong.

Chapter 7. DaCS for Hybrid-x86 configuration

The following topics describe the configuration information you need to use DaCS for Hybrid-x86.

- "Daemon configuration"
- "Topology configuration"
- "Affinity requirements" on page 53

Note: ALF for Hybrid-x86 depends on DaCS for Hybrid-x86, therefore this configuration information is also needed for Hybrid ALF.

Daemon configuration

This topic describes DaCS daemon configuration.

The host daemon service is named *hdacsd* and the accelerator daemon service is named *adacsd*. Both daemons are configured by editing the /etc/dacsd.conf file on the respective system.

Default versions of these files are installed by the daemon RPMs. These default files contain comments about the supported parameters and values. Back up your configuration files before making changes.

Changes will not take effect until the daemon is restarted. Start and stop the daemon using the service command in the/sbin directory. To stop the host daemon, type:

```
/sbin/service hdacsd stop
```

To start the host daemon, type:

```
/sbin/service hdacsd start
```

To stop the accelerator daemon, type:

```
/sbin/service adacsd stop
```

To start the accelerator daemon, type:

```
/sbin/service adacsd start
```

See the service man page for more details on controlling daemons.

Topology configuration

This topic describes DaCS topology configuration.

The topology configuration file /etc/dacs_topology.config is only used by the host daemon service. Back up this file before changing it. Changes will not take effect until the daemon is restarted.

The host DaCS daemon might stop if there is a configuration error in the dacs_topology.config file. Check the log file specified by the dacsd.conf file (default is /var/log/hdacsd.log) for configuration errors.

The topology configuration file identifies the hosts and accelerators and their relationship to one another. The host can contain more than one CPU core, for example a Ridgeback contains four cores. The host can be attached to one or more accelerators, for example Cell BE BladeCenters. The topology configuration file allows you to specify a number of configurations for this hardware. For example, it can be configured such that each core is assigned one Cell Broadband Engine or it might be configured so that each core can reserve any (or all) of the Cell Broadband Engines.

The default topology configuration file is for a host that has four cores and is attached to a single Cell BE BladeCenter:

```
<DaCS_Topology version="1.0">
  <hardware>
    <de tag="OB1" type="DACS_DE_SYSTEMX" ip="192.168.1.100">
      <de tag="OC1" type="DACS_DE_SYSTEMX_CORE"></de>
      <de tag="OC2" type="DACS_DE_SYSTEMX_CORE"></de>
      <de tag="OC3" type="DACS_DE_SYSTEMX_CORE"></de>
      <de tag="OC4" type="DACS_DE_SYSTEMX_CORE"></de>
    </de>
    <de tag="CB1" type="DACS_DE_CELLBLADE" ip="192.168.1.101">
      <de tag="CBE11" type="DACS_DE_CBE"></de>
      <de tag="CBE12" type="DACS_DE_CBE"></de>
    </de>
  </hardware>
  <topology>
    <canreserve he="OC1" ae="CB1"/>
    <canreserve he="OC2" ae="CB1"/>
    <canreserve he="OC3" ae="CB1"/>
    <canreserve he="OC4" ae="CB1"/>
  </topology>
</DaCS_Topology>
```

The `<hardware>` section identifies the host system with its four cores (OC1-OC4) and the Cell BE BladeCenter (CB1) with its two Cell Broadband Engines (CBE11 and CBE12).

The `<topology>` section identifies what each core (host) can use as an accelerator. In this example, each core can reserve and use either the entire Cell BE BladeCenter (CB1) or one or more of the Cell Broadband Engines on the BladeCenter. The ability to use the Cell BE is implicit in the `<canreserve>` element. This element has an attribute **only** which defaults to false. When it is set to true, only the Cell BE BladeCenter can be reserved. If the fourth `<canreserve>` element was changed to `<canreserve he="OC4" ae="CB1" only="TRUE"></canreserve>`, then OC4 can only reserve the Cell BE BladeCenter. The usage can be made more restrictive by being more specific in the `<canreserve>` element. If the fourth `<canreserve>` element is changed to `<canreserve he="OC4" ae="CBE12"></canreserve>`, then OC4 can only reserve CBE12 and can not reserve the Cell BE BladeCenter.

Modify the topology configuration file to match your hardware configuration. Make a copy of the configuration file before changing it. At a minimum, update the IP addresses of the **ip** attributes to match the interfaces between the host and the accelerator. You might need to add additional entries if you have a second BladeCenter. The following is an example of the topology configuration file changed to add a second BladeCenter:

```
<DaCS_Topology version="1.0">
  <hardware>
    <de tag="OB1" type="DACS_DE_SYSTEMX" ip="192.168.1.100">
      <de tag="OC1" type="DACS_DE_SYSTEMX_CORE"></de>
      <de tag="OC2" type="DACS_DE_SYSTEMX_CORE"></de>
      <de tag="OC3" type="DACS_DE_SYSTEMX_CORE"></de>
```

```
      <de tag="OC4" type="DACS_DE_SYSTEMX_CORE"></de>
    </de>
    <de tag="CB1" type="DACS_DE_CELLBLADE" ip="192.168.1.101">
      <de tag="CBE11" type="DACS_DE_CBE"></de>
      <de tag="CBE12" type="DACS_DE_CBE"></de>
    </de>
    <de tag="CB2" type="DACS_DE_CELLBLADE" ip="192.168.1.102">
      <de tag="CBE21" type="DACS_DE_CBE"></de>
      <de tag="CBE22" type="DACS_DE_CBE"></de>
    </de>
  </hardware>
  <topology>
    <canreserve he="OC1" ae="CB1"></canreserve>
    <canreserve he="OC1" ae="CB2"></canreserve>
    <canreserve he="OC2" ae="CB1"></canreserve>
    <canreserve he="OC2" ae="CB2"></canreserve>
    <canreserve he="OC3" ae="CB1"></canreserve>
    <canreserve he="OC3" ae="CB2"></canreserve>
    <canreserve he="OC4" ae="CB1"></canreserve>
    <canreserve he="OC4" ae="CB2"></canreserve>
  </topology>
</DaCS_Topology>
```

Affinity requirements

This topic describes the affinity requirements for DaCS.

A DaCS for Hybrid-x86 application on the host (X86_64) must have processor affinity to start. This can be done

- on the command line.
- in mpirun.
- through the sched_setaffinity function.

The following is a command line example to set affinity of the shell to the first processor:

```
# taskset -p 0x00000001  $$
```

The following example launches a DaCS application using `taskset`:

```
# taskset 0x00000001 HelloDaCSApp Mike
```

The application program name is HelloDaCSApp which is passed an argument of Mike.

The man page for `taskset` states that a user must have *CAP_SYS_NICE* permission to change CPU affinity.

Chapter 8. Getting support

The SDK is supported through the CBEA architecture forum on the developerWorks Web site at http://www.ibm.com/developerworks/power/cell/.

The XL C/C++ compilers are supported through the XL compiler Web site. See http://www.ibm.com/software/awdtools/xlcpp/support/.

The XL Fortran compiler is supported through the XL compiler Web site. See http://www.ibm.com/software/awdtools/fortran/support/.

This version of the SDK supersedes all versions of the SDK that were available from alphaWorks.

Appendix A. Accessibility features

Accessibility features help users who have a physical disability, such as restricted mobility or limited vision, to use information technology products successfully.

The following list includes the major accessibility features:
- Keyboard-only operation
- Interfaces that are commonly used by screen readers
- Keys that are tactilely discernible and do not activate just by touching them
- Industry-standard devices for ports and connectors
- The attachment of alternative input and output devices

IBM and accessibility

See the IBM Accessibility Center at http://www.ibm.com/able/ for more information about the commitment that IBM has to accessibility.

Appendix B. cellsdk script SDK installation example

This is an example of using the cellsdk script to install the SDK.

The following output is the result of typing the commands:

```
cd /opt/cell
./cellsdk --iso /tmp/cellsdkiso install
```

Here is the output:

```
cellsdk logs to /var/log/cellsdk.log

The IBM SDK 3.0 for Multicore Acceleration contains components governed by
the following Open Source licenses:

GNU Public License (GPL) - see http://www.gnu.org/licenses/gpl.html.
  GPL licensed components include GCC Toolchain, Linux Kernel, netpbm,
  numactl, oprofile, crash-spu-command, spu_tools, and SYSROOT image.

Lesser GNU Public License (LGPL) - see http://www.gnu.org/copyleft/lesser.html.
  LGPL licensed components include LibSPE, LibSPE2 and SYSROOT image.

Installation and use of this software requires you to certify you have read
the licenses above, and accept their terms.  To accept these terms, type 'yes'
at the prompt below.  If you do not wish to accept, type 'no' or press 'ctrl-C'
to abort this program without installing.

After typing 'yes', you will be presented with licenses for IBM owned code,
Follow the instructions on the screen to accept the IBM Licenses and proceed
with installation of the SDK.

I have read and accept the licenses above [no/yes]: cellsdk INFO-2001:
license accepted
cellsdk INFO-2023: Trying to install/update cell-early-license
Loading "installonlyn" plugin
Setting up Install Process
Parsing package install arguments
file:///tmp/sdk/CellSDK-Devel-Fedora/ppc64/repodata/repomd.xml: [Errno 5]
Resolving Dependencies
--> Running transaction check
---> Package cell-early-license.noarch 0:3.0.0-0.0 set to be updated

Dependencies Resolved

=============================================================================
 Package                 Arch       Version         Repository       Size

=============================================================================
Installing:
 cell-early-license      noarch   3.0.0-0.0   CellSDK-Devel-Fedora-ppc64 238 k

Transaction Summary
=============================================================================
Install      1 Package(s)
Update       0 Package(s)
Remove       0 Package(s)

Total download size: 238 k
Downloading Packages:
Running Transaction Test
Finished Transaction Test
Transaction Test Succeeded
```

```
Running Transaction
   Installing: cell-early-license          ######################### [1/1]

Installed: cell-early-license.noarch 0:3.0.0-0.0
Complete!
cellsdk INFO-2024: cell-early-license is installed
International License Agreement for Early Release of Programs

Part 1 - General Terms

THIS INTERNATIONAL LICENSE AGREEMENT FOR EARLY RELEASE OF PROGRAMS
("AGREEMENT") IS A LEGAL AGREEMENT BETWEEN YOU AND IBM. BY DOWNLOADING,
INSTALLING, COPYING, ACCESSING, OR USING THE PROGRAM YOU AGREE TO THE TERMS
OF THIS AGREEMENT. IF YOU ARE ACCEPTING THESE TERMS ON BEHALF OF ANOTHER PERSON
OR A COMPANY OR OTHER LEGAL ENTITY, YOU REPRESENT AND WARRANT THAT YOU HAVE
FULL AUTHORITY TO BIND THAT PERSON, COMPANY, OR LEGAL ENTITY TO THESE TERMS.

"Early Release" is a release of a Program that (1) may still be under
development (and therefore, is potentially unreliable) or (2) may no longer
be under development but has not been made commercially available to users.

"IBM" is International Business Machines Corporation or one of its subsidiaries.

Press Enter to continue viewing the license agreement, or, Enter "1" to accept
the agreement, "2" to decline it or "99" to go back to the previous screen,
"3" Print, "4" Read non-IBM terms.

cellsdk INFO-2014: License accepted.
cellsdk INFO-2019: yum groupinstall  'Cell Runtime Environment'
'Cell Development Tools' 'Cell Development Libraries'
 'Cell Programming Examples' 'Cell Simulator' 'Cell Performance Tools'
Loading "installonlyn" plugin
Setting up Group Process
Package cell-early-license - 3.0.0-0.0.noarch already installed and latest version
Package systemsim-cell - 3.0-14.ppc64 already installed and latest version
Resolving Dependencies
--> Running transaction check
---> Package numactl-devel.ppc64 0:0.9.10-1 set to be updated
---> Package alfman.noarch 0:3.0-4 set to be updated
---> Package cell-buildutils.noarch 0:3.0-10 set to be updated
---> Package ppu-simdmath.ppc64 0:3.0-3 set to be updated
---> Package libspe2-devel.ppc 0:2.2.0-87 set to be updated
---> Package cell-demos.ppc64 0:3.0-8 set to be updated
---> Package dacsman.noarch 0:3.0-4 set to be updated
---> Package dacs-devel.ppc64 0:3.0.0-18 set to be updated
---> Package cell-tutorial-source.noarch 0:3.0-4 set to be updated
---> Package libspe2.ppc64 0:2.2.0-87 set to be updated
---> Package ppu-simdmath-devel.ppc 0:3.0-3 set to be updated
---> Package blas-devel.ppc64 0:3.1.1-1.fc7 set to be updated
---> Package cell-libs-devel.ppc 0:3.0-15 set to be updated
---> Package numactl-devel.ppc 0:0.9.10-1 set to be updated
---> Package numactl.ppc 0:0.9.10-1 set to be updated
---> Package libspe2man.noarch 0:2.2.0-4 set to be updated
---> Package blas-devel.ppc 0:3.1.1-1.fc7 set to be updated
---> Package cell-libs.ppc64 0:3.0-15 set to be updated
---> Package cell-libs-devel.ppc64 0:3.0-15 set to be updated
---> Package cell-documentation.noarch 0:3.0-3 set to be updated
---> Package ppu-simdmath-devel.ppc64 0:3.0-3 set to be updated
---> Package libspe2-devel.ppc64 0:2.2.0-87 set to be updated
---> Package numactl.ppc64 0:0.9.10-1 set to be updated
---> Package cell-demos-source.noarch 0:3.0-8 set to be updated
---> Package sysroot_image.noarch 0:3.0-7 set to be updated
---> Package blas.ppc64 0:3.1.1-1.fc7 set to be updated
---> Package blas.ppc 0:3.1.1-1.fc7 set to be updated
---> Package cell-libs.ppc 0:3.0-15 set to be updated
---> Package libspe.ppc 0:1.2.2-2 set to be updated
---> Package ppu-mass-devel.ppc 0:4.5.0-9 set to be updated
```

```
---> Package dacs.ppc64 0:3.0.0-18 set to be updated
---> Package spu-simdmath-devel.ppc 0:3.0-3 set to be updated
---> Package spu-gcc-c++.ppc 0:4.1.1-100 set to be updated
---> Package alf-devel.ppc64 0:3.0.0-8 set to be updated
---> Package ppu-binutils.ppc 0:2.17.50-31 set to be updated
---> Package ppu-gdb.ppc 0:6.6.50-23 set to be updated
---> Package simdman.noarch 0:3.0-4 set to be updated
---> Package spu-newlib.ppc 0:1.15.0-76 set to be updated
---> Package ppu-mass-devel.ppc64 0:4.5.0-9 set to be updated
---> Package libspe.ppc64 0:1.2.2-2 set to be updated
---> Package ppu-gcc.ppc 0:4.1.1-54 set to be updated
---> Package spu-gdb.ppc 0:6.6.50-10 set to be updated
---> Package spu-gcc.ppc 0:4.1.1-100 set to be updated
---> Package spu-binutils.ppc 0:2.17.50-31 set to be updated
---> Package cell-libs-source.noarch 0:3.0-15 set to be updated
---> Package cell-examples.ppc64 0:3.0-9 set to be updated
---> Package spu-mass-devel.ppc 0:4.5.0-9 set to be updated
---> Package alf-examples-source.noarch 0:3.0.0-6 set to be updated
---> Package alf-devel.ppc 0:3.0.0-8 set to be updated
---> Package ppu-gcc-c++.ppc 0:4.1.1-54 set to be updated
---> Package ppu-simdmath.ppc 0:3.0-3 set to be updated
---> Package cell-tutorial.ppc 0:3.0-4 set to be updated
---> Package alf.ppc 0:3.0.0-8 set to be updated
---> Package libspe2.ppc 0:2.2.0-87 set to be updated
---> Package alf.ppc64 0:3.0.0-8 set to be updated
---> Package cell-examples-source.noarch 0:3.0-9 set to be updated

Dependencies Resolved

=============================================================================
 Package                Arch       Version          Repository       Size
 
=============================================================================
Installing:
 alf                    ppc        3.0.0-8    CellSDK-Devel-Fedora-ppc64  33 k
 alf                    ppc64      3.0.0-8    CellSDK-Devel-Fedora-ppc64  38 k
 alf-devel              ppc64      3.0.0-8    CellSDK-Devel-Fedora-ppc64  40 k
 alf-devel              ppc        3.0.0-8    CellSDK-Devel-Fedora-ppc64  99 k
 alf-examples-source    noarch     3.0.0-6    CellSDK-Devel-Fedora-ppc64 108 k
 alfman                 noarch     3.0-4      CellSDK-Devel-Fedora-ppc64  42 k
 blas                   ppc64      3.1.1-1.fc7          updates          345k
 blas                   ppc        3.1.1-1.fc7          updates          338k
 blas-devel             ppc64      3.1.1-1.fc7          updates          173k
 blas-devel             ppc        3.1.1-1.fc7          updates          165k
 cell-buildutils        noarch     3.0-10     CellSDK-Devel-Fedora-ppc64  19 k
 cell-demos             ppc64      3.0-8      CellSDK-Devel-Fedora-ppc64  12 M
 cell-demos-source      noarch     3.0-8      CellSDK-Devel-Fedora-ppc64  12 M
 cell-documentation     noarch     3.0-3      CellSDK-Devel-Fedora-ppc64  31 M
 cell-examples          ppc64      3.0-9      CellSDK-Devel-Fedora-ppc64 365 k
 cell-examples-source   noarch     3.0-9      CellSDK-Devel-Fedora-ppc64 325 k
 cell-libs              ppc64      3.0-15     CellSDK-Devel-Fedora-ppc64 8.3 k
 cell-libs              ppc        3.0-15     CellSDK-Devel-Fedora-ppc64  83 k
 cell-libs-devel        ppc        3.0-15     CellSDK-Devel-Fedora-ppc64 668 k
 cell-libs-devel        ppc64      3.0-15     CellSDK-Devel-Fedora-ppc64  96 k
 cell-libs-source       noarch     3.0-15     CellSDK-Devel-Fedora-ppc64 210 k
 cell-tutorial          ppc        3.0-4      CellSDK-Devel-Fedora-ppc64  48 k
 cell-tutorial-source   noarch     3.0-4      CellSDK-Devel-Fedora-ppc64  13 k
 dacs                   ppc64      3.0.0-18   CellSDK-Devel-Fedora-ppc64  24 k
 dacs-devel             ppc64      3.0.0-18   CellSDK-Devel-Fedora-ppc64 131 k
 dacsman                noarch     3.0-4      CellSDK-Devel-Fedora-ppc64  59 k
 libspe                 ppc        1.2.2-2    CellSDK-Open-Fedora-ppc64   31 k
 libspe                 ppc64      1.2.2-2    CellSDK-Open-Fedora-ppc64   32 k
 libspe2                ppc64      2.2.0-87   CellSDK-Open-Fedora-ppc64   35 k
 libspe2                ppc        2.2.0-87   CellSDK-Open-Fedora-ppc64   33 k
 libspe2-devel          ppc        2.2.0-87   CellSDK-Open-Fedora-ppc64  7.3 k
 libspe2-devel          ppc64      2.2.0-87   CellSDK-Open-Fedora-ppc64  7.3 k
 libspe2man             noarch     2.2.0-4    CellSDK-Devel-Fedora-ppc64  52 k
```

```
 numactl              ppc       0.9.10-1   CellSDK-Open-Fedora-ppc64   82 k
 numactl              ppc64     0.9.10-1   CellSDK-Open-Fedora-ppc64   70 k
 numactl-devel        ppc64     0.9.10-1   CellSDK-Open-Fedora-ppc64   15 k
 numactl-devel        ppc       0.9.10-1   CellSDK-Open-Fedora-ppc64   15 k
 ppu-binutils         ppc       2.17.50-31 CellSDK-Open-Fedora-ppc64  8.2 M
 ppu-gcc              ppc       4.1.1-54   CellSDK-Open-Fedora-ppc64  4.2 M
 ppu-gcc-c++          ppc       4.1.1-54   CellSDK-Open-Fedora-ppc64   17 M
 ppu-gdb              ppc       6.6.50-23  CellSDK-Open-Fedora-ppc64  3.1 M
 ppu-mass-devel       ppc       4.5.0-9    CellSDK-Devel-Fedora-ppc64 257 k
 ppu-mass-devel       ppc64     4.5.0-9    CellSDK-Devel-Fedora-ppc64 265 k
 ppu-simdmath         ppc64     3.0-3      CellSDK-Devel-Fedora-ppc64  31 k
 ppu-simdmath         ppc       3.0-3      CellSDK-Devel-Fedora-ppc64  26 k
 ppu-simdmath-devel   ppc       3.0-3      CellSDK-Devel-Fedora-ppc64  93 k
 ppu-simdmath-devel   ppc64     3.0-3      CellSDK-Devel-Fedora-ppc64  98 k
 simdman              noarch    3.0-4      CellSDK-Devel-Fedora-ppc64 148 k
 spu-binutils         ppc       2.17.50-31 CellSDK-Open-Fedora-ppc64  3.2 M
 spu-gcc              ppc       4.1.1-100  CellSDK-Open-Fedora-ppc64  2.7 M
 spu-gcc-c++          ppc       4.1.1-100  CellSDK-Open-Fedora-ppc64   13 M
 spu-gdb              ppc       6.6.50-10  CellSDK-Open-Fedora-ppc64  2.3 M
 spu-mass-devel       ppc       4.5.0-9    CellSDK-Devel-Fedora-ppc64  96 k
 spu-newlib           ppc       1.15.0-76  CellSDK-Open-Fedora-ppc64  1.3 M
 spu-simdmath-devel   ppc       3.0-3      CellSDK-Devel-Fedora-ppc64 179 k
 sysroot_image        noarch    3.0-7      CellSDK-Open-Fedora-ppc64  271 M

Transaction Summary
=============================================================================
Install     56 Package(s)
Update       0 Package(s)
Remove       0 Package(s)

Total download size: 387 M
Is this ok [y/N]: Downloading Packages:
Running Transaction Test
Finished Transaction Test
Transaction Test Succeeded
Running Transaction
   Installing: libspe2                         ####################### [ 1/56]
   Installing: libspe2                         ####################### [ 2/56]
   Installing: alf                             ####################### [ 3/56]
   Installing: ppu-simdmath                    ####################### [ 4/56]
   Installing: blas                            ####################### [ 5/56]
   Installing: numactl                         ####################### [ 6/56]
   Installing: numactl                         ####################### [ 7/56]
   Installing: cell-buildutils                 ####################### [ 8/56]
   Installing: cell-libs                       ####################### [ 9/56]
   Installing: cell-libs                       ####################### [10/56]
   Installing: spu-binutils                    ####################### [11/56]
   Installing: spu-gcc                         ####################### [12/56]
   Installing: ppu-gcc                         ####################### [13/56]
   Installing: dacs                            ####################### [14/56]
   Installing: blas                            ####################### [15/56]
   Installing: numactl-devel                   ####################### [16/56]
   Installing: alfman                          ####################### [17/56]
   Installing: ppu-simdmath                    ####################### [18/56]
   Installing: libspe2-devel                   ####################### [19/56]
   Installing: cell-demos                      ####################### [20/56]
   Installing: dacsman                         ####################### [21/56]
   Installing: dacs-devel                      ####################### [22/56]
   Installing: cell-tutorial-source            ####################### [23/56]
   Installing: ppu-simdmath-devel              ####################### [24/56]
   Installing: blas-devel                      ####################### [25/56]
   Installing: cell-libs-devel                 ####################### [26/56]
   Installing: numactl-devel                   ####################### [27/56]
   Installing: libspe2man                      ####################### [28/56]
   Installing: blas-devel                      ####################### [29/56]
   Installing: cell-libs-devel                 ####################### [30/56]
   Installing: cell-documentation              ####################### [31/56]
```

```
   Installing: ppu-simdmath-devel          ####################### [32/56]
   Installing: libspe2-devel               ####################### [33/56]
   Installing: cell-demos-source           ####################### [34/56]
   Installing: sysroot_image               ####################### [35/56]
   Installing: libspe                      ####################### [36/56]
   Installing: ppu-mass-devel              ####################### [37/56]
   Installing: spu-simdmath-devel          ####################### [38/56]
   Installing: spu-gcc-c++                 ####################### [30/56]
   Installing: alf-devel                   ####################### [40/56]
   Installing: ppu-binutils                ####################### [41/56]
   Installing: ppu-gdb                     ####################### [42/56]
   Installing: simdman                     ####################### [43/56]
   Installing: spu-newlib                  ####################### [44/56]
   Installing: ppu-mass-devel              ####################### [45/56]
   Installing: libspe                      ####################### [46/56]
   Installing: spu-gdb                     ####################### [47/56]
   Installing: cell-libs-source            ####################### [48/56]
   Installing: cell-examples               ####################### [49/56]
   Installing: spu-mass-devel              ####################### [50/56]
   Installing: alf-examples-source         ####################### [51/56]
   Installing: alf-devel                   ####################### [52/56]
   Installing: ppu-gcc-c++                 ####################### [53/56]
   Installing: cell-tutorial               ####################### [54/56]
   Installing: alf                         ####################### [55/56]
   Installing: cell-examples-source        ####################### [56/56]


Installed: alf.ppc 0:3.0.0-8 alf.ppc64 0:3.0.0-8 alf-devel.ppc64 0:3.0.0-8
alf-devel.ppc 0:3.0.0-8 alf-examples-source.noarch 0:3.0.0-6 alfman.noarch
0:3.0-4 blas.ppc64 0:3.1.1-1.fc7 blas.ppc 0:3.1.1-1.fc7
blas-devel.ppc64 0:3.1.1-1.fc7 blas-devel.ppc 0:3.1.1-1.fc7
cell-buildutils.noarch 0:3.0-10 cell-demos.ppc64
0:3.0-8 cell-demos-source.noarch 0:3.0-8 cell-documentation.noarch 0:3.0-3
cell-examples.ppc64 0:3.0-9 cell-examples-source.noarch 0:3.0-9 cell-libs.ppc64
0:3.0-15 cell-libs.ppc 0:3.0-15 cell-libs-devel.ppc 0:3.0-15 cell-libs-devel.ppc64
0:3.0-15 cell-libs-source.noarch 0:3.0-15 cell-tutorial.ppc 0:3.0-4
cell-tutorial-source.noarch 0:3.0-4 dacs.ppc64 0:3.0.0-18
dacs-devel.ppc64 0:3.0.0-18 dacsman.noarch 0:3.0-4
libspe.ppc 0:1.2.2-2 libspe.ppc64 0:1.2.2-2
libspe2.ppc64 0:2.2.0-87 libspe2.ppc 0:2.2.0-87 libspe2-devel.ppc 0:2.2.0-87
libspe2-devel.ppc64 0:2.2.0-87 libspe2man.noarch 0:2.2.0-4 numactl.ppc
0:0.9.10-1 numactl.ppc64 0:0.9.10-1 numactl-devel.ppc64 0:0.9.10-1
numactl-devel.ppc 0:0.9.10-1 ppu-binutils.ppc 0:2.17.50-31
ppu-gcc.ppc 0:4.1.1-54 ppu-gcc-c++.ppc 0:4.1.1-54 ppu-gdb.ppc 0:6.6.50-23
ppu-mass-devel.ppc 0:4.5.0-9 ppu-mass-devel.ppc64 0:4.5.0-9 ppu-simdmath.ppc64
0:3.0-3 ppu-simdmath.ppc 0:3.0-3 ppu-simdmath-devel.ppc 0:3.0-3
ppu-simdmath-devel.ppc64 0:3.0-3 simdman.noarch 0:3.0-4
spu-binutils.ppc 0:2.17.50-31 spu-gcc.ppc 0:4.1.1-100
spu-gcc-c++.ppc 0:4.1.1-100 spu-gdb.ppc 0:6.6.50-10
spu-mass-devel.ppc 0:4.5.0-9 spu-newlib.ppc 0:1.15.0-76
spu-simdmath-devel.ppc 0:3.0-3 sysroot_image.noarch 0:3.0-7
Complete!

cellsdk INFO-2022: Copying rpms to install in the simulator sysroot

< verbose output from wget and file copies as cellsdk tries to find the
  ppc versions of files and copy them into /tmp/cellsdk/rpms >

...


< more verbose output from wget and file copies as cellsdk tries to find the
  cellsdk versions of blas, numactl and oprofile and copy them into
  /tmp/cellsdk/openSrc >

cellsdk INFO-2027: Installing cellsdk versions of openSource rpms
Loading "installonlyn" plugin
```

```
Setting up Local Package Process
Examining /tmp/cellsdk/openSrc/blas-3.0-6.ppc64.rpm: blas - 3.0-6.ppc64
Examining /tmp/cellsdk/openSrc/numactl-0.9.10-1.ppc64.rpm:
      numactl - 0.9.10-1.ppc64
Examining /tmp/cellsdk/openSrc/numactl-devel-0.9.10-1.ppc64.rpm:
      numactl-devel - 0.9.10-1.ppc64
Examining /tmp/cellsdk/openSrc/blas-devel-3.0-6.ppc.rpm: blas-devel - 3.0-6.ppc
Examining /tmp/cellsdk/openSrc/blas-3.0-6.ppc.rpm: blas - 3.0-6.ppc
Examining /tmp/cellsdk/openSrc/numactl-devel-0.9.10-1.ppc.rpm:
      numactl-devel - 0.9.10-1.ppc
Examining /tmp/cellsdk/openSrc/blas-devel-3.0-6.ppc64.rpm: blas-devel - 3.0-6.ppc64
Examining /tmp/cellsdk/openSrc/numactl-0.9.10-1.ppc.rpm: numactl - 0.9.10-1.ppc
Marking /tmp/cellsdk/openSrc/blas-3.0-6.ppc64.rpm to be installed
Marking /tmp/cellsdk/openSrc/numactl-0.9.10-1.ppc64.rpm to be installed
Marking /tmp/cellsdk/openSrc/numactl-devel-0.9.10-1.ppc64.rpm to be installed
Marking /tmp/cellsdk/openSrc/blas-devel-3.0-6.ppc.rpm to be installed
Marking /tmp/cellsdk/openSrc/blas-3.0-6.ppc.rpm to be installed
Marking /tmp/cellsdk/openSrc/numactl-devel-0.9.10-1.ppc.rpm to be installed
Marking /tmp/cellsdk/openSrc/blas-devel-3.0-6.ppc64.rpm to be installed
Marking /tmp/cellsdk/openSrc/numactl-0.9.10-1.ppc.rpm to be installed
Resolving Dependencies
--> Running transaction check
---> Package numactl-devel.ppc64 0:0.9.10-1 set to be updated
---> Package blas-devel.ppc64 0:3.0-6 set to be updated
---> Package blas.ppc 0:3.0-6 set to be updated
---> Package blas-devel.ppc 0:3.0-6 set to be updated
---> Package numactl.ppc64 0:0.9.10-1 set to be updated
---> Package numactl-devel.ppc 0:0.9.10-1 set to be updated
---> Package blas.ppc64 0:3.0-6 set to be updated
---> Package numactl.ppc 0:0.9.10-1 set to be updated

Dependencies Resolved

=============================================================================
 Package                 Arch       Version          Repository        Size

=============================================================================
Installing:
 blas           ppc        3.0-6     /tmp/cellsdk/openSrc/blas-3.0-6.ppc.rpm
  1.3 M
 blas           ppc64      3.0-6     /tmp/cellsdk/openSrc/blas-3.0-6.ppc64.rpm
  1.4 M
 blas-devel     ppc64      3.0-6
        /tmp/cellsdk/openSrc/blas-devel-3.0-6.ppc64.rpm
  0.0
 blas-devel     ppc        3.0-6     /tmp/cellsdk/openSrc/blas-devel-3.0-6.ppc.rpm
  741 k
 numactl        ppc64      0.9.10-1
        /tmp/cellsdk/openSrc/numactl-0.9.10-1.ppc64.rpm
  180 k
 numactl        ppc        0.9.10-1  /tmp/cellsdk/openSrc/numactl-0.9.10-1.ppc.rpm
  186 k
 numactl-devel  ppc64      0.9.10-1
        /tmp/cellsdk/openSrc/numactl-devel-0.9.10-1.ppc64.rpm
  12 k
 numactl-devel  ppc        0.9.10-1
        /tmp/cellsdk/openSrc/numactl-devel-0.9.10-1.ppc.rpm
  12 k

Transaction Summary
=============================================================================
Install      8 Package(s)
Update       0 Package(s)
Remove       0 Package(s)

Total download size: 3.8 M
Downloading Packages:
```

```
Running Transaction Test
Finished Transaction Test
Transaction Test Succeeded
Running Transaction
   Installing: blas                          ######################### [1/8]
   Installing: numactl                       ######################### [2/8]
   Installing: numactl                       ######################### [3/8]
   Installing: numactl-devel                 ######################### [4/8]
   Installing: blas-devel                    ######################### [5/8]
   Installing: blas                          ######################### [6/8]
   Installing: blas-devel                    ######################### [7/8]
   Installing: numactl-devel                 ######################### [8/8]


Installed: blas.ppc 0:3.0-6 blas.ppc64 0:3.0-6 blas-devel.ppc64 0:3.0-6
blas-devel.ppc 0:3.0-6 numactl.ppc64 0:0.9.10-1 numactl.ppc 0:0.9.10-1
numactl-devel.ppc64 0:0.9.10-1 numactl-devel.ppc 0:0.9.10-1
Complete!
cellsdk INFO-2007: Please run '/opt/cell/cellsdk_sync_simulator install'
cellsdk INFO-2007: to install IBM-licensed rpms into the simulator.
```

Appendix C. cellsdk script SDK verify example

The following text is an example of the output produced on a PPC64 architecture Fedora 7 system:

The following output is a result of typing the command:

```
./cellsdk verify
```

Here is the output:

```
cellsdk logs to /var/log/cellsdk.log

repository=CellSDK-Devel-Fedora-ppc64
    default   CellDevelopmentLibraries  alf-devel-3.0.0-8.ppc
    default   CellDevelopmentLibraries  alf-devel-3.0.0-8.ppc64
    default   CellDevelopmentLibraries  alfman-3.0-4.noarch
    default   CellDevelopmentLibraries  blas-devel-3.0-6.ppc
    default   CellDevelopmentLibraries  blas-devel-3.0-6.ppc64
    default   CellDevelopmentLibraries  dacs-devel-3.0.0-18.ppc64
    default   CellDevelopmentLibraries  dacsman-3.0-4.noarch
    default   CellDevelopmentLibraries  libspe2man-2.2.0-4.noarch
    default   CellDevelopmentLibraries  ppu-mass-devel-4.5.0-9.ppc
    default   CellDevelopmentLibraries  ppu-mass-devel-4.5.0-9.ppc64
    default   CellDevelopmentLibraries  ppu-simdmath-devel-3.0-3.ppc
    default   CellDevelopmentLibraries  ppu-simdmath-devel-3.0-3.ppc64
    default   CellDevelopmentLibraries  simdman-3.0-4.noarch
    default   CellDevelopmentLibraries  spu-mass-devel-4.5.0-9.ppc
    default   CellDevelopmentLibraries  spu-simdmath-devel-3.0-3.ppc
    default   CellProgrammingExamples   alf-examples-source-3.0.0-6.noarch
    default   CellProgrammingExamples   cell-buildutils-3.0-10.noarch
    default   CellProgrammingExamples   cell-demos-3.0-8.ppc64
    default   CellProgrammingExamples   cell-demos-source-3.0-8.noarch
    default   CellProgrammingExamples   cell-examples-3.0-9.ppc64
    default   CellProgrammingExamples   cell-examples-source-3.0-9.noarch
    default   CellProgrammingExamples   cell-libs-3.0-15.ppc
    default   CellProgrammingExamples   cell-libs-3.0-15.ppc64
    default   CellProgrammingExamples   cell-libs-devel-3.0-15.ppc
    default   CellProgrammingExamples   cell-libs-devel-3.0-15.ppc64
    default   CellProgrammingExamples   cell-libs-source-3.0-15.noarch
    default   CellProgrammingExamples   cell-tutorial-3.0-4.ppc
    default   CellProgrammingExamples   cell-tutorial-source-3.0-4.noarch
    default   CellRuntimeEnvironment    alf-3.0.0-8.ppc
    default   CellRuntimeEnvironment    alf-3.0.0-8.ppc64
    default   CellRuntimeEnvironment    blas-3.0-6.ppc
    default   CellRuntimeEnvironment    blas-3.0-6.ppc64
    default   CellRuntimeEnvironment    dacs-3.0.0-18.ppc64
    default   CellRuntimeEnvironment    ppu-simdmath-3.0-3.ppc
    default   CellRuntimeEnvironment    ppu-simdmath-3.0-3.ppc64
    default   CellSimulator             systemsim-cell-3.0-14.ppc64
    mandatory CellDevelopmentLibraries  cell-documentation-3.0-3.noarch
    mandatory CellRuntimeEnvironment    cell-early-license-3.0.0-0.0.noarch
    optional  CellDevelopmentLibraries  alf-hybrid-devel not installed
    optional  CellDevelopmentLibraries  alf-hybrid-trace-devel not installed
    optional  CellDevelopmentLibraries  alf-trace-devel not installed
    optional  CellDevelopmentLibraries  cell-spu-isolation-devel not installed
    optional  CellDevelopmentLibraries  dacs-hybrid-devel not installed
    optional  CellDevelopmentLibraries  dacs-hybrid-trace-devel not installed
    optional  CellDevelopmentLibraries  dacs-trace-devel not installed
    optional  CellDevelopmentLibraries  libfft-devel not installed
    optional  CellDevelopmentLibraries  libmc-rand-devel not installed
    optional  CellDevelopmentLibraries  pdt-devel not installed
    optional  CellDevelopmentLibraries  spu-timer-devel not installed
```



```
    optional  CellDevelopmentLibraries  trace-devel not installed
    optional  CellDevelopmentTools      alf-ide-template not installed
    optional  CellDevelopmentTools      cellide not installed
    optional  CellDevelopmentTools      cell-spu-isolation-tool not installed
    optional  CellDevelopmentTools
        cell-spu-isolation-tool-source not installed
    optional  CellDevelopmentTools      cell-xlc-ssc-cmp not installed
    optional  CellDevelopmentTools      cell-xlc-ssc-help not installed
    optional  CellDevelopmentTools      cell-xlc-ssc-lib not installed
    optional  CellDevelopmentTools      cell-xlc-ssc-omp not installed
    optional  CellDevelopmentTools      cell-xlc-ssc-rte-lnk not installed
    optional  CellDevelopmentTools      cell-xlc-ssc-rte not installed
    optional  CellPerformanceTools      cell-spu-timing not installed
    optional  CellPerformanceTools      fdprpro not installed
    optional  CellPerformanceTools      pdt not installed
    optional  CellPerformanceTools      pdtr not installed
    optional  CellProgrammingExamples   alf-hybrid-examples-source not installed
    optional  CellProgrammingExamples   cell-compliance-tests not installed
    optional  CellProgrammingExamples   cell-compliance-tests-source not installed
    optional  CellProgrammingExamples
        cell-spu-isolation-emulated-samples not installed
    optional  CellProgrammingExamples   libfft-examples-source not installed
    optional  CellRuntimeEnvironment    alf-debuginfo not installed
    optional  CellRuntimeEnvironment    alf-hybrid not installed
    optional  CellRuntimeEnvironment    alf-hybrid-trace not installed
    optional  CellRuntimeEnvironment    alf-trace not installed
    optional  CellRuntimeEnvironment    cell-spu-isolation-loader not installed
    optional  CellRuntimeEnvironment    dacs-debuginfo not installed
    optional  CellRuntimeEnvironment    dacs-hybrid not installed
    optional  CellRuntimeEnvironment    dacs-hybrid-trace not installed
    optional  CellRuntimeEnvironment    dacs-trace not installed
    optional  CellRuntimeEnvironment    libfft not installed
    optional  CellRuntimeEnvironment    simdmath-debuginfo not installed

repository=CellSDK-Open-Fedora-ppc64
    default   CellDevelopmentLibraries  libspe2-devel-2.2.0-87.ppc
    default   CellDevelopmentLibraries  libspe2-devel-2.2.0-87.ppc64
    default   CellDevelopmentLibraries  numactl-devel-0.9.10-1.ppc
    default   CellDevelopmentLibraries  numactl-devel-0.9.10-1.ppc64
    default   CellDevelopmentTools      ppu-binutils-2.17.50-31.ppc
    default   CellDevelopmentTools      ppu-gcc-4.1.1-54.ppc
    default   CellDevelopmentTools      ppu-gcc-c++-4.1.1-54.ppc
    default   CellDevelopmentTools      ppu-gdb-6.6.50-23.ppc
    default   CellDevelopmentTools      spu-binutils-2.17.50-31.ppc
    default   CellDevelopmentTools      spu-gcc-4.1.1-100.ppc
    default   CellDevelopmentTools      spu-gcc-c++-4.1.1-100.ppc
    default   CellDevelopmentTools      spu-gdb-6.6.50-10.ppc
    default   CellDevelopmentTools      spu-newlib-1.15.0-76.ppc
    default   CellRuntimeEnvironment    numactl-0.9.10-1.ppc
    default   CellRuntimeEnvironment    numactl-0.9.10-1.ppc64
    default   CellSimulator             sysroot_image-3.0-7.noarch
    mandatory CellRuntimeEnvironment    libspe-1.2.2-2.ppc
    mandatory CellRuntimeEnvironment    libspe-1.2.2-2.ppc64
    mandatory CellRuntimeEnvironment    libspe2-2.2.0-87.ppc
    mandatory CellRuntimeEnvironment    libspe2-2.2.0-87.ppc64
    optional  CellDevelopmentLibraries  libspe2-adabinding-devel not installed
    optional  CellDevelopmentTools      ppu-binutils-debuginfo not installed
    optional  CellDevelopmentTools      ppu-gcc-debuginfo not installed
    optional  CellDevelopmentTools      ppu-gcc-fortran not installed
    optional  CellDevelopmentTools      ppu-gcc-gnat not installed
    optional  CellDevelopmentTools      ppu-gdb-debuginfo not installed
    optional  CellDevelopmentTools      spu-binutils-debuginfo not installed
    optional  CellDevelopmentTools      spu-gcc-debuginfo not installed
    optional  CellDevelopmentTools      spu-gcc-fortran not installed
    optional  CellDevelopmentTools      spu-gdb-debuginfo not installed
    optional  CellDevelopmentTools      spu-newlib-debuginfo not installed
    optional  CellDevelopmentTools      spu-tools-debuginfo not installed
```

```
optional  CellDevelopmentTools      spu-tools not installed
optional  CellRuntimeEnvironment    libspe2-debuginfo not installed
optional  CellRuntimeEnvironment    libspe-debuginfo not installed
```

Appendix D. cellsdk script SDK uninstallation example

This is an example of using the cellsdk script to uninstall the SDK.

The following output is the result of typing the commands:

```
cd /opt/cell
./cellsdk --iso /tmp/cellsdkiso uninstall
```

Here is the output:

```
cellsdk logs to /var/log/cellsdk.log
cellsdk INFO-2019: yum groupremove  'Cell Runtime Environment'
 'Cell Development Tools' 'Cell Development Libraries'
 'Cell Programming Examples' 'Cell Simulator''Cell Performance Tools'
Setting up Group Process
Resolving Dependencies
--> Running transaction check
---> Package systemsim-cell.ppc64 0:3.0-14 set to be erased
---> Package alfman.noarch 0:3.0-4 set to be erased
---> Package cell-buildutils.noarch 0:3.0-10 set to be erased
---> Package ppu-simdmath.ppc64 0:3.0-3 set to be erased
---> Package cell-early-license.noarch 0:3.0.0-0.0 set to be erased
---> Package libspe2-devel.ppc 0:2.2.0-87 set to be erased
---> Package cell-demos.ppc64 0:3.0-8 set to be erased
---> Package dacs-devel.ppc64 0:3.0.0-18 set to be erased
---> Package cell-tutorial-source.noarch 0:3.0-4 set to be erased
---> Package libspe2.ppc64 0:2.2.0-87 set to be erased
---> Package ppu-simdmath-devel.ppc 0:3.0-3 set to be erased
---> Package cell-libs-devel.ppc 0:3.0-15 set to be erased
---> Package dacsman.noarch 0:3.0-4 set to be erased
---> Package libspe2man.noarch 0:2.2.0-4 set to be erased
---> Package cell-libs.ppc64 0:3.0-15 set to be erased
---> Package cell-libs-devel.ppc64 0:3.0-15 set to be erased
---> Package cell-documentation.noarch 0:3.0-3 set to be erased
---> Package ppu-simdmath-devel.ppc64 0:3.0-3 set to be erased
---> Package libspe2-devel.ppc64 0:2.2.0-87 set to be erased
---> Package cell-demos-source.noarch 0:3.0-8 set to be erased
---> Package sysroot_image.noarch 0:3.0-7 set to be erased
---> Package blas.ppc 0:3.1.1-1.fc7 set to be erased
---> Package cell-libs.ppc 0:3.0-15 set to be erased
---> Package libspe.ppc 0:1.2.2-2 set to be erased
---> Package ppu-mass-devel.ppc 0:4.5.0-9 set to be erased
---> Package dacs.ppc64 0:3.0.0-18 set to be erased
---> Package spu-simdmath-devel.ppc 0:3.0-3 set to be erased
---> Package spu-gcc-c++.ppc 0:4.1.1-100 set to be erased
---> Package alf-devel.ppc64 0:3.0.0-8 set to be erased
---> Package ppu-binutils.ppc 0:2.17.50-31 set to be erased
---> Package ppu-gdb.ppc 0:6.6.50-23 set to be erased
---> Package simdman.noarch 0:3.0-4 set to be erased
---> Package spu-newlib.ppc 0:1.15.0-76 set to be erased
---> Package ppu-mass-devel.ppc64 0:4.5.0-9 set to be erased
---> Package libspe.ppc64 0:1.2.2-2 set to be erased
---> Package ppu-gcc.ppc 0:4.1.1-54 set to be erased
---> Package spu-gdb.ppc 0:6.6.50-10 set to be erased
---> Package spu-gcc.ppc 0:4.1.1-100 set to be erased
---> Package spu-binutils.ppc 0:2.17.50-31 set to be erased
---> Package cell-libs-source.noarch 0:3.0-15 set to be erased
---> Package cell-examples.ppc64 0:3.0-9 set to be erased
---> Package spu-mass-devel.ppc 0:4.5.0-9 set to be erased
---> Package alf-examples-source.noarch 0:3.0.0-6 set to be erased
---> Package alf-devel.ppc 0:3.0.0-8 set to be erased
---> Package ppu-gcc-c++.ppc 0:4.1.1-54 set to be erased
```

```
---> Package ppu-simdmath.ppc 0:3.0-3 set to be erased
---> Package cell-tutorial.ppc 0:3.0-4 set to be erased
---> Package alf.ppc 0:3.0.0-8 set to be erased
---> Package libspe2.ppc 0:2.2.0-87 set to be erased
---> Package alf.ppc64 0:3.0.0-8 set to be erased
---> Package cell-examples-source.noarch 0:3.0-9 set to be erased

Dependencies Resolved

=============================================================================
 Package                 Arch       Version          Repository        Size
=============================================================================
Removing:
 alf                     ppc        3.0.0-8          installed          71 k
 alf                     ppc64      3.0.0-8          installed          96 k
 alf-devel               ppc64      3.0.0-8          installed         136 k
 alf-devel               ppc        3.0.0-8          installed         366 k
 alf-examples-source     noarch     3.0.0-6          installed         1.4 M
 alfman                  noarch     3.0-4            installed          32 k
 blas                    ppc        3.1.1-1.fc7      installed         673 k
 cell-buildutils         noarch     3.0-10           installed          76 k
 cell-demos              ppc64      3.0-8            installed          19 M
 cell-demos-source       noarch     3.0-8            installed          19 M
 cell-documentation      noarch     3.0-3            installed          46 M
 cell-early-license      noarch     3.0.0-0.0        installed         949 k
 cell-examples           ppc64      3.0-9            installed         1.4 M
 cell-examples-source    noarch     3.0-9            installed         1.1 M
 cell-libs               ppc64      3.0-15           installed          20 k
 cell-libs               ppc        3.0-15           installed         172 k
 cell-libs-devel         ppc        3.0-15           installed         2.5 M
 cell-libs-devel         ppc64      3.0-15           installed         540 k
 cell-libs-source        noarch     3.0-15           installed         1.5 M
 cell-tutorial           ppc        3.0-4            installed         145 k
 cell-tutorial-source    noarch     3.0-4            installed          80 k
 dacs                    ppc64      3.0.0-18         installed          67 k
 dacs-devel              ppc64      3.0.0-18         installed         597 k
 dacsman                 noarch     3.0-4            installed          47 k
 libspe                  ppc        1.2.2-2          installed          78 k
 libspe                  ppc64      1.2.2-2          installed          96 k
 libspe2                 ppc64      2.2.0-87         installed         109 k
 libspe2                 ppc        2.2.0-87         installed          86 k
 libspe2-devel           ppc        2.2.0-87         installed          18 k
 libspe2-devel           ppc64      2.2.0-87         installed          18 k
 libspe2man              noarch     2.2.0-4          installed          43 k
 ppu-binutils            ppc        2.17.50-31       installed          19 M
 ppu-gcc                 ppc        4.1.1-54         installed          12 M
 ppu-gcc-c++             ppc        4.1.1-54         installed          97 M
 ppu-gdb                 ppc        6.6.50-23        installed         7.9 M
 ppu-mass-devel          ppc        4.5.0-9          installed         556 k
 ppu-mass-devel          ppc64      4.5.0-9          installed         669 k
 ppu-simdmath            ppc64      3.0-3            installed         190 k
 ppu-simdmath            ppc        3.0-3            installed         156 k
 ppu-simdmath-devel      ppc        3.0-3            installed         623 k
 ppu-simdmath-devel      ppc64      3.0-3            installed         707 k
 simdman                 noarch     3.0-4            installed         125 k
 spu-binutils            ppc        2.17.50-31       installed         6.9 M
 spu-gcc                 ppc        4.1.1-100        installed         7.0 M
 spu-gcc-c++             ppc        4.1.1-100        installed          60 M
 spu-gdb                 ppc        6.6.50-10        installed         5.1 M
 spu-mass-devel          ppc        4.5.0-9          installed         412 k
 spu-newlib              ppc        1.15.0-76        installed         4.8 M
 spu-simdmath-devel      ppc        3.0-3            installed         1.0 M
 sysroot_image           noarch     3.0-7            installed         1.8 G
 systemsim-cell          ppc64      3.0-14           installed          13 M

Transaction Summary
=============================================================================
```

```
Install      0 Package(s)
Update       0 Package(s)
Remove      51 Package(s)

Is this ok [y/N]: Downloading Packages:
Running rpm_check_debug
--> Populating transaction set with selected packages. Please wait.
---> Package systemsim-cell.ppc64 0:3.0-14 set to be erased
---> Package alfman.noarch 0:3.0-4 set to be erased
---> Package cell-buildutils.noarch 0:3.0-10 set to be erased
---> Package ppu-simdmath.ppc64 0:3.0-3 set to be erased
---> Package cell-early-license.noarch 0:3.0.0-0.0 set to be erased
---> Package libspe2-devel.ppc 0:2.2.0-87 set to be erased
---> Package cell-demos.ppc64 0:3.0-8 set to be erased
---> Package dacs-devel.ppc64 0:3.0.0-18 set to be erased
---> Package cell-tutorial-source.noarch 0:3.0-4 set to be erased
---> Package libspe2.ppc64 0:2.2.0-87 set to be erased
---> Package ppu-simdmath-devel.ppc 0:3.0-3 set to be erased
---> Package cell-libs-devel.ppc 0:3.0-15 set to be erased
---> Package dacsman.noarch 0:3.0-4 set to be erased
---> Package libspe2man.noarch 0:2.2.0-4 set to be erased
---> Package cell-libs.ppc64 0:3.0-15 set to be erased
---> Package cell-libs-devel.ppc64 0:3.0-15 set to be erased
---> Package cell-documentation.noarch 0:3.0-3 set to be erased
---> Package ppu-simdmath-devel.ppc64 0:3.0-3 set to be erased
---> Package libspe2-devel.ppc64 0:2.2.0-87 set to be erased
---> Package cell-demos-source.noarch 0:3.0-8 set to be erased
---> Package sysroot_image.noarch 0:3.0-7 set to be erased
---> Package blas.ppc 0:3.1.1-1.fc7 set to be erased
---> Package cell-libs.ppc 0:3.0-15 set to be erased
---> Package libspe.ppc 0:1.2.2-2 set to be erased
---> Package ppu-mass-devel.ppc 0:4.5.0-9 set to be erased
---> Package dacs.ppc64 0:3.0.0-18 set to be erased
---> Package spu-simdmath-devel.ppc 0:3.0-3 set to be erased
---> Package spu-gcc-c++.ppc 0:4.1.1-100 set to be erased
---> Package alf-devel.ppc64 0:3.0.0-8 set to be erased
---> Package ppu-binutils.ppc 0:2.17.50-31 set to be erased
---> Package ppu-gdb.ppc 0:6.6.50-23 set to be erased
---> Package simdman.noarch 0:3.0-4 set to be erased
---> Package spu-newlib.ppc 0:1.15.0-76 set to be erased
---> Package ppu-mass-devel.ppc64 0:4.5.0-9 set to be erased
---> Package libspe.ppc64 0:1.2.2-2 set to be erased
---> Package ppu-gcc.ppc 0:4.1.1-54 set to be erased
---> Package spu-gdb.ppc 0:6.6.50-10 set to be erased
---> Package spu-gcc.ppc 0:4.1.1-100 set to be erased
---> Package spu-binutils.ppc 0:2.17.50-31 set to be erased
---> Package cell-libs-source.noarch 0:3.0-15 set to be erased
---> Package cell-examples.ppc64 0:3.0-9 set to be erased
---> Package spu-mass-devel.ppc 0:4.5.0-9 set to be erased
---> Package alf-examples-source.noarch 0:3.0.0-6 set to be erased
---> Package alf-devel.ppc 0:3.0.0-8 set to be erased
---> Package ppu-gcc-c++.ppc 0:4.1.1-54 set to be erased
---> Package ppu-simdmath.ppc 0:3.0-3 set to be erased
---> Package cell-tutorial.ppc 0:3.0-4 set to be erased
---> Package alf.ppc 0:3.0.0-8 set to be erased
---> Package libspe2.ppc 0:2.2.0-87 set to be erased
---> Package alf.ppc64 0:3.0.0-8 set to be erased
---> Package cell-examples-source.noarch 0:3.0-9 set to be erased
Running Transaction Test
Finished Transaction Test
Transaction Test Succeeded
Running Transaction
rm: cannot remove `/etc/udev/rules.d/99-systemsim-cell.rules':
 No such file or directory
error: %preun(systemsim-cell-3.0-14.ppc64) scriptlet failed, exit status 1

Removed: alf.ppc 0:3.0.0-8 alf.ppc64 0:3.0.0-8 alf-devel.ppc64 0:3.0.0-8
```

```
 alf-devel.ppc 0:3.0.0-8 alf-examples-source.noarch 0:3.0.0-6
 alfman.noarch 0:3.0-4 blas.ppc 0:3.1.1-1.fc7 cell-buildutils.noarch 0:3.0-10
 cell-demos.ppc64 0:3.0-8 cell-demos-source.noarch 0:3.0-8
 cell-documentation.noarch 0:3.0-3 cell-early-license.noarch 0:3.0.0-0.0
 cell-examples.ppc64 0:3.0-9 cell-examples-source.noarch 0:3.0-9
 cell-libs.ppc64 0:3.0-15 cell-libs.ppc 0:3.0-15 cell-libs-devel.ppc 0:3.0-15
 cell-libs-devel.ppc64 0:3.0-15 cell-libs-source.noarch 0:3.0-15
 cell-tutorial.ppc 0:3.0-4 cell-tutorial-source.noarch 0:3.0-4
 dacs.ppc64 0:3.0.0-18 dacs-devel.ppc64 0:3.0.0-18 dacsman.noarch 0:3.0-4
 libspe.ppc 0:1.2.2-2 libspe.ppc64 0:1.2.2-2
 libspe2.ppc64 0:2.2.0-87 libspe2.ppc 0:2.2.0-87 libspe2-devel.ppc 0:2.2.0-87
 libspe2-devel.ppc64 0:2.2.0-87 libspe2man.noarch 0:2.2.0-4
 ppu-binutils.ppc 0:2.17.50-31 ppu-gcc.ppc 0:4.1.1-54 ppu-gcc-c++.ppc 0:4.1.1-54
 ppu-gdb.ppc 0:6.6.50-23 ppu-mass-devel.ppc 0:4.5.0-9
 ppu-mass-devel.ppc64 0:4.5.0-9 ppu-simdmath.ppc64 0:3.0-3
 ppu-simdmath.ppc 0:3.0-3 ppu-simdmath-devel.ppc 0:3.0-3
 ppu-simdmath-devel.ppc64 0:3.0-3 simdman.noarch 0:3.0-4
 spu-binutils.ppc 0:2.17.50-31 spu-gcc.ppc 0:4.1.1-100
 spu-gcc-c++.ppc 0:4.1.1-100 spu-gdb.ppc 0:6.6.50-10
 spu-mass-devel.ppc 0:4.5.0-9 spu-newlib.ppc 0:1.15.0-76
 spu-simdmath-devel.ppc 0:3.0-3 sysroot_image.noarch 0:3.0-7
 systemsim-cell.ppc64 0:3.0-14
Complete!
cellsdk INFO-2009: looking for still-installed cellsdk rpms
installedCount=1
There are 1 cellsdk rpms still installed:
    default   CellSimulator             systemsim-cell-3.0-14.ppc64
Uninstall them [y/n]?Setting up Group Process
Resolving Dependencies
--> Running transaction check
---> Package systemsim-cell.ppc64 0:3.0-14 set to be erased

Dependencies Resolved

=============================================================================
 Package                 Arch       Version          Repository        Size
=============================================================================
Removing:
 systemsim-cell          ppc64      3.0-14           installed          13 M

Transaction Summary
=============================================================================
Install      0 Package(s)
Update       0 Package(s)
Remove       1 Package(s)

Downloading Packages:
Running rpm_check_debug
--> Populating transaction set with selected packages. Please wait.
---> Package systemsim-cell.ppc64 0:3.0-14 set to be erased
Running Transaction Test
Finished Transaction Test
Transaction Test Succeeded
Running Transaction
rm: cannot remove `/etc/udev/rules.d/99-systemsim-cell.rules':
 No such file or directory
error: %preun(systemsim-cell-3.0-14.ppc64) scriptlet failed, exit status 1

Removed: systemsim-cell.ppc64 0:3.0-14
Complete!

Completely remove cellsdk from the system [y/n]?
If you have files in the /opt/cell you want to keep, answer no.
Completely remove /opt/cell [y/n]?
If you have files in the /opt/ibm/systemsim you want to keep, answer no.
Completely remove /opt/ibm/systemsim [y/n]?
If you have files in the /tmp/cellsdk/rpms you want to keep, answer no.
```

```
Completely remove /tmp/cellsdk/rpms [y/n]?
If you have files in the /tmp/cellsdk/openSrc you want to keep, answer no.
Completely remove /tmp/cellsdk/openSrc [y/n]?
```

Appendix E. Known limitations

There are a number of known limitations with this early release of SDK 3.0. These are documented in the following installed file: /opt/cell/sdk/doc/README

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Related documentation

This topic helps you find related information.

Document location

Links to documentation for the SDK are provided on the developerWorks Web site located at:

`http://www-128.ibm.com/developerworks/power/cell/`

Click on the **Docs** tab.

The following documents are available, organized by category:

Architecture

- *Cell Broadband Engine Architecture*
- *Cell Broadband Engine Registers*
- *SPU Instruction Set Architecture*

Standards

- *C/C++ Language Extensions for Cell Broadband Engine Architecture*
- *SPU Assembly Language Specification*
- *SPU Application Binary Interface Specification*
- *SIMD Math Library Specification for Cell Broadband Engine Architecture*
- *Cell Broadband Engine Linux Reference Implementation Application Binary Interface Specification*

Programming

- *Cell Broadband Engine Programming Handbook*
- *Programming Tutorial*
- *SDK for Multicore Acceleration Version 3.0 Programmer's Guide*

Library

- *SPE Runtime Management library*
- *SPE Runtime Management library Version 1.2 to Version 2.0 Migration Guide*
- *Accelerated Library Framework for Cell Programmer's Guide and API Reference*
- *Accelerated Library Framework for Hybrid-x86 Programmer's Guide and API Reference*
- *Data Communication and Synchronization for Cell Programmer's Guide and API Reference*
- *Data Communication and Synchronization for Hybrid-x86 Programmer's Guide and API Reference*
- *SIMD Math Library Specification*
- *Monte Carlo Library API Reference Manual (Prototype)*

Installation

- *SDK for Multicore Acceleration Version 3.0 Installation Guide*

IBM XL C/C++ Compiler and IBM XL Fortran Compiler

Detail about documentation for the compilers is available on the developerWorks Web site.

IBM Full-System Simulator and debugging documentation

Detail about documentation for the simulator and debugging tools is available on the developerWorks Web site.

PowerPC Base

- *PowerPC Architecture Book, Version 2.02*
  - *Book I: PowerPC User Instruction Set Architecture*
  - *Book II: PowerPC Virtual Environment Architecture*
  - *Book III: PowerPC Operating Environment Architecture*
- *PowerPC Microprocessor Family: Vector/SIMD Multimedia Extension Technology Programming Environments Manual Version 2.07c*

Glossary

This glossary provides definitions for terms included in the *SDK Installation Guide*.

ALF

Accelerated Library Framework. This an API that provides a set of services to help programmers solving data parallel problems on a hybrid system. ALF supports the multiple-program-multiple-data (MPMD) programming style where multiple programs can be scheduled to run on multiple accelerator elements at the same time. ALF offers programmers an interface to partition data across a set of parallel processes without requiring architecturally-dependent code.

Barcelona Supercomputing Center

Spanish National Supercomputing Center, supporting Bladecenter and Linux on cell.

BE

Broadband Engine.

BOOTP

Bootstrap Protocol. A UDP network protocol used by a network client to obtain its IP address automatically. Replaced in many networks by DHCP.

Broadband Engine

See *CBEA*.

CBEA

Cell Broadband Engine Architecture. A new architecture that extends the 64-bit PowerPC Architecture. The CBEA and the Cell Broadband Engine are the result of a collaboration between Sony, Toshiba, and IBM, known as STI, formally started in early 2001.

Cell BE processor

The Cell BE processor is a multi-core broadband processor based on IBM's Power Architecture.

Cell Broadband Engine processor

See *Cell BE*.

DaCS

The Data Communication and Synchronization (DaCS) library provides functions that focus on process management, data movement, data synchronization, process synchronization, and error handling for processes within a hybrid system.

DaCS Element

A general or special purpose processing element in a topology. This refers specifically to the physical unit in the topology. A DE can serve as a Host or an Accelerator.

DHCP

Dynamic Host Configuration Protocol. Similar to BOOTP, DHCP is a protocol for assigning IP addresses to client devices on a network.

FDPR-Pro

Feedback Directed Program Restructuring. A feedback-based post-link optimization tool.

Fedora

Fedora is an operating system built from open source and free software. Fedora is free for anyone to use, modify, or distribute. For more information about Fedora and the Fedora Project, see the following Web site: http://fedoraproject.org/.

firmware

A set of instructions contained in ROM usually used to enable peripheral devices at boot.

GNU

GNU is Not Unix. A project to develop free Unix-like operating systems such as Linux.

GPL

GNU General Public License. Guarantees freedom to share, change and distribute free software.

GUI

Graphical User Interface. User interface for interacting with a computer which employs graphical images and widgets in addition to text to represent the information and actions available to the user. Usually the actions are performed through direct manipulation of the graphical elements.

host

A general purpose processing element in a hybrid system. A host can have multiple accelerators attached to it. This is often referred to as the master node in a cluster collective.

HTTP

Hypertext Transfer Protocol. A method used to transfer or convey information on the World Wide Web.

Hybrid

A module comprised of two Cell BE cards connected via an AMD Opteron processor.

hypervisor

A control (or virtualization) layer between hardware and the operating system. It allocates resources, reserves resources, and protects resources among (for example) sets of SPEs that may be running under different operating systems. The Cell Broadband Engine has three operating modes: user, supervisor and hypervisor. The hypervisor performs a meta-supervisor role that allows multiple independent supervisors' software to run on the same hardware platform. For example, the hypervisor allows both a real-time operating system and a traditional operating system to run on a single PPE. The PPE can then operate a subset of the SPEs in the Cell Broadband Engine with the realtime operating system, while the other SPEs run under the traditional operating system.

IDE

Integrated Development Environment. Integrates the Cell/B.E. GNU tool chain, compilers, the Full-System Simulator, and other development components to provide a comprehensive, Eclipse-based development platform that simplifies Cell/B.E. development.

initrd

A command file read at boot

ISO image

Commonly a disk image which can be burnt to CD. Technically it is a disk image of and ISO 9660 file system.

kernel

The core of an operating which provides services for other parts of the operating system and provides multitasking. In Linux or UNIX operating system, the kernel can easily be rebuilt to incorporate enhancements which then become operating-system wide.

LGPL

Lesser General Public License. Similar to the *GPL*, but does less to protect the user's freedom.

Makefile

A descriptive file used by the `make`command in which the user specifies: (a) target program or library, (b) rules about how the target is to be built, (c) dependencies which, if updated, require that the target be rebuilt.

netboot

Command to boot a device from another on the same network. Requires a TFTP server.

NUMA

Non-uniform memory access. In a multiprocessing system such as the Cell/B.E., memory is configured so that it can be shared locally, thus giving performance benefits.

Oprofile

A tool for profiling user and kernel level code. It uses the hardware performance counters to sample the program counter every N events.

PDF

Portable document format.

PPC

See *Power PC*.

PPC-64

64 bit implementation of the *PowerPC Architecture*.

proxy

Allows many network devices to connect to the internet using a single IP address. Usually a single server, often acting as a firewall, connects to the internet behind which other network devices connect using the IP address of that server.

RPM

Originally an acronym for Red Hat Package Manager, and RPM file is a packaging format for one or more files used by many Linux systems when installing software programs.

SDK

Software development toolkit. A complete package of tools for application development. The Cell/B.E. SDK includes sample software for the Cell Broadband Engine.

SIMD

Single Instruction Multiple Data. Processing in which a single instruction operates on multiple data elements that make up a vector data-type. Also known as vector processing. This style of programming implements data-level parallelism.

SMP

Symmetric Multiprocessing. This is a multiprocessor computer architecture where two or more identical processors are connected to a single shared main memory.

Tcl

Tool Command Language. An interpreted script language used to develop GUIs, application prototypes, Common Gateway Interface (CGI) scripts, and other scripts. Used as the command language for the Full System Simulator.

TFTP

Trivial File Transfer Protocol. Similar to, but simpler than the Transfer Protocol (FTP) but less capable. Uses UDP as its transport mechanism.

topology

A topology is a configuration of DaCS elements in a system. The topology specifies how the different processing elements in a system are related to each other. DaCS assumes a tree topology: each DE has at most one parent.

x86

Generic name for Intel-based processors.

yaboot

Linux utility which is a boot loader for PowerPC-based hardware.

yum

Yellow dog Updater, Modified. A package manager for RPM-compatible Linux systems.

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