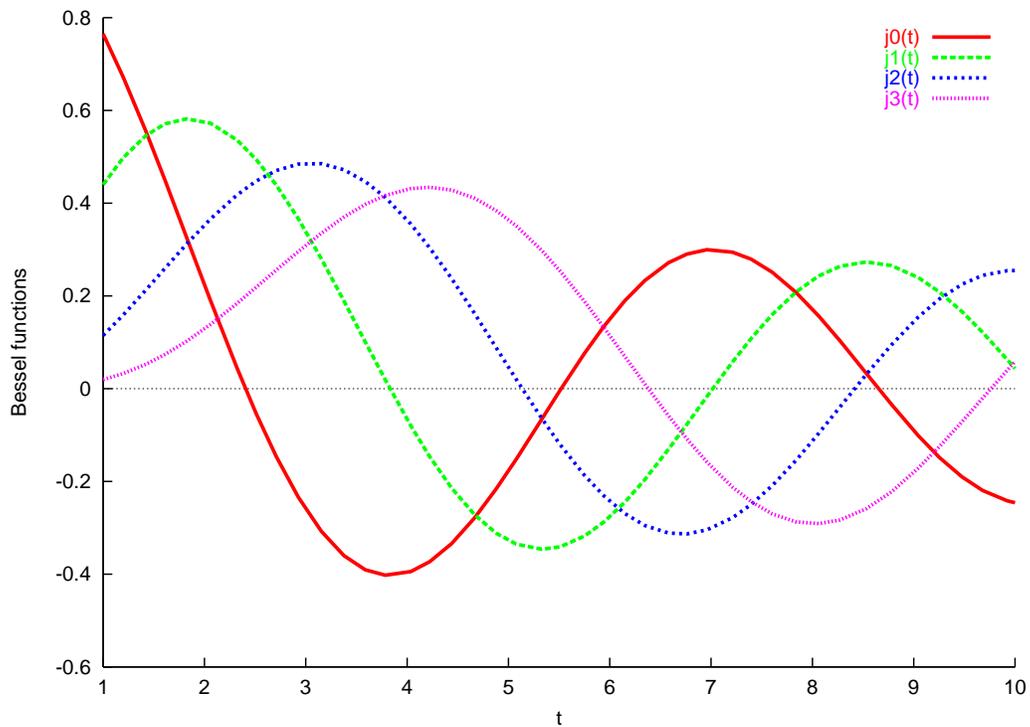


The Ch Language Environment

Version 8.0

Installation and System Administration Guide



How to Contact SoftIntegration

Mail SoftIntegration, Inc.
216 F Street, #68
Davis, CA 95616
Phone + 1 530 297 7398
Fax + 1 530 297 7392
Web <http://www.softintegration.com>
Email info@softintegration.com

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Revision 8.0.0, November 24 2016

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Chapter 1

Introduction

1.1 Welcome to Ch

Ch (pronounced C H) is a C-compatible cross-platform language environment. Ch is also a C virtual machine and a superset of C interpreter with salient features from C++, other languages and software packages. Ch provides an elegant way for programmers, system administrators, system integrators, engineers, scientists, etc. to leverage their C/C++ programming language skills. With Ch, one can develop almost anything from simple scripts to large-scale programs based on the software design of C/C++.

1.2 Who Should Use This Document?

This manual is intended for system administrators and Web masters who install software and configure system setups of Ch. After installation, sample Ch programs and Ch CGI scripts can be tested. This manual is also useful for Ch users who want to gain a further understanding of how Ch is installed and setup. Following instructions in this documentation, experienced C/C++ programmers or computer users can quickly get started using Ch.

Chapter 2

System Requirements

This chapter describes the system requirement in both Windows and Unix for installation.

2.1 System Requirement for Windows 32 bit

To install and use Ch for Windows 32 bit, the following minimum requirements should be met:

- Operating System: Windows 2000/XP/Vista/7/8/10
- CPU: with a 486 or higher microprocessor
- Memory: a minimum of 16 Mb RAM
- Disk Space: 120 Mb for Ch Professional Edition, and 120 Mb for Student Edition.

2.2 System Requirement for Windows 64 bit

To install and use Ch for Windows 64 bit, the following minimum requirements should be met:

- Operating System: Windows XP/Vista/7/8/10
- CPU: with a 486 or higher microprocessor
- Memory: a minimum of 16 Mb RAM
- Disk Space: 120 Mb for Ch Professional Edition, and 160 Mb for Student Edition.

2.3 System Requirement for Unix

For Unix, the supported Operating System is

- Intel Linux 2.4.20-8 or above
- Sparc Solaris 2.6 or above
- HP-UX 10.20 or above
- FreeBSD 9.0 or above

- QNX 6.2.1 or above
- AIX 6.1 or above

The hardware requirement for the Intel Linux platform is

- Pentium/90Mhz or above
- A minimum of 16 Megabytes of RAM
- Disk Space Requirement. 30 Mb for Ch Professional and Student Editions,

2.4 System Requirement for Mac OS X

2.4.1 System Requirement for Mac OS X x86

To install and use Ch for Mac OS X x86, the following minimum requirements should be met:

- Operating System: Mac OS X 10.6 (Darwin 9.2.1) or above
- CPU: Intel x86
- Memory: a minimum of 16 Megabytes of RAM
- Disk Space: 63 Mb for Ch Professional and Student Editions,

2.4.2 System Requirement for Mac OS X PPC

To install and use Ch for Mac OS X PPC, the following minimum requirements should be met:

- Operating System: Mac OS X 10.3 or above
- CPU: PowerPC
- Memory: a minimum of 16 Megabytes of RAM
- Disk Space: 30 Mb for Ch Professional and Student Editions,

Chapter 3

Install Ch in Windows

Before starting the installation, close all running applications. If you have installed an older version or a beta version of Ch before, uninstall it off the system first. You may want to backup the configuration files in directory **CHHOME/config** before installation. **Note that CHHOME is not the string “CHHOME”.** Rather, it is the Windows filesystem path under which Ch is installed. For instance use **C:\Ch** for CHHOME in Windows.

3.1 Install Ch from a Downloaded File

You need to have the system administrator privilege for installing **Ch** into the Windows 2000/XP or above.

1. Download the self-extracting file such as **chprofessional-8.0.0.exe** for Ch version 8.0 from the Soft-Integration website.
2. From Windows Explorer, navigate to the directory; then, double-click the **chprofessional-8.0.0.exe** file.
3. To complete installation, just follow the prompted instructions. When prompted, choose a directory for installation. It is recommended to use the default setting such as using **C:\Ch** as the home directory for Ch.

3.2 Install Ch from a CD

To start the installation process from a CD:

1. Login to the computer with an Administrator privilege under Windows 2000/XP or above.
2. Insert the Ch setup CD into the CD-ROM drive.
3. On Windows 2000/XP or above, the setup process starts automatically if AutoPlay for CDs is enabled. Click **Next** to continue.
If AutoPlay for CDs is not enabled, use Windows Explorer to navigate from the root directory of the CD. Then, double-click the **Setup.exe** file.
4. Read and accept the SoftIntegration license agreement.
5. Enter the product Key (if required)

3.3. GET A VALID LICENSE FOR CH PROFESSIONAL EDITION

6. Accept default folder names.
7. Accept the typical installation and press `Next`
8. Follow the instructions of the setup program to install Ch on your computer.
9. Click `Finish` to complete the installation

Note: You are able to quit the installation at any time by pressing the `<Cancel>` button displayed in every dialog box during the installation. You can also move back and forth to review your settings by clicking the `<Back>` and `<Next>` buttons.

3.3 Get a Valid License for Ch Professional Edition

The installed Ch Professional Edition will run for 40 days by default. It will give you an alert 20 days before expiration for the first time installation. For renewing the license, it will give you an alert 65 days before expiration. If you use a floating license, you can have a roaming license for up to 21 days with your computer not connected to the internet with the license server. You can start a Ch Command Shell or run a Ch program to check out a valid roaming license.

There are two methods to get a valid license for Ch Professional Edition. The first method is through an activation program. In this case, your computer needs to be connected to the internet and you should have a valid activation code from SoftIntegration or our reseller. The second method is through a license file.

3.3.1 Get a Valid License for Ch Professional Edition Through On-Line Activation

To activate a license for Ch Professional Edition, follow the instruction below.

1. For Windows XP and Windows 7, click the command `Start->All Programs->SoftIntegration Ch Professional->License Activation`.
2. For Windows 10, left click the lower left corner to bring up the Windows 10 user interface. Hold the left button and scroll down to find `SoftIntegration Ch Professional`, then click `License Activation`.

It will bring up the graphical user interface for license activation shown in Figure 3.1. Then, enter an activation key, in the format of `xxxx-xxxx-xxxx-xxxx`, from SoftIntegration or our reseller into the entry for *Activation Key*. Next, click the button *Activate* to activate the license.



Figure 3.1: The graphical interface for license activation.

3.4. UNINSTALL CH

3.3.2 Get a Valid License for Ch Professional Edition Through a License File

The hostid for your computer is needed to issue a valid license file to you. Follow the instructions below to get the hostid of your computer and valid license.

1. On your desktop, click the icon Ch in the red color. A Ch command shell will be launched.
2. At the prompt of the launched Ch command shell, type the following command to get the hostid of your computer.

```
C:\> rlmutil rlmhostid -q ether
00248cbf7c1e
```

3. Send the hostid of your computer, such as 00248cbf7c1e, displayed in the above command, information about your platform (such as Windows 32 bit or 64 bit, Linux 32 bit or 64-bit, or Mac OS X 32 bit or 64 bit), and the invoice number of the product to support@softintegration.com or our reseller. Then, a valid license will be sent to you.

3.4 Uninstall Ch

Stop all the Ch programs.

Click **Control Panel** in **My Computer**. Click **Add/Remove Programs**, select **SoftIntegration Ch xxx Edition 8.0** for Ch version 8.0, where xxx can be Professional, Standard, Student, then Click **Add/Remove ...**. Press **Yes** if you are asked to completely remove Ch and all of its components.

Delete the start up file **_chrc** or **_chsrc** file in **C:\>** or your home directory. For Windows 2000/XP or above, you need to remove the environment variable settings for Ch. Click **Start, Settings, Control Panel, System, Environment**, select the environment variable **PATHEXT**, and delete the added pathext **.ch**.

Chapter 4

System Administration and Getting Started in Windows

This chapter addresses the setup, system administration, and startup of Ch in Windows 2000/XP or above.

4.1 Windows Environment Settings

This section explains how the environment variables are set, and what changes you can make if you want to.

In general, Ch installation will take care of any path or configuration settings, and you can ignore this section if you are not interested in how the environment settings are done in Windows.

Ch will create and set CHHOME in its registry upon installation. CHHOME is the directory where Ch is installed. For Ch Standard and professional edition, the default CHHOME value is C:\Ch.

The path CHHOME\bin will be added to the environment variable PATH for commands.

Upon uninstallation, the above changes will be undone. If you reinstall or upgrade the Ch software again into the same directory as before, you will have to reboot the computer for the changes to take effect.

4.2 Startup

Once you have downloaded and installed the software according to the installation instruction, you can begin to write and run the C code with enhanced functionality. A Ch program typically has the file extension **.ch**. Ch can give you an interactive way of writing and running programs. You can get into either a **regular Ch** or **safe Ch** language environment.

There are three ways to get into the ChIDE to edit and execute C/Ch/C++ programs.

1. Click the icon ChIDE on the desktop.
2. Click **Start**, followed by **Run**, then type `chide.exe` or `chide`.
3. Go to the MS-DOS prompt, and type `chide`.

There are four ways to get into the Ch language environment.

4.2. STARTUP

1. Click the icon **Ch Professional**, **Ch Student**, on the Desktop screen to get into the regular Ch shell of the corresponding edition, similar to MS-DOS.
2. Click **Start**→**Programs**→**SoftIntegration Ch #.# XXX**→**Ch XXX**, where **#.#** is the version number and **XXX** is one of editions **Standard**, **Professional**, and **Student**.
3. Click **Start**, followed by **Run**, then type `ch.exe`, `chs` or `ch -S`.
4. Go to the MS-DOS prompt, and type `ch`. This turns the MS-DOS shell into an interactive Ch shell.

Note: `chs` and `ch -S` is the same in functionality for the safe Ch. However, it is recommended to use `ch -S` whenever possible for high efficiency.

C code can run directly in Ch shell. C programs with file extension `.c` can also run without compilation.

By running command `ch`, you can get into the regular Ch shell. By running command `ch -S`, you can get into the safe Ch shell. Safe Ch shell disables the pointer and many other functions, such as `system()`, which may jeopardize the security of the system.

4.2.1 Home Directory

At the initialization of Ch, the system variable `_home` for the user's home directory will get its value according to the following algorithm:

- If environment variable **HOME** has been setup, the value of `$HOME` will be used.
- If environment variables **HOMEDRIVE** and **HOMEPATH** have been setup, these value will be used to form the user's home directory.
- If the root of the windows directory, such as `C:\`, is writable to the user, it becomes the home directory.
- If directory `X:\` is writable to the user, where X is the drive to which Ch is installed, `X:\` will be the home directory.
- If none of the above is valid, initialization of Ch will fail.

In Windows 2000/XP or above, it can be setup by clicking `Control Panel, System, then Environment`. If you do not set environmental variable `HOME` manually, Ch will set `HOME` to the value of environmental variables `%HOMEDRIVER%%HOMEPATH%`. If the value for `%HOMEDRIVER%%HOMEPATH%` is empty, the `HOME` will be set to your current working directory.

4.2.2 Startup Files

Assume the environment variable **CHHOME** is the top directory where Ch is installed. Its default value is `C:\Ch` in Windows. The following startup files are executed when the Ch language environment is invoked.

CHHOME/config/chrc	Invoked automatically upon starting Ch.
CHHOME/config/chsrc	Invoked automatically upon starting safe Ch.
_home/_chrc	User's local file invoked by <code>chrc</code> .
_home/_chsrc	User's local file invoked by <code>chsrc</code> .

There are four built-in system variables that can be used to set search paths, `_path`, `_lpath`, `_fpath` and `_ipath`. They can be setup in the configuration file `_chrc`.

4.2. STARTUP

- **_path**: A built-in system variable in Ch used to search the binary commands and executable script files.
- **_lpath**: The path for dynamically loaded libraries.
- **_fpath**: The function path. The default path for safe Ch shell is **CHHOME/lib/libc** and **CHHOME/lib/libch**; while the default function path for regular Ch shell is **CHHOME/lib/libc**, **CHHOME/lib/libch**, and **CHHOME/lib/libopt**;
Functions not located in the above directories cannot be used in startup files **_chrc** and **_chsrc**. But, generic functions can be used in these startup files.
- **_ipath**: the path for included header files.

There is also an environment variable **PATH** which has the same value as system variable **_path** in Ch. Some programs, such as `command.com` and `cmd.exe`, use it to search for other programs.

4.2.3 Startup Ch

For Windows 2000/XP or above, type the command `ch` from MS-DOS Shell or click the `ch` icon to get into the regular Ch. The startup files are executed according to the following pseudo algorithm.

```
execute CHHOME/config/chrc
if _home\_chrc exists
then
    call _home\_chrc
endif
```

If you start Ch as a safe shell, run the command `ch -S` or `chs`.

```
execute CHHOME/config/chsrc
if _home\_chsrc exists
then
    call _home\_chsrc
endif
```

If you start Ch with argument `-f`, similar to the `csh`, for the regular Ch, they will bypass `CHHOME/chrc` and `_chrc`. For safe Ch shell, they will bypass `CHHOME/chsrc` and `_chsrc`.

By default, there is no startup file `_chrc` in a user's home directory. The system administrator may add a startup file in a user's home directory. However, the user can execute Ch with option `-d` as follows

```
ch -d
```

to copy a sample startup file from directory `CHHOME/config/` to the user's home directory if there is no startup file in the home directory yet.

Chapter 5

Install Ch in Unix

If you have installed an older version or a beta version before, uninstall that version off the system first. You may want to backup some configuration files in directory **CHHOME/config** that you have modified in the older version. **Note that CHHOME is not the string “CHHOME”. Rather, it is the Unix filesystem path under which Ch is installed.** Under Unix, the default directory for installing Ch version 8.0 is **/usr/local/ch8.0**, and the symbolic **/usr/local/ch**, **/opt/ch**, or **/usr/ch** will be created, and CHHOME will be set to one of the directories **/usr/local/ch**, **/opt/ch**, and **/usr/ch**.

5.1 Install Ch from a Downloaded File

1. Download the compressed file from the SoftIntegration website.
2. When prompted, choose a temporary directory for the **ChEdition-Version.OSversion.platform.tar.gz** file, for example:

/tmp

where Platform and OSversion will be substituted by a real platform and OS version, for example, **chprofessional-8.0.0.solaris2.6.sparc.tar.gz** for Ch version 8.0 for Sun Sparc station with Solaris 2.6 or higher. The recommended directory to install Ch is **/usr/local/ch8.0** or **HOME/ch**.

3. For Ch version 8.0, run the following command from the temporary directory, and follow the prompted instructions.

```
gzip -cd chprofessional-8.0.0.solaris2.6.sparc.tar.gz | tar xvof -
cd chprofessional-8.0.0.solaris2.6.sparc
sh ./install.sh
```

5.2 Install Ch from a CD

If you have the CD with you, install using the following steps.

1. Login as root
2. Insert the Ch setup CD into the CD-ROM drive. Depending on how your operating system is configured, your CD drive may be mounted automatically. If the CD drive is not mounted, you must mount it before continuing.

5.3. GET A VALID LICENSE FOR CH PROFESSIONAL EDITION IN LINUX

3. Go to your CD-ROM directory where the CD-ROM is mounted.
4. Run the following command.

```
sh ./install.sh
```

5.3 Get a Valid License for Ch Professional Edition in Linux

The installed Ch Professional Edition will run for 40 days by default. It will give you an alert 20 days before expiration for the first time installation. For renewing the license, it will give you an alert 65 days before expiration. If you use a floating license, you can have a roaming license for up to 21 days with your computer not connected to the internet with the license server. You can start a Ch Command Shell or run a Ch program to check out a valid roaming license.

The hostid for your computer is needed to issue a valid license to you. Follow the instructions below to get the hostid of your computer and valid license.

1. At the prompt of a comamnd shell, type the following command to get the hostid of your computer.

```
> ch rlmutil rlmhostid -q ether
00248cbf7c1e
```

2. Send the hostid of your computer, such as 00248cbf7c1e, displayed in the above command, information about your platform (such as Windows 32 bit or 64 bit, Linux 32 bit or 64-bit, or Mac OS X 32 bit or 64 bit), and the invoice number of the product to support@softintegration.com or our reseller. Then, a valid license will be sent to you.

5.4 Uninstall Ch in Unix

Take the following steps:

- Remove all Ch and its components from the CHHOME directory where you installed Ch.
- Check /etc/shells to see if login shells /bin/ch and /bin/chs are deleted.
- Check if startup files \$HOME/.chrc and \$HOME/.chsrc are deleted.
- Check if the symbolic links /usr/ch, /usr/local/ch, /opt/ch /bin/ch, and /bin/chs are deleted

Chapter 6

Install Ch in Mac OS X

You need to have the system privilege as a superuser to install Ch on Mac OS X. If you have installed an older version before, uninstall that version off the system first. You may want to backup some configuration files in directory **CHHOME/config** that you have modified in the older version. **Note that CHHOME is not the string “CHHOME”. Rather, it is the Mac OS X filesystem path under which Ch is installed.** In the following description, we assume Ch version 8.0 will be installed or uninstalled. For a different version, change the numerical version number 8.0.0 to a different number. Under Mac OS X, the default directory for installing Ch Professional Edition version 8.0.0 is **/usr/local/chprofessional8.0.0**. For different versions, the numerical number following **/usr/local/ch** will be different. The symbolic **/usr/local/ch** will be created, and CHHOME is **/usr/local/ch**.

6.1 Install Ch from a Downloaded File

6.1.1 Install Ch from a Downloaded File for Mac OS X x86

1. Download the compressed file from the SoftIntegration website. For example, download the file `chprofessional-8.0.0.macosx10.6.x86.dmg` for Ch Professional Edition version 8.0.0.
2. Your Mac OS X shuttle will uncompress the file and mount it automatically. If not, you can double click the downloaded file name to mount it. Then you can find the mounted file, such as `chprofessional-8.0.0.macosx10.6.x86` depending on the Ch edition you downloaded, under Finder -> Devices.
3. Then, click `chprofessional-8.0.0.macosx10.6.x86`, you will find the file name `chprofessional-8.0.0.pkg`. Double clicking it will take you into Mac GUI for installation. Follow the instructions on the screen to finish installation.
4. During the installation, you will be prompted to ask to type in the password of the system administrator (sudo user) account to proceed.

6.1.2 Install Ch from a Downloaded File for Mac OS X ppc

1. Download the compressed file from the SoftIntegration website.
2. Go to Utilities, then click Terminal.

6.2. INSTALL CH FROM A CD

3. Change to the directory where your downloaded file such as `chprofessional-8.0.0.macosx10.ppc.tar.gz` is located. For example, if it is located on your desktop, by command

```
cd /Users/your_account_name/Desktop
```

4. You can untar and decompress the downloaded file with the command below.

```
gzip -cd chprofessional-8.0.0.macosx10.ppc.tar.gz | tar xvf -
cd chprofessional-8.0.0.macosx10.ppc
sudo sh ./install.sh
```

6.2 Install Ch from a CD

If you have the CD with you, install using the following steps.

6.2.1 Install Ch from a CD for Mac OS X x86

1. Insert the Ch setup CD into the CD-ROM drive. Depending on how your operating system is configured, your CD drive may be mounted automatically on your Desktop.
2. Double click the file `chprofessional-8.0.0.macosx10.6.x86.dmg` to mount it. Then you can find the mounted file `chprofessional-8.0.0.macosx10.6.x86` under Finder -> Devices.
3. Click `chprofessional-8.0.0.macosx10.6.x86`, you will find the file `chprofessional-8.0.0.pkg`. Double clicking it will take you into Mac GUI for installation. Follow the instructions on the screen to finish installation.
4. During the installation, you will be prompted to ask to type in the password of the system administrator (sudo user) account to proceed.

6.2.2 Install Ch from a CD for Mac OS X ppc

1. Insert the Ch setup CD into the CD-ROM drive. Depending on how your operating system is configured, your CD drive may be mounted automatically on your Desktop.
2. Run the following command.

```
sudo sh ./install.sh
```

then you can follow the instructions to install.

6.3 Get a Valid License for Ch Professional Edition in Mac OS X x86

The installed Ch Professional Edition will run for 40 days by default. It will give you an alert 20 days before expiration for the first time installation. For renewing the license, it will give you an alert 65 days before expiration. If you use a floating license, you can have a roaming license for up to 21 days with your computer not connected to the internet with the license server. You can start a Ch Command Shell or run a Ch program to check out a valid roaming license.

The hostid for your computer is needed to issue a valid license to you. Follow the instructions below to get the hostid of your computer and valid license.

6.4. UNINSTALL CH

1. On your desktop, click the icon Ch in the red color. A Ch command shell will be launched.
2. At the prompt of the launched Ch command shell, type the following command to get the hostid of your computer.

```
> ch rlmutil rlmhostid -q ether
00248cbf7c1e
```

3. Send the hostid of your computer, such as 00248cbf7c1e, displayed in the above command, information about your platform (such as Windows 32 bit or 64 bit, Linux 32 bit or 64-bit, or Mac OS X 32 bit or 64 bit), and the invoice number of the product to support@softintegration.com or our reseller. Then, a valid license will be sent to you.

6.4 Uninstall Ch

You will have to be the root user for uninstalling Ch.

6.4.1 Uninstall Ch in Mac OS X x86

- Remove /usr/local/chprofessional8.0.0 by command

```
sudo rm -rf /usr/local/chprofessional8.0.0
```

Remove the symbolic links /usr/local/ch, /bin/ch, /bin/chs, /Applications/Ch.app, /Applications/ChIDE.app by commands

```
sudo rm -f /usr/local/ch
sudo rm -f /bin/ch
sudo rm -f /bin/chs
sudo rm -f /Applications/Ch.app
sudo rm -f /Applications/ChIDE.app
```

- If ch or chs are installed to be used as login shells, remove the login shells /bin/ch and /bin/chs inside the file /etc/shells.
- Remove startup files \$HOME/.chrc and \$HOME/.chsrc .

6.4.2 Uninstall Ch in Mac OS X ppc

- Remove /usr/local/ch8.0 by command

```
sudo rm -rf /usr/local/ch8.0
```

- Remove the symbolic links /usr/local/ch, /bin/ch, and /bin/chs by commands

```
sudo rm -f /usr/local/ch
sudo rm -f /bin/ch
sudo rm -f /bin/chs
```

- If ch or chs are installed to be used as login shells, remove the login shells /bin/ch and /bin/chs inside the file /etc/shells.
- Remove startup files \$HOME/.chrc and \$HOME/.chsrc .

Chapter 7

System Administration and Getting Started in Unix and Mac OS X

This chapter addresses the setup, system administration, and startup of Ch in Unix.

7.1 Unix and Mac OS X Configuration

Upon installation, the Ch installer will create two symbolic links `/bin/ch` and `/bin/chs` which point to the installed binary files. Also, they will append `/bin/ch` and `/bin/chs` to the file `/etc/shells` for ftp to be able take ch as a login shell if you selected **yes** upon installation for the prompted questions.

Ch can run as a login shell similar to the C-Shell and Bash under Unix. You can become a root and modify the password file `/etc/passwd` to make ch as a default login shell for any user account. For example,

```
tempuser:X:500:500:temp user:/home/tempuser:/bin/csh
```

changed to either regular Ch shell :

```
tempuser:X:500:500:temp user:/home/tempuser:/bin/ch
```

or safe shell:

```
tempuser:X:500:500:temp user:/home/tempuser:/bin/chs
```

7.2 Internet Computing

Ch is denoted by a specific file extension. `.ch` as the default Ch file extension, `.chs` is the safe Ch file extension. Both the Web browser and server can be configured to take advantage of internet computing.

7.2.1 Web Browser Configuration

1. Copy the file `CHHOME/config/mime.types` to your home directory or append the following to your existing file `~/mime.types` in the user's home directory

```
# handle CH language environment
application/x-chs          chs
```

2. Then, copy the file **CHHOME/config/mailcap** to your home directory or append the following to your existing file **~/mailcap** in the user's home directory.

```
#handle CH language environment
application/x-chs; ch -S %s
```

When file **~/mailcap** in user's home directory is changed, the Web browser needs to be restarted to make it effective.

7.3 Startup

Once you have downloaded and installed the software according to the installation instruction, in Mac OS X x86, after the installation, Ch or ChIDE can be launched by clicking its icon on the dashboard or in the Applications folder.

In Linux, you can launch Ch by clicking the icon **Ch** under the entry **System Tools** in the startup menu. You can also click **Run Program** in the startup menu. Then, enter **ch** and check **Run in terminal** to launch Ch. ChIDE can be launched under the entry **Programming Tools** in the startup menu.

You can also get into either the **regular Ch** or **safe Ch** language environment.

The **ch** and **chs** shells are similar to **csh**, and you will find it much easier if you are already familiar with **csh** or **tcsh**.

You can type **ch** to get into the regular Ch, **ch -S** or **chs** to the safe Ch from your Unix shell. (**Note: chs** is equivalent to **ch -S**, However, it is recommended to use **ch -S** whenever possible for efficiency.)

Note: HOME is the user's home directory while CHHOME is the directory where Ch is installed. By default, CHHOME is **/usr/local/ch** or **/usr/local/ch**.

Running command **ch** can take you into regular Ch shell while **ch -S** can get you into the safe Ch shell. Safe Ch shell disables the pointer and many other functions, such as **system()**, which may jeopardize the security of the system,

When regular Ch is started,

```
execute CHHOME/config/chrc
if HOME/.chrc exists
then
    call HOME/.chrc
endif
```

When safe Ch is started,

```
execute CHHOME/config/chsrc
if HOME/.chsrc exists
then
    call $HOME/.chsrc
endif
```

Ch can also be used as a login shell in Unix and plays the similar role as a Unix Shell such as sh, bash, csh and tsh. You can change login shell to either **/bin/ch** or **/bin/chs** in **/etc/passwd**. If the shell is invoked with a name that starts with '-', as when started by login(1), the shell runs as a login shell. In this case, the regular Ch login shell will start as the follows:

```
execute CHHOME/config/chrc
if HOME/.chrc exists
then
    call HOME/.chrc
endif
execute CHHOME/config/chlogin
if HOME/.chlogin exists
then
    call HOME/.chlogin
endif
```

For the safe Ch login shell, it starts:

```
execute CHHOME/config/chsrc
if HOME/.chsrc exists
then
    call HOME/.chsrc
endif
execute CHHOME/config/chslogin
if HOME/.chslogin exists
then
    call HOME/.chslogin
endif
```

Typically, the file **.chlogin** and **.chslogin** contain commands to specify the terminal type and environment.

As a login shell terminates, the regular Ch shell will execute the commands from **\$HOME/.chlogout**, and the safe Ch shell will execute the commands from **\$HOME/.chslogout**.

By default, there is no startup file **.chrc** in a user's home directory. The system administrator may add a startup file in a user's home directory. However, the user can execute Ch with option **-d** as follows

```
ch -d
```

to copy a sample startup file from directory **CHHOME/config/** to the user's home directory if there is no startup file in the home directory yet.

7.3.1 Startup Files

Assume the environment variable **CHHOME** is the top directory where Ch is installed. Its value is **/usr/local/ch** in Unix. The following startup files are executed when the Ch language environment is invoked.

CHHOME/config/chrc	Invoked automatically upon starting Ch.
CHHOME/config/chlogin	Invoked by Ch automatically after chrc when Ch is used as login shell.
CHHOME/config/chlogout	Invoked by Ch automatically while Ch logout.
CHHOME/config/chsrc	Invoked automatically upon starting safe Ch.
CHHOME/config/chslogin	Invoked by safe Ch automatically after chsrc when safe Ch is used as a login shell.
CHHOME/config/chslogout	Invoked by safe Ch automatically when safe Ch logout.
CHHOME/config/mime.types	Used by Web browser
CHHOME/config/mailcap	Used by Web browser.
~/chrc	User's local file invoked by chrc.
~/chlogin	User's local file invoked by chlogin.
~/chlogout	User's local file invoked by regular Ch login shells at logout.
~/chsrc	User's local file invoked by chsrc.
~/chslogin	User's local file invoked by chslogin.
~/chslogout	User's local file invoked by safe Ch login shells at logout.

There are four built-in system variables can be used to set search paths, **_path**, **_lpath**, **_fpath** and **_ipath**. They can be setup in the configuration file **.chrc**.

- **_path**: A built-in system variable in Ch used to search the binary command s and executable script files.
- **_lpath**: The path for dynamically loaded libraries.
- **_fpath**: The function path, the default path for safe Ch shell is **/usr/local/ch/lib/libc** and **/usr/local/ch/lib/libch**. while the default path for regular Ch shell is **/usr/local/ch/lib/libc**, **/usr/local/ch/lib/libch** and **/usr/local/ch/lib/libopt**.

Functions not located in the above directories cannot be used in startup files **.chrc** and **.chsrc** But, generic functions can be used in these startup files.

- **_ipath** the path for included header files.

There is also an environment variable **PATH** which has the same value as system variable **_path** in Ch . Some programs, such as sh, use it to search for other programs.

Chapter 8

Testing Setup and Demos

After Ch is installed, the following commands can be used to test if the setup is correct or not. These commands also demonstrate some of Ch features.

- The commands given below will give you some limited help.

```
ch -d
help
```

- The commands given below will give you a quick demo of Ch as a C interpreter.

```
ch
int i = 90
i
i*i+2

int *p1, **p2
p1 = &i
p2 = &p1
i=5
*p1
**p2 = 10
*p1
i
printf("i= %d\n", i)
sin(3.14/2.0)
exit
```

- Similar to C-shell, Ch is also a command shell.

```
ch
pwd
alias cool "echo Ch is cool!"
alias cool
cool
unalias cool
```

```
cool
alias("mydir", "cd /bin");
mydir
pwd
alias
```

- Programs and commands are integrated in Ch.

```
ls
ls -l
int j =-1
ls $j
string_t s
s = `ls`
s
s = ``ls``
s
printf("s = %s\n", s)
```

- A quite useful program is **which**. This program, written in Ch, can be used to find commands, function files, header files, and environment variables.

```
which pwd
which ls
which int sin
which unknown
which which
which -a which
which stdio PATH
which -a stdio PATH
```

- IO stream similar to C++

```
int k
cout <<"Type in a number for k"
cin >> k
k
cout << k
```

- Try complex numbers by typing

```
complex z = complex(3, 4)
z+z;
2*z;
sin(z);
abs(z);
```

- Array bounds are checked to prevent memory corruption

```
double a[3] = {1, 2, 3}
a[0]
a[1]
a[2]
a[-1]
a[3]
```

- The range of array subscripts can be adjusted

```
double b[1:3] = {1, 2, 3}
b[0]
b[1]
b[2]
b[3]
b[4]
```

- Try class/struct

```
struct cube{int i, j; float f;} c1 = {1,2,3}
c1
struct cube c2;
c2 = c1
c2
cube c3
c3
c3.i = 10
c3
2*c3.i
```

- Try union

```
union tag {int i; double d;} m
m.i = 10
m
m.d = 10
m
sizeof(m)
```

- To test a Ch applet and safe shell, open the following file **CHHOME/demos/chs/c1.chs** from a Web browser such as Internet Explorer or Netscape. For example, if the environment variable **CHHOME** is set to `/usr/local/ch`, after clicking the **Open** menu on your Web browser, type

```
/usr/local/ch/demos/chs/c1.chs
```

Then, the output of program **c1.chs** “Hello, world!” and today’s date will be displayed. If you have not followed the setup steps outlined in section 7.2 on page 15, program **c1.chs** will be displayed instead of being executed.

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