

# Building RPMs

Josko Plazonic  
Princeton University  
&  
Thomas Uphill  
Institute for Advanced Study

January 25, 2007

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

What is RPM?

SPEC file

Working with SPECS

Simple SPEC

Advanced Topics

Kernel Module RPMs

Summary

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECS

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# What is RPMs?

## RPM Package Manager

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# What is RPMs?

RPM Package Manager

Two types of RPM packages.

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# What is RPMs?

## RPM Package Manager

Two types of RPM packages.

- ▶ binary

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# What is RPMs?

## RPM Package Manager

Two types of RPM packages.

- ▶ binary
- ▶ source

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

**name - version - release . arch . rpm**

**name - version - release . arch . rpm**  
**tar - 1.13.25 - 4.7.1 . i386 . rpm**

## rpm -qi tar

```
Name       : tar                               Relocations: (not relocateable)
Version    : 1.13.25                          Vendor: Red Hat, Inc.
Release    : 4.7.1                            Build Date: Tue 10 Sep 2002 07:10:58 AM EDT
Install date: Thu 12 Dec 2002 06:14:11 PM EST  Build Host: stripples.devel.redhat.com
Group      : Applications/Archiving           Source RPM: tar-1.13.25-4.7.1.src.rpm
Size       : 273826                           License: GPL
Packager   : Red Hat, Inc. <http://bugzilla.redhat.com/bugzilla>
Summary    : A GNU file archiving program.
```

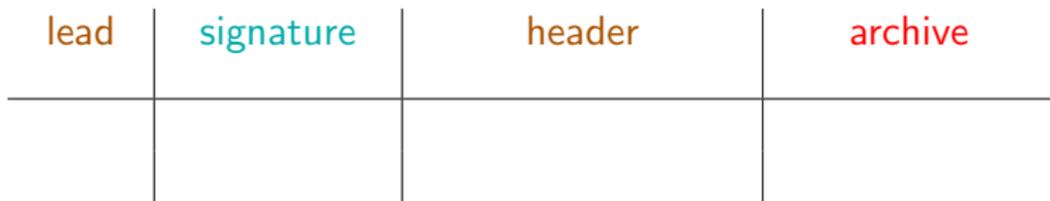
### Description :

The GNU tar program saves many files together in one archive and can restore individual files (or all of the files) from that archive. Tar can also be used to add supplemental files to an archive and to update or list files in the archive. Tar includes multivolume support, automatic archive compression/decompression, the ability to perform remote archives, and the ability to perform incremental and full backups.

If you want to use tar for remote backups, you also need to install the rmt package.

[What is RPM?](#)[SPEC file](#)[Working with  
SPECS](#)[Simple SPEC](#)[Advanced Topics](#)[Kernel Module  
RPMs](#)[Summary](#)

# RPM Structure



Building RPMs

Josko Plazonic  
Princeton  
University  
&  
Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

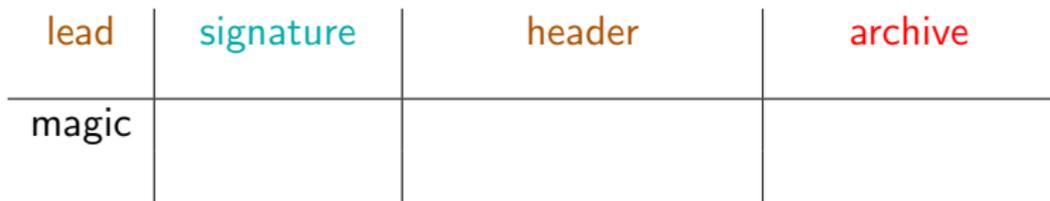
Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# RPM Structure



Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

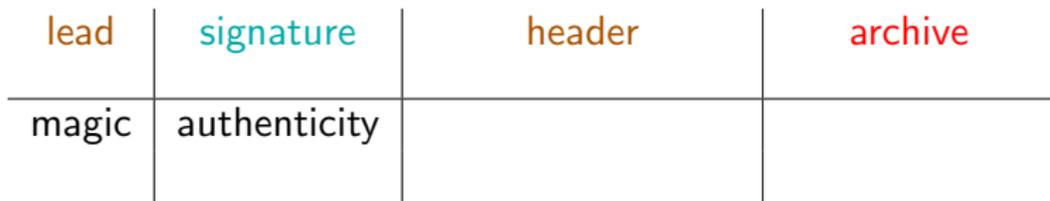
Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# RPM Structure



Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

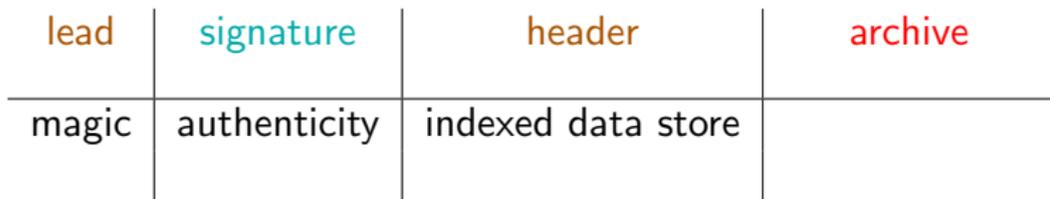
Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# RPM Structure



Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# RPM Structure

lead	signature	header	archive
magic	authenticity	indexed data store	payload <i>(gzipped cpio)</i>

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# Usage

## Installation

-i install

-U Update `rpm -U tar-1.13.25-4.i386.rpm`

-F Freshen

-e erase

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECS

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# Usage

## Installation

-i install

-U Update rpm -U tar-1.13.25-4.i386.rpm

-F Freshen

-e erase

rpm -Uvh tar-1.13.25-4.i386.rpm

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# Usage

## Installation

-i install

-U Update rpm -U tar-1.13.25-4.i386.rpm

-F Freshen

-e erase

rpm -Uvh tar-1.13.25-4.i386.rpm

–nodeps

–nofiles

–nomd5

–noscripts

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECS

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# Usage

## Installation

-i install

-U Update rpm -U tar-1.13.25-4.i386.rpm

-F Freshen

-e erase

rpm -Uvh tar-1.13.25-4.i386.rpm

–nodeps

–nofiles

–nomd5

–noscripts

## Query (-q)

### Package Selection Options

-a all

rpm -qa

-f file

rpm -qf /bin/bash

-g group

rpm -qg Development/Libraries

-p rpm package

rpm -qp bash-2.04-1.2.i386.rpm

–whatprovides pkgs that provide

rpm –whatprovides -q libgnome.so.32

–whatrequires pkgs that require

rpm –whatrequires -q libgnome.so.32

## Output options

-i	info	<code>rpm -qi bash</code>
-l	list files	<code>rpm -qilp bash-2.04-1.2.i386.rpm</code>
-R	on what depends	<code>rpm -qR bash</code>
-provides	what does it provide	<code>rpm -provides -qR bash</code>

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# Verify (-V)

S file Size  
M Mode  
5 md5sum  
D device major/minor  
L readlink path  
U user ownership  
G group ownership  
T modification time

## Signature Checking

-K

-checksig

# SPEC file

- ▶ `%define`
- ▶ header
- ▶ `%description`
- ▶ `%prep`
- ▶ `%build`
- ▶ `%install`
- ▶ `%pre`
- ▶ `%post`
- ▶ `%preun`
- ▶ `%postun`
- ▶ `%files`
- ▶ `%changelog`

Summary:  
Name:  
Version:  
Release:

Source[n]: [http://][ftp://]hostname/filename.tar.gz  
Patch[n]: filename.patch  
BuildRequires: *packages required to build*  
Buildroot: %[\_tmppath]/%{name}-%{version}-root

#### %description

Description of package  
one line of whitespace to terminate

#### %changelog

\* Date Who <email> version  
- Notes

# %prep

```
%prep
%setup -q
%patch[n] -p1 [-bfilename]
```

Unpack files, patch tree as necessary.

Make directories for later.

bash syntax legal in this section, when rpmbuild runs, it takes this section of the spec out and runs it as an sh script.

Building RPMs

Josko Plazonic  
Princeton  
University  
&  
Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# rpm-tmp.[pid]

```
#!/bin/sh
RPM_SOURCE_DIR="/home/uphill/source/SOURCES/ieee80211"
RPM_BUILD_DIR="/home/uphill/source/BUILD/i386"
RPM_OPT_FLAGS="-O2 -g -pipe -m32 -march=i386 -mtune=pentium4"
RPM_ARCH="i386"
RPM_OS="linux"
export RPM_SOURCE_DIR RPM_BUILD_DIR RPM_OPT_FLAGS RPM_ARCH RPM_OS
RPM_DOC_DIR="/usr/share/doc"
export RPM_DOC_DIR
RPM_PACKAGE_NAME="ieee80211"
RPM_PACKAGE_VERSION="1.2.16"
RPM_PACKAGE_RELEASE="%{mrelease}_2.6.9.42.0.3.EL"
export RPM_PACKAGE_NAME RPM_PACKAGE_VERSION RPM_PACKAGE_RELEASE
RPM_BUILD_ROOT="/tmp/ieee80211-1.2.16-1.PU.IAS.2-root"
export RPM_BUILD_ROOT

set -x
umask 022
cd /home/uphill/source/BUILD/i386
```

*Sets all variables, expands %variable's.  
Good place to spot errors*

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# %build

```
%build
%ifos OS
%else
%endif
%define optflags $VARIABLE -DTHIS
for i in this that them
do
    something
done
export THIS=that
%configure --obscureoption
make CFLAGS=this
```

## *Simplest build section*

```
%build
%configure
make
```

*Do the compilation only here, don't install things*  
`rpmbuild -bc` stops at this stage

# %install

*Create and directories, make symlinks, make copies, move files*

```
%install
make prefix=${RPM_BUILD_ROOT}%{_prefix}
    bindir=    ...
    install
mkdir there
ln this that
install 0644 newfile
```

*Simplest Install section*

```
%makeinstall
```

*Move all files into `$RPM_BUILD_ROOT`*

# %pre

Anything that needs to be done before this package is installed.

Create a group or user that is needed by this package.

```
%pre
/usr/sbin/groupadd -g 38 ntp 2> /dev/null || :
/usr/sbin/useradd -u 38 -g 38 -s /sbin/nologin -M -r -d /etc/ntp ntp 2>/dev/null || :
```

Building RPMs

Josko Plazonic  
Princeton  
University  
&  
Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# %post

Anything you want to happen after installation Install info pages, rebuild a database, start a daemon just installed, etc....

```
%post
/sbin/install-info --delete /usr/info/thispackage.info.gz /usr/info/dir
/sbin/ldconfig
/sbin/chkconfig --add thispackage
```

Anything you want to have happen before you uninstall the package.  
Stop a daemon that is about to be removed.

```
%preun
/etc/init.d/sendmail stop >/dev/null 2>&1
/sbin/chkconfig --del sendmail
/usr/sbin/alternatives --remove mta /usr/sbin/sendmail.sendmail
```

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

Something that has to be done after files have been removed

```
%postun  
/sbin/ldconfig
```

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# %clean

Remove any files used in building

```
%clean  
rm -rf $RPM_BUILD_ROOT
```

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECS

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# %files

Files/Directories

default permissions/owner/group

Config files

Documentation

```
%files
%defattr(mode,owner,group)
%doc location/relative/to/build-root
%dir directory
%config %{_sysconfdir}configfile
%files -f [filename]
```

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# Creating a SPEC

vi ....

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# Very simple package, unpack, configure, compile and install.

**Summary:** An MPEG audio player.  
**Name:** mpg321  
**Version:** 0.2.10  
**Release:** 2.PU\_IAS.2  
**License:** GPL  
**Group:** Applications/Multimedia  
**Source:** [http://prdownloads.sourceforge.net/mpg321-0.2.10-security.tar.gz](http://prdownloads.sourceforge.net/mpg321/mpg321-0.2.10-security.tar.gz)  
**Patch1:** mpg321-0.2.10-security.patch  
**URL:** <http://mpg321.sourceforge.net/>  
**Buildroot:** `%{_tmppath}/%{name}-%{version}-%{release}-root`  
**BuildRequires:** libao-devel >= 0.8.0, libmad >= 0.14.2b

```
%prep
%setup -q
%patch1 -p1

%build
%configure
make

%install
%makeinstall

%clean
rm -rf %{buildroot}

%files
%defattr(-, root, root)
%doc AUTHORS BUGS ChangeLog COPYING HACKING NEWS README* THANKS TODO
%{_bindir}/*
%{_mandir}/man1/*
```

Building RPMs

Josko Plazonic  
Princeton  
University  
&  
Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# Building

## *SPEC*

```
rpmbuild [-ba|-bb|-bc|-bi|-bl|-bp|-bs] package.spec  
[--target=%{arch}]
```

## *src.rpm*

```
rpm --rebuild package.src.rpm
```

Building RPMs

Josko Plazonic  
Princeton  
University  
&  
Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

## Creating dependencies

```
BuildRoot: %[_tmppath]/%{name}-%{version}-build  
BuildRequires: autoconf automake>=123  
Requires: gcc >= 2.96
```

## Creating a list of files

```
cat > files.list <<EOF  
%[_bindir]/perl  
%attr(4711,root,root) %[_bindir]/suidperl  
EOF  
%files -f files.list
```

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# Multiple Architectures

```
Patch0: alpha.patch
```

```
%ifarch alpha  
%patch0 -p1  
%endif
```

```
ExcludeArch: sparc
```

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# Kernel Modules

- ▶ Modules out of tree
- ▶ Modules in tree

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# ieee80211 - out of tree

```
# use kernel from command line if given, else, uname -r
%{!?kernel: %{expand: %%define kernel %(uname -r)}}
%define kversion %(echo %{kernel} | sed -e s/smp// -)

# define a kernel version string to append to the package version
%define kernel_ver_str %(echo %{kversion} | tr -s '-' '_')

# define major and minor revisions (some packages need this)
%define kmajor %(echo %{kversion} | cut -d'-' -f1)
%define kminor %(echo %{kversion} | cut -d'-' -f2)

# define the target
%ifarch i386 i686
%define arch i686
%endif
%ifarch x86_64
%define arch x86_64
%endif
```

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

This spec creates several RPMs  
Create new packages with `%package -n`  
`name_of_new_package`

```
# modules package
%package -n kernel-%{name}
Release: %{mrelease}_%{kernel_ver_str}
License: Other
Summary: ieee80211 subsystem modules
Group: System Environment
Requires: kernel = %{kversion}
Provides: kernel-module kernel-modules
```

Each `%package` requires a `%description` and `%files` section.  
Can have specific `%pre`, `%post`, `%preun` and `%postun`  
sections.

What is RPM?

SPEC file

Working with  
SPECS

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# %build

To build, we need kernel source

`BuildRequires: kernel-devel`

We copy the kernel source into the build directory and configure

```
%build
%ifarch %x86
export TARGET=i386-elf
%endif

%ifarch x86_64 ia32e
export TARGET=x86_64-elf
%endif
export TOOLPREFIX='which gcc|sed -e's,gcc$,,'
echo %{kernel} - %{kmajor}
cp -ar /usr/src/kernels/%{kversion}-%{arch} .
cd %{kversion}-%{arch}
  ln -s . build
  perl -pi -e 's#%{kminor}custom#%{kminor}#' Makefile
  make oldconfig >/dev/null
cd ..

%define ksrc 'pwd'/%{kversion}-%{arch}
%define kmodule_dir /lib/modules/%{kversion}
```

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECS

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

## Create directories for modules to live in

```
#modules should go here
mkdir -p %{buildroot}%{kmodule_dir}/updates/net/ieee80211
mkdir -p %{buildroot}%{kmodule_dir}smp/updates/net/ieee80211
```

## Sometimes requires patching the Makefile for the modules.

```
--- ieee80211-1.2.16/Makefile.rpmdemo    2007-01-04 21:51:15.000000000 -0500
+++ ieee80211-1.2.16/Makefile          2007-01-11 13:08:09.000000000 -0500
@@ -63,7 +63,7 @@
 # Begin dual Makefile mode here.  First we provide support for when we
 # are being invoked by the kernel build system
 #
-ifdef $(KERNELRELEASE),)
+ifndef $(KERNELRELEASE),)
```

## Use gendiff to create patches.

```
cp Makefile Makefile.rpmdemo
edit Makefile
cd ..
gendiff ieee80211-1.2.16 .rpmdemo >ieee80211-rpmdemo.patch
```

[What is RPM?](#)[SPEC file](#)[Working with  
SPECs](#)[Simple SPEC](#)[Advanced Topics](#)[Kernel Module  
RPMs](#)[Summary](#)

```
%install
echo Building SMP modules
make \
    KSRC=%{ksrc} \
    KERNELRELEASE=%{kversion}smp \
    IEEE80211_INC=%{buildroot}%{_includedir}/ieee80211 \
    KMISC=%{buildroot}%{kmodule_dir}smp/net/ieee80211 \
    DESTDIR='pwd' \
install
```

## Move modules into appropriate directory

```
mv %{buildroot}%{kmodule_dir}smp/net/ieee80211/* \
%{buildroot}%{kmodule_dir}smp/updates/net/ieee80211
```

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

RHEL4 and earlier have separate smp kernels.  
In RHEL5 and FC6, there is no uniprocessor kernel.

```
cd %>{kversion}-%{arch}
    make clean >/dev/null
    make oldconfig >/dev/null
    sed -e 's/CONFIG_SMP=.*# CONFIG_SMP is not set/' -i .config
    sed -e 's/CONFIG_X86_SMP=.*# CONFIG_X86_SMP is not set/' -i .config
    sed -e 's/CONFIG_HOTPLUG_PCI=.*# CONFIG_HOTPLUG_PCI is not set/' -i .config
    sed -e 's/CONFIG_PROFILING=.*# CONFIG_PROFILING is not set/' -i .config
    sed -e 's/CONFIG_OPROFILE=.*# CONFIG_OPROFILE is not set/' -i .config
    sed -e 's/CONFIG_HIGHMEM64G=.*# CONFIG_HIGHMEM64G is not set/' -i .config

cd ..
make clean
```

Then remove the smp from the make lines

```
make \
    KSRC=%{ksrc} \
    KERNELRELEASE=%{kversion} \
    IEEE80211_INC=%{buildroot}%{_includedir}/ieee80211 \
    KMISC=%{buildroot}%{kmodule_dir}/net/ieee80211 \
    DESTDIR='pwd' \
    install
```

What is RPM?

SPEC file

Working with  
SPECS

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

```
# depmod required on the module rpms
%post -n kernel-%{name}
/sbin/depmod -ae %{kversion}

%post -n kernel-smp-%{name}
/sbin/depmod -ae %{kversion}smp
```

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

# rocket - in tree

Package to turn on a module not included by our distro  
Copy source files from kernel source

```
Source: rocket.c  
Source1: rocket_int.h  
Source2: rocket.h  
Source3: rocket.txt
```

No tar, tell `%setup` to create directories  
Copy files  
Add module to makefile

```
%prep  
%setup -c -n %{name}-%{version} -T  
cp %{SOURCE0} .  
cp %{SOURCE1} .  
cp %{SOURCE2} .  
cp %{SOURCE3} .  
echo "obj-m += rocket.o" > Makefile
```

Use kernel-devel tree, tell Makefile that Modules are in the current directory (M='pwd')

```
%build
buildmodule() {
  rm -f rocket.o *.mod.* *.ko
  make -C /lib/modules/%{kversion}$1/build M='pwd' modules
  mkdir build$1
  mv rocket.ko build${1}/rocket.ko
}
buildmodule
%if %{buildsmp}
buildmodule smp
%endif
%if %{buildhugemem}
buildmodule hugemem
%endif
```

Move the built module \*.ko into a temporary build directory...copy in %install

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary

```
%install
installmodule() {
mkdir -p $RPM_BUILD_ROOT/lib/modules/%{kversion}$1/%{minstalldir}
install -m 644 build$1/*.ko $RPM_BUILD_ROOT/lib/modules/%{kversion}$1/%{minstalldir}
}
installmodule
%if %{buildsmp}
installmodule smp
%endif
%if %{buildhugemem}
installmodule hugemem
%endif
```

[What is RPM?](#)[SPEC file](#)[Working with  
SPECs](#)[Simple SPEC](#)[Advanced Topics](#)[Kernel Module  
RPMs](#)[Summary](#)

# Tips

- ▶ use `%variable` as much as possible  
use `rpm --showrc` to see all variables.  
use `%{version}` instead of hard coding the version in the spec.
- ▶ build from `src`, modify files as necessary, use `gendiff` to create patch
- ▶ always build as yourself, not root
- ▶ Update `%changelog`

# Links

- ▶ RPM.org  
<http://www.rpm.org>
- ▶ RPM-HOWTO  
<http://www.rpm.org/RPM-HOWTO>
- ▶ Linux Documentation Project  
<http://en.tldp.org/HOWTO/RPM-HOWTO>
- ▶ Mandrake SPECS  
<http://cvs.mandrakesoft.com/cgi-bin/cvsweb.cgi/SPECS>

# Questions?

Building RPMs

Josko Plazonic  
Princeton  
University  
&

Thomas Uphill  
Institute for  
Advanced Study

What is RPM?

SPEC file

Working with  
SPECs

Simple SPEC

Advanced Topics

Kernel Module  
RPMs

Summary