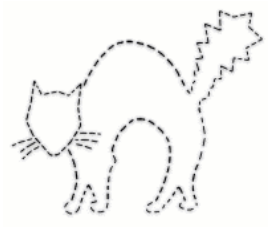
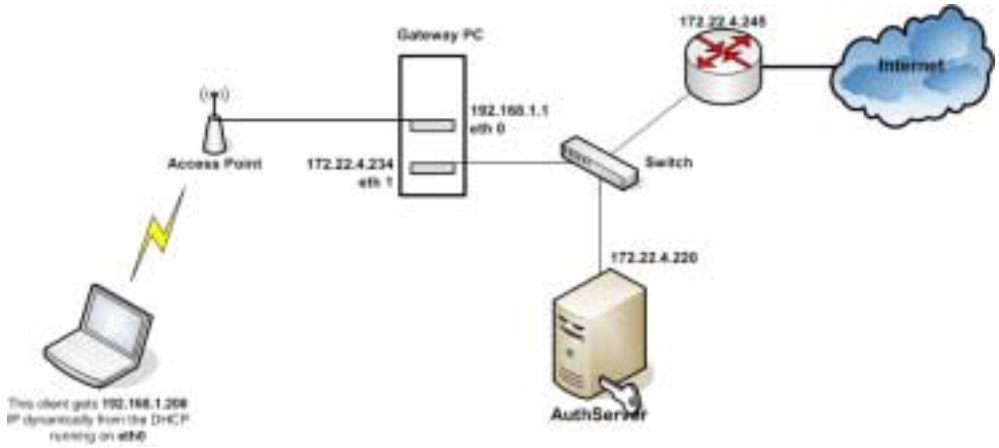
NoCatAuth Project

Installing Gateway





Network

Configuration of Gateway

Network Configuration of eth0

IP Address	192.168.1.1
Subnet mask	255.255.255.0

Network Configuration of eth1

IP Address	172.22.4.234
Subnet mask	255.255.255.0
Default gateway	172.22.4.245

DNS

Primary DNS	203.115.0.1
Secondary DNS	203.115.0.18

The first thing we should do is setting up DHCP server in gateway at eth0 interface

You can edit /etc/dhcpd.conf as follows

```
ddns-update-style interim;
ignore client-update;
default-lease-time 600;
max-lease-time 7200;
option subnet-mask 255.255.255.0;
```

```
option brodcat-address 192.168.1.255;
option roters 192.168.1.1;
option domain-name-servers 203.115.0.1
subnet 192.168.1.0 netmask 255.255.255.0 {
        range 192.168.1.100 192.168.1.200
}
```

Make sure to give the interface that the DHCP drags in

```
/etc/sysconfig/dhcpd as follows
        #command line option here
        DHCPDRAGS = eth0
```

Now start the DHCP by executing the following command.

```
/sbin/service dhcpd start
```

If you want to change the configuration of a DHCP server that was running before, then you have to change the lease database stored in /var/lib/dhcp/dhcpd.leases as follows,

```
mv dhcpd.leases~ dhcpd.leases
```

Say Yes to over write the file and restart the dhcpd.

```
service dhcpd restart
```

Download the NoCatAuth and put in /nocat directory if there is no such directory create it by executing this command
mkdir /nocat

```
/nocat/NoCatAuth-0.82.tar.gz
cd /nocat
tar zvxf NoCatAuth-x.xx.tar.gz
cd NoCatAuth-x.xx
make gateway
```

Now go to /usr/local/nocat and edit the nocat.conf as follows.

GatewayMode	Passive
AuthServiceAddress	172.22.4.1
ExternalDevice	eth1
InternalDevice	eth0
LocalNetwork	192.168.1.0/255.255.255.0
DNS Address	203.115.0.1

- ***Following steps should follow only after installing the FreeRADIUS on the AuthServer***

Installing the Radius Patch

Download the patch from pogozon site and save it in /usr/local/nocat
cd /usr/local/nocat
execute the following command
patch –p0 < NoCatAuth-0.82+RADIUS-20031015.patch

once we patch the gateway the configuration file (nocat.conf) changes. We have to make some changes in nocat.conf of gateway as follows.

AccountingMethod	RADIUS
RADIUS_HOST	172.22.4.1:1646
RADIUS_Secret	testing123
RADIUS_TimeOut	5

Note:

The radius port of gateway is 1646 and radius port of authserver is 1645, because 1645 is the port that free radius work and 1646 is the port for accounting.

Other important configurations

Remove iptables rules

Put stats.fw into /usr/local/nocat/bin where the original is at /usr/local/nocat/libexec/iptables/stats.fw and give the permission to execute

Get the trustedkeys.gpg of the AuthServer and put it into the /usr/local/nocat/pgp of the gateway.

Installing Authen Radius Module

perl –MCPAN –e shell
install Authen::Radius

Installing AuthServer

Network Configuration of AuthServer

Network Configuration of eth0

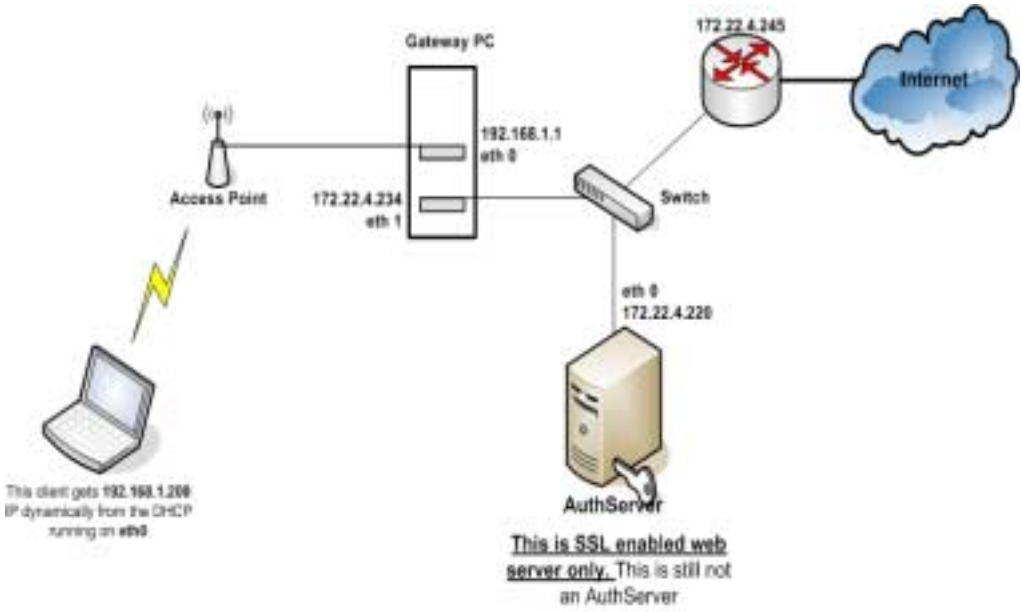
IP Address	172.22.4.1
Subnet mask	255.255.255.0
Default gateway	172.22.4.245

Setting up a SSL enable Web Server with Self-signed Certificate

The first thing we should do is setting up a SSL enable web server with self-signed certificate. This is a pre-requisite of the AuthServer.

1. Install RedHat Linux 8 in AuthServer (as a Linux Server)
2. /sibn/service httpd start
3. cd /etc/https/conf
4. rm ssl.key/server.key
5. rm ssl.crt/server.crt
6. cd /usr/share/ssl/certs
7. make genkey
8. Enter the password (PEM pass phrase)
9. Re-enter the password (PEM pass phrase)
10. make testcert
11. Enter the password
12. Then enter the following arguments
    - sl
    - central
    - clombo
    - slts
    - networking
    - suranga
    - suranga@slts.lk
13. /sbin/service httpd restart
14. Enter password
15. Check this in the browser https://localhost

In stage 2 we connect our own SSL enabled web server (not an AuthServer) as follows



AuthServer Installation

Download the NoCatAuth and put in this directory

/nocat/NoCatAuth-0.82.tar.gz
cd /nocat
tar zvxf NoCatAuth-x.xx.tar.gz
cd NoCatAuth-x.xx
make authserv

Your selection ? 1
Keysize ? 1024 bits
Key is valid for ? 0
(Y/N) ? y
Real Name:? suranga
Emailad : suranga@slts.lk
Comments : good
(N)(C)(E)(O)(Q) ? O
Enter passphrase : ↵
Repeat passphrase : ↵

(IMPORTANT – do not enter passprase)

#chown –R nobody:nobody /usr/local/nocat/pgp

Install relevant modules from CPAN

#perl –mcpan –e shell
Cpan> install Digest::MD5

httpd.conf

```
ServerTokens OS
ServerRoot "/etc/httpd"
PidFile run/httpd.pid
Timeout 300
KeepAlive Off
MaxKeepAliveRequests 100
KeepAliveTimeout 15
<IfModule prefork.c>
StartServers       8
MinSpareServers    5
MaxSpareServers   20
MaxClients       150
MaxRequestsPerChild  1000
</IfModule>
<IfModule worker.c>
StartServers         2
MaxClients         150
MinSpareThreads     25
MaxSpareThreads     75
ThreadsPerChild     25
MaxRequestsPerChild  0
</IfModule>
<IfModule perchild.c>
NumServers           5
StartThreads         5
MinSpareThreads      5
MaxSpareThreads     10
MaxThreadsPerChild  20
MaxRequestsPerChild  0
</IfModule>
Listen 80
Include conf.d/*.conf
LoadModule access_module modules/mod_access.so
LoadModule auth_module modules/mod_auth.so
LoadModule auth_anon_module modules/mod_auth_anon.so
LoadModule auth_dbm_module modules/mod_auth_dbm.so
LoadModule auth_digest_module modules/mod_auth_digest.so
LoadModule include_module modules/mod_include.so
LoadModule log_config_module modules/mod_log_config.so
LoadModule env_module modules/mod_env.so
LoadModule mime_magic_module modules/mod_mime_magic.so
LoadModule cern_meta_module modules/mod_cern_meta.so
LoadModule expires_module modules/mod_expires.so
LoadModule headers_module modules/mod_headers.so
LoadModule usertrack_module modules/mod_usertrack.so
LoadModule unique_id_module modules/mod_unique_id.so
LoadModule setenvif_module modules/mod_setenvif.so
LoadModule mime_module modules/mod_mime.so
LoadModule dav_module modules/mod_dav.so
```

```
LoadModule status_module modules/mod_status.so
LoadModule autoindex_module modules/mod_autoindex.so
LoadModule asis_module modules/mod_asis.so
LoadModule info_module modules/mod_info.so
LoadModule cgi_module modules/mod_cgi.so
LoadModule dav_fs_module modules/mod_dav_fs.so
LoadModule vhost_alias_module modules/mod_vhost_alias.so
LoadModule negotiation_module modules/mod_negotiation.so
LoadModule dir_module modules/mod_dir.so
LoadModule imap_module modules/mod_imap.so
LoadModule actions_module modules/mod_actions.so
LoadModule speling_module modules/mod_speling.so
LoadModule userdir_module modules/mod_userdir.so
LoadModule alias_module modules/mod_alias.so
LoadModule rewrite_module modules/mod_rewrite.so
LoadModule proxy_module modules/mod_proxy.so
LoadModule proxy_ftp_module modules/mod_proxy_ftp.so
LoadModule proxy_http_module modules/mod_proxy_http.so
LoadModule proxy_connect_module modules/mod_proxy_connect.so
User nobody
Group nobody
ServerAdmin root@localhost
UseCanonicalName Off
DocumentRoot "/var/www/html"
<Directory />
    Options FollowSymLinks
    AllowOverride None
</Directory>
<Directory "/var/www/html">
    Options Indexes FollowSymLinks
    AllowOverride Options
    Order allow,deny
    Allow from all
</Directory>
<LocationMatch "^/$>
    Options -Indexes
    ErrorDocument 403 /error/noindex.html
</LocationMatch>
<IfModule mod_userdir.c>
    UserDir disable
</IfModule>
DirectoryIndex index.html index.html.var
AccessFileName .htaccess
<Files ~ "^\.ht">
    Order allow,deny
    Deny from all
</Files>
TypesConfig /etc/mime.types
DefaultType text/plain
<IfModule mod_mime_magic.c>
```

```
    MIMEMagicFile conf/magic
</IfModule>
HostnameLookups Off
ErrorLog logs/error_log
LogLevel warn
LogFormat "%h %l %u %t \"%r\" %>s %b \"%{Referer}i\" \"%{User-Agent}i\"" combined
LogFormat "%h %l %u %t \"%r\" %>s %b" common
LogFormat "%{Referer}i -> %U" referer
LogFormat "%{User-agent}i" agent
CustomLog logs/access_log combined
ServerSignature On
Alias /icons/ "/var/www/icons/"

<Directory "/var/www/icons">
    Options Indexes MultiViews
    AllowOverride None
    Order allow,deny
    Allow from all
</Directory>
Alias /manual "/var/www/manual"

<Directory "/var/www/manual">
    Options Indexes FollowSymLinks MultiViews
    AllowOverride None
    Order allow,deny
    Allow from all
</Directory>

<IfModule mod_dav_fs.c>
    DAVLockDB /var/lib/dav/lockdb
</IfModule>
ScriptAlias /cgi-bin/ "/var/www/cgi-bin/"

<IfModule mod_cgid.c>
</IfModule>
<Directory "/var/www/cgi-bin">
    AllowOverride None
    Options None
    Order allow,deny
    Allow from all
</Directory>

<Directory "/usr/local/nocat/cgi-bin">
Options +ExecCGI
</Directory>
IndexOptions FancyIndexing VersionSort NameWidth=*
AddIconByEncoding (CMP,/icons/compressed.gif) x-compress x-gzip

AddIconByType (TXT,/icons/text.gif) text/*
AddIconByType (IMG,/icons/image2.gif) image/*
```

```
AddIconByType (SND,/icons/sound2.gif) audio/*
AddIconByType (VID,/icons/movie.gif) video/*

AddIcon /icons/binary.gif .bin .exe
AddIcon /icons/binhex.gif .hqx
AddIcon /icons/tar.gif .tar
AddIcon /icons/world2.gif .wrl .wrl.gz .vrml .vrm .iv
AddIcon /icons/compressed.gif .Z .z .tgz .gz .zip
AddIcon /icons/a.gif .ps .ai .eps
AddIcon /icons/layout.gif .html .shtml .htm .pdf
AddIcon /icons/text.gif .txt
AddIcon /icons/c.gif .c
AddIcon /icons/p.gif .pl .py
AddIcon /icons/f.gif .for
AddIcon /icons/dvi.gif .dvi
AddIcon /icons/uuencoded.gif .uu
AddIcon /icons/script.gif .conf .sh .shar .csh .ksh .tcl
AddIcon /icons/tex.gif .tex
AddIcon /icons/bomb.gif core

AddIcon /icons/back.gif ..
AddIcon /icons/hand.right.gif README
AddIcon /icons/folder.gif ^^DIRECTORY^^
AddIcon /icons/blank.gif ^^BLANKICON^^
DefaultIcon /icons/unknown.gif
ReadmeName README.html
HeaderName HEADER.html
IndexIgnore .??* *~ *# HEADER* README* RCS CVS *,v *,t
AddEncoding x-compress Z
AddEncoding x-gzip gz tgz
AddLanguage da .dk
AddLanguage nl .nl
AddLanguage en .en
AddLanguage et .et
AddLanguage fr .fr
AddLanguage de .de
AddLanguage he .he
AddLanguage el .el
AddLanguage it .it
AddLanguage ja .ja
AddLanguage pl .po
AddLanguage kr .kr
AddLanguage pt .pt
AddLanguage nn .nn
AddLanguage no .no
AddLanguage pt-br .pt-br
AddLanguage ltz .ltz
AddLanguage ca .ca
AddLanguage es .es
AddLanguage sv .se
```

```
AddLanguage cz .cz
AddLanguage ru .ru
AddLanguage tw .tw
AddLanguage zh-tw .tw
AddLanguage hr .hr
LanguagePriority en da nl et fr de el it ja kr no pl pt pt-br ltz ca es sv tw
ForceLanguagePriority Prefer Fallback
AddDefaultCharset ISO-8859-1
AddCharset ISO-8859-1  .iso8859-1  .latin1
AddCharset ISO-8859-2  .iso8859-2  .latin2 .cen
AddCharset ISO-8859-3  .iso8859-3  .latin3
AddCharset ISO-8859-4  .iso8859-4  .latin4
AddCharset ISO-8859-5  .iso8859-5  .latin5 .cyr .iso-ru
AddCharset ISO-8859-6  .iso8859-6  .latin6 .arb
AddCharset ISO-8859-7  .iso8859-7  .latin7 .grk
AddCharset ISO-8859-8  .iso8859-8  .latin8 .heb
AddCharset ISO-8859-9  .iso8859-9  .latin9 .trk
AddCharset ISO-2022-JP .iso2022-jp .jis
AddCharset ISO-2022-KR .iso2022-kr .kis
AddCharset ISO-2022-CN .iso2022-cn .cis
AddCharset Big5        .Big5       .big5
AddCharset WINDOWS-1251 .cp-1251   .win-1251
AddCharset CP866       .cp866
AddCharset KOI8-r      .koi8-r .koi8-ru
AddCharset KOI8-ru     .koi8-uk .ua
AddCharset ISO-10646-UCS-2 .ucs2
AddCharset ISO-10646-UCS-4 .ucs4
AddCharset UTF-8       .utf8
AddCharset GB2312      .gb2312 .gb
AddCharset utf-7       .utf7
AddCharset utf-8       .utf8
AddCharset big5        .big5 .b5
AddCharset EUC-TW      .euc-tw
AddCharset EUC-JP      .euc-jp
AddCharset EUC-KR      .euc-kr
AddCharset shift_jis   .sjis
AddType application/x-tar .tgz
AddHandler cgi-script .cgi .pl
AddHandler imap-file map
AddHandler type-map var
AddOutputFilter INCLUDES .shtml
Alias /error/ "/var/www/error/"

<IfModule mod_negotiation.c>
<IfModule mod_include.c>
    <Directory "/var/www/error">
        AllowOverride None
        Options IncludesNoExec
        AddOutputFilter Includes html
        AddHandler type-map var
```

```
    Order allow,deny
    Allow from all
    LanguagePriority en es de fr
    ForceLanguagePriority Prefer Fallback
  </Directory>

  ErrorDocument 400 /error/HTTP_BAD_REQUEST.html.var
  ErrorDocument 401 /error/HTTP_UNAUTHORIZED.html.var
  ErrorDocument 403 /error/HTTP_FORBIDDEN.html.var
  ErrorDocument 404 /error/HTTP_NOT_FOUND.html.var
  ErrorDocument 405 /error/HTTP_METHOD_NOT_ALLOWED.html.var
  ErrorDocument 408 /error/HTTP_REQUEST_TIME_OUT.html.var
  ErrorDocument 410 /error/HTTP_GONE.html.var
  ErrorDocument 411 /error/HTTP_LENGTH_REQUIRED.html.var
  ErrorDocument 412 /error/HTTP_PRECONDITION_FAILED.html.var
  ErrorDocument 413 /error/HTTP_REQUEST_ENTITY_TOO_LARGE.html.var
  ErrorDocument 414 /error/HTTP_REQUEST_URI_TOO_LARGE.html.var
  ErrorDocument 415 /error/HTTP_SERVICE_UNAVAILABLE.html.var
  ErrorDocument 500 /error/HTTP_INTERNAL_SERVER_ERROR.html.var
  ErrorDocument 501 /error/HTTP_NOT_IMPLEMENTED.html.var
  ErrorDocument 502 /error/HTTP_BAD_GATEWAY.html.var
  ErrorDocument 503 /error/HTTP_SERVICE_UNAVAILABLE.html.var
  ErrorDocument 506 /error/HTTP_VARIANT_ALSO_VARIES.html.var

</IfModule>
</IfModule>
BrowserMatch "Mozilla/2" nokeepalive
BrowserMatch "MSIE 4\.0b2;" nokeepalive downgrade-1.0 force-response-1.0
BrowserMatch "RealPlayer 4\.0" force-response-1.0
BrowserMatch "Java/1\.0" force-response-1.0
BrowserMatch "JDK/1\.0" force-response-1.0
BrowserMatch "Microsoft Data Access Internet Publishing Provider" redirect-carefully
BrowserMatch "^WebDrive" redirect-carefully
```

ssl.conf

```
LoadModule ssl_module modules/mod_ssl.so
Listen 443
AddType application/x-x509-ca-cert .crt
AddType application/x-pkcs7-crl    .crl
SSLPassPhraseDialog  builtin
SSLSessionCache        dbm:/var/cache/mod_ssl/scache
SSLSessionCacheTimeout  300
SSLMutex  file:logs/ssl_mutex
SSLRandomSeed startup builtin
SSLRandomSeed connect builtin
<VirtualHost _default_:443>
DocumentRoot "/var/www/html"
```

```
ServerName 203.94.84.205:443
ServerAdmin you@your.address
ErrorLog logs/ssl_error_log
TransferLog logs/ssl_access_log
SSLEngine on
SSLCipherSuite
ALL:!ADH:!EXPORT56:RC4+RSA:+HIGH:+MEDIUM:+LOW:+SSLv2:+EXP:+eNULL
SSLCertificateFile /etc/httpd/conf/ssl.crt/server.crt
SSLCertificateKeyFile /etc/httpd/conf/ssl.key/server.key
<Files ~ "\.(cgi|shtml|phtml|php3?)$">
   SSLOptions +StdEnvVars
</Files>
<Directory "/usr/local/nocat/cgi-bin">
   SSLOptions +StdEnvVars
</Directory>
SetEnvIf User-Agent ".*MSIE.*" \
        nokeepalive ssl-unclean-shutdown \
        downgrade-1.0 force-response-1.0

CustomLog logs/ssl_request_log \
         "%t %h %{SSL_PROTOCOL}x %{SSL_CIPHER}x \"%r\" %b"

</VirtualHost>

ScriptAlias /cgi-bin/ /usr/local/nocat/cgi-bin/

<Directory /usr/local/nocat/cgi-bin>
   SetEnv PERL5LIB /usr/local/nocat/lib
   SetEnv NOCAT    /usr/local/nocat/nocat.conf
</Directory>
SetEnvIf User-Agent ".*MSIE.*" \
  nokeepalive ssl-unclean-shutdown \
  downgrade-1.0 force-response-1.0
```

Use ‘passwd’ file for NoCatAuth user authentication

- Run bin/admintool to create a new users and group admins.
  Eg: Set the password for the user “sura”
  [root@mail nocat]#bin/admintool –c sura surabest
  Adding the user “sura” to the group “members”
  [root@mail nocat]#bin/admintool –a sura members

- After this copy the trustedkeys.gpg from authserver (user/local/nocal) and paste it in gateway /usr/local/nocat/pgp

Note :

I got error 500 premature and of script headers:login in wireless client PC's IE browser. I overcome that problem by changing user and group to nobody as mentioned in the configuration previously.

- We need to edit NoCatAuth configuration file (/usr/local/nocat/nocat.conf) to change authentication section:

```
##### Authservice authentication source.
#
# DataSource -- specifies what to authenticate against.
#   Possible values are DBI, Passwd, LDAP, RADIUS, PAM, Samba, IMAP, NIS.

DataSource  Passwd

## Alternately, you can use the Passwd data source.

UserFile        /usr/local/nocat/etc/passwd
GroupUserFile         /usr/local/nocat/etc/group
GroupAdminFile    /usr/local/nocat/etc/groupadm

# The format of these files is as follows:

# In UserFile, each line is of the form <username>:<password>, where the
#   password is an MD5 digest of the user's actual password.

# In GroupUserFile and GroupAuthFile, each line is of the form
#   <group>:<user1>,<user2>,<user3>,...

# The UserFile may be updated with the bin/admintool script included in
this
# distribution.
```

NoCatAuth 0.82 + MySQL for users repository

- Running MySQL
  # /etc/init.d/mysqld start

- Assigning password to user "root" for MySQL Server
  #mysqladmin password your-password

- Creating the nocat DB
  #mysqladmin create nocat –p

- Adding the nocat DB structure to MySQL
  Copy nocat.shema file to /etc from /nocat/NoCatAuth-0.82/etc
  # mysql nocat < /etc/nocat.shema –p

Making the nocat DB is a property of the user “nocat” with password “nocatauth”

- Login to the MySQL as root
  # mysql –u root –p

- Assign permissions
  mysql > grant all on nocat.* to nocat@localhost identified by “nocatauth”;
  mysql > flush privileges;
  mysql> quit

- Verifying that we have granted the privileges to the user “nocat” (-ppassword is without space character)
  #mysql –u nocat –pnocatauth
  mysql > use nocat
  mysql > show tables

- We need to edit NoCatAuth configuration file (/usr/local/nocat/nocat.conf) to change authentication section:

```
##### Authservice authentication source.
#
# DataSource -- specifies what to authenticate against.
#   Possible values are DBI, Passwd, LDAP, RADIUS, PAM, Samba, IMAP, NIS.
#
DataSource  DBI

##
# Auth service database settings.
#
# If you select DataSource DBI, then Database, DB_User, and DB_Password
#   are required.
#
# Database is a DBI-style data source specification.
#
# For postgres support:
# Database  dbi:Pg:dbname=nocat
#
# For mysql support:
Database          dbi:mysql:database=nocat
DB_User           nocat
DB_Passwd   nocatauth
```

- We add users to our new nocat data base with admintool NoCatAuth utility.
  # usr/local/nocat/bin/admintool –c toni password
  # usr/local/nocat/bin/admintool –a toni members

- We can verify that we have added the user correctly to members tables.
  # mysql –u nocat –pnocatauth

```
mysql > use nocat;
mysql > select * from member;
mysql > exit
```

NoCatAuth 0.82 + FreeRADIUS

Installing FreeRADIUS

- Download the FreeRADIUS from www.freeradius.org.

```
# rar –zxvf freeradius.tar.gz
# cd /freeradius
#./configure --localstatedir=/var --sysconfdir=/etc
# make
# makeinstall
```

- Then you have to modify the ***etc/raddb/clients*** file. This file lists the hosts authorized to hit the FreeRADIUS server with requests and secret key those will use in their requests. Also, add the IP address of a desktop console machine with which you can test your setup using RADIUS ping utility. (This can refer to our gateway that is 172.22.4.234)

Eg:

```
# Client Name           Key
#----------------       ----------------------
#portmaster1.isp.com    testing123
#portmaster2.isp.com    testing123
#proxyradius.isp2.com   TheirKey
localhost               testing123
172.22.4.238            testing123
tc-clt.hasselltech.net  oreilly
```

- Next you have to add the IP address of the gateway into the ***etc/raddb/naslist*** file.

Eg:

```
# NAS Name              Short Name        Type
#---------------        -----------       ----
#portmaster1.isp.com    pm1.NY      livingston
localhost               local       portslave
172.22.4.238            local       portslave
tc-clt.hasselltech.net  tc.char           tc
```

Configuring FreeRADIUS to use MySQL

- Edit the ***/etc/raddb/sql.conf*** and enter the server name and password details to connect to your MySQL server and the RADIUS database.

- Edit the ***/etc/raddb/radiusd.conf*** and add a line saying ‘sql’ to the authorize{} section (which is towards the end of the file). The best place to put it is just before the ‘files’ entry. Indeed, if you will just be using MySQL, and not falling back to text files, you could comment out or lose the ‘files’ entry altogether.

- The end of your radiusd.conf should then look something like this:

```
authorize {
            preprocess
            chap
            mschap
            #counter
            #attr_filter
            #eap
            Suffix
            Sql
            #files
            #etc_smbpasswd
}

authenticate {
            authtype PAP {
                  pap
}
            authtype CHAP {
                  chap
}
            authtype MS-CHAP {
                  ms chap
}
#pam
#unix
#authtype LDAP {
#     ldap
#}
}

preact {
            preprocess
            suffix
            #files
}

accounting {
            acct_unique
            detail
            #counter
            unix
            sql
            radutmp
            #sradutmp
}

session {
            radutmp
}
```

Modify the nocat.conf

DataSource	RADIUS
RADIUS_Host	localhost:1645
RADIUS_Secret	testing123
RADIUS_TimeOut	5

Note:

The radius port of gateway is 1646 and radius port of authserver is 1645, because 1645 is the port that free radius work and 1646 is the port for accounting.

Populating MySQL

You should now create some dummy data in the database to test against. It goes something like this:

- In usergroup, put entries matching a user account name to a group name.
- In radcheck, put an entry for each user account name with a 'Password' attribute with a value of their password.
- In radreply, create entries for each user-specific radius reply attribute against their username
- In radgroupreply, create attributes to be returned to all group members

Here's a dump of tables from the 'radius' database from mysql on my test box (edited slightly for clarity). This example includes three users, one with a dynamically assigned IP by the NAS (fredf), one assigned a static IP (barney), and one representing a dial-up routed connection (dialrouter):

```
mysql> select * from usergroup;
+----+---------------+-----------+
| id | UserName      | GroupName |
+----+---------------+-----------+
|  1 | fredf         | dynamic   |
|  2 | barney        | static    |
|  2 | dialrouter    | netdial   |
+----+---------------+-----------+
3 rows in set (0.00 sec)


mysql> select * from radcheck;
+----+----------+-------------+-----------|----+
id | UserName    | Attribute    | Value      | Op |
+----+----------+-------------+-----------+----+
|  1 | fredf     | Password     | wilma      | == |
|  2 | barney    | Password     | betty      | == |
|  2 | dialrouter| Password     | dialup     | == |
+----+----------+-------------+-----------+----+
3 rows in set (0.02 sec)
```

```
mysql> select * from radgroupcheck;
+----+-----------+--------------+------------|----+
| id | GroupName | Attribute    | Value      | Op
+----+-----------+--------------+------------|----+
|  1 | dynamic   | Auth-Type    | Local      | := |
|  2 | static    | Auth-Type    | Local      | := |
|  3 | netdial   | Auth-Type    | Local      | := |
+----+-----------+--------------+------------|----+
     3 rows in set (0.01 sec)
```

```
mysql> select * from radreply;
+----+-----------+-------------------+----------------|------+
| id | UserName  | Attribute         | Value          | Op   |
+----+-----------+-------------------+----------------|------+
|  1 | barney    | Framed-IP-Address | 1.2.3.4        | :=   |
|  2 | dialrouter| Framed-IP-Address | 2.3.4.1        | :=   |
|  3 | dialrouter| Framed-IP-Netmask |255.255.255.255 | :=   |
|  4 | dialrouter| Framed-Routing    |Broadcast-Listen| :=   |
|  5 | dialrouter| Framed-Route |2.3.4.0 255.255.255.248 |:= |
| 6  | dialrouter| Idle-Timeout      | 900            | :=   |
+-----+-----------+-------------------+----------------|------+
     6 rows in set (0.01 sec)
```

```
mysql> select * from radgroupreply;
+----+----------+--------------------+---------------------|---+
| id |GroupName | Attribute          | Value               |Op |
+----+----------+--------------------+---------------------|---+
| 34 | dynamic  | Framed-Compression | Van-Jacobsen-TCP-IP |:= |
| 33 | dynamic  | Framed-Protocol    | PPP                 |:= |
| 32 | dynamic  | Service-Type       | Framed-User         | :=|
| 35 | dynamic  | Framed-MTU         | 1500                | :=|
| 37 | static   | Framed-Protocol    | PPP                 | :=|
| 38 | static   | Service-Type       | Framed-User         | :=|
| 39 | static   | Framed-Compression | Van-Jacobsen-TCP-IP | :=|
| 41 | netdial  | Service-Type       | Framed-User         | :=|
| 42 | netdial  | Framed-Protocol    | PPP                 | :=|
+----+----------+--------------------+---------------------|---+
     12 rows in set (0.01 sec)

     mysql>
```

Installing Authen Radius Module

perl –MCPAN –e shell
install Authen::Radius

Getting Started with FreeRADIUS

Introduction

[*RADIUS* covers, among other things,] the theoretical underpinnings of both the authentication-authorization-accounting (AAA) architecture as well as the specific implementation of AAA characteristics that is the RADIUS protocol. [In this excerpt from Chapter 5], I will now focus on practical applications of RADIUS: implementing it, customizing it for your specific needs, and extending its capabilities to meet other needs in your business. First, though, I need a product that talks RADIUS.

Enter FreeRADIUS.

Introduction to FreeRADIUS

The developers of FreeRADIUS speak on their product and its development, from the FreeRADIUS Web site:

FreeRADIUS is one of the most modular and featureful [sic] RADIUS servers available today. It has been written by a team of developers who have more than a decade of collective experience in implementing and deploying RADIUS software, in software engineering, and in Unix package management. The product is the result of synergy between many of the best-known names in free software-based RADIUS implementations, including several developers of the Debian GNU/Linux operating system, and is distributed under the GNU GPL (version 2).

FreeRADIUS is a complete rewrite, ground-up compilation of a RADIUS server. The configuration files exhibit many similarities to the old Livingston RADIUS server. The product includes support for:

- Limiting the maximum number of simultaneous logons, even on a per-user basis
- More than one `DEFAULT` entry, with each being capable of "falling through" to the next
- Permitting and denying access to users based on the `huntgroup` to which they are connected
- Setting certain parameters to be `huntgroup` specific
- Intelligent "hints" files that select authentication protocols based on the syntax of the username
- Executing external programs upon successful login

- Using the `$INCLUDE` filename format with configuration, users, and dictionary files
- Vendor-specific attributes
- Acting as a proxy RADIUS server

FreeRADIUS supports the following popular NAS equipment:

- 3Com/USR Hiper Arc Total Control
- 3Com/USR NetServer
- 3Com/USR TotalControl
- Ascend Max 4000 family
- Cisco Access Server family
- Cistron PortSlave
- Computone PowerRack
- Cyclades PathRAS
- Livingston PortMaster
- Multitech CommPlete Server
- Patton 2800 family

FreeRADIUS is available for a wide range of platforms, including Linux, FreeBSD, OpenBSD, OSF/Unix, and Solaris. For the purposes of this book, I will focus on FreeRADIUS running under Linux. Also, as of this printing, a stable Version 1.0 of the product had not been released. However, development of the server is very stable, careful, and somewhat slow, so changes to the procedures mentioned are unlikely. In the event a procedure does change, it's likely to be a relatively small modification. Always check the FreeRADIUS Web site for up-to-date details.

Installing FreeRADIUS

At present, the FreeRADIUS team doesn't offer precompiled binaries. The best way to start off is to grab the latest source code, compressed using *tar* and *gzip*, from the FreeRADIUS Web site. Once the file is on your computer, execute the following command to uncompress the file:

tar -zxvf freeradius.tar.gz

Next, you'll need to compile FreeRADIUS. Make sure your system at least has gcc, glibc, binutils, and gmake installed before trying to compile. To begin compiling, change to the directory where your uncompressed source code lies and execute ./configure from the command line. You can also run ./configure -flags and customize the settings for the flags in Table 5-1.

Table 5-1: Optional configuration flags for FreeRADIUS

Flag	Purpose	Default
`--enable-shared[=PKGS]`	Builds shared libraries.	Yes
`--enable-static[=PKGS]`	Builds static libraries.	Yes
`--enable-fast-install[=PKGS]`	Optimizes the resulting files for fastest installation.	Yes
`--with-gnu-ld`	Makes the procedure assume the C compiler uses *GNU lD*.	No
`--disable-libtool-lock`	Avoids locking problems. This may break parallel builds.	Not applicable
`--with-logdir=DIR`	Specifies the directory for log files.	`LOCALSTATEDIR/log`
`--with-radacctdir=DIR`	Specifies the directory for detail files.	`LOGDIR/radacct`
`--with-raddbdir=DIR`	Specifies the directory for configuration files.	`SYSCONFDIR/raddb`
`--with-dict-nocase`	Makes the dictionary case insensitive.	Yes
`--with-ascend-binary`	Includes support for attributes provided with the Ascend binary filter.	Yes
`--with-threads`	Uses threads if they're supported and available.	Yes
`--with-snmp`	Compiles SNMP support into the binaries.	Yes
`--with-mysql-include-dir=DIR`	Specifies where the include files for MySQL can be found.	Not applicable

`--with-mysql-lib-dur=DIR`	Specifies where the dictionary files for MySQL can be found.	Not applicable
`--with-mysql-dir-DIR`	Specifies where MySQL is installed on the local system.	Not applicable
`--disable-ltdl-install`	Does not install `libltdl`.	Not applicable
`--with-static-modules=QUOTED-MODULE-LIST`	Compiles the list of modules statically.	Not applicable
`--enable-developer`	Turns on extra developer warnings in the compiler.	Not applicable

Commonly, the following locations are used when installing a RADIUS product (these practices go back to the Cistron RADIUS server):

Binaries: */usr/local/bin* and */usr/local/sbin*

Manual (man) pages: */usr/local/man*

Configuration files: */etc/raddb*

Log files: */var/log* and */var/log/radacct*

To make the compiler use these locations automatically, execute:

```
./configure --localstatedir=/var --sysconfdir=/etc
```

The programs will then be configured to compile. The rest of this chapter will assume that you installed FreeRADIUS in these locations.

Next, type make. This will compile the binaries. Finally, type make install. This will place all of the files in the appropriate locations. It will also install configuration files if this server has not had a RADIUS server installed before. Otherwise, the procedure will not overwrite your existing configuration and will report to you on what files it did not install.

At this point, your base FreeRADIUS software is installed. Before you begin, though, you'll need to customize some of the configuration files so that they point to machines and networks specific to your configuration. Most of these files are located in */etc/raddb*. The following files are contained by default:

```
radius:/etc/raddb # ls -al
total 396
drwxr-xr-x    2 root   root      4096 Apr 10 10:39 .
drwxr-xr-x    3 root   root      4096 Apr 10 10:18 ..
-rw-r--r--    1 root   root       635 Apr 10 10:18 acct_users
-rw-r--r--    1 root   root      3431 Apr 10 10:18 attrs
```

```
-rw-r--r--    1 root   root       595 Apr 10 11:02 clients
-rw-r--r--    1 root   root      2235 Apr 10 10:39 clients.conf
-rw-r--r--    1 root   root     12041 Apr 10 10:18 dictionary
-rw-r--r--    1 root   root     10046 Apr 10 10:39 dictionary.acc
-rw-r--r--    1 root   root      1320 Apr 10 10:39 dictionary.aptis

-rw-r--r--    1 root   root     54018 Apr 10 10:39 dictionary.ascend
-rw-r--r--    1 root   root     11051 Apr 10 10:39 dictionary.bay
-rw-r--r--    1 root   root      4763 Apr 10 10:39 dictionary.cisco
-rw-r--r--    1 root   root      1575 Apr 10 10:39 dictionary.compat
-rw-r--r--    1 root   root      1576 Apr 10 10:39 dictionary.erx
-rw-r--r--    1 root   root       375 Apr 10 10:39 dictionary.foundry
-rw-r--r--    1 root   root       279 Apr 10 10:39 dictionary.freeradius
-rw-r--r--    1 root   root      2326 Apr 10 10:39 dictionary.livingston
-rw-r--r--    1 root   root      2396 Apr 10 10:39 dictionary.microsoft
-rw-r--r--    1 root   root       190 Apr 10 10:39 dictionary.nomadix
-rw-r--r--    1 root   root      1537 Apr 10 10:39 dictionary.quintum
-rw-r--r--    1 root   root      8563 Apr 10 10:39 dictionary.redback
-rw-r--r--    1 root   root       457 Apr 10 10:39 dictionary.shasta
-rw-r--r--    1 root   root      2958 Apr 10 10:39 dictionary.shiva
-rw-r--r--    1 root   root      1274 Apr 10 10:39 dictionary.tunnel
-rw-r--r--    1 root   root     63265 Apr 10 10:39 dictionary.usr
-rw-r--r--    1 root   root      2199 Apr 10 10:39 dictionary.versanet
-rw-r--r--    1 root   root      1767 Apr 10 10:18 hints
-rw-r--r--    1 root   root      1603 Apr 10 10:18 huntgroups
-rw-r--r--    1 root   root      2289 Apr 10 10:39 ldap.attrmap
-rw-r--r--    1 root   root       830 Apr 10 10:18 naslist
-rw-r--r--    1 root   root       856 Apr 10 10:18 naspasswd
-rw-r--r--    1 root   root      9533 Apr 10 10:39 postgresql.conf
-rw-r--r--    1 root   root      4607 Apr 10 10:39 proxy.conf
-rw-r--r--    1 root   root     27266 Apr 10 10:57 radiusd.conf
-rw-r--r--    1 root   root     27232 Apr 10 10:39 radiusd.conf.in
-rw-r--r--    1 root   root      1175 Apr 10 10:18 realms
-rw-r--r--    1 root   root      1405 Apr 10 10:39 snmp.conf
-rw-r--r--    1 root   root      9089 Apr 10 10:39 sql.conf
-rw-r--r--    1 root   root      6941 Apr 10 10:18 users
-rw-r--r--    1 root   root      6702 Apr 10 10:39 x99.conf
-rw-r--r--    1 root   root      3918 Apr 10 10:39 x99passwd.sample
```

The *clients* File

First, take a look at the */etc/raddb/clients* file. This file lists the hosts authorized to hit the FreeRADIUS server with requests and the secret key those hosts will use in their requests. Some common entries are already included in the */etc/raddb/clients* file, so you may wish to simply uncomment the appropriate lines. Make sure the secret key that is listed in the *clients* file is the same as that programmed into your RADIUS client equipment. Also, add the IP

address of a desktop console machine with which you can test your setup using a RADIUS ping utility. A sample ‘clients’ file looks like this:

```
# Client Name           Key
#---------------       ----------
#portmaster1.isp.com    testing123
#portmaster2.isp.com    testing123
#proxyradius.isp2.com   TheirKey
localhost               testing123
192.168.1.100           testing123
tc-clt.hasselltech.net  oreilly
```

TIP: It's recommended by the FreeRADIUS developers that users move from the clients file to the *clients.conf* file. The *clients.conf* file is not addressed in this chapter, but for the sake of simplicity and startup testing, I will continue using the plain clients file in this introduction.

While it may seem obvious, *change the shared secrets* from the defaults in the file or the samples listed previously. Failing to do so presents a significant security risk to your implementation and network.

The *naslist* File

Next, open the */etc/raddb/naslist* file. Inside this file, you should list the full canonical name of every NAS that will hit this server, its nickname, and the type of NAS. For your test console, you can simply use the "portslave" type. Table 5-2 lists the FreeRADIUS-supported NAS equipment and the type identifier needed for the *naslist* file.

Table 5-2: Supported NAS equipment and its type identifier

NAS equipment	Type identifier
3Com/USR Hiper Arc Total Control	`usrhiper`
3Com/USR NetServer	`netserver`
3Com/USR TotalControl	`Tc`
Ascend Max 4000 family	`max40xx`
Cisco Access Server family	`cisco`
Cistron PortSlave	`portslave`
Computone PowerRack	`computone`
Cyclades PathRAS	`pathras`
Livingston PortMaster	`livingston`
Multitech CommPlete Server	`multitech`

Patton 2800 family	`patton`

A sample */etc/raddb/naslist* file looks like this:

```
# NAS Name              Short Name      Type
#----------------       ----------      ----
#portmaster1.isp.com    pm1.NY          livingston
localhost               local           portslave
192.168.1.100           local           portslave
tc-clt.hasselltech.net  tc.char         tc
```

The *naspasswd* File

If you have 3Com/USR Total Control, NetServer, or Cyclades PathRAS equipment, you may need to edit the */etc/raddb/naspasswd* file. This lets the checkrad utility log onto your NAS machine and check to see who is logged on at what port--which is commonly used to detect multiple logins. Normally, the SNMP protocol can do this, but the equipment listed previously needs a helping hand from the checkrad utility. A sample */etc/raddb/naspasswd* file looks like this:

```
206.229.254.15 !root JoNAThaNHasSELl
206.229.254.5  !root FoOBaR
```

The *hints* File

Progressing along with the FreeRADIUS setup you will come to the */etc/raddb/hints* file. This file can be used to provide "hints" to the RADIUS server about how to provision services for a specific user based on how his login name is constructed. For example, when you've configured your default service to be a SLIP connection, then a SLIP connection will be set up if a user logs in with her standard username (e.g., *meis*). However, if that same user wanted a PPP connection, she could alter her username to be *Prneis*, and the RADIUS server (knowing about that convention from the */etc/raddb/hints* file) would set up a PPP connection for her. Suffixes on the end of the username work in the same way. More on the hints file will be provided later in the chapter. You shouldn't need to edit this file initially since we're just testing, but if you'd like to check it out, a sample */etc/raddb/hints* file looks like this:

```
DEFAULT Prefix = "P", Strip-User-Name = Yes
        Hint = "PPP",
        Service-Type = Framed-User,
        Framed-Protocol = PPP

DEFAULT Prefix = "S", Strip-User-Name = Yes
        Hint = "SLIP",
        Service-Type = Framed-User,
        Framed-Protocol = SLIP

DEFAULT Suffix = "P", Strip-User-Name = Yes
        Hint = "PPP",
        Service-Type = Framed-User,
```

```
        Framed-Protocol = PPP

DEFAULT Suffix = "S", Strip-User-Name = Yes
        Hint = "SLIP",
        Service-Type = Framed-User,
        Framed-Protocol = SLIP
```

The *huntgroups* File

Let's move on to the */etc/raddb/huntgroups* file, where you define certain huntgroups. *Huntgroups* are sets of ports or other communication outlets on RADIUS client equipment. In the case of FreeRADIUS, a huntgroup can be a set of ports, a specific piece of RADIUS client equipment, or a set of calling station IDs that you want to separate from other ports.

You can filter these defined huntgroups to restrict their access to certain users and groups and match a username/password to a specific huntgroup, possibly to assign a static IP address. You define huntgroups based on the IP address of the NAS and a port range. (Keep in mind that a range can be anywhere from 1 to the maximum number of ports you have.) To configure this file, you first specify the terminal servers in each POP. Then, you configure a stanza that defines the restriction and the criteria that a potential user must satisfy to pass the restriction. That criteria is most likely a Unix username or groupname.

Again, you shouldn't have to configure this file to get basic functionality enabled for testing; if you would like to peruse the file and its features, however, I've provided a sample */etc/raddb/huntgroups* file. It's for an ISP with a POP in Raleigh, North Carolina that wants to restrict the first five ports on its second of three terminal servers in that POP to only premium customers:

```
raleigh         NAS-IP-Address == 192.168.1.101
raleigh         NAS-IP-Address == 192.168.1.102
raleigh         NAS-IP-Address == 192.168.1.103
premium         NAS-IP-Address == 192.168.1.101, NAS-Port-Id == 0-4
                Group = premium,
                Group = staff
```

The *users* File

FreeRADIUS allows several modifications to the original RADIUS server's style of treating users unknown to the *users* file. In the past, if a user wasn't configured in the *users* file, the server would look in the Unix password file, and then deny him access if he didn't have an account on the machine. There was only one default entry permitted. In contrast, FreeRADIUS allows multiple default entries and can "fall through" each of them to find an optimal match. The entries are processed in the order they appear in the users file, and once a match is found, RADIUS stops processing it. The Fall-Through = Yes attribute can be set to instruct the server to keep processing, even upon a match. The new FreeRADIUS *users* file can also accept spaces in the username attributes, either by escaping the space with a backslash (\) or putting the entire username inside quotation marks. Additionally, FreeRADIUS will not strip out spaces in usernames received from PortMaster equipment.

Since we won't add any users to the *users* file for our testing purposes, FreeRADIUS will fall back to accounts configured locally on the Unix machine. However, if you want to add a user to the *users* file to test that functionality, a sample */etc/raddb/users* file looks like this:

```
steve  Auth-Type := Local, User-Password == "testing"
       Service-Type = Framed-User,
       Framed-Protocol = PPP,
       Framed-IP-Address = 172.16.3.33,
       Framed-IP-Netmask = 255.255.255.0,
       Framed-Routing = Broadcast-Listen,
       Framed-Filter-Id = "std.ppp",
       Framed-MTU = 1500,
       Framed-Compression = Van-Jacobsen-TCP-IP
DEFAULT Service-Type == Framed-User
       Framed-IP-Address = 255.255.255.254,
       Framed-MTU = 576,
       Service-Type = Framed-User,
       Fall-Through = Yes
DEFAULT Framed-Protocol == PPP
       Framed-Protocol = PPP,
       Framed-Compression = Van-Jacobson-TCP-IP
```

There will be much more about the *users* file later in this chapter.

The *radiusd.conf* File

This file is much like Apache's *httpd.conf* file in that it lists nearly every directive and option for the basic functionality of the FreeRADIUS product. You will need to edit the Unix section of this file to make sure that the locations of the *passwd*, *shadow*, and *group* files are not commented out and are correct. FreeRADIUS needs these locations to start up. The appropriate section looks like this:

```
unix {
  (some content removed)
    #  Define the locations of the normal passwd, shadow, and group files.
    #
    #  'shadow' is commented out by default, because not all
    #  systems have shadow passwords.
```

```
    #
    #  To force the module to use the system passwd fnctns,
    #  instead of reading the files, comment out the 'passwd'
    #  and 'shadow' configuration entries.  This is required
    #  for some systems, like FreeBSD.
    #
    passwd = /etc/passwd
    shadow = /etc/shadow
    group = /etc/group
  (some content removed)
  }
```

I will cover the *radiusd.conf* file in more detail later in this chapter.

With that done, it's now time to launch the `radiusd` daemon and test your setup. Execute `radiusd` from the command line; it should look similar to this:

```
radius:/etc/raddb # radiusd
radiusd: Starting - reading configuration files ...
radius:/etc/raddb #
```

If you receive no error messages, you now have a functional FreeRADIUS server. Congratulations!

Testing the Initial Setup

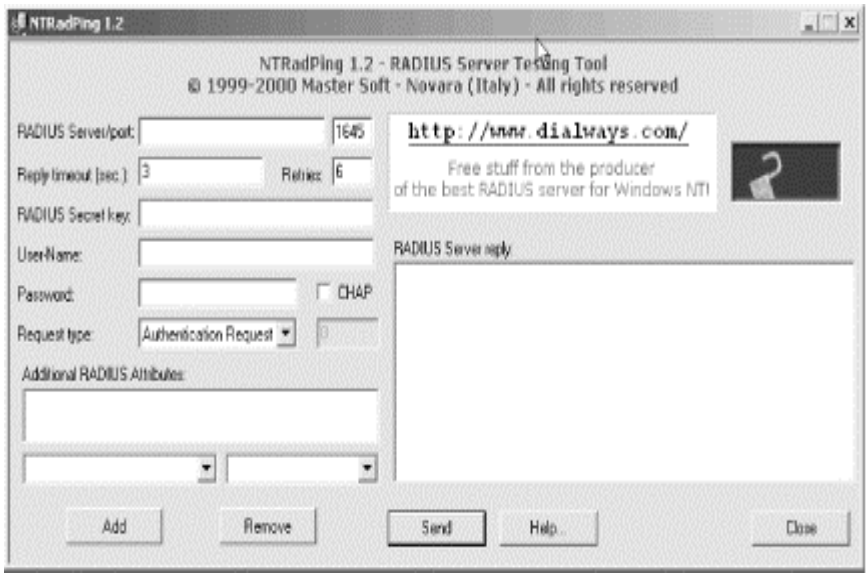
Once you have FreeRADIUS running, you need to test the configuration to make sure it is responding to requests. FreeRADIUS starts up listening, by default, on the port specified either in the local */etc/services* file or in the port directive in *radiusd.conf*. While RFC 2138 defines the standard RADIUS port to be 1812, historically RADIUS client equipment has used port 1645. Communicating via two different ports is obviously troublesome, so many users start the FreeRADIUS daemon with the -p flag, which overrides the setting in both the */etc/services* file and anything set in *radiusd.conf*. To do this, run the following from the command line:

```
radius:/etc/raddb # radiusd -p 1645
radiusd: Starting - reading configuration files ...
radius:/etc/raddb #
```

The server is now running; it is listening for and accepting requests on port 1645.

So, what is an easy way to test your configuration to see if it functions properly? It's easier than you might think, in fact. MasterSoft, Inc. has released a Windows desktop RADIUS server testing tool called NTRadPing, available at http://www.dialways.com. The latest version as of this writing is 1.2, and it's a freeware tool. Download and install this utility on a Windows machine, and then run it. The initial application window should look much like Figure 5-1.

Figure 5-1. The NTRadPing 1.2 application window



To do a quick test, follow these steps:

1. Enter the IP address of your FreeRADIUS machine in the RADIUS Server/port box, and then the port number in the adjacent box. For this example, I've used IP address 192.168.1.103 and port 1645.

1. Type in the secret key you added in */etc/raddb/clients* for this Windows console machine. For this example, I used the key "testing123."

3. In the User-Name field, enter root, and in the Password field, enter the root password for your FreeRADIUS machine.

4. Select *Authentication Request* from the Request Type drop-down list box.

5. Click Send.

If your server is working properly, and you entered a valid root password, you should see the reply in the RADIUS Server reply box to the right of the NTRadPing window. You should see something like:

```
Sending authentication request to server 192.168.1.103:1645
Transmitting packet, code=1 id=1 length=47
Received response from the server in 15 milliseconds
Reply packet code=2 id=1 length=20
Response: Access-Accept

------------------attribute dump----------------------
```

Now, change the password for root inside NTRadPing to something incorrect, and resend the request. You should get an Access-Reject message much like the one shown here:

```
Sending authentication request to server 192.168.1.103:1645
Transmitting packet, code=1 id=3 length=47
No response from server (timed out), new attempt (#1)
Received response from the server in 3516 milliseconds
Reply packet code=3 id=3 length=20
Response: Access-Reject

------------------attribute dump----------------------
```

Next, you'll need to test accounting packets. The old standard for RADIUS accounting used port 1646. Change the port number in NTRadPing accordingly, and select *Accounting Start* from the Request Type drop-down list box. Make sure the root password is correct again, and send your request along. The response should be similar to the following:

```
Sending authentication request to server 192.168.1.103:1646
Transmitting packet, code=4 id=5 length=38
Received response from the server in 15 milliseconds
Reply packet code=5 id=5 length=20
Response: Accounting-Response

------------------attribute dump----------------------
```

Finally, stop that accounting process by changing the Request Type box selection to *Accounting Stop* and resending the request. You should receive a response like this:

```
Sending authentication request to server 192.168.1.103:1645
Transmitting packet, code=4 id=6 length=38
Received response from the server in 16 milliseconds
Reply packet code=5 id=6 length=20
Response: Accounting-Response

------------------attribute dump----------------------
```

If you received successful responses to all four ping tests, then FreeRADIUS is working properly. If you haven't, here's a quick list of things to check:

- Is FreeRADIUS running? Use

```
ps -aux | grep radiusd
```

to determine whether the process is active or not.

- Is FreeRADIUS listening on the port you're pinging? If necessary, start

  radiusd with an explicit port, i.e.,

  ```
  radiusd -p 1645
  ```

- Have you added your Windows console machine to the list of authorized clients that can hit the RADIUS server? Do this in the */etc/raddb/clients* file.

- Are you using the correct secret key? This as well is configured in the */etc/raddb/clients* file.

- Have you double-checked the locations of the *group*, *passwd*, and *shadow* files inside the *radiusd.conf* file? These locations are specified in the Unix section. Make sure they're not commented out and that the locations are correct.
- Can FreeRADIUS read the *group*, *passwd*, and *shadow* files? If you're running FreeRADIUS as root, this shouldn't be a problem, but check the permissions on these files to make sure the user/group combination under which radiusd is running can access those files.

- Is there any port filtering or firewalling between your console machine and the RADIUS server that is blocking communications on the ping port?

- Is the daemon taking a long time to actually start up and print a ready message (if you're running in debugging mode)? If so, your DNS configuration is broken.

To assist in diagnosing your problem, you may want to try running the server in debugging mode. While operating in this mode, FreeRADIUS outputs just about everything it does, and by simply sifting through all of the messages it prints while running, you can identify most problems.

To run the server in debugging mode, enter the following on the command line to start radiusd:

```
radiusd -sfxxyz -l stdout
```

It should respond with a ready message if all is well. If it doesn't, then look at the error (or errors as the case may be) and run through the checklist above.

You can also check the configuration of FreeRADIUS using the following command:

radiusd -c

This command checks the configuration of the RADIUS server and alerts you to any syntax errors in the files. It prints the status and exits with either a zero, if everything is correct, or a one if errors were present. This command is also useful when you're updating a production server that cannot be down: if there were a syntax error in the files, radiusd would fail to load correctly, and downtime would obviously ensue. With the check capability, this situation can be avoided.

In-depth Configuration

At this point, you've compiled, installed, configured, started, and tested a simple FreeRADIUS implementation that is functional. However, 99.5% of the RADIUS/AAA implementations around the world are just not that simple. In this section, I'll delve into the two major configuration files and discuss how to tweak, tune, customize, and effect change to the default FreeRADIUS installation.

Configuring *radiusd.conf*

radiusd.conf file is the central location to configure most aspects of the FreeRADIUS product. It includes configuration directives as well as pointers and two other configuration files that may be located elsewhere on the machine. There are also general configuration options for the multitude of modules available now and in the future for FreeRADIUS. The modules can request generic options, and FreeRADIUS will pass those defined options to the module through its API.

Before we begin, some explanation is needed of the operators used in the statements and directives found in these configuration files. The `=` operator, as you might imagine, sets the value of an attribute. The `:=` operator sets the value of an attribute and overwrites any previous value that was set for that attribute. The `==` operator compares a state with a set value. It's critical to understand how these operators work in order to obtain your desired configuration.

In this chapter, I'll look at several of the general configuration options inside *radiusd.conf*.

`Pidfile`

This file contains the process identification number for the `radiusd` daemon. You can use this file from the command line to perform any action to a running instance of FreeRADIUS. For example, to shut FreeRADIUS down without any protests, issue:

```
kill -9 `cat /var/run/radiusd.pid'
```

Usage:

```
pidfile = [path]
```

Suggestion:

```
pidfile = ${run_dir}/radiusd.pid
```

user and group

These options dictate under what user and group `radiusd` runs. It is not prudent to allow FreeRADIUS to run under a user and group with excessive permissions. In fact, to minimize the permissions granted to FreeRADIUS, use the `user` and `group` "nobody." However, on systems configured to use shadow passwords, you may need to set the `user` to "nobody" and the `group` to "shadow" so that `radiusd` can read the *shadow* file. This is not a desirable idea. On some systems, you may need to set both the user and group to "root," although it's clear why that is an even worse idea.

Usage:

```
user = [username]; group = [groupname]
```

Suggestion:

```
user = nobody; group = nobody
```

max_request_time

This option specifies the maximum number of seconds a request will be processed by FreeRADIUS. If the handling of a request takes longer than this threshold, the process can be killed off and an Access-Reject message returned. This value can range from 5 to 120 seconds.

Usage:

```
max_request_time = 30
```

Suggestion:

```
max_request_time = 60
```

delete_blocked_requests

This directive is paired with the `max_request_time` directive in that it controls when requests that exceed the time threshold should be killed. Most of the time, this value should be set to "no."

Usage:

```
delete_blocked_requests = [yes/no]
```

Suggestion:

```
delete_blocked_requests = no
```

cleanup_delay

When FreeRADIUS sends a reply to RADIUS client equipment, it generally caches that request internally for a few seconds to ensure that the RADIUS client will receive the message (sometimes network problems, offline servers, and large traffic loads might prevent the client from picking up the packet). The client receives a quick reply on its prompting for a second copy of the packet, since the internal cache mechanism for FreeRADIUS is much

quicker than processing the request again. This value should be set between 2 and 10: this range is the happy medium between treating every request as a new request and caching so many processed requests that some new requests are turned away.

Usage:

```
cleanup_delay = [value]
```

Suggestion:

```
cleanup_delay = 6
```

max_requests

This directive specifies the maximum number of requests FreeRADIUS will keep tabs on during operation. The value starts at 256 and scales with no upper limit, and ideally this is set at the number of RADIUS clients you have multiplied by 256. Setting this value too high causes the server to eat up more system memory, while setting it too low causes a delay in processing new requests once this threshold has been met. New requests must wait for the cleanup delay period to finish before they can be serviced.

Usage:

```
max_requests = [value]
```

Suggestion:

```
max_requests = [256 * x number of clients]
```

bind_address

This directive specifies the address under which `radiusd` will accept requests and reply to them. The "address" can be an IP address, fully qualified domain name, or the `*` wildcard character (to instruct the daemon to listen on all interfaces).

Usage:

```
bind_address = [value]
```

Suggestion:

```
bind_address = *
```

port

This setting instructs FreeRADIUS to listen on a specific port. While the RADIUS RFC specifies that the official RADIUS port is 1812, historically NAS equipment and some RADIUS servers have used port 1645. You should be aware of the port your implementation uses. While you can specify a certain port here, you can also instruct `radiusd` to use the machine's */etc/services* file to find the port to use. Additionally, using the `-p` switch when executing `radiusd` will override any port setting provided here.

Usage:

```
port = [value]
```

Suggestion:

```
port = 1645
hostname_lookups
```

This directive tells FreeRADIUS whether to look up the canonical names of the requesting clients or simply log their IP address and move on. Much like with Apache, DNS queries take a long time and, especially on highly loaded servers, can be a detriment to performance. Turning this option on also causes `radiusd` to block the request for 30 seconds while it determines the CNAME associates with that IP address. Only turn this option on if you are sure you need it.

Usage:

```
hostname_lookups = [yes/no]
```

Suggestion:

```
hostname_lookups = no
allow_core_dumps
```

This directive determines whether FreeRADIUS should dump to core when it encounters an error or simply silently quit with the error. Only enable this option if you're developing for FreeRADIUS or attempting to debug a problem with the code.

Usage:

```
allow_core_dumps = [yes/no]
```

Suggestion:

```
allow_core_dumps = no
```

regular and extended expressions

This set of controls configures regular and extended expression support. Realistically, you shouldn't need to alter these as they're set when running the *./configure* command upon initial install.

Usage:

```
regular_expressions = [yes/no]; extended_expressions = [yes/no]
```

Suggestion:

```
regular_expressions = yes; extended_expressions = yes
log
```

These directives control how access to and requests of the FreeRADIUS server are logged. The `log_stripped_names` control instructs FreeRADIUS whether to include the full `User-Name` attribute as it appeared in the packet. The `log_auth` directive specifies whether to log authentication requests or simply carry them out without logging. The `log_auth_badpass` control, when set to yes, causes `radiusd` to log the bad password that was attempted, while the `log_auth_goodpass` logs the password if it's correct.

Usage:

```
log_stripped_names = [yes/no]; log_auth = [yes/no];
log_auth_badpass = [yes/no]; log_auth_goodpass = [yes/no]
```

Suggestion:

```
log_stripped_names = no; log_auth = yes;
log_auth_badpass = yes; log_auth_goodpass = no
```

`lower_user` and `lower_pass`

To eliminate case problems that often plague authentication methods such as RADIUS, the FreeRADIUS developers have included a feature that will attempt to modify the `User-Name` and `User-Password` attributes to make them all lowercase; this is done either before an authentication request, after a failed authentication request using the values of the attributes as they came, or not at all.

Clearly setting the `lower_user` directive to `after` makes the most sense: it adds processing time to each request, but unless this particular machine normally carries a high load, the reduced troubleshooting time is worth the extra performance cost. However, a secure password often makes use of a combination of uppercase and lowercase letters, so security dictates leaving the password attribute alone.

Usage:

```
lower_user = [before/after/no]; lower_pass = [before/after/no]
```

Suggestion:

```
lower_user = after; lower_pass = no
```

`nospace_user` and `nospace_pass`

Much like the `lower_user` and `lower_pass` controls, these directives preprocess an `Access-Request` packet and ensure that no spaces are included. The available options are the same: `before`, `after`, or `no`. Again, the most obvious choice is to set `nospace_user` to `after` to save helpdesk time. Some administrators have a tendency to not allow spaces in passwords; if this is the case, set `nospace_pass` to `before` (since there is a system-wide policy against spaces in passwords, testing a request as-is is not required).

Usage:

```
nospace_user = [before/after/no]; nospace_password = [before/after/no]
```

Suggestion:

```
nospace_user = after; nospace_password = before
```

Configuring the *users* File

The *users* file, located at */etc/raddb/users*, is the home of all authentication security information for each user configured to access the system. Each user has an individual stanza, or entry. The file has a standard format for each stanza:

1. The first field is the username for each user, up to 253 characters.

2. On the same line, the next criteria are a list of required authentication attributes such as protocol type, password, and port number.

3. Following the first line, each user has a set of defined characteristics that allow FreeRADIUS to provision a service best for that user. These characteristics are indented under the first line and separated into one characteristic per line. For example, you might find a Login-Host entry, a dial-back configuration, or perhaps PPP configuration information.

The *users* file also comes with a default username of--you guessed it--DEFAULT, which is generally the catchall configuration. That is to say, if there is no explicit match for a particular user, or perhaps the attribute information for a user is incomplete, radiusd will configure the session based on the information in the DEFAULT entry.

FreeRADIUS processes this file in the order in which the entries are listed. When information received from the RADIUS client equipment matches an entry in the *users* file, FreeRADIUS stops processing and sets the service up based on that *users* file entry. However, you can alter this behavior by setting the Fall-Through attribute to yes in an entry. When radiusd encounters a positive fall-through entry, it will continue processing the *users* file and then select the best match for the particular session. The DEFAULT user can also have a Fall-Through attribute, which means you can have multiple DEFAULT entries for various connection scenarios.

If you don't want to issue a password for each user via their entry in the *users* file, then simply set Auth-Type := System on the first line for each user. FreeRADIUS will then query the system password database for the correct password, which saves some administrative headache.

A sample complete entry

The following is a complete entry for the user *jhassell*, dialing into a NAS server using PPP. Note that (a) there is no Fall-Through attribute set, so FreeRADIUS will stop processing when it encounters this entry, and (b) no DEFAULT entry will be used to add attribute information to this connection:

```
jhassell    Auth-Type := System
            Service-Type = Framed-User,
```

```
            Framed-Protocol = PPP,
            Framed-IP-Address = 192.168.1.152,
            Framed-IP-Netmask = 255.255.255.0,
            Framed-Routing = Broadcast-Listen,
            Framed-Filter-Id = "20modun",
            Framed-MTU = 1500,
            Framed-Compression = Van-Jacobsen-TCP-IP
```

Next, here's a complete entry for the user Anna Watson. She has a space in her user-name and she also has a password specified in her entry. She also gets a positive fall-through so that she can use some of the `DEFAULT` user's attributes with her connection:

```
"Anna Watson"    Auth-Type := Local, User-Password == "yes123"
                 Reply-Message = "Hello, %u"
                 Service-Type = Framed-User,
                 Framed-Routing = Broadcast-Listen,
                 Framed-Filter-Id = "20modun",
                 Fall-Through = Yes
```

DEFAULT entries

These `DEFAULT` user configurations match with all usernames that can get to them (i.e., the individual users must have a positive `Fall-Through` attribute). Recall from the earlier discussion that `DEFAULT` entries may also have `Fall-Through` attributes.

First, let's make sure that all users are checked against the system password file unless they have a password explicitly assigned in the entry.

```
DEFAULT     Auth-Type := System
            Fall-Through = Yes
```

Now, include a `DEFAULT` entry for all users connecting via a framed protocol, such as PPP or SLIP. Note that I tell the RADIUS client to assign the IP address via the `Framed-IP-Address` attribute's value.

```
DEFAULT    Service-Type = Framed-User
           Framed-IP-Address = 255.255.255.254,
           Framed-MTU = 576,
           Service-Type = Framed-User,
           Fall-Through = Yes
```

Finally, set the `DEFAULT` entry for PPP users. I've already told FreeRADIUS to assign framed protocol users with a dynamic IP address, so all I need to do is set the compression method and explicitly designate PPP as the framed protocol for this default.

```
DEFAULT    Framed-Protocol == PPP
           Framed-Protocol = PPP,
           Framed-Compression = Van-Jacobsen-TCP-IP
```

If a user attempts to connect and matches neither any of the explicit user entries nor any of the DEFAULT entries, then he will be denied access. Notice that with the last DEFAULT entry, Fall-Through isn't set: this ensures the user is kicked off if he doesn't match any of the scenarios.

Prefixes and suffixes

You can use prefixes and suffixes appended to the user name to determine what kind of service to provision for that particular connection. For example, if a user adds *.shell* to their username, you add the following DEFAULT entry to the users file to provision a shell service for her. FreeRADIUS authenticates her against the system password file, telnets to your shell account machine, and logs her in.

```
DEFAULT     Suffix == ".shell", Auth-Type := System
            Service-Type = Login-User,
            Login-Service = Telnet,
            Login-IP-Host = shellacct1.rduinternet.com
```

Similarly, you can set up an entry in the users file where if a user connects with a prefix of "s.", then you can provision SLIP service for him. FreeRADIUS can authenticate him against the system passwords, and then fall through to pick up the SLIP attributes from another `DEFAULT` entry. Here is an example:

```
DEFAULT     Prefix == "s.", Auth-Type := System
            Service-Type = Framed-User,
            Framed-Protocol = SLIP,
            Fall-Through = Yes]
```

Using RADIUS callback

The callback feature of the RADIUS protocol is one of the most interesting and useful security measures that you, as an administrator, can enforce. You can configure FreeRADIUS to call a specific user back via his individual entry in the users file. (Of course, you could make a DEFAULT entry that calls every user back, but the application of that technique is more limited and requires many more resources than a standard implementation.) The following is an example of a callback configuration for user *rneis*: she dials in, is then called back, is authenticated, and then given a session on the shell account machine.

```
rneis     Auth-Type := System
          Service-Type = Callback-Login-User,
          Login-Service = Telnet,
          Login-IP-Host = shellacct1.rduinternet.com,
          Callback-Number = "9,1-919-555-1212"
```

Completely denying access to users

You can set up a specific user entry to deny access to him. For example, you may have an automated script that takes input from your billing system (a list of usernames that have not paid their bills, possibly) and re-writes user entries to deny access. They would write something like the following, for the user *aslyter*:

```
aslyter     Auth-Type := Reject
            Reply-Message = "Account disabled for nonpayment."
```

Alternatively, you could also set up a group on your system called "suspended," and FreeRADIUS could detect whether an individual username was contained within that group and reject access as necessary. To do this, create a DEFAULT entry much like the following:

```
DEFAULT    Group == "suspended", Auth-Type := Reject
           Reply-Message = "Account suspended for late payment."
```

Troubleshooting Common Problems

In this section, I'll take a look at some of the most frequently occurring problems with a new FreeRADIUS setup and how to fix them.

Linking Errors When Starting FreeRADIUS

If you receive an error similar to the following:

```
Module: Loaded SQL
rlm_sql: Could not link driver rlm_sql_mysql: file not found
rlm_sql: Make sure it (and all its depend libraries!) are in the search
path
radiusd.conf[50]: sql: Module instantiation failed.
```

It means that some shared libraries on the server are not available. There are a couple of possible causes from this.

First, the libraries that are needed by the module listed in the error messages couldn't be found when FreeRADIUS was being compiled. However, if a static version of the module was available, it was built at compile time. This would have been indicated with very prominent messages at compile time.

The other cause is that the dynamic linker on your server is not configured correctly. This would result in the libraries that are required being found at compile time, but not run time. FreeRADIUS makes use of standard calls to link to these shared libraries, so if these calls fail, the system is misconfigured. This can be fixed by telling the linker where these libraries are on your system, which can be done in one of the following ways:

- Write a script that starts FreeRADIUS and includes the variable `LD_LIBRARY_PATH`. This sets the paths where these libraries can be found.
- If your system allows it, edit the */etc/ld.so.conf* file and add the directory containing the shared libraries to the list.
- Set the path to these libraries inside *radiusd.conf* using the *libdir* configuration directive. The *radiusd.conf* file has more details on this.

Incoming Request Passwords Are Gibberish

Gibberish is usually indicative of an incorrectly formed or mismatched shared secret, the phrase shared between the server and the RADIUS client machine and used to perform secure encryption on packets. To identify the problem, run the server in debugging mode, as described previously. The first password printed to the console screen will be inside a RADIUS attribute (e.g., Password = "rneis\dfkjdf7482odf") and the second will be in a logged message (e.g., Login failed [rneis/dfkjdf7482odf]). If the data after the slash is gibberish--ensure it's not just a really secure password--then the shared secret is not consistent between the server and the RADIUS client. This may even be due to hidden characters, so to be completely sure both are the same, delete and re-enter the secret on both machines.

The gibberish may also result from a shared secret that is too long. FreeRADIUS limits the secret length to 16 characters, since some NAS equipment has limitations on the length of the secret yet don't make it evident in error logs or the documentation.

NAS Machine Ignores a RADIUS Reply

You may be seeing duplicate accounting or authentication requests without accompanying successful user logins. In this case, it's likely that you have a multi-homed RADIUS server, or at least a server with multiple IP addresses. If the server receives a request on one IP address, but responds with a different one, even if the reply comes from the machine for which the original packet was destined, the NAS machine will not accept it. To rectify this, launch FreeRADIUS with the -i command-line switch, which binds the daemon to one specific IP address.

CHAP Authentication Doesn't Work Correctly

If PAP authentication works normally, but users authenticating with the CHAP protocol receive errors and denials, you do not have plain text passwords in the users file. CHAP requires this, while PAP can take passwords from the system or from any other source. For each user who needs CHAP authentication, you must add the Password = changeme check item to his individual entry, of course changing the value of the password as appropriate.

Some people may say using CHAP is much more secure, since the user passwords are not transmitted in plain text over the connection between the user and the NAS. This is simply not true in practice. While hiding the password during transmission is beneficial, the CHAP protocol requires you to leave plain text passwords sitting in a file on a server, completely unencrypted. Obviously, it's much more likely that a cracker will gain access to your RADIUS server, grab the *users* file with all of these plainly available passwords, and wreak havoc and harm on your network than it is that the same cracker would intercept *one* user's password during the establishment of the connection.

FreeRadius and MySQL

Introduction

In September 2001 I started playing around with FreeRadius (then at version 0.2!) and storing user authorisation details in a MySQL database. I had previously been using a proprietary RADIUS solution and wanted rid of it. Lots of people seemed to be posting to the freeradius-users list that they were trying to do the same and found it tricky due to the lack of documentation. Thus, to help anyone out there who needed it, I wrote down all the snippets of info, tips I'd received, and steps I'd used to make it work. This is the result.

This document assumes that you are familiar with:

- *nix system admin and networking
- What RADIUS is and should do
- MySQL administration
- The basics of how to compile and install open source software.

I'm not going to describe any of the above stuff, especially the latter as I'm far from an expert on it. This document focuses on getting FreeRadius running with MySQL. It does NOT describe a basic FreeRadius installation in detail (e.g. getting it up and running with a 'users' text file or other FreeRadius configurations), nor does it cover using multiple authentication methods, fall-through's or any of that stuff. Just plain-old-MySQL-only. If you don't know about RADIUS itself, go do some background reading... the O'Reilly book ('RADIUS') is pretty good and covers FreeRadius too.

Please note: This isn't official documentation. It's not even UNofficial documentation. It's not documentation of any type by any stretch of the imagination. So far, it's just my own personal notes, written on the fly. Little editing, little detail. You takes your chances. I will try to improve when I can, or have additional information - don't hold your breath though, as life can get busy around here. The notes focus on the SQL element, NOT generally on getting FreeRadius installed and configured and operational with text files (maybe later!) although there is a little bit on that.

Also note: I'm not a programmer - editing low-level code and compiling stuff is not something I'm particularly familiar with. Ask me to read C code and I'll probably panic. My background and experience on Linux (and other stuff) puts me in the system admin/networking bracket (I'm a network builder and web app developer by day), so please bear that in mind here. Feel free to mail me, especially with suggestions and any info useful to add here, but please don't ask me 'how to I compile' stuff. Thanks.

Lastly for this bit : a big thank you to all those that helped, emailed and generally contributed to me getting this up and going, and thus to the creation of these notes.

System

I did my original testing on SuSe Linux 7.0 on Intel with FreeRadius 0.2 and MySQL 3.23.42 using a Cisco 3640 acting as a test NAS unit. The final deployment was to RedHat 7.1. Today I'm running FreeRadius 0.8.1. If you're running an older version you are strongly recommended to upgrade.

Before You Start

Before starting with FreeRadius, make sure your box is up and configured on your network, that you have MySQL installed and running, and that your NAS is configured to point to your server.

If you're using Cisco kit as your NAS, here's a quick example snippet of how to configure IOS to authenticate PPP (e.g. dial, DSL etc) users to a RADIUS server:

```
aaa new-model
aaa authentication ppp default if-needed group radius local
aaa authorization network default group radius
aaa accounting update newinfo
aaa accounting exec default start-stop group radius
aaa accounting network default wait-start group radius
aaa accounting connection default start-stop group radius

radius-server host a.b.c.d auth-port 1645 acct-port 1646
radius-server host e.f.g.h auth-port 1645 acct-port 1646
radius-server key YOUR-RADIUS-KEY
```

[a.b.c.d and e.f.g.h are the IP's of your primary and secondary RADIUS servers. YOUR-RADIUS-KEY is your RADIUS secret key as defined in clients.conf (see below).]

Make SURE you have included the development headers in your MySQL installation otherwise the FreeRadius installation/compilation will barf. To make my own life easy, I just installed MySQL to the default location.

Just to clarify: ABSOLUTELY MAKE SURE you have the mysql-devel (headers and libraries) package installed with your MySQL, otherwise freeradius won't compile with MySQL support properly. Many people seem to miss having this.

Oh yep, did I mention about having the MySQL development headers installed? No? Make sure you do... ;-)

Getting Started

First off, you should get FreeRadius compiled, installed and running in a basic text file configuration (e.g. using the 'users' file) on your box. This I'm not going to describe in details (read the stuff in /docs, etc), but it should basically be the following:

1 . Get the latest FreeRadius source code tarball from ftp://ftp.freeradius.org/pub/radius/freeradius.tar.gz. If you're so minded, get the latest CVS instead.

2. Unpack the tarball and install it. On my own system the basic steps were all that was needed, and everything got dumped in the standard places:

```
tar xvf freeradius.tar.gz
cd freeradius
./configure
make
make install
```

Note that you might need to add options to ./configure if you installed MySQL to a non-standard place, or want FreeRadius to a non-standard place, or want or need any other odd bits and pieces. I was keeping it simple and didn't need to.

Then you should configure FreeRadius appropriately. It's best to start with a simple config using the standard text files, if at least only to test that FreeRadius installed OK and will work. To very briefly summarise getting the text files configured :

1. Edit /usr/local/etc/raddb/clients.conf and enter the details of your NAS unit(s). There are examples here, so it should be easy. Tip: You'll also want to enter 'localhost' here for testing purposes (i.e. so you can use radtest).

2. Edit /usr/local/etc/raddb/users and create an example user account. The file is commented on how to do this. I'm not going to repeat that here. If you've previously used another RADIUS server with text-file configuration (e.g. Livingston, Cistron) you'll know what goes here...

3. Edit /usr/local/etc/raddb/realms. I just put a single line 'DEFAULT LOCAL' and that was sufficient to strip any suffix domain names in given user names - if you're using realms or proxing you'll doubtless need to do something else here, but I recommend you start with this then come back to setting up realms/ proxying when you know MySQL is working. If you're not using realms, just ignore this.

4. Edit /usr/local/etc/raddb/radiusd.conf and change as needed. For my own installation I changed the default port to run on 1645 (old port) to match what our existing boxes use (but otherwise make sure your NAS and FreeRadius are using the same) and said 'yes' to all the logging options (I'd strongly recommend you do switch on all the logging to start with). At this point I also said 'no' to using proxy to keep stuff simple. I then told it to run under the 'radius' user and group (I'd initially installed FreeRadius as root and didn't want to run it as such, so I created a user account called 'radius' in a group called 'radius' and then just blanket chown'd and chgrp'd the various radius directories to that user just to be sure the account can access all the right stuff. A bit of

a sledgehammer there, but it was quick! I'm sure there's a better and/or more elegant way of doing this!). The rest of the radiusd.conf file was left alone.

At this point you should be able to manually fired up /usr/local/sbin/radiusd. You should do this with the debug turned on so you can see what happens:

```
/usr/local/sbin/radiusd -X
```

Lots of stuff will scroll to the screen, and it should tell you it's ready to accept requests. If you get an error, READ THE DEBUG, then check the docs, check the above and try again.

You should now be able to use FreeRadius. You can use radtest to test an account from the command line:

```
radtest username password servername port secret
```

So, if your example user is 'fred' with password 'wilma', your server is called 'radius.domain.com', is using port 1645, and you put localhost (or your localhost's IP) in clients.conf with a secret of 'mysecret', you should use:

```
radtest fred wilma radius.domain.com 1645 mysecret
```

And you should get back something like:

```
Sending Access-Request of id 226 to 127.0.0.1:1645
        User-Name = 'fred'
        User-Password = '\304\2323\326B\017\376\322?K\332\350Z;}'
        NAS-IP-Address = radius.domain.com
        NAS-Port = 1645

rad_recv : Access-Accept packet from host 127.0.0.1:1645,id=226, length=56
        Framed-IP-Address = 80.84.161.1
        Framed-Protocol = PPP
        Service-Type = Framed-User
        Framed-Compression = Van-Jacobson-TCP-IP
        Framed-IP- Netmask = 255.255.255.255
```

You should get an 'Access Accept' response. If you don't, do not pass Go, do not collect £200. Go back and check *everything*. Read the docs, **READ THE DEBUG!!**

Personally, I used NTradPing (downloadable from MasterSoft) on a desktop Windows PC to send test packets towards the radius server - very handy tool. If you do this, or test from any other machine, remember your PC (or other machine) needs to be in your NAS list in clients.conf too!

OK, so at this point you should have text-file authentication working in FreeRadius...

Setting up the RADIUS database in MySQL

First, you should a new empty 'radius' database in MySQL and login user with permissions to that database. You could of course call the database and the user anything you like but we'll stick to 'radius' for both for the purposes of this discussion

Next up, you need to create the schema for the database. There is a file which describes this and is actually a SQL script file. It can be found at /src/modules/rlm_sql/drivers/rlm_sql_mysql/db_mysql.sql where you untar'd FreeRadius. This is the bit that, at least at the time I originally wrote these notes, wasn't really documented anywhere and was the thing most people seemed to be asking.

How you run that script is up to you and how you like to admin MySQL. The easiest way is to:

```
mysql -uroot -prootpass radius < db_mysql.sql
```

...where 'root' and 'rootpass' are your mysql root name and password respectively.

I happened to run it using MacSQL 2.0 on my Powerbook G4/OS X machine (Cool...). You could do it on the server, or use a MySQL admin tool from a Windows PC (e.g. MySQL CC, SQLion, dbtools etc) or whatever.

Now you have the database running, albeit empty.

Configuring FreeRadius to use MySQL

Edit /usr/local/etc/raddb/sql.conf and enter the server, name and password details to connect to your MySQL server and the RADIUS database. The database and table names should be left at the defaults if you used the default schema. For testing/debug purposes, switch on sqltrace if you wish - FreeRadius will dump all SQL commands to the debug output with this on.

If you're stripping all realm names (i.e. you want user joe@domain.com to authenticate as just 'joe'), then in sql.conf, under the 'query config: username' section, you MAY need to adjust the line(s) referring to sql_user_name. I needed to do this originally because we want to dump all realms, but you probably won't need to do this with the latest FreeRadius. For example, in our case I needed to uncomment the line:

sql_user_name = '%{Stripped-User-Name}'

...and comment out the following line referring to just User-Name. If you want to see what's happening here, switch on all the logging options in radiusd.conf and run radiusd in debug mode (-X) to see what's happening : you'll see " user@domain" being passed to MySQL when using User-Name, but just "user" when using Stripped-User-Name. Using the latter, realms worked for me (basically, I strip everything, as all user names are unique on the server anyway). Of course, set all your other SQL options as needed (database login details, etc)

Edit /usr/local/etc/raddb/radiusd.conf and add a line saying 'sql' to the authorize{} section (which is towards the end of the file). The best place to put it is just before the 'files' entry. Indeed, if you'll *just* be using MySQL, and not falling back to text files, you could comment out or lose the 'files' entry altogether.

Also add a line saying 'sql' to the accounting{} section too between 'unix' and 'radutmp'. FreeRadius will now do accounting to MySQL as well.

The end of your radiusd.conf should then look something like this:

```
authorise {
        preprocess
        chap
        mschap
        #counter
        #attr_filter
        #eap
        suffix
        sql
        #files
        #etc_smbpasswd
}

authenticate {
        authtype PAP {
                pap
        }
        authtype CHAP {
                chap
        }
        authtype MS-CHAP{
                mschap
        }
        #pam
        #unix
        #authtype LDAP {
        #       ldap
        #}
}

preacct {
```

```
        preprocess
        suffix
        #files
}

accounting {
        acct_unique
        detail
        #counter
        unix
        sql
        radutmp
        #sradutmp
}

session {
        radutmp
}
```

Populating MySQL

You should now created some dummy data in the database to test against. It goes something like this:

- In usergroup, put entries matching a user account name to a group name.
- In radcheck, put an entry for each user account name with a 'Password' attribute with a value of their password.
- In radreply, create entries for each user-specific radius reply attribute against their username
- In radgroupreply, create attributes to be returned to all group members

Here's a dump of tables from the 'radius' database from mysql on my test box (edited slightly for clarity). This example includes three users, one with a dynamically assigned IP by the NAS (fredf), one assigned a static IP (barney), and one representing a dial-up routed connection (dialrouter):

```
mysql> select * from usergroup;
   +----+---------------+-----------+
   | id | UserName      | GroupName |
   +----+---------------+-----------+
   |  1 | fredf         | dynamic   |
   |  2 | barney        | static    |
   |  2 | dialrouter    | netdial   |
```

```
      +----+--------------+-----------+
      3 rows in set (0.00 sec)


     mysql> select * from radcheck;
+----+--------------+--------------+--------------+------+
| id | UserName     | Attribute    | Value        | Op   |
+----+--------------+--------------+--------------+------+
|  1 | fredf        | Password     | wilma        | ==   | |  2 | barney
| Password     | betty        | ==   |
|  2 | dialrouter   | Password     | dialup       | ==   |
+----+--------------+--------------+--------------+------+
      3 rows in set (0.02 sec)


         mysql> select * from radgroupcheck;
+----+--------------+--------------+--------------+------+
| id | GroupName    | Attribute    | Value        | Op   |
+----+--------------+--------------+--------------+------+
|  1 | dynamic      | Auth-Type    | Local        | :=   |
|  2 | static       | Auth-Type    | Local        | :=   | |  3 | netdial
| Auth-Type    | Local        | :=   |
+----+--------------+--------------+--------------+------+
      3 rows in set (0.01 sec)


        mysql> select * from radreply;
+----+------------+------------------+----------------------+----+
| id | UserName   | Attribute        | Value                | Op |
+----+------------+------------------+----------------------+----+
|  1 | barney     | Framed-IP-Address| 1.2.3.4              | := |
|  2 | dialrouter | Framed-IP-Address| 2.3.4.1              | := |
|  3 | dialrouter | Framed-IP-Netmask| 255.255.255.255      | := |
|  4 | dialrouter | Framed-Routing   |Broadcast-Listen      | := |
|  5 | dialrouter | Framed-Route | 2.3.4.0 255.255.255.248 | := |
|  6 | dialrouter | Idle-Timeout     | 900                  | := |
+----+------------+------------------+----------------------+----+
      6 rows in set (0.01 sec)


      mysql> select * from radgroupreply;
+----+-----------+------------------+----------------------+----+
| id | GroupName | Attribute        | Value                | Op |
+----+-----------+------------------+----------------------+----+
| 34 | dynamic   |Framed-Compression | Van-Jacobsen-TCP-IP |:=  |
| 33 | dynamic   | Framed-Protocol  | PPP                  | := |
| 32 | dynamic   | Service-Type     | Framed-User          | := |
| 35 | dynamic   | Framed-MTU       | 1500                 | := |
| 37 | static    | Framed-Protocol  | PPP                  | := |
| 38 | static    | Service-Type     | Framed-User          | := |
| 39 | static    | Framed-Compression| Van-Jacobsen-TCP-IP | := |
| 41 | netdial   | Service-Type     | Framed-User          | := |
| 42 | netdial   | Framed-Protocol  | PPP                  | := |
+----+-----------+------------------+----------------------+----+
      12 rows in set (0.01 sec)


 mysql>
```

In this example, 'barney' (who is a single user dialup) only needs an attribute for IP address in radreply so he gets his static IP - he does not need any other attributes here as all the others get picked up from the 'static' group entries in radgroupreply.

'fred' needs no entries in radreply as he is dynamically assigned an IP via the NAS - so he'll just get the 'dynamic' group entries from radgroupreply ONLY.

'dialrouter' is a dial-up router, so as well as needing a static IP it needs route and mask attributes (etc) to be returned. Hence the additional entries.

'dialrouter' also has an idle-timeout attribute so the router gets kicked if it's not doing anything - you could add this for other users too if you wanted to. Of course, if you feel like or need to add any other attributes, that's kind of up to you!

Note the operator ('op') values used in the various tables. The password check attribute should use ==. Most return attributes should have a := operator, although if you're returning multiple attributes of the same type (e.g. multiple Cisco- AVpair's) you should use the += operator instead otherwise only the first one will be returned. Read the docs for more details on operators.

If you're stripping all domain name elements from usernames via realms, remember NOT to include the domain name elements in the usernames you put in the MySQL tables - they should get stripped BEFORE the database is checked, so name@domain will NEVER match if you're realm stripping (assuming you follow point 2 above) – you should just have 'name' as a user in the database. Once it's working without, and if you want more complex realm handling, go back to work out not stripping (and keeping name@domain in the db) if you really want to.

Auth-Type Note, Feb 2003: At the time of writing (i.e. up to and including FreeRadius 0.8.1), FreeRadius will default to an Auth-Type of 'local' if one is not found. This means that you do not need to include this (i.e. the radgroupcheck table above could actually be empty, and indeed is on my own box), but you probably should include it for clarity and for future-proofing in case FreeRadius changes. Please note that a previous version of this page indicated that Auth-Type should be included in the rad(group)reply tables. It appears that this is incorrect and that Auth-Type should be in the rad(group)check tables. Other than Auth-Type, for simple setups, you probably need nothing in radgroupcheck - unless you want users dialing certain nas'es, etc etc.

Using FreeRadius and MySQL

Fire up radiusd again in debug mode. The debug output should show it connecting to the MySQL database. Use radtest (or NTradPing) to test again - the user should authenticate and the debug output should show FreeRadius talking to MySQL.

You're done!

Additional Snippets:

To use encrypted passwords in radcheck use the attribute 'Crypt-Password', instead of 'Password', and just put the encrypted password in the value field. (i.e. UNIX crypt'd password).

To get NTradPing to send test accounting (e.g. stop) packets it needs arguments, namely acct-session-time. Put something like 'Acct-Session-Time=99999' into the 'Additional RADIUS Attributes' box when sending stops. Thanks to JL for the tip.

If you have a Cisco nas, set the cisco-vsa-hack

Running a backup FreeRadius server and need to replicate the RADIUS database to it? I followed Colin Bloch's basic instructions at http://www.ls-l.net/mysql/ and got replication setup between two MySQL servers. Real easy. Read the MySQL docs on replication for more details. Note that MySQL replication is one-way-only.

On the subject of backup servers. If you want to run TWO MySQL servers and have FreeRadius fall over between them, you'll need to do something like this: duplicate your sql.conf and edit the second copy to reflect connecting to your backup server ; then name the files something like sql1.conf and sql2.conf ; in radiusd.conf change and duplicate the include line for sql.conf to include sql1.conf and sql2.conf instead ; in the 'authorize' section of radiusd.conf change the 'sql' entry to a 'group' one, like this:

```
group {
  sql1 {
    fail  = 1
    notfound = return
    noop  = 2
    ok  = return
    updated = 3
    reject = return
    userlock = 4
    invalid = 5
    handled = 6
  }
  sql2 {
    fail  = 1
    notfound = return
    noop  = 2
    ok  = return
    updated = 3
    reject = return
    userlock = 4
    invalid = 5
```

```
    handled = 6
  }
 }
```

Note that if FreeRadius fails over to the second MySQL server and tries to update the accounting table (radacct), nasty things might possibly happen to your replication setup and database integrity as the first MySQL server won't have got the updates...