

GDB 调试说明

---- SeaSon from DB-LAB of HIT

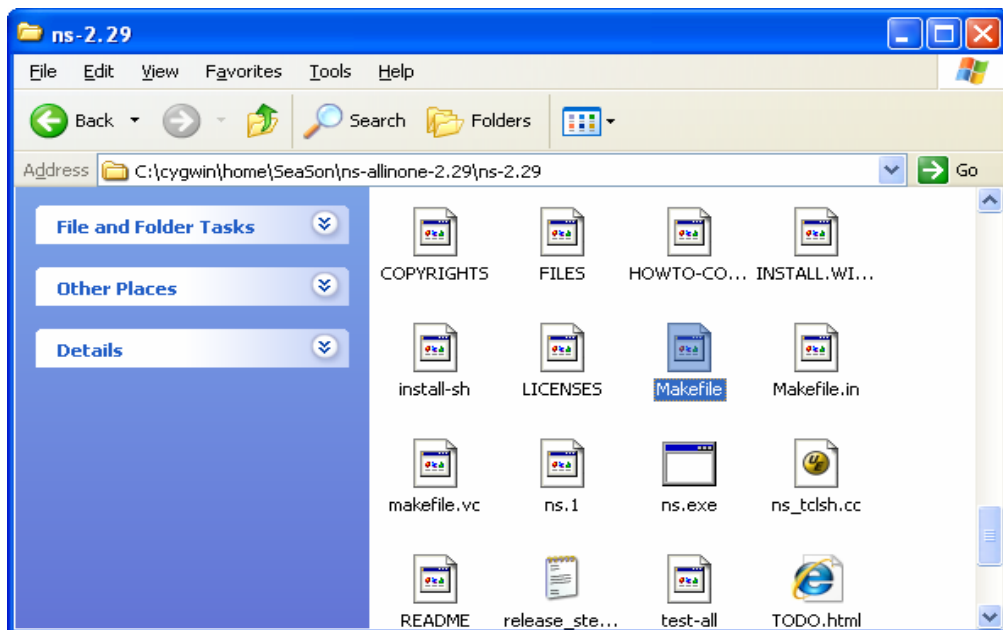
安装篇

下面介绍的方法是在 cygwin 中安装 gdb 为例说明。

1. 重新运行 cygwin 的 setup 文件，选择界面中的 keep（必须!!! 否则会死的很惨的），从列表中选择 gdb 组件，然后选择安装即可。

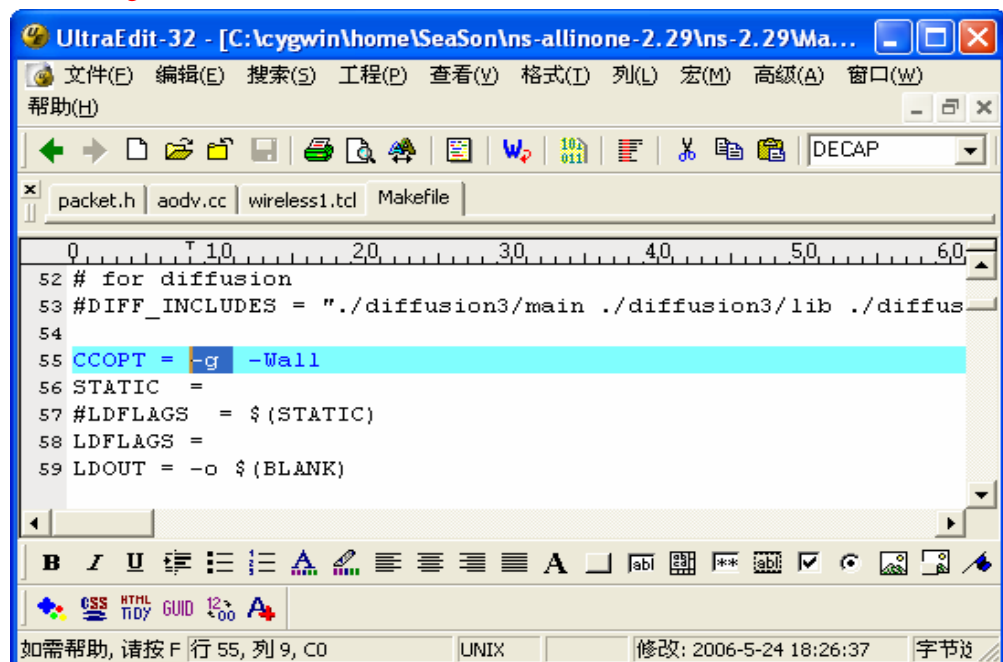
2. 修改 Makefile，添加调试信息

修改 Makefile（注意：修改的是没有任何后缀的文件，不是 Makefile.vc 或者 Makefile.in）

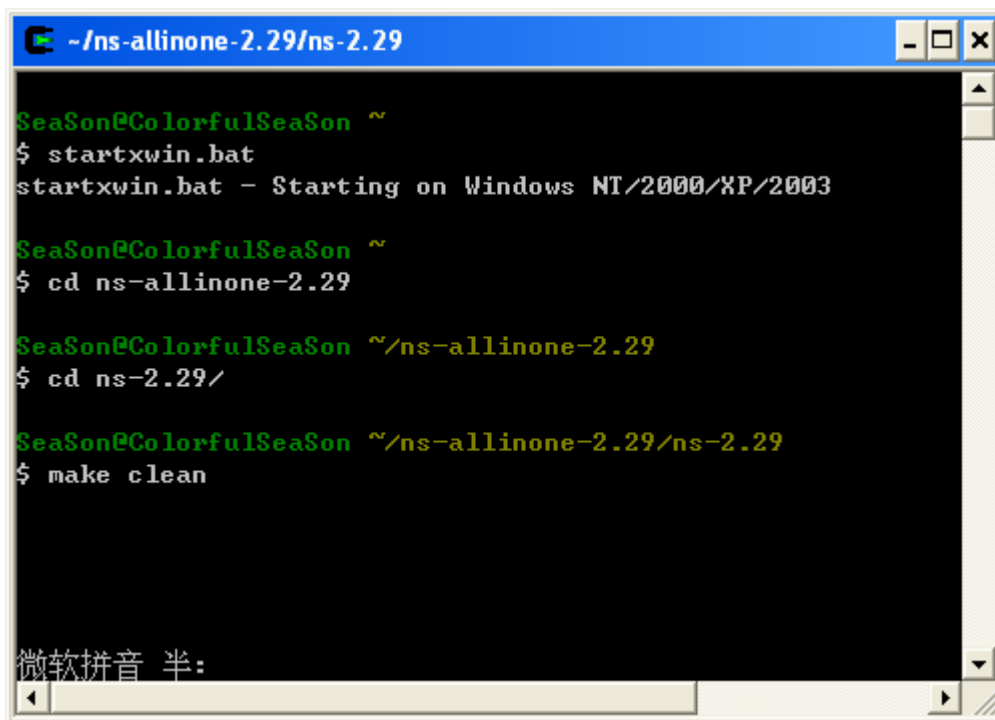


在下面位置添加-g

CCOPT = -g //这后面可能还有其他参数，保留即可



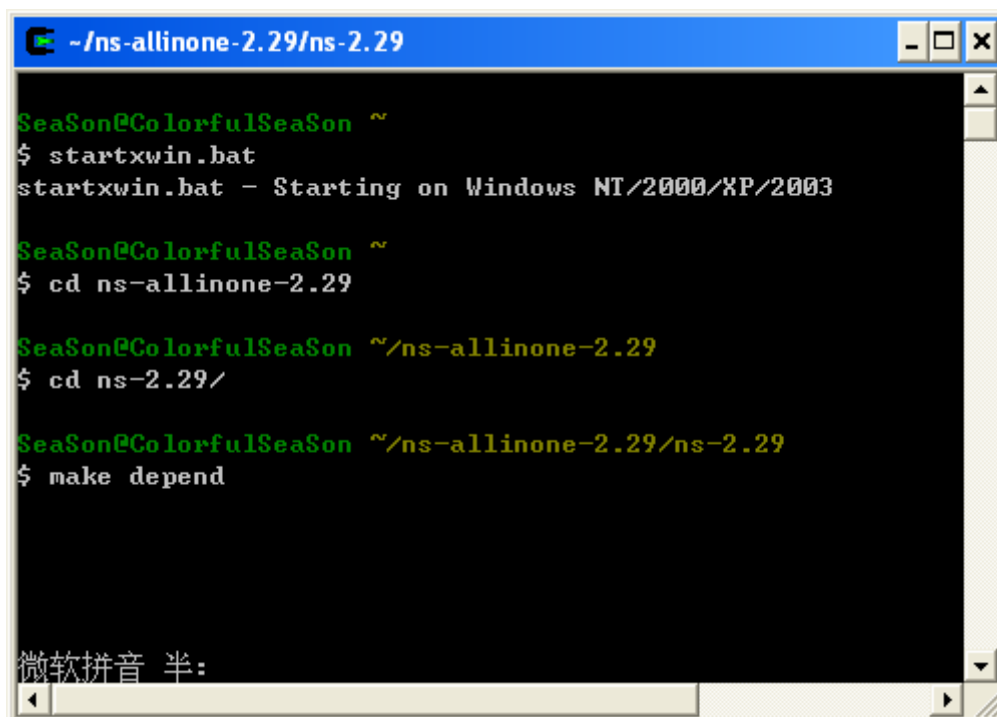
- 接着需要重新编译 NS2
进入 ns-2.2* 目录下执行
make clean



```
SeaSon@ColorfulSeaSon ~  
$ startxwin.bat  
startxwin.bat - Starting on Windows NT/2000/XP/2003  
  
SeaSon@ColorfulSeaSon ~  
$ cd ns-allinone-2.29  
  
SeaSon@ColorfulSeaSon ~/ns-allinone-2.29  
$ cd ns-2.29/  
  
SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29  
$ make clean
```

微软拼音 半:

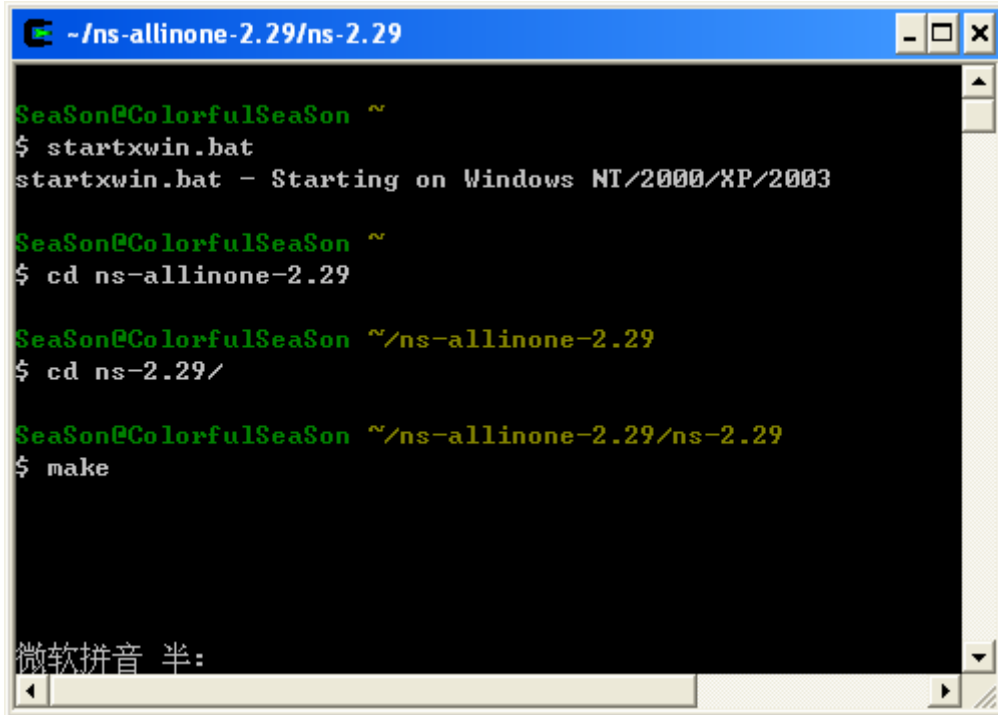
接着 make depend # 执行这个命令过程中如出错，不用管！



```
SeaSon@ColorfulSeaSon ~  
$ startxwin.bat  
startxwin.bat - Starting on Windows NT/2000/XP/2003  
  
SeaSon@ColorfulSeaSon ~  
$ cd ns-allinone-2.29  
  
SeaSon@ColorfulSeaSon ~/ns-allinone-2.29  
$ cd ns-2.29/  
  
SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29  
$ make depend
```

微软拼音 半:

然后 make



```
~/ns-allinone-2.29/ns-2.29
SeaSon@ColorfulSeaSon ~
$ startxwin.bat
startxwin.bat - Starting on Windows NT/2000/XP/2003

SeaSon@ColorfulSeaSon ~
$ cd ns-allinone-2.29

SeaSon@ColorfulSeaSon ~/ns-allinone-2.29
$ cd ns-2.29/

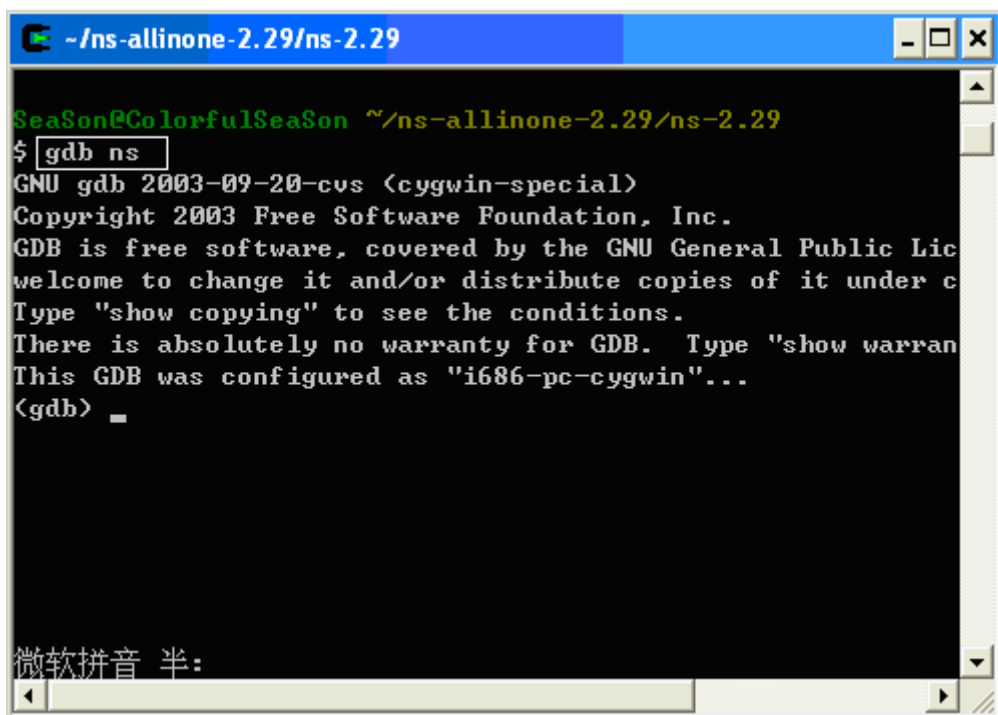
SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29
$ make
```

如果上面过程中没有错误，则恭喜你安装成功:)

如果要使用图形界面，则安装过程中需要安装 tcltk 库，然后对于 2003(以前的有些版本页可以)以后的默认都回安装图形界面调试工具 insight。后面的说明都是基于命令行界面的，适用比较稳定、方便。

常用命令

1. 进入 gdb 调试状态，在 Cygwin 窗口或者 Xwin 窗口输入命令 `gdb ns`，如下图所示:



```
~/ns-allinone-2.29/ns-2.29
SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29
$ gdb ns
GNU gdb 2003-09-20-cvs (cygwin-special)
Copyright 2003 Free Software Foundation, Inc.
GDB is free software, covered by the GNU General Public Lic
welcome to change it and/or distribute copies of it under c
Type "show copying" to see the conditions.
There is absolutely no warranty for GDB. Type "show warran
This GDB was configured as "i686-pc-cygwin"...
(gdb) _
```

2. 设置断点

命令格式 `<gdb> b file.cc:112`，下图即在 `aodv.cc` 的第 112 行设置一个断点

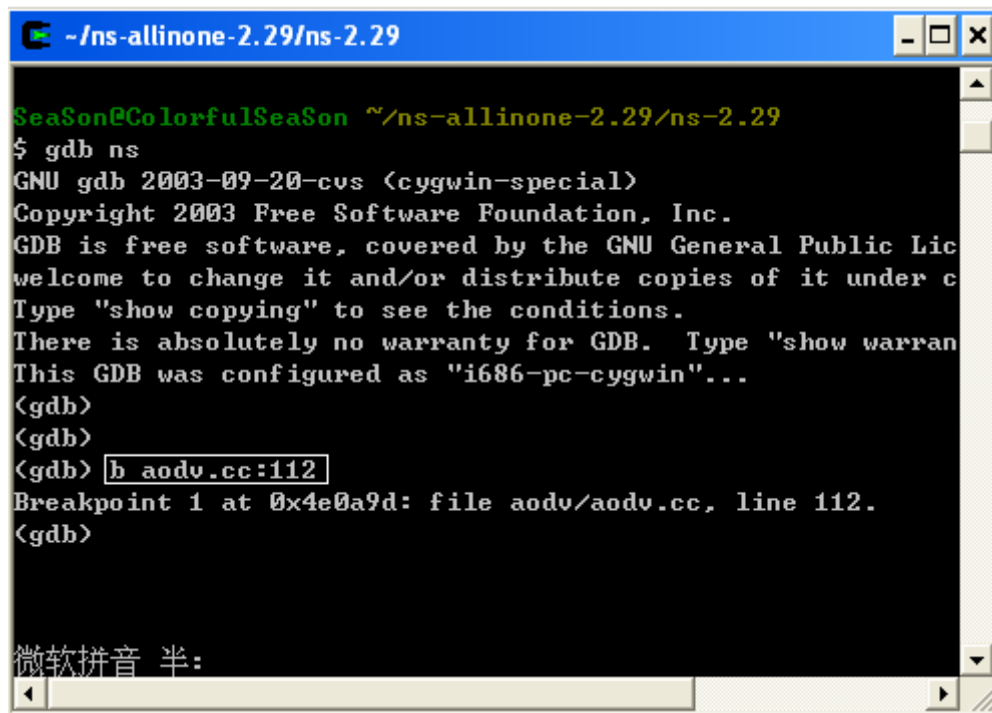
其中 `<gdb>` 为命令提示符

b 设置断点命令

file.cc 调试的文件，Ns2 中任何一个 C++ 文件都可以进行调试

“:” 行数指示符

112 为行号



```
SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29
$ gdb ns
GNU gdb 2003-09-20-cvs (cygwin-special)
Copyright 2003 Free Software Foundation, Inc.
GDB is free software, covered by the GNU General Public License.
You are welcome to change it and/or distribute copies of it under certain
conditions. Type "show copying" to see the conditions.
There is absolutely no warranty for GDB. Type "show warranty" for details.
This GDB was configured as "i686-pc-cygwin"...
(gdb)
(gdb)
(gdb) b aodv.cc:112
Breakpoint 1 at 0x4e0a9d: file aodv/aodv.cc, line 112.
(gdb)
```

当然设置断点的格式还有其他，具体参见手册。

3. 删除断点

命令格式：`<gdb>d b 2`

其中 **d** 为 delete

b 为 breakpoints

2 为断点的编号

利用 2. 中的方法继续创建断点 2、3。

```
-/ns-allinone-2.29/ns-2.29
(gdb) q
SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29
$ gdb ns
GNU gdb 2003-09-20-cvs (cygwin-special)
Copyright 2003 Free Software Foundation, Inc.
GDB is free software, covered by the GNU General Public Lic
welcome to change it and/or distribute copies of it under c
Type "show copying" to see the conditions.
There is absolutely no warranty for GDB. Type "show warran
This GDB was configured as "i686-pc-cygwin"...
(gdb) b aodv.cc:112
Breakpoint 1 at 0x4e0a9d: file aodv/aodv.cc, line 112.
(gdb) b aodv.cc:145
Breakpoint 2 at 0x4e0cca: file aodv/aodv.cc, line 145.
(gdb) b aodv.cc:333
Breakpoint 3 at 0x4e15ce: file aodv/aodv.cc, line 333.
(gdb)
微软拼音 半:
```

利用命令 `d b 1` 即删除第一个断点 (Breakpoint 1 at 0x4e0a9d: file aodv/aodv.cc, line 112.), 如下图所示

```
-/ns-allinone-2.29/ns-2.29
$ gdb ns
GNU gdb 2003-09-20-cvs (cygwin-special)
Copyright 2003 Free Software Foundation, Inc.
GDB is free software, covered by the GNU General Public Lic
welcome to change it and/or distribute copies of it under c
Type "show copying" to see the conditions.
There is absolutely no warranty for GDB. Type "show warran
This GDB was configured as "i686-pc-cygwin"...
(gdb) b aodv.cc:112
Breakpoint 1 at 0x4e0a9d: file aodv/aodv.cc, line 112.
(gdb) b aodv.cc:145
Breakpoint 2 at 0x4e0cca: file aodv/aodv.cc, line 145.
(gdb) b aodv.cc:333
Breakpoint 3 at 0x4e15ce: file aodv/aodv.cc, line 333.
(gdb) d b 1
(gdb)
(gdb)
(gdb)
(gdb)
微软拼音 半:
```

4.运行脚本

命令格式: `r scrip.tcl`

其中 **r** 为命令

`scrip.tcl` 为脚本

以 `ns` 自带的 `wireless1.tcl` 为例, 我们首先在 `aodv.cc` 的 `recv` 函数开始设置端点如下图所示:

```

14: void
15: AODV::rcv(Packet *p, Handler*) {
16:     struct hdr_cmn *ch = HDR_CMN(p);
17:     struct hdr_ip *ih = HDR_IP(p);
18:     //add by season
19:     //struct hdr_aodv *ah = HDR_AODV(p);
20:
21:     assert(initialized());
22:     //assert(p->incoming == 0);
23:     // XXXXX NOTE: use of incoming flag has been depracated; In order to track dir
24:     设置断点在此
25:     if(ch->ptype() == PI_AODV) {
26:         ih->ttl_ -= 1;
27:         rcvAODV(p);
28:         return;
29:     }
30:
31:
32:     /*
33:     * Must be a packet I'm originating...

```

运行测试脚本 wireless.tcl，如下图所示：

```

~/ns-allinone-2.29/ns-2.29
(gdb)
(gdb) b aodv.cc:588
Breakpoint 4 at 0x4e1c28: file aodv/aodv.cc, line 588.
(gdb) r wireless.tcl
Starting program: /home/SeaSeason/ns-allinone-2.29/ns-2.29/ns.
---Type <return> to continue, or q <return> to quit---
num_nodes is set 3
warning: Please use -channel as shown in tcl/ex/wireless-mi
INITIALIZE THE LIST xListHead
Loading connection pattern...
Loading scenario file...
Starting Simulation...
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
微软拼音 半:

```

然后程序在断点位置停止，如下图所示：

```
~/ns-allinone-2.29/ns-2.29
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed

Breakpoint 4, AODU::recv(Packet*, Handler*) <
  this=0xa0e88c8, p=0xa2d09a0) at aodv/aodv.cc:595
595     if(ch->ptype() == PT_AODU) <
(gdb) _
```

5. 显示变量或函数值

命令格式: `display var`

其中 **var** 可以为变量名或者函数名

在 `recv()` 函数的端点处我们想要查看数据包的源地址, 即利用下列命令

`display ih->saddr()`

结果如下图所示, 即数据包源地址为 0, 目的地址为 2.

```
~/ns-allinone-2.29/ns-2.29
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed

Breakpoint 4, AODU::recv(Packet*, Handler*) <
  this=0xa0e88c8, p=0xa2d09a0) at aodv/aodv.cc:595
595     if(ch->ptype() == PT_AODU) <
(gdb) display ih->saddr()
1: ih->saddr () = (nsaddr_t &) @0xa2d17a8: 0
(gdb) display ih->daddr()
2: ih->daddr () = (nsaddr_t &) @0xa2d17b0: 2
(gdb)
```

6. 删除变量或函数值显示

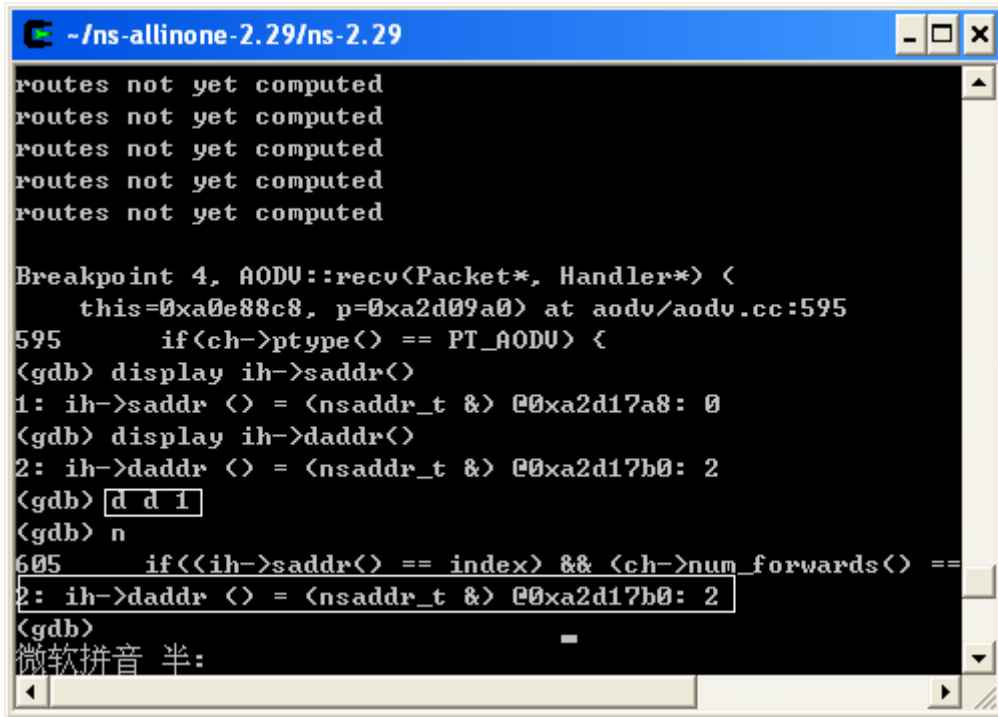
命令格式: `dd 1`

其中 d---delete

d--- display

1--- 变量编号

使用命令”d d 1”即删除第一个变量显示。这是在单步调试的时候将不再显示 ih->saddr(),否则如果不删除将显示所有的。



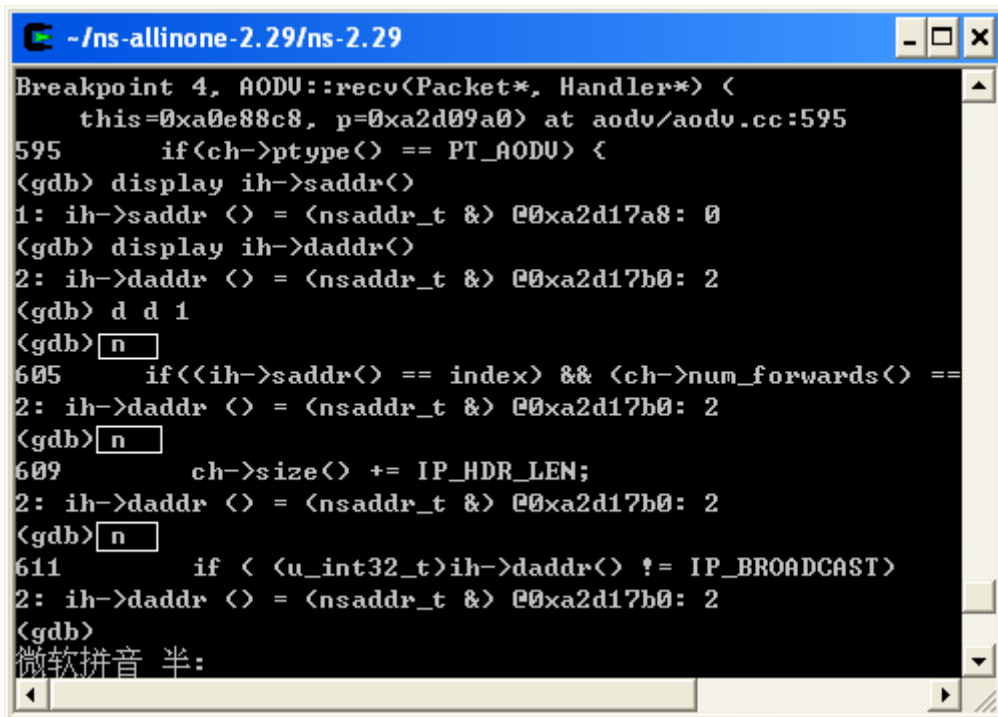
```
~/ns-allinone-2.29/ns-2.29
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed

Breakpoint 4, AODU::recv(Packet*, Handler*) <
  this=0xa0e88c8, p=0xa2d09a0) at aodv/aodv.cc:595
595     if(ch->ptype() == PT_AODU) <
(gdb) display ih->saddr()
1: ih->saddr (<nsaddr_t &) @0xa2d17a8: 0
(gdb) display ih->daddr()
2: ih->daddr (<nsaddr_t &) @0xa2d17b0: 2
(gdb) d d 1
(gdb) n
605     if((ih->saddr() == index) && (ch->num_forwards() ==
2: ih->daddr (<nsaddr_t &) @0xa2d17b0: 2
(gdb)
微软拼音 半:
```

7. 单步执行

命令格式: n

即 next



```
~/ns-allinone-2.29/ns-2.29
Breakpoint 4, AODU::recv(Packet*, Handler*) <
  this=0xa0e88c8, p=0xa2d09a0) at aodv/aodv.cc:595
595     if(ch->ptype() == PT_AODU) <
(gdb) display ih->saddr()
1: ih->saddr (<nsaddr_t &) @0xa2d17a8: 0
(gdb) display ih->daddr()
2: ih->daddr (<nsaddr_t &) @0xa2d17b0: 2
(gdb) d d 1
(gdb) n
605     if((ih->saddr() == index) && (ch->num_forwards() ==
2: ih->daddr (<nsaddr_t &) @0xa2d17b0: 2
(gdb) n
609     ch->size() += IP_HDR_LEN;
2: ih->daddr (<nsaddr_t &) @0xa2d17b0: 2
(gdb) n
611     if ( (<u_int32_t>ih->daddr() != IP_BROADCAST)
2: ih->daddr (<nsaddr_t &) @0xa2d17b0: 2
(gdb)
微软拼音 半:
```


8. 单步跳入

命令格式: s

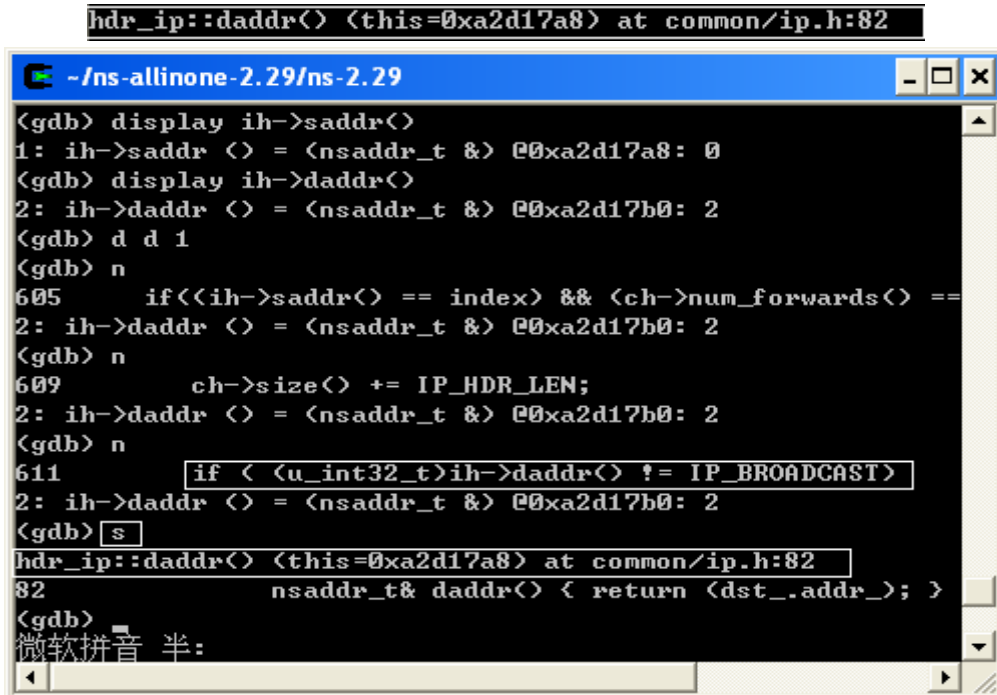
即 step

如下图所示, 在执行到下面代码的时候, 执行 s 命令

```
00611:   if ( (u_int32_t)ih->daddr() != IP_BROADCAST)
```

则跳转到 daddr()函数

```
hdr_ip::daddr() (this=0xa2d17a8) at common/ip.h:82
```

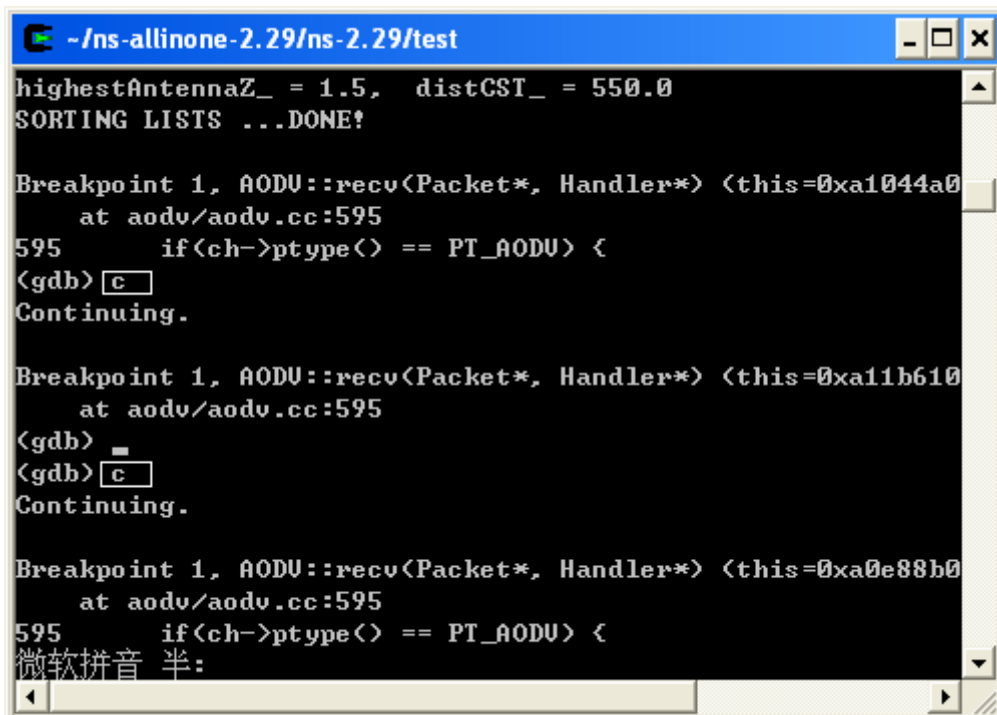


```
<gdb> display ih->saddr()
1: ih->saddr (<) = (nsaddr_t &) @0xa2d17a8: 0
<gdb> display ih->daddr()
2: ih->daddr (<) = (nsaddr_t &) @0xa2d17b0: 2
<gdb> d d 1
<gdb> n
605     if (<ih->saddr (<) == index) && <ch->num_forwards (<) ==
2: ih->daddr (<) = (nsaddr_t &) @0xa2d17b0: 2
<gdb> n
609     ch->size (<) += IP_HDR_LEN;
2: ih->daddr (<) = (nsaddr_t &) @0xa2d17b0: 2
<gdb> n
611     if (<(u_int32_t)ih->daddr (<) != IP_BROADCAST)
2: ih->daddr (<) = (nsaddr_t &) @0xa2d17b0: 2
<gdb> s
hdr_ip::daddr() (this=0xa2d17a8) at common/ip.h:82
82     nsaddr_t& daddr (<) { return <dst_.addr_>; }
<gdb>
```

9. 循环执行

命令格式: c

即 continue



```
highestAntennaZ_ = 1.5,  distCST_ = 550.0
SORTING LISTS ...DONE!

Breakpoint 1, AODU::recv(Packet*, Handler*) (this=0xa1044a0
at aodv/aodv.cc:595
595     if (<ch->ptype (<) == PT_AODU) {
<gdb> c
Continuing.

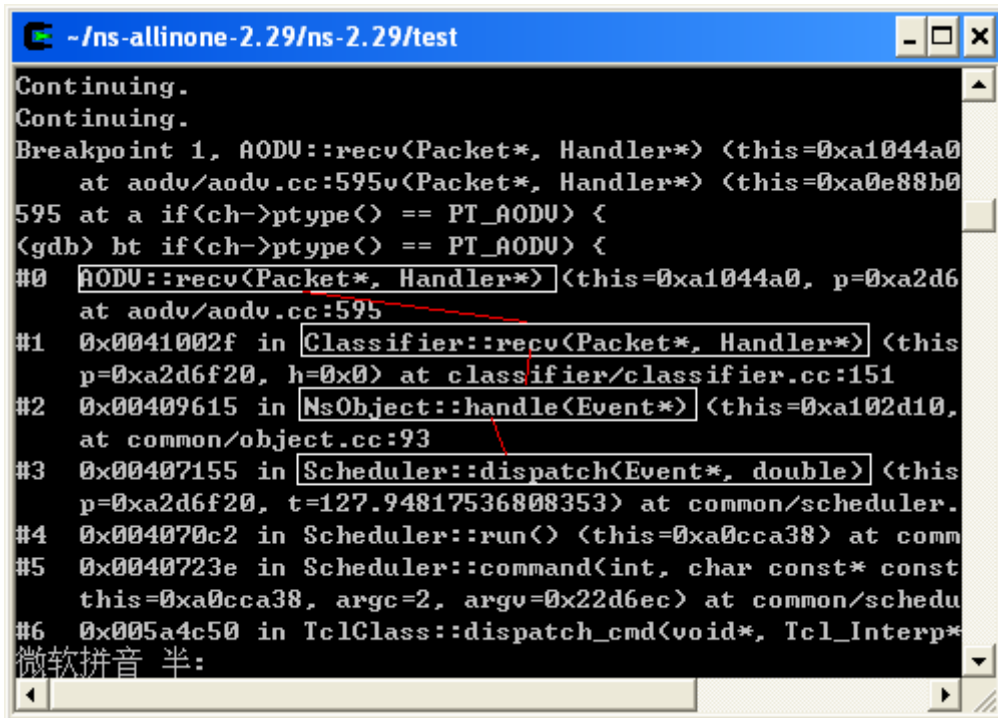
Breakpoint 1, AODU::recv(Packet*, Handler*) (this=0xa11b610
at aodv/aodv.cc:595
<gdb> _
<gdb> c
Continuing.

Breakpoint 1, AODU::recv(Packet*, Handler*) (this=0xa0e88b0
at aodv/aodv.cc:595
595     if (<ch->ptype (<) == PT_AODU) {
微软拼音 半:
```

10.下面介绍的命令是非常有用的，列出运行栈的内容。

命令格式 bt

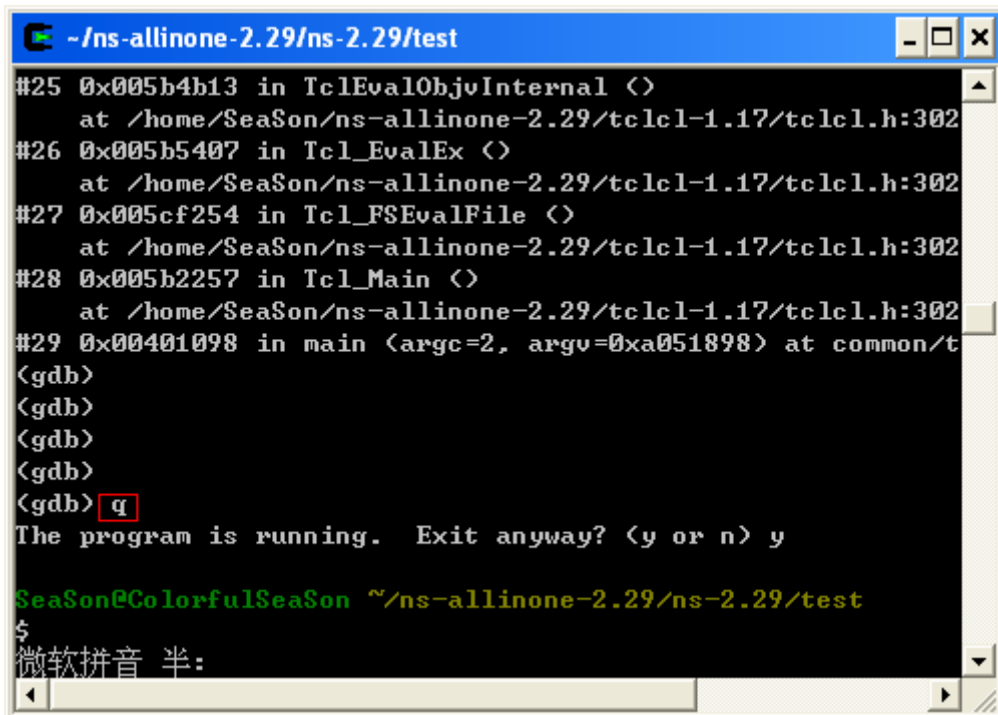
主要针对的是如果你遇到 segment fault 的时候，你可以用以上命令，确定在那个为止出问题，以及函数之间的调用关系，后面会具体说明的。



```
~/ns-allinone-2.29/ns-2.29/test
Continuing.
Continuing.
Breakpoint 1, AODU::recv(Packet*, Handler*) (this=0xa1044a0
  at aodv/aodv.cc:595v(Packet*, Handler*) (this=0xa0e88b0
595 at a if(ch->ptype() == PT_AODU) <
(gdb) bt if(ch->ptype() == PT_AODU) <
#0  AODU::recv(Packet*, Handler*) (this=0xa1044a0, p=0xa2d6
  at aodv/aodv.cc:595
#1  0x0041002f in Classifier::recv(Packet*, Handler*) (this
  p=0xa2d6f20, h=0x0) at classifier/classifier.cc:151
#2  0x00409615 in NsObject::handle(Event*) (this=0xa102d10,
  at common/object.cc:93
#3  0x00407155 in Scheduler::dispatch(Event*, double) (this
  p=0xa2d6f20, t=127.94817536808353) at common/scheduler.
#4  0x004070c2 in Scheduler::run() (this=0xa0cca38) at comm
#5  0x0040723e in Scheduler::command(int, char const* const
  this=0xa0cca38, argc=2, argv=0x22d6ec) at common/schedu
#6  0x005a4c50 in TclClass::dispatch_cmd(void*, Tcl_Interp*
```

11. 退出调试

命令格式 q



```
~/ns-allinone-2.29/ns-2.29/test
#25 0x005b4b13 in TclEvalObjvInternal (<)
  at /home/SeaSon/ns-allinone-2.29/tclcl-1.17/tclcl.h:302
#26 0x005b5407 in Tcl_EvalEx (<)
  at /home/SeaSon/ns-allinone-2.29/tclcl-1.17/tclcl.h:302
#27 0x005cf254 in Tcl_FSEvalFile (<)
  at /home/SeaSon/ns-allinone-2.29/tclcl-1.17/tclcl.h:302
#28 0x005b2257 in Tcl_Main (<)
  at /home/SeaSon/ns-allinone-2.29/tclcl-1.17/tclcl.h:302
#29 0x00401098 in main (argc=2, argv=0xa051898) at common/t
(gdb)
(gdb)
(gdb)
(gdb)
(gdb) q
The program is running.  Exit anyway? (y or n) y

SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29/test
$
```

其他的相关命令可以参看手册，不过调试 NS2 以上的命令基本上已经够用了。

调试示例

示例一、调试 segmentation fault

为了具有普遍性，我特意在 aodv.cc 添加了一个 segmentation fault

添加方法：

1. 打开 aodv.cc, 添加头文件

```
#include "mac-802_11.h"
```

如下图所示：

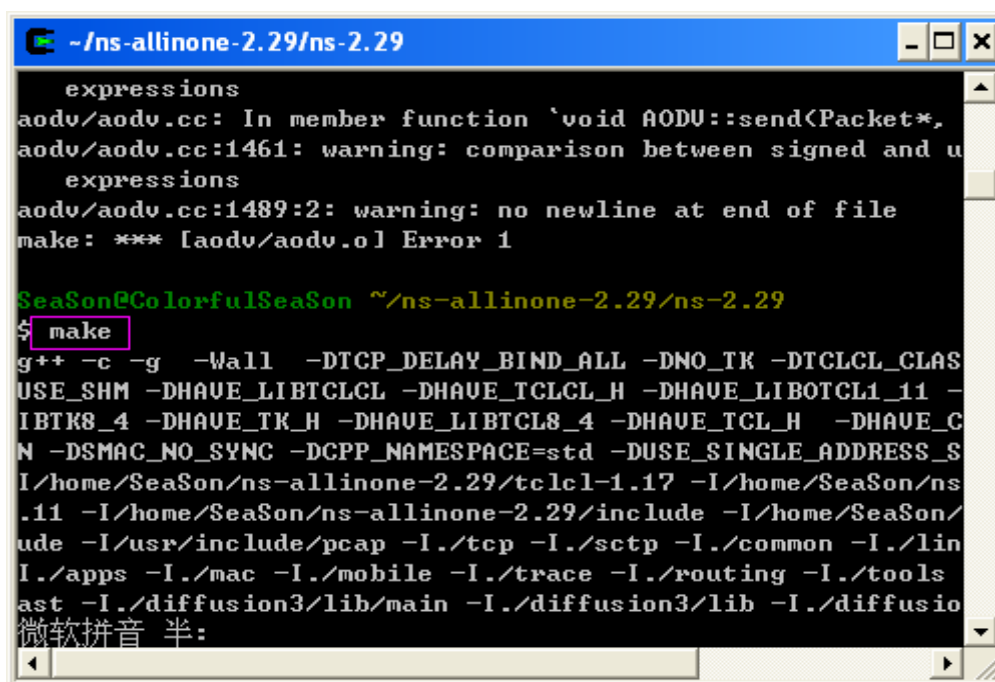
```
#include <aodv/aodv.h>
#include <aodv/aodv_packet.h>
#include <random.h>
#include <cmu-trace.h>
// #include <energy-model.h>
// add by season
#include "../common/mobilenode.h"

// add by season 2006-7-8
#include "mac-802_11.h"
#define max(a,b) ((a) > (b) ? (a) : (b))
#define CURRENT_TIME Scheduler::instance().clock()
```

2. 在 recv() 函数中开头添加下面的代码引入 segmentation fault 错误：

```
-----
00585:
00586: void
00587: AODV::recv(Packet *p, Handler*) {
00588:     struct hdr_cmh *ch = HDR_CMH(p);
00589:     struct hdr_ip *ih = HDR_IP(p);
00590:
00591:     // add by season
00592:     struct hdr_mac802_11 *mh;
00593:     int test = mh->dh_duration; 这句话产生错误
00594:
00595:
```

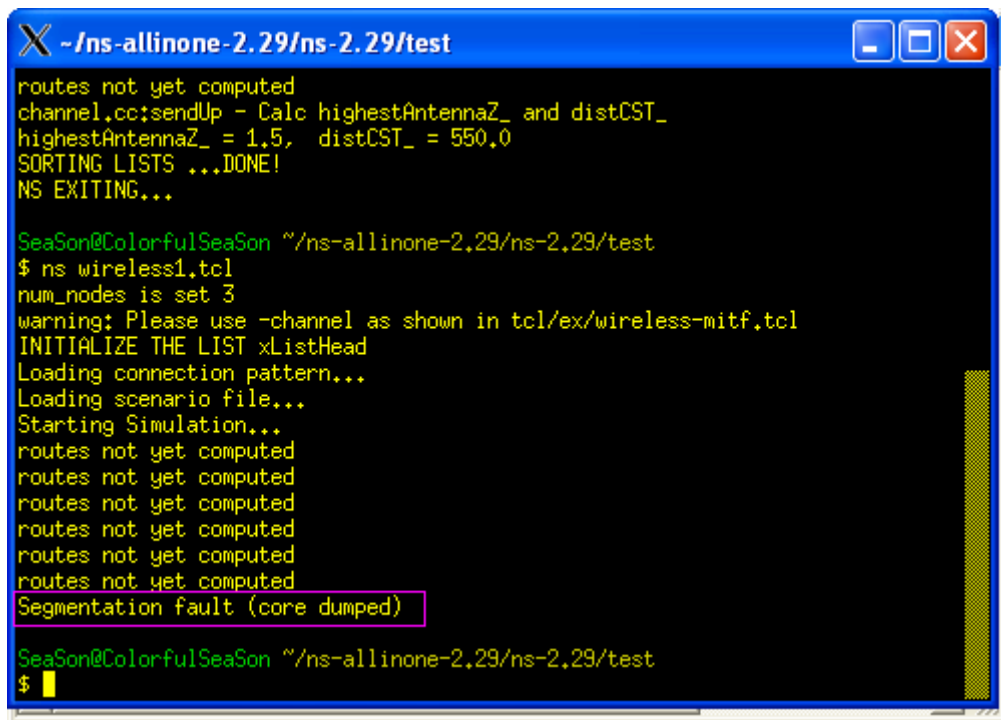
3. 重新编译 NS2，是错误生效。在 ns-2.2*/目录下输入 make



```
~/ns-allinone-2.29/ns-2.29
expressions
aodv/aodv.cc: In member function 'void AODV::send(Packet*,
aodv/aodv.cc:1461: warning: comparison between signed and u
expressions
aodv/aodv.cc:1489:2: warning: no newline at end of file
make: *** [aodv/aodv.o] Error 1

SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29
$ make
g++ -c -g -Wall -DTCP_DELAY_BIND_ALL -DNO_TK -DTCLCL_CLAS
USE_SHM -DHAVE_LIBTCLCL -DHAVE_TCLCL_H -DHAVE_LIBOTCL1_11 -
IBTK8_4 -DHAVE_TK_H -DHAVE_LIBTCL8_4 -DHAVE_TCL_H -DHAVE_C
N -DSMAC_NO_SYNC -DCPP_NAMESPACE=std -DUSE_SINGLE_ADDRESS_S
I/home/SeaSon/ns-allinone-2.29/tclcl1-1.17 -I/home/SeaSon/ns
.11 -I/home/SeaSon/ns-allinone-2.29/include -I/home/SeaSon/
ude -I/usr/include/pcap -I./tcp -I./sctp -I./common -I./lin
I./apps -I./mac -I./mobile -I./trace -I./routing -I./tools
ast -I./diffusion3/lib/main -I./diffusion3/lib -I./diffusio
微软拼音 半:
```

4. 在 xwin 窗口中运行脚本，路由协议必须为 AODV,以 wireless1.tcl 为例。运行后产生，下列错误：

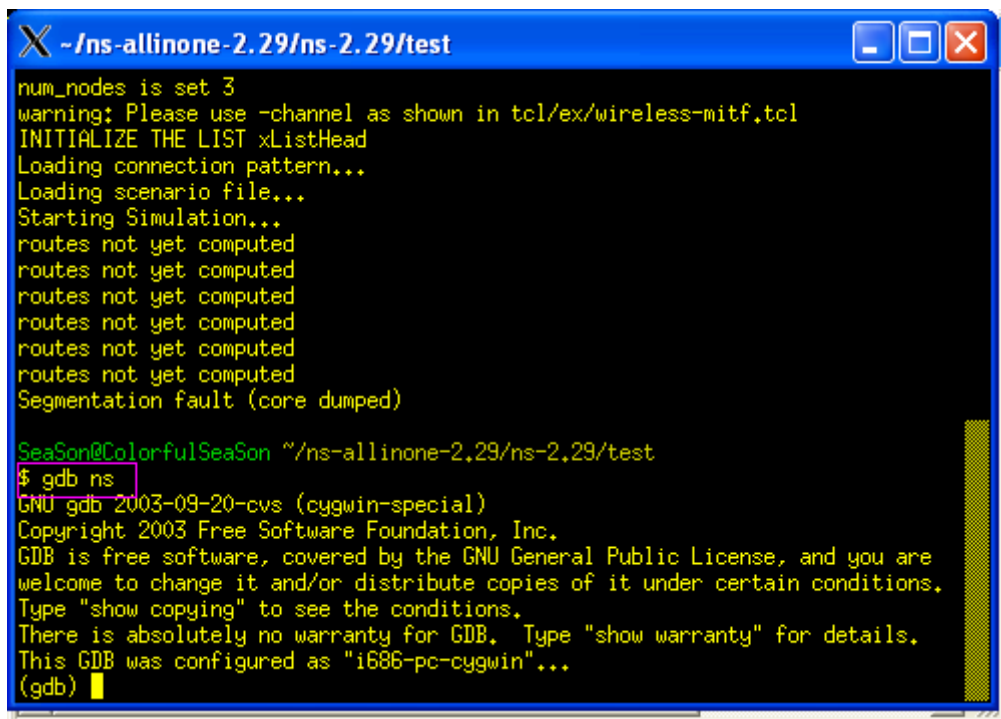


```
X ~/ns-allinone-2.29/ns-2.29/test
routes not yet computed
channel.cc:sendUp - Calc highestAntennaZ_ and distCST_
highestAntennaZ_ = 1.5, distCST_ = 550.0
SORTING LISTS ...DONE!
NS EXITING...

SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29/test
$ ns wireless1.tcl
num_nodes is set 3
warning: Please use -channel as shown in tcl/ex/wireless-mitf.tcl
INITIALIZE THE LIST xListHead
Loading connection pattern...
Loading scenario file...
Starting Simulation...
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
Segmentation fault (core dumped)

SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29/test
$
```

5. 利用 gdb 确定错误的位置
1) (在 xwin 窗口)输入 gdb ns，进入调试状态。



```
X ~/ns-allinone-2.29/ns-2.29/test
num_nodes is set 3
warning: Please use -channel as shown in tcl/ex/wireless-mitf.tcl
INITIALIZE THE LIST xListHead
Loading connection pattern...
Loading scenario file...
Starting Simulation...
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
Segmentation fault (core dumped)

SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29/test
$ gdb ns
GNU gdb 2003-09-20-cvs (cygwin-special)
Copyright 2003 Free Software Foundation, Inc.
GDB is free software, covered by the GNU General Public License, and you are
welcome to change it and/or distribute copies of it under certain conditions.
Type "show copying" to see the conditions.
There is absolutely no warranty for GDB. Type "show warranty" for details.
This GDB was configured as "i686-pc-cygwin"...
(gdb)
```

- 2) 在 gdb 中运行脚本，便会在出错的地方停止程序，如下图所示：

```
X ~/ns-allinone-2.29/ns-2.29/test
SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29/test
$ gdb ns
GNU gdb 2003-09-20-cvs (cygwin-special)
Copyright 2003 Free Software Foundation, Inc.
GDB is free software, covered by the GNU General Public License, and you are
welcome to change it and/or distribute copies of it under certain conditions.
Type "show copying" to see the conditions.
There is absolutely no warranty for GDB. Type "show warranty" for details.
This GDB was configured as "i686-pc-cygwin"...
(gdb) r wireless1.tcl
Starting program: /home/SeaSon/ns-allinone-2.29/bin/ns.exe wireless1.tcl
warning: Please use -channel as shown in tcl/ex/wireless-mitf.tcl
INITIALIZE THE LIST xListHead
Loading connection pattern...
Loading scenario file...
Starting Simulation...

Program received signal SIGSEGV, Segmentation fault.
0x004e1c2b in ADDV::recv(Packet*, Handler*) (this=0xa0e9600, p=0xa2d1720)
    at aodv/aodv.cc:591
warning: Source file is more recent than executable.

591      //add by season
(gdb) █
```

3) 如果你想进一步知道在什么地方调用这个函数出错的，可以使用 bt 命令，具体结果如下图所示。

当然有些错误没这么明显找到的，可能显示的错误是系统文件，这时候你就需要仔细的分析运行栈中的内容，一般的方法是观察运行栈中的函数调用，看看哪一个是你修改的函数，然后将断点设在相应位置，然后重新开始调试，一般都可以找出错误的原因，这就需要你足够的耐性了。

```
X ~/ns-allinone-2.29/ns-2.29/test
Loading scenario file...
Starting Simulation...

Program received signal SIGSEGV, Segmentation fault.
0x004e1c2b in ADDV::recv(Packet*, Handler*) (this=0xa0e9600, p=0xa2d1720)
    at aodv/aodv.cc:591
warning: Source file is more recent than executable.

591      //add by season
(gdb) bt
#0  0x004e1c2b in ADDV::recv(Packet*, Handler*) (this=0xa0e9600, p=0xa2d1720)
    at aodv/aodv.cc:591
#1  0x0041002f in Classifier::recv(Packet*, Handler*) (this=0xa0e6c28,
    p=0xa2d1720, h=0x0) at classifier/classifier.cc:151
#2  0x0067f150 in Connector::send(Packet*, Handler*) (this=0xa13cc00,
    p=0xa2d1720, h=0x0) at common/connector.h:56
#3  0x004c0b97 in CMUTrace::recv(Packet*, Handler*) (this=0xa13cc00,
    p=0xa2d1720, h=0x0) at trace/cmu-trace.cc:1239
#4  0x0041f63e in JdpAgent::sendmsg(int, AppData*, char const*) (
    this=0xa137048, nbytes=512, data=0x0, flags=0x0) at apps/udp.cc:122
#5  0x0067dd82 in UdpAgent::sendmsg(int, char const*) (this=0xa137048,
    nbytes=512, flags=0x0) at apps/udp.h:61
#6  0x004157fd in Application::send(int) (this=0xa133a70, nbytes=512)
    at apps/app.cc:111
```

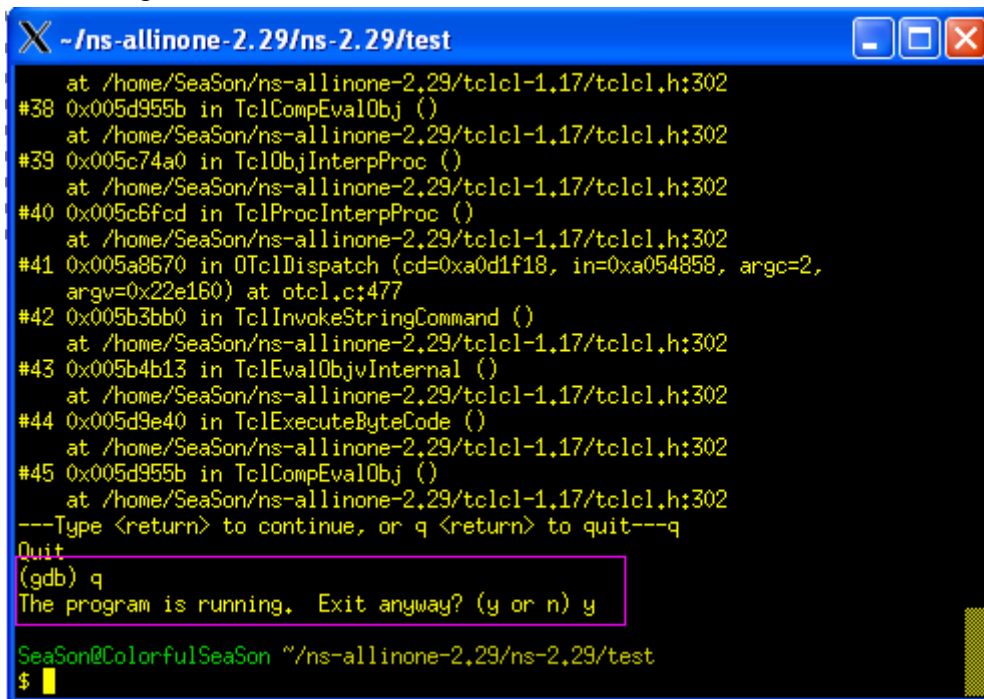
4) 通过上面的步骤我们就确定了错误的位置，然后将最开始我们修改的去掉就 OK 了。

注释掉我们引入的错误:

```
00586: void
00587: AODV::RECV(Packet *p, Handler*) {
00588:     struct hdr_cmn *ch = HDR_CMN(p);
00589:     struct hdr_ip *ih = HDR_IP(p);
00590:
00591:     //add by season
00592:     //struct hdr_mac802_11 *mh;
00593:     //int     test = mh->dh_duration;
00594:
```

重新编译, (注意, 一定要退出 gdb, 否则编译会出错的)

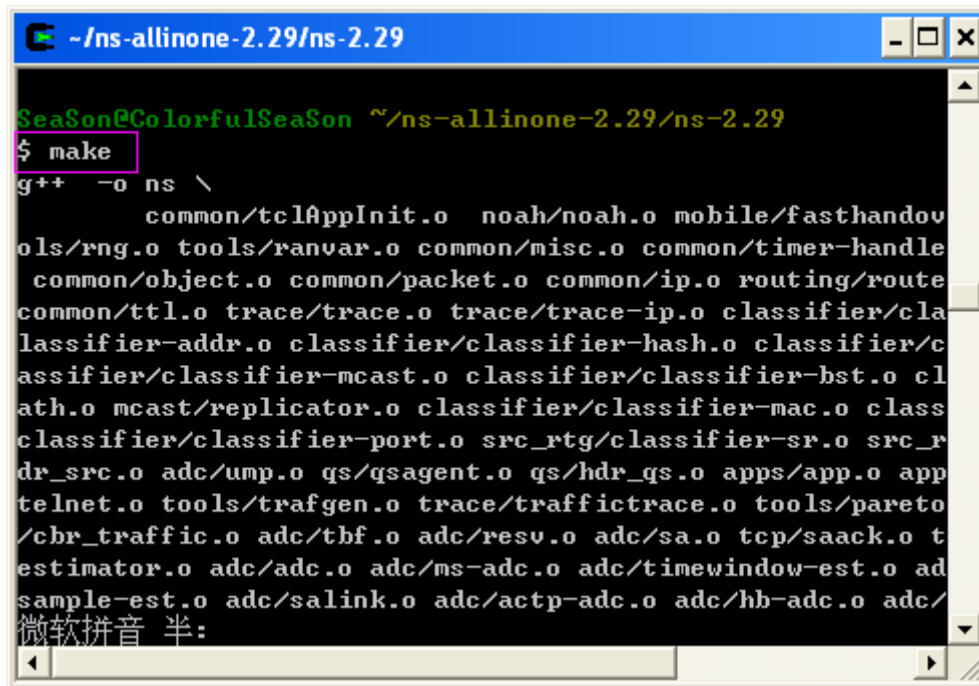
首先退出 gdb 调试状态



```
X -/ns-allinone-2.29/ns-2.29/test
  at /home/SeaSon/ns-allinone-2.29/tclcl-1.17/tclcl.h:302
#38 0x005d955b in TclCompEvalObj ()
  at /home/SeaSon/ns-allinone-2.29/tclcl-1.17/tclcl.h:302
#39 0x005c74a0 in TclObjInterpProc ()
  at /home/SeaSon/ns-allinone-2.29/tclcl-1.17/tclcl.h:302
#40 0x005c6fcd in TclProcInterpProc ()
  at /home/SeaSon/ns-allinone-2.29/tclcl-1.17/tclcl.h:302
#41 0x005a8670 in OTclDispatch (cd=0xa0d1f18, in=0xa054858, argc=2,
  argv=0x22e160) at otcl.c:477
#42 0x005b3bb0 in TclInvokeStringCommand ()
  at /home/SeaSon/ns-allinone-2.29/tclcl-1.17/tclcl.h:302
#43 0x005b4b13 in TclEvalObjvInternal ()
  at /home/SeaSon/ns-allinone-2.29/tclcl-1.17/tclcl.h:302
#44 0x005d9e40 in TclExecuteByteCode ()
  at /home/SeaSon/ns-allinone-2.29/tclcl-1.17/tclcl.h:302
#45 0x005d955b in TclCompEvalObj ()
  at /home/SeaSon/ns-allinone-2.29/tclcl-1.17/tclcl.h:302
---Type <return> to continue, or q <return> to quit---
Quit
(gdb) q
The program is running.  Exit anyway? (y or n) y

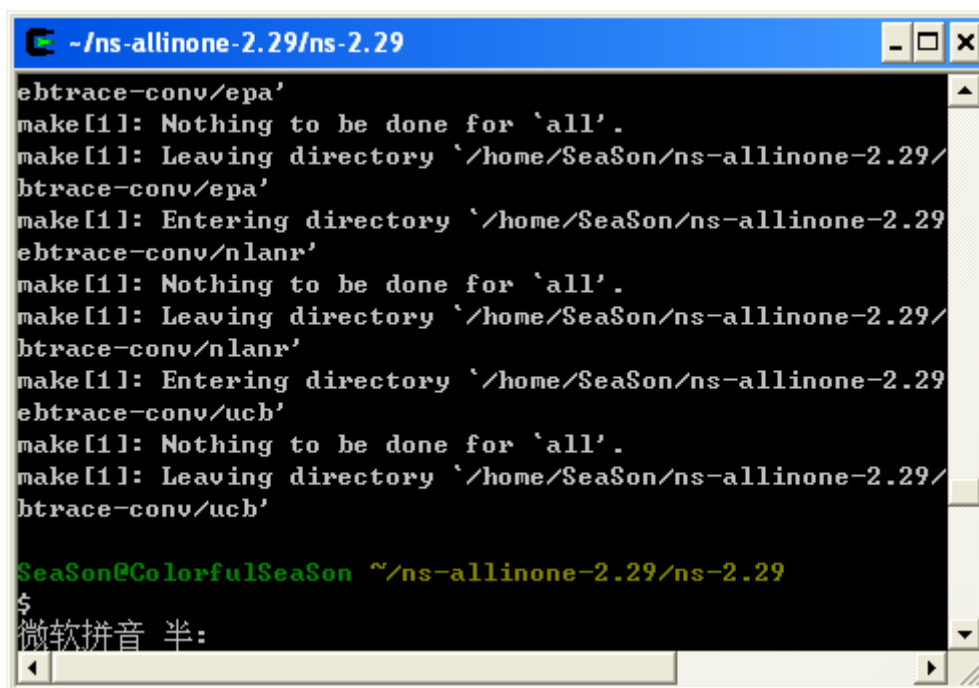
SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29/test
$
```

然后重新编译 make



```
~/ns-allinone-2.29/ns-2.29
SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29
$ make
g++ -o ns \
    common/tclAppInit.o noah/noah.o mobile/fasthandov
ols/rng.o tools/ranvar.o common/misc.o common/timer-handle
common/object.o common/packet.o common/ip.o routing/route
common/ttl.o trace/trace.o trace/trace-ip.o classifier/cla
classifier-addr.o classifier/classifier-hash.o classifier/c
lassifier/classifier-mcast.o classifier/classifier-bst.o cl
ath.o mcast/replicator.o classifier/classifier-mac.o class
classifier/classifier-port.o src_rtg/classifier-sr.o src_r
dr_src.o adc/ump.o qs/qsagent.o qs/hdr_qs.o apps/app.o app
telnet.o tools/trafgen.o trace/trafficttrace.o tools/pareto
/cbr_traffic.o adc/tbf.o adc/resv.o adc/sa.o tcp/saack.o t
estimator.o adc/adc.o adc/ms-adc.o adc/timewindow-est.o ad
sample-est.o adc/salink.o adc/actp-adc.o adc/hb-adc.o adc/
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```

如果出现下面界面，即编译成功。



```
~/ns-allinone-2.29/ns-2.29
ebrate-conv/epa'
make[1]: Nothing to be done for 'all'.
make[1]: Leaving directory `/home/SeaSon/ns-allinone-2.29/
brate-conv/epa'
make[1]: Entering directory `/home/SeaSon/ns-allinone-2.29
ebrate-conv/nlanr'
make[1]: Nothing to be done for 'all'.
make[1]: Leaving directory `/home/SeaSon/ns-allinone-2.29/
brate-conv/nlanr'
make[1]: Entering directory `/home/SeaSon/ns-allinone-2.29
ebrate-conv/ucb'
make[1]: Nothing to be done for 'all'.
make[1]: Leaving directory `/home/SeaSon/ns-allinone-2.29/
brate-conv/ucb'
SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29
$
微软拼音 半:
```

重新运行我们的脚本 wireless1.tcl，就不会出现刚才的错误了。如下图所示：

```
~/ns-allinone-2.29/ns-2.29/test
The program is running. Exit anyway? (y or n) y

SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29/test
$ ns wireless1.tcl
num_nodes is set 3
warning: Please use -channel as shown in tcl/ex/wireless-mitf.tcl
INITIALIZE THE LIST xListHead
Loading connection pattern...
Loading scenario file...
Starting Simulation...
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
routes not yet computed
channel.cc:sendUp - Calc highestAntennaZ_ and distCST_
highestAntennaZ_ = 1.5, distCST_ = 550.0
SORTING LISTS ...DONE!
NS EXITING...

SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29/test
$
```

这个是我修改引入的，你的脚本可能没有这信息，不用考虑

示例二、逻辑错误的调试

说明，一般遇到的都是 **segmentation fault** 错误，但并非是这个错误没有了你的程序就完全 **OK** 了，还需要调试逻辑错误，就是跟踪某个数据包，看他是否按照你设计的流程去走，这个一般我是通过跟踪数据包的地址实现的。即下图所示。

```
~/ns-allinone-2.29/ns-2.29/test
SeaSon@ColorfulSeaSon ~/ns-allinone-2.29/ns-2.29/test
$ gdb ns
GNU gdb 2003-09-20-cvs (cygwin-special)
Copyright 2003 Free Software Foundation, Inc.
GDB is free software, covered by the GNU General Public License, and you are
welcome to change it and/or distribute copies of it under certain conditions.
Type "show copying" to see the conditions.
There is absolutely no warranty for GDB. Type "show warranty" for details.
This GDB was configured as "i686-pc-cygwin"...
(gdb) b aodv.cc:595
Breakpoint 1 at 0x4e1c28: file aodv/aodv.cc, line 595.
(gdb) r wireless1.tcl
Starting program: /home/SeaSon/ns-allinone-2.29/bin/ns.exe wireless1.tcl
warning: Please use -channel as shown in tcl/ex/wireless-mitf.tcl
INITIALIZE THE LIST xListHead
Loading connection pattern...
Loading scenario file...
Starting Simulation...

Breakpoint 1, AODV::recv(Packet*, Handler*) (this=0xa0e9600, p=0xa2d1720)
at aodv/aodv.cc:600
600     if(ch->ptype() == PT_AODV) {
(gdb)
```

具体的步骤我就不写了，太多了，我介绍一下思路：

1. 在节点内各协议之间的发送，这个需要你熟悉下图的结构，一般断点设在各

层协议的 `recv()` 函数之内，然后你逐层的跟踪就可以确定问题出现在那个协议上了，这个是体力活，呵呵。

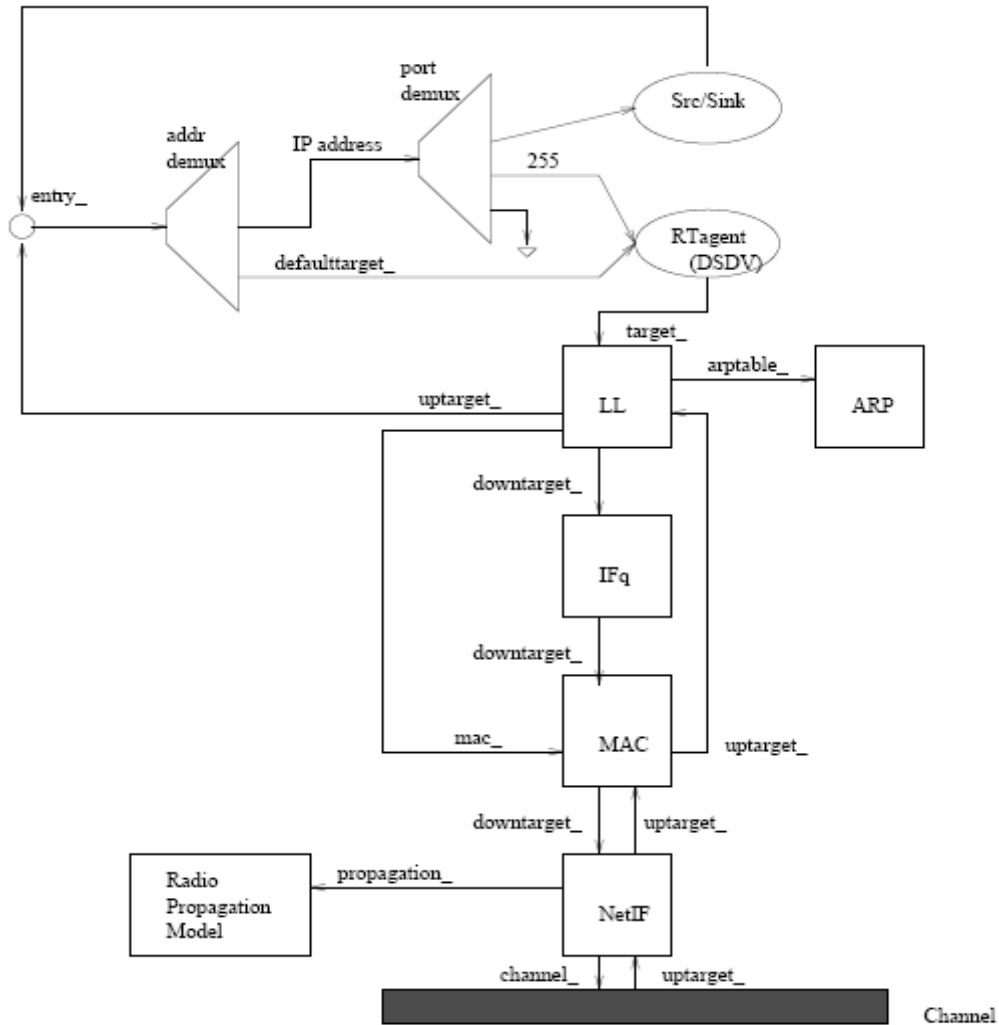


Figure 16.1: Schematic of a mobilenode under the CMU monarch's wireless extensions to ns

2. 节点之间的发送

这个你仔细分析一下 `channel.cc` 文件中的 `sendUp()` 函数就明白了，注意有两个同名的函数，都看看。节点之间发送数据就是通过这个函数，我一般设置端点都在这个函数中。

```

00327: WirelessChannel::sendUp(Packet* p, Phy *tifp)
00328: {
00329:     Scheduler &s = Scheduler::instance();
00330:     Phy *rifp = ifhead_.lh_first;
00331:     Node *tnode = tifp->node();
00332:     Node *rnode = 0;
00333:     Packet *newp;
00334:     double propldelay = 0.0;
00335:     struct hdr_cmn *hdr = HDR_CMN(p);
00336:
00337:     /* list-based improvement */
00338:     if(highestAntennaZ_ == -1) {
00339:         fprintf(stdout, "channel.cc:sendUp - Calc highestAntennaZ_ at
00340:         calcHighestAntennaZ(tifp);
00341:         fprintf(stdout, "highestAntennaZ_ = %0.1f, distCST_ = %0.1f
00342:     }
00343:

```