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802.11b in NS2

本文稍微大概介绍了一下ns2里的802.11b...

Making NS-2 simulate an 802.11b link

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For a research project I worked on in 2004 (resulting paper [here](#)), I used two Netgear MA311 cards to create a simple ad hoc connection. These cards are 802.11b PCI cards, stuck in the back of brand new dell workstations. I did some simple throughput tests using [netperf](#), and found that my results differed significantly from what NS told me.

So I set about to figure out why things were different and what needed to be done to sync the results. I'll quickly explain my findings as it wasn't a complex process. Skip to [here](#) if you want to see my actual results.

First, I'm assuming version 2.27 or newer here. If you're using older versions, some things will be different and I'll try to point them out if I can.

Data Rate

NS, by default, has the data rate for the MAC set at 2 Mbps. But cards are faster now. My cards are 802.11b, which means they're 11 Mbps, and so we need to change this. Add the following to the *beginning* of your simulation script:

```
Mac/802_11 set dataRate_ 11Mb
```

The card can send at 1, 2, 5.5, or 11 Mbps. Most cards support some kind of ARF (Auto-Rate Fallback) for automatic rate selection between these choices. ARF basically seems to be a slow-timescale feedback mechanism. If there are a lot of packet errors, ARF will step down the rate, and conversely, if there are no errors then the rate will be increased. I'm not explaining this in detail because NS *doesn't* support any multi-rate functionality by default. That means mobile nodes will always send their packets at dataRate_. So if you really want to be realistic, you need to support this somehow. I didn't.

RTS Threshold

Almost all commercial 802.11b cards have the RTS/CTS exchange turned off by default. This is not a bad decision since I think most people's home wlan networks are simple enough so that the RTS/CTS really is just unnecessary overhead. NS by default has this feature turned on, so we probably want to tell NS not to use this feature. Add this line to the beginning of your script:

```
Mac/802_11 set RTSThreshold_ 3000
```

This means that an RTS will only be sent for packets that are bigger than 3000 bytes, which should be never. Note: if you want RTS/CTS on, then set this value to zero.

Preamble

I think this is probably the least obvious modification so I'll try to be a little more detailed. Every packet is sent with a preamble, which is just a known pattern of bits at the beginning of the packet so that the receiver can sync up and be ready for the real data. This preamble must be sent at the basic rate (1 Mbps), according to the official standard. But there are two different kinds of preambles, short and long – referring to the length of the sync field. The long preamble has a field size of 128 bits, while the short preamble is only 56 bits. I would guess this short preamble option came about as

hardware progressed and transceivers got better at locking on to a signal. NS is set by default to use the long preamble. My cards use the short preamble by default, and unfortunately, I don't know a good way to determine if your card is using long or short preambles. Email me if you have any ideas.

To support short preambles in NS, add the following line at the beginning of your script:
Mac/802_11 set PreambleLength_ 72
Note: there are 16 other bits in the preamble that aren't affected by the short/long distinction. To go back to long, change this value to 144.

The Channel

Above is everything you need to simulate an 802.11b card accurately (at least more accurately than the default NS does), but there's still a big assumption in NS – that's the wireless channel model. Currently the received power of a packet only depends on the distance between sender and receiver. But in real life, there are a lot of other factors influencing received power. And if you want a realistic simulation, you need to simulate this. I would suggest going [here](#) to find out more information about a more realistic channel fading model.

Packet Size

There is a slightly annoying default setting in many versions of ns that makes your packet size not what you think it is. The default setting is this:
Agent/UDP set packetSize_ 1000
Which means that if you try to set your UDP packet size to greater than this, it will actually split up each packet into two smaller ones. You really want this line:
Agent/UDP set packetSize_ 1500
If you are not sure if this is a problem, I would recommend checking the packet sizes in your trace file. If you see the wrong packet sizes, this is most likely the problem.

Results

The table below shows achieved UDP throughput in Mbps.

Packet Size (Bytes)	Simulation RTS off	Experimental RTS off	Simulation RTS on	Experimental RTS on
128	1.28	1.2	0.75	0.76
256	2.03	2.08	1.4	1.42
512	3.67	3.58	2.48	2.5
1024	5.49	5.38	4.03	4.05
1440	6.41	6.35	4.93	4.96

As you can see, the simulation results are very close to the real results I obtained. In fact, I believe that they are close enough so that the difference can be entirely accounted for by the randomness of the CSMA MAC.

Please send me any comments/questions/corrections. Thanks.

转自: http://www.ece.rice.edu/~jpr/ns/docs/ns-802_11b.html#Results

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1.  [motorcycle service manuals](#) says:
[March 15, 2009 at 11:40 pm](#)

Interesting post, i have bookmarked your site for future reference 😊

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Fei Reply:

June 23rd, 2009 at 9:57 am

Thanks a lot~! ^^

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2.  [Jimmy](#) says:
[June 23, 2009 at 1:45 am](#)

Hi friend. Congratulations an blog very good.

I need to do a favor. You have the script of 802.11b?

I am working on my thesis but with 802.11n, I serve as the script rferencia b.

I shall be eternally grateful

[Reply](#)



Fei Reply:


June 23rd, 2009 at 10:08 am

Hi, as I know there is no published extension for 802.11n... If you have found please tell me ^^

Only some papers talking about 11n by ns2, but they don't share their code.

Good Luck!

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3.  [Asif](#) says:
[October 4, 2009 at 4:26 pm](#)

Hi Fei,

I'm doing my thesis on cooperative MAC with ns 2.29. Instead of sending the data directly to the destination I'd like to

forward data pkts to a high data rate supported relay/helper node to achieve higher data rate. Now plz let me know how can I change the mac header address field to put the address of that relay node instead of real destination. I've tried by changing dh_ta and dh_ra but I found ns2 treats the ARP pkts as data packets and also tries to forward the ARP packets towards relay/helper node.

On the other hand if I make the relay and the destination both receive the data pkts and again relay forwards the same data to destination. Then destination can have diversity and can choose the best signal and drop the less energy signal. Can you plz let me know how to implement it?

I am really very grateful for your help.

Asif

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4.  Asif says:

[October 4, 2009 at 4:28 pm](#)

Hello again Fei,

Its asif again.

My email address is mar24julg1@gmail.com

Please help me. I would be grateful to you.

Thanks again.

Bye

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