

Cloning a New IEEE 802.11 MAC Protocol in ns-2

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I. INTRODUCTION

This article is a hand-on for those who would like to modify ns-2 implementation of IEEE 802.11 MAC protocol but wish to keep the original one for comparison. All stuffs about ns-2 except the main topic described here are skipped throughly. For formal information please check ns-2 official website[1]. For informative material, please check Dr. Ko's website[2]. The baseline ns-2 implementation chosen for our testbed is all-in-one version of ns-2.33 from sourceforge[3].

Assume we want a new MAC protocol such that we can use "Mac/802_11new" in our tcl script: What's the todos?

II. STEPS

- 1) Check source code to be modified or added, maybe a backup is necessary for future diff.

Action	File to be modified
Modify	ns-allinone-2.33\Makefile
Modify	ns-allinone-2.33\dei80211mr-1.1.4\src\InitTCL.cc
Modify	ns-allinone-2.33\ns-2.33\indep-utils\webtrace-conv\dec\my-endian.h
Modify	ns-allinone-2.33\ns-2.33\tcl\lib\ns-mobilenode.tcl
Modify	ns-allinone-2.33\ns-2.33\tcl\lib\ns-default.tcl
Modify	ns-allinone-2.33\ns-2.33\tcl\lan\ns-mac-802_11.tcl
Modify	ns-allinone-2.33\ns-2.33\tcl\lan\ns-mac.tcl
Add	ns-allinone-2.33\ns-2.33\mac\mac-802_11new.cc
Add	ns-allinone-2.33\ns-2.33\mac\mac-802_11new.h
Add	ns-allinone-2.33\ns-2.33\mac\mac-timersnew.cc
Add	ns-allinone-2.33\ns-2.33\mac\mac-timersnew.h

- 2) Modify Makefile by

- a) adding "mac-802_11new.o" next to existing "mac-802_11.o" in OBJ_CC section.
- b) adding "mac-timersnew.o" next to existing "mac-timers.o" in OBJ_CC section.

- 3) Modify InitTCL.c by adding following portion next to existing codes, from about line 70.

```
---BEGIN---
Mac/802_11new/Multirate set useShortPreamble_ false
Mac/802_11new/Multirate set gSyncInterval_ 0
Mac/802_11new/Multirate set bSyncInterval_ 0
Mac/802_11new/Multirate set CWMin_ 32
Mac/802_11new/Multirate set CWMax_ 1024
Mac/802_11new/Multirate set VerboseCounters_ 0
---END---
```

- 4) Modify my-endian.h by marking off first line and last line, this is to fix the compile error.

- 5) Modify ns-mobilenode.tcl by adding following 2 portions next to existing codes, from about line 500 and 700.

```
---BEGIN---
    set god_ [God instance]
    if {$mactype == "Mac/802_11new"} {
        $mac nodes [$god_ num_nodes]
    }
---END---
```

```
---BEGIN---
```

```
    if {$mactype == "Mac/802_11new"} {
        $self instvar mac_
        set ns_ [Simulator instance]
        set beacon_period [$ns_ delay_parse $beacon_period]
        set cfp_duration [$ns_ delay_parse $cfp_duration]
        $mac_(0) cfp $beacon_period $cfp_duration
    }
---END---
```

- 6) Modify ns-default.tcl by adding following portion next to existing codes, from about line 700.

```
---BEGIN---
```

```
# Mac/802_11new
Mac/802_11new set CWMin_ 31
```

```

Mac/802_11new set CWMax_          1023
Mac/802_11new set SlotTime_       0.000020
Mac/802_11new set SIFS_           0.000010
Mac/802_11new set PreambleLength_ 144
Mac/802_11new set PLCPHeaderLength_ 48
Mac/802_11new set PLCPDataRate_  1.0e6
Mac/802_11new set RTSThreshold_   0
Mac/802_11new set ShortRetryLimit_ 7
Mac/802_11new set LongRetryLimit_ 4
Mac/802_11new set bugFix_timer_   true
Mac/802_11new set BeaconInterval_ 0.1
Mac/802_11new set ScanType_       PASSIVE
Mac/802_11new set ProbeDelay_     0.0001
Mac/802_11new set MaxChannelTime_ 0.011
Mac/802_11new set MinChannelTime_ 0.005
Mac/802_11new set ChannelTime_    0.12
---END---

```

- 7) Modify ns-mac-802_11.tcl by adding following portion next to existing codes, from about line 50.

```

---BEGIN---
Mac/802_11new set debug_ false Mac/802_11new instproc init {} {
    eval $self next
    set ns [Simulator instance]
    $ns create-eventtrace Event $self
}
---END---

```

- 8) Modify ns-mac.tcl by adding following portion next to existing codes, from about line 65.

```

---BEGIN---
# IEEE 802.11new MAC settings if [TclObject is-class Mac/802_11new]
{
    Mac/802_11new set delay_ 64us
    Mac/802_11new set ifs_ 16us
    Mac/802_11new set slotTime_ 16us
    Mac/802_11new set cwmin_ 16
    Mac/802_11new set cwmax_ 1024
    Mac/802_11new set rtxLimit_ 16
    Mac/802_11new set bssId_ -1
    Mac/802_11new set sifs_ 8us
    Mac/802_11new set pifs_ 12us
    Mac/802_11new set difs_ 16us
    Mac/802_11new set rtxAckLimit_ 1
    Mac/802_11new set rtxRtsLimit_ 3
    Mac/802_11new set basicRate_ 1Mb
    Mac/802_11new set dataRate_ 1Mb
}
---END---

```

- 9) mac-802_11new.cc

- copy this file from "mac-802_11.cc"
- substitute "Mac802_11" with "Mac802_11new", there are 83 instances. (match case, only full matched word)
- substitute "Mac802_11Class" with "Mac802_11newClass", there are 2 instances. (match case, only full matched word)
- substitute "Mac/802_11" with "Mac/802_11new", there are 5 instances. (match case, only full matched word)
- substitute "mac-802_11" with "mac-802_11new" in line 34.
- substitute "mac-timers.h" with "mac-timersnew.h" in line 53.
- substitute "mac-802_11.h" with "mac-802_11new.h" in line 54.
- substitute "class_mac802_11" with "class_mac802_11new" in line 149.
- substitute "MAC_802_11" with "MAC_802_11new" in line 1963.

- 10) mac-802_11new.h

- copy this file from "mac-802_11.h"
- *substitute "mac-802_11.h" with "mac-802_11new.h" in line 34 and 37.
- substitute "ns_mac_80211_h" with "ns_mac_80211new_h" in line 40, 41 and 602.
- substitute "mac-timers.h" with "mac-timersnew.h" in line 47.
- substitute "Mac802_11" with "Mac802_11new", there are 4 instances. (match case, only full matched word)
- from line 356 to line 365, postfix the name of each timer class with "NEW", for example, substitute "DeferTimer" with "DeferTimerNEW"

- g) from line 554 to line 562, postfix the name of each timer class with "NEW", for example, substitute "IFTimer" with "IFTimerNEW"

11) mac-timersnew.cc

- a) copy this file from "mac-timers.cc"
- b) substitute "mac-timers.h" with "mac-timersnew.h" in line 49.
- c) substitute "mac-802_11.h" with "mac-802_11new.h" in line 50.
- d) postfix the name of each timer class with "NEW", for example, substitute "MacTimer" with "MacTimerNEW" in line 79, 95, 114, 134, 157, 169, 183, 201, 215, 230, 245, 262, 277, 289, 315 and 349.

12) mac-timersnew.h

- a) copy this file from "mac-timers.h"
- b) substitute "__mac_timers_h__" with "__mac_timersnew_h__" in line 36, 37 and 140.
- c) substitute "Mac802_11" with "Mac802_11new", there are 11 instances. (match case, only full matched word)
- d) substitute "MacTimer" with "MacTimerNEW", there are 18 instances. (match case, only full matched word)
- e) postfix the name of each timer class with "NEW", for example, substitute "BackoffTimer" with "BackoffTimerNEW" in line 73/75, 87/89, 95/97, 103/105, 112/114, 119/121, 126/128 and 133/135.

- 13) Remake load by entering "make" command under "ns-allinone-2.33\ns-2.33\".

REFERENCES

- [1] <http://www.isi.edu/nsnam/ns/index.html>
- [2] <http://hpds.ee.ncku.edu.tw/~smallko/ns2/ns2.htm>
- [3] http://sourceforge.net/project/showfiles.php?group_id=149743&package_id=169689&release_id=588643