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**Product:** RTL8198C/8198CD/8198CS/8954E/8954ES 11n/11ac  
Firmware  
**Version:** 3.4.7.3  
**Date:** May 20, 2015

### **Description:**

Realtek provides the turnkey solution for 11n/11ac Router/AP in hardware and software. The firmware could be adopted in Realtek EV (evaluation) board, or platforms designed according to Realtek reference circuit.

The current release firmware has only supported for router package. Will add AP package support in the future.

The following sections will describe the hardware requirements, firmware features, to-do list, and the release history.

### **Hardware Supported:**

#### **Realtek 11n/11ac GE/FE Router/AP EV board:**

- RTL8198C/RTL8198CD/ RTL 8954E – SoC, including a MIPS 1074k CPU, Giga ethernet switch controller, dual PCIe interface, one USB 2.0 host/device selective interface, one USB3.0 host interface
- RTL8198CS/ RTL8954ES – SoC, including a MIPS 1074k CPU, Giga ethernet switch controller, dual PCIe interface, one USB 2.0 host/device selective interface, one USB3.0 host interface, two SATA II interface
- RTL8192ER– 802.11 b/g/n 2x2 MAC/BB/RF controller
- RTL8812AR – 802.11ac 2x2 MAC/BB/RF controller
- DDR2 –64M bytes
- DDR3 –128M bytes
- SPI Flash –8M bytes (note1)

**Note1:** MX25L1605D, MX25L3205D, MX25L6405D, MX25L12805D, MX25L1635D, MX25L3235D, MX25L6445E , MX25L12845E , S25FL016A, S25FL032A, S25FL064P, EN25F16, EN25F32, EN25Q16, EN25Q32, SST25VF032B, GD25Q16, GD25Q32, W25Q16, W25Q32, W25X32 , W25X64 , AT25DF161

### **Limitation:**

- To pass WiFi 11AC logo test, there are two criteria needed to be noted:
  - Because of throughput requirement, device must include giga bit Ethernet
  - For 1x1 AC device, device must include internal battery.

### **Firmware Features Supported(note2):**

- 802.11 a/b/g/n/ac Access Point, WiFi compliant
- 802.1x, WEP, WPA TKIP and WPA2 AES/Mixed mode for PSK and TLS (Radius)

- Wireless Auto-channel selection
- WMM and WMM-APSD supported
- WDS supported with WEP, TKIP and AES encryption
- WPS(1.0/2.0) supported in AP and client mode
- 802.11 a/b/g/n/ac client mode
  - Support infrastructure mode and ad-hoc mode with roaming capability
  - Support wireless security for WEP, WPA TKIP and WPA2 AES PSK
  - Support MAC Clone (single Ether device) and NAT2.5 (Multiple Ether clients)
  - Support site survey scan and manual connect
  - Support WPA/WPA2 PSK client
  - Support 802.1X
  - Wireless ISP supported (set wireless interface on WAN interface)
- Support universal repeater mode
- Wireless access control by MAC address (deny or accept)
- Support multiple SSID and guest access (note 3)
- 5G /2.4G con-current/selective mode support
- External LNA and high power PA support
- DFS support for 5G band
- Antenna diversity support
- 802.1d with spanning tree protocol
- TCP/UDP/ICMP/ARP protocol stack
- NAT/NAPT. ALG for: FTP, NetMeeting, SIP, VPN pass-through with multiple sessions (IPSEC, L2TP, PPTP)
- Firewall
- Virtual DMZ
- DHCP client and server
- PPPoE
- PPTP client
- L2TP client
- Boa web server
- DNS relay
- UPnP IGD
- VPN gateway and NAT traversal
- IPV6/PPPOE pass through support
- DDNS
- NTP client and daylight saving supported
- URL Filtering and DoS (Deny of Service)
- QoS supported by IP or MAC address
- Routing support for RIP1, RIP2 and static route
- System log
- IGMP proxy(v2/v3) and snooping
- MLD snooping support
- Support 802.1Q VLAN for Ethernet and wireless
- WAPI support
- SAMBA support
- DLNA support
- USB 3G module support
- Hostapd support
- HTTP file server support
- FTP server support
- WiFi Direct support (for 2.4G only according to WFA spec.)

- Mesh network support
- Multiple STA+repeater support for 8192E only platform

**Note2:** WAPI/USB 3G/Mesh /Multiple STA+repeater has not been supported by SDK3.4.7.2 yet

**Note3:** It could support up to 5 AP SSID (including primary) in the same time. Each virtual SSID could be configured with different security, WMM, data rate, band and port access (LAN or WAN). When using multiple SSID, the MAC address of each AP must be pre-configured with a unique address.

**Note4:** We support LDPC function for 8192E with some limitation. Please refer to section 7.44 of “Kernel\_2\_6\_SDK\_User\_Guide.pdf”

### **Boot Code Features Supported:**

- Support TFTP upload
- Support SPI flash
- Support LZMA compression
- Support Debug Command

### **Release History:**

**\*\* Gateway/AP firmware v3.4.7.3 – May 20, 2015 \*\***

Wireless LAN driver changes as:

- Fix beacon sending issue after config AP from unconfig state by WPS
- Support DFS function for universal repeater mode
- Update auto channel selection function for 8192ER and 8188ER
- Fix client mode rate adaptive function working abnormal issue
- Fix some PMF function issues
- Fix some universal repeater mode issues
- Add 8192ER LNA type selection in menu config
- Fix some simple config issues
- Fix mesh connectivity issue when br0 and wlan0 have same MAC address
- Fix some 802.11h function issues
- Fix WDS bandwidth wrong issue in 11ac mode
- Update rate adaptive function and some settings to improve 8192ER and 8188ER performance
- Update rate adaptive function to improve 8812AR and 8881A performance
- Add 8881AM 2 layer board support
- Modify 92E CCK Cyclic Delay Diversity setting
- Fix some function\_off function issues
- Fix WAPI group key not working when MBSSID is enabled
- Fix some A4 station function connectivity issues

- Add 8196E BSP and driver support in kernel 3.10
- Add bluez-5.22 support for BLE
- Add WAC/Homekit support for 8196E
- Add adapter-api and fine-tune inband control
- Refine fast ppoe

- Add azwave usb hub support for bluetooth
- Add DHCP auto support in bridge mode
- Add Green Ethernet support for 8198C
- Fix hardware crypto engine failure
- Fine tune SPI/ NAND flash driver
- Fix nand flash upgrade firmware failure
- Refine IPv6 support
- Fix ethernet driver can't receive packet in case of DUT boot up without cable plug-in
- Fix 98c nand flash mp not working
- Refine wan dhcpc connection flow
- Enhance ethernet IOT link
- Fix boa crash when receiving cgi request if cgi support is not enabled
- Enhance miniigd security
- Refine TR069 engine
- Fix wps daemon segment fault under port 52881 attack
- Enhance 98C Ethernet PHY IOT
- Enhance system stability
- Add VoIP RTL89xxE Support

**\*\* Boot code v3.4.7.3 –May 20, 2015 \*\***

- Bootcode\_rtl8198c
  - Add ESMT 4G bytes nand flash support
  - Add DDRIII 530MHz support for 98CD
  - Fine tune 4 bytes SPI flash support
  - Fine tune parameter for DDRII
  - Add F59L4G81A nand flash support
  - Fix nand flash don't support image size larger than 128M size
  - Enhance system stability

**\*\* Gateway/AP firmware v3.4.7.2 – Oct 20, 2014 \*\***

Wireless LAN driver changes as:

- Fix antenna diversity function not working for station connected in vxd or vap interface
- Fix WiFi logo test failed item 4.2.5, 4.2.10, 4.2.47, when station enter power save mode, ping test will fail for 8192E, 8881A, 8188E, and 8812
- Fix 8812 and 8881A frequency deviation issue when doing power tracking for large temperature difference (induced from v3.4.7.1)
- Improve stability of throughput test for 8812
- Add external LNA support for 8188E
- Add BT coexisting support for 8192E
- Modify client mode group-key re-key function to support 2 group keys and fix MIC error issue with Apple AP for 8188E pure client mode
- Fix TRX antenna diversity setting issue for 8188E
- Add A4 Station function support and disabled by default
- Add internal PA support for 8881AM and 8881AB
- Update DFS function to v1.0.23 to improve fault detection ability
- Add TRX antenna diversity support for 8881A selectable configuration
- Update adaptivity function to v7.1 for new test conditions
- Fix pure WDS mode low throughput issue for 8192E
- Add 802.11h support
- Add PMF function support for AP mode

- Fix the issue that STA cannot connect to hidden VAP when HotSpot 2.0 is enabled
  - Add client mode WPA-mixed security support
  - Update SPAIN region 2.4G channel table, RUSSIA region 5G channel table, and CN region 2.4G and 5G channel tables
  - Fix TRX antenna diversity setting issue for 8192E with external LNA
  - Add PA support of RTC5633 and RTC5634 for 8881AN
  - Fix throughput unstable and beacon missing issues when Tx beamforming is enabled for 8192E
  - Add dynamic bandwidth switching function for 5G band
  - Fix WiFi logo test failed item 4.2.25-T06
  - Fix low Rx sensitivity issue for 8188E in MP mode
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- Improve system performance by enable L2 cache and code refining
  - Support up to 512M bytes memory
  - Refine nand flash driver for 2K,4K page
  - Fix samba disk size issue
  - Add Giga Lite (2-pair 500Mbps) support
  - Update WPS code to version 2.16
  - Fix igmp packet cause system crash when L2TP fastpath is enabled
  - Refine UART bluetooth bsp/driver to support baud rate up to 921600
  - Fine tune samba performance
  - Fix hardware multicast fail when disable multi lan option
  - Add simple config support
  - Refine ethernet driver for linux vlan
  - Fix hardware NAT not work for PPPOE wan type when dual wan
  - Refine 98C watchdog and using software watchdog
  - Fix duplicate broadcast between lan port when multi-lan feature enabled
  - Add ds-lite and 6rd support
  - Fix ipv6 multicast packets pass-through failed from lan to wan
  - Add exFAT support
  - Fix wan PC access lan samba server fail
  - Refine TR069
  - Refine IPv6 6to4 tunnel
  - Improve system stability
  - Refine HTTP file server
  - Fix busybox tar not work
  - Refine IPv6 for ready logo test
  - Refine ethernet port link speed configure command
  - Add zmodem file transfer protocol support
  - Refine fastpath for better forwarding performance
  - Fix dual image bug
  - Refine web UI

\*\* Boot code v3.4.7.2 –Oct 20, 2014 \*\*

- Bootcode\_rtl8198c
  - Fix watchdog reboot issue when enable "Power On Self Test Enable" and "ESD SUPPORT"
  - Add tftp client command support
  - Fix "DHCP Server" failed issue
  - Add command history support and fix ESC cause command failed
  - Add "Power On Self Test" feature
  - Add ESD patch

- Enable "Support reset button feature" by default
- Enable 98C 512k bytes L2 cache
- Fix dual image bug
- Boot code version has been updated to "v1.4"

**\*\* Gateway/AP firmware v3.4.7.1 - May 9, 2014 \*\***

Wireless LAN driver changes as:

- Disable PCIe spread spectrum when using 8192E
- Fix WiFi logo test failed item 4.2.47 for 8812 and 8192E
- Fix Tx beamforming not working when MBSSID is enabled for 8812 and 8192E
- Fix CCK power degraded issue for 8192E high power board when power tracking is not enabled
- Modify 5G channel plan for Russia
- Fix NSS1 MCS0-MCS3 tx power too large issue for 8812 1T1R mode (induced from v3.4.6)
- Update power by rate and power limit table for 8192E high power board to avoid burning PA
- Modify adaptivity function for new test plan
- Add RF IQ calibration for 8192E high power board to improve performance
- Disable "Improve more power save in idle mode for 2-receiver devices" by default (enabled in v3.4.5) (can be manually enabled by mib)
- Fix P2P IOT issue with some smart phones
- Fix 8192E client mode long connection time issue in channel 11 and 40M mode
- Add for 8812 and 8192E wlan interfaces swappable
- Fix system crash issue when doing traffic with more than 8 stations
- Fix compile error when enabling hostapd support

■ Wireless LAN MP image changes as:

- Add command to show signal strength in MP mode

- Enhance samba write performance
- Fix ipv6 compile error and add hardware ipv6 routing support
- Support hardware ipv6 multicast
- Add igmp/mld fast leave support
- Add nand flash (2k page size/yaffs2) support
- Add BT RTL8761AU BSP and driver support
- Add guest zone support
- Add openssl 0.9.8y support
- Support 2.4G at wlan0, 5G at wlan1
- Add OTG support
- Add SATA support
- Refine dual image support for webpages backup
- Drop invalid frame received from LAN by iptables
- Correct 98C EEE function
- Fix watch dog not work
- Fix lan-->wan upload big attachment failed at Vietnamese ISP pppoe wan type
- Fix DUT send GARP with lan mac
- Fine tune soft-irq for load balance in ethernet heavy loading test
- Fix oray ddns not work
- Enhance the USB PHY quality
- Remove IAPP

- Fix lan ping ppp0's ip with big packet failed
- Fix lan-->wlan unicast packets flooding
- Fix cannot access DUT when enable Spanning tree and change lan MAC address from web UI
- Fix compile error when enable linux vlan
- Web UI bug fix
- Enhance system stability

**\*\* Boot code v3.4.7.1 –May 9, 2014 \*\***

- Bootcode\_rtl8198c
  - Add nand flash (2k page size/yaffs2) support
  - Fix http server failed
  - Refine memory clock setting
  - Add tftp client support
  - Boot code version has been updated to “v1.2”

**\*\* Gateway/AP firmware v3.4.7 – Feb 27, 2014 \*\***

Wireless LAN driver changes as:

- Fix 8812 and 8881A tx/rx stopping issue while testing throughput
- Modify DFS function to prevent signal leakage issue when DFS switch channel
- Improve performance for 8192E with external LNA in open space
- Fix adaptivity function not working in client mode (induced from v3.4.6.3)
- Fix 8188E power tracking compensation not enough issue
- Fix 8192E Tx power calculation when power limit is greater than target power and tx2path is enabled
- Modify security key setting to prevent packet error in the beginning of connection
- Fix mesh proxy table may go wrong and affect packet forwarding issue when some mesh node with wrong security key

- Add RTL8198CD/8954E +RTL8812AR+RTL8192ER support
- Add support for Linux 3.10 for RTL8198C

**\*\* Boot code v3.4.7 –Feb 27, 2014 \*\***

- Bootcode\_rtl8198c
  - Add RTL8198C/8198CD/8954E support

**\*\* Gateway/AP firmware v3.4.6.3 – Jan 15, 2014 \*\***

- Wireless LAN driver changes as:
  - Fix compile error if client mode function is disabled
  - Fix system crash when mesh interface is re-initialized
  - Fix 8881A WiFi logo test failed item of 4.2.5
  - Fix system crash when system is config as bridge mode and repeater mode simultaneously
  - Fix 8812 VHT NSS1 MCS8,9 power index calculation error
  - Modify RF register write timing to improve stability of RF related function, e.g. IQK
  - Fix virtual client not report coexist management frame issue
  - Fix 8192E tx hang issue when Tx beamforming and MBSSID are enabled simultaneously
  - Fix system crash when cat mib\_all and access web pages frequently
  - Fix FA and CCA counter reading in auto channel selection for 8812 and 8881a
  - Fix 8812 power tracking not working in 8197D+8812+8192C platform (induced from v3.4.6.2)
  - Modify 8881A PHY parameters to improve Tx power linear



- Modify WPS function to prevent ER attack with PIN 00000000 when AP is under PBC handshaking
- Add 802.1x PMK ID cache function
- Fix group key setting error under Mesh mode
- Fix occasionally beacon stop issue for 2.4G 2T2R WiFi IC when there are stations connected and do site survey from UI frequently (induced from v3.4.6)
- Fix Mesh connectivity failed issue when AP interface has security key, and modify Mesh security key setting flow
- Fix beacon sending issue when root AP is function off under repeater mode
- Update adaptivity function for better application in normal environment

- Fix system crash when using USB device

**\*\* Boot code v3.4.6.3 –Jan 15, 2014 \*\***

- **Bootcode\_rtl819xd**
  - boot code version has been updated to "v1.3"
  - add tftp client support

**\*\* Gateway/AP firmware v3.4.6.2 – Nov 29, 2013 \*\***

- Wireless LAN driver changes as:
  - Fix performance test unstable issue when testing with multiple clients (induced from v3.4.6)
  - Fix 8812 Tx beamforming function not working issue (induced from v3.4.6)
  - Fine tune Mesh performance
  - Modify initialization flow for 8192E to improve stability
  - Modify system architecture for multiple repeater
  - Modify client mode WPS function to accept WPA-TKIP credential
  - Fix client mode multicast cipher setting for no connection issue between APs with different multicast ciphers when profile is not enabled
  - Fix power by rate function for 8812 and 8881A in 2.4G
  - Improve throughput under noisy environment for 8192C and 8192D
  - Add wapi support for 11ac
- Fix "init switch core failed!!!" error for 8198
- Fix mp image crash
- Fix voip platform build code error when disable printk
- Fix multicast packet loopback when enable linux vlan
- Add multicast cam support for 8197D to avoid two multicast streaming hash collision issue
- Correct 8881AB+8367RB gpio share pin setting
- Refine cache write\_back/invalidate operation in ethernet driver(induced from sdk3.4.6.1)

**\*\* Gateway/AP firmware v3.4.6.1 – Nov 14, 2013 \*\***

- Wireless LAN driver changes as:
  - Fix 20/40 coexist function not able to enable (induced from v3.4.6)
  - Fix WiFi Direct bandwidth setting of only 20M mode under GO mode
  - Modify DFS functions for root AP function off case and fine tune detection threshold
  - Modify vxd client WPS site survey flow to prevent disconnection in root AP
  - Fix vap beacon sending issue when root AP is function off
  - Support power by rate function for all external PA configuration
  - Fix antenna diversity setting bug for 8192ER with internal PA



- Fix 8192D Rx sensitivity not good issue and support short GI for 8192D in 5G band 4
- Modify hardware setting to improve RF quality for 8192C with external PA
- Add DHCP content clone function under multiple repeater function
- Fix multiple repeater mode WEP encryption issue
- Fix MESH bugs for 1. Pure MESH point can be found by client 2. SSID and MESH id of AP+MESH cannot be the same
- Add 8812 and 8881A 2.4G 256QAM support

■ Wireless LAN MP image changes as:

- Fix 8188E continuous Tx function not working issue with power tracking enabled

■ Fix RTL89xxC and RTL89xxD compile error

■ Fix RTL8198 compile error

■ Add TR069/TR098/TR104/TR181 support

■ Correct EEE command for RTL8367RB platform

■ Fine tune ethernet driver performance

**\*\* Gateway/AP firmware v3.4.6 – Oct 22, 2013 \*\***

■ Wireless LAN driver changes as:

- Disable 8192E ACPR function by default
- Improve 8881A throughput stability in very near range
- Send deauth req in vap interface when switching channel according to vxd-client roaming
- Improve stability of 8192E and 8881A long run test
- Support WiFi Direct for 96E+92C, 96E+92E, 8881A+88E, and 8881AN selective platforms (for 2.4G only according to WFA spec.)
- Add Mesh function support
- Update 8881AN PHY parameter to increase 5G Tx power
- Support Tx beamforming and antenna diversity coexisting for 8812 and 8192E
- Support HotSpot 2.0 phase 1 functions
- Support RTS rate adaptive to improve long range performance
- Add 8192E eFuse support
- Support multiple STA+repeater function for 8192E
- Modify DFS function to improve radar detection rate and fix vap no beacon issue when root AP is function off

■ Wireless LAN MP image changes as:

- Fix 8192C path-B Rx sensitivity degrade 9dB issue (induced from v3.4.3)
- Fix 8812 not able to send single tone issue
- Fix 8192E high power board not able to send single tone issue

■ Add VoIP RTL89xxc Support

■ Add fast lcp reply in fastpath for PPPoE

■ Add Sending IGMP query repeatly for joined clients

■ Fix UPnP port mapping not work under WISP Wan PPPoE mode

■ Fix Web can not access or console hang after long time stress testing

■ Fix IPv6 pass-through not work when enable bridge vlan

■ Refine Web UI

■ Refine Watchdog Mechanism

**\*\* Boot code v3.4.6 –Oct 22, 2013 \*\***

■ Bootcode\_rtl819xd

- boot code version has been updated to "v1.2"

#### ■ **Bootcode\_rtl8197d\_8367r**

- boot code version has been updated to "v1.1"

#### ■ **bootcode\_rtl8881A**

- Refine code size to 24K
- Refine for only ethernet port 4 used
- boot code version has been updated to "v1.0"

### **\*\* Gateway/AP firmware v3.4.5.0.2 – Sep 27, 2013 \*\***

#### ■ Wireless LAN driver changes as:

- Fix repeater mode connection issue when multiple profile is enabled
- Disable 8192E ACPR function by default
- Improve 8881A throughput stability in very near range
- Send deauth req in vap interface when switching channel according to vxd-client roaming
- Fine tune performance of iPad Dropbox application for 8192E and 8188E
- Improve stability of 8192E and 8881A long run test
- Update DFS functions to pass weather radar test in CE domain

#### ■ Wireless LAN MP image changes as:

- Fix bad Rx sensitivity of B patch for 8192C (induced from v3.4.3)

#### ■ Fine tune lan<-->wlan performance

### **\*\* Gateway/AP firmware v3.4.5.0.1 – Aug 26, 2013 \*\***

#### ■ Wireless LAN driver changes as:

- Fix Samsung S4 and HTC New One connection issue with 8812 (induced from v3.4.5)
- Improve 8881A performance when testing with iPad/iPad mini
- Disable Tx beamforming if antenna diversity is enabled
- Fix Tx beamforming may not work on long distance issue
- Fix repeater mode connection issue when bandwidth settings of AP and remote AP are different
- Fix repeater mode connection issue when multiple profiles are used
- Disable spread spectrum in 92E when use extpa
- Fix 8812 re-init failed issue after watchdog reboot
- Modify 8192E high power RF settings to improve performance
- Fix bad WDS throughput issue in middle and long range for 8812, 8881A, and 8192E
- Add 8881AB support

#### ■ Wireless LAN MP image changes as:

- Fix power tracking function not working issue (induced from v3.4.5)

#### ■ Add 8881AB support

#### ■ Fix lan dhcp server config wrong when lan/wan ip conflict and wan network mask is 255.255.0.0/lan network mask is 255.255.255.0,

#### ■ Fix DUT wan dhcp renew issue(can not update new ip address/dns/default gw)

#### ■ Bug fix for multiple profile when enable smart repeater

#### ■ Fix 8197D+8367 platform wi-fi pppoe passthrough failure at gateway mode

#### ■ Fix client mode mac clone failure when lan dhcp disable and use AES encryption

#### ■ Refine web UI and init flow

- Refine web UI for 11ac Rate (remove NSS1-MCS9/20M)

- refine web ui for wlan ACL/firewall macfilter to reject invalid MAC address
- Enlarge 8197D+8367 platform upload firmware reboot time to 120s
- Fix wlan profile WPA encrypt setting issue
- Fix SSID distorted when include special character (eg:“, ’,\) and change band setting
- Fix UI channel number display issue when regDomain=11(channel 100/104/108/112/116/136/140 should not be shown)

■ **\*\* Gateway/AP firmware v3.4.5 –July 29, 2013 \*\***

■ Wireless LAN driver changes as:

- Fix WISP mode system crash issue when wireless WAN shutdown for 8881A and 8192E
- Fix 8812 128 stations support issue
- Add Tx beamforming support for 8812 and 8192E
- Add antenna diversity support for 8881A, 8192e, and 8812
- Add PA Skywork-5023 support for 8812
- Improve connection stability for repeater mode by sending ARP response for station connecting with AP
- Modify adaptivity function for new adaptivity test
- Improve more power save in idle mode for 2-receiver devices
- Support GPIO 8~15 for 8192E and 8881A
- Add support WiFi 11AC logo test
- Fine tune DFS functions to improve detection rate and improve stability
- Fix auto channel selection for choosing 80M mode channel or 40M mode channel
- Fix 8192E pure WDS mode throughput issue
- Fix 8192E repeater mode throughput issue in noisy environment
- Fix 8881A Tx performance issue when turning on STBC
- Modify repeater mode connection bandwidth to follow remote AP
- Fix Tx power setting when auto channel and Tx power limit are enabled for 8192C, 8188RE, and 8188E
- Add 8881AN support
- Modify setting flow of crystal capacitor to prevent system hang on some hardware board when enabling xcap calibration
- Correct tx power setting for 8812AR-VN
- Fix 8192D DFS function and carrier sense test function
- Improve repeater site survey mechanism
- Add 802.11s mesh function support for 8196E+8188E and 8196E+8192E platform, enable by menuconfig and default is disabled

■ Wireless LAN MP image changes as:

- Improve 8881A Rx sensitivity at 80MHz for VHT MCS8/MCS9
- Add PA Skywork-5023 support for 8812

■ Fix L2TP/PPTP/PPPOE dial issue at WISP mode

■ Fix lan pc can't access internet at L2TP manual mode and after “connect -> disconnect -> connect”

■ Fix client mode can not connect to the AP with SSID includes special character(eg: “)

■ Fix WISP vxd interface dhcp can not get ip address when enable multiple SSID

■ Fix wds wpa/wpa2 leads to init flow dead loop

■ Fix the DUT sometimes 100% frame loss issue in RFC2544 test of JDSU MTS-5800 instrument

■ Correct "echo port [port\_mask] auto > /proc/rtl865x/port\_status" command

■ Fix the bridge mode L2 mac learning issue when enable CONFIG\_RTL\_IVL\_SUPPORT

■ Fix build code error, when enable OTG and USB gadget at the same time

- Improve 8881A 100M IOL overshoot issue
- Fine-tune 5G+2.4G <--> 3 LAN PCs throughput of 8881AQ+88E.
- Add linux 802.1q vlan support
- Fix boa was killed when upload wrong and big size config file several times
- Add ESMT SPI flash support
- Fix WISP mode upnp failure
- Fix skb leak at WISP+DHCP (which is queued in igmpproxy and dnrd, and can not be released)
- Fix STA connects to AP failure when DUT works at bridge+dhcp client mode and attain new ip, caused by iapp can not detect br0 ip changed
- Fix dhcp server can lease DUT own ip by ip/mac binding.
- Refine igmp snooping's behaviour to process leave packets to avoid upper stream AP multicast to unicast failure
- Fix CSRF\_SECURITY cause http file server upload/delete file failed
- Refine fast path to improve BT session number
- Fix pppoe/ipv6 passthrough failure at 8197d+8367rb platform
- Modify mtdblock driver to fix the issue that it may cause upload flash image failure in rare case.
- Add enhance USB isochronous application supports such as USB IP-cam applications and USB audio streamer servers.
- Disable super account for boa web server
- Refine boa web ui and mib

**\*\* Boot code v3.4.5 –July 29, 2013 \*\***

- **Bootcode\_rtl819xd**
  - Support bootcode to update config file
  - Add 8197D+8211E support
  - Fix dual image failure on rtl819xd platform
  - boot code version has been updated to "v1.1"
- **Bootcode\_rtl8197d\_8367r**
  - Support bootcode to update config file
  - boot code version has been updated to "v1.0"
- **bootcode\_rtl8196c\_98**
  - Support bootcode to update config file
  - boot code version has been updated to "v1.4"
- **bootcode\_rtl8881A**
  - Add dual image support for rtl8881a
  - Improve 8881A 100M IOL overshoot issue
  - Add ESMT SPI flash support.
  - For 8881AQ or 8881AN, please use def-rtl8881AQ-8881AN-config
  - For 8881AM, please use def-rtl8881AM-config
  - boot code version has been updated to "v0.7"

**\*\* Gateway/AP firmware v3.4.4 –May 16, 2013 \*\***

- Wireless LAN driver changes as:
  - Improve performance with Intel when short GI is enabled
  - Fix system stability issue when connected by Intel 3945 with old driver (10.1.1.3) connecting with 8192E
  - Fix 8192E 20/40 coexistence function

- Reduce 8192E memory usage
  - Add adaptivity test support
  - Add tx power limit support for 8192E and 8881A
  - Fine tune 8881A RF settings to improve tx power and rx sensitivity
  - Support power tracking and power by rate for 8881A
  - Support 8881A 2.4G and 5G selectable mode
  - Fix bug of setting crystal capacitor adjustment for 8812 induced from v3.4.3
  - Fix memory leak issue when running infinite re-init test in 8812 and 8881A dual band platform
  - Fine tune DFS function
  - Support LDPC Tx/Rx for 8192E and Tx for 8881A
  - Enable LDPC and STBC by default if WiFi IC supports LDPC or STBC
  - Add support RTL8812AR-AN 802.11a/n 2x2 MAC/BB/RF controller
  - Fix WiFi WMM-PS logo test issues
- Wireless LAN MP image changes as:
- Fix 8881A and 8192E not able to send single tone issue
- Update USB PHY parameter for RTL8881A
- Refine RTL8198/RTL8881A watch dog time out to 10s
- Fix not generate config.dat for RTL8881A
- Refine stability for DOS(UDP EchoChargen)
- Refine boa web UI and flash mib
- Support RTL8197DN chip for internal SWR (switch regulator)
- Fix ipv6 pass through fail (induced from v3.4.3)
- Fix upnp exploitable from wan
- Enhance ethernet reliability for RTL819xD and RTL8881A
- Fix minidlina not update media list when plug/unplug usb disk
- Fix mount/umount usb disk failure after several times of rapid plug/un-plug
- Fix dial on demand failure when wan type is PPTP/L2TP+dhcp
- Improve USB OTG host IOT issues for RTL819xD and RTL8196E platform
- Add 2M/16M package support for 96E+88ER or 96E+92ER (Note2)
- Refine sending gratuitous arp to WAN
- Fix url filter code dump when url address includes character "#"
- Fix PPTP/L2TP Manual mode re-connect failure when eth1 uses static IP and run Connect/Disconnect several times
- Fix wisp mode hang issue

**Note2:** Difference between 2M/16M and 4M/32M(4M/64M) solution:

- Only support 1 VAP
- Not support DBCC/802.1d spanning tree/SNMP/L2TP/PPTP/DDNS/DLNA/SAMBA/Win7 logo/RIP/RIP2/Static route/TR069/IPV6

**\*\* Boot code v3.4.4 –May 16, 2013 \*\***

- **Bootcode\_rtl819xd**
- Optimize boot code size and speed up boot time
  - Support for 96E/96EU MCM  
RTL8196E3/RTL8196EU3---32MB DDR1  
RTL8196E2/RTL8196EU2---16MB SDRAM  
RTL8196E1/RTL8196EU1---8MB SDRAM
  - 96E/96EU/96ES/96D/97D boot code version has been updated to "v1.0"

**■ Bootcode\_rtl8197d\_8367r**

- Add Winbond SPI flash W25Q128 support.
- boot code version has been updated to "v0.8"

**\*\* Gateway/AP firmware v3.4.3 –Mar 15, 2013 \*\*****■ Wireless LAN driver changes as:**

- Modify 20/40 coexist function to avoid new Intel 6300 driver switching wrong channel
- Improve 8812 performance and stability
- Support tx power limit for 8812
- Fix bug of 8812 receiving energy threshold setting
- Fix bug of 8812 retry setting to avoid infinite retry
- Fix source MAC of broadcast/multicast being modified unreasonably under client mode of repeater mode
- Modify to let client mode with WEP encryption not connect to WPA/WPA2 AP
- Support 8192E and 8881A WiFi function
- Modify the format of tx power limit table and support easily extension for 8812/8192C/8192D/8188RE/8188ER.

**■ Add RTL8881A support****■ Add minidlna****■ Enhance miniigd****■ Fix dhcp server lease duplicated IP****■ Fix lld network topology map issues****■ Add 3TB usb harddisk support****■ Enhance bridge mode ethernet performance for 8197D+8367RB****■ Enhance the compatibility of 8197D+8367RB.****■ Add AP package support for RTL8198 and RTL8197D****\*\* Boot code v3.4.3 –Mar 15, 2013 \*\*****■ Bootcode\_rtl819xd**

- Fix MP download fail issue
- boot code version has been updated to "v0.8"

**■ Bootcode\_rtl8197d\_8367r**

- Enhance the compatibility of 8197D and 8367RB
- boot code version has been updated to "v0.7"

**\*\* Gateway/AP firmware v3.4.2 –Dec 30, 2012 \*\*****■ Wireless LAN driver changes as:**

- Support repeater mode for 8812
- Support Ad-hoc mode for 8812
- Support DFS function for 8812
- Improve pure-wds mode throughput for 8812
- Support AC-only mode and AC+N mode for 8812
- Add 8812 crystal cap support
- Improve 8812 long distance throughput
- Fix some 8812 IOT issues
- Add PA of skyworth 85703 and RFMD 4501 support for 8812
- Fix WDS data forwarding issue in WEP encryption for 8188E
- Add support of Tx Power Limit for 8192CE/8188RE
- Modify wlan PCIe setting to avoid spur issue



- Fix repeater mode connection issue when channel bandwidth is different between remote AP and root AP
- Fix the bug that it may switch channel between DFS and non-DFS channel repeatedly when auto channel and DFS channel are enabled simultaneously
- Fix IOT issue with Sony PSP game console
- Modify driver to allow doing WPS function in vxd interface of repeater mode
- Add a new feature to limit maximum Tx/Rx throughput by wlan interface (ie. root AP and virtual AP)
- Fix a 8188E client mode bug that it may cause disconnection when doing group key rekey under WPA/WPA2
- Fix IOT issue with INTEL 6205 in TKIP mode
- Support auto select 2nd channel in 5G band
- Improve throughput under noisy environment
- Improve client mode WPS IOT
- Wireless LAN MP image changes as:
  - Add 8812 efuse support with MP tool
  - Add 8812 MP single tone support
  - Add 8812 crystal cap support
  - Fix 92C continue tx abnormal wave issue
  - Add PA of skyworth 85703 and RFMD 4501 support for 8812
- Add miniigd ipv6 support
- Fix memory leak issue in firmware upgrade of web server when image is corrupted
- Fix the issue that it may show "IP fragment" error while doing SONY PS3 "network connected test"
- Enhance URL filter to support both black list and white list.
- Fix boa IOT issue with chrome browser
- Fix win7 sometimes can not access samba
- Fix the Ethernet will send out 802.3x pause frame in Chariot WLAN to LAN bi-directional test
- Fix ethernet link up or link down will cause the IPv6 multicast streaming traffic stop for 0.15s~0.2s
- Fix the issue when mib table size is defined over 255
- Add rtl8367rb reset pin support
- Refine samba performance
- Update IAPP to not sending disassociation request to already-left stations
- Enlarge Rx skb buffer number to fine tune 11AC performance
- Fix rtk vlan issue for rtl8367rb

**\*\* Boot code v3.4.2 –Dec 30, 2012 \*\***

- Add rtl8367rb reset pin support
- Add SWR support for 97D rev-C
- Refine DDR2 32MB/64MB/128MB DTR parameter
- boot code version has been updated to "v0.6"

**\*\* Gateway/AP firmware v3.4.1.2 –Oct 26, 2012 \*\***

- Wireless LAN driver changes as:
  - Improve long rang performance for 8812
  - Fix some WiFi logo test items for STA

**\*\* Gateway/AP firmware v3.4.1.1 –Oct 12, 2012 \*\***



- Wireless LAN driver changes as:
  - Improve throughput with 11n clients for 8812
  - Improve throughput for Broadcom 11ac STA
  - Modify content of probe response for better site survey result of PSP
- Enhance USB 3.0 devices for IOT issues with OTG host controller
- Modified to speedup SAMBA performance
- Fix ESD recovery failed (induced from v3.4.1)

**\*\* Gateway/AP firmware v3.4.1 –Sep 28, 2012 \*\***

- Wireless LAN driver changes as:
  - Add 8812 MP chip support
  - Add 8812 power by rate support
  - Add 8812 client mode support
  - Add 8812 Tx Power tracking
  - Add 8812 efuse support
  - Fix CCK power not restricted PA in mp mode when using external PA
  - Fix client mode unnecessarily reconnection when STA channel width of HT information in AP's beacon changed frequently
  - Fix 5G channel list without DFS in NCC domain
  - Add two regulation domain for global (14) and world-wide (15)
  - Support 2-path TX for 1ss-MCS, OFDM and CCK rates for 8192C and 8192D
- Improve eth(wan port)<-->wlan performance at bridge mode
- Fix ethernet port send out flow control pause frame when DUT power on and receive heavy loading multicast streaming
- Fix read mib counter and ifconfig display issue
- Fix STA can't associate DUT when DUT at bridge+dhcp client mode
- Add hardware NAT for 8197D+8367RB
- Use new firmware upgrade mechanism to avoid update failure in some corner case
- Add usb OTG resume/suspend support
- Fix ipv6 passthrough failure on second wlan interface

**\*\* Boot code v3.4.1 –Sep 28, 2012 \*\***

- Enhance Ethernet compatibility for 8197D+8367RB

**\*\* Gateway/AP firmware v3.4 –Jul 23, 2012 \*\***

- Wireless LAN driver changes as:
  - Add 8197D+8812+8192C DBCC support
  - Add 8812 MP support and high power support
  - Improve 8812 performance
  - Check IE length when association to avoid system crash
  - Filter tx packet according to control port under WPA/WPA2
  - Fix the issue that broadcast packet may be discarded by wifi client during group key rekey
  - Add 96D pcie clock auto scan mechanism
  - Support copy\_mib for repeater mode
  - Transfer received DHCP Offer/Ack to broadcast packet in client mode for better interoperability
  - Extend GPIO control API to 8192C/8192D
  - Fix sequence number check error when receiving QoS and non-QoS data packets simultaneously
  - Fix IOT issue with Intel new version driver
  - Refine auto channel selection and add disable\_ch1213 mib

- Improve pppoe wan type stability
- Add ipv6 qos/firewall support
- Add ipv6 prefix delegation
- Add ipv6 over pppoe
- Add ipv6 boa web server support
- Add ipv6 wan SLAAC configuration
- Refine dns6 to be independent with dns4
- Refine Ping6 can display peer's ipv6 address when ping all-nodes/ all-routers multicast address for ipv6 ready logo test
- Add ipv6 address validation on web UI
- Add mld proxy support
- Refine igmpv3 for cd-router test
- Disable igmp and mld query in bridge mode by default
- Add igmp/mld querier selection mechanism.
- Fix vlc client at nat lan port can't play ipv6 multicast when enable bridge vlan
- Fix boa page fault or crash under attack tool (peach/w3af) test
- Fix upload >2M firmware from WEB UI failure
- Fix ipad or chrome play streaming failure via http file server
- Fix 3G dongle can't run usb\_modeswitch on 98/96D/97D ehci port
- Fix bridge mode eth1<--->wlan0/wlan1 low throughput issue
- Fix icmpv6 NS/RA packet can't be forwarded to lan when enable ipv6 passthrough
- Fix dhcp client renew failure when dhcp server packet's broadcast bit on
- Fix dhcp client can not renew ip address when lan subnet the same as wan and enable IPSpoof DOS
- Fix dhcp client renew dns error if dhcp server changed its ip address
- Fix not clean dhcp client process when change WISP+repeater mode to GW mode
- Refine iptables firewall setting for pptp/l2tp passthrough
- Fix wan pc can ping lan pc when disable port forwarding
- Patch dns proxy to support edns relay
- Refine /proc/sys/net/ipv4/ip\_forward setting flow for NAT mode after reinit router
- Fix dhcp+pptp/l2tp manual mode dial up issue
- Fix compile vsftp error when use toolchain 1.5.5
- Add DHCP option 58 and 59(T1/T2 option) Support
- Fix ethernet link IOT issue with IC PLUS IP101
- Refine code dependency

**\*\* Boot code v3.4 –Jul 23, 2012 \*\***

- Fix 96C/98 bootcode tftp upload image hang up issue
- Refine SWR setting to enhance PCI-E stability on 96D/97D platform
- 96C/98 boot code version has been updated to "v1.3"
- 96E/96EU/96ES/96D/97D boot code version has been updated to "v0.5"

**\*\* Gateway/AP firmware v3.3(alpha version) –Jun 04, 2012 \*\***

- Wireless LAN driver changes as:
  - Add support for RTL8812

**\*\* Gateway/AP firmware v3.2.1 –May 31, 2012 \*\***

- Wireless LAN driver changes as:
  - Bug fixed for WPS fail when concurrent run two WPS daemons under the environment that dual band and one side is AP mode, the other side is client mode
  - WPS daemon version string has upgraded to "v2.11"

- Add 8196E PCIE bus frequency autoscan
  - Fix smart repeater connection issue when 2nd side band differs with target AP in 40M mode
  - Fix smart repeater mode vxd-client connection issue with hidden AP
  - Fix auto channel selection under smart repeater mode
  - Fine tune performance of pure WDS
  - Fix wrong RTS rate under B sta + G sta + N sta mixed connection
  - Enable NAT25 and Mac Addr Clone feature concurrent
  - Modify setting to fix crypto engine unstable issue in some hardware board
  - Fix some setting error for 92D
  - Refine 8188E Tx Power Tracking function
  - Improve performance for 88E
  - Improve performance via multiple wifi clients
  - Add multiple profile support in wlan client and repeater mode.
  - Wifi logo patch for 92D 1x1 concurrent mode
- Ulinker changes as:
- Improve usb ethernet performance.
  - Blink system led while system boot or change mode.
  - Refine auto mode detection: add repeater case.
  - Refine usb ethernet/storage switch algorithm.
  - Add Win8 support
- Wireless LAN MP image changes as:
- Fix MP wrong setting when change bandwidth for 88E
  - Fix MP single tone not able to stop issue
  - Fix MP power tracking for 88E
  - Update Tx gain table to get better output power linearity
- Enhance USB IOT
- Improve software nat pppoe performance
- Fix skb leak when ifconfig down all eth interface
- Fix usb gadget compile error
- Fix sprintf log\_info oversize when enable url filter
- Patch for dhcp client can't receive broadcast ack before lease time
- Fix dhcp client use 0.0.0.0 to rebind ip.
- Fix dhcp server allocate ip issues
- Fix SmartBits half duplex backpressure IOT issue.
- Refine flash tool to write uncompressed HW setting
- Fix forwarding multicast packets twice when enable rtk bridge vlan feature
- Refine rtk vlan tx flow to avoid OOM in some cases
- Fix dns proxy process Ipv6 'AAAA' query issue
- Refine fastpath for better compatibility with some abroad ISP
- Support to config pptp/l2tp server by domain name or ip
- Fix http file server can not download ntfs files
- Fix http file server can not show or download files with size equal or more than 4GB
- Fix http file server can not remove files with size equal or more than 2GB
- Fix http file server can not access unicode dir with IE
- Refine pppoe disconnect flow
- Enable Bridge/NAT support in default for VLAN configuration
- Send GARP when dhcp client get ip address or wan port is link up

- Disable always-host feature when domain name query is enable
- Patch for DNS tcp port 53 transaction id issue

**\*\* Boot code v3.2.1 – May 31, 2012 \*\***

- Fix SmartBits half duplex backpressure IOT issue
- Add GigaDevice SPI support
- Update MXIC and Winbond SPI Flash clock parameter to follow spec
- Add 8196ES support
- Add reset button support and speedup booting sequence
- Fixed internal SWR issue to enhance PCI-E stability on 96D/97D platform
- Add SDRAM 8M/64M support
- 96C/98 boot code version has been updated to “v1.2”
- 96E/96EU/96ES/96D/97D boot code version has been updated to "v0.4"

**\*\* Gateway/AP firmware v3.2 –Feb,29 2012 \*\***

- Wireless LAN driver changes as:
  - Add RTL8188E support
  - Improve throughput under weak signal and noisy condition
  - Improve throughput in some 5G channels
  - Fix bug of sending CTS\_TO\_SELF
  - Fix some connection issues of client mode
  - Refine performance for RTL8192D high power board
  - Add smart repeater mode
  - Fix some bug of WPS IE contents
  - Improve station expiring mechanism
  - Improve throughput for Galaxy with BenchBee app
  - Improve the accuracy of power tracking for high power board
  - Modify WPS to support WPS spec 2.02 for brute PIN attack.
- Wireless LAN MP image changes as:
  - Improve the accuracy of power tracking for high power board
- Enhance system stability
- Refine DDR and SDRAM parameters for system stability in bootcode
- Add universal linker(96EU) Support
- Bug Fix for Switch Port 0 not stable sometimes
- Add regular expression function for DNS to select an interface
- Bug Fix for 97D high power with 8211DS Throughput no balance
- Bug Fix for RTL8139 nic link slow issue
- Reserve multicast address and do m2u for MDNS packets

**\*\* Boot code v3.2 –Feb,29 2012 \*\***

- Refine Memory parameter for 96E

**\*\* Gateway/AP firmware v3.1 – Jan 16, 2012 \*\***

- Wireless LAN driver changes as:
  - Fix win7 wzc can't do WPS success when set AP band to n only.
  - Refine dual band performance
  - Fix dual band client connection issue with 2.4G AP
  - Fix dual band client mode issue with "b" only AP
  - Fix client mode IOT issues
  - Fine tune client mode performance

- Fix NDSi connection issue with dual band AP
- Fix ethernet lan pc get DHCP renew failure when DUT is at client mode and as DHCP client
- Refine Auto Channel Selection
- Fix wapi can not use N rate, and wapi client mode sometimes connect to AP failure.
- Fix some wifi logo issues of new test plan
- Add brute force attack mitigation for WPS
- Fix repeater mode some connection failed issue
- Refine repeater mode performance
- Add region domains for CN and Russia
- Fix bugs of some functions in MP mode
- Enhance system stability
- Bug fix for IPv6 ready LOGO phase 2
- Add 96E Support
- Add 97D+92CE+92D Demo-Board high power support
- Fix nf\_conntrack number may exceed nf\_conntrack\_max in bt stress test, and decrease drop conntrack overhead
- Refine rtk vlan, and add rtk vlan wan<-->lan bridge feature
- Fix airplay disconnect issue
- Bug fix pocket AP domain name query failure in some cases
- Fix lan pc/sta can not access internet when wan mac clone wlan sta mac address.
- Bug fix for web UI will redirect to lan ip when access web from wan side
- Bug fix adding default route failure when lan ip and wan dhcp server ip address is the same
- Fix boa IOT issues with opera/firefox/chrome browser
- Add switch core debug tool command
- Forbid sta under virtual ssid to access AP webpage when access
- Fix l2tp low throughput when l2tp server behind a NAT devices
- Refine redirect IP when LAN/WAN IP conflict
- Avoid CPU utilization high when plug/un-plug lan cable under dhcp wan type
- Improve samba NTFS write performance

**\*\* Boot code v3.1 – Jan 16, 2012 \*\***

- Add 8196E support

**\*\* Gateway/AP firmware v3.0 – Sep 29, 2011 \*\***

First Release

**\*\* Boot code v3.0 – Sep 29, 2011 \*\***

First Release