

**Product:** RTL8186 Firmware  
**Version:** 1.4d  
**Date:** August 1, 2008

## **Description:**

Realtek provides the turnkey solution for RTL8186 SoC 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 includes three versions, one for VPN gateway, one for router (without VPN), and the other one for AP (no NAT and WAN support).

The release firmware image will be included in the package of RTL8186 CMK (Customization Kit). This kit will allow customers to modify the web pages and configuration settings to the target system as their need.

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

## **Hardware Supported:**

Realtek Router EV board:

- RTL8186 – SoC, including a CPU, two Ethernet controller, one 802.11a/g MAC/Baseband controller and UART
- RTL8305/RTL8306 series – 5 port L2 switch
- SDRAM – 32M bytes (with 2 2Mx16x4 SDRAM chips)
- Flash – 4M bytes
- 11 b/g RF module – RTL8225

Realtek Portable AP EV board:

- RTL8186P – SoC, including a CPU, two Ethernet controller, one 802.11a/g MAC/Baseband controller and UART
- RTL8201CP – Two 10/100 Fast Ethernet PHY (with Auto Crossover).
- SDRAM – 16M bytes (one 2Mx16x4 SDRAM chip).
- Flash – 2M bytes
- 11g RF module – RTL8225
- 11 a/b/g RF module – RTL8255B

**Note:** Currently, only MXIC (Macronix) flash memory MX29LV800B, MX29LV160AB, MX29LV320AB, MX29LV3620AB and MX29LV640AB, and AMD flash memory AM29LV800BB, AM29LV160DB, and AM29LV320DB, and ST flash memory for M29W160DB are supported.

## **Firmware Feature Supported:**

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

- 802.11f (IAPP)
- Wireless Auto-channel selection
- WDS supported with WEP, TKIP and AES encryption
- Wireless access control by MAC address (deny or accept)
- 802.11b/g client mode
  - Support Ad-hoc and infrastructure 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
- Wireless ISP supported (set wireless interface on WAN interface)
- Support universal repeater mode (one wlan interface used as AP and client concurrently)
- 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)
- IPSEC supported with DES, 3DES and AES-128 encryption/decryption algorithm for ESP encryption, authentication algorithms for HMAC-MD5 and HMAC-SHA-1
- Firewall
- Virtual DMZ
- DHCP client and server
- PPPoE
- PPTP client
- web server
- DNS relay
- UPnP IGD
- IPSec/VPN gateway and NAT traversal
- DDNS and NTP client
- URL Filtering and DoS (Deny of Service)
- System log
- Realtek Auto-Discovery protocol
- Support WMM (Wi-Fi Multimedia) for AP and Client mode
- Support WPS (Wi-Fi Protected Setup) for AP and Client mode
- Support Microsoft LLTD (Link Layer Topology Discovery) protocol (note4)
- Support Microsoft Vista Basic logo for wireless router
- Support SNMP MIB-I, MIB-II and IEEE 802.11 MIB (note4)

**Note1:** AP could use WDS (Wireless Distribution System) to communicate with other APs through wireless media (like Ethernet does currently). To use WDS, each AP must use the same frequency channel, and set other APs MAC address into WDS AP table, (in web page of WDS setting). Up to 8 WDS APs could be supported in current release software.

**Note2:** In the current IAPP implementation, it will send "ADD-notify" and "Layer 2 Update" packet to notify other AP and L2 switch whenever a wireless client is associated or re-associated.

**Note3:** Regarding to memory size requirement of Flash and SDRAM for running Realtek turnkey image, it needs about 2M/16M bytes Flash/SDRAM for VPN gateway, 2M/8M bytes Flash/SDRAM for Gateway and 1M/8M bytes for AP.

**Note4:** Due to FLASH/SDRAM memory constraint in Realtek demo board, these features will not be put in the image of CMK package. Customer may enable these features in SDK and re-build the image.

## **To-Do List:**

## Release History:

### **\*\* VPN/Gateway/AP firmware v1.4d – August 1, 2008\*\***

- Update WPA daemon (auth) to fix Radius authentication fail if WPA/WPA2 have been set.
- Update WPA daemon to fix WPA-PSK fail of client mode with some AP.
- Update WPA daemon to reject illegal STA in PSK mode that doesn't take RSN IE in association.
- Update iwcontrol to support repeater mode.
- Update IAPP daemon (v1.7) to change routing entry adding.
- Update wlan driver to fix protection mode checking on wrong channel.
- Update wlan driver to fix auto channel function when used with channel limitation.
- Support multicast to unicast transformation in wireless LAN interface for video streaming.
- Update SIP ALG for SIP interoperability issue.
- Using Fast Path to instead of old Fast-NAT module
- Update DHCP server to fix issue of one ip address shortage in DHCP address pool user configured
- Fine tune system for P2P traffics
- Add an option in ADK/SDK to support SNMP agent

### **\*\* VPN/Gateway/AP firmware v1.4c – March 19, 2007 \*\***

- Update IAPP daemon (v1.6) to fix the issue that when repeater mode and WPA were enabled, sometimes it may cause wireless connection to be disconnected for a while because TKIP MIC error.
- Update WPA daemon (auth) to fix the issue that it may show the replay counter error in AP system log when 8186 client is associated.
- Modify flash tool (AP/goahead-2.1.1/LINUX/flash.c) to fix the issue that it will use wrong WDS WEP key when input key is in hex format. This bug is ended in v1.4b.
- Modify basic setting web page to disable repeater mode option when ad-hoc client or WDS is used.
- Update WPA daemon to fix the issue that an virtual AP may fail with a WPA client association when MAC clone is enabled in root interface.
- Update WPA daemon to fix the issue that when AP client associated with Allied Telesyn WA7400 AP in WPA mixed mode, it will fail in obtaining WPA group key.
- Modify script file (init.sh) to fix the issue that AP client can't associate with AP under WISP mode with WPA enabled.
- Update WPA daemon to fix an issue that 8186 AP may fail with the association by an Athereos client in WPA/WPA2 PSK mode.
- Update wlan driver to fix the issue that 8186 AP may not be associated by any client in WPA/WPA2 mode after running for several days.
- Update Fast-NAT module to v1.3f to fix some out of order issue for PPPoE and PPTP traffics.
- Remove Realtek Easy-Config, and add WPS support.
- Add LLTD support in GW and VPN version.
- Add WMM support.
- Add WPS support.
- Replace IGD daemon with a new one to shrink memory utilization.
- Enable SIP ALG patch in SDK.
- Disable cache of DNS relay (DNRD) to shrink memory utilization.

### **\*\* VPN/Gateway/AP firmware v1.4b – August 7, 2006 \*\***

- Update WPA daemon (auth) to version v1.7b for the following changes:
  - Add security log.
  - Reset new allocated memory to fix the connection unstable problem when for 2<sup>nd</sup> or later STA to

associate with AP.

- Fix a memory leak issue when WPA authentication was failed.
- Support multiple space in SSID string.
- Add setup time for 20s when doing Realtek Easy-Config in button method. Update Easy-Config daemon (autoconf) to version v1.4a.
- Update wlan driver to version v1.11 for the following changes:
  - Fine tune Realtek turbo mode performance.
  - Add support for external LNA.
  - Add support for 8255B RF (802.11 a/b/g full-band).
  - Add log for ACL.
  - Find tune rate adaptive mechanism.
  - Skip VLAN tag while doing NAT2.5 in client mode.
  - Fix bug of G-only client mode to associate to BG AP
  - Fix AP+WDS encryption problem. When AP is set to WPA or WPA2, WDS channel may not work if WDS security is enabled.
  - Fix the problem that a universal virtual client could not associate to an AP, which broadcast SSID is disabled.
- Fix uPnP IGD daemon for some security issue.
- Fix the problem of setting wrong mtu size for PPTP client.
- Update Fast-NAT module to version v1.3b for the following changes:
  - Add URL filtering for sub-domain.
  - Fix some PPTP compatibility issue when Fast-PPTP is enabled (which is added in v1.4).
  - Add Fast-L2TP support.
- Update Linux loader to set proper SDRAM clock when boot loader version is v1.3b or older than v1.3b.
- Update CMK tools (mgbin and cvcfg-xx) for converting config-file and merge image to exclude boot code and h/w setting. Use this option could keep h/w related setting while update image through TFTP of boot loader.

**\*\* Boot code v1.4a – March 9, 2006 \*\***

- Modify SDRAM clock for stability.

**\*\* VPN/Gateway/AP firmware v1.4 – March 16, 2006 \*\***

- Modify the way of setting wlan mib from script file to binary data at one time (by flash utility) to reduce configuration time.
- Modify web server to response user update after configuration data has been updated into flash. It will not wait until the system is re-initialized.
- Replace 'reload.sh' script file with a daemon program (reload) to fix the performance degrade issue.
- Fix an auto-channel issue that AP may not be able to detect other APs which broadcast SSID is disabled.
- Add Tx priority queue in wlan driver for Ethernet LAN priority packet. This option is disabled in default.
- Fix aWPA/WPA2 mixed mode issue in 802.1x daemon (auth) under AP mode.
- Fix a 802.1x daemon problem that 8186 client may not be able to connect to an AP in WPA2 TKIP.
- Reduce allocated memory for 802.1x daemon.
- Add wlan "turbo" mode. When it is enabled, it will burst packet to get better performance when 8186 AP via Realtek wlan clients (i.e., 8185 PCI, 8187 USB or 8186 client).
- Add an option to allow user to adjust RF output power in wlan advanced setting page.
- Add an option that user could disable/enable RF interface manually by a jumper (through GPIO). This jumper will be exported in new Realtek demo board.

- Fix a power saving mode issue that a client device may use wlan control packet to notify AP about the power mode change.
- Fix some universal repeater mode problem when WPA is enabled.
- Speedup roaming time when 8186 is configured as infrastructure client.
- Fix bug of connection fail in Ad-hoc mode if hidden AP function is turned on.
- Improve wlan rate adaptive mechanism.
- Fix a wlan hang up problem when auto channel selection is used under AP+WDS mode.
- Fix the problem that spanning tree protocol packet can't pass-through through Ethernet-wlan bridge in client mode.
- Add repeater mode support in AP package.
- Fix a compatibility issue when 8186 client is set to B band only.
- Add DoS support in GW package.
- Downsize the conntrack table size to fix memory insufficient issue during BT test in 8M gateway version.
- Add an option to allow user enable/disable MPPE encryption in PPTP.
- Improve PPTP performance.
- Increase PPPoE Tx queue size to improve PPPoE performance.
- Upgrade DDNS to version 2.5 to fix some server compatibility issue.
- Add SIP ALG support.
- Modify web server to allow user update f/w, including web-page+Linux+config-data.
- Use LZMA compression algorithm to compress Linux image to get better compression ratio.
- Add an option to enable/disable PING access on WAN port.
- Add MTU size adjustment in WAN interface for static IP and DHCP.
- Add host name support in WAN DHCP setting.
- Add domain name support in LAN DHCP server setting.
- Support PPPoE/PPTP user-name/password length up to 128, and allow user to input special characters (e.g., !@#\$%...).
- Fix an issue that DDNS is not working in GW version.

**\*\* Boot code v1.4 – September 29, 2005 \*\***

- Rearrange booting sequence.

**\*\* VPN/Gateway/AP firmware v1.3 – September 29, 2005 \*\***

- Add an option (iwpriv wlan0 disable\_olbc=1/0) in wlan driver to disable(1)/enable(0) OLBC detection. Default is enabled.
- Add an option (iwpriv wlan0 deny\_legacy=1/0) in wlan driver to accept(0)/deny(1) the association of legacy client in b+g. Default is accept.
- Report WPA status in site-survey status.
- Support Realtek 8255 RF module (802.11 a/b/g).
- Support “auto” mode authentication in client mode.
- Fix some WPA compatible problems in client mode.
- Fix the problem of associating with AP with broadcasting SSID disabled in client mode.
- Add DFS support in 5G band.
- Add a feature to support external antenna diversity.
- Add support for universal repeater mode.
- Add an option to allow user to select TKIP or AES algorithm in WPA/WPA2 mode.
- Add an option to disable/enable VPN pass-through in WAN setting.
- Add support for URL filtering.
- Add support for DoS (it is only added in VPN package due to flash size limitation).
- Fix the problem that system will hang up when reload default button is pressed under log is enabled.

- Fix the problem of failed access hotmail or Yahoo mail through Ethernet/wlan LAN to WAN.
- Fix the uPNP problem via Windows XP SP2.
- Add an option to allow user set service name in PPPoE.
- Fix some compatible problem in DHCP server.
- Reset the system when hangs up.

**\*\* Boot code v1.3b – April 14, 2005 \*\***

- Fine tune bridge clock to improve WLAN performance.

**\*\* VPN/Gateway/AP firmware v1.2c – April 14, 2005 \*\***

- Fine tune RF parameters for improving performance and supporting Realtek 8225 E-cut.
- Add region domain of Israel (channel 3 ~ channel 13). The value of HW\_WLAN0\_REG\_DOMAIN is 7 in Israel domain.
- Add an option to check basic rates of STA according to WiFi test plan or not to check basic rates for compatibility.

**\*\* VPN/Gateway/AP firmware v1.2b – March 18, 2005 \*\***

- Fix WPA compatible issue that WPA may fail when using 8186 AP with WLAN NIC of TI chipset.
- Fix WLAN driver out-of-order processing of receiving packets.
- Fix WLAN driver forwarding issue of packets transmitted between associated clients.

**\*\* Boot code v1.3a – February 15, 2005 \*\***

- Add a feature to set UART baud rate divider for 38400 bps by checking CPU clock automatically.

**\*\* VPN/Gateway/AP firmware v1.2a – February 15, 2005 \*\***

- Fix WPA compatible issue that WPA may fail when using 8186 AP via some Windows XP clients. Update 802.1x daemon reversion number to v1.4.

**\*\* Boot code v1.3 – January 17, 2005 \*\***

- Add a feature to auto detect 8186 chip version. If it is a new one, it will take the default value for CPU clock (180M).
- Delete the check for image size when writing upload image into flash memory.

**\*\* VPN/Gateway/AP firmware v1.2 –January 17, 2005 \*\***

- Fix the compatible issue while broadcast SSID is disabled in wlan driver.
- Fine tune wlan driver performance, and rate adaptive algorithm.
- Support 8186 new revision chip.
- Add system log feature.
- Add NAT traversal for IPSec/VPN.
- Add RSA authentication for IPSec/VPN.
- Fix the problem that EasyConfig will be failed between 8186 AP and 8186 client mode when its mac address of wlan and Ethernet is set different.
- Fix the problem that the application program will run in a loop when WISP mode and EasyConfig is enabled simultaneously.
- Modify the time zone setting to be independent with NTP.
- Fix the problem that upload web image will fail if it is generated from Windows CMK (CMK tool compweb.exe is updated).
- Add an option in WAN web page to enable/disable web access for WAN port.
- Fix the problem that can't set user name and password on web server in gateway package.
- Fix the problem that multicast/broadcast packet could be dropped in WDS.
- Add TLS client support for AP client (it could be enabled through the patch in ADK package).

- Add RIP1, RIP2 and static route support (it could be enabled through the patch in ADK package).

**\*\* Boot code v1.2 – November 23, 2004 \*\***

- Add a feature that user could press the reset button to force boot loader escape the booting for Linux image and enter monitor mode while power on. When it enters the monitor mode, the LED of reset button will be steady on, and under this mode, user may upload firmware through Ethernet by TFTP.

**\*\* VPN/Gateway/AP firmware v1.1a – November 23, 2004 \*\***

- Add support for wireless client mode
- Add support for WPA2
- Add support for wireless ISP mode
- Add a feature that user could disable/enable 802.11g protection mode (in wireless advanced setting page)

**\*\* Boot code v1.1a – November 1, 2004 \*\***

First Release.

**\*\* VPN firmware v1.0a – November 1, 2004 \*\***

First Release