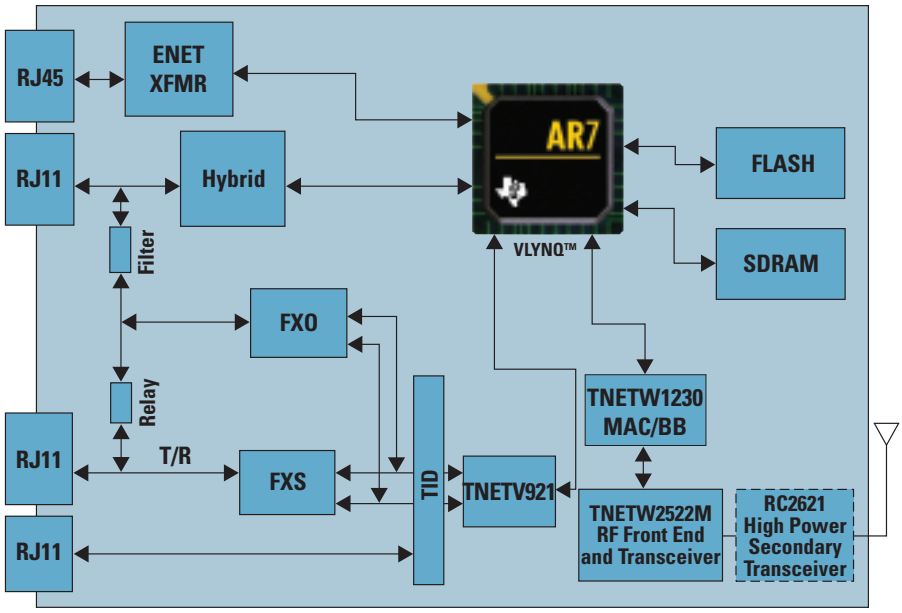
Product Bulletin

AR7VWi Wireless ADSL Voice Gateway



Extending Texas Instruments' (TI's) established and market-proven AR7 family of digital subscriber line (DSL) routers, the AR7VWi is a complete reference design for a residential and small office gateway, which includes ADSL, 802.11 wireless local area network (WLAN) and VoIP. Based on Telogy Software® for VoIP, a robust suite of capabilities ensures an AR7VWi-powered system will provide high-quality and full-featured voice communication exceeding user expectations. Configuration flexibility and scalable options give manufacturers and service providers exceptional opportunities for product and service differentiation.

VoIP Capabilities

The AR7VWi reference design has been developed with all the capabilities needed to support VoIP applications. The AR7VWi has two RJ11 connectors for either two telephone lines or one phone line and one fax line. In addition, board space is available for a second FXO line, should the manufacturer decide to populate the area with additional voice or fax lines. The AR7VWi design includes a relay on the FXO line for continuous lifeline telephone service in the event of a power failure. The AR7VWi's FXO and FXS devices support drivers for SLIC/SLAC chipsets from Silicon Laboratories and Legerity. A TID socket on the AR7VWi supports a variety of telephony interfaces.

Key Features

- Complete solution for integrated ADSL/802.11b/g WLAN gateway with VoIP
- Cost-effective extension from AR7 ADSL modem designs to full-featured ADSL/WLAN/VoIP gateways
- Comprehensive support for VoIP:
  - Robust QoS capabilities include priority memory queues, packet classifications for differentiated traffic flow and others
  - Security with integrated firewall policies, digital signature protection, intrusion detection and others
  - System management includes SNMP, command line interface, Web interface with small memory footprint and others
    - Easy to use, simple to install, UPnP Internet Gateway Device certified
    - Up to 32-ms echo cancellation for high-quality voice
    - Channels include two low-bit rate codecs (LBRC) and one PCM
  - An array of low-bit rate codecs available including G.711, G.723.1 and G.729 offering flexible choices between bandwidth and voice quality
- FXO and FXS driver support for Legerity and SiLabs, SLIC/SLAC
- T.38 FAX relay (V.21, V.27ter, V.29, V.17)
- Scalable with optional second FXS line and RJ11 connector
- Telephony interface daughtercard (TID) socket for plug-in modules
- Lifeline relay for power failure telephony operation
- Reference designs include schematics, layouts, Gerber files, configuration utilities, router software, Linux®-based Network Support Package (NSP), drivers and technical documentation
- Compliance with all DSL, VoIP and 802.11 Wi-Fi® standards

AR7VWi VoIP Features	
Channels	2 LBRC/1 PCM
Codecs	G.711, Annex 1,2 G.729AB G.723.1A
Call Agent	MGCP, H.323, SIP
CID Generation	Bellcore, China, ETSI, UK (planned)
Fax Relay	V.21, V.27ter, V.29, V.17
Fax Protocol	T.38
Conferencing Support	Included
Up to 32-ms Echo Cancellation	G.168-2000 NLP Double Talk Detection
Voice Activity Detector	Noise level matching, adaptive level, SID support, Pink CNG
Tone Generator/Detector	DTMF, MF R1, MF R2 forward signaling, MF R2 backward signaling, V.21 fax, V.25 modems/fax via network, call progress detection, V.18A, SS7 continuity checktone at 2010 Hz, CNG FAX calling tone 1100 Hz
Gain Control	DTMF relay, DTMF RTP relay
PCM Hardware Interface	ulaw, alaw, linear

Network Support Package

The AR7VWi's Linux®-based Network Support Package (NSP) has a small memory footprint requiring only four megabytes of FLASH and 16 megabytes of SDRAM (MGCP implementation). The NSP includes a comprehensive set of software features that enhance the VoIP, broadband ADSL and WLAN operations of the AR7VWi in the following key areas:

- Quality of service (QoS)
- Security
- System management
- Ease-of-use

Quality of Service

QoS is of particular importance to time-critical, real-time applications such as VoIP and streaming media, enabling video conferencing, video on demand, high-quality music over the internet, online gaming and more. Based on the ADSL capabilities, the AR7VWi's QoS methodology dynamically allocates the limited upstream bandwidth for optimum performance. The AR7VWi includes several hardware and software features that facilitate sophisticated QoS operations. Chief among these are the AR7VWi's priority memory queues, which enable efficient packet prioritization and traffic differentiation.

The AR7VWi has four priority queues. The two queues with the highest priority, the expedited forwarding (EF) queues, ensure clear communication with low latency for voice media streams and voice signaling. The other two priority queues, the assured forwarding (AF) queues, can be configured by the service provider or user to differentiate data traffic priorities.

The AR7VWi's QoS capabilities have been architected to be upgradeable to DiffServ and TR-059. Dynamic packet fragmentation is used to optimize the upstream bandwidth available for data traffic after voice packets have been prioritized. In addition, the AR7VWi takes advantage of VLAN tagging to efficiently separate voice and data traffic.

AR7VWi QoS Features

- QoS memory queues
- Two expedited forwarding queues for high-quality voice communication
- Two assured forwarding queues with customizable priority settings for data traffic
- Five categories of packet classifications
- VLAN tagging per PVC
- ATM QoS
- WLAN QoS with conformance to 802.11e
- Dynamic packet fragmentation

Security

The AR7VWi has a number of security features to protect the device, its contents and users from unwanted or malicious access. Integrated firewall policies provide a secure network environment without interfering with applications like communications software or interactive gaming which often require special port forwarding or application layer gateways (ALGs).

An example of a critical security feature is the AR7VWi's digital signatures protection. Digital signatures can be used to ensure the authenticity of upgrade software when it is downloaded to the device. Before loading software that might contain viruses or other security threats, the AR7VWi uses an encrypted public key algorithm to authenticate the digital signature associated with the software download.

AR7VWi Security Features

- Firewall capabilities
- Digital signature for firmware upgrade
- Intrusion detection
- Denial of service (DoS) protection
- WLAN security support (802.11i)
- Secure shell version 2
- Extended bridge filtering with per-port rules

System Management

To meet the needs of a wide variety of service providers and users, the AR7VWi has a considerable number of system management options. For example, SNMP v1, v2 and v2c GET, SET and TRAP commands are supported for four groups of MIB II, including system, Internet control message protocol (ICMP), IP and interface. In addition, the AR7VWi also has an industry-standard command line interface for controlling the ADSL, WLAN and VoIP functions. Moreover, users or service providers can upgrade the AR7VWi by way of its TFTP or FTP clients, which support username and password authentication. To ensure the AR7VWi security, all uploaded files are treated as firmware and are subject to file type validation, checksum verification and the AR7VWi's automatic upgrade procedure. The platform also supports Telnet and console ports.

AR7VWi System Management Features

- SNMP agent and standard MIB II support
- Command line interface
- Extendible configuration manager
- Web server and reference Web pages
- Telnet, TFTP and FTP
- Diagnostics and test capabilities

Ease-of-Use

The AR7VWi has been equipped with many features that make it easy to install and simple to maintain and operate, resulting in a high-level end user satisfaction.

The AR7VWi supports UPnP NAT Traversal and the UPnP Internet Gateway Device (IGD) so it can be quickly and seamlessly incorporated into a digital home environment, automatically communicating with other UPnP devices and services, providing gateway services to the Internet. Moreover, the Web-based graphic interface for end users can be easily customized by the manufacturer or service provider with company colors and logos. Router status and control screens are simply removed or added to the Web-based UI.

AR7VWi Ease-of-Use Features

- Web-based graphic user interface (GIF)
- Integrated UPnP NAT Traversal
- UPnP Internet Gateway Device, version 1
- DHCP client/server/relay
- DNS relay
- Syslog
- Compliant with the Digital Home Working Group requirements

Integrated and Modular Options

The AR7VWi is available in two different configurations:

- The AR7VWi design integrates all components on a motherboard. Because of the high-level silicon integration in the AR7VWi, the BOM cost efficiencies are passed through to manufacturers, making for an exceedingly competitive product in the marketplace. In addition, the relatively low number of components in the AR7VWi simplifies assembly and manufacture while increasing the design's reliability.
- The second alternative, the AR7VW design, implements the 802.11 WLAN functionality on a mini-PCI mezzanine card plugged into the motherboard. With this approach, the manufacturer can still take advantage of the AR7VWi NSP software environment, including its roadmap to future upgrades, while maintaining flexibility with regards to the source of the system's 802.11 mezzanine card and radio. In addition, the AR7VW design gives manufacturers added options for specifying the mezzanine card location to accommodate back panel, antenna and enclosure considerations.

AR7V Design Option

If your design calls for only DSL and VoIP capabilities, but not wireless, TI provides a design option which requires only minor modifications to layout, hardware and software. Using TI software, retest and remanufacturing time is kept to a minimum. If time-to-market with an AR7V design is critical, TI provides a depopulation option of AR7VWi as well.

High-Performance WLAN Functionality

The AR7VWi design includes TI's high-throughput TNETW1230 802.11b/g MAC/baseband processor, which supports WLAN rates over 100 Mbps. In settings where the WLAN signaling must cover a large footprint, TI's optional extended range technology automatically amplifies output power up to the 802.11 standard's maximum of 1 Watt to achieve an extended effective signaling range.

The AR7VWi's TNETW1230 is compliant with all current Wi-Fi CERTIFIED™ and 802.11 standards, including draft standards 802.11i for security, 802.11e for QoS and 802.11h for global deployments. A QoS engine supports enhanced distributed coordination

function (EDCF) and hybrid coordination function (HCF), allowing the AR7VWi to dedicate bandwidth for VoIP and other time-critical applications like broadcast video, video conferencing, online gaming and others.

TI Support

TI has earned a reputation for comprehensive customer support that, in many cases, has given manufacturers a competitive advantage in their markets by shortening the typical time-to market for new product introductions.

The AR7VWi reference design is supported by the comprehensive programs that have been developed over the years for TI's ADSL, 802.11 WLAN and VoIP technologies. These include classroom and regional training sessions, a comprehensive eServices support system, which provides online access to TI's applications engineering teams, enrollment in TI's interOps Test Labs and weekly product updates. Crucial support services are available at key points in the development cycle, including hardware design review, hardware diagnostics check and initial on-site software/hardware integration. In addition, TI can assist with system interoperability and performance tuning. TI's technical support teams are applications experts dedicated to sharing their knowledge and insight.

A wealth of documentation including white papers, technical manuals, datasheets, application notes and frequently asked questions has been produced to help project teams complete their development quickly and efficiently.

For More Information

To learn more about the AR7VWi residential gateway solution and TI's other ADSL, 802.11 WLAN and VoIP products, contact your local TI field sales office or visit:
www.ti.com/ar7vwi

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