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.
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.

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.
**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.

**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.

**Integrated and Modular Options**

The AR7VWi is available in two different configurations:

- **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.

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**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

**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

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**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
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