Product Bulletin

IP Phone Solution
TNETV1050

Texas Instruments' TNETV1050 IP Phone Solution is composed of an integrated silicon platform, featuring the market leading programmable TMS320C55x™ Digital Signal Processor (DSP) and a MIPS32™ 4KEc™ processor, combined with the field-proven VoIP Telogy Software™ product.

TI's TNETV1050 IP Phone solution leverages TI's investment in communication processors for VoIP and broadband applications to provide the superior processing horsepower needed to support current and evolving IP phone standards, as well as the addition of advanced functionality.

One of the unique features of TI's IP Phone solution is the accompanying starter kit. The starter kit includes the software development license, software training and complete IP Phone reference design for immediate demonstration and development.

Telogy Software for IP Phone Applications

Telogy Software provides an efficient framework for real-time voice processing that has been pre-integrated and rigorously tested. The complete DSP solution feature set includes: PCM reception, tone generation, acoustic echo cancellation, voice activity detection, voice playout, and a variety of voice compression options. The solutions are provided in several packages to allow customization for a full range of phone products.

The Telogy microprocessor software, along with third party components, offers a toolkit with a variety of functions to support IP Phone implementations. This includes voice applications services that access DSP services and support APIs necessary for implementation of call processing features. Sample code for device drivers and network management is provided. Additional packages include full signaling services with standard network protocols, SIP, H.323, and MGCP. Figure 1 shows the IP phone software architecture.

The TNETV1050 IP Phone product provides the functionality required for today's executive enterprise desktop speakerphones. It includes acoustic echo cancellation for full duplex speakerphone capability (when used in a properly designed enclosure), support for three-way conferencing and support for low bit rate and wideband codecs.

Silicon Solution

The IP Phone Solution includes a programmable TI C55x™ DSP for optimal IP Phone voice processing and signal processing features. The MIPS32 4KEc processor provides a standards based RISC architecture for customer ease in feature development and integration with Telogy Software services. The three port line rate internal Ethernet Switch with dual MAC and PHY provides support for IP Phone and PC connectivity to the Ethernet LAN.

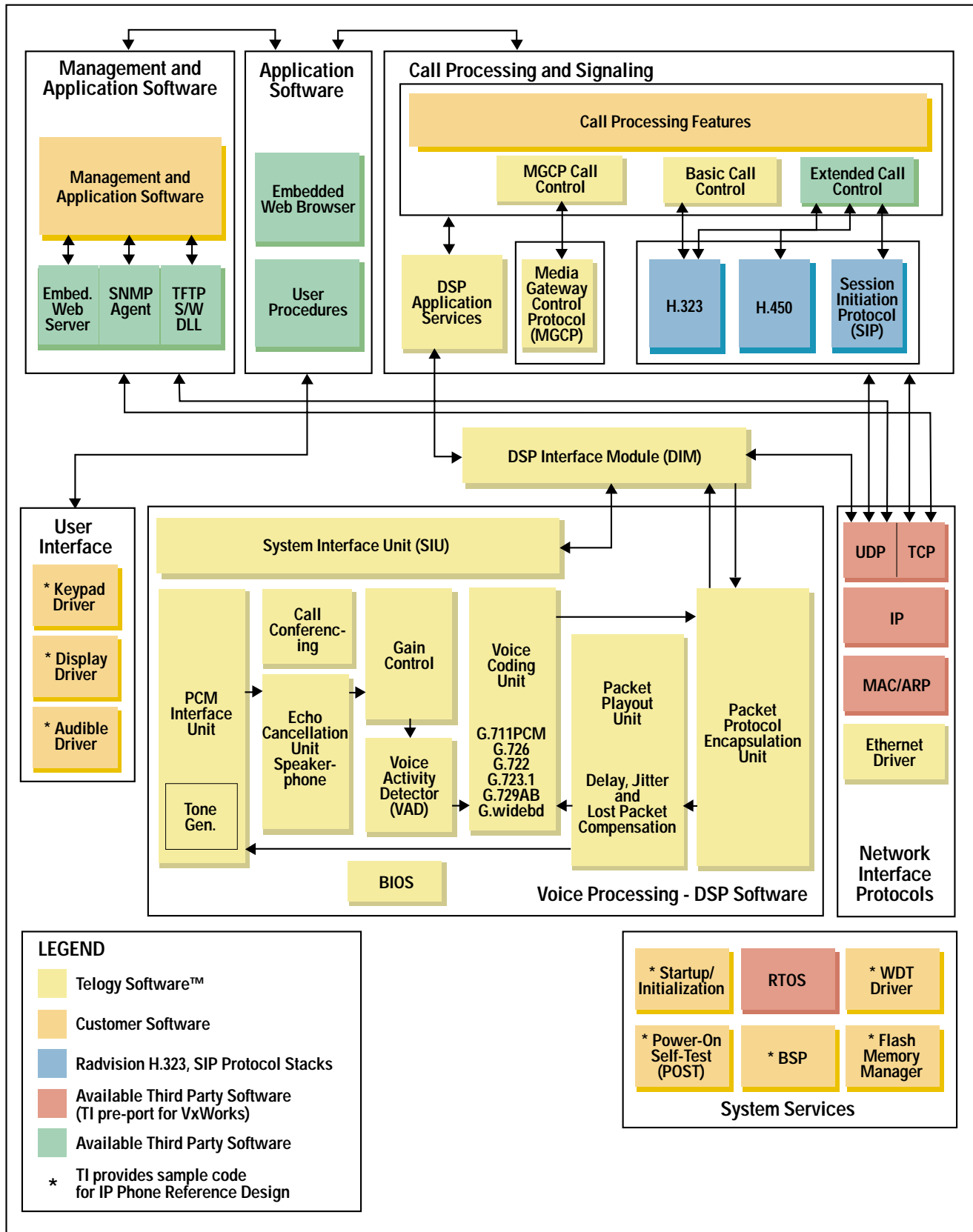The IP Phone processor has a USB 1.1 controller and PHY that support either USB host or peripheral. The USB interface; allows for a wide variety of possible devices to connect to the phone for user value add. These devices support applications such as card readers, fingerprint recognition, PDA synchronization, video conferencing, etc.

The TNETV1050 also supports TI's VLYNQ™ interface; a low cost, low pin count and low complexity chip-to-chip serial interface. VLYNQ makes it easy to add off-chip co-processors and peripheral capability to the phone. VLYNQ enables the customer to bring in value-added features such as video/multimedia, wireless connectivity, security, speech recognition and more.

TNETV1050 IP Phone Software Architecture

Management and Application Software

- Management and Application Software
  - Embed. Web Server
  - SNMP Agent
  - TFTP S/W DLL

Application Software

- Embedded Web Browser
- User Procedures

Call Processing and Signaling

- Call Processing Features
  - MGCP Call Control
  - Basic Call Control
  - Extended Call Control
- DSP Application Services
- Media Gateway Control Protocol (MGCP)
- H.323
- H.450
- Session Initiation Protocol (SIP)

DSP Interface Module (DIM)

User Interface

- * Keypad Driver
- * Display Driver
- * Audible Driver

Voice Processing - DSP Software

- System Interface Unit (SIU)
- PCM Interface Unit
- Tone Gen.
- Call Conferenc-ing
- Echo Cancellation Unit Speaker-phone
- Gain Control
- Voice Activity Detector (VAD)
- Voice Coding Unit
  - G.711PCM
  - G.726
  - G.722
  - G.723.1
  - G.729AB
  - G.widebd
- Packet Playout Unit
- Delay, Jitter and Lost Packet Compensation
- Packet Protocol Encapsulation Unit
- BIOS

Network Interface Protocols

- UDP
- TCP
- IP
- MAC/ARP
- Ethernet Driver

LEGEND

- Telogy Software™
- Customer Software
- Radvision H.323, SIP Protocol Stacks
- Available Third Party Software (TI pre-port for VxWorks)
- Available Third Party Software
- * TI provides sample code for IP Phone Reference Design

System Services

- * Startup/ Initialization
- RTOS
- * WDT Driver
- * Power-On Self-Test (POST)
- * BSP
- * Flash Memory Manager

Description

The TNETV1050 is a communications processor based on a MIPS32 Reduced Instruction Set Computer (RISC) processor along with a C55x DSP. This device has a rich peripheral set architected specifically for VoIP Phone applications, which reduces the bill of materials cost, time, and complexity to develop an IP Phone. The TNETV1050 combines the key processor, communication, and peripheral functions necessary to build a basic or advanced IP phone. The TNETV1050 architecture uses advanced design features to provide flexibility and performance throughput, while conserving power consumption. Combined with Telogy Software for IP Phone applications, the TNETV1050 provides a complete hardware/software solution capable of reducing system design cycle times.

The RISC processor supplies the overall system services and performs user interface, network management, protocol stack management, call processing, and task scheduling functions. The DSP processor provides real-time voice processing functions such as echo cancellation, compression, PCM processing, and tone generation/detection.

IP phone designs are simplified through on-chip peripherals such as a 16-bit color LCD controller, 8x8 keypad interface, USB 1.1 controller (Host or Device), UART serial interface, programmable serial port, two VLYNQ interfaces, and several general purpose I/O.

The integrated dual-channel 16-bit CODEC includes the critical functions needed for IP Phone applications, including two ADCs (with five programmable inputs) and two DACs (with four programmable outputs).
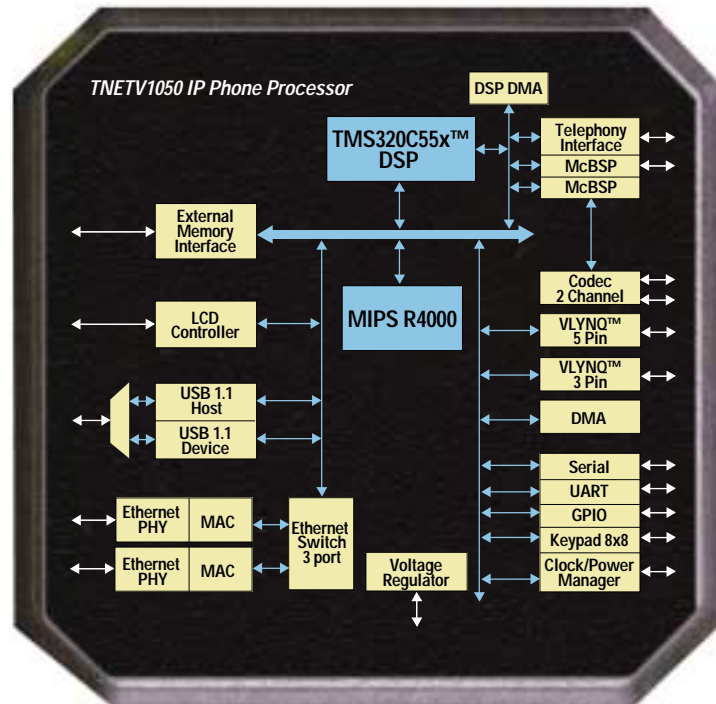
Other codec features include analog and digital sidetone control, anti-aliasing filter, programmable gain options, and programmable sampling rate (8 or 16 ksps).

32-bit RISC Processor

Memory Configuration
- 16K-Byte 4-way set associative Instruction-Cache
- 16K-Byte 4-way set associative Data-Cache
- Programmable Memory Management Unit (MMU)
- 4K-Byte RAM on chip
- 4K-Byte ROM on chip, with boot code

Digital Signal Processor (DSP)

Memory Configuration
- 12K-Word 2-way set associative Instruction-Cache
- 64K-Word RAM on chip:
  - 32K-Word dual access
  - 32K-Word single access
- Universal 4-channel DMA controller
- Dedicated peripheral DMA controller

External Memory Interface

Supporting
- 2 SDRAM Chip Selects providing 128M-Byte
- 3 Chip Selects providing 16M-Byte each, RAM or ROM
- 1 Chip Select providing 32M-Byte, FLASH

Overall

- 324-Ball PBGA (Plastic Ball Grid Array) package
- 3.3V I/O Supply Voltage
- 1.5V Core Supply Voltage, integrated Voltage Regulator
- Reduced power modes available

Specifications: Telogy Software™ for IP Phone Processor

IP PHONE FEATURES – DSP

PCM Voice Mode
    G.711 Codec with support for Annex I and II

Gain Control
    Analog and Digital Tx/Rx Control

Voice Activity Detection
    Adaptive Voice Activity Detection (VAD)
    Configurable Hangover Period
    Useable with any Codec (disabled w/ codec internal VAD)
    Bi-Directional Silence Detection
    Silence Insertion Descriptor (SID) Support

Voice Playout
    Noise Level Matching
    Adaptive Pink Comfort Noise Generation
    Configurable, Adaptive Jitter Buffer
    Lost Packet Compensation

Echo Cancellation
    Acoustic Echo Cancellation for Full Duplex Speakerphone when used
     with properly designed enclosure
    Doubletalk Detection

Packet Protocol
    VoIP (RTP) Packet Format

Real Time Diagnostics
    Telchemy™ QOS Support
    PCM Pattern Detection
    Signal Level Measurement and Report
    Jitter Statistics
    Transmit, Receive, Lost Packet Counts
    Loopback Mode

Codec Options*
    G.711 Codec, G.726, G.729AB, G.723.1A, G.722 wideband codec

Advanced Power Management

3-Way Conferencing and Group Listen

Full Duplex Speakerphone Support
    G.167 Acoustic Echo Cancellation*

IP Phone Processor Software Product Specifications

MICROPROCESSOR FEATURES

IP Phone Platform

Voice Applications Services
  APIs to access DSP Services
  APIs needed to setup DSP for basic and supplementary services
  APIs to generate inband tones
  Sample Display and Keypad Drivers

Sample Network Management Module

VxWorks® RTOS support
  RTOS Run-Time licenses provided with complete solution (optional).
  Development and any related tools must be obtained via RTOS vendors

Signaling Services Package (In addition to Voice Application Services features above)

TI MGCP (NCS) Protocol – with TI sample Basic Call control Basic call support

OR

TI H.323 Protocol support - TI sample Basic Call control. H.323 Network Protocol Stack available via Radvision, Third Party partner

OR

Radvision H.323 Call Control and Protocol Stack support - with support for supplementary services, available via Radvision, a TI Third Party partner

OR

Radvision SIP Call Control and Protocol Stack support - with support for supplementary services, available via Radvision, a TI Third Party partner

* Please consult your sales representative for latest product features and availability.

For more information, please contact your TI sales representative or call 301-515-8580.
www.ti.com/voip

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