TNETV3020
Carrier Infrastructure Platform

Telogy Software™ products integrated with TI's DSP-based high-density communications processor

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Product Bulletin

The Texas Instruments TNETV3020 carrier infrastructure platform is the leading industry solution for voice and video applications required for fixed and mobile media gateways and transcoding applications. The TNETV3020 is a bundled solution based on TI's TMS320TCI6486 DSP and is available with a variety of software solutions. The Telogy voice processing software bundle enables media gateway support for the IP Multimedia Subsystem (IMS) and support for fixed mobile convergence (FMC) applications with a single software build.

TI's Telogy Software provides a full voice-over-packet (VoP) gateway solution and is the leading VoP software solution in today's market, with more than 250 million ports deployed across client, enterprise and high-density, carrier-class systems. Telogy Software has been proven interoperable worldwide. Standards-based and optimized voice and video codecs allow customers to reduce their development time for media gateway, transcoding and other customized applications.

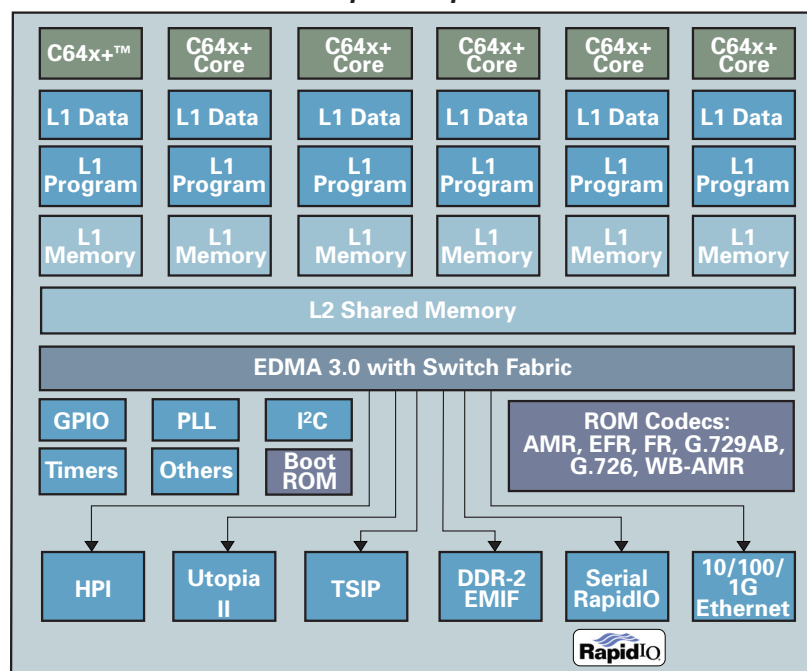### Industry-leading silicon architecture

The TNETV3020 system-on-chip (SoC) is based on TI's industry-leading TMS320C64x+™ DSP subsystems. The TNETV3020 has six C64x+™ DSP cores, each operating at 500 MHz. The device has more than 5.5 MB of integrated memory and an advanced set of communication

peripherals like telecom serial interface ports (TSIP), Serial Rapid IO, UTOPIA and Gigabit Ethernet, making it the ideal platform for TDM and IP-based systems. The internal, non-blocking, switch-fabric architecture facilitates efficient on-chip data movements between DSPs, memory and peripherals. In addition, the chip includes a DDR2 external memory interface. The high level of system integration offered on the TNETV3020 minimizes the bill of materials (BOM) and development costs by slashing component counts while decreasing board layers and simplifying implementation complexities.

Key Features

- Multi-core DSP
  - Over 3 GHz of performance
  - Maximizes solution density
  - Reduces total cost of ownership
- Telogy Software
  - Field hardened carrier-class software with over 250 M ports deployed
  - Fixed Mobile Convergence in a single build for media gateway applications
- Voice and video for IMS/other multimedia applications

TNETV3020 delivers 3 GHz of optimized performance

Software offerings

TI provides a complete set of software to support both voice and video applications on the TNETV3020. This software includes the full Telogy carrier-grade VoIP solution as well as software modules for various voice processing functions. In addition, TI provides a video developer's kit for complex video applications. Both voice and video codecs are also available.

Telogy Software products

For VoP media gateway solutions, you can achieve true toll quality through a full implementation of carrier-class features, including PCM support, carrier-grade echo cancellation, wireless features, carrier-class diagnostics, fax relay, low system latency, complete system flexibility and many other features. This feature set allows the TI solution to exceed the quality levels expected in modern telephony systems.

Solution density

TI's Telogy Software solutions are designed with an emphasis on maximizing solution density. Solution density implies a system-level approach, optimizing power, space and cost while targeting specific applications. Solution power, space and cost are kept low through strategic use of internal memory, a combined data and packet bus, and by allowing for high channel count on the TDM interface.

Channel definition and density

TI provides the most flexible and comprehensive channel configuration available in today's market. Each channel is independently con-figurable and includes the following features:

- Optimized delay – no density penalty for low-latency applications
- 128-ms echo canceller
- Adaptive jitter buffer
- Comprehensive tone package
- Voice activity detection
- Caller ID generation
- Signaling (CAS/CCS)
- In-band signaling (RFC 2833)
- RTCP
- Network encapsulation
- Fax relay
- Any codec on any channel

- Variable packet sizes (5 ms to 80 ms, depending on codec)
  ○ 10 ms – RTP
- Full-featured diagnostics
- RTCP-XR support for network-quality management
- Support for TI's award-winning PIQUA™ software

Security

For today's demanding regulatory environment, Telogy Software products support sRTP as well as PacketCable encryption.

Echo cancellation

Line echo cancellation is a difficult problem to solve because of constantly evolving networks with often extreme variations (signal levels, hybrids, nonlinearities, etc.). TI's Telinnovation™ echo canceller software allows OEMs to develop their own framework around a robust and widely deployed echo cancellation solution with more than 20 years of field-proven experience.

Wireless support

Operating in today's mobile networks requires much more than simply supporting wireless codecs. In addition to the standard wireless codecs, Telogy Software products support voice quality enhancements (VQE) such as automatic level control, tandem-free operation (TFO), acoustic echo control (AEC) and noise reduction (NR). Appropriate wireless protocol support is also available in the form of Iu/Nb over IP or ATM, along with many other wireless-specific features and enhancements.

PIQUA™ technology

The TNETV3020 software includes support for TI's award-winning quality-initiative PIQUA technology. PIQUA technology provides easy access to comprehensive network diagnostics and statistics in a standards-based architec-ture. This support vastly improves the carrier's ability to find and fix problems within the network and enhance the user's experience. PIQUA technology provides added value for carriers through statistics such as the following:

- Echo Quality Index (EQI) – provides a measure of the propensity for echo on any given conversation

- Packet loss recovery statistics – measures the effectiveness of packet loss recovery mechanisms
- Fax and modem performance indicators
- Customized quality alerts
- Support for RTCP-XR (RFC 3611)
- RTCP-HR

Voice-band data (VBD)

VBD allows fax and modem services to be transported over IP. To protect against packet loss, TI developed a standards-based packet loss recovery mechanism (RFC2198). TI also supports a standards-based forward error correction (FEC) mechanism (RFC2733). Together, these provide a complete V.152-compliant service.

Fax relay

Fax relay provides reliable real-time fax service between two analog fax machines over a packet network. The equipment at both ends of the packet network spoofs the analog fax machines such that they operate as if directly connected over a public switched telephone network (PSTN) connection.

The equipment performing the fax relay functions must handle the effects of network delay, jitter (variable delay) and lost packets while preventing the fax machines from timing out. Fax relay, as a part of the TI solution, is T.38-compliant. In addition, FEC and advanced error concealment techniques help improve document quality. T.38 over UDP, T.38 over RTP are also included.

Text relay

Support for text relay over IP is provided in Telogy Software products. This solution provides services for the hearing impaired, is V.151-compliant, incorporates redundancy and is T.38-compliant. In addition, FEC and advanced error concealment techniques help improve document quality.

Low system latency

Effective DSP solutions should constantly strive to minimize latency to maintain quality voice services. Latency in a high-density gateway degrades signal quality and can cause more serious issues. Latency is present in each network component as well as in the

network itself; minimizing latency provides toll-quality voice service.

Latency in the PSTN to network direction arises from the following areas:

- Sample frame collection
- VAD algorithmic delay (PCM, ADPCM only)
- Codec algorithmic delay
- Processing delay in the Telogy Software solution is minimized by a staggered processing schedule

Latency in the network to PSTN direction is affected by:

- Delay associated with playout buffers
- Processing delay
- Codec algorithmic delay

System flexibility
Telogy Software products provide an extremely flexible solution without sacrificing maximum channel density.
Examples of this flexibility include:
- Assigning codecs on a channel-by-channel basis without restrictions based on DSP or DSP cores
- Multiple codec frame sizes:
  - 5 ms to 30 ms (PCM)
  - 10 ms to 80 ms
  - Support for low bit-rate codecs

With state-of-the-art MIPS and memory management, combining channel

configuations and features will not impact performance. Each DSP is autonomous, so there are no master/slave relationships between DSPs in a design.

Software modules
Various software modules can help independent developers to speed time to market while focusing on product differentiation. The following software modules are available for the TNETV3020:

- Line Echo Canceller (Based upon the industry standard Telinnovation echo canceller algorithm)
- T.38 fax
- Caller ID
- Tone detection
- Cellular text modem (CTM)
- Noise matching (G.711, Appendix II)
- Packet loss concealment (G.711, Appendix I)
- Voice playout & jitter buffer
- Transcoding engine
- Border gateway engine

Video developer's kit
Time to market is critical for today's video applications. TI provides a source code video developer's kit to address these complex solutions. This developer's kit integrates TI video codecs with applicable packetization, encapsulation modules and provides basic solutions for a multitude of video applications such as:

- Direct transcoding
- Text and graphics overlaying
- Video-conferencing mixing
- Integrated RTCP support
- Extension to QVGA, VGA and SD (D1)
- Security - ISMACrypt 2.0, Packet Cable, CSA
- QOS – Bandwidth management, traffic policing
- Error resilience – FEC

Other functionality will be included in the future.

Support and quality assurance
When you base your communications products on TI's DSP-based carrier infrastructure platform, you receive comprehensive technical services and support from our software and systems experts. TI's software has been in continuous use at major carrier networks for more than 20 years. We protect your R&D investment by continually enhancing our roadmap through maintenance release updates, feature upgrades and customer inputs.

In addition, we offer targeted support at key milestones in the development process, such as hardware design review and onsite software/hardware integration.

TI offers the support and valuable assistance that can help you speed time to market.

Solution density comparing the TNETV3020 to other solutions

A complete solution density evaluation is a very complex process that includes many factors and is likely to become even more complex as technology advances. TI is the industry leader in solution density.

- What is the definition of a channel?
- What is the typical and maximum power rating for the DSP?
- Does the device power change when using certain interfaces?
- How much space does the DSP require?
- Is external memory required?
- What is the effect of low-bit rate codecs on channel density?
- How does packet size affect density?
- Is solution density affected by network-latency requirements?
- What is the total cost of ownership over the life of the program?

Global feature list: software products*

Telogy VoP software

Multiple software builds available for fixed, mobile, cable and FMC applications.

Voice codecs

G.711 PCM 64 Kbps, G.722 Wideband codec 48, 56, 65 Kbps, G.723.1 5.3/6.3 Kbps, G.723.1 Annex A (silence suppression), G.726 ADPCM 16, 24, 32, 40 Kbps, G.727 ADPCM, G.728 16 Kbps, G.729 8 Kbps, G.729 AB 8 Kbps (Annex A and B – VAD, CNG), G.729 Annex D 6.4 Kbps, G.729 Annex E 11.8 Kbps, GSM FR, GSM EFR, GSM AMR, WB-AMR, EVRC, QCELP13, iLBC

Telinnovation echo canceller software

Up to 128-ms echo tail
G.168-2004 compliant
Voice quality enhancements (VQE)
Tandem-free operation (TFO)
Echo quality index (EQI): indicates propensity for echo on any given channel

TI video codec software

H.263, H.264, MPEG4

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– Security - ISMACrypt 2.0, Packet Cable, CSA

– QOS – Bandwidth management, traffic policing
– Error resilience – FEC

* Please contact your TI sales representative for supported feature combinations at 972-644-5580 or **www.ti.com/voip**

TNETV3020 carrier infrastructure platform specifications

Cores	Six
Power consumption	3.8-W device
Memory	Separate L1 program and data memory per CP • 32-KB L1 program • 32-KB L1 data Unified L2 memory per CPU Shared L2 memory
Interfaces	2x Serial Rapid IO UTOPIA II 2x 10/100/1000 Ethernet I^{2}C 3x telecom serial ports (3072 timeslots) HPI host port
Package	24 mm x 24 mm FC-BGA package
Channel density (per DSP)	AMR 216 channels G.711 504 channels

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