bf3Net TCP/IP Protocol Stack

eXpressDSP-compliant Internet connectivity for Texas Instruments' TSM320 DSP

Product Features

- Only eXpressDSP-compliant TCP/IP protocol stack available in the world today
- Unsurpassed ease-of-integration, runs as single thread
- Highly scalable, configurable and modular architecture
- Documented performance figures, no interference with DSP real-time deadlines
- RFC-compliant protocol implementations
- Available for Ethernet and Point-to-Point Protocol (PPP) connections
- Integrated debug strategy
- Extremely low system resource requirements
- Available for TMS320C6700, TMS320C6400, TMS320C6200, TMS320C5500, TMS320C5400, and TMS320C2800 Digital Signal Processors (some versions to be released)

Product Description

eXpressDSP-compliant Internet connectivity for TMS320 DSP

Windmill Innovations' engineers have created a superior solution for implementing Internet connectivity in embedded applications based on Texas Instruments' TMS320 DSP: the revolutionary bf3Net TCP/IP protocol stack. Designed from scratch with DSP applications in mind, Windmill Innovations' bf3Net embedded Internet software is the only eXpressDSP-compliant TCP/IP protocol stack available today.

Leveraging Texas Instruments' eXpressDSP Software Technology, bf3Net offers unsurpassed ease-of-integration. The configuration and integration of the bf3Net TCP/IP protocol stack is a straightforward task with the bf3Net tools, which are tightly integrated with the Code Composer Studio 2.0 development environment. Performance monitoring and profiling tools further simplify the design process.

Designed to comply with the rules and guidelines of Texas Instruments' TMS320 Algorithm Standard, the performance figures (including worst-case interrupt latency, stack and heap size) are clearly documented. This significantly facilitates integration of the bf3Net algorithm into the embedded project. The bf3Net algorithm is completely re-entrant and runs as a single thread, e.g. as a DSP/BIOS task. In addition, it merely requires a timer reference (e.g. with a DSP/BIOS periodic timer) for maintaining the internal timers. As any eXpressDSP-compliant algorithm, the operational characteristics of bf3Net can be completely configured with the instance creation parameters.

Available versions and protocols

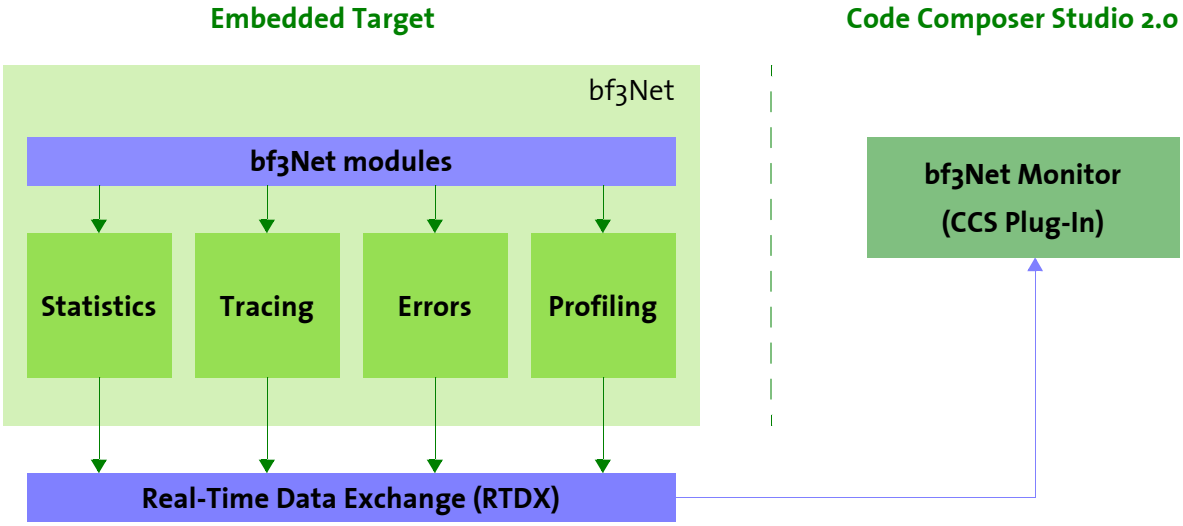
Windmill Innovations' bf3Net TCP/IP stack is available for Ethernet and Point-to-Point Protocol (PPP) connections. The table below lists the protocols which come with each version.

Protocol	Ethernet	PPP
bf3Net Socket Layer Application Programming Interface	x	x
Transmission Control Protocol (TCP)	x	x
User Datagram Protocol (UDP)	x	x
Internet Protocol (IP)	x	x
Internet Control Message Protocol (ICMP)	x	x
Internet Group Management Protocol (IGMP)	x	x
Address Resolution Protocol (ARP)	x	
Point-to-Point Protocol (PPP)		x
Link Control Protocol (LCP)		x
Internet Protocol Control Protocol (IPCP)		x
Password Authentication Protocol (PAP)		x
Challenge Handshake Authentication Protocol (PAP)		x

All bf3Net protocol implementations are completely RFC-compliant. To save program memory, protocols which are not used by the embedded application can easily be removed from the bf3Net library. bf3Net is or will be available for all TMS320 DSP families which support DSP/BIOS. Please contact Windmill Innovations for a product roadmap. A number of bf3Net-compatible application protocols (e.g. SMTP, HTTP) is also available.

bf3Net integrated debug strategy

The bf3Net software provides a sophisticated debugging and profiling strategy, shown below. The strategy is based on DSP/BIOS Real-Time Data eXchange (RTDX) for communication with the development host (Code Composer Studio 2.0). A graphical interface plug-in visualizes the data from the target conveyed to the host through RTDX.



Four modules implement the bf3Net debugging and profiling strategy: Statistics (S), event Tracing (T), Error logging (E), and Profiling (P), or STEP for short.

- The statistics module provides insight into the performance of the Internet communication, e.g. the number of transferred bytes, sustained and peak data throughput, number of checksum errors.
- The event tracing module reports events such as a successful negotiation of the datalink parameters, or the establishment of a TCP connection.
- The error logging module reports any errors which occur such as buffer overflows, and timer shortages, and which require a modification of the configuration.
- The profiling module keeps track of the actual buffer and timer usage at run-time, thus allowing the system integrator to detect and eliminate redundancy in the stack configuration.

The acquired data is transferred to the Code Composer Studio 2.0 development environment by means of Real-Time Data Exchange (RTDX) where it is visualized by the bf3Net Monitor plug-in.

bf3Net system resource requirements

Windmill Innovations has developed and designed the bf3Net TCP/IP protocol stack with digital signal processing applications in mind. It has clearly documented system resource requirements as part of the eXpressDSP-compliance. The key performance figures are listed in the table below.

Item	C54x/LAN	C54x/PPP
CPU load (average)	< 14 MIPS[a]	< 12 MIPS[b]
Program memory (minimum)	19 K	23 K
Program memory (maximum)	31 K	38 K
Data memory (typical)	4 K	4 K
Interupt latency (worst-case)	200 cycles	200 cycles
Stack size (worst -case)	190 words	160 words
Maximum number of sockets	1023	63

a. measured at 400 kByte/s TCP receive troughput
b. measured at 4.9 kByte/s TCP receive troughput

Please contact Windmill Innovations for more detailed performance figures or other questions related to the bf3Net TCP/IP protocol stack.

CONTACT INFORMATION

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