



## SurfExpress/PCIe™

### Modular PCI Express DSP Multimedia Processing Board for Enterprise and CTI Applications

#### Main Features

- » PCI Express (PCIe) form-factor DSP farm with 2x Gigabit Ethernet ports and CT bus
- » Complete media processing package for audio, video, modem and fax
- » Flexible and scalable modular design supporting up to 8 TI C64x™ DSPs on board
- » Enterprise-grade, field-proven and cost-effective solution saving resources and reducing R&D efforts
- » Dedicated customer service, ensuring fastest time-to-market
- » Built-in diagnostics, providing easier troubleshooting and better application control
- » Can be provided as hardware-only solution for DSP-intensive applications

#### Target Applications

- » Telecom Applications
  - ▣ CTI
  - ▣ Audio and Video Gateways
  - ▣ Media Servers
  - ▣ iPBX
  - ▣ Session Border Controllers
  - ▣ Remote Access Servers
- » Military Applications
  - ▣ Cryptography
  - ▣ Lawful Interception
- » Other DSP-intensive Applications
  - ▣ Image processing
  - ▣ Video processing

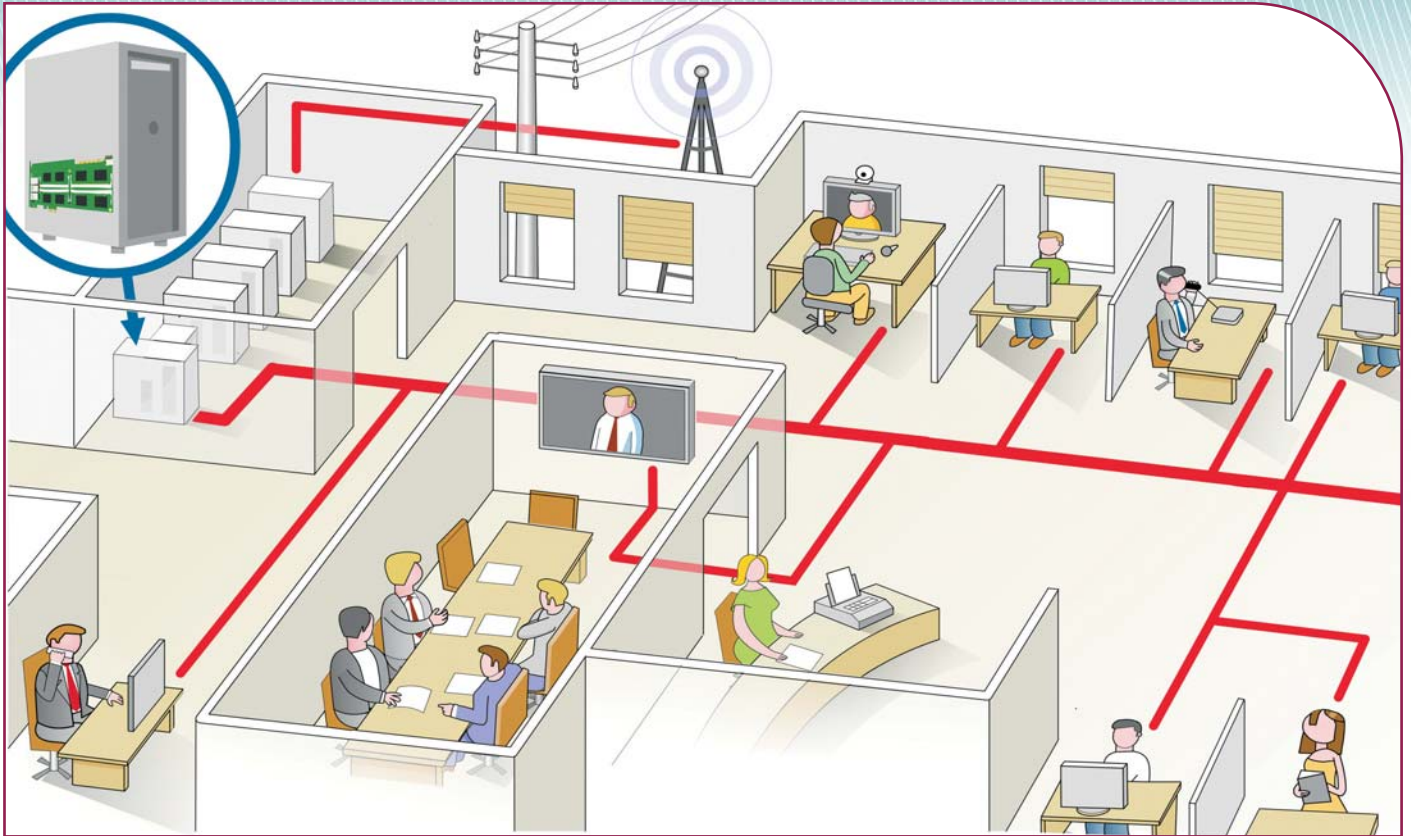
#### Overview

The SurfExpress/PCIe™ is a RoHS-compliant single-lane, half-length, full-height PCI Express form-factor DSP farm with multimedia processing capabilities. Providing two Gigabit Ethernet ports and a CT bus for additional TDM interfaces, the SurfExpress/PCIe is designed to meet the requirements of V2oIP enterprise-scale media servers, media gateways, 3G-324M video servers, MMSC content adaptation engines, and CTI applications. Optimized for mobile applications, the SurfExpress/PCIe also provides convergence of audio, video and data across other wireless and wireline networks.

The SurfExpress/PCIe utilizes a highly innovative patent-pending design featuring the SurfDock™ modular plug-in, which carries up to four pairs of mixed types of DSPs and supports a variety of configurations to meet the application developer's requirements. This paradigm allows varying types of DSPs to be assembled simultaneously on a single PCI Express carrier, including TI's C64x generation or any new C64 family member that is released to market. Up to four SurfDock modules can be plugged into a single SurfExpress/PCIe, for a total of eight DSPs per PCI Express board. This flexible and scalable hardware design results in a cost-effective solution providing reduced time-to-market.

The SurfExpress/PCIe comes complete with SurfUP™, Surf's telecom-ready comprehensive media processing software that perform concurrent processing of audio, video and data (fax + modem) on the DSPs, enabling real-time intelligent resource management and load balancing for maximum flexibility. This makes the SurfExpress/PCIe a powerful content adaptation platform enabling service interoperability among various clients and networks.

## Optimized for CTI and Enterprise Telecom Applications

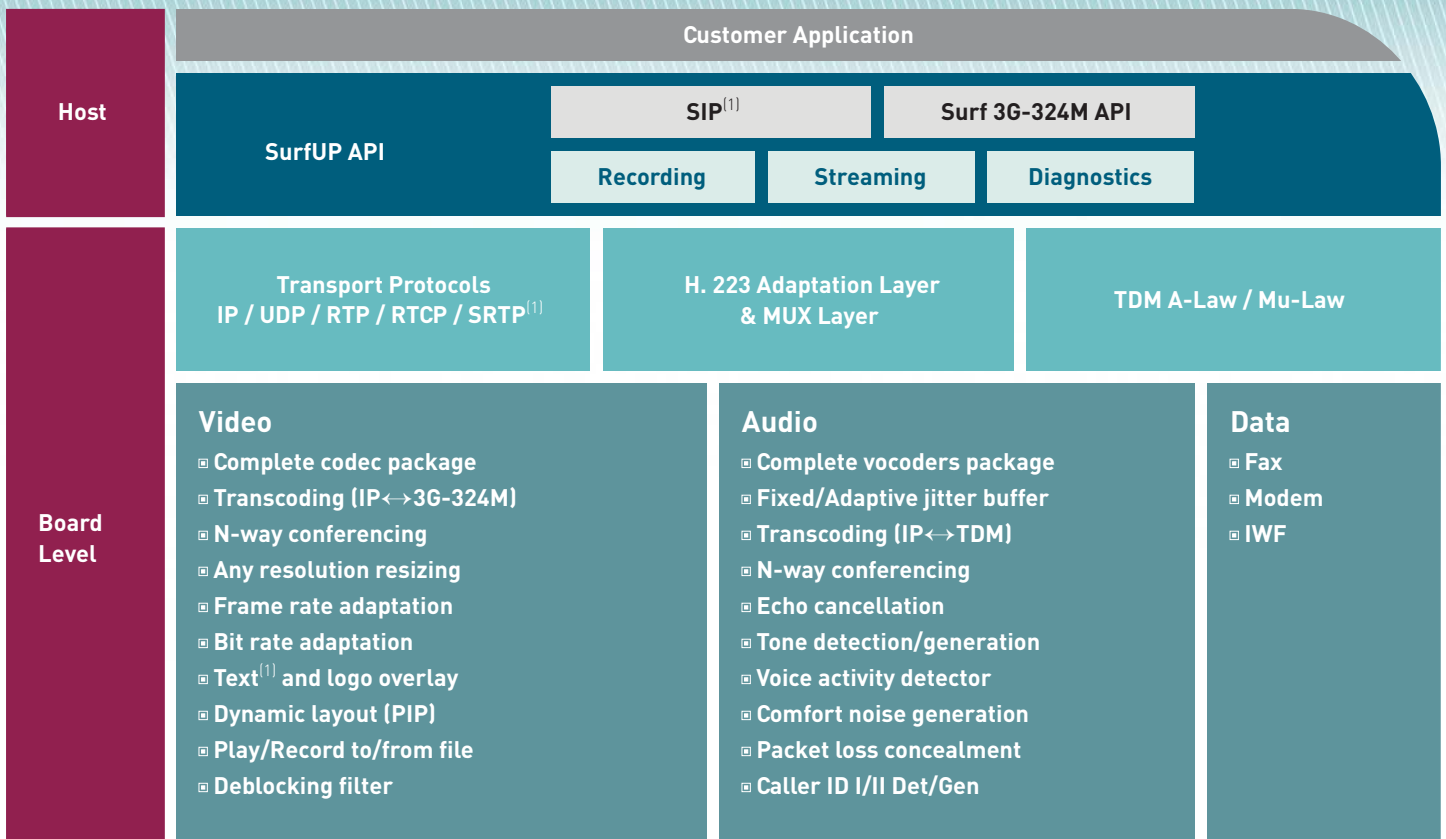


Typical office environment diagram illustrating how the SurfExpress/PCIe DSP multimedia processing card supports convergence of voice, video and data in the enterprise.

### System Highlights

- » Simple, high-level API provides access and control over DSP interfaces
- » Video Features
  - ▣ Play/record of audio and video streams from Host file system to IP, TDM, or 3G networks
  - ▣ Content adaptation; real-time audio-video transcoding
  - ▣ Video Conferencing
    - ▣ N-Way conferencing on a single DSP
    - ▣ Dynamic dominant speaker recognition and participants display layout
    - ▣ Addition/removal of participants during video conference
    - ▣ User-defined/pre-defined screen layout defining size and location for each picture component
    - ▣ Background and foreground setting in run-time
    - ▣ Picture overlap support (picture-in-picture)
  - ▣ Advanced Video Toolbox
    - ▣ Configurable frame rate
    - ▣ Bit rate change
    - ▣ Resize to any resolution
    - ▣ Video codec change
    - ▣ Logo insertion
    - ▣ Text overlay
- » Supports Linux, VxWorks, Windows Host OS
- » Reliable Host-DSP communication over UDP
- » Quick integration of user firmware value-add code

## System and Board Architecture



The system architecture used in the SurfExpress/PCIe is optimized to reduce bottlenecks.

### Board Architecture: Unique Flexible Design

The SurfExpress/PCIe has been designed to support application development from prototype through production:

the same board can be used for all stages of the development cycle.

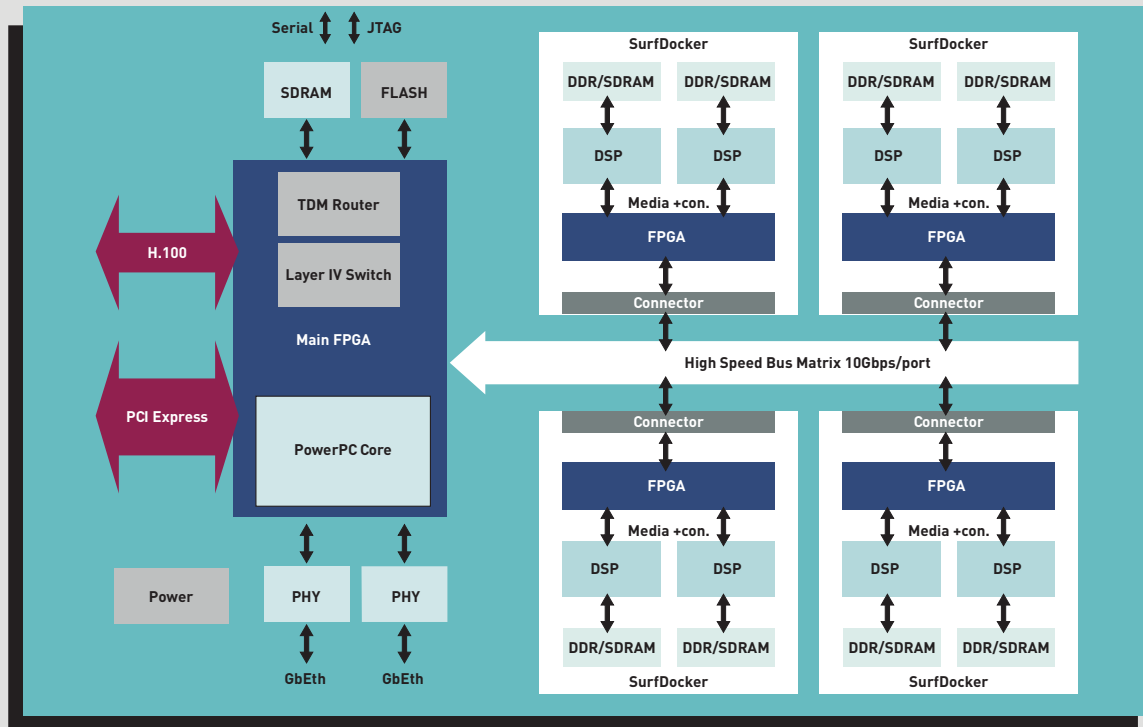
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With this innovative, modular approach, hardware design decisions can be made in parallel to application development, such as:

- » the specific type of DSPs to be used in the final system
- » the number of DSPs per board needed to achieve the required channel density
- » the types of DSPs to be integrated on the same board simultaneously

(1) Roadmap feature

## High-Level Board Design



Surf's SurfExpress/PCIe solution is comprised of a main board and plug-in modules, enabling exceptional flexibility and comprehensive management and control of all components.

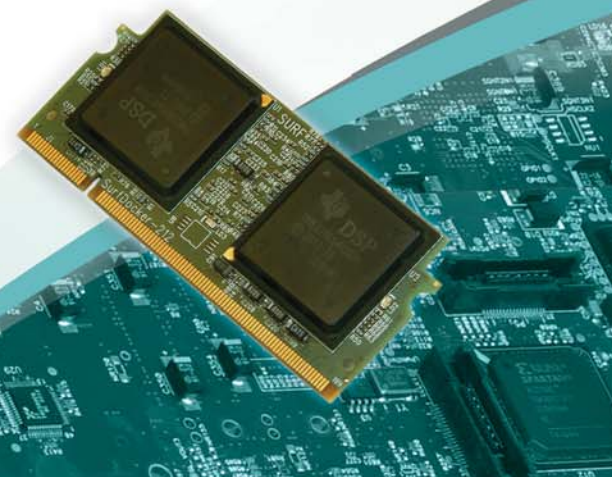
### Main Board

- » Single lane PCI Express form factor
- » Configurable interfaces to each DSP based on DSP type, including Gbit Ethernet and PCI Express
- » 2 x 1000Base-T Ethernet interface (RJ-45)
- » H.100 connector
- » PowerPC 405 implemented within the Interface FPGA for board management
- » Hosts up to eight DSPs using 1-4 SurfDocker plug-in modules, with two DSPs on each module (i.e., flexible support for 2, 4, 6, or 8 DSPs)
- » Supports different types of DSPs on the same PCIe board, using different SurfDocker plug-in modules
- » Features shared memory architecture that enables superior performance when heavy intra-DSP communication is required
- » Supports E1/T1 ports using an additional card (4/8/16)
- » All data and controls are passed to the DSPs via Surf's proprietary high-speed interface
- » Supports single IP for entire board or individual DSP IP for maximum resource management flexibility

### SurfDocker Plug-in Module

(module differs per DSP type)

- » Two DSPs from the C64x family
- » Private memory per DSP (SDRAM, DDR, DDR2; based on the DSP)
- » FPGA: handles the interface between the main board and the specific DSP



## Voice Capabilities

<b>Audio Codecs</b>	<ul style="list-style-type: none"> <li>▣ G.711</li> <li>▣ G.726</li> <li>▣ G.723.1A</li> <li>▣ G.722.2 (WB-AMR)</li> <li>▣ GSM NB-AMR</li> </ul>	<ul style="list-style-type: none"> <li>▣ G.729AB</li> <li>▣ GSM FR</li> <li>▣ GSM HR<sup>(2)</sup></li> <li>▣ GSM EFR</li> <li>▣ EVRC</li> </ul>	<ul style="list-style-type: none"> <li>▣ G.729E<sup>(2)</sup></li> <li>▣ iLBC<sup>(2)</sup></li> <li>▣ QCELP<sup>(2)</sup></li> <li>▣ SMV<sup>(2)</sup></li> <li>▣ G.728<sup>(2)</sup></li> </ul>
<b>Conferencing</b>	<ul style="list-style-type: none"> <li>▣ N-way: 1560</li> <li>▣ 3-way: 720 bridges</li> </ul>		
<b>Echo Cancellation</b>	G.168 2002 echo tail up to 128ms		
<b>Quality</b>	<ul style="list-style-type: none"> <li>▣ Voice Activity Detection</li> <li>▣ Comfort Noise Generation</li> <li>▣ Packet Loss Concealment</li> <li>▣ Fixed/Adaptive Jitter Buffer Up to 500 ms</li> </ul>		
<b>Transport</b>	<ul style="list-style-type: none"> <li>▣ RTP/RTCP: RFC 3550, 3551, 3389</li> <li>▣ SRTP: RFC 3711<sup>(2)</sup></li> <li>Packet Size: 5-60ms (5ms resolution)</li> <li>Single or multiple frames per packet</li> </ul>		
<b>Caller ID (CID)</b>	Caller ID detection and generation		
<b>Tone and Events</b>	<ul style="list-style-type: none"> <li>▣ Monitoring</li> <li>▣ Relay</li> </ul>	<ul style="list-style-type: none"> <li>▣ Detection/Generation</li> <li>▣ User-defined tones</li> </ul>	

## Video Capabilities

<b>Video Codecs</b>	<ul style="list-style-type: none"> <li>▣ MPEG-4</li> <li>▣ H.263</li> </ul>	<ul style="list-style-type: none"> <li>▣ H.264<sup>(2)</sup></li> <li>▣ H.261<sup>(2)</sup></li> </ul>
<b>Resolution</b>	<ul style="list-style-type: none"> <li>▣ CIF</li> <li>▣ QCIF</li> </ul>	
<b>Frame Rate</b>	▣ 1-30FPS	
<b>Bit Rate</b>	▣ Constant and variable	
<b>Quality</b>	<ul style="list-style-type: none"> <li>▣ RTP Encapsulation</li> <li>▣ Configurable deblocking levels</li> <li>▣ Multiple destination support</li> <li>▣ Jitter Buffer</li> <li>▣ Packet rearrangement</li> <li>▣ Packet loss handling</li> </ul>	

## Modem over IP Capabilities

<b>MoIP</b>	<ul style="list-style-type: none"> <li>▣ V.8 modem relay as ITU V.150.1 (contributed by Surf)</li> <li>▣ Connection scenarios</li> <li>▣ Voice Band Data</li> <li>▣ MR1</li> </ul>
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## Mobile Video Capabilities

<b>3G-324M Support</b>	<ul style="list-style-type: none"> <li>▣ H.264<sup>(2)</sup> H.324 Annex C</li> <li>▣ H.223 Annex A &amp; B</li> <li>▣ Passive 3G-324M for Lawful Interception<sup>(2)</sup></li> <li>▣ High-level 3G-324M APIs</li> </ul>
<b>Protocols</b>	<ul style="list-style-type: none"> <li>▣ H.223 running on the DSP for enhanced performance</li> <li>▣ H.245 running on the host</li> <li>▣ H.324 interface to modem channel to support</li> <li>▣ H.324 over V.34<sup>(2)</sup></li> </ul>

## Fax Capabilities

<b>Data Pumps</b>	<ul style="list-style-type: none"> <li>▣ V.17, V.29, V.27ter, V.21</li> <li>▣ V.34HD High Speed Fax<sup>(2)</sup></li> </ul>
<b>Fax over IP</b>	<ul style="list-style-type: none"> <li>▣ T.38 Protocols</li> <li>▣ FEC/Redundancy</li> <li>▣ Max Jitter 1 sec</li> <li>▣ Supported roundtrip delay up to 6 sec</li> </ul>

## Typical Channel Densities

<b>IP-TDM G.711</b>	▣ 1088
<b>Video Transcoding Gateway</b>	▣ 224

## Hardware Specifications

- » Power Requirements
  - ▣ Up to 30W per fully-populated board (up to 22W for fully-populated C6412)
- » Operating Conditions
  - ▣ Temperature: 0°C - 55°C (32°F - 131°F)
  - ▣ Humidity: 20% to 80% (non-condensing)
- » Storage Conditions
  - ▣ Temperature: -25°C - 85°C (-13°F - 185°F)

- » JTAG
  - ▣ DSP JTAG connector for DSP emulation
  - ▣ FPGA JTAG connector for FPGA booting and programming
  - ▣ Boundary-Scan JTAG

(2) Roadmap feature

## International Headquarters

Surf Communication Solutions, Ltd.  
Tavor Building, P.O. Box 343  
Yokne'am 20692 Israel  
Tel: +972 (0) 73 714 0700  
Fax: +972 (0) 4 959 4055  
e-Mail: surf@surf-com.com

US Toll-Free Tel:

**(866) 644-3379**

## About Surf Communication Solutions®

SURF Communication Solutions develops a suite of hardware and software products that drives a wide variety of applications whose common goal is high-capacity distribution of voice and video. These applications are predominantly developed by media gateway, media server and IMS equipment manufacturers in the telecommunication infrastructure field.

The Surf media processing engine is available in a variety of integration levels, such as AMC, PTMC and PCI form factor resource boards or DSP chips, which are pre-integrated with leading ATCA, MicroTCA and cPCI carrier boards and blades.

By utilizing the capabilities and flexibility of Surf's media processing engine, customers can significantly reduce time-to-market while supporting market demands for true convergence of all media types: audio/voice, video, and data (fax/modem), over all networks: IP, mobile, wireline, and wireless – all on a single DSP.



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