SOHO Remote Access Router Using RC32364 and RC32134

RISController
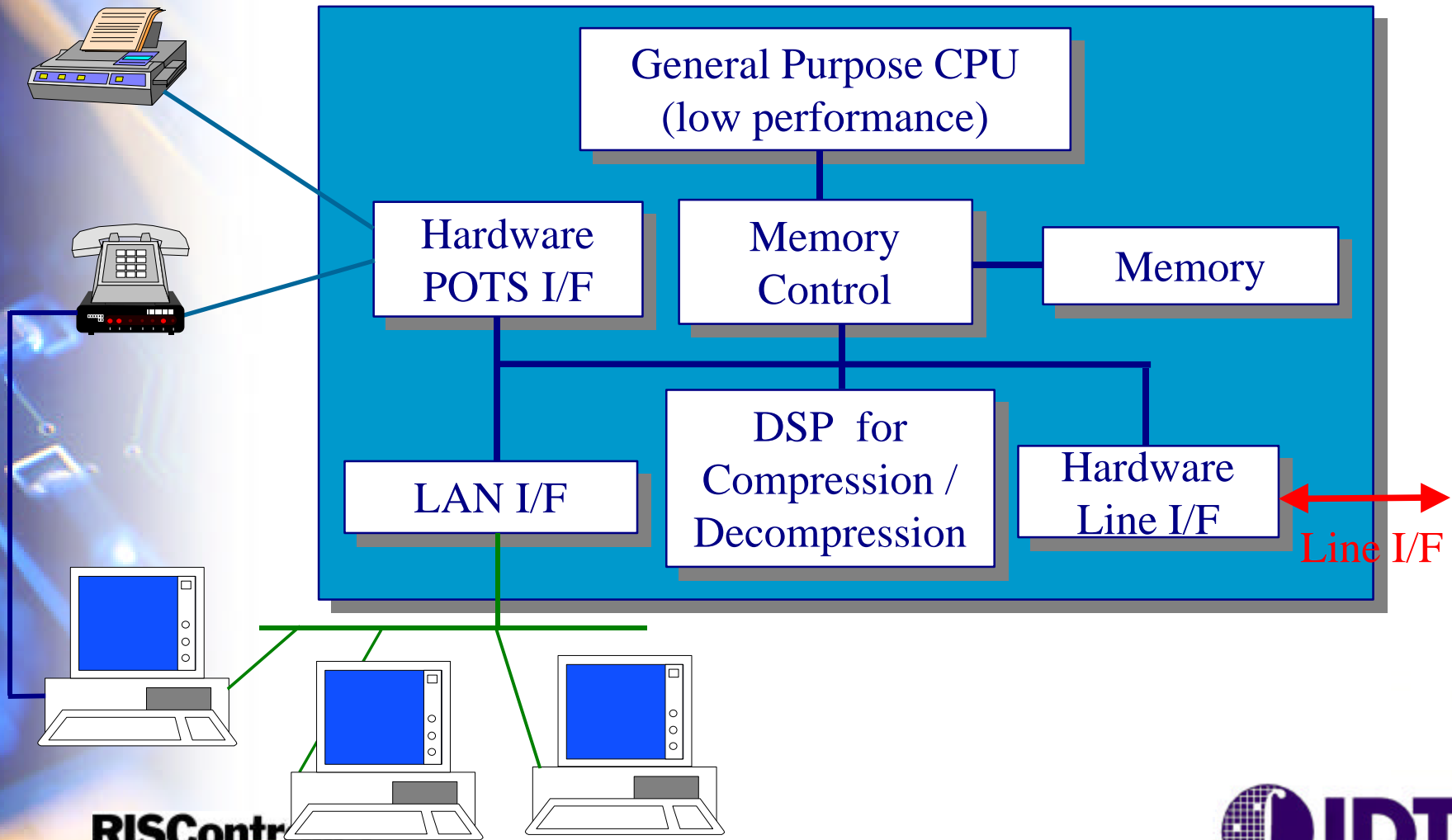
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The SOHO Market

POTS

Remote access Router

"Hi speed" Connection

LAN

IDT

BN. Rc32134-soho.ppt 2/99

Editor's Choice
IDT
RC32364
Best Price /
Performance
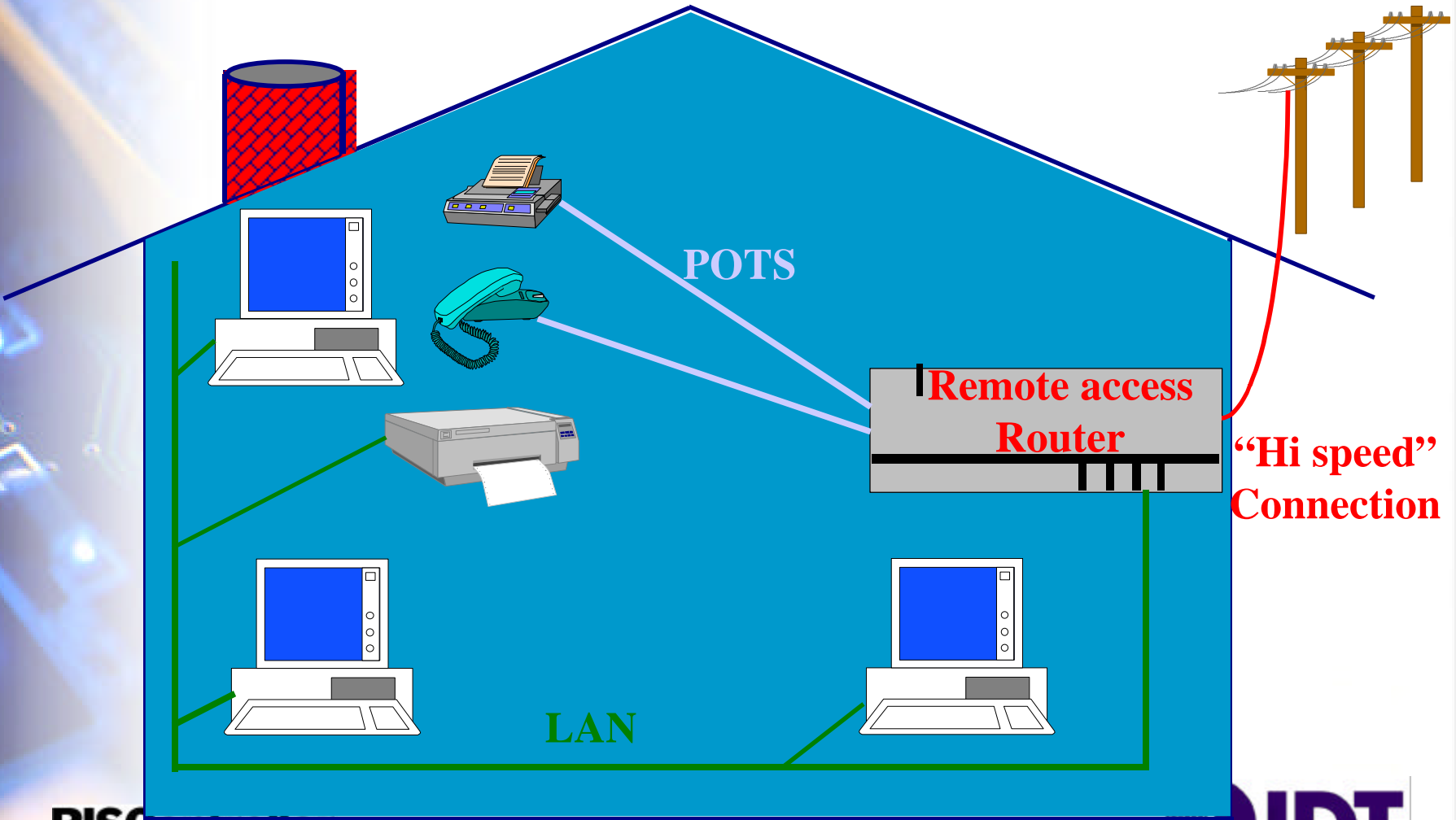
Traditional Solutions are Hardware Intensive

General Purpose CPU
(low performance)

Hardware POTS I/F

Memory Control

Memory

LAN I/F

DSP for Compression / Decompression

Hardware Line I/F

Line I/F

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Limitations of Traditional Solutions

q Long design time

q Expensive

q Performance not easy to scale to meet new requirements

q System not flexible to adapt to new market needs

q Not easy to maintain

 ò Multiple code trees

  å General purpose CPU and DSP CPU

Or Do More in Software …..

q Migrate more functionality to Software

q A single CPU is preferable to multiple hardware elements

  ò More cost effective

  ò Less components

  ò Greater flexibility

    å Modify software base to add new capability

q Requires higher performance CPU for multiple functions

    å Softmodem, ISDN I/F, data compression, routing, ...

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Use RISController CPU Family

Entry Level Systems:

q RC32364 - 32-bit Advanced generation CPU

    ò RC32134 - Generic System controller with PCI bridge

    ò GT96010A - System controller with integrated communications modules

Medium Performance Systems

q RC4640 - 64-bit CPU with DSP capability

    ò GT64111 - Generic system controller with PCI bridge

High End Systems

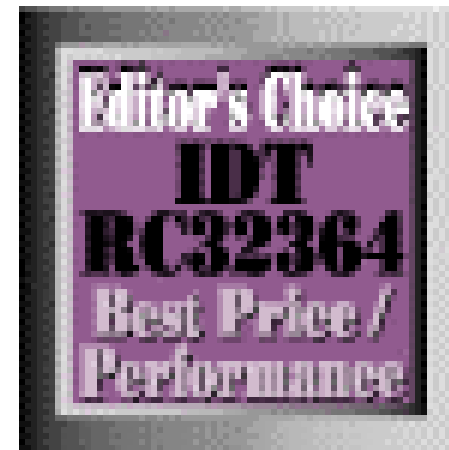q RC64474 - 64-bit CPU, pin compatible with the RC4640

    ò GT64111

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Award Winning ...

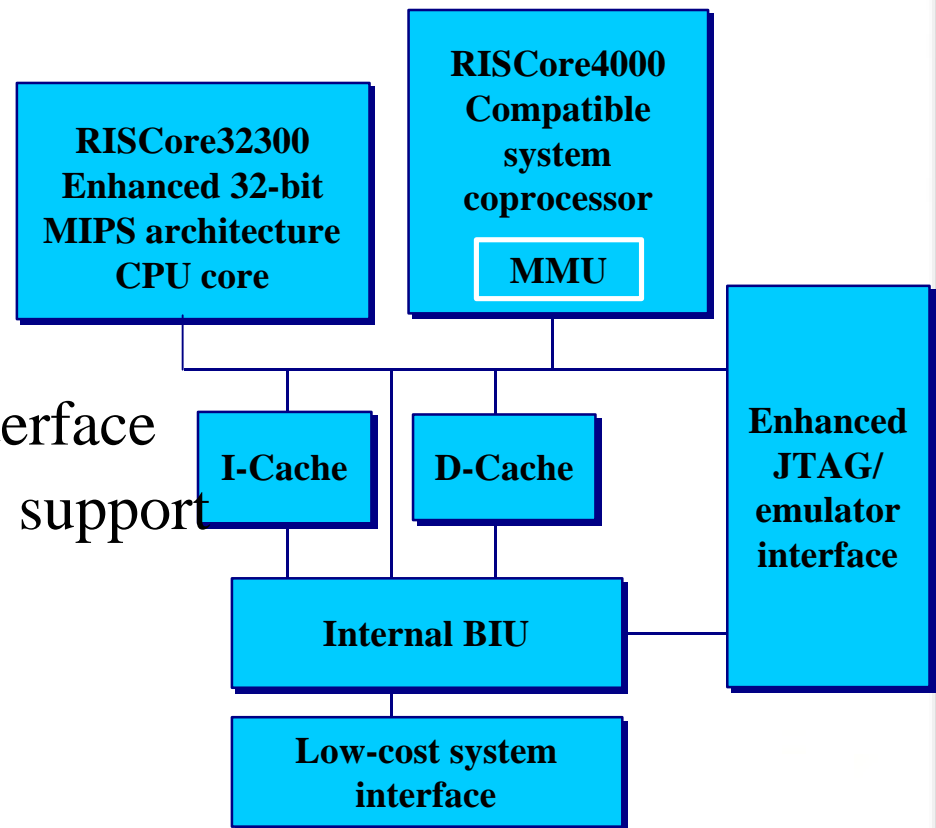Microprocessor Report, January 25 1999
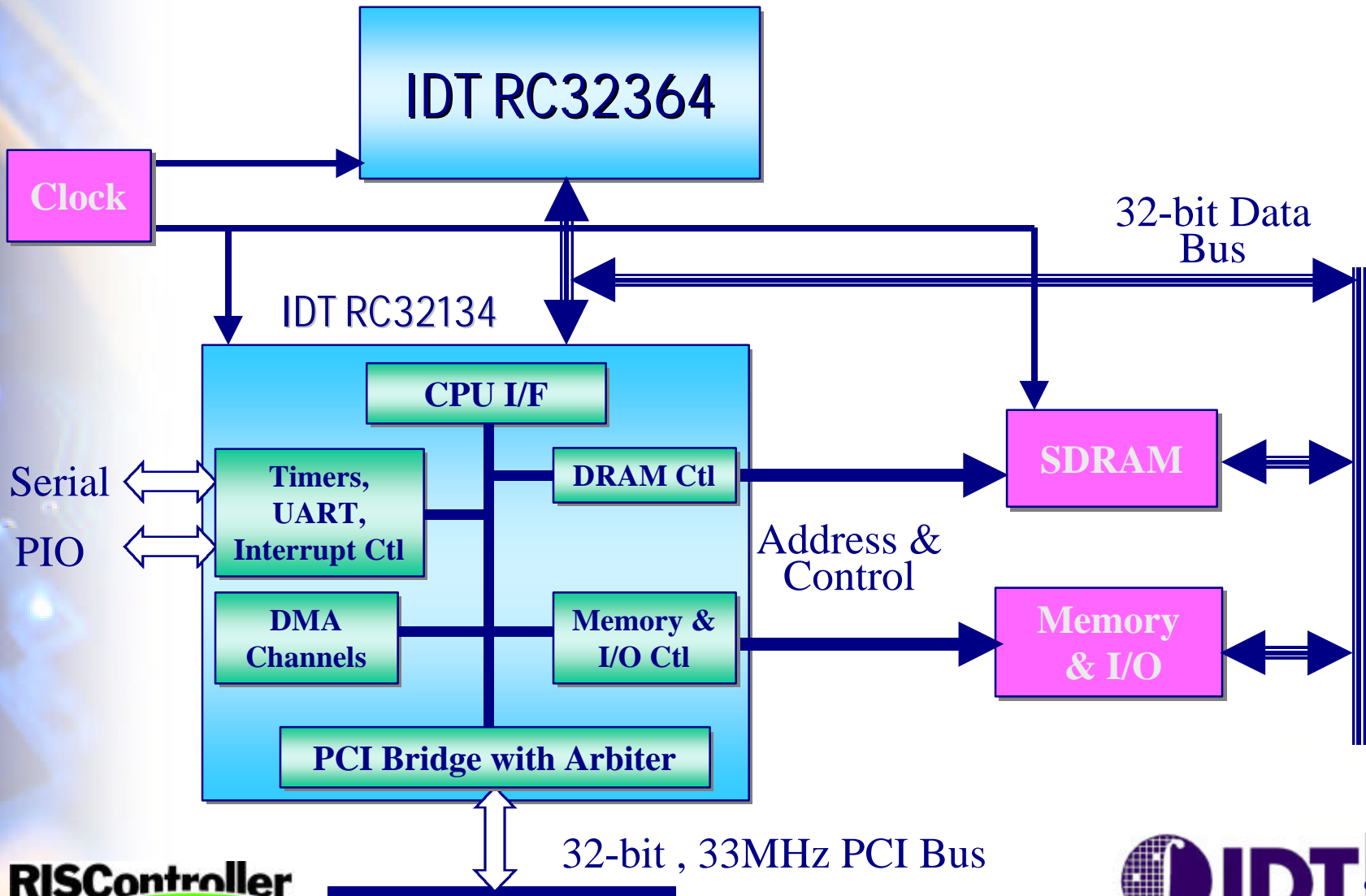
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RC32364: Advanced Generation 32-bit Architecture

q 100/133MHz (175 dhrystones)

q 8k I / 2k D caches, lockable per line

q 32-bit enhanced architecture

  ò Non-blocking loads

  ò Cache pre-fetch support

  ò Enhanced DSP capability

q Programmable CPU/bus clock

q 8/16/32-bit configurable Bus interface

q Windows CE compatible/RTOS support

q Static 3.3V core, low-power (.8W@100MHz)

q On-chip debug interface

q Industrial Temp.

RISCore32300 Enhanced 32-bit MIPS architecture CPU core

RISCore4000 Compatible system coprocessor

MMU

I-Cache

D-Cache

Enhanced JTAG/ emulator interface

Internal BIU

Low-cost system interface

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Typical System using the RC32364 ...

Clock

IDT RC32364

32-bit Data Bus

IDT RC32134

CPU I/F

Serial

Timers, UART, Interrupt Ctl

DRAM Ctl

SDRAM

PIO

Address & Control

DMA Channels

Memory & I/O Ctl

Memory & I/O

PCI Bridge with Arbiter

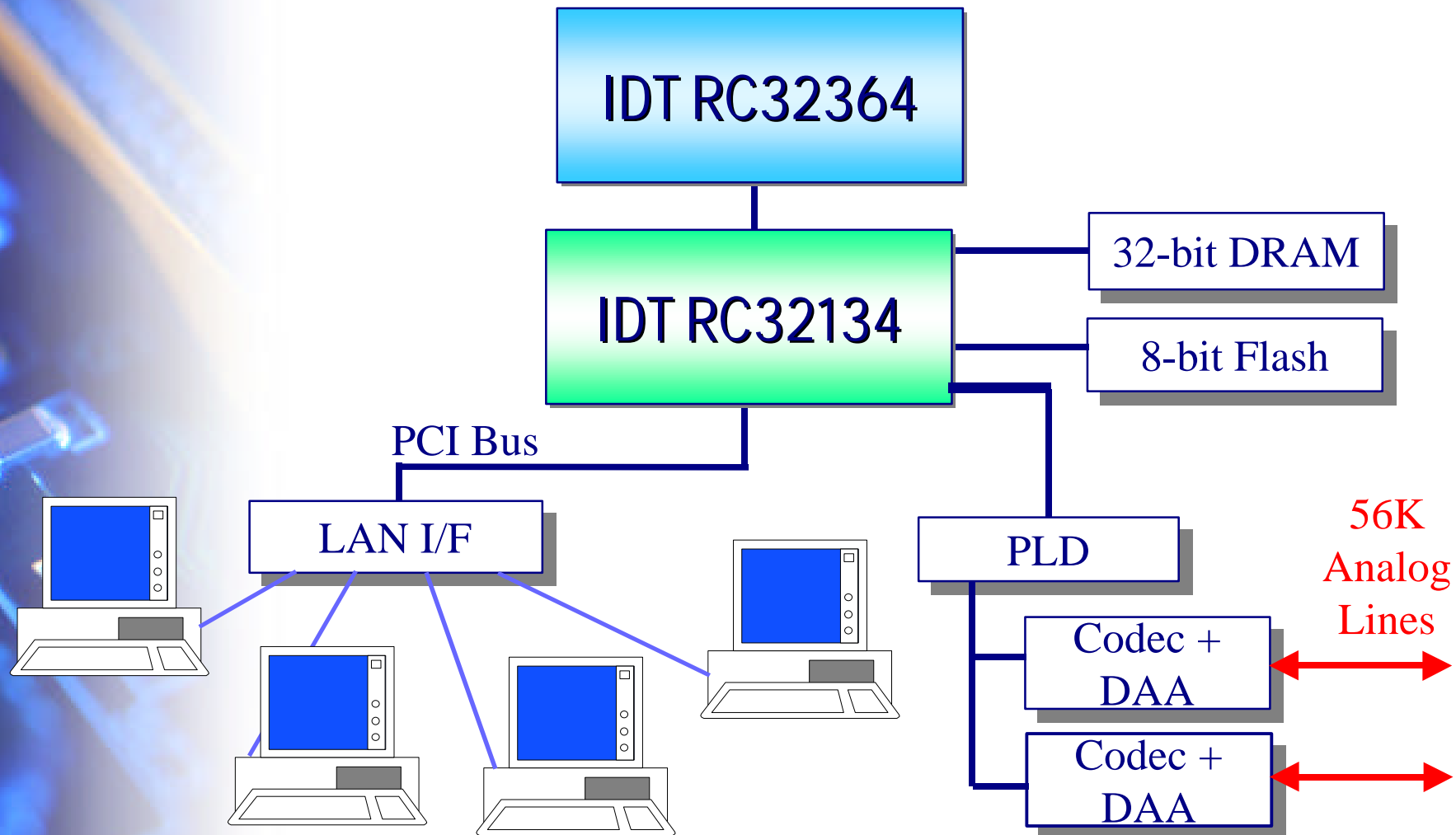32-bit , 33MHz PCI Bus

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RC32134 Features

q Direct CPU interface
- ò up to 75 MHz maximum

q Direct DRAM control (SDRAM / EDO)
- ò SyncDRAM:
  - å 4 banks, 2 to 16-M devices
- ò EDO
  - å 4 banks, 4 to 32-M devices

q Local memory, I/O interface
- ò Supports RAM, Flash/ROM, Dual-Ports and peripherals
- ò 6-chip selects
  - å 8-, 16- and 32-bit wide
  - å Variable latency
- ò Supports 8-bit boot PROM

q 32-bit, 33-MHz PCI bridge
- ò Asynchronous to CPU clock
- ò Endian-ness byte swapping
- ò Host or satellite capability with built-in arbiter
- ò Plug-and-play support

q Scatter/gather 4-channel DMA controller

q Dual channel 16552 compatible UART

q Serial Peripheral Interface

q Parallel I/O

q Timer/counters

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IDT RC32364

IDT RC32134

32-bit DRAM

8-bit Flash

PCI Bus

LAN I/F

PLD

56K Analog Lines

Codec + DAA

Codec + DAA

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Functions of the RC32364

q General management functions:
- ò Routing
- ò Firewall, Encryption, Network Management, ...

q DSP Functions:
- ò Modem emulation in software ==> SoftModem
- ò ISDN emulation in Software
- ò Data Compression / Decompression
- ò Tone Detect (DTMF)
- ò Echo cancellation, ...

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SoftModem Implementation on the RC32364

- 1 modem port in Software ==> SoftModem
- Full Modem Function in Software
  - 8K-Constant or Variable Sample Rate
  - V.34 (33.6Kbit/sec)
  - 256 KB code size
  - Heavy use of DSP MAC instructions
- Required performance @ 133MHz:
  - 33.6Kbit/sec modem ==> 35 MIPS* ==> 20% of CPU horsepower
  - 56Kbit/sec modem ==> 40 MIPS* ==> 23 % of CPU horsepower

*Dhrystone-MIPS based on a MIPS RISC
CPU using a 2 cycle MAC Instruction*

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RC32364 Performance

Soft Function	MIPS
SoftModem @ 56Kbit/sec (Per channel)	40
Router	8
SNMP & Network Management	4
Resource Management	4
Additional Tasks:	5
Firewall, Encryption, …	
Total	**~100 Mips**

~ 55% of CPU Performance

* Dhrystone-MIPS based on a MIPS RISC CPU using a 2 cycle MAC Instruction

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Key Features of RC32364 and RC32134

Feature	Benefits
Complete CPU subsystem solution Low cost On-chip required system functionality SDRAM Control, UART, Timers	Rapid Time to market Reduced board real estate 300 MB/sec DRAM bandwidth sustains line speed On-chip timers to support RTOS On-chip UART for debug and diagnostics
High performance CPU Non Blocking loads Cache locking Prefetch instruction DSP instructions	Migrate more hardware functions to software soft SAR Firewall, encryption/decryption Efficient scheduling of slow IO, increase PPS Lower system cost
Access to PCI	Easy system expansion Access to Plug-in cards
Low power CPU Subsystem	Increased Reliability Lower power budget
Code compatible with RISController processor family	Reuse of code for L3 switches and other apps Reuse of tools

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All This For ...

q Component cost is about $140 for the entire system

IDT RC32364-133	$16
RC32134	$20
DRAM	$10
Flash	$10
LAN I/F	$10
Codec + DAA (2x)	$20
PLD	$10
Discrete + connectors	$20
Board + casing	$20
Total	**$140**

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RC32364 and RC32134 Advantages

- q Complete CPU subsystem solution
  - ò Access to PCI
  - ò Flexible design
- q High benefits for the system designer
  - ò Single CPU
  - ò Routing and system management
  - ò ISDN I/F in Software
  - ò Modem I/F in software
  - ò Quick time-to-Market
- q Excellent set of design and development tools

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