



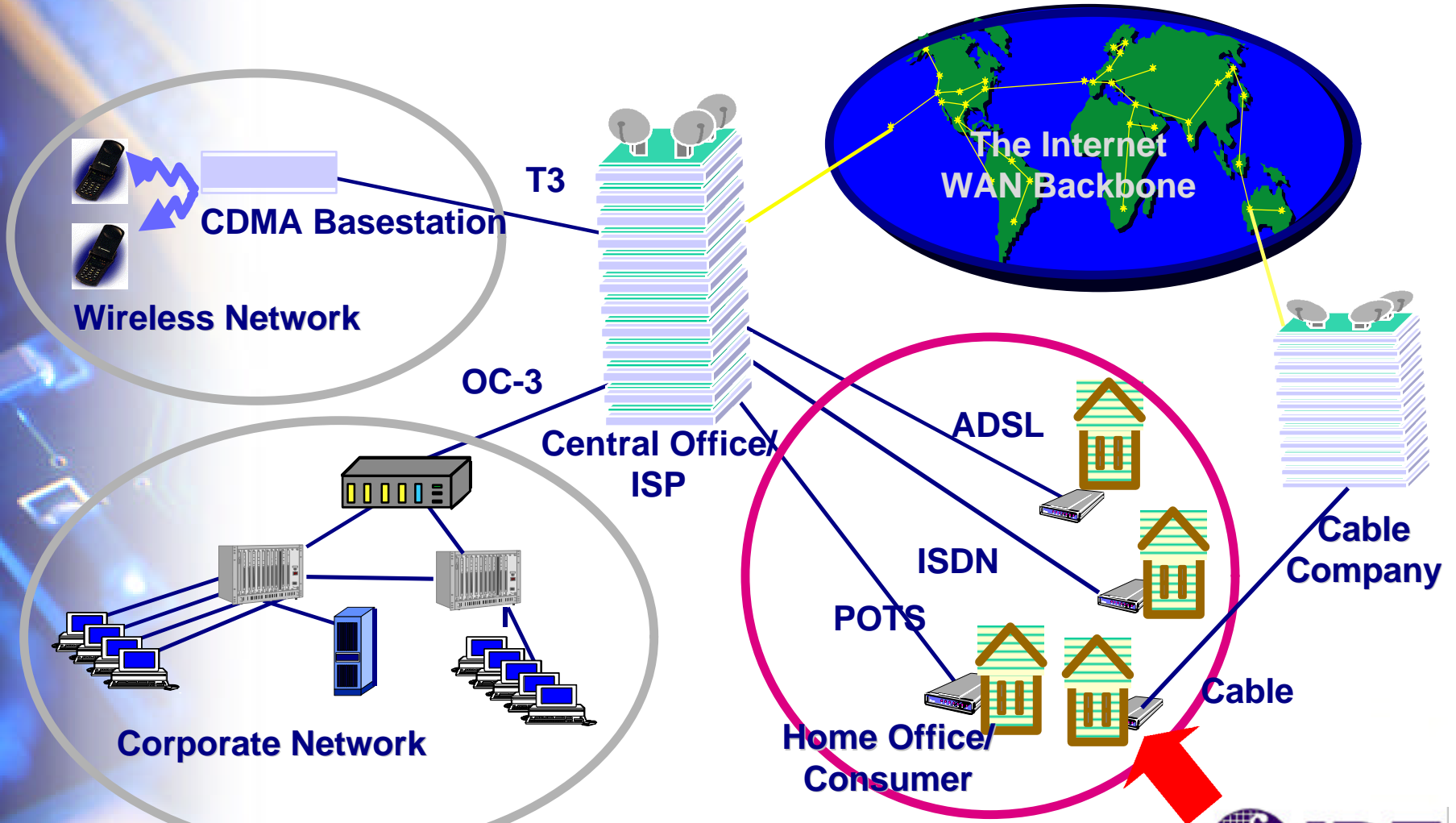
Cable Modem using the RC32364 CPU and the RC32134

RISController

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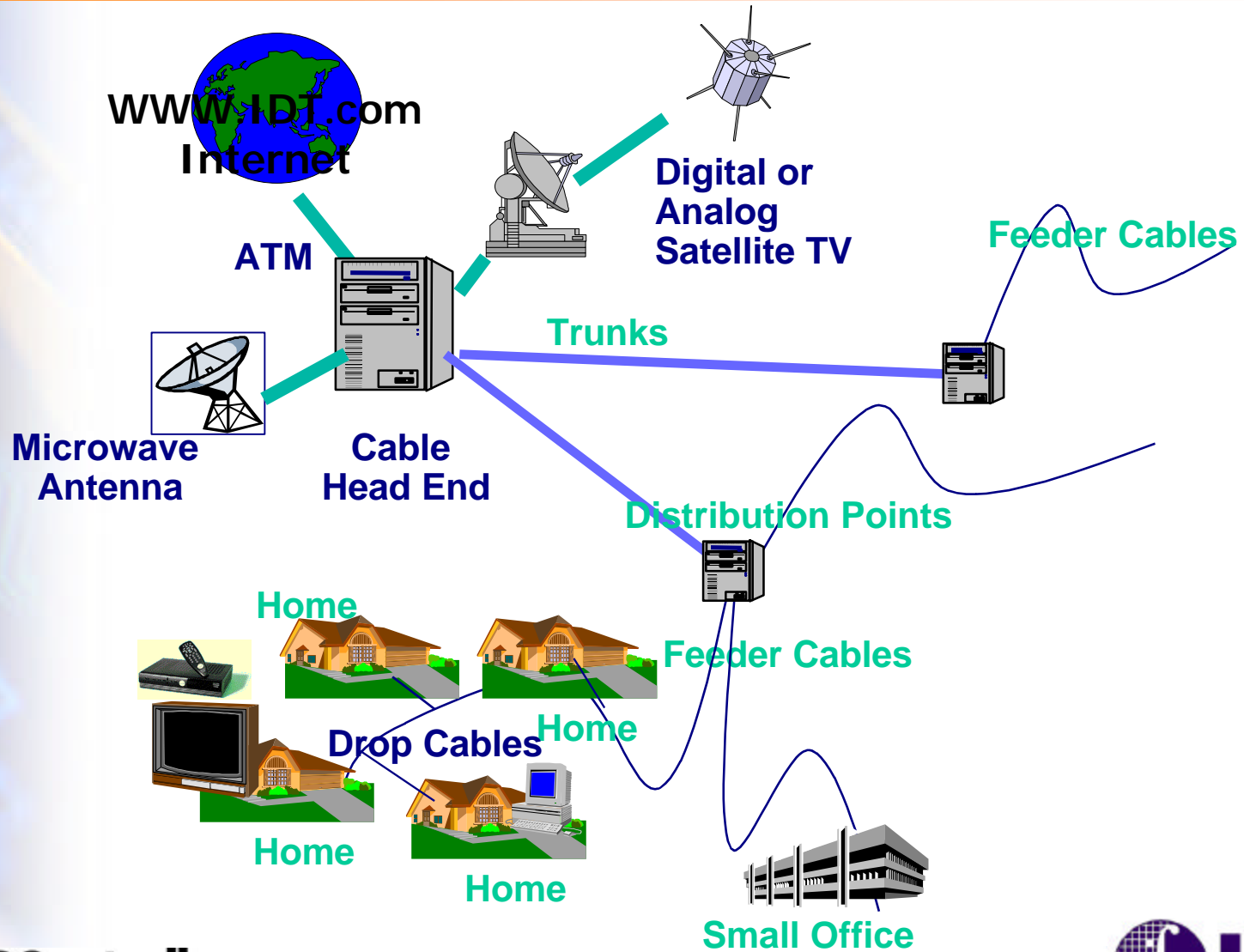
The Network



RISController



Cable Network



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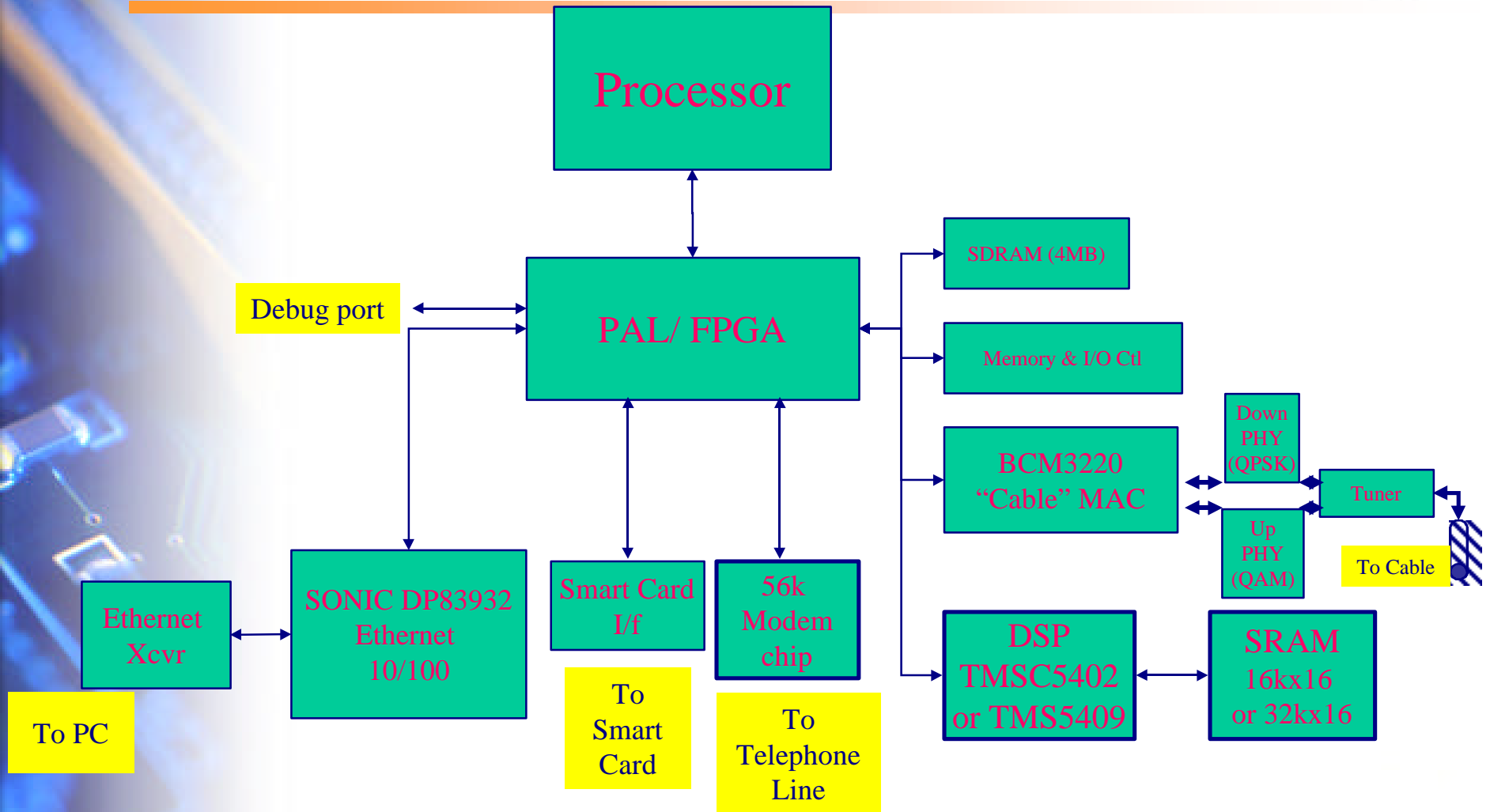
Cable modem specification



- q Broadband Access Bit rate:
 - ò Variable rate from 2 to 10 Mbps
- q Broadband Access
 - ò QAM demodulation
 - ò QPSK demodulation
 - ò Media Access Control (MAC. Docsis 1.0-1.1, DVB-C...)
 - ò Modem Telephony for some back channel
- q Very low cost system
- q Flexibility
 - ò Easy upgrade after installation
 - ò Standard HW interface for easy expansion
- q LAN Medium access/ Customer side
 - ò PCI
 - ò Ethernet (10BT and 100BT)
 - ò USB connectivity
- q New Applications
 - ò Voice over IP and over Packet
- q RISController
 - ò RC3041 ==> for entry level systems
 - ò **RC32364**
 - à **RC32134 System controller**

RISController

Current cable modem with 56k modem & Voice over IP



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
 - â 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, voice over IP, ...

Use RC32364 ...

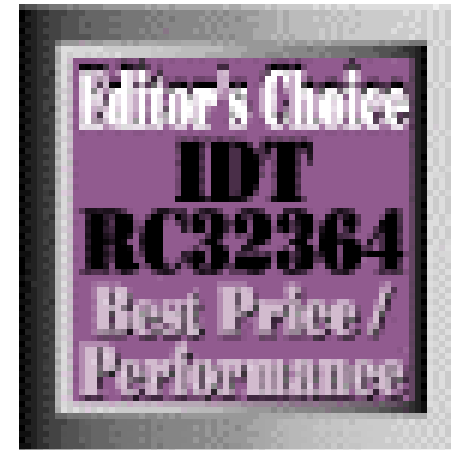
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Award Winning ...



Microprocessor Report, January 25 1999

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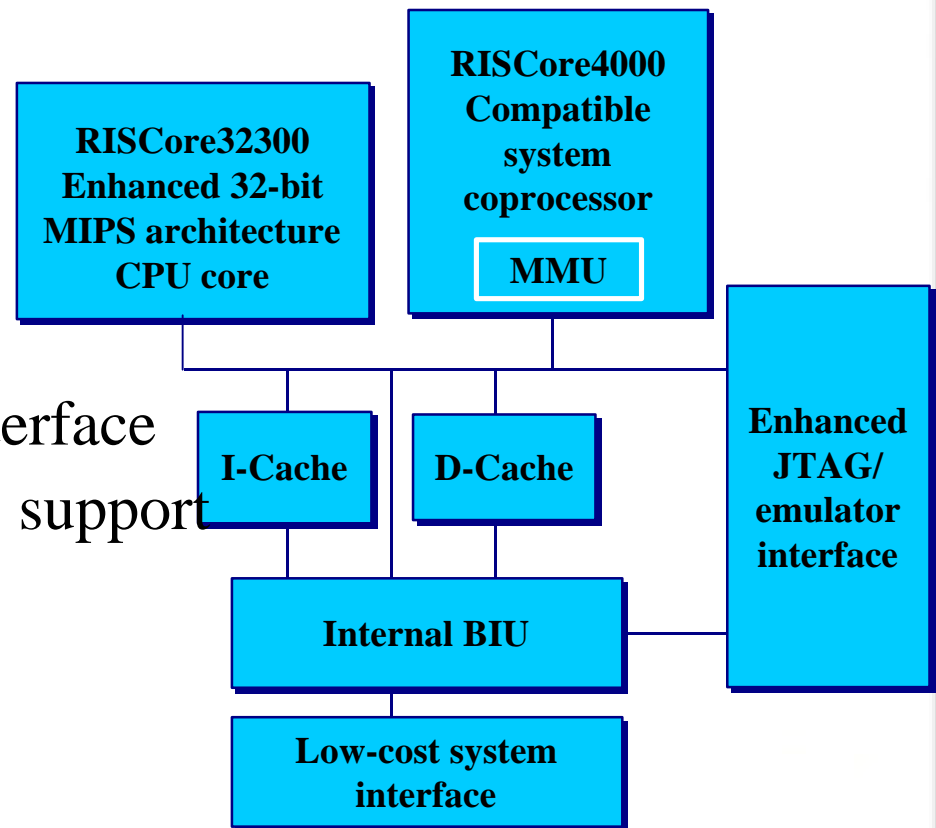
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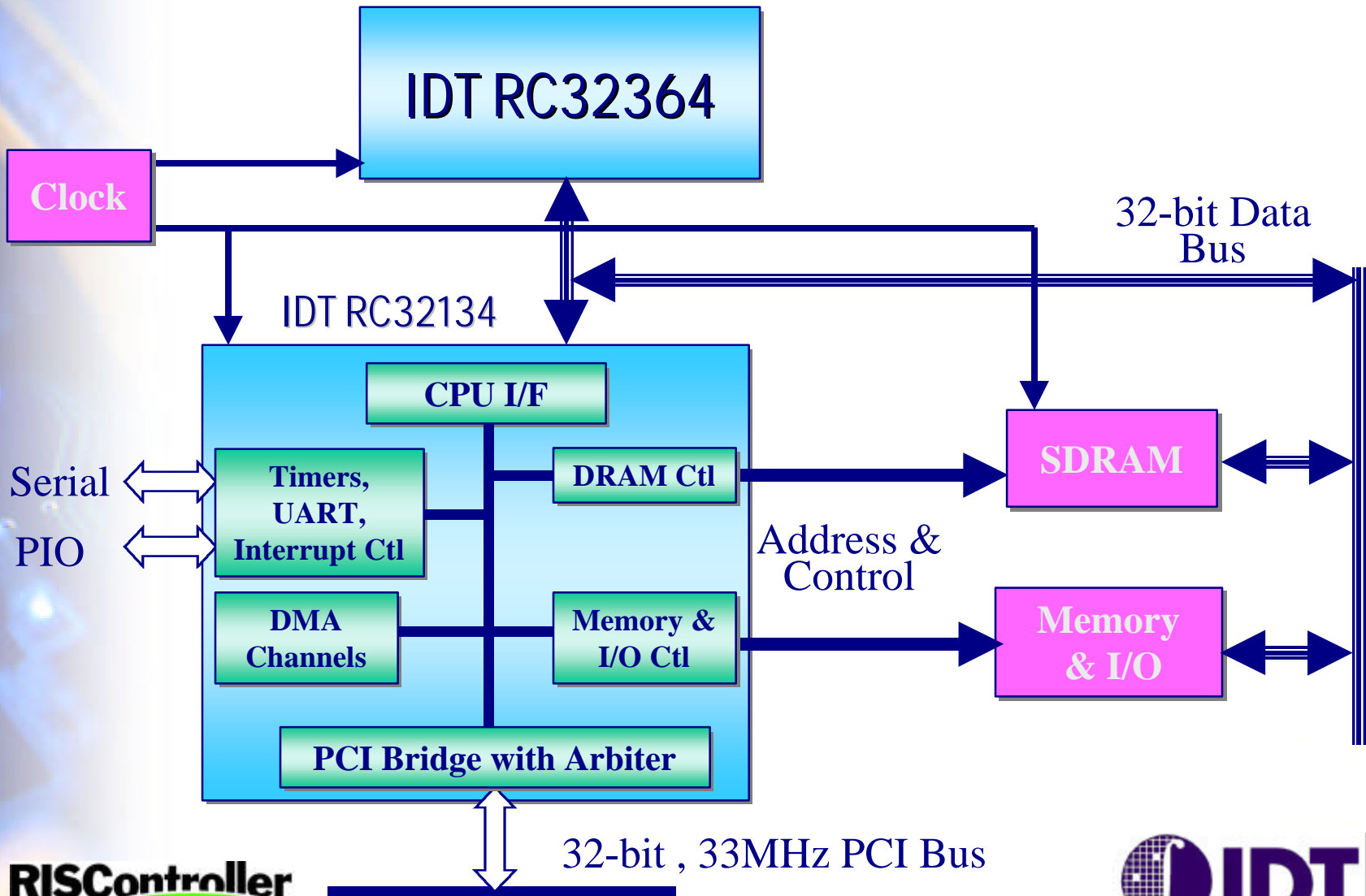
RC32364: Advanced Generation 32-bit Architecture



- 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.



Typical System using the RC32364 ...



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RC32134 Features



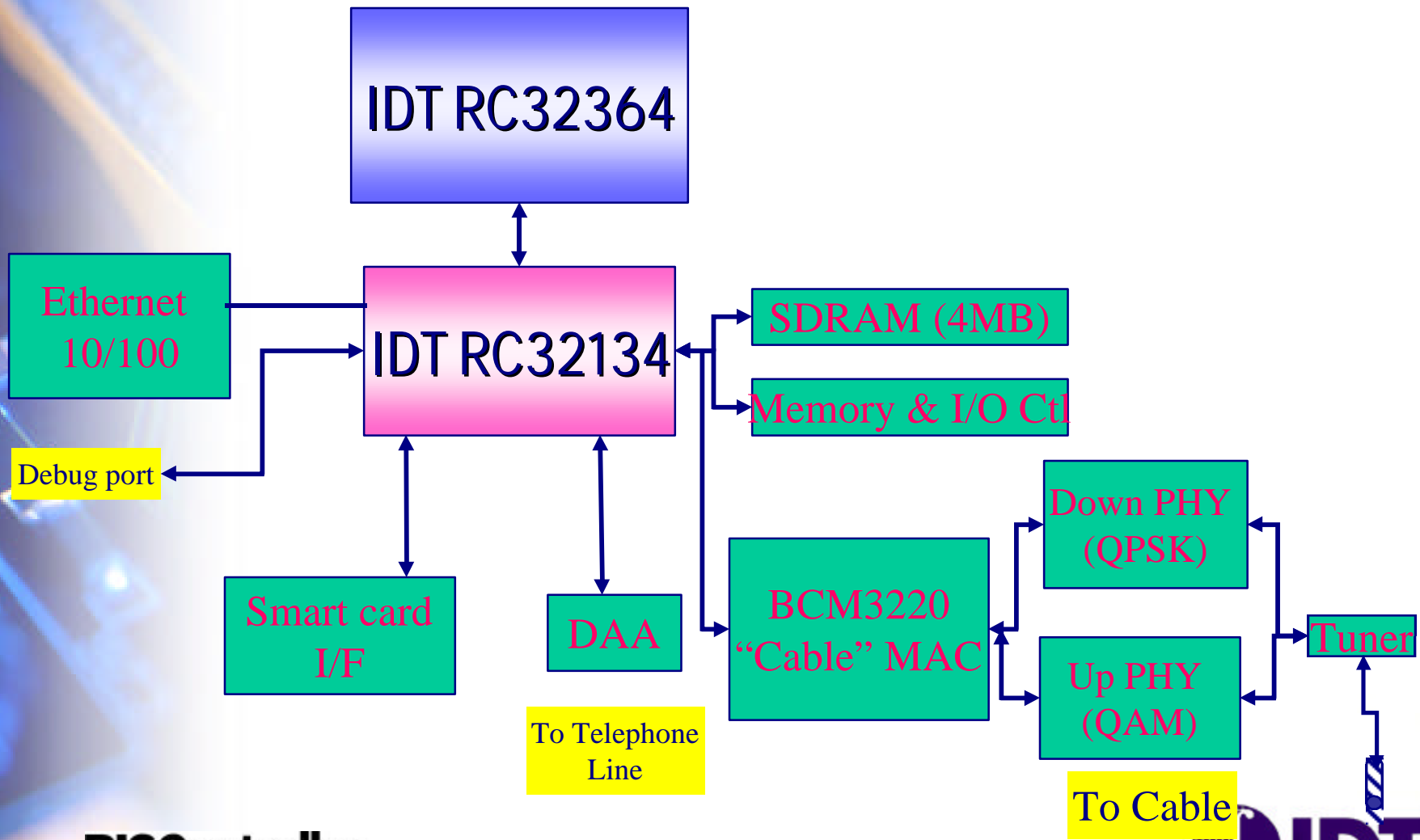
- q Direct CPU interface
 - ò up to 75 MHz maximum
- q Direct DRAM control (SDRAM / EDO)
 - ò SyncDRAM:
 - â 4 banks, 2 to 16-M devices
 - ò EDO
 - â 4 banks, 4 to 32-M devices
- q Local memory, I/O interface
 - ò Supports RAM, Flash/ROM, Dual-Ports and peripherals
 - ò 6-chip selects
 - â 8-, 16- and 32-bit wide
 - â 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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Cable modem using RC32364 & RC32134



Key Features of RC32364 and RC32134



Feature	Benefits
<u>Complete CPU subsystem solution</u> Low cost On-chip required system functionality SDRAM Control, UART, Timers ...	Rapid Time to market Reduced board real estate 300 MB/s DRAM bw sustains line speed On-chip timers to support RTOS On-chip UART for debug and diagnostics
<u>High performance CPU</u> Non Blocking loads Cache locking Prefetch instruction DSP instructions	Migrate more hardware functions to software SoftModem Voice over IP Flexibility to easily upgrade the system Lower system cost
<u>Access to PCI</u>	Easy system expansion Used in Plug-in cards
<u>Low power CPU Subsystem</u>	Increased Reliability Lower power budget



Role of the RC32364

Move traditional hardware functions into software

q 56k modem telephony

ò Altocom s/w modem requires about 40 MIPS on RC32364

q Voice Over IP Algorithm and signaling

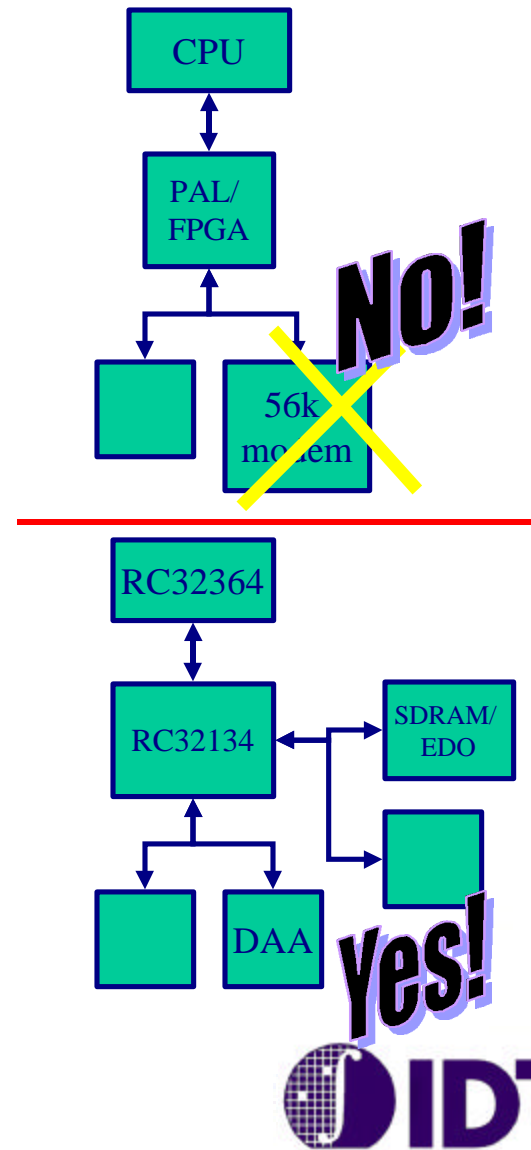
ò Compression Algorithm requires about 25 'C54 style MIPS DSP per voice channel

ò Less than 10 MIPS for the signaling

SoftModem Implementation on the RC32364



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



RISController

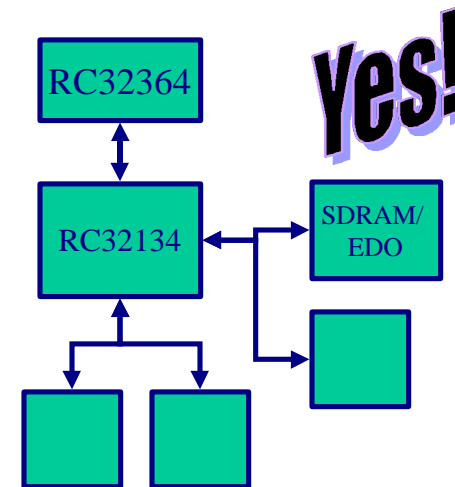
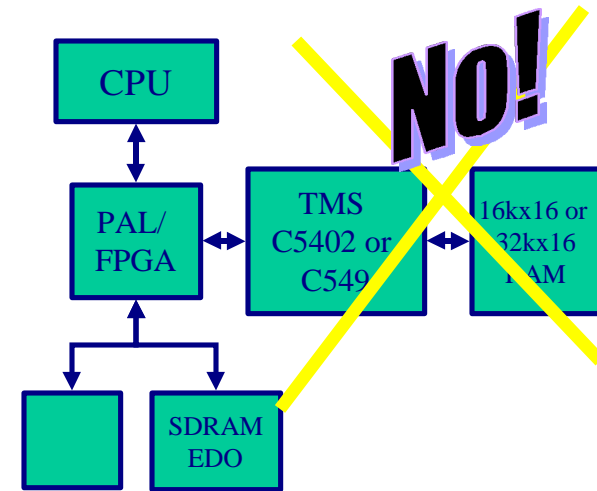
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Voice Over IP Implementation on the RC32364



- q Currently porting with leader in this market
- q Voice format
 - ò G711, G726, G729A, G723
- q RC32364 CPU performance required:
 - ò Voice processing: 25 Mips DSP
 - ò Signaling: 20 MIPS
 - ò Total:
 - â 2 channel: 50% of RC32364/133MHz
 - ò RC32364 power dissipation low: 0.85 W at 133MHz
- q Cost saving by doing on RC32364:
 - ò for 2 voice channels
 - â DSP TMS C5402=\$5, 16kx16=\$3
 - ò Cost saving is ~\$8 in using RC32364+RC32134 for voice over IP handling.



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 Modem I/F in software
 - ò Quick time-to-Market
 - ò Voice Over IP capability
- q Excellent set of design and development tools