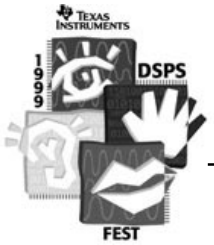


’C5000: The Digital Communications DSP

Mark Mattson

’C5000 Strategic Marketing Manager

Today's Agenda

- Market Success & Advantages
- Product Roadmap: Power-Efficient Performance
- Development Environment
  - Code Composer Studio
  - New DSK & EVM
- Sophisticated Data Converter and Power Management Solutions

TMS320C5000: The Digital Communications DSP

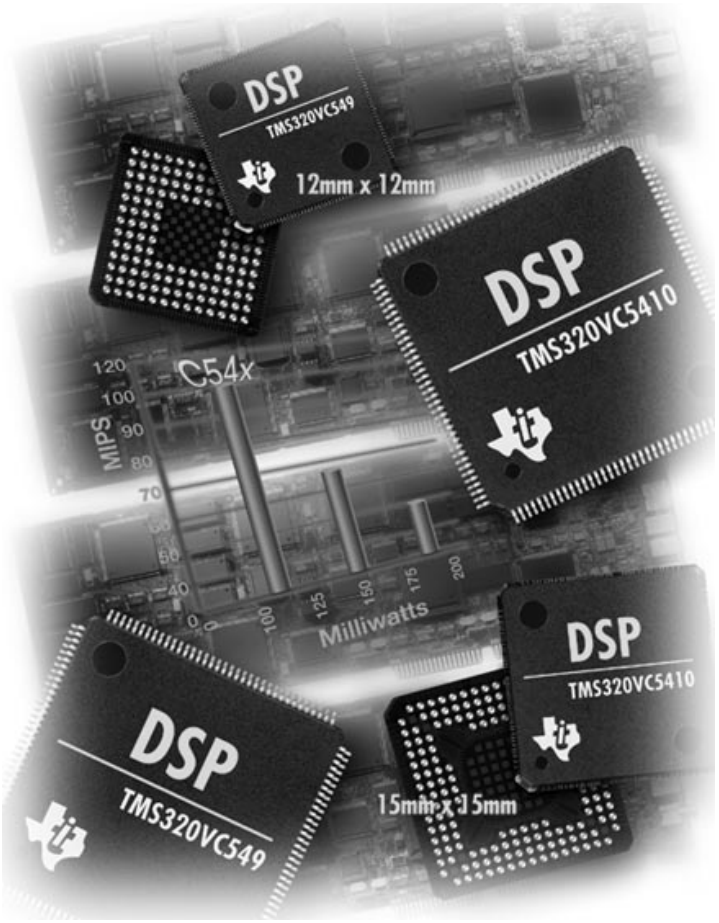
- Wireless Handsets: 1 out of every 2 digital cellular
- Voice-Over-Packet: 8 out of every 10 gateways

- Wireless subscriber market growing at 19.5% CAGR
- VOP market growing at 40% CAGR
- Digital Still Camera market growing at 34% CAGR
- Wireless local loop market growing over 300% CAGR

Source: Nikkei Market Access, IDC, Dataquest, Forward Concepts, internal data

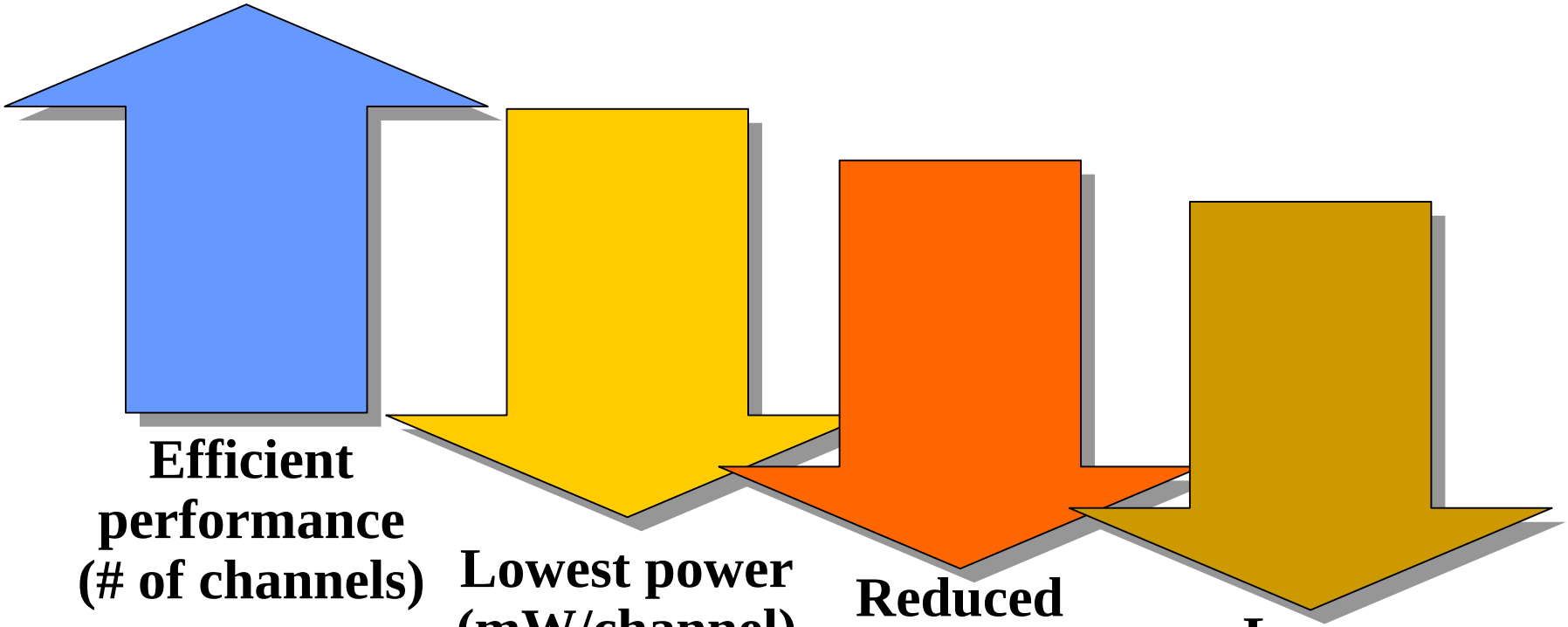
C5000 Customer Base is Exploding

- 100's of Millions of units shipped based on C54x architecture
- 100% increase in # of customers from 1Q98 to 1Q99
- 70% increase in # of customers from 1Q99 to 2Q99
- TI's #1 architecture in terms of units shipped and revenue



'C5000: Power-Efficient Performance

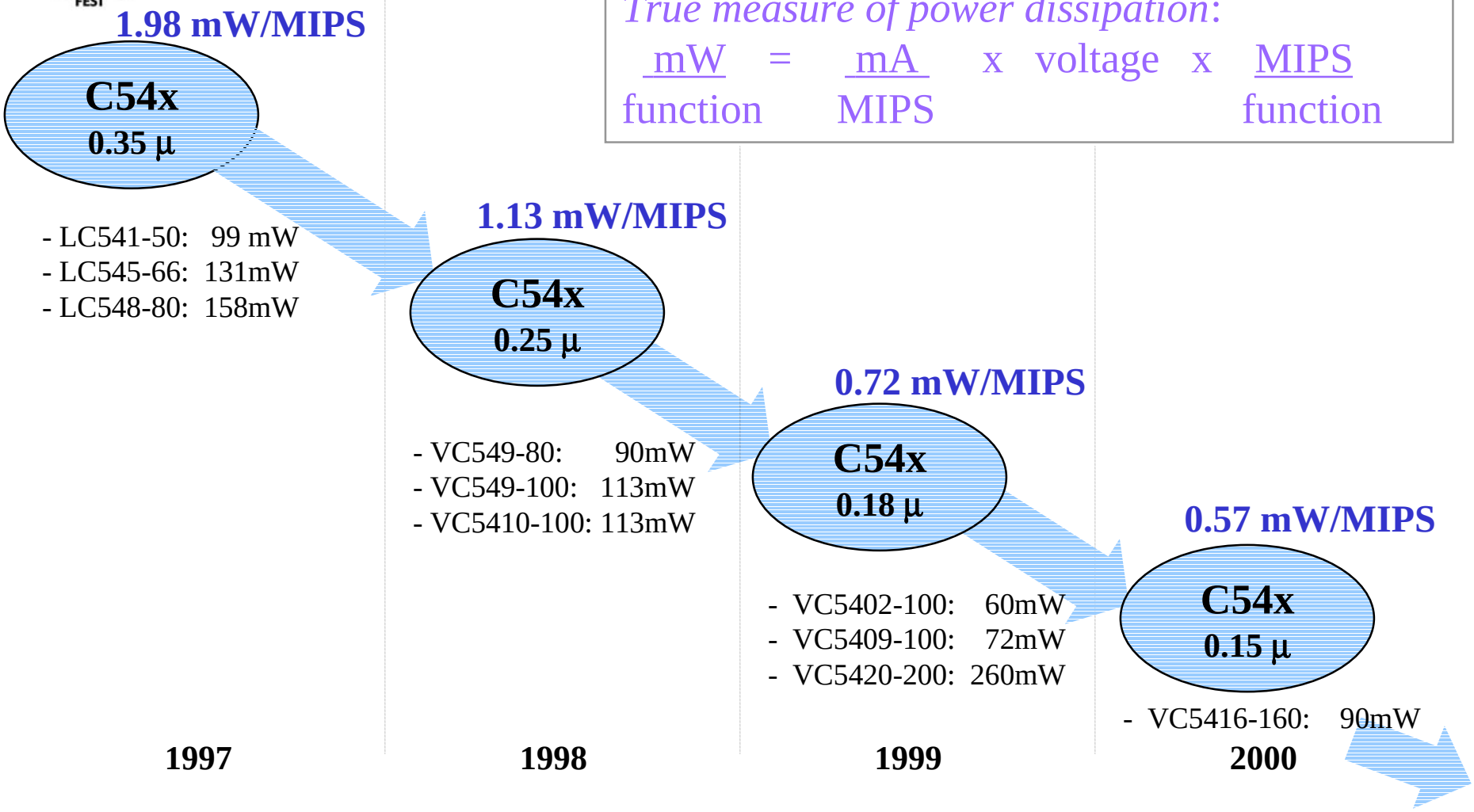
Efficiency in MIPS, memory, power, space, cost!



’C5000: Lowest Power Dissipation

True measure of power dissipation:

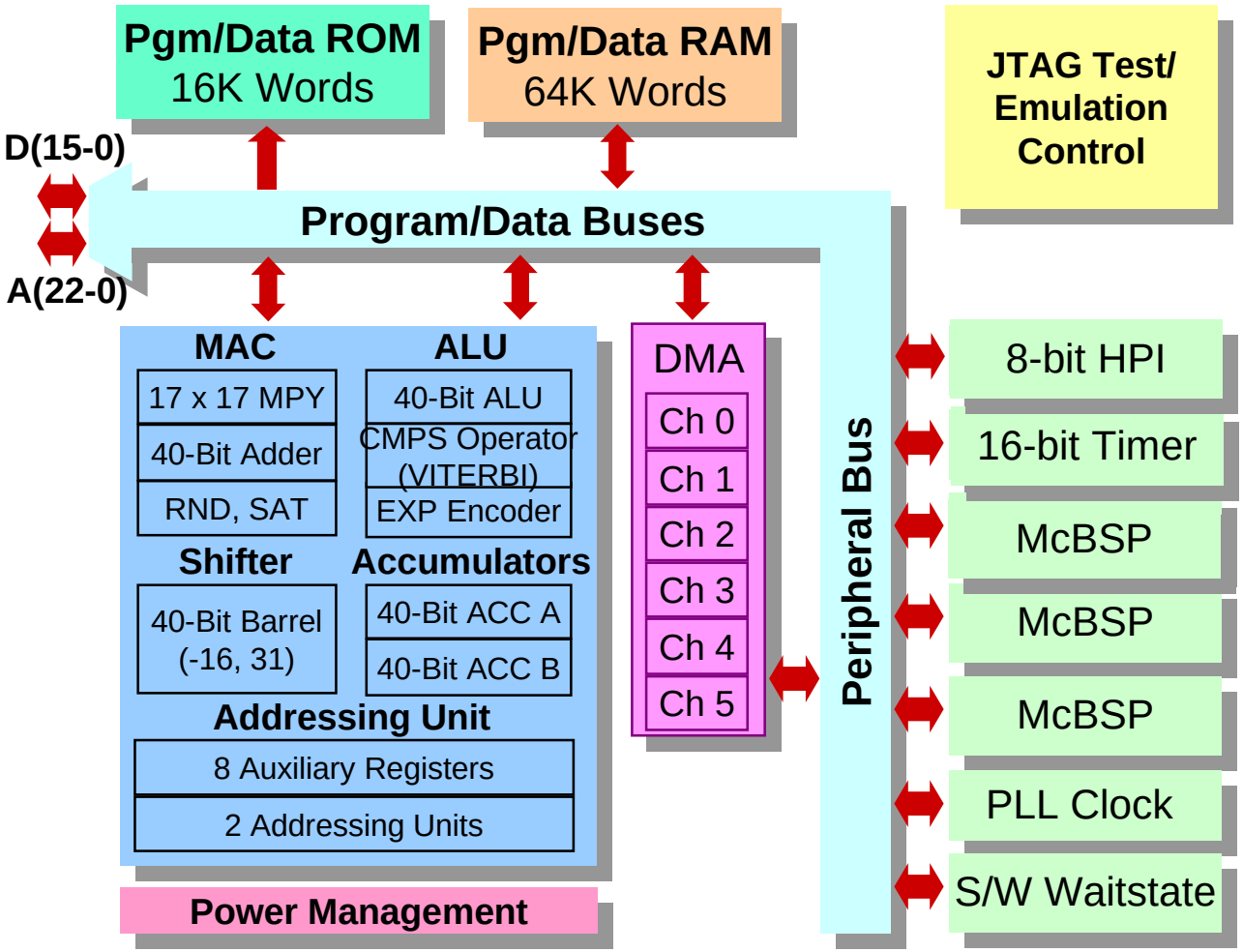
$$\frac{\text{mW}}{\text{function}} = \frac{\text{mA}}{\text{MIPS}} \times \text{voltage} \times \frac{\text{MIPS}}{\text{function}}$$



’C5000 Application Segments

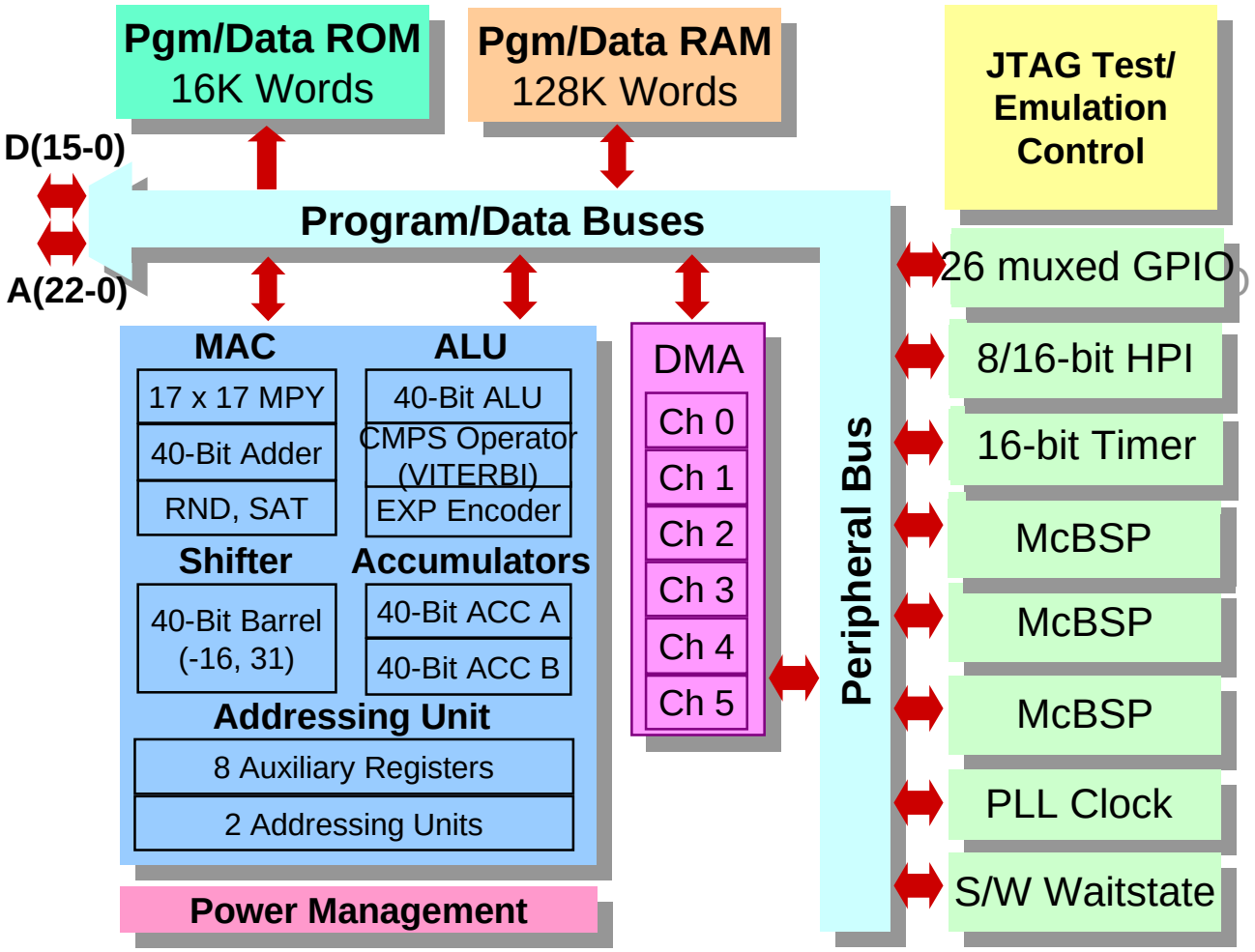
- **High-end carrier class & enterprise equipment**
  - > Examples: basestations, gateways, RAS modems, large switches, telecom infra.
  - > Careabouts: 1) mW/channel; 2) in^2/channel 3) $/channel
- **Mid-range Telecom (Customer Premise Equipment)**
  - > Examples: PBX/comm servers, SOHO voice/data systems, WLL, etc.
  - > Careabouts: 1) performance; 2) cost ; 3) power/function; 4) space
- **Portable, consumer communications**
  - > Examples: solid-state audio, GPS, DSC, voicemail pagers, wireless modems
  - > Careabouts: 1) low power; 2) performance; 3) cost; 4) space
- **Client-side Telephony**
  - > Examples: metering, point-of-sale, webphones, speakerphones, feature phones
  - > Careabouts: 1) cost ; 2) performance; 3) power; 4) space
- **Ultra-low power applications**
  - > Examples: digital hearing aids, biometric, personal medical, wireless headset, etc.
  - > Careabouts: 1) Ultra-low power; 2) space; 3) performance; 4) cost

’C5410: Now Shipping in Production



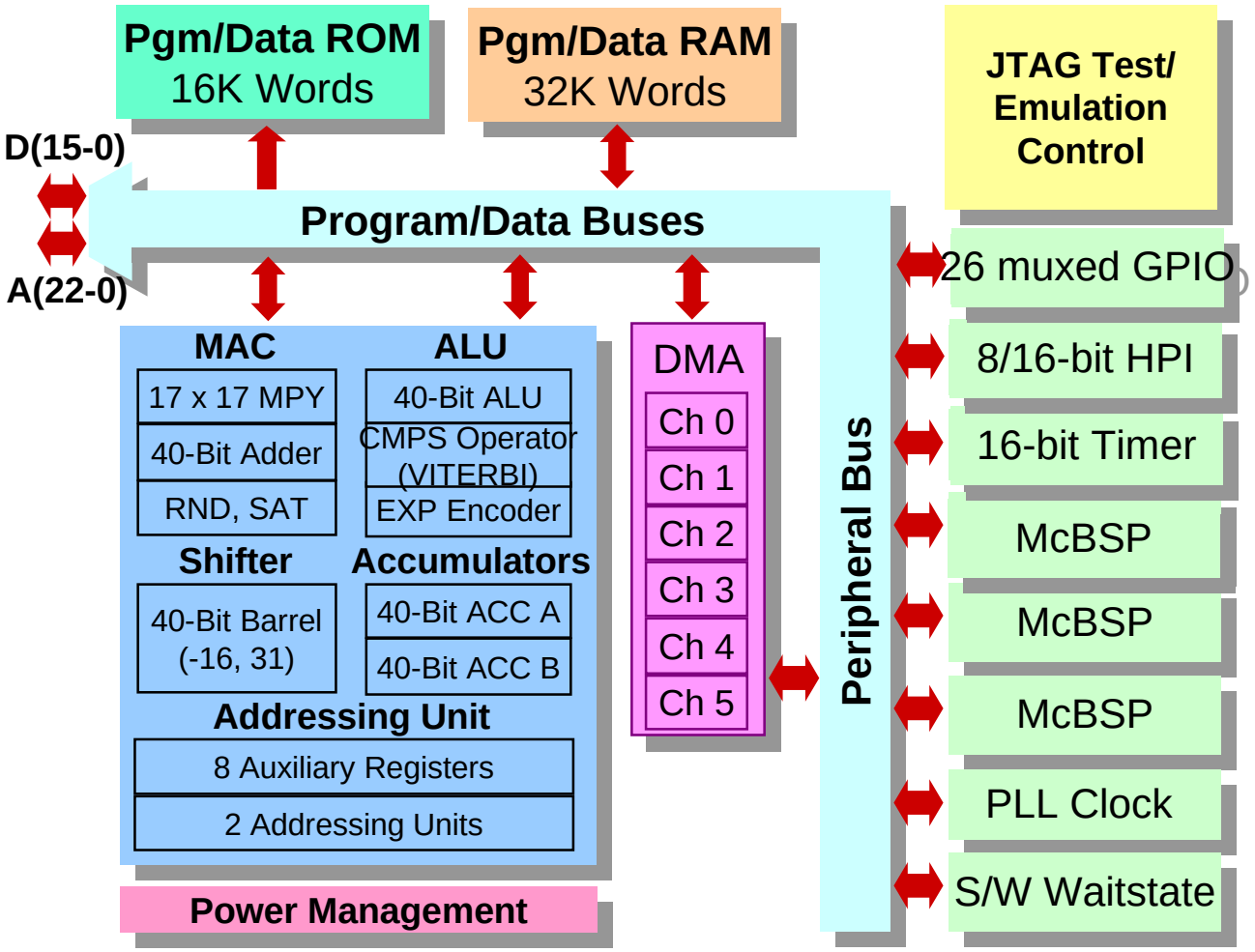
- **Performance**
  - Up to 120 MIPS
  - 64K words SRAM
  - 16K words ROM
  - 3 McBSPs
  - 6-channel DMA
  - 8-bit HPI
  - Extended Program Addressing
- **Low Power**
  - 2.5-V core
  - < 120 mW active @ 100 MIPS
- **Small Size**
  - 144 TQFP
  - 176 microStar BGA (15 x 15 mm)

’C5416: 60% Core Performance Boost



- **Performance**
  - 160 MIPS
  - 128K words SRAM
  - 16K words ROM
  - 3 McBSPs
  - 6-channel DMA
  - 8/16-bit HPI
  - Extended Program Addressing
- **Low Power**
  - 1.5-V core
  - 90 mW active @ 160 MIPS
- **Small Size**
  - 144 TQFP
  - 144 microStar BGA (12 x 12 mm)

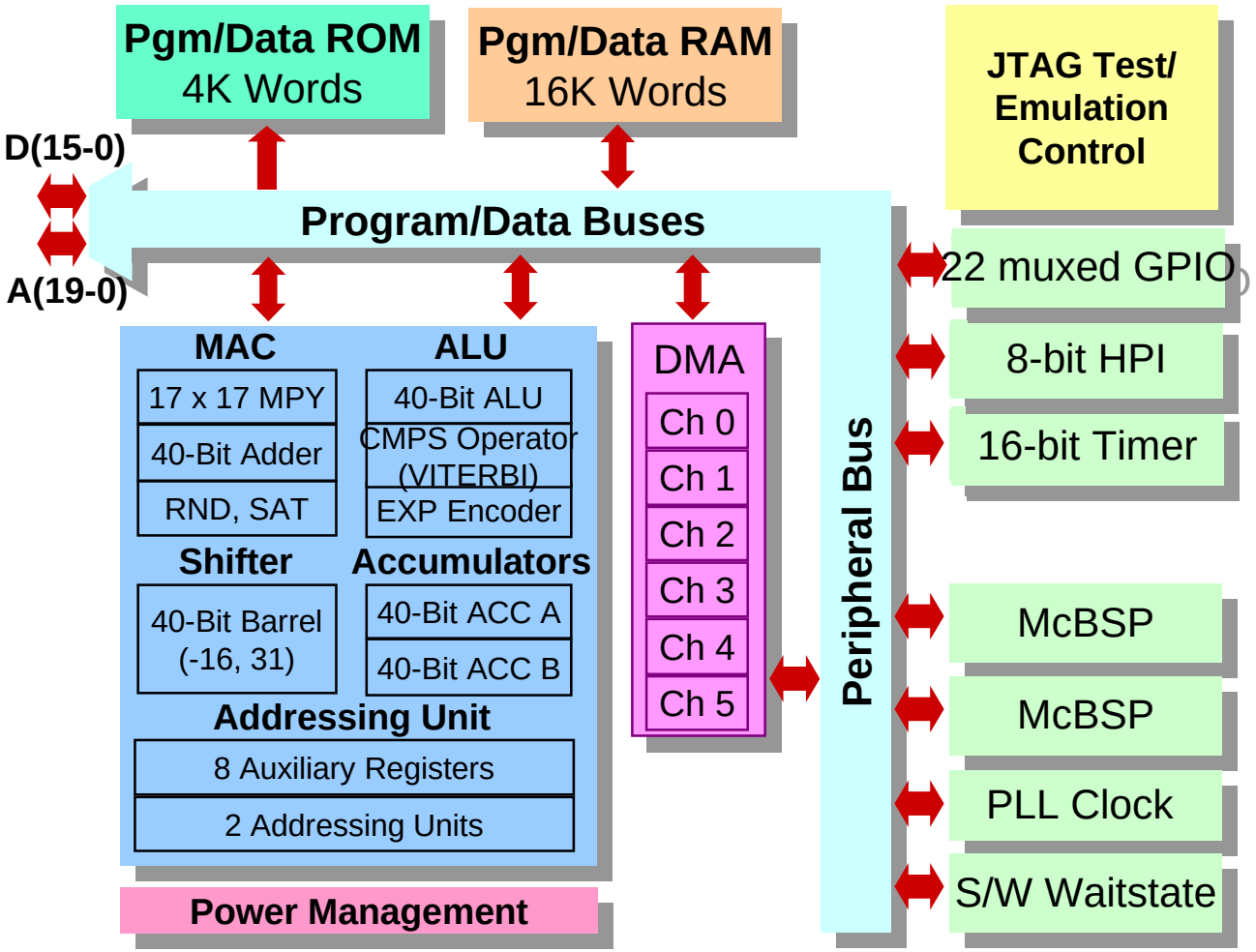
C5409: Ideal for Portable Consumer Market



- **Performance**
  - 30, 80, 100 MIPS
  - 32K words SRAM
  - 16K words ROM
  - 3 McBSPs
  - 6-channel DMA
  - 8/16-bit HPI
  - Extended Program Addressing
- **Low Power**
  - 1.2 & 1.8-V core versions
  - Variable I/O voltage
  - < 80 mW active @ 100 MIPS
- **Small Size**
  - 144 TQFP
  - 144 microStar BGA (12 x 12 mm)

’C5402: 100 MIPS for $5

1st General Purpose DSP at 1.2V

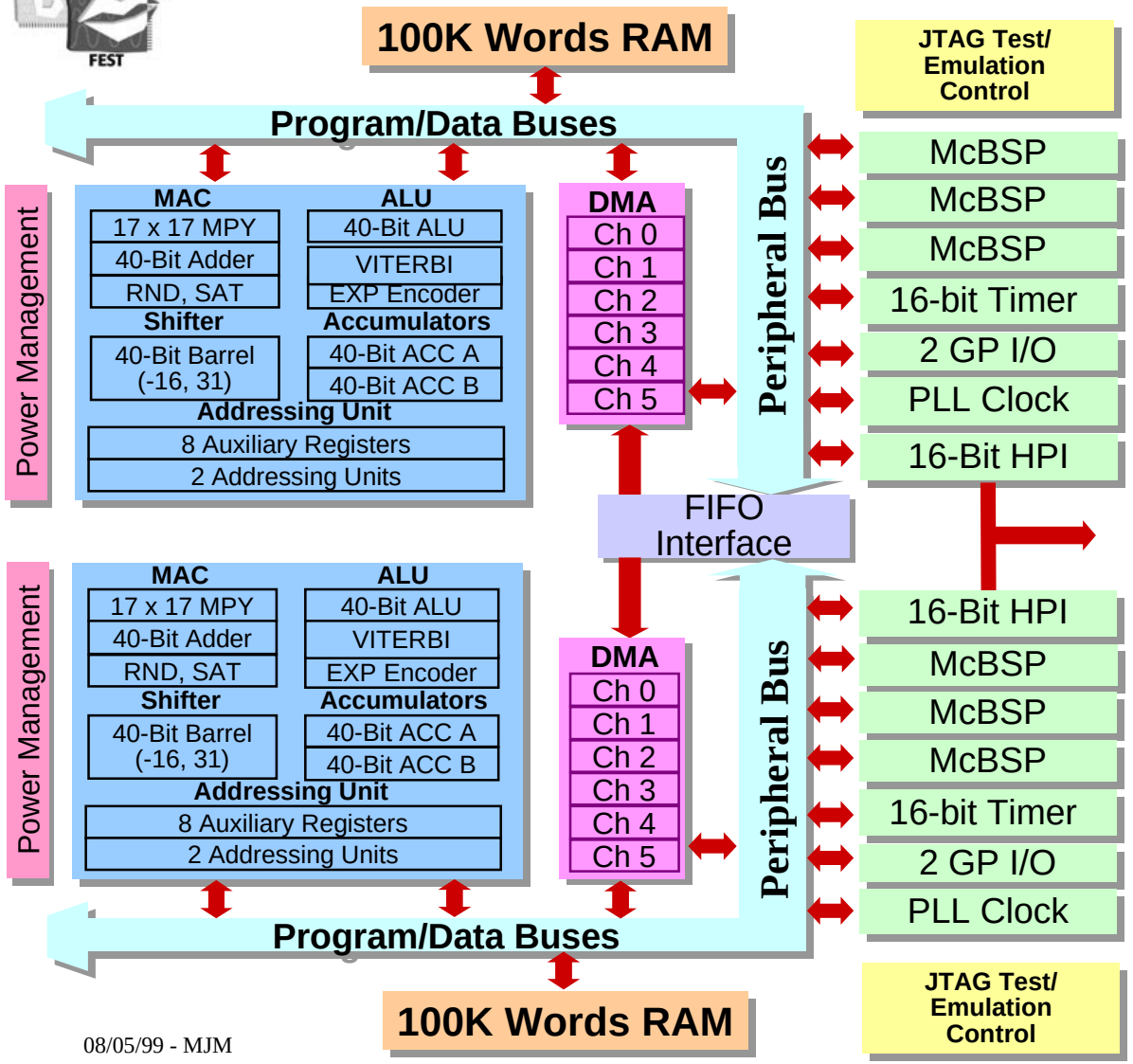


- **Performance**
  - 30, 80, 100 MIPS
  - 16K words SRAM
  - 4K words ROM
  - 3 McBSPs
  - 6-channel DMA
  - 8-bit HPI
  - Extended Program Addressing
- **Low Power**
  - 1.2 & 1.8-V core versions
  - Variable I/O voltage
  - ~ 60 mW active @ 100 MIPS
- **Small Size**
  - 144 TQFP
  - 144 microStar BGA (12 x 12 mm)

’C5000: Ultra-Low Power Summary

Device	Core Voltage Min Nom Max	I/O Voltage Min Nom Max	MIPS	Samples	Production
’C5409	1.71 1.80 1.98	3.00 3.30 3.60	100	09/99	4Q99
’C5409	1.71 1.80 1.98	1.71 - 3.60	80	4Q99	1Q00
’C5409	1.14 1.20 1.26	1.14 - 2.75	30	4Q99	1Q00
’C5402	1.71 1.80 1.98	3.00 3.30 3.60	100	----	Now
’C5402	1.71 1.80 1.98	1.71 - 3.60	80	Now	09/99
’C5402	1.14 1.20 1.26	1.14 - 2.75	30	Now	09/99

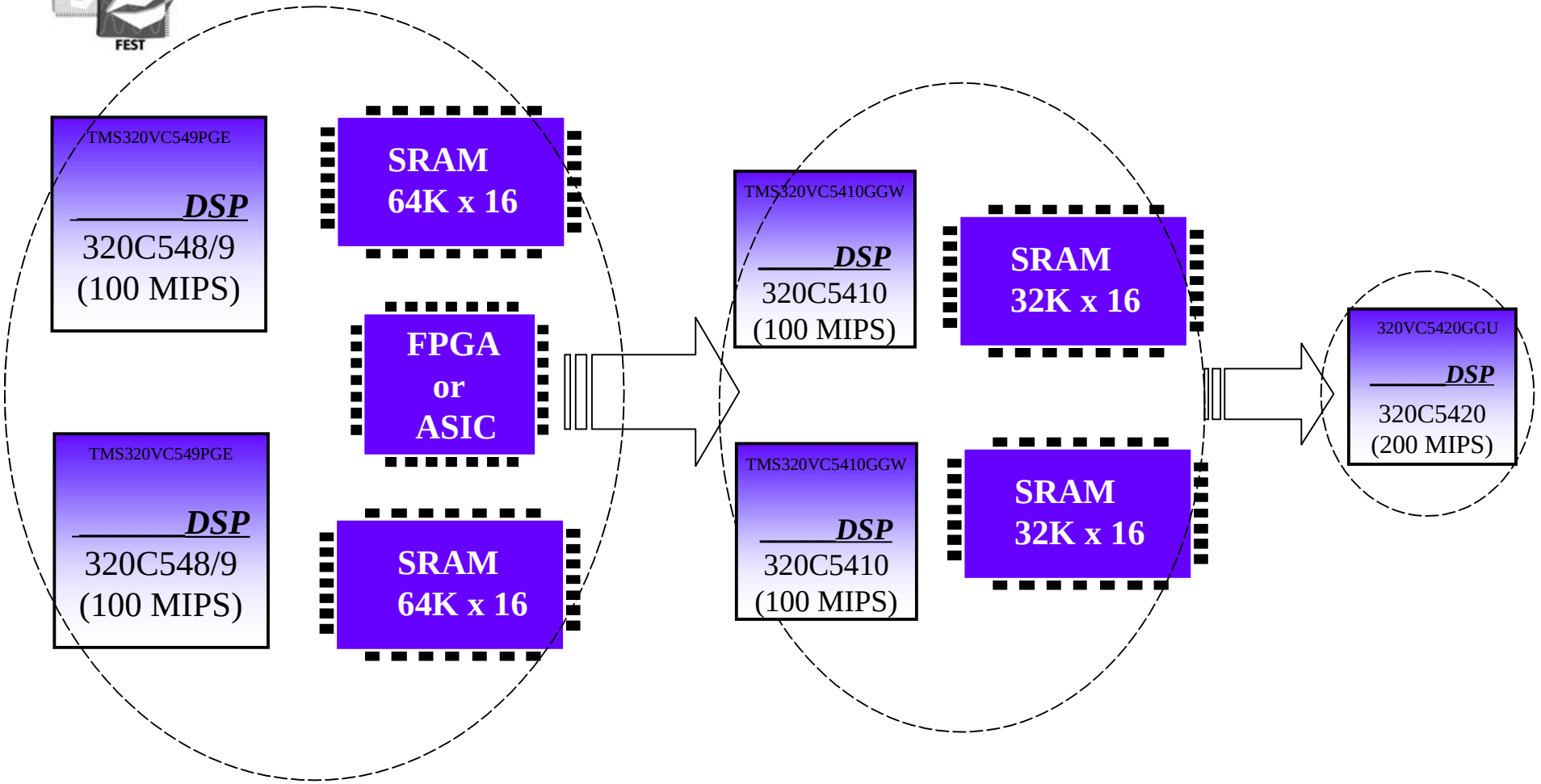
'C5420: Minimize mW & in^2 per channel



- **Performance**
  - 200 MIPS for
  - 200K words SRAM (3.2 Mbits)
  - 6 McBSPs
  - 12-channels DMA
  - 16-bit HPI
- **Low Power**
  - 1.8-V core
  - 266 mW active power
  - Low power per channel
- **Small Size**
  - 144-pin TQFP
  - 144 microStar BGA (12 x 12 mm)

08/05/99 - MJM

C542x Maximizes Power & Space Density



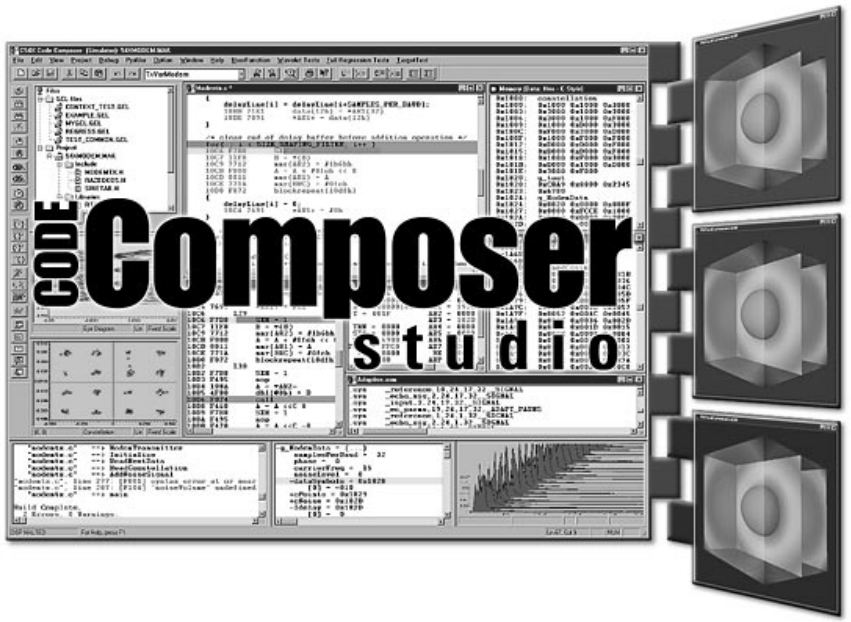
Increasing channel density ⟶

’C5000 Device Summary

Features	’C5402	’C5409	’C5410	’C5416	’C5420	’C5421
MIPS	30/80/100	30/80/100	100/120	160	200	200
RAM (words)	16K	32K	64K	128K	200K	256K
ROM (words)	4K	16K	16K	16K	---	4K
McBSP	2	3	3	3	6	6
HPI	8-bit	8/16-bit	8-bit	8/16-bit	16-bit	16-bit
DMA	6-ch	6-ch	6-ch	6-ch	12-ch	12-ch
Timer	2	1	1	1	2	2
Core Voltage	1.8 V 1.2 V	1.8 V 1.2 V	2.5 V	1.5 V	1.8 V	1.8 V
Power	60mW (100 Mhz)	72mW (100 Mhz)	115mW (100 Mhz)	90mW (160 Mhz)	266mW (100 Mhz)	160mW (100 Mhz)
Package	144 TQFP 144 BGA	144 TQFP 144 BGA	144 TQFP 176 BGA	144 TQFP 144 BGA	144 TQFP 144 BGA	144 TQFP 144 BGA
Samples	---	8/99	---	4Q99	---	11/99
TMS	NOW	4Q99	NOW	3Q00	NOW	2Q00
Price	$5 - $8	$10 - $20	$24 - $36	$30 - $38	$50 - $65	$65 - 85

Code Composer Studio Simplifies Development

- Integrates IDE, DSP/BIOS, RTDX and Code Gen tools together
- Open plug-in architecture for third-party host and target tools

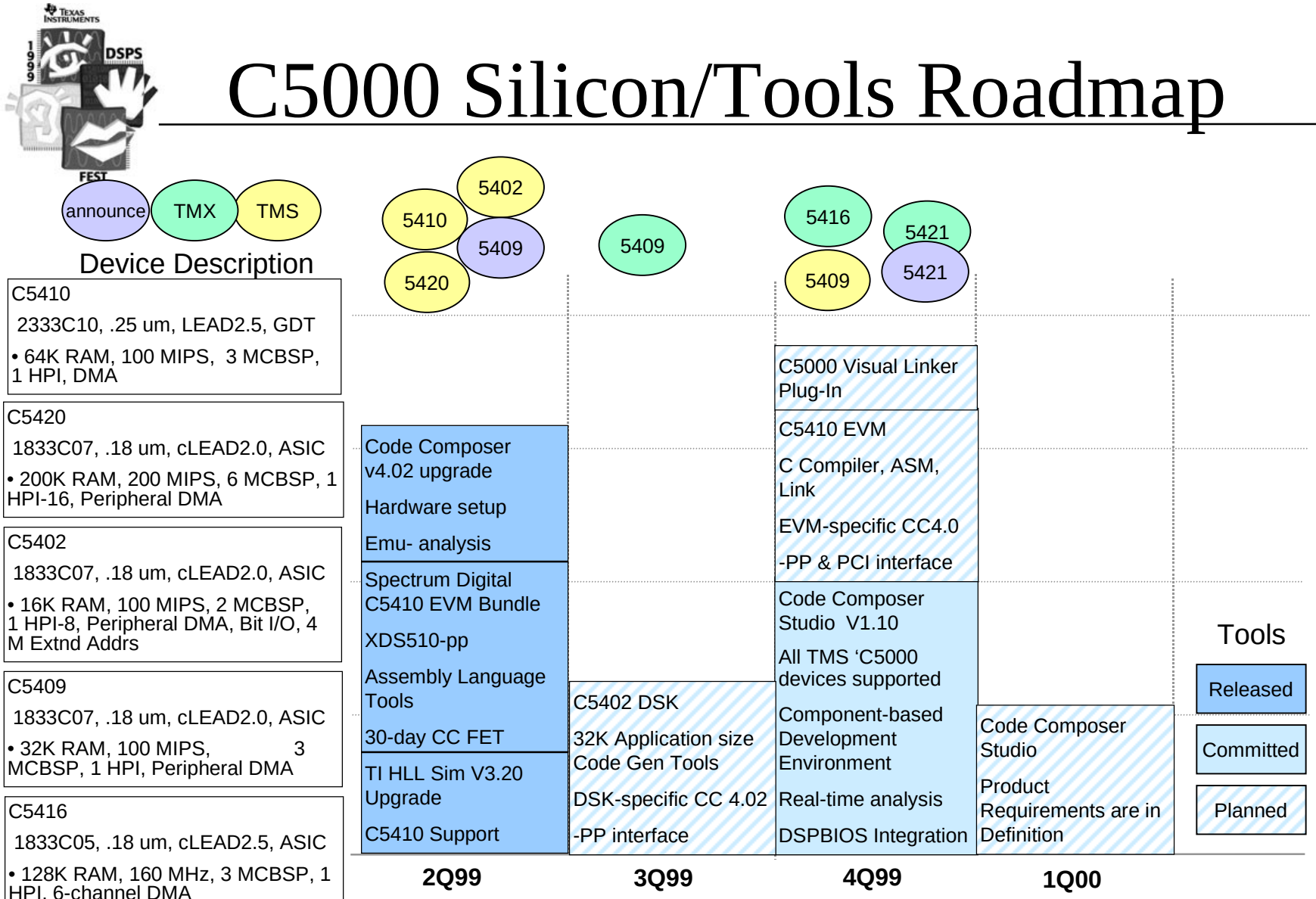


- Real-time analysis & debugging
- Real-time data visualization
- Visual configuration of run-time facilities
- Multi-target functionality
- Workgroup development
- A truly visual environment

Available for C5000: October '99

08/05/99 - MJM

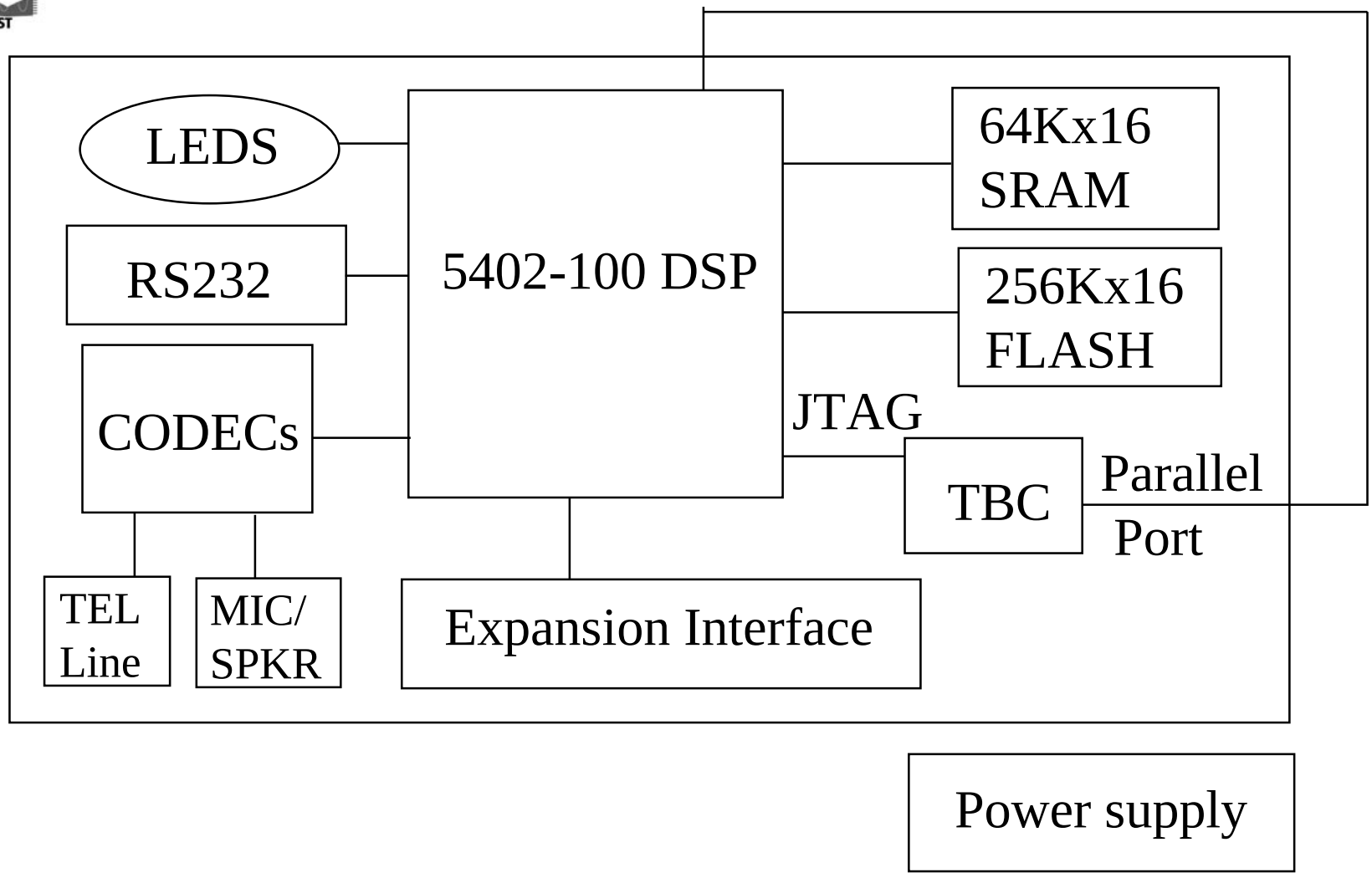
C5000 Silicon/Tools Roadmap



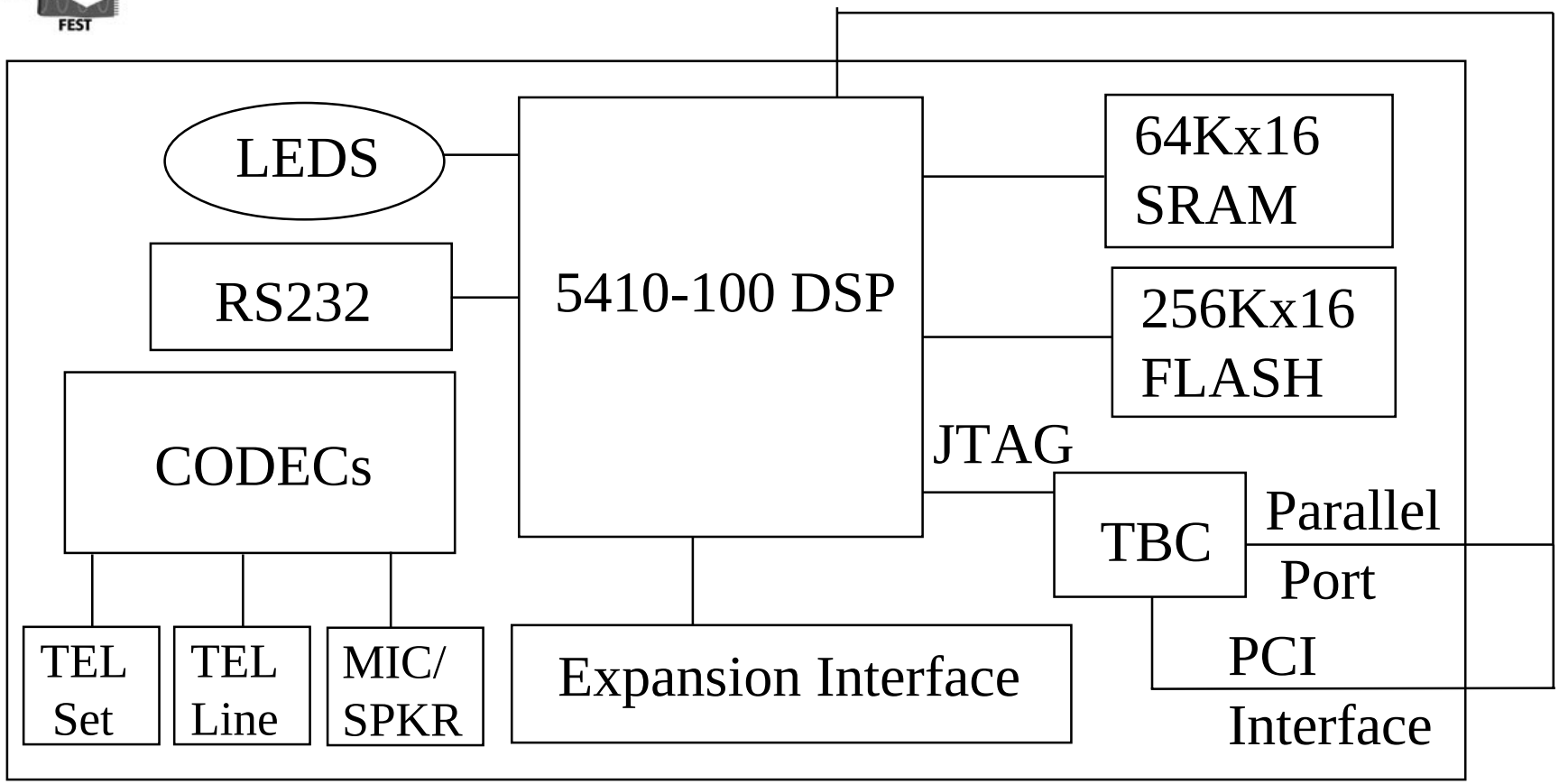
‘C5000 DSP Starter Kit (DSK)

- Low Cost…Get started on TI’s TMS320C5000 DSP for less than $200
- Complete Development Environment
  - ‘C5402-based Development Board
  - DSK Code Generation Tools
  - Full featured Code Composer DSK Debug Tools
  - Parallel Port Emulation
  - Power Supply
  - Tutorial, On Line Help, Sample Code

‘C5402 DSK Hardware



‘C5410 EVM Hardware



New DSK & EVM Summary

- **New DSK**
  - $200 price ; based on C5402
  - Full featured Code Composer DSK Debug Tools
  - Code Gen limited to 32K size
  - Parallel Port Emulation
  - Tutorial, On Line Help, Sample Code
  - Availability: October 1st
- **New EVM bundle**
  - $1995 price ; based on C5410
  - Full-featured Code Composer Studio (IDE, RTDX, BIOS)
  - Full code generation tools
  - Can be used as plug-in board (PCI) or standalone
  - Tutorial, On Line Help, Sample Code
  - Availability: November
- **Plans for October 11th Announcement include**:
  - New DSK availability
  - Code Composer Studio availability for C5000
  - Visual linker tool (CCS plug-in)
  - Plans for new EVM (C5410-based)