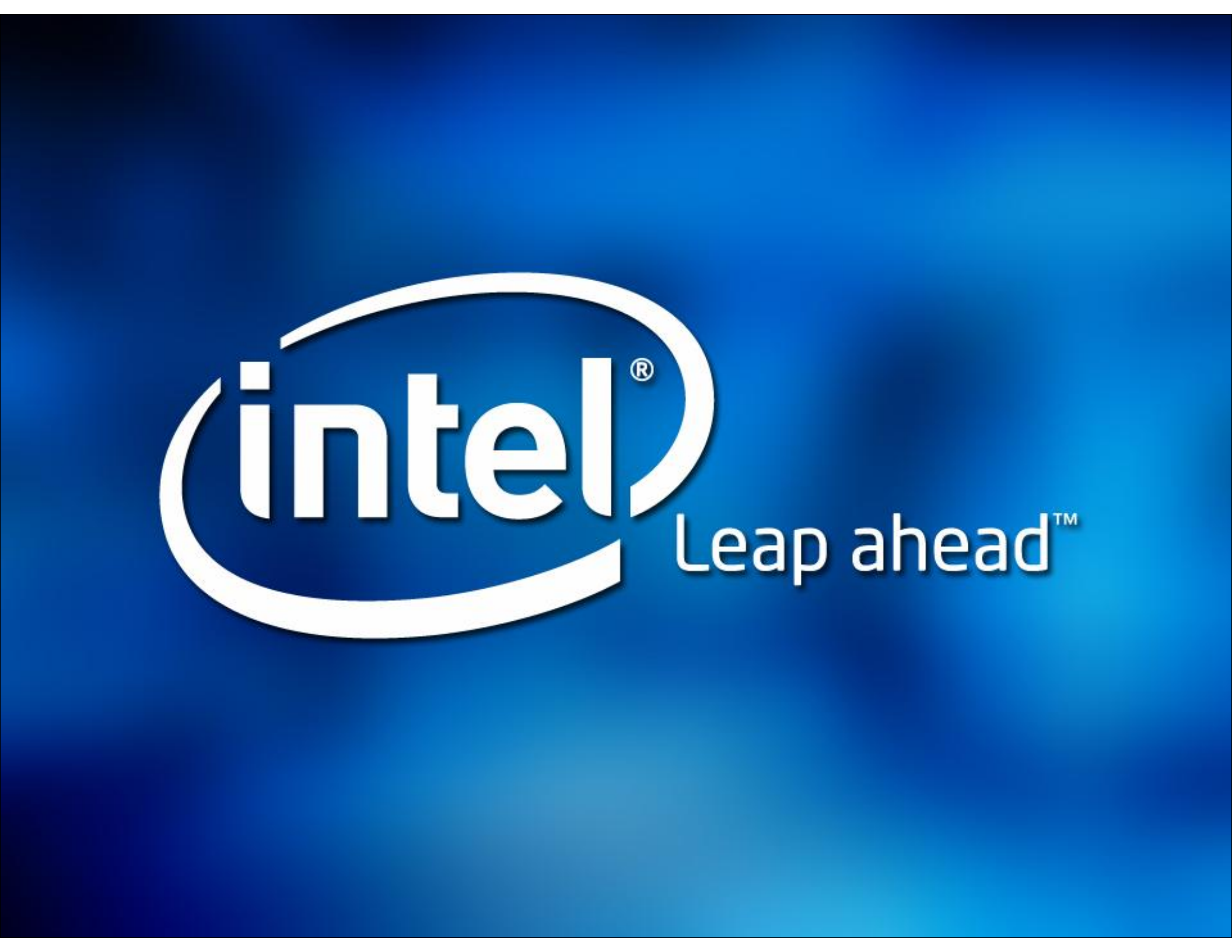
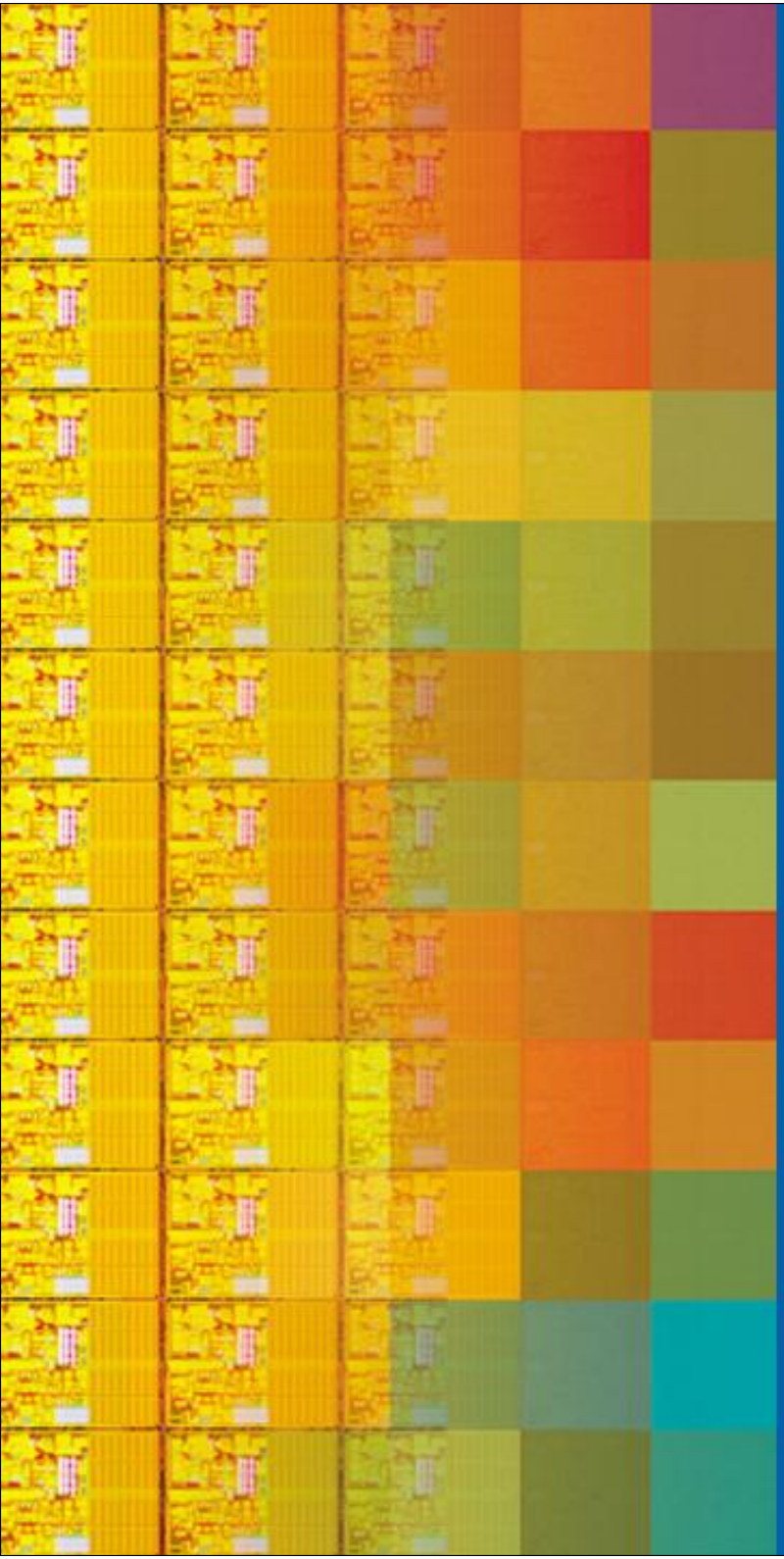
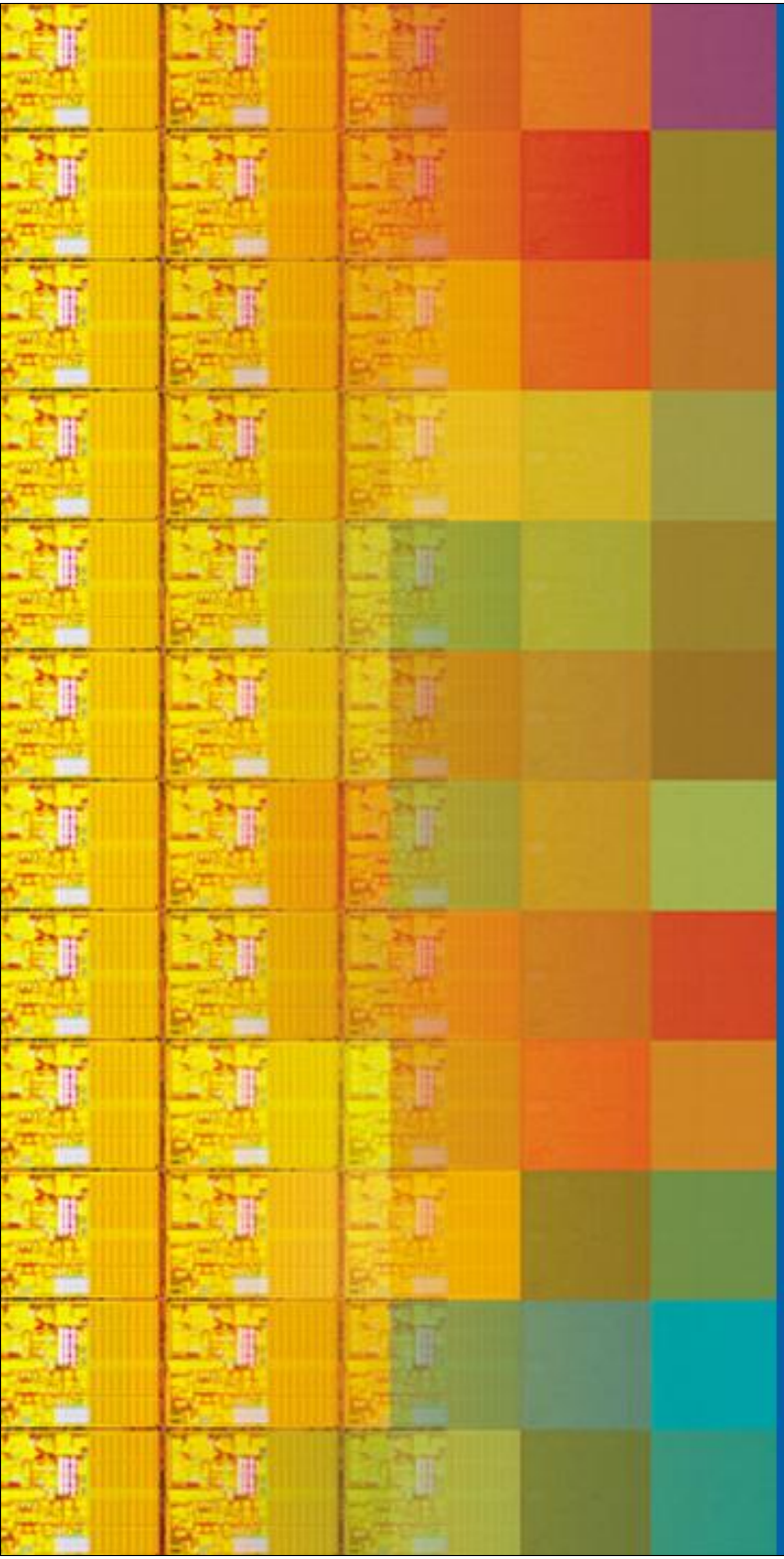

intel®
Leap ahead™



intel Leap ahead™

Intel Developer FORUM



Justin Rattner

Senior Fellow
Chief Technology Officer

Intel Developer
FORUM


Imagine what can be
Create what will be

FOR DEVELOPERS
BY DEVELOPERS

Chalk Talks
Shop Talks

Wednesday Technology Insights

Extracting The Most Out Of Intel's Multi-Core Platforms

Richard Wirt
Intel Vice President, Senior Fellow
General Manager – Software and Solutions Group

Intel's Next Generation Microarchitecture

Steve Pawlowski
Intel Senior Fellow, Digital Enterprise Group Chief Tech

Ofri Wechsler
Intel Fellow, Director, M

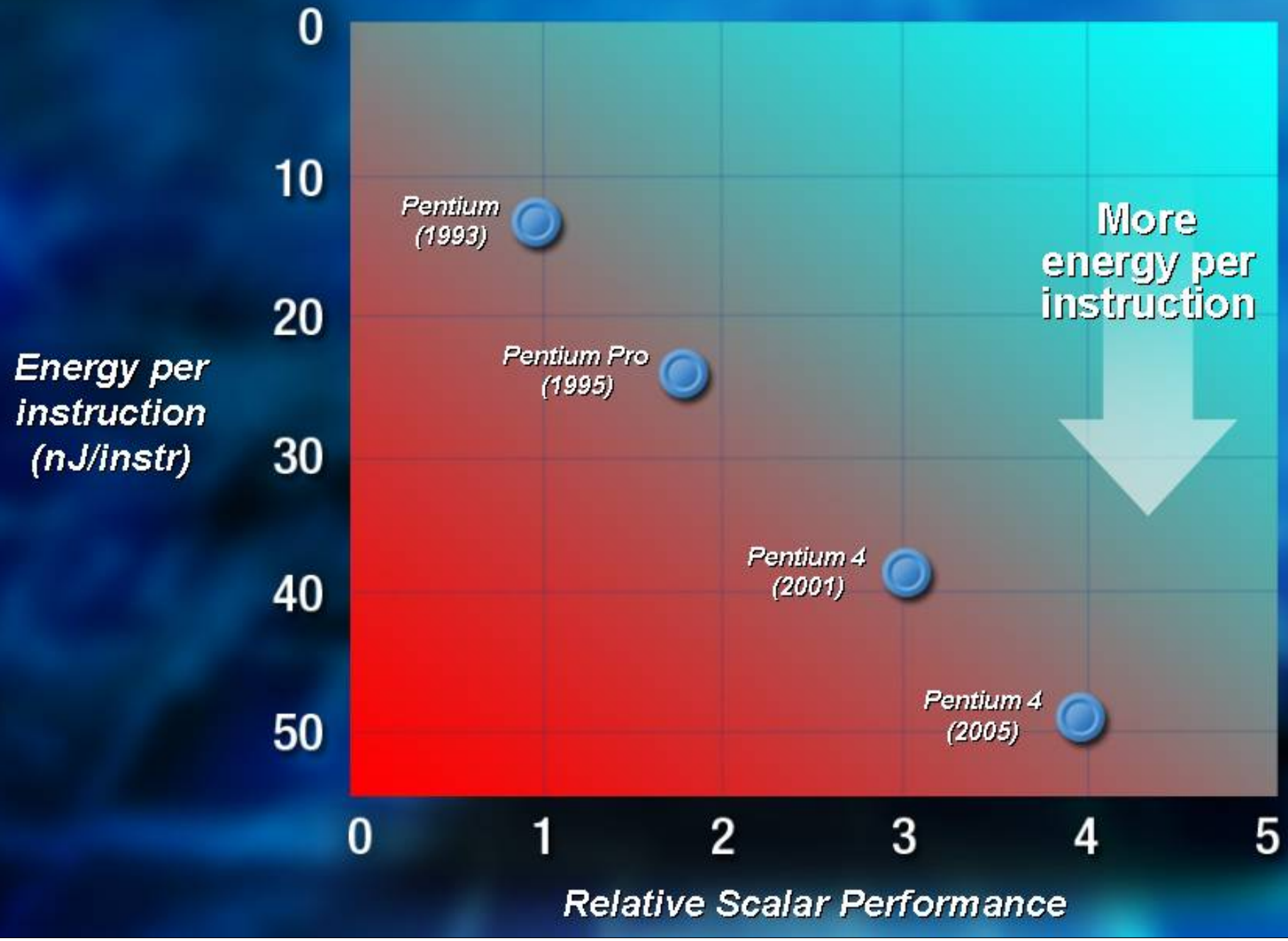
Energy:
The Next Frontier

The Classic Tradeoff

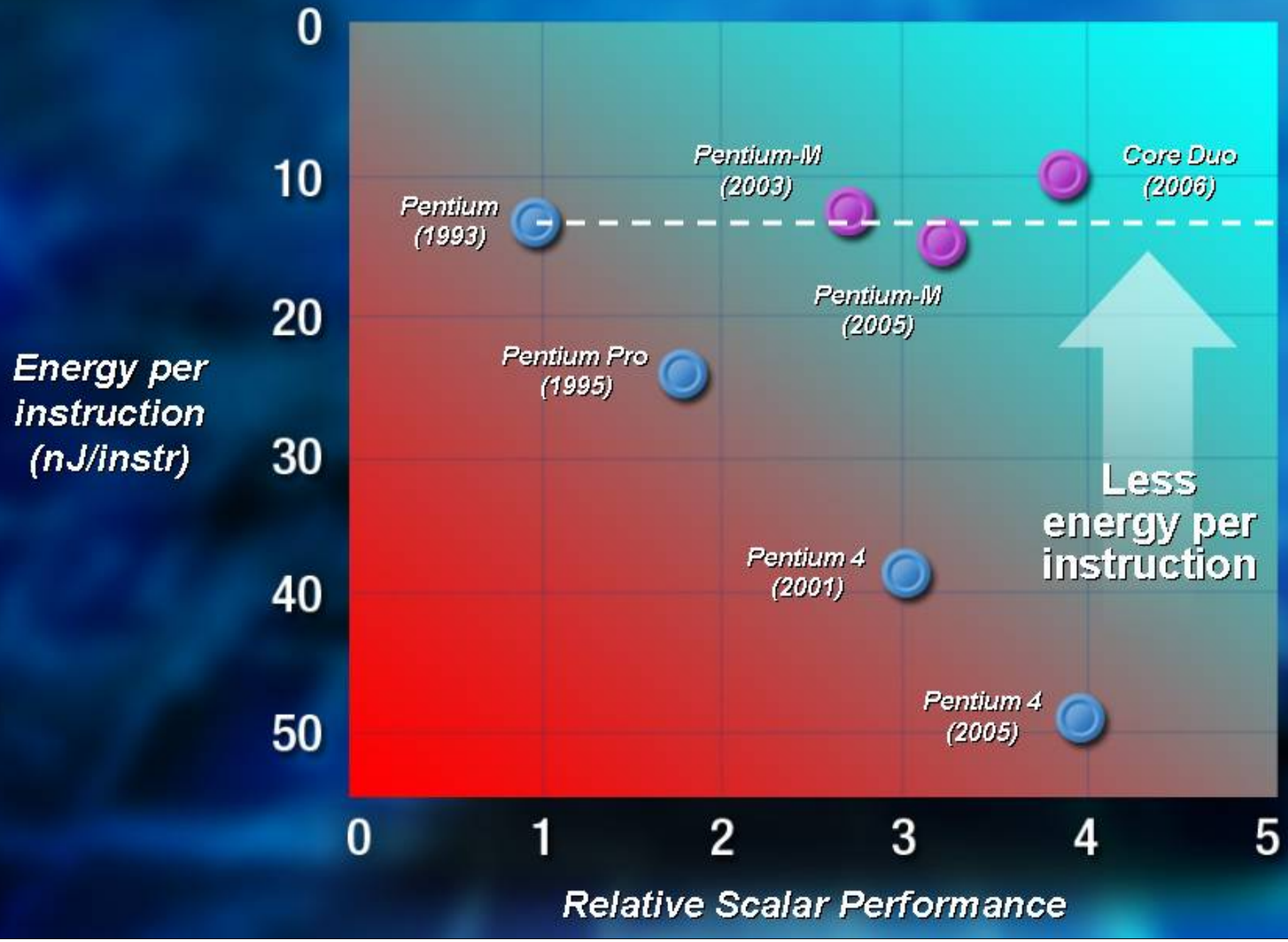
Higher
Top Speed and Acceleration

Increased
Range and Economy

No Way Out?


0
10
20
30
40
50
Energy per instruction (nJ/instr)
Pentium (1993)
Pentium Pro (1995)
Pentium 4 (2001)
Pentium 4 (2005)
More energy per instruction
0
1
2
3
4
5
Relative Scalar Performance

Breaking Through the Power Wall



The Real Challenge

Energy-Efficient Performance

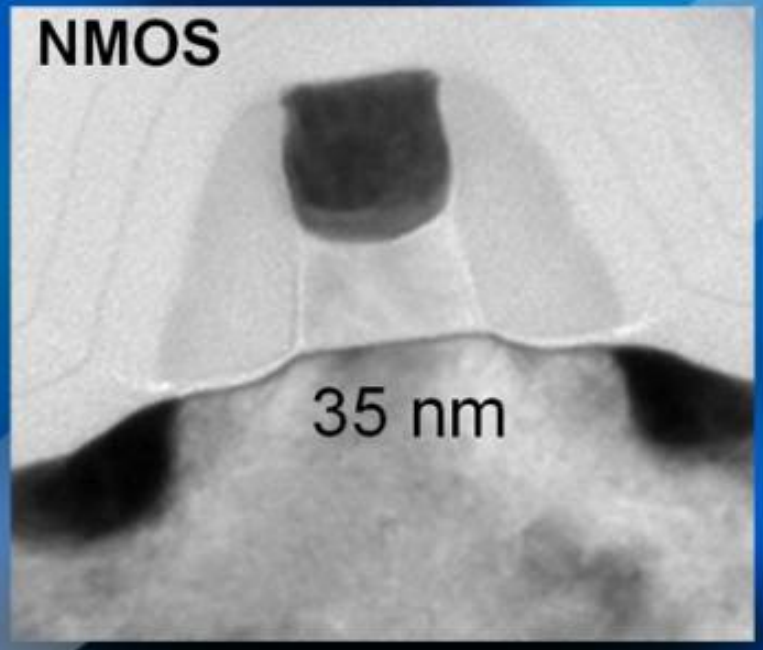
Critical Capabilities

Intel® Core™ Microarchitecture

Next-Generation Processors for Mobile, Desktop and Server

High Volume 65nm

TRANSISTOR PERFORMANCE
20%

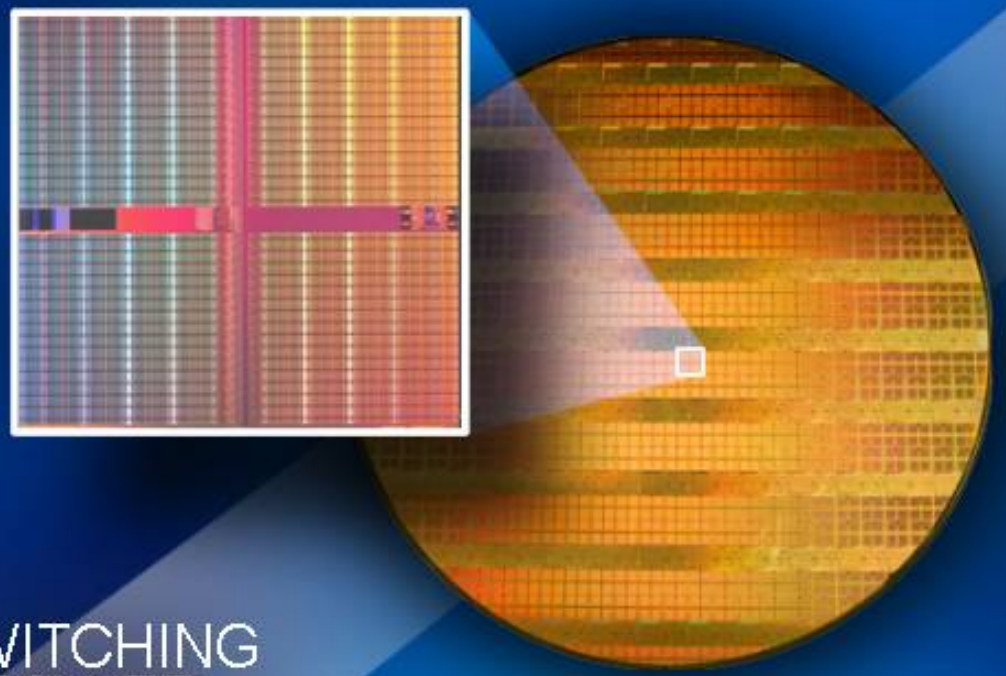


SWITCHING POWER
30%

…relative to Intel 90nm process

45nm in 2007

TRANSISTOR PERFORMANCE
20%



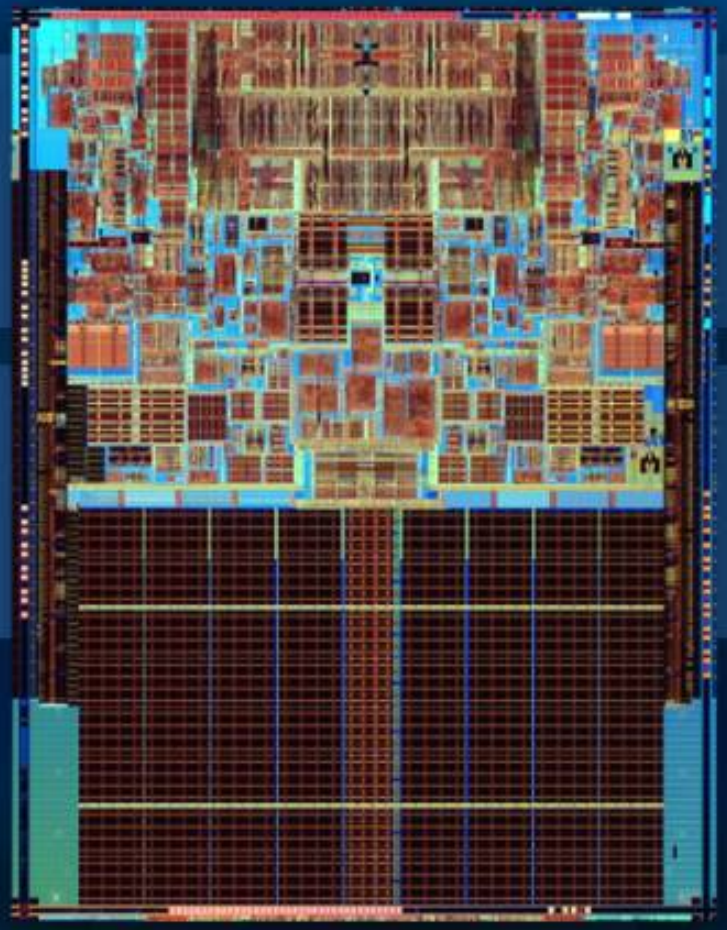
SWITCHING POWER
30%

…relative to Intel 65nm process

Five Key Innovations

Intel® Wide Dynamic Execution

Intel® Intelligent Power Capability



Intel® Advanced Digital Media Boost

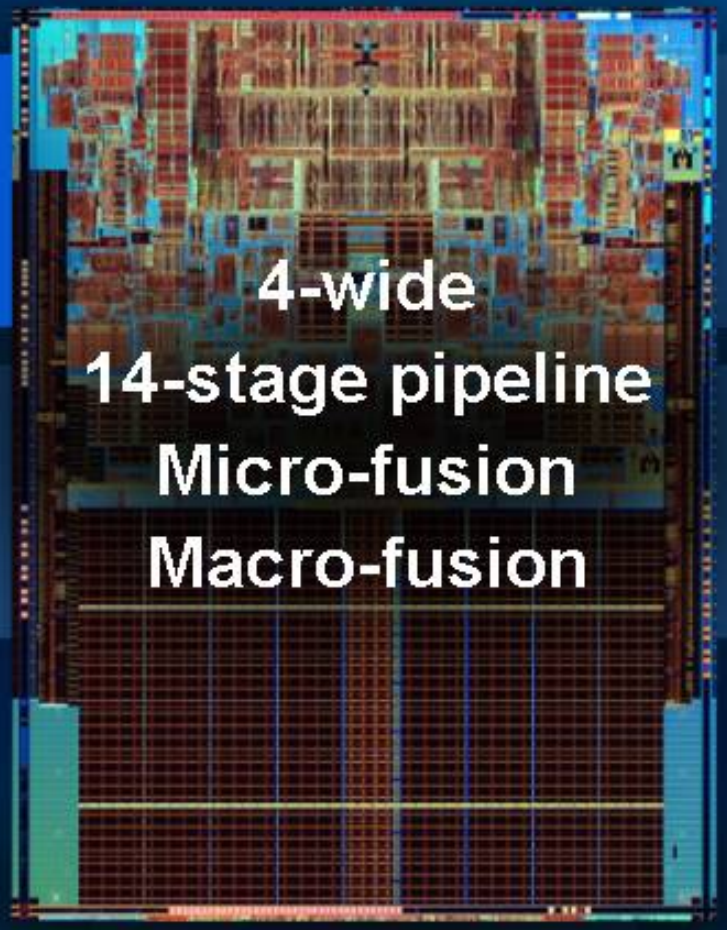
Intel® Smart Memory Access

Intel® Advanced Smart Cache

Five Key Innovations

Intel® Wide Dynamic Execution

Intel® Intelligent Power Capability



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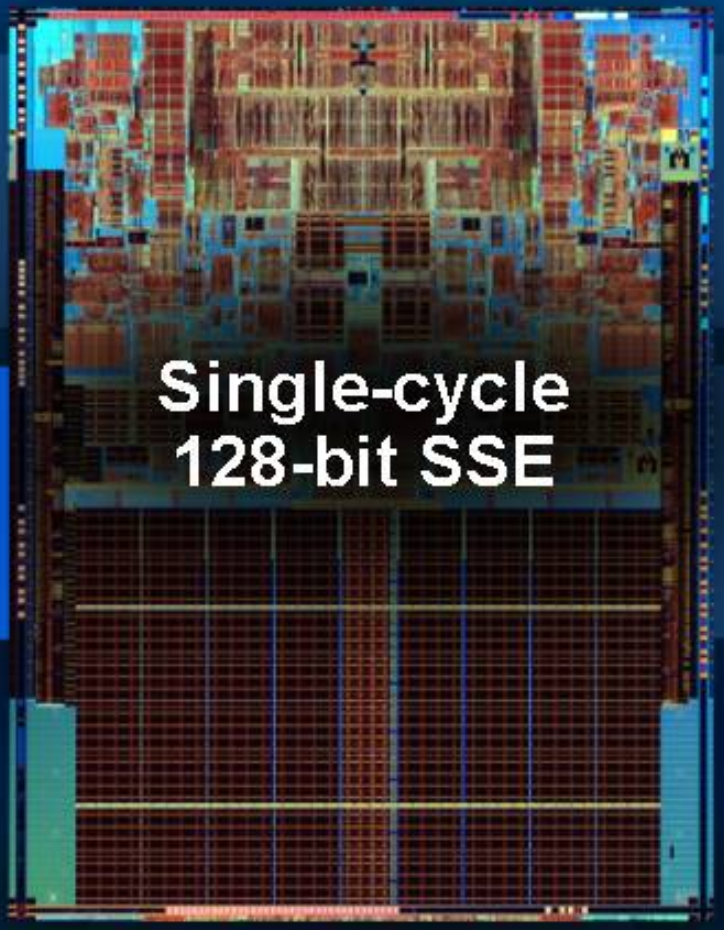

Intel® Advanced Digital Media Boost

Intel® Smart Memory Access

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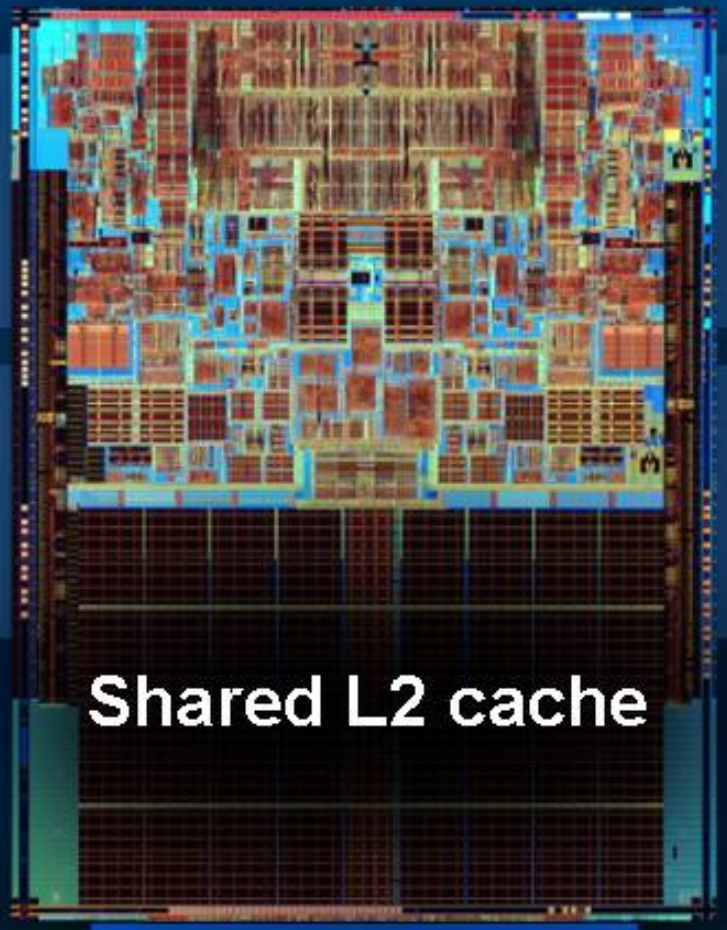
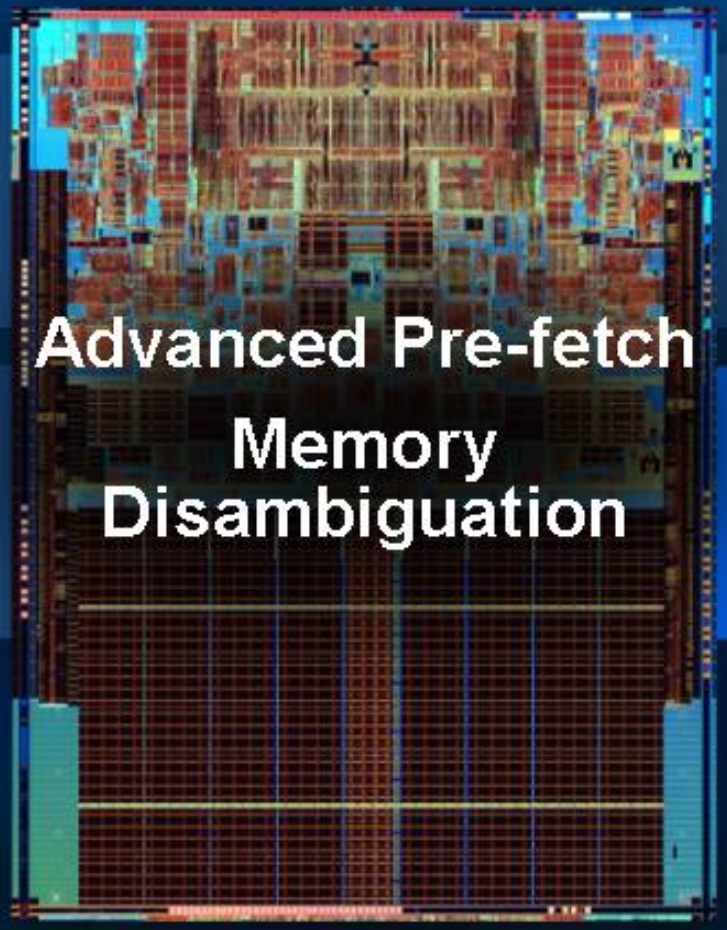


Intel® Advanced Smart Cache

Five Key Innovations

Intel® Wide Dynamic Execution

Intel® Intelligent Power Capability



Intel® Advanced Digital Media Boost

Intel® Smart Memory Access

Intel® Advanced Smart Cache

Five Key Innovations

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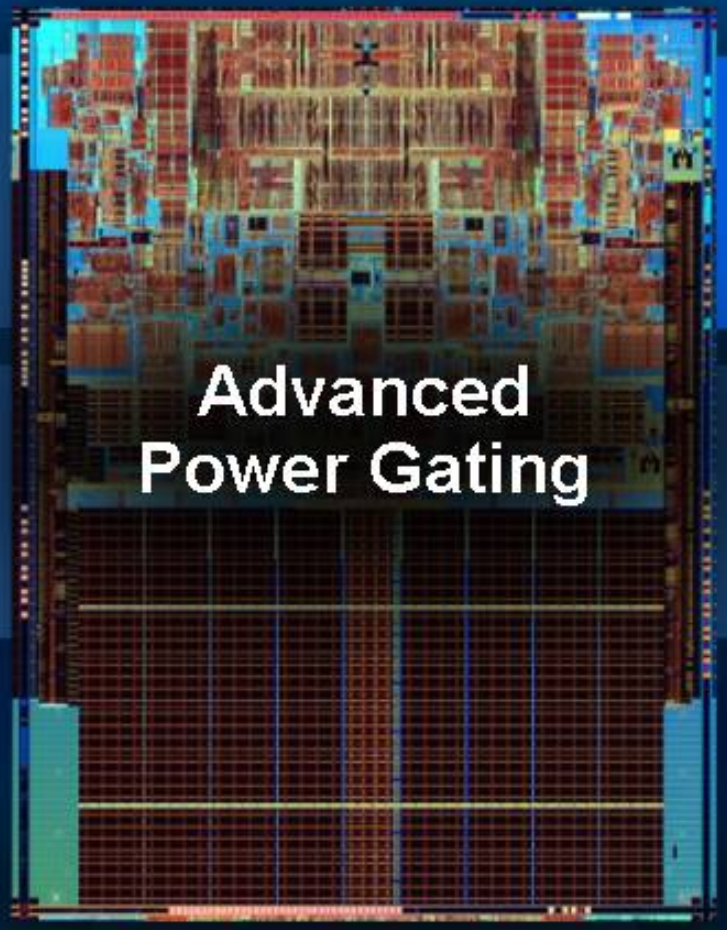


Intel® Advanced Digital Media Boost

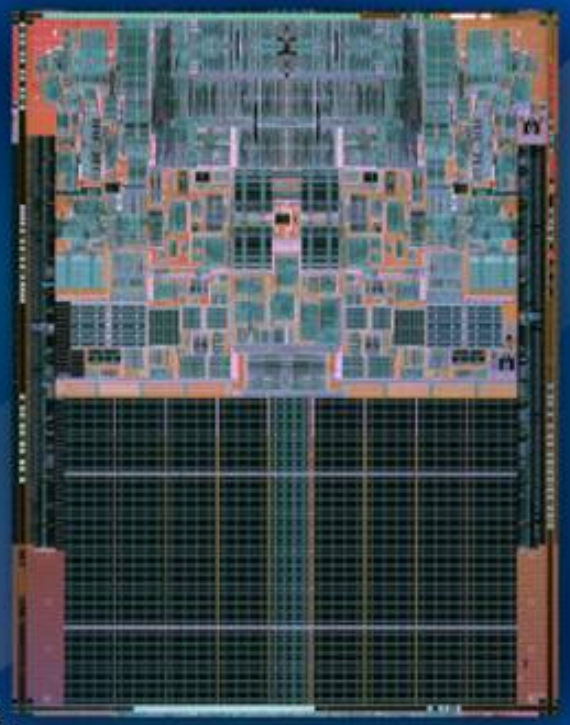
Intel® Smart Memory Access

Intel® Advanced Smart Cache

Merom for Mobile

PERFORMANCE

>20%



BATTERY LIFE

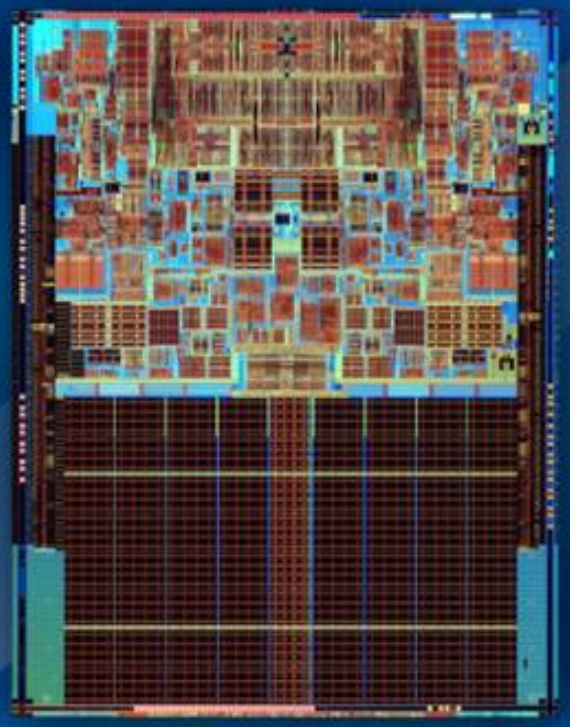
Constant

...relative to
Intel® Core Duo™ T2600

Source: Intel based on estimated SPECint*_rate_base2000

Conroe for the Desktop

PERFORMANCE
40%



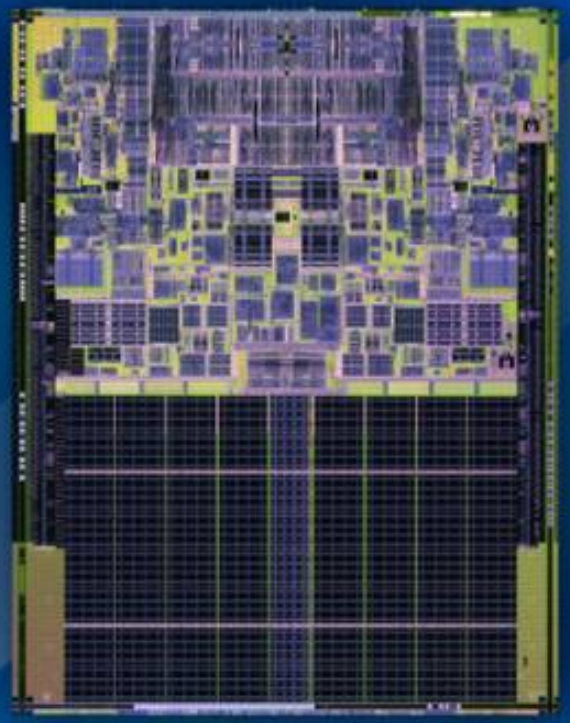
POWER
40%

…relative to
Intel® Pentium® D 950

Source: Intel based on estimated SPECint*_rate_base2000 and thermal design power

Woodcrest for Servers

PERFORMANCE
80%



POWER
35%

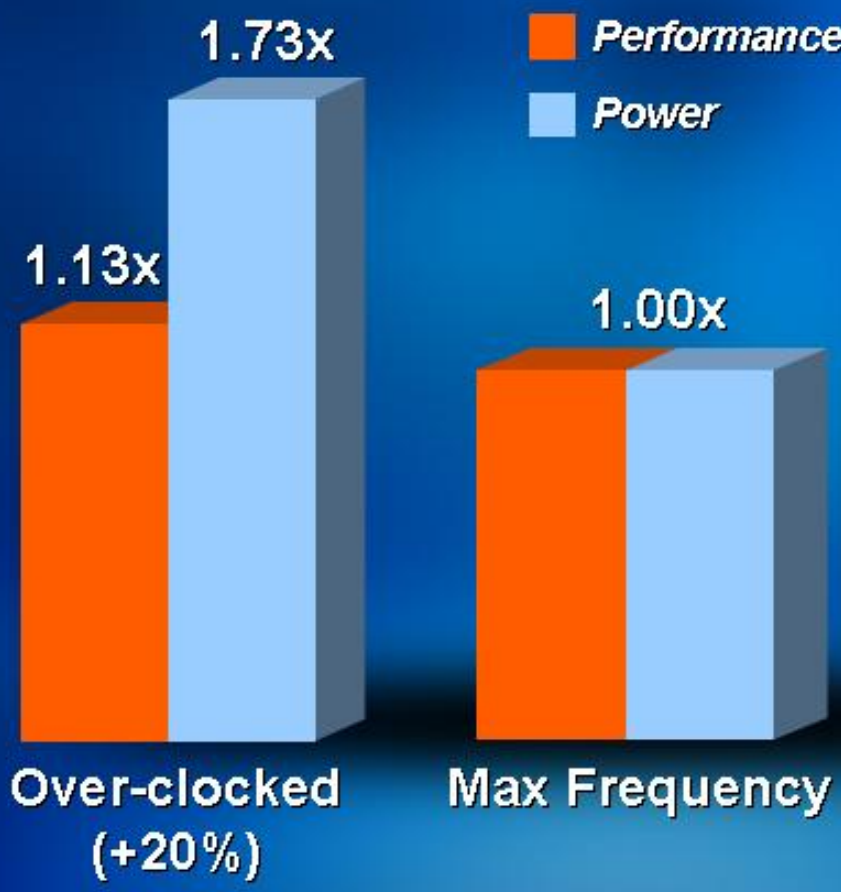
...relative to
Intel® Xeon® 2.8GHz 2x2MB

Source: Intel based on estimated SPECint*_rate_base2000 and thermal design power

Why Multi-Core?

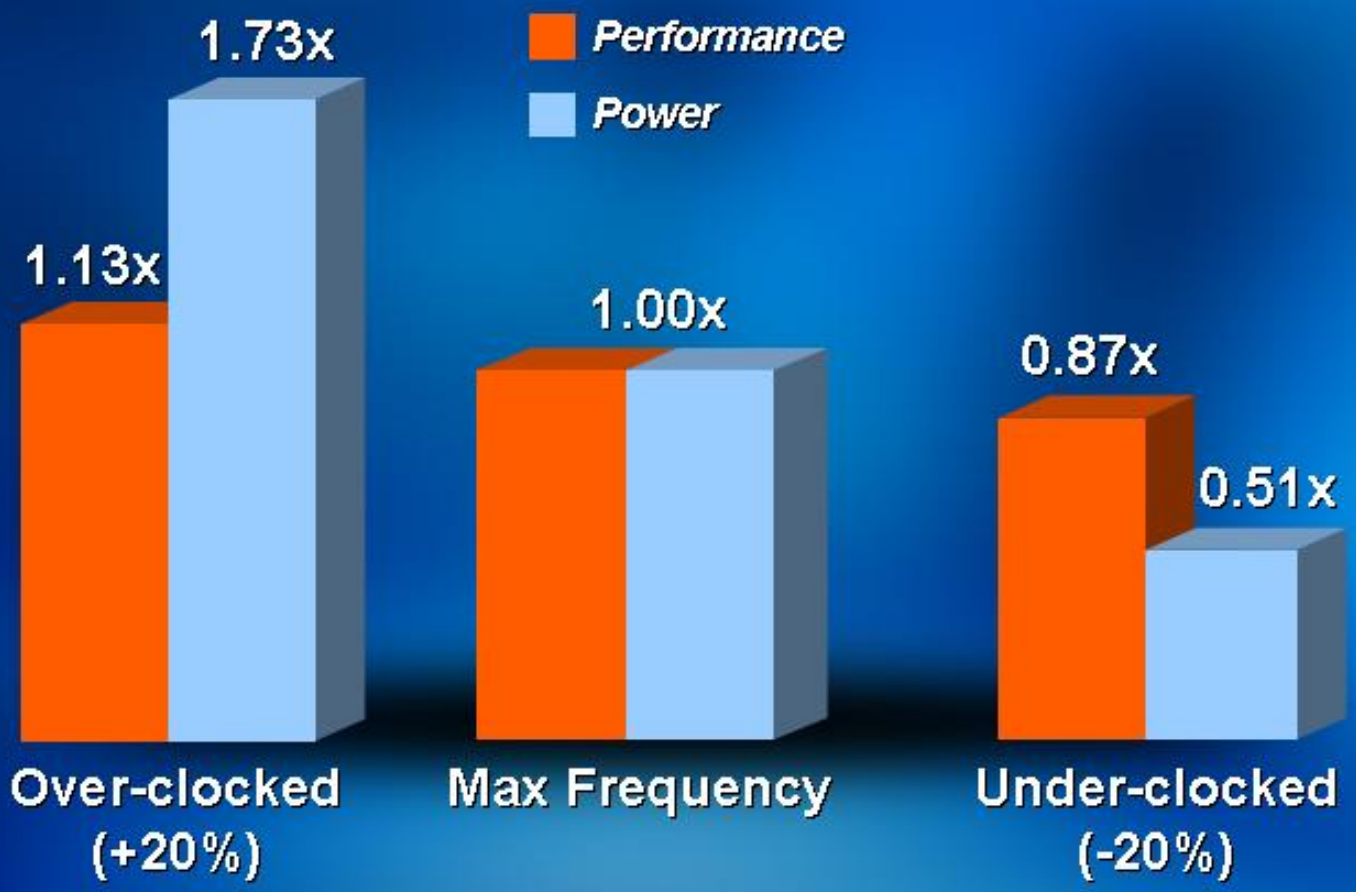
Relative single-core frequency and Vcc

Over-clocking



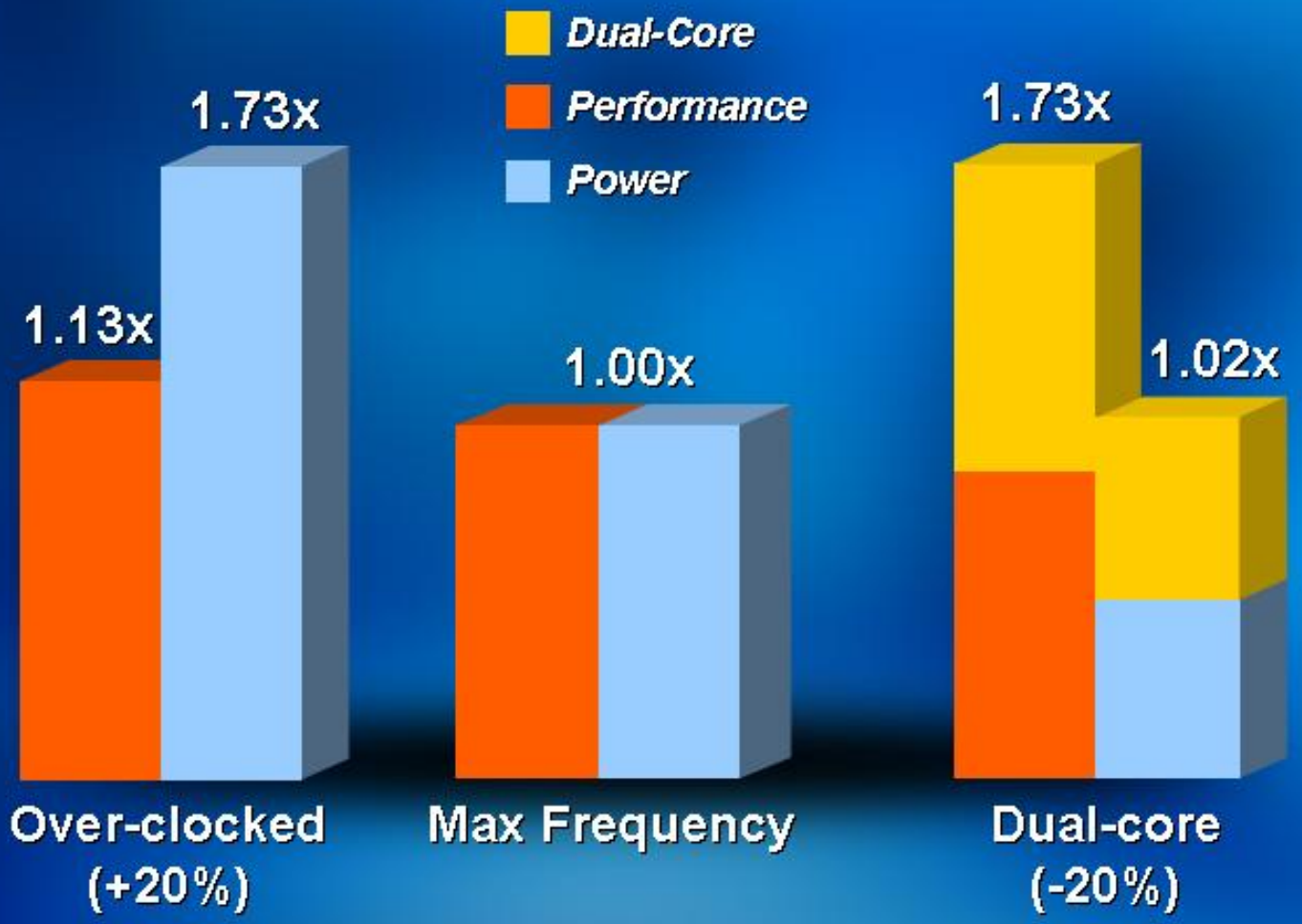
Relative single-core frequency and Vcc

Under-clocking



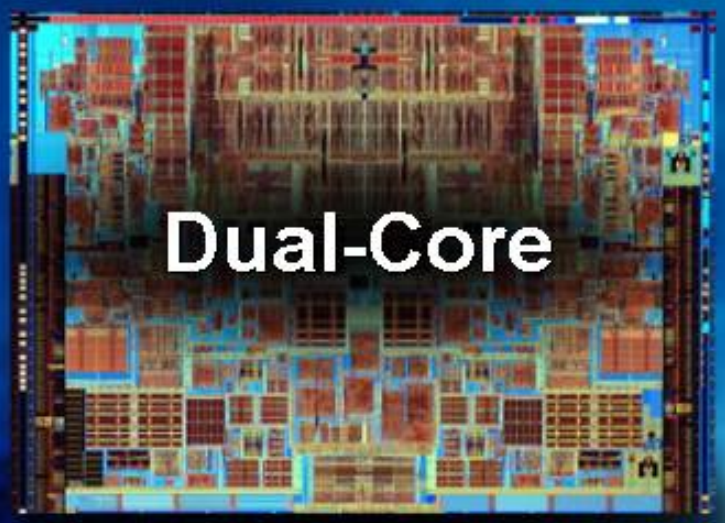
Relative single-core frequency and Vcc

Multi-Core Energy-Efficient Performance

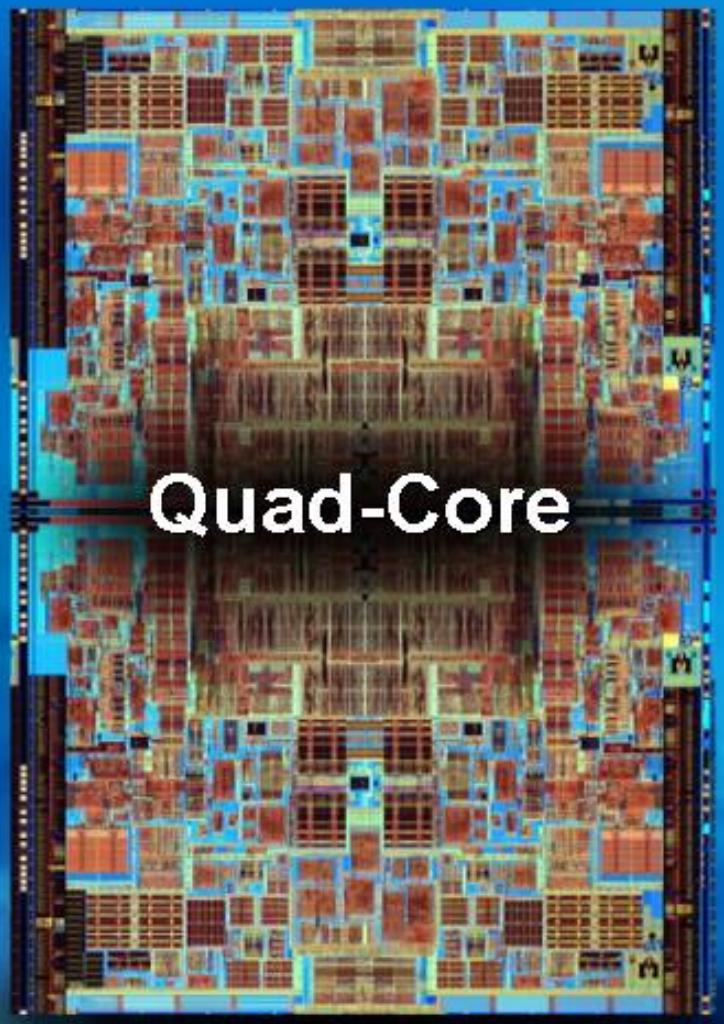


Relative single-core frequency and Vcc

Multi-Core Trajectory



2006



2007

Enabling Multi-Threaded Software

Automatic Loop Parallelization

Critical Path Analysis with Thread Profiler

Load Balancing with VTune™

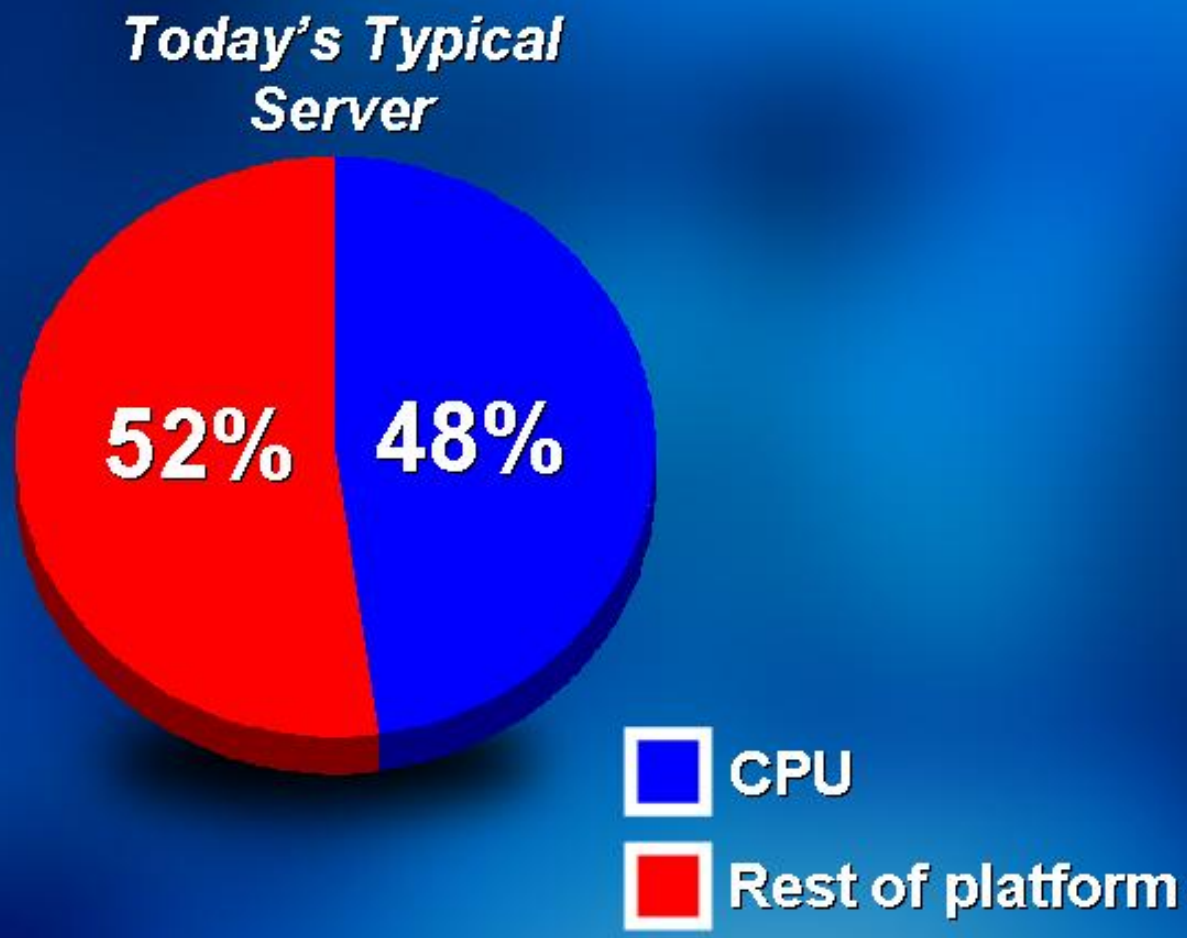
Optimized MKL and IPP Libraries

Multi-threading Momentum

Activision (Ravensoft)
Adobe
Algorithmics
Alias
Autodesk
Business Objects
Cakewalk
CodecPeople
Computer Associates
Corel (WordPerfect)
Cyberlink
Discreet
IBM
id Software
Landmark
Macromedia
Mainconcept
Maxon
mental images
Microsoft (Office Suite)
Midway
MSC
Novell SUSE
Oracle
Pegasus
Pinnacle
Pixar (Renderman)
Paradigm
PTC
Red Hat
SAP
SAS
Siebel CRM
Signet
Skype
SLB
SnapStream
Sonic (Roxio)
Sony
Steinberg
SunGard
Sybase
Symantec
Thomson
THQ
Ubisoft
UGS
Valve
Yahoo (Musicmatch)

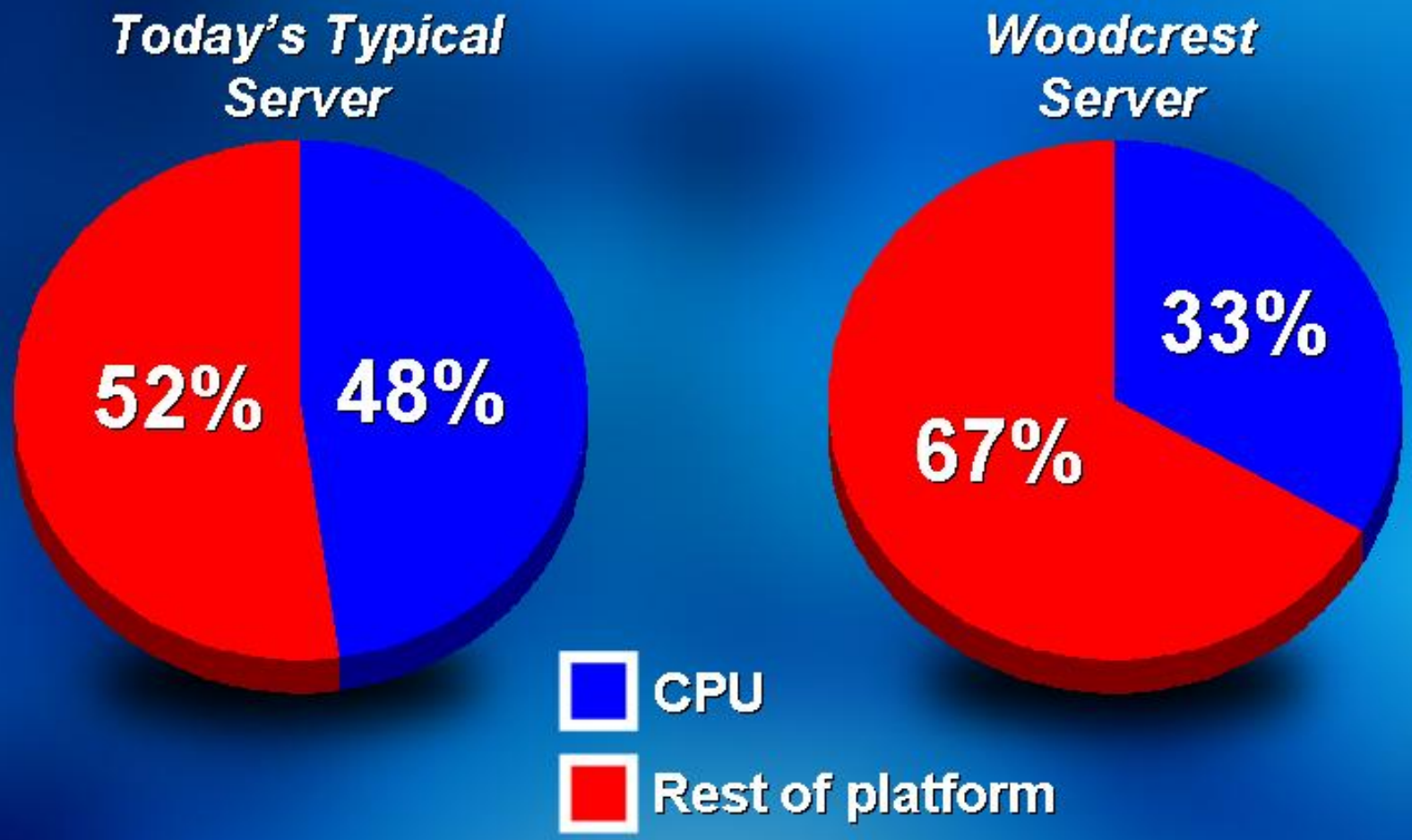

Core™ microarchitecture
Multi-core processors
Multi-threaded software
Are we done?

Today's Platform Even Split



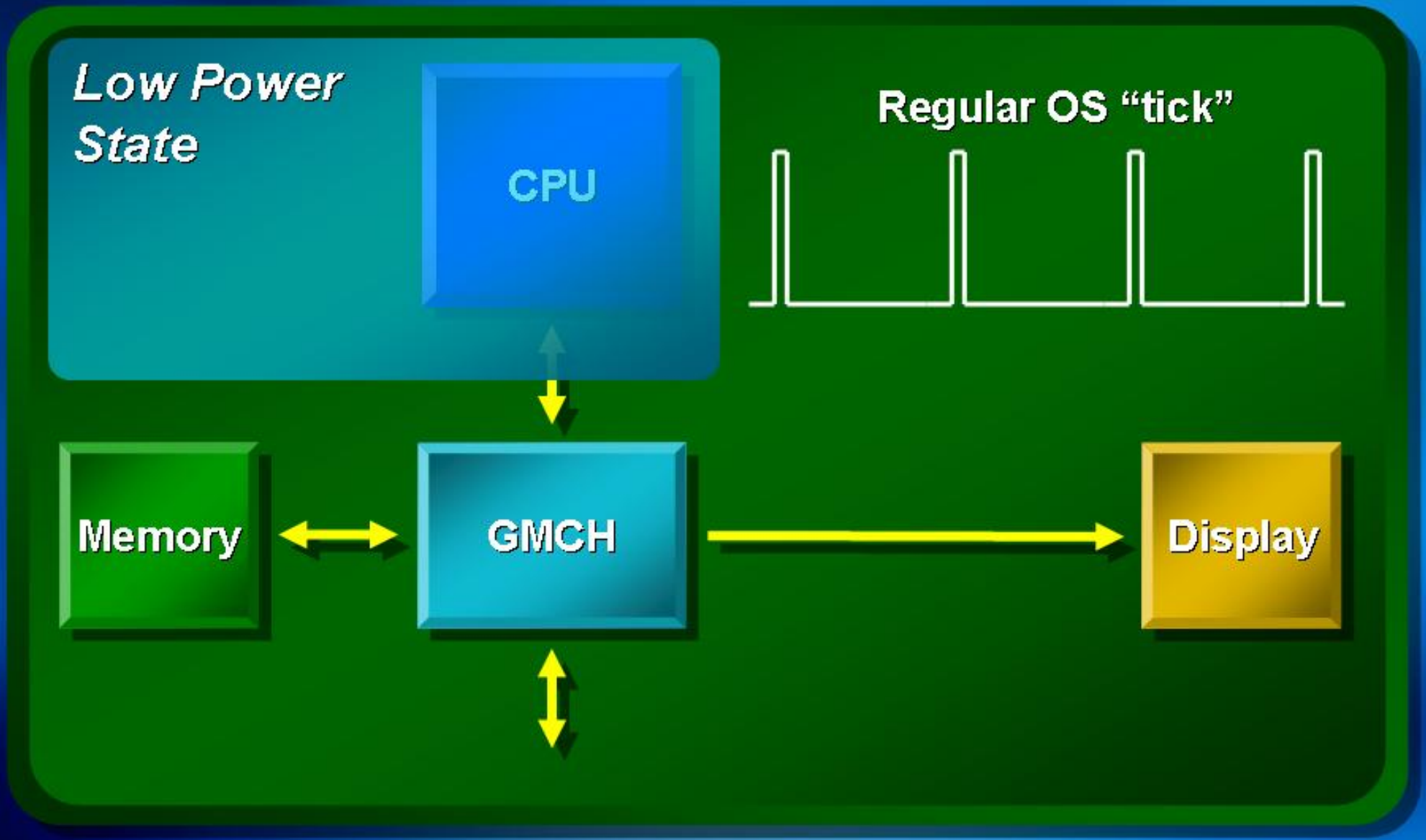
Based on power consumption running SPECint_rate2000

Tomorrow's Platform Demands

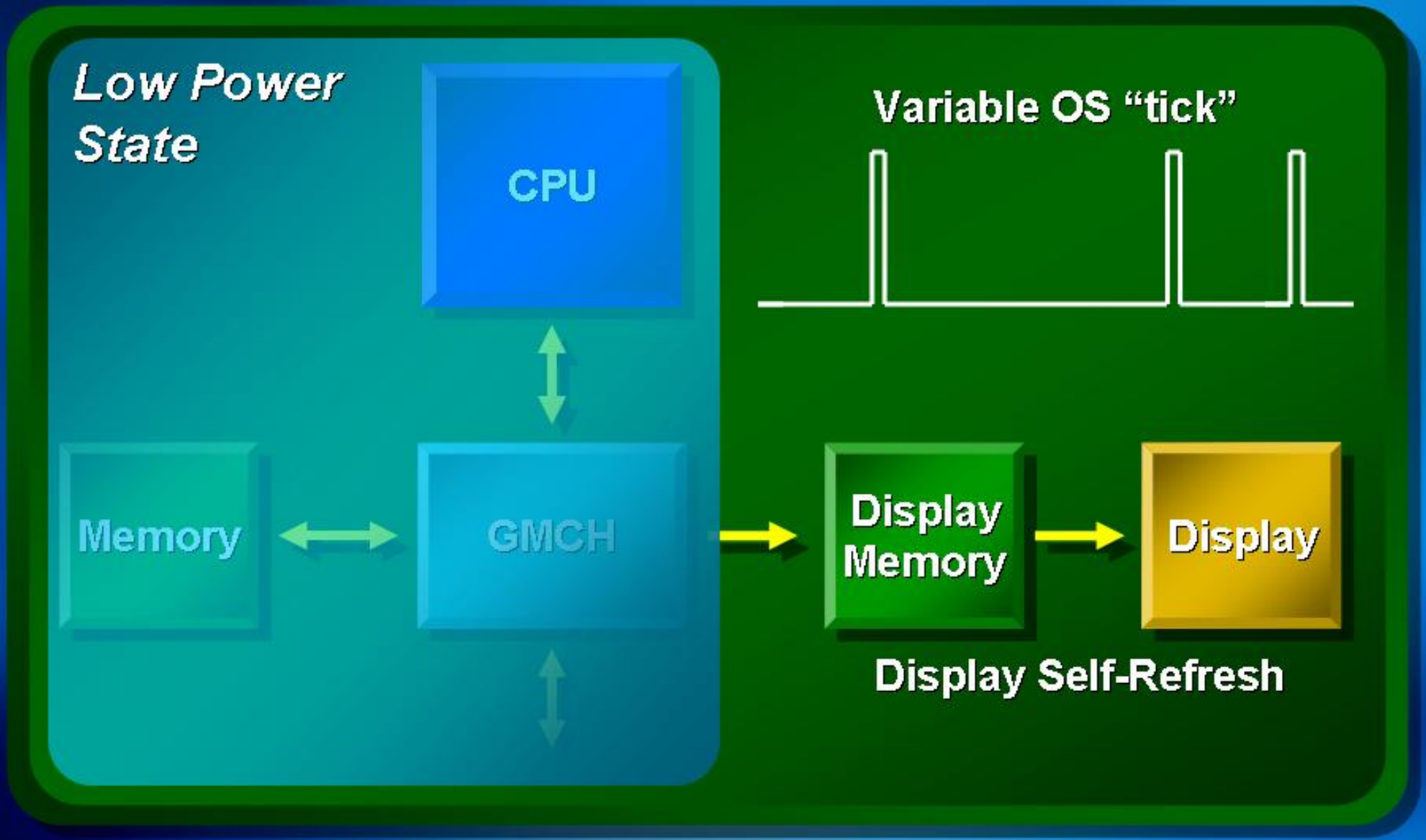


Based on power consumption running SPECint_rate2000

Today's Platform at Idle



Improving Platform Idle Efficiency



What Will it Take?

Operating System

Communication and Storage

Display

Standards


The Dawn of
Energy-Efficient Performance