# Giving Technology 2020 Vision

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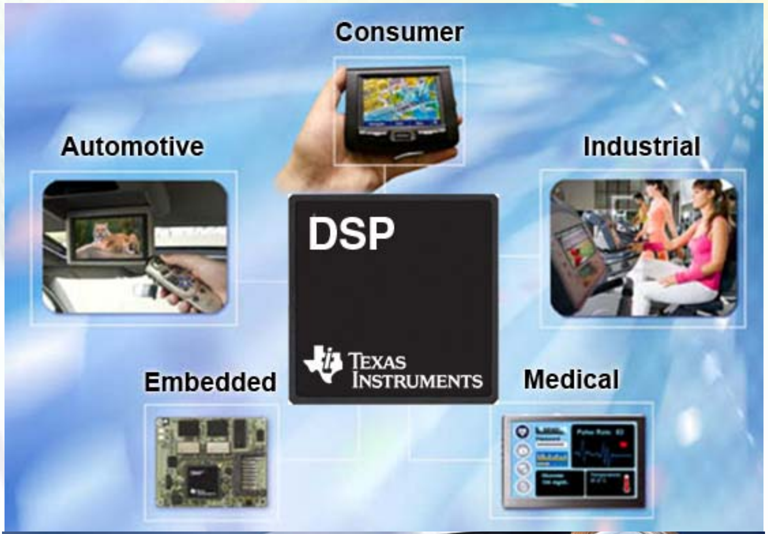
**Texas Instruments**

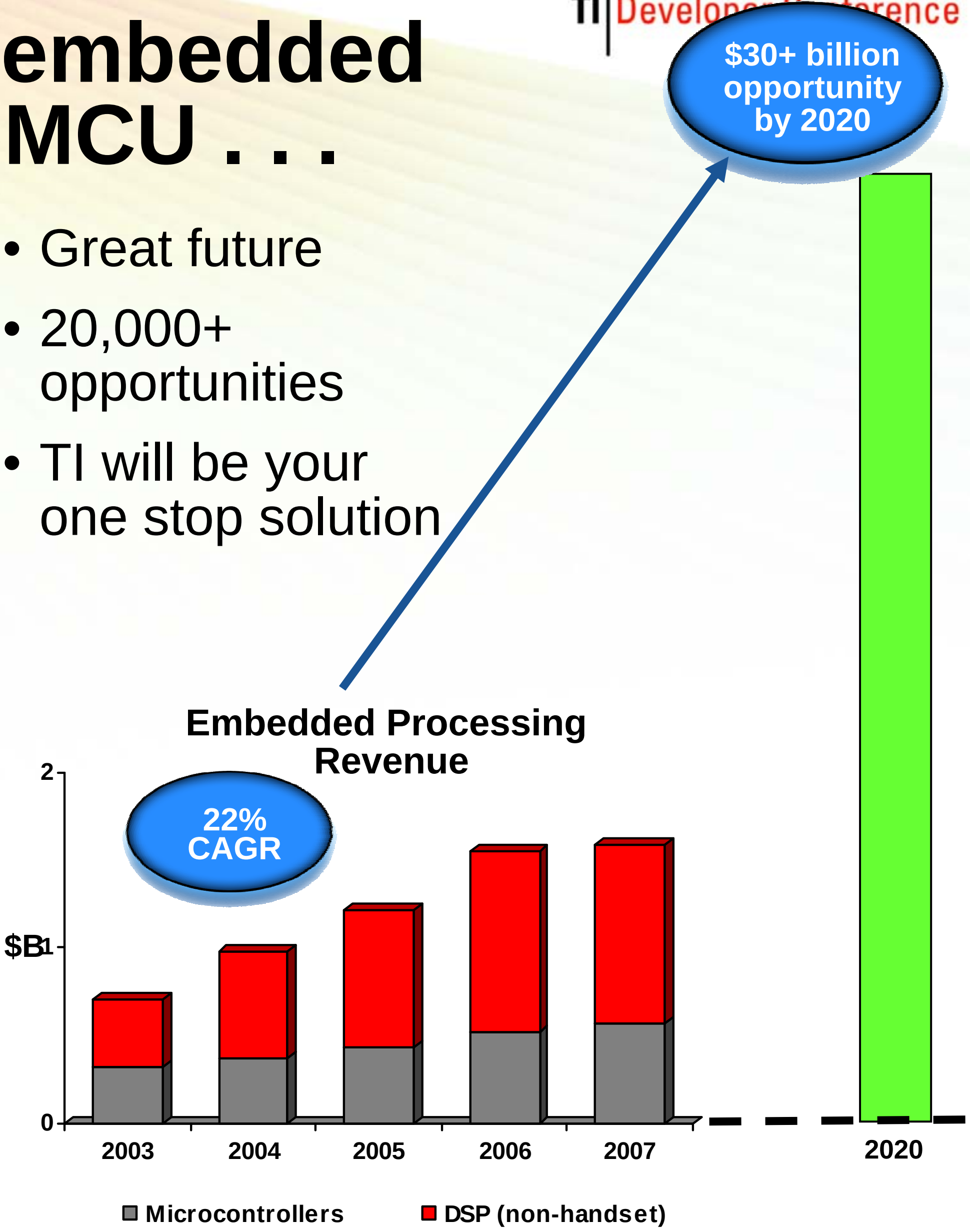
# Giving Technology 2020 Vision

- What will be the market drivers?
- What will be the state of the art of IC technology in 2020?
- How will technology enable your products to be differentiated?

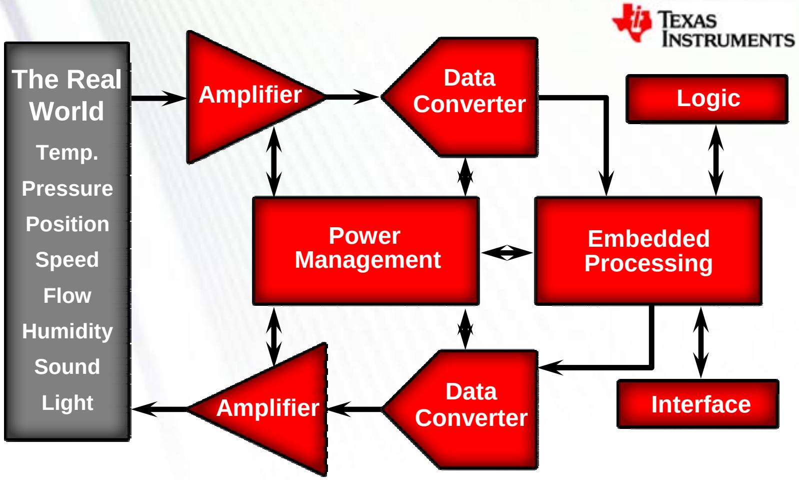
# Tightening focus on embedded processing: DSP, MCU . . .


Consumer
Automotive
Industrial
DSP
Texas Instruments
Embedded
Medical

- Great future
- 20,000+ opportunities
- TI will be your one stop solution



# Tightening focus on analog



Texas Instruments

**The Real World**

Temp.
Pressure
Position
Speed
Flow
Humidity
Sound
Light

Amplifier

Data Converter

Logic

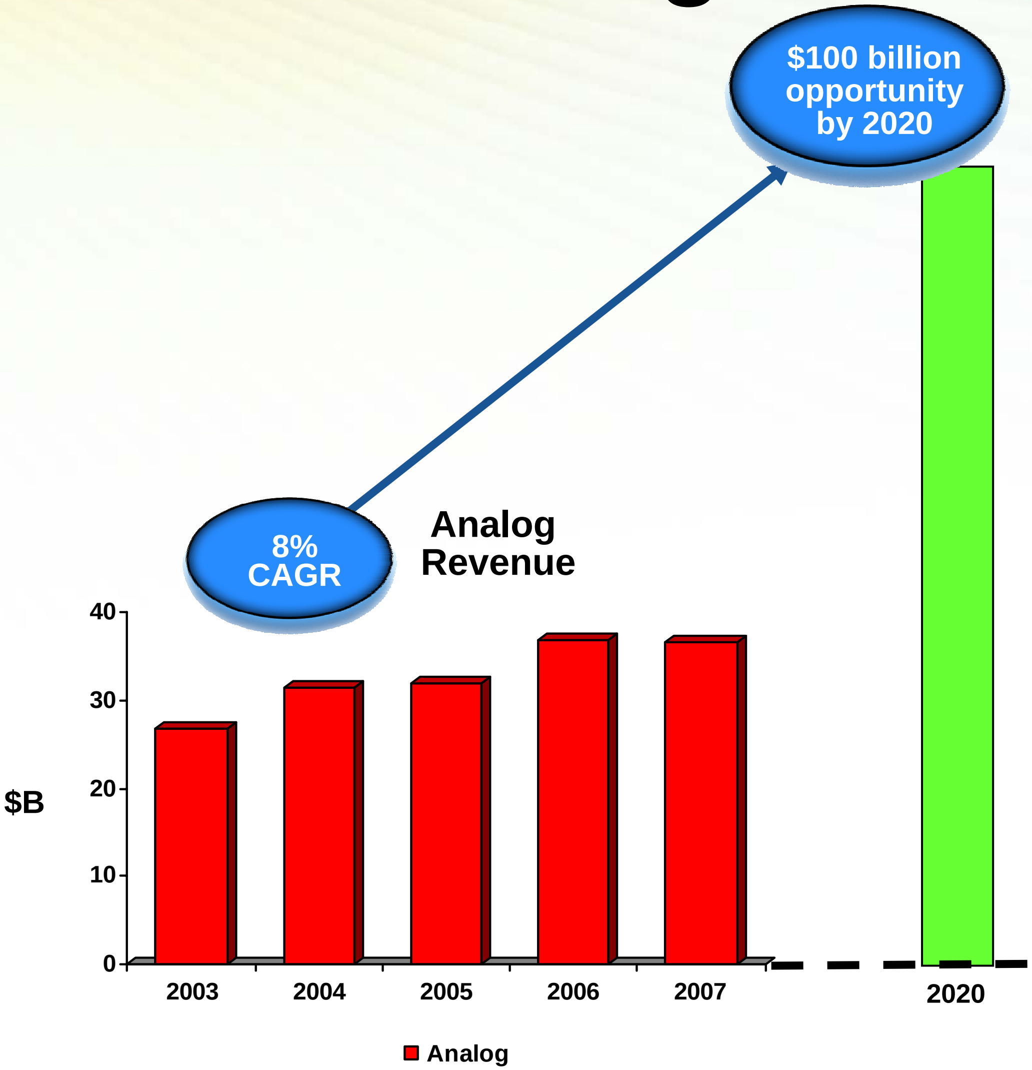
Power Management

Embedded Processing

Amplifier

Data Converter

Interface

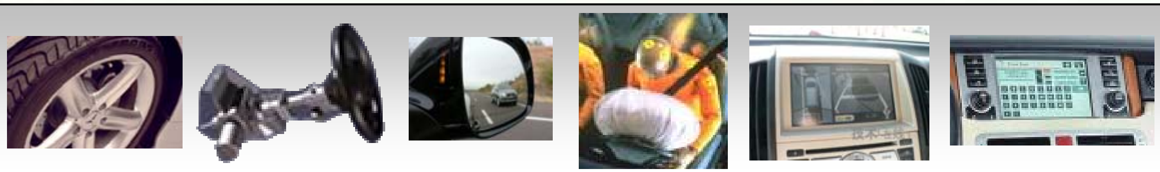


# Fast-growing, diversified markets

**Video/ Imaging**

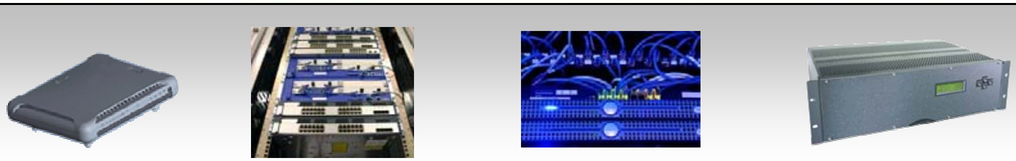
. . .

**Automotive**



. . .

**Infrastructure**



. . .

**Industrial**

. . .

**Medical**

. . .

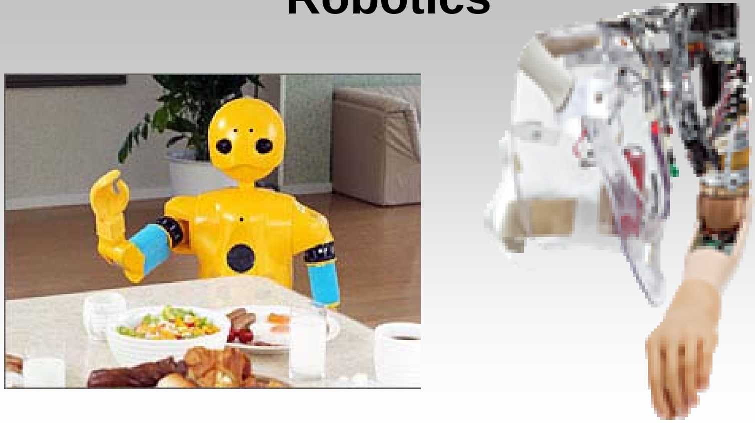
**Yet to be invented**

. . .

# Driving the market to 2020

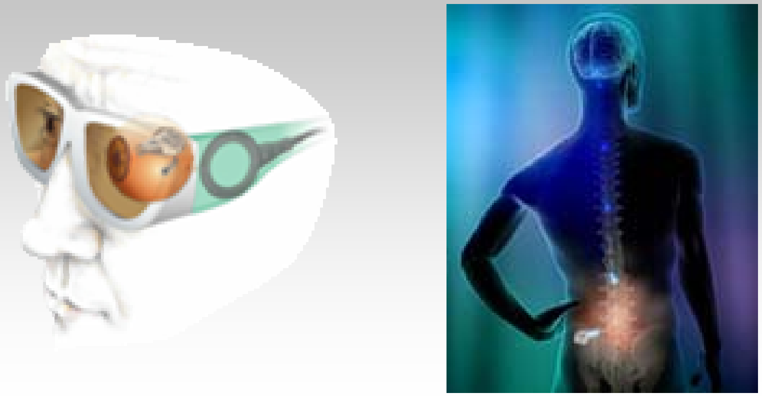
**Green**

**Robotics**



**Full immersion**

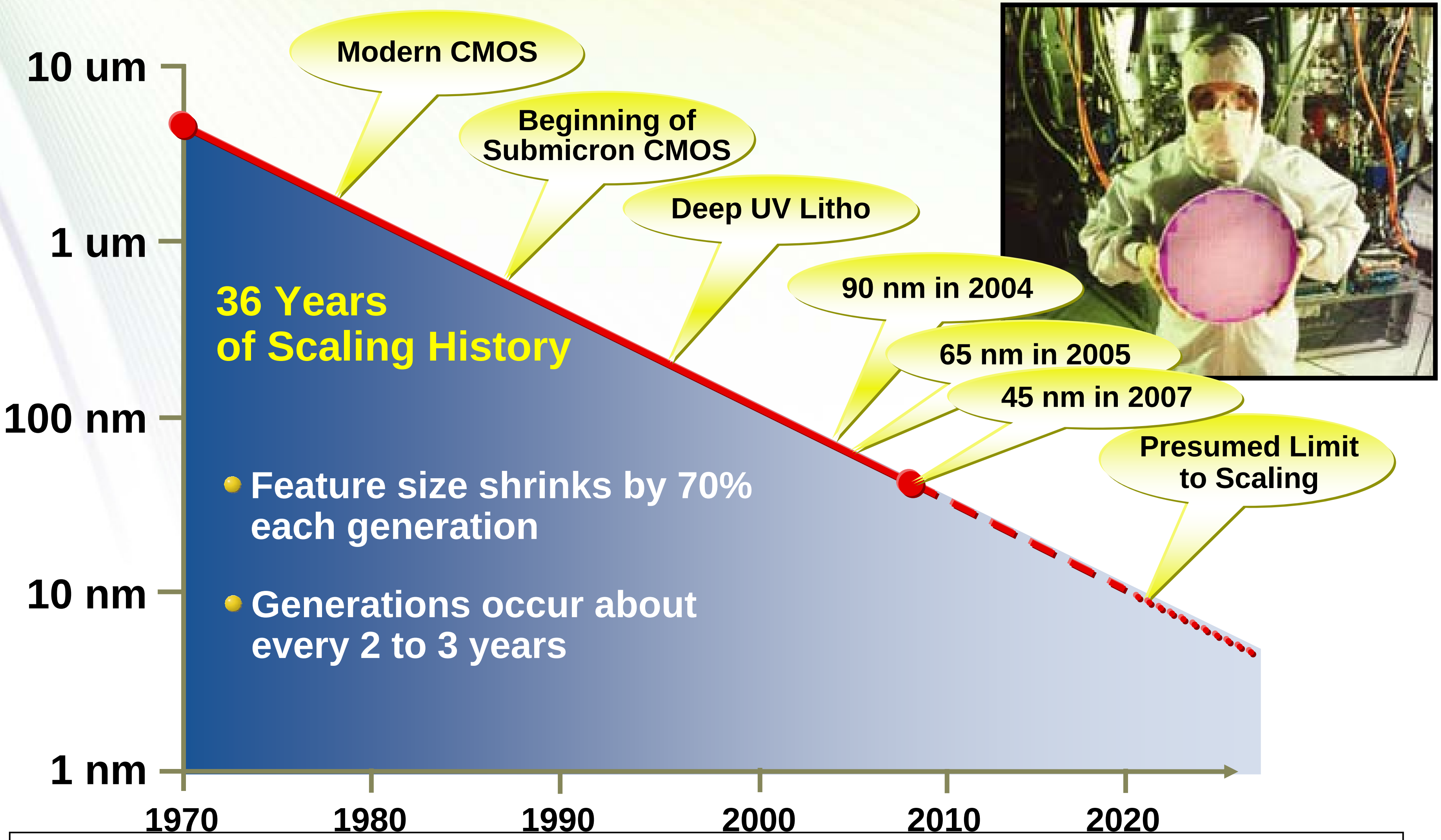
**Health**



# Defining state of the art IC technology for 2020

- Moore’s law
- Performance increases
- Lower power dissipation
- System in package integration
- New development environments

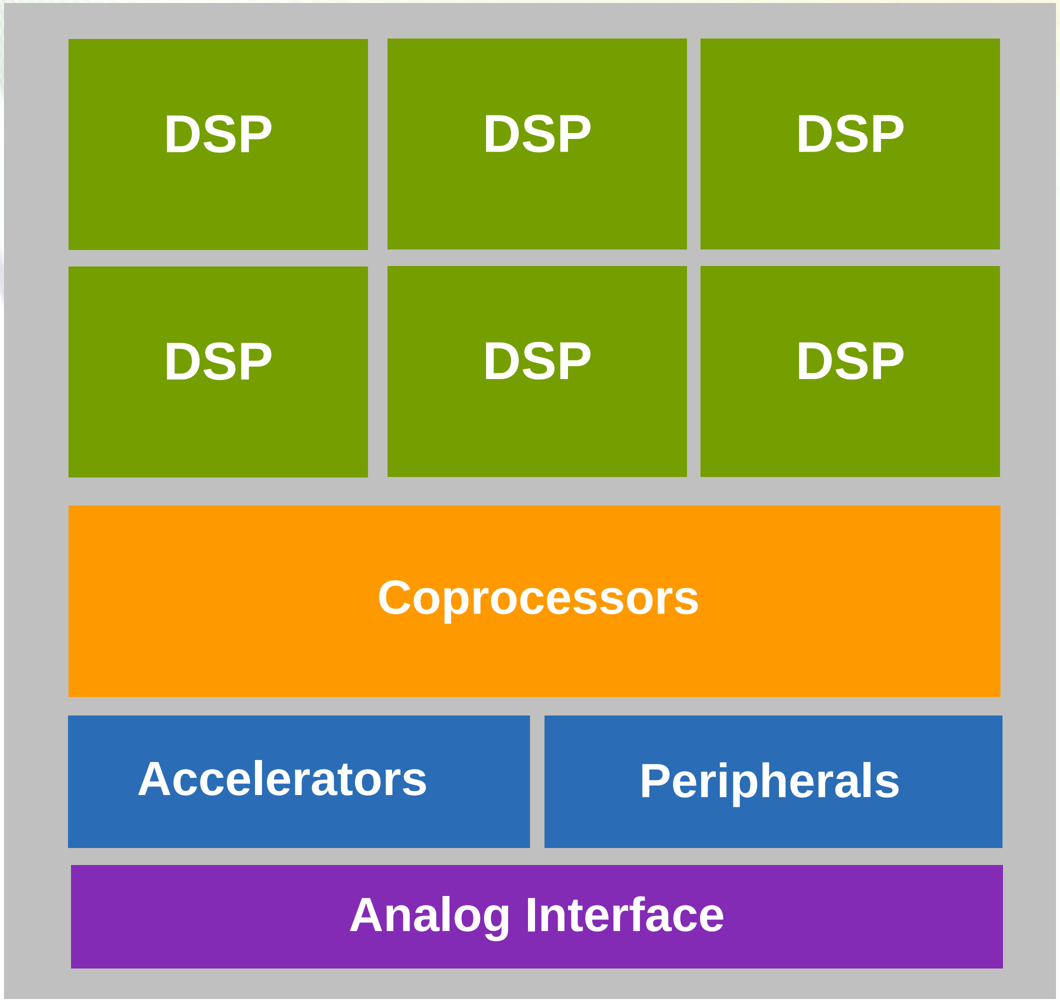
# Moore’s Law



**36 Years of Scaling History**

- Feature size shrinks by 70% each generation
- Generations occur about every 2 to 3 years

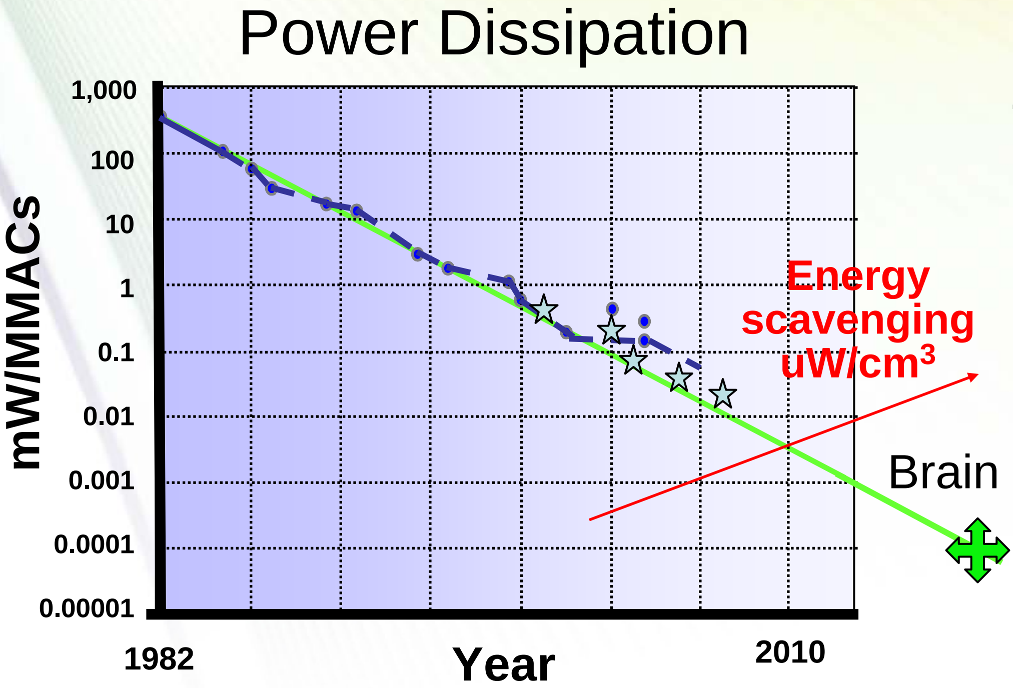
# Achieving performance increases

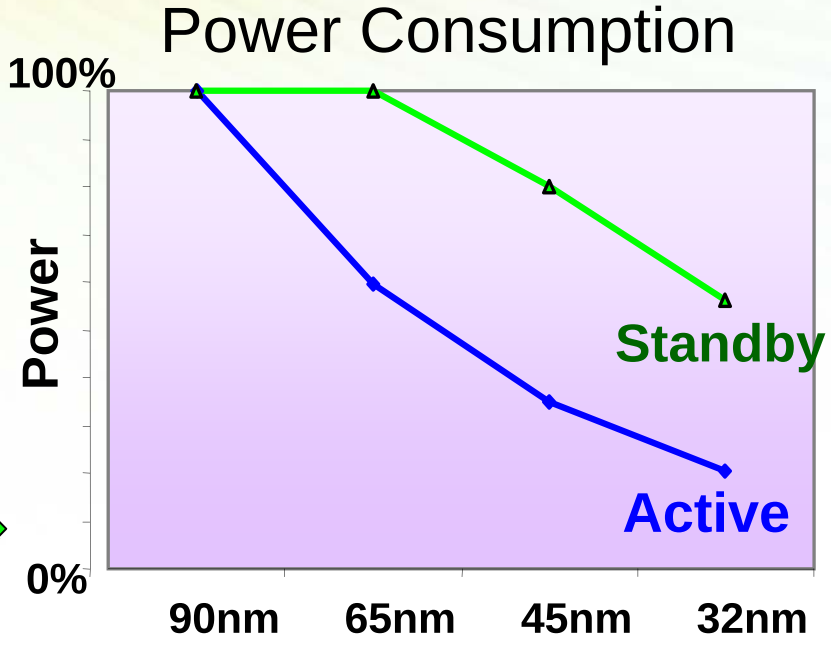

DSP
DSP
DSP
DSP
DSP
DSP
Coprocessors
Accelerators
Peripherals
Analog Interface

## Higher-performance through parallelism – More multi-core DSPs + flexible coprocessors

- The trend continues
  - More programmable DSP cores when generality is important.
  - Add optimized programmable coprocessors.
  - Use accelerators where the function is more fixed.
- Look for even more programmable DSP cores in the future:
  - 6 → 32 → …
  - Stacking of chips for increasing integration

# Lower power dissipation





**Gene's Law:** Power dissipation will decrease by half every 18 months

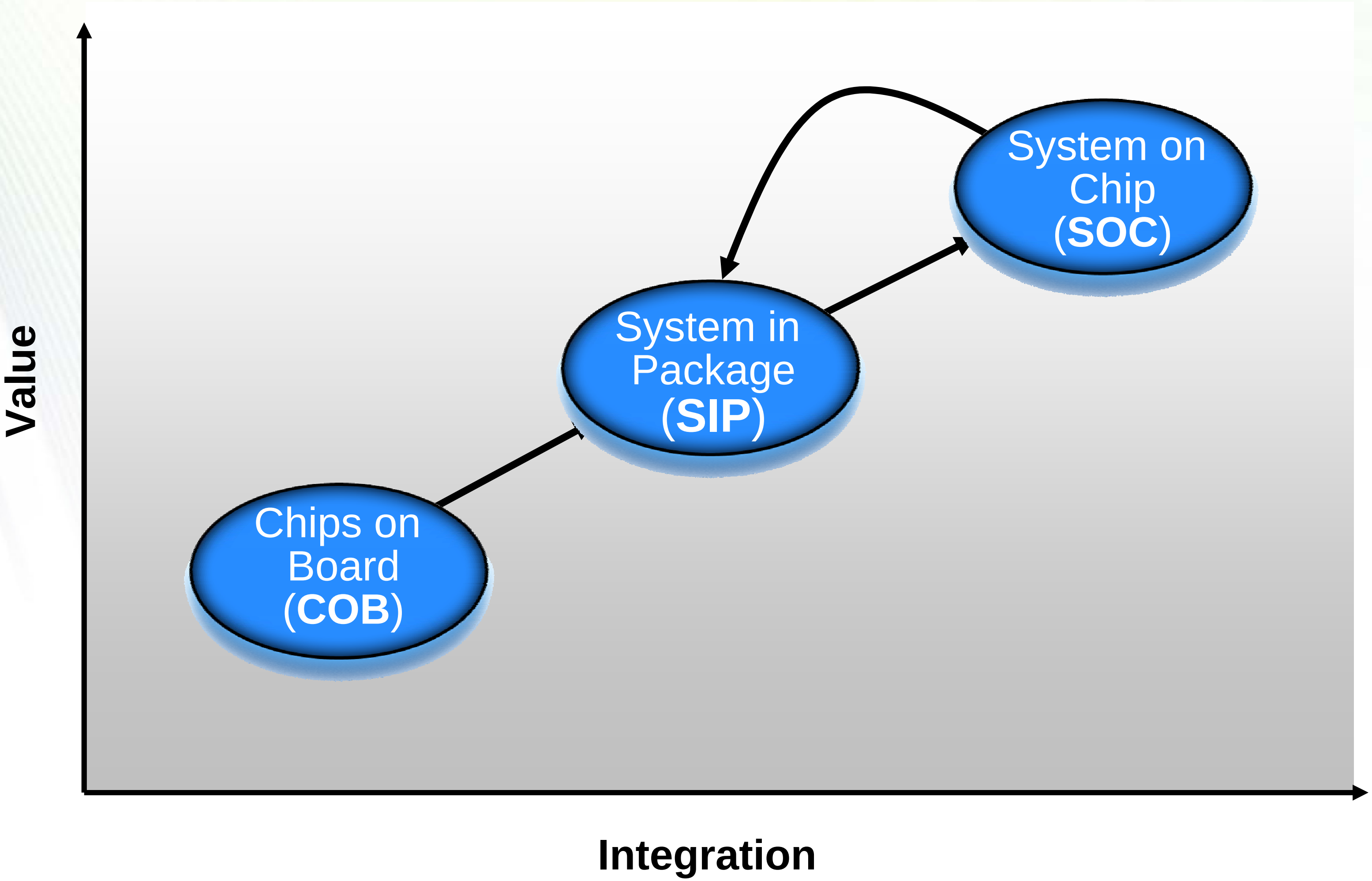
Gene's Law 🟩

DSP Power ●

Mobile Phone ☆

- Lower power dissipation per function will be driven down aggressively – allowing perpetual devices
- Batteries will be, in some cases, replaced with energy scavenging plus energy storage elements

# Roadmap of the future: System in package integration

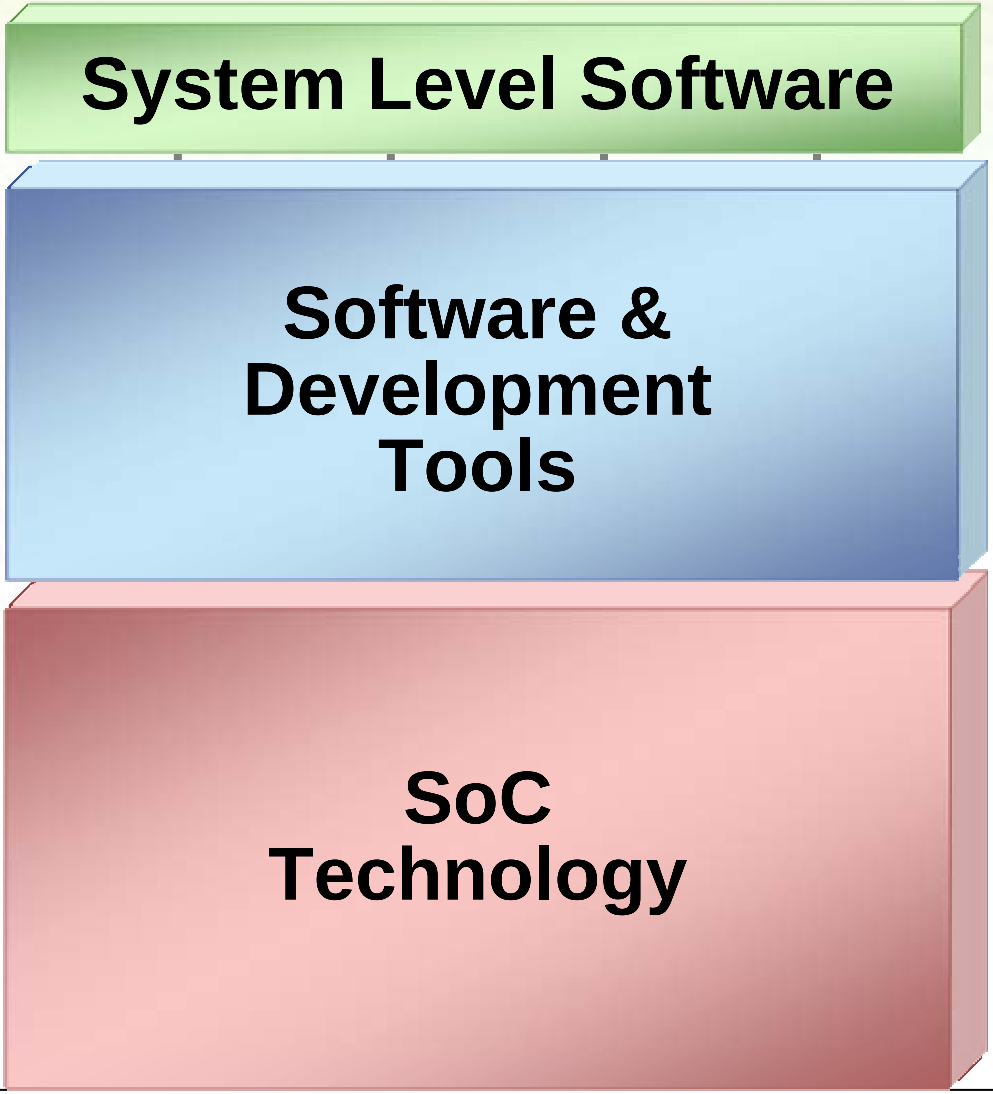

Value
Integration
Chips on Board (**COB**)
System in Package (**SIP**)
System on Chip (**SOC**)

# Redefining development environments

- Differentiation
- Scalable

- Open Platform
- Upgradeable
- Application-specific optimization

- Balanced Architecture
- Highly Integrated
- Flexible
- Scalable
- Faster Time-to-Market



**System Level Software**

**Software & Development Tools**

**SoC Technology**

**Will incorporate:**

- Higher level language
- Both analog and digital
- A complete knowledge of components in the system
- A comprehension of Amdahl's law – it will know what parts can be parallelized and what parts can not be

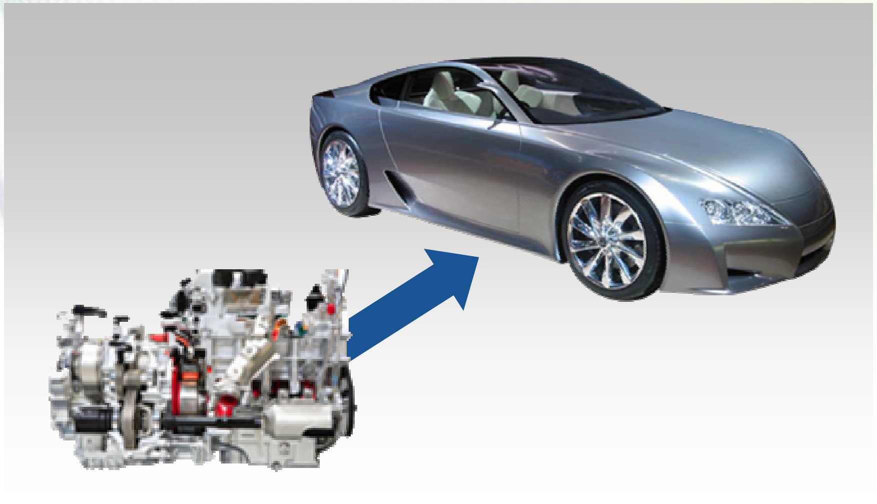
# How 2020 technology will enable customer differentiation

- Power efficiency & programmability
- Systems expertise
- Total system integration
- Software & development environments

# How power efficiency will impact end products

- Half the power means
  - twice the battery life or
  - half the weight of the battery
- Power dissipation will be reduced by orders of magnitude
- The end goal is the perpetual device

# Systems expertise for complete product development



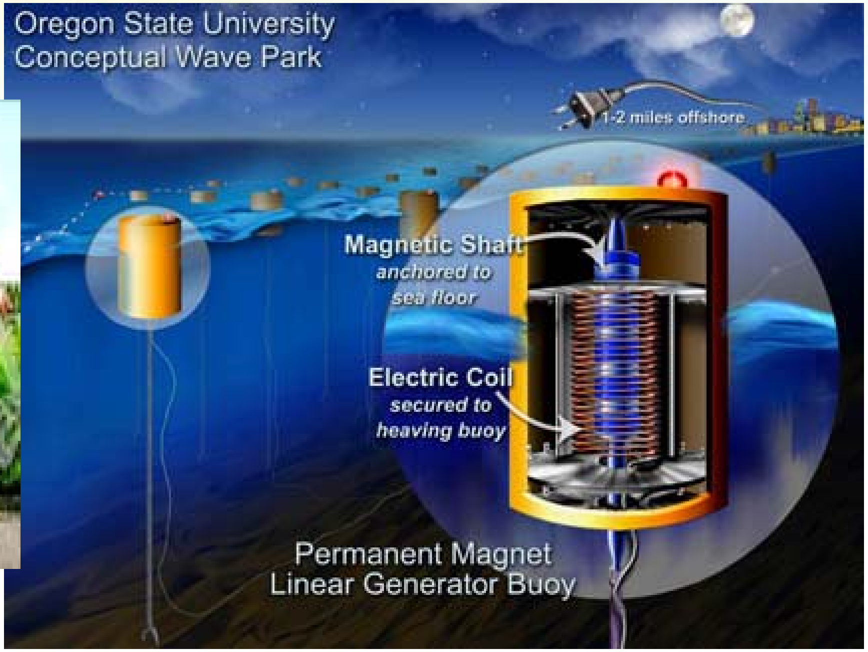
MICROSOFT
Microsoft MS-DOS
Operating System
For Personal Computers Compatible with IBM Personal Computers

Semiconductor companies will support entire systems, enabling customers to focus on value added application differentiation

# Software & development environments

- Software components will be readily available
- Open Source will be the norm
- Value will be found in the use of software rather than in the software
- New system-aware development environments will make it easier to implement

# Achieving Success in 2020


Oregon State University
Conceptual Wave Park
1-2 miles offshore
Magnetic Shaft
anchored to
sea floor
Electric Coil
secured to
heaving buoy
Permanent Magnet
Linear Generator Buoy

**Excitement is just beginning**
**Technology will not be our limiting item**
**Innovation will be the key to the future**

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