



# **Amending Moore's Law for Embedded Applications Panel Discussion**

**David R. Martinez**

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High Performance Embedded Computing**

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# Report Documentation Page

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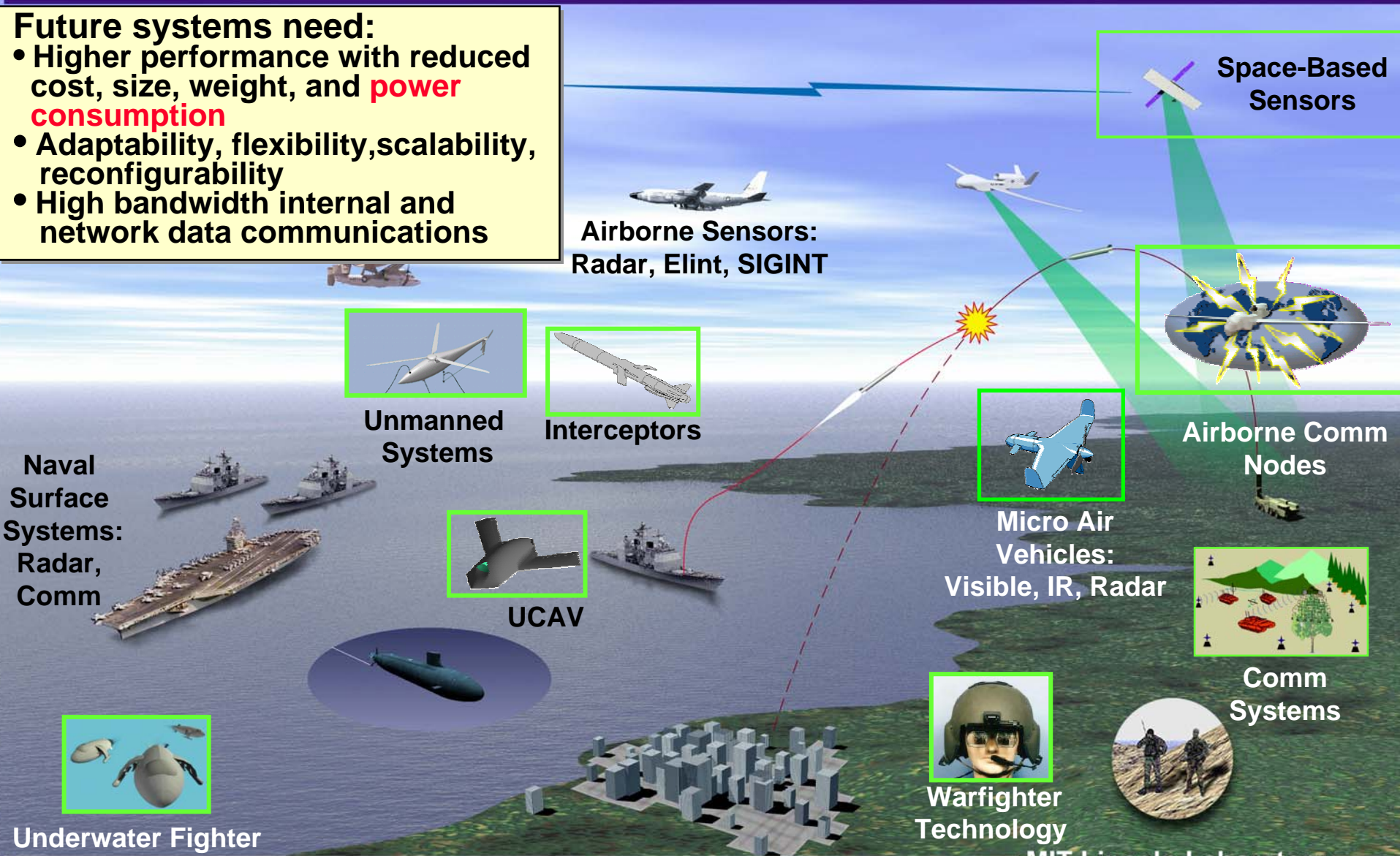
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# DoD Embedded Processing Applications

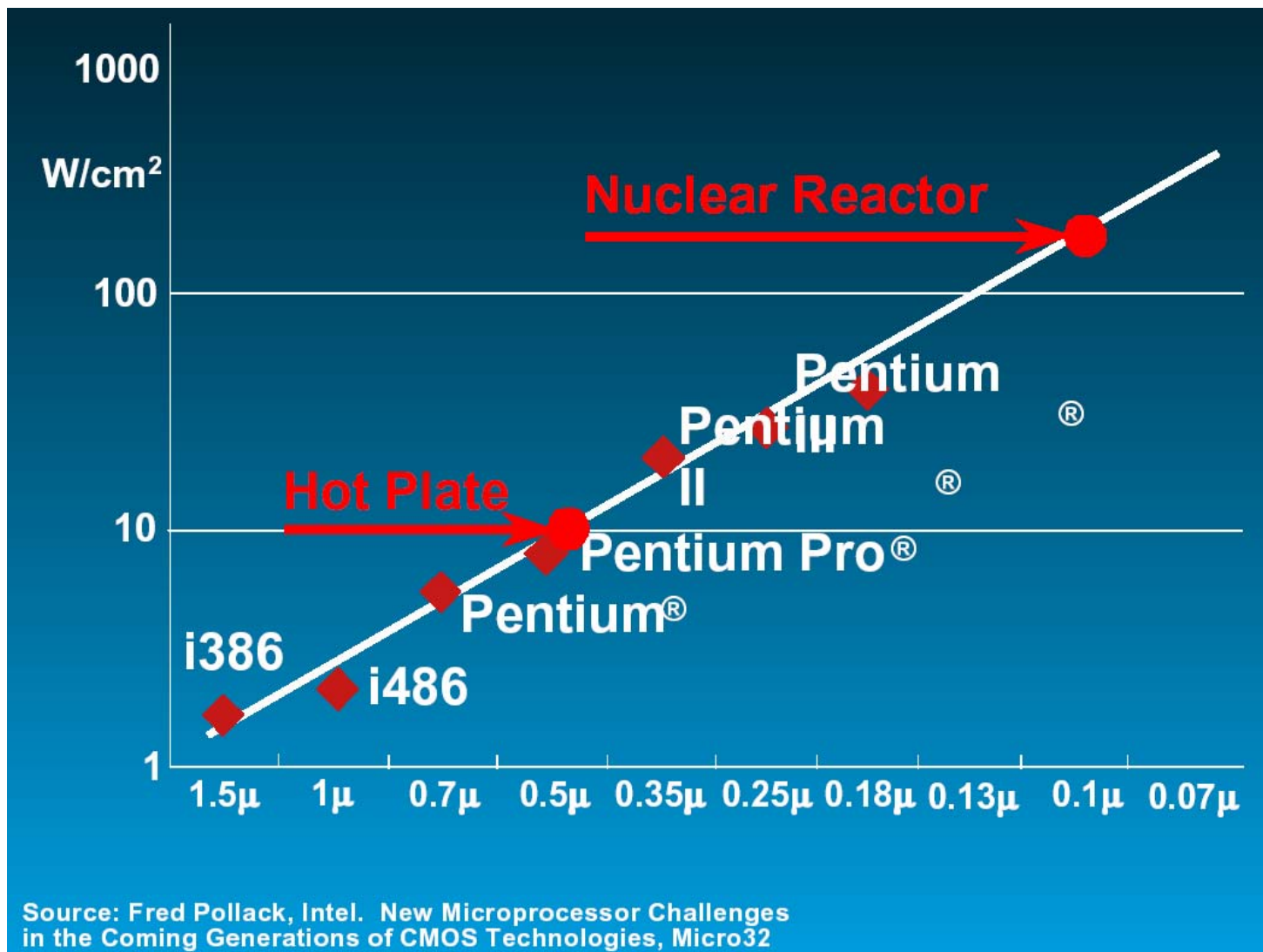
## Future systems need:

- Higher performance with reduced cost, size, weight, and **power consumption**
- Adaptability, flexibility, scalability, reconfigurability
- High bandwidth internal and network data communications





# Power Density: The Fundamental Problem

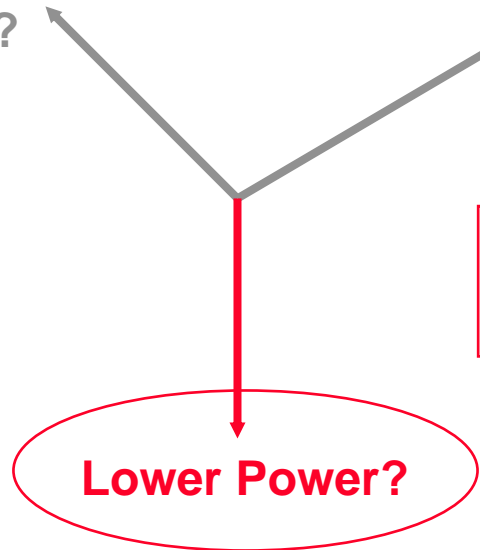




# Prognosis For Moore's Law Benefits

Higher Speed?

Lower Cost?



Pentium 4 (90nm): ~80 W/cm<sup>2</sup>

Stovetop: ~10 W/cm<sup>2</sup>

## Past

Supply voltage (V) scales as 1/s

Capacitance (C) scales as 1/s

Energy per op scales as  $CV^2 \propto 1/s^3$

⇒ Voltage scaling from 5V to 1V accounts for 25X reduction in power, just by itself

## Future Issues

Only 2x voltage scaling planned (1V now to ~0.5V in 2016)

⇒ **Scaling energy per op is critical to long endurance battery powered systems and to supercomputers (getting power in and heat out)**