Requirements for Scalable Application Specific Processing in Commercial HPEC
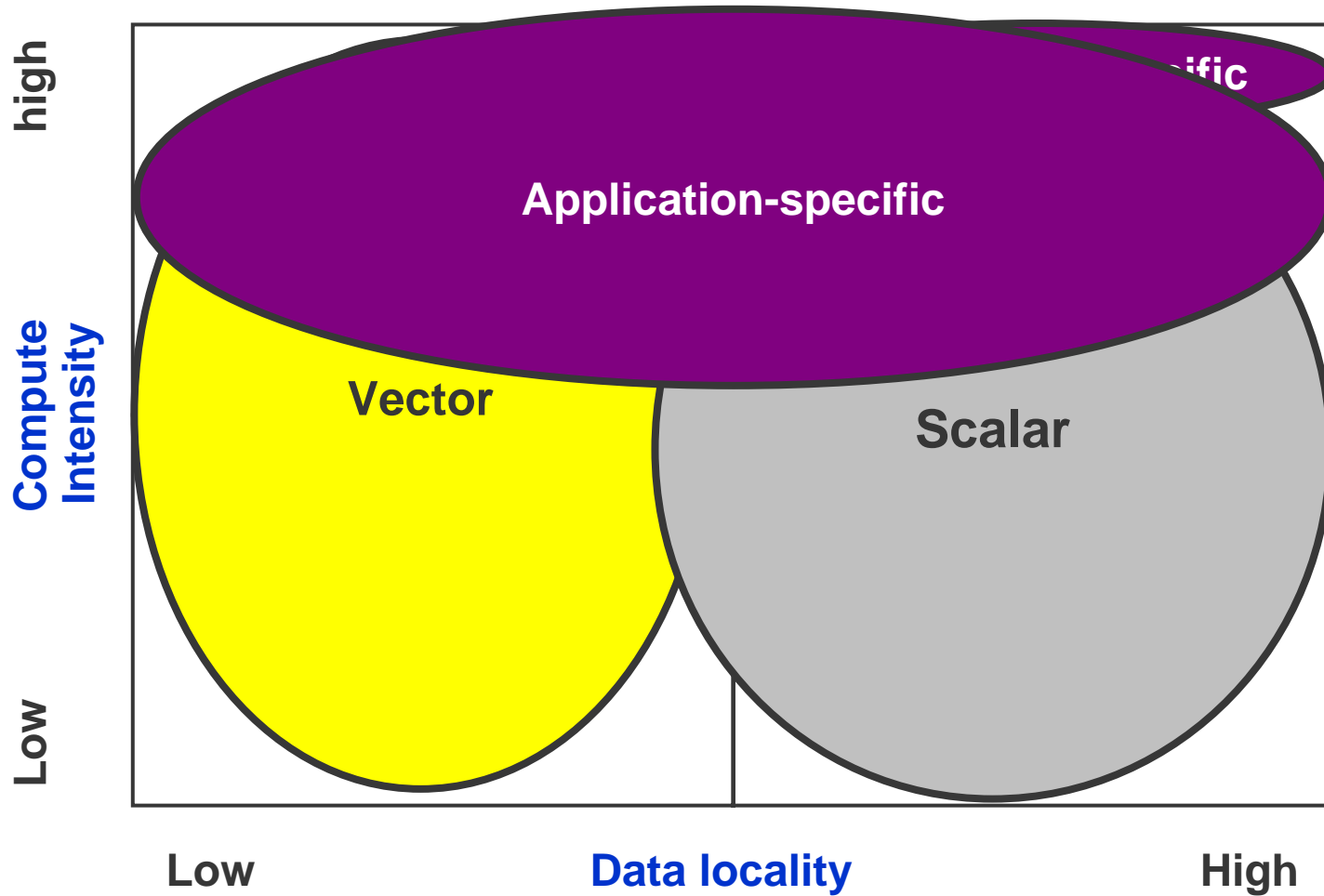
Presented by:

**Steve Miller
Chief Engineer**

Silicon Graphics, Inc.
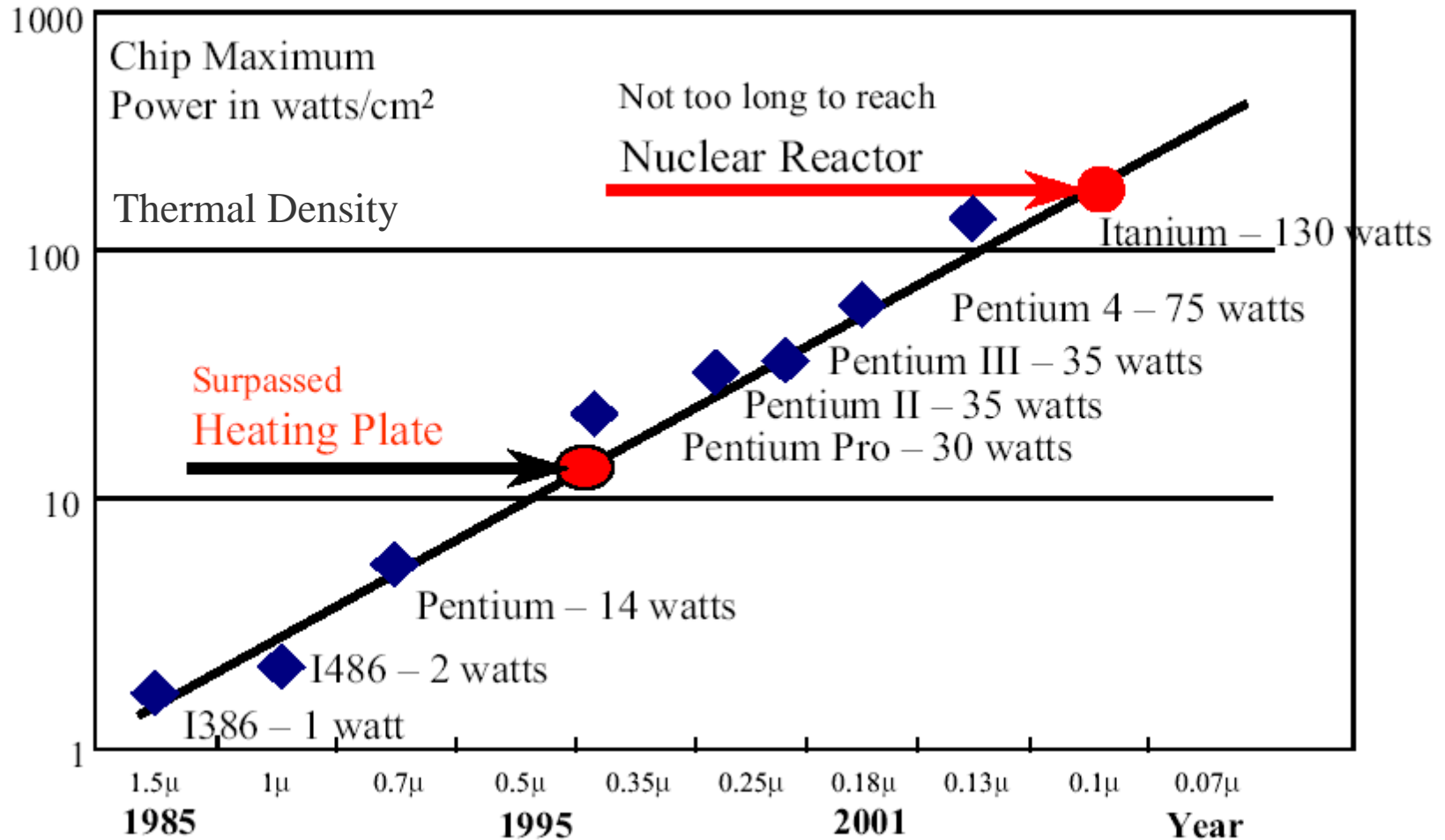
The 3 Single-Paradigm Architectures

Scalar	**Vector**	**App-Specific**
Intel Itanium	Cray X1	Graphics - GPU
SGI MIPS	NEC SX	Signals - DSP
IBM Power		Prog'ble - FPGA
Sun SPARC		Other ASICs
HP PA		

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Paradigms to Applications

Microprocessors & Heat

Chip Maximum Power in watts/cm² — Thermal Density vs Year

- Not too long to reach Nuclear Reactor
- Surpassed Heating Plate
- Itanium – 130 watts
- Pentium 4 – 75 watts
- Pentium III – 35 watts
- Pentium II – 35 watts
- Pentium Pro – 30 watts
- Pentium – 14 watts
- I486 – 2 watts
- I386 – 1 watt

Years: 1985 (1.5μ), 1μ, 0.7μ, 1995 (0.5μ), 0.35μ, 0.25μ, 0.18μ, 2001 (0.13μ), 0.1μ, 0.07μ

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Architectural Challenges

- ## Ease of Use
  - – Languages
  - – Compilers
  - – Debuggers
  - – APIs

- ## Performance
  - – Bandwidth to/from System
  - – Scalability

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