

# Intel's Contribution to HPC This Decade

**SOS7**

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# The Trends In HPC Technologies



- **Custom CPUs**
- **Custom memory**
- **Custom packaging**
- **Custom interconnects**
- **Custom OS**

- **COTS CPUs**
- **COTS memory**
- **Custom packaging**
- **Custom interconnects**
- **Custom OS**

- **COTS CPU**
- **COTS Memory**
- **COTS Packaging**
- **COTS Interconnects**
- **COTS OS**

**1980**

**~\$5 million/gigaflop**

**1990**

**~\$200K /gigaflop**

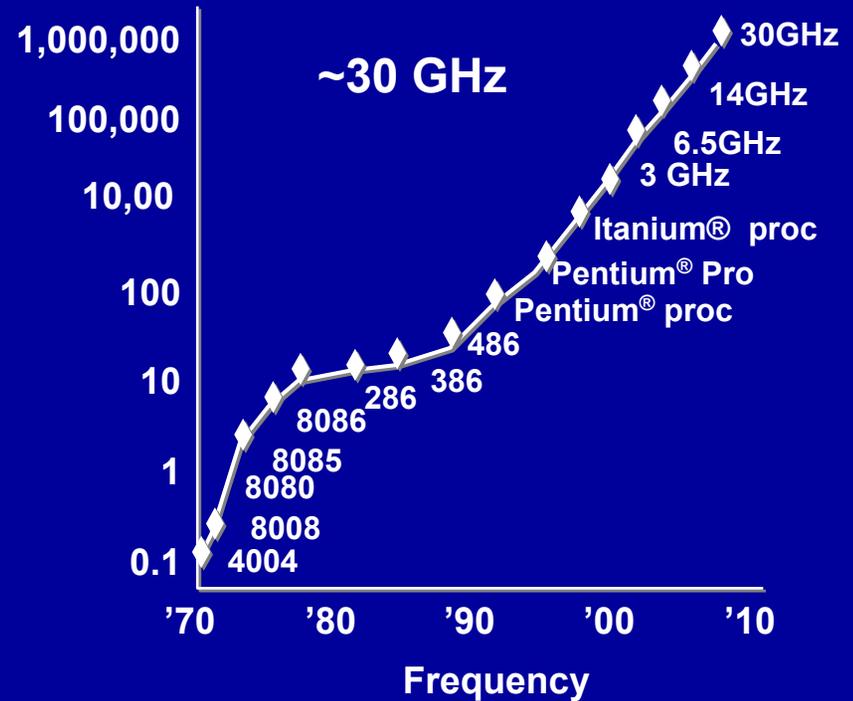
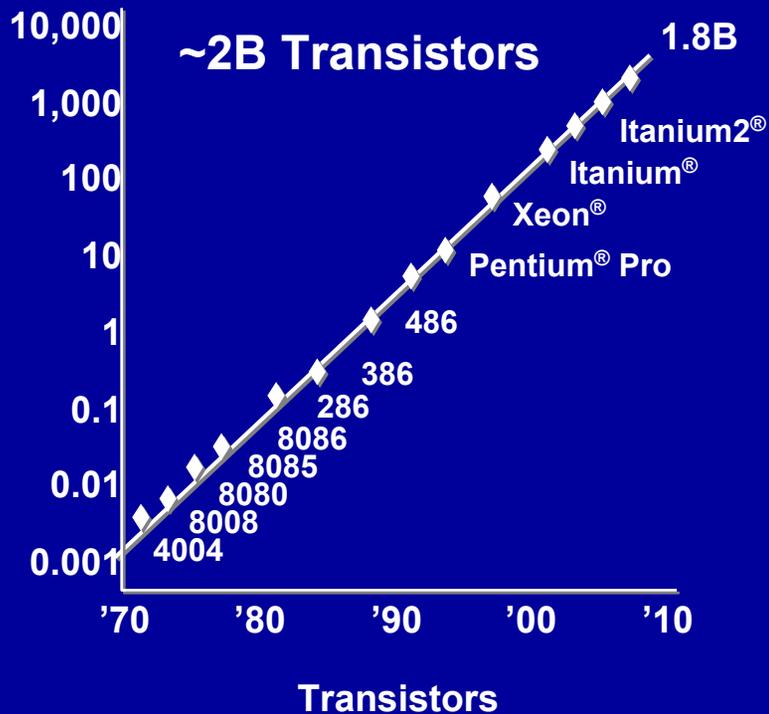
**2000**

**~\$4K /gigaflop**



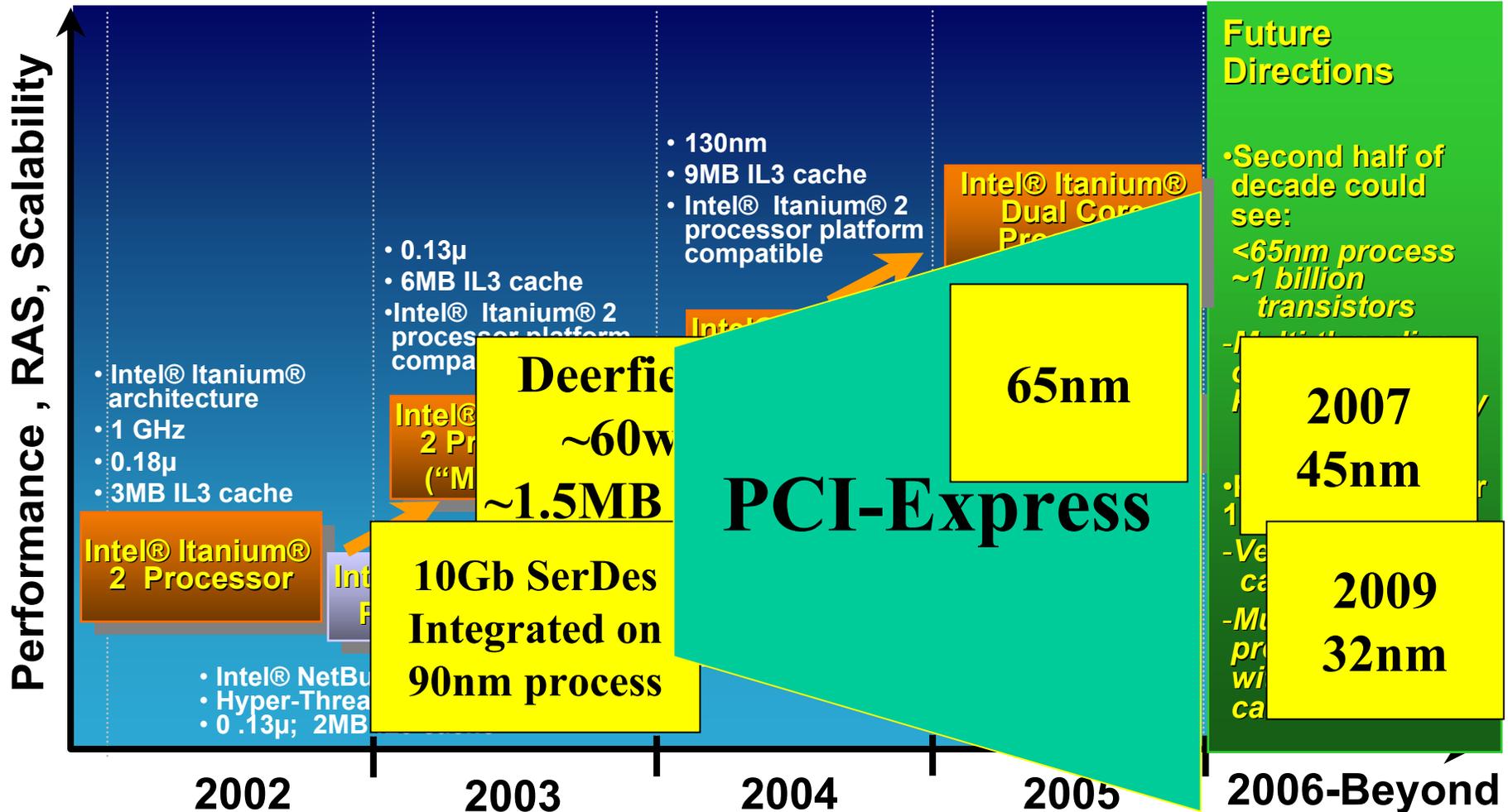
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# Silicon by the end of the Decade



“30 gigahertz devices, 10 nanometer or less delivering a tera instruction of performance by 2010”<sup>(1)</sup>

# Intel® Architecture Server Processor Roadmap



All dates specified are target dates, are provided for planning purposes only and are subject to change

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# Pointers to a Few Items of Interest

## Terahertz Transistors

“Intel’s 90nm Technology: Moore’s Law and More”

Mark Bohr, Intel Fellow

Director of Process Architecture and Integration

[http://www.intel.com/research/silicon/Bohr\\_IDF\\_0902.pdf](http://www.intel.com/research/silicon/Bohr_IDF_0902.pdf)

## Nano-structures and Precision Biology

[http://www.intel.com/pressroom/archive/releases/20030220corp\\_a.htm](http://www.intel.com/pressroom/archive/releases/20030220corp_a.htm)

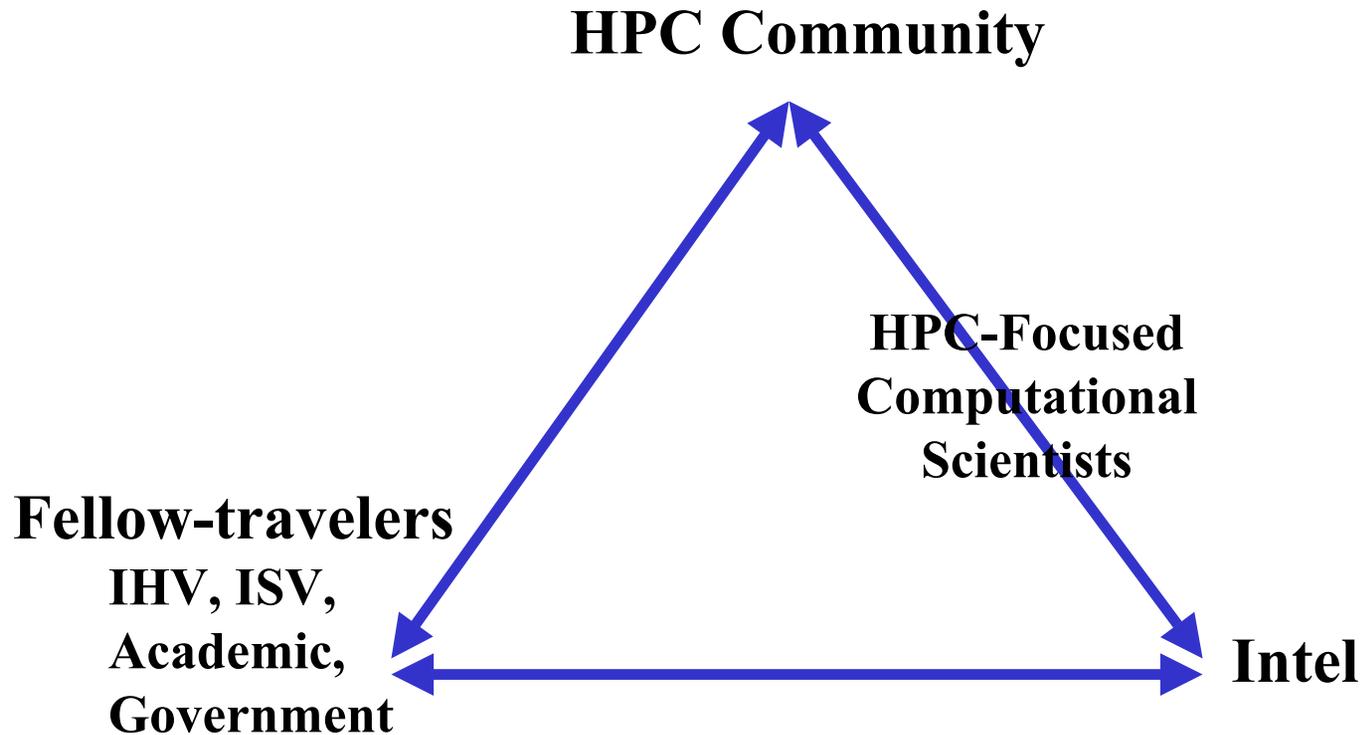
# How Intel is going about HPC

# Background: HPC Roundtable with US Gov't Labs & Agencies

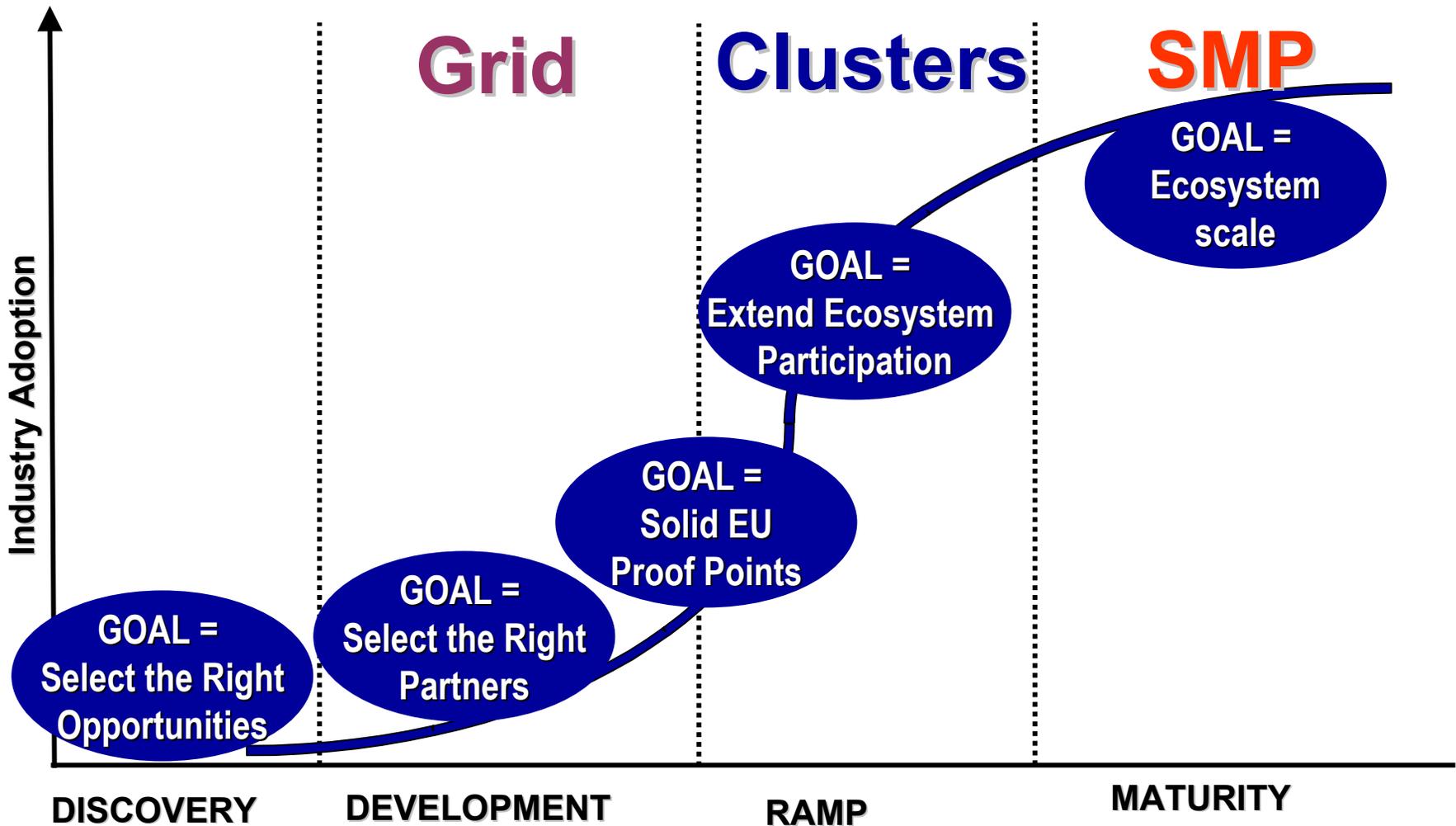
- Event held in Santa Clara, CA, Feb 11-12, '03.
- As part of a strategy to engage with the influencer organizations within the HPC Public Sector in order to learn of their needs and receive first-hand feedback.
- 23 technologists and strategists from 11 US Gov't orgs participated.
- The issues and feedback have been inserted into Intel's strategic planning process.
- Intel application and software engineers are in the process of acquiring and characterizing codes that are representative of the Labs computational workload.
- Intel plans to repeat the roundtable annually

Led to the creation of world-wide HPC team chartered with being the conduit between Intel and the HPC user community

# The Community Triangle



# Solutions Adoption Curve



# iA Solution Deployments over the last 18mos

## Industry

- Western GECO
- GCC
- Shell
- Saudi Aramco
- Tensor Geophysical
- WETA
- Pemex
- Google
- Inpharmatica
- Syrxx
- Immunex
- MDS Proteomics
- Pixar
- British Petroleum
- DaimlerChrysler
- SAS
- Ifineon
- Volvo

## Academic

- SUNY Buffalo
- Denmark Scientific
- Mississippi State
- Louisiana State
- Brookhaven
- Clemson
- Utah
- Cornell
- Toronto
- Virginia Polytech
- Ohio State
- Tsinghua Uni.
- Imperial College
- National U of Singapore
- Swinburne
- Stanford Linear Accelerator
- South Hampton
- Valencia
- Oxford
- Johns Hopkins
- Cal Tech
- Belfast
- Zeijing
- Princeton

## Government

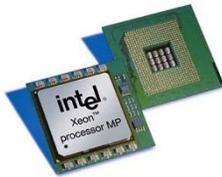
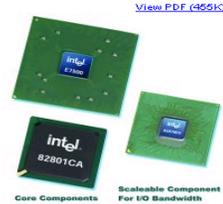
- Tera-Grid
- Los Alamos National Lab
- Lawrence Livermore National Lab
- NOAA
- Pacific Northwest National Lab
- Sandia National Lab
- NCSA
- Classified Defense Sites
- China Atmospheric Center
- CERN
- China Atmosphere
- Seoul National University Grid
- Ohio Supercomputing Center
- Inria

...and many others

## Processors



## Chipsets



## Platform



## Interconnect



## Software



# HPC Program Office

More than Silicon

## Intel Building Blocks

- Microprocessors
- Chipsets
- Interconnects
- Platform Enabling
- Software Suite

## Intel Programs

- 13 major hardware vendors
- Regional Leaders
- SI Programs
- iSV enabling

## Intel WW Services

- Dedicated HPC Personnel
- End User Developer Enabling
- Infrastructure (WA, NM, VG)
- Premier Technical Support
- HW Design Support

## Joint Solutions Centers

- Channel
- Oil
- Finance
- Life Sciences

## Intel Portfolio Investments

- SCALI\*, United Devices\*
- Portfolio Matchmaking

## Intel Training

- Worldwide Software College
- Worldwide Training
- Cluster Recipes
- Case Studies/Blue Prints

**intel  
Ecosystem**

## Intel Manufacturing

- .13us, 90nm, 300mm
- Platform Validation

## Strategic Collaborations

- Cornell Theory Center\* (CTC)
- CERN
- NCSA
- Western GECO\*
- European Virtual Grid Center\*
- Daresbury Benchmark Center\*
- Singapore BioIT Grid\*

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# Summary

- **Intel is playing a key role in accelerating discovery and science with open COTS technology and industry enabling**
- **The absolute performance and price-performance of Intel processors have fundamentally changed the economics of HPC**
- **Intel and the HPC Community have become closer thanks to YOUR input.**

<http://www.intel.com/go/hpc>



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Solution Enabling for  
High Performance  
Computing**

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