

The background of the slide is a complex, abstract composition. It features a dark, textured surface with various elements: binary code (0s and 1s) scattered throughout, faint technical diagrams and circuit-like patterns, and several overlapping circles and lines in shades of blue and white. The overall aesthetic is futuristic and technological.

# Supercomputing for the Mortals

**Earl J. Dodd, Ideas And Machines, Inc.**

# Broad Characterization of Supercomputing

**Supercomputing** or what is often called High Performance Computing (HPC) is...

...designed to address computational and data problems that are either **too large** for an enterprise-class computer or would take **too long**

...a computing system that **handles more** computing performance, data, or resource than is generally available

...a vastly coupled **network of servers** optimized for specific workloads.

# What Constitutes Supercomputing?

- Numerical Intensive



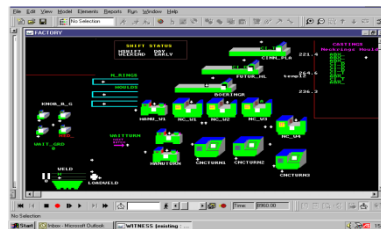
- Data Intensive



- Graphics Intensive



- Modeling, Simulation, Analytics

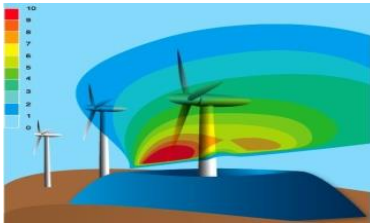


- Collaborative Decision Support

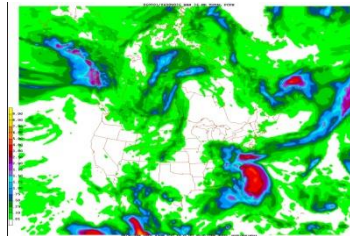


# HPC in a few Selected Domains

Wind Energy & Placement



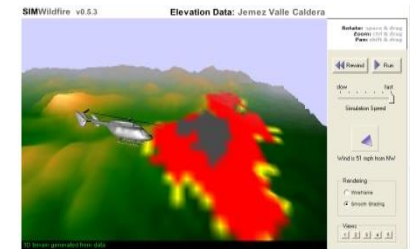
Climate Modeling



Precision Agriculture



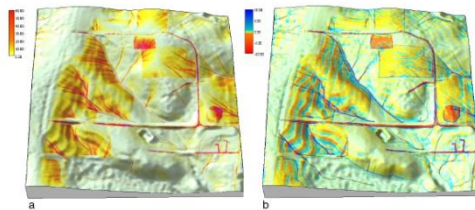
Wildfire Modeling



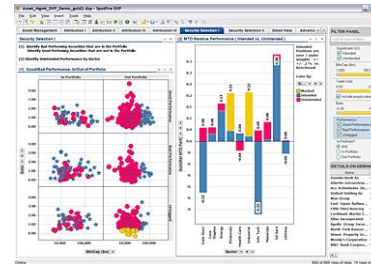
Carbon Management



Erosion Modeling



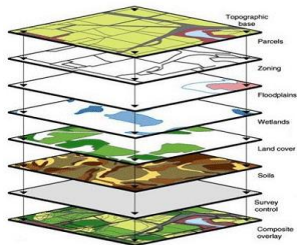
Financial Analytics



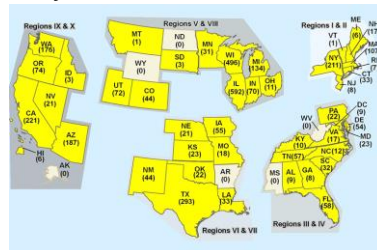
Surveillance & Pattern Recognition



Superfund Analysis



Syndromic Surveillance



Medicare/Medicaid Fraud



Electronics Design





# Kilo, Mega, Giga, Tera, Peta, and all that...

	Prefix	Symbol	Power of 10	Power of 2		Prefix	Symbol	Power of 10	Power of 2	
"Small"	yocto-	y	-24 *	--		(none)	--	0	0	"Large"
	zepto-	z	-21 *	--		deka-	D	1 *	--	
	atto-	a	-18 *	--		hecto-	h	2 *	--	
	femto-	f	-15	--		kilo-	k or K **	3	10	
	pico-	p	-12	--		mega-	M	6	20	
	nano-	n	-9	--		giga-	G	9	30	
	micro-	u	-6	--		tera-	T	12	40	
	milli-	m	-3	--		peta-	P	15	50	
	centi-	c	-2 *	--		exa-	E	18 *	60	
	deci-	d	-1 *	--		zetta-	Z	21 *	70	
					yotta-	Y	24 *	80		

\* Not generally used to express data speed

\*\* k = 10<sup>3</sup> and K = 2<sup>10</sup>

# Kilo, Mega, Giga, Tera, Peta, and all that...

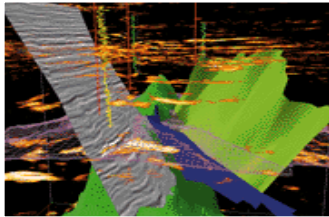
Prefix	Symbol	Power of 10	Power of 2	Prefix	Symbol	Power of 10	Power of 2
yocto-	y	-24 *	--	(none)	--	0	0
zepto-	z	-21 *	--	deka-	D	1 *	--
atto-	a	-18 *	--	hecto-	h	2 *	--
femto-	f	-15	--	kilo-	k or K **	3	10
pico-	p	-12	--	mega-	M	6	20
nano-	n	-9	--	giga-	G	9	30
micro-	u	-6	--	tera-	T	12	40
milli-	m	-3	--	peta-	P	15	50 ←
centi-	c	-2 *	--	exa-	E	18 *	60
deci-	d	-1 *	--	zetta-	Z	21 *	70
				yotta-	Y	24 *	80

\* Not generally used to express data speed

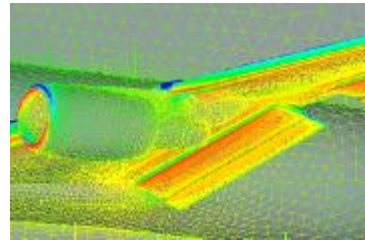
\*\* k = 10<sup>3</sup> and K = 2<sup>10</sup>

# Why Supercomputing?

Computational needs of technical, scientific, digital media & business applications require extreme performance



**Real-time Seismic**  
 **$45 \times 10^{15}$  FLOPS**



**CFD Wing Simulation**  
 **$2.1 \times 10^{14}$  FLOPS**



**Intelligent Oilfield**  
 **$1.7 \times 10^{21}$  FLOPS**



**CFD Full Plane Simulation**  
 **$8.7 \times 10^{24}$  FLOPS**

**Digital Movies & Special Effects**  
 **$27 \times 10^{18}$  FLOPS**



**Spare Parts Inventory Planning**  
 **$2.4 \times 10^{15}$  FLOPS**



# Supercomputing in Houston...

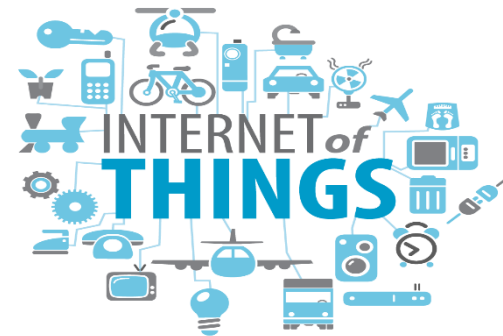
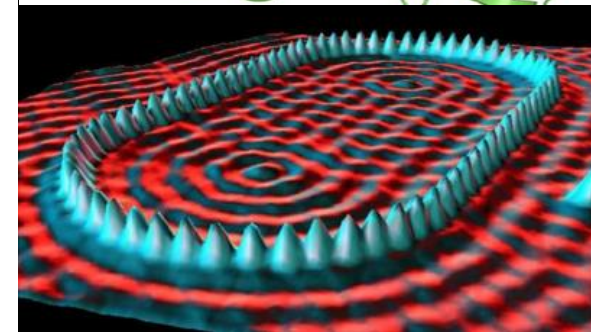
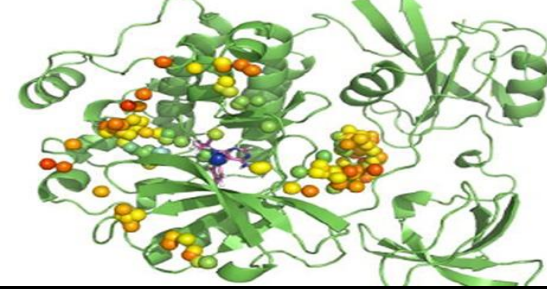
## ■ Industry

- Petroleum
- Medical, Healthcare, Biopharma
- Utility, Energy
- Cybersecurity, Risk

## ■ Academia

## ■ Government

## ■ Public-Private Partnerships



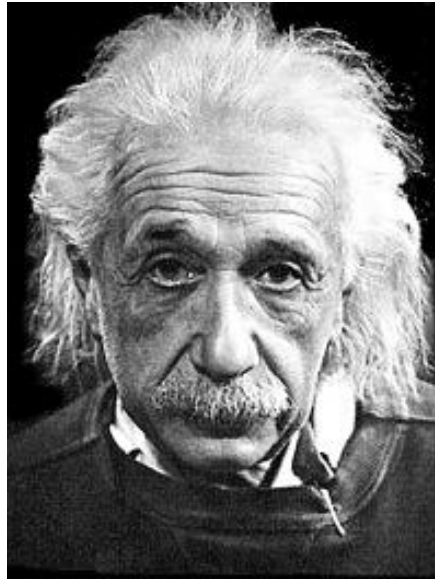


# What are the Benefits of Supercomputing?

- Competitive advantage
- Greater productivity
- Increased profitability
- Global reach

Tool enabling scientists, engineers and business leaders to investigate problems that simply cannot be explored easily.

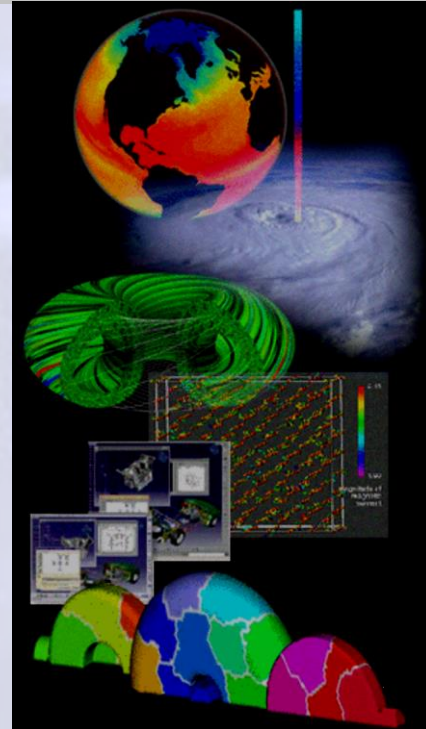
- An experiment or model that would take **19 Years** to run on yesterday's GigaScale computers will only require:
  - **1 Week** on a TeraScale computer
  - **10 Minutes** on a PetaScale computer
  - Less than **1 Second** on an ExaScale computer



“We can't solve problems by using the same kind of thinking [and tools] we used when we created them.”

Albert Einstein

**Thank You...**



**Presented by ...**

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