NIMBIX

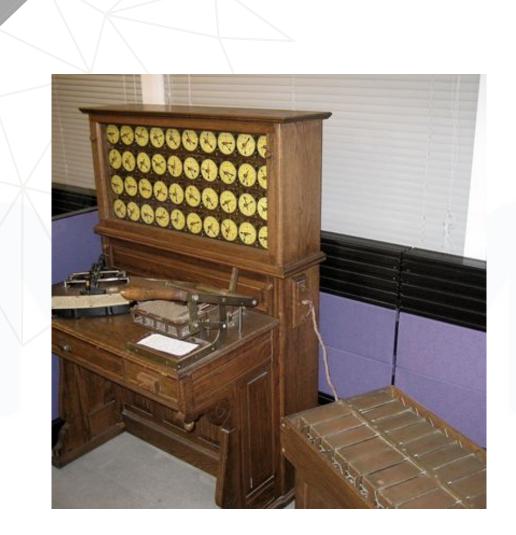
Supercomputing made super human[™]



The New Age of Accelerated Computing: A History of Innovation and Optimization in Computing

Steve Hebert, Cofounder and CEO, Nimbix





The First "Supercomputers"

A History

- 1880 census had taken eight years to process
- 1890 Census used the Hollerith "Tabulator" reducing census processing by 2 years
- Innovation: Electro-mechanical relay
- Became core of IBM





Supercomputing Defined

A History

- "Supercomputer" referred to large tabulators that IBM had made for Columbia University in the late 1920s
- In 1935, punch card systems processed data for Social Security for 26 million workers



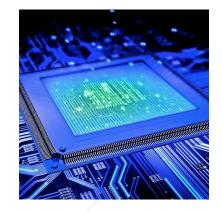


Control Data CDC6600

A History

- In 1964, the CDC 6600 ran 10 times faster than the next fastest machines
- •1 MegaFLOPS
- Innovation: Germanium to Silicon transistors, refrigeration





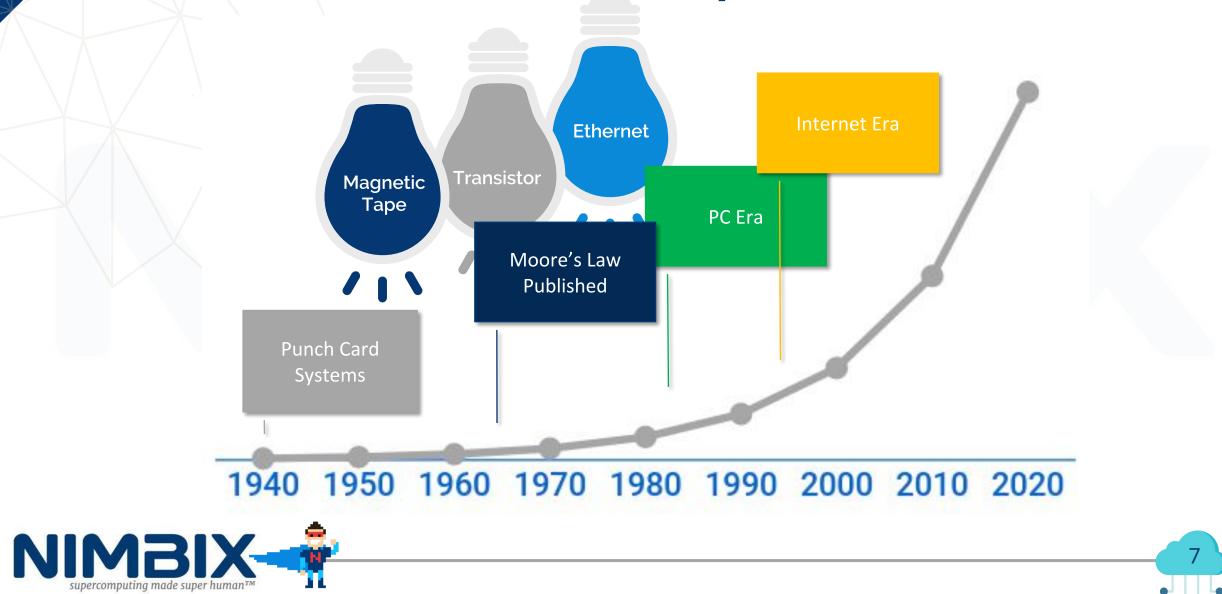
Moore's Law

Since CDC6600, 50 Years of Moore "Moore's Law" is the observation that, over the history of computing hardware, the number of transistors in a dense integrated circuit doubles approximately every two years.

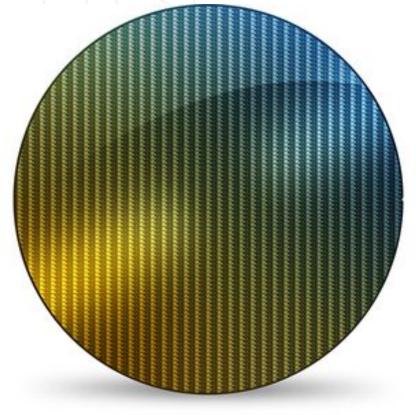




Innovation and Optimization



What has Moore's Law Enabled?



- Consumerization of Computing
- Democratization of Software Development
- Economic Predictability



Consumerization of Computing



- < 5000 PCs in 1975
- By 2004, > 130M units shipped annually
- PCs give way to notebooks, tablets and smartphones



Development



Platforms for writing code and applications
FORTRAN, COBOL, BASIC
C, Python



Economic Predictability

	← → ♡ A platform.ja ≡ Compute						□☆ = & છ NIMBI
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	Nimbix File Manager	Abaqus Explicit Danault Dysternen Abaqus	ANSYS0 Electronics	ANSYS® Electronics R18 ((C))	ANSYS® Fluids ANSYS, Inc.	ANSYS® Fluids R18	PushToCompute ¹⁴
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- We live in a tech world of planned Release Cycles
- Moore's Law -> The next semiconductor process node, is the clock cycle of optimization (and certainly incremental innovations)



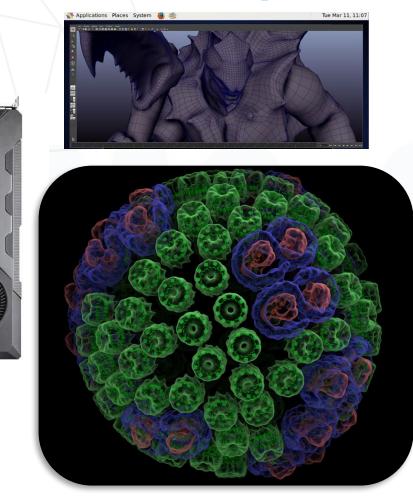


What Happens Next?

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Graphics Processors



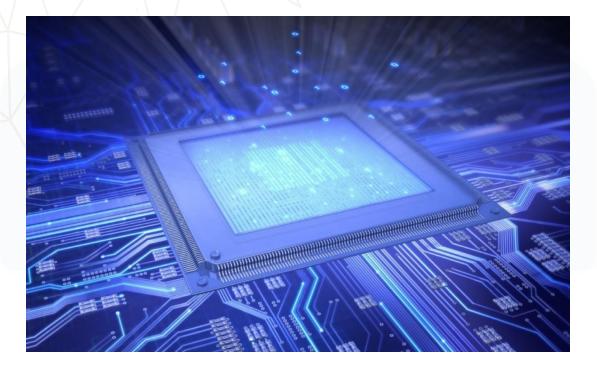
- From Gaming to Supercomputing
- Highly Parallel Structure
- Moore's Law at work: Thousands of thread cores per device
- Significant performance gains over CPU for certain classes of problems and algorithms



TES



The Field Programmable Gate Arrays



- A blank slate of logic gates that can be reconfigured with different functionality
- Moore's Law at work: significant growth in gate count
- Important devices in the communications industry



Deep Learning



- Create automation to deal with massive amount of data
- Use massive amounts of labeled data to train machines
 ->Make them smart, fast
- Apply unsupervised learning to assemble unstructured data into groups -> New Insights





Go and AlphaGo

"After humanity spent thousands of years improving our tactics, computers tell us that humans are completely wrong... I would go as far as to say not a single human has touched the edge of the truth of Go."

– Ke Jie, #1 Worldwide in Go



Moore's Law and Cloud Computing



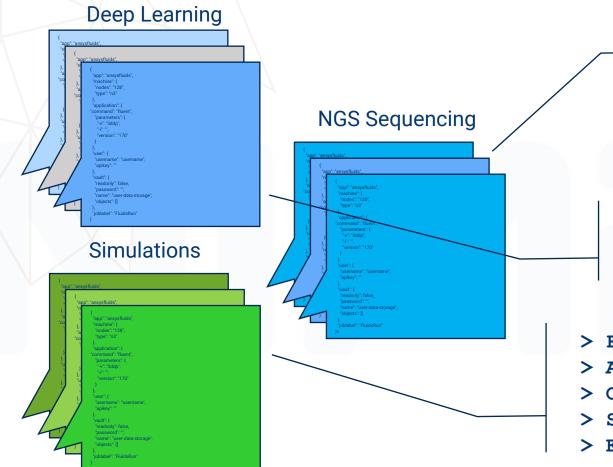
"What Moore's Law has delivered for Computing, Cloud Computing will deliver for Deep Learning."



- Consumerization of Deep Learning
- Democratizing software and model development
- Economic Predictability -> Cloud Machine Release Cycles



Machines Defined at Run Time



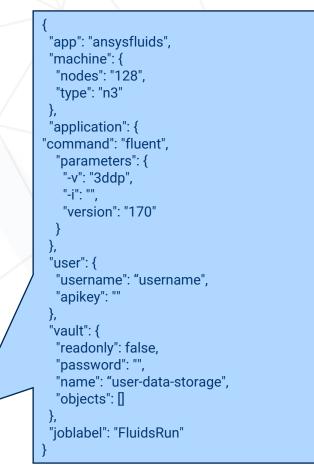
- > Genome Assembly
- > Allocate 2 Nodes, 1TB RAM, FPGAs

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- > Optimize code
- > Synthesize, load bitstream
- > Execute
- > Parallel Tensorflow
- > Allocate 4 CPUs, 32 GPUs
- > Execute
- > Fluid Simulation
- > Allocate 2000 CPU Cores
- > Optimize code
- > Synthesize,load bitstream
- > Execute



Deep Learning Applied to Cloud Computing

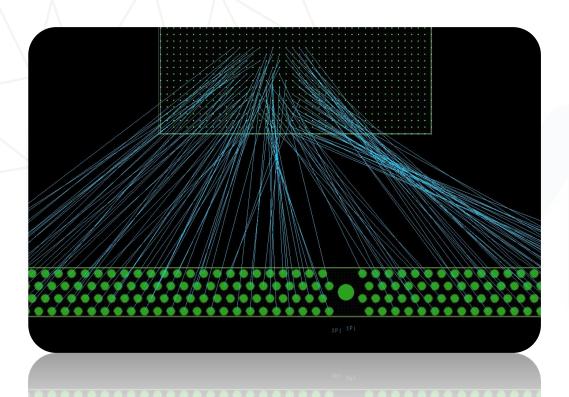


- Compute Workloads as API Calls
 Millions and billions of API calls define compute tasks and data payloads
- Rules to determine reward:
 - Optimize for Energy efficiency, throughput, run time, resource utilization





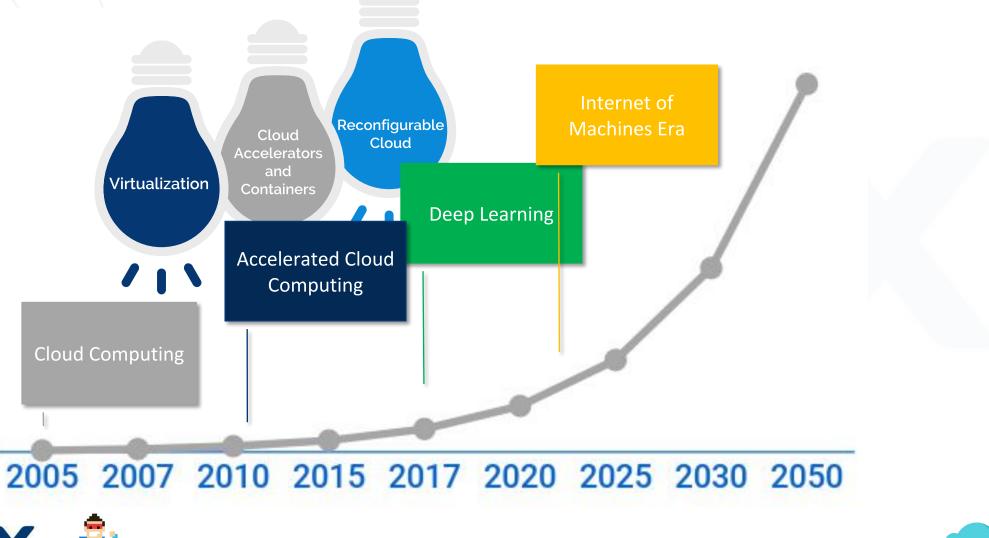
Machine-Driven Innovation



- Millions and billions of API calls define compute tasks and data payloads
- Rules to determine reward:
 - Optimize for Energy efficiency, throughput, run time, resource utilization
- Moving from "machine-assisted" to "machine-driven"
- Evolve to Self Optimizing, Intelligient Systems



Innovation and Optimization



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A New Kind of "Supercomputing"

"The Internet of Machines is the collection of intelligent systems that self-optimize in order to automate and accelerate the collection, distribution, analysis and transformation of zettabytes of data."

