



superBlazer: Building Hood's First
Supercomputer
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Name	Organization	CPU Type	CPUs	CPU Clock (GHz)	FLOPS (GFLOPS)	Location
Nirvana	Northeastern University	EM64T-4	16	1.90	121.6	Boston
ILC MSU CLUSTER	International Laser Center of Moscow State University	EM64T	12	2.40	57.6	Moscow
superBlazer	Hood College	Pentium 4	20	2.99	119.6	Frederick, Maryland
FWGrid	UCSD, CSE	EM64T	640	2.80	3584	San Diego
Condor-zeus	OeRC	Other	96	3.20	307.2	Oxford

What is Parallel Computing?

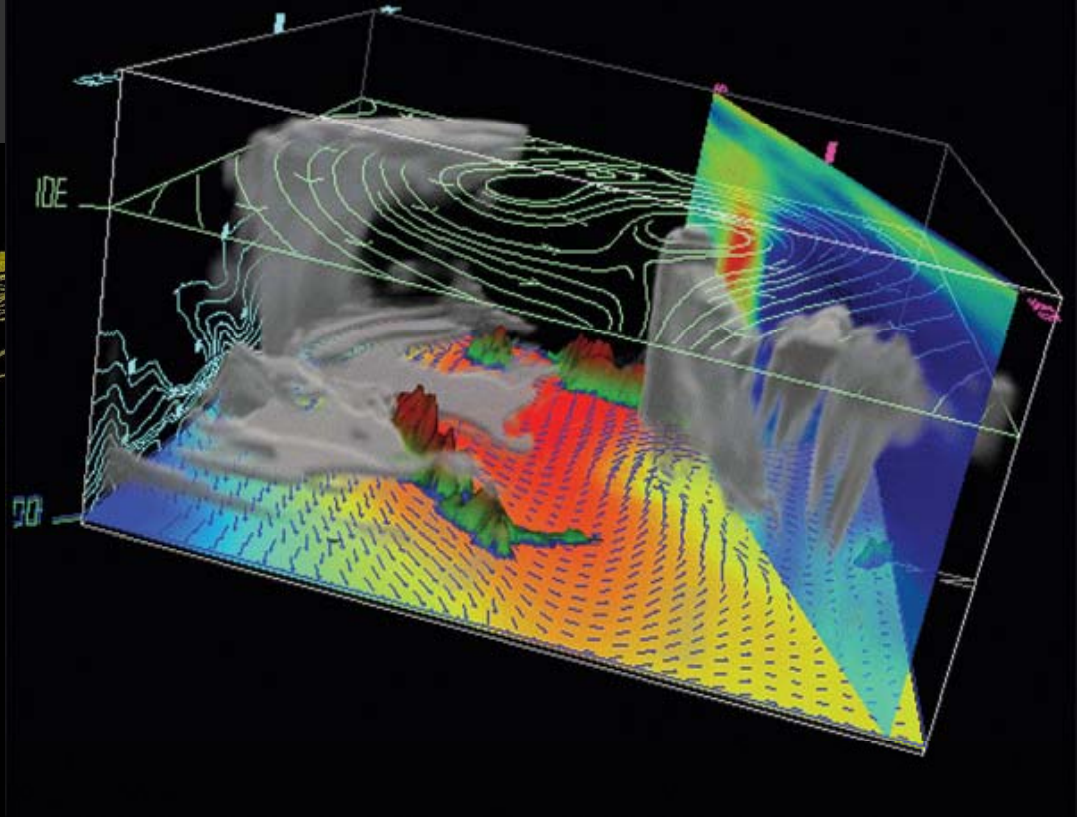
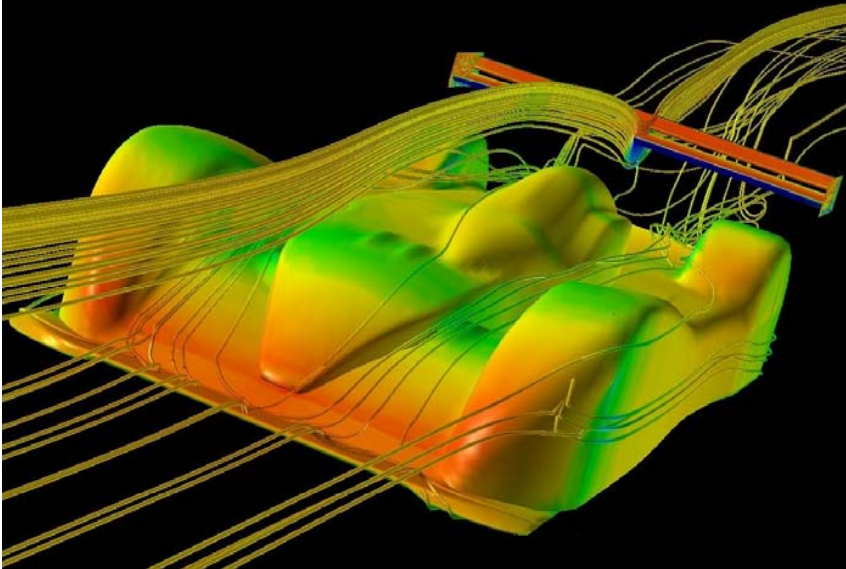
- Many computation be performed simultaneously
- Large problems can be divided into smaller ones

What is Used to Perform Parallel Computing?

- Multi-core processors
- Clusters
- Supercomputers



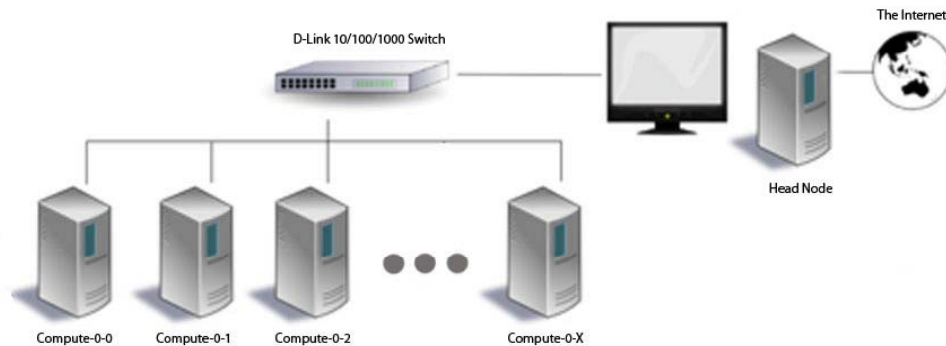
Applications



Google™

- ❑ Web Search Engines/Databases
- ❑ Aerospace
- ❑ Finance
- ❑ Weather and Climate Forecasting
- ❑ Ecommerce
- ❑ Simulations

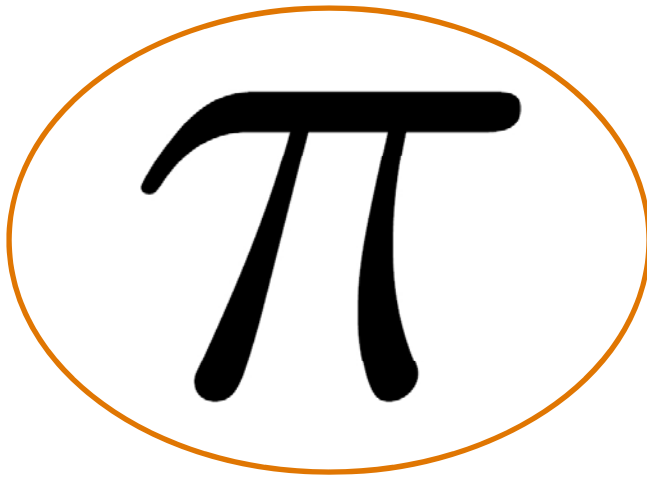
Hood's superBlazer



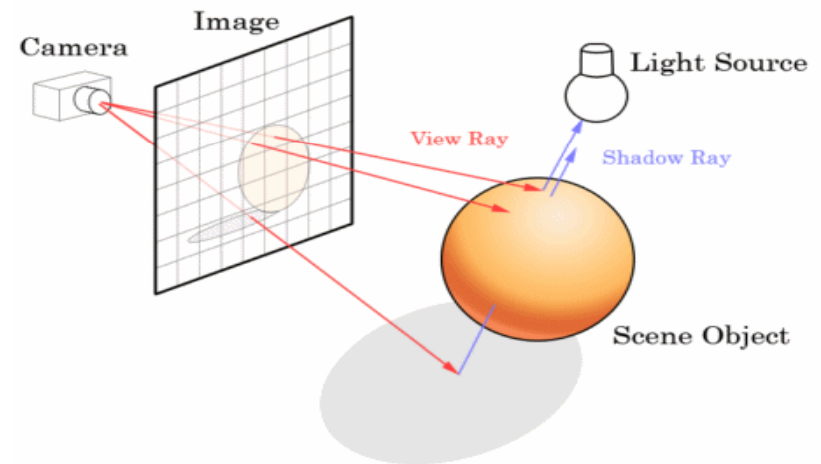
- 5 HP DL360 ProLiant G3 servers
 - each having 4 processing cores performing at 2.99Ghz and,
 - 4 GB of memory
- They are connected by an 8 port D-Link gigabit switch.

Performance Analysis

- Benchmarking
 - Processing power
 - Memory access
 - Disk access
 - Input/Output speed
- Tests
- Calculating Pi (3.14159265)



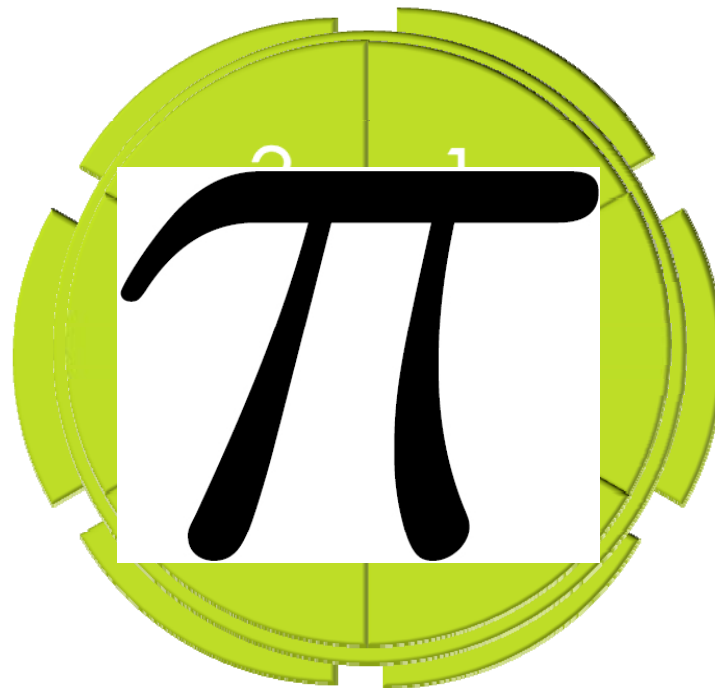
- Tachyon Ray Tracing



Calculating Pi (3.14159265)

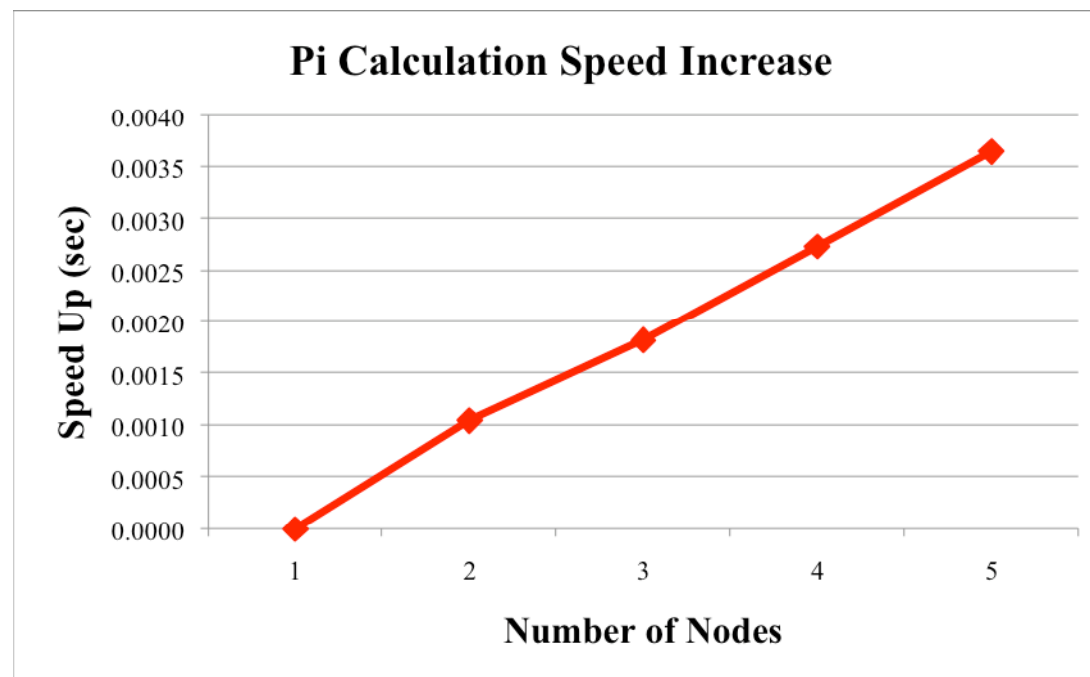
- $\pi = \frac{C}{d}$
- π is an irrational number
- π 's decimal representation never ends or repeats

The Pi Calculation Process



Pi Calculation Experiment Results

Number of Nodes	Time (sec)
1	0.142920
2	0.141874
3	0.141096
4	0.140184
5	0.139272



What is Ray Tracing?

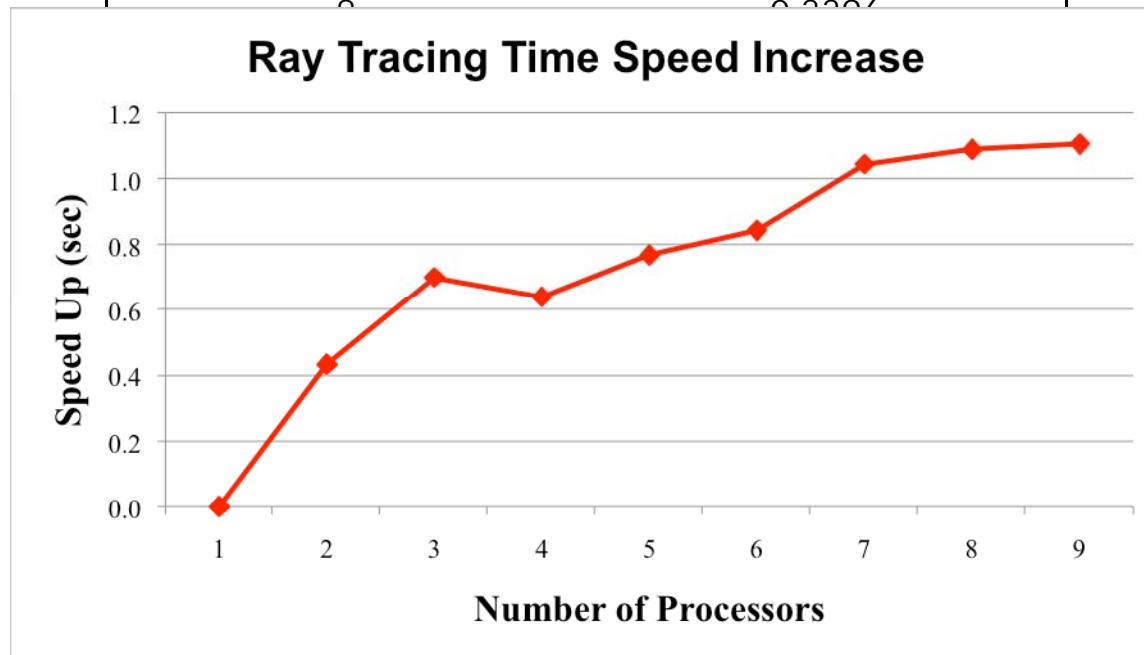
- ▣ Takes the path of light and,
- ▣ Makes an image.

The Tachyon Parallel Ray Tracing Process

```
SPHERE CENTER 0 0 0 RAD 0.5  
txt002  
SPHERE CENTER 0.272166 0.272166 0.544331 RAD 0.166667  
txt002  
SPHERE CENTER 0.420314 0.420314 0.618405 RAD 0.0555556  
txt002  
SPHERE CENTER 0.470715 0.470715 0.598245 RAD 0.0185185  
txt002  
SPHERE CENTER 0.481689 0.481689 0.57904 RAD 0.00617284  
txt002  
SPHERE CENTER 0.475329 0.45787 0.577669 RAD 0.00617284  
txt002  
SPHERE CENTER 0.45787 0.475329 0.577669 RAD 0.00617284  
txt002  
SPHERE CENTER 0.477074 0.494534 0.599616 RAD 0.00617284  
txt002  
SPHERE CENTER 0.453255 0.488174 0.598245 RAD 0.00617284  
txt002  
SPHERE CENTER 0.4661 0.48356 0.618821 RAD 0.00617284  
txt002  
SPHERE CENTER 0.494534 0.477074 0.599616 RAD 0.00617284  
txt002  
SPHERE CENTER 0.48356 0.4661 0.618821 RAD 0.00617284  
txt002  
SPHERE CENTER 0.488174 0.453255 0.598245 RAD 0.00617284  
txt002
```


Tachyon Ray Tracing Experiment Results

Number of Processors	Ray Tracing Time
1	1.4255
2	0.9954
3	0.7277
4	0.7888
5	0.6596
6	0.5846
7	0.3838
8	0.3307
9	0.3207



Challenge – Conclusions – Future Work

□ Challenges

- Power
- Cooling

□ Conclusion

- Successfully built a cluster out of commodity parts
- Successfully tested the cluster's performances gains

□ Future Work

- Expansion
 - To be used in education
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Acknowledgements

Jim Voss, Senior Manager at Life Technologies

