

# HPFS-REU 2011

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# Cluster Computing

A group of computer systems connected together to act as a single computational group.

## Optimal Usage:

- Able to separate a computation problem into smaller tasks
- Each task is asynchronous with little to no dependence on another task

## Benefits:

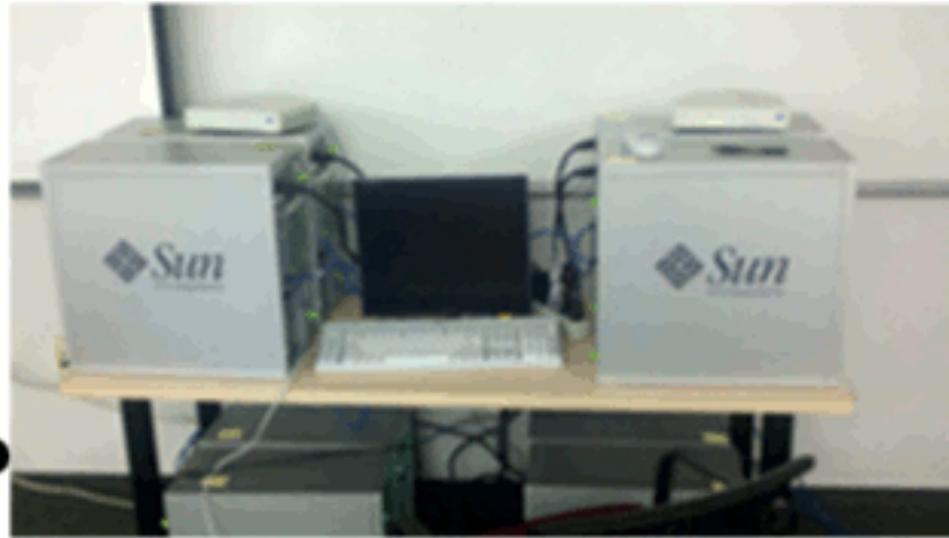
- Can speed up computation by as many systems that are in the cluster
- Increased scalability
- Decreases reliance on a single system

# Computing in the Clouds

- Cloud computing - almost a marketing term
- The key, "Software as a Service" - SaaS
- Cloud provider runs large data center(s) and rents out resources. Elastic capacity - illusion of infinite resources
- Pay-per-unit of computation, storage, bandwidth
- For our app, we use cloud resources provided by Amazon Web Services (AWS) to create a virtual cluster environment
- Users of cloud services don't need to own any of their own hardware

# Android Client

Send up the  
coordinates of  
the touch to  
cluster.

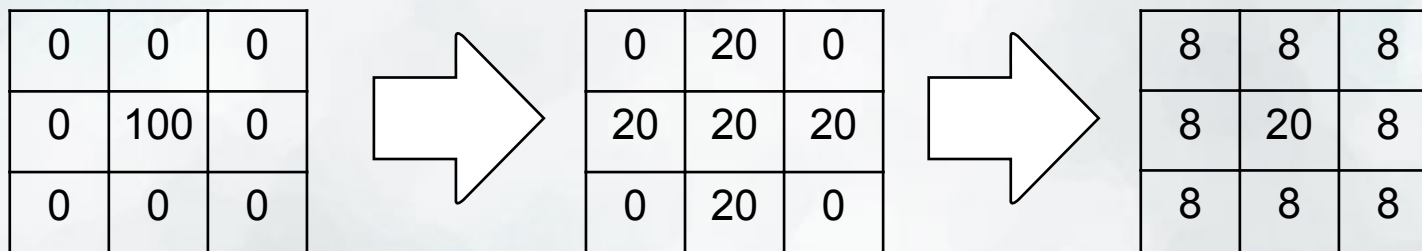


Receive frame-by-frame the  
animation of the Jacobi relaxation  
generated by the cluster.

# Simplified Jacobi Relaxation

The Jacobi Method is used to solve systems of linear equations. Jacobi Relaxation approximates this in a way that is suitable to model heat transfer<sup>[1]</sup>

Values are stored in a two dimensional matrix. As the computation progresses, new/updated values are calculated to be an average of their adjacent neighbors.



[1] <http://blogs.msdn.com/b/visualizeparallel/archive/2010/03/29/the-jacobi-relaxation-an-instance-of-data-parallelism.aspx>