

# Seagull: Intelligent Cloud Bursting For Enterprise Applications

**Tian Guo**, Upendra Sharma, Timothy Wood<sup>‡</sup>,  
Sambit Sahu<sup>†</sup>, Prashant Shenoy

University of Massachusetts Amherst,  
The George Washington University<sup>‡</sup>, IBM Research<sup>†</sup>



# Cloud Computing

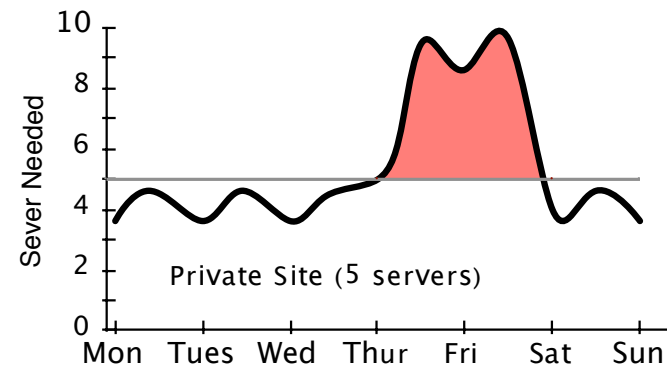
## ■ Cloud Computing:

- Pay-as-you-go service
- Rent Resources
- Infrastructure as a Service
  - Virtualization technology, rent VMs
  - Popular for Apps with dynamic workload



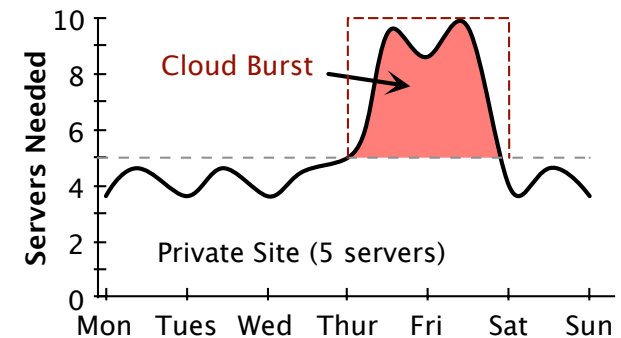
## ■ Benefits

- Flexible pricing model
- Agile to workload changes

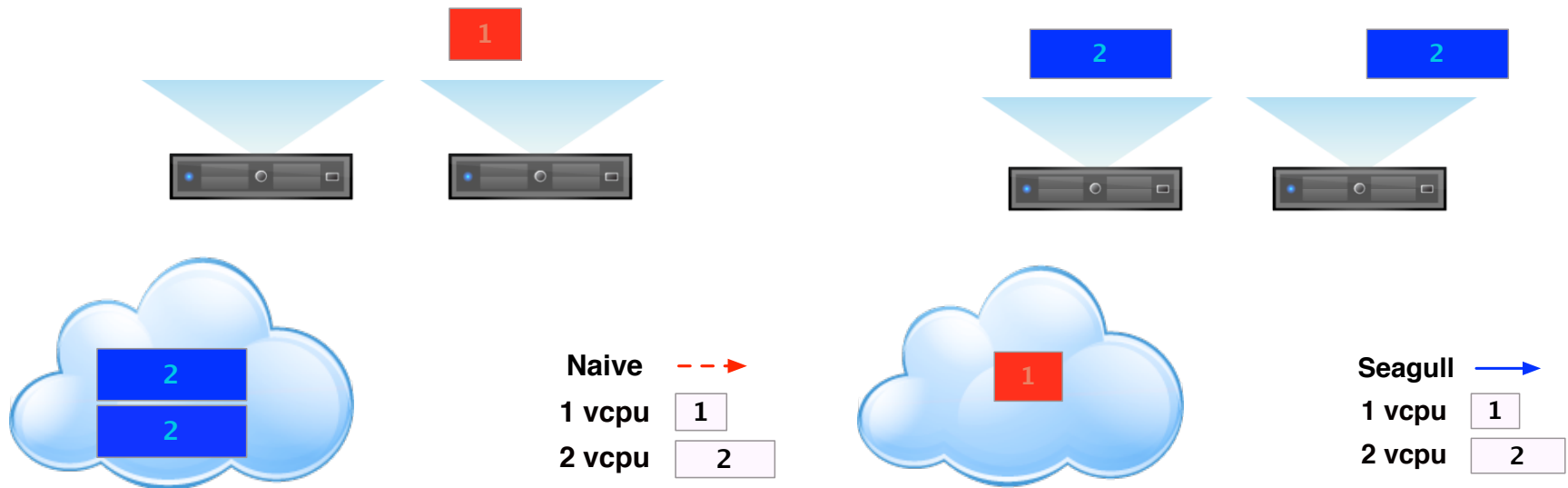


# Cloud Bursting

- Enterprises own private data centers
  - Try to use the existing infrastructure (hybrid)
- Cloud Bursting
  - Enables Enterprise to use local data center
  - rents public resource upon workload changes
  - seamless and transparent resource sharing between local and public cloud
- Challenges
  - When to trigger cloud bursting?
  - Which Apps to cloud Burst?
  - How to balance cost and time trade-off?
- Seagull
  - Cloud Bursting Algorithm
  - Precopying Algorithm



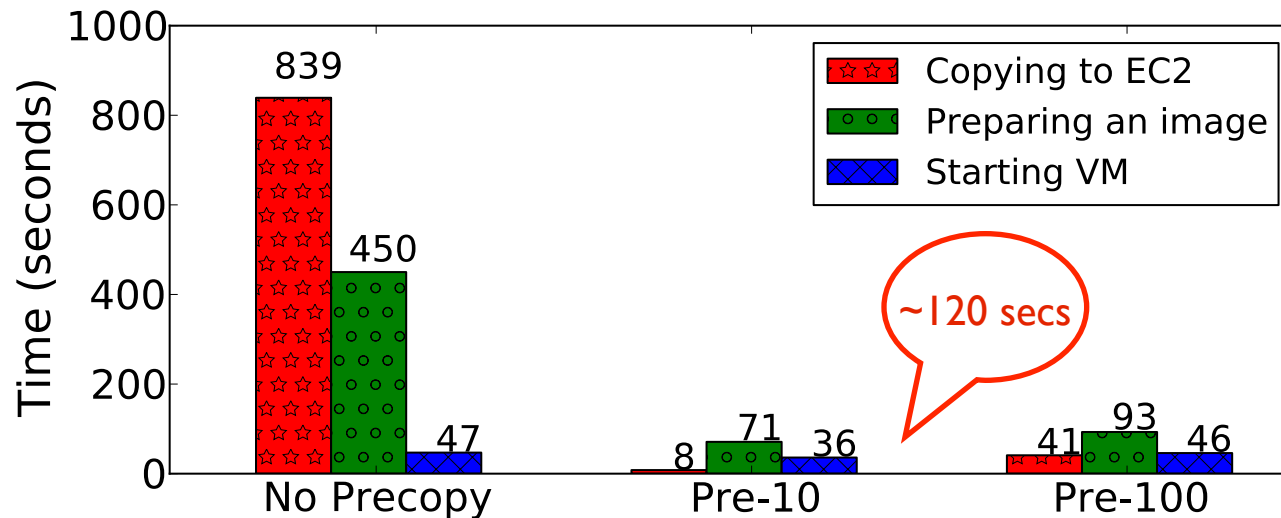
# Seagull Cloud Bursting Algorithm



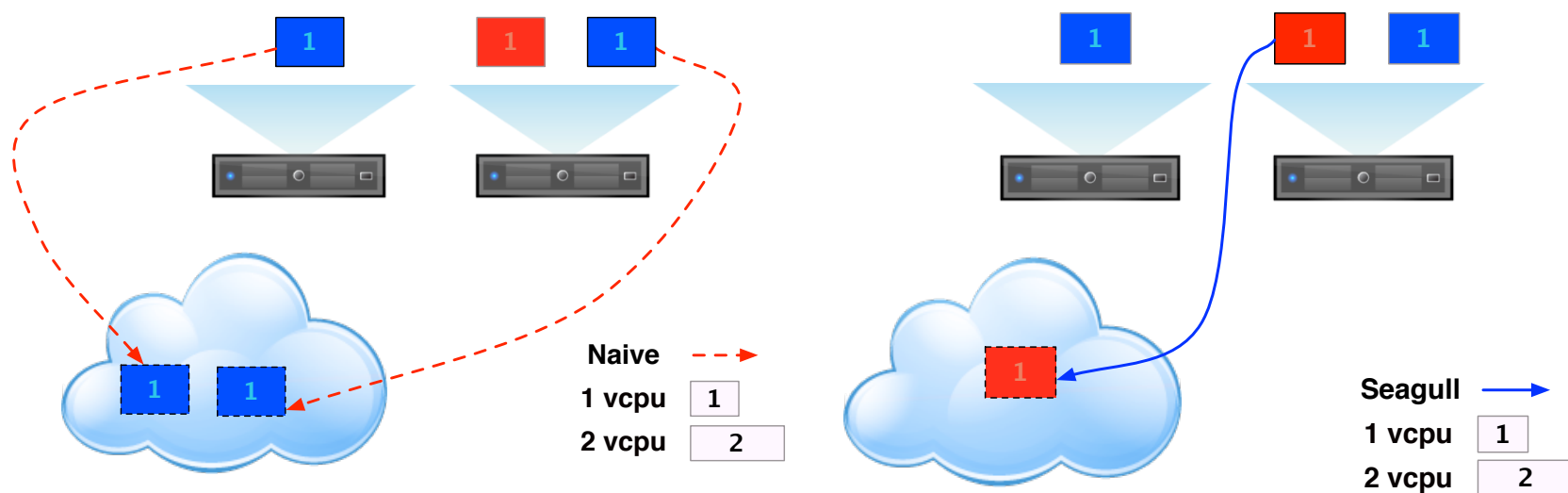
- Which applications to cloud burst?
  - Naive approach: move overloaded applications
    - Incurs high **cost and overhead**
  - Seagull approach: Pick the cheapest applications
    - Multi-resource bin packing problem
    - Greedy approach
    - Metric:  $\text{App\_Costs} / \text{VM\_cores}$  to run in public cloud

# How to Lower Migration Time ?

- Cloud bursting on demand
  - e.g 5 GB disk state, takes a long time ( ~22 mins)
- Opportunistic Precopying
  - Copys app vm state to the public cloud in the background
  - Benefit: Dramatically shortens the migration time
  - Some experiments:



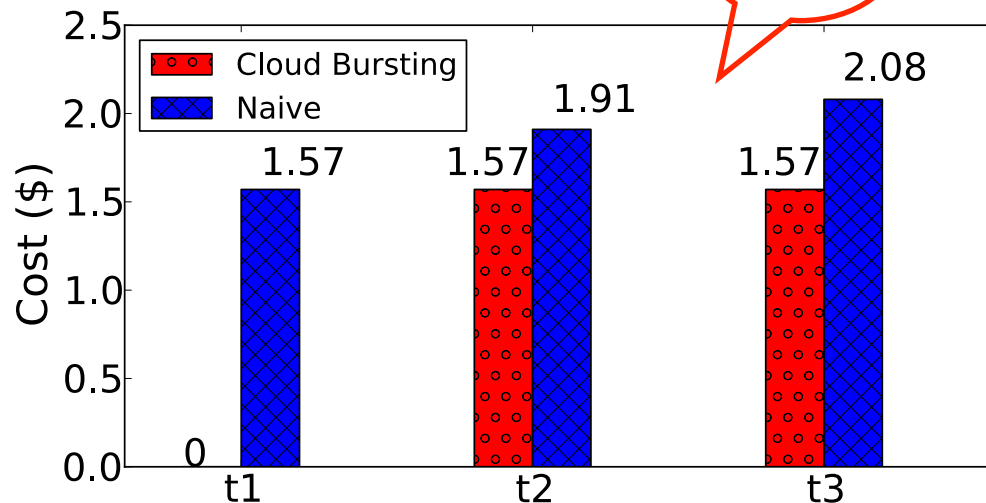
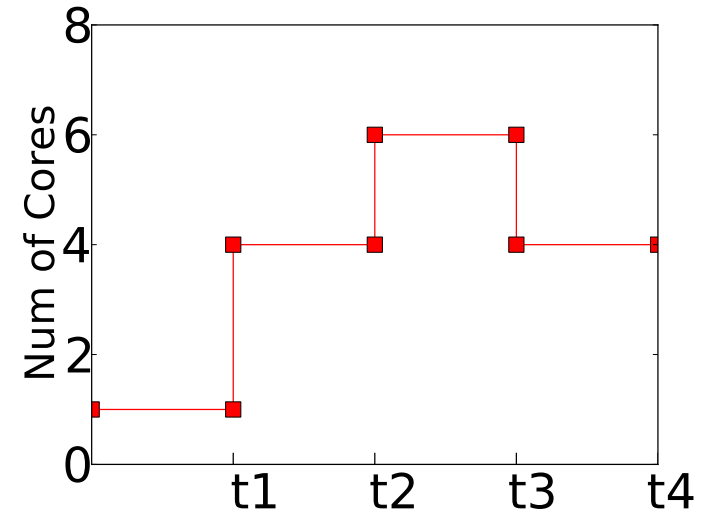
# Seagull Precopying Algorithm



- How to balance cost and time trade-off?
  - Naive Precopying: Precopying overloaded applications
    - Not Necessary lower migration time
  - Intelligent Precopying
    - Intuition: Choose the apps that are most likely to be migrated

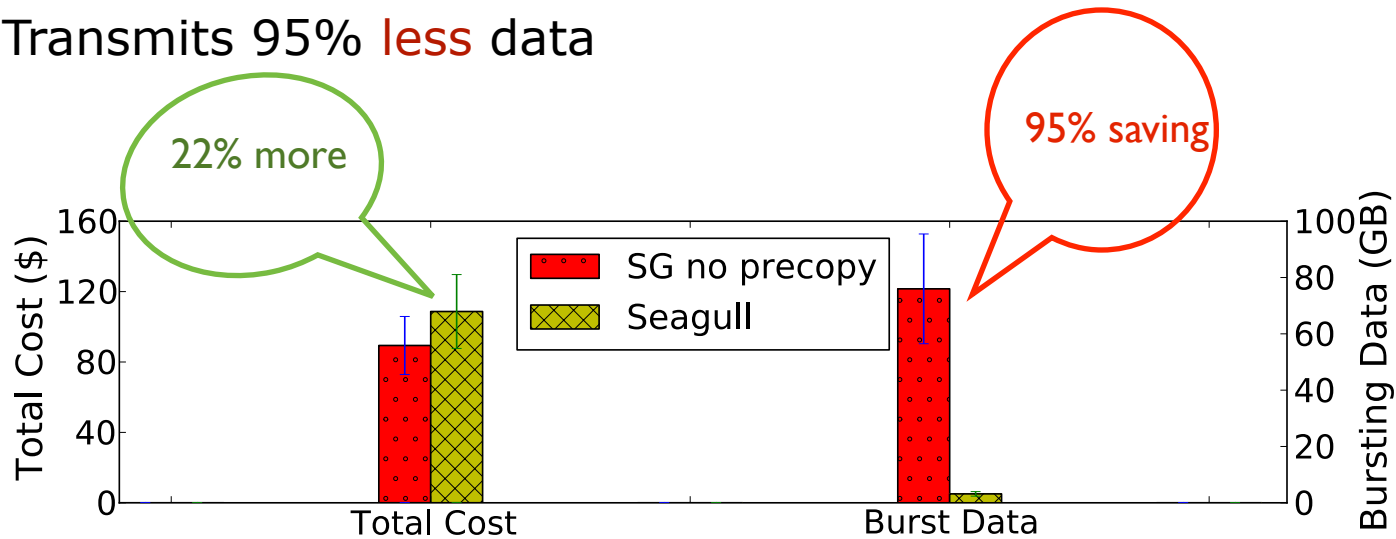
# Cloud Bursting Algorithm Evaluation

- Experiment Setup
  - 3 hosts and 5 Apps
  - Varying workload of A for 4 hours
- Seagull is cost Efficient
  - Lowers cost by 25% over 4 hours



# Precopying Algorithm Evaluation

- Experiment Setup
  - Emulation with 200 quad-core hosts
  - 40 applications, 30% were overloaded
  - Precopying frequency: 1 hr & total time: 24 hrs
- Seagull balances time and cost well
  - Spends 22% **more** money
  - Transmits 95% **less** data





# Summary

- Cloud Bursting
  - Hybrid solution for dynamic workload
  - Good for Enterprises with private data centers
- Seagull: Intelligent and automated Cloud Bursting
  - Determines which Apps to Cloud Burst
    - Lowers Cost by 25%
  - Determines which Apps to Precopy
    - Saves 95% Data Transmission