Seagull: Intelligent Cloud Bursting For Enterprise Applications

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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

Graph showing server needed over the week with peak load on weekdays and low load on weekends.
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
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: App_Costs/ 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
  - Copies app vm state to the public cloud in the background
  - Benefit: Dramatically shortens the migration time
  - Some experiments:

![Bar chart showing time differences with precopying]
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

![Graph showing cost comparison between Cloud Bursting and Naive methods over time.]

- 25% saving
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